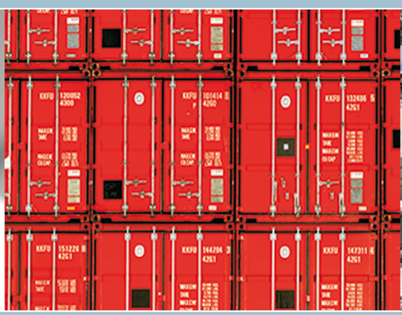
# Product Manual


## Application Inverter
## MOVIDRIVE® technology

Edition 07/2022

26860791/EN



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# 1 Product description

With its brand MOVI-C®, SEW-EURODRIVE is launching a new generation of drive and automation technology. MOVI-C® is the modular automation system that enables the highest level of system and machine automation. MOVI-C® comprises drive technology, motion control, control technology, and visualization.

## 1.1 MOVIDRIVE® technology

In this case, MOVIDRIVE® technology is the application inverter for direct line connection. It is suited to a wide variety of applications, ranging from simple open-loop speed control to servo drives with kinematic model. The product range is used for direct connection to controllers via industrial communication networks, such as PROFINET or EtherNet/IP™.

MOVIDRIVE® technology consists of the following:

- Application inverter basic device
- Application level for using MOVIKIT® software modules of the Drive category
- Optional keypads
- Cards for connecting to industrial communication networks
- Cards for functional safety in functionally different versions
- Cards for connecting additional distance encoders
- Cards for upgrading digital and analog inputs and outputs
- Accessories for EMC-compliant installation
- Accessories for connecting and controlling motors and brakes
- Prefabricated motor and encoder cables

For use in harsh environments, the inverters can be supplied with painted PCBs. The coating of the printed circuit boards increases their resistance against environmental influences.

### 1.1.1 Main features

The inverter has the following main features:

| | |
|---|---|
| Consistency: | Entire MOVI-C® portfolio |
| Engineering software: | MOVISUITE® |
| Software modules: | MOVIKIT® |
| Connection to controllers via: | • PROFINET<br>• PROFIBUS<br>• EtherNet/IP™<br>• Modbus TCP<br>• EtherCAT®<br>• POWERLINK<br>• Safety over EtherCAT®<br>• ISOFAST® |
| Data management: | Via portable memory module |

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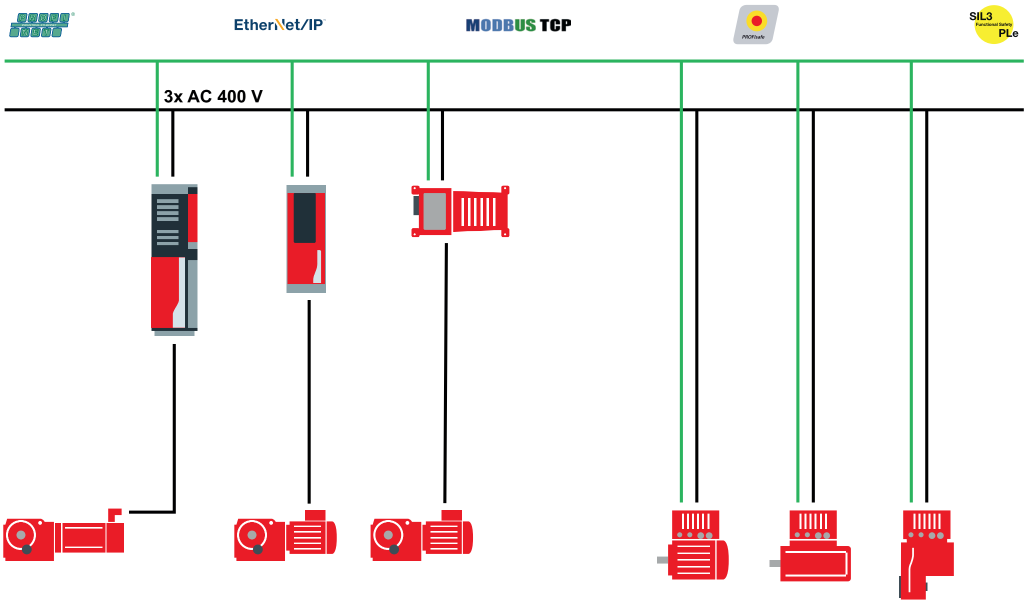
SEW EURODRIVE

| | |
|---|---|
| Nominal line voltage: | • 3 × 380 to 500 V<br>• 3 × 200 to 240 V |
| Degree of protection: | IP20 in accordance with EN 60529 |
| Overload capacity: | 200% |
| EtherCAT®/SBus$^{PLUS}$: | Integrated |
| Multi-encoder interface: | Integrated |
| Digital motor integration interface: | Integrated |
| STO Pl e safety function: | Integrated |
| Output current: | • 2 – 588 A (400 V)<br>• 7 – 108 A (230 V) |
| Control mode: | • V/f for simple applications with asynchronous motors<br>• VFC$^{PLUS}$ for precise control of asynchronous motors<br>• CFC for asynchronous and synchronous servomotors<br>• ELSM® for synchronous motors without encoders |
| Functions: | • Speed control<br>• Torque control<br>• Positioning control |
| Operable motors: | • Rotary and linear asynchronous motors with and without encoders<br>• Rotary and linear synchronous motors with and without encoders |
| DC 24 V switched-mode power supply: | • MDX90A-..: Without DC 24 V switched-mode power supply<br>• MDX91A-..: With DC 24 V switched-mode power supply |
| Card slot 1: | For connection to PROFINET, PROFIBUS, EtherNet/IP™, Modbus TCP, POWERLINK |
| Card slot 2: | For safety module and/or additional encoder |
| Card slot 3: | For I/O extension |

### 1.1.2 Topologies

#### MOVI-C® single-axis automation

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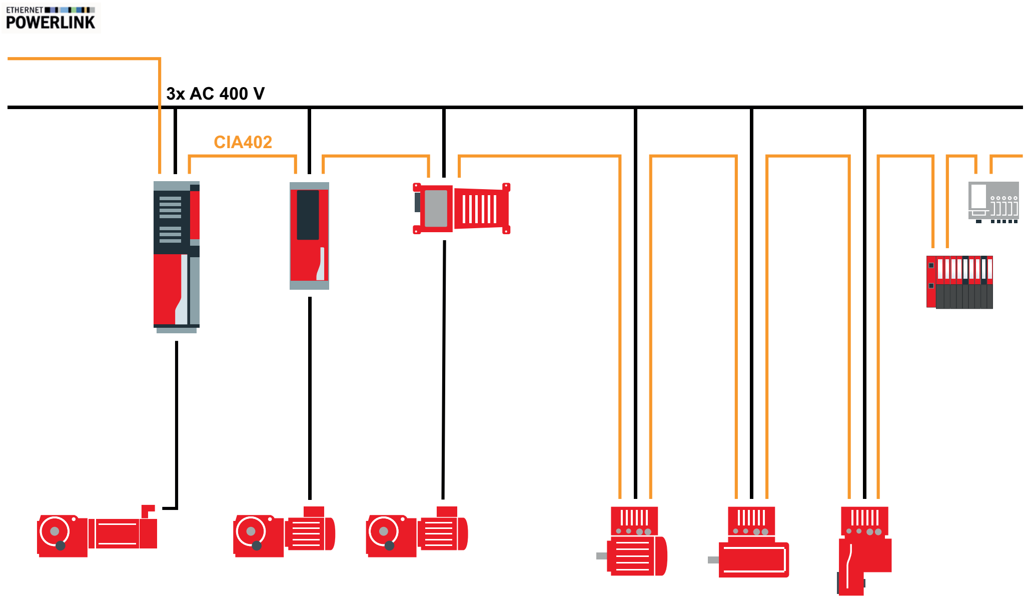
The following devices are connected directly to the higher-level master via fieldbus interfaces:

- MOVIDRIVE® technology application inverter
- MOVITRAC® advanced standard inverter
- MOVIGEAR® performance decentralized drive unit
- MOVIMOT® advanced decentralized drive unit
- MOVIMOT® performance decentralized drive unit
- MOVIMOT® flexible decentralized inverter

The drive function is delivered at speed and safely with graphic editors using the predefined MOVIKIT® software modules. Each drive axis is controlled individually via the network.

Data is stored via a data exchange function, for example, on a memory card in the application inverters and decentralized units.

### POWERLINK

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The CiA402 profile for controlling inverters has established itself in systems with highly specific motion control applications that are calculated in the higher-level master controller.

For control via the CiA402 communication profile, the following devices can be connected to the controller via the integrated EtherCAT® or POWERLINK interface:

- MOVIDRIVE® application inverter
- MOVITRAC® inverter
- MOVIGEAR® performance decentralized drive unit
- MOVIMOT® flexible decentralized inverter

This means integration into the higher-level controller is particularly quick and easy, without any need for extensive conversion work.

### 1.1.3 Engineering software

The MOVISUITE® engineering software is the central component of the MOVI-C® modular automation system. This software allows for intuitive operation with modern operating concepts.

Central functions of MOVISUITE®:

- Network scan
- Device startup and parameterization
- Data storage and data management
- Scope and diagnostics
- Programming environment for MOVI-C® CONTROLLER
- Parameterization for functional safety
- Parameterization and diagnostics environment for application modules

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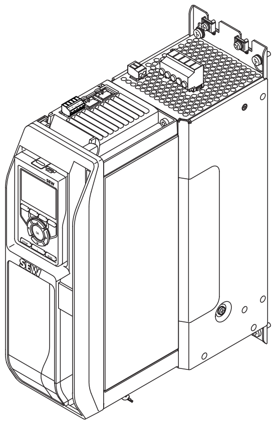
## 1.2 MOVIDRIVE® technology at a glance

| MOVIDRIVE® technology | |
|---|---|
|  | Description: (→ 🗎 17)<br>Technical data: (→ 🗎 58)<br><br>• Nominal output current: 2 to 588 A<br>• Voltage ranges: 3 × 380 to 500 V, 3 × 200 to 240 V<br>• Frequency range: 50 to 60 Hz<br>• Overload capacity: Up to 200% of the nominal output current<br>• System bus: EtherCAT®/SBus$^{PLUS}$<br><br>For more information on the device, refer to the following documents:<br>• "DC Link Connection" manual<br>• "MOVI-C® with regenerative power supply MDR60A0150-503-00" manual<br>• Addendum to the "Information about the EU Ecodesign Regulation 2019/1781" operating instructions |

| Accessories | |
|---|---|
| Prefabricated motor and encoder cables | "Description and technical data:" |
| Braking resistors | "Description and technical data:" (→ 🗎 78) |
| Line filter | "Description and technical data:" (→ 🗎 93) |
| Output filter | "Description and technical data:" (→ 🗎 97) |
| Line choke | "Description and technical data:" (→ 🗎 95) |
| DC link choke | "DC link chokes ZD.." (→ 🗎 101) |
| Output choke | "Description and technical data:" (→ 🗎 99) |
| Valid motor encoders | (→ 🗎 116) |

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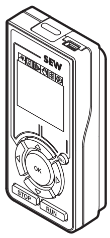
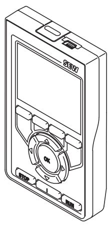
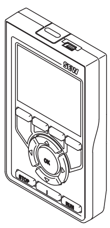
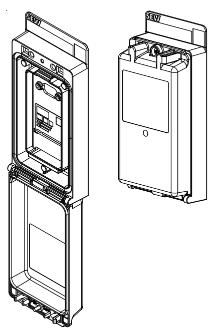
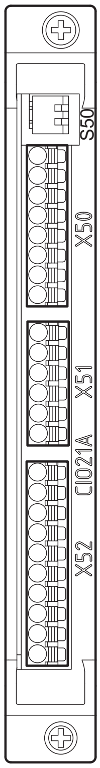
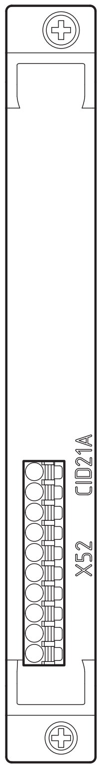
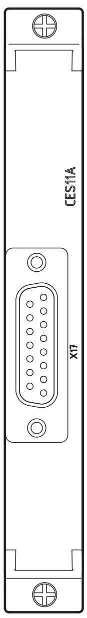
| Keypads | |
|---|---|
| CBG11A<br> | Description: (→ 🗎 19)<br>Technical data: (→ 🗎 65)<br><br>• 1.5" monochrome display (38 mm)<br>• Startup of simple applications (asynchronous motors without an encoder)<br>• Diagnostics<br>• Saving and copying a parameter set<br>• Connection to MOVISUITE® engineering software via keypad<br>• Language: EN |
| CBG21A<br> | Description: (→ 🗎 20)<br>Technical data: (→ 🗎 65)<br><br>• 2.4" color display (61 mm)<br>• Language selection. Selectable languages: DE/EN/FR/IT/ES/PT/HU/ZH/RU<br>• Startup of motor, brake, encoder<br>• Diagnostics<br>• Saving and copying several parameter sets<br>• Connection to MOVISUITE® engineering software via keypad |
| CBG22A<br> | Description: (→ 🗎 21)<br>Technical data: (→ 🗎 65)<br><br>• Simple and intuitive manual mode for maintaining operation in the event of a malfunction in the facility<br>• Extensive diagnostics options<br>• Exclusively read-only access to parameters in order to protect against incorrect use<br>• Optional access to functions and states of the control elements and data transfer for Ethernet-based communication methods of the drive systems |

| Door mounting frame | |
|---|---|
| COG11A<br> | Door mounting frame for the following keypads:<br>• CBG11A<br>• CBG21A<br>• CBG22A<br><br>For information on this device, refer to the "Installation instructions for COG11A". |

<table>
<tr><th colspan="3">Cards</th></tr>
<tr><td colspan="2">Input/output card</td><td rowspan="3">Description: (→ 🗎 23)<br>Technical data: (→ 🗎 66)<br><br>CIO21A<br>• 4 digital inputs<br>• 4 digital outputs<br>• 2 analog inputs<br>• 2 analog outputs<br><br>CID21A<br>• 4 digital inputs<br>• 4 digital outputs</td></tr>
<tr><td>CIO21A</td><td>CID21A</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>CES11A multi-encoder card<br>
</td><td colspan="2">Description: (→ 🗎 23)<br>Technical data: (→ 🗎 68)<br><br>The multi-encoder card makes it possible to evaluate additional encoders.<br><br>For information on this card, refer to the following document:<br>• "Multi-encoder card CES11A" manual</td></tr>
</table>

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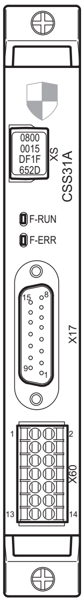
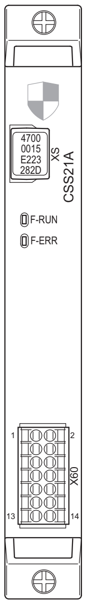
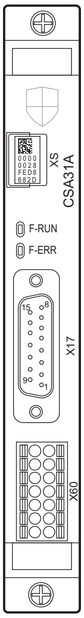
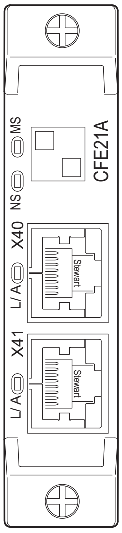
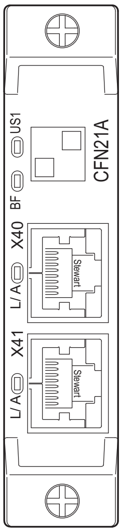
<table>
<tr><th colspan="3">Cards</th></tr>
<tr>
<td>CSS31A/CSB31A safety card<br><br></td>
<td>CSS21A/CSB21A safety card<br><br></td>
<td rowspan="2">Description: (→ 🗎 25)<br>Technical data: (→ 🗎 75)<br><br>The basic device already contains the safety function STO with activation via safe inputs. Higher-level functional safety requirements can be added by inserting a CS.. safety card. Four different variants are used to implement safety functions of varying quality.<br>Safety card properties:<br>• SIL3 in accordance with EN 61800-5-2, EN 61508<br>• PL e in line with EN ISO 13849-1<br>• Can be inserted retrospectively at any time, with no additional external cables needed. Internal connection to motor encoder, safe communication, and STO<br>• Safety card parameters are included in the device data set<br>• Easy replacement during servicing due to pluggable safety key on the safety card<br>• Parameterization and diagnostics using the MOVISUITE® engineering software<br>• Process data and safety data in the same Scope recording<br>• Safe output for activating functionally safe braking systems<br><br>For information on this card, refer to the following document:<br>• "MOVISAFE® CS..A Safety Card" manual</td>
</tr>
<tr>
<td>CSA31A safety card<br><br></td>
<td></td>
</tr>
</table>

| Fieldbus interfaces | |
|---|---|
| CFE21A<br>EtherNet/IP™, Modbus TCP<br> | Description: (→ 🗎 24)<br>Technical data: (→ 🗎 69)<br><br>The CFE21A card acts as the interface to the EtherNet/IP™ and Modbus TCP communication protocols.<br>The POWERLINK fieldbus interface can only be used in the L-0. device variant of the MOVIDRIVE® technology application inverter. |
| CFN21A<br>PROFINET<br> | Description: (→ 🗎 24)<br>Technical data: (→ 🗎 70)<br><br>The CFN21A card acts as the interface to the PROFINET communication protocol. The POWERLINK fieldbus interface can only be used in MOVIDRIVE® technology with the L-0. device variant. |

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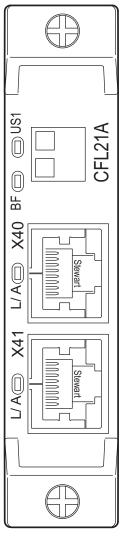
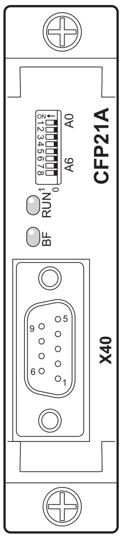
| Fieldbus interfaces | |
|---|---|
| CFL21A<br>POWERLINK<br> | Description: (→ 🗎 25)<br>Technical data: (→ 🗎 74)<br><br>The CFL21A card acts as the interface to the POWERLINK communication protocol. |
| CFP21A<br>PROFIBUS<br> | Description: (→ 🗎 24)<br>Technical data: (→ 🗎 72)<br><br>The CFP21A card acts as the interface to the PROFIBUS communication protocol. |

| Engineering software | |
|---|---|
| Engineering software | MOVISUITE® |

| Software modules | |
|---|---|
| MOVIKIT® | • MOVIKIT® Velocity Drive<br>• MOVIKIT® Positioning Drive<br>• MOVIKIT® RapidCreepPositioning Drive |

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## 1.3 Product overview of MOVIDRIVE® technology

Characteristics

- Coverage of a wide range of power ratings with finely graded performance classes
- Universal use due to a wide voltage range for line connection
- Suitable for TN/TT and IT voltage supply systems
- The EtherCAT®/SBus^PLUS system bus and the EtherNet/IP™, Modbus TCP, PROFINET, PROFIBUS and POWERLINK fieldbus interfaces are available for communication
- 4-quadrant capability due to integrated brake chopper
- High overload capacity of up to 200% of the nominal output current
- Optimized control modes with and without encoder feedback for asynchronous and synchronous motors
- Integrated flux optimization for partial load operation of asynchronous motors and standby mode
- Integrated drive safety function for safe disconnection of PL e in accordance with EN 13849, see chapter "Functional safety"
- Simplified motor startup for asynchronous motors and synchronous motors, and for unknown motors supported by measuring the motor parameters
- Consistent operation in user units

Device data 3 × AC 230 V

| Type designation | Nominal output current at the smallest possible PWM frequency | Recommended motor power ASM | Nominal line current | Size | Technical data |
|---|---|---|---|---|---|
| | A | kW | A | | |
| MDX9.A-0070-2E3-4-T.. | 7 | 1.5 | 6.4 | 2 | (→ 🗎 52) |
| MDX9.A-0093-2E3-4-T.. | 9.3 | 2.2 | 8.4 | | |
| MDX9.A-0140-2E3-4-T.. | 14 | 3.7 | 12.4 | 3 | |
| MDX9.A-0213-203-4-T.. | 21.3 | 5.5 | 18.9 | 4 | |
| MDX9.A-0290-203-4-T.. | 29 | 7.5 | 27.4 | | |
| MDX9.A-0420-203-4-T.. | 42 | 11 | 40.8 | 5 | |
| MDX9.A-0570-203-4-T.. | 57 | 15 | 52 | | |
| MDX91A-0840-203-4-T.. | 84 | 22 | 76 | 6 | |
| MDX91A-1080-203-4-T.. | 108 | 30 | 86 | | |

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Device data 3 × AC 400 V

| Type designation | Nominal output current at the smallest possible PWM frequency | Recommended motor power ASM | Nominal line current | Size | Technical data |
|---|---|---|---|---|---|
| | A | kW | A | | |
| MDX9.A-0020-5E3-4-T.. | 2 | 0.55 | 1.9 | 1 | (→ 🗎 49) |
| MDX9.A-0025-5E3-4-T.. | 2.5 | 0.75 | 2.3 | | |
| MDX9.A-0032-5E3-4-T.. | 3.2 | 1.1 | 2.9 | | |
| MDX9.A-0040-5E3-4-T.. | 4 | 1.5 | 3.6 | | |
| MDX9.A-0055-5E3-4-T.. | 5.5 | 2.2 | 5 | 2 | |
| MDX9.A-0070-5E3-4-T.. | 7 | 3 | 6.3 | | |
| MDX9.A-0950-5E3-4-T.. | 9.5 | 4 | 8.6 | | |
| MDX9.A-0125-5E3-4-T.. | 12.5 | 5.5 | 11.3 | 3 | |
| MDX9.A-0160-5E3-4-T.. | 16 | 7.5 | 14.4 | | |
| MDX9.A-0240-503-4-T.. | 24 | 11 | 22 | 4 | |
| MDX9.A-0320-503-4-T.. | 32 | 15 | 29 | | |
| MDX9.A-0460-503-4-T.. | 45 | 22 | 42 | 5 | |
| MDX9.A-0620-503-4-T.. | 62 | 30 | 56 | | |
| MDX9.A-0750-503-4-T.. | 75 | 37 | 68 | | |
| MDX91A-0910-503-4-T.. | 91 | 45 | 82 | 6 | (→ 🗎 49) |
| MDX91A-1130-503-4-T.. | 113 | 55 | 102 | | |
| MDX91A-1490-503-4-T.. | 149 | 75 | 135 | | |
| MDX91A-1770-503-4-T.. | 177 | 90 | 160 | 7 | |
| MDX91A-2200-503-4-T.. | 220 | 110 | 198 | | |
| MDX91A-2500-503-4-T.. | 250 | 132 | 225 | | |
| MDX91A-3000-503-4-T.. | 300 | 160 | 280 | | |
| MDX91A-3800-503-4-T.. | 380 | 200 | 340 | 8 | |
| MDX91A-4700-503-4-T.. | 470 | 250 | 435 | | |
| MDX91A-5880-503-4-T.. | 588 | 315 | 545 | | |

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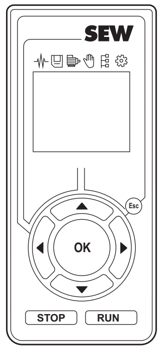
## 1.4 Product overview of accessories

### 1.4.1 CBG11A keypad

The keypad enables convenient startup, operation, parameterization, and diagnostics of inverters of the MOVI-C® modular automation system due to the full-text display.

The keypad has a mini USB interface with gateway function. A connection from the inverter to a PC can be established using this interface for engineering with MOVISUITE®.

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Range of functions of CBG11A:

- Startup of asynchronous motors without encoder, with or without brake, with motor sensor
- Brake selection
- Temperature sensor selection
- Determining the load inertia
- Access to all parameters

A COG11A door mounting frame is available for the keypad.

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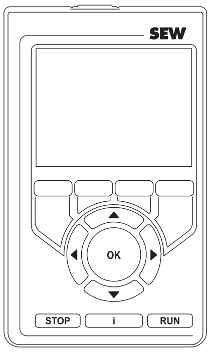
### 1.4.2 CBG21A keypad

The keypad enables convenient startup, operation, parameterization, and diagnostics of inverters of the MOVI-C® modular automation system due to the full-text display.

The keypad has a mini USB interface with gateway function. A connection from the inverter to a PC can be established using this interface for engineering with MOVISUITE®.




30556392331

Range of functions of CBG21A:

- Startup of asynchronous motors
- Startup of synchronous motors
- Brake selection
- Temperature sensor selection
- Selection of encoders
- Determining the load inertia
- Optimization of the drive train in terms of clearance and stiffness
- Access to all parameters

A COG11A door mounting frame is available for the keypad.

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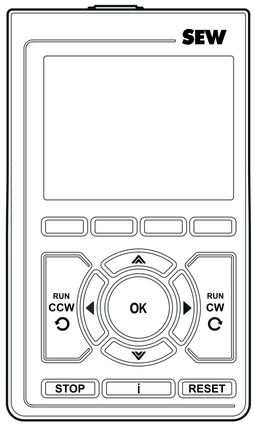
### 1.4.3 CBG22A keypad

The full-text display of the keypad allows for a convenient display of customer-specific information texts of the higher-level controller. It also allows for the operator to perform diagnostics and manual operation.

The keypad has a mini USB interface with gateway function. A connection from the inverter to a PC can be established using this interface for engineering with MOVISUITE®.

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Range of functions of the CBG22A:

- Can be used for diagnostic purposes

A COG11A door mounting frame is available for the keypad.

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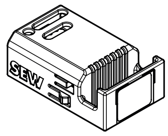
### 1.4.4 CMM11A or CMM21A memory module

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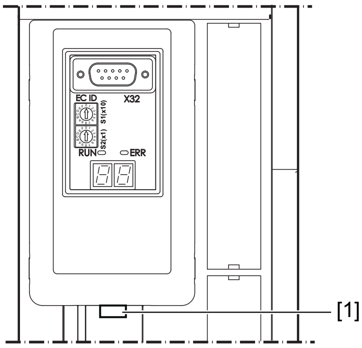
The pluggable memory module is supplied independently of the device variant.

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[1] Memory module

All device data is always stored up-to-date on the memory module. If a device needs to be replaced, the system can be started up again in next to no time without additional tools by simply removing the memory module from the old device and plugging it into the replacement.

The memory module can be simply removed or plugged in when it is switched off.

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### 1.4.5 CID21A input/output card

This input/output card is used to increase the number of digital inputs and outputs of the basic device.

- 4 digital inputs
- 4 digital outputs

### 1.4.6 CIO21A input/output card

This input/output card is used to increase the number of digital and analog inputs and outputs of the basic device.

- 4 digital inputs
- 4 digital outputs
- 2 analog inputs (current/voltage)
- 2 analog outputs (current/voltage)

### 1.4.7 CES11A multi-encoder card

The CES11A multi-encoder card enables evaluation of an additional encoder. The additional encoder can be used as an external encoder or as a motor encoder.

The following encoders are supported:

| |
|---|
| HTL 12/24 V (differential) |
| TTL (differential) |
| RS422 |
| SIN/COS 1 $V_{PP}$ (differential) |
| HIPERFACE® with sin/cos signals 1 $V_{PP}$ |
| SEW encoder (RS485) with sin/cos signals 1 $V_{PP}$, e.g. AK8W, AS7W, AG7W |
| EnDat 2.1 with sin/cos signals 1 $V_{PP}$ |
| SSI encoder with/without sin/cos signals 1 $V_{PP}$ |
| CANopen encoder |

Besides the encoders listed above, further encoders that can be used are described in chapter "Applicable motor encoders from SEW-EURODRIVE".

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### 1.4.8 Fieldbus interface for EtherNet/IP™ and Modbus TCP CFE21A fieldbus card

The fieldbus interface makes it possible to connect the inverter to EtherNet/IP™ or Modbus TCP-based, higher-level automation, project planning, and visualization systems. The fieldbus interface has the following characteristics:

- EtherNet/IP™ or Modbus TCP
- Media redundancy
- Integrated switch with cut-through procedure

When using the fieldbus interface, you can communicate directly with the devices via Ethernet and use the MOVISUITE® engineering software for startup, diagnostics, and parameterization purposes.

An integrated web server also makes it possible to access diagnostic values quickly and easily using a standard Internet browser. You can access this web server at the following address: http: //*IP address of the device*.

### 1.4.9 Fieldbus interface for PROFINET CFN21A fieldbus card

The fieldbus interface makes it possible to connect the inverter to PROFINET-based, higher-level automation, project planning and visualization systems.

When using the fieldbus interface, you can communicate directly with the devices via Ethernet and use the MOVISUITE® engineering software for startup, diagnostics, and parameterization purposes.

An integrated web server also makes it possible to access diagnostic values quickly and easily using a standard Internet browser. You can access this web server at the following address: http: //*IP address of the device*.

### 1.4.10 Fieldbus interface for PROFIBUS CFP21A fieldbus card

This fieldbus interface makes it possible to connect the inverter to PROFIBUS-based, higher-level automation, project planning and visualization systems.

The fieldbus interface has the following characteristics:

- PROFIBUS DP/DP-V1 – cyclic and acyclic communication

For communication, the engineering PC with the USM21A interface adapter or the CBG21A keypad must be connected to the inverter.

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### 1.4.11 Fieldbus interface for POWERLINK CFL21A fieldbus card

The fieldbus interface makes it possible to connect the inverter to POWERLINK-based, higher-level automation, project planning and visualization systems, as well as the CiA402 device profile.

The fieldbus interface has the following characteristics:

- POWERLINK slave (CiA402 drive profile)
- Integrated switch with cut-through procedure

The POWERLINK fieldbus interface can only be used in the L-0. device variant of the MOVIDRIVE® technology application inverter.

When using the fieldbus interface, you can communicate directly with the devices via POWERLINK and use the MOVISUITE® engineering software for startup, diagnostics, and parameterization purposes. The POWERLINK fieldbus interface can only be used in MOVIDRIVE® technology with the L-0. device variant.

An integrated web server also makes it possible to access diagnostic values quickly and easily using a standard Internet browser. You can access this web server at the following address: http: //*IP address of the device*.

### 1.4.12 CS..A safety cards

The MOVISAFE® CS..A safety cards provide further functional safety functions according to EN IEC 61800-5-2 in addition to STO. The MOVISAFE® CS..A safety cards and the CES11A multi-encoder card are intended to be used in the same card slot and thus cannot be used simultaneously. For this reason, the CS.31A safety cards are available with an additional multi-encoder input.

For a detailed description, refer to the "MOVISAFE® CS..A Safety Card" manual.

| | CSB21A | CSB31A | CSS21A | CSS31A | CSA31A |
|---|---|---|---|---|---|
| Safe inputs | 4 | 4 | 4 | 4 | 4 |
| Safe outputs | - | 2 | 2 | 2 | 2 |
| Safe stop functions | STO, SS1-t | STO, SS1-t, SBC | STO, SS1-t, SBC | STO, SS1-t, SBC | STO, SS1-t, SBC |
| Safe movement functions | - | - | SOS, SS1-r, SS2, SLS, SSR, SLA, SSM, SDI | SOS, SS1-r, SS2, SLS, SSR, SLA, SSM, SDI | SOS, SS1-r, SS2, SLS, SSR, SLA, SSM, SDI |
| Safe positioning functions | - | - | SLI | SLI | SLI, SLP, SCA |
| Other functions | - | - | - | - | SBT |
| Multi-encoder input | - | yes | - | yes | yes |
| Safe communication | PROFIsafe, FSoE, ISOFAST® | | | | |

## 1.5 FCB concept

FCB = Function Control Block

The FCB concept describes the modular firmware design of MOVI-C® inverters. This feature ensures that a wide range of drive functions can be selected or deselected quickly and easily using control words.

All primary functions are selected as FCBs. For example, positioning control requires the FCB 09, while speed control is implemented with FCB 05.

You can switch between different FCBs at any time. Switching to another FCB is performed with a maximum delay of 0.5 ms.

Different priorities are assigned to the FCBs. If an FCB with a higher priority than the currently active FCB is selected, the FCB with the higher priority is activated.

The FCBs are sorted in descending order of their priority in the following list:

- FCB 01 Output stage inhibit
- FCB 14 Emergency stop
- FCB 13 Stop at application limits
- FCB 18 Rotor position identification
- FCB 25 Motor parameter measurement
- FCB 12 Reference travel
- FCB 04 Manual mode
- FCB 20 Jog mode
- FCB 19 Position hold control
- FCB 21 Brake test
- FCB 10 Interpolated position control
- FCB 09 Position control
- FCB 06 Interpolated speed control
- FCB 05 Speed control
- FCB 08 Interpolated torque control
- FCB 07 Torque control
- FCB 26 Stop at user limits
- FCB 02 Default stop

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### 1.5.1 Description of the FCBs

**FCB 01 Output stage inhibit**

Activating FCB 01 stops the connected motor via the motor brake. If no brake is installed, the motor coasts to a stop.

**FCB 02 Default stop**

FCB 02 stops the drive with the preset profile value "Maximum deceleration". This value is limited by "Application limit – deceleration".

FCB 02 is active (default) when no other FCB is selected.

FCB 02 is selected by the system, not by the operator.

**FCB 04 Manual mode**

The function block can be selected and activated via the function "Manual mode" using the MOVISUITE® engineering software. Manual mode is used for startup or for teach mode without higher-level controller.

FCB 04 is selected by the system, not by the operator.

**FCB 05 Speed control**

The inverter can be operated as a speed-controlled axis.

The user can specify profile values for acceleration, deceleration, and jerk as the basic conditions for speed control. The actual speed setpoint for the drive controller is generated in the controller cycle by a profile generator integrated in the inverter using the specified limit values.

**FCB 06 Interpolated speed control**

FCB 06 is used for cyclical speed setpoint inputs from higher-level controllers.

In multi-axis applications, a controller often calculates a path profile for several drive axes. The axis is only assigned setpoints (speed/torque and torque limits/precontrol values/inertia) that it has to follow. The axis limits the setpoints using the application limits. The course of the path curve profile is controlled by the controller.

The setpoint cycle of the controller usually does not correspond to the setpoint cycle of the axis. If the axis were to "see" the same setpoint for several cycles, a step-shaped actual value would result. To prevent this from happening, the axis interpolates intermediate values. To do so, the setpoint cycle of the controller has to be known.

**FCB 07 Torque control**

The inverter can be operated as a torque-controlled axis.

The user can specify profile values for deceleration and jerk as the basic conditions for torque control. The actual torque setpoint for the drive controller is generated in the controller cycle by a profile generator integrated in the inverter using the specified limit values.

During torque control, the maximum speed is restricted by the speed limits so that the drive cannot permanently accelerate with the preset setpoint torque while the counter-torque is too low.

**FCB 08 Interpolated torque control**

FCB 08 is used for cyclical torque setpoint input from a higher-level controller.

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This higher-level controller usually calculates a track profile for several drive axes. The axis is then assigned just one setpoint (torque, torque limits, precontrol values, inertia) that it has to follow.

The inverter limits the setpoints using the application limits. The path curve profile is controlled by the controller.

The cycle in which the controller sends the setpoints to the axis does not usually correspond to the setpoint processing cycle of the inverter. If the inverter were to "see" the same controller setpoint for several cycles, a step-shaped actual torque value would result.

To prevent this from happening, the axis can calculate (interpolate) intermediate values if it knows the controller cycle. The inverter can be set to different cycle times of higher-level controllers.

### FCB 09 Position control

FCB 09 is used for positioning to make it possible to use a position profile for reaching the target position. This position profile is parameterized by the profile generator.

The inverter additionally provides several positioning modes, which are described as follows:

**Absolute positioning:**

The position setpoint in user units is interpreted as an absolute target and is converted and executed in system units.

The travel range in system units is $-2^{31}$ to $2^{31}$ -1. If the travel range is exceeded after calculation, the FCB issues an error.

**Relative positioning:**

The position setpoint in user units is interpreted as an offset to the latest setpoint and is added to the last setpoint after conversion into system units.

If the time calculated in system units is outside the travel range of $-2^{31}$ to $2^{31}$ -1, the FCB issues an error.

**Modulo in positive direction with absolute position specification:**

The position setpoint in user units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo min."

Upper limit = "Modulo max."

If the position setpoint is outside this range, an error is issued. The drive always turns in a positive direction to reach the position.

**Modulo in negative direction with absolute position specification:**

The position setpoint in user units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo min."

Upper limit = "Modulo max."

If the position setpoint is outside this range, an error is issued. The drive always turns in a negative direction to reach the position.

**Modulo with shortest distance with absolute position specification:**

The position setpoint in user units is interpreted as the absolute position. It must be within the modulo range of the active drive:

Lower limit = "Modulo min."

Upper limit = "Modulo max."

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If the position setpoint is outside this range, an error is issued.

The direction of the drive is determined using the last setpoint position (= current actual position after activation without an "In position" message) and the current setpoint position. From here, the shortest distance is determined and the direction of rotation for positioning is specified accordingly.

### FCB 10 Interpolated position control

FCB 10 is used for cyclic preselected position setpoints of higher-level controllers.

In multi-axis applications, a higher-level controller usually calculates a track profile for several drive axes. The axis is only assigned setpoints (position, speed, torque, torque limits, precontrol values, inertia) that it has to follow. The axis limits the setpoints using the application limits. The course of the profile of the path curve is controlled by the controller.

The setpoint cycle of the controller does usually not correspond to the setpoint cycle of the axis. If the axis were to "see" the same setpoint for several cycles, a step-shaped actual value would result. To prevent this from happening, the axis can interpolate intermediate values. To do so, the setpoint cycle of the controller has to be known.

### FCB 12 Reference travel

To perform positioning operations, a drive has to be referenced to a defined start or reference position within the permitted travel distance.

From this reference position, positions such as the machine zero can be specified and approached. With each restart of the inverter, referencing the position encoders is always necessary if position encoders do not have an absolute position detection. When using absolute encoders, the absolute position is immediately known when starting the system. An absolute encoder still has to be referenced to match the displayed position with the plant's reference system.

Several reference travel types are available for referencing and for finding the reference point:

0: Deactivated

1: Zero pulse – negative end

2: Reference cam – negative end

3: Reference cam – positive end

4: Positive limit switch

5: Negative limit switch

6: Reference cam flush – limit switch positive

7: Reference cam flush – limit switch negative

8: Referencing to reference travel

9: Positive fixed stop

10: Negative fixed stop

11: Absolute position of encoder

### FCB 13 Stop at application limits

When FCB 13 is activated, the drive stops with speed control using the preset application limit deceleration.

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### FCB 14 Emergency stop

When FCB 14 is activated, the drive stops with the preset emergency stop deceleration.

Note that the application limits are not taken into account.

### FCB 18 Rotor position identification

For the operation of permanent magnet synchronous motors, the exact position information of the rotor is required for closed-loop control.

FCB 18 is required for the encoder calibration of rotary and linear synchronous motors with encoder. FCB 18 requires an electrical startup of the drive.

The drive must be disconnected from the load, which means also from the gear unit.

For a third-part motor, it is recommended to run FCB 25 before performing rotor position identification.

### FCB 19 Position hold control

When FCB 19 is activated, the drive stops with speed control. After the standstill of the drive, the position is kept with position control as long as FCB 19 is active.

### FCB 20 Jog mode

FCB 20 is used for setup mode when a higher-level controller is used.

FCB 20 can only be activated in operating modes with encoder feedback.

FCB 20 allows the user to move an axis in positive and negative direction.

Control is performed via control signals that are specified by means of control words, via digital inputs of a higher-level controller or via input terminals.

For startup or for setup mode without higher-level controller, use the manual mode of the MOVISUITE® engineering software, see "FCB 04" (→ 🗎 27).

### FCB 21 Brake test

The FCB 21 tests the function and performance of up to 2 brakes. The function separately applies an adjustable torque (static test) to the applied brakes.

The brake test can be adapted to the various requirements. The test result "passed" or "failed" is available as feedback for each brake. Other measured values are also available.

An application-specific load torque must be taken into account when specifying the torque. The user can specify values. Alternatively, FCB 21 can determine the current load situation itself, which simplifies startup and offers more flexibility.

FCB 21 works with drive train 1. An encoder feedback (motor encoder or external encoder) that matches the used VFC$^{PLUS}$ or CFC control mode is required.

When testing a brake, the brake control is integrated via DB0/DB00.

When testing two brakes, additional wiring is required in the brake control.

### FCB 25 Motor parameter measurement

FCB 25 is used for determining the necessary parameters from the electric equivalent wiring diagram during startup.

The nameplate data of the connected motor is required for motor parameter measurement.

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After the motor parameter measurement has been completed, the motor is completely started up electrically. Values that are not yet final at this stage, such as maximum speed and maximum torque, are estimated. The values have to be corrected at a later time to reach the full performance of the motor.

The FCB 25 should only be called up if no output filter is used. Otherwise, the FCB provides incorrect results because of the output filter inductance.

Calling FCB 25 is generally recommended for third-party motors. FCB 18 must be executed afterward for encoder calibration with synchronous motors, if required.

#### FCB 26 Stop at user limits

FCB 26 is used for stops at user limits. The user limits are either available as local setpoints or initiate the deceleration ramp set via the fieldbus.

You can choose between a speed-controlled ramp and a position-controlled ramp. In contrast to other stop FCBs (FCB 13/FCB 14), the FCB 26 has a very low priority.

This allows you to select FCB 26 as default (e.g. bit in the control word that selects this FCB is always TRUE). This means that FCB 26 is always active when all other FCBs are deactivated. This makes it possible to always stop with position control.

FCB 26 provides lag error monitoring in position-controlled mode.

When the stop is reached, the brake remains released and the motor remains energized.

### 1.5.2 Setpoints and limits in the FCBs

#### Setpoint connection

The following table shows which setpoints are used by which FCBs:

| Parameter | FCB | | | | | | |
|---|---|---|---|---|---|---|---|
| | 05 | 06 | 07 | 08 | 09 | 10 | 20 |
| Position | | | | | x | x | |
| Speed | x | x | | | | o | o |
| Torque | | | x | x | | | |
| Acceleration precontrol | | o | | | | o | |
| Mass moment of inertia | | o | | x | | o | |
| Torque precontrol | | o | | x | | o | |
| Correcting value of external position controllers | | o | | | | | |

x Always active

o Depending on FCB setting

## INFORMATION

In the V/f control mode, only the "Speed" setpoint is used.

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### Profile value connection

The following table shows which profile values are used by which FCBs:

| Parameter | FCB | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 02 | 05 | 06 | 07 | 08 | 09 | 10 | 13 | 14 | 20 | 26 |
| Maximum positive speed | | | | x | x | x | | | | | |
| Maximum negative speed | | | | x | x | x | | | | | |
| Maximum acceleration | | x | | | | x | | | | o | |
| Maximum deceleration | x | x | | | | x | | | | o | x |
| Jerk time | | x | | x | | x | | | | o | x |
| Maximum torque Q1 to Q4 | | x | x | x | x | x | x | o | o | | |

x Always active

o Depending on FCB setting

## INFORMATION

In the V/f control mode, the "Maximum torque Q1 to Q4" profile value is not used.

### Limit values

The following table shows which limit values are used by which FCBs:

| Parameter | FCB | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 02 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 12 | 13 | 14 | 19 | 20 | 21 | 26 |
| Positive speed | | x | x | x | x | x | x | x | x | | | | x | | |
| Negative speed | | x | x | x | x | x | x | x | x | | | | x | | |
| Acceleration | | x | x | | | | x | | x | | | x | x | | |
| Deceleration | x | x | x | | | | x | | x | x | | x | x | + | x |
| Jerk time | x | x | x | | x | | x | | x | x | x | x | x | + | x |
| Torque | x | x | x | x | x | x | x | x | x | x | x | x | x | + | x |
| Apparent output current | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Voltage limit | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| Emergency stop deceleration | | | | | | | | | | | x | | | | |

x Always active

\+ Only active if FCB 21 is activated with a rotating drive. With these parameters, the drive is stopped before FCB 21 is executed.

## INFORMATION

In the V/f control mode, the "Torque" limit value is not used.

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## 1.6 Control modes

The following control modes are available:

- V/f
- VFC$^{PLUS}$
- CFC
- ELSM®

### 1.6.1 Description of the control modes

The characteristics of the motor connected to the inverter are influenced by the control modes used.

**V/f**

V/f control is intended for easy controlled operation of asynchronous motors without encoder feedback. The procedure operates an asynchronous machine on a parameterizable voltage/frequency characteristic. To keep the magnetizing current on a constant level, the voltage (V) is adjusted in proportion to the frequency (f).

The actual slip is estimated and can be compensated.

V/f control is suitable for applications with a limited speed setting range, where no dynamic step changes in load occur and where there are small requirements regarding the control characteristics.

V/f control is suitable for group drives. A group drive is an electrical parallel connection of several identical or different motors at one inverter. The motors do not have a rigid mechanical connection.

*Speed control*

The V/f mode is an encoder-less mode and calculates the actual speed value. The calculation is always based on the electrical values of the motors. Therefore, information from a potentially existing encoder system is not used.

If an encoder is parameterized in the encoder assignment as "Actual speed source", the speed measured by this encoder is issued as the actual speed by the inverter. Otherwise, the model speed calculated by the V/f method based on stator frequency and slip, is issued as the actual speed.

The V/f mode does not have a higher-level speed controller, speed controller parameterization is therefore not possible. An acceleration and torque precontrol is also not possible.

**VFC$^{PLUS}$**

VFC$^{PLUS}$ is a high-performance control mode that is able to operate asynchronous motors with very high torque dynamics with or without rotary encoder.

The control mode can be operated as speed or torque control.

This control mode calculates all important state variables for controlling the motor by using a motor model. As a result, optimal magnetic conditions are always achieved for the motor.

For applications with a large speed setting range (especially for low speeds through to idle state) and high requirements regarding the control characteristics or for drives with high dynamic step changes in load, a rotary encoder is absolutely necessary.

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For applications with low requirements regarding the speed control characteristics and the torque dynamics, an encoder is not necessary. Without a rotary encoder, the electric rotor frequency is calculated in a model. In this case, stable stationary operation of the mode at < 0.5 Hz is not possible.

Due to the good torque dynamics, the VFC$^{PLUS}$ control mode remains stable even in the event of sudden load changes and has a high torque accuracy. Typical applications for the VFC$^{PLUS}$ control mode are speed-controlled asynchronous machines with high demands on the speed and torque stability.

Switching to a rotating motor is possible (flying start function).

*Speed control*

A higher-level speed control loop that has to be parameterized accordingly is always used for speed control.

If the control mode is operated without an encoder, the actual speed of the motor is calculated by the control mode.

If an encoder is used, the angle information of this encoder is used for the control mode. The actual speed of the motor is calculated from this encoder. The maximum dynamics of the control loop are reached with a high-resolution encoder.

*Torque control*

The torque control operating mode can be selected independently of an encoder and does not need an encoder. With an encoder, however, stable stationary operation at stator frequency 0 Hz is also possible.

A higher-level speed control loop that has to be parameterized accordingly is always used for torque control.

*Position control*

Position-controlled operation is only possible with an encoder, as the actual position is calculated from the parameterized encoder. This encoder can either be mounted on the track or on the motor.

The accuracy of the position control can be increased with a motor encoder.

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## CFC

The CFC control mode is a current-controlled control mode. The CFC control mode allows the operation of asynchronous and synchronous motors with maximum torque dynamics. For this purpose, the current components for the magnetic flux and for the torque generation are controlled separately.

The control mode requires information about the rotor angle and the motor speed. For this reason, an encoder feedback (motor encoder) is always necessary.

For asynchronous motors, only the relative rotor angle is necessary. Thus, an incremental encoder is sufficient.

The control mode requires the absolute position for synchronous motors. In the case of encoder types that do not provide an absolute value, a commutation must be performed before every first enable after booting the system (FCB 18).

The advantage of the CFC control mode is the very high dynamics that can be achieved, as a control reserve for reaching the dynamic maximum torque is always available. For this reason, the CFC control mode is suitable for drives with highly dynamic motion control.

## ELSM®

The ELSM® control mode allows the operation of permanent-field synchronous servomotors without encoder.

This procedure is exclusively intended for applications in horizontal materials handling technology with one single motor. It is not permitted to use it in vertical drives, inclining tracks or as a group drive.

Make sure that the inverter provides at least 150% $I_0$ of the motor throughout the rotor alignment process.

Switching to a rotating motor is possible (flying start function). Continuous operation is only permitted above a transition speed of approx. 2% of the nominal motor speed.

*Rotor adjustment/rotor position measurement*

When the inverter is enabled in ELSM® control mode, the rotor position of the permanent-field synchronous motors is unknown. For this reason, the rotor position has to be determined first or the rotor has to be adjusted by turning so that its angular position is defined.

### Measuring the rotor position

The rotor position of the synchronous motor is measured with test pulses for each enable. This occurs at standstill. If a brake is used, this brake remains applied. The measurement is finished after a maximum of 50 ms. After the measurement is completed, the synchronous motor accelerates to the setpoint speed. A prerequisite for the measurement is the one-time determination of the complete motor parameters with the FCB 25 motor parameter measurement.

SEW-EURODRIVE recommends measuring the rotor position.

### Adjusting the rotor

If the complete motor data is not known, the rotor is moved to a defined position at each enable. During adjustment, a motor movement takes place depending on the number of poles of the motor. If a brake is used, this brake is released. The adjustment is completed after 1 s.

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*Speed control*

For operation of synchronous motors in the ELSM® control mode, there are two modes, i.e. open-loop and closed-loop operation.

Open-loop operation is active when starting from standstill and below a transition speed. The transition speed is about 2% of the nominal speed. Above this transition speed value, the drive is operated in closed-loop operation.

The time during which the drive is in open-loop operation should be as short as possible since the position of the rotor is not detected in this mode and the drive is only operated in speed-controlled mode.

If the drive is in open-loop operation, a current of at least 150% of the standstill current of the connected motor is impressed to stabilize the drive, which is why the motor heats up significantly at standstill and at low speeds.

*Torque control*

The ELSM® control mode enables the "Torque control" operating mode; however, only above the transition speed in closed-loop operation.

Practical meaning: The FCB 07 "Torque control" can only be activated when the flying start function is active and above the transition speed (example: winding drive). If the speed is too low, the system shuts down with a fault message.

The transition speed can be reached either by an external drive or by speed control of the inverter in the FCB 05.

*Flying start function*

If it cannot be ensured that the motor is at standstill when starting, the flying start function must be activated. This way, the ELSM® control mode can also be enabled for a turning motor.

If the speed can be calculated plausibly, the control mode proceeds to speed-controlled operation. If this is not the case, the drive proceeds to the "rotor adjustment" or "rotor measurement" function and then to open-loop operation.

## 1.7 Energy-saving functions

### 1.7.1 Flux optimization

Flux optimization is a function that allows for operating an asynchronous motor in control mode $VFC^{PLUS}$ with minimal losses. Depending on the torque setpoint, the magnetic flux is managed in such a way that the motor is operated with minimum current. In partial load operation, as well as in case of overload, the total losses of the motor can be significantly reduced. This function has no influence in the range of the nominal torque or a bit below, as the motor is usually operated at almost optimum conditions.

For system-related reasons, the torque control times are longer with flux optimization than without flux optimization, due to necessary changes in flux. The flux optimization is especially suitable for applications with little dynamics, such as fans, pumps, escalators, and conveyor systems with constant speed.

The flux optimization can reduce magnetization losses in the motor by up to 70%.

### 1.7.2 Standby mode

Standby mode is intended for times in which operation is paused. The main difference between disconnection of the DC 24 V supply voltage and standby mode is that switching from standby mode to operation only takes approx. 500 ms and that bus communication is maintained. This allows for reducing the energy consumption even during short pauses.

The following functions are deactivated in standby mode:

- 7-segment display
- STO function
- Digital outputs on basic device and cards
- Analog outputs on card
- Power section control
- Fan in power section
- Encoder supply and encoder evaluation on basic device and card (optional)

Standby mode can be activated via a digital input or via a control word bit. Bus communication is active without restrictions in standby mode.

#### Energy consumption in standby mode

| Size | DC 24 V power consumption in standby mode |
|---|---|
| 1 – 5 | 3.6 W |
| 6 | 10.3 W |
| 7 | 8.4 W |

The energy-saving function "standby operation" can reduce the DC 24 V power consumption by 89%.

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## 1.8 MOVISUITE® engineering software

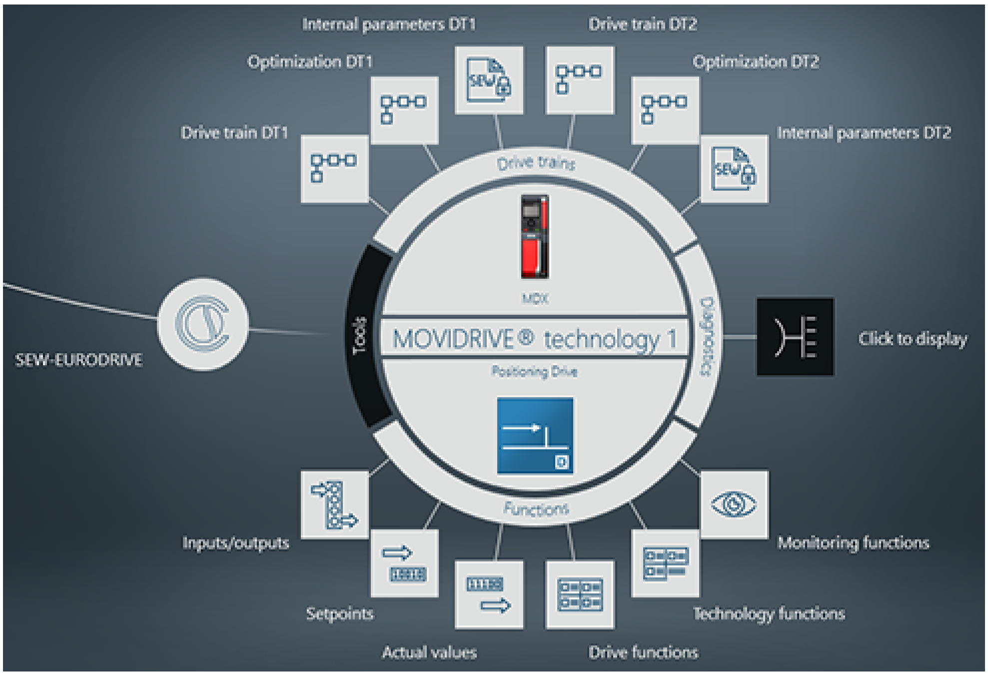
With its innovative design of the user interface and optimal user guidance, MOVISUITE® is a future-oriented engineering software from SEW-EURODRIVE.

The MOVISUITE® engineering software is the operating platform for all hardware and software components of the MOVI-C® modular automation system. The concept of the user interface enables users to configure, parameterize, as well as start up, and monitor their applications almost intuitively (simple auto startup with MOVILINK® DDI).

Using the various views, the users can switch to the suitable display mode depending on their requirements.

Circle view

In the circle view, for example, single components can be edited in a clear structure.

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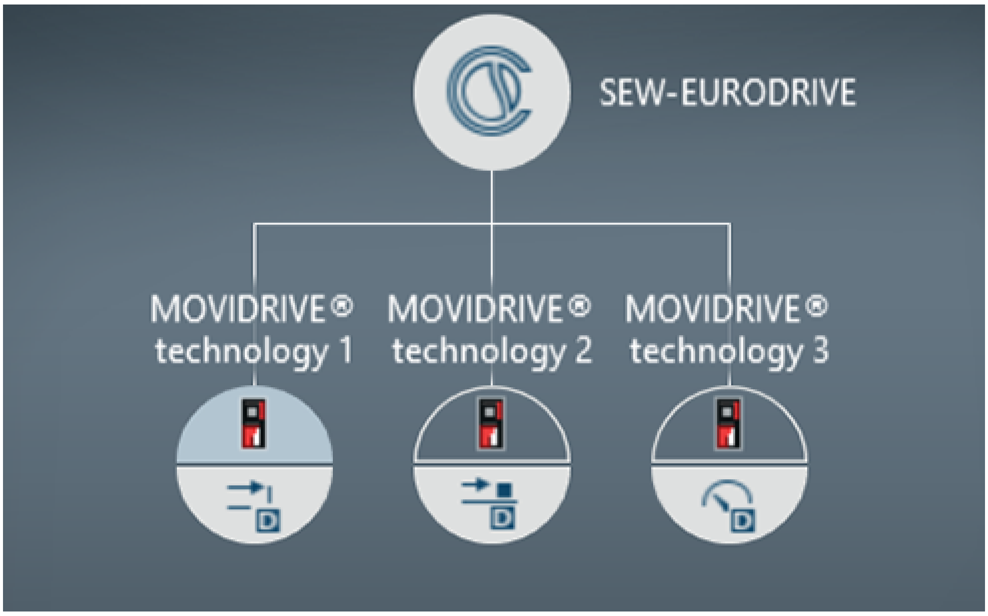
Tree view

The tree view provides an overview of the entire network. The tree view shows large systems and machines in a clear manner. With various analysis functions (digital scope) already integrated in the standard scope, MOVISUITE® allows for a coordinated position/speed/torque controller for dynamic setting of the applications.

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The view can be selected depending on the application and personal preferences; the functionality is identical in both views.

The user interface concept of MOVISUITE® allows the system structure to be arranged using freely definable structure nodes. These structure nodes are displayed with a varying level of detail in the views mentioned above.

The data management has clearly marked transfer directions, and thus is clearly structured during data transmission.

The scan function enables the reading of available devices, and the creation of these devices as projects in MOVISUITE®.

The drive train can be set up from motor to gear unit using the product catalog. Furthermore, encoders, brakes, control modes, and user units can be selected and parameterized.

The data required for the drive train can typically be read off the nameplates of the motor and gear unit and entered, or selected via a catalog function in the engineering software.

Another variant is automatic identification of the gear unit motor data by output of the electronic nameplate stored in the motor encoder. During startup, the engineering software checks whether an electronic nameplate is present in the encoder and suggests the use of this data.

The Scope recording function is available for diagnostic purposes. This enables a diagnostics overview of connected devices and functions. Long-term data acquisition on the engineering PC hard disk is also possible.

Manual mode can be intuitively used for each application via the new interface.

## 1.9 MOVIKIT® software modules

The inverter can be ordered with a specific application level. The use of MOVIKIT® software modules in the Drive category is allocated to every application level.

| Application level | MOVIKIT® Drive category software module |
|---|---|
| 0 | Standard delivery state:<br>e.g. activation for MOVIKIT® Velocity |
| 1 | e.g. activation for MOVIKIT® Positioning |
| 2 | e.g. activation for customer-specific solutions |

MOVIKIT® software modules are standardized control programs with a defined process data interface and a user-friendly configuration and diagnostics interface. The MOVIKIT® software modules in the Drive category make it much easier to connect to a higher-level control program.

Features

- Wide range of functions
- User-friendly user interface
- You only have to enter the parameters needed for the application
- Guided parameter setting instead of complicated programming
- No programming experience required
- No lengthy training, therefore quick project planning and startup
- All motions are controlled directly in the application inverter

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## 1.10 Digital motor integration with MOVILINK® DDI interface

### 1.10.1 Digital motor integration

With the "digital motor integration", SEW-EURODRIVE presents solutions for integrating drive technology into the networked world. The MOVILINK® DDI digital data interface connects the inverter with the drive and integrates the previously unconnected drive into the data network.

Features:

- Voltage supply of the MOVILINK® DDI electronics in the drive
- Detection of the drive, its options and their properties
- Data transmission for identification, startup, operation, and diagnostics
  - Electronic nameplate
  - Encoder data
  - Motor temperature
  - Data of additionally integrated or external sensors, such as sensors for detecting brake wear

Assistance functions:

- Automatic startup of the drive (motor, gear unit, sensors, actuators)
- Simple startup of the speed controller with adjusted dynamics settings
- Automatic detection of a drive replacement. Simple new startup in case of a modified drive

This makes detection, startup and communication with the drive as simple as with a USB interface between a computer and an external device.

### 1.10.2 Key features of MOVILINK® DDI

**Detect: Motor functions**

- MOVILINK® DDI communication unit in the motor, connection of optional sensors
- Integrated data memory for automatic startup of the motor
- Optional sensors detect, for example:
  - Motor temperature and motor protection via temperature sensor
  - Motor position via different encoders
  - Integrated brake control with wear measurement
  - Vibration
  - Acceleration
  - Mounting position
  - Humidity
  - Air pressure
  - Magnetic fields
- Connection to the motor via hybrid connector or cable gland
- Available for asynchronous motors, synchronous motors, linear motors

**Transfer: Interface**

- Digital interface between motor and inverter
- Transfer of process data

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- Transfer of functionally safe data (in preparation)
- Coaxial cable for data transmission with high bandwidth and high interference immunity
- Cable length up to 200 m
- Voltage supply with modulated data transmission
- Single-cable technology for controlling motor, brake control, and data transmission

**Receive: Inverter functions**

- Automatic startup using startup data saved in the motor
- Automatic detection of motor replacement
- Automatic new startup if the replacement motor is different
- Display and processing of motor data
- Provision of the voltage supply for motor electronics
- Transfer of sensor data to the PLC or to a DriveRadar® edge processing unit or to the DriveRadar® Smart Data Collector

### 1.10.3 MOVILINK® DDI interface

The MOVILINK® DDI interface connects inverters of the MOVI-C® modular automation system with drives. The MOVILINK® DDI interface is based on a coaxial signal cable. The coaxial signal cable is used for supplying the motor electronics with power and for communication with the drive.

The inverters can be connected to the drive in different ways depending on the requirements:

- Hybrid cable for single-cable connection (alternatively for fixed installation and for cable carrier installation) consisting of:
  - Motor cable
  - Brake control
  - PE
  - Coaxial signal cable
- Separate coaxial signal cable in addition to the motor cable for two-cable connection, especially for large cross sections for controlling the motor.
- The motor can be connected via cable glands on the terminal box or at the plug connector.

# 2 Technical data

## 2.1 Marks

### 2.1.1 Basic device

The application inverter complies with the following directives and guidelines:

| Mark | Definition |
|---|---|
| CE | The CE mark states compliance with the following European directives:<br>• Low Voltage Directive 2014/35/EU[1]<br>• EMC Directive 2014/30/EU<br>• Machinery Directive 2006/42/EC<br>• Directive 2011/65/EU for limiting the use of certain hazardous substances in electric and electronic equipment<br>• Ecodesign Directive 2009/125/EC |
| | The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU. |
| EAC | The EAC mark states compliance with the requirements of the technical regulations of the Customs Union (Eurasian Economic Union), Armenia, Belarus, Kazakhstan, Kyrgyzstan, and Russia. |
| | The RCM mark declares compliance with the technical regulations of the Australian Communications and Media Authority (ACMA). |
| 50 | The China RoHS mark states compliance with Directive SJ/T 11364-2014 for limiting the use of hazardous substances in electric and electronic equipment and their packaging. |
| | The NM mark states compliance with the following Moroccan directives[2]:<br>• Low Voltage Directive no. 2573-14 (16 July, 2015)<br>• EMC Directive N° 2574-14 (16 July, 2015) |
| UA.TR. 013 | The UA.TR mark declares conformity with the technical regulations of Ukraine. |
| KC | The KC mark declares compliance with §3 of Article 58-2 for the Korean Radio Wave Act. |

| Mark | Definition |
|---|---|
| UK CA | The UKCA mark states compliance with the following British directives[2]<br>• Low Voltage Directive S.I. 2016/1101[3]<br>• EMC S. I. 2016/1091<br>• Machinery Safety S. I. 2008/1597<br>• Directive S. I. 2012/3032 for limiting the use of certain hazardous substances in electrical and electronic equipment<br>• Ecodesign Regulation S. I. 2019/539 |
| c UL US LISTED | The UL and cUL marks state UL approval.[4]<br>cUL is equivalent to CSA approval. |

1) For products with functional safety, the requirements from the Low Voltage Directive are fulfilled by the Machinery Directive.
2) The selectable approvals UKCA (Great Britain) and NM (Morocco) are mutually exclusive.
3) For products with functional safety, the requirements from the Low Voltage Directive are fulfilled by the Machinery Safety S.I. 2008/1597.
4) The UL and cUL mark for the following devices is still in preparation at the time of publication of this document: MDX91A-1770 – 3000-5_3-..

### 2.1.2 Accessories

**BW.. braking resistors**

| Mark | Definition |
|---|---|
| CE | The CE mark states compliance with the following European directives:<br>• Low Voltage Directive 2014/35/EU<br>• Directive 2011/65/EU for limiting the use of certain hazardous substances in electric and electronic equipment |
| | The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU. |
| 25 50 e | The China RoHS mark declares compliance with the Directive SJ/T 11364-2014 regarding the restriction of use of certain hazardous substances in electrical and electronic equipment and its packaging. |
| UK CA | The UKCA mark states compliance with the following British guidelines:<br>• Low Voltage Directive S. I. 2016/1101<br>• Directive S. I. 2012/3032 for limiting the use of certain hazardous substances in electric and electronic equipment |
| c US | The cUR mark states the UL approval for this component. |

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### NF.. line filters

| Mark | Definition |
|---|---|
| | The CE mark states compliance with the following European directives:<br>• Low Voltage Directive 2014/35/EU<br>• Directive 2011/65/EU for limiting the use of certain hazardous substances in electric and electronic equipment |
| | The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU. |
| | The China RoHS mark declares compliance with the Directive SJ/T 11364-2014 regarding the restriction of use of certain hazardous substances in electrical and electronic equipment and its packaging. |
| | The UKCA mark states the compliance with the following British guidelines:<br>• Low Voltage Directive S. I. 2016/1101<br>• Directive S. I. 2012/3032 for limiting the use of certain hazardous substances in electrical and electronic equipment |
| | The cUR mark states the UL approval for this component. |

### ND.. line chokes

| Mark | Definition |
|---|---|
| | The CE mark states compliance with the following European directives:<br>• Low Voltage Directive 2014/35/EU<br>• Directive 2011/65/EU for limiting the use of certain hazardous substances in electric and electronic equipment |
| | The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU. |
| | The China RoHS mark declares compliance with the directive SJ/T 11364-2014 regarding the restriction of use of certain hazardous substances in electrical and electronic equipment and its packaging. |
| | The UKCA mark states compliance with the following British guidelines:<br>• Low Voltage Directive S. I. 2016/1101<br>• Directive S. I. 2012/3032 for limiting the use of certain hazardous substances in electric and electronic equipment |
| | The cUR mark states the UL approval for this component. |

### HF.. output filters

| Mark | Definition |
|---|---|
| | The CE mark states compliance with the following European directives:<br>• Low Voltage Directive 2014/35/EU<br>• Directive 2011/65/EU for limiting the use of certain hazardous substances in electric and electronic equipment |
| | The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU. |
| | The China RoHS mark declares compliance with the directive SJ/T 11364-2014 regarding the restriction of use of certain hazardous substances in electrical and electronic equipment and its packaging. |
| | The UKCA mark states compliance with the following British guidelines:<br>• Low Voltage Directive S. I. 2016/1101<br>• Directive S. I. 2012/3032 for limiting the use of certain hazardous substances in electric and electronic equipment |
| | The cUR mark states the UL approval for this component. |

### HD.. output chokes

| Mark | Definition |
|---|---|
| | The CE mark states compliance with the following European directives:<br>• Low Voltage Directive 2014/35/EU<br>• Directive 2011/65/EU for limiting the use of certain hazardous substances in electric and electronic equipment |
| | The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU. |
| | The China RoHS mark declares compliance with the directive SJ/T 11364-2014 regarding the restriction of use of certain hazardous substances in electrical and electronic equipment and its packaging. |
| | The UKCA mark states compliance with the following British guidelines:<br>• Low Voltage Directive S. I. 2016/1101<br>• Directive S. I. 2012/3032 for limiting the use of certain hazardous substances in electric and electronic equipment |
| | The cUR mark states the UL approval for this component. |

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### ZD.. DC link chokes

| Mark | Definition |
|---|---|
| | The CE mark states compliance with the following European directives:<br>• Low Voltage Directive 2014/35/EU<br>• Directive 2011/65/EU for limiting the use of certain hazardous substances in electric and electronic equipment |
| | The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU. |
| | The China RoHS mark declares compliance with the directive SJ/T 11364-2014 regarding the restriction of use of certain hazardous substances in electrical and electronic equipment and its packaging. |
| | The UKCA mark states the compliance with the following British guidelines:<br>• Low Voltage Directive S. I. 2016/1101<br>• Directive S. I. 2012/3032 for limiting the use of certain hazardous substances in electrical and electronic equipment |
| | The cUR mark states the UL approval for this component. |

## 2.2 General technical data

The following table lists the technical data for all inverters independent of

- Type
- Design
- Size
- Power rating

| General data | |
|---|---|
| Interference immunity | Meets EN 61800-3; 2. Environment |
| Interference emission | Limit value class C2 according to EN 61800-3.<br>From size 4, a line filter is required for limit class C2.<br>The interference suppression level can be improved with relevant measures.<br>Refer to chapter "EMC-compliant installation according to EN 61800-3" in the product manual for further information. |
| Ambient temperature $\vartheta_{amb}$ | 0 °C to +40 °C without derating<br>40 °C to +60 °C with derating[1)]<br>For further information, refer to chapter "Selection of an inverter > Derating". |
| Type of cooling | Increased air cooling due to an installed, temperature-controlled fan. |
| Short-circuit current | The uninfluenced short-circuit current according to EN 61800-5-1 (Icc) is 5000 A. |
| Degree of protection | Sizes 1 – 4: IP20 in accordance with EN 60529<br>From size 5: IP10 according to EN 60529 (IP20 optional) |
| Pollution class | 2 in accordance with IEC 60664-1 |
| Overvoltage category | III in accordance with IEC 60664-1 |
| Installation altitude | Up to h ≤ 1000 m without restrictions.<br>The following restrictions apply to altitudes > 1000 m:<br>• From 1000 m to max. 3800 m: $I_N$ reduction by 1% per 100 m<br>• From 2000 m to max. 3800 m: To maintain protective separation and the air gaps and creepage distances in accordance with EN 61800-5-1, you have to connect an overvoltage protection device in order to reduce the overvoltages from category III to category II. |

1) When using a CS.A card, the ambient temperature is limited to a maximum of 55 °C.

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## 2.3 Environmental conditions

| Environmental conditions | |
|---|---|
| Climatic conditions | • Long-term storage (weatherproof):<br>EN 60721-3-1 class 1K2 temperature -25 °C to +70 °C (deviating from the standard)<br>Non-condensing; no moisture condensation<br>• Transport (weatherproof):<br>EN 60721-3-2 class 2K3 temperature -25 °C to +70 °C<br>Non-condensing; no moisture condensation<br>• Operation (fixed installation, weatherproof):<br>EN 60721-3-3 class 3K3 temperature 0 °C to +40 °C (deviating from the standard)<br>Non-condensing; no moisture condensation |
| Chemically active substances | • Extended storage (weatherproof):<br>EN 60721-3-1 class 2C2, no corrosive gases, no salt mist (deviating from the standard)<br>• Transport (weatherproof):<br>EN 60721-3-2 class 2C2, no corrosive gases, no salt mist, no sea water (deviating from the standard)<br>• Operation (fixed installation, weatherproof):<br>EN 60721-3-3 class 3C2, no corrosive gases, no salt mist |
| Mechanically active substances | • Extended storage (weatherproof):<br>EN 60721-3-1 class 1S1, no conductive dust<br>• Transport (weatherproof):<br>EN 60721-3-2 class 2S1<br>• Operation (fixed installation, weatherproof):<br>EN 60721-3-3 class 3S1, no conductive dust |

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## 2.4 Technical data of basic device

### 2.4.1 Performance data 3 × AC 400 V

| | Unit | MDX9.A-....-5.3-4-... | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | | **0020** | **0025** | **0032** | **0040** | **0055** | **0070** | **0095** | **0125** | **0160** |
| **Size** | | **1** | | | | **2** | | | **3** | |
| Nominal output current $I_N$ at $f_{PWM}$ = 4 kHz | A | 2 | 2.5 | 3.2 | 4 | 5.5 | 7 | 9.5 | 12.5 | 16 |
| Input | | | | | | | | | | |
| Nominal line voltage (according to EN 50160) AC $V_{line}$ | | 3 × 380 – 500 V | | | | | | | | |
| Nominal line current AC $I_{line}$ | A | 1.8 | 2.25 | 2.88 | 3.6 | 4.95 | 6.3 | 8.55 | 11.3 | 14.4 |
| Line frequency $f_{line}$ | Hz | 50 – 60 ± 5% | | | | | | | | |
| Controlled rectifier | | No | | | | | | | | |
| X1 connection contacts | | Plug connector<br>– 1 conductor: 0.25 – 4 $mm^2$<br>– 2 conductors: 0.25 – 2.5 $mm^2$ (Twin conductor end sleeve) | | | | | | | | |
| Output | | | | | | | | | | |
| Output voltage $V_{out}$ | V | 0 – $V_{line}$ | | | | | | | | |
| Motor power ASM $P_{Mot}$ | kW | 0.55 | 0.75 | 1.1 | 1.5 | 2.2 | 3 | 4 | 5.5 | 7.5 |
| Nominal output current $I_N$ at $f_{PWM}$ = 4 kHz | A | 2 | 2.5 | 3.2 | 4 | 5.5 | 7 | 9.5 | 12.5 | 16 |
| Overload capacity | | 200%: 3 s at $f_{PWM}$ = 4 kHz | | | | | | | | |
| Continuous output current at f = 0 Hz | | 100% × $I_N$ at $f_{PWM}$ = 4 kHz | | | | | | | | |
| Apparent output power $S_N$ | kVA | 1.4 | 1.7 | 2.2 | 2.8 | 3.8 | 4.8 | 6.6 | 8.7 | 11.1 |
| Nominal DC link voltage $V_{NDCL}$ | V | DC 560 | | | | | | | | |
| Frequency $f_{PWM}$ | kHz | 4, 8, 16 (adjustable) | | | | | | | | |
| Max. output frequency $f_{max}$ | Hz | 599<br>Recommendation: $VFC^{PLUS}$ maximum 250 Hz,<br>do not exceed all other control modes $f_{PWM}$/10. | | | | | | | | |
| X2 connection contacts | | Plug connector<br>– 1 conductor: 0.25 – 4 $mm^2$<br>– 2 conductors: 0.25 – 2.5 $mm^2$ (Twin conductor end sleeve) | | | | | | | | |
| General | | | | | | | | | | |
| Power consumption 24 V | W | 20 | | | | | | | | |
| Power section nominal power loss[1)] | W | 16 | 20 | 27 | 34 | 45 | 58 | 83 | 112 | 147 |
| Permitted number of times power may be switched on/off | $min^{-1}$ | 1 | | | | | | | | |
| Minimum switch-off time for power off | s | 10 | | | | | | | | |
| Power section interference suppression | | EMC filter limit value category C2 to EN 61800-3 | | | | | | | | |
| PE connection | | Rigid wire or conductor end sleeve (max. 2.5 mm²) on bracket with M4 screw, either basic device or shield plate | | | | | | | Rigid wire/conductor end sleeve (max. 2.5 mm²) on bracket with M4 screw or M6 bolt on shield plate | |
| Mass | kg | 4.1 | | | | 4.4 | | | 5.7 | |
| Brake chopper and braking resistor | | | | | | | | | | |
| Minimum braking resistance value $R_{BWmin}$ | Ω | 90 | | | | 42 | | | 24 | |
| Brake chopper continuous power | kW | 1.4 | 1.7 | 2.2 | 2.8 | 3.8 | 4.8 | 6.6 | 8.7 | 11.1 |
| Brake chopper peak power | | 200% × apparent output power $S_N$ × 0.9 | | | | | | | | |
| Connection contacts | | Plug connector<br>– 1 conductor: 0.25 – 4 $mm^2$<br>– 2 conductors: 0.25 – 2.5 $mm^2$ (Twin conductor end sleeve) | | | | | | | | |
| Dimensions | | | | | | | | | | |
| Width | mm | 95 | | | | 105 | | | 105 | |
| Height of the basic device | mm | 350 | | | | 350 | | | 350 | |
| Height of basic device with shield plates | mm | 479 | | | | 479 | | | 494 | |
| Depth | mm | 215 | | | | 215 | | | 260 | |

1) To calculate the thermal power loss, add the values of "Power consumption 24 V" and "Power section nominal power loss".

| | Unit | MDX9.A-....-5.3-4-... | | | | | MDX91A-....-5.3-4-... | | |
|---|---|---|---|---|---|---|---|---|---|
| **Type** | | **0240** | **0320** | **0460** | **0620** | **0750** | **0910** | **1130** | **1490** |
| **Size** | | **4** | | **5** | | | **6** | | |
| Nominal output current $I_N$ at $f_{PWM}$ = 4 kHz | A | 24 | 32 | 46 | 62 | 75 | 91 | 113 | 149 |
| Input | | | | | | | | | |
| Nominal line voltage (according to EN 50160) AC $V_{line}$ | | 3 × 380 – 500 V | | | | | | | |
| Nominal line current AC $I_{line}$ | A | 21.6 | 28.8 | 41.4 | 55.8 | 67.5 | 81.9 | 102 | 134 |
| Line frequency $f_{line}$ | Hz | 50 – 60 ± 5% | | | | | | | |
| Controlled rectifier | | Yes | | | | | | | |
| X1 connection contacts | | Plug connector – 1 conductor: 0.5 – 16 $mm^2$ – 2 conductors: 0.25 – 6 $mm^2$ (twin CES)[1] | | M8 | | | M10 | | |
| Output | | | | | | | | | |
| Output voltage $V_{out}$ | V | 0 – $V_{line}$ | | | | | | | |
| Motor power ASM $P_{Mot}$ | kW | 11 | 15 | 22 | 30 | 37 | 45 | 55 | 75 |
| Nominal output current $I_N$ at $f_{PWM}$ = 4 kHz | A | 24 | 32 | 46 | 62 | 75 | 91 | 113 | 149 |
| Overload capacity | | 200%: 3 s at $f_{PWM}$ = 4 kHz | | | | | | | |
| Continuous output current at f = 0 Hz | | 100% × $I_N$ at $f_{PWM}$ = 4 kHz | | | | | | | |
| Apparent output power $S_N$ | kVA | 16.6 | 22.2 | 31.9 | 43 | 52 | 63 | 78 | 103 |
| Nominal DC link voltage $V_{NDCL}$ | V | DC 560 | | | | | | | |
| Frequency $f_{PWM}$ | kHz | 4, 8, 16 (adjustable) | | | | | | | |
| Max. output frequency $f_{max}$ | Hz | 599 Recommendation: VFC[PLUS] maximum 250 Hz, do not exceed all other control modes $f_{PWM}$/10. | | | | | | | |
| X2 connection contacts | | Plug connector – 1 conductor: 0.5 – 16 $mm^2$ – 2 conductors: 0.25 – 6 $mm^2$ (twin CES)[1] | | M8 | | | M10 | | |
| General | | | | | | | | | |
| Power consumption 24 V | W | 30 | | 15 | | | 20 | | |
| Power section nominal power loss[2] | W | 202 | 282 | 419 | 600 | 760 | 931 | 968 | 1332 |
| Permitted number of times power may be switched on/off | $min^{-1}$ | 1 | | | | | | | |
| Minimum switch-off time for power off | s | 10 | | | | | | | |
| Power section interference suppression | | Basic interference suppression integrated | | | | | | | |
| PE connection | | M6 stud | | M8 stud | | | M10 stud | | |
| Mass | kg | 6.6 | | 12.1 | | | 24.1 | | |
| Brake chopper and braking resistor | | | | | | | | | |
| Minimum braking resistance value $R_{BWmin}$ | Ω | 13 | | 9 | 5.4 | | 4.2 | 2.7 | |
| Brake chopper continuous power | kW | 16.6 | 22.2 | 31.9 | 43 | 52 | 63 | 78 | 103 |
| Brake chopper peak power | | 200% × apparent output power $S_N$ × 0.9 | | | | | | | |
| Connection contacts | | Plug connector – 1 conductor: 0.5 – 16 $mm^2$ – 2 conductors: 0.25 – 6 $mm^2$ (twin CES)[1] | | M8 | | | M10 | | |
| Dimensions | | | | | | | | | |
| Width | mm | 135 | | 196 | | | 240 | | |
| Height of the basic device | mm | 350 | | 471 | | | 544 | | |
| Height of basic device with shield plates | mm | 494 | | 471 | | | 544 | | |
| Depth | mm | 260 | | 293 | | | 328 | | |

1) CES: Conductor end sleeve

2) To calculate the thermal power loss, add the values of "Power consumption 24 V" and "Power section nominal power loss".

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| | Unit | MDX91A-....-5.3 -... | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Type** | | **1770** | **2200** | **2500** | **3000** | **3800** | **4700** | **5880** |
| **Size** | | **7** | | | | **8[1)]** | | |
| Nominal output current $I_N$ at the smallest possible PWM frequency | A | 177 | 220 | 250 | 300 | 380 | 470 | 588 |
| Input | | | | | | | | |
| Nominal line voltage (according to EN 50160) AC $V_{line}$ | | 3 × 380 – 500 V | | | | | | |
| Nominal line current AC $I_{line}$ | A | 159 | 198 | 225 | 270 | 342 | 423 | 529 |
| Line frequency $f_{line}$ | Hz | 50 – 60 ± 5% | | | | | | |
| Controlled rectifier | | Yes | | | | | | |
| X1 connection contacts | | M12 | | | | M12, each terminal is available twice | | |
| Output | | | | | | | | |
| Output voltage $V_{out}$ | V | 0 – $V_{line}$ | | | | | | |
| Motor power ASM $P_{Mot}$ | kW | 90 | 110 | 132 | 160 | 200 | 250 | 315 |
| Nominal output current $I_N$ at the smallest possible PWM frequency | A | 177 | 220 | 250 | 300 | 380 | 470 | 588 |
| Overload capacity | | 200% at $f_{PWM}$ = 4 kHz | | 200% at $f_{PWM}$ = 2.5 kHz | 150% at $f_{PWM}$ = 2.5 kHz | 150% at $f_{PWM}$ = 2.5 kHz | | |
| Continuous output current at f = 0 Hz | | 100% × $I_N$ at $f_{PWM}$ = 4 kHz | | 100% × $I_N$ at $f_{PWM}$ = 2.5 kHz | | | | |
| Apparent output power $S_N$ | kVA | 123 | 152 | 173 | 208 | 263 | 326 | 407 |
| Nominal DC link voltage $V_{NDCL}$ | V | DC 560 | | | | | | |
| Frequency $f_{PWM}$ | kHz | 4, 8 (adjustable) | | 2.5, 4, 8 (adjustable) | | 2.5, 4 (adjustable) | | |
| Max. output frequency $f_{max}$ | Hz | 599<br>Recommendation: VFC$^{PLUS}$ maximum 250 Hz,<br>do not exceed all other control modes $f_{PWM}$/10. | | | | | | |
| X2 connection contacts | | M12 | | | | M12, double design | | |
| General | | | | | | | | |
| Power consumption 24 V | W | 20 | | | | Not available | | |
| Power section nominal power loss[2)] | W | 1725 | 2164 | 2131 | 2631 | Not available | | |
| Permitted number of times power may be switched on/off | $min^{-1}$ | 1 | | | | | | |
| Minimum switch-off time for power off | s | 10 | | | | | | |
| Power section interference suppression | | Basic interference suppression integrated | | | | | | |
| PE connection | | M12 stud | | | | | | |
| Mass | kg | 84 | | | | Not available | | |
| Brake chopper and braking resistor | | | | | | | | |
| Minimum braking resistance value $R_{BWmin}$ | Ω | 2 | | | | 0.9 | | |
| Brake chopper continuous power | kW | 123 | 152 | 173 | 208 | 263 | 326 | 407 |
| Brake chopper peak power | | 200% × apparent output power $S_N$ × 0.9 | | | | | | |
| Connection contacts | | M12 | | | | M12, each terminal is available twice | | |
| Dimensions | | | | | | | | |
| Width | mm | 320 | | | | Not available | | |
| Height of the basic device | mm | 990 | | | | | | |
| Height of basic device with shield plates | mm | 990 | | | | | | |
| Depth | mm | 410 | | | | | | |

1) Size 8 is not yet available.

2) To calculate the thermal power loss, add the values of "Power consumption 24 V" and "Power section nominal power loss".

### 2.4.2 Performance data 3 × AC 230 V

| | Unit | MDX9.A-...-2.3-4-... | | |
|---|---|---|---|---|
| **Type** | | **0070** | **0093** | **0140** |
| **Size** | | **2** | | **3** |
| Nominal output current $I_N$ at $f_{PWM}$ = 4 kHz | A | 7 | 9.3 | 14 |
| Input | | | | |
| Nominal line voltage (according to EN 50160) AC $V_{line}$ | | 3 × 200 – 240 V | | |
| Nominal line current AC $I_{line}$ | A | 6.3 | 8.37 | 12.6 |
| Line frequency $f_{line}$ | Hz | 50 – 60 ± 5% | | |
| Controlled rectifier | | No | | |
| X1 connection contacts | | Plug connector<br>– 1 conductor: 0.25 – 4 mm²<br>– 2 conductors: 0.25 – 2.5 mm² (Twin conductor end sleeve) | | |
| Output | | | | |
| Output voltage $V_{out}$ | V | 0 – $V_{line}$ | | |
| Motor power ASM $P_{Mot}$ | kW | 1.5 | 2.2 | 3.7 |
| Nominal output current $I_N$ at $f_{PWM}$ = 4 kHz | A | 7 | 9.3 | 14 |
| Overload capacity | | 200%: 3 s at $f_{PWM}$ = 4 kHz | | |
| Continuous output current at f = 0 Hz | | 100% × $I_N$ at $f_{PWM}$ = 4 kHz | | |
| Apparent output power $S_N$ | kVA | 2.8 | 3.7 | 5.6 |
| Nominal DC link voltage $V_{NDCL}$ | V | DC 325 | | |
| Frequency $f_{PWM}$ | kHz | 4, 8, 16 (adjustable) | | |
| Max. output frequency $f_{max}$ | Hz | 599<br>Recommendation: VFC$^{PLUS}$ maximum 250 Hz,<br>do not exceed all other control modes $f_{PWM}$/10. | | |
| X2 connection contacts | | Plug connector<br>– 1 conductor: 0.25 – 4 mm²<br>- 2 cores: 0.25 – 2.5 mm² (Twin conductor end sleeve) | | |
| General | | | | |
| Power consumption 24 V | W | 20 | | |
| Power section nominal power loss[1)] | W | 51 | 72 | 105 |
| Permitted number of times power may be switched on/off | min$^{-1}$ | 1 | | |
| Minimum switch-off time for power off | s | 10 | | |
| Power section interference suppression | | EMC filter limit value category C2 to EN 61800-3 | | |
| PE connection | | Rigid wire or conductor end sleeve (max. 2.5 mm²) on bracket with M4 screw, either basic device or shield plate | | Rigid wire or conductor end sleeve (max. 2.5 mm²) on bracket with M4 screw on basic device or M6 bolt on shield plate |
| Mass | | 4.4 | | 5.7 |
| Brake chopper and braking resistor | | | | |
| Minimum braking resistance value $R_{BWmin}$ | Ω | 24 | | 13 |
| Brake chopper continuous power | kW | 2.8 | 3.7 | 5.6 |
| Brake chopper peak power | | 200% × apparent output power $S_N$ × 0.9 | | |
| Connection contacts | | Plug connector<br>– 1 conductor: 0.25 – 4 mm²<br>– 2 conductors: 0.25 – 2.5 mm² (Twin conductor end sleeve) | | |
| Dimensions | | | | |
| Width | mm | 105 | | 105 |
| Height of the basic device | mm | 350 | | 350 |
| Height with shield plates | mm | 479 | | 494 |
| Depth | mm | 215 | | 260 |

1) To calculate the thermal power loss, add the values of "Power consumption 24 V" and "Power section nominal power loss".

| | Unit | MDX9.A-...-2.3-4-... | | | | MDX91A-...-2.3-4-... | |
|---|---|---|---|---|---|---|---|
| **Type** | | **0213** | **0290** | **0420** | **0570** | **0840** | **1080** |
| **Size** | | **4** | | **5** | | **6** | |
| Nominal output current $I_N$ at $f_{PWM}$ = 4 kHz | A | 21.3 | 29 | 42 | 57 | 84 | 108 |
| Input | | | | | | | |
| Nominal line voltage (according to EN 50160) AC $V_{line}$ | | 3 × 200 – 240 V | | | | ??? | ??? |
| Nominal line current AC $I_{line}$ | A | 19.2 | 26.1 | 37.8 | 51.3 | 75.6 | 97.2 |
| Line frequency $f_{line}$ | Hz | 50 – 60 ± 5% | | | | | |
| Controlled rectifier | | Yes | | | | | |
| X1 connection contacts | | Plug connector<br>– 1 conductor: 0.5 – 16 $mm^2$<br>- 2 cores: 0.25 – 6 $mm^2$<br>(Twin conductor end sleeve) | | M8 | | M10 | |
| Output | | | | | | | |
| Output voltage $V_{out}$ | V | 0 – $V_{line}$ | | | | | |
| Motor power ASM $P_{Mot}$ | kW | 5.5 | 7.5 | 11 | 15 | 22 | 30 |
| Nominal output current $I_N$ at $f_{PWM}$ = 4 kHz | A | 21.3 | 29 | 42 | 57 | 84 | 108 |
| Overload capacity | | 200%: 3 s at $f_{PWM}$ = 4 kHz | | | | | |
| Continuous output current at f = 0 Hz | | 100% × $I_N$ at $f_{PWM}$ = 4 kHz | | | | | |
| Apparent output power $S_N$ | kVA | 8.5 | 11.6 | 16.7 | 22.7 | 33.5 | 43 |
| Nominal DC link voltage $V_{NDCL}$ | V | DC 325 | | | | | |
| Frequency $f_{PWM}$ | kHz | 4, 8, 16 (adjustable) | | | | | |
| Max. output frequency $f_{max}$ | Hz | 599<br>Recommendation: VFC$^{PLUS}$ maximum 250 Hz,<br>do not exceed all other control modes $f_{PWM}$/10. | | | | | |
| X2 connection contacts | | Plug connector<br>– 1 conductor: 0.5 – 16 $mm^2$<br>- 2 cores: 0.25 – 6 $mm^2$<br>(Twin conductor end sleeve) | | M8 | | M10 | |
| General | | | | | | | |
| Power consumption 24 V | W | 30 | | 15 | | 20 | |
| Power section nominal power loss[1)] | W | 152 | 218 | 315 | 459 | 729 | 764 |
| Permitted number of times power may be switched on/off | $min^{-1}$ | 1 | | | | | |
| Minimum switch-off time for power off | s | 10 | | | | | |
| Power section interference suppression | | Basic interference suppression integrated | | | | | |
| PE connection | | M6 bolt<br>on basic device | | M8 bolt<br>on basic device | | M10 bolt<br>on basic device | |
| Mass | | 6.6 | | 12.1 | | 24.1 | |
| Brake chopper and braking resistor | | | | | | | |
| Minimum braking resistance value $R_{BWmin}$ | Ω | 6.7 | | 4.7 | 3 | 2 | |
| Brake chopper continuous power | kW | 8.5 | 11.6 | 16.7 | 22.7 | 33.5 | 43 |
| Brake chopper peak power | | 200% × apparent output power $S_N$ × 0.9 | | | | | |
| Connection contacts | | Plug connector<br>– 1 conductor: 0.5 – 16 $mm^2$<br>- 2 cores: 0.25 – 6 $mm^2$<br>(Twin conductor end sleeve) | | M8 | | M10 | |
| Dimensions | | | | | | | |
| Width | mm | 135 | | 196 | | 240 | |
| Height of the basic device | mm | 350 | | 471 | | 544 | |
| Height with shield plates | mm | 494 | | 471 | | 544 | |
| Depth | mm | 260 | | 293 | | 328 | |

1) To calculate the thermal power loss, add the values of "Power consumption 24 V" and "Power section nominal power loss".

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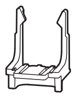
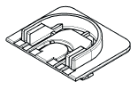
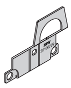
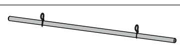
## 2.5 Accessories part numbers

### 2.5.1 Installation accessories

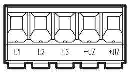
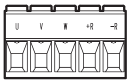
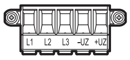
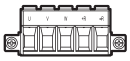
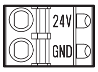
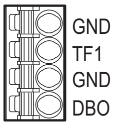
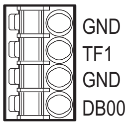
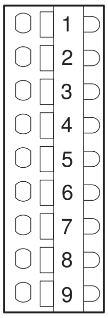
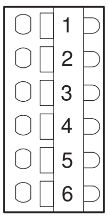
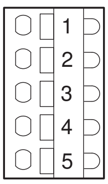
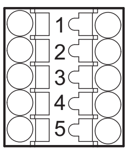
| Size | Plastic cover | Quantity | Scope of delivery | Description | Part number |
|---|---|---|---|---|---|
| Size 5 |  | 10 | Not included in the delivery | (→ 🗎 252) | 28243625 |
| Size 6 |  | 10 | | | 28244540 |
| Size 7 | | 12 | | | 28257677 |
| Size 8 | | 24 | | | Not available |

| Size | Carrying aid | Quantity | Scope of delivery | Description | Part number |
|---|---|---|---|---|---|
| Size 6 |  | 1 | Included in the delivery | (→ 🗎 236) | 28106229 |
| Size 7 |  | | | | 28257685 |

| Size | Shielding | Part number of "shield terminals" accessory pack |
|---|---|---|
| Sizes 1 – 8 | Control unit shielding | 28220250 |
| Sizes 1 – 2 | Motor and encoder cable shielding | 28209060 |
| Sizes 3– 4 | | 28222725 |
| Size 5 | Encoder cable shielding | 28270789 |

### 2.5.2 Connector

The following list is used for re-ordering connectors.

| Representation | Slot | Function | Size | Part number |
|---|---|---|---|---|
|  | X1 | Line connection | Sizes 1 – 3 | 19148429 |
|  | X2 | Motor connection | Sizes 1 – 3 | 19148437 |
|  | X1 | Line connection | Size 4 | 19148496 |
|  | X2 | Motor connection | Size 4 | 19148380 |
|  | X5 | DC 24 V supply voltage | All | 19148410 |
|  | X10 | Brake control | Sizes 1 – 4 | 19151314 |
|  | X10 | Brake control | Sizes 5 – 8 | 19147392 |
|  | X20 | Signal connection 1 | All | 19148615 |
|  | X21 | Signal connection 2 | All | 19148623 |
|  | X22 | Signal connection 3 | All | 19148631 |
|  | X6 | STO single connector (without jumpers) | All | 19155611 |
| | | STO E-connector (with jumpers) | All | 18177905 |

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### 2.5.3 CMM11A memory module

| Type designation | Part number |
|---|---|
| CMM11A memory module | 28230760 |

## 2.6 Electronics data – signal terminals

**NOTICE**

Connection of inductive loads to digital outputs.

Destruction of digital outputs.

If inductive loads are connected to digital outputs, you must install an external protective element (freewheeling diode).

| General | Terminal designation | Specification |
|---|---|---|
| Design | - | In accordance with IEC 61131-2 |
| **Supply voltage** | | |
| Connection | - | External power supply unit 24 V according to IEC 61131, 24 V +20%, -10% |
| Assignment | X5:24 V | DC 24 V supply voltage |
| | X5:GND | Reference potential |
| Connection contacts | X5 | Plug connector: – 1 conductor: 0.25 – 2.5 mm² – 2 conductors: 0.5 – 1.5 mm² (Twin conductor end sleeve) |
| **Digital inputs** | | |
| Cycle time input | - | 1 ms / 500 µs |
| Quantity | - | 8 |
| Response time | - | 100 µs plus cycle time |
| Assignment | X20:1 – 8 | DI00: with fixed "Output stage enable" assignment.<br>DI01 – DI07: For the selection option, see the parameter menu.<br>All inputs are suitable for Touchprobe function. Latency period < 100 µs, max. 2 Touchprobe inputs can be configured.<br>DI04, DI05: HTL low-resolution encoder connection.<br>DI04: Counter input<br>Current consumption: 3 mA at 30 V |
| | X20:9 | GND |
| Connection contacts | - | Plug connector: – 1 conductor: 0.25 – 2.5 mm² – 2 conductors: 0.5 – 1.5 mm² (Twin conductor end sleeve) |
| **Digital outputs** | | |
| Cycle time output | - | 1 ms / 500 µs |
| Quantity | - | 4 |
| Response time | - | 175 µs plus cycle time |
| Output current | - | $I_{max}$ = 50 mA |
| Short-circuit protection | - | Yes |
| Assignment | X21:1 | 24 V supply voltage, maximum output current = 50 mA |
| | X21:2 – 5 | DO00 – DO03: For the selection option, see the parameter menu. |
| | X21:6 | GND |
| Connection contacts | - | Plug connector: – 1 conductor: 0.25 – 2.5 mm² - 2 cores: 0.5 – 1.5 mm² (Twin conductor end sleeve) |
| **Relay output** | | |
| Assignment | X22:1:DO01-C | Shared relay contact |
| | X22:2:DO01-NO | NO contact |
| | X22:3:DO01-NC | NC contact |
| | | Current-carrying capacity of relay contacts: $U_{max}$ = DC 30 V, $I_{max}$ = DC 2 A |
| | X22:4:VO24 | Reserved |
| | X22:5:GND | GND |

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| Brake control | | |
|---|---|---|
| Assignment | X10:DB0<br>X10:DB00 | DB00:<br>- Brake control<br>– Control braking contactor DC 24 V, max. 150 mA |
| | X10:GND | GND |
| | X10:TF1 | Sensor input for temperature evaluation of the motor |
| Connection contacts | - | See chapter "Permitted terminal cross sections" (→ 🗎 234) |

| Encoder output | | |
|---|---|---|
| | X15:13 | DC 24 V, $I_{max}$ = 500 mA |
| | X15:15 | DC 12 V, $I_{max}$ = 500 mA |
| Maximum permitted cable length | - | - HTL encoders ES7C, EG7C and EK8C[1]: 300 m<br>- TTL encoder EK8R: 300 m<br>- Standard HTL encoder: 200 m<br>- Other encoders: 100 m |

1) EK8C encoders in preparation.

| Digital motor integration with MOVILINK® DDI | | |
|---|---|---|
| Maximum permitted cable length | X16 | 200 m |

## 2.7 Electronics data – safety subfunction

The table below shows the technical data of the application inverter relating to the integrated safety technology.

The safe digital inputs comply with type 3 according to IEC 61131-2.

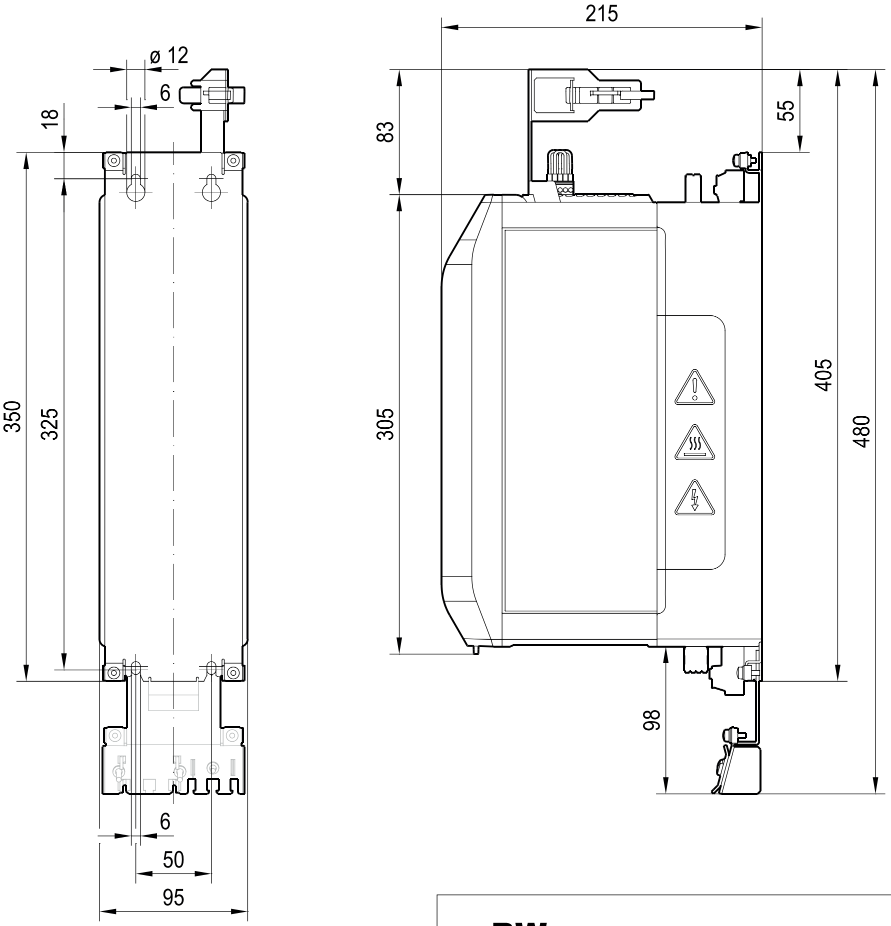
Reference potential for the F_STO_P1 and F_STO_P2 is STO_M (contact at terminal X6:2).

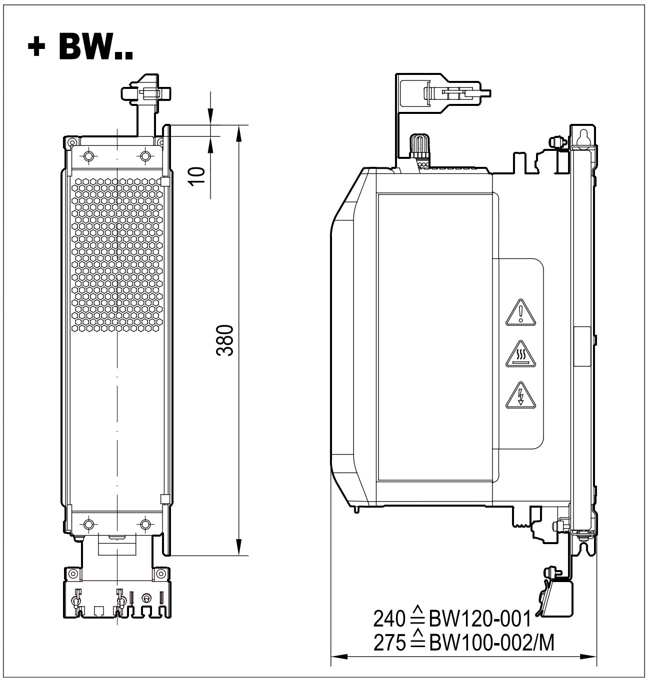
| | | Terminal designation | General electronics data | | |
|---|---|---|---|---|---|
| Safety contact STO | | X6 | | | |
| **Electrical data of inputs F_STO_P1, F_STO_P2** | | | **Minimum** | **Typical** | **Maximum** |
| Input voltage range | | X6:1 and X6:3 | DC -3 V | DC 24 V | DC 30 V |
| Input capacitance against STO_M | | | – | 300 pF | 500 pF |
| Input capacitance against GND | | | – | 300 pF | 500 pF |
| Power consumption at DC 24 V: | F_STO_P1 | | – | 150 mW | 200 mW |
| | F_STO_P2 | | – | 150 mW | 200 mW |
| | Sum[1] | | – | 300 mW | 400 mW |
| Input voltage for ON status (STO) | | | DC 11 V | – | – |
| Input voltage for OFF status (STO) | | | – | – | DC 5 V |
| Permitted leakage current of the external safety controller | | | – | – | 1 mA |
| **Technical data** | | | | | |
| Time from disconnecting the safety voltage until deactivation of the rotating field | | | – | 1.5 ms | 10 ms<br>2 ms[2] |
| Time from connecting the safety voltage until activation of the rotating field | | | – | – | 110 ms |
| Connection contacts | | | Plug connector<br>– 1 conductor: 0.25 – 1.5 $mm^2$<br>– 2 conductors: 0.25 – 0.5 $mm^2$ (Twin conductor end sleeve) | | |

1) Each drive unit always requires a power consumption of 300 mW.
2) Only when STO is used and controlled via a MOVISAFE® CS..A card.

