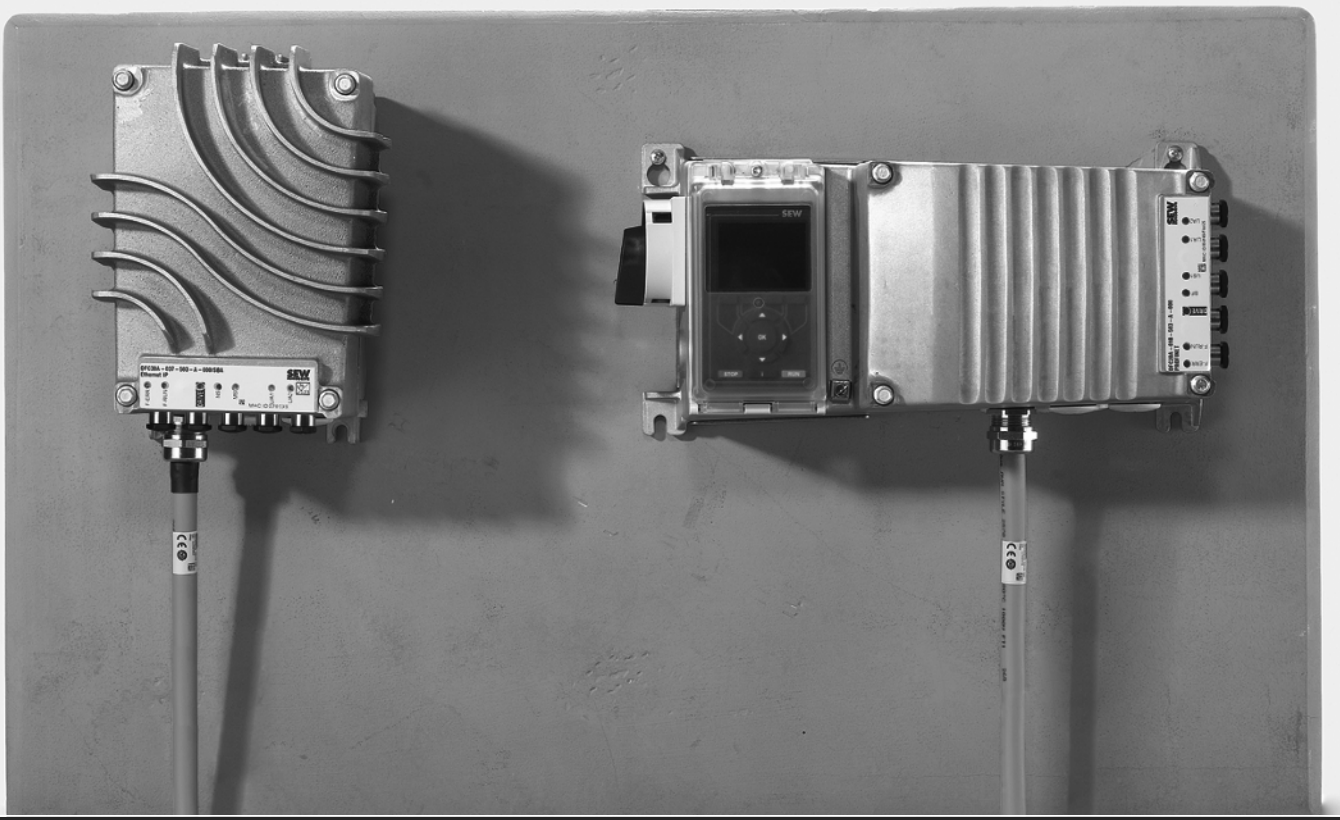
SEW EURODRIVE

Product Manual



Decentralized Inverter

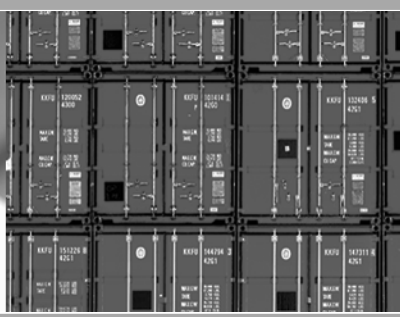
MOVIMOT® flexible DAC

MMF..-C/DAC (AS-Interface)

Edition 03/2024

31545599/EN



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1 General information

1.1 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.

1.2 Other applicable documentation

Refer to the corresponding documentation for all other components.

Always use the latest edition of the documentation and the software.

The SEW-EURODRIVE website (www.sew-eurodrive.com) provides a wide selection of documents for download in various languages. If required, you can also order printed and bound copies of the documentation from SEW-EURODRIVE.

1.3 Structure of the safety notes

1.3.1 Meaning of signal words

The following table shows the graduation and meaning of the signal words in the safety notes.

Signal word	Meaning	Consequences if not observed
⚠ **DANGER**	Imminent danger	Death or severe injuries
⚠ **WARNING**	Possibly dangerous situation	Death or severe injuries
⚠ **CAUTION**	Possibly 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.	

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1.3.2 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.

1.3.3 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 of risk of crushing
	Warning about suspended load
	Warning of automatic restart

1.3.4 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous step.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD!** Type and source of danger. Possible consequence(s) if disregarded. Measure(s) to prevent danger.

1.4 Decimal separator in numerical values

In this document, a period is used to indicate the decimal separator.

Example: 30.5 kg

1.5 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.

1.6 Recycling, reprocessing, reuse

SEW-EURODRIVE GmbH & Co KG strives to use as few new natural resources as possible in the production of its products. An important aspect of this is the circular economy with the recycling of materials as well as the inspection and/or reprocessing of returned components and their reuse in new products. SEW-EURODRIVE GmbH & Co KG only uses these processes if the resulting materials and components are of the same quality as new parts.

1.7 Product names and trademarks

The product names mentioned in this documentation are trademarks or registered trademarks of the respective titleholders.

1.8 Copyright notice

2 Safety notes for MOVIMOT® flexible

2.1 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.

2.2 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:

- The national and regional regulations governing safety and the prevention of accidents
- Product safety label on the product
- All other associated project planning documents, installation and startup instructions, as well as wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and regulations

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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2.3 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, and 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, and 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.

2.4 IT security

2.4.1 Contact

If you need support with the configuration, contact SEW-EURODRIVE Service. You can obtain information about current security-related issues by e-mail or on the Product Security Management website. There you will find various contact options for reporting security-related problems.

2.4.2 IT security of the product

The product can be set to different access levels. Certain parameters are protected by these access levels. Authentication is implemented by using static access data. This data is not used to defend against attacks on IT security but to protect against unintentional modification.

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2.4.3 IT security of the environment

For drive and control components that are integrated into a network (e.g. a fieldbus, WLAN, or Ethernet network), it is possible to make settings even more remotely. This brings with it the risk of a parameter change that is not visible externally resulting in unexpected, but not uncontrolled system behavior, and this may impact negatively on operational security, system availability, or data security.

Make sure that unauthorized access is not possible, especially for WLAN- or 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 Online Support. 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 guaranteed during operation. SEW-EURODRIVE recommends an IT security management system in accordance with ISO/IEC 27001 and ISO/IEC 62443-2-4.

2.5 Designated use

The product is intended for 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.

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.

Do not use the product as a climbing aid.

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2.5.1 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.

2.5.2 Restrictions of use

The following applications are prohibited unless the device is explicitly designed for such use:

- Use in potentially explosive areas.
- 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 line voltage is taken into account as per chapter "Technical data" in the associated product manual.
- 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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2.6 Functional safety technology

The product includes the STO safety subfunction. As an option, additional safety subfunctions can be available for the product.

The safety subfunctions are deactivated in the delivery state. The product may not perform any safety function without higher-level safety systems.

Observe the product manual of the device for use of the STO safety subfunction or other safety subfunctions.

2.7 Transportation

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product or the packaging is damaged, do not assemble, install, connect, or start up the product. If the packaging is damaged, the product itself may also be damaged.

Observe the following notes when transporting the device:

- Ensure that the product is not subject to mechanical impact.
- Before transportation, cover the connections with the supplied protection caps.
- Only place the product on the cooling fins or on the side without connectors during transportation.

If necessary, use suitable, adequately dimensioned transport aids.

Observe the notes on the climatic conditions in accordance with chapter "Technical data" in the corresponding product manual.

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2.8 Creating a safe working environment

Before you work on the product, ensure a safe working environment. Observe the following basic safety note:

2.8.1 Performing work on the product safely

Defective or damaged product

Never install defective or damaged products. Observe the following information to avoid injuries or damage:

- Before installation, check the product for external damage and replace a damaged product.

Hot surfaces

The surfaces of the product can become very hot during operation. Observe the following information to avoid burns:

- Let the product and its accessories cool down before touching it.
- Do not touch any surfaces of the product during operation, except for the control elements.
- Also observe the labels and hazard symbols on the product.

Falling load

Observe the following information to avoid death or severe injury due to falling loads:

- Do not stand under the load.
- Secure the area where loads can fall down.
- Use personal protective equipment (such as helmet and safety shoes).
- Use a suitable lifting tool (chain hoist, forklift) and transport protection.

Sharp edges

Observe the following information to avoid cuts caused by sharp or non-deburred cutting edges:

- Wear safety gloves.

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2.8.2 Performing electrical work safely

Observe the following information to perform electrical work safely:

Electrical work may only be performed by an electrically skilled person or an electronically instructed person under the supervision of an electrically skilled person.

The fact that the operation or 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.

Live parts

Always adhere to the 5 safety rules for all work on electrical components:

1. Disconnect.
2. Secure the device against a restart.
3. Check that no voltage is applied.
4. Ground and short-circuit.
5. Cover or isolate neighboring live parts.

Depending on the situation, it is possible to deviate from rules 4 and 5. Observe standard EN 50110-1.

Dangerous voltage

When the system is switched on, dangerous voltages are present at all power connections as well as any cables and terminals that are connected. This also applies even when the voltage supply has been disconnected at the device's switch disconnector or if the product is inhibited. Observe the following information to avoid the risk of electric shock:

- Do not touch any exposed live parts (e.g. male contacts, plug connectors, terminals).
- Secure all open live components with a touch guard.
- Ensure that the connection boxes are closed and screwed down before applying the supply voltage.
- Before applying the supply voltage, make sure that all required covers are mounted.

Danger due to electric arc

An electric arc may occur when plug-in connections are disconnected or connected while voltage is applied (e.g. connection between drive and control). In order to avoid damaging electrical components, observe the following information:

- Do not disconnect power connections during operation.
- Do not connect power connections during operation.
- Ensure that the product is de-energized before disconnecting and connecting the plug-in connections.

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Dangerous voltage

Voltage from charged capacitors can still be present in live product components or power connections after disconnecting from the supply voltage. Observe the following information:

- Observe the following waiting periods before performing electrical work and after disconnecting the supply voltage: **5 minutes**.
- Ensure that the unit is de-energized.
- Also observe the labels and hazard symbols on the product.

2.9 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.

2.10 Protective separation

The product meets all requirements for protective separation of power and electronics connections in accordance with IEC 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 IEC 61800-5-1.

2.11 Electrical installation

The preventive measures and protection devices must comply with the applicable regulations (e.g. EN 60204-1 or EN 61800-5-1).

2.11.1 Stationary application

The necessary preventive measure for the product is:

Type of energy transfer	Preventive measure
Direct power supply	Ground connection

2.11.2 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.

2.12 Startup/operation

Observe the safety notes in chapters "Startup" and "Operation" in the associated product manual.

Depending on the degree of protection, products may have live, uninsulated, and sometimes moving or rotating parts as well as hot surfaces during operation.

Never plug or unplug plug connectors while they are energized.

Do not separate the connection to the product during operation. This may result in dangerous electric arcs damaging the product.

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:

5 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. Removing the cause of this problem or performing a reset can result in the machine or the system re-starting on its own. First, disconnect the product from the supply system before you 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.

2.12.1 Switch disconnector

- The load disconnectors /D11 and /M11 disconnect the inverter MOVIMOT® flexible from the supply system. The terminals of the inverter are still connected to the line voltage after the switch disconnector /D11 or /M11 is switched off.
- The load disconnector /R01 disconnects the motor from the inverter MOVIMOT® flexible. The inverter remains supplied with the line voltage even when the load disconnector /R01 is switched off. Do not perform any electrical work on the motor or inverter even when the load disconnector /R01 is switched off.

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3 Product description

3.1 System overview of MOVI-C® for decentralized installation

Consistent – connected – complete

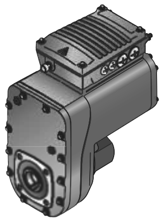
The basis of the new product portfolio is the MOVI-C® decentralized drive electronics. It is the same for all products from the new decentralized portfolio and can be installed either integrated in the motor or close to the motor.

MOVI-C® decentralized drive electronics is suitable for all applications with speed control, with and without encoders, through to positioning applications.

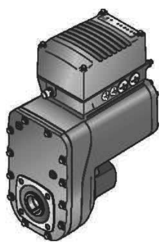
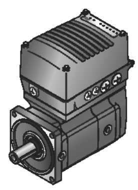
3.1.1 Highlights of the decentralized product portfolio

End-to-end solution	MOVI-C® allows users to switch between control cabinet installation and decentralized installation. The consistency of the functions and features is not dependent on the product family or type of installation.
Modularity	Identical drive electronics for all product families, whether integrated in the product or installed close to the motor, is the ideal supplement to the control cabinet inverters of the MOVI-C® modular automation system.
Flexibility	The decentralized product range provides flexible support for connections to various higher-level systems.
Single-axis automation	• DBC – Direct Binary Communication • DAC – Direct AS-Interface Communication • DFC – Direct Fieldbus Communication (PROFINET, EtherNet/IP™, Modbus TCP)
Motion slave	• DSI – Direct System Bus Installation (EtherCAT®) • DFC – Direct Fieldbus Communication (POWERLINK CiA402)
Motion/automation control	• DSI – Direct System Bus Installation (SBus^{PLUS})
Simple installation	On the supply side, installation is made easier using terminals or plug connectors along with digital motor integration when installed close to the motor (single-cable technology).
Decentralized electronics performance class	2.0 A, 2.5 A, 3.2 A, 4.0 A, 5.5 A, 7.0 A, 9.5 A, 12.5 A, 16.0 A

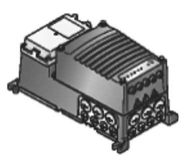
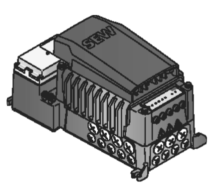
Drive unit without decentralized inverter

MOVIGEAR® classic
MGF..-DSM-C

8 – 400 Nm continuous output torque motor
475 Nm maximum short-time torque motor
Can be combined with all MOVI-C® inverters (e.g. MOVIMOT® flexible)

Drive units with decentralized inverters

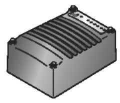
MOVIGEAR® performance	**MOVIMOT® advanced DRN..**	**MOVIMOT® advanced DR2C..**	**MOVIMOT® performance**
Mechatronic drive unit (IE5)	Asynchronous motor (IE3)	Synchronous motor (up to IE5)	Synchronous motor (IE5)
			
0.8 – 2.2 kW nominal motor power or 4 – 10 Nm rated motor torque	0.37 – 7.5 kW nominal power	0.69 – 2.43 kW nominal power	0.75 – 4.19 kW nominal power or 3.6 – 20 Nm rated torque

Decentralized inverter for mounting close to the motor

MOVIMOT® flexible		
MMF1.	MMF31	MMF32
		
2 – 16.0 A nominal output current,		
up to 300% overload capacity		
Can be combined with all motors from SEW-EURODRIVE.		

3.1.2 Technical data

MOVI-C® decentralized inverter



MOVI-C® decentralized inverter (electronics cover)	
Description	Decentralized inverter for mounting to: • MOVIGEAR® performance • MOVIMOT® advanced • MOVIMOT® performance • MOVIMOT® flexible
Nominal output current	 • Size 1 without cooling fins: 2.0 A, 2.5 A, 3.2 A  • Size 1 with cooling fins: 4.0 A, 5.5 A  • Size 2 without fan: 7.0 A, 7.5 A  • Size 2 with fan: 12.5 A, 16.0 A
Overload capacity	Up to 300%
Communication variants	• DBC – Direct Binary Communication • DAC – Direct AS-Interface Communication • DFC – Direct Fieldbus Communication (PROFINET IO, EtherNet/IP™, Modbus TCP, POWER-LINK CiA402) • DSI – Direct System Bus Control (EtherCAT®, SBus^{PLUS})
Options	• Integrated brake control (AC 100 – 525 V) • Integrated safe communication CSB51A/CSL51A/CSS51A (STO, SS1c, ...) • MOVIKIT® Drive software modules

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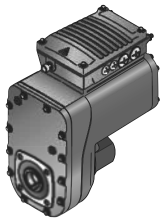
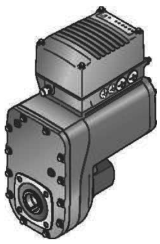
MOVIGEAR® classic



MOVIGEAR® classic (≙ IE5)	
Description	Drive unit consisting of gear unit and synchronous motor (can be combined with electronics close to the motor or control cabinet technology from the MOVI-C® modular automation system).
Output speed range At n_e = 2000 min^{-1}	• MGF..1-DSM-C: 35.7 – 555 min^{-1} • MGF..2-DSM-C: 36.2 – 593 min^{-1} • MGF..4-DSM-C, MGF..4-DSM-C/XT: 35.4 – 566 min^{-1}
Recommended inverter combinations	In connection with MOVIDRIVE® modular, MOVIDRIVE® system, and MOVIDRIVE® technology or the decentralized inverter MOVIMOT® flexible. • MGF..1-DSM-C with inverter nominal output current 2.0 A • MGF..2-DSM-C with nominal inverter output current 2.0 A • MGF..4-DSM-C with nominal inverter output current 4.0 A • MGF..4-C-DSM-C/XT with nominal inverter output current 5.5 A Alternatively, MOVITRAC® LTP-B (380 V – 480 V) can also be used.

MOVIGEAR® performance



MOVIGEAR® performance (≙ IE5)	
Description	Drive unit consisting of synchronous motor, gear unit, and decentralized inverter
Overload capacity	Up to 300%
Power rating	• MGF..2-C: Torque 200 Nm, up to 0.8 kW nominal power • MGF..4-C: Torque 400 Nm, up to 1.5 kW nominal power • MGF..4-C/XT: 400 Nm torque with extended continuous torque, nominal power of up to 2.1 kW
Output speed range	Speed control range 1:40 (without encoder) • MGF..2-C: 0.9 – 593 min^{-1} • MGF..4-C, MGF..4-C/XT: 0.9 – 566 min^{-1} Speed control range 1:2000 (with encoder) • MGF..2-C: 0.02 – 593 min^{-1} • MGF..4-C, MGF..4-C/XT: 0.02 – 566 min^{-1}
Options	• Digital Interface (MOVILINK® DDI) /DI • Multi-turn absolute encoder /AZ1Z • Electrodynamic retarding function DynaStop® /DSP • IV /plug connector • Pressure compensation fitting electronics /PE • Integrated braking resistor /BW1 • For more options, see MOVI-C® decentralized inverter options

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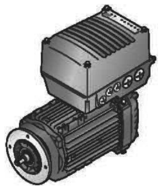
MOVIMOT® advanced with DR2C..A motor



MOVIMOT® advanced with DR2C..A motor (≙ IE5)	
Description	Drive unit consisting of gear unit, synchronous motor and decentralized inverter
Power rating	• 0.69 kW – 2.26 kW • 0.69 kW – 2.43 kW
Overload capacity	Up to 270%[1)]
Drive data (Without gear unit)	Torque range • Speed class 2000 min^{-1}: 3.3 Nm – 10.8 Nm • Speed class 3000 min^{-1}: 3.5 Nm – 7.2 Nm Speed control range (without encoder): 1:40 • Speed class 2000 min^{-1}: 50 min^{-1}– 2000 min^{-1} • Speed class 3000 min^{-1}: 75 min^{-1}– 3000 min^{-1} Speed control range (with encoder): In preparation
Options	• Digital Interface (MOVILINK®-DDI) /DI • IV /plug connector • Motor protection /TF • Load disconnector with feedback contact /D11 • Integrated braking resistor /BW1 • Pressure compensation fitting electronics /PE • Metal fan /AL • Canopy /C • Reinforced winding insulation /RI • Second shaft end on the motor/brakemotor /2W • For more options, see MOVI-C® decentralized inverter options

1) The value refers to the IE5 torque of the drive unit.

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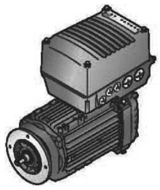
MOVIMOT® advanced with DRN.. motor



MOVIMOT® advanced with DRN.. motor (≙ IE3)	
Description	Drive unit consisting of gear unit, asynchronous motor and decentralized inverter
Power rating	• With star connection: 0.37 kW – 7.5 kW • With delta connection: 0.55 – 7.5 kW
Overload capacity	Up to 210%[1]
Drive data (Without gear unit)	Torque range • With star connection: 2.5 Nm – 49.4 Nm • With delta connection: 1.81 Nm – 24.7 Nm Speed range (with encoder) • With star connection: 1 min^{-1} – 1400 min^{-1} (size 1) • With star connection: 1 min^{-1} – 1450 min^{-1} (size 2) • With delta connection: 1 min^{-1} – 2900 min^{-1} Speed range (without encoder) • With star connection: 140 min^{-1} – 1400 min^{-1} (size 1) • With star connection: 145 min^{-1} – 1450 min^{-1} (size 2) • With delta connection: 145 min^{-1} – 2900 min^{-1}
Options	• Digital Interface (MOVILINK® DDI) /DI • Single-turn encoder /EI8Z • Safe single-turn encoder /EI7C-FS[2] • Multi-turn absolute encoder /AK8Z • IV /plug connector • Motor protection /TF • Load disconnector with feedback contact /D11 • Integrated braking resistor /BW1 or /BW2 • Pressure compensation fitting electronics /PE • Metal fan /AL • Canopy /C • Reinforced winding insulation /RI • Second shaft end on the motor/brakemotor /2W • For more options, see MOVI-C® decentralized inverter options

1) With the exception of DRN132M4 motors with electronics cover D..-0160.. (16 A): max. overload capacity = 200%
2) Only in combination with CSL51 safety option.

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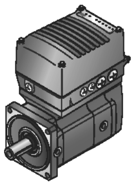
MOVIMOT® performance



MOVIMOT® performance (≙ IE5)	
Description	Drive unit consisting of gear unit, synchronous motor and decentralized inverter
Power	• Size 1: 0.75 – 1.88 kW • Size 2: 3.14 kW – 4.19 kW
Overload capacity	Up to 300%
Drive data (Without gear unit)	Torque range • Size 1: 3.6 Nm – 9 Nm • Size 2: 15 Nm – 20 Nm Speed range (with encoder) • 1 min^{-1} – 2000 min^{-1} Speed range (without encoder) • 50 min^{-1} – 2000 min^{-1}
Options	• Digital Interface (MOVILINK® DDI) /DI • Single-turn encoder /EZ2Z • Multi-turn encoder /AZ2Z • IV /plug connector • Motor protection /PK • Integrated braking resistor /BW1 or /BW2 • Pressure compensation fitting electronics /PE • For more options, see MOVI-C® decentralized inverter options

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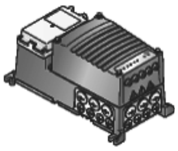
MOVIMOT® flexible



MOVIMOT® flexible (up to IE5)	
Description	Decentralized inverters
Output power of asynchronous motor	• Size 1 without cooling fins: 0.55 – 1.1 kW • Size 1 with cooling fins: 1.5 kW – 2.2 kW • Size 2 without fan: 3.0 kW – 4.0 kW • Size 2 with fan: 5.5 kW – 7.5 kW
Overload capacity	Up to 300%
Options	• Load disconnector with feedback contact /D11 • Load disconnector with feedback contact and overcurrent relay /M11 • Load disconnector /R01 for disconnecting the motor with leading signal contact • MOVILINK® DDI integrated data node /DI • MOVILINK® DDI interface via coaxial cable /CO • DynaStop® electrodynamic retarding function /DSP • Control module BES brake rectifier 24 V /BES • IV /plug connector • Pressure compensation fitting electronics /PE • Integrated braking resistor /BW1, /BW2 • Mounting plate /M31, /M32 • External braking resistor /EWB • Line filter /MO • Additional digital inputs /ODI • For more options, see MOVI-C® decentralized inverter options

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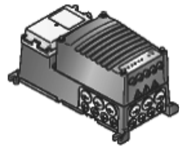
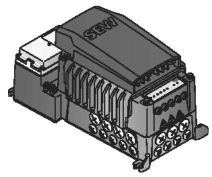
3.2 MOVIMOT® flexible inverters at a glance

The following table provides an overview of the most important technical data of MOVIMOT® flexible inverters:

MOVIMOT® flexible			
"Technical data" (→ 🗎 28)	MMF1. 	MMF31 	MMF32 
Nominal output current	2.0 – 16.0 A		
Nominal line voltage	3 x 380 – 500 V		
Line frequency	50 – 60 Hz		
Overload capacity	Up to 300% of the nominal output current		
Communication designs	• DBC – direct binary communication (binary control) • DAC – direct AS-Interface communication (AS-Interface) • DFC – direct fieldbus communication (PROFINET, EtherNet/IP™, Modbus TCP, POWERLINK) • DSI – direct system bus installation (SBus^PLUS, EtherCAT®, EtherCAT® with CIA402)		

For further information on the device, refer to the addendum to the operating instructions "MOVI-C® Electronics Cover – Information about the EU Ecodesign Regulation 2019/1781".

Accessories	
Prefabricated cables	Chapter "Terminal assignment .." (→ 🗎 215) Chapter "Plug connector in the connection unit" Chapter "Plug connector at the connection box" (→ 🗎 281)
Braking resistors	Chapter "Braking resistors" (→ 🗎 55)
Line filter	Chapter "NF.. line filters" (→ 🗎 144)
Line choke	Chapter "ND.. line choke" (→ 🗎 144), "Line choke" (→ 🗎 74)
Permitted motor encoders	Chapter "Applicable motor encoders from SEW-EURODRIVE" (→ 🗎 126)

3.3 Motor assignment of MOVIMOT® flexible

You can find the motor/inverter assignment on the website sew-eurodrive.de under "Online support" > "Engineering & selection" > "Motor/inverter characteristic curves".

4 Technical data

4.1 General information

4.1.1 Air admission and accessibility

When installing the driven machine, make sure there is enough space in axial and radial direction for a sufficient supply of cooling air and unobstructed heat dissipation.

4.2 General technical data

Interference immunity	EN 61800-3; 2nd Environment (industrial environment)	
Interference emission	EN 61800-3 category C3 (with IT systems, **no** EMC category is specified)	
Ambient temperature ϑ_{amb}	See chapter "Environmental conditions" (→ 🗎 30)	
Operating mode	S1, DB according to EN 60034-1	
Type of cooling	Devices without fan: (Size 1 and size 2 without fan)	Natural cooling
	Devices with fan: (Size 2 with fan)	Cooling by fan
Degree of protection	Devices without fan: (Size 1 and size 2 without fan)	IP65 according to EN 60529 • Enclosed housing • All cable bushings are sealed • With MMF3..: Cover screw plug at the protective housing of the front module is tightened (tightening torque: 1.2 – 1.4 Nm)
	Devices with fan: (Size 2 with fan)	IP54 according to EN 60529 • Enclosed housing • All cable bushings are sealed
Pollution class	2 in accordance with IEC 60664-1	
Overvoltage category	III in accordance with IEC 60664-1	
Permitted number of times power may be switched on/off	1 × per minute	
Minimum switch-off time for power off	10 s	
Startup phase	During the startup phase of the device, signal states may differ from the expected state. The "DRIVE" status LED shows the status of the startup phase, see chapter ""DRIVE" status LED" (→ 🗎 425). For devices that support cyclic data exchange, the end of the startup phase is indicated by the values being reported back to the higher-level controller via the PI data of the inverter.	
Required preventive measure	Grounding of the device	

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Protection functions	• Shutdown caused by overcurrent due to ground fault, short circuit, overload • Shutdown caused by DC link overvoltage • Shutdown caused by overtemperature • Motor monitoring in accordance with UL function
Signaling functions	Display elements on housing to indicate the device state
Current carrying capacity of terminals	See chapter "Current carrying capacity of terminals" (→ 🗎 36). For further information, refer to chapter "Permitted cable cross section of terminals" (→ 🗎 206).
Installation altitude	Up to h ≤ 1000 m: without restrictions The following restrictions apply to altitudes > 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, an overvoltage protection device must be connected upstream to reduce the overvoltages from category **III** to category **II**.
Proof of mechanical strength	• 3M7 according to DIN EN 60721-3-3: 1995 • 5M2 according to DIN EN 60721-3-5: 1997
Mass	MMF1. Without cooling fins: 3.5 kg MMF1. With cooling fins: 4.0 kg MMF31 without cooling fins: 5.0 kg MMF31 with cooling fins: 5.5 kg MMF32 without fan: 9.5 kg MMF32 with fan: 10 kg

4.3 Environmental conditions

4.3.1 Climatic conditions

Extended storage	Weatherproof IEC 60721-3-1; class 1K21, non-condensing, no condensation Deviating from the standard: Temperature -25 °C to +70 °C
Transport	Weatherproof IEC 60721-3-2; class 2K11, non-condensing, no condensation Deviating from the standard: Temperature -25 °C to +70 °C
Operation	Stationary use, weatherproof IEC 60721-3-3; class 3K22, non-condensing, no condensation Deviating from the standard: Temperature -25 °C to +60 °C

4.3.2 Special climatic conditions

Extended storage	Weatherproof IEC 60721-3-1 class 1Z1
Operation	Stationary use, weatherproof IEC 60721-3-3 class 3Z1

4.3.3 Biological conditions

Extended storage	Weatherproof IEC 60721-3-1 class 1B1
Transport	Weatherproof IEC 60721-3-2 class 2B1
Operation	Stationary use, weatherproof IEC 60721-3-3 class 3B1

4.3.4 Chemically active substances

Extended storage	Weatherproof IEC 60721-3-1 class 1C2 Deviating from the standard: no corrosive gases, no salt mist
Transport	Weatherproof IEC 60721-3-2 class 2C2, no sea water Deviating from the standard: no corrosive gases, no salt mist
Operation	Stationary use, weatherproof ISO 9223 class C3 Deviating from the standard: no corrosive gases, no salt mist

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4.3.5 Mechanically active substances

Extended storage	Weatherproof IEC 60721-3-1 class 1S10, no conductive dust
Transport	Weatherproof IEC 60721-3-2 class 2S1, no conductive dust
Operation	Stationary use, weatherproof IEC 60721-3-3 class 3S5, no conductive dust

4.3.6 Mechanical conditions

The specifications are characteristic values for the device test. The specifications are based on the test characteristic values according to IEC 60721-3-3 and correspond to class 3M7 according to EN 60721-3-3:1995.

Vibration (sinusoidal)	2 – 200 Hz: 3 g
Vibration (noise)	10 – 200 Hz: 1 m^2/s^3 200 – 500 Hz: 0.3 m^2/s^3 Corresponds to approx. 1.7 g_{rms} (g_{rms} = r.m.s. acceleration value)
Shocks (half sine)	25 g at 6 ms shock duration

4.4 Technical data of MOVIMOT® flexible

4.4.1 Size 1

Input

Electronics cover (inverter)		**..0020..**	**..0025..**	**..0032..**	**..0040..**	**..0055..**
Nominal output current		**2.0 A**	**2.5 A**	**3.2 A**	**4.0 A**	**5.5 A**
Nominal supply voltage (to EN 50160)	V_{line}	3 × AC 380 V – 500 V				
Nominal line current	I_{line}	1.8 A	2.3 A	2.9 A	3.6 A	5.0 A
	I_{max}	6.0 A	7.5 A	9.6 A	12.0 A	12.0 A
Line frequency	f_{line}	50 to 60 Hz ±5%				
Unaffected short-circuit current according to EN 61800-5-1		65 kA 5 kA (devices with maintenance switch)				
Maximum rated current		40 A				

Output

Electronics cover (inverter)		**..0020..**	**..0025..**	**..0032..**	**..0040..**	**..0055..**
Nominal output current		**2.0 A**	**2.5 A**	**3.2 A**	**4.0 A**	**5.5 A**
Recommended motor power ASM	P_{Mot}	0.55 kW	0.75 kW	1.1 kW	1.5 kW	2.2 kW
Output voltage	V_A	0 – U_{line}				
Nominal output current f_{PWM} = 4 kHz	I_N	2.0 A	2.5 A	3.2 A	4.0 A	5.5 A
Apparent output power	S_N	1.4 kVA	1.7 kVA	2.2 kVA	2.8 kVA	3.8 kVA
Power section nominal power loss	P_V	For further information on the power loss, refer to the addendum to the operating instructions "MOVI-C® Electronics Cover – Information about the EU Ecodesign Regulation 2019/1781".				
Overload capacity of I_N at f_{PWM} = 4 kHz	V_{line} = 400 V	300%				f_{off} < 3 Hz: 220% f_{off} ≥ 3 Hz: 300%
	V_{line} = 500 V	f_{off} < 3 Hz: 270% f_{off} ≥ 3 Hz: 300%				f_{off} < 3 Hz: 200% f_{off} ≥ 3 Hz: 280%
PWM frequency	f_{PWM}	4/8/16 kHz (adjustable)				
Max. output frequency	f_{max}	V/f: 599 Hz VFC^{PLUS}: 250 Hz CFC: 500 Hz ELSM®: 500 Hz				
Max. permitted cable length		15 m				

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Brake chopper

Electronics cover (inverter)		..0020..	..0025..	..0032..	..0040..	..0055..
Nominal output current		**2.0 A**	**2.5 A**	**3.2 A**	**4.0 A**	**5.5 A**
Minimum braking resistance	R_{BWmin}	100 Ω				
Brake chopper Continuous power		550 W	750 W	900 W	900 W	900 W
Brake chopper Peak power		3.8 kVA	4.6 kVA	5.9 kVA	7.6 kVA	7.7 kVA

4.4.2 Size 2

Input

Electronics cover (inverter)		**..0070..**	**..0095..**	**..0125..**	**..0160..**
Nominal output current		**7.0 A**	**9.5 A**	**12.5 A**	**16.0 A**
Nominal supply voltage (to EN 50160)	V_{line}	3 × AC 380 V – 500 V			
Nominal line current	I_{line}	6.3 A	8.55 A	11.3 A	14.4 A
	I_{max}	21.0 A	28.5 A	31.25 A	32.0 A
Line frequency	f_{line}	50 to 60 Hz ±5%			
Unaffected short-circuit current according to EN 61800-5-1		65 kA 5 kA (devices with maintenance switch)			
Maximum rated current		40 A			

Output

Electronics cover (inverter)		**..0070..**	**..0095..**	**..0125..**	**..0160..**
Nominal output current		**7.0 A**	**9.5 A**	**12.5 A**	**16.0 A**
Recommended motor power ASM	P_{Mot}	3.0 kW	4.0 kW	5.5 kW	7.5 kW
Output voltage	V_A	$0 – U_{line}$			
Nominal output current f_{PWM} = 4 kHz	I_N	7.0 A	9.5 A	12.5 A	16.0 A
Apparent output power	S_N	4.9 kVA	6.6 kVA	8.7 kVA	11.1 kVA
Power section nominal power loss	P_V	For further information on the power loss, refer to the addendum to the operating instructions "MOVI-C® Electronics Cover – Information about the EU Ecodesign Regulation 2019/1781".			
Overload capacity of I_N at f_{PWM} = 4 kHz, V_{line} = 400 V	V_{line} = 400 V	f_{off} < 3 Hz: 235% $f_{off} \geq$ 3 Hz: 300%		f_{off} < 3 Hz: 195% $f_{off} \geq$ 3 Hz: 250%	f_{off} < 3 Hz: 155% $f_{off} \geq$ 3 Hz: 200%
	V_{line} = 500 V	f_{off} < 3 Hz: 215% $f_{off} \geq$ 3 Hz: 300%		f_{off} < 3 Hz: 175% $f_{off} \geq$ 3 Hz: 250%	f_{off} < 3 Hz: 140% $f_{off} \geq$ 3 Hz: 200%
PWM frequency	f_{PWM}	4/8/16 kHz (adjustable)			
Max. output frequency	f_{max}	V/f: 599 Hz VFC^{PLUS}: 250 Hz		CFC: 500 Hz ELSM®: 500 Hz	
Max. permitted cable length		15 m			

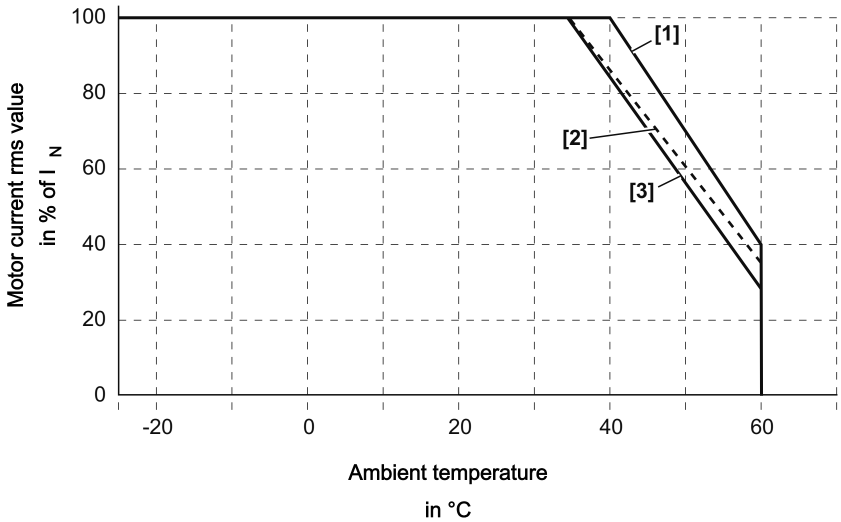
Brake chopper

Electronics cover (inverter)		..0070..	..0095..	..0125..	..0160..
Nominal output current		**7.0 A**	**9.5 A**	**12.5 A**	**16.0 A**
Minimum braking resistance	R_{BWmin}	47 Ω		33 Ω	
Brake chopper Continuous power		4.9 kW	6.6 kW	8.7 kW	11.1 kW
Brake chopper Peak power		13.2 kVA	17.8 kVA	19.6 kVA	20.0 kVA

4.4.3 Derating factors

Derating depending on the ambient temperature

The following figure shows the $I_{N\ motor}$ reduction depending on the ambient temperature:



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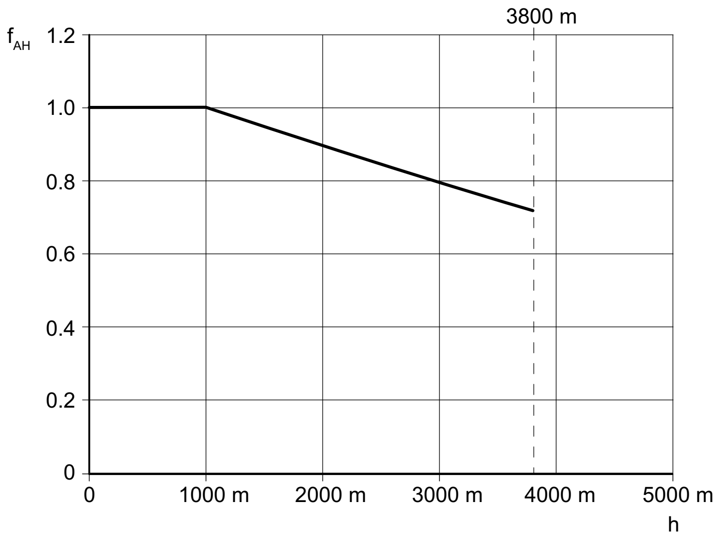
[1] 3% I_N per K at 40 °C to 60 °C
[2] 2.5% I_N per K at 35 °C to 60 °C
Only for MOVIMOT® flexible with an electronics cover 5.5 A and option /B (brake control)
[3] 3% I_N per K at 35 °C to 60 °C
Only for MOVIMOT® flexible with electronics cover 9.5 A and nominal line voltage V_{line} > 3 × AC 400 V

Derating depending on the installation altitude

The following diagram shows the factor f_{AH} (according to IEC 60034-1:2017, Table 12) by which the thermal motor torque has to be reduced depending on the installation altitude H.



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Also observe chapter "Derating depending on the ambient temperature" (→ 🗎 35).

Notes

INFORMATION

Derating is based on typical operating conditions with a supply voltage of 24 V (sensor supply, input voltage of STO input).

4.4.4 Current carrying capacity of terminals

Current carrying capacity of terminals		
Line terminals	X1	24 A (max. loop-through current)
Control terminals	X9	10 A (max. loop-through current)

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4.5 Electronics data

4.5.1 DC 24 V supply

Input for the independent backup voltage supply of the electronics		
DC 24 V input	24V_IN	V_{IN} = DC 24 V -10%/+20% according to EN 61131-2
	0V24_IN	

Configuration

Check whether the available current from the electronics cover power supply unit is sufficient for the total current demand of all consumers:

1. Determine the available current from the electronics cover according to the following table:

Electronics cover	Available current without external 24 V supply	Maximum current with external 24 V supply
Size 1 Size 2 without fan	820 mA	1250 mA
Size 2 with fan	1180 mA	1600 mA

2. Sum up the current demand of all consumers according to the following table:

Consumer			Current requirement
	Electronics cover (Basic requirement)	Size 1 Size 2 without fan	210 mA
		Size 2 with fan	570 mA
1st	MOVILINK® DDI encoder (..Z)		120 mA
2nd	Keypad (CBG..)		50 mA
3rd	Safety technology	STO connected	0 mA
		Internal STO jumpered	20 mA
4th	DC 24 V output		Max. 100 mA

3. Compare the total current demand of all consumers to the available current without external 24 V supply (i.e. 24 V through internal power supply unit):

If the total current demand of all consumers is greater than the available current from the electronics cover power supply unit, you must supply the drive unit with 24 V externally.

In this case, the specified maximum currents must not be exceeded.

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Example

The drive unit has the following consumer:

- Basic requirement of electronics cover size 1 (-210 mA).
- MOVILINK® DDI encoder (-120 mA)
- Keypad (-50 mA),
- The STO is internally jumpered in the inverter (-20 mA).

Without an external 24 V supply, 420 mA are still available for the DC 24 V output after deducting the basic requirement and the electricity requirement of the consumer.

820 mA - 210 mA - 120 mA - 50 mA - 20 mA = **420 mA**

However, the electricity requirement of the DC 24 V output is no greater than 100 mA.

Therefore, an external 24 V supply is not required.

4.5.2 DC 24 V output

Internal voltage supply for the sensors		
DC 24 V output	24V_OUT	V_{OUT} = DC 24 V -10%/+20% according to EN 61131-2
X9	0V24_OUT	External-voltage proof and short-circuit proof Permitted output current: I_{OUT} ≤ 100 mA

4.5.3 Digital inputs

Digital inputs	
Number of inputs	4
Input type	PLC-compatible according to EN 61131-2 (digital inputs type 3) DI01 – DI04: R_i ≈ 4.5 kΩ, sampling cycle ≤ 2 ms DI03/DI04: HTL encoder connection for counter function, maximum 120 kHz DI03: Master frequency input, maximum 120 kHz Signal level DC +11 to +30 V = "1" = contact closed DC -3 to +5 V = "0" = contact open
Sensor/actuator supply	DC 24 V according to EN 61131-2, External-voltage proof and short-circuit proof
Maximum cable length	30 m
Permitted total current for internal supply	100 mA (total of all connected sensors/actuators, maximum individual load: 100 mA)
Permitted total current for external supply	100 mA (total of all connected sensors/actuators, maximum individual load: 100 mA)

4.5.4 Relay output

Relay output	
Response time	≤ 15 ms
Contact details	DC 24 V/50 mA (DC 12 according to IEC 60947-5-1) (Only SELV or PELV circuits)

4.6 Interfaces

4.6.1 AS-Interface

Description

The AS-Interface interface allows for the device to be integrated into AS-Interface installations. The interface supports various station profiles for cyclic and acyclic data exchange with the AS-Interface master.

Technical data

AS-Interface	
External electronics supply	AS-Interface: 29.5 – 31.6 V (AS-Interface power supply unit according to EN 50295) I_E AS-Interface: ≤ 50 mA (typical 30 mA at 30 V)
Control input	Pin AS+: Connection of AS-interface data lines Pin AS- : Connection of AS-interface data lines

Participant profiles

Station profiles AS-Interface							
Station type	**Number of data bits**	**Station profile**	**Profile configuration**				**Address range**
			I/O configu-ration	**ID code**	**Ext. ID2 code**	**Ext. ID1 code**	
Binary stations	4 DI/4 DO	S-7.F	7_{hex}	F_{hex}	E_{hex}	F_{hex}[1)]	1 – 31
A/B station	4 DI/4 DO	S-7.A.7	7_{hex}	A_{hex}	7_{hex}	7_{hex}	1A – 31A, and 1B – 31B
	8 DI/8 DO	S-7.A.A	7_{hex}	A_{hex}	A_{hex}	7_{hex}	1A – 31A, and 1B – 31B
Double stations	4 DI/4 DO	A: S-7.A.7	7_{hex}	A_{hex}	7_{hex}	7_{hex}	1A – 31A[2)]
		B: S-7.A.5	7_{hex}	A_{hex}	5_{hex}	7_{hex}	1B – 31B[2)]
	8 DI/8 DO	A: S-7.A.A	7_{hex}	A_{hex}	A_{hex}	7_{hex}	1A – 31A[2)]
		B: S-7.A.5	7_{hex}	A_{hex}	5_{hex}	7_{hex}	1B – 31B[2)]

1) The extended ID1 code can be changed for the binary station.
2) The A station and the B station in one drive have the same numeric station address.

4.7 Technical data – functional safety

4.7.1 STO safety sub-function

The following table shows the technical data of the STO safety sub-function.

The safe digital inputs F_STO_P1 and F_STO_P2 correspond to type 3 according to IEC 61131-2.

Reference potential for the F_STO_P1 and F_STO_P2 is F_STO_M (contact at terminal X9:11).

		Terminal	Technical data		
STO safety contact		X9			
Electrical data of the safe digital inputs F_STO_P1, F_STO_P2			**Minimum**	**Typical**	**Maximum**
Input voltage range		X9:1 and X9:3	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 state (STO)			DC 11 V	–	–
Input voltage for OFF state (STO)			–	–	DC 5 V
Permitted leakage current of the external safety controller			–	–	1 mA
Maximum cable length			100 m		

1) Each drive unit always requires a power consumption of 300 mW.

4.7.2 Characteristic safety values STO

	Characteristic values	
	IEC 61800-5-2	ISO 13849-1
Tested safety class/standard basis	Safety integrity level 3	Performance level e/category 3
Probability of dangerous failure per hour (PFH_D value)	2.5×10^{-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 sub-function	STO, SS1[1)] according to IEC 61800-5-2	

1) With suitable external control

INFORMATION

In the case of single-pole wiring, the achievable performance level according to ISO 13849-1 is reduced to PL d, and the achievable Safety Integrity Level according to 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.

4.8 TSM memory module

The TSM memory module is the only memory of the decentralized inverter. Therefore, all data and settings are saved on this memory module. The data and settings that were loaded onto the device at the time of delivery (delivery state or optional customer-specific parameterization /P "Parameters ex works") are also saved on the memory module.

The settings stored on the memory module are not indicated on the outside.

If you need to replace a device, the system can be started up again in next to no time without additional tools by simply removing the TSM memory module from the old device and plugging it into the replacement.

Make sure that you hear two clear clicks when inserting the TSM memory module. The TSM memory module is plugged in correctly and locked only if you hear two clear clicks.

TSM memory module		
Housing color	Black	Gray
Part number	28242882	28285271
Description	Memory module • With startup data for the following motor types:	Memory module • Without safety key data set and safety key ID • Only for devices without MOVISAFE® CS.. safety option • with startup data for the following motor types:
Motor types	• DRN.. • DR2C.. • DR2S.. • MOVIGEAR® classic • CMP.. • CM3C	• DRN.. • DR2C.. • DR2S.. • MOVIGEAR® classic • CMP.. • CM3C
	For more information, see chapter "Startup" > "Detailed motor selection tables for startup via DIP switch S3" (→ 🗎 361).	

In case of devices with functional safety, the memory module also serves as a safety key. Only use the black memory module for devices with functional safety.

If you order a device with the option /P "Parameters ex works", SEW EURODRIVE saves the ordered data set to the delivered TSM memory module. However, you cannot recognize the "Parameters ex works" option on the outside of the TSM memory module. Observe this note especially when replacing the device.

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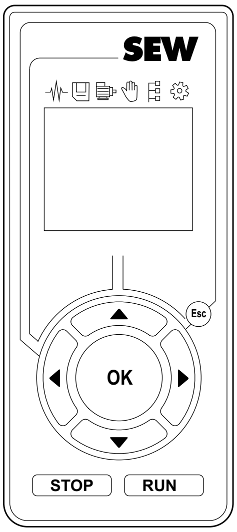
4.9 CBG.. keypads and accessories

4.9.1 CBG11A keypad

Description

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®.



CBG11A properties:

- 1.5" monochrome display (38 mm)
- Startup of asynchronous motors:
  - with or without brake
  - with or without motor temperature evaluation
  - without encoder
- Diagnostics
- Saving and copying a parameter set
- Firmware update of the inverter via USB connection
- Connection to MOVISUITE® engineering software via keypad
- Selection of brakes, temperature sensors
- Determination of load moment of inertia
- Access to all parameters
- Language: EN
- Door-mounting frame available

A CBM22A/K-2.0 wall fixing is available for the keypad.

Technical data

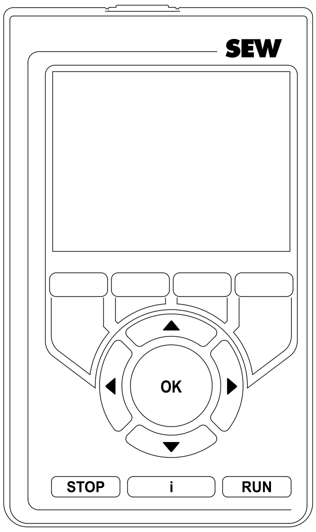
CBG11A keypad	
Part number	28233646
Operating temperature	0 to 60 °C
Degree of protection	IP40 according to EN 60529
Power consumption	0.6 W
Dimensions in mm (W × H × D)	45 × 100 × 20
Display dimensions in mm (W × H)	28.5 × 23
Diagonal screen measurement	38 mm (1.5")
Screen resolution in pixels (W × H)	78 × 64
Screen type	Monochrome display
Engineering interface	USB 2.0 mini B, female
Connection interface	D-sub 9-pin, female
Mechanical strength	3M5 according to DIN EN 60721-3-3: 1995 5M1 according to DIN EN 60721-3-5: 1997

4.9.2 CBG21A keypad

Description

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®.



CBG21A properties:

- 2.4" color display (61 mm)
- Startup of asynchronous and synchronous motors:
  – with or without brake
  – with or without motor temperature evaluation
  – with or without encoder
- Diagnostics
- Saving and copying several parameter sets
- Firmware update of the inverter via USB connection
- Connection to MOVISUITE® engineering software via keypad
- Selection of brakes, temperature sensors, encoders
- Determination of load moment of inertia
- Optimization of the drive train in terms of clearance and stiffness
- Access to all parameters
- Languages: DE/EN/FR/IT/ES/KO/PT/HU/ZH/RU
- Door-mounting frame available

A CBM22A/K-2.0 wall fixing is available for the keypad.

Technical data

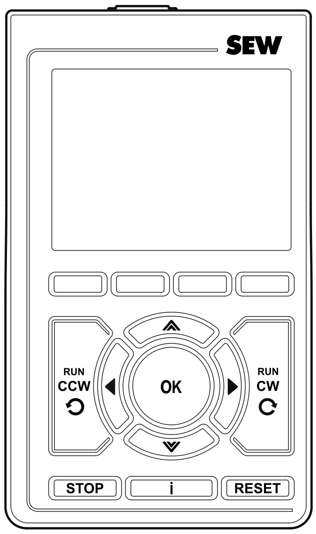
CBG21A keypad	
Part number	28238133
Operating temperature	0 to 60 °C
Degree of protection	IP40 in accordance with EN 60529
Power consumption	1.4 W
Dimensions in mm (W × H × D)	65 × 110 × 20
Display dimensions in mm (W × H)	49 × 37
Diagonal screen measurement	61 mm (2.4")
Screen resolution in pixels (W × H)	320 × 240
Screen type	Color display
Engineering interface	USB 2.0 mini B, female
Connection interface	D-sub 9-pin, female
Mechanical strength	3M5 according to DIN EN 60721-3-3: 1995 5M1 according to DIN EN 60721-3-5: 1997

4.9.3 CBG22A local keypad

Description

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

The local 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®.



CBG22A properties:

- 2.4" color display (61 mm)
- Display of customer-specific information texts of the higher-level controller, diagnostics and manual mode by the operator
- Simple and intuitive manual mode for maintaining operation in the event of a malfunction in the facility
- Comprehensive diagnostics methods
- 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
- Connection to MOVISUITE® engineering software via keypad
- Door-mounting frame available
- Languages: DE/EN/FR/ES/PT/ZH/RU

A CBM22A/K-2.0 wall fixing is available for the keypad.

Technical data

CBG22A local keypad	
Part number	28277554
Operating temperature	0 to 60 °C
Degree of protection	IP40 in accordance with EN 60529
Power consumption	1.4 W
Dimensions in mm (W × H × D)	65 × 110 × 20
Display dimensions in mm (W × H)	49 × 37
Diagonal screen measurement	61 mm (2.4")
Screen resolution in pixels (W × H)	320 × 240
Screen type	Color display
Engineering interface	USB 2.0 mini B, female
Connection interface	D-sub 9-pin, female

CBG22A local keypad	
Mechanical strength	3M5 according to DIN EN 60721-3-3: 1995 5M1 according to DIN EN 60721-3-5: 1997

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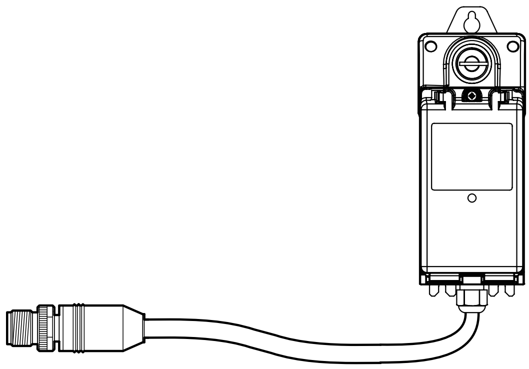
4.9.4 Wall mounting CBM22A/K-20

Description

The CBM22A/K-2.0 wall mounting is used to mount the CBG11A, CBG21A or CBG22A keypads.

For connection to the X4142 engineering interface of the device, the CBM22A/K-2.0 wall mounting has a connection cable with an M12 plug connector (see the following figure).



45737162251

Technical data

Wall mounting CBM22A/K-20	
Part number	28282892
Scope of delivery	• CBM22A/K-2.0 • Connection cable 2 m, type: LEONI L TRAILING CABLE 4X1X0.15
Bending radius of connection cable	Minimum 20 mm (4 × cable diameter)
Connection	M12 plug connector, 5-pin, male, B-coded
Protection class	IP65 with tightening torque of cover screw 1.2 – 1.4 Nm
Dimensions in mm (H × W × D)	• Closed: 230 × 81 × 71 • Open: 350 × 81 × 71 • With inserted key: 230 × 81 × 85
Installation distance, front flap	min. 200 mm
Mechanical strength	3M5 according to DIN EN 60721-3-3: 1995 5M1 according to DIN EN 60721-3-5: 1997

4.10 USM21A interface adapter

Technical data	
Part number	28231449
Ambient temperature	0 to 40 °C
Storage temperature	-25 – 70 °C
Degree of protection	IP20
Dimensions in mm (W × H × D)	42 × 89 × 25

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

The USM21A interface adapter is used to connect the PC and the engineering interface of the device.

The data is transferred according to the USB 2.0 standard. It is also possible to work with a USB 3.0 interface.

You need the following components for the connection:

Component	Part number
USM21A interface adapter The following connection cables are included in the delivery: • USB 2.0 connection cable – USB type A/USB type B – Length: 1.5 m • RJ10/RJ10 connection cable For connection to the X31 engineering interface – With 2 RJ10 plug connectors – Length: 3 m	28231449
Connection cable RJ10/M12 (USK15A) For connection to the X4141 engineering interface or to the M12 optional engineering interface at the front module of MMF3...: • With RJ10 plug connector • With M12 SPEEDCON plug connector, 5-pin, male, B-coded • Length: 3 m	28139038
M12/M12 Extension cable For extending the RJ10/M12 (USK15A) connection cable to the X4142 engineering interface • With M12 SPEEDCON plug connector, 5-pin, female, B-coded • With M12 SPEEDCON plug connector, 5-pin, male, B-coded • Length: 13 m	28168860

Component	Part number
RJ10/SUB-D9 connection cable For connection to the SUB-D9 optional engineering interface at the front module of MOVIMOT® flexible MMF3...2.. or MMF3...3..: • With RJ10 plug connector • With Sub-D9 plug connector, female • Length: 1.5 m	18123864
Retrofit set M12 engineering interface X4142 M12 SPEEDCON, 5-pin, B-coded, female	28273273

4.11 Brake control

4.11.1 Functional description

With MOVIMOT® flexible, brake control is only possible via the following options:

Brake type (nominal voltage)	Required option
DC 24 V brakes	/BES option The 24 V brake control is installed in the connection box.
AC brakes 100 – 525 V	Option /B The HV brake control is installed in the electronics cover.

Control via other brake rectifiers or brake controls is not possible.

If both brake controls are integrated in the device, only the /BES option is active. HV brake control /B has no function in this case.

4.11.2 HV brake control /B

Description

The optional HV brake control /B in the electronics cover is supplied from the DC link of the device. The HV brake control /B controls brakes with nominal voltages of AC 100 – 525 V via PWM pulsed voltage supply.

You can operate the brake control in the following control types:

- **Standard**
- Voltage-controlled

The selection of the control type depends on the supported brake types and additional functions. See chapter "Technical data" (→ 🗎 52).

Technical data

HV brake control /B	
Voltage supply	From the DC link of the device
Disconnection time t_{off}	10 – 20 ms

Brake	Inverter	
	Size 1	Size 2
Nominal voltage	AC 100 – 525 V[1](230 V recommended)	
Control voltage	DC 45 – 250 V	
Holding current I_G	max. DC 0.6 A	max. DC 1.1 A
Accelerator current	max. DC 2.0 A	max. DC 5.0 A

1) Some brake types with low nominal voltage may be incompatible with the max. holding current of the brake control.

Functions

<table>
<tr><th colspan="2" rowspan="2">HV brake control /B functions</th><th colspan="2">Control type</th></tr>
<tr><th>Standard</th><th>Voltage control</th></tr>
<tr><td>Functional safety</td><td>Availability with safety brakes</td><td colspan="2">Not available</td></tr>
<tr><td>Explosion protection</td><td>Availability for applications in an explosion-protected area</td><td>Not available</td><td>For information on installation and startup, refer to the operating instructions of the motor.
INFORMATION
Install MOVIMOT® flexible only outside of the explosion-protected area.</td></tr>
<tr><td rowspan="4">Brake control</td><td>Supported brake types</td><td>SEW brakes
• BE..
• BZ..</td><td>Brakes from SEW-EURODRIVE and third-party brakes in compatible voltage and current ranges</td></tr>
<tr><td>Control functions</td><td>• Energy-optimized operation
• Rapid release and brake application</td><td>• Rapid release and brake application</td></tr>
<tr><td rowspan="2">Monitoring functions of the brake control and the brake</td><td>• Brake monitoring:
Monitoring: Temperature, short circuit, interruption</td><td>• Brake monitoring:
Monitoring: Short circuit</td></tr>
<tr><td colspan="2">• Monitoring of the output stage (hardware and temperature faults)
• Monitoring of startup (initialization)
• Monitoring for calculation and memory errors</td></tr>
</table>

HV brake control /B functions		Control type	
		Standard	**Voltage control**
Brake chopper function	General description	The brake control uses the brake coil to dissipate the regenerative energy from the DC link of the inverter. With this brake chopper function and the optional braking resistor, 2 independent paths for dissipating regenerative energy are available. **INFORMATION**: This function is deactivated if the CSL51A (/SLA) or CSS51A (/SSA) option is integrated.	Not available
	Optimum energy consumption	The brake chopper function achieves optimum energy consumption for brake coils with a **nominal voltage of AC 230 V**.	
Brake condition monitoring	Condition recording functions	• Air gap measurement • Brake lining reserve • Brake coil temperature • Relative thermal brake coil utilization	Not available
	Air gap measurement Brake lining reserve (Ratio, % specification, parameter 8437.11)	100% brake lining reserve: Minimum air gap (no wear) Counting increments and air gap range depend on the brake type and size	
		0% brake lining reserve: Maximum air gap (maximum wear)	
	Brake coil temperature Temperature in °C, parameter 8437.5)	Measurement increment: 1 K	
	Thermal brake coil utilization Ratio, % specification, parameter 8437.12	0%: T ≤ 0 °C or no measured value available	
		100%: T ≥ maximum brake coil temperature	

4.11.3 Brake rectifier /BES

Description

The optional brake rectifier /BES controls brakes with a nominal voltage of DC 24 V. Supply the brake rectifier externally with DC 24 V via an optional plug connector, see chapter "Technical data" (→ 🗎 52).

INFORMATION

To protect the brake linings of the motor, a fault message appears if there is no external 24 V backup voltage.
If necessary, you can deactivate this fault message in the MOVISUITE® engineering software.

Path: *Functions* > *Monitoring functions* > *Overview of fault response* > *Brake control*

Parameter: "Response to brake supply voltage fault" (8622.26)

Default value: "Output stage inhibit"

Technical data

Brake rectifier /BES		
Function		Brake control for rapid switching (release and application) of the mechanical brake.
Supply voltage		DC 24 V +10% / -15% Connection to the supply voltage is only made via the following optional plug connectors: • X1216 • X1523
Switch-off time	t_{off}	10 – 20 ms
Holding current of the brake	I_G	max. DC 3.0 A
Accelerator current of the brake		max. DC 7.5 A

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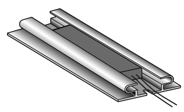
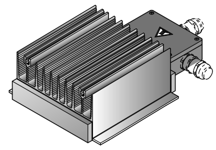
4.12 Braking resistors BW.../BW...-T

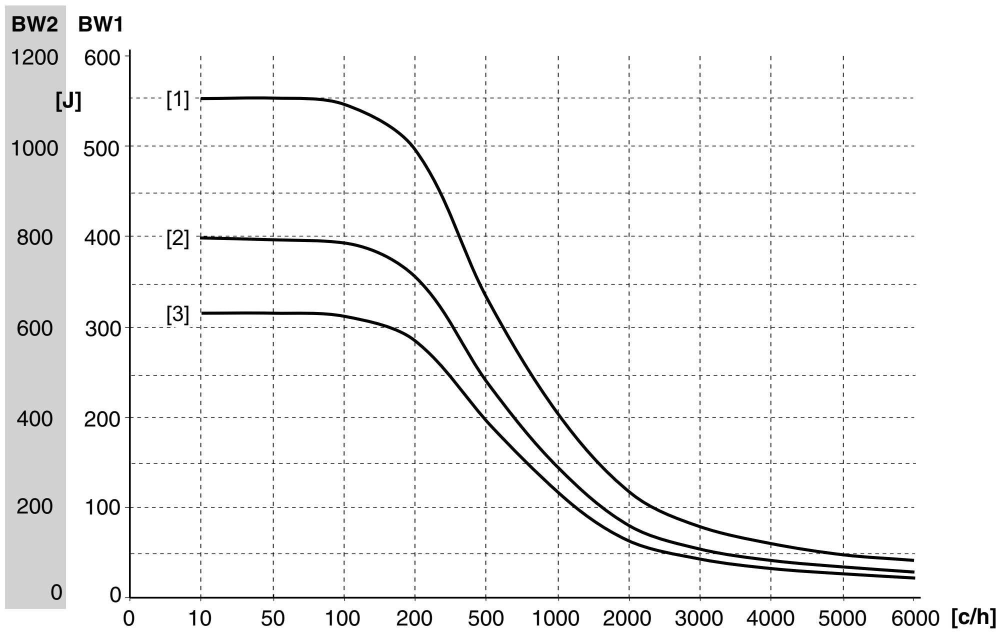
4.12.1 Overview

MOVIMOT® flexible is equipped with a brake chopper. The following table shows their possible use in regenerative mode:

Application	Inverter	Dissipation of regenerative energy
		Brake chopper
Small amount of regenerative energy	MOVIMOT® flexible	Integrated braking resistor 
Medium/large amount of regenerative energy	MOVIMOT® flexible	External braking resistor 

4.12.2 Integrated BW1/BW2 braking resistor

The following diagram shows the current-carrying capacity of the BW1/BW2 braking resistor per braking operation:



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[1] Deceleration ramp 10 s
[2] Deceleration ramp 4 s
[3] Deceleration ramp 0.2 s
c/h Cycles/hour

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Calculation example

The known values are:

- Average braking power: 144 W
- Deceleration ramp: 2 s
- 200 brake applications per hour

Calculating the energy from the power of the deceleration ramp:

$$W = P \times t$$
$$W = 144\ W \times 2\ s$$
$$W = 288\ J$$

9007224551650827

For the deceleration ramp of 2 s, you can use deceleration ramp [3] (0.2 s) in the diagram. Use the characteristic curve with the shorter deceleration ramp because a shorter deceleration ramp means more braking energy.

The diagram permits 290 J of braking energy for the 0.2 s deceleration ramp and 200 cycles per hour. In this case, the required 288 J can be dissipated via BW1.

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4.12.3 External braking resistor

Description

Operation with external braking resistor is necessary for applications with a large amount of regenerative energy.

Assignment

The following table shows the assignment of the external braking resistors to the electronics covers.

Braking resistor		Electronics cover[1]								
Type	Part number	Size 1 without cooling fins			Size 1 with cooling fins		Size 2 without fan		Size 2 with fan	
		0020	0025	0032	0040	0055	0070	0095	0125	0160
BW150-003/K-1.5	08282927	x	x	x	x	x	x	x	x	x
BW100-005/K-1.5	08282862	x	x	x	x	x	x	x	x	x
BW150-006-T	17969565	x	x	x	x	x	x	x	x	x
BW100-009-T	17969573	x	x	x	x	x	x	x	x	x
BW068-006-T	17970008						x	x	x	x
BW068-012-T	17970016						x	x	x	x
BW050-008-001	17962242						x	x	x	x
BW033-012-01	17962196								x	x

1) "x": You can use the braking resistor together with this electronics cover.

4Q operation with external braking resistor is necessary for applications with a large amount of regenerative energy.

NOTICE

In case of incorrect assignment of the inverters, an overload may occur at the braking resistor and damage the braking resistor.

Damage to braking resistor.

- Observe the assignment of the braking resistor to the inverter and the project planning guidelines.

A flat-type resistor has internal thermal protection (fuse cannot be replaced) that interrupts the current circuit in the event of overload. Additional components for thermal monitoring are not necessary.

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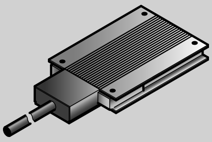
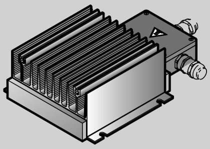
BW100-005/K-1.5, BW150-003/K-1.5, BW047-004/K-0.61

 **Braking resistor**			**BW100-005/K1.5**	**BW150-003/K-1.5**	**BW047-004/K-0.61**
Braking resistor part number with open cable end			08282862	08282927	28179145
Braking resistor part number with plug connector (for X2304)			28176448	28176421	–
Peak braking power P_N		kW	9.4	6.3	20
Approval			CE, cURus	CE, cURus	CE, cURus
Current-carrying capacity	100% cdf	kW	0.2	0.1	0.24
	50% cdf	kW	0.3	0.15	0.5
	25% cdf	kW	0.6	0.3	1.0
	12% cdf	kW	1.0	0.5	1.9
	6% cdf	kW	1.8	0.9	3.0
	Observe the regenerative power limit for the inverter.				
Resistance value R_{BW}		Ω	100	150	47
Tripping current I_F		A	1.0	0.6	1.7
Design			Flat design resistor		
Power connections			Connection cable		
PE connection			Connection cable		
Degree of protection			IP65		
Ambient temperature ϑ_{amb}		°C	-25 – 40		
			Derating at ambient temperature > 40 °C: -4% P_N/10 K up to maximum 60 °C		
Mass		kg	0.91	0.65	1.1
Dimensions W × H × D		mm	251 × 80 × 15	145 × 80 × 15	216 × 80 × 30
Cable length approx.		m	1.5	1.5	0.61 (total) 0.26 (with sheath) 0.36 (without sheath)
Assigned grids			BS-005 Part no.: 0813152X		–
Assigned mounting panel			M31 Part no.: 28296699	–	M32 Part no.: 28307313

BW150-006-T, BW100-009-T

 **Braking resistor**		BW150-006-T	BW100-009-T
Braking resistor part number		17969565	17969573
Connection cable part number (with plug connector for X2304)		28172558	28172558
Peak braking power P_N	kW	6.3	9.4
Approval		CE, cURus	CE, cURus
Current-carrying capacity 100% cdf	kW	0.6	0.9
50% cdf	kW	0.9	1.2
25% cdf	kW	1.8	2.4
12% cdf	kW	3.8	5.0
6% cdf	kW	7.5	10.0
Observe the regenerative power limit for the inverter.			
Resistance value R_{BW}	Ω	150	100
Tripping current I_F	A	2.0	3.0
Design		Compact resistor	
Power connections		Terminals	
Tightening torque	Nm	2	
PE connection		M5 bolt	
Tightening torque PE	Nm	2.5	
Degree of protection		IP66	
Ambient temperature ϑ_{amb}	°C	-25 – 40	
		Derating at ambient temperature > 40 °C: -4% P_N/10 K up to maximum 60 °C	
Mass	kg	3.0	5.5
Dimensions W × H × D	mm	285 × 174 × 75	435 × 174 × 75
Temperature switch		30 V DC, < 1 A, NC contact	
Prescribed connection cables		Shielded cables with a temperature resistance T_{amb} ≥ 90 °C (194 °F)	

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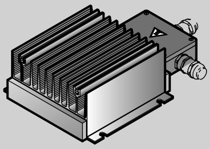
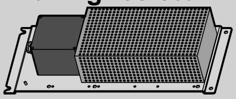
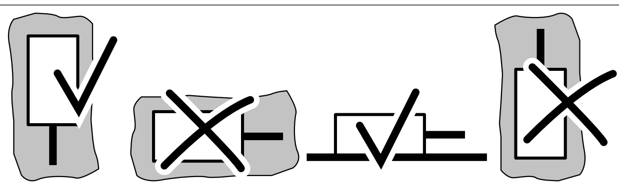
BW068-006-T, BW068-012-T

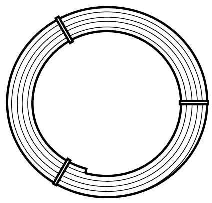
 **Braking resistor**			**BW068-006-T**	**BW068-012-T**
Braking resistor part number			17970008	17970016
Connection cable part number (with plug connector for X2304)			28172558	28172558
Peak braking power P_N		kW	13.8	13.8
Approval			CE, cURus	CE, cURus
Current-carrying capacity	100% cdf	kW	0.6	1.2
	50% cdf	kW	0.9	1.6
	25% cdf	kW	1.8	3.1
	12% cdf	kW	3.8	6.5
	6% cdf	kW	7.5	13.0
	Observe the regenerative power limit for the inverter.			
Resistance value R_{BW}		Ω	68	68
Tripping current I_F		A	3.0	4.2
Design			Compact resistor	
Power connections			Terminals	
Tightening torque		Nm	2	
PE connection			M5 bolt	
Tightening torque PE		Nm	2.5	
Degree of protection			IP66	
Ambient temperature ϑ_{amb}		°C	-25 – 40	
			Derating at ambient temperature > 40 °C: -4% P_N/10 K up to maximum 60 °C	
Mass		kg	3	9
Dimensions W × H × D		mm	285 × 174 × 75	635 × 174 × 75
Temperature switch			30 V DC, < 1 A, NC contact	
Prescribed connection cables			Shielded cables with a temperature resistance T_{amb} ≥ 90 °C (194 °F)	

BW050-008-01, BW033-012-01

Braking resistor 			**BW050-008-01**		**BW033-012-01**	
Braking resistor part number			17962242		17962196	
Connection cable part number (with plug connector for X2304)			28172558		28172558	
Peak braking power P_N		kW	18.8		28.3	
Approval			CE	cURus	CE	cURus
Current-carrying capacity	100% cdf	kW	0.8	0.48	1.2	0.72
	50% cdf	kW	1.6	1.0	2.4	1.5
	25% cdf	kW	3.0	2.0	4.5	3.0
	12% cdf	kW	4.4	4.4	6.6	6.6
	6% cdf	kW	7.2	7.2	10.8	10.8
	Observe the regenerative power limit for the inverter.					
Resistance value R_{BW}		Ω	50		33	
Tripping current I_F		A	2.4		3.6	
Design			Flat-design combination			
Power connections			Terminals			
Tightening torque		Nm	2			
PE connection			M5 bolt			
Tightening torque PE		Nm	3 – 6			
Degree of protection			IP65			
Ambient temperature ϑ_{amb}		°C	-25 – 40			
			Derating at ambient temperature > 40 °C: -4% P_N/10 K up to maximum 60 °C			
Mass		kg	4.75		5.9	
Dimensions W × H × D		mm	105 × 230 × 550		105 × 230 × 550	
Temperature switch			30 V DC, < 1 A, NC contact			
Mounting positions						
Prescribed connection cables			Shielded cables with a temperature resistance T_{amb} ≥ 90 °C (194 °F) Max. connection cross section at the terminals of the drive unit: 4 mm^2			

Connection cable

The following cable is available for connecting the external braking resistors:

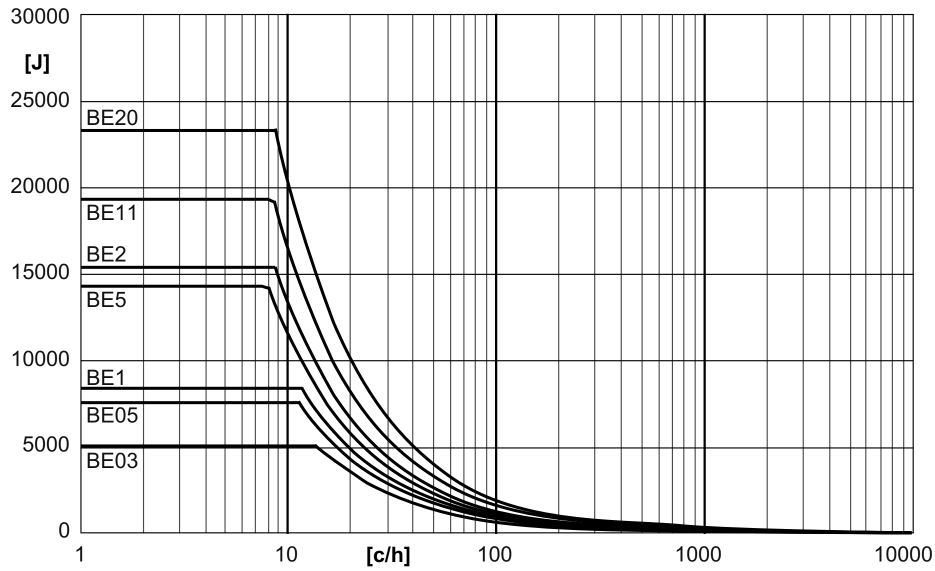
Device	Connection cable	Length	Braking resistor
MOVIMOT® advanced MOVIMOT® performance MOVIGEAR® performance MOVIMOT® flexible	Part number: 13230409 [1)] Type: LEONI LEC 001637 3Gx2.5 mm^2, shielded, halogen-free (cable roll) 	30 m	BW150-006-T BW100-009-T BW068-006-T BW068-012-T BW050-008-01

1) This cable is intended exclusively for the power connection. For braking resistors with a thermo contact (-T), you must also connect a cable for evaluating the thermo contact. For additional information, refer to the data sheet of the braking resistor.

4Q operation for motors with mechanical brake

- In 4Q operation, the brake coil can be used as a braking resistor.
- The brake voltage is generated internally in the device and is thus network-independent.
- Should the regenerative current-carrying capacity be insufficient for the application, refer to chapter "4Q operation with integrated brake and external braking resistor" (→ 🗎 63).
- The brake coil can be used under specified conditions, see chapter "Brake controls" (→ 🗎 51).

The following figure shows the current-carrying capacity of the DR.. motor brake coils:



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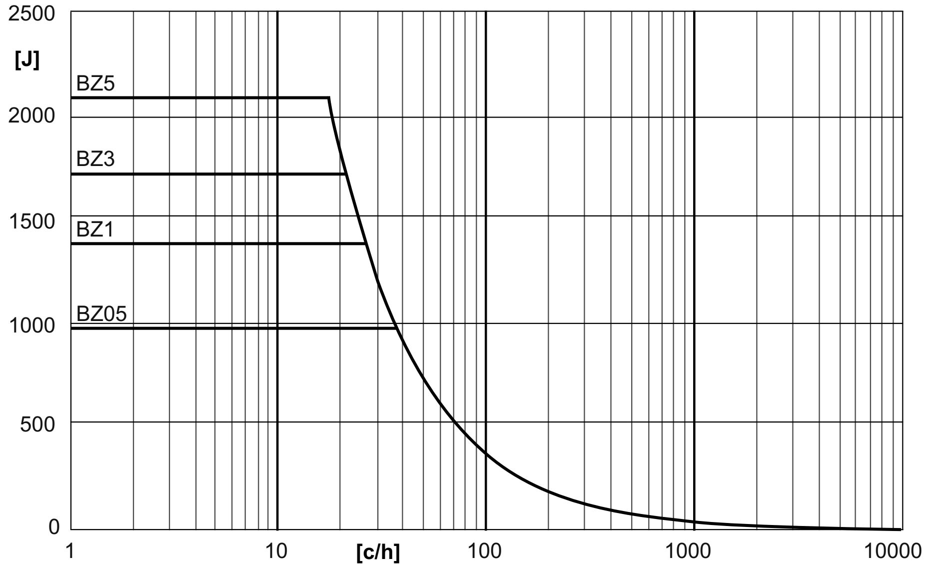
The following figure shows the current-carrying capacity of the CM3C.. motor brake coils:



41075769355

[J] Maximum permitted energy per braking operation
[c/h] Braking operations per hour

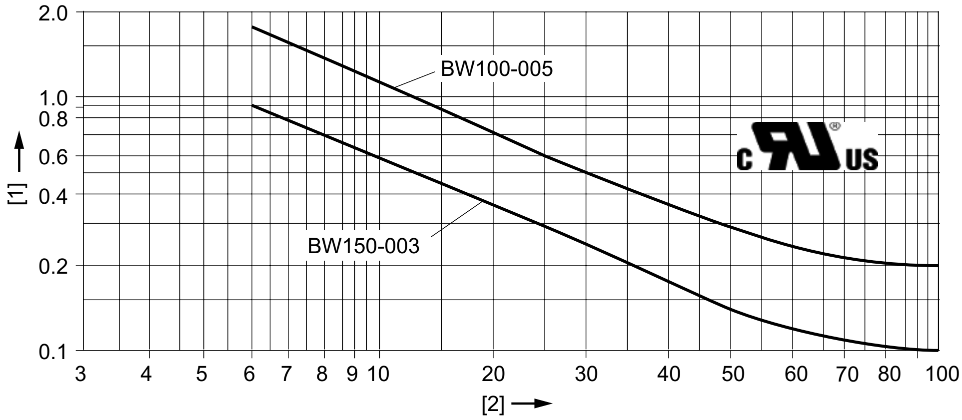
4Q operation with integrated brake and external braking resistor

The regenerative energy converted in the braking resistor and in the brake coil is added to the total energy.

4.12.4 Technical data of BW100-005/K-1.5 and BW150-003/K-1.5

Power diagrams

The following figure shows the rating diagrams of the braking resistors BW100-005/K-1.5, BW150-003/K-1.5:

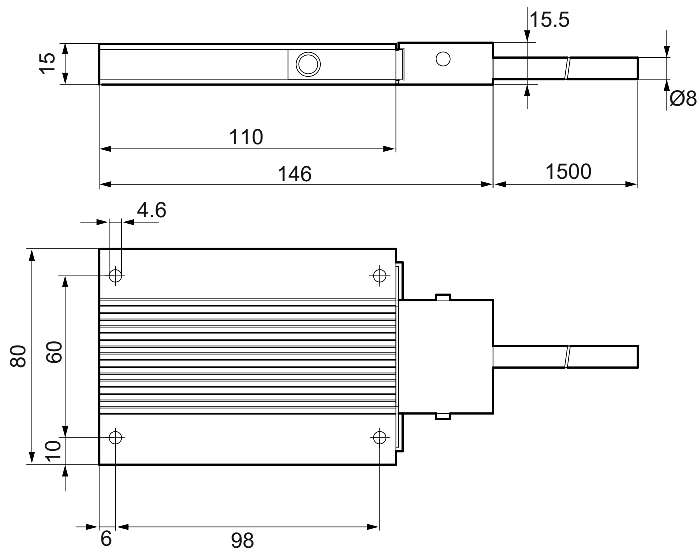


9007224553399051

[1] Power in KW
[2] Cyclic duration factor cdf in %

Dimension drawing of BW150-003/K-1.5

The following figure shows the dimensions of the external braking resistor BW150-003/K-1.5:



9007224553514251

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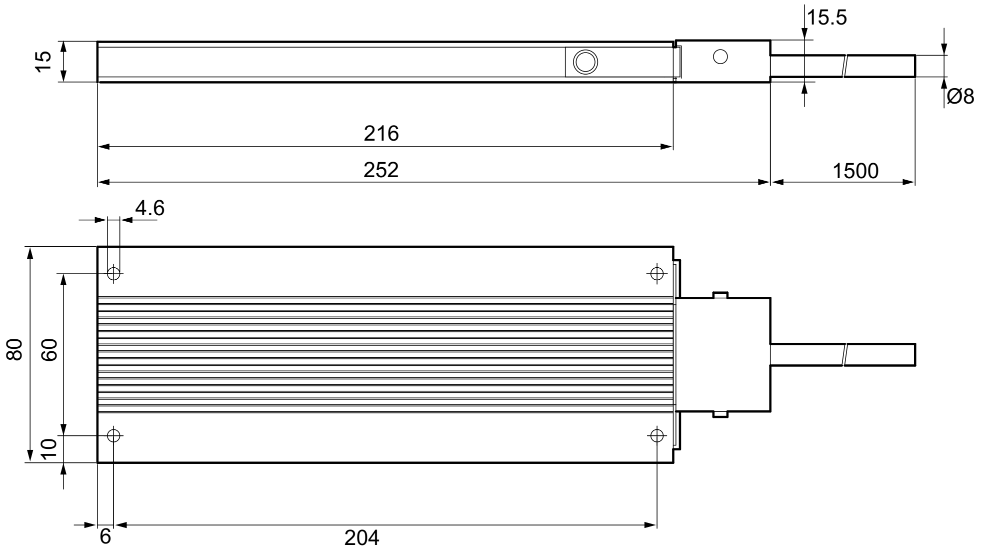
Dimension drawing BW100-005/K-1.5 (option /EBW)

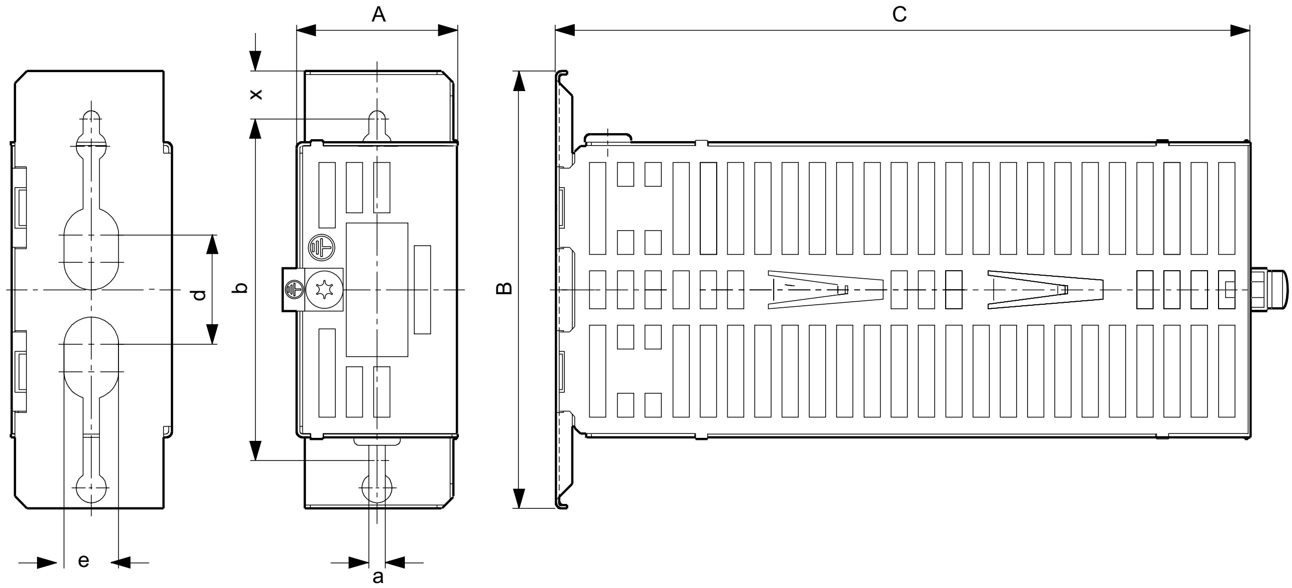
The following figure shows the dimensions of the external braking resistor BW100-005/K-1.5:



9007224553521035

Dimension drawing for the BS.. protective grid

The following figure shows the dimensions of the BS-005 protective grid:



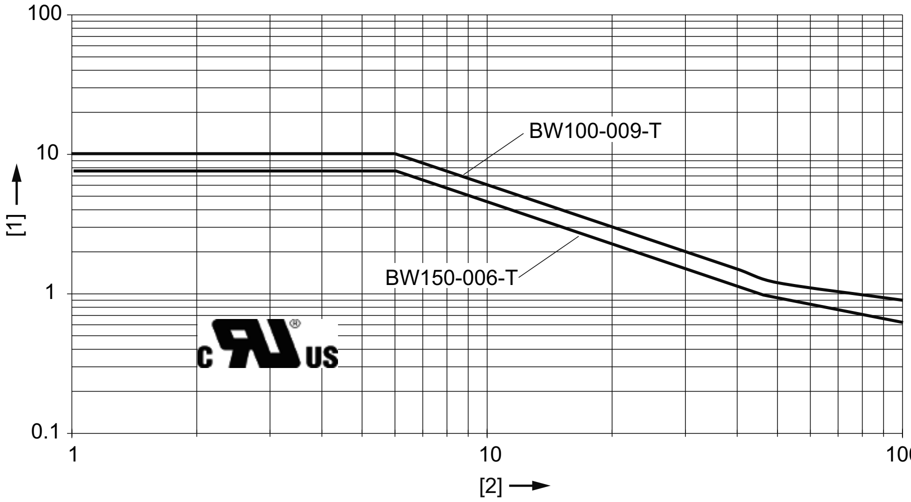
25842294795

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

4.12.5 Technical data of BW150-006-T and BW100-009-T

Power diagrams

The following figure shows the rating diagrams of the braking resistors BW150-006-T and BW100-009-T:

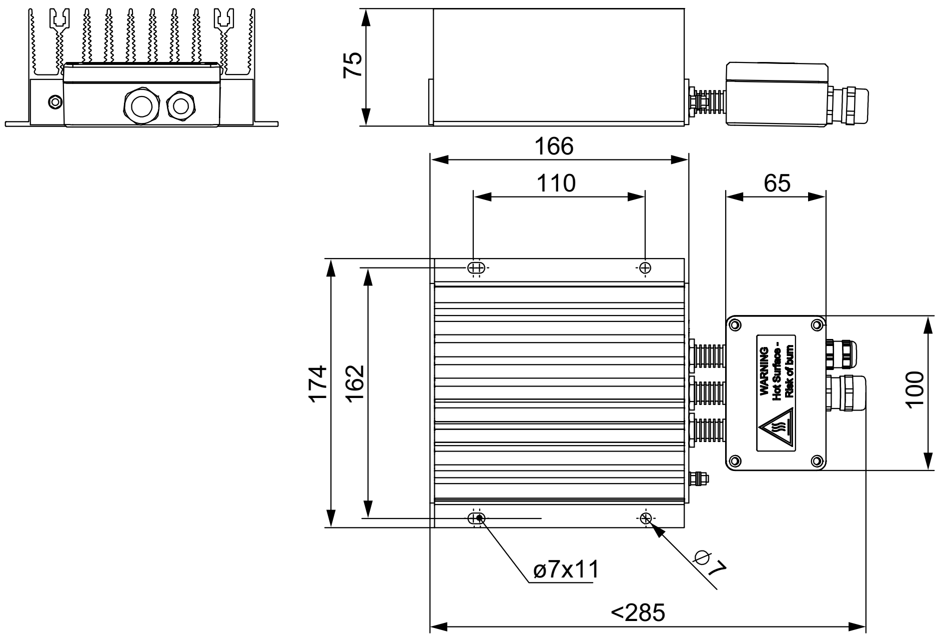


25298798219

[1] Power in KW
[2] Cyclic duration factor cdf in %
ED Cyclic duration factor of the braking resistor, based on a cycle time of 120 s.

Dimension drawing of BW150-006-T

The following figure shows the dimensions of the external braking resistor BW150-006-T:



25298808587

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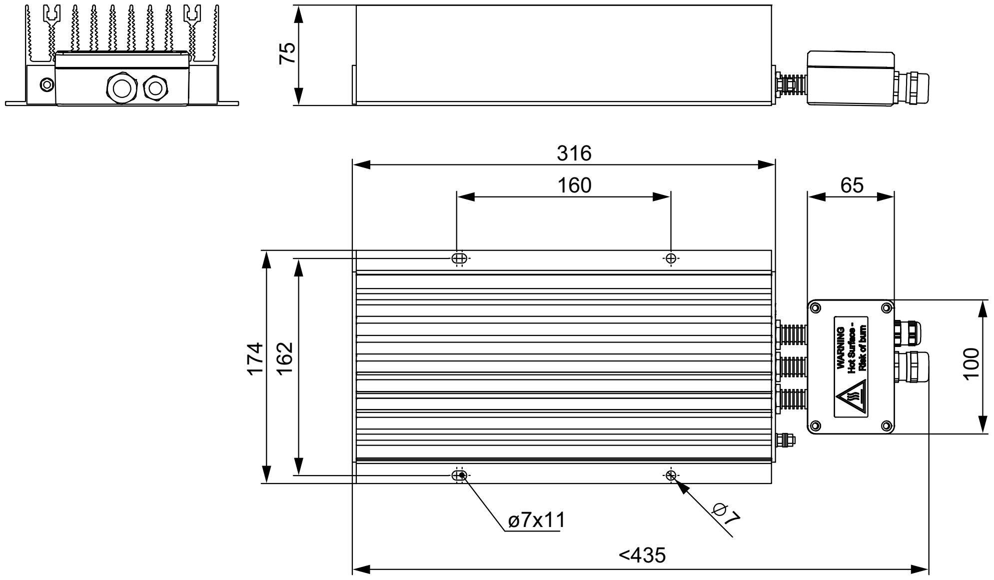
Dimension drawing of BW100-009-T

The following figure shows the dimensions of the external braking resistor BW100-009-T:

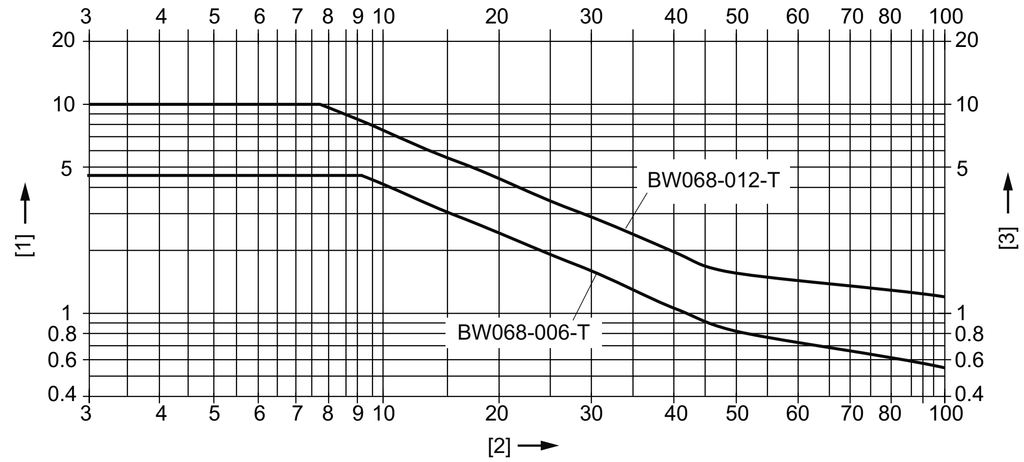


25298815755

4.12.6 Technical data of BW068-006-T and BW068-012-T

Power diagrams

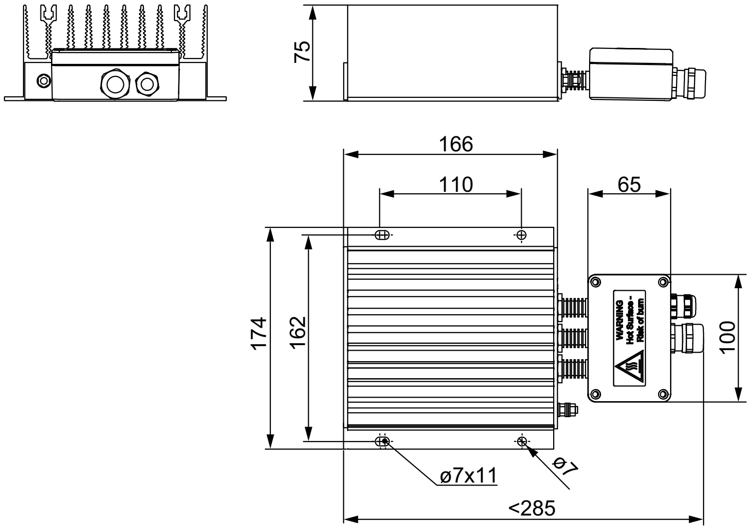
The following figure shows the power diagrams of the BW068-006-T and BW068-012-T braking resistors according to UL approval:



34606950539

Dimension drawing of BW068-006-T

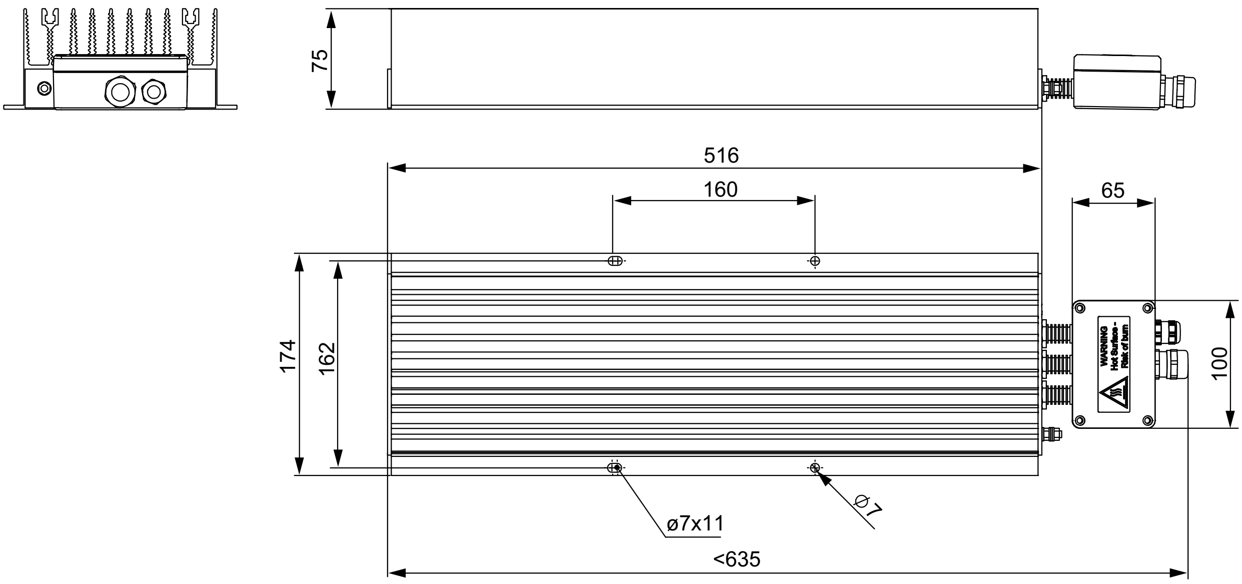
The following figure shows the dimensions of the external braking resistor BW068-006-T:



34606358411

Dimension drawing of BW068-012-T

The following figure shows the dimensions of the external braking resistor BW068-012-T:



25298820747

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4.12.7 Technical data of BW050-008-01 and BW033-012-01

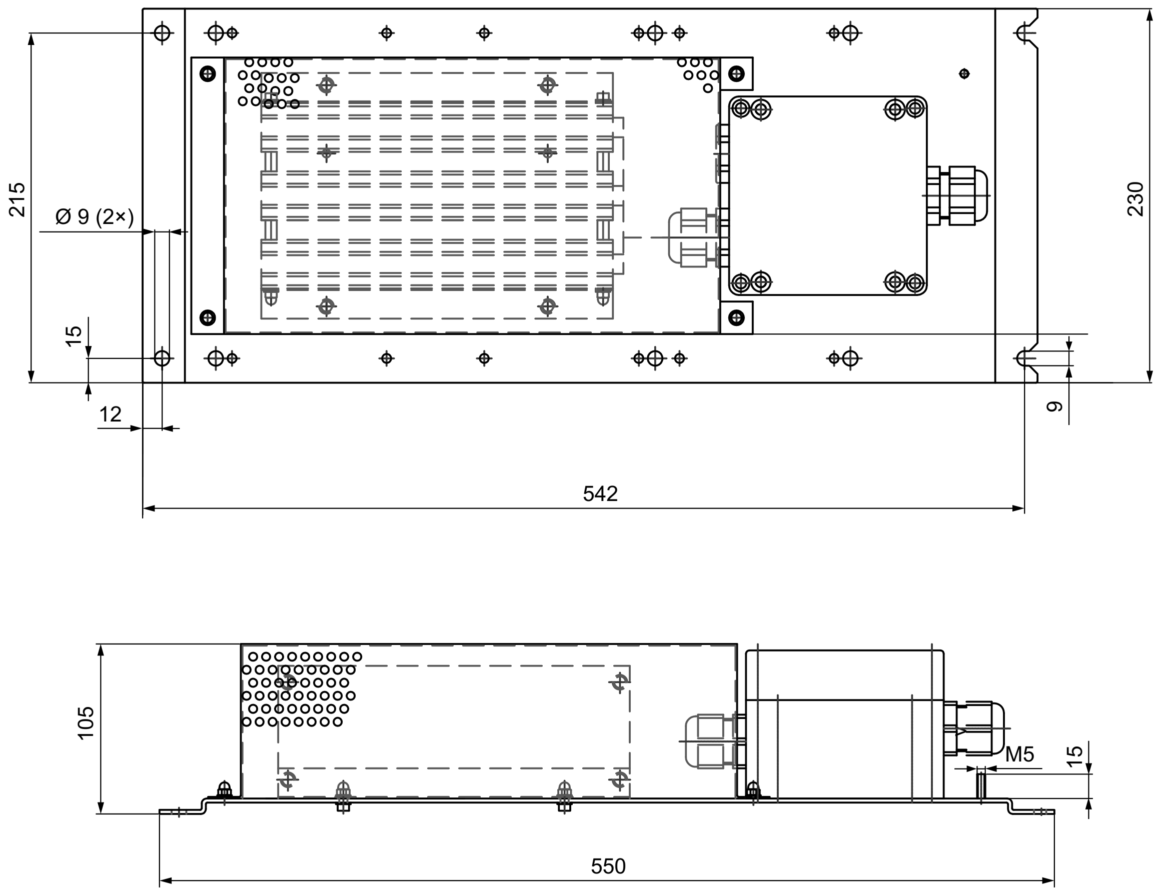
Continuous braking power

The following table shows the continuous braking power of the BW050-008-01 and BW033-012-01 braking resistors:

Braking resistor		BW050-008-01		BW033-012-01	
Continuous braking power		according to IEC	according to UL	according to IEC	according to UL
	100% cdf	0.8 kW	0.48 kW	1.2 kW	0.72 kW
	50% cdf	1.6 kW	1 kW	2.4 kW	1.5 kW
	25% cdf	3 kW	2 kW	4.5 kW	3 kW
	12% cdf	4.4 kW	4.4 kW	6.6 kW	6.6 kW
	6% cdf	7.2 kW	7.2 kW	10.8 kW	10.8 kW
	3% cdf	12 kW	12 kW	18 kW	18 kW
	2% cdf	15.4 kW	15.4 kW	23.1 kW	23.1 kW
	1% cdf	28.8 kW	28.8 kW	43.2 kW	43.2 kW

Dimension drawing of BW050-008-01, BW033-012-01

The following figure shows the dimensions of the external braking resistor BW068-006-T:



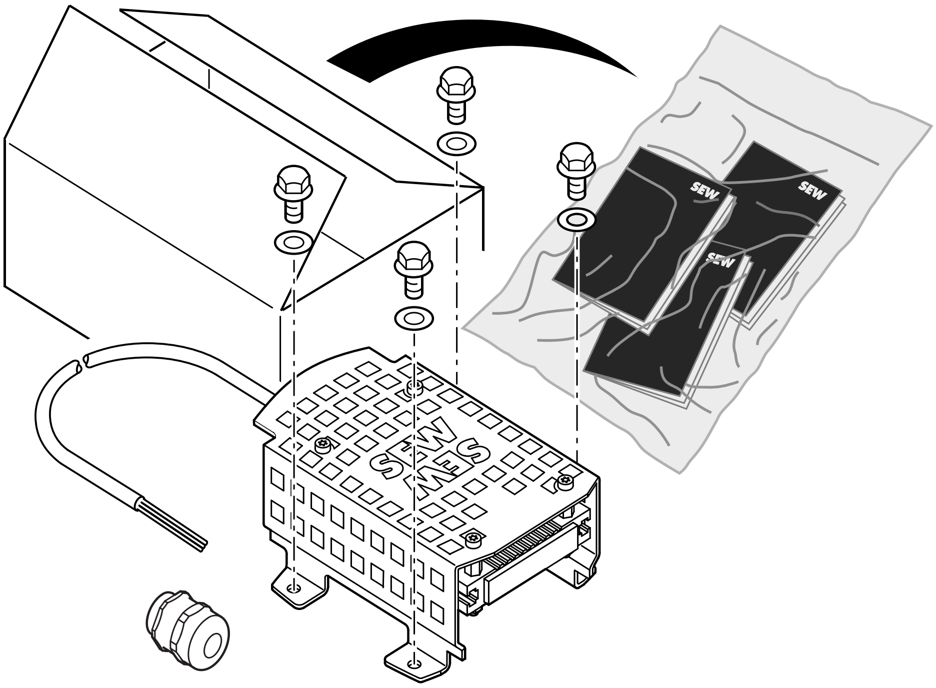
9007201317080331

4.13 Mounting kit for braking resistor BW...-.../..C

INFORMATION

- The BW...-.../..C braking resistor must always be mounted and installed by the customer.
- Observe the installation instructions "Braking resistor BW...-.../..C".

The following figure shows the mounting kit for braking resistor BW...-.../..C:



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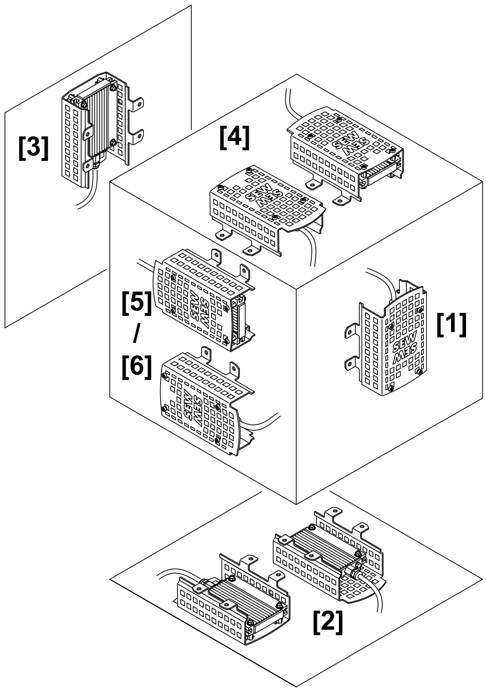
4.13.1 Technical data

Mounting kit Braking resistor			BW100-001/ K-1.5/M2C	BW100-001/ K-1.5/M4C	BW100-002/ K-1.5/M2C	BW100-002/ K-1.5/M4C
Braking resistor part number			18272886	18272894	18272908	18272916
Connection cable part number with plug connector for X2304			28306031	28306066	28306058	28306058
Peak braking power P_N		kW	9.4		9.4	
Approval			CE, cURus		CE, cURus	
Current-carrying capacity	100% cdf	kW	0.1		0.2	
	50% cdf	kW	0.15		0.3	
	25% cdf	kW	0.3		0.6	
	12% cdf	kW	0.5		1.0	
	6% cdf	kW	0.9		1.8	
	Observe the regenerative power limit for the inverter.					
Resistance value R_{BW}		Ω	100		100	
Tripping current I_F		A	1.0		1.4	
Design			Flat design resistor			
Power connections			Connection cable			
PE connection			Connection cable			
Degree of protection			IP65			
Ambient temperature ϑ_{amb}		°C	-30 – 40			
			Derating at ambient temperature > 40 °C: -4% P_N/10 K up to maximum 60 °C			
Mass		kg	1.1			
Dimensions W × H × D		mm	116 × 80 × 15		116 × 80 × 51	
Cable length approx.		m	1.5 for braking resistor without plug connector 0.145 for braking resistor with plug connector			

4.13.2 Current-carrying capacity



25893524363

BW100-001/.../...	Current-carrying capacity at % cdf in W				
cdf	**[1]**	**[2]**	**[3]**	**[4]**	**[5]/[6]**
100%	100	100	100	100	100
50%	150	150	150	150	150
25%	250	250	250	250	250
12%	300	300	300	300	300
6%	500	500	500	500	500
cdf = Cyclic duration factor of braking resistor based on cycle duration TD ≤ 120 s					

BW100-002/.../...	Current-carrying capacity at % cdf in W				
cdf	**[1]**	**[2]**	**[3]**	**[4]**	**[5]/[6]**
100%	200	200	200	160	160
50%	300	300	300	240	240
25%	500	500	500	400	400
12%	600	600	600	480	480
6%	1000	1000	1000	800	800
cdf = Cyclic duration factor of braking resistor based on cycle duration TD ≤ 120 s					

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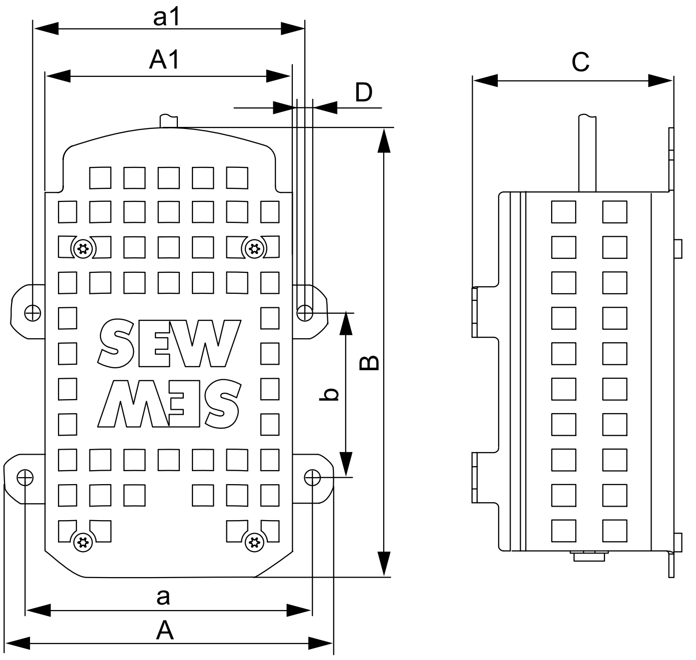
4.13.3 Dimension drawing

The following figure shows the dimension drawing of the mounting kit:



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	A	A1	B	C	D	a	a1	b
	mm	mm	mm	mm	mm	mm	mm	mm
18272886 (BW100-001/K-1.5/M2C)	126.0	89.0	148.2	61.8	7	111.0	106.0	54.7
18272908 (BW100-002/K-1.5/M2C)								
18272894 (BW100-001/K-1.5/M4C)	158.0	94.0	149.0	61.8	7	144.0	142.0	82.0
18272916 (BW100-002/K-1.5/M4C)								

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4.14 Line choke

The line choke can be used as an option:

- To support overvoltage protection
- To smoothen the line current
- For protection in the event of distorted line voltage
- To limit the charging current, for example, when several inverters are connected together in parallel on the input end (nominal current of line choke = total of nominal input currents)

4.14.1 UL and cUL approval

The listed line chokes have cRUus approval independent of the drive unit.

4.14.2 Technical data

Line choke	ND0070-503	ND0160-503	ND0300-503	ND0420-503
Part number	17984173	17984181	17983800	17983819
Nominal line voltage V_L	3 × AC 230 V – 500 V 50/60 Hz			
Nominal current I_N	7 A	16 A	30 A	42 A
Nominal inductance	0.36 mH	0.2 mH	0.1 mH	0.045 mH
Nominal power loss	4 W	9 W	11 W	13 W
Ambient temperature ϑ_{amb}	-10 °C – 45 °C (reduction: 3 % I_N up to maximum 60 °C)			
Connection contacts L1/L2/L3 – L1'/L2'/L3'	0.2 – 4 mm²		0.2 – 10 mm²	2.5 – 16 mm²
Tightening torque L1/L2/L3 – L1'/L2'/L3'	0.5 – 1 Nm		1.2 – 2 Nm	2.5 Nm
PE connection contact	M4		M5	
PE tightening torque	1.5 Nm		3 Nm	
Degree of protection	IPXXB in accordance with EN 60529			
Mass	0.5 kg	1.3 kg	1.95 kg	1.82 kg

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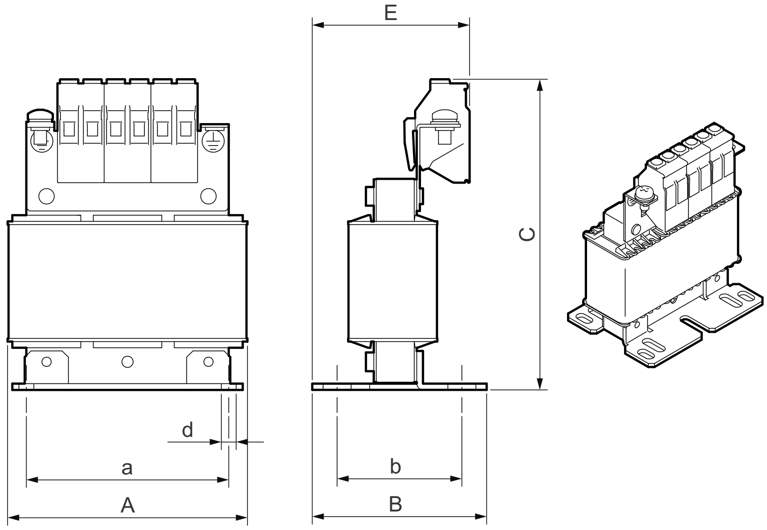
4.14.3 Dimension drawing

The following figure shows dimensioned drawing of the line choke.



31249196171

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

4.15 Maintenance switch

4.15.1 Description of the D11 switch disconnector

The D11 load disconnector disconnects the line voltage supply between terminals X1 and the electronics cover.

The feedback contact of the switch disconnector affects the digital input DI04.

For further information, see chapter "Operation" > "Maintenance switch" (→ 🗎 402).

4.15.2 Technical data of the D11 load disconnector

Switch disconnector D11	
Function	Load disconnector with feedback contact
Maintenance switch from	MOVIMOT® flexible size 1 and size 2

4.15.3 Description of the M11 switch disconnector

The M11 load disconnector disconnects the line voltage supply between the terminals X1 and the electronics cover.

The M11 load disconnector also disconnects the line voltage supply when the maximum permitted tripping current is exceeded. This overcurrent tripping can have advantages when installing according to the NEC code (GROUP installation) or when troubleshooting a device with fuse tripping.

