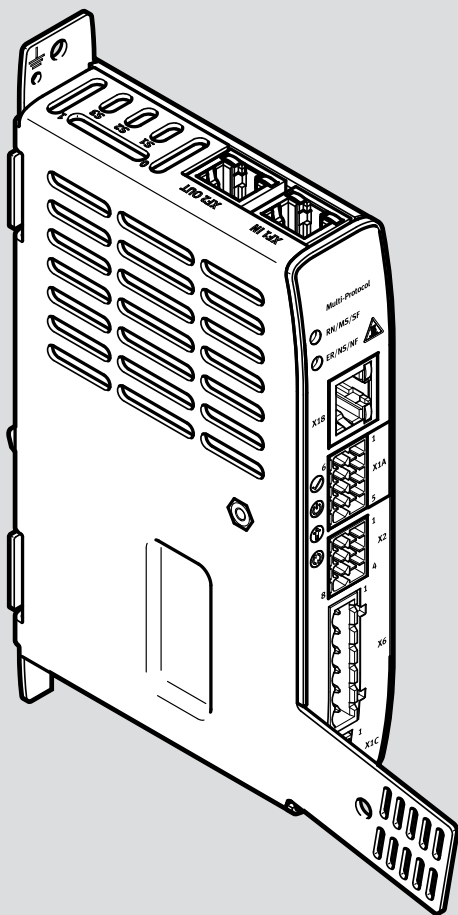


CMMT-ST-C8-1C-MP-S0

Servo drive

FESTO

Manual | Assembly,
Installation



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2023-03
[8186535]

Translation of the original instructions

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1 About this document

1.1 Target group

The document is targeted towards individuals who perform assembly, installation and service work on the product.

1.2 Applicable documents



All available documents for the product → www.festo.com/sp.

The user documentation for the product also includes the following documents:

Designation	Contents
Operating instructions for the product	Installation, safety sub-function
Manuals for the product	Detailed description of assembly, installation
	Detailed description of safety sub-function
Manual/online help plug-in	Plug-in: – Functions and operation of the software – Initial commissioning wizard Firmware functions: – Configuration and parameterisation – Operating modes and operational functions – Diagnostics and optimisation Bus protocol/control: – Device profile – Controller and parameterisation
Festo Automation Suite online help	– Function of the Festo Automation Suite – Management and integration of device-specific plug-ins

Tab. 1: User documentation for the product

1.3 Product variants

The following order code indicates the equipment features of the product variant.

Characteristic	Order code	Type
Servo drive	CMMT-	Servo drive, series T
Motor type	ST-	Stepper motor or EC motor
Nominal current	C8-	8 A
Nominal input voltage	1C-	24 ... 48 V DC

Characteristic	Order code	Type
Bus protocol/control	MP-	Multi-protocol: EtherCAT, EtherNet/IP, Modbus TCP, PROFINET
Safety function	S0	Basic safety

Tab. 2: Key features CMMT-ST-C8-1C-MP-S0

This documentation refers to the following version:

- Servo drive CMMT-ST-C8-1C-MP-S0, revision 1 and higher, see product labelling.

This is the first available revision.

- For later revisions of the product, check whether updated documentation is available → 3 Additional information.

1.4 Product labelling

- Observe the specifications on the product.

The product labelling is located on the right side of the device. The product labelling is for identification of the product and shows the following information:

Product labelling (example)	Meaning
CMMT-ST-C8-1C-MP-S0	Order code
8163946 MM-YYYY:XX SNM Rev 01SNW	Part number, serial number (production month and production year, plant number), revision
Main input: 1x 24 ... 48 V DC 8 A	Technical data for the power supply (PELV fixed power supply)
Motor out: 4x 0 ... input V AC 0 ... 20 kHz 8 A _{RMS} 300 W	Technical data for the motor output (output voltage, output frequency, nominal current, nominal output power)
T _{AMB} : max. 50 °C	Ambient temperature (T _{AMB})
IP20 PD2	Degree of protection, pollution degree
MAC-ID: XF1 IN XX-XX-XX-XX-XX-XX	First MAC address of the device for RTE communication XF1 IN, also represented as a bar code
R-R-FTO-KC-2018-1092	KC mark certificate (test mark for Korea)
Data matrix code, 123456789AB	Product Key as a data matrix code and an 11-character alphanumeric code
Festo SE & Co. KG	Manufacturer
DE-73734 Esslingen	Manufacturer's address
Made in Germany	Country of origin Germany

Tab. 3: Product labelling (example)

Warning symbol on the front of the product

The following warning symbol can be seen on the front of the product:

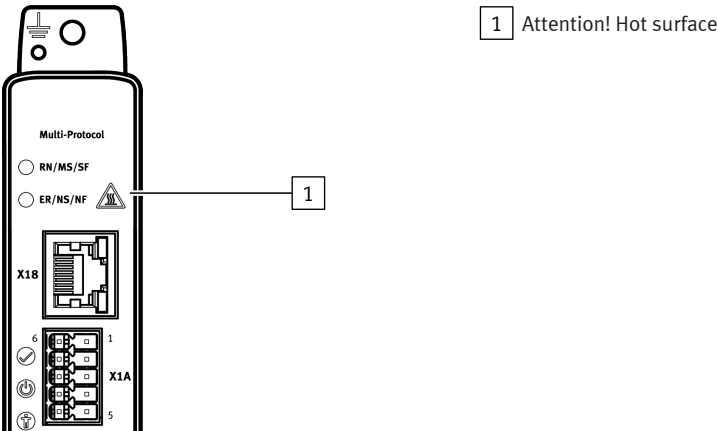


Fig. 1: Warning symbol on the front of the product

General meaning	Meaning for the CMMT-ST
Attention! Hot surface	Metallic housing parts of the device can reach high temperatures during operation.

Tab. 4: Meaning of the warning symbol

1.5 Specified standards

Version	
EN 60204-1:2018-09	EN 61800-3:2004+A1:2012
EN 61131-2:2007	EN 61800-5-2:2017

Tab. 5: Standards specified in the document

2 Safety

2.1 Safety instructions

General safety instructions

- Assembly and installation are only to be carried out by qualified personnel.
- Only use the product if it is in perfect technical condition.
- Only use the product in its original condition without unauthorised modifications.
- Do not carry out repairs on the product. If defective, replace the product immediately.
- Observe the identifications on the product.
- The product may generate high frequency interference, which may require interference suppression measures in residential areas.

- Take into account the ambient conditions at the location of use.
The safety function might fail and malfunctions might occur if you do not comply with the parameters required for the ambient and connection conditions.
- Never remove or insert the plug connector when the power is switched on.
- Install the product in a suitable control cabinet. The minimum degree of protection required for the control cabinet is IP54.
- Prior to commissioning, ensure that the resulting movements of the connected actuator technology cannot endanger anyone.
- During commissioning: systematically check all control functions and the communication and signal interface between controller and servo drive.
- Keep the documentation available throughout the entire product lifecycle.

If the product is damaged by unauthorised manipulation or use other than the intended use, the guarantee will be invalidated and the manufacturer will not be liable for damages.

If the product is damaged by using unauthorised software or firmware with the device, the warranty will be invalidated, and the manufacturer will not be liable for damages.



Safety instructions for the safety sub-functions of the product → 1.2 Applicable documents, Manual Safety sub-function.

2.2 Intended use

The servo drive CMMT-ST is intended to supply power to and to regulate a stepper motor or an EC motor. The integrated electronics enable regulation of torque (current), rotational speed and position. Use exclusively:

- in perfect technical condition
- in its original condition, without unauthorised modifications
- within the limits of the product defined by the technical data → 10 Technical data
- in an industrial environment



Intended use of the safety sub-functions for the product → 1.2 Applicable documents, Manual Safety sub-function.

2.2.1 Range of application

The device is intended for use in an industrial environment.

The device is intended to be installed in a control cabinet. The minimum degree of protection required for the control cabinet is IP54.