## 2.8 Dimension sheets

### 2.8.1 Size 1

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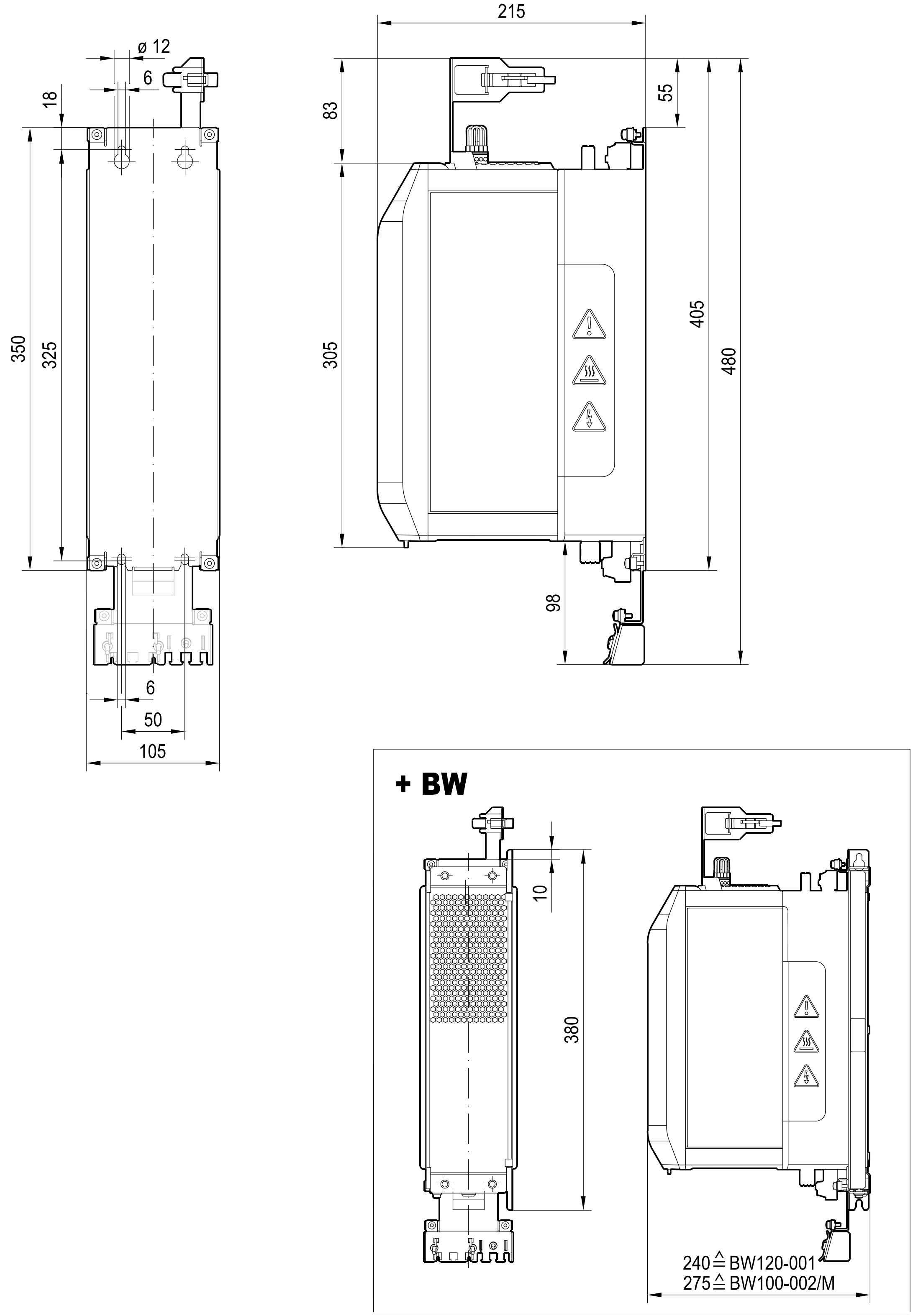
### 2.8.2 Size 2

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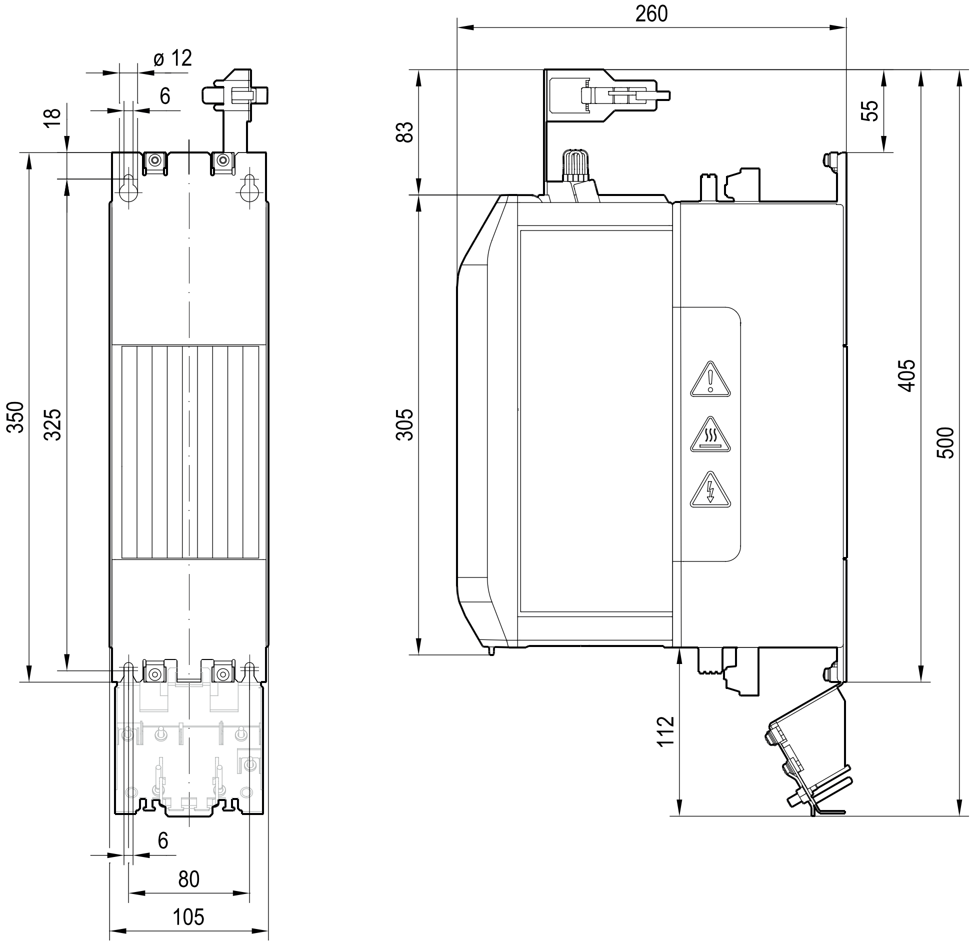
### 2.8.3 Size 3

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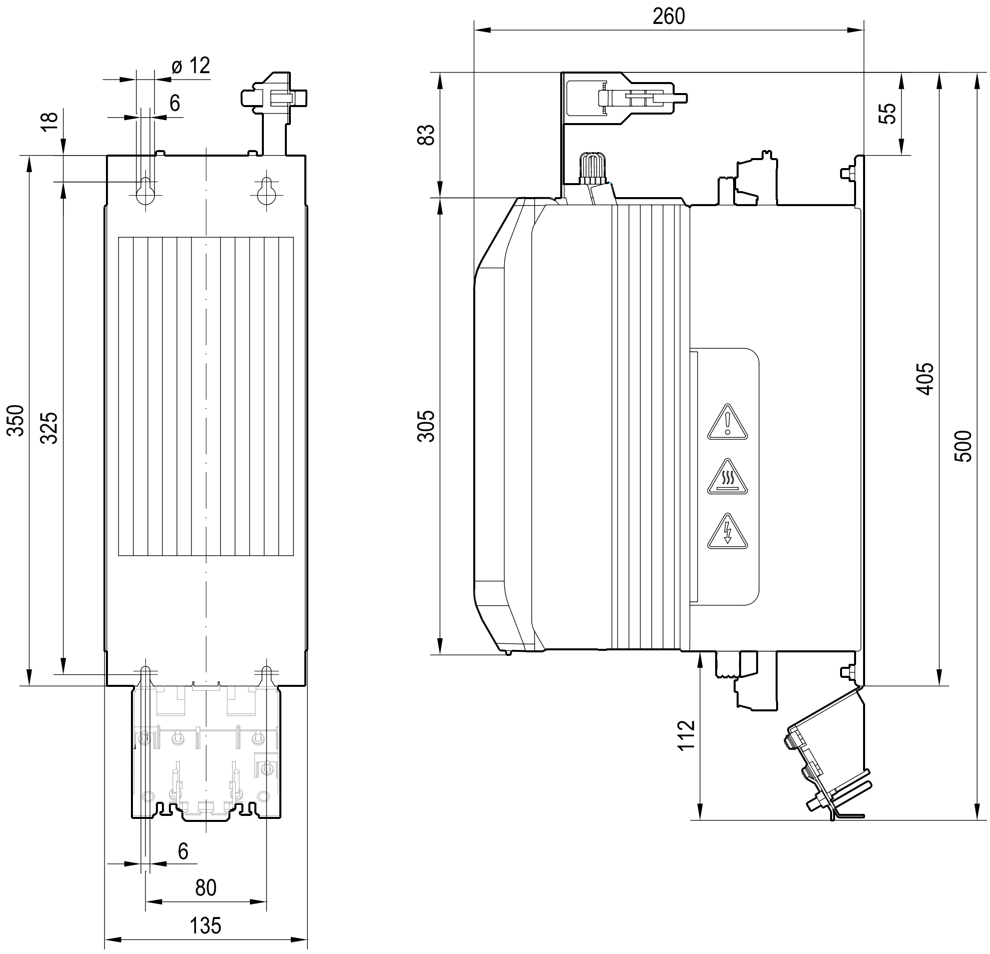
### 2.8.4 Size 4

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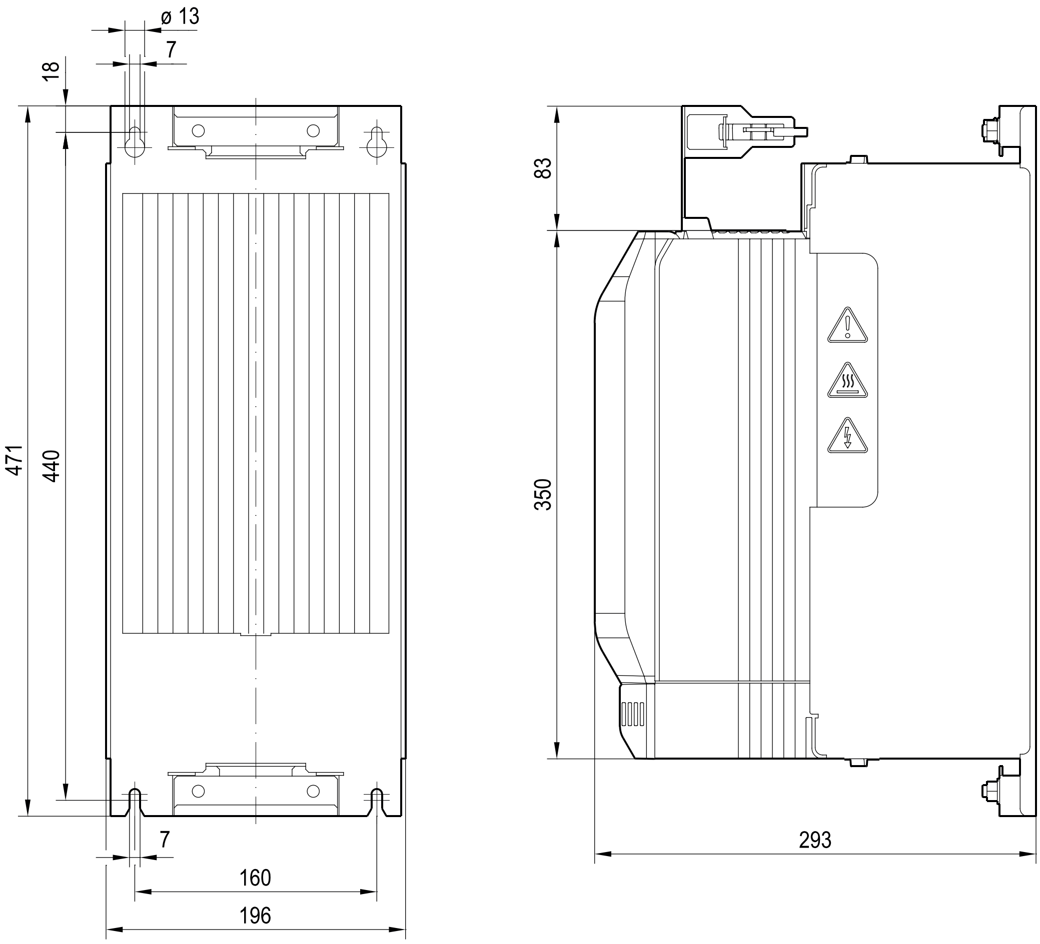
### 2.8.5 Size 5

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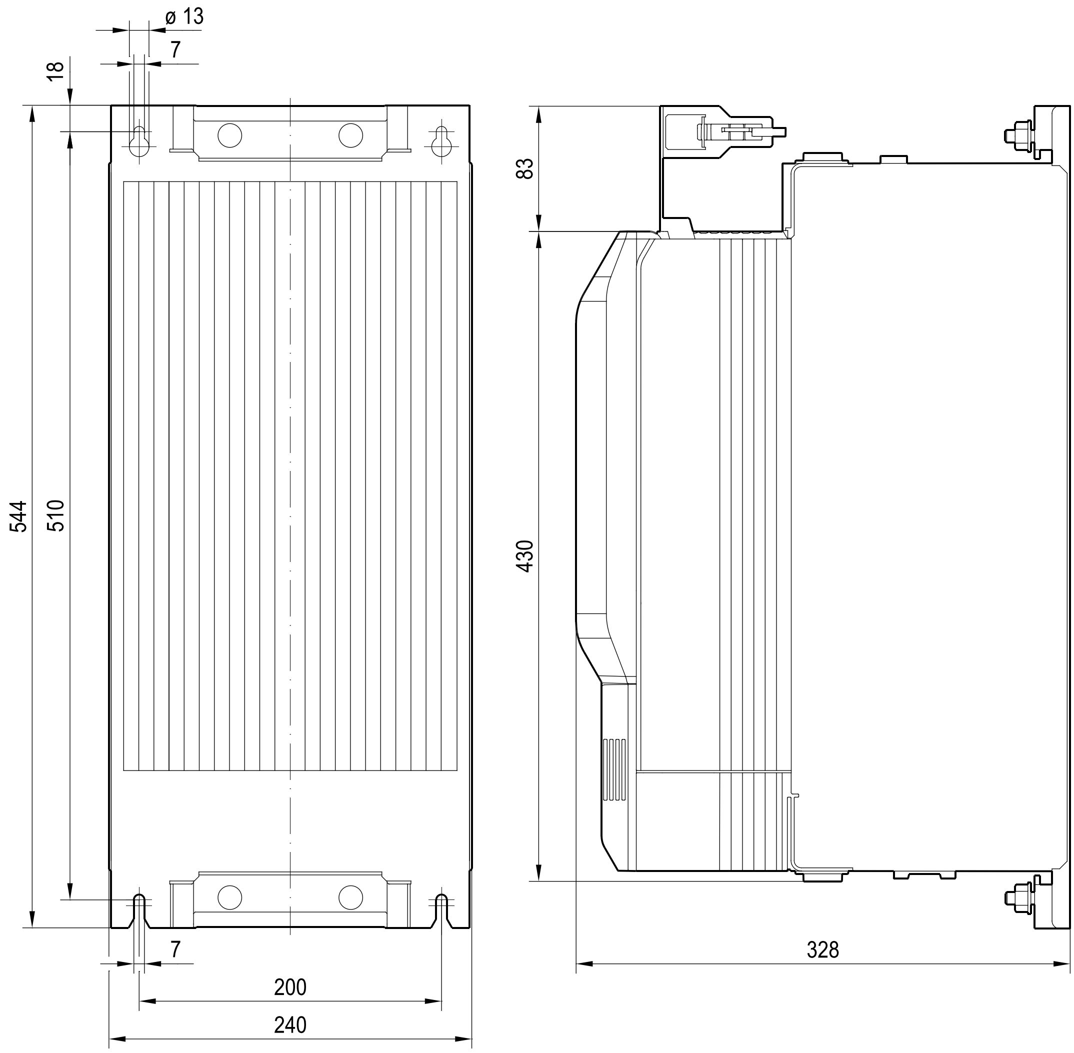
### 2.8.6 Size 6

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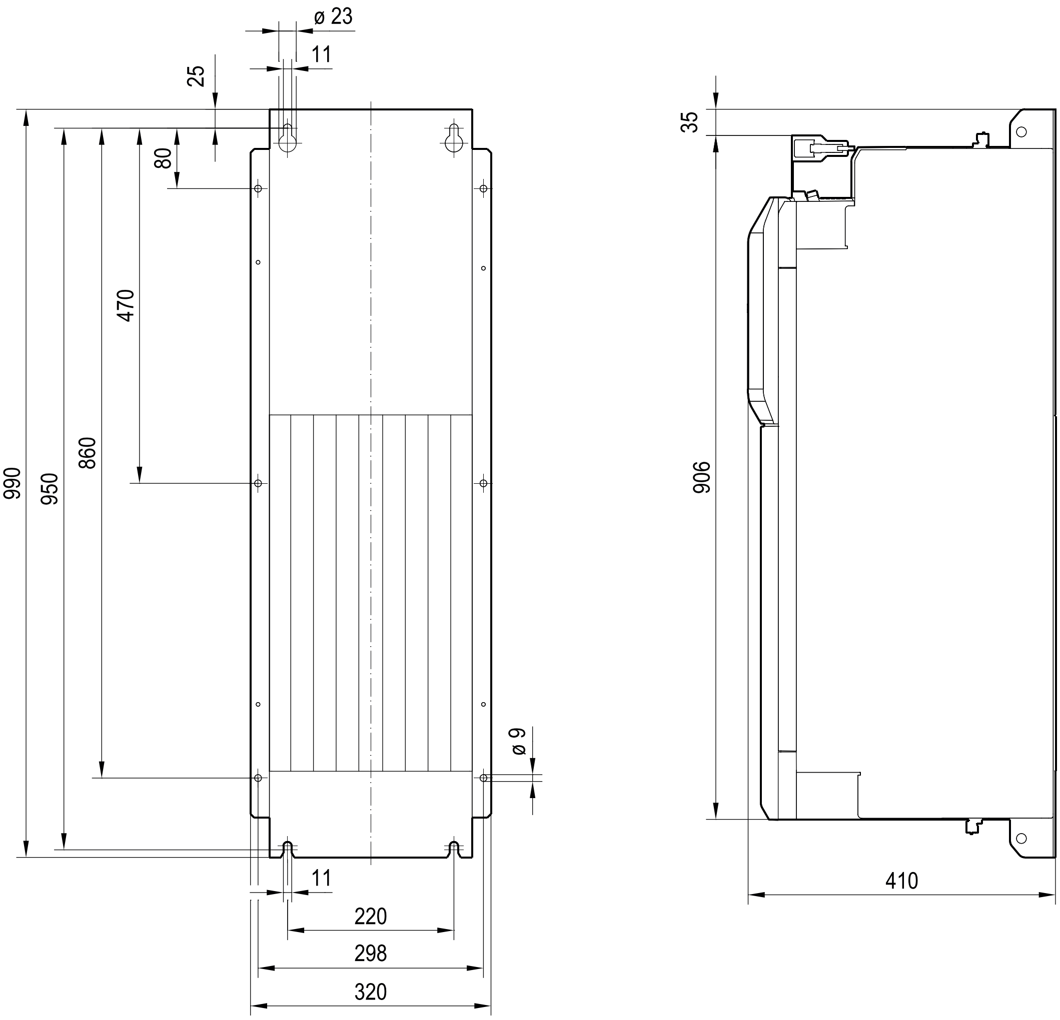
### 2.8.7 Size 7

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## 2.9 Technical data of the keypads

| | CBG11A | CBG21A | CBG22A |
|---|---|---|---|
| Part number | 28233646 | 28238133 | 28277554 |
| Operating temperature | 0 – 60 °C | | |
| Degree of protection | IP40 in accordance with EN 60529 | | |
| Power consumption in W | 0.6 | 1.4 | |
| Dimensions W x H x D in mm | 45 × 100 × 20 | 65 × 110 × 20 | |
| Screen size W × H in mm | 28.5 × 23 | 49 × 37 | |
| Screen diagonal in mm | 38 (1.5") | 61 (2.4") | |
| Screen resolution W × H in px | 78 × 64 | 320 × 240 | |
| Screen type | Monochrome display | Color display | |
| Engineering interface | Mini-USB socket | | |
| Connection interface | D-sub, 9-pin | | |

## 2.10 Technical data of the cards

### 2.10.1 CIO21A and CID21A input/output cards

The CIO21A input/output card provides digital/analog inputs and outputs; the CID21A cards provide digital inputs and outputs.

**NOTICE**

Connection of inductive loads to digital outputs.

Destruction of digital outputs.

If inductive loads are connected to digital outputs, you must install an external protective element (freewheeling diode).

| | Terminal designation/ specification | | Specification |
|---|---|---|---|
| | **CIO21A** | **CID21A** | |
| Part number | 28229495 | 28229487 | |
| **General** | | | |
| Design | | | In accordance with IEC 61131-2 (type 3 for digital inputs) |
| Cycle time | | | 1 ms |
| Power consumption | 1.2 W | 0.4 W | Base load (exclusively total power at outputs) |
| Connection contacts | | | Plug connector<br>– 1 conductor: 0.25 – 0.5 mm$^2$<br>(shield terminals for control cables are available) |
| **Digital inputs** | | | |
| Quantity | | | 4 |
| Response time | | | 160 µs plus cycle time |
| Assignment | X52:1 – 4 | | DI10 – DI13: For the selection option, see parameter menu |
| | X52:5 | | GND |
| **Digital outputs** | | | |
| Quantity | | | 4 |
| Response time | | | 175 µs plus cycle time |
| Output current | | | I ≤ 50 mA |
| Capacitive load | | | ≤ 300 nF |
| Inductive load | | | Not permitted |
| Protection device | | | Short-circuit-proof,<br>protected against external voltage DC 0 – 30 V |
| Assignment | X52:6 – 9 | | DO10 – DO13: For the selection option, see parameter menu |
| | X52:10 | | GND |
| **Analog inputs** | | | |
| Quantity | | | 2 |
| Type | | | Differential/can be switched to current input |
| Range of values | | | 0 to +10 V, -10 V to +10 V<br>0(4) – 20 mA |
| Assignment | X50:2<br>X50:3 | - | Analog input AI21<br>Reference of analog input AI21 |
| | X50:4<br>X50:7 | - | GND |
| | X50:5<br>X50:6 | - | Analog input AI31<br>Reference of analog input AI31 |
| **Voltage input** | | | |
| Resolution | | | 0 to +10 V (11 bit), -10 V to +10 V (12 bit) |
| Tolerance | | | ±0.5% |
| Electric strength | | | DC -20 V to DC +20 V |
| Input resistance | | | ≥ 10 kΩ |

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| | | | |
|---|---|---|---|
| **Current input** | | | |
| Resolution | | | 0(4) – 20 mA (11 bit) |
| Tolerance | | | ± 2% |
| Load impedance | | | Internal 250 Ω |
| Electric strength | | | DC -10 V to DC +10 V |
| **Analog outputs** | | | |
| Quantity | | | 2 |
| Short-circuit protection | | | Yes |
| Assignment | X51:1<br>X51:4 | | Analog voltage output AOV2/AOV3 |
| | X51:2<br>X51:5 | | Analog current output AOC2/AOC3 |
| | X51:3<br>X51:6 | | GND |
| **Voltage output** | | | |
| Tolerance | | | ± 5% |
| Capacitive load | | | ≤ 300 nF |
| Inductive load | | | ≤ 500 µH |
| Load resistance | | | ≥ 1 kΩ |
| Resolution | | | 12 bit |
| Reset state | | | 0 V |
| Output value | | | -10 V to +10 V ≤ 10 mA |
| **Current output** | | | |
| Tolerance | | | ± 3% |
| Capacitive load | | | ≤ 300 nF |
| Inductive load | | | None |
| Load resistance | | | ≤ 500 Ω |
| Resolution | | | 11 bit |
| Reset state | | | 0 mA |
| Measuring range | | | 0(4) – 20 mA |
| **Reference voltage output** | | | |
| Short-circuit protection | | | Yes |
| Output voltage | | | DC -10 V, DC +10 V |
| Tolerance | | | ± 0.5% |
| Noise | | | ≤ 10 mA |
| Output current | | | ≤ 3 mA |
| Capacitive load | | | ≤ 300 nF |
| Inductive load | | | ≤ 500 µH |
| Assignment | X50:1 | | REF1 (DC +10 V) |
| | X50:8 | | REF2 (DC -10 V) |

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### 2.10.2 CES11A multi-encoder card

#### Voltage supply

The multi-encoder card is supplied by the basic device.

#### Technical data of encoder supply

| | Terminal designation | Specification |
|---|---|---|
| Part number | | 28229479 |
| Power consumption | | |
| Power consumption 24 V | | 0.8 W |
| Maximum power consumption 24 V (card including encoder supply) | | 12.8 W |
| Encoder supply | | |
| 12 V | X17:15 | DC 12 V ± 10% |
| 24 V | X17:13 | DC 24 V -10%, +20% |
| Nominal output current 12 V or 24 V | | 500 mA |
| Peak current $I_{max}$ for 150 µs | | 1000 mA |
| Capacitive load | | < 220 µF |
| Inductive load | | < 500 µH |
| Short-circuit protection for encoder supply | | Yes, a permanent short circuit is not permitted. |
| Evaluable temperature sensor | | TF / TH / KTY84-130 / Pt1000 |

#### Encoder connection

| Encoder connection | Specification |
|---|---|
| Connection on encoder card end | 15-pin socket |
| Maximum encoder cable length | – HTL encoders ES7C, EG7C, and EK8C: 300 m<br>– TTL encoder EK8R: 300 m<br>– Standard HTL encoder: 200 m<br>– Other encoders: 100 m |

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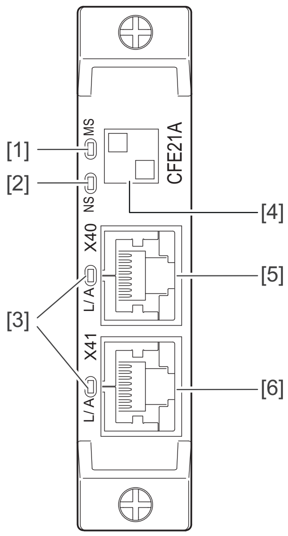
### 2.10.3 CFE21A EtherNet/IP™ and Modbus TCP fieldbus interface

| CFE21A EtherNet/IP™ and Modbus TCP fieldbus interface | |
|---|---|
| Part number | 28249984 |
| Power consumption | 2 W |
| Application protocols | EtherNet/IP™, Modbus TCP, HTTP, SNMP, DHCP, SEW Application Services |
| Port numbers used | 67/68, 80, 161, 310, 502, 2222, 44818 |
| Network protocols | ARP, ICMP |
| Media redundancy (DLR) | Yes |
| Baud rate | 100 MBaud/10 MBaud full duplex/half duplex |
| Connection technology | RJ45 |
| Ethernet switch | Integrated |
| Ethernet switch switching technology | Cut through |
| Ethernet switch latency period | 5.5 µs |
| Manufacturer ID | 013Bhex (EtherNet/IP™) |
| Application profiles | CIP Safety™ |

#### Connections and LEDs on the fieldbus interface

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| No. | Designation | Terminal/LED | Function |
|---|---|---|---|
| [1] | Status LED | MS | Operating state of the fieldbus |
| [2] | Status LED | NS | Bus fault |
| [3] | Status LED | L/A | Status of the fieldbus connection |
| [4] | Fieldbus card nameplate | – | MAC address of the fieldbus card |
| [5] | Fieldbus interface (RJ45 socket) | X40 | Ethernet connection (port 1) |
| [6] | Fieldbus interface (RJ45 socket) | X41 | Ethernet connection (port 2) |

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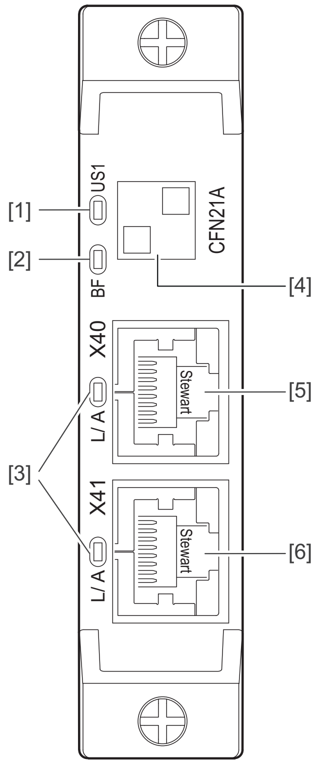
### 2.10.4 CFN21A PROFINET fieldbus interface

| CFN21A PROFINET fieldbus interface | |
|---|---|
| Part number | 28231694 |
| Power consumption | 2 W |
| PROFINET | RT<br>IRT (Isochronous Realtime) |
| Conformance class | C |
| Netload class | 3 |
| Topology detection (LLDP) | Yes |
| Automatic addressing (LLDP, DCP) | Yes |
| Media redundancy (MRP) | Yes |
| I&M data | I&M0 – I&M5 |
| Application profiles | PROFIsafe, PROFIenergy |
| Shared device | Yes |
| Manufacturer ID | 010Ahex |
| Baud rate | 100 MBaud, full duplex |
| Connection technology | RJ45 |
| Ethernet switch | Integrated |
| Ethernet switch switching technology | Cut through |
| Ethernet switch latency period | 5.5 µs |
| Ethertype 8892hex | PROFINET |
| Ethertype 88B5 | SEW MOVI-C® Address Editor |
| Port numbers used | • 80 (http)<br>• 161 (SNMP)<br>• 310 (SEW Data Streaming)<br>• PROFINET DCE/RPC Ports (dynamic via end point mapper) |
| GSD file name | GSDML-Vx.xy-SEW-MOVI-C-MOVIDRIVE-yyymmdd-hhmmss |

### Connections and LEDs on the fieldbus interface

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| No. | Designation | Terminal/LED | Function |
|---|---|---|---|
| [1] | Status LED | US1 | Operating state of the fieldbus |
| [2] | Status LED | BF | Bus error |
| [3] | Status LED | L/A | Status of the fieldbus connection |
| [4] | Fieldbus interface nameplate | – | MAC address of the fieldbus interface |
| [5] | Fieldbus interface<br>(RJ45 socket) | X40 | PROFINET port (port 1) |
| [6] | Fieldbus interface<br>(RJ45 socket) | X41 | PROFINET port (port 2) |

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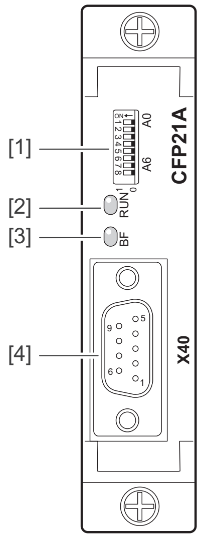
### 2.10.5 Fieldbus card CFP21A PROFIBUS

| **Fieldbus card CFP21A PROFIBUS** | |
|---|---|
| Part number | 28231708 |
| Power consumption | 2 W |
| PROFIBUS protocol variants | PROFIBUS DP and DP-V1 according to IEC 61158 |
| Automatic baud rate detection | 9.6 kBaud – 12 MBaud |
| Connection technology | • Via 9-pin D-sub connector<br>• Pin assignment acc. to IEC 61158<br>– Pin 3: RxD/TxD-P<br>– Pin 4: CNTR-P<br>– Pin 5: DGND<br>– Pin 6: VP<br>– Pin 8: RxD/TxD-N |
| Bus termination | Not integrated, implement using suitable PROFIBUS connector with connection resistors that can be activated. |
| Station address | 1 – 125, can be set via DIP switch |
| GSD file name | SEW_6011.gsd |
| DP ID number | 6011hex = 24593dez |
| Set-Pm-UserData | Length: 3 bytes<br>Hex parameterization C4 00 00 = DP diagnostic alarm = OFF<br>Hex parameterization C4 20 00 = DP diagnostic alarm = ON |
| DP configurations for DDLM-ChkCfg | 00 hex = empty space<br>C0 hex, C0 hex, C0 hex = 1 process data word (1 I/O word)<br>C0 hex, C1 hex, C1 hex = 2 process data word (2 I/O words)<br>C0 hex, C2 hex, C2 hex = 3 process data word (3 I/O words)<br>C0 hex, C3 hex, C3 hex = 4 process data word (4 I/O words)<br>C0 hex, C4 hex, C4 hex = 5 process data word (5 I/O words)<br>C0 hex, C5 hex, C5 hex = 6 process data word (6 I/O words)<br>C0 hex, C6 hex, C6 hex = 7 process data word (7 I/O words)<br>C0 hex, C7 hex, C7 hex = 8 process data word (8 I/O words)<br>C0 hex, C8 hex, C8 hex = 9 process data word (9 I/O words)<br>C0 hex, C9 hex, C9 hex = 10 process data word (10 I/O words)<br>C0 hex, CA hex, CA hex = 11 process data word (11 I/O words)<br>C0 hex, CB hex, CB hex = 12 process data word (12 I/O words)<br>C0 hex, CC hex, CC hex = 13 process data word (13 I/O words)<br>C0 hex, CD hex, CD hex = 14 process data word (14 I/O words)<br>C0 hex, CE hex, CE hex = 15 process data word (15 I/O words)<br>C0 hex, CF hex, CF hex = 16 process data word (16 I/O words) |
| Diagnostics data | Standard diagnostics 6 bytes<br>Max. byte 18:<br>• Standard diagnostics 6 bytes<br>• Status diagnostics block 5 bytes<br>• Alarm block 7 bytes |
| Tools for startup | MOVISUITE®<br>CBG11A or CBG21A (diagnostics only) |
| Maximum number of PDs | 16 words (see above) |

### Connections and LEDs on the fieldbus interface

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| No. | Designation | Terminal/LED | Function |
|---|---|---|---|
| [1] | DIP switch | | DIP switch for setting the PROFIBUS address |
| [2] | Status LED | RUN | Operating state of the fieldbus |
| [3] | Status LED | BF | State of the PROFIBUS interface |
| [4] | Fieldbus interface | X40 | PROFIBUS connection |

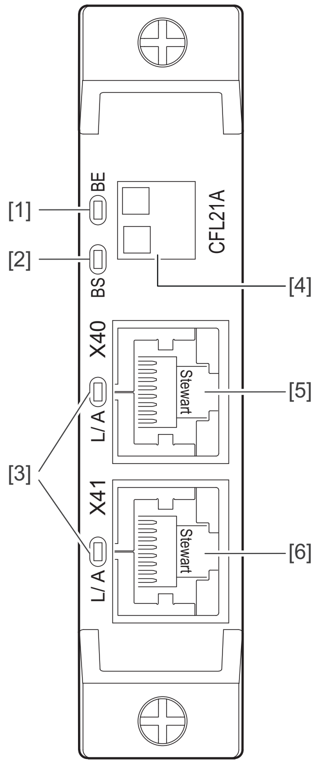
### 2.10.6 CFL21A POWERLINK fieldbus card

## INFORMATION

The fieldbus card can only be used with the MDX9.A-....-503-4-L00 device variant.

| POWERLINK CFL21A fieldbus card | |
|---|---|
| Part number | 28281039 |
| Power consumption | 2 W |
| Automatic baud rate detection | Yes, full duplex |
| Supported baud rate | 100 MBaud |
| Connection technology | 2 × RJ45 |
| XDD file name | SEW-MOVI-C-MOVIDRIVE.xdd |
| Application profiles | CiA402 |
| Vendor ID | $59_{hex}$ |
| Device family | MOVI-C® |
| Application protocols | POWERLINK, SEW Application Services |
| Permitted cable types | Category 5 and higher, class D according to IEC 11801 |
| Maximum cable length | 100 m |

### Connections and LEDs on the card

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| No. | Designation | Terminal/LED | Function |
|---|---|---|---|
| [1] | Status LED | BE | Operating state |
| [2] | Status LED | BS | Operating state |
| [3] | Status LED | L/A | Status |
| [4] | Nameplate | - | MAC address |
| [5] | Fieldbus interface | X40 | Connection |
| [6] | Fieldbus interface | X41 | Connection |

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### 2.10.7 CS..A safety cards

#### General technical data

*MOVIDRIVE® technology*

| | Value |
|---|---|
| Ambient temperature for storage of the safety card | ≥ -25 °C to ≤ 85 °C |
| Ambient temperature for MOVIDRIVE® technology, all sizes<br>(Derating, see "MOVIDRIVE® technology" operating instructions) | • with MOVISAFE® CS..A: 0 °C – 40 °C without derating<br>• with MOVISAFE® CSB..A, CSS..A: 40 °C – 55 °C with derating<br>• with MOVISAFE® CSA31A: 40 °C – 50 °C with derating |
| Installation altitude | Maximum 3800 m above sea level |

*Part numbers of the safety cards*

| Safety card | Part number |
|---|---|
| MOVISAFE® CSB21A | 28233360 |
| MOVISAFE® CSS21A | 28233379 |
| MOVISAFE® CSB31A | 28233387 |
| MOVISAFE® CSS31A | 28233395 |
| MOVISAFE® CSA31A | 28266412 |

#### Safe digital inputs

| F-DI00 – F-DI03 | Value/description |
|---|---|
| Properties | DC 24 V input pursuant to EN 61131-2, type 3 |
| Signal level | • Logic "0" = LOW input:<br>≤ 5 V or ≤ 1.5 mA<br>• Logic "1" = HIGH input:<br>≥ 11 V and ≥ 2 mA |
| Reference ground | GND |
| Input current | ≤ 15 mA |
| Input resistance | ≤ 4 kΩ at DC 24 V |
| Input filter time, parameterizable | 4 ms – 250 ms |
| Permitted cable length | 30 m |
| Error response time with single-pole connection | Not greater than the response time without error |
| Edge steepness of input signal | > 120 V/s |
| Input capacitance | < 500 pF |

### Sensor supply

| F-SS0, F-SS1 | Value/description |
|---|---|
| Properties | • DC 24 V output pursuant to EN 61131-2<br>• Short circuit and overload protection<br>• No galvanic isolation |
| Rated current | 150 mA |
| Inrush current (≤ 10 ms) | 300 mA |
| Short-circuit protection | 1.2 A |
| Internal voltage drop | < DC 1.3 V |
| Pulsed voltage supply (if activated) | • 2 ms open (LOW)<br>• Period duration, pulsed voltage supply: 8 ms |
| Permitted cable length | 30 m (per sensor) |
| Leakage current (F-SSx disabled) | < 0.1 mA |

### Safe digital outputs

| F-DO00_P/M, F-DO01_P/M | Value/description |
|---|---|
| Properties | • DC 24 V output pursuant to EN 61131-2<br>• Short circuit and overload protection |
| Rated current | 150 mA |
| Inrush current (≤ 10 ms) | 300 mA |
| Leakage current (F-DOx disabled) | < 0.1 mA |
| Maximum switching frequency | • 10 Hz during operation < 1 minute<br>• 0.5 Hz during operation > 1 minute |
| Overload protection | 210 mA |
| Minimum current for wire break monitoring | 15 mA |
| Permitted cable length | 30 m |
| Load capacitance (max. test pulse duration) | ≤ 300 nF |
| Load capacitance (1 ms test pulse duration) | ≤ 50 nF |
| Capacitance to GND/PE (sourcing output only) | ≤ 10 nF |
| Load capacitance with diode decoupling | ≤ 12 µF |
| Load inductance | ≤ 100 µH |
| Load inductance with freewheeling diode | ≤ 40 H |
| Minimum load resistance | > 130 Ω |

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## 2.11 Technical data of encoder interfaces

### 2.11.1 Basic device

| | Terminal designation | Specification |
|---|---|---|
| Encoder interface | X15:1 – 15 | Supported encoders |
| | | Resolver |
| | | sin/cos |
| | | TTL/HTL |
| | | HIPERFACE® |
| | | Encoders with RS422 signals |
| Maximum input frequency | | 250 kHz |
| Connection contacts | | 15-pin socket |
| Encoder supply | | |
| Voltage supply 1 | X15:15 | DC 12 V ± 10% |
| Voltage supply 2 | X15:13 | DC 24 V -10%, +20% |
| $I_{max}$ | | 500 mA |
| $I_{peak}$ for 150 µs | | 1000 mA |
| Short-circuit protection for encoder supply | | Yes, a permanent short circuit is not permitted. |

### 2.11.2 MOVILINK® DDI

| | Terminal designation | Specification |
|---|---|---|
| Interface | X16 | DC 24 V, $I_{max}$ = 500 mA |

### 2.11.3 CES11A multi-encoder card

| | Terminal designation | Specification |
|---|---|---|
| Encoder interface | X17:1 – 15 | Supported encoders |
| | | sin/cos |
| | | TTL/HTL |
| | | HIPERFACE® |
| | | EnDat 2.1 with sin/cos signals |
| | | SSI |
| | | CANopen |
| | | Encoders with RS422 signals |
| Maximum input frequency | | 250 kHz |
| Connection contacts | | 15-pin socket |
| Encoder supply | | |
| Voltage supply 1 | X17:15 | DC 12 V ± 10% |
| Voltage supply 2 | X17:13 | DC 24 V -10%, +20% |
| $I_{max}$ | | 500 mA |
| $I_{peak}$ for 150 µs | | 1000 mA |
| Short-circuit protection for encoder supply | | Yes, a permanent short circuit is not permitted. |

## 2.12 Technical data of braking resistors, filters, and chokes

### 2.12.1 BW.../BW...-T braking resistors

**General**

The BW.../BW...-T braking resistors are adapted to the technical characteristics of the inverter.

Braking resistors with different continuous and peak braking powers are available.

The braking resistors can be protected against overload and overtemperature by the customer when a thermal overload relay is used. The tripping current is set to the value $I_F$; for this, see the following tables "Technical data and assignment to an inverter".

A PTC resistor protects itself (reversible) against regenerative overload by changing abruptly to high resistance and no longer consuming any more energy. The inverter then switches off and signals an "overvoltage" fault.

A flat-type resistor has internal thermal protection (fuse cannot be replaced) that interrupts the current circuit in the event of overload. The configuration guidelines and the documented assignments of the drive inverter and braking resistor must be adhered to.

**INFORMATION**

Use of protection devices.

Use only the protection devices listed in the following section:

- Internal temperature switch T
- External bimetallic relay

→ See also the chapter "Protection of the braking resistor against thermal overload".

**UL and cURus approval**

The listed braking resistors have a cURus approval independent of the inverter.

**Parallel connection of braking resistors**

Identical braking resistors must be connected in parallel for some inverter/resistor combinations.

In this case, protect each braking resistor against overload and overtemperature using a thermal overload relay.

The temperature switches must be connected in series for braking resistors of the BW...-T series.

### Technical data and assignment to an inverter

*Technical data*

<table>
<tr><th>Braking resistor</th><th>Unit</th><th>BW120-001</th><th>BW100-002/M</th><th>BW100-001</th><th>BW100-002</th><th>BW100-006-T</th></tr>
<tr><td>Part number</td><td></td><td>18176011</td><td>25664514</td><td>08281718</td><td>08281653</td><td>18204198</td></tr>
<tr><td>Current-carrying capacity at 100% cdf</td><td>kW</td><td>0.03</td><td>0.15</td><td>0.1</td><td>0.2</td><td>0.6</td></tr>
<tr><td>Resistance value $R_{BW}$</td><td>Ω</td><td>117</td><td>100</td><td colspan="3">100 ± 10%</td></tr>
<tr><td>Tripping current $I_{trip}$</td><td>A</td><td>-</td><td>1.2</td><td>0.8</td><td>1</td><td>2.4</td></tr>
<tr><td>Design</td><td></td><td>PTC submounting resistor</td><td>Submounting resistor in flat design</td><td colspan="2">Flat-type resistor</td><td>Wire resistor</td></tr>
<tr><td>Power connections</td><td></td><td colspan="4">Single conductors</td><td>Ceramic terminal 2.5 mm²</td></tr>
<tr><td>Wire length</td><td>mm</td><td>170</td><td>300</td><td colspan="2">510</td><td>-</td></tr>
<tr><td>Cable cross section</td><td>mm²</td><td>0.5</td><td></td><td colspan="2">1.5</td><td>-</td></tr>
<tr><td>Tightening torque</td><td>Nm</td><td colspan="4">-</td><td>0.5</td></tr>
<tr><td>PE connection</td><td></td><td colspan="4">-</td><td>M4</td></tr>
<tr><td>PE tightening torque</td><td>Nm</td><td colspan="4">-</td><td>1.8</td></tr>
<tr><td>Degree of protection in accordance with EN 60529</td><td></td><td>IP20</td><td>IP40</td><td colspan="2">IP54</td><td>IP20</td></tr>
<tr><td>Ambient temperature $\vartheta_{amb}$</td><td></td><td colspan="5">-20 °C to +40 °C<br>(reduction 4% $P_N$/10K to +60 °C)</td></tr>
<tr><td>Mass</td><td>kg</td><td>0.95</td><td>1.4</td><td>0.3</td><td>0.6</td><td>3</td></tr>
</table>

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

<table>
<tr><th>Braking resistor</th><th>BW120-001</th><th>BW100-002/M</th><th>BW100-001</th><th>BW100-002</th><th>BW100-006-T</th></tr>
<tr><td>MDX9.A-....-5.3-...</td><td colspan="2">0020<br>0025<br>0032<br>0040</td><td colspan="3">0020<br>0025<br>0032<br>0040</td></tr>
</table>

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*Technical data*

| Braking resistor | Unit | BW047-010-T | BW147-T | BW247-T |
|---|---|---|---|---|
| Part number | | 17983207 | 18201342 | 18200842 |
| Current-carrying capacity at 100% cdf | kW | 1 | 1.2 | 2 |
| Resistance value $R_{BW}$ | Ω | 47 ± 10% | | |
| Tripping current $I_{trip}$ | A | 4.6 | 5.1 | 6.5 |
| Design | | Wire resistor | | |
| Power connections | | Ceramic terminal 2.5 mm$^2$ | | |
| Tightening torque | Nm | 0.5 | | |
| PE connection | | M4 | | |
| PE tightening torque | Nm | 1.8 | | |
| Degree of protection | | IP20 | | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | | |
| Mass | kg | 4 | 4.9 | 6.7 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW047-010-T | BW147-T | BW247-T |
|---|---|---|---|
| MDX9.A-....-5.3-... | 0055<br>0070<br>0095 | | |

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*Technical data*

| Braking resistor | Unit | BW027-016-T | BW027-024-T | BW027-042-T |
|---|---|---|---|---|
| Part number | | 17983215 | 17983231 | 19155301 |
| Current-carrying capacity at 100% cdf | kW | 1.6 | 2.4 | 4.2 |
| Resistance value $R_{BW}$ | Ω | 27 ± 10% | | |
| Tripping current $I_{trip}$ | A | 7.7 | 9.4 | 12.5 |
| Design | | Wire resistor | | Frame resistor |
| Power connections | | Ceramic terminal 2.5 $mm^2$ | | |
| Tightening torque | Nm | 0.5 | | |
| PE connection | | M4 | | M5 |
| PE tightening torque | Nm | 1.8 | | 2.5 |
| Degree of protection | | IP20 | | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | | |
| Mass | kg | 5.8 | 8 | 10 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW027-016-T | BW027-024-T | BW027-042-T |
|---|---|---|---|
| MDX9.A-....-5.3-... | 0125<br>0160 | | |
| MDX9.A-....-2.3-... | 0070<br>0093 | | |

*Technical data*

| Braking resistor | Unit | BW015-016 | BW015-042-T | BW015-075-T | BW915-T |
|---|---|---|---|---|---|
| Part number | | 17983258 | 19155328 | 19155271 | 18204139 |
| Current-carrying capacity at 100% cdf | kW | 1.6 | 4.2 | 7.5 | 16 |
| Resistance value $R_{BW}$ | Ω | 15 ± 10% | | | |
| Tripping current $I_{trip}$ | A | 10.3 | 16.7 | 22.4 | 32.7 |
| Design | | Wire resistor | Frame resistor | Grid resistor mounting position 1 | |
| Power connections | | Ceramic terminal 2.5 mm² | Ceramic terminal 4 mm² | M8 stud | |
| Tightening torque | Nm | 0.5 | 0.9 | 6 | |
| PE connection | | M4 | M5 | M6 stud | |
| PE tightening torque | Nm | 1.8 | 2.5 | 3 | |
| Degree of protection | | IP20 | | | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | | | |
| Mass | kg | 5.8 | 10 | 12 | 32 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW015-016 | BW015-042-T | BW015-075-T | BW915-T |
|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0240<br>0320<br>0620 (Parallel connection of 2 braking resistors)<br>0750 (Parallel connection of 2 braking resistors) | | | |
| MDX9.A-....-2.3-... | 0140<br>0213 (Parallel connection of 2 braking resistors)<br>0290 (Parallel connection of 2 braking resistors) | | | |

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*Technical data*

| Braking resistor | Unit | BW010-024 | BW010-050-T | BW010-108-T |
|---|---|---|---|---|
| Part number | | 17983266 | 17983274 | 19155298 |
| Current-carrying capacity at 100% cdf | kW | 2.4 | 5 | 10.8 |
| Resistance value $R_{BW}$ | Ω | 10 ± 10% | | |
| Tripping current $I_{trip}$ | A | 15.5 | 22.4 | 32.9 |
| Design | | Wire resistor | Grid resistor mounting position 1 | |
| Power connections | | Ceramic terminal 2.5 $mm^2$ | M8 stud | |
| Tightening torque | Nm | 0.5 | 6 | |
| PE connection | | M4 stud | M6 stud | |
| PE tightening torque | Nm | 1.8 | 3 | |
| Degree of protection | | IP20 | | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | | |
| Mass | kg | 8 | 11 | 17.5 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW010-024 | BW010-050-T | BW010-108-T |
|---|---|---|---|
| MDX9.A-....-5.3-... | 0460<br>0910 (Parallel connection of 2 braking resistors)<br>1130 (Parallel connection of 2 braking resistors) | | |
| MDX9.A-....-2.3-... | 0213<br>0290<br>0420 (Parallel connection of 2 braking resistors) | | |

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*Technical data*

| Braking resistor | Unit | BW006-025-01[1] | BW006-050-01[1] | BW106-T | BW206-T |
|---|---|---|---|---|---|
| Part number | | 18200117 | 18200125 | 18200834 | 18204120 |
| Current-carrying capacity at 100% cdf | kW | 2.5 | 5 | 13.5 | 18 |
| Resistance value $R_{BW}$ | Ω | 6 ± 10% | | | |
| Tripping current $I_{trip}$ | A | 20.4 | 28.9 | 47.4 | 54.8 |
| Design | | Grid resistor mounting position 1 | | | |
| Power connections | | M8 stud | | | |
| Tightening torque | Nm | 6 | | | |
| PE connection | | M6 stud | | | |
| PE tightening torque | Nm | 3 | | | |
| Degree of protection | | IP20 | | | |
| Ambient temperature $\vartheta_{amb}$ | | -25 °C to +40 °C | | | |
| Mass | kg | 7.5 | 12 | 30 | 40 |

1) Braking resistor has a 1 Ω tap

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW006-025-01 | BW006-050-01 | BW106-T | BW206-T |
|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0620<br>0750<br>1490 (Parallel connection of 2 braking resistors) | | | |
| MDX9.A-....-2.3-... | 0570 (Parallel connection of 2 braking resistors) | | | |

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*Technical data*

| Braking resistor | Unit | BW005-070 | BW005-170-T | BW004-050-01 | BW004-070-01 |
|---|---|---|---|---|---|
| Part number | | 17983282 | 17983290 | 18200133 | 17967678 |
| Current-carrying capacity at 100% cdf | kW | 7 | 17 | 5 | 7 |
| Resistance value $R_{BW}$ | Ω | 4.7 ± 10% | | 3.6 ± 10% | |
| Tripping current $I_{trip}$ | A | 38.6 | 60.1 | 32.6 | 38.6 |
| Design | | Grid resistor mounting position 1 | | | |
| Power connections | | M8 stud | | | |
| Tightening torque | Nm | 6 | | | |
| PE connection | | M6 stud | | | |
| PE tightening torque | Nm | 3 | | | |
| Degree of protection | | IP20 | | | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | | | |
| Mass | kg | 13 | 33 | 13 | |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW005-070 | BW005-170-T | BW004-050-01 | BW004-070-01 |
|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0910<br>1130<br>1770 (Parallel connection of 2 braking resistors)<br>2200 (Parallel connection of 2 braking resistors)<br>2500 (Parallel connection of 2 braking resistors)<br>3000 (Parallel connection of 2 braking resistors) | | 1490 | |
| MDX9.A-....-2.3-... | 0420<br>0840 (Parallel connection of 2 braking resistors)<br>1080 (Parallel connection of 2 braking resistors) | | 0570 | |

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*Technical data*

| Braking resistor | Unit | BW003-420-T | BW002-070 |
|---|---|---|---|
| Part number | | 13302345 | 17983304 |
| Current-carrying capacity at 100% cdf | kW | 42 | 7 |
| Resistance value $R_{BW}$ | Ω | 2.5 ± 10% | 2.3 ± 10% |
| Tripping current $I_{trip}$ | A | 135.1 | 55.2 |
| Design | | Grid resistor mounting position 2 | Grid resistor mounting position 1 |
| Power connections | | M12 stud | M8 stud |
| Tightening torque | Nm | 15.5 | 6 |
| PE connection | | M10 stud | M6 stud |
| PE tightening torque | Nm | 10 | 3 |
| Degree of protection | | IP20 | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | |
| Mass | kg | 93 | 33 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW003-420-T | BW002-070 |
|---|---|---|
| MDX9.A-....-5.3-... | 1770<br>2200<br>2500<br>3000<br>3800 (Parallel connection of 2 braking resistors)<br>4700 (Parallel connection of 2 braking resistors)<br>5880 (Parallel connection of 2 braking resistors) | |
| MDX9.A-....-2.3-... | 0840<br>1080 | |

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*Technical data*

| Braking resistor | Unit | BW1.0-170 |
|---|---|---|
| Part number | | 17985455 |
| Current-carrying capacity at 100% cdf | kW | 17 |
| Resistance value $R_{BW}$ | Ω | 1 ± 10% |
| Tripping current $I_{trip}$ | A | 130.4 |
| Design | | Grid resistor mounting position 2 |
| Power connections | | M12 stud |
| Tightening torque | Nm | 15.5 |
| PE connection | | M10 stud |
| PE tightening torque | Nm | 10 |
| Degree of protection | | IP20 |
| Ambient temperature $\vartheta_{amb}$ | | -25 °C to +40 °C |
| Mass | kg | 45 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

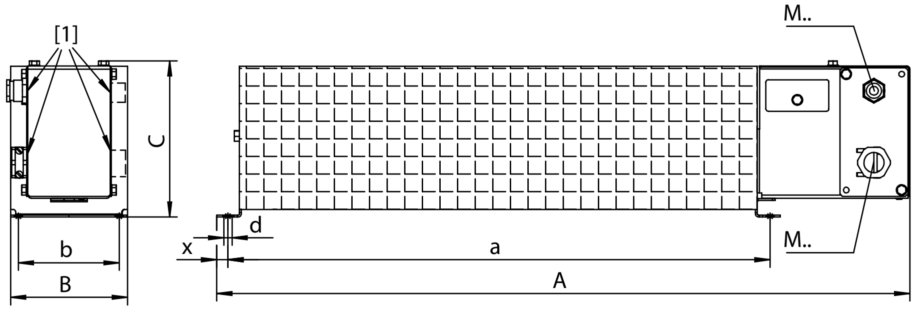
| Braking resistor | BW1.0-170 |
|---|---|
| MDX9.A-....-5.3-... | 3800<br>4700<br>5880 |

*Technical data BW..-T signal contact*

| Specifications for BW..-T | Design |
|---|---|
| Signal contact connection cross section | 1 × 2.5 mm$^2$ |
| Tightening torque of the signal contact | 1 Nm |
| Switching capacity signal contact | DC 2 A / DC 24 V (DC11)<br>AC 2 A / AC 230 V (AC11) |
| Switch contact (NC contact) | According to EN 60730 |

### Dimension sheets and dimensions

*Wire resistor*




*9007218129604875*

| Braking resistor | Main dimensions in mm | | | Mounting dimensions in mm | | | | Cable gland |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | d | x | |
| BW100-006-T | 549 | 92 | 125 | 430 | 80 | 6.5 | 8 | M25 + M12 |
| BW047-010-T | 749 | 92 | 125 | 630 | 80 | 6.5 | 8 | M25 + M12 |
| BW147-T | 549 | 185 | 125 | 430 | 150 | 6.5 | 8 | M25 + M12 |
| BW247-T | 749 | 185 | 125 | 630 | 150 | 6.5 | 8 | M25 + M12 |
| BW027-016-T | 649 | 185 | 125 | 530 | 150 | 6.5 | 8 | M25 + M12 |
| BW027-024-T | 649 | 275 | 125 | 530 | 240 | 6.5 | 8 | M25 + M12 |
| BW015-016 | 649 | 185 | 125 | 530 | 150 | 6.5 | 8 | M25 |
| BW010-024 | 649 | 275 | 125 | 530 | 240 | 6.5 | 8 | M25 |

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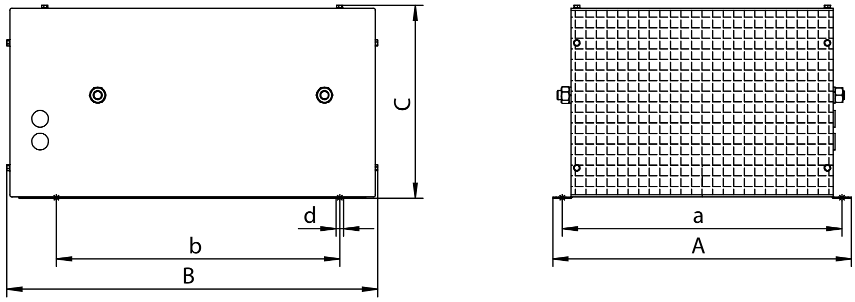
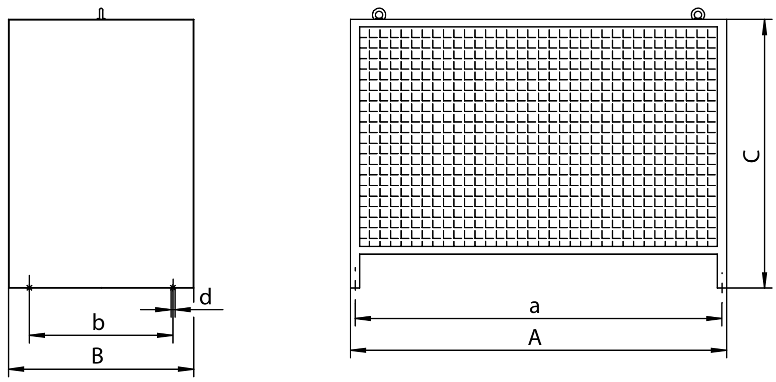
*Grid resistor mounting position 1*




*18874868747*

| Braking resistor | Main dimensions in mm | | | Mounting dimensions in mm | | | | Cable gland |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | d | x | |
| BW015-075-T | 415 | 500 | 270 | 395 | 380 | 9 | – | – |
| BW106-T | 795 | 490 | 270 | 770 | 380 | 10.5 | – | – |
| BW206-T | 995 | 490 | 270 | 970 | 380 | 10.5 | – | – |
| BW915-T | 795 | 490 | 270 | 770 | 380 | 10.5 | – | – |
| BW010-050-T | 395 | 490 | 260 | 370 | 380 | 10.5 | – | – |
| BW010-108-T | 525 | 500 | 270 | 505 | 380 | 9 | – | – |
| BW004-050-01 | 395 | 490 | 260 | 370 | 380 | 10.5 | – | – |
| BW005-070 | 395 | 490 | 260 | 370 | 380 | 10.5 | – | – |
| BW002-070 | 395 | 490 | 260 | 370 | 380 | 10.5 | – | – |
| BW005-170-T | 490 | 795 | 270 | 380 | 770 | 10.5 | – | – |
| BW006-025-01 | 295 | 490 | 260 | 270 | 380 | 10.5 | – | – |
| BW006-050-01 | 395 | 490 | 260 | 370 | 380 | 10.5 | – | – |

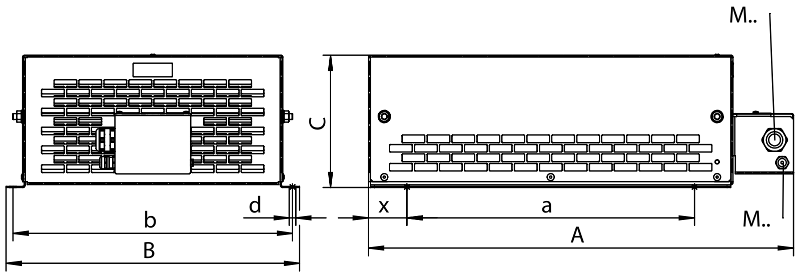
*Grid resistor mounting position 2*




*18874876043*

| Braking resistor | Main dimensions in mm | | | Mounting dimensions in mm | | | | Cable gland |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | d | x | |
| BW003-420-T | 995 | 490 | 710 | 970 | 380 | 10.5 | – | – |
| BW1.0-170 | 490 | 795 | 490 | 380 | 770 | 10.5 | – | – |

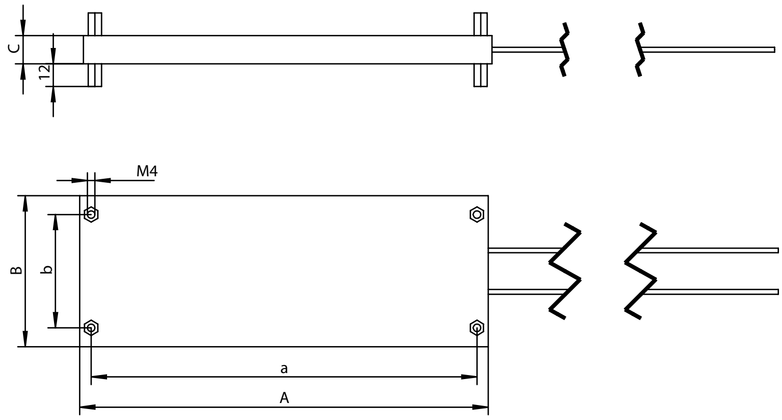
*Frame resistor*




9007218129614603

| Braking resistor | Main dimensions in mm | | | Mounting dimensions in mm | | | | Cable gland |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | d | x | |
| BW027-042-T | 570 | 390 | 180 | 380 | 370 | 6.5 | 55 | M25 + M12 |
| BW015-042-T | 570 | 390 | 180 | 380 | 370 | 6.5 | 55 | M25 + M12 |

*Flat-type resistor*




18874878475

| Braking resistor | Main dimensions in mm | | | Mounting dimensions in mm | | | | Connection length in mm |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | d | x | |
| BW100-001 | 110 | 80 | 15 | 98 | 60 | – | – | 300 |
| BW100-002 | 216 | 80 | 15 | 204 | 60 | – | – | 300 |

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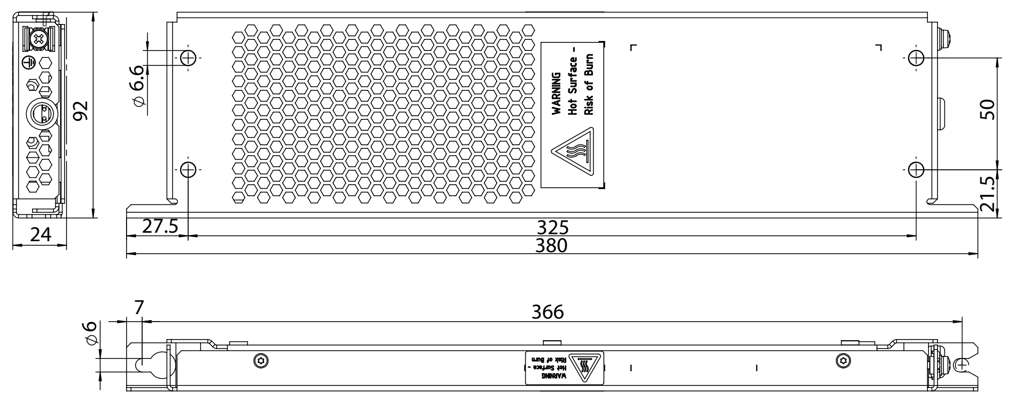
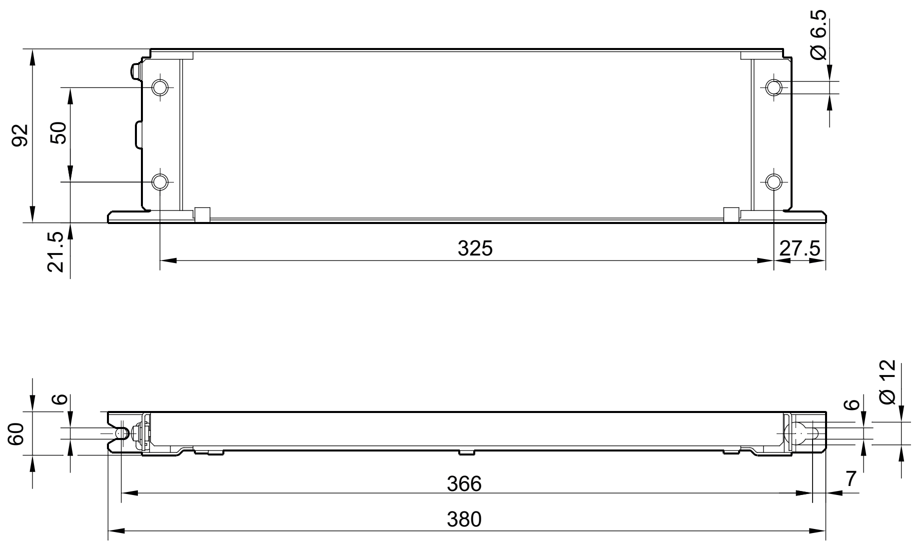
*BW120-001 resistor*




19506873227

Length of connections: 130 mm

*BW100-002/M resistor*



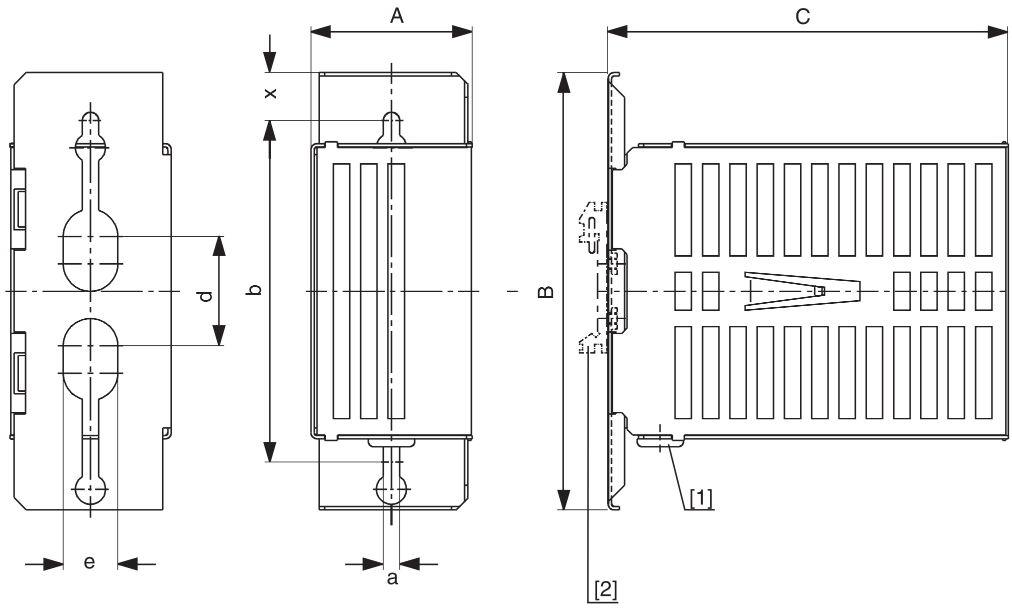

34416105867

*BS.. touch guard*

A BS.. touch guard is available for braking resistors in flat design.

| Touch guard | BS003 | BS005 |
|---|---|---|
| Part number | 8131511 | 813152X |
| Braking resistor | BW100-001 | BW100-002 |

*Dimension drawing of BS...*




*1455849867*

[1] Grommet

[2] Support rail mounting

| Type | Main dimensions in mm | | | Mounting dimensions in mm | | | | | Mass in kg |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | b | d | e | a | x | |
| BS-003 | 60 | 160 | 146 | 125 | 40 | 20 | 6 | 17.5 | 0.35 |
| BS-005 | 60 | 160 | 252 | 125 | 4 | 20 | 6 | 17.5 | 0.5 |

*Mounting rail installation*

A mounting rail attachment HS001 is available from SEW-EURODRIVE, part number 8221944, for mounting the touch guard on a mounting rail.

### 2.12.2 NF.. line filter

Line filters are used to suppress interference emission on the line side of inverters.

**INFORMATION**

Do not switch between the NF.. line filter and inverter.

#### UL and cURus approval

The listed line filters have a cURus approval independent of the inverter.

#### Technical data

| Line filter | Unit | NF0055-503 | NF0120-503 | NF0220-503 | NF0420-513 | NF0910-523 | NF1800-523 | NF2700-503 |
|---|---|---|---|---|---|---|---|---|
| Part number | | 17984319 | 17984270 | 17984300 | 17983789 | 17987504 | 17987865 | 18000576 |
| Nominal line voltage (according to EN 50160) AC $V_{line}$ | V | 3 × 230 – 500 V | | | | | | |
| Line frequency $f_{line}$ | Hz | 50 – 60 ± 5% | | | | | | |
| Nominal current $I_N$ | A | 5.5 | 12 | 22 | 42 | 91 | 180 | 270 |
| Nominal power loss | W | 4 | 6 | 30 | 30 | 51.5 | 89 | 103 |
| Ambient temperature $\vartheta_{amb}$ | | 0 °C to 45 °C (reduction: 3% $I_N$ up to maximum 60 °C) | | | | | | |
| Connection contacts L1/L2/L3 – L1'/L2'/L3' | | Cage clamp terminals | | | Screw terminal | | | M12 stud |
| Cross section L1/L2/L3 – L1'/L2'/L3' | $mm^2$ | Max. 6 | | | 2.5 – 16 | 10 – 50 | 16 – 120 | – |
| Tightening torque L1/L2/L3 – L1'/L2'/L3' | Nm | - | | | 2 – 4 | 3.5 – 6 | 12 – 20 | 14 – 20 |
| PE connection contacts | | M4 screw | | M5 screw | M6 stud | M8 stud | M10 stud | M12 stud |
| PE tightening torque | Nm | 1.5 | | 3 | 6 | 12 | 23 | 30 |
| Degree of protection | | IP20 according to EN 60529 | | | | | | IP00 |
| Mass | kg | 1 | 1 | 1.4 | 3 | 5 | 9 | 15.8 |

#### Assignment to an inverter

| Line filter | NF0055-503 | NF0120-503 | NF0220-503 | NF0420-513 | NF0910-523 | NF1800-523 | NF2700-503 |
|---|---|---|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0020 – 0040 | 0055 – 0095 | 0125 – 0160 | 0240 – 0320 | 0460 – 0750 | 0910 – 1490 | 1770 – 3000 |
| MDX9.A-....-2.3-... | - | 0070 – 0093 | 0140 | 0213 – 0290 | 0420 – 0570 | 0840 – 1080 | - |

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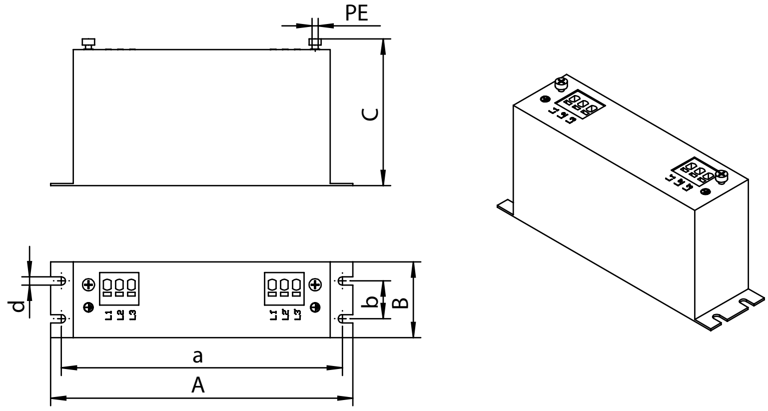
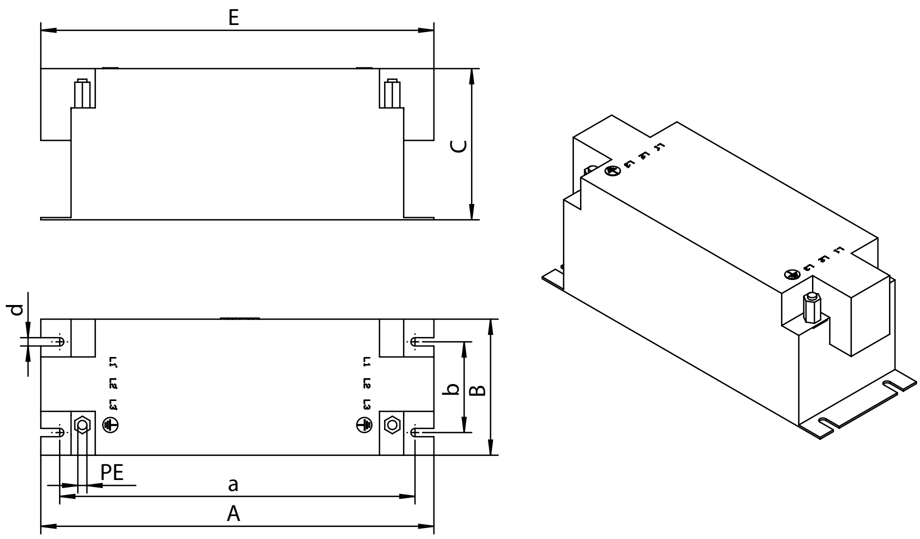
### Dimension sheets and dimensions




18891135115

| Line filter | Main dimensions in mm | | | | Mounting dimensions in mm | | | Connection |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | E | a | b | d | PE |
| NF0055-503 | 200 | 50 | 97 | - | 186 | 25 | 5.5 | M4 |
| NF0120-503 | 200 | 50 | 97 | - | 186 | 25 | 5.5 | M4 |
| NF0220-503 | 230 | 55 | 102 | - | 216 | 30 | 5.5 | M4 |




9007218145873675

| Line filter | Main dimensions in mm | | | | Mounting dimensions in mm | | | Connection |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | E | a | b | d | PE |
| NF0420-513 | 250 | 88 | 98 | 255 | 235 | 60 | 5.5 | M6 |
| NF0910-523 | 270 | 97 | 152 | 322 | 255 | 65 | 6.5 | M8 |
| NF1800-523 | 360 | 131 | 182 | 464 | 365 | 102 | 6.5 | M10 |
| NF2700-503 | 450 | 231 | 284 | 463 | 435 | 172 | 6.5 | M12 |

### 2.12.3 ND.. line chokes

Line chokes are used as follows:

- To support overvoltage protection
- To smoothen the line current, to reduce harmonics
- For protection in the event of distorted line voltage
- To limit the charging current when several inverters are connected together in parallel on the input end with a shared line contactor (nominal current of line choke = total of inverter currents)

#### UL and cURus approval

The listed line chokes have cURus approvals independent of the inverter.

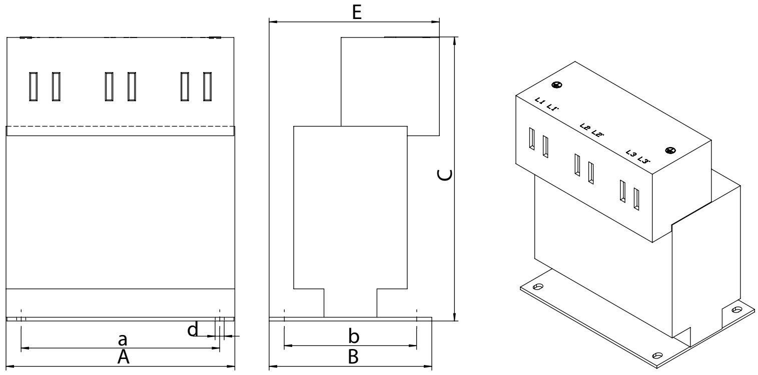
#### Technical data

| Line choke | Unit | ND0070-503 | ND0160-503 | ND0300-503 | ND0420-503 | ND0910-503 | ND1800-503 | ND3000-503 |
|---|---|---|---|---|---|---|---|---|
| Part number | | 17984173 | 17984181 | 17983800 | 17983819 | 17987520 | 17987539 | 18001211 |
| Nominal line voltage (according to EN 50160) AC $V_{line}$ | V | 3 × 230 – 500 V | | | | | | |
| Nominal current $I_N$ | A | 7 | 16 | 30 | 42 | 91 | 180 | 300 |
| Line frequency $f_{line}$ | Hz | 50 – 60 ± 5% | | | | | | |
| Nominal inductance | mH | 0.36 | 0.2 | 0.1 | 0.045 | 0.035 | 0.018 | 0.05 |
| Nominal power loss | W | 4 | 9 | 11 | 13 | 53 | 116 | 280 |
| Ambient temperature $\vartheta_{amb}$ | | -10 °C to 45 °C (reduction: 3% $I_N$ up to maximum 60 °C) | | | | | | |
| Connection contacts L1/L2/L3 – L1'/L2'/L3' | | Screw terminal | | | | | | M12 stud |
| Cross section L1/L2/L3 – L1'/L2'/L3' | $mm^2$ | 0.2 – 4 | | 0.2 – 10 | 2.5 – 16 | 10 – 50 | 16 – 120 | – |
| Tightening torque L1/L2/L3 – L1'/L2'/L3' | Nm | 0.5 – 1 | | 1.2 – 2 | 2.5 | 3.5 – 6 | 12 – 20 | 15.5 |
| PE connection contacts | | M4 screw | | M5 screw | | M8 stud | M10 stud | 2 × M10 stud |
| PE tightening torque | Nm | 1.5 | | 3 | | 12 | 20 | 20 |
| Degree of protection according to EN 60529 | | IPXXB | | | | IPXXA | | IP00 |
| Mass | kg | 0.5 | 1.3 | 1.95 | 1.82 | 4.4 | 10 | 36 |

#### Assignment to an inverter

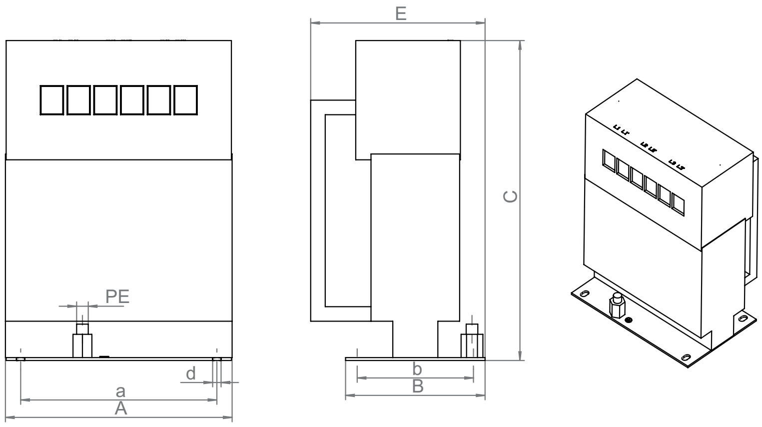
| Line choke | ND0070-503 | ND0160-503 | ND0300-503 | ND0420-503 | ND0910-503 | ND1800-503 | ND3000-503 |
|---|---|---|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0020 – 0040 | 0055 – 0095 | 0125 – 0160 | 0240 – 0320 | 0460 – 0750 | 0910 – 1490 | 1770 – 3000 |
| MDX9.A-....-2.3-... | - | 0070 – 0093 | 0140 | 0213 – 0290 | 0420 – 0570 | 0840 – 1080 | - |

### Dimension sheets and dimensions




18891130251

| Line choke | Main dimensions in mm | | | | Mounting dimensions in mm | | | Connection |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | E | a | b | d | PE |
| ND0070-503 | 78 | 57 | 105 | 56 | 65 | 40 | 4.8 | M4 |
| ND0160-503 | 96 | 70 | 120 | 65 | 71 | 54 | 4.8 | M4 |
| ND0300-503 | 121 | 86 | 145 | 86 | 105 | 70 | 4.8 | M5 |
| ND0420-503 | 121 | 86 | 150 | 90 | 105 | 70 | 4.8 | M5 |




20917778571

| Line choke | Main dimensions in mm | | | | Mounting dimensions in mm | | | Connection |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | E | a | b | d | PE |
| ND0910-503 | 156 | 96 | 220 | 120 | 135 | 80 | 5.8 | M8 |
| ND1800-503 | 187 | 121 | 260 | 153 | 166 | 93 | 6.2 | M10 |
| ND3000-503 | 280 | - | 286 | 188 | 255 | 144 | 11 × 22 slotted hole | M10 |

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### 2.12.4 HF.. output filters

#### Description of the output filter

HF.. type output filters are sine filters used to smooth the output voltages of inverters.

- Discharge currents in the motor cables are suppressed.
- Motor winding insulations of third-party motors that are not suitable for inverters are protected.
- For long motor cables (> 100 m), overvoltage peaks are prevented.

#### UL and cURus approval

The listed output filters have a cURus approval independent of the inverter.

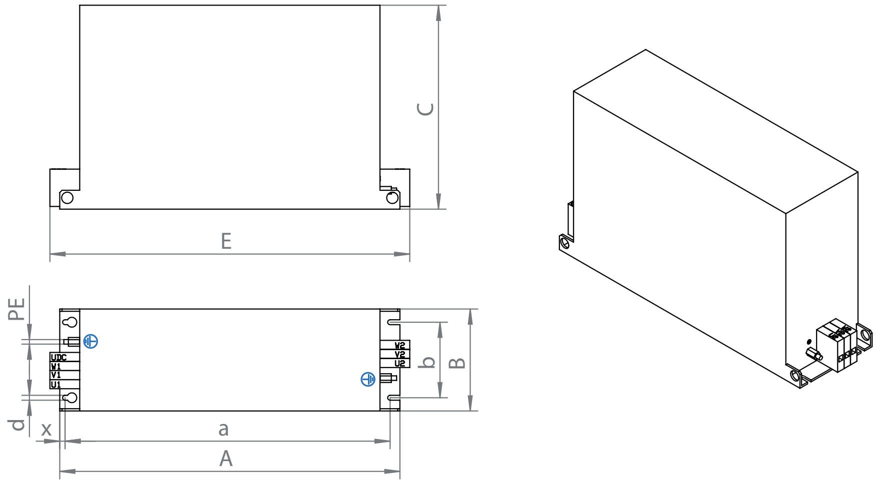
#### Technical data

| Output filter | Unit | HF0055-503 | HF0125-503 | HF0240-503 | HF0460-503 | HF0650-503 | HF1150-503 |
|---|---|---|---|---|---|---|---|
| Part number | | 17985110 | 17985129 | 17985137 | 17985145 | 17991277 | 17991269 |
| Nominal line voltage (according to EN 50160) AC $V_{line}$ | V | 3 × 230 – 500 V | | | | | |
| Nominal current $I_N$ | A | 5.5 | 12.5 | 24 | 46 | 65 | 115 |
| Line frequency $f_{line}$ | Hz | 50 – 60 ± 5% | | | | | |
| Nominal power loss | W | 80 | 120 | 200 | 400 | 500 | 900 |
| Ambient temperature $\vartheta_{amb}$ | | 0 °C to 45 °C (reduction: 3% $I_N$/K up to maximum 60 °C) | | | | | |
| Connection contacts U1/V1/W1/UDC – U2/V2/W2 | | Screw terminal | | | | | |
| Cross section U1/V1/W1/UDC – U2/V2/W2 | $mm^2$ | 0.2 – 10 | | 2.5 – 16 | | 16 – 50 | 16 – 95 |
| Tightening torque U1/V1/W1/UDC – U2/V2/W2 | Nm | 1.2 – 2 | | 2 – 4 | | 3 – 6 | 12 – 20 |
| PE connection contacts | | M6 stud | | | | M8 stud | M10 stud |
| PE tightening torque | Nm | 6 | | | | 12 | 23 |
| Degree of protection in accordance with EN 60529 | | IPXXB | | | | IPXXA | |
| Mass | kg | 8 | 18 | 25 | 40 | 48 | 68 |

#### Assignment to an inverter

| Output filter | HF0055-503 | HF0125-503 | HF0240-503 | HF0460-503 | HF0650-503 | HF1150-503 |
|---|---|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0020 – 0040 | 0055 – 0095 | 0125 – 0160 | 0240 – 0320 | 0460<br>0910 (parallel connection of 2 filters) | 0620 – 0750<br>1130 – 1490 (parallel connection of 2 filters) |
| MDX9.A-....-2.3-... | - | 0070 – 0093 | 0140 | 0213 – 0290 | 0420 | 0570 |

### Dimension sheets and dimensions




*9007218523812619*

| Output filter | Main dimensions in mm | | | | Mounting dimensions in mm | | | | Connection |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | E | a | b | d | x | PE |
| HF0055-503 | 310 | 105 | 160 | - | 290 | 75 | 6.5 | 7 | M6 |
| HF0125-503 | 390 | 120 | 215 | - | 370 | 90 | 6.5 | 7 | M6 |
| HF0240-503 | 450 | 135 | 270 | - | 430 | 100 | 6.5 | 7 | M6 |
| HF0460-503 | 450 | 160 | 310 | - | 430 | 120 | 6.5 | 7 | M6 |
| HF0650-503 | 635 | 210 | 285 | 637 | 610 | 174 | 8.5 | 10 | M8 |
| HF1150-503 | 725 | 260 | 273 | 755 | 700 | 224 | 8.5 | 10 | M10 |

### 2.12.5 HD.. output chokes

#### Description of output chokes

HD.. type output chokes suppress interference emitted from unshielded motor cables.

#### UL and cURus approval

The listed output chokes have a cURus approval independent of the inverter.

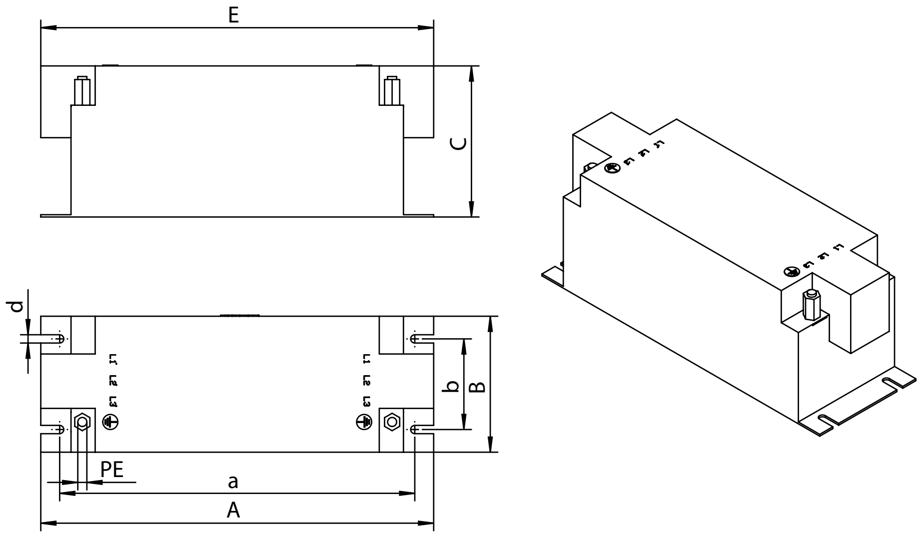
#### Technical data

| Output choke | Unit | HD0125-503 | HD0240-503 | HD0460-503 | HD1000-503 | HD2000-503 | HD6000-503 |
|---|---|---|---|---|---|---|---|
| Part number | | 17985153 | 17985188 | 17985161 | 17991307 | 17991250 | 17963362 |
| Nominal line voltage (according to EN 50160) AC $V_{line}$ | V | 3 × 230 – 500 V | | | | | |
| Nominal current $I_N$ | A | 12.5 | 24 | 46 | 100 | 200 | 600 |
| Line frequency $f_{line}$ | Hz | 50 – 60 ± 5% | | | | | |
| Nominal power loss | W | 2.9 | 6 | 14 | 37 | 83 | 162 |
| Ambient temperature $\vartheta_{amb}$ | | 0 °C to 45 °C (reduction: 3% $I_N$/K up to maximum 60 °C) | | | | | |
| Connection contacts U1/V1/W1/UDC – U2/V2/W2 | | Screw terminal | | | | | Copper rail |
| Cross section U1/V1/W1/UDC – U2/V2/W2 | $mm^2$ | 0.2 – 10 | 2.5 – 16 | | 16 – 50 | 16 – 150 | 30 × 8, bore Ø M12 mm |
| Tightening torque U1/V1/W1/UDC – U2/V2/W2 | Nm | 1.2 – 2 | 2 – 4 | | 6 – 8 | 12 – 20 | - |
| PE connection contacts | | M6 stud | | | M8 stud | M10 stud | M12 × 50 |
| PE tightening torque | Nm | 6 | | | 12 | 23 | 30 |
| Degree of protection in accordance with EN 60529 | | IPXXB | | | IPXXA | | IP00 |
| Mass | kg | 0.85 | 1.46 | 2.35 | 3 | 6.5 | 16 |

#### Assignment to an inverter

| Output choke | HD0125-503 | HD0240-503 | HD0460-503 | HD1000-503 | HD2000-503 | HD6000-503 |
|---|---|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0020 – 0095 | 0125 – 0160 | 0240 – 0320 | 0460 – 0750 | 0910 – 1490 | 1770 – 3000 |
| MDX9.A-....-2.3-... | 0070 – 0093 | 0140 | 0213 – 0420 | 0420 – 0840 | 1080 | - |

### Dimension sheets and dimensions

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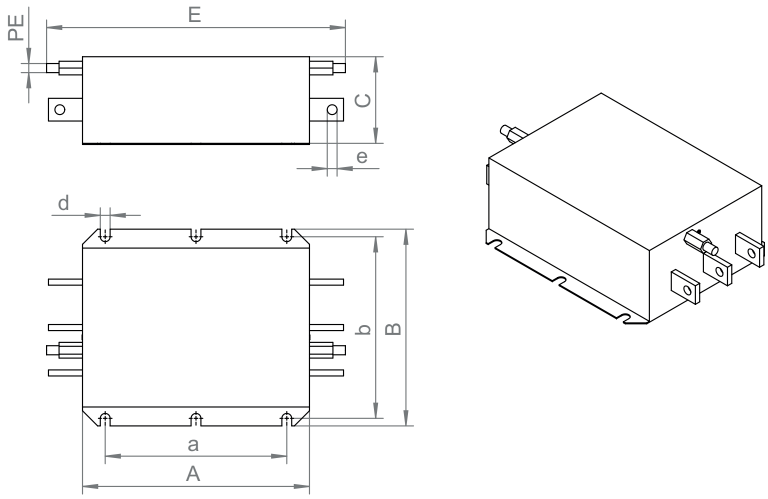
| Output choke | Main dimensions in mm | | | | Mounting dimensions in mm | | | Connection |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | E | a | b | d | PE |
| HD0125-503 | 153 | 62.5 | 72.5 | 151 | 138 | 40 | 5.5 | M6 |
| HD0240-503 | 173 | 92.5 | 82.5 | 178 | 158 | 65 | 5.5 | M6 |
| HD0460-503 | 185 | 122.5 | 112.5 | 189 | 170 | 90 | 5.5 | M6 |
| HD1000-503 | 255 | 116 | 143.5 | 265 | 240 | 82 | 6.5 | M8 |
| HD2000-503 | 300 | 178 | 175 | 330 | 286 | 120 | 6.5 | M10 |




*35975896715*

| Output choke | Main dimensions in mm | | | | Mounting dimensions in mm | | | | Connection |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | E | a | b | d | e | PE |
| HD6000-503 | 300 | 260 | 116 | 395 | 240 | 240 | 13 | 13 | M12 |

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### 2.12.6 DC link chokes ZD..

The necessity of a DC link choke must be checked according to the information in the "Project planning" chapter.

#### Technical data

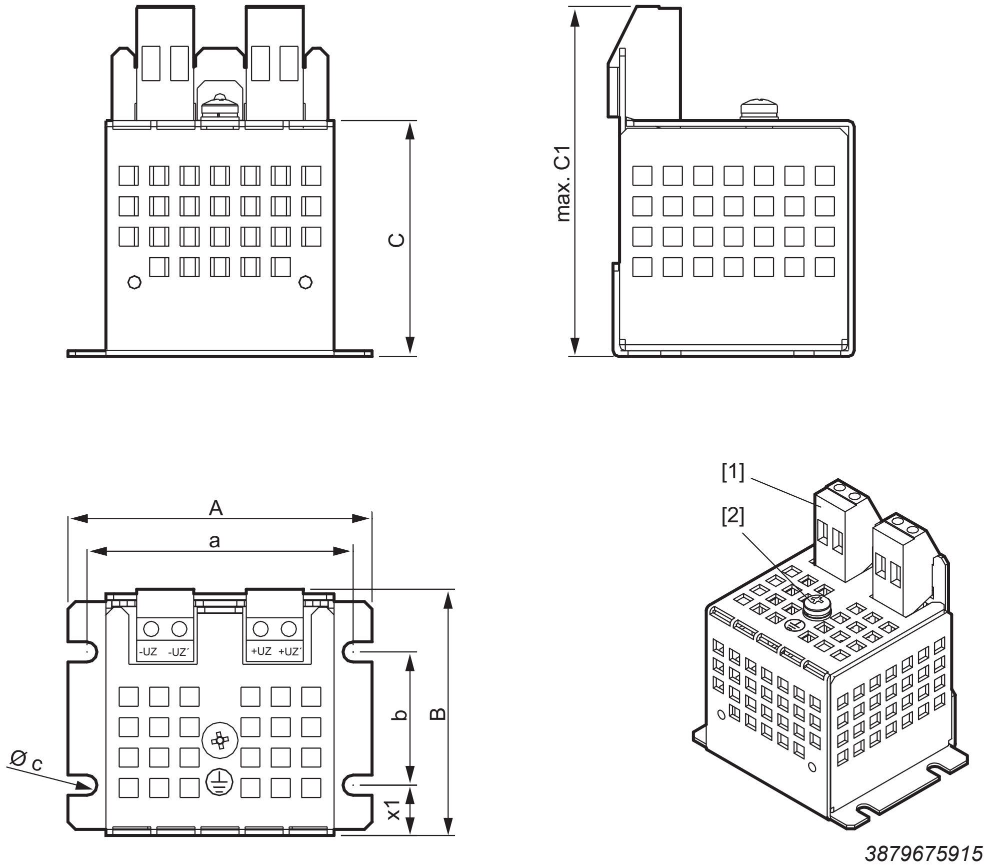
| DC link choke | Unit | ZD010-0200 | ZD040-0070 | ZD140-0020 | ZD330-0006 |
|---|---|---|---|---|---|
| Part number | | 17968437 | 17968402 | 17968410 | 17968429 |
| Nominal line voltage (according to EN 50160) AC $V_{line}$ | V | 3 × 380 – 500 V | | | |
| Nominal current DC $I_N$ | A | 10 | 40 | 140 | 330 |
| Line frequency $f_{line}$ | Hz | 50 – 60 ± 5% | | | |
| Power loss at $I_N$ $P_V$ | W | 7 | 17 | 29 | 40 |
| Ambient temperature $\vartheta_{amb}$ | °C | -10 – 40 | | | |
| Degree of protection | | IP10 | | | |
| Connection contacts $+U_Z$ /$-U_Z$/$+U_Z'$/$-U_Z'$ | | Terminal strips | M6 stud | M10 stud | M12 stud |
| Cross section | $mm^2$ | 4 | – | – | – |
| PE connection contacts | | M5 stud | M6 stud | M8 stud | M8 stud |
| Tightening torque | Nm | 0.6 – 0.8 | 3 | M10: 10<br>PE: 6 | M12: 15.5<br>PE: 6 |
| Assignment | | | | | |
| MDX9.A-....-5.3-... | | 0020 – 0070 | 0095 – 0240 | 0320 – 0750 | 0910 – 1490 |
| MDX9.A-....-2.3-... | | 0070 | 0093 – 0213 | 0290 – 0570 | 0840 – 1080 |

#### UL and cURus approval

The listed DC link chokes have a cURus approval independent of the inverter.

### Dimension sheets and dimensions

*DC link choke ZD010..*




[1] Connecting terminal
[2] Ground stud

| DC link choke | Main dimensions in mm | | | | Mounting dimensions in mm | | | | Mass |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | C1 | a | b | x1 | c | kg |
| ZD010-0200 | 80 | 64.75 | 62 | 95 | 70 | 35 | 13.25 | 5.3 | 0.56 |

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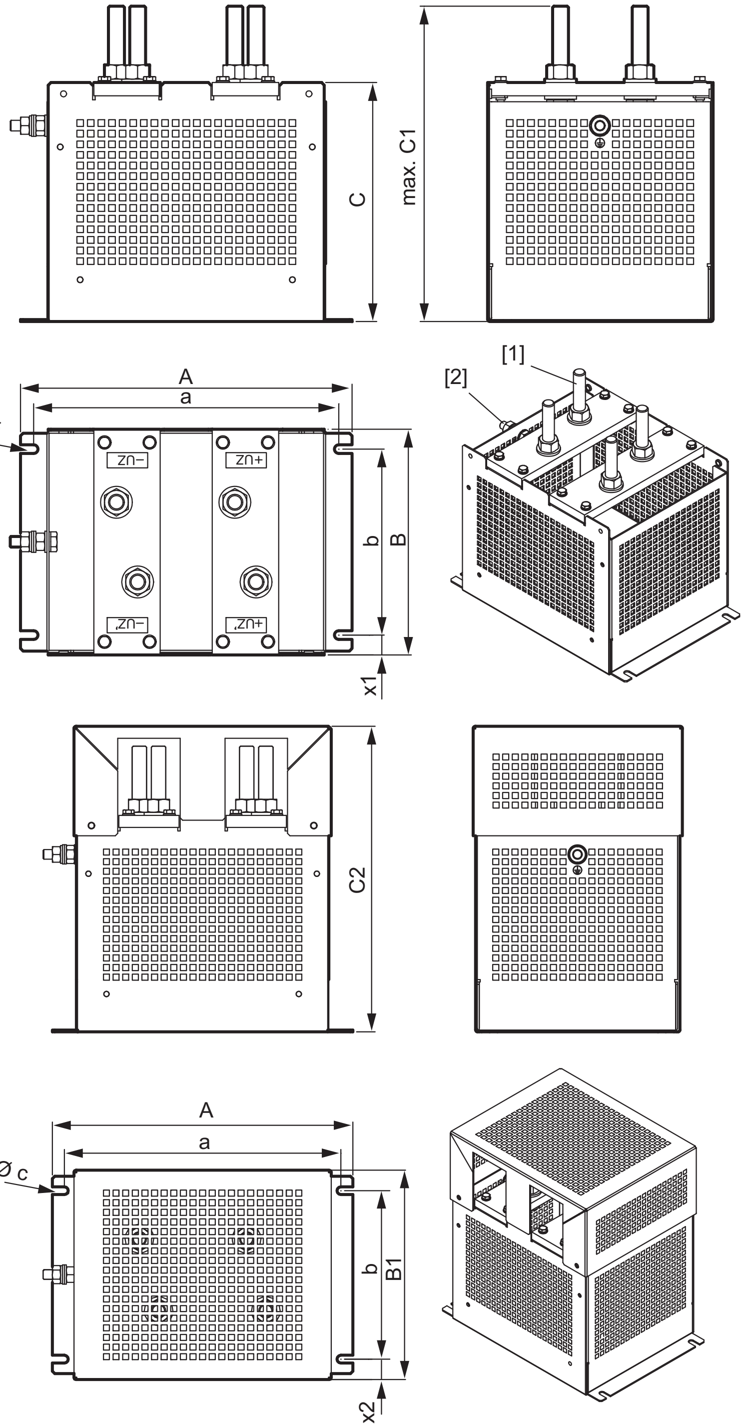
*DC link choke ZD040.. / ZD140.. / ZD330.. with and without cover*

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[1] Terminal stud

[2] Ground stud

| DC link choke | Main dimensions in mm | | | | | | Mounting dimensions in mm | | | | | Mass |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | B1 | C | C1 | C2 | a | b | c | x1 | x2 | kg |
| ZD040-0070 | 130 | 94 | 98 | 116 | 145 | 156 | 120 | 60 | 5.3 | 15 | 17 | 2 |
| ZD140-0020 | 190 | 130 | 134 | 110 | 150 | 164.5 | 170 | 100 | 6.5 | 15 | 17 | 4.5 |
| ZD330-0006 | 250 | 170 | 174 | 180 | 240 | 254 | 230 | 140 | 6.5 | 15 | 17 | 8.8 |

## 2.13 USM21A interface adapter

With the USM21A interface adapter, it is possible to connect an engineering PC with a USB interface to the X32 Service interface of the inverter.

| USM21A | Technical data |
|---|---|
| Part number | 28231449 |
| Ambient temperature | 0 °C to 40 °C |
| Storage temperature | -25 °C to 70 °C |
| Degree of protection | IP20 |
| Dimensions | |
| Width | 42 mm |
| Height | 89 mm |
| Depth | 25 mm |

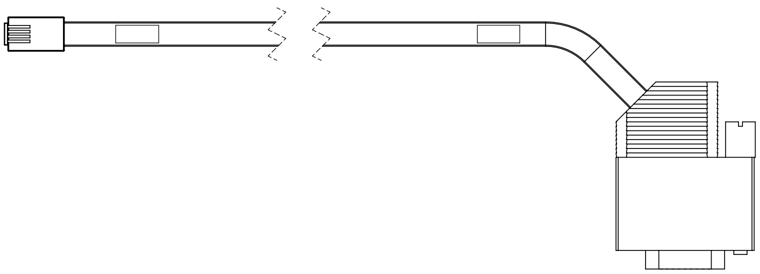
An order using part number 28231449 includes the following parts:

- USM21A interface adapter
- USB connection cable for the USM21A – PC connection
- Serial interface cable with 2 RJ10 connectors

### INFORMATION

To connect the inverter to the USM21A, you need an additional serial interface cable with an RJ10 connector and a 9-pin D-sub connector, part number 18123864.

This cable must be ordered separately.



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# 3 Project planning

## 3.1 SEW-Workbench

The SEW-Workbench is the central configuration software for inverters from SEW-EURODRIVE.

It can process any required configurations, from entering the application to gear unit, motor and inverter calculations. Other features are optimization of the various axis cycles including the selection of accessories and a fault check of the entire drive system configuration.

Of course, the Workbench can also be used to select and dimension all other products from SEW-EURODRIVE (such as decentralized drives and gearmotors). This means the SEW-Workbench allows for thoroughly specifying drive solutions from the entire range of products from SEW-EURODRIVE. The straightforward operation saves a great deal of time and minimizes complexity.

The key features of the SEW-Workbench are:

- Application selection
- Gear unit and motor calculation
- Price-optimized configuration
- Comparison of different solutions
- Inverter calculation
- Multi-axis optimization
- Parameterization of cable and accessories selection
- Dimensioning error check
- Parts list generation
- Electronic catalog with all products

The configuration software SEW-Workbench is available for download from the official SEW-EURODRIVE website.

To use SEW-Workbench, all you need to do is to register via the Online Support once you have downloaded and installed the software or received the data DVD. An Internet update service ensures that the products and functions are always up to date.

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## 3.2 Schematic workflow for project planning

The following flow diagram illustrates the drive selection procedure for a positioning drive. The drive consists of a gearmotor that is supplied by an application inverter.

**Necessary information regarding the machine to be driven**
- Technical data and ambient conditions
- Positioning accuracy
- Speed setting range
- Travel cycle calculation

↓

**Calculation of the relevant application data**
- Travel diagram
- Motor speeds
- Static, dynamic torques
- Regenerative power

↓

**Gear unit selection**
- Define gear unit type, gear unit size, gear unit ratio, and gear unit design
- Check positioning accuracy
- Check gear unit load
- Check input speed

↓

**Motor selection**
- Maximum torque
- With dynamic drives: effective torque at medium speed
- Maximum speed
- Observe dynamic and thermal torque curves
- Motor equipment (brake, plug connector, thermal motor protection, etc.)

↓

**Selection of application modules**
- Determine control mode
- Make motor/inverter assignment
- Define PWM frequency
- Check whether application inverters meet duration and overload requirements

↓

**Selection of the braking resistor**
- Check whether braking resistor meets duration and overload requirements
- Observe braking resistor assignment

↓

**Selection of other system components**
- Option cards
- Motor and supply system cables
- Signal and encoder cables
- EMC measures

↓

**Selection of 24 V voltage supply**
- Determine the current demand of the 24 V voltage supply
- Observe the requirements for the voltage tolerance

↓

**Ensure that all requirements have been met.**

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## 3.3 Drive selection

For drive selection, in addition to the travel diagram that describes the exact travel cycle, a large number of additional specifications must be made about the operating and ambient conditions.

It is first necessary to have data for the machine to be driven such as mass, setting range, speed, information about the mechanical design and so on in order to select the drive correctly. The appropriate drive can be determined with the calculated torques and speeds of the drive while taking other mechanical requirements such as environmental and operating conditions into account.

For selecting the drive, a decision is to be taken if an asynchronous motor or a synchronous motor is to be used. The extensive product range of SEW-EURODRIVE is available for this purpose.

### 3.3.1 Characteristics of the control modes

**INFORMATION**

The values in the following tables only apply in case of a basic clock frequency of 4 kHz.

**Overview of the control modes**

| | V/f | VFC$^{PLUS}$ | | CFC | | ELSM® |
|---|---|---|---|---|---|---|
| Principle | Voltage controlled according to characteristic curve | Field-oriented, voltage-controlled, stator flux controller, torque controller | | Field-oriented, current controller | | Field-oriented, current controller |
| Motor | ASM/LSPM | ASM | ASM | ASM | SM | SM |
| Encoder | Without | Without | With | With | With | Without |
| Dynamics | + | +++ | ++++ | +++++ | +++++ | ++ |
| Energy efficiency | + | +++ | +++ | ++ | +++++ | ++++++ |
| Speed control | Yes[1)] | Yes | | Yes | | Yes |
| Torque control | No | Yes | | Yes | | Yes |
| Positioning | No | No | Yes | Yes | | No |
| Flying start | No[2)] | Yes | | Yes | | Yes |
| Typical applications | Group drive, multi-motor drives | General materials handling technology, horizontal drives, vertical drives, pumps/fans, winding drives | | Packaging technology, handling technology, highly-dynamic positioning | | Horizontal materials handling technology |
| Characteristics | Maximum robustness | Maximum precision | | Maximum dynamics | | Maximum energy efficiency |

1) Open-loop speed control

2) DC braking

**Characteristic values for dynamics**

| | V/f | VFC$^{PLUS}$ | CFC | ELSM® |
|---|---|---|---|---|
| Torque control time | – | ≥ 2 ms[1)] | ≥ 150 µs | ≥ 150 µs |
| Time constant speed controller | – | ≥ 4 – 6 ms | ≥ 2 ms | ≥ 6 ms |
| Speed ripple | The speed ripple is mainly determined by the total mass moment of inertia, the torque ripple and in particular the mechanical structure. It is therefore not possible to specify a general value. | | | |

1) Valid in voltage control range, in field weakening range < 5 ms.

### Characteristic values for setpoint resolution

| | V/f | VFC^PLUS | CFC | ELSM® |
|---|---|---|---|---|
| Torque | - | 32 bits<br>0.001% $M_{NMot}$ | 32 bits<br>0.001% $M_{NMot}$ | 32 bits<br>0.001% $M_{NMot}$ |
| Speed | 32 bits<br>0.0001 $min^{-1}$ | 32 bits<br>0.0001 $min^{-1}$ | 32 bits<br>0.0001 $min^{-1}$ | 32 bits<br>0.0001 $min^{-1}$ |
| Position<br>(increment/revolution) | - | 16 bits | 16 bits | - |
| Position<br>(absolute increment) | - | 32 bits | 32 bits | - |

### Characteristic values for accuracy of torque and speed

<table>
<tr><th rowspan="3"></th><th colspan="2">VFC^PLUS without encoder</th><th colspan="2">VFC^PLUS with encoder</th></tr>
<tr><th colspan="2">Motor temperature sensor</th><th colspan="2">Motor temperature sensor</th></tr>
<tr><th>Without</th><th>With</th><th>Without</th><th>With</th></tr>
<tr><td>Accuracy of the calculated torque</td><td colspan="4">depends on the accuracy of the motor parameters<br>INFORMATION: The more accurate the motor parameters, the more accurate the torque. For greater torque accuracy, measure the motor parameters with FCB25.</td></tr>
<tr><td>Deviation with FCB25</td><td>< 5% $M_N$</td><td>< 5% $M_N$</td><td>< 5% $M_N$</td><td>< 5% $M_N$</td></tr>
<tr><td>Typical deviation</td><td>< 10% $M_N$</td><td>< 10% $M_N$</td><td>< 10% $M_N$</td><td>< 10% $M_N$</td></tr>
<tr><td>Maximum deviation[1)]</td><td>< 15% $M_N$</td><td>< 15% $M_N$</td><td>< 25% $M_N$</td><td>< 15% $M_N$</td></tr>
</table>

1) If n is permanently < 20% of the nominal speed.

| | CFC without temperature sensor | CFC with temperature sensor |
|---|---|---|
| **Accuracy of the calculated torque** | depends on the accuracy of the motor parameters and motor temperature | depends on the accuracy of the motor parameters, typical deviation: < 5% $M_N$ |

| | VFC^PLUS without encoder | All control modes with encoders |
|---|---|---|
| **Accuracy of the calculated speed**[1)] | depends on the accuracy of the motor parameters, typical deviation: 0.2 × $f_{nominal\ slip}$ | Maximum deviation: 0.007% $n_{setp}$, $10^{-4}$ $min^{-1}$ |

1) Stationary inaccuracy is the deviation between the mean value of the exact physical speed and the speed setpoint.

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#### Maximum output frequency

| $f_{PWM}$ | V/f | VFC^PLUS | CFC | ELSM® |
|---|---|---|---|---|
| 2.5 kHz | 250 Hz | 250 Hz | 250 Hz | 250 Hz |
| 4 kHz | 400 Hz | 250 Hz | 400 Hz | 400 Hz |
| ≥ 8 kHz | 599 Hz | 250 Hz | 500 Hz | 500 Hz |

#### FCBs that can be activated for selected control mode

| FCB no. | Designation | V/f | VFC^PLUS | CFC | ELSM® |
|---|---|---|---|---|---|
| 01 | Output stage inhibit | + | + | + | + |
| 02 | Default stop | + | + | + | + |
| 04 | Manual mode | + | + | + | + |
| 05 | Speed control | + | + | + | + |
| 06 | Interpolated speed control | + | + | + | + |
| 07 | Torque control | – | + | + | + |
| 08 | Interpolated torque control | – | + | + | + |
| 13 | Stop at application limits | + | + | + | + |
| 14 | Emergency stop | + | + | + | + |
| 25 | Motor parameter measurement | + | + | + | + |
| 26 | Stop at user limits | + | + | + | + |
| FCBs requiring a position encoder | | | | | |
| 09 | Positioning control | – | + | + | – |
| 10 | Interpolated positioning control | – | + | + | – |
| 12 | Reference travel | – | + | + | + |
| 18 | Rotor position identification | – | – | + | – |
| 19 | Position hold control | – | + | + | – |
| 20 | Jog | – | + | + | – |
| 21 | Brake test | – | + | + | – |

### 3.3.2 General requirements for motors

**Motors that can be connected**

- Asynchronous motors with squirrel-cage rotor
- Permanent-field synchronous motors

When third-party motors are operated with inverters, SEW-EURODRIVE cannot ensure that the specified performance data is reached.

**Dielectric strength of the motor**

The operation of an AC motor with a frequency inverter places a much greater load on the motor winding than in the case of operation on the supply system. All AC motors by SEW-EURODRIVE have the required voltage endurance.

The connected third-party motor has to be designed in inverter mode for these DC link voltages.

At a line voltage of AC 3 × 400 V, the nominal DC link voltage is DC 560 V. In regenerative operation, the DC link voltage can rise to 980 V.

The inverters pulse the DC voltage of the DC link $U_{DC}$ to the supply cables to the motor. At SEW-EURODRIVE, the pulsed voltage supply is available with 2.5 kHz, 4 kHz, 8 kHz, or 16 kHz. As a result, the motor is loaded with voltage peaks, high amplitude and very short rise times.

For operation of third-party motors on inverters by SEW-EURODRIVE, their suitability must be checked.

**Requirements for third-party motors**

The connected third-party motor has to be designed in inverter mode for the relevant DC link voltage.

The inverters pulse the DC voltage of the DC link $U_{DC}$ to the supply cables to the motor. At SEW-EURODRIVE, the pulsed voltage supply is available with 2.5 kHz, 4 kHz, 8 kHz, or 16 kHz. As a result, the motor is loaded with voltage peaks, high amplitude and very short rise times.

The technical data of the motors must lie within the following ranges:

| | Permitted input values | Realistic area |
|---|---|---|
| Nominal motor speed | 0 – 36000 $min^{-1}$ | 0 – 36000 $min^{-1}$ |
| Nominal motor current | 0 – 10000 A | 0 – 900 A |
| Nominal motor voltage | 0 – 2000 V | 0 – 690 V |
| Nominal motor torque | 0 – 50000 Nm | 0 – 50000 Nm |
| Rated motor frequency | 0 – 20000 Hz | 0 – 599 Hz |
| Number of pole pairs asynchronous/synchronous motor | 1 – 64 | 1 – 64 |

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### Thermal motor protection

Thermal motor protection avoids overheating and, therefore, prevents irreparable damage from being caused to the motor. For this purpose, temperature sensors detect the winding temperature. As standard, the inverters can evaluate the following temperature sensors:

| Motor protection | Number of sensors | SEW designation |
|---|---|---|
| PTC thermistor | 3 | TF |
| Bimetallic temperature switch | 3 | TH |
| Semiconductor temperature sensor KTY84 – 130 | 1 | KY/KTY |
| Pt1000 platinum temperature sensor, mounted in winding | 1 | PK |
| Pt1000 platinum temperature sensor, mounted in stator housing | 1 | PI[1] |

1) In preparation.

| Motor series | Temperature sensor | Motor protection |
|---|---|---|
| CM.. | KTY84 – 130, Pt1000 | Comprehensive protection[1] |
| CM.. | TF | Limited protection[2] |
| DR.. | TF, TH | Comprehensive protection[3] |
| DR.. | KTY84 – 130 | Limited protection[4] |
| DR.. | Pt1000 (PK) | Limited protection[4] |
| DR.. | Pt1000 (PI) | Comprehensive protection[1] |
| Third-party motors | PTC thermistor,<br>Bimetallic temperature switch | Comprehensive protection[3] |
| Third-party motors | KTY84 – 130, Pt1000 | Limited protection[4] |

1) Comprehensive protection, as a thermal model protects the winding in addition to the measured value.
2) Depending on the motor size.
3) Comprehensive protection, as one sensor per motor phase is included.
4) If the temperature measured by the temperature sensor exceeds the limit temperature of the set thermal class of the motor, the inverter issues a fault message. There is no evaluation of the motor model. Thermal overload of windings is possible since the sensor is only installed in one winding.

For additional information on the thermal motor protection, refer to the documentation of the motors.

### Thermal motor protection without temperature sensor

Thermal motor protection without temperature sensor is an inverter function that can protect motors without temperature sensors (e.g. PTC thermistors, bimetallic switches) against thermal overload. The level of protection is similar to that of a thermal overload relay. However, the reduced cooling is taken into account, especially at lower speeds.

- Insufficient cooling conditions and increased ambient temperature are influencing factors that cannot be taken into account.
- In the event of overloads in the low speed range, it cannot be ruled out that increased winding temperatures may occur which may damage the winding or lead to premature aging of the motor.
- The cooling of the motor is stronger at low temperatures. A temperature sensor only measures and triggers an overtemperature at increased motor utilization. This increased motor utilization is not possible with thermal motor protection without a sensor.

This means that thermal motor protection without a temperature sensor only represents basic protection. For complete thermal motor protection, SEW-EURODRIVE recommends using a temperature sensor.

*Requirements*

The following table lists the requirements that must be met to use thermal motor protection without a temperature sensor.

| Category | Requirements |
|---|---|
| Firmware version | Version 7.0 or later |
| Motor series | DRN.., DR2S.. |
| Motor size | 63 – 132M |
| Number of poles | 4 |

*Boundary conditions*

The following table shows the framework conditions that must be met in order to be able to use thermal motor protection without a temperature sensor.

| Category | Requirements |
|---|---|
| Type of cooling | fan-cooled |
| Ambient temperature | -20 °C to +40 °C |
| Thermal class of winding | 155(F), 180(H) |
| Installation altitude | < 1000 m |

For motors with forced cooling fans as well as fan-free and non-ventilated motors, the thermal motor protection must not be used without a temperature sensor.