The feedback contact of the switch disconnector affects the digital input DI04.

For further information, see chapter "Operation" > "Maintenance switch" (→ 🗎 402).

4.15.4 Technical data of the M11 load disconnector

Load disconnector M11		
Function	Load disconnector with feedback contact and overcurrent tripping	
Tripping current	6.3 A	16 A
Manufacturer/type	EATON PKZM0-10	EATON PKZM0-16
Maintenance switch from	MOVIMOT® flexible size 1	MOVIMOT® flexible size 2

4.15.5 Description of the R01 switch disconnector

The R01 load disconnector separates the motor phases (U, V, W) of the motor between the inverter output of the electronics cover and terminals X2_A.

Only switch the load disconnector when the output stage is inhibited.

The feedback contact of the switch disconnector affects the digital input DI04.

This digital input DI04 must be configured using the function "Output stage inhibit" (factory setting).

For further information, see chapter "Operation" > "Maintenance switch" (→ 🗎 402).

4.15.6 Technical data of the R01 load disconnector

Load disconnector R01	
Function	Load disconnector at the inverter output with leading feedback contact for the function "Output stage inhibit"
Maintenance switch from	MOVIMOT® flexible size 1

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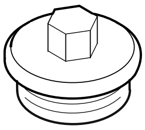
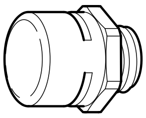
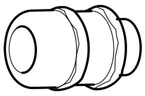
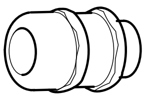
4.16 Screw fittings

4.16.1 Cable glands / screw plugs / pressure compensation

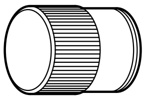
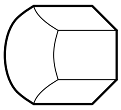
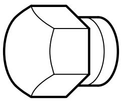
The following table shows the screw fittings and the screw plug optionally available from SEW-EURODRIVE:

Screw fitting type	Image	Content	Size	Tightening torque		Outer cable diameter	Tightening force[1)]	Part number
				Threaded jacket	Cable clamping			
Screw plugs external hexagon (made of stainless steel)		10 pieces	M16 × 1.5	6.8 Nm	–	–	–	18247342
		10 pieces	M25 × 1.5	6.8 Nm	–	–	–	18247350
Pressure compensation screw fittings (made of stainless steel)		1 piece	M16 × 1.5	4.0 Nm	–	–	–	28214617
EMC-compliant cable gland (brass, nickel-plated)		10 pieces	M16 × 1.5	4.0 Nm	3.5 Nm	> 4 to 8 mm	75 N	18204783
		10 pieces	M25 × 1.5	7.0 Nm	5.0 Nm	> 8 to 11 mm	120 N	18204805
						> 11 to 16 mm	130 N	
EMC-compliant cable gland (made of stainless steel)		10 pieces	M16 × 1.5	4.0 Nm	3.5 Nm	> 4 to 8 mm	75 N	18216366
		10 pieces	M25 × 1.5	7.0 Nm	5.0 Nm	> 8 to 11 mm	120 N	18216382
						> 11 to 16 mm	130 N	

1) Fasten the cable in the cable gland so that it achieves the following cable pull-out force from the cable gland. This is usually achieved with the specified tightening torque of the cable clamp.

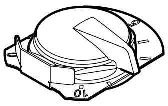
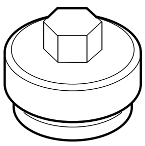
4.16.2 Screw fittings: Plug connectors

The following table shows the screw plugs for plug connectors optionally available from SEW-EURODRIVE:

Screw fitting type	Image	Contents	Size	Tightening torque	Part number
M23 plug for plug connector with male thread (stainless steel)		1 pieces	M23 × 1.5	Tighten to the stop	19094558
M12 plug for plug connector with male thread (stainless steel)		10 pieces	M12 × 1.0	2.3 Nm	18202799
M12 plug for plug connector with female thread (stainless steel)		10 pieces	M12 × 1.0	2.3 Nm	18202276

4.16.3 Screw plug/control knob for potentiometer

The following table shows the control knob and screw plug that are optionally available from SEW-EURODRIVE:

Screw fitting type	Image	Contents	Size	Tightening torque	Part number
MBK11A control knob for setting the setpoints f1 or f2 NOTICE When installing the control knob, the degree of protection of the device is reduced to max. IP54.		1 pieces	M24 × 1.5	2.5 Nm	28230035
Hexagon head screw plug for potentiometer (stainless steel)		10 pieces	M24 × 1.5	6.8 Nm	18241077

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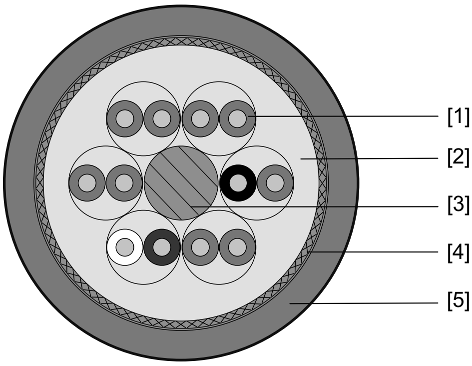
4.17 Connection cables

4.17.1 Specification of signal cables for digital inputs and relay output

Mechanical design

The following table describes the mechanical design of the cable:

		HELUKABEL® Li9Y91YC11Y-HF
Mechanical structure		 *29747895691*
[1]	Conductors	6 core pairs, 2 × 0.25 mm^2 copper
	Insulation	Polypropylene, 0.24 mm
	Colors	DIN 47100 yellow/green, pink/gray, blue/red, black/violet, pink and gray/red and blue, brown/white
[2]	Inner sheathing	TPE-O, halogen-free
	Color	Natural
[3]	Filler	-
[4]	Shield	Braided copper wires, tinned min. optical coverage 85%
[5]	Outer cable jacket	TPU, halogen-free
	Color	Green, similar to RAL2018
	Label	SEW-EURODRIVE 150665 Li9Y91YC11Y-HF ..
	Diameter	15.6 mm

Technical data

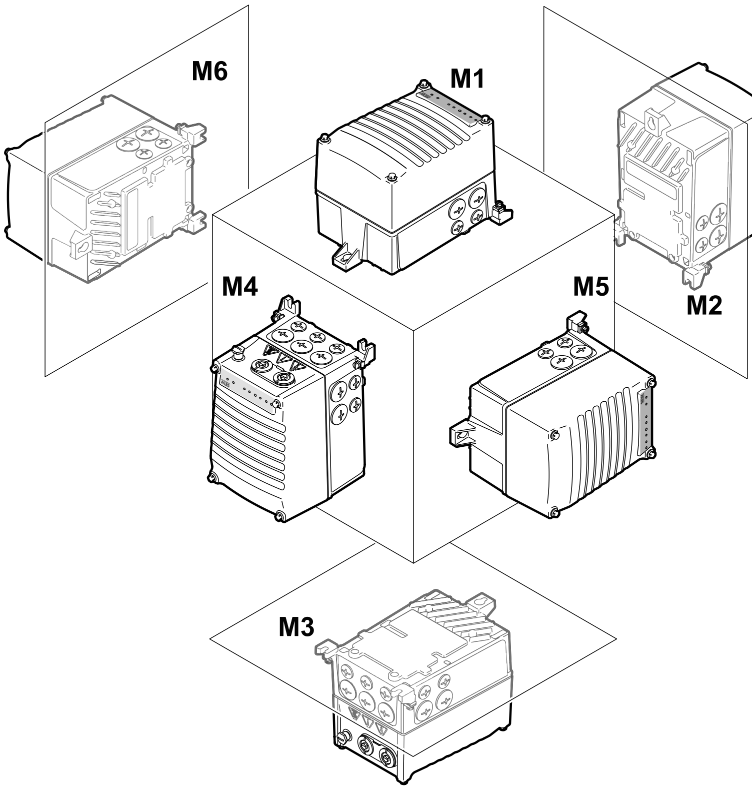
The following table shows the technical data of the signal cable:

Properties	**Type: HELUKABEL® Li9Y91YC11Y-HF SEW EURODRIVE 150665**
UL properties	UL758 (AWM) UL Style 20223 (sheath) UL Style 10493 (insulation)
RoHS conformity	Yes
Test voltage conductor/con-ductor	AC 1.5 kV 50 Hz/1 min.
Test voltage conductor/shield	AC 1.5 kV 50 Hz/1 min.
Operating voltage	Max. AC 300 V (UL)
Insulation resistance	≥ 500 MΩ/km
Operating temperature	-50 °C to +80 °C (fixed installation) -30 °C to +80 °C (cable carrier) -20 °C to +60 °C (cable carrier with mechanical load)
Outer diameter	15.6 mm
Bending radii	Min. 5 × outer diameter (fixed installation)
	Min. 8 × outer diameter (cable carrier)
Bending cycles	Min. 10 million.
Acceleration	Max. 20 m/s^2
Torsion	Max. ±30 °/m
Chemical characteristics	• Oil resistance according to DIN EN 60811-404, HD 22.10 Appendix A
	• Flame retardant according to IEC 60332-1-2, UL758 cable flame test
	• Halogen-free according to DIN VDE 0472 T.815 • Silicone-free

4.18 Mounting positions

4.18.1 Mounting positions of the MMF1. design

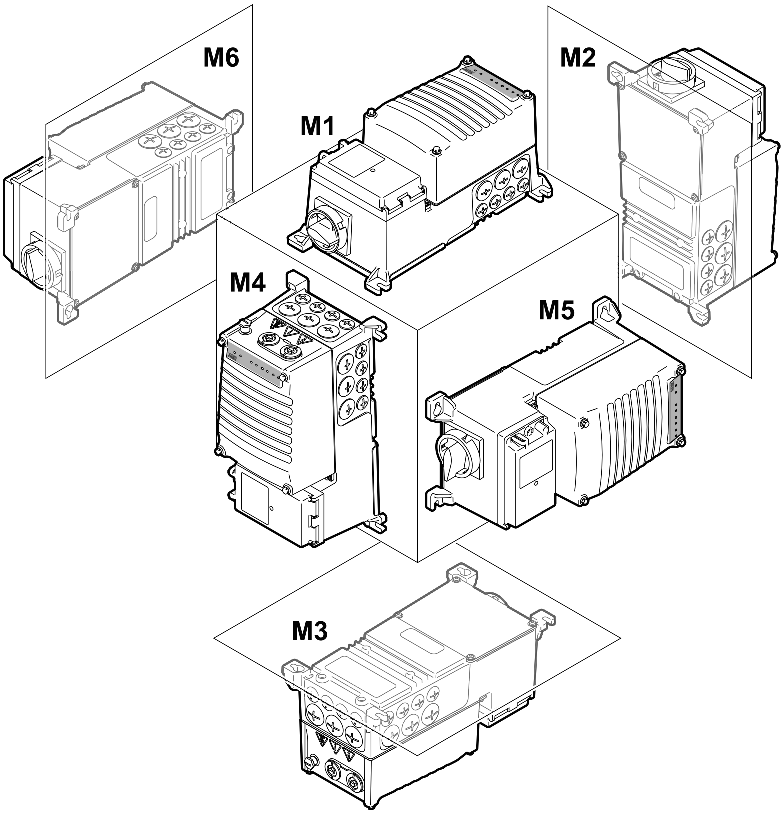
You can use the device in all mounting positions.



9007229823475339

4.18.2 Mounting positions of the MMF3. design

You can use the device in all mounting positions.



9007229823480587

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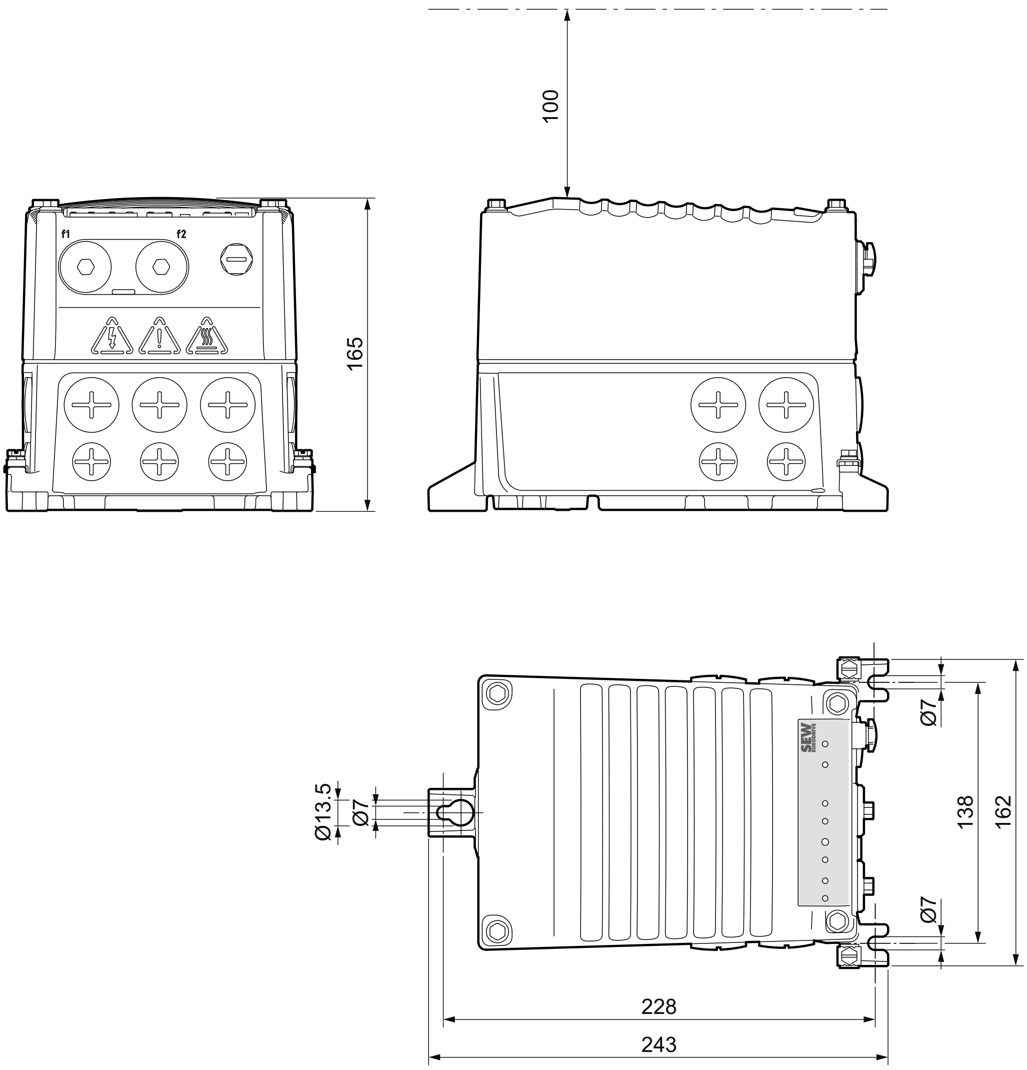
4.19 Device dimension drawings

4.19.1 Dimension drawing of the MMF1. design

The following figure shows the dimensions of the device.

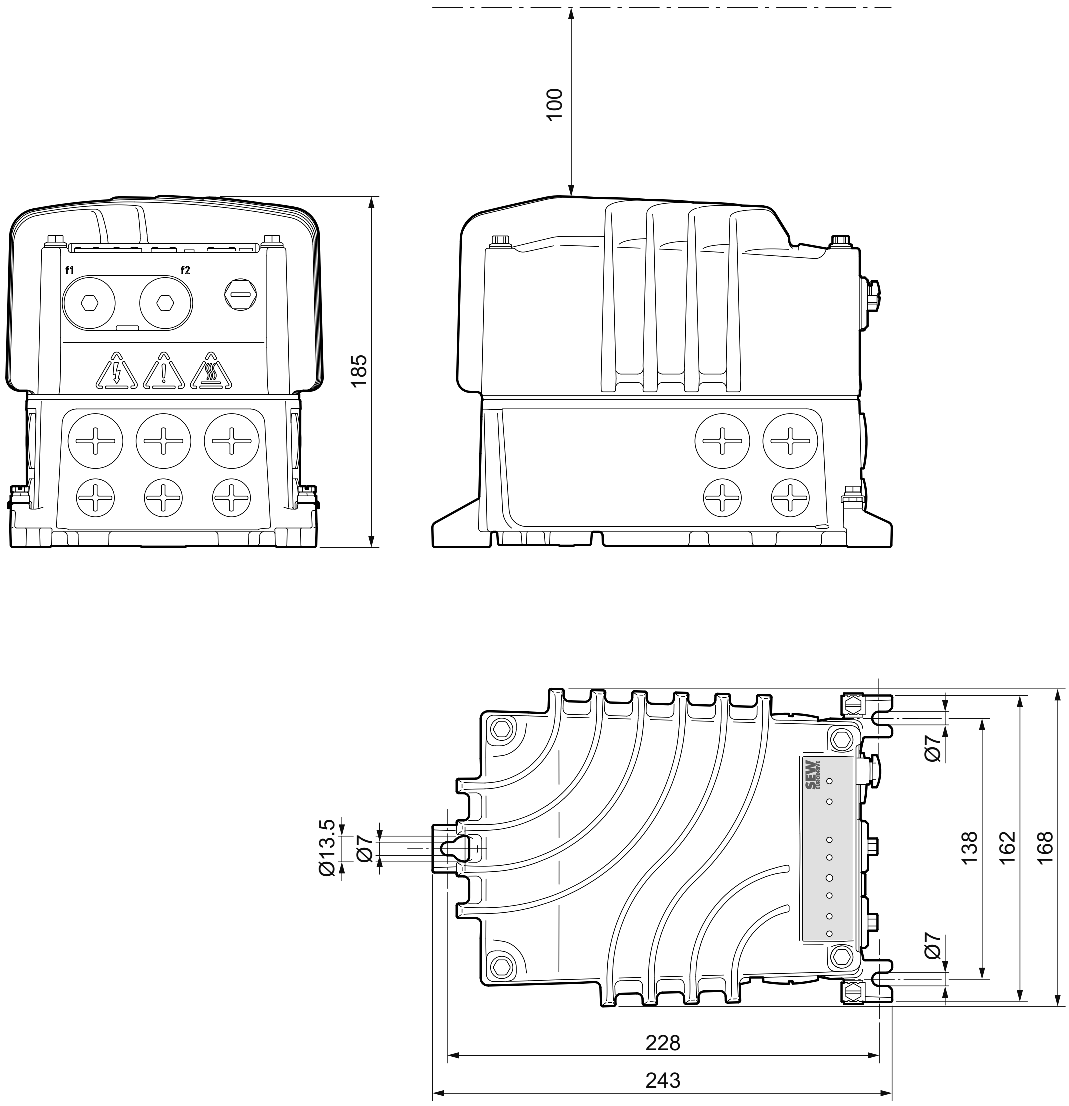


30564611595

All dimensions in mm.

4.19.2 Dimension drawing of the MMF1. design with cooling fins

The following figure shows the dimensions of the device.

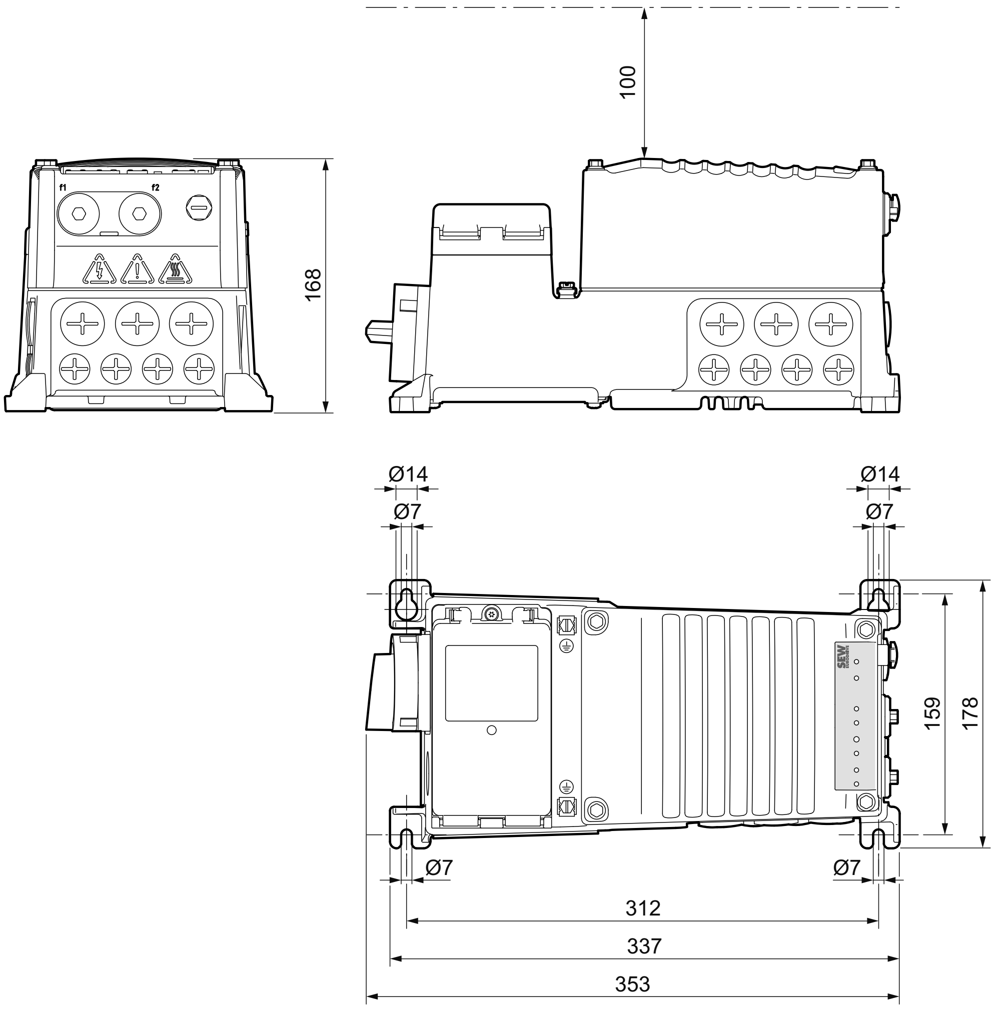


30564620171

All dimensions in mm.

4.19.3 Dimension drawing of the MMF31 design

The following figure shows the dimensions of the device.

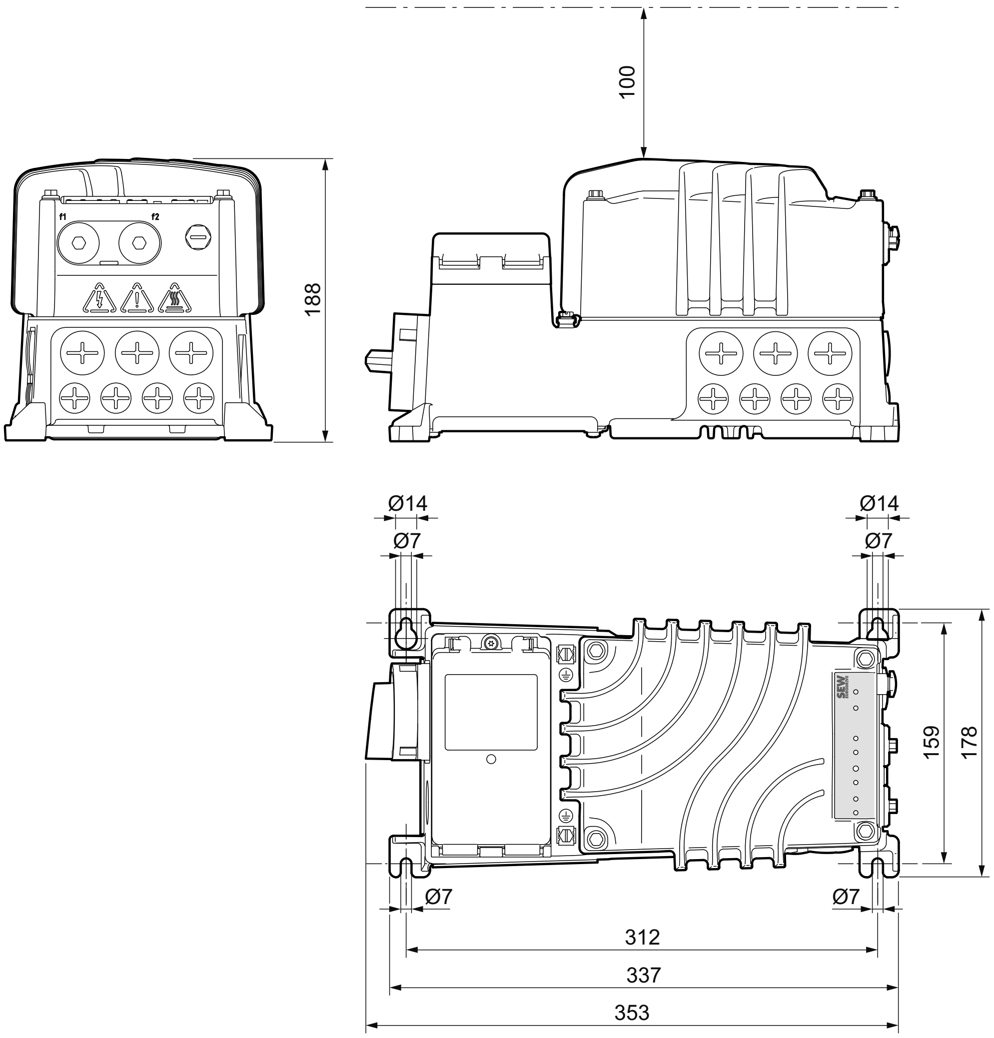


30564628747

All dimensions in mm.

4.19.4 Dimension drawing of the MMF31 design with cooling fins

The following figure shows the dimensions of the device.

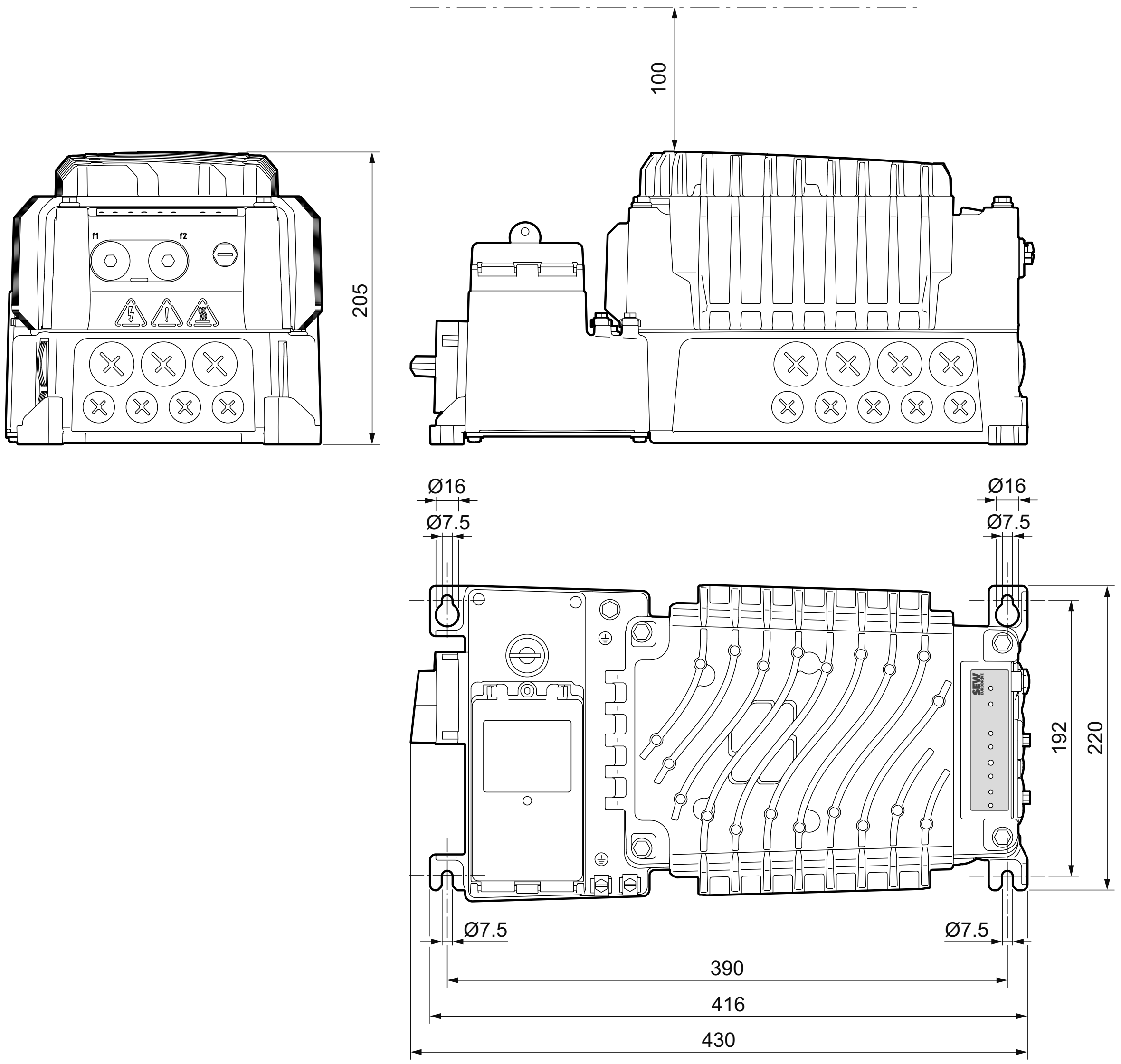


30564637323

All dimensions in mm.

4.19.5 Dimension drawing of the MMF32 design

The following figure shows the dimensions of the device.

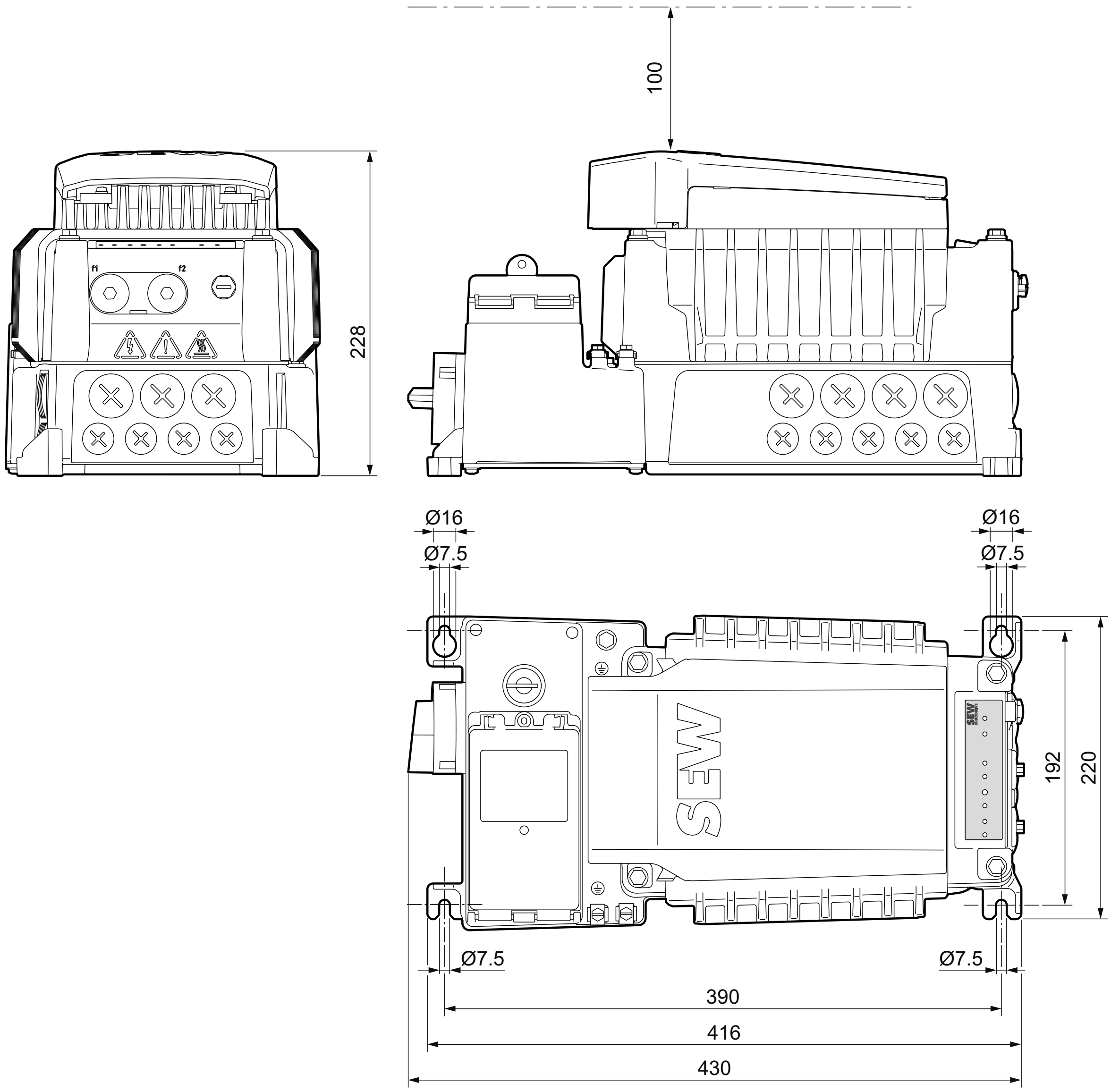


34352309771

All dimensions in mm.

4.19.6 Dimension drawing of the MMF32 design with fan

The following figure shows the dimensions of the device.



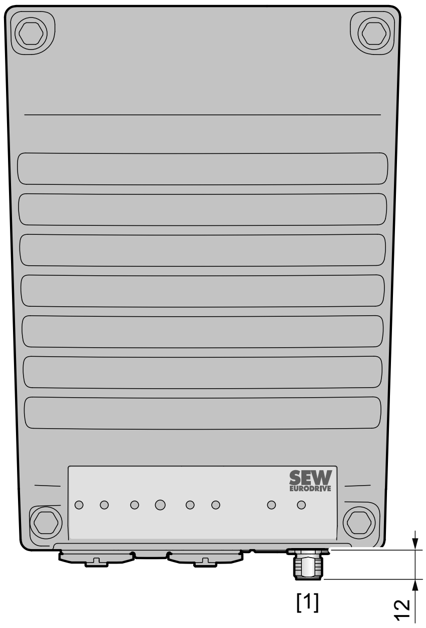
34237222027

All dimensions in mm.

4.20 Dimension drawings of plug connectors in the electronics cover

4.20.1 Dimension drawing of the plug connectors on electronics cover size 1

The following figure shows the additional dimensions of the plug connector.



9007229877301643

[1] M12 plug connector design, male

All dimensions in mm.

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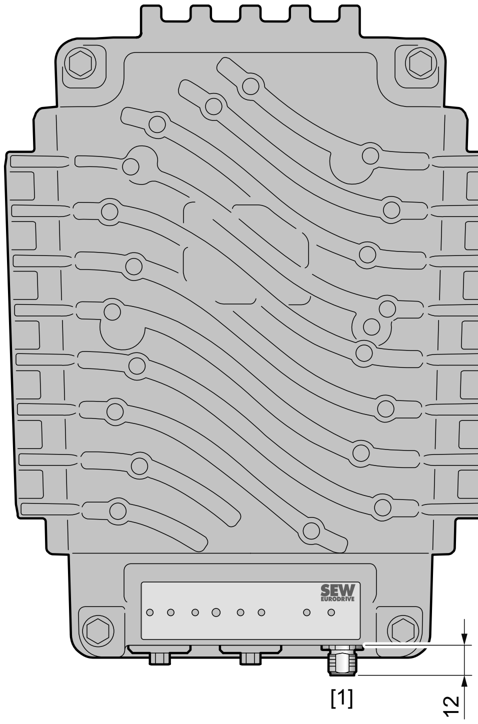
4.20.2 Dimension drawing of the plug connectors on electronics cover size 2

The following figure shows the additional dimensions of the plug connector.



9007233591844363

[1] M12 plug connector design, male

All dimensions in mm.

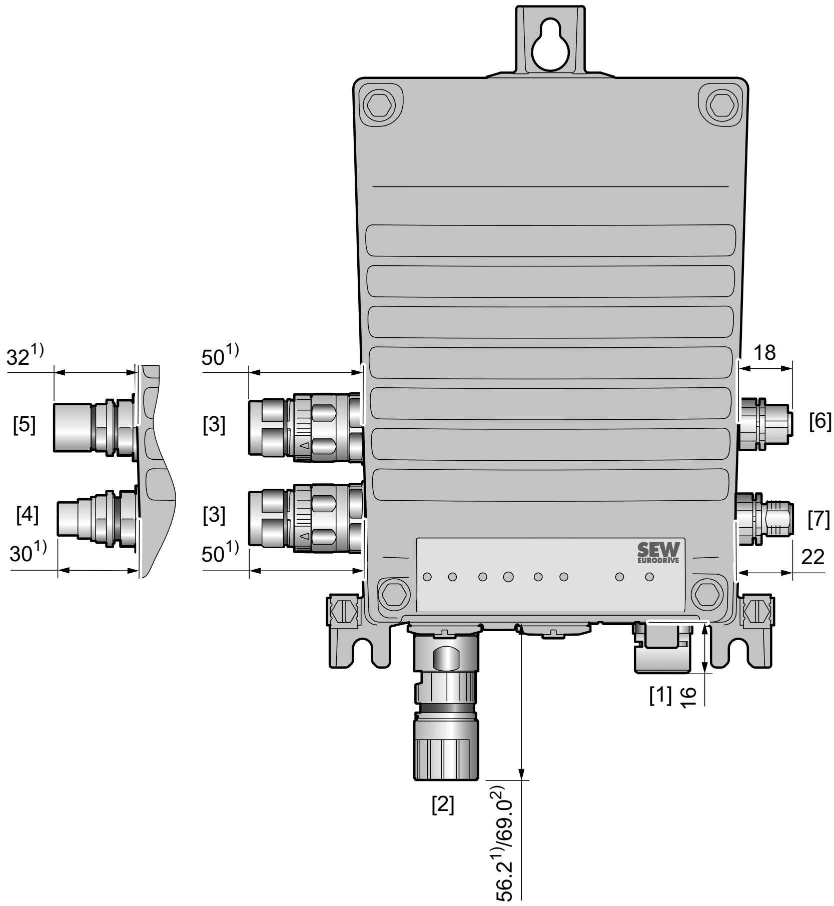
4.21 Dimension drawings of plug connectors in the connection box

4.21.1 Dimension drawings of the MMF1. design

Dimension drawing of the MMF1. design Plug connectors

The following figure shows an example of the additional dimensions of the optional plug connectors for a possible plug connector configuration.

For more information, refer to chapter "Electrical installation" > "Plug connector" > "Plug connector positions ...".



31249323659

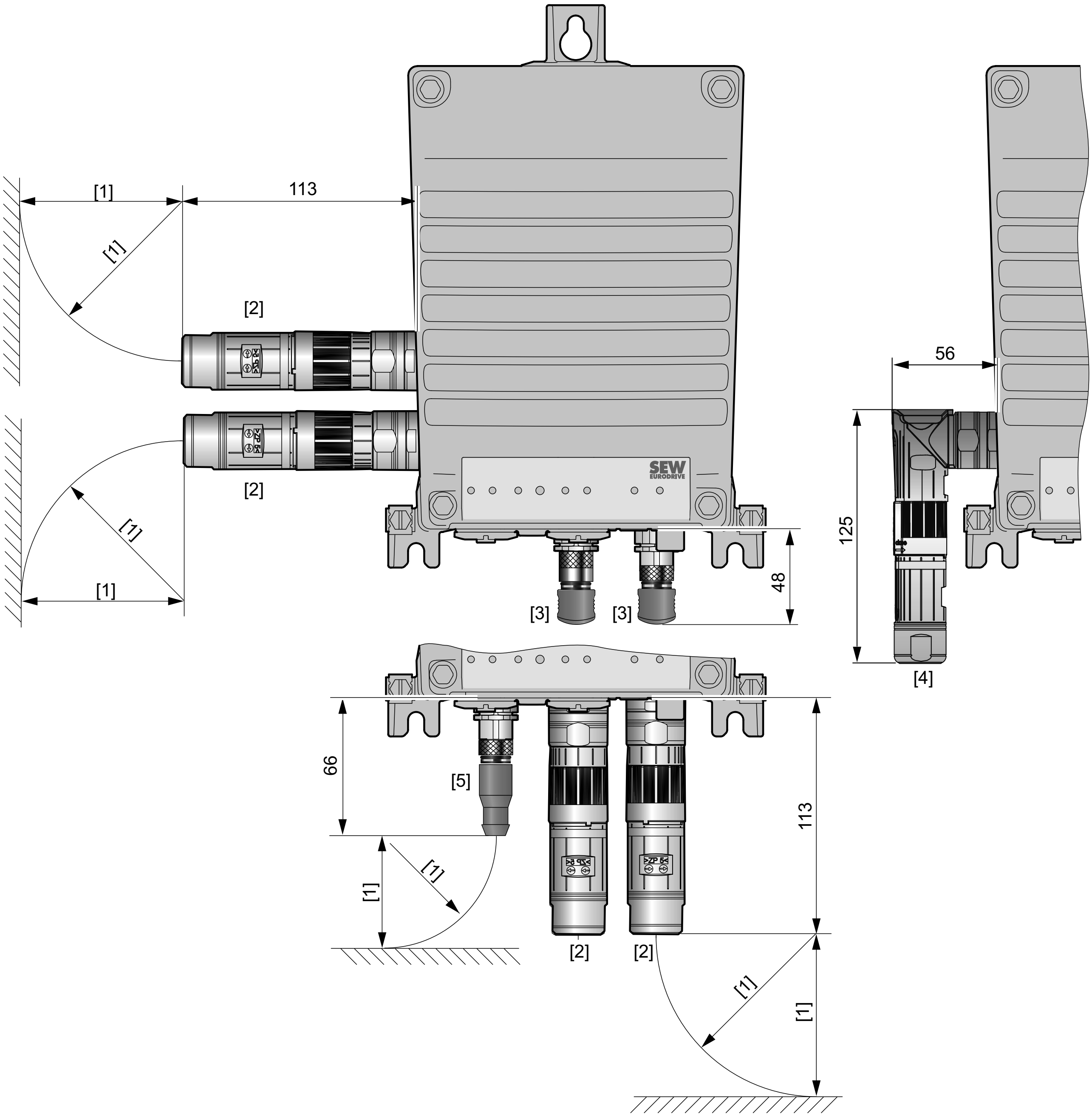
1) "Straight" M23 plug connector design
2) "Angled" M23 plug connector design
[1] Optional pressure compensation
[2] Plug connector design M23, with union nut, female
[3] Plug connector design M23, without union nut, female
[4] Plug connector design MQ15-X-Power, without union nut, male
[5] Plug connector design MQ15-X-Power, with union nut, female
[6] M12 plug connector design, female
[7] M12 plug connector design, male

All dimensions in mm.

Dimension drawing of the MMF1. design Plug connector including mating connector

The following image shows the multiple dimensions/bending radii of the optional connector, including mating connector, together with prefabricated cables from SEW-EURODRIVE.

For more information, see chapter "Electrical installation" > "Plug connectors" > "Plug connector positions ..".



9007229819526411

[1] Distance according to the permitted bending radius of the cable
[2] "Straight" M23 plug connector design
[3] "Right-angle" M12 plug connector design
[4] "Angled" M23 plug connector design
[5] "Straight" M12 plug connector design

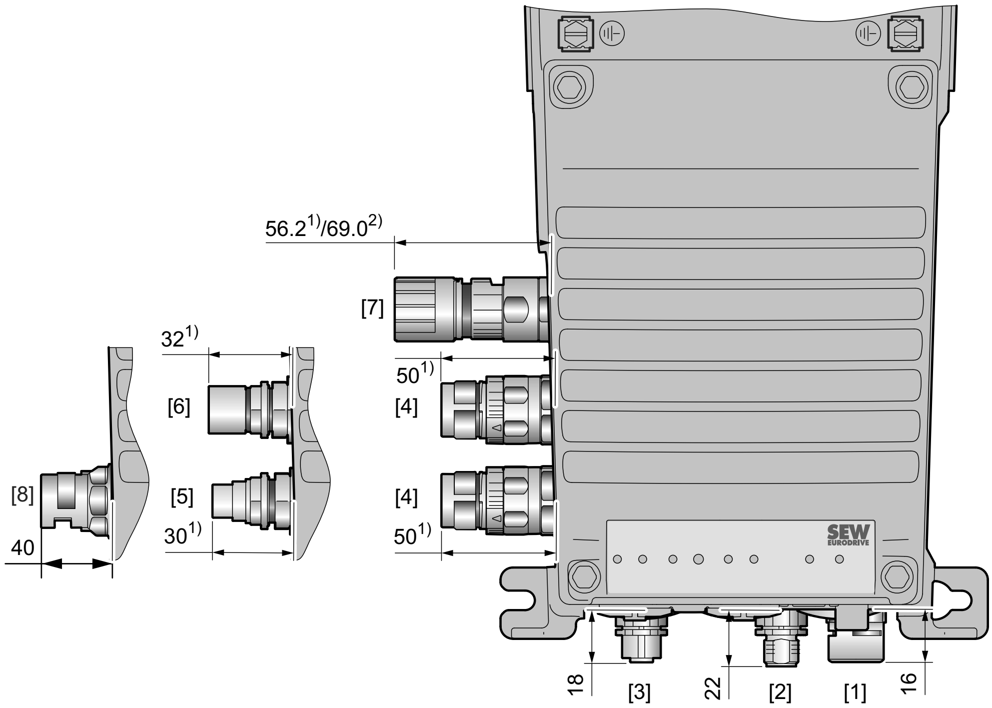
All dimensions in mm.

4.21.2 Dimension drawings of MMF31 design

Dimension drawing of MMF31 design plug connector

The following figure shows an example of the additional dimensions of the optional plug connectors for a possible plug connector configuration.

For more information, refer to chapter "Electrical installation" > "Plug connector" > "Plug connector positions ...".



9007230504090507

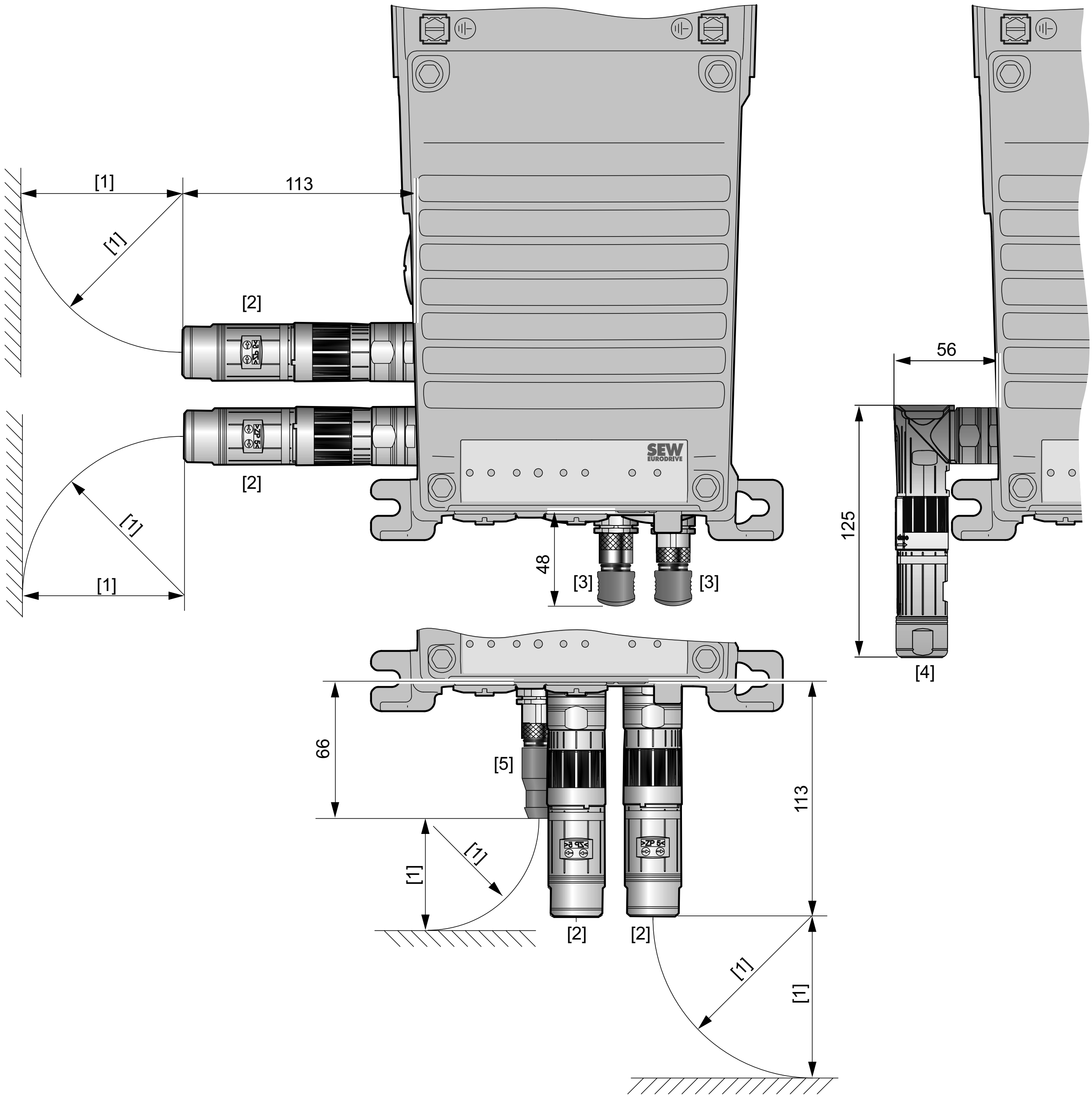
1) "Straight" M23 plug connector design
2) "Angled" M23 plug connector design
[1] Optional pressure compensation
[2] M12 plug connector design, male
[3] M12 plug connector design, female
[4] Plug connector design M23, without union nut, female
[5] Plug connector design MQ15-X-Power, without union nut, male
[6] Plug connector design MQ15-X-Power, with union nut, female
[7] Plug connector design M23, with union nut, female
[8] Plug connector design PhoenixContact, QPD W 4PE2.5, female

All dimensions in mm.

Dimension drawing of MMF31 design plug connectors including mating connector

The following image shows the multiple dimensions/bending radii of the optional connector, including mating connector, together with prefabricated cables from SEW-EURODRIVE.

For more information, see chapter "Electrical installation" > "Plug connectors" > "Plug connector positions ..".



9007229819538955

[1] Distance according to the permitted bending radius of the cable
[2] "Straight" M23 plug connector design
[3] "Right-angle" M12 plug connector design
[4] "Angled" M23 plug connector design
[5] "Straight" M12 plug connector design

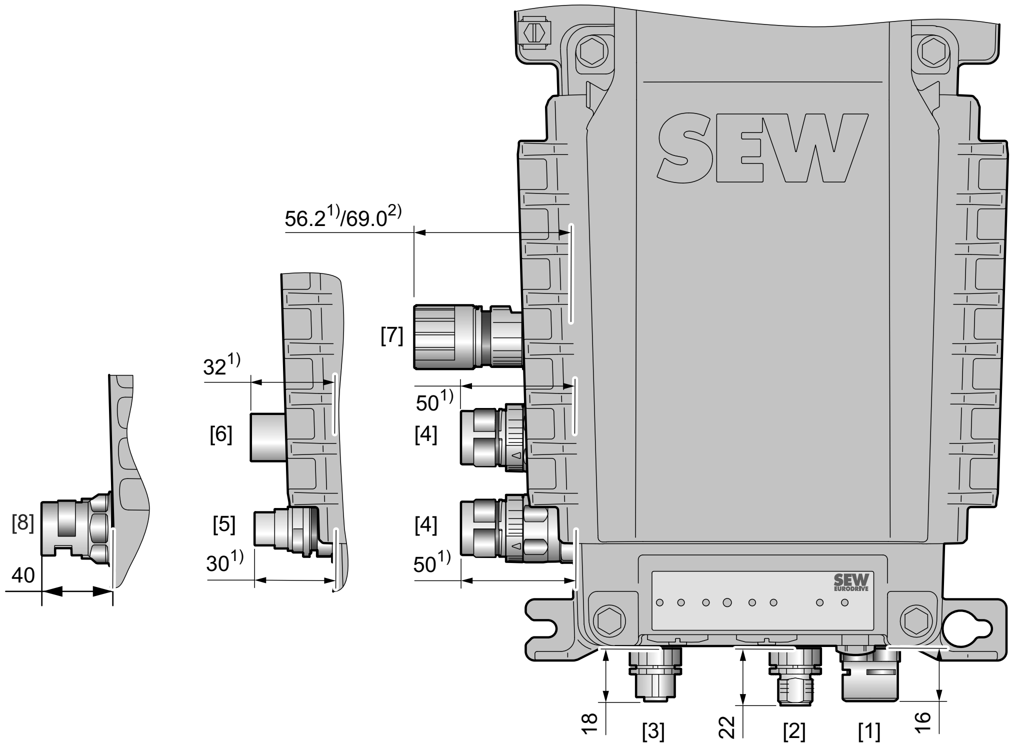
All dimensions in mm.

4.21.3 Dimension drawings of MMF32 design

Dimension drawing of MMF32 plug connector design

The following figure shows an example of the additional dimensions of the optional plug connectors for a possible plug connector configuration.

For more information, refer to chapter "Electrical installation" > "Plug connector" > "Plug connector positions ...".



9007233491953291

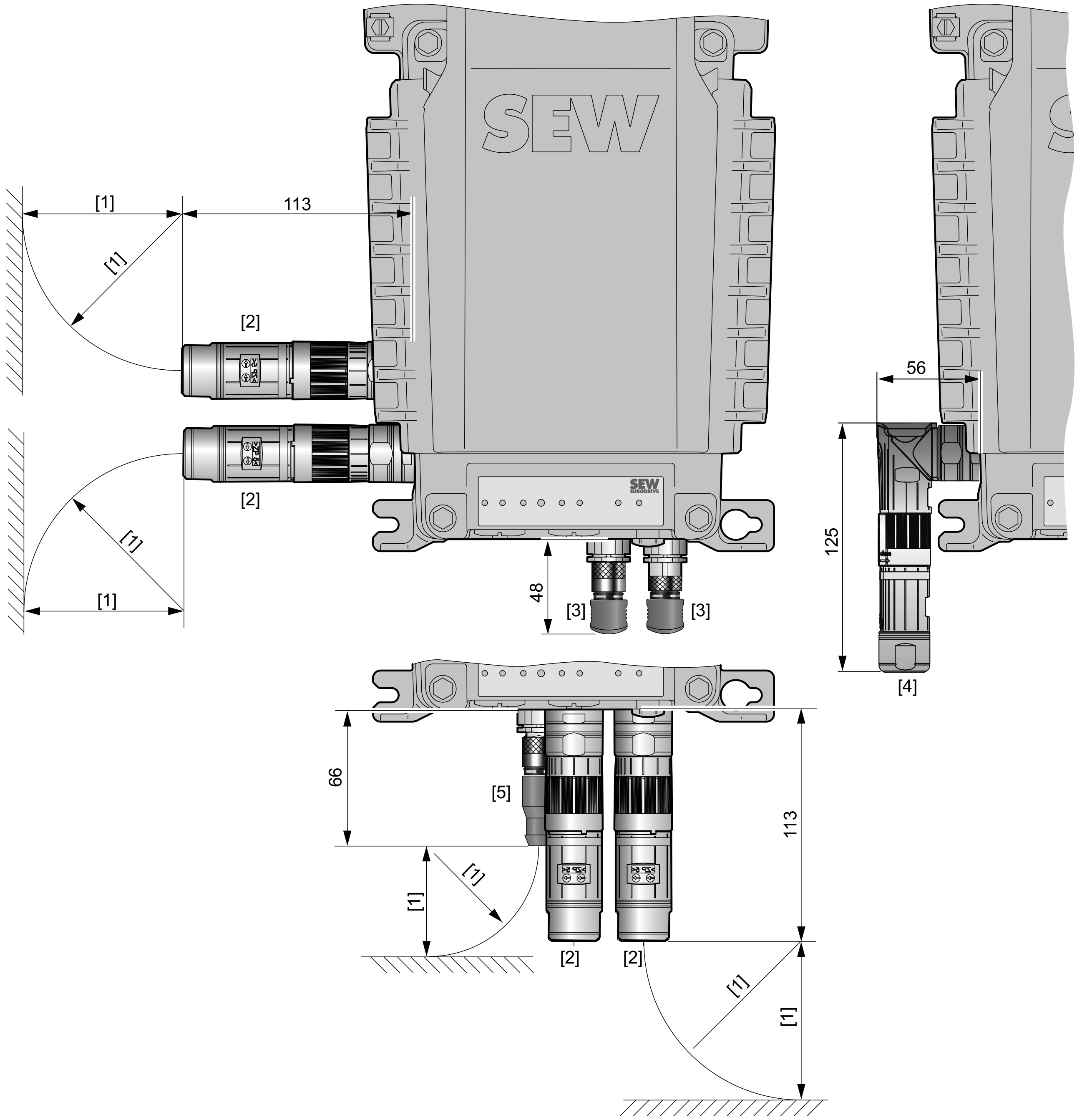
1) "Straight" M23 plug connector design
2) "Angled" M23 plug connector design
[1] Optional pressure compensation
[2] M12 plug connector design, male
[3] M12 plug connector design, female
[4] Plug connector design M23, without union nut, female
[5] Plug connector design MQ15-X-Power, without union nut, male
[6] Plug connector design MQ15-X-Power, with union nut, female
[7] Plug connector design M23, with union nut, female
[8] Plug connector design PhoenixContact, QPD W 4PE2.5, female

All dimensions in mm.

Dimension drawing of MMF32 design plug connectors including mating connector

The following image shows the multiple dimensions/bending radii of the optional connector, including mating connector, together with prefabricated cables from SEW-EURODRIVE.

For more information, see chapter "Electrical installation" > "Plug connectors" > "Plug connector positions ..".



[1] Distance according to the permitted bending radius of the cable
[2] "Straight" M23 plug connector design
[3] "Right-angle" M12 plug connector design
[4] "Angled" M23 plug connector design
[5] "Straight" M12 plug connector design

All dimensions in mm.

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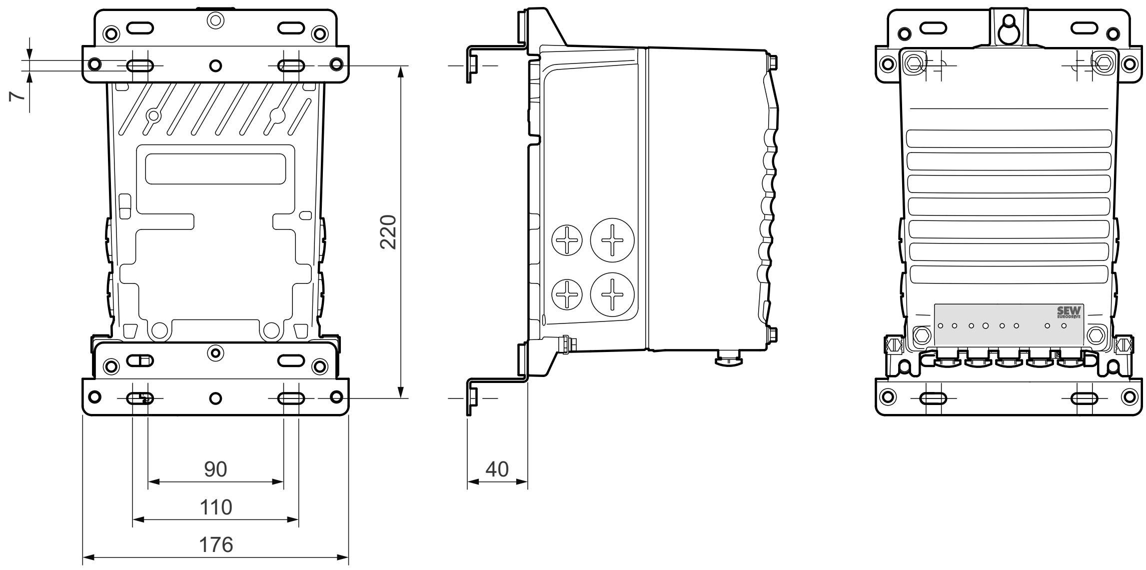
4.22 Dimension drawing of M01 mounting panel

4.22.1 Dimension drawing of the M01 mounting panel on MMF1. design

The following figure shows the dimensions of the M01 mounting panel on the MMF1 design.

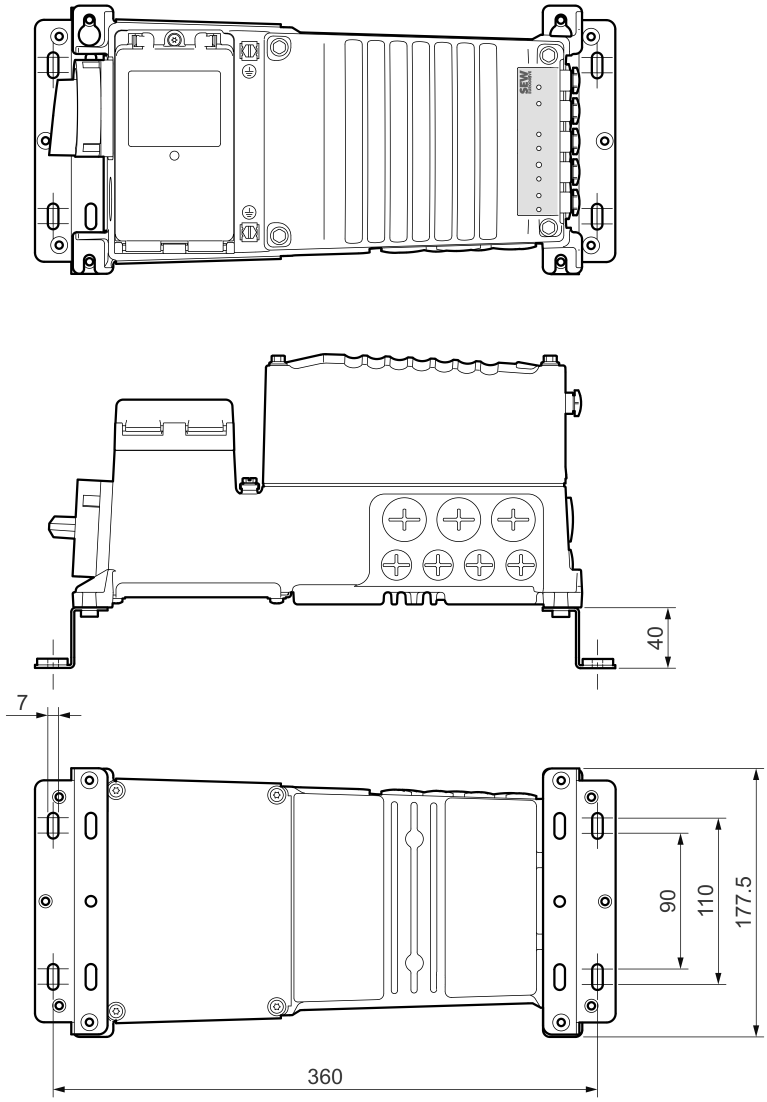


31257836171

All dimensions in mm.

4.22.2 Dimension drawing of the M01 mounting panel on MMF31 design

The following figure shows the dimensions of the M01 mounting panel on the MMF31 design.



31257838603

All dimensions in mm.

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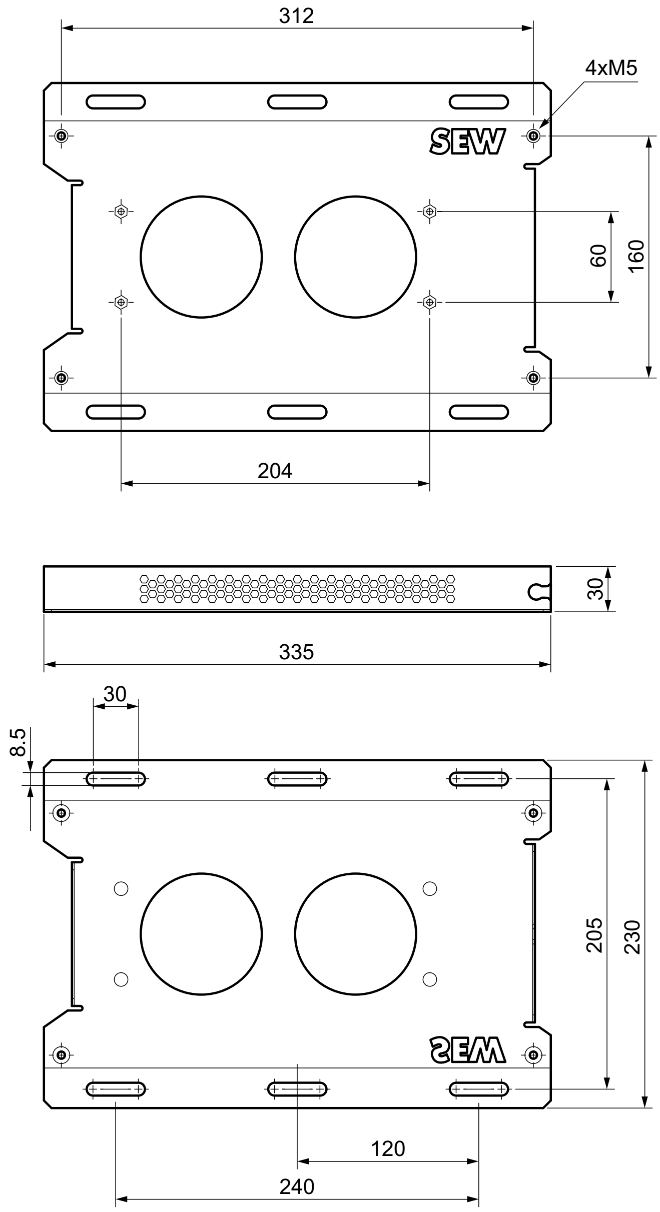
4.23 Dimension drawing of M31 mounting panel

4.23.1 Dimension drawing of the M31 mounting panel

The following figure shows the dimensions of the M31 mounting panel.



9007234050307211

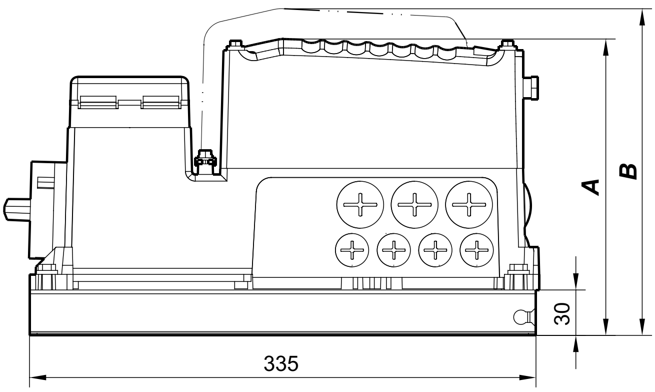
All dimensions in mm.

4.23.2 Dimension drawing of the M31 mounting plate on MMF31../M31/EBW design

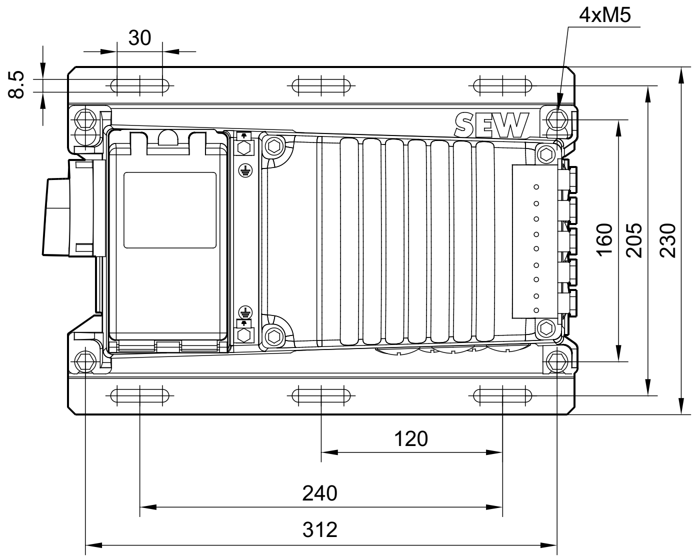
The following figure shows the dimensions of the M31 mounting panel on the MMF31../M31/EBW design.

MM31..-0020
MM31..-0025
MM31..-0032
MM31..-0040
MM31..-0055

80 004 01 23



	MMF31..-0020	MMF31..-0040
	MMF31..-0025	MMF31..-0050
	MMF31..-0032	-
A	198	-
B	-	218



9007234050310155

All dimensions in mm.

The figure shows an example of the cable entry on position 3.

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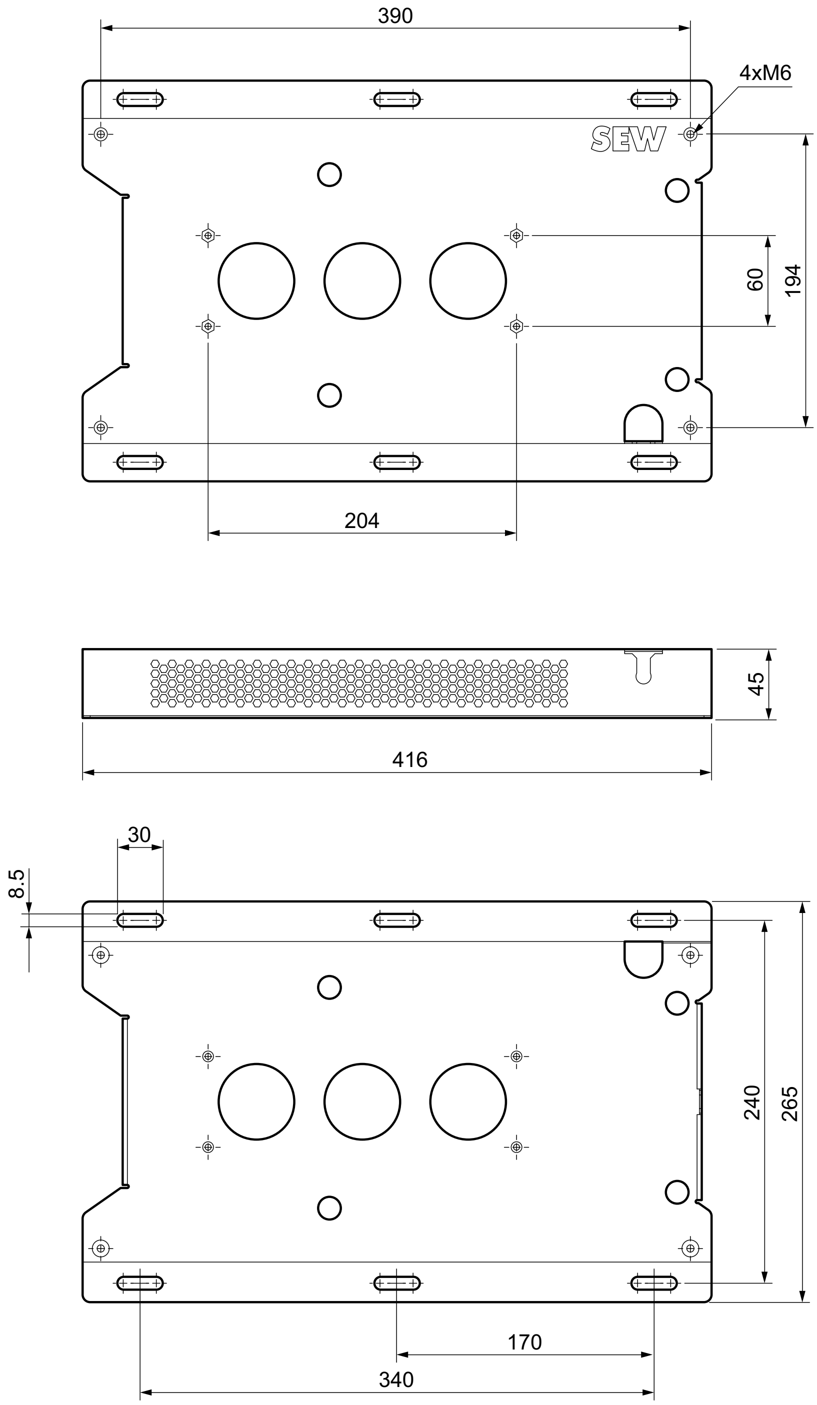
4.24 Dimension drawings of the M32 mounting panel

4.24.1 Dimension drawing of the M32 mounting panel

The following figure shows the dimensions of the M32 mounting panel.



45246553355

All dimensions in mm.

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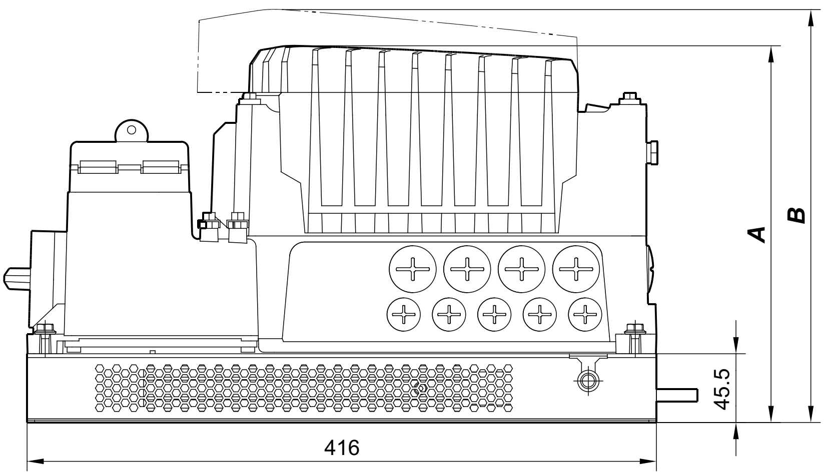
4.24.2 Dimension drawing of the M32 mounting plate on MMF32../M32/EBW design

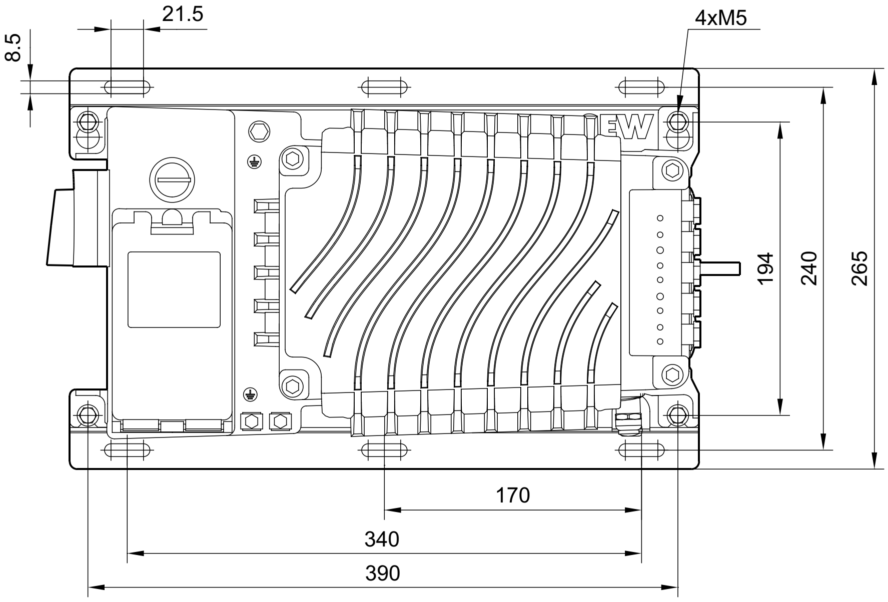
The following figure shows the dimensions of the M32 mounting panel on the MMF32../M32/EBW design.

80 003 01 23

MM32..-0070
MM32..-0095
MM32..-0125
MM32..-0160



	MMF32..-0070 MMF32..-0095	MMF32..-0125 MMF32..-0160
A	250	-
B	-	275



45246548491

All dimensions in mm.

The figure shows an example of the cable entry on position 3.

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5 Configuration of the drive unit

5.1 Preliminary information

INFORMATION

Data may differ due to continuous product development.

5.2 SEW-Workbench

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

All necessary configurations can be processed, from entering the application to gear unit, motor and inverter calculations. Other features are optimization of various axis cycles, including accessory selection, and a check for errors regarding dimensioning for the entire drive system.

Of course, the SEW-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 dimensioning 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:

- The choice of application
- Gear unit and motor calculation
- Price-optimized configuration
- Comparison of different solutions
- Inverter calculation
- Multi-axis optimization
- Parameterization of cable and accessories selection
- Dimensioning fault check
- Creating parts lists
- Electronic catalog with all products

The planning and 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 products and functions are continuously updated.

5.3 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 inverter.

Required information about the machine to be driven
- Technical data and ambient conditions.
- Positioning accuracy
- Speed setting range
- Calculating the travel cycle

↓

Calculate the relevant application data
- Travel diagram
- Rotational speeds
- Static, dynamic torques
- Regenerative power

↓

Gear unit selection
- Defining gear unit type, gear unit size, gear unit ratio, and gear unit design.
- Checking the positioning accuracy.
- Checking the gear unit load.
- Checking the 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.)

↓

Inverter selection
- Selecting the communication variant
- Selecting the safety feature.
- Determining the control mode
- Motor/inverter assignment
- Check if the inverters fulfill the duration and overload requirements.

↓

Select the braking resistor
- Checking if the braking resistor fulfills the duration and overload requirements.
- Observe braking resistor assignment.

↓

Select other system components
- Motor and supply system cables
- Signal and encoder cables
- EMC accessories

↓

Selecting the 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.

5.4 Control mode

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

5.4.1 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 motor; 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 mode 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 not possible. An acceleration and torque precontrol is not possible either.

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5.4.2 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 and synchronous reluctance motors[1)]

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.

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).

1) In preparation.

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 speed 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, stable stationary operation at a stator frequency of 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.

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5.4.3 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.

5.4.4 ELSM®

The ELSM® control mode enables operation of permanent-field synchronous motors without an 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 can deliver at least 150% I_0 of the motor.

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.

Speed control

For operation of synchronous motors in the ELSM® control mode, there are 2 modes, i.e. open-loop and closed-loop operation.

Open-loop operation is active when starting from an idle state 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 idle state and at low speeds.

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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.

5.4.5 Characteristics of the control modes

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	✓ 1)	✓		✓		✓
Torque control	–	✓		✓		✓
Positioning	–	–	✓	✓		–
Flying start	– 2)	✓		✓		✓
Typical applications	Group drives, 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

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Characteristic values for dynamics

	V/f	VFC^PLUS	CFC	ELSM®
Torque control time	–	≥ 2 ms[1]	≥ 150 µs	
Time constant speed controller	–	≥ 4 – 6 ms	≥ 2 ms	≥ 6 ms
Rotational 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 bit (0.001% M_{NMot})		
Rotational speed	32 bit (0.0001 min^{-1})			
Position (increment/revolution)	–	16 bit		–
Position (increment absolute)	–	32 bit		–

Characteristic values for accuracy of torque and speed

	VFC^PLUS without encoder		VFC^PLUS with encoder	
	Motor temperature sensor		Motor temperature sensor	
	without	with	without	with
Accuracy of the calculated torque	depends on the accuracy of the motor parameters **INFORMATION:** The more accurate the motor parameters, the more accurate the torque. For greater torque accuracy, measure the motor parameters with FCB25.			
Deviation with FCB25	< 5% M_N			
Typical deviation	< 10% M_N			
Maximum deviation[1]	< 15% M_N		< 25% M_N	< 15% M_N

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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Recommended maximum output frequency

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

FCBs that can be activated for selected control mode

FCB	Designation	U/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	Position control	–	✓	✓	–
10	Interpolated position control	–	✓	✓	–
12	Reference travel	–	✓	✓	✓
18	Rotor position identification	–	–	✓	–
19	Position hold control	–	✓	✓	–
20	Jog	–	✓	✓	–
21	Brake test	–	✓	✓	–

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5.5 FCB concept

FCB = Function control block

The FCB concept describes the modular firmware design of inverters from the MOVI-C® modular automation system with which it is ensured 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 takes place 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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5.5.1 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 the "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 setup mode without a 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 condition for speed control. The actual speed setpoint for the drive controller is generated in the controller cycle with the specified limit values by a profile generator integrated in the inverter.

FCB 06 Interpolated speed control

FCB 06 is used for cyclic 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 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 with the specified limit values by a profile generator integrated in the inverter.

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 cyclic torque setpoint inputs from a higher-level controller.

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 normally does not 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 intermediate values (interpolate) 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 the following positioning modes:

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 this travel range is exceeded after conversion, the FCB issues a fault.

Relative positioning

The position setpoint in user units is interpreted as the offset for the last setpoint that was transferred. After it has been converted into system units, it is added to the last setpoint.

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

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."

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If the position setpoint is outside this range, a fault is issued.

The drive always turns in a positive direction to reach the target.

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, a fault is issued.

The drive always turns in a negative direction to reach the new target.

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."

If the position setpoint is outside this range, a fault 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 from higher-level controllers.

In multi-axis applications, a higher-level controller usually calculates a track profile for several drive axes. The axis only receives setpoints (position, speed, torque, torque limits, precontrol values, inertia), which it must follow directly. The axis limits the setpoints using the application limits. 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 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 – positive limit switch

7: Reference cam flush – negative limit switch

8: Referencing to reference travel

9: Fixed stop positive

10: Fixed stop negative

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.

FCB 14 Emergency stop

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

The emergency stop deceleration should always be greater than or equal to the "Application limit deceleration". If a smaller deceleration value than the "Application limit deceleration" is specified for the emergency stop deceleration, the "Application limit deceleration" is used as the emergency stop deceleration.

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 separated from the load, i.e. also from the gear unit.

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

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FCB 19 Position hold control

When FCB 19 is activated, the drive stops with speed control. After the drive reaches an idle state, the position is kept with position control as long as FCB 19 is active.

FCB 20 Jog mode

FCB 20 is used for the 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 a 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 a higher-level controller, use the manual mode of the MOVISUITE® engineering software, see "FCB 04 Manual mode" (→ 🗎 113).

FCB 21 Brake test

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 various requirements. The test result "passed" (test result OK) or "failed" (test result not OK) 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 that matches the used VFC^{PLUS} or CFC control mode is required.

When testing a brake, the integrated brake control is used.

For testing 2 brakes, you can only use the /BES brake control in conjunction with additional external wiring.

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.

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.

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 up 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. Unlike the other stop FCBs (FCB 13/FCB 14), 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 deselected. This makes it possible to always stop in a position-controlled manner.

In position-controlled mode, FCB 26 has lag error monitoring.

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

5.5.2 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	–	–	–	–	✓	✓	–
Speed	✓	✓	–	–	–	o	o
Torque	–	–	✓	✓	–	–	–
Acceleration precontrol	–	o	–	–	–	o	–
Mass moment of inertia	–	o	–	✓	–	o	–
Torque precontrol	–	o	–	✓	–	o	–
Correcting value of external position controller	–	o	–	–	–	–	–

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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	–	–	–	✓	✓	✓	–	–	–	–	–
Maximum negative speed	–	–	–	✓	✓	✓	–	–	–	–	–
Maximum acceleration	–	✓	–	–	–	✓	–	–	–	o	–
Maximum deceleration	✓	✓	–	–	–	✓	–	–	–	o	✓
Jerk time	–	✓	–	✓	–	✓	–	–	–	o	✓
Maximum torque Q1 to Q4	–	✓	✓	✓	✓	✓	✓	o	o	–	–

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	–	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–	✓	–	–
Negative speed	–	✓	✓	✓	✓	✓	✓	✓	✓	–	–	–	✓	–	–
Acceleration	–	✓	✓	–	–	–	✓	–	✓	–	–	✓	✓	–	–
Deceleration	✓	✓	✓	–	–	–	✓	–	✓	✓	–	✓	✓	o	✓
Jerk time	✓	✓	✓	–	✓	–	✓	–	✓	✓	✓	✓	✓	o	✓
Torque	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	o	✓
Apparent output current	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Voltage limit	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Emergency stop deceleration	–	–	–	–	–	–	–	–	–	–	✓	–	–	–	–

5.6 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.

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.

5.6.1 General requirements for motors

Motors that can be connected

Motors that can be connected include:

- Asynchronous motors
- Permanent-field synchronous motors
- Synchronous reluctance motors
- with and without motor encoder

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 from 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} from the supply cable 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 inverters pulse the DC voltage of the DC link V_{DC} from the supply cable to the motor. At SEW-EURODRIVE, the pulsed voltage supply is available with 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 from SEW-EURODRIVE, their suitability must be checked.

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Thermal motor protection

Thermal motor protection avoids overheating and, therefore, prevents irreparable damage 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-EURODRIVE 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

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, 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 due to one sensor per motor phase.
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 shows the prerequisites that must be met in order to be able to use thermal motor protection without a temperature sensor:

Category	Prerequisites
Motor series	DRN.., DR2S..
Motor size	63 – 132M
Number of poles	4

Boundary conditions

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

Category	Boundary conditions
Type of cooling	fan-cooled
Ambient temperature	-20 – 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 a 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.

The thermal motor protection without temperature sensor has no memory, i.e. it does not take the current motor temperature into account after a switch-on/switch-off process. Consequently, avoid subjecting an overheated motor to another overload immediately by switching the inverter off and on. SEW-EURODRIVE recommends performing a fault reset in the event of a fault message of the thermal motor protection without temperature sensor, instead of switching on or off.

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5.6.2 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. Operation of a group drive is only possible in the U/f operating mode.

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 by 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.

Observe the maximum number of motors that can be connected in parallel, see I_{tot} = maximum permitted sum of the connected motor cables in chapter "Permissible cable length for group and multi-motor drives" (→ 🗎 124). Maximum number of motors that can be connected in parallel = 3.

Selection of brakes for group drives and multi-motor drives

For group and multi-motor drives, the brake coils are connected electrically in parallel and controlled by the inverter.

Observe the following technical data:

- The nominal voltages of the brakes must be identical.
- The sum of the holding currents of the brakes connected in parallel must be ≤ than the nominal current of the brake control.
- The sum of the accelerator currents of the brakes connected in parallel must be ≤ than the maximum output current of the brake control.
- The operating mode of the HV brake control /B must be set to "Voltage control".

When using AC brakes, SEW-EURODRIVE recommends brakes with a nominal voltage ≥ AC 400 V. This reduces the current load of the HV brake control /B.

Temperature evaluation for group and multi-motor drives

Observe the following additional notes for group and multi-motor drives:

- 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.

Permissible cable length for group and multi-motor drives

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

$$l_{tot} = 15 \text{ m}$$

l_{tot} = Maximum total sum of connected motor cables.

5.6.3 Connection of the motors for group drives or multi-motor drives

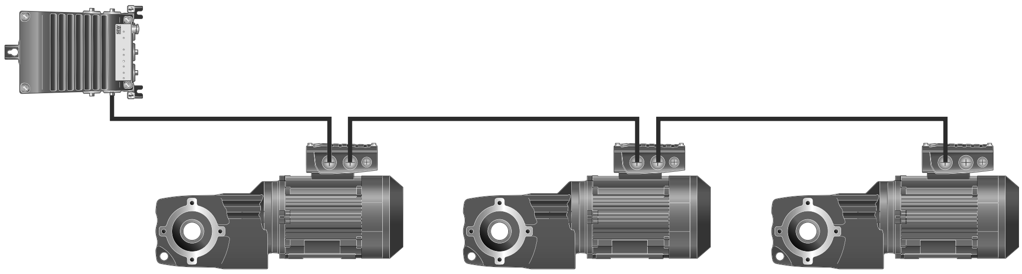
For group or multi-motor drives, SEW-EURODRIVE recommends looping the motor cables through the motor terminal box (DAISY CHAIN installation).

Observe the following information:

- Connect the motor phases of the individual motors in parallel.
- Connect the connection cores of the individual brake coils in parallel.
- Connect the temperature sensors in series.

Make sure that you do not exceed the permitted total length of all motor cables connected to the inverter (sum of all individual cables).

The following figure shows the basic connection of the motors for group and multi-motor drives:



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5.6.4 Connecting explosion-protected AC motors

Observe the following information:

- Install the inverter outside 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 2014/34/EU or IEC 60079.
- In connection with the HV brake control /B, the brake control must be set to "voltage control" because choppers in the brake coil is not permitted.
- The sensor input of the motor's temperature monitoring must not be used in potentially explosive atmospheres. 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 further information, refer to the associated catalogs and the operating instructions of the explosion-protected motors.

5.6.5 General requirements for encoders

Applicable motor encoders from SEW-EURODRIVE

The following overview shows the motor encoders that can be used. For the corresponding encoder cables, refer to the description of the respective plug connector.

Encoder designation	Interface/signal type	Interface on the inverter
A...Z, E..Z	MOVILINK® DDI	X16[1)] or X2104[2)]
EI7C-FS[3)]	HTL (Functional Safety)	X3301[4)]

1) The X16 plug connector is only available in the /CO unit design.
2) Optional hybrid motor connector
3) Only for DFC and DSI communication variants
4) The X3301 plug connector is only available with the /SLA or /SSA option.

The encoder resolution of incremental encoders influences the control quality of speed and position control.

Motor and encoder with electronic nameplate (MOVILINK® DDI)

Electronic nameplates can only be evaluated with encoders and motors from SEW-EURODRIVE.

The advantages of the electronic nameplate are:

- Complete and correct identification of motor and gear unit
- Automatic data input
- Easy drive identification, even with drives that are difficult to access
- Significant time savings during startup
- Optional transmission of other drive information such as temperature or vibration data of the motor

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5.7 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.

5.7.1 Thermal limit characteristic curve

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

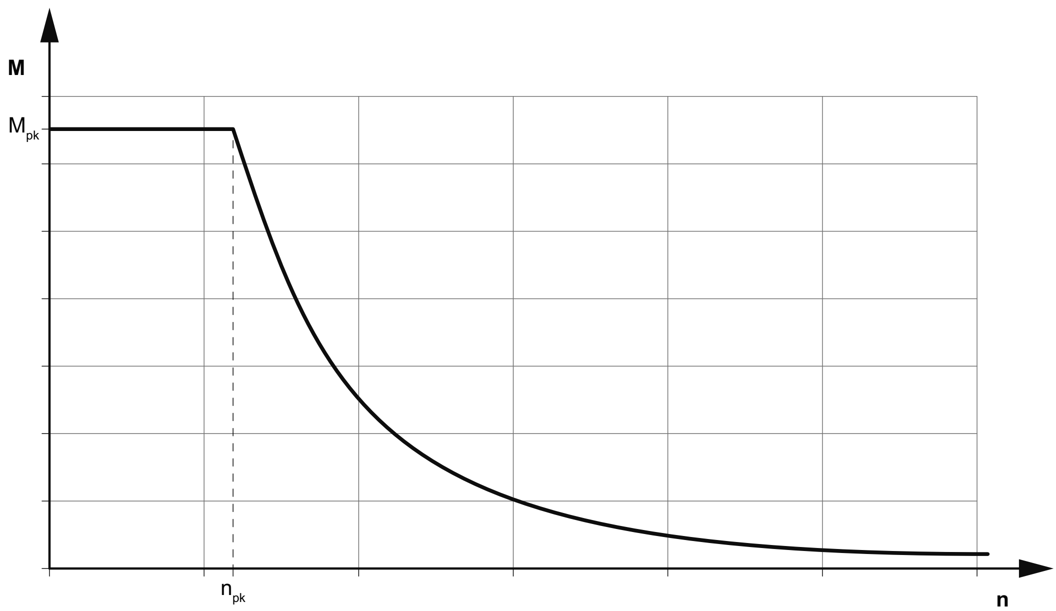
5.7.2 Dynamic limit characteristic curve

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_{pk} and n_{pk} depend on the motor/inverter combination. The values for M_{pk} and n_{pk} in the VFC^{PLUS}, CFC, ELSM® control modes can be found on the website sew-eurodrive.de.

Typical dynamic limit characteristic of an asynchronous motor in the VFC^{PLUS}/CFC control mode



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M_{pk} Maximum torque for the motor-inverter combination

n_{pk} Rotational speed until the maximum torque M_{pk} of the motor-inverter combination is available.

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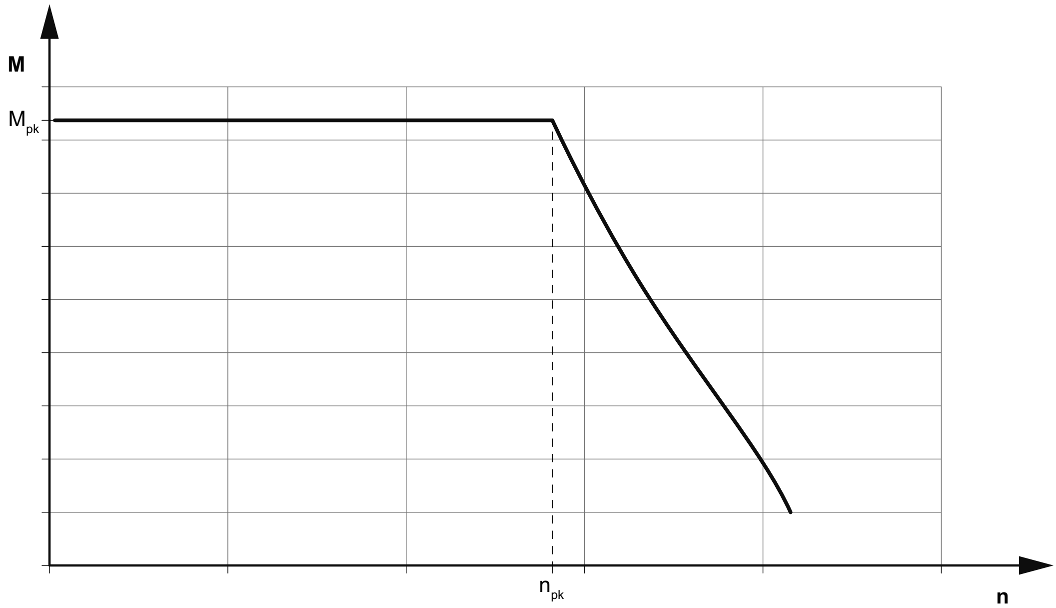
Typical dynamic limit characteristic of a synchronous motor in CFC control mode



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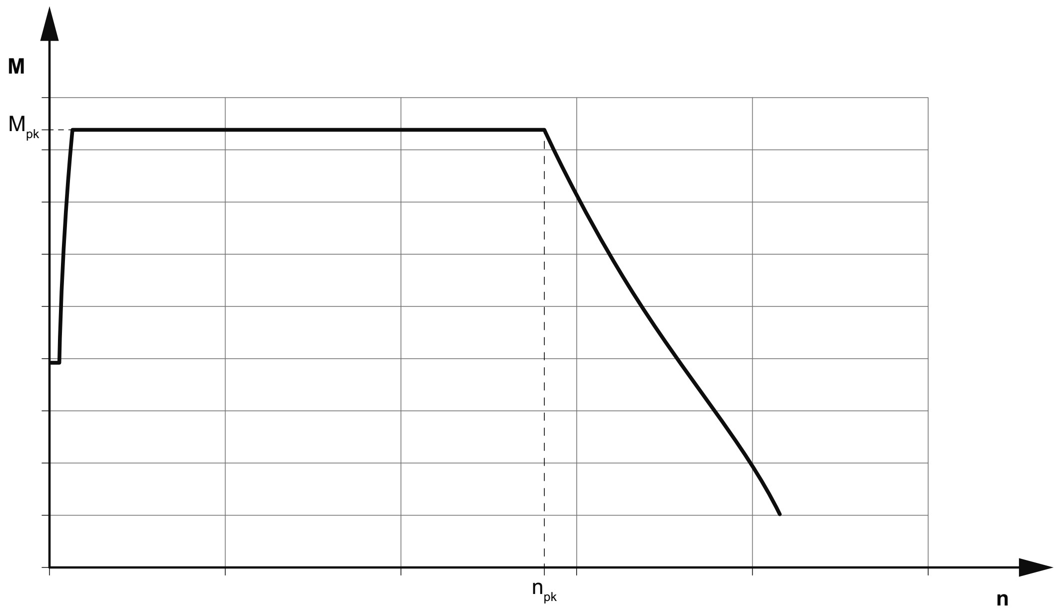
M_{pk} Maximum torque for the motor-inverter combination
n_{pk} Rotational speed until the maximum torque M_{pk} of the motor-inverter combination is available.

Typical dynamic limit characteristic of a synchronous motor in ELSM® control mode



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M_{pk} Maximum torque for the motor-inverter combination
n_{pk} Rotational speed until the maximum torque M_{pk} of the motor-inverter combination is available.

5.7.3 Motor selection for asynchronous motors

In this case, the mechanical resistance of the motor against the overload, which might exceed the permitted threshold values, must always be checked.

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

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.

Asynchronous motors in VFC^{PLUS} control mode

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

- Motoring operation: 1% of the asynchronous motor nominal speed
- Regenerative operation: 10% of the asynchronous motor nominal speed

Asynchronous motors in U/f control mode

The U/f control mode is intended for easy open-loop 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.

Control mode 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.

Control mode is suitable for multi-motor drives.

Slip compensation may only be activated with rigidly coupled drives.

Speed control

The U/f control mode is an encoder-less mode and calculates the actual speed value. The calculation is always based on the electrical values of the motor. 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 control mode based on stator frequency and slip is issued as the actual speed.

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

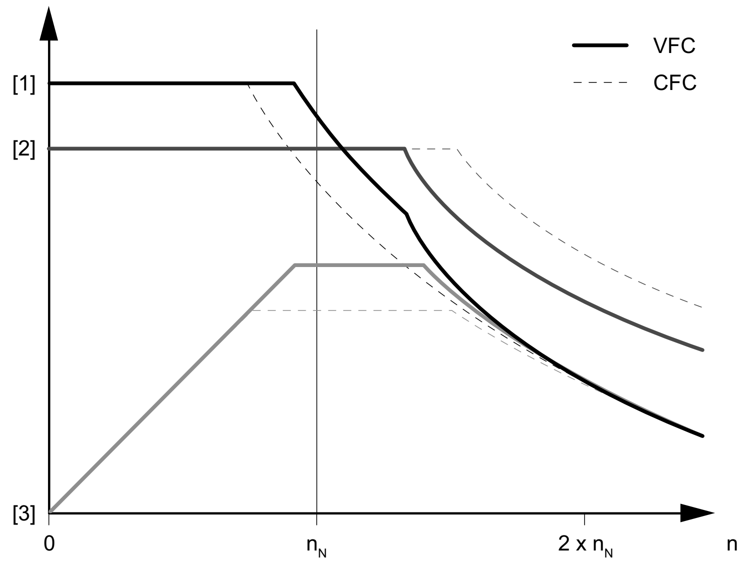
Asynchronous motors in control mode CFC

Either standard asynchronous motors (e.g. DRN.. motors) or asynchronous servomotors (e.g. DR2L../DRL.. motors) can be used in the CFC control mode. A prerequisite for the CFC operating modes is that the motor must always be equipped with an encoder.

Standard asynchronous motors in control mode CFC

In comparison to the VFC^{PLUS} control mode, 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 the VFC^{PLUS} operating mode. 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 n_N Nominal speed

Asynchronous servomotors in control mode CFC

DRL../DR2L.. series asynchronous servomotors have such a high-quality mechanical design to allow dynamic overload values to be achieved that exceed the values of the standard asynchronous motor 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}

Do not configure the maximum speed of the motor higher than 1.4 times the base speed.

5.7.4 Motor selection for synchronous motors

The demands made on a servo drive include speed dynamics, stable speed, and positioning accuracy. As a rule, the synchronous servomotors and the corresponding inverters are designed for a high short-time overload. This allows a multiple of the nominal torque.

Synchronous motors in CFC control mode

Technically speaking, these are synchronous motors with permanent magnets on the rotor and an integrated encoder. The mass moment of inertia of the synchronous motor is lower than that of the asynchronous motor. For this reason, these motors are optimally suited to applications requiring dynamic speeds.

Do not configure the maximum speed higher than the rated speed of the motor.

SEW-EURODRIVE recommends a PWM frequency of 8 kHz or 16 kHz for the following motors:

- 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)

Synchronous motors in ELSM® control mode

For operation of synchronous motors in the ELSM® control mode, there are 2 modes, i.e. open-loop and closed-loop operation.

Open-loop operation is active when starting from an idle state and below a transition speed. The transition speed is about 2% of the nominal speed. In this range, the available torque is limited. In open-loop control, the rated output current of the inverter is 1.5 times the standstill current I_0 of the connected motor, regardless of the load. It is therefore necessary to check whether the inverter can also provide this current at low output frequencies. Check whether the thermal characteristics of the motor are suitable for this. Permanent operation below the transition speed is not permitted.

Above this transition speed value, the drive is operated in closed-loop operation. In closed-loop control, the usable torque depends on the motor as well as on the motor-inverter combination.

The values for the transition speed, base speed and maximum dynamic torque in open-loop and closed-loop control can be found in the speed-torque characteristics. For motor/inverter characteristic curves, refer to the SEW-EURODRIVE website.

The ELSM® control mode allows dynamic use of the entire speed range of the drive. Reversing and moving through the speed 0 are also possible.

Do not configure the maximum speed higher than the rated speed of the motor.

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

SEW-EURODRIVE recommends a PWM frequency of 8 kHz or 16 kHz for the following motors:

- 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)

5.8 Motor/inverter characteristic curves

The motor/inverter characteristic curves apply to the edition of these operating instructions. You can find further motor/inverter characteristic curves on the website sew-eurodrive.de under "Online support" > "Engineering & selection" > "Motor/inverter characteristic curves".

5.9 Selecting an inverter

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 a higher 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 the power semiconductors and the heat sink. Dynamic utilization monitors the permitted temperature of the barrier layer of the power semiconductors.

- Thermal 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 sub-chapters.

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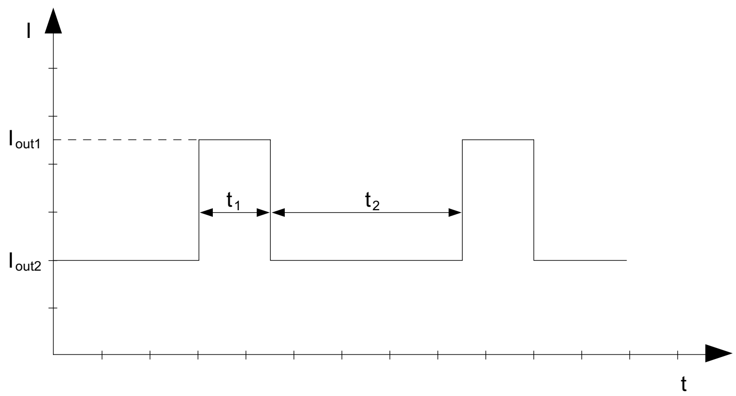
5.9.1 Overload capacity

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

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



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Overload capacity at f_{PWM} = 4 kHz, f_A ≥ 3 Hz

Overload current $I_{out\,1}/I_N$	Overload time t_1	Base load current $I_{out\,2}/I_N$	Required pause interval t_2	Base load current $I_{out\,2}/I_N$	Required pause interval t_2
150%	3 s	25%	2 s	50%	2.5 s
200%	3 s	25%	6.5 s	50%	8.0 s
250%	3 s	25%	12.5 s	50%	15 s
350%	3 s	25%	20.5 s	50%	24.5 s

5.9.2 Power reduction factors

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

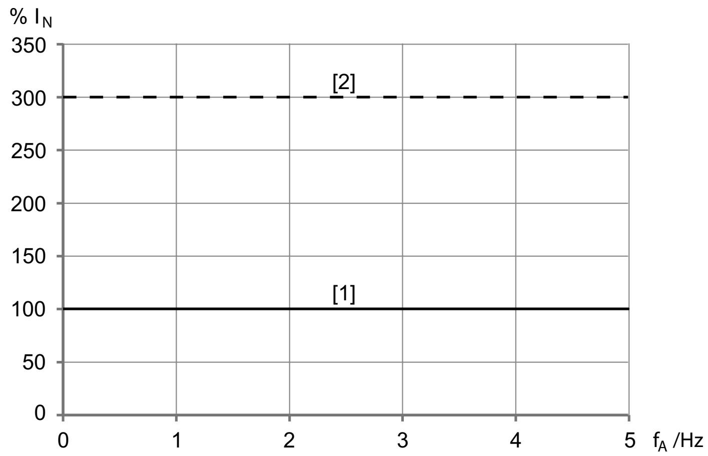
Derating due to the rotary field frequency

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.

The following characteristic curves show the required derating depending on the output frequency f_A of the various electronics covers:

Electronics cover size 1, $I_N \leq 4.0$ A

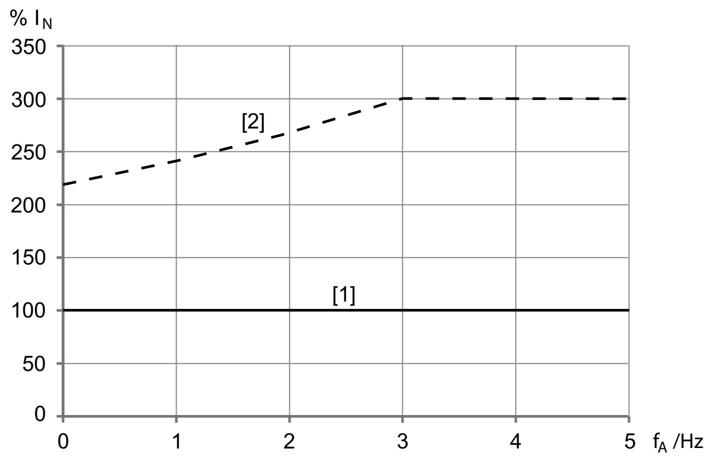


48637660299

[1] Continuous output current I_{cont} at the smallest possible PWM frequency
[2] Temporally limited overload current[1)]

1) Configure the overload current in the SEW Workbench.

Electronics cover size 1, $I_N = 5.5$ A



48637898123

[1] Continuous output current I_{cont} at the smallest possible PWM frequency
[2] Temporally limited overload current[1)]

1) Configure the overload current in the SEW Workbench.

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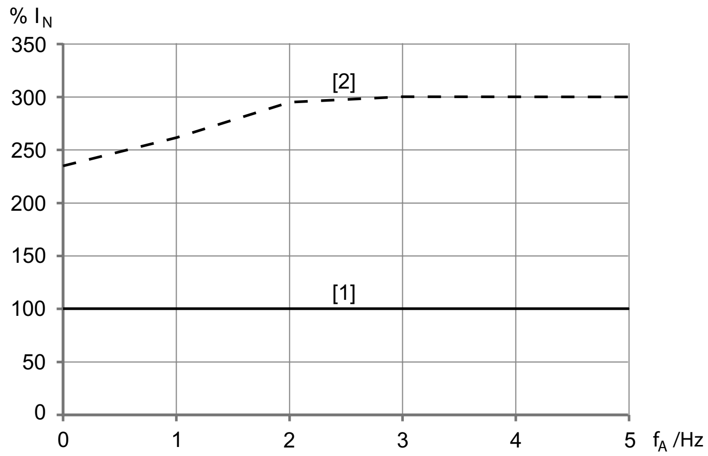
Electronics cover size 2, $I_N \leq 9.5$ A

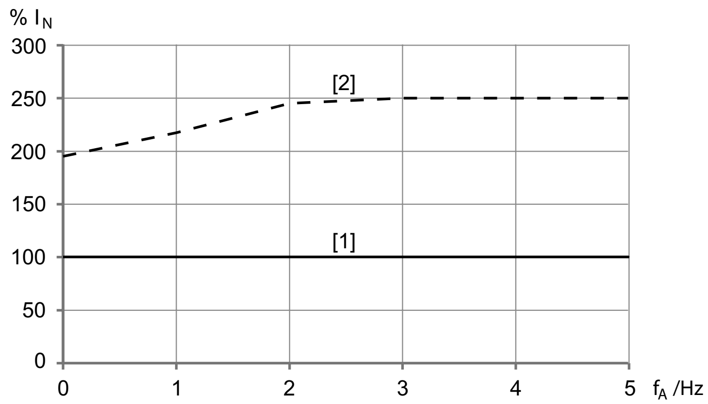


48639185803

[1] Continuous output current I_{cont} at the smallest possible PWM frequency
[2] Temporally limited overload current[1)]

1) Configure the overload current in the SEW Workbench.

Electronics cover size 2, I_N = 12.5 A

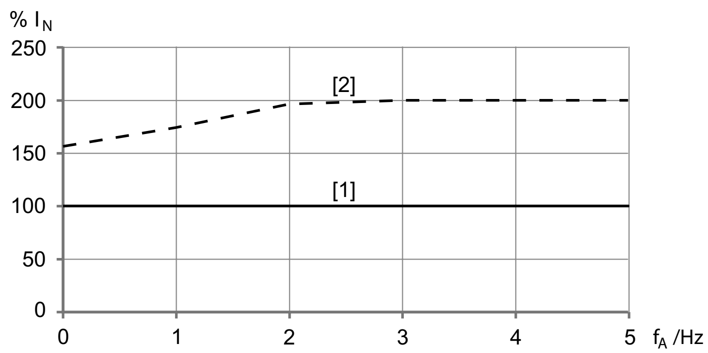


48639193867

[1] Continuous output current I_{cont} at the smallest possible PWM frequency
[2] Temporally limited overload current[1)]

1) Configure the overload current in the SEW Workbench.

Electronics cover size 2, I_N = 16.0 A



48639880715

[1] Continuous output current I_{cont} at the smallest possible PWM frequency
[2] Temporally limited overload current[1)]

1) Configure the overload current in the SEW Workbench.

Observe the overload capacity of the device according to chapter "Output" (→ 🗎 32).

Derating due to the installation altitude

Frequency inverters by SEW-EURODRIVE 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.

No restrictions apply to altitudes < 1000 m.

The following restrictions apply to altitudes ≥ 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, an overvoltage protection device must be connected upstream to reduce the overvoltages from category III to category II.

Derating due to the ambient temperature

Observe the additional derating as described in chapter "Technical data" > ... > "Derating depending on the ambient temperature" (→ 🗎 35).

5.10 Selecting the braking resistor

5.10.1 General Information

Using a braking resistor is only required if generator mode is reached during operation. A braking resistor is not required if the device is operated solely in motor mode.

Using a braking resistor is only required if generator mode is reached during operation. A braking resistor is not required if the device is operated solely in motor mode.

5.10.2 Derating due to the ambient temperature

The following derating applies at ambient temperatures of > 40 °C:

- Reduction of the continuous power by 4% per 10 K
- Reduction of the tripping current by 2% per 10 K

Do not exceed a maximum ambient temperature of 60 °C.

5.10.3 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 selection parameters in the following sections are the basis for selecting the braking resistor.

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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.

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

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cdf	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 OF" and the cyclic duration factor cdf.

