SEW EURODRIVE

Manual

Drive Systems for Decentralized Installation
EtherCAT® Interfaces, Field Distributors

Edition 01/2019

25809148/EN

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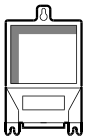
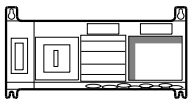
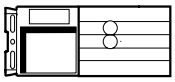
1 Valid components

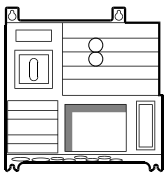
This manual applies to the following EtherCAT® products:

Connection module ..Z.1. with fieldbus interface	
	**4 × I, 2 × IO (M12)**  MFE72A/Z21D

Field distributor ..Z.3. with fieldbus interface	
	**4 × I, 2 × IO (M12)**  MFE72A/Z23D

Field distributor ..Z.6. with fieldbus interface	
	**4 × I, 2 × IO (M12)**  MFE72A/Z26F/AF0

Field distributor ..Z.7. with fieldbus interface	
	**4 × I, 2 × IO (M12)**  MFE72A/MM../Z27F.

Field distributor ..Z.8. with fieldbus interface	
	**4 × I, 2 × IO (M12)**  MFE72A/MM../Z28F./AF0

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2 General information

2.1 About this documentation

The current version of the documentation 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.

2.2 Structure of the safety notes

2.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

2.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

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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 automatic restart

2.2.3 Structure of embedded safety notes

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

This is the formal structure of an embedded safety note:

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

2.3 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.

2.4 Other applicable documentation

You must also note the following documents:

- "AC Motor" operating instructions
- "MOVIMOT® MM..D" operating instructions

2.5 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

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2.5.1 EtherCAT®

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

2.6 Copyright notice

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3 Safety notes

3.1 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.

3.2 Duties of the user

As the user, you must ensure that the basic safety notes are observed and complied with. Make sure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it.

As the user, you must ensure that all of the work listed in the following is carried out only by qualified specialists:

- Setup and installation
- Installation and connection
- Startup
- Maintenance and repairs
- Shutdown
- Disassembly

Ensure that the persons who work on the product pay attention to the following regulations, conditions, documentation, and information:

- National and regional safety and accident prevention regulations
- Warning and safety signs on the product
- All other relevant project planning documents, installation and startup instructions, and wiring diagrams
- Do not assemble, install or operate damaged products
- All system-specific specifications and conditions

Ensure that systems in which the product is installed are equipped with additional monitoring and protection devices. Observe the applicable safety regulations and legislation governing technical work equipment and accident prevention regulations.

3.3 Target group

Specialist for mechanical work

Any mechanical work may only be performed by adequately qualified specialists. Specialists in the context of this documentation are persons familiar with the design, mechanical installation, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualification in the mechanical area in accordance with the national regulations
- Familiarity with this documentation

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Specialist for electrotechnical work

Any electrotechnical work may only be performed by electrically skilled persons with a suitable education. Electrically skilled persons in the context of this documentation are persons familiar with electrical installation, startup, troubleshooting, and maintenance of the product who possess the following qualifications:

- Qualification in the electrotechnical area in accordance with the national regulations
- Familiarity with this documentation

Additional qualification

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 transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately. The purpose of the instruction is that the persons are capable of performing the required tasks and work steps in a safe and correct manner.

3.4 Designated use

The product is intended for installation in electrical plants or machines.

In case of installation in electrical systems or machines, startup of the product is prohibited until it is determined that the machine meets the requirements stipulated in the local laws and directives. For Europe, Machinery Directive 2006/42/EC as well as the EMC Directive 2014/30/EU apply. Observe EN 60204-1 (Safety of machinery - electrical equipment of machines). The product meets the requirements stipulated in the Low Voltage Directive 2014/35/EU.

The standards given in the declaration of conformity apply to the product.

The systems can be mobile or stationary. The motors must be suitable for operation with inverters. Do not connect any other loads to the product. Never connect capacitive loads to the product.

The product can be used to operate the following motors in industrial and commercial systems:

- AC asynchronous motors with squirrel-cage rotor

Technical data and information on the connection conditions are provided on the nameplate and in the 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.

3.4.1 Hoist applications

To avoid danger of fatal injury by falling hoists, observe the following points when using the product in lifting applications:

- Use mechanical protection devices.
- Perform a hoist startup.

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3.5 Functional safety technology

The product must not perform any safety functions without a higher-level safety system, unless explicitly allowed by the documentation.

3.6 Transport

Inspect the shipment for damage as soon as you receive the delivery. Inform the shipping company immediately about any damage. If the product is damaged, it must not be assembled, installed or started up.

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.
- Always use lifting eyes if available.

If necessary, use suitable, sufficiently dimensioned handling equipment.

Observe the information on climatic conditions in the chapter "Technical data" of the documentation.

3.7 Installation/assembly

Ensure that the product is installed and cooled according to the regulations in the documentation.

Protect the product from strong mechanical strain. The product and its mounting parts must never protrude into the path of persons or vehicles. Ensure that components are not deformed and insulation spaces are not changed, particularly during transportation and handling. Electric components must not be mechanically damaged or destroyed.

Observe the notes in chapter "Mechanical installation" (→ 🗎 24) in the documentation.

3.7.1 Restrictions of use

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

- Use in potentially explosive atmospheres
- Use in areas exposed to harmful oils, acids, gases, vapors, dust, and radiation
- Operation in applications with impermissibly high mechanical vibration and shock loads in excess of the regulations stipulated in EN 61800-5-1
- Use at an elevation of more than 4000 m above sea level

The product can be used at altitudes above 1000 m above sea level up to 4000 m above sea level under the following conditions:

- The reduction of the nominal output current and/or the line voltage is considered according to the data in chapter "Technical data" (→ 🗎 120) in the documentation.

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- Above 2000 m above sea level, the air and creeping distances are only sufficient for overvoltage class II according to EN 60664. At altitudes above 2000 m above sea level limiting measures must be taken, which 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.

3.8 Electrical installation

Ensure that all of the required covers are correctly attached after carrying out the electrical installation.

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

3.8.1 Required preventive measure

Make sure that the product is correctly attached to the ground connection.

3.9 Protective separation

The product meets all requirements for protective separation of power and electronics connections in accordance with EN 61800-5-1. To ensure protective separation, all connected circuits must also meet the requirements for protective separation.

3.10 Startup/operation

Observe the safety notes in the chapters "Startup" and "Operation" in the documentation.

Make sure that the present transport protection is removed.

Do not deactivate monitoring and protection devices of the machine or system even for a test run.

Make sure the connection boxes are closed and screwed before connecting the supply voltage.

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

Additional preventive measures may be required for applications with increased hazard potential. You have to check the protection devices after each modification.

When in doubt, switch off the product whenever changes occur in relation to normal operation. Possible changes are e.g. increased temperatures, noise, or oscillation. Determine the cause. Contact SEW-EURODRIVE if necessary.

When the device is switched on, dangerous voltages are present at all power connections as well as at any connected cables and terminals. This also applies even when the product is inhibited and the motor is at standstill.

Do not separate the connection to the product during operation.

This may result in dangerous electric arcs damaging the product.

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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:

1 minute.

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 safety functions of the product can cause a motor standstill. Eliminating the cause of the problem or performing a reset may result in the drive re-starting automatically. If, for safety reasons, this is not permitted for the drive-controlled machine, first disconnect the product from the supply system and then start troubleshooting.

Risk of burns: The surface temperature of the product can exceed 60 °C during operation.

Do not touch the product during operation.

Let the product cool down before touching it.

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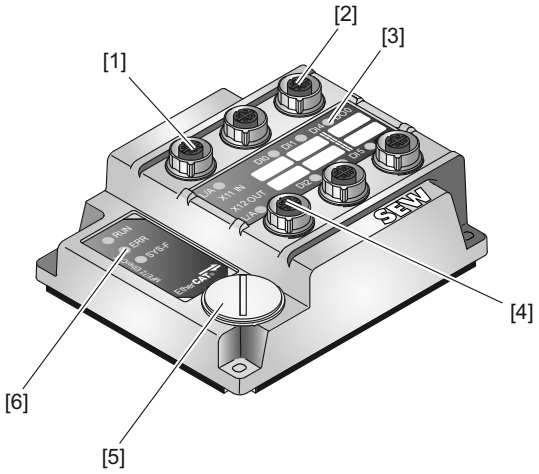
4 Device structure

4.1 Fieldbus interface

4.1.1 Fieldbus interface

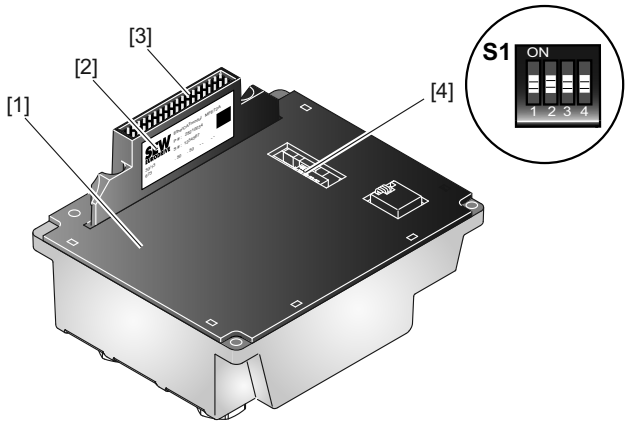
The following figure depicts the top side of the fieldbus interface:



8816327179

[1] X11 connection EtherCAT®, IN
[2] M12 connection sockets for digital inputs/outputs
[3] Status LEDs of digital inputs/outputs
[4] X12 connection EtherCAT®, OUT
[5] Diagnostics interface (underneath the gland)
[6] Status LEDs

The following figure depicts the bottom side of the fieldbus interface:



8817978891

[1] Gasket
[2] Nameplate
[3] Connection to connection module
[4] DIP switch S1

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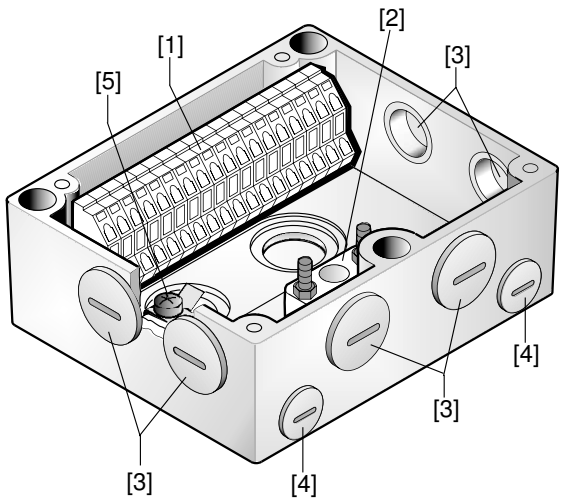
4.1.2 Device structure of MFZ connection module

The following figure shows the MFZ connection module.



9007200390917003

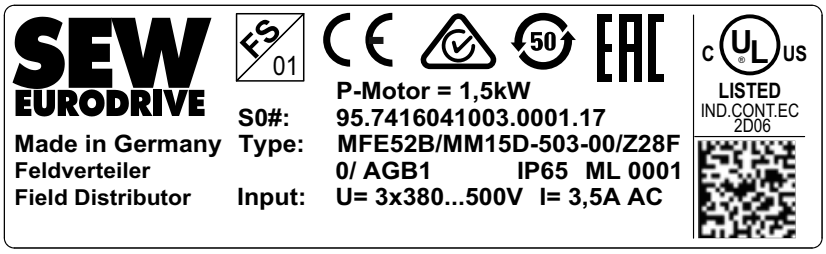
[1] Terminal strip X20
[2] Isolated terminal block for 24 V through-wiring
(NOTICE: Do not use for shielding.)
[3] M20 cable gland
[4] M12 cable gland
[5] Grounding terminal
The scope of delivery includes 2 EMC cable glands.

4.2 Type designation EtherCAT® interfaces

4.2.1 Nameplate

Order-specific nameplate

The following figure shows an example of the order-specific nameplate of the MFE../MM../Z.8 field distributors:



General nameplate

The following figure shows an example of the general nameplate of the MFE../MM../Z.8 field distributors:

Input:	Output to next Field Distributor:
U= 3x200...500V Imax= 30A AC	U= 3x200...500V Imax= 30A AC
Input:	**Output to drive:**
U= 3x200...500V Imax= 1,3...3,5A AC f= 50...60Hz	U= 3x0...Uinput Imax= 1,6...4,0A AC P-Motor= 0,37...1,5kW

The MF../Z.1 fieldbus interface does not have a general nameplate.

Only field distributors marked with the FS logo for functional safety may be installed in safety applications. For field distributors marked with the FS logo, the safety function must be described in the documentation.

4.2.2 Type designation

MFE	**Fieldbus interface**		
	MFP..	=	PROFIBUS
	MQP..	=	PROFIBUS with integrated minicontroller
	MFE..	=	PROFINET IO, EtherNet/IP™ or EtherCAT®
	MFD..	=	DeviceNet™
	MQD..	=	DeviceNet™ with integrated minicontroller
72	**Connections**		
	21 = 4 × I, 2 x O		(connection via terminals)
	22 = 4 × I, 2 x O		(connection via plug connector + terminals)
	32 = 6 × I		(connection via plug connector + terminals)
	52 = 4 × I, 2 × I/O		(connection via plug connector + terminals) for PROFINET IO
	62 = 4 × I, 2 × I/O		(connection via plug connector + terminals) for EtherNet/IP™
	72 = 4 × I, 2 × I/O		(connection via plug connector + terminals) for EtherCAT®
A	**Design**		
/			
Z21	**Connection module**		
	Z21	=	for PROFIBUS, PROFINET IO, EtherNet/IP™ and EtherCAT®
	Z31	=	for DeviceNet™
D	**Design**		

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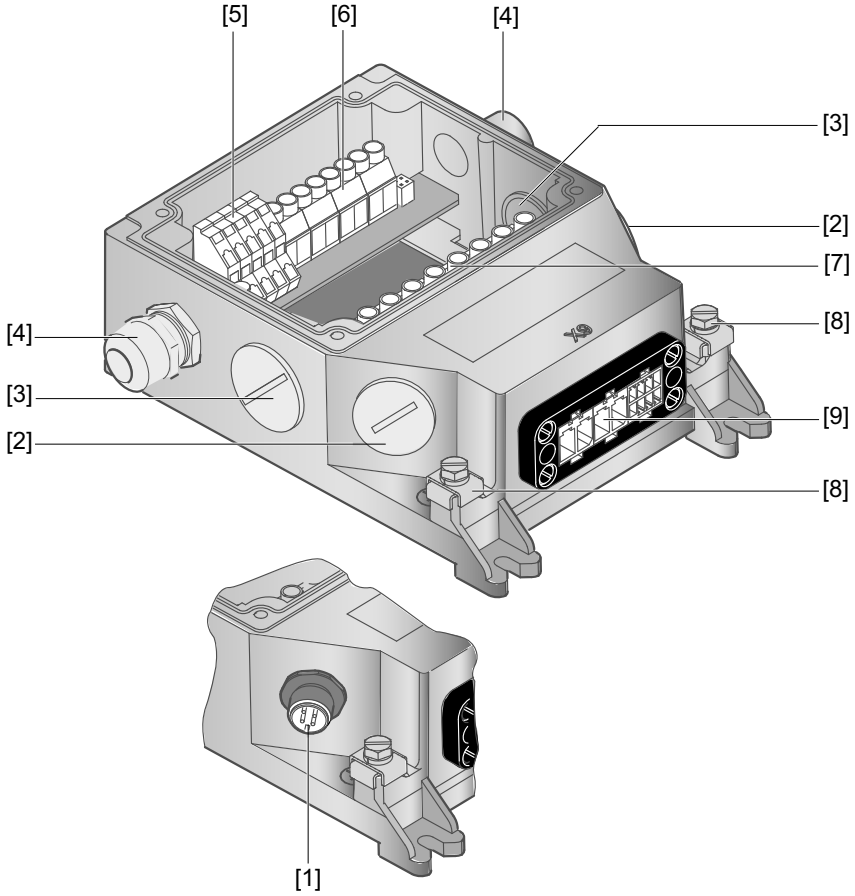
4.3 Device overview

4.3.1 Field distributor ..Z.3.



9007200390936971

[1] For DeviceNet™: Micro-style connector/M12 connector (X11)
[2] 2 × M20 × 1.5
[3] 2 × M25 × 1.5
[4] 2 × M16 × 1.5 (2 EMC cable glands included in the delivery)
[5] Terminals for fieldbus connection (X20)
[6] Terminals for 24 V connection (X21)
[7] Terminals for power supply and PE connection (X1)
[8] Connection PE/equipotential bonding
[9] Socket for hybrid cable, connection to MOVIMOT® (X9)

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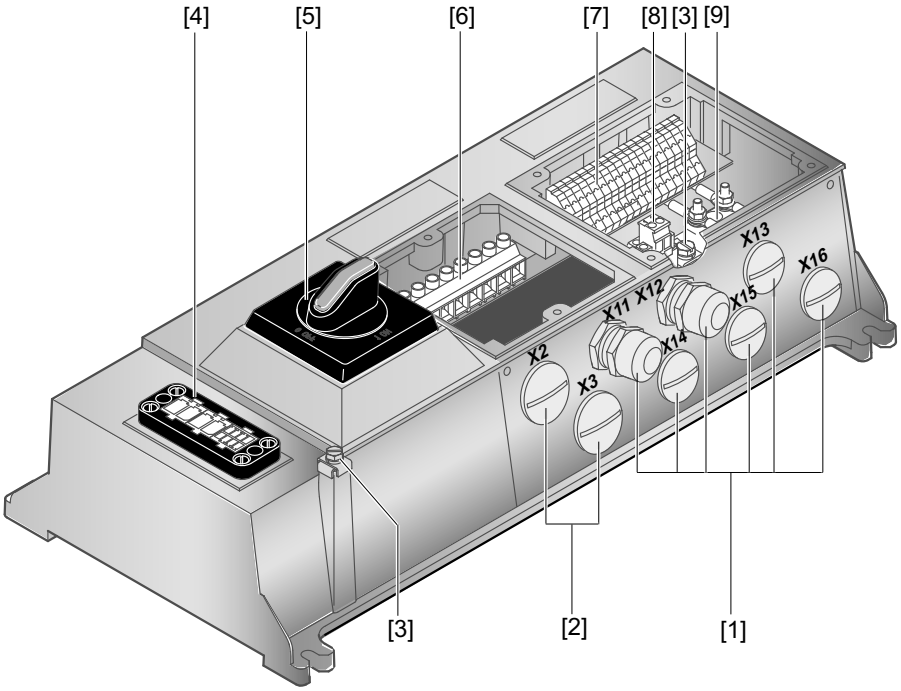
4.3.2 Field distributor ..Z.6.



9007200390944651

[1] 6 × M20 × 1.5 (2 EMC cable glands included in the delivery). For DeviceNet™: Micro-style connector/M12 connector (X11)
[2] 2 × M25 × 1.5
[3] Connection PE/equipotential bonding
[4] Hybrid cable socket, connection to MOVIMOT® inverter (X9)
[5] Maintenance switch "Maintenance switch" (→ 🖹 20)
[6] Terminals for power supply and PE connection (X1)
[7] Terminals for bus, sensor, actuator, 24 V connection (X29)
[8] Pluggable terminal "Safety Power" for 24 V MOVIMOT® supply (X40)
[9] Terminal block for 24 V through-wiring (X29), internal connection to 24 V on X20

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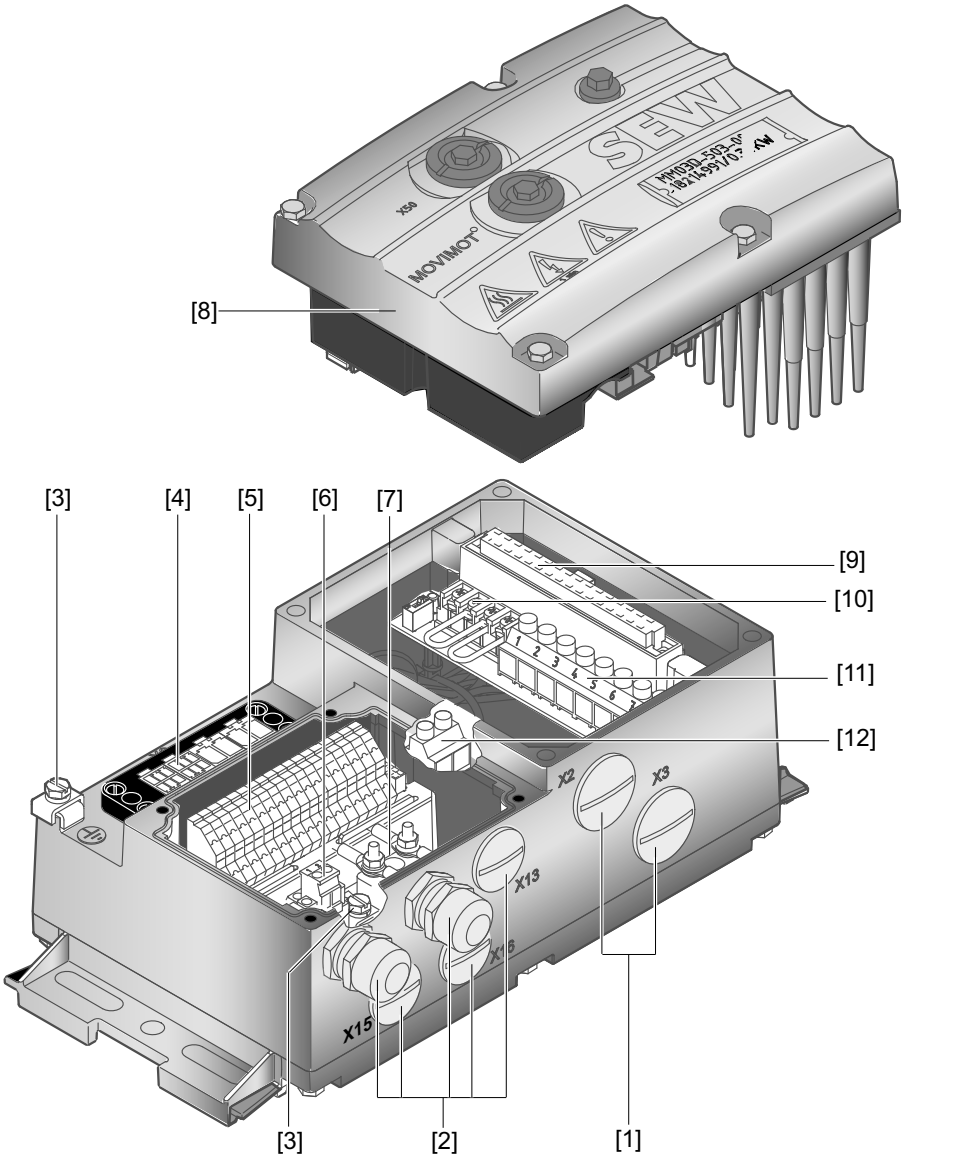
4.3.3 Field distributor ..Z.7.



9007200391188619

[1] 2 × M25 × 1.5 cable glands
[2] Cable gland 5 × M20 × 1.5 (2 EMC cable glands included in the delivery). For DeviceNet™: Micro-style connector/M12 connector (X11)
[3] Connection PE/equipotential bonding
[4] Hybrid cable connection; connection to AC motor (X9)
[5] Terminals for bus, sensor, actuator, 24 V connection (X20)
[6] Pluggable terminal "Safety Power" for 24 V MOVIMOT® supply (X40)
[7] Terminal block for 24 V through-wiring (X29), internal connection to 24 V on X20
[8] MOVIMOT® inverter
[9] Connection to MOVIMOT® inverter
[10] Terminals for enabling the direction of rotation
[11] Terminals for power supply and PE connection (X1)
[12] Terminal for integrated braking resistor

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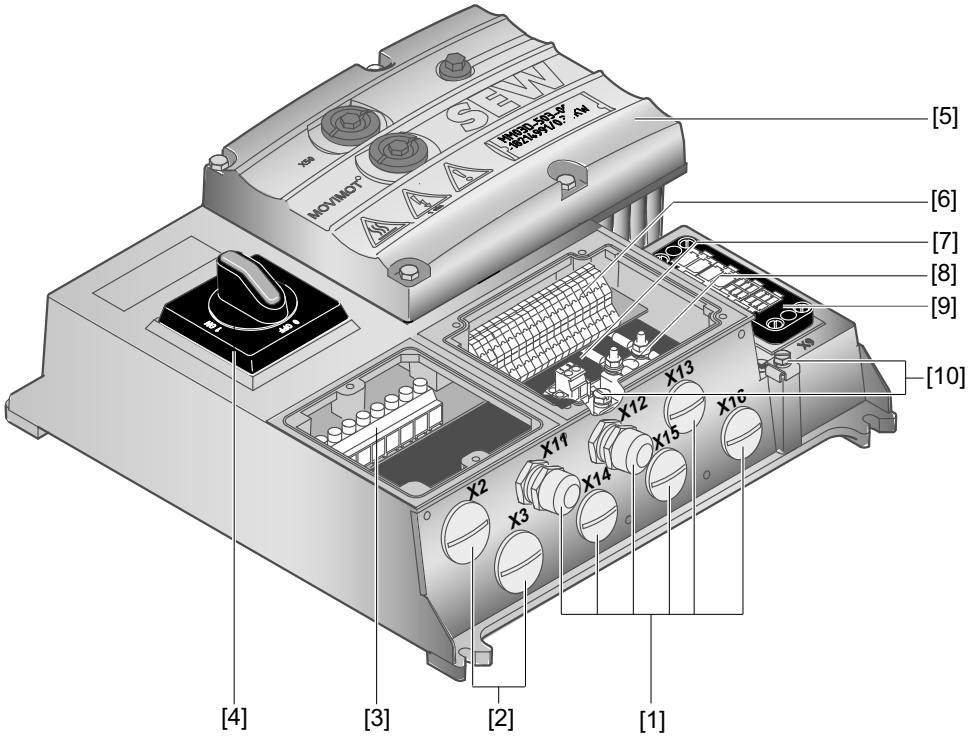
4.3.4 Field distributor ..Z.8.



18014399645961355

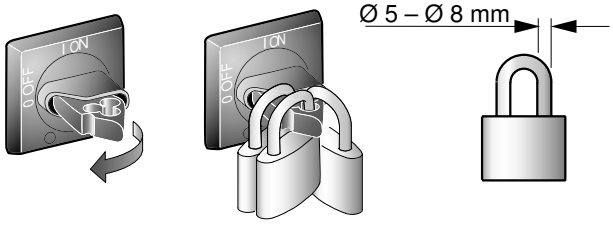
[1] Cable gland 6 × M20 × 1.5 (2 EMC cable glands included in the delivery). For DeviceNet™: Micro-style connector/M12 connector (X11)
[2] 2 × M25 × 1.5 cable glands
[3] Terminals for power supply and PE connection (X1)
[4] Maintenance switch "Maintenance switch" (→ 🗎 20)
[5] MOVIMOT® inverter
[6] Terminals for bus, sensor, actuator, 24 V connection (X20)
[7] Pluggable terminal "Safety Power" for 24 V MOVIMOT® supply (X40)
[8] Terminal block for 24 V through-wiring (X29), internal connection to 24 V on X20
[9] Hybrid cable connection; connection to AC motor (X9)
[10] Connection PE/equipotential bonding

4.3.5 Maintenance switch

The maintenance switch with line protection can be secured with 3 locks.

For the designs MFZ26J, MFPZ28J, and MFZ29J, the maintenance switch offers an integrated feedback option for the current position. Feedback is evaluated by the DI0 binary input. For further information, refer to the chapter "Connecting MFE72 fieldbus interface inputs/outputs" (→ 🗎 52).

The following figure shows the maintenance switch:



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4.4 Type designation EtherCAT® field distributors

4.4.1 Example of MF../Z.3.

The following table shows the type designation for MF../Z.3. field distributors as an example:

MFE72A	**Fieldbus interface**		
	MFP../MQP..	=	PROFIBUS
	MFE..	=	PROFINET IO, EtherNet/IP™ or EtherCAT®
	MFD../MQD..	=	DeviceNet™
/			
Z23	**Connection module**		
	Z23	=	for PROFIBUS, PROFINET IO, EtherNet/IP™ and EtherCAT®
	Z33	=	for DeviceNet™
D	**Design**		

4.4.2 Example of MF/Z.6.

The following table shows the type designation for MF../Z.6. field distributors as an example:

MFE72A	**Fieldbus interface**		
	MFP../MQP..	=	PROFIBUS
	MFE..	=	PROFINET IO, EtherNet/IP™ or EtherCAT®
	MFD../MQD..	=	DeviceNet™
/			
Z26	**Connection module**		
	Z26	=	for PROFIBUS, PROFINET IO, EtherNet/IP™ and EtherCAT®
	Z36	=	for DeviceNet™
F	**Design**		
/			
AF0	**Connection technology**		
	AF0	=	Metric cable entry
	AF1	=	With micro-style connector/M12 connector for DeviceNet™
	AF2	=	M12 plug connector for PROFIBUS
	AF3	=	M12 plug connector for PROFIBUS + M12 plug connector for 24 V DC supply

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4.4.3 Example of MF/MM/Z.7.

The following table shows the type designation for MF../MM../Z.7. field distributors as an example:

MFE72A	**Fieldbus interface**		
	MFP../MQP..	=	PROFIBUS
	MFE..	=	PROFINET IO, EtherNet/IP™ or EtherCAT®
	MFD../MQD..	=	DeviceNet™
/			
MM..	**MOVIMOT® inverter**		
/			
Z27	**Connection module**		
	Z27	=	for PROFIBUS, PROFINET IO, EtherNet/IP™ and EtherCAT®
	Z37	=	for DeviceNet™
F	**Design**		
0	**Connection type**		
	0	=	⅄
	1	=	△

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4.4.4 Example of MF/MM/Z.8.

The following table shows the type designation for MF../MM../Z.8. field distributors as an example:

MFE72A	**Fieldbus interface**		
	MFP../MQP..	=	PROFIBUS
	MFE..	=	PROFINET IO, EtherNet/IP™ or EtherCAT®
	MFD../MQD..	=	DeviceNet™
/			
MM..	**MOVIMOT® inverter**		
/			
Z28	**Connection module**		
	Z28	=	for PROFIBUS, PROFINET IO, EtherNet/IP™ and EtherCAT®
	Z38	=	for DeviceNet™
F	**Design**		
0	**Connection type**		
	0	=	⅄
	1	=	△
/			
AF0	**Connection technology**		
	AF0	=	Metric cable entry
	AF1	=	With micro-style connector/M12 connector for DeviceNet™
	AF2	=	M12 plug connector for PROFIBUS
	AF3	=	M12 plug connector for PROFIBUS + M12 plug connector for 24 V DC supply

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5 Mechanical installation

5.1 Installation instructions

INFORMATION

On delivery, field distributors are equipped with transportation protection covering the plug connector of the outgoing motor circuit (hybrid cable).

This only guarantees the degree of protection IP40. To obtain the specified degree of protection, remove the transport protection and plug on the appropriate mating connector. Screw them together.

5.1.1 Assembly

- Mount field distributors on a level, vibration-proof and torsionally rigid support structure only.
- Use M5 screws and suitable washers for attaching the **MFZ.3** field distributor. Tighten screws with a torque wrench (permitted tightening torque 2.8 – 3.1 Nm).
- Use M6 screws and suitable washers for installing **MFZ.6, MFZ.7**, **MFZ.8** or **MFZ.9** field distributors. Tighten screws with torque wrench (permitted tightening torque 3.1 – 3.5 Nm).

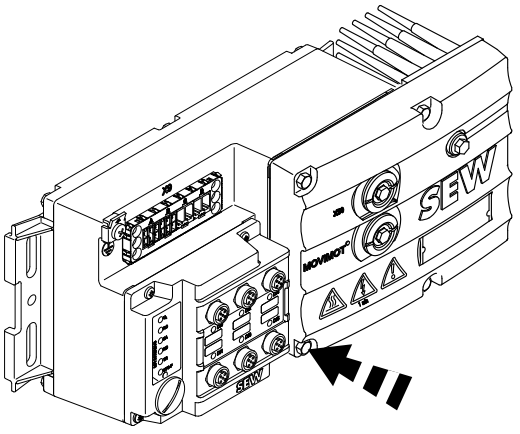
5.1.2 Installation in damp locations or in the open

Observe the following notes for mounting the fieldbus interface and the field distributor in damp locations or outdoors:

- Use suitable cable glands for the cables. Use reducing adapters, if necessary.
- Seal open cable entries and M12 connection sockets with screw plugs.
- When the cable entry on the side is used, route the cable with a drip loop.
- Thoroughly clean the sealing surface of the fieldbus interface and of the connection box cover before re-installing.

5.2 Tightening torques

5.2.1 MOVIMOT® inverter



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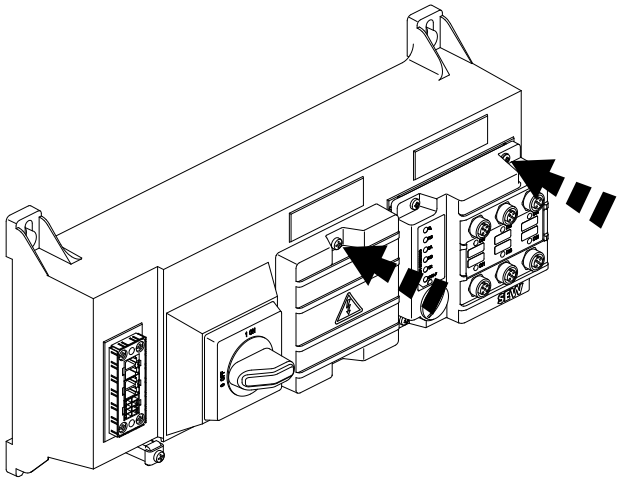
Tighten the screws for fastening MOVIMOT® using 3.0 Nm in diametrically opposite sequence.

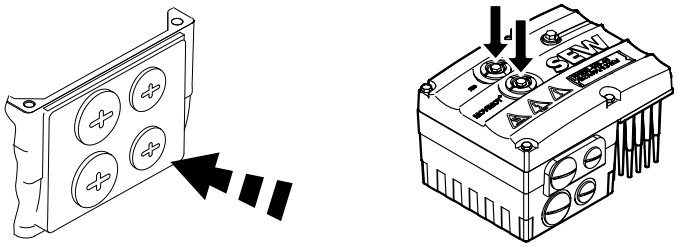
5.2.2 Fieldbus interface / connection box cover



9007200393245323

Tighten the screws on the fieldbus interfaces or connection box cover using 2.5 Nm in diametrically opposite sequence.

5.2.3 Screw plugs

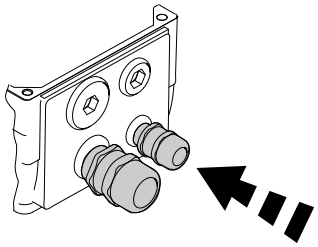


9007200393250059

Tighten the blanking plugs and the screw plugs of potentiometer f1, and of connection X50, if applicable, using 2.5 Nm.

5.2.4 EMC cable glands

The following figure shows the position of the EMC cable glands:



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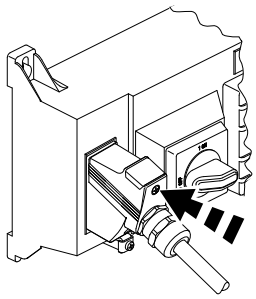
Tighten EMC cable glands supplied by SEW-EURODRIVE using the following torque ratings:

Screw fitting	Tightening torque
M12 × 1.5	2.5 Nm – 3.5 Nm
M16 × 1.5	3.0 Nm – 4.0 Nm
M20 × 1.5	3.5 Nm – 5.0 Nm
M25 × 1.5	4.0 Nm – 5.5 Nm

The cable retention in the cable gland must be able to withstand the following removal force:

- Cable with outer diameter > 10 mm: ≥ 160 N
- Cable with outer diameter < 10 mm: = 100 N

5.2.5 Motor cable



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Tighten screws for motor cables using 1.2 – 1.8 Nm.