2.2.2 Permissible components

Supported motors:

- Stepper motors
- EC motors

The servo drive supports motors with and without an integrated holding brake (electrically actuated spring-loaded brake). The holding brake is actuated automatically by the controller enable of the servo drive. The actuation concept is based on the assumption that a drive that is already stationary is being held. The actuation system is not designed for decelerating a moving drive. If a moving drive is decelerated, this can cause excessive wear on the brake.

Motor configuration	Behaviour following removal of controller enable
Motor without holding brake	The drive can move freely.
Motor with holding brake	The holding brake is applied and holds the motor and axis in position.

Tab. 6: Example: removal of controller enable

The holding brake must be designed for the load torque that is to be stopped. Detailed information about brake control → Online help for the CMMT-ST plug-in.

Supported encoders:

- BiSS-C encoders
- Incremental encoders

Additional information → www.festo.com/catalogue.

2.3 Training of qualified personnel

The product may be installed and commissioned only by a qualified electrical engineer who is familiar with:

- The installation, operation and maintenance of electrical control systems
- Applicable regulations for operating safety-related systems

Work on safety engineering systems may only be carried out by qualified personnel trained in safety engineering.

2.4 Product conformity

The product-relevant directives are listed in the declaration of conformity → www.festo.com/sp.

Product conformity	
	in accordance with EU EMC Directive in accordance with EU Machinery Directive in accordance with EU RoHS Directive
	to UK EMC Regulations to UK Supply of Machinery Regulations to UK RoHS Regulations

Tab. 7: Product conformity

2.5 Safety engineering approval

The product is a safety device in accordance with the EC Machinery Directive. For details of the safety-oriented standards and test values with which the product complies and fulfils, see → 1.2 Applicable documents, Manual Safety sub-function, Technical data, safety engineering. Please note that compliance with the listed standards is limited to the CMMT-ST-...-S0.

2.6 UL/CSA certification

Technical data and environmental conditions may be subject to change in order to comply with Underwriters Laboratories Inc. (UL) certification requirements for the USA and Canada. Deviating values → 10.4 Technical data UL/CSA certification.

3 Additional information

- Contact the regional Festo contact if you have technical problems → www.festo.com.
- Accessories and spare parts → www.festo.com/catalogue.



Firmware, software or configuration files → www.festo.com/sp.

4 Product overview

4.1 Scope of delivery

Component	Number
Servo drive CMMT-ST-...	1
Assortment of plugs NEKM-C-23	1
H-rail clamp (premounted)	1
Operating instruction CMMT-ST-C8-1C-MP-S0	1

Tab. 8: Scope of delivery

Below are some examples of the available accessories:

- Patch cable for linkage of RTE interface



Up-to-date information on the accessories → www.festo.com/catalogue.

4.2 System structure

The servo drive CMMT-ST is a single-axis servo drive for controlling a stepper motor or an EC motor with connected mechanisms, e.g. a Festo axis. The device is controlled by a higher-order controller with, depending on the configuration, the EtherCAT, EtherNet/IP, Modbus TCP or PROFINET bus protocol over a real-time Ethernet interface. The device can be parameterised with a PC using either the real-time Ethernet interface or the separate standard Ethernet interface.

The device is a low voltage controller. The load and logic power supply must be provided by a PELV fixed power supply.

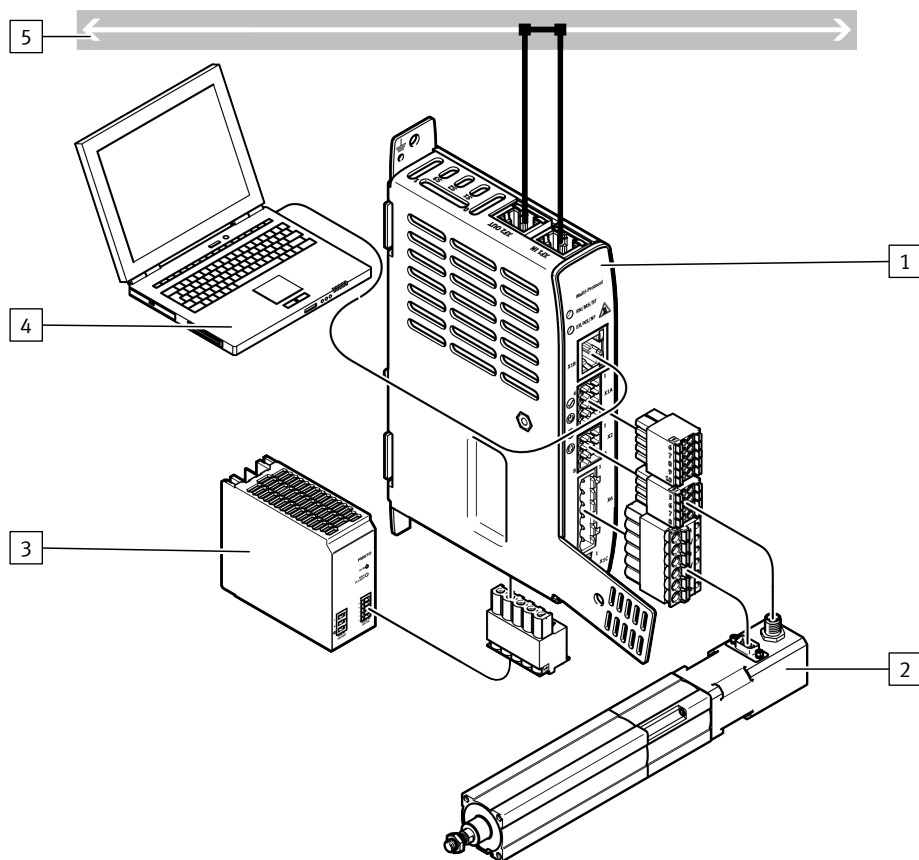


Fig. 2: System structure (example)

- | | |
|---|--|
| <p>1 Servo drive CMMT-ST</p> <p>2 Stepper motor or EC motor with drive</p> <p>3 Fixed power supply (or supplies) for logic and load voltage supply (PELV)</p> | <p>4 PC with Ethernet connection for parameterisation</p> <p>5 Bus/network</p> |
|---|--|

4.2.1 Product design

The device has a compact design. The connections are on the front, top and bottom of the device as pin header, socket strip or RJ45 bushing.

The ventilation slots on the bottom, top and left side of the device ensure sufficient air flow for cooling the device.

The metal housing parts form the cooling elements. Heat is also dissipated to the surroundings via the cooling elements. The device does not have a fan.

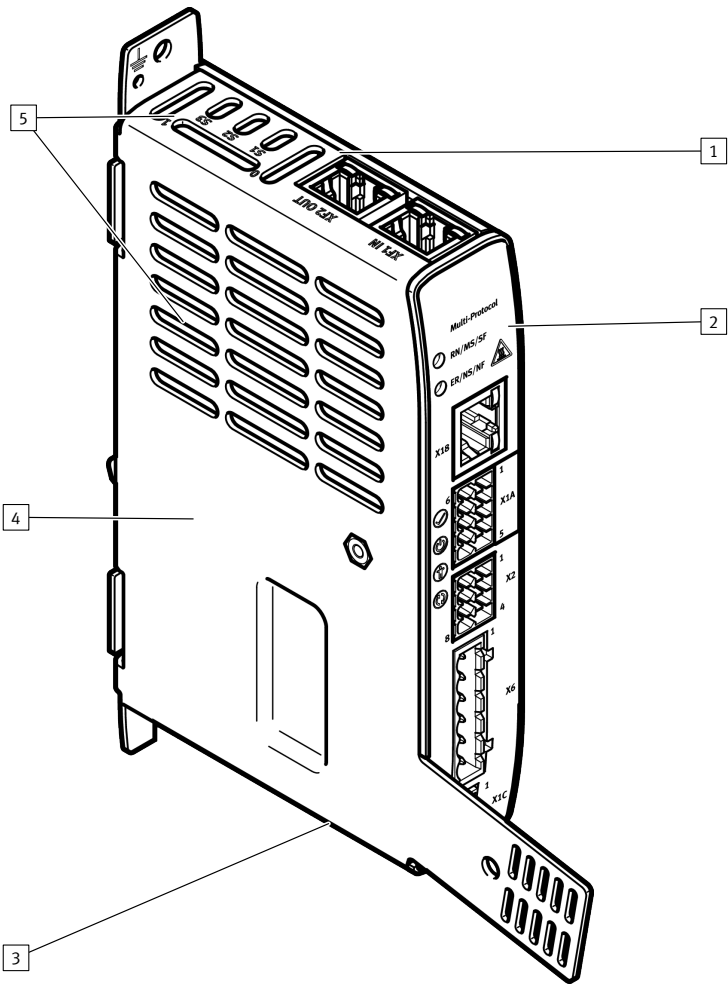


Fig. 3: Servo drive CMMT-ST-C8-1C-MP-S0

- 1

Top
- 2

Front panel
- 3

Bottom
- 4

Cooling element (metal housing parts, top, bottom left side and back of housing)
- 5