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
n	Number of braking sections

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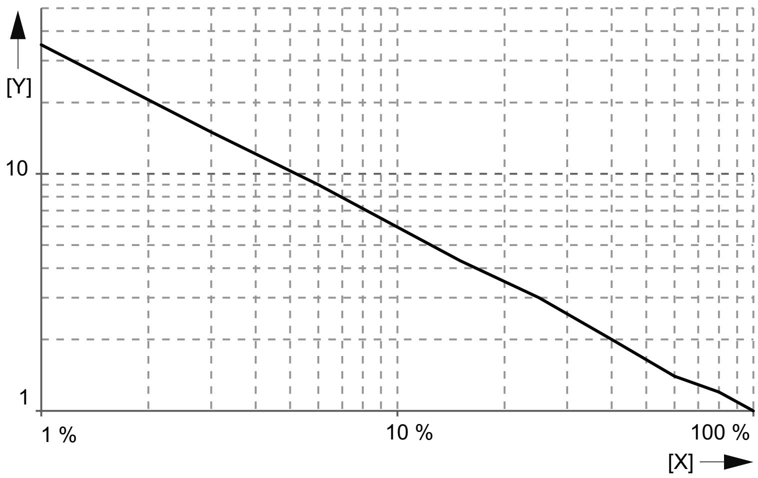
$P_{100\%cdf}$	Braking power at 100% cdf
P_B	Average braking power
k	Overload factor

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 OF

Flatpack resistors



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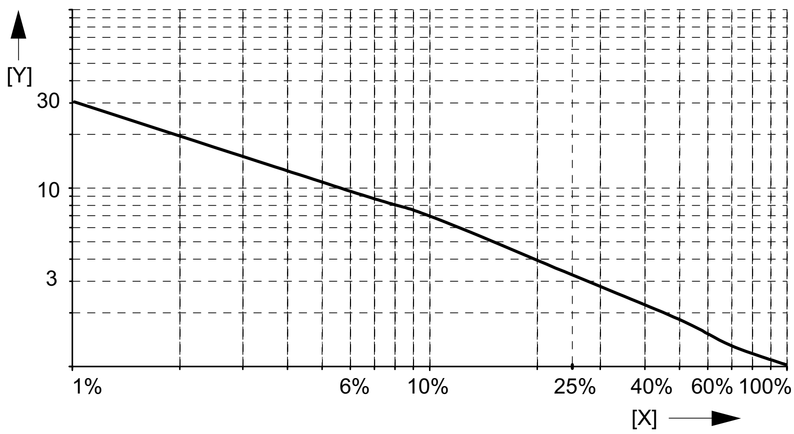
X	Cyclic duration factor in % (cdf)
Y	Overload factor k (OF)

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

Wire resistors, frame resistors



43742214923

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

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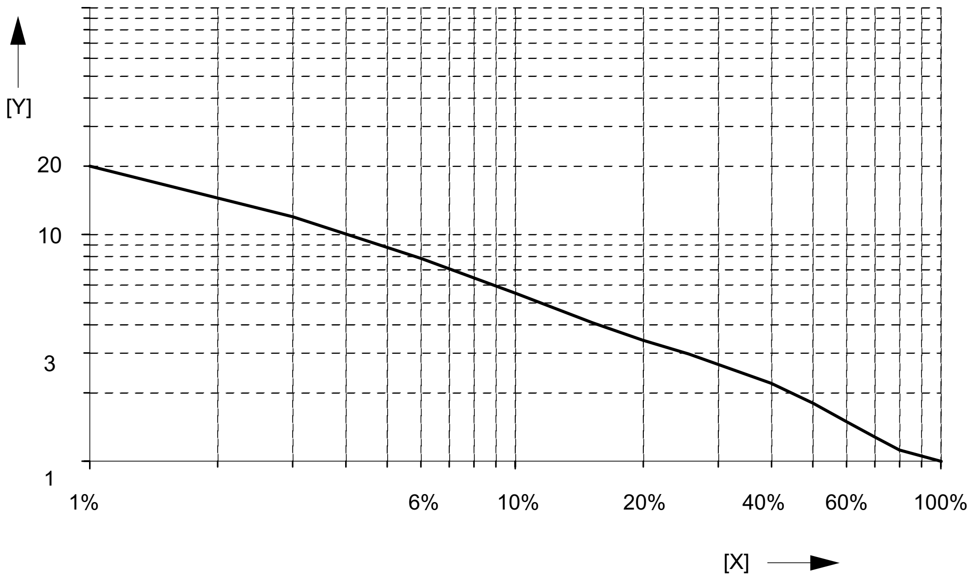
Grid resistors



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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	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:

$$P_{\text{max}} = \frac{V^2_{\text{DCL max}}}{R \times 1.4}$$

P_{max}	Maximum peak braking power that the braking resistor can absorb
V_{DCL_max}	Maximum DC link voltage: • 980 V for 400 V units
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 chapter "Braking resistors".

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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 chapter "Technical data" (→ 🗎 28). 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.

5.10.4 Calculation example

Given

- Peak braking power: 1 kW
- Average braking power: 0.4 kW
- Braking time: 7 s
- Cycle duration: 28 s

Required

- Braking resistor BW...

Calculation

1. **Determining 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" > "Braking resistors" > ... > "Assignment" (→ 🗎 57).
2. **Determine the overload capacity**

   Determining the overload factor, e.g. for a flatpack resistor at a cyclic duration factor cdf of 25% from the respective diagram.
   - Overload factor OF = 3.0
3. **Calculating the braking power at 100% cdf**
   - Braking power 100% cdf = average braking power/overload factor
   - Braking power 100% ED = 0.4 W/3.0 = 0.133 kW
   - The braking power of the braking resistor at 100% cdf must be ≥ 0,133 kW.
4. **Selecting the braking resistor**
   - For MOVIMOT® flexible, the minimum permitted braking resistance value = 100 Ω, see chapter "Technical data" > "Braking resistors BW.../BW...-T" (→ 🗎 55).
   - Selected braking resistor: BW100-005/K1.5
   - Resistance value R_{BR} = 100 Ω
   - Peak braking power: 1.8 kW
   - Current-carrying capacity at 100% cdf: 0.2 kW

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5.10.5 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 V_0/V = 450 V/750 V.

The maximum permitted cable length between the inverter and the braking resistor is 15 m.

The temperature resistance of the braking resistor cables must be ≥ 90 °C.

5.10.6 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.

5.10.7 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.

5.11 Supply system cables and motor cables

5.11.1 Supply system cable

The supply system cable is generally dimensioned system-specifically and depends on the design of the line connection. The structure of a line connection is described in chapters "Terminal assignment .." and "Permitted cable cross section of the terminals". Observe the country-specific and system-specific regulations when selecting the cross section of the supply system cable.

5.11.2 Recommended cross section for nominal operation

Dimension the cross section of the supply system cable based on the nominal line current I_{line}. Refer to the data in chapter "Technical data" (→ 🗎 28).

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5.12 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.

5.13 Line components

5.13.1 Line contactor

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

For further information, refer to chapter "Using the line contactor" (→ 🗎 210).

5.13.2 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 choice of line filter depends on the nominal line current and the line voltage of the inverter.

5.13.3 ND.. line choke

The ND.. line chokes can be used optionally:

- 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)

5.13.4 Residual current device

For further information, refer to chapter "Electrical installation" > "Installation instructions" > "Selecting the residual current device".

5.14 24 V supply voltage selection

5.14.1 Description

The device has an internal 24 V voltage supply that can also be supported externally.

If the device is supported by an external supply, the entire 24 V supply is provided by the external power supply unit.

5.14.2 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 inverter. The 24 V voltage supply must provide the sum of all powers.

INFORMATION

The power peaks during switch-on (caused by internal capacitances present in the devices) must not be taken into consideration as those capacitances are very small. Commercially available switched-mode power supplies can reliably switch on the maximum occurring capacities.

5.14.3 Power consumption of the 24 V supply

For technical data of the 24 V supply, refer to chapter "DC 24 V supply" > "Configuration" (→ 🗎 37) "Configuration".

5.15 Energy-saving functions

5.15.1 Flux optimization

Flux optimization is a function that allows operation of an asynchronous motor in VFC^{PLUS} control mode 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%.

5.15.2 Standby mode

The energy-saving function standby operation is designed for periods in which the operation is paused.

If necessary, activate standby operation with a binary input or a bit of the control word.

Switching from standby operation to operation takes only approx. 500 ms. This is the main difference to switching off the DC 24 V supply voltage. This short changeover time reduces energy consumption even in short pauses.

The following functions are deactivated in standby mode:

- Power section control
- Fan of the power heat sink (if present)
- Binary outputs
- STO function
- CBG functions (display: "standby operation")
- Changing parameters
- Updating the firmware
- Reset to delivery state
- Drive and motor startup
- Optional:
  - Switch off the supply of the encoder and the safety card
  - Encoder evaluation

The bus communication remains active without restrictions in standby operation.

5.16 UL-compliant installation

INFORMATION

Due to UL requirements, the following chapter is always printed in English and French, regardless of the language of this documentation.

Observe the following notes for UL-compliant installation:

The devices are for use only in industrial machinery NFPA 79 applications.

For use in a Pollution Degree 1 or Pollution Degree 2 environmental only.

5.16.1 Field Wiring Power Terminals

- Use 75 °C copper wire only.
- Tighten terminals to 17.7 – 21.24 in-lbs (screw connect terminals only).

5.16.2 Short Circuit Current Rating

Suitable for use on a circuit capable of delivering not more than 65,000 rms symmetrical amperes (models with maintenance switch not more than 5,000 rms) when protected by when protected by 600 V maximum non-semiconductor fuses (Class CA, CB, CD, CF, G, J, K-1, K-5, RK1, RK5, T) or when protected by 500 V maximum inverse time circuit breakers having an interrupting rating not less than 65 kA rms symmetrical amperes..

Suitable for motor group installation on a circuit capable of delivering not more than 65,000 rms symmetrical amperes (models with maintenance switch not more than 5,000 rms) when protected by 600 V maximum non-semiconductor fuses (Class CA, CB, CD, CF, G, J, K-1 , K-5, RK1, RK5, T) or when protected by 500 V maximum inverse time circuit breakers having an interrupting rating not less than 65 kA rms symmetrical amperes.

The max. voltage is limited to 500 V.

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5.16.3 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.

WARNING - The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electric shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.

ATTENTION - LE DÉCLENCHEMENT DU DISPOSITIF DE PROTECTION DU CIRCUIT DE DÉRIVATION PEUT ÊTRE DÛ À UNE COUPURE QUI RÉSULTE D'UN COURANT DE DÉFAUT. POUR LIMITER LE RISQUE D'INCENDIE OU DE CHOC ÉLECTRIQUE, EXAMINER LES PIÈCES PORTEUSES DE COURANT ET LES AUTRES ÉLÉMENTS DU CONTRÔLEUR ET LES REMPLACER S'ILS SONT ENDOMMAGÉS. EN CAS DE GRILLAGE DE L'ÉLÉMENT TRAVERSÉ PAR LE COURANT DANS UN RELAIS DE SURCHARGE, LE RELAIS TOUT ENTIER DOIT ÊTRE REMPLACÉ.

For maximum branch circuit protection see table below.

SCCR: 65 kA/500 V 5 kA/500V (devices with maintenance switch) when protected by	
Non-semiconductor fuses (currents are maximum values)	Inverse time circuit breakers (currents are maximum values)
40 A max./600 V	40 A max./500 V min.

5.16.4 Motor Overload Protection

The devices 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.

5.16.5 Surrounding Air Temperature Rating

The devices are suitable for an ambient temperature of 40 °C, max. 60 °C with de-rated output current. To determine the output current rating at temperatures above 40 °C, the output current should be de-rated by 3 % per K between 40 °C and 60 °C.

5.16.6 Wiring Diagrams

For wiring diagrams, refer to chapter "Electrical Installation".

6 Project planning for functional safety

6.1 Definitions

- The term "safe" used in this manual refers to the classification as a safe function according to EN ISO 13849-1.
- The SS1 safety sub-function is described according to the currently applicable EN 61800-5-2 as follows:
  - SS1-t corresponds to the former presentation of SS1(c)

6.2 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) according to EN ISO 13849-1 • Safety Integrity Level (SIL) according to EN 61800-5-2, EN 61508 and EN 62061

Note the versions of the relevant standards on the declaration of conformity or on the TÜV certificate.

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6.3 Integrated safety technology

6.3.1 Safety sub-function STO

The STO safety sub-function is always available in the device.

The described safety technology of the device (safety sub-function STO) has been developed and tested according to the following safety requirements:

- SIL 3 according to EN 61800-5-2, EN 61508
- PL e according to EN ISO 13849-1

This was certified by TÜV Rheinland. A copy of the TÜV certificate can be requested from SEW-EURODRIVE.

6.3.2 Safe condition

For safety-related operation of the device, Safe Torque Off is defined as a safe state (see "Safety sub-function STO" (→ 🗎 150)). This is the basis of the underlying safety concept.

6.3.3 STO safety concept

The device is supposed to be able to perform the safety sub-function "Safe Torque Off" according to EN 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 two-pole 24 V switching signal (e.g. 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.
- 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 safety sub-function STO is activated, the generated PWM signals from the device are interrupted by the STO circuit and are not transmitted to the power output stage (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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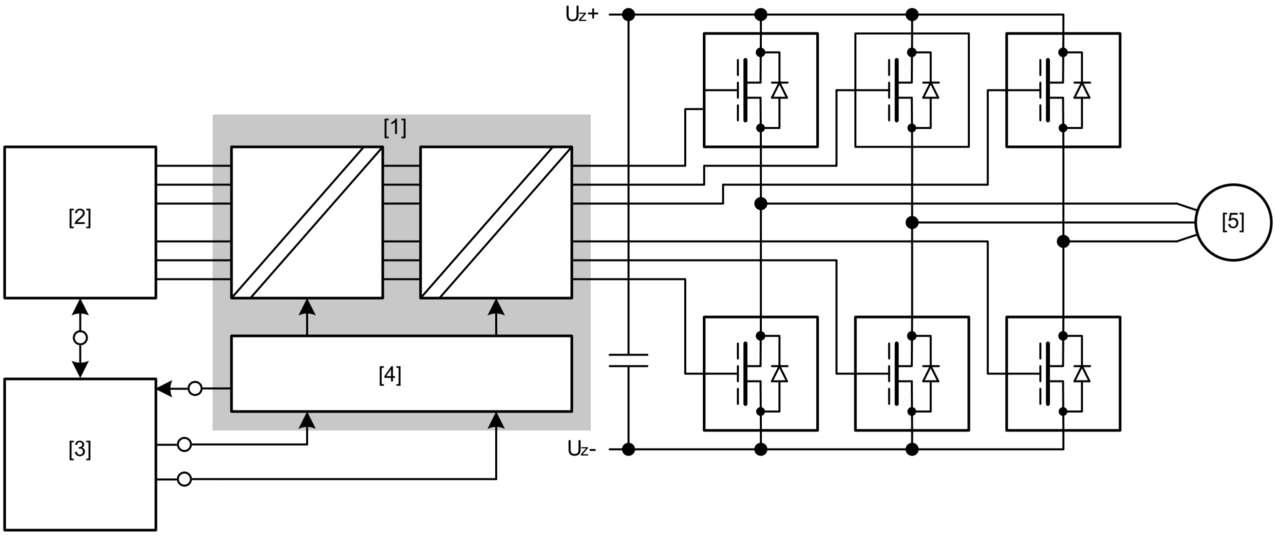
6.3.4 Schematic representation of the STO safety concept



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[1] STO function
[2] Drive controller
[3] Internal safety option (optional)
[4] Diagnostics and inhibiting unit
[5] Motor

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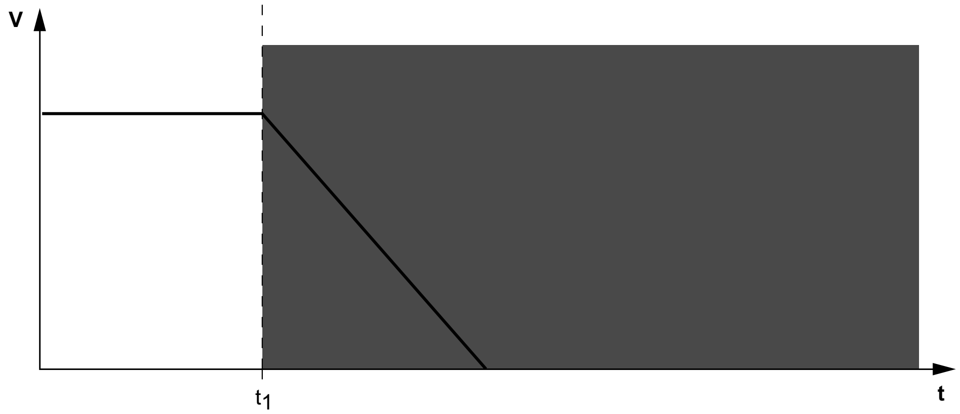
6.3.5 Safety sub-functions according to EN 61800-5-2

STO – Safe Torque Off

When the STO safety sub-function is active, the power supply to the motor is interrupted and the drive cannot generate any torque. The STO safety sub-function corresponds to a non-controlled stop according to EN 60204-1, stop category 0.



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■	=	STO safety sub-function active
v	=	Speed
t	=	Time
t_1	=	Point in time at which STO is activated.

INFORMATION

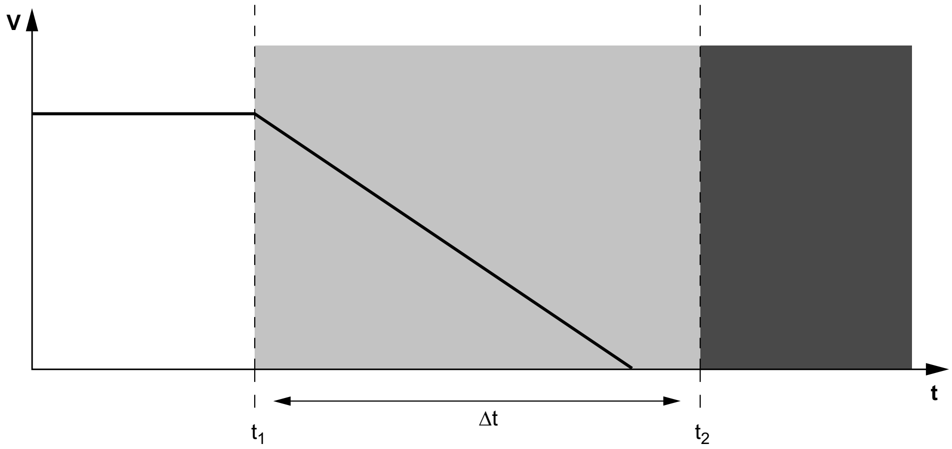
The motor coasts to a halt or is stopped mechanically.

Controlled standstill is preferred, if possible.

SS1-t – Safe Stop 1 with time control

When the SS1-t safety sub-function is active, the motor is brought to a standstill electrically. The STO safety sub-function will be triggered after a specified, safety-related time.

The SS1-t safety sub-function corresponds to a controlled stop of the drive according to EN 60204-1, stop category 1.



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(light grey)	= SS1-t safety sub-function monitored
(dark grey)	= STO safety sub-function active
v	= Speed
t	= Time
t_1	= Point of time when SS1-t is activated and motor deceleration is triggered.
t_2	= Point in time at which STO is activated.
Δt	= Safety-related period of time

INFORMATION

- The SS1-t function does not monitor the stopping of the drive.
- The safety-relevant period of time Δt allows the drive to come to a stop. In the event of a fault, the drive does not come to a stop and becomes de-energized at the time t_2 (STO).

6.3.6 Restrictions

- It is to be noted 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).

  The drive unit cannot be used without an additional brake system for application-specific safety sub-functions that require active deceleration (braking) of the dangerous movement.
- When using the SS1-t function, the deceleration ramp of the drive is not monitored with respect to safety. In the case of a fault, the drive might not be decelerated during the delay time, or the drive can accelerate in the worst case. In this case, the safety-related deactivation via the STO function is only activated after the set delay time has passed. The resulting hazard must be taken into account in the risk assessment of the system/machine and may need to be covered through additional safety measures.
- The STO function cannot prevent a possible jerk or DC braking.

⚠ WARNING

The safety concept is suitable only for performing mechanical work on driven system/machine components.

Severe or fatal injuries.

Hazardous voltages are present in the connection box when the STO signal is disconnected.

- 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 of the voltage supply.

⚠ WARNING

Electric shock due to incompletely discharged capacitors.

Severe or fatal injuries.

- Observe a minimum switch-off time of 5 minutes after disconnecting the power supply.

INFORMATION

The brake and DynaStop® are not safety-related. If the parameter *Apply brake/ DynaStop® in STO state (Index 8501.3)* is enabled, the following is activated when the STO function is triggered:

- The brake is applied.
- DynaStop® is activated.

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6.4 Safety requirements

6.4.1 Introduction

The requirement for safe operation is that the safety sub-functions of the device are properly integrated into an application-specific, higher-level safety sub-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 the 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
- Requirements for operation

6.4.2 Approved devices

The MOVIMOT® flexible device variant is permitted for safety-related applications (STO function):

Device	Nominal output current
MOVIMOT® flexible	2.0 – 16.0 A

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6.4.3 Installation requirements

- The wiring technology must comply with the EN 60204-1 standard.
- The safe control cables must be routed in accordance with the EMC requirements. The following points must therefore be observed:
  – Shielded cables must be permanently (fixed) installed and protected against external damage, or equivalent measures must be taken.
  – Adhere to the regulations in force for the application.
  – If the safe outputs and inputs are wired in a 2-channel configuration, the corresponding cables must be routed closely together.
  – The cables must have the same length. A difference in length ≤ 3% of the two cables is permitted.
  – The following maximum cable length must be observed:
    STO: 100 m
  – You must use suitable measures to ensure that the safe 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 voltages can occur in the STO control cables
  – The external safety controller can detect a crossfault from an external potential to the STO control cables.
- The values specified for the safety components must be strictly adhered to when designing the safety circuits.
- The STO signals must not be used for feedback.
- Only grounded voltage sources with protective electrical separation (PELV) in accordance with EN 61131-2 and EN 60204-1 may be used for safety controllers/ safety relays.
- When planning the installation, observe the technical data of the device.
- The 0V24_Out and 24V_Out supply voltages of the device may only be used to supply the device-internal STO input. The cable length must not exceed 30 m.

  This connection variant is not permitted for STO group disconnection.
- The STO function does not detect short circuits or interference voltage in the supply line, so you must ensure the following:
  – No parasitic voltages can occur in the STO control cables
  – The external safety controller can detect a crossfault from an external potential to the STO control cables.
- When the STO control cables are routed into the connection box to terminal X9 of the connection unit, the cable ends must be covered with conductor end sleeves and the cables must be fixed close to terminal X9 using cable ties. Other low-voltage signals can be bundled together with the STO signals.
- For safety-related applications using the device, the jumpers labeled with "Caution, remove Jumper for Safety Operation" at STO terminal X9 must be removed. The unit designs in which the STO connection is made using plug connectors do not have labeled jumpers. The installed jumper is relevant to the function.

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6.4.4 Startup requirements

- To validate the implemented safety sub-functions, the safety sub-functions must be checked and documented after successful startup.
- When doing so, the restrictions for the safety sub-functions in chapter "Restrictions" must be taken into consideration. Non-safety-related parts and components which affect the test result (e.g. motor brake) must be deactivated.
- In order to use the device in safety-related applications, it is essential that you perform and record startup checks for the disconnecting device and correct wiring.
- For the CS..A safety options, the startup check and logging is supported by the "Assist CS.." parameterization tool with an acceptance report.

INFORMATION

- In order to avoid a hazard in the intended application when a fault occurs, the user must check whether the fault response time of each safety sub-function is shorter than the maximum permissible fault response time of the application. The maximum permissible fault response time must not be exceeded!
- The user must ensure implementation of the requirements of the required safety integrity level (SIL) in accordance with EN 61508 or performance level (PL) pursuant to EN ISO 13849-1.

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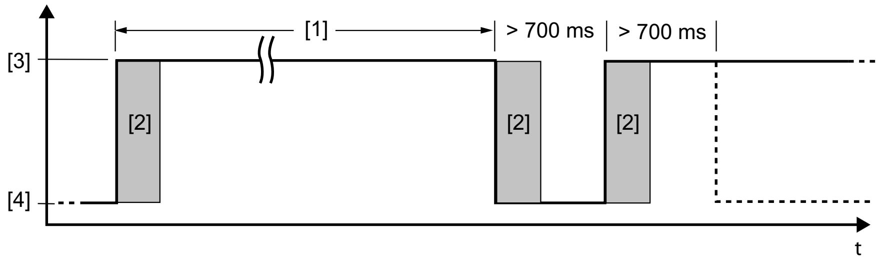
6.4.5 Requirements for the operation of the STO safety sub-function

- Operation is only permitted within the limits specified on the data sheets. This applies to the external safety controller as well as to the device and the approved safety 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. The safety sub-function must therefore be requested via the STO input for PL d in accordance with EN ISO 13849-1 and SIL 2 in accordance with EN 61800-5-2 at least once every 12 months, and for PL e in accordance with EN ISO 13849-1 and SIL 3 in accordance with EN 61800-5-2 at least once every 3 months with the line voltage applied in order to achieve full test coverage. Adhere to the following test procedure for this purpose.



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[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 switching on the supply voltage), the test transition (STO active → STO not active) may be started after > 700 ms at the earliest. The device signals the "ready for operation" or "STO – Safe Torque Off" state 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 supply 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.

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6.4.6 External safety controller requirements

A safety relay can be used as an alternative to a safety controller. The following requirements apply analogously:

- 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 sub-function.

The following table shows an example of the required safety class of the safety controller:

Application	Requirement for safety controller
Performance level d in accordance with ISO 13849-1, SIL 2 in accordance with IEC 62061	Performance level d in accordance with ISO 13849-1 SIL 2 in accordance with IEC 61508
Performance level e in accordance with ISO 13849-1, SIL 3 in accordance with IEC 62061	Performance level e in accordance with EN ISO 13849-1 SIL 3 in accordance with IEC 61508

- The wiring of the safety controller must be suitable for the endeavored safety class (see manufacturer's documentation). The STO input of the device can be switched with 2 poles (sourcing output, sourcing/sinking, or serial sourcing), or with 1 pole (sourcing output).
- 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 using safety relays, safety controllers, etc.
- To ensure protection against an unexpected restart 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 only be carried out after a manual reset of the safety circuit.
- If no fault exclusion is used for the STO wiring in accordance with DIN EN ISO 13849-2 or DIN EN 61800-5-2, the external safety device must detect the following faults with regard to the STO wiring within 20 s depending on the connection type:
  - Two-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
  - Two-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)
  - Dual-channel serial sourcing output:

    Fault exclusion is mandatory
  - Single-pole sourcing:

    Short circuit of 24 V at F_STO_P (Stuck-at 1)
- Test pulses can take place in the switched on or switched off condition with connection type "Two-pole sourcing output".

- The test pulses on both sourcing channels must be switched with a time delay. However, additional switch-off test pulses may occur simultaneously.
- The test pulses in both sourcing channels must not exceed 1 ms.
- The next switch-off test pulse in one sourcing channel must only occur after a 2 ms time period.
- A maximum 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 signal levels must be read back by the safety controller and compared to the expected value.
- 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).

• Test pulses can take place in the switched on or switched off condition with connection type "Two-pole sourcing/sinking".
  - The test pulses in the sourcing and sinking channel must not exceed 1 ms.
  - The next switch-off test pulse in the sourcing or sinking channel must only occur after a 2 ms time period.
  - A maximum 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 signal levels must be read back by the safety controller and compared to the expected value.

• Test pulses can take place in the switched on or switched off condition with connection type "Single-pole sourcing output".
  - The test pulse on 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 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 signal levels must be read back by the safety controller and compared to the expected value.

6.4.7 Acceptance

The system manufacturer must perform an overall evaluation in order to determine the safety of a machine or a system. The effectiveness of each risk minimization must be checked. It must also be checked if the required safety integrity (SIL and/or PL) is reached for each implemented safety function.

To validate the safety integrity level, you can use the "SISTEMA" calculation tool from the "Institut für Arbeitsschutz" (Institute for Occupational Safety and Health of the German Social Accident Insurance).

6.5 Response times

The response time plays a decisive role in the design and implementation of safety sub-functions for systems and machines. In order to match the response time to the requirements of a safety sub-function, the entire system from the sensor (or command device) to the actuator must always be taken into consideration. The following times are of particular importance in connection with the MOVISAFE® CS..A safety option:

- Response time of the connected sensors
- Safe communication cycle time
- Processing time (cycle time) in the safety controller
- Safe communication monitoring time
- Internal response times of the MOVISAFE® CS..A safety option
- Response time of the actuators (e.g. frequency inverters)

Establish the response sequence for each safety sub-function in your application and determine the maximum response time for each case, taking the relevant manufacturer data into consideration. It is particularly important to observe the information in the documentation of the used components.

Details of the maximum response time of the MOVISAFE® CS..A safety option can be found in chapter "Technical data". For detailed information regarding response time consideration for safe PROFIsafe communication, refer to the respective IEC 61784-3-3 standard.

6.5.1 Response times of the STO safety sub-function

The following response times are fixed:

	STO response times	
	Typical	**Maximum**
Duration from activation of the STO safety sub-function to the shutdown of the rotating field	1.5 ms	10 ms 2 ms[1)]
Duration from deactivation of the STO safety sub-function to the enabling of the rotating field	–	110 ms

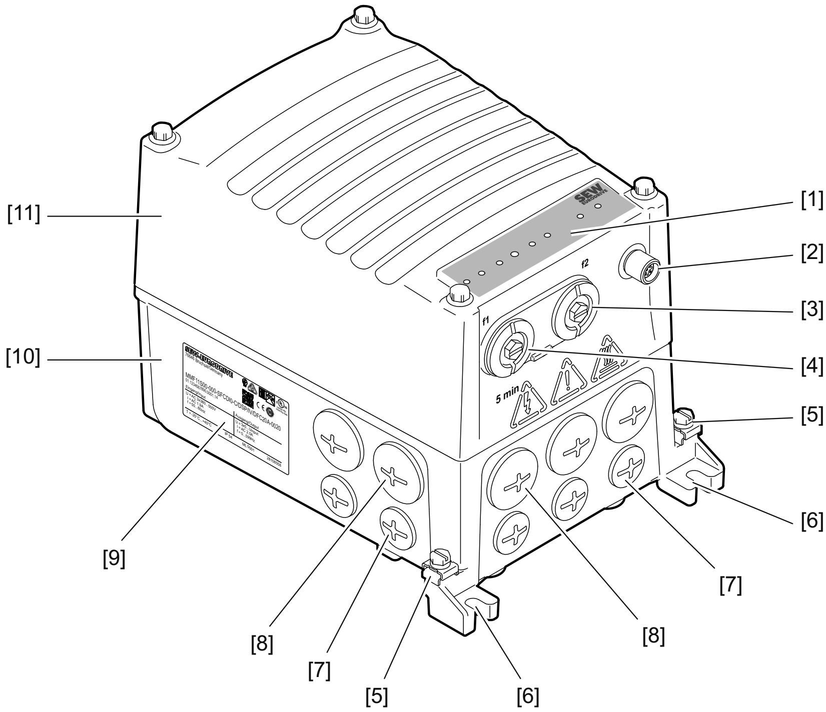
1) Only when STO is being used and controlled via a MOVISAFE® CS..A safety option

7 Device structure

7.1 MOVIMOT® flexible

7.1.1 MOVIMOT® flexible MMF1.

MOVIMOT® flexible MMF1. is a decentralized frequency inverter that serves to control drive units. It comprises of 2 core components, the electronics cover and the universal connection box (see the following figure).



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[1] LED displays
[2] Plug connector
[3] Potentiometer f2 (underneath the screw plug)
[4] Potentiometer f1 (underneath the screw plug)
[5] Screws for PE connection
[6] Mounting lug
[7] Cable glands M16
[8] Cable glands M25
[9] Nameplate
[10] Connection box
[11] Decentralized inverter (referred to as electronics cover in the following)

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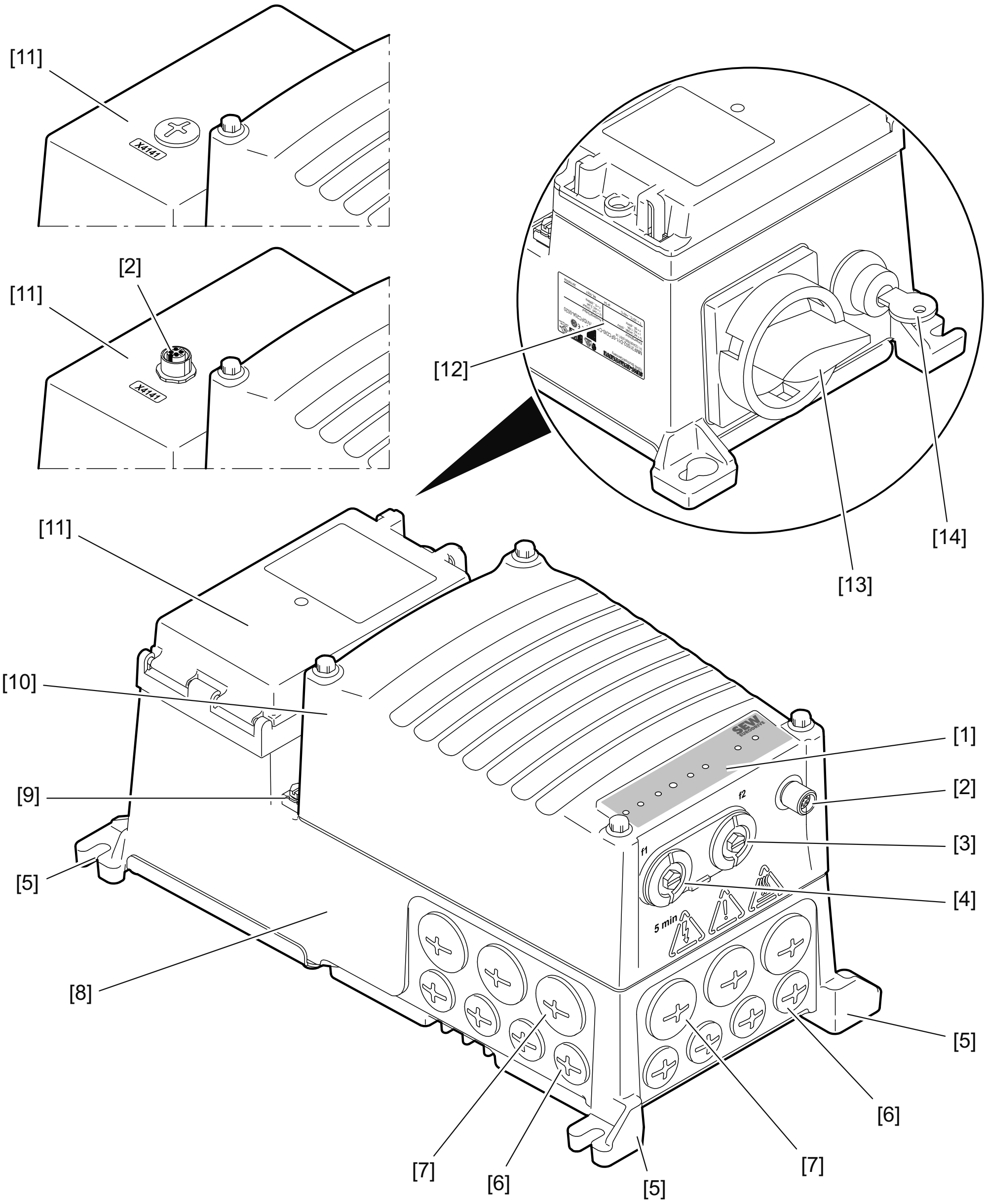
7.1.2 MOVIMOT® flexible MMF31

MOVIMOT® flexible MMF3. is a decentralized frequency inverter that serves to control drive units. It comprises of 4 core components, the electronics cover, connection box, front module, and maintenance switch (see the following figure).



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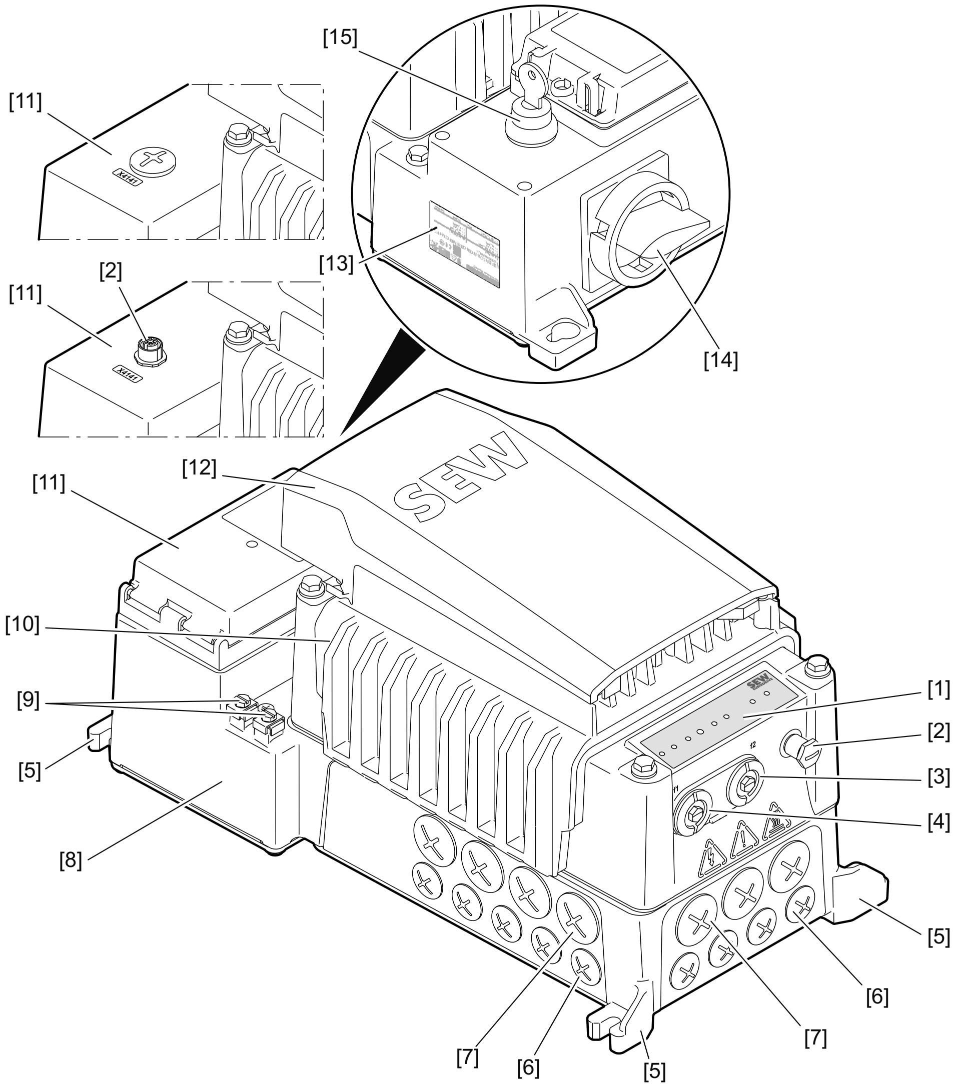
[1] LED displays
[2] Plug connector
[3] Potentiometer f2 (underneath the screw plug)
[4] Potentiometer f1 (underneath the screw plug)
[5] Mounting lugs
[6] M16 Cable glands
[7] M25 cable gland
[8] Connection box
[9] Screws for PE connection
[10] Decentralized inverter (referred to as electronics cover in the following)
[11] Front module in protective housing (different designs possible)
[12] Nameplate
[13] Switch disconnector (optional)
[14] Key switch (optional)

7.1.3 MOVIMOT® flexible MMF32

MOVIMOT® flexible MMF3. is a decentralized frequency inverter that serves to control drive units. It comprises of 4 core components, the electronics cover, connection box, front module, and maintenance switch (see the following figure).



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[1]	LED displays	[8]	Connection box
[2]	Plug connector	[9]	Screws for PE connection
[3]	Potentiometer f2 (underneath the screw plug)	[10]	Decentralized inverter (referred to as electronics cover in the following)
		[11]	Front module in protective housing (different designs possible)
[4]	Potentiometer f1 (underneath the screw plug)	[12]	Fan
		[13]	Nameplate
[5]	Mounting lugs	[14]	Switch disconnector (optional)
[6]	M16 Cable glands	[15]	Key switch (optional)
[7]	M25 cable gland		

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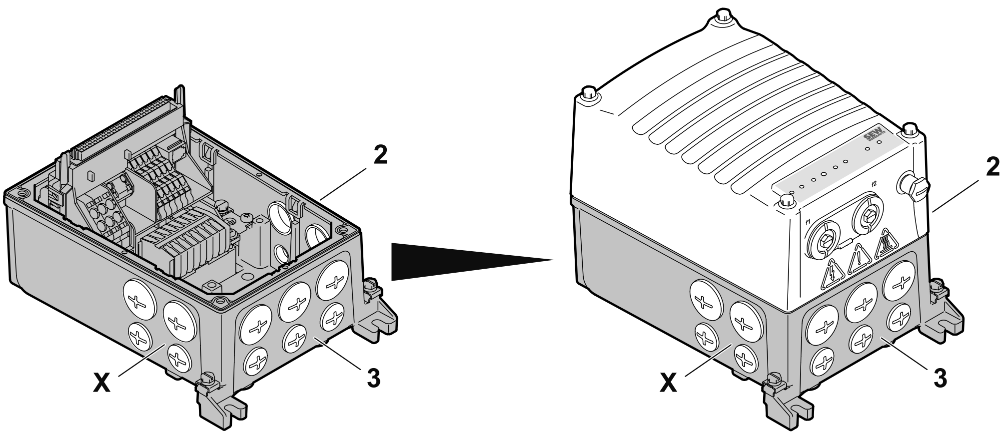
7.2 Cable entry position

7.2.1 Design MMF1.

The following cables entries are possible for the device:

- Position X + 2 + 3
  - X: 2 × M25 × 1.5 + 2 × M16 × 1.5
  - 2: 2 × M25 × 1.5 + 2 × M16 × 1.5
  - 3: 3 × M25 × 1.5 + 3 × M16 × 1.5

The following figure shows the possible cable entries:



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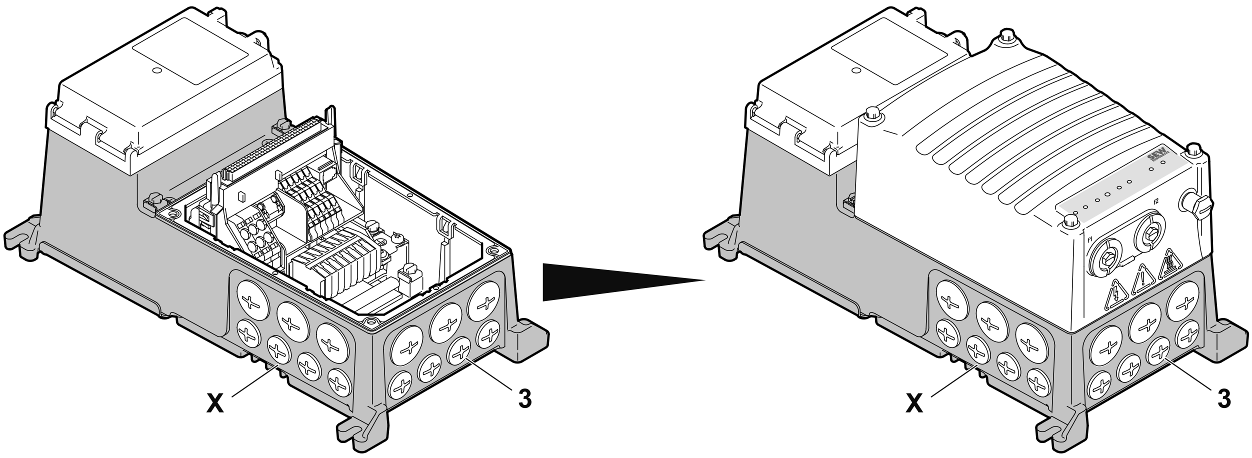
7.2.2 MMF31 design

The following cables entries are possible for the device:

- Position X + 3
  - X: 3 × M25 × 1.5 + 4 × M16 × 1.5
  - 3: 3 × M25 × 1.5 + 4 × M16 × 1.5

The following figure shows the possible cable entries:



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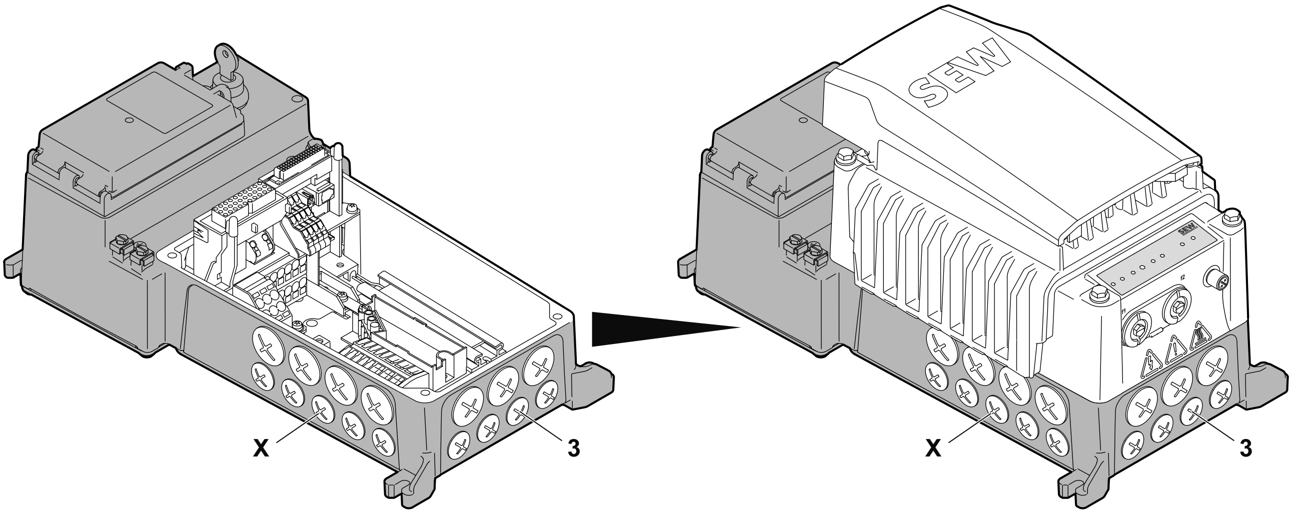
7.2.3 MMF32 design

The following cables entries are possible for the device:

- Position X + 3
  - X: 4 × M25 × 1.5 + 5 × M16 × 1.5
  - 3: 3 × M25 × 1.5 + 4 × M16 × 1.5

The following figure shows the possible cable entries:



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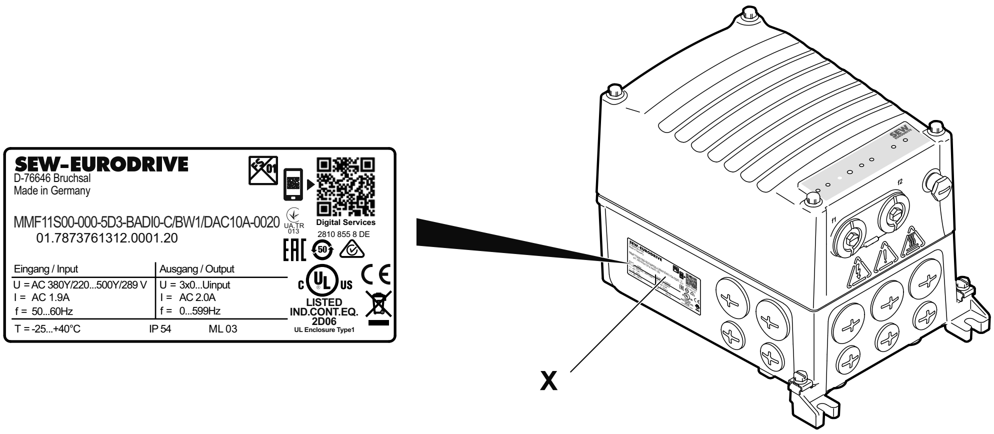
7.3 Nameplate position

7.3.1 Design MMF1.

The following nameplate positions are possible for the device:

- Nameplate of the complete device: Position X
- Optional nameplate: Position 2

The following figure shows an example of the position of the nameplates and labels on the device:



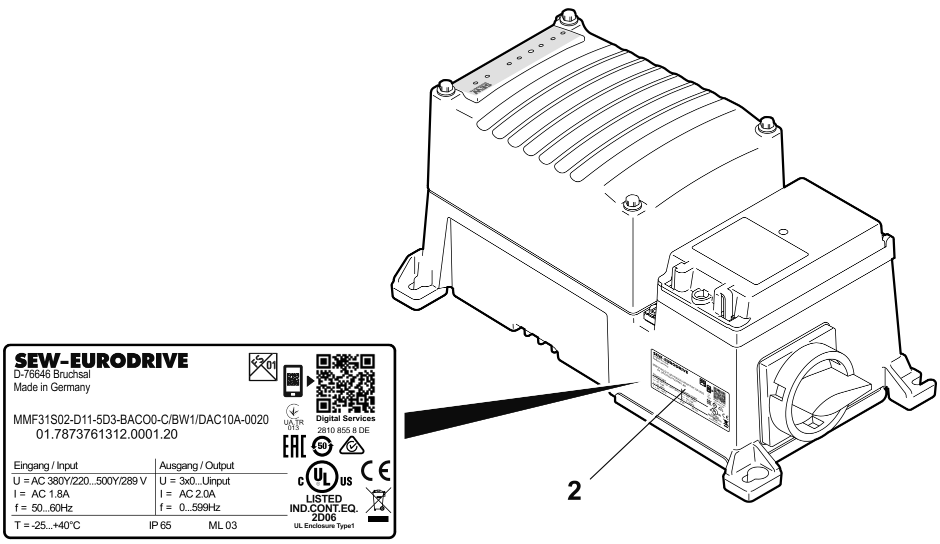
9007228572797707

7.3.2 Design MMF3.

The following nameplate positions are possible for the device:

- Nameplate of the complete device: Position 2 (left)
- Optional nameplate: Position 2 (right)

The following figure shows an example of the position of the nameplates and labels on the device:

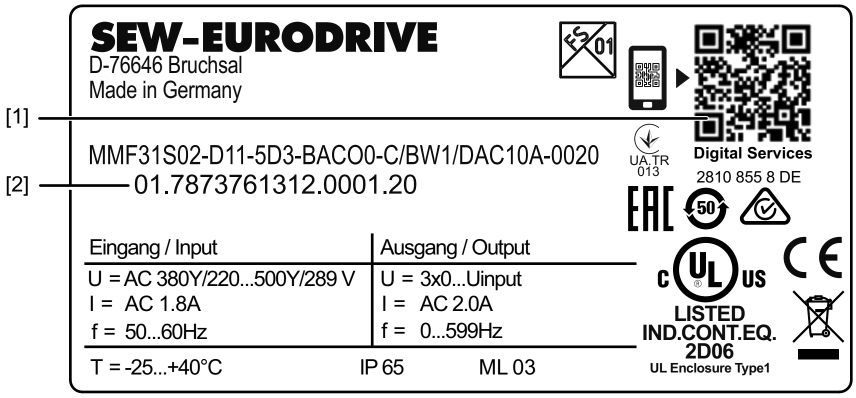


9007228572825867

7.4 Example of a nameplate and type designation

7.4.1 Nameplate of MOVIMOT® flexible DAC

The following figure shows an example of the nameplate of the device. For the structure of the type designation, see chapter "Type designation ...".



18014427827335819

[1]	Digital Services	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. **In the "Documentation" > "Data and documents" area, the product manual of the device with further information is available.**
[2]		Unique serial number

7.4.2 Type designation of MOVIMOT® flexible DAC

The following table shows the type designation of the device.

MMF	**Product family** MMF = MOVIMOT® flexible
3	**Variant** 1 = Device variant 1 3 = Device variant 3
1	**Flange dimensions for the sizes of electronics covers** 1 = Suitable for electronics cover size 1 with or without cooling fins 2 = Suitable for electronics cover size 2 with or without fan
S0	**Mechanical design** S0 = Housing with metric threads for cable entry
2	**Front module** 0 = Closed 1 = Engineering interface M12[1)] 2 = Protective housing for CBG.. keypad[1)] 3 = Protective housing for CBG.. on-site keypad and key switch[1)]
–	
D11	**Maintenance switch** 000 = Without switching element D11 = Load disconnector with feedback contact[1)] M11 = Load disconnector with feedback contact and overcurrent tripping[1)] R01 = Load disconnector at inverter output with contact signal for output stage inhibit[1)]
–	
5	**Connection voltage** 5 = AC 500 V
D	**Power section variant EMC** D = EMC filter with limit value category C3 (EN 61800-3)
3	**Connection type** 3 = 3-phase
–	
BA	**Connection unit** BA = Connection unit binary or AS-Interface
CO	**Digital Interface (MOVILINK® DDI)** DI = Integrated MOVILINK® DDI slave (for motors without digital interface) CO = MOVILINK® DDI interface via coaxial cable (for motors with digital interface)
0	**Board design** 0 = Standard connection board

–	
C	**Version** C = Generation C
/	
BW1	**Options** DSP = Electrodynamic retarding function DynaStop®[2] BES = BES brake rectifier control module 24 V[2] IV = Plug connector at the connection box PE = Pressure compensation fitting for electronics BW1 = Integrated BW1 braking resistor BW2 = Integrated BW2 braking resistor M31 = Mounting panel M31 for MMF31 design[3] M32 = Mounting panel M32 for MMF32 design[3] EBW = External BW100-005 braking resistor[4]
/	
DAC 10A	**Electronics cover design** DAC10A = **D**irect **A**S-Interface **C**ommunication – AS-Interface (communication via M12)
–	
0020	**Nominal output current of the electronics cover** 0020 = 2.0 A 0025 = 2.5 A 0032 = 3.2 A 0040 = 4.0 A 0055 = 5.5 A 0070 = 7.0 A 0095 = 9.5 A 0125 = 12.5 A 0160 = 16.0 A

1) Only available in conjunction with MOVIMOT® flexible MMF3.
2) These options cannot be combined.
3) Options /M31 and /M32 are installed at the factory.
4) Option /EBW is only available in conjunction with option /M31. Option /EBW is installed and connected at the factory.

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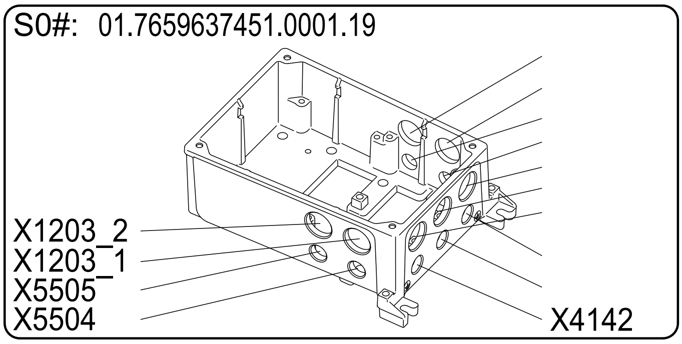
7.5 Example of the optional nameplate "Plug connector positions"

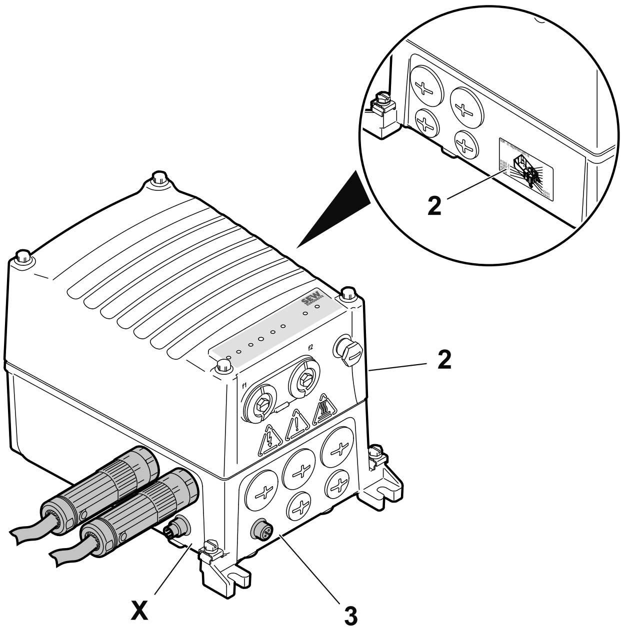
7.5.1 Design MMF1.

The following figure shows an example of the optional nameplate "Plug connector positions":



27021623667009547

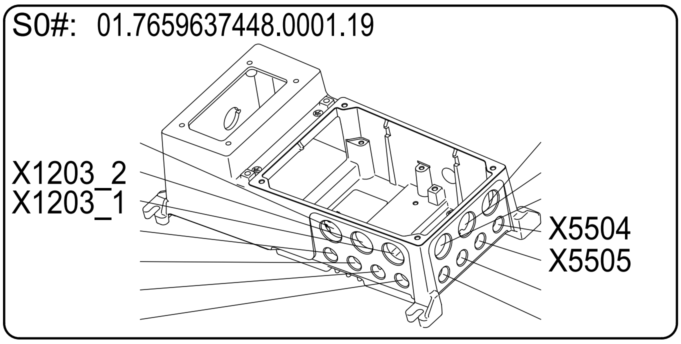
The nameplate shows the designations and positions of the plug connectors at the connection box. This nameplate can be installed in position 2.



29320599051

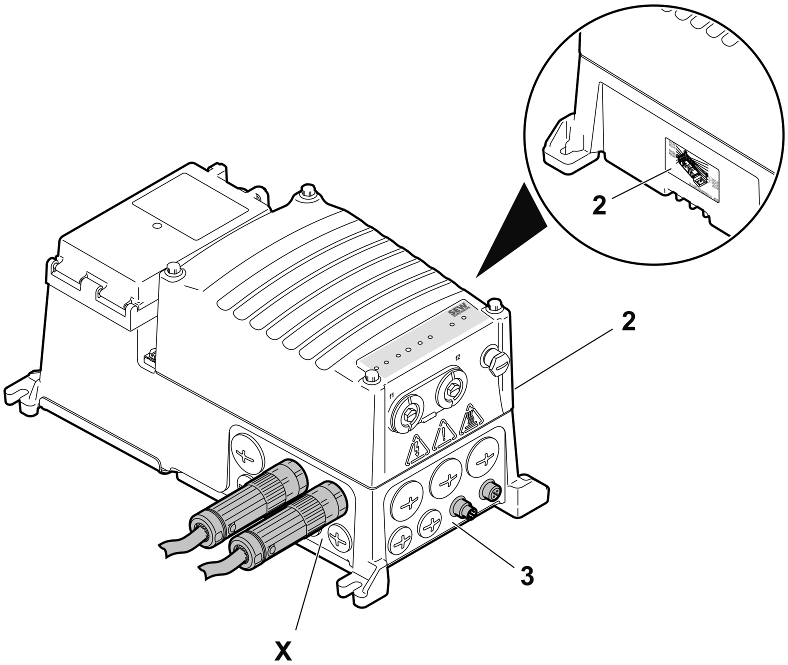
7.5.2 MMF31 design

The following figure shows an example of the optional nameplate "Plug connector positions":



30580203403

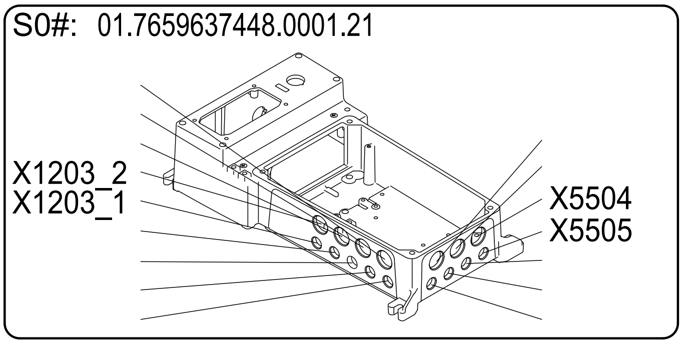
The nameplate shows the designations and positions of the plug connectors at the connection box. This nameplate can be installed in position 2.



29321051275

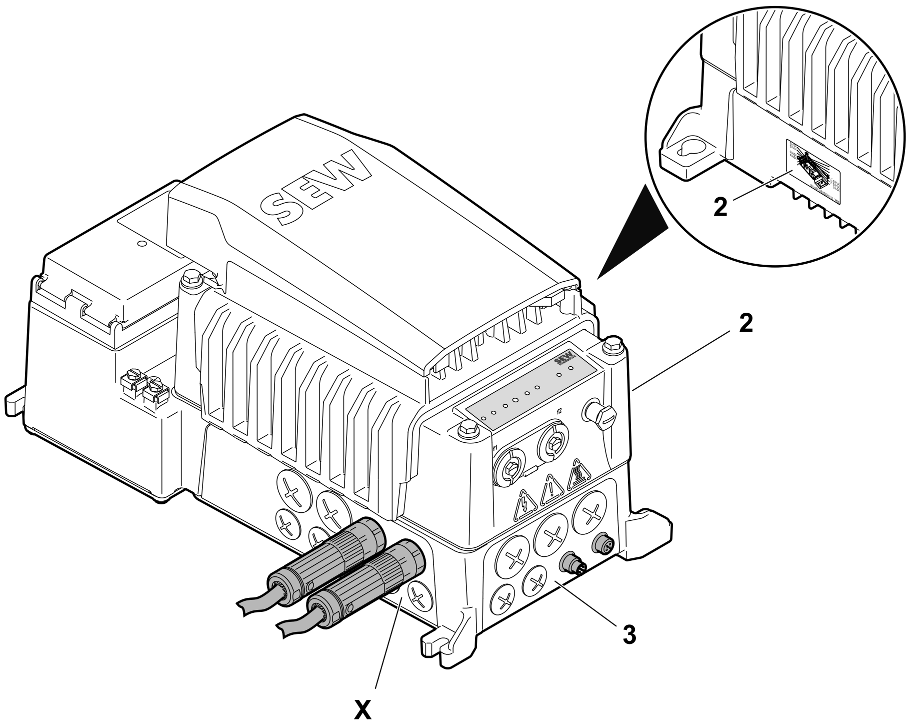
7.5.3 MMF32 design

The following figure shows an example of the optional nameplate "Plug connector positions":



34346821003

The nameplate shows the designations and positions of the plug connectors at the connection box. This nameplate can be installed in position 2.

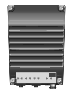


34237180683

7.6 Electronics

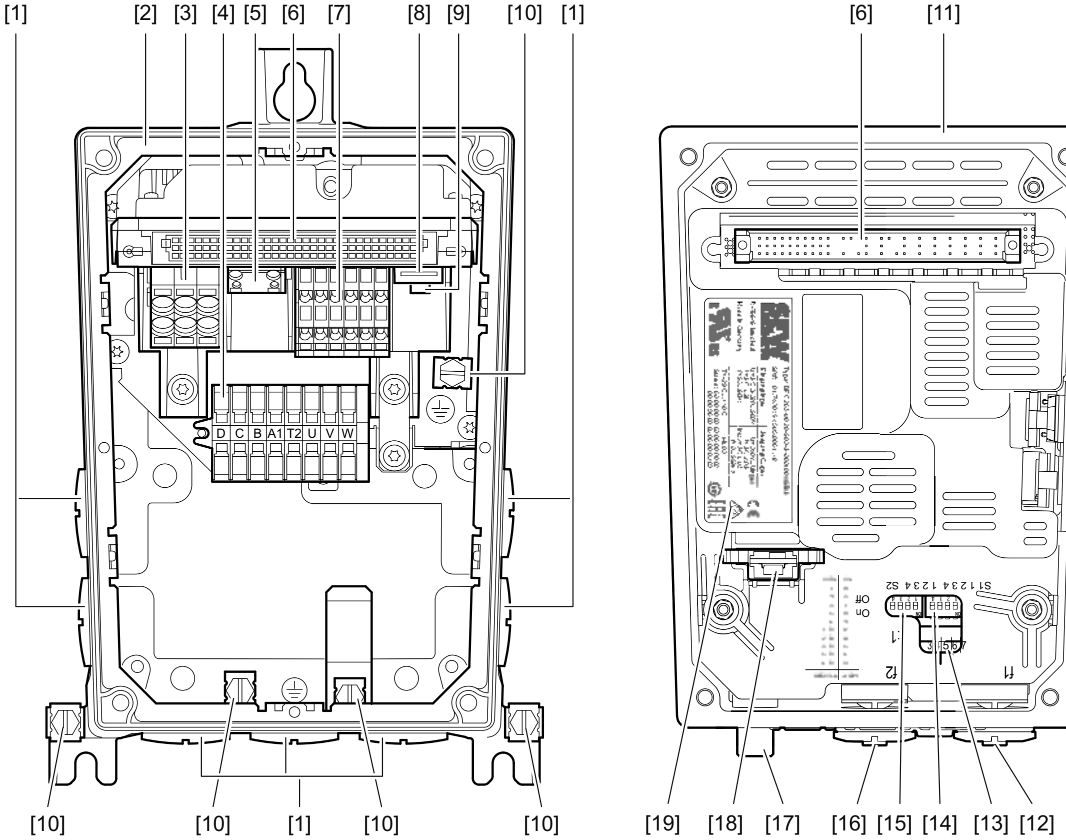
7.6.1 Overview of electronics cover

Devices with the following electronics covers are available depending on the nominal output current:

Electronics cover			
Nominal output current	**Type designation**	**Size**	**Image**
2.0 A	DAC...-0020..	Size 1 without cooling fins	
2.5 A	DAC...-0025..		
3.2 A	DAC...-0032..		
4.0 A	DAC...-0040..	Size 1 with cooling fins	
5.5 A	DAC...-0055..		
7.0 A	DAC...-0070..	Size 2 without fan	
9.5 A	DAC...-0095..		
12.5 A	DAC...-0125..	Size 2 with fan	
16.0 A	DAC...-0160..		

7.6.2 Connection box and electronics cover (internal) MMF1. design

The following figure shows the connection box and the bottom side of the electronics cover:

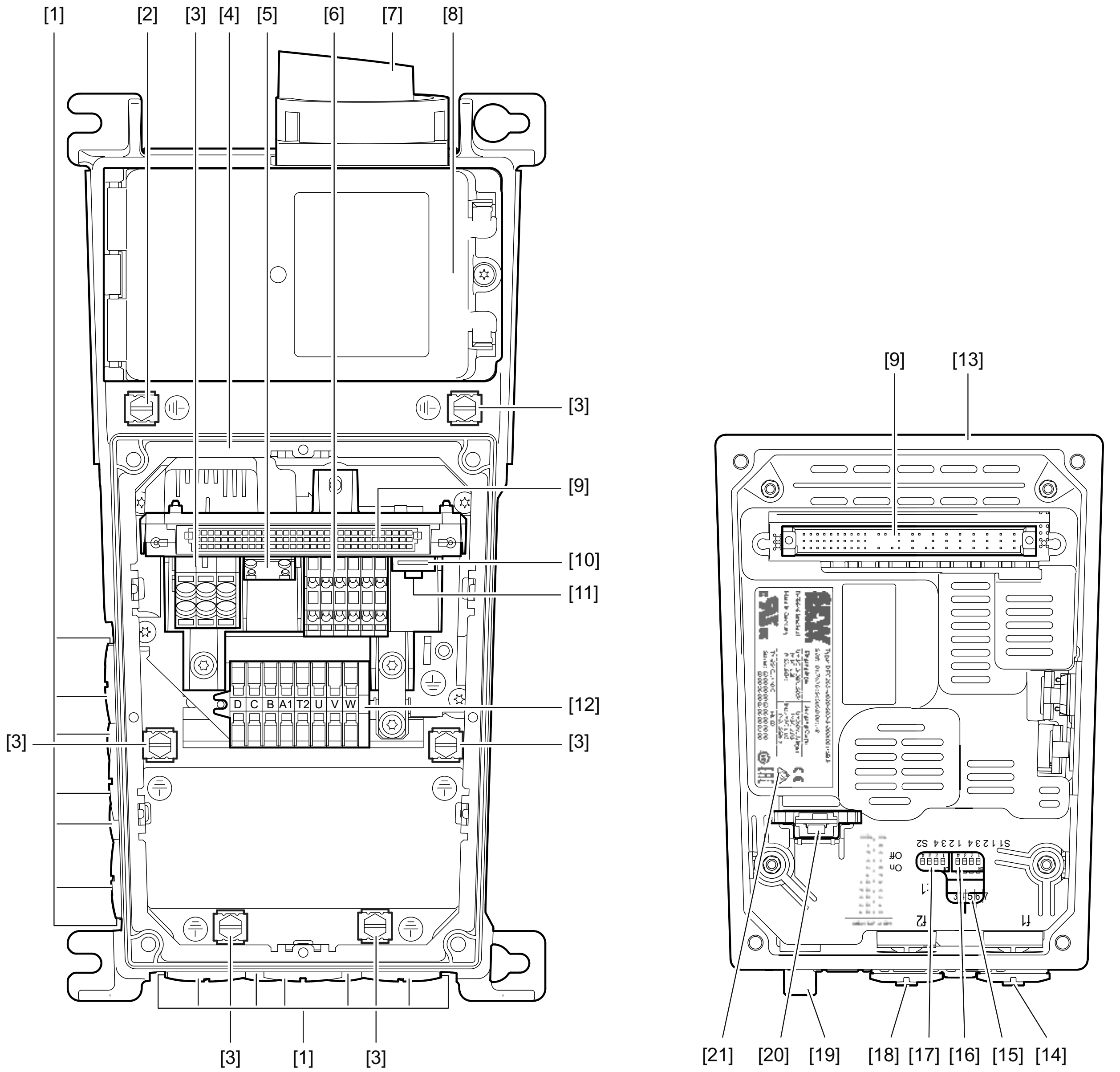


29487275019

[1] Cable glands
[2] Connection box
[3] Connection line L1, L2, L3
[4] Connection for motor, brake and temperature sensor
[5] Braking resistor connection
[6] Plug connector connection unit for electronics cover
[7] Electronics terminal strip
[8] Engineering interface
[9] MOVILINK® DDI connection
[10] Screws for PE connection
[11] Electronics cover
[12] Potentiometer f1 (underneath the screw plug)
[13] Potentiometer t1
[14] DIP switches S1/1 – S1/4
[15] DIP switches S2/1 – S2/4
[16] Potentiometer f2 (underneath the screw plug)
[17] Plug connector
[18] Replaceable memory module
[19] Electronics cover nameplate

7.6.3 Connection box and electronics cover (internal) MMF31 design

The following figure shows the connection box and the bottom side of the electronics cover:

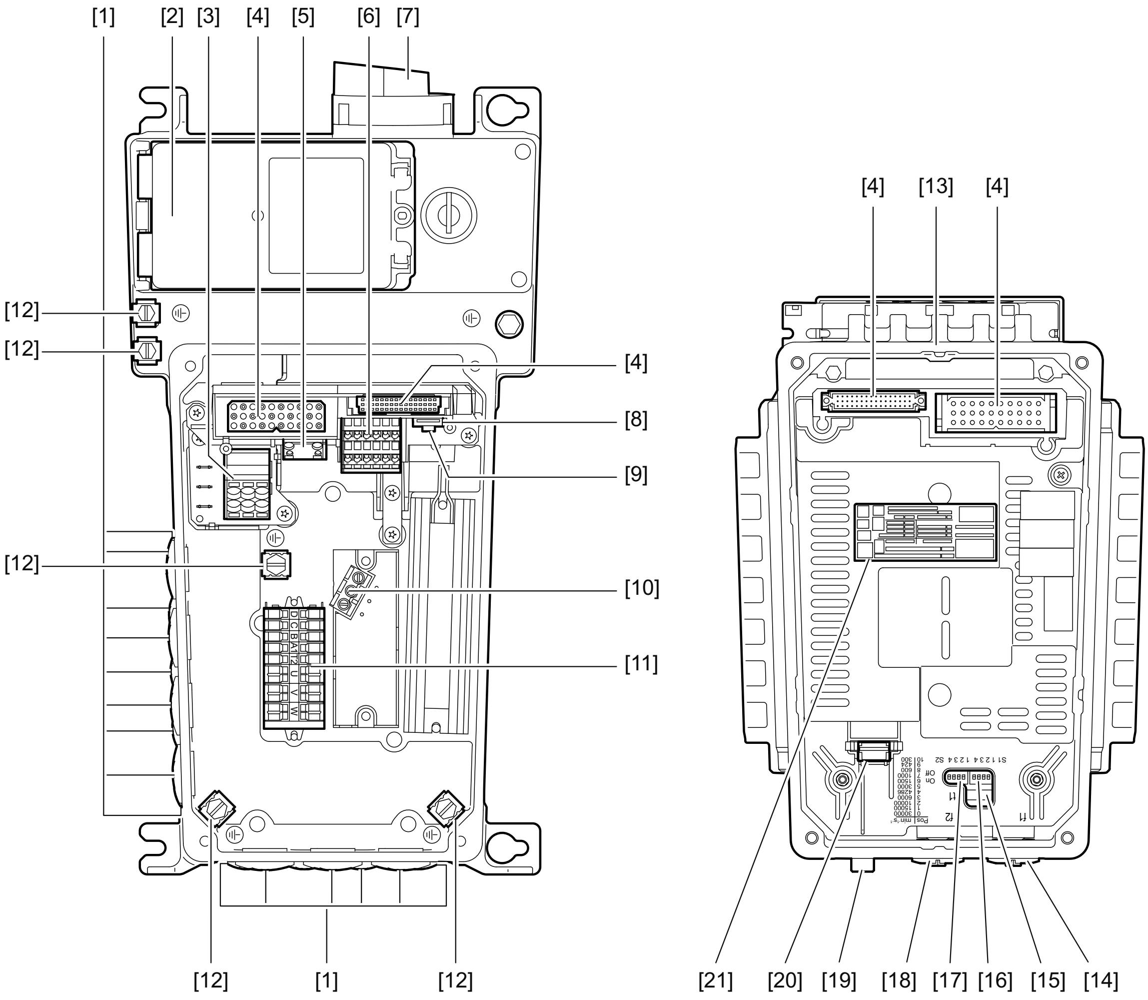


29487277963

[1] Cable glands
[2] Screws for PE connection
[3] Connection line L1, L2, L3
[4] Connection box
[5] Braking resistor connection
[6] Electronics terminal strip
[7] Maintenance switch
[8] Front module
[9] Plug connector connection unit for electronics cover
[10] Engineering interface
[11] MOVILINK® DDI connection
[12] Motor and brake connection
[13] Electronics cover
[14] Potentiometer f1 (underneath the screw plug)
[15] Potentiometer t1
[16] DIP switches S1/1 – S1/4
[17] DIP switches S2/1 – S2/4
[18] Potentiometer f2 (underneath the screw plug)
[19] Plug connector
[20] Replaceable memory module
[21] Electronics cover nameplate

7.6.4 Connection box and electronics cover (internal) MMF32 design

The following figure shows the connection box and the bottom side of the electronics cover:



34323112971

[1] Cable glands
[2] Front module
[3] Connection line L1, L2, L3
[4] Plug connector connection unit for electronics cover
[5] Braking resistor connection
[6] Electronics terminal strip
[7] Maintenance switch
[8] Engineering interface
[9] MOVILINK® DDI connection
[10] Internal terminals
[11] Motor and brake connection
[12] Screws for PE connection
[13] Electronics cover
[14] Potentiometer f1 (underneath the screw plug)
[15] Potentiometer t1
[16] DIP switches S1/1 to S1/4
[17] DIP switches S2/1 to S2/4
[18] Potentiometer f2 (underneath the screw plug)
[19] Plug connector
[20] Replaceable memory module
[21] Electronics cover nameplate

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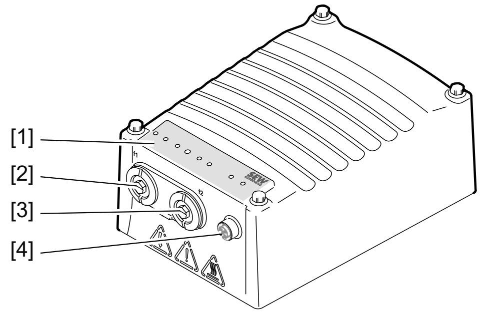
7.6.5 Electronics cover (outer) size 1

The following figure gives an example of electronics cover designs:

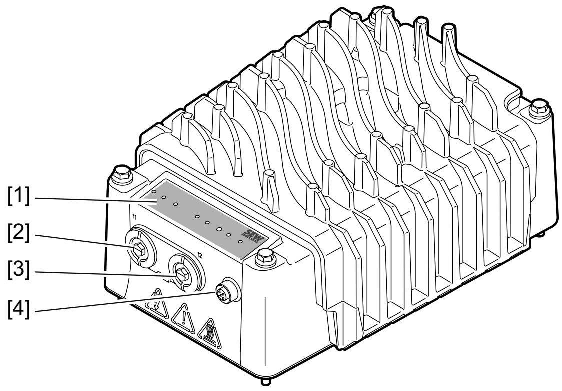


29317784459

[1] "LED displays" (→ 🗎 424)
[2] "Potentiometer f1 (underneath the screw plug)" (→ 🗎 347)
[3] "Potentiometer f2 (underneath the screw plug)" (→ 🗎 349)
[4] "Plug connector" (→ 🗎 262)

7.6.6 Electronics cover (outer) size 2

The following figure gives an example of electronics cover designs:



36725585163

[1] "LED displays" (→ 🗎 424)
[2] "Potentiometer f1 (underneath the screw plug)" (→ 🗎 347)
[3] "Potentiometer f2 (underneath the screw plug)" (→ 🗎 349)
[4] "Plug connector" (→ 🗎 262)

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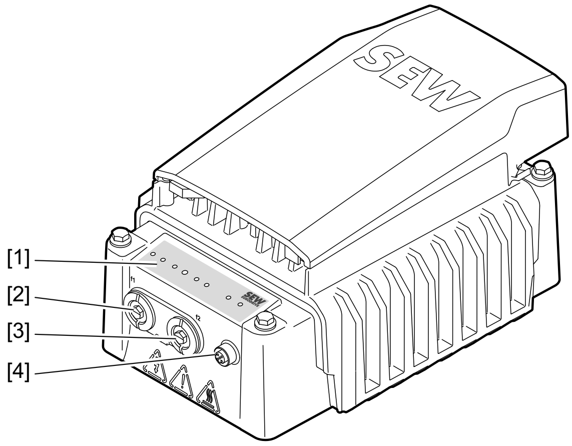
7.6.7 Electronics cover (outer) size 2 with fan

The following figure gives an example of electronics cover designs:



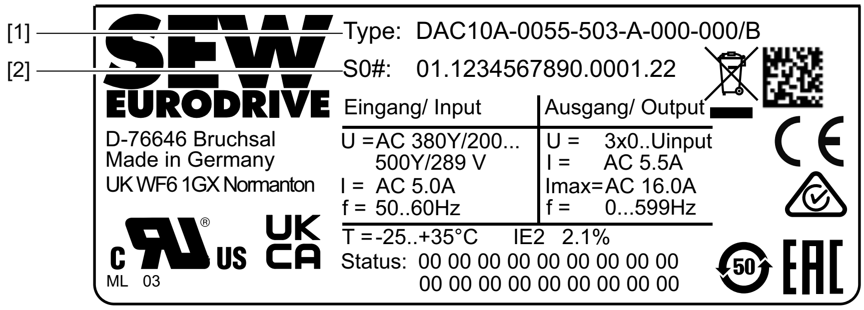
34237122187

[1] "LED displays" (→ 🗎 424)
[2] "Potentiometer f1 (underneath the screw plug)" (→ 🗎 347)
[3] "Potentiometer f2 (underneath the screw plug)" (→ 🗎 349)
[4] "Plug connector" (→ 🗎 262)

7.7 Example nameplate and type designation of the electronics

7.7.1 Inner nameplate of DAC.. electronics cover

The following figure gives an example of a nameplate of the electronics cover. For the structure of the type designation, refer to chapter "Type designation of the electronics cover ...".

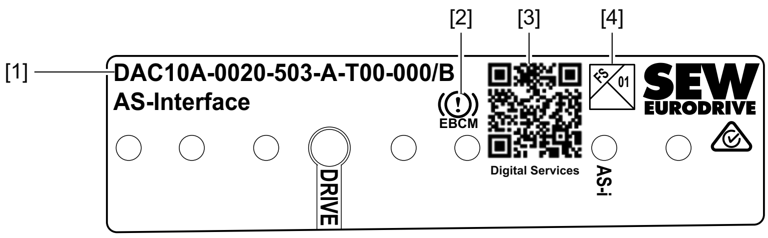


45036025257243403

[1]	Type designation of the electronics cover
[2]	Unique serial number of the electronics cover
	DataMatrix code with the unique serial number of the electronics cover

7.7.2 Outer nameplate of DAC.. electronics cover

The following figure gives an example of a nameplate of the electronics cover. For the structure of the type designation, refer to chapter "Type designation of the electronics cover ...".



18014431494699531

[1]	Type designation of the electronics cover
[2]	Identification of the optional HV brake control /B
[3]	Digital Services — 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. **In the "Documentation" > "Data and documents" area, the product manual of the device with further information is available.**
[4]	FS logo

7.7.3 Type designation of DAC.. electronics cover

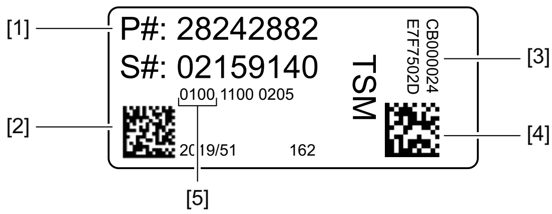
The following table shows the type designation of the electronics cover:

DAC	**Product family** DAC = Electronics cover **D**irect **A**S-Interface **C**ommunication
1	**Communication type** 1 = AS-Interface
0	**Connection configuration** 0 = M12 plug connector on electronics cover (standard)
A	**Communication version**
–	
0020	**Nominal output current of the electronics cover** 0020 = 2.0 A 0025 = 2.5 A 0032 = 3.2 A 0040 = 4.0 A 0055 = 5.5 A 0070 = 7.0 A 0095 = 9.5 A 0125 = 12.5 A 0160 = 16.0 A
–	
5	**Connection voltage** 5 = AC 500 V
0	**Power section variant EMC** 0 = Basic interference suppression 1 = IT system design
3	**Connection type** 3 = 3-phase
–	
A	**Version**
–	
T	**Device variant** T = Technology profile (fieldbus connection)
0	**Technology level** 0 = Technology level 0 (standard)
0	**Application level** 0 = Application level 0 (standard)
–	

000	**MOVIKIT® version** 000 = No MOVIKIT® module loaded ex-works
/	
B	**Operating mode options** B = Brake control C = Specific customer identification P = Customer-specific parameterization

7.7.4 Example nameplate for the TSM memory module

The following figure shows an example of the nameplate for the replaceable memory module:



18014431501924747

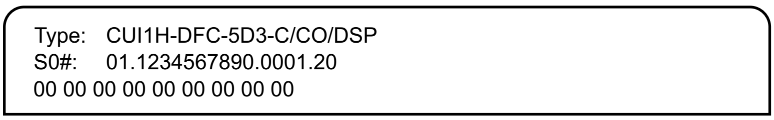
[1] Part number of the replaceable memory module
[2] Data Matrix code with unique part number, serial number, and version statuses of the memory module
[3] Unique safety key ID for designs with optional safety card
[4] Data Matrix code with unique safety key ID for designs with optional safety card
[5] Status of the motor data required for starting up the DIP switches S3 (available for MOVIMOT® flexible only)

For technical data of the memory module, refer to chapter "TSM memory module" (→ 🗎 42).

7.8 Example nameplate and type designation of the connection unit

7.8.1 Nameplate

The following figure gives an example of a nameplate of the connection unit. For the structure of the type designation, refer to chapter "Type designation of the connection unit".



27021626020720011

7.8.2 Type designation of connection unit

The following table shows the type designation of the drive unit:

CU	**Product family** CU = Connection unit
I	**Hardware design** I = For MOVIMOT® flexible MMF1. C = For MOVIMOT® flexible MMF3.
1	**Flange dimensions for the sizes of electronics covers** 1 = Suitable for electronics cover size 1 with or without cooling fins 2 = Suitable for electronics cover size 2 with or without fan
H	**Fieldbus connection configuration** S = Standard H = Hybrid
–	
DFC	**Communication version** DBC = **D**irect **B**inary **C**ommunication DAC = **D**irect **A**S-Interface **C**ommunication DFC = **D**irect **F**ieldbus **C**ommunication DSI = **D**irect **S**ystem bus **I**nstallation
–	
5	**Connection voltage** 5 = AC 500 V
D	**EMC variant** D = EMC filter with limit value category C3 (EN 61800-3)
3	**Connection type** 3 = 3-phase
–	
C	**Version**
/	
CO	**Option** DI = Integrated MOVILINK® DDI slave (for motors without digital interface) CO = MOVILINK® DDI interface via coaxial cable (for motors with digital interface) DSP = DynaStop® electrodynamic deceleration option

7.9 Markings

The following table shows an example of the markings on the nameplate.

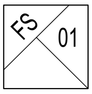
Mark	Definition
CE	The CE marking indicates compliance with the following European directives: • Low Voltage Directive 2014/35/EU[1)] • EMC Directive 2014/30/EU • Machinery Directive 2006/42/EC • Directive 2011/65/EU for limiting the use of certain hazardous substances in electrical and electronic equipment • Ecodesign Regulation 2019/1781
UK CA	The UKCA mark indicates compliance with British guidelines.
c UL US LISTED	The UL and cUL mark indicates UL approval. cUL is equally eligible for approval by the CSA.
EAC	The EAC mark indicates compliance with the requirements of the technical regulations of the Customs Union (Eurasian Economic Union), Armenia, Belarus, Kazakhstan, Kyrgyzstan, and Russia.
013	UA.TR (Declaration of conformity to Technical Regulation of Ukraine) The UA.TR mark on the nameplate certifies adherence to the technical regulations of Ukraine for the documented device series.
	CMIM mark to confirm compliance with the technical regulations of Morocco. The CMIM mark is currently in preparation.
	The RCM mark indicates compliance with the technical regulations of the Australian Communications and Media Authority (ACMA).
50	The China RoHS mark indicates 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 KC mark declares compliance with §3 of Article 58-2 for the Korean Radio Wave Act.
	The waste disposal of this product is performed in compliance with the WEEE Directive 2012/19/EU.

1) For products with functional safety, the requirements from the Low Voltage Directive are fulfilled by the Machinery Directive.

7.9.1 FS logo description

The FS logo on the nameplate is based on the combination of safety-related components that is installed.

The following FS logo variants are possible:

	Device with STO connection via terminals or plug connectors

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8 Mechanical installation

8.1 Installation notes

Perform the following steps before installation:

1. ⚠ **WARNING!** Electric shock caused by dangerous voltages in the connection box. Severe or fatal injuries.
   De-energize the device. Pay attention to the 5 safety rules in chapter “Carrying out electrical work safely”.
2. Secure the output shaft of permanently excited motors against rotation. You thereby avoid an electric shock from the regenerative operation during the rotation of the shaft.
3. Secure the input and output elements with a touch guard. You thereby avoid injuries caused by rapid movements of the output elements.

8.2 Required tools and resources

You require the following tools and resources for mechanical installation:

- Set of wrenches, set of screwdrivers, set of socket wrenches
- Torque wrench
- Mounting device
- If necessary, compensation elements (washers, spacing rings)
- Fasteners for output elements
- Standard parts are not included in the delivery

8.3 Tolerances for torque ratings

Adhere to the specified torques with a tolerance of +/- 10%.

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8.4 Installation requirements

Check that the following conditions have been met:

- The information on the nameplate of the device corresponds to the line voltage.
- The device is undamaged (no damage caused by transport or storage).
- The ambient temperature corresponds to the operating instructions and nameplate.
- The device must not be installed in the following ambient conditions:
  - Potentially explosive atmosphere
  - Oils
  - Acids
  - Gases
  - Vapors
  - Radiation
- For special designs: The device is designed in accordance with the actual ambient conditions.

8.5 Installing the device

8.5.1 Notes

Observe the following information when installing the drive unit:

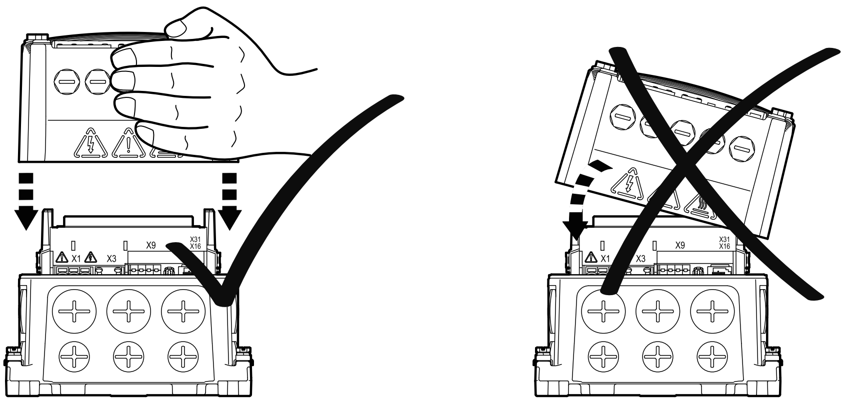
- Only install the device on a level, low-vibration, and torsionally rigid support structure.
- Check the validity of the degree of protection using the information in the operating instructions and the data on the nameplate.
- Make sure that the cooling air supply is unobstructed; warm exhaust air from other units must not influence the cooling.
- Use suitable cable glands for the supply leads (use reducing adapters if necessary).
- Seal the cable entries properly.
- Clean the sealing surfaces of the cover before reinstalling it.
- Observe the specified tightening torques. If no tightening torques are specified or available, observe the specifications in directive VDI 2230-1.

8.5.2 Electronics cover

Installing the electronics cover

Install the electronics cover as follows:

1. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Let the device cool sufficiently before touching it.
2. **NOTICE!** Loss of the guaranteed degree of protection. Possible damage to property.
   When the electronics cover is removed from the connection box, you have to protect the electronics cover and the wiring space from humidity, dust or foreign particles.
3. Use only electronics covers that match the size.
4. Fit the electronics cover to the connection box. Make sure that the electronics cover does not become jammed.
   ⇨ Example of MMF1.. design:



5. Screw the electronics cover onto the connection box with 4 screws. Gradually tighten the screws in diametrically opposite sequence.
   ⇨ Tightening torque for size 1 electronics cover: 6.0 Nm
   ⇨ Tightening torque for size 2 electronics cover: 9.5 Nm

Likewise install the size 2 electronics cover.

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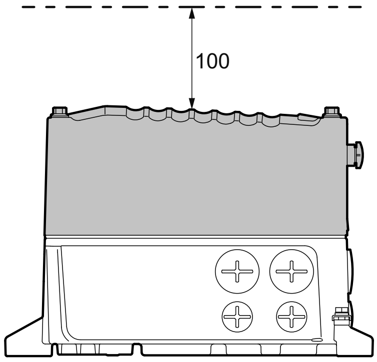
Minimum installation clearance

Note the minimum installation clearance required to remove the electronics cover. You can find detailed dimension drawings in chapter "Technical data" (→ 🗎 28).

The following figure shows the minimum installation clearance from the electronics cover for the MMF1.. design:



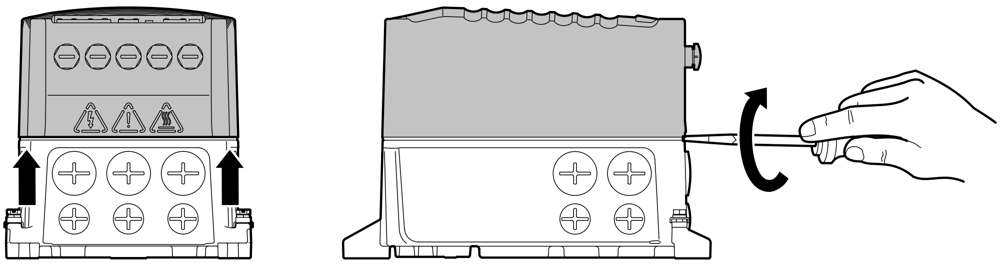
25847860491

For MMF31.. and MMF32.. designs this minimum clearance is also 100 mm.

Removing the electronics cover

Remove the electronics cover as follows:

1. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Let the device cool sufficiently before touching it.
2. Undo the screws of the electronics cover.
3. Remove the electronics cover from the connection box as shown in the following figure. Pay attention to the intended positions in the figure when doing this.
   ⇨ Example of MMF1.. design:



18014424360809867

4. Check the gasket. If the gasket is damaged, replace the gasket, see chapter "Replacing the gasket between connection box and electronics cover" (→ 🗎 513).
5. **NOTICE!** Loss of the guaranteed degree of protection. Possible damage to property.
   When the electronics cover is removed from the connection box, you have to protect the electronics cover and the wiring space from humidity, dust or foreign particles.

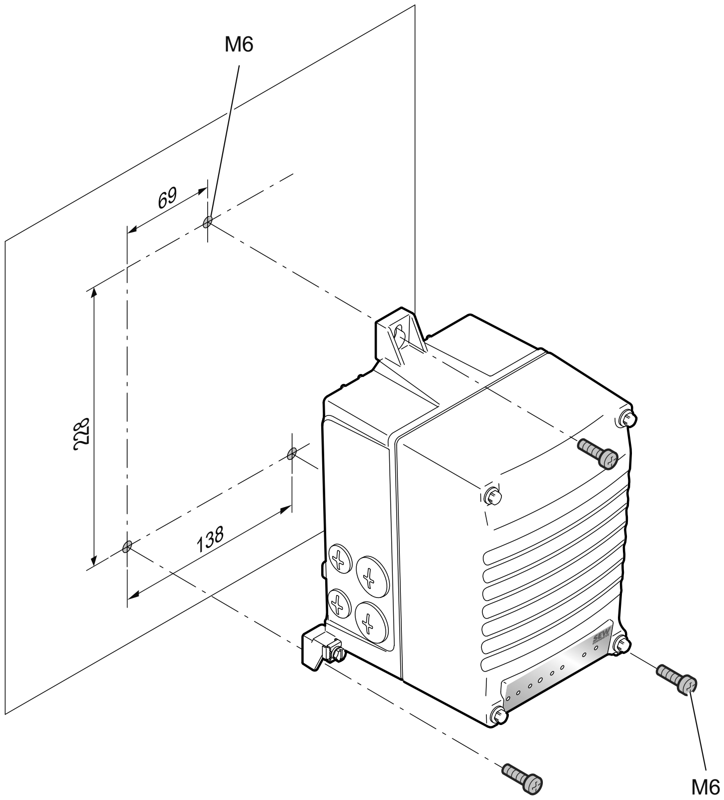
8.5.3 Derating depending on the installation altitude

Refer to the product manual > chapter "Technical data" > "Power-reducing factors" > "Derating depending on the installation altitude" (→ 🗎 36).

8.6 Mounting the device

8.6.1 Installing the MMF1.. design

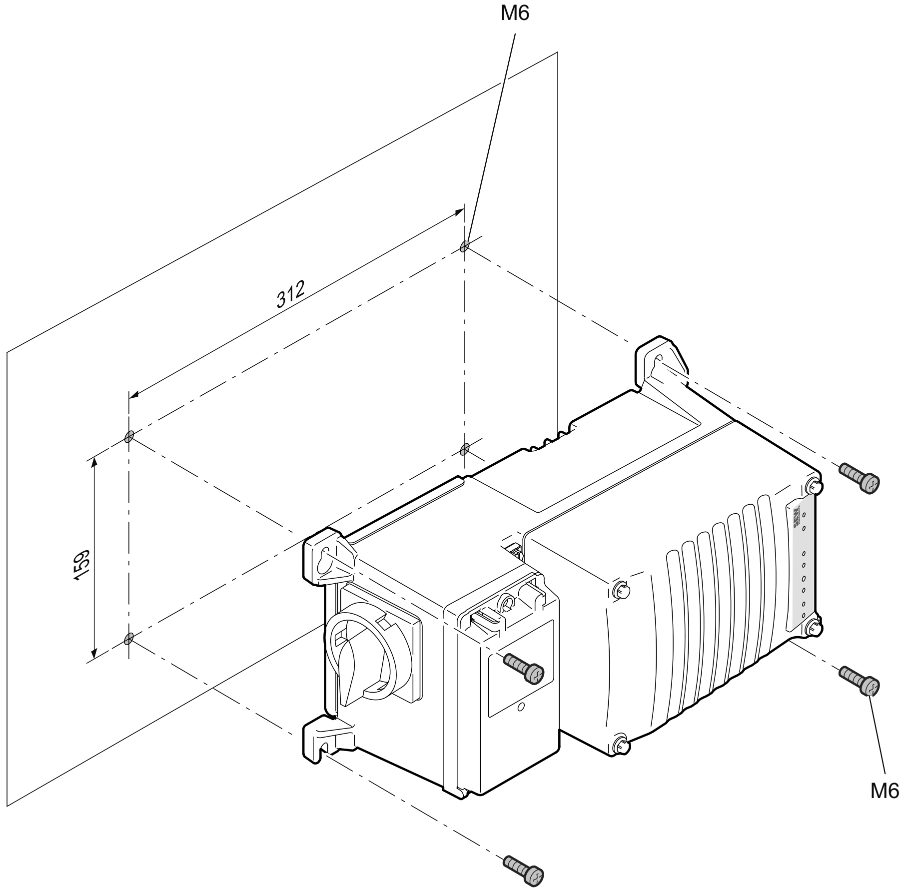
Install the device according to the following figure.



25829928715

8.6.2 Installing the MMF31.. design

Install the device according to the following figure.



25829932299

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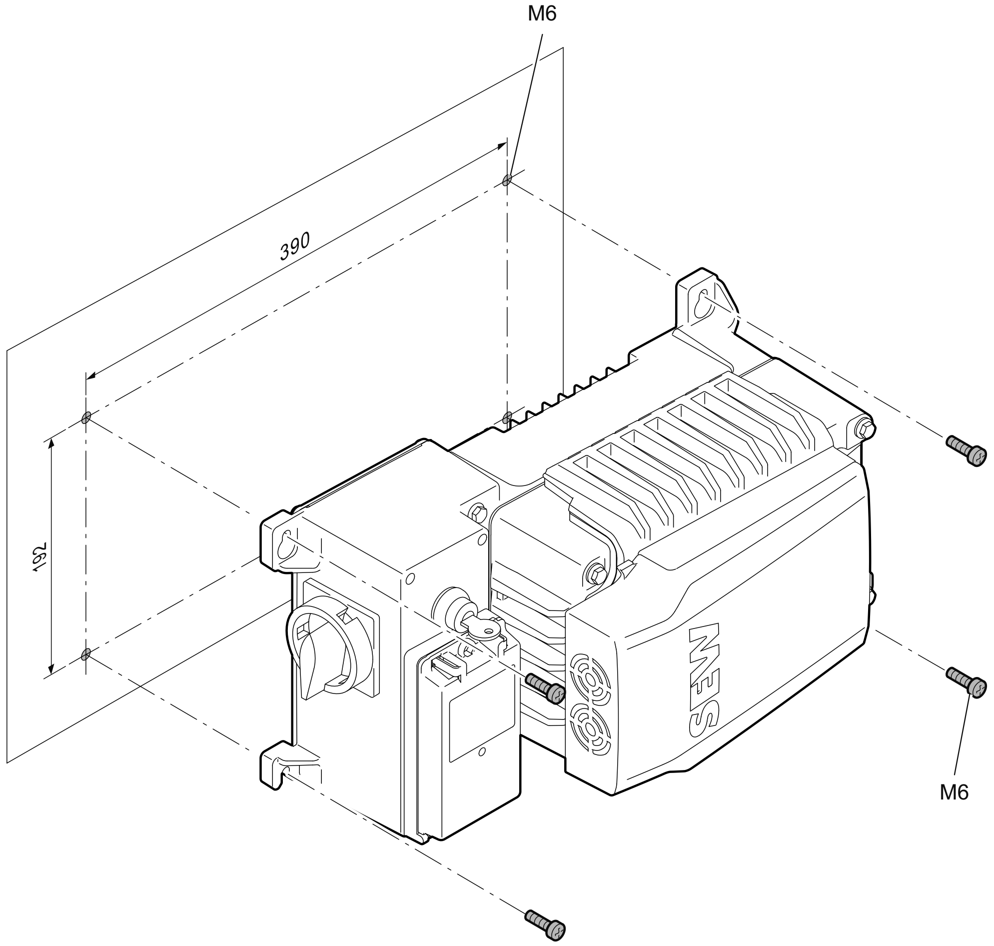
8.6.3 Installing the MMF32.. design

Install the device according to the following figure.

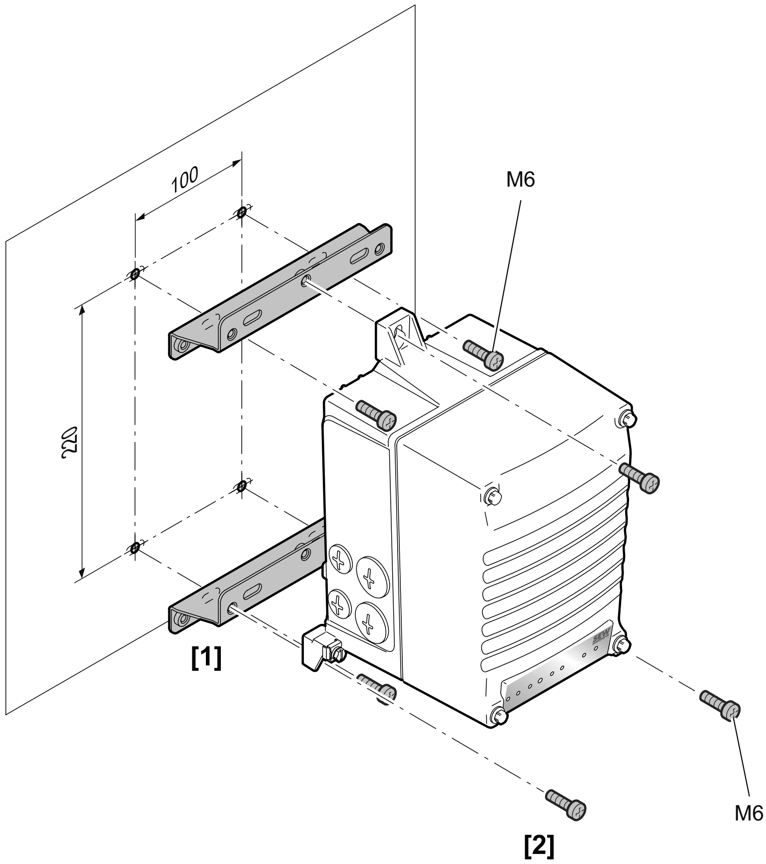


34237219595

8.7 Mounting the device with mounting panel M01

8.7.1 Mounting the MMF1 design with mounting panel M01

Install the device with mounting panel M01 according to the following figure.



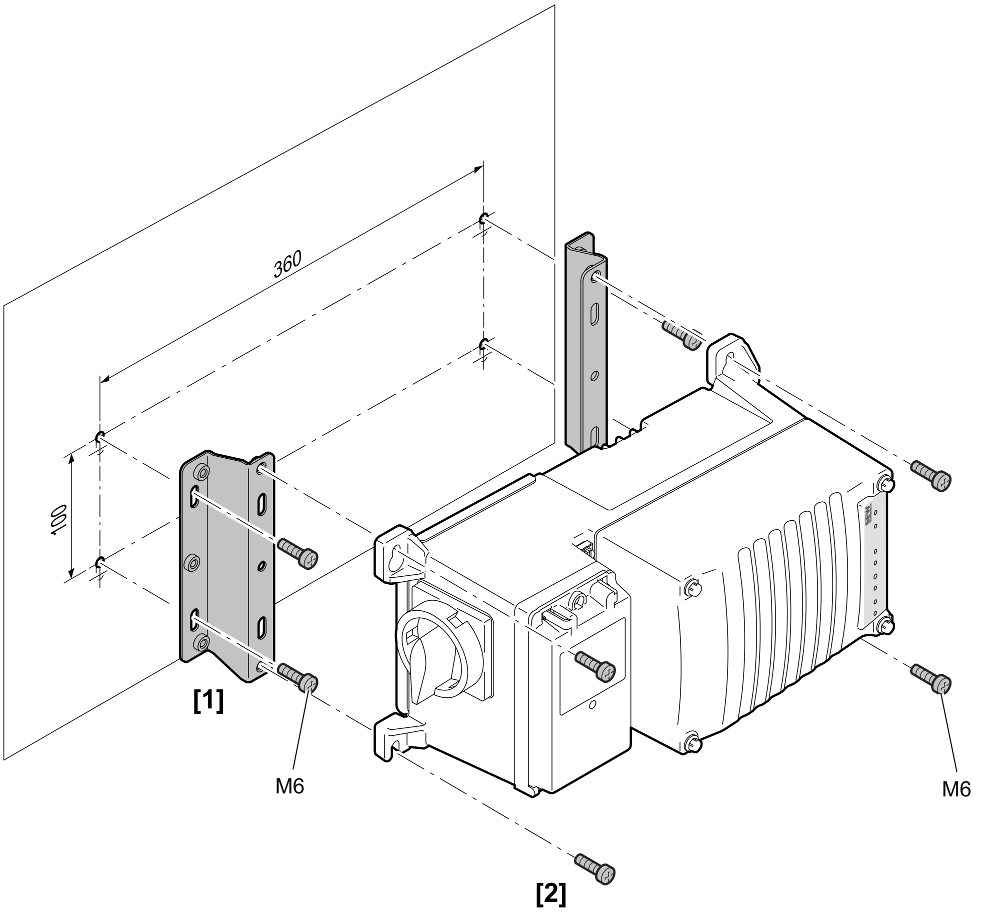
31263212171

[1] Mounting panel M01 (stainless steel)
(available for delivery from SEW-EURODRIVE, part number: 28266129, scope of delivery: 2 spacers, 4 hex head screws M6 × 20, stainless steel, torque: 3.3 Nm)

[2] Hex head screw 4 × M6

8.7.2 Installing the MMF31 design with mounting panel M01

Install the device with mounting panel M01 according to the following figure.



31263214603

[1] Mounting panel M01 (stainless steel)
(available for delivery from SEW-EURODRIVE, part number: 28266129,
scope of delivery: 2 spacers, 4 hex head screws M6 × 20,
stainless steel, torque: 3.3 Nm)

[2] Hex head screw 4 × M6

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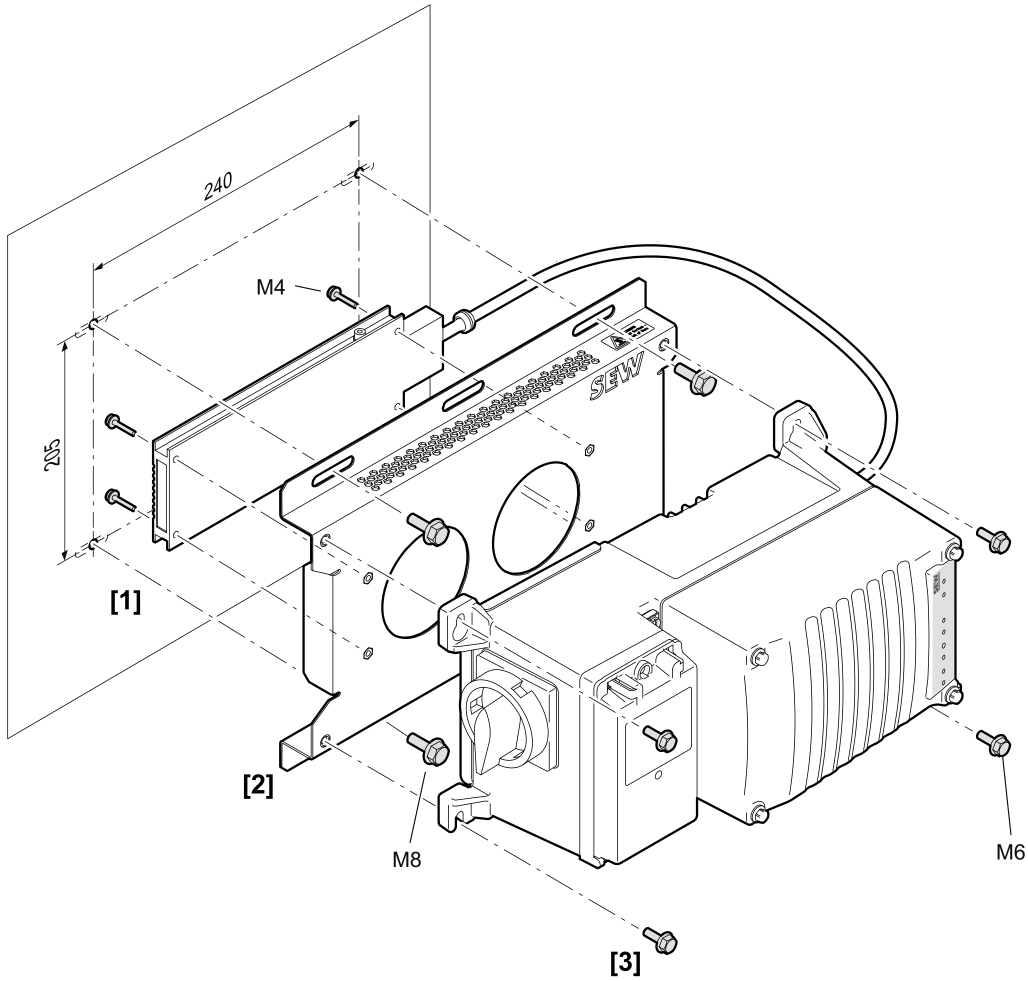
8.8 Mounting the device with mounting panel M31

8.8.1 Installing the MMF31../M31/EBW design with mounting panel M31

Install the device with mounting panel M31 according to the following figure.

The following figure shows the mounting dimensions for the device with mounting panel M31 and the braking resistor BW100-005:



34764001419

[1] Breaking resistor BW100-005 (option /EBW)
[2] Mounting panel M31 (galvanized steel)
[3] Hex head screw 4 × M6

When design **MMF31../M31** is ordered, MOVIMOT® flexible MMF31 is mounted to the M31 mounting panel at the factory.

When design **MMF../M31/EBW** is ordered, MOVIMOT® flexible MMF31 and the BW100-005 braking resistor are mounted to the M31 mounting panel at the factory. The BW100-005 braking resistor is wired to the connection box at the factory.

The following retrofit accessories sets are available:

- Accessory set MMF31 - BW100-005/K-0.46 braking resistor (28296680)
- Accessory set MMF31 – protection cover (28296699)

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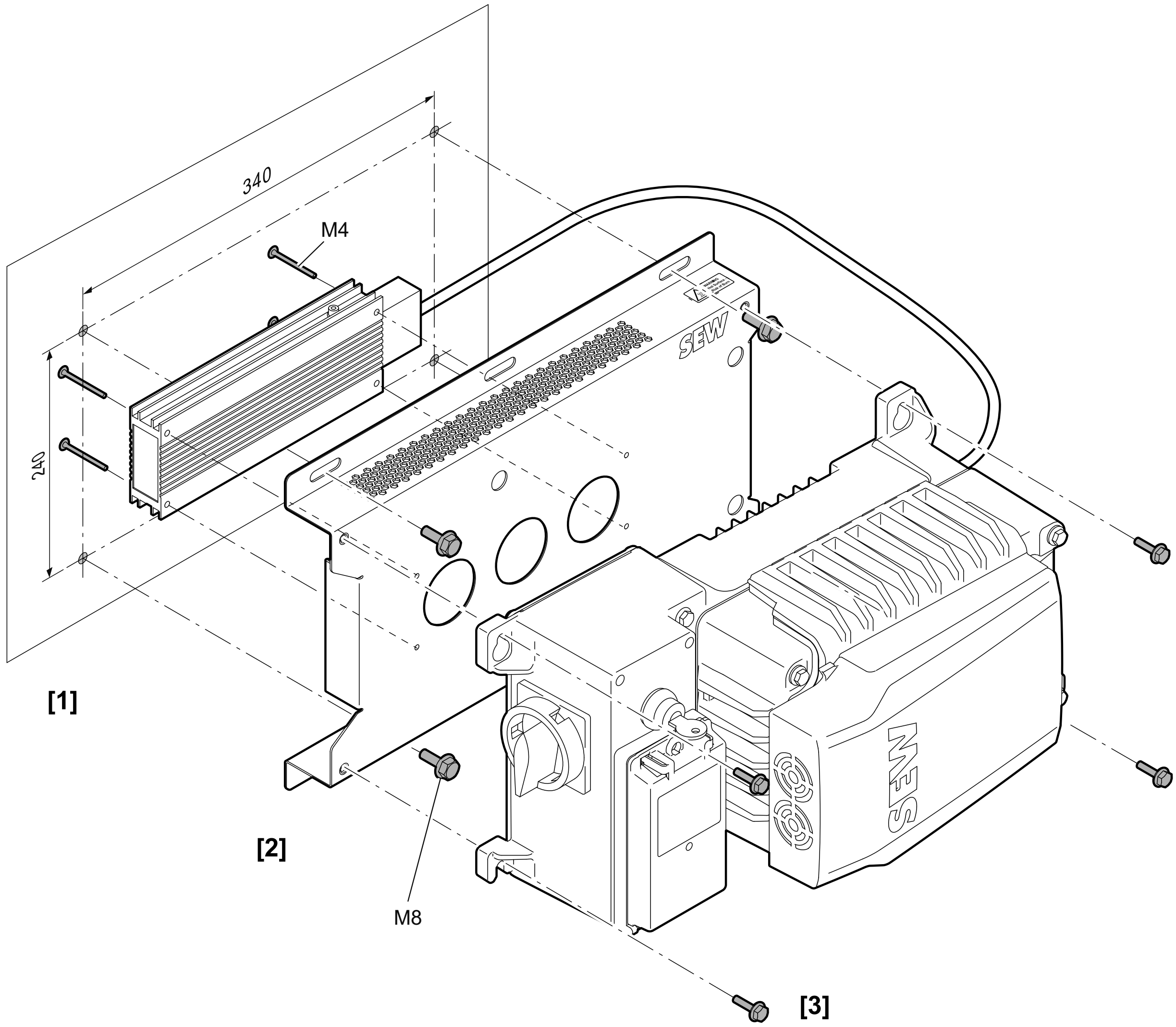
8.9 Installing the device with mounting panel M32

8.9.1 Installing the MMF32../M32/EBW design with mounting panel M32

Install the device with mounting panel M32 according to the following figure.

The following figure shows the mounting dimensions for the device with mounting panel M32 and the braking resistor BW100-005:



45246546059

[1] Breaking resistor BW100-005 (option /EBW)
[2] Mounting panel M32 (galvanized steel)
[3] Hex head screw 4 × M6

When design **MMF32../M32** is ordered, MOVIMOT® flexible MMF32 is mounted to the M32 mounting panel at the factory.