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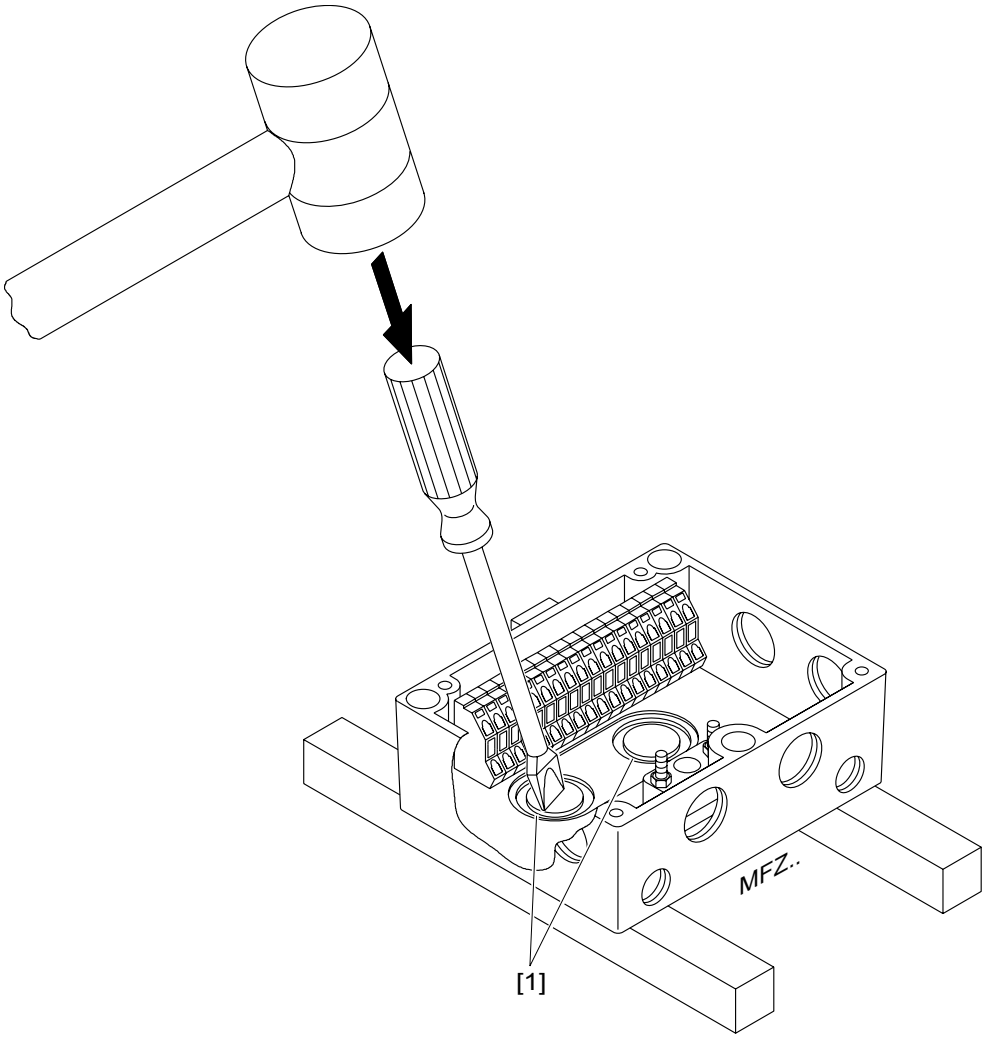
5.3 Fieldbus interface

5.3.1 Installation on MOVIMOT® connection box

1. Remove the stamped perforations in the connection module as shown in the picture below.



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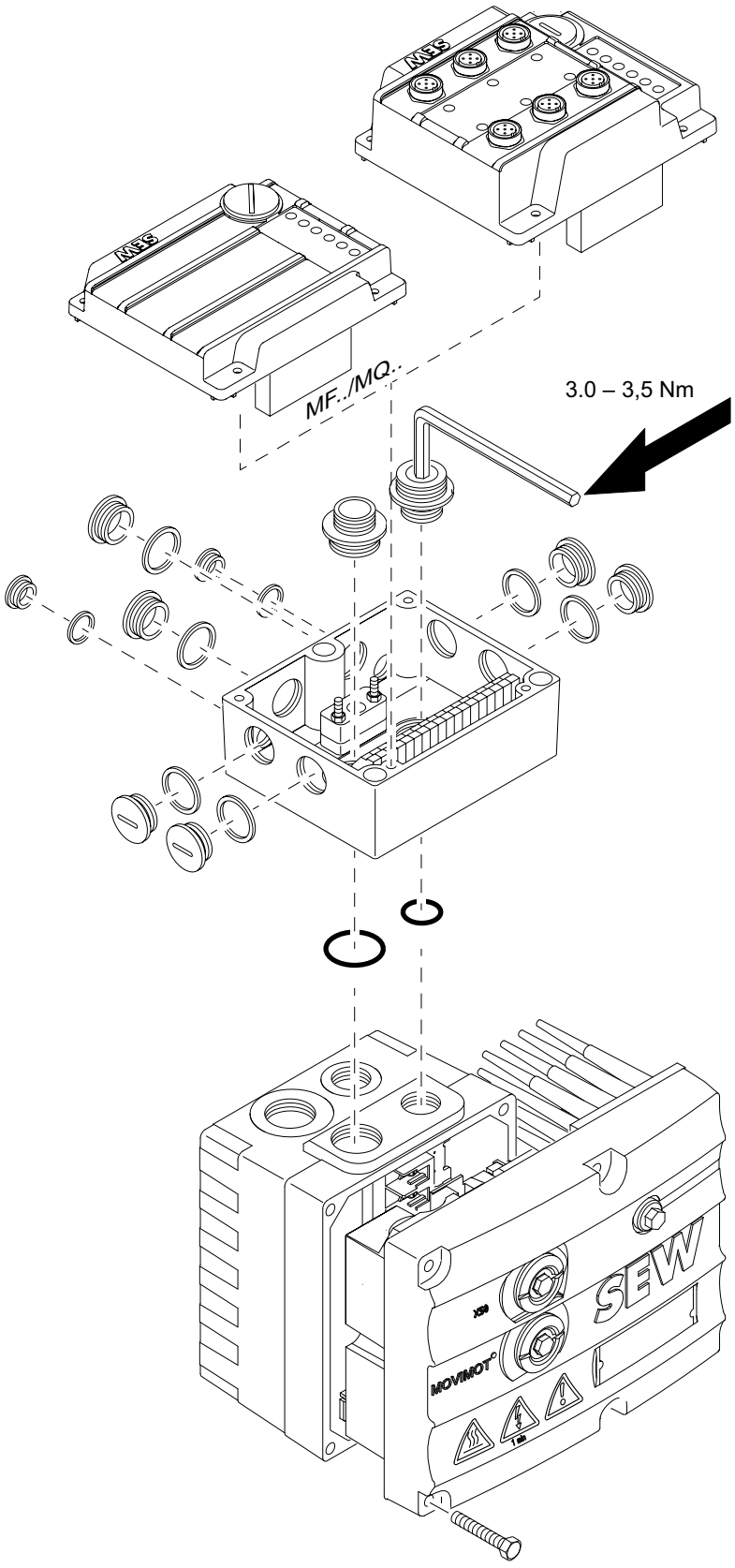
2. Deburr sharp edges.
3. Install the fieldbus interface to the connection module according to the following figure.



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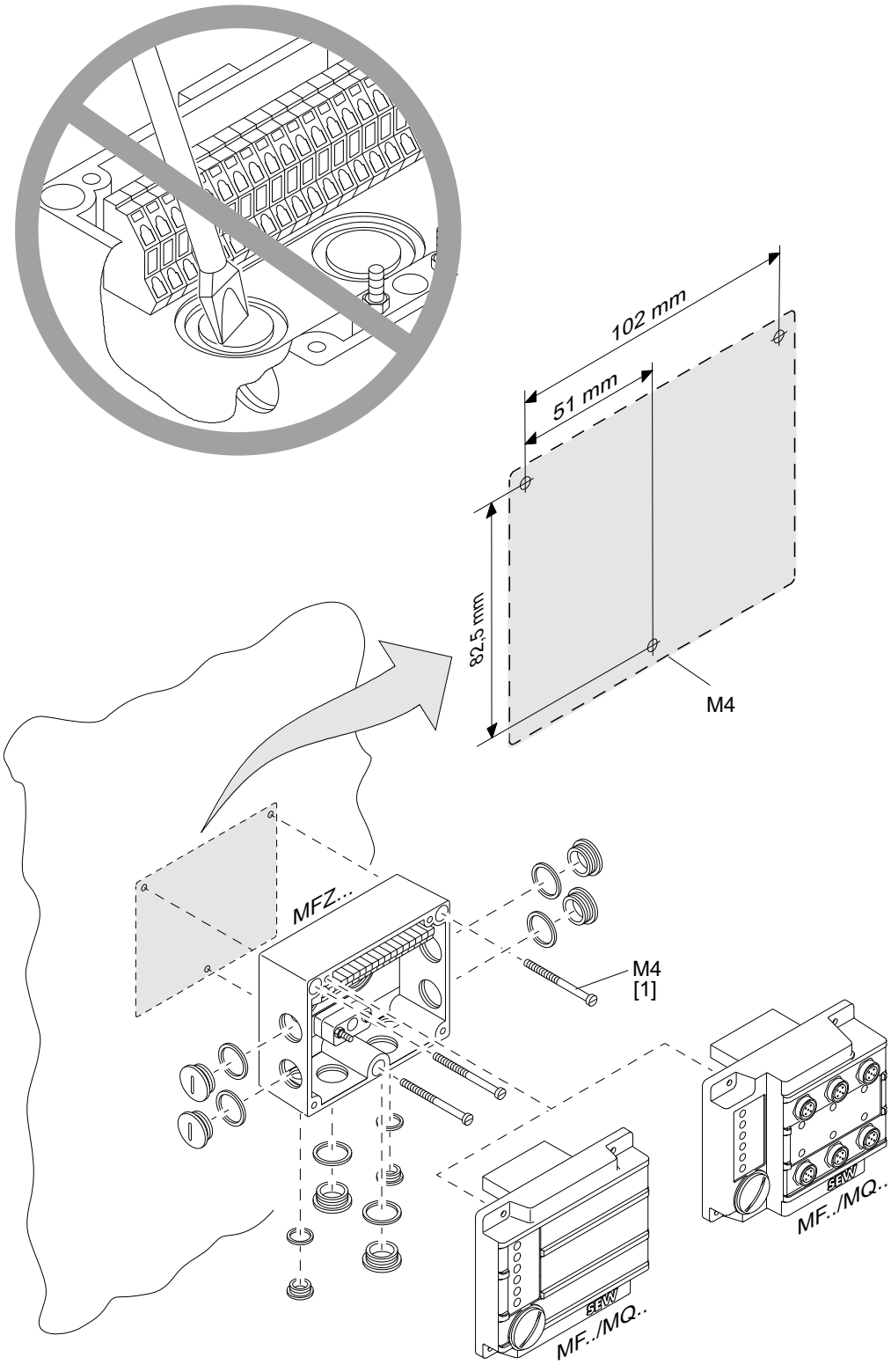
5.3.2 Installation in the field

The following figure shows the installation of an MF../MQ.. fieldbus interface close to the motor:



[1] Length of screws min. 40 mm

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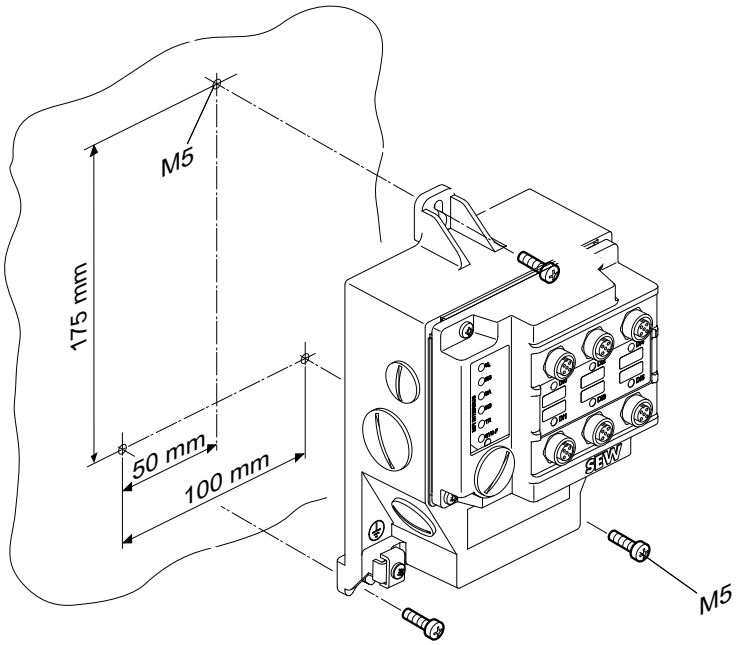
5.4 Field distributor

5.4.1 MF../Z.3., MQ../Z.3.



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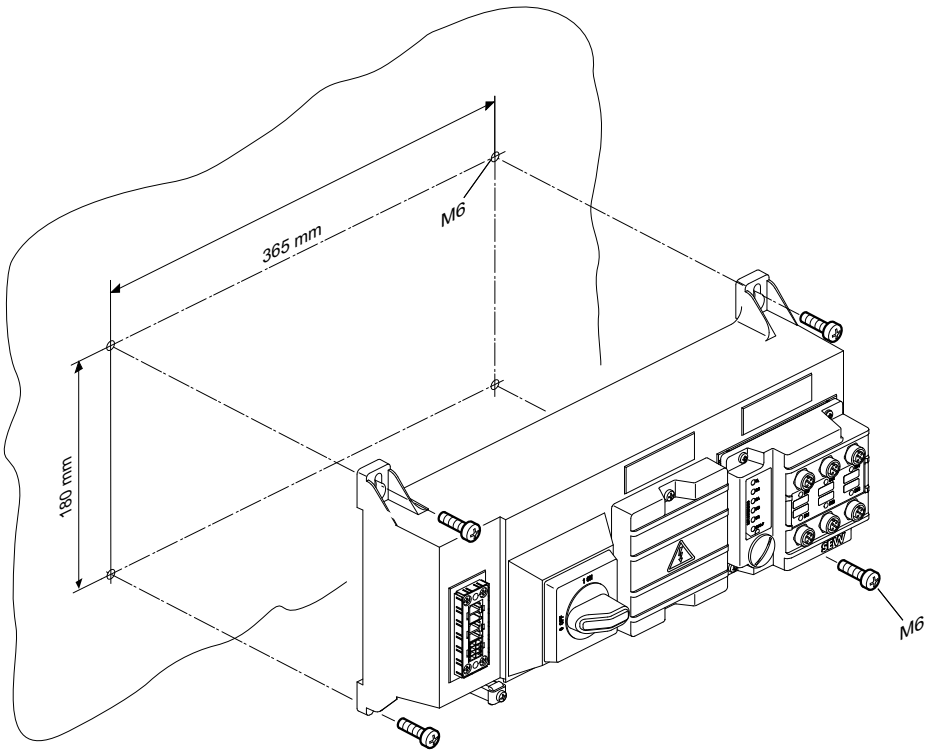
5.4.2 MF../Z.6., MQ../Z.6.



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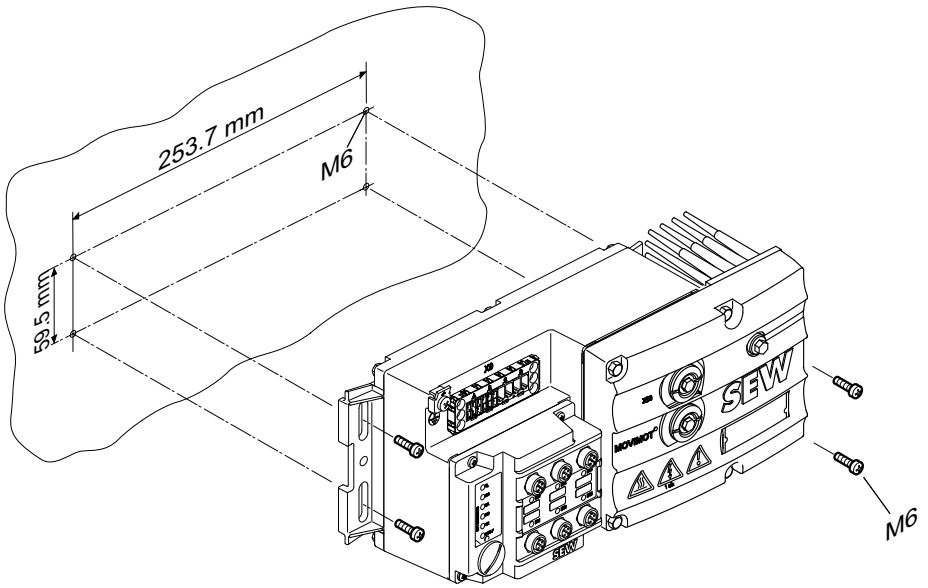
5.4.3 MF../MM../Z.7., MQ../MM../Z.7.



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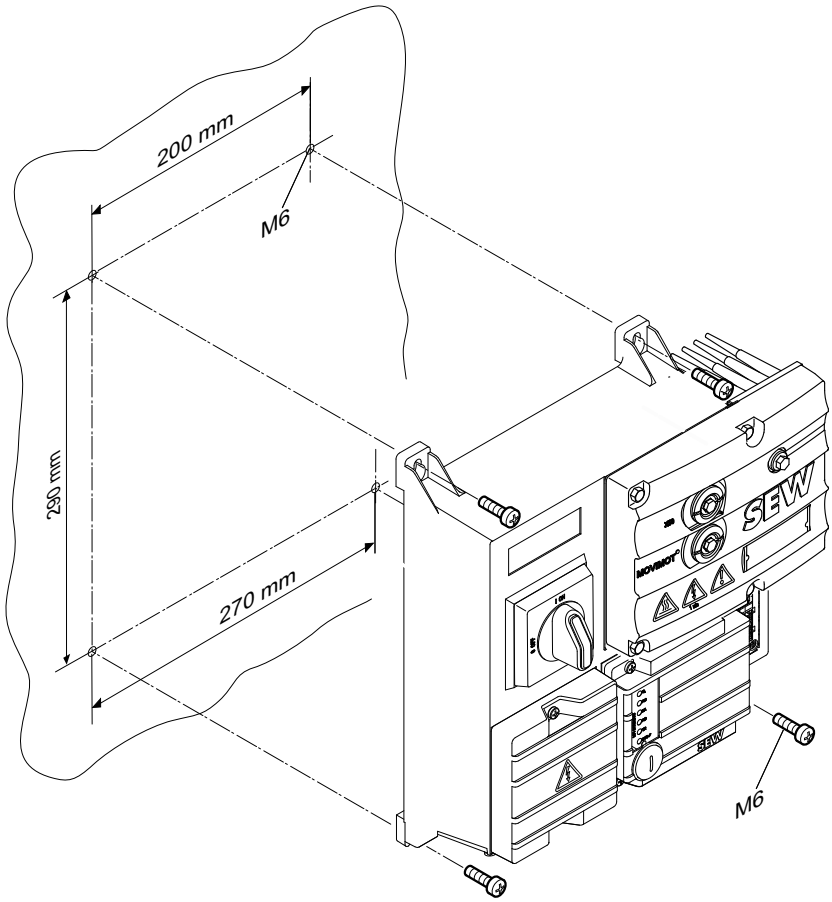
5.4.4 MF../MM../Z.8., MQ../MM../Z.8. (size 1)



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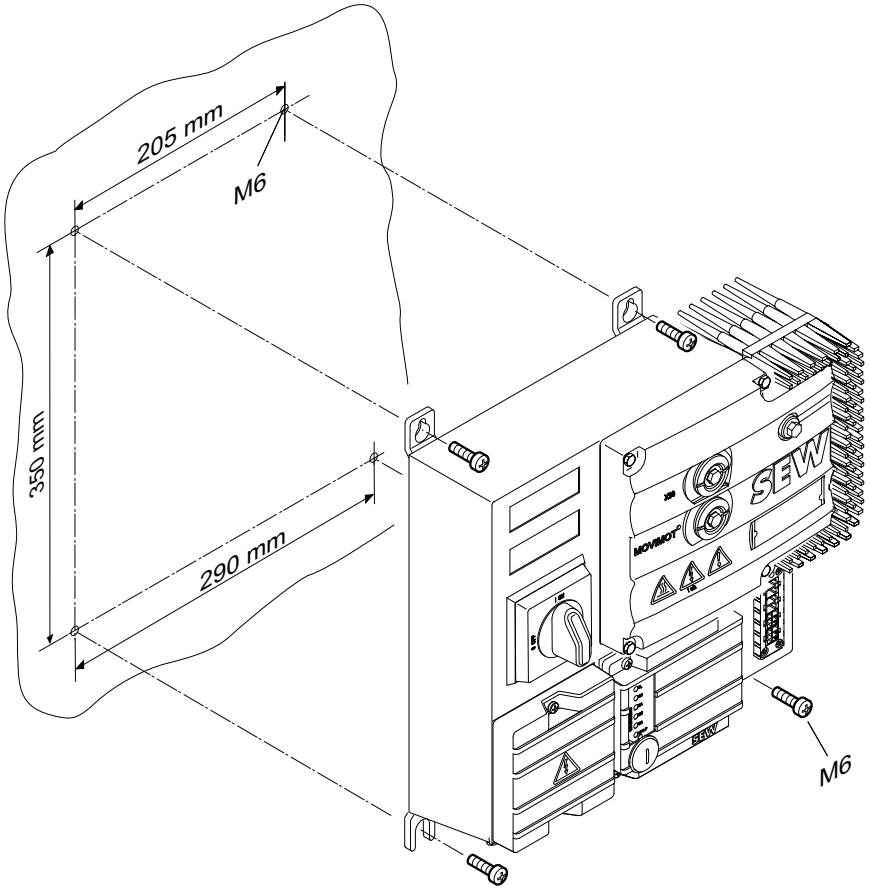
5.4.5 MF../MM../Z.8., MQ../MM../Z.8. (size 2)



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6 Electrical installation

6.1 Installation planning taking EMC aspects into account

INFORMATION

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

MOVIMOT® can cause EMC interference within the permitted limit range according to EN 61800-3. In this case, it is recommended for the operator to take suitable measures.

For detailed information on EMC-compliant installation, refer to the SEW publication Drive Engineering – Practical Implementation, "Electromagnetic Compatibility in Drive Engineering".

Successful installation of decentralized drives depends on selecting the correct cables, providing correct grounding and a functioning equipotential bonding.

Always adhere to the **relevant standards**.

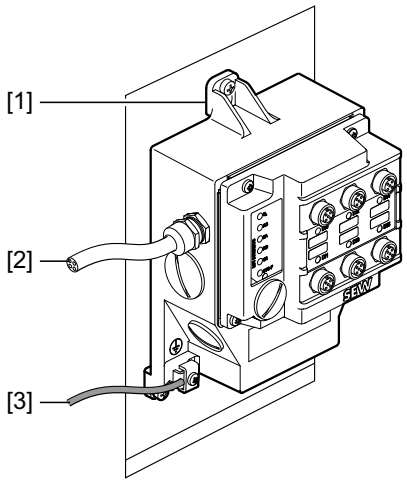
Observe the notes in the following chapters in particular.

6.1.1 Equipotential bonding

Low-impedance and HF-capable equipotential bonding must be provided independent of the PE connection (see also VDE 0113 or VDE 0100 part 540).

Establish a connection over a wide surface area between the field distributor and the system (untreated, unpainted, uncoated mounting surface).

Do not use the cable shields of data lines for equipotential bonding.



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[1] Conductive connection over a large area between field distributor and mounting plate
[2] PE conductor in the supply system cable
[3] Connection second PE conductor
If you install a highly flexible PE conductor with a large cross section (e.g. 6 mm^2), this PE conductor also fulfills the function of an HF-capable equipotential bonding in terms of EMC.

6.1.2 Data lines and 24 V supply

Route data lines and 24 V supply separately from cables that emit interference (such as control lines of solenoid valves, motor cables).

6.1.3 Field distributor

We recommend using prefabricated SEW-EURODRIVE hybrid cables for connecting field distributors and motors.

6.1.4 Cable glands

Select only cable glands with a shield connected over a large area. Observe the notes regarding the selection of the cable glands.

6.1.5 Cable shields

Observe the following points regarding cable shields:

- Cable shields must have good EMC properties (high screening attenuation).
- Cable shields must protect the cable mechanically and serve as shielding.
- Cable shields must be connected at the cable ends via EMC metal cable glands to a wide area of the device's metal housing. Also observe the further notes regarding the selection of the cable glands.

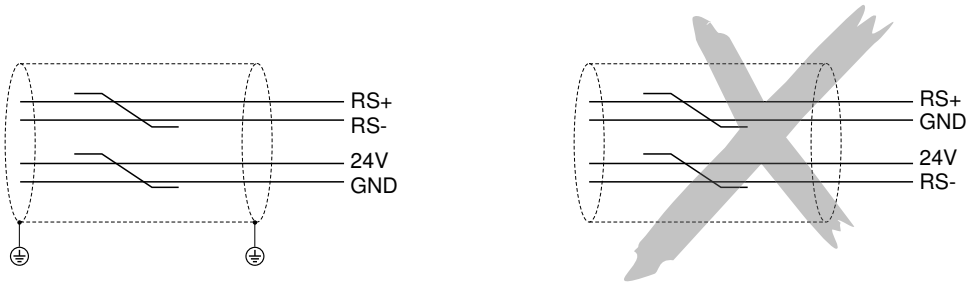
Additional information is available in the document "Drive Engineering – Practical Implementation – EMC in Drive Engineering."

6.1.6 Example for connection of the MF../MQ.. fieldbus interface and MOVIMOT®

If the MF../MQ.. fieldbus interface and the MOVIMOT® drive are installed separately, the RS485 connection drive must be implemented as follows:

Carrying the DC 24 V supply

- Use shielded cables.
- Connect the shield to the housing of both units using EMC cable glands.
- Twist the conductors in pairs as shown in the following figure.



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Without carrying the DC 24 V supply

If the MOVIMOT® drive is supplied with DC 24 V via a separate connection, the RS485 connection must be carried out as follows:

- Use shielded cables.

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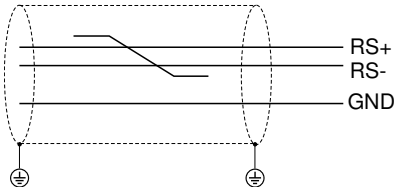
- Connect the shield to the housing of both units using EMC cable glands. Also observe the further notes regarding the selection of the cable glands.
- Generally provide the GND reference potential.
- Twist the conductors as shown in the following figure.



6.2 Installation instructions for fieldbus interfaces, field distributors

6.2.1 Connecting supply system leads

- The nominal voltage and frequency of the MOVIMOT® inverter must correspond to the data for the power supply system.
- Dimension the cable cross section according to the input current I_{line} for rated power (see MOVIMOT®operating instructions, "Technical data" chapter).
- Install fuses at the beginning of the power supply cables behind the supply bus junction.

  The following fuses are permitted:

  – Fuses in utilization category gG

  – Power circuit breakers with characteristic B or C

  – Motor circuit breaker

  Size the fuses according to the cable cross section.
- SEW-EURODRIVE recommends using earth-leakage monitors with pulse-code measurement in voltage supply systems with a non-grounded star point (IT systems). Using such devices prevents the earth-leakage monitor mis-tripping due to the ground capacitance of the inverter.

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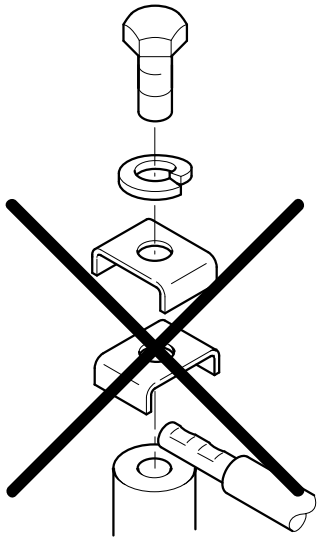
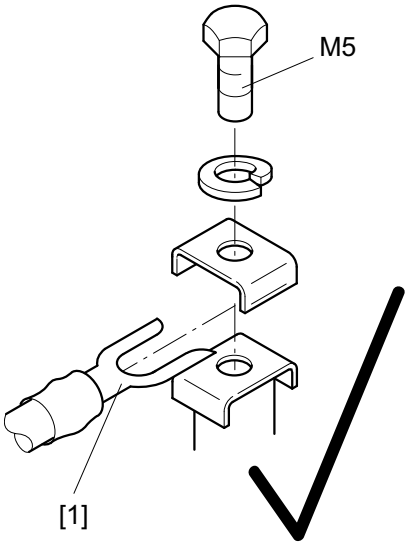
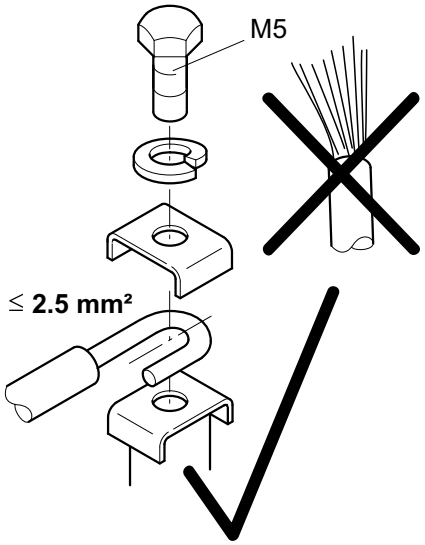
6.2.2 Notes on PE connection

⚠ WARNING

Electric shock due to faulty ground connection or faulty equipotential bonding.

Severe, fatal injuries

- The permitted tightening torque for the retaining screws is 2.0 – 2.4 Nm.
- Make sure to install the ground connection and equipotential bonding correctly.

Prohibited assembly	Recommendation: Assembly with forked cable lug Permitted for all cross sections	Assembly with solid connecting wire Permitted for cross section up to max. 2.5 mm²
		

[1] Forked cable lug suitable for M5 PE screws

Earth-leakage currents of ≥ 3.5 mA can occur during normal operation. To meet the requirements of EN 61800-5-1, observe the following notes:

- The protective earth (PE) connection must meet the requirements for plants with high earth-leakage currents.
- This usually means
  - installing a PE connection cable with a minimum cross section of 10 mm²
  - or installing a second PE connection cable via separate terminals that must not be smaller than the cable cross section of the supply system cable.

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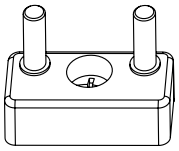
6.2.3 Permitted connection cross section of terminals

	Power terminals X1, X21 (screw terminals)	Control terminals X20 (cage clamp terminals)
Connection cross section	0.2 mm^2 – 4 mm^2	0.08 mm^2 – 2.5 mm^2

The permitted tightening torque of the power terminals is 0.6 Nm.

6.2.4 Looping through the DC 24 V supply voltage in the MFZ.1 module terminal box

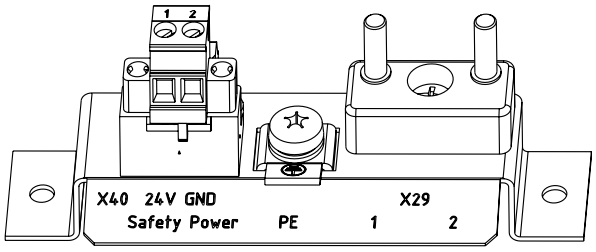
- There are 2 M4 × 12 studs in the connection area of the DC 24 V supply. The studs can be used for looping the DC 24 V supply voltage.



- The terminal studs have a current carrying capacity of 16 A.
- The permitted tightening torque for the hex nuts of the terminal studs is 1.2 Nm ± 20 %.

6.2.5 Additional connection options with MFZ.6, MFZ.7 and MFZ.8 field distributors

- The connection area of the DC 24 V supply comprises an X29 terminal block with 2 M4 × 12 studs and a pluggable X40 terminal.



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- The X29 terminal block can be used as an alternative to the X20 terminal (see chapter "Unit Structure" in the manual) for looping through the DC 24 V supply voltage. Both studs are connected internally to the 24 V connection at terminal X20.

Terminal assignment			
No.		**Name**	**Function**
X29	1	24 V	0V24 reference potential for module electronics and sensors (studs, jumpered with terminal X20/11)
	2	GND	0V24 reference potential for module electronics and sensors (studs, jumpered with terminal X20/13)

- The plug-in terminal X40 ("Safety Power") is intended for the external DC 24 V supply of the MOVIMOT® inverter using a safety relay.

  This setup allows for the operation of a MOVIMOT® drive with FS marking in safety applications. For detailed information, refer to the "MOVIMOT® MM..D – Functional Safety" manual

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Terminal assignment			
No.		**Name**	**Function**
X40	1	24 V	24 V MOVIMOT® voltage supply for disconnection with safety relay
	2	GND	0V24 MOVIMOT® reference potential for disconnection with safety relay

- Terminal X29/1 is factory-jumpered with X40/1 and terminal X29/2 with X40/2, so that the MOVIMOT® inverter is supplied by the same DC 24 V voltage as the fieldbus interface.
- The guide values for both studs are:
  - Current carrying capacity: 16 A
  - Permitted tightening torque for the hex nuts: 1.2 Nm ± 20%.
- The guide values for screw terminal X40 are:
  - Current carrying capacity: 10 A
  - Connection cross section: 0.25 mm^2 – 2.5 mm^2
  - Permitted tightening torque: 0.6 Nm

6.2.6 Residual current device

⚠ WARNING

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

Severe or fatal injuries.

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

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

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6.2.7 Line contactor

NOTICE

Damage to the MOVIMOT® inverter when using the line contactor for jog mode.

Damage to the MOVIMOT® inverter.

- Do not use the line contactor for jog mode, but only for switching the inverter on and off.
- Observe a minimum switch-off time of 2 s for the line contactor.

- Use only a contactor of utilization category AC3 (EN 60947-4-1) as a line contactor.

6.2.8 Installation above 1000 m amsl

MOVIMOT® drives with mains voltages of 200 – 240 V or 380 – 500 V can also be operated at an altitude of 1000 – 4000 m amsl. To do so, you must observe the following basic conditions.

- At heights above 1000 m amsl, the nominal continuous power is reduced due to reduced cooling: I_N reduction by 1% per 100 m.
- At altitudes of 2000 – 4000 m amsl you must take limiting measures which reduce the line side overvoltage from category III to category II for the entire system.

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6.2.9 UL-compliant installation

INFORMATION

Due to UL requirements, the following chapter is always printed in English independent of the language of the documentation.

Field wiring power terminals

Observe the following notes for UL-compliant installation:

- Use 60/75 °C copper wire only
- Tighten terminals to 1.5 Nm (13.3 in-lb.)

Short circuit current rating

Suitable for use on a circuit capable of delivering not more than 200,000 rms symmetrical amperes when protected as follows:

For 240V systems:

250V minimum, 25A maximum non-semiconductor fuses or

250V minimum, 25A maximum inverse time circuit breakers

For 500V systems:

500V minimum, 25A maximum, non-semiconductor fuses or

500V minimum, 25A maximum, inverse time circuit breakers

The max. voltage is limited to 500 V.