Ventilation slots

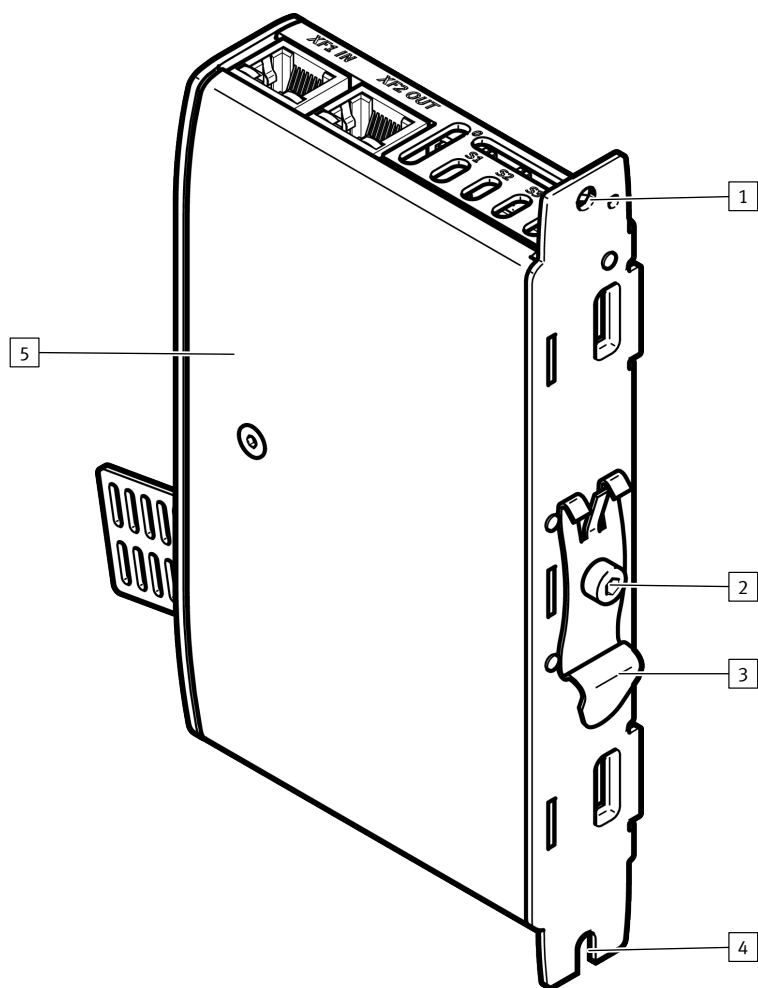


Fig. 4: Elements on the back

- | | |
|---|--|
| 1 Top hole for wall mounting | 4 Bottom slot for wall mounting |
| 2 Retaining screw for H-rail clamp | 5 Hood (right side of housing) |
| 3 H-rail clamp | |

There is a hole at the back on top and a slot at the bottom for wall mounting. The H-rail clamp is mounted in the centre of the back.

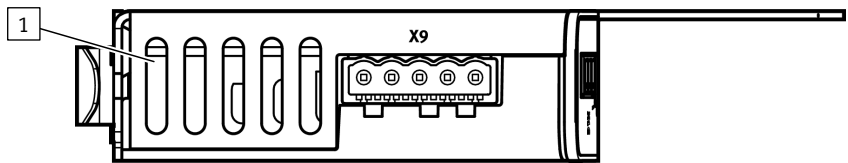


Fig. 5: Bottom

1 Ventilation slots

4.2.2 Overview of connection technology

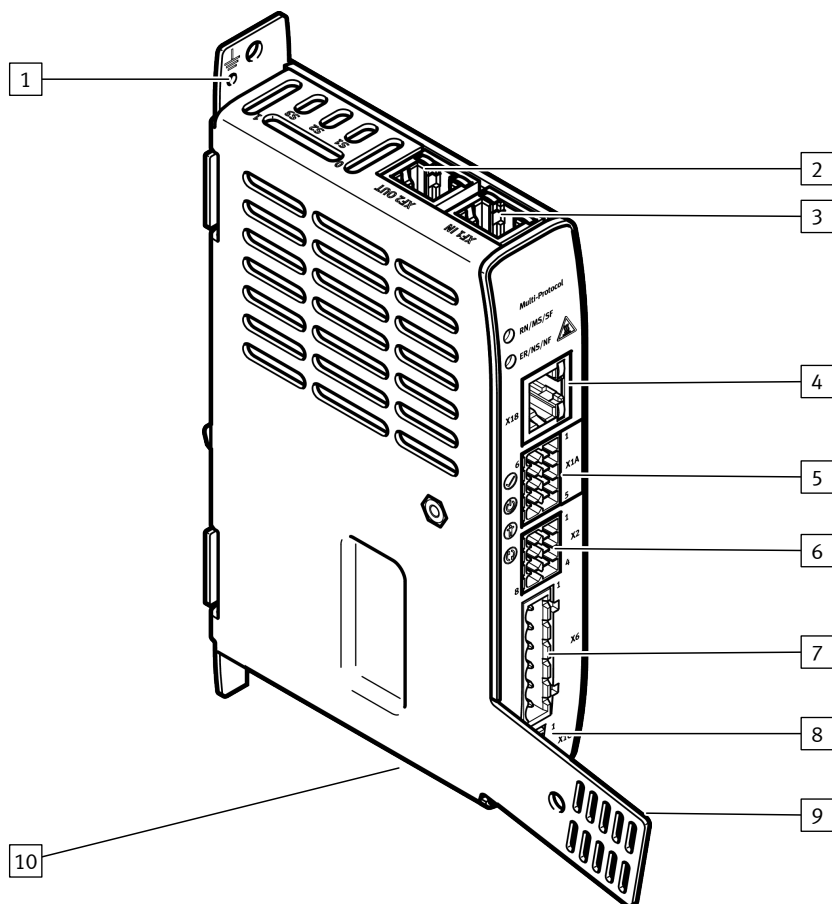


Fig. 6: Connections of the CMMT-ST-C8-1C-MP-S0

- | | |
|--|---|
| 1 Functional earth connection with label | 7 [X6] motor connection |
| 2 [XF2 OUT] RTE interface port 2 | 8 [X1C] connection for the reference switch or limit switch |
| 3 [XF1 IN] RTE interface port 1 | 9 Sheet metal for connecting the cable shield and strain relief |
| 4 [X18] standard Ethernet | 10 [X9] load and logic voltage (underneath) |
| 5 [X1A] I/O interface | |
| 6 [X2] encoder connection | |

4.3 Setting bus protocol

The CMMT-ST-C8-1C-MP-S0 product variant supports multiple bus protocols.