When design **MMF../M32/EBW** is ordered, MOVIMOT® flexible MMF32 and the BW100-005 braking resistor are mounted to the M32 mounting panel at the factory. The BW100-005 braking resistor is wired to the connection box at the factory.

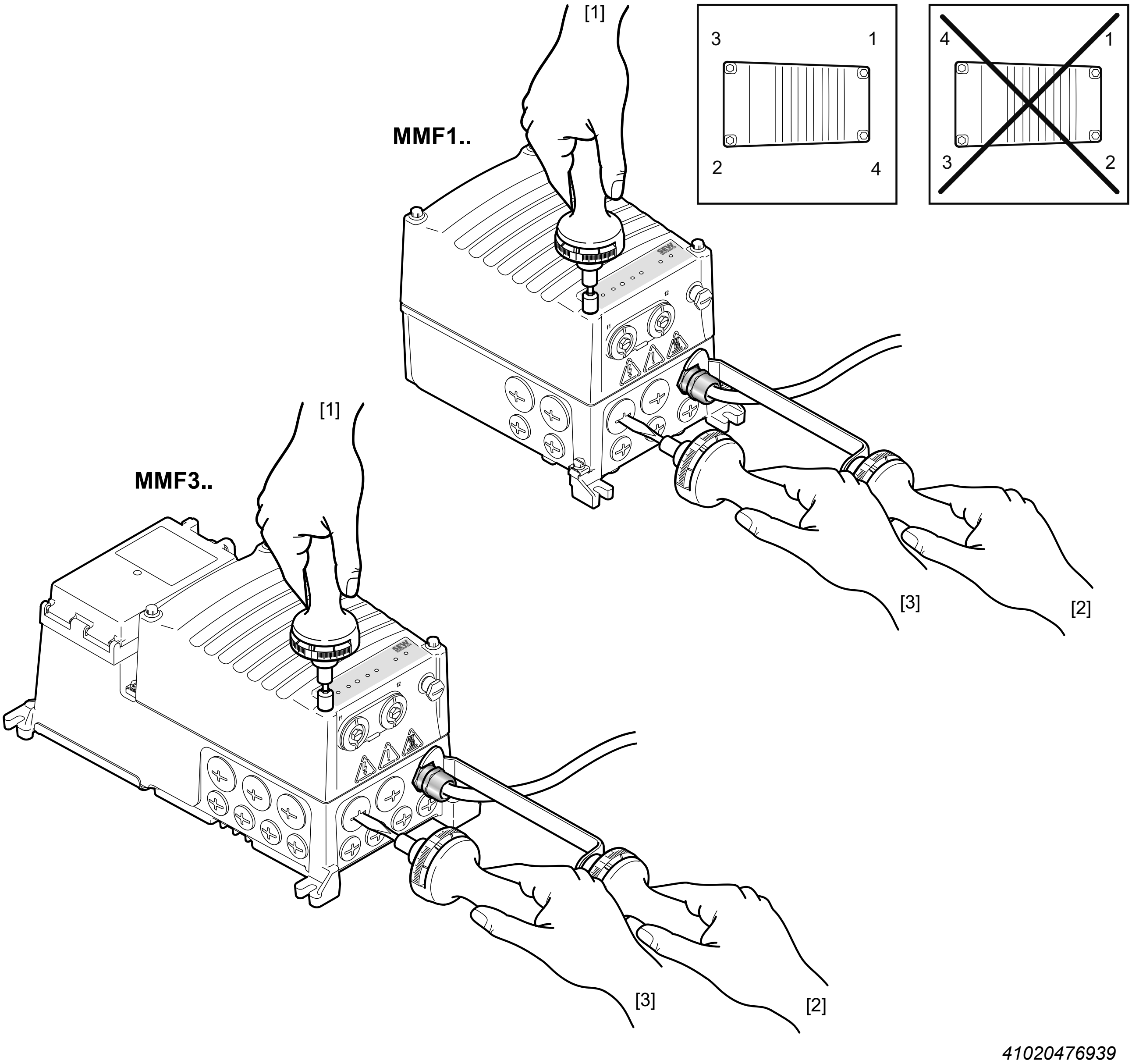
The following retrofit accessories sets are available:

- Accessory set MMF32 - braking resistor BW47-004/K-0.61 (28307321)
- Accessory set MMF32 – protection cover (28307313)

8.10 Tightening torques

8.10.1 Example MOVIMOT® flexible

The following figure shows an example of the installation of the threaded blanking plugs, cable glands and electronics cover. The number and position of threaded blanking plugs and cable bushings depend on the ordered variant.



41020476939

[1] Tighten the screws step by step in diametrically opposite sequence with a tightening torque of 6.0 Nm (for MMF1.. and MMF31.. design) or 9.5 Nm (for MMF32.. design).

[2] Tighten the cable gland with a tightening torque according to chapter "Mechanical installation" > "Tightening torques" > "Cable glands" (→ 🗎 198).

[3] Tighten the threaded plastic blanking plugs supplied by SEW-EURODRIVE with a tightening torque of 2.5 Nm.

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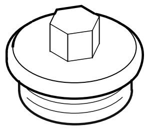
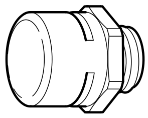
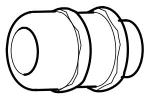
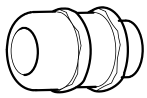
8.10.2 Cable glands / screw plugs / pressure compensation

The following table shows the screw fittings and the screw plug optionally available from SEW-EURODRIVE:

Screw fitting type	Image	Content	Size	Tightening torque		Outer cable diameter	Tightening force 1)	Part number
				Threaded jacket	Cable clamping			
Screw plugs external hexagon (made of stainless steel)		10 pieces	M16 × 1.5	6.8 Nm	–	–	–	18247342
		10 pieces	M25 × 1.5	6.8 Nm	–	–	–	18247350
Pressure compensation screw fittings (made of stainless steel)		1 piece	M16 × 1.5	4.0 Nm	–	–	–	28214617
EMC-compliant cable gland (brass, nickel-plated)		10 pieces	M16 × 1.5	4.0 Nm	3.5 Nm	> 4 to 8 mm	75 N	18204783
		10 pieces	M25 × 1.5	7.0 Nm	5.0 Nm	> 8 to 11 mm	120 N	18204805
						> 11 to 16 mm	130 N	
EMC-compliant cable gland (made of stainless steel)		10 pieces	M16 × 1.5	4.0 Nm	3.5 Nm	> 4 to 8 mm	75 N	18216366
		10 pieces	M25 × 1.5	7.0 Nm	5.0 Nm	> 8 to 11 mm	120 N	18216382
						> 11 to 16 mm	130 N	

1) Fasten the cable in the cable gland so that it achieves the following cable pull-out force from the cable gland. This is usually achieved with the specified tightening torque of the cable clamp.

9 Electrical installation

9.1 Installation planning taking EMC aspects into account

9.1.1 Notes on arranging and routing installation components

The correct operation of decentralized inverters depends on selecting the correct cables, providing correct grounding, and on a properly functioning equipotential bonding.

Always adhere to the **relevant standards**.

Note the following information.

9.1.2 EMC-compliant installation

INFORMATION

This drive system is not designed for operation on a public low voltage supply system that supplies residential areas.

This is a product with restricted availability in accordance with IEC 61800-3. This product may cause EMC interference. In this case, it is recommended for the user to take suitable measures.

9.1.3 Cable selection, routing and shielding

⚠ WARNING

Electric shock caused by faulty installation.

Severe or fatal injuries.

- Take the utmost care when installing the units.
- Observe the connection examples.

For important information on cable selection, cable routing and cable shielding, refer to chapter "Cable routing and cable shielding" (→ 249).

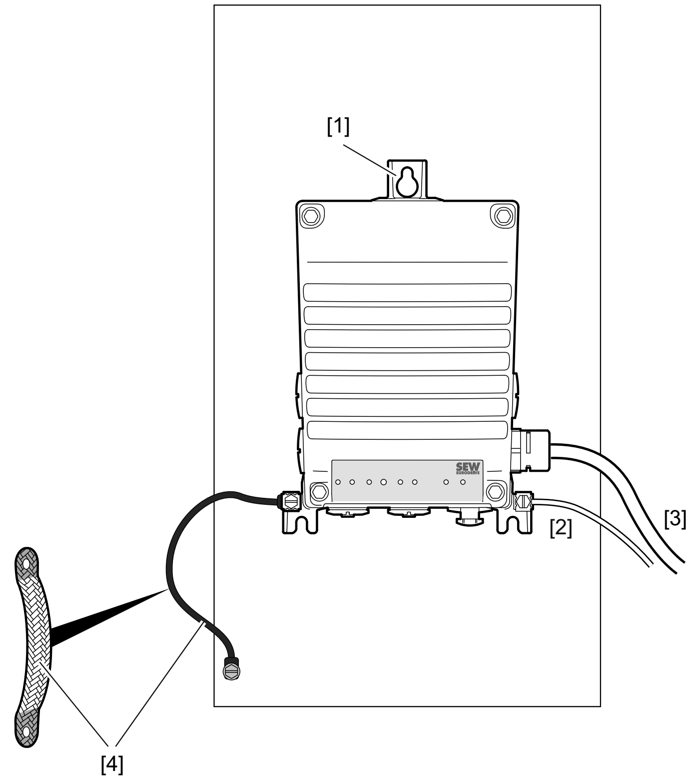
9.1.4 Equipotential bonding

Regardless of the PE connection, it is essential that **low-impedance, HF-capable equipotential bonding** is provided (see also EN 60204-1 or DIN VDE 0100-540):

- Provide for a connection over a wide area between the device and the mounting plate.
- To do so, use a ground strap (HF litz wire), for example, to connect the device and the grounding point of the system.
- Do not use the cable shields of data lines for equipotential bonding.

Design MMF1.

The following figure shows the connection of the equipotential bonding and the PE conductor:



30583362571

[1] Conductive connection over a wide surface between the decentralized frequency inverter and the mounting plate, in case the entire contact surface is electrically conductive (e.g. unpainted).
[2] 2nd PE conductor via separate terminals
[3] PE conductor in the supply system cable
[4] EMC-compliant equipotential bonding, e.g. via grounding strap (HF litz wire). The contact surfaces must be electrically conductive (e.g. unpainted).

INFORMATION

For detailed information on equipotential bonding for decentralized inverters and drive units, refer to the publication "Drive Engineering – Practical Implementation, EMC in Drive Engineering" in chapter "Equipotential Bonding of Decentralized Inverters" by SEW-EURODRIVE.

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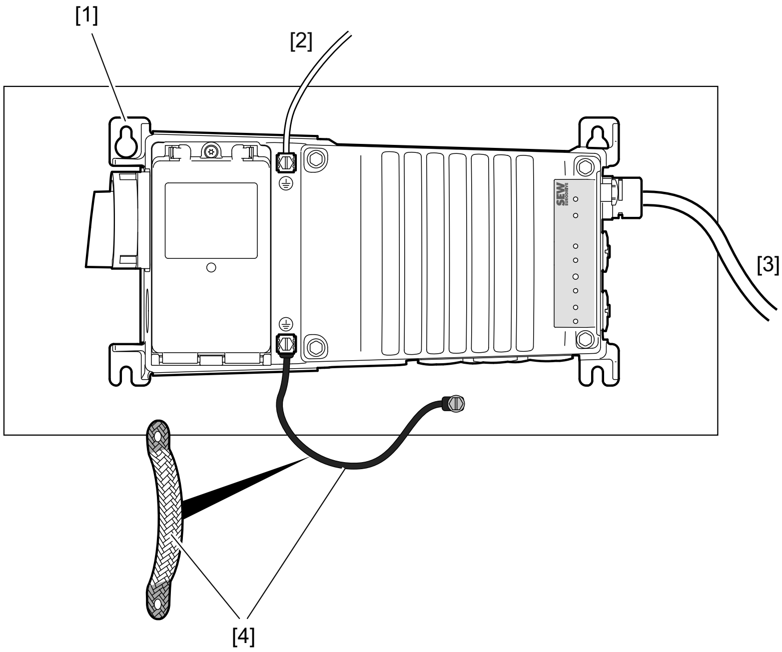
MMF31 design

The following figure shows the connection of the equipotential bonding and the PE conductor:



30583397003

[1] Conductive connection over a wide surface between the decentralized frequency inverter and the mounting plate, in case the entire contact surface is electrically conductive (e.g. unpainted).
[2] 2nd PE conductor via separate terminals
[3] PE conductor in the supply system cable
[4] EMC-compliant equipotential bonding, e.g. via grounding strap (HF litz wire). The contact surfaces must be electrically conductive (e.g. unpainted).

INFORMATION

For detailed information on equipotential bonding for decentralized inverters and drive units, refer to the publication "Drive Engineering – Practical Implementation, EMC in Drive Engineering" in chapter "Equipotential Bonding of Decentralized Inverters" by SEW-EURODRIVE.

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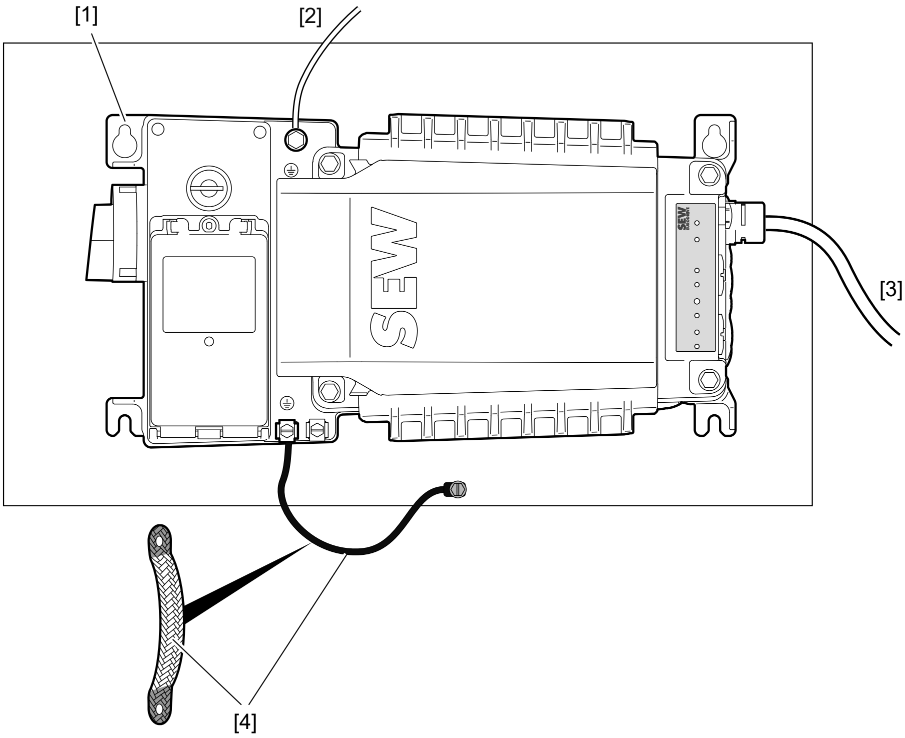
MMF32 design

The following figure shows the connection of the equipotential bonding and the PE conductor:



34237127051

[1] Conductive connection over a wide surface between the decentralized frequency inverter and the mounting plate, in case the entire contact surface is electrically conductive (e.g. unpainted).
[2] 2nd PE conductor via separate terminals
[3] PE conductor in the supply system cable
[4] EMC-compliant equipotential bonding, e.g. via grounding strap (HF litz wire). The contact surfaces must be electrically conductive (e.g. unpainted).

INFORMATION

For detailed information on equipotential bonding for decentralized inverters and drive units, refer to the publication "Drive Engineering – Practical Implementation, EMC in Drive Engineering" in chapter "Equipotential Bonding of Decentralized Inverters" by SEW-EURODRIVE.

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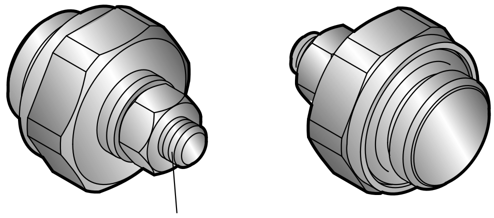
9.2 Equipotential bonding at the connection box

The following cable gland with an M6 threaded bolt provides an additional option for HF-compatible equipotential bonding on a connection box:



9007203139701899

	Tightening torque		Part number
	Cable gland	M6 nut for stud bolt	
M16 cable gland with M6 threaded bolt	4.0 Nm	3.0 Nm	08189234
M25 cable gland with M6 threaded bolt	7.0 Nm	3.0 Nm	08192685

You can install this cable gland in a connection box as long as a cable entry of size M16 or M25 is still free.

Screw the cable gland into the free cable entry and install the grounding cable (with ring cable lug) or the HF litz wire on the M6 threaded bolt.

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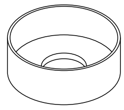
9.3 Installation instructions

9.3.1 Permitted voltage systems

Information on voltage supply 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	Operation with an electronics cover of size 1 in IT system design is permitted (...-513-....)! For devices with electronics cover of size 2, mount an insulating bushing according to chapter "Installing the insulating bushing" (→ 🗎 205). • For use in IT systems, SEW-EURODRIVE recommends using insulation monitors with pulse-code measurement. Using such devices prevents false tripping of the insulation monitor due to the earth capacitance of the inverter. • The EMC limit values for interference emission are not specified for IT systems. The EMC limits for interference emission specified in the product manual, chapter "Technical data" do not apply to IT system designs.
Voltage systems with grounded outer conductor	Use is prohibited.

Mounting of insulating bushing (only with electronics cover size 2)

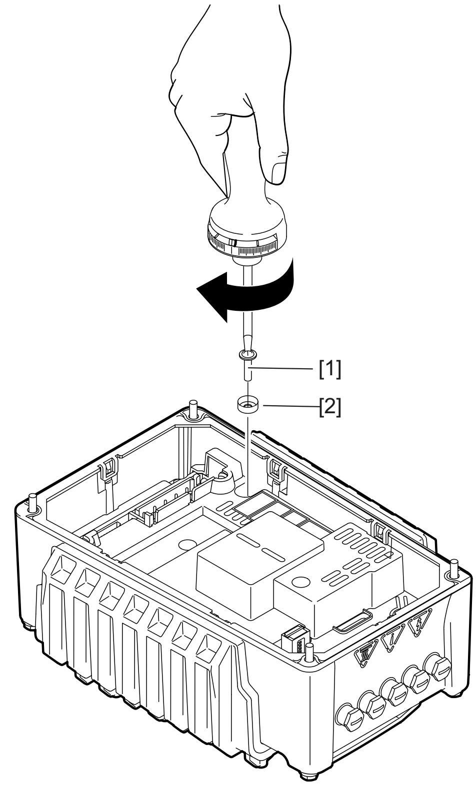
The electronics covers of size 2 are compatible with IT systems only if you mount an insulating bushing. When ordering the electronics cover, SEW-EURODRIVE supplies the insulating bushing as a single item in an accessory bag, provided it has been selected separately. The insulating bushing is not included in the delivery as standard. Alternatively, you can order the insulating bushing separately as an accessory (1, 5 or 10 pieces) later:

Image of insulating socket	Contents	Part number
	1 pc.	28284437
	5 pc.	28284445
	10 pc.	28284453

Mounting

When electrically installing a device with an electronics cover of size 2 in IT systems, mount the insulating bushing in the electronics cover as follows:

1. Observe the notes in chapter "Preliminary work regarding inspection and maintenance".
2. Loosen the 4 screws of the electronics cover and remove it.
3. Loosen the screw [1] of the electronics cover.
4. Screw the screw [1] with the insulating bushing [2] into the electronics cover. Tighten the screw with a tightening torque of 1.4 to 1.6 Nm.



9007233821379851

5. Place the electronics cover onto the connection box and fasten the electronics cover.
   ⇨ Insert/screw in the screws and tighten them in a diametrically opposed sequence step by step with a tightening torque of 9.5 Nm.

9.3.2 Connecting supply system cables

Observe the following information when connecting the supply system cables:

- The nominal voltage and frequency of the device must correspond with the data of the supply system.
- Dimension the cable cross section according to the input current I_{line} for rated power (see product manual, chapter "Technical data").
- Install safety equipment F11/F12/F13 for line fuses at the beginning of the supply system cable behind the supply bus junction, see chapter "Wiring diagram".

  Dimension the safety equipment according to the cable cross section.
- When selecting the fuse, observe the information in the product manual > chapter "Technical data".
- Use only copper conductors with a permitted minimum temperature of 75 °C as connection cables.

9.3.3 Permitted cable cross section of terminals

Line terminals X1

Observe the permitted cable cross sections for installation:

Line terminals X1	Without conductor end sleeve	With conductor end sleeve (with or without plastic collar)
Connection cross section	0.5 mm² to 6 mm²	0.5 mm² to 6 mm²
Stripping length	13 mm – 15 mm	

Terminals X2_A for motor, brake and temperature sensor

Observe the permitted cable cross sections for installation:

Terminals X2_A for motor, brake and temperature sensor	Without conductor end sleeve	With conductor end sleeve
Connection cross section	0.08 mm² to 2.5 mm²	0.25 mm² to 2.5 mm²
Stripping length	8 mm – 9 mm	

Terminals X3 for braking resistor

Observe the permitted cable cross sections for installation:

Terminals X3 for braking resistor	Without conductor end sleeve	With conductor end sleeve (with or without plastic collar)
Connection cross section	0.08 mm² – 4.0 mm²	0.25 mm² – 2.5 mm²
Stripping length	8 mm – 9 mm	

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Control terminals X9

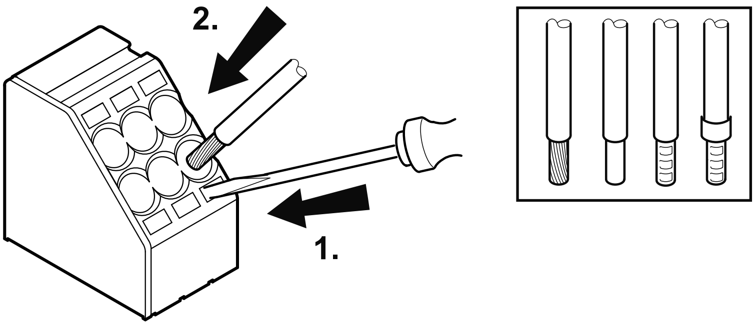
Observe the permitted cable cross sections for installation:

Control terminals X9	Without conductor end sleeve	With conductor end sleeve (without plastic collar)	With conductor end sleeve (with plastic collar)
Connection cross section	0.08 mm^2 – 2.5 mm^2	0.25 mm^2 – 2.5 mm^2 [1)]	0.25 mm^2 – 1.5 mm^2
Stripping length	5 mm – 6 mm		

[1)] 2.5 mm^2 only in combination with quadratically crimping (e.g. with WAGO® Variocrimp crimping tool)

9.3.4 Activating line terminals X1

Adhere to the following sequence when actuating the line terminals X1:

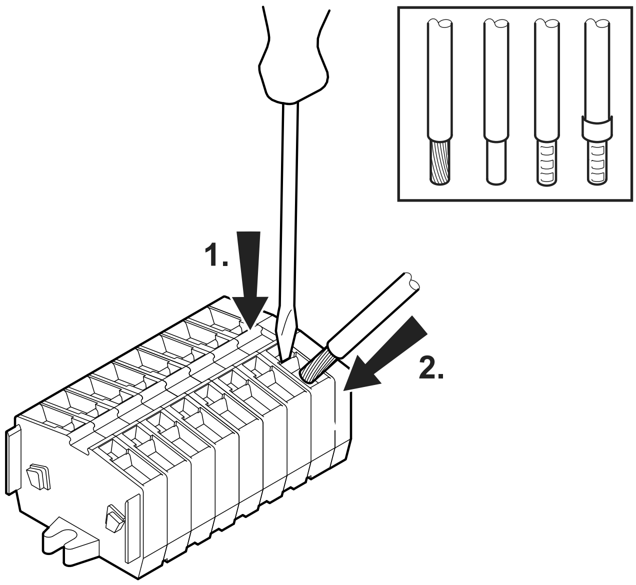


25649924107

9.3.5 Activating terminals X2_A for motor, brake and temperature sensor

Adhere to the following sequence when you activate the terminals X2_A for motor, brake and temperature sensor:

- Terminals X2_A in designs MMF1. and MMF31



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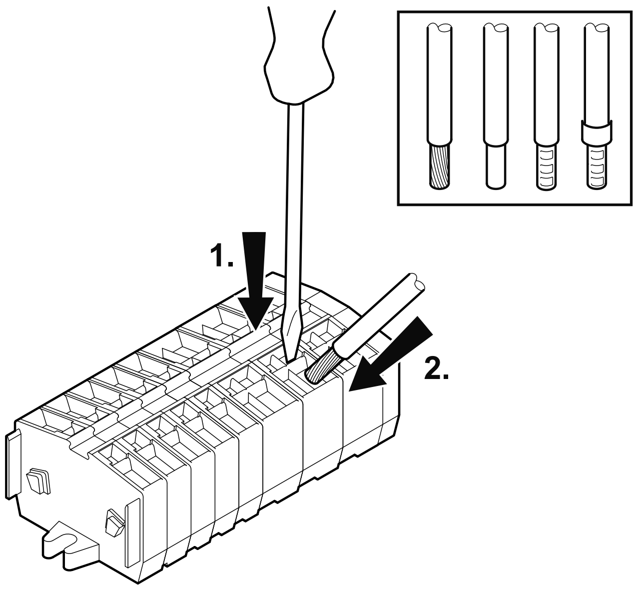
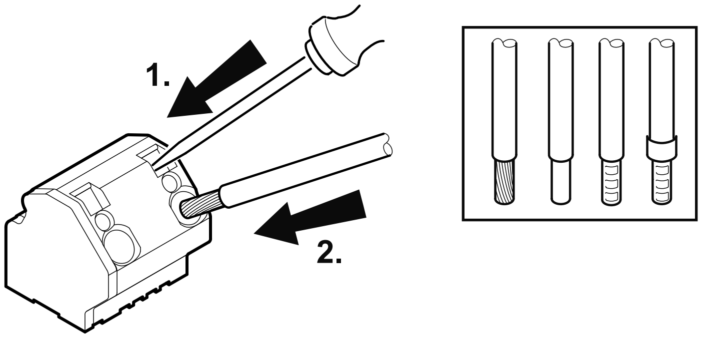
- Terminals X2_A in design MMF32



34316713355

9.3.6 Activating terminals X3 for the braking resistor

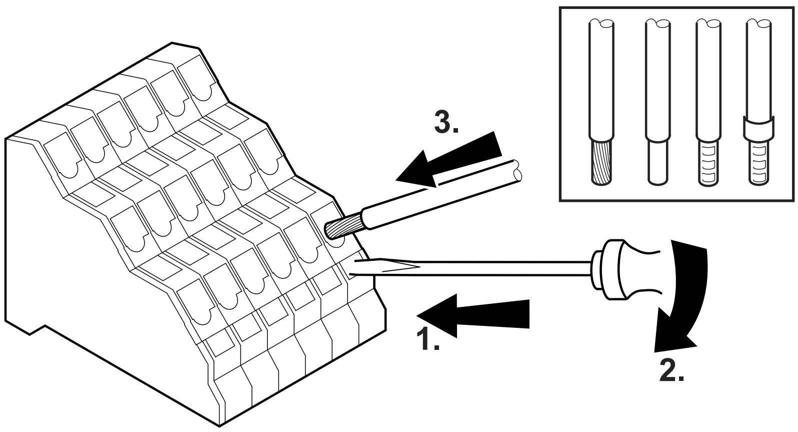
Adhere to the following sequence when actuating the X3 terminals for the braking resistor:



25650172171

9.3.7 Activating control terminals X9

Observe the following sequence when actuating the X9 control terminals:



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9.3.8 Selecting the residual current device

The inverter can cause a direct current in the PE conductor.

Proceed as follows to select the residual current device:

1. If using a residual current device is not mandatory according to the standards, SEW-EURODRIVE recommends not using a residual current device.
2. ⚠ **WARNING!** No protection against electric shock if an incorrect type of residual current device is used. Severe or fatal injuries.
   If a residual current device (residual current device RCD or residual current monitor RCM) is provided, use an all-current-sensitive RCD or RCM of type B.
3. If a residual current device is required, select the residual current device according to the requirements for protecting persons, fire protection or system protection. Observe the tripping characteristic, the deceleration and the rated tripping current of the residual current device during selection.
4. During project planning, note that leakage currents which are as low as possible occur in the system for operational reasons.
5. If the operational leakage currents are too high, you can distribute the current supply among several RCDs.

9.3.9 Using the line contactor

Proceed as follows when using the line contractor:

1. Use only a contactor of utilization category AC-3 (EN 60947-4-1) as a line contactor.
2. **NOTICE!** Failing to observe the minimum switch-off time of the line contactor can cause material damage. Irreparable damage to the inverter or unforeseen malfunctions.
   After switching off the voltage supply, keep it switched off for at least 10 s.
   - ⇨ Do not switch the voltage supply on or off at the line contactor more than once per minute.

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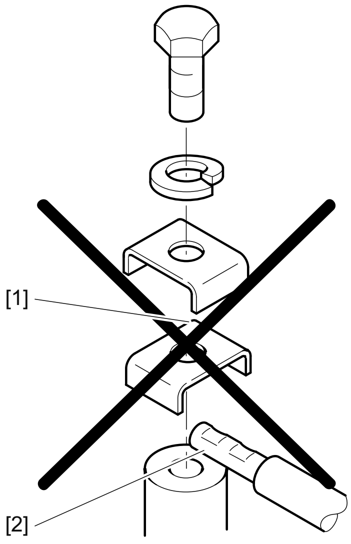
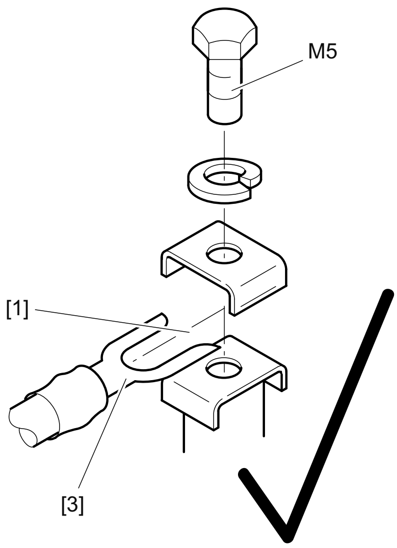
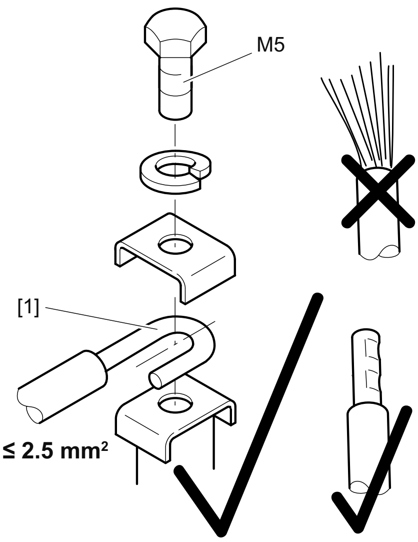
9.3.10 Notes on PE connection

1. Install the PE connection cable to the connection box as follows (screw tightening torque: 2.0 – 2.4 Nm).
2. ⚠ **WARNING!** Electric shock due to incorrect connection of PE Severe or fatal injuries.
   Observe the following notes for the PE connection.

<table>
<tr><th>Non-permitted mounting</th><th>Recommendation:
Mounting with forked cable lug[1)]
Permitted for all cross sections</th><th>Mounting with solid connecting wire or litz wire with conductor end sleeve[1)]
Permitted for cross sections up to
maximum 2.5 mm²</th></tr>
<tr><td>
</td><td>

9007222159700491</td><td>

18014421414430219</td></tr>
</table>

1) Use the specified material for the assembly that is included in the accessory bag.

[1] Install the PE connection cable between both U-shaped mounting panels.

[2] Incorrect installation sequence

[3] Forked cable lug suitable for M5 PE screws

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Leakage currents

During normal operation, leakage currents ≥ 3.5 mA may occur. In order to fulfill EN 61800-5-1, observe the following information:

- The ground connection (PE) must be installed in such a way that it meets the requirements for systems with high leakage currents.
- This usually means
  - installing a PE connection cable with a minimum cross section of 10 mm^2 (copper conductor)
  - or installing a second PE connection cable in parallel to the protective earth.

    According to DIN EN 61800-5-1, the second PE connection is not required if the line connection is equipped with a plug connector for industrial applications (according to IEC 60309) and if the supply system cable has a cross section of ≥ 2.5 mm^2.

INFORMATION

According to the IEC 60309-1 standard > chapter "General requirements for connectors, sockets and couplings for industrial applications", the M23 circular plug connectors from TE Connectivity - Intercontec products of the 723 series comply with plug connectors for industrial applications.

9.3.11 Installation with protective separation

The electronics cover meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. The connected signal circuits and the DC 24 V voltage supply must meet the 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.

9.3.12 Protection devices

- The units come equipped with integrated protection devices against overload and short circuit.
- The power contactor of the supply system cable must be realized through external overload devices.
- The relevant standards must be observed concerning the cable cross section, the voltage drop, and the type of routing that is used.

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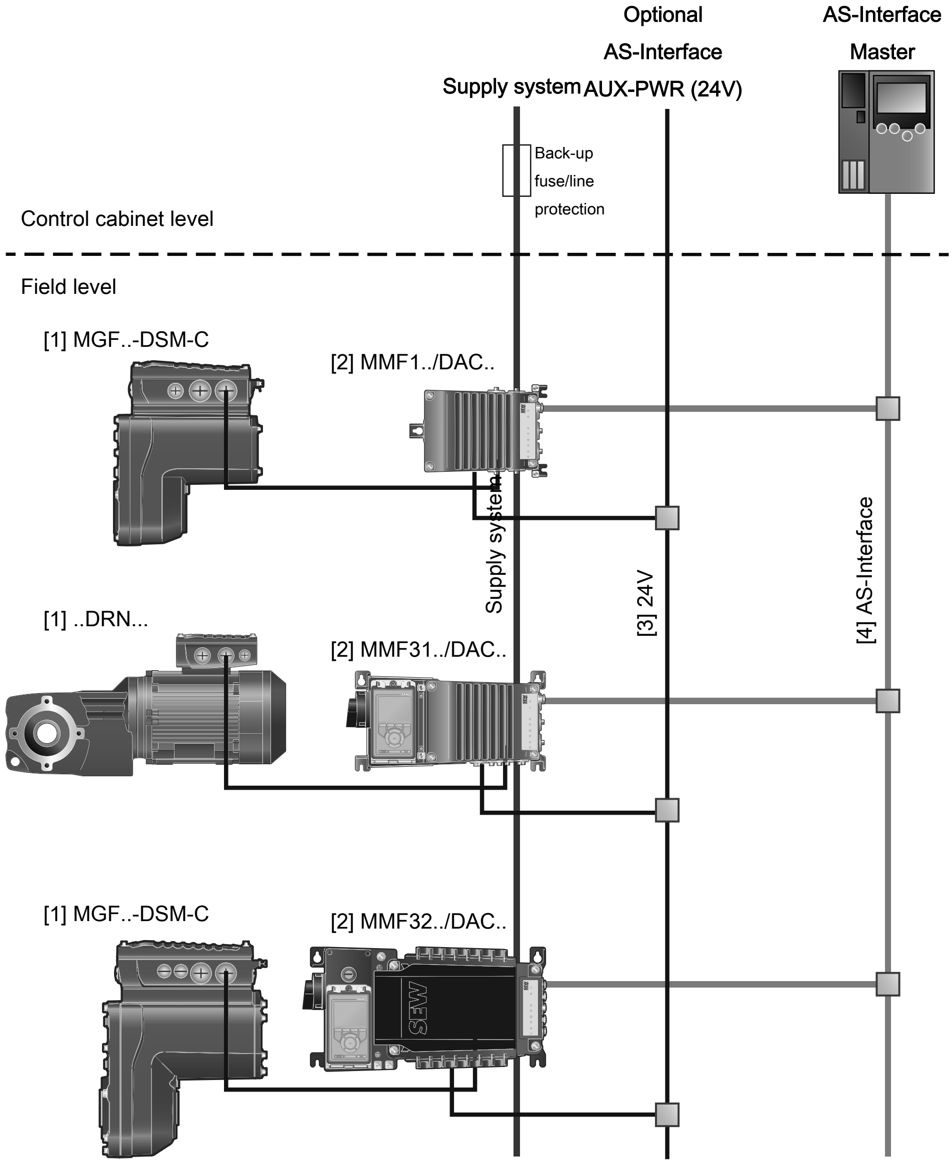
9.3.13 Installation above 1000 m asl

The devices can be used at altitudes above 1000 m above sea level up to 3800 m above sea level under the following marginal conditions. The maximum altitude is limited due to the decreased dielectric strength at lower air density.

- The nominal motor current I_N is reduced due to the reduced cooling above 1000 m, see **product manual** > chapter "Technical data" (→ 🗎 28).
- Above 2000 m above sea level, the air and creepage distances are only sufficient for overvoltage category II. If the installation requires overvoltage category III, you will have to install additional external overvoltage protection to limit overvoltage peaks to 1.5 kV phase-to-phase and 2.5 kV phase-to-ground.
- If safe electrical disconnection is required, it must be implemented outside the device at altitudes of more than 2000 m above sea level (safe electrical disconnection in accordance with EN 61800-5-1).
- At installation altitudes between 2000 m and 3800 m above sea level, measures must be taken that reduce the line side overvoltage from category III to category II for the entire system.

9.4 Installation topology (example: standard installation)

The following figure shows a basic installation topology with the device:



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[1] Connected drive units with/without digital interface
[2] MOVIMOT® flexible with DAC.. electronics cover
[3] Optional 24 V backup voltage via the AS-Interface (AUX-PWR)
[4] AS-Interface communication cable

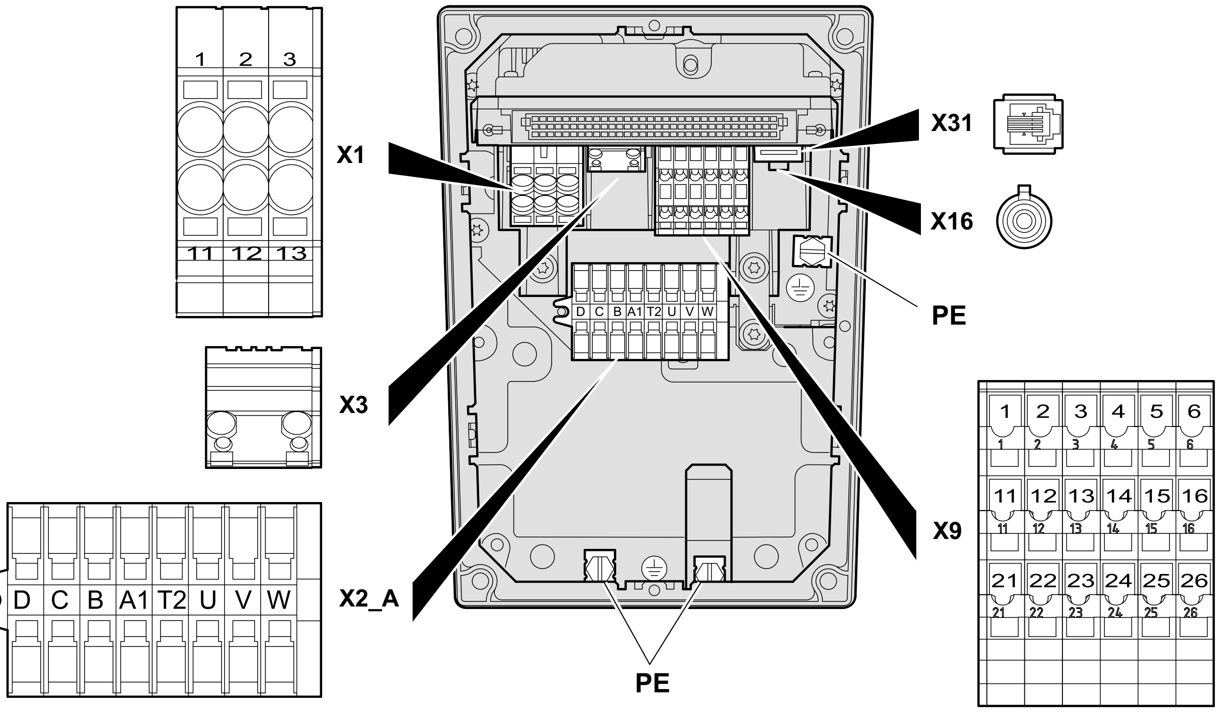
9.5 Terminal assignment of MOVIMOT® flexible DAC

Attach units without a plug connector to the terminals as follows:

1. ⚠ **WARNING!** Electric shock caused by dangerous voltages in the connection box. Severe or fatal injuries.
   De-energize the device. Pay attention to the 5 safety rules in chapter “Carrying out electrical work safely”. Afterwards, wait 5 minutes.
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Let the device cool sufficiently before touching it.
3. Undo the screws of the electronics cover. Remove the electronics cover.
4. Route the cables through the cable glands into the connection box.
5. If terminal X3 for connecting the braking resistor is occupied with an optional internal braking resistor and the capacity of this braking resistor is insufficient, you can alternatively connect an external braking resistor as follows:
   ⇨ Undo the connections of the internal braking resistor.
   ⇨ Insulate and fix the connections of the internal braking resistor. Ensure that the connections are electrically isolated from all other components.
   ⇨ Connect the external braking resistor. When doing this, pay attention to the installation instructions of the unit and the external braking resistor.
6. Connect the device according to the following "terminal assignment" (→ 🗎 216).

9.5.1 Design MMF1., MMF31

The following figure shows the terminals of MOVIMOT® flexible MMF1.., MMF31../ DAC:



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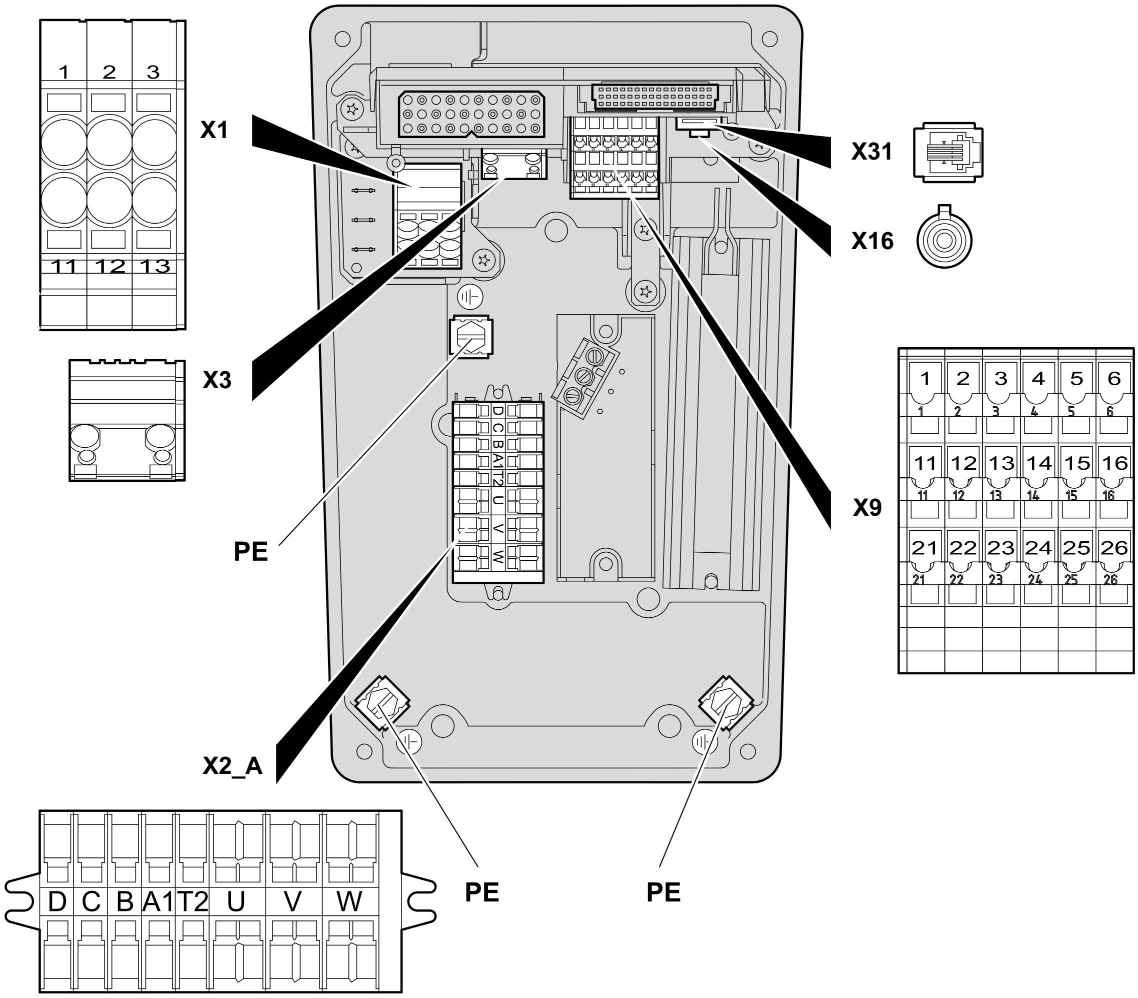
9.5.2 MMF32 design

The following figure shows the terminals of MOVIMOT® flexible MMF32../DAC:



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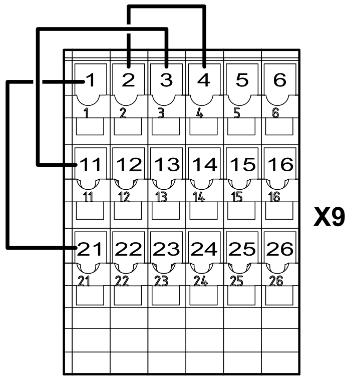
9.5.3 Assignment

The following table shows the terminal assignment of MOVIMOT® flexible DAC:

Terminal	No.	Marking	Function	
X1 **line terminals**	1	Brown	L1	Line connection, phase L1 – IN
	2	Black	L2	Line connection, phase L2 – IN
	3	Gray	L3	Line connection, phase L3 – IN
	11	Brown	L1	Line connection, phase L1 – OUT
	12	Black	L2	Line connection, phase L2 – OUT
	13	Gray	L3	Line connection, phase L3 – OUT
⏚	–	–	PE	Protective earth connection
X3 **braking resistor terminals**	1	–	BW	Braking resistor connection
	2	–	BW	Braking resistor connection

Terminal	No.	Marking	Function	
X9 control terminals	1	Yellow	F_STO_P1	Input STO+
	2	Yellow	F_STO_P1	Input STO+ (to loop through)
	3	–	0V24_OUT	0V24 reference potential for DC 24 V output/digital inputs
	4	–	24V_OUT	DC 24 V output
	5	–	DI01	Digital input DI01
	6	–	DI02	Digital input DI02
	11	Yellow	F_STO_M	Input STO_ground
	12	Yellow	F_STO_M	Input STO_ground (to loop through)
	13	–	24V_IN	DC 24 V supply
	14	–	DOR-C	Relay output DO R, common contact
	15		DI03	Digital input DI03
	16		DI04	Digital input DI04
	21	Yellow	F_STO_P2	Input STO+
	22	Yellow	F_STO_P2	Input STO+ (to loop through)
	23	–	0V24_IN	0V24 reference potential for DC 24 V supply
	24	–	DOR-NO	Relay output DO R, NO contact
	25		0V24_OUT	0V24 reference potential for DC 24 V output/digital inputs
	26		24V_OUT	DC 24 V output
X31 engineering interface	1	–	0V24_OUT	0V24 reference potential for DC 24 V auxiliary output
	2	–	CAN_L	CAN Low connection
	3	–	CAN_H	CAN High connection
	4	–	24V_OUT	DC 24 V auxiliary output
X16 MOVILINK® DDI interface	1	–	DDI	MOVILINK® DDI supply/communication
	2	–	DDI_GND	MOVILINK® DDI reference potential

The following figure shows the factory-installed jumpers at the X9 terminals:



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These jumpers are not present in the following designs:

- Designs with plug connectors with STO function

For further information, refer to the product manual > chapter "Project planning for functional safety" and chapter "Connection variants for functional safety".

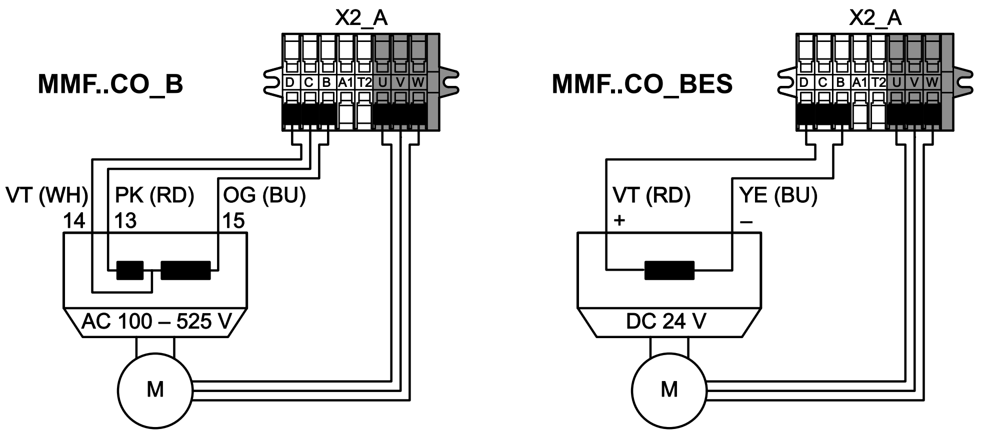
Assignment of terminal X2_A with MMF..CO.. design

For motors with digital interface (MOVILINK® DDI interface).
As an alternative, also for motors without digital interface (MOVILINK®-DDI interface), but then without connecting a motor temperature sensor.

Terminal	No.	Marking	Connection Depending on the brake control	
			Brake control /B for AC brakes 100 – 525 V.	**Brake control /BES for DC brakes 24 V.**
X2_A Terminals for motor and brake For MMF...**CO** design For motors with digital interface (MOVILINK® DDI)	D	White	**Connection of brake 14** • Brake coil: White • Hybrid cable: Violet (D)	**Connection of brake +** • BK, BZ brake coil: Red • BP brake coil: Yellow • Hybrid cable: Violet (D)
	C	White	**Connection of brake 13** • Brake coil: Red • Hybrid cable: Pink (C)	**Reserved** • Hybrid cable: Pink (C)
	B	White	**Connection of brake 15** • Brake coil: Blue • Hybrid cable: Orange (B)	**Reserved** • Hybrid cable: Orange (B)
	A1	White	**Reserved** • Hybrid cable: Yellow (A)	**Connection of brake -** • BK, BZ brake coil: Blue • BP brake coil: Yellow • Hybrid cable: Yellow (D)
	T2	White	Reserved	
	U	Gray	**Motor connection, phase U**	
	V	Gray	**Motor connection, phase V**	
	W	Gray	**Motor connection, phase W**	

Wiring diagrams

The following figures show the connection options for motors with digital interface (MOVILINK®DDI interface).



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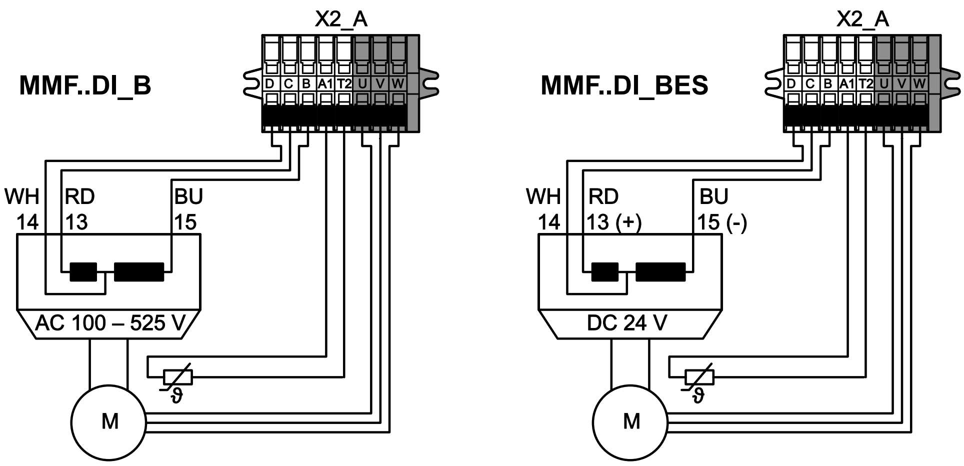
Assignment of terminal X2_A with MMF..DI.. design

For motors without digital interface (MOVILINK® DDI interface)

Terminal	No.	Marking	Connection depending on the brake control	
			Brake control /B for AC brakes 100 – 525 V.	**/BES brake control for DC brakes 24 V.**
X2_A Terminals for motor and brake For MMF...**DI** design For motors without digital interface (MOVILINK® DDI)	D	White	**Connection of brake 14** White	**Brake connection 14** Accelerator coil: White
	C	White	**Connection of brake 13** Red	**Connection of brake +** • BK, BZ brake coil: Red • BP brake coil: Yellow
	B	White	**Connection of brake 15** Blue	**Connection of brake -** • BK, BZ brake coil: Blue • BP brake coil: Yellow
	A1	White	**Temperature sensor connection (Temp +)**	
	T2	White	**Temperature sensor connection (Temp -)**	
	U	Gray	**Motor connection, phase U**	
	V	Gray	**Motor connection, phase V**	
	W	Gray	**Motor connection, phase W**	

Wiring diagrams

The following figures show the connection options for motors with digital interface (MOVILINK®DDI interface).



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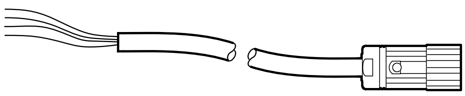
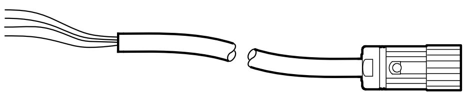
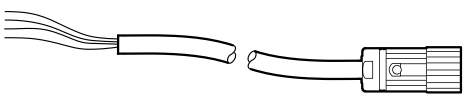
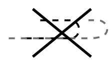
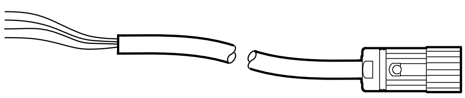
9.5.4 X_2A: Connection cable for motors with digital interface

Connection cable to terminal X_2A for motors with digital interface

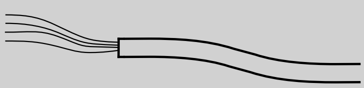
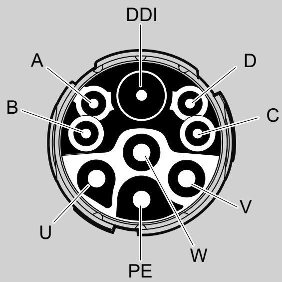
The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 Open M23, without coding ring, female	CE/cURus: 28123808	LEONI LEHC®	Variable 	4 × 1.5 mm^2 + 4 × 1.0 mm^2 + RG58 / AC 500 V
 Open M23, without coding ring, female	CE/cURus: 28123743	LEONI LEHC® 005244	Variable 	4 × 1.5 mm^2 + 4 × 1.0 mm^2 + RG58 / AC 500 V
 Open M23, without coding ring, female	CE/cURus: 28123816	LEONI LEHC® 005244	Variable 	4 × 2.5 mm^2 + 4 × 1.0 mm^2 + RG58 / AC 500 V
 Open M23, without coding ring, female	CE/cURus: 28123751	LEONI LEHC® 005244	Variable 	4 × 2.5 mm^2 + 4 × 1.0 mm^2 + RG58 / AC 500 V

Connection to terminal X_2A of the open-end cables and with M23 plug connector

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28123808, 28123743, 28123816, 28123751

<table>
<tr><th colspan="8">Assembly</th></tr>
<tr><th colspan="3">Open cable end at the motor</th><th colspan="3">Motor connection depending on brake control</th><th colspan="2">Assembled plug connector</th></tr>
<tr><td colspan="3"></td><th>Without brake</th><th>Three-wire brake
AC 100 – 525 V
(E.g. BE/BZ brake)</th><th>Two-wire brake
DC 24 V
(e.g. BK/BP brake)</th><td colspan="2">
</td></tr>
<tr><th>Conductor color/ core cross section</th><th>Identification</th><th>Assembly</th><th colspan="3">Description</th><th>Signal</th><th>Contact</th></tr>
<tr><td rowspan="3">Black
1.5 mm²
2.5 mm²</td><td>U/L1</td><td>Open end</td><td colspan="3">Motor connection, phase U</td><td>U</td><td>U</td></tr>
<tr><td>V/L2</td><td>Open end</td><td colspan="3">Motor connection, phase V</td><td>V</td><td>V</td></tr>
<tr><td>W/L3</td><td>Open end</td><td colspan="3">Motor connection, phase W</td><td>W</td><td>W</td></tr>
<tr><td>Green/yellow
1.5 mm²
2.5 mm²</td><td>–</td><td>Open end</td><td colspan="3">Protective earth connection</td><td>PE</td><td>PE</td></tr>
<tr><td>Violet coaxial cable</td><td>–</td><td>Coaxial cable</td><td colspan="3">MOVILINK® DDI connection</td><td>DDI</td><td>1</td></tr>
<tr><td>Yellow
1.0 mm²</td><td>A</td><td>Open end</td><td>Reserved[1)]</td><td>Reserved[1)]</td><td>Brake-</td><td>Brake A</td><td>A</td></tr>
<tr><td>Orange
1.0 mm²</td><td>B</td><td>Open end</td><td>Reserved[1)]</td><td>Brake 15 (blue)</td><td>Reserved[1)]</td><td>Brake B</td><td>B</td></tr>
<tr><td>Pink
1.0 mm²</td><td>C</td><td>Open end</td><td>Reserved[1)]</td><td>Brake 13 (red)</td><td>Reserved[1)]</td><td>Brake C</td><td>C</td></tr>
<tr><td>Violet
1.0 mm²</td><td>D</td><td>Open end</td><td>Reserved[1)]</td><td>Brake 14 (white)</td><td>Brake+</td><td>Brake D</td><td>D</td></tr>
</table>

1) Reserved conductors must be isolated and fixed in the connection box.

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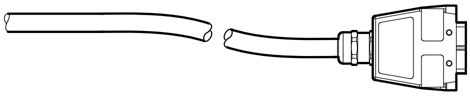
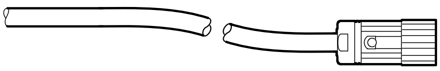
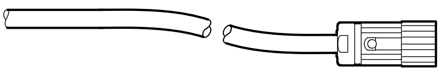
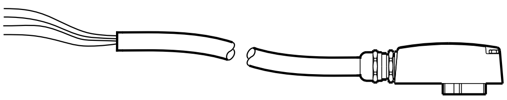
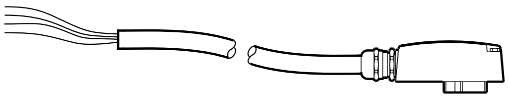
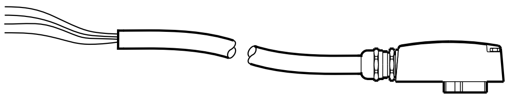
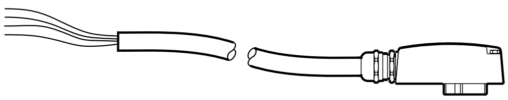
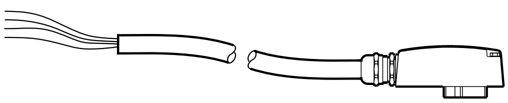
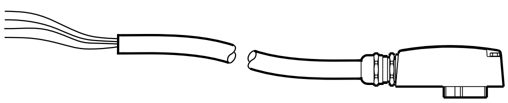
9.5.5 X_2A: Connection cables for motors without digital interface

Connection cable to terminal X_2A for motors without digital interface

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 Open — HAN 10E Female (ASB4)	CE/UL: 28128524	LEONI LEHC® 005272	Variable	1.5 mm^2 AC 500 V
 Open — M23, without encoding ring: female (SH1/KH1)	CE/UL: 18191290	LEONI LEHC® 005272	Variable	1.5 mm^2 / AC 500 V
 Open — M23, without encoding ring, female (SH1/KH1)	CE/UL: 18191304	LEONI LEHC® 005275	Variable	2.5 mm^2 / AC 500 V
 Open Conductor end sleeve — IS1 female (star)	CE/UL: 28128516	LEONI LEHC® 005272	Variable	1.5 mm^2 AC 500 V

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 Open Conductor end sleeve — IS1 female (star)	CE/UL: 28135253	LEONI LEHC® 005275	Variable	2.5 mm² AC 500 V
 Open Conductor end sleeve — IS1 female (delta)	CE/UL: 28128508	LEONI LEHC® 005272	Variable	1.5 mm² AC 500 V
 Open Conductor end sleeve — IS1 female (delta)	CE/UL: 28135245	LEONI LEHC® 005275	Variable	2.5 mm² AC 500 V
 Open Conductor end sleeve — IS2 female (star)	CE/UL: 28128494	LEONI LEHC® 005272	Variable	1.5 mm² AC 500 V
 Open Conductor end sleeve — IS2 female (star)	CE/UL: 28135237	LEONI LEHC® 005275	Variable	2.5 mm² AC 500 V

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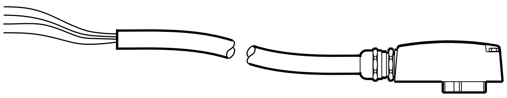
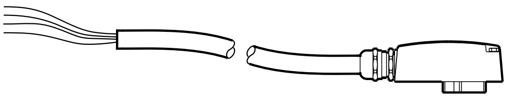
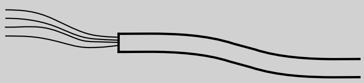
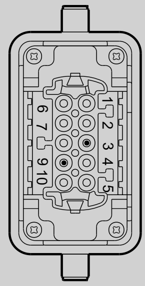
Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 Open Conductor end sleeve / IS2 female (delta)	CE/UL: 28128486	LEONI LEHC® 005272	Variable 	1.5 mm² AC 500 V
 Open Conductor end sleeve / IS2 female (delta)	CE/UL: 28135229	LEONI LEHC® 005275	Variable 	2.5 mm² AC 500 V

Connection to terminal X_2A of open-end cables with HAN-10E plug connector

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28128524

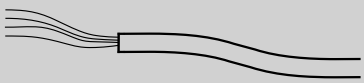
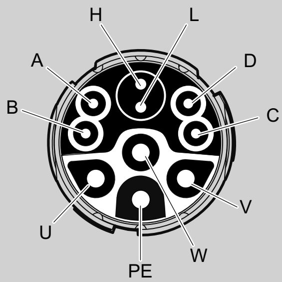
<table>
<tr><th colspan="8">Assembly</th></tr>
<tr><th colspan="3">Open cable end at the motor</th><th colspan="3">Motor connection depending on brake control</th><th colspan="2">Assembled plug connector</th></tr>
<tr><td colspan="3"></td><th>Without brake</th><th>Three-wire brake
AC 100 – 525 V
(E.g. BE/BZ brake)</th><th>Two-wire brake
DC 24 V
(e.g. BK/BP brake)</th><td colspan="2"></td></tr>
<tr><th>Conductor color/ core cross section</th><th>Identification</th><th>Assembly</th><th colspan="3">Description</th><th>Signal</th><th>Contact</th></tr>
<tr><td rowspan="3">Black
1.5 mm²</td><td>U1</td><td>Conductor end sleeve</td><td colspan="3">Motor connection, phase U</td><td>U</td><td>1</td></tr>
<tr><td>V1</td><td>Conductor end sleeve</td><td colspan="3">Motor connection, phase V</td><td>V</td><td>2</td></tr>
<tr><td>W1</td><td>Conductor end sleeve</td><td colspan="3">Motor connection, phase W</td><td>W</td><td>3</td></tr>
<tr><td>Red
1.5 mm²</td><td>13</td><td>Conductor end sleeve</td><td>Reserved[1)]</td><td>Brake 13</td><td>Brake+</td><td>Brake 13</td><td>4</td></tr>
<tr><td>White
1.5 mm²</td><td>14</td><td>Conductor end sleeve</td><td>Reserved[1)]</td><td>Brake 14</td><td>Reserved[1)]</td><td>Brake 14</td><td>6</td></tr>
<tr><td>Blue
1.5 mm²</td><td>15</td><td>Conductor end sleeve</td><td>Reserved[1)]</td><td>Brake 15</td><td>Brake-</td><td>Brake 15</td><td>5</td></tr>
<tr><td>Green/yellow
1.5 mm²</td><td>–</td><td>Conductor end sleeve</td><td colspan="3">Protective earth connection</td><td>PE</td><td>PE frame</td></tr>
<tr><td>Black
0.75 mm²</td><td>1</td><td>Conductor end sleeve</td><td colspan="3">Temperature sensor+ connection</td><td>Temp+</td><td>9</td></tr>
<tr><td>Black
0.75 mm²</td><td>2</td><td>Conductor end sleeve</td><td colspan="3">Temperature sensor- connection</td><td>Temp-</td><td>10</td></tr>
<tr><td>–</td><td>–</td><td>–</td><td colspan="3">–</td><td>res.</td><td>7, 8</td></tr>
</table>

1) Reserved conductors must be isolated and fixed in the connection box.

Connection to terminal X_2A of the open-end cables and with M23 plug connector

The following table shows the core assignment of cables with the following part numbers:

Part numbers
18191290, 18191304

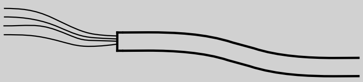
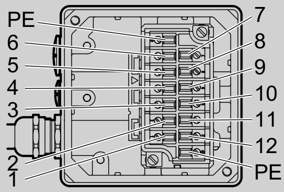
<table>
<tr><th colspan="8">Assembly</th></tr>
<tr><th colspan="3">Open cable end at the motor</th><th colspan="3">Motor connection depending on brake control</th><th colspan="2">Assembled plug connector</th></tr>
<tr><td colspan="3"></td><th>Without brake</th><th>Three-wire brake
AC 100 – 525 V
(E.g. BE/BZ brake)</th><th>Two-wire brake
DC 24 V
(e.g. BK/BP brake)</th><td colspan="2">
</td></tr>
<tr><th>Conductor color/ core cross section</th><th>Identification</th><th>Assembly</th><th colspan="3">Description</th><th>Signal</th><th>Contact</th></tr>
<tr><td rowspan="3">Black
1.5 mm²
2.5 mm²</td><td>U</td><td>Open end</td><td colspan="3">Motor connection, phase U</td><td>U</td><td>U</td></tr>
<tr><td>V</td><td>Open end</td><td colspan="3">Motor connection, phase V</td><td>V</td><td>V</td></tr>
<tr><td>W</td><td>Open end</td><td colspan="3">Motor connection, phase W</td><td>W</td><td>W</td></tr>
<tr><td>Black
1.0 mm²</td><td>1</td><td>Open end</td><td>Reserved[1)]</td><td>Brake 13</td><td>Brake+</td><td>Brake 13</td><td>C</td></tr>
<tr><td>Black
1.0 mm²</td><td>2</td><td>Open end</td><td>Reserved[1)]</td><td>Brake 14</td><td>Reserved[1)]</td><td>Brake 14</td><td>B</td></tr>
<tr><td>Black
1.0 mm²</td><td>3</td><td>Open end</td><td>Reserved[1)]</td><td>Brake 15</td><td>Brake-</td><td>Brake 15</td><td>D</td></tr>
<tr><td>Green/yellow
1.5 mm²
2.5 mm²</td><td>–</td><td>Open end</td><td colspan="3">Protective earth connection</td><td>PE</td><td>PE</td></tr>
<tr><td>White
0.34 mm²</td><td>WH</td><td>Open end</td><td colspan="3">Temperature sensor+ connection</td><td>Temp+</td><td>H</td></tr>
<tr><td>Blue
0.34 mm²</td><td>BU</td><td>Open end</td><td colspan="3">Temperature sensor- connection</td><td>Temp-</td><td>L</td></tr>
<tr><td>–</td><td>–</td><td>–</td><td colspan="3">–</td><td>res.</td><td>A</td></tr>
</table>

1) Reserved conductors must be isolated and fixed in the connection box.

Connection to terminal X_2A of open-end cables with IS1 plug connector (star)

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28128516, 28135253

<table>
<tr><th colspan="8">Assembly</th></tr>
<tr><th colspan="3">Open cable end at the motor</th><th colspan="3">Motor connection depending on brake control</th><th colspan="2">Assembled plug connector</th></tr>
<tr><td colspan="3"></td><th>Without brake</th><th>Three-wire brake AC 100 – 525 V (E.g. BE/BZ brake)</th><th>Two-wire brake DC 24 V (e.g. BK/BP brake)</th><td colspan="2"></td></tr>
<tr><th>Conductor color/ core cross section</th><th>Identification</th><th>Assembly</th><th colspan="3">Description</th><th>Signal</th><th>Contact</th></tr>
<tr><td rowspan="3">Black 1.5 mm² 2.5 mm²</td><td>U1</td><td>Conductor end sleeve</td><td colspan="3">Motor connection, phase U</td><td>U</td><td>2</td></tr>
<tr><td>V1</td><td>Conductor end sleeve</td><td colspan="3">Motor connection, phase V</td><td>V</td><td>4</td></tr>
<tr><td>W1</td><td>Conductor end sleeve</td><td colspan="3">Motor connection, phase W</td><td>W</td><td>6</td></tr>
<tr><td>Red 1.5 mm² Black 1.0 mm²</td><td>RD 1</td><td>Conductor end sleeve</td><td>Reserved[1)]</td><td>Brake 13</td><td>Brake+</td><td>Brake 13</td><td>10</td></tr>
<tr><td>White 1.5 mm² Black 1.0 mm²</td><td>WH 2</td><td>Conductor end sleeve</td><td>Reserved[1)]</td><td>Brake 14</td><td>Reserved[1)]</td><td>Brake 14</td><td>9</td></tr>
<tr><td>Blue 1.5 mm² Black 1.0 mm²</td><td>BU 3</td><td>Conductor end sleeve</td><td>Reserved[1)]</td><td>Brake 15</td><td>Brake-</td><td>Brake 15</td><td>11</td></tr>
<tr><td>Green/yellow 1.5 mm²</td><td>GN/YE</td><td>Conductor end sleeve</td><td colspan="3">Protective earth connection</td><td>PE</td><td>PI1</td></tr>
<tr><td>Black 0.75 mm² 0.34 mm²</td><td>1</td><td>Conductor end sleeve</td><td colspan="3">Temperature sensor+ connection</td><td>Temp+</td><td>7</td></tr>
<tr><td>Black 0.75 mm² 0.34 mm²</td><td>2</td><td>Conductor end sleeve</td><td colspan="3">Temperature sensor- connection</td><td>Temp-</td><td>12</td></tr>
<tr><td>–</td><td>–</td><td>–</td><td colspan="3">Jumper for star connection</td><td></td><td>1, 3, 5</td></tr>
</table>

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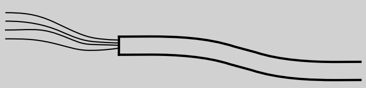
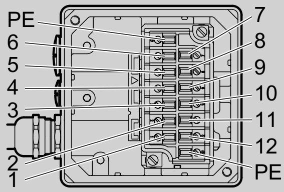
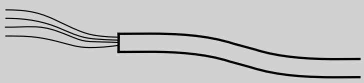
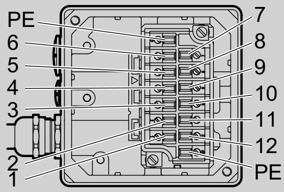
<table>
<tr><th colspan="6">Assembly</th></tr>
<tr><th colspan="3">Open cable end at the motor</th><th>Motor connection depending on brake control</th><th colspan="2">Assembled plug connector</th></tr>
<tr><td colspan="3"></td><td><table><tr><td>Without brake</td><td>Three-wire brake
AC 100 – 525 V
(E.g. BE/BZ brake)</td><td>Two-wire brake
DC 24 V
(e.g. BK/BP brake)</td></tr></table></td><td colspan="2">
</td></tr>
<tr><th>Conductor color/ core cross section</th><th>Identification</th><th>Assembly</th><th>Description</th><th>Signal</th><th>Contact</th></tr>
<tr><td></td><td></td><td></td><td></td><td>res.</td><td>8</td></tr>
</table>

1) Reserved conductors must be isolated and fixed in the connection box.

Connection to terminal X_2A of open-end cables with IS1 plug connector (delta)

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28128508, 28135245

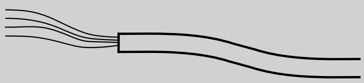
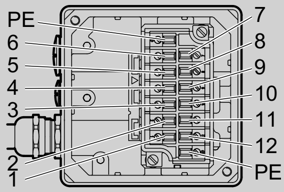
Assembly							
Open cable end at the motor			**Motor connection depending on brake control**			**Assembled plug connector**	
			**Without brake**	**Three-wire brake AC 100 – 525 V** (E.g. BE/BZ brake)	**Two-wire brake DC 24 V** (e.g. BK/BP brake)	 	
Conductor color/ core cross section	**Identification**	**Assembly**	**Description**			**Signal**	**Contact**
Black 1.5 mm² 2.5 mm²	U1	Conductor end sleeve	Motor connection, phase U			U	2
	V2	Conductor end sleeve	Motor connection, phase V			V	4
	W3	Conductor end sleeve	Motor connection, phase W			W	6
Black 1.0 mm²	1	Conductor end sleeve	Reserved[1]	Brake 13	Brake+	Brake 13	10
Black 1.0 mm²	2	Conductor end sleeve	Reserved[1]	Brake 14	Reserved[1]	Brake 14	9
Black 1.0 mm²	3	Conductor end sleeve	Reserved[1]	Brake 15	Brake-	Brake 15	11
Green/yellow 1.5 mm² 2.5 mm²	–	Conductor end sleeve	Protective earth connection			PE	PI1
Black 0.34 mm²	PK	Conductor end sleeve	Temperature sensor+ connection			Temp+	7
Black 0.34 mm²	GY	Conductor end sleeve	Temperature sensor- connection			Temp-	12
–	–	–	–			res.	8
–	–	–	3 jumpers for delta connection				1 – 2
–	–	–					3 – 4
–	–	–					5 – 6

1) Reserved conductors must be isolated and fixed in the connection box.

Connection to terminal X_2A of open-end cables with IS2 plug connector (star)

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28128494, 28135237

Assembly							
Open cable end at the motor			Motor connection depending on brake control			Assembled plug connector	
			Without brake	Three-wire brake AC 100 – 525 V (E.g. BE/BZ brake)	Two-wire brake DC 24 V (e.g. BK/BP brake)		
Conductor color/ core cross section	Identification	Assembly	Description			Signal	Contact
Black 1.5 mm² 2.5 mm²	U	Conductor end sleeve	Motor connection, phase U			U	2
	V	Conductor end sleeve	Motor connection, phase V			V	4
	W	Conductor end sleeve	Motor connection, phase W			W	6
Black 1.0 mm²	1	Conductor end sleeve	Reserved[1)]	Brake 13	Brake+	Brake 13	10
Black 1.0 mm²	2	Conductor end sleeve	Reserved[1)]	Brake 14	Reserved[1)]	Brake 14	9
Black 1.0 mm²	3	Conductor end sleeve	Reserved[1)]	Brake 15	Brake-	Brake 15	11
Green/yellow 1.5 mm²	–	Conductor end sleeve	Protective earth connection			PE	PI1
Black 0.34 mm²	PK	Conductor end sleeve	Temperature sensor+ connection			Temp+	7
Black 0.34 mm²	GY	Conductor end sleeve	Temperature sensor- connection			Temp-	12
–	–	–	Jumper for star connection				1, 3, 5
–	–	–	–			res.	8

1) Reserved conductors must be isolated and fixed in the connection box.

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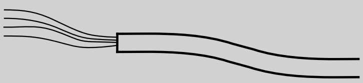
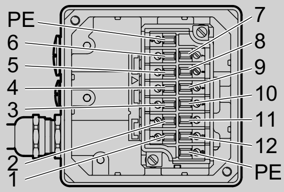
Connection to terminal X_2A of open-end cables with IS2 plug connector (delta)

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28128486, 28135229

Assembly							
Open cable end at the motor			**Motor connection depending on brake control**			**Assembled plug connector**	
			**Without brake**	**Three-wire brake AC 100 – 525 V** **(E.g. BE/BZ brake)**	**Two-wire brake DC 24 V** **(e.g. BK/BP brake)**		
Conductor color/ core cross section	**Identification**	**Assembly**	**Description**			**Signal**	**Contact**
Black 1.5 mm² 2.5 mm²	U	Conductor end sleeve	Motor connection, phase U			U	2
	V	Conductor end sleeve	Motor connection, phase V			V	4
	W	Conductor end sleeve	Motor connection, phase W			W	6
Black 1.0 mm²	1	Conductor end sleeve	Reserved[1)]	Brake 13	Brake+	Brake 13	10
Black 1.0 mm²	2	Conductor end sleeve	Reserved[1)]	Brake 14	Reserved[1)]	Brake 14	9
Black 1.0 mm²	3	Conductor end sleeve	Reserved[1)]	Brake 15	Brake-	Brake 15	11
Green/yellow 1.5 mm² 2.5 mm²	–	Conductor end sleeve	Protective earth connection			PE	PI1
Black 0.34 mm²	PK	Conductor end sleeve	Temperature sensor+ connection			Temp+	7
Black 0.34 mm²	GY	Conductor end sleeve	Temperature sensor- connection			Temp-	12
–	–	–	–			res.	8
–	–	–	3 jumpers for delta connection				1 – 2
–	–	–					3 – 4
–	–	–					5 – 6

1) Reserved conductors must be isolated and fixed in the connection box.

9.6 Electrical installation – functional safety

9.6.1 Installation instructions

⚠ WARNING

Only the types of connection described in this documentation may be used.

Severe or fatal injuries.

- Non-compliant connection variants specified in other documentation are not permissible.

9.6.2 Connection variants of the safety sub-function STO

General information

If the safety requirements from this documentation are met, then all connection variants listed in this documentation are generally permitted for safety-relevant applications. 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 in chapter "Electrical installation" are block diagrams whose only purpose is to show the safety sub-function(s) with the relevant components. For reasons of clarity, circuit-related measures that 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.

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.

When connecting the device to the safety relays, observe the installation requirements in accordance with chapter "Installation requirements" (→ 🗎 156).

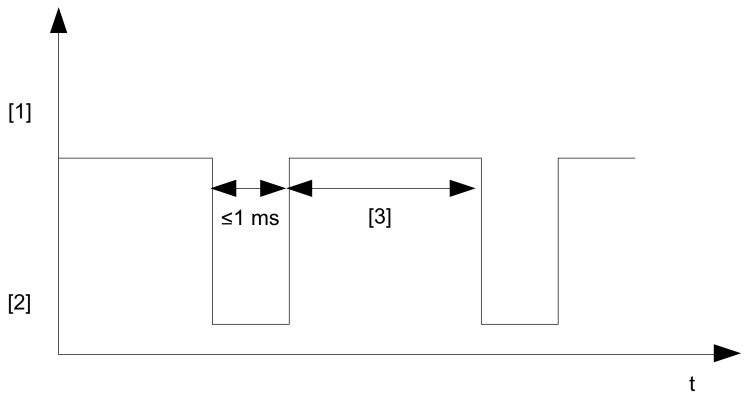
All information from the manufacturer about the use of safety relays for specific applications must also be observed.

INFORMATION

If F_STO_P1 and F_STO_P2 are connected to DC 24 V and if F_STO_M is connected to GND, STO is deactivated.

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.



9007214469079819

[1] High
[2] Low

INFORMATION

- SEW-EURODRIVE recommends setting the dark tests (switch-off tests) to 0.8 ms due to tolerances in the safety controllers. Please refer to the description of your safety controller for where and how to set this time.
- If the safety-related control voltage at the STO connection is switched off (STO activated), you must observe chapter "External safety controller requirements" (→ 🗎 159) with regard to the test pulses.
- If F_STO_P1 and F_STO_P2 are connected to DC 24 V and if F_STO_M is connected to GND, STO is deactivated.

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Switching off the STO signal for several drive units (STO group disconnection)

The STO signal for several drive units can be provided 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.
- You must comply with the permitted signal levels at the STO input and all other technical data of the device. The routing of the STO control cables and the voltage drop must be considered.
- Other requirements of the safety 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 STO group disconnection.
- A maximum of 20 drive units may be used in one STO group disconnection.

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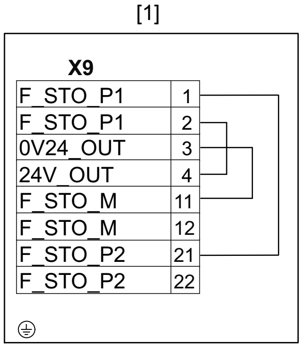
Wiring diagrams of the connection variants

STO connection at terminal X9

For detailed information on terminal X9, refer to chapter "Electrical Installation" > "Terminal assignment".

Delivery state

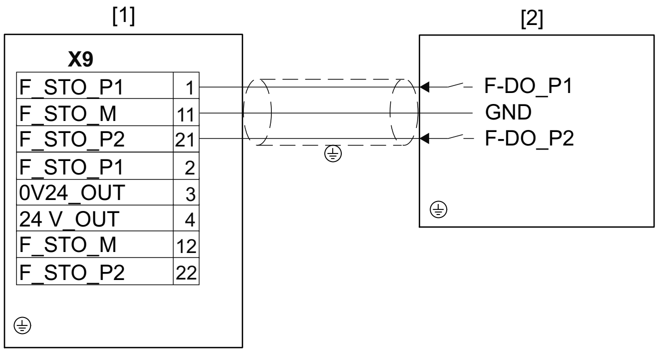
In the delivery state, the following terminals are bridged on STO connection X9. The jumpers are marked with the text "Caution, remove jumper for safety operation". To use the drive unit in safety-related applications, remove the jumpers from the STO terminal X9.



9007222815498379

[1] Drive unit

Two-pole sourcing output



9007222818851979

[1] Drive unit
[2] External safety device

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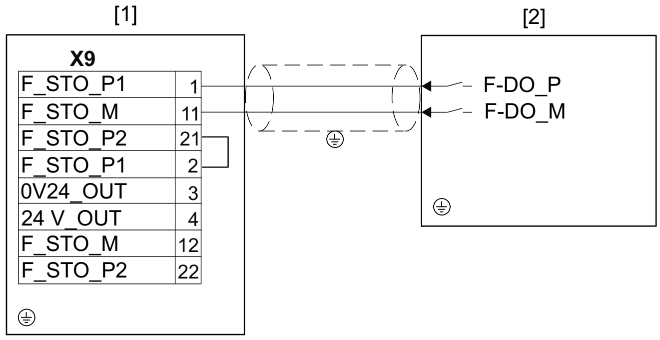
Two-pole sourcing/sinking output

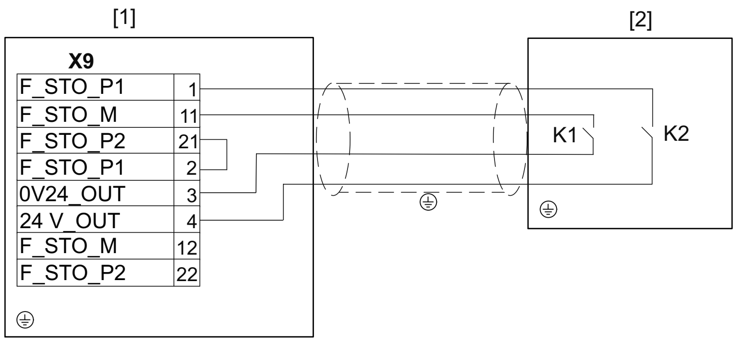
Example 1



9007222818872587

[1] Drive unit
[2] External safety device

Example 2



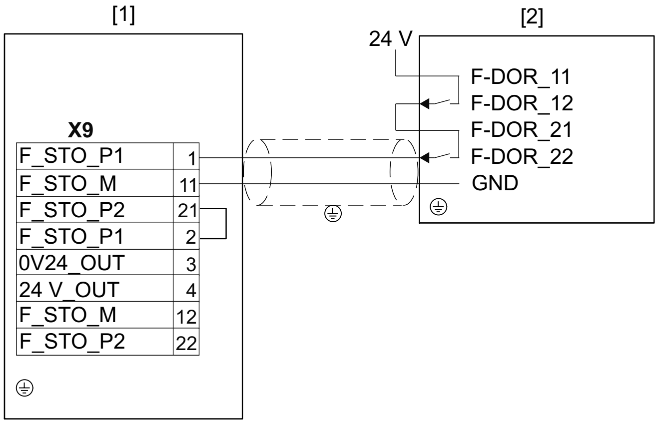
34106433163

[1] Drive unit
[2] External safety device

Observe the following information:

- The supply voltages 0V24_OUT and 24V_OUT must not be used to supply the external safety device.
- This connection variant (example 2) is only permitted if a fault can be excluded for the cable between the drive unit and the external safety device. Fault exclusion between any 2 conductors in a cable according to EN ISO 13849-2 is possible if the cable is permanently (fixed) installed and protected against external damage, for example, by using cable duct or armored conduit.

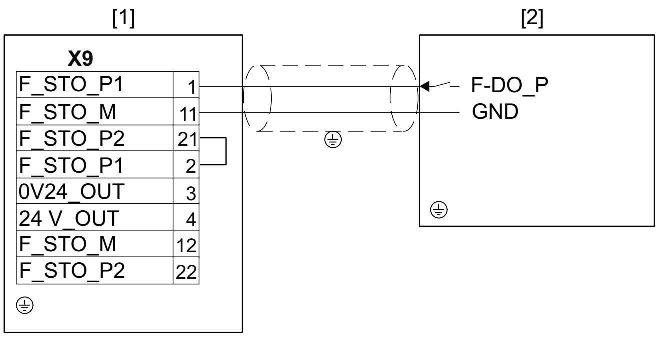
Two-channel serial sourcing output



9007222818944907

[1] Drive unit
[2] External safety device

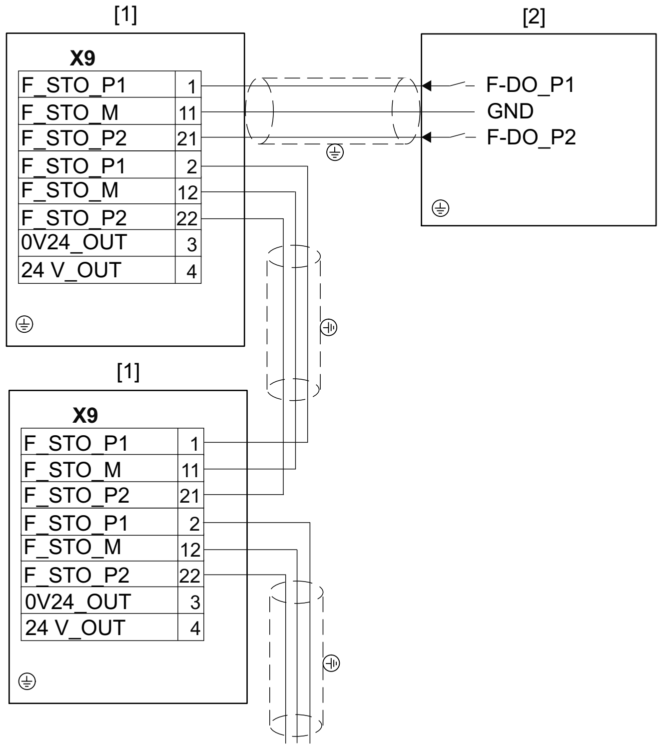
Single-pole sourcing output



9007222819398155

[1] Drive unit
[2] External safety device

STO group disconnection, two-pole, sourcing output



25228151435

[1] Drive unit
[2] External safety controller

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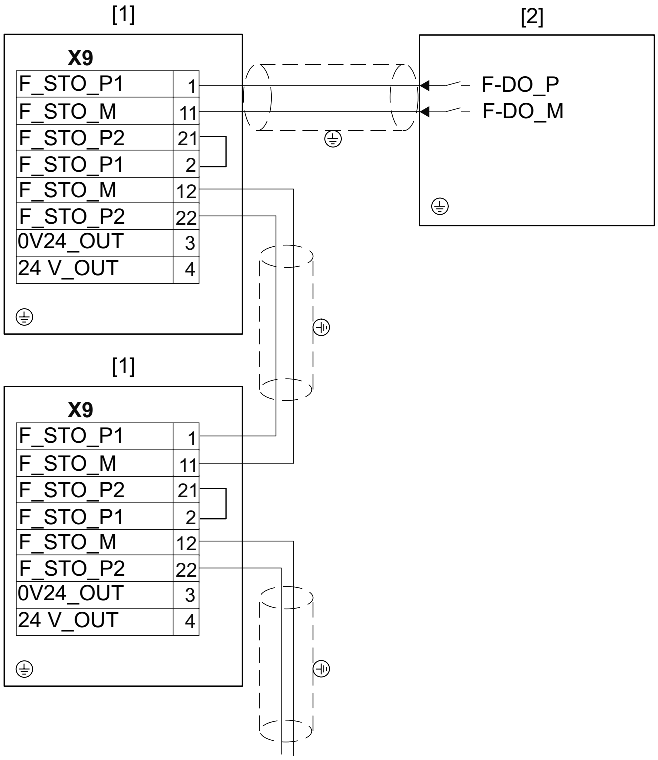
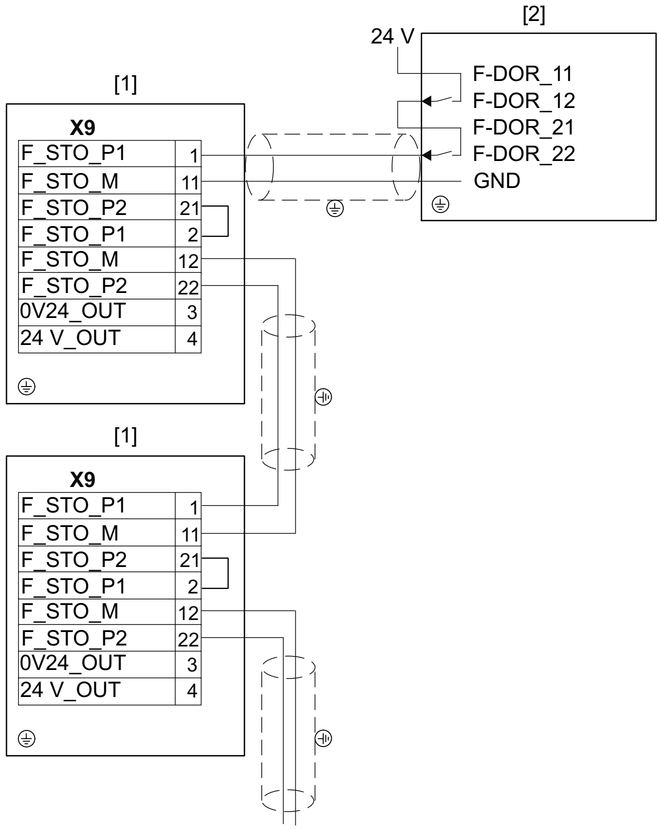
STO group disconnection, two-pole, sourcing/sinking output



25228157067

[1] Drive unit
[2] External safety controller

STO group disconnection, two-channel, serial sourcing output



25229441035

[1] Drive unit
[2] External safety controller

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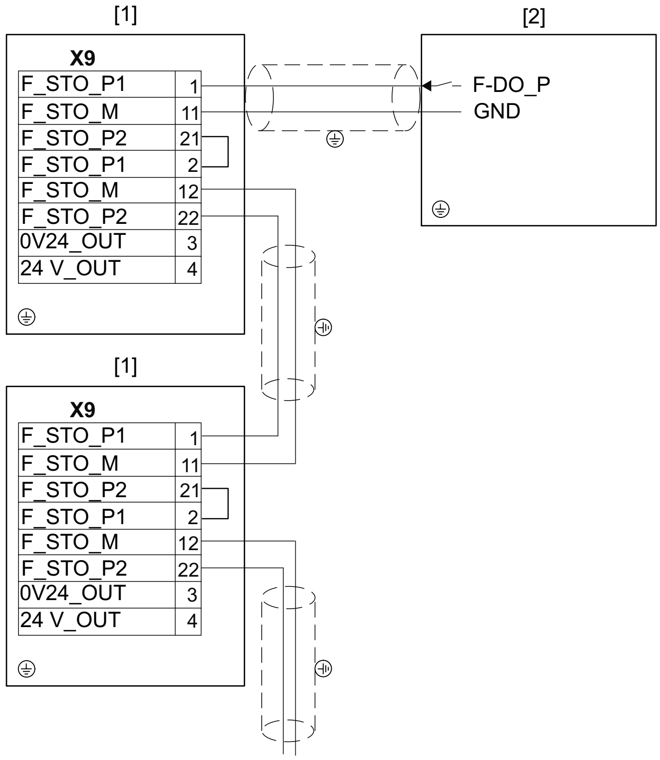
STO group disconnection, one-pole, sourcing output



25229445003

[1] Drive unit
[2] External safety controller

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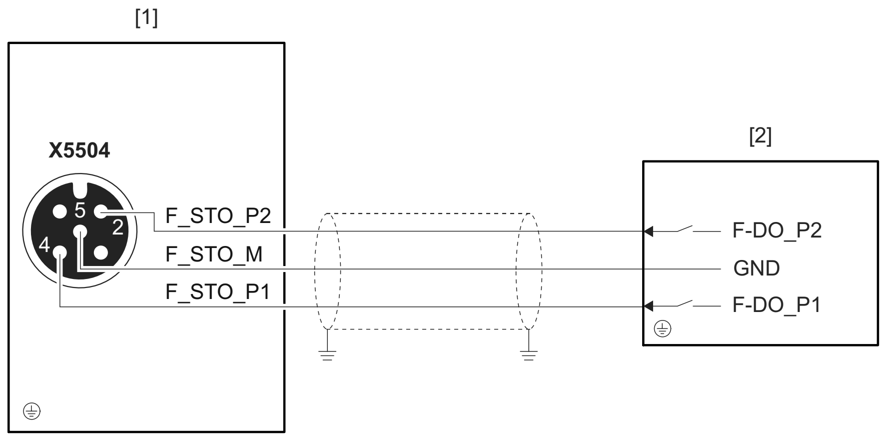
STO connection via M12 plug connector X5504/X5505

For further information on the connection of X5504/X5505, refer to the **product manual** > chapter "Electrical installation" > "Assignment of optional plug connectors".

Delivery state

In the delivery state, X5504 is not connected, which means the STO input is active. According to the safety concept, X5504 must be connected or temporarily jumpered using the optionally available STO jumper plug for starting up the device.

Two-pole sourcing output

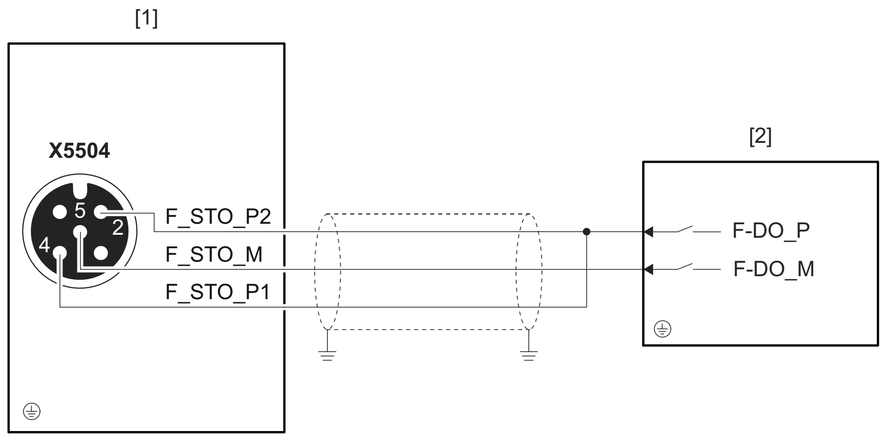


23876274315

[1] Drive unit
[2] External safety device

Two-pole sourcing/sinking output

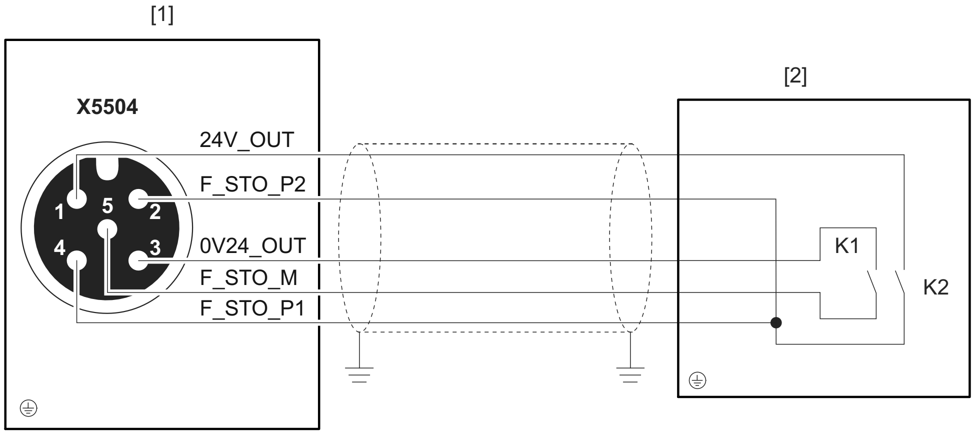
Example 1



23876260491

[1] Drive unit
[2] External safety device

Example 2



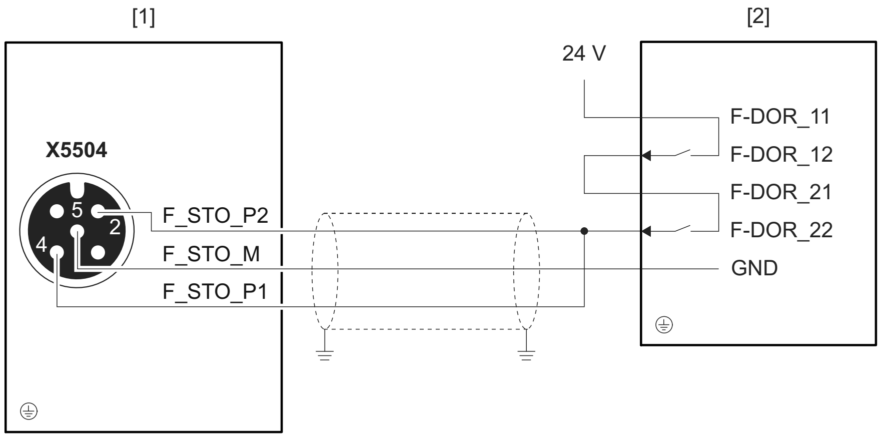
34216188171

[1] Drive unit
[2] External safety device

Observe the following information:

- The supply voltages 0V24_OUT and 24V_OUT must not be used to supply the external safety device.
- This connection variant (example 2) is only permitted if a fault can be excluded for the cable between the drive unit and the external safety device. Fault exclusion between any 2 conductors in a cable according to EN ISO 13849-2 is possible if the cable is permanently (fixed) installed and protected against external damage, for example, by using cable duct or armored conduit.

Two-channel serial sourcing output



23875551243

[1] Drive unit
[2] External safety device

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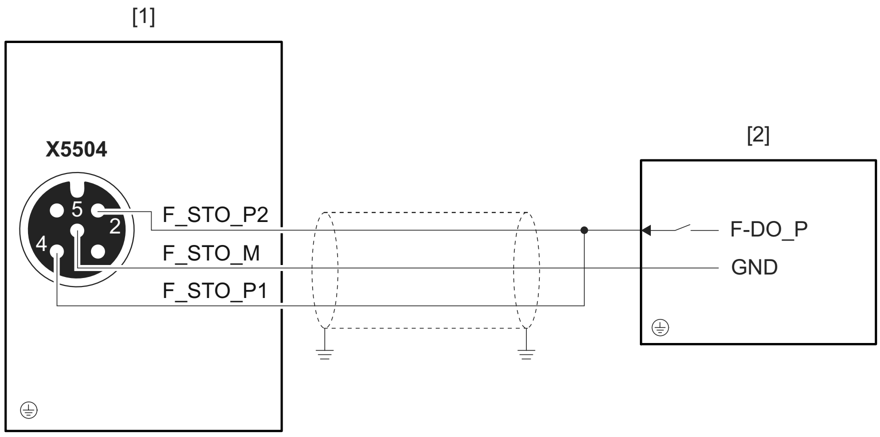
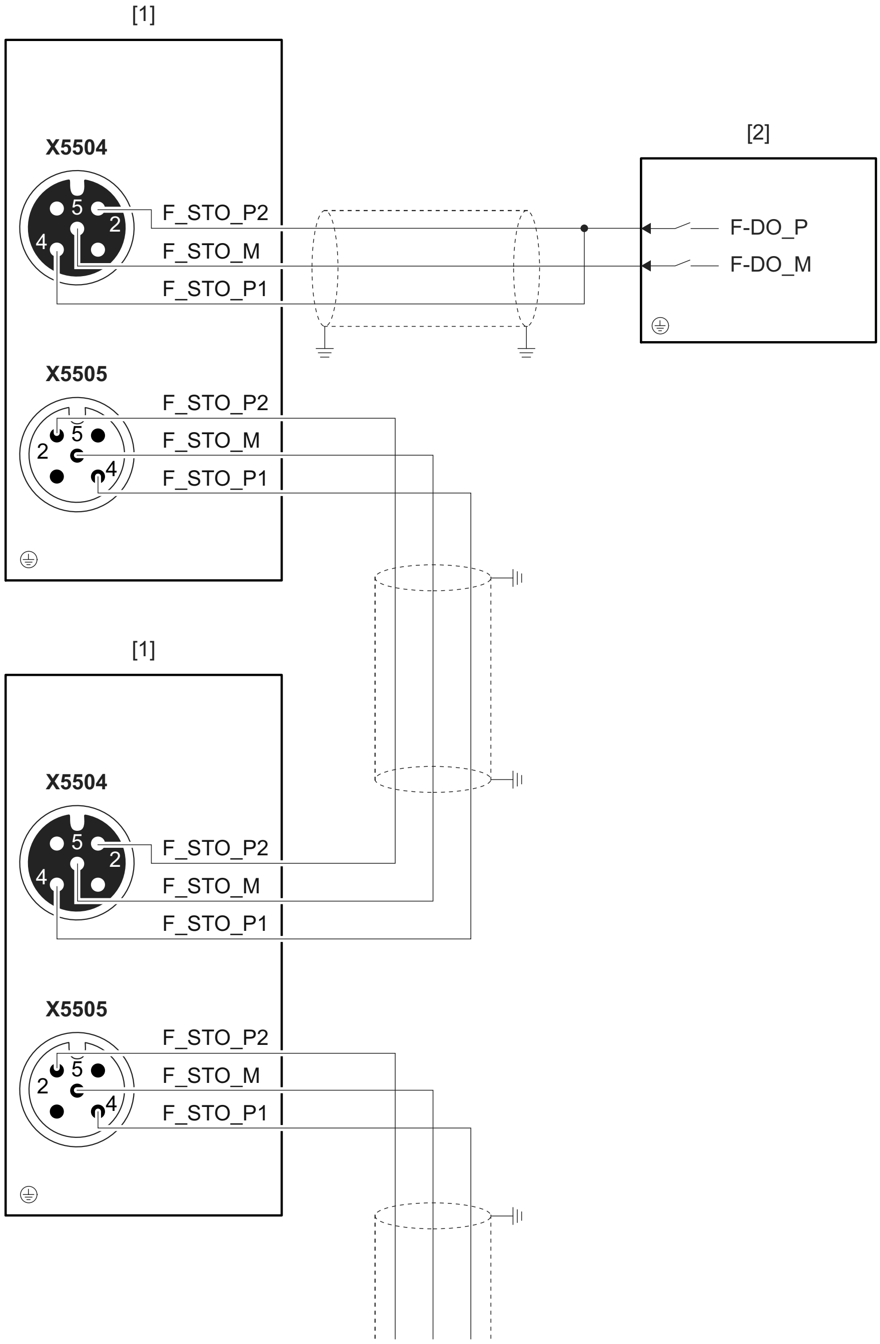
Single-pole sourcing output



23875545995

[1] Drive unit
[2] External safety device

STO group disconnection, two-pole, sourcing/sinking output



9007223142162187

[1] Drive unit
[2] External safety device

STO jumper plug (three-pin)

⚠ WARNING

Safe disconnection of the device is not possible when the jumper plug is used.

Severe or fatal injuries.

- Only use the jumper plug if the device is not used to fulfill any safety function.

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WARNING

Disabling of the safety-related disconnection of further devices due to parasitic voltages when using an STO jumper plug.

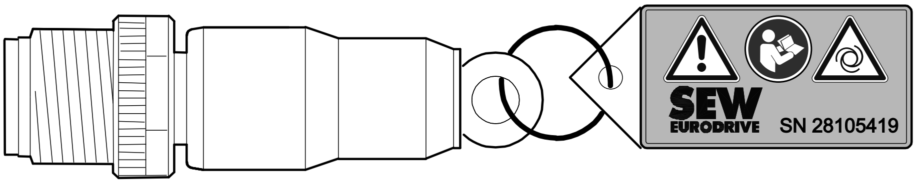
Severe or fatal injuries.

- Only use the STO jumper plug when all incoming and outgoing STO connections have been removed from the device.

A printed red tag is attached to the STO jumper plug.

The STO jumper plug can be connected to the STO plug connector X5504 of the device. The STO jumper plug deactivates the safety functions of the device.

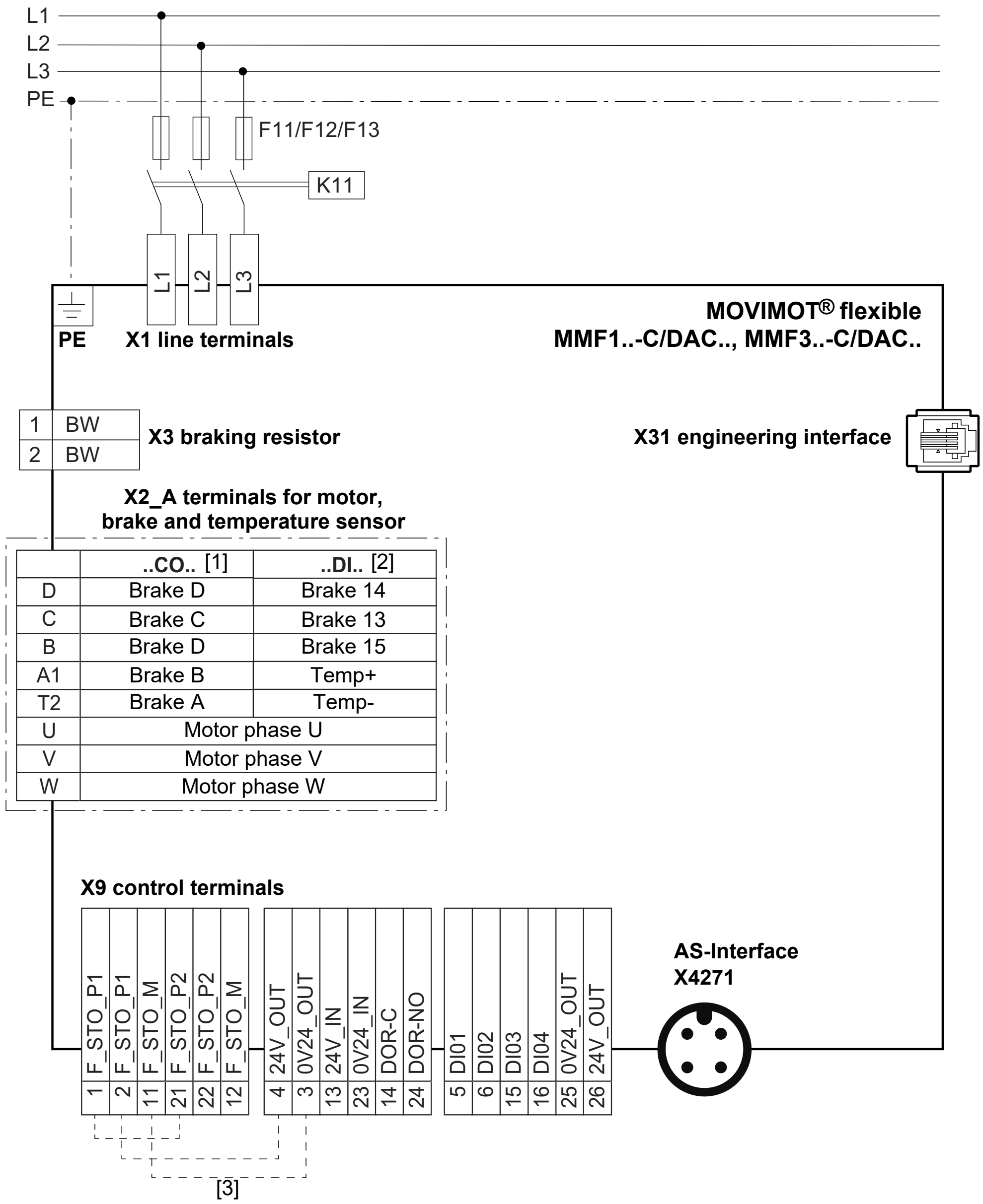
The following figure shows the STO jumper plug with the printed **red** tag, part number 28105419:



25247142411

9.7 Connection diagram MOVIMOT® flexible DAC

The following figure shows the connections of the device:



[1] Connection unit option, see chapter "Type designation of MOVIMOT® flexible DAC" (→ 🗎 169)

[2] Devices with option /BES include additionally integrated auxiliary terminals. These auxiliary terminals are intended for connecting the BES brake rectifier only. Do not change the installation of this auxiliary terminal.

[3] Jumpers installed at the factory for designs without plug connectors with STO function. For further information, refer to chapter "Connection variants of the safety sub-function STO" (→ 🗎 233) in the product manual.

For terminal assignment, refer to chapter "Terminal assignment of MOVIMOT® flexible DAC" (→ 🗎 215).

For the positions of the plug connectors, refer to chapter "Plug connectors" > "MMF1 design" (→ 🗎 264), "MMF31 design" (→ 🗎 268), "MMF32 design" (→ 🗎 272), "DAC electronics cover" (→ 🗎 275).

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For further information regarding the brake control, refer to the product manual > chapter "Technical data" > "Brake control".

9.8 Cable routing and cable shielding

9.8.1 Installation with separately routed AS-Interface/AUX-PWR cable

Notes on cable routing and shielding – Recommended cable routing

Note the following points for cable routing and cable shielding:

- Cable selection
  - When selecting cables, observe the recommended connection cables in the product manual > chapter "Technical data" > "Connection cables".
  - You can use unshielded connection cables as line connection cables.
- Cable shielding
  - Connect the shields of the cables to the metal housing of the unit using the shield clamps of the accessory bag. To do so, expose the shield in the area of the shield contact surface.
  - As an alternative, you can use optionally available EMC cable glands to connect the shield of cables, see "EMC cable glands" chapter.
- External braking resistor
  - Also observe the notes in chapter "Terminal assignment ...".
- Observe the permitted bending radii of the cables for cable routing.