Group installation

Suitable for motor group installation on a circuit capable of delivering not more than 5,000 rms symmetrical amperes when protected by:

For 240V systems:

240V minimum, 25A maximum non-semiconductor fuses, or

240V minimum, 25A maximum inverse time circuit breaker

For 500V systems:

500V minimum, 25A maximum, non-semiconductor fuses, or

500V minimum, 25A maximum, inverse time circuit breakers

Suitable for motor group installation on a circuit capable of delivering not more than 18,000 rms symmetrical amperes when protected by:

For 240V systems:

240V minimum, 25A maximum non-semiconductor fuses

For 500 V systems:

500V minimum, 25A maximum, non-semiconductor fuses

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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.

For maximum branch circuit protection see table below.

Series	non-semiconductor fuses	inverse time circuit breaker
MOVIMOT® MM..D	250 V/500 V minimum, 25 A maximum	250 V/500 V minimum, 25 A maximum

Motor overload protection

MOVIMOT® MM..D is provided with load and speed-sensitive overload protection and thermal memory retention upon shutdown or power loss.

The trip current is adjusted to 140 % of the rated motor current.

Ambient temperature

MOVIMOT® MM..D is suitable for an ambient temperature of 40 °C, max. 60 °C with derated output current. To determine the output current rating at higher than 40 °C, the output current should be derated 3.0 % per °C between 40 °C and 60 °C.

- Only use certified units with a limited output voltage (V_{max} = DC 30 V) and limited output current (I ≤ 8 A) as an external DC 24 V voltage source.
- The UL certification only applies for the operation on voltage supply systems with voltages to ground of max. 300 V. The UL-certification does not apply to operation on voltage supply systems with a non-grounded star point (IT systems).

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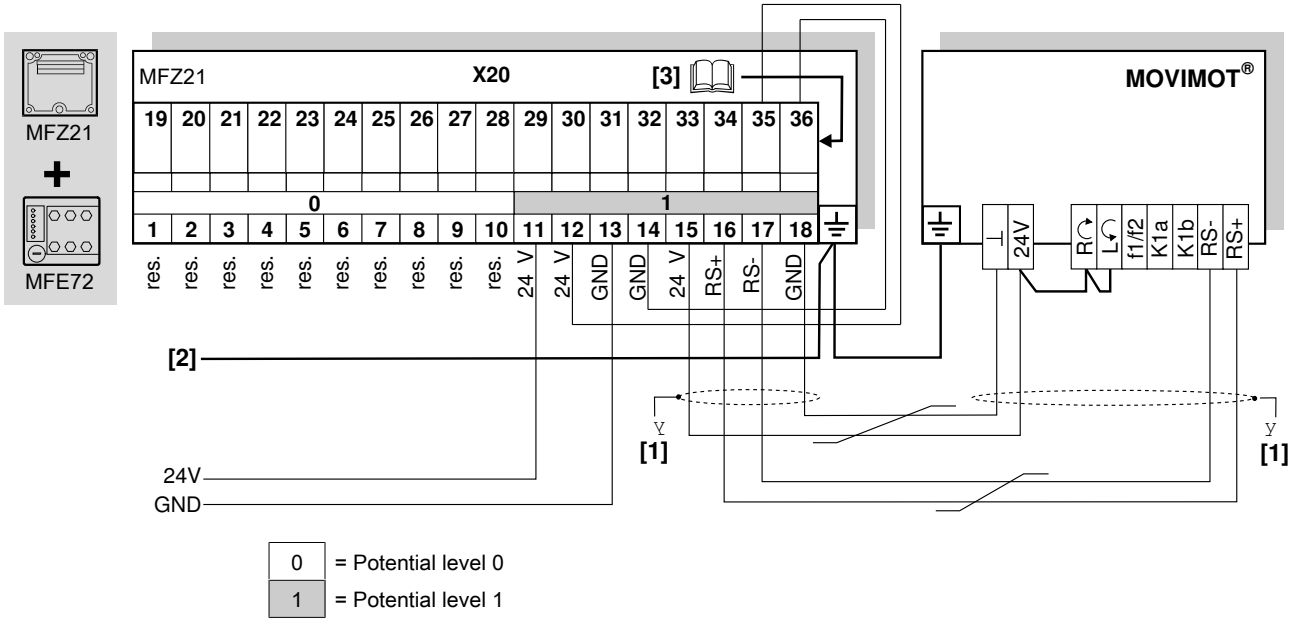
6.3 MFZ21 connection module with MFE72 to MOVIMOT®

6.3.1 Wiring diagram

MFZ21 connection module with MFR72 EtherCAT® interface to MOVIMOT®, for configuration with 6 inputs or with 4 inputs and 2 outputs.



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[1] For separate installation MF../Z21 and MOVIMOT®: Connect the shield of the RS485 cable using EMC metal cable gland to MFZ and to the MOVIMOT® housing.
[2] Ensure equipotential bonding between all bus stations
[3] Assignment of terminals 19 - 36 (→ 🗎 52)

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6.3.2 Terminal assignment

X20			
No.	**Name**	**Direction**	**Function**
1 – 10	res.	-	Reserved
11	24 V	Input	24 V voltage supply for module electronics and sensors
12	24 V	Output	24 V voltage supply for module electronics and sensors jumpered with terminal X20/11
13	GND	-	0V24 reference potential for module electronics and sensors
14	GND	-	0V24 reference potential for module electronics and sensors
15	24 V	Output	24 V voltage supply for module electronics and sensors jumpered with terminal X20/11
16	RS+	Output	Communication link to MOVIMOT® terminal RS+
17	RS-	Output	Communication link to MOVIMOT® terminal RS-
18	GND	-	0V24 reference potential for module electronics and sensors jumpered with terminal X20/13

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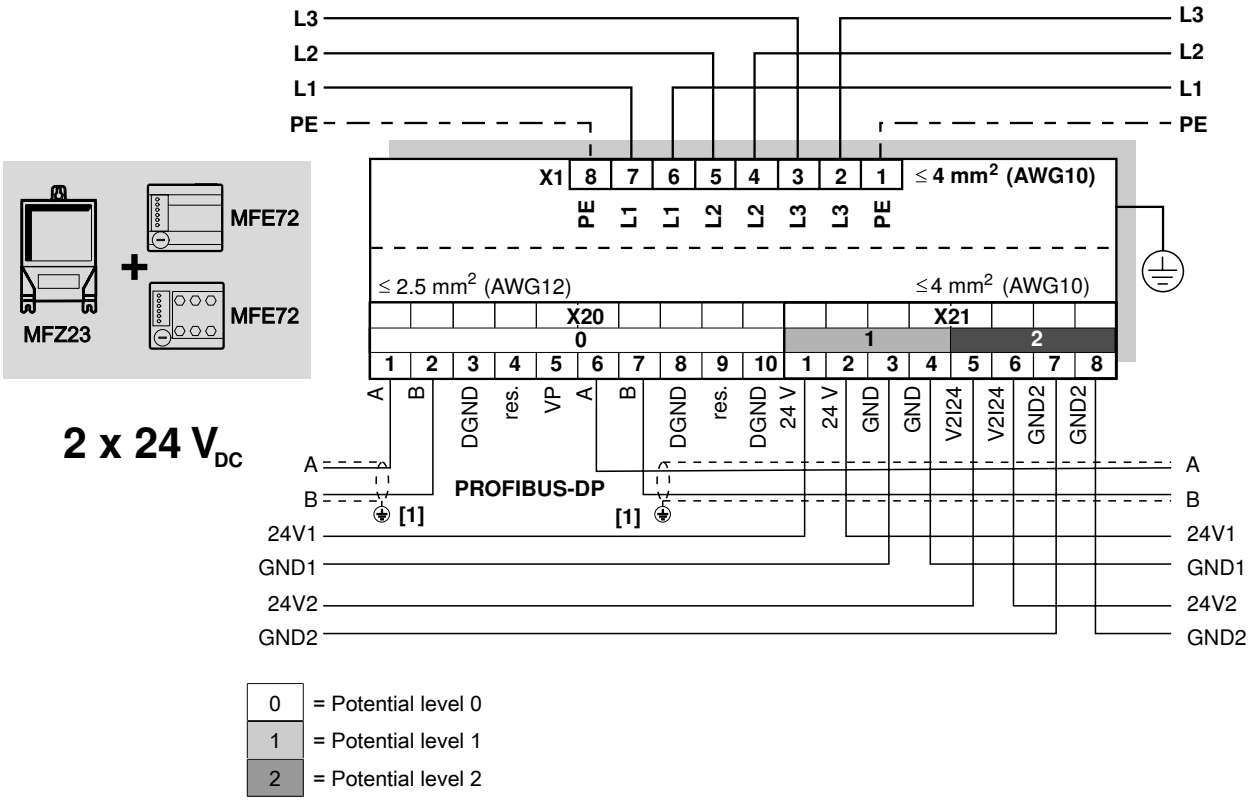
6.4 MFZ23 field distributor with MFE72

6.4.1 Wiring diagram

MFZ23 connection module with MFE72 EtherCAT® interface and 2 separate DC 24 V voltage circuits, for configuration with 4 inputs and 2 outputs.



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6.4.2 Terminal assignment

X20			
No.	**Name**	**Direction**	**Function**
1 – 10	res.	-	Reserved

X21			
No.	**Name**	**Direction**	**Function**
1	24 V	Input	24 V voltage supply for module electronics, sensors and MOVIMOT®
2	24 V	Output	24 V voltage supply for module electronics, sensors and MOVIMOT® (jumpered with terminal X21/1)
3	GND	-	0V24 reference potential for module electronics, sensors and MOVIMOT®
4	GND	-	0V24 reference potential for module electronics, sensors and MOVIMOT®
5	V2I24	Input	24 V voltage supply for actuators (binary outputs)
6	V2I24	Output	24 V voltage supply for actuators (binary outputs) jumpered with terminal X21/5
7	GND2	-	0V24 reference potential for actuators
8	GND2	-	0V24 reference potential for actuators

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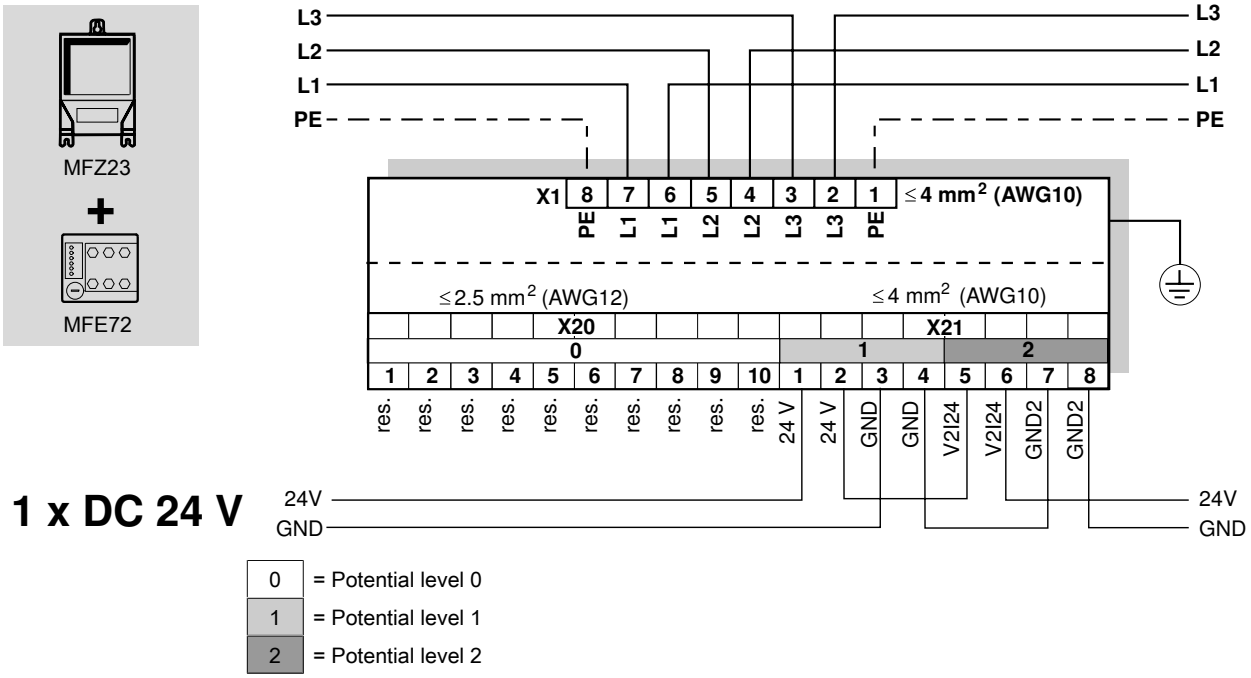
6.4.3 Wiring diagram

MFZ23 connection module with MFE72 EtherCAT® interface and 1 common DC 24 V voltage circuit, for configuration with 6 inputs or 4 inputs and 2 outputs.



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6.4.4 Terminal assignment

X20			
No.	**Name**	**Direction**	**Function**
1 – 10	res.	-	Reserved

X21			
No.	**Name**	**Direction**	**Function**
1	24 V	Input	24 V voltage supply for module electronics, sensors and MOVIMOT®
2	24 V	Output	24 V voltage supply for module electronics, sensors and MOVIMOT® (jumpered with terminal X21/1)
3	GND	-	0V24 reference potential for module electronics, sensors and MOVIMOT®
4	GND	-	0V24 reference potential for module electronics, sensors and MOVIMOT®
5	V2I24	Input	24 V voltage supply for actuators (binary outputs)
6	V2I24	Output	24 V voltage supply for actuators (binary outputs) jumpered with terminal X21/5
7	GND2	-	0V24 reference potential for actuators
8	GND2	-	0V24 reference potential for actuators

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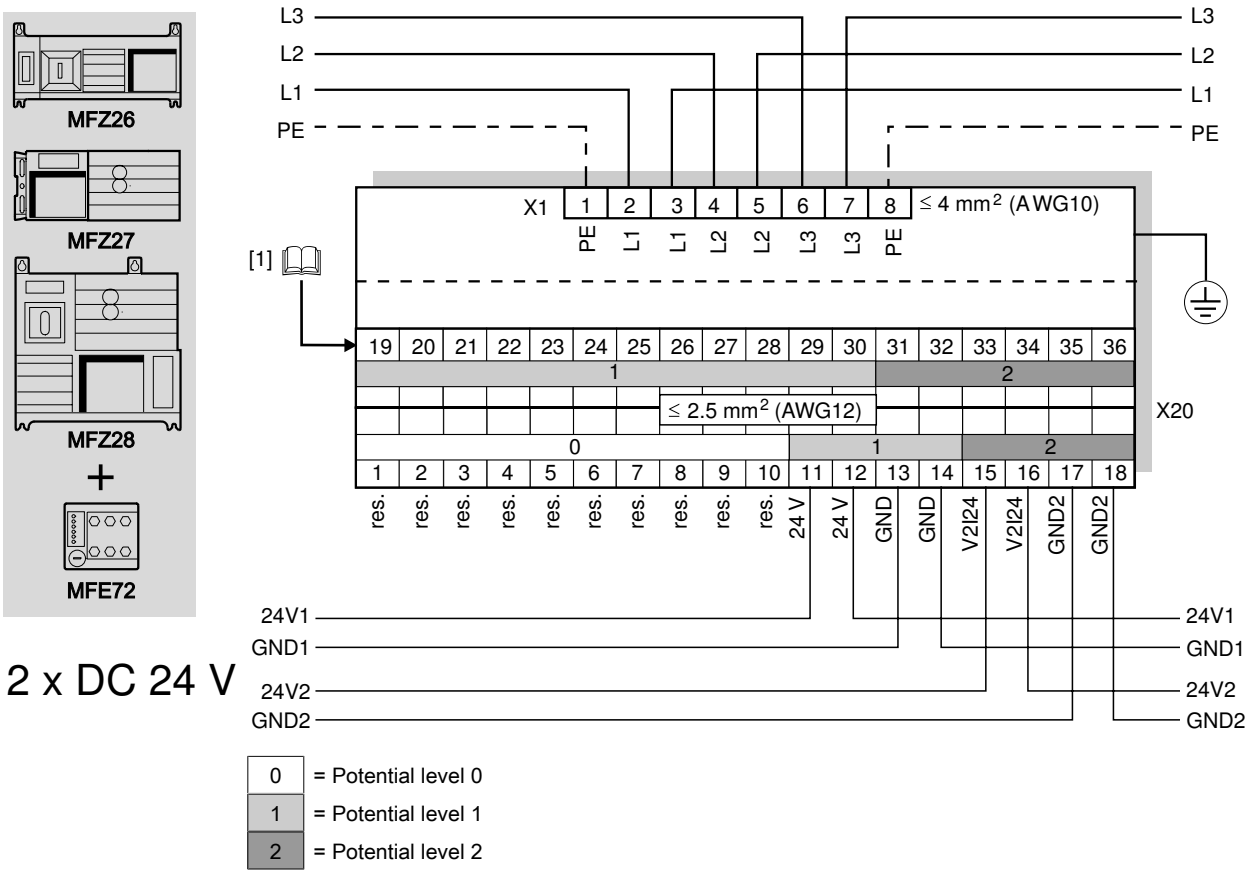
6.5 MFZ26, MFZ27, MFZ28 field distributors with MFE72

6.5.1 Wiring diagram

MFZ26, MFZ27, MFZ28 connection module with MFE72 EtherCAT® interface and 2 separate DC 24 V voltage circuits, for configuration with 4 inputs and 2 outputs



9007225125198347

[1] Assignment of terminals 19 - 36 (→ 🗎 52)

6.5.2 Terminal assignment

X20			
No.	**Name**	**Direction**	**Function**
1 – 10	res.	-	Reserved
11	24 V	Input	24 V voltage supply for module electronics and sensors
12	24 V	Output	24 V voltage supply for module electronics and sensors jumpered with terminal X20/11
13	GND	-	0V24 reference potential for module electronics and sensors
14	GND	-	0V24 reference potential for module electronics and sensors
15	V2I24	Input	24 V voltage supply for actuators (binary outputs)
16	V2I24	Output	24 V voltage supply for actuators (binary outputs) jumpered with terminal X20/15
17	GND2	Output	0V24 reference potential for module electronics and sensors for actuators (binary outputs)
18	GND2	-	0V24 reference potential for module electronics and sensors

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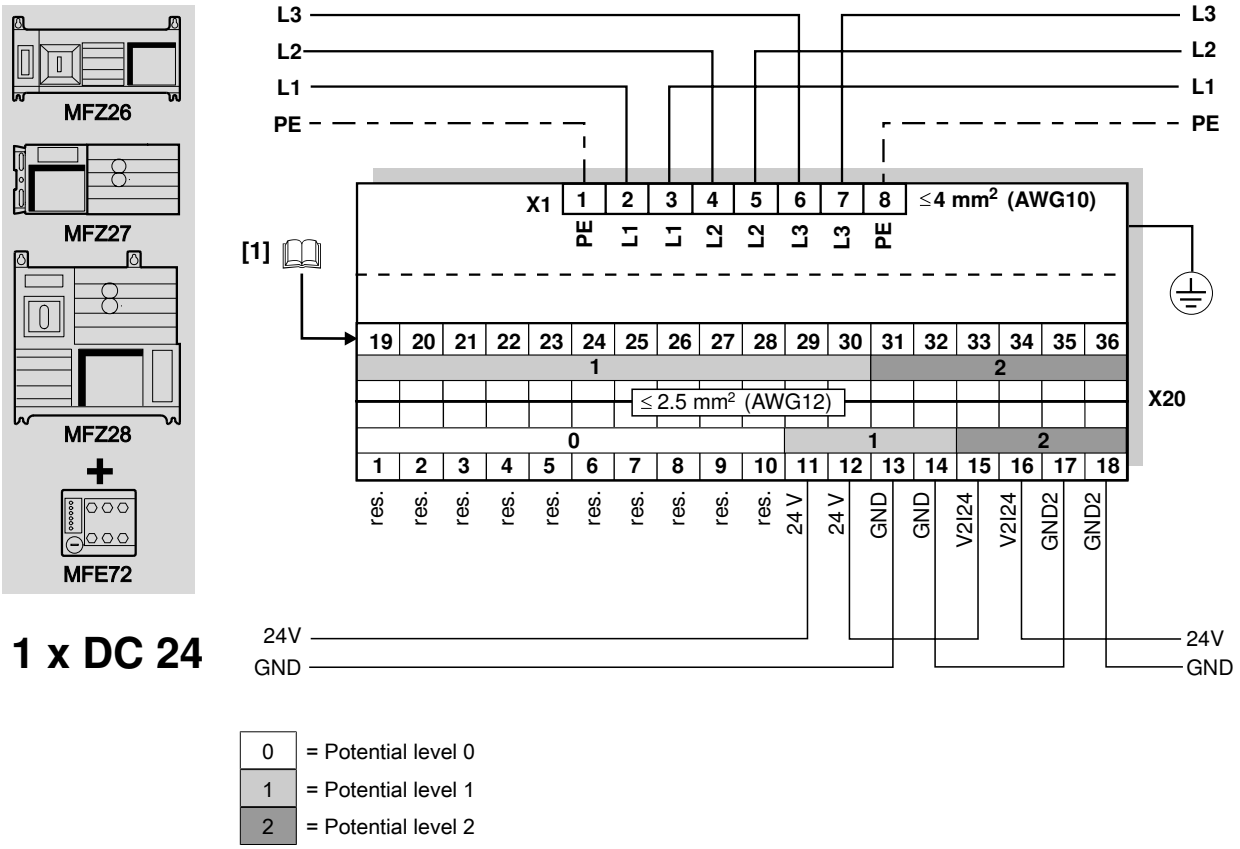
6.5.3 Wiring diagram

MFZ26, MFZ27, MFZ28 connection module with MFE72 EtherCAT® interface and 1 common DC 24 V voltage circuit, for configuration with 6 inputs or 4 inputs and 2 outputs.



25872164875

[1] Assignment of terminals 19 - 36 (→ 🖹 52)

6.5.4 Terminal assignment

X20			
No.	**Name**	**Direction**	**Function**
1 – 10	res.	-	Reserved
11	24 V	Input	24 V voltage supply for module electronics and sensors
12	24 V	Output	24 V voltage supply for module electronics and sensors jumpered with terminal X20/11
13	GND	-	0V24 reference potential for module electronics and sensors
14	GND	-	0V24 reference potential for module electronics and sensors
15	V2I24	Input	24 V voltage supply for actuators (binary outputs)
16	V2I24	Output	24 V voltage supply for actuators (binary outputs) jumpered with terminal X20/15
17	GND2	Output	0V24 reference potential for module electronics and sensors for actuators (binary outputs)
18	GND2	-	0V24 reference potential for module electronics and sensors

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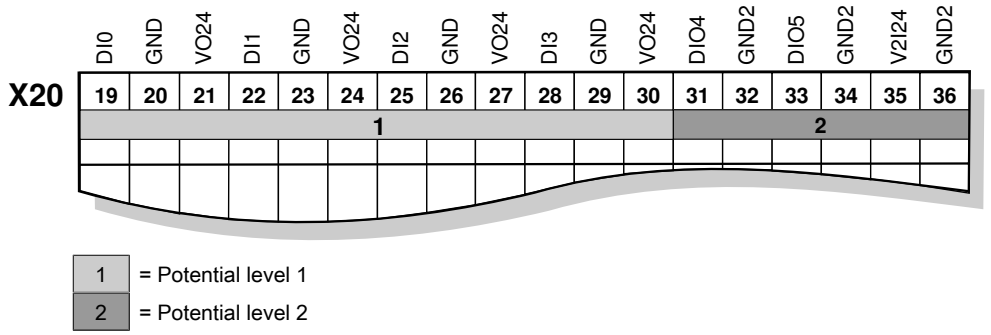
6.6 Connecting MFE72 fieldbus interface inputs/outputs

The fieldbus interfaces are connected via terminals or M12 plug connectors.

6.6.1 Connection via terminals

For fieldbus interfaces with 4 digital inputs and 2 digital inputs/outputs:

MFZ.1 **MFZ.6** **MFZ.7** **MFZ.8**	in combination with	**MFE72**



28641613579

Terminal assignment

INFORMATION

With MFZ26J and MFZ28J field distributors, the signals on the terminals 19 and 21 are used as maintenance switch feedback signal (NO contact). Evaluation using a controller is possible.

X20			
No.	**Name**	**Direction**	**Function**
19	DI0	Input	Sensor DI0 switching signal
20	GND	-	0V24 reference potential for sensor DI0
21	VO24	Output	24 V voltage supply for sensor DI0.
22	DI1	Input	Sensor DI1 switching signal
23	GND	-	0V24 reference potential for sensor DI1
24	VO24	Output	24 V voltage supply for sensor DI1
25	DI2	Input	Sensor DI2 switching signal
26	GND	-	0V24 reference potential for sensor DI2
27	VO24	Output	24 V voltage supply for sensor DI2
28	DI3	Input	Sensor DI3 switching signal
29	GND	-	0V24 reference potential for sensor DI3
30	VO24	Output	24 V voltage supply for sensor DI3
31	DIO4	Input	Sensor DI4 switching signal
		Output	Actuator DO0 switching signal
32	GND2	-	0V24 reference potential for sensor DI4
		-	0V24 reference potential for actuator DO0
33	DIO5	Input	Sensor DI5 switching signal
		Output	Actuator DO1 switching signal
34	GND2	-	0V24 reference potential for sensor DI5
		-	0V24 reference potential for actuator DO1
35	V2I24	Input	24 V voltage supply for actuators **(only for MFZ.6, MFZ.7 and MFZ.8: jumpered with terminal 15 or 16)**
36	GND2	-	0V24 reference potential for actuators DO0 and DO1 or sensors DI4 and DI5 **(only for MFZ.6, MFZ.7 and MFZ.8: jumpered with terminal 17 or 18)**

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6.6.2 Connection via M12 plug connector

For MFE72 fieldbus interfaces with 4 digital inputs and 2 binary outputs: DIP S1/1 = "OFF"

NOTICE

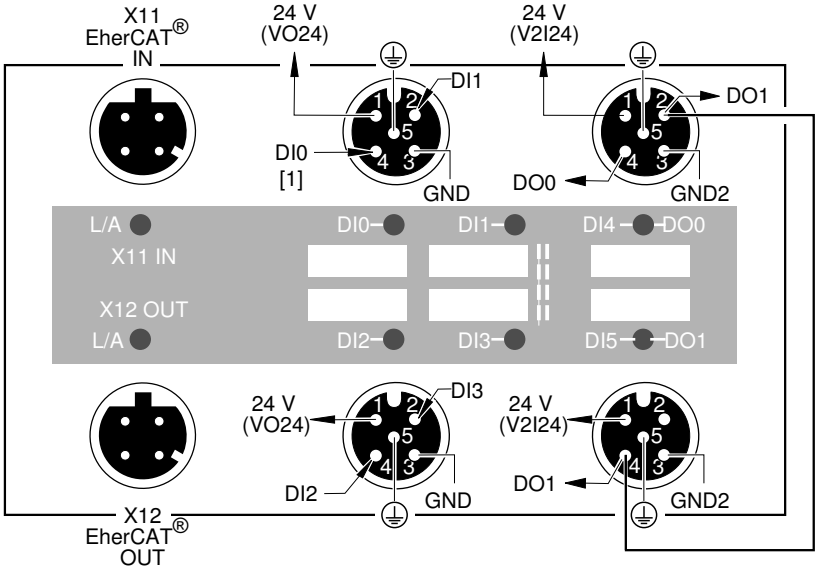
Loss of the guaranteed degree of protection if the screw plugs in the unused M12 connections are not installed or not installed correctly.

Damage to the fieldbus interface.

- Seal all unused M12 connections with screw plugs.

- Connect sensors and actuators using either M12 sockets or terminals.
- Connect two-channel sensors and actuators to DI0, DI2 and DO0.

  DI1, DI3 and DO2 can no longer be used.



18014407325572875

[1] Do not use DI0 in combination with field distributors MFZ26J and MFZ28J.

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For MFE72 fieldbus interfaces with 6 digital inputs: DIP S1/1 = "ON"

NOTICE

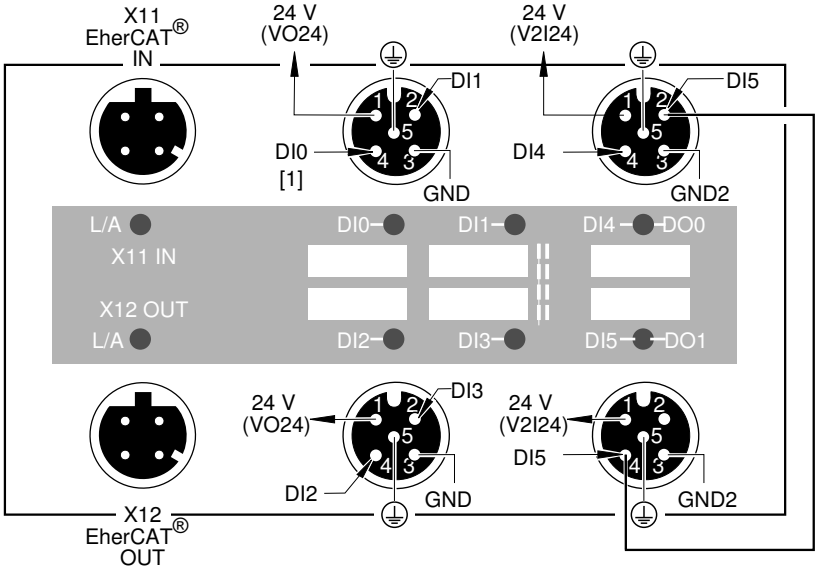
Loss of the guaranteed degree of protection if the screw plugs in the unused M12 connections are not installed or not installed correctly.

Damage to the fieldbus interface.

- Seal all unused M12 connections with screw plugs.

- Connect sensors/actuators using either M12 sockets or terminals.
- Connect two-channel sensors/actuators to DI0, DI2 and DI4.

  DI1, DI3 and DI5 can no longer be used.



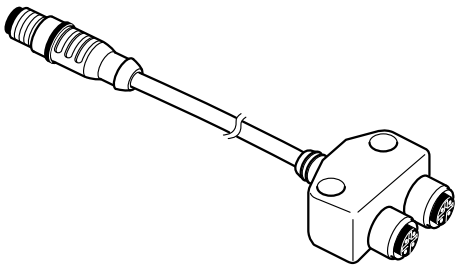
27021606754751755

[1] Do not use DI0 in combination with field distributors MFZ26J and MFZ28J.

Y adapter

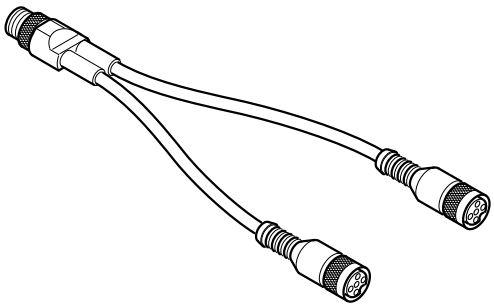
For connecting 2 sensors/actuators to an M12 plug connector, use a Y adapter with extension.

The Y adapter is available from different manufacturers:



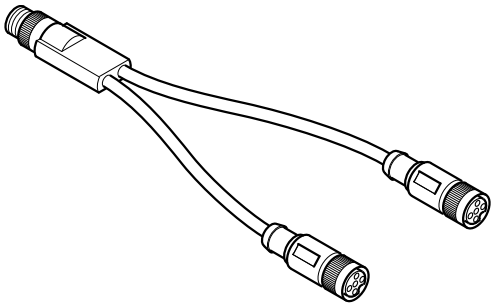
Manufacturer: Escha

Type: WAS4-0,3-2FKM3/..



Manufacturer: Binder

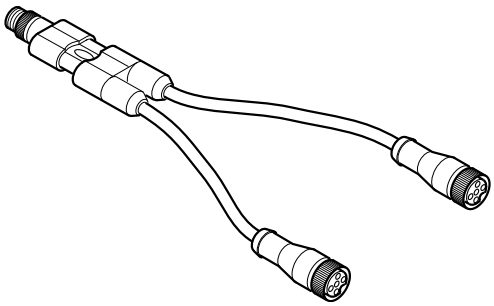
Type: 79 5200..



Manufacturer: Phoenix Contact

Type: SAC-3P-Y-2XFS SCO/.../...

The sheath of the cables is made of PVC. Provide suitable UV protection.



Manufacturer: Murrelektronik

Type: 7000-40721-..

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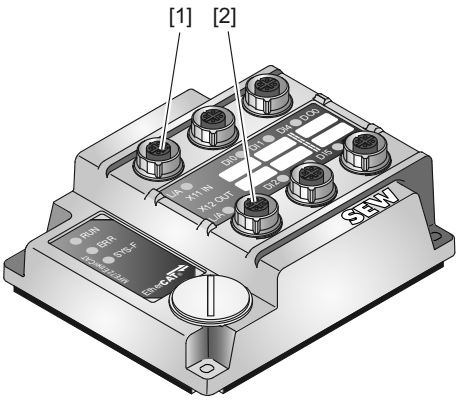
6.7 Connection of EtherCAT®

The following figure shows the connections of the EtherCAT® bus:



8817703947

[1] X11, connection EtherCAT®, IN

[2] X12, connection EtherCAT®, OUT

The following table shows the pin assignment of the EtherCAT® ports X11 and X12:

Function		
EtherCAT® Interface		
Connection type		
M12, 4-pole, female, D-coded		
Wiring diagram		
 3545032843		
Assignment		
No.	**Name**	**Function**
1	TX+	Transmit line (+)
2	RX+	Receive line (+)
3	TX-	Transmit line (-)
4	RX-	Receive line (-)

6.7.1 Routing the Ethernet cable

NOTICE

In case of fluctuations in the ground potential, a compensating current may flow via the bilaterally connected shield that is also connected to the protective earth (PE). Make sure you supply adequate equipotential bonding in accordance with relevant VDE regulations in such a case.

Only use shielded cables and connection elements that meet the requirements of category 5, class D according to IEC 11801 edition 2.0.

The following measures ensure the best possible EMC properties:

- Manually tighten the mounting screws on the connectors, modules and equipotential bonding conductors.
- Use only connectors with a metal housing or a metalized housing.
- Route signal and bus cables in separate cable ducts. Do not route them parallel to power cables (motor leads).
- Use metallic, grounded cable racks in industrial environments.
- Route the signal cable and the corresponding equipotential bonding close to each other using the shortest possible route.
- Avoid using plug connectors to extend bus cables.
- Route the bus cables closely along existing grounding surfaces.

6.7.2 Bus termination

Bus termination (e.g. with bus terminating resistors) is not necessary. If no slave is connected to an EtherCAT® device, it recognizes this immediately.

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6.8 Connecting the incremental encoder EI7.

6.8.1 Area of application

With the MFE72A EtherCAT® interface and the built-in EI7 encoder from SEW-EURODRIVE, you can implement simple positioning based on a higher-level controller. Just connect the built-in EI7 encoder to the MFE72A EtherCAT interface and evaluate the position with a 32-bit counter. This design allows non-dynamic positioning with an accuracy of approx. ¼ of a motor rotation when using the EI7C encoder. However, direct position control or time-critical positioning is not supported.

With this design, you can replace applications that were previously implemented with a rapid traverse/creep switch with initiator evaluation. Variable evaluation of any actual position and specification of different speeds and acceleration ramps gives you greater flexibility.

When in 10-PD mode (see "chapter "Process data object configuration"" (→ 🗎 71)), the counter and thereby the current actual position is sent to the higher-level controller and evaluated.

6.8.2 Features

The EI7. incremental encoder offers the following features:

- HTL interface

EI71:	1 pulse/revolution	=> 4 increments/revolution[1)]
EI72:	2 pulses/revolution	=> 8 increments/revolution[1)]
EI76:	6 pulses/revolution	=> 24 increments/revolution[1)]
EI7C:	24 pulses/revolution	=> 96 increments/revolution[1)]

1) due to 4-fold evaluation

6.8.3 Technical data of encoders

Technical data of encoders	
Encoder signals (2 tracks)	Tracks A and B
Phase sequence	90° ± 20°
Pulse duty factor	1:1 ± 20%
Max. pulse frequency	120 kHz
Connection track A	Terminal X20/19 (DI0) or M12 plug connector (DI0)
Connection track B	Terminal X20/22 (DI1) or M12 plug connector (DI1)
Reference potential	GND on PE potential

The counter counts up for advancing A track and down for advancing B track.