The following options are available for setting the protocol:

- Configuration in the CMMT-ST plug-in
- Direct setting with DIL switches S1 to S3

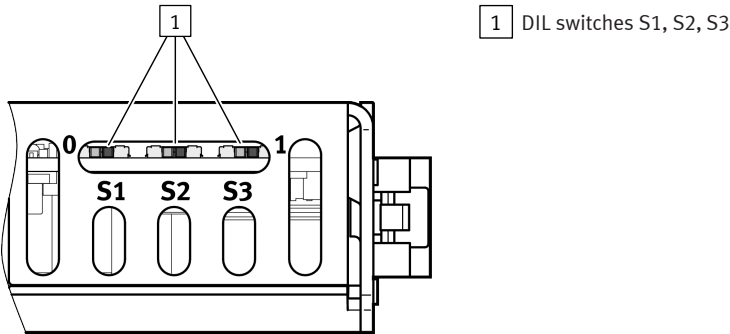


Fig. 7: DIL switches S1, S2, S3

The switches can be adjusted with a small slotted head screwdriver. The switch position is evaluated once when the device is started. A change in the switch position therefore only takes effect after the device has been restarted.

i Protocols supported by the firmware version used → 1.2 Applicable documents, manual/online help plug-in, software, function, fieldbus, device profile.

Protocol	S3	S2	S1
Parameterisation	0	0	0
PROFINET	0	0	1
EtherCAT	0	1	0
EtherNet/IP, Modbus TCP	0	1	1
Parameterisation	1	1	1

Tab. 9: Bus protocol switch setting

5 Transport and storage

- Protect the product from excessive stress during transport and storage. Excessive stress factors include:
 - mechanical stresses
 - impermissible temperatures

- moisture
- aggressive atmospheres
- Store and transport the product in its original packaging or installed in the control cabinet. The original packaging offers sufficient protection from typical stresses.

6 Assembly

Dimensions

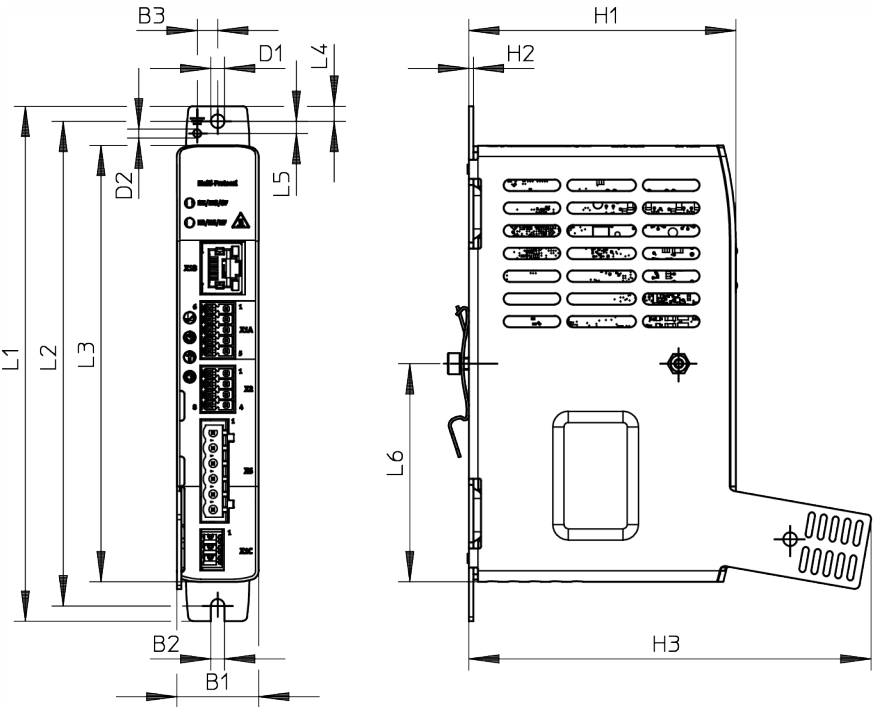


Fig. 8: Dimensions

Dimension	B1	B2	B3	D1	D2	H1	H2
[mm]	27	4.5	6.8	4.5	M3x0.5	88.3	1.5

Tab. 10: CMMT-ST-C8-1C-MP Part 1 dimensions

Dimension	H3	L1	L2	L3	L4	L5	L6
[mm]	133	170	160	144	5	4	85

Tab. 11: CMMT-ST-C8-1C-MP Part 2 dimensions

6.1 Mounting clearances

The CMMT-ST series servo drives can be connected in series.
With effective output currents > 4.6 A mounting clearances may be required on both sides to allow dissipation of the heat generated during operation by allowing sufficient air flow.
Detailed information about the required mounting clearances and any power reduction that may be necessary as a function of the ambient temperature → 10.3 Characteristic curves.
The table below shows the mounting clearances for standard output currents and ambient temperatures.

Examples	Ambient operating temperature		
	30 °C	40 °C	50 °C
Continuous, constant output current in controlled operation [A]	Mounting clearances		
4	0 mm	0 mm	0 mm
5			3 mm
6			10 mm
7		3 mm	Impermissible
8		15 mm	

Tab. 12: Required mounting clearances (examples)

The maximum housing interior temperature must be restricted to ensure that the device will reach its specified service life. The specified derating is intended to restrict the interior temperature in the housing.

The necessary clearances are determined by the temperature in the control cabinet and the required effective current. The Festo PositioningDrives software can be used to calculate the effective current. If the clearances are insufficient, the device will be switched off by the I²t or temperature monitoring function of the power stage. The maximum device current can be parameterised in the plug-in regardless of the nominal current of the connected motor → online help for the CMMT-ST plug-in.

In the cases below, the required effective current that will cause the device to heat up is lower than the nominal current of the device:

- in closed-loop operation
- in open-loop operation, if the device is running in intermittent duty

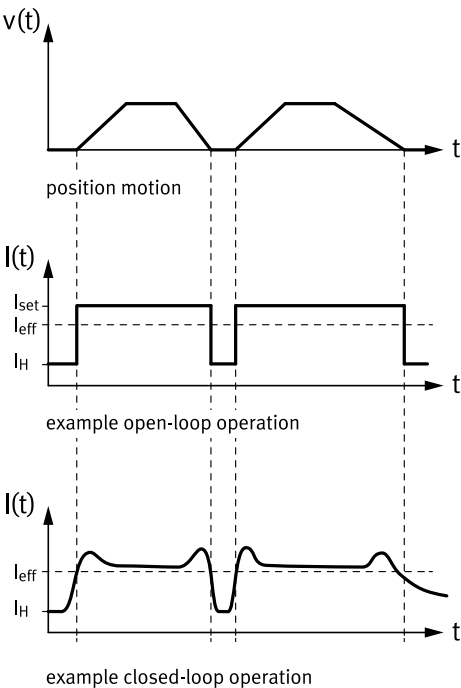


Fig. 9: Effective current timing graph (example)

Name	Description
I_{eff}	Effective current
I_{set}	Nominal current
I_H	Holding current
positioning motion	Traversing movement
example open-loop operation	Example of open-loop operation
example closed-loop operation	Example of closed-loop operation

Tab. 13: Legend for effective current timing graph

6.2 Mounting

The servo drive is intended for installation in a control cabinet that has at least IP54 degree of protection. The servo drive can be screwed onto the back panel of the control cabinet or fastened to an H-rail mounting.

Assembly instructions

- Always install the device vertically in the control cabinet (mains supply line [X9] underneath).
- Maintain minimum distances and mounting clearance to guarantee sufficient air flow. The ambient air in the control cabinet must be able to flow through the device from bottom to top without hindrance. Detailed information about the required mounting clearances and any power reduction that may be necessary as a function of the ambient temperature → 10.3 Characteristic curves.
- Take into account the required clearance for the wiring (connecting cables of the device must be routed from above, from below and from the front).
- Do not mount any temperature-sensitive components near the device. The device can become very hot during operation (switch-off temperature of the temperature monitoring → 10 Technical data).
- When mounting on an H-rail: use a DIN mounting rail TH 35-7.5 or TH 35-15 in accordance with EN 60715.
- When mounting on the rear wall of the control cabinet: screw the device vertically and flush with the mounting surface.

Installation of the H-rail clamp

- If the H-rail clamp is not premounted, screw it on using the original screw on the back → Fig. 4.