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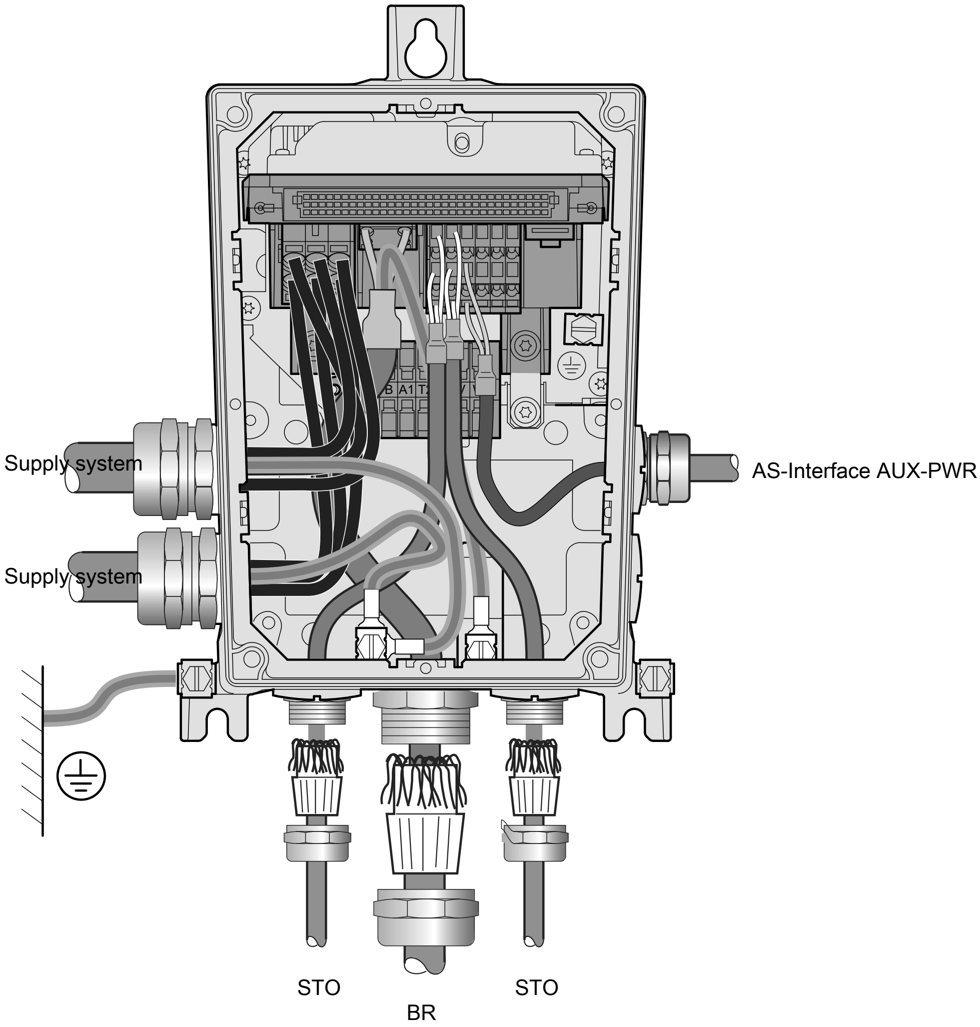
Cable routing MMF1. design

The following figure shows the cable routing of the device without motor connection:



30722356235

For the cable routing of the motor connection, refer to chapter "Cable routing and cable shielding" "Motor connection" > "Motor connection without DDI" (→ 🗎 253), "Motor connection with DDI" (→ 🗎 254).

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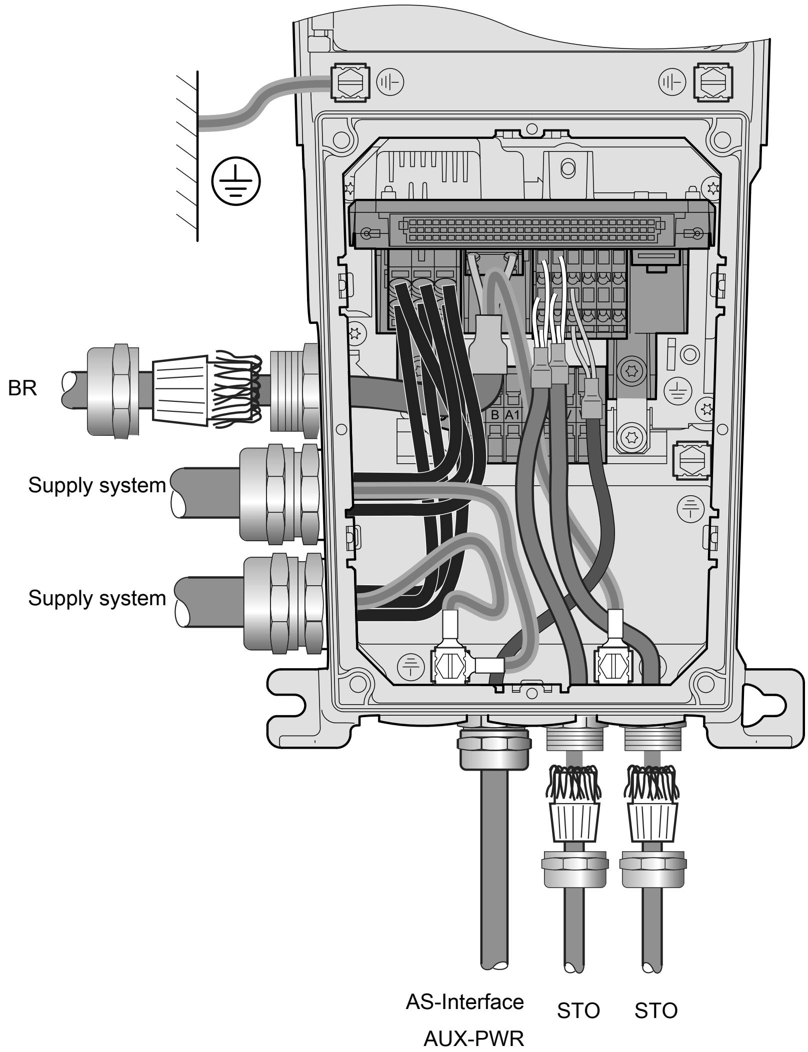
Cable routing MMF31 design

The following figure shows the cable routing of the device without motor connection:

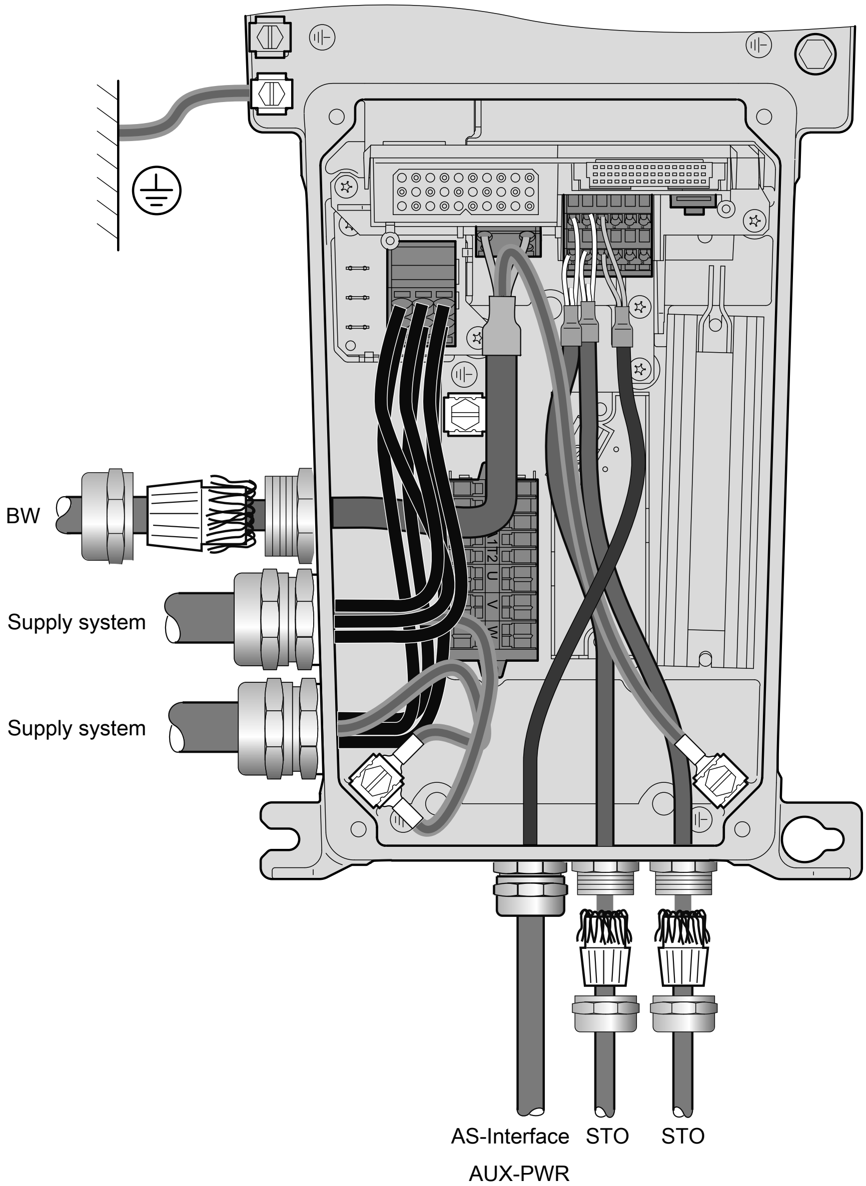


30726880779

For the cable routing of the motor connection, refer to chapter "Cable routing and cable shielding" "Motor connection" > "Motor connection without DDI" (→ 🗎 253), "Motor connection with DDI" (→ 🗎 254).

Cable routing MMF32 design

The following figure shows the cable routing of the device without motor connection:



34335046667

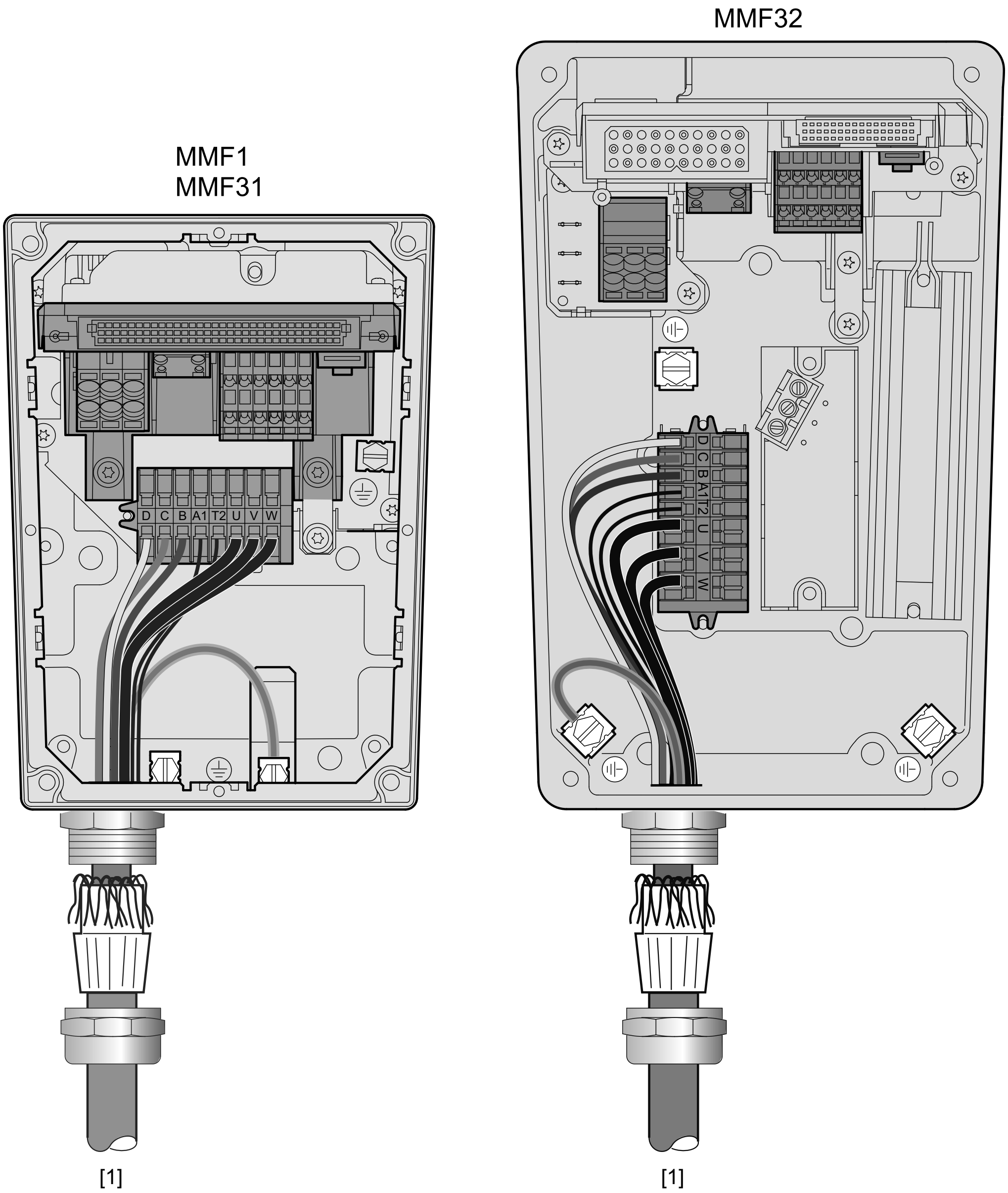
For the cable routing of the motor connection, refer to chapter "Cable routing and cable shielding" "Motor connection" > "Motor connection without DDI" (→ 🗎 253), "Motor connection with DDI" (→ 🗎 254).

9.8.2 Motor connection

Motor connection for motors without digital interface

(Connection unit with /DI option)

The following figure shows the motor connection with hybrid cable for motors without digital interface:



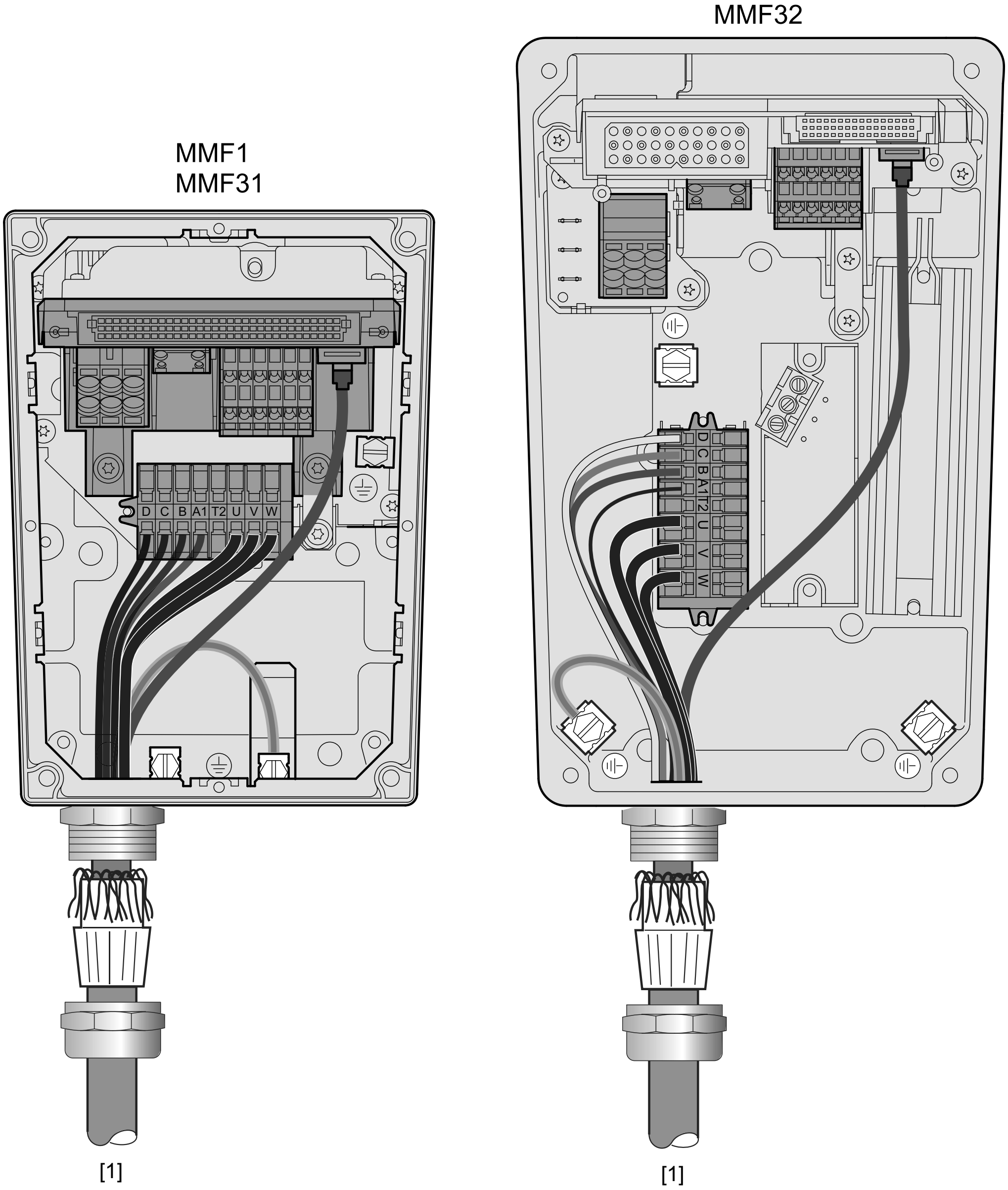
41031319691

[1] Motor connection for motors without digital interface

Motor connection for motors with digital interface (MOVILINK® DDI)

(Connection unit with /CO option)

The following figure shows the motor connection with hybrid cable for motors with digital interface:



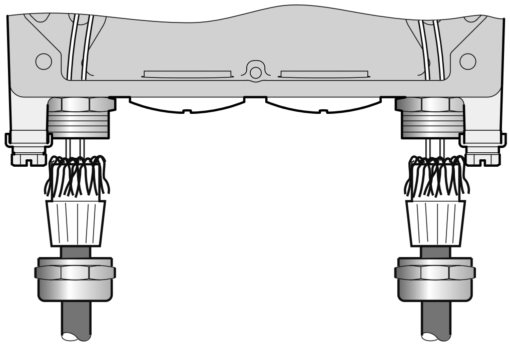
41035377675

[1] Motor connection for motors with digital interface (MOVILINK® DDI)

9.9 EMC cable glands

9.9.1 Cable shielding

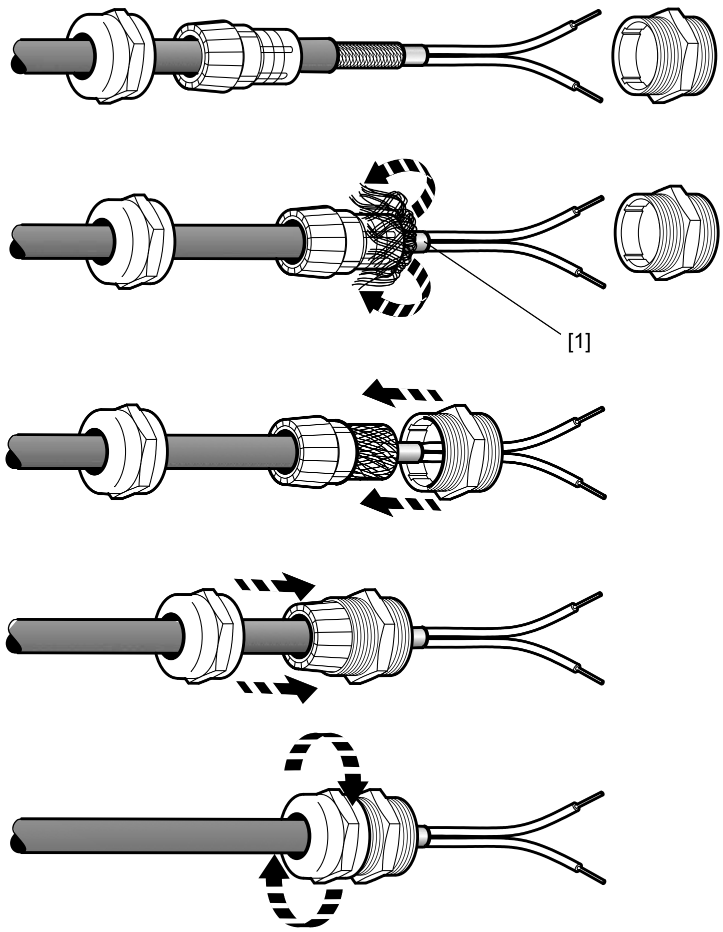
For shielded cables, it is best to use EMC cable glands to connect the shield. EMC cable glands are available as option.



25216680843

9.9.2 Assembly of EMC cable glands

Assemble the EMC cable glands supplied by SEW-EURODRIVE according to the following figure:



18014401170670731

[1] Cut off insulation foil and fold it back.

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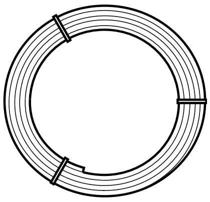
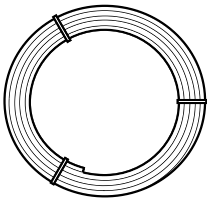
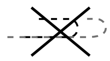
9.10 Bulk cables

9.10.1 Brake motor cables for motors with digital interface (MOVILINK® DDI)

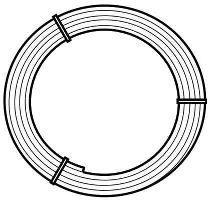
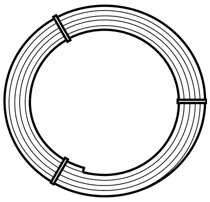
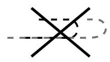
Connection cable 1.5 mm²

The following table shows the available connection cables:

Connection cable	Conformity/ Operating voltage	Cable reel/in-stallation type	Cable type/ properties	Cable cross section/ Part number
Motor connection with MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	50 m 200 m 	LEONI LEHC® 005796 Halogen-free	1.5 mm² 28123336
Motor connection with MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	50 m 200 m 	LEONI LEHC® 005775	1.5 mm² 28123395

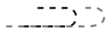
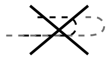
Connection cable 2.5 mm²

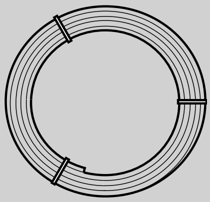
The following table shows the available connection cables:

Connection cable	Conformity/ Operating voltage	Cable reel/in-stallation type	Cable type/ properties	Cable cross section/ Part number
Motor connection with MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	50 m 200 m 	LEONI LEHC® 005770 Halogen-free	2.5 mm² 28123344
Motor connection with MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	50 m 200 m 	LEONI LEHC® 005776	2.5 mm² 28123409

Connection of bulk cables

The following table shows the core assignment of cables with the following part numbers:

Part numbers	
Installation method of cable	**Part numbers**
	28123336, 28123344
	28123395, 28123409

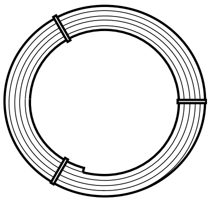
Connection description					
Bulk cable			**Motor connection depending on brake control**		
			**Without brake**	**3-wire brake AC 100-525 V** (e.g. BE/BZ brake)	**2-wire brake DC 24 V** (e.g. B.BK/BP brake)
Conductor color/ core cross section	**Identifi-cation**	**Signal**	**Description**		
Black 1.5 mm² 2.5 mm²	U/L1	U	Motor connection, phase U		
Black 1.5 mm² 2.5 mm²	V/L2	V	Motor connection, phase V		
Black 1.5 mm² 2.5 mm²	W/L3	W	Motor connection, phase W		
Green/yellow 1.5 mm² 2.5 mm²	–	PE	Protective earth connection		
Purple Coaxial cable	–	DDI	MOVILINK® DDI connection		
Yellow 1.0 mm²	A	Brake A	Reserved[1]	Reserved[1]	Brake-
Orange 1.0 mm²	B	Brake B	Reserved[1]	Brake 15 (blue)	Reserved[1]
Pink 1.0 mm²	C	Brake C	Reserved[1]	Brake 13 (red)	Reserved[1]
Violet 1.0 mm²	D	Brake D	Reserved[1]	Brake 14 (white)	Brake+

1) Reserved wires must be isolated and fixed in the connection box.

9.10.2 Brake motor cables for motors without digital interface

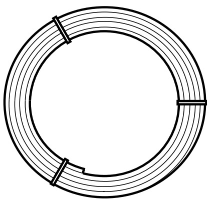
Connection cable 1.5 mm²

The following table shows the available connection cables:

Connection cables	Conformity/ Operating voltage	Cable reel/in-stallation type	Cable type/ properties	Cable cross section/ Part number
Motor connection without MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	100 m 200 m	LEONI LEHC® 005272 Halogen-free	1.5 mm² 19150067

Connection cable 2.5 mm²

The following table shows the available connection cables:

Connection cables	Conformity/ Operating voltage	Cable reel/in-stallation type	Cable type/ properties	Cable cross section/ Part number
Motor connection without MOVILINK® DDI  **Open cable end (not prefabricated)**	CE/UL: AC 500 V	100 m 200 m	LEONI LEHC® 005275 Halogen-free	2.5 mm² 19150075

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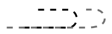
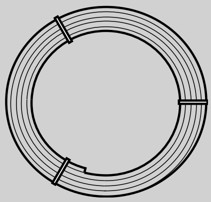
Connection of bulk cables

The following table shows the core assignment of cables with the following part numbers:

Part numbers	
Installation method of cable	**Part numbers**
	19150067, 19150075

Connection description					
Bulk cable			**Motor connection depending on brake control**		
			**Without brake**	**3-wire brake AC 100 – 525 V** (E.g. BE/BZ brake)	**2-wire brake DC 24 V** (E.g. BK/BP brake)
Conductor color/ core cross section	**Identification**	**Signal**	**Description**		
Black 1.5 mm^2 2.5 mm^2	U/L1	U	Motor connection, phase U		
Black 1.5 mm^2 2.5 mm^2	V/L2	V	Motor connection, phase V		
Black 1.5 mm^2 2.5 mm^2	W/L3	W	Motor connection, phase W		
Green/yellow 1.5 mm^2 2.5 mm^2	-	PE	Protective earth connection		
Black 1.0 mm^2	1	Brake 13	Reserved[1)]	Brake 13 (red)	Brake+
Black 1.0 mm^2	2	Brake 14	Reserved[1)]	Brake 14 (white)	Reserved[1)]
Black 1.0 mm^2	3	Brake 15	Reserved[1)]	Brake 15 (blue)	Brake−
White 0.34 mm^2	-	Temp+	Temperature sensor+ connection		
Blue 0.34 mm^2	-	Temp−	Temperature sensor connection−		
Gray 0.34 mm^2	-	res.	Reserved[1)]		

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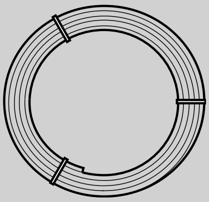
Connection description					
Bulk cable			**Motor connection depending on brake control**		
			**Without brake**	**3-wire brake AC 100 – 525 V**	**2-wire brake DC 24 V**
				(E.g. BE/BZ brake)	**(E.g. BK/BP brake)**
Conductor color/ core cross section	**Identifi-cation**	**Signal**	**Description**		
Pink 0.34 mm^2	-	res.	Reserved[1)]		

1) Reserved wires must be isolated and fixed in the wiring space.

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9.11 Plug connectors

9.11.1 Representation of connections

The connection diagrams of the plug connectors depict the contact end of the connections.

9.11.2 Connection cables

INFORMATION

For more information about cable types, see chapter "Technical data".

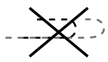
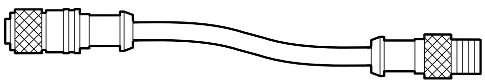
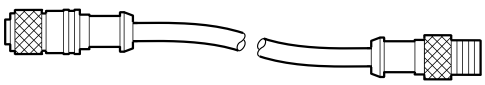
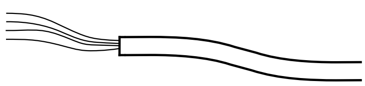
Connection cables are not included in the scope of delivery.

Prefabricated cables for connecting SEW-EURODRIVE components are available to order. For each connection, the available prefabricated cables are listed. Specify the part number and length of the required cable in your order.

The quantity and design of the required connection cables depend on the design of the devices and the components to be connected. This is why you do not need all listed cables.

Cable types

The table below shows the depictions used and what they mean:

Depiction	Meaning
	Suitable for cable carriers
	Not suitable for cable carriers
	Fixed length
	Variable length
	Cable cut off Not prefabricated
	Cable stripped (Partially) assembled

Cable routing

Observe the permitted bending radii of the cables used when routing the cables. For further information, refer to the product manual > chapter "Technical data" > "Dimension drawings of plug connectors in the connection box" (→ 🗎 92).

Using prefabricated cables with plug connectors

SEW-EURODRIVE uses prefabricated cables for certifications, type tests, and approval of the devices. The cables available from SEW-EURODRIVE meet all the requirements necessary for the functions of the device and the connected components. Device considerations are always carried out for the basic device including all the components to be connected and the corresponding connection cable.

As such, SEW-EURODRIVE recommends using only the prefabricated cables listed in the documentation.

When using devices with integrated safety functions according to EN ISO 13849, you also have to adhere to all the conditions and requirements for the installation and routing of cables described in the documentation for the devices concerning functional safety.

Using third-party cables with or without plug connectors

If third-party cables are used – even if these cables are technically equivalent – SEW-EURODRIVE will not accept any liability and cannot guarantee compliance with device properties or that the device will function correctly.

If you use third-party cables for connecting the device and the connected components, you must ensure that the respective, national provisions are followed. Note that using third-party cables may unintentionally affect the technical characteristics of the device or unit network. This particularly applies to the following properties:

- Mechanical properties (e.g. IP protection class, cable carrier suitability)
- Chemical properties (e.g. silicone and halogen free, resistance to substances)
- Thermal properties (e.g. thermal stability, increase in device temperature, flammability class)
- EMC behavior (e.g. limit values, interference emission, compliance with normative interference immunity values)
- Functional safety (approvals according to EN ISO 13849-1)

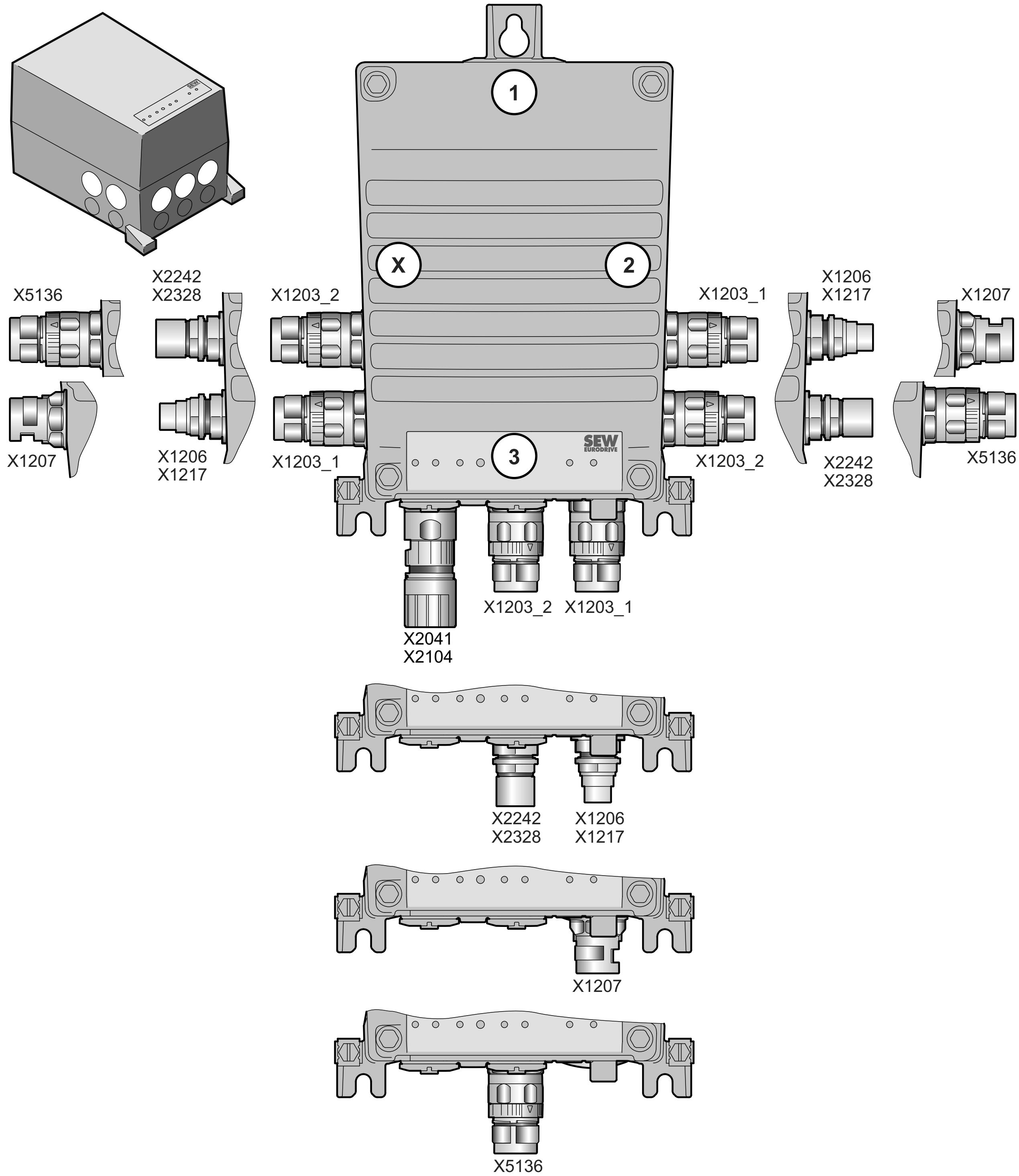
Cables that are not explicitly recommended by SEW-EURODRIVE must at least meet the requirements of the following standards and be approved according to these connector standards:

- IEC 60309
- IEC 61984

9.11.3 Plug connector positions MMF1../DAC.. design

Cable entries M25

The following figure shows possible plug connector positions:



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Plug connector				Not together at a position with the connector socket:
Designation	Coding ring/ color	Function	Position	
X1203_1	Black	"AC 400 V connection" (→ 🗎 281)[1]	X, 2 or 3	• X1206 • X1207 • X1217
X1203_2	Black	"AC 400 V connection" (→ 🗎 281)	X, 2 or 3	• X2242 • X2328 • X5136
X1206	–	"AC 400 V connection (IN)" (→ 🗎 287)[2]	X, 2 or 3	• X1203_1 • X1207 • X1217
X2242	–	"AC 400 V connection (OUT)" (→ 🗎 288)	X, 2 or 3	• X1203_2 • X2328 • X5136
X1207	Black	"AC 400 V connection" (→ 🗎 289)	X, 2 or 3	• X1203_1 • X1206 • X1217
X1217	–	"PA hybrid connection (IN)" (→ 🗎 290)[3] AC 400 V and DC 24 V backup voltage	X, 2 or 3	• X1203_1 • X1206 • X1207
X2328	–	"Hybrid connection PA (OUT)" (→ 🗎 291) AC 400 V and DC 24 V backup voltage	X, 2 or 3	• X1203_2 • X2242 • X5136
X2041	Brown	"Connection for motors without digital interface" (→ 🗎 292)	3	• X2104
X2104	–	"Connection for motors with digital interface " (→ 🗎 301) (MOVILINK® DDI)	3	• X2041
X5136	–	"Digital inputs/outputs" (→ 🗎 318)	X, 2 or 3	• X1203_2 • X2242 • X2328

1) Plug connector X1203_1 can also be ordered separately (i.e. without plug connector X1203_2).
2) Plug connector X1206 can also be ordered separately (i.e. without plug connector X2242).
3) Plug connector X2317 can also be ordered separately (i.e. without plug connector X2328).

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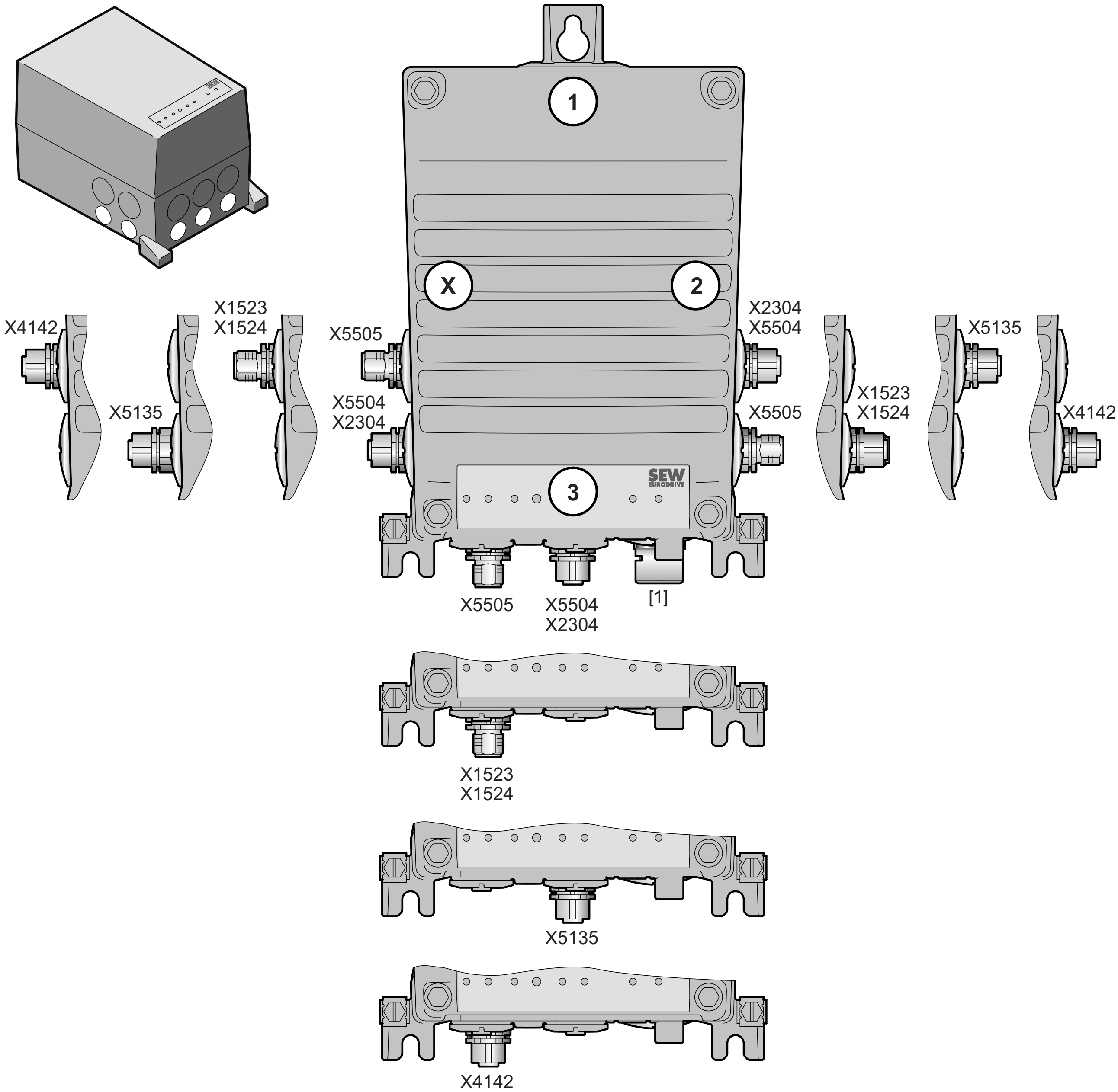
Cable entries M16

The following figure shows possible plug connector positions:



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Plug connector				Not together at a position with the connector socket:
Designation	**Coding ring/ color**	**Function**	**Position**	
X5504	Yellow	"STO" (→ 🗎 306)$^{1)}$ (3-wire connection)	X, 2 or 3	• X2304 • X5135
X5505	Yellow	"STO" (→ 🗎 311) (3-wire connection)	X, 2 or 3	• X1523 • X1524 • X4142

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Plug connector				Not together at a position with the connector socket:
Designation	**Coding ring/ color**	**Function**	**Position**	
X2304	–	"Connection of external braking resistor" (→ 🗎 316)	X, 2 or 3	• X5135 • X5504
X5135	Black	"Digital inputs" (→ 🗎 317)	X, 2 or 3	• X2304 • X5504
X1523	Light gray	"DC 24 V backup voltage – input" (→ 🗎 321)	X, 2 or 3	• X1524 • X4142 • X5505
X1524	Black	"DC 24 V backup voltage (AUX-PWR)" (→ 🗎 325)	X, 2 or 3	• X1523 • X4142 • X5505
X4142	Red	"Engineering interface" (→ 🗎 326)	X, 2 or 3	• X1523 • X1524 • X5505
–	–	[1] Optional pressure compensation	3	–

1) Plug connectors X5504 and X5505 can only be ordered together.

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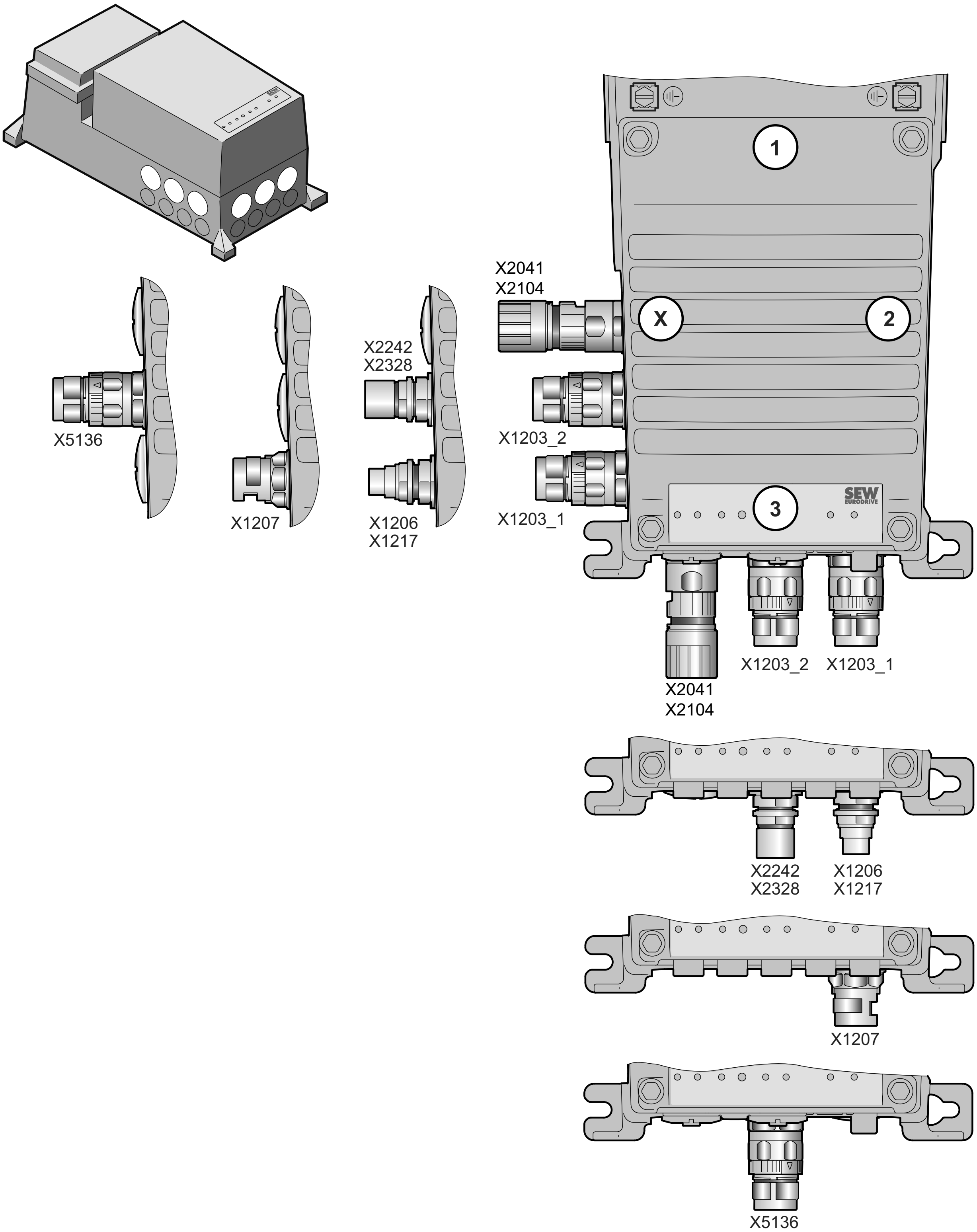
9.11.4 Plug connector positions MMF31../DAC.. design

Cable entries M25

The following figure shows possible plug connector positions:



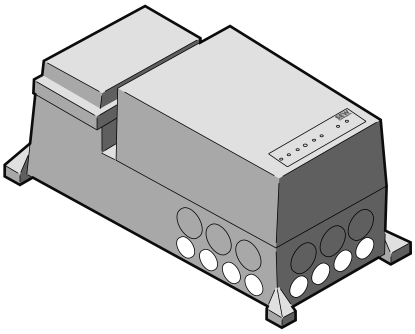
18014429758407435

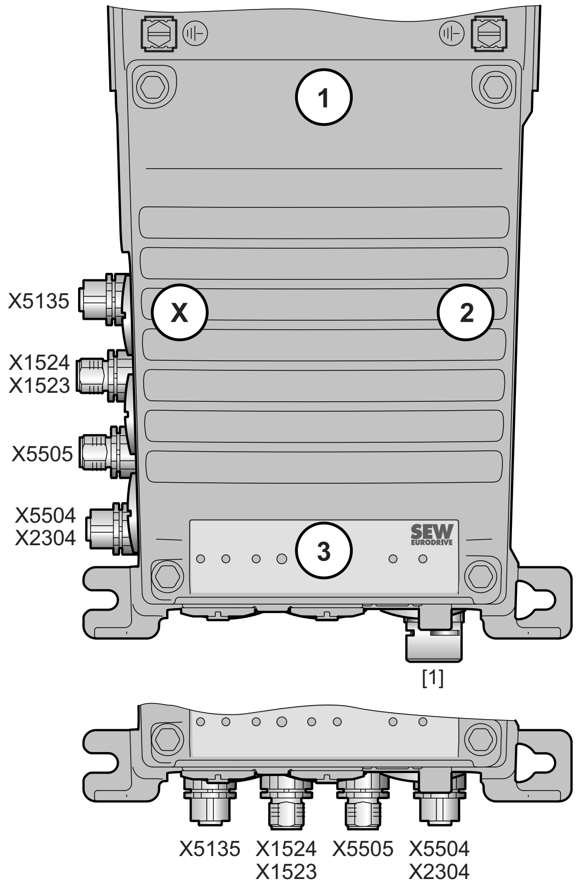
Plug connector				Not together at a position with the connector socket:
Designation	**Coding ring/ color**	**Function**	**Position**	
X1203_1	Black	"AC 400 V connection" (→ 🗎 281)[1]	X or 3	• X1206 • X1207 • X1217
X1203_2	Black	"AC 400 V connection" (→ 🗎 281)	X or 3	• X2242 • X2328 • X5136
X1206	–	"AC 400 V connection (IN)" (→ 🗎 287)[2]	X or 3	• X1203_1 • X1207 • X1217
X2242	–	"AC 400 V connection (OUT)" (→ 🗎 288)	X or 3	• X1203_2 • X2328 • X5136
X1207	Black	"AC 400 V connection" (→ 🗎 289)	X or 3	• X1203_1 • X1206 • X1217
X1217	–	"PA hybrid connection (IN)" (→ 🗎 290)[3] AC 400 V and DC 24 V backup voltage	X or 3	• X1203_1 • X1206 • X1207
X2328	–	"Hybrid connection PA (OUT)" (→ 🗎 291) AC 400 V and DC 24 V backup voltage	X or 3	• X1203_2 • X2242 • X5136
X2041	Brown	"Connection for motors without digital interface" (→ 🗎 292)	X or 3	• X2104
X2104	–	"Connection for motors with digital interface" (→ 🗎 301) (MOVILINK® DDI)	X or 3	• X2041
X5136	–	"Digital inputs/outputs" (→ 🗎 318)	X or 3	• X1203_2 • X2242 • X2328

1) Plug connector X1203_1 can also be ordered separately (i.e. without plug connector X1203_2).
2) Plug connector X1206 can also be ordered separately (i.e. without plug connector X2242).
3) Plug connector X2317 can also be ordered separately (i.e. without plug connector X2328).

Cable entries M16

The following figure shows possible plug connector positions:





18014429076144139

Plug connector				Not together at a position with the connector socket:
Designation	**Coding ring/ color**	**Function**	**Position**	
X5504	Yellow	"STO" (→ 🗎 306)[1)] (3-wire connection)	X or 3	• X2304 • Optional pressure compensation
X5505	Yellow	"STO" (→ 🗎 311) (3-wire connection)	X or 3	–
X2304	–	"Connection of external braking resistor" (→ 🗎 316)	X, 2 or 3	• X5504 • Optional pressure compensation
X5135	Black	"Digital inputs" (→ 🗎 317)	X or 3	–
X1523	Light gray	"DC 24 V backup voltage" (→ 🗎 321)	X or 3	• X1524
X1524	Black	"DC 24 V backup voltage (AUX-PWR)" (→ 🗎 325)	X or 3	• X1523

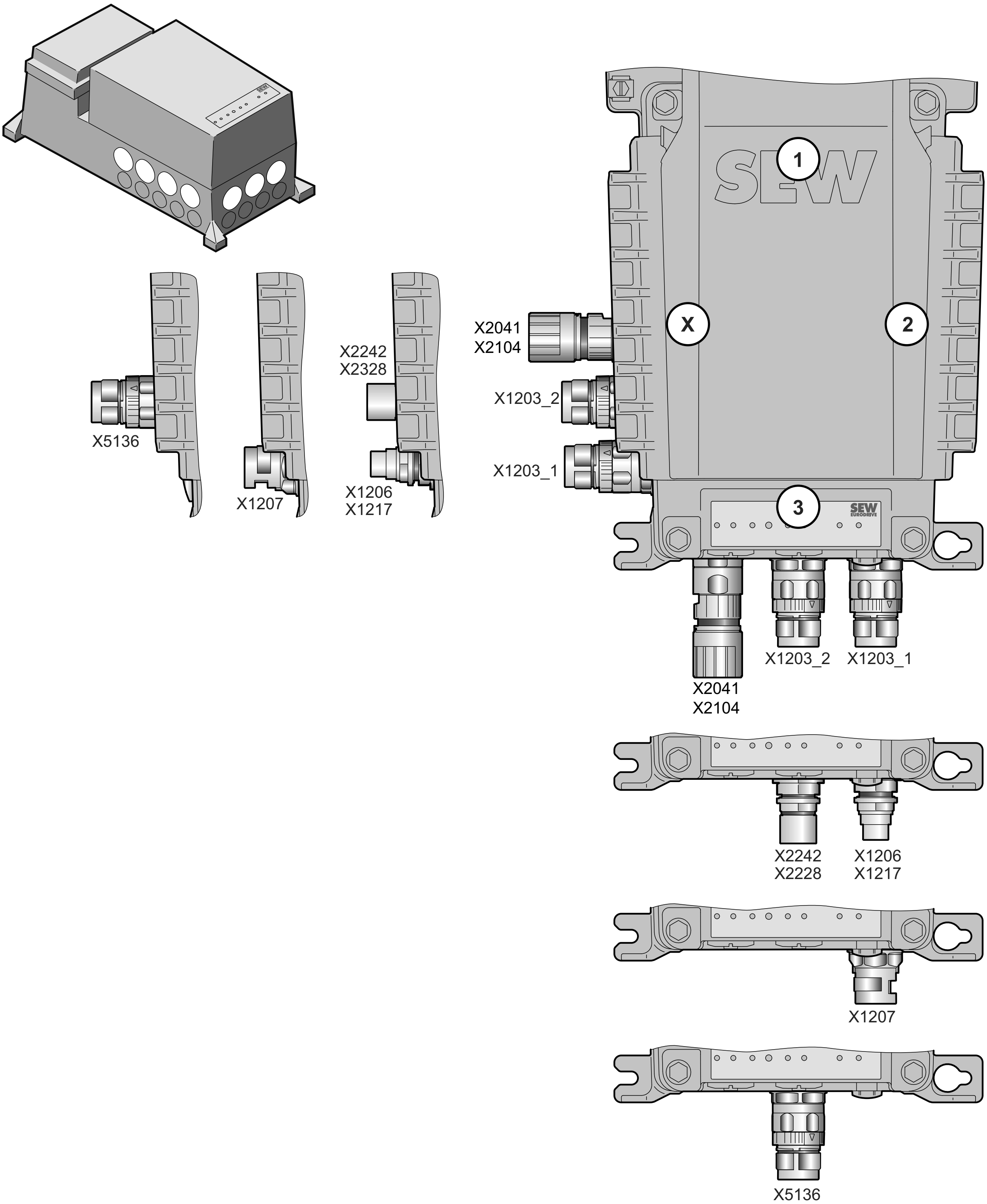
Plug connector				Not together at a position with the connector socket:
Designation	Coding ring/ color	Function	Position	
–	–	[1] Optional pressure compensation	3	• X2304 • X5504

1) Plug connectors X5504 and X5505 can only be ordered together.

9.11.5 Plug connector positions MMF32../DAC.. design

Cable entries M25

The following figure shows possible plug connector positions:



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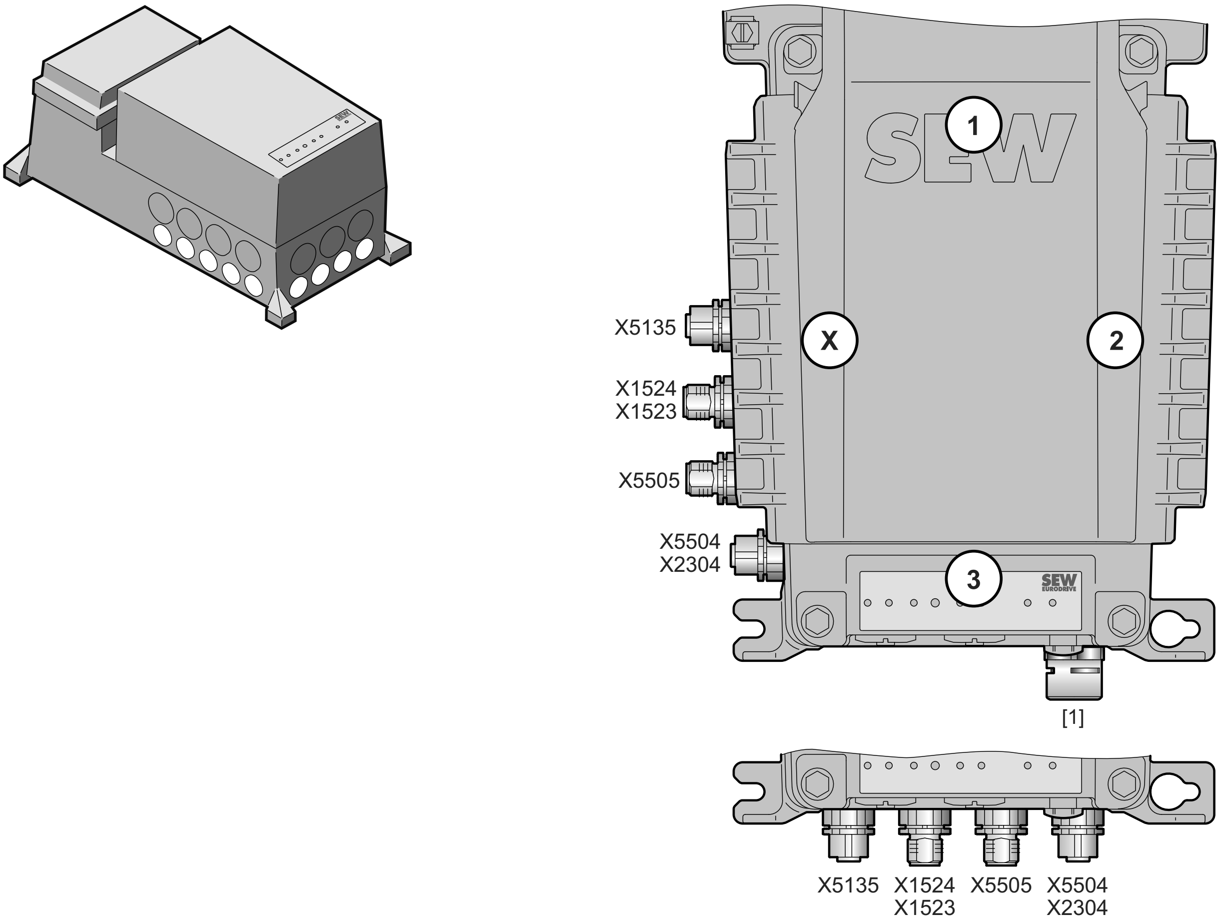
Plug connector				Not together at a position with the connector socket:
Designation	Coding ring/ color	Function	Position	
X1203_1	Black	"AC 400 V connection" (→ 🗎 281)[1]	X or 3	• X1206 • X1207 • X1217
X1203_2	Black	"AC 400 V connection" (→ 🗎 281)	X or 3	• X2242 • X2328 • X5136
X1206	–	"AC 400 V connection (IN)" (→ 🗎 287)[2]	X or 3	• X1203_1 • X1207 • X1217
X2242	–	"AC 400 V connection (OUT)" (→ 🗎 288)	X or 3	• X1203_2 • X2328 • X5136
X1207	Black	"AC 400 V connection" (→ 🗎 289)	X or 3	• X1203_1 • X1206 • X1217
X1217	–	"PA hybrid connection (IN)" (→ 🗎 290)[3] AC 400 V and DC 24 V backup voltage	X or 3	• X1203_1 • X1206 • X1207
X2328	–	"Hybrid connection PA (OUT)" (→ 🗎 291) AC 400 V and DC 24 V backup voltage	X or 3	• X1203_2 • X2242 • X5136
X2041	Brown	"Connection for motors without digital interface" (→ 🗎 292)	X or 3	• X2104
X2104	–	"Connection for motors with digital interface" (→ 🗎 301) (MOVILINK® DDI)	X or 3	• X2041
X5136	–	"Digital inputs/outputs" (→ 🗎 318)	X or 3	• X1203_2 • X2242 • X2328

1) Plug connector X1203_1 can also be ordered separately (i.e. without plug connector X1203_2).
2) Plug connector X1206 can also be ordered separately (i.e. without plug connector X2242).
3) Plug connector X2317 can also be ordered separately (i.e. without plug connector X2328).

Cable entries M16

The following figure shows possible plug connector positions:



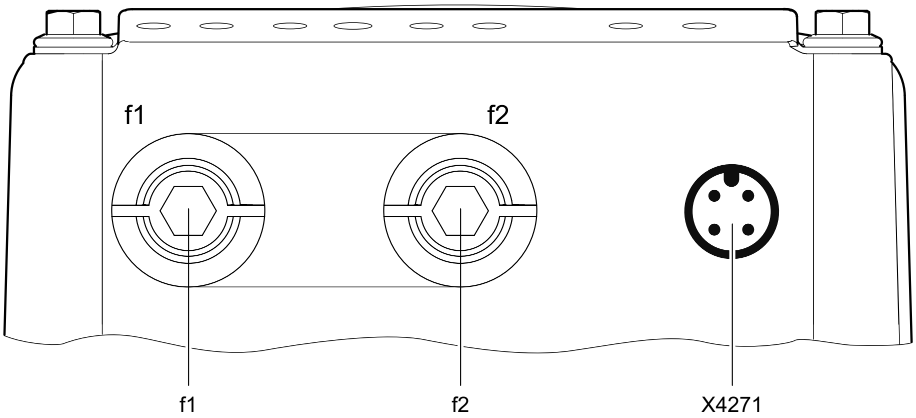
9007233491924107

Plug connector				Not together at a position with the connector socket:
Designation	**Coding ring/ color**	**Function**	**Position**	
X5504	Yellow	"STO" (→ 🗎 306)[1] (3-wire connection)	X or 3	• X2304 • Optional pressure compensation
X5505	Yellow	"STO" (→ 🗎 311) (3-wire connection)	X or 3	–
X2304	–	"Connection of external braking resistor" (→ 🗎 316)	X, 2 or 3	• X5504
X5135	Black	"Digital inputs" (→ 🗎 317)	X or 3	–
X1523	Light gray	"DC 24 V backup voltage" (→ 🗎 321)	X or 3	• X1524
X1524	Black	"DC 24 V backup voltage (AUX-PWR)" (→ 🗎 325)	X or 3	• X1523
–	–	[1] Optional pressure compensation	3	• X2304 • X5504

1) Plug connectors X5504 and X5505 can only be ordered together.

9.11.6 Plug connector positions at the DAC.. electronics cover

The following figure shows an example of the positions of the potentiometers and plug connectors:



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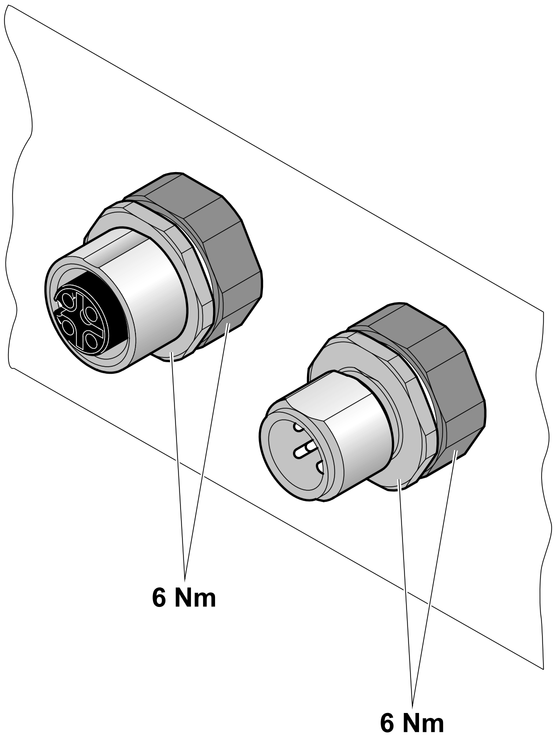
Designation	Function
f1	"Potentiometer f1" (→ 🗎 347) (underneath the screw plug)
f2	"Potentiometer f2" (→ 🗎 349) (underneath the screw plug)
X4271	"AS-Interface" (→ 🗎 328)

9.11.7 Plug connector variants

M12 plug connector at the connection box

M12 plug connectors at the connection box are pre-installed at delivery so they match the connection cables provided by SEW-EURODRIVE. Customers can adjust the alignment of plug connectors if required.

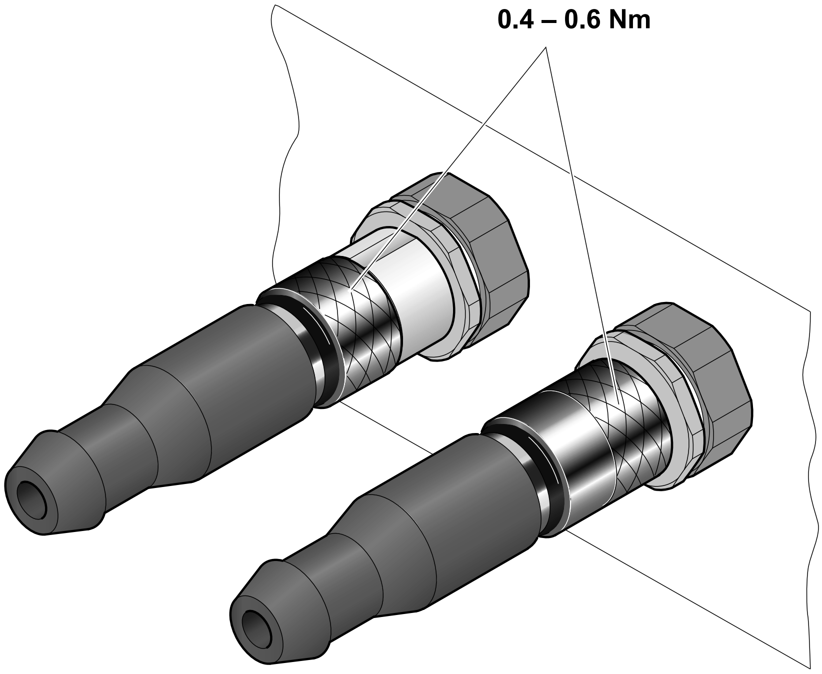
The following figure shows a schematic illustration with the permitted tightening torque:



19443420299

M12 plug connector with mating connector

The following figure shows a schematic illustration with the permitted tightening torques:



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INFORMATION

The M12 plug connectors are usually tightened with a torque of 0.4 – 0.6 Nm. Observe the data sheet of the used prefabricated cables.

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M23 plug connector

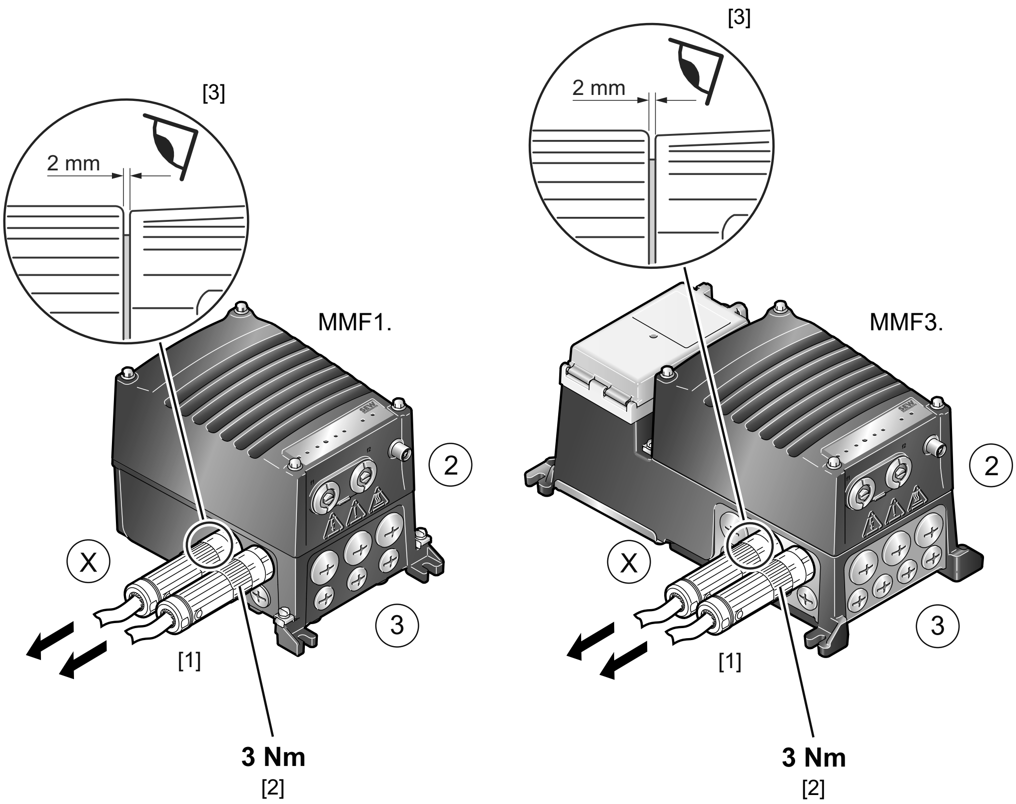
M23 plug connectors are available in the "Straight" plug connector design.

Observe the following information:

- Only align the plug connector when mounting and connecting the drive unit.
- Do not use pliers to adjust the plug connector.
- Turn the plug connector only with plugged-in mating connector.
- The gap between the connector and the socket is approx. 2 mm.
- Tighten the union nut of the M23 plug connector to 3 Nm.
- Make sure that the plug connector does not perform any permanent movements.

Example MOVIMOT® flexible

The following figure shows the installation of the straight M23 plug connector:



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[1] "Straight" design
[2] Tightening torque of the union nut 3 Nm
You can order suitable tools from TE Connectivity – Intercontec products:
- Torque wrench 3 Nm, 1/4" external square: C1.020.00
- Spanner wrench 1/4" square socket, suitable to the 923/723 series with SpeedTec equipment: C6.215.00

[3] There is a gap of 2 mm between plug connector and socket

9.11.8 Using plug connectors assembled by yourself

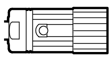
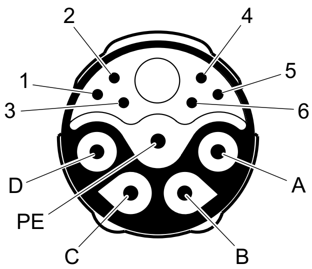
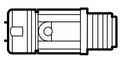
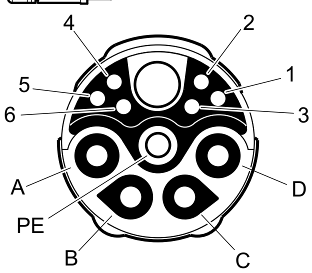
M23 plug connector by TE connectivity – Intercontec Products

The power plug connectors for assembling connection cables yourself, and the corresponding assembly tool set is available for order from TE Connectivity - Intercontec products.

Contact TE Connectivity - Intercontec products if the order designation is not available in the online order system of Intercontec.

Order information

The table below shows the order designations for connectors by TE Connectivity - Intercontec products with the matching coding for assembly by the customer:

Plug connector type		Outer cable diameter/core cross section of crimp contacts	Designation for order from the supplier TE Connectivity - Intercontec products
Plug connector AC 400 V Coding ring: Black	Cable plug (male, union nut)   	14 mm – 17 mm / 2.5 mm² – 4.0 mm²	H 51 A 019 MR 02 59 0102 000
		9.5 mm – 14.5 mm / 2.5 mm² – 4.0 mm²	H 51 A 019 MR 02 42 0102 000
		9.5 mm – 14.5 mm / 0.35 mm² – 2.5 mm²	H 51 A 019 MR 12 42 0102 000
	Cable socket (female/male thread)   	14 mm – 17 mm / 2.5 mm² – 4.0 mm²	H 52 A 013 FR 02 59 0102 000
		9.5 mm – 14.5 mm / 2.5 mm² – 4.0 mm²	H 52 A 013 FR 02 42 0102 000
		9.5 mm – 14.5 mm / 0.35 mm² – 2.5 mm²	H 52 A 013 FR 17 42 0102 000

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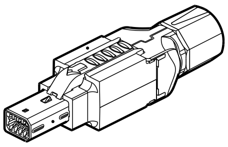
Mini-I/O plug connector

The following tables contains the part numbers and purchase order numbers of the mini-I/O plug connectors for customer assembly of mini I/O connection cables.

Connector type	Cable Outer diameter Core cross section	Cable Category	Purchase order number TE Connectivity Intercontec products (quantity)	Part number SEW-EURODRIVE (quantity)
Industrial mini I/O plug connector (male) Type 1 for field installation 	4.7 to 5.7 mm[1)] 4 × AWG22	CAT5e	1-2350278-1 (60 pieces)	25697064[1)] (1 piece)
	5.8 to 8.2 mm 4 × AWG22	CAT5e	1-2350323-1 (60 pieces)	25708775 (1 piece)
	4.7 to 5.7 mm 4 × AWG26 – AWG24	CAT5e	1-2350304-1 (60 pieces)	Not available
	5.7 to 8.2 mm 8 × AWG26 – AWG24	CAT6A	1-2350310-1 (60 pieces)	Not available

1) Suitable for use with PAC/PSC hybrid cables (cable type: HELUKABEL Li9Y11-HF, HELUKABEL Li9YYö)

9.12 Assignment of optional plug connectors

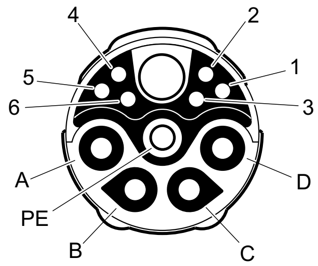
9.12.1 X1203_1 and X1203_2: AC 400 V connection

The following table provides information about this connection:

Function
AC 400 V connection for supplying the device/for looping through

Connection type
M23, SEW-EURODRIVE insert, Series 723, SpeedTec equipment, company: TE Connectivity – Intercontec products, female, coding ring: black, protected against contact

Connection diagram

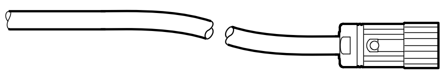


Assignment		
Contact	**Function**	
A	L1	Line connection, phase L1
B	L2	Line connection, phase L2
C	L3	Line connection, phase L3
D	Res.	Reserved
PE	PE	Protective earth connection
1	Res.	Reserved
2	Res.	Reserved
3	Res.	Reserved
4	Res.	Reserved
5	Res.	Reserved
6	Res.	Reserved

Connection cables

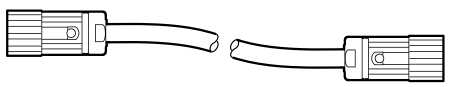
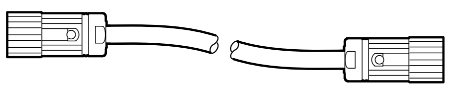
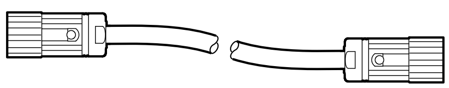
Cable cross section 1.5 mm²

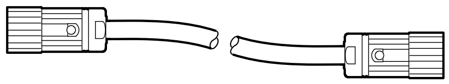
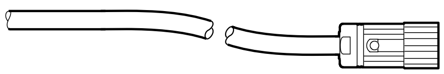
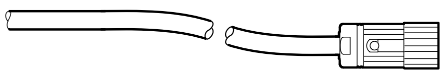
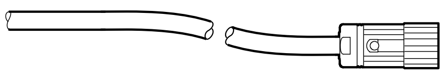
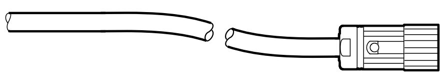
The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 Open — M23, coding ring: black, male	CE: 18180094	HELUKABEL® JZ-600	Variable	1.5 mm² / AC 500 V

Cable cross section 2.5 mm²

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18127460	HELUKABEL® TOPFLEX® – 600-PVC	Variable	2.5 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18133959	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable	2.5 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153267	HELUKABEL® – JZ-602	Variable	2.5 mm² / AC 500 V

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153275	HELUKABEL® MULTIFLEX® – 512	Variable	2.5 mm² / AC 500 V
 Open — M23, coding ring: black, male	CE: 18127479	HELUKABEL® TOPFLEX® – 600-PVC	Variable	2.5 mm² / AC 500 V
 Open — M23, coding ring: black, male	CE: 18133967	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable	2.5 mm² / AC 500 V
 Open — M23, coding ring: black, male	UL: 18153283	HELUKABEL® – JZ-602	Variable	2.5 mm² / AC 500 V
 Open — M23, coding ring: black, male	UL: 18153291	HELUKABEL® MULTIFLEX® – 512	Variable	2.5 mm² / AC 500 V

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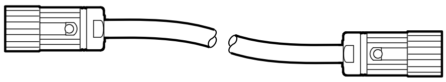
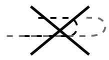
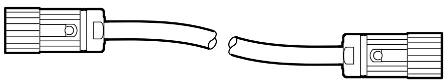
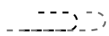
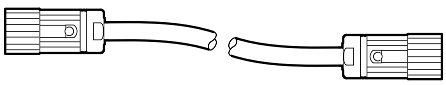
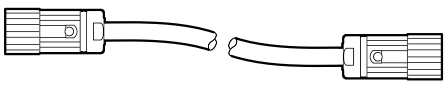
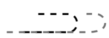
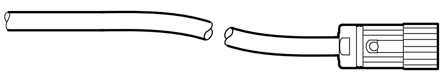
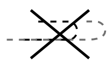
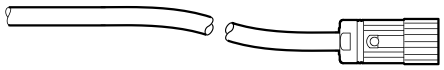
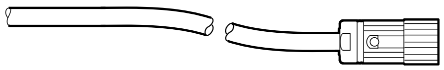
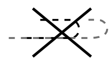
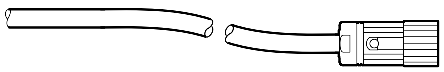
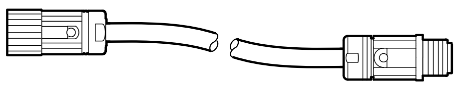
Cable cross section 4.0 mm²

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18127487	HELUKABEL® TOPFLEX® – 600-PVC	Variable 	4.0 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	CE: 18133975	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable 	4.0 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153305	HELUKABEL® – JZ-602	Variable 	4.0 mm² / AC 500 V
 M23, coding ring: black, male — M23, coding ring: black, male	UL: 18153313	HELUKABEL® MULTIFLEX® – 512	Variable 	4.0 mm² / AC 500 V
 Open — M23, coding ring: black, male	CE: 18127495	HELUKABEL® TOPFLEX® – 600-PVC	Variable 	4.0 mm² / AC 500 V

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 Open M23, coding ring: black, male	CE: 18133983	HELUKABEL® TOPFLEX® – 611-PUR (halogen-free)	Variable 	4.0 mm^2 / AC 500 V
 Open M23, coding ring: black, male	UL: 18153321	HELUKABEL® – JZ-602	Variable 	4.0 mm^2 / AC 500 V
 Open M23, coding ring: black, male	UL: 18153348	HELUKABEL® MULTIFLEX® – 512	Variable 	4.0 mm^2 / AC 500 V
 M23, coding ring: black, male M23, coding ring: black, female	UL: 18166318	HELUKABEL® MULTIFLEX® – 512	Variable 	4.0 mm^2 / AC 500 V

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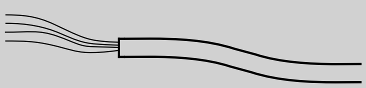
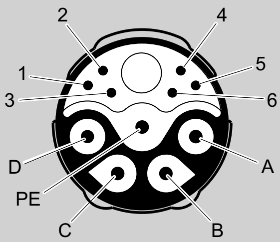
Connection of cables with open end

The following table shows the core assignment of cables with the following part numbers:

Part numbers
18180094, 18127479, 18133967, 18153283, 18153291, 18127495, 18133983, 18153321, 18153348

Assembly					
Open cable end			**Description**	**Prefabricated plug connector**	
					
Core color/ core cross section	**Identification**	**Assembly**		**Signal**	**Contact**
Black 1.5 mm² 2.5 mm² 4.0 mm²	1	Not prefabricated	Line connection, phase L1	L1	A
Black 1.5 mm² 2.5 mm² 4.0 mm²	2	Not prefabricated	Line connection, phase L2	L2	B
Black 1.5 mm² 2.5 mm² 4.0 mm²	3	Not prefabricated	Line connection, phase L3	L3	C
Green/yellow 1.5 mm² 2.5 mm² 4.0 mm²	-	Not prefabricated	PE connection	PE	PE

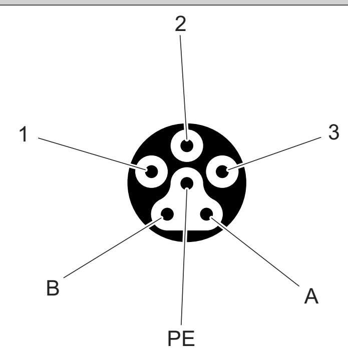
9.12.2 X1206: AC 400 V connection, input

The following table provides information about this connection:

Function
AC 400 V connection (IN)

Connection type
M15-X-Power, male, plug connector without union nut, (current load max. 16 A)

Connection diagram



Assignment		
Contact	**Function**	
1	L1	Line connection, phase L1 (IN)
2	L2	Line connection, phase L2 (IN)
3	L3	Line connection, phase L3 (IN)
PE	PE	Protective earth connection
A	res.	Reserved
B	res.	Reserved

The plug connector cannot be aligned. You should therefore check whether angled mating connectors can be used.

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of plug connector.

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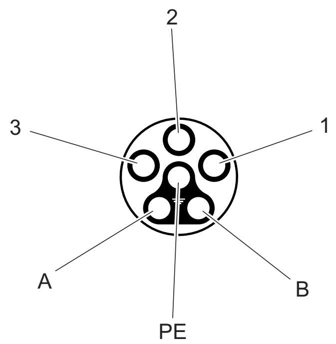
9.12.3 X2242: AC 400 V connection, output

The following table provides information about this connection:

Function
AC 400 V connection (OUT)

Connection type
M15-X-Power, female, plug connector with union nut, (current load max. 16 A)

Connection diagram



Assignment		
Contact	**Function**	
1	L1	Line connection, phase L1 (OUT)
2	L2	Line connection, phase L2 (OUT)
3	L3	Line connection, phase L3 (OUT)
PE	PE	Protective earth connection
A	res.	Reserved
B	res.	Reserved

The plug connector cannot be aligned. You should therefore check whether angled mating connectors can be used.

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of plug connector.

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9.12.4 X1207: AC 400 V connection (IN)

INFORMATION

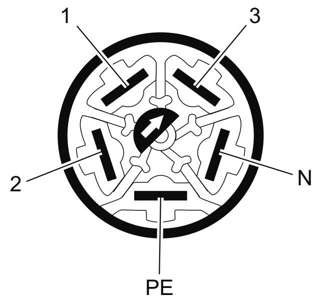
The number of permitted plug-in cycles for this connector is 10 times.

The following table provides information about this connection:

Function
AC 400 V connection (IN)

Connection type
QPD W 4PE2,5, QUICKON connector, coding 3, male, PhoenixContact

Connection diagram



Assignment		
Contact	**Function**	
1	L1	Line connection, phase L1 (IN)
2	L2	Line connection, phase L2 (IN)
3	L3	Line connection, phase L3 (IN)
PE	PE	Protective earth connection
Once	Res.	Reserved

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of plug connector.

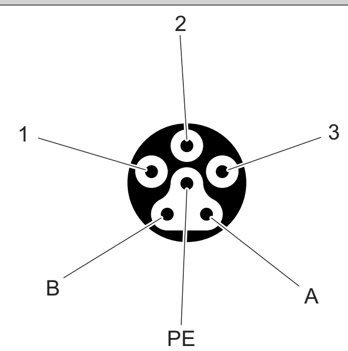
9.12.5 X1217: PA connection for AC 400 V and 24 V backup voltage (IN)

The following table provides information about this connection:

Function
PA connection for AC 400 V and DC 24 V backup voltage (IN)

Connection type
MQ15-X-Power, male, plug connector without union nut, MURR Elektronik, (current load max. 16 A)

Connection diagram



Assignment		
Contact	**Function**	
1	L1	Line connection, phase L1 (IN)
2	L2	Line connection, phase L2 (IN)
3	L3	Line connection, phase L3 (IN)
PE	PE	Protective earth connection
A	+24 V	DC 24 V input for backup mode (IN)
B	0V24	0 V 24 reference potential for backup mode (IN)

The plug connector cannot be aligned. You should therefore check whether angled mating connectors can be used.

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of plug connector.

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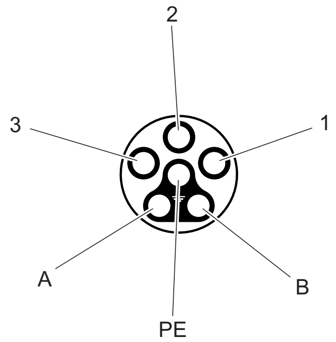
9.12.6 X2328: PA connection for AC 400 V and 24 V backup voltage (OUT)

The following table provides information about this connection:

Function
PA connection for AC 400 V and DC 24 V backup voltage (OUT)

Connection type
MQ15-X-Power, female, plug connector with union nut, MURR Elektronik, (current load max. 16 A)

Connection diagram



Assignment		
Contact	**Function**	
1	L1	Line connection, phase L1 (OUT)
2	L2	Line connection, phase L2 (OUT)
3	L3	Line connection, phase L3 (OUT)
PE	PE	Protective earth connection
A	+24 V	DC 24 V output for backup mode (OUT)
B	0V24	0 V 24 reference potential for backup mode (OUT)

The plug connector cannot be aligned. You should therefore check whether angled mating connectors can be used.

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of plug connector.

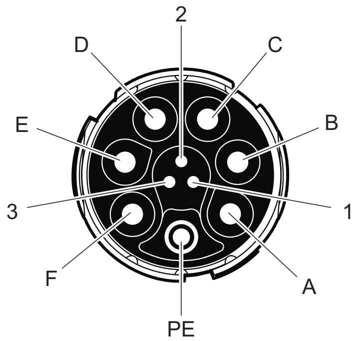
9.12.7 X2041: Connection for motors without digital interface

The following table provides information about this connection:

Function
Inverter output for connecting motors without digital interface

Connection type
M23, female, union nut with female thread, TE Connectivity - Intercontec Products, series 723, SEW insert, SpeedTec equipment, coding ring: brown, protected against contact

Wiring diagram



Assignment		
Contact	**Function**	
A	U	Motor connection, phase U
B	V	Motor connection, phase V
C	W	Motor connection, phase W
D	13	Brake connection 13
E	14	Brake connection 14
F	15	Brake connection 15
PE	PE	Protective earth connection
1	Temp+	Temperature sensor+ connection
2	res.	Reserved
3	Temp-	Temperature sensor- connection

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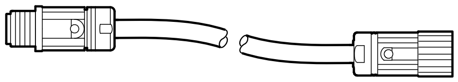
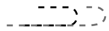
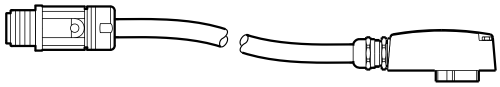
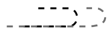
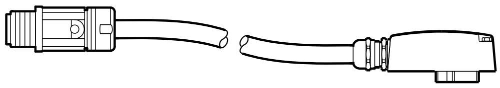
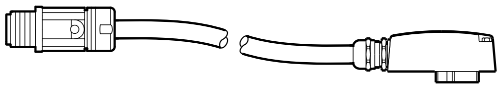
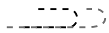
Connection cables

Cable cross section 1.5 mm²

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
Extension cable  M23, coding ring: brown, male — M23, coding ring: brown, female	CE/UL: 28128710	LEONI LEHC® 005272	Variable 	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — IS2, female, △	CE/UL: 28125932	LEONI LEHC® 005272	Variable 	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — IS2, female, ⅄	CE/UL: 28125940	LEONI LEHC® 005272	Variable 	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — IS1, female, △	CE/UL: 28125959	LEONI LEHC® 005272	Variable 	1.5 mm² / AC 500 V

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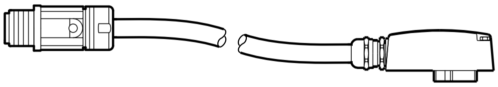
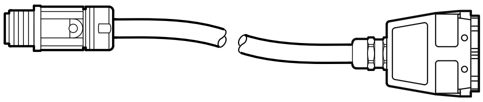
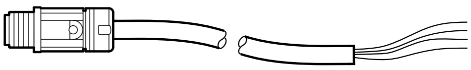
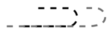
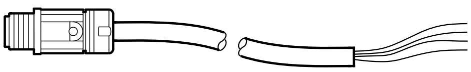
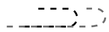
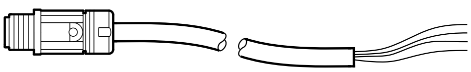
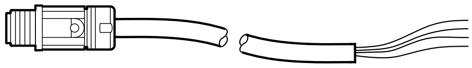
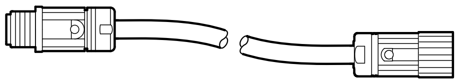
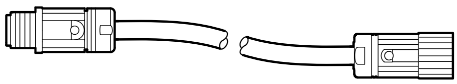
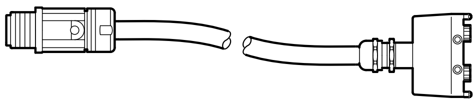
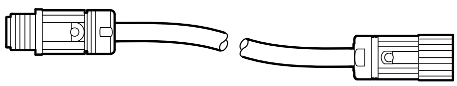
Connection cable		Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: brown, male	IS1, female, ⅄	CE/UL: 28125967	LEONI LEHC® 005272	Variable 	1.5 mm² / AC 500 V
 M23, coding ring: brown, male	HAN® 10E, female (ASB4)	CE/UL: 28125975	LEONI LEHC® 005272	Variable 	1.5 mm² / AC 500 V
 M23, coding ring: brown, male	Open, M5 ring cable lug, conductor end sleeves	CE/UL: 28125983	LEONI LEHC® 005272	Variable 	1.5 mm² / AC 500 V
 M23, coding ring: brown, male	Open, M4 ring cable lug, conductor end sleeves	CE/UL: 28125991	LEONI LEHC® 005272	Variable 	1.5 mm² / AC 500 V
 M23, coding ring: brown, male	Open	CE/UL: 28128435	LEONI LEHC® 005272	Variable 	1.5 mm² / AC 500 V

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: brown, male — Open, conductor end sleeves	CE/UL: 28126009	LEONI LEHC® 005272	Variable	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — M23, female (SH1/KH1)	CE/UL: 28128451	LEONI LEHC® 005272	Variable	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — M23, female (SB11)	CE/UL: 28170806	Helukabel Li9YC11Y-HF 4G1.5 + (3 × 1 .0) C	Variable	1.5 mm² / AC 500 V
 M23, coding ring: brown, male — HAN®, 10E, female (ABB8)	CE/UL: 28170601	LEONI LEHC® 005272	Variable	1.5 mm² / AC 500 V
 M23, without coding ring, male (SH1/KH1) — M23, without encoding ring: female (SH1/KH1)	CE/UL: 18191347	LEONI LEHC® 005272	Variable	1.5 mm² / AC 500 V

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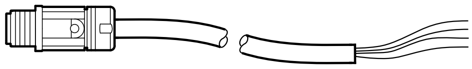
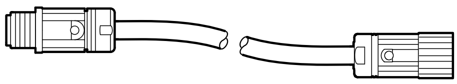
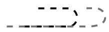
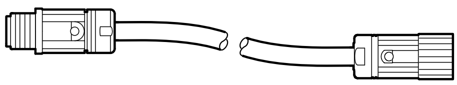
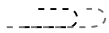
Cable cross section 2.5 mm²

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, coding ring: brown, male — Open	CE/UL: 28135369	LEONI LEHC® 005275	Variable 	2.5 mm² / AC 500 V
 M23, coding ring: brown, male — M23, female (SH1/KH1)	CE/UL: 28128443	LEONI LEHC® 005275	Variable 	2.5 mm² / AC 500 V
Extension cable  M23, coding ring: brown, male — M23, coding ring: brown, female	CE/UL: 28128478	LEONI LEHC® 005275	Variable 	2.5 mm² / AC 500 V

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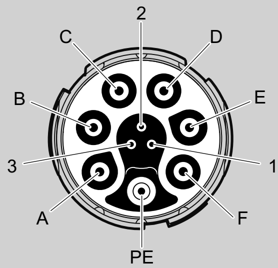
Connection of cables with open end

28128435, 28135369

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28128435, 28135369

Assembly							
Open cable end, cable cut off			**Motor connection depending on brake control**			**Assembled plug connector**	
			**Without brake**	**3-wire brake AC 100 – 525 V** **(E.g. BE/BZ brake)**	**2-wire brake DC 24 V** **(E.g. BK/BP brake)**		
Conductor color/ core cross section	**Identification**	**Assembly**	**Description**			**Signal**	**Contact**
Black 1.5 mm^2 2.5 mm^2	U1	Not prefabricated	Motor connection, phase U			U	A
Black 1.5 mm^2 2.5 mm^2	V2	Not prefabricated	Motor connection, phase V			V	B
Black 1.5 mm^2 2.5 mm^2	W3	Not prefabricated	Motor connection, phase W			W	C
Black 1.0 mm^2	1	Not prefabricated	Reserved[1)]	Brake 13 (red)	Brake+ (red or yellow)	Brake 13	D
Black 1.0 mm^2	2	Not prefabricated	Reserved[1)]	Brake 14 (white)	Accelerator coil (white)	Brake 14	E
Black 1.0 mm^2	3	Not prefabricated	Reserved[1)]	Brake 15 (blue)	Brake (blue or yellow)	Brake 15	F
Green/yellow 2.5 mm^2	–	Not prefabricated	Protective earth connection			PE	PE
Pink 0.34 mm^2	4	Not prefabricated	Temperature sensor+ connection			Temp+	1
–	–	–	–			res.	2

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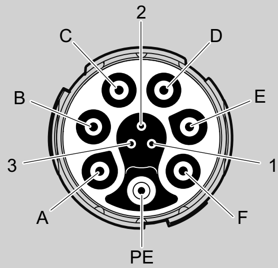
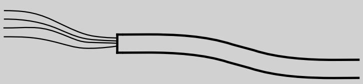
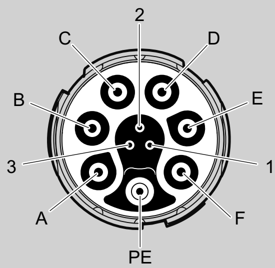
Assembly							
Open cable end, cable cut off			**Motor connection depending on brake control**			**Assembled plug connector**	
			**Without brake**	**3-wire brake AC 100 – 525 V** **(E.g. BE/BZ brake)**	**2-wire brake DC 24 V** **(E.g. BK/BP brake)**		
Conductor color/ core cross section	**Identification**	**Assembly**	**Description**			**Signal**	**Contact**
Gray 0.34 mm²	5	Not prefabricated	Temperature sensor- connection			Temp-	3

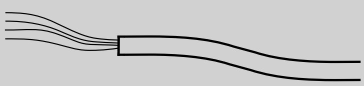
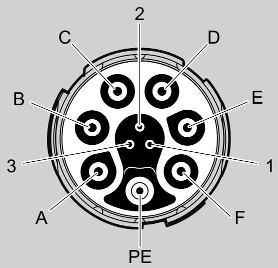
1) Reserved wires must be isolated and fixed in the connection box.

28135350, 28126009

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28135350, 28126009

Assembly							
Open cable end, with conductor end sleeves			**Motor connection depending on brake control**			**Assembled plug connector**	
			**Without brake**	**Three-wire brake AC 100 – 525 V** **(E.g. BE/BZ brake)**	**Two-wire brake DC 24 V** **(E.g. BK/BP brake)**		
Conductor color/ core cross section	**Identification**	**Assembly**	**Description**			**Signal**	**Contact**
Black 1.5 mm² 2.5 mm²	U1	Conductor end sleeve	Motor connection, phase U			U	A
Black 1.5 mm² 2.5 mm²	V2	Conductor end sleeve	Motor connection, phase V			V	B

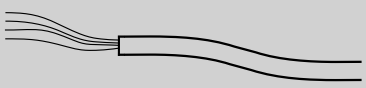
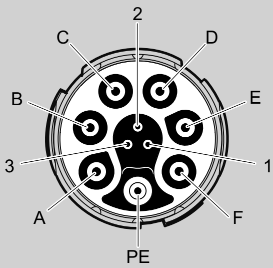
Assembly							
Open cable end, with conductor end sleeves			**Motor connection depending on brake control**			**Assembled plug connector**	
			**Without brake**	**Three-wire brake AC 100 – 525 V** **(E.g. BE/BZ brake)**	**Two-wire brake DC 24 V** **(E.g. BK/BP brake)**		
Conductor color/ core cross section	**Identifi-cation**	**Assembly**	**Description**			**Signal**	**Contact**
Black 1.5 mm² 2.5 mm²	W3	Conductor end sleeve	Motor connection, phase W			W	C
Black 1.0 mm²	1	Conductor end sleeve	Reserved[1)]	Brake 13 (red)	Brake+ (red or yel-low)	Brake 13	D
Black 1.0 mm²	2	Conductor end sleeve	Reserved[1)]	Brake 14 (white)	Accelerator coil (white)	Brake 14	E
Black 1.0 mm²	3	Conductor end sleeve	Reserved[1)]	Brake 15 (blue)	Brake (blue or yel-low)	Brake 15	F
Green/yel-low 1.5 mm² 2.5 mm²	–	Conductor end sleeve	Protective earth connection			PE	PE
Black 0.34 mm²	4	Conductor end sleeve	Temperature sensor+ connection			Temp+	1
–	–	–	–			res.	2
Black 0.34 mm²	5	Conductor end sleeve	Temperature sensor- connection			Temp-	3

1) Reserved conductors must be isolated and fixed in the connection box.

28125991, 28125983

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28125991, 28125983

Assembly							
Open cable end, conductor end sleeves, ring cable lugs			**Motor connection depending on brake control**			**Assembled plug connector**	
			**Without brake**	**3-wire brake AC 100 to 525 V** **(E.g. BE/BZ brake)**	**2-wire brake DC 24 V** **(E.g. BK/BP brake)**		
Conductor color/ core cross section	**Identifi-cation**	**Assembly**	**Description**			**Signal**	**Contact**
Black 1.5 mm² 2.5 mm² 4.0 mm²	U1	Ring cable lug M4, M5	Motor connection, phase U			U	A
	V2	Ring cable lug M4, M5	Motor connection, phase V			V	B
	W3	Ring cable lug M4, M5	Motor connection, phase W			W	C
Black 1.0 mm²	1	Conductor end sleeve	Reserved[1)]	Brake 13 (red)	Brake+ (red or yel-low)	Brake 13	D
Black 1.0 mm²	2	Conductor end sleeve	Reserved[1)]	Brake 14 (white)	Accelerator coil (white)	Brake 14	E
Black 1.0 mm²	3	Conductor end sleeve	Reserved[1)]	Brake 15 (blue)	Brake (blue or yel-low)	Brake 15	F
Green/yel-low 1.5 mm² 2.5 mm² 4.0 mm²	–	Conductor end sleeve	Protective earth connection			PE	PE
Pink 0.34 mm²	4	Conductor end sleeve	Temperature sensor+ connection			Temp+	1
–	–	–	–			res.	2
Gray 0.34 mm²	5	Conductor end sleeve	Temperature sensor- connection			Temp-	3

1) Reserved wires must be isolated and fixed in the connection box.

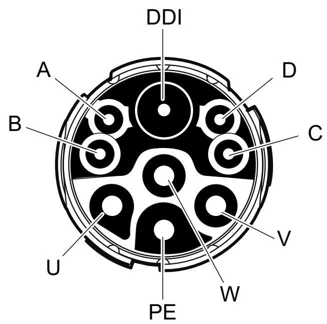
9.12.8 X2104: Inverter output for connecting motors with digital interface (MOVILINK® DDI)

The following table provides information about this connection:

Function
Inverter output for connecting motors with digital interface (MOVILINK® DDI)

Connection type
M23, female, union nut with female thread, TE Connectivity – Intercontec Products, series 723, SEW insert, SpeedTec equipment, coding ring: without, protected against contact

Connection diagram



Assignment			
Contact	**Function**		
		Connection depending on brake control	
		Standard design for 2-wire and 3-wire brakes AC 100 – 525 V	**Design for 2-wire brakes DC 24 V**
U	U	Motor connection, phase U	
V	V	Motor connection, phase V	
W	W	Motor connection, phase W	
PE	PE	Protective earth connection	
1	DDI	MOVILINK® DDI	
A	Brake A	Reserved	Connection brake-
B	Brake B	Connection brake 15 (blue)	Reserved
C	Brake C	Connection brake 13 (red)	Reserved
D	Brake D	Connection brake 14 (white)	Connection brake+

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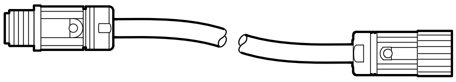
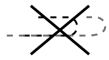
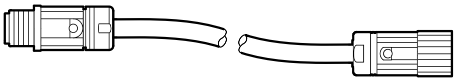
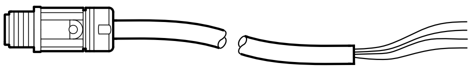
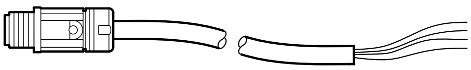
Connection cables

Cable cross section 1.5 mm²

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, without coding ring, male — M23, without coding ring, female	CE/UL: 28123905	LEONI LEHC® 005775	Variable 	4 × 1.5 mm² + 4 × 1 mm² + Z50 / AC 500 V
 M23, without coding ring, male — M23, without coding ring, female	CE/UL: 28123859	LEONI LEHC® 005769	Variable 	4 × 1.5 mm² + 4 × 1 mm² + Z50 / AC 500 V
 M23, without coding ring, male — Open	CE/UL: 28124332	LEONI LEHC® 005769	Variable 	4 × 1.5 mm² + 4 × 1 mm² + Z50 / AC 500 V
 M23, without coding ring, male — Open	CE/UL: 28124367	LEONI LEHC® 005775	Variable 	4 × 1.5 mm² + 4 × 1 mm² + Z50 / AC 500 V

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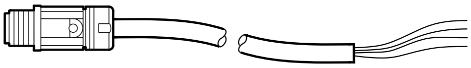
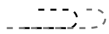
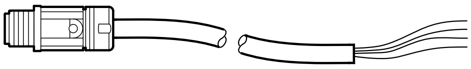
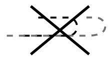
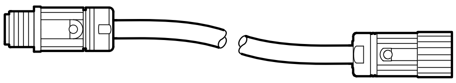
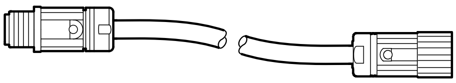
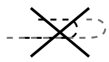
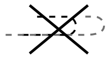
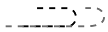
Cable cross section 2.5 mm²

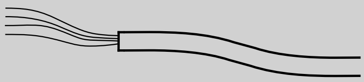
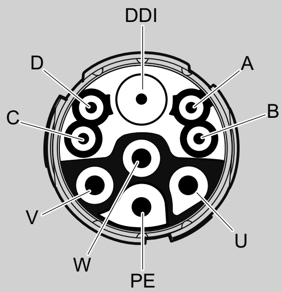
The following table shows the cables available for this connection:

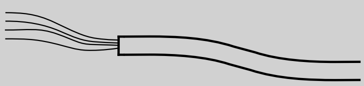
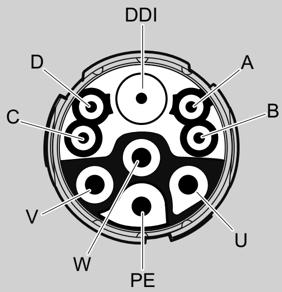
Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, without coding ring, male — Open	CE/UL: 28124340	LEONI LEHC® 005770	Variable 	4 × 2.5 mm² + 4 × 1 mm² + Z50 / AC 500 V
 M23, without coding ring, male — Open	CE/UL: 28124375	LEONI LEHC® 005776	Variable 	4 × 2.5 mm² + 4 × 1 mm² + Z50 / AC 500 V
 M23, without coding ring, male — M23, without coding ring, female	CE/UL: 28123867	LEONI LEHC® 005244	Variable 	4 × 2.5 mm² + 4 × 1 mm² + Z50 / AC 500 V
 M23, without coding ring, male — M23, without coding ring, female	CE/UL: 28123913	LEONI LEHC® 005244	Variable 	4 × 2.5 mm² + 4 × 1 mm² + Z50 / AC 500 V

Connection of cables with open end

The following table shows the core assignment of cables with the following part numbers:

Part numbers	
Installation method of cable	**Part numbers**
	28124367, 28124375, 28124383
	28124332, 28124340, 28124359

<table>
<tr><th colspan="8">Assembly</th></tr>
<tr><th colspan="3">Open cable end at the motor</th><th colspan="3">Motor connection depending on brake control</th><th colspan="2">Assembled plug connector</th></tr>
<tr><td colspan="3"></td><td>Without brake</td><td>Three-wire brake AC 100 – 525 V
(E.g. BE/BZ brake)</td><td>Two-wire brake DC 24 V
(e.g. BK/BP brake)</td><td colspan="2">
</td></tr>
<tr><th>Conductor color/ core cross section</th><th>Identification</th><th>Assembly</th><th colspan="3">Description</th><th>Signal</th><th>Contact</th></tr>
<tr><td rowspan="3">Black
1.5 mm²
2.5 mm²
4.0 mm²</td><td>U/L1</td><td>Not prefabricated</td><td colspan="3">Motor connection, phase U</td><td>U</td><td>U</td></tr>
<tr><td>V/L2</td><td>Not prefabricated</td><td colspan="3">Motor connection, phase V</td><td>V</td><td>V</td></tr>
<tr><td>W/L3</td><td>Not prefabricated</td><td colspan="3">Motor connection, phase W</td><td>W</td><td>W</td></tr>
<tr><td>Green/yellow
1.5 mm²
2.5 mm²
4.0 mm²</td><td>-</td><td>Not prefabricated</td><td colspan="3">Protective earth connection</td><td>PE</td><td>PE</td></tr>
<tr><td>Violet coaxial cable</td><td>-</td><td>Coaxial connector</td><td colspan="3">MOVILINK® DDI connection</td><td>DDI</td><td>1</td></tr>
<tr><td>Yellow
1.0 mm²</td><td>A</td><td>Not prefabricated</td><td>Reserved[1)]</td><td>Reserved[1)]</td><td>Brake-</td><td>Brake A</td><td>A</td></tr>
<tr><td>Orange
1.0 mm²</td><td>B</td><td>Not prefabricated</td><td>Reserved[1)]</td><td>Brake 15 (blue)</td><td>Reserved[1)]</td><td>Brake B</td><td>B</td></tr>
<tr><td>Pink
1.0 mm²</td><td>C</td><td>Not prefabricated</td><td>Reserved[1)]</td><td>Brake 13 (red)</td><td>Reserved[1)]</td><td>Brake C</td><td>C</td></tr>
</table>

<table>
<tr><th colspan="8">Assembly</th></tr>
<tr><th colspan="3">Open cable end at the motor</th><th colspan="3">Motor connection depending on brake control</th><th colspan="2">Assembled plug connector</th></tr>
<tr><td colspan="3"></td><th>Without brake</th><th>Three-wire brake
AC 100 – 525 V
(E.g. BE/BZ brake)</th><th>Two-wire brake
DC 24 V
(e.g. BK/BP brake)</th><td colspan="2"></td></tr>
<tr><th>Conductor color/ core cross section</th><th>Identification</th><th>Assembly</th><th colspan="3">Description</th><th>Signal</th><th>Contact</th></tr>
<tr><td>Violet 1.0 mm²</td><td>D</td><td>Not prefabricated</td><td>Reserved[1)]</td><td>Brake 14 (white)</td><td>Brake+</td><td>Brake D</td><td>D</td></tr>
</table>

1) Reserved conductors must be isolated and fixed in the connection box.

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9.12.9 X5504: STO (3 cores)

⚠ WARNING

No safe disconnection of the device.

Severe or fatal injuries.

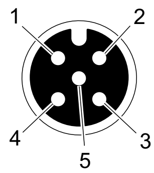
- You may bridge the STO connection with 24 V only if the device is not intended to fulfill any safety functions.

The following table provides information about this connection:

Function
Connection for safe disconnection (STO, 3-core)

Connection type
M12, 5-pin, female, A-coded

Wiring diagram



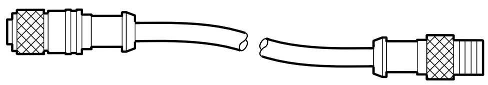
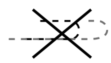
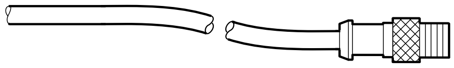
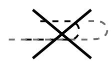
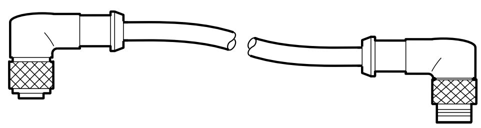
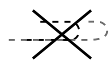
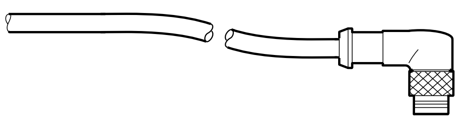
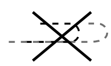
Assignment		
Contact	**Function**	
1	24V_OUT	DC 24 V auxiliary output (permitted only for operation with STO jumper plug)
2	F_STO_P2	F_STO_P2 connection
3	0V24_OUT	0V24 reference potential for DC 24 V auxiliary output (permitted only for operation with STO jumper plug)
4	F_STO_P1	F_STO_P1 connection
5	F_STO_M	F_STO_M connection

Connection cables

INFORMATION

Use only shielded cables for this connection and only suitable plug connectors that connect the shield with the device in an HF-capable manner.

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110935	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm^2 / DC 60 V
 Open — M12, 5-pin, A-coded, male	CE/UL: 28110943	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110951	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm^2 / DC 60 V
 Open — M12, 5-pin, A-coded, male	CE/UL: 28110978	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm^2 / DC 60 V

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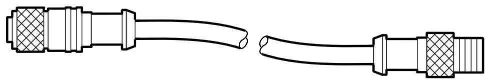
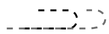
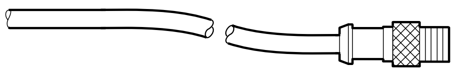
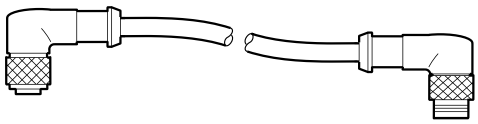
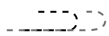
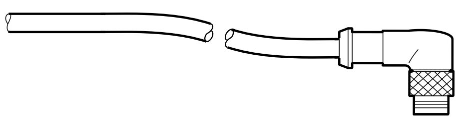
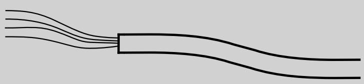
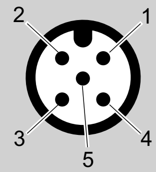
Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110994	igus chainflex CF78.UL Shielded	Variable 	4 × 0.5 mm^2 / DC 60 V
 Open — M12, 5-pin, A-coded, male	CE/UL: 28111001	igus chainflex CF78.UL Shielded	Variable 	4 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28111028	igus chainflex CF78.UL Shielded	Variable 	4 × 0.5 mm^2 / DC 60 V
 Open — M12, 5-pin, A-coded, male	CE/UL: 28111036	igus chainflex CF78.UL Shielded	Variable 	4 × 0.5 mm^2 / DC 60 V

Connection of cables with open end

HELUKABEL®

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28110978, 28110943

Assembly					
Open cable end			Description	Assembled plug connector	
					
Conductor color/ core cross section	Identification	Assembly		Signal	Contact
	–	–	DC 24 V auxiliary output[1)]	24V_OUT	1
White 0.5 mm²	–	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
	–	–	0V24 reference potential for DC 24 V auxiliary output[1)]	0V24_OUT	3
Brown 0.5 mm²	–	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Green 0.5 mm²	–	Not prefabricated	F_STO_M connection	F_STO_M	5

1) Do not connect these conductors in the plug connector.

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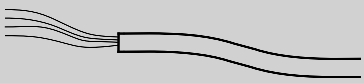
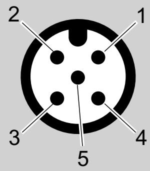
igus chainflex

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28111001, 28111036

Assembly					
Open cable end			**Description**	**Assembled plug connector**	
					
Conductor color/ core cross section	**Identification**	**Assembly**		**Signal**	**Contact**
	–	–	DC 24 V auxiliary output[1)]	24V_OUT	1
Black 0.5 mm²	1	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
	–	–	0V24 reference potential for DC 24 V auxiliary output[1)]	0V24_OUT	3
Black 0.5 mm²	2	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Black 0.5 mm²	3	Not prefabricated	F_STO_M connection	F_STO_M	5
Green/yellow 0.5 mm²	–	Not prefabricated	This conductor is not used in the plug connector.	–	–

1) Do not connect these conductors in the plug connector.

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9.12.10 X5505: STO (3 cores)

⚠ WARNING

Disabling of the safety-related disconnection of further devices due to parasitic voltages when using an STO jumper plug.

Severe or fatal injuries.

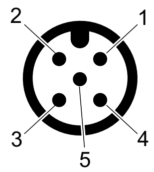
- Only use the STO jumper plug when all incoming and outgoing STO connections have been removed from the device.

The following table provides information about this connection:

Function
Connection for safe torque off (STO, 3-core)

Connection type
M12, 5-pin, male, A-coded

Connection diagram



Assignment		
Contact	**Function**	
1	res.	Reserved
2	F_STO_P2	F_STO_P2 connection
3	res.	Reserved
4	F_STO_P1	F_STO_P1 connection
5	F_STO_M	F_STO_M connection

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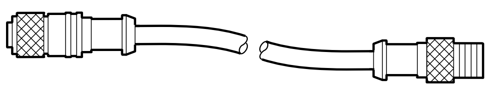
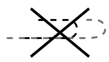
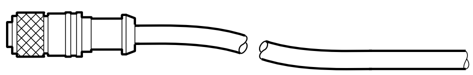
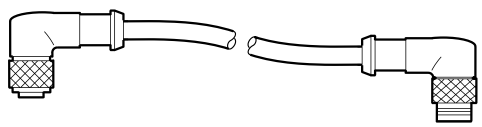
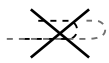
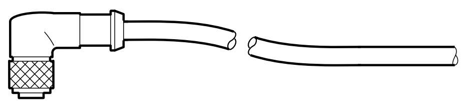
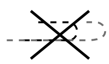
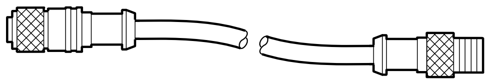
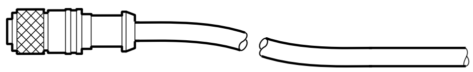
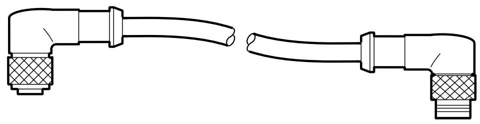
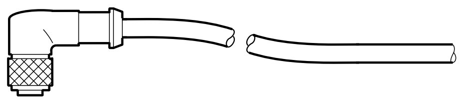
Connection cables

INFORMATION

Use only shielded cables for this connection and only suitable plug connectors that connect the shield with the device in an HF-capable manner.