In the case of multi-motor drives and group drives, as well as third-party motors, it is not possible to use the thermal motor protection without a temperature sensor.

For motors with speed sensor, SEW-EURODRIVE recommends using a thermal sensor.

*Further information*

The thermal motor protection without temperature sensor is active as long as the inverter is in operation and supplied with at least DC 24 V.

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The thermal motor protection without temperature sensor has no memory, i.e. it does not take into account the current motor temperature after a switch-on/switch-off process. Therefore, it must be avoided that an overheated motor is immediately subject to another overload by switching the inverter off and on again. SEW-EURODRIVE recommends performing a fault reset in the event of a fault message of the thermal motor protection without temperature sensor.

### 3.3.3 Startup of third-party motors

Asynchronous motors

The nameplate data must be entered during startup, a calibration function then determines further data not specified on the nameplate. While the calibration function is running, the rotor does not turn and the brake is not released.

In case of asynchronous motors, at least the nameplate data must be known. The parameters required for startup are calculated based on the nameplate data and the motor is taken into operation. This only works in online mode.

An additional parameter measurement can be performed for enhanced control characteristics. In case of asynchronous motors, the measurement is performed while the motor is at standstill; if a brake is available, it can be and should remain applied. The duration of the measurement depends on the motor parameters.

Synchronous motors

For synchronous motors without encoder, the startup procedure is performed in the same way as with asynchronous motors using the nameplate data.

For synchronous motors with encoder, the correct encoder offset must be ensured after startup. This is performed using the function "Rotor position identification". The rotor turns during the rotor position identification. Make sure that the rotor can turn freely. For this reason, the motor must be separated from the gear unit or system.

In case of synchronous motors the nameplate data alone is not sufficient, but an additional parameter calibration must be performed. In addition to the nameplate data, other values must also be known, such as the number of pole pairs, maximum speed, maximum current, or maximum torque and mass moment of inertia.

With synchronous motors, the brake is released (if available) during the measurement to align the rotor electrically. No load must be attached to the motor during the measurement, i.e. the motor must be in no-load operation. Otherwise, a correct calibration of the motor parameters cannot be guaranteed. The entire measurement only takes a few seconds with synchronous motors. After the measurement has been successfully performed, the motor is taken into operation electrically.

In case of drives with permanent magnet synchronous motors, encoder operation always requires knowledge of the absolute rotor position. The knowledge of the initial rotor position angle offset is called "commutation". The offset of the rotor position angle can be determined using FCB18 and saved to the inverter. No load must be attached to the motor during the calibration, otherwise, a correct commutation cannot be guaranteed.

### 3.3.4 Group drive and multi-motor drive

#### Group drive of asynchronous motors

A group drive is a group of asynchronous motors of any power rating. The motors do not have a rigid mechanical connection or only have a connection that is subject to slip and are connected to an electrically parallel inverter.

After a suitable startup, operation is possible.

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If motors with different power ratings are operated at the inverter in parallel, the motor with the largest power rating has to be set up.

- The total of the motor currents must not exceed the nominal output current of the inverter.

The maximum number of motors depends on the control mode:

| Control mode | Number of motors |
|---|---|
| V/f | 64 |

### Multi-motor drive of asynchronous motors

Multi-motor drive means the electrical parallel connection of several identical asynchronous motors at 1 inverter, that are rigidly and mechanically coupled and drive a load.

Parallel operation of several identical asynchronous motors is possible provided the strict compliance with the following conditions:

- Only use gearmotors of the same type and with the same winding data.
- The rotor position of the individual motors must not differ in more than the following mechanical angle:

  $Z_p \times \Delta\varphi_{mech\_max} < 20°$

  $Z_p$ = Number of motor pole pairs

  $\Delta\varphi_{mech\_max}$ = Maximum torsion angle of the shaft connection in regard of the motor shaft

  This must be ensured by the mechanics, even for maximally different torque loads of the motor shafts.
- If encoder feedback is used, just one of the motors needs to be equipped with an encoder. This encoder must be installed on the gearmotor which has the greatest clearance or elasticity with respect to the load inertia.

The maximum number of motors depends on the control mode:

| Control mode | Number of motors |
|---|---|
| V/f | 64 |
| $VFC^{PLUS}$ | 10 |
| CFC | 10 |

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### Temperature evaluation for group drive/multi-motor drive

- Preferably use bimetallic temperature switches TH.
- The series connection of the TH contacts (normally closed) is not subject to any restriction if joint monitoring is provided.
- If the TF temperature sensors are available in motors, the temperature sensors of up to 3 motors can be connected in series.

### Permitted cable length for group drive/multi-motor drive

Note the permitted length of all motor cables connected in parallel:

$$l_{tot} \leq \frac{l_{max}}{n} \qquad l_{tot} = \sum_{i=1}^{n} l_i$$

$l_{tot}$ = Maximum total length of motor cables connected in parallel

$l_{max}$ = Permitted motor cable length

$l_i$ = Cable length of the inverter to the motor

n = Number of motors connected in parallel

## 3.3.5 Connecting explosion-protected AC motors

Observe the following instructions when connecting explosion-protected AC motors to the inverters:

- The inverter must be installed outside of the potentially explosive atmosphere.
- Observe industry and country-specific regulations.
- Observe the regulations and information of the motor manufacturer with regard to operation on a frequency inverter, e.g. mandatory sine filter.
- All operating resources used in potentially explosive atmospheres must adhere to the relevant standards, such as Directive 94/9/EC (ATEX 100a) or IEC 60079.
- The sensor input of the motor's temperature monitoring must not be used in potentially-explosive areas. For thermal monitoring use a monitoring device approved for potentially explosive atmospheres.
- In case of motors with speed feedback, the speed sensor must also be approved for potentially explosive atmospheres. The speed sensor can be directly connected to the inverter.

### INFORMATION

For more information on the operation of explosion-protected AC motors, refer to the "Explosion-Protected AC Motors, Asynchronous Servomotors" operating instructions. You can order the operating instructions from SEW-EURODRIVE.

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### 3.3.6 General requirements for encoders

#### Applicable motor encoders from SEW-EURODRIVE

The following overview shows the motor encoders that can be used. For information on the respective encoder cables, refer to chapter "Prefabricated cables".

| Last letter of the encoder type designation | Interface on the inverter |
|---|---|
| ...C | X15 |
| ...R | |
| ...T | |
| ...S | |
| ...W | |
| ...H | |
| ...L | |
| ...M | |
| ...Z | X16 |
| ...C | X17 |
| ...R | |
| ...T | |
| ...S | |
| ...W | |
| ...H | |
| ...Y | |

#### Encoder with electronic nameplate

Electronic nameplates can only be evaluated when using encoders from SEW-EURODRIVE.

The electronic nameplate allows for automatic identification of the drive. This channel can also be used to transmit further information to the inverter.

Advantages:

- Complete and correct identification of motor and gear unit
- No manual data entry necessary
- Easy drive identification, even with drives that are difficult to access
- Significant time savings during startup

### 3.3.7 General requirements for brake control

Refer to the motor catalogs for extensive information and technical data regarding the brakes.

#### Brake control

Brakes are controlled via digital output X10: (DB0; DB00) on the inverter. When using a CS..A safety card, brake control can also be performed via an assigned safe F-DOx digital output of the safety card. It is not permitted to control them via other electronic devices or via controllers.

The digital output (DB0; DB00) is designed as an output for operating a relay with protection circuit with a DC 24 V control voltage, a maximum current of 150 mA and a power rating of 3.6 W.

With this, a power contactor with DC 24 V coil voltage or a suitable brake rectifier from SEW-EURODRIVE can be controlled. This power contactor is used to switch the brake.

The technical data of the safe digital outputs of the CS..a safety card is described in the corresponding documentation.

Direct switching of the brake via (DB0; DB00; D-DOx) is not permitted.

#### Three-wire brake with accelerator coil (BE, BM, BMG)

With this brake type, the brakes are controlled using brake control units.

#### 24 V holding brake (BP, BK)

In every application, a holding brake can be controlled via a customer relay with varistor overvoltage protection or via the BMV brake control unit from SEW-EURODRIVE.

#### Permitted load of brake control and brake

One complete switching sequence (opening and closing) must not be repeated more often than a maximum of every 2 seconds. SEW-EURODRIVE brakes must remain switched off for at least 100 ms before they can be switched on again.

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## 3.4 Recommendations for motor and inverter selection

The basis for motor selection are the limit characteristic curves of the motors in inverter operation. The limit characteristic curve states the torque characteristic of the motor depending on the speed.

The dynamic and thermal limits must be observed when selecting the motor.

### 3.4.1 Thermal limit characteristic curve

The mean motor speed and the effective torque are calculated during drive selection to determine the thermal utilization of the motor. The operating point of the motor must lie below the thermal limit characteristic curve of the motor; otherwise the motor will be thermally overloaded.

### 3.4.2 Dynamic limit characteristic curve

The dynamic limit characteristic curve depicts the maximum torque the motor can generate at a certain speed. Note that the inverter must supply sufficient current for the motor to reach its maximum torque.

The base speed is especially important for configuration. The base speed is the available speed up to the maximum motor torque. In inverter operation, the base speed indicates the beginning of field weakening. The motor torque is limited by the voltage limit characteristic curve in the field-weakening range, and decreases with increasing speed.

$M_N$ is determined by the motor. $M_{max}$ and $n_{base}$ depend on the motor/inverter combination. The values for $M_{max}$ and $n_{base}$ in the VFC$^{PLUS}$, CFC, ELSM® control modes can be found in the motor selection tables in chapter "Motor/inverter assignments".

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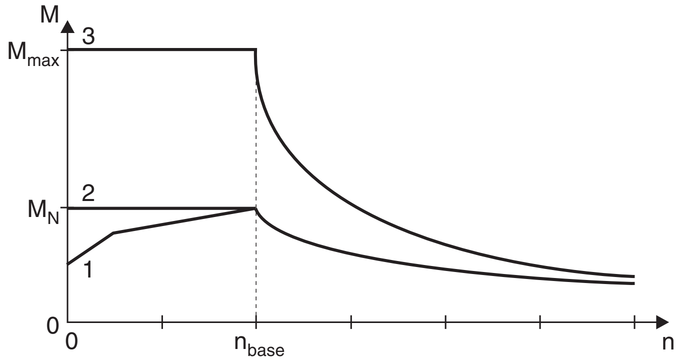
### Typical characteristic curve of asynchronous motors



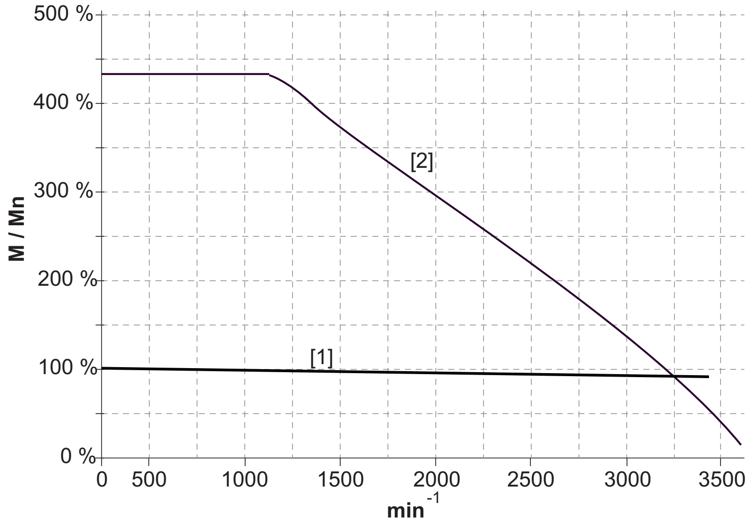

*24537317259*

[1] S1 operation with self-cooling

[2] S1 operation with external cooling

[3] Mechanical limit for gearmotors

### Typical characteristic curve of synchronous motors




*9007217201768843*

[1] Thermal limit characteristic curve S1 operation

[2] Dynamic limit torque

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### 3.4.3 Motor selection for asynchronous motors

Asynchronous motors are mainly operated in $VFC^{PLUS}$ control mode. The control mode efficiently adjusts the motor magnetization to the respective operating point. It simultaneously enables dynamic responses to load shocks on the drive train.

The mechanical resistance of the motor against the overload, which might exceed the permitted limit values, must be strictly checked.

$M_{pk}$ and $n_{base}$ depend on the motor/inverter combination, as well as on the control mode used.

### 3.4.4 Asynchronous motors in control mode $VFC^{PLUS}$

The control mode $VFC^{PLUS}$ without encoder allows dynamic use of the entire speed range of the drive. Reversing and moving through speed 0 is also possible.

However, continuous operation of asynchronous motors without encoder at low speeds is not possible. The minimum speeds that must not be permanently undercut during operation without encoder are:

- Motor mode: 1% of the asynchronous motor nominal speed
- Generator mode: 10% of the asynchronous motor nominal speed

The described restrictions do not apply in control mode $VFC^{PLUS}$ with encoder. In comparison to operation without encoder, higher dynamic properties can be achieved with an encoder.

When determining the maximum speed, note that the breakdown torque $M_K$ is reduced in a quadratic relationship in the field weakening range.

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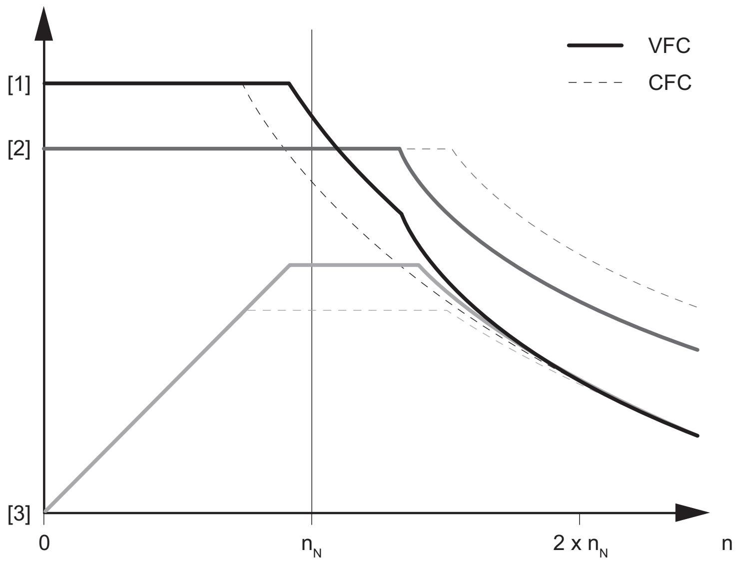
### 3.4.5 Asynchronous motors in control mode CFC

Either standard asynchronous motors (e.g. DRN.. motors) or asynchronous servomotors (e.g. DR2L../DRL.. motors) can be used in control mode CFC. SEW-EURODRIVE recommends using asynchronous servomotors to achieve optimum benefit from the advantages of the control mode CFC.

#### Standard asynchronous motors in control mode CFC

In comparison to control mode $VFC^{PLUS}$, higher dynamic properties can be achieved using CFC. The full motor magnetization is maintained in each operating state, so that the highest dynamic requirements are met. Due to the voltage reserves required for this, standard asynchronous motors are operated with a lower base speed in this operating mode than in operating mode $VFC^{PLUS}$. Power yield and energy efficiency are consequently lower.

Speed/torque characteristic for $VFC^{PLUS}$ and CFC in comparison:




*19531895051*

| [1] | Torque | [2] | Current | [3] | Power rating | $n_N$ | Nominal speed |
|---|---|---|---|---|---|---|---|

### Asynchronous servomotors in control mode CFC

The high-quality mechanical design of the DRL../DR2L.. series asynchronous AC servomotors allows for dynamic overload values that exceed the values of the standard asynchronous motors in line or inverter operation. Due to these characteristics, the values of a synchronous servomotor are almost reached.

SEW-EURODRIVE provides the DRL../DR2L.. motors in two dynamics packages:

| Package | Overload capacity in relation to the nominal torque |
|---|---|
| Dynamics package 1 (D1) | 190 – 220% |
| Dynamics package 2 (D2) | 300 – 350% |

To obtain an optimal adjustment of the motor speed to the required controller output limit of the application, SEW-EURODRIVE offers DRL../DR2L.. servomotors with the following 4 rated speeds:

- 1200 $min^{-1}$
- 1700 $min^{-1}$
- 2100 $min^{-1}$
- 3000 $min^{-1}$

### 3.4.6 Synchronous servomotors in control mode CFC

In general, synchronous servomotors and the corresponding inverters are designed for a high short-time overload capacity. This allows a multiple of the nominal torque.

When using the following motors in the higher speed ranges, it is recommended to only set the PWM frequencies 8 kHz or 16 kHz.

- CMP40/..50/..63 for speeds above 4500 $min^{-1}$
- CMP71/..80/..100 for speeds above 3000 $min^{-1}$
- CM3C63/..71/..80/..100 for speeds above 3000 $min^{-1}$

SEW-EURODRIVE recommends using the following temperature sensors:

- KTY84 – 130 (SEW-EURODRIVE designation: KY)
- Pt1000 (SEW-EURODRIVE designation: PK)

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### 3.4.7 Synchronous servomotors in control mode ELSM®

The control mode ELSM® allows for dynamic use of the entire speed range of the drive. Reversing and moving through speed 0 is also possible. The speed must not permanently drop below the minimum speed of approx. 2% of the nominal motor speed.

When the control mode ELSM® is operated without encoder, the maximum motor torque is 150% $M_0$ of the connected motor.

The nominal output current of the inverter must not be lower than 1.5 × $I_0$ of the connected motor.

The maximum speed must not be dimensioned higher than the rated speed of the motor.

When using the following motors in the higher speed ranges, it is recommended to only set the PWM frequencies 8 kHz or 16 kHz.

- CMP40/..50/..63 for speeds above 4500 $min^{-1}$
- CMP71/..80/..100 for speeds above 3000 $min^{-1}$
- CM3C63/..71/..80/..100 for speeds above 3000 $min^{-1}$

SEW-EURODRIVE recommends using the following temperature sensors:

- KTY84 – 130 (SEW-EURODRIVE designation: KY)
- Pt1000 (SEW-EURODRIVE designation: PK)

Using the ELSM® control mode for hoists and inclining tracks is not permitted.

## 3.5 Motor/inverter assignments

For motor/inverter assignments, refer to the SEW-EURODRIVE homepage.

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## 3.6 Inverter selection

The inverter is selected based on the course of the output current over time. The required current has to be determined from the required torque characteristic of the connected motor.

The inverters are dimensioned for a nominal output current $I_N$. In many applications, there is a demand for short-time overload operation. For this purpose, the inverters can be operated with up to 200% of the nominal output current for a short period of time.

For overload operation, make sure that the inverter is not thermally overloaded. For protection of the power components, inverters have various monitoring mechanisms.

The following thermal monitoring functions are available:

- Dynamic utilization

  The periodic current load of the switching power semiconductors lets them heat and cool down cyclically. Due to the different thermal time constants, large temperature differences can occur between power semiconductor and heat sink. Dynamic utilization monitors the permitted temperature of the barrier layer of the power semiconductors.
- Thermal capacity utilization

  The power semiconductors are limited by the maximum permitted temperature during operation. Thermal utilization monitors the heat sink temperature of the power semiconductors.
- Electromechanical utilization ($I^2t$ utilization)

  Electromechanical utilization protects the components that have a large thermal time constant compared to the power semiconductors.

Due to the complexity of the utilization curves, the calculation can only be performed using software. The SEW-Workbench software offers support for dimensioning an inverter.

For a rough selection of the inverter without using software, characteristic load cycles are provided in the following section.

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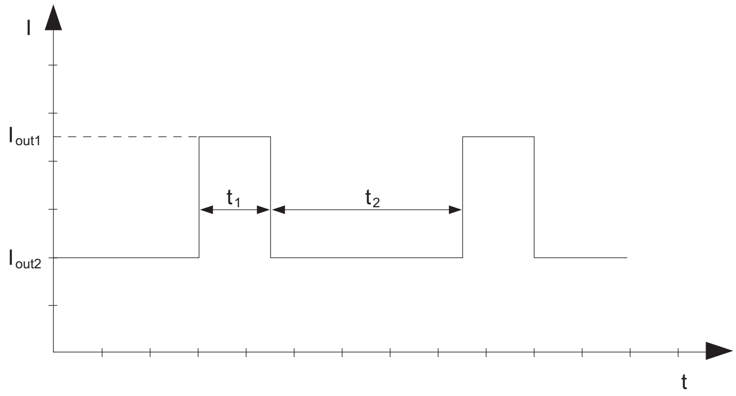
### 3.6.1 Overload capacity

**Load cycle with base load current – typical for the selection of asynchronous motors and servomotors**

The characteristic load cycle consists of a load and a load relief period. In the load relief period, the output current must not exceed the specified value. After this load relief period, overload is possible again.




*18014415982173963*

*Examples of permitted current profiles*

*Overload capacity*

This table applies to inverter sizes 1 to 6 (exception: BG5 MDX9.A-0750-...):

**Overload capacity at $V_{line}$ = 400 V, smallest possible PWM frequency, $f_A \geq 3$ Hz, $\vartheta_{amb}$ = 40 °C**

| Overload current $I_{out\,1}/I_N$ | Overload time $t_1$ | Base load current $I_{out\,2}/I_N$ | Required base load time $t_2$ |
|---|---|---|---|
| 200% | 3 s | 50% | 7 s |
| 200% | 3 s | 100% | 17 s |
| 150% | 60 s | 100% | 60 s |
| 150% | 60 s | 50% | 30 s |

This table applies to size 5 MDX9.A-0750-... inverters:

**Overload capacity at $V_{line}$ = 400 V, smallest possible PWM frequency, $f_A \geq 3$ Hz, $\vartheta_{amb}$ = 40 °C**

| Overload current $I_{out\,1}/I_N$ | Overload time $t_1$ | Base load current $I_{out\,2}/I_N$ | Required base load time $t_2$ |
|---|---|---|---|
| 200% | 3 s | 50% | 7 s |
| 200% | 3 s | 100% | 17 s |
| 150% | 60 s | 25% | 60 s |

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This table applies to size 7 inverters (up to MDX91A-2500-.. inverters):

**Overload capacity at $V_{line}$ = 400 V, smallest possible PWM frequency, $f_A \geq 3$ Hz, $\vartheta_{amb}$ = 40 °C**

| Overload current $I_{out\,1}/I_N$ | Overload time $t_1$ | Base load current $I_{out\,2}/I_N$ | Required base load time $t_2$ |
|---|---|---|---|
| 150% | 60 s | 50% | 60 s |

This table applies to size 7 MDX91A-3000-.. inverters and to size 8:

**Overload capacity at $V_{line}$ = 400 V, smallest possible PWM frequency, $f_A \geq 3$ Hz, $\vartheta_{amb}$ = 40 °C**

| Overload current $I_{out\,1}/I_N$ | Overload time $t_1$ | Base load current $I_{out\,2}/I_N$ | Required base load time $t_2$ |
|---|---|---|---|
| 150% | 30 s | 50% | 150 s |

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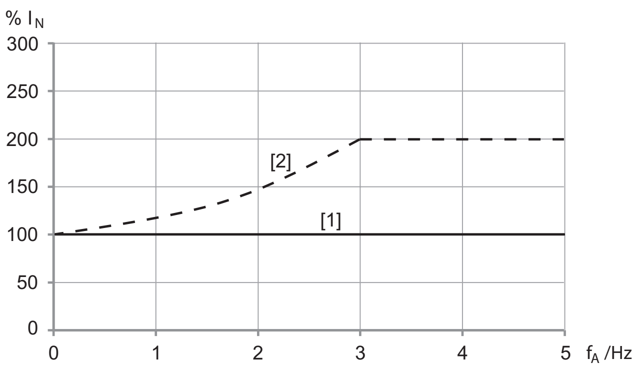
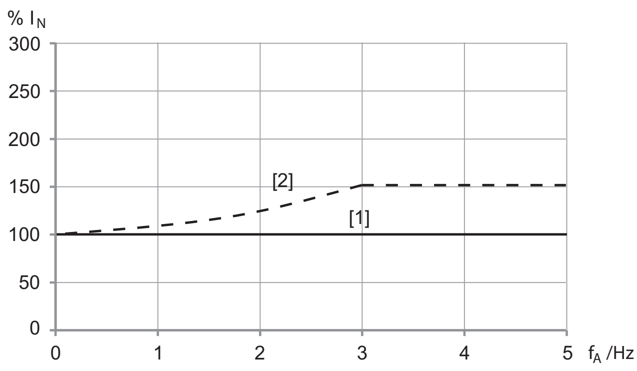
### 3.6.2 Derating

Due to the following operating and ambient conditions, a reduction of the output current may be necessary.

#### Derating due to the rotary field frequency

The specified nominal output current $I_N$ of the inverter is the effective value. The increased load on the power semiconductors has to be considered especially for slow rotating fields and rotating fields at standstill. In case of a rotating field at standstill, direct current that can correspond to the peak value of the sine current depending on the phase position is flowing.

It is particularly important to consider output frequencies $f_A$ < 3 Hz.

| Sizes 1 to 7 (up to MDX91A-2500-...) | Size 7 (from MDX91A-3000-...) and size 8 |
|---|---|
|  |  |

[1] Continuous output current at the smallest possible PWM frequency

[2] Time-limited overload current

#### Derating due to the installation altitude

SEW-EURODRIVE frequency inverters are designed for overvoltage category III and for altitudes up to 2000 m according to EN 61800-5-1. The air pressure and the air density decrease depending on the installation altitude. This leads to a reduced cooling capacity and to a reduced electrical isolation effect of the air.

Up to h < 1000 m: without restrictions.

The following restrictions apply to heights ≥ 1000 m:

- From 1000 m to max. 3800 m: $I_N$ reduction by 1% per 100 m
- From 2000 m to max. 3800 m: To maintain protective separation and the air gaps and creepage distances according to EN 61800-5-1, you have to connect an overvoltage protection device in order to reduce the overvoltages from category III to category II.

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### Derating due to the line voltage and temperature

Derating depending on the line voltage $V_{line}$ and the ambient temperature T:

| Inverter | $f_{PWM}$ | $V_{line}$: 3 × 400 V | $V_{line}$: 3 × 500 V |
|---|---|---|---|
| | | Continuous current $I_{cont}$ | |
| Size 1 | 4 kHz | $I_{duration}/I_N$ = 125% - (T - 40 °C) × 2.5% | $I_{duration}/I_N$ = 114% - (T - 40 °C) × 2.3% |
| | 8 kHz | $I_{duration}/I_N$ = 94% - (T - 40 °C) × 2.15% | $I_{duration}/I_N$ = 81% - (T - 40 °C) × 1.85% |
| | 16 kHz | $I_{duration}/I_N$ = 63% - (T - 40 °C) × 1.5% | $I_{duration}/I_N$ = 50% - (T - 40 °C) × 1.7% |
| Size 2 | 4 kHz | $I_{duration}/I_N$ = 132% - (T - 40 °C) × 2.65% | $I_{duration}/I_N$ = 120% - (T - 40 °C) × 2.45% |
| | 8 kHz | $I_{duration}/I_N$ = 99% - (T - 40 °C) × 2.25% | $I_{duration}/I_N$ = 86% - (T - 40 °C) × 2% |
| | 16 kHz | $I_{duration}/I_N$ = 66% - (T - 40 °C) × 1.6% | $I_{duration}/I_N$ = 53% - (T - 40 °C) × 1.8% |
| Size 3 | 4 kHz | $I_{duration}/I_N$ = 128% - (T - 40 °C) × 2.55% | $I_{duration}/I_N$ = 116% - (T - 40 °C) × 2.35% |
| | 8 kHz | $I_{duration}/I_N$ = 96% - (T - 40 °C) × 2.2% | $I_{duration}/I_N$ = 83% - (T - 40 °C) × 1.9% |
| | 16 kHz | $I_{duration}/I_N$ = 64% - (T - 40 °C) × 1.55% | $I_{duration}/I_N$ = 51% - (T - 40 °C) × 1.7% |
| Size 4 | 4 kHz | $I_{duration}/I_N$ = 133% - (T - 40 °C) × 2.65% | $I_{duration}/I_N$ = 121% - (T - 40 °C) × 2.45% |
| | 8 kHz | $I_{duration}/I_N$ = 100% - (T - 40 °C) × 2.25% | $I_{duration}/I_N$ = 87% - (T - 40 °C) × 2% |
| | 16 kHz | $I_{duration}/I_N$ = 67% - (T - 40 °C) × 1.6% | $I_{duration}/I_N$ = 53% - (T - 40 °C) × 1.8% |
| Size 5 | 4 kHz | $I_{duration}/I_N$ = 121% - (T - 40 °C) × 2.4% | $I_{duration}/I_N$ = 110% - (T - 40 °C) × 2.25% |
| | 8 kHz | $I_{duration}/I_N$ = 91% - (T - 40 °C) × 2.05% | $I_{duration}/I_N$ = 79% - (T - 40 °C) × 1.85% |
| | 16 kHz | $I_{duration}/I_N$ = 51% - (T - 40 °C) × 1.6% | $I_{duration}/I_N$ = 41% - (T - 40 °C) × 1.55% |
| Size 6 | 4 kHz | $I_{duration}/I_N$ = 119% - (T - 40 °C) × 2.4% | $I_{duration}/I_N$ = 108% - (T - 40 °C) × 2.2% |
| | 8 kHz | $I_{duration}/I_N$ = 89% - (T - 40 °C) × 2% | $I_{duration}/I_N$ = 77% - (T - 40 °C) × 1.75% |
| | 16 kHz | $I_{duration}/I_N$ = 59% - (T - 40 °C) × 1.4% | $I_{duration}/I_N$ = 48% - (T - 40 °C) × 1.65% |
| Size 7 MDX91A-1770 – 2200-...-5.3-.. | 4 kHz | $I_{duration}/I_N$ = 114% - (T - 40 °C) × 2.7% | $I_{duration}/I_N$ = 103% - (T - 40 °C) × 2.5% |
| | 8 kHz | $I_{duration}/I_N$ = 80% - (T - 40 °C) × 2.25% | $I_{duration}/I_N$ = 72% - (T - 40 °C) × 2.05% |
| Size 7 MDX91A-2500-...-5.3-.. | 2.5 kHz | $I_{duration}/I_N$ = 120% - (T - 40 °C) × 2.45% | $I_{duration}/I_N$ = 109% - (T - 40 °C) × 2.25% |
| | 4 kHz | $I_{duration}/I_N$ = 104% - (T - 40 °C) × 2.25% | $I_{duration}/I_N$ = 95% - (T - 40 °C) × 2.1% |
| | 8 kHz | $I_{duration}/I_N$ = 72% - (T - 40 °C) × 1.85% | $I_{duration}/I_N$ = 65% - (T - 40 °C) × 1.7% |
| Size 7 MDX91A-3000-...-5.3-.. | 2.5 kHz | $I_{duration}/I_N$ = 100% - (T - 40 °C) × 2.05% | $I_{duration}/I_N$ = 91% - (T - 40 °C) × 1.9% |
| | 4 kHz | $I_{duration}/I_N$ = 87% - (T - 40 °C) × 1.9% | $I_{duration}/I_N$ = 79% - (T - 40 °C) × 1.75% |
| | 8 kHz | $I_{duration}/I_N$ = 60% - (T - 40 °C) × 1.55% | $I_{duration}/I_N$ = 54% - (T - 40 °C) × 1.4% |

| Inverter | $f_{PWM}$ | $V_{line}$: 3 × 230 V |
|---|---|---|
| | | Continuous current $I_{cont}$ |
| Size 2 | 4 kHz | $I_{duration}/I_N$ = 132% - (T - 40 °C) × 2.65% |
| | 8 kHz | $I_{duration}/I_N$ = 99% - (T - 40 °C) × 2.25% |
| | 16 kHz | $I_{duration}/I_N$ = 66% - (T - 40 °C) × 1.6% |
| Size 3 | 4 kHz | $I_{duration}/I_N$ = 128% - (T - 40 °C) × 2.55% |
| | 8 kHz | $I_{duration}/I_N$ = 96% - (T - 40 °C) × 2.2% |
| | 16 kHz | $I_{duration}/I_N$ = 64% - (T - 40 °C) × 1.55% |
| Size 4 | 4 kHz | $I_{duration}/I_N$ = 133% - (T - 40 °C) × 2.65% |
| | 8 kHz | $I_{duration}/I_N$ = 100% - (T - 40 °C) × 2.25% |
| | 16 kHz | $I_{duration}/I_N$ = 67% - (T - 40 °C) × 1.6% |
| Size 5 | 4 kHz | $I_{duration}/I_N$ = 121% - (T - 40 °C) × 2.4% |
| | 8 kHz | $I_{duration}/I_N$ = 91% - (T - 40 °C) × 2.05% |
| | 16 kHz | $I_{duration}/I_N$ = 51% - (T - 40 °C) × 1.6% |
| Size 6 | 4 kHz | $I_{duration}/I_N$ = 119% - (T - 40 °C) × 2.4% |
| | 8 kHz | $I_{duration}/I_N$ = 89% - (T - 40 °C) × 2% |
| | 16 kHz | $I_{duration}/I_N$ = 59% - (T - 40 °C) × 1.4% |

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# 3.7 Braking resistor selection

## 3.7.1 Tables of braking resistors

The following braking resistors are intended for use with MOVIDRIVE® system/technology. The technical data applies within a temperature range of -20 °C to +40 °C.

### Information on ambient temperature

For ambient temperatures above +40 °C, the continuous power must be reduced by 4% for every 10 K. The tripping current must be reduced by 2% for every 10 K. Do not exceed a maximum ambient temperature of 80 °C.

### Braking resistors

| Braking resistor type BW.. | | Unit | BW120-001 | BW100-001 | BW100-002 | BW100-002/M | BW100-006-T |
|---|---|---|---|---|---|---|---|
| Part number | | | 18176011 | 08281718 | 08281653 | 25664514 | 18204198 |
| Peak braking power | | kW | | 6.9 | | 9.4 | 6.9 |
| Continuous braking power | 100% cdf | kW | 0.03 | 0.1 | 0.2 | 0.15 | 0.6 |
| Load-bearing capacity | 50% cdf | kW | 0.06 | 0.15 | 0.3 | 0.27 | 1.1 |
| | 25% cdf | kW | 0.1 | 0.3 | 0.6 | 0.45 | 1.9 |
| | 12% cdf | kW | 0.18 | 0.5 | 1 | 0.75 | 3.6 |
| | 6% cdf | kW | 0.3 | 0.9 | 1.8 | 1.23 | 5.7 |
| | | | Observe the regenerative power limit of the inverter.<br>(See chapter "Technical data – Basic device": Peak power brake chopper 200% × apparent output power × 0.9) | | | | |
| Resistance $R_{BW}$ | | Ω | 117 | 100 | 100 ± 10% | | |
| Tripping current $I_{trip}$ | | A | - | 0.8 | 1 | 1.2 | 2.4 |
| Design | | | PTC submounting resistor | Flat-type resistor | | Submounting resistor in flat design | Wire resistor |

| Braking resistor type BW.. | | Unit | BW047-010-T | BW147-T | BW247-T | BW027-016-T | BW027-024-T | BW027-042-T |
|---|---|---|---|---|---|---|---|---|
| Part number | | | 17983207 | 18201342 | 18200842 | 17983215 | 17983231 | 19155301 |
| Peak braking power | | kW | 14.6 | | | 25.4 | | |
| Continuous braking power | 100% cdf | kW | 1 | 1.2 | 2 | 1.6 | 2.4 | 4.2 |
| Load-bearing capacity | 50% cdf | kW | 1.8 | 2.20 | 3.6 | 2.9 | 4.3 | 7.6 |
| | 25% cdf | kW | 3.2 | 3.80 | 6.4 | 5.1 | 7.7 | 13.3 |
| | 12% cdf | kW | 6 | 7.20 | 12.0 | 9.6 | 14.4 | 23.9 |
| | 6% cdf | kW | 9.5 | 11.40 | 14.6 | 15.2 | 22.8 | 25.4 |
| | | | Observe the regenerative power limit of the inverter.<br>(See chapter "Technical data – Basic device": Peak power brake chopper 200% × apparent output power × 0.9) | | | | | |
| Resistance $R_{BW}$ | | Ω | 47 ± 10% | | | 27 ± 10% | | |
| Tripping current $I_{trip}$ | | A | 4.6 | 5.1 | 6.5 | 7.7 | 9.4 | 12.5 |
| Design | | | Wire resistor | | | | | Frame resistor |

| Braking resistor type BW.. | | Unit | BW015-016 | BW015-042-T | BW015-075-T | BW915-T |
|---|---|---|---|---|---|---|
| Part number | | | 17983258 | 19155328 | 19155271 | 18204139 |
| Peak braking power | | kW | 45.7 | | | |
| Continuous braking power | 100% cdf | kW | 1.6 | 4.2 | 7.5 | 16 |

| Braking resistor type BW.. | | Unit | BW015-016 | BW015-042-T | BW015-075-T | BW915-T |
|---|---|---|---|---|---|---|
| Load-bearing capacity | 50% cdf | kW | 2.9 | 7.6 | 12.8 | 27.2 |
| | 25% cdf | kW | 5.1 | 13.3 | 22.5 | 45.7 |
| | 12% cdf | kW | 9.6 | 23.9 | 33.8 | 45.7 |
| | 6% cdf | kW | 15.2 | 41.8 | 45.7 | 45.7 |
| | | | Observe the regenerative power limit of the inverter. (See chapter "Technical data – Basic device": Peak power brake chopper 200% × apparent output power × 0.9) | | | |
| Resistance $R_{BW}$ | | Ω | 15 ± 10% | | | |
| Tripping current $I_{trip}$ | | A | 10.3 | 46.7 | 22.4 | 32.7 |
| Design | | | Wire resistor | Frame resistor | Grid resistor mounting position 1 | |

| Braking resistor type BW.. | | Unit | BW010-024 | BW010-050-T | BW010-108-T |
|---|---|---|---|---|---|
| Part number | | | 17983266 | 17983274 | 19155298 |
| Peak braking power | | kW | 57.2 | | |
| Continuous braking power | 100% cdf | kW | 2.4 | 5 | 10.8 |
| Load-bearing capacity | 50% cdf | kW | 4.3 | 8.5 | 18.4 |
| | 25% cdf | kW | 7.7 | 15.0 | 32.4 |
| | 12% cdf | kW | 14.4 | 22.5 | 48.6 |
| | 6% cdf | kW | 22.8 | 38.0 | 57.2 |
| | | | Observe the regenerative power limit of the inverter. (See chapter "Technical data – Basic device": Peak power brake chopper 200% × apparent output power × 0.9) | | |
| Resistance $R_{BW}$ | | Ω | 10 ± 10% | | |
| Tripping current $I_{trip}$ | | A | 15.5 | 22.4 | 32.9 |
| Design | | | Wire resistor | Grid resistor mounting position 1 | |

| Braking resistor type BW.. | | Unit | BW006-025-01 | BW006-050-01 | BW106-T | BW206-T |
|---|---|---|---|---|---|---|
| Part number | | | 18200117 | 18200125 | 18200834 | 18204120 |
| Peak braking power | | kW | 114.3 | | | |
| Continuous braking power | 100% cdf | kW | 2.5 | 5 | 13.5 | 18 |
| Load-bearing capacity | 50% cdf | kW | 4.3 | 8.5 | 23.0 | 30.6 |
| | 25% cdf | kW | 7.5 | 15.0 | 40.5 | 54.0 |
| | 12% cdf | kW | 11.3 | 22.5 | 60.8 | 81.0 |
| | 6% cdf | kW | 19.0 | 38.0 | 102.6 | 114.3 |
| | | | Observe the regenerative power limit of the inverter. (See chapter "Technical data – Basic device": Peak power brake chopper 200% × apparent output power × 0.9) | | | |
| Resistance $R_{BW}$ | | Ω | 6 ± 10% | | | |
| Tripping current $I_{trip}$ | | A | 20.4 | 28.9 | 47.4 | 54.8 |
| Design | | | Grid resistor mounting position 1 | | | |

| Braking resistor type BW.. | | Unit | BW005-070 | BW005-170-T | BW004-050-01 | BW004-070-01 |
|---|---|---|---|---|---|---|
| Part number | | | 17983282 | 17983290 | 18200133 | 17967678 |
| Peak braking power | | kW | 146 | | 190.6 | |
| Continuous braking power | 100% cdf | kW | 7 | 17 | 5 | 7 |
| Load-bearing capacity | 50% cdf | kW | 11.9 | 28.9 | 8.5 | 11.9 |
| | 25% cdf | kW | 21.0 | 51.0 | 15.0 | 21.0 |
| | 12% cdf | kW | 31.5 | 76.5 | 22.5 | 31.5 |
| | 6% cdf | kW | 53.2 | 129.2 | 38.0 | 53.2 |
| | | | Observe the regenerative power limit of the inverter. (See chapter "Technical data – Basic device": Peak power brake chopper 200% × apparent output power × 0.9) | | | |
| Resistance $R_{BW}$ | | Ω | 4.7 ± 10% | | 3.6 ± 10% | |
| Tripping current $I_{trip}$ | | A | 38.6 | 60.1 | 32.6 | 38.6 |

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| Braking resistor type BW.. | Unit | BW005-070 | BW005-170-T | BW004-050-01 | BW004-070-01 |
|---|---|---|---|---|---|
| Design | | Grid resistor mounting position 1 | | | |

| Braking resistor type BW.. | | Unit | BW003-420-T | BW002-070 | BW1.0-170 |
|---|---|---|---|---|---|
| Part number | | | 13302345 | 17983304 | 17985455 |
| Peak braking power | | kW | 274.4 | 298.3 | 686 |
| Continuous braking power | 100% cdf | kW | 42 | 7 | 17 |
| Load-bearing capacity | 50% cdf | kW | 71.4 | 11.9 | 28.9 |
| | 25% cdf | kW | 126.0 | 21.0 | 51.0 |
| | 12% cdf | kW | 189.0 | 31.5 | 76.5 |
| | 6% cdf | kW | 274.4 | 53.2 | 129.2 |
| | | | Observe the regenerative power limit of the inverter. (See chapter "Technical data – Basic device": Peak power brake chopper 200% × apparent output power × 0.9) | | |
| Resistance $R_{BW}$ | | Ω | 2.5 ± 10% | 2.3 ± 10% | 1 ± 10% |
| Tripping current $I_{trip}$ | | A | 135.1 | 55.2 | 130.4 |
| Design | | | Grid resistor mounting position 2 | Grid resistor mounting position 1 | Grid resistor mounting position 2 |

### 3.7.2 Selection criteria

The braking resistor is selected in the SEW-Workbench. The necessary selection parameters for the braking resistor are calculated during the project planning procedure. Depending on these selection parameters, a braking resistor is selected from the table.

The following selection parameters are the basis for selecting the braking resistor.

#### Continuous braking power

The minimum required continuous braking power (braking power at 100% cdf) of the braking resistor for load cycles can be calculated using the relative cyclic duration factor cdf and the overload factor k.

If the cyclic duration factor cdf is unknown, it can be calculated from the cycle duration $t_{tot}$ and the braking time $t_B$ using the following formula:

$$cdf = \frac{t_B}{t_{tot}} \times 100\ \%$$

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| | |
|---|---|
| ED | Cyclic duration factor |
| $t_B$ | Braking time |
| $t_{tot}$ | Cycle duration |

## INFORMATION

The cycle duration must not exceed 120 s.

The overload factor k can be determined using the diagrams in chapter "Overload factor k" (→ 🗎 132) and the cyclic duration factor ED (cdf).

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The value of the average braking power $P_B$ is taken from the project planning data of the application.

$$P_B = \frac{\sum_{i=1}^{n} P_i}{\sum_{i=1}^{n} t_i}$$

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| | |
|---|---|
| $P_B$ | Average braking power |
| $P_i$ | Braking power section i |
| $t_i$ | Braking time section i |

The minimum required braking power at 100% cdf is calculated using the following formula:

$$P_{100\%ED} = \frac{P_B}{k}$$

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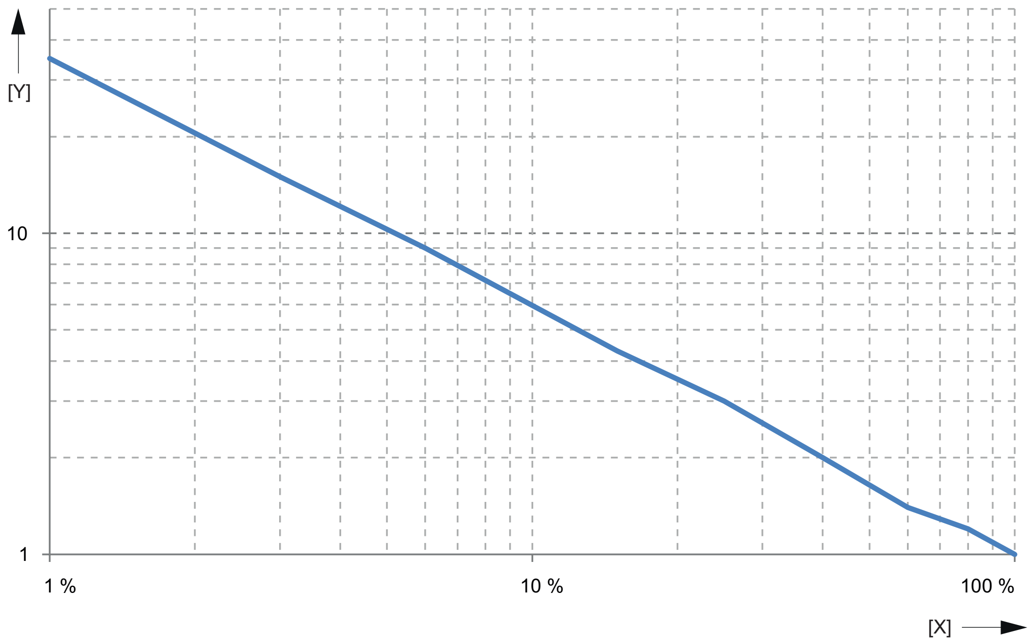
| | |
|---|---|
| $P_{100\%cdf}$ | Braking power at 100% cdf |
| $P_B$ | Average braking power |
| k | Overload factor |

The braking power required by the application at 100% cdf must be smaller than or equal to the typical braking power at 100% cdf (continuous braking power) of the braking resistor.

**Overload factor k**

*Flatpack resistors*

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| | |
|---|---|
| X | Cyclic duration factor in % (cdf) |
| Y | Overload factor k (OF) |

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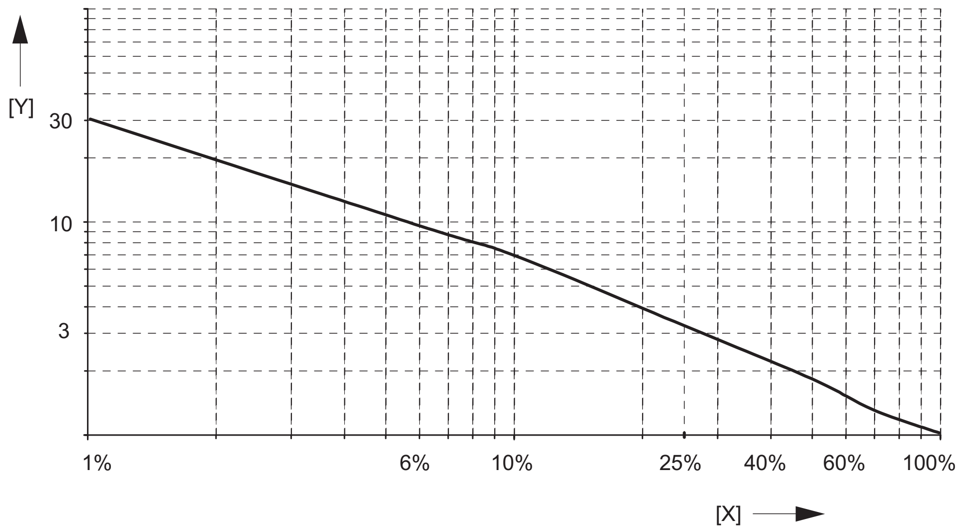
| cdf in % | 1 | 3 | 6 | 15 | 25 | 40 | 60 | 80 | 100 |
|---|---|---|---|---|---|---|---|---|---|
| OF | 35 | 15 | 9 | 4.3 | 3 | 2 | 1.4 | 1.2 | 1 |

*Wire resistors, frame resistors*

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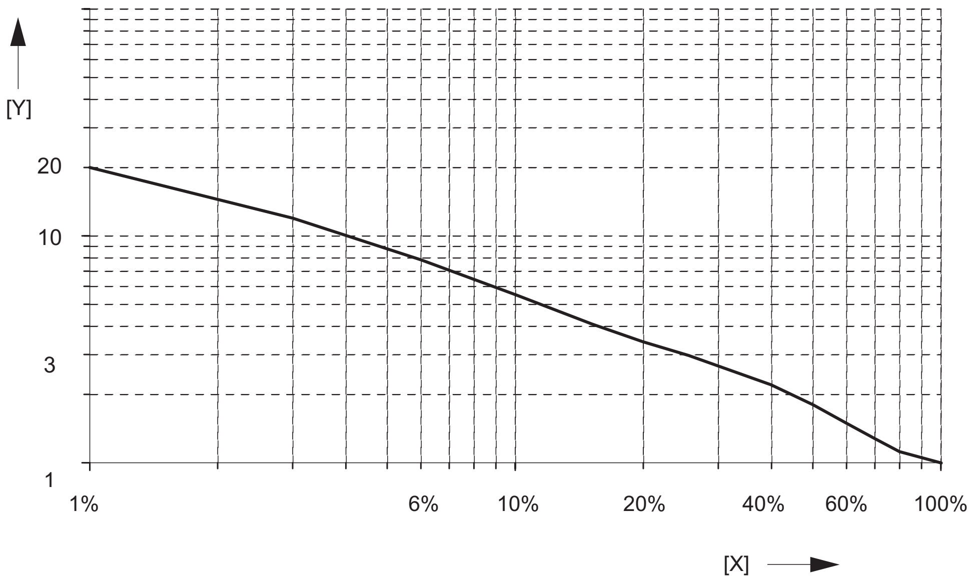
X Cyclic duration factor in % (cdf)
Y Overload factor k (OF)

| cdf in % | 1 | 3 | 6 | 15 | 25 | 40 | 60 | 80 | 100 |
|---|---|---|---|---|---|---|---|---|---|
| OF | 30 | 15 | 9.5 | 5 | 3.2 | 2.2 | 1.5 | 1.12 | 1 |

*Grid resistors*

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X Cyclic duration factor in % (cdf)
Y Overload factor k (OF)

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| cdf in % | 1 | 3 | 6 | 15 | 25 | 40 | 60 | 80 | 100 |
|---|---|---|---|---|---|---|---|---|---|
| OF | 20 | 12 | 7.6 | 4 | 3 | 2.2 | 1.5 | 1.12 | 1 |

### Peak braking power

The maximum peak braking power that can be achieved is specified by the resistance value and the DC link voltage. It is calculated as follows:

$$P_{\text{max}} = \frac{U_{ZK\,max}^2}{R \times 1.4}$$

| | |
|---|---|
| $P_{max}$ | Maximum peak braking power that the braking resistor can absorb |
| $V_{DCL\_max}$ | Maximum DC link voltage:<br>• 650 V for MDX9.A-....-2.3-4-...<br>• 980 V for MDX9.A-....-5.3-4-... |
| R | Braking resistance value |

The maximum peak braking power required by the application is calculated from the regenerative parts within a cycle.

The peak braking power required by the application must be lower than the maximum peak braking power that can be achieved and absorbed by the braking resistor.

The peak braking power for each braking resistor is specified in the chapter "Braking resistors".

### Current-carrying capacity of the brake chopper

The resistance value of the braking resistor $R_{BR}$ must not be lower than the minimum permitted braking resistance $R_{BRmin}$, see the chapter "Technical data of basic device". This ensures that the brake chopper is not damaged.

$R_{BR} \geq R_{BRmin}$

The continuous braking power toward the braking resistor must not exceed the apparent output power of the inverter.

### 3.7.3 Calculation example

Given: Peak braking power: 13 kW

Average braking power: 6 kW

Braking time: 7 s

Cycle duration: 28 s

Inverter used: MDX90A-0095-5-3-4-S00

Required: BW.. braking resistor

Calculation: 1) Determine the cyclic duration factor

Cyclic duration factor cdf = braking time/cycle duration

Cyclic duration factor cdf = (7 s/28 s) × 100% = 25%

When selecting the braking resistor, observe the assignment of inverter and braking resistor, see chapter "Technical data and assignment to an inverter" (→ 🗎 139).

2) Determine the overload capacity

Determine the overload factor, e.g. for a wire resistor at a cyclic duration factor cdf of 25% from the respective diagram.

Overload factor k = 3.2

3) Calculate the braking power at 100% cdf

Braking power 100% cdf = average braking power/overload factor

Braking power 100% cdf = 6 kW/3.2 = 1.88 kW

The braking power of the braking resistor at 100% cdf must be ≥ 1.88 kW.

4) Select the braking resistor

The minimum permitted braking resistance value is = 47 Ω for the MDX90A-0095-5-3-4-S00 inverter that is used, see chapter "Technical data and assignment to an inverter" (→ 🗎 139).

Selected braking resistor: BW247-T.

Resistance value $R_{BW}$ = 47 Ω

Peak braking power: 14.3 kW, see chapter "Tables of braking resistors" (→ 🗎 129).

Current-carrying capacity at 100% cdf: 2 kW

### 3.7.4 Supply cable for braking resistor

Use only shielded or twisted cables.

The cable cross section depends on the tripping current $I_F$.

The nominal voltage of the cable must be at least $U_0$/U = 450 V/750 V.

The maximum permitted cable length between the inverter/power supply module and the braking resistor is 100 m.

When the braking resistor is connected to its protection device, the shield of the supply cable must be routed via an additional shield terminal.

### 3.7.5 Protection against thermal overload of the braking resistor

To avoid thermal damage of the braking resistor as well as subsequent damage, the braking resistor has to be thermally monitored. SEW-EURODRIVE suggests the following options:

- Integrated temperature switch –T

  Braking resistors with the label –T are equipped with an integrated temperature switch. The temperature switch is thermally coupled to the braking resistor and switches an NC contact in case of overtemperature of the braking resistor. The braking resistor-inverter connection is not interrupted. In case of thermal overload, the regenerative operation has to be terminated. SEW-EURODRIVE recommends shielding the connection cable of the temperature switch.
- Thermal overload relay

  A thermal overload relay is installed in the control cabinet, connected to the supply cable to the braking resistor and set to the tripping current of the braking resistor. If the measured mean current exceeds the tripping current, an NC contact switches and reports an overload of the braking resistor. The braking resistor-inverter connection is not interrupted. In case of thermal overload, the regenerative operation has to be terminated.

Wiring diagrams for the situations described above can be found in the operating instructions in chapter "Protection of braking resistor against thermal overload".

### 3.7.6 Parallel connection of braking resistors

It is permitted to connect several identical braking resistors in parallel. The following applies:

- The power connections of the braking resistors must be connected to +R and -R in parallel.
- Each braking resistor requires separate protection against thermal overload.
- The signal contacts (NC contacts) of the protection devices must be connected in series.

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### 3.7.7 Technical data

#### BW.../BW...-T braking resistors

*General*

The BW.../BW...-T braking resistors are adapted to the technical characteristics of the inverter.

Braking resistors with different continuous and peak braking powers are available.

The braking resistors can be protected against overload and overtemperature by the customer when a thermal overload relay is used. The tripping current is set to the value $I_F$; for this, see the following tables "Technical data and assignment to an inverter".

A PTC resistor protects itself (reversible) against regenerative overload by changing abruptly to high resistance and no longer consuming any more energy. The inverter then switches off and signals an "overvoltage" fault.

A flat-type resistor has internal thermal protection (fuse cannot be replaced) that interrupts the current circuit in the event of overload. The configuration guidelines and the documented assignments of the drive inverter and braking resistor must be adhered to.

**INFORMATION**

Use of protection devices.

Use only the protection devices listed in the following section:

- Internal temperature switch T
- External bimetallic relay

→ See also the chapter "Protection of the braking resistor against thermal overload".

*UL and cURus approval*

The listed braking resistors have a cURus approval independent of the inverter.

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*Technical data and assignment to an inverter*

*Technical data*

| Braking resistor | Unit | BW120-001 | BW100-002/M | BW100-001 | BW100-002 | BW100-006-T |
|---|---|---|---|---|---|---|
| Part number | | 18176011 | 25664514 | 08281718 | 08281653 | 18204198 |
| Current-carrying capacity at 100% cdf | kW | 0.03 | 0.15 | 0.1 | 0.2 | 0.6 |
| Resistance value $R_{BW}$ | Ω | 117 | 100 | 100 ± 10% | | |
| Tripping current $I_{trip}$ | A | - | 1.2 | 0.8 | 1 | 2.4 |
| Design | | PTC submounting resistor | Submounting resistor in flat design | Flat-type resistor | | Wire resistor |
| Power connections | | Single conductors | | | | Ceramic terminal 2.5 $mm^2$ |
| Wire length | mm | 170 | 300 | 510 | | - |
| Cable cross section | $mm^2$ | 0.5 | | 1.5 | | - |
| Tightening torque | Nm | - | | | | 0.5 |
| PE connection | | - | | | | M4 |
| PE tightening torque | Nm | - | | | | 1.8 |
| Degree of protection in accordance with EN 60529 | | IP20 | IP40 | IP54 | | IP20 |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C<br>(reduction 4% $P_N$/10K to +60 °C) | | | | |
| Mass | kg | 0.95 | 1.4 | 0.3 | 0.6 | 3 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW120-001 | BW100-002/M | BW100-001 | BW100-002 | BW100-006-T |
|---|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0020<br>0025<br>0032<br>0040 | | 0020<br>0025<br>0032<br>0040 | | |

*Technical data*

| Braking resistor | Unit | BW047-010-T | BW147-T | BW247-T |
|---|---|---|---|---|
| Part number | | 17983207 | 18201342 | 18200842 |
| Current-carrying capacity at 100% cdf | kW | 1 | 1.2 | 2 |
| Resistance value $R_{BW}$ | Ω | 47 ± 10% | | |
| Tripping current $I_{trip}$ | A | 4.6 | 5.1 | 6.5 |
| Design | | Wire resistor | | |
| Power connections | | Ceramic terminal 2.5 $mm^2$ | | |
| Tightening torque | Nm | 0.5 | | |
| PE connection | | M4 | | |
| PE tightening torque | Nm | 1.8 | | |
| Degree of protection | | IP20 | | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | | |
| Mass | kg | 4 | 4.9 | 6.7 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW047-010-T | BW147-T | BW247-T |
|---|---|---|---|
| MDX9.A-....-5.3-... | 0055<br>0070<br>0095 | | |

*Technical data*

| Braking resistor | Unit | BW027-016-T | BW027-024-T | BW027-042-T |
|---|---|---|---|---|
| Part number | | 17983215 | 17983231 | 19155301 |
| Current-carrying capacity at 100% cdf | kW | 1.6 | 2.4 | 4.2 |
| Resistance value $R_{BW}$ | Ω | 27 ± 10% | | |
| Tripping current $I_{trip}$ | A | 7.7 | 9.4 | 12.5 |
| Design | | Wire resistor | | Frame resistor |
| Power connections | | Ceramic terminal 2.5 $mm^2$ | | |
| Tightening torque | Nm | 0.5 | | |
| PE connection | | M4 | | M5 |
| PE tightening torque | Nm | 1.8 | | 2.5 |
| Degree of protection | | IP20 | | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | | |
| Mass | kg | 5.8 | 8 | 10 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW027-016-T | BW027-024-T | BW027-042-T |
|---|---|---|---|
| MDX9.A-....-5.3-... | 0125<br>0160 | | |
| MDX9.A-....-2.3-... | 0070<br>0093 | | |

*Technical data*

| Braking resistor | Unit | BW015-016 | BW015-042-T | BW015-075-T | BW915-T |
|---|---|---|---|---|---|
| Part number | | 17983258 | 19155328 | 19155271 | 18204139 |
| Current-carrying capacity at 100% cdf | kW | 1.6 | 4.2 | 7.5 | 16 |
| Resistance value $R_{BW}$ | Ω | 15 ± 10% | | | |
| Tripping current $I_{trip}$ | A | 10.3 | 16.7 | 22.4 | 32.7 |
| Design | | Wire resistor | Frame resistor | Grid resistor mounting position 1 | |
| Power connections | | Ceramic terminal 2.5 mm² | Ceramic terminal 4 mm² | M8 stud | |
| Tightening torque | Nm | 0.5 | 0.9 | 6 | |
| PE connection | | M4 | M5 | M6 stud | |
| PE tightening torque | Nm | 1.8 | 2.5 | 3 | |
| Degree of protection | | IP20 | | | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | | | |
| Mass | kg | 5.8 | 10 | 12 | 32 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW015-016 | BW015-042-T | BW015-075-T | BW915-T |
|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0240<br>0320<br>0620 (Parallel connection of 2 braking resistors)<br>0750 (Parallel connection of 2 braking resistors) | | | |
| MDX9.A-....-2.3-... | 0140<br>0213 (Parallel connection of 2 braking resistors)<br>0290 (Parallel connection of 2 braking resistors) | | | |

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*Technical data*

| Braking resistor | Unit | BW010-024 | BW010-050-T | BW010-108-T |
|---|---|---|---|---|
| Part number | | 17983266 | 17983274 | 19155298 |
| Current-carrying capacity at 100% cdf | kW | 2.4 | 5 | 10.8 |
| Resistance value $R_{BW}$ | Ω | 10 ± 10% | | |
| Tripping current $I_{trip}$ | A | 15.5 | 22.4 | 32.9 |
| Design | | Wire resistor | Grid resistor mounting position 1 | |
| Power connections | | Ceramic terminal 2.5 $mm^2$ | M8 stud | |
| Tightening torque | Nm | 0.5 | 6 | |
| PE connection | | M4 stud | M6 stud | |
| PE tightening torque | Nm | 1.8 | 3 | |
| Degree of protection | | IP20 | | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | | |
| Mass | kg | 8 | 11 | 17.5 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW010-024 | BW010-050-T | BW010-108-T |
|---|---|---|---|
| MDX9.A-....-5.3-... | 0460<br>0910 (Parallel connection of 2 braking resistors)<br>1130 (Parallel connection of 2 braking resistors) | | |
| MDX9.A-....-2.3-... | 0213<br>0290<br>0420 (Parallel connection of 2 braking resistors) | | |

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*Technical data*

| Braking resistor | Unit | BW006-025-01 1) | BW006-050-01 1) | BW106-T | BW206-T |
|---|---|---|---|---|---|
| Part number | | 18200117 | 18200125 | 18200834 | 18204120 |
| Current-carrying capacity at 100% cdf | kW | 2.5 | 5 | 13.5 | 18 |
| Resistance value $R_{BW}$ | Ω | 6 ± 10% | | | |
| Tripping current $I_{trip}$ | A | 20.4 | 28.9 | 47.4 | 54.8 |
| Design | | Grid resistor mounting position 1 | | | |
| Power connections | | M8 stud | | | |
| Tightening torque | Nm | 6 | | | |
| PE connection | | M6 stud | | | |
| PE tightening torque | Nm | 3 | | | |
| Degree of protection | | IP20 | | | |
| Ambient temperature $\vartheta_{amb}$ | | -25 °C to +40 °C | | | |
| Mass | kg | 7.5 | 12 | 30 | 40 |

1) Braking resistor has a 1 Ω tap

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW006-025-01 | BW006-050-01 | BW106-T | BW206-T |
|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0620<br>0750<br>1490 (Parallel connection of 2 braking resistors) | | | |
| MDX9.A-....-2.3-... | 0570 (Parallel connection of 2 braking resistors) | | | |

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*Technical data*

| Braking resistor | Unit | BW005-070 | BW005-170-T | BW004-050-01 | BW004-070-01 |
|---|---|---|---|---|---|
| Part number | | 17983282 | 17983290 | 18200133 | 17967678 |
| Current-carrying capacity at 100% cdf | kW | 7 | 17 | 5 | 7 |
| Resistance value $R_{BW}$ | Ω | 4.7 ± 10% | | 3.6 ± 10% | |
| Tripping current $I_{trip}$ | A | 38.6 | 60.1 | 32.6 | 38.6 |
| Design | | Grid resistor mounting position 1 | | | |
| Power connections | | M8 stud | | | |
| Tightening torque | Nm | 6 | | | |
| PE connection | | M6 stud | | | |
| PE tightening torque | Nm | 3 | | | |
| Degree of protection | | IP20 | | | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | | | |
| Mass | kg | 13 | 33 | 13 | |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW005-070 | BW005-170-T | BW004-050-01 | BW004-070-01 |
|---|---|---|---|---|
| MDX9.A-....-5.3-... | 0910<br>1130<br>1770 (Parallel connection of 2 braking resistors)<br>2200 (Parallel connection of 2 braking resistors)<br>2500 (Parallel connection of 2 braking resistors)<br>3000 (Parallel connection of 2 braking resistors) | | 1490 | |
| MDX9.A-....-2.3-... | 0420<br>0840 (Parallel connection of 2 braking resistors)<br>1080 (Parallel connection of 2 braking resistors) | | 0570 | |

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*Technical data*

| Braking resistor | Unit | BW003-420-T | BW002-070 |
|---|---|---|---|
| Part number | | 13302345 | 17983304 |
| Current-carrying capacity at 100% cdf | kW | 42 | 7 |
| Resistance value $R_{BW}$ | Ω | 2.5 ± 10% | 2.3 ± 10% |
| Tripping current $I_{trip}$ | A | 135.1 | 55.2 |
| Design | | Grid resistor mounting position 2 | Grid resistor mounting position 1 |
| Power connections | | M12 stud | M8 stud |
| Tightening torque | Nm | 15.5 | 6 |
| PE connection | | M10 stud | M6 stud |
| PE tightening torque | Nm | 10 | 3 |
| Degree of protection | | IP20 | |
| Ambient temperature $\vartheta_{amb}$ | | -20 °C to +40 °C | |
| Mass | kg | 93 | 33 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

| Braking resistor | BW003-420-T | BW002-070 |
|---|---|---|
| MDX9.A-....-5.3-... | 1770<br>2200<br>2500<br>3000<br>3800 (Parallel connection of 2 braking resistors)<br>4700 (Parallel connection of 2 braking resistors)<br>5880 (Parallel connection of 2 braking resistors) | |
| MDX9.A-....-2.3-... | 0840<br>1080 | |

*Technical data*

| Braking resistor | Unit | BW1.0-170 |
|---|---|---|
| Part number | | 17985455 |
| Current-carrying capacity at 100% cdf | kW | 17 |
| Resistance value $R_{BW}$ | Ω | 1 ± 10% |
| Tripping current $I_{trip}$ | A | 130.4 |
| Design | | Grid resistor mounting position 2 |
| Power connections | | M12 stud |
| Tightening torque | Nm | 15.5 |
| PE connection | | M10 stud |
| PE tightening torque | Nm | 10 |
| Degree of protection | | IP20 |
| Ambient temperature $\vartheta_{amb}$ | | -25 °C to +40 °C |
| Mass | kg | 45 |

*Assignment*

The assignment considers the maximum peak braking power of the inverter.

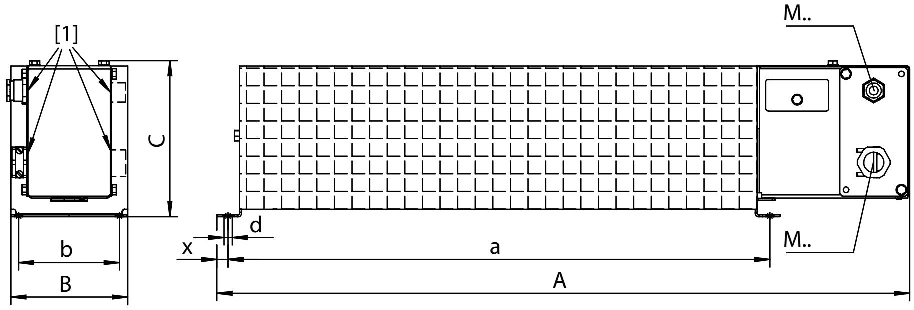
| Braking resistor | BW1.0-170 |
|---|---|
| MDX9.A-....-5.3-... | 3800<br>4700<br>5880 |

*Technical data BW..-T signal contact*

| Specifications for BW..-T | Design |
|---|---|
| Signal contact connection cross section | 1 × 2.5 mm$^2$ |
| Tightening torque of the signal contact | 1 Nm |
| Switching capacity signal contact | DC 2 A / DC 24 V (DC11)<br>AC 2 A / AC 230 V (AC11) |
| Switch contact (NC contact) | According to EN 60730 |

*Dimension sheets and dimensions*

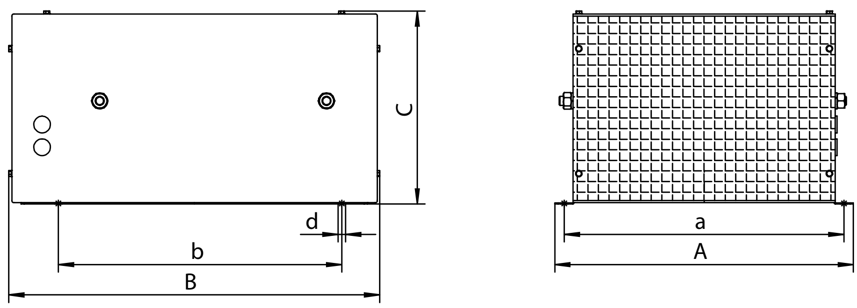
*Wire resistor*




9007218129604875

| Braking resistor | Main dimensions in mm | | | Mounting dimensions in mm | | | | Cable gland |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | d | x | |
| BW100-006-T | 549 | 92 | 125 | 430 | 80 | 6.5 | 8 | M25 + M12 |
| BW047-010-T | 749 | 92 | 125 | 630 | 80 | 6.5 | 8 | M25 + M12 |
| BW147-T | 549 | 185 | 125 | 430 | 150 | 6.5 | 8 | M25 + M12 |
| BW247-T | 749 | 185 | 125 | 630 | 150 | 6.5 | 8 | M25 + M12 |
| BW027-016-T | 649 | 185 | 125 | 530 | 150 | 6.5 | 8 | M25 + M12 |
| BW027-024-T | 649 | 275 | 125 | 530 | 240 | 6.5 | 8 | M25 + M12 |
| BW015-016 | 649 | 185 | 125 | 530 | 150 | 6.5 | 8 | M25 |
| BW010-024 | 649 | 275 | 125 | 530 | 240 | 6.5 | 8 | M25 |

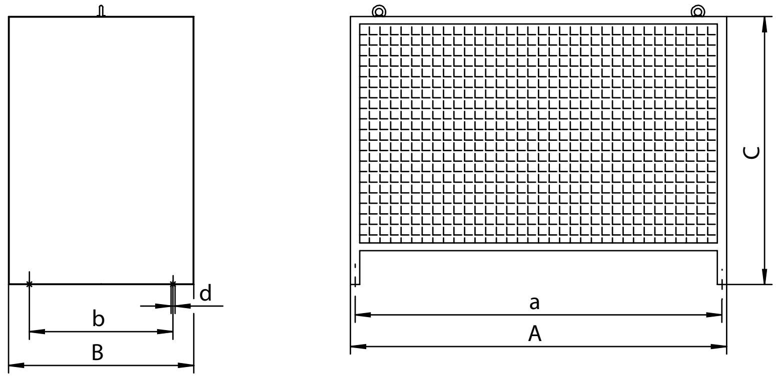
*Grid resistor mounting position 1*




18874868747

| Braking resistor | Main dimensions in mm | | | Mounting dimensions in mm | | | | Cable gland |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | d | x | |
| BW015-075-T | 415 | 500 | 270 | 395 | 380 | 9 | – | – |
| BW106-T | 795 | 490 | 270 | 770 | 380 | 10.5 | – | – |
| BW206-T | 995 | 490 | 270 | 970 | 380 | 10.5 | – | – |
| BW915-T | 795 | 490 | 270 | 770 | 380 | 10.5 | – | – |
| BW010-050-T | 395 | 490 | 260 | 370 | 380 | 10.5 | – | – |
| BW010-108-T | 525 | 500 | 270 | 505 | 380 | 9 | – | – |
| BW004-050-01 | 395 | 490 | 260 | 370 | 380 | 10.5 | – | – |
| BW005-070 | 395 | 490 | 260 | 370 | 380 | 10.5 | – | – |
| BW002-070 | 395 | 490 | 260 | 370 | 380 | 10.5 | – | – |
| BW005-170-T | 490 | 795 | 270 | 380 | 770 | 10.5 | – | – |
| BW006-025-01 | 295 | 490 | 260 | 270 | 380 | 10.5 | – | – |
| BW006-050-01 | 395 | 490 | 260 | 370 | 380 | 10.5 | – | – |

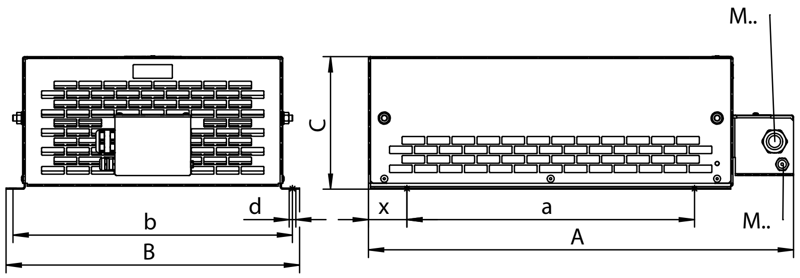
*Grid resistor mounting position 2*




18874876043

| Braking resistor | Main dimensions in mm | | | Mounting dimensions in mm | | | | Cable gland |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | d | x | |
| BW003-420-T | 995 | 490 | 710 | 970 | 380 | 10.5 | – | – |
| BW1.0-170 | 490 | 795 | 490 | 380 | 770 | 10.5 | – | – |

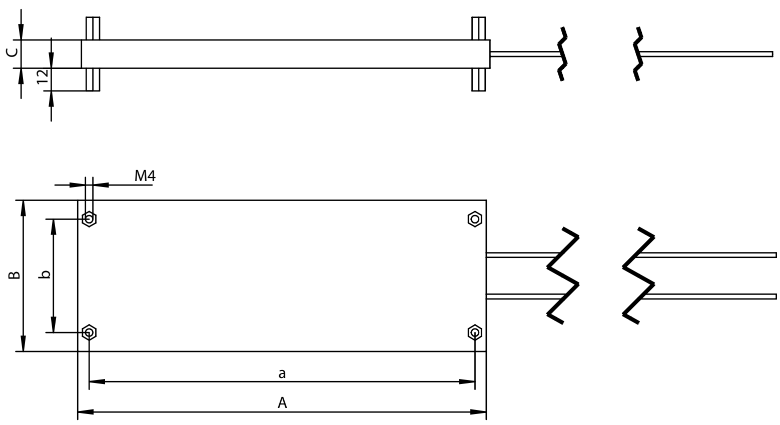
*Frame resistor*




9007218129614603

| Braking resistor | Main dimensions in mm | | | Mounting dimensions in mm | | | | Cable gland |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | d | x | |
| BW027-042-T | 570 | 390 | 180 | 380 | 370 | 6.5 | 55 | M25 + M12 |
| BW015-042-T | 570 | 390 | 180 | 380 | 370 | 6.5 | 55 | M25 + M12 |

*Flat-type resistor*




18874878475

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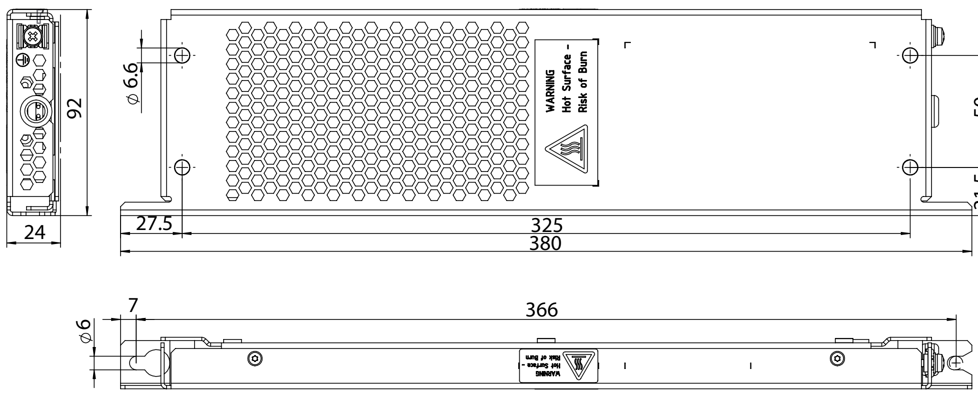
| Braking resistor | Main dimensions in mm | | | Mounting dimensions in mm | | | | Connection length in mm |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | a | b | d | x | |
| BW100-001 | 110 | 80 | 15 | 98 | 60 | – | – | 300 |
| BW100-002 | 216 | 80 | 15 | 204 | 60 | – | – | 300 |

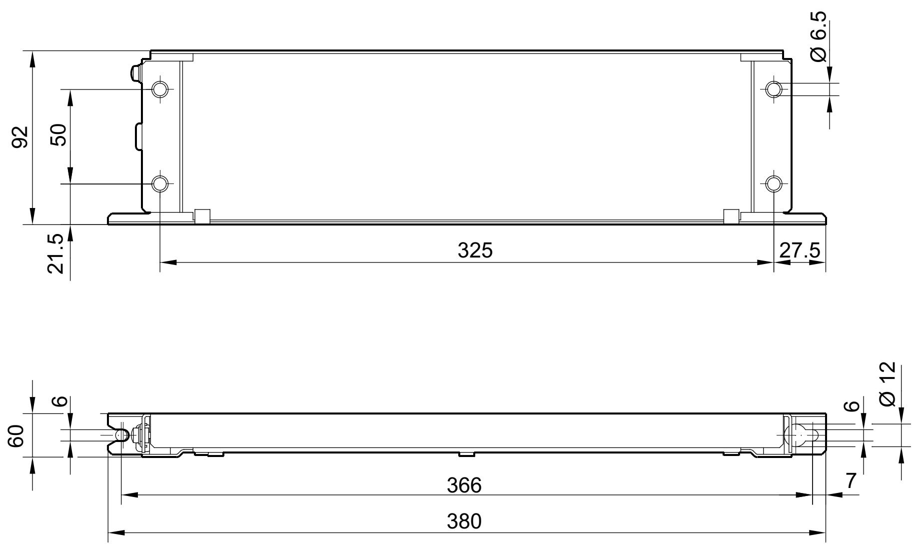
*BW120-001 resistor*




19506873227

Length of connections: 130 mm

*BW100-002/M resistor*




34416105867

*BS.. touch guard*

A BS.. touch guard is available for braking resistors in flat design.

| Touch guard | BS003 | BS005 |
|---|---|---|
| Part number | 8131511 | 813152X |
| Braking resistor | BW100-001 | BW100-002 |

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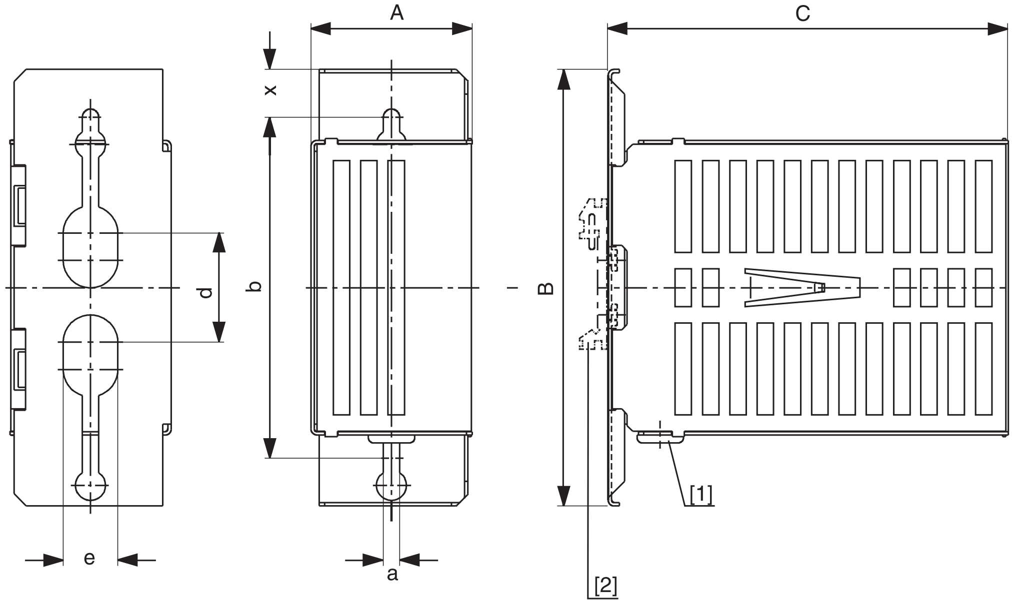
*Dimension drawing of BS...*




*1455849867*

[1] Grommet

[2] Support rail mounting

| Type | Main dimensions in mm | | | Mounting dimensions in mm | | | | | Mass in kg |
|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | b | d | e | a | x | |
| BS-003 | 60 | 160 | 146 | 125 | 40 | 20 | 6 | 17.5 | 0.35 |
| BS-005 | 60 | 160 | 252 | 125 | 4 | 20 | 6 | 17.5 | 0.5 |

*Mounting rail installation*

A mounting rail attachment HS001 is available from SEW-EURODRIVE, part number 8221944, for mounting the touch guard on a mounting rail.

## 3.8 Supply system cables and motor cables

### 3.8.1 Supply system cable

The supply system cable is generally dimensioned system-specifically and depends on the design of the line connection. Line connection is shown in the chapter "Power connection" (→ 🗎 296). Observe the country-specific and system-specific regulations when selecting the cross section of the supply system cable.

#### Recommended cross section for nominal operation

The cross section of the supply system cables must be dimensioned based on the nominal line current $I_{line}$.

SEW-EURODRIVE suggests the cable cross sections listed in the table. Cables with these cross sections can be used if the following conditions are met:

- The single-core cables are made of copper with PVC insulation.
- The cables are routed in cable ducts according to IEC 60204-1 installation type C at an ambient temperature of 40 °C.

| MDX9.A-….-5.3-... | | 0020 | 0025 | 0032 | 0040 | 0055 | 0070 | 0095 | 0125 | 0160 | 0240 | 0320 | 0460 | 0620 | 0750 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal line current AC $I_{line}$ | A | 1.9 | 2.3 | 2.9 | 3.6 | 5 | 6.3 | 8.6 | 11.3 | 14.4 | 22 | 32 | 42 | 56 | 68 |
| Supply system cable L1/L2/L3 | mm² | 1.5 | | | | | | | 2.5 | | 4 | 6 | 10 | 16 | 25 |
| Fuse/miniature circuit breaker | A | 10 | | | | | | | 16 | | 25 | 32 | 50 | 63 | 80 |

| MDX9.A-….-2.3-... | | 0070 | 0093 | 0140 | 0213 | 0290 | 0420 | 0570 |
|---|---|---|---|---|---|---|---|---|
| Nominal line current AC $I_{line}$ | A | 6.4 A | 8.4 A | 12.4 A | 18.9 A | 27.4 A | 40.8 A | 52 A |
| Supply system cable L1/L2/L3 | mm² | 1.5 mm² | | 2.5 mm² | | 6 mm² | 10 mm² | 16 mm² |
| Fuse/miniature circuit breaker | A | 10 A | | 16 A | 20 A | 32 A | 50 A | 63 A |

## INFORMATION

Recommended cross section

The values are only recommendations. They are no substitute for detailed project planning of the cables depending on the concrete application and considering the applicable regulations.

## INFORMATION

Securing the supply system cable

Secure the supply system cable with appropriate safety elements.

When selecting the supply system cable, make sure that the selected cross section is in the range of the connectable cross section of the terminals.

### 3.8.2 Motor cable

#### Cable length

A maximum motor cable length must not be exceeded when connecting a motor.

The following configuration guidelines must be observed:

- When shielded motor cables are used, a capacitance core/shield of maximum 280 pF/m must not be exceeded.

| MDX9.A-...-5.3 With $V_{line}$ = 3 × AC 400 V | 0020 – 0040 | 0055 | 0070 | 0095 | 0125 | 0160 | 0240 – 1490 | 1770 – 2200 | 2500 – 3000 | 3800 – 5880 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum motor cable length in m | | | | | | | | | |
| | Shielded cable | | | | | | | | | |
| PWM frequency | | | | | | | | | | |
| 2.5 kHz | - | - | - | - | - | - | - | - | 400 | 400 |
| 4 kHz | 120 | 200 | 250 | 300 | 300 | 400 | 400 | 400 | 300 | 300 |
| 8 kHz | 80 | 120 | 150 | 250 | 250 | 300 | 300 | 300 | 200 | - |
| 16 kHz | 40 | 60 | 100 | 150 | 150 | 200 | 200 | - | - | - |

| MDX9.A-...-5.3 With $V_{line}$ = 3 × AC 400 V | 0020 – 0040 | 0055 | 0070 | 0095 | 0125 | 0160 | 0240 – 1490 | 1770 – 2200 | 2500 – 3000 | 3800 – 5880 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum motor cable length in m | | | | | | | | | |
| | Unshielded cable | | | | | | | | | |
| PWM frequency | | | | | | | | | | |
| 2.5 kHz | - | - | - | - | - | - | - | - | 1200 | 1200 |
| 4 kHz | 360 | 600 | 750 | 900 | 900 | 1200 | 1200 | 1200 | 900 | 900 |
| 8 kHz | 240 | 360 | 450 | 750 | 750 | 900 | 900 | 900 | 600 | - |
| 16 kHz | 120 | 180 | 300 | 450 | 450 | 600 | 600 | - | - | - |

| MDX9.A-...-5.3 With $V_{line}$ = 3 × AC 230 V | 0070 | 0093 | 0140 | 0213 – 0290 | 0420 – 1080 |
|---|---|---|---|---|---|
| | Maximum motor cable length in m | | | | |
| | Shielded cable | | | | |
| PWM frequency | | | | | |
| 4 kHz | 120 | 200 | 250 | 300 | 400 |
| 8 kHz | 80 | 120 | 150 | 250 | 300 |
| 16 kHz | 40 | 60 | 100 | 150 | 200 |

## INFORMATION

If the use of a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not using a residual current device. Leakage currents caused by cable capacitances can lead to false tripping.

#### Voltage drop

Select the cable cross section of the motor cable so the voltage drop is as small as possible. An excessively high voltage drop means that the full motor torque is not achieved.

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## 3.9 Signal cables

### 3.9.1 Encoder cables

| Connection/encoder | Maximum cable length |
|---|---|
| HTL encoders ES7C, EG7C, and EK8C | 300 m |
| TTL encoder EK8R | 300 m |
| Standard HTL encoder | 200 m |
| MOVILINK® DDI | 200 m |
| Other encoders | 100 m |

### 3.9.2 Digital inputs/outputs and DC 24 V supply

The maximum permitted cable length of the connections on the inputs and outputs and on terminal X6 (STO) is 30 m.

### 3.9.3 Digital motor integration

The maximum permitted cable length with or without encoder is 200 m.

## 3.10 EMC-compliant installation according to EN 61800-3

The inverters are designed for use as components for installation in machinery and systems. They comply with the EMC product standard EN 61800-3 "Adjustable-speed electrical drives".

Provided the EMC-compliant installation is observed, the appropriate requirements for a CE marking are met on the basis of the EMC Directive 2014/30/EU.

### 3.10.1 Interference emission

The cable length must be as short as possible for EMC-compliant installation. SEW-EURODRIVE recommends using low-capacity cables. To comply with limit classes C1 and C2 in accordance with EN 61800-3, take the measures listed in the tables.

Limit class C1

| Inverter | Measures | | |
|---|---|---|---|
| | On the line side | On the motor side | |
| | Line filter NF.. | Output filter HF..<br>Output choke HD.. | Shielded cables |
| Sizes 1 – 3 | NF.. | - | yes |

Limit class C2

| Inverter | Measures | | |
|---|---|---|---|
| | On the line side | On the motor side | |
| | Line filter NF.. | Output filter HF..<br>Output choke HD.. | Shielded cables |
| Sizes 1 – 3 | - | - | yes |
| Sizes 1 – 7 | NF.. | - | yes |
| Sizes 1 – 4 | NF.. | HD.. | no |
| Sizes 5 – 7 | NF.. | HD.. | no |
| Sizes 1 – 4 | NF.. | HF.. | no |
| Sizes 5 – 6 | NF.. | HF.. | no |

## INFORMATION

No EMC limit values are specified for interference emission in voltage supply systems without a grounded star point (IT systems).

## INFORMATION

During startup, "Operation with output filter" must be set if the relevant criteria are met.

## INFORMATION

EMC limit values

No EMC limit values are specified for interference emission in voltage supply systems without a grounded star point (IT systems). The effectiveness of filters is severely limited.

## 3.11 Line components

### 3.11.1 Line fuses and miniature circuit breakers

Line fuses and miniature circuit breakers are used for protecting the supply system cables. For fusing, use fuses and miniature circuit breakers with the following properties:

| Type class | Requirement |
|---|---|
| Fuses in utilization categories gL, gG | Fusing voltage ≥ nominal line voltage |
| Miniature circuit breaker with characteristics B, C, D | Nominal miniature circuit breaker voltage ≥ nominal line voltage |
| | Nominal currents of the miniature circuit breaker must be 10% higher than the nominal line current of the inverter |

Adhere to the country-specific and system-specific regulations when carrying out the fusing. If required, observe the notes in the chapter "UL-compliant installation".

### 3.11.2 Line contactor

A line contactor is used to separate the inverter from the supply system in the event of an error and to switch the power supply on and off.

For more information on operation with a line contactor, refer to the chapter "Line connection".

**INFORMATION**

If necessary, use a line contactor in utilization category AC-3 (IEC 158-1) or better.

The line contactor must be installed before the line filter and the line choke.

**INFORMATION**

Observe the information for electrical installation of a line contactor.

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### 3.11.3 NF.. line filters

A line filter reduces interference emission via the supply system cable, which is generated by the inverter. The line filter mainly serves to meet interference voltage limit requirements in the frequency range from 150 kHz to 30 MHz at the line connection. In addition, a line filter dampens the interference from the grid affecting the inverter. The selection of the line filter depends on the nominal line current and the line voltage of the frequency inverter.

Select the line filter type based on the following table.

### 3.11.4 ND.. line chokes

The main reason for using line chokes is the reduction of grid disturbances that may occur due to harmonic currents. In addition, line chokes improve the overvoltage protection.

For 5 or more 3-phase units, connect a line choke to limit the inrush current.

Select the line choke based on the following table.

### 3.11.5 Residual current device

**⚠ WARNING**

No protection against electric shock if an incorrect type of residual current device is used.

Severe or fatal injuries.

- The product can cause direct current in the PE conductor. If a residual current device (RCD) or a residual current monitoring device (RCM) is used for protection in the event of a direct or indirect contact, only a type B RCD or RCM is permitted on the supply end of the product.

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- If the use of a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not using a residual current device.

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## 3.12 Components on the output side

### 3.12.1 HD.. output chokes

SEW-EURODRIVE recommends using output chokes to suppress interference emission when using unshielded motor cables.

### 3.12.2 HF.. output filters

Observe the following information when using an output filter:

- Output filters may only be used in inverter operating modes V/f and VFC plus.
- Output filters may be used up to a maximum inverter output frequency of 250 Hz.
- When selecting the output filter, make sure that it is assigned correctly to the inverter.
- Maintain a ventilation clearance of at least 100 mm below and above the output filter. There is no need for a clearance on the side.
- Limit the length of the cable between the inverter and the output filter to the required length. Maximum permitted length:
  - 1 m with unshielded cable
  - 10 m with shielded cable
- An unshielded motor supply cable is sufficient when using an output filter.

For technical data, see chapter "HF.. output filters".

#### Operating modes of output filters

Output filters can be operated with or without DC link connection. The recommended operation with DC link connection improves the filter effect between the phases and PE. This increases the device utilization.

Observe the following notes:

- Operation with DC link connection
  - Nominal filter current ≥ 65 A: Minimum clock frequency = 8 kHz, this must be set permanently.
- Operation without DC link connection
  - Maximum clock frequency = 8 kHz
  - The maximum shielded motor cable length is 200 m.

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**Voltage drop**

Observe the following voltage drop at the output filter during project planning:

- At 400 V ≤ 6.5%
- At 500 V ≤ 5%

These values refer to an output frequency of 50 Hz.

**Derating**

Derating refers to the current dependency of the following operating parameters.

- Operating parameters: Line voltage, clock frequency, ambient temperature
  - The output filters do not require derating beyond that of the inverter if the permitted control modes are observed.
- Operating parameters: Output frequency

  150 – 250 Hz
  - Nominal filter current ≤ 46 A

    Derating: Filter current = 100% - 0.1% × (output frequency - 150 Hz)
  - Nominal filter current ≥ 65 A

    Derating: Filter current = 100% - 0.2% × (output frequency - 150 Hz)

  0 – 20 Hz
  - 400 V without/with DC link connection, 500 V without DC link connection:

    No derating
  - 500 V DC link connection, nominal filter current ≤ 46 A

    Derating: Filter current = 70% + 1.5% × output frequency (in the range from 0 to 20 Hz)
  - 500 V DC link connection, nominal filter current ≥ 65 A

    Derating: Filter current = 10% + 9% × output frequency (in the range from 0 to 10 Hz)

  Short-time operation without speed derating (e.g. startup)
  - Filter current 100% for 5 min every 60 min permitted

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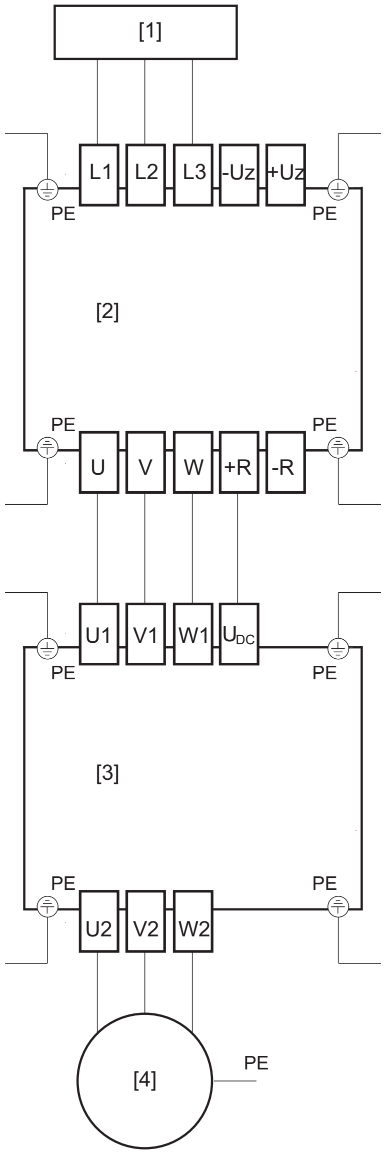
#### Wiring diagram




33412335115

[1] Grid
[2] Inverter
[3] Output filter
[4] Motor

## 3.13 24 V supply voltage selection

The MDX90A-... application inverter requires an external 24 V voltage supply for the electronics.

The MDX91.A-... application inverter has an internal 24 V voltage supply (80 W) that can also be supported externally.

### 3.13.1 Project planning for 24 V supply power

For dimensioning the 24 V supply voltage, it is necessary to know the power and current consumption of the application inverter.

**INFORMATION**

Commercially available switched-mode power supplies can reliably switch on the maximum occurring capacities.

### 3.13.2 Power consumption of the 24 V supply

Tables for the power demand of the 24 V supply depending on the modules in use and on the installed options.

**Inverter**

| Size | Unit | Power consumption without I/O, encoder, motor brake |
|---|---|---|
| Sizes 1 – 3 | W | 20 |
| Size 4 | | 30 |
| Size 5 | | 15 |
| Sizes 6 – 7 | | 20 |

**Cards**

| Card | Unit | Power consumption without I/O, encoder | Maximum power consumption |
|---|---|---|---|
| CIO21A | W | 1.2 | 6.5 |
| CID21A | | 0.4 | 5.2 |
| CES11A | | 0.8 | 12.8 |

**Safety cards**

| Card | Unit | Power consumption without I/O, encoder | Maximum power consumption |
|---|---|---|---|
| CSB21A | W | 17.7 | 17.7 |
| CSS21A | | | 26.4 |
| CSB31A | | | 38.4 |
| CSS31A | | | 38.4 |
| CSA31A | | | 38.4 |

### 3.13.3 Project planning example

The following example illustrates the project planning of the 24 V voltage supply for the MDX9.A-0040-5E3-4-.00 application inverter with CES11A multi-encoder card and I/O extension CID21A.

The inverter supplies the DI00 digital input (output stage enable) with voltage.

The motor brake is controlled via DB00. The coil of the brake relay requires DC 100 mA at DC 24 V.

The 4 outputs of the CID21A option are each subject to a load of DC 50 mA.

Power demand of the basic device: 20 W + 1 × motor encoder: 5 W

Power demand of the CES11A option without encoder: 0.8 W

1 × external encoder: 12 W

Power demand of the CID21A option without terminals: 0.4 W

Power demand of the inputs (basic device): 1 × 0.1 W = 0.1 W

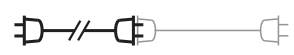
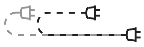
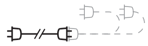
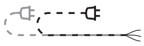
Power demand of the brake control at DB00: 24 V × 0.1 A = 2.4 W

Power demand of the binary outputs: 4 × 24 V × 0.05 A = 4.8 W

The total power demand is: 45.6 W

# 4 Prefabricated cables

## 4.1 Meaning of the symbols

| Symbol | Meaning |
|---|---|
|  | Connection cable: Connector → connector for fixed installation |
|  | Connection cable extension: Connector → connector for fixed installation |
|  | Connection cable: Connector → encoder connection cover for fixed installation |
|  | Connection cable: Connector → encoder connection cover for cable carrier installation |
|  | Connection cable: Connector → connector for cable carrier installation |
|  | Connection cable extension: Connector → connector for cable carrier installation |
|  | Connection cable: Connector → open end for fixed installation |
|  | Connection cable: Connector → open end for cable carrier installation |

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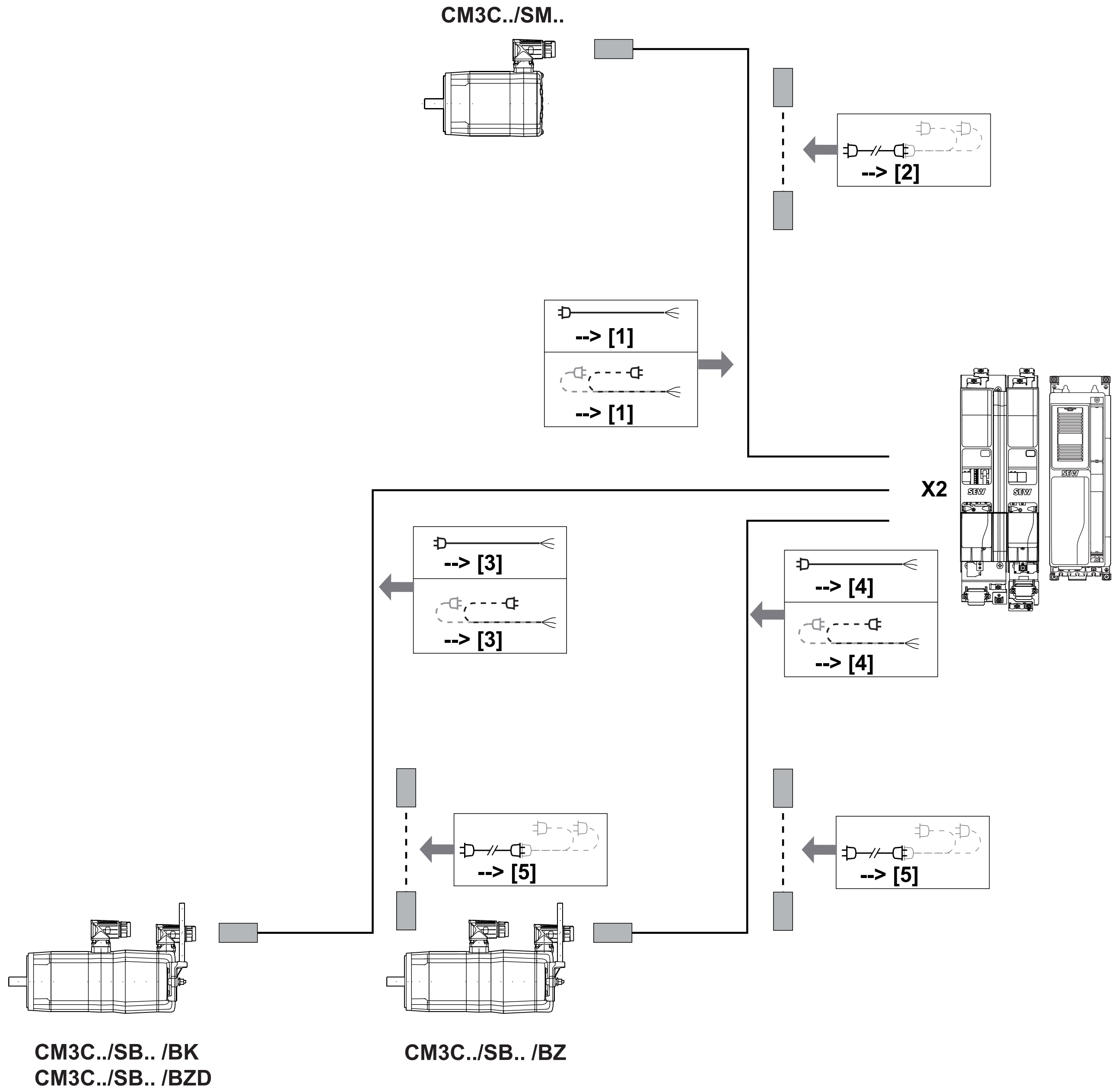
## 4.2 Power cables for CM3C.. motors

### 4.2.1 Overview




*18014431390159883*

[1] Motor cable ../SM.. " "
[2] Motor extension cable ../ SM.. " "
[3] Brakemotor cable ../SB.. for /BK and /BZD brakes " "
[4] Brakemotor cable ../SB.. for /BZ brakes " "
[5] Brakemotor extension cable ../SB.. for /BK, /BZD and /BZ brakes " "

### 4.2.2 Power cables for fixed installation

| Cable type | Connector type | Thread | Cable cross section | Part number | |
|---|---|---|---|---|---|
| | | | | Prefabricated cable | Replacement mating connectors[1] |
| Motor cable | SM11 | M23 | 4 × 1.5 $mm^2$ | 28125002 | 13354698 |
| | SM12 | | 4 × 2.5 $mm^2$ | 28125029 | 13354698 |
| | SM14 | | 4 × 4 $mm^2$ | 28125045 | 13354264 |
| | SMB6 | M40 | 4 × 6 $mm^2$ | 28125061 | 13421778 |
| | SMB10 | | 4 × 10 $mm^2$ | 28125096 | 13421751 |
| | SMB16 | | 4 × 16 $mm^2$ | 28125126 | 13421670 |
| Brakemotor cable BK.. brake[2] or BZ.D | SB11 | M23 | 4 × 1.5 $mm^2$ + 3 × 1 $mm^2$ | 28125207 | 13354698 |
| | SB12 | | 4 × 2.5 $mm^2$ + 3 × 1 $mm^2$ | 28125223 | 13354698 |
| | SB14 | | 4 × 4 $mm^2$ + 3 × 1 $mm^2$ | 28125258 | 13354264 |
| | SBB6 | M40 | 4 × 6 $mm^2$ + 3 × 1.5 $mm^2$ | 28125274 | 13421778 |
| | SBB10 | | 4 × 10 $mm^2$ + 3 × 1.5 $mm^2$ | 28125290 | 13421751 |
| | SBB16 | | 4 × 16 $mm^2$ + 3 × 1.5 $mm^2$ | 28125312 | 13421670 |
| Brakemotor cable BZ.. brake | SB11 | M23 | 4 × 1.5 $mm^2$ + 3 × 1 $mm^2$ | 28125339 | 13354698 |
| | SB12 | | 4 × 2.5 $mm^2$ + 3 × 1 $mm^2$ | 28125355 | 13354698 |
| | SB14 | | 4 × 4 $mm^2$ + 3 × 1 $mm^2$ | 28125371 | 13354264 |
| | SBB6 | M40 | 4 × 6 $mm^2$ + 3 × 1.5 $mm^2$ | 28125401 | 13421778 |
| | SBB10 | | 4 × 10 $mm^2$ + 3 × 1.5 $mm^2$ | 28125436 | 13421751 |
| | SBB16 | | 4 × 16 $mm^2$ + 3 × 1.5 $mm^2$ | 28125452 | 13421670 |

1) The complete connector service pack always includes the following parts: Power connector, insulation inserts, female contacts. No differentiation is made between motor and brakemotor plug connectors.
2) Power cable for brakemotors with BK.. brake: 3-core cable, only 2 cores are used.

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### 4.2.3 Power cables for cable carrier installation

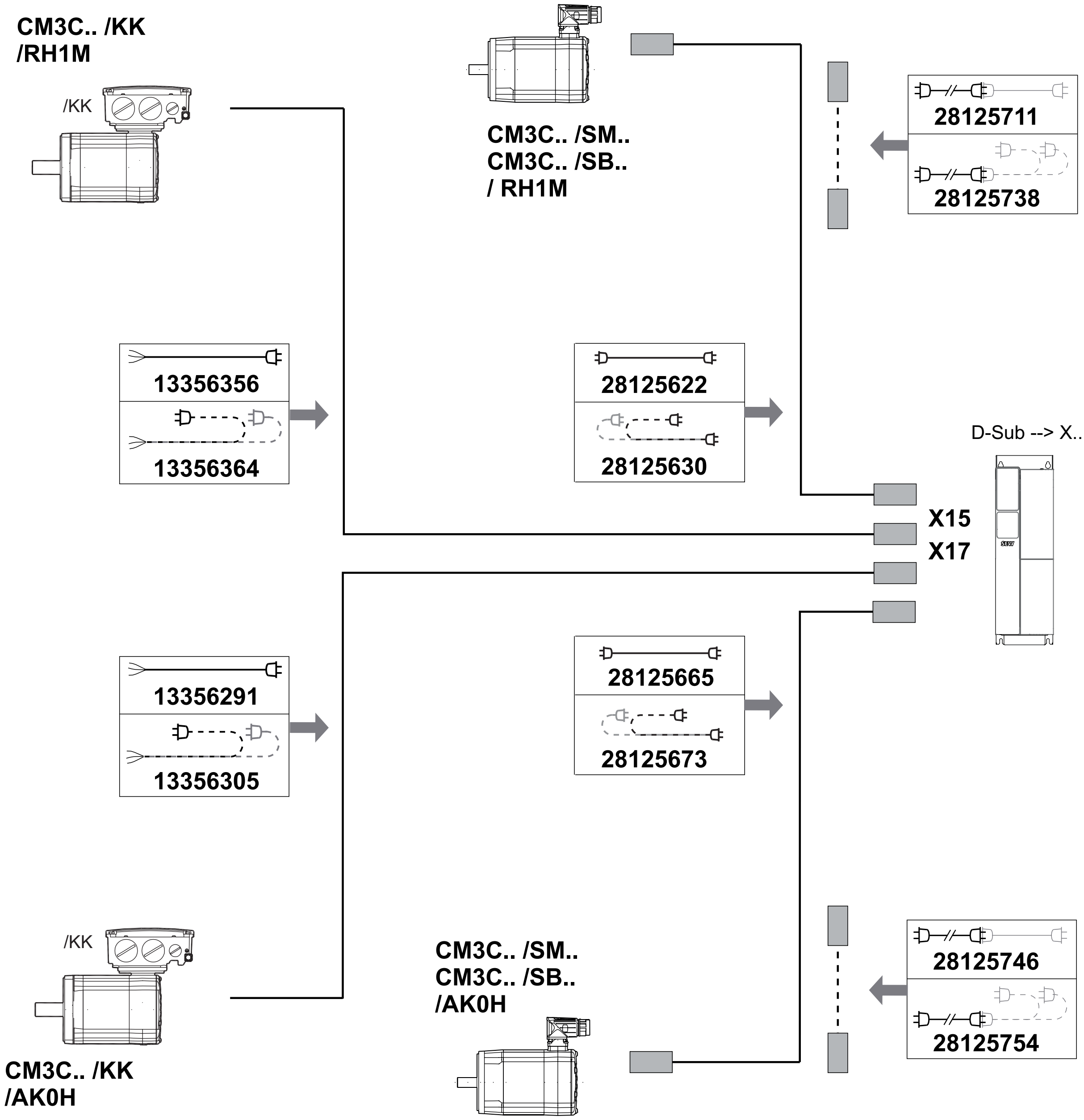
| Cable type | Connector type | Thread | Cable cross section | Part number | |
|---|---|---|---|---|---|
| | | | | Prefabricated cable | Replacement mating connectors[1] |
| Motor cable | SM11 | M23 | 4 × 1.5 $mm^2$ | 28125010 | 13354698 |
| | SM12 | | 4 × 2.5 $mm^2$ | 28125037 | 13354256 |
| | SM14 | | 4 × 4 $mm^2$ | 28125053 | 13354264 |
| | SMB6 | M40 | 4 × 6 $mm^2$ | 28125088 | 13421778 |
| | SMB10 | | 4 × 10 $mm^2$ | 28125118 | 13421751 |
| | SMB16 | | 4 × 16 $mm^2$ | 28125134 | 13421670 |
| Brakemotor cable BK.. brake[2] or BZ.D | SB11 | M23 | 4 × 1.5 $mm^2$ + 3 × 1 $mm^2$ | 28125215 | 13354256 |
| | SB12 | | 4 × 2.5 $mm^2$ + 3 × 1 $mm^2$ | 28125231 | 13354256 |
| | SB14 | | 4 × 4 $mm^2$ + 3 × 1 $mm^2$ | 28125266 | 13354264 |
| | SBB6 | M40 | 4 × 6 $mm^2$ + 3 × 1.5 $mm^2$ | 28125282 | 13421751 |
| | SBB10 | | 4 × 10 $mm^2$ + 3 × 1.5 $mm^2$ | 28125304 | 13421751 |
| | SBB16 | | 4 × 16 $mm^2$ + 3 × 1.5 $mm^2$ | 28125320 | 13421670 |
| Brakemotor cable BZ.. brake | SB11 | M23 | 4 × 1.5 $mm^2$ + 3 × 1 $mm^2$ | 28125347 | 13354256 |
| | SB12 | | 4 × 2.5 $mm^2$ + 3 × 1 $mm^2$ | 28125363 | 13354256 |
| | SB14 | | 4 × 4 $mm^2$ + 3 × 1 $mm^2$ | 28125398 | 13354264 |
| | SBB6 | M40 | 4 × 6 $mm^2$ + 3 × 1.5 $mm^2$ | 28125428 | 13421751 |
| | SBB10 | | 4 × 10 $mm^2$ + 3 × 1.5 $mm^2$ | 28125444 | 13421751 |
| | SBB16 | | 4 × 16 $mm^2$ + 3 × 1.5 $mm^2$ | 28125460 | 13421670 |

1) The complete connector service pack always includes the following parts: Power connector, insulation inserts, female contacts. No differentiation is made between motor and brakemotor plug connectors.