Mounting on an H-rail

1. Attach the device by hooking the top of the H-rail clamp onto the H-rail from above.
2. Press the lower part of the device onto the H-rail until the H-rail clamp clicks into place on the H-rail.

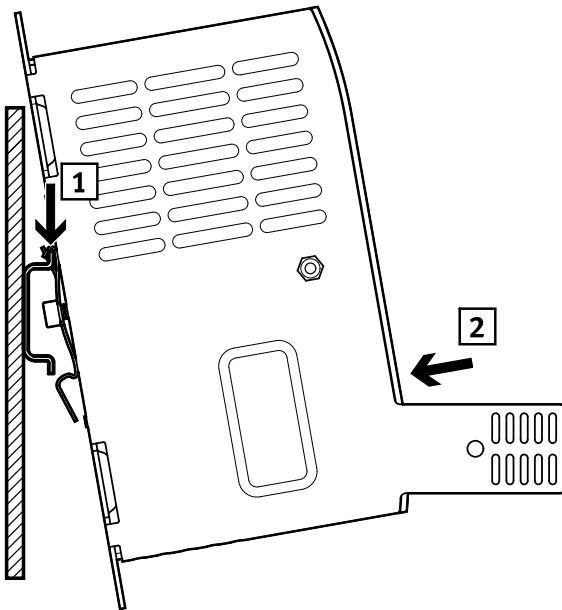


Fig. 10: Mounting on an H-rail

Wall mounting

The backwall of the device has a hole at the top and a cutout at the bottom. The device is screwed vertically and flush with the mounting surface using the hole and the cutout.

1. If an H-rail clamp is mounted on the back, remove it.
2. Mount the servo drive on the backwall of the control cabinet with suitable screws while complying with the assembly instructions.

7 Installation

7.1 Safety

WARNING

Danger of burns from hot housing surfaces.

Metallic housing parts can reach high temperatures during operation.

Contact with metal housing parts can cause burn injuries.

- Do not touch metallic housing parts.
- After the power supply is switched off, let the device cool down to room temperature.

7.2 EMC-compliant installation



A non-EMC-compliant installation can lead to signal interference on the encoder, motor or communication cables.

Cable lengths and cable shield

- Only use suitable cables that fulfil the requirements of EN 60204-1.
- Do not exceed maximum permissible cable lengths.

Connection		Max. cable length [m]	Cable shield
[X1A]	Inputs/outputs for the higher-order PLC	25	Not required
[X1C]	Inputs/outputs for the reference/limit switches	25	
[X2]	Encoder	25 ¹⁾	Shielded, twisted pair
[X6]	Motor phase connection	25	Shielded
[X9]	Logic power supply and load voltage supply	30	Not required
	Braking resistor	30	Not required
[X18]	Standard Ethernet	30	Double shielded (CAT 5)

Connection		Max. cable length [m]	Cable shield
[XF1 IN]	RTE (port 1)	30	Double shielded (CAT 5)
[XF2 OUT]	RTE (port 2)		

1) Comply with the maximum permissible cable length for the installed encoder.

Tab. 14: Cable lengths and cable shield

Laying cables

Follow the general guidelines for EMC-compliant installation, e.g.:

- Earth the servo drive at the functional earth terminal (➔ 4.2.2 Overview of connection technology) and the mounting plate with fine-wire copper strips.
- Use cables that are as short as possible; install the servo drive as close to the motor as possible.
- Do not run signal cables parallel to power cables. Avoid loops when laying the cables.
- Maintain required minimum distances between signal cables and power cables dependent on the installation conditions. Signal cables must be physically separated from the power cables as far as possible.

For example, the encoder cable is a signal cable and the motor cable is a power cable. These cables must therefore be installed separated from each other.

In hybrid motor cables the signal cables are internally shielded against the motor phases.

- Wherever possible, avoid crossing signal cables with power cables or running them at only a 90° angle to one another.
- Strip the motor cable and encoder cable from a length of 7 m at the switch cabinet input or in the vicinity of the servo drive and earth the entire surface on the shield connection on the metal of the servo drive or use a suitable shield clamp.

Shield connection on the metal housing

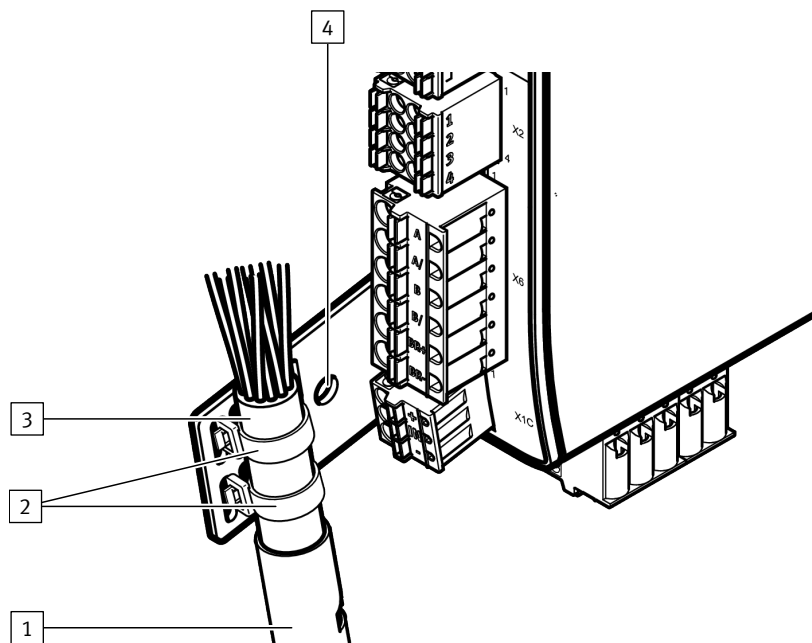


Fig. 11: Shield connection

- 1 Hybrid cable, optional motor cable and encoder cable
- 2 Cable binders

- 3 Cable shield
- 4 Sheet metal with slots for cable binders and hole for optional shield clamp

7.3 Connection example

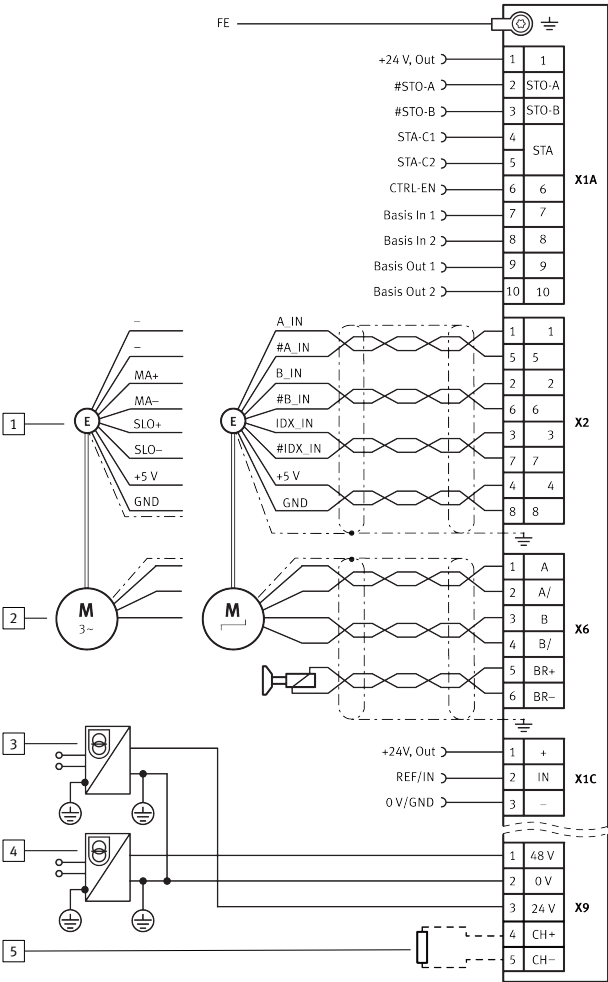


Fig. 12: Connection example

- 1

BiSS-C or incremental encoder
- 2

EC motor or stepper motor
- 3

PELV fixed power supply for logic voltage (24 V)
- 4

PELV fixed power supply for load voltage supply (24 V ... 48 V)
- 5

Braking resistor, optional

7.4 Interfaces

7.4.1 [X1A], inputs and outputs for the higher-order PLC

The I/O interface [X1A] is located on the front of the device. This interface features:

- 2 freely configurable digital outputs (switching logic PNP)
- 2 freely configurable digital inputs (PNP switching logic)
- 1 digital input for the power stage enable and reset error functions; whether or not the function will be used can be parameterised in the plug-in (PNP switching logic)
- 2 inputs for the circuitry of the STO safety sub-function (#STO-A, #STO-B)
- 2 contacts for the circuitry of the diagnostic contact of the STO safety sub-function (STA-C1, STA-C2)

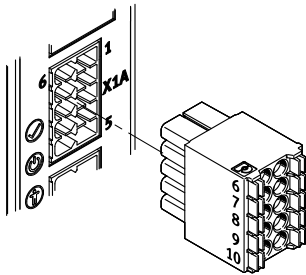
Detailed information on the circuitry of the safety sub-functions of the product ➔ 1.2 Applicable documents, Manual Safety sub-function.

For example, the functional inputs and outputs of this I/O interface are used for coupling to a higher-order PLC.

The devices connected to the CMMT-ST all need to have the same switching logic (PNP).

Signal	Level	Input	Output
logic 0	0 V	Internal via pull-down resistor	Internal via pull-down resistor
logic 1	24 V	–	Via high-side driver (delivers current)

Tab. 15: PNP logic

[X1A]	Pin	Function	Description	Mating plug labelling
	1	+ 24 V, out	+ 24 V DC output (fused)	1
	2	#STO-A	Safe torque off control input, channel A	STO-A
	3	#STO-B	Safe torque off control input, channel B	STO-B
	4	STA-C1	STA diagnostic contact Safe torque off acknowledge	STA
	5	STA-C2		
	6	CTRL-EN	Power stage enable/acknowledge error	6
	7	Basic in 01	Configurable input	7
	8	Basic in 02	Configurable input	8
	9	Base Out 01	Configurable output	9
	10	Base Out 02	Configurable output	10

Tab. 16: Inputs and outputs for the higher-order PLC

The inputs and outputs are configured using the CMMT-ST plug-in → online help for the CMMT-ST plug-in.

The signals of the STO-A/B inputs are low active and are therefore marked with #.

Mating plug requirements	
Designation	Based on PHOENIX CONTACT DFMC 1.5/ 5-ST-3.5 Included in assortment of plugs NEKM-C-23 (included with the product)
Signal contacts	10 (10-pin, 2-row)
Nominal current	8 A
Pitch	3.5 mm
Strip length	10 mm
UL use group	D

Tab. 17: Mating plug requirements

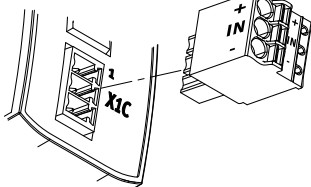
Requirements for the connecting cable	
Shielding	Not required
Min. conductor cross section including wire end sleeve with plastic sleeve ¹⁾	0.2 mm ²
Max. conductor cross section including wire end sleeve with plastic sleeve	1.5 mm ²
Max. length	25 m

1) The conductor cross section used must be suitable for the expected currents. If flexible leads are used with plastic wire end sleeves, minimum cross sections of 0.14 mm² are possible.

Tab. 18: Requirements for the connecting cable

7.4.2 [X1C], reference switch/limit switch

The connection [X1C] is located on the front of the device and is used to connect the reference switch or a limit switch.

[X1C]	Pin	Function	Description	Mating plug labelling
	1	+24 V, out	+ 24 V DC output (fused)	+
	2	REF/IN	Reference signal/limit switch signal	IN
	3	0 V/GND	Reference potential, reference switch	–

Tab. 19: Connection for the reference switch/limit switch

Mating plug requirements	
Designation	Based on PHOENIX CONTACT FK-MCP 1.5/ 3-ST-3.5 Included in assortment of plugs NEKM-C-23 (included with the product)
Signal contacts	3
Nominal current	8 A
Pitch	3.5 mm
Strip length	9 mm
UL use group	D

Tab. 20: Mating plug requirements

Cable requirements	
Shielding	Not required
Min. conductor cross section including wire end sleeve with plastic sleeve ¹⁾	0.14 mm ²
Max. conductor cross section including wire end sleeve with plastic sleeve	1.5 mm ²
Max. length	25 m

¹⁾ The conductor cross section used must be suitable for the expected currents.

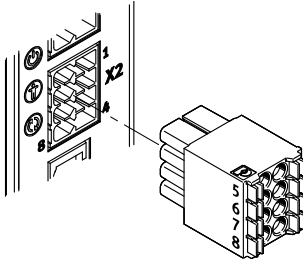
Tab. 21: Cable requirements

7.4.3 [X2], encoder interface

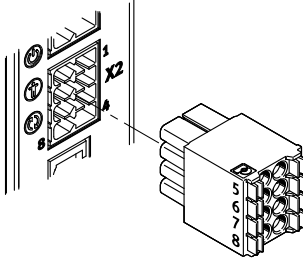
The encoder interface [X2] is located on the front panel of the device. Communication with the encoder is via this interface. The encoder signals are received, and the encoder is supplied with voltage.

The following encoders are supported:

- Incremental encoders with AB signals (quadrature encoder)
- Absolute encoders with BiSS C-protocol

[X2]	Pin	Function	Description	Mating plug labelling
	1	A_IN	A signal input	1
	2	B_IN	B signal input	2
	3	IDX_IN	Index signal input	3
	4	+5 V	5 V encoder supply	4
	5	#A_IN	A signal input, inverse	5
	6	#B_IN	B signal input, inverse	6
	7	#IDX_IN	Index signal input, inverse	7
	8	GND	Reference potential of encoder supply	8

Tab. 22: Incremental encoders with AB signals (quadrature encoder)

[X2]	Pin	Function	Description	Mating plug labelling
	1	–	–	1
	2	MA+	Clock line BiSS C, output	2
	3	SLO+	Data transmission line BiSS C, input	3
	4	+5 V	5 V encoder supply	4
	5	–	–	5
	6	MA–	Clock line BiSS C, output inverse	6
	7	SLO–	Data transmission line BiSS-C, input inverse	7
	8	GND	Reference potential of encoder supply	8

Tab. 23: Absolute encoders with BiSS C-protocol

Mating plug requirements	
Designation	Based on PHOENIX CONTACT DFMC 1.5/ 4-ST-3.5 Included in assortment of plugs NEKM-C-23 (included with the product)
Number of pins	8
Nominal current	8 A
Pitch	3.5 mm
Strip length	10 mm
UL use group	D

Tab. 24: Mating plug requirements

Requirements for the connecting cable	
Shielding	Shielded, twisted pair
Min. cable cross section ¹⁾	0.2 mm ²
Max. conductor cross section	1.5 mm ²
Max. length	25 m

1) The conductor cross section used must be suitable for the expected currents. If flexible leads are used with plastic wire end sleeves, minimum cross sections of 0.14 mm² are possible.

Tab. 25: Requirements for the connecting cable

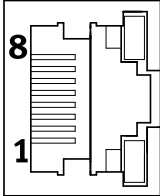
7.4.4 [X18], standard Ethernet

The interface [X18] is located on the front panel of the device. The following can be performed via the interface [X18] using the commissioning software:

- Diagnostics
- Parameterisation
- Controller
- Firmware updates

The interface fulfils the requirements of IEEE 802.3:2012. The interface is galvanically isolated and intended for use with limited cable lengths.

The connection [X18] is designed as an RJ45 socket. 2 LEDs are integrated into the RJ45 socket. The green LED lights when the interface is activated and flashes during communication.