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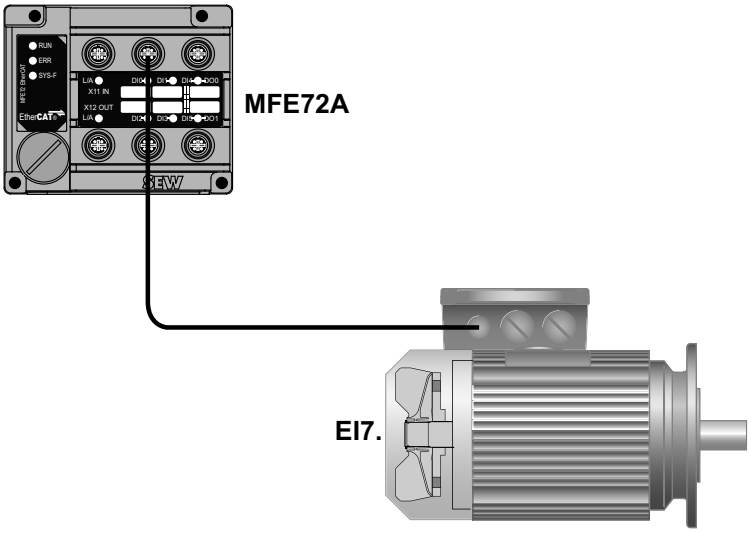
6.8.4 Installation

Use a shielded cable to connect the EI7 incremental encoder to the appropriate encoder input of the MFE72A EtherCAT® interface; see the “Connecting MFE72 fieldbus interface inputs/outputs” chapter.



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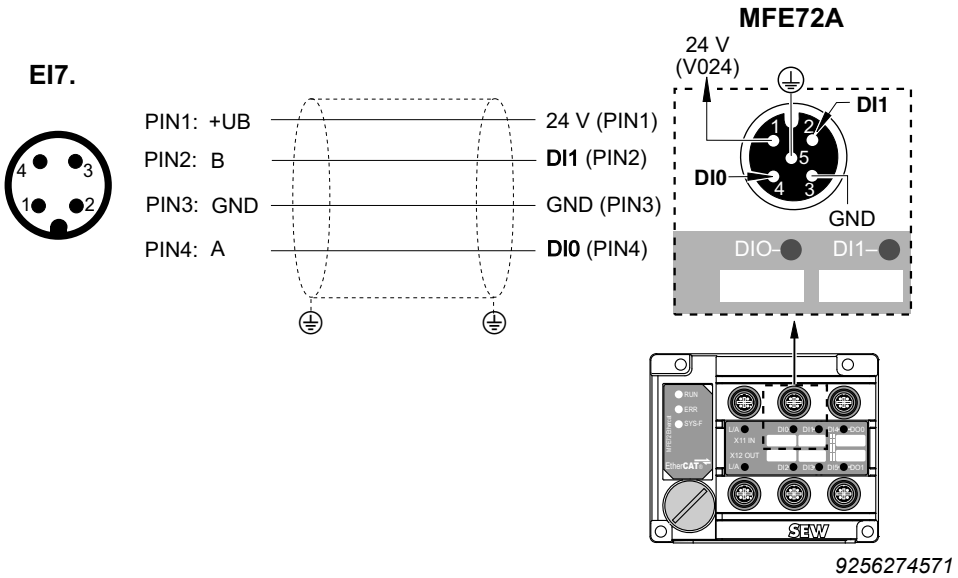
6.8.5 Wiring diagram for mounting the inverter to the motor

If the MOVIMOT® inverter is mounted on the motor, the encoder is connected to the MFE72 fieldbus interface with a shielded cable with M12 plug connectors on both ends.

There are 2 possible variants:

Variant 1: AVSE



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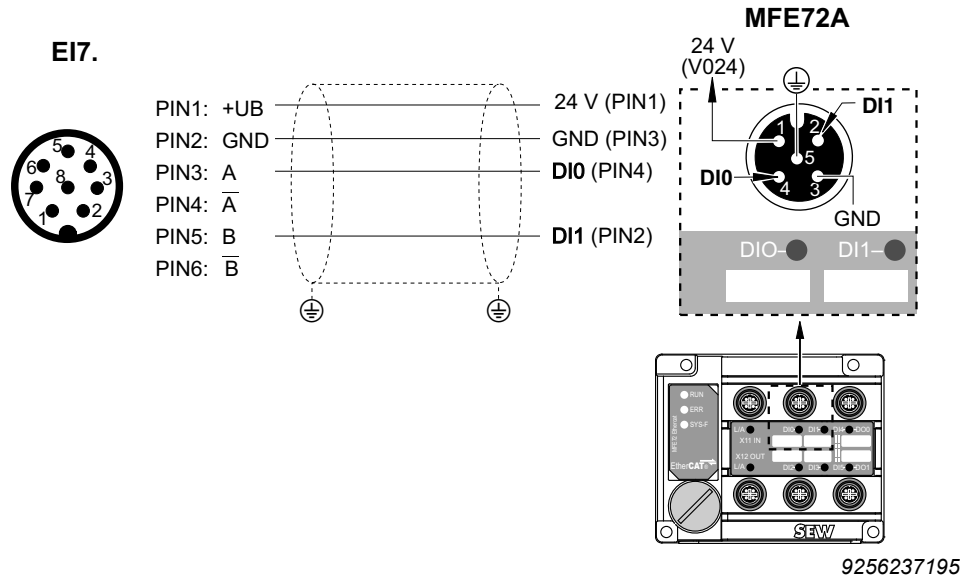
Variant 2: AVRE

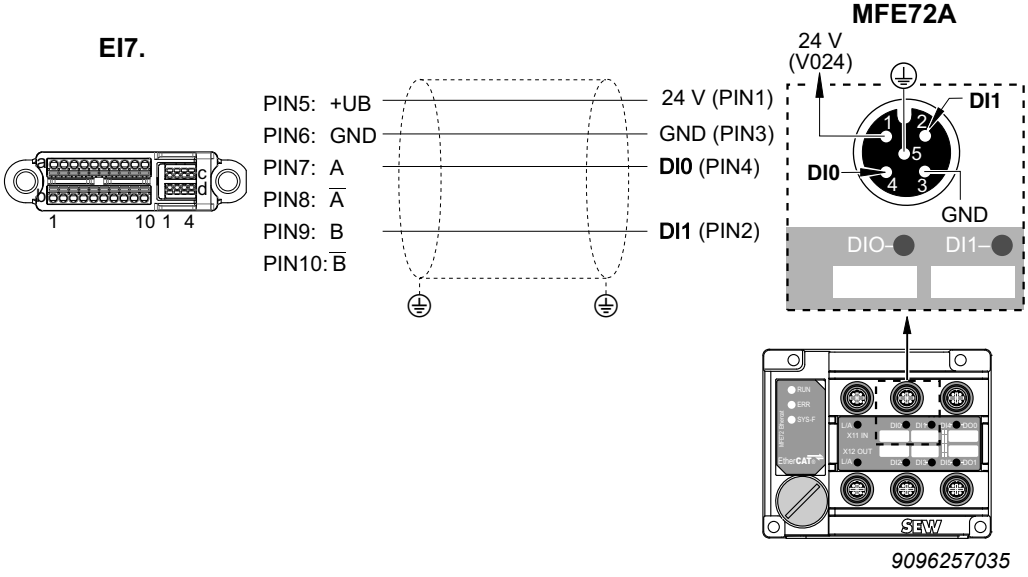


9256237195

Do not assign the input socket DI1 more than once.

6.8.6 Wiring diagram for mounting the inverter on the field distributor

If the MOVIMOT® inverter is mounted to the field distributor (mounting close to the motor), the shielded connection cable is connected to the terminals in the drive connection box and plugged into the input socket of the MFE72 fieldbus interface.



9096257035

6.9 Counter input DI2

You can connect a rapid signal with a maximum frequency of 5 kHz to input DI2. The signal is evaluated by a unidirectional counter that counts the rising edges. The 32-bit counter value can be scanned from the process image (PI9 and PI10).

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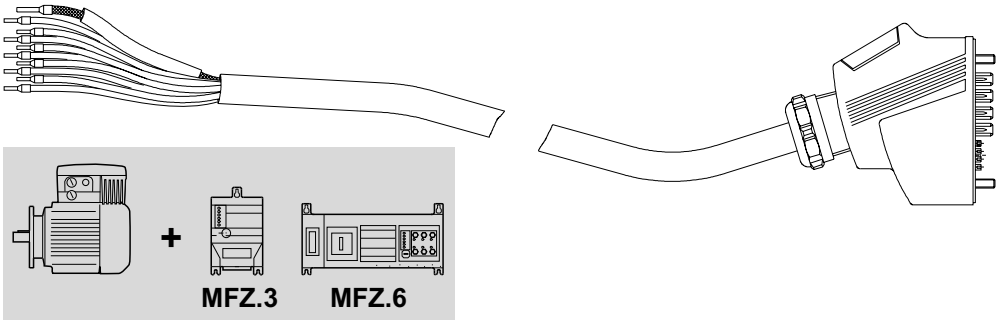
6.10 Hybrid cable connection

6.10.1 Hybrid cable between MFZ.3. or MFZ.6. field distributor and MOVIMOT®

The following figure shows the hybrid cable for connecting the MOVIMOT® drive **part number (01867253)**.



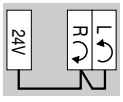
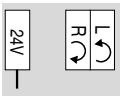
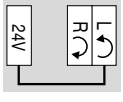
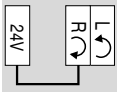
9007200401506827

The following table shows the terminal assignment of the hybrid cable in the MOVIMOT® connection box:

Terminal assignment	
MOVIMOT® terminal	**Wire color/hybrid cable designation**
L1	Black/L1
L2	Black/L2
L3	Black/L3
24 V	Red/24 V
⏚	White/0 V
RS+	Orange/RS+
RS-	Green/RS-
PE terminal	Green/yellow + shield end

Note the enabled direction of rotation

Check to see if requested direction of rotation has been enabled.

	Both directions of rotation are enabled.		Drive is inhibited or is being brought to a standstill.
	Only CCW operation is enabled. Setpoint specifications for CW rotation result in stopping of drive.		Only CW operation is enabled. Pre-selected setpoints for CCW rotation result in stopping of the drive.

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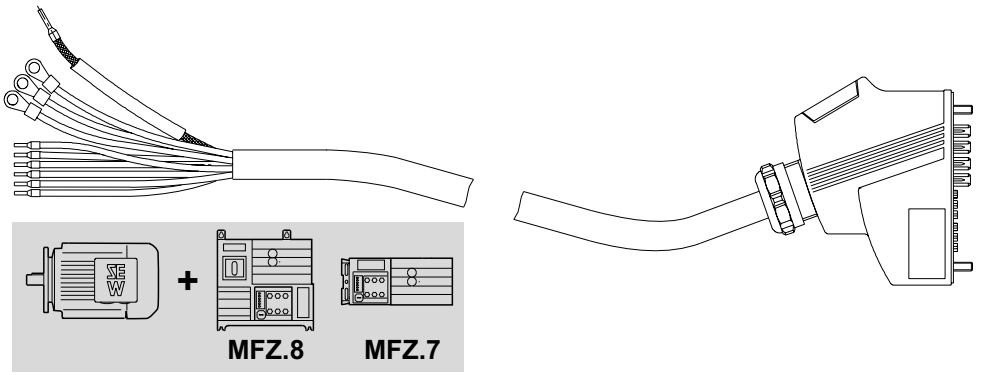
6.10.2 Hybrid cable between MFZ.7. or MFZ.8. field distributor and AC motors

The following figure shows the hybrid cable for connecting the AC motor **part number 01867423**.



9007200402006667

The following table shows the terminal assignment of the hybrid cable in the motor terminal box:

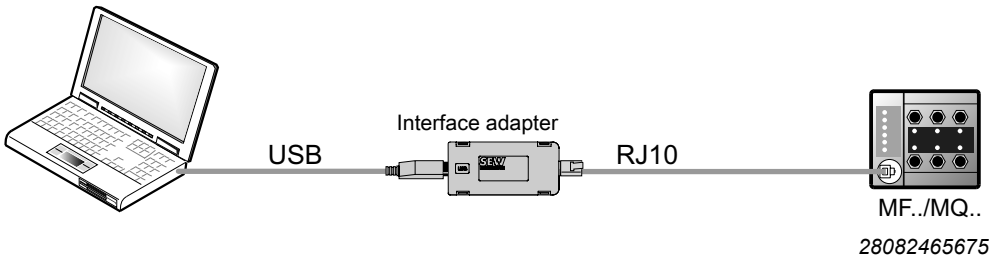
Terminal assignment	
Motor terminal	**Wire color/hybrid cable designation**
U1	Black/U1
V1	Black/V1
W1	Black/W1
4a	Red/13
3a	White/14
5a	Blue/15
1a	Black/1
2a	Black/2
PE terminal	Green/yellow + shield end (inner shield)

INFORMATION

Attach the outer shield of the cable to the housing of the motor terminal box using an EMC metal cable gland.

6.11 PC connection

Underneath the screw plug, the fieldbus interfaces have an RJ10 diagnostic interface for startup, parameterization, and service. The diagnostic interface is connected to a commercially available PC/Laptop via the interface adapter with USB port.



The following interface adapters are available:

Designation	Part number
USB11A	08248311
USM21A	28231449

The following components are included each in the scope of delivery:

- Interface adapter
- Cable with RJ10 plug connector
- USB interface cable

Establish a connection

Proceed as follows to establish the connection:

✓ Wait for the MOVIMOT® drive to cool down sufficiently before touching it.

1. Remove the screw plugs of the diagnostic interface.
2. Connect the fieldbus interface and the interface adapter with the RJ10 plug connector using a cable.
3. Connect the PC/laptop to the interface adapter using the USB interface cable.

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6.12 Wiring check

INFORMATION

For ensuring the isolation and the effectiveness of preventive measures, you have to perform the checks of the valid and applicable standards (e.g. EN 60204-1 or EN 61800-5) after any wiring work for installation, conversion, repair, etc.

In order to prevent injury to persons or damage to the plant, check the wiring as described below before you connect the voltage supply for the first time:

- Remove all fieldbus interfaces from the connection module.
- Disconnect all MOVIMOT® inverters from the connection module (only with MFZ.7, MFZ.8, MFZ.9).
- Disconnect all plug connectors of the motor connection (hybrid cable) from the field distributor.
- Check the insulation of the wiring in accordance with applicable national standards.
- Check the grounding.
- Check the insulation between the supply system cable and the DC 24 V cable.
- Check the insulation between supply system cable and communication cable.
- Check the polarity of the DC 24 V cable.
- Check the polarity of the communication line.
- Check the mains phase sequence.
- Ensure equipotential bonding between the fieldbus interfaces.

6.12.1 After the wiring check

- Connect and fasten all motor connections (hybrid cable).
- Plug in and fasten all fieldbus interfaces.
- Install and fasten all MOVIMOT® inverters (only with MFZ.7, MFZ.8, MFZ.9).
- Install all connection box covers.
- Seal any plug connections not in use.

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7 Startup

7.1 Startup instructions

⚠ WARNING

Risk of crushing due to missing or defective protective covers.

Severe or fatal injuries.

- Install the protective covers of the plant according to the instructions, see the operating instructions of the gear unit.
- Never start the device if the protective covers are not installed.

⚠ WARNING

Electric shock from capacitors that have not been fully discharged.

Severe or fatal injuries.

- Disconnect the inverter from the power. Observe the minimum switch-off time after disconnection from the supply system:
  - **1 minute**

⚠ WARNING

Danger of burns due to hot surfaces of the device (e.g. the heat sink).

Serious injuries.

- Do not touch the device until it has cooled down sufficiently.

⚠ WARNING

Device malfunction due to incorrect device setting.

Severe or fatal injuries.

- The installation may only be carried out by qualified personnel.
- Only use settings that are suitable for operation.

NOTICE

Danger due to arcing.

Damage to electrical components.

- Do not unplug the power connectors (e.g. hybrid cables) during operation. Do not plug in the power connectors during operation.
- Never remove the MOVIMOT® inverter during operation.

INFORMATION

- Remove the paint protection cap from the status LED before startup. Remove the paint protection film from the nameplates before startup.
- Observe a minimum switch-off time of 2 seconds for the line contactor.

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INFORMATION

- Switch off the DC 24 V voltage supply before removing/installing the fieldbus interface.
- The incoming and outgoing PROFINET IO bus cables are connected to the module electronics. If the module electronics are removed, the PROFINET IO line is interrupted.
- In addition, observe the notes in chapter "Supplementary Field Distributor Startup Information" of the manual.

7.2 Startup procedure

INFORMATION

This chapter describes the startup procedure for MOVIMOT® MM..D in **Easy mode**. For information on the startup of MOVIMOT® MM..D in Expert mode, refer to the "MOVIMOT® MM..D" operating instructions.

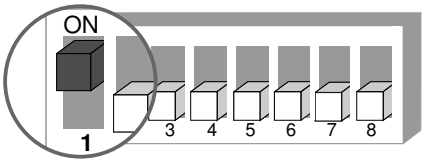
⚠ WARNING

Electric shock from capacitors that have not been fully discharged.

Severe or fatal injuries.

- Disconnect the inverter from the power. Observe the minimum switch-off time after disconnection from the supply system:
  - **1 minute**

1. Make sure the MOVIMOT® inverter and the EtherCAT® interface (MFZ21, MFZ23, MFZ26, MFZ27 or MFZ28) are installed correctly.
2. Set the S1/1 DIP switch on the MOVIMOT® inverter (see relevant MOVIMOT® operating instructions) to "ON" (= address 1).



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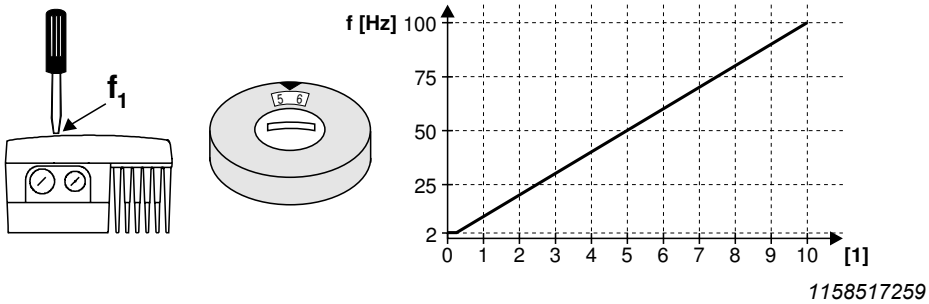
3. Remove the screw plug above the f1 setpoint potentiometer on the MOVIMOT® inverter.
4. Set the maximum speed using setpoint potentiometer f1.



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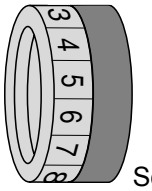
5. Make sure the screw plug of the setpoint potentiometer has a seal and screw it in.

   NOTICE Loss of guaranteed degree of protection if the screw plugs on the f1 setpoint potentiometer and X50 diagnostic interface are not installed or not installed correctly.

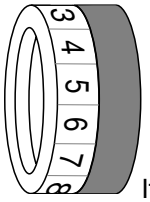
   Damage to the MOVIMOT® inverter.

   - Make sure the screw plug of the setpoint potentiometer has a seal and screw it in.

6. 

Set minimum frequency f_{min} with switch f2.

Function	Setting										
Detent setting	0	1	2	3	4	5	6	7	8	9	10
Minimum frequency f_{min} [Hz]	2	5	7	10	12	15	20	25	30	35	40

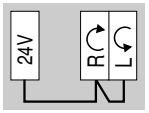
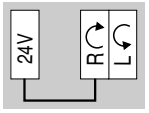
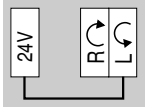
7. 

If the ramp time is not specified via the fieldbus (S1/2 DIP switch = "ON"), set the ramp time at the t1 switch of the MOVIMOT® inverter.

   The ramp time is based on a setpoint step change of 1500 min^{-1} (50 Hz).

Function	Setting										
Detent setting	0	1	2	3	4	5	6	7	8	9	10
Ramp time t1 [s]	0.1	0.2	0.3	0.5	0.7	1	2	3	5	7	10

8. Check to see if the required direction of rotation on the MOVIMOT® inverter has been enabled.

Terminal R	Terminal L	Meaning
Activated	Activated	• Both directions of rotation are enabled.
		
Activated	Not activated	• Only CW rotation is enabled • Setpoint input for CCW rotation will stop the drive.
		
Not activated	Activated	• Only CCW rotation is enabled. • Setpoint input for CW rotation will stop the drive.
		

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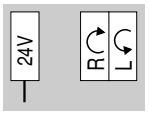
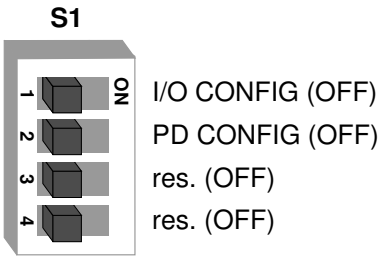
Terminal R	Terminal L	Meaning
not activated	Not activated	• The device is inhibited or the drive is brought to a stop.
		

9. Set the S1/1 and S1/2 DIP switches on the MFE EtherCAT® interface according to your system's requirements.



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DIP switch	Designation	Meaning	
S1/1	I/O CONFIG	Configuration of digital inputs and outputs	
		OFF:	4 DI + 2 DO (factory setting)
		ON:	6 DI
S1/2	PD CONFIG	Configuration of process data transfer between MFE EtherCAT® interface and MOVIMOT®	
		OFF:	3 PD => higher-level controller ramp (factory setting)
		ON:	2 PD => ramp configuration on t1 DIP switch of MOVIMOT® inverter

10. Place the MOVIMOT® inverter and the MFE housing cover on the field distributor and screw them on.
11. Switch on the 24 V DC supply voltage for the MFE EtherCAT® interface and the MOVIMOT® inverter.

    Startup has been completed successfully when the MFE... fieldbus interface shows the following.

    - The green "RUN" LED lights up.
    - The red "SYS-F" LED is not lit.

12. Configure the MFE EtherCAT® interface on the EtherCAT® master.

INFORMATION

In conjunction with EtherCAT®, no further settings are necessary on the drive.

EtherCAT® is configured entirely using software tools. For more information on the configuration, refer to chapter "EtherCAT® configuration".

8 Project planning

This chapter provides information on configuration and startup of the EtherCAT® master.

INFORMATION

The latest version of the XML file for the MFE72 EtherCAT® interface is available on the SEW website (www.sew-eurodrive.com) under the heading "Software".

8.1 MOVIMOT® and EtherCAT®

The behavior of the MOVIMOT® inverter which forms the basis of EtherCAT® operation is referred to as the device profile and is independent of any particular fieldbus, making it a uniform feature. This feature allows the user to develop fieldbus-independent drive applications. This makes it much easier to change to other bus systems, such as PROFINET IO.

8.2 XML file validity for EtherCAT® interface

INFORMATION

Do not edit or amend the entries in the XML file. SEW-EURODRIVE is not liable for any malfunctions in the MOVIMOT® inverter due to an edited XML file.

8.3 Configuring the EtherCAT® master for MOVIMOT® with XML file

8.3.1 XML file for operating the MFE72 EtherCAT® interface on MOVIMOT®

For the configuration of the EtherCAT® master, you can use a special XML file (`SEW_MFE72A.XML`). Import this file into the configuration software of the controller manufacturer.

Refer to the manuals of the respective configuration software for details on the procedure.

The XML files standardized by the EtherCAT® Technology Group (ETG) can be read by all EtherCAT® masters.

8.3.2 Configuration procedure

Configure the MOVIMOT® drive with the EtherCAT® interface as follows:

1. Install the XML file according to the requirements of your project planning software. Once the file has been installed correctly, the device appears next to the slave stations (under SEW-EURODRIVE → Drives) as `MOVIMOT+MFE72A`.
2. Use the menu item [Insert] to add the device to the EtherCAT® structure. The address is assigned automatically. For easier identification, you can give the device a name.

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3. Select the process data configuration required for your application (see chapter "Configuration of process data objects (PDO)" (→ 🗎 71)).
4. Link the I/O or periphery data with the input and output data of the application program.

After configuration, you can start EtherCAT® communication. The "RUN" and "ERR" LEDs signal the communication status of the MFE72 EtherCAT® interface (see chapter "Meaning of LED display" (→ 🗎 82)).

8.3.3 Configuration of process data objects (PDO)

In the CoE (CAN application protocol over EtherCAT®) version, EtherCAT® uses the process data objects (PDO) defined in the CANopen standard for cyclic communication between master and slave. In line with CANopen, a difference is made between Rx (receive) and Tx (transmit) process data objects.

Rx process data objects

Rx process data objects (Rx-PDO) are received by the EtherCAT® slave. They contain process output data (control values, setpoints, digital output signals).

Tx process data objects

Tx process data objects (TX-PDO) are returned from the EtherCAT® slave to the EtherCAT® master. They contain process input data (actual values, status, digital input information, etc.).

Two PDOs of different size can be used for cyclic process input and output data for communication with the MFE72 EtherCAT® interface.

- *OutputData1* (Standard 4 PO)

  Static PDO with 4 cyclic process output data words that are permanently linked to the standard process data of the MOVIMOT® inverter (see chapter "MOVILINK® device profile" (→ 🗎 92)) and 1 additional PD for the outputs.

- *OutputData1* (Standard 10 PO)

  Static PDO with 10 cyclic process output data words that are permanently linked to the standard process data of the MOVIMOT® inverter (see chapter "MOVILINK® device profile" (→ 🗎 92)) whereby process output data 4 – 10 can be used for the binary outputs.

- *InputData1* (standard 4 PI)

  Static PDO with 4 cyclic process input data words that are permanently linked to the standard process data of the MOVIMOT® inverter (see chapter "MOVILINK® device profile" (→ 🗎 92)) and 1 additional PD for the inputs.

- *InputData1* (standard 10 PI)

  Static PDO with 10 cyclic process input data words that are permanently linked to the standard process data of the MOVIMOT® inverter (see chapter "MOVILINK® device profile" (→ 🗎 92)) whereby process output data 4 – 10 can be used for the binary inputs.

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INFORMATION

Results

- Either 4 or 10 process data words can be transmitted in each direction. If, for example, PDO *OutputData1* (standard 10 PO) is used, PDO *InputData1* (standard 10 PI) must be used as well.
- Both input PDO or both output PDO may not be activated at the same time.

List of possible process data objects (PDO) for the MFE72 EtherCAT® interface

Index	Size	Name	Mapping	Sync Manager	Sync Unit
1600hex (5632dec)	8 bytes	OutputData1 (standard 4 PO)	Fixed content	2	0
1601hex (5633dec)	20 bytes	OutputData1 (Standard 10 PO)	Fixed content	2	0
1A00hex (6656dec)	8 bytes	InputData1 (standard 4 PI)	Fixed content	3	0
1A01hex (6657dec)	20 bytes	InputData1 (standard 10 PI)	Fixed content	3	0

Example: Static PDO for 10 cyclic process data words

PO1	MOVIMOT® control word 1
PO2	MOVIMOT® speed
PO3	MOVIMOT® ramp (only if DIP switch S1/2 = "OFF")
PO4	DO0 - DO1 setpoint
PO5	Module control word
PO6	Reserved
PO7	Reserved
PO8	Reserved
PO9	Reserved
PO10	Reserved

The process output data transported with *OutputData1* is assigned according to this table. The process output data PO1 - PO3 can be connected with various process data (control words, setpoints) using the process data parameterization in the MOVIMOT® inverter. For further information, refer to the chapter "MOVILINK® device profile" (→ 🗎 92).

You can control the switching signals for actuators DO0 – DO1 with process output data PO4, bit 0 – bit 1. The following table shows the assignment of the module control word for process output data PO5:

Bit	Assignment
0	**Reset encoder input** Encoder value PI7/PI0 is set to "0" when Bit 0 experiences a rising edge.

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Bit	Assignment
1	**Reset counter input** Encoder value PI9/PI10 is set to "0" when Bit 1 experiences a rising edge.
2 – 15	**Reserved**

Example: Assignment of the preset process output data

PI1	MOVIMOT® status word 1
PI2	MOVIMOT® output current
PI3	MOVIMOT® status word 2 (if DIP switch S1/2 = "OFF")
PI4	DI./DO. actual values The assignment of process input data PI4 depends on the I/O configuration.
PI5	MFE interface status word (only at 10 PI)
PI6	Reserved (only at 10 PI)
PI7	Encoder, high (only at 10 PI)
PI8	Encoder, low (only at 10 PI)
PI9	Counter, high (only at 10 PI)
PI10	Counter, low (only at 10 PI)

The process input data transferred with *InputData1* is permanently assigned according to this table. The process input data PI1 - PI3 can be connected with various process data (status words, actual values) using the process data parameterization in the MOVIMOT® inverter. For further information, refer to the chapter "MOVILINK® device profile" (→ 🗎 92).

The process input data PI4 - PI10 are only available for digital inputs and outputs.

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The following figure shows the assignment of process input data PI4 depending on the set I/O configuration:

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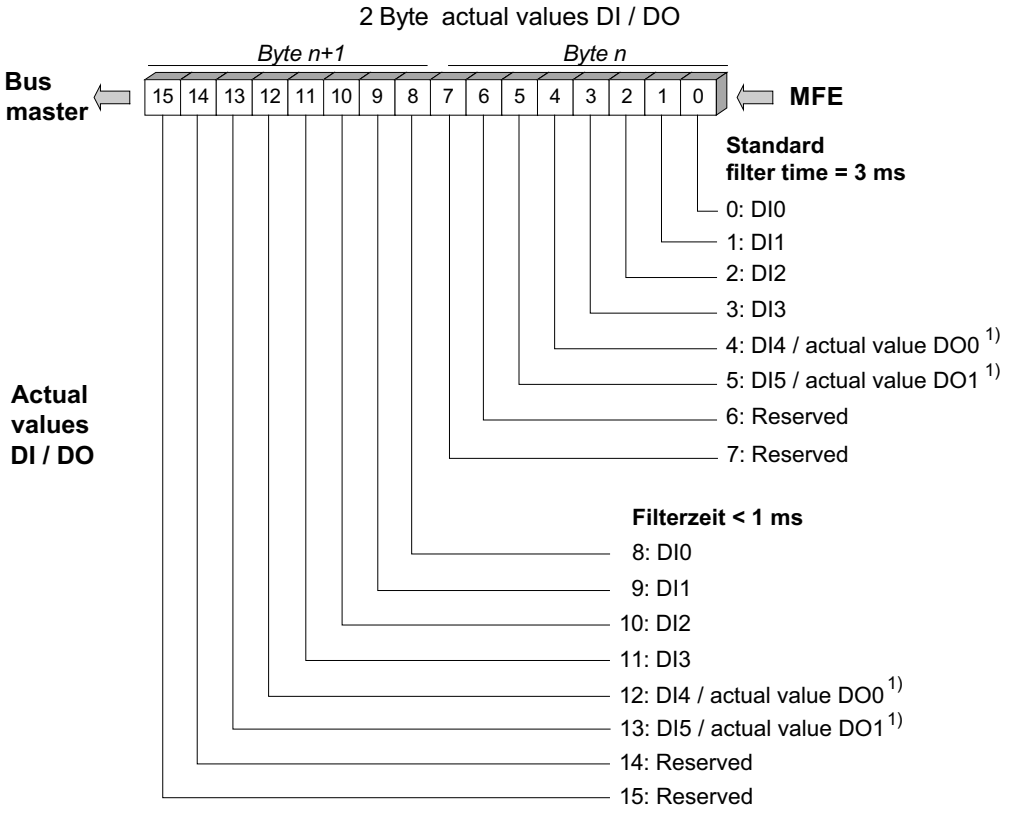

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1) With the configuration 4 DI + 2 DO (S1/1 = "OFF"), the actual value of the DO0 and DO1 binary outputs are transferred. With the configuration 6 DI (S1/1 = "ON"), the actual value of the DI4 and DO5 digital inputs are transferred.

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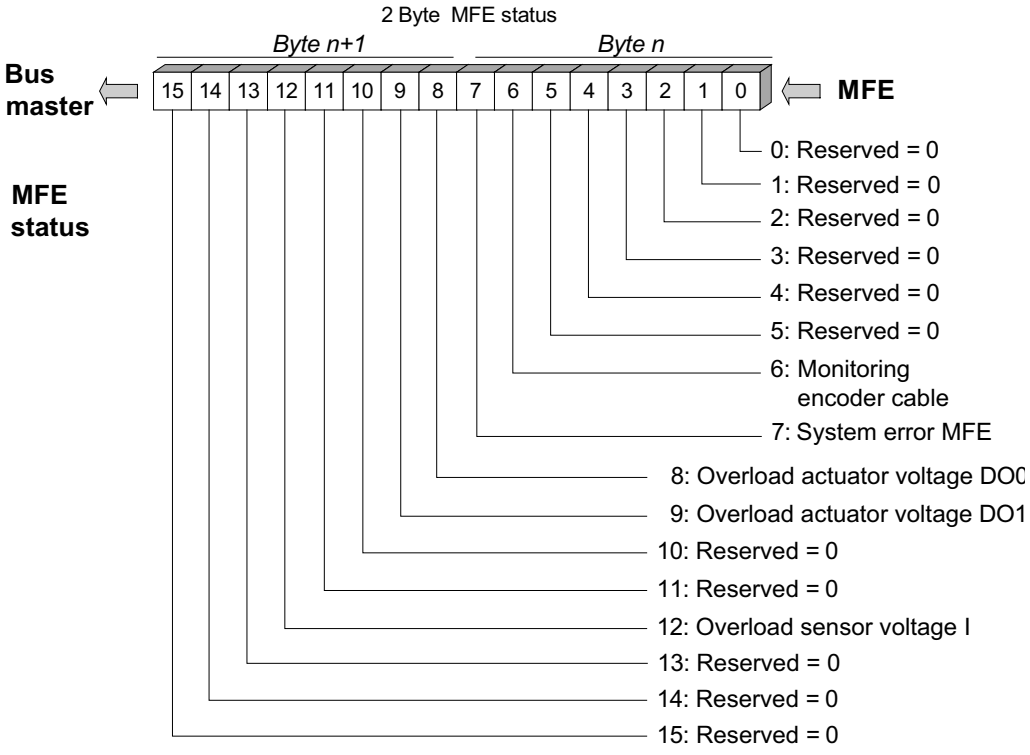
8.4 MFE status word

The following figure shows the assignment of the status word of the MFE fieldbus interface:



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The following table shows the diagnostics information of the MFE fieldbus interface set up for evaluation in the higher-level PLC application. The signals are transferred to the controller via parameters and via the process data channel.

The logical communication status "0" signals the status "OK" for each signal to ensure that no asynchronous startup sequences from the bus master and the PLC can cause incorrect diagnostic messages when the systems are started up (bus startup with user data = 0).

MFE status bit	Diagnostics name via bus	Function and coding
0	Reserved	–
1	Reserved	–
2	Reserved	–
6	Encoder line monitoring	1 = Error in encoder line (wire break) or encoder axis not turning.
		0 = No error
		The two encoder cables are checked for wire breaks. The cables are only monitored when the MOVIMOT® inverter is enabled. Response time is 1.5 s. This status bit remains set until the MOVIMOT® controller enable is reset.