2) Power cable for brakemotors with BK.. brake: 3-core cable, only 2 cores are used.

## 4.3 Encoder cables for CM3C.. motors

### 4.3.1 Overview




*18014431391548811*

All prefabricated encoder cables with connectors on the motor side are designed in SpeedTec.

| | | |
|---|---|---|
| D-sub → | X15 | Encoder connection basic device (resolvers can only be connected to X15) |
| | X17 | Encoder connection multi-encoder card |

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### 4.3.2 Signal cables

**Fixed installation**

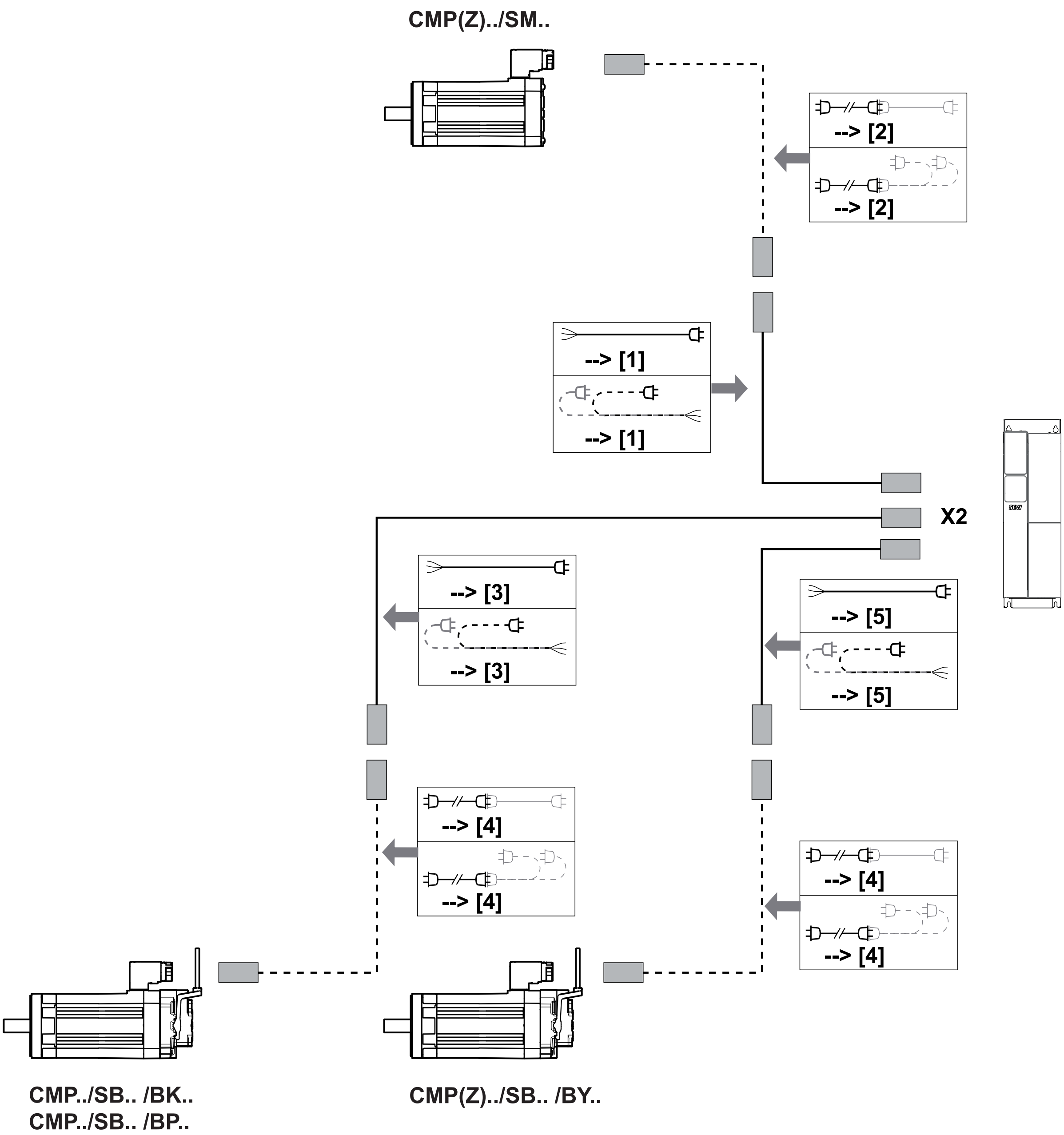
| Signal encoder | Connection (motor) | Cable cross section | Part number | |
|---|---|---|---|---|
| | | | Prefabricated cable | Replacement mating connector |
| RH1M resolver | M23 | 5 × 2 × 0.25 mm² | 28125622 | 16447115 |
| AK1H, EK1H, AK0H encoders | | 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 28125665 | |
| RH1M resolver | Open end | 5 × 2 × 0.25 mm² | 13356356 | – |
| AK1H, EK1H, AK0H encoders | | 6 × 2 × 0.25 mm² | 13356291 | – |

**Cable carrier installation**

| Signal encoder | Connection (motor) | Cable cross section | Part number | |
|---|---|---|---|---|
| | | | Prefabricated cable | Replacement mating connector |
| RH1M resolver | M23 | 5 × 2 × 0.25 mm² | 28125630 | 16447115 |
| AK1H, EK1H, AK0H encoders | | 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 28125673 | |
| RH1M resolver | Open end | 5 × 2 × 0.25 mm² | 13356364 | – |
| AK1H, EK1H, AK0H encoders | | 6 × 2 × 0.25 mm² | 13356305 | – |

## 4.4 Power cables for CMP.. motors

### 4.4.1 Overview




*18014413264996619*

[1] Motor cables ../SM.. (→ 🗎 170)
[2] Motor extension cables ../SM.. (→ 🗎 171)
[3] Brakemotor cables ../SB.. for /BK and /BP brakes (→ 🗎 172)
[4] Brakemotor extension cables ../SB.. for /BK, /BP, and /BY brakes" "
[5] Brakemotor cables ../SB.. for /BY brakes (→ 🗎 173)

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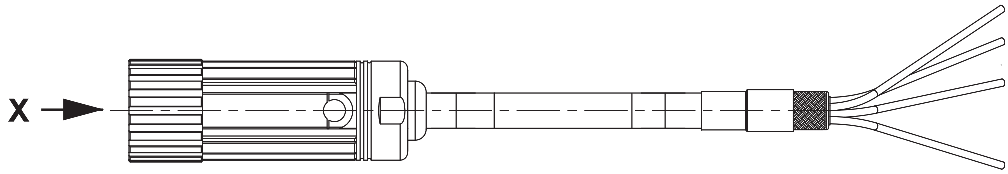
### 4.4.2 Motor cables with connector at motor side

**Illustration of motor cable**




**Types of CMP.. motor cables**

| Plug connector | Number of cores and cable cross section | Part number | Installation type |
|---|---|---|---|
| SM11 | 4 × 1.5 mm² | 05904544 | Fixed installation |
| SM11 | 4 × 1.5 mm² | 05906245 | Cable carrier installation |
| SM12 | 4 × 2.5 mm² | 05904552 | Fixed installation |
| SM12 | 4 × 2.5 mm² | 05906253 | Cable carrier installation |
| SM14 | 4 × 4 mm² | 05904560 | Fixed installation |
| SM14 | 4 × 4 mm² | 05904803 | Cable carrier installation |
| SMB6 | 4 × 6 mm² | 13350269 | Fixed installation |
| SMB6 | 4 × 6 mm² | 13350293 | Cable carrier installation |
| SMB10 | 4 × 10 mm² | 13350277 | Fixed installation |
| SMB10 | 4 × 10 mm² | 13350307 | Cable carrier installation |
| SMB16 | 4 × 16 mm² | 13350285 | Fixed installation |
| SMB16 | 4 × 16 mm² | 13350315 | Cable carrier installation |
| SMC16 | 4 × 16 mm² | 18148476 | Fixed installation |
| SMC16 | 4 × 16 mm² | 18148484 | Cable carrier installation |
| SMC25 | 4 × 25 mm² | 18148581 | Cable carrier installation |
| SMC35 | 4 × 35 mm² | 18148697 | Cable carrier installation |

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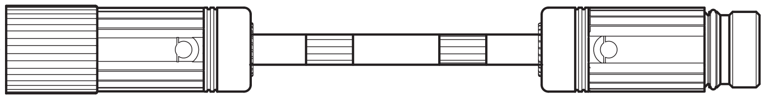
### Illustration of motor extension cable



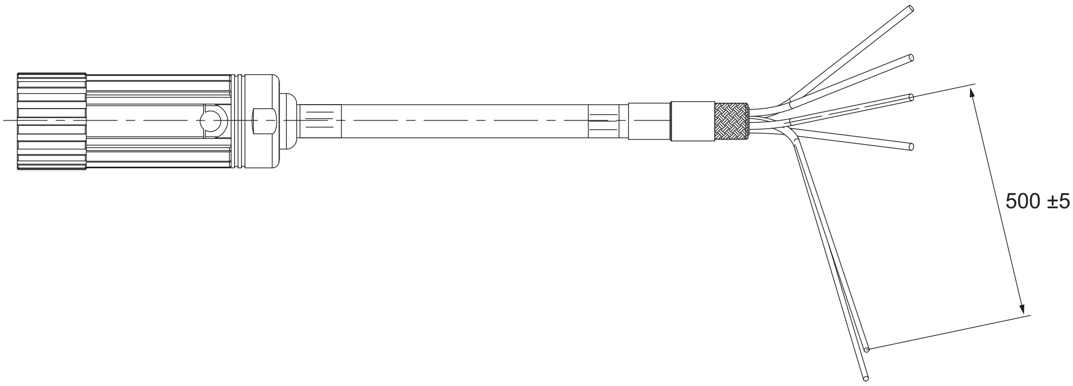

4818839179

### Types of CMP.. motor extension cables

| Plug connector | Number of cores and cable cross section | Part number | Installation type |
|---|---|---|---|
| SM11 | 4 × 1.5 $mm^2$ | 13332457 | Cable carrier installation |
| SM12 | 4 × 2.5 $mm^2$ | 13332465 | Cable carrier installation |
| SM14 | 4 × 4 $mm^2$ | 13332473 | Cable carrier installation |
| SMB6 | 4 × 6 $mm^2$ | 13350021 | Cable carrier installation |
| SMB10 | 4 × 10 $mm^2$ | 13350048 | Cable carrier installation |
| SMB16 | 4 × 16 $mm^2$ | 13350056 | Cable carrier installation |
| SMC16 | 4 × 16 $mm^2$ | 18156819 | Cable carrier installation |
| SMC25 | 4 x 25 $mm^2$ | 18156827 | Cable carrier installation |
| SMC35 | 4 x 35 $mm^2$ | 18156835 | Cable carrier installation |

### 4.4.3 Brakemotor cables for BP/BK brake with connector at motor side

**Illustration of CMP.. brakemotor cable**




24323160075

**Types of CMP.. brakemotor cables**

| Plug connector | Number of cores and cable cross section | Part number | Installation type |
|---|---|---|---|
| SB11 | 4 × 1.5 mm$^2$ + 3 × 1 mm$^2$ | 13354345 | Fixed installation |
| SB11 | 4 × 1.5 mm$^2$ + 3 × 1 mm$^2$ | 13354388 | Cable carrier installation |
| SB12 | 4 × 2.5 mm$^2$ + 3 × 1 mm$^2$ | 13354353 | Fixed installation |
| SB12 | 4 × 2.5 mm$^2$ + 3 × 1 mm$^2$ | 13354396 | Cable carrier installation |
| SB14 | 4 × 4 mm$^2$ + 3 × 1 mm$^2$ | 13354361 | Fixed installation |
| SB14 | 4 × 4 mm$^2$ + 3 × 1 mm$^2$ | 13421603 | Cable carrier installation |
| SBB6 | 4 × 6 mm$^2$ + 3 × 1.5 mm$^2$ | 13350196 | Fixed installation |
| SBB6 | 4 × 6 mm$^2$ + 3 × 1.5 mm$^2$ | 13350234 | Cable carrier installation |
| SBB10 | 4 × 10 mm$^2$ + 3 × 1.5 mm$^2$ | 13350218 | Fixed installation |
| SBB10 | 4 × 10 mm$^2$ + 3 × 1.5 mm$^2$ | 13350242 | Cable carrier installation |
| SBB16 | 4 × 16 mm$^2$ + 3 × 1.5 mm$^2$ | 13350226 | Fixed installation |
| SBB16 | 4 × 16 mm$^2$ + 3 × 1.5 mm$^2$ | 13350250 | Cable carrier installation |

## INFORMATION

As for the power cables for brakemotors with BP/BK brake, only two signal cables are required, the third signal core is cut off during cable assembly.

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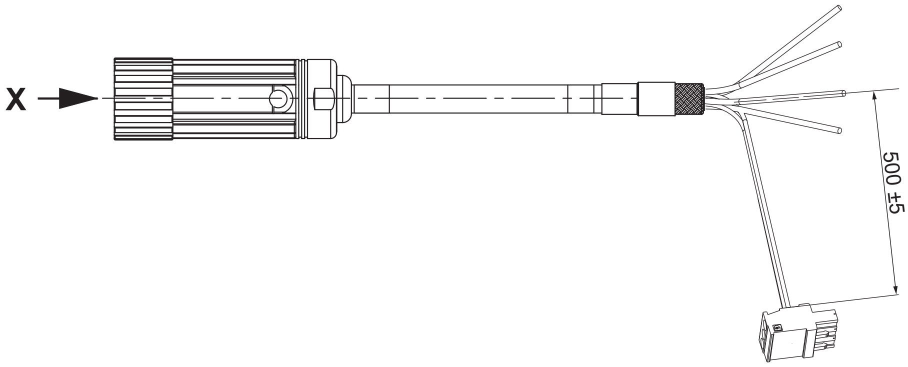
### 4.4.4 Brakemotor cables for BY brake with connector at motor side

**Illustration of CMP.. brakemotor cable**




14824163467

**Types of CMP.. brakemotor cables**

| Plug connector | Number of cores and cable cross section | Part number | Installation type |
|---|---|---|---|
| SB11 | 4 × 1.5 mm$^2$ + 3 × 1 mm$^2$ | 13354272 | Fixed installation |
| SB11 | 4 × 1.5 mm$^2$ + 3 × 1 mm$^2$ | 13354302 | Cable carrier installation |
| SB12 | 4 × 2.5 mm$^2$ + 3 × 1 mm$^2$ | 13354280 | Fixed installation |
| SB12 | 4 × 2.5 mm$^2$ + 3 × 1 mm$^2$ | 13354310 | Cable carrier installation |
| SB14 | 4 × 4 mm$^2$ + 3 × 1 mm$^2$ | 13354299 | Fixed installation |
| SB14 | 4 × 4 mm$^2$ + 3 × 1 mm$^2$ | 13354329 | Cable carrier installation |
| SBB6 | 4 × 6 mm$^2$ + 3 × 1.5 mm$^2$ | 13350129 | Fixed installation |
| SBB6 | 4 × 6 mm$^2$ + 3 × 1.5 mm$^2$ | 13350153 | Cable carrier installation |
| SBB10 | 4 × 10 mm$^2$ + 3 × 1.5 mm$^2$ | 13350137 | Fixed installation |
| SBB10 | 4 × 10 mm$^2$ + 3 × 1.5 mm$^2$ | 13350161 | Cable carrier installation |
| SBB16 | 4 × 16 mm$^2$ + 3 × 1.5 mm$^2$ | 13350145 | Fixed installation |
| SBB16 | 4 × 16 mm$^2$ + 3 × 1.5 mm$^2$ | 13350188 | Cable carrier installation |
| SBC16 | 4 × 16 mm$^2$ + 3 × 1.5 mm$^2$ | 18148514 | Fixed installation |
| SBC16 | 4 × 16 mm$^2$ + 3 × 1.5 mm$^2$ | 18148522 | Cable carrier installation |

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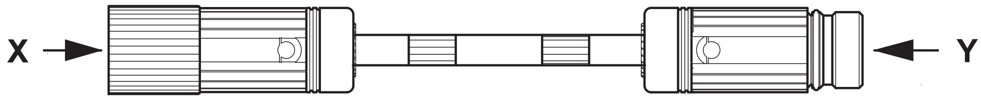
### 4.4.5 Extension cable for BP.., BK.., BY.. brakes

**Illustration of brakemotor extension cable**



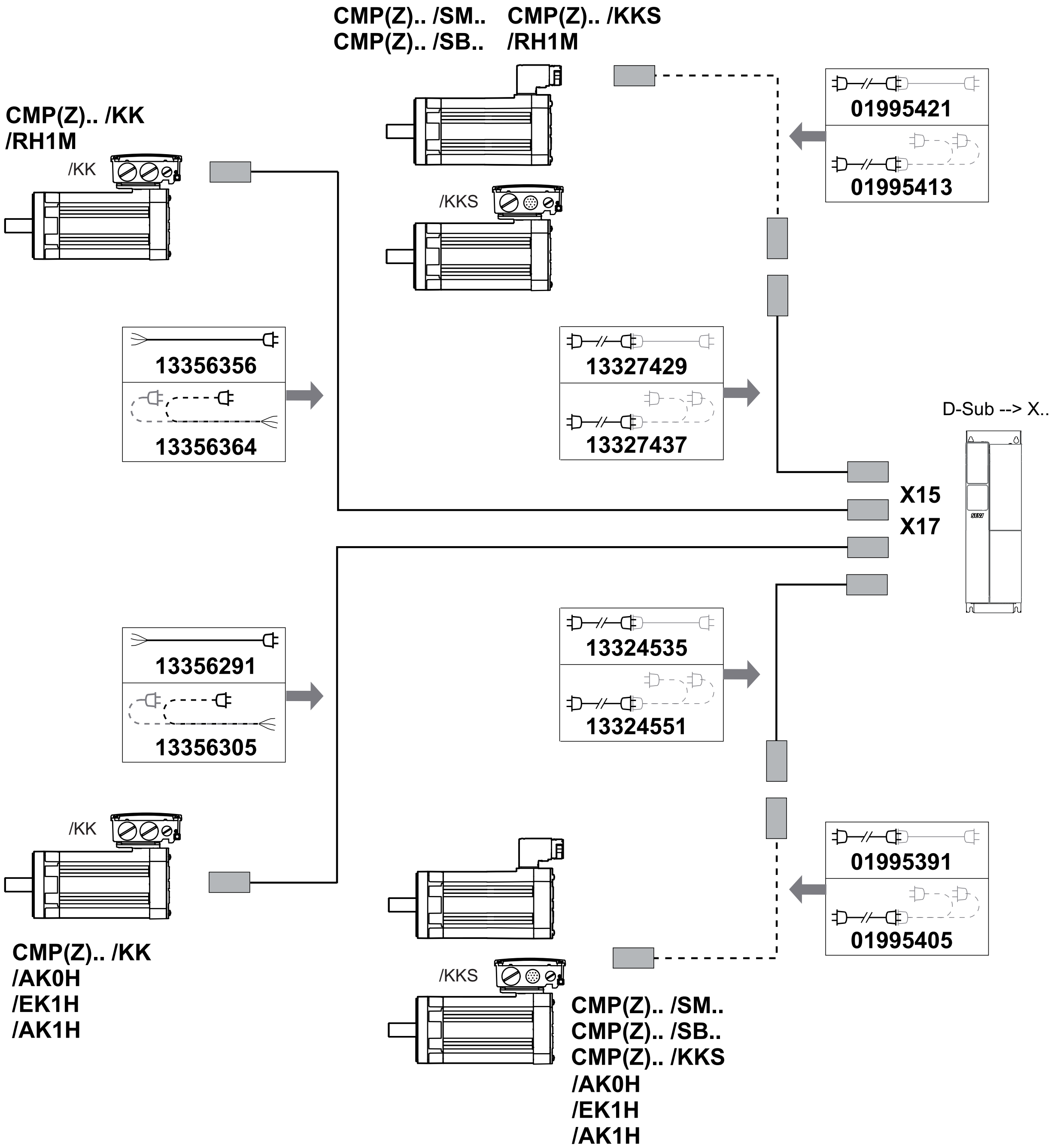
4818839179

**Types of CMP.. brakemotor extension cables**

| Plug connector | Number of cores and cable cross section | Part number | Installation type |
|---|---|---|---|
| SB11 | $4 \times 1.5\ mm^2 + 3 \times 1\ mm^2$ | 13354221 | Cable carrier installation |
| SB12 | $4 \times 2.5\ mm^2 + 3 \times 1\ mm^2$ | 13354248 | Cable carrier installation |
| SB14 | $4 \times 4\ mm^2 + 3 \times 1\ mm^2$ | 13354337 | Cable carrier installation |
| SBB6 | $4 \times 6\ mm^2 + 3 \times 1.5\ mm^2$ | 13350099 | Cable carrier installation |
| SBB10 | $4 \times 10\ mm^2 + 3 \times 1.5\ mm^2$ | 13350102 | Cable carrier installation |
| SBB16 | $4 \times 16\ mm^2 + 3 \times 1.5\ mm^2$ | 13350110 | Cable carrier installation |
| SBC16 | $4 \times 16\ mm^2 + 3 \times 1.5\ mm^2$ | 18156843 | Cable carrier installation |

## 4.5 Encoder cables for CMP.. motors

### 4.5.1 Overview

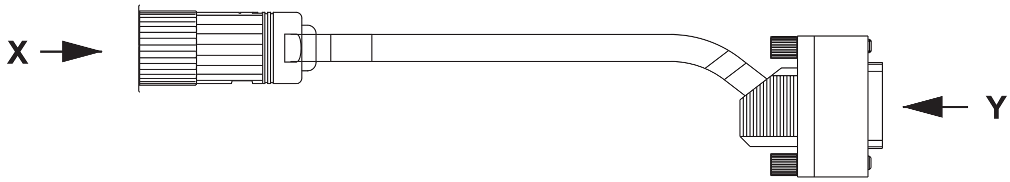



*18014413270582027*

| | | |
|---|---|---|
| D-sub → | X15 | Encoder connection basic device (resolvers can only be connected to X15) |
| | X17 | Encoder connection multi-encoder card |

### 4.5.2 Resolver

**Illustration of RH1M resolver cable**

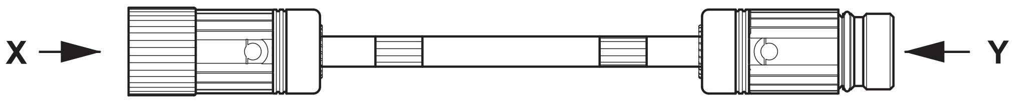



4819185931

**Types of RH1M resolver cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 $mm^2$ + 2 × 0.5 $mm^2$ | 13327429 | Fixed installation |
| 4 × 2 × 0.25 $mm^2$ + 2 × 0.5 $mm^2$ | 13327437 | Cable carrier installation |

**Illustration of RH1M extension cable**

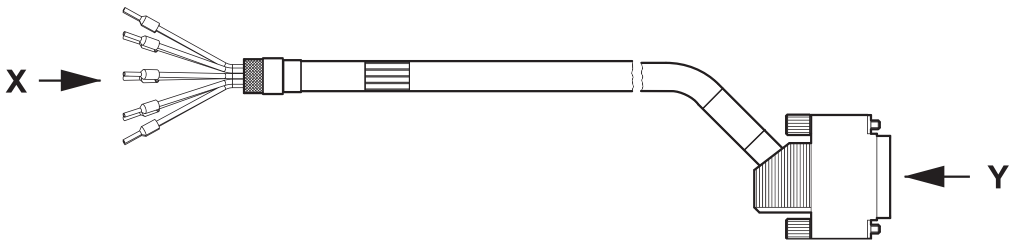



4819192715

**Types of RH1M extension cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 $mm^2$ + 2 × 0.5 $mm^2$ | 01995421 | Fixed installation |
| 4 × 2 × 0.25 $mm^2$ + 2 × 0.5 $mm^2$ | 01995413 | Cable carrier installation |

**Illustration of RH1M resolver cable for terminal box**



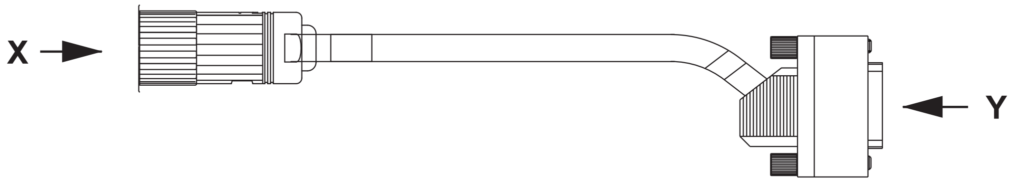

4838463371

**RH1M resolver cables for terminal box**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 5 × 2 × 0.25 $mm^2$ | 13356356 | Fixed installation |
| 5 × 2 × 0.25 $mm^2$ | 13356364 | Cable carrier installation |

### 4.5.3 HIPERFACE® encoders

**Illustration of HIPERFACE® encoder cable**

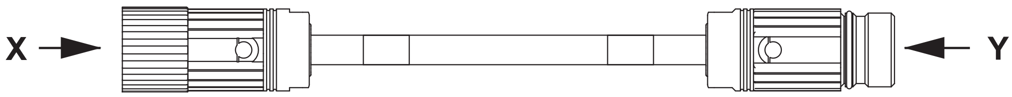



4819185931

**Types of HIPERFACE® encoder cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 13324535 | Fixed installation |
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 13324551 | Cable carrier installation |

**Illustration of HIPERFACE® encoder extension cable**

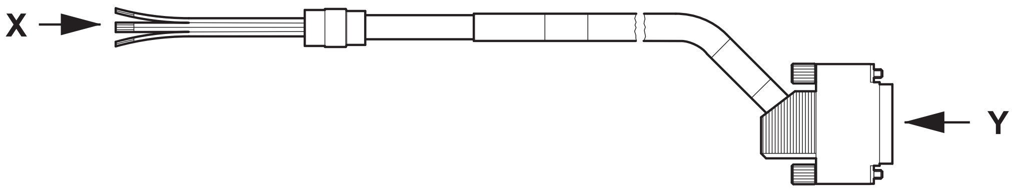



4819207051

**Types of HIPERFACE® encoder extension cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 01995391 | Fixed installation |
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 01995405 | Cable carrier installation |

**Illustration of HIPERFACE® encoder cable for terminal box**




4838486411

**Types of HIPERFACE® encoder cables for terminal box**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 6 × 2 × 0.25 mm² | 13356291 | Fixed installation |
| 6 × 2 × 0.25 mm² | 13356305 | Cable carrier installation |

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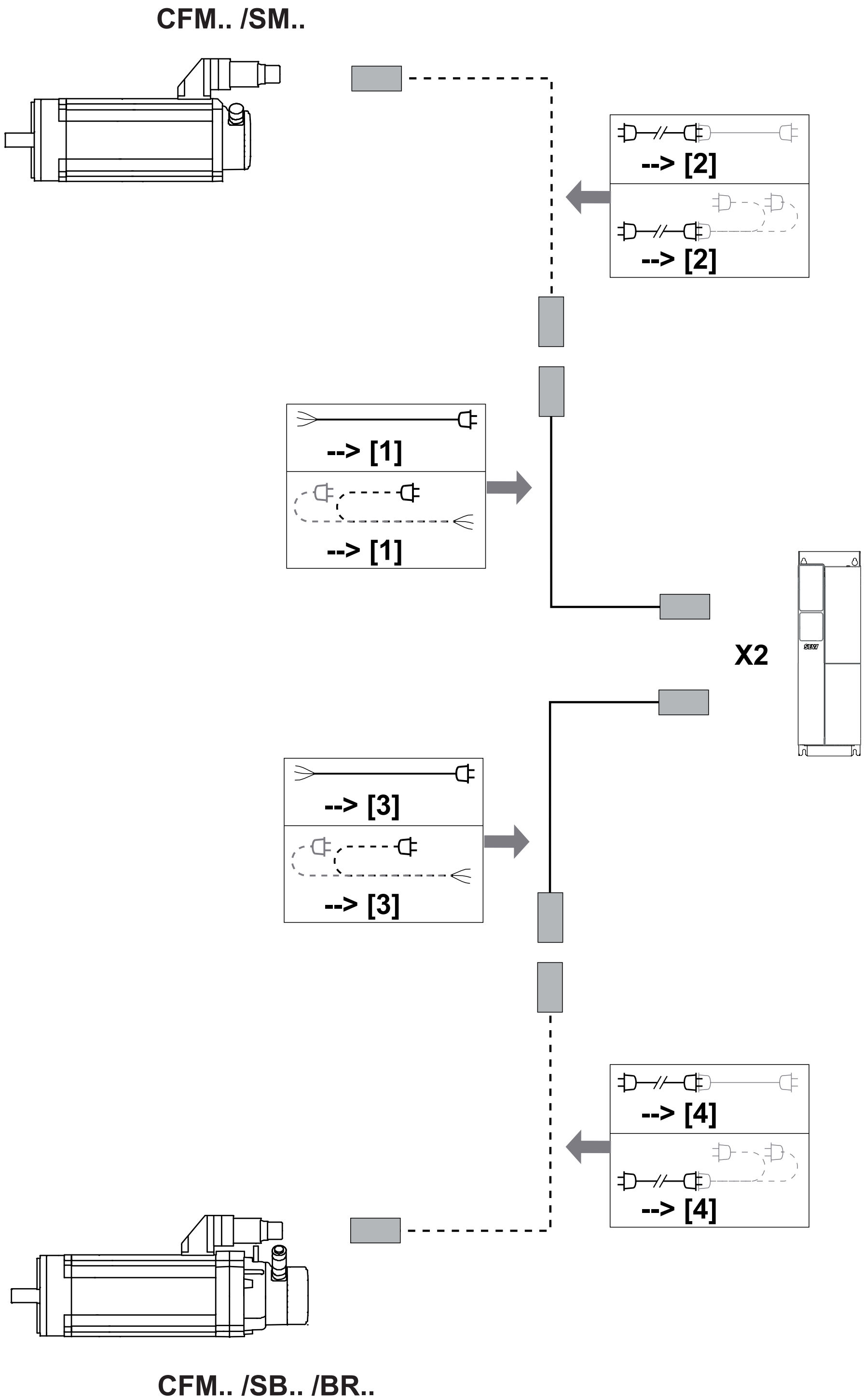
## 4.6 Power cables for CFM.. motors

### 4.6.1 Overview




*27021612574006283*

[1] Motor cables ../SM.. (→ 🗎 179)
[2] Motor extension cables ../SM.. (→ 🗎 180)
[3] Brakemotor cables ../SB.. /BR (→ 🗎 181)
[4] Brakemotor extension cables ../SB.. /BR (→ 🗎 182)

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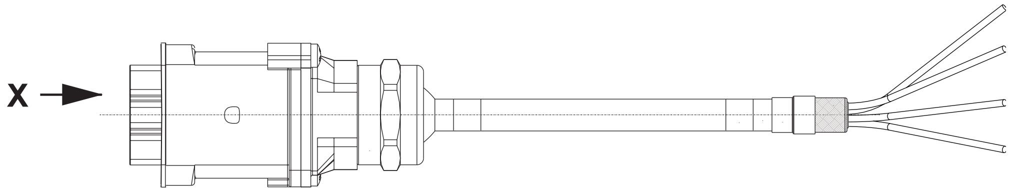
### 4.6.2 Motor cables

**Illustration of motor cable**




4836649099

**Types of motor cables**

The cables are equipped with a connector for motor connection and conductor end sleeves for inverter connection.

| Plug connector | Number of cores and cable cross section | Part number | Installation type |
|---|---|---|---|
| SM51/SM61 | 4 × 1.5 $mm^2$ | 01991795 | Fixed installation |
| SM51/SM61 | 4 × 1.5 $mm^2$ | 13331140 | Cable carrier installation |
| SM52/SM62 | 4 × 2.5 $mm^2$ | 01991817 | Fixed installation |
| SM52/SM62 | 4 × 2.5 $mm^2$ | 13331159 | Cable carrier installation |
| SM54/SM64 | 4 × 4 $mm^2$ | 01991833 | Fixed installation |
| SM54/SM64 | 4 × 4 $mm^2$ | 01991841 | Cable carrier installation |
| SM56/SM66 | 4 × 6 $mm^2$ | 0199185X | Fixed installation |
| SM56/SM66 | 4 × 6 $mm^2$ | 01991868 | Cable carrier installation |
| SM59/SM69 | 4 × 10 $mm^2$ | 01991876 | Fixed installation |
| SM59/SM69 | 4 × 10 $mm^2$ | 01991884 | Cable carrier installation |

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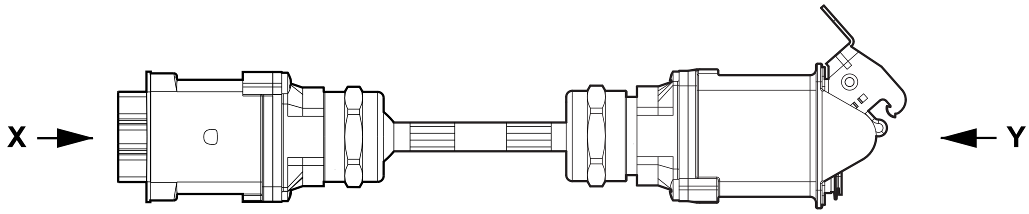
### 4.6.3 Motor extension cables

#### Illustration of motor extension cable



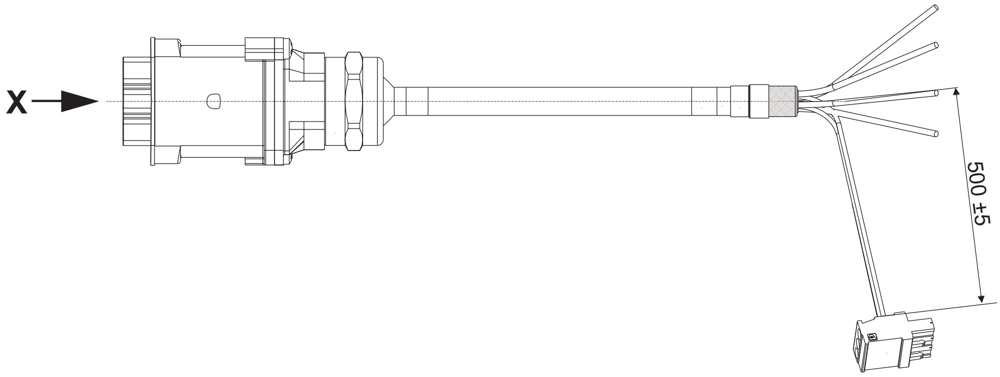

#### Types of motor extension cables

The cables are equipped with a connector and adapter for extending the CFM.. motor cable.

| Plug connector | Number of cores and cable cross section | Part number | Installation type |
|---|---|---|---|
| SM51/SM61 | 4 × 1.5 mm² | 01995499 | Fixed installation |
| SM51/SM61 | 4 × 1.5 mm² | 13331183 | Cable carrier installation |
| SM52/SM62 | 4 × 2.5 mm² | 01995510 | Fixed installation |
| SM52/SM62 | 4 × 2.5 mm² | 13331191 | Cable carrier installation |
| SM54/SM64 | 4 × 4 mm² | 01995537 | Fixed installation |
| SM54/SM64 | 4 × 4 mm² | 01995545 | Cable carrier installation |
| SM56/SM66 | 4 × 6 mm² | 01995553 | Fixed installation |
| SM56/SM66 | 4 × 6 mm² | 01995561 | Cable carrier installation |
| SM59/SM69 | 4 × 10 mm² | 0199557X | Fixed installation |
| SM59/SM69 | 4 × 10 mm² | 01995588 | Cable carrier installation |

### 4.6.4 Brakemotor cables

**Illustration of brakemotor cable**



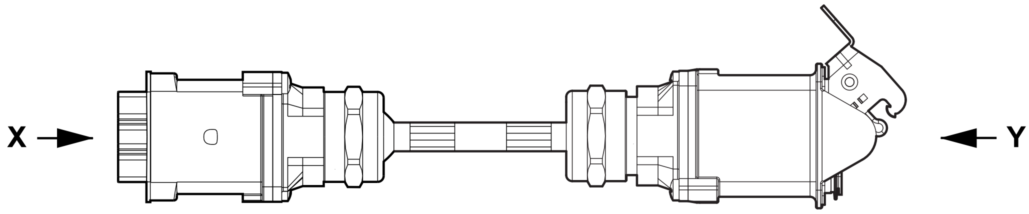

4838352907

**Types of brakemotor cables**

| Plug connector | Number of cores and cable cross section | Part number | Installation type |
|---|---|---|---|
| SB51/SB61 | $4 \times 1.5\ mm^2 + 3 \times 1.0\ mm^2$ | 01991892 | Fixed installation |
| SB51/SB61 | $4 \times 1.5\ mm^2 + 3 \times 1.0\ mm^2$ | 13331167 | Cable carrier installation |
| SB52/SB62 | $4 \times 2.5\ mm^2 + 3 \times 1.0\ mm^2$ | 01991914 | Fixed installation |
| SB52/SB62 | $4 \times 2.5\ mm^2 + 3 \times 1.0\ mm^2$ | 13331175 | Cable carrier installation |
| SB54/SB64 | $4 \times 4\ mm^2 + 3 \times 1.0\ mm^2$ | 01991930 | Fixed installation |
| SB54/SB64 | $4 \times 4\ mm^2 + 3 \times 1.0\ mm^2$ | 01991949 | Cable carrier installation |
| SB56/SB66 | $4 \times 6\ mm^2 + 3 \times 1.5\ mm^2$ | 01991957 | Fixed installation |
| SB56/SB66 | $4 \times 6\ mm^2 + 3 \times 1.5\ mm^2$ | 01991965 | Cable carrier installation |
| SB59/SB69 | $4 \times 10\ mm^2 + 3 \times 1.5\ mm^2$ | 01991973 | Fixed installation |
| SB59/SB69 | $4 \times 10\ mm^2 + 3 \times 1.5\ mm^2$ | 01991981 | Cable carrier installation |

### 4.6.5 Brakemotor extension cables

**Illustration of brakemotor extension cable**




4838345099

**Types of brakemotor extension cables**

| Plug connector | Number of cores and cable cross section | Part number | Installation type |
|---|---|---|---|
| SK51/SK61 | 4 × 1.5 mm$^2$ + 3 × 1.0 mm$^2$ | 0199199X | Fixed installation |
| SK51/SK61 | 4 × 1.5 mm$^2$ + 3 × 1.0 mm$^2$ | 13331205 | Cable carrier installation |
| SK52/SK62 | 4 × 2.5 mm$^2$ + 3 × 1.0 mm$^2$ | 01992015 | Fixed installation |
| SK52/SK62 | 4 × 2.5 mm$^2$ + 3 × 1.0 mm$^2$ | 13331213 | Cable carrier installation |
| SK54/SK64 | 4 × 4 mm$^2$ + 3 × 1.0 mm$^2$ | 01992031 | Fixed installation |
| SK54/SK64 | 4 × 4 mm$^2$ + 3 × 1.0 mm$^2$ | 0199204X | Cable carrier installation |
| SK56/SK66 | 4 × 6 mm$^2$ + 3 × 1.5 mm$^2$ | 01992058 | Fixed installation |
| SK56/SK66 | 4 × 6 mm$^2$ + 3 × 1.5 mm$^2$ | 01992066 | Cable carrier installation |
| SK59/SK69 | 4 × 10 mm$^2$ + 3 × 1.5 mm$^2$ | 01992074 | Fixed installation |
| SK59/SK69 | 4 × 10 mm$^2$ + 3 × 1.5 mm$^2$ | 01992082 | Cable carrier installation |

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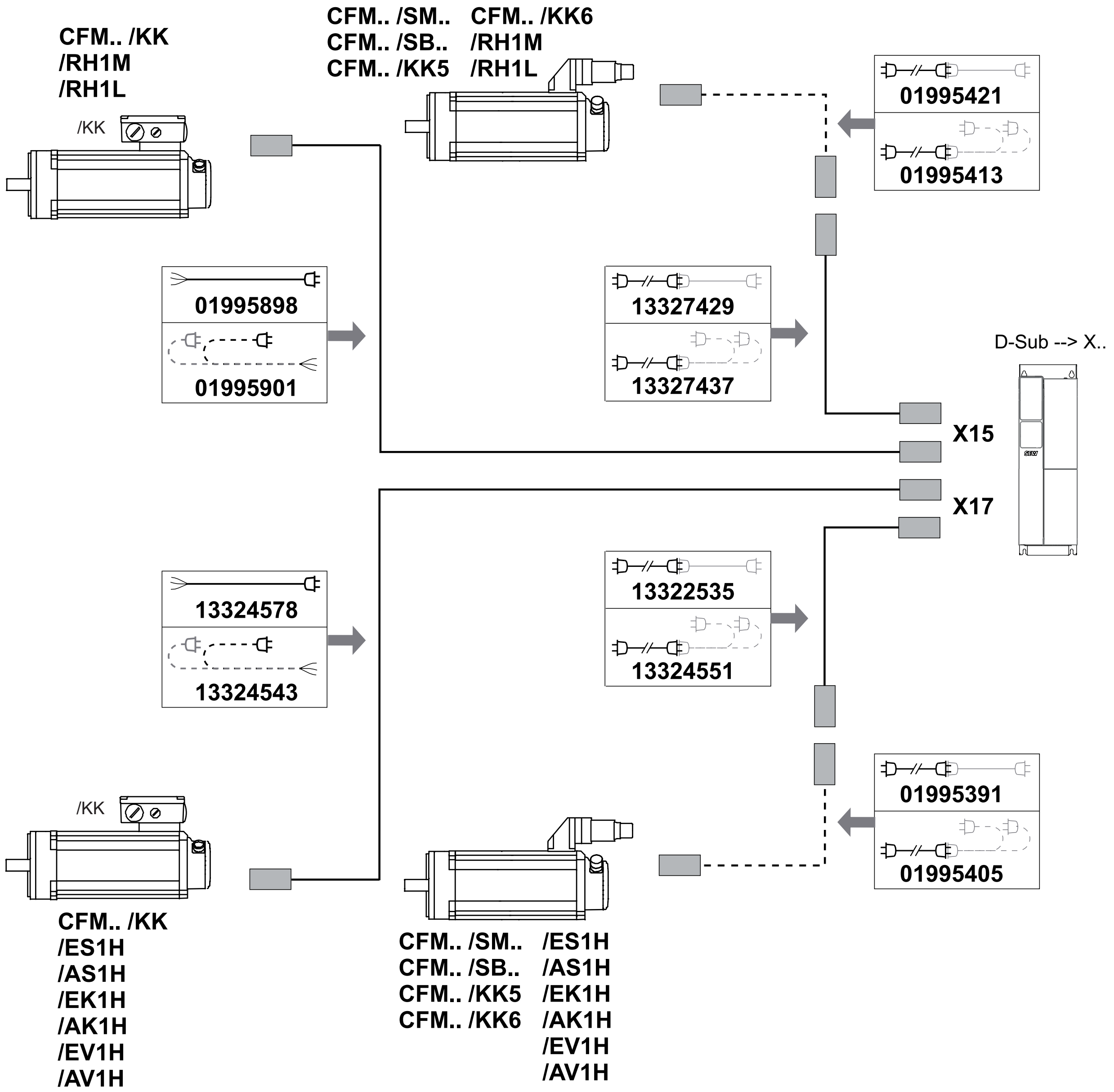
## 4.7 Encoder cables for CFM.. motors

### 4.7.1 Overview

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| | | |
|---|---|---|
| D-sub → | X15 | Encoder connection basic device (resolvers can only be connected to X15) |
| | X17 | Encoder connection multi-encoder card |

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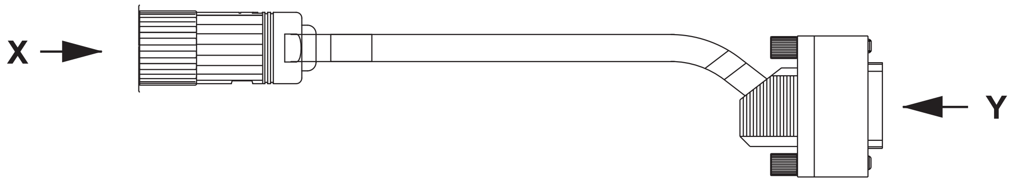
### 4.7.2 Resolver

**Illustration of RH1M/RH1L resolver cable**




4819185931

**Types of RH1M/RH1L resolver cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 mm$^2$ + 2 × 0.5 mm$^2$ | 13327429 | Fixed installation |
| 4 × 2 × 0.25 mm$^2$ + 2 × 0.5 mm$^2$ | 13327437 | Cable carrier installation |

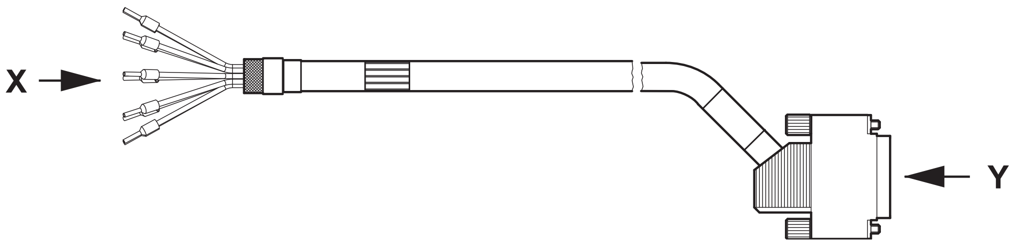
**Illustration of RH1M/RH1L extension cable**


4819192715

**Types of RH1M/RH1L extension cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 mm$^2$ + 2 × 0.5 mm$^2$ | 01995421 | Fixed installation |
| 4 × 2 × 0.25 mm$^2$ + 2 × 0.5 mm$^2$ | 01995413 | Cable carrier installation |

**Illustration of RH1M/RH1L resolver cable for terminal box**



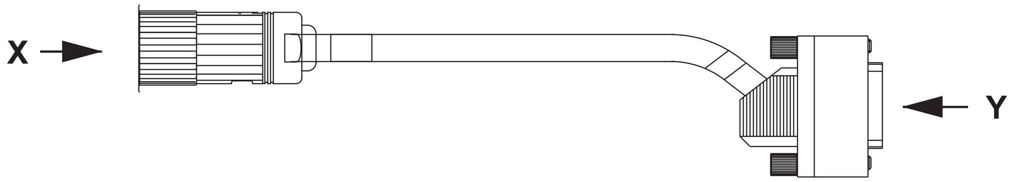

4838463371

**Types of RH1M/RH1L resolver cables for terminal box**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 5 × 2 × 0.25 mm$^2$ | 13327623 | Fixed installation |
| 5 × 2 × 0.25 mm$^2$ | 13327631 | Cable carrier installation |

### 4.7.3 HIPERFACE® encoders

**Illustration of HIPERFACE® encoder cable**

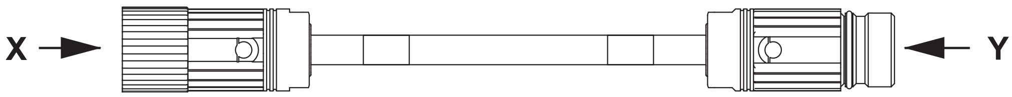



4819185931

**Types of HIPERFACE® encoder cables**

| Number of cores and cable cross section | Part number | Installation |
|---|---|---|
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 13324535 | Fixed installation |
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 13324551 | Cable carrier installation |

**Illustration of HIPERFACE® encoder extension cable**

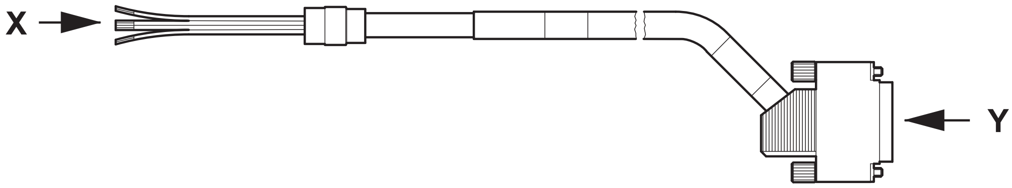



4819207051

**Types of HIPERFACE® encoder extension cables**

| Number of cores and cable cross section | Part number | Installation |
|---|---|---|
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 01995391 | Fixed installation |
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 01995405 | Cable carrier installation |

**Illustration of HIPERFACE® encoder cable for terminal box**




4838486411

**Types of HIPERFACE® encoder cables for terminal box**

| Number of cores and cable cross section | Part number | Installation |
|---|---|---|
| 6 × 2 × 0.25 mm² | 13356291 | Fixed installation |
| 6 × 2 × 0.25 mm² | 13356305 | Cable carrier installation |

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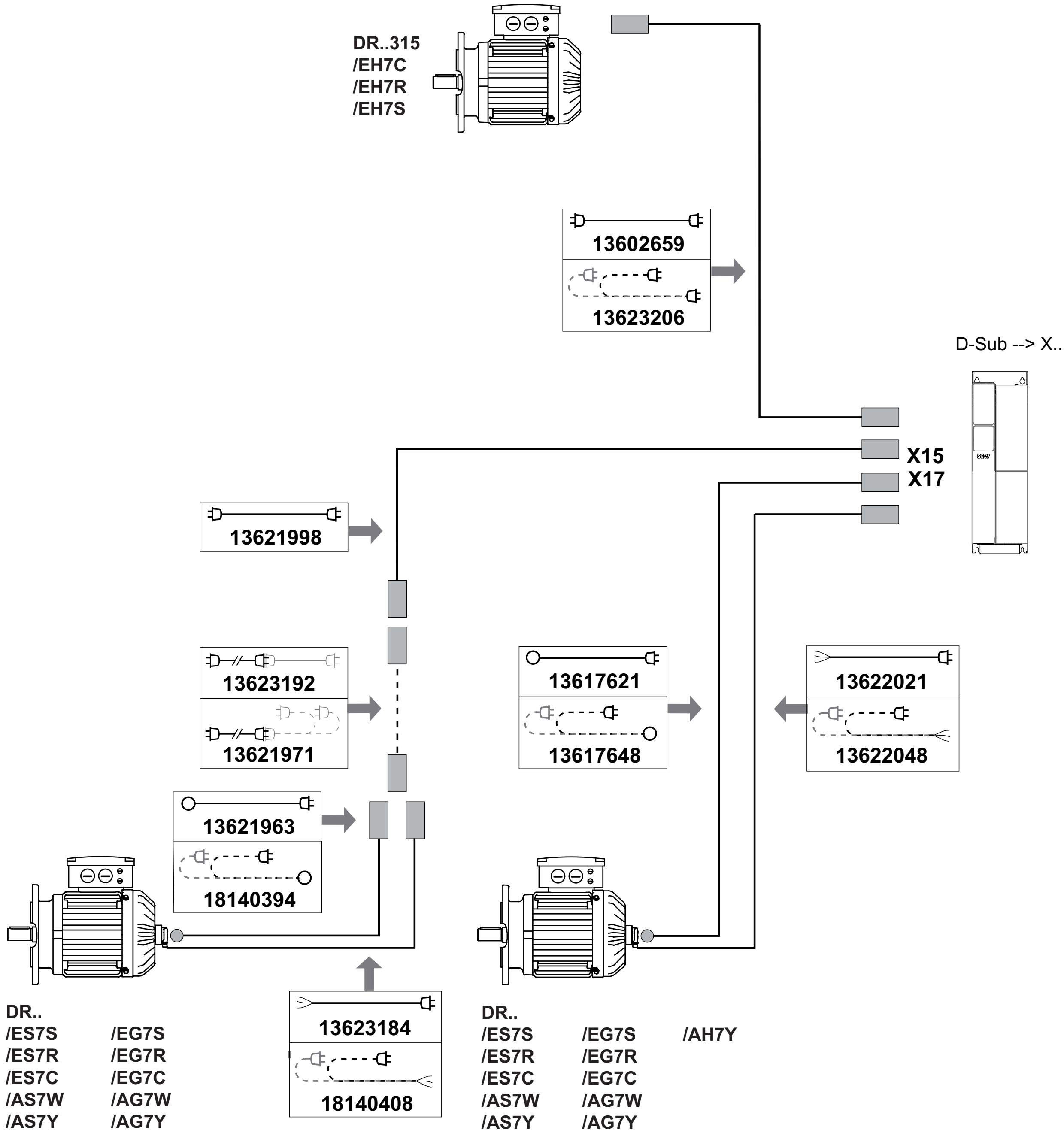
## 4.8 Encoder cables for DR.. motors

### 4.8.1 Overview

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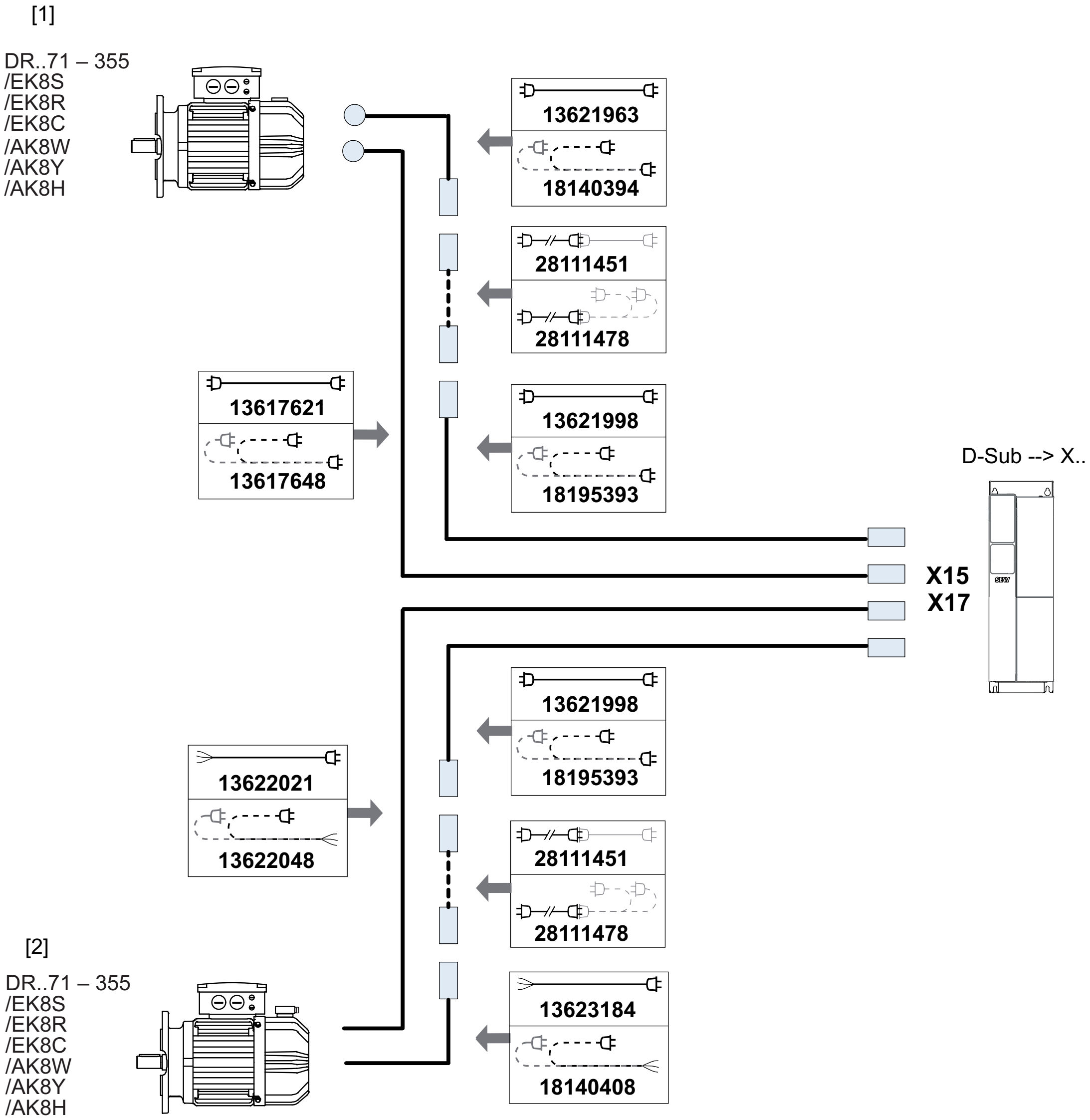
| | | |
|---|---|---|
| D-sub → | X15 | Encoder connection basic device (resolvers can only be connected to X15) |
| | X17 | Encoder connection multi-encoder card (A..Y encoders can only be connected to X17) |




*36028821502253707*

| | | |
|---|---|---|
| D-sub → | X15 | Encoder connection basic device (resolvers can only be connected to X15) |
| | X17 | Encoder connection multi-encoder card (A..Y encoders can only be connected to X17) |

[1] Motors with integrated plug connector for encoder signals **without** connection cover, connection type A2GA. The signals for thermal monitoring of the motor are not present in the encoder cable.

[2] Motors with integrated plug connector for encoder signals **with** connection cover, connection type A1GA. The signals for thermal monitoring of the motor are not present in the encoder cable.

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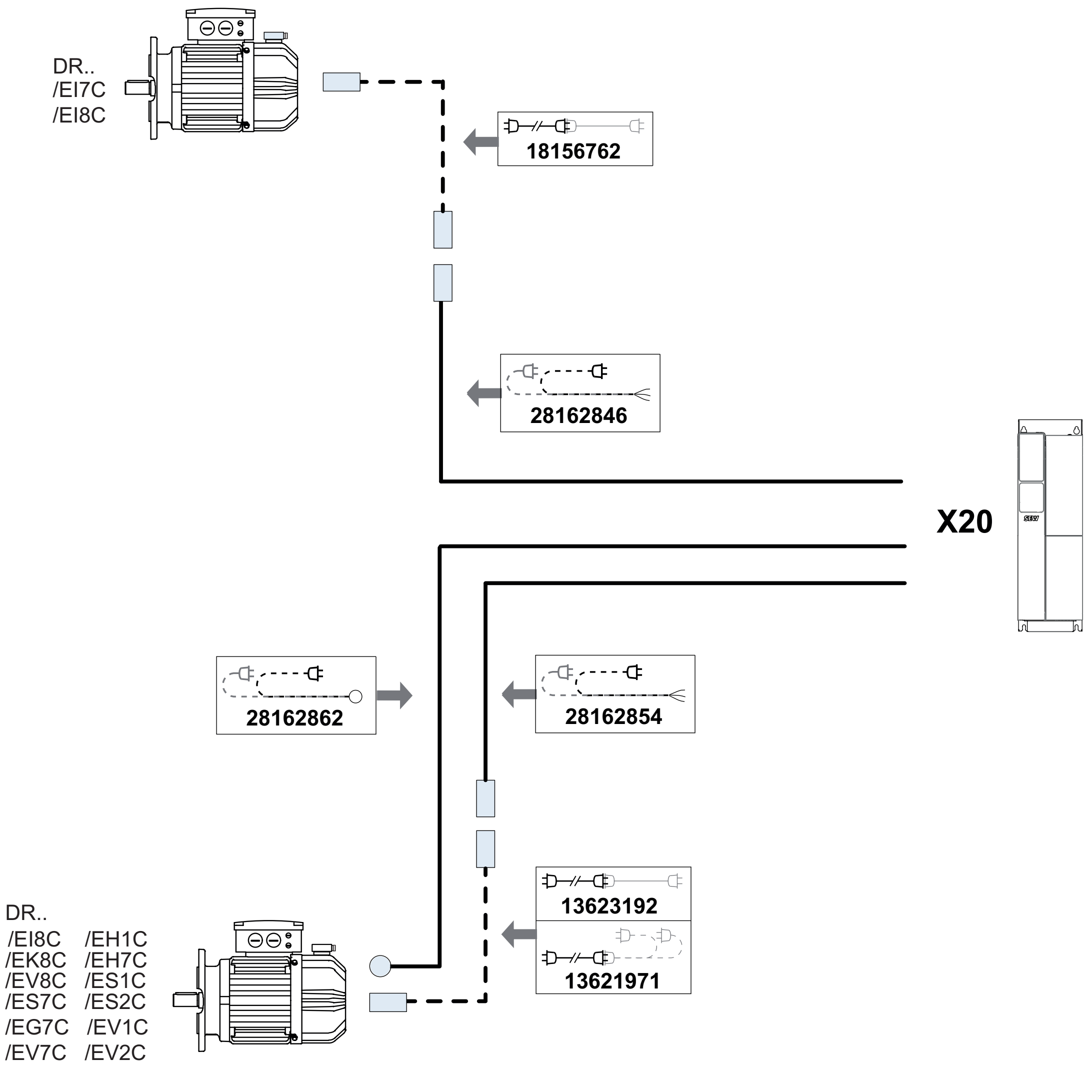


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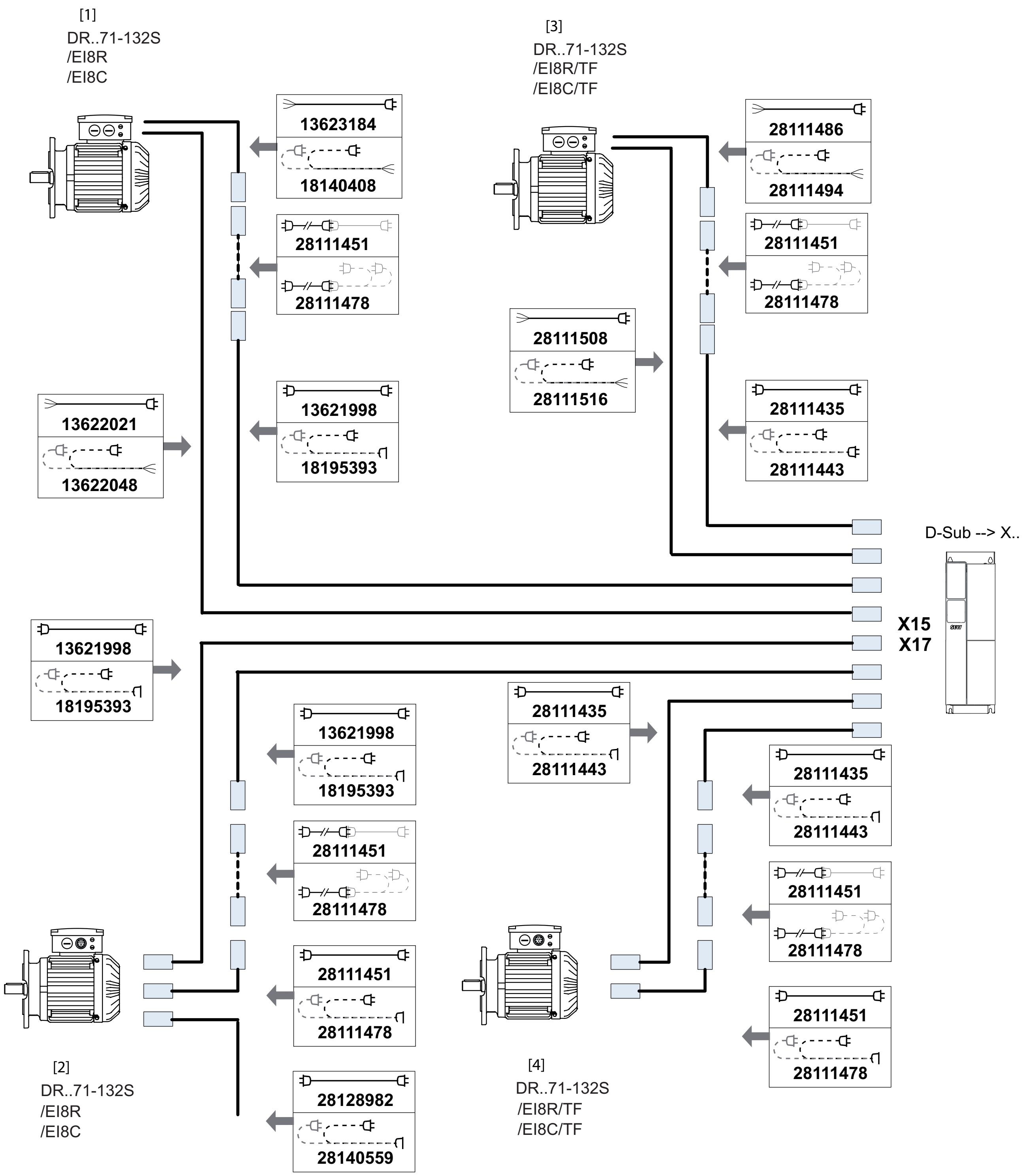
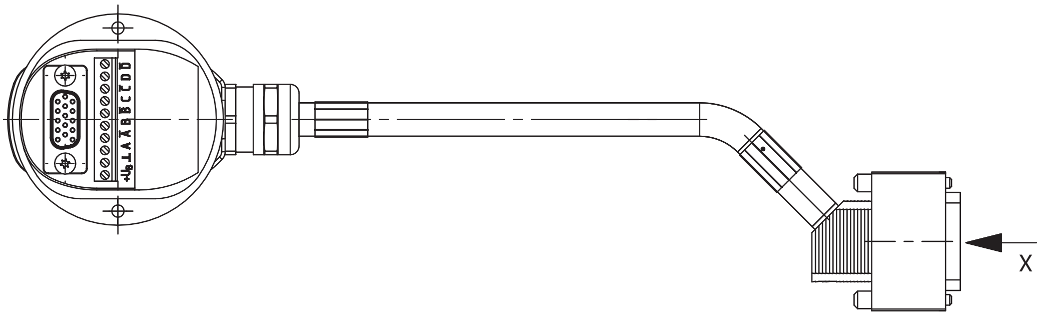



*36028821502256139*

| | | |
|---|---|---|
| D-sub → | X15 | Encoder connection basic device (resolvers can only be connected to X15) |
| | X17 | Encoder connection multi-encoder card (A..Y encoders can only be connected to X17) |
| [1] | | Motors with terminal strip in the terminal box for encoder signals and thermal monitoring. The signals for thermal monitoring of the motor are **not** present in the encoder cable. |
| [2] | | Motors with M23 plug connector at the terminal box for encoder signals, connection type AIGA. The signals for thermal monitoring of the motor are **not** present in the encoder cable. |
| [3] | | Motors with terminal strip in the terminal box for encoder signals and thermal monitoring. The signals for thermal monitoring of the motor are present in the encoder cable. |
| [4] | | Motors with M23 plug connector at the terminal box for encoder signals and thermal monitoring, connection type AIGB. The signals for thermal monitoring of the motor are present in the encoder cable. |

### 4.8.2 Encoder cables with connection cover and D-sub

**Illustration of encoder cable**



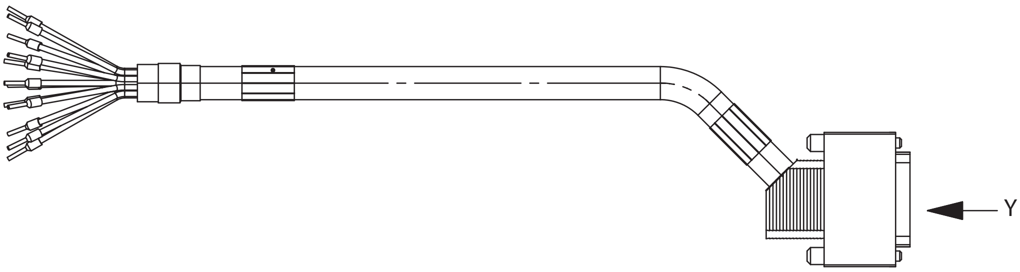

14818281099

**Types of encoder cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 mm$^2$ + 2 × 0.5 mm$^2$ | 13617621 | Fixed installation |
| 4 × 2 × 0.25 mm$^2$ + 2 × 0.5 mm$^2$ | 13617648 | Cable carrier installation |

### 4.8.3 Encoder cable with conductor end sleeves and D-sub

**Illustration of encoder cable**




14818291467

### Types of encoder cables

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| $4 \times 2 \times 0.25\ mm^2 + 2 \times 0.5\ mm^2$ | 13622021 | Fixed installation |
| $4 \times 2 \times 0.25\ mm^2 + 2 \times 0.5\ mm^2$ | 13622048 | Cable carrier installation |
| $5 \times 2 \times 0.25\ mm^2 + 2 \times 0.5\ mm^2$ | 28111508 | Fixed installation |
| $5 \times 2 \times 0.25\ mm^2 + 2 \times 0.5\ mm^2$ | 28111516 | Cable carrier installation |

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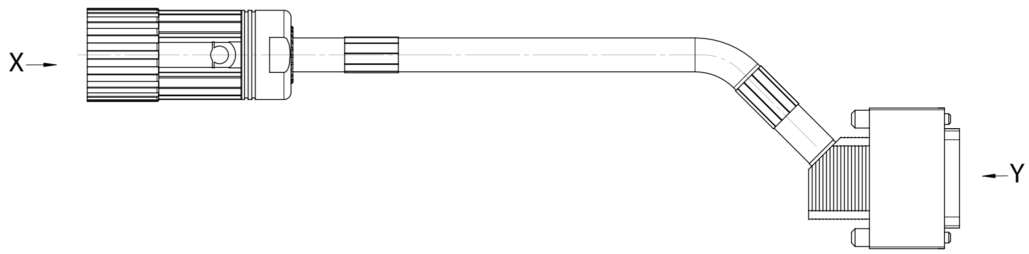
### 4.8.4 Encoder cable with M23 and D-sub

**Illustration of encoder cable**



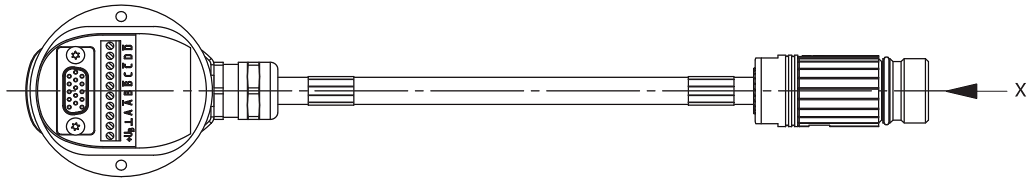

*14818370059*

**Types of encoder cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 5 × 2 × 0.25 $mm^2$ | 13602659 | Fixed installation |
| 5 × 2 × 0.25 $mm^2$ | 13623206 | Cable carrier installation |

### 4.8.5 Encoder extension cable with connection cover and M23

**Illustration of encoder extension cable**




*14818380043*

**Types of encoder extension cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 13621963 | Fixed installation |
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 18140394 | Cable carrier installation |

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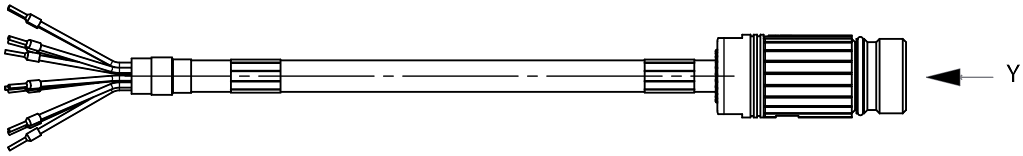
### 4.8.6 Encoder extension cable with conductor end sleeves and M23

**Illustration of encoder extension cable**



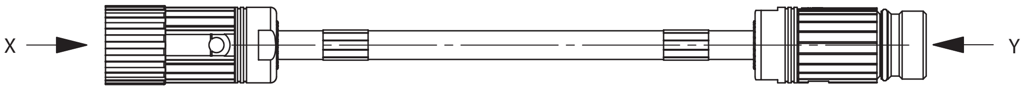

*14818388875*

**Types of encoder extension cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 13623184 | Fixed installation |
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 18140408 | Cable carrier installation |
| 5 × 2 × 0.25 mm² + 2 × 0.5 mm² | 28111486 | Fixed installation |
| 5 × 2 × 0.25 mm² + 2 × 0.5 mm² | 28111494 | Cable carrier installation |

### 4.8.7 Encoder extension cable with two M23

**Illustration of encoder extension cable**



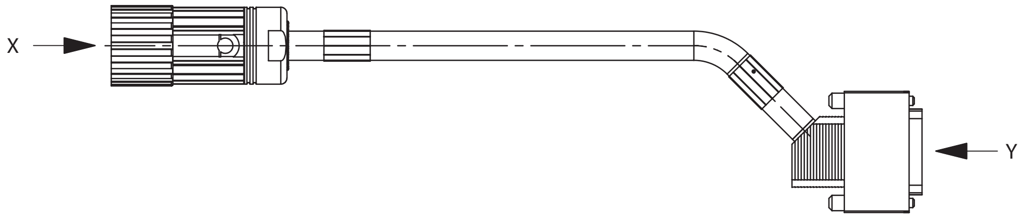

*14818397963*

**Types of encoder extension cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 mm$^2$ + 2 × 0.5 mm$^2$ | 13623192 | Fixed installation |
| 4 × 2 × 0.25 mm$^2$ + 2 × 0.5 mm$^2$ | 13621971 | Cable carrier installation |
| 5 × 2 × 0.25 mm$^2$ + 2 × 0.5 mm$^2$ | 28111451 | Fixed installation |
| 5 × 2 × 0.25 mm$^2$ + 2 × 0.5 mm$^2$ | 28111478 | Cable carrier installation |

### 4.8.8 Encoder extension cable with M23 and D-sub

**Illustration of encoder extension cable**




14818406795

**Types of encoder extension cables**

| Number of cores and cable cross section | Part number | Installation type |
|---|---|---|
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 13621998 | Fixed installation |
| 4 × 2 × 0.25 mm² + 2 × 0.5 mm² | 18195393 | Cable carrier installation |
| 5 × 2 × 0.25 mm² + 2 × 0.5 mm² | 28111435 | Fixed installation |
| 5 × 2 × 0.25 mm² + 2 × 0.5 mm² | 28111443 | Cable carrier installation |

## 4.9 Cables for MOVILINK® DDI

The MOVILINK® DDI interface requires a coaxial cable for data transmission between motor and inverter.

If the motor control requires a cross section of up to 10 mm², the coaxial cable is routed in a hybrid cable.

With cross sections larger than 10 mm², the motor and brake control and the coaxial cable are routed in separate cables.

SEW-EURODRIVE offers prefabricated cables with M23/M40 plug connectors. If the connection is made via a cable gland, a FAKRA connector is required on the coaxial cable.

If hybrid cables with open ends on both sides are used, the coaxial cable is connected to the motor and inverter with one FAKRA connector each.

SEW-EURODRIVE also offers hybrid cables that are already equipped with the FAKRA connector on both sides, or raw cables on a roll, for which the FAKRA connectors must be attached. The FAKRA connectors can be assembled using the "MOVILINK® DDI Tool Set 1".

**Single-cable technology up to 10 mm²**

Prefabricated hybrid cables for motors with MOVILINK® DDI interface are structured as follows:

- 1 conductor for PE
- 3 conductors for controlling the motor
- 4 conductors for control of the brake
- 1 coaxial cable for MOVILINK® DDI

With this universal hybrid cable, all variants of the brake can be controlled.

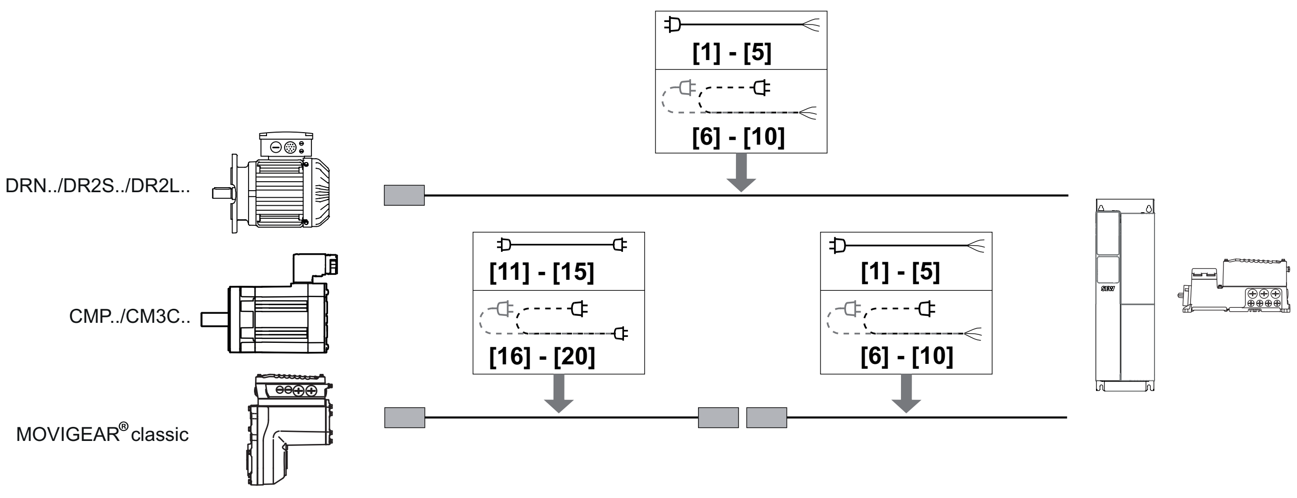
**Multi-cable technology larger than 10 mm²**

For cross sections larger than 10 mm², the coaxial cable is routed separately in a cable. Individual coaxial cables are available as prefabricated cables.

Six plugging positions are available.

An M23 plug connector is always used for the coaxial cable on the motor side.

### 4.9.1 Hybrid cables with connector on the motor side, open end on the inverter side

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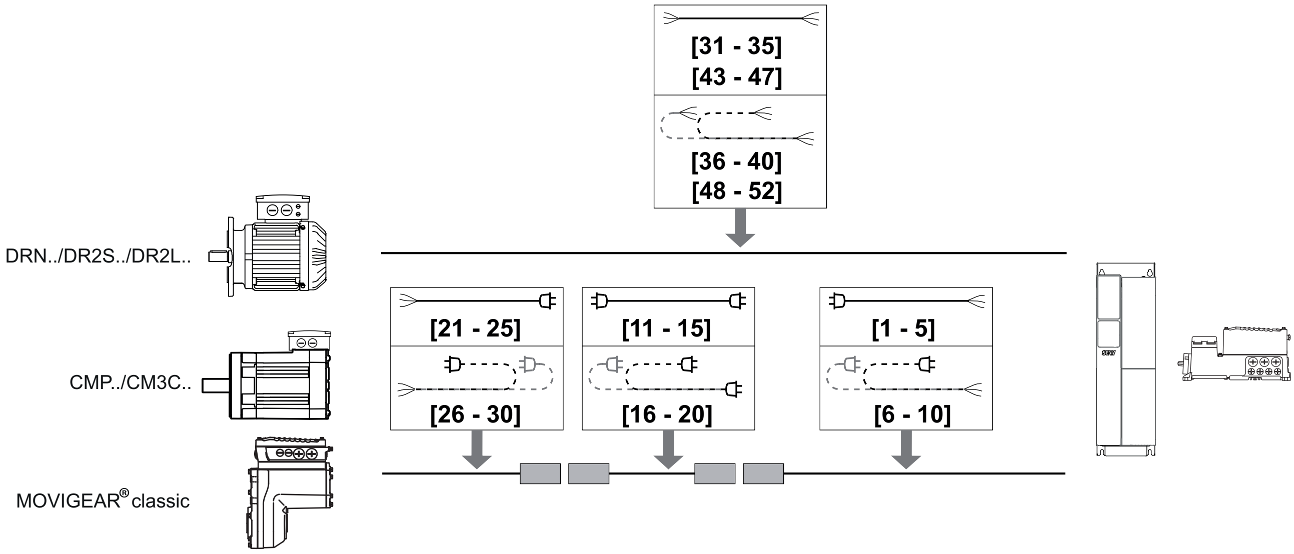
### 4.9.2 Hybrid cables with open end on the motor side, open end on the inverter side

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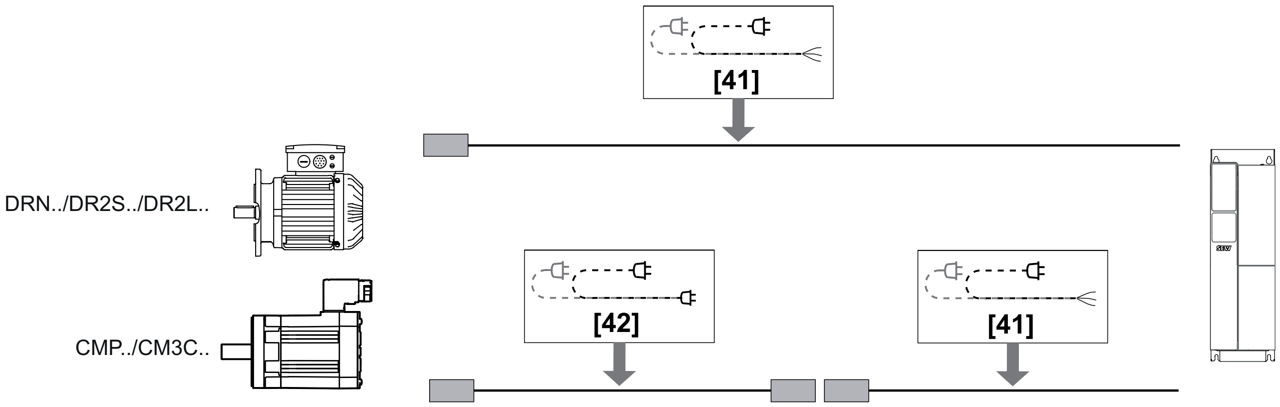
### 4.9.3 Coaxial cables with connector on the motor side, open end on the inverter side

The coaxial cable is needed with a cross-section of greater than 10 mm² for the conductors for controlling the motor, and contains the signal cable for the MOVILINK® DDI connection. The cable for controlling the motor and the brake must be routed separately.

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### 4.9.4 Cable tables

| Number | Part number | Cross section in mm² | Installation type | Motor connection | Motor side | Inverter side |
|---|---|---|---|---|---|---|
| [1] | 28123808 | 4 × 1.5 + 4 × 1 + coaxial cable | Fixed installation | SD1/KD1 | M23 | open |
| [2] | 28123816 | 4 × 2.5 + 4 × 1 + coaxial cable | Fixed installation | SD1/KD1 | M23 | open |
| [3] | 28123824 | 4 × 4 + 4 × 1 + coaxial cable | Fixed installation | SD1/KD1 | M23 | open |
| [4] | 28123832 | 4 × 6 + 4 × 1.5 + coaxial cable | Fixed installation | SDB/KDB | M40 | open |
| [5] | 28123840 | 4 × 10 + 4 × 1.5 + coaxial cable | Fixed installation | SDB/KDB | M40 | open |
| [6] | 28123743 | 4 × 1.5 + 4 × 1 + coaxial cable | Cable carrier installation | SD1/KD1 | M23 | open |
| [7] | 28123751 | 4 × 2.5 + 4 × 1 + coaxial cable | Cable carrier installation | SD1/KD1 | M23 | open |
| [8] | 28123778 | 4 × 4 + 4 × 1 + coaxial cable | Cable carrier installation | SD1/KD1 | M23 | open |
| [9] | 28123786 | 4 × 6 + 4 × 1.5 + coaxial cable | Cable carrier installation | SDB/KDB | M40 | open |
| [10] | 28123794 | 4 × 10 + 4 × 1.5 + coaxial cable | Cable carrier installation | SDB/KDB | M40 | open |
| | | | | | | |
| [11] | 28123905 | 4 × 1.5 + 4 × 1 + coaxial cable | Fixed installation | SD1/KD1 | M23 | M23 |
| [12] | 28123913 | 4 × 2.5 + 4 × 1 + coaxial cable | Fixed installation | SD1/KD1 | M23 | M23 |

| Number | Part number | Cross section in mm² | Installation type | Motor connection | Motor side | Inverter side |
|---|---|---|---|---|---|---|
| [13] | 28123921 | 4 × 4 + 4 × 1 + coaxial cable | Fixed installation | SD1/KD1 | M23 | M23 |
| [14] | 28123948 | 4 × 6 + 4 × 1.5 + coaxial cable | Fixed installation | SDB/KDB | M40 | M40 |
| [15] | 28123956 | 4 × 10 + 4 × 1.5 + coaxial cable | Fixed installation | SDB/KDB | M40 | M40 |
| [16] | 28123859 | 4 × 1.5 + 4 × 1 + coaxial cable | Cable carrier installation | SD1/KD1 | M23 | M23 |
| [17] | 28123867 | 4 × 2.5 + 4 × 1 + coaxial cable | Cable carrier installation | SD1/KD1 | M23 | M23 |
| [18] | 28123875 | 4 × 4 + 4 × 1 + coaxial cable | Cable carrier installation | SD1/KD1 | M23 | M23 |
| [19] | 28123883 | 4 × 6 + 4 × 1.5 + coaxial cable | Cable carrier installation | SDB/KDB | M40 | M40 |
| [20] | 28123891 | 4 × 10 + 4 × 1.5 + coaxial cable | Cable carrier installation | SDB/KDB | M40 | M40 |
| | | | | | | |
| [21] | 28124367 | 4 × 1.5 + 4 × 1 + coaxial cable | Fixed installation | KD | open | M23 |
| [22] | 28124375 | 4 × 2.5 + 4 × 1 + coaxial cable | Fixed installation | KD | open | M23 |
| [23] | 28124383 | 4 × 4 + 4 × 1 + coaxial cable | Fixed installation | KD | open | M23 |
| [24] | 28143884 | 4 × 6 + 4 × 1.5 + coaxial cable | Fixed installation | KD | open | M40 |
| [25] | 28143892 | 4 × 10 + 4 × 1.5 + coaxial cable | Fixed installation | KD | open | M40 |
| [26] | 28124332 | 4 × 1.5 + 4 × 1 + coaxial cable | Cable carrier installation | KD | open | M23 |
| [27] | 28124340 | 4 × 2.5 + 4 × 1 + coaxial cable | Cable carrier installation | KD | open | M23 |
| [28] | 28124359 | 4 × 4 + 4 × 1 + coaxial cable | Cable carrier installation | KD | open | M23 |
| [29] | 28143868 | 4 × 6 + 4 × 1.5 + coaxial cable | Cable carrier installation | KD | open | M40 |
| [30] | 28143876 | 4 × 10 + 4 × 1.5 + coaxial cable | Cable carrier installation | KD | open | M40 |
| | | | | | | |
| [31] | 28152395 | 4 × 1.5 + 4 × 1 + coaxial cable | Fixed installation | KD | open | open |
| [32] | 28152409 | 4 × 2.5 + 4 × 1 + coaxial cable | Fixed installation | KD | open | open |
| [33] | 28152417 | 4 × 4 + 4 × 1 + coaxial cable | Fixed installation | KD | open | open |

| Number | Part number | Cross section in mm² | Installation type | Motor connection | Motor side | Inverter side |
|---|---|---|---|---|---|---|
| [34] | 28152425 | 4 × 6 + 4 × 1.5 + coaxial cable | Fixed installation | KD | open | open |
| [35] | 28152433 | 4 × 10 + 4 × 1.5 + coaxial cable | Fixed installation | KD | open | open |
| [36] | 28152441 | 4 × 1.5 + 4 × 1 + coaxial cable | Cable carrier installation | KD | open | open |
| [37] | 28152468 | 4 × 2.5 + 4 × 1 + coaxial cable | Cable carrier installation | KD | open | open |
| [38] | 28152476 | 4 × 4 + 4 × 1 + coaxial cable | Cable carrier installation | KD | open | open |
| [39] | 28152484 | 4 × 6 + 4 × 1.5 + coaxial cable | Cable carrier installation | KD | open | open |
| [40] | 28152492 | 4 × 10 + 4 × 1.5 + coaxial cable | Cable carrier installation | KD | open | open |
| [41] | 28129431 | Coaxial cable | Cable carrier installation | SMCD/ SBCD/ KDD | M23 | open |
| [42] | 28138376 | Coaxial cable | Cable carrier installation | SMCD/ SBCD/ KDD | M23 | M23 |

The prefabricated cables "open on the motor side" and "open on the inverter side" (lines 31 – 40) can also be supplied as cable reels in lengths 30 m, 100 m, and 200 m (lines 43 – 52). These cables are not prefabricated.

For more information on assembly, refer to the addendum to the "MOVILINK® DDI Tool Set 1" operating instructions.

| Number | Part number | Cross section in mm² | Installation type | Motor connection | Motor side | Inverter side |
|---|---|---|---|---|---|---|
| [43] | 28123395 | 4 × 1.5 + 4 × 1 + coaxial cable | Fixed installation | KD | open | open |
| [44] | 28123409 | 4 × 2.5 + 4 × 1 + coaxial cable | Fixed installation | KD | open | open |
| [45] | 28123417 | 4 × 4 + 4 × 1 + coaxial cable | Fixed installation | KD | open | open |
| [46] | 28123425 | 4 × 6 + 4 × 1.5 + coaxial cable | Fixed installation | KD | open | open |
| [47] | 28123433 | 4 × 10 + 4 × 1.5 + coaxial cable | Fixed installation | KD | open | open |
| [48] | 28123336 | 4 × 1.5 + 4 × 1 + coaxial cable | Cable carrier installation | KD | open | open |
| [49] | 28123344 | 4 × 2.5 + 4 × 1 + coaxial cable | Cable carrier installation | KD | open | open |

| Number | Part number | Cross section in mm² | Installation type | Motor connection | Motor side | Inverter side |
|---|---|---|---|---|---|---|
| [50] | 28123352 | 4 × 4 + 4 × 1 + coaxial cable | Cable carrier installation | KD | open | open |
| [51] | 28123360 | 4 × 6 + 4 × 1.5 + coaxial cable | Cable carrier installation | KD | open | open |
| [52] | 28123379 | 4 × 10 + 4 × 1.5 + coaxial cable | Cable carrier installation | KD | open | open |

## 4.10 Motor cables for motors with MOVILINK® DDI interface

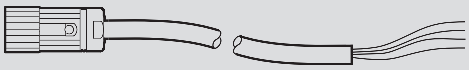
### 4.10.1 Connecting motor cables for motors without brake with MOVILINK® DDI interface

Connecting cables with connectors at the motor side for the following motors:

- DRN../DR2S../DR2L.. asynchronous motors
- CMP../CM3C.. synchronous motors
- MOVIGEAR® classic drive unit

The following table shows the conductor assignment of the cables:

**Motor side**



**Inverter side**

| Contact M23 | Contact M40 | Signal | Conductor color | Conductor color IEC 60757 | Identification | Assembly | Description |
|---|---|---|---|---|---|---|---|
| U | U | U | Black | BK | U/L1 | Not prefabricated | Motor connection phase U |
| V | V | V | Black | BK | V/L2 | Not prefabricated | Motor connection phase V |
| W | W | W | Black | BK | W/L3 | Not prefabricated | Motor connection phase W |
| A | 1 | Reserved | Yellow | YE | A | Not prefabricated | Do not connect |
| B | + | Reserved | Orange | OG | B | Not prefabricated | Do not connect |
| C | N | Reserved | Pink | PK | C | Not prefabricated | Do not connect |
| D | 2 | Reserved | Violet | VT | D | Not prefabricated | Do not connect |
| PE | PE | PE | Yellow/ green | YE/GN | | Not prefabricated | PE connection |
| DDI | DDI | DDI | Violet | VT | | Coaxial connector | MOVILINK® DDI |

Insulate each unconnected conductor end.

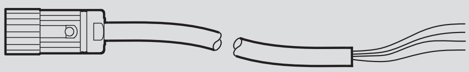
### 4.10.2 Connecting motor cables for motors with BE or BZ brake with MOVILINK® DDI interface

Connecting cables with connectors on the motor side for the following motors:

- DRN../DR2S../DR2L.. asynchronous motors
- CM3C.. synchronous motors

The following table shows the conductor assignment of the cables:

**Motor side**



**Inverter side**

| Contact | | Signal | Con-ductor color | Conductor color IEC 60757 | Identi-fication | Assembly | Description |
|---|---|---|---|---|---|---|---|
| M23 | M40 | | | | | | |
| U | U | U | Black | BK | U/L1 | Not prefabricated | Motor connection phase U |
| V | V | V | Black | BK | V/L2 | Not prefabricated | Motor connection phase V |
| W | W | W | Black | BK | W/L3 | Not prefabricated | Motor connection phase W |
| A | 1 | Reserved | Yellow | YE | A | Not prefabricated | Do not connect |
| B | + | 15 | Orange | OG | B | Not prefabricated | Brake connection 15 |
| C | N | 13 | Pink | PK | C | Not prefabricated | Brake connection 13 |
| D | 2 | 14 | Violet | VT | D | Not prefabricated | Brake connection 14 |
| PE | PE | PE | Yellow/ green | YE/GN | | Not prefabricated | PE connection |
| DDI | DDI | DDI | Violet | VT | | Coaxial connector | MOVILINK® DDI |

Insulate each unconnected conductor end.

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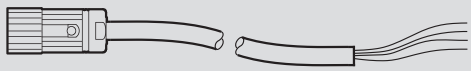
### 4.10.3 Connecting motor cables for motors with BK or BP brake with MOVILINK® DDI interface

Connecting cables with connectors on the motor side for the following motors:

- CMP../CM3C.. synchronous motors

The following table shows the conductor assignment of the cables:

**Motor side**



**Inverter side**

| Contact M23 | Contact M40 | Signal | Conductor color | Conductor color IEC 60757 | Identification | Assembly | Description |
|---|---|---|---|---|---|---|---|
| U | U | U | Black | BK | U/L1 | Not prefabricated | Motor connection phase U |
| V | V | V | Black | BK | V/L2 | Not prefabricated | Motor connection phase V |
| W | W | W | Black | BK | W/L3 | Not prefabricated | Motor connection phase W |
| A | 1 | Brake - | Yellow | YE | A | Not prefabricated | Brake connection - |
| B | + | Reserved | Orange | OG | B | Not prefabricated | Do not connect |
| C | N | Reserved | Pink | PK | C | Not prefabricated | Do not connect |
| D | 2 | Brake + | Violet | VT | D | Not prefabricated | Brake connection + |
| PE | PE | PE | Yellow/ green | YE/GN | | Not prefabricated | PE connection |
| DDI | DDI | DDI | Violet | VT | | Coaxial connector | MOVILINK® DDI |

Insulate each unconnected conductor end.

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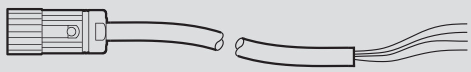
### 4.10.4 Connecting motor cables for motors with integrated BGZ brake control

Connecting cables with connectors on the motor side for the following motors:

- DRN../DR2S../DR2L.. asynchronous motors
- CMP../CM3C.. synchronous motors

The following table shows the conductor assignment of the cables:

**Motor side**  **Inverter side**

| Contact M23 | Contact M40 | Signal | Conductor color | Conductor color IEC 60757 | Identification | Assembly | Description |
|---|---|---|---|---|---|---|---|
| U | U | U | Black | BK | U/L1 | Not prefabricated | Motor connection phase U |
| V | V | V | Black | BK | V/L2 | Not prefabricated | Motor connection phase V |
| W | W | W | Black | BK | W/L3 | Not prefabricated | Motor connection phase W |
| A | 1 | Reserved | Yellow | YE | A | Not prefabricated | Do not connect |
| B | + | L2 | Orange | OG | B | Not prefabricated | L2 (N) connection |
| C | N | Reserved | Pink | PK | C | Not prefabricated | Do not connect |
| D | 2 | L1 | Violet | VT | D | Not prefabricated | L1 connection |
| PE | PE | PE | Yellow/green | YE/GN | | Not prefabricated | PE connection |
| DDI | DDI | DDI | Violet | VT | | Coaxial connector | MOVILINK® DDI |

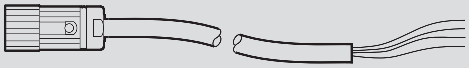
Insulate each unconnected conductor end.

### 4.10.5 Connecting motor cables for motors with integrated BS.Z brake control

Connecting cables with connectors on the motor side for the following motors:

- CMP../CM3C.. synchronous motors

The following table shows the conductor assignment of the cables:

**Motor side**  **Inverter side**

| Contact | | Signal | Con-ductor color | Conductor color IEC 60757 | Identi-fication | Assembly | Description |
|---|---|---|---|---|---|---|---|
| M23 | M40 | | | | | | |
| U | U | U | Black | BK | U/L1 | Not prefabricated | Motor connection phase U |
| V | V | V | Black | BK | V/L2 | Not prefabricated | Motor connection phase V |
| W | W | W | Black | BK | W/L3 | Not prefabricated | Motor connection phase W |
| A | 1 | GND | Yellow | YE | A | Not prefabricated | GND connection |
| B | + | DC 23 V | Orange | OG | B | Not prefabricated | DC 24 V connection |
| C | N | Reserved | Pink | PK | C | Not prefabricated | Do not connect |
| D | 2 | Reserved | Violet | VT | D | Not prefabricated | Do not connect |
| PE | PE | PE | Yellow/ green | YE/GN | | Not prefabricated | PE connection |
| DDI | DDI | DDI | Violet | VT | | Coaxial connector | MOVILINK® DDI |

Insulate each unconnected conductor end.

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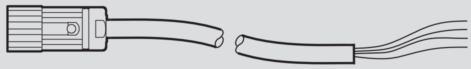
### 4.10.6 Connecting motor cables for motors with integrated braking resistor

Connecting cables with connectors on the motor side for the following motors:

- MOVIGEAR® classic drive unit

The following table shows the conductor assignment of the cables:

**Motor side**



**Inverter side**

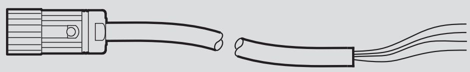
| Contact M23 | Contact M40 | Signal | Conductor color | Conductor color IEC 60757 | Identification | Assembly | Description |
|---|---|---|---|---|---|---|---|
| U | U | U | Black | BK | U/L1 | Not prefabricated | Motor connection phase U |
| V | V | V | Black | BK | V/L2 | Not prefabricated | Motor connection phase V |
| W | W | W | Black | BK | W/L3 | Not prefabricated | Motor connection phase W |
| A | 1 | Reserved | Yellow | YE | A | Not prefabricated | Do not connect |
| B | | Braking resistor | Orange | OG | B | Not prefabricated | Braking resistor connection |
| C | | Braking resistor | Pink | PK | C | Not prefabricated | Braking resistor connection |
| D | 2 | Reserved | Violet | VT | D | Not prefabricated | Do not connect |
| PE | PE | PE | Yellow/ green | YE/GN | | Not prefabricated | PE connection |
| DDI | DDI | DDI | Violet | VT | | Coaxial connector | MOVILINK® DDI |

Insulate each unconnected conductor end.

### 4.10.7 Connecting coaxial cables with separate routing of power and signal cable

The power and signal cables can only be routed together up to a cable cross section of 10 mm². With larger cable cross sections, the power cable is routed separately from the signal cable.

**Motor side**



**Inverter side**

| Contact M23 | Signal | Conductor color | Conductor color IEC 60757 | Identification | Assembly | Description |
|---|---|---|---|---|---|---|
| DDI | DDI | Violet | VT | | Coaxial connector | MOVILINK® DDI |

## 4.11 System bus and module bus cables

The RJ45 connectors of the system bus and module bus cables, the connectors that are preassembled in the field, and the sockets in the application inverters have been tested by SEW-EURODRIVE for mechanical stability and contact reliability. SEW-EURODRIVE recommends using the system bus and module bus cables listed below. If other cables and connectors are used, SEW-EURODRIVE makes no statement about the quality of the plug-in connection.

**NOTICE**

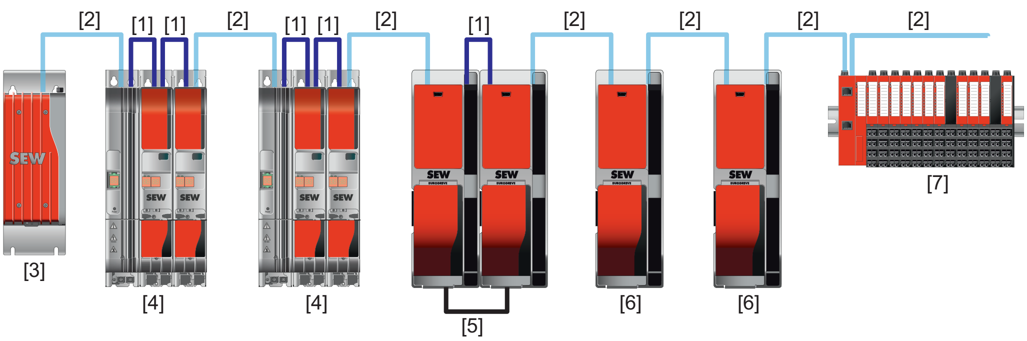
Use of the wrong cables.

Damage to the application inverter.

Only 4-pin cables are permitted for use as system bus cables. If an 8-pin cable is used, malfunctions or failures may occur at the connected devices.

### 4.11.1 System bus and module bus cabling

Example of system bus and module bus cabling




9007217271733643

[1] Module bus cable: EtherCAT®/SBus^PLUS and internal signals, 8-pin, color: Anthracite gray
[2] System bus cable: EtherCAT®/SBus^PLUS, 4-pin, color: Light gray
[3] MOVI-C® CONTROLLER power UHX85A
[4] MOVIDRIVE® modular
[5] MOVIDRIVE® system/technology with DC link connection
[6] MOVIDRIVE® system/technology
[7] Other EtherCAT® stations on the EtherCAT®/SBus^PLUS

### 4.11.2 System bus cables

**Figure**


*9007214291596811*

[1] Connector, red

[2] Connector, red

The 4-pin system bus cable [2] for EtherCAT® and SBus$^{PLUS}$ is used between the automation components as shown in the figure. Some of these components are listed here as examples:

- MOVI-C® CONTROLLER
- Application inverter
- PC with MOVISUITE® engineering software
- MOVI-PLC® I/O system
- Other EtherCAT® stations on the EtherCAT®/SBus$^{PLUS}$

**Cable assignment**

The cable is available in the following lengths for fixed installation:

| Cable length | Part number |
|---|---|
| 0.23 m | 18179932 |
| 0.26 m | 18179940 |
| 0.29 m | 18179959[1)] |
| 0.44 m | 18179967[2)] |
| 0.75 m | 18167039[3)] |
| 1.5 m | 18179975[3)] |
| 3 m | 18167047[3)] |
| 5 m | 18179983[3)] |
| 10 m | 18179991[3)] |

1) Sizes 1 – 3 with devices directly next to each other
2) Sizes 4 – 6 with devices directly next to each other
3) With devices not directly next to each other

If you use system bus cables from other manufacturers, it is necessary to comply with the relevant requirements of the "EtherCAT® Technology Group" (ETG). On this subject, note the "EtherCAT® Installation Guideline" from the ETG.

**Pin assignment**

The prefabricated system bus cables are assigned according to EIA/TIA-568A. Also use this assignment for prefabrication in the field.

| Contact | Conductor color | Function |
|---|---|---|
| 1 | White/green | RX+ |
| 2 | Green | RX- |
| 3 | White/orange | TX+ |
| 4 | Reserved | – |
| 5 | Reserved | – |
| 6 | Orange | TX- |
| 7 | Reserved | – |
| 8 | Reserved | – |

### 4.11.3 Module bus cable

**Figure**


18027071371

[1] Connector, black

[2] Connector, red

The module bus cable is used when two inverters are connected with one another in the DC link, see also the "DC link connection" manual.

**Cable assignment**

The cable is available in the following lengths for fixed installation:

| Cable length | Part number |
|---|---|
| 0.2 m | 18166970 |
| 0.23 m | 18166989 |
| 0.26 m | 18166997 |
| 0.29 m | 18167004[1)] |
| 0.35 m | 18167012 |
| 0.44 m | 18167020[2)] |
| 0.59 m | 28124251 |
| 0.75 m | 28118618 |
| 1.6 m | 18174205[3)] |
| 2.6 m | 28123549[3)] |

1) Sizes 1 – 3 with devices directly next to each other
2) Sizes 4 – 6 with devices directly next to each other
3) With devices not directly next to each other

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# 5 General information

## 5.1 About this documentation

**The documentation at hand is the original.**

This documentation is an integral part of the product. The documentation is intended for all employees who perform work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the systems and their operation as well as persons who work on the product independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or if you require further information, contact SEW-EURODRIVE.

## 5.2 Structure of the safety notes

### 5.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes:

| Signal word | Meaning | Consequences if disregarded |
|---|---|---|
| ⚠ DANGER | Imminent hazard | Severe or fatal injuries |
| ⚠ WARNING | Possible dangerous situation | Severe or fatal injuries |
| ⚠ CAUTION | Possible dangerous situation | Minor injuries |
| NOTICE | Possible damage to property | Damage to the product or its environment |
| INFORMATION | Useful information or tip: Simplifies handling of the product. | |

### 5.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

**SIGNAL WORD**

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

### Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

| Hazard symbol | Meaning |
|---|---|
|  | General hazard |
|  | Warning of dangerous electrical voltage |
|  | Warning of hot surfaces |
|  | Warning about suspended load |
|  | Warning of automatic restart |

### 5.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

**SIGNAL WORD!** Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

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## 5.3 Decimal separator in numerical values

In this document, a period is used to indicate the decimal separator.

Example: 30.5 kg

## 5.4 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the product.

## 5.5 Content of the documentation

This documentation contains additional safety-related information and conditions for operation in safety-related applications.

## 5.6 Other applicable documentation

Observe the corresponding documentation for all additional components.

### 5.6.1 Information on the EU Ecodesign Regulation

For information on the guideline, refer to the addendum to the "Information about the EU Ecodesign Regulation 2019/1781" operating instructions.

## 5.7 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

### 5.7.1 Trademark of Beckhoff Automation GmbH

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

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### 5.7.2 Trademark of Beckhoff Automation GmbH

Safety over EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

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### 5.7.3 Trademarks of ODVA, Inc.

EtherNet/IP™, CIP™, CIP Safety™, ODVA® and ODVA CONFORMANT® are registered trademarks of ODVA, Inc.

## 5.8 Copyright notice



## 5.9 Short designation

The following short designations are used in this document.

| Type designation | Short designation |
|---|---|
| MOVIDRIVE® technology application inverter | Inverter |

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# 6 Safety notes

## 6.1 Preliminary information

The following general safety notes serve the purpose of preventing injury to persons and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components, also observe the relevant warning and safety notes.

## 6.2 Duties of the user

As the user, you must ensure that the basic safety notes are observed and complied with. Make sure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it.

As the user, you must ensure that all of the work listed in the following is carried out only by qualified specialists:

- Setup and installation
- Installation and connection
- Startup
- Maintenance and repairs
- Shutdown
- Disassembly

Ensure that the persons who work on the product pay attention to the following regulations, conditions, documentation, and information:

- National and regional safety and accident prevention regulations
- Warning and safety signs on the product
- All other relevant project planning documents, installation and startup instructions, and wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and conditions

Ensure that systems in which the product is installed are equipped with additional monitoring and protection devices. Observe the applicable safety regulations and legislation governing technical work equipment and accident prevention regulations.

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## 6.3 Target group

**Specialist for mechanical work**

Any mechanical work may be performed only by adequately qualified specialists. Specialists in the context of this documentation are persons who are familiar with the design, mechanical installation, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualifications in the field of mechanics in accordance with the national regulations
- Familiarity with this documentation

**Specialist for electrotechnical work**

Any electrotechnical work may be performed only by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons who are familiar with electrical installation, startup, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualifications in the field of electrical engineering in accordance with the national regulations
- Familiarity with this documentation

**Additional qualifications**

In addition to that, these persons must be familiar with the valid safety regulations and laws, as well as with the requirements of the standards, directives, and laws specified in this documentation.

The persons must have the express authorization of the company to operate, program, parameterize, label, and ground devices, systems, and circuits in accordance with the standards of safety technology.

**Instructed persons**

All work in the areas of transport, storage, installation, operation and waste disposal may only be carried out by persons who are trained and instructed appropriately. These instructions must enable the persons to carry out the required activities and work steps safely and in accordance with regulations.

## 6.4 IT security of the environment

For drive and control components that are integrated in a network (e.g. fieldbus or Ethernet network), settings can even be made from more remote locations. There is a risk that a change of parameters that cannot be detected externally may result in unexpected, but not uncontrolled, system behavior and may have a negative impact on operational safety, system availability, or data security.

Ensure that unauthorized access is prevented, particularly with respect to Ethernet-based networked systems and engineering interfaces. Using IT-specific security standards, such as network segmentation, adds to the protection of access to the ports. For an overview of the ports and of the services provided by the communication interfaces, refer to chapter "Technical data" (→ 🗎 42). The IT security of the product is only guaranteed when used in an environment secured by defense-in-depth strategies.

Ensure that clear responsibility for security is ensured during operation. SEW-EURODRIVE recommends an IT security management system in accordance with ISO/IEC 27001 and ISO/IEC 62443-2-4.

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## 6.5 Designated use

The product is intended for control cabinet installation in electrical systems or machines.

In case of installation in electrical systems or machines, startup of the product is prohibited until it is determined that the machine meets the requirements stipulated in the local laws and directives. For Europe, Machinery Directive 2006/42/EC as well as the EMC Directive 2014/30/EU apply. Observe EN 60204-1 (Safety of machinery - electrical equipment of machines). The product meets the requirements stipulated in the Low Voltage Directive 2014/35/EU.

The standards given in the declaration of conformity apply to the product.

The systems can be mobile or stationary.

Do not connect any other loads to the product. Never connect capacitive loads to the product.

The product can be used to operate the following motors in industrial and commercial systems:

- AC asynchronous motors with squirrel-cage rotor
- Permanent-field AC synchronous motors

Technical data and information on the connection conditions are provided on the nameplate and in chapter "Technical data" in the documentation. Always comply with the data and conditions.

Unintended or improper use of the product may result in severe injury to persons and damage to property.

### 6.5.1 Restrictions under the European WEEE Directive 2012/19/EU

Options and accessories from SEW-EURODRIVE may only be used in combination with products from SEW-EURODRIVE.

### 6.5.2 Lifting applications

To avoid danger of fatal injury due to falling hoists, observe the following points when using the product in lifting applications:

- Use mechanical protection devices.
- Perform a hoist startup.

#### Application in ELSM® control mode

When the inverter is operated in ELSM® control mode, using it in lifting applications is not permitted. In this control mode only applications of horizontal materials handling are permitted.

## 6.6 Functional safety technology

The product must not perform any safety functions without a higher-level safety system unless explicitly allowed by the documentation.

## 6.7 Installation/assembly

Ensure that the product is installed and cooled in accordance with the regulations in the documentation.

Protect the product from excessive mechanical strain. The product and its mounted components must not protrude into the path of persons or vehicles. Ensure that no components are deformed or no insulation spaces are modified, particularly during transportation. Electrical components must not be mechanically damaged or destroyed.

Observe the notes in chapter "Mechanical installation" in the documentation.