Standard Ethernet			
[X18]	Pin	Function	Description
	1	TX+	Transmitted data+
	2	TX-	Transmitted data-
	3	RX+	Received data+
	4	n. c.	Not connected
	5	n. c.	
	6	RX-	Received data-
	7	n. c.	Not connected
	8	n. c.	
	Housing	FE	The housing is used as a support for the cable shield and is connected to the FE.

Tab. 26: Standard Ethernet

Mating plug requirements	
Design	VS-08-RJ45-5-Q/IP20 from PHOENIX CONTACT or compatible
Number of pins	8
Shielded	yes
Degree of protection	IP20

Tab. 27: Mating plug requirements

Requirements for the connecting cable	
Characteristics	CAT 5, patch cable, double shielded
Max. cable length	30 m

Tab. 28: Requirements for the connecting cable

The following connections are possible via the Ethernet interface:

Connections	Description
Point-to-point connection	The device is connected directly to the PC via an Ethernet cable.
Network connection	The device is connected to an Ethernet network.

Tab. 29: Options for connection

The device supports the following methods of IP configuration (based on IPv4):

Methods	Description
Obtain IP address automatically (DHCP client)	The device obtains its IP configuration from a DHCP server in the network. This method is suitable for networks with a DHCP server installed.
Fixed IP configuration	The device uses a fixed IP configuration. The IP configuration of the device can be permanently assigned manually. However, the device can only be addressed if the assigned IP configuration matches the IP configuration of the PC. Factory setting: 192.168.0.1

Tab. 30: Options for IP configuration

Requirements for the shield support

- Connect the cable shield to the plug housings on both sides.

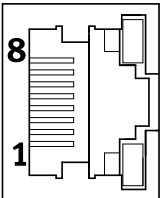
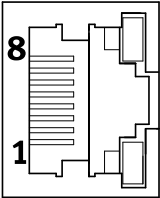
Possible connections

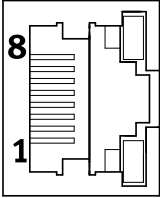
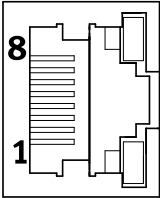
- Connect CMMT to your network via a hub/switch or directly to the PC.

7.4.5 [XF1 IN] and [XF2 OUT], real-time Ethernet (RTE) ports 1 and 2

The real-time Ethernet interface [XF1 IN] and [XF2 OUT] is located on the top of the device. The interface enables RTE communication. Different protocols are supported depending on the bus configuration → 4.3 Setting bus protocol.

The physical level of the interface fulfils the requirements according to IEEE 802.3:2012-00. The interface is galvanically isolated and intended for use with limited cable lengths.
2 LEDs are integrated into the RJ45 bushings. The behaviour of the LEDs depends on the bus protocol. Both LEDs are not always used.

Real-time Ethernet (RTE) port 1 and port 2			
[XF2 OUT] and [XF1 IN]	Pin	Function	Description
XF2 OUT  XF1 IN 	1	TX+	Transmitted data+
	2	TX-	Transmitted data-
	3	RX+	Received data+
	4	n. c.	Not connected
	5	n. c.	
	6	RX-	Received data-

Real-time Ethernet (RTE) port 1 and port 2			
[XF2 OUT] and [XF1 IN]	Pin	Function	Description
XF2 OUT  XF1 IN 	7	n. c.	Not connected
	8	n. c.	
	Housing	FE	The housing is used as a support for the cable shield and is connected to the FE.

Tab. 31: [XF1 IN] and [XF2 OUT], RTE port 1 and 2

Mating plug requirements	
Design	VS-08-RJ45-5-Q/IP20 from PHOENIX CONTACT or compatible
Number of pins	8
Shielded	Yes
Degree of protection	IP20

Tab. 32: Mating plug requirements

Requirements for the connecting cable	
Characteristics	CAT 5, patch cable, double shielded
Max. cable length	30 m

Tab. 33: Requirements for the connecting cable

Requirements for the shield support

- Connect the cable shield to the plug housings on both sides.

7.5 Motor connection

The connection [X6] is on the front panel of the device. The following functions are carried out via the connection [X6]:

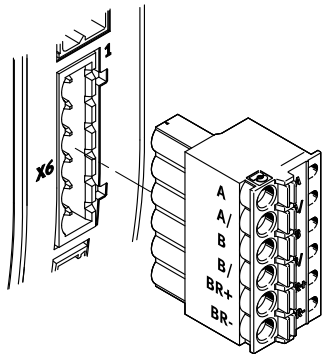
- Supply motor coils with current
- Control optional holding brake of the motor

As a rule, the brakes used are holding brakes. This means the brakes are well suited to keeping the motor at a standstill. The holding brake must be designed for the load torque that is to be held. Holding brakes are not usually suitable for braking moving masses or loads.

- Check that the holding brake used is suitable for the application.

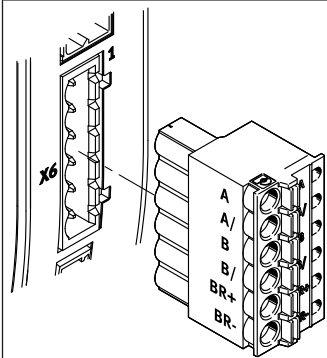
The servo drive controls the output for the holding brake automatically. Information about the brake controller → Online help for the CMMT-ST plug-in.

Pin allocation for connecting a stepper motor:

[X6]	Pin	Function	Description	Mating plug label- ling
	1	A	String A	A
	2	A/	String A/	A/
	3	B	String B	B
	4	B/	String B/	B/
	5	Br+	Brake +24 V	Br+
	6	Br-/0 V	Brake 0 V	Br-

Tab. 34: Motor phase connection for connecting a stepper motor

Pin allocation for connecting an EC motor:

[X6]	Pin	Function	Description	Mating plug labelling
	1	U	Phase U	A
	2	V	Phase V	A/
	3	W	Phase W	B
	4	Reserved	Do not connect	B/
	5	Br+	Brake +24 V	Br+
	6	Br-/0 V	Brake 0 V	Br-

Tab. 35: Motor phase connection for connecting an EC motor

Mating plug requirements	
Designation	Based on PHOENIX CONTACT FK 2.5/6-ST-5.08 Included in assortment of plugs NEKM-C-23 (included with the product)
Signal contacts	6
Nominal current	CE: 12 A cUL: 10 A ¹⁾
Pitch	5.08 mm
Strip length	10 mm
UL use group	D

1) Only 10 A is permitted for the cUL approval.

Tab. 36: Mating plug requirements

Requirements for the connecting cable	
Shielding	Shielded
Min. cable cross section ¹⁾ including wire end sleeve with plastic sleeve	0.2 mm ²
Max. conductor cross section without wire end sleeve	2.5 mm ²
Max. length	25 m

1) The conductor cross section used must be suitable for the expected currents.

Tab. 37: Requirements for the connecting cable

Festo offers prefabricated motor cables as accessories ➔ www.festo.com/catalogue.

7.6 Load and logic power supply

The connection [X9] is located underneath the device.

The control unit and power unit of the device are supplied with electrical power separately via the connection [X9].

- Supply of the control unit with 24 V DC (logic power supply)
- Supply of the power unit with 24 V DC to 48 V DC (load voltage supply)

The load and logic power supply features internal overcurrent protection. The internal overcurrent protection device cannot be reset!

A suitable external braking resistor can also be connected as an option. During braking, the motor works as a generator. In these cases, the motor returns electrical energy to the DC link. Alternatively, a certain part of the regenerated energy can also be dissipated internally. If the energy feedback is too high, an external braking resistor must be connected, which absorbs the energy and converts it into heat. The energy absorption integrated into the device is sufficient for many applications with moderate cycle times and small moving masses. This means that an external braking resistor is often not required.

- Connect an external braking resistor if greater pulse power or continuous power must be absorbed during braking.