MFE status bit	Diagnostics name via bus	Function and coding
7	MFE system error	MFE system error
		1 = MFE system error present.
		0 = OK
		See parameter index 8310 for more information.
8	Overload actuator voltage DO0	Short circuit/overload of the actuator supply for output DO0
		1 = DO0 short circuit/overload
		0 = OK
9	Overload actuator voltage DO1	Short circuit/overload of the actuator supply for output DO1
		1 = DO1 short circuit/overload
		0 = OK
10	Reserved	–
11	Reserved	–
12	Overload sensor voltage group I	Short circuit/overload of sensor supply
		1 = Short circuit/overload of sensor supply
		0 = Sensor supply OK
13	Reserved	–
14	Reserved	–
15	Reserved	–

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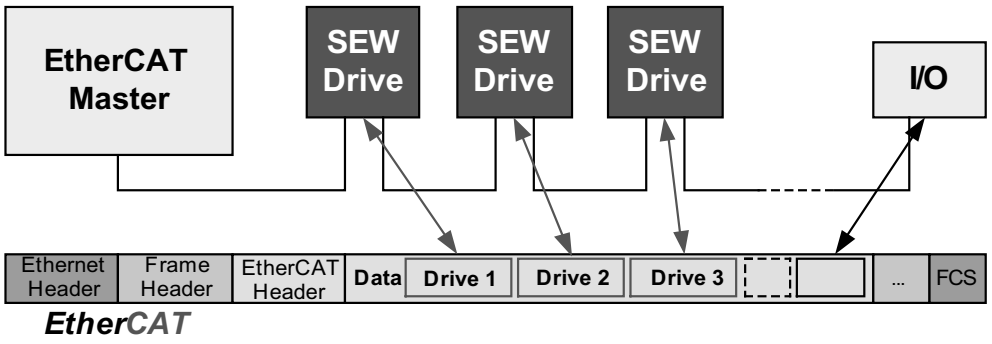
9 Operating behavior on EtherCAT®

This chapter describes the basic behavior of the MOVIMOT® inverter on EtherCAT® when controlled with process data objects (PDO) for fieldbus communication.

9.1 Control of the MOVIMOT® inverter

The MOVIMOT® inverter is controlled via the permanently configured PDOs, which are 3 or 10 process data words in length. These process data words are directly mapped in the process image when using an EtherCAT® master, which allows them to be addressed directly by the control program.



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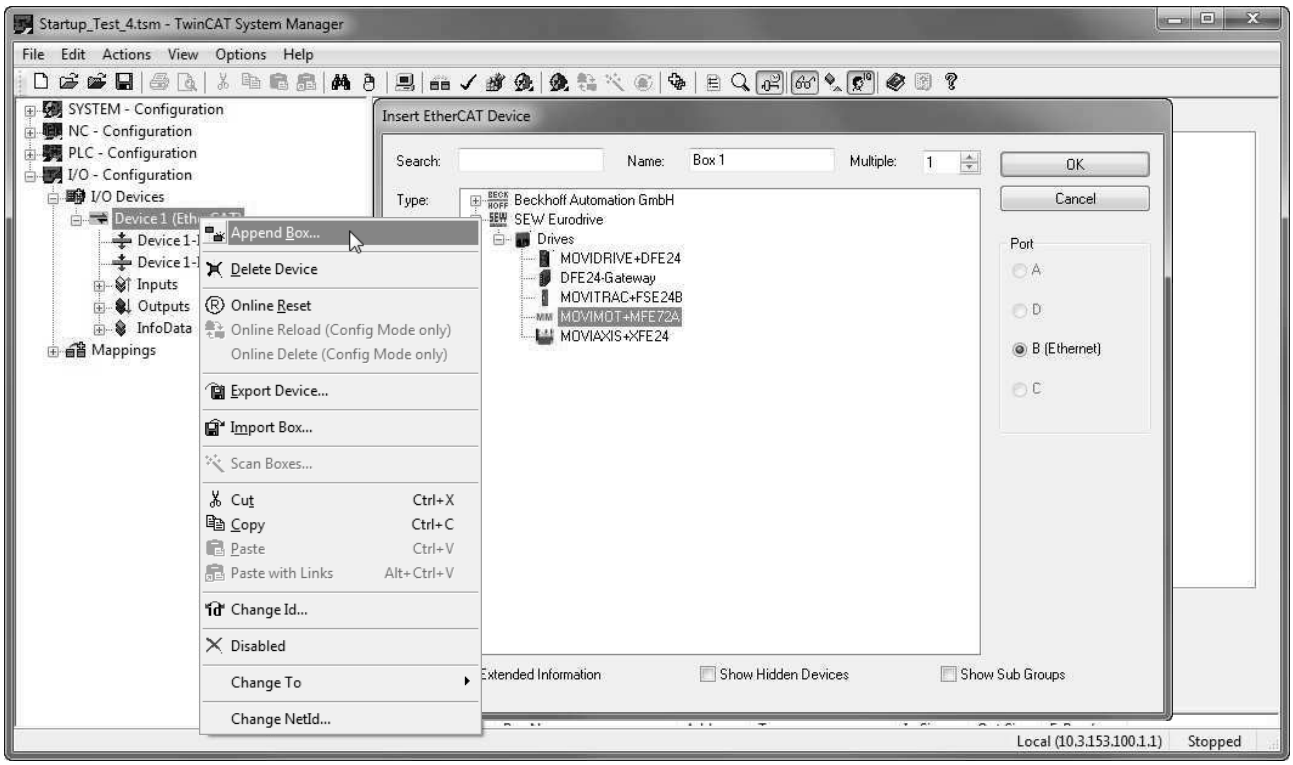
INFORMATION

See chapter "MOVILINK® device profile" for more information about control via the process data channel, specifically about coding the control and status word.

9.1.1 Control example in TwinCAT with MOVIMOT®

Once the file *SEW_MFE72A.xml* has been copied to the TwinCAT subdirectory "\IO \EtherCAT", you can use the "Append box" menu item in "offline" mode to add a MOVIMOT® inverter into the EtherCAT® structure (see following figure).



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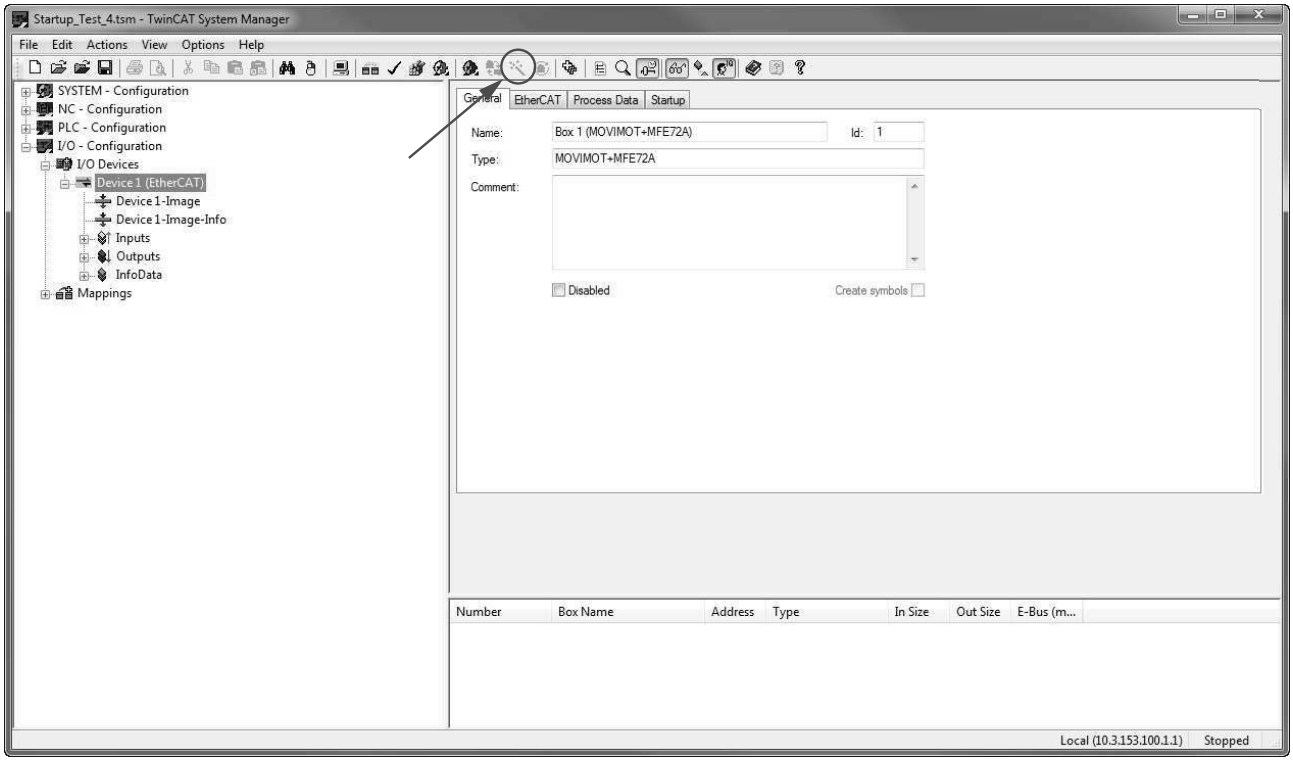
In "online" mode (i.e. when connected to the EtherCAT® line), you can use the "Find devices" icon to search the EtherCAT® line for connected MOVIMOT® inverters (see following figure).



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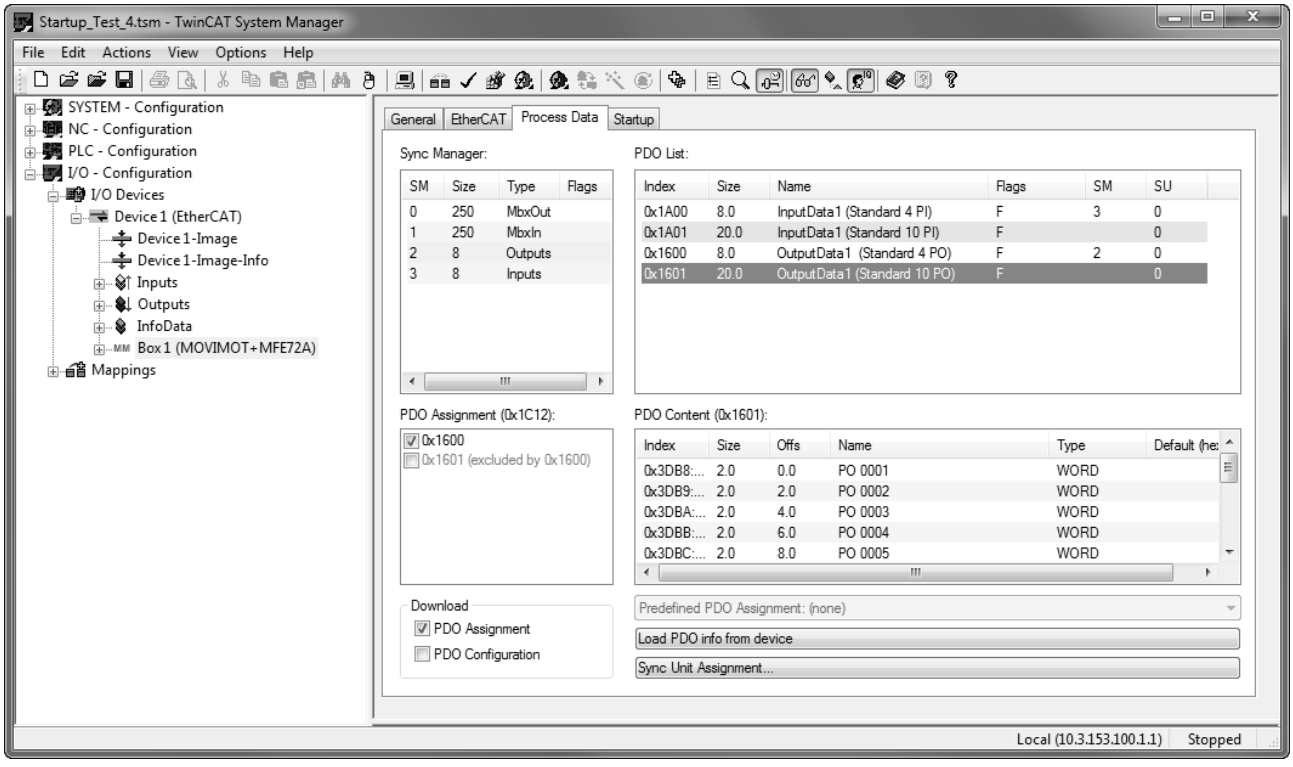
For the simplest form of process data transport, only the two PDOs *InputData1* and *OutputData1* are required.



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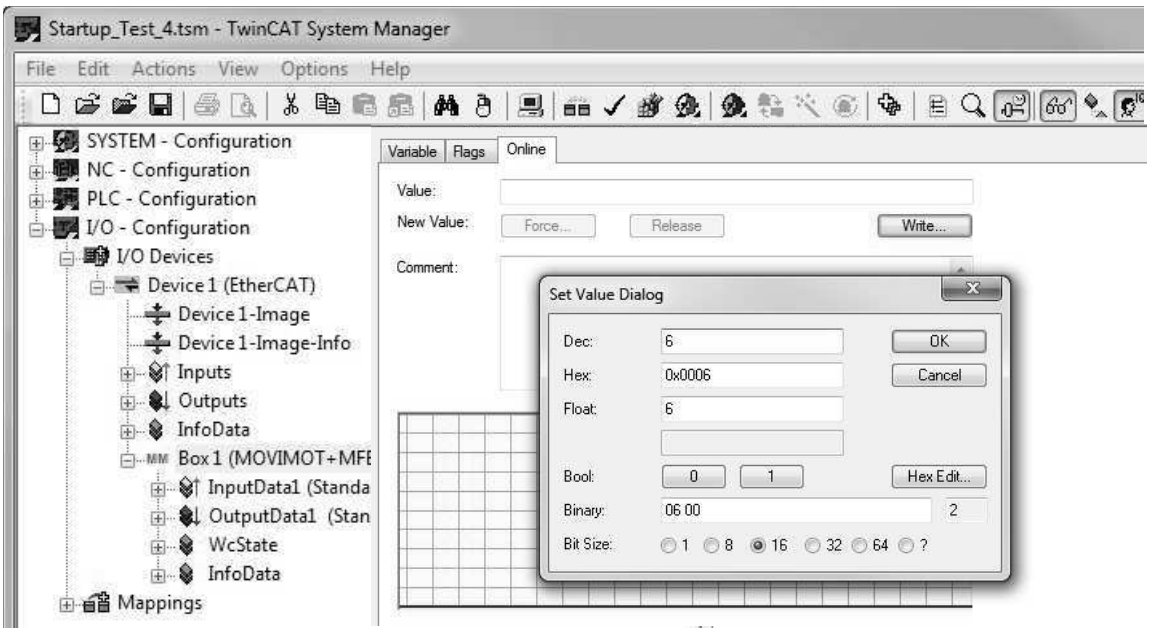
Now, you can link the process data words to the PLC program or write data into them for manual testing as shown in the following figure.



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First, mark the process output data PO1. In the window that appears, choose the tab page "Online". Click the [Write...] button. The "Set Value Dialog" window opens. Enter your data in the field "Dec" or "Hex". Handle the PO2 process output data in the same way.

The assignment and scaling of the process input and output data words are configured in parameter group *87.* in the MOVIMOT® inverter.

INFORMATION

See chapter "MOVILINK® device profile" for more information.

9.1.2 Communication timeout between EtherCAT® and MFE72

If the data transmission via EtherCAT® is disrupted or interrupted ...

- Control word bits 0 - 2 are set to "0". The MOVIMOT® drive executes a rapid stop.
- The "ERR" LED on the MFE72 EtherCAT® interface lights up, see chapter "Meaning of LED display".
- All DO binary outputs are set to "0".
- Error 28 "fieldbus timeout" is reported to the MOVITOOLS® MotionStudio software through the *P8310.0* parameter.

When the disruption no longer exists, the error resets itself.

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10 Function

10.1 Operating notes

⚠ WARNING

Electric shock caused by dangerous voltages at the connections, cables and motor terminals.

When the device is switched on, dangerous voltages are present at the connections as well as at any connected cables and motor terminals. This also applies even when the device is inhibited and the motor is at standstill.

Severe or fatal injuries.

- Do not switch under load.
- Before performing any work on the device, disconnect it from the voltage supply. Note that dangerous voltages can occur at the terminals and connections for up to 1 minute after the controller is switched off.
- Block the output stage of the inverter before switching at the output of the device.

⚠ WARNING

Electric shock from capacitors that have not been fully discharged.

Severe or fatal injuries.

- Disconnect the inverter from the power. Observe the minimum switch-off time after disconnection from the supply system:
  - **1 minute**

⚠ WARNING

Risk of crushing if the motor starts up unintentionally.

Severe or fatal injuries

- Observe the startup instructions.
- Deactivate all control signals.

⚠ WARNING

Danger of burns due to hot surfaces of the device (e.g. the heat sink).

Serious injuries.

- Do not touch the device until it has cooled down sufficiently.

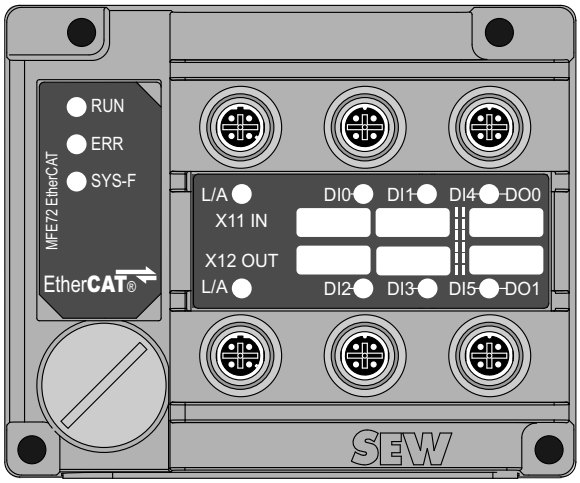
INFORMATION

- The maximum output frequency in any operating mode is 120 Hz.
- If the maximum output frequency is exceeded, the status LED of the MOVIMOT® inverter flashes slowly red (error 08 "speed monitoring").

10.2 Meaning of LED display

The MFE EtherCAT® interface has 5 LEDs for diagnostic purposes.

- The "RUN" LED indicates the operating state of the MFE fieldbus interface.
- The "ERR" LED displays errors in EtherCAT®.
- "SYS-F" LED for displaying system errors.
- The "L/A" (link/act) LEDs signal the activity of EtherCAT® ports X11 and X12.



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10.2.1 "RUN" LED

The "RUN" LED signals the operating state of the MFE EtherCAT® interface.

LED	Operating status	Meaning
Off	INIT	The MFE EtherCAT® interface is in the INIT status.
Green Flashing	PRE-OPERATIONAL	Mailbox communication is possible but no process data communication.
Green Lights up 1 time	SAFE-OPERATIONAL	Mailbox and process data communication is possible. The slave outputs are not output yet.
Green Lights up	OPERATIONAL	Mailbox and process data communication is possible.

10.2.2 "ERR" LED

The "ERR" LED indicates an EtherCAT® error.

LED	Meaning
Off	EtherCAT® communication from the MFE EtherCAT® interface is in operating state.
Red Flickering	A boot error was detected. The state INIT was achieved, but the "Change" parameter in the AL status register has been set to "0x01:change/error".
Red Flashing	Invalid configuration.

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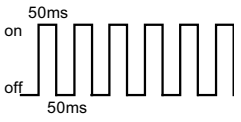
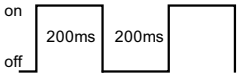
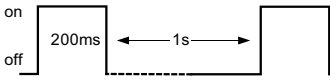
LED	Meaning
Red Lights up 1 time	The slave application has automatically changed the EtherCAT® state. The "Change" parameter in the AL state register is set to "0x01:change/ error".
Red Lights up 2 time	A watchdog timeout has occurred in the application.
Red Lights up	A PDI watchdog timeout occurred.

Definition of the display statuses

LED display	Definition	Timeline
Illuminated	Display is lighted permanently.	
Off	Display does not light up.	
Flickering	The display switches between on and off with a frequency of 10 Hz.	
Flickering 1 time	The display flickers once very shortly, followed by an off phase.	
Flashing	Display switches on and off at a frequency of 2.5 Hz (200 ms on, 200 ms off).	
Lights up 1 time	The display flashes once shortly (200 ms), followed by a longer off phase (1,000 ms).	
Lights up 2 time	The display lights up twice in rapid succession, followed by an off phase.	

10.2.3 "SYS-F" LED

The following table shows the statuses of the "SYS-F" LED:

LED SYS-F	Meaning	Measure
Off	Standard operating state. MFE is currently exchanging data with the MOVIMOT® inverter.	-
Red Lights up	MFE cannot exchange data with the MOVIMOT® drive.	Check the RS485 wiring between MFE and MOVIMOT® drive. Check the voltage supply of the MOVIMOT® drive.

LED SYS-F	Meaning	Measure
Red Flashing (2 s cycle)	MFE initialization error or serious device error	Use MOVITOOLS® MotionStudio to read out the fault status. Determine cause and acknowledge error.

10.2.4 "L/A" LED (Link/Activity)

Each EtherCAT® port for incoming EtherCAT® cables (X11 IN) and outgoing EtherCAT® cables (X12 OUT) has a "L/A" LED (Link/Activity). It indicates whether the EtherCAT® connection to the preceding or following unit is available and active.

The following table shows the statuses of the "L/A" LEDs:

LED	Meaning
Off	No EtherCAT® connection.
Green Lights up	EtherCAT® cable is connected.
Green Flickering	Ethernet communication is active.
Red Flashing	Ethernet communication is inactive.

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11 Supplementary field distributor startup information

The startup procedure is described in the chapter "Startup".

In addition, observe the following notes on the startup of field distributors.

11.1 MF../Z.6. field distributor

11.1.1 Maintenance switch

The maintenance/line protection switch of the Z.6. field distributor protects the hybrid cable against overload and switches the following supplies:

- Power supply and
- DC 24 V supply

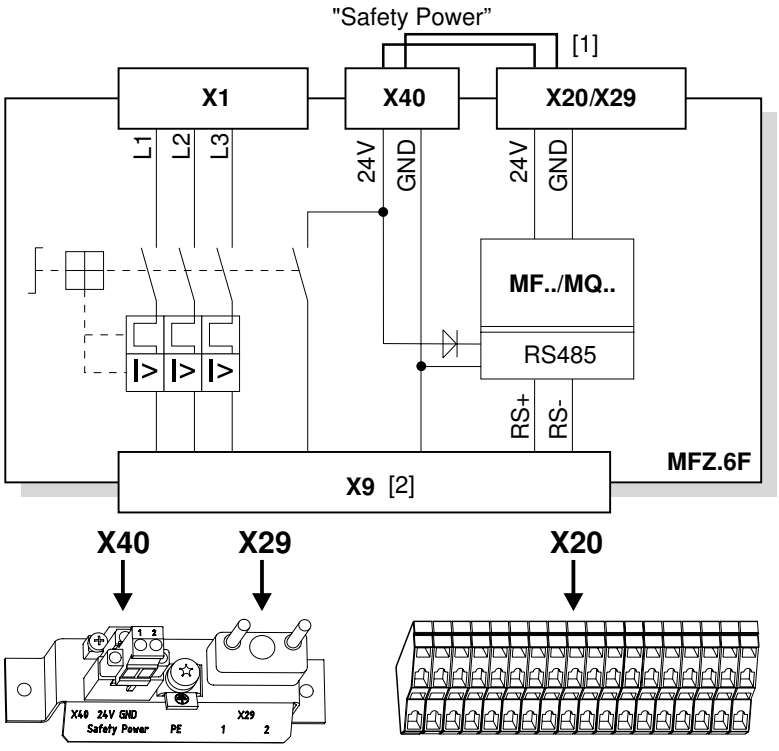
⚠ WARNING

Electric shock caused by dangerous voltages in the connection box and field distributor.

The maintenance/miniature circuit breaker disconnects only the MOVIMOT® drive from the power supply system, not the field distributor.

- Disconnect the field distributor from the power supply. Observe the minimum switch-off time after disconnection from the supply system:
  - **1 minute**

Block diagram:



[1] Jumper to supply the MOVIMOT® drive with DC 24 V voltage for the fieldbus interface (installed at the factory)
[2] Hybrid cable connection

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11.2 MF../MM../Z.7. field distributor

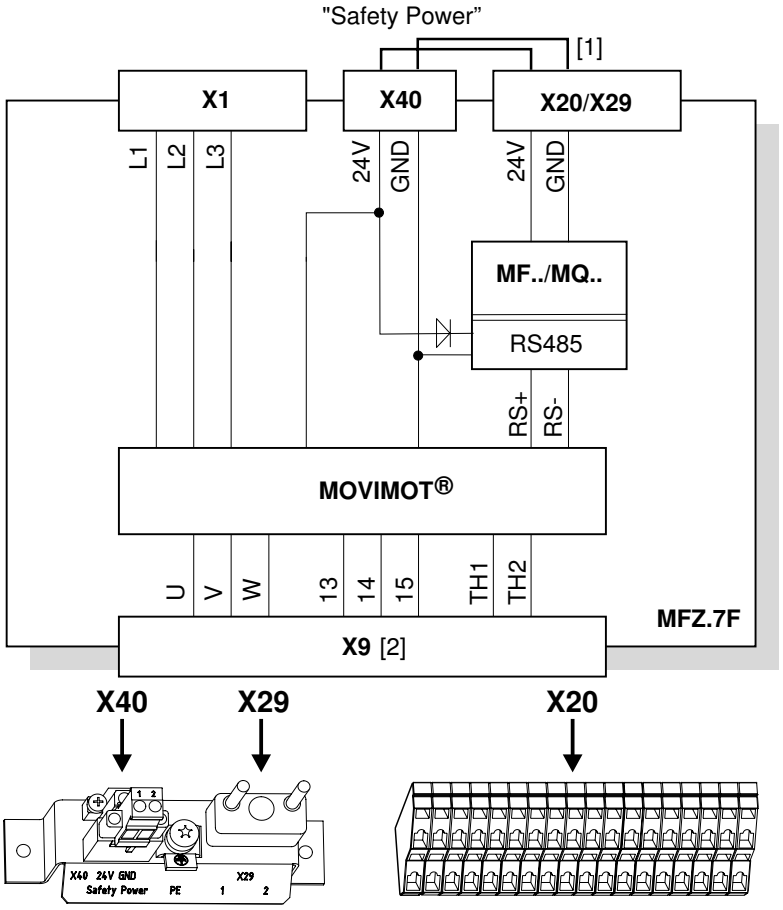
11.2.1 Checking the connection type of the motor

Use the following figure to check that the selected connection type is identical for the field distributor and the connected motor.

INFORMATION

For brake motors: Do not install brake rectifiers inside the terminal box of the motor!

Block diagram:



[1] Jumper to supply the MOVIMOT® drive with DC 24 V voltage for the fieldbus interface (installed at the factory)
[2] Hybrid cable connection

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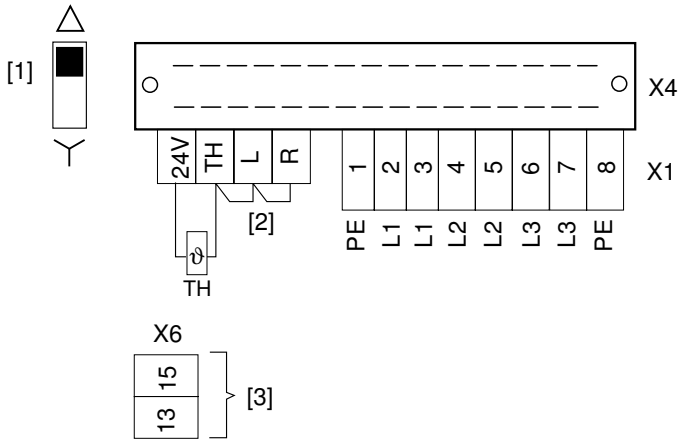
11.2.2 Internal wiring of the MOVIMOT® inverter in the field distributor

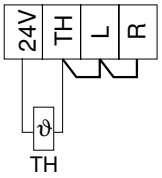


9007200441652619

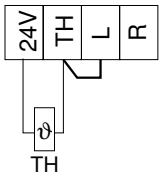
[1] DIP switches for setting the connection type (⅄ or △)
Make sure that the connection type of the connected motor corresponds with the setting of the DIP switch.

[2] **Note the enabled direction of rotation**
(Both directions of rotation are enabled as standard)

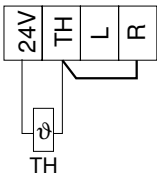
Both directions of rotation are enabled



Only **CCW** direction of rotation is enabled



Only **CW** direction of rotation is enabled



[3] Connection for internal braking resistor (in motors without brake only)

11.3 MF../MM../Z.8. field distributor

11.3.1 Maintenance switch

The maintenance switch of the Z.8. field distributor switches the following supplies:

- Power supply and
- DC 24 V supply

⚠ WARNING

Electric shock caused by dangerous voltages in the connection box and field distributor.

The maintenance/miniature circuit breaker disconnects only the MOVIMOT® drive from the power supply system, not the field distributor.

- Disconnect the inverter from the power. Observe the minimum switch-off time after disconnection from the supply system:
  - **1 minute**

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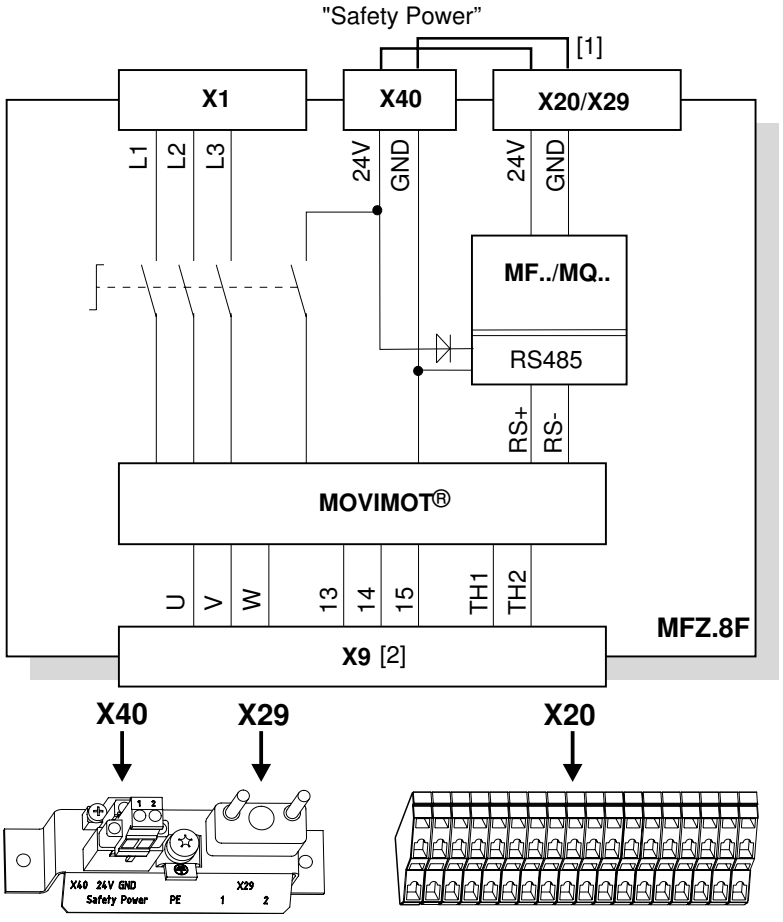
Block diagram:



9007200441668363

[1] Jumper to supply the MOVIMOT® drive with DC 24 V voltage for the fieldbus interface (installed at the factory)
[2] Hybrid cable connection

11.3.2 Checking the connection type of the motor

Use the following figure to check that the selected connection type is identical for the field distributor and the connected motor.

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INFORMATION

For brake motors: Do not install brake rectifiers inside the terminal box of the motor!

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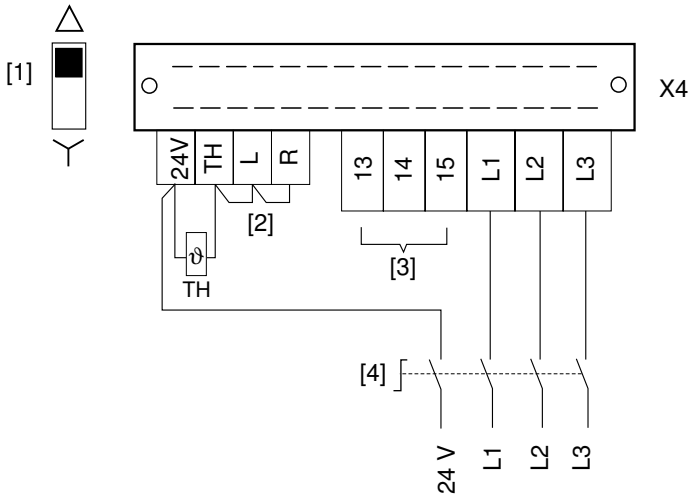
11.3.3 Internal wiring of the MOVIMOT® inverter in the field distributor

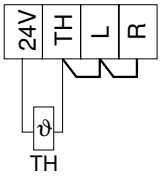


9007200441675147

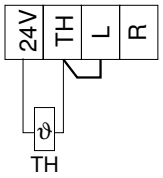
[1] DIP switches for setting the connection type (⅄ or △)
Make sure that the connection type of the connected motor corresponds with the setting of the DIP switch.

[2] **Note the enabled direction of rotation**
(Both directions of rotation are enabled as standard)

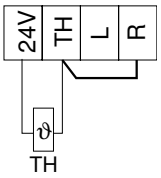
Both directions of rotation are enabled



Only **CCW** direction of rotation is enabled



Only **CW** direction of rotation is enabled



[3] Connection for internal braking resistor (in motors without brake only)
[4] Maintenance switch

11.4 MOVIMOT® inverter integrated in field distributor

The following chapter describes the differences in the use of the MOVIMOT® inverter integrated in the field distributor compared to use when it is integrated in the motor.

11.4.1 Different factory settings for MOVIMOT® integrated in the field distributor

Note the changes to the factory settings (in bold) when using MOVIMOT® integrated in Z.7. or Z.8 field distributors:

DIP switch S1

S1		**1**	**2**	**3**	**4**
Meaning		**RS485 address**			
		2^0	**2^1**	**2^2**	**2^3**
MOVIMOT® 1	**ON**	**1**	1	1	1
	OFF	0	**0**	**0**	**0**

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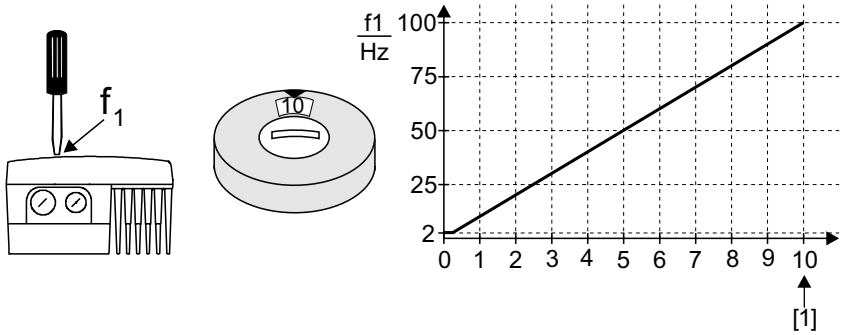
S1 Meaning		5 Motor protection	6 Motor power rating	7 PWM frequency	8 No-load damping
	ON	**Off**	Motor one size smaller	**Variable** (16, 8, 4 kHz)	On
	OFF	On	**Adjusted**	4 kHz	**Off**

Setpoint potentiometer f1



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[1] Factory setting

All other settings are identical to the settings for a MOVIMOT® drive with integrated inverter. See MOVIMOT® operating instructions.

11.4.2 Additional functions for MOVIMOT® integrated in the field distributor

The following additional functions are available when MOVIMOT® is integrated in the Z.7., Z.8. or Z.9. field distributor (to a limited extent). A detailed description of the additional functions can be found in the MOVIMOT® operating instructions.