### 6.7.1 Restrictions of use

The following applications are prohibited unless the device is explicitly designed for such use:

- Use in potentially explosive atmospheres
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation
- Operation in applications with impermissibly high mechanical vibration and shock loads in excess of the regulations stipulated in EN 61800-5-1
- Use at an elevation of more than 3800 m above sea level

The product can be used at altitudes above 1000 m above sea level up to 3800 m above sea level under the following conditions:

- The reduction of the nominal output current and/or the line voltage is considered according to the data in chapter "Technical data" (→ 🗎 42) in the documentation.
- Above 2000 m above sea level, the air and creepage distances are only sufficient for overvoltage class II according to EN 60664. At altitudes above 2000 m above sea level, limiting measures must therefore be taken that reduce the line side overvoltage from category III to category II for the entire system.
- If a protective electrical separation (in accordance with EN 61800-5-1 and EN 60204-1) is required, then implement this outside the product at altitudes of more than 2000 m above sea level.

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## 6.8 Electrical installation

Ensure that all of the required covers are correctly attached after the electrical installation.

Make sure that preventive measures and protection devices comply with the applicable regulations (e.g. EN 60204-1 or EN 61800-5-1).

### 6.8.1 Required preventive measure

Make sure that the product is correctly attached to the ground connection.

### 6.8.2 Stationary application

Necessary preventive measure for the product:

| Type of energy transfer | Preventive measure |
|---|---|
| Direct power supply | • Ground connection |

### 6.8.3 Regenerative operation

The drive is operated as a generator due to the kinetic energy of the system/machine. Before opening the connection box, secure the output shaft against rotation.

## 6.9 Protective separation

The product meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. The connected signal circuits must meet requirements according to SELV (**S**afety **E**xtra **L**ow **V**oltage) or PELV (**P**rotective **E**xtra **L**ow **V**oltage) to ensure protective separation. The installation must meet the requirements for protective separation.

In order to avoid exceeding the permitted contact voltages in SELV or PELV power circuits in the event of a fault, continuous equipotential bonding is required in the vicinity of these power circuits. If this is not possible, other preventive measures must be taken. These preventive measures are described in EN 61800-5-1.

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## 6.10 Startup/operation

Observe the safety notes in chapters "Startup" (→ 🗎 315) and "Operation" (→ 🗎 330) in this documentation.

Make sure the connection boxes are closed and screwed before connecting the supply voltage.

Depending on the degree of protection, products may have live, uninsulated, and sometimes moving or rotating parts as well as hot surfaces during operation.

When the device is switched on, dangerous voltages are present at all power connections as well as at any connected cables and terminals. This also applies even when the product is inhibited and the motor is at standstill.

Risk of burns due to arcing: Do not disconnect power connections during operation. Do not connect power connections during operation.

If you disconnect the product from the voltage supply, do not touch any live components or power connections because capacitors might still be charged. Observe the following minimum switch-off time:

10 minutes.

Observe the corresponding information signs on the product.

The fact that the operation LED and other display elements are no longer illuminated does not indicate that the product has been disconnected from the supply system and no longer carries any voltage.

Mechanical blocking or internal protective functions of the product can cause a motor standstill. Eliminating the cause of the problem or performing a reset may result in the drive restarting automatically. If, for safety reasons, this is not permitted for the drive-controlled machine, first disconnect the product from the supply system and then start troubleshooting.

Risk of burns: The surface temperature of the product can exceed 60 °C during operation. Do not touch the product during operation. Let the product cool down before touching it.

### 6.10.1 Energy storage unit

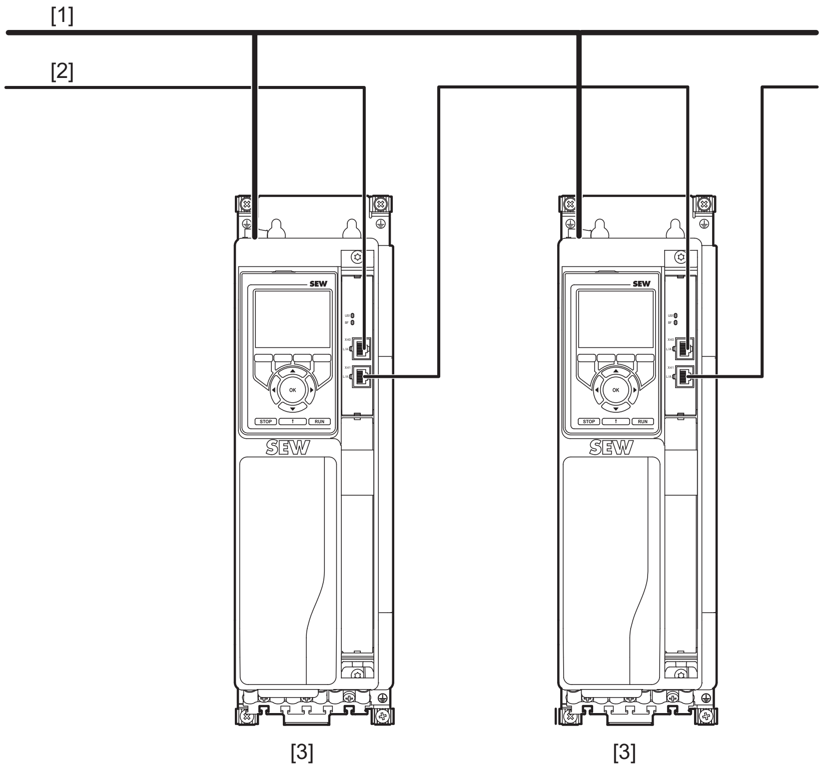
Products with a connected energy storage unit are not necessarily de-energized when they have been disconnected from the supply system. Usually, the energy storage unit stores sufficient energy to continue operation of the connected motors for a limited period of time. It is not sufficient to observe a minimum switch-off time.

Perform a shutdown as described in the documentation in the chapter "Service" > "Shutdown".

# 7 Device structure

## 7.1 Connection variants

The MOVIDRIVE® technology application inverter is used for direct control via fieldbus systems. The communication interfaces are inserted into the basic device using cards.




*25926993419*

[1] Line voltage

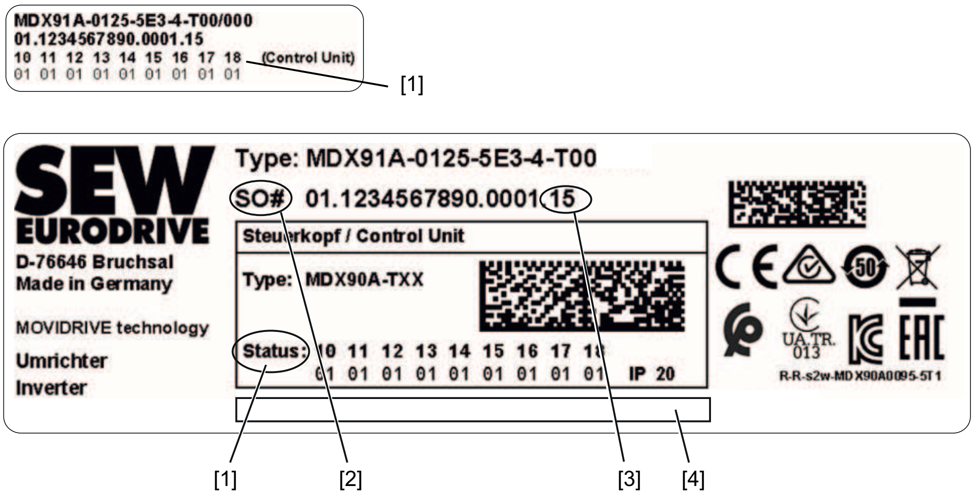
[2] Industrial communication

[3] MOVIDRIVE® technology

## 7.2 Nameplates

The nameplates are presented as an example.

### 7.2.1 System nameplate




*27021619314465675*

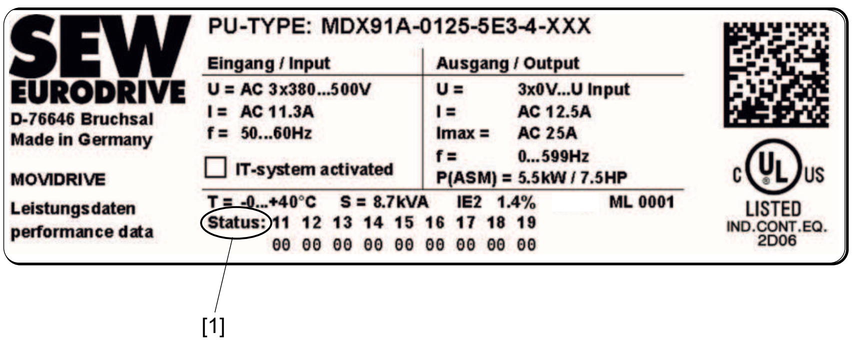
[1] Device status

[2] Serial number

[3] Year of manufacture as part of the serial number. Example: 15 → year of manufacture 2015

[4] Free text

### 7.2.2 Performance data nameplate




*9007223162722955*

[1] Device status

### 7.2.3 Product label

| | |
|---|---|
| | Product label with QR code. The QR code can be scanned. You will be redirected to the digital services of SEW-EURODRIVE. There, you have access to product-specific data, documents, and further services. |

## 7.3 MOVIDRIVE® technology type code

| Example: MDX90A-0125-5E3-X-T00 | | |
|---|---|---|
| Product family | MD | MOVIDRIVE® |
| Device type | X | • X = Single-axis inverter |
| Series | 90 | • 90 = Without DC 24 V switched-mode power supply<br>• 91 = With DC 24 V switched-mode power supply |
| Version | A | • A = Version status of the device series |
| Power class | 0.125 | • 0125 = Nominal output current – e.g. 0125 = 12.5 A |
| Connection voltage | 5 | • 2 = AC 200 – 240 V<br>• 5 = AC 380 – 500 V |
| Power section variant EMC | E | • 0 = Basic interference suppression integrated<br>• E = EMC filter limit value category C2 in accordance with EN 61800-3 |
| Connection type | 3 | • 3 = 3-phase connection type |
| Operating mode | X | • 4 = 4-quadrant operation<br>• X = Not relevant |
| Device variant | T | • 0 = Not relevant<br>• T = MOVIDRIVE® technology: Control via fieldbus<br>• L = Inverter with POWERLINK CiA402 |
| Technology level | 0 | • 0 = Standard design |
| Application level | 0 | • 0 = Standard/MOVIKIT® Velocity Drive<br>• 1 = MOVIKIT® Positioning Drive<br>• 2 = Customized solution |
| Options | | • /L = Design with coated printed circuit boards<br>The following list is an example:<br>• /CES11A = Multi-encoder card<br>• /CID21A, /CIO21A = Input/output cards<br>• /CFE21A = EtherNet/IP™ and Modbus TCP<br>• /CFN21A = PROFINET<br>• /CFP21A = PROFIBUS<br>• /CFL21A = POWERLINK |

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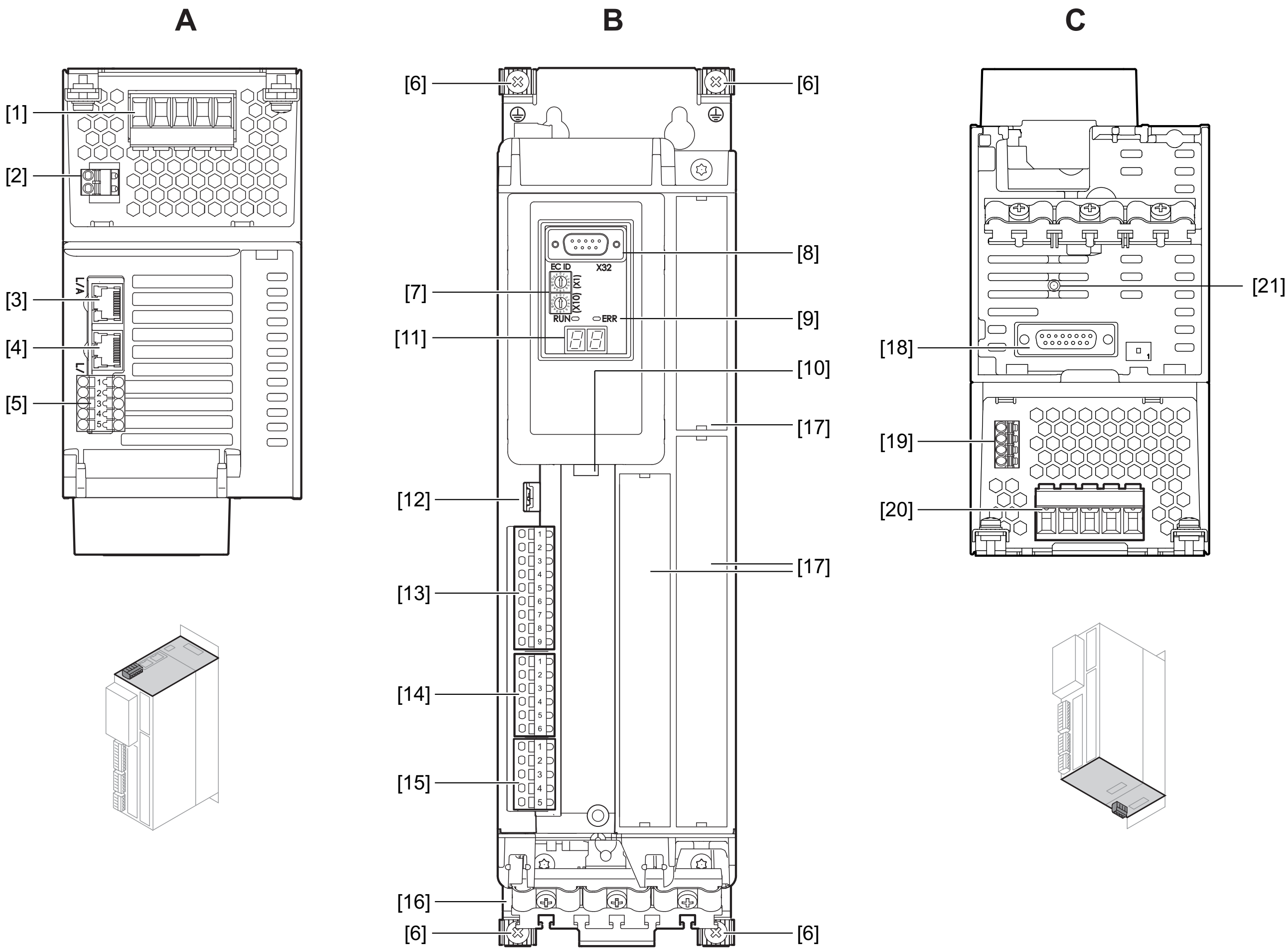
## 7.4 Device structure of the inverter

### 7.4.1 Size 1




9007220017827595

**A: View from top**

[1] X1: Mains and DC link connection

[2] X5: 24 V supply voltage

[3] X30 OUT: System bus

[4] X30 IN: System bus

[5] X6: STO input

**B: View from front**

[6] 4 × PE connection at housing

[7] EtherCAT® ID switch

[8] X32: Operator interface

[9] Status LEDs EtherCAT®/SBus$^{PLUS}$ "RUN", "ERROR"

[10] Memory module

[11] 7-segment display

[12] S3: Switch for module bus operating mode

[13] X20: Digital inputs

[14] X21: Digital outputs

[15] X22: Isolated relay contact

[16] Shield plate

[17] Card slot

**C: View from bottom**

[18] X15: Motor encoder connection

[19] X10: Brake control and motor temperature monitoring

[20] X2: Motor and braking resistor connection

[21] X16: Digital motor integration connection

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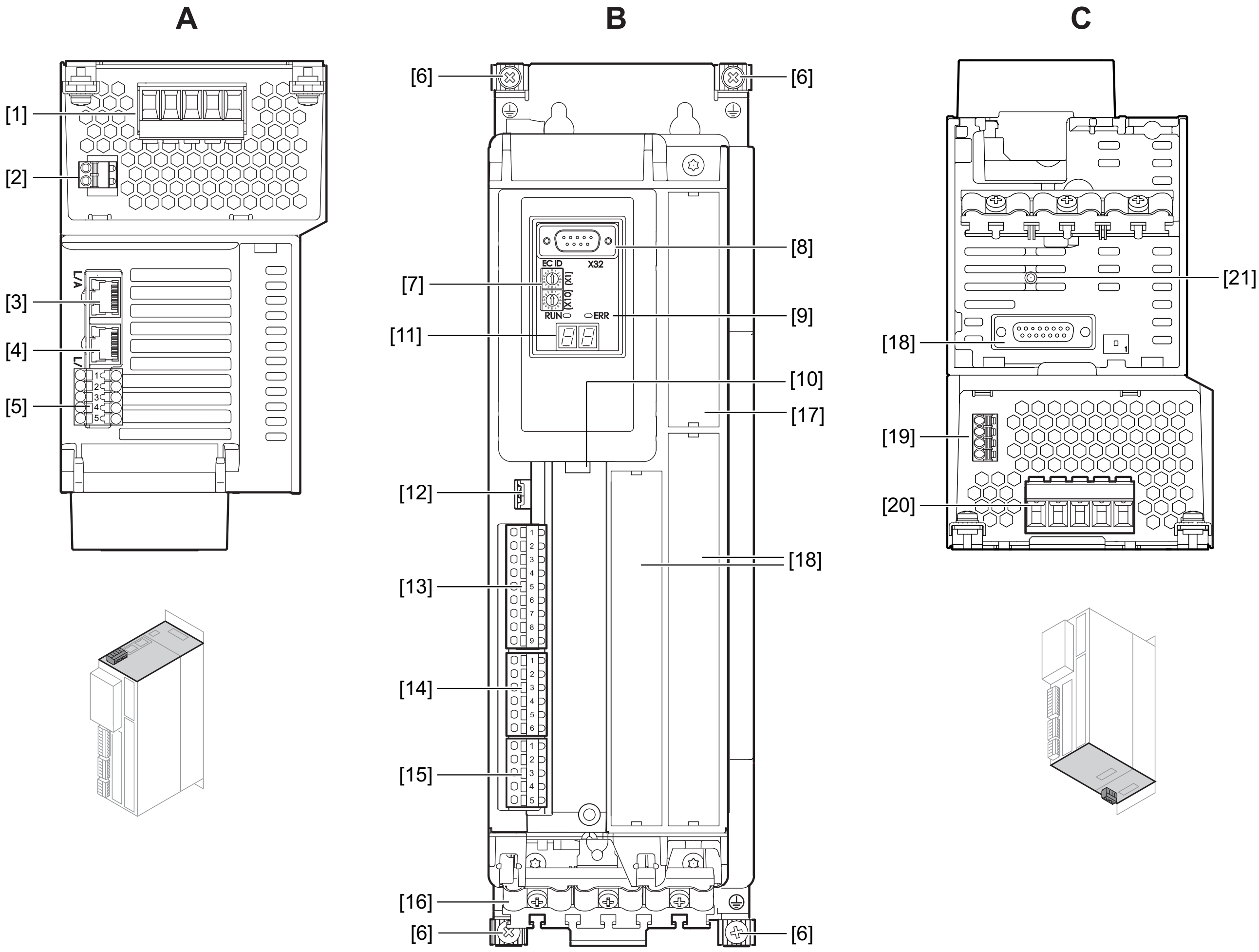
### 7.4.2 Size 2

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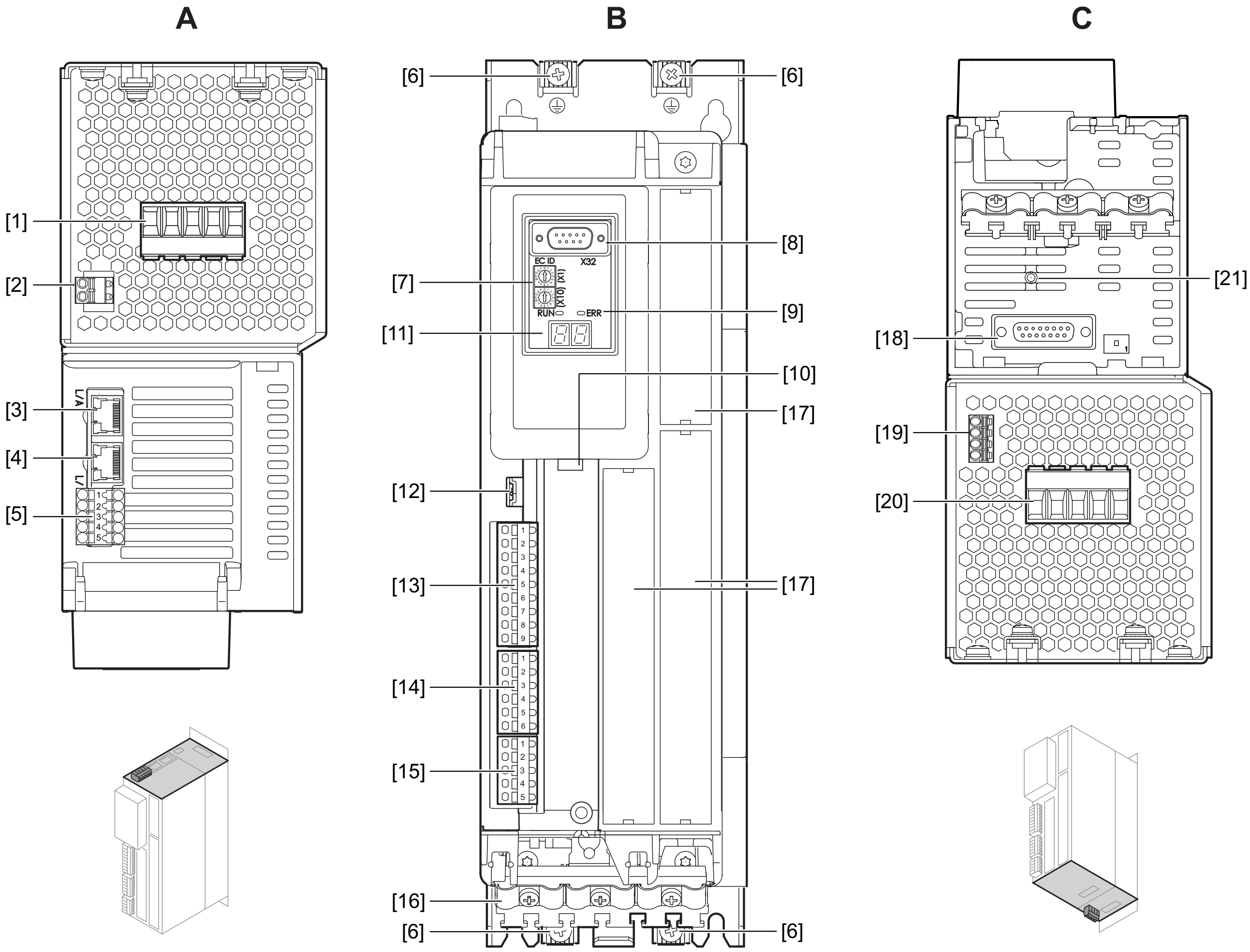
| | A: View from top | | B: View from front | | C: View from bottom |
|---|---|---|---|---|---|
| [1] | X1: Mains and DC link connection | [6] | 4 × PE connection at housing | [18] | X15: Motor encoder connection |
| [2] | X5: 24 V supply voltage | [7] | EtherCAT® ID switch | [19] | X10: Brake control and motor temperature monitoring |
| [3] | X30 OUT: System bus | [8] | X32: Operator interface | [20] | X2: Motor and braking resistor connection |
| [4] | X30 IN: System bus | [9] | Status LEDs EtherCAT®/SBus$^{PLUS}$ "RUN", "ERROR" | [21] | X16: Digital motor integration connection |
| [5] | X6: STO input | [10] | Memory module | | |
| | | [11] | 7-segment display | | |
| | | [12] | S3: Switch for module bus operating mode | | |
| | | [13] | X20: Digital inputs | | |
| | | [14] | X21: Digital outputs | | |
| | | [15] | X22: Isolated relay contact | | |
| | | [16] | Shield plate | | |
| | | [17] | Card slot | | |

### 7.4.3 Size 3




9007220017832459

**A: View from top**

[1] X1: Mains and DC link connection

[2] X5: 24 V supply voltage

[3] X30 OUT: System bus

[4] X30 IN: System bus

[5] X6: STO input

**B: View from front**

[6] 4 × PE connection at housing

[7] EtherCAT® ID switch

[8] X32: Operator interface

[9] Status LEDs EtherCAT®/SBus$^{PLUS}$ "RUN", "ERROR"

[10] Memory module

[11] 7-segment display

[12] S3: Switch for module bus operating mode

[13] X20: Digital inputs

[14] X21: Digital outputs

[15] X22: Isolated relay contact

[16] Shield plate

[17] Card slot

**C: View from bottom**

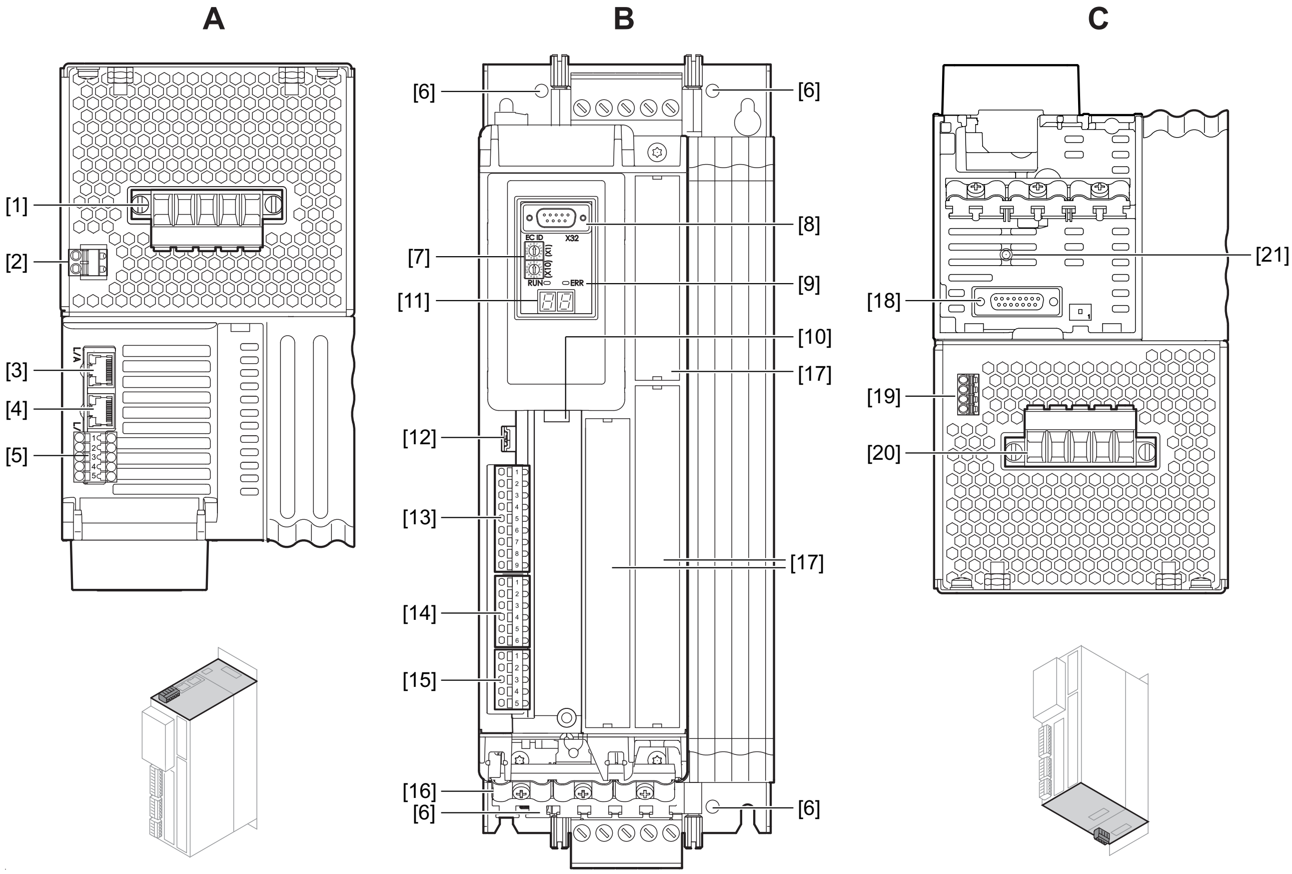
[18] X15: Motor encoder connection

[19] X10: Brake control and motor temperature monitoring

[20] X2: Motor and braking resistor connection

[21] X16: Digital motor integration connection

### 7.4.4 Size 4

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**A: View from top**

[1] X1: Mains and DC link connection

[2] X5: 24 V supply voltage

[3] X30 OUT: System bus

[4] X30 IN: System bus

[5] X6: STO input

**B: View from front**

[6] 4 × PE connection at housing

[7] EtherCAT® ID switch

[8] X32: Operator interface

[9] Status LEDs EtherCAT®/SBus$^{PLUS}$ "RUN", "ERROR"

[10] Memory module

[11] 7-segment display

[12] S3: Switch for module bus operating mode

[13] X20: Digital inputs

[14] X21: Digital outputs

[15] X22: Isolated relay contact

[16] Shield plate

[17] Card slot

**C: View from bottom**

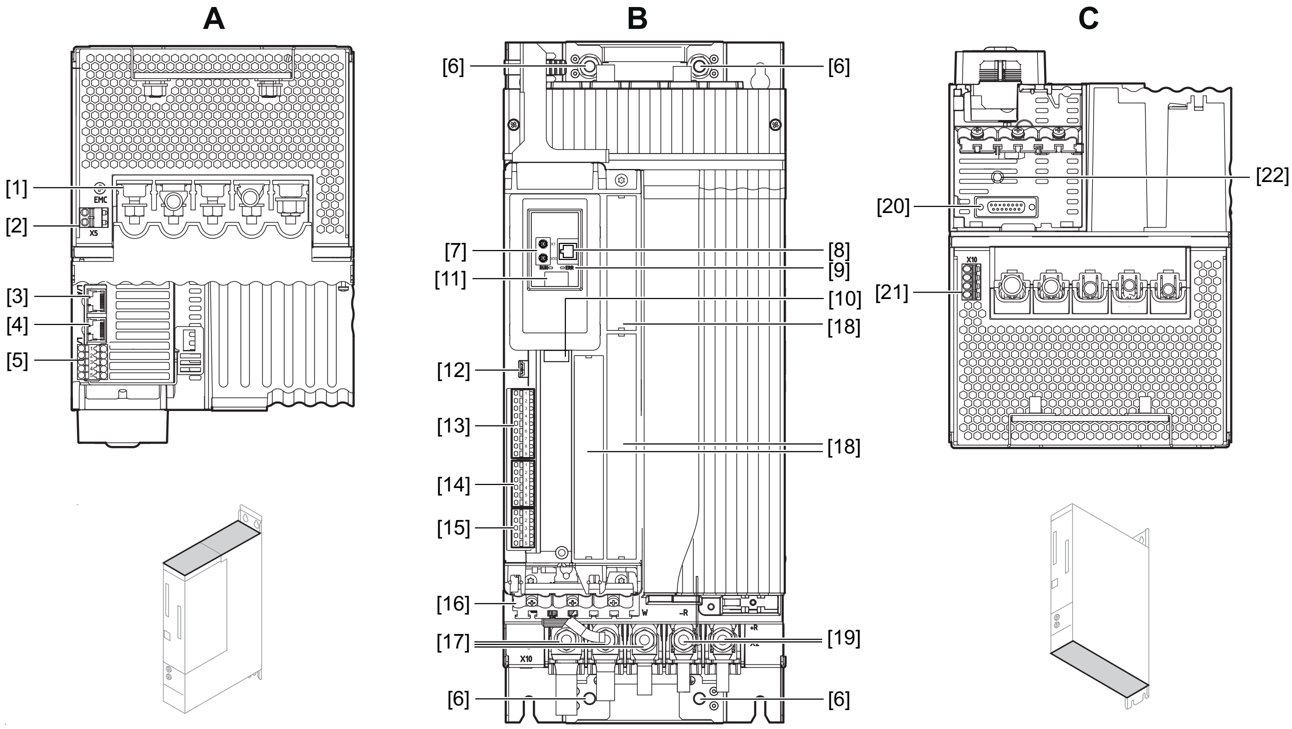
[18] X15: Motor encoder connection

[19] X10: Brake control and motor temperature monitoring

[20] X2: Motor and braking resistor connection

[21] X16: Digital motor integration connection

### 7.4.5 Size 5

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**A: View from top**

[1] X1: Mains and DC link connection

[2] X5: 24 V supply voltage

[3] X30 OUT: System bus

[4] X30 IN: System bus

[5] X6: STO input

**B: View from front**

[6] 4 × PE connection at housing

[7] EtherCAT® ID switch

[8] X31: SEW-EURODRIVE Service interface

[9] Status LEDs EtherCAT®/SBus$^{PLUS}$ "RUN", "ERROR"

[10] Memory module

[11] 7-segment display

[12] S3: Switch for module bus operating mode

[13] X20: Digital inputs

[14] X21: Digital outputs

[15] X22: Isolated relay contact

[16] Shield plate

[17] X2: Motor connection

[18] Card slot

[19] X2: Braking resistor connection

**C: View from bottom**

[20] X15: Motor encoder connection

[21] X10: Brake control and motor temperature monitoring

[22] X16: Digital motor integration connection

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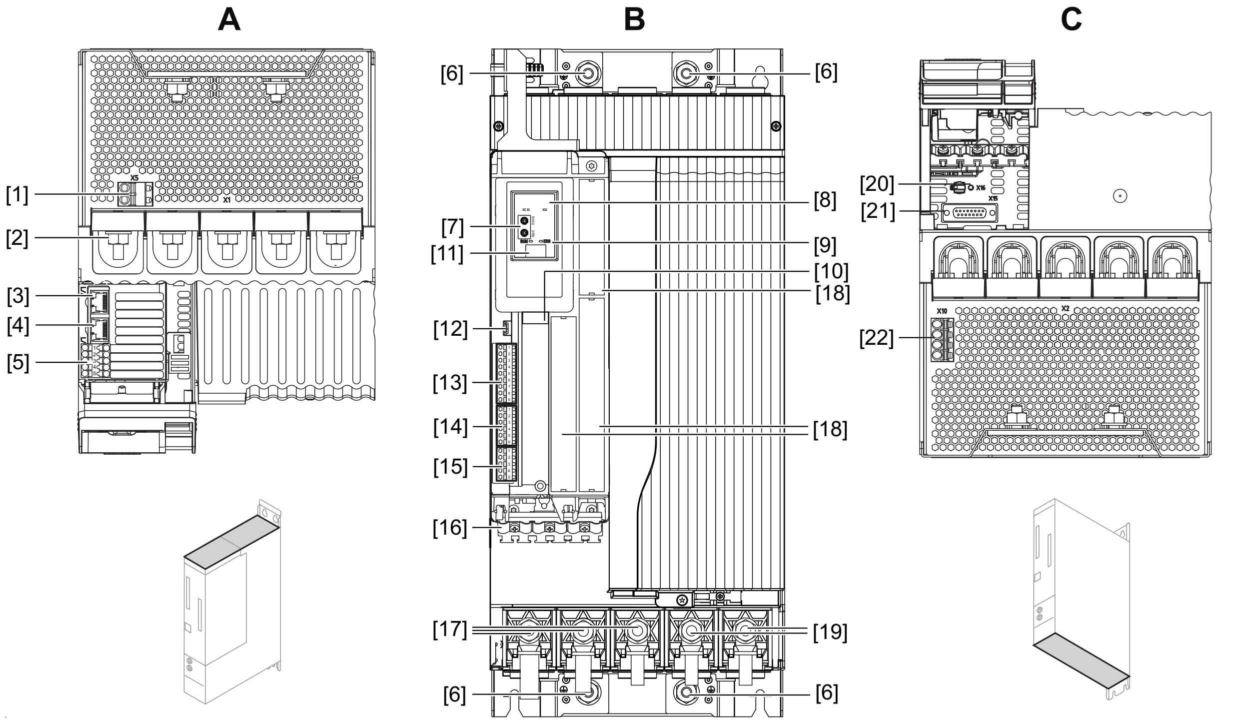
### 7.4.6 Size 6

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**A: View from top**

- [1] X5: 24 V supply voltage
- [2] X1: Mains and DC link connection
- [3] X30 OUT: System bus
- [4] X30 IN: System bus
- [5] X6: STO input

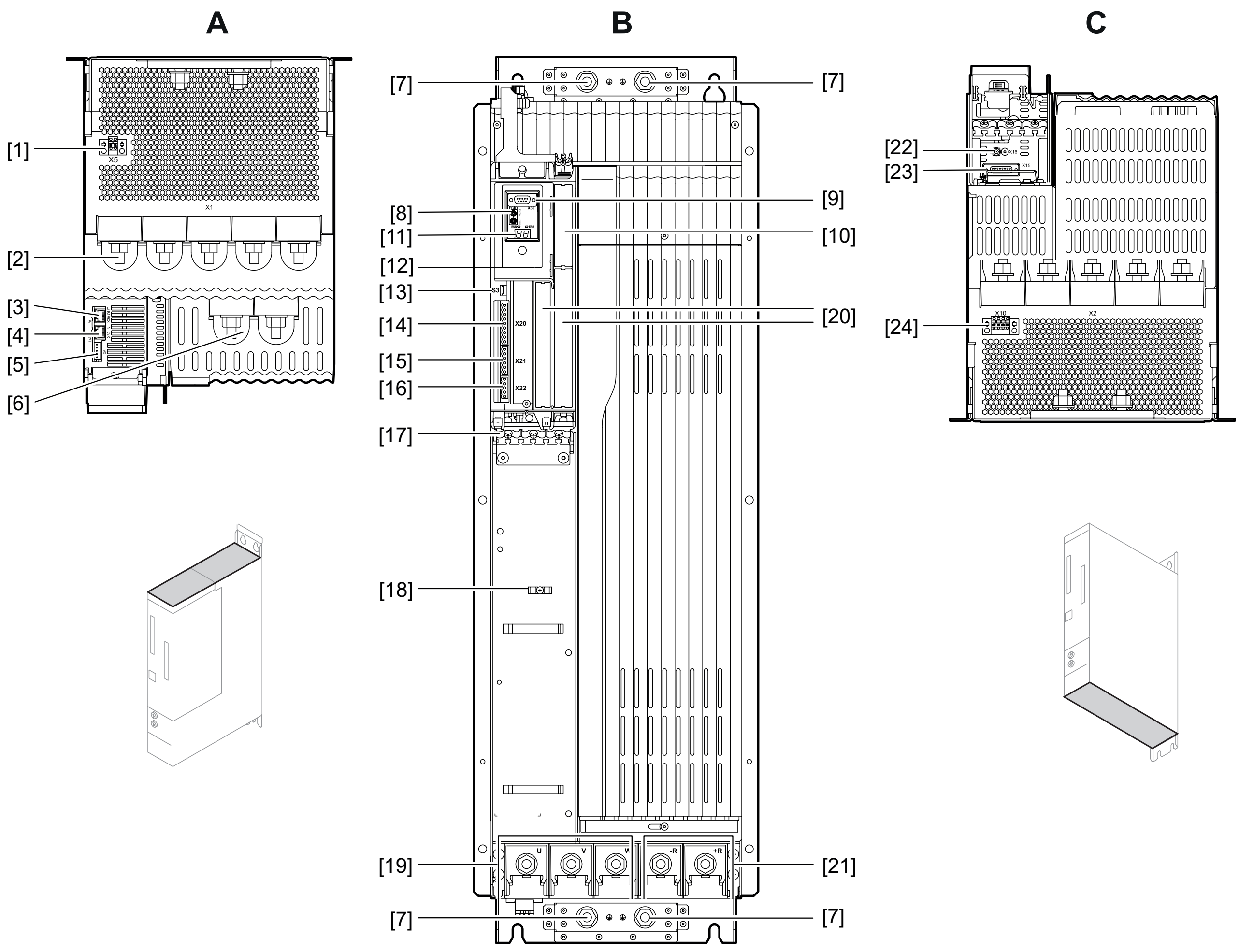
**B: View from front**

- [6] 4 × PE connection at housing
- [7] EtherCAT® ID switch
- [8] X31: SEW-EURODRIVE Service interface
- [9] Status LEDs EtherCAT®/SBus$^{PLUS}$ "RUN", "ERROR"
- [10] Memory module
- [11] 7-segment display
- [12] S3: Switch for module bus operating mode
- [13] X20: Digital inputs
- [14] X21: Digital outputs
- [15] X22: Isolated relay contact
- [16] Shield plate
- [17] X2: Motor connection
- [18] Card slot
- [19] X2: Braking resistor connection

**C: View from bottom**

- [20] X16: Digital motor integration connection
- [21] X15: Motor encoder connection
- [22] X10: Brake control and motor temperature monitoring

### 7.4.7 Size 7




37500406027

**A: View from top**

[1] X5: 24 V supply voltage
[2] X1: Connection for supply system
[3] X30 OUT: System bus
[4] X30 IN: System bus
[5] X6: STO input
[6] DC link connection

**B: View from front**

[7] 4 × PE connection at housing
[8] EtherCAT® ID switch
[9] X32: SEW-EURODRIVE Service interface
[10] Card slot
[11] 7-segment display
[12] Memory module
[13] S3: Switch for module bus operating mode
[14] X20: Digital inputs
[15] X21: Digital outputs
[16] X22: Isolated relay contact
[17] Shield plate
[18] Shield terminal
[19] X2: Motor connection
[20] Card slot
[21] X2: Braking resistor connection

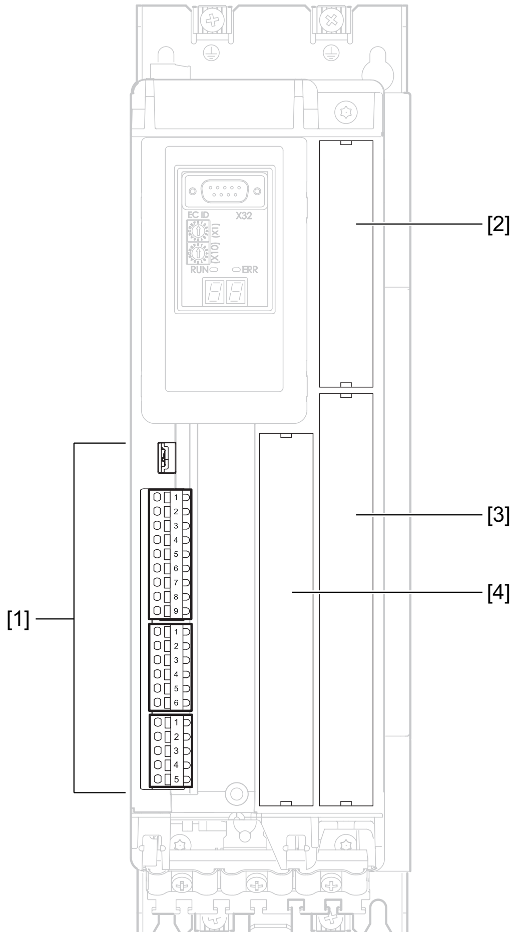
**C: View from bottom**

[22] X16: Digital motor integration connection
[23] X15: Motor encoder connection
[24] X10: Brake control and motor temperature monitoring

## 7.5 Card slots

Inverters can accommodate up to 3 cards. The following section describes the assignment of the slots and possible combinations of cards.

| Type designation | Description | Slot |
|---|---|---|
| CFE21A, CFN21A, CFP21A, CFL21A | Fieldbus cards | [2] |
| CES11A | Multi-encoder card | [3] |
| CS..A | Safety card | [3] |
| CID21A, CIO21A | Input/output cards | [4] |

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[1] Connector panel of basic device

[2] Fieldbus card slot

[3] Slot for safety card/multi-encoder card

[4] Slot for input/output cards

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# 8 Installation

## 8.1 Permitted tightening torques

**NOTICE**

Failure to adhere to prescribed tightening torques.

Possible inverter damage.

- Always adhere to the stipulated tightening torques. Otherwise, excessive heat can develop, causing damage to the inverter.

| Size | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| **Screw connection** | | **Tightening torques in Nm** | | | | | | | |
| Connection for supply system | X1 | 0.5 – 0.6 | | | 1.7 – 1.8 | 8.5 – 9.5 | 10 – 15 | 14 – 20 | |
| Motor and braking resistor connection | X2 | 0.5 – 0.6 | | | 1.7 – 1.8 | 8.5 – 9.5 | 10 – 15 | 14 – 20 | |
| Terminal screw for TN/IT systems | EMC | 1 – 1.2 | | | | | | | |
| PE connection | | 1.2 – 1.5 | | M4: 1.2 – 1.5 or M6: 2.5 – 3 | 2.5 – 3 | 6 – 10 | 10 – 15 | 14 – 20 | |
| Fastening the cards | | 0.6 – 0.8 | | | | | | | |

## 8.2 Permitted terminal cross sections

### 8.2.1 Single conductor, without conductor end sleeve, rigid and flexible

| Inverter | Terminal | Terminal type | Stripping length in mm | Cable cross section in $mm^2$ | | | |
|---|---|---|---|---|---|---|---|
| | | | | Rigid | | Flexible | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Control unit | | | | | | | |
| Sizes 1 – 8 | X20 | Spring terminal | 10 | 0.2 | 2.5 | 0.2 | 2.5 |
| | X21 | | 10 | 0.2 | 2.5 | 0.2 | 2.5 |
| | X22 | | 10 | 0.2 | 2.5 | 0.2 | 2.5 |
| | X6 | | 10 | 0.2 | 1.5 | 0.2 | 1.5 |
| Power section | | | | | | | |
| Sizes 1 – 8 | X5 | Spring terminal | 10 | 0.2 | 2.5 | 0.2 | 2.5 |
| Sizes 1 – 4 | X10 | | 10 | 0.2 | 1.5 | 0.2 | 1.5 |
| Sizes 5 – 8 | X10 | | 10 | 0.2 | 2.5 | 0.2 | 2.5 |
| Sizes 1 – 3 | X1/X2 | Screw terminal[1] | 10 | 0.2 | 10 | 0.2 | 6 |
| Size 4 | X1/X2 | | 12 | 0.75 | 16 | 0.75 | 16 |

1) SEW-EURODRIVE recommends using conductor end sleeves for installation with screw terminals and flexible cable.

### 8.2.2 Single conductor, flexible, with conductor end sleeve, with or without plastic collar

| Inverter | Terminal | Terminal type | Stripping length in mm | Cable cross section in $mm^2$ | | | |
|---|---|---|---|---|---|---|---|
| | | | | Plastic collar | | | |
| | | | | With | | Without | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Control unit | | | | | | | |
| Sizes 1 – 8 | X20 | Spring terminal | 10 | 0.25 | 2.5 | 0.25 | 2.5 |
| | X21 | | 10 | 0.25 | 2.5 | 0.25 | 2.5 |
| | X22 | | 10 | 0.25 | 2.5 | 0.25 | 2.5 |
| | X6 | | 10 | 0.25 | 0.75 | 0.25 | 1.5 |
| Power section | | | | | | | |
| Sizes 1 – 8 | X5 | Spring terminal | 10 | 0.25 | 2.5 | 0.25 | 2.5 |
| Sizes 1 – 4 | X10 | | 10 | 0.25 | 0.75 | 0.25 | 1.5 |
| Sizes 5 – 8 | X10 | | 10 | 0.25 | 2.5 | 0.25 | 2.5 |
| Sizes 1 – 3 | X1/X2 | Screw terminal[1] | 10 | 0.25 | 4 | 0.25 | 6 |
| Size 4 | X1/X2 | | 12 | 0.5 | 10 | 0.5 | 16 |

1) SEW-EURODRIVE recommends using conductor end sleeves for installation with screw terminals and flexible cable.

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### 8.2.3 Double conductor, flexible, with conductor end sleeve, with plastic collar

| Inverter | Terminal designation | Terminal type | Stripping length in mm | Double conductor, same cross section in mm², Twin conductor end sleeve | | | |
|---|---|---|---|---|---|---|---|
| | | | | Plastic collar | | | |
| | | | | With | | Without | |
| | | | | Minimum | Maximum | Minimum | Maximum |
| Control unit | | | | | | | |
| Sizes 1 – 8 | X20 | Spring terminal | 10 | 0.5 | 1.5 | – | – |
| | X21 | | 10 | 0.5 | 1.5 | – | – |
| | X22 | | 10 | 0.5 | 1.5 | – | – |
| | X6 | | – | – | – | – | – |
| Power section | | | | | | | |
| Sizes 1 – 8 | X5 | Spring terminal | 10 | 0.5 | 1.5 | – | – |
| Sizes 1 – 4 | X10 | | 10 | – | – | – | – |
| Sizes 5 – 8 | X10 | | 10 | 0.5 | 2.5 | – | – |
| Sizes 1 – 3 | X1/X2 | Screw terminal[1)] | 10 | 0.25 | 2.5 | 0.25 | 1.5 |
| Size 4 | X1/X2 | | 12 | 0.5 | 6 | 0.5 | 4 |

"–" Not permitted

1) SEW-EURODRIVE recommends using conductor end sleeves for installation with screw terminals and flexible cable.

## 8.3 Special aspects when transporting the devices

**NOTICE**

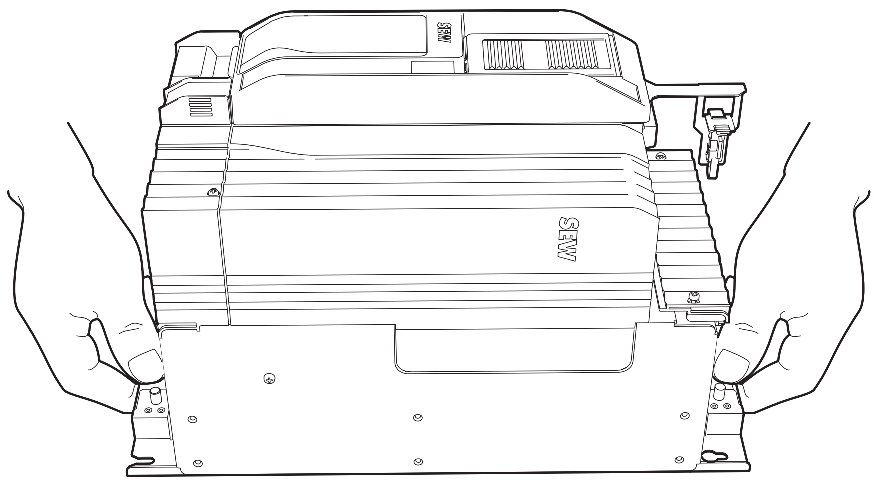
Improper lifting and transportation of the inverter.

Improper lifting and transportation of the inverter on the plastic parts or on the covers will cause damage.

- Observe the following notes before lifting and transporting the inverter:
- Hold inverters of size 5 by the handling points provided on the rear panel of the housing.
- Transport inverters of sizes 6 – 7 using the supporting aids provided for this purpose.

### 8.3.1 Size 5

The rear panel of the housing of size 5 inverters is designed in such a way that you can grip them securely by hand to lift and transport the inverters without damaging them.

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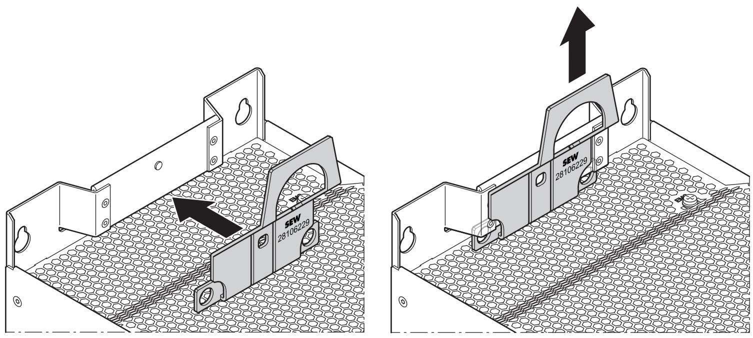
### 8.3.2 Sizes 6 – 7

Due to their weight, the following inverters must be transported using a supporting aid:

- **Lifting eye** for size 6 inverters

  The lifting eye is attached to the top of the housing and can be attached to lifting devices using suitable lifting equipment.



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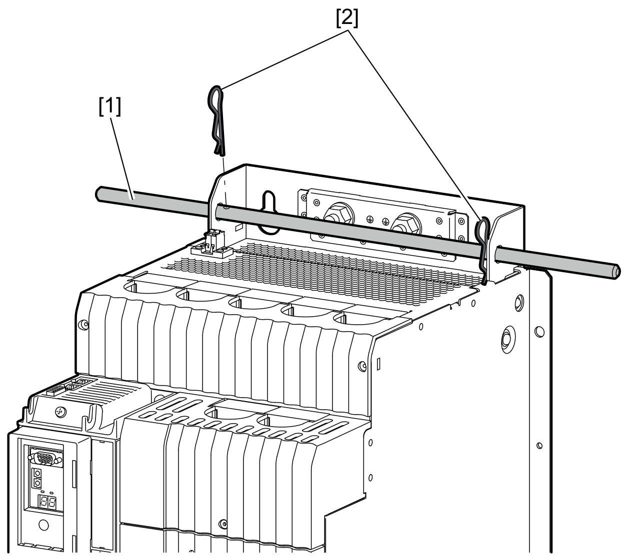
- **Carrying bar** for size 7 inverters

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If a crane is not available, you can push a carrying bar [1] through the rear panel to facilitate installation (included in the delivery). Secure the carrying bar against axial displacement using the two split pins [2].

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## 8.4 Mechanical installation

### ⚠ CAUTION

Risk of injury to persons and damage to property.

Never install defective or damaged products.

- Before installing any products, check them for external damage. Replace any damaged products.

### NOTICE

Risk of damage to property due to mounting surfaces with poor conductivity.

Inverter damage.

- The mounting plate in the control cabinet must be conductive over a large area for the mounting surface of the inverter (metallically pure, good conductivity). An EMC-compliant installation of the inverter can only be achieved with a mounting plate that is conductive over a large area.

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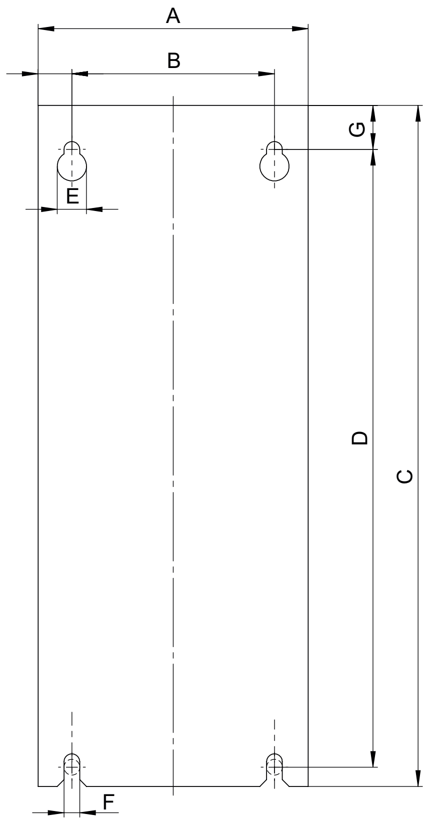
### 8.4.1 Bore patterns

| Size | Dimensions of the device base plate in mm | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G |
| Size 1 | 95 | 50 | 350 | 325 | 12 | 6 | 18 |
| Size 2 | 105 | 50 | 350 | 325 | 12 | 6 | 18 |
| Size 3 | 105 | 80 | 350 | 325 | 12 | 6 | 18 |
| Size 4 | 135 | 80 | 350 | 325 | 12 | 6 | 18 |
| Size 5 | 196 | 160 | 471 | 440 | 13 | 7 | 18 |
| Size 6 | 240 | 200 | 544 | 510 | 13 | 7 | 18 |
| Size 7 | 320 | 220 | 990 | 950 | 23 | 11 | 25 |

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### 8.4.2 Minimum clearance and mounting position

When installing the inverters in the control cabinet, observe the following:

- To ensure unobstructed cooling, leave a minimum clearance of 100 mm above and below the inverter housings. Ensure that the air circulation in this clearance is not impaired by cables or other installation equipment.
- Make sure that the inverters are not within the area of the warm exhaust air of other devices.
- Install the inverters only vertically. Do not install them horizontally, tilted or upside down.
- Clearance at the side is not necessary. The units can be arranged directly next to one another.

## INFORMATION

Special bending spaces are required according to EN 61800-5-1 for cables with a cross section of 10 $mm^2$ and larger. This means the clearance must be increased if required.

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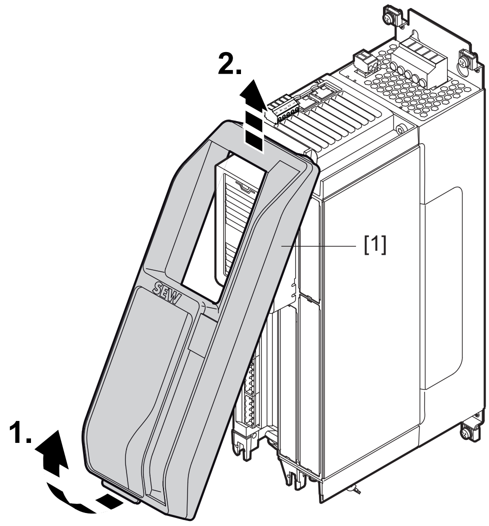
## 8.5 Covers

### 8.5.1 Covers

The application inverter is equipped with a safety cover [1].

Removing the safety cover

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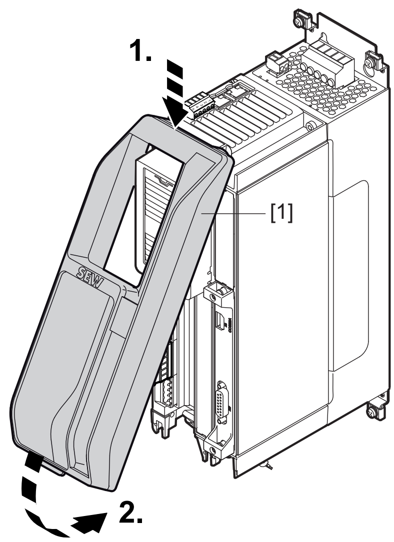
1. The safety cover [1] has a latching mechanism at the bottom. Pull the lower part of the safety cover away from the application inverter to unlatch it.
2. Pivot the safety cover forward and lift it to remove it from the application inverter.

Installing the safety cover

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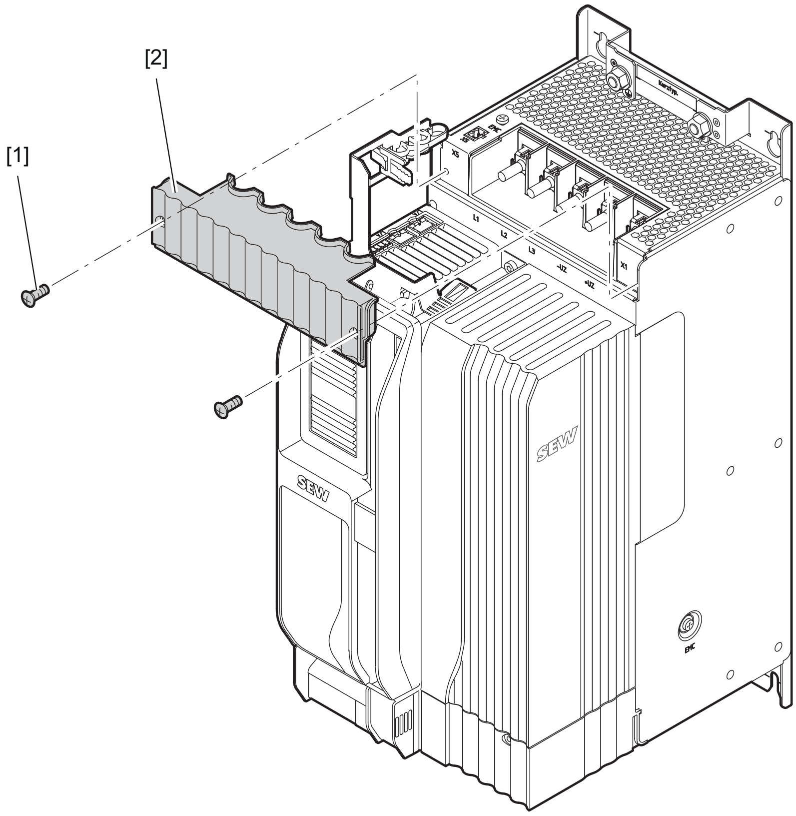
3. Place the safety cover [1] into the upper recess and move it towards the application inverter until it clicks into place.
4. Always attach the cover [1] after having carried out installation work.

### 8.5.2 Touch guards

For inverters of size 5 and higher, touch guard covers must be removed for the line connection and the connection of the motor and braking resistor.

Line connection

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1. Remove the 2 screws [1] on the upper touch guard cover [2].
2. Remove the touch guard cover [2].

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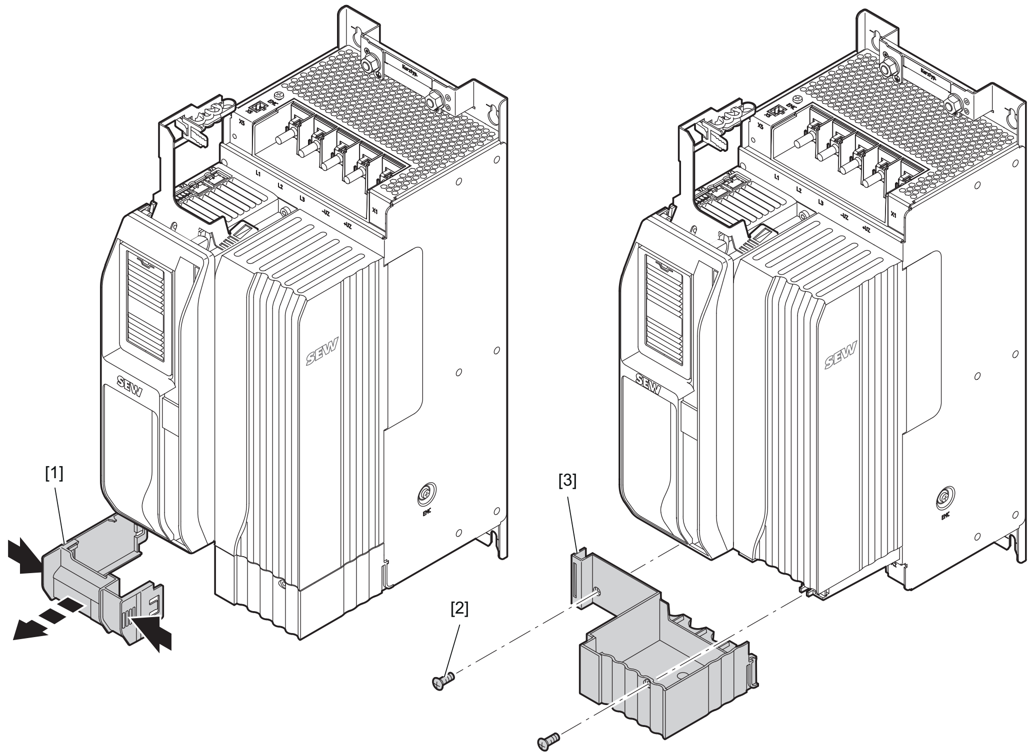
Connection of motor/braking resistor

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3. Press the plastic clips of the touch guard cover [1] inwards and remove the touch guard cover [1] by pulling it to the front.
4. Remove the 2 screws [2] and remove the touch guard cover [3] to the front.

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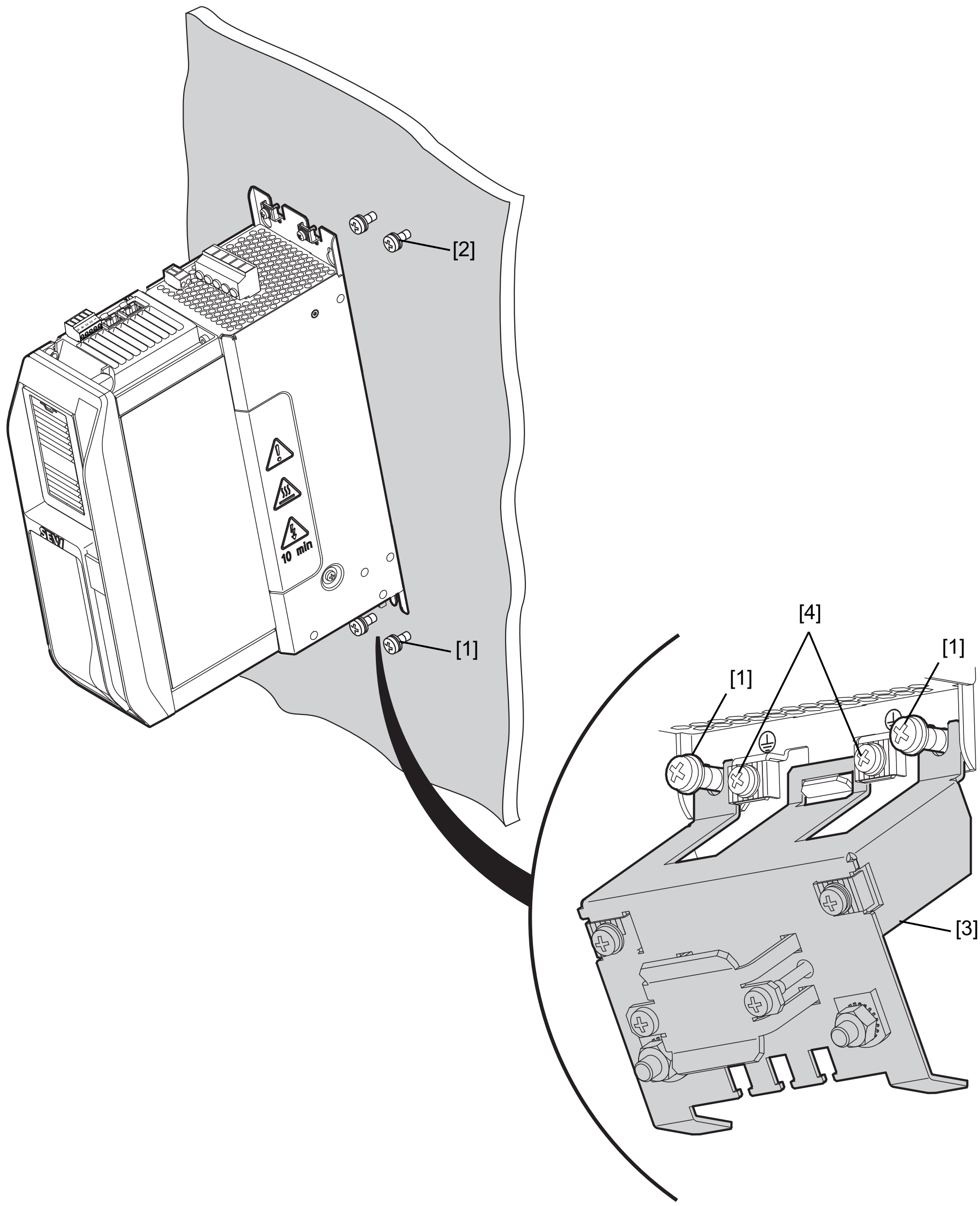
## 8.6 Control cabinet installation

### 8.6.1 Inverter and bottom shield plate

The retaining screws [1] and [2] are screwed into the prepared tapped holes in the mounting plate in the control cabinet but are not tightened.

1. Place the application inverter with the slotted holes in the device base plate onto the retaining screws [1] from the top.

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2. Push the application inverter backwards to insert the retaining screws [2] into the upper holes in the device base plate.
3. Lower the application inverter.
4. Install the shield plate [3] as shown above. This step applies to inverters of sizes 1 – 4.
5. Tighten the retaining screws [1] and [2].

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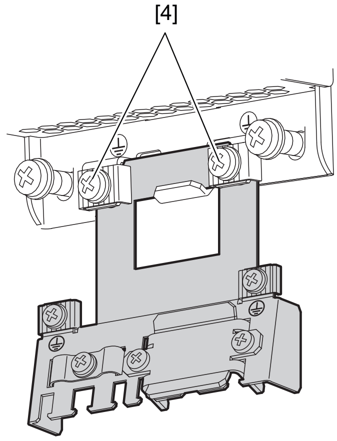
Shield plate for motor and encoder

✓ This step applies to inverters of sizes 1 – 2.

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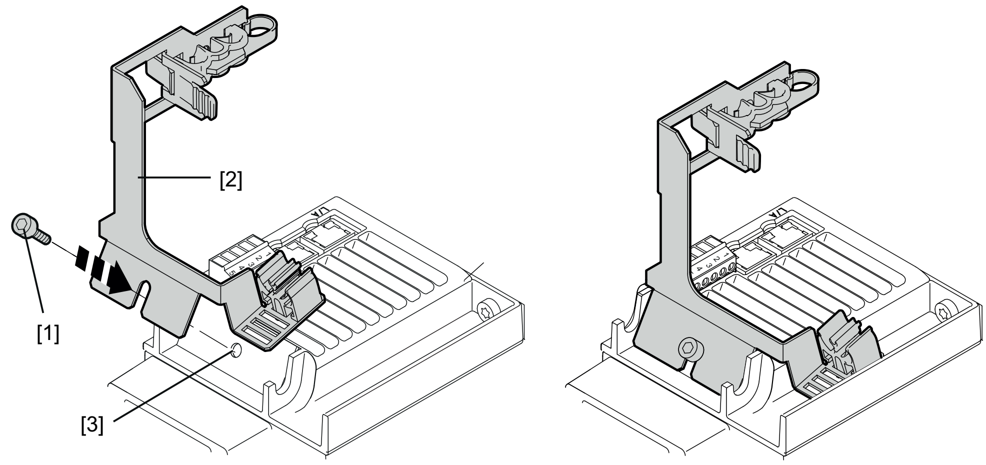
6. Install the shield plate as shown above and tighten the screws [4].

### 8.6.2 Top shield plate

1. Insert the shield plate [2] so that you can fasten it to the device housing [3] with the screw [1].

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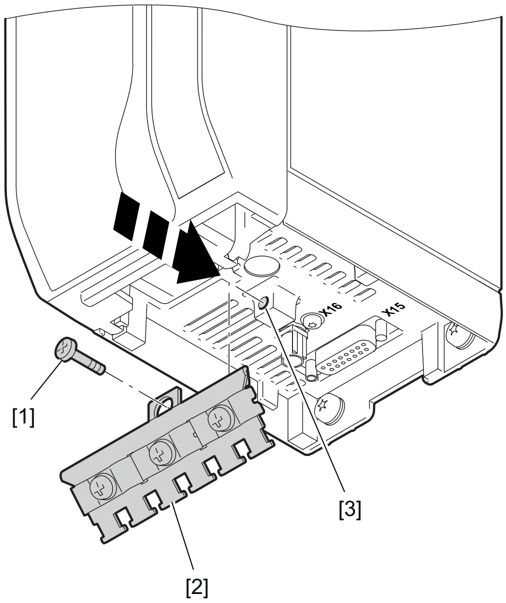
### 8.6.3 Shield plate at bottom of control unit

1. Insert the shield plate [2] so that you can fasten it with the screw [1] in the position [3] shown in the figure.

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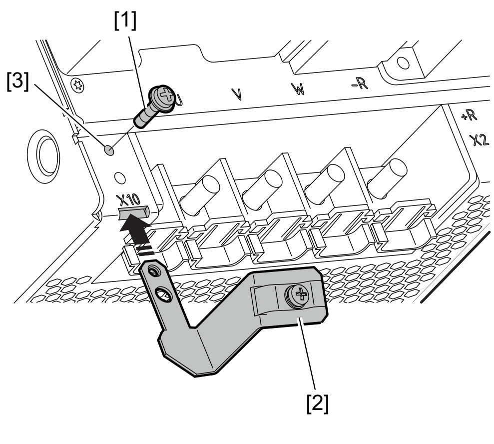
### 8.6.4 Shield plate at the bottom – encoder

✓ This step applies to inverters of size 5.

1. Insert the shield plate [2] so that you can fasten it with the screw [1] in the position [3] shown in the figure.

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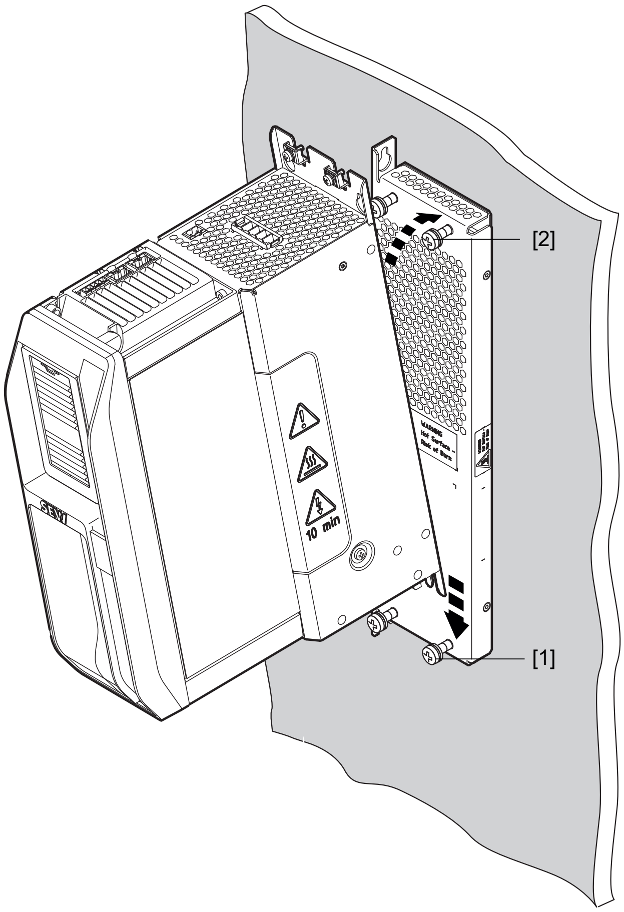
### 8.6.5 Installation with submounting resistor BW120-001, BW100-002/M

Size 1 inverters can be installed in the control cabinet together with a braking resistor. The braking resistor is located on the rear panel of the inverter and therefore has the same mounting hole pattern as the inverter.

Note that the retaining screws [1] and [2] must be 20 mm longer for installation with a braking resistor.

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1. Place the braking resistor at the desired position in the control cabinet as shown in the figure, and screw in the 4 retaining screws [1] and [2] without tightening them.
2. Place the inverter with the slotted holes in the device base plate onto the retaining screws [1] from the top.
3. Push the inverter backwards to insert the retaining screws [2] into the upper holes in the device base plate.
4. Lower the inverter.
5. Install the shield plate; see the chapter "Control cabinet installation" (→ 🗎 244).
6. Tighten the retaining screws [1] and [2].

The submounting resistor can be installed next to an application inverter; see the following figure.

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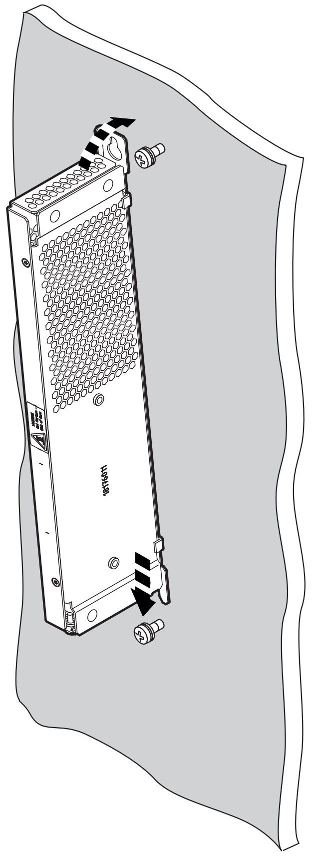
The hole distance of the submounting braking resistor must be larger than the hole distance of the application inverter.



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## 8.7 Electrical installation

**⚠ DANGER**

Dangerous voltage levels may still be present inside the device and at the terminal strips up to 10 minutes after the application inverter has been disconnected from the power supply.

Severe or fatal injuries from electric shock.

To prevent electric shocks:

- Disconnect the application inverter from the power supply and wait 10 minutes before removing the protective covers.

**⚠ DANGER**

A leakage current > 3.5 mA can occur during operation of the application inverter.

Severe or fatal injuries from electric shock.

To avoid dangerous shock currents in accordance with EN 61800-5-1, strictly observe the following:

- Supply system cable < 10 $mm^2$:
  – Route a second PE conductor with the cable cross-section of the supply system cable in parallel to the protective earth via separate terminals or use a copper PE conductor with a cable cross-section of 10 $mm^2$.
- Supply system cable 10 $mm^2$ – 16 $mm^2$:
  – Route a copper PE conductor with the cable cross-section of the supply system cable.
- Supply system cable 16 $mm^2$ – 35 $mm^2$:
  – Route a copper protective earth conductor with a cable cross-section of 16 $mm^2$.
- Supply system cable > 35 $mm^2$:
  – Route a copper protective earth conductor with half the cross-section of the supply system cable.
- If an earth leakage circuit breaker is used for protection against direct and indirect contact in isolated cases, it must be universal current-sensitive (RCD type B).

**INFORMATION**

Installation with protective separation.

The application inverter meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. The connected signal circuits must meet requirements according to SELV (**S**afety **E**xtra **L**ow **V**oltage) or PELV (**P**rotective **E**xtra **L**ow **V**oltage) to ensure protective separation. The installation must meet the requirements for protective separation.

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### 8.7.1 General information

- Take suitable measures to prevent the motor starting up inadvertently, for example by removing the electronics terminal block X20. Take additional safety measures depending on the application to prevent possible injuries to people and damage to machinery.
- Only use closed cable lugs or conductor end sleeves for connection to the screws to prevent litz strands from emerging.

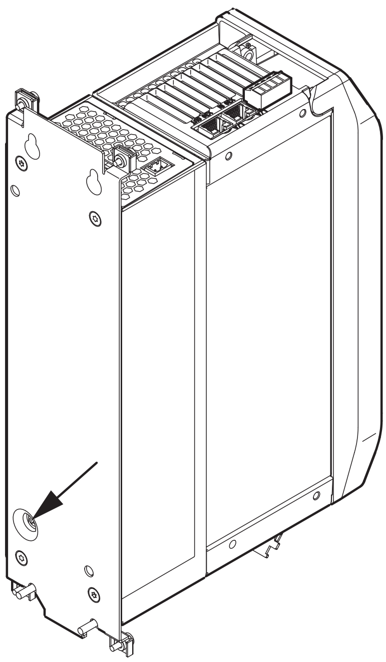
### 8.7.2 Permitted voltage systems

| Information on voltage systems | Information on permissibility |
|---|---|
| TN and TT systems – voltage systems with directly grounded star point. | Use is possible without restrictions. |
| IT systems – voltage systems with non-grounded star point. | Use is only permitted adhering to specific measures. The measures are described in chapter "Use in IT systems". |
| Voltage systems with grounded outer conductor. | Use only for nominal line voltages up to max. 240 V. |

### 8.7.3 Use in IT systems

To ensure IT system capability, the terminal screw shown in the following figures must be removed from the application inverter.

When converting to an IT network, mark this on the nameplate in the "IT system activated" box provided for this purpose.

| Size | Position of the terminal screw |
|---|---|
| Size 1, size 2 | On the back of the application inverter.  15144351755 |

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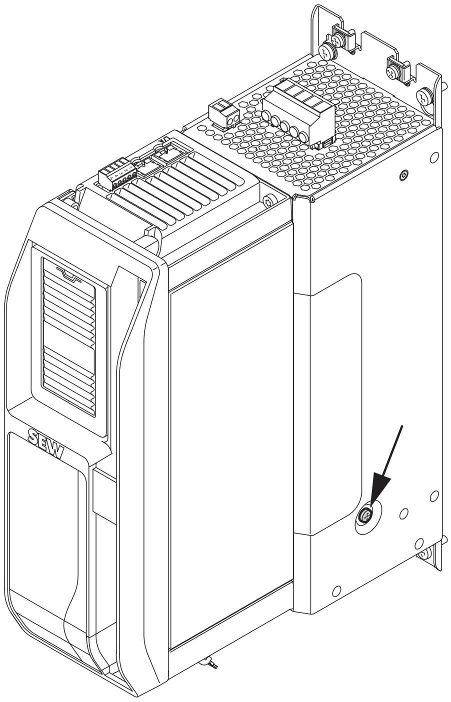
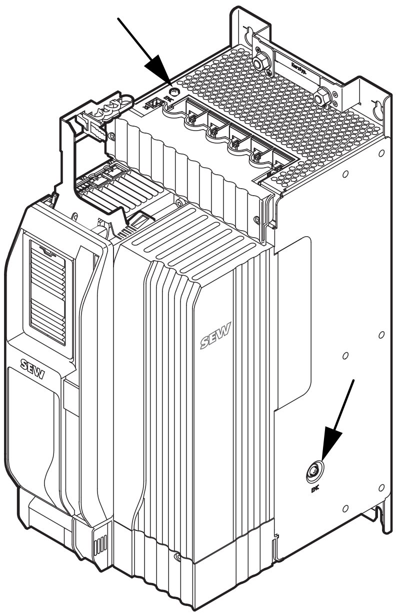
| Size | Position of the terminal screw |
|---|---|
| Sizes 3, 4, 6, 7 | On the right side of the application inverter.<br><br>9007214280971403 |
| Size 5 | One screw on the top, another screw on the right side of the application inverter.<br><br>21425923467 |

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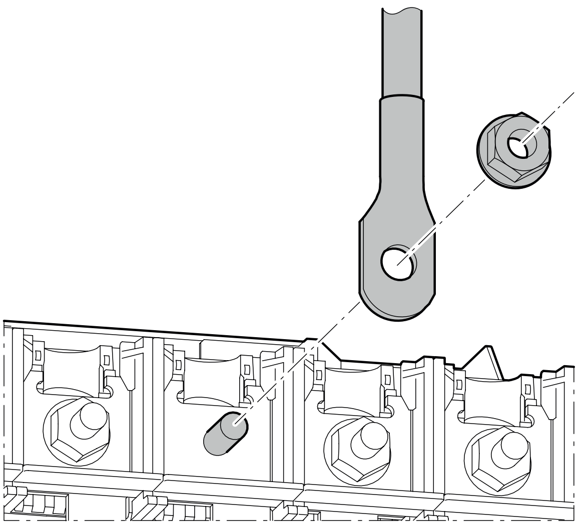
### 8.7.4 Line fuses, fuse types

| Type class | Requirement |
|---|---|
| Fuses in utilization categories gL, gG | Fusing voltage ≥ nominal line voltage |
| Miniature circuit breaker with characteristics B, C, D | Nominal miniature circuit breaker voltage ≥ nominal line voltage |
| | Nominal currents of the miniature circuit breaker must be 10% higher than the nominal line current of the inverter |

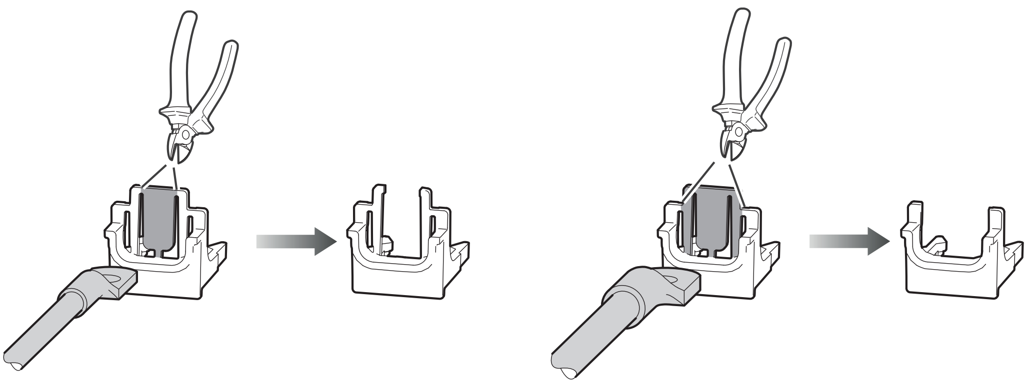
### 8.7.5 Special aspects for connecting power terminals

Note that for inverters from size 5 upwards, degree of protection IP20 is only achieved if the terminal studs (for connecting the grid, motor, braking resistor, and DC link) are protected against contact with plastic covers. The plastic covers can be ordered optionally, see chapter "Installation accessories" (→ 🗎 54).

1. Connect the cables.



2. The plastic covers must be removed in different ways depending on the cross section used.



3. Attach the plastic covers at the individual connections.

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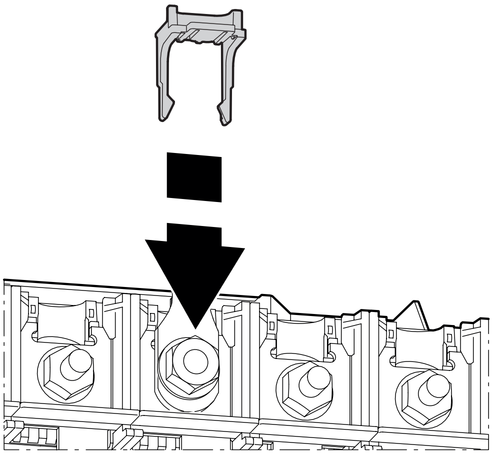
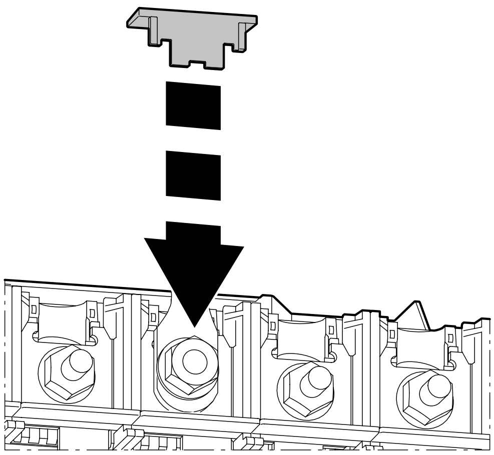
| Size 5 | Sizes 6 – 8 |
|---|---|
|  |  |

### 8.7.6 Line connection

- The line contactor must always be located upstream of the line filter.
- Use only line contactors of utilization category AC-3 (EN 60947-4-1) or higher.
- Do not use the line contactor for jog mode, but only for switching the inverter on and off. The FCB 20 "Jog" must be used for jog mode.
- Observe the required dimensioning of the cable cross-section for UL-compliant installation.

For the terminal assignment for line connection of the various sizes, refer to chapter "Terminal assignment".

Observe a minimum switch-off time of 10 s for the inverter. Do not switch the power on more than once per minute.

**NOTICE**

Non-compliance with the minimum switch-on/switch-off times

Inverter damage.

- Observe a minimum switch-off time of 10 s before switching on the power supply again.
- Do not switch on the supply system more than once per minute/every 2 minutes.

### 8.7.7 Motor connection

For the terminal assignment for the motor connection of the various devices, refer to chapter "Terminal assignment".

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### 8.7.8 Line contactor

The following table provides an overview of when a line contactor is required and what kind of preventive measures must be taken for the braking resistor used, see chapter "Protection against thermal overload of the braking resistor" (→ 🗎 276).

| Inverter | Braking resistor | Protective element/ preventive measure | Line contactor required? |
|---|---|---|---|
| Sizes 1 – 3 | No braking resistor | - | No |
| | BW... flat design | - | No |
| | BW... as PTC | - | No |
| | BW… | External bimetallic relay | Yes |
| | BW...-T | External bimetallic relay | Yes |
| From size 4 | No braking resistor | - | No |
| | BW... flat design | - | No |
| | BW... as PTC | - | no |
| | BW… | External bimetallic relay | No |
| | BW...-T | Temperature contact evaluation | No |

If a braking resistor is connected to the inverter from size 4 without using a line contactor, an external DC 24 V voltage supply must be provided on the inverter.

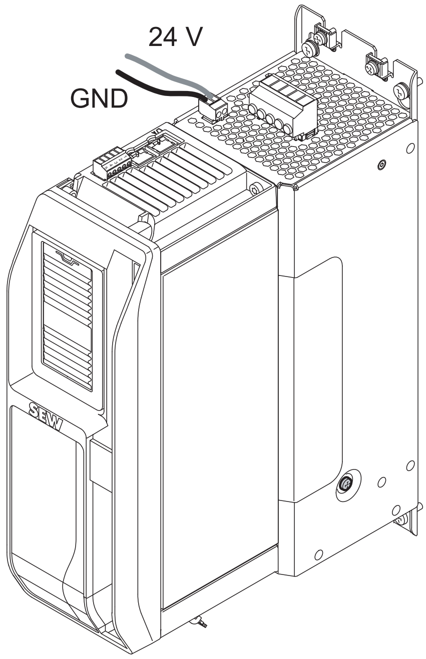
### 8.7.9 24 V supply voltage

The MDX90A-... application inverter requires an external 24 V voltage supply for the electronics.

The MDX91.A-... application inverter has an internal 24 V voltage supply (80 W) that can also be supported externally.

The maximum cable cross section is 2.5 mm². The maximum permitted length of the 24 V supply cable is 30 m.

Whether an external 24 V supply is required for MDX91A-.. depends on the load, e.g. the encoder supply and the outputs.

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Select the cross section of the supply cable according to the power demand of the devices to be supplied.

### 8.7.10 Motor output

**NOTICE**

Connecting capacitive loads to the application inverter.

Destruction of the application inverter.

- Only connect ohmic/inductive loads (motors).
- Never connect capacitive loads.

### 8.7.11 Brake chopper output

**NOTICE**

Connecting capacitive loads to the output of the brake chopper.
Connecting inductive loads to the output of the brake chopper.

Damage to the inverter.

- Only connect ohmic loads (braking resistors) to the output of the brake chopper.
- Never connect capacitive or inductive loads to the output of the brake chopper.

The braking resistor is connected to the +R and -R terminals of the inverter.

The maximum permitted cable length between braking resistor and inverter is 100 m.

### 8.7.12 Temperature evaluation of the motor

The temperature evaluation unit can be connected in 3 ways:

- The encoder cable includes the cables of the temperature evaluation unit.
- The temperature evaluation unit is connected to terminal X10 via connections TF1 and GND.
- Temperature evaluation via MOVILINK® DDI

**⚠ WARNING**

Dangerous contact voltages at the terminals of the inverter when connecting the wrong temperature sensors.

Severe or fatal injuries from electric shock.

- Connect only temperature sensors with protective separation from the motor winding to the temperature evaluation unit. Otherwise, the requirements for protective separation are not met. Dangerous contact voltages can occur at the terminals of the inverter via the signal electronics in the event of a fault.

- It is preferable to use TH bimetallic temperature switches for group drives on one inverter.
- The series connection of the TH contacts (normally closed) is not subject to any restriction if joint monitoring is provided.
- If TF temperature sensors are available in motors that are intended for a group drive, the temperature sensors of a maximum of 3 motors may be connected in parallel.

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### 8.7.13 Brake output

## INFORMATION

- If the brake connection and the motor connection are combined in one power cable, the brake cable must be shielded separately. The shielding of the power cable and the brake cable must be connected to the motor and inverter over a large area.
- SEW-EURODRIVE recommends also using a shielded brake cable for separate brake cable routing.
- Note the different project planning criteria to determine the length of brake cable and motor cable.

### 8.7.14 Inputs/outputs

## NOTICE

Damage to the digital inputs and digital outputs.

The digital inputs and digital outputs are not electrically isolated. Incorrectly applied voltages can damage the digital inputs and digital outputs.

- Do not apply a voltage > DC 30 V to the digital inputs and digital outputs.
- The digital inputs and outputs are dimensioned according to IEC 61131-2.

If you route the cables outside the control cabinet, you have to shield them irrespective of the length.

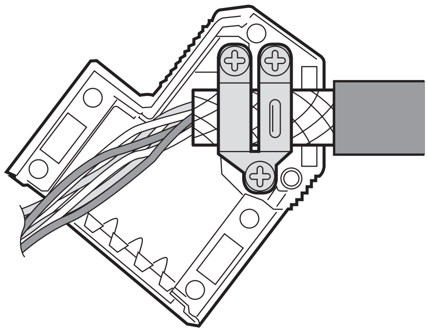
When connecting the shielding, ensure equipotential bonding.

### 8.7.15 Encoders

#### Installation notes for encoder connection

*Encoder cables*

- Use shielded cables with twisted pair cores. Connect the shield over a wide area at both ends:
  - At the encoder in the cable gland or in the encoder plug.
  - To the application inverter in the housing of the D-sub connector.



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- Route the encoder cable separately from the power cables.
- Connect the shield on the inverter end in the housing of the D-sub connector over a large area.

*On the encoder/resolver*

- To ensure a flawless shield connection, an EMC screw fitting must be used for the cable entry of the signal cable.
- For drives with a plug connector, connect the shield on the encoder plug.

#### Prefabricated cables

SEW-EURODRIVE offers prefabricated cables for connecting encoders. SEW-EURODRIVE recommends using these prefabricated cables.

#### Encoder connection/cable lengths

| Connection/encoder | Cable length |
|---|---|
| HTL encoders ES7C, EG7C, and EK8C | 300 m |
| TTL encoder EK8R | 300 m |
| Standard HTL encoder | 200 m |
| MOVILINK® DDI | 200 m |
| Other encoders | 100 m |

## INFORMATION

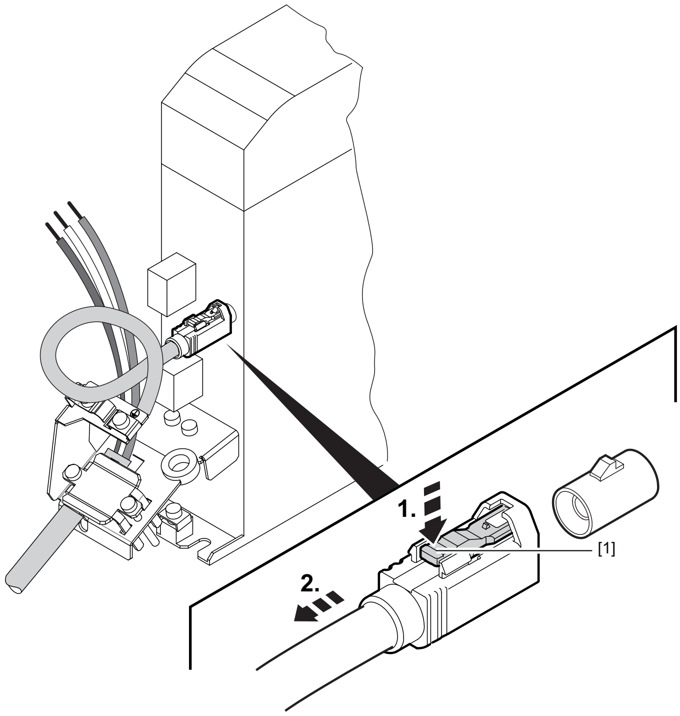
The maximum cable length might be reduced depending on the technical data of the respective encoder. Observe the manufacturer's specifications.

### 8.7.16 Installation notes for MOVILINK® DDI

#### Removing the MOVILINK® DDI connector

Observe the following notes before removing the MOVILINK® DDI connector:

- Remove the MOVILINK® DDI connector only when the 24 V voltage supply is switched off or when standby mode is activated.
- Before removing the MOVILINK® DDI connector X16, press the lock [1] on the connector, see the example figure.

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#### Connection with hybrid cable

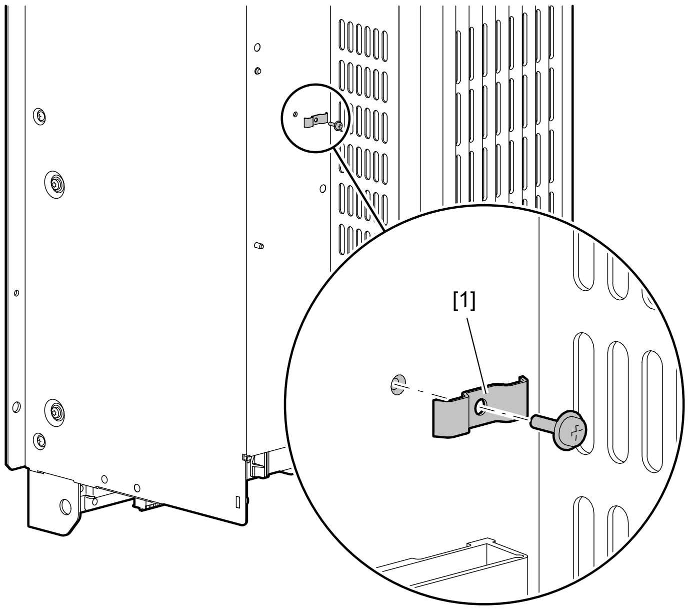
When connecting MOVILINK® DDI with a hybrid cable, observe the following notes:

- Apply the shielding of the hybrid cable over the entire circumference over a large area.
- For inverters of sizes 1 – 4, use the shield plates provided for this purpose on the basic device for the shield connection.
- Keep the distance or cable length between the shield connection and the connection for the cable conductors as short as possible.
- The exposed length of the coaxial cable should not exceed 50 cm.

### Connection when power and coaxial cables are routed separately

*Sizes 1 – 6*

Connect the shield of the coaxial cable to the terminal [1] provided for this purpose.

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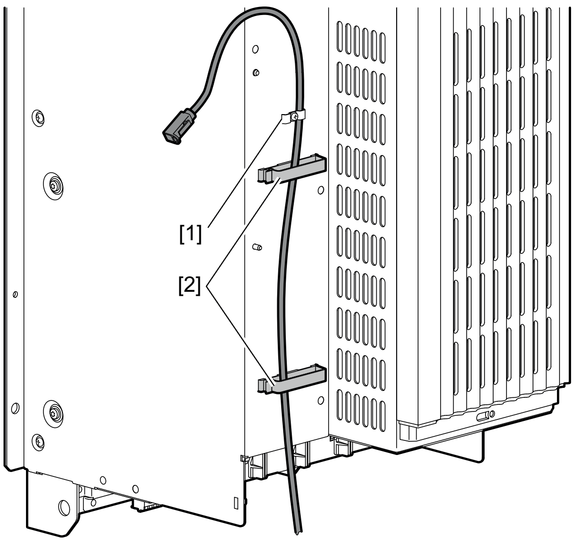
*Sizes 7 – 8*

Route the coaxial cable in such a way that it passes through the two lugs [2]. Connect the shield of the coaxial cable to the terminal [1] provided for this purpose.

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### Maximum line length

The MOVILINK® DDI interface supports a total cable length of the coaxial cable or coaxial line between the drive and MOVILINK® DDI connection X16 on the inverter of up to 200 m.

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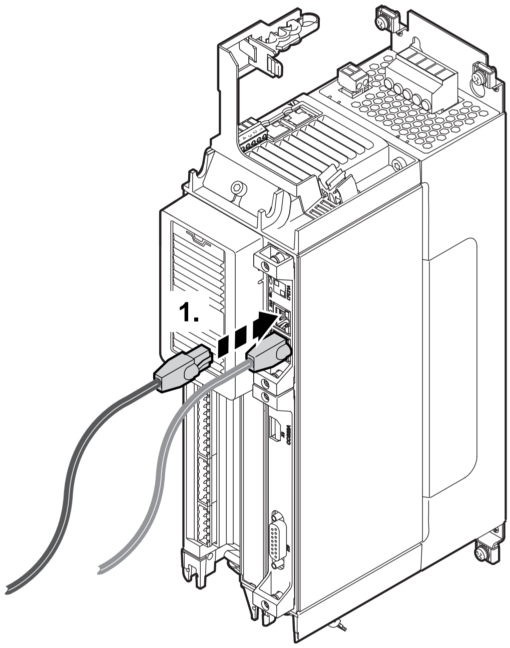
### Permitted number of connection or cable disconnection points

A maximum of 4 connection or cable disconnection points are permitted at the MOVILINK® DDI interface when using a hybrid cable or a solo coaxial cable. The connection points that are implemented directly on the inverter or in the drive by means of FAKRA connectors are not included in the count. Communication errors can occur if there are more than 4 connection or cable disconnection points.

### 8.7.17 Installation of the fieldbus cables and cable routing

Proceed as follows to route the fieldbus cables:

1. Remove the safety cover; see the chapter "Covers" (→ 🗎 241).
2. Connect both the cables to the connections X40 and X41 on the card.

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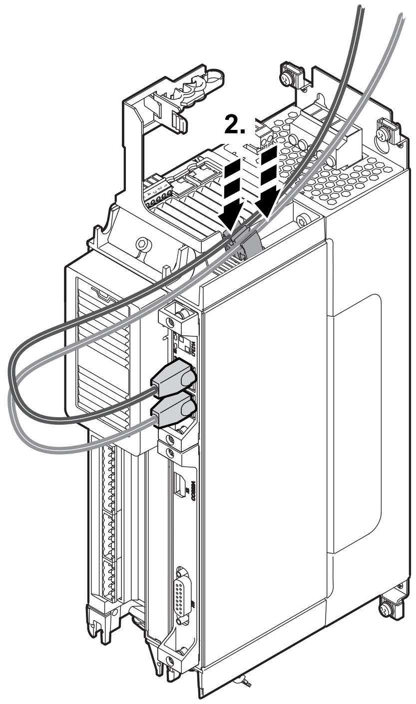
3. Route the cables as shown and press both the cables into the clips.

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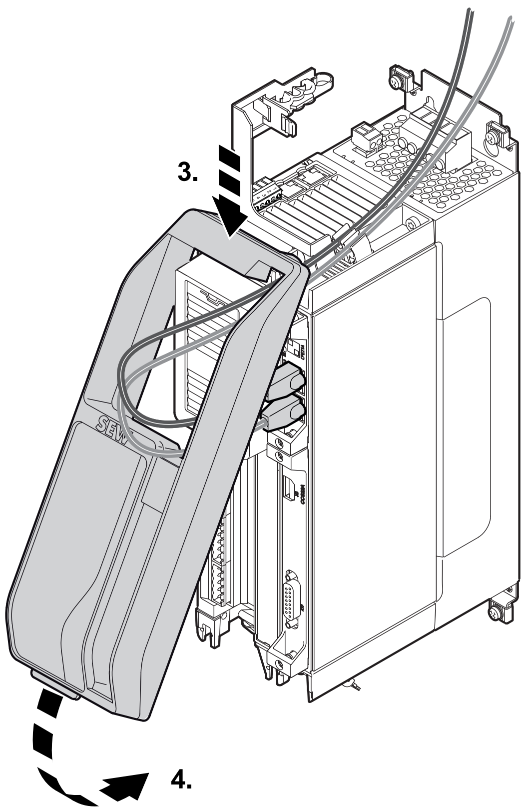
4. Attach the safety cover again.

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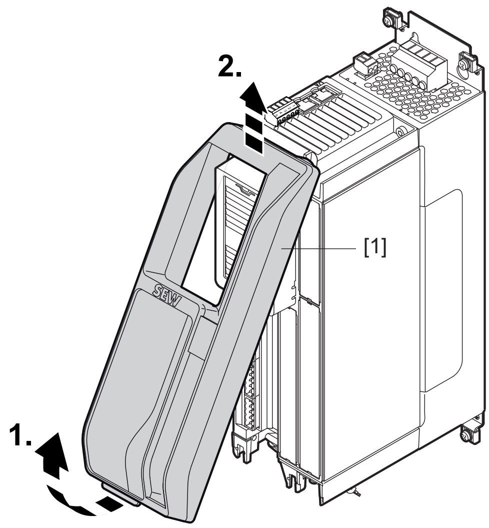
## 8.8 Installing options and accessories

### 8.8.1 Installing a card

Observe the safety notes in chapter "Electrical installation" (→ 🗎 249).

For information on which option card can be installed in which slot, refer to chapter "Card slots" (→ 🗎 232).

1. Disconnect the application inverter from the power supply. Switch off the external 24 V voltage supply for the electronics and the main voltage supply.
2. Before starting work, ensure electrostatic discharge with suitable measures. Suitable measures for equipotential bonding include, for example, using a discharge strap or wearing conductive shoes.
3. Remove the safety cover [1] from the front of the application inverter. The slot in which the card is installed depends on the card used.

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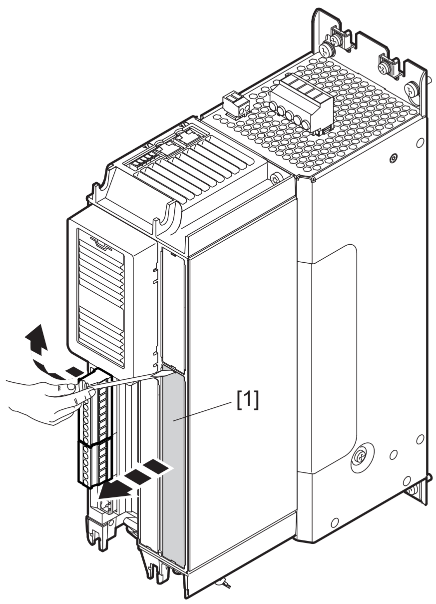
4. Remove the plastic cover [1] of the card slot using a screwdriver.

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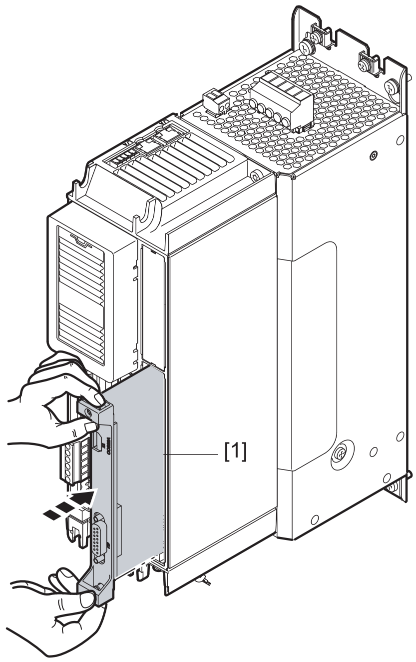
## INFORMATION

Hold the card by its edges only.

5. Take the card [1] and insert it into the slot with slight pressure.

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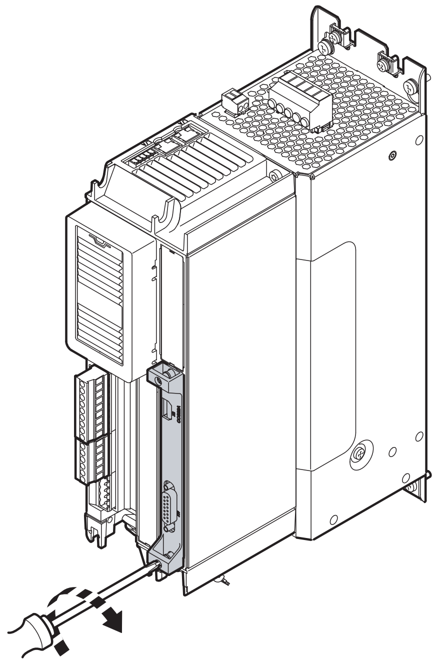
6. Tighten the card with the specified tightening torque (→ 🗎 233).



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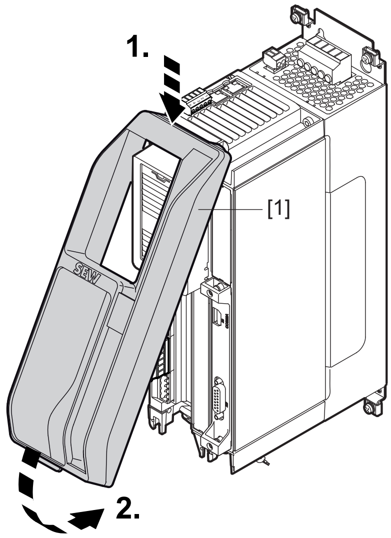
7. Attach the safety cover [1] to the front of the application inverter again.

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### 8.8.2 CIO21A and CID21A input/output card

**INFORMATION**

Technical data of the cards

For technical data and a detailed description of the encoder interface, refer to chapter "Technical data of the cards".

#### Voltage supply

The I/O cards are supplied by the basic device via the 24 V voltage supply.

#### Short-circuit behavior of digital outputs

The digital outputs are short-circuit-proof.

As soon as the short circuit is remedied, the target output voltage is output, meaning the output does not switch off.

#### Short circuit behavior of analog outputs

The analog outputs are short-circuit-proof.

In the event of a short circuit, the output current is limited to a maximum value of 30 mA. The short circuit current is not pulsating.

As soon as the short circuit is remedied, the target output voltage is output, meaning the output does not switch off.

#### Connecting inductive loads at digital outputs

For inductive loads an external protective element (e.g. freewheeling diode) is required.

#### Connecting 2 digital outputs in parallel

Connecting digital outputs in parallel is possible. The possible output current is doubled. Ensure identical parameterization of the digital outputs.

#### Cable lengths and shielding

The maximum cable length of connections on the inputs and outputs is 30 m.

Cables outside the control cabinet must be shielded.

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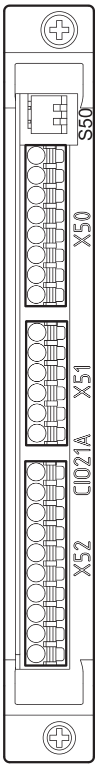
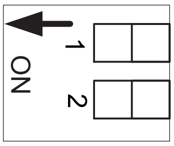
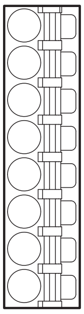
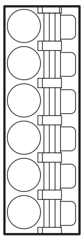
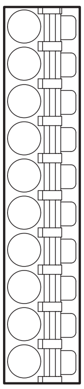
**CIO21A terminal assignment**

| CIO21A | Terminal | | Connec-tion | Brief description |
|---|---|---|---|---|
|  |  | | | S50/1 on: Current input active for AI2x<br>S50/2 on: Current input active for AI3x<br>S50/1 off[1]: Voltage input active for AI2x<br>S50/2 off[1]: Voltage input active for AI3x |
| |  | X50:1 | REF1 | +10 V DC reference voltage output |
| | | X50:2 | AI21 | Analog current and voltage input |
| | | X50:3 | AI22 | Analog current and voltage input, reference for AI21 |
| | | X50:4 | GND | Reference potential |
| | | X50:5 | AI31 | Analog current and voltage input |
| | | X50:6 | AI32 | Analog current and voltage input, reference for AI31 |
| | | X50:7 | GND | Reference potential |
| | | X50:8 | REF2 | -10 V DC reference voltage output |
| |  | X51:1 | AOV2 | Analog voltage output, freely programmable |
| | | X51:2 | AOC2 | Analog current output, freely programmable |
| | | X51:3 | GND | Reference potential for the outputs AOV2 and AOC2 |
| | | X51:4 | AOV3 | Analog voltage output, freely programmable |
| | | X51:5 | AOC3 | Analog current output, freely programmable |
| | | X51:6 | GND | Reference potential for the outputs AOV3 and AOC3 |
| |  | X52:1 | DI10 | Digital input 1, freely programmable |
| | | X52:2 | DI11 | Digital input 2, freely programmable |
| | | X52:3 | DI12 | Digital input 3, freely programmable |
| | | X52:4 | DI13 | Digital input 4, freely programmable |
| | | X52:5 | GND | Reference potential for the digital inputs DI10 – DI13 |
| | | X52:6 | DO10 | Digital output 1, freely programmable |
| | | X52:7 | DO11 | Digital output 2, freely programmable |
| | | X52:8 | DO12 | Digital output 3, freely programmable |
| | | X52:9 | DO13 | Digital output 4, freely programmable |
| | | X52:10 | GND | Reference potential for the digital outputs DO10 – DO13 |

1) Delivery state

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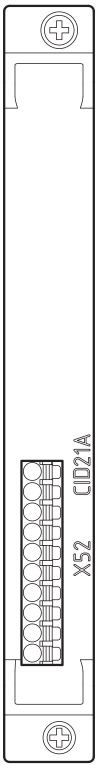
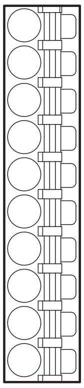
### CID21A terminal assignment

| CID21A | Terminal | | Connec-tion | Brief description |
|---|---|---|---|---|
|  |  | X52:1 | DI10 | Digital input 1, freely programmable |
| | | X52:2 | DI11 | Digital input 2, freely programmable |
| | | X52:3 | DI12 | Digital input 3, freely programmable |
| | | X52:4 | DI13 | Digital input 4, freely programmable |
| | | X52:5 | GND | Reference potential for the digital inputs DI10 – DI13 |
| | | X52:6 | DO10 | Digital output 1, freely programmable |
| | | X52:7 | DO11 | Digital output 2, freely programmable |
| | | X52:8 | DO12 | Digital output 3, freely programmable |
| | | X52:9 | DO13 | Digital output 4, freely programmable |
| | | X52:10 | GND | Reference potential for the digital outputs DO10 – DO13 |

### 8.8.3 CES11A multi-encoder card

**INFORMATION**

Technical data of the cards

For technical data and a detailed description of the encoder interface, refer to the chapter "Technical data of the cards".