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110935	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm² / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28117808	HELUKABEL® LiYCY Shielded	Variable 	3 x 0.5 mm² / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110951	HELUKABEL® LiYCY Shielded	Variable 	3 × 0.5 mm² / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28110986	HELUKABEL® LiYCY Shielded	Variable 	3 x 0.5 mm² / DC 60 V

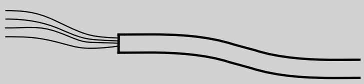
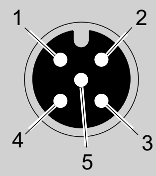
Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28110994	igus chainflex CF78.UL Shielded	Variable	4 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28117816	igus chainflex CF78.UL Shielded	Variable	4 x 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — M12, 5-pin, A-coded, male	CE/UL: 28111028	igus chainflex CF78.UL Shielded	Variable	4 × 0.5 mm^2 / DC 60 V
 M12, 5-pin, A-coded, female — Open	CE/UL: 28111044	igus chainflex CF78.UL Shielded	Variable	4 x 0.5 mm^2 / DC 60 V

Connection of cables with open end

HELUKABEL®

The following table shows the core assignment of cables with the following part numbers:

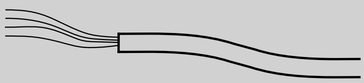
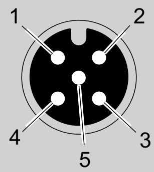
Part numbers
28117808, 28110986

Assembly					
Open cable end			**Description**	**Assembled plug connector**	
					
Conductor color/ core cross section	**Identification**	**Assembly**		**Signal**	**Contact**
	–	–	Reserved	res.	1
White 0.5 mm²	–	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
	–	–	Reserved	res.	3
Brown 0.5 mm²	–	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Green 0.5 mm²	–	Not prefabricated	F_STO_M connection	F_STO_M	5

igus chainflex

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28117816, 28111044

Assembly					
Open cable end			**Description**	**Assembled plug connector**	
					
Conductor color/core cross section	**Identification**	**Assembly**		**Signal**	**Contact**
	–	–	Reserved	res.	1
Black 0.5 mm^2	1	Not prefabricated	F_STO_P2 connection	F_STO_P2	2
	–	–	Reserved	res.	3
Black 0.5 mm^2	2	Not prefabricated	F_STO_P1 connection	F_STO_P1	4
Black 0.5 mm^2	3	Not prefabricated	F_STO_M connection	F_STO_M	5
Green/yellow 0.5 mm^2	–	Not prefabricated	This conductor is not used in the plug connector.	–	–

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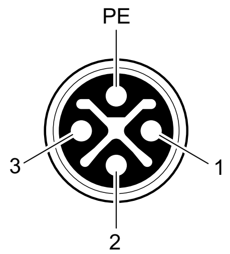
9.12.11 X2304: Connection of external braking resistor

The following table provides information about this connection:

Function
Connection of external braking resistor

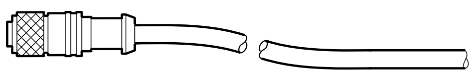
Connection type
M12, 4-pin, female, S-coded

Wiring diagram


Assignment		
Contact	**Function**	
1	BW+	Braking resistor connection +
2	res.	Reserved
3	BW-	Braking resistor connection -
PE	PE	Protective earth connection

Connection cables

The following table shows the cables available for this connection:

Connection cable		Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, S-coded, female	Open	CE/UL: 28172558	HELUKABEL® JZ-604-FCY TC	Variable	3 x 1.5 mm^2 / DC 850 V

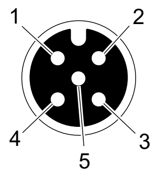
9.12.12 X5135: Digital inputs

The following table provides information about this connection:

Function
Digital inputs

Connection type
M12, 5-pin, female, A-coded, color: black

Connection diagram



Assignment		
Contact	**Function**	
1	+24 V	DC 24 V sensor supply
2	DI02	Digital input DI02
3	0V24	0V24 reference potential for sensors
4	DI01	Digital input DI01
5	FE	Functional earth

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of plug connector.

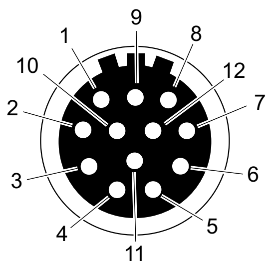
9.12.13 X5136: Digital inputs, relay output

The following table provides information about this connection:

Function
Digital inputs, relay output

Connection type
M23, female, male thread, TE Connectivity-Intercontec products, P insert, SpeedTec equipment, 12-pin, 0°-coded, coding ring: without, protected against contact

Connection diagram



Assignment		
Contact	**Function**	
1	DI01	Digital input DI01
2	DI02	Digital input DI02
3	DI03	Digital input DI03
4	DI04	Digital input DI04
5	Res.	Reserved
6	DOR-C	Relay output DO R, common contact
7	DOR-NO	Relay output DO R, NO contact
8	+24V_O	DC 24 V output
9	0V24_O	0V24 reference potential
10	Res.	Reserved
11	+24V_O	DC 24 V output
12	FE	Functional earth

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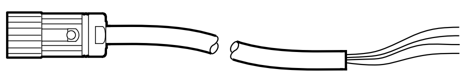
Connection cables

INFORMATION

Use only shielded cables for this connection and only suitable plug connectors that connect the shield with the device in an HF-capable manner.

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M23, 12-pin, 0°-coded / Open, conductor end sleeves	CE/UL: 11741457	HELUKABEL Li9Y91YC11Y-HF	Variable 	6 × 2 × 0.25 mm² / DC 60 V

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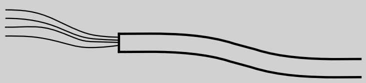
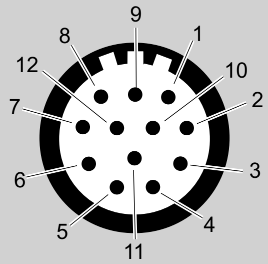
Connection of cables with open end

The following table shows the core assignment of cables with the following part numbers:

Part numbers
11741457

Assembly					
Open cable end			Description	Prefabricated plug connector	
					
Core color/ core cross section	Identification	Assembly		Signal	Contact
Pink 0.25 mm²	-	Not prefabricated	Digital input DI01	DI01	1
Gray 0.25 mm²	-	Not prefabricated	Digital input DI02	DI02	2
Red 0.25 mm²	-	Not prefabricated	Digital input DI03	DI03	3
Blue 0.25 mm²	-	Not prefabricated	Digital input DI04	DI04	4
Yellow 0.25 mm²	-	Not prefabricated	Reserved	Res.	5
Green 0.25 mm²	-	Not prefabricated	Relay output DO R, common contact	DOR-C	6
Purple 0.25 mm²	-	Not prefabricated	Relay output DO R, NO contact	DOR-NO	7
Black 0.25 mm²	-	Not prefabricated	DC 24 V output	+24V_O	8
Brown 0.25 mm²	-	Not prefabricated	0V24 reference potential	0V24_O	9
White 0.25 mm²	-	Not prefabricated	Reserved	Res.	10
Gray/pink 0.25 mm²	-	Not prefabricated	DC 24 V output	+24V_O	11
Green/yellow 0.25 mm²	-	Not prefabricated	Functional earth	FE	12

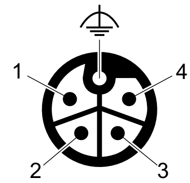
9.12.14 X1523: DC 24 V backup voltage, input

The following table provides information about this connection:

Function
Input DC 24 V backup voltage

Connection type
M12, 5-pin, male, L-coded, color: light gray

Connection diagram

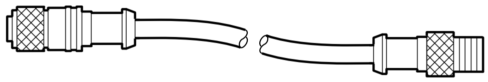
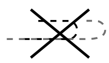
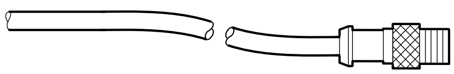
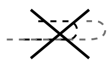
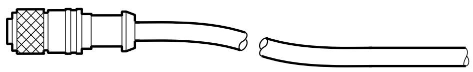
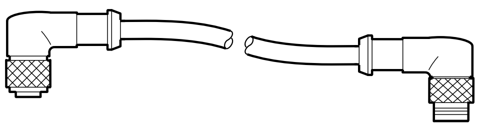
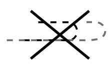
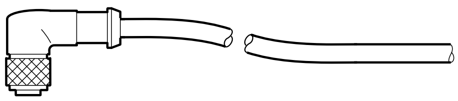
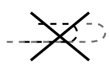


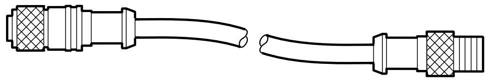
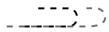
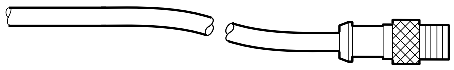
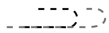
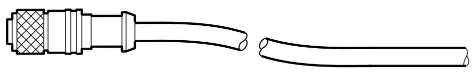
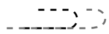
Assignment		
Contact	**Function**	
1	+24V/L1	DC 24 V input/L1 (for backup mode)
2	0 V 24/N2	0 V 24 reference potential/N2 (for DC 24 V /BES brake rectifier)
3	0 V 24/N1	0 V 24 reference potential/N1 (for backup mode)
4	+24V/L2	DC 24 V connection/L2 (for DC 24 V /BES brake rectifier)
⏚	FE	Functional earth

Devices with plug connectors X1523 and X2313 include additionally integrated auxiliary terminals which are exclusively intended for connecting the second voltage level (contacts 2 and 3). Do not change the installation of this auxiliary terminal.

Connection cable

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, L-coded, female / M12, 5-pin, L-coded, male	CE: 28114345	HELUKABEL® JZ-500	Variable 	5 × 2.5 mm^2 / DC 60 V
 Open / M12, 5-pin, L-coded, male	CE: 28117751	HELUKABEL® JZ-500	Variable 	5 × 2.5 mm^2 / DC 60 V
 M12, 5-pin, L-coded, female / Open	CE: 28117786	HELUKABEL® JZ-500	Variable 	5 × 2.5 mm^2 / DC 60 V
 M12, 5-pin, L-coded, female / M12, 5-pin, L-coded, male	CE: 28128184	HELUKABEL® JZ-500	Variable 	5 × 2.5 mm^2 / DC 60 V
 M12, 5-pin, L-coded, female / Open	CE: 28128192	HELUKABEL® JZ-500	Variable 	5 × 2.5 mm^2 / DC 60 V

Connection cable		Conformity/ part number	Cable type	Length/installation type	Cable cross section/operating voltage
 M12, 5-pin, L-coded, female	M12, 5-pin, L-coded, male	CE/UL: 28114353	HELUKABEL® Li9Y11Y-HF	Variable 	5 × 2.5 mm^2 / DC 60 V
 Open	M12, 5-pin, L-coded, male	CE/UL: 28117778	HELUKABEL® Li9Y11Y-HF	Variable 	5 × 2.5 mm^2 / DC 60 V
 M12, 5-pin, L-coded, female	Open	CE/UL: 28117794	HELUKABEL® Li9Y11Y-HF	Variable 	5 × 2.5 mm^2 / DC 60 V

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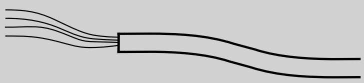
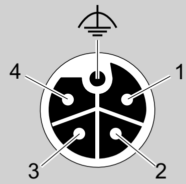
Connection of cables with open end

The following table shows the core assignment of cables with the following part numbers:

Part numbers
28117786

<table>
<tr><th colspan="6">Assembly</th></tr>
<tr><th colspan="3">Open cable end</th><th rowspan="3">Description</th><th colspan="2">Prefabricated plug connector</th></tr>
<tr><td colspan="3"></td><td colspan="2">
</td></tr>
<tr><th>Core color/ core cross section</th><th>Identification</th><th>Assembly</th><th>Signal</th><th>Contact</th></tr>
<tr><td>Black 2.5 mm²</td><td>1</td><td>Not prefabricated</td><td>DC 24 V output/L1
(for backup voltage/supply)</td><td>+24V/L1</td><td>1</td></tr>
<tr><td>Black 2.5 mm²</td><td>2</td><td>Not prefabricated</td><td>0V24 reference potential/N2
(for DC 24 V /BES brake rectifier)</td><td>0V24/N2</td><td>2</td></tr>
<tr><td>Black 2.5 mm²</td><td>3</td><td>Not prefabricated</td><td>0V24 reference potential/N1
(for backup voltage/supply)</td><td>0V24/N1</td><td>3</td></tr>
<tr><td>Black 2.5 mm²</td><td>4</td><td>Not prefabricated</td><td>DC 24 V output/L2
(for DC 24 V /BES brake rectifier)</td><td>+24V/L2</td><td>4</td></tr>
<tr><td>Black 2.5 mm²</td><td>5</td><td>Not prefabricated</td><td>Functional earth</td><td>FE</td><td>⏚</td></tr>
</table>

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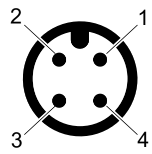
9.12.15 X1524: DC 24 V backup voltage, input (AUX-PWR)

The following table provides information about this connection:

Function
Input of DC 24 V backup voltage / DC 24 V supply (AUX-PWR)

Connection type
M12, 4-pole, male, A-coded, color: black

Connection diagram


Assignment		
No.	**Function**	
1	+24 V	DC 24 V input (AUX-PWR)
2	Res.	Reserved
3	0V24	0 V 24 Reference potential (AUX-PWR)
4	Res.	Reserved

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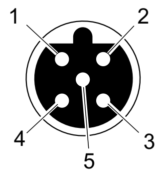
9.12.16 X4142: Engineering interface

The following table provides information about this connection:

Function
Engineering interface (CAN)

Connection type
M12-SPEEDCON, 5-pin, female, B-coded, color: red

Connection diagram


Assignment		
Contact	**Function**	
1	res.	Reserved
2	24V_OUT	DC 24 V auxiliary output[1)]
3	0V24_OUT	0V24 reference potential[2)]
4	CAN_H	CAN High connection
5	CAN_L	CAN Low connection

1) Only use this output to supply components from SEW-EURODRIVE.
2) Only use this output to supply components from SEW-EURODRIVE.

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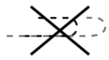
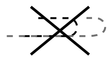
Connection cables

The following table shows the cables available for this connection:

Connection cable	Conformity/ part number	Length/installation type	Operating voltage
Connection to USM21A interface adapter: USK15A  M12-SPEED-CON, 5-pin, B-coded, male RJ10	CE: 28139038	3.0 m 	DC 60 V
Connection to CBG.. keypad: USK25A  M12-SPEED-CON, 5-pin, B-coded, male D-sub, 9-pin, male, angled	CE: 28139046	3.0 m 	DC 60 V

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9.13 Plug connector assignment at the electronics cover

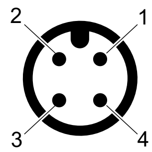
9.13.1 X4271: AS-Interface

The following table provides information about this connection:

Function
AS-Interface

Connection type
M12, 4-pole, male, A-coded, color: black

Connection diagram



Assignment		
Contact	**Function**	
1	ASI+	AS-Interface signal cable +
2	Res.	Reserved
3	ASI-	AS-Interface signal cable -
4	Res.	Reserved

INFORMATION

SEW-EURODRIVE does not offer prefabricated cables for this type of plug connector.

9.14 PC connection

Connect the PC to the drive unit before you start the engineering software MOVISUITE®.

You have several options to connect a PC to the device.

Observe the information in the **product manual** > chapter "Electrical installation" > "PC connection" including the sub-chapters.

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9.14.1 Connection via interface adapter USM21A

The USM21A interface adapter is used to connect the PC and the engineering interface of the device.

The data is transferred according to the USB 2.0 standard. It is also possible to work with a USB 3.0 interface.

You need the following components for the connection:

Component	Part number
USM21A interface adapter The following connection cables are included in the delivery: • USB 2.0 connection cable – USB type A/USB type B – Length: 1.5 m • RJ10/RJ10 connection cable For connection to the X31 engineering interface – With 2 RJ10 plug connectors – Length: 3 m	28231449
Connection cable RJ10/M12 (USK15A) For connection to the X4141 engineering interface or to the M12 optional engineering interface at the front module of MMF3...: • With RJ10 plug connector • With M12 SPEEDCON plug connector, 5-pin, male, B-coded • Length: 3 m	28139038
M12/M12 Extension cable For extending the RJ10/M12 (USK15A) connection cable to the X4142 engineering interface • With M12 SPEEDCON plug connector, 5-pin, female, B-coded • With M12 SPEEDCON plug connector, 5-pin, male, B-coded • Length: 13 m	28168860
RJ10/SUB-D9 connection cable For connection to the SUB-D9 optional engineering interface at the front module of MOVIMOT® flexible MMF3...2.. or MMF3...3..: • With RJ10 plug connector • With Sub-D9 plug connector, female • Length: 1.5 m	18123864
Retrofit set M12 engineering interface X4142 M12 SPEEDCON, 5-pin, B-coded, female	28273273

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Connection to X4142 (M12 at the connection box)

The engineering interface X31 in the connection box is assigned to the internal wiring of plug connector X4142.

NOTICE

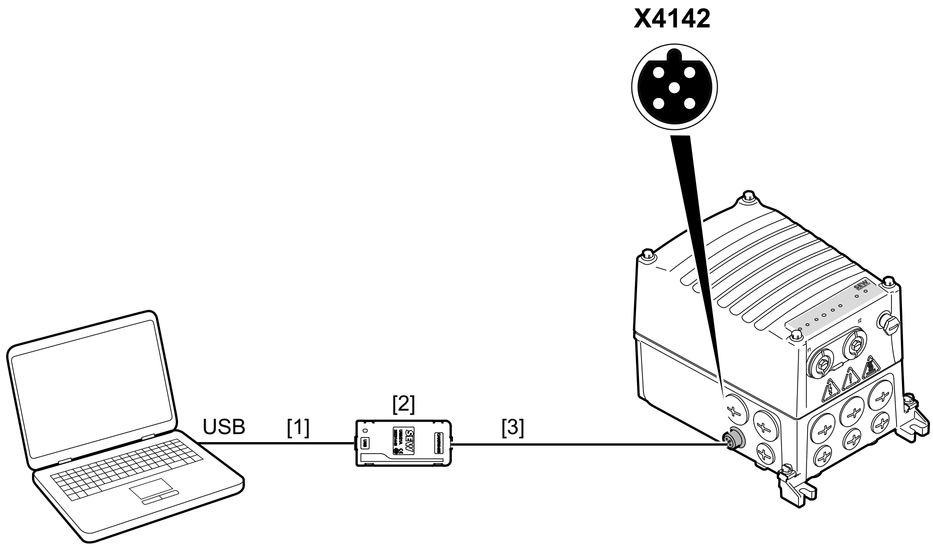
Unauthorized insertion of the STO jumper plug into the engineering interface.

Damage to the device.

- **Never** insert the STO jumper plug into the engineering interface.

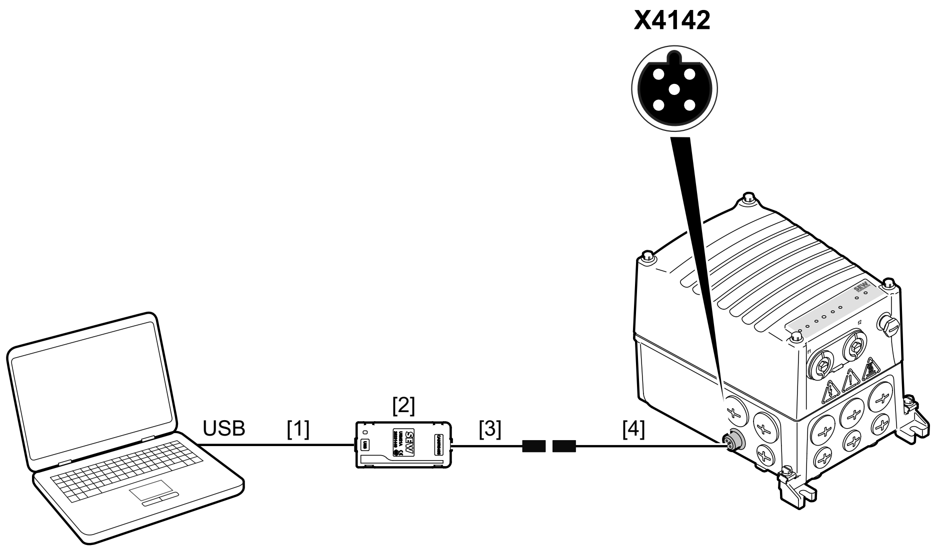
The following illustration shows how to connect the PC to the device:

Connection without extension cable



9007229806018187

Connection with extension cable



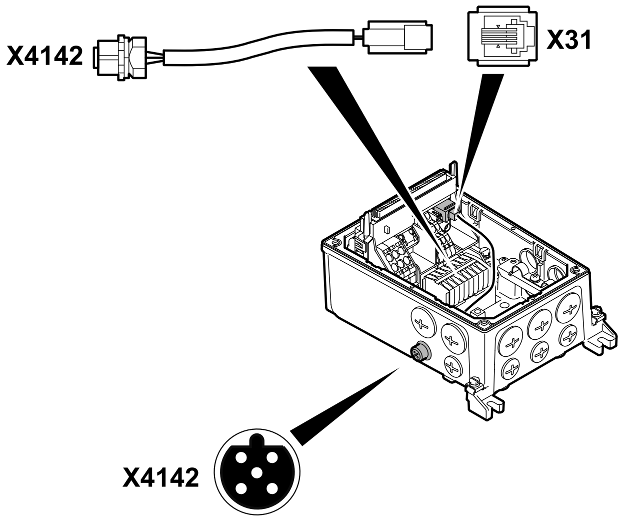
41350739211

[1] USB 2.0 connection cable
(commercially available, included with the USM21A interface adapter)
[2] USM21A interface adapter
[3] Connection cable RJ10/M12 (USK15A)
(available for delivery from SEW-EURODRIVE, part number: 28139038)
[4] M12/M12 extension cable
(available for delivery from SEW-EURODRIVE, part number: 28168860)

Installing the included engineering plug connector X4142

SEW-EURODRIVE supplies the engineering plug connector X4142 in some cases in an accessory bag (part number: 28273273) with the decentralized inverter. In this case, install the engineering plug connector X4142 to the connection box of the decentralized frequency inverter as follows:

1. Observe the startup instructions.
2. Switch off the voltage supply and wait for at least 5 minutes.
3. Loosen the screws and remove the electronics cover from the connection box.
4. Plug in the plug connector RJ10 from outside through one of the permitted cable bushing bores (for the permitted positions, see chapter "Plug connector positions"). Push the cable completely into the connection box.
5. Screw plug connector M12 into the cable bushing bore. Tighten the nut of the M12 plug connector (tightening torque: 6 Nm).
6. Insert the RJ10 plug connector into plug connector X31 in the connection box. The following figure shows an example of cable routing:



9007225086897291

7. Plug the electronics cover onto the connection box. Screw on the electronics cover with 4 screws (tightening torque: 6 Nm).

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Connection to X31 (RJ10 in the connection box)

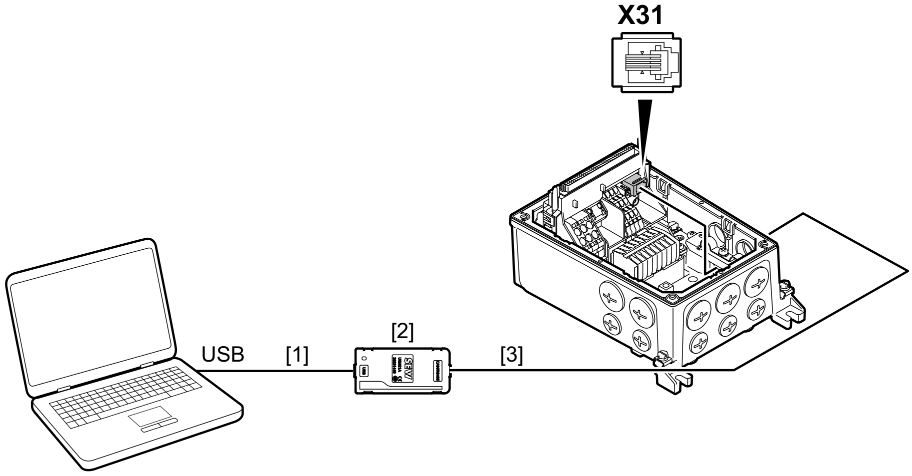
NOTICE

Connector X31 provides a 24 V supply voltage for operating the connected options.

Damage to connected options with low nominal voltage.

- Only connect options with a nominal voltage of 24 V to connector X31, such as:
  - Interface adapter USM21A,
  - CBG.. keypads
- Do **not** connect the following options with 5 V nominal voltage to the X31 connector:
  - Interface adapters USB11A, UWS11A, UWS21A
  - Keypads DBG.., GBG21A.

The following illustration shows how to connect the PC to the device:

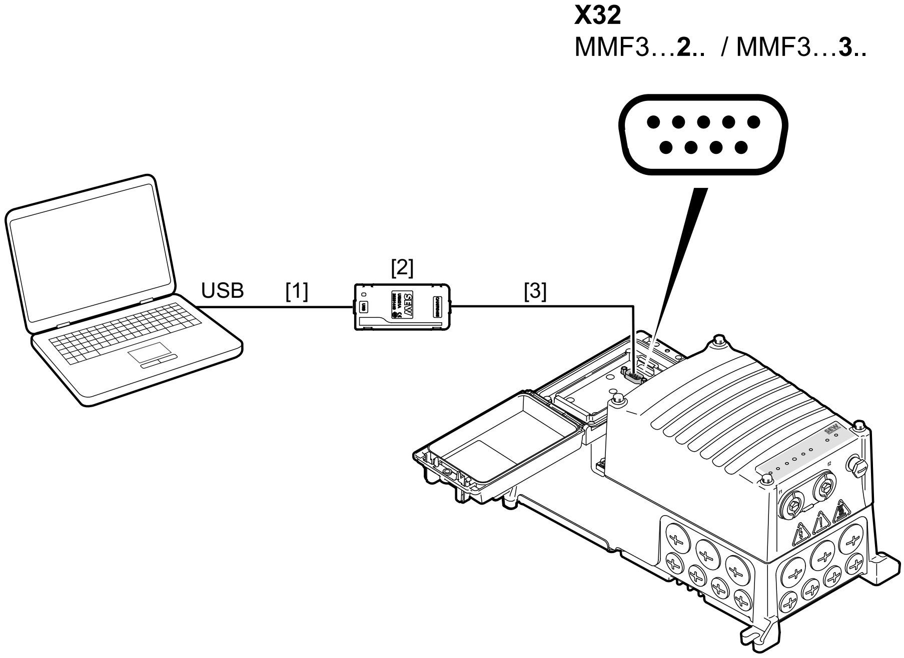


25824402315

[1] USB 2.0 connection cable
(commercial, included in the USM21A interface adapter delivery)
[2] USM21A interface adapter
[3] RJ10/RJ10 connection cable (included in the USM21A interface adapter delivery)

Connection to X32 at the front module of MMF3.

The following figure shows how to connect the PC to the X32 optional engineering interface at the front module of MOVIMOT® flexible MMF3...2.. or MMF3...3..:



30551451147

[1] USB 2.0 connection cable
(commercial, included in the USM21A interface adapter delivery)
[2] USM21A interface adapter
[3] RJ10/Sub-D9 connection cable
(available for delivery from SEW-EURODRIVE, part number: 18123864)

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Connection to X4142 at the front module of MMF3.

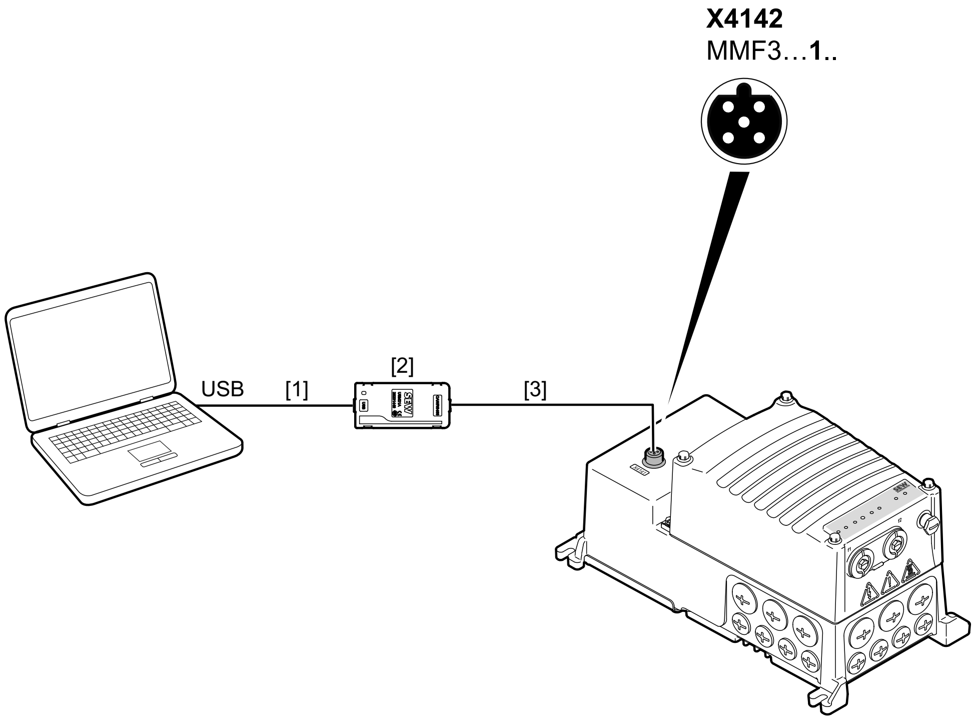
NOTICE

Unauthorized insertion of the STO jumper plug into the engineering interface.

Damage to the device.

- **Never** insert the STO jumper plug into the engineering interface.

The following figure shows how to connect the PC to the X4142 optional engineering interface at the front module of MOVIMOT® flexible MMF3...1..:



9007229806274955

[1] USB 2.0 connection cable
(commercially available, included in the delivery of the USM21A interface)
[2] USM21A interface adapter
[3] Connection cable RJ10/M12 (USK15A)
(available for delivery from SEW-EURODRIVE, part number: 28139038)

9.14.2 Connection via keypad

You can establish a connection between the PC and the device's engineering interface using the CBG22A, CBG21A, CBG11A or CBM22A keypads.

The data is transferred according to the USB 2.0 standard. It is also possible to work with a USB 3.0 interface.

You need the following components for the connection:

Component	Part number
CBG22A keypad	28277554
CBG21A keypad	28238133
CBG11A keypad	28233646
InstaCBM22A for keypad	28282892
CBG.. connection cable D-sub/RJ10 (USK21A) For connecting the X31 engineering interface to the 24 V supply voltage • With D-sub plug connector 9-pin, male • With RJ10 plug connector • Length: 3 m	28117832
USB connection cable USB A/USB 2.0 Mini B For connecting the CBG.. keypad to the USB interface of the PC • With USB A plug connector • With USB 2.0 Mini B plug connector • Length: 3 m	25643517
CBG.. connection cable D-sub/M12, B-coded (USK25A) For connecting the X4142 engineering interface to the 24 V supply voltage • With D-sub plug connector 9-pin, male • With M12 SPEEDCON plug connector, 5-pin, male, B-coded • Length: 3 m	28139046

Connection to X4142 (M12 at the connection box)

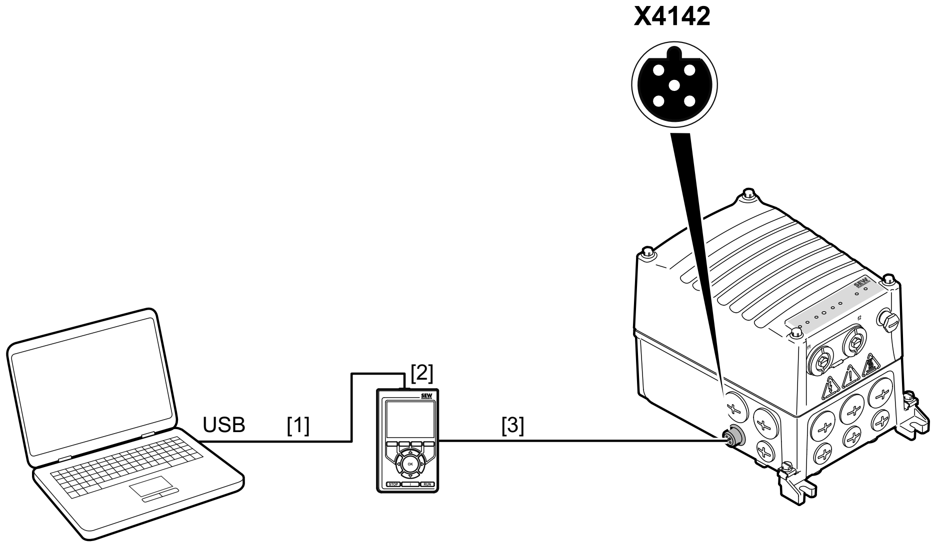
NOTICE

Unauthorized insertion of the STO jumper plug into the engineering interface.

Damage to the device.

- **Never** insert the STO jumper plug into the engineering interface.

The following illustration shows how to connect the PC to the device:



9007229806361867

[1] Connection cable USB A/USB 2.0 Mini B
(available for delivery from SEW-EURODRIVE, part number: 25643517)
[2] Keypad CBG22AC, CBG21A or CBG11A
[3] Connection cable D-Sub/M12 (USK25A)
(available for delivery from SEW-EURODRIVE, part number: 28139046)

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Connection to X31 (RJ10 in the connection box)

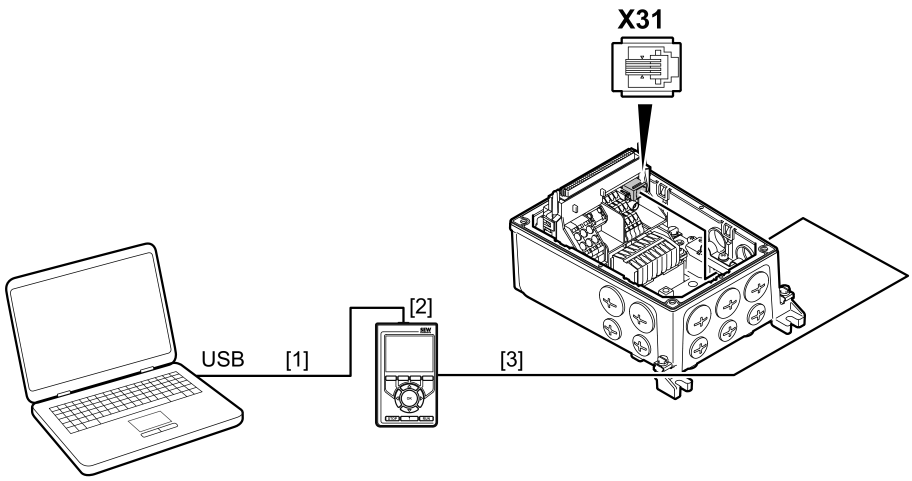
NOTICE

Connector X31 provides a 24 V supply voltage for operating the connected options.

Damage to connected options with low nominal voltage.

- Only connect options with a nominal voltage of 24 V to connector X31, such as:
  - Interface adapter USM21A,
  - CBG.. keypads
- Do **not** connect the following options with 5 V nominal voltage to the X31 connector:
  - Interface adapters USB11A, UWS11A, UWS21A
  - Keypads DBG.., GBG21A.

The following illustration shows how to connect the PC to the device:

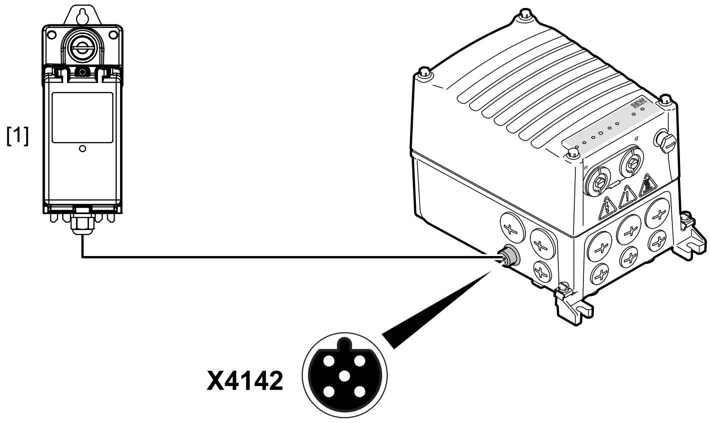


25824398731

[1] Connection cable USB A/USB 2.0 Mini B
(available for delivery from SEW-EURODRIVE, part number: 25643517)
[2] Keypad CBG22A, CBG21A, or CBG11A
[3] Sub-D9/RJ10 connection cable
(available for delivery from SEW-EURODRIVE, part number: 28117832)

Connection of CBM22A installation housing with integrated keypad to X4142

The following figure shows how to connect the CBM22A installation housing with integrated keypad to MOVIMOT® flexible MMF1.:

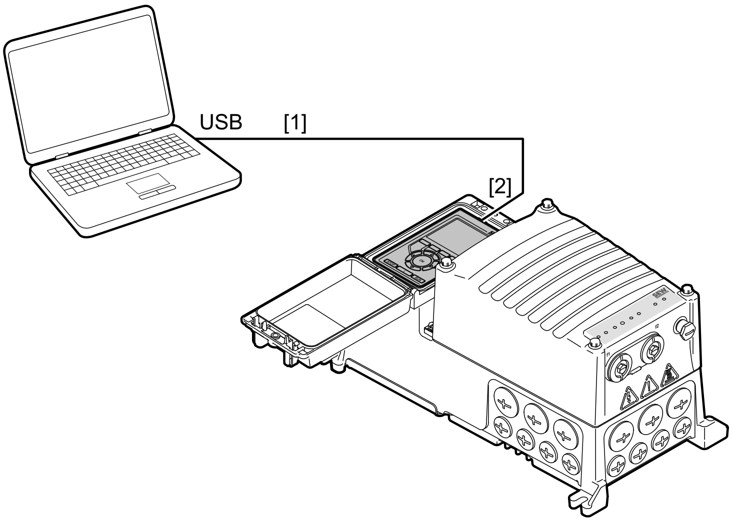


41040883083

[1] CBM22A installation housing with integrated keypad

Connection to the front module of MMF3.

The following illustration shows how to connect the PC to the front module of MOVIMOT® flexible MMF3.:



30551665419

[1] Connection cable USB A/USB 2.0 Mini B (available for delivery from SEW-EURODRIVE, part number: 25643517)
[2] CBG21A or CBG11A keypad

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9.14.3 Adapter cables for connection to the engineering interface X4141

As part of product improvement, SEW-EURODRIVE has replaced the optional engineering interface X4141 (M12-A-coded) with the engineering interface X4142 (M12-B-coded).

In this context, SEW-EURODRIVE has also adapted the associated connection cables [3] for connection to the X4142 engineering interface.

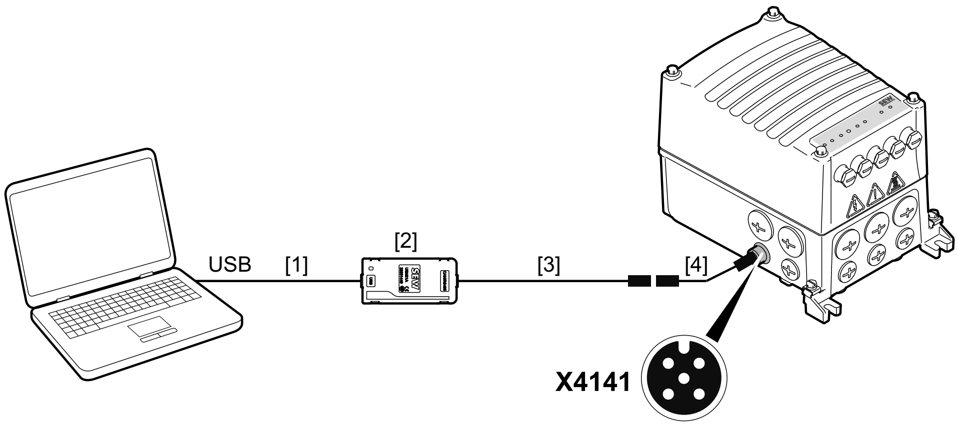
The adapter cable M12/M12 (USK54A) [4] allows for connection to the previous engineering interface X4141.

Component	Part number
Adapter cable M12/M12 (USK54A) • with M12-SPEEDCON plug connector, 5-pin, B-coded, female • with M12 plug connector, 5-pin, A-coded, male • Length: 0.3 m The adapter cable is required to connect the following connection cables to the engineering interface X4141: • Connection cable RJ10/M12 (USK15A) (for connection to interface adapter USM21A) • D-sub/M12 connection cable (USK25A) (for connection to the CBG.. keypad)	28146530

Using the adapter cable in conjunction with the USM21A interface adapter

Example MOVIFIT® flexible MMF1..

The engineering interface X31 in the connection box of the drive unit is assigned to the internal wiring of plug connector X4141.



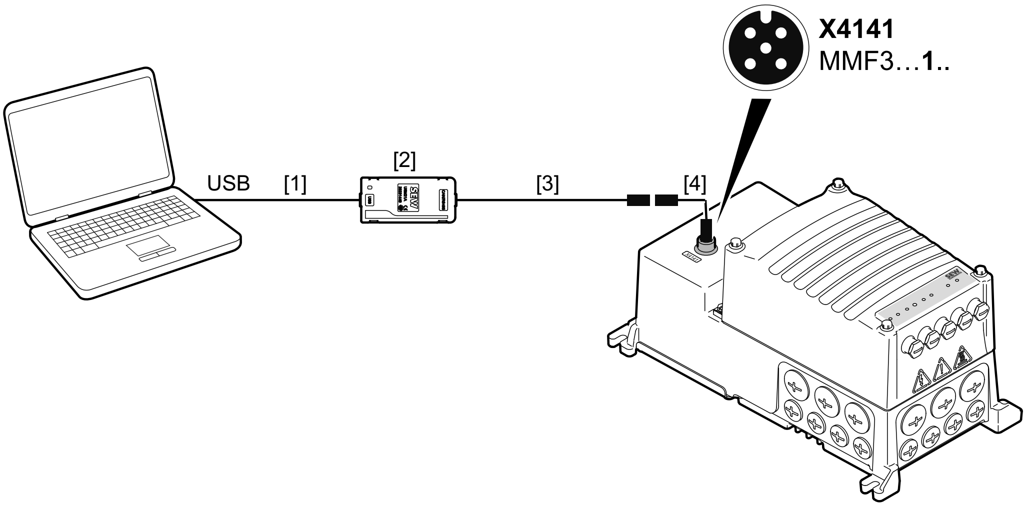
33430043531

[1] USB 2.0 connection cable
(commercially available, included in the delivery of USM21A)
[2] USM21A interface adapter
[3] Connection cable RJ10/M12, B-coded, male (USK15A)
(available for delivery from SEW-EURODRIVE, part number: 28139038)
[4] Adapter cable M12, B-coded, female/M12, A-coded, male (USK54A)
(available for delivery from SEW-EURODRIVE, part number: 28146530)

The adapter cable is required to connect the connection cable RJ10/M12 (USK15A) to the previous engineering interface X4141.

Example MOVIFIT® flexible MMF3..

The engineering interface X31 in the connection box of the drive unit is assigned to the internal wiring of plug connector X4141.



33429666955

[1] USB 2.0 connection cable
(commercially available, included in the delivery of USM21A)
[2] CBG.. keypad
[3] Connection cable D-Sub/M12, B-coded, male (USK25A)
(available for delivery from SEW-EURODRIVE, part number: 28139046)
[4] Adapter cable M12, B-coded, female/M12, A-coded, male (USK54A)
(available for delivery from SEW-EURODRIVE, part number: 28146530)

The adapter cable is required to connect the connection cable D-Sub/M12 (USK25A) to the previous engineering interface X4141.

10 Startup

10.1 Startup information

Perform the following steps before startup:

1. ⚠ **WARNING!** Electric shock caused by dangerous voltages in the connection box. Severe or fatal injuries.
   De-energize the device. Pay attention to the 5 safety rules in chapter “Carrying out electrical work safely”. Afterwards, wait 5 minutes.
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Let the device cool sufficiently before touching it.
3. **NOTICE!** Failing to observe the minimum switch-off time of the line contactor can cause material damage. Irreparable damage to the inverter or unforeseen malfunctions.
   After switching off the voltage supply, keep it switched off for at least 10 s.
   ⇨ Do not switch the voltage supply on or off at the line contactor more than once per minute.
4. Secure the output shaft of permanently excited motors against rotation. You thereby avoid an electric shock from the regenerative operation during the rotation of the shaft.
5. ⚠ **WARNING!** Faulty device behavior due to incorrect device setting. Severe or fatal injuries.
   Observe the following information.
   ⇨ Always have the installation carried out by trained specialists.
   ⇨ Only use settings that are correct for the function.
6. Install the protective covers of the system according to the instructions. This will avoid injuries.
   ⇨ Never start the device if the protective covers are not installed.
7. If necessary, remove the paint protection film from the LED displays.
8. If necessary, remove the paint protection film from the nameplates.
9. Product variants with a customer-specific parameter set ex works (.../P...) can start up automatically.

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10.1.1 Lifting applications

Perform the following additional steps before starting up the lifting applications:

1. ⚠ **WARNING!** Danger from falling hoist. Severe or fatal injuries.
   Observe the following information.
   - ⇨ Do not use the device alone as a safety device for the lifting application.
   - ⇨ Use additional monitoring systems or mechanical protection devices as a safety device.
2. ⚠ **WARNING!** Danger from falling hoist. Severe or fatal injuries.
   Do not use the "Release brake/deactivateDynaStop® with FCB01" function in lifting devices or applications with loads that may potentially fall down. Disable the function as follows:
   - ⇨ Deactivate the function of DIP switch S1/2 via parameter *Functions* > *Inputs/outputs* > *Basic device* > *DIP switch functions* > *Release brake/deactivate DynaStop® for FCB01 – enable* > *Deactivation* = **"1"** (yes).
   - ⇨ Disable the function via parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > *Release brake/deactivate DynaStop® for FCB01 – enable* = **"0"** (no).
3. ⚠ **WARNING!** The DynaStop® electrodynamic retarding function does not allow for a definite stop at a position. Severe or fatal injuries.
   Observe the following information.
   - ⇨ Do not use drive units with DynaStop® in lifting applications.
   - ⇨ When using DynaStop® on ascending/descending sections or vertical conveyors without freely suspended loads, comply with the basic safety and health requirements (e.g. EC Machinery Directive 2006/42/EC).
   - ⇨ The behavior of the DynaStop® function must be taken into account for the risk assessment of the application that determines the required safety measures.
4. In the MOVISUITE® engineering software, configure the parameters according to the lifting application requirements and its safety assessment.
   - ⇨ Set the parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > *Apply brake with STO* = "1" (Yes).
   - ⇨ Set the parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > *Activate with DynaStop®* according to the requirements of the application. Observe the notes in chapter "DynaStop® in conjunction with STO".
5. Check the setting of the parameter *Drive train* > *ASx drive train* > *Controller* > *Motor behavior* > *Hoist preload* in the MOVISUITE® engineering software. Set the parameter in accordance with the lifting application requirements.

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Lifting application without encoder

ELSM® — Use of the drive unit in lifting applications with **ELSM®** control mode is not permitted.

V/f — SEW-EURODRIVE recommends that you do not use the drive unit in hoist applications with V/f control mode.

VFC^{PLUS} — SEW-EURODRIVE recommends the following settings and control behavior for using the drive unit in lifting applications with the **VFC**^{PLUS} control mode (without encoder):

Parameter settings:

- For vertical drives, use the setpoint/stop function (FCB05 - speed control). *Functions* > *Drive functions* > *FCB 05 Speed control* > *Stop by setpoint function* > *Activation* = **"1"** (Yes).
  - Set the parameter *Functions* > *Drive functions* > *FCB 05 Speed control* > *Stop by setpoint function* > *Stop setpoint* so that the resulting motor speed is ≥ 1.5 × nominal slip of the motor.
  - As an alternative, set the parameter *Functions* > *Drive functions* > *FCB 05 Speed control* > *Minimum speed* so that the resulting motor speed is ≥ 1.5 × nominal slip of the motor.
- Set the parameter *Drive train* > *Drive train ASx* > *Controller* > *Control behavior* > *Flying restart* = **"0"** (off).
- Set the parameter *Drive train* > *Drive train ASx* > *Controller* > *Control behavior* > *Flow optimization* = **"0"** (off).
- Set the parameter *Drive train* > *Optimization ASx* > *VFCplus* > *Boost*=**10%**.

Control behavior:

- Design the control in such a way that a direction of rotation reversal is only possible in an idle state (with the brake applied).
- If you want to change the direction of rotation without a standstill, use a drive with encoder.
- Control the drive at a setpoint speed that corresponds to a speed ≥ 1.5 × nominal slip of the motor.

10.2 Startup requirements

Startup is only required when you need to change the factory set parameterization.

In this case, the following conditions apply to startup:

- You have installed the device correctly both mechanically and electrically.
- You have performed a correct project planning for the device.
- Safety measures prevent accidental startup of devices.
- Safety measures prevent danger to people and machines.

Required hardware components:

- PC or laptop according to the product manual > chapter "PC connection" (→ 🗎 328).
- Interface cable and, if applicable, interface adapter according to product manual > chapter "PC connection"

Required software:

- MOVISUITE® engineering software from SEW-EURODRIVE

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10.3 Parameterization mode

The following parameterization modes are available to perform the device startup:

Easy mode

Easy startup with predefined control interface.

- Setting parameters, setpoints, and additional functions can only be set using the mechanical setting elements (potentiometer and DIP switch) at the device.
- Startup does not require any software or keypads.
- When you switch to Easy mode, all parameters are reset to the delivery state.
- All device parameters are write-protected.

Exceptions:

- You can also change the parameters for device address configuration and the parameterization mode when the device is set to Easy mode.

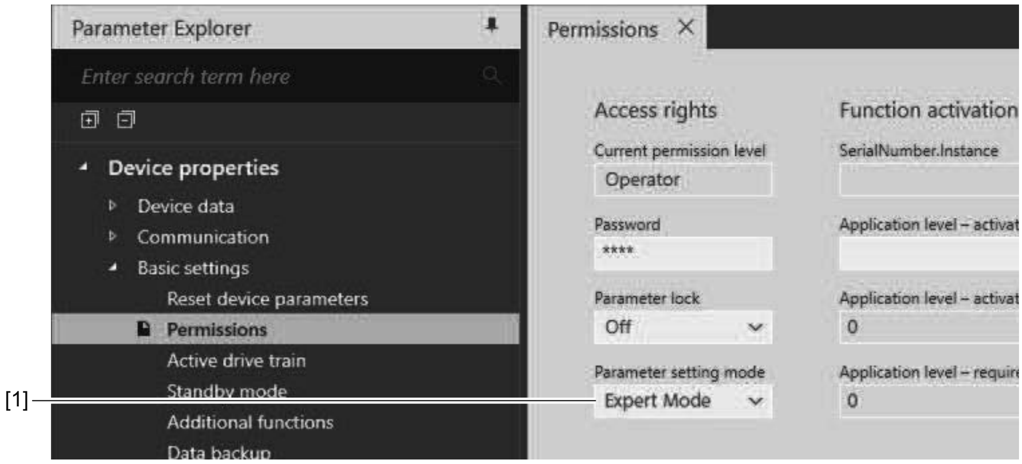
Easy mode is only available up to firmware version < 11.

Expert mode

Expert mode is a parameterization mode that allows full access to all device functions via the MOVISUITE® engineering software or the CBG.. keypad.

- The predefined connection interfaces of the device can be adjusted to the requirements of the application.
- You can deactivate the mechanical setting elements. In this way, you activate their parameterized substitute values.
- You can set the device parameters.

The parameterization mode can be set via the MOVISUITE® engineering software or the CBG.. keypad.



18014427828675339

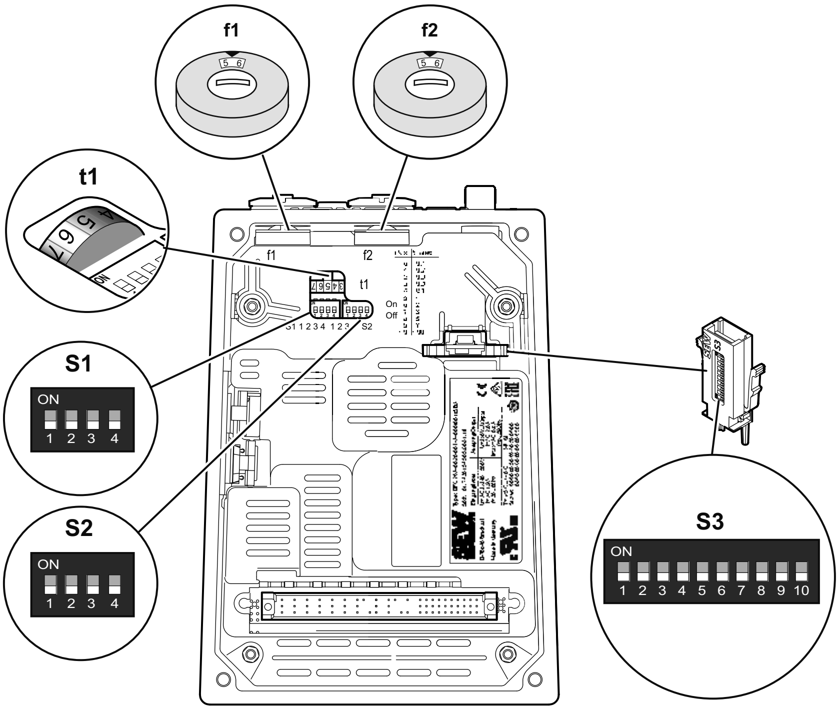
[1] Basic settings > authorizations > parameterization mode > Expert mode

10.4 Control elements

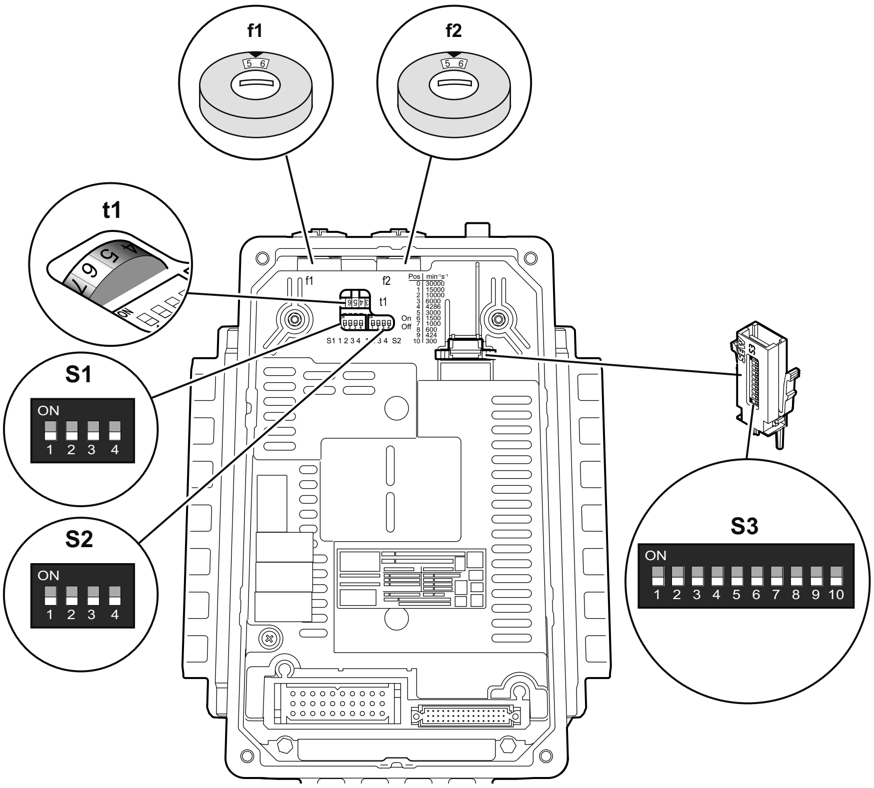
10.4.1 Overview of control elements

The following figure gives an overview of the control elements at the electronics cover:

MMF1.
MMF31



MMF32



41051618315

f1 Potentiometer f1
f2 Potentiometer f2 (underneath the screw plug)
t1 Potentiometer t1
S1 DIP switch S1
S2 DIP switch S2
S3 DIP switch S3

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10.4.2 Potentiometer f1

NOTICE

Loss of the ensured degree of protection if the screw plug of the potentiometer is not installed or not installed correctly.

Damage to the device.

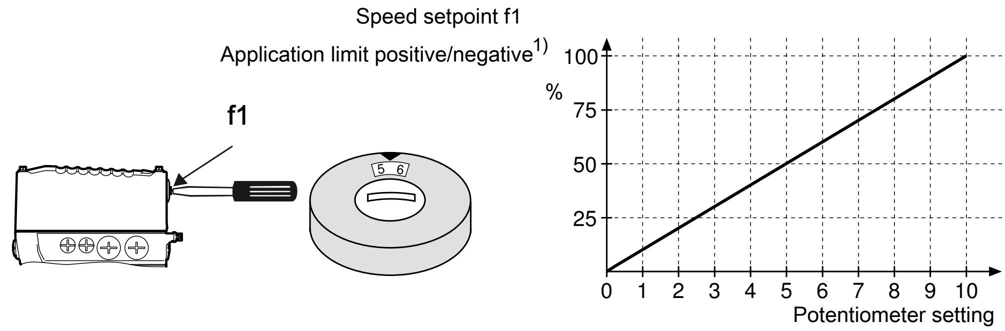
- After setting the setpoint, make sure the screw plug of the potentiometer has a seal and screw it in.

Use the f1 potentiometer to adjust speed setpoint f1.

- When the device is set to Easy mode, the predefined setpoint is always active at the potentiometer f1.

  Easy mode is only available up to firmware version < 11.
- The potentiometer f1 can be deactivated in Expert mode. In this case, the parameterizable replacement value is activated as speed setpoint f1.

The following figure shows how to scale the speed setpoint f1 using potentiometer f1:



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1) Depending on the selected direction of rotation, the parameter *Application limit – positive speed* or the parameter *Application limit – negative speed* are used to scale the speed setpoint f1.
For the application limit, refer to the MOVISUITE® parameter tree in the following menu: *Functions* > *Monitoring functions* > *Limit values* > *Application limit*.

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Parameter application limit speed

The following table shows the default setting of the *Application limit speed* parameter:

Startup	Drive unit			Default setting parameter *Application limit speed*[1]
Automatic startup via the digital interface or Manual startup via DIP switch S3[2]	MOVIGEAR® classic			2000 min^{-1}
	C3C.. CMP.. DR2C..			Rated speed of the motor
	DRN.. DR2S..	50 Hz	2-pole	6000 min^{-1}
			4-pole	**2000 min^{-1}**
			6-pole	2000 min^{-1}
			8-pole	1500 min^{-1}
		60 Hz	2-pole	7200 min^{-1}
			4-pole	**3600 min^{-1}**
			6-pole	2400 min^{-1}
			8-pole	1800 min^{-1}
Perform manual startup via MOVISUITE®	The parameter *Application limit speed* is not changed during startup. Check the parameter and set it according to the drive system. **Default value 2000 min^{-1}**			

1) The value may be lower due to possible gear unit limitations.

2) During startup via DIP switch S3 does not start up a gear unit, therefore no possible gear unit limitations are taken into account.

10.4.3 Potentiometer f2

NOTICE

Loss of the ensured degree of protection if the screw plug of the potentiometer is not installed or not installed correctly.

Damage to the device.

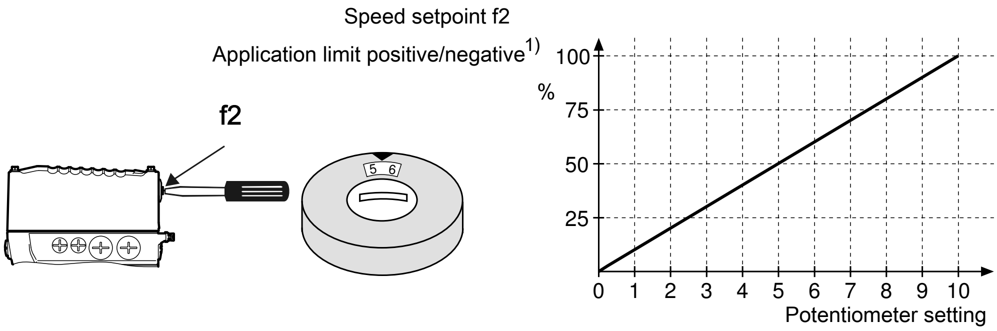
- After setting the setpoint, make sure the screw plug of the potentiometer has a seal and screw it in.

Use the potentiometer f2 to adjust speed setpoint f2.

- When the device is set to Easy mode, the predefined setpoint is always active at the potentiometer f2.

  Easy mode is only available up to firmware version < 11.
- The potentiometer f2 can be deactivated in Expert mode. In this case, the parameterizable replacement value is activated as speed setpoint f2.

The following figure shows how to scale the speed setpoint f2 using potentiometer f2:



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1) Depending on the selected direction of rotation, the parameter *Application limit positive* or the parameter *Application limit negative* are used to scale the speed setpoint f2.
For the application limit, refer to the MOVISUITE® parameter tree in the following menu: *Functions* > *Monitoring functions* > *Limit values* > *Application limit*.

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Parameter application limit speed

The following table shows the default setting of the *Application limit speed* parameter:

Startup	Drive unit			Default setting parameter *Application limit speed*[1]
Automatic startup via the digital interface or Manual startup via DIP switch S3[2]	MOVIGEAR® classic			2000 min^{-1}
	C3C.. CMP.. DR2C..			Rated speed of the motor
	DRN.. DR2S..	50 Hz	2-pole	6000 min^{-1}
			4-pole	**2000 min^{-1}**
			6-pole	2000 min^{-1}
			8-pole	1500 min^{-1}
		60 Hz	2-pole	7200 min^{-1}
			4-pole	**3600 min^{-1}**
			6-pole	2400 min^{-1}
			8-pole	1800 min^{-1}
Perform manual startup via MOVISUITE®	The parameter *Application limit speed* is not changed during startup. Check the parameter and set it according to the drive system. **Default value 2000 min^{-1}**			

1) The value may be lower due to possible gear unit limitations.
2) During startup via DIP switch S3 does not start up a gear unit, therefore no possible gear unit limitations are taken into account.

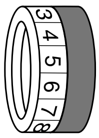
10.4.4 Potentiometer t1

Use the potentiometer t1 to set the acceleration/deceleration setpoint t1.

- When the device is set to Easy mode, the predefined setpoint is always active at the potentiometer t1.

  Easy mode is only available up to firmware version < 11.
- The potentiometer f1 can be deactivated in Expert mode.

  In this case, the parameters *Acceleration 1* and *Deceleration 1* of the fixed setpoint processing are activated.



The following table lists the scaling of acceleration/deceleration setpoint t1 depending on the setting of potentiometer t1:

Potentiometer t1											
Detent position	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Acceleration/deceleration min^{-1}s^{-1}	30000	15000	10000	6000	4286	**3000**	1500	1000	600	429	300
Ramp time[1] s	0.1	0.2	0.3	0.5	0.7	**1**	2	3	5	7	10

1) Alternative information on the equivalent ramp times for acceleration/deceleration based on a speed change of 3000 min-1.

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10.5 DIP switch

10.5.1 Overview

NOTICE

Damage to the DIP switches caused by unsuitable tools.

Damage to property.

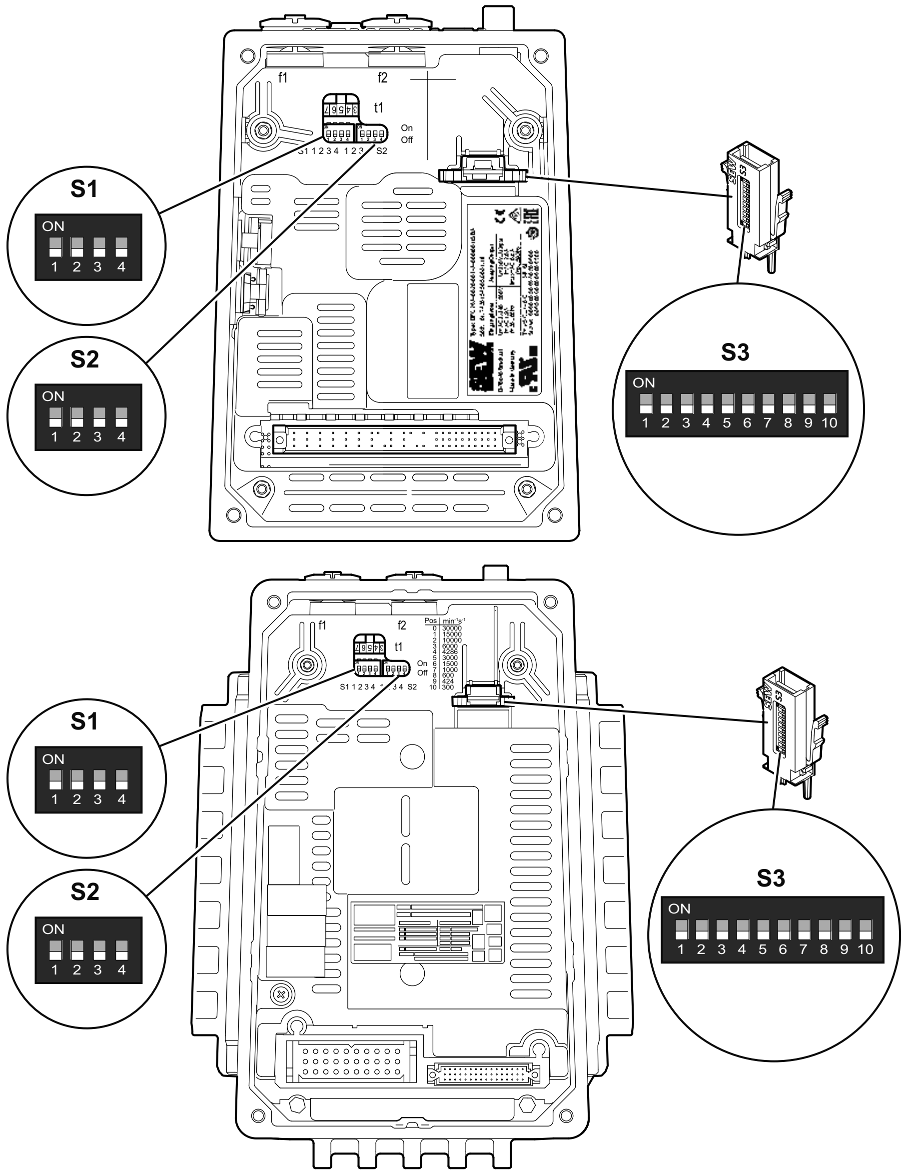
- Set the DIP switches only using suitable tools, such as a slotted screwdriver with a blade width of ≤ 3 mm.
- The force used for setting the DIP switches must not exceed 5 N.

DIP switch overview

The following figure shows the DIP switches of the device:

MMF1.
MMF31

MMF32



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DIP switch S1

The following table shows the functions of DIP switch S1:

DIP switch	**S1**			
	1	**2**	**3**	**4**
Meaning	**Direction of rotation reversal**	**Release brake/ deactivate DynaStop® with FCB01 – enable**	**Speed monitoring deactivation**	**Reserved**
ON	On	On	Speed monitoring off	On
OFF	**Off**[1]	**Off**[1]	**Speed monitoring On**[2]	**Off**[1]

1) The factory settings are shown in boldface.
2) Factory settings are indicated in bold.

You must not alter the factory setting of the S1/4 DIP switch = OFF.

DIP switch S2

The following table shows the functions of DIP switch S2:

DIP switch	**S2**			
	1	**2**	**3**	**4**
	Reserved	**Selection of AS-Interface slave type/profile**		
		Bit 2^0	**Bit 2^1**	**Bit 2^2**
ON	–	1	1	1
OFF	–	**0**	**0**	**0**

You must not alter the factory setting of the S2/1 DIP switch = OFF.

DIP switch S3

Use the DIP switch S3 to perform startup of the drive train for motors without digital interface. Motor assignment depends on the nominal output current of the electronics cover via the DIP switches S3/3 and S3/4.

Startup via DIP switch S3 is only effective if the following requirements are met when using the memory module:

- The drive train has not been started up using MOVISUITE® or CBG...
- The drive train has not been started up via digital interface (DDI).
- The connected motor is not quipped with a digital interface (DDI).

The following table shows the functions of DIP switch S3:

DIP switch	**S3**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Meaning	**Brake type**	**Motor connection type**[1)]	**Binary coding**							
			Motor assignment		**Motor protection**		**Motor series**			
			2^0	2^1	2^0	2^1	2^0	2^1	2^2	2^3
ON	Optional brake	△	1	1	1	1	1	1	1	1
OFF	**Standard brake**	⅄	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

1) If the motor connection type is changed via DIP switch S3/2, the motor connection type via DIP switch D3/3 and S3/4 must be checked and adapted if necessary.

10.5.2 Description of the DIP switches

DIP switch S1/1: Direction of rotation reversal

INFORMATION

The direction of rotation is reversed depending on the setting of the DIP switch and of the parameter drive train 1 > Controller > *Direction of rotation reversal*. If both settings are active, the speed setpoint is not inverted (logical XOR).

You can reverse the direction of rotation of the drive using this DIP switch.

- OFF (S1/1 = OFF): The drive turns clockwise for a positive setpoint and counterclockwise for a negative setpoint.
- ON (S1/1 = ON): The drive turns counterclockwise for a positive setpoint and clockwise for a negative setpoint.

DIP switch S1/2: Releasing the brake / deactivating DynaStop® with FCB01 – enable

⚠ WARNING

Risk from falling loads.

This can result in severe or fatal injuries.

- Do not enable the function "Releasing the brake / deactivating DynaStop®" for hoist applications and applications with potentially falling loads.

INFORMATION

If the function of this DIP switch is deactivated via parameter access, the last active setting of the relevant parameter is maintained.

Use this DIP switch to enable the function "Releasing the brake / deactivating DynaStop® with FCB 01" even when the drive is disabled.

- OFF (S1/2 = OFF): The function "Releasing the brake / deactivating DynaStop® with FCB 01" is inhibited.
- ON (S1/2 = ON): The function "Releasing the brake / deactivating DynaStop® with FCB 01" is enabled.

  When the function block FCB 01 is active, you can release the brake or deactivate DynaStop® using a digital input or an actuated process data bit.

INFORMATION

You can find more information on deactivating DynaStop® without a drive release in the product manual > chapter "Operation".

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DIP switch S1/3: Deactivating the speed monitoring

INFORMATION

If the function of this DIP switch is deactivated via parameter access, the last active setting of the relevant parameter is maintained.

This DIP switch is used to disable speed monitoring.

- Speed monitoring OFF (S1/3 = ON): Speed monitoring is not active.
- Speed monitoring ON (S1/3 = OFF): Speed monitoring is active.

  Speed monitoring is used to protect the drive in case of blockage.

  When speed monitoring is active and the drive operates at the current limit for longer than 1 second (factory settings), the drive unit triggers the fault "Speed monitoring". The drive unit signals the fault, for example via the "DRIVE" status LED. The current limit must be reached permanently for the duration of the delay time before the monitoring function trips.

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DIP switches S2/2 – S2/4: Selecting the AS-Interface station type/profile

Use this DIP switch to select the station type and the profile for the AS-Interface communication.

DIP switch			Station type	Station profile
S2/2	**S2/3**	**S2/4**		
OFF	OFF	OFF	Binary station 4 DI/4 DO	S-7.F
ON	OFF	OFF	Double station 4 DI/4 DO A station for drive controller B station for parameter communication	A station: S-7.A.7 (CTT3) B station: S-7.A.5 (CTT2)
OFF	**ON**	OFF	A/B station 4 DI/4 DO A station or B station[1]	S-7.A.7 (CTT3)
ON	**ON**	OFF	Double station 8 DI/8 DO A station for drive controller B station for parameter communication	A station[2]: S-7.A.A (CTT3) B station: S-7.A.5 (CTT2)
OFF	OFF	**ON**	A/B station 8 DI/8 DO A station or B station[1]	S-7.A.A (CTT3)[2]
ON	OFF	**ON**	Reserved	
OFF	**ON**	**ON**	Reserved	
ON	**ON**	**ON**	Reserved	

1) Defined by the address of the station.
2) The S-7.A.A profile (8 DI/8 DO) is designed by AS-Interface for analog data transmission, which is why the data bits in the PLC are located in the data blocks for analog data.

DIP switch S3/1: Brake type

Use this DIP switch to select the brake type of the motor.

- **OFF (S3/1 = OFF): Use this setting to select the standard brake.**

  This setting corresponds to the brake type that is automatically assigned to the motor type.[1)]
- ON (S3/1 = ON): Use this setting to select the optional brake.

  This setting corresponds to the brake type that is optionally assigned to the motor type.

If no brake specified in the "motor selection tables" (→ 🗎 361) matches the brake in the existing motor, start up the drive train using the MOVISUITE® engineering software. Startup via DIP switch S3 is not possible.

1) See chapter "Detailed motor selection table for startup via DIP switch S3".

DIP switch S3/2: Motor connection type

You can select the connection type of asynchronous motors at this DIP switch. When selecting synchronous motors, the switch does not have any function.

- **OFF (S3/2 = OFF): Use this setting to select the connection type of asynchronous motors ⅄.**
- ON (S3/2 = ON): Use this setting to select the connection type of asynchronous motors △.

If the motor connection type is changed via DIP switch S3/2, the motor connection type via DIP switch D3/3 and S3/4 must be checked and adapted if necessary, see chapter "Detailed motor selection table for startup via DIP switch S3".

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DIP switch S3/3 – S3/4: Motor assignment

Use these DIP switches to select the relative motor power in relation to inverter power. The selection depends on the selected motor series, motor connection type, and the nominal output current of the electronics cover.

S3/3	S3/4	Motor assignment
0	**0**	**Adjusted**
1	0	1 stage smaller
0	1	2 stages smaller
1	1	3 stages smaller

DIP switch S3/5 – S3/6: Motor protection

Use these DIP switches to select the temperature sensor type for thermal protection of the motor.

S3/5	S3/6	Motor protection
		Temperature sensor type
0	**0**	**No temperature sensor/thermal protection model**[1]
1	0	PK (PT1000)
0	1	TF
1	1	TH

1) If no suitable temperature sensor type can be selected, select "No temperature sensor/thermal motor protection without temperature sensor". With DRN.. or DR2S.. motors, a thermal motor protection model without temperature sensor is activated. See product manual > chapter "Configuration of the drive unit" > "Drive selection .." > "Thermal motor protection without temperature sensor". Temperature protection of the motor is not active for other motors!

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DIP switch S3/7 – S3/10: Motor series

Use these DIP switches to select the motor series (motor type).

Motor series	S3/7	S3/8	S3/9	S3/10	Motor series	
					Motor type	Nominal voltage Nominal frequency
0	**0**	**0**	**0**	**0**	**DRN.. 4-pole**	**230 V/400 V 50 Hz**
1	1	0	0	0	DRN.. 4-pole	266 V/460 V 60 Hz
2	0	1	0	0	DRN.. 4-pole	Wide-range voltage 50/60 Hz
3	1	1	0	0	DR2S.. 4-pole	230 V/400 V 50 Hz
4	0	0	1	0	DR2S.. 4-pole	266 V/460 V 60 Hz
5	1	0	1	0	DR2S.. 4-pole	Wide-range voltage 50/60 Hz
6	0	1	1	0	MOVIGEAR® classic	400 V 133 Hz
7	1	1	1	0	CM3C 2000 min^{-1}	400 V 133 Hz
8	0	0	0	1	CM3C 3000 min^{-1}	400 V 200 Hz
9	1	0	0	1	CM3C 1) 4500 min^{-1}	400 V 300 Hz
10	0	1	0	1	CMP 2000 min^{-1}	400 V 167 Hz
11	1	1	0	1	CMP 3000 min^{-1}	400 V 150/250 Hz
12	0	0	1	1	CMP 1) 4500 min^{-1}	400 V 225/375 Hz
13	1	0	1	1	DR2C.. 2000 min^{-1}	400 V –
14	0	1	1	1	DR2C.. 3000 min^{-1}	400 V –
15	1	1	1	1	Reserved	

1) Only for MMF32..

Nominal voltage range for wide-range voltage motors			
50 Hz		60 Hz	
△	⅄	△	⅄
220 – 240 V	380 – 420 V	254 – 277 V	440 – 480 V

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10.6 Detailed motor selection table for startup via DIP switch S3.

The following detailed motor selection tables show how to perform startup via DIP switch S3 on the **standard memory module** (part no. 28242882).

10.6.1 DRN.. motor series, 4-pole

DRN.. motor series, 4-pole											
230/400 V, 50 Hz				266/460 V, 60 Hz				Wide-range voltage, 50/60 Hz			
DIP switch S3				DIP switch S3				DIP switch S3			
S3/7	S3/8	S3/9	S3/10	S3/7	S3/8	S3/9	S3/10	S3/7	S3/8	S3/9	S3/10
0	0	0	0	1	0	0	0	0	1	0	0

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
Thermal protection model without temperature sensor[1)]	0	0
PK (PT1000)	1	0
TF	0	1
TH	1	1

1) The function is active as of status 0300 of the motor data of the memory module. Temperature protection is not active for motor data in the memory module with status < 0300.

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DRN71MS4	BE03/230 V	0	0020	2.0 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0025	2.5 A	⅄	0	1	1	3 stages smaller
	BE05/230 V				△	1	0	1	2 stages smaller
			0032	3.2 A	⅄	0			
					△	1	1	1	3 stages smaller
DRN71M4	BE05/230 V	0	0020	2.0 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**Adjusted**
			0025	2.5 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0032	3.2 A	⅄	0	1	1	3 stages smaller
	BE1/230 V	1			△	1	0	1	2 stages smaller
			0040	4.0 A	⅄	0			
					△	1	1	1	3 stages smaller
			0055	5.5 A	⅄	0			
					△	1			
DRN80MK4	BE1/230 V	0	0020	2.0 A	⅄	**0**	**0**	**0**	**adjusted**
					△	1			
			0025	2.5 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**adjusted**
			0032	3.2 A	⅄	0	0	1	2 stages smaller
	BE05/230 V	1			△	1	1	0	1 stage smaller
			0040	4.0 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0055	5.5 A	⅄	0			
					△	1	1	1	3 stages smaller

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DRN80M4	BE1/230 V	0	0025	2.5 A	⅄	**0**	**0**	**0**	**adjusted**
					△	1			
			0032	3.2 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**adjusted**
			0040	4.0 A	⅄	0	0	1	2 stages smaller
	BE05/230 V	1			△	1	1	0	1 stage smaller
			0055	5.5 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0070	7.0 A	⅄	0			
					△	1	1	1	3 stages smaller
DRN90S4	BE2/230 V	0	0032	3.2 A	⅄	**0**	**0**	**0**	**adjusted**
					△	1			
			0040	4.0 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**adjusted**
			0055	5.5 A	⅄	0	0	1	2 stages smaller
	BE1/230 V	1			△	1	1	0	1 stage smaller
			0070	7.0 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0095	9.5 A	⅄	0			
					△	1	1	1	3 stages smaller
DRN90L4	BE2/230 V	0	0040	4.0 A	⅄	**0**	**0**	**0**	**adjusted**
					△	1			
			0055	5.5 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**adjusted**
			0070	7.0 A	⅄	0	0	1	2 stages smaller
	BE1/230 V	1			△	1	1	0	1 stage smaller
			0095	9.5 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0125	12.5 A	⅄	0			
					△	1	1	1	3 stages smaller
DRN100LS4 (50 Hz) DRN100LM4 (60 Hz and 50/60 Hz)	BE5/230 V	0	0055	5.5 A	⅄	**0**	**0**	**0**	**adjusted**
					△	1			
			0070	7.0 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**adjusted**
			0095	9.5 A	⅄	0	0	1	2 stages smaller
	BE2/230 V	1			△	1	1	0	1 stage smaller
			0125	12.5 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0160	16.0 A	⅄	0			
					△	1	1	1	3 stages smaller
DRN100L4[1)]	BE5/230 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	**0**	**0**	**0**	**adjusted**
					△	1			
			0095	9.5 A	⅄	0	1	0	1 stage smaller
	BE2/230 V	1			△	**1**	**0**	**0**	**adjusted**
			0125	12.5 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0160	16.0 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type desig-nation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DRN112M4[1]	BE5/230 V	0	0095	9.5 A	⅄	**0**	**0**	**0**	**adjusted**
					△	1			
			0125	12.5 A	⅄	0	1	0	1 stage smaller
	BE11/230 V	1			△	**1**	**0**	**0**	**adjusted**
			0160	16.0 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
DRN132S4[1]	BE11/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	**0**	**0**	**0**	**adjusted**
	BE5/230 V	1			△	1			
			0160	16.0 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**adjusted**
DRN132M4[1]	BE11/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	0			
	BE20/230 V	1			△	1			
			0160	16.0 A	⅄	**0**	**0**	**0**	**adjusted**
					△	1			

1) The motor parameters are included in the standard memory module of status 0400 or higher.

(grey field) Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21 keypad.

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10.6.2 DR2S.. motor series, 4-pole

DR2S.. motor series, 4-pole											
230/400 V, 50 Hz				266/460 V, 60 Hz				Wide-range voltage, 50/60 Hz			
DIP switch S3				DIP switch S3				DIP switch S3			
S3/7	S3/8	S3/9	S3/10	S3/7	S3/8	S3/9	S3/10	S3/7	S3/8	S3/9	S3/10
1	1	0	0	0	0	1	0	1	0	1	0

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
Thermal protection model without temperature sensor[1]	0	0
PK (PT1000)	1	0
TF	0	1
TH	1	1

1) The function is active in status 0300 or higher for the motor data of the memory module. Temperature protection is not active for lower states.

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DR2S63M4	BE03/230 V	0	0020	2.0 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0025	2.5 A	⅄	0	1	1	3 stages smaller
	BE03/230 V	1			△	1	0	1	2 stages smaller
			0032	3.2 A	⅄	0			
					△	1	1	1	3 stages smaller
DR2S71MS4	BE05/230 V	0	0020	2.0 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**Adjusted**
			0025	2.5 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0032	3.2 A	⅄	0	1	1	3 stages smaller
	BE1/230 V	1			△	1	0	1	2 stages smaller
			0040	4.0 A	⅄	0			
					△	1	1	1	3 stages smaller
			0055	5.5 A	⅄	0			
					△	1			
DR2S71M4	BE1/230 V	0	0020	2.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0025	2.5 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**Adjusted**
			0032	3.2 A	⅄	0	0	1	2 stages smaller
	BE05/230 V	1			△	1	1	0	1 stage smaller
			0040	4.0 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0055	5.5 A	⅄	0			
					△	1	1	1	3 stages smaller

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Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DR2S80MK4	BE1/230 V	0	0020	2.0 A	⅄	0			
					△	1			
			0025	2.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0032	3.2 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**Adjusted**
	BE05/230 V	1	0040	4.0 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0055	5.5 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0070	7.0 A	⅄	0			
					△	1	1	1	3 stages smaller
			0095	9.5 A	⅄	0			
					△	1			
DR2S80M4	BE2/230 V	0	0032	3.2 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0040	4.0 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**Adjusted**
			0055	5.5 A	⅄	0	0	1	2 stages smaller
	BE1/230 V	1			△	1	1	0	1 stage smaller
			0070	7.0 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0095	9.5 A	⅄	**0**			
					△	1	1	1	3 stages smaller
DR2S90S4[1)]	BE2/230 V	0	0040	4.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0055	5.5 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**Adjusted**
			0070	7.0 A	⅄	0	0	1	2 stages smaller
	BE1/230 V	1			△	1	1	0	1 stage smaller
			0095	9.5 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
			0125	12.5 A	⅄	0			
					△	1	1	1	3 stages smaller
DR2S90L4[1)]	BE5/230 V	0	0055	5.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0070	7.0 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**Adjusted**
			0095	9.5 A	⅄	0	0	1	2 stages smaller
	BE2/230 V	1			△	1	1	0	1 stage smaller
			0125	12.5 A	⅄	0	1	1	3 stages smaller
					△	1	1	0	2 stages smaller
			0160	16.0 A	⅄	0			
					△	1	1	1	3 stages smaller

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Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type desig-nation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DR2S100LS4[1]	BE5/230 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0095	9.5 A	⅄	0	1	0	1 stage smaller
	BE2/230 V	1			△	**1**	**0**	**0**	**Adjusted**
			0125	12.5 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
			0160	16.0 A	⅄	0	1	1	3 stages smaller
					△	1	0	1	2 stages smaller
DR2S100L4[1]	BE5/230 V	0	0095	9.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0125	12.5 A	⅄	0	1	0	1 stage smaller
	BE2/230 V	1			△	**1**	**0**	**0**	**Adjusted**
			0160	16.0 A	⅄	0	0	1	2 stages smaller
					△	1	1	0	1 stage smaller
DR2S112M4[1]	BE11/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	**0**	**0**	**0**	**Adjusted**
	BE5/230 V	1			△	1			
			0160	16.0 A	⅄	0	1	0	1 stage smaller
					△	**1**	**0**	**0**	**Adjusted**
DR2S132S4[1]	BE11/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	0			
	BE5/230 V	1			△	1			
			0160	16.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			

1) The motor parameters are included in the standard memory module of status 0600 or higher.

(grey shading) Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21A keypad.

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10.6.3 MOVIGEAR® classic motor series

Motor series			
DIP switch S3			
S3/7	S3/8	S3/9	S3/10
0	1	1	0

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF[1]	0	1
TH [1]	1	1

1) MOVIGEAR® classic is available only with PK temperature sensor (PT1000).

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1[1]			S3/2		S3/3	S3/4	Motor power
MGF..-1-..C	–	0	0020	2.0 A	⅄	0	0	0	Adjusted
					△	1			
			0025	2.5 A	⅄	0	1	0	1 stage smaller
					△	1			
			0032	3.2 A	⅄	0	0	1	2 stages smaller
					△	1			
			0040	4.0 A	⅄	0	1	1	3 stages smaller
					△	1			
MGF..-2-..C	–	0	0025	2.5 A	⅄	0	0	0	Adjusted
					△	1			
			0032	3.2 A	⅄	0	0	0	Adjusted
					△	1			
			0040	4.0 A	⅄	0	1	0	1 stage smaller
					△	1			
			0055	5.5 A	⅄	0	0	1	2 stages smaller
					△	1			
MGF..-4-..C	–	0	0040	4.0 A	⅄	0	0	0	Adjusted
					△	1			
			0055	5.5 A	⅄	0	1	0	1 stage smaller
					△	1			
MGF..-4-..C/XT	–	0	0055	5.5 A	⅄	0	0	0	Adjusted
					△	1			

1) MOVIGEAR® classic is not available with brake. DIP switch S3/1 is ignored.

(grey field) Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21A keypad.

10.6.4 Motor series CM3C, 2000 min^{-1}

Motor series CM3C, n_N = 2000 min^{-1} 400 V, 133 Hz			
DIP switch S3			
S3/7	S3/8	S3/9	S3/10
1	1	1	0

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF[1]	0	1
TH [1]	1	1

1) CM3C.. is available only with PK temperature sensor (PT1000).

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CM3C71S[1]	BZ1/230 V	0	0020	2.0 A	⅄	**0**	**0**	**0**	**Adjusted[2]**
					△	1			
			0025	2.5 A	⅄	**0**	**0**	**0**	**Adjusted[2]**
					△	1			
			0032	3.2 A	⅄	**0**	**0**	**0**	**Adjusted[2]**
					△	1			
	BZ1/400 V	1	0040	4.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0055	5.5 A	⅄	0	1	0	1 stage smaller
					△	1			
			0070	7.0 A	⅄	0	0	1	2 stages smaller
					△	1			
			0095	9.5 A	⅄	0	1	1	3 stages smaller
					△	1			
CM3C71M[1]	BZ1/230 V	0	0055	5.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0070	7.0 A	⅄	0	1	0	1 stage smaller
					△	1			
	BZ1/400 V	1	0095	9.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0125	12.5 A	⅄	0	1	1	3 stages smaller
					△	1			
			0160	16.0 A	⅄	0			
					△	1			
CM3C80S[1]	BZ3/230 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
	BZ3/400 V	1	0095	9.5 A	⅄	0	1	0	1 stage smaller
					△	1			
			0125	12.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0160	16.0 A	⅄	0	1	1	3 stages smaller
					△	1			

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CM3C80M[1]	BZ3/230 V	0	0095	9.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0125	12.5 A	⅄	0	1	0	1 stage smaller
	BZ3/400 V	1			△	1			
			0160	16.0 A	⅄	0	0	1	2 stages smaller
					△	1			
CM3C100M[1]	BZ5/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	**0**	**0**	**0**	**Adjusted**[2]
	BZ5/400 V	1			△	1			
			0160	16.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			

1) The motor parameters are included in the standard memory module of status 0400 or higher.
2) The inverter output voltage is lower than the nominal motor current. Check the capacity utilization of the motor/frequency inverter combination.

(grey field) Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21 keypad.

10.6.5 Motor series CM3C, 3000 min^{-1}

Motor series CM3C, n_N = 3000 min^{-1} 400 V, 200 Hz			
DIP switch S3			
S3/7	S3/8	S3/9	S3/10
0	0	0	1

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF[1]	0	1
TH [1]	1	1

1) CM3C.. is available only with PK temperature sensor (PT1000).

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CM3C63S[1]	BZ05/230 V	0	0020	2.0 A	⅄	**0**	**0**	**0**	**Adjusted**[2]
					△	1			
			0025	2.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0032	3.2 A	⅄	0	1	0	1 stage smaller
	BZ05/400 V	1			△	1			
			0040	4.0 A	⅄	0	0	1	2 stages smaller
					△	1			
			0055	5.5 A	⅄	0	1	1	3 stages smaller
					△	1			

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Motor			Electronics cover		DIP switch S3				
Motor type	Brake: Type/nominal voltage	Brake: S3/1	Type designation	Nominal output current	Connection type S3/2		Motor assignment in relation to the inverter power: S3/3	S3/4	Motor power
CM3C63M[1]	BZ05/230 V	0	0032	3.2 A	⅄	0	0	0	**Adjusted[2]**
					△	1			
			0040	4.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0055	5.5 A	⅄	0	1	0	1 stage smaller
	BZ05/400 V	1			△	1			
			0070	7.0 A	⅄	0	0	1	2 stages smaller
					△	1			
			0095	9.5 A	⅄	0	1	1	3 stages smaller
					△	1			
CM3C71S[1]	BZ1/230 V	0	0055	5.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0070	7.0 A	⅄	0	1	0	1 stage smaller
					△	1			
			0095	9.5 A	⅄	0	0	1	2 stages smaller
	BZ1/400 V	1			△	1			
			0125	12.5 A	⅄	0	1	1	3 stages smaller
					△	1			
			0160	16.0 A	⅄	0			
					△	1			
CM3C71M[1]	BZ1/230 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0095	9.5 A	⅄	0	1	0	1 stage smaller
	BZ1/400 V	1			△	1			
			0125	12.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0160	16.0 A	⅄	0	1	1	3 stages smaller
					△	1			
CM3C71L[1]	BZ1/230 V	0	0095	9.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0125	12.5 A	⅄	0	1	0	1 stage smaller
	BZ1/400 V	1			△	1			
			0160	16.0 A	⅄	0	0	1	2 stages smaller
					△	1			
CM3C80M[1]	BZ3/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	**0**	**0**	**0**	**Adjusted**
	BZ3/400 V	1			△	1			
			0160	16.0 A	⅄	0	1	0	1 stage smaller
					△	1			
CM3C80L[1]	BZ3/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	0			
	BZ3/400 V	1			△	1			
			0160	16.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			

1) The motor parameters are included in the standard memory module of status 0400 or higher.

2) The inverter output voltage is lower than the nominal motor current. Check the capacity utilization of the motor/frequency inverter combination.

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Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21 keypad.

10.6.6 Motor series CM3C, 4500 min^{-1}

Motor series CM3C, n_N = 4500 min^{-1} 400 V, 300 Hz			
DIP switch S3			
S3/7	S3/8	S3/9	S3/10
1	0	0	1

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF[1]	0	1
TH [1]	1	1

1) CM3C.. is available only with PK temperature sensor (PT1000).

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CM3C63S[1]	BZ05/250 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	0	0	1	2 stages smaller
	BZ05/400 V	1			△	1			
			0095	9.5 A	⅄	0	1	1	3 stages smaller
					△	1			
CM3C63M[1]	BZ05/230 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	0	1	0	1 stage smaller
					△	1			
			0095	9.5 A	⅄	0	0	1	2 stages smaller
	BZ05/400 V	1			△	1			
			0125	12.5 A	⅄	0	1	1	3 stages smaller
					△	1			
			0160	16.0 A	⅄	0			
					△	1			
CM3C63L[1]	BZ05/230 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0095	9.5 A	⅄	0	1	0	1 stage smaller
	BZ05/400 V	1			△	1			
			0125	12.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0160	16.0 A	⅄	0	1	1	3 stages smaller
					△	1			
CM3C71S[1]	BZ1/230 V	0	0095	9.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0125	12.5 A	⅄	0	1	0	1 stage smaller
	BZ1/400 V	1			△	1			
			0160	16.0 A	⅄	0	0	1	2 stages smaller
					△	1			

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Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CM3C71M[1]	BZ1/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	**0**	**0**	**0**	**Adjusted**
	BZ1/400 V	1			△	1			
			0160	16.0 A	⅄	0	1	0	1 stage smaller
					△	1			
CM3C71L[1]	BZ1/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	0			
	BZ1/400 V	1			△	1			
			0160	16.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			

1) The motor parameters are included in the standard memory module of status 0400 or higher.

(grey cell) Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21 keypad.

10.6.7 Motor series CMP, 2000 min^{-1}

Motor series CMP. n_N = 2000 min^{-1} 400 V, 167 Hz			
DIP switch S3			
S3/7	S3/8	S3/9	S3/10
0	1	0	1

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF	0	1
TF[1]	1	1

1) CMP.. is available only with PK temperature sensor (PT1000).

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CMP71S[1]	BP1/24 V	0	0020	2.0 A	⅄	**0**	**0**	**0**	**Adjusted**[2]
					△	1			
			0025	2.5 A	⅄	**0**	**0**	**0**	**Adjusted**[2]
					△	1			
			0032	3.2 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
	No brake	1	0040	4.0 A	⅄	**0**	1	0	1 stage smaller
					△	1			
			0055	5.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0070	7.0 A	⅄	0	1	1	3 stages smaller
					△	1			
			0095	9.5 A	⅄	0			
					△	1			
CMP71M[1]	BP1/24 V	0	0055	5.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0070	7.0 A	⅄	0	1	0	1 stage smaller
					△	1			
	No brake	1	0095	9.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0125	12.5 A	⅄	0	1	1	3 stages smaller
					△	1			
			0160	16.0 A	⅄	0			
					△	1			
CMP71L[1]	BP1/24 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
	No brake	1	0095	9.5 A	⅄	0	1	0	1 stage smaller
					△	1			
			0125	12.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0160	16.0 A	⅄	0	1	1	3 stages smaller
					△	1			

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CMP80M[1)]	BP3/24 V	0	0095	9.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0125	12.5 A	⅄	0	1	0	1 stage smaller
	No brake	1			△	1			
			0160	16.0 A	⅄	0	0	1	2 stages smaller
					△	1			
CMP80L[1)]	BP3/24 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	**0**	**0**	**0**	**Adjusted**
	No brake	1			△	1			
			0160	16.0 A	⅄	0	1	0	1 stage smaller
					△	1			
CMP100M[1)]	BP5/24 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	0			
	No brake	1			△	1			
			0160	16.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			

1) The motor parameters are included in the standard memory module of status 0400 or higher.
2) The inverter output voltage is lower than the nominal motor current. Check the capacity utilization of the motor/frequency inverter combination.

(grey field) Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21 keypad.

10.6.8 Motor series CMP, 3000 min^{-1}

Motor series CMP, n_N = 3000 min^{-1} 400 V, 150/250 Hz			
DIP switch S3			
S3/7	S3/8	S3/9	S3/10
1	1	0	1

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF	0	1
TF[1)]	1	1

1) CMP.. is available only with PK temperature sensor (PT1000).

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CMP40S[1)]	BK01/24 V	0	0020	2.0 A	⅄	0	1	1	3 stages smaller
					△	1			
			0025	2.5 A	⅄	0			
	No brake	1			△	1			
			0032	3.2 A	⅄	0			
					△	1			

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
			0020	2.0 A	⅄	0	0	1	2 stages smaller
	BK01/24 V	0			△	1			
CMP40M[1]			0025	2.5 A	⅄	0	1	1	3 stages smaller
					△	1			
	No brake	1	0032	3.2 A	⅄	0			
					△	1			
			0020	2.0 A	⅄	0	1	0	1 stage smaller
	BK02/24 V	0			△	1			
CMP50S[1]			0025	2.5 A	⅄	0	0	1	2 stages smaller
					△	1			
	No brake	1	0032	3.2 A	⅄	0	1	1	3 stages smaller
					△	1			
			0020	2.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
	BK02/24 V	0	0025	2.5 A	⅄	0	1	0	1 stage smaller
					△	1			
CMP50M[1]			0032	3.2 A	⅄	0	0	1	2 stages smaller
					△	1			
			0040	4.0 A	⅄	0	1	1	3 stages smaller
	No brake	1			△	1			
			0055	5.5 A	⅄	0			
					△	1			
			0020	2.0 A	⅄	0			
					△	1			
	BK04/24 V	0	0025	2.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
CMP50L[1]			0032	3.2 A	⅄	0	1	0	1 stage smaller
					△	1			
			0040	4.0 A	⅄	0	0	1	2 stages smaller
	No brake	1			△	1			
			0055	5.5 A	⅄	0	1	1	3 stages smaller
					△	1			
			0032	3.2 A	⅄	**0**	**0**	**0**	**Adjusted**[2]
					△	1			
	BK07/24 V	0	0040	4.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
CMP63M[1]			0055	5.5 A	⅄	0	1	0	1 stage smaller
					△	1			
			0070	7.0 A	⅄	0	0	1	2 stages smaller
	No brake	1			△	1			
			0095	9.5 A	⅄	0	1	1	3 stages smaller
					△	1			

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Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CMP63L[1]	BK07/24 V	0	0055	5.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0070	7.0 A	⅄	0	1	0	1 stage smaller
					△	1			
			0095	9.5 A	⅄	0	0	1	2 stages smaller
	No brake	1			△	1			
			0125	12.5 A	⅄	0	1	1	3 stages smaller
					△	1			
			0160	16.0 A	⅄	0			
					△	1			
CMP71M[1]	BP1/24 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0095	9.5 A	⅄	0	1	0	1 stage smaller
	No brake	1			△	1			
			0125	12.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0160	16.0 A	⅄	0	1	1	3 stages smaller
					△	1			
CMP71L[1]	BP1/24 V	0	0095	9.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0125	12.5 A	⅄	0	1	0	1 stage smaller
	No brake	1			△	1			
			0160	16.0 A	⅄	0	0	1	2 stages smaller
					△	1			
CMP80S[1]	BP3/24 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	**0**	**0**	**0**	**Adjusted**
	No brake	1			△	1			
			0160	16.0 A	⅄	0	1	0	1 stage smaller
					△	1			
CMP80M[1]	BP3/24 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	0			
	No brake	1			△	1			
			0160	16.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			

1) The motor parameters are included in the standard memory module of status 0400 or higher.

2) The inverter output voltage is lower than the nominal motor current. Check the capacity utilization of the motor/frequency inverter combination.

(grey field) Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21 keypad.

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10.6.9 Motor series CMP, 4500 min^{-1}

Motor series CMP, n_N = 4500 min^{-1} 400 V, 225/375 Hz			
DIP switch S3			
S3/7	S3/8	S3/9	S3/10
0	0	1	1

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF	0	1
TF[1]	1	1

1) CMP.. is available only with PK temperature sensor (PT1000).

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type desig-nation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CMP50L[1]	BK04/24 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	0	0	1	2 stages smaller
	No brake	1			△	1			
			0095	9.5 A	⅄	0	1	1	3 stages smaller
					△	1			
CMP63M[1]	BK07/24 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	0	1	0	1 stage smaller
					△	1			
			0095	9.5 A	⅄	0	0	1	2 stages smaller
	No brake	1			△	1			
			0125	12.5 A	⅄	0	1	1	3 stages smaller
					△	1			
			0160	16.0 A	⅄	0			
					△	1			
CMP63L[1]	BK07/24 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	**0**	**0**	**0**	**adjusted**
					△	1			
			0095	9.5 A	⅄	0	1	0	1 stage smaller
	No brake	1			△	1			
			0125	12.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0160	16.0 A	⅄	0	1	1	3 stages smaller
					△	1			
CMP71S[1]	BP1/24 V	0	0095	9.5 A	⅄	**0**	**0**	**0**	**adjusted**
					△	1			
			0125	12.5 A	⅄	0	1	0	1 stage smaller
	No brake	1			△	1			
			0160	16.0 A	⅄	0	0	1	2 stages smaller
					△	1			
CMP71M[1]	BP1/24 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	0	**0**	**0**	**Adjusted**
	No brake	1			△	1			
			0160	16.0 A	⅄	0	1	0	1 stage smaller
					△	1			

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type desig-nation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
CMP71L[1]	BP1/24 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	0			
	No brake	1			△	1			
			0160	16.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			

1) The motor parameters are included in the standard memory module of status 0400 or higher.

(grey field) Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21 keypad.

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10.6.10 Motor series DR2C., 2000 min-1

Motor series DR2S., 2000 min^{-1}			
DIP switch S3			
S3/7	S3/8	S3/9	S3/10
1	0	1	1

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF	0	1
TH	1	1

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DR2C71MSA4[1]	BE1/230 V	0	0020	2.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0025	2.5 A	⅄	0	1	0	1 stage smaller
					△	1			
			0032	3.2 A	⅄	0	0	1	2 stages smaller
	BE05/230 V	1			△	1			
			0040	4.0 A	⅄	0	1	1	3 stages smaller
					△	1			
			0055	5.5 A	⅄	0			
					△	1			
DR2C71MA4[1]	BE1/230 V	0	0020	2.0 A	⅄	0			
					△	1			
			0025	2.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0032	3.2 A	⅄	0	1	0	1 stage smaller
	BE05/230 V	1			△	1			
			0040	4.0 A	⅄	0	0	1	2 stages smaller
					△	1			
			0055	5.5 A	⅄	0	1	1	3 stages smaller
					△	1			
DR2C80MKA4[1]	BE2/230 V	0	0040	4.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0055	5.5 A	⅄	0	1	0	1 stage smaller
					△	1			
			0070	7.0 A	⅄	0	0	1	2 stages smaller
	BE1/230 V	1			△	1			
			0095	9.5 A	⅄	0	1	1	3 stages smaller
					△	1			
			0125	12.5 A	⅄	0			
					△	1			

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Motor			Electronics cover		DIP switch S3				
Motor type	**Brake: Type/nominal voltage**	**Brake: S3/1**	**Type designation**	**Nominal output current**	**Connection type: S3/2**		**Motor assignment in relation to the inverter power: S3/3**	**S3/4**	**Motor power**
DR2C80MA4[1]	BE2/230 V	0	0040	4.0 A	⅄	0			
					△	1			
			0055	5.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
	BE1/230 V	1	0070	7.0 A	⅄	0	1	0	1 stages smaller
					△	1			
			0095	9.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0125	12.5 A	⅄	0	1	1	3 stages smaller
					△	1			
DR2C90SA6[1]	BE5/230 V	0	0095	9.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0125	12.5 A	⅄	0	1	0	1 stage smaller
	BE2/230 V	1			△	1			
			0160	16.0 A	⅄	0	0	1	2 stages smaller
					△	1			
DR2C90LA6[1]	BE5/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	**0**	**0**	**0**	**Adjusted**
	BE2/230 V	1			△	1			
			0160	16.0 A	⅄	0	1	0	1 stage smaller
					△	1			
DR2C100S6[1]	BE5/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	0			
	BE2/230 V	1			△	1			
			0160	16.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			

1) The motor parameters are included in the standard memory module of status 0600 or higher.

(grey) Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21A keypad.

10.6.11 Motor series DR2C., 3000 min-1

Motor series DR2S., 3000 min^{-1}			
DIP switch S3			
S3/7	S3/8	S3/9	S3/10
0	1	1	1

Motor protection		
Temperature sensor type	DIP switch S3	
	S3/5	S3/6
No temperature sensor	0	0
PK (PT1000)	1	0
TF	0	1
TH	1	1

The following table shows the settings of the DIP switch S3 depending on the motor and the nominal output current of the inverter.

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DR2C71MSA4[1)]	BE1/230 V	0	0025	2.5 A	⅄	0			
					△	1			
			0032	3.2 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0040	4.0 A	⅄	0	1	0	1 stage smaller
	BE05/230 V	1			△	1			
			0055	5.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0070	7.0 A	⅄	0	1	1	3 stages smaller
					△	1			
DR2C71MA4[1)]	BE1/230 V	0	0032	3.2 A	⅄	0			
					△	1			
			0040	4.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0055	5.5 A	⅄	0	1	0	1 stage smaller
	BE05/230 V	1			△	1			
			0070	7.0 A	⅄	0	0	1	2 stages smaller
					△	1			
			0095	9.5 A	⅄	0	1	1	3 stages smaller
					△	1			
DR2C80MKA4[1)]	BE2/230 V	0	0055	5.5 A	⅄	0			
					△	1			
			0070	7.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0095	9.5 A	⅄	0	1	0	1 stage smaller
	BE1/230 V	1			△	1			
			0125	12.5 A	⅄	0	0	1	2 stages smaller
					△	1			
			0160	16.0 A	⅄	0	1	1	3 stages smaller
					△	1			
DR2C80MA4[1)]	BE2/230 V	0	0095	9.5 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			
			0125	12.5 A	⅄	0	1	0	1 stage smaller
	BE1/230 V	1			△	1			
			0160	16.0 A	⅄	0	0	1	2 stages smaller
					△	1			

Motor			Electronics cover		DIP switch S3				
Motor type	Brake		Type designation	Nominal output current	Connection type		Motor assignment in relation to the inverter power		
	Type/nominal voltage	S3/1			S3/2		S3/3	S3/4	Motor power
DR2C90SA6[1)]	BE5/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	**0**	**0**	**0**	**Adjusted**
	BE2/230 V	1			△	1			
			0160	16.0 A	⅄	0	1	0	1 stage smaller
					△	1			
DR2C90LA6[1)]	BE5/230 V	0	0095	9.5 A	⅄	0			
					△	1			
			0125	12.5 A	⅄	0			
	BE2/230 V	1			△	1			
			0160	16.0 A	⅄	**0**	**0**	**0**	**Adjusted**
					△	1			

1) The motor parameters are included in the standard memory module of status 0600 or higher.

(grey cells) Motor startup via DIP switch S3 is not possible. Start up the motor using the MOVISUITE® software or the CBG21A keypad.

10.7 Startup with "ex works parameters"

SEW-EURODRIVE offers the ordering of products with customer-specific parameter settings in the delivery state. This option is known as "ex works parameters". Startup procedures and processes can be optimized in the best possible way using this option. Products with a customer-specific parameter set are marked with .../P... in the type designation.

The "Parameters ex works" data set is stored on the TSM memory module.

10.8 Startup of third-party motors

Asynchronous motors

The nameplate data of the motor must be entered during startup:

- Nominal motor speed
- Rated motor frequency
- Nominal motor voltage
- Nominal motor current
- Power factor cos φ
- Nominal motor power

The parameters required for startup are calculated based on the nameplate data and the motor is taken into operation. A prerequisite is that the inverter is connected with the MOVISUITE® engineering software.

SEW-EURODRIVE also recommends carrying out a parameter measurement with FCB25 for better control characteristics. This determines the equivalent wiring diagram data of the motor. The duration of the measurement depends on the motor parameters. In the case of asynchronous motors, the measurement is carried out in an idle state. If a brake is present, it remains closed.

Permanent-field synchronous motors

The nameplate data of the motor must be entered during the startup of synchronous motors:

- Nominal motor speed

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- Rated motor frequency or number of poles
- Nominal motor voltage
- Nominal motor torque
- Maximum torque at the motor shaft
- Maximum motor current
- Optional:
  - Phase inductance
  - Internal voltage

In the case of permanent-field synchronous motors without an encoder, a parameter measurement must then be carried out with FCB25. In the case of synchronous motors with an encoder, SEW-EURODRIVE recommends carrying out the parameter measurement. The brake is released (if present) during the measurement to align the rotor electrically. Make sure that the rotor can turn freely. For this reason, the motor must be separated from the gear unit or system. The duration of the measurement is limited to a few seconds.

In the case of synchronous motors with an encoder, the encoder offset must also be set after the above-mentioned startup procedure. This commutation takes place using the "Rotor position identification" function (FCB18). 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.

Synchronous reluctance motors

The nameplate data of the motor must be entered during the startup of synchronous reluctance motors:

- Nominal motor voltage
- Nominal motor torque
- Nominal motor speed
- Rated motor frequency
- Optional:
  - Number of pole pairs
  - Mechanical power
  - Power factor

After startup according to the nameplate data, SEW-EURODRIVE recommends carrying out a parameter measurement with FCB25.

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10.9 Startup of motors with the MOVILINK® DDI interface

If an inverter has the MOVILINK® DDI interface and is connected to a motor that also has this interface, the motor is started up automatically via its electronic nameplate. The process is started by switching on the inverter. This function is only supported if the inverter is in the delivery state.

The status of the inverter is "AC" (Auto Configuration) during the data transfer from the electronic nameplate. You can obtain more information from the SEW-EURODRIVE hotline.

10.10 Application-related startup

The applications are started up with specific settings using the MOVISUITE® engineering software.

Pay attention to the information in the product manual > chapter "Startup" > "Application-related startup", including the sub-chapters.

10.10.1 Pumps and fans

Observe the following information:

- The control mode to be used depends on the motor type.
- Activate the "Flying start" function.

10.10.2 Hoist

Set the following parameters:

- Preload hoist (index 8404.9): This parameter determines the behavior of the integrator when re-entering control. Example: When the output stage is inhibited (e.g. with FCB 02, FCB 01, FCB 13, FCB 14), the I component (which corresponds to the preload in the case of the hoist) is deleted. The following selections are available to prevent this:
  - "Off" (= default): The integrator always starts with the value "0". Adjustment is made to an existing load torque. The speed controller can usually compensate for sagging of the hoist without additional settings.
  - "Save": The value that was present at the time of opening the speed control loop is retained. If the load torque has not changed, no adjustment is necessary when closing the speed control loop.
  - "Initialization value": If the load torque is known, this can be specified on the speed controller as an initial value via the parameter "Torque bias" in the range -1000% to 1000% of the nominal motor torque. This can be done during startup or optimization of the drive with the MOVISUITE® engineering software or you can use a local setpoint or a channel of the process data buffer. If the direction of rotation is positive in the stroke direction, enter a positive value and vice versa.
- Activate speed monitoring (index 8550.1). You must set the monitoring time (index 8550.2) for the specific application.

Also observe the notes in chapter "Lifting applications" (→ 🗎 342).

10.10.3 Prioritized terminal control

Description

The prioritized terminal control is a control function that allows you to control a drive with priority via digital inputs. After activating the "prioritized terminal control" function, a drive can be operated independently of the parameterized control signal source (e.g. Fieldbus) via digital inputs.

You can implement the following functions with the prioritized terminal control:

- Setpoint changeover: Automatic/manual control
- Setpoint changeover: Bus connection/terminal control
- Setpoint changeover: Basic device function/prioritized terminal control

INFORMATION

For drives with safe fieldbus communication, the STO function remains active when the prioritized terminal control is activated.

- For drives with safe fieldbus communication, SEW-EURODRIVE therefore does not recommend using the prioritized terminal control.
- For further Information, refer to chapter "Restrictions in connection with safe communication" (→ 🗎 385).

The STO safety sub-function can be used by connecting the STO signal to the terminals specified for this purpose.

The prioritized terminal control and manual mode are mutually exclusive.

- If the prioritized terminal control is active, you cannot open the manual mode on the CBG.. keypad or in the MOVISUITE® engineering software. The message "Manual mode cannot be activated" appears in the MOVISUITE® engineering software.
- If manual mode is open in the MOVISUITE® engineering software or on the CBG.. keypad, you cannot activate the prioritized terminal control.

Restrictions in connection with safe communication

INFORMATION

The prioritized terminal control is not a safety-related function and therefore cannot take over a safety function of the safety options.

After a safety fault, you cannot start the drive without additional configuration and controls.

When activating the prioritized terminal control, stop the fieldbus. This means that the STO function is permanently active when using safe communication. Therefore, you must not use the prioritized terminal control in conjunction with the MOVISAFE® CSB..A safety option.

Prioritized terminal control with MOVISAFE® CSL51A

You can use the prioritized terminal control in conjunction with the MOVISAFE® CSL51A safety option under the following conditions:

- If the STO function is active, you must deactivate the STO function by activating the muting function. This is only possible if fieldbus communication is interrupted or disrupted.

  To use the muting function, you must configure it as follows using the "Assist CS" of the MOVISUITE® engineering software:

  - Configure a safe digital input using the "muting" function.
  - In the basic settings of the safety option, set the "Selection muting" parameter to "Encoder fault and F-PO".
  - Set the maximum muting time according to your application's requirements.