Additional function		Restriction
1	MOVIMOT® with increased ramp times	–
2	MOVIMOT® with adjustable current limiting (fault if limit is exceeded)	–
3	MOVIMOT® with adjustable current limiting (switchable using terminal f1/f2)	**Not available**
4	MOVIMOT® with bus configuration	**Not available**
5	MOVIMOT® with motor protection in Z.7., Z.8. or Z.9. field distributor	–
6	MOVIMOT® with maximum 8 kHz PWM frequency	–
7	MOVIMOT® with rapid start/stop	**The mechanical brake can only be controlled by MOVIMOT®. It is not possible to control the brake using the relay output.**
8	MOVIMOT ® with minimum frequency 0 Hz	–
10	MOVIMOT® with minimum frequency 0 Hz and reduced torque at low frequencies	–
11	Monitoring of line phase failure deactivated	–

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Additional function		Restriction
12	MOVIMOT® with rapid start/stop and motor protection in Z.7., Z.8. or Z.9. field distributors	**The mechanical brake can only be controlled by MOVIMOT®. It is not possible to control the brake using the relay output.**
14	MOVIMOT® with deactivated slip compensation	–

INFORMATION

Do not use additional function 9 "MOVIMOT® for lifting applications" and additional function 13 "MOVIMOT® for lifting applications with extended n-monitoring" when the MOVIMOT® inverter is integrated in the Z.7., Z.8. and Z.9. field distributor.

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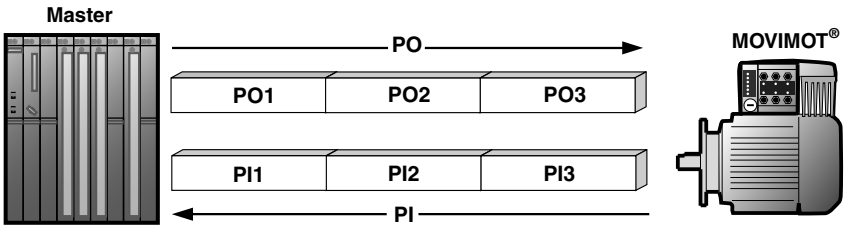
12 MOVILINK® device profile

12.1 Coding of the process data

The same process data information is used for control and setpoint selection in all fieldbus systems. The coding of the process data takes place according to the uniform MOVILINK® profile for SEW-EURODRIVE drive inverters.

Two variants can generally be distinguished for MOVIMOT® drives operated on the ..Z.1, ..Z.3, ..Z.6, ..Z.8 or ..Z.9 field distributors:

- 2 process data words (2 PD)
- 3 process data words (3 PD)



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PO = Process output data
PO1 = Control word
PO2 = Speed (%)
PO3 = Ramp

PI = Process input data
PI1 = Status word 1
PI2 = Output current
PI3 = Status word 2

12.1.1 2 process data words

For controlling the MOVIMOT® inverter via 2 process data words, the higher-level controller sends the process output data "Control word" and "Speed [%]" to the MOVIMOT® inverter. The MOVIMOT® inverter sends the process input data "Status word 1" and "Output current" to the higher-level controller.

12.1.2 3 process data words

When control uses 3 process data words, the ramp is sent as the additional process output data word and status word 2 is sent as the third process input data word.

12.1.3 Process output data

Process output data is sent from the higher-level controller to the MOVIMOT® inverter (control information and setpoints). They only take effect in the MOVIMOT® inverter if the RS485 address in the MOVIMOT® inverter (DIP switches S1/1 to S1/4) is set to a value other than "0".

The MOVIMOT® drive can be controlled via the following process output data:

- PO1: Control word
- PO2: Speed [%] (setpoint)
- PO3: Ramp

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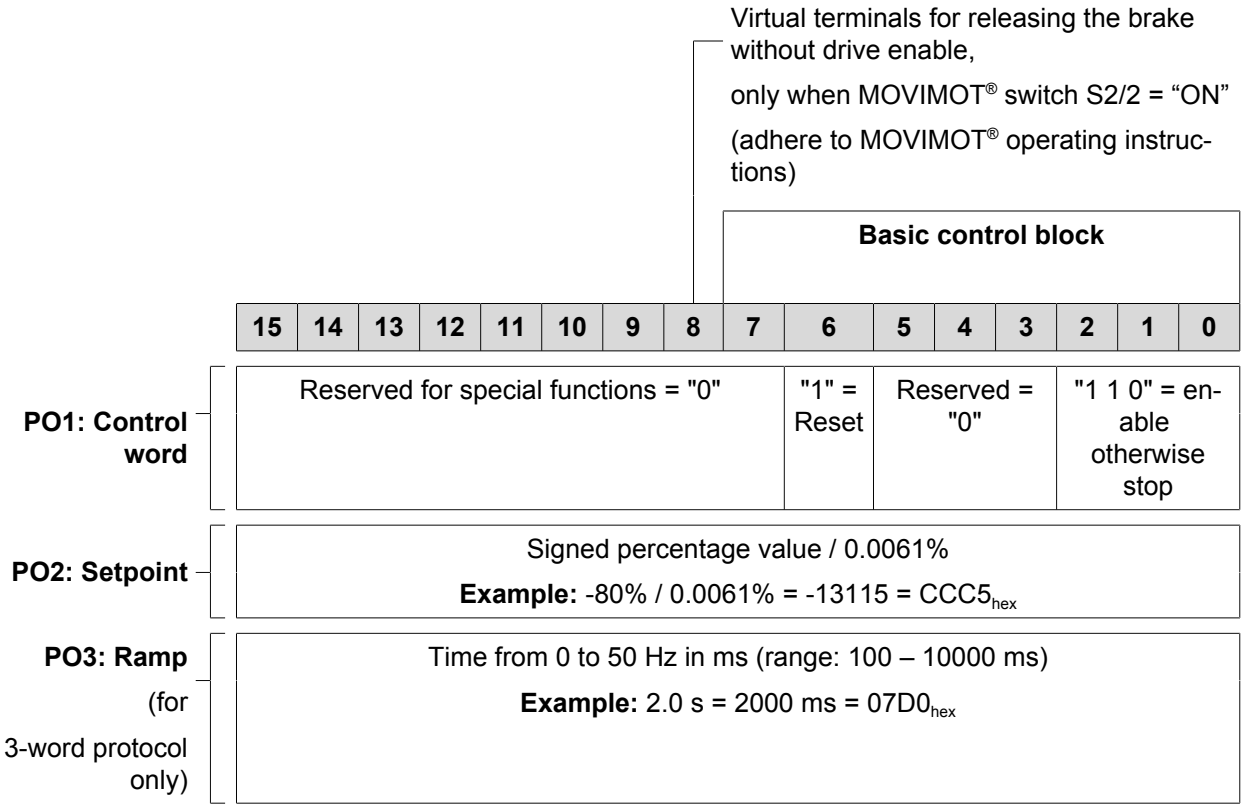

Control word bit 0 – 2

The "Enable" control command is set with bits 0 – 2 by entering the control word = 0006_{hex}. The CW and/or CCW input terminal must also be set to +24 V (jumpered) to enable the MOVIMOT® drive.

The "Stop" control command is issued by resetting bit 2 = "0." Use the stop command 0002_{hex} to enable compatibility with other SEW-EURODRIVE inverter series. MOVIMOT® inverter always triggers a stop with the current ramp whenever bit 2 = "0," regardless of the status of bit 0 and bit 1.

Control word, bit 6 = reset

In the event of a malfunction, the fault can be acknowledged by setting bit 6 = "1" (Reset). For reasons of compatibility, any control bits not assigned must be set to the value "0".

Speed [%]

The speed setpoint is given as a relative value in percentage and refers to maximum speed set using the setpoint potentiometer f1.

Coding:	$C000_{hex}$ = -100% (counterclockwise rotation)
	4000_{hex} = +100% (clockwise rotation)
	→ 1 digit = 0.0061%
Example:	80% f_{max}, CCW rotation:
Calculation:	-80% / 0.0061 = -13115_{dec} = $CCC5_{hex}$

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Ramp

The current integrator in the process output data word PO3 is transferred if the process data exchange takes place using three process data words. The integrator ramp set with switch t1 is used if the MOVIMOT® drive is controlled using 2 process data words.

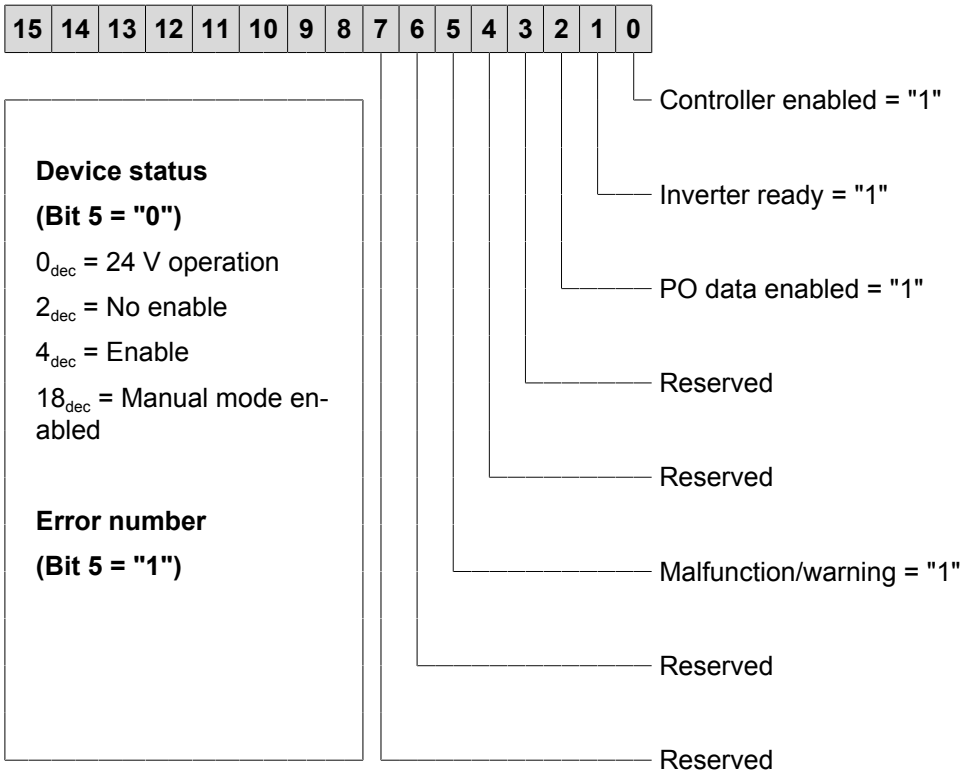
Coding:	1 digit = 1 ms
Range:	100 – 10000 ms
Example:	2.0 s = 2000 ms = 2000_{dec} = $07D0_{hex}$

12.1.4 Process input data

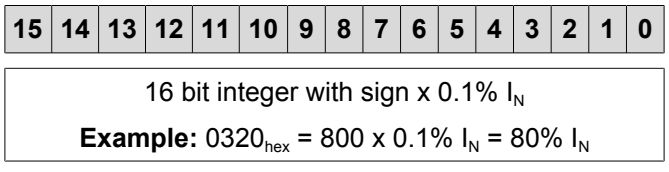
The MOVIMOT® inverter sends the process input data back to the higher-level controller. The process input data contains information on statuses and actual values. The MOVIMOT® drive supports the following process input data:

- PI1: Status word 1
- PI2: Output current
- PI3: Status word 2

PI1: Status word 1



PI2: Actual current value



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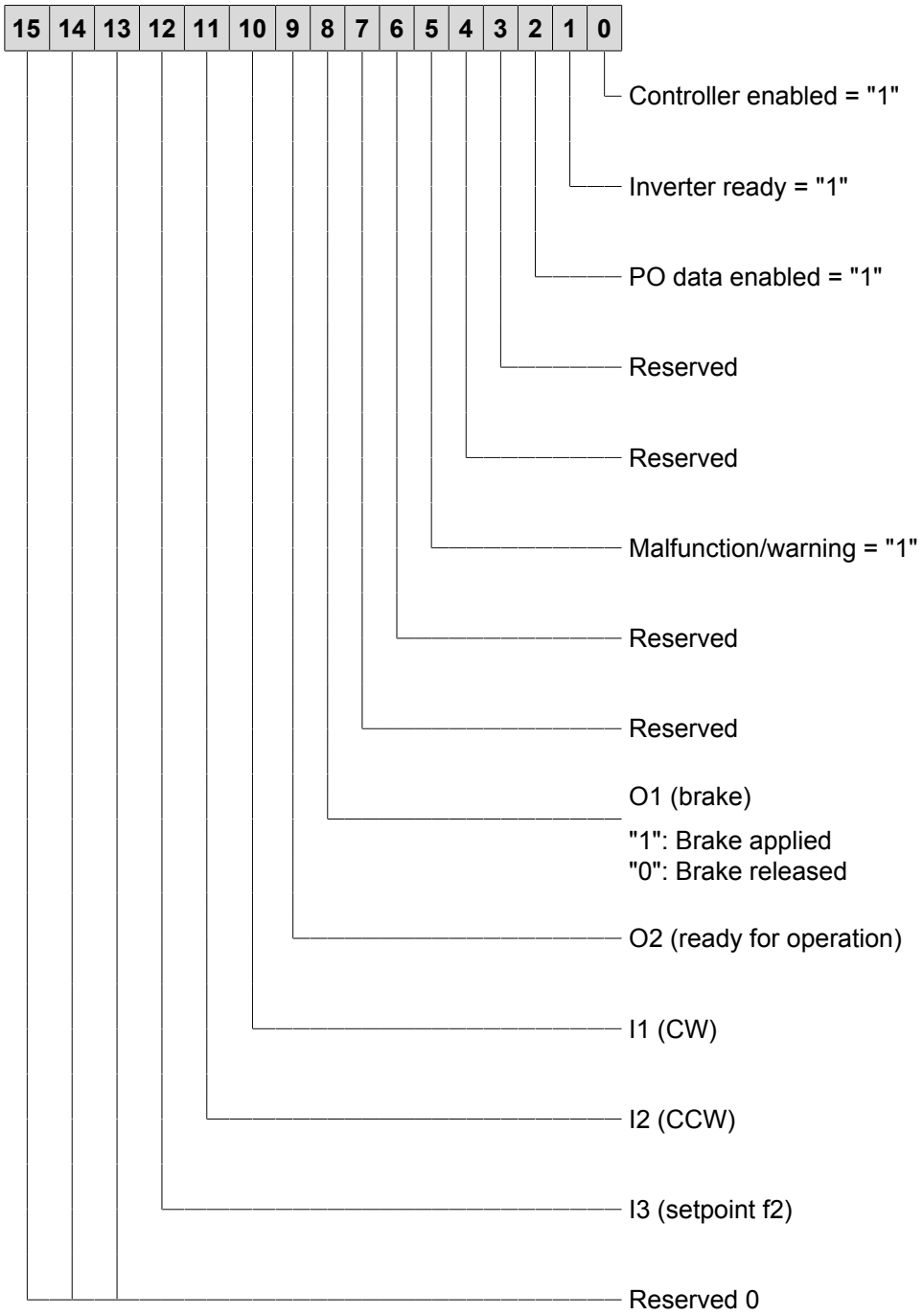
PI3: Status word 2

(only for 3-word protocol)



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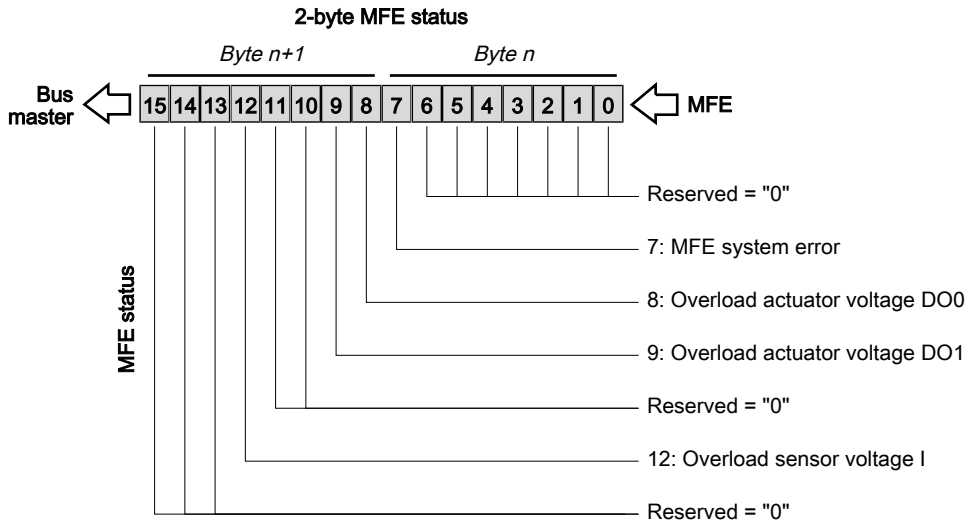
12.2 MFE status word

The following figure shows the assignment of the status word of the MFE fieldbus interface:



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The following table shows the diagnostics information of the MFE fieldbus interface set up for evaluation in the higher-level PLC application. The signals are transferred to the controller via parameters and via the process data channel.

The logical communication status "0" signals the status "OK" for each signal. Therefore, the asynchronously running start-up sequences of the PLC and the device do not output any false diagnostic messages upon start-up of the system (bus start-up with useful data = 0).

MFE status bit	Diagnostic name via bus	Function and coding
0, 1, 2	Reserved	–
7	MFE system error	MFE system error 1 = MFE system error present. 0 = OK See parameter index 8310 for more information.
8	Overload actuator voltage DO0	Short circuit/overload of the actuator supply for output DO0 1 = Short circuit/overload DO0 0 = OK
9	Overload actuator voltage DO1	Short circuit/overload of the actuator supply for output DO1 1 = Short circuit/overload DO1 0 = OK
10, 12	Reserved	–

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MFE status bit	Diagnostic name via bus	Function and coding
12	Overload sensor voltage group I	Short circuit/overload of the sensor supply group I (VO24-I) 1 = Short circuit/overload sensor supply 0 = Sensor supply OK
13, 14, 15	Reserved	–

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13 Operation with the MOVITOOLS® MotionStudio engineering software

13.1 About MOVITOOLS® MotionStudio

13.1.1 Tasks

The MOVITOOLS® MotionStudio engineering software enables you to perform the following tasks with consistency:

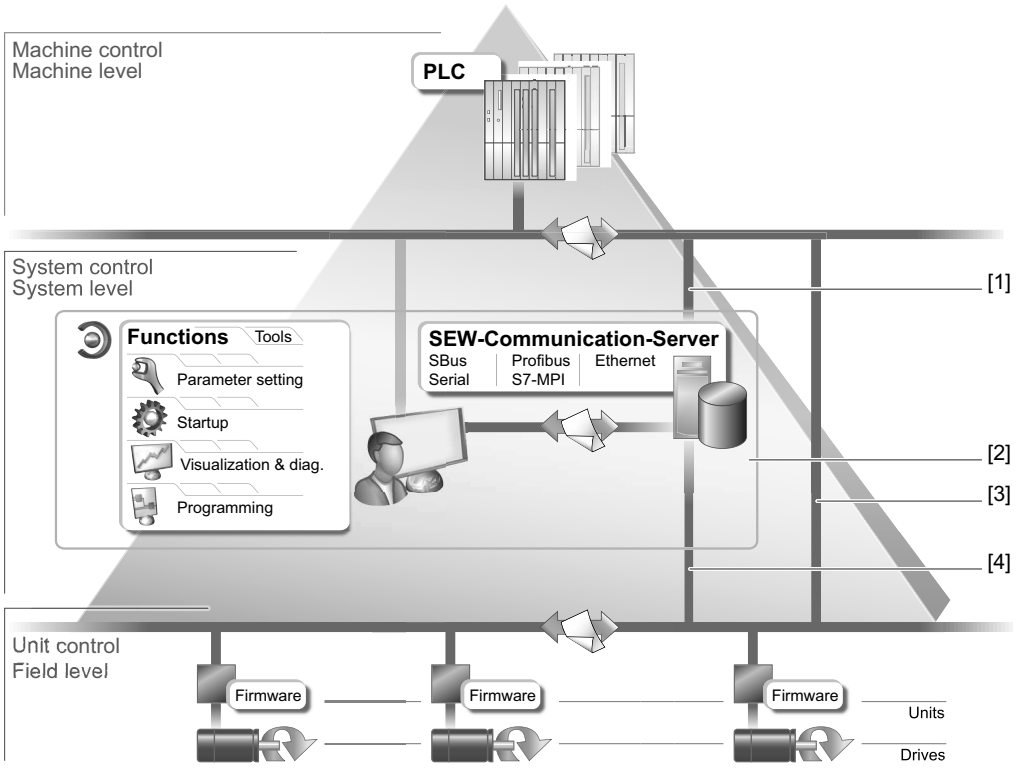
- Establishing communication with devices
- Executing functions with the devices

13.1.2 Functional principle

Overview

The following figure illustrates the functional principle of the MOVITOOLS® MotionStudio software package.

Note that this illustration only shows the logical communication relationships and not the hardware connections.



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[1] Communication channel for fieldbus or Industrial Ethernet
[2] MOVITOOLS® MotionStudio software package with integrated SEW Communication Server
[3] Communication between fieldbus nodes or Industrial Ethernet
[4] Communication channel via interface adapter to SBus (CAN) or serial

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Engineering via interface adapters

If your device supports the "SBus" or "Serial" communication options, you can use a suitable interface adapter for engineering.

The interface adapter is additional hardware that you can obtain from SEW-EURODRIVE. You can use it to connect your engineering PC with the respective communication option of the device.

The type of interface adapter you require depends on the communication options of the respective device.

Communication channels

The SEW Communication Server is integrated into the engineering software MOVITOOLS® MotionStudio for establishing communication with the devices.

The SEW Communication Server allows you to create communication channels. Once the channels are established, the devices communicate via these communication channels using their communication options. You can operate up to 4 communication channels at the same time.

MOVITOOLS® MotionStudio supports the following types of communication channels:

- Serial (RS485) via interface adapters
- System bus (SBus) via interface adapters
- Ethernet TCP/IP, PROFINET IO, EtherNet/IP™, Modbus/TCP
- EtherCAT®
- Fieldbus (PROFIBUS DP-V1)
- Non-proprietary software interface Tool Calling Interface

The available channels can vary depending on the device and its communication options.

Functions

The MOVITOOLS® MotionStudio engineering software enables you to perform the following tasks with consistency:

- Parameterization (e. g. in the parameter tree of the device)
- Startup
- Visualization and diagnostics
- Programming

MOVITOOLS® MotionStudio provides the right tools for every device type.

13.2 First steps

13.2.1 Starting the software and creating a project

Proceed as follows:

1. Select the following item from the Windows start menu: [Start] / [Programs] / [SEW] / [MOVITOOLS MotionStudio] / [MOVITOOLS MotionStudio]
   ⇨ MOVITOOLS® MotionStudio is started.
2. Create a project with a name and directory.

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13.2.2 Establishing communication and scanning the network

Proceed as follows:

1. Click "Configure communication channels" [1] in the toolbar.

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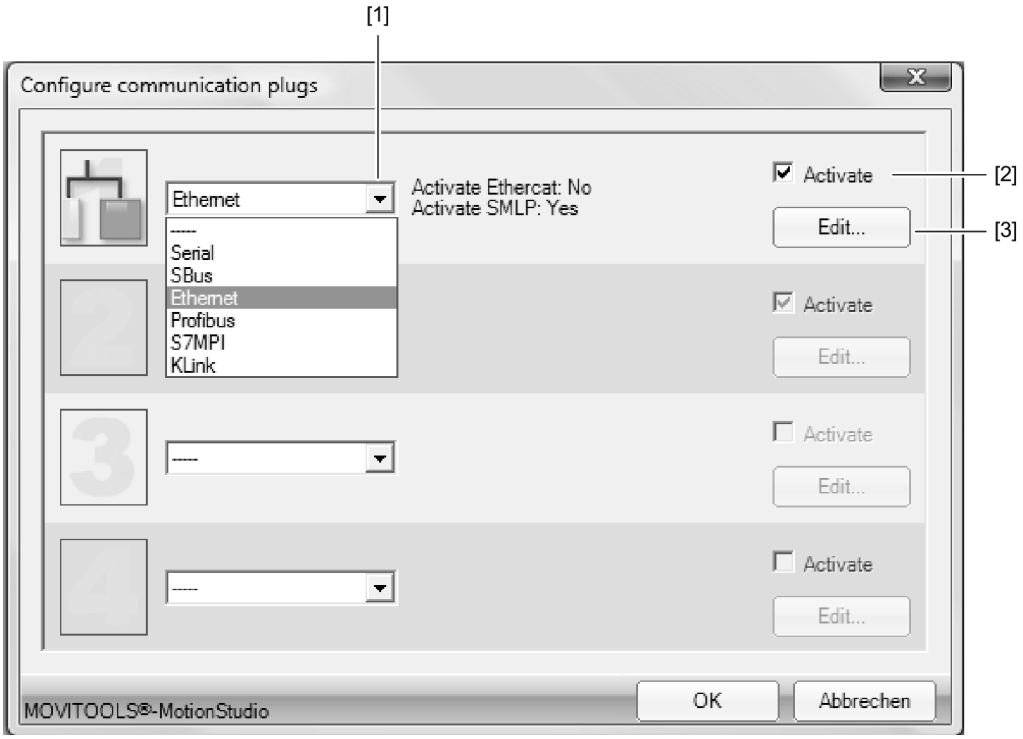
⇨ The following window opens.



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2. From the drop-down list [1], select the communication type.
3. Activate the selected communication type [2].
4. To edit the settings of the selected communication type, click the button [3].
5. If necessary, change the preset communication parameters. When doing so, refer to the detailed description of the communication channels.
6. Scan your network via the "Device scan" icon [1] in the toolbar.

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13.2.3 Configuring devices

The following example uses a MOVIFIT® device to show how to display the tools for configuring the device.

The connection mode is "online". The device has been scanned in the network view.

Proceed as follows:

1. Select the device (in this example the power section [1]) in the network view.

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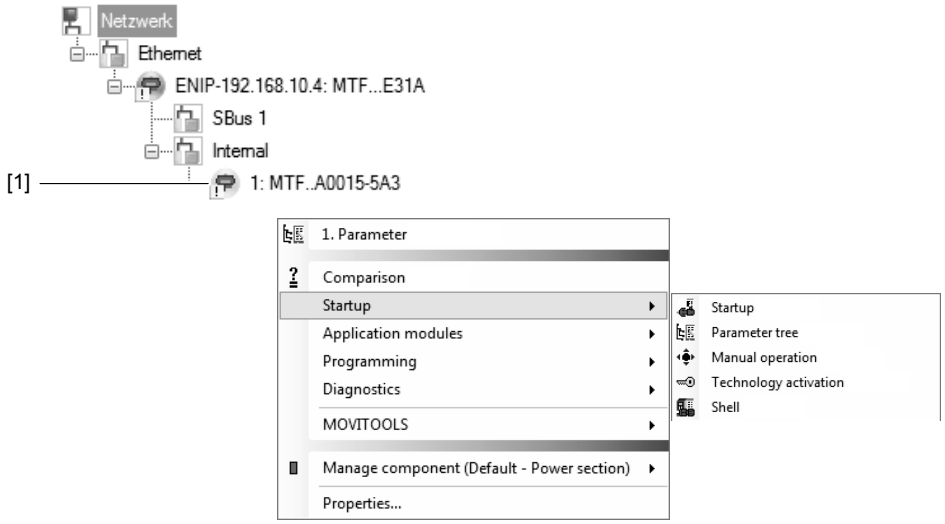
2. Right-click to open the context menu.



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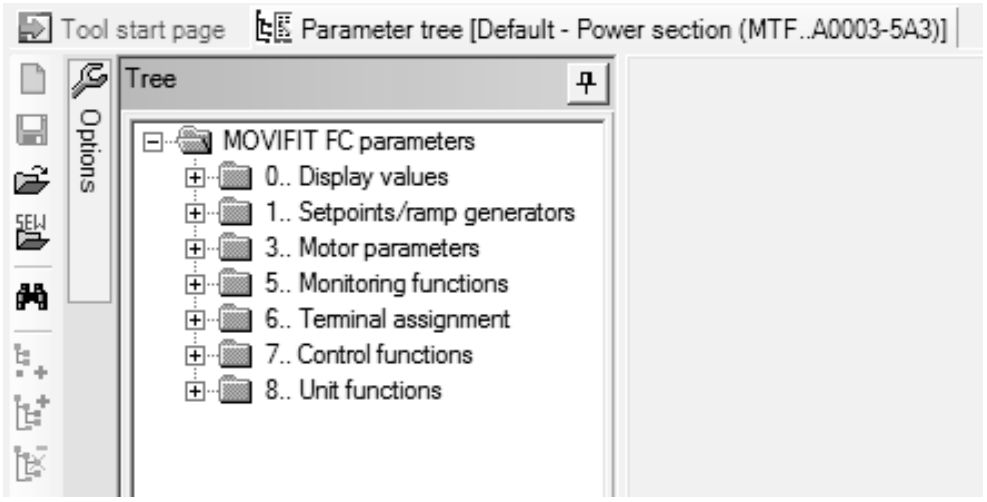
3. Select the tool for configuring the device (in this example the command [Startup] > [Parameter tree]).



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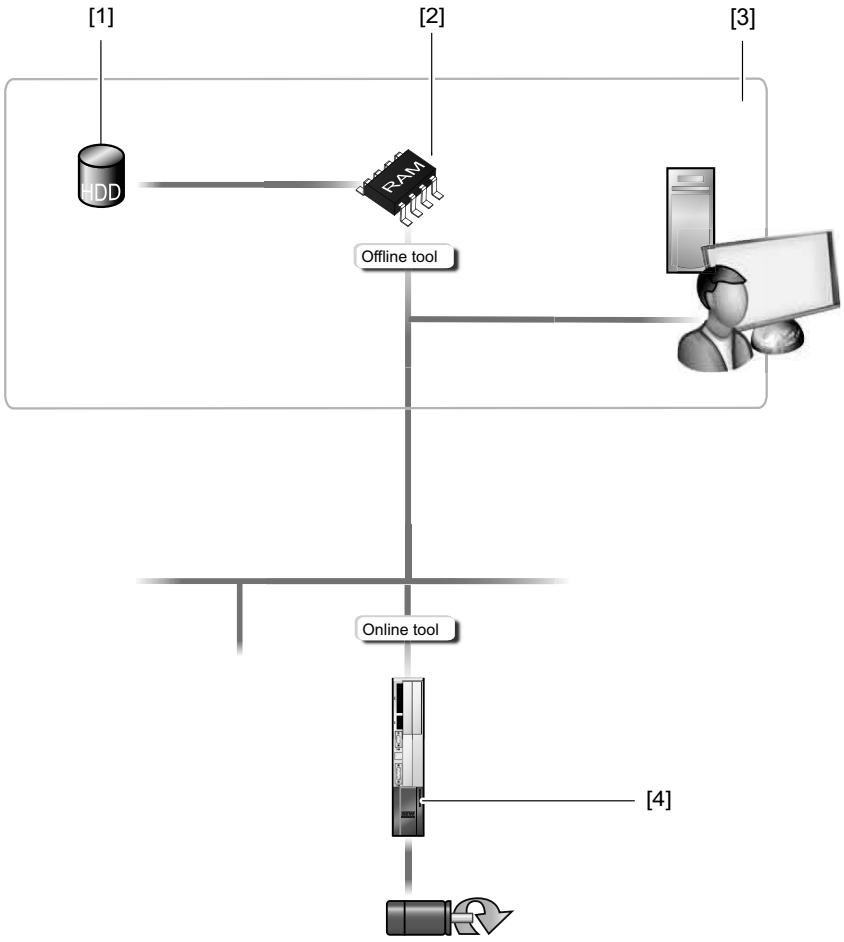
13.3 Connection mode

13.3.1 Overview

MOVITOOLS® MotionStudio differentiates between "online" and "offline" connection mode. You determine the connection mode yourself. Depending on the selected connection mode, you can choose offline or online tools specific to your device.

The following figure illustrates the two types of tools:



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[1] Hard drive of the engineering PC
[2] RAM of the engineering PC
[3] Engineering PC
[4] Unit

Tools	Description
Offline tools	Changes made using offline tools affect **"ONLY"** the RAM [2] at first. • Save your project so that the changes can be stored on the hard disk [1] of your engineering PC [3]. • Execute the "Download (PC->unit)" function if you want to transfer the changes to your unit [4] as well. This is only possible, when the PC is connected to the device via USB.
Online tools	Changes made using online tools affect **"ONLY"** the unit [4] at first. • Perform the "Upload (unit->PC)" function if you want to transfer the changes to your RAM. • Save your project so that the changes can be stored on the hard disk [1] of your engineering PC [3].

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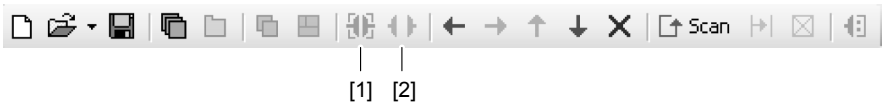
INFORMATION

- The "Online" connection status is **NOT** a response message which informs you that you are currently connected to the unit or that your unit is ready for communication. If you need this response message, pay attention to the chapter "Setting up the cyclic availability test" in the online help (or in the manual) of MOVITOOLS® MotionStudio.
- Project management commands (such as "download" and "upload"), the online device status, and the "device scan" operate independently of the set connection mode.
- MOVITOOLS® MotionStudio starts up in the connection state that you set before you closed down.

13.3.2 Selecting the communication mode (online or offline)

Proceed as follows to set the connection mode:

1. Select the connection mode:
   - ⇨ "Switch to online mode" [1] for functions (online tools) that should directly influence the device.
   - ⇨ "Switch to offline mode" [2] for functions (offline tools) that should influence your project.



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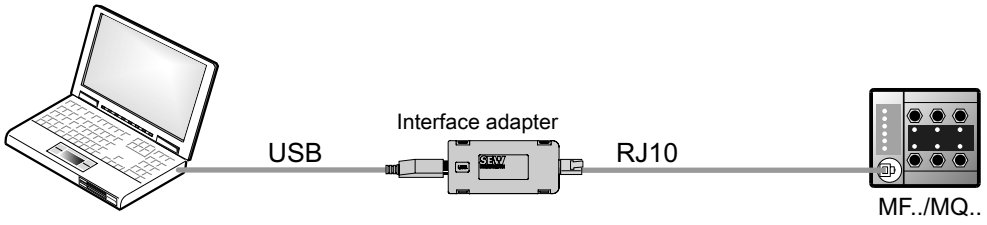
[1] "Switch to online mode" icon
[2] "Switch to offline mode" icon

2. Select the device node.
3. Right-click to open the context menu and display the tools for configuring the device.

13.4 Serial communication (RS485) via interface adapters

13.4.1 PC connection

Underneath the screw plug, the fieldbus interfaces have an RJ10 diagnostic interface for startup, parameterization, and service. The diagnostic interface is connected to a commercially available PC/Laptop via the interface adapter with USB port.



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The following interface adapters are available:

Designation	Part number
USB11A	08248311
USM21A	28231449

The following components are included each in the scope of delivery:

- Interface adapter
- Cable with RJ10 plug connector
- USB interface cable

Establish a connection

Proceed as follows to establish the connection:

✓ Wait for the MOVIMOT® drive to cool down sufficiently before touching it.

1. Remove the screw plugs of the diagnostic interface.
2. Connect the fieldbus interface and the interface adapter with the RJ10 plug connector using a cable.
3. Connect the PC/laptop to the interface adapter using the USB interface cable.

Installing the drivers

The drivers for the interface adapter are copied to your PC during installation of MOVITOOLS® MotionStudio.