#### Overview of functions

The CES11A multi-encoder card expands the functionality of the application inverter in a way that an additional encoder can be evaluated. The encoder connected to the CES11A multi-encoder card can be used as a motor encoder or external encoder.

#### Supported encoder types

The following encoder types can be evaluated by the CES11A multi-encoder card:

| |
|---|
| HTL 12/24 V (differential) |
| TTL (differential) |
| RS422 |
| sin/cos 1 $V_{PP}$ (differential) |
| HIPERFACE® with sin/cos signals 1 $V_{PP}$ |
| SEW encoder (RS485) with sin/cos signals 1 $V_{PP}$, e.g. AS7W, AG7W |
| EnDat 2.1 with sin/cos signals 1 $V_{PP}$ |
| SSI encoder with/without sin/cos signals 1 $V_{PP}$ |
| CANopen encoder |

#### Encoder connection/cable lengths

| Connection/encoder | Cable length |
|---|---|
| HTL encoders ES7C, EG7C, and EK8C | 300 m |
| TTL encoder EK8R | 300 m |
| Standard HTL encoder | 200 m |
| MOVILINK® DDI | 200 m |
| Other encoders | 100 m |

**INFORMATION**

The maximum cable length might be reduced depending on the technical data of the respective encoder. Observe the manufacturer's specifications.

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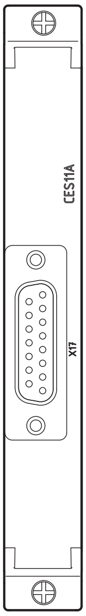
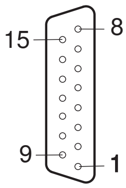
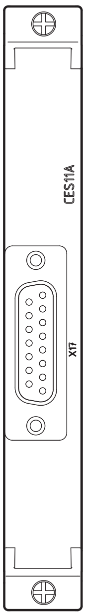
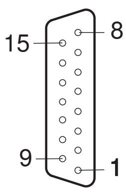
### Terminal assignment of TTL, HTL, sin/cos encoders

| Card | Terminal | | Connection | Brief description |
|---|---|---|---|---|
|   |   | X17:1 | A (cos+) (K1) | Signal track A (cos+) (K1) |
| | | X17:2 | B (sin+) (K2) | Signal track B (sin+) (K2) |
| | | X17:3 | C | Signal track C (K0) |
| | | X17:4 | DATA+[1] | Data cable for electronic nameplate |
| | | X17:5 | Reserved | – |
| | | X17:6 | -TEMP_M | Motor temperature evaluation |
| | | X17:7 | Reserved | – |
| | | X17:8 | GND | Reference potential |
| | | X17:9 | $\overline{A}$ (cos-) ($\overline{K1}$) | Negated signal track $\overline{A}$ (cos-) ($\overline{K1}$) |
| | | X17:10 | $\overline{B}$ (sin-) ($\overline{K2}$) | Negated signal track $\overline{B}$ (sin-) ($\overline{K2}$) |
| | | X17:11 | $\overline{C}$ | Negated signal track $\overline{C}$ ($\overline{K0}$) |
| | | X17:12 | DATA-[1] | Data cable for electronic nameplate |
| | | X17:13 | $V_{S24VG}$ | Encoder supply 24 V |
| | | X17:14 | +TEMP_M | Motor temperature evaluation |
| | | X17:15 | $V_{S12VG}$ | Encoder supply 12 V |

1) For encoders from SEW-EURODRIVE with electronic nameplate of type E.7S

### Terminal assignment of HIPERFACE® and SEW-EURODRIVE encoders (RS485)

| Card | Terminal | | Connection | Brief description |
|---|---|---|---|---|
|   |   | X17:1 | A (cos+) (K1) | Signal track A (cos+) (K1) |
| | | X17:2 | B (sin+) (K2) | Signal track B (sin+) (K2) |
| | | X17:3 | Reserved | – |
| | | X17:4 | DATA+ | Data line |
| | | X17:5 | Reserved | – |
| | | X17:6 | -TEMP_M | Motor temperature evaluation |
| | | X17:7 | Reserved | – |
| | | X17:8 | GND | Reference potential |
| | | X17:9 | $\overline{A}$ (cos-) ($\overline{K1}$) | Negated signal track $\overline{A}$ (cos-) ($\overline{K1}$) |
| | | X17:10 | $\overline{B}$ (sin-) ($\overline{K2}$) | Negated signal track $\overline{B}$ (sin-) ($\overline{K2}$) |
| | | X17:11 | Reserved | – |
| | | X17:12 | DATA- | Data line |
| | | X17:13 | $U_{S24VG}$ | Encoder supply 24 V |
| | | X17:14 | +TEMP_M | Motor temperature evaluation |
| | | X17:15 | $U_{S12VG}$ | Encoder supply 12 V |

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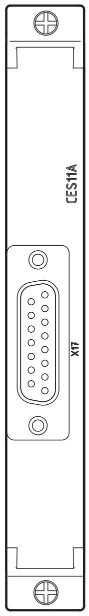
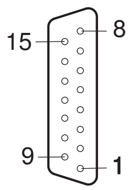
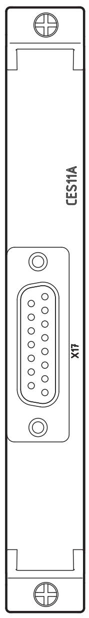
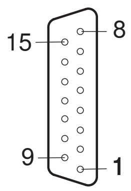
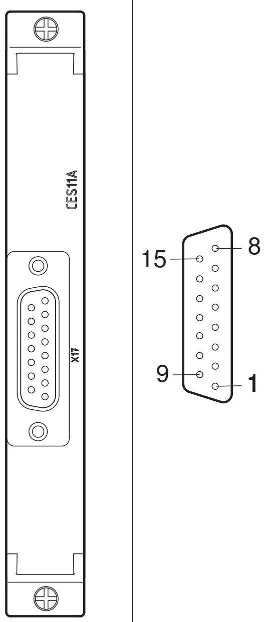
### Terminal assignment for EnDat 2.1 encoder

| Card | Terminal | | Connection | Brief description |
|---|---|---|---|---|
|  |  | X17:1 | A (cos+) | Signal track A (cos+) |
| | | X17:2 | B (sin+) | Signal track B (sin+) |
| | | X17:3 | PULSE+ | Clock signal |
| | | X17:4 | DATA+ | Data line |
| | | X17:5 | Reserved | – |
| | | X17:6 | -TEMP_M | Motor temperature evaluation |
| | | X17:7 | Reserved | – |
| | | X17:8 | GND | Reference potential |
| | | X17:9 | $\overline{A}$ (cos-) | Negated signal track $\overline{A}$ (cos-) |
| | | X17:10 | $\overline{B}$ (sin-) | Negated signal track $\overline{B}$ (sin-) |
| | | X17:11 | PULSE- | Clock signal |
| | | X17:12 | DATA- | Data line |
| | | X17:13 | $U_{S24VG}$ | Encoder supply 24 V |
| | | X17:14 | +TEMP_M | – |
| | | X17:15 | $U_{S12VG}$ | Encoder supply 12 V |

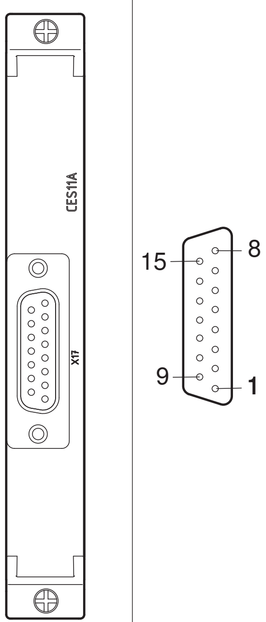
### Terminal assignment of SSI encoders

| Card | Terminal | | Connection | Brief description |
|---|---|---|---|---|
|  |  | X17:1 | Reserved | – |
| | | X17:2 | Reserved | – |
| | | X17:3 | PULSE+ | Clock signal |
| | | X17:4 | DATA+ | Data line RS485 |
| | | X17:5 | Reserved | – |
| | | X17:6 | -TEMP_M | Motor temperature evaluation |
| | | X17:7 | Reserved | – |
| | | X17:8 | GND | Reference potential |
| | | X17:9 | Reserved | – |
| | | X17:10 | Reserved | – |
| | | X17:11 | PULSE- | Clock signal |
| | | X17:12 | DATA- | Data line |
| | | X17:13 | $V_{S24VG}$ | 24 V encoder supply |
| | | X17:14 | +TEMP_M | Motor temperature evaluation |
| | | X17:15 | $V_{S12VG}$ | 12 V encoder supply |

### Terminal assignment of SSI and sin/cos combination encoders

| Card | Terminal | | Connection | Brief description |
|---|---|---|---|---|
|   | | X17:1 | A (cos+) | Signal track A (cos+) |
| | | X17:2 | B (sin+) | Signal track B (sin+) |
| | | X17:3 | PULSE+ | Clock signal |
| | | X17:4 | DATA+ | Data line |
| | | X17:5 | Reserved | – |
| | | X17:6 | -TEMP_M | Motor temperature evaluation |
| | | X17:7 | Reserved | – |
| | | X17:8 | GND | Reference potential |
| | | X17:9 | $\overline{A}$ (cos-) | Negated signal track $\overline{A}$ (cos-) |
| | | X17:10 | $\overline{B}$ (sin-) | Negated signal track $\overline{B}$ (sin-) |
| | | X17:11 | PULSE- | Clock signal |
| | | X17:12 | DATA- | Data line |
| | | X17:13 | $U_{S24VG}$ | Encoder supply 24 V |
| | | X17:14 | +TEMP_M | Motor temperature evaluation |
| | | X17:15 | $U_{S12VG}$ | Encoder supply 12 V |

### Terminal assignment of CANopen encoders

| Card | Terminal | | Connection | Brief description |
|---|---|---|---|---|
|   | | X17:1 | Reserved | – |
| | | X17:2 | Reserved | – |
| | | X17:3 | Reserved | – |
| | | X17:4 | CAN_H | CAN high data cable |
| | | X17:5 | Reserved | – |
| | | X17:6 | -TEMP_M | Motor temperature evaluation |
| | | X17:7 | Reserved | – |
| | | X17:8 | GND | Reference potential |
| | | X17:9 | Reserved | – |
| | | X17:10 | Reserved | – |
| | | X17:11 | Reserved | – |
| | | X17:12 | CAN_L | CAN low data cable |
| | | X17:13 | $V_{S24VG}$ | 24 V encoder supply |
| | | X17:14 | +TEMP_M | Motor temperature evaluation |
| | | X17:15 | $V_{S12VG}$ | 12 V encoder supply |

## 8.9 BW.. braking resistors

The supply cables to the braking resistors carry a high pulsed DC voltage during operation.

**⚠ DANGER**

Dangerous pulsed DC voltage of up to 980 V.

Severe or fatal injuries from electric shock.

- Disconnect the inverter from the power supply and wait 10 minutes before working on a braking resistor or its supply cables.
- Never operate the inverter without touch guards and installed closing covers.

**⚠ WARNING**

The surfaces of the braking resistors will reach temperatures of up to 250 °C when the braking resistors are loaded with the nominal power.

Severe burns.

- Do not touch any braking resistor.
- Select a suitable installation location for the braking resistors such as the control cabinet roof.

### 8.9.1 Permitted installation of braking resistors

The surfaces of the resistors become very hot if loaded with nominal power. The installation location of the resistor must be designed in accordance with the high temperatures. For this reason, braking resistors are usually mounted on the control cabinet roof.

The following minimum clearances must be observed for convection cooling depending on the continuous braking power and the mounting type.

| Continuous braking power at 100% cdf | Mounting type | Lateral clearance or clearance between resistors in mm | Downward clearance in mm | Upward clearance in mm |
|---|---|---|---|---|
| Up to 1 kW | Horizontal | 200 | 0 | 350 |
| | Vertical | 150 | 250 | 300 |
| Up to 10 kW | Horizontal | 300 | 0 | 650 |
| | Vertical | 250 | 350 | 600 |
| Up to 22 kW | Horizontal | 400 | 0 | 750 |
| | Vertical | 350 | 400 | 700 |
| Up to 44 kW | Horizontal | 500 | 0 | 850 |
| | Vertical | Not permitted | Not permitted | Not permitted |

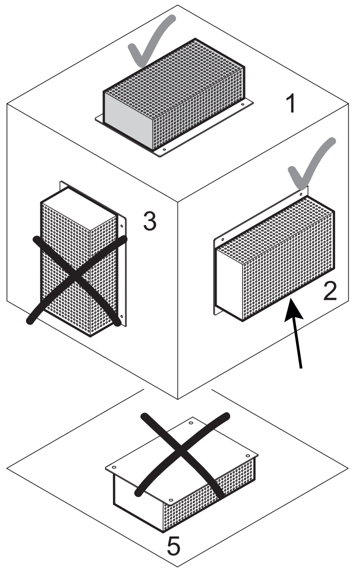
**NOTICE**

Overheating of the braking resistor.

Non-permissible installation might lead to heat build-up in the braking resistor due to reduced convection. A tripping temperature contact or an overheated braking resistor can lead to a system standstill.

Observe the following permitted mounting positions when installing the resistors:

- Grid resistor, frame resistor




*27021616276683147*

Braking resistors BW003-420-T and BW1.0-170 may only be used in position 1.

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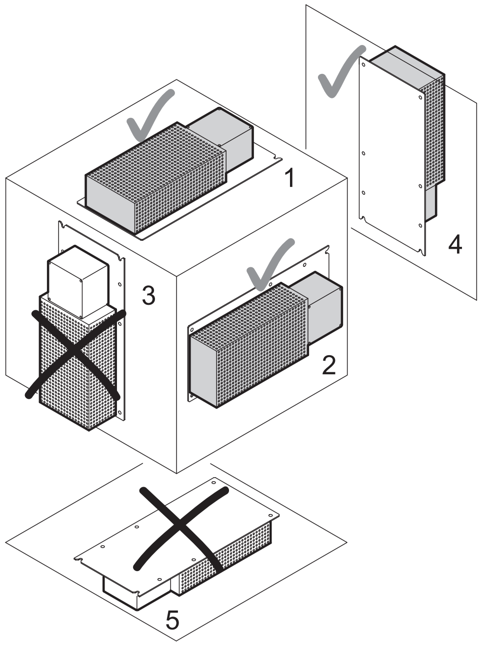
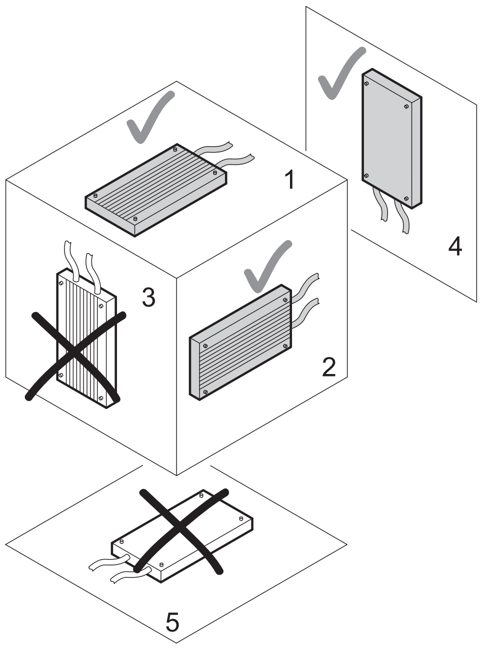
- Wire resistor




18512455307

- Flat-type resistor




18512457739

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### 8.9.2 Protection against thermal overload of the braking resistor

**INFORMATION**

PTC braking resistor

A PTC braking resistor becomes highly resistive in the event of an overload.

**INFORMATION**

Flat-type resistor

Flat-type resistors have internal thermal protection (fuse cannot be replaced) that interrupts the current circuit in the event of overload. The configuration guidelines and the documented assignments of the drive inverter and braking resistor must be adhered to.

#### Parallel connection of braking resistors

It is permitted to connect several identical braking resistors in parallel. The following applies:

- The power connections of the braking resistors must be connected to +R and -R in parallel.
- Each braking resistor requires separate protection against thermal overload.
- The signal contacts (NC contacts) of the protection devices must be connected in series.

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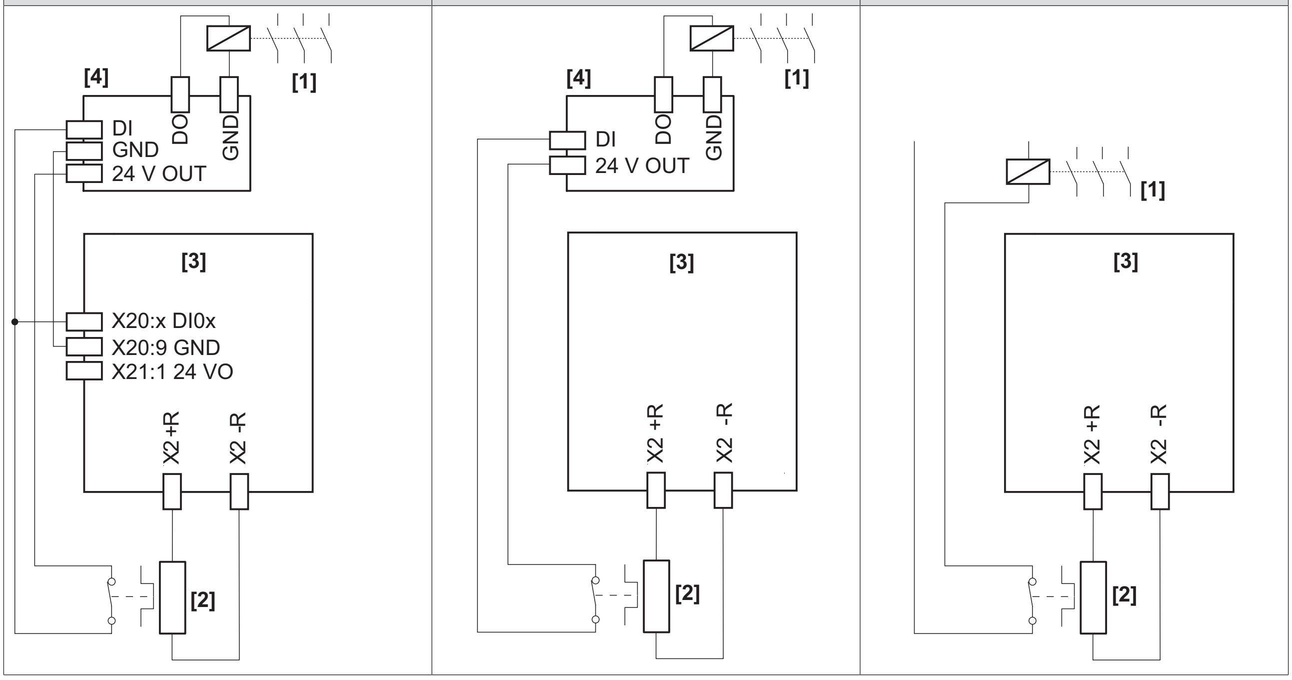
### Internal temperature switch -T

*Inverters of size 1 – 3*

If a BW...-T braking resistor with internal temperature switch is used with these application inverters, there are 3 possible connections.

| Connection 1 | Connection 2 | Connection 3 |
|---|---|---|




| | | | |
|---|---|---|---|
| [1] | Line contactor | [3] | Inverter |
| [2] | Braking resistor | [4] | PLC |

Note that the reference potential GND of the digital inputs on the controller must be the same as the reference potential of the application inverter when connection 1 is used.

- Connection 1

  The digital input of the application inverter connected to the signal contact of the internal temperature switch must be parameterized to the function "External braking resistor error".

  – If the thermal circuit breaker trips, the signal is evaluated in the application inverter and the PLC.

  – If the thermal circuit breaker trips, the PLC must interrupt the power supply.

  – If the thermal circuit breaker trips, the application inverter switches to "Output stage inhibit".

- Connection 2

  – If the thermal circuit breaker trips, the signal is evaluated only in the PLC.

  – If the thermal circuit breaker trips, the PLC must interrupt the power supply.

  – If the thermal circuit breaker trips, there is no direct response in the application inverter.

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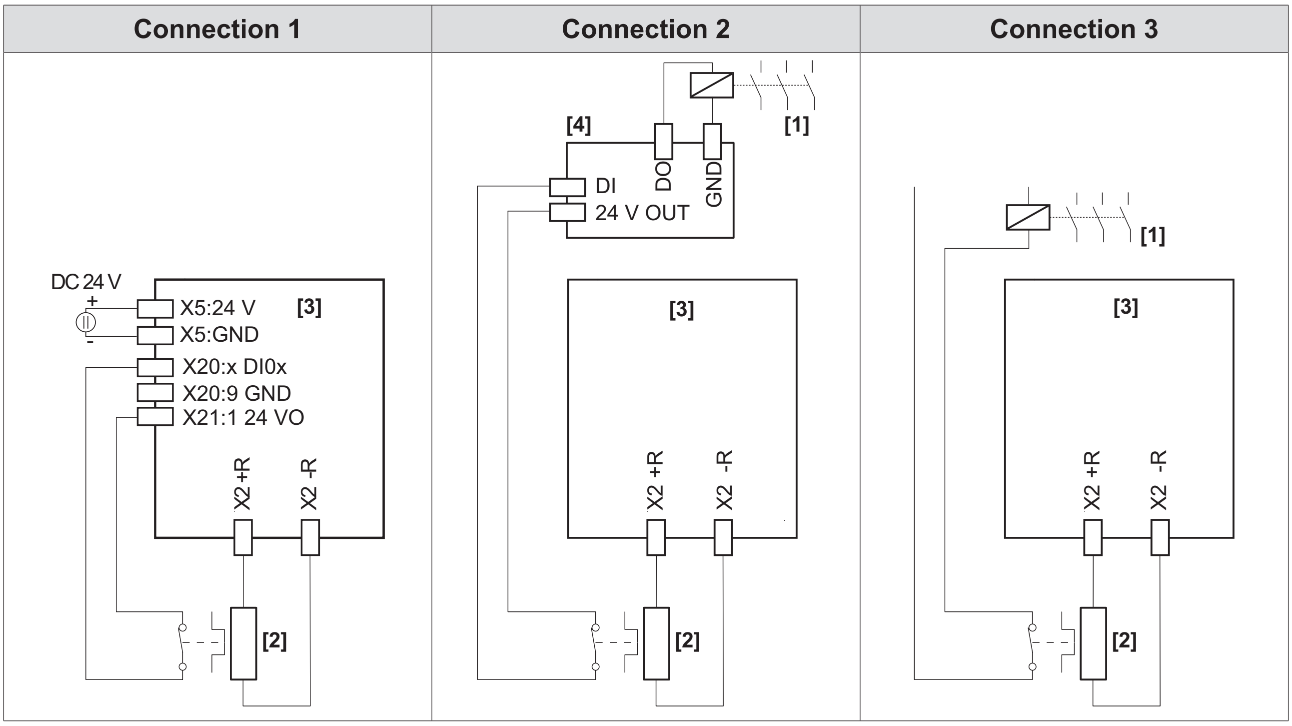
- With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.

- Connection 3
  - If the thermal circuit breaker trips, the signal directly affects the line contactor.
  - This does not require a response by the PLC.
  - If the thermal circuit breaker trips, there is no direct response in the application inverter.

*Inverters of size 4 and larger*

If a BW...-T braking resistor with internal temperature switch is used with these application inverters, there are 3 possible connections.




| | | | |
|---|---|---|---|
| [1] | Line contactor | [3] | Inverter |
| [2] | Braking resistor | [4] | PLC |

- Connection 1

  The digital input of the application inverter connected to the signal contact of the internal temperature switch must be parameterized to the function "External braking resistor error".

  - If the thermal circuit breaker trips, the signal is evaluated in the application inverter.
  - This does not require a response by the PLC.
  - It is not required to disconnect the supply system connection with an external switching device.
  - If an internal short circuit in the brake chopper is detected by the application inverter, the application inverter interrupts the energy supply by inhibiting the rectifier.

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– If the thermal circuit breaker trips, the application inverter switches all axis modules to "Output stage inhibit".

## INFORMATION

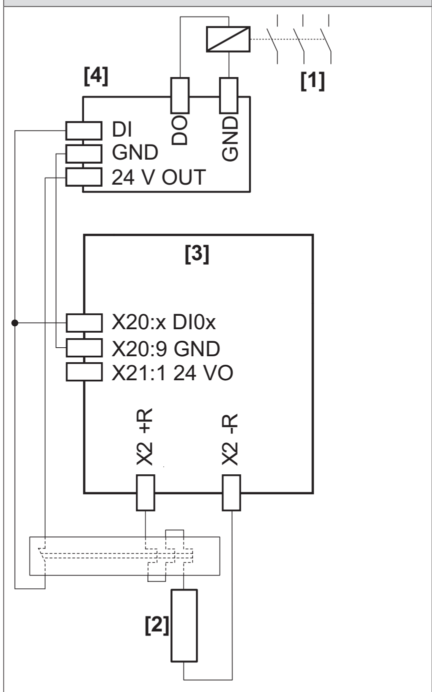
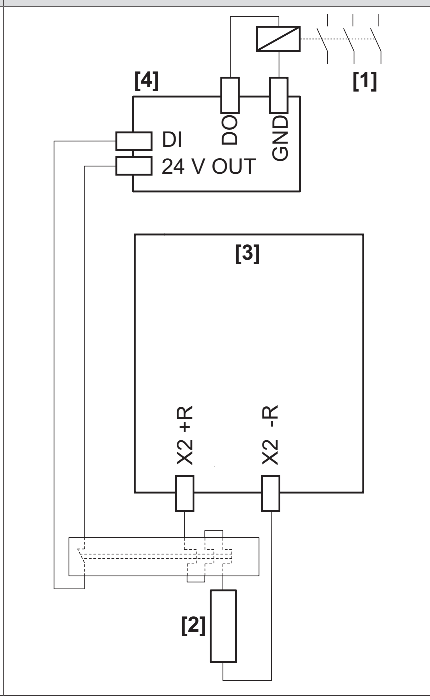
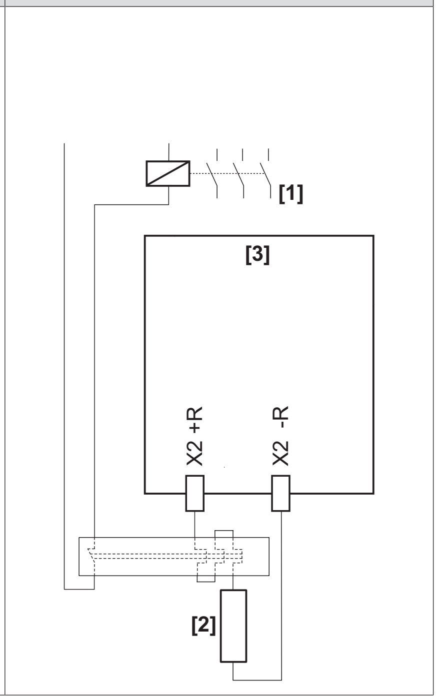
When using connection variant 1 (connection of braking resistor without line contactor), the application inverter must be supplied with external DC 24 V.

- Connection 2
  - If the thermal circuit breaker trips, the signal is evaluated only in the PLC.
  - If the thermal circuit breaker trips, the PLC must interrupt the power supply.
  - If the thermal circuit breaker trips, there is no direct response in the application inverter.
  - With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.
- Connection 3
  - If the thermal circuit breaker trips, the signal directly affects the line contactor.
  - This does not require a response by the PLC.
  - If the thermal circuit breaker trips, there is no direct response in the application inverter.

### External bimetallic relay

*Inverters of size 1 – 3*

If an external bimetallic relay is used with the application inverter, there are 3 possible connections.

| Connection 1 | Connection 2 | Connection 3 |
|---|---|---|
|  |  |  |







[1] Line contactor [3] Inverter

| | | | |
|---|---|---|---|
| [2] | Braking resistor | [4] | PLC |

Note that the reference potential GND of the digital inputs on the controller must be the same as the reference potential of the application inverter when connection 1 is used.

- Connection 1

  The digital input of the application inverter connected to the signal contact of the external bimetallic relay must be parameterized to the function "External braking resistor error".

  – If the thermal circuit breaker trips, the signal is evaluated in the application inverter and the PLC.

  – If the thermal circuit breaker trips, the PLC must interrupt the power supply.

  – If the thermal circuit breaker trips, the application inverter switches to "Output stage inhibit".

- Connection 2

  – If the thermal circuit breaker trips, the signal is evaluated only in the PLC.

  – If the thermal circuit breaker trips, the PLC must interrupt the power supply.

  – If the thermal circuit breaker trips, there is no direct response in the application inverter.

  – With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.

- Connection 3

  – If the thermal circuit breaker trips, the signal directly affects the line contactor.

  – This does not require a response by the PLC.

  – If the thermal circuit breaker trips, there is no direct response in the application inverter.

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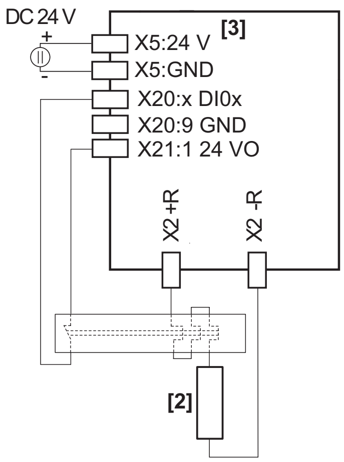
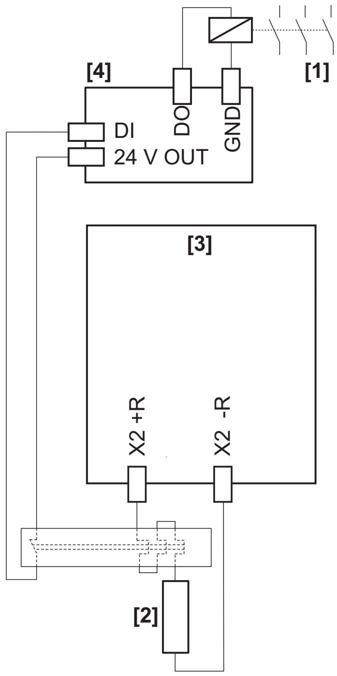
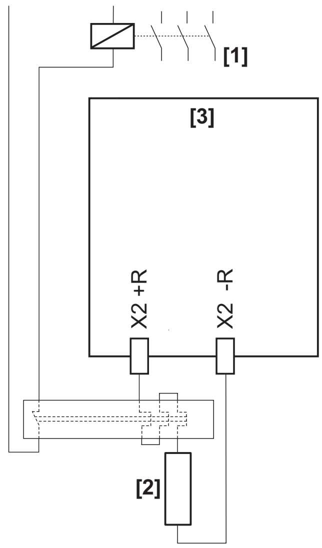
*Inverters of size 4 and larger*

If an external bimetallic relay is used with the application inverter, there are 3 possible connections.

<table>
<tr><th>Connection 1</th><th>Connection 2</th><th>Connection 3</th></tr>
<tr>
<td>
</td>
<td>
</td>
<td>
</td>
</tr>
</table>

| | | | |
|---|---|---|---|
| [1] | Line contactor | [3] | Inverter |
| [2] | Braking resistor | [4] | PLC |

- Connection 1

  The digital input of the application inverter connected to the signal contact of the external bimetallic relay must be parameterized to the function "External braking resistor error".

  – If the thermal circuit breaker trips, the signal is evaluated in the application inverter.

  – This does not require a response by the PLC.

  – It is not required to disconnect the supply system connection with an external switching device.

  – If the thermal circuit breaker trips, the application inverter switches to the operating state "Output stage inhibit".

  – If an internal short circuit in the brake chopper is detected by the application inverter, the application inverter interrupts the energy supply by inhibiting the rectifier.

## INFORMATION

When using connection variant 1 (connection of braking resistor without line contactor), the application inverter must be supplied with external DC 24 V.

- Connection 2

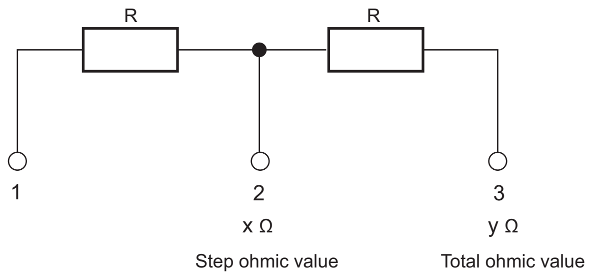
  – If the thermal circuit breaker trips, the signal is evaluated only in the PLC.

  – If the thermal circuit breaker trips, the PLC must interrupt the power supply.

  – If the thermal circuit breaker trips, there is no direct response in the application inverter.
  – With connection 2, it is possible that the PLC finishes the current travel cycle although the thermal circuit breaker has tripped. Only then is the power supply disconnected. In this case, the residual braking energy $W_{Rest} = P_{BRnom} \times 20$ s must not be exceeded.
- Connection 3
  – If the thermal circuit breaker trips, the signal directly affects the line contactor.
  – This does not require a response by the PLC.
  – If the thermal circuit breaker trips, there is no direct response in the application inverter.

### 8.9.3 Connection of the braking resistor with center tap

The following figure shows a braking resistor with center tap.




*9007202044405771*

[1] Stepped ohm value
[2] Total ohm value

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## 8.10 NF.. line filter

- Install the line filter close to the inverter but outside the minimum clearance for cooling. The line filter must not be heated by the exhaust air of the application inverter.
- No other consumers may be wired between the line filter and the inverter.
- The connection cable between the line filter and inverter does not have to be shielded.
- Limit the length of the cable between the line filter and the inverter to the required length.
- No switching is allowed between the line filter and the inverter.

## 8.11 EMC-compliant installation

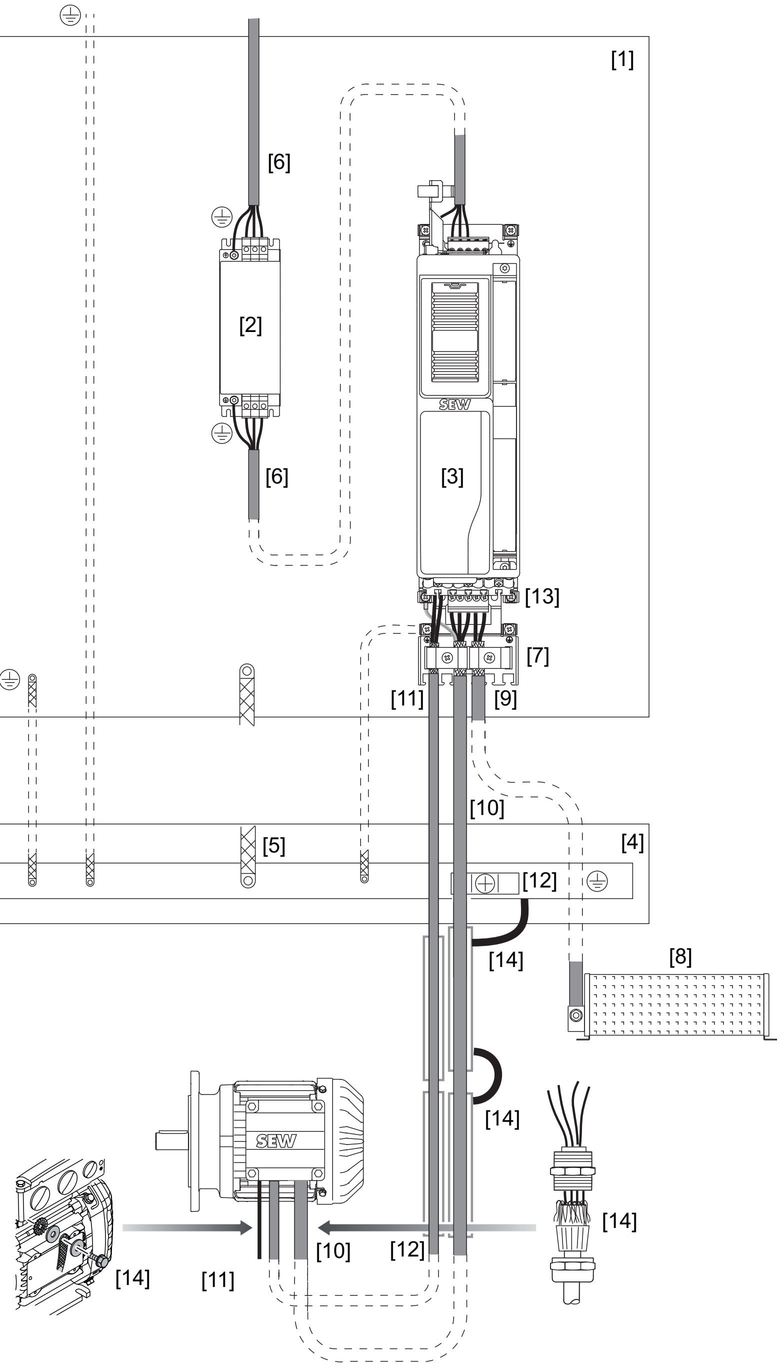
The information in this chapter will help you to optimize the system with respect to electromagnetic compatibility, or to eliminate already existing EMC interferences.

The notes in this chapter are not legal regulations, but rather recommendations for improving the electromagnetic compatibility of your plant.

For further notes on EMC-compliant installation, refer to the publication Drive Engineering – Practical Implementation edition "EMC in Drive Engineering – Basic Theoretical Principles – EMC-Compliant Installation in Practice".

Compliance with limit classes C1 and C2 has been tested in a CE-typical drive system. SEW-EURODRIVE can provide detailed information on request.

### 8.11.1 Installation example




*19508519307*

| | |
|---|---|
| [1] Galvanized mounting plate | [8] Braking resistor |
| [2] Line filter | [9] Braking resistor cable |
| [3] Inverter | [10] Motor cable |
| [4] PE busbar | [11] Brake cable |
| [5] HF connection of PE busbar/ mounting plate | [12] Grounding clamp |
| [6] Supply system cable | [13] Electronics shield plate |
| [7] Power shield plate | [14] HF connection |

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### 8.11.2 Control cabinet

Use control cabinets with electrically conductive (galvanized) mounting plates. If several mounting plates are used, connect them in such a way that they are conductive over a large area.

Mount the line filter and inverter on a shared mounting plate if possible. Make sure they are connected over a large area and with good conductivity.

### 8.11.3 HF equipotential bonding in the system

Make sure that there is a suitable equipotential bonding between the system, the control cabinet, the machine structure, the cable ducts, and the drives.

Connect the individual sections together in an HF-compatible manner.

From an electrical safety perspective, the PE busbar is the star point. However, the PE connection does not replace either the HF grounding or the shielding.

In terms of EMC, it is advantageous if the mounting plate is used as a star point with respect to HF equipotential bonding.

Perform the following measures for a suitable HF equipotential bonding:

- Connect the PE busbar to the mounting plate in an HF-compatible manner.
- Connect the sheet metal cable ducts to the control cabinet in an HF-compatible manner.
- Connect the cable ducts to the mounting plate in the control cabinet using a high frequency litz wire.
- Connect the parts of the sheet metal cable ducts together in an HF-compatible manner.
- Connect the sheet metal cable ducts to the gearmotor in an HF-compatible manner.

### 8.11.4 Cable installation

Route the power cables, such as the motor cable and the brake cable, separately from the supply system cable and the control cables.

Route all cables as closely to the reference potential as possible, e.g. the mounting plate.

Keep all cables as short as possible. Avoid spare loops.

### 8.11.5 Supply system cable connection

The supply system cable can be connected to the line choke and/or line filter using twisted unshielded single conductors or using unshielded cables.

If necessary, shielded cables may improve EMC.

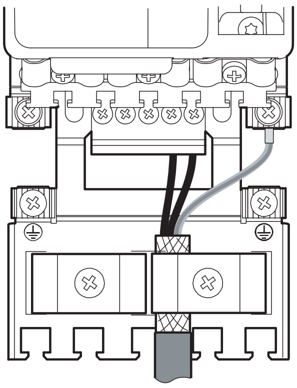
### 8.11.6 Line filter connection

Limit the length of the connection lead between the line filter and the inverter to the absolute minimum needed.

You must never route filtered and unfiltered cables together. For this reason, route incoming and outgoing line filter cables separately.

### 8.11.7 Braking resistor connection

For connecting braking resistors, use two closely twisted cores or a shielded power cable. In the case of shielded cables, connect the braided shields over the entire circumference. Use the designated shield plates on the basic device to connect the shield.



*19508521739*

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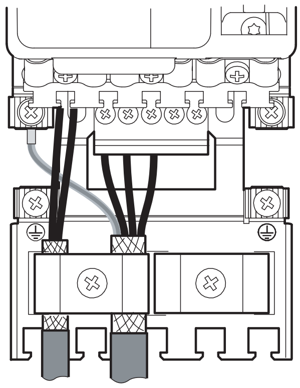
### 8.11.8 Motor and brake connection

Use shielded motor cables only. Connect the braided shield of the motor cable at both ends over its entire circumference to the power shield plate at the inverter.

Provide shielded cables for the brake supply. The shield of the brake cable can be connected to the power shield plate at the inverter.

If the motor cable and brake cable are combined in a shared cable, the cable must have an inner shield separating the brake cables from the motor cores. The cables also possess an overall shield.



*19508524171*

SEW-EURODRIVE recommends the use of prefabricated cables.

In the event of especially high EMC requirements, an additional connection point for the shield is recommended. To limit the emitted interference, the motor shield can additionally be grounded to the control cabinet outlet using commercial installation materials (grounding clamps or EMC screw fittings).

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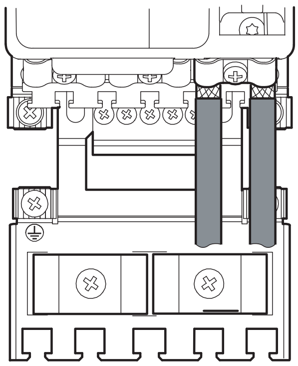
### 8.11.9 Control cable connection

Ensure that the digital inputs are connected with unshielded individual cores. Shielded cables increase the EMC. Use the designated shield plates to connect the shield.

For routing outside of the control cabinet, you must use shielded cables.



*19508526603*

### 8.11.10 Encoder connection

SEW-EURODRIVE recommends the use of prefabricated encoder cables.

The shield of prefabricated cables from SEW-EURODRIVE is connected via the connector.

### 8.11.11 Shielding connection

Ensure that there is an HF-compatible shield connection, e.g. by using grounding clamps or EMC cable glands, so that the braided shield has a large connection surface.

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## 8.12 Terminal assignment of basic device

**INFORMATION**

Reference potentials inside the device.

The device-internal reference potential is designated as GND in the following table.

All reference potentials GND are internally connected to PE.

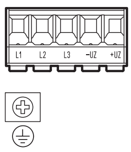
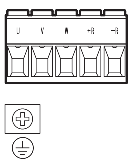
**INFORMATION**

The assignment "Reserved" means that no cable may be connected to this connection.

**INFORMATION**

The technical data for the power and control electronics connections is provided in chapter "Technical data".

### 8.12.1 Sizes 1 – 3

| Illustration | Terminal | Connection | Assignment |
|---|---|---|---|
|  | X1:L1 | L1 | Line connection |
| | X1:L2 | L2 | |
| | X1:L3 | L3 | |
| | X1:-$U_Z$ | -$U_Z$ | DC link connection |
| | X1:+$U_Z$ | +$U_Z$ | |
| | ⏚ | PE | PE connection |
|  | X2:U | U | Motor connection |
| | X2:V | V | |
| | X2:W | W | |
| | X2:+R | +R | Braking resistor connection |
| | X2:-R | -R | |
| | ⏚ | PE | PE connection |

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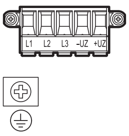
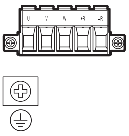
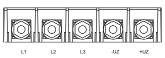
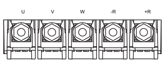
### 8.12.2 Size 4

| Illustration | Terminal | Connection | Assignment |
|---|---|---|---|
|  | X1:L1 | L1 | Line connection |
| | X1:L2 | L2 | |
| | X1:L3 | L3 | |
| | X1:-$U_Z$ | -$U_Z$ | DC link connection |
| | X1:+$U_Z$ | +$U_Z$ | |
| | ⏚ | PE | PE connection |
|  | X2:U | U | Motor connection |
| | X2:V | V | |
| | X2:W | W | |
| | X2:+R | +R | Braking resistor connection |
| | X2:-R | -R | |
| | ⏚ | PE | PE connection |

### 8.12.3 Sizes 5 – 8

**INFORMATION**

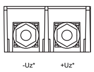
Size 8 is not yet available.

| Illustration | Terminal | Connection | Assignment |
|---|---|---|---|
|  | X1:L1 | L1 | Line connection |
| | X1:L2 | L2 | |
| | X1:L3 | L3 | |
| | X1:-$U_Z$ | -$U_Z$ | DC link connection |
| | X1:+$U_Z$ | +$U_Z$ | |
| | ⏚ | PE | PE connection |
|  | X2:U | U | Motor connection |
| | X2:V | V | |
| | X2:W | W | |
| | X2:+R | +R | Braking resistor connection |
| | X2:-R | -R | |
| | ⏚ | PE | PE connection |

### 8.12.4 Sizes 7 – 8

**INFORMATION**

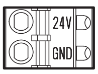
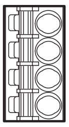
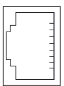
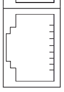
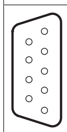
Size 8 is not yet available.

| Illustration | Terminal | Connection | Assignment |
|---|---|---|---|
|  | $-U_Z$* | $-U_Z$ | Connection in front of DC link choke |
| | $+U_Z$* | $+U_Z$ | |

### 8.12.5 Sizes 1 – 8

**INFORMATION**

Size 8 is not yet available.

| Illustration | Terminal | Connection | Assignment |
|---|---|---|---|
|  | X5:24 V | $V_I$24 V | DC 24 V supply voltage |
| | X5:GND | GND | Reference potential |
|  GND TF1 GND DBO | X10:DB0<br>X10:DB00 | DB00 | Brake control |
| | X10:GND | GND | Reference potential |
| | X10:TF1 | TF1 | Sensor input for temperature evaluation of the motor |
| | X10:GND | GND | Reference potential |
|  X30 OUT | X30 OUT | | EtherCAT®/SBus$^{PLUS}$ system bus |
|  X30 IN | X30 IN | | |
|  | X32 | | SEW-EURODRIVE Service interface<br>Interface for keypad |

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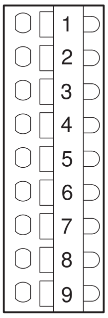
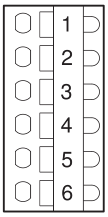
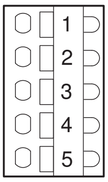
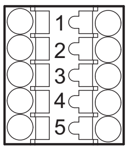
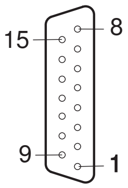
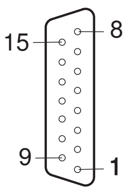
| Illustration | Terminal | Connection | Assignment |
|---|---|---|---|
|  | X20:1 | DI00 | Digital input 1, with fixed assignment "Output stage enable" |
| | X20:2 | DI01 | Digital input 2, fixed setpoints – positive direction of rotation |
| | X20:3 | DI02 | Digital input 3, fixed setpoints – negative direction of rotation |
| | X20:4 | DI03 | Digital input 4, fixed speed setpoint bit 0 |
| | X20:5 | DI04 | Digital input 5, fixed speed setpoint bit 1 |
| | X20:6 | DI05 | Digital input 6, fault reset |
| | X20:7 | Reserved | – |
| | X20:8 | Reserved | – |
| | X20:9 | GND | Reference potential |
|  | X21:1 | +24 V | DC 24 V voltage output |
| | X21:2 | DO00 | Digital output 1, operational |
| | X21:3 | DO01 | Digital output 2, output stage enable |
| | X21:4 | DO02 | Fault at digital output 3 |
| | X21:5 | DO03 | Digital output 4, STO active |
| | X21:6 | GND | Reference potential |
|  | X22:1 | DOR-C | Shared relay contact |
| | X22:2 | DOR-NO | NO contact |
| | X22:3 | DOR-NC | NC contact |
| | X22:4 | Reserved | – |
| | X22:5 | GND | GND |
|  | X6:1 | F_STO_P1 | DC +24 V input F_STO_P1 |
| | X6:2 | F_STO_M | DC 0 V input F_STO_M |
| | X6:3 | F_STO_P2 | DC +24 V input F_STO_P2 |
| | X6:4 | GND | Reference potential |
| | X6:5 | 24 V STO_OUT | $U_{out}$ = DC 24 V supply of F_STO_P1 and F_STO_P2 |

### 8.12.6 X15: Motor encoder – resolver

| Illustration | Terminal | Connection | Assignment |
|---|---|---|---|
|   | X15:1 | S2 (sin+) | Signal track |
| | X15:2 | S1 (cos+) | Signal track |
| | X15:3 | Reserved | - |
| | X15:4 | Reserved | - |
| | X15:5 | R1 (REF+) | Supply voltage of resolver |
| | X15:6 | -TEMP_M | Motor temperature evaluation |
| | X15:7 | Reserved | - |
| | X15:8 | Reserved | - |
| | X15:9 | S4 (sin-) | Signal track |
| | X15:10 | S3 (cos-) | Signal track |
| | X15:11 | Reserved | - |
| | X15:12 | Reserved | - |
| | X15:13 | R2 (REF-) | Supply voltage of resolver |
| | X15:14 | +TEMP_M | Motor temperature evaluation |
| | X15:15 | Reserved | - |

### 8.12.7 X15: Motor encoder – sin/cos encoder

| Illustration | Terminal | Connection | Assignment |
|---|---|---|---|
|   | X15:1 | A (cos+) (K1) | Signal track A (cos+) (K1) |
| | X15:2 | B (sin+) (K2) | Signal track B (sin+) (K2) |
| | X15:3 | C (K0) | Signal track C (K0) |
| | X15:4 | DATA+[1] | Data cable for electronic nameplate |
| | X15:5 | Reserved | – |
| | X15:6 | -TEMP_M | Motor temperature evaluation |
| | X15:7 | Reserved | – |
| | X15:8 | GND | Reference potential |
| | X15:9 | $\overline{A}$ (cos -) ($\overline{K1}$) | Negated signal track $\overline{A}$ (cos-) ($\overline{K1}$) |
| | X15:10 | $\overline{B}$ (sin-) ($\overline{K2}$) | Negated signal track $\overline{B}$ (sin-) ($\overline{K2}$) |
| | X15:11 | $\overline{C}$ ($\overline{K0}$) | Negated signal track $\overline{C}$ ($\overline{K0}$) |
| | X15:12 | DATA-[2] | Data cable for electronic nameplate |
| | X15:13 | $V_{S24VG}$ | Encoder supply 24 V |
| | X15:14 | +TEMP_M | Motor temperature evaluation |
| | X15:15 | $V_{S12VG}$ | Encoder supply 12 V |

1) For encoders from SEW-EURODRIVE with electronic nameplate.

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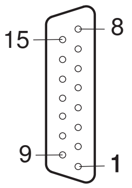
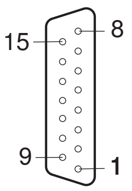
### 8.12.8 X15: Motor encoder – TTL encoder

| Illustration | Terminal | Connection | Assignment |
|---|---|---|---|
|  | X15:1 | A (K1) | Signal track A (K1) |
| | X15:2 | B (K2) | Signal track B (K2) |
| | X15:3 | C (K0) | Signal track C (K0) |
| | X15:4 | Reserved | – |
| | X15:5 | Reserved | – |
| | X15:6 | -TEMP_M | Motor temperature evaluation |
| | X15:7 | Reserved | – |
| | X15:8 | GND | Reference potential |
| | X15:9 | $\overline{A}$ ($\overline{K1}$) | Negated signal track $\overline{A}$ ($\overline{K1}$) |
| | X15:10 | $\overline{B}$ ($\overline{K2}$) | Negated signal track $\overline{B}$ ($\overline{K2}$) |
| | X15:11 | $\overline{C}$ ($\overline{K0}$) | Negated signal track $\overline{C}$ ($\overline{K0}$) |
| | X15:12 | Reserved | – |
| | X15:13 | $V_{S24VG}$ | Encoder supply 24 V |
| | X15:14 | +TEMP_M | Motor temperature evaluation |
| | X15:15 | $V_{S12VG}$ | Encoder supply 12 V |

### 8.12.9 X15: HIPERFACE® motor encoder, SEW-EURODRIVE encoder

| Illustration | Terminal | Connection (RS485) | Assignment |
|---|---|---|---|
|  | X15:1 | A (cos+) (K1) | Signal track A (cos+) (K1) |
| | X15:2 | B (sin+) (K2) | Signal track B (sin+) (K2) |
| | X15:3 | Reserved | – |
| | X15:4 | DATA+ | Data line RS485 |
| | X15:5 | Reserved | – |
| | X15:6 | -TEMP_M | Motor temperature evaluation |
| | X15:7 | Reserved | – |
| | X15:8 | GND | Reference potential |
| | X15:9 | $\overline{A}$ (cos -) ($\overline{K1}$) | Negated signal track $\overline{A}$ (cos-) ($\overline{K1}$) |
| | X15:10 | $\overline{B}$ (sin-) ($\overline{K2}$) | Negated signal track $\overline{B}$ (sin-) ($\overline{K2}$) |
| | X15:11 | Reserved | – |
| | X15:12 | DATA- | Signal cable |
| | X15:13 | $V_{S24VG}$ | Encoder supply 24 V |
| | X15:14 | +TEMP_M | Motor temperature evaluation |
| | X15:15 | $V_{S12VG}$ | Encoder supply 12 V |

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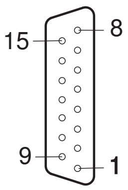
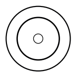
### 8.12.10 X15: SEW-EURODRIVE encoder with RS485 interface

| Illustration | Terminal | Connection (RS485) | Assignment |
|---|---|---|---|
|   | X15:1 | A (cos+) (K1) | Signal track A (cos+) (K1) |
| | X15:2 | B (sin+) (K2) | Signal track B (sin+) (K2) |
| | X15:3 | Reserved | – |
| | X15:4 | DATA+ | Data line RS485 |
| | X15:5 | Reserved | – |
| | X15:6 | -TEMP_M | Motor temperature evaluation |
| | X15:7 | Reserved | – |
| | X15:8 | GND | Reference potential |
| | X15:9 | $\overline{A}$ (cos -) ($\overline{K1}$) | Negated signal track $\overline{A}$ (cos-) ($\overline{K1}$) |
| | X15:10 | $\overline{B}$ (sin-) ($\overline{K2}$) | Negated signal track $\overline{B}$ (sin-) ($\overline{K2}$) |
| | X15:11 | Reserved | – |
| | X15:12 | DATA- | Signal cable |
| | X15:13 | $V_{S24VG}$ | Encoder supply 24 V |
| | X15:14 | +TEMP_M | Motor temperature evaluation |
| | X15:15 | $V_{S12VG}$ | Encoder supply 12 V |

### 8.12.11 X16: MOVILINK® DDI interface

| Illustration | Terminal | Connection | Assignment |
|---|---|---|---|
|  | X16 | Coaxial connection | MOVILINK® DDI |

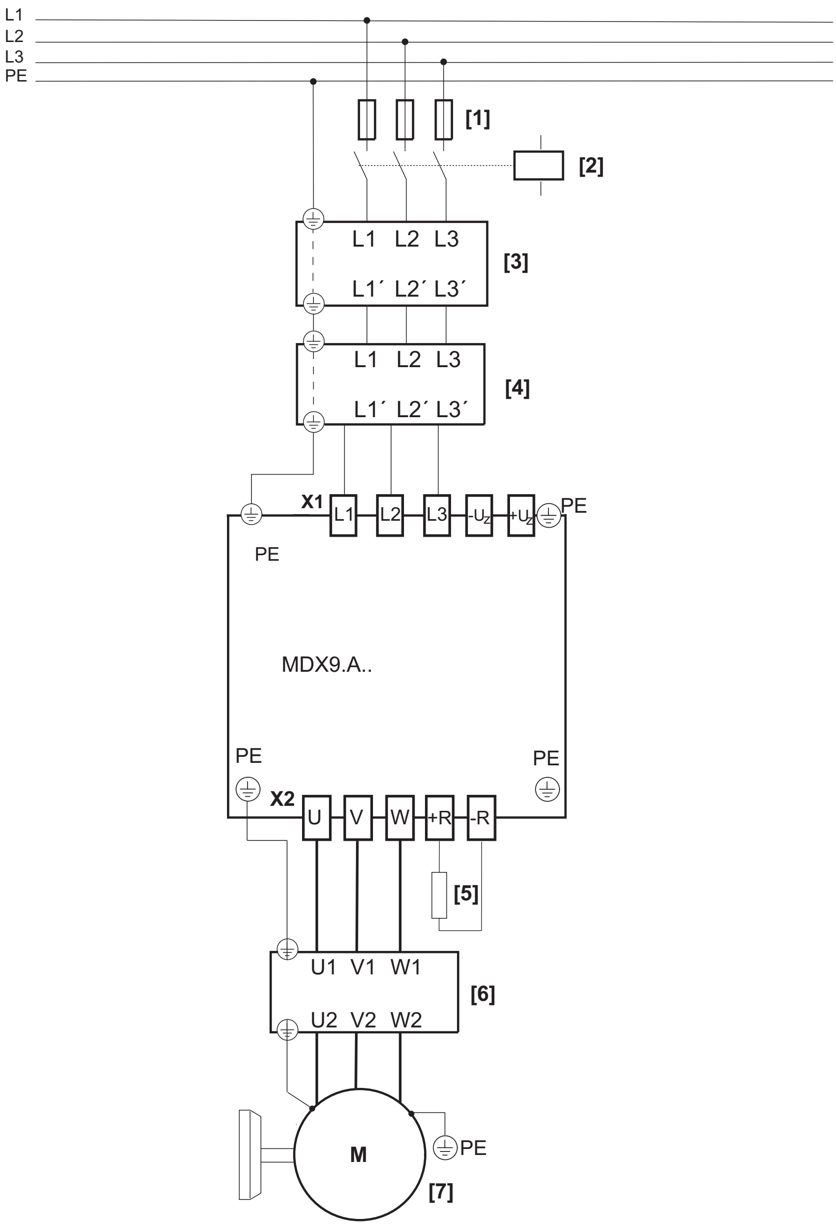
## 8.13 Wiring diagrams

### 8.13.1 General information on the wiring diagrams

- For technical data of the power electronics and the control electronics, refer to chapter "Technical data".
- For the terminal assignment and connections, refer to chapter "Terminal assignment of basic device" (→ 🗎 289).

### 8.13.2 Power connection

**Wiring of the power connections with line contactor, line choke, line filter, and output choke**




*63050408662092427*

| | | | |
|---|---|---|---|
| [1] | Fuses | [5] | Braking resistor (optional) |
| [2] | Line contactor | [6] | Output choke and/or output filter (both optional) |
| [3] | Line choke (optional) | [7] | Motor |
| [4] | Line filter (optional) | | |

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#### Wiring of the power connections with line choke, line filter, output choke, without line contactor

Refer to the table in chapter "Line contactor" (→ 🗎 254) to find out which application inverters can be operated without a line contactor.

## NOTICE

Operation without line contactor.

If the required measures are not taken, operation of an application inverter with connected braking resistor without line contactor may result in severe damage to property.

Refer to the chapter "Line contactor" (→ 🗎 254) for the necessary measures.

## INFORMATION

For line connection without line contactor, the temperature evaluation of the braking resistor must be ensured via a digital input on the application inverter. The connected digital input must be parameterized for monitoring the braking resistor temperature evaluation.

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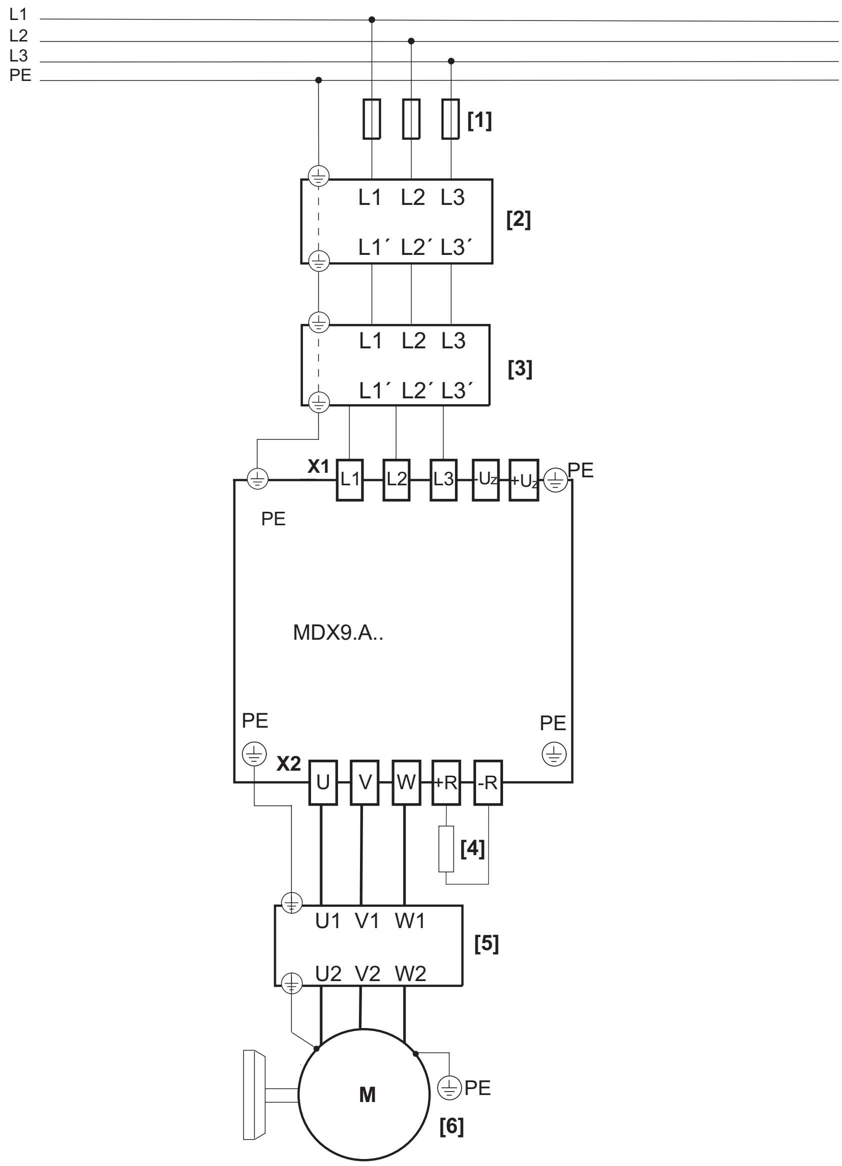
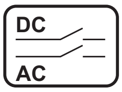



*54043209407696267*

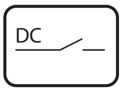
| | | | |
|---|---|---|---|
| [1] | Fuses | [4] | Braking resistor (optional) |
| [2] | Line choke (optional) | [5] | Output choke and/or output filter (both optional) |
| [3] | Line filter (optional) | [6] | Motor |

### 8.13.3 Brake control

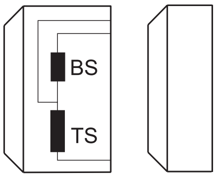
Key:



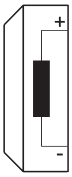

Cut-off in the DC and AC circuits
(rapid brake application)




Cut-off in the DC circuit




Brake
BS = Accelerator coil
TS = Coil section




DC brake with one brake coil


Auxiliary terminal strip in terminal box

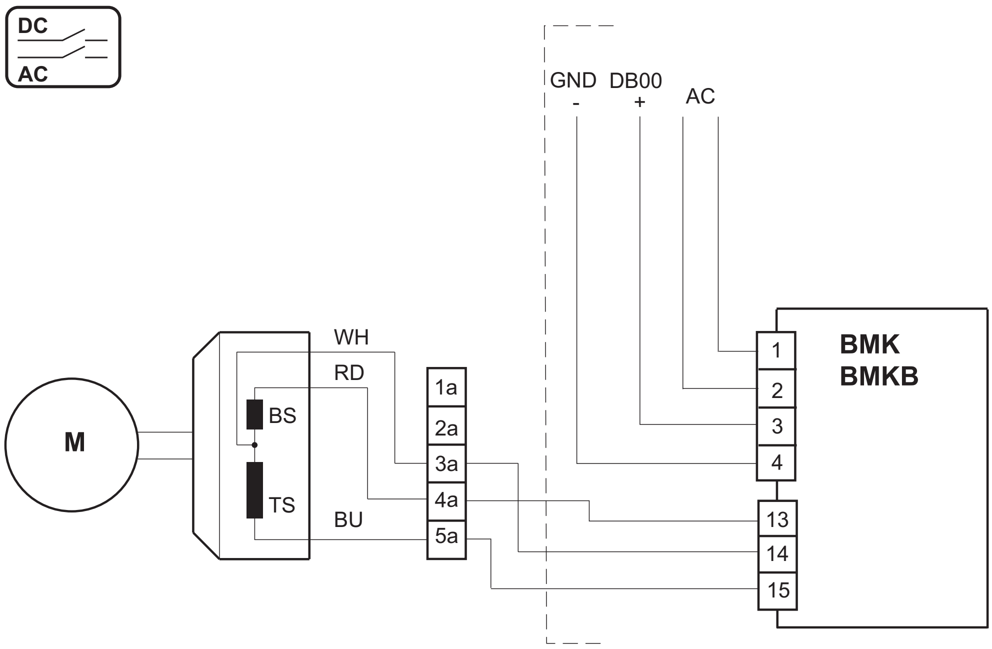
Control cabinet limit

| | |
|---|---|
| **WH** | White |
| **RD** | Red |
| **BU** | Blue |

## INFORMATION

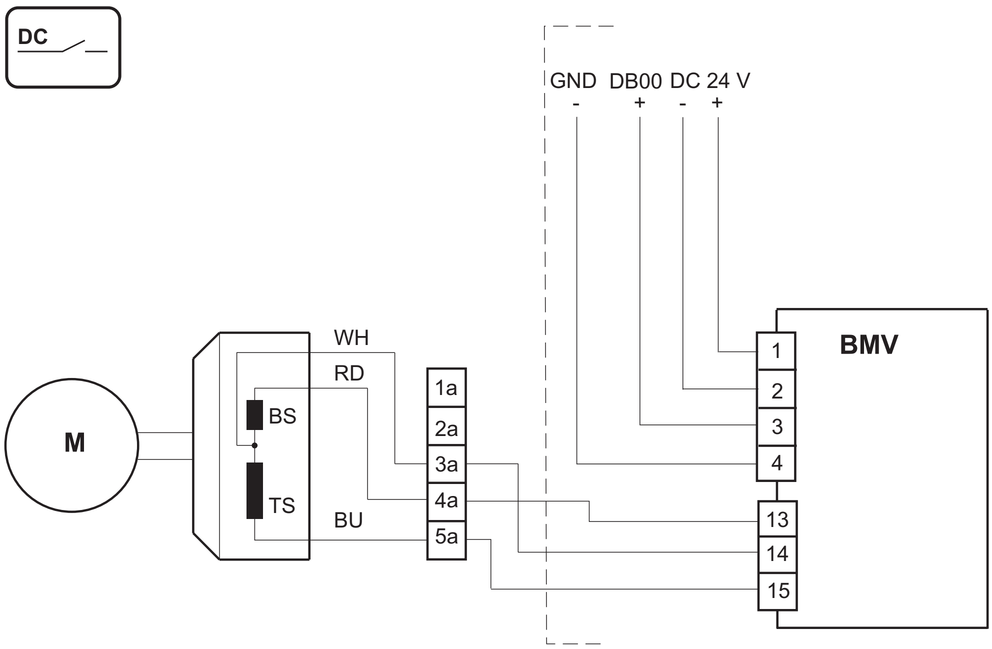
The selection of the brake control and the shown connection diagrams only represent one of the many possibilities. Observe the catalogs and operating instructions of the motors for more information and installation notes.

**BMK. brake control**




*14324495755*

**BMV brake control – 2 coils**




*14373482507*

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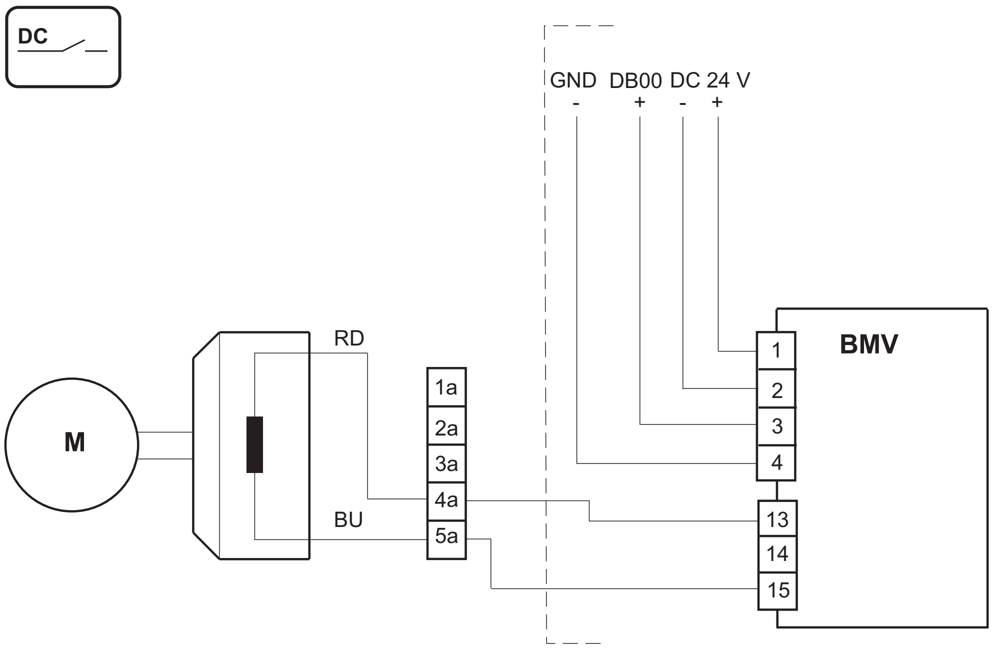
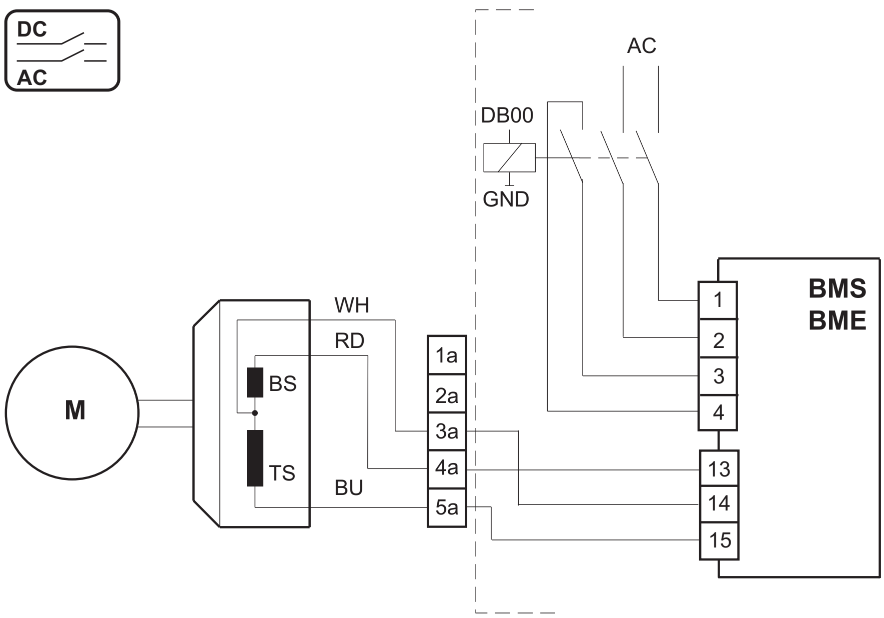
**BMV brake control – 1 coil**




14373494923

**BMS, BME brake control**




14324554891

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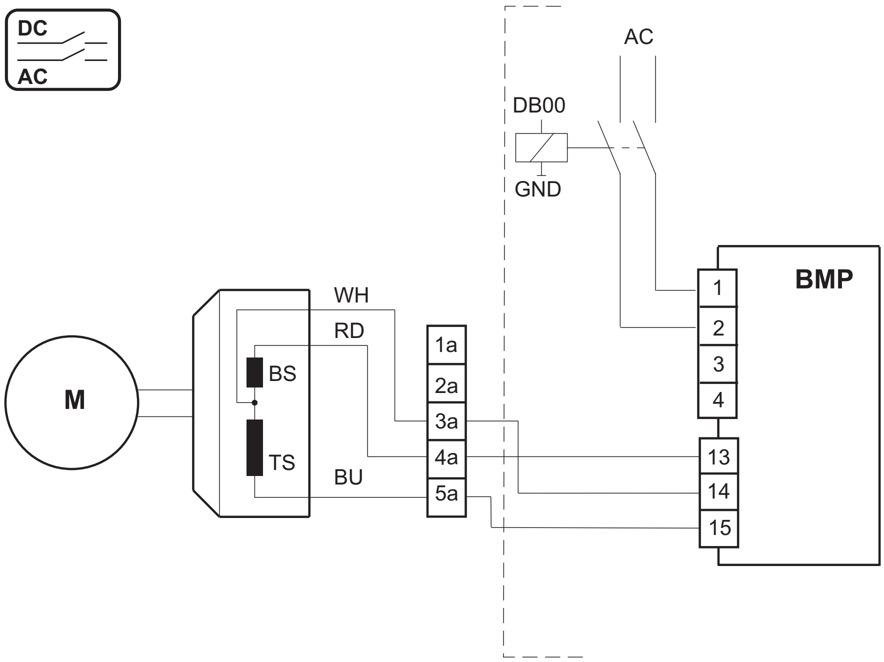
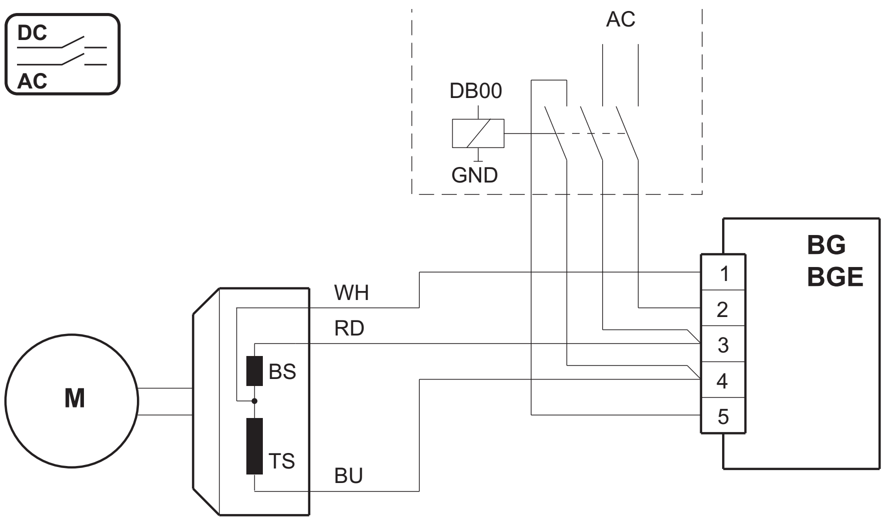
### BMP brake control



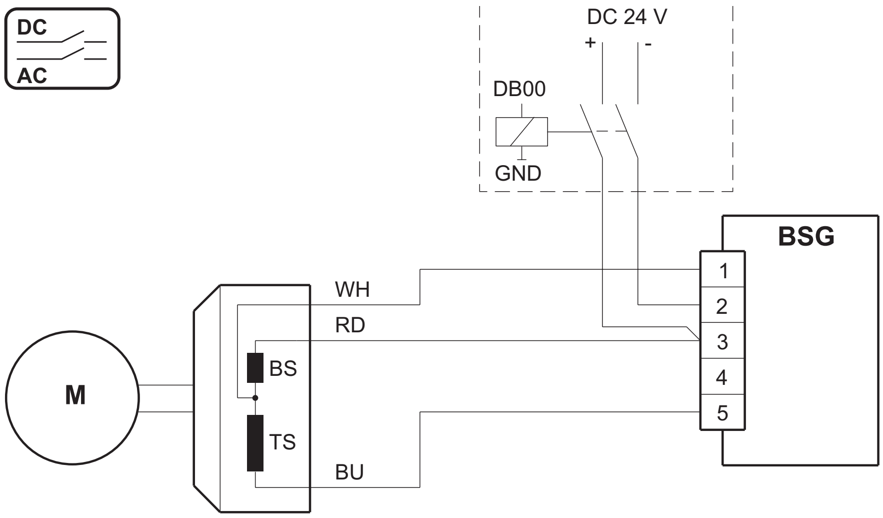

*14324544523*

### BG, BGE brake control



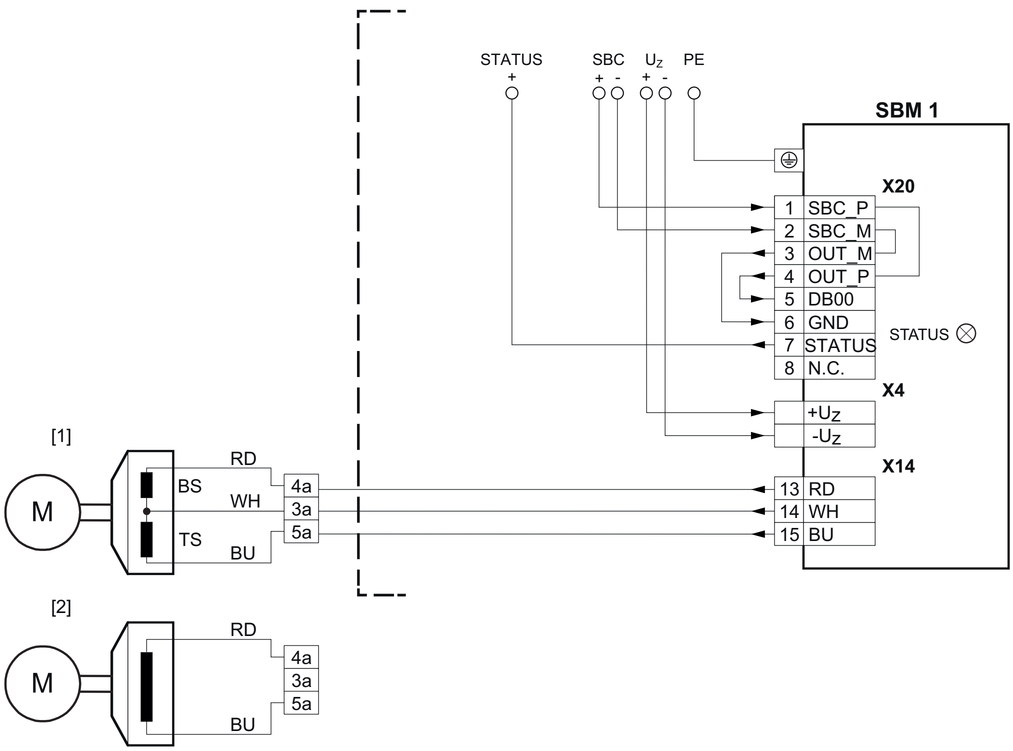

*14324565259*

### BSG brake control




14324597131

### Brake control SBM with 1 control cable

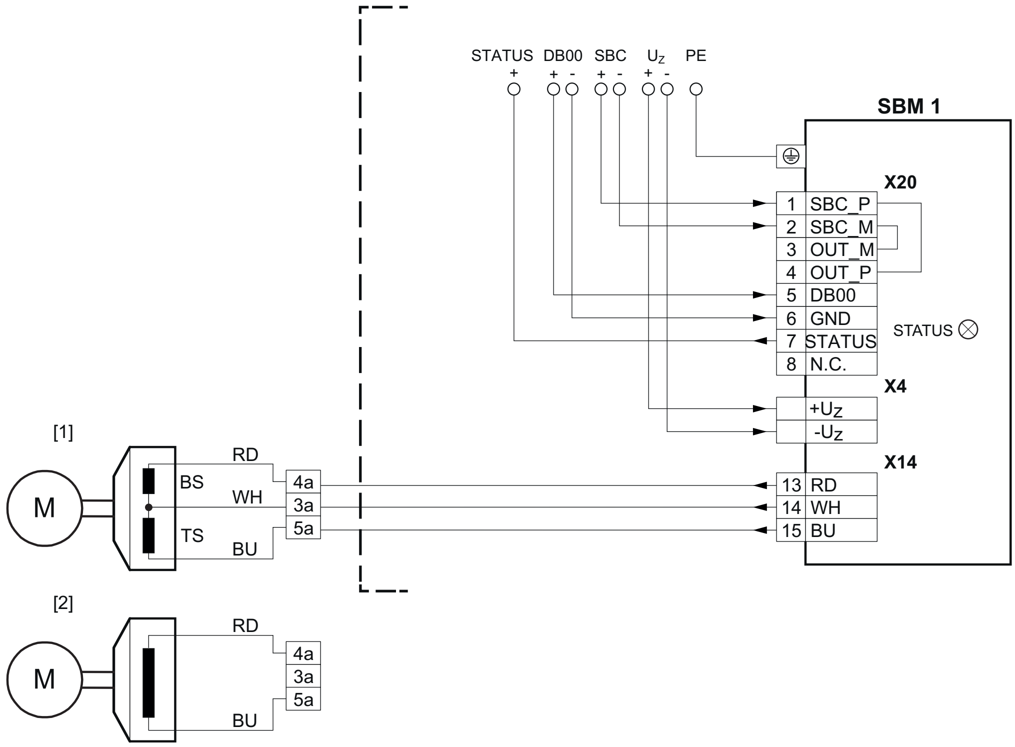



9007232120094731

[1] Connection of the brake with 3-wire technology (standard)

[2] Connection of the brake with 2-wire technology (optional). In this case, there is no connection from terminal X14:14 of the brake module to terminal 3a of the auxiliary terminal strip.

### Brake control SBM with 2 control cables




*9007232118783115*

[1] Connection of the brake with 3-wire technology (standard)

[2] Connection of the brake with 2-wire technology (optional). In this case, there is no connection from terminal X14:14 of the brake module to terminal 3a of the auxiliary terminal strip.

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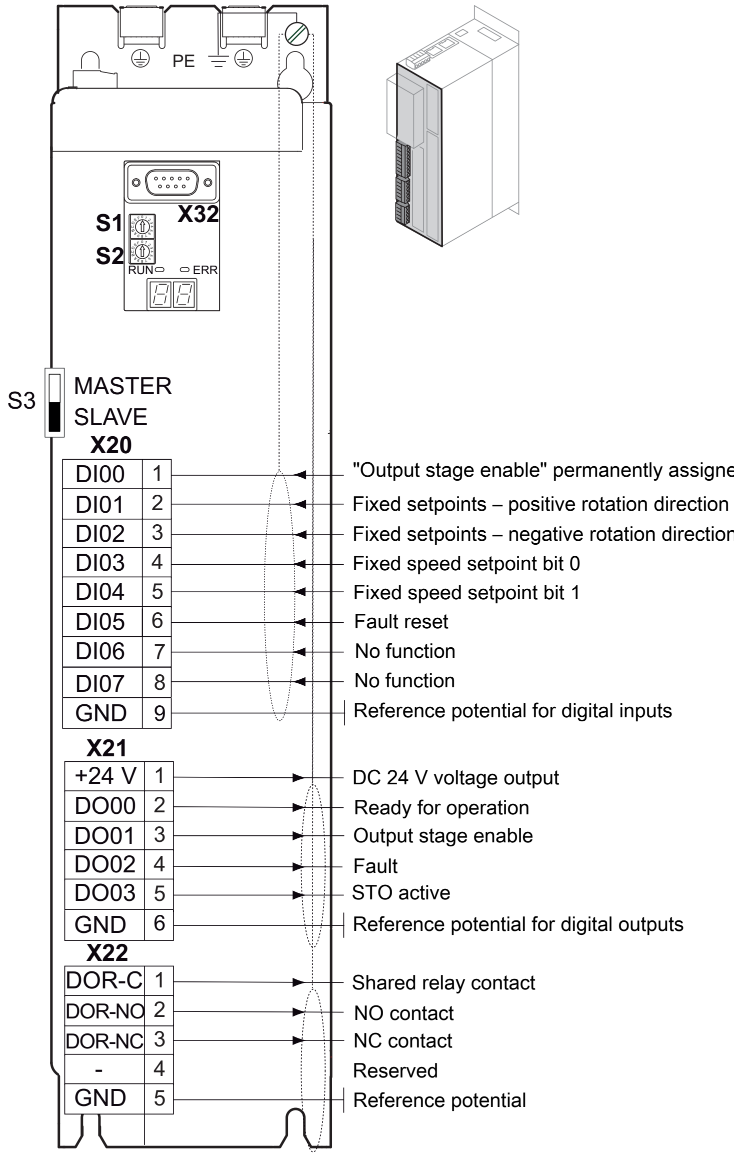
### 8.13.4 Electronics connection

For the assignment of the signal terminals and connections, refer to chapter "Terminal assignment of basic device" (→ 🗎 289).

#### Wiring of the control electronics – front

The assignment of the digital inputs and outputs shown here is the factory setting.




*18014424112917771*

| | |
|---|---|
| S3 | Module bus operating mode |
| X20 | Digital inputs |
| X21 | Digital outputs |
| X22 | Isolated relay contact |

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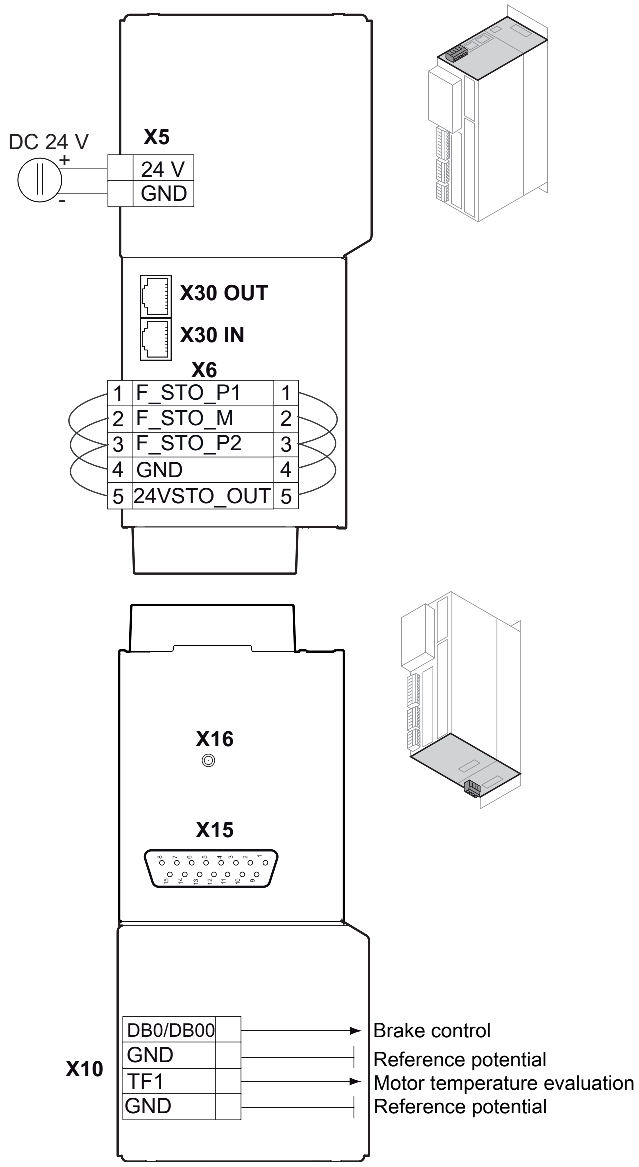
### Wiring of the control electronics – top and bottom

The assignment of the digital inputs and outputs shown here is the factory setting.

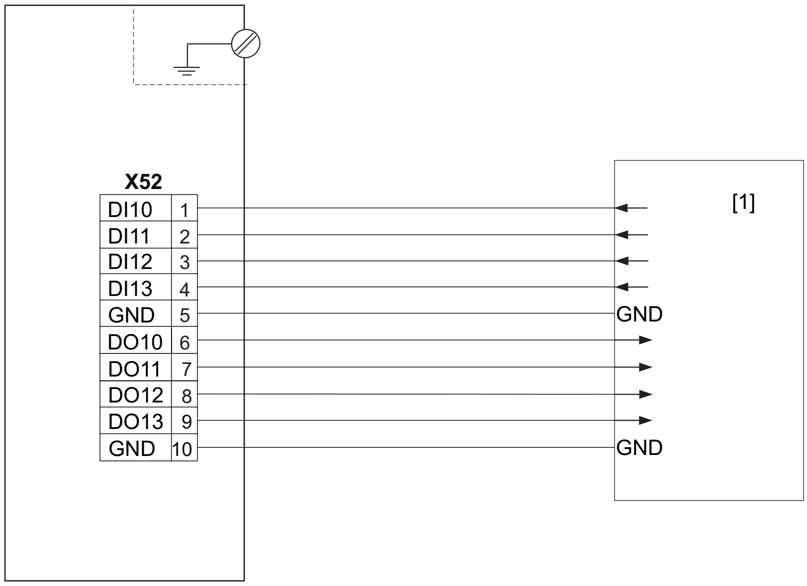



*9007223162791691*

| | |
|---|---|
| X5 | 24 V supply voltage |
| X6 | Connection for Safe Torque Off (STO)<br>With installed CS.A card, the cable bridges are removed at the factory.<br>If no CS.A card is installed upon delivery, the cable bridges are installed at the factory. |
| X10 | Connection of brake control and motor temperature monitoring |
| X15 | Motor encoder connection |
| X16 | Connection of MOVILINK® DDI digital motor integration |
| X30 | SBus$^{PLUS}$/EtherCAT® system bus |

### 8.13.5 Connection diagram CIO21A and CID21A input/output card

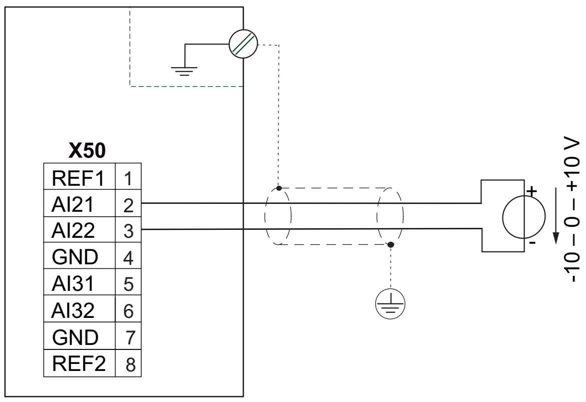
**Digital inputs and outputs**




*18014412829087243*

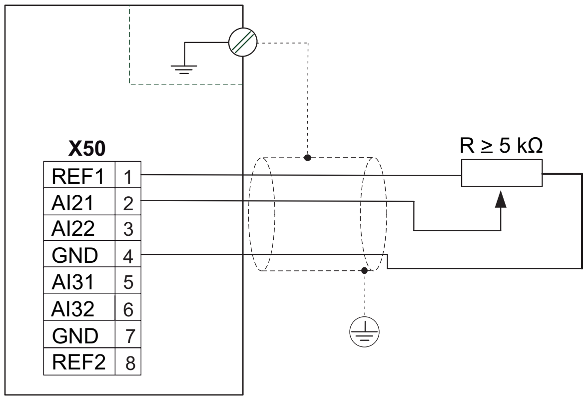
[1] Higher-level controller

**Voltage input**




*9007213575393675*

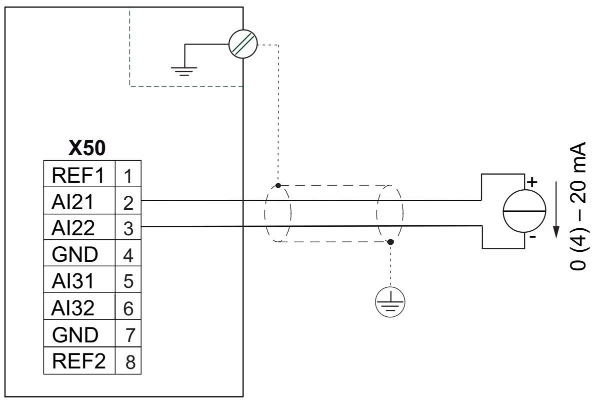
Connection to the terminals AI31 and AI32 is carried out analogously to the connection to the terminals AI21 and AI22 shown in the wiring diagrams.




*18014412830137099*

Connection to the terminals REF2 and AI31 is carried out analogously to the connection to the terminals REF1 and AI21 shown in the wiring diagrams.

**Current input**




*9007213575398539*

Observe the switch position of "DIP switch S50" (→ 🗎 267) when activating the current input.

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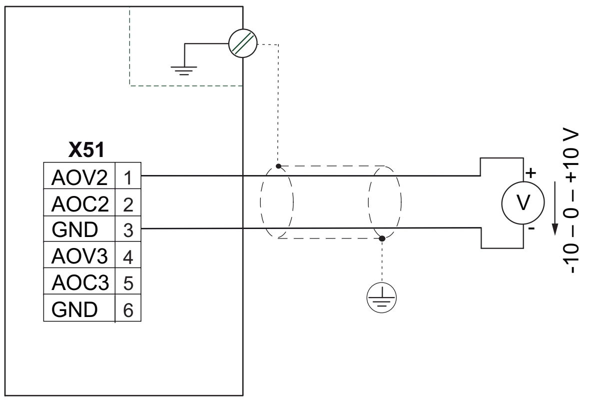
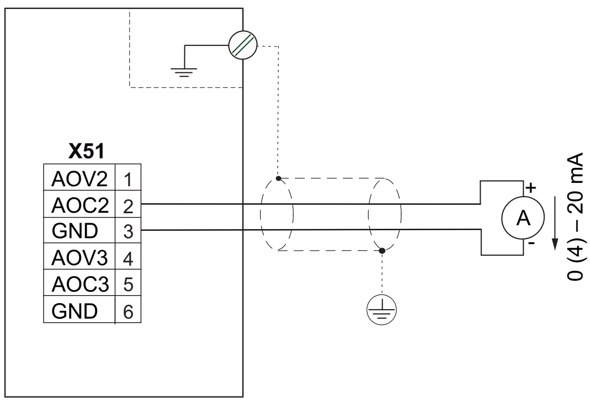
**Voltage output**




*18014412830141963*

Connection to the terminals AOV2 and GND is carried out analogously to the connection to the terminals AOV1 and GND shown in the wiring diagram.

**Current output**




*18014412830272395*

Connection to the terminals AOC2 and GND is carried out analogously to the connection to the terminals AOC1 and GND shown in the wiring diagram.

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## 8.14 Information regarding UL

### INFORMATION

- Use only tested units with a limited output voltage ($V_{max}$ = DC 30 V) and limited output current ($I_{max}$ = 8 A) as an external DC 24 V voltage source.

- UL certification does not apply to operation in voltage supply systems with a non-grounded star point (IT systems).

### 8.14.1 Field wiring power terminals

- Use 60/75 °C copper wire only.
- Tighten terminals to in-lbs (Nm) as follows:

| | Tightening torque in-lbs (Nm) | | | |
|---|---|---|---|---|
| MDX9.A-...-5.3-.. | Line connection | | Motor and braking resistor terminals | |
| 0020 - 0160 | X1 | 4.43 – 7.08 (0.5 – 0.8)<br>Wire sizes 14 – 12 AWG | X2 | 4.43 – 7.08 (0.5 – 0.8)<br>Wire sizes 14 – 12 AWG |
| 0240 - 0320 | X1 | 15.05 – 15.93 (1.7 – 1.8) | X2 | 15.05 – 15.93 (1.7 – 1.8) |
| 0460 - 0750 | X1 | 75.2 – 84.1 (8.5 – 9.5) | X2 | 75.2 – 84.1 (8.5 – 9.5) |
| 0910 - 1490 | X1 | 159.3 – 194.7 (18 – 22) | X2 | 159.3 – 194.7 (18 – 22) |
| MDX9.A-...-2.3-.. | Line connection | | Motor and braking resistor terminals | |
| 0070 - 0140 | X1 | 4.43 – 7.08 (0.5 – 0.8)<br>Wire sizes 14 – 12 AWG | X2 | 4.43 – 7.08 (0.5 – 0.8)<br>Wire sizes 14 – 12 AWG |
| 0213 - 0290 | X1 | 15.05 – 15.93 (1.7 – 1.8) | X2 | 15.05 – 15.93 (1.7 – 1.8) |
| 0420 - 0570 | X1 | 75.2 – 84.1 (8.5 – 9.5) | X2 | 75.2 – 84.1 (8.5 – 9.5) |
| 0840 - 1080 | X1 | 159.3 – 194.7 (18 – 22) | X2 | 159.3 – 194.7 (18 – 22) |
| All modules | PE connection | | | |
| | | M4: 8.85 – 10.62 (1.0 – 1.2)<br>M6: 26.55 – 35.4 (3.0 – 4.0) | | |

### 8.14.2 Short circuit current rating

Suitable for use on a circuit capable of delivering not more than

- 5,000/10,000 rms symmetrical amperes when protected by circuit breakers and Type E combination motor controllers as described in the tables below.
- 65,000 rms symmetrical amperes when protected by fuses, circuit breakers and Type E combination motor controllers as described in the tables below.

Max. voltage is limited to 240 V (230 V units only) or 500 V (400 V units only).

### 8.14.3 Branch circuit protection

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes.

- If you use cable cross sections that are dimensioned for a smaller current than the rated current of the unit, make sure that the fuse is dimensioned for the used cable cross section.
- For information on selecting cable cross sections, refer to the project planning manual.
- Comply with the country-specific installation regulations in addition to the above notes.

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## AC 380 – 500 V devices

| **MDX9.A-..** | **SCCR: 5 kA/ 500 V** | | |
|---|---|---|---|
| | Non semiconductor fuses (currents are maximum values) | Inverse-time circuit breaker (currents are maximum values) | Type E Combination Motor Controller |
| 0020-5.3-4-y (size 1) | - | 50 A/500 V min. | Siemens Sirius 3RV2011-1CA10 1.8 – 2.5 A, 480 V |
| 0025-5.3-4-y (size 1) | - | 50 A/500 V min. | Siemens Sirius 3RV2011-1CA10 1.8 – 2.5 A, 480 V |
| 0032-5.3-4-y (size 1) | - | 50 A/500 V min. | Siemens Sirius 3RV2011-1EA10 2.8 – 4 A, 480 V |
| 0040-5.3-4-y (size 1) | - | 50 A/500 V min. | Siemens Sirius 3RV2011-1EA10 2.8 – 4 A, 480 V |
| 0055-5.3-4-y (size 2) | - | 50 A/500 V min. | Siemens Sirius 3RV2011-1GA10 4.5 – 6.3 A, 480 V |
| 0070-5.3-4-y (size 2) | - | 50 A/500 V min. | Siemens Sirius 3RV2011-1HA10 5.5 – 8 A, 480 V |
| 0095-5.3-4-y (size 2) | - | 50 A/500 V min. | Siemens Sirius 3RV2011-1JA10 7 – 10 A, 480 V |
| 0125-5.3-4-y (size 3) | - | 50 A/500 V min. | Siemens Sirius 3RV2011-4AA10 10 – 16 A, 480 V |
| 0160-5.3-4-y (size 3) | - | 50 A/500 V min. | Siemens Sirius 3RV2011-4AA10 10 – 16 A, 480 V |
| 0240-5.3-4-y (size 4) | - | 60 A/500 V min. | Siemens Sirius 3RV2021-4DA10 18 – 25 A, 480 V |
| 0320-5.3-4-y (size 4) | - | 60 A/500 V min. | Siemens Sirius 3RV2031-4EA10 22 – 32 A, 480 V |
| 0460-5.3-4-y (size 5) | - | 125 A/500 V min. | Siemens Sirius 3RV2031-4VA10 35 – 45 A, 480 V |
| 0620-5.3-4-y (size 5) | - | 125 A/500 V min. | Siemens Sirius 3RV2041-4JA10 45 – 63 A, 480 V |
| 0750-5.3-4-y (size 5) | - | 125 A/500 V min. | Siemens Sirius 3RV2041-4KA10 57 – 75 A, 480 V |

| **MDX9.A-..** | **SCCR: 10 kA/ 500 V** | | |
|---|---|---|---|
| | Non semiconductor fuses (currents are maximum values) | Inverse-time circuit breaker (currents are maximum values) | Type E Combination Motor Controller |
| 0910-5.3-4-y (size 6) | - | 225 A/500 V min. | Siemens Sirius 3RV2041-4YA10 75 – 93 A, 480 V |
| 1130-5.3-4-y (size 6) | - | 225 A/500 V min. | - |
| 1490-5.3-4-y (size 6) | - | 225 A/500 V min. | - |

| **MDX9.A-..** | **SCCR: 65 kA/ 500 V** | | |
|---|---|---|---|
| | Non semiconductor fuses (currents are maximum values) | Inverse-time circuit breaker (currents are maximum values) | Type E Combination Motor Controller |

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| MDX9.A-.. | SCCR: 65 kA/ 500 V | | |
|---|---|---|---|
| 0020-5.3-4-y<br>(size 1) | 50 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius<br>3RV2011-1CA10<br>1.8 – 2.5 A, 480 V |
| 0025-5.3-4-y<br>(size 1) | 50 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius<br>3RV2011-1CA10<br>1.8 – 2.5 A, 480 V |
| 0032-5.3-4-y<br>(size 1) | 50 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius<br>3RV2011-1EA10<br>2.8 – 4 A, 480 V |
| 0040-5.3-4-y<br>(size 1) | 50 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius<br>3RV2011-1EA10<br>2.8 – 4 A, 480 V |
| 0055-5.3-4-y<br>(size 2) | 50 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius<br>3RV2011-1GA10<br>4.5 – 6.3 A, 480 V |
| 0070-5.3-4-y<br>(size 2) | 50 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius<br>3RV2011-1HA10<br>5.5 – 8 A, 480 V |
| 0095-5.3-4-y<br>(size 2) | 50 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius<br>3RV2011-1JA10<br>7 – 10 A, 480 V |
| 0125-5.3-4-y<br>(size 3) | 50 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius<br>3RV2011-4AA10<br>10 – 16 A, 480 V |
| 0160-5.3-4-y<br>(size 3) | 50 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius<br>3RV2011-4AA10<br>10 – 16 A, 480 V |
| 0240-5.3-4-y<br>(size 4) | 60 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 60 A/500 V min. | Siemens Sirius<br>3RV2021-4DA10<br>18 – 25 A, 480 V |
| 0320-5.3-4-y<br>(size 4) | 60 A/600 V<br>Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 60 A/500 V min. | Siemens Sirius<br>3RV2031-4EA10<br>22 – 32 A, 480 V |
| 0460-5.3-4-y<br>(size 5) | 125 A/600 V<br>Class: J, K-1, RK1, T | 125 A/500 V min. | Siemens Sirius<br>3RV2031-4VA10<br>35 – 45 A, 480 V |
| 0620-5.3-4-y<br>(size 5) | 125 A/600 V<br>Class: J, K-1, RK1, T | 125 A/500 V min. | Siemens Sirius<br>3RV2041-4JA10<br>45 – 63 A, 480 V |
| 0750-5.3-4-y<br>(size 5) | 125 A/600 V<br>Class: J, K-1, RK1, T | 125 A/500 V min. | Siemens Sirius<br>3RV2041-4KA10<br>57 – 75 A, 480 V |
| 0910-5.3-4-y<br>(size 6) | 225 A/600 V<br>Class: J, T | 225 A/500 V min. | Siemens Sirius<br>3RV2041-4YA10<br>75 – 93 A, 480 V |
| 1130-5.3-4-y<br>(size 6) | 225 A/600 V<br>Class: J, T | 225 A/500 V min. | - |
| 1490-5.3-4-y<br>(size 6) | 225 A/600 V<br>Class: J, T | 225 A/500 V min. | - |

### AC 200 – 240 V devices

| MDX9.A-.. | SCCR: 5 kA/ 240 V | | |
|---|---|---|---|
| | Non semiconductor fuses (currents are maximum values) | Inverse-time circuit breaker (currents are maximum values) | Type E Combination Motor Controller |
| 0070-2.3-4-y<br>(size 2) | - | 50 A/500 V min. | Siemens Sirius<br>3RV2011-1HA10<br>5.5 – 8 A, 480 V |
| 0093-2.3-4-y<br>(size 2) | - | 50 A/500 V min. | Siemens Sirius<br>3RV2011-1JA10<br>7 – 10 A, 480 V |
| 0140-2.3-4-y<br>(size 3) | - | 50 A/500 V min. | Siemens Sirius<br>3RV2011-4AA10<br>10 – 16 A, 480 V |

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| MDX9.A-.. | SCCR: 5 kA/ 240 V | | |
|---|---|---|---|
| 0213-2.3-4-y (size 4) | - | 60 A/500 V min. | Siemens Sirius 3RV2021-4DA10 18 – 25 A, 480 V |
| 0290-2.3-4-y (size 4) | - | 60 A/500 V min. | Siemens Sirius 3RV2031-4EA10 22 – 32 A, 480 V |
| 0420-2.3-4-y (size 5) | - | 125 A/500 V min. | Siemens Sirius 3RV2031-4VA10 35 – 45 A, 480 V |
| 0570-2.3-4-y (size 5) | - | 125 A/500 V min. | Siemens Sirius 3RV2041-4JA10 45 – 63 A, 480 V |
| 0840-2.3-4-y (size 6) | - | 225 A/500 V min. | Siemens Sirius 3RV2041-4YA10 75 – 93 A, 480 V |
| 1080-2.3-4-y (size 6) | - | 225 A/500 V min. | Siemens Sirius 3RV2041-4YA10 75 – 93 A, 480 V |

| MDX9.A-.. | SCCR: 65 kA/ 240 V | | |
|---|---|---|---|
| | Non semiconductor fuses (currents are maximum values) | Inverse-time circuit breaker (currents are maximum values) | Type E Combination Motor Controller |
| 0070-2.3-4-y (size 2) | 50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius 3RV2011-1HA10 5.5 – 8 A, 480 V |
| 0093-2.3-4-y (size 2) | 50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius 3RV2011-1JA10 7 – 10 A, 480 V |
| 0140-2.3-4-y (size 3) | 50 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 50 A/500 V min. | Siemens Sirius 3RV2011-4AA10 10 – 16 A, 480 V |
| 0213-2.3-4-y (size 4) | 60 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 60 A/500 V min. | Siemens Sirius 3RV2021-4DA10 18 – 25 A, 480 V |
| 0290-2.3-4-y (size 4) | 60 A/600 V Class: CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T | 60 A/500 V min. | Siemens Sirius 3RV2031-4EA10 22 – 32 A, 480 V |
| 0420-2.3-4-y (size 5) | 125 A/600 V Class: J, K-1, RK1, T | 125 A/500 V min. | Siemens Sirius 3RV2031-4VA10 35 – 45 A, 480 V |
| 0570-2.3-4-y (size 5) | 125 A/600 V Class: J, K-1, RK1, T | 125 A/500 V min. | Siemens Sirius 3RV2041-4JA10 45 – 63 A, 480 V |
| 0840-2.3-4-y (size 6) | 225 A/600 V Class: J, T | 225 A/500 V min. | Siemens Sirius 3RV2041-4YA10 75 – 93 A, 480 V |
| 1080-2.3-4-y (size 6) | 225 A/600 V Class: J, T | 225 A/500 V min. | Siemens Sirius 3RV2041-4YA10 75 – 93 A, 480 V |

### 8.14.4 Motor overload protection

The units are provided with load and speed-sensitive overload protection and thermal memory retention upon shutdown or power loss.

The trip current is adjusted to 150% of the rated motor current.

### 8.14.5 Ambient temperature

The units are suitable for a maximum surrounding air temperature of 40 °C, max. 60 °C with derated output current.

To determine output current rating at higher than 40 °C, the output current should be derated 3.0% per °C between 40 °C and 60 °C.

### 8.14.6 Environmental conditions

The units are for use in pollution degree 2 environments.

### 8.14.7 Wiring Diagrams

For wiring diagrams, refer to chapter “Wiring Diagrams” in Operating Instructions "MOVIDRIVE® system" or "MOVIDRIVE® technology".

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# 9 Startup

## 9.1 General

### 9.1.1 Lifting applications

**⚠ WARNING**

Danger of fatal injury if the hoist falls.

Severe or fatal injuries.

- The inverter is not designed for use as a safety device in lifting applications. Use monitoring systems or mechanical protection devices to ensure safety.

**INFORMATION**

Lifting application with encoder

The controller must be designed in such a way that the direction of rotation of the drive can only be reversed when it is at a standstill (with the brake applied).

If the direction of rotation should be changed without standstill, a motor encoder must be used.

### 9.1.2 Connecting power

**NOTICE**

Undercutting the minimum switch-off time of the line contactor.

Irreparable damage to the inverter or unforeseeable malfunctions.

Adhere to the specified times and intervals.