  ⚠ **WARNING!** Danger due to unexpected startup. The active "Muting F-PO" function deactivates the encoder-dependent safety sub-functions (except STO). This can cause the system to start up immediately. Severe or fatal injuries.
  Before activating the "Muting F-PO" function, the user must take organizational measures for the protection of personnel and the system.

- By activating the prioritized terminal control, you trigger a fault reset that resets pending device errors.
  - **NOTICE!** Device faults that are caused by a hardware defect, for example, may not be reset. This causes the drive to stop in the fault state.
    Take this behavior into account during the risk assessment.
- If a **device fault** occurs during the active prioritized terminal control, you must acknowledge the fault by performing a fault reset.
  - **NOTICE!** Device faults that are caused by a hardware defect, for example, may not be reset. This causes the drive to stop in the fault state.
    Take this behavior into account in the risk assessment of the system.
- If a **fault of the safety option** occurs during the active prioritized terminal control, you must safely acknowledge the fault by assigning a safe digital input with the parameter "acknowledge fault" and activating it.
  - **NOTICE!** You cannot reset all errors of the safety option (e.g. hardware fault, critical fault). This causes the drive to stop in the fault state.
    Take this behavior into account in the risk assessment of the system.

Functions

The following table describes the functions of the prioritized terminal control:

Signal at digital input	Description
Prioritized terminal control – **activation**	This signal activates the prioritized terminal control. During activation, the inverter performs a fault reset once. The drive only starts in combination with a selected direction of rotation (signal "positive direction of rotation" or "negative direction of rotation").
Prioritized terminal control – **positive direction of rotation**	• **Signal level**[1)] If you set the "positive direction of rotation" signal when the prioritized terminal control is activated, the drive starts at speed 1 in positive direction of rotation. If the "positive direction of rotation" and "negative direction of rotation" signals are set at the same time, the drive decelerates to an idle state. • **Positive signal edge (edge-controlled)** The "activation" signal must be set before the direction of rotation is selected. A positive edge of the "positive direction of rotation" signal starts the drive in positive direction of rotation at speed 1. – After a power off or STO, the drive only starts when the device is ready for operation, the "activation" signal is set and a positive signal edge of the "positive direction of rotation" signal (0 → 1) is generated. – If the "positive direction of rotation" and "negative direction of rotation" signals are set at the same time, the earlier edge defines the direction of rotation.
Prioritized terminal control – **negative direction of rotation**	• **Signal level** If you set the "negative direction of rotation" signal when the prioritized terminal control is activated, the drive starts in negative direction of rotation at speed 1. If the "positive direction of rotation" and "negative direction of rotation" signals are set at the same time, the drive decelerates to an idle state. • **Positive signal edge (edge-controlled)** The "activation" signal must be set before the direction of rotation is selected. A positive edge of the "negative direction of rotation" signal starts the drive in negative direction of rotation at speed 1. – After a power off or STO, the drive only starts when the device is ready for operation, the "activation" signal is set and a positive signal edge of the "negative direction of rotation" signal (0 → 1) is generated. – If the "positive direction of rotation" and "negative direction of rotation" signals are set at the same time, the earlier edge defines the direction of rotation.
Prioritized terminal control – **speed 2** (optional)	If the signals for "activation" and "direction of rotation .." are set, the "speed 2" signal activates speed 2 of the drive.
Fault reset (optional)	You can reset faults with the "fault reset" signal. **NOTICE!** Device faults that are caused by a hardware defect, for example, may not be reset. This causes the drive to stop in the fault state. Take this behavior into account in the risk assessment of the system.

1) Select the edge detection "signal level" or "positive signal edge" in the basic settings.

Observe the following information:

- You control the functions of the prioritized terminal control via the signals at the digital inputs.
- When the prioritized terminal control is activated, the inverter resets the present fault once (fault reset).
- Further digital inputs (e.g. from limit switches or external faults) are still evaluated.
- If several digital inputs are assigned the same function (e.g. "Positive direction of rotation"), the signals are linked with OR.
- Unused functions are assigned level 0 and are therefore not active.

Check whether the inverter has enough free digital inputs for the functions of the prioritized terminal control.

At least 2 digital inputs are required for the prioritized terminal control:

- "Prioritized terminal control – activation" (= "Activation")

  and the

- "Prioritized terminal control – positive direction of rotation" (= "Positive direction of rotation")

  or

- "Prioritized terminal control – negative direction of rotation" (= "Negative direction of rotation")

You can optionally use an additional digital input for the fault reset and/or speed 2.

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Parameters, setpoints

The following parameters and setpoints for the prioritized terminal control can be found in the MOVISUITE® engineering software > "Functions" > "Setpoints" > "Prioritized terminal control".

Basic settings

- "Edge detection after STO and power ON"

  The control signals at the digital inputs must always be present.

  Selection:

  – "Signal level"

    The function starts whenever the input signals are set or are already present.

  – "Positive signal edge (edge-controlled)"

    The function only starts

    - after resetting STO or

    - after switching on the line voltage (power on) or

    - after switching from 24 V backup mode to line operation (power on)

    - when a positive edge of the "positive direction of rotation" or "negative direction of rotation" signal (0 → 1) occurs.

Status

- "Prioritized terminal control – activation"
- "Prioritized terminal control – positive direction of rotation"
- "Prioritized terminal control – negative direction of rotation"
- "Prioritized terminal control – speed 2"

Velocity

- "Speed 1 DT1"
- "Speed 2 DT1"
- "Speed 1 DT2"
- "Speed 2 DT2"

Acceleration/deceleration

- "Acceleration/deceleration DT1"
- "Acceleration/deceleration DT2"

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Operating principle

For prioritized terminal control, the controller uses FCB 04 function block (= manual mode). This function block can only be overwritten by a higher-level FCB (e.g. FCB 01, FCB 14, FCB 13, ..).

Activation

If you set the "Activation" signal, the prioritized terminal control is activated.

- The previous setpoint inputs (e.g. from MOVIKIT®, fieldbus control, basic device functions, …) are deactivated.
- The inverter resets present faults once (e.g. fieldbus fault, etc.).
- The drive is not enabled.
- The output stage is inhibited.
- Display: **FCB 01**

Starting the drive

If you set the "positive direction of rotation" or "negative direction of rotation" signal, the drive is started.

- The drive is enabled in the selected direction of rotation.
- The drive accelerates up to speed 1 of the selected drive train (DT). The "Acceleration DT1" or "Acceleration DT2" parameter specifies the acceleration.
- Display: **FCB 04**

Speed 2

If you set the "Speed 2" signal, speed 2 is activated.

- The drive accelerates up to speed 2 of the selected drive train (DT). The "Acceleration DT1" or "Acceleration DT2" parameter specifies the acceleration.
- Display: **FCB 04**

Status display

The status of the prioritized terminal control (e.g. message "Prioritized terminal control active" or group message "Manual mode/prioritized terminal control active") can be output as follows:

- Via a binary output
- Via a relay
- Via a status word bit
- Via a message bit
- Via the visual 7-segment display
- Via the "DRIVE" LED

  For units without a 7-segment display (MOVIMOT®.., MOVIGEAR®, MOVITRAC® advanced), the "DRIVE" LED flashes green with a frequency of 1 Hz (= manual mode/prioritized terminal control).

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INFORMATION

Process data communication is completely deactivated in firmware version 9.00. Therefore, the process data for the higher-level controller is not updated. The process data thus indicates the previous operating state.

As of firmware version 9.50, process data communication remains active. The process data reports the current status to the higher-level controller.

Stopping the drive

If **none of the signals** "Positive direction of rotation" and "Negative direction of rotation” is set, the drive is stopped.

- The drive decelerates until standstill.
- The output stage of the inverter is inhibited.
- Display: **FCB 01**

INFORMATION

If **none of the signals** "Positive direction of rotation" and "Negative direction of rotation” is set, the drive is stopped and remains energized.

- The drive decelerates until standstill.
- The drive remains energized.
- The output stage of the inverter is not inhibited.
- Display: **FCB 04**

Deactivation

⚠ WARNING

Danger due to unexpected startup. If you deactivate the prioritized terminal control, the drive is immediately controlled by the original control source. Depending on the settings of the original control source, the drive may restart unexpectedly.

Severe or fatal injuries.

- Check the parameters and signals of the original control source before deactivating.
- Make sure that the settings of the parameters and signals of the original control source do not pose any risks.

If you reset the "Activation" signal, the prioritized terminal control is deactivated.

- The inverter no longer responds to the signals at the digital inputs of the prioritized terminal control.
- The inverter only responds to the parameters and signals of the original control source (e.g. fieldbus signals, other inverter functions, etc.).

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10.11 Startup with MOVISUITE® engineering software

The inverters are started up using the MOVISUITE® engineering software from SEW-EURODRIVE.

The motor is started up in drive train 1.

When using a motor from SEW-EURODRIVE, select the motor type from the catalog or enter the nameplate. You can perform the startup for motors and encoders from SEW-EURODRIVE with an electronic nameplate based on the data contained there.

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.

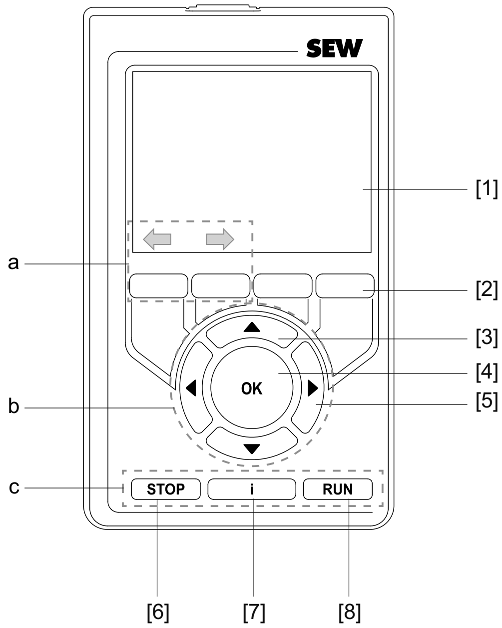
10.12 Startup with the CBG21A keypad

Using the CBG21A keypad, startup can be performed intuitively guided by the symbols and functions of the color display.

Further information can be found in the **product manual** > chapter "Startup" > "Startup with the CBG21A keypad", including the sub-chapters.

10.12.1 CBG21A keypad

The following figure shows the CBG21A keypad:



9007225148764555

[1] Color display
[2] 4 function keys that are assigned according to the context. The assigned functions are shown in the color display above the keys.

a = Permanently assigned with Back/Next

b = Navigate in the menu		**c = Manual mode control section**	
[3]	<Up/down> arrow keys	[6]	<STOP> key
[4]	<OK> key	[7]	<I> information key
[5]	<Left/right> arrow keys	[8]	<RUN> key

The user interface of the CBG21A keypad is multilingual.

Activating a field

Proceed as follows:

1. Select a field using the <up/down> arrow keys.
2. Activate the field with the <OK> key.

Entering a number

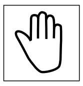
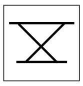
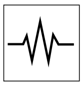
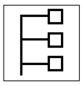
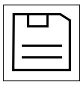
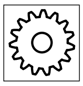
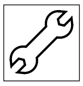
Proceed as follows:

- Change the digit within a number by using the <left/right> arrow keys.
- The editable digit is highlighted.

- Change the value of the digit by using the <up/down> arrow keys.
- Confirm the number with the <OK> key.

Symbols used

The available functions are shown with pictograms in the keypad display.

	Manual operation
	Optimization of the control mode
	Application
	Diagnostics
	Parameter
	Data management
	Settings
	Back
	Next
	Startup

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10.13 Startup with the CBG11A keypad

Using the CBG11A keypad, startup can be performed intuitively guided by the symbols and functions of the color display. See product manual

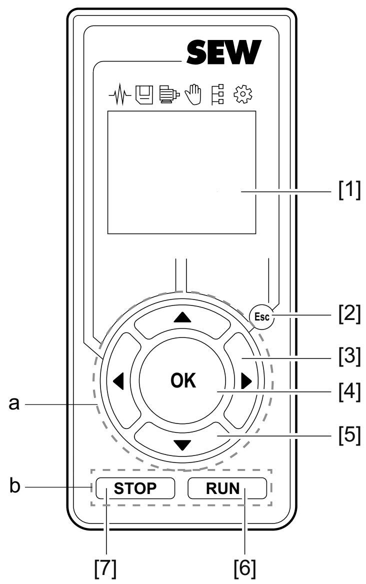
INFORMATION

You cannot start up a motor with encoder using the keypad.

You can carry out this particular startup with the MOVISUITE® engineering software.

10.13.1 CBG11A keypad

The following figure shows the CBG11A keypad:



18014424428189195

[1] Color display
[2] <Esc> key

a = Navigate in the menu
[3] <Left/right> arrow keys
[4] <OK> key
[5] <Up/down> arrow keys

b = Manual mode control section
[6] <RUN> key
[7] <STOP> key

The user interface of the CBG11A keypad is in English.

Selecting a function

Proceed as follows:

1. To open the main menu, press the <Esc> key.
2. Select a function using the <left/right> arrow keys.
3. Confirm your selection with the <OK> key.

Entering a number

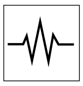
Proceed as follows:

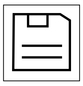
1. Change the digit within a number by using the <left/right> arrow keys.
2. The editable digit is underlined.

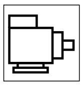
3. Change the value of the digit by using the <up/down> arrow keys.
4. Confirm the number with the <OK> key.

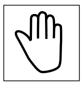
Symbols used

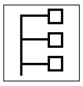
The available functions are shown with pictograms in the keypad display.

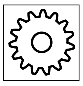
 Diagnostics

 Data management

 Startup

 Manual operation

 Parameter tree

 Keypad settings

A firmware update of the drive unit is not possible with the CBG11A keypad.

10.14 Process data configuration

In Easy mode[1)] the following process data configuration is active.

In Expert mode, you can assign different functions to the individual data bits.

1) Easy mode is only available up to firmware version < 11.

10.14.1 Control word 1

<table>
<tr><th colspan="5">Control word 1 – Cyclic data bits of the AS-Interface</th></tr>
<tr><th>DO
(AS-Interface)</th><th>PA1[1)]
(Device)</th><th>Function</th><th colspan="2">Usable data width of the AS-interface Slave profile</th></tr>
<tr><td>DO 0</td><td>0</td><td>Positive direction of rotation</td><td rowspan="4">4 bits</td><td rowspan="8">8 bits</td></tr>
<tr><td>DO 1</td><td>1</td><td>Negative direction of rotation</td></tr>
<tr><td>DO 2</td><td>2</td><td>Potentiometer f2</td></tr>
<tr><td>DO 3</td><td>3</td><td>Output stage enable/fault reset</td></tr>
<tr><td>DO 4</td><td>4</td><td>Fixed speed setpoint bit 0</td><td rowspan="12"></td></tr>
<tr><td>DO 5</td><td>5</td><td>Fixed speed setpoint bit 1</td></tr>
<tr><td>DO 6</td><td>6</td><td>FCB 13 Stop at application limit</td></tr>
<tr><td>DO 7</td><td>7</td><td>Release brake/deactivate DynaStop® with FCB 01</td></tr>
<tr><td>–</td><td>8</td><td>No function</td><td rowspan="8"></td></tr>
<tr><td>–</td><td>9</td><td>No function</td></tr>
<tr><td>–</td><td>10</td><td>No function</td></tr>
<tr><td>–</td><td>11</td><td>No function</td></tr>
<tr><td>–</td><td>12</td><td>No function</td></tr>
<tr><td>–</td><td>13</td><td>No function</td></tr>
<tr><td>–</td><td>14</td><td>No function</td></tr>
<tr><td>–</td><td>15</td><td>No function</td></tr>
</table>

1) PA data word 1

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10.14.2 Status word 1

Status word 1 – Cyclic data bits of the AS-Interface				
DI (AS-Interface)	**PE1[1] (Device)**	**Function**	**Usable data width of the AS-interface Slave profile**	
DI 0	0	Ready for operation	4 bits	8 bits
DI 1	1	Local mode/manual mode active		
DI 2	2	DI 01		
DI 3	3	DI 02		
DI 4	4	Motor stopped – filtered		
DI 5	5	STO active		
DI 6	6	Electromechanical capacity utilization pre-warning		
DI 7	7	Faults		
–	8	No function		
–	9	No function		
–	10	No function		
–	11	No function		
–	12	No function		
–	13	No function		
–	14	No function		
–	15	No function		

1) PE data word 1

10.14.3 Control word 2

INFORMATION

You can configure the switch-on state of the parameter bits in the slave configuration in the AS-Interface master. The default setting of the value of the parameter bits is usually "1".

<table>
<tr><th colspan="5">Control word 2 – Acyclic parameter bits of the AS-Interface</th></tr>
<tr><th>PO
(AS-Interface)</th><th>PA2[1)]
(Device)</th><th colspan="2">Function</th><th>Usable data width of the AS-interface
Slave profile</th></tr>
<tr><td>PO 0</td><td>0</td><td colspan="2">No function</td><td rowspan="5">4 bits</td></tr>
<tr><td>PO 1</td><td>1</td><td colspan="2">No function</td></tr>
<tr><td>PO 2</td><td>2</td><td colspan="2">No function</td></tr>
<tr><td rowspan="2">PO 3</td><td rowspan="2">3</td><td>Bits reserved for AS-Interface
-> Bit permanently set to "0"</td><td>A/B slave,
Double station</td></tr>
<tr><td>No function</td><td>Binary station</td></tr>
<tr><td>–</td><td>4</td><td colspan="2">No function</td><td rowspan="12"></td></tr>
<tr><td>–</td><td>5</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>6</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>7</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>8</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>9</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>10</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>11</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>12</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>13</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>14</td><td colspan="2">No function</td></tr>
<tr><td>–</td><td>15</td><td colspan="2">No function</td></tr>
</table>

1) PA data word 2

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10.15 Deactivating DynaStop® for the startup procedure

10.15.1 Important information about deactivating DynaStop® (option /DSP)

⚠ WARNING

Removing the electronics cover will deactivate DynaStop®.

Severe or fatal injuries.

- If deactivation is not permitted for the plant, you will need to initiate additional measures (e.g. mechanical disconnection).

⚠ WARNING

Electric shock due to regenerative energy created by moving system or machine. The regenerative energy can cause dangerous voltages at the terminals or plug connectors, even when the supply voltage is disconnected.

Severe or fatal injuries.

- Never touch the wiring space with wiring board and plug connector.
- If you cannot rule out that the wiring space is touched, provide for suitable protection covers.

NOTICE

Damage to the connector plug between connection unit and electronics cover due to regenerative energy created by movement of the system or machine.

Damage to property.

- To prevent the connection plug from being damaged (destroyed contacts), you must remove the electronics cover completely in order to deactivate DynaStop®!

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10.15.2 Steps to deactivate DynaStop®

INFORMATION

For further information on the DynaStop® function, refer to chapter "Operation" in the product manual and the documentation of the connected drive unit.

Disabling DynaStop® by removing the electronics cover

Deactivate the DynaStop® function as follows:

1. Observe chapter "Startup information" (→ 🗎 341).
2. Observe chapter "Important information about deactivating DynaStop®" (→ 🗎 400).
3. De-energize all of the components and safeguard them with an external switch-off device to prevent unintentional activation of the voltage supply.
4. Remove the electronics cover completely.

The DynaStop® function is deactivated as a result. The system/machine can be moved mechanically observing the notes in chapter "Important notes on disabling DynaStop" (→ 🗎 400).

Disabling DynaStop® using the control signal

Alternatively, the DynaStop® function can also be deactivated using a control signal (process data or digital input). When doing this, observe the instructions in the product manual > chapter "Operation" > "Deactivating DynaStop® with FCB01" (→ 🗎 412).

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11 Operation

11.1 Maintenance switch

11.1.1 Load disconnectors /D11 and /M11

⚠ WARNING

Electric shock due to dangerous voltages at the line terminals.

The switch disconnector disconnects the electronics cover from the voltage supply. Voltage is still present at the terminals of the device.

- A correct installation includes that terminals of the device are protected against contact.
- Secure the device against unintended reconnection of the voltage supply.
- Wait for at least the following time before removing the electronics cover: **5 minutes**

NOTICE

Premature aging of the switch contacts.

- Do not operate the switch disconnector under load.

The switch disconnector of the device serves to interrupt the voltage supply of the electronics cover. The control unit of the decentralized inverter will remain supplied after the load disconnector is opened only if the optional, external DC 24 V backup voltage is connected.

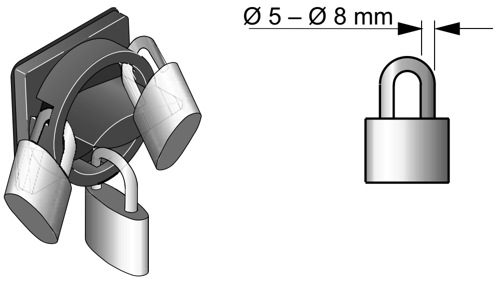
The feedback contact (NC contact) of the switch disconnector affects the digital input DI04. You can query the load disconnector status at the digital input DI04 when the DC 24 V backup voltage is connected to the device.

INFORMATION

The M11 load disconnector remains in the "TRIP" position after an overcurrent trip.

To switch the device on again, set the switching position to "0". Only then can the power be switched on again.

The load disconnector can be secured with 3 locks.



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11.1.2 Load disconnector /R01 at the inverter output

⚠ WARNING

Electric shock due to mixing up the load disconnector and its function.

Severe or fatal injuries.

- Before opening the device, check the type designation on the nameplate to see which load disconnector is installed in the device.
  - The optional load disconnectors **/D11** and **/M11** disconnect the 400 V power supply between the power terminals X1 and the electronics cover.
  - The optional load disconnector **/R01** at the inverter output disconnects the connection between the inverter output of the electronics cover (power output stage) and the motor connection terminals X2_A (terminals U, V, W).
- Before opening the device, check that the voltage supply to the device has been switched off using external measures.

NOTICE

Unexpected drive functions by using the load disconnector /R01 at the inverter output.

Possible damage to property.

- Do not use the load disconnector /R01 at the inverter output with the following motors and options:
  - Brakemotors
  - Option /DSP (DynaStop®)
  - Option /BES (24 V brake control)

NOTICE

Damage to the power semiconductors or increased wear of the switching contacts.

Possible damage to property.

- Only operate the load disconnector /R01 at the inverter output when the output stage is disabled.
- Make sure that the leading feedback contact of the load disconnector /R01 at the inverter output acts on digital input DI04 with the output stage inhibit function (corresponds to delivery state).
- Do not use digital input DI04 for other signals.

The load disconnector /R01 at the inverter output of MOVIMOT® flexible MMF3... is used to interrupt the connection between the inverter output of the electronics cover (power output stage) and the motor connection terminals X2_A (terminals U, V, W). The leading feedback contact (normally closed contact) of the load disconnector /R01

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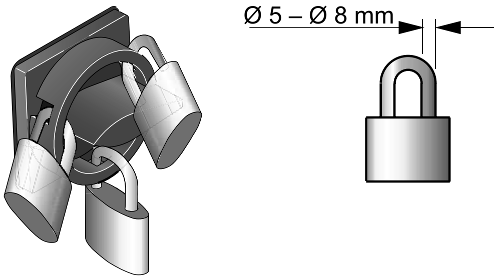
at the inverter output acts on digital input DI04 (output stage inhibit) of the unit. This means that the output stage is inhibited when the load disconnector is actuated. You can query the switching state of the load disconnector via the state of digital input DI04.

The load disconnector can be secured with 3 locks.



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11.2 Manual mode with CBG22A on-site keypad

With the CBG22A on-site keypad, you can intuitively operate the drive unit or device using the function keys, symbols and functions on the color display.

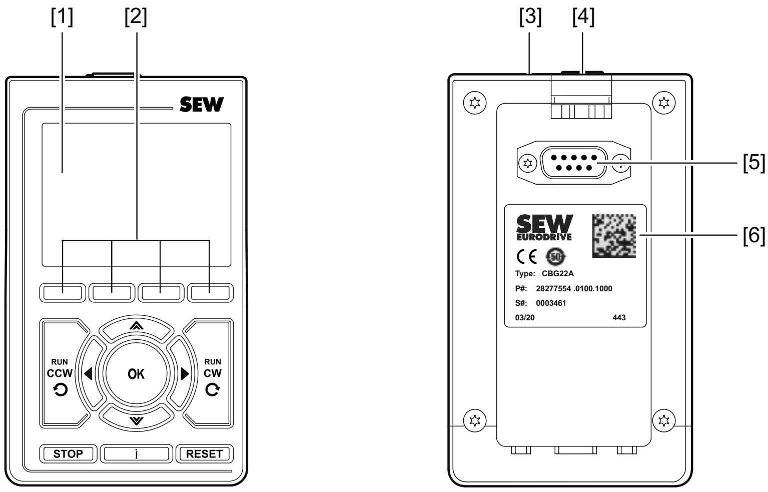
On-site operation is only possible under the following conditions:

- The decentralized inverter MOVIMOT® flexible has a front module with key switch.
- The CBM22A wall mounting with integrated key switch (accessories) is connected to the decentralized inverter MOVIMOT® flexible.

Further information can be found in the **product manual** > chapter "Operation" > "Manual mode with the CBG22A local keypad", including the sub-chapters.

11.2.1 CBG22A local keypad

The following figure shows the front and rear of the CBG22A local keypad:



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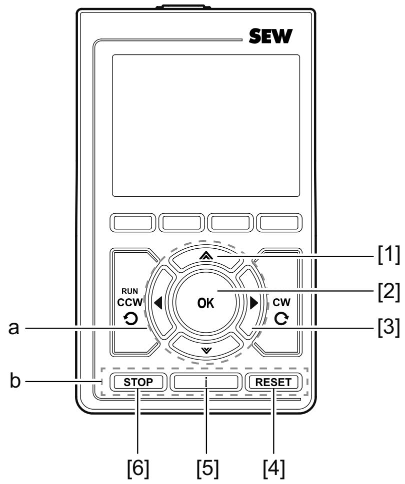
[1] Color display
[2] 4 function keys that are assigned according to the context. The assigned functions are shown in the color display above the keys.
[3] USB 2.0 Mini B interface, female (PC connection)
[4] Locking element
[5] D-sub interface, 9-pin, female
[6] Nameplate

Keys

The following figure shows the keys of the CBG22A local keypad:



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a = Navigate in the menu

[1] <Up/down> arrow keys
[2] <OK> key
[3] <Left/right> arrow keys

b = Manual mode control section

[4] <RESET> key
[5] <i> Information key
[6] <STOP> key

Activating a field

Proceed as follows:

1. Select a field using the <up/down> arrow keys.
2. Activate the field with the <OK> key.

Entering a number

Proceed as follows:

- Change the digit within a number by using the <left/right> arrow keys.
- The editable digit is highlighted.
- Change the value of the digit by using the <up/down> arrow keys.
- Confirm the number with the <OK> key.

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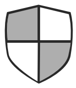
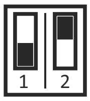
Symbols used

The selectable functions are shown on the display of the local keypad in the form of icons.

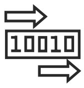

Start menu


Monitoring

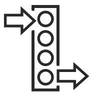

MOVISAFE® CS..

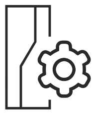


DIP switch



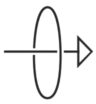
Process data

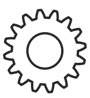

Digital inputs/outputs

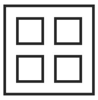
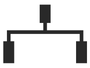

Operating and energy data


Device information


Fault memory


Gateway operation


Settings

	Main menu
	Direct control mode active
	Indirect control mode active
	Manual mode

11.3 Manual mode with MOVISUITE®

For manual operation of the device, you can use the manual mode function of the MOVISUITE® engineering software.

1. First connect the PC to the device, see chapter "PC connection".
2. Start the MOVISUITE® engineering software and add the device to MOVISUITE®.
3. Next, click the "Tools" [1] choice box. Select the "Manual mode" menu item.

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⇨ MOVISUITE® opens the "Manual mode" window.

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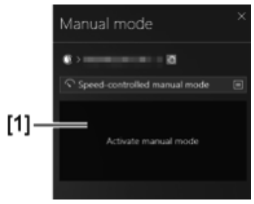
11.3.1 Activating/deactivating manual mode

Activation

Manual mode can only be activated when the device is inhibited.

To activate manual mode, click the [Activate manual mode] button [1].



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Manual mode remains active even after a fault reset.

Deactivation

⚠ WARNING

Risk of injury if the device starts up unintentionally.

Severe or fatal injuries.

- Before deactivating manual mode, take measures to prevent the device from starting up unintentionally.
- Take additional safety precautions depending on the application to avoid injury to people and damage to machinery.

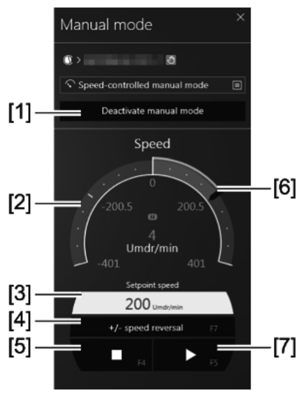
Manual mode is deactivated:

- When you click the [Deactivate manual mode] button
- Or when you close the "Manual mode" window.

11.3.2 Control in manual mode

Manual mode window

Once manual mode has been successfully activated, you can control the device using the controls in the MOVISUITE® "Manual mode" window.



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Control

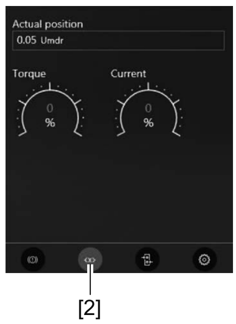
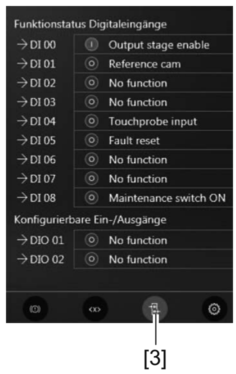
1. Set the setpoint speed using the edit box [3] or graphic input [6].

2. To specify the direction of rotation, click the button [4].
3. To enable the device, click the button [7].
4. To stop the device, click the button [5].

The "Speed" group [2] shows the actual speed of the device.

Advanced functions and displays of manual mode

The following functions are available in manual mode using MOVISUITE®:

Release brake Disable output stages	Actual values	Digital inputs and outputs	Acceleration Reference travel Timeout
			
Key [1]	Key [2]	Key [3]	Key [4]

11.4 Drive unit behavior in case of a voltage failure

The motor of the drive unit has the following function when the drive is in motion:

In case of a voltage failure, the drive unit uses the motion energy (energy recovery) to supply the electronics cover with voltage. The inverter in the electronics cover realizes a controlled motor deceleration.

If the regenerated energy is not sufficient, the inverter activates the holding function.

11.5 DynaStop®

11.5.1 Functional description

⚠ WARNING

The DynaStop® electrodynamic retarding function does not allow for a definite stop at a position.

Severe or fatal injuries.

- DynaStop® must not be used for hoists.
- When using DynaStop® on ascending/descending sections or vertical conveyors without freely suspended loads, you must comply with the basic safety and health requirements (e.g. EC Machinery Directive 2006/42/EC).
- The behavior of the DynaStop® function must be taken into account for the risk assessment of the application that determines the required safety measures.

NOTICE

Activating the FCB01 Output stage inhibit while the drive unit is running will activate DynaStop®. This can cause high torque loads, which may damage the drive unit and the application.

Possible damage to property.

- Activate the FCB01 output stage inhibit only when the speed is "0".

The DynaStop® function allows a speed-dependent torque to be generated that acts against the rotational movement.

Within the permitted operating range, this torque prevents an excessive acceleration of the motor shaft by an external force (e.g. lowering at inclining tracks).

11.5.2 DynaStop® torques

INFORMATION

The possible DynaStop® torques can be found in the product manual of the connected drive unit MOVIGEAR® classic.

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11.6 Release brake/deactivate DynaStop® with FCB 01

11.6.1 Information

INFORMATION

For information on deactivating the DynaStop® function for startup and assembly work, refer to chapter "Deactivating DynaStop® for startup work" (→ 400).

11.6.2 Activation of the function

⚠ WARNING

Danger from falling loads.

Severe or fatal injuries.

- Do **not** use the "Release brake/deactivate DynaStop® for FCB01" function for hoists or applications with potentially falling loads.
- Inhibit the function via the following steps:
  – Deactivate the function of DIP switch S1/2 via parameter *Functions* > *Inputs/outputs* > *Basic device* > *DIP switch functions* > *Release brake/deactivate DynaStop® for FCB01 – enable* > **"Deactivation"** = **"1"**.
  – Disable the function via parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **"Release brake/deactivate DynaStop® for FCB01 – enable"** = **"0"**.

In case the output stage is inhibited by a control signal (digital input or process data bit), you can release the brake/deactivate DynaStop® by using the "Release brake/deactivate DynaStop® with FCB 01" function. For example, this allows to move loads freely using a horizontal conveyor.

Now make the following settings:

1. **Enabling the function**:

   ⇨ **Via DIP switch S1/2**
   Switch DIP switch S1/2 "Release brake/deactivate DynaStop® for FCB01 – enable" = ON.

   ⇨ **Via parameter setting**
   Make sure that DIP switch S1/2 has been deactivated via parameter *Functions* > *Inputs/outputs* > *Basic device* > *DIP switch functions* > *Release brake / deactivate DynaStop® for FCB01 enable* > **"Deactivation"** = **"1"**.
   Enable the function via parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **"Release brake/deactivate DynaStop® with FBC 01- enable"** = **"1"** [1].

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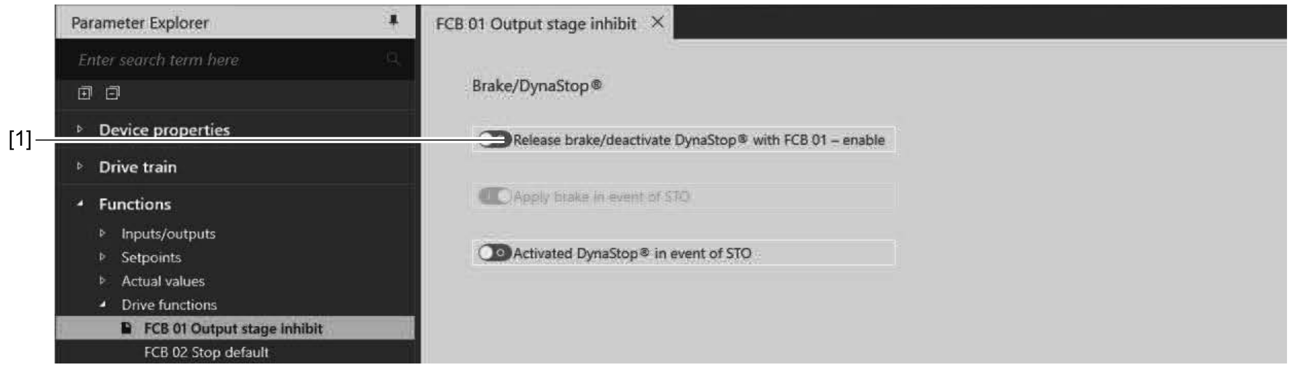

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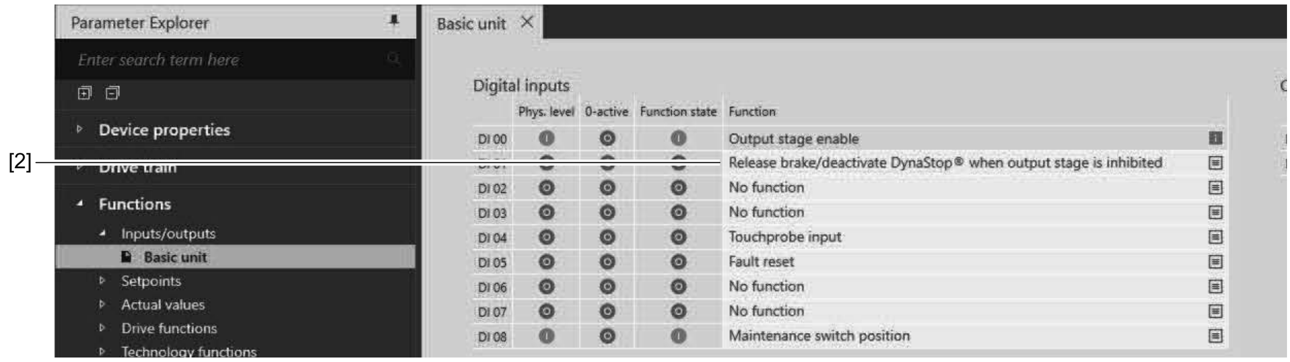
2. **Configuring the control signal**:

⇨ **Control via digital input**
Assign a digital input via the function "Release brake/deactivate DynaStop® when output stage is inhibited" [2].



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⇨ **Control via process data bit** (not available with DBC designs)
Use the "Release brake" control bit of the MOVIKIT® control word to release the brake/deactivate DynaStop® for FCB01.
For further information, refer to the corresponding MOVIKIT® documentation.

11.7 DynaStop® in conjunction with STO

⚠ WARNING

The DynaStop® electrodynamic retarding function does not allow for a definite stop at a position.

Severe or fatal injuries.

- DynaStop® must not be used for hoists.
- When using DynaStop® on ascending/descending sections or vertical conveyors without freely suspended loads, you must comply with the basic safety and health requirements (e.g. EC Machinery Directive 2006/42/EC).
- The behavior of the DynaStop® function must be taken into account for the risk assessment of the application that determines the required safety measures.

INFORMATION

For information about using the STO function, refer to chapter "Project planning for functional safety".

The optional DynaStop® function is not safety-related and it is not part of the safety functions described in chapter "Project planning for functional safety".

11.7.1 Using the brake/DynaStop® in conjunction with STO

To use the DynaStop® function in conjunction with the STO function, SEW-EURODRIVE recommends control using the SS1-t safety function.

NOTICE

Activating the FCB01 Output stage inhibit while the drive unit is running will activate DynaStop®. This can cause high torque loads, which may damage the drive unit and the application.

Possible damage to property.

- Activate the FCB01 output stage inhibit only when the speed is "0".

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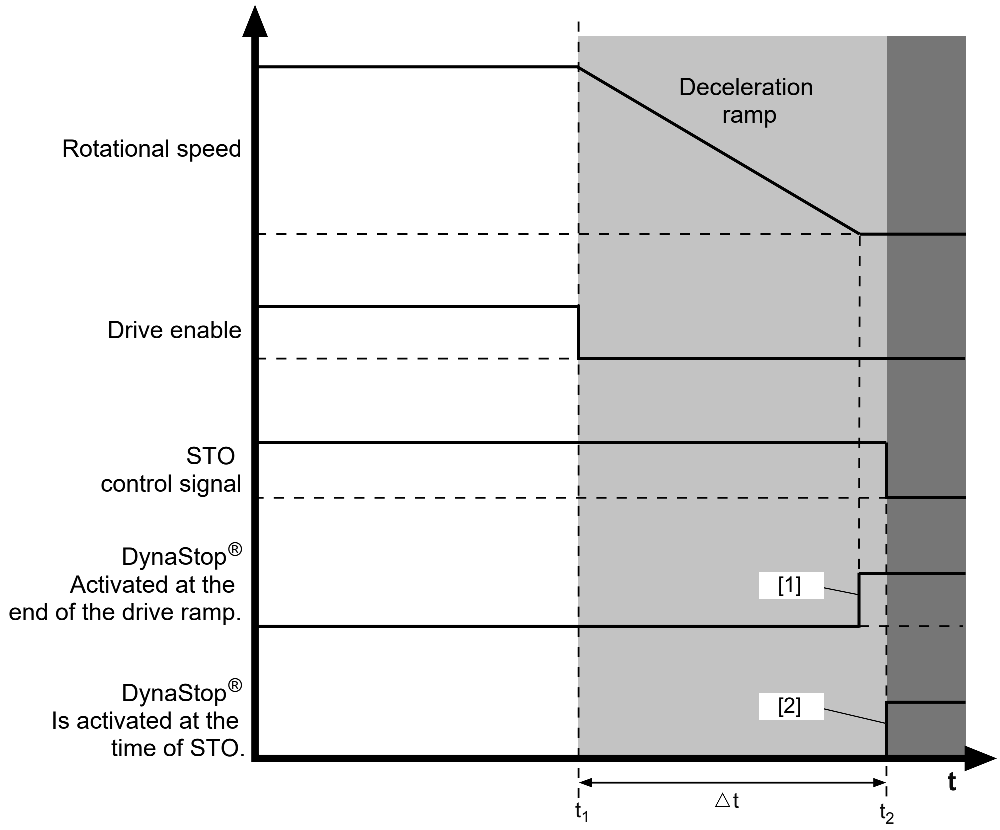
The following figure shows the use of the DynaStop® function in conjunction with the STO function and controller according to SS1-t:



[1] DynaStop® is activated at the end of the downward ramp at standstill.

Parameter setting:

- *Functions* > *Drive functions* > *FCB02 Stop standard* > **Behavior at standstill** = "Drive not energized (brake applied/DynaStop® activated (factory setting)

[2] At the end of the downward ramp, the motor initially remains energized. DynaStop® is activated when STO is triggered.

Parameter settings:

- *Functions* > *Drive functions* > *FCB02 Stop standard* > **Behavior at standstill** = Drive energized (brake released/DynaStop® deactivated)
- *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > Activate DynaStop® with STO = **"1" (factory setting = "0")**

t Time
t_1 Point in time at which the deceleration ramp is initiated
t_2 Point in time at which STO is activated
Δt Time span between initiating the deceleration ramp and STO
Range of safe time delay
Range with active STO function

11.7.2 Drive behavior when STO is activated before rotational speed "0" is reached

NOTICE

Danger due to incorrect parameter setting.

If the parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **Activate DynaStop® for STO** = **"1"**, the DynaStop® function can be activated outside the permitted operating range.
This can cause high torque loads / high motor currents, which may damage the drive unit and the application.

Possible damage to property.

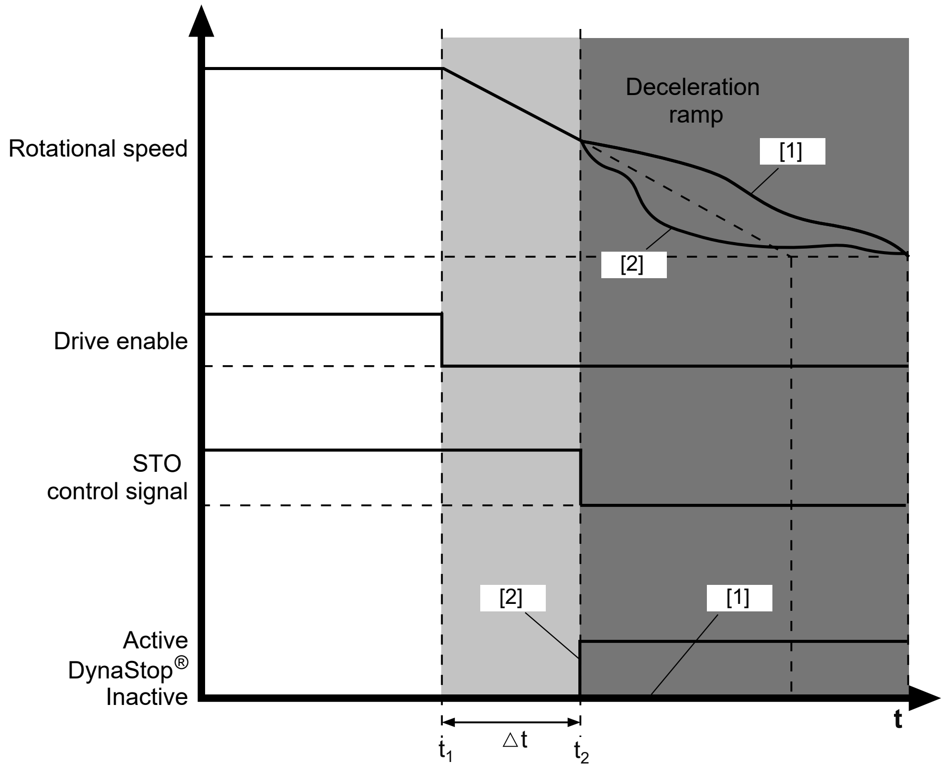
- Use DynaStop® in conjunction with STO with control according to SS1-t.
- Use the factory setting/recommended setting of the parameter.

If STO is activated before speed "0" is reached, If the DynaStop® function behaves according to the setting of parameter *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **Activate DynaStop® for STO**:

Index	Parameter	Setting	Meaning
8501.4	*Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **Activate DynaStop® for STO**	**0 = No** **(Factory setting)**	The DynaStop® status remains unchanged when STO is activated. • Depending on the application, the motor will coast to a stop or even accelerate. • The stopping distance is undefined.
		1 = Yes	DynaStop® is activated (not safety-related) when STO is activated. • If DynaStop® is activated before speed "0" is reached, high torques/motor currents can occur that may damage the drive and the application. • Evaluate the possible consequences. • The stopping distance is undefined.

Recommended setting/factory setting

The following figure shows the behavior when STO is activated before rotational speed "0" is reached:



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[1] Parameter setting:

- *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **Activate DynaStop® for STO** = **0 (No)** factory setting.

[2] Parameter setting:

- *Functions* > *Drive functions* > *FCB01 Output stage inhibit* > **Activate DynaStop® for STO** = **1 (Yes)**

t Time
t_1 Point in time at which the deceleration ramp is initiated
t_2 Point in time at which STO is activated
Δt Time span between initiating the deceleration ramp and STO
Range of safe time delay
Range with active, safety-related STO function

Activating the STO function during the deceleration ramp aborts controlled deceleration:

Reasons for early activation of STO can be:

- Delay time Δt selected too short
- Extension of the deceleration ramp when the current limit is reached, e.g. due to too high load

11.8 IT safety

11.8.1 Hardening measures

Perform the following hardening measures:

- Regularly check if updates are available for your products.
- Report incidents concerning IT security by e-mail to cert@sew-eurodrive.com.
- Regularly check which Security Advisories are available in the Online Support of SEW-EURODRIVE.
- Evaluate the fault memories and diagnostics information of your products regularly and check whether there are entries that affect IT security.

11.8.2 Guidelines for secure operation

The engineering protocol from SEW-EURODRIVE allows authorized personnel to activate various service accesses on the device. Authentication is implemented by using static access data. This data is not used to defend against attacks on IT security but to protect against unintentional modification. This is the reason why it cannot be changed.

To prevent misuse of these service accesses, network access must be restricted according to the state of the art. For more information, refer to section "IT security of the environment" (→ 🗎 12).

11.8.3 Guidelines for user account management

The device has no user accounts.

12 Service

NOTICE

Improper work on the devices can result in damage.

Damage to property.

- Make sure that the devices from SEW-EURODRIVE are repaired by qualified specialists only.
- Consult SEW-EURODRIVE SERVICE.

12.1 Evaluating fault messages

12.1.1 MOVISUITE®

The following section shows a sample evaluation of a fault message in MOVISUITE®:

1. Open the parameter tree in MOVISUITE®.
2. In the parameter tree, select the "Status" node [7].
   ⇨ The **current fault messages** can be found in the "Fault status" group [5].
   ⇨ **Additional information** on the causes for the "Not ready" status can be found in the "Device status" group [6].
   ⇨ Information on the **history of the fault messages** can be found in the "Fault memory" node [4].

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[1] Fault status of the main component
[2] Fault status of the subcomponent
[3] Display of the status bits
[4] Fault memory
[5] Fault status
[6] Device status
[7] Status

12.2 Resetting fault messages

⚠ WARNING

Removing the source of the malfunction or performing a reset can result in an automatic restart of the connected drives.

Severe or fatal injuries.

- Prevent the system from performing an unintentional startup.

Acknowledge a fault message by:

- Switching the supply system off and on again.
- Using the controller/PLC: Send "reset command".

12.3 Fault responses

The following table describes the fault responses to faults:

Fault response	Description
No response	The inverter ignores the event.
Warning with self reset	The inverter issues 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. (Index 8357.13) If 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. (Index 8357.20)
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 results in acknowledgment of the fault. The inverter automatically resumes the operation before the fault occurred. The drive can restart automatically.

12.4 Fault messages with parameterizable response

The following table shows the fault messages with parameterizable responses:

Fault	Description	Index no.	Possible fault response
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 • Warning
Positioning lag error	Here you can set the device response to a lag error (lag error window exceeded, index 8509.4).	8622.3	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Line phase failure	Here you can set the device response to a line phase failure.	8622.4	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
External fault	Here you can set the device response to an external fault (e.g. triggered by terminal or control word).	8622.5	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Fieldbus – timeout	Here you can set how the device responds to a process data timeout on the bus system (timeout time).	8622.6	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage • Warning with self reset • Application stop (with output stage inhibit) with self-reset • Emergency stop (with output stage inhibit) with self-reset • Inhibit output stage with self-reset

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Fault	Description	Index no.	Possible fault response
External synchronization	Here you can set the device response to loss of external synchronization.	8622.7	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage • Warning with self reset • Application stop (with output stage inhibit) with self-reset • Emergency stop (with output stage inhibit) with self-reset • Inhibit output stage with self-reset
Motor temperature prewarning – current parameter set	Motor temperature current parameter set – prewarning.	8442.5	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Electromechanical capacity utilization – prewarning	Here you can set the device response to an exceeded prewarning threshold for electromechanical capacity utilization (index 8336.2).	8622.10	• No response • Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
HW limit switches – current parameter set		8572.1	• No response • Emergency stop (with output stage inhibit) • Emergency stop (with output stage inhibit) with self-reset
SW limit switches – current parameter set		8572.2	• No response • Emergency stop (with output stage inhibit) • Emergency stop (with output stage inhibit) with self-reset

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Fault	Description	Index no.	Possible fault response
Encoder – warning	Here you can set the device response to an encoder warning.	8622.13	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Encoder – fault	Here you can set the device response to an encoder fault.	8622.14	• Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Application heartbeat timeout (only with DSI designs)	Here you can set the device response to a timeout of the application heartbeat.	8622.21	• Warning • Application stop (with output stage inhibit) • Emergency stop (with output stage inhibit) • Inhibit output stage
Fault response in the brake voltage supply	Here you can set how the device responds to a missing voltage supply for the optional 24 V brake control / BES.	8622.26	• No response • Warning • Inhibit output stage

12.5 Responses to fault acknowledgement

12.5.1 Fault acknowledgement

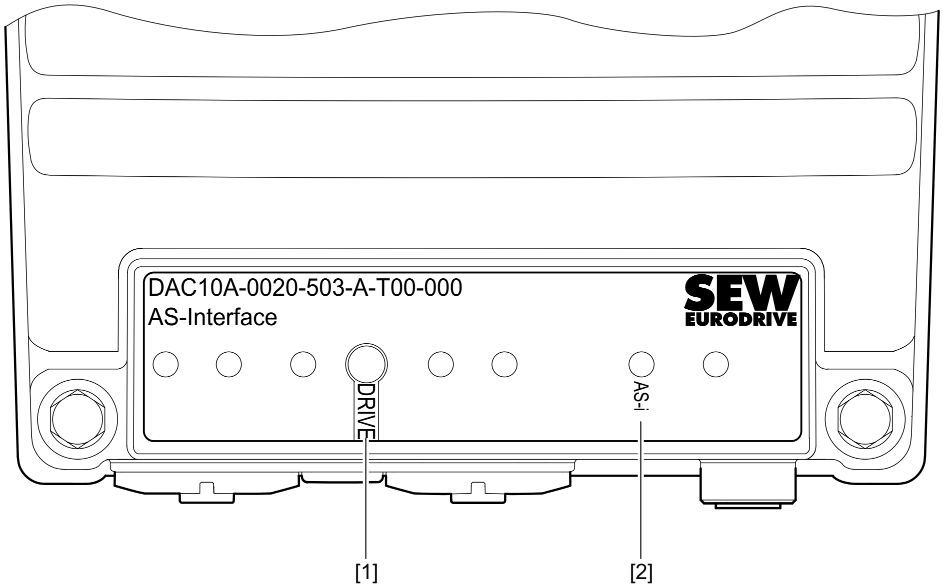
When a fault is acknowledged, the fault end state defines which type of reset is carried out, see following table:

Fault end state	Response to fault acknowledgment
System locked	System restart
System waiting	Warm start: Delete fault code
Only display fault	Warm start: Delete fault code

12.6 Status and operating displays

12.6.1 Overview of the LEDs for AS-Interface

The following figure shows an example of the LEDs of the AS-Interface design:



18014427523379339

[1]	"DRIVE" status LED
[2]	LED "AS-i"

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12.6.2 General LEDs

"DRIVE" status LED

The following table describes the display functions of the "DRIVE" LED:

LED	Operating status/		Meaning	Measure
	Fault code	Subfault code		
– **Off**	Not ready for operation		Line voltage absent.	Power on the line voltage.
Yellow **Flashing very rapidly, 4 Hz**	Not ready for operation		Initialization phase	Wait until initialization is complete.
Green/yellow **Flashing with changing colors, 0.5 Hz** **(1 × green, 1 × yellow)**	Ready for operation, but device inhibited.		The "STO" signal is active.	Deactivate the "STO" signal.
Yellow **Flashing slowly, 0.5 Hz**	Ready for operation, but manual mode/ local mode, device inhibited.		Line voltage is OK.	–
Yellow **Flashes rapidly, 2 Hz**	Ready		Deactivating DynaStop® without drive enable active.	–
Yellow **Steady light**	Ready for operation, but device inhibited.		Line voltage is OK. The output stage is inhibited.	–
Green **Flashing slowly, 0.5 Hz**	Device enabled, but condition manual operation/local mode		The output stage is enabled. The motor is in operation.	–
Green **Flashing very rapidly, 4 Hz**	Device enabled, but current limit active.		The drive is at the current limit.	Reduce the load.
Green **Steady light**	Device enabled.		The output stage is enabled. The motor is in operation.	–
Yellow/red **Flashing with changing colors, 1 Hz** **(2 × yellow, 2 × red)**	Ready		A displaying fault is present. The output stage is inhibited.	Refer to chapter "Fault description" in the product manual for possible measures.

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LED	Operating status/		Meaning	Measure
	Fault code	Subfault code		
Green/red **Flashing with changing colors, 1 Hz** **(2 × green, 2 × red)**	Ready		A displaying fault is present. The output stage is enabled. The motor is in operation.	Refer to chapter "Fault description" in the product manual for possible measures.

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LED	Operating status/ Fault code	Subfault code	Meaning	Measure
Red **Flashing, 1 Hz**	3	1	Ground fault	Refer to chapter "Fault description" in the product manual for possible measures.
	4	1	Brake chopper fault	
	6	1	Line fault	
	7	1	DC link fault	
	8	1, 2, 3	Speed monitoring fault	
	9	1, 2, 5, 6, 9, 10	Control mode fault	
	10	1, 3 – 11	Data Flexibility fault	
	11	1 – 6	Temperature monitoring fault	
	12	1, 2	Brake fault	
	13	5, 24	Encoder 1 fault	
	16	5 – 8, 10, 20 – 27	Startup fault	
	19	1 – 9	Process data fault	
	20	2, 11	Device monitoring fault	
	23	4	Power section fault	
	25	2 – 7, 20, 21, 30,31, 61, 70	Parameter memory monitoring	
	26	1, 3	External fault	
	28	1, 12 – 14	FCB drive function fault	
	29	1 – 4	Hardware limit switch fault	
	30	1 – 3	Software limit switch fault	
	31	1 – 4, 7, 9	Thermal motor protection fault	
	32	2 – 6, 12	Communication fault	
	33	11, 12, 13	System initialization fault	
	34	1	Process data configuration fault	
	35	1 – 5	Function activation fault	
	42	1 – 3	Lag error	
	44	2, 3, 4	Fault overcurrent phase U, V, W	
	46	2, 3, 50 51, 52	Safety card fault	
	51	1	Analog processing fault	

LED	Operating status/ Fault code	Subfault code	Meaning	Measure
Red **Steady light**	1	1, 2	Output stage monitoring fault	Contact SEW-EURODRIVE Service.
	4	2	Brake chopper fault	
	7	2	DC link fault	
	9	3, 4, 8	Control mode fault	
	10	2, 99	Data Flexibility fault	
	11	7, 8	Temperature monitoring fault	
	13	1, 3, 6, 7, 8, 9, 11, 13, 15, 22, 23	Encoder 1 fault	
	16	2, 11, 12. 30	Startup fault	
	17	7	Internal processor fault	
	18	1, 3, 4, 7, 8, 9, 10, 12, 13	Software error	
	20	1, 7	Device monitoring fault	
	21	1	S-Drive 1 fault	
	23	5, 6, 7, 8	Power section fault	
	25	10, 12 – 19, 50, 51, 81	Parameter memory monitoring	
	28	13	FCB drive function fault	
	33	1, 2, 6, 7, 8, 10	System initialization fault	
	46	1	Safety card fault	

12.6.3 Bus-specific LEDs for AS-Interface

LED "AS-i"

The following table shows the display functions of the "AS-i" LED:

LED	Operating status/	Meaning	Measure
– **Off**	Not ready for operation	Line voltage absent.	Power on the line voltage. Wait until initialization is complete.
		The firmware of the subcomponent is not compatible to the used hardware.	Contact SEW-EURODRIVE Service.
		The firmware of the subcomponent cannot be started.	Contact SEW-EURODRIVE Service.
Green **Steady light**	Ready	The device works in normal operation.	–
Yellow **Flashing**	Not ready for operation	A firmware update of the sub component is running.	Wait for the update to be completed.
Red **Flashing**	Not ready for operation	The communication to the AS-Interface master is interrupted.	Check the AS-Interface connection of the device. Check the configuration of the AS-Interface master. Check all connections of the AS-Interface installation.
1 × red, 1 × yellow **Flashing**	Not ready for operation	The station address is set to 0.	Set a valid station address.
2 × red, 2 × yellow **Flashing**	Not ready for operation	The AS-Interface master has detected an address conflict. The address is used by another station.	Set an unused station address.
Red **Steady light**	Not ready for operation	The AS-Interface communication is interrupted.	Check the AS-Interface connection of the device. Check all connections of the AS-Interface installation.

12.7 Fault description

12.7.1 Fault 1 Output stage monitoring

Fault: 1.1 (0101hex | 257dec) **Description: Overcurrent on motor output terminals**		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit at the motor output.	– Check motor cable for short circuit. – Remove the short circuit.
	Power output stage defective.	Contact SEW-EURODRIVE Service.
	Motor current too high.	Connect a smaller motor.

Fault: 1.2 (0102hex | 258dec) **Description: Overcurrent in output stage**		
	Response: Output stage inhibit	
	Cause	Measure
	Motor current too high.	Connect a smaller motor.
	Current controller of intelligent supply module set incorrectly.	Contact SEW-EURODRIVE Service.
	Ramp time too short.	Increase the ramp time.
	One of the following components is faulty: – Internal current supply – Current measurement – Phase module	Contact SEW-EURODRIVE Service.
	External DC 24 V supply voltage instable.	Check the DC 24 V supply voltage.
	The voltage fluctuations are too strong. The current controller of the intelligent power supply module cannot compensate for them.	– Stabilize the voltage. – Check the supply. – Check the project planning.

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12.7.2 Fault 3 Ground fault

Fault: 3.1 (0301hex | 769dec)

Description: Ground fault

Response: Output stage inhibit

Cause	Measure
Ground fault in the motor lead.	Eliminate the ground fault.
Ground fault in the inverter.	Contact SEW-EURODRIVE Service.
Ground fault in the motor.	Eliminate the ground fault.
Ground fault in line components.	Eliminate the ground fault.
Ground fault detected in the storage line.	Eliminate the ground fault.
Ground fault detected in the store	Contact the service department of the respective store manufacturer.

12.7.3 Fault 4 Brake chopper

Fault: 4.1 (0401hex | 1025dec)

Description: Overcurrent in brake chopper

Response: Output stage inhibit

Cause	Measure
Excessive regenerative power.	Decrease deceleration.
Short circuit in braking resistor circuit.	Check supply cable to braking resistor.
Braking resistor impedance too low.	Check the minimum permitted resistance value of the braking resistor and connected a suitable braking resistor.

Fault: 4.2 (0402hex | 1026dec)

Description: Brake chopper defective

Response: Output stage inhibit

Cause	Measure
Brake chopper defective.	Contact SEW-EURODRIVE Service.

12.7.4 Fault 6 Line fault

Fault: 6.1 (0601hex | 1537dec)

Description: Line phase failure

Response: Line phase failure

Cause	Measure
Line phase missing.	Check the power supply cable.
Poor line voltage quality.	Check supply (fuses, contactor, line compo-nents).
DC link voltage periodically too low.	Check the line voltage.

12.7.5 Fault 7 DC link

Fault: 7.1 (0701hex | 1793dec) Description: DC link overvoltage		
	Response: Output stage inhibit	
	Cause	Measure
	Maximum permitted DC link voltage limit exceeded.	– Check the connection of the braking resistor. – Decrease deceleration. – Check the configuration of the braking resistor (resistance value).

12.7.6 Fault 8 Speed monitoring

Fault: 8.1 (0801hex | 2049dec) 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 delay time of speed monitoring. – Reduce the load. – Increase current limiting/torque limiting. – Reduce the acceleration. – Check the motor cable, motor, and line phases.
	Encoder not connected correctly.	Check the encoder connection.
	Encoder has incorrect direction of rotation.	Check the direction of rotation.

Fault: 8.2 (0802hex | 2050dec) 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 delay time of speed monitoring. – Reduce the load. – Increase current limiting/torque limiting. – Decrease deceleration. – Check the motor cable, motor, and line phases.
	Encoder not connected correctly.	Check the encoder connection.
	Encoder has incorrect direction of rotation.	Check the direction of rotation.

Fault: 8.3 (0803hex | 2051dec) Description: Maximum speed at motor shaft exceeded		
	Response: Output stage inhibit	
	Cause	Measure
	The actual speed has exceeded the limit value "Maximum speed at motor shaft". This limit value is set to match the motor and gear unit at startup.	Reduce the maximum motor speed.
	The setpoint is too high.	Reduce the setpoint
	The motor is driven by the load.	Check the project planning of the drive.

12.7.7 Fault 9 Control mode

Fault: 9.1 (0901hex | 2305dec) Description: Magnetization of motor not possible		
	Response: Output stage inhibit	
	Cause	Measure
	User-defined current limit or output stage monitoring has reduced the possible maximum current to such a degree that the required magnetizing current cannot be set.	– Reduce output stage utilization by reducing the PWM frequency or the load. – Increase user-defined current limit. – Connect a smaller motor.

Fault: 9.2 (0902hex | 2306dec) Description: Operating mode not possible with active control mode		
	Response: Output stage inhibit	
	Cause	Measure
	The active control mode does not support the operating mode selected in the current FCB. EXAMPLE: The U/f control mode does not support the "position control" or "torque control" FCB.	– Use a control mode that supports the required operating mode. If necessary, connect an encoder. or – Select an operating mode that is supported by the current control mode.

Fault: 9.3 (0903hex | 2307dec) Description: Absolute rotor position not available		
	Response: Output stage inhibit	
	Cause	Measure
	The active control mode requires an absolute rotor position. The encoder set as the source of the actual speed does not provide an absolute rotor position.	– Use an absolute encoder. or – Identify the rotor position using FCB 18.

Fault: 9.4 (0904hex | 2308dec)	
Description: Correct current supply of motor not possible	
Response: Output stage inhibit	
Cause	Measure
With active current monitoring during premagnetization, the required current could not be impressed into the motor.	– Check motor cable. – Check motor windings. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service. NOTE to SEW-EURODRIVE Service: Check output stage.

Fault: 9.5 (0905hex | 2309dec)	
Description: Maximum output frequency exceeded	
Response: Output stage inhibit	
Cause	Measure
The maximum output frequency has been exceeded.	– Reduce maximum rotation speed/maximum speed. – Reduce setpoint.

Fault: 9.6 (0906hex | 2310dec)	
Description: Maximum model speed exceeded	
Response: Output stage inhibit	
Cause	Measure
The motor speed calculated in ELSM® control mode is too high for motor control.	– Reduce the sampling cycle ("Sampling cycle n/x control" parameter). – Reduce the speed.

Fault: 9.8 (0908hex | 2312dec)	
Description: Motor protection function – demagnetization	
Response: Output stage inhibit	
Cause	Measure
The motor is blocked.	Check the motor for blockage.
Motor has already been operated at a speed below the transition speed for too long.	Check the drive selection.
Motor has not been started up properly.	Perform motor startup again and run the drive function "FCB 25 Motor parameter measurement".

Fault: 9.9 (0909hex | 2313dec)	
Description: Parameter measurement not possible with active motor type	
Response: Output stage inhibit	
Cause	Measure
Only the parameters of an asynchronous motor or synchronous motor can be measured.	Omit parameter measurement.

Fault: 9.10 (090Ahex | 2314dec) **Description: Rotor stall monitoring**		
	Response: Output stage inhibit	
	Cause	Measure
	Current control cannot hold load torque.	Reduce the load.

Fault: 9.11 (090Bhex | 2315dec) **Description: Standstill current function not possible**		
	Response: Output stage inhibit	
	Cause	Measure
	In ELSM® control mode, the standstill current function can only be used if the rotor position can be measured.	Activate rotor position measurement and perform the drive function "FCB 25 Motor parameter measurement".

Fault: 9.13 (090Dhex | 2317dec) **Description: Torque control not within valid speed range**		
	Response: Output stage inhibit	
	Cause	Measure
	Motor speed too low.	– Perform motor startup again and run the drive function "FCB 25 Motor parameter measurement". – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.
	The flying start function is deactivated.	Activate the flying start function.
	The motor is blocked.	Check the motor for blockage.

Fault: 9.14 (090Ehex | 2318dec) **Description: Transition of open-loop speed control to closed-loop speed control failed**		
	Response: Output stage inhibit	
	Cause	Measure
	The motor is blocked.	Check the motor for blockage.
	The motor accelerates too slowly.	Check the setting of the speed controller parameter "Load moment of inertia".
	Ohmic resistance was measured incorrectly.	If the ohmic resistance of the motor cable is less than 10% of the ohmic resistance of the motor winding, deactivate the parameter "Measure stator resistance".
	Motor has not been started up properly.	Perform motor startup again and run the drive function "FCB 25 Motor parameter measurement".
	The drive is overloaded by mechanical sluggishness.	– Reduce the load. – Check the mechanical components. – Check the drive selection.

Fault: 9.15 (090Fhex | 2319dec) Description: Timeout	
Response: Output stage inhibit	
Cause	Measure
The parameterization of the motor model is implausible.	– Perform motor startup again and run the drive function "FCB 25 Motor parameter measurement". – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

12.7.8 Fault 10 Data Flexibility

Fault: 10.1 (0A01hex | 2561dec) Description: Initialization fault	
Response: Application stop + output stage inhibit	
Cause	Measure
Fault detected in the init task. The return code is not equal to 0.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.2 (0A02hex | 2562dec) Description: Illegal program command	
Response: Application stop + output stage inhibit	
Cause	Measure
Unknown program command (illegal opcode) detected in Data Flexibility program.	Check the program. Contact SEW-EURODRIVE Service.
The version of the MOVIKIT® software module in use is not compatible with the current firmware version of the device.	– Adjust the firmware version of the device according to the version overview in the installation notes. or – Adjust the version of the MOVIKIT® software module according to the version overview in the installation notes. In the context menu of the device, execute the [Adjust version and device] menu command.

Fault: 10.3 (0A03hex | 2563dec) Description: Memory access faulty	
Response: Application stop + output stage inhibit	
Cause	Measure
Memory area violated while accessing array. For example, an address that does not exist or is not permitted was addressed.	Check the program. Contact SEW-EURODRIVE Service.

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Fault: 10.4 (0A04hex | 2564dec) Description: Stack overflow		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Overflow of Data Flexibility stack detected.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.5 (0A05hex | 2565dec) Description: Division by 0		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Division by 0 was performed in the program.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.6 (0A06hex | 2566dec) Description: Runtime error		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Watchdog has detected a fault. The program runtime exceeds the permitted time.	Check the program. Contact SEW-EURODRIVE Service.
	Execution time of PDI task or PDO task exceeds permitted time.	– Use slicing mode. – Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.7 (0A07hex | 2567dec) Description: Calculation result too large		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Calculation result of multiplication/division command exceeds 32 bits.	Check the program. Contact SEW-EURODRIVE Service.
	Failed to write calculation result of multiplication/division command into result variable.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.8 (0A08hex | 2568dec) Description: Illegal connection		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The parameter index to be linked with the connect command in the init task does not exist or is not permitted for access via process data (see parameter list).	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.9 (0A09hex | 2569dec) Description: CRC fault		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The checksum (CRC) is incorrect. This can be due to the following reasons: – The program memory is corrupt. – Unauthorized write access was executed on the program memory.	Adjust the program and load it again.

Fault: 10.10 (0A0Ahex | 2570dec) Description: Setpoint cycle time not supported		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The set setpoint cycle time is not supported.	Set the setpoint cycle time to the default value of 1 ms.

Fault: 10.11 (0A0Bhex | 2571dec) Description: No application program loaded		
	Response: Output stage inhibit	
	Cause	Measure
	No Data Flexibility application program loaded.	– Load program. or – Deactivate Data Flexibility.

Fault: 10.12 (0A0Chex | 2572dec) Description: Runtime warning		
	Response: Warning	
	Cause	Measure
	The program requires more runtime than has been configured.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.20 (0A14hex | 2580dec) Description: Application fault – warning		
	Response: Warning	
	Cause	Measure
	Fault detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

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Fault: 10.21 (0A15hex | 2581dec)		
Description: Application fault – application stop + output stage inhibit		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Fault detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.22 (0A16hex | 2582dec)		
Description: Application fault – emergency stop + output stage inhibit		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Fault detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.23 (0A17hex | 2583dec)		
Description: Application fault – output stage inhibit		
	Response: Output stage inhibit	
	Cause	Measure
	Fault detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.24 (0A18hex | 2584dec)		
Description: Application fault – warning with self-reset		
	Response: Warning with self-reset	
	Cause	Measure
	Fault detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.25 (0A19hex | 2585dec)		
Description: Application fault – application stop + output stage inhibit with self-reset		
	Response: Application stop + output stage inhibit with self-reset	
	Cause	Measure
	Fault detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.26 (0A1Ahex | 2586dec)		
Description: Application fault – emergency stop + output stage inhibit with self-reset		
	Response: Emergency stop + output stage inhibit with self-reset	
	Cause	Measure
	Fault detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.27 (0A1Bhex | 2587dec)		
Description: Application fault – output stage inhibit with self-reset		
	Response: Output stage inhibit with self-reset	
	Cause	Measure
	Fault detected in the application program.	Check the program. Contact SEW-EURODRIVE Service.

Fault: 10.99 (0A63hex | 2659dec)		
Description: Unknown fault		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Unknown Data Flexibility fault detected.	Contact SEW-EURODRIVE Service.

12.7.9 Fault 11 Temperature monitoring

Fault: 11.1 (0B01hex | 2817dec)		
Description: Heat sink overtemperature		
	Response: Output stage inhibit	
	Cause	Measure
	The capacity utilization is too high. Maximum permitted heat sink temperature exceeded.	– Reduce the load. – Reduce the PWM frequency. – Reduce the ambient temperature.
	Air circulation disrupted. Maximum permitted heat sink temperature exceeded.	– Check air circulation. – Ensure sufficient cooling.
	The fan (if available) is defective. Maximum permitted heat sink temperature exceeded.	Contact SEW-EURODRIVE Service.
	Temperature sensor defective. Maximum permitted heat sink temperature exceeded.	Contact SEW-EURODRIVE Service.

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Fault: 11.2 (0B02hex | 2818dec)		
Description: Heat sink utilization – prewarning		
	Response: Heat sink utilization – prewarning	
	Cause	Measure
	High thermal load on heat sink of device. Prewarning threshold reached.	– Reduce the load. – Reduce the PWM frequency. – Reduce the ambient temperature.
	Air circulation disrupted. Prewarning threshold reached.	– Check air circulation. – Ensure sufficient cooling.
	The fan (if available) is defective. Prewarning threshold reached.	Contact SEW-EURODRIVE Service.
	Temperature sensor defective. Prewarning threshold reached.	Contact SEW-EURODRIVE Service.
	Unfavorable air convection.	Check the air convection.

Fault: 11.3 (0B03hex | 2819dec)		
Description: Device utilization		
	Response: Output stage inhibit	
	Cause	Measure
	The mean output current is too high. The device utilization has reached or exceeded the switch-off threshold.	– Reduce the load. – Check motor/inverter combination.
	The PWM frequency is too high. The device utilization has reached or exceeded the switch-off threshold.	Reduce the PWM frequency.
	The ambient temperature is too high. The device utilization has reached or exceeded the switch-off threshold.	Reduce the ambient temperature.
	Air circulation disrupted. The device utilization has reached or exceeded the switch-off threshold.	– Check air circulation. – Ensure sufficient cooling.
	The fan (if available) is defective. The device utilization has reached or exceeded the switch-off threshold.	Contact SEW-EURODRIVE Service.

Fault: 11.5 (0B05hex | 2821dec)		
Description: Electromechanical capacity utilization		
	Response: Output stage inhibit	
	Cause	Measure
	Electromechanical components of the device overloaded by excessive continuous current.	Reduce the load.

Fault: 11.6 (0B06hex | 2822dec)		
Description: Electromechanical capacity utilization – prewarning		
	Response: Electromechanical capacity utilization – prewarning	
	Cause	Measure
	High load on electromechanical components of the device due to high continuous current. Prewarning threshold reached.	Reduce the load.

Fault: 11.7 (0B07hex | 2823dec)		
Description: Wire break at temperature sensor of heat sink		
	Response: Output stage inhibit	
	Cause	Measure
	Wire break detected at temperature sensor of heat sink.	Contact SEW-EURODRIVE Service.

Fault: 11.8 (0B08hex | 2824dec)		
Description: Short circuit at temperature sensor of heat sink		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit detected at temperature sensor of heat sink.	Contact SEW-EURODRIVE Service.

Fault: 11.9 (0B09hex | 2825dec)		
Description: Overtemperature of signal electronics		
	Response: Output stage inhibit	
	Cause	Measure
	Maximum permitted temperature of signal electronics exceeded.	– Reduce the load. – Reduce the ambient temperature.

Fault: 11.10 (0B0Ahex | 2826dec)		
Description: Wire break at temperature sensor of signal electronics		
	Response: Output stage inhibit	
	Cause	Measure
	Wire break detected at temperature sensor of signal electronics.	Contact SEW-EURODRIVE Service.

Fault: 11.11 (0B0Bhex | 2827dec)		
Description: Short circuit at temperature sensor of signal electronics		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit at temperature sensor of signal electronics.	Contact SEW-EURODRIVE Service.

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12.7.10 Fault 12 Brake

Fault: 12.1 (0C01hex | 3073dec) **Description: Brake output fault**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	No brake connected.	– Check the brake connection. – Check the startup.
	Brake cable disconnected in switched-on state.	Check the connection of the brake.
	The brake was overloaded by an overcurrent > 2 A.	– Make sure that the connected brake is permitted. – Check the brake.
	The brake was overloaded by frequent connection (> 0.5 Hz).	Reduce the switching frequency of the brake.

Fault: 12.2 (0C02hex | 3074dec) **Description: DC 24 V brake voltage not within permitted tolerance range**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	DC 24 V supply voltage not within permitted tolerance of 24 – 26.4 V.	Check the DC 24 V supply voltage.

Fault: 12.3 (0C03hex | 3075dec) **Description: Brake temperature not within permitted range**		
	Response: Output stage inhibit	
	Cause	Measure
	Brake temperature is outside the permitted range (too low or too high).	Check ambient conditions and the application.
	In the case of decentralized devices, the overvoltage of the DC link is dissipated via the brake. As a result, the temperature of the brake is too high.	Check the application for how often generator mode occurs.

Fault: 12.4 (0C04hex | 3076dec) **Description: Brake control module missing**		
	Response: Output stage inhibit	
	Cause	Measure
	Brake control has been activated even though the device is not equipped with a corresponding module.	Select another brake type or brake connection.

Fault: 12.5 (0C05hex | 3077dec)		
Description: Short circuit on the brake		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit on the brake.	Check the brake connection.

Fault: 12.7 (0C07hex | 3079dec)		
Description: Overcurrent in the brake		
	Response: Output stage inhibit	
	Cause	Measure
	Brake coil defective.	Replace the brake.
	The brake requires more current than the brake control electronics can supply.	– Check the parameterization of the brake. – Use a suitable brake/brake control electronics.

Fault: 12.8 (0C08hex | 3080dec)		
Description: Supply voltage fault		
	Response: Brake supply voltage fault	
	Cause	Measure
	The fault can be caused as follows: – The supply voltage of the brake rectifier is outside the valid range. – The supply voltage of the brake rectifier is not available.	– Check the supply voltage. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 12.9 (0C09hex | 3081dec)		
Description: Plausibility fault		
	Response: Output stage inhibit	
	Cause	Measure
	No brake connected.	Connect a brake.
	Brake connected incorrectly.	Check and correct the brake connection.
	Wrong brake taken into operation.	Check the startup.

Fault: 12.20 (0C14hex | 3092dec)		
Description: Digital motor integration – critical fault		
	Response: Output stage inhibit with self-reset	
	Cause	Measure
	The intelligent brake rectifier of digital motor integration has detected a critical fault.	Observe the fault message of the subslave. Identify the exact cause of this fault message and take the appropriate measures to eliminate the fault.

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Fault: 12.21 (0C15hex | 3093dec) 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 fault.	Observe the fault message of the subslave. Identify the exact cause of this fault message and take the appropriate measures to eliminate the fault.

Fault: 12.22 (0C16hex | 3094dec) Description: Digital motor integration – warning		
	Response: Warning with self-reset	
	Cause	Measure
	The intelligent brake rectifier of digital motor integration has signaled a warning.	Observe the warning of the subslave. Identify the exact cause of this warning and take the appropriate measures for elimination.

Fault: 12.23 (0C17hex | 3095dec) Description: Digital motor integration – timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Communication with intelligent brake rectifier disrupted.	Check the connection.

Fault: 12.24 (0C18hex | 3096dec) Description: Digital motor integration – initialization fault		
	Response: Output stage inhibit	
	Cause	Measure
	Initialization of intelligent brake rectifier has failed.	– Acknowledge the fault. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

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12.7.11 Fault 13 Encoder 1

Fault: 13.1 (0D01hex | 3329dec) **Description: Fault during 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 wiring of the track signals. – Check for EMC-compliant installation. – Replace the encoder. – Replace the encoder card. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.2 (0D02hex | 3330dec) **Description: Unknown encoder type**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Encoder type not known and not supported by the device.	– Check the encoder type. – Contact SEW-EURODRIVE Service. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.3 (0D03hex | 3331dec) Description: Invalid data		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Invalid encoder nameplate data (measuring steps/pulses per revolution/multi-turn).	Use a different encoder type. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
	The ratio of motor encoder resolution and distance encoder resolution is too large.	– Check the startup. – Check the project planning. – Check whether a suitable encoder is being used. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.
	The number of pole pairs of the resolver is not equal to 1 in "Single-turn absolute position" position mode.	– Change the positioning mode of the encoder. – Use a resolver that has 1 as its number of pole pairs.

Fault: 13.4 (0D04hex | 3332dec) Description: Track measurement fault		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Fault detected during track measurement.	– Switch the device off and on again. – Check the wiring. – Check for EMC-compliant installation. – Check the encoder. Replace if necessary. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.5 (0D05hex | 3333dec) Description: Internal warning		
	Response: Encoder – warning	
	Cause	Measure
	Encoder has signaled a warning.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Clean the sensor.

Fault: 13.6 (0D06hex | 3334dec)		
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. – Check for EMC-compliant installation. – Check the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.7 (0D07hex | 3335dec)		
Description: Signal level too high		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The value of one or both of the track signals A and B exceeds the permitted limit.	Check the gear ratio of the resolver that is being used.

Fault: 13.8 (0D08hex | 3336dec)		
Description: Fault during 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 mounting position of the resolver.

Fault: 13.9 (0D09hex | 3337dec)		
Description: Fault during quadrant check		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Fault checking quadrants (sine tracks/cosine tracks).	– Switch the device off and on again. – Check the wiring. – Check for EMC-compliant installation. – Check the encoder. Replace if necessary. INFORMATION 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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Fault: 13.10 (0D0Ahex | 3338dec)		
Description: Positional tolerance range exceeded		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Jump in position impermissibly large.	– Check the startup parameters. – Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Replace the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.11 (0D0Bhex | 3339dec)		
Description: Encoder data timeout		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Internal fault detected in resolver evaluation.	Check for EMC-compliant installation.
	1Communication to the encoder has failed.	Contact SEW-EURODRIVE Service.

Fault: 13.12 (0D0Chex | 3340dec)		
Description: Emergency		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	CANopen encoder signals an emergency.	For measures to correct the fault, refer to the documentation of the respective encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.13 (0D0Dhex | 3341dec)		
Description: Initialization fault		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Communication fault during initialization.	– Check the wiring. – Check the startup parameters. – Check the encoder settings. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.14 (0D0Ehex | 3342dec) Description: Communication fault	
Response: Encoder 1 – latest fault	
Cause	Measure
Faulty communication with encoder.	– Check the voltage supply. – Check for EMC-compliant installation. – Check the wiring. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.15 (0D0Fhex | 3343dec) Description: System fault	
Response: Encoder 1 – latest critical fault	
Cause	Measure
System fault while evaluating encoder.	– Check the setting of the encoder numerator/denominator factors. – Check whether the frame length matches the set transmission rate. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.16 (0D10hex | 3344dec) Description: High level in signal cable – critical fault	
Response: Encoder 1 – latest critical fault	
Cause	Measure
Permanent high level of data signal detected.	– Check the wiring. – Check the encoder. INFORMATION 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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Fault: 13.17 (0D11hex | 3345dec) **Description: High level in signal cable – fault**		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Permanent high level of data signal detected.	– Check the wiring. – Check the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.18 (0D12hex | 3346dec) **Description: Low level in signal cable – critical fault**		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	Permanent low level of data signal detected.	– Check the wiring. – Check the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.19 (0D13hex | 3347dec) **Description: Low level in signal cable – fault**		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Permanent low level of data signal detected.	– Check the wiring. – Check the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.20 (0D14hex | 3348dec) Description: SSI encoder – critical fault	
Response: Encoder 1 – latest critical fault	
Cause	Measure
SSI encoder has detected a critical fault.	– Check the startup parameters. – Check the settings on the SSI encoder. – Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Replace the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive even with a faulty external position encoder.

Fault: 13.21 (0D15hex | 3349dec) Description: SSI encoder – fault	
Response: Encoder 1 – latest fault	
Cause	Measure
SSI encoder has detected a fault.	– Check the startup parameters. – Check the settings on the SSI encoder. – Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Replace the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive even with a faulty external position encoder.

Fault: 13.22 (0D16hex | 3350dec) Description: Critical internal fault	
Response: Encoder 1 – latest critical fault	
Cause	Measure
Encoder has detected an internal fault.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Replace the encoder. INFORMATION 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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Fault: 13.23 (0D17hex | 3351dec) Description: Internal fault		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Encoder has detected an internal fault. INFORMATION The encoder fault code is displayed in MOVISUITE® in the [Diagnostics] > [Fault memory T.] parameter group in the "Internal" parameter.	– Check the wiring. – Check interference sources (light beam interrupted, reflector, signal cables, etc.). – Replace the encoder. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.24 (0D18hex | 3352dec) Description: Travel range exceeded		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Current position mode does not allow for larger travel range.	– Ensure that the multi-turn encoder remains within the configured track range. – Check the limits. – Check the "Position mode" parameter. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

Fault: 13.25 (0D19hex | 3353dec) Description: Fault during encoder startup		
	Response: Output stage inhibit	
	Cause	Measure
	Fault during encoder startup.	Switch the device off, check the connection of the encoder, and switch the device on again.

Fault: 13.26 (0D1Ahex | 3354dec) Description: Digital motor integration – critical fault		
	Response: Encoder 1 – latest critical fault	
	Cause	Measure
	The encoder of the digital motor integration has detected a fault. The exact cause of the fault is displayed in the fault status of the subslave.	– Check for EMC-compliant installation. – Replace the encoder.

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Fault: 13.27 (0D1Bhex | 3355dec)		
Description: Digital motor integration – fault		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	The encoder of the digital motor integration has detected a fault. The exact cause of the fault is displayed in the fault status of the subslave.	– Check for EMC-compliant installation. – Replace the encoder.

Fault: 13.28 (0D1Chex | 3356dec)		
Description: Digital motor integration – warning		
	Response: Encoder – warning	
	Cause	Measure
	The encoder of the digital motor integration has signaled a warning. The exact cause of the fault is displayed in the fault status of the subslave.	Check for EMC-compliant installation.

Fault: 13.29 (0D1Dhex | 3357dec)		
Description: Absolute position invalid		
	Response: Encoder 1 – latest fault	
	Cause	Measure
	Diagnostics fault detected while evaluating absolute encoder position. Referencing has been canceled.	– Reference the drive again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service. INFORMATION In "Emergency mode" manual mode, you can move the drive using the motor encoder even if the external position encoder is faulty.

12.7.12 Fault 16 Startup

Fault: 16.1 (1001hex | 4097dec)		
Description: Writing motor parameters with active FCB 25		
	Response: Output stage inhibit	
	Cause	Measure
	A motor parameter has been written while FCB 25 is still active.	Deactivate FCB 25.

Fault: 16.2 (1002hex | 4098dec)		
Description: Cannot calculate controller parameters		
	Response: Output stage inhibit	
	Cause	Measure
	Long delay of encoder used prevents calculation of required filter coefficients.	Use an encoder with a shorter delay.

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Fault: 16.3 (1003hex | 4099dec) Description: Thermal motor model not possible		
	Response: Output stage inhibit	
	Cause	Measure
	Startup of thermal model not yet completed or its parameterization is invalid.	Perform startup again.

Fault: 16.5 (1005hex | 4101dec) Description: Current limit smaller than magnetizing current of the motor		
	Response: Output stage inhibit	
	Cause	Measure
	Current limit smaller than magnetizing current of motor calculated by active control mode.	Increase the current limit.

Fault: 16.6 (1006hex | 4102dec) Description: Control mode not possible		
	Response: Output stage inhibit	
	Cause	Measure
	Wrong control mode selected for the motor.	Choose a suitable control mode.
	When starting up a synchronous third-party motor, some control modes and drive functions are only permitted after a motor parameter measurement.	Perform a motor parameter measurement using the FCB 25 drive function.

Fault: 16.7 (1007hex | 4103dec) Description: PWM frequency not possible		
	Response: Output stage inhibit	
	Cause	Measure
	The set speed controller sampling cycle of 1 ms is not possible with the set PWM frequency.	– Set a PWM frequency of 4, 8, or 16 kHz. or – Adjust the sampling cycle.
	The motor requires a higher PWM frequency than the inverter can provide.	Use an inverter with suitable PWM frequency.
	The ELSM® control mode can only be used with an inverter that supports PWM frequencies of 2.5, 4 or 8 kHz.	Use an inverter with suitable PWM frequency.
	The FCB 25 drive function can only be used with an inverter that supports PWM frequencies of 2.5, 4 or 8 kHz.	Use an inverter with suitable PWM frequency.
	The FCB 18 drive function can only be used with an inverter that supports PWM frequencies of 2.5, 4 or 8 kHz.	Use an inverter with suitable PWM frequency option.

Fault: 16.8 (1008hex | 4104dec) Description: Temperature sensor motor 1 – startup fault		
	Response: Output stage inhibit	
	Cause	Measure
	Fault taking into operation the temperature sensor of motor 1.	Check the startup parameters.

Fault: 16.9 (1009hex | 4105dec) Description: Temperature sensor motor 2 – startup fault		
	Response: Output stage inhibit	
	Cause	Measure
	Fault taking into operation the temperature sensor of motor 2.	Check the startup parameters.

Fault: 16.10 (100Ahex | 4106dec) Description: Actual position source not assigned		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	In the selected drive function, an encoder is required for position control that is used as the source for calculating the actual position.	– Assign an encoder for the position control in the drive train configuration. – If no encoder is present, only use FCBs without positioning control.

Fault: 16.11 (100Bhex | 4107dec) Description: Fault calculating motor data		
	Response: Output stage inhibit	
	Cause	Measure
	Motor startup cannot be performed because of inconsistent motor data or wrong device configuration data.	– Check the startup. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 16.12 (100Chex | 4108dec) Description: Motor data write sequence not adhered to		
	Response: Output stage inhibit	
	Cause	Measure
	Write sequence not adhered to before writing electrical startup parameters.	Perform startup again.

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Fault: 16.13 (100Dhex | 4109dec) Description: Several motor protection models active		
	Response: Output stage inhibit	
	Cause	Measure
	Several motor protection models are active in one of the thermal motor monitorings.	– Perform startup again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 16.20 (1014hex | 4116dec) Description: Nominal speed too high or nominal frequency too low		
	Response: Output stage inhibit	
	Cause	Measure
	No plausible value could be determined when calculating the number of pole pairs from the nominal speed and nominal frequency.	– Check the settings for nominal speed and nominal frequency. – Perform startup again.

Fault: 16.21 (1015hex | 4117dec) Description: Negative nominal slip determined		
	Response: Output stage inhibit	
	Cause	Measure
	Negative slip determined at startup.	– Check the settings for nominal speed and nominal frequency. – Perform startup again.

Fault: 16.22 (1016hex | 4118dec) Description: Number of pole pairs cannot be determined		
	Response: Output stage inhibit	
	Cause	Measure
	It is not possible to calculate the number of pole pairs accurately from nominal frequency and nominal speed.	Enter the number of pole pairs.

Fault: 16.23 (1017hex | 4119dec) Description: Plausibility check failed		
	Response: Output stage inhibit	
	Cause	Measure
	The estimated nominal power does not match the nominal power entered at startup.	– Check the entered data. – Perform startup again.

Fault: 16.24 (1018hex | 4120dec)		
Description: Speed controller sampling cycle not possible with PWM frequency or control mode		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The set speed controller sampling cycle of 2 ms is not possible with the set PWM frequency.	– Set PWM frequency that is suitable for the sampling cycle. or – Set sampling cycle to 2 ms (suitable for PWM frequency).
	For the ELSM® control mode, the only permitted speed controller sampling cycles are 1 ms and 2 ms.	Set the sampling cycle to 1 ms or 2 ms.

Fault: 16.25 (1019hex | 4121dec)		
Description: User-defined current limit too low for standstill current		
	Response: Output stage inhibit	
	Cause	Measure
	User-defined current limit value too low for configured standstill current.	– Increase user-defined current limit. or – Reduce standstill current.

Fault: 16.26 (101Ahex | 4122dec)		
Description: Nominal values incomplete or not plausible		
	Response: Output stage inhibit	
	Cause	Measure
	One or all of the following parameters are not set or are not plausible: – Nominal voltage – Nominal current – Nominal speed – Nominal torque	– Check the entered data. – Perform startup again.

Fault: 16.27 (101Bhex | 4123dec)		
Description: Maximum current or maximum torque not plausible		
	Response: Output stage inhibit	
	Cause	Measure
	The following parameters are not set or are not plausible: – Maximum current – Maximum torque	– Check the entered data. – Perform startup again.

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Fault: 16.30 (101Ehex | 4126dec)		
Description: Faulty EtherCAT® EEPROM configuration state		
	Response: Warning	
	Cause	Measure
	EtherCAT®/SBusPLUS EEPROM not configured correctly.	Contact SEW-EURODRIVE Service.

Fault: 16.40 (1028hex | 4136dec)		
Description: Startup data set invalid		
	Response: Output stage inhibit	
	Cause	Measure
	The startup data set on the replaceable memory module is not valid for the selected motor.	– Start up a different motor. – Replace the memory module.

Fault: 16.41 (1029hex | 4137dec)		
Description: Startup data set missing		
	Response: Output stage inhibit	
	Cause	Measure
	No startup data set found on the replaceable memory module for the selected motor.	– Start up a different motor. – Replace the memory module.

Fault: 16.50 (1032hex | 4146dec)		
Description: Brake parameters not initialized		
	Response: Output stage inhibit	
	Cause	Measure
	No brake data available.	Check the startup.

Fault: 16.55 (1037hex | 4151dec)		
Description: PID controller – source of actual value not defined		
	Response: Output stage inhibit	
	Cause	Measure
	The PID controller has been activated, but the source of the actual value has not yet been defined.	Define the source of the actual value.

Fault: 16.60 (103Chex | 4156dec)		
Description: Parameterization for 3-wire control not valid		
	Response: Warning	
	Cause	Measure
	No 3-wire control stop terminal parameterized.	Set stop terminal parameters.

12.7.13 Fault 17 Internal processor fault

Fault: 17.7 (1107hex | 4359dec) **Description: Exception fault**		
	Response: Output stage inhibit	
	Cause	Measure
	Internal computing error (trap) in the CPU.	– Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 17.8 (1108hex | 4360dec) **Description: Non-volatile data not loaded**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The CPU has been restarted several times without firmware being fully initialized. The non-volatile data is not loaded, the default values remain active.	– Acknowledge the fault. – Check the voltage supply. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

12.7.14 Fault 18 Software error

Fault: 18.1 (1201hex | 4609dec) **Description: Fault in motor management interface**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Fault at motor management interface.	– Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 18.3 (1203hex | 4611dec) **Description: Task system – warning**		
	Response: Warning	
	Cause	Measure
	Fault detected while processing internal task system.	– Acknowledge the warning. – If the warning occurs repeatedly, contact SEW-EURODRIVE Service.

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Fault: 18.4 (1204hex | 4612dec)		
Description: Task system – fault		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Fault detected while processing internal task system.	– Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 18.7 (1207hex | 4615dec)		
Description: Fatal software fault		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Fatal software error detected.	– Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 18.8 (1208hex | 4616dec)		
Description: Invalid fault code		
	Response: Output stage inhibit	
	Cause	Measure
	Invalid fault code requested.	– Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 18.9 (1209hex | 4617dec)		
Description: Internal software fault		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The software has reported an unexpected event.	– Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 18.10 (120Ahex | 4618dec)		
Description: Watchdog error		
	Response: Output stage inhibit	
	Cause	Measure
	Watchdog has detected a fault. The software is not operating within the intended cycle time.	– Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 18.12 (120Chex | 4620dec) Description: Configuration data faulty		
	Response: Output stage inhibit	
	Cause	Measure
	Configuration data not plausible or cannot be interpreted by active firmware version.	– Perform a firmware update. – Contact SEW-EURODRIVE Service.

Fault: 18.13 (120Dhex | 4621dec) Description: Calibration data not plausible		
	Response: Output stage inhibit	
	Cause	Measure
	Calibration data not plausible.	Contact SEW-EURODRIVE Service.

Fault: 18.14 (120Ehex | 4622dec) Description: Energy management fault		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	An application that switches supply voltages (e.g. standby mode) off or on could not be stopped or started.	– Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

12.7.15 Fault 19 Process data

Fault: 19.1 (1301hex | 4865dec) Description: Torque profile value violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The set torque profile values are not plausible. The torque limit may only be specified as an absolute value.	Correct the profile values.

Fault: 19.2 (1302hex | 4866dec) 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 positioning range.	Check the position setpoint.
	Position in user unit generates number overflow in system unit.	Check position in user unit.

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Fault: 19.3 (1303hex | 4867dec) Description: Speed setpoint violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The speed setpoints in the profile value connection are not plausible. The speed limit may only be specified as an absolute value.	Correct the setpoints.

Fault: 19.4 (1304hex | 4868dec) Description: Acceleration setpoint violation		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The acceleration setpoint in the profile value connection is not plausible. The acceleration limit may only be specified as an absolute value.	Correct the setpoint.

Fault: 19.5 (1305hex | 4869dec) Description: Drive function not available		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Non-existent drive function (FCB) selected.	Specify an existing FCB number.

Fault: 19.6 (1306hex | 4870dec) Description: Mass moment of inertia setpoint violation		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The mass moment of inertia setpoint is not plausible. The mass moment of inertia may only be specified as an absolute value.	Correct the setpoint.

Fault: 19.7 (1307hex | 4871dec) Description: Referencing missing		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The activated function can only be performed with a referenced drive.	Reference the drive.

Fault: 19.8 (1308hex | 4872dec) 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.

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Fault: 19.9 (1309hex | 4873dec) Description: Jerk setpoint violation		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	The jerk time is not plausible. The jerk time may only be specified as an absolute value.	Adjust the jerk time.

12.7.16 Fault 20 Device monitoring

Fault: 20.1 (1401hex | 5121dec) 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 supply voltage not within permitted voltage range.	– Check the voltage level of the external DC 24 V supply voltage and check for correct connection. – Acknowledge the fault. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.
	24 V power supply unit overloaded.	Check the project planning for the power demand.

Fault: 20.2 (1402hex | 5122dec) Description: Supply voltage overloaded		
	Response: Output stage inhibit	
	Cause	Measure
	The current load on the current paths of the DC 24 V supply voltage inside the device is too high. The signal outputs of the device were therefore de-energized.	– Remove all external consumers: – from the digital outputs of the basic device – from any options that may be present – from all encoder connections – from other consumers at the DC 24 V output voltage terminals – Acknowledge the fault. – Reconnect the consumers with the device, one after the other, until the fault message appears once again. – Connect a consumer with a lower current consumption or eliminate the short circuit.

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Fault: 20.7 (1407hex | 5127dec)	
Description: Internal hardware fault	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
Fault in device hardware.	– Acknowledge the fault. – If the fault occurs repeatedly, replace the device.

Fault: 20.8 (1408hex | 5128dec)	
Description: Fan – warning	
Response: Warning with self-reset	
Cause	Measure
Fan function impaired.	– Check fan for contamination. – If the warning occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 20.9 (1409hex | 5129dec)	
Description: Fan – fault	
Response: Application stop + output stage inhibit	
Cause	Measure
Fan defective.	Contact SEW-EURODRIVE Service.

Fault: 20.10 (140Ahex | 5130dec)	
Description: Fan – supply voltage fault	
Response: Emergency stop + output stage inhibit	
Cause	Measure
Supply voltage of fan missing.	Contact SEW-EURODRIVE Service.

Fault: 20.11 (140Bhex | 5131dec)	
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. – Make sure that both STO signals are switched to low level. – Acknowledge the fault.

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Fault: 20.23 (1417hex | 5143dec) Description: Temperature detection in power section faulty	
Response: Output stage inhibit	
Cause	Measure
Fault in device hardware. Power section does not provide temperature data.	– Acknowledge the fault. – Contact SEW-EURODRIVE Service.

12.7.17 Fault 21 Digital motor integration 1

Fault: 21.1 (1501hex | 5377dec) Description: Communication fault	
Response: Output stage inhibit	
Cause	Measure
Communication fault at interface of digital motor integration.	Check the cabling.

Fault: 21.2 (1502hex | 5378dec) 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.	– Check the connection of the digital motor integration. – Perform startup again.

Fault: 21.3 (1503hex | 5379dec) Description: Incompatible drive	
Response: Output stage inhibit	
Cause	Measure
The connected drive does not match the drive that was started up.	– Connect an appropriate drive. – Perform startup again.

Fault: 21.4 (1504hex | 5380dec) Description: Invalid label	
Response: Output stage inhibit	
Cause	Measure
The connected drive contains invalid data.	Replace the drive.

Fault: 21.5 (1505hex | 5381dec) Description: Incompatible slave	
Response: Output stage inhibit	
Cause	Measure
The firmware versions of the slaves used are not compatible with one another.	Update the inverter and/or the slave.

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Fault: 21.6 (1506hex | 5382dec) Description: Overload/short circuit on the interface		
	Response: Output stage inhibit	
	Cause	Measure
	Short circuit in the cabling of the digital motor integration slave.	Check the cabling of the slave.
	The voltage of the digital motor integration slave is too low.	Check the permitted cable length.

Fault: 21.7 (1507hex | 5383dec) Description: High current demand of slave		
	Response: Output stage inhibit	
	Cause	Measure
	The current consumption of the slave is too high.	Use a slave with lower current consumption.

Fault: 21.8 (1508hex | 5384dec) Description: Parameter fault		
	Response: Output stage inhibit	
	Cause	Measure
	Fault while processing data from slave of digital motor integration.	Repeat the process in configuration state.
	The connected drive contains invalid data.	Replace the drive.

Fault: 21.9 (1509hex | 5385dec) 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.	– Activate the configuration state of the inverter, e.g. by inhibiting the output stage. – Switch the inverter off and on again. – Connect the slave when it is de-energized.
	A slave of digital motor integration was connected while the inverter was in standby mode without switching off the encoder supply.	– Switch off encoder supply in standby mode. – Connect the slave when it is de-energized.

Fault: 21.10 (150Ahex | 5386dec) Description: Connection type not configured correctly		
	Response: Output stage inhibit	
	Cause	Measure
	The connection type of the connected drive cannot be determined.	Set the connection type on the drive correctly.

Fault: 21.11 (150Bhex | 5387dec) Description: Illegal subslave		
	Response: Output stage inhibit	
	Cause	Measure
	The device cannot be operated with a subslave connected via digital motor integration.	Connect another subslave.

Fault: 21.12 (150Chex | 5388dec) Description: Slave/subslave not accessible – fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	A slave/subslave of digital motor integration is in the Device Update Manager.	– Update the firmware of the slave/subslave. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 21.13 (150Dhex | 5389dec) Description: Slave/subslave not accessible – warning		
	Response: Warning	
	Cause	Measure
	A slave/subslave of digital motor integration is in the Device Update Manager.	– Update the firmware of the slave/subslave. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 21.14 (150Ehex | 5390dec) Description: Missing startup of brake control		
	Response: Output stage inhibit	
	Cause	Measure
	Brake control not taken into operation.	Take brake control into operation or connect another drive.

Fault: 21.15 (150Fhex | 5391dec) Description: Motor temperature detection not available		
	Response: Output stage inhibit	
	Cause	Measure
	The drive does not have a motor temperature detection function.	– Deactivate temperature evaluation. or – Connect a different drive.

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Fault: 21.20 (1514hex | 5396dec) Description: Slave – critical fault		
	Response: Output stage inhibit	
	Cause	Measure
	A slave of digital motor integration has detected a critical fault.	Observe the fault message of the subslave. Identify the exact cause of this fault message and take the appropriate measures to eliminate the fault.

Fault: 21.21 (1515hex | 5397dec) Description: Slave – fault		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	A slave of digital motor integration has detected a fault.	Observe the fault message of the subslave. Identify the exact cause of this fault message and take the appropriate measures to eliminate the fault.

Fault: 21.22 (1516hex | 5398dec) Description: Slave – warning		
	Response: Warning	
	Cause	Measure
	A slave of digital motor integration has signaled a warning.	Observe the warning of the subslave. Identify the exact cause of this warning and take the appropriate measures for elimination.

12.7.18 Fault 23 Power section

Fault: 23.4 (1704hex | 5892dec) Description: Hardware fault		
	Response: Output stage inhibit	
	Cause	Measure
	A fault was detected on a component of the power section.	– Check for short circuit/ground fault at the output of the inverter. – Reduce the line capacity at the output of the inverter. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.
	Fault detected on switched-mode power supply.	Check the DC 24 V supply voltage.
	Fault detected at the gate driver of a power semiconductor.	Contact SEW-EURODRIVE Service.

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12.7.19 Fault 25 Parameter memory monitoring

Fault: 25.1 (1901hex | 6401dec) **Description: Timeout warning**		
	Response: Warning with self-reset	
	Cause	Measure
	Access to memory (read/write) takes longer than expected.	No measure required. The fault will be reset automatically after completed memory access.

Fault: 25.2 (1902hex | 6402dec) **Description: Non-volatile memory system – runtime error**		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Runtime error detected in non-volatile memory system.	– Switch the device off and on again. – Restore delivery state. Note that doing so will reset all data in the non-volatile memory to the values at delivery. – If the fault occurs repeatedly, replace the device/memory module. Contact SEW-EURODRIVE Service. – Perform basic initialization. Contact SEW-EURODRIVE Service for this purpose.

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Fault: 25.6 (1906hex | 6406dec) Description: Incompatible device configuration	
Response: Output stage inhibit	
Cause	**Measure**
The data set of another device was copied in the device, which differs in device family, power or voltage from the current device.	– Acknowledge the fault through a manual fault reset. To do so, under [Diagnostics] > [Status] > [Fault status] in the "Manual fault reset" parameter, select the "With parameter set acceptance" setting. – Restore delivery state. Note that doing so will reset all data in the non-volatile memory to the values at delivery.
The replaceable memory module of another device has been inserted in the device, which differs from the current device in device family, power, voltage or design, for example.	– Insert the correct memory module. – Acknowledge the fault through a manual fault reset. To do so, under [Diagnostics] > [Status] > [Fault status] in the "Manual fault reset" parameter, select the "With parameter set acceptance" setting. – Restore delivery state. Note that doing so will reset all data in the non-volatile memory to the values at delivery. – Perform basic initialization. Contact SEW-EURODRIVE Service for this purpose.
The power section has been replaced and differs in its power rating or voltage from the original power section.	– Insert the correct power section. – Acknowledge the fault through a manual fault reset. To do so, under [Diagnostics] > [Status] > [Fault status] in the "Manual fault reset" parameter, select the "With parameter set acceptance" setting. – Restore delivery state. Note that doing so will reset all data in the non-volatile memory to the values at delivery.
Subcomponent defective.	Contact SEW EURODRIVE Service.

Fault: 25.7 (1907hex | 6407dec) Description: Non-volatile memory system – initialization fault	
Response: Output stage inhibit	
Cause	**Measure**
Initialization of the non-volatile memory system has failed.	– Switch the device off and on again. – Restore delivery state. Note that doing so will reset all data in the non-volatile memory to the values at delivery. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service. – Perform basic initialization. Contact SEW-EURODRIVE Service for this purpose.

Fault: 25.10 (190Ahex | 6410dec)	
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.

Fault: 25.12 (190Chex | 6412dec)	
Description: Power section configuration data – CRC error	
Response: Output stage inhibit	
Cause	Measure
Faulty configuration data of power section.	Contact SEW-EURODRIVE Service.

Fault: 25.13 (190Dhex | 6413dec)	
Description: Control electronics configuration data – CRC error	
Response: Output stage inhibit	
Cause	Measure
Faulty configuration data of control electronics.	Contact SEW-EURODRIVE Service.

Fault: 25.14 (190Ehex | 6414dec)	
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.

Fault: 25.15 (190Fhex | 6415dec)	
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.

Fault: 25.16 (1910hex | 6416dec)	
Description: Calibration data of power section – CRC error	
Response: Output stage inhibit	
Cause	Measure
Faulty calibration data of power section.	Contact SEW-EURODRIVE Service.

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Fault: 25.17 (1911hex | 6417dec) Description: Calibration data of control electronics – CRC error	
Response: Output stage inhibit	
Cause	Measure
Faulty calibration data of control electronics.	Contact SEW-EURODRIVE Service.

Fault: 25.18 (1912hex | 6418dec) Description: Power section QA data – CRC error	
Response: Warning	
Cause	Measure
Faulty quality assurance data of power section.	Contact SEW-EURODRIVE Service.

Fault: 25.19 (1913hex | 6419dec) Description: Control electronics QA data – CRC error	
Response: Warning	
Cause	Measure
Faulty quality assurance data of control electronics.	Contact SEW-EURODRIVE Service.

Fault: 25.20 (1914hex | 6420dec) Description: Basic device memory – initialization fault	
Response: Output stage inhibit	
Cause	Measure
Initialization of basic device memory has failed.	Contact SEW-EURODRIVE Service.

Fault: 25.21 (1915hex | 6421dec) Description: Basic device memory – runtime error	
Response: Emergency stop + output stage inhibit	
Cause	Measure
Runtime error detected in memory of basic device.	Contact SEW-EURODRIVE Service.

Fault: 25.30 (191Ehex | 6430dec) Description: Replaceable memory module – initialization fault	
Response: Output stage inhibit	
Cause	Measure
The formatting of the replaceable memory module does not match.	– Switch the device off and on again. – Restore delivery state. Note that doing so will reset all data in the replaceable memory module to the values at delivery.
Initialization of replaceable memory module failed after restoring delivery state.	– Contact SEW-EURODRIVE Service. – Perform basic initialization. Contact SEW-EURODRIVE Service for this purpose.

Fault: 25.31 (191Fhex | 6431dec)	
Description: Replaceable memory module – runtime error	
Response: Emergency stop + output stage inhibit	
Cause	Measure
Runtime error detected in replaceable memory module.	– Insert new memory module and perform startup again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 25.32 (1920hex | 6432dec)	
Description: Incompatible replaceable memory module	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
The replaceable memory module is not compatible with the device.	Replace the memory module.

Fault: 25.33 (1921hex | 6433dec)	
Description: Replaceable memory module – incompatible equipment category	
Response: Output stage inhibit	
Cause	Measure
The replaceable memory module is formatted, but it contains data from a device of a different equipment category. The data is not compatible and cannot be used.	– Replace the memory module. – Restore delivery state. Note that doing so will reset all data in the replaceable memory module to the values at delivery.

Fault: 25.50 (1932hex | 6450dec)	
Description: Replaceable memory module of safety option – runtime error	
Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
Cause	Measure
Runtime error detected in the replaceable memory module of the safety option.	Contact SEW-EURODRIVE Service.

Fault: 25.51 (1933hex | 6451dec)	
Description: Replaceable memory module of safety option – initialization fault	
Response: Warning	
Cause	Measure
Initialization of the replaceable memory module of the safety option has failed.	Contact SEW-EURODRIVE Service.

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Fault: 25.61 (193Dhex | 6461dec) Description: Restore point – failure		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Failed to create restore point.	Create the restore point again.

Fault: 25.70 (1946hex | 6470dec) Description: Incompatible card configuration		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The current configuration of the cards does not match the configuration state saved during startup. For example, a card was removed that was still present during startup.	– Restore the original configuration of the cards. – Acknowledge the fault through a manual fault reset. To do so, under [Diagnostics] > [Status] > [Fault status] in the "Manual fault reset" parameter, select the "With parameter set acceptance" setting.

12.7.20 Fault 26 External fault

Fault: 26.1 (1A01hex | 6657dec) Description: External fault via digital input/control bit		
	Response: External fault	
	Cause	Measure
	A fault was triggered via a digital input or a bit of a control word.	– Eliminate the external fault. or – Change the response to an external fault under [Functions] > [Setpoints] > [Basic settings].

Fault: 26.3 (1A03hex | 6659dec) Description: Power section emergency shutdown		
	Response: Output stage inhibit	
	Cause	Measure
	Power section has detected a critical fault and requested external emergency shutdown.	Contact SEW-EURODRIVE Service.

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Fault: 26.4 (1A04hex | 6660dec)		
Description: Fault while monitoring temperature of external braking resistor		
	Response: Response to external braking resistor fault	
	Cause	Measure
	The connected temperature switch of the external braking resistor has tripped.	– Check the mounting position of the braking resistor. – Clean the braking resistor. – Check the configuration of the braking resistor. – Install a larger braking resistor. – Check the external trip switch settings. – Optimize the travel cycle so that less regenerative energy is created. – Check the settings of the storage discharge function in the MOVIKIT® software module concerned. – Check plug connections.

12.7.21 Fault 28 FCB drive functions

Fault: 28.1 (1C01hex | 7169dec)		
Description: FCB 11/12 – Searching zero pulse timeout		
	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 wiring of the encoder.

Fault: 28.2 (1C02hex | 7170dec)		
Description: FCB 11/12 – Hardware limit switch before 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 behind the hardware limit switch.

Fault: 28.3 (1C03hex | 7171dec)		
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 hardware limit switch are mounted flush.

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Fault: 28.4 (1C04hex | 7172dec)		
Description: FCB 11/12 – Faulty reference offset		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Fault determining reference offset.	– Make sure that the reference offset is smaller than the "Modulo maximum" limit value. – When using a single-turn absolute encoder, make sure that the reference offset is not larger than one encoder revolution. – Make sure that an encoder has been set as the source of the actual position when assigning the encoder.

Fault: 28.5 (1C05hex | 7173dec)		
Description: FCB 11/12 – Referencing not possible		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	In the active drive train during encoder assignment, no encoder was specified as the source of the actual position.	– Set an encoder as the source of the actual position. – Activate the "Referencing all encoders of the drive train" parameter.
	The reference travel type "Absolute encoder position" is only permitted for absolute encoders in the position mode "Linear mode" or "Single-turn absolute position".	– Adjust the position mode of the encoder. – Use a different reference travel type.
	No encoder is assigned in the active drive train.	Assign encoder.

Fault: 28.6 (1C06hex | 7174dec)		
Description: FCB 11/12 – Limit switch/reference cam not flush/overlapping with fixed stop		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	A hardware limit switch and a reference cam were hit at the same time during reference travel to fixed stop.	Check whether the position of hardware limit switches and reference cams for reference travel have been set correctly.
	During reference travel to fixed stop and active speed changeover at hardware limit switch or reference cam, the fixed stop has been reached without the hardware limit switch or reference cam being hit.	Check whether the position of hardware limit switches and reference cams for reference travel have been set correctly.