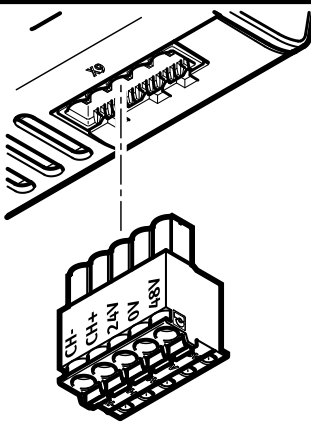
Power supply

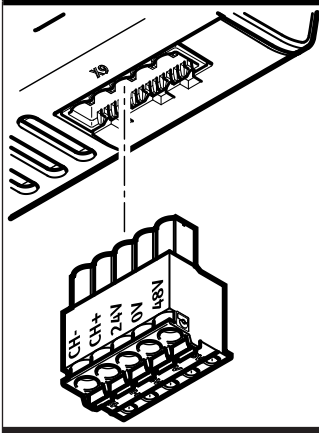
 **WARNING**

Risk of injury due to electric shock.

- For the electrical power supply with extra-low voltages, use only PELV circuits that guarantee a reinforced isolation from the mains network.
- Observe IEC 60204-1/EN 60204-1.

Power supply

[X9]	Pin	Function	Description	Mating plug labelling
	1	+ 48 V	Power supply for the load circuit 24 V DC to 48 V DC	48 V
	2	0 V	Reference potential for the load and logic voltage	0 V
	3	+24 V	Power supply for the logic circuit 24 V DC	24 V

[X9]	Pin	Function	Description	Mating plug labelling
	4	CH+	Braking resistor positive connection	CH+
	5	CH-	Braking resistor negative connection	CH-

Tab. 38: Power supply

Mating plug requirements	
Designation	Based on PHOENIX CONTACT FK 2.5/5-ST-5.08 Included in assortment of plugs NEKM-C-23 (included with the product)
Signal contacts	3
Nominal current	CE: 12 A cUL: 10 A ¹⁾
Pitch	5.08 mm
Strip length	10 mm
UL use group	D

1) Only 10 A is permitted for the cUL approval.

Tab. 39: Mating plug requirements

Requirements for the connecting cable for the power supply	
Shielding	Not required
Min. cable cross section ¹⁾ including wire end sleeve with plastic sleeve	0.2 mm²
Max. conductor cross section including wire end sleeve with plastic sleeve	2.5 mm²
Max. length of power supply pins 1, 2 and 3	30 m

1) The conductor cross section used must be suitable for the expected currents.

Tab. 40: Requirements for the connecting cable for the power supply

7.7 Cross-wiring of multiple servo drives

Cross-wiring enables a device compound to be created.

- When cross-wiring configurable inputs/outputs, note the current rating of the cables and the mating plugs.

Whether cross-wiring the diagnostic contact is permissible depends on the required safety classification.

The diagnostic contact must be evaluated separately for EC motors with the classification SIL 3, cat. 3, PL e. It is not permissible to cross-wire the diagnostic contact. In all other cases, the following rules apply when cross-wiring multiple servo drives:

- Wire inputs #STO-A and #STO-B in parallel in each case.
- Wire diagnostic contacts STA-C1/C2 in series in each case.
- Wire the diagnostic contacts of a maximum of 10 servo drives in series. The maximum cable length applies to the entire line, from the safety relay unit to the final device.

i
Example of cross-wiring → 1.2 Applicable documents, Manual Safety sub-function.

Mixed cross-wiring of diagnostic contacts and diagnostic outputs is not recommended. The connections for the load and logic power supply can be cross-wired to create a device compound. Twin wire end sleeves or double mating plugs can be used for cross-wiring. According to the datasheet of the mating plug, twin wire end sleeves allow conductor cross-sections of maximum 2 × 1 mm² per contact. With the double mating plug TFKC 2.5/3-ST-5.08 from PHOENIX CONTACT, conductor cross sections of maximum 2x 1.5 mm² per contact are possible.

Cross-wiring	Twin wire end sleeve	Double mating plug TFKC 2.5/ 3-ST-5.08
Max. conductor cross section per cable (2)	1 mm ²	1.5 mm ²
Max. permissible current with heat-resistant cable	19 A	24 A, according to mating plug data sheet max. 10 A for cUL

Tab. 41: Max. permissible current

Recommendation:

- Insert a suitable fuse for line protection. The rated current of the fuse must be less than or equal to the permissible current rating of the selected conductor cross section.
- The number of devices that can be cross-wired depends on the current consumption of the devices.

7.7.1 DC link coupling and braking resistor

Basics

Reactive current braking:

- The parameterisation of the reactive current braking should be activated in the servo drive by default.
- Reactive current braking can be deactivated in order to recover braking energy; in this case, the power pack must handle the higher voltage.
- Deactivation of the reactive current braking is typically suitable for battery systems.

DC link regeneration:

- The power pack must be able to handle the higher voltage.
- For battery systems, check that the charger can also handle the higher voltage. Otherwise simply connect the servo drive directly to the battery.
- The design must take into account that the resulting higher voltage is present on all servo drive that are connected to the same power supply.

External braking resistor:

- The parameterisation of the external braking resistor must be activated in the servo drive in order to use the braking resistor.
- If the DC link regenerative function is used together with other low-voltage servo drives in the same system, all other low-voltage servo drives should have the same switch-on threshold.
A better alternative is to use the external braking resistor on only one of the low-voltage servo drives. The other servo drives only use the DC link regenerative function and do not have a braking resistor connected. This means that only one servo drive is responsible for energy management.

The following examples each show 2 servo drives; depending on the performance of the power supply any number of devices can be connected.

Example 1

- The DC links are not coupled.
- A DC link feedback with different switch-on thresholds is unfavourable.
- Each servo drive has a separate braking resistor.

Parameter	CMMT-ST-...-MP - 1	CMMT-ST-...-MP - 2
Reactive current braking:	Active	Active
Overvoltage protection regeneration:	Active	Active
External braking resistor:	Active	Active

Tab. 42: Parameterisation example 1

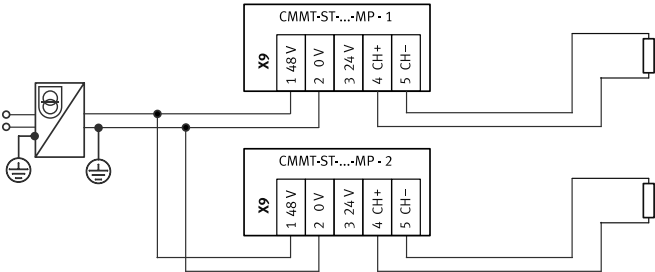


Fig. 13: DC link coupling example 1

Example 2

- DC link feedback is possible, but not necessary.
- Servo drive 2 takes over the energy management.
- CH+ of servo drive 1 is connected to the braking resistor of servo drive 2, CH- is not connected.
- Because of the current rating of the wire end sleeves, the braking resistor is connected via a DIN rail terminal.
- The sizing of the braking resistor must be checked.

Parameter	CMMT-ST-...-MP - 1	CMMT-ST-...-MP - 2
Reactive current braking:	Active	Active
Overvoltage protection regeneration:	Active	Active
External braking resistor:	Not active	Active

Tab. 43: Parameterisation example 2

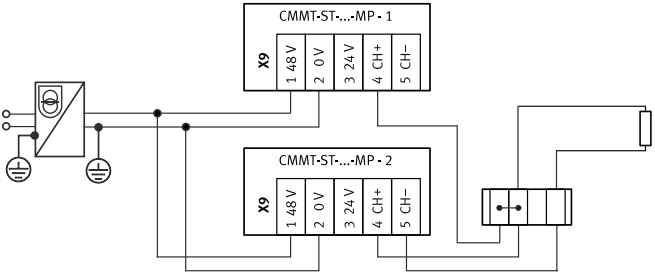


Fig. 14: DC link coupling example 2

Example 3

- DC link feedback is required.
- Servo drive 2 takes over the energy management.
- The sizing of the braking resistor must be checked.

Parameter	CMMT-ST-...-MP - 