- After disconnection from the supply system, observe a minimum switch-off time of 10 s.
- Do **not** turn the power of the supply system on or off **more than once per minute**.

### 9.1.3 Connecting the cables

**NOTICE**

Cables may only be connected and plugged in a de-energized state.

Irreparable damage to the inverter or unforeseeable malfunctions.

- De-energize the inverter.

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## 9.2 Setting the EtherCAT® ID

An EtherCAT® ID can be permanently assigned to the application inverter using the hexadecimal switches S1 and S2. With these switches, you can set a decimal EtherCAT® ID between 1 and 255 in hexadecimal notation.

The ID serves as a unique device identification of the respective EtherCAT® slave for the EtherCAT® master. The EtherCAT® ID is not an EtherCAT® address.

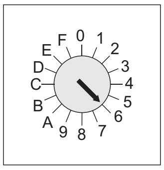
In the delivery state of the application inverter, the ID is set to 0 by default (S1 = 0 and S2 = 0).

Setting an EtherCAT® ID is not mandatory. The slaves are automatically addressed by the master by default.

The EtherCAT® ID must only be set at the application inverter if the use of EtherCAT® IDs was preset in the hardware configuration of the master.

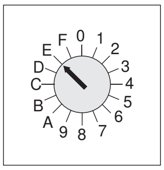
| Required ID, decimal | ID, hexadecimal | Setting S1 (× 10) | Setting S2 (× 1) |
|---|---|---|---|
| 3 | 03 | 0 | 3 |
| 18 | 12 | 1 | 2 |
| 25 | 19 | 1 | 9 |
| 100 | 64 | 6 | 4 |
| 110 | 6E | 6 | E |
| 255 | FF | F | F |

S1 EtherCAT® ID (×10)



6

S2 EtherCAT® ID (×1)



E

The EtherCAT® ID "110" is set as an example in the illustration above.

## 9.3 Startup requirements

The following requirements apply to startup:

- You have installed the application inverter correctly, both mechanically and electrically.
- You have configured the application inverter and connected drives correctly.
- Safety measures prevent accidental startup of the drive.
- Safety precautions prevent danger to persons or machines.

You can perform startup in different ways:

- If you use a power-adjusted motor, you can dispense with startup (operation without startup), depending on the requirements.
- You can perform startup using the MOVISUITE® engineering software.

### 9.3.1 Required hardware for startup with MOVISUITE®

- USM21A interface adapter (28231449)
- Serial interface cable RJ10 ↔ D-sub 9 (18123864)

  or
- Keypad CBG11A, CBG21A or CBG22A
- USB cable A ↔ mini B

  or
- Ethernet cable (category 6) and access via EtherCAT®/Ethernet/PROFINET

| Part number | Scope of delivery |
|---|---|
| 28231449 | • USM21A interface adapter<br>• Serial interface cable with 2 × RJ10 connectors<br>• USB cable (A-B) |
| 18123864 | • Serial interface cable RJ10 ↔ D-sub 9 |

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## 9.4 Startup with MOVISUITE® engineering software

The inverters are started up using the MOVISUITE® engineering software from SEW-EURODRIVE.


*9007214897993483*

The motor is started up in drive train 1 or drive train 2.

When using a motor from SEW-EURODRIVE, select the motor type from the catalog.

When using a third-party motor, enter the corresponding nominal motor data. SEW-EURODRIVE recommends performing a motor parameter measurement using the FCB 25 for third-party motors.

The engineering software can be operated intuitively and is not described further in this document.

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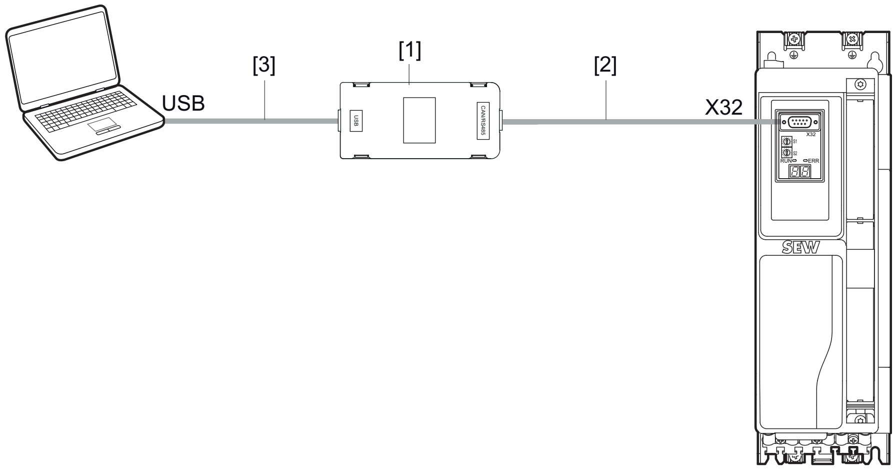
## 9.5 Connection to the service interface

There are 2 possibilities for connecting the inverter to a PC:

1. With the interface adapter USM21A



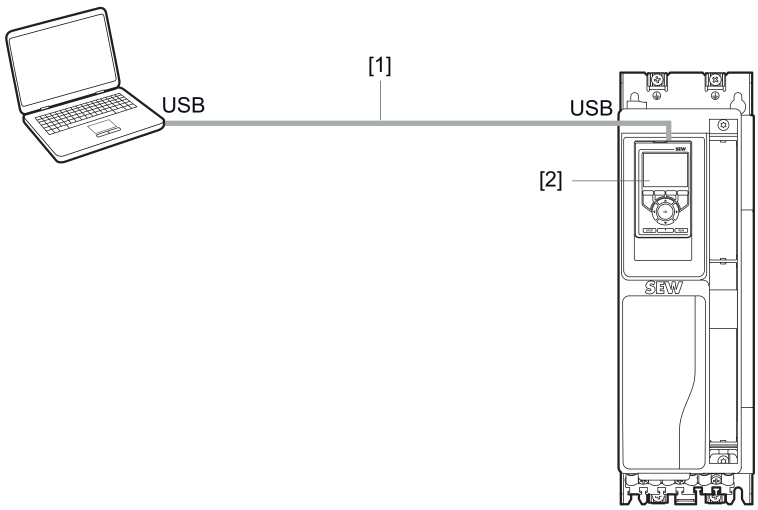

23976103179

| | |
|---|---|
| [1] | USM21A interface adapter |
| [2] | Serial interface cable with an RJ10 connector and a 9-pin D-sub connector, part number 18123864.<br>This cable is necessary for the connection of the interface adapter to MOVIDRIVE® technology, and must be ordered separately. |
| [3] | Commercially available USB connection cable, type USB A-B. The cable is included in the scope of delivery of the interface adapter. |

With the interface adapter USM21A, it is possible to connect an engineering PC with a USB interface to the X32 Service interface of the inverter. For more information, refer to the "USM21A interface adapter" manual.

The data is transferred according to the USB 2.0 standard. It is also possible to work with a USB 3.0 device.

2. With the CBG21A or CBG11A keypad with USB interface




21879112715

[1] USB cable, type USB A-Mini-B, 25643517

[2] Keypad, here the CBG21A as an example

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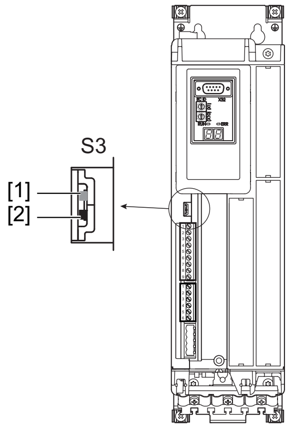
## 9.6 Setting the module bus operating mode

If 2 inverters are connected via a DC link connection, they require the information whether they are "module bus master" or "module bus slave" in the network.

This is set using switch S3 "Module bus operating mode". For further information, refer to the "DC link connection" manual.

If the inverters are not connected to each other via a DC link connection, always set switch "S3" to switch position "Master".




*20763162123*

[1] "Master" switch setting

[2] "Slave" switch setting

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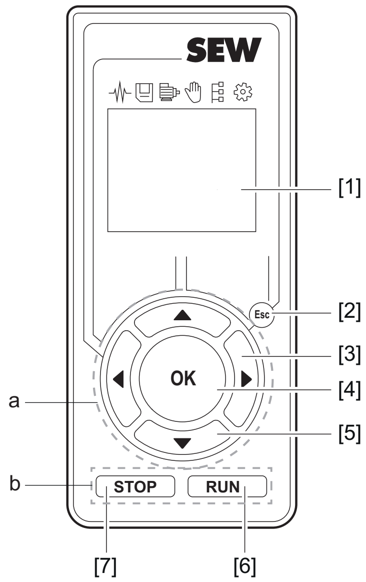
## 9.7 Startup with the CBG11A keypad

You can perform the startup intuitively with a CBG11A keypad using the symbols and functions shown in the display.

Only asynchronous motors without encoder can be started up with the CBG11A keypad. The startup of other motors can only be performed with the CBG21A keypad or with the MOVISUITE® engineering software.

### 9.7.1 CBG11A keypad

The user interface of this keypad is in English.




*9007225173448203*

[1] Display

[2] Esc key

a = Navigate in the menu

[3] Right/left arrow keys

[4] Confirm entry

[5] Up/down arrow keys

b = Manual mode operating range

[6] RUN key

[7] STOP key

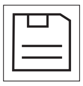
To open the main menu, press the <Esc> key. Press the <right/left> arrow keys to select functions in the main menu. Confirm your selection with the <OK> key.

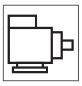
When entering numbers, you must confirm the proposed or entered number with the <OK> key. The digit of the number that is currently editable is then shown underlined. You can use the <up/down> arrow keys to change the value of the digit. Use the <right/left> arrow keys to switch the digit to be edited within the number.

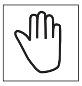
**Symbols used**

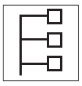
The available functions are shown with pictograms in the keypad display.

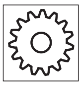

Diagnostics


Data management


Startup


Manual mode


Parameter tree


Keypad settings

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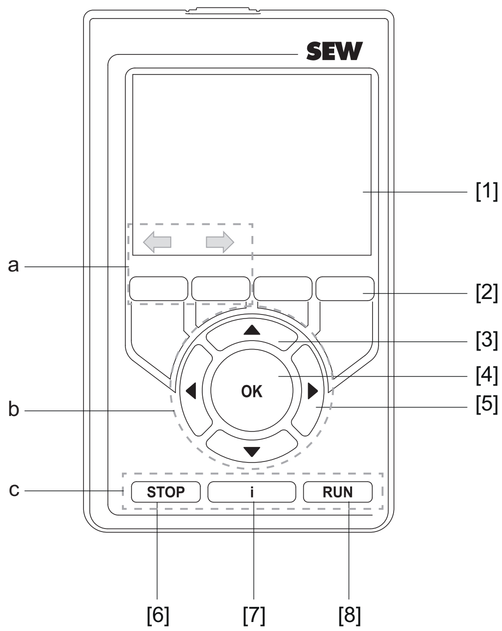
## 9.8 Startup with the CBG21A keypad

You can perform the startup intuitively with a CBG21A keypad using the symbols and functions shown in the display.

Asynchronous motors and synchronous motors can be started up with the CBG21A keypad.

### 9.8.1 CBG21A keypad

The user interface of this keypad is multilingual.




25894023563

[1] Color display

[2] 4 function keys that are assigned according to the context. The assigned functions are shown in the display above the keys

a = Permanently assigned with Back/Next

b = Navigate in the menu

[3] Up/down arrow keys

[4] Confirm entry

[5] Right/left arrow keys

c = Manual mode operating range

[6] STOP key

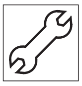
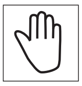
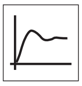
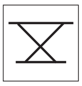
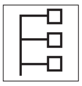
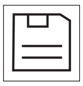
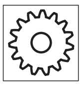
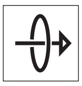
[7] Information key

[8] RUN key

Choice boxes are activated with <OK>, and the selection is then made with the <up/down> arrow keys. Confirm the selection with <OK>.

When entering numbers, you must confirm the proposed or entered number with the <OK> key. The digit of the number that is currently editable is then shown with a colored background. You can use the <up/down> arrow keys to change the value of the digit. Use the <right/left> arrow keys to switch the digit to be edited within the number.

**Symbols used**

| | |
|---|---|
|  | Startup |
|  | Manual mode |
|  | Drive train optimization |
|  | Application |
|  | Diagnostics |
|  | Parameters |
|  | Data management |
|  | Keypad settings |
|  | Start menu |
|  | MOVISAFE® CS.. |
|  | Gateway |
|  | Back |
|  | Next |

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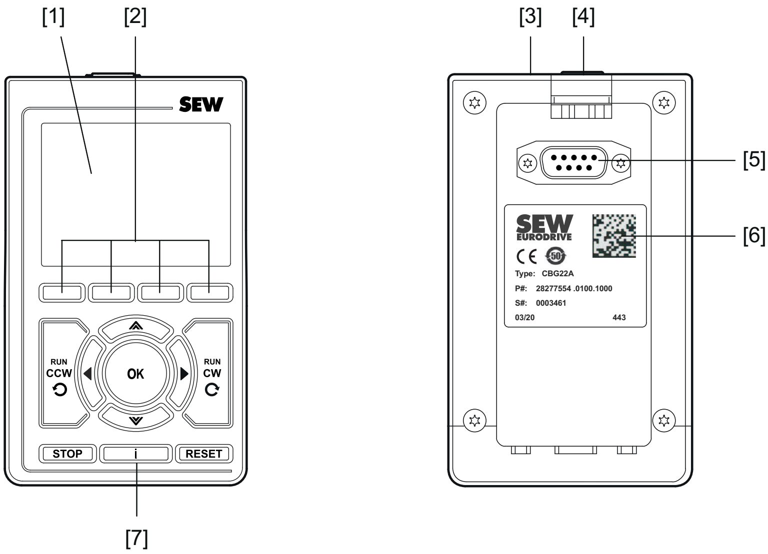
## 9.9 Startup with the CBG22A keypad

The CBG22 keypad offers the following functions:

- Simple and intuitive manual mode for maintaining operation in the event of a malfunction in the facility
- Extensive diagnostics options
- Exclusively read-only access to parameters in order to protect against incorrect use
- Optional access to functions and states of the control elements and data transfer for Ethernet-based communication methods of the drive systems

### 9.9.1 CBG22A keypad

The following figure shows the CBG22A keypad (front and rear):




34005940491

[1] Color display
[2] Function keys (function according to bottom line on color display)
[3] USB 2.0 Mini B interface, female (PC connection)
[4] Locking element
[5] D-Sub interface, 9-pin, female
[6] Nameplate
[7] Info key (for information about the selected menu)

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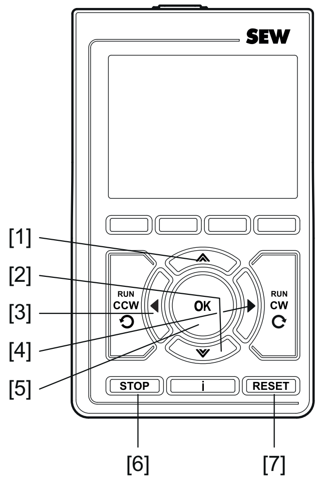
**Keys**

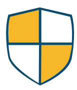
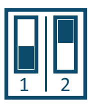
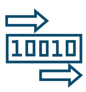
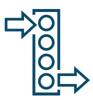
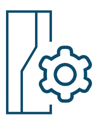
The following figure shows the required keys of the CBG22A keypad:

[1] Key 1 "∧"
[2] Key 2 "∨"
[3] Key 3 "◀"
[4] Key 4 "▶"
[5] Key 5 "OK"
[6] Key 6 "STOP"
[7] Key 7 "RESET"




**Symbols used**

The display of the keypad shows the selectable functions in the form of icons.

| Icon | Meaning |
|---|---|
|  | Start menu |
|  | Monitoring |
|  | MOVISAFE® CS.. |
|   | DIP switch |
|   | Process data |
|  | Digital inputs/outputs |
|  | Operating and energy data |

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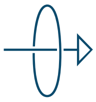
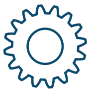
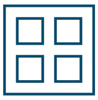
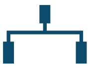
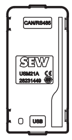
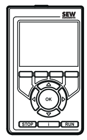
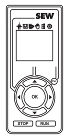
| Icon | Meaning |
|---|---|
|  | Device information |
|  | Fault memory |
|  | Gateway operation |
|  | Settings |
|  | Main menu |
|  | Manual mode |
|  | Direct control mode active |
|  | Indirect control mode active |

## 9.10 Engineering accesses of the inverter

The following table shows the access options from an engineering PC to the inverter.

| Connection to device | Connection: Via the USB interface of the PC | | |
|---|---|---|---|
| | Cable<br>PC – USM21A | Cable<br>USM21 – device | Interface adapter<br>USM21A |
| Part number | – | 18123864 | 28231449 |
| X32<br>D-sub plug con-nector , 9-pin, male | USB 2.0 connec-tion cable[1] | RJ10/D-sub con-nection cable,<br>Length: 1.5 m |  |

1) Included in the delivery of the interface adapter.

| Connection to device | Connection: Via the USB interface of the PC | | | |
|---|---|---|---|---|
| | Cable<br>PC – CBG.. | Cable<br>CBG.. – device | Keypad | |
| | | | CBG21A | CBG11A |
| Part number | 25643517 | – | 28238133 | 28233646 |
| X32<br>D-sub plug con-nector , 9-pin, male | Connection cable USB-A/USB-2.0 Mini B<br>Length: 3 m | Directly plugged |  |  |

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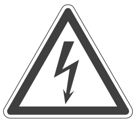
# 10 Operation

## 10.1 General information



**⚠ DANGER**

Dangerous voltages present at cables and motor terminals.

Severe or fatal injuries from electric shock.

- Dangerous voltages are present at the output terminals and the cables and motor terminals connected to them when the device is switched on. This also applies even when the device is inhibited and the motor is at standstill.
- The fact that the operation LED is no longer illuminated does not indicate that the inverter has been disconnected from the power supply and no longer carries any voltage.
- Before you touch the power terminals, check that the inverter has been disconnected from the power supply.
- Observe the general safety notes in the chapter "Safety notes" and the notes in the chapter "Electrical installation" (→ 🗎 249).

**⚠ DANGER**

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries.

- Ensure that the motor cannot start inadvertently, for example by removing the electronics terminal block X20.
- Additional safety precautions must be taken, depending on the application, to avoid injury to personnel and damage to machinery.

**NOTICE**

Switching the motor output at the inverter with enabled output stage.

Damage to the inverter.

- The motor output of the inverter may only be switched or disconnected when the output stage is inhibited.

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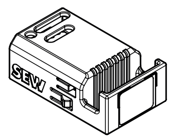
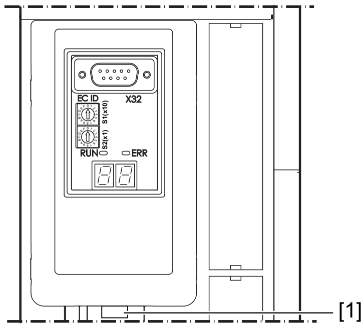
## 10.2 CMM11A memory module




*25585405451*

The plug-in memory module is included in the scope of delivery and installed in the basic device.




*9007224798050699*

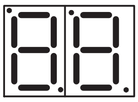
[1] Memory module

All device data is always stored up-to-date on the memory module. If a device needs to be replaced, the system can be started up again quickly without additional tools by simply replugging the memory module.

The memory module can be simply unplugged or plugged in.

## 10.3 7-segment display

### 10.3.1 Operating displays



- The two 7-segment displays indicate the operating state of the inverter.

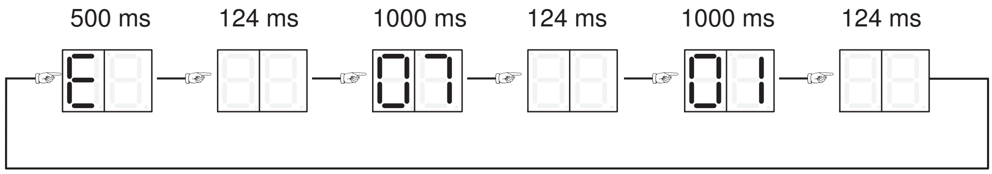
### 10.3.2 Fault display

The inverter detects any faults that occur and displays them as a fault code. Each fault is clearly defined by its fault code and corresponding attributes, as shown below:

- Fault response
- Final state after executing the fault response
- Type of reset response.

The fault codes are displayed as flashing numeric values in the inverter.

The fault code is displayed in the following display sequence:




*12082058123*

In the example, a 2-digit fault code with subfault is shown; in this example, fault 07.01.

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## 10.4 Operating displays

### 10.4.1 7-segment display

| Display | Description | State | Comment/action |
|---|---|---|---|
| **Displays during boot process** | | | |
| b0 | Device passes through several states when loading firmware (boot) to become ready for operation | • Status: Not ready<br>• Output stage is inhibited.<br>• Communication is not yet possible. | • Waiting for boot process to finish.<br>• Device stays in this condition: Device is defective. |
| b1 | | | |
| b2 | | | |
| b3 | | | |
| br | | | |

| Display | Description | State | Comment/action |
|---|---|---|---|
| **Displays of different device states** | | | |
| . | Energy-saving mode | | Energy-saving mode active |
| 00 | DC link voltage missing | • Status: Not ready<br>• Output stage is inhibited.<br>• Communication is possible. | Check the supply system. |
| C0<br>Flashing | Module bus not ready | | Check the module bus connection. |
| C1<br>Flashing | Startup state | | Startup state is active. |
| C2<br>Flashing | STO active | • Status: Not ready<br>• Output stage is inhibited.<br>• Communication is possible. | The Safe Torque Off function is active. |
| C3<br>Flashing | Synchronization with bus incorrect. Process data processing not ready. | | • Check the bus connection.<br>• Check the synchronization setting at the device and controller.<br>• Check the process data settings at the device and controller. |
| C4<br>Flashing | Encoder evaluation not ready | | • Encoders are being initialized.<br>• Device stays in this condition:<br>– No encoder selected.<br>– "Source actual speed" or "Actual position" parameter shows an encoder that does not exist. |
| C5<br>Flashing | Motor management not ready | | |
| C6<br>Flashing | Internal device supply incomplete | | |
| C7<br>Flashing | Power section not ready | | |

| Display | Description | State | Comment/action |
|---|---|---|---|
| C8<br>Flashing | External device not ready | | |
| C9<br>Flashing | Data flexibilization layer not ready | | |
| Cd<br>Flashing | Parameter download running | | |
| CA | MOVILINK® DDI not ready | | MOVILINK® DDI interface not ready. |

| Display | Description | State | Comment/action |
|---|---|---|---|
| **Displays during initialization processes** (parameters will be reset to default values) | | | |
| d0<br>Flashing | Basic initialization | • Status: Not ready<br>• Output stage is inhibited.<br>• Communication is possible. | Waiting for initialization to finish. |
| d1<br>Flashing | Initialization at delivery state | | |

| Display | Description | State | Comment/action |
|---|---|---|---|
| **Displays in normal operation** | | | |
| 01 | Output stage inhibit | • Output stage is inhibited. | The drive is not actuated by the output stage. The brake is applied; without the brake, the motor coasts to a halt. FCB 01 can be selected from various sources. |
| AC | Auto Configuration | Data is transferred to the inverter via MOVILINK® DDI interface. | The motor is started up via the MOVILINK® DDI interface. |

| Display | Description | State | Comment/action |
|---|---|---|---|
| 02 | Default stop | For further information, refer to the description of the FCBs. | Drive function (FCB) "Default stop" active if no other FCB is selected and the system is ready. |
| 04 | Manual mode | | Manual mode is active. |
| 05 | Speed control | | Speed control with internal ramp generator. |
| 06 | Interpolated speed control | | Speed control with setpoints cyclically via bus. The ramp generator is located externally, e.g. in the higher-level controller. |
| 07 | Torque control | | Torque control. |
| 08 | Interpolated torque control | | Torque control with setpoints cyclically via bus. |
| 09 | Positioning control | | Positioning mode with internal ramp generator. |
| 10 | Interpolated positioning control | | Positioning mode with setpoints cyclically via bus. The ramp generator is located externally, e.g. in the higher-level controller. |
| 12 | Reference travel | | The drive performs reference travel. |
| 13 | Stop at application limits | | Deceleration at the application limit. FCB 13 is active if no other FCB is selected with the default FCB 02. |
| 14 | Emergency stop | | Deceleration at the emergency stop limit. |
| 18 | Rotor position identification | | Encoder commutation for synchronous motors. |
| 19 | Position hold control | | Position control on current position. |
| 20 | Jog | | Jog mode is active. |
| 21 | Brake test | | Brake is tested by applying a torque when the brake is applied. |
| 25 | Motor parameter measurement | | Motor parameter measurement is active. |
| 26 | Stop at user limits | | Serves to stop at user limits. |

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### 10.4.2 LED displays – basic device

**"RUN" LED**

| LED | Meaning |
|---|---|
| **Off** | "INIT" state<br>The interface is in the "INIT" state. |
| **Green**<br>**Flashing** | "PRE_OPERATIONAL" state<br>Mailbox communication is possible.<br>Process data communication is not possible. |
| **Green**<br>**Flashing once** | "SAFE_OPERATIONAL" state<br>Mailbox and process data communication is possible.<br>Safety-related output signals are not output. |
| **Green**<br>**Illuminated** | "OPERATIONAL Mode" state<br>Mailbox and process data communication is possible. |

**"ERR" LED**

| LED | Meaning |
|---|---|
| **Off** | No error<br>The interface is in operating state. |
| **Red**<br>**Flickering** | Boot error<br>A BOOT error has occurred.<br>"INIT" state has not been reached.<br>However the "Change" parameter is set to "0x01:change/error". |
| **Red**<br>**Flashing** | Invalid configuration<br>A general configuration error has occurred. |
| **Red**<br>**Flashing once** | Unprompted state change<br>The slave application has changed the state automatically.<br>The "Change" parameter is set to "0x01:change/error". |
| **Red**<br>**Flashing twice** | Application watchdog timeout<br>A watchdog timeout error has occurred in the application. |
| **Red**<br>**Illuminated** | PDI[1)] Watchdog Timeout<br>A PDI watchdog timeout error has occurred. |

1) PDI = Process Data Interface

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### "LNK/ACT" LED

| LED | Meaning |
|---|---|
| **Off** | No link available.<br>No physical connection to a neighboring device was detected. |
| **Green**<br>**Illuminated** | Link available, no bus activity.<br>A physical connection to a neighboring device was detected.<br>No data is being exchanged via the Ethernet port. |
| **Green**<br>**Flickering** | Link available, bus activity.<br>A physical connection to a neighboring device was detected.<br>Data is being exchanged via the Ethernet port. |

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### 10.4.3 PROFINET CFN21A fieldbus card

#### "BF" LED

This LED indicates the status of the PROFINET interface. The state includes communication link, bus error and process data configuration.

| Status | Possible cause | Measure |
|---|---|---|
| Off | Fault-free operating state.<br>The PROFINET device is exchanging data with the PROFINET controller (Data Exchange state). | – |
| Red<br>Permanently lit | Connection to the PROFINET controller has failed.<br>Bus communication has been interrupted. | Check the PROFINET connection of the PROFINET device.<br>Check all the cables in the PROFINET network. |
| | The PROFINET controller is not in operation. | Check the PROFINET controller. |
| | The PROFINET device does not detect a PROFINET baud rate. | Check the configuration of the PROFINET controller. |
| Yellow<br>Permanently lit | There is a connection to the PROFINET controller, but the configuration of the PROFINET network is faulty.<br>The following faults may have occurred:<br>• A hardware module was selected that does not support the PROFINET interface.<br>• The standard process data and the safe process data have been assigned mixed to the PROFINET device. | Check the configuration of the PROFINET controller. |

#### "US1" LED

This LED indicates the status of the PROFINET interface. The state includes the startup, normal operation, error mode and energy-saving operation operating modes.

| Status | Possible cause | Measure |
|---|---|---|
| Yellow, flashing<br>Cyclic duration factor: 250 ms<br>Switch-off time: 250 ms | The PROFINET interface box is just starting up after a reset. | – |
| Green<br>Permanently lit | The PROFINET interface is operating without faults. | – |

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| Status | Possible cause | Measure |
|---|---|---|
| Green, flashing<br>Cyclic duration factor: 500 ms<br>Switch-off time: 3000 ms | The PROFINET interface is in energy-saving mode (PROFIenergy mode). | – |
| Red<br>Permanently lit | The PROFINET interface box has detected a fault.<br>**Information:** A timeout of the PROFINET connection is not an internal fault. | Switch the device off and back on again.<br>If the fault occurs repeatedly, contact SEW-EURODRIVE Service. |

#### "LNK/ACT" LED

| Status | Meaning |
|---|---|
| All LEDs<br>Green<br>Permanently lit | A physical connection to another Ethernet node was detected. Currently, no data is being exchanged via the Ethernet port. |
| All LEDs<br>Flashing green<br>Cyclic duration factor: 500 ms<br>Switch-off time: 500 ms | The flashing test has been activated to localize the Ethernet nodes visually. |
| All LEDs<br>Off | No physical connection to further Ethernet nodes was detected. |
| LED at the respective Ethernet port<br>Green/yellow, flashing | Data is being sent or received via the Ethernet port. |

### 10.4.4 EtherNet/IP™ and Modbus TCP CFE fieldbus card

**"NS" LED**

| LED | Meaning | Measure |
|---|---|---|
| **–**<br>**Off** | Device is switched off.<br>No DC 24 V supply. | • Check the DC 24 V voltage supply.<br>• Switch on the device again. |
| | The IP address is not set. | • Set the IP address. |
| **Green**<br>**Flashing** | The connection to the Ethernet master has failed.<br>The device does not detect a connection to the Ethernet master (bus error). | • Check the Ethernet connection of the device.<br>• Check all Ethernet connections. |
| **Green**<br>**Illuminated** | The IP address is set. The Ethernet connection has been established. | – |
| **Red**<br>**Flashing** | Timeout delay of the controlling connection has expired.<br>The state is reset by restarting communication. | • Check the fieldbus connection.<br>• Check the master/scanner.<br>• Check all Ethernet connections. |
| **Red**<br>**Illuminated** | Conflict detected in IP address assignment. | • Check whether there is another device with the same IP address in the network.<br>• Change the IP address of the device.<br>• Check the DHCP settings for IP address assignment of the DHCP server (only when using a DHCP server). |
| **Red/green**<br>**Flashing** | The device performs a LED test.<br>This state may only be active for a short time during startup. | – |
| | The device has received the designated target unit network ID (TUNID).<br>The LED will keep flashing until the device has received the APPLY_TUNID service and the validation is successfully completed. | |

**"MS" LED**

| LED | Meaning | Measure |
|---|---|---|
| **–**<br>**Off** | No power supply or DC 24 V supply. | • Check the voltage supply. |
| **Green**<br>**Flashing** | The device has not been configured yet. | • Configure the device.<br>• Check the DHCP server connection (only if DHCP is activated and in persistent status). |

| LED | Meaning | Measure |
|---|---|---|
| **Green**<br>**Illuminated** | Device OK. | – |
| **Red**<br>**Flashing** | A correctable fault has occurred on the device. | • Check whether there is another device with the same IP address in the network.<br>• Change the IP address of the device.<br>• Check the DHCP settings for IP address assignment of the DHCP server (only when using a DHCP server). |
| **Red**<br>**Illuminated** | A fault that cannot be corrected has occurred on the device. | • Switch on the device again.<br>• Reset the device to the factory settings.<br>• If this fault occurs repeatedly, replace the device or contact SEW-EURODRIVE Service. |
| **Red/green**<br>**Flashing** | The device performs a LED test.<br>This state may only be active for a short time during startup. | – |
| | The device is waiting for a target unit network ID (TUNID). | Assign a target unit network ID (TUNID) to the device. |
| | Device parameter setting is required. | Check the parameterization of the CSB51A/CSL51A safety option. |

**"LNK/ACT" LED**

| Status | Meaning |
|---|---|
| All LEDs<br>Green<br>Permanently lit | A physical connection to another Ethernet node was detected. Currently, no data is being exchanged via the Ethernet port. |
| All LEDs<br>Flashing green<br>Cyclic duration factor: 500 ms<br>Switch-off time: 500 ms | The flashing test has been activated to localize the Ethernet nodes visually. |
| All LEDs<br>Off | No physical connection to further Ethernet nodes was detected. |
| LED at the respective Ethernet port<br>Green/yellow, flashing | Data is being sent or received via the Ethernet port. |

### 10.4.5 CFL21A POWERLINK fieldbus card

#### "BS" LED

| LED | Meaning |
|---|---|
| **Off** | "INIT" state<br>The interface is in "INIT" state. |
| **Green**<br>**Flickering** | "BASIC ETHERNET Mode" state<br>None of the SoA, SoC, PReq, or PRes message types detected. |
| **Green**<br>**Flashing once** | "PRE_OPERATIONAL_1Mode" state<br>Only acyclic communication is possible. |
| **Green**<br>**Flashing twice** | "PRE_OPERATIONAL_2Mode" state<br>Acyclic and cyclic communication are possible.<br>Process data not valid. |
| **Green**<br>**Flashing three times** | "READY_TO_OPERATE_Mode" state |
| **Green**<br>**Flashing** | "STOPPED_Mode" state |
| **Green**<br>**Illuminated** | "OPERATIONAL Mode" state |

#### "BE" LED

| LED | Meaning | Measure |
|---|---|---|
| **Off** | Transition to "OPERATIONAL_Mode" state | – |
| | Software reset of the NMT state machine (start basic node initialization) | – |
| | Transition to "BASIC_ETHERNET_Mode" state after a timeout of the SoC, PReq, Pres, and SoA message types. | – |
| **Red**<br>**Illuminated** | POWERLINK cycle time exceeded. | Check/adjust the network. |
| | The number of managing nodes (MN) in the POWERLINK network is > 1. | Check/adjust the network.<br>Configure only 1 managing node. |
| | Invalid Ethernet frame format,<br>e.g. wrong Ethernet CRC (redundancy checksum) | Check/adjust the network. |
| | Loss of frame | Check/adjust the network. |
| | Frame collision | Check/adjust the network. |
| | Invalid IP address | Set a valid IP address. |

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### "LNK/ACT" LED

| Status | Meaning |
|---|---|
| All LEDs<br>Green<br>Permanently lit | A physical connection to another Ethernet node was detected. Currently, no data is being exchanged via the Ethernet port. |
| All LEDs<br>Flashing green<br>Cyclic duration factor: 500 ms<br>Switch-off time: 500 ms | The flashing test has been activated to localize the Ethernet nodes visually. |
| All LEDs<br>Off | No physical connection to further Ethernet nodes was detected. |
| LED at the respective Ethernet port<br>Green/yellow, flashing | Data is being sent or received via the Ethernet port. |

### 10.4.6 PROFIBUS CFP21A fieldbus card

#### "BF" LED

The "BF" LED indicates communication errors on the PROFIBUS interface.

| | | Measure |
|---|---|---|
| Off | Error-free operating state.<br>The device is exchanging data with the PROFIBUS master (data exchange state). | – |
| Red<br>Illuminated | • PROFIBUS master not in operation.<br>• The connection to the PROFIBUS master has failed.<br>• The device does not detect a PROFIBUS baud rate.<br>• Bus communication has been interrupted. | • Check the PROFIBUS connection of the device.<br>• Check all the cables in the PROFIBUS network.<br>• Check the configuration of the PROFIBUS master. |
| Red<br>Flashing with 2 Hz | • The device detects the PROFIBUS baud rate but is not addressed by the PROFIBUS master.<br>• The device was not configured or was configured incorrectly in the PROFIBUS master. | • Check the PROFIBUS address set in the device and in the engineering tool of the PROFIBUS master.<br>• Check the configuration of the PROFIBUS master.<br>• Check whether you are using the appropriate device description file (). |

#### "RUN" LED

The "RUN" LED indicates whether the bus electronics is functioning properly.

| | | Measure |
|---|---|---|
| Green | PROFIBUS hardware OK.<br>Bus electronics without faults. | – |
| Red<br>Illuminated | The hardware of the bus electronics is faulty. | Switch the device off and back on again.<br>If the fault occurs repeatedly, contact SEW-EURODRIVE Service. |
| Red<br>Flashing with 2 Hz | The PROFIBUS address is set to 0 or to a value greater than 125. | • Check the PROFIBUS address set in the device.<br>• Reset the device. |

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## 10.5 Fault description on basic device

### 10.5.1 Fault 1 Output stage monitoring

| **Subfault: 1.1**<br>**Description: Short circuit in motor output terminals** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Overcurrent in output stage or faulty output stage control detected, and output stage inhibited by hardware. | Possible causes for overcurrent are short circuit at the output, excessive motor current, or a defective power output stage. |

| **Subfault: 1.2**<br>**Description: Overcurrent in output stage** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Motor current too high. | Connect a smaller motor. |
| | Current supply | Check the current supply. |
| | Current transformer | Check the current transformer. |
| | Ramp limit deactivated and set ramp time too short. | Increase the ramp time. |
| | Phase module defective. | Check the phase module. |
| | DC 24 V supply voltage unstable. | Check the DC 24 V supply voltage. |
| | Interruption or short circuit on signal lines of phase modules. | Check the signal lines. |

### 10.5.2 Fault 3 Ground fault

| **Subfault: 3.1**<br>**Description: Ground fault** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Ground fault in the motor lead. | Eliminate the ground fault in the motor lead. |
| | Ground fault in the inverter. | Eliminate the ground fault in the inverter. |
| | Ground fault in the motor. | Eliminate the ground fault in the motor. |
| | Ground fault in line components. | Eliminate the ground fault in the line components. |

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### 10.5.3 Fault 4 Brake chopper

| **Subfault: 4.1<br>Description: Brake chopper overcurrent** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Excessive regenerative power. | Extend the deceleration ramps. |
| | Short circuit detected in braking resistor circuit. | Check the supply cable to the braking resistor. |
| | Braking resistance too high. | Check the technical data of the braking resistor. |

| **Subfault: 4.2<br>Description: Brake chopper defective** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Output stage of brake chopper defective. | Replace the defective brake chopper. |

### 10.5.4 Fault 6 Line fault

| **Subfault: 6.1<br>Description: Line phase failure** | | |
|---|---|---|
| | Response: Line phase failure | |
| | Cause | Measure |
| | Missing line phase detected. | Check the supply system cable. |
| | DC link voltage periodically too low. | Check the configuration of the supply system. |
| | Inadequate line voltage quality. | Check the supply (fuses, contactor). |

### 10.5.5 Fault 7 DC link

| **Subfault: 7.1<br>Description: DC link overvoltage** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Maximum permitted DC link voltage limit exceeded and output stage inhibited by hardware. | – Extend the deceleration ramps.<br>– Check the supply cable to the braking resistor.<br>– Check the technical data of the braking resistor. |

| **Subfault: 7.2<br>Description: DC link discharge failed** | | |
|---|---|---|
| | Response: Warning | |
| | Cause | Measure |
| | DC link voltage level not dropped below discharge threshold within discharge time. | Contact SEW-EURODRIVE Service. |

### 10.5.6 Fault 8 Speed monitoring

| **Subfault: 8.1**<br>**Description: Speed monitoring – motor mode** | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| Speed controller operates at setting limit (mechanical overload or phase failure in supply system or motor). | Increase the delay time set for speed monitoring, or reduce the load. |
| Encoder not connected correctly. | Check the encoder connection and direction of rotation. If necessary, increase the current limiting or reduce the acceleration values. |
| Encoder has incorrect direction of rotation. | – Check the encoder connection and direction of rotation. If necessary, increase the current limiting or reduce the acceleration values.<br>– Check the motor lead and motor, check line phases. |

| **Subfault: 8.2**<br>**Description: Speed monitoring – generator mode** | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| Speed controller operates at setting limit (mechanical overload or phase failure in supply system or motor). | Increase the delay time set for speed monitoring, or reduce the regenerative load. |
| Encoder not connected correctly. | Check the encoder connection and direction of rotation. If necessary, increase the current limiting or reduce the deceleration values. |
| Encoder has incorrect direction of rotation. | – Check the encoder connection and direction of rotation. If necessary, increase the current limiting or reduce the deceleration values.<br>– Check the motor lead and motor. – Check the line phases. |

| **Subfault: 8.3**<br>**Description: Maximum speed at motor shaft** | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| Actual speed exceeded "Maximum speed at motor shaft" limit value (index 8360.9 / 8361.9). This limit value is set at startup matching the motor and gear unit. | Reduce the maximum speed. |

### 10.5.7 Fault 9 Control mode

| Subfault: 9.1<br>Description: Magnetization of motor not possible | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| The user-defined current limit or output stage monitoring have reduced the possible maximum current to such a degree that the required magnetizing current cannot be set. | – Reduce the output stage utilization, e.g. by reducing the PWM frequency or reducing the load.<br>– Increase the user-defined current limit. |

| Subfault: 9.2<br>Description: Requested operating mode not possible with active control mode | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| The current FCB activated an operating mode. The active control mode does not support this operating mode, for example "position control" or "torque control" with U/f control mode. | – Use a control mode that supports the required operating mode. Connect an encoder if necessary.<br>– Select an operating mode that is supported by the current control mode. |

| Subfault: 9.3<br>Description: Absolute rotor position not available | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| The current control mode requires an absolute rotor position. The encoder selected for "Source of actual speed" does not provide an absolute rotor position. | Use an absolute encoder, or identify the rotor position using FCB 18. |

| Subfault: 9.4<br>Description: Correct current supply of motor not possible | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| Failed to set required current during premagnetization. | Check the cabling, or disable the function "Current monitoring during premagnetization". |

| Subfault: 9.5<br>Description: Maximum output frequency exceeded | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| Maximum output frequency exceeded. | Reduce the maximum speed. |

| Subfault: 9.6 | | |
|---|---|---|
| **Description: Maximum model speed exceeded** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Speed of drive calculated in ELSM® control mode too high for motor control. | If possible, minimize the "Speed/position controller sampling cycle", or reduce the speed. |

| Subfault: 9.8 | | |
|---|---|---|
| **Description: Motor protection function – demagnetization** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The fault can be caused as follows:<br>– The motor is blocked.<br>– The motor has already been operated at a speed below the transition speed for too long.<br>– The motor has not been started up properly. | – Check the motor for blockage.<br>– Check the drive selection.<br>– Optimize the speed controller.<br>– Perform motor startup again and run the drive function "FCB 25 Motor parameter measurement".<br>– If the fault occurs repeatedly, contact SEW-EURODRIVE Service. |

| Subfault: 9.9 | | |
|---|---|---|
| **Description: Parameter measurement not possible with active motor type** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Parameter measurement is possible only with "asynchronous" and "synchronous" motor types. No magnetic reluctance motors and LSPM motors. | Select the correct motor type. |

| Subfault: 9.10 | | |
|---|---|---|
| **Description: Rotor stall monitoring** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The current control cannot hold the load torque. The deviation between stationary setpoint voltage and actual voltage is too large. | Reduce the load torque (hoist) in the controlled system. |

| Subfault: 9.11 | | |
|---|---|---|
| **Description: Standstill current function** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | With the ELSM method, the standstill current function is possible only in combination with rotor position measurement. | – Enable rotor position measurement.<br>– Check motor data. |

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### 10.5.8 Fault 10 Data flexibility

| Subfault: 10.1<br>Description: Initialization | |
|---|---|
| Response: Application stop + output stage inhibit | |
| Cause | Measure |
| Init task error. | The init task has issued a return code ! = 0. Check the program. |

| Subfault: 10.2<br>Description: Illegal program command | |
|---|---|
| Response: Application stop + output stage inhibit | |
| Cause | Measure |
| The version of the MOVIKIT® software module in use is not compatible with the current firmware version of the device. | – Use the latest firmware version of the device.<br>– Adjust the firmware version of the device according to the version overview in the installation notes.<br>– Adjust the version of the MOVIKIT® software module according to the version overview in the installation notes.<br>– In the shortcut menu of the device, execute the "Adjust version and device" menu command. |
| Unknown program command (illegal opcode) detected in Data Flexibility program. | Contact SEW-EURODRIVE Service. |

| Subfault: 10.3<br>Description: Memory access | |
|---|---|
| Response: Application stop + output stage inhibit | |
| Cause | Measure |
| Memory area violated while accessing array. | For example, an array access results in writing beyond the permitted memory range. Check the program. |

| Subfault: 10.4<br>Description: Stack | |
|---|---|
| Response: Application stop + output stage inhibit | |
| Cause | Measure |
| Overflow of Data Flexibility stack detected. | Check the program. |

| Subfault: 10.5<br>Description: Division by 0 | |
|---|---|
| Response: Application stop + output stage inhibit | |
| Cause | Measure |
| Division by 0. | Check the program. |

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| Subfault: 10.6<br>Description: Runtime | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Runtime error/watchdog | Check the program. The program execution time exceeds the permitted time. |
| | PDI or PDO tasks. | Check the program. The execution time of the PDI or PDO task exceeds the permitted time. |

| Subfault: 10.7<br>Description: Calculation result of multiplication/division command too large | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Calculation result of multiplication/division command exceeds 32 bits. | Check the program. |
| | Failed to write calculation result of multiplication/ division command into result variable. | Check the program. |

| Subfault: 10.8<br>Description: Illegal connection | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Index used in connect not allowed. | Check the program. The index used either does not exist or is not permitted for access via process data – see parameter list. |

| Subfault: 10.9<br>Description: CRC code | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Wrong CRC checksum of code. | Load the program again. The program memory is corrupt. Unauthorized write access to the program memory. |

| Subfault: 10.10<br>Description: Setpoint cycle time not supported | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Non-supported setpoint cycle time parameterized. | Set the setpoint cycle time to the default value 1 ms. |

| Subfault: 10.11<br>Description: No application program loaded | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | No Data Flexibility application program loaded. | Load the program or disable Data Flexibility. |

| Subfault: 10.12<br>Description: Runtime warning | | |
|---|---|---|
| | Response: Warning | |
| | Cause | Measure |
| | The program requires more runtime than configured. | Check the program. |

| Subfault: 10.99<br>Description: Unknown fault | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Unknown Data Flexibility error. | Contact SEW-EURODRIVE Service. |

### 10.5.9 Fault 11 Temperature monitoring

| Subfault: 11.1<br>Description: Heat sink overtemperature | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Maximum permitted heat sink temperature exceeded. The capacity utilization is possibly too high. | – Reduce the load.<br>– Reduce the rms value of the current.<br>– Reduce the PWM frequency.<br>– Ensure sufficient cooling.<br>– Reduce the ambient temperature. |

| Subfault: 11.2<br>Description: Heat sink utilization – prewarning | | |
|---|---|---|
| | Response: Heat sink utilization – prewarning | |
| | Cause | Measure |
| | High thermal load on heat sink of device, and prewarning threshold reached. | – Reduce the load.<br>– Reduce the rms value of the output current.<br>– Reduce the PWM frequency.<br>– Ensure sufficient cooling.<br>– Reduce the ambient temperature. |

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| Subfault: 11.3<br>Description: Device utilization | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| The temperature has reached or exceeded the switch-off threshold. Possible causes: Mean output current too high. | Reduce the load. |
| PWM frequency too high. | Reduce the PWM frequency. |
| Ambient temperature too high. | Ensure sufficient cooling. |
| Unfavorable air convection. | Check air convection. |
| Fan defective. | Check the fan and replace if necessary. |

| Subfault: 11.5<br>Description: Electromechanical capacity utilization | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| Electromechanical components of device overloaded by excessive continuous current. | Reduce the load. If necessary, reduce the rms value of the current. |

| Subfault: 11.6<br>Description: Electromechanical capacity utilization – prewarning | |
|---|---|
| Response: Electromechanical capacity utilization – prewarning | |
| Cause | Measure |
| High load on electromechanical components of device due to high continuous current. Prewarning threshold reached. | – Reduce the load.<br>– Reduce the PWM frequency.<br>– Reduce the rms value of the current.<br>– Reduce the ambient temperature. |

| Subfault: 11.7<br>Description: Wire break at temperature sensor of heat sink | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| Wire break at temperature sensor of heat sink. | Contact SEW-EURODRIVE Service. |

| Subfault: 11.8<br>Description: Short circuit at temperature sensor of heat sink | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| Short circuit at temperature sensor of heat sink. | Contact SEW-EURODRIVE Service. |

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### 10.5.10 Fault 12 Brake

| **Subfault: 12.20** | | |
|---|---|---|
| **Description: Digital motor integration fault – critical** | | |
| | Response: Output stage inhibit with self-reset | |
| | Cause | Measure |
| | The intelligent brake rectifier of digital motor integration has detected a critical component fault. | For the exact cause of the fault and for information on how to correct it, refer to the fault detected by the subcomponent. |

| **Subfault: 12.21** | | |
|---|---|---|
| **Description: Digital motor integration fault** | | |
| | Response: Emergency stop + output stage inhibit with self-reset | |
| | Cause | Measure |
| | The intelligent brake rectifier of digital motor integration has detected a component fault. | For the exact cause of the fault and for information on how to correct it, refer to the fault detected by the subcomponent. |

| **Subfault: 12.22** | | |
|---|---|---|
| **Description: Digital motor integration warning** | | |
| | Response: Warning with self-reset | |
| | Cause | Measure |
| | The intelligent brake rectifier of digital motor integration signaled a warning. | For the exact cause of the fault and for information on how to correct the warning, refer to the fault signaled by the subcomponent. |

| **Subfault: 12.23** | | |
|---|---|---|
| **Description: Digital motor integration timeout** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Communication with intelligent brake rectifier disrupted. | Check the connection. |

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### 10.5.11 Fault 13 Encoder 1

**Subfault: 13.1**

**Description: Position comparison check**

Response: Encoder 1 – latest critical fault

| Cause | Measure |
|---|---|
| Fault detected when comparing raw position and track counter of absolute encoder. | – Check the track signal wiring.<br>– Check interference sources (e.g. from the area of EMC).<br>– Replace the encoder.<br>– Replace the encoder card.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

**Subfault: 13.2**

**Description: Unknown encoder type**

Response: Encoder 1 – latest critical fault

| Cause | Measure |
|---|---|
| Encoder type not known and not supported by device. | – Check the encoder type.<br>– Contact SEW-EURODRIVE Service.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

**Subfault: 13.3**

**Description: Invalid data**

Response: Encoder 1 – latest critical fault

| Cause | Measure |
|---|---|
| Invalid encoder nameplate data (measuring steps/pulses per revolution/multi-turn). | – Check the startup parameters.<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

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| Subfault: 13.4<br>Description: Track measurement error | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | Error during track measurement. | – Switch the device off and on again.<br>– Check the wiring.<br>– Check interference sources (e.g. from the area of EMC).<br>– Check the encoder. Replace if necessary.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.5<br>Description: Internal warning | | |
|---|---|---|
| | Response: Encoder – warning | |
| | Cause | Measure |
| | Encoder signaled warning. | – Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Clean the sensor. |

| Subfault: 13.6<br>Description: Signal level too low | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | The value established from the level of the two track signals A and B is below the permitted limit. | – Check the wiring.<br>– Check interference sources (e.g. from the area of EMC).<br>– Check the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.7<br>**Description: Signal level too high** | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | The value established from the level of the two track signals A and B exceeds the permitted limit. | Check the gear ratio of the resolver in use.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.8<br>**Description: Signal level monitoring** | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | The value established from the level of the two track signals A and B exceeds the permitted limit. | Check the resolver mounting position.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.9<br>**Description: Quadrant check** | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | Error checking quadrants (sine encoder). | – Switch the device off and on again.<br>– Check the wiring.<br>– Check interference sources (e.g. from the area of EMC).<br>– Check the encoder. Replace if necessary.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| **Subfault: 13.10<br>Description: Position tolerance range exceeded** | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | Position outside tolerance range. | – Check the startup parameters.<br>– Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| **Subfault: 13.11<br>Description: Encoder data timeout** | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | Encoder process data triggered timeout state. | – Check interference sources (e.g. from the area of EMC).<br>– Check the startup parameters.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| **Subfault: 13.12<br>Description: Emergency** | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | Encoder signaled emergency. | – Check interference sources (e.g. from the area of EMC).<br>– Check the startup parameters.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

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| Subfault: 13.13<br>Description: Error during initialization | | |
|---|---|---|
| | Response: Encoder 1 – latest fault | |
| | Cause | Measure |
| | Communication error during initialization. | With encoders from SEW-EURODRIVE:<br>– Check the wiring.<br>With encoders of other manufacturers:<br>– Check the wiring.<br>– Check the parameter setting in MOVISUITE®.<br>– Compare the settings via DIP switches, display, USB interface, etc. on the encoder with the specifications in the operating instructions of the inverter or option (e.g. baud rate, node ID).<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.14<br>Description: Communication error | | |
|---|---|---|
| | Response: Encoder 1 – latest fault | |
| | Cause | Measure |
| | Faulty communication with encoder. | – Check the voltage supply.<br>– Check interference sources (e.g. from the area of EMC).<br>– Check the wiring.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.15 | | |
|---|---|---|
| **Description: System error** | | |
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | System error while evaluating encoder. | – Ensure that the multi-turn encoder is within the configured track range.<br>– Check the limits.<br>– Check for correct settings of encoder numerator/denominator factors.<br>– Check interference sources (e.g. from the area of EMC).<br>– Check the startup parameters.<br>– Switch the device off and on again.<br>– If the fault occurs repeatedly, contact SEW-EURODRIVE Service.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.16 | | |
|---|---|---|
| **Description: Permanent high level in signal cable – critical** | | |
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | Permanent high level of data signal detected. | – Check the wiring.<br>– Check the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.17 | | |
|---|---|---|
| **Description: Permanent high level in signal cable** | | |
| | Response: Encoder 1 – latest fault | |
| | Cause | Measure |
| | Permanent high level of data signal detected. | – Check the wiring.<br>– Check the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

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| Subfault: 13.18<br>Description: Permanent low level in signal cable – critical | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | Permanent low level of data signal detected. | – Check the wiring.<br>– Check the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.19<br>Description: Permanent low level in signal cable | | |
|---|---|---|
| | Response: Encoder 1 – latest fault | |
| | Cause | Measure |
| | Permanent low level of data signal detected. | – Check the wiring.<br>– Check the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.20<br>Description: SSI encoder – critical fault | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | SSI encoder signaled a critical fault. | – Check the startup parameters.<br>– Check the settings on the SSI encoder.<br>– Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive even with a faulty external position encoder. |

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| **Subfault: 13.21**<br>**Description: SSI encoder – fault** | | |
|---|---|---|
| | Response: Encoder 1 – latest fault | |
| | Cause | Measure |
| | SSI encoder signaled a fault. | – Check the startup parameters.<br>– Check the settings on the SSI encoder.<br>– Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive even with a faulty external position encoder. |

| **Subfault: 13.22**<br>**Description: Internal fault – critical** | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | Encoder signaled internal fault. | – Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| **Subfault: 13.23**<br>**Description: Internal fault** | | |
|---|---|---|
| | Response: Encoder 1 – latest fault | |
| | Cause | Measure |
| | Encoder signaled internal fault. | – Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

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| Subfault: 13.24<br>Description: Travel range exceeded | | |
|---|---|---|
| | Response: Encoder 1 – latest fault | |
| | Cause | Measure |
| | Current position mode does not allow for larger travel range. | Check the travel range.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.25<br>Description: Error during encoder startup | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Fatal error during encoder startup. | Switch the device off and on again.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 13.26<br>Description: Digital motor integration fault – critical | | |
|---|---|---|
| | Response: Encoder 1 – latest critical fault | |
| | Cause | Measure |
| | Encoder of digital motor integration detected a component fault. | – Check interference sources.<br>– Replace the encoder. |

| Subfault: 13.27<br>Description: Digital motor integration fault | | |
|---|---|---|
| | Response: Encoder 1 – latest fault | |
| | Cause | Measure |
| | Encoder of digital motor integration detected a component fault. | – Check interference sources.<br>– Replace the encoder. |

| Subfault: 13.28<br>Description: Digital motor integration warning | | |
|---|---|---|
| | Response: Encoder – warning | |
| | Cause | Measure |
| | Encoder of digital motor integration signaled a warning. | Check interference sources. |

| Subfault: 13.29<br>Description: Absolute position invalid | | |
|---|---|---|
| | Response: Encoder 1 – latest fault | |
| | Cause | Measure |
| | Diagnostics error detected while evaluating absolute encoder position. Referencing is canceled. | – Reference the drive again.<br>– If the fault occurs repeatedly, contact SEW-EURODRIVE Service.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

### 10.5.12 Fault 14 Encoder 2

| Subfault: 14.1<br>Description: Position comparison check | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Fault detected when comparing raw position and track counter of absolute encoder. | – Check the track signal wiring.<br>– Check interference sources (e.g. from the area of EMC).<br>– Replace the encoder.<br>– Replace the encoder card.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.2<br>Description: Unknown encoder type | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Encoder type not known and not supported by device. | – Check the encoder type.<br>– Contact SEW-EURODRIVE Service.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

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| Subfault: 14.3<br>Description: Invalid data | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Invalid encoder nameplate data (measuring steps/pulses per revolution/multi-turn). | – Check the startup parameters.<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.4<br>Description: Track measurement error | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Error during track measurement. | – Switch the device off and on again.<br>– Check the wiring.<br>– Check interference sources (e.g. from the area of EMC).<br>– Check the encoder. Replace if necessary.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.5<br>Description: Internal warning | | |
|---|---|---|
| | Response: Encoder – warning | |
| | Cause | Measure |
| | Encoder signaled warning. | – Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Clean the sensor. |

| **Subfault: 14.6**<br>**Description: Signal level too low** | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | The value established from the level of the two track signals A and B is below the permitted limit. | – Check the wiring.<br>– Check interference sources (e.g. from the area of EMC).<br>– Check the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| **Subfault: 14.7**<br>**Description: Signal level too high** | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | The value established from the level of the two track signals A and B exceeds the permitted limit. | Check the gear ratio of the resolver in use.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| **Subfault: 14.8**<br>**Description: Signal level monitoring** | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | The value established from the level of the two track signals A and B exceeds the permitted limit. | Check the resolver mounting position.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

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| Subfault: 14.9<br>Description: Quadrant check | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Error checking quadrants (sine encoder). | – Switch the device off and on again.<br>– Check the wiring.<br>– Check interference sources (e.g. from the area of EMC).<br>– Check the encoder. Replace if necessary.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.10<br>Description: Position tolerance range exceeded | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Position outside tolerance range. | – Check the startup parameters.<br>– Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.11<br>Description: Encoder data timeout | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Encoder process data triggered timeout state. | – Check interference sources (e.g. from the area of EMC).<br>– Check the startup parameters.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

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| Subfault: 14.12<br>Description: Emergency | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Encoder signaled emergency. | – Check interference sources (e.g. from the area of EMC).<br>– Check the startup parameters.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.13<br>Description: Error during initialization | | |
|---|---|---|
| | Response: Encoder 2 – latest fault | |
| | Cause | Measure |
| | Communication error during initialization. | With encoders from SEW-EURODRIVE:<br>– Check the wiring.<br>With encoders of other manufacturers:<br>– Check the wiring.<br>– Check the parameter setting in MOVISUITE®.<br>– Compare the settings via DIP switches, display, USB interface, etc. on the encoder with the specifications in the operating instructions of the inverter or option (e.g. baud rate, node ID).<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.14<br>Description: Communication error | | |
|---|---|---|
| | Response: Encoder 2 – latest fault | |
| | Cause | Measure |
| | Faulty communication with encoder. | – Check the voltage supply.<br>– Check interference sources (e.g. from the area of EMC).<br>– Check the wiring.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

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| Subfault: 14.15<br>Description: System error | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | System error while evaluating encoder. | – Make sure that the multi-turn encoder is within the configured track area.<br>– Check the limits.<br>– Check for correct settings of encoder numerator/denominator factors.<br>– Check interference sources (e.g. from the area of EMC).<br>– Check the startup parameters.<br>– Switch the device off and on again.<br>– If the fault occurs repeatedly, contact SEW-EURODRIVE Service.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.16<br>Description: Permanent high level in signal cable – critical | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Permanent high level of data signal detected. | – Check the wiring.<br>– Check the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.17<br>Description: Permanent high level in signal cable | | |
|---|---|---|
| | Response: Encoder 2 – latest fault | |
| | Cause | Measure |
| | Permanent high level of data signal detected. | – Check the wiring.<br>– Check the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

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| Subfault: 14.18<br>Description: Permanent low level in signal cable – critical | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Permanent low level of data signal detected. | – Check the wiring.<br>– Check the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.19<br>Description: Permanent low level in signal cable | | |
|---|---|---|
| | Response: Encoder 2 – latest fault | |
| | Cause | Measure |
| | Permanent low level of data signal detected. | – Check the wiring.<br>– Check the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.20<br>Description: SSI encoder – critical fault | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | SSI encoder detected a critical fault. | – Check the startup parameters.<br>– Check the settings on the SSI encoder.<br>– Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive even with a faulty external position encoder. |

| **Subfault: 14.21**<br>**Description: SSI encoder – fault** | | |
|---|---|---|
| | Response: Encoder 2 – latest fault | |
| | Cause | Measure |
| | SSI encoder detected a fault. | – Check the startup parameters.<br>– Check the settings on the SSI encoder.<br>– Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive even with a faulty external position encoder. |

| **Subfault: 14.22**<br>**Description: Internal fault – critical** | | |
|---|---|---|
| | Response: Encoder 2 – latest critical fault | |
| | Cause | Measure |
| | Encoder signaled internal fault. | – Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| **Subfault: 14.23**<br>**Description: Internal fault** | | |
|---|---|---|
| | Response: Encoder 2 – latest fault | |
| | Cause | Measure |
| | Encoder signaled internal fault. | – Check the wiring.<br>– Check interference sources (light beam interrupted, reflector, signal cables, etc.).<br>– Replace the encoder.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

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| Subfault: 14.24<br>Description: Travel range exceeded | | |
|---|---|---|
| | Response: Encoder 2 – latest fault | |
| | Cause | Measure |
| | Current position mode does not allow for larger travel range. | Check the travel range.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.25<br>Description: Error during encoder startup | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Fatal error during encoder startup. | Switch the device off and on again.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

| Subfault: 14.29<br>Description: Absolute position invalid | | |
|---|---|---|
| | Response: Encoder 2 – latest fault | |
| | Cause | Measure |
| | Diagnostics error detected while evaluating absolute encoder position. Referencing is canceled. | – Reference the drive again.<br>– If the fault occurs repeatedly, contact SEW-EURODRIVE Service.<br>INFORMATION<br>In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty. |

### 10.5.13 Fault 16 Startup

| Subfault: 16.1<br>Description: Motor not started up | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Motor not started up or not started up completely. | Perform complete motor startup. |

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| **Subfault: 16.2**<br>**Description: Cannot calculate controller parameters** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Delay of encoder in use too long to calculate required filter coefficients. | Use an encoder with a shorter delay, or contact SEW-EURODRIVE Service. |

| **Subfault: 16.3**<br>**Description: Thermal motor model not possible** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Invalid parameters for thermal motor model or for drive enable although starting up thermal model not yet completed. | Check the parameters of the thermal motor model, and perform startup. |

| **Subfault: 16.5**<br>**Description: Current limit smaller than magnetizing current of the motor** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Current limit smaller than magnetizing current of the motor calculated by active control mode. | Increase the current limit. Required magnetizing current: See diagnostics parameters of control mode. |

| **Subfault: 16.6**<br>**Description: Control mode not possible** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Wrong control mode selected for the motor. | Choose a control mode that matches the selected motor. |

| **Subfault: 16.7**<br>**Description: PWM frequency not possible** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The motor cannot be operated with the inverter. The motor requires a higher PWM frequency than the inverter can provide. | Use an inverter with a suitable PWM frequency range. |
| | Specified PWM frequency not allowed for this power output stage. | Choose another PWM frequency. The possible PWM frequencies can be found in the device configuration data. |

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| Subfault: 16.8<br>Description: Temperature sensor motor 1 | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Faulty startup of temperature sensor of motor 1. | Perform startup again. |

| Subfault: 16.9<br>Description: Temperature sensor motor 2 | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Faulty startup of temperature sensor of motor 2. | Perform startup again. |

| Subfault: 16.10<br>Description: Actual position source not assigned | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Active control mode requires an encoder for position mode. | – Assign actual position source in encoder assignment of the active drive train (index 8565.3 or 8566.3).<br>– If no encoder is installed, activate the FCBs only using "torque control" or "speed control" operating modes. |

| Subfault: 16.11<br>Description: Motor data calculation error | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Motor startup not possible because of inconsistent motor data or wrong device configuration data. | Check the motor data for plausibility, or contact SEW-EURODRIVE Service. |

| Subfault: 16.12<br>Description: Motor data write sequence | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Subindex 1 not written to zero before writing electrical startup parameters (index 8357, 8360, 8394, 8420 or 8358, 8361, 8395, 8421). | Reset the error. Set parameters 8360/1 or 8361/1 to "0" before writing additional parameters. |

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| **Subfault: 16.13<br>Description: Several motor protection models are active** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | More than one model active at the same time in thermal motor monitoring, e.g. for asynchronous motor and synchronous motor. | If the startup parameters were changed manually, switch off motor monitoring.<br>In all other cases, contact SEW-EURODRIVE Service. |

| **Subfault: 16.20<br>Description: Nominal speed too high or nominal frequency too low** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | During startup using nameplate data: Nominal speed too high or nominal frequency too low. The resulting number of pole pairs is 0. | Enter plausible motor data (nominal speed and nominal frequency). |

| **Subfault: 16.21<br>Description: Nominal slip negative** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | During startup using nameplate data, the calculated nominal slip is negative: Nominal frequency too low, or nominal speed too high, or number of pole pairs too high. | Enter plausible motor data (nominal frequency, nominal speed, number of pole pairs). |

| **Subfault: 16.22<br>Description: Specify the number of pole pairs** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | During startup using nameplate data: It is not possible to calculate the number of pole pairs accurately from nominal frequency and nominal speed. | Enter the number of pole pairs. |

| **Subfault: 16.23<br>Description: Plausibility check failed** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | During startup using nameplate data: The estimated nominal power does not match the entered nominal power. | Check entered nameplate data for plausibility. |

| Subfault: 16.24 | | |
|---|---|---|
| **Description: Speed controller sampling cycle not possible with current PWM frequency or current control mode** | | |
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | At a PWM frequency of "2.5 kHz", only the speed controller sampling cycle of 2 ms is permitted. For the ELSM® control mode, the only permitted speed controller sampling cycles are 1 ms and 2 ms. | Increase the PWM frequency or increase the sampling cycle of the speed controller to 2 ms. Set the sampling cycle to 1 ms or 2 ms for ELSM® control mode. |

| Subfault: 16.25 | | |
|---|---|---|
| **Description: User-defined current limit too low for standstill current** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | User-defined current limit value too small for minimum standstill current. | Increase the user-defined current limit, or disable the standstill current function. |

| Subfault: 16.26 | | |
|---|---|---|
| **Description: Nominal values incomplete or implausible** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | During startup using nameplate data: Nominal voltage, nominal current, nominal speed or nominal torque are not entered or are not plausible. | Enter or check nominal voltage, nominal current, nominal speed, and nominal torque. |

| Subfault: 16.27 | | |
|---|---|---|
| **Description: Maximum current or maximum torque not plausible** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | During startup using nameplate data: Maximum current or maximum torque not entered, or maximum current and maximum torque not plausible. | Check the maximum current and maximum torque. |

| Subfault: 16.30 | | |
|---|---|---|
| **Description: Faulty EtherCAT® EEPROM configuration status** | | |
| | Response: Warning | |
| | Cause | Measure |
| | Faulty EtherCAT®/SBusPLUS EEPROM configuration status.<br>EEPROM not loaded; binary file not loaded. | Contact SEW-EURODRIVE Service. |
| | Faulty EEPROM loading procedure. | Contact SEW-EURODRIVE Service. |
| | Faulty EEPROM checksum. | Contact SEW-EURODRIVE Service. |

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| Subfault: 16.60<br>Description: Parameter setting for 3-wire control not valid | | |
|---|---|---|
| | Response: Warning | |
| | Cause | Measure |
| | No 3-wire control stop terminal configured. | Set stop terminal parameters. |

### 10.5.14 Fault 17 Internal processor fault

| Subfault: 17.7<br>Description: Exception error | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Exception trap in CPU. | Contact SEW-EURODRIVE Service. |

### 10.5.15 Fault 18 Software error

| Subfault: 18.1<br>Description: Motor management | | |
|---|---|---|
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | Error detected at motor management interface. | – Switch the device off and on again.<br>– Contact SEW-EURODRIVE Service if the fault persists. |

| Subfault: 18.3<br>Description: Task system warning | | |
|---|---|---|
| | Response: Warning | |
| | Cause | Measure |
| | Error while processing internal task system. This may be a timeout for cyclical tasks, for example. | – Acknowledge the warning.<br>– Contact SEW-EURODRIVE Service if the warning occurs regularly. |

| Subfault: 18.4<br>Description: Task system | | |
|---|---|---|
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | A fault was detected during the processing of the internal task system. This may be a timeout for cyclical tasks, for example. | – Switch the device off and on again.<br>– Contact SEW-EURODRIVE Service if the fault persists. |

| **Subfault: 18.7<br>Description: Fatal error** | | |
|---|---|---|
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | Fatal software error. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

| **Subfault: 18.8<br>Description: Invalid fault code** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Invalid fault code requested. | – Switch the device off and on again.<br>– Contact SEW-EURODRIVE Service if the fault persists. |

| **Subfault: 18.9<br>Description: Internal software error** | | |
|---|---|---|
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | The software reports an unexpected event. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

| **Subfault: 18.10<br>Description: Watchdog** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Software no longer operates within intended cycle time. | – Switch the device off and on again.<br>– Contact SEW-EURODRIVE Service if the fault persists. |

| Subfault: 18.12 | | |
|---|---|---|
| **Description: Configuration data** | | |
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | Configuration data not plausible or cannot be interpreted by active firmware version. | Update the firmware or load valid configuration data. |

| Subfault: 18.13 | | |
|---|---|---|
| **Description: Calibration data** | | |
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | Calibration data not plausible. | Load valid calibration data. |

### 10.5.16 Fault 19 Process data

| Subfault: 19.1 | | |
|---|---|---|
| **Description: Torque setpoint violation** | | |
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Implausible values specified as torque setpoints. | Adjust torque setpoints. |

| Subfault: 19.2 | | |
|---|---|---|
| **Description: Position setpoint violation** | | |
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Position setpoint outside software limit switches. | Check the position setpoint. |
| | Position setpoint outside modulo range. | Check the position setpoint. |
| | Position in user unit generates number overflow in the system unit. | Check the position in user unit. |

| Subfault: 19.3 | | |
|---|---|---|
| **Description: Speed setpoint violation** | | |
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Specified rotational speed setpoints not plausible. | Adjust rotational speed setpoints. |

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| Subfault: 19.4 | | |
|---|---|---|
| **Description: Acceleration setpoint violation** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | The specified acceleration setpoints are not plausible. Only a value range of >= 0 is permitted. | Adjust acceleration setpoints. |

| Subfault: 19.5 | | |
|---|---|---|
| **Description: Drive function does not exist** | | |
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Non-existing drive function (FCB) selected via process data. | Specify an existing FCB number for FCB activation via process data. |

| Subfault: 19.6 | | |
|---|---|---|
| **Description: Mass moment of inertia setpoint violation** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Implausible values specified as mass moment of inertia setpoints. Only a value range of >= 0 is permitted. | Adjust the setpoints for the mass moment of inertia. |

| Subfault: 19.7 | | |
|---|---|---|
| **Description: Referencing missing** | | |
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Activated function permitted only with referenced encoder. | Reference the encoder first, then activate the function. |

| Subfault: 19.8 | | |
|---|---|---|
| **Description: Drive train changeover not allowed** | | |
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Drive train changeover requested while output stage is enabled. | Inhibit the output stage before changing to another drive train. |

| Subfault: 19.9 | | |
|---|---|---|
| **Description: Jerk setpoint violation** | | |
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Jerk values not plausible. | Adjust the jerk setpoints. |

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### 10.5.17 Fault 20 Device monitoring

**Subfault: 20.1**

**Description: Supply voltage fault**

Response: Output stage inhibit

System state: Fault acknowledgment with CPU reset

| Cause | Measure |
|---|---|
| Internal electronics supply voltage or externally connected DC 24 V standby supply voltage outside permitted voltage range. | Check the voltage level of the external DC 24 V standby supply voltage and check for correct connection. If required, correct.<br>– Acknowledge the fault.<br>– If the fault occurs repeatedly, replace the device. For further support, contact SEW-EURODRIVE Service. |

**Subfault: 20.2**

**Description: Supply voltage overload**

Response: Output stage inhibit

| Cause | Measure |
|---|---|
| For MOVIDRIVE® system, the current load of the current paths of the DC 24 V standby supply voltage inside the device is too high. The device signal output of the device was de-energized because of the fault message. | Identify the consumer that is overloading the internal supply voltage:<br>1. Remove all external consumers:<br>– At the digital outputs of the basic unit.<br>– At options that may be present.<br>– At all encoder connections.<br>– At other consumers at the DC 24 V output voltage terminals.<br>2. Acknowledge the error.<br>3. Reconnect the consumers with the device, one after the other, until the fault message appears once again.<br>4. To eliminate the fault, connect a consumer with a lower current consumption or eliminate the short circuit. |

**Subfault: 20.7**

**Description: Internal hardware fault**

Response: Output stage inhibit

System state: Fault acknowledgment with CPU reset

| Cause | Measure |
|---|---|
| Fault in the device hardware. | – Acknowledge the fault.<br>– If the fault occurs repeatedly, replace the device. For further support, contact SEW-EURODRIVE Service. |

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| Subfault: 20.8<br>Description: Fan warning | | |
|---|---|---|
| | Response: Warning with self-reset | |
| | Cause | Measure |
| | Fan function impaired. | Check the fan for proper functioning. |

| Subfault: 20.9<br>Description: Fan fault | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Fan defective. | Contact SEW-EURODRIVE Service. |

| Subfault: 20.10<br>Description: Fan supply voltage fault | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Supply voltage of fan missing. | Check the connection or establish a connection. |

| Subfault: 20.11<br>Description: STO – switching delay | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Switching delay between STO signals F-STO_P1 and F-STO_P2. | – Check the STO wiring.<br>– Before acknowledging the fault, make sure that both STO signals are switched to low level. |

| Subfault: 20.23<br>Description: Power section temperature detection | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Fault in the device hardware. Power section does not provide temperature data. | – Acknowledge the fault.<br>– If the fault occurs repeatedly, replace the device. For further support, contact SEW-EURODRIVE Service. |

### 10.5.18 Fault 21 Digital motor integration 1

| Subfault: 21.1<br>Description: Communication error | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Communication error detected on the interface of digital motor integration. | Check the cabling. |

| Subfault: 21.2<br>Description: Slave required | | |
|---|---|---|
| | Response: Digital motor integration | |
| | Cause | Measure |
| | Device started up with a drive with digital motor integration but no drive with digital motor integration is connected. | Connect a suitable drive with digital motor integration for startup, or perform a new startup. |

| Subfault: 21.3<br>Description: Incompatible driving motor | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Connected drive not compatible with started-up drive. | Connect a drive that matches startup, or perform a new startup. |

| Subfault: 21.4<br>Description: Invalid label | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The connected drive contains invalid data. | Replace the drive. |

| Subfault: 21.5<br>Description: Incompatible slave | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The connected slave of digital motor integration cannot be used with this inverter firmware. | Update the inverter or the slave. |

| Subfault: 21.6<br>Description: Overload/short circuit on the interface | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Short circuit in the cabling of components of digital motor integration. | Check the cabling of the digital motor integration component. |
| | Voltage of digital motor integration component too low. | Check the voltage supply of the component. |

| Subfault: 21.7<br>Description: Continuous supply current of slave too high | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The continuous supply current of the slave is too large for operation on the device. | Use a slave with lower supply current. |

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| **Subfault: 21.8** | | |
|---|---|---|
| **Description: Parameter error** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Error while processing data from digital motor integration slave. | Repeat the process in configuration state. |
| | The connected drive contains invalid data. | Replace the drive. |

| **Subfault: 21.9** | | |
|---|---|---|
| **Description: Illegal hot plug** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | A slave of digital motor integration was connected while the drive was enabled. | Set the device to configuration state or switch it off. Connect the slave. |
| | A slave of digital motor integration was connected while the device was in standby mode without switching off the encoder supply. | Switch off encoder supply in standby mode. Connect the slave. |

| **Subfault: 21.20** | | |
|---|---|---|
| **Description: Slave fault – critical** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | A slave of digital motor integration detected a critical component fault. | For the exact cause of the fault and for information on how to remedy it, refer to the fault signaled by the subcomponent. |

| **Subfault: 21.21** | | |
|---|---|---|
| **Description: Slave fault** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | A slave of digital motor integration detected a component fault. | For the exact cause of the fault and for information on how to remedy it, refer to the fault signaled by the subcomponent. |

| **Subfault: 21.22** | | |
|---|---|---|
| **Description: Slave warning** | | |
| | Response: Warning | |
| | Cause | Measure |
| | A slave of digital motor integration issued a warning. | For the exact cause of the fault and for information on how to correct the warning, refer to the fault signaled by the subcomponent. |

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### 10.5.19 Fault 23 Power section

| **Subfault: 23.1**<br>**Description: Warning** | | |
|---|---|---|
| | Response: Warning with self-reset | |
| | Cause | Measure |
| | Power section fault with fault response of the type "Warning". | See also "Power section subcomponent" fault status. |

| **Subfault: 23.2**<br>**Description: Fault** | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Power section fault with fault response of the type "Standard". | See also "Power section subcomponent" fault status. |

| **Subfault: 23.3**<br>**Description: Critical fault** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Power section fault with fault response of the type "Critical fault". | See also "Power section subcomponent" fault status. |

| **Subfault: 23.4**<br>**Description: Hardware fault** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | A fault occurred in a hardware component of the power section, e.g.: Overcurrent hardware comparator. | – Check the current supply.<br>– Increase the ramp time.<br>– Check for correct motor size (the motor current is too high).<br>– Contact SEW-EURODRIVE Service. |
| | Switched-mode power supply fault, hardware fault. | – Check the current supply.<br>– Check the DC 24 V supply voltage. |
| | Fault at the gate driver of an IGBT. | Defect in the power output stage. Contact SEW-EURODRIVE Service. |
| | Invalid process data configuration. Status of control section and power section are not compatible. | Contact SEW-EURODRIVE Service. |

| **Subfault: 23.5**<br>**Description: Invalid process data configuration** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Invalid process data configuration. | Contact SEW-EURODRIVE Service. |

| Subfault: 23.6 | | |
|---|---|---|
| **Description: Process data timeout** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Power section communication interface detected process data timeout. | If the fault occurs repeatedly, contact SEW-EURODRIVE Service. |

| Subfault: 23.7 | | |
|---|---|---|
| **Description: Parameter communication timeout** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Power section communication interface detected timeout in parameter communication. | If the fault occurs repeatedly, contact SEW-EURODRIVE Service. |

| Subfault: 23.8 | | |
|---|---|---|
| **Description: Parameter communication error** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Power section communication interface detected error in parameter communication. | If the fault occurs repeatedly, contact SEW-EURODRIVE Service. |

| Subfault: 23.9 | | |
|---|---|---|
| **Description: Firmware of power section corrupt** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Failed to update firmware on power section. | Update the firmware again. |

### 10.5.20 Fault 24 Cam switch

| Subfault: 24.1 | | |
|---|---|---|
| **Description: Cam window limits interchanged** | | |
| | Response: Warning | |
| | Cause | Measure |
| | Left cam window limit larger than right limit. | Check cam window limits and adjust. |

| Subfault: 24.2 | | |
|---|---|---|
| **Description: Cam window limit not within modulo range** | | |
| | Response: Warning | |
| | Cause | Measure |
| | Cam window limits outside modulo range. | Check cam window limits and adjust. |

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| Subfault: 24.3<br>Description: Overlapping cam windows in track | | |
|---|---|---|
| | Response: Warning | |
| | Cause | Measure |
| | Cam window limits of a track overlap. | Adjust the cam window limits in such a way that they are flush. |

| Subfault: 24.4<br>Description: Modulo limits swapped | | |
|---|---|---|
| | Response: Warning | |
| | Cause | Measure |
| | The left limit of the modulo range is larger than the right limit. | Check the limits of the modulo range and adjust accordingly. |

### 10.5.21 Fault 25 Parameter memory monitoring

| Subfault: 25.1<br>Description: Timeout warning | | |
|---|---|---|
| | Response: Warning with self-reset | |
| | Cause | Measure |
| | Access to memory (R/W) takes longer than expected. | The error will be reset automatically after completed memory access. |

| Subfault: 25.2<br>Description: NV memory – runtime error | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Runtime error of non-volatile memory system. | – Reset the device.<br>– If this error occurs repeatedly, replace the device. Contact SEW-EURODRIVE Service. |

| Subfault: 25.6 | | |
|---|---|---|
| **Description: Incompatible device configuration** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The data set in the device was copied from another device, which differs from the current device in the device family, power, or voltage. | – Check whether the configuration is correct and repeat the startup, if necessary.<br>– Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset". |
| | Replaceable memory module used by another device. Power, device family, or voltage differs from the current device. | – Check whether the configuration is correct and repeat the startup, if necessary.<br>– Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset". |
| | The power section was replaced and differs in its power rating or voltage from the original power section. | – Check whether the configuration is correct and repeat the startup, if necessary.<br>– Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset". |

| Subfault: 25.7 | | |
|---|---|---|
| **Description: NV memory initialization – error** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Error initializing non-volatile memory system. | – Reset the device.<br>– If this error occurs repeatedly, replace the device. Contact SEW-EURODRIVE Service. |

| Subfault: 25.10 | | |
|---|---|---|
| **Description: Power section configuration data – version conflict** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Wrong version of configuration data of power section. | Contact SEW-EURODRIVE Service. |

| Subfault: 25.12 | | |
|---|---|---|
| **Description: Power section configuration data – CRC error** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Faulty configuration data of power section. | Contact SEW-EURODRIVE Service. |

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| **Subfault: 25.13<br>Description: Control electronics configuration data – CRC error** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Faulty configuration data of control electronics. | Contact SEW-EURODRIVE Service. |

| **Subfault: 25.14<br>Description: Calibration data of power section – version conflict** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Wrong version of calibration data of power section. | Contact SEW-EURODRIVE Service. |

| **Subfault: 25.15<br>Description: Calibration data of control electronics – version conflict** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Wrong version of calibration data of control electronics. | Contact SEW-EURODRIVE Service. |

| **Subfault: 25.16<br>Description: Power section calibration data – CRC error** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Faulty calibration data of power section. | Contact SEW-EURODRIVE Service. |

| **Subfault: 25.17<br>Description: Control electronics calibration data – CRC error** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Faulty calibration data of control electronics. | Contact SEW-EURODRIVE Service. |

| **Subfault: 25.18<br>Description: Power section QA data – CRC error** | | |
|---|---|---|
| | Response: Warning | |
| | Cause | Measure |
| | Faulty quality assurance data of power section. | Contact SEW-EURODRIVE Service. |

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| Subfault: 25.19 | | |
|---|---|---|
| **Description: Control electronics QA data – CRC error** | | |
| | Response: Warning | |
| | Cause | Measure |
| | Faulty quality assurance data of control electronics. | Contact SEW-EURODRIVE Service. |

| Subfault: 25.20 | | |
|---|---|---|
| **Description: Initialization error – basic unit memory** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Initialization error of the basic unit memory. | Contact SEW-EURODRIVE Service. |

| Subfault: 25.21 | | |
|---|---|---|
| **Description: Runtime error – basic unit memory** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Runtime error in memory of basic unit. | Contact SEW-EURODRIVE Service. |

| Subfault: 25.30 | | |
|---|---|---|
| **Description: Initialization error – replaceable memory module** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The formatting of the replaceable memory module does not match. | Restore delivery state.<br>NOTICE<br>All the data on the replaceable memory module will be reset to default. |
| | Initialization error of replaceable memory module after delivery state. | Contact SEW-EURODRIVE Service. |

| Subfault: 25.31 | | |
|---|---|---|
| **Description: Runtime error – replaceable memory module** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Runtime error of replaceable memory module. | Contact SEW-EURODRIVE Service. |

| Subfault: 25.32 | | |
|---|---|---|
| **Description: Replaceable memory module not compatible** | | |
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | The inserted replaceable memory module cannot be used. | Replace the memory module. |

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| Subfault: 25.50 | | |
|---|---|---|
| **Description: Runtime error – replaceable safety memory module** | | |
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | Runtime error of the replaceable safety memory module. | Contact SEW-EURODRIVE Service. |

| Subfault: 25.51 | | |
|---|---|---|
| **Description: Initialization error – replaceable safety memory module** | | |
| | Response: Warning | |
| | Cause | Measure |
| | Initialization error of the replaceable safety memory module. | Contact SEW-EURODRIVE Service. |

| Subfault: 25.61 | | |
|---|---|---|
| **Description: Failure – restore point** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Failed to create restore point. | Delete restore point. |

| Subfault: 25.70 | | |
|---|---|---|
| **Description: Incompatible card configuration** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | The current configuration of the cards does not match the state of the stored startup.<br>For example, a card was removed that was still present during startup. | – Restore the original configuration of the cards.<br>– Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset". |

### 10.5.22 Fault 26 External fault

| Subfault: 26.1 | | |
|---|---|---|
| **Description: Terminal** | | |
| | Response: External fault | |
| | Cause | Measure |
| | Fault message about external fault source. | Programmable via 8622.5 (default: application stop (with output stage inhibit)). |

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| Subfault: 26.2 | | |
|---|---|---|
| **Description: Emergency shutdown** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Another module bus station requested external emergency shutdown. | Check other module bus stations for faults. |

| Subfault: 26.3 | | |
|---|---|---|
| **Description: Power section emergency shutdown** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Power section requested external emergency shutdown because it detected critical fault. | Contact SEW-EURODRIVE Service. |

| Subfault: 26.4 | | |
|---|---|---|
| **Description: External braking resistor fault** | | |
| | Response: Response to external braking resistor fault | |
| | Cause | Measure |
| | External braking resistor's temperature switch connected to terminal tripped. | – Check the resistor mounting position.<br>– Clean the resistor.<br>– Check the configuration of the resistor.<br>– Install a larger resistor.<br>– Check the trip switch settings.<br>– Optimize the travel cycle so that less regenerative operation energy arises. |

### 10.5.23 Fault 28 FCB drive functions

| Subfault: 28.1 | | |
|---|---|---|
| **Description: FCB 11/12 – Timeout while searching zero pulse** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Failed to find zero pulse of encoder's C track within specified search time during reference travel. | Check the encoder wiring. |

| Subfault: 28.2 | | |
|---|---|---|
| **Description: FCB 11/12 – Hardware limit switch upstream of reference cam** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | The hardware limit switch was reached during reference travel. The reference cam was not detected. | Make sure that the reference cam is not installed downstream of the hardware limit switch. |

| **Subfault: 28.3**<br>**Description: FCB 11/12 – Hardware limit switch and reference cam not flush** | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Hardware limit switch and reference cam not mounted flush. | Make sure that the reference cam and the hardware limit switch are mounted flush. |

| **Subfault: 28.4**<br>**Description: FCB 11/12 – Reference offset error** | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Error while determining reference offset. | – Make sure that the reference offset is smaller than the "Modulo maximum" limit value.<br>– When using a single-turn absolute encoder, make sure that the reference offset is larger than one encoder revolution. |

| **Subfault: 28.5**<br>**Description: FCB 11/12 – Referencing not possible** | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | In the active drive train, the "Actual position source" parameter is set to "No encoder". | Assign "Actual position source", or do not perform any referencing. |

| **Subfault: 28.6**<br>**Description: FCB 11/12 – Limit switch/reference cam not flush/overlapping with fixed stop** | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Hardware limit switch or reference cam that has not been selected was approached during reference travel to fixed stop. | Check whether the parameters set for reference travel are correct. |
| | During reference travel to fixed stop with selected hardware limit switch or reference cam, the fixed stop was reached without hitting the hardware limit switch or reference cam. | Check whether the parameters set for reference travel are correct. |

| **Subfault: 28.7**<br>**Description: FCB 21 – Total torque greater than maximum torque at motor shaft** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The required total torque from the torque input and load torque is greater than the permitted maximum torque at the motor shaft. | Reduce the torque input. |

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**Subfault: 28.8**

**Description: FCB 21 – Total torque not reached**

Response: Output stage inhibit

| Cause | Measure |
|---|---|
| The required total torque from torque input and load torque is limited internally. | – Reduce the torque input.<br>– Check limit values. |

**Subfault: 28.9**

**Description: FCB 18 – Rotor position identification not possible**

Response: Output stage inhibit

| Cause | Measure |
|---|---|
| Rotor position identification started with incremental encoder but aborted prematurely. | – Restart the rotor position identification.<br>– Check whether the encoder is connected correctly.<br>– Check whether the encoder is defective. |
| Result of rotor position identification cannot be stored in encoder. | Select "Inverter" as storage location. |
| Combination of "Automatic" operating mode and "Encoder" storage location not permitted. | Set the operating mode to "Manual" or the storage location to "Inverter". |

**Subfault: 28.10**

**Description: FCB 25 – Asymmetrical motor phases**

Response: Output stage inhibit

| Cause | Measure |
|---|---|
| Significantly different values determined in the 3 phases while measuring stator resistances. | – Check whether the motor is connected correctly.<br>– Check all contact points on the motor and inverter.<br>– Check the motor and motor cable for damage. |

**Subfault: 28.11**

**Description: FCB 25 – At least one phase with high resistance**

Response: Output stage inhibit

| Cause | Measure |
|---|---|
| At least one motor phase could not be measured during motor parameter measurement. | – Check whether the motor is connected correctly.<br>– Check all contact points on the motor and inverter.<br>– Check the motor and motor cable for damage. |

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| Subfault: 28.12 | | |
|---|---|---|
| **Description: FCB 25 – Timeout during stator resistance measurement** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Motor parameter measurement activated while motor is turning. | – Stop the motor.<br>– Start motor parameter measurement when the motor is at standstill. |

| Subfault: 28.13 | | |
|---|---|---|
| **Description: FCB 25 – Characteristic curve identification not possible** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Motor parameter measurement does not allow for unique identification of the characteristic curve. | Contact SEW-EURODRIVE Service. |

| Subfault: 28.14 | | |
|---|---|---|
| **Description: Modulo min. and max. swapped** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | In the active data set, the value for "Modulo minimum" is greater than the value for "Modulo maximum"; see Monitoring functions\Limit values 1 or Monitoring functions\Limit values 2. | Swap the values for modulo minimum and modulo maximum. |

| Subfault: 28.15 | | |
|---|---|---|
| **Description: FCB 25 – Timeout** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Measuring rotor resistance, LSigma, or stator inductance not completed. | Contact SEW-EURODRIVE Service. |

| Subfault: 28.17 | | |
|---|---|---|
| **Description: FCB only possible for drive train 1** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The activated FCB can only be operated if drive train 1 is set as the active drive train. | Select drive train 1 as the active drive train. |

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| Subfault: 28.18 | | |
|---|---|---|
| **Description: FCB 21 – Brake missing** | | |
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | No brake is parameterized. Only brakes controlled by the inverter are tested during the brake test. | – Connect the brake to the inverter and parameterize it.<br>– Start FCB 21 again. |

| Subfault: 28.19 | | |
|---|---|---|
| **Description: FCB 21 – Motor encoder missing** | | |
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | No encoder is parameterized. An encoder is required for the brake test to detect the movement of the drive. | – Mount the encoder to the motor and parameterize it.<br>– Start the FCB again. |

### 10.5.24 Fault 29 HW limit switches

| Subfault: 29.1 | | |
|---|---|---|
| **Description: Positive limit switch hit** | | |
| | Response: HW limit switch – current drive train | |
| | Cause | Measure |
| | Positive hardware limit switch hit. | – Check the wiring of the hardware limit switch.<br>– Check the target position.<br>– Move clear of the hardware limit switch at negative speed. |

| Subfault: 29.2 | | |
|---|---|---|
| **Description: Negative limit switch hit** | | |
| | Response: HW limit switch – current drive train | |
| | Cause | Measure |
| | Negative hardware limit switch hit. | – Check the wiring of the hardware limit switch.<br>– Check the target position.<br>– Move clear of the hardware limit switch at positive speed. |

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| Subfault: 29.3 | | |
|---|---|---|
| **Description: Limit switch missing** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Both positive and negative hardware limit switches hit at the same time. | – Check the wiring of the hardware limit switch.<br>– Check the parameter setting of the digital inputs.<br>– Check the parameter setting of the process output data. |

| Subfault: 29.4 | | |
|---|---|---|
| **Description: Limit switches swapped** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Positive hardware limit switch hit at negative speed, or negative hardware limit switch hit at positive speed. | Check whether hardware limit switch connections are swapped. |

### 10.5.25 Fault 30 Software limit switches

| Subfault: 30.1 | | |
|---|---|---|
| **Description: Positive limit switch hit** | | |
| | Response: SW limit switches – current drive train | |
| | Cause | Measure |
| | Positive software limit switch hit. | – Check software limit switch position.<br>– Check the target position.<br>– Move clear of software limit switch at negative speed. |

| Subfault: 30.2 | | |
|---|---|---|
| **Description: Negative limit switch hit** | | |
| | Response: SW limit switches – current drive train | |
| | Cause | Measure |
| | Negative software limit switch hit. | – Check software limit switch position.<br>– Check the target position.<br>– Move clear of software limit switch at positive speed. |

| Subfault: 30.3<br>Description: Limit switches swapped | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Position value of negative software limit switch greater than position value of positive software limit switch. | Check software limit switch positions. |

### 10.5.26 Fault 31 Thermal motor protection

| Subfault: 31.1<br>Description: Temperature sensor wire break – motor 1 | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Connection to temperature sensor of motor 1 interrupted. | Check the wiring of the temperature sensor. |

| Subfault: 31.2<br>Description: Temperature sensor short circuit – motor 1 | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Short circuit in connection with temperature sensor of motor 1. | Check the wiring of the temperature sensor. |

| Subfault: 31.3<br>Description: Temperature sensor overtemperature – motor 1 | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Temperature sensor of motor 1 signals overtemperature. | – Allow the motor to cool down.<br>– Check for motor overload.<br>– Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (PT1000). |

| Subfault: 31.4<br>Description: Temperature model overtemperature – motor 1 | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Temperature model of motor 1 signals overtemperature. | – Allow the motor to cool down.<br>– Check for motor overload.<br>– Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (PT1000). |

| Subfault: 31.5<br>Description: Temperature sensor prewarning – motor 1 | | |
|---|---|---|
| | Response: Thermal motor protection 1 – prewarning threshold | |
| | Cause | Measure |
| | Temperature signaled by temperature sensor of motor 1 exceeds prewarning threshold. | Check for motor overload. |

| Subfault: 31.6<br>Description: Temperature model prewarning – motor 1 | | |
|---|---|---|
| | Response: Thermal motor protection 1 – prewarning threshold | |
| | Cause | Measure |
| | Temperature signaled by temperature model of motor 1 exceeds prewarning threshold. | Check for motor overload. |

| Subfault: 31.7<br>Description: UL temperature monitoring | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Temperature model of active motor signals overtemperature. | Check for motor overload. |

| Subfault: 31.8<br>Description: Communication timeout temperature sensor – motor 1 | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Communication with temperature sensor is disrupted, e.g. via MOVILINK® DDI. | Check the cabling. |

| Subfault: 31.9<br>Description: Temperature too low – temperature sensor – motor 1 | | |
|---|---|---|
| | Response: Warning with self-reset | |
| | Cause | Measure |
| | Temperature signaled by temperature sensor of motor 1 below -50 °C. | – Check if a KTY temperature sensor is installed in the motor but the parameterization has been carried out for a PT1000 temperature sensor.<br>– Heat the motor. |

| Subfault: 31.11<br>Description: Temperature sensor wire break – motor 2 | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Connection to temperature sensor of motor 2 interrupted. | Check the wiring of the temperature sensor. |

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| Subfault: 31.12<br>Description: Temperature sensor short circuit – motor 2 | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Short circuit in connection with temperature sensor of motor 2. | Check the wiring of the temperature sensor. |

| Subfault: 31.13<br>Description: Temperature sensor overtemperature – motor 2 | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Temperature sensor of motor 2 signals overtemperature. | – Allow the motor to cool down.<br>– Check for motor overload.<br>– Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (PT1000). |

| Subfault: 31.14<br>Description: Temperature model overtemperature – motor 2 | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Temperature model of motor 2 signals overtemperature. | – Allow the motor to cool down.<br>– Check for motor overload.<br>– Check whether the correct temperature sensor KY (KTY) was parameterized instead of PK (PT1000). |

| Subfault: 31.15<br>Description: Temperature sensor prewarning – motor 2 | | |
|---|---|---|
| | Response: Thermal motor protection 2 – prewarning threshold | |
| | Cause | Measure |
| | Temperature signaled by temperature sensor of motor 2 exceeds prewarning threshold. | Check for motor overload. |

| Subfault: 31.16<br>Description: Temperature model prewarning – motor 2 | | |
|---|---|---|
| | Response: Thermal motor protection 2 – prewarning threshold | |
| | Cause | Measure |
| | Temperature signaled by temperature model of motor 2 exceeds prewarning threshold. | Check for motor overload. |

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| Subfault: 31.19 | | |
|---|---|---|
| **Description: Temperature too low – temperature sensor – motor 2** | | |
| | Response: Warning with self-reset | |
| | Cause | Measure |
| | Temperature signaled by temperature sensor of motor 2 below -50 °C. | – Check if a KTY temperature sensor is installed in the motor but the parameterization has been carried out for a PT1000 temperature sensor.<br>– Heat the motor. |

### 10.5.27 Fault 32 Communication

| Subfault: 32.2 | | |
|---|---|---|
| **Description: EtherCAT®/SBus$^{PLUS}$ process data timeout** | | |
| | Response: Fieldbus – timeout response | |
| | Cause | Measure |
| | Timeout in process data transfer during EtherCAT®/SBus$^{PLUS}$ communication. | – Check the wiring of the system bus and module bus.<br>– Check that the EtherCAT®/SBus$^{PLUS}$ configuration is set correctly in the MOVI-C® CONTROLLER.<br>– Check the EtherCAT®/SBus$^{PLUS}$ timeout configuration in the device. |

| Subfault: 32.3 | | |
|---|---|---|
| **Description: Faulty synchronization signal** | | |
| | Response: External synchronization | |
| | Cause | Measure |
| | Faulty synchronization signal period. | Make sure that the EtherCAT®/SBus$^{PLUS}$ configuration is set correctly in the MOVI-C® CONTROLLER. |

| Subfault: 32.4 | | |
|---|---|---|
| **Description: No synchronization signal** | | |
| | Response: External synchronization | |
| | Cause | Measure |
| | No synchronization signal present. | Make sure that the EtherCAT®/SBus$^{PLUS}$ configuration is set correctly in the MOVI-C® CONTROLLER. |

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| Subfault: 32.5<br>Description: Synchronization timeout | | |
|---|---|---|
| | Response: External synchronization | |
| | Cause | Measure |
| | Timeout while synchronizing to synchronization signal. | Make sure that the EtherCAT®/SBus$^{PLUS}$ configuration is set correctly in the MOVI-C® CONTROLLER. |

| Subfault: 32.6<br>Description: Copy parameter set | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Error while downloading parameter set to device. | – Check the wiring of the system bus and module bus.<br>– Restart download. |

| Subfault: 32.7<br>Description: Application heartbeat timeout | | |
|---|---|---|
| | Response: Application heartbeat – timeout response | |
| | Cause | Measure |
| | Communication interrupted between IEC program in MOVI-C® CONTROLLER and device. | – Check the status of the IEC program.<br>– Restart the IEC program. |

| Subfault: 32.8<br>Description: User-timeout timeout | | |
|---|---|---|
| | Response: User timeout – timeout response | |
| | Cause | Measure |
| | The timeout time of the user timeout function elapsed. | Write the parameter for triggering the user timeout function cyclically before the timeout time elapses. |

| Subfault: 32.12<br>Description: Manual mode timeout | | |
|---|---|---|
| | Response: Manual mode – timeout response | |
| | Cause | Measure |
| | Communication connection to device interrupted in manual mode. | – Check whether too many programs are open on the engineering PC.<br>– Increase the timeout time in manual mode. |
| | New Scope project created. | – Reset the fault.<br>– Restart manual mode. |
| | Scope measurement loaded from device. | – Reset the fault.<br>– Restart manual mode. |

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### 10.5.28 Fault 33 System initialization

| Subfault: 33.1<br>Description: Offset determination current measurement | | |
|---|---|---|
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | Error detected during current measurement. | Contact SEW-EURODRIVE Service. |

| Subfault: 33.2<br>Description: Firmware CRC check | | |
|---|---|---|
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | Error checking firmware. | Contact SEW-EURODRIVE Service. |

| Subfault: 33.6<br>Description: FPGA configuration | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Error checking FPGA configuration. | Contact SEW-EURODRIVE Service. |

| Subfault: 33.7<br>Description: Function block compatibility error | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Error checking compatibility of function block. | Contact SEW-EURODRIVE Service. |

| Subfault: 33.8<br>Description: SW function block configuration | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Error detected while checking configuration of software function block. | Contact SEW-EURODRIVE Service. |

| Subfault: 33.10<br>Description: Run-up timeout | | |
|---|---|---|
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | Timeout during system run-up. | Contact SEW-EURODRIVE Service. |

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| Subfault: 33.11 | | |
|---|---|---|
| **Description: Hardware compatibility error** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Firmware does not match device. | Contact SEW-EURODRIVE Service. |

| Subfault: 33.12 | | |
|---|---|---|
| **Description: Memory module plugged in** | | |
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | A plugged-in memory module was detected during device start. The setting for the device parameter source is set to "Internal memory". | – Switch off the device. Remove the memory module and restart the device.<br>– Change the parameter "Non-volatile memory source" to "Arbitrary" or "Replaceable memory module". Switch the device off and on again. |

| Subfault: 33.13 | | |
|---|---|---|
| **Description: Memory module removed** | | |
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | The device was started without a memory module. This device variant can be operated without memory module. | Switch off the device, insert the memory module, and switch on the device again. |
| | The device was started without a memory module. For the parameter "NV memory source", however, the setting "Replaceable memory module" was defined. | – Switch off the device, insert the memory module, and switch on the device again.<br>– Change the setting of the "NV memory source" to "Internal memory". Switch the device off and on again. |
| | Replaceable memory module removed during ongoing operation. | – Switch off the device, insert the memory module, and switch on the device again.<br>– Change the setting of the "NV memory source" to "Internal memory". Switch the device off and on again. |

| Subfault: 33.14 | | |
|---|---|---|
| **Description: EtherCAT® slave controller cannot be accessed** | | |
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | EtherCAT® slave controller cannot be accessed. | Contact SEW-EURODRIVE Service. |

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| Subfault: 33.15<br>Description: Firmware configuration | | |
|---|---|---|
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | The Device Update Manager detected a modified version of the application firmware. | Acknowledge the error. Doing so will update the configuration data of the Device Update Manager. |
| | The error occurs repeatedly several times. The Device Update Manager is outdated and cannot save the configuration. | Update the Device Update Manager. |

| Subfault: 33.18<br>Description: Fieldbus configuration | | |
|---|---|---|
| | Response: Output stage inhibit<br>System state: Fault acknowledgment with CPU reset | |
| | Cause | Measure |
| | The fieldbus variant is not compatible with the firmware variant of the main firmware:<br>– With CiA402 firmware variants, only POWERLINK or EtherCAT® is possible.<br>– With standard firmware variants, POWERLINK is not possible. | – Load the appropriate variant of the main firmware.<br>– Load the appropriate variant of the fieldbus firmware.<br>– For devices with pluggable fieldbus card, replace the card. |

### 10.5.29 Fault 34 Process data configuration

| Subfault: 34.1<br>Description: Changed process data configuration | | |
|---|---|---|
| | Response: Application stop + output stage inhibit | |
| | Cause | Measure |
| | Process data configuration changed during active process data operation. | – Stop the process data and make your changes. Then start the process data again.<br>– Perform a reset. Doing so will stop the process data, apply the changes, and restart the process data. |

### 10.5.30 Fault 35 Function activation

| **Subfault: 35.1**<br>**Description: Activation level – invalid activation key** | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | The activation key was entered incorrectly. | Enter the activation key again. |
| | The activation key was not created for this device. | Check the activation key. |
| | When using a double axis, the activation key for the wrong instance was entered in the device. | Enter the activation key for the allocated instance. |
| | Activation key entered for technology level in parameter "Application level – activation key". | Enter the activation key in the correct parameter. |

| **Subfault: 35.2**<br>**Description: Application level too low** | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | The activated software module requires a higher application level. | Activation key was entered for required application level. You can read the required level from the parameter "Application level – Required level". |

| **Subfault: 35.3**<br>**Description: Technology level too low** | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | An activated technology function requires a higher technology level. | Enter an activation key for the required technology level. You can find the required level in the parameter 8438.13 "Technology level – Required level". |

| **Subfault: 35.4**<br>**Description: Technology level – invalid activation key** | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | The activation key was entered incorrectly. | Enter the activation key again. |
| | The activation key was not created for this device. | Check the activation key. |
| | When using a double axis, the activation key for the wrong instance was entered in the device. | Enter the activation key for the allocated instance. |
| | Activation key entered for application level in parameter "Technology level – activation key". | Enter the activation key in the correct parameter. |

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### 10.5.31 Fault 42 Lag error

| Subfault: 42.1<br>Description: Positioning lag error | |
|---|---|
| Response: Positioning lag error | |
| Cause | Measure |
| A lag error occurred during positioning.<br>Incorrect encoder connection. | Check the connection of the encoder. |
| Position encoder inverted or not installed correctly at the track. | Check the installation and connection of the position encoder. |
| Wiring faulty. | Check the wiring of encoder, motor, and line phases. |
| Acceleration ramps too short. | Extend the acceleration ramps. |
| P component of the position controller too small. | Set the P component of the position controller to a larger value. |
| Speed controller parameters set incorrectly. | Check the controller parameters. |
| Value of lag error tolerance too small. | Increase the lag error tolerance. |
| Mechanical components cannot move freely or are blocked. | Make sure mechanical parts can move freely, and check whether they are blocked. |

| Subfault: 42.2<br>Description: Jog mode lag error | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| A lag error occurred in jog mode (FCB 20).<br>Incorrect encoder connection. | Check the connection of the encoder. |
| Position encoder inverted or not installed correctly at the track. | Check the installation and connection of the position encoder. |
| Wiring faulty. | Check the wiring of encoder, motor, and line phases. |
| Acceleration ramps too short. | Extend the acceleration ramps. |
| P component of the position controller too small. | Set the P component of the position controller to a larger value. |
| Speed controller parameters set incorrectly. | Check the controller parameters. |
| Value of lag error tolerance too small. | Increase the lag error tolerance. |
| Mechanical components cannot move freely or are blocked. | Make sure mechanical parts can move freely, and check whether they are blocked. |

| Subfault: 42.3<br>Description: Standard lag error | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | A lag error has occurred outside a positioning process.<br>Incorrect encoder connection. | Check the connection of the encoder. |
| | Position encoder inverted or not installed correctly at the track. | Check the installation and connection of the position encoder. |
| | Wiring faulty. | Check the wiring of encoder, motor, and line phases. |
| | Acceleration ramps too short. | Extend the acceleration ramps. |
| | P component of the position controller too small. | Set the P component of the position controller to a larger value. |
| | Speed controller parameters set incorrectly. | Check the controller parameters. |
| | Value of lag error tolerance too small. | Increase the lag error tolerance. |

### 10.5.32 Fault 45 Fieldbus card

| Subfault: 45.1<br>Description: No response from fieldbus interface | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | The fieldbus interface does not start properly and is therefore not functional. | – Switch the power off and on again/perform a reset.<br>– If the fault occurs repeatedly, replace the fieldbus interface or device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

| Subfault: 45.2<br>Description: Fieldbus interface – fault | | |
|---|---|---|
| | Response: Fieldbus – timeout response | |
| | Cause | Measure |
| | Device detected fault on device-internal connection to fieldbus interface. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the fieldbus interface or device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

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| Subfault: 45.3<br>Description: Process output data timeout | |
|---|---|
| Response: Fieldbus – timeout response | |
| Cause | Measure |
| Fieldbus interface detected timeout of process output data. | – Check the communication connection between the fieldbus master and the fieldbus interface for interruption.<br>– Check the configuration of the fieldbus master.<br>– Adjust the fieldbus timeout monitoring. |

| Subfault: 45.5<br>Description: Engineering interface | |
|---|---|
| Response: Warning | |
| Cause | Measure |
| Engineering via fieldbus interface no longer works, or only works to a limited extent. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the field-bus interface or device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

| Subfault: 45.7<br>Description: Invalid process output data | |
|---|---|
| Response: Fieldbus – timeout response | |
| Cause | Measure |
| – The fieldbus master sends invalid process output data.<br>– The fieldbus interface has detected an internal fault in the exchange of process data exchange and marks the process output data as invalid. | – Check whether the PLC is in "Stop" state.<br>– Restart the PLC.<br>– Check the configuration of the fieldbus master.<br>– In the event of an error in the internal exchange of process data, switch the device off and then on again. |

| Subfault: 45.9<br>Description: Fieldbus interface – warning | |
|---|---|
| Response: Warning | |
| Cause | Measure |
| Device detected non-critical fault on device-internal connection to fieldbus interface. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the field-bus interface or device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

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| **Subfault: 45.50**<br>**Description: Fieldbus card – warning** | | |
|---|---|---|
| | Response: Warning with self-reset | |
| | Cause | Measure |
| | Fieldbus interface signals subcomponent fault of the type "warning". | Refer to the subcomponent fault of the fieldbus interface and take the measures required for eliminating the fault. |

| **Subfault: 45.51**<br>**Description: Fieldbus card – fault** | | |
|---|---|---|
| | Response: Fieldbus – timeout response | |
| | Cause | Measure |
| | Fieldbus interface signals subcomponent fault of the type "standard". | Refer to the subcomponent fault of the fieldbus interface and take the measures required for eliminating the fault. |

| **Subfault: 45.52**<br>**Description: Fieldbus card – critical fault** | | |
|---|---|---|
| | Response: Fieldbus – timeout response | |
| | Cause | Measure |
| | Fieldbus interface signals subcomponent fault of the type "Critical fault". | Refer to the subcomponent fault of the fieldbus interface and take the measures required for eliminating the fault. |

### 10.5.33 Fault 46 Safety card

| **Subfault: 46.1**<br>**Description: No response** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Failed to synchronize with subcomponent. | – Check the device assignment of the basic unit and the option.<br>– Check the card slot and the installation, and correct if necessary.<br>– Restart the device.<br>– Contact SEW-EURODRIVE Service. |