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Fault: 28.7 (1C07hex | 7175dec)		
Description: FCB 21 – Required total torque too high		
	Response: Output stage inhibit	
	Cause	Measure
	The required total torque is greater than the permitted maximum torque at the motor shaft. The total torque is calculated from the torque specification and the determined/specified load torque.	– Reduce the torque specification. – Change the direction of rotation. – Increase the power of the drive.

Fault: 28.8 (1C08hex | 7176dec)		
Description: FCB 21 – Total torque not reached		
	Response: Output stage inhibit	
	Cause	Measure
	The required total torque (at least 90%) was not reached. The total torque is calculated from the torque specification and the determined/specified load torque.	– Reduce the torque specification. – Check the limit values of the inverter. – Check the motor connection.

Fault: 28.9 (1C09hex | 7177dec)		
Description: FCB 18 – Rotor position identification not possible		
	Response: Output stage inhibit	
	Cause	Measure
	Rotor position identification with an incremental encoder was aborted.	– Restart the rotor position identification. – Check whether the encoder is connected correctly. – Check whether the encoder is defective.
	Result of rotor position identification (measured encoder offset) cannot be stored in encoder.	Store the measured encoder offset in the inverter.
	In the "Automatic" operating mode, the result of rotor position identification (measured encoder offset) cannot be stored in the encoder. In this operating mode, the measured value can only be stored in the inverter.	– Set the operating mode to "Manual". or – Store the measured encoder offset in the inverter.

Fault: 28.10 (1C0Ahex | 7178dec)		
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. – Check all contact points on the motor and inverter. – Check the motor and motor cable for damage.

Fault: 28.11 (1C0Bhex | 7179dec) Description: FCB 25 – High impedance motor phase		
	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. – Check all contact points on the motor and inverter. – Check the motor and motor cable for damage.

Fault: 28.12 (1C0Chex | 7180dec) Description: FCB 25 – Stator resistance measurement timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Motor parameter measurement activated while motor is turning.	– Stop motor. – Start motor parameter measurement when the motor is at standstill.

Fault: 28.13 (1C0Dhex | 7181dec) Description: FCB 25 – Characteristic curve identification not possible		
	Response: Output stage inhibit	
	Cause	Measure
	The characteristic curve cannot be clearly identified by the motor parameter measurement.	Contact SEW-EURODRIVE Service.

Fault: 28.14 (1C0Ehex | 7182dec) Description: Modulo minimum and modulo maximum not plausible		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The value of the "Modulo minimum" parameter is greater than the value of the "Modulo maximum" parameter.	Correct the parameter values.

Fault: 28.15 (1C0Fhex | 7183dec) Description: FCB 25 – Timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Measurement of rotor resistance, leakage inductance, and stator inductance not completed.	Contact SEW-EURODRIVE Service.

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Fault: 28.18 (1C12hex | 7186dec) Description: FCB 21 – Brake missing	
Response: Application stop + output stage inhibit	
Cause	Measure
No brake has been parameterized in the inverter. However, a brake is required to perform the brake test.	– Parameterize the brake in drive train 1. – Start FCB 21 again.

Fault: 28.19 (1C13hex | 7187dec) Description: FCB 21 – Encoder missing	
Response: Application stop + output stage inhibit	
Cause	Measure
No encoder has been parameterized in the inverter. However, an encoder is required to detect a movement of the drive.	– Parameterize the encoder in drive train 1. – Use an encoder for speed control or position control. – Start FCB 21 again.

Fault: 28.20 (1C14hex | 7188dec) Description: FCB 21 – Load torque not within tolerance range	
Response: Application stop + output stage inhibit	
Cause	Measure
The measured load torque is outside the permitted range. The permitted range is defined by the "Load torque" and "Permitted load torque tolerance" parameters as follows: Load torque ± permitted load torque tolerance	– Check the load torque of the system. – Check the "Load torque" parameter value. – Check the "Permitted load torque tolerance" parameter value.

Fault: 28.21 (1C15hex | 7189dec) Description: FCB 09 – Position overshoot through changes to the active travel order	
Response: Application stop + output stage inhibit	
Cause	Measure
Due to changing of the target position or profile values during an active travel order, the drive must travel beyond the target and then reverse to adhere to the profile. Reversing is forbidden in the current operating mode, so when the target position is overrun, the drive triggers a fault and stops in the permitted direction.	Change the target position/profile values in such a way that it is still possible to stop at the target position.

Fault: 28.22 (1C16hex | 7190dec) Description: FCB 09 – Wrong touchprobe data source	
Response: Application stop + output stage inhibit	
Cause	Measure
For the "Remaining travel from touchprobe 1" operating mode, the data source of the touchprobe used must be set to "Actual position in user unit".	Change the data source of the touchprobe.

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Fault: 28.23 (1C17hex | 7191dec)		
Description: Minimum speed too high		
	Response: Output stage inhibit	
	Cause	Measure
	Minimum speed greater than application limit of the speed.	– Reduce the minimum speed. or – Increase the application limit.

Fault: 28.24 (1C18hex | 7192dec)		
Description: FCB 05 – Limits of skip range outside setpoint limits		
	Response: Output stage inhibit	
	Cause	Measure
	The speed range of the active speed resonance skip function is larger than the permitted setpoint range. Both the minimum speed as well as the application limit lie within the skip range. As such, each setpoint falls within the skip range.	– Adjust the speed resonance range skip function. – Adjust the minimum speed. – Adjust the application limit.

Fault: 28.25 (1C19hex | 7193dec)		
Description: FCB 11/12 – Faulty reference offset of encoder 1		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Fault determining reference offset for encoder 1.	– Make sure that the reference offset is smaller than the "Modulo maximum" limit value. – When using a single-turn absolute encoder, make sure that the reference offset is not larger than one encoder revolution.

Fault: 28.27 (1C1Bhex | 7195dec)		
Description: FCB 11/12 – Reference cams and hardware limit switches active		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	During reference travel, the hardware limit switch was hit when the reference cam was active.	– Check the position of the reference cam to the hardware limit switch. – Check the signal of the reference cam.

Fault: 28.28 (1C1Chex | 7196dec)		
Description: FCB 11/12 – Homing not possible		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Position control cannot be performed with the active control mode and the active encoder setting. Homing is performed exclusively in position control.	– Set an encoder as the source of the actual position. or – Deactivate "Go to home position" parameter.

12.7.22 Fault 29 HW limit switches

Fault: 29.1 (1D01hex | 7425dec) **Description: Positive limit switch hit**	
Response: HW limit switches – current drive train	
Cause	Measure
Positive hardware limit switch hit.	– Check the wiring of the hardware limit switch. – Check the target position. – Leave the hardware limit switch in the opposite direction.

Fault: 29.2 (1D02hex | 7426dec) **Description: Negative limit switch hit**	
Response: HW limit switches – current drive train	
Cause	Measure
Negative hardware limit switch hit.	– Check the wiring of the hardware limit switch. – Check the target position. – Leave the hardware limit switch in the opposite direction.

Fault: 29.3 (1D03hex | 7427dec) **Description: Limit switch missing**	
Response: Emergency stop + output stage inhibit	
Cause	Measure
Positive and negative hardware limit switches hit at the same time.	– Check the wiring of the hardware limit switches. – Check the parameter setting of the digital inputs. – Check the parameter setting of the process output data.

Fault: 29.4 (1D04hex | 7428dec) **Description: Limit switches swapped**	
Response: Emergency stop + output stage inhibit	
Cause	Measure
The fault can be caused as follows: – The positive hardware limit switch was hit with a negative direction of rotation or – The negative hardware limit switch was hit with a positive direction of rotation.	Check whether the hardware limit switch connections are swapped.

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12.7.23 Fault 30 SW limit switches

Fault: 30.1 (1E01hex | 7681dec) **Description: Positive limit switch hit**		
	Response: SW limit switches – current drive train	
	Cause	Measure
	Positive software limit switch hit.	– Check the position of the software limit switch. – Check the target position. – Leave the software limit switch in the opposite direction.

Fault: 30.2 (1E02hex | 7682dec) **Description: Negative limit switch hit**		
	Response: SW limit switches – current drive train	
	Cause	Measure
	Negative software limit switch hit.	– Check the position of the software limit switch. – Check the target position. – Leave the software limit switch in the opposite direction.

Fault: 30.3 (1E03hex | 7683dec) **Description: Limit switches swapped**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Position of negative software limit switch greater than position of positive software limit switch.	Check the positions of the software limit switches.

Fault: 30.4 (1E04hex | 7684dec) **Description: Distance of software limit switches too small/noise suppression window too large**		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The range limited by the positive and negative software limit switches is smaller than the range set in the "SW limit switch noise suppression window" parameter.	– Check the positions of the software limit switches. or – Adjust the width of the noise suppression window.

12.7.24 Fault 31 Thermal motor protection

Fault: 31.1 (1F01hex | 7937dec) **Description: Temperature sensor motor 1 – wire break**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Wire break detected at the temperature sensor of the motor.	Check the wiring of the temperature sensor.

Fault: 31.2 (1F02hex | 7938dec) **Description: Temperature sensor motor 1 – short circuit**		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Short circuit at temperature sensor of motor.	Check the wiring of the temperature sensor.

Fault: 31.3 (1F03hex | 7939dec) **Description: Temperature sensor motor 1 – overtemperature**		
	Response: Output stage inhibit	
	Cause	Measure
	The motor temperature determined by the temperature sensor exceeds the maximum permitted motor temperature.	– Let the motor cool down. – Check the motor for overload. – Check whether the correct temperature sensor has been configured.

Fault: 31.4 (1F04hex | 7940dec) **Description: Temperature model motor 1 – overtemperature**		
	Response: Output stage inhibit	
	Cause	Measure
	The motor temperature determined by the temperature model exceeds the maximum permitted motor temperature.	– Let the motor cool down. – Check the motor for overload. – Check whether the correct temperature sensor has been configured.

Fault: 31.5 (1F05hex | 7941dec) **Description: Temperature sensor motor 1 – prewarning**		
	Response: Thermal motor protection 1 – prewarning threshold	
	Cause	Measure
	The motor temperature determined by the temperature sensor has exceeded the prewarning threshold.	Check the motor for overload.

Fault: 31.6 (1F06hex | 7942dec) Description: Temperature model motor 1 – prewarning		
	Response: Thermal motor protection 1 – prewarning threshold	
	Cause	Measure
	The motor temperature determined by the motor model has exceeded the prewarning threshold.	Check the motor for overload.

Fault: 31.7 (1F07hex | 7943dec) Description: UL temperature model – overtemperature		
	Response: Output stage inhibit	
	Cause	Measure
	The temperature of the active motor determined via the UL temperature model exceeds the maximum permitted motor temperature.	Check the motor for overload.

Fault: 31.8 (1F08hex | 7944dec) Description: Temperature sensor motor 1 – communication timeout		
	Response: Output stage inhibit	
	Cause	Measure
	Communication with temperature sensor (e.g. via MOVILINK® DDI) is disrupted.	Check the wiring of the temperature sensor.

Fault: 31.9 (1F09hex | 7945dec) Description: Temperature sensor motor 1 – temperature too low		
	Response: Output stage inhibit	
	Cause	Measure
	The temperature determined by the temperature sensor has fallen below -50 °C.	– Check whether the correct temperature sensor has been configured. – Heat the motor.
	Short circuit in the long connection to the temperature sensor of the motor.	Check the wiring of the temperature sensor.

Fault: 31.11 (1F0Bhex | 7947dec) Description: Temperature sensor motor 2 – wire break		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Wire break detected at the temperature sensor of the motor.	Check the wiring of the temperature sensor.

Fault: 31.12 (1F0Chex | 7948dec) Description: Temperature sensor motor 2 – short circuit		
	Response: Application stop + output stage inhibit	
	Cause	Measure
	Short circuit at temperature sensor of motor.	Check the wiring of the temperature sensor.

Fault: 31.13 (1F0Dhex | 7949dec) Description: Temperature sensor motor 2 – overtemperature		
	Response: Output stage inhibit	
	Cause	Measure
	The motor temperature determined by the temperature sensor exceeds the maximum permitted motor temperature.	– Let the motor cool down. – Check the motor for overload. – Check whether the correct temperature sensor has been configured.

Fault: 31.14 (1F0Ehex | 7950dec) Description: Temperature model motor 2 – overtemperature		
	Response: Output stage inhibit	
	Cause	Measure
	The motor temperature determined by the temperature model exceeds the maximum permitted motor temperature.	– Let the motor cool down. – Check the motor for overload. – Check whether the correct temperature sensor has been configured.

Fault: 31.15 (1F0Fhex | 7951dec) Description: Temperature sensor motor 2 – prewarning		
	Response: No response	
	Cause	Measure
	The motor temperature determined by the temperature sensor has exceeded the prewarning threshold.	Check the motor for overload.

Fault: 31.16 (1F10hex | 7952dec) Description: Temperature model motor 2 – prewarning		
	Response: No response	
	Cause	Measure
	The motor temperature determined by the motor model has exceeded the prewarning threshold.	Check the motor for overload.

Fault: 31.19 (1F13hex | 7955dec) Description: Temperature sensor motor 2 – temperature too low		
	Response: Output stage inhibit	
	Cause	Measure
	The temperature determined by the temperature sensor has fallen below -50 °C.	– Check whether the correct temperature sensor has been configured. – Heat the motor.
	Short circuit in the long connection to the temperature sensor of the motor.	Check the wiring of the temperature sensor.

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Fault: 31.50 (1F32hex | 7986dec)		
Description: Fault at temperature sensor 1		
	Response: Output stage inhibit	
	Cause	Measure
	Fault detected at temperature sensor 1 of the motor.	Observe the fault code of the main component. Identify the exact cause of this fault message and take the appropriate measures to eliminate the fault.

Fault: 31.51 (1F33hex | 7987dec)		
Description: Fault at temperature sensor 2		
	Response: Output stage inhibit	
	Cause	Measure
	Fault detected at temperature sensor 2 of the motor.	Observe the fault code of the main component. Identify the exact cause of this fault message and take the appropriate measures to eliminate the fault.

Fault: 31.52 (1F34hex | 7988dec)		
Description: Fault at temperature sensor 3		
	Response: Output stage inhibit	
	Cause	Measure
	Fault detected at temperature sensor 3 of the motor.	Observe the fault code of the main component. Identify the exact cause of this fault message and take the appropriate measures to eliminate the fault.

12.7.25 Fault 32 Communication

Fault: 32.3 (2003hex | 8195dec)		
Description: Faulty synchronization signal		
	Response: External synchronization	
	Cause	Measure
	Synchronization signal period is not correct.	Make sure that the EtherCAT®/SBusPLUS configuration in the controller is set correctly.

Fault: 32.4 (2004hex | 8196dec)		
Description: Missing synchronization signal		
	Response: External synchronization	
	Cause	Measure
	No synchronization signal present.	Make sure that the EtherCAT®/SBusPLUS configuration in the controller is set correctly.

Fault: 32.5 (2005hex | 8197dec) Description: Synchronization timeout	
Response: External synchronization	
Cause	Measure
Timeout while synchronizing to synchronization signal.	Make sure that the EtherCAT®/SBusPLUS configuration in the controller is set correctly.

Fault: 32.6 (2006hex | 8198dec) Description: Fault while transferring parameter set	
Response: Output stage inhibit	
Cause	Measure
Fault while downloading parameter set to device.	– Check the wiring of system bus and module bus. – Restart the transfer.

Fault: 32.7 (2007hex | 8199dec) Description: Application heartbeat timeout	
Response: Application heartbeat – timeout response	
Cause	Measure
Communication between application program (e.g. IEC program or MOVIKIT® of the Drive category) and device interrupted.	– Check the status of the application program. – Restart the application program.

Fault: 32.8 (2008hex | 8200dec) Description: User-timeout timeout	
Response: User timeout – timeout response	
Cause	Measure
The timeout time of the user timeout function has expired.	– Check communication. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 32.12 (200Chex | 8204dec) Description: Manual mode timeout	
Response: Manual mode – timeout response	
Cause	Measure
Communication connection to inverter interrupted in manual mode.	– Check whether too many programs are open on the engineering PC. – Increase the timeout time in manual mode.
New Scope project created.	– Acknowledge the fault. – Restart manual mode.
Scope measurement transferred from inverter to project.	– Acknowledge the fault. – Restart manual mode.

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12.7.26 Fault 33 System initialization

Fault: 33.1 (2101hex | 8449dec)

Description: Fault during offset determination of current measurement

Response: Output stage inhibit

System state: Fault acknowledgment with CPU reset

Cause	Measure
Fault detected during current measurement.	Contact SEW-EURODRIVE Service.

Fault: 33.2 (2102hex | 8450dec)

Description: Firmware – checksum error

Response: Output stage inhibit

System state: Fault acknowledgment with CPU reset

Cause	Measure
Fault calculating firmware checksum.	Contact SEW-EURODRIVE Service.

Fault: 33.6 (2106hex | 8454dec)

Description: Faulty FPGA configuration

Response: Output stage inhibit

Cause	Measure
Fault in FPGA configuration.	Contact SEW-EURODRIVE Service.

Fault: 33.7 (2107hex | 8455dec)

Description: Function block compatibility fault

Response: Output stage inhibit

Cause	Measure
Fault checking compatibility of function block.	Contact SEW-EURODRIVE Service.

Fault: 33.8 (2108hex | 8456dec)

Description: Software function block not configured correctly

Response: Output stage inhibit

Cause	Measure
Fault detected in the configuration of the software function block.	Contact SEW-EURODRIVE Service.

Fault: 33.9 (2109hex | 8457dec)

Description: Hardware compatibility fault of the power section

Response: Output stage inhibit

Cause	Measure
The firmware is not compatible with the hardware of the power section.	Contact SEW-EURODRIVE Service.

Fault: 33.10 (210Ahex | 8458dec)		
Description: Boot timeout		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Timeout during system boot.	Contact SEW-EURODRIVE Service.

Fault: 33.11 (210Bhex | 8459dec)		
Description: Hardware compatibility fault		
	Response: Output stage inhibit	
	Cause	Measure
	Firmware not compatible with device.	Contact SEW-EURODRIVE Service.

Fault: 33.12 (210Chex | 8460dec)		
Description: Memory module plugged in		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	A plugged-in memory module was detected during device start. However, the internal memory was set as the storage location.	Switch off the device. Remove the memory module and restart the device.

Fault: 33.13 (210Dhex | 8461dec)		
Description: Memory module removed		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	Memory module removed from device parameterized for operation with replaceable memory module.	Switch off the device, insert the memory module, and switch on the device again.
	Replaceable memory module removed during ongoing operation.	Switch off the device, insert the memory module, and switch on the device again.
	Memory module missing for a device that can only be operated with a replaceable memory module.	Switch off the device, insert the memory module, and switch on the device again.

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Fault: 33.15 (210Fhex | 8463dec)		
Description: Firmware configuration conflict in the Device Update Manager		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The firmware does not correspond with the expected configuration in the Device Update Manager.	– Acknowledge the fault. Doing so will update the configuration data of the Device Update Manager. – If the fault occurs again after a reset, contact SEW-EURODRIVE Service.

Fault: 33.18 (2112hex | 8466dec)		
Description: Incompatible fieldbus configuration		
	Response: Output stage inhibit System state: Fault acknowledgment with CPU reset	
	Cause	Measure
	The fieldbus used is not compatible with the basic device.	– For devices with pluggable fieldbus card, replace the card. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 33.22 (2116hex | 8470dec)		
Description: Function status too low		
	Response: Output stage inhibit	
	Cause	Measure
	The parameter set to be loaded into the device requires a higher function status.	– Perform a firmware update. – Use a parameter set that matches the device. – Acknowledge the fault with parameter set acceptance. This applies the data and overwrites the parameter set in the device with a lower function status.
	The parameter set in the replaceable memory module requires a higher function status.	– Perform a firmware update. – Use a memory module with a parameter set that matches the device. – Acknowledge the fault with parameter set acceptance. This applies the data and overwrites the replaceable memory module with a lower function status.

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12.7.27 Fault 34 Process data configuration

Fault: 34.1 (2201hex | 8705dec) **Description: Change of process data configuration**	
Response: Application stop + output stage inhibit	
Cause	Measure
Process data configuration changed during active process data operation.	Perform a reset. Doing so will stop the process data, apply the changes, and restart the process data.

12.7.28 Fault 35 Function activation

Fault: 35.1 (2301hex | 8961dec) **Description: Application level – invalid activation key**	
Response: Emergency stop + output stage inhibit	
Cause	Measure
Activation key not entered properly.	Enter the activation key again.
Activation key not created for this device.	Check the activation key.
In the case of a double axis, the activation key of the wrong instance was entered in the device.	Enter the activation key for the assigned instance.
Activation key entered for technology level in parameter "Application level – activation key".	Enter the activation key in the correct parameter.

Fault: 35.2 (2302hex | 8962dec) **Description: Application level too low**	
Response: Emergency stop + output stage inhibit	
Cause	Measure
The activated software module requires a higher application level.	Determine the required application level ("Application level – required level" parameter) and enter its activation key.

Fault: 35.3 (2303hex | 8963dec) **Description: Technology level too low**	
Response: Emergency stop + output stage inhibit	
Cause	Measure
An activated technology function requires a higher technology level.	Determine the required technology level ("Technology level – required level" parameter) and enter its activation key.

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Fault: 35.4 (2304hex | 8964dec) Description: Technology level – invalid activation key		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Activation key not entered properly.	Enter the activation key again.
	Activation key not created for this device.	Check the activation key.
	In the case of a double axis, the activation key of the wrong instance was entered in the device.	Enter the activation key for the assigned instance.
	Activation key entered for application level in parameter "Technology level – activation key".	Enter the activation key in the correct parameter.

12.7.29 Fault 42 Lag error

Fault: 42.1 (2A01hex | 10753dec) Description: Positioning lag error		
	Response: Positioning lag error	
	Cause	Measure
	Encoder not connected correctly.	Check the wiring of the encoder.
	Position encoder inverted or not installed correctly on the track.	Check the installation and connection of the position encoder.
	Motor phases not connected properly.	Check the wiring of the motor.
	Acceleration too high.	– Check the profile values. – Increase the torque limit and/or current limit. – Check the project planning.
	P component of position controller too small.	Increase the P component of the position controller.
	Speed controller parameterized incorrectly.	Check controller parameters.
	Lag error window too small.	Increase the lag error window.
	Mechanical components cannot move freely or are blocked.	– Check the mechanical components for stiffness. – Check the mechanical components for blockage.
	Supply voltage too low or line phase missing.	Check the supply voltage.

Fault: 42.2 (2A02hex | 10754dec) Description: Jog mode lag error	
Response: Output stage inhibit	
Cause	**Measure**
Encoder not connected correctly.	Check the wiring of the encoder.
Position encoder inverted or not installed correctly on the track.	Check the installation and connection of the position encoder.
Motor phases not connected properly.	Check the wiring of the motor.
Acceleration too high.	– Check the profile values. – Increase the torque limit and/or current limit. – Check the project planning.
P component of position controller too small.	Increase the P component of the position controller.
Speed controller parameterized incorrectly.	Check controller parameters.
Lag error window too small.	Increase the lag error window.
Mechanical components cannot move freely or are blocked.	– Check the mechanical components for stiffness. – Check the mechanical components for blockage.
Supply voltage too low or line phase missing.	Check the supply voltage.

Fault: 42.3 (2A03hex | 10755dec) Description: Standard lag error	
Response: Output stage inhibit	
Cause	**Measure**
Encoder not connected correctly.	Check the wiring of the encoder.
Position encoder inverted or not installed correctly on the track.	Check the installation and connection of the position encoder.
Motor phases not connected properly.	Check the wiring of the motor.
Acceleration too high.	– Check the profile values. – Increase the torque limit and/or current limit. – Check the project planning.
P component of position controller too small.	Increase the P component of the position controller.
Speed controller parameterized incorrectly.	Check controller parameters.
Lag error window too small.	Increase the lag error window.
Supply voltage too low or line phase missing.	Check the supply voltage.

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12.7.30 Fault 44 Subcomponent power section

Fault: 44.2 (2C02hex | 11266dec) **Description: Overcurrent phase U**	
Response: Remote – critical fault	
Cause	Measure
The connected motor is too large.	Connect a smaller motor.
Acceleration too high.	Reduce the acceleration.
A short circuit has occurred.	– Remove the short circuit on the motor connection. – Check the motor phases.
There is a problem with the output filter.	– Activate the output filter during startup of the drive train. – Check assignment of output filter and inverter.
Output stage defective.	Contact SEW-EURODRIVE Service.

Fault: 44.3 (2C03hex | 11267dec) **Description: Overcurrent phase V**	
Response: Remote – critical fault	
Cause	Measure
The connected motor is too large.	Connect a smaller motor.
Acceleration too high.	Reduce the acceleration.
A short circuit has occurred.	– Remove the short circuit on the motor connection. – Check the motor phases.
There is a problem with the output filter.	– Activate the output filter during startup of the drive train. – Check assignment of output filter and inverter.
Output stage defective.	Contact SEW-EURODRIVE Service.

Fault: 44.4 (2C04hex | 11268dec) **Description: Overcurrent phase W**	
Response: Remote – critical fault	
Cause	Measure
The connected motor is too large.	Connect a smaller motor.
Acceleration too high.	Reduce the acceleration.
A short circuit has occurred.	– Remove the short circuit on the motor connection. – Check the motor phases.
There is a problem with the output filter.	– Activate the output filter during startup of the drive train. – Check assignment of output filter and inverter.
Output stage defective.	Contact SEW-EURODRIVE Service.

12.7.31 Fault 45 Fieldbus interface

Fault: 45.1 (2D01hex | 11521dec)		
Description: No response from fieldbus interface		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	Fieldbus interface does not start properly and is therefore not functional.	– Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 45.2 (2D02hex | 11522dec)		
Description: Fieldbus interface – fault		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fault detected on device-internal connection to fieldbus interface.	– Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 45.3 (2D03hex | 11523dec)		
Description: Process output data timeout		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Timeout in process data transfer during fieldbus communication.	– Check the communication connection between the fieldbus master and the fieldbus interface for interruption. – Check the configuration of the fieldbus master. – Adjust the timeout monitoring of the fieldbus interface.

Fault: 45.5 (2D05hex | 11525dec)		
Description: Engineering fault		
	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. – Check the network load in the communication network. – Close unneeded engineering connections that are open in parallel (e.g. parameter access via managing EDGE devices, asset management tools, network scanners, etc.). – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

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Fault: 45.7 (2D07hex | 11527dec) Description: Invalid process output data		
	Response: Fieldbus – timeout response	
	Cause	Measure
	– The fieldbus master sends invalid process output data. – The fieldbus interface has detected an internal failure of the process data exchange and marks the process output data as invalid.	– Check whether the PLC is in "Stop" state. – Restart the PLC. – Check the configuration of the fieldbus master. – In the event of a failure of the internal process data exchange, switch the device off and then on again.

Fault: 45.9 (2D09hex | 11529dec) Description: Warning		
	Response: Warning	
	Cause	Measure
	Inverter has detected a non-critical fault on device-internal connection to fieldbus interface.	– Switch the device off and on again. – If the warning occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 45.50 (2D32hex | 11570dec) Description: Warning		
	Response: Warning with self-reset	
	Cause	Measure
	Fieldbus interface signals a warning.	Observe the warning of the fieldbus interface subcomponent. Identify the exact cause of this warning and take the appropriate measures for elimination.

Fault: 45.51 (2D33hex | 11571dec) Description: Fault		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fieldbus interface has detected a fault.	Observe the fault code of the fieldbus interface subcomponent. Identify the exact cause of this fault message and take the appropriate measures to eliminate the fault.

Fault: 45.52 (2D34hex | 11572dec) Description: Critical fault		
	Response: Fieldbus – timeout response	
	Cause	Measure
	Fieldbus interface has detected a critical fault.	Observe the fault code of the fieldbus interface subcomponent. Identify the exact cause of this fault message and take the appropriate measures to eliminate the fault.

12.7.32 Fault 46 MOVISAFE® CS..A

Fault: 46.1 (2E01hex | 11777dec)

Description: MOVISAFE® CS..A safety option no longer responding

Response: Output stage inhibit

Cause	Measure
No synchronization could be performed with the safety option.	– When using a pluggable safety option, check the device assignment of the basic device and the safety option. – When using a pluggable safety option, check the slot and installation of the safety option. – Switch the device off and on again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 46.2 (2E02hex | 11778dec)

Description: Invalid variant

Response: Output stage inhibit

Cause	Measure
Safety option variant does not match inverter type.	Use the correct safety option variant.
In a double axis of the MOVIDRIVE® modular application inverter, only safety options without an encoder interface may be used.	Use the correct safety option variant.

Fault: 46.3 (2E03hex | 11779dec)

Description: MOVISAFE® CS..A safety option no longer responding

Response: Output stage inhibit with self-reset

Cause	Measure
Communication between inverter and safety option interrupted.	– When using a pluggable safety option, check the installation. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.
Safety option has signaled a warning.	– When using a pluggable safety option, check the installation. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 46.50 (2E32hex | 11826dec)

Description: Warning

Response: Warning with self-reset

Cause	Measure
Safety option has signaled a warning.	Observe the warning of the safety option subcomponent. Identify the exact cause of this warning and take the appropriate measures for elimination.

Fault: 46.51 (2E33hex | 11827dec) Description: Fault		
	Response: Emergency stop + output stage inhibit with self-reset	
	Cause	Measure
	Safety option detected a fault.	Observe the fault code of the safety option subcomponent. Identify the exact cause of this fault message and take the appropriate measures to eliminate the fault.

Fault: 46.52 (2E34hex | 11828dec) Description: System fault/data fault/critical fault		
	Response: Output stage inhibit with self-reset	
	Cause	Measure
	The MOVISAFE® CS.. safety option has detected a fault.	Open the fault status of the safety option in section [Diagnostics] > [MOVISAFE® CS..]. Identify the exact cause of this fault message of highest priority and take the appropriate measures to eliminate the fault.

12.7.33 Fault 51 Analog processing

Fault: 51.1 (3301hex | 13057dec) Description: Current at analog current input too small		
	Response: Analog input – 4 mA limit undershot	
	Cause	Measure
	Input current at analog input below 4 mA.	– Check the wiring. – Check the parameterization of the analog input.

12.7.34 Fault 52 Category 2 explosion protection function

Fault: 52.1 (3401hex | 13313dec) Description: Startup fault		
	Response: Output stage inhibit	
	Cause	Measure
	One or more parameters of the explosion protection function have been changed.	Before activating the function, take the explosion protection function into operation.

Fault: 52.2 (3402hex | 13314dec) Description: Invalid function activated		
	Response: Output stage inhibit	
	Cause	Measure
	The explosion protection function and the "standstill current" function cannot be activated at the same time.	Deactivate the "standstill current" function.

Fault: 52.3 (3403hex | 13315dec) Description: Nominal inverter current too large		
	Response: Output stage inhibit	
	Cause	Measure
	Ratio of nominal inverter current and nominal motor current too large.	Check the assignment of motor and inverter.

Fault: 52.4 (3404hex | 13316dec) Description: Parameterization of current limit characteristic faulty		
	Response: Output stage inhibit	
	Cause	Measure
	Fault detected in the parameterization of the current limit characteristic.	– Perform startup again. – If the fault occurs repeatedly, contact SEW-EURODRIVE Service.

Fault: 52.5 (3405hex | 13317dec) Description: Time duration exceeded for f < 5 Hz		
	Response: Emergency stop + output stage inhibit	
	Cause	Measure
	The rotating field frequency must not be below 5 Hz for longer than 60 s. This time period has been exceeded.	– Check the project planning. – Make sure that work is not performed below 5 Hz for a longer period of time. – Check behavior in idle state. For instance, activate the "FCB 01 output stage inhibit" drive function for position hold control on the device.

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12.8 Device replacement

12.8.1 Information

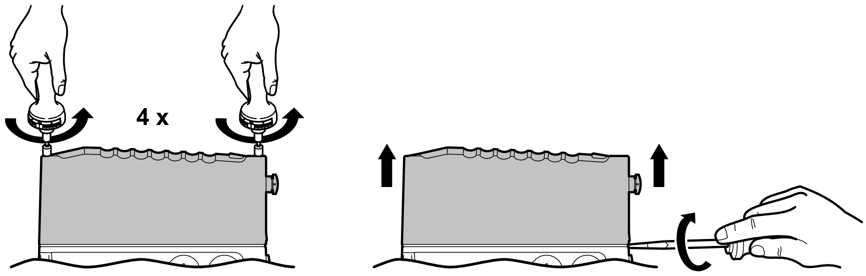
INFORMATION

When activating the delivery state of devices with the option /P (customer-specific parameter set), parameter settings are implemented that deviate from the default delivery state set by SEW-EURODRIVE.

12.8.2 Replacing the electronics cover

Replace the electronics cover as follows:

1. Consider the safety notes in chapter "Creating a safe working environment" (→ 🗎 15).
   ⇨ Make sure the device is de-energized. The 400 V line voltage and the 24 V backup voltage must be disconnected.
2. Loosen the screws and remove the electronics cover from the connection box.



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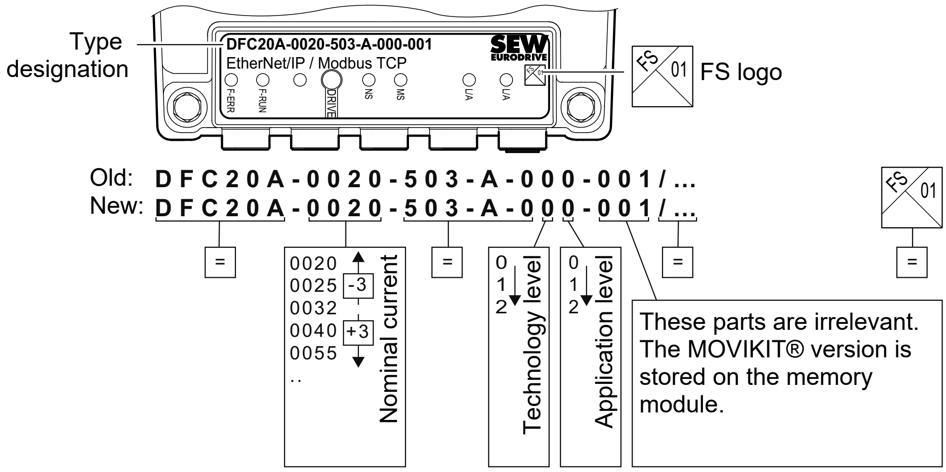
3. Compare the data on the nameplate of the previous electronics cover with the data on the nameplate of the new electronics cover.

INFORMATION

Always replace the electronics cover with an electronics cover with the same type designation.

But it is permitted to use an electronics cover with a nominal output current that is up to 3 times higher or lower than what the old electronics cover had.

- However, if you use an electronics cover with a higher nominal output current, the power at the output shaft will not be increased.
- When you use an electronics cover with a lower nominal output current than the old electronics cover, the power at the output shaft may no longer be high enough to meet the requirements.



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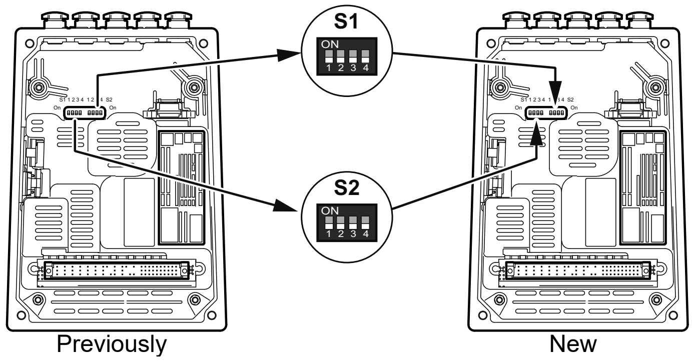
INFORMATION

In safety-related applications, replace an electronics cover only with an electronics cover with the same FS logo.

4. Set all the control elements (e.g. DIP switches, see chapter "Startup") on the new electronics cover in the same way as the control elements of the previous electronics cover.



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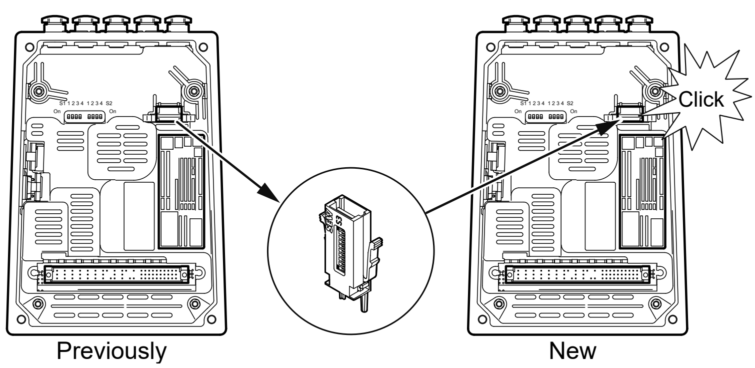
5. Remove the replaceable memory module from the old electronics cover. Insert the replaceable memory module in the new electronics cover.



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6. Place the new electronics cover onto the connection box and screw it in place.

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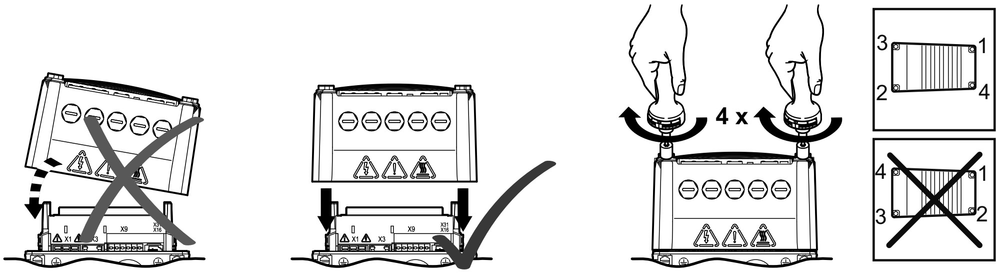
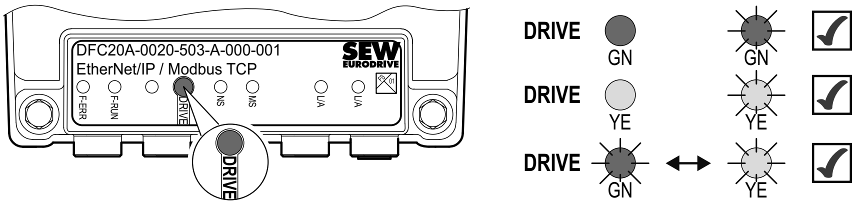


45451087883

7. Supply the device with voltage.
8. Check the functionality of the new electronics cover. If the electronics cover functions properly, the "DRIVE" LED shows one of the following states:



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9. If the device contains an optional safety card, a safety acknowledgment may be required. This acknowledgment cancels the start inhibit on the safety card.

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12.8.3 Replacing the memory module

Replace the memory module as follows:

1. Consider the safety notes in chapter "Creating a safe working environment" (→ 🗎 15).
   ⇨ Make sure the device is de-energized. The 400 V line voltage and the 24 V backup voltage must be disconnected.
2. Loosen the screws and remove the electronics cover from the connection box.
3. Remove the memory module from the old electronics cover.
4. Compare the part number and the status of the memory module.

INFORMATION

The new memory module must have the same part number and the same (or a higher) status as the old memory module.

5. Set the DIP switches on the new memory module in the same way as the control elements of the previous memory module.
6. Insert the new memory module into the electronics cover.
7. Place the electronics cover onto the connection box and screw it in place.
8. Supply the device with voltage.
9. Check the startup of the device.
   ⇨ If required, perform startup again or load the saved startup to the device.
   ⇨ For devices with safety card, check the startup of the safety card. For further information, refer to the product manual > chapter "Project planning for functional safety" > "Safety conditions" > "Startup requirements".
10. Check the functionality of the new electronics cover.

If the device was ordered with the option /P "Parameters ex works", the customer-specific parameter set is saved on the supplied memory module upon delivery.

When ordering a new memory module using the part number, no data set is stored on the memory module.

- Start up the device manually.
- As an alternative, save the data set of a previously created data backup to the memory module. Start up the device with the saved data set.

12.8.4 Device replacement

Replace the device as follows:

1. Consider the safety notes in chapter "Creating a safe working environment" (→ 🗎 15).
   ⇨ Make sure the device is de-energized. The 400 V line voltage and the 24 V backup voltage must be disconnected.
2. When you replace the device including the electronics cover, you also have to carry out the steps described in chapter "Replacing the electronics cover".
3. Remove the device. Observe the removal notes in chapter "Mechanical installation".
4. Compare the data on the nameplate of the old device with the nameplate data of the new device.

INFORMATION

Always replace the decentralized inverter with a decentralized inverter that has the same properties.

In safety-related applications, replace a decentralized inverter only with a decentralized inverter with the same FS logo.

5. Install the device. Observe chapter "Mechanical installation".
6. Perform the installation according to chapter "Electrical installation".
7. Remove the memory module from the old electronics cover. Insert this memory module in the new electronics cover.
8. Place the electronics cover onto the connection box and screw it in place.
9. Supply the device with voltage.
10. Check the function of the new device.

12.9 SEW-EURODRIVE Service

12.9.1 Sending in a device for repair

If a fault cannot be repaired, contact SEW-EURODRIVE Service (see chapter "Address list").

Always provide the numbers of the status sticker when consulting with SEW-EURODRIVE electronics service. so our Service personnel can assist you more effectively.

Provide the following when you send in the device for repair:

- Serial number (see nameplate)
- Type designation
- Unit design
- Short description of the application (application, control type, etc.)
- Type of fault
- Surrounding circumstances
- Your own presumptions
- Preceding, unconventional events, etc.

12.10 Shutdown

⚠ WARNING

Risk of burns due to hot surfaces.

Severe injuries.

- Let the devices cool down before touching them.

⚠ WARNING

Electric shock caused by dangerous voltages in the connection box. Dangerous voltages can still be present for up to 5 minutes after disconnection from the power supply system.

Severe or fatal injuries.

- Before removing the electronics cover, de-energize the device via a suitable external disconnection device.
- Secure the device against unintended re-connection of the voltage supply.
- Secure the output shaft against rotation.
- Wait for at least the following time before removing the electronics cover: **5 minutes**

To shut down the device, de-energize the device using appropriate measures. Disconnect the 400 V line voltage and the 24 V backup voltage from the device.

12.11 Storage

Observe the following instructions when shutting down or storing the device:

- If you shut down and store the device for a longer period, you must close open cable bushings and cover contacts with protection caps.
- Make sure that the device is not subject to mechanical impact during storage.
- Observe the notes on storage temperature in the product manual > chapter "Technical data".

12.12 Extended storage

12.12.1 Storage conditions

Observe the storage conditions specified in the following table for extended storage:

Climate zone	Packaging[1]	Storage location[2]	Storage duration
Temperate (Europe, USA, Canada, China and Russia, excluding tropical zones)	Packed in containers, with desiccant and moisture indicator sealed in plastic wrap.	Under roof, protected against rain and snow, no shock loads.	Up to 3 years with regular checks of the packaging and moisture indicator (relative humidity < 50%).
	Open	Under roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 50 °C, < 50% relative humidity). No sudden temperature variations. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors and no shocks.	2 years or more with regular inspections. Check for cleanness and mechanical damage during inspection. Check corrosion protection.
Tropical (Asia, Africa, Central and South America, Australia, New Zealand excluding temperate zones)	Packed in containers, with desiccant and moisture indicator sealed in plastic wrap. Protected against insect damage and mildew by chemical treatment.	Under a roof, protected against rain and free from shocks.	Up to 3 years with regular checks of the packaging and moisture indicator (relative humidity < 50%).
	Open	Under roof and enclosed at constant temperature and atmospheric humidity (5 °C < ϑ < 50 °C, < 50% relative humidity). No sudden temperature variations. Controlled ventilation with filter (free from dust and dirt). No aggressive vapors and no shocks. Protected against insect damage.	2 years or more with regular inspections. Check for cleanness and mechanical damage during inspection. Check corrosion protection.

1) The packaging must be carried out by an experienced company using the packaging materials that have been explicitly specified for the particular application.
2) SEW-EURODRIVE recommends storing the drive according to the mounting position.

12.12.2 Electronics

INFORMATION

For electronics components, adhere to the following notes in addition to the notes in chapters "Extended storage" > "Drive" and "Extended storage" > "Storage conditions".

If the device is in extended storage, connect it to the supply voltage for at least 5 minutes every 2 years. Otherwise, the device's service life may be reduced.

Procedure when maintenance has been neglected

Electrolytic capacitors that are subject to an aging effect when depowered are utilized in the inverters. This effect might result in damage to the capacitors if the device is directly connected to the nominal voltage after a long period of storage. If maintenance has been neglected, SEW-EURODRIVE recommends slowly increasing the line voltage up to the maximum voltage. For instance, this can occur with a variable transformer, whose output voltage is configured according to the following overview. According to this regeneration, the device can be used immediately or continue to undergo long-term storage with maintenance.

The following graduations are recommended:

AC 400/500 V devices:

- Stage 1: AC 0 V to AC 350 V within a few seconds
- Stage 2: AC 350 V for 15 minutes
- Stage 3: AC 420 V for 15 minutes
- Stage 4: AC 500 V for 1 hour

12.13 IT security guidelines for secure waste disposal

12.13.1 Removing the product from its intended environment

If the data stored on the product is considered relevant for IT security, remove it as described in the section "Secure removal of data stored in the product." (→ 🗎 508)

12.13.2 Removing reference and configuration data in the environment

Reference files, configuration files, log files, and other data belonging to the product can be stored in the environment on other devices, such as a higher-level controller or a local OPC-UA client. If the stored data is considered relevant for IT security, remove it from the corresponding devices.

12.13.3 Secure removal of data stored in the product

You can reset the data saved in the product to the factory settings using the MOVISUITE® engineering software.

This encompasses the following data, if present on the device variant:

- Configuration of the device
- Scope recording of the device
- Fault memory

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  - Fault number
  - Timestamp
  - Fault code, subfault code, descriptive text
  - Process data
  - States of the digital inputs/outputs
  - Control word and status word
- Device name
- IP address
- Safety-relevant data

The following data is not reset with this procedure and can be changed individually, if present on the device variant:

- Enabled functions
- AS-Interface address
- Data set of the safety option
- EtherCAT® device designation
- PROFINET name
- Last detected options

12.13.4 Removing a customer data backup

You can delete a customer data backup using the MOVISUITE® engineering software. To do so, in the parameter configuration of the corresponding device under [Basic setting] > [Data backup] > [Backup of customer-specific device parameters] click the [Delete] button.

Some of the data of the product is stored on removable storage media. If the data on the removable storage medium is classified as sensitive data from the operator's point of view and is not intended for later use, reset the device to the factory settings before disposing of the data. This also deletes the storage medium content.

12.14 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:

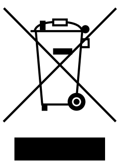
- Iron, steel or cast iron
- Stainless steel
- Magnets
- Aluminum
- Copper
- Electronic parts
- Plastics

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.

13 Inspection and maintenance

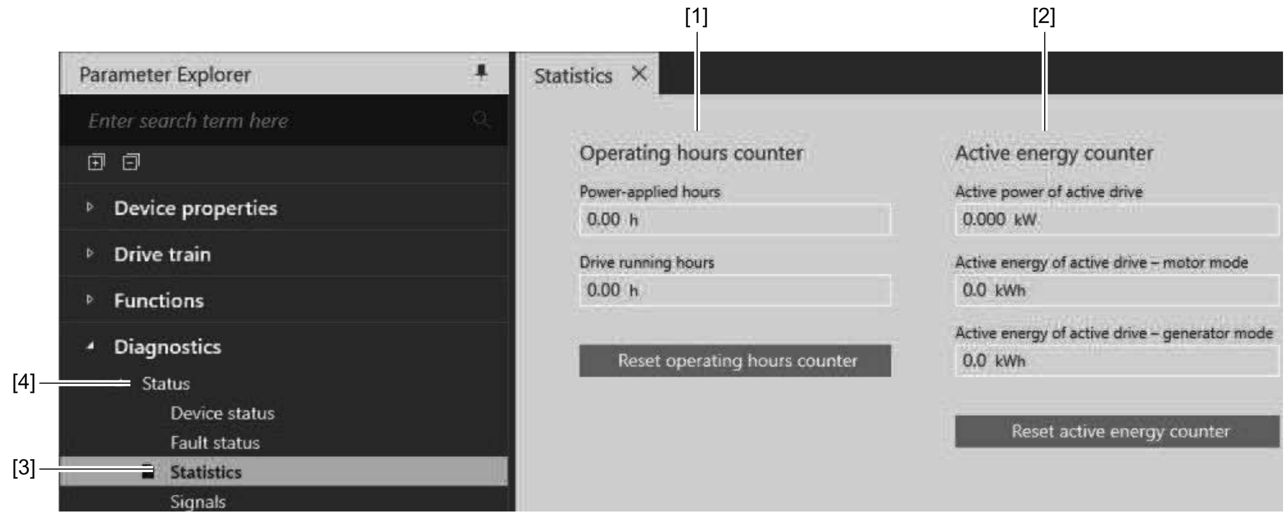
13.1 Determining the operating hours

13.1.1 About MOVISUITE®

The device can read out the operating hours so you can plan inspection and maintenance work more easily.

To determine the operating hours performed, proceed as follows:

1. In MOVISUITE®, open the parameter tree of the device.
2. In the parameter tree, select the "Status" node [4].
   ⇨ The **operating hours** performed can be found in the "Statistics" [3] group.



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[1] Display of operating and drive running hours performed
[2] Display of active power and active energy

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13.2 Inspection and maintenance intervals

The following table shows the inspection and replacement intervals for the device:

Time interval	What should I do?	Who is permitted to perform the work?
When the electronics cover is opened after an operating period of ≥ 6 months	If you open the electronics cover after an operating period of ≥ 6 months, you must replace the gasket between the connection box and the electronics cover to ensure the IP protection class. The 6-month period can be shortened by harsh ambient/operating conditions, e.g. cleaning with aggressive chemicals or frequent temperature variations.	Specialists at customer site
Each time the electronics cover is opened	Visual inspection of the gasket between connection box and electronics cover: In case of damage, replace this gasket.	Specialists at customer site

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13.3 Inspection and maintenance work

13.3.1 Preliminary work regarding inspection and maintenance

Please carry out the following steps before all inspection and maintenance work:

1. ⚠ **WARNING!** Electric shock caused by dangerous voltages in the connection box. Severe or fatal injuries.
   De-energize the device. Pay attention to the 5 safety rules in chapter "Carrying out electrical work safely". Afterwards, wait 5 minutes.
2. ⚠ **WARNING!** Risk of burns due to hot surfaces. Severe injuries.
   Let the device cool sufficiently before touching it.
3. Secure the output shaft of permanently excited motors against rotation. You thereby avoid an electric shock from the regenerative operation during the rotation of the shaft.

13.3.2 Cleaning the device

Observe the following information:

- Excessive dirt, dust or chips can have a negative impact on the function of the device and might even cause it to fail.
- It is therefore important to clean the device at regular intervals, at the latest after one year. This allows you to achieve sufficient heat dissipation.
- Insufficient heat dissipation can have undesirable consequences. The bearing service life is reduced by operating at impermissibly high temperatures (bearing grease decomposes).

13.3.3 Connection cables

Check the connection cables for damage at regular intervals. If the connection cables are damaged, replace them.

13.3.4 Replacing the gasket between connection box and electronics cover

Spare part kit

The gasket is available as a spare part (1, 10 or 50 pieces) from SEW-EURODRIVE.

Contents	Part number of gasket for size 1	Part number of gasket for size 2
1 piece	18187765	28131738
10 pieces	28266161	28278097
50 pieces	28266188	28284356

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Work steps with electronics cover size 1

NOTICE

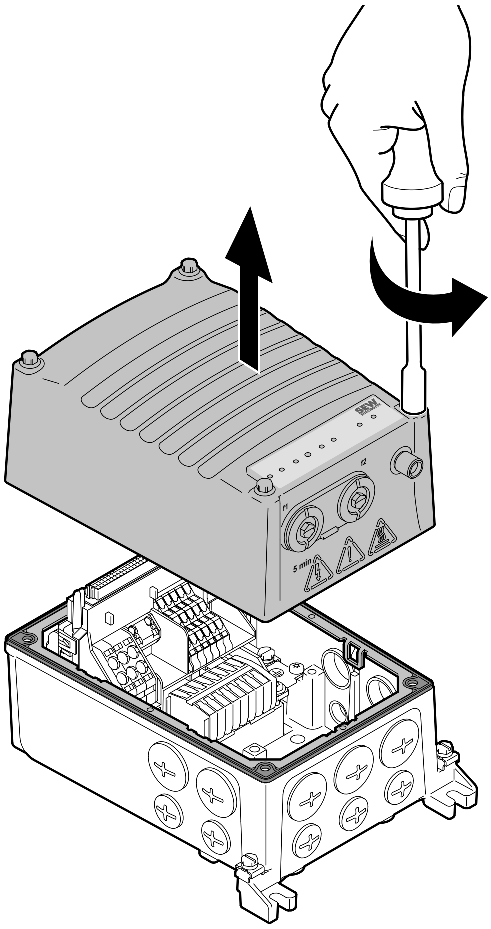
Loss of the guaranteed degree of protection.

Damage to property.

- When the cover is removed from the connection box, the cover and the wiring space must be protected from humidity, dust or foreign particles.

Replace the gasket of MOVIMOT® flexible as follows:

1. Perform the steps according to chapter "Preliminary work regarding inspection and maintenance" (→ 🗎 513).
2. Loosen the screws of the electronics cover and remove it.



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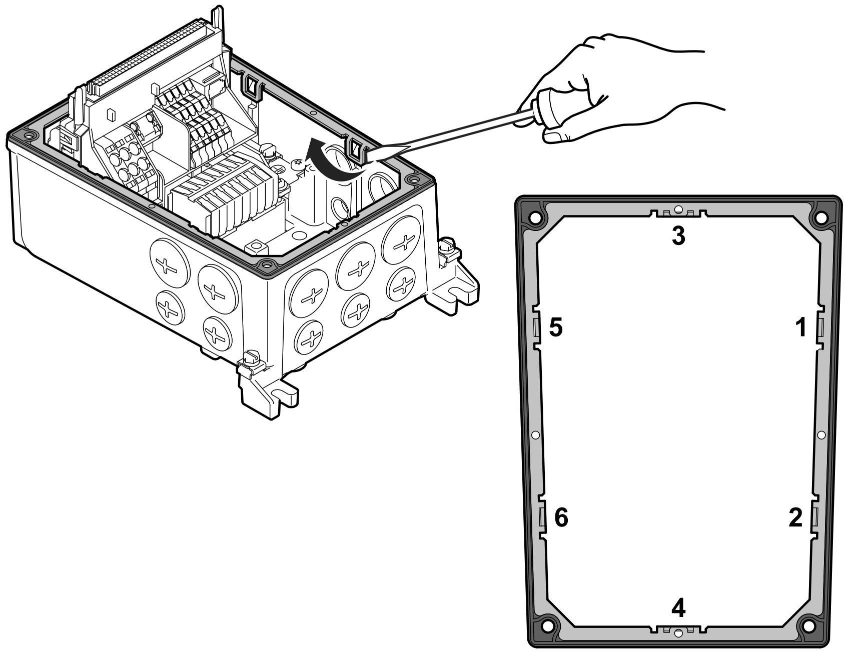
3. **NOTICE!** Loss of the guaranteed degree of protection. Possible damage to property. Make sure that the sealing surfaces are not damaged when removing the gasket.
   Loosen the used seal by levering it off the retaining cams.
   ⇨ Disassembly is easier if you adhere to the sequence shown in the following figure.



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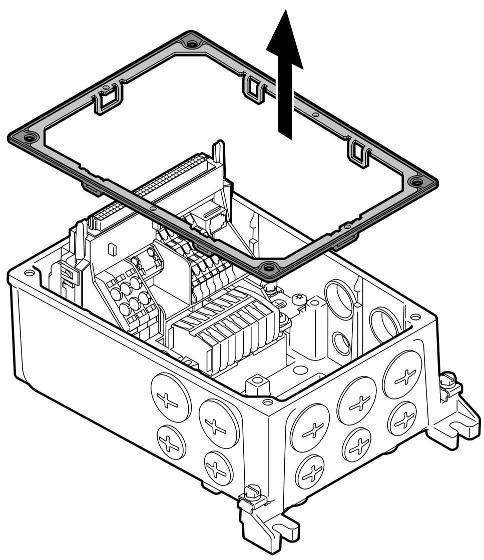
4. Remove the old gasket completely from the connection box.



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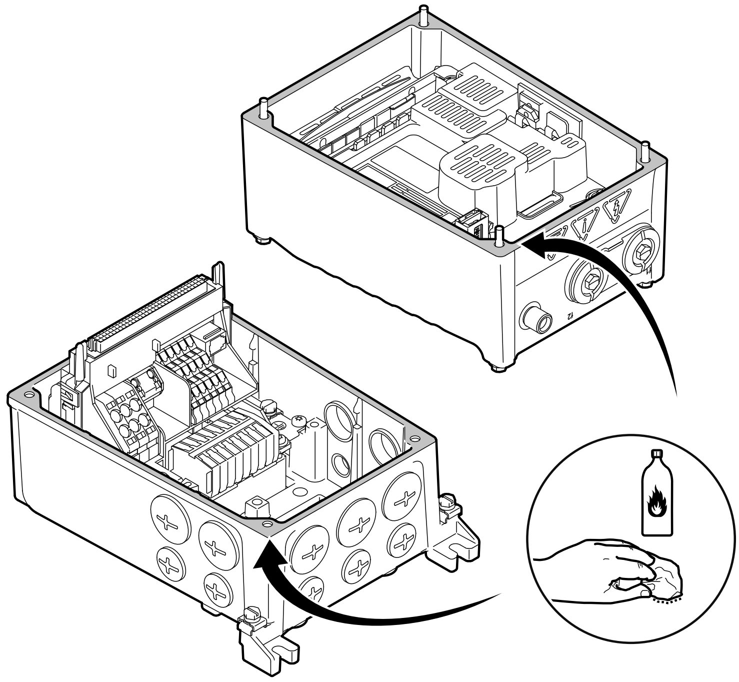
5. **CAUTION!** Risk of injury due to sharp edges. Cutting injuries. Use protective gloves when cleaning. Ensure that work is carried out by trained specialists only.
   Carefully clean the sealing surfaces of the connection box and the electronics cover.



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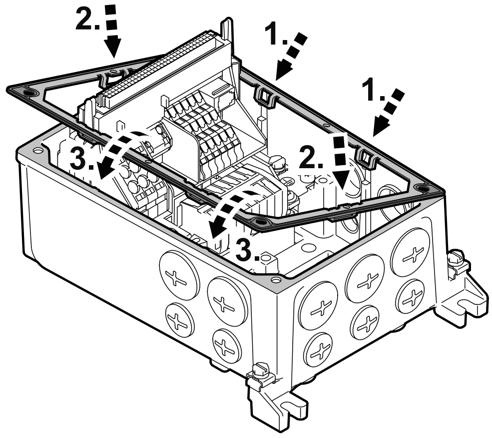
6. Place the new gasket on the connection box and fix it with the retaining cams. Installation is facilitated if you follow the illustrated order.



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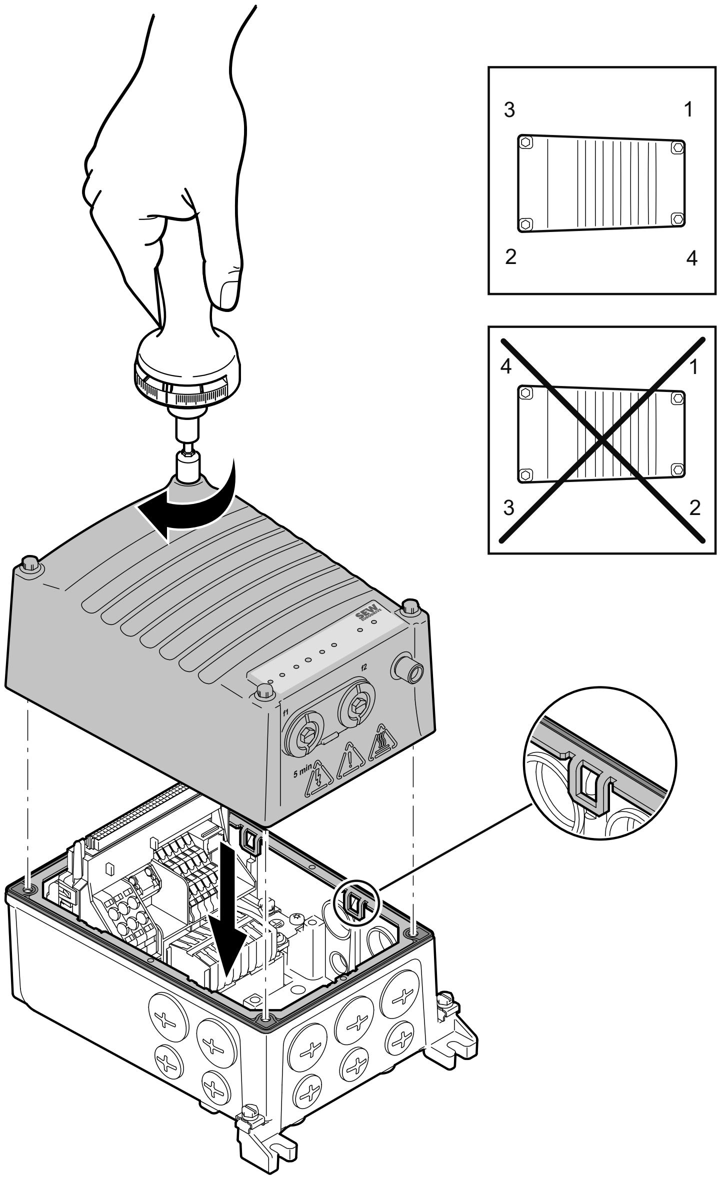
7. Check the installation and startup of the device using the applicable operating instructions.
8. Place the electronics cover back onto the connection box and secure it.
   ⇨ Proceed as follows when mounting the electronics cover: Insert/screw in the screws and tighten them in diametrically opposite sequence step by step with a tightening torque of 6.0 Nm.



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Work steps with electronics cover size 2

NOTICE

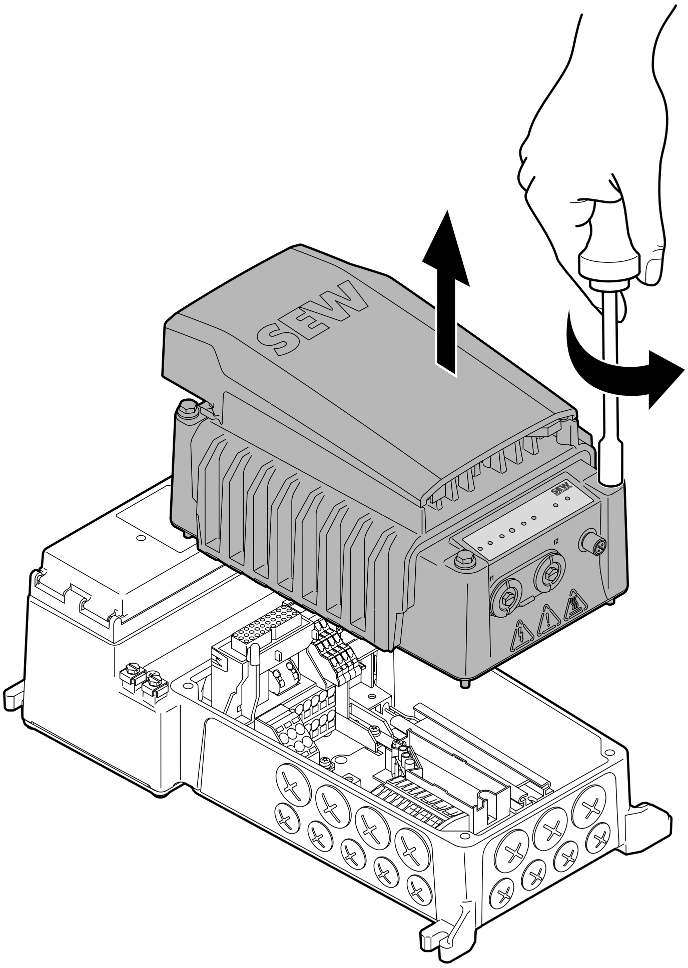
Loss of the guaranteed degree of protection.

Damage to property.

- When the cover is removed from the connection box, the cover and the wiring space must be protected from humidity, dust or foreign particles.

Replace the gasket of MOVIMOT® flexible as follows:

1. Perform the steps according to chapter "Preliminary work regarding inspection and maintenance" (→ 🗎 513).
2. Loosen the screws of the electronics cover and remove it.



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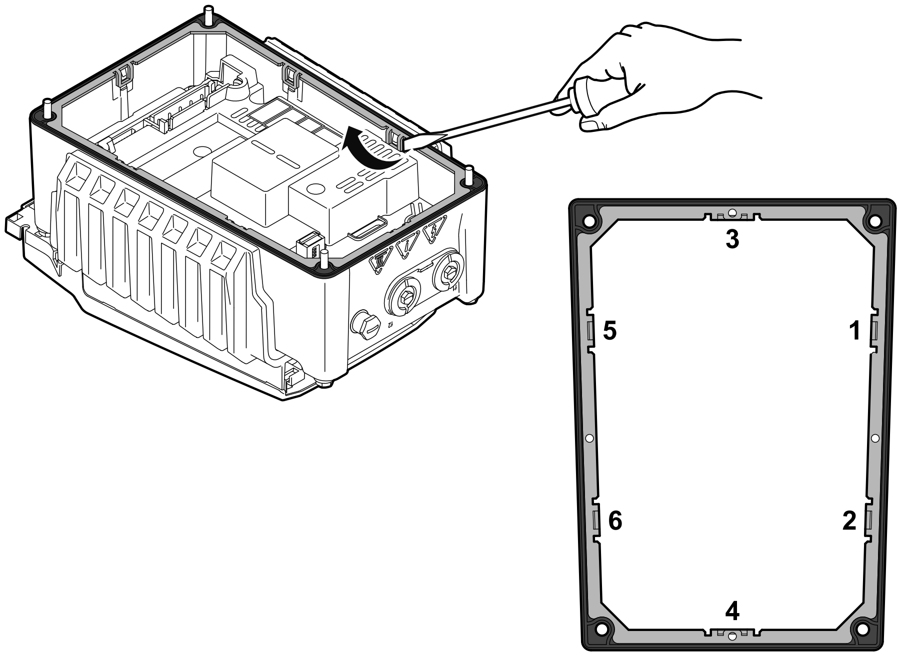
3. **NOTICE!** Loss of the guaranteed degree of protection. Possible damage to property. Make sure that the sealing surfaces are not damaged when removing the gasket.
   Loosen the used seal by levering it off the retaining cams.
   ⇨ Disassembly is easier if you adhere to the sequence shown in the following figure.



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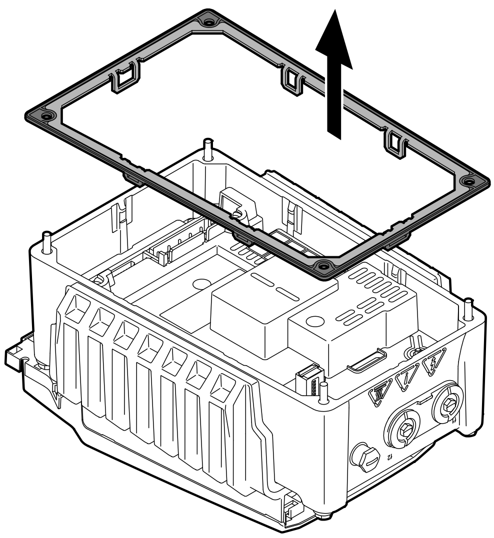
4. Remove the old gasket completely from the electronics cover.



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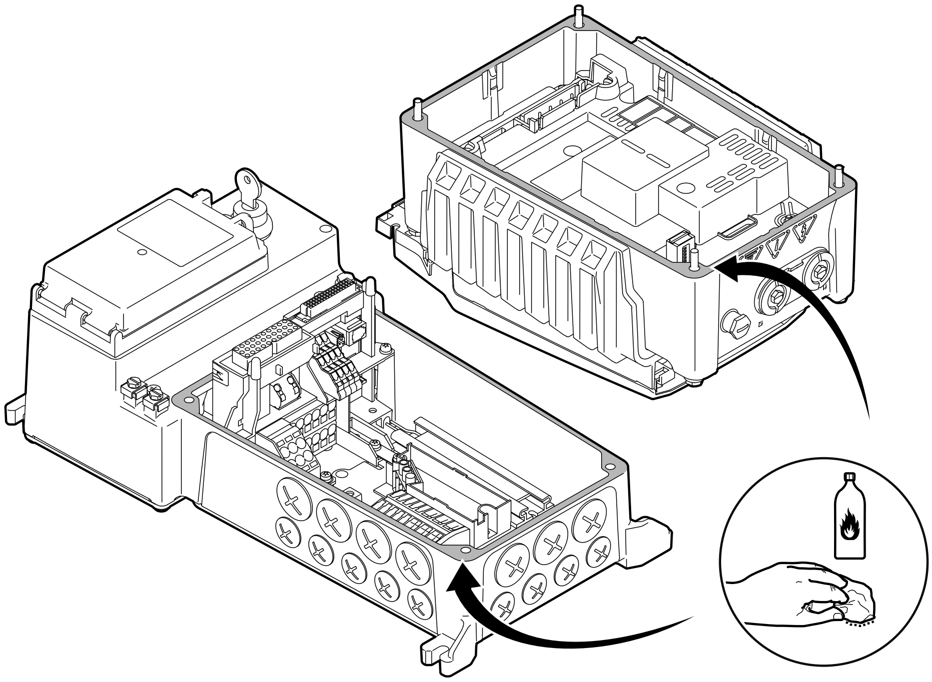
5. ⚠ **CAUTION!** Risk of injury due to sharp edges. Cutting injuries. Use protective gloves when cleaning. Ensure that work is carried out by trained specialists only.
   Carefully clean the sealing surfaces of the connection box and the electronics cover.



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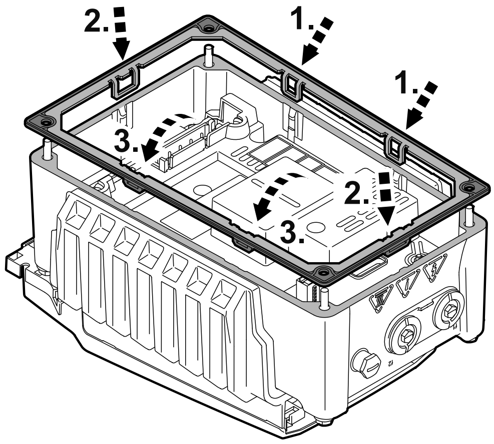
6. Place the new gasket on the electronics cover and fix it in position with the retaining cams. Installation is facilitated if you follow the illustrated order.



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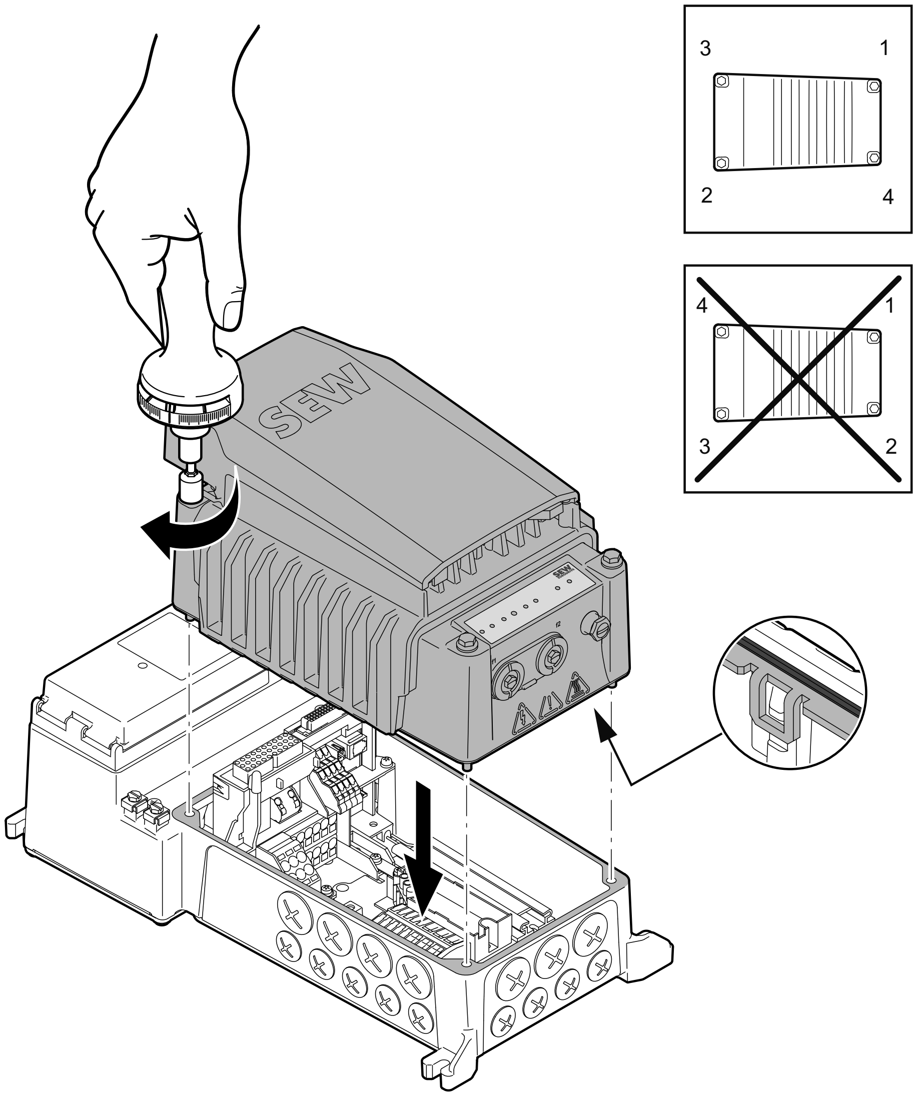
7. Check the installation and startup of the device using the applicable operating instructions.
8. Place the electronics cover back onto the connection box and secure it.
   - ⇨ Proceed as follows when mounting the electronics cover: Insert/screw in the screws and tighten them in diametrically opposite sequence step by step with a tightening torque of 9.5 Nm.



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14 Address list

Argentina			
Assembly Sales	Buenos Aires	SEW EURODRIVE ARGENTINA S.A. Ruta Panamericana Km 37.5, Lote 35 (B1619IEA) Centro Industrial Garín Prov. de Buenos Aires	Tel. +54 3327 4572-84 Fax +54 3327 4572-21 http://www.sew-eurodrive.com.ar sewar@sew-eurodrive.com.ar
Australia			
Assembly Sales Service	Melbourne	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. +61 3 9933-1000 Fax +61 3 9933-1003 http://www.sew-eurodrive.com.au enquires@sew-eurodrive.com.au
	Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park New South Wales, 2164	Tel. +61 2 9725-9900 Fax +61 2 9725-9905 enquires@sew-eurodrive.com.au
Service	Tomago	SEW-EURODRIVE PTY. LTD. 8 Epson Drive Tomago, New South Wales, 2322	Tel. +61 2 49505585 mail@sew-eurodrive.com.au
Austria			
Assembly Sales Service	Vienna	SEW-EURODRIVE Ges.m.b.H. Richard-Strauss-Straße 24 1230 Wien	Tel. +43 1 617 55 00-0 Fax +43 1 617 55 00-30 http://www.sew-eurodrive.at sew@sew-eurodrive.at
Bangladesh			
Sales	Bangladesh	SEW-EURODRIVE INDIA PRIVATE LIMITED 345 DIT Road East Rampura Dhaka-1219, Bangladesh	Tel. +88 01729 097309 salesdhaka@seweurodrivebangladesh.com
Belgium			
Assembly Sales Service	Brussels	SEW-EURODRIVE n.v./s.a. Researchpark Haasrode 1060 Evenementenlaan 7 3001 Haasrode	Tel. +32 16 386-311 Fax +32 16 386-336 http://www.sew-eurodrive.be info@sew-eurodrive.be
Service Competence Center	Industrial Gears	SEW-EURODRIVE n.v./s.a. Rue du Parc Industriel, 31 6900 Marche-en-Famenne	Tel. +32 84 219-878 Fax +32 84 219-879 http://www.sew-eurodrive.be info@sew.be
Brazil			
Production Sales Service	São Paulo	SEW-EURODRIVE Brasil Ltda. Estrada Municipal José Rubim, 205 – Rodovia Santos Dumont Km 49 Indaiatuba – 13347-510 – SP	Tel. +55 19 3835-8000 sew@sew.com.br
Assembly Sales Service	Rio Claro	SEW-EURODRIVE Brasil Ltda. Rodovia Washington Luiz, Km 172 Condomínio Industrial Conpark Caixa Postal: 327 13501-600 – Rio Claro / SP	Tel. +55 19 3522-3100 Fax +55 19 3524-6653 montadora.rc@sew.com.br
	Joinville	SEW-EURODRIVE Brasil Ltda. Jvl / Ind Rua Dona Francisca, 12.346 – Pirabeiraba 89239-270 – Joinville / SC	Tel. +55 47 3027-6886 Fax +55 47 3027-6888 filial.sc@sew.com.br
Bulgaria			
Sales	Sofia	BEVER-DRIVE GmbH Bogdanovetz Str.1 1606 Sofia	Tel. +359 2 9151160 Fax +359 2 9151166 bever@bever.bg
Cameroon			
Sales	Douala	SEW-EURODRIVE SARLU Ancienne Route Bonabéri P.O. Box B.P 8674 Douala-Cameroun	Tel. +237 233 39 12 35 Fax +237 233 39 02 10 www.sew-eurodrive.ci/ info@sew-eurodrive.cm

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Canada			
Assembly Sales Service	Toronto	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive Bramalea, ON L6T 3W1	Tel. +1 905 791-1553 Fax +1 905 791-2999 http://www.sew-eurodrive.ca l.watson@sew-eurodrive.ca
	Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. Tilbury Industrial Park 7188 Honeyman Street Delta, BC V4G 1G1	Tel. +1 604 946-5535 Fax +1 604 946-2513 b.wake@sew-eurodrive.ca
	Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2001 Ch. de l'Aviation Dorval Quebec H9P 2X6	Tel. +1 514 367-1124 Fax +1 514 367-3677 n.paradis@sew-eurodrive.ca

Chile			
Assembly Sales Service	Santiago de Chile	SEW-EURODRIVE CHILE LTDA Las Encinas 1295 Parque Industrial Valle Grande LAMPA Santiago de Chile P.O. Box Casilla 23 Correo Quilicura - Santiago - Chile	Tel. +56 2 2757 7000 Fax +56 2 2757 7001 http://www.sew-eurodrive.cl ventas@sew-eurodrive.cl

China			
Production Assembly Sales Service	Tianjin	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 78, 13th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25323273 http://www.sew-eurodrive.cn info@sew-eurodrive.cn
Assembly Sales Service	Suzhou	SEW-EURODRIVE (Suzhou) Co., Ltd. 333, Suhong Middle Road Suzhou Industrial Park Jiangsu Province, 215021	Tel. +86 512 62581781 Fax +86 512 62581783 suzhou@sew-eurodrive.cn
	Guangzhou	SEW-EURODRIVE (Guangzhou) Co., Ltd. No. 9, JunDa Road East Section of GETDD Guangzhou 510530	Tel. +86 20 82267890 Fax +86 20 82267922 guangzhou@sew-eurodrive.cn
	Shenyang	SEW-EURODRIVE (Shenyang) Co., Ltd. 10A-2, 6th Road Shenyang Economic Technological Develop-ment Area Shenyang, 110141	Tel. +86 24 25382538 Fax +86 24 25382580 shenyang@sew-eurodrive.cn
	Taiyuan	SEW-EURODRIVE (Taiyuan) Co,. Ltd. No.3, HuaZhang Street, TaiYuan Economic & Technical Development Zone ShanXi, 030032	Tel. +86-351-7117520 Fax +86-351-7117522 taiyuan@sew-eurodrive.cn
	Wuhan	SEW-EURODRIVE (Wuhan) Co., Ltd. 10A-2, 6th Road No. 59, the 4th Quanli Road, WEDA 430056 Wuhan	Tel. +86 27 84478388 Fax +86 27 84478389 wuhan@sew-eurodrive.cn
	Xi'An	SEW-EURODRIVE (Xi'An) Co., Ltd. No. 12 Jinye 2nd Road Xi'An High-Technology Industrial Development Zone Xi'An 710065	Tel. +86 29 68686262 Fax +86 29 68686311 xian@sew-eurodrive.cn
Assembly	Tianjin	SEW-EURODRIVE (Tianjin) Co., Ltd. No. 66, 10th Avenue, TEDA Tianjin 300457	Tel. +86 22 25322612 Fax +86 22 25322611 http://www.sew-sew-eurodrive.cn info@sew-eurodrive.cn
Sales Service	Hong Kong	SEW-EURODRIVE LTD. Unit No. 801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. +852 36902200 Fax +852 36902211 contact@sew-eurodrive.hk

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Colombia			
Assembly Sales Service	Bogota	SEW-EURODRIVE COLOMBIA LTDA. Calle 17 No. 132-18 Interior 2 Bodega 6, Manzana B Santafé de Bogotá	Tel. +57 1 54750-50 Fax +57 1 54750-44 http://www.sew-eurodrive.com.co sew@sew-eurodrive.com.co
Croatia			
Sales Service	Zagreb	KOMPEKS d. o. o. Zeleni dol 10 10 000 Zagreb	Tel. +385 1 4613-158 Fax +385 1 4613-158 kompeks@inet.hr
Czech Republic			
Assembly Sales Service	Hostivice	SEW-EURODRIVE CZ s.r.o. Floriánova 2459 253 01 Hostivice	Tel. +420 255 709 601 Fax +420 235 350 613 http://www.sew-eurodrive.cz sew@sew-eurodrive.cz
Denmark			
Assembly Sales Service	Copenhagen	SEW-EURODRIVEA/S Geminivej 28-30 2670 Greve	Tel. +45 43 95 8500 Fax +45 43 9585-09 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk
Service	Vejle	SEW-EURODRIVE A/S Bødkervej 2 7100 Vejle	Tel. +45 43 9585 00 http://www.sew-eurodrive.dk sew@sew-eurodrive.dk
Egypt			
Technical Office	Cairo	SEW-EURODRIVE Representative Office in Egypt REGUS Paramount Business Complex, Block 1258M, Unit 1, Ground Floor, Sheraton Heliopolis Cairo	Tel. +20 2 2503 2807 Fax +20 2 2503 2801 info@sew-eurodrive.eg
Estonia			
Sales	Tallin	ALAS-KUUL AS Loomäe tee 1, Lehmja küla 75306 Rae vald Harjumaa	Tel. +372 6593230 Fax +372 6593231 http://www.alas-kuul.ee info@alas-kuul.ee
Finland			
Assembly Sales Service	Hollola	SEW-EURODRIVE OY Vesimäentie 4 15860 Hollola	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi
Service	Hollola	SEW-EURODRIVE OY Keskikankaantie 21 15860 Hollola	Tel. +358 201 589-300 Fax +358 3 780-6211 http://www.sew-eurodrive.fi sew@sew.fi
	Tornio	SEW-EURODRIVE Oy Lossirannankatu 5 95420 Tornio	Tel. +358 201 589 300 Fax +358 3 780 6211 http://www.sew-eurodrive.fi sew@sew.fi
Production Assembly	Karkkila	SEW Industrial Gears Oy Santasalonkatu 6, PL 8 03620 Karkkila, 03601 Karkkila	Tel. +358 201 589-300 Fax +358 201 589-310 http://www.sew-eurodrive.fi sew@sew.fi
France			
Production Sales	Haguenau	SEW USOCOME 48-54 route de Soufflenheim B. P. 20185 67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 http://www.usocome.com sew@usocome.com
Production	Forbach	SEW USOCOME Zone industrielle Technopôle Forbach Sud B. P. 30269 57604 Forbach Cedex	Tel. +33 3 87 29 38 00

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France			
	Brumath	SEW USOCOME 1 Rue de Bruxelles 67670 Mommenheim Cedex	Tel. +33 3 88 37 48 00
Assembly Sales Service	Bordeaux	SEW USOCOME Parc d'activités de Magellan 62 avenue de Magellan – B. P. 182 33607 Pessac Cedex	Tel. +33 5 57 26 39 00 dtcbordeaux@usocome.com
	Haguenau	SEW USOCOME 48-54 route de Soufflenheim B. P. 20185 67506 Haguenau Cedex	Tel. +33 3 88 73 67 00 dtchaguenau@usocome.com
	Lyon	SEW USOCOME 75 rue Antoine Condorcet 38090 Vaulx-Milieu	Tel. +33 4 74 99 60 00 dtclyon@usocome.com
	Nantes	SEW USOCOME Parc d'activités de la forêt 4 rue des Fontenelles 44140 Le Bignon	Tel. +33 2 40 78 42 00 dtcnantes@usocome.com
	Paris	SEW USOCOME Zone industrielle 2 rue Denis Papin 77390 Verneuil I'Étang	Tel. +33 1 64 42 40 80 dtcparis@usocome.com
Gabon			
Representation: Cameroon			
Germany			
Headquarters Production Sales	Bruchsal	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 http://www.sew-eurodrive.de sew@sew-eurodrive.de
Production / Industrial Gears	Bruchsal	SEW-EURODRIVE GmbH & Co KG Christian-Pähr-Str. 10 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-2970
Production / Precision Gear Units	Bruchsal	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 42 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 sew@sew-eurodrive.de
Production	Graben	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 76676 Graben-Neudorf	Tel. +49 7251 75-0 Fax +49 7251-2970
Service Competence Center	Mechanics / Mechatronics	SEW-EURODRIVE GmbH & Co KG Ernst-Blickle-Straße 1 76676 Graben-Neudorf	Tel. +49 7251 75-1710 Fax +49 7251 75-1711 scc-mechanik@sew-eurodrive.de
	Electronics	SEW-EURODRIVE GmbH & Co KG Christian-Pähr-Straße 12 76646 Bruchsal	Tel. +49 7251 75-1780 Fax +49 7251 75-1769 scc-elektronik@sew-eurodrive.de
	MAXOLUTION® Factory Automation	SEW-EURODRIVE GmbH & Co KG Eisenbahnstraße 11 76646 Bruchsal	Tel. +49 7251 75-0 Fax +49 7251 75-1970 sew@sew-eurodrive.de
Drive Technology Center	North	SEW-EURODRIVE GmbH & Co KG Alte Ricklinger Straße 43 30823 Garbsen (Hannover)	Tel. +49 5137 8798-30 Fax +49 5137 8798-55 dtc-nord@sew-eurodrive.de
	East	SEW-EURODRIVE GmbH & Co KG Dänkritzer Weg 1 08393 Meerane (Zwickau)	Tel. +49 3764 7606-0 Fax +49 3764 7606-20 dtc-ost@sew-eurodrive.de
	South	SEW-EURODRIVE GmbH & Co KG Domagkstraße 5 85551 Kirchheim (München)	Tel. +49 89 909551-21 Fax +49 89 909551-50 dtc-sued@sew-eurodrive.de
	West	SEW-EURODRIVE GmbH & Co KG Siemensstraße 1 40764 Langenfeld (Düsseldorf)	Tel. +49 2173 8507-10 Fax +49 2173 8507-50 dtc-west@sew-eurodrive.de
Drive Center	Berlin	SEW-EURODRIVE GmbH & Co KG Melitta-Schiller-Straße 8 12526 Berlin	Tel. +49 306331131-30 Fax +49 306331131-36 dc-berlin@sew-eurodrive.de

Germany			
	Bremen	SEW-EURODRIVE GmbH & Co KG Allerkai 4 28309 Bremen	Tel. +49 421 33918-10 Fax +49 421 33918-22 dc-bremen@sew-eurodrive.de
	Hamburg	SEW-EURODRIVE GmbH & Co KG Hasselbinnen 11 22869 Schenefeld	Tel. +49 40298109-60 Fax +49 40298109-70 dc-hamburg@sew-eurodrive.de
	Saarland	SEW-EURODRIVE GmbH & Co KG Gottlieb-Daimler-Straße 4 66773 Schwalbach Saar – Hülzweiler	Tel. +49 6831 48946 10 Fax +49 6831 48946 13 dc-saarland@sew-eurodrive.de
	Ulm	SEW-EURODRIVE GmbH & Co KG Dieselstraße 18 89160 Dornstadt	Tel. +49 7348 9885-0 Fax +49 7348 9885-90 dc-ulm@sew-eurodrive.de
	Würzburg	SEW-EURODRIVE GmbH & Co KG Nürnbergerstraße 118 97076 Würzburg-Lengfeld	Tel. +49 931 27886-60 Fax +49 931 27886-66 dc-wuerzburg@sew-eurodrive.de
Drive Service Hotline	/ 24 Hour Service		0 800 SEWHELP 0 800 7394357
Great Britain			
Assembly Sales Service	Normanton	SEW-EURODRIVE Ltd. DeVilliers Way Trident Park Normanton West Yorkshire WF6 1GX	Tel. +44 1924 893-855 Fax +44 1924 893-702 http://www.sew-eurodrive.co.uk info@sew-eurodrive.co.uk
Greece			
Sales	Athens	Christ. Boznos & Son S.A. 12, K. Mavromichali Street P.O. Box 80136 18545 Piraeus	Tel. +30 2 1042 251-34 Fax +30 2 1042 251-59 http://www.boznos.gr info@boznos.gr
Hungary			
Sales Service	Budapest	SEW-EURODRIVE Kft. Csillaghegyí út 13. 1037 Budapest	Tel. +36 1 437 06-58 Fax +36 1 437 06-50 http://www.sew-eurodrive.hu office@sew-eurodrive.hu
Iceland			
Sales	Reykjavik	Varma & Vélaverk ehf. Knarrarvogi 4 104 Reykjavík	Tel. +354 585 1070 Fax +354 585)1071 https://vov.is/ vov@vov.is
India			
Registered Office Assembly Sales Service	Vadodara	SEW-EURODRIVE India Private Limited 302, NOTUS IT PARK, Sarabhai Campus, Beside Notus Pride, Genda Circle, Vadodara 390023 Gujarat	Tel. +91 265 3045200 Fax +91 265 3045300 https://www.seweurodriveindia.com salesvadodara@seweurodriveindia.com
Assembly Sales Service	Chennai	SEW-EURODRIVE India Private Limited Plot No. K3/1, Sipcot Industrial Park Phase II Mambakkam Village Sriperumbudur - 602105 Kancheepuram Dist, Tamil Nadu	Tel. +91 44 37188888 Fax +91 44 37188811 saleschennai@seweurodriveindia.com
	Pune	SEW-EURODRIVE India Private Limited Plant: Plot No. D236/1, Chakan Industrial Area Phase- II, Warale, Tal- Khed, Pune-410501, Maharashtra	Tel. +91 21 35 628700 Fax +91 21 35 628715 salespune@seweurodriveindia.com
	Tapukara	SEW-EURODRIVE India Private Limited Plot No SP-6-46, Tapukara, Karoli Industrial Area, No. 1, district : Alwar , Rajasthan - 301707	Tel. +91 265 3045200 Fax +91 265 3045300 tapukara.plant@seweurodriveindia.com

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India			
Sales	Gurgaon	SEW-EURODRIVE India Private Limited Global Business Park, Sector -26, M.G. Road, Sikanderpur Unit No. 205, 2nd Floor, Tower – D Gurugram 122002, Haryana	Tel. +91 9958376669 salesgurgaon@seweurodriveindia.com
Drive Center	Raipur	SEW-EURODRIVE India Private Limited Plot unit no. 129/17 P.O. GSI-Mandhar District: Raipur, State: Chhattisgarh	Tel. +91 8294630772 salesraipur@seweurodriveindia.com
Indonesia			
Registered Office Sales Service	Jakarta	PT SEW EURODRIVE INDONESIA Palma Tower, 16th Floor, Unit H & I, Jl R.A. Kartini II-S Kav 06 Pondok Pinang, Kebayoran Lama Jakarta Selatan 12310	Tel. +62 21 7593 0272 Fax +62 21 7593 0273 sales.indonesia@sew-eurodrive.com https://www.sew-eurodrive.com.sg
Sales	Medan	PT. Serumpun Indah Lestari Jl.Pulau Solor no. 8, Kawasan Industri Medan II Medan 20252	Tel. +62 61 687 1221 Fax +62 61 6871429 / +62 61 6871458 / +62 61 30008041 sil@serumpunindah.com serumpunindah@yahoo.com http://www.serumpunindah.com
	Jakarta	PT. Cahaya Sukses Abadi Komplek Rukan Puri Mutiara Blok A no 99, Sunter Jakarta 14350	Tel. +62 21 65310599 Fax +62 21 65310600 csajkt@cbn.net.id
	Jakarta	PT. Agrindo Putra Lestari JL.Pantai Indah Selatan, Komplek Sentra Industri Terpadu, Pantai indah Kapuk Tahap III, Blok E No. 27 Jakarta 14470	Tel. +62 21 2921-8899 Fax +62 21 2921-8988 aplindo@indosat.net.id http://www.aplindo.com
	Surabaya	PT. TRIAGRI JAYA ABADI Jl. Sukosemolo No. 63, Galaxi Bumi Permai G6 No. 11 Surabaya 60111	Tel. +62 31 5990128 Fax +62 31 5962666 sales@triagri.co.id http://www.triagri.co.id
	Surabaya	CV. Multi Mas Jl. Raden Saleh 43A Kav. 18 Surabaya 60174	Tel. +62 31 5458589 Fax +62 31 5317220 sianhwa@sby.centrin.net.id http://www.cvmultimas.com
Ireland			
Sales Service	Dublin	Alperton Engineering Ltd. 48 Moyle Road Dublin Industrial Estate Glasnevin, Dublin 11	Tel. +353 1 830-6277 Fax +353 1 830-6458 http://www.alperton.ie info@alperton.ie
Israel			
Sales	Tel Aviv	Liraz Handasa Ltd. Ahofer Str 34B / 228 58858 Holon	Tel. +972 3 5599511 Fax +972 3 5599512 http://www.liraz-handasa.co.il office@liraz-handasa.co.il
Italy			
Assembly Sales Service	Milan	SEW-EURODRIVE S.a.s. di SEW S.r.l. & Co. Via Bernini,12 20033 Solaro (Milano)	Tel. +39 02 96 980229 Fax +39 02 96 980 999 http://www.sew-eurodrive.it milano@sew-eurodrive.it
Ivory Coast			
Sales	Abidjan	SEW-EURODRIVE SARL Ivory Coast Rue des Pêcheurs, Zone 3 26 BP 916 Abidjan 26	Tel. +225 27 21 21 81 05 Fax +225 27 21 25 30 47 info@sew-eurodrive.ci http://www.sew-eurodrive.ci
Japan			
Assembly Sales Service	Iwata	SEW-EURODRIVE JAPAN CO., LTD 250-1, Shimoman-no, Iwata Shizuoka 438-0818	Tel. +81 538 373811 Fax +81 538 373814 http://www.sew-eurodrive.co.jp sewjapan@sew-eurodrive.co.jp

Kazakhstan			
Sales Service	Almaty	SEW-EURODRIVE LLP 291-291A, Tole bi street 050031, Almaty	Tel. +7 (727) 350 5156 Fax +7 (727) 350 5156 http://www.sew-eurodrive.com kazakhstan@sew-eurodrive.com
	Tashkent	Representative Office SEW-EURODRIVE Representative office in Uzbekistan 95A Amir Temur ave, office 401/3 100084 Tashkent	Tel. +998 97 134 01 99 http://www.sew-eurodrive.uz sew@sew-eurodrive.uz
	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230, MN	Tel. +976-77109997 Fax +976-77109997 imt@imt.mn
Latvia			
Sales	Riga	SIA Alas-Kuul Katlakalna 11C 1073 Riga	Tel. +371 6 7139253 Fax +371 6 7139386 http://www.alas-kuul.lv info@alas-kuul.com
Lebanon			
Sales (Lebanon)	Beirut	Gabriel Acar & Fils sarl B. P. 80484 Bourj Hammoud, Beirut	Tel. +961 1 510 532 Fax +961 1 494 971 ssacar@inco.com.lb
Sales (Jordan, Kuwait , Saudi Arabia, Syria)	Beirut	Middle East Drives S.A.L. (offshore) Sin El Fil. B. P. 55-378 Beirut	Tel. +961 1 494 786 Fax +961 1 494 971 http://www.medrives.com info@medrives.com
Lithuania			
Sales	Alytus	UAB Irseva Statybininku 106C 63431 Alytus	Tel. +370 315 79204 Fax +370 315 56175 http://www.irseva.lt irmantas@irseva.lt
Luxembourg			
Representation: Belgium			
Macedonia			
Sales	Skopje	Boznos DOOEL Dime Anicin 2A/7A 1000 Skopje	Tel. +389 23256553 Fax +389 23256554 http://www.boznos.mk
Malaysia			
Assembly Sales Service	Johor	SEW-EURODRIVE SDN BHD No. 95, Jalan Seroja 39, Taman Johor Jaya 81000 Johor Bahru, Johor West Malaysia	Tel. +60 7 3549409 Fax +60 7 3541404 sales@sew-eurodrive.com.my
Mexico			
Assembly Sales Service	Quéretaro	SEW-EURODRIVE MEXICO S.A. de C.V. SEM-981118-M93 Tequisquiapan No. 102 Parque Industrial Quéretaro C.P. 76220 Querétaro, México	Tel. +52 442 1030-300 Fax +52 442 1030-301 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Sales Service	Puebla	SEW-EURODRIVE MEXICO S.A. de C.V. Calzada Zavaleta No. 3922 Piso 2 Local 6 Col. Santa Cruz Buenavista C.P. 72154 Puebla, México	Tel. +52 (222) 221 248 http://www.sew-eurodrive.com.mx scmexico@seweurodrive.com.mx
Mongolia			
Technical Office	Ulaanbaatar	IM Trading LLC Olympic street 28B/3 Sukhbaatar district, Ulaanbaatar 14230, MN	Tel. +976-77109997 Tel. +976-99070395 Fax +976-77109997 http://imt.mn/ imt@imt.mn

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Morocco			
Sales Service Assembly	Bouskoura	SEW-EURODRIVE Morocco SARL Parc Industriel CFCIM, Lot. 55/59 27182 Bouskoura Grand Casablanca	Tel. +212 522 88 85 00 Fax +212 522 88 84 50 http://www.sew-eurodrive.ma sew@sew-eurodrive.ma
Namibia			
Sales	Swakopmund	DB MINING & INDUSTRIAL SUPPLIES CC Einstein Street Strauss Industrial Park Unit1 Swakopmund	Tel. +264 64 462 738 Fax +264 64 462 734 anton@dbminingnam.com
Netherlands			
Assembly Sales Service	Rotterdam	SEW-EURODRIVE B.V. Industrieweg 175 3044 AS Rotterdam Postbus 10085 3004 AB Rotterdam	Tel. +31 10 4463-700 Fax +31 10 4155-552 Service: 0800-SEWHELP http://www.sew-eurodrive.nl info@sew-eurodrive.nl
New Zealand			
Assembly Sales Service	Auckland	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount drive East Tamaki Auckland	Tel. +64 9 2745627 Fax +64 9 2740165 http://www.sew-eurodrive.co.nz sales@sew-eurodrive.co.nz
	Christchurch	SEW-EURODRIVE NEW ZEALAND LTD. 30 Lodestar Avenue, Wigram Christchurch	Tel. +64 3 384-6251 Fax +64 3 384-6455 sales@sew-eurodrive.co.nz
Nigeria			
Sales	Lagos	Greenpeg Nig. Ltd 64C Toyin Street Opebi-Allen Ikeja Lagos-Nigeria	Tel. +234-701-821-9200-1 http://www.greenpegltd.com sales@greenpegltd.com
Norway			
Assembly Sales Service	Moss	SEW-EURODRIVE A/S Hornebergvegen 11 B 7038 Trondheim	Tel. +47 69 24 10 20 Fax +47 69 24 10 40 http://www.sew-eurodrive.no sew@sew-eurodrive.no
Pakistan			
Sales	Karachi	Industrial Power Drives Al-Fatah Chamber A/3, 1st Floor Central Commercial Area, Sultan Ahmed Shah Road, Block 7/8, Karachi	Tel. +92 21 452 9369 Fax +92-21-454 7365 seweurodrive@cyber.net.pk
Paraguay			
Sales	Fernando de la Mora	SEW-EURODRIVE PARAGUAY S.R.L Nu Guazu No. 642 casi Campo Esperanza Santisima Trinidad Asuncion	Tel. +595 991 519695 Fax +595 21 3285539 sewpy@sew-eurodrive.com.py
Peru			
Assembly Sales Service	Lima	SEW EURODRIVE DEL PERU S.A.C. Los Calderos, 120-124 Urbanizacion Industrial Vulcano, ATE, Lima	Tel. +51 1 3495280 Fax +51 1 3493002 http://www.sew-eurodrive.com.pe sewperu@sew-eurodrive.com.pe
Philippines			
Sales	Makati	P.T. Cerna Corporation 4137 Ponte St., Brgy. Sta. Cruz Makati City 1205	Tel. +63 2 519 6214 Fax +63 2 890 2802 mech_drive_sys@ptcerna.com http://www.ptcerna.com
Poland			
Assembly Sales Service	Łódź	SEW-EURODRIVE Polska Sp.z.o.o. ul. Techniczna 5 92-518 Łódź	Tel. +48 42 293 00 00 Fax +48 42 293 00 49 http://www.sew-eurodrive.pl sew@sew-eurodrive.pl

Poland			
	Service	Tel. +48 42 293 0030 Fax +48 42 293 0043	24 Hour Service Tel. +48 602 739 739 (+48 602 SEW SEW) serwis@sew-eurodrive.pl
Portugal			
Assembly Sales Service	Coimbra	SEW-EURODRIVE, LDA. Av. da Fonte Nova, n.º 86 3050-379 Mealhada	Tel. +351 231 20 9670 Fax +351 231 20 3685 http://www.sew-eurodrive.pt infosew@sew-eurodrive.pt
Romania			
Sales Service	Bucharest	Sialco Trading SRL str. Brazilia nr. 36 011783 Bucuresti	Tel. +40 21 230-1328 Fax +40 21 230-7170 http://www.sialco.ro sialco@sialco.ro
Senegal			
Sales	Dakar	SENEMECA Mécanique Générale Km 8, Route de Rufisque B.P. 3251, Dakar	Tel. +221 338 494 770 Fax +221 338 494 771 http://www.senemeca.com senemeca@senemeca.sn
Serbia			
Sales	Belgrade	DIPAR d.o.o. Ustanicka 128a PC Košum, IV floor 11000 Beograd	Tel. +381 11 347 3244 / +381 11 288 0393 Fax +381 11 347 1337 office@dipar.rs
Singapore			
Assembly Sales Service	Singapore	SEW-EURODRIVE PTE. LTD. 9, Tuas Drive 2 Singapore 638644	Tel. +65 68621701 Fax +65 68612827 http://www.sew-eurodrive.com.sg sewsingapore@sew-eurodrive.com
Slovakia			
Drive Technology Center	Bernolákovo	SEW-Eurodrive SK s.r.o. Priemyselná ulica 6267/7 900 27 Bernolákovo	Tel.+421 2 48 212 800 http://www.sew-eurodrive.sk sew@sew-eurodrive.sk
Slovenia			
Representation: Austria			
South Africa			
Assembly Sales Service	Johannesburg	SEW-EURODRIVE (PROPRIETARY) LIMITED 32 O'Connor Place Eurodrive House Aeroton Johannesburg 2190 P.O.Box 90004 Bertsham 2013	Tel. +27 11 248-7000 Fax +27 11 248-7289 http://www.sew.co.za info@sew.co.za
	Cape Town	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens Cape Town P.O.Box 36556 Chempet 7442	Tel. +27 21 552-9820 Fax +27 21 552-9830 Telex 576 062 bgriffiths@sew.co.za
	Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 48 Prospecton Road Isipingo Durban P.O. Box 10433, Ashwood 3605	Tel. +27 31 902 3815 Fax +27 31 902 3826 cdejager@sew.co.za
	Nelspruit	SEW-EURODRIVE (PROPRIETARY) LIMITED 7 Christie Crescent Vintonia P.O.Box 1942 Nelspruit 1200	Tel. +27 13 752-8007 Fax +27 13 752-8008 robermeyer@sew.co.za

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South Korea			
Assembly Sales Service	Ansan	SEW-EURODRIVE Korea Co., Ltd. 7, Dangjaengi-ro, Danwon-gu, Ansan-si, Gyeonggi-do, Zip 425-839	Tel. +82 31 492-8051 Fax +82 31 492-8056 http://www.sew-eurodrive.kr master.korea@sew-eurodrive.com
	Busan	SEW-EURODRIVE Korea Co., Ltd. 28, Noksansandan 262-ro 50beon-gil, Gangseo-gu, Busan, Zip 618-820	Tel. +82 51 832-0204 Fax +82 51 832-0230
Assembly Service	Siheung	SEW-EURODRIVE Korea Co., Ltd. 35, Emtibeui 26-ro 58beon-gil, Siheung-si, Gyeonggi-do	http://www.sew-eurodrive.kr
Spain			
Assembly Sales Service	Bilbao	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnológico, Edificio, 302 48170 Zamudio (Vizcaya)	Tel. +34 94 43184-70 http://www.sew-eurodrive.es sew.spain@sew-eurodrive.es
Sri Lanka			
Sales	Colombo	SM International (Pte) Ltd 254, Galle Raod Colombo 4, Sri Lanka	Tel. +94 1 2584887 Fax +94 1 2582981
Swaziland			
Sales	Manzini	C G Trading Co. (Pty) Ltd Simunye street Matsapha, Manzini	Tel. +268 7602 0790 Fax +268 2 518 5033 charles@cgtrading.co.sz www.cgtradingswaziland.com
Sweden			
Assembly Sales Service	Jönköping	SEW-EURODRIVE AB Gnejsvägen 6-8 553 03 Jönköping Box 3100 S-550 03 Jönköping	Tel. +46 36 34 42 00 Fax +46 36 34 42 80 http://www.sew-eurodrive.se jonkoping@sew.se
Switzerland			
Assembly Sales Service	Basel	Alfred Imhof AG Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. +41 61 417 17 17 http://www.imhof-sew.ch info@imhof-sew.ch
Taiwan			
Sales	Taipei	Ting Shou Trading Co., Ltd. 6F-3, No. 267, Sec. 2 Tung Huw S. Road Taipei	Tel. +886 2 27383535 Fax +886 2 27368268 Telex 27 245 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
	Nan Tou	Ting Shou Trading Co., Ltd. No. 55 Kung Yeh N. Road Industrial District Nan Tou 540	Tel. +886 49 255353 Fax +886 49 257878 sewtwn@ms63.hinet.net http://www.tingshou.com.tw
Tanzania			
Sales	Daressalam	SEW-EURODRIVE PTY LIMITED TANZANIA Plot 52, Regent Estate PO Box 106274 Dar Es Salaam	Tel. +255 0 22 277 5780 Fax +255 0 22 277 5788 http://www.sew-eurodrive.co.tz info@sew.co.tz
Thailand			
Assembly Sales Service	Chonburi	SEW-EURODRIVE (Thailand) Ltd. 700/456, Moo.7, Donhuaroh Muang Chonburi 20000	Tel. +66 38 454281 Fax +66 38 454288 sewthailand@sew-eurodrive.com https://www.sew-eurodrive.co.th
Tunisia			
Sales	Tunis	T. M.S. Technic Marketing Service Zone Industrielle Mghira 2 Lot No. 39 2082 Fouchana	Tel. +216 79 40 88 77 Fax +216 79 40 88 66 http://www.tms.com.tn tms@tms.com.tn

Turkey			
Assembly Sales Service	Kocaeli-Gebze	SEW-EURODRIVE Ana Merkez Gebze Organize Sanayi Böl. 400 Sok No. 401 41480 Gebze Kocaeli	Tel. +90 262 9991000 04 Fax +90 262 9991009 http://www.sew-eurodrive.com.tr sew@sew-eurodrive.com.tr
Ukraine			
Assembly Sales Service	Dnipropetrovsk	SEW-EURODRIVE, LLC Robochya str., bld. 23-B, office 409 49008 Dnipro	Tel. +380 56 370 3211 Fax +380 56 372 2078 http://www.sew-eurodrive.ua sew@sew-eurodrive.ua
United Arab Emirates			
Drive Technology Center	Dubai	SEW-EURODRIVE FZE PO Box 263835 Jebel Ali Free Zone – South, P.O. Box Dubai, United Arab Emirates	Tel. +971 (0)4 8806461 Fax +971 (0)4 8806464 info@sew-eurodrive.ae
Uruguay			
Assembly Sales	Montevideo	SEW-EURODRIVE Uruguay, S. A. Jose Serrato 3569 Esqina Corumbe CP 12000 Montevideo	Tel. +598 2 21181-89 Fax +598 2 21181-90 sewuy@sew-eurodrive.com.uy
USA			
Production Sales Service	Southeast Region	SEW-EURODRIVE INC. 1295 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. +1 864 439-7537 Fax Sales +1 864 439-7830 Fax Production +1 864 439-9948 Fax Assembly +1 864 439-0566 Fax Confidential/HR +1 864 949-5557 http://www.seweurodrive.com cslyman@seweurodrive.com
Assembly Sales Service	Northeast Region	SEW-EURODRIVE INC. Pureland Ind. Complex 2107 High Hill Road, P.O. Box 481 Bridgeport, New Jersey 08014	Tel. +1 856 467-2277 Fax +1 856 845-3179 csbridgeport@seweurodrive.com
	Midwest Region	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. +1 937 335-0036 Fax +1 937 332-0038 cstroy@seweurodrive.com
	Southwest Region	SEW-EURODRIVE INC. 202 W. Danieldale Rd. DeSoto, TX 75115	Tel. +1 214 330-4824 Fax +1 214 330-4724 csdallas@seweurodrive.com
	Western Region	SEW-EURODRIVE INC. 30599 San Antonio St. Hayward, CA 94544	Tel. +1 510 487-3560 Fax +1 510 487-6433 cshayward@seweurodrive.com
	Wellford	SEW-EURODRIVE INC. 148/150 Finch Rd. Wellford, S.C. 29385	Tel. +1 864 439-7537 Fax +1 864 661 1167 IGOrders@seweurodrive.com
		SEW-EURODRIVE INC. 220 Finch Rd. Wellford, S.C. 29385-9630	
	Additional addresses for service provided on request!		
Vietnam			
Sales	Ho Chi Minh City	SEW-EURODRIVE PTE. LTD. RO at Hochiminh City 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 huytam.phan@sew-eurodrive.com
	Hanoi	MICO LTD Quảng Trị - North Vietnam / All sectors except Construction Materials 8th Floor, Ocean Park Building, 01 Dao Duy Anh St, Ha Noi, Viet Nam	Tel. +84 4 39386666 Fax +84 4 3938 6888 nam_ph@micogroup.com.vn http://www.micogroup.com.vn
Zambia			
Representation: South Africa			

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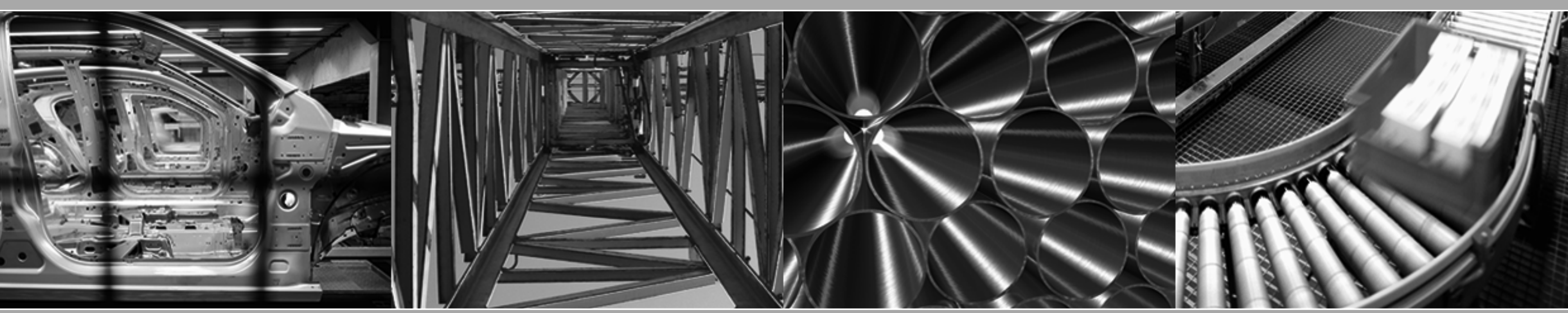

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