Proceed as follows:

1. Make sure that you have local administrator rights on your PC.
2. Connect the interface adapter to a free USB connection of your PC.
   ⇨ Your PC will detect the new hardware and launch the hardware wizard.

⇨ The interface adapter is ready for operation.

Checking the COM port of the interface adapter on the PC

Proceed as follows:

1. Select the following item from the Windows start menu on your PC: [Start]>[Settings]>[Control Panel]>[System].
2. Open the "Hardware" tab page.
3. Click on the [Device manager] button.
4. Expand the directory "Connections (COM and LPT)".
   ⇨ The virtual COM port assigned to the interface adapter is displayed (e.g. "USB Serial Port (COM3)").

To avoid conflicts with another COM port, change the COM port of the interface adapter:

5. Select the COM port of the interface adapter in the device manager.
6. In the context menu, click the [Properties] command and assign the interface adapter to another COM port.
7. Restart your PC/laptop for the changes to become effective.

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13.4.2 Configuring the serial communication

Proceed as follows:

✓ There is a serial connection between your PC and the devices you want to configure via the interface adapter.

1. Click on the icon [1] in the toolbar.

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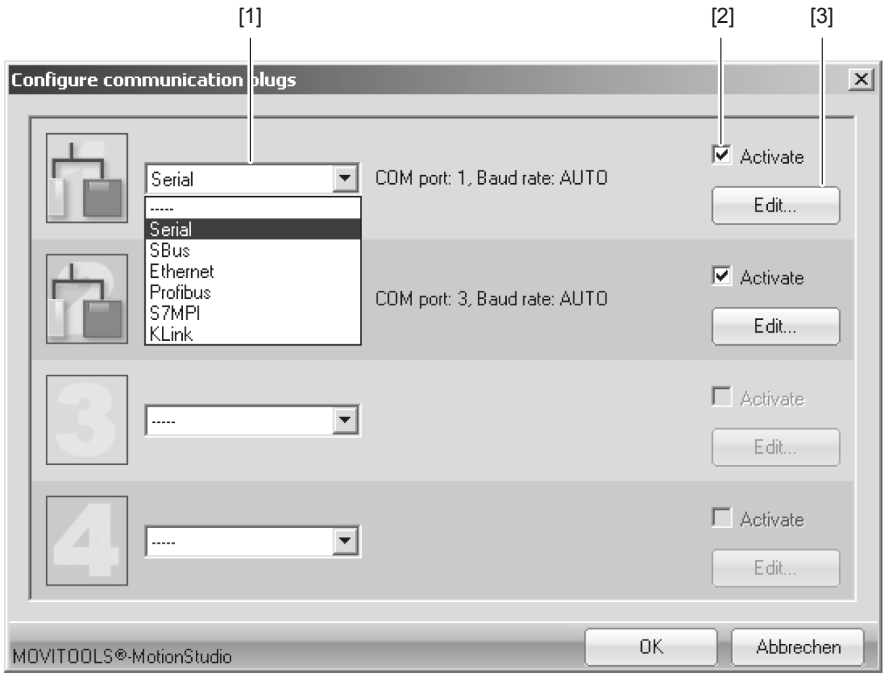
⇨ The following window is displayed.



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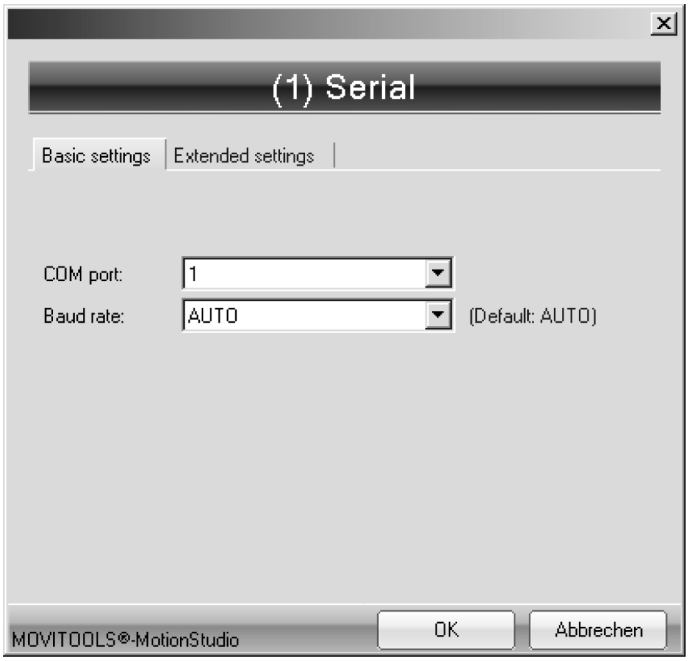
2. Select the communication type “Serial” from the drop-down list [1].

⇨ In the example, "Serial" is activated as the communication type for the first communication channel [2].

3. Click the button [3].
   ⇨ This displays the settings for the communication type "Serial". The figure shows the USB11A interface adapter selected as COM port as an example.



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4. It might be necessary to change the preset communication parameters on the tab pages "Basic settings" and "Extended settings". For a detailed description of the communication parameters, refer to chapter "Serial communication parameter (RS485)" (→ 🗎 106).

13.4.3 Serial communication parameter (RS485)

The following table describes the [Basic setting] for the serial (RS485) communication channel:

Communication parameters	Description	Note
COM port	Serial port connected to the interface adapter	• If there is no value entered here, the SEW Communication Server uses the first available port.
Baud rate	Transmission speed with which the connected PC communicates with the device in the network via the communication channel.	• Possible values: – 9.6 kbit/s – 57.6 kbit/s – AUTO (default setting) • Find the correct value for the connected device in the documentation. • If you set "AUTO", the devices are scanned with both baud rates in succession. • Set the initial value for automatic baud rate detection under [Settings] > [Options] > [Communication].

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The following table describes the [Extended setting] for the serial (RS485) communication channel:

Communication parameters	Description	Note
Parameter telegrams	Telegram with 1 single parameter	Used to transfer 1 **single parameter** of a device.
Multi-byte telegrams	Telegram with several parameters	Used to transfer the **complete parameter set** of a device.
Timeout	Waiting time in [ms] that the master waits for a response from the slave after it has sent a request.	• Default setting: – 100 ms (parameter telegram) – 350 ms (multi-byte telegram) • If not all devices are detected during a network scan of communication problems occur, increase the values as follows: – 300 ms (parameter telegram) – 1000 ms (multi-byte telegram)
Repetitions	Number of request retries after the timeout is exceeded	Default setting: 3

13.5 Communication via EtherCAT®

13.5.1 Overview

INFORMATION

Do not use unused EtherCAT® interfaces of an EtherCAT® slave for engineering purposes. Use only the EtherCAT® master interface intended for engineering for this purpose.

Aside from cyclical process data. EtherCAT® offers acyclically transmitted parameter adjustment services. The mailbox gateway of the EtherCAT® master performs the following tasks:

- Adding the parameter adjustment services of MOVITOOLS® MotionStudio to the EtherCAT® telegrams.
- Forwarding the drive feedback to MOVITOOLS® MotionStudio.

The installation of the mailbox gateway and the EtherCAT® master can be performed on one or various devices.

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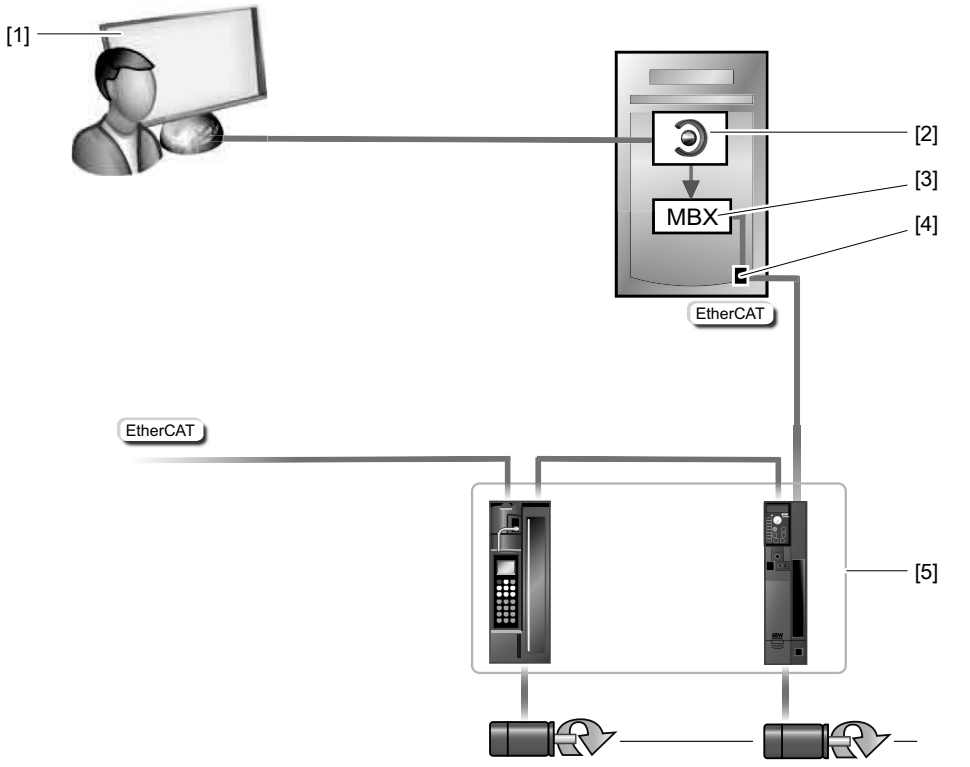
Installation on the same device

The EtherCAT® master and MOVITOOLS® MotionStudio are installed on the same device.



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[1] Monitor
[2] Engineering PC with EtherCAT® master, integrated mailbox gateway (MBX), and MOVITOOLS® MotionStudio
[3] Internal IP routing
[4] EtherCAT® interface
[5] Devices with EtherCAT® interfaces

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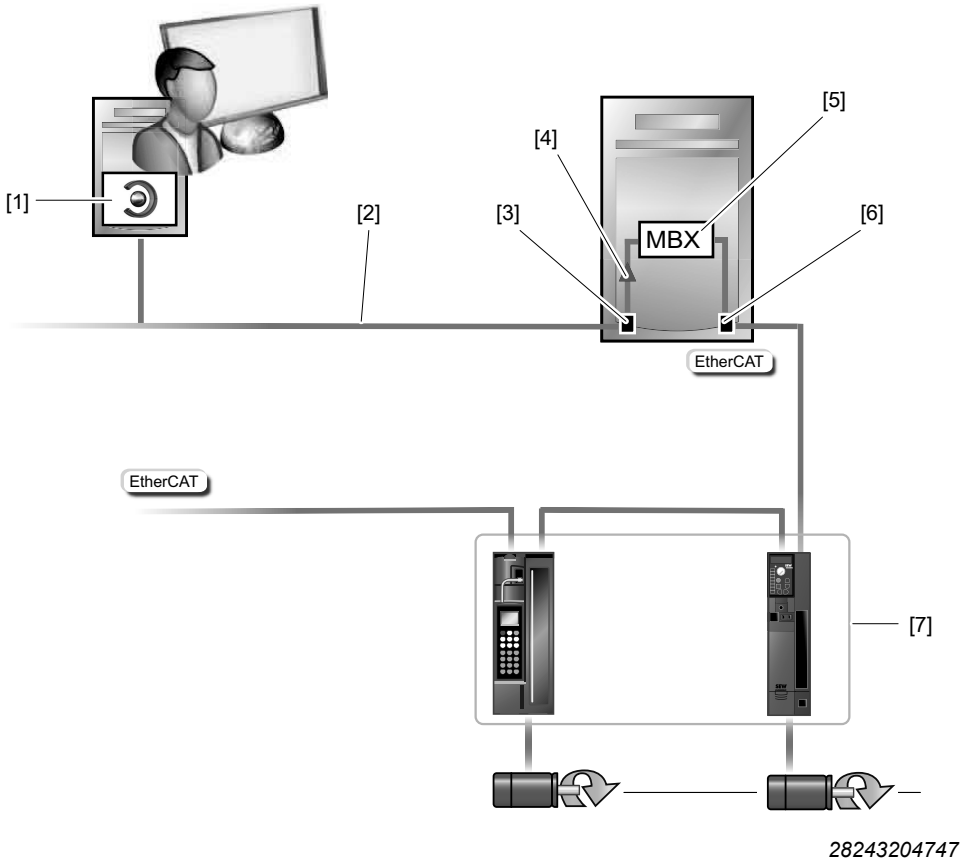
Installation on different devices

The EtherCAT® master and engineering PC with MOVITOOLS® MotionStudio are installed on different devices.



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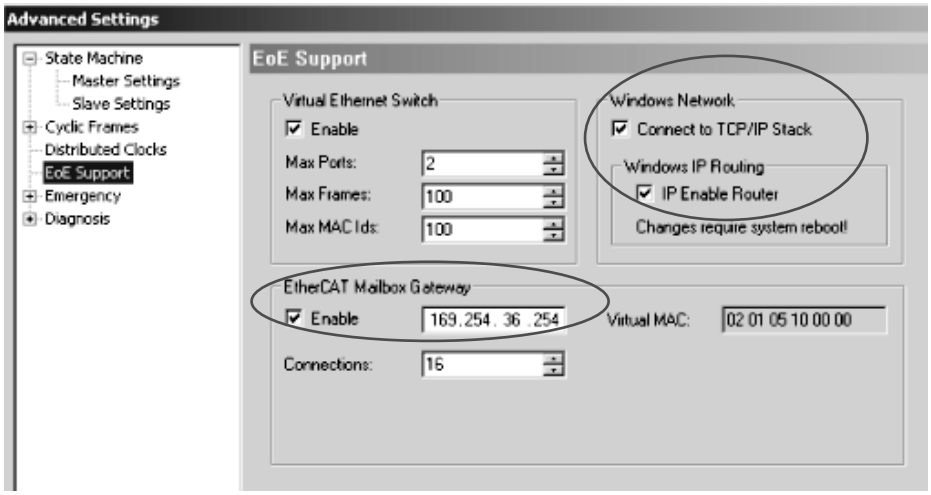
[1] Engineering PC with Ethernet interface and MOVITOOLS® MotionStudio
[2] Ethernet network
[3] Engineering interface of the EtherCAT® master
[4] Internal IP routing
[5] EtherCAT® master (e.g. TwinCAT system) with integrated mailbox gateway (MBX)
[6] EtherCAT® interface
[7] Devices with EtherCAT® interfaces

13.5.2 Configuration of the mailbox gateway in the EtherCAT® master

- Activate VoE/EoE support on the EtherCAT® controller.
- Activate the connection to the TCP/IP stack and IP routing.
- Specify the IP address of the EtherCAT® mailbox gateway. The IP address is usually assigned by the engineering tool (e.g. TwinCAT) and should not be changed.

The settings look as follows in Beckhoff's TwinCAT program:



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13.5.3 Configuring the network at the engineering PC

If MOVITOOLS® MotionStudio and the EtherCAT® master are running on the same PC, you do not have to make any additional network settings.

If the EtherCAT® master is connected to an Ethernet network via an engineering interface, PCs in the same subnet can access SEW drives on EtherCAT® with MOVITOOLS® MotionStudio. To do so, the telegrams from the engineering PC are routed via the Ethernet interface of the EtherCAT® master to the mailbox gateway (so-called routing).

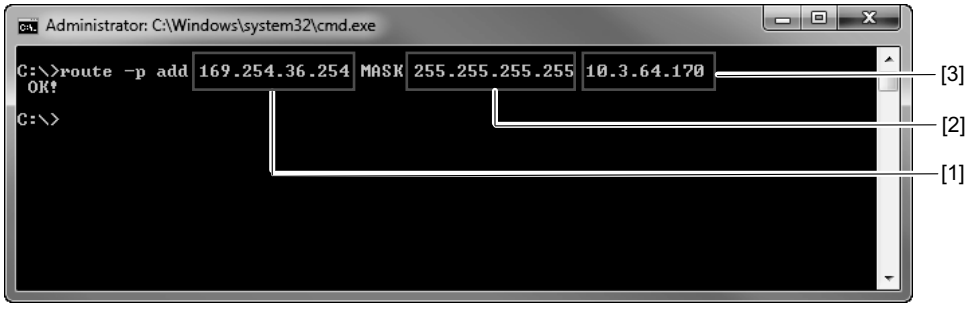
Two variants are available for routing:

1. Design: Defining a static route.

   In this variant, an entry is added to the routing table of the engineering PC that routes the engineering data via the EtherCAT® master to the mailbox gateway.

   The command for creating a static route in the DOS box is:

   ```
   route -p add [Target] MASK [Net mask] [Gateway]
   ```



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13.5.4 Checking the network settings

Irrespective of whether MOVITOOLS® MotionStudio and the EtherCAT® master are running on the same PC or the EtherCAT® mailbox gateway is accessed via routing, you should check the network settings.

You can use the ping command to check whether the communication path to the EtherCAT® mailbox gateway is established correctly. To do so, proceed as follows:

- Open a command-line interface window on your engineering PC to enter a DOS command.
- Enter "ping" and the IP address of the EtherCAT® mailbox gateway. The complete command line for the described network setting (example) is:

  ```
  Ping 169.254.61.254
  ```

- If there is no response to the ping command, repeat the steps described in the two previous sections:
  - "Configuration of the mailbox gateway in the EtherCAT master" (→ 🗎 109)
  - "Configuring the network at the engineering PC" (→ 🗎 110)

INFORMATION

Settings of the EtherCAT® master are not adopted

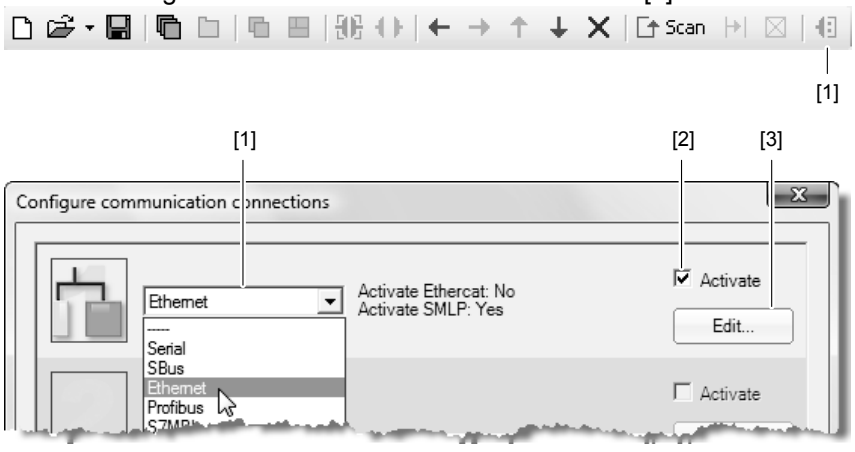
- If the settings of the EtherCAT® master are not adopted, perform a reboot.

13.5.5 Communication settings in MOVITOOLS® MotionStudio

Configuring the communication channel via EtherCAT®

Proceed as follows to configure a communication channel for EtherCAT®:

1. Click on "Configure communication connections" [1] in the toolbar.



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Setting communication parameters for EtherCAT®

Proceed as follows to set the EtherCAT® communication parameters:

1. Set up the EtherCAT® protocol. Select the "EtherCAT settings" tab.
2. Tick the "Activate EtherCAT" checkbox.
3. Change the set communication parameters if necessary. Refer to the detailed description of the communication parameters for EtherCAT®.
4. To add an IP address, click on the symbol [Add IP address] [2].

Communication parameters for EtherCAT®

The following table describes the communication parameters for EtherCAT®:

Communication parameters	Description	Note
Timeout	Waiting time in [ms] that the client waits for a reply from the server after it has made a request.	• Default setting: 200 ms • Increase the value as required if a delay in communication is causing malfunctions.
Scan range of:	Start address for the EtherCAT® scan range	By entering values here, you can limit the EtherCAT® scan range and thereby shorten the duration of the scan.
Scan range up to:	Start address for the EtherCAT® scan range	
IP address EtherCAT® master	IP address of the mailbox gateway in the EtherCAT® master	-

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14 Service

14.1 Diagnostic procedures

The diagnostics procedures described in the following section demonstrate the fault analysis methods for the following problems:

- Inverter does not operate on EtherCAT®.
- Inverter cannot be controlled using the EtherCAT® master.

Additional information on parameterization can be found in the MOVIMOT® inverter operating instructions.

Please also refer to the information on voltage supply in chapter "Installation instructions for fieldbus interfaces, field distributors" (→ 🗎 35).

Step 1: Check the connection between the inverter and EtherCAT®

Are the bus plugs properly plugged in the master and EtherCAT® interface?	NO →	**[A]**
YES ↓		
What are the "L/A" LEDs on the EtherCAT® interface doing?	OFF →	**[A]**
ON ↓		
Is the EtherCAT® interface physically connected to the EtherCAT® properly? Check the EtherCAT® connection at X11 IN (EtherCAT® incoming) and X12 OUT (EtherCAT® outgoing).	NO →	**[A]**
YES ↓		
Continue with 2: What is the "RUN" LED doing?		

[A]	Check the bus cabling.

Step 2: What is the "RUN" LED doing?

"RUN" LED = OFF	Has the master switched the slave to INIT state?	YES → NO →	**[A]** **[B]**
"RUN" LED flashes green	Slave is in PRE-OPERATIONAL state.	→	**[C]**
"RUN" LED lights up green 1x	Slave is in SAFE-OPERATIONAL state.	→	**[C]**
"RUN" LED lights up green	Slave is in OPERATIONAL state.	→	**[C]**

[A]	Startup the bus in the master.		
[B]	EtherCAT® interface is defective.		
[C]	Continue with 3: What is the "ERR" LED doing?		

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Step 3: What is the "ERR" LED doing?

"ERR" LED = OFF	**Case 1:** "RUN" LED lights up green (slave is in OPERATIONAL status). ↓ EtherCAT® interface communication is in operational status.
	Case 2: • "RUN" LED flashes green (slave is in PRE-OPERATIONAL status). • "RUN" LED lights up green 1× (slave is in SAFE-OPERATIONAL status). ↓ Startup the bus in the master and activate the state OPERATIONAL in the slave. ↓ Start process data communication.
"ERR" LED flickers	Prerequisite: • "RUN" LED flashes green (slave is in PRE-OPERATIONAL status). • "RUN" LED lights up green 1× (slave is in SAFE-OPERATIONAL status). ↓ A boot error was detected. Boot up the EtherCAT® interface. ↓ If the "ERR" LED continues to flicker, the EtherCAT® interface is defective.
"ERR" LED flashes red 2×	**Case 1:** "RUN" LED lights up green (slave is in OPERATIONAL status). ↓ Fieldbus timeout, activate process output data.
	Case 2: • "RUN" LED flashes green (slave is in PRE-OPERATIONAL status). • "RUN" LED lights up green 1x (slave is in SAFE-OPERATIONAL status). ↓ Watchdog timeout → Start bus in the master and switch slave to OPERATIONAL state. ↓ Start process data communication.

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"ERR" LED lights up green 1x	Prerequisite: • "RUN" LED flashes green (slave is in PRE-OPERATIONAL status). • "RUN" LED lights up green 1× (slave is in SAFE-OPERATIONAL status). ↓ An unprompted state change has occurred. Repair the configuration error and start the bus in the master again. ↓ Switch the slave to OPERATIONAL state. ↓ Start the process data communication.
"ERR" LED flashes	Prerequisite: • "RUN" LED flashes green (slave is in PRE-OPERATIONAL status). • "RUN" LED lights up green 1x (slave is in SAFE-OPERATIONAL status). ↓ Invalid configuration. Repair the configuration error and start the bus in the master again. ↓ Switch the slave to OPERATIONAL state. ↓ Start the process data communication.

14.2 Bus diagnostics with MOVITOOLS® MotionStudio

14.2.1 Fieldbus diagnostics with parameter tree

The MF72A fieldbus interface has a diagnostic interface for startup and diagnostics. This interface allows for bus diagnostics with the parameter tree in the SEW software MOVITOOLS® MotionStudio.

1. Connect the PC/laptop to the MFE fieldbus interface (see chapter "Connecting PC").
2. Perform an online scan.

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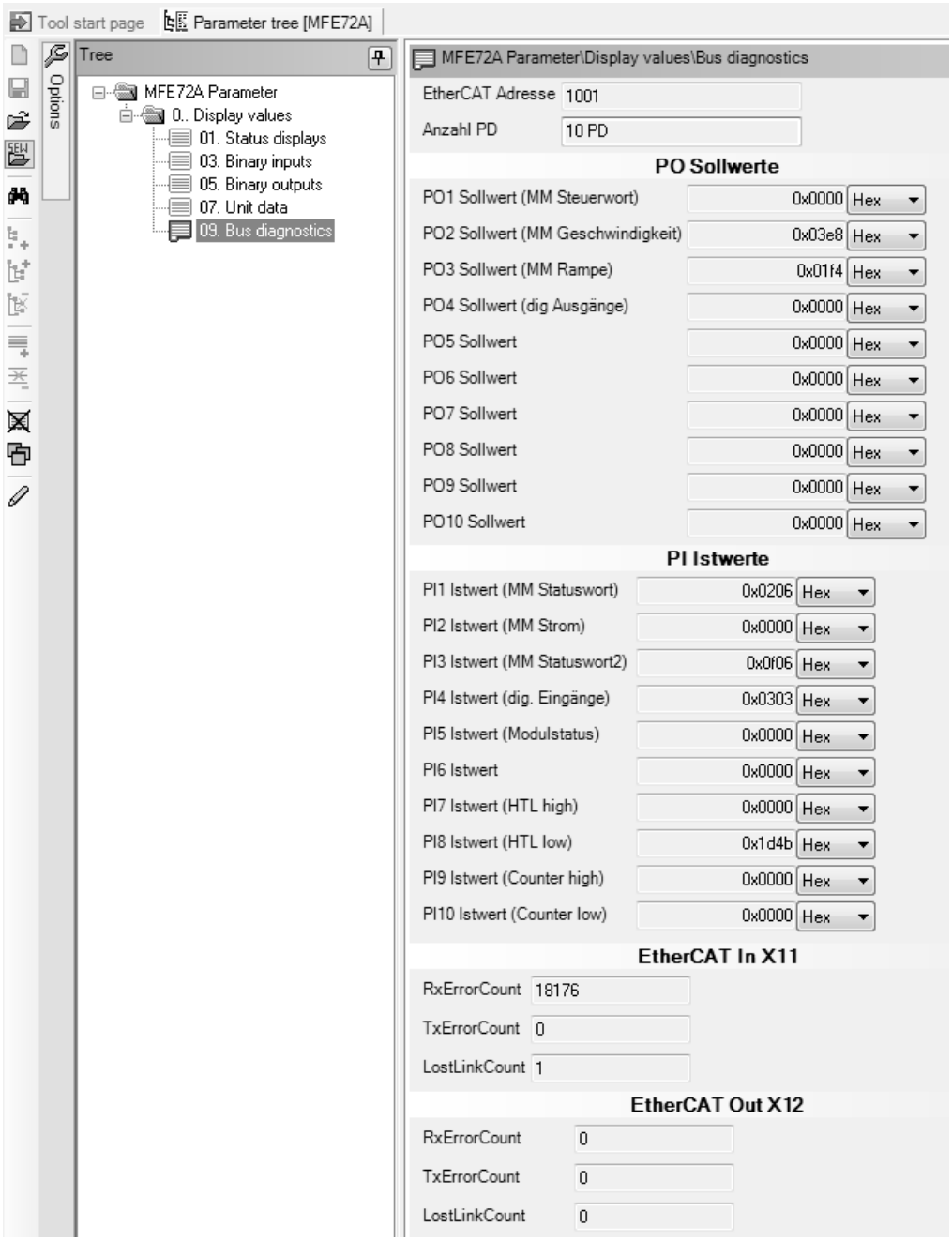
3. Right-click on the communications unit and select the "Parameter tree" menu item. Select the "09 Bus diagnostics" menu from the parameter tree.



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14.2.2 Fieldbus interfaces error table

Error code/ Designation		Response	Cause	Measure
25	**EEPROM**	Rapid stop of MOVIMOT® drive DO = 0	Error while accessing EEPROM	• Perform reset and set parameters again (NOTICE: signatures will be lost) • If the fault occurs again, contact SEW Service.

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Error code/ Designation		Response	Cause	Measure
28	**Fieldbus timeout**	Process output data = 0 DO = 0	No communication between master and slave within the configured response monitoring.	• Check master communication routine. • Check fieldbus cable.
37	**Watchdog error**	Restart MFE fieldbus interface	Error while executing system software	• Contact SEW Service.
111	**Timeout MOVIMOT®**	Normal stop of MOVIMOT® drive	MOVIMOT® drive does not respond to MFE fieldbus interface within the timeout period.	• Check voltage supply and RS485 wiring. • Check address of configured stations.
112	**Periphery error**	No response	Overload or short circuit of a binary output or sensor supply	• Check voltage supply. • Analyze MFE status word and correct cause of error.

14.3 Inspection and maintenance

14.3.1 MOVIMOT® inverter

The MOVIMOT® inverter is maintenance-free. SEW-EURODRIVE does not prescribe any inspection or maintenance work for the MOVIMOT® inverter and the fieldbus interface.

Exception: In case of extended storage times, observe the notes in chapter "Extended storage" (→ 🗎 118).

14.3.2 Repairs

Only SEW-EURODRIVE is authorized to carry out repairs.

14.4 Device replacement

14.4.1 Notes on replacing devices

The MFE fieldbus interface can be quickly replaced.

If the MFE fieldbus interface must be replaced, you can start up the system again quickly by simply adjusting the DIP switches.

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14.4.2 Replacing the device

⚠ WARNING

Electric shock caused by dangerous voltages in the connection box. Dangerous voltages may still be present for up to 1 minute after disconnection from the supply system.

Severe or fatal injuries.

- De-energize the MOVIMOT® drive using a suitable cut-off device before removing the MOVIMOT® inverter.
- Secure the drive against unintended re-connection to the voltage supply.
- Wait for at least 1 minute before removing the MOVIMOT® inverter.

Replace the MFE fieldbus interface as follows:

1. Loosen the retaining screw and remove the MFE fieldbus interface from the field distributor.
2. Set DIP switches S1/1 to S1/4 on the new MFE fieldbus interface to the same settings as the DIP switches on the old MFE fieldbus interface.
3. Set the new MFE fieldbus interface on the field distributor.

   Fasten the MFE fieldbus interface with 4 screws to the field distributor.
4. Connect the field distributor to the new MFE fieldbus interface.

14.4.3 MOVIMOT® device replacement

INFORMATION

For information on the device replacement of the MOVIMOT® inverter, refer to the "MOVIMOT® MM..D" operating instructions.

14.5 Extended storage

If a unit with inverter is being stored for a long time, connect it to the mains voltage for at least 5 minutes every 2 years. Otherwise, the service life of the unit may be reduced.

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14.6 Procedure when maintenance has been neglected

Electrolytic capacitors are used in the inverters. They are subject to aging effects when de-energized. This effect can damage the capacitors if the unit is connected using the nominal voltage after a longer period of storage.

If you have not performed maintenance regularly, SEW-EURODRIVE recommends that you increase the line voltage slowly up to the maximum voltage. This can be done, for example, by using a variable transformer for which the output voltage has been set according to the following overview. After you have completed the regeneration process, the unit can be used immediately or stored again for an extended period with maintenance.

The following stages are recommended:

AC 400/500 V units:

- Step 1: AC 0 V to AC 350 V within a few seconds
- Step 2: AC 350 V for 15 minutes
- Step 3: AC 420 V for 15 minutes
- Step 4: AC 500 V for 1 hour

14.7 Disposal

This product consists of:

- Iron
- Aluminum
- Copper
- Plastics
- Electronic components

Dispose of all components in accordance with applicable regulations!

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15 Technical data

15.1 Electrical specification

MFE72A	
Part number	28210034
Electronic supply	U = +24 V +/- 25%, I_i ≤ 150 mA
Electrical isolation	• EtherCAT® connection isolated • Between logic and 24 V supply voltage • Between logic and periphery/drivevia optocoupler
Bus connection technology	2 × M12 plug connector
Digital inputs (sensors)	PLC-compatible according to EN 61131-2 (digital inputs type 1), Ri ≈ 3.0 kΩ, Sampling cycle about 1 ms
Signal level	15 V – +30 V: "1" = contact closed -3 V – +5 V: "0" = contact open
Permitted cable length	max. 30 m
Sensor supply	DC 24 V to EN 61131-2, interference-voltage-proof and short-circuit proof
Rated current	Σ 500 mA
Internal voltage drop	Max. 1 V
Digital outputs (actuators)	PLC-compatible to EN 61131-2, interference-voltage-proof and short-circuit proof
Signal level	"0" = 0 V "1" = 24 V
Rated current	500 mA
Leakage current	max. 0.2 mA
Internal voltage drop	Max. 1 V
Permitted cable length	max. 30 m
Length of RS485 cable	30 m between MFE72A and drive if installed separately
Ambient temperature	-25 °C – 60 °C
Storage temperature	-25 °C – 85 °C
Degree of protection	IP65 (installed on MFZ.. connection module, all plug connections sealed)

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15.2 Specifications of EtherCAT®

EtherCAT®	
Standards	IEC 61158, IEC 61784-2
Supported baud rate	100 Mbit/s (full duplex)
Connection technology	2 × M12 plug connector
Bus termination	Not integrated, as bus termination is activated automatically.
OSI layer	Ethernet II
Station address	Setting via EtherCAT® master
XML file name	`SEW_MFE72A.xml`
Vendor ID	0x59 (CANopenVendor ID)
EtherCAT® services	CoE, FoE and EoE(VoE)

15.3 Technical data of the fieldbus interface

15.3.1 MF../Z.1. connection module with fieldbus interface

MF../Z.1.		
Max. permitted total current		16 A
Ambient temperature		-25 °C – 60 °C
Storage temperature		-25 °C – 85 °C
Degree of protection		IP65 (fieldbus interface and motor connection cable attached and fastened, all plug connections sealed)
Interface		PROFIBUS, PROFINET IO, EtherNet/IP™, EtherCAT®, DeviceNet™
Permitted cable length between connection module and MOVIMOT®		max. 30 m
Mass		Approx. 1.0 kg

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15.4 Technical data for field distributors

15.4.1 MF../Z.3. field distributors

MF../Z.3.		
Supply voltages	V_{line}	AC 3 x 380 V -10% – AC 500 V +10% AC 3 x 200 V -10% – AC 240 V +10%
Line frequency	f_{line}	50 – 60 Hz
Max. permitted total current X1 (X1 terminal)	I_{max}	32 A (according to UL max. 30 A)
Max. permitted total current X21 (X21 terminals)		32 A
Max. permitted total current X20 (X20 terminals)		12 A
Ambient temperature		-25 °C – 60 °C
Storage temperature		-25 °C – 85 °C
Degree of protection		IP65 (fieldbus interface and motor connection cable attached and fastened, all plug connections sealed)
Interface		PROFIBUS, PROFINET IO, EtherNet/IP™, EtherCAT®, DeviceNet™
Permitted motor cable length		max. 30 m (with SEW-EURODRIVE hybrid cable, type B) for cross section reduction compared to the supply system cable Note the line fusing.
Mass		Approx. 1.3 kg

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15.4.2 MF../Z.6. field distributors

MF../Z.6.		
Connection voltages	V_{line}	AC 3 x 380 V -10% – AC 500 V +10% AC 3 x 200 V -10% – AC 240 V +10%
Line frequency	f_{line}	50 – 60 Hz
Max. permitted total current X1 (X1 terminal)	I_{max}	32 A (according to UL max. 30 A)
Max. permitted total current X21 (X21 terminals)		32 A
Max. permitted total current X20 (X20 terminals)		12 A
Maintenance switch		Load disconnector and line protection Type: ABB MS 325 – 9 + HK20 Switching: black/red, triple lock
Ambient temperature		-25 °C – 55 °C
Storage temperature		-25 °C – 85 °C
Degree of protection		IP65 (fieldbus interface, power supply connection cover and motor connection cable attached and fastened, all plug connections sealed)
Interface		PROFIBUS, PROFINET IO, EtherNet/IP™, EtherCAT®, DeviceNet™
Permitted motor cable length		max. 30 m (with SEW-EURODRIVE hybrid cable, type B)
Mass		Approx. 3.6 kg

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15.4.3 MF../MM../Z.7. field distributors

MF../MM..-..3-00/Z.7.						
MOVIMOT® inverter		**MM 03D**	**MM 05D**	**MM 07D**	**MM 11D**	**MM 15D**
Connection voltages	V_{line}	AC 3 x 380 V -10% – AC 500 V +10% AC 3 x 200 V -10% – AC 240 V +10%				
Line frequency	f_{line}	50 – 60 Hz				
Max. permitted total current X1 (X1 terminal)	I_{max}	32 A (according to UL max. 30 A)				
Motor power S1	P_{Mot}	**0.37 kW** 0.5 HP	**0.55 kW** 0.75 HP	**0.75 kW** 1.0 HP	**1.1 kW** 1.5 HP	**1.5 kW** 2.0 HP
Nominal line current	I_{line}					
with V_{line} = AC 400 V		AC 1.3 A	AC 1.6 A	AC 1.9 A	AC 2.4 A	AC 3.5 A
with V_{line} = AC 230 V		AC 1.9 A	AC 2.4 A	AC 3.5 A	-	-
Nominal output current	I_N					
with V_{line} = AC 400 V		AC 1.6 A	AC 2.0 A	AC 2.5 A	AC 3.2 A	AC 4.0 A
with V_{line} = AC 230 V		AC 2.5 A	AC 3.2 A	AC 4.0 A	-	-
Output voltage	V_O	0 – V_{line}				
Max. permitted total current X21 (X21 terminals)		32 A				
Max. permitted total current X20 (X20 terminals)		12 A				
Ambient temperature		-25 °C – 40 ˚C (P_N reduction: 3% I_N per K to max. 60 °C)				
Storage temperature		-25 °C – 85 °C				
Degree of protection		IP65 (fieldbus interface, power supply connection cover, MOVIMOT® inverter and motor connection cable attached and fastened, all plug connections sealed)				
Interface		PROFIBUS, PROFINET IO, EtherNet/IP™, EtherCAT®, DeviceNet™				
Permitted motor cable length		15 m (with SEW-EURODRIVE hybrid cable, type A)				
Mass		Approx. 3.6 kg				

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15.4.4 MF../MM../Z.8. field distributors with operating point 400 V/50 Hz

MF../MM..-503-00/Z.8.									
MOVIMOT® inverter		**MM 03D**	**MM 05D**	**MM 07D**	**MM 11D**	**MM 15D**	**MM 22D**	**MM 30D**	**MM 40D**
Size		**1**					**2**		**2L**
Connection voltages	V_{line}	AC 3 x 380 V -10% – AC 500 V +10%							
Line frequency	f_{line}	50 – 60 Hz							
Max. permitted total current X1 (X1 terminal)	I_{max}	32 A (according to UL max. 30 A)							
Motor power S1	P_{Mot}	**0.37 kW** 0.5 HP	**0.55 kW** 0.75 HP	**0.75 kW** 1.0 HP	**1.1 kW** 1.5 HP	**1.5 kW** 2.0 HP	**2.2 kW** 3.0 HP	**3.0 kW** 4.0 HP	**4.0 kW** 5.4 HP
Nominal line current	I_{line}	AC 1.3 A	AC 1.6 A	AC 1.9 A	AC 2.4 A	AC 3.5 A	AC 5.0 A	AC 6.7 A	AC 7.3 A
Nominal output current	I_N	AC 1.6 A	AC 2.0 A	AC 2.5 A	AC 3.2 A	AC 4.0 A	AC 5.5 A	AC 7.3 A	AC 8.7 A
Output voltage	V_O	0 – V_{line}							
Max. permitted total current X21 (X21 terminals)		32 A							
Max. permitted total current X20 (X20 terminals)		12 A							
Maintenance switch		Load disconnector Type: ABB OT16ET3HS3ST1 Switching: black/red, triple lock							
Ambient temperature		-25 °C – 40 ˚C (P_N reduction: 3% I_N per K to max. 55 °C)							
Storage temperature		-25 °C – 85 °C							
Degree of protection		IP65 (fieldbus interface, power supply connection cover, MOVIMOT® inverter and motor connection cable attached and fastened, all plug connections sealed)							
Interface		PROFIBUS, PROFINET IO, EtherNet/IP™, EtherCAT®, DeviceNet™							
Permitted motor cable length		15 m (with SEW-EURODRIVE hybrid cable, type A)							
Mass		Approx. 5.2 kg					Approx. 6.7 kg		

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15.4.5 MF../MM../Z.8. field distributors with operating point 230 V/60 Hz

MF../MM..-233-00/Z.8.							
MOVIMOT® inverter		**MM 03D**	**MM 05D**	**MM 07D**	**MM 11D**	**MM 15D**	**MM 22D**
Size		**1**			**2**		
Connection voltages	V_{line}	AC 3 x 200 V -10% – AC 240 V +10%					
Line frequency	f_{line}	50 – 60 Hz					
Max. permitted total current X1 (X1 terminal)	I_{max}	32 A (according to UL max. 30 A)					
Motor power S1	P_{Mot}	**0.37 kW** 0.5 HP	**0.55 kW** 0.75 HP	**0.75 kW** 1.0 HP	**1.1 kW** 1.5 HP	**1.5 kW** 2.0 HP	**2.2 kW** 3.0 HP
Nominal line current	I_{line}	AC 1.9 A	AC 2.4 A	AC 3.5 A	AC 5.0 A	AC 6.7 A	AC 7.3 A
Nominal output current	I_N	AC 2.5 A	AC 3.2 A	AC 4.0 A	AC 5.5 A	AC 7.3 A	AC 8.7 A
Output voltage	V_O	0 – V_{line}					
Max. permitted total current X21 (X21 terminals)		32 A					
Max. permitted total current X20 (X20 terminals)		12 A					
Maintenance switch		Load disconnector Type: ABB OT16ET3HS3ST1 Switching: black/red, triple lock					
Ambient temperature		-25 °C – 40 ˚C (P_N reduction: 3% I_N per K to max. 55 °C)					
Storage temperature		-25 °C – 85 °C					
Degree of protection		IP65 (fieldbus interface, power supply connection cover, MOVIMOT® inverter and motor connection cable attached and fastened, all plug connections sealed)					
Interface		PROFIBUS, PROFINET IO, EtherNet/IP™, EtherCAT®, DeviceNet™					
Permitted motor cable length		15 m (with SEW-EURODRIVE hybrid cable, type A)					
Mass		Approx. 5.2 kg			Approx. 6.7 kg		

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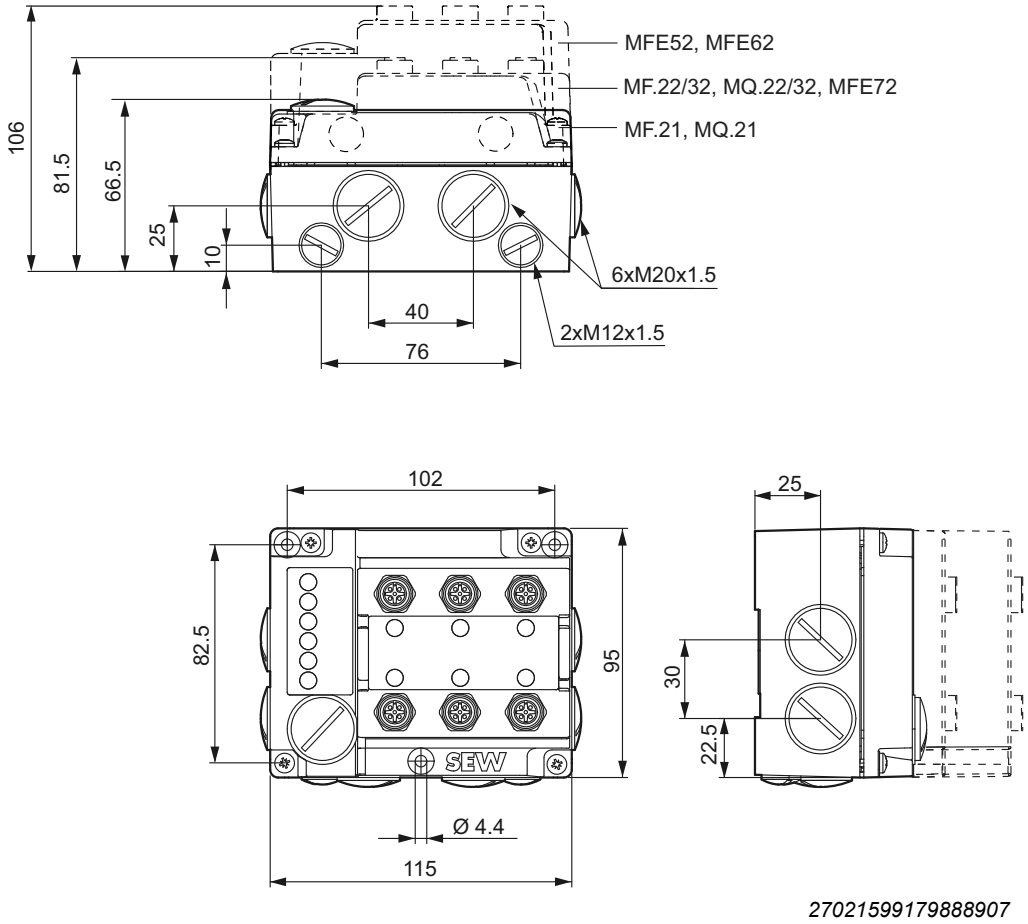
15.5 Dimension drawings

15.5.1 Dimension drawing of MF ..Z.1./MQ ../Z.1. fieldbus interface

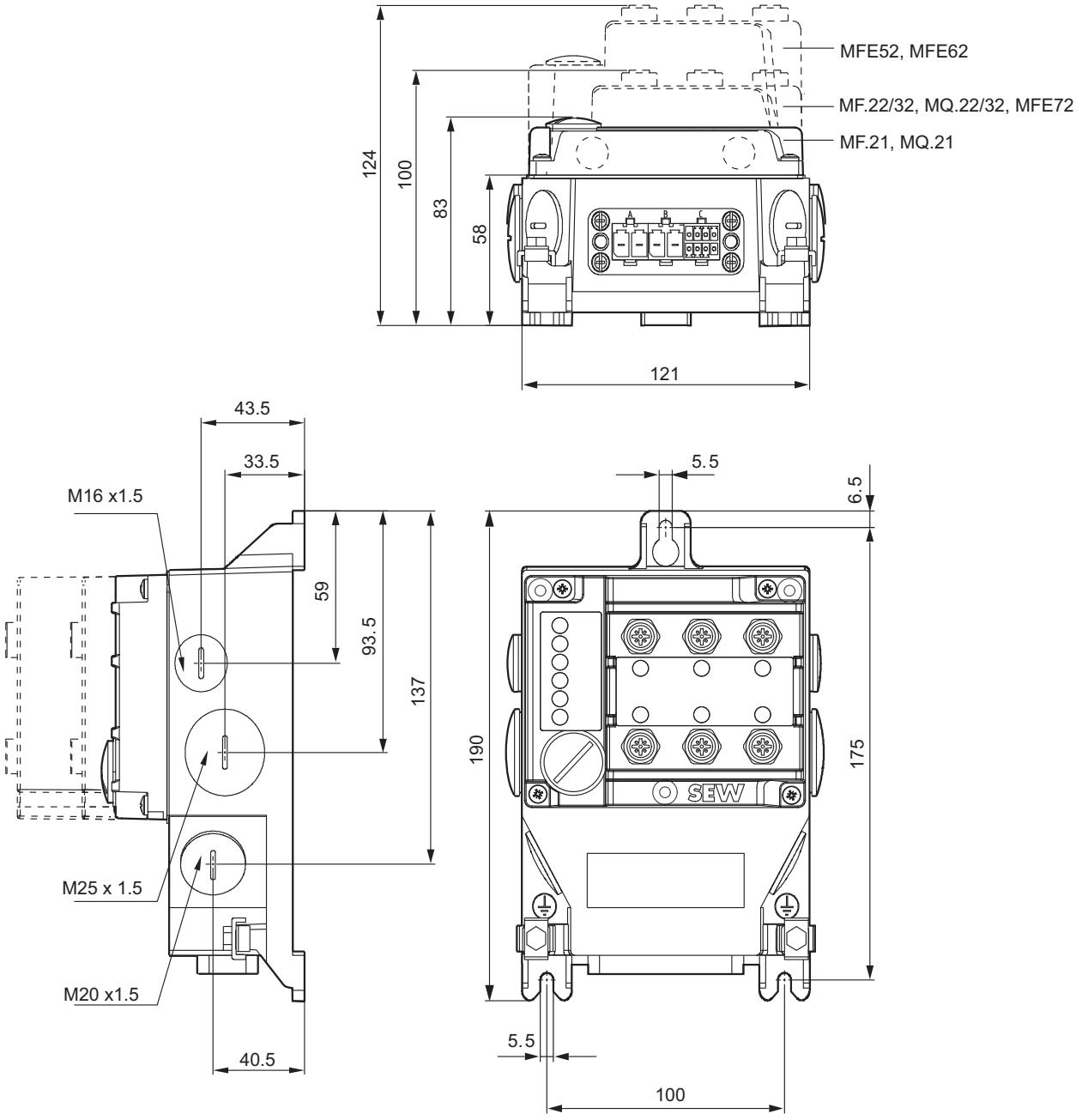
The following figure shows the dimensions of the fieldbus interface MF ..Z.1./MQ ../Z.1.



27021599179888907

15.5.2 MF../Z.3., MQ../Z.3. field distributors – dimension drawing

The following figure shows the dimensions of the field distributors MF../Z.3. and MQ../Z.3.:



27021599245579275

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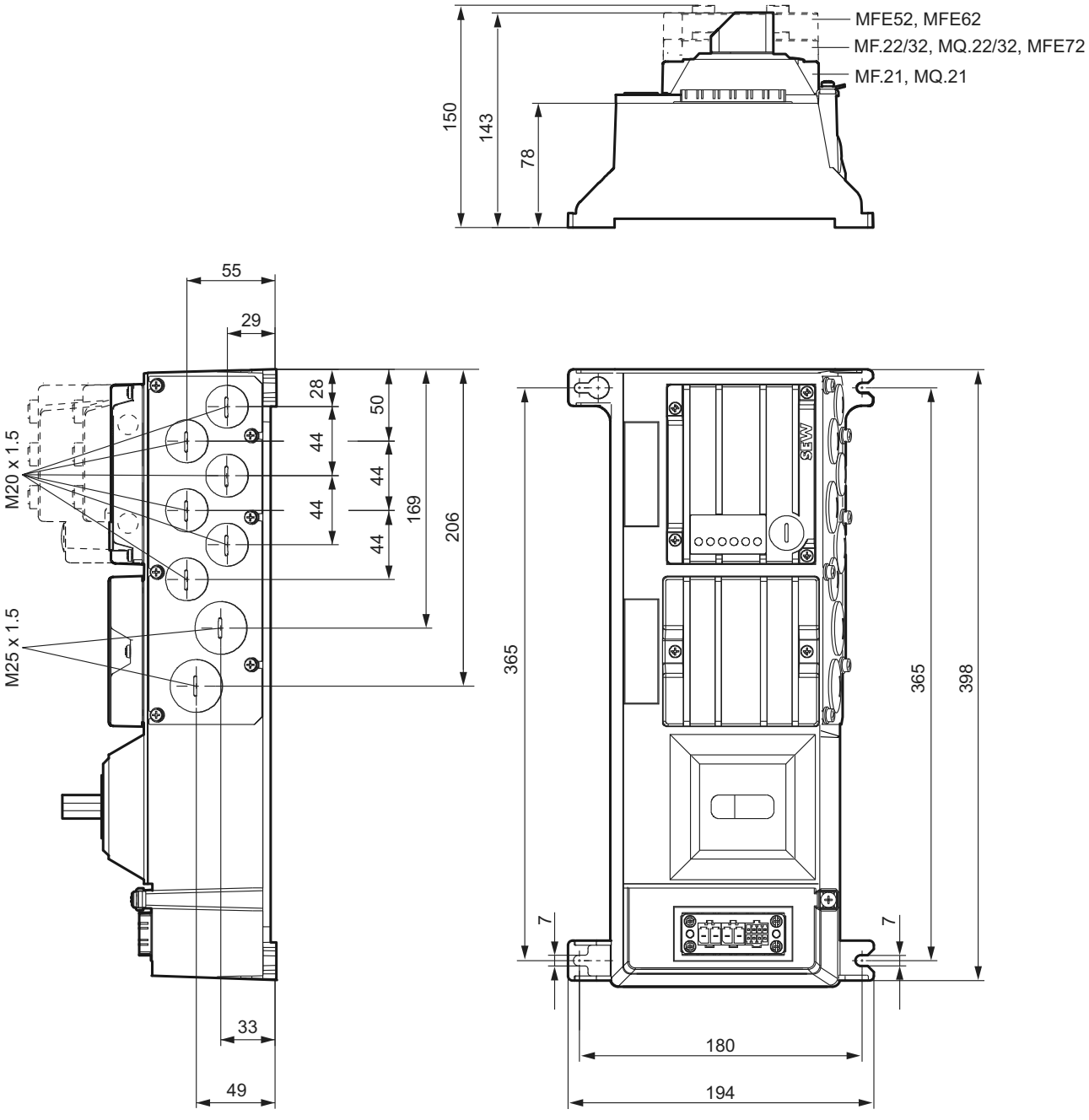
15.5.3 MF../Z.6., MQ../Z.6. field distributors – dimension drawing

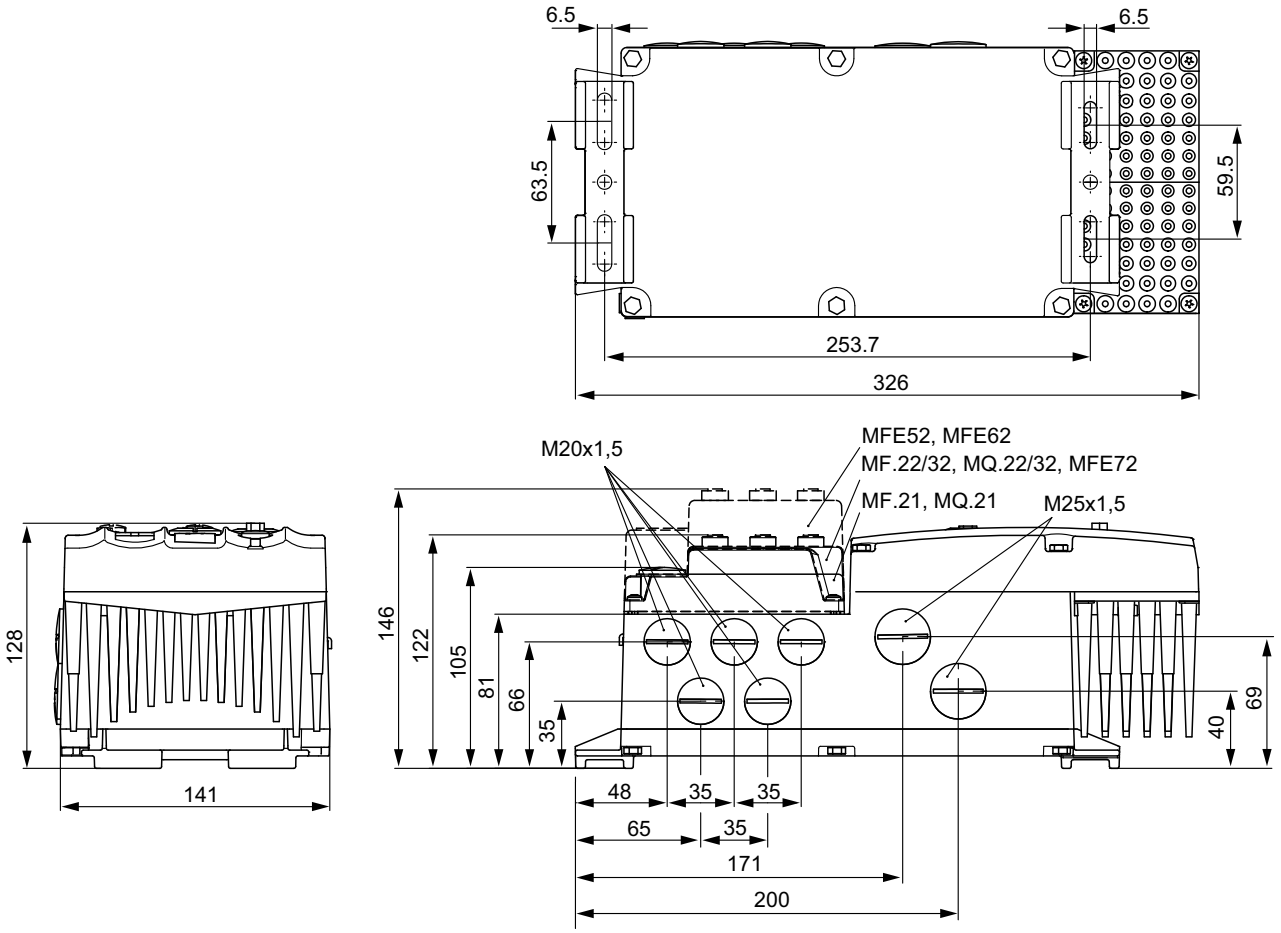
The following figure shows the dimensions of the field distributors MF../Z.6. and MQ../Z.6.:



27021599246139275

15.5.4 Dimension drawing of field distributors MF../MM03 – MM15/Z.7., MQ../MM03 – MM15/Z.7.

The following figure shows the dimensions of MF../MM03-MM15/Z.7., MQ../MM03-MM15/Z.7. field distributors:



27021599304777355

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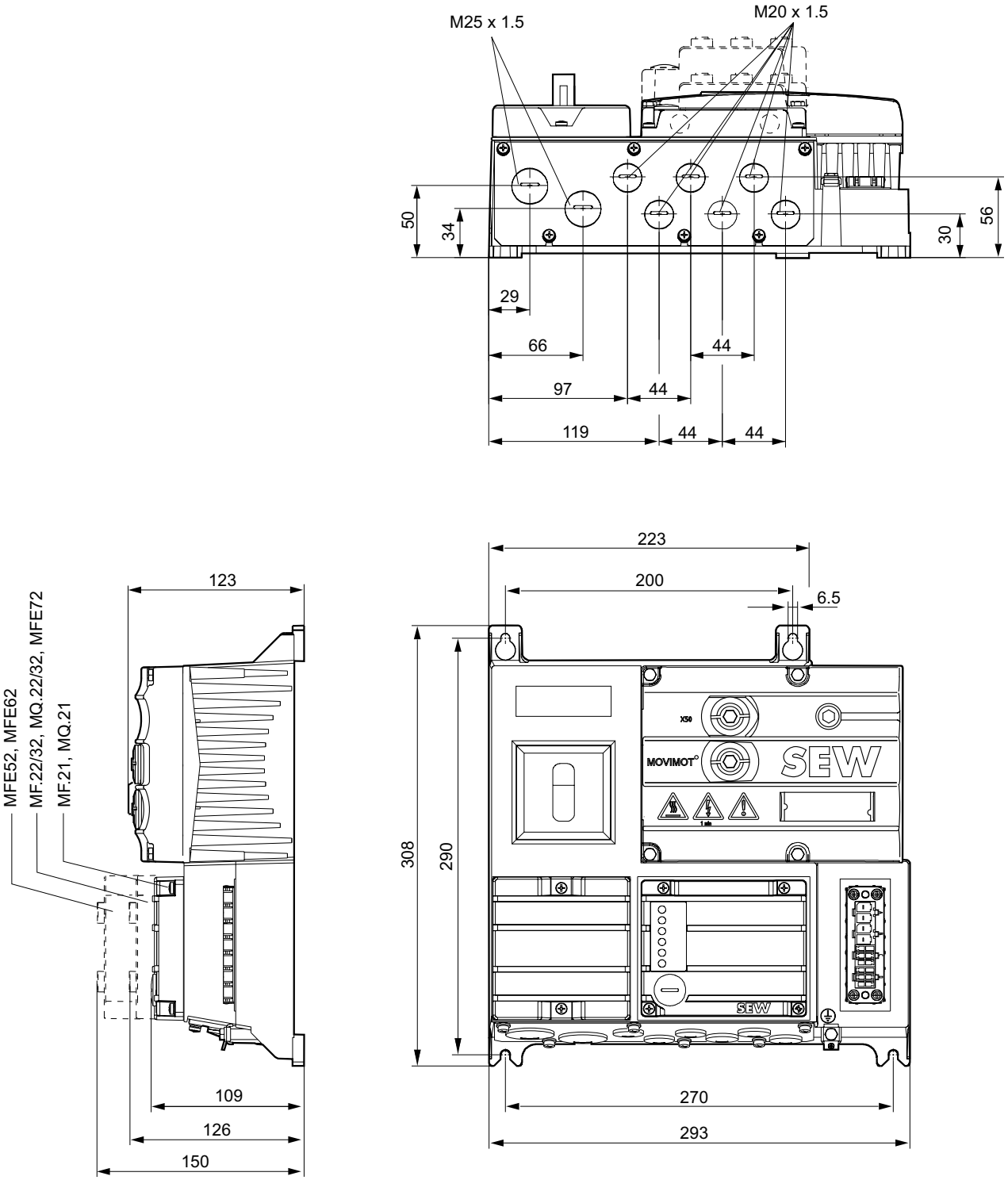
15.5.5 Dimension drawing of field distributors MF../MM03 – MM15/Z.8., MQ../MM03 – MM15/Z.8.

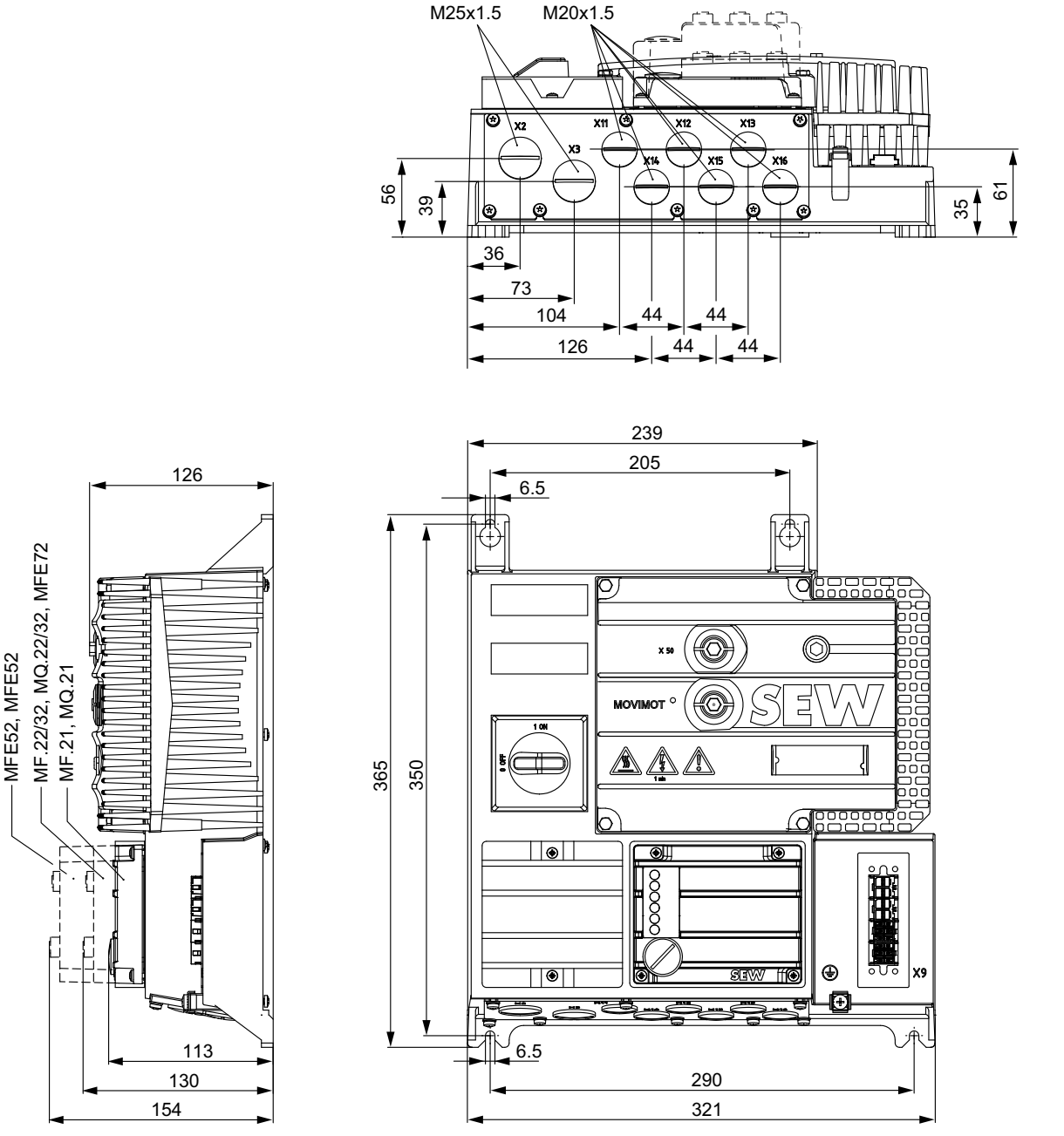
The following figure shows the dimensions of the field distributors MF../MM03 – MM15/Z.8., MQ../MM03 – MM15/Z.8.:



27021599307058827

15.5.6 Dimension drawing of field distributors MF../MM22 – MM30/Z.8., MQ../MM22 – MM30/Z.8.

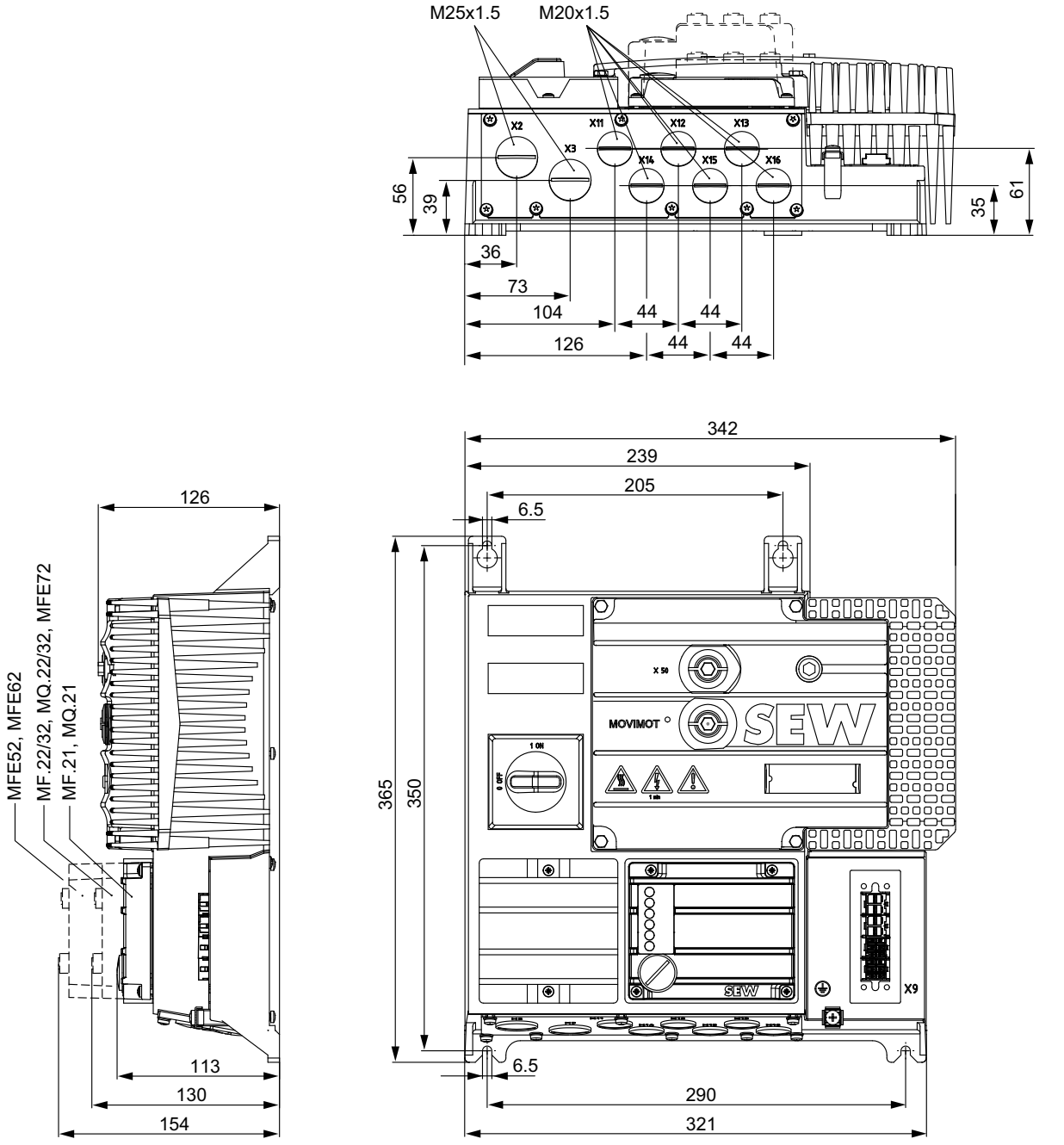
The following figure shows the dimensions of the field distributors MF../MM22 – MM30/Z.8., MQ../MM22 – MM30/Z.8.:



27021599307060747

15.5.7 MF../MM40/Z.8., MQ../MM40/Z.8. field distributors – dimension drawing

The following figure shows the dimensions of the field distributors MF../MM40/Z.8., MQ../MM40/Z.8.:



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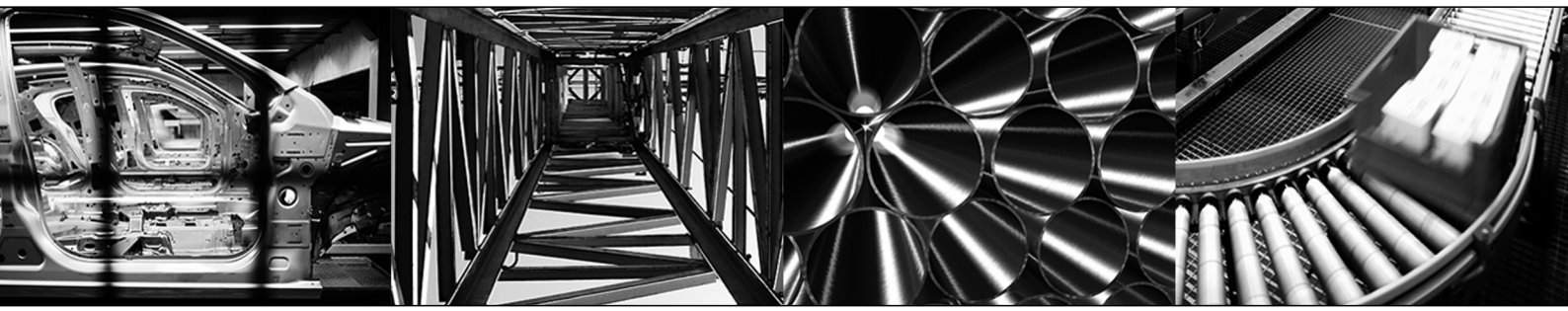

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