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| **Subfault: 46.2**<br>**Description: Invalid variant** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Plugged safety card design does not match inverter type. | – Remove the safety card.<br>– Use the correct safety card design. |
| | For double axes, only designs without encoder interface can be used. | – Remove the option.<br>– Use the design without encoder interface. |
| | For double axes, no encoder option must be plugged in. | Remove the option. |

| **Subfault: 46.3**<br>**Description: Internal communication timeout** | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Communication interrupted between inverter and safety card. | Check the card slot and installation of the card, and correct if necessary. Contact SEW-EURODRIVE Service if the error is still present. |
| | Safety card signals subcomponent fault of the type "warning". | Check the card slot and installation of the card, and correct if necessary. Contact SEW-EURODRIVE Service if the error is still present. |

| **Subfault: 46.50**<br>**Description: Warning** | | |
|---|---|---|
| | Response: Warning with self-reset | |
| | Cause | Measure |
| | Safety card signals subcomponent fault of the type "warning". | Observe the subcomponent fault of the safety card and take measures according to the subcomponent fault. |

| **Subfault: 46.51**<br>**Description: Fault** | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit with self-reset | |
| | Cause | Measure |
| | Safety card signals subcomponent fault of the type "standard fault". | Observe the subcomponent fault of the safety card and take measures according to the subcomponent fault. |

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| Subfault: 46.52 | | |
|---|---|---|
| **Description: System error** | | |
| | Response: Output stage inhibit with self-reset | |
| | Cause | Measure |
| | Safety card signals subcomponent fault of the type "system error" or "critical fault". | Observe the subcomponent fault of the safety card and take measures according to the subcomponent fault. |

### 10.5.34 Fault 47 Supply unit

| Subfault: 47.1 | | |
|---|---|---|
| **Description: Supply unit – warning** | | |
| | Response: Warning with self-reset | |
| | Cause | Measure |
| | The supply unit signals a fault with response type "warning". The fault is only displayed. | For the exact cause of the fault and for information on how to remedy it, refer to the fault signaled by the subcomponent. |

| Subfault: 47.2 | | |
|---|---|---|
| **Description: Supply unit – standard fault** | | |
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | The supply unit signals a fault with response type "standard". The driver implemented on the axis or the module bus slave determines a fault response. The axis or module bus slave performs the fault response. | For the exact cause of the fault and for information on how to remedy it, refer to the fault signaled by the subcomponent. |

| Subfault: 47.3 | | |
|---|---|---|
| **Description: Supply unit – critical fault** | | |
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | The supply unit signals a fault with response type "critical fault". The driver implemented on the axis or the module bus slave determines a fault response. The axis or module bus slave performs the fault response. | For the exact cause of the fault and for information on how to remedy it, refer to the fault signaled by the subcomponent. |

### 10.5.35 Fault 48 Module bus

| Subfault: 48.1<br>Description: Incompatible | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| Module bus slave and module bus master not compatible with each other. | Update the firmware of the module bus at the supply unit or the axis modules to a compatible version. |

| Subfault: 48.2<br>Description: Timeout | |
|---|---|
| Response: Emergency stop + output stage inhibit | |
| Cause | Measure |
| Timeout detected via module bus. | Check the cable connections and voltage supply of the module bus stations. |

| Subfault: 48.3<br>Description: Number of module bus slaves exceeded | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| Too many module bus slaves are connected. | Reduce the number of module bus slaves. |

| Subfault: 48.4<br>Description: CRC error | |
|---|---|
| Response: Emergency stop + output stage inhibit | |
| Cause | Measure |
| CRC error during module bus communication. | – Restart the device.<br>– Reset the fault.<br>– Contact SEW-EURODRIVE Service if the fault is still present. |

### 10.5.36 Fault 50 I/O card

| Subfault: 50.1<br>Description: Boot synchronization timeout | |
|---|---|
| Response: Output stage inhibit | |
| Cause | Measure |
| I/O card is plugged in device but cannot be addressed. | – Check the device assignment of the basic unit and the option.<br>– Check the card slot and installation of the I/O card, and correct if necessary.<br>– Restart the device. |

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| Subfault: 50.2<br>Description: CRC error of FPGA driver | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Communication between FPGA and I/O card does not work, or is interrupted. | – Check the card slot and installation of the I/O card, and correct if necessary.<br>– Check for EMC-compliant installation.<br>– Restart the device. |

| Subfault: 50.3<br>Description: CRC error of I/O card | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | I/O card signals CRC error on SPI bus. | – Check the card slot and installation of the I/O card, and correct if necessary.<br>– Check for EMC-compliant installation.<br>– Restart the device. |

| Subfault: 50.4<br>Description: Timeout error of I/O card | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | I/O card signals timeout error on SPI bus. | – Check the card slot and installation of the I/O card, and correct if necessary.<br>– Check for EMC-compliant installation.<br>– Restart the device. |

| Subfault: 50.5<br>Description: Watchdog error of I/O card | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Microcontroller of I/O card signals a watchdog error. | – Check the card slot and installation of the I/O card, and correct if necessary.<br>– Check for EMC-compliant installation.<br>– Restart the device. |

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| Subfault: 50.6<br>Description: Ready signal timeout | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | I/O card booted but cyclic communication is not possible. | – Check the card slot and installation of the I/O card, and correct if necessary.<br>– Check for EMC-compliant installation.<br>– Restart the device. |

| Subfault: 50.7<br>Description: Frame error of I/O card | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Faulty communication between I/O card and basic unit. | – Replace the I/O card.<br>– Replace the basic unit. |

### 10.5.37 Fault 51 Analog processing

| Subfault: 51.1<br>Description: Analog current input 4 mA limit | | |
|---|---|---|
| | Response: Warning with self-reset | |
| | Cause | Measure |
| | Input current below 4 mA. | Check the input current. |

### 10.5.38 Fault 52 Category 2 explosion protection function

| Subfault: 52.1<br>Description: Startup error | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | No valid startup available. | Perform startup. |

| Subfault: 52.2<br>Description: Impermissible system function | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Impermissible system function activated. | Disable impermissible functions when the Ex protection function is active, such as "Activate standstill current" = "On" in the active control mode. |

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| Subfault: 52.3<br>Description: Inverter too large | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Ratio of inverter current to nominal motor current too large. | Check the assignment of motor and inverter, and check the dimensioning of the system. |

| Subfault: 52.4<br>Description: Parameterization of current limit characteristic | | |
|---|---|---|
| | Response: Output stage inhibit | |
| | Cause | Measure |
| | Error while setting parameters for current limit characteristic. | – Parameterize the current limit characteristic.<br>– Perform startup again. |

| Subfault: 52.5<br>Description: Time duration exceeded f < 5 Hz | | |
|---|---|---|
| | Response: Emergency stop + output stage inhibit | |
| | Cause | Measure |
| | Duration of 60 s for f < 5 Hz exceeded. | Check the dimensioning of the system: If speed control = FCB05, increase the speed. If speed = 0, inhibit output stage / with stop FCBs, activate the brake function if a brake is installed. |

## 10.6 Power section fault description

### 10.6.1 Fault 6 Line fault

| **Subfault: 6.1**<br>**Description: Line phase failure** | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Missing line phase detected. | Check the supply system cable. |
| | DC link voltage periodically too low. | Check the configuration of the supply system. |
| | Inadequate line voltage quality. | Check the supply (fuses, contactor). |

| **Subfault: 6.3**<br>**Description: Line overvoltage** | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Line voltage exceeds permitted upper threshold value. | Check the nominal line voltage of the project planning. |
| | Inadequate line voltage quality. | Check the quality of the power system. |

| **Subfault: 6.4**<br>**Description: Line undervoltage** | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Line voltage dropped below permitted lower threshold value. | Check the nominal line voltage of the project planning. |
| | Inadequate line voltage quality. | Check the quality of the power system. |
| | Supply system cable missing. | Check the wiring. |

| **Subfault: 6.5**<br>**Description: Grid quality** | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Insufficient line voltage quality. | Check the quality of the power system. |

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### 10.6.2 Fault 7 DC link

| **Subfault: 7.1**<br>**Description: DC link overvoltage** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Maximum permitted DC link voltage limit exceeded and output stage inhibited by hardware. | – Extend the deceleration ramps.<br>– Check the supply cable to the braking resistor.<br>– Check the technical data of the braking resistor. |

| **Subfault: 7.11**<br>**Description: DC link overvoltage at rectifier** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Maximum permitted limit of DC link voltage of rectifier exceeded or AC component of DC link voltage too high. The emergency shutdown is triggered and the output stage is inhibited. | – Remove the ground fault on the motor side, also on adjacent drives.<br>– When operated on an Ethernet network: Remove both the supply ground fault and the ground fault on the motor side, also on adjacent drives.<br>– Check impermissible high line voltage distortion and line voltage. |

### 10.6.3 Fault 11 Temperature monitoring

| **Subfault: 11.7**<br>**Description: Wire break at temperature sensor of heat sink** | | |
|---|---|---|
| | Response: Remote – warning with self-reset | |
| | Cause | Measure |
| | Wire break at temperature sensor of heat sink. | Contact SEW-EURODRIVE Service. |

| **Subfault: 11.8**<br>**Description: Short circuit at temperature sensor of heat sink** | | |
|---|---|---|
| | Response: Remote – warning with self-reset | |
| | Cause | Measure |
| | Short circuit at temperature sensor of heat sink. | Contact SEW-EURODRIVE Service. |

### 10.6.4 Fault 17 Internal processor fault

| **Subfault: 17.6**<br>**Description: Watchdog** | | |
|---|---|---|
| | Response: Disable rectifier | |
| | Cause | Measure |
| | CPU watchdog tripped. | Contact SEW-EURODRIVE Service. |

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| Subfault: 17.7<br>Description: Exception error | | |
|---|---|---|
| | Response: Disable rectifier | |
| | Cause | Measure |
| | Exception trap in CPU. | Contact SEW-EURODRIVE Service. |

### 10.6.5 Fault 18 Software error

| Subfault: 18.7<br>Description: Fatal error | | |
|---|---|---|
| | Response: Disable rectifier | |
| | Cause | Measure |
| | Fatal software error. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

| Subfault: 18.8<br>Description: Invalid fault code | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | Invalid fault code requested. | – Switch the device off and on again.<br>– Contact SEW-EURODRIVE Service if the fault persists. |

### 10.6.6 Fault 20 Device monitoring

| Subfault: 20.1<br>Description: Supply voltage fault | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Internal electronics supply voltage or externally connected DC 24 V standby supply voltage outside permitted voltage range. | Check the voltage level of the external DC 24 V standby supply voltage and check for correct connection. If required, correct.<br>– Acknowledge the fault.<br>– If the fault occurs repeatedly, replace the device. For further support, contact SEW-EURODRIVE Service. |

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| Subfault: 20.8<br>Description: Fan warning | | |
|---|---|---|
| | Response: Remote – warning with self-reset | |
| | Cause | Measure |
| | Fan function impaired. | Check the fan for proper functioning. |

| Subfault: 20.9<br>Description: Fan fault | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | Fan defective. | Contact SEW-EURODRIVE Service. |

### 10.6.7 Fault 23 Power section

| Subfault: 23.5<br>Description: Invalid process data configuration | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Invalid process data configuration. | Contact SEW-EURODRIVE Service. |

| Subfault: 23.6<br>Description: Process data timeout | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Power section communication interface detected process data timeout. | If the fault occurs repeatedly, contact SEW-EURODRIVE Service. |

| Subfault: 23.7<br>Description: Parameter communication timeout | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Power section communication interface detected timeout in parameter communication. | If the fault occurs repeatedly, contact SEW-EURODRIVE Service. |

| Subfault: 23.8<br>Description: Parameter communication error | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Power section communication interface detected error in parameter communication. | If the fault occurs repeatedly, contact SEW-EURODRIVE Service. |

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| Subfault: 23.9<br>Description: Firmware of power section corrupt | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Failed to update firmware on power section. | Update the firmware again. |

### 10.6.8 Fault 25 Parameter memory monitoring

| Subfault: 25.1<br>Description: Timeout warning | | |
|---|---|---|
| | Response: Remote – warning with self-reset | |
| | Cause | Measure |
| | Access to memory (R/W) takes longer than expected. | The error will be reset automatically after completed memory access. |

| Subfault: 25.2<br>Description: NV memory – runtime error | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | Runtime error of non-volatile memory system. | – Reset the device.<br>– If this error occurs repeatedly, replace the device. Contact SEW-EURODRIVE Service. |

| Subfault: 25.3<br>Description: NV data import – error | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | Error importing non-volatile memory data from non-volatile memory. | – Reset the device.<br>– If this error occurs repeatedly, replace the device. Contact SEW-EURODRIVE Service. |

| Subfault: 25.4<br>Description: NV setup – error | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | Error while performing delivery state or during basic initialization of the parameters. | – Reset the device.<br>– If this error occurs repeatedly, replace the device. Contact SEW-EURODRIVE Service. |

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| Subfault: 25.5<br>Description: NV data error | |
|---|---|
| Response: Remote – standard fault | |
| Cause | Measure |
| Faulty data detected in non-volatile memory system. | The data on the (mobile) non-volatile memory might have been formatted for another unit. You can rectify the error by reformatting the data (basic initialization). |

| Subfault: 25.6<br>Description: Incompatible device configuration | |
|---|---|
| Response: Remote – standard fault | |
| Cause | Measure |
| The data set in the device was copied from another device, which differs from the current device in the device family, power, or voltage. | – Check whether the configuration is correct and repeat the startup, if necessary.<br>– Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset". |
| Replaceable memory module used by another device. Power, device family, or voltage differs from the current device. | – Check whether the configuration is correct and repeat the startup, if necessary.<br>– Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset". |
| The power section was replaced and differs in its power rating or voltage from the original power section. | – Check whether the configuration is correct and repeat the startup, if necessary.<br>– Acknowledge the fault by manual reset with parameter set acceptance. Setting under [Diagnostics] > [Status] > [Fault status] parameter "Manual fault reset". |

| Subfault: 25.7<br>Description: NV memory initialization – error | |
|---|---|
| Response: Remote – standard fault | |
| Cause | Measure |
| Error initializing non-volatile memory system. | – Reset the device.<br>– If this error occurs repeatedly, replace the device. Contact SEW-EURODRIVE Service. |

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| Subfault: 25.9<br>Description: NV memory hardware – fault | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | Faulty access to non-volatile memory hardware. | – Reset the device.<br>– If this occurs repeatedly, replace the device. Contact SEW-EURODRIVE Service. |

| Subfault: 25.10<br>Description: Power section configuration data – version conflict | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | Wrong version of configuration data of power section. | Contact SEW-EURODRIVE Service. |

| Subfault: 25.12<br>Description: Power section configuration data – CRC error | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | Faulty configuration data of power section. | Contact SEW-EURODRIVE Service. |

### 10.6.9 Fault 32 Communication

| Subfault: 32.6<br>Description: Copy parameter set | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | Error while downloading parameter set to device. | – Check the wiring of the system bus and module bus.<br>– Restart download. |

| Subfault: 32.13<br>Description: Process data timeout | | |
|---|---|---|
| | Response: Remote – warning with self-reset | |
| | Cause | Measure |
| | Process data timeout occurred. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the safety card and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

### 10.6.10 Fault 33 System initialization

| **Subfault: 33.2<br>Description: Firmware CRC check** | | |
|---|---|---|
| | Response: Disable rectifier | |
| | Cause | Measure |
| | Error checking firmware. | Contact SEW-EURODRIVE Service. |

| **Subfault: 33.8<br>Description: SW function block configuration** | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | Error detected while checking configuration of software function block. | Contact SEW-EURODRIVE Service. |

| **Subfault: 33.9<br>Description: Power section hardware compatibility fault** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Firmware does not match hardware of power section. | Contact SEW-EURODRIVE Service. |

### 10.6.11 Fault 44 Subcomponent power section

| **Subfault: 44.1<br>Description: Power section SMPS fault** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Switched-mode power supply in power section is faulty. Hardware fault. | Contact SEW-EURODRIVE Service. |

| **Subfault: 44.2<br>Description: Overcurrent phase U** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Overcurrent phase U. | – Rectify the short circuit.<br>– Connect a smaller motor.<br>– Increase the ramp time.<br>– If the output stage is defective, contact SEW-EURODRIVE Service. |

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| **Subfault: 44.3**<br>**Description: Overcurrent phase V** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Overcurrent phase V. | – Rectify the short circuit.<br>– Connect a smaller motor.<br>– Increase the ramp time.<br>– If the output stage is defective, contact SEW-EURODRIVE Service. |

| **Subfault: 44.4**<br>**Description: Overcurrent phase W** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Overcurrent phase W. | – Rectify the short circuit.<br>– Connect a smaller motor.<br>– Increase the ramp time.<br>– If the output stage is defective, contact SEW-EURODRIVE Service. |

| **Subfault: 44.5**<br>**Description: Faulty supply voltage for gate drivers** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Faulty supply voltage for gate drivers for phases U, V, W. | Switch the power off and on again/perform a reset. |
| | Phase module not ready for operation. | If the fault is still present, replace the device. Contact SEW-EURODRIVE Service. |

| **Subfault: 44.6**<br>**Description: Faulty supply voltage in gate drivers for brake chopper** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Faulty supply voltage in gate drivers for brake chopper. | Switch the power off and on again/perform a reset. |
| | Brake chopper not ready for operation. | If the fault is still present, replace the device. Contact SEW-EURODRIVE Service. |

| Subfault: 44.7<br>Description: Hardware error signal | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Power section hardware signals a fault. It is not possible to pinpoint the fault. | – Switch the power off and on again/perform a reset.<br>– If the fault is still present, replace the device. Contact SEW-EURODRIVE Service. |

### 10.6.12 Fault 84 Rectifier

| Subfault: 84.1<br>Description: Warning | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Rectifiers of type BG7 or higher signals a warning | Contact SEW-EURODRIVE Service |

| Subfault: 84.2<br>Description: Fault | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Rectifiers of type BG7 or higher signals a standard fault | Contact SEW-EURODRIVE Service |

| Subfault: 84.3<br>Description: Critical fault | | |
|---|---|---|
| | Response: No response | |
| | Cause | Measure |
| | Rectifiers of type BG7 or higher signals a critical fault | Contact SEW-EURODRIVE Service |

## 10.7 Fieldbus interface fault description

### 10.7.1 Fault 17 Internal processor fault

| **Subfault: 17.7<br>Description: Exception error** | | |
|---|---|---|
| | Response: Remote – warning | |
| | Cause | Measure |
| | Exception trap in CPU. | Contact SEW-EURODRIVE Service. |

### 10.7.2 Fault 18 Software error

| **Subfault: 18.4<br>Description: Task system** | | |
|---|---|---|
| | Response: Remote – warning | |
| | Cause | Measure |
| | A fault was detected during the processing of the internal task system. This may be a timeout for cyclical tasks, for example. | – Switch the device off and on again.<br>– Contact SEW-EURODRIVE Service if the fault persists. |

| **Subfault: 18.7<br>Description: Fatal error** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Fatal software error. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

| **Subfault: 18.8<br>Description: Invalid fault code** | | |
|---|---|---|
| | Response: Remote – critical fault | |
| | Cause | Measure |
| | Invalid fault code requested. | – Switch the device off and on again.<br>– Contact SEW-EURODRIVE Service if the fault persists. |

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### 10.7.3 Fault 25 Parameter memory monitoring

**Subfault: 25.9**
**Description: NV memory hardware – fault**

Response: Remote – standard fault

| Cause | Measure |
|---|---|
| Faulty access to non-volatile memory hardware. | – Reset the device.<br>– If this occurs repeatedly, replace the device. Contact the SEW-EURODRIVE Service. |

### 10.7.4 Fault 45 Fieldbus card

**Subfault: 45.2**
**Description: Fieldbus interface – fault**

Response: Remote – standard fault

| Cause | Measure |
|---|---|
| Device detected fault on device-internal connection to fieldbus interface. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the fieldbus interface or device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

**Subfault: 45.5**
**Description: Engineering interface**

Response: Remote – warning

| Cause | Measure |
|---|---|
| Engineering via fieldbus interface no longer works, or only works to a limited extent. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the fieldbus interface or device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

**Subfault: 45.6**
**Description: Process data exchange faulty**

Response: Remote – standard fault

| Cause | Measure |
|---|---|
| Fieldbus interface detected disrupted process data exchange. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the fieldbus interface or device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

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| Subfault: 45.8<br>Description: Invalid parameters | | |
|---|---|---|
| | Response: Remote – warning | |
| | Cause | Measure |
| | Fieldbus interface detected invalid address parameters. The invalid parameters were replaced with standard parameters. | – Check the IP address parameters.<br>– Check the MAC address. |

| Subfault: 45.9<br>Description: Fieldbus interface – warning | | |
|---|---|---|
| | Response: Remote – warning | |
| | Cause | Measure |
| | Device detected non-critical fault on device-internal connection to fieldbus interface. | – Switch the device off and on again.<br>– If the fault occurs repeatedly, replace the fieldbus interface or device and send it together with the fault number to SEW-EURODRIVE. For further support, contact SEW-EURODRIVE Service. |

| Subfault: 45.10<br>Description: Port statistics – Rx threshold exceeded | | |
|---|---|---|
| | Response: Remote – warning | |
| | Cause | Measure |
| | Port statistics check detected that the number of faulty frames exceeded Rx threshold. | Check the network. |

| Subfault: 45.11<br>Description: Port statistics – Tx threshold exceeded | | |
|---|---|---|
| | Response: Remote – warning | |
| | Cause | Measure |
| | Port statistics check detected that the number of faulty frames exceeded Tx threshold. | Check the network. |

| Subfault: 45.12<br>Description: Address conflict | | |
|---|---|---|
| | Response: Remote – standard fault | |
| | Cause | Measure |
| | One or several stations connected to the fieldbus have the same address as the device. | For each fieldbus station, set an address that is unique in the system. |

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## 10.8 Responses to fault acknowledgement

### 10.8.1 Fault acknowledgement

During fault acknowledgement, the final fault status determines which reset type will be executed, see following table.

| Final fault status | Responses to fault acknowledgement |
|---|---|
| System blocked | System restart |
| System waiting | Warm start: Delete fault code |
| Only display fault | Warm start: Delete fault code |

**Software reset**

| Response | Impact |
|---|---|
| System restart with start of the CPU | Behavior equal to device start |
| | Reference is lost |
| | Fieldbus interface is restarted |
| | EtherCAT®/SBus$^{PLUS}$ is restarted |
| | The active "fault message" is reset (digital output = 1, system status = 0). |

*Software restart*

A software restart is **no** real reset of the micro controller.

| Response | Effect |
|---|---|
| Software restart | The firmware will be restarted, without the boot loader becoming active (no display "b0"!). |
| | Reference positions of incremental encoder systems will be lost. |
| | Any existing fieldbus interfaces are not affected. |
| | The interface between options and firmware system is initialized again. A new boot synchronization to the fieldbus or control option takes place. |
| | The active "fault message" is reset (digital output = 1, system status = 0). |

The ready signal is set again depending on the system state after the reset by the system state control.

**Warm start**

A warm start only resets the fault code.

| Response | Effect |
| --- | --- |
| Warm start | The firmware system is not rebooted. |
| | All reference positions will be maintained. |
| | Communication is not interrupted. |
| | The active "fault message" is reset (digital output = 1, system status = 0). |

**Fieldbus timeout**

After manual reset of a fault, the fault message is deleted. The system changes to the state "Waiting for data".

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## 10.9 Fault responses

### 10.9.1 Default fault response

| Fault response | Description |
|---|---|
| No response | The inverter ignores the event. |
| Warning with self-reset | The inverter sends a warning message with self-reset. The fault is automatically reset after the cause of fault is eliminated. |
| Warning | The inverter issues a warning message. |
| Application stop (with output stage inhibit) | The inverter stops with the deceleration set for the application limit.<br>Parameter set 1 Index 8375.0-13<br>Parameter set 2 Index 8375.8-13<br>For n=0: Brake "applied" and output stage "off". |
| Application stop (with output stage inhibit) with self-reset | |
| Emergency stop (with output stage inhibit) | The inverter stops with the set emergency stop deceleration.<br>Parameter set 1 Index 8375.0-20<br>Parameter set 2 Index 8375.8-20 |
| Emergency stop (with output stage inhibit) with self-reset | |
| Inhibit output stage with self-reset | The output stage is deactivated and the brake is applied. |
| Inhibit output stage | |

Self-reset means: Eliminating the cause of the fault acknowledges the fault. The inverter automatically resumes the operation performed before the fault. The drive restarts automatically.

### 10.9.2 Parameterizable faults

| Parameterizable faults | Description | Index no. | Possible fault response |
|---|---|---|---|
| Manual mode – timeout response | This parameter is used to set the response to a bus timeout during manual mode. | 8504.3 | • Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |
| Heat sink overtemperature – prewarning | Here, you can set the device response when the prewarning threshold for heat sink utilization is exceeded (index 8336.1). | 8622.2 | • No response<br>• Warning |
| Positioning lag fault | This parameter is used to set the device response to a lag error (lag error window exceeded, index 8509.4). | 8622.3 | • No response<br>• Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |
| Line phase failure | This parameter is used to set the device response to a line phase failure (values below threshold defined by the user, index 8351.5). | 8622.4 | • No response<br>• Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |
| External fault | This parameter is used to set the device response to an external fault (e.g. triggered by terminal or control word). | 8622.5 | • No response<br>• Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |

| Parameterizable faults | Description | Index no. | Possible fault response |
|---|---|---|---|
| Fieldbus – timeout | This parameter is used to set the device response to an EtherCAT®/SBus$^{PLUS}$ timeout (timeout time, index 8455.3). | 8622.6 | • Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage<br>• Warning with self reset<br>• Application stop (with output stage inhibit) with self reset<br>• Emergency stop (with output stage inhibit) with self reset<br>• Inhibit output stage with self reset |
| External synchronization | This parameter is used to set the device response to loss of external synchronization. | 8622.7 | • No response<br>• Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage<br>• Warning with self reset<br>• Application stop (with output stage inhibit) with self reset<br>• Emergency stop (with output stage inhibit) with self reset<br>• Inhibit output stage with self reset |
| Motor temperature prewarning – current parameter set | Motor temperature active parameter set – prewarning. | 8622.8 | • No response<br>• Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |
| Electromechanical utilization – prewarning | This parameter is used to set the device response to an exceeded prewarning threshold for electromechanical utilization (index 8336.2). | 8622.10 | • No response<br>• Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |
| HW limit switches – current parameter set | | 8622.11 | • No response<br>• Emergency stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit) with self reset |
| SW limit switches – current parameter set | | 8622.12 | • No response<br>• Emergency stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit) with self reset |
| Encoder – warning | This parameter is used to set the device response to an encoder warning. | 8622.13 | • Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |
| Encoder – fault | This parameter is used to set the device response to an encoder fault. | 8622.14 | • Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |
| Additional encoder | This parameter is used to set the device response to a fault of an encoder that is not used for control (speed or positioning control). | 8622.15 | • Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |
| Encoder 1 – latest fault | | 8622.16 | • No response |
| Encoder 2 – latest fault | | 8622.17 | • No response |

| Parameterizable faults | Description | Index no. | Possible fault response |
|---|---|---|---|
| Encoder 1 – latest critical fault | | 8622.18 | • No response<br>• Inhibit output stage |
| Encoder 2 – latest critical fault | | 8622.19 | • No response<br>• Inhibit output stage |
| Response to external braking resistor fault | External braking resistor fault | 8622.20 | • No response<br>• Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |
| Application heartbeat timeout | This parameter is used to set the device response to a timeout of the application heartbeat. | 8622.21 | • Warning<br>• Application stop (with output stage inhibit)<br>• Emergency stop (with output stage inhibit)<br>• Inhibit output stage |

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# 11 Service

## 11.1 Electronics Service by SEW-EURODRIVE

If you are unable to rectify a fault, contact SEW-EURODRIVE Service. For addresses, refer to www.sew-eurodrive.com.

When contacting SEW-EURODRIVE Service, always specify the following information so that our service personnel can assist you more effectively:

- Information regarding the device type on the nameplate (e.g. type designation, serial number, part number, product key, purchase order number)
- Brief description of the application
- Fault message on the status display
- Nature of the fault
- Accompanying circumstances
- Any unusual events preceding the problem

## 11.2 Extended storage

The device is maintenance-free.

## 11.3 Device replacement

Device replacement without error messages is only possible when using an identical replacement device. Deviating device configurations lead to error E25.06 and can be acknowledged with parameter acceptance. The device can then be used without further startup.

If a device needs to be replaced, the following procedures apply.

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### 11.3.1 Exclusive use of the CMM.. memory module

If the inverter is equipped with a CMM.. memory module, the parameter and configuration settings are stored on the memory module. By plugging the memory module into another inverter, this data is available so that the inverter is immediately ready for operation for the specific application.

#### Instructions on the use of the memory module when exchanging a device

The prerequisite for the error-free exchange of an inverter is that the same options must be installed in the new device as in the original one.

If this is not the case, the error message "25.70 NV memory initialization" is displayed. You can acknowledge the error by opening the "Error reset with parameter acceptance" menu item in the context menu, and you must ensure that the information that was provided via the previous options (e.g. encoder signals via encoder option) reach the application inverter through different means or are deselected.

Alternatively, the device can also be reset to the delivery state. A new startup is then required.

If a memory module is removed during operation, the following error message is displayed: "33.13 System initialization: Memory module removed".

This fault status can be acknowledged with a fault reset.

SEW-EURODRIVE recommends operating the inverter only with an inserted memory module.

### 11.3.2 Using a CBG.. keypad

When using a keypad, the parameter and configuration settings can be stored on the keypad. By plugging the keypad into another inverter and activating data transmission, data is transferred to the inverter. After the transmission is complete, the inverter is immediately ready for operation for the specific application.

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## 11.4 Shutdown

To shut down the inverter, de-energize the inverter using appropriate measures.

**⚠ WARNING**

Electric shock due to incompletely discharged capacitors.

Severe or fatal injuries.

- Observe a minimum switch-off time of 10 minutes after disconnecting the power supply.

## 11.5 Waste disposal

Dispose of the product and all parts separately in accordance with their material structure and the national regulations. Put the product through a recycling process or contact a specialist waste disposal company. If possible, divide the product into the following categories:

- Iron, steel or cast iron
- Stainless steel
- Magnets
- Aluminum
- Copper
- Electronic parts
- Plastics

The following materials are hazardous to health and the environment. These materials must be collected and disposed of separately.

- Oil and grease

  Collect used oil and grease separately according to type. Ensure that the used oil is not mixed with solvent. Dispose of used oil and grease correctly.
- Screens
- Capacitors

**Waste disposal according to WEEE Directive 2012/19/EU**

This product and its accessories may fall within the scope of the country-specific application of the WEEE Directive. Dispose of the product and its accessories according to the national regulations of your country.

For further information, contact the responsible SEW-EURODRIVE branch or an authorized partner of SEW-EURODRIVE.

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# 12 Functional safety

## 12.1 General information

### 12.1.1 Underlying standards

The safety assessment of the device is based on the following standards and safety classes:

| Underlying standards | |
|---|---|
| Safety class/ underlying standard | • Performance Level (PL) in accordance with EN 13849-1<br>• Safety Integrity Level (SIL) in accordance with EN 61800-5-2<br>• Safety Integrity Level Claim Limit (SILCL) in accordance with EN 62061 |

Note the versions of the relevant standards on the declaration of conformity or on the TÜV certificate.

## 12.2 Integrated safety technology

The described safety technology of the device has been developed and tested in accordance with the following safety requirements:

- SIL 3 in accordance with IEC 61800-5-2, IEC 61508
- PL e in accordance with ISO 13849-1

This was certified by TÜV Rheinland. A copy of the TÜV certificate can be requested from SEW-EURODRIVE.

### 12.2.1 Safe condition

For safety-related operation of the device, Safe Torque Off is defined as a safe state (see STO safety subfunction). The safety concept is based on this definition.

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### 12.2.2 Safety concept

The device is supposed to be able to perform the safety subfunction "Safe Torque Off" in accordance with IEC 61800-5-2:

- The device is characterized by the optional connection of an external safety controller/safety relay. This external safety controller/safety relay disconnects the safety-related STO input via a 2-pole 24 V switching signal (sourcing/sinking) when a connected command device (e.g. emergency stop button with latching function) is activated. This activates the STO function of the device. As an alternative to an external safety controller/safety relay, the STO function can also be implemented with the optional MOVISAFE® CS..A safety card.
- An internal, dual-channel structure with diagnostics prevents the generation of pulse trains at the power output stage (IGBT).
- Instead of a galvanic isolation of the drive from the supply system by means of contactors or switches, the disconnection of the STO input described here safely prevents the activation of the power semiconductors in the output stage. The rotary-field generation for the respective motor is deactivated even though the line voltage is still present.
- When the STO safety subfunction is activated, the generated PWM signals from the device are interrupted by the STO circuit and are not transmitted to the IGBTs.
- If the internal diagnostics of the STO circuit detects a discrepancy between the two channels, the PWM signals are locked, i.e. STO is activated. This locking requires a reset by switching the DC 24 V supply voltage of the device or the DC 24 V switching signal at the STO inputs F_STO_P1 and F_STO_P2 off and on.

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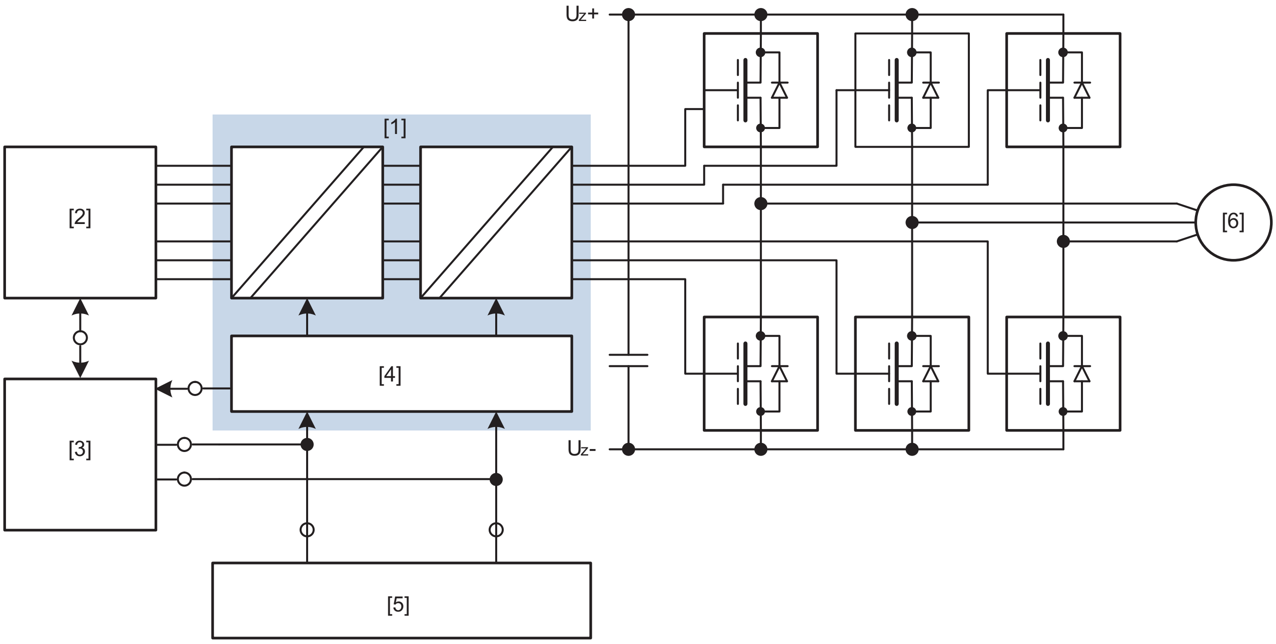
### 12.2.3 Schematic representation of the safety concept




*23543720971*

[1] STO function
[2] Drive controller
[3] Internal safety card/safety option (optional)
[4] Diagnostics and inhibiting unit
[5] External safety device (optional)
[6] Motor

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### 12.2.4 Safety subfunctions

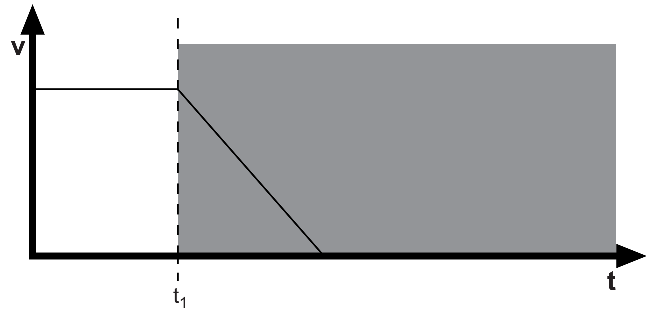
The following drive-related safety functions can be used:

- **STO** (Safe Torque Off in accordance with IEC 61800-5-2) by disconnecting the STO input

  When the STO function is activated, the frequency inverter does not supply power to the motor for generating torque. This safety subfunction corresponds to a non-controlled stop according to EN 60204-1, stop category 0.

  The STO input must be disabled by a suitable external safety controller/safety relay.

  The following figure shows the STO function:




*2463228171*

| | |
|---|---|
| v | Velocity |
| t | Time |
| $t_1$ | Point of time when STO is triggered |
| | Disconnection range |

- **SS1-t** (Safe stop 1 with time control by means of suitable external control, e.g. safety relay with delayed disconnection).

  The following sequence must be observed:

  – Decelerate the drive using an appropriate braking ramp specified via the setpoint input.

  – Disconnect the STO input (= triggering the STO function) after a specified safety-related time delay.

  This safety subfunction corresponds to a controlled stop in accordance with EN 60204-1, stop category 1. The SS1-t function corresponds to the former presentation of the SS1(c) function.

  The following figure illustrates the SS1-t function:

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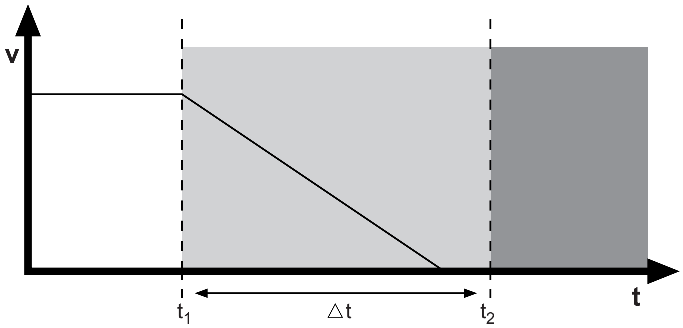


*2463226251*

| | |
|---|---|
| v | Velocity |
| t | Time |
| $t_1$ | Point of time at which the braking ramp is initiated |
| $t_2$ | Point of time when STO is triggered |
| Δt | Delay time until STO is triggered |
| | Safe time delay range |
| | Disconnection range |

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### 12.2.5 Restrictions

- Note that if the drive does not have a mechanical brake or if the brake is defective, the drive may coast to a halt (depending on the friction and mass moment of inertia of the system). In the event of regenerative loads or with axes that are loaded with gravitational forces or driven externally, the drive can even accelerate. This must be taken into account in a risk assessment of the system/machine. Additional safety measures might have to be implemented (e.g. safety brake system).

  In the case of application-related safety subfunctions that require stopping the hazardous motion safely, an additional safety brake system may be necessary on an application-specific basis.
- When using the SS1-t function as described in chapter "Safety subfunctions", the brake ramp of the drive is not monitored with respect to safety. In the case of an error, the drive might not be decelerated during the delay time, or it might even be accelerated in the worst case. In this case, the STO function is only activated after the set time delay has elapsed, see chapter "Safety subfunctions". The resulting hazard must be taken into account in the risk assessment of the system/machine. Additional safety measures might have to be implemented.
- The STO function cannot prevent a possible jerk or DC braking.

**⚠ WARNING**

When the STO signal is disconnected, voltage is still present at the DC link of the device.

Severe or fatal injuries.

- Before working on the electric part of the drive system, disconnect it from the supply voltage using an appropriate external disconnecting device and secure it against unintentional reconnection.

**⚠ WARNING**

Electric shock due to incompletely discharged capacitors.

Severe or fatal injuries.

- Observe a minimum switch-off time of 10 minutes after disconnecting the power supply.

**INFORMATION**

In the event of a safety-related disconnection of the DC 24 V supply voltage at the STO connection, the brake control is switched off. The brake control in the device is not safety-related.

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## 12.3 Safety conditions

The requirement for safe operation is that the safety subfunctions of the device are properly integrated into an application-specific, higher-level safety function. A system/machine-specific risk assessment must be carried out without fail by the system/machine manufacturer and taken into account for the use of the drive system with the device.

The system/machine manufacturer and the user are responsible for compliance of the system/machine with the applicable safety regulations.

The following requirements are mandatory when installing and operating the device in safety-related applications:

- Use of the approved devices
- Installation requirements
- Requirements for external safety controllers and safety relays
- Startup requirements
- Operational requirements

### 12.3.1 Approved devices

The following device versions of MOVIDRIVE® technology are permitted for safety-related applications:

| Device | Size |
|---|---|
| MOVIDRIVE® technology | All sizes |

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### 12.3.2 Requirements for the installation

- The components must be protected against conductive dirt, e.g. by installing them in a control cabinet with degree of protection IP54 in accordance with IEC 60529.

  Assuming that the presence of conductive dirt can be excluded at the installation site, a control cabinet with a correspondingly lower degree of protection is also permitted if in accordance with the applicable standards, e.g. EN 60204-1.
- The wiring technology used must comply with the standard EN 60204-1.
- The STO control cables must be routed according to EMC guidelines and as follows:
  – Within an installation space, single conductors can be routed up to a cable length of 30 m.
  – Outside a closed installation space: Shielded cables must be routed permanently (fixed) and protected against external damage, or equivalent measures must be taken. The maximum cable length of 100 m must not be exceeded.
  – Adhere to the regulations in force for the application.
  – The sinking and sourcing cables from the external safety controller/safety relay to the device must be routed close to one another.
  – The sinking and sourcing cables from the external safety device to the device must have the same cable length. A difference in length ≤ 3% of the two cables is permitted.
  – You must use suitable measures to ensure that STO control cables are routed separately from the power lines of the drive. This does not apply to cables approved by SEW-EURODRIVE specifically for this application case.
- The STO function does not detect short circuits or interference voltage in the supply line, so you must ensure the following:
  – No parasitic voltage is present in the STO control cables
  – The external safety controller can detect a crossfault from an external potential to the STO control cables
- Observe without fail the values specified for safety components when designing the safety circuits.
- The STO signal (F_STO_P1, F_STO_P2, and F_STO_M) must not be used for feedback.
- For safety controller/safety relays, you must only use grounded voltage sources with protective electrical separation (PELV) in accordance with EN 61131-2 and EN 60204-1.
- If several voltage sources are used, each voltage source must be connected to a PE system.
- When planning the installation, observe the technical data of the device.
- The supply voltages 0V24_Out (X6:4) and 24 V_Out (X6:5) of the device may only be used to supply the STO input (X6). The cable length must not exceed 30 m.

  This connection variant is not permitted for STO group disconnection.
- For safety-related applications with the device, the jumpers at the STO input X6 must be removed.

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### 12.3.3 Requirements for external safety controllers

A safety relay can be used as an alternative to a safety controller. The following requirements apply accordingly.

- The safety controller and all other safety-related subsystems must be approved for at least the safety class required in the overall system for the respective application-related safety subfunction.

  The following table shows an example of the required safety class of the safety controller:

| Application | Safety controller requirements |
|---|---|
| Performance level d in accordance with ISO 13849-1, SIL 2 in accordance with EN 62061 | Performance level d in accordance with ISO 13849-1<br>SIL 2 in accordance with IEC 61508 |
| Performance level e in accordance with ISO 13849-1, SIL 3 in accordance with EN 62061 | Performance level e in accordance with ISO 13849-1, SIL 3 in accordance with EN 61508 |

- The wiring of the safety controller must be suitable for the required safety class (see manufacturer documentation). The STO input of the device can be switched with 2 poles (sourcing or sourcing/sinking) or with 1 pole (sourcing).
- The values specified for the safety controller must be strictly adhered to when designing the circuit.
- No electro-sensitive protective equipment (such as a light grid or scanner) in accordance with EN 61496-1 or emergency stop buttons may be connected directly to the STO input. The connection must be made via a safety controller or a safety relay.
- To ensure protection against an unintended startup in accordance with EN ISO 14118, the safe control system must be designed and connected in such a way that resetting the command device alone does not lead to a restart. This means that a restart may be carried out only after a manual reset of the safety circuit.
- If no fault exclusion is used for the STO wiring in accordance with ISO 13849-2 or IEC 61800-5-2, the external safety device must detect the following faults in the STO wiring within 20 s depending on the connection type:
  - 2-pole sourcing output:

    Short circuit of 24 V at F_STO_P1 or F_STO_P2 (Stuck-at 1)

    Crossfault between F_STO_P1 and F_STO_P2
  - 2-pole sourcing/sinking:

    Short circuit of 24 V at F_STO_P1 (Stuck-at 1)

    Short circuit of 0 V at F_STO_M (Stuck-at 0)
  - 1-pole sourcing output:

    In the case of a single-pole connection, a fault exclusion is necessary for the wiring between the safety relay and the STO input.

**2-pole sourcing output:**

- Test pulses can be present when the device is switched on or off:
  - The test pulses on both sourcing channels must be switched with a time delay. However, additional test pulses may occur simultaneously.
  - The test pulses in both sourcing channels must not exceed 1 ms.

  - The next test pulse in one sourcing channel must occur only after a 2 ms time period.
  - A maximum packet of 3 switch-on test pulses may be generated in sequence at an interval of 2 ms. Wait for at least 500 ms after any packet before you generate another switch-on test pulse or another switch-on test pulse packet.
  - The test pulses must be monitored in the safety device. If a fault is detected, the safety device must initiate a suitable fault response.
  - The signal levels may have a maximum temporal discrepancy of 130 ms. In case of a larger temporal discrepancy, the device changes to the STO fault state (F20.11).

**2-pole sourcing/sinking:**

- Test pulses can be present when the device is switched on or off:
  - The test pulses in the sourcing and sinking channel must not exceed 1 ms.
  - The next test pulse in the sourcing or sinking channel must only occur after a 2 ms time period at the earliest.
  - A maximum packet of 3 switch-on test pulses may be generated in sequence at an interval of 2 ms. Wait for at least 500 ms after any packet before you generate another switch-on test pulse or another switch-on test pulse packet.
  - The test pulses must be monitored in the safety device. If a fault is detected, the safety device must initiate a suitable fault response.

**1-pole sourcing output:**

- In switched-off state, no switch-on test pulses must occur in the sourcing cable.
- In switched-on state:
  - The switch-off test pulse in the sourcing channel must not exceed 1 ms.
  - The next switch-off test pulse may only occur after a time period of 2 ms at the earliest.
  - A maximum packet of 3 switch-on test pulses may be generated in sequence at an interval of 2 ms. Wait for at least 500 ms after any packet before you generate another switch-on test pulse or another switch-on test pulse packet.
  - The test pulses must be monitored in the safety device. If a fault is detected, the safety device must initiate a suitable fault response.

### 12.3.4 Requirements for startup

- To validate the implemented safety subfunctions, they must be documented and checked after successful startup (functional test).
- Observe the restrictions for safety subfunctions in chapter "Limitations". Non-safety-related parts and components that affect the result of the functional test (e.g. motor brake) must be deactivated, if necessary.
- For use of the device in safety-related applications, it is essential that you perform and document startup checks for the disconnecting device and the correct electrical connection.

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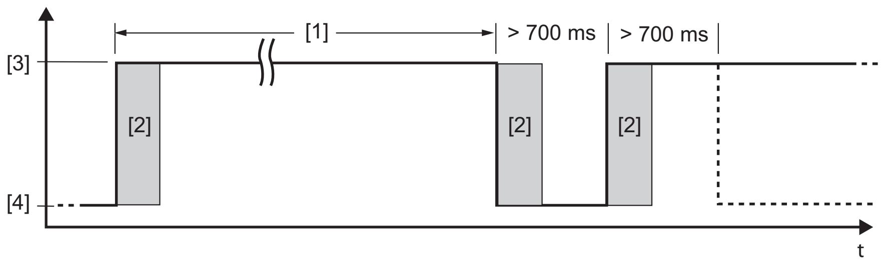
### 12.3.5 Requirements for operation

- Operation is permitted only within the limits specified in the corresponding documentation. This principle applies to the external safety controller as well as to the device and any approved options.
- The built-in diagnostic function is limited in the case of a permanently enabled or permanently disabled STO input. Advanced diagnostic functions are performed only upon a level change of the STO signal. This is why the STO input of the device must be requested with connected line voltage at least once every 12 months for PL d in accordance with ISO 13849-1 and SIL 2 IEC 61800-5-2, and at least once every 3 months for PL e in accordance with ISO 13849-1 and SIL 3 IEC 61800-5-2 to achieve complete test coverage. Adhere to the following test procedure.




*15205932683*

[1] Maximum 12 months for PL d/SIL 2
Maximum 3 months for PL e/SIL 3
[2] Internal diagnostics
[3] High: No STO
[4] Low: STO active

- To achieve complete test coverage after a device reset (e.g. after connecting the line voltage), the state transition (STO active → not active) can be started only > 700 ms later. The device signals "ready for operation" or "STO – Safe Torque Off" if it is not in fault state.
- A detected hardware fault in the internal switch-off channels for STO will lead to a locking fault state in the device. If the fault is reset (e.g. by switching the line voltage on/off or by a low level at the STO input for at least 30 ms), a complete test with internal diagnostics according to the above-mentioned test procedure must be performed. If the fault occurs again, replace the device or contact SEW-EURODRIVE Service.

## 12.4 Connection designs

### 12.4.1 General information

Generally, all the connection designs listed in this documentation are permitted for safety-relevant applications, insofar as the safety conditions arising from this documentation are satisfied. This means that you must ensure without fail that the DC 24 V safety inputs are activated by a safety controller or an external safety relay, so that an independent restart is not possible.

All the safety conditions stipulated in the chapters "Integrated safety technology", "Safety conditions", and "Connection variants" must be satisfied on a primary basis for the basic selection, installation, and application of the safety components such as safety relay, emergency stop switch, and the approved connection variants.

The wiring diagrams are block diagrams whose only purpose is to show the safety subfunction(s) with the relevant components. For reasons of clarity, circuit-related measures that usually always have to be implemented are not shown in the diagram. These measures are e.g.:

- Ensuring the availability of touch guards.
- Handling overvoltages and undervoltages.
- Avoiding insulation faults.
- Detecting ground faults or short circuits in externally installed lines.
- Guaranteeing the required interference immunity against electromagnetic interference.

### 12.4.2 Requirements

**Use of safety relays**

The requirements of the manufacturers of safety relays (such as protecting the output contacts against welding) or of other safety components must be strictly observed. The basic requirements for cable routing apply as described in this documentation.

For connecting the device to the safety relays, observe the installation requirements in accordance with the chapter "Installation requirements".

All instructions by the manufacturer of the safety relay used in the particular application must be observed.

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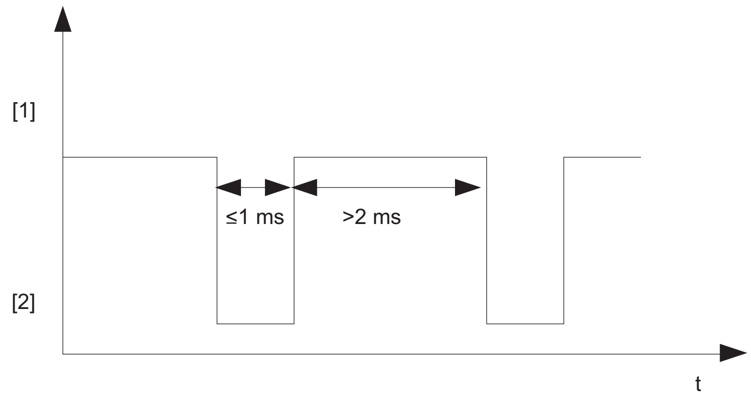
### Use of safety controllers

The switch-off test pulse of the used safe digital outputs (F-DO) must be ≤ 1 ms and another switch-off test pulse must only occur 2 ms later at the earliest.




*15214338827*

[1] High
[2] Low

## INFORMATION

If the safety-related control voltage at X6 is switched off (STO activated), you must observe the chapter "Requirements for the external safety controller" with regard to the test pulses.

## INFORMATION

If F_STO_P1, F_STO_P2 are connected to DC 24 V, and F_STO_M is connected to GND, STO is deactivated.

### STO signal for group disconnection

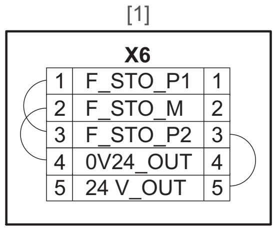
For group drives, the STO signal may be provided for several devices by a single safety relay. The following requirements must be met:

- The total cable length is limited to max. 100 m. Any other instructions published by the manufacturer on the use of the safety device (for the respective application) must also be observed.
- The maximum output current and the maximally permitted contact load of the safety device must be observed (see chapter "Technical data" > "Electronic data – Safety subfunctions").
- You must comply with the permitted signal levels at the STO input and all other technical data of the device. The respective routing of the STO control cables and the voltage drop must be considered.
- Other requirements of the safety device manufacturer (such as protecting the output contacts against welding) must be strictly observed. The basic requirements for cable routing also apply.
- A calculation based on the technical data of the device must be performed separately for each case of group drive disconnection.
- A maximum of 20 devices may be used in a group disconnection.

### 12.4.3 Wiring diagrams

**Delivery state**

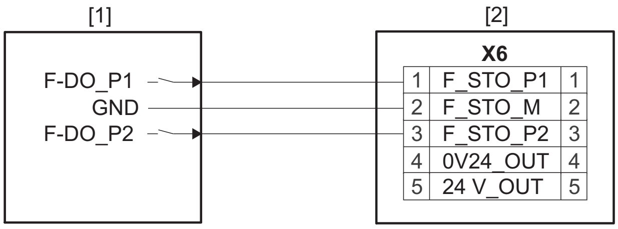
In the delivery state, the terminals at the port for safe disconnection X6 are jumpered.




*27743538443*

[1] STO terminal X6

**2-pole sourcing**

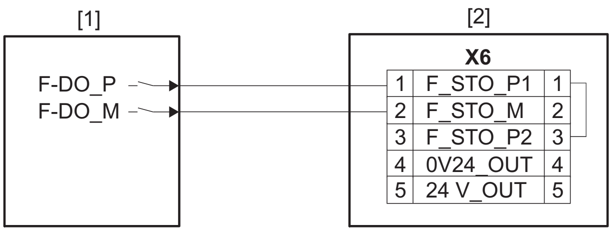



*27743543947*

[1] External safety device
[2] STO terminal X6

**2-pole sourcing/sinking**

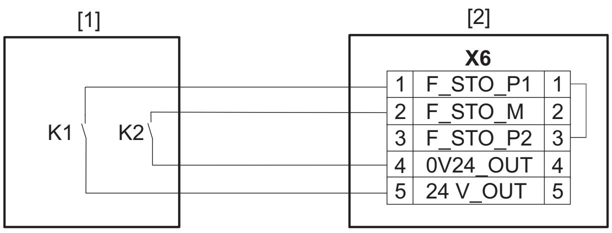
*Example 1*




*27743625995*

[1] External safety device
[2] STO terminal X6

*Example 2*



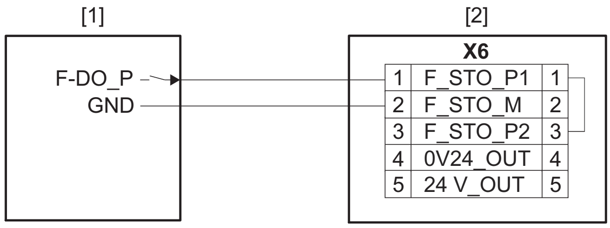

*34101943179*

[1] External safety device
[2] STO terminal X6

## INFORMATION

The supply voltages 0V24_Out (X6:4) and 24V_Out (X6:5) must not be used to supply the external safety device.

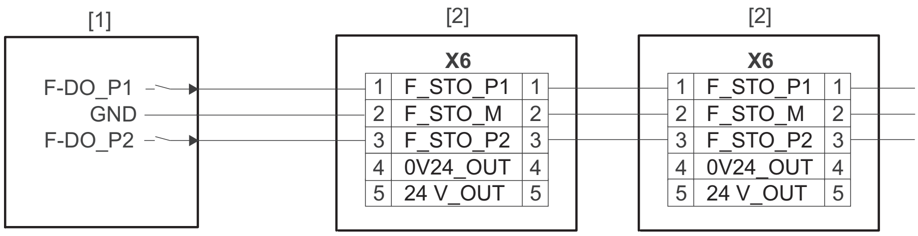
### 1-pole sourcing




27743633163

[1] External safety device
[2] STO terminal X6

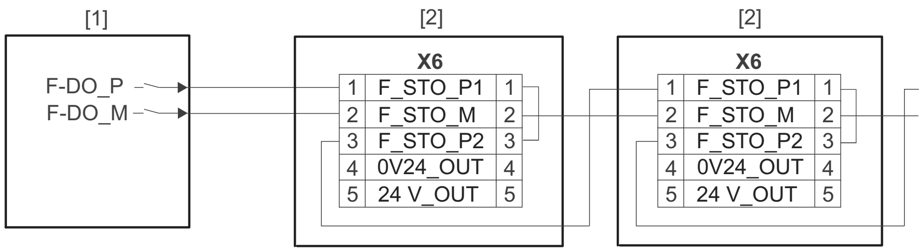
### STO group disconnection, 2-pole, sourcing




27739017995

[1] External safety controller
[2] STO terminal X6

### STO group disconnection, 2-pole, sourcing/sinking




27739021579

[1] External safety controller
[2] STO terminal X6

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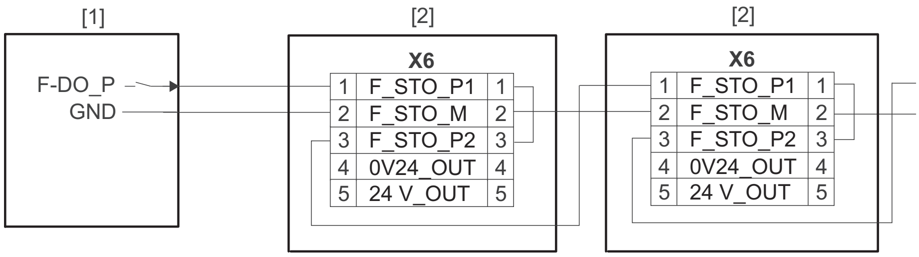
### STO group disconnection, 1-pole, sourcing




27738973707

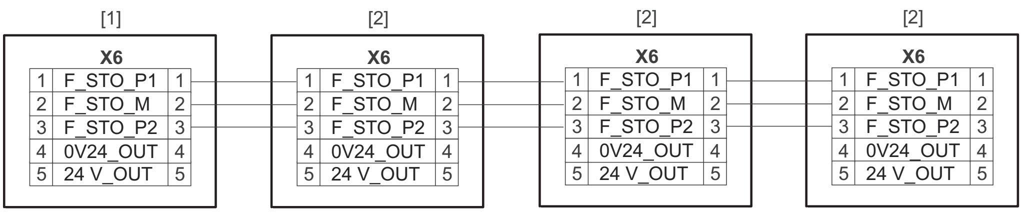
[1] External safety controller
[2] STO terminal X6

### Group disconnection via CS..A

The safety card has an internal safe digital output for switching the inverter's internal STO function as well as 3 additional axes of the MOVIDRIVE® modular/system/technology application inverter. No other components may be connected to the inverter's STO terminal X6.

The following conditions apply for shutting down the 3 additional axes:

- The cable length is limited to a maximum of 3 m up to the last axis.
- Cabling is permitted only within a control cabinet.
- The M-terminal of the individual axes must also be connected.
- No CS..A safety card may be installed in the additional axes.
- F-DO_STO's advanced diagnostics is available only for the device's internal STO circuit of the axis with a plugged CS..A safety card.
- For the additional axes, only short circuits of the cabling are detected.
- A connection according to the following figure is permissible.




36101842699

[1] STO terminal X6 of a MOVI-C® MOVIDRIVE® with a CS..A safety card
[2] STO terminal X6 of a MOVI-C® MOVIDRIVE® without a CS..A safety card

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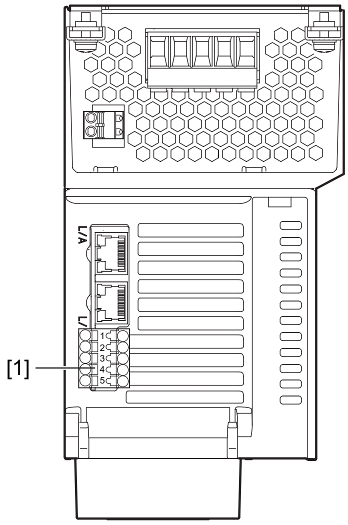
### 12.4.4 Port X6 on the device

The following figure shows the X6 port on the top of the device.




17915451659

[1] X6: Connection for Safe Torque Off (STO)

## 12.5 Safety characteristics

| | Characteristic values in accordance with | |
|---|---|---|
| | **IEC 61800-5-2** | **ISO 13849-1** |
| Tested safety class/underlying standards | Safety integrity level 3 | Performance level e / category 3 |
| Probability of a dangerous failure per hour (PFH value) | $2.5 \times 10^{-9}$ 1/h | |
| Service life | 20 years, after which the component must be replaced with a new one. | |
| Proof test interval | > 20 years | - |
| Safe state | Safe Torque Off (STO) | |
| Safety subfunction | STO, SS1[1)] in accordance with IEC 61800-5-2 | |

1) With suitable external control

## INFORMATION

In the case of 1-pole wiring, the achievable performance level in accordance with ISO 13849-1 is reduced to PL d, and the achievable Safety Integrity Level in accordance with IEC 61800-5-2 is reduced to SIL 2. A fault exclusion is necessary for the wiring between the safety relay and the STO input.

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# 13 Appendix

## 13.1 Abbreviation key

The following table lists the abbreviations that are used in this documentation together with their unit and meaning:

| Abbreviation | Information on the nameplate | Unit | Meaning |
|---|---|---|---|
| ASM | | | Asynchronous motor |
| BG.. | | | Inverter size |
| C | C | µF | Capacitance |
| $f_{max}$ | f | Hz | Maximum output frequency |
| $f_{line}$ | f | Hz | Line frequency |
| $f_{PWM}$ | | kHz | Frequency of the pulse width modulation |
| h | | m | Installation altitude |
| HF | | | High frequency |
| $I_{trip}$ | | A | Tripping current (braking resistor) |
| $I_{max}$ | Imax | A | Max. DC link current (specification on the nameplate) |
| $I_{max}$ | | A | Maximum output current (encoder cards) |
| $I_{peak}$ | | A | Output peak current (encoder cards) |
| $I_{A\ max}$ | | A | Max. output current |
| $I_{Appl}$ | | A | Total current of the application |
| $I_N$ | | A | Nominal output current/nominal current (filter, choke) |
| $I_{line}$ | I | A | Nominal line current |
| $I_{NDCL}$ | I | A | Nominal DC link current |
| $L_N$ | | mH | Inductance |
| LSPM | | | Line Start Permanent Magnet |
| asl | | m | Above sea level, reference for altitudes above sea level |
| $P_{eff}$ | | kW | Effective power (braking resistor) |
| $P_{max}$ | | kW | Maximum power (braking resistor) |
| $P_{Mot}$ | P(ASM) | kW | Motor power of the asynchronous motor |
| $P_N$ | | kW | Nominal motor power (rated power) |
| $P_V$ | | W | Power loss |
| PWM | | | Pulse width modulation |
| $R_{BW}$ | | Ω | Value of the braking resistance |
| $R_{BWmin}$ | | Ω | Minimum value of the braking resistance |
| $S_N$ | S | kVA | Apparent output power |
| SM | | | Synchronous motor |
| $V_{out}$ | U | V | Motor output voltage |
| $V_{BR}$ | | V | Brake supply voltage |

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| Abbreviation | Information on the nameplate | Unit | Meaning |
|---|---|---|---|
| $V_N$ | | V | Nominal line voltage (filter, choke) |
| $V_{line}$ | U | V | Connection voltage |
| $V_{NDCL}$ | U | V | Nominal DC link voltage |
| $V_{DCL}$ | | V | DC link voltage |
| $V_{out}$ | | V | DC 24 V to supply STO_P1 and STO_P2 |
| $V_S$ | | V | Supply voltage of encoders |
| $V_{S12VG}$ | | V | DC 12 V supply voltage of encoders |
| $V_{S24VG}$ | | V | DC 24 V supply voltage of encoders |
| $V_{I24}$ | | V | Voltage supply for electronics and brake |
| $\vartheta_U$ | T | °C | Ambient temperature |
| (+ES) | | | ... with output stage inhibit |

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# Index

## Numerical



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## S



## T

# 14 Address list

| | | | |
|---|---|---|---|
| **Argentina** | | | |
| Assembly<br>Sales | Buenos Aires | SEW EURODRIVE ARGENTINA S.A.<br>Ruta Panamericana Km 37.5, Lote 35<br>(B1619IEA) Centro Industrial Garín<br>Prov. de Buenos Aires | Tel. +54 3327 4572-84<br>Fax +54 3327 4572-21<br>http://www.sew-eurodrive.com.ar<br>sewar@sew-eurodrive.com.ar |
| **Australia** | | | |
| Assembly<br>Sales<br>Service | Melbourne | SEW-EURODRIVE PTY. LTD.<br>27 Beverage Drive<br>Tullamarine, Victoria 3043 | Tel. +61 3 9933-1000<br>Fax +61 3 9933-1003<br>http://www.sew-eurodrive.com.au<br>enquires@sew-eurodrive.com.au |
| | Sydney | SEW-EURODRIVE PTY. LTD.<br>9, Sleigh Place, Wetherill Park<br>New South Wales, 2164 | Tel. +61 2 9725-9900<br>Fax +61 2 9725-9905<br>enquires@sew-eurodrive.com.au |
| **Austria** | | | |
| Assembly<br>Sales<br>Service | Vienna | SEW-EURODRIVE Ges.m.b.H.<br>Richard-Strauss-Straße 24<br>1230 Wien | Tel. +43 1 617 55 00-0<br>Fax +43 1 617 55 00-30<br>http://www.sew-eurodrive.at<br>sew@sew-eurodrive.at |
| **Bangladesh** | | | |
| Sales | Bangladesh | SEW-EURODRIVE INDIA PRIVATE LIMITED<br>345 DIT Road<br>East Rampura<br>Dhaka-1219, Bangladesh | Tel. +88 01729 097309<br>salesdhaka@seweurodrivebangladesh.com |
| **Belarus** | | | |
| Sales | Minsk | Foreign unitary production enterprise SEW-EURODRIVE<br>Novodvorskij village council 145<br>223016, Minsk region | Tel. +375 17 319 47 56 / +375 17 378 47 58<br>Fax +375 17 378 47 54<br>http://www.sew-eurodrive.by<br>sew@sew-eurodrive.by |
| **Belgium** | | | |
| Assembly<br>Sales<br>Service | Brussels | SEW-EURODRIVE n.v./s.a.<br>Researchpark Haasrode 1060<br>Evenementenlaan 7<br>3001 Leuven | Tel. +32 16 386-311<br>Fax +32 16 386-336<br>http://www.sew-eurodrive.be<br>info@sew-eurodrive.be |
| Service Competence Center | Industrial Gears | SEW-EURODRIVE n.v./s.a.<br>Rue du Parc Industriel, 31<br>6900 Marche-en-Famenne | Tel. +32 84 219-878<br>Fax +32 84 219-879<br>http://www.sew-eurodrive.be<br>info@sew.be |
| **Brazil** | | | |
| Production<br>Sales<br>Service | São Paulo | SEW-EURODRIVE Brasil Ltda.<br>Estrada Municipal José Rubim, 205 – Rodovia Santos Dumont Km 49<br>Indaiatuba – 13347-510 – SP | Tel. +55 19 3835-8000<br>sew@sew.com.br |
| Assembly<br>Sales<br>Service | Rio Claro | SEW-EURODRIVE Brasil Ltda.<br>Rodovia Washington Luiz, Km 172<br>Condomínio Industrial Conpark<br>Caixa Postal: 327<br>13501-600 – Rio Claro / SP | Tel. +55 19 3522-3100<br>Fax +55 19 3524-6653<br>montadora.rc@sew.com.br |
| | Joinville | SEW-EURODRIVE Brasil Ltda. Jvl / Ind<br>Rua Dona Francisca, 12.346 – Pirabeiraba<br>89239-270 – Joinville / SC | Tel. +55 47 3027-6886<br>Fax +55 47 3027-6888<br>filial.sc@sew.com.br |
| **Bulgaria** | | | |
| Sales | Sofia | BEVER-DRIVE GmbH<br>Bogdanovetz Str.1<br>1606 Sofia | Tel. +359 2 9151160<br>Fax +359 2 9151166<br>bever@bever.bg |

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| **Cameroon** | | | |
| Sales | Douala | SEW-EURODRIVE SARLU<br>Ancienne Route Bonabéri<br>P.O. Box<br>B.P 8674<br>Douala-Cameroun | Tel. +237 233 39 12 35<br>Fax +237 233 39 02 10<br>www.sew-eurodrive.ci/<br>info@sew-eurodrive.cm |
| **Canada** | | | |
| Assembly<br>Sales<br>Service | Toronto | SEW-EURODRIVE CO. OF CANADA LTD.<br>210 Walker Drive<br>Bramalea, ON L6T 3W1 | Tel. +1 905 791-1553<br>Fax +1 905 791-2999<br>http://www.sew-eurodrive.ca<br>l.watson@sew-eurodrive.ca |
| | Vancouver | SEW-EURODRIVE CO. OF CANADA LTD.<br>Tilbury Industrial Park<br>7188 Honeyman Street<br>Delta, BC V4G 1G1 | Tel. +1 604 946-5535<br>Fax +1 604 946-2513<br>b.wake@sew-eurodrive.ca |
| | Montreal | SEW-EURODRIVE CO. OF CANADA LTD.<br>2001 Ch. de l'Aviation<br>Dorval<br>Quebec H9P 2X6 | Tel. +1 514 367-1124<br>Fax +1 514 367-3677<br>n.paradis@sew-eurodrive.ca |
| **Chile** | | | |
| Assembly<br>Sales<br>Service | Santiago de Chile | SEW-EURODRIVE CHILE LTDA<br>Las Encinas 1295<br>Parque Industrial Valle Grande<br>LAMPA<br>Santiago de Chile<br>P.O. Box<br>Casilla 23 Correo Quilicura - Santiago - Chile | Tel. +56 2 2757 7000<br>Fax +56 2 2757 7001<br>http://www.sew-eurodrive.cl<br>ventas@sew-eurodrive.cl |
| **China** | | | |
| Production<br>Assembly<br>Sales<br>Service | Tianjin | SEW-EURODRIVE (Tianjin) Co., Ltd.<br>No. 78, 13th Avenue, TEDA<br>Tianjin 300457 | Tel. +86 22 25322612<br>Fax +86 22 25323273<br>http://www.sew-eurodrive.cn<br>info@sew-eurodrive.cn |
| Assembly<br>Sales<br>Service | Suzhou | SEW-EURODRIVE (Suzhou) Co., Ltd.<br>333, Suhong Middle Road<br>Suzhou Industrial Park<br>Jiangsu Province, 215021 | Tel. +86 512 62581781<br>Fax +86 512 62581783<br>suzhou@sew-eurodrive.cn |
| | Guangzhou | SEW-EURODRIVE (Guangzhou) Co., Ltd.<br>No. 9, JunDa Road<br>East Section of GETDD<br>Guangzhou 510530 | Tel. +86 20 82267890<br>Fax +86 20 82267922<br>guangzhou@sew-eurodrive.cn |
| | Shenyang | SEW-EURODRIVE (Shenyang) Co., Ltd.<br>10A-2, 6th Road<br>Shenyang Economic Technological Develop-ment Area<br>Shenyang, 110141 | Tel. +86 24 25382538<br>Fax +86 24 25382580<br>shenyang@sew-eurodrive.cn |
| | Taiyuan | SEW-EURODRIVE (Taiyuan) Co,. Ltd.<br>No.3, HuaZhang Street,<br>TaiYuan Economic & Technical Development Zone<br>ShanXi, 030032 | Tel. +86-351-7117520<br>Fax +86-351-7117522<br>taiyuan@sew-eurodrive.cn |
| | Wuhan | SEW-EURODRIVE (Wuhan) Co., Ltd.<br>10A-2, 6th Road<br>No. 59, the 4th Quanli Road, WEDA<br>430056 Wuhan | Tel. +86 27 84478388<br>Fax +86 27 84478389<br>wuhan@sew-eurodrive.cn |
| | Xi'An | SEW-EURODRIVE (Xi'An) Co., Ltd.<br>No. 12 Jinye 2nd Road<br>Xi'An High-Technology Industrial Development Zone<br>Xi'An 710065 | Tel. +86 29 68686262<br>Fax +86 29 68686311<br>xian@sew-eurodrive.cn |
| Sales<br>Service | Hong Kong | SEW-EURODRIVE LTD.<br>Unit No. 801-806, 8th Floor<br>Hong Leong Industrial Complex<br>No. 4, Wang Kwong Road<br>Kowloon, Hong Kong | Tel. +852 36902200<br>Fax +852 36902211<br>contact@sew-eurodrive.hk |

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| Colombia | | | |
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| Assembly<br>Sales<br>Service | Bogota | SEW-EURODRIVE COLOMBIA LTDA.<br>Calle 17 No. 132-18<br>Interior 2 Bodega 6, Manzana B<br>Santafé de Bogotá | Tel. +57 1 54750-50<br>Fax +57 1 54750-44<br>http://www.sew-eurodrive.com.co<br>sew@sew-eurodrive.com.co |
| **Croatia** | | | |
| Sales<br>Service | Zagreb | KOMPEKS d. o. o.<br>Zeleni dol 10<br>10 000 Zagreb | Tel. +385 1 4613-158<br>Fax +385 1 4613-158<br>kompeks@inet.hr |
| **Czech Republic** | | | |
| Assembly<br>Sales<br>Service | Hostivice | SEW-EURODRIVE CZ s.r.o.<br>Floriánova 2459<br>253 01 Hostivice | Tel. +420 255 709 601<br>Fax +420 235 350 613<br>http://www.sew-eurodrive.cz<br>sew@sew-eurodrive.cz |
| **Denmark** | | | |
| Assembly<br>Sales<br>Service | Copenhagen | SEW-EURODRIVEA/S<br>Geminivej 28-30<br>2670 Greve | Tel. +45 43 95 8500<br>Fax +45 43 9585-09<br>http://www.sew-eurodrive.dk<br>sew@sew-eurodrive.dk |
| Service | Vejle | SEW-EURODRIVE A/S<br>Bødkervej 2<br>7100 Vejle | Tel. +45 43 9585 00<br>http://www.sew-eurodrive.dk<br>sew@sew-eurodrive.dk |
| **Egypt** | | | |
| Representation: United Arab Emirates | | | |
| **Estonia** | | | |
| Sales | Tallin | ALAS-KUUL AS<br>Loomäe tee 1, Lehmja küla<br>75306 Rae vald Harjumaa | Tel. +372 6593230<br>Fax +372 6593231<br>http://www.alas-kuul.ee<br>info@alas-kuul.ee |
| **Finland** | | | |
| Assembly<br>Sales<br>Service | Hollola | SEW-EURODRIVE OY<br>Vesimäentie 4<br>15860 Hollola | Tel. +358 201 589-300<br>Fax +358 3 780-6211<br>http://www.sew-eurodrive.fi<br>sew@sew.fi |
| Service | Hollola | SEW-EURODRIVE OY<br>Keskikankaantie 21<br>15860 Hollola | Tel. +358 201 589-300<br>Fax +358 3 780-6211<br>http://www.sew-eurodrive.fi<br>sew@sew.fi |
| | Tornio | SEW-EURODRIVE Oy<br>Lossirannankatu 5<br>95420 Tornio | Tel. +358 201 589 300<br>Fax +358 3 780 6211<br>http://www.sew-eurodrive.fi<br>sew@sew.fi |
| Production<br>Assembly | Karkkila | SEW Industrial Gears Oy<br>Santasalonkatu 6, PL 8<br>03620 Karkkila, 03601 Karkkila | Tel. +358 201 589-300<br>Fax +358 201 589-310<br>http://www.sew-eurodrive.fi<br>sew@sew.fi |
| **France** | | | |
| Production<br>Sales | Haguenau | SEW USOCOME<br>48-54 route de Soufflenheim<br>B. P. 20185<br>67506 Haguenau Cedex | Tel. +33 3 88 73 67 00<br>http://www.usocome.com<br>sew@usocome.com |
| Production | Forbach | SEW USOCOME<br>Zone industrielle<br>Technopôle Forbach Sud<br>B. P. 30269<br>57604 Forbach Cedex | Tel. +33 3 87 29 38 00 |
| | Brumath | SEW USOCOME<br>1 Rue de Bruxelles<br>67670 Mommenheim Cedex | Tel. +33 3 88 37 48 00 |

| France | | | |
|---|---|---|---|
| Assembly<br>Sales<br>Service | Bordeaux | SEW USOCOME<br>Parc d'activités de Magellan<br>62 avenue de Magellan – B. P. 182<br>33607 Pessac Cedex | Tel. +33 5 57 26 39 00<br>dtcbordeaux@usocome.com |
| | Haguenau | SEW USOCOME<br>48-54 route de Soufflenheim<br>B. P. 20185<br>67506 Haguenau Cedex | Tel. +33 3 88 73 67 00<br>dtchaguenau@usocome.com |
| | Lyon | SEW USOCOME<br>75 rue Antoine Condorcet<br>38090 Vaulx-Milieu | Tel. +33 4 74 99 60 00<br>dtclyon@usocome.com |
| | Nantes | SEW USOCOME<br>Parc d'activités de la forêt<br>4 rue des Fontenelles<br>44140 Le Bignon | Tel. +33 2 40 78 42 00<br>dtcnantes@usocome.com |
| | Paris | SEW USOCOME<br>Zone industrielle<br>2 rue Denis Papin<br>77390 Verneuil I'Étang | Tel. +33 1 64 42 40 80<br>dtcparis@usocome.com |

| Gabon |
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| Representation: Cameroon |

| Germany | | | |
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| Headquarters<br>Production<br>Sales | Bruchsal | SEW-EURODRIVE GmbH & Co KG<br>Ernst-Blickle-Straße 42<br>76646 Bruchsal | Tel. +49 7251 75-0<br>Fax +49 7251 75-1970<br>http://www.sew-eurodrive.de<br>sew@sew-eurodrive.de |
| Production / Industrial Gears | Bruchsal | SEW-EURODRIVE GmbH & Co KG<br>Christian-Pähr-Str. 10<br>76646 Bruchsal | Tel. +49 7251 75-0<br>Fax +49 7251 75-2970 |
| Production / Precision Gear Units | Bruchsal | SEW-EURODRIVE GmbH & Co KG<br>Ernst-Blickle-Straße 42<br>76646 Bruchsal | Tel. +49 7251 75-0<br>Fax +49 7251 75-1970<br>sew@sew-eurodrive.de |
| Production | Graben | SEW-EURODRIVE GmbH & Co KG<br>Ernst-Blickle-Straße 1<br>76676 Graben-Neudorf | Tel. +49 7251 75-0<br>Fax +49 7251-2970 |
| Service Competence Center | Mechanics / Mechatronics | SEW-EURODRIVE GmbH & Co KG<br>Ernst-Blickle-Straße 1<br>76676 Graben-Neudorf | Tel. +49 7251 75-1710<br>Fax +49 7251 75-1711<br>scc-mechanik@sew-eurodrive.de |
| | Electronics | SEW-EURODRIVE GmbH & Co KG<br>Christian-Pähr-Straße 12<br>76646 Bruchsal | Tel. +49 7251 75-1780<br>Fax +49 7251 75-1769<br>scc-elektronik@sew-eurodrive.de |
| | MAXOLUTION® Factory Automation | SEW-EURODRIVE GmbH & Co KG<br>Eisenbahnstraße 11<br>76646 Bruchsal | Tel. +49 7251 75-0<br>Fax +49 7251 75-1970<br>sew@sew-eurodrive.de |
| Drive Technology Center | North | SEW-EURODRIVE GmbH & Co KG<br>Alte Ricklinger Straße 43<br>30823 Garbsen (Hannover) | Tel. +49 5137 8798-30<br>Fax +49 5137 8798-55<br>dtc-nord@sew-eurodrive.de |
| | East | SEW-EURODRIVE GmbH & Co KG<br>Dänkritzer Weg 1<br>08393 Meerane (Zwickau) | Tel. +49 3764 7606-0<br>Fax +49 3764 7606-20<br>dtc-ost@sew-eurodrive.de |
| | South | SEW-EURODRIVE GmbH & Co KG<br>Domagkstraße 5<br>85551 Kirchheim (München) | Tel. +49 89 909551-21<br>Fax +49 89 909551-50<br>dtc-sued@sew-eurodrive.de |
| | West | SEW-EURODRIVE GmbH & Co KG<br>Siemensstraße 1<br>40764 Langenfeld (Düsseldorf) | Tel. +49 2173 8507-10<br>Fax +49 2173 8507-50<br>dtc-west@sew-eurodrive.de |
| Drive Center | Berlin | SEW-EURODRIVE GmbH & Co KG<br>Alexander-Meißner-Straße 44<br>12526 Berlin | Tel. +49 306331131-30<br>Fax +49 306331131-36<br>dc-berlin@sew-eurodrive.de |
| | Bremen | SEW-EURODRIVE GmbH & Co KG<br>Allerkai 4<br>28309 Bremen | Tel. +49 421 33918-10<br>Fax +49 421 33918-22<br>tb-bremen@sew-eurodrive.de |

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| **Germany** | | | |
| | Hamburg | SEW-EURODRIVE GmbH & Co KG<br>Hasselbinnen 11<br>22869 Schenefeld | Tel. +49 40298109-60<br>Fax +49 40298109-70<br>dc-hamburg@sew-eurodrive.de |
| | Saarland | SEW-EURODRIVE GmbH & Co KG<br>Gottlieb-Daimler-Straße 4<br>66773 Schwalbach Saar – Hülzweiler | Tel. +49 6831 48946 10<br>Fax +49 6831 48946 13<br>dc-saarland@sew-eurodrive.de |
| | Ulm | SEW-EURODRIVE GmbH & Co KG<br>Dieselstraße 18<br>89160 Dornstadt | Tel. +49 7348 9885-0<br>Fax +49 7348 9885-90<br>dc-ulm@sew-eurodrive.de |
| | Würzburg | SEW-EURODRIVE GmbH & Co KG<br>Nürnbergerstraße 118<br>97076 Würzburg-Lengfeld | Tel. +49 931 27886-60<br>Fax +49 931 27886-66<br>dc-wuerzburg@sew-eurodrive.de |
| Drive Service Hotline / 24 Hour Service | | | 0 800 SEWHELP<br>0 800 7394357 |
| **Great Britain** | | | |
| Assembly<br>Sales<br>Service | Normanton | SEW-EURODRIVE Ltd.<br>DeVilliers Way<br>Trident Park<br>Normanton<br>West Yorkshire<br>WF6 1GX | Tel. +44 1924 893-855<br>Fax +44 1924 893-702<br>http://www.sew-eurodrive.co.uk<br>info@sew-eurodrive.co.uk |
| **Greece** | | | |
| Sales | Athens | Christ. Boznos & Son S.A.<br>12, K. Mavromichali Street<br>P.O. Box 80136<br>18545 Piraeus | Tel. +30 2 1042 251-34<br>Fax +30 2 1042 251-59<br>http://www.boznos.gr<br>info@boznos.gr |
| **Hungary** | | | |
| Sales<br>Service | Budapest | SEW-EURODRIVE Kft.<br>Csillaghegyí út 13.<br>1037 Budapest | Tel. +36 1 437 06-58<br>Fax +36 1 437 06-50<br>http://www.sew-eurodrive.hu<br>office@sew-eurodrive.hu |
| **Iceland** | | | |
| Sales | Reykjavik | Varma & Vélaverk ehf.<br>Knarrarvogi 4<br>104 Reykjavík | Tel. +354 585 1070<br>Fax +354 585)1071<br>https://vov.is/<br>vov@vov.is |
| **India** | | | |
| Registered Office<br>Assembly<br>Sales<br>Service | Vadodara | SEW-EURODRIVE India Private Limited<br>302, NOTUS IT PARK,<br>Sarabhai Campus,<br>Beside Notus Pride, Genda Circle,<br>Vadodara 390023<br>Gujarat | Tel. +91 265 3045200<br>Fax +91 265 3045300<br>http://www.seweurodriveindia.com<br>salesvadodara@seweurodriveindia.com |
| Assembly<br>Sales<br>Service | Chennai | SEW-EURODRIVE India Private Limited<br>Plot No. K3/1, Sipcot Industrial Park Phase II<br>Mambakkam Village<br>Sriperumbudur - 602105<br>Kancheepuram Dist, Tamil Nadu | Tel. +91 44 37188888<br>Fax +91 44 37188811<br>saleschennai@seweurodriveindia.com |
| | Pune | SEW-EURODRIVE India Private Limited<br>Plant: Plot No. D236/1,<br>Chakan Industrial Area Phase- II,<br>Warale, Tal- Khed,<br>Pune-410501, Maharashtra | Tel. +91 21 35 628700<br>Fax +91 21 35 628715<br>salespune@seweurodriveindia.com |
| Sales<br>Service | Gurgaon | SEW-EURODRIVE India Private Limited<br>Drive Center Gurugram<br>Plot no 395, Phase-IV, UdyogVihar<br>Gurugram , 122016 Haryana | Tel. +91 99588 78855<br>salesgurgaon@seweurodriveindia.com |

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| **Indonesia** | | | |
| Sales | Medan | PT. Serumpun Indah Lestari<br>Jl.Pulau Solor no. 8, Kawasan Industri Medan II<br>Medan 20252 | Tel. +62 61 687 1221<br>Fax +62 61 6871429 / +62 61 6871458 / +62 61 30008041<br>sil@serumpunindah.com<br>serumpunindah@yahoo.com<br>http://www.serumpunindah.com |
| | Jakarta | PT. Cahaya Sukses Abadi<br>Komplek Rukan Puri Mutiara Blok A no 99, Sunter<br>Jakarta 14350 | Tel. +62 21 65310599<br>Fax +62 21 65310600<br>csajkt@cbn.net.id |
| | Jakarta | PT. Agrindo Putra Lestari<br>JL.Pantai Indah Selatan, Komplek Sentra Industri Terpadu, Pantai indah Kapuk Tahap III, Blok E No. 27<br>Jakarta 14470 | Tel. +62 21 2921-8899<br>Fax +62 21 2921-8988<br>aplindo@indosat.net.id<br>http://www.aplindo.com |
| | Surabaya | PT. TRIAGRI JAYA ABADI<br>Jl. Sukosemolo No. 63, Galaxi Bumi Permai G6 No. 11<br>Surabaya 60111 | Tel. +62 31 5990128<br>Fax +62 31 5962666<br>sales@triagri.co.id<br>http://www.triagri.co.id |
| | Surabaya | CV. Multi Mas<br>Jl. Raden Saleh 43A Kav. 18<br>Surabaya 60174 | Tel. +62 31 5458589<br>Fax +62 31 5317220<br>sianhwa@sby.centrin.net.id<br>http://www.cvmultimas.com |
| **Ireland** | | | |
| Sales<br>Service | Dublin | Alperton Engineering Ltd.<br>48 Moyle Road<br>Dublin Industrial Estate<br>Glasnevin, Dublin 11 | Tel. +353 1 830-6277<br>Fax +353 1 830-6458<br>http://www.alperton.ie<br>info@alperton.ie |
| **Israel** | | | |
| Sales | Tel Aviv | Liraz Handasa Ltd.<br>Ahofer Str 34B / 228<br>58858 Holon | Tel. +972 3 5599511<br>Fax +972 3 5599512<br>http://www.liraz-handasa.co.il<br>office@liraz-handasa.co.il |
| **Italy** | | | |
| Assembly<br>Sales<br>Service | Milan | SEW-EURODRIVE S.a.s. di SEW S.r.l. & Co.<br>Via Bernini,12<br>20033 Solaro (Milano) | Tel. +39 02 96 980229<br>Fax +39 02 96 980 999<br>http://www.sew-eurodrive.it<br>milano@sew-eurodrive.it |
| **Ivory Coast** | | | |
| Sales | Abidjan | SEW-EURODRIVE SARL<br>Ivory Coast<br>Rue des Pêcheurs, Zone 3<br>26 BP 916 Abidjan 26 | Tel. +225 27 21 21 81 05<br>Fax +225 27 21 25 30 47<br>info@sew-eurodrive.ci<br>http://www.sew-eurodrive.ci |
| **Japan** | | | |
| Assembly<br>Sales<br>Service | Iwata | SEW-EURODRIVE JAPAN CO., LTD<br>250-1, Shimoman-no,<br>Iwata<br>Shizuoka 438-0818 | Tel. +81 538 373811<br>Fax +81 538 373814<br>http://www.sew-eurodrive.co.jp<br>sewjapan@sew-eurodrive.co.jp |
| **Kazakhstan** | | | |
| Sales<br>Service | Almaty | SEW-EURODRIVE LLP<br>291-291A, Tole bi street<br>050031, Almaty | Tel. +7 (727) 350 5156<br>Fax +7 (727) 350 5156<br>http://www.sew-eurodrive.com<br>kazakhstan@sew-eurodrive.com |
| | Tashkent | Representative Office SEW-EURODRIVE<br>Representative office in Uzbekistan<br>95A Amir Temur ave, office 401/3<br>100084 Tashkent | Tel. +998 97 134 01 99<br>http://www.sew-eurodrive.uz<br>sew@sew-eurodrive.uz |
| | Ulaanbaatar | IM Trading LLC<br>Olympic street 28B/3<br>Sukhbaatar district,<br>Ulaanbaatar 14230, MN | Tel. +976-77109997<br>Fax +976-77109997<br>imt@imt.mn |

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| **Latvia** | | | |
| Sales | Riga | SIA Alas-Kuul<br>Katlakalna 11C<br>1073 Riga | Tel. +371 6 7139253<br>Fax +371 6 7139386<br>http://www.alas-kuul.lv<br>info@alas-kuul.com |
| **Lebanon** | | | |
| Sales (Lebanon) | Beirut | Gabriel Acar & Fils sarl<br>B. P. 80484<br>Bourj Hammoud, Beirut | Tel. +961 1 510 532<br>Fax +961 1 494 971<br>ssacar@inco.com.lb |
| Sales (Jordan, Kuwait , Saudi Arabia, Syria) | Beirut | Middle East Drives S.A.L. (offshore)<br>Sin El Fil.<br>B. P. 55-378<br>Beirut | Tel. +961 1 494 786<br>Fax +961 1 494 971<br>http://www.medrives.com<br>info@medrives.com |
| **Lithuania** | | | |
| Sales | Alytus | UAB Irseva<br>Statybininku 106C<br>63431 Alytus | Tel. +370 315 79204<br>Fax +370 315 56175<br>http://www.irseva.lt<br>irmantas@irseva.lt |
| **Luxembourg** | | | |
| Representation: Belgium | | | |
| **Macedonia** | | | |
| Sales | Skopje | Boznos DOOEL<br>Dime Anicin 2A/7A<br>1000 Skopje | Tel. +389 23256553<br>Fax +389 23256554<br>http://www.boznos.mk |
| **Malaysia** | | | |
| Assembly<br>Sales<br>Service | Johor | SEW-EURODRIVE SDN BHD<br>No. 95, Jalan Seroja 39, Taman Johor Jaya<br>81000 Johor Bahru, Johor<br>West Malaysia | Tel. +60 7 3549409<br>Fax +60 7 3541404<br>sales@sew-eurodrive.com.my |
| **Mexico** | | | |
| Assembly<br>Sales<br>Service | Quéretaro | SEW-EURODRIVE MEXICO S.A. de C.V.<br>SEM-981118-M93<br>Tequisquiapan No. 102<br>Parque Industrial Quéretaro<br>C.P. 76220<br>Querétaro, México | Tel. +52 442 1030-300<br>Fax +52 442 1030-301<br>http://www.sew-eurodrive.com.mx<br>scmexico@seweurodrive.com.mx |
| Sales<br>Service | Puebla | SEW-EURODRIVE MEXICO S.A. de C.V.<br>Calzada Zavaleta No. 3922 Piso 2 Local 6<br>Col. Santa Cruz Buenavista<br>C.P. 72154<br>Puebla, México | Tel. +52 (222) 221 248<br>http://www.sew-eurodrive.com.mx<br>scmexico@seweurodrive.com.mx |
| **Mongolia** | | | |
| Technical Office | Ulaanbaatar | IM Trading LLC<br>Olympic street 28B/3<br>Sukhbaatar district,<br>Ulaanbaatar 14230, MN | Tel. +976-77109997<br>Tel. +976-99070395<br>Fax +976-77109997<br>http://imt.mn/<br>imt@imt.mn |
| **Morocco** | | | |
| Sales<br>Service<br>Assembly | Bouskoura | SEW-EURODRIVE Morocco SARL<br>Parc Industriel CFCIM, Lot. 55/59<br>27182 Bouskoura<br>Grand Casablanca | Tel. +212 522 88 85 00<br>Fax +212 522 88 84 50<br>http://www.sew-eurodrive.ma<br>sew@sew-eurodrive.ma |
| **Namibia** | | | |
| Sales | Swakopmund | DB MINING & INDUSTRIAL SUPPLIES CC<br>Einstein Street<br>Strauss Industrial Park<br>Unit1<br>Swakopmund | Tel. +264 64 462 738<br>Fax +264 64 462 734<br>anton@dbminingnam.com |

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| **Netherlands** | | | |
| Assembly<br>Sales<br>Service | Rotterdam | SEW-EURODRIVE B.V.<br>Industrieweg 175<br>3044 AS Rotterdam<br>Postbus 10085<br>3004 AB Rotterdam | Tel. +31 10 4463-700<br>Fax +31 10 4155-552<br>Service: 0800-SEWHELP<br>http://www.sew-eurodrive.nl<br>info@sew-eurodrive.nl |
| **New Zealand** | | | |
| Assembly<br>Sales<br>Service | Auckland | SEW-EURODRIVE NEW ZEALAND LTD.<br>P.O. Box 58-428<br>82 Greenmount drive<br>East Tamaki Auckland | Tel. +64 9 2745627<br>Fax +64 9 2740165<br>http://www.sew-eurodrive.co.nz<br>sales@sew-eurodrive.co.nz |
| | Christchurch | SEW-EURODRIVE NEW ZEALAND LTD.<br>30 Lodestar Avenue, Wigram<br>Christchurch | Tel. +64 3 384-6251<br>Fax +64 3 384-6455<br>sales@sew-eurodrive.co.nz |
| **Nigeria** | | | |
| Sales | Lagos | Greenpeg Nig. Ltd<br>64C Toyin Street Opebi-Allen<br>Ikeja Lagos-Nigeria | Tel. +234-701-821-9200-1<br>http://www.greenpegltd.com<br>sales@greenpegltd.com |
| **Norway** | | | |
| Assembly<br>Sales<br>Service | Moss | SEW-EURODRIVE A/S<br>Solgaard skog 71<br>1599 Moss | Tel. +47 69 24 10 20<br>Fax +47 69 24 10 40<br>http://www.sew-eurodrive.no<br>sew@sew-eurodrive.no |
| **Pakistan** | | | |
| Sales | Karachi | Industrial Power Drives<br>Al-Fatah Chamber A/3, 1st Floor Central Commercial Area,<br>Sultan Ahmed Shah Road, Block 7/8,<br>Karachi | Tel. +92 21 452 9369<br>Fax +92-21-454 7365<br>seweurodrive@cyber.net.pk |
| **Paraguay** | | | |
| Sales | Fernando de la Mora | SEW-EURODRIVE PARAGUAY S.R.L<br>Nu Guazu No. 642 casi Campo Esperanza<br>Santisima Trinidad<br>Asuncion | Tel. +595 991 519695<br>Fax +595 21 3285539<br>sewpy@sew-eurodrive.com.py |
| **Peru** | | | |
| Assembly<br>Sales<br>Service | Lima | SEW EURODRIVE DEL PERU S.A.C.<br>Los Calderos, 120-124<br>Urbanizacion Industrial Vulcano, ATE, Lima | Tel. +51 1 3495280<br>Fax +51 1 3493002<br>http://www.sew-eurodrive.com.pe<br>sewperu@sew-eurodrive.com.pe |
| **Philippines** | | | |
| Sales | Makati | P.T. Cerna Corporation<br>4137 Ponte St., Brgy. Sta. Cruz<br>Makati City 1205 | Tel. +63 2 519 6214<br>Fax +63 2 890 2802<br>mech_drive_sys@ptcerna.com<br>http://www.ptcerna.com |
| **Poland** | | | |
| Assembly<br>Sales<br>Service | Łódź | SEW-EURODRIVE Polska Sp.z.o.o.<br>ul. Techniczna 5<br>92-518 Łódź | Tel. +48 42 293 00 00<br>Fax +48 42 293 00 49<br>http://www.sew-eurodrive.pl<br>sew@sew-eurodrive.pl |
| | Service | Tel. +48 42 293 0030<br>Fax +48 42 293 0043 | 24 Hour Service<br>Tel. +48 602 739 739 (+48 602 SEW SEW)<br>serwis@sew-eurodrive.pl |
| **Portugal** | | | |
| Assembly<br>Sales<br>Service | Coimbra | SEW-EURODRIVE, LDA.<br>Av. da Fonte Nova, n.º 86<br>3050-379 Mealhada | Tel. +351 231 20 9670<br>Fax +351 231 20 3685<br>http://www.sew-eurodrive.pt<br>infosew@sew-eurodrive.pt |

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| **Romania** | | | |
| Sales<br>Service | Bucharest | Sialco Trading SRL<br>str. Brazilia nr. 36<br>011783 Bucuresti | Tel. +40 21 230-1328<br>Fax +40 21 230-7170<br>http://www.sialco.ro<br>sialco@sialco.ro |
| **Russia** | | | |
| Assembly<br>Sales<br>Service | St. Petersburg | ЗАО «СЕВ-ЕВРОДРАЙФ»<br>188660, Russia, Leningrad Region, Vsevolozhsky District, Korabselki, Aleksandra Nevskogo str.<br>building 4, block 1<br>P.O. Box 36<br>195220 St. Petersburg | Tel. +7 812 3332522 / +7 812 5357142<br>Fax +7 812 3332523<br>http://www.sew-eurodrive.ru<br>sew@sew-eurodrive.ru |
| **Senegal** | | | |
| Sales | Dakar | SENEMECA<br>Mécanique Générale<br>Km 8, Route de Rufisque<br>B.P. 3251, Dakar | Tel. +221 338 494 770<br>Fax +221 338 494 771<br>http://www.senemeca.com<br>senemeca@senemeca.sn |
| **Serbia** | | | |
| Sales | Belgrade | DIPAR d.o.o.<br>Ustanicka 128a<br>PC Košum, IV floor<br>11000 Beograd | Tel. +381 11 347 3244 / +381 11 288 0393<br>Fax +381 11 347 1337<br>office@dipar.rs |
| **Singapore** | | | |
| Assembly<br>Sales<br>Service | Singapore | SEW-EURODRIVE PTE. LTD.<br>No 9, Tuas Drive 2<br>Jurong Industrial Estate<br>Singapore 638644 | Tel. +65 68621701<br>Fax +65 68612827<br>http://www.sew-eurodrive.com.sg<br>sewsingapore@sew-eurodrive.com |
| **Slovakia** | | | |
| Sales | Bernolákovo | SEW-Eurodrive SK s.r.o.<br>Priemyselná ulica 6267/7<br>900 27 Bernolákovo | Tel.+421 2 48 212 800<br>http://www.sew-eurodrive.sk<br>sew@sew-eurodrive.sk |
| **Slovenia** | | | |
| Sales<br>Service | Celje | Pakman - Pogonska Tehnika d.o.o.<br>Ul. XIV. divizije 14<br>3000 Celje | Tel. +386 3 490 83-20<br>Fax +386 3 490 83-21<br>pakman@siol.net |
| **South Africa** | | | |
| Assembly<br>Sales<br>Service | Johannesburg | SEW-EURODRIVE (PROPRIETARY) LIMITED<br>32 O'Connor Place<br>Eurodrive House<br>Aeroton<br>Johannesburg 2190<br>P.O.Box 90004<br>Bertsham 2013 | Tel. +27 11 248-7000<br>Fax +27 11 248-7289<br>http://www.sew.co.za<br>info@sew.co.za |
| | Cape Town | SEW-EURODRIVE (PROPRIETARY) LIMITED<br>Rainbow Park<br>Cnr. Racecourse & Omuramba Road<br>Montague Gardens<br>Cape Town<br>P.O.Box 36556<br>Chempet 7442 | Tel. +27 21 552-9820<br>Fax +27 21 552-9830<br>Telex 576 062<br>bgriffiths@sew.co.za |
| | Durban | SEW-EURODRIVE (PROPRIETARY) LIMITED<br>48 Prospecton Road<br>Isipingo<br>Durban<br>P.O. Box 10433, Ashwood 3605 | Tel. +27 31 902 3815<br>Fax +27 31 902 3826<br>cdejager@sew.co.za |
| | Nelspruit | SEW-EURODRIVE (PROPRIETARY) LIMITED<br>7 Christie Crescent<br>Vintonia<br>P.O.Box 1942<br>Nelspruit 1200 | Tel. +27 13 752-8007<br>Fax +27 13 752-8008<br>robermeyer@sew.co.za |

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| **South Korea** | | | |
| Assembly<br>Sales<br>Service | Ansan | SEW-EURODRIVE Korea Co., Ltd.<br>7, Dangjaengi-ro,<br>Danwon-gu,<br>Ansan-si, Gyeonggi-do, Zip 425-839 | Tel. +82 31 492-8051<br>Fax +82 31 492-8056<br>http://www.sew-eurodrive.kr<br>master.korea@sew-eurodrive.com |
| | Busan | SEW-EURODRIVE Korea Co., Ltd.<br>28, Noksansandan 262-ro 50beon-gil,<br>Gangseo-gu,<br>Busan, Zip 618-820 | Tel. +82 51 832-0204<br>Fax +82 51 832-0230 |
| Assembly<br>Service | Siheung | SEW-EURODRIVE Korea Co., Ltd.<br>35, Emtibeui 26-ro 58beon-gil,<br>Siheung-si, Gyeonggi-do | http://www.sew-eurodrive.kr |
| **Spain** | | | |
| Assembly<br>Sales<br>Service | Bilbao | SEW-EURODRIVE ESPAÑA, S.L.<br>Parque Tecnológico, Edificio, 302<br>48170 Zamudio (Vizcaya) | Tel. +34 94 43184-70<br>http://www.sew-eurodrive.es<br>sew.spain@sew-eurodrive.es |
| **Sri Lanka** | | | |
| Sales | Colombo | SM International (Pte) Ltd<br>254, Galle Raod<br>Colombo 4, Sri Lanka | Tel. +94 1 2584887<br>Fax +94 1 2582981 |
| **Swaziland** | | | |
| Sales | Manzini | C G Trading Co. (Pty) Ltd<br>Simunye street<br>Matsapha, Manzini | Tel. +268 7602 0790<br>Fax +268 2 518 5033<br>charles@cgtrading.co.sz<br>www.cgtradingswaziland.com |
| **Sweden** | | | |
| Assembly<br>Sales<br>Service | Jönköping | SEW-EURODRIVE AB<br>Gnejsvägen 6-8<br>553 03 Jönköping<br>Box 3100 S-550 03 Jönköping | Tel. +46 36 34 42 00<br>Fax +46 36 34 42 80<br>http://www.sew-eurodrive.se<br>jonkoping@sew.se |
| **Switzerland** | | | |
| Assembly<br>Sales<br>Service | Basel | Alfred Imhof A.G.<br>Jurastrasse 10<br>4142 Münchenstein bei Basel | Tel. +41 61 417 1717<br>Fax +41 61 417 1700<br>http://www.imhof-sew.ch<br>info@imhof-sew.ch |
| **Taiwan** | | | |
| Sales | Taipei | Ting Shou Trading Co., Ltd.<br>6F-3, No. 267, Sec. 2<br>Tung Huw S. Road<br>Taipei | Tel. +886 2 27383535<br>Fax +886 2 27368268<br>Telex 27 245<br>sewtwn@ms63.hinet.net<br>http://www.tingshou.com.tw |
| | Nan Tou | Ting Shou Trading Co., Ltd.<br>No. 55 Kung Yeh N. Road<br>Industrial District<br>Nan Tou 540 | Tel. +886 49 255353<br>Fax +886 49 257878<br>sewtwn@ms63.hinet.net<br>http://www.tingshou.com.tw |
| **Tanzania** | | | |
| Sales | Daressalam | SEW-EURODRIVE PTY LIMITED TANZANIA<br>Plot 52, Regent Estate<br>PO Box 106274<br>Dar Es Salaam | Tel. +255 0 22 277 5780<br>Fax +255 0 22 277 5788<br>http://www.sew-eurodrive.co.tz<br>info@sew.co.tz |
| **Thailand** | | | |
| Assembly<br>Sales<br>Service | Chonburi | SEW-EURODRIVE (Thailand) Ltd.<br>700/456, Moo.7, Donhuaroh<br>Muang<br>Chonburi 20000 | Tel. +66 38 454281<br>Fax +66 38 454288<br>sewthailand@sew-eurodrive.com |
| **Tunisia** | | | |
| Sales | Tunis | T. M.S. Technic Marketing Service<br>Zone Industrielle Mghira 2<br>Lot No. 39<br>2082 Fouchana | Tel. +216 79 40 88 77<br>Fax +216 79 40 88 66<br>http://www.tms.com.tn<br>tms@tms.com.tn |

| Turkey | | | |
|---|---|---|---|
| Assembly<br>Sales<br>Service | Kocaeli-Gebze | SEW-EURODRIVE Ana Merkez<br>Gebze Organize Sanayi Böl. 400 Sok No. 401<br>41480 Gebze Kocaeli | Tel. +90 262 9991000 04<br>Fax +90 262 9991009<br>http://www.sew-eurodrive.com.tr<br>sew@sew-eurodrive.com.tr |

| Ukraine | | | |
|---|---|---|---|
| Assembly<br>Sales<br>Service | Dnipropetrovsk | SEW-EURODRIVE, LLC<br>Robochya str., bld. 23-B, office 409<br>49008 Dnipro | Tel. +380 56 370 3211<br>Fax +380 56 372 2078<br>http://www.sew-eurodrive.ua<br>sew@sew-eurodrive.ua |

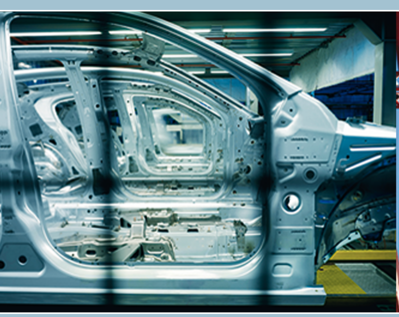
| United Arab Emirates | | | |
|---|---|---|---|
| Drive Technology Center | Dubai | SEW-EURODRIVE FZE<br>PO Box 263835<br>Jebel Ali Free Zone – South,<br>P.O. Box<br>Dubai, United Arab Emirates | Tel. +971 (0)4 8806461<br>Fax +971 (0)4 8806464<br>info@sew-eurodrive.ae |

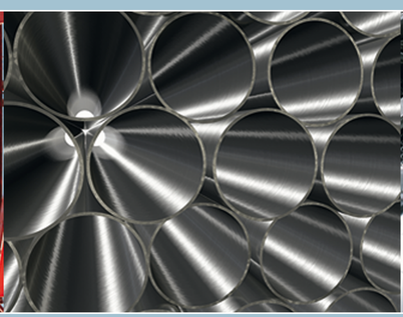
| Uruguay | | | |
|---|---|---|---|
| Assembly<br>Sales | Montevideo | SEW-EURODRIVE Uruguay, S. A.<br>Jose Serrato 3569 Esqina Corumbe<br>CP 12000 Montevideo | Tel. +598 2 21181-89<br>Fax +598 2 21181-90<br>sewuy@sew-eurodrive.com.uy |

| USA | | | |
|---|---|---|---|
| Production<br>Assembly<br>Sales<br>Service | Southeast Region | SEW-EURODRIVE INC.<br>220 Finch Rd<br>P.O. Box 518<br>Wellford SC , 29385 | Tel. +1 864 439-7537<br>Fax Sales +1 864 439-7830<br>Fax Production +1 864 439-9948<br>Fax Assembly +1 864 439-0566<br>Fax Confidential/HR +1 864 949-5557<br>http://www.seweurodrive.com<br>cslyman@seweurodrive.com |
| Assembly<br>Sales<br>Service | Northeast Region | SEW-EURODRIVE INC.<br>Pureland Ind. Complex<br>2107 High Hill Road, P.O. Box 481<br>Bridgeport, New Jersey 08014 | Tel. +1 856 467-2277<br>Fax +1 856 845-3179<br>csbridgeport@seweurodrive.com |
| | Midwest Region | SEW-EURODRIVE INC.<br>2001 West Main Street<br>Troy, Ohio 45373 | Tel. +1 937 335-0036<br>Fax +1 937 332-0038<br>cstroy@seweurodrive.com |
| | Southwest Region | SEW-EURODRIVE INC.<br>202 W. Danieldale Rd.<br>DeSoto, TX 75115 | Tel. +1 214 330-4824<br>Fax +1 214 330-4724<br>csdallas@seweurodrive.com |
| | Western Region | SEW-EURODRIVE INC.<br>30599 San Antonio St.<br>Hayward, CA 94544 | Tel. +1 510 487-3560<br>Fax +1 510 487-6433<br>cshayward@seweurodrive.com |
| | Wellford | SEW-EURODRIVE INC.<br>148/150 Finch Rd.<br>Wellford, S.C. 29385 | Tel. +1 864 439-7537<br>Fax +1 864 661 1167<br>IGOrders@seweurodrive.com |
| | Additional addresses for service provided on request! | | |

| Vietnam | | | |
|---|---|---|---|
| Sales | Ho Chi Minh City | SEW-EURODRIVE PTE. LTD. RO at Hochiminh City<br>Floor 8, KV I, Loyal building, 151-151 Bis Vo Thi Sau street, ward 6, District 3, Ho Chi Minh City, Vietnam | Tel. +84 937 299 700<br>huytam.phan@sew-eurodrive.com |
| | Hanoi | MICO LTD<br>Quảng Trị - North Vietnam / All sectors except Construction Materials<br>8th Floor, Ocean Park Building, 01 Dao Duy Anh St, Ha Noi, Viet Nam | Tel. +84 4 39386666<br>Fax +84 4 3938 6888<br>nam_ph@micogroup.com.vn<br>http://www.micogroup.com.vn |

| Zambia |
|---|
| Representation: South Africa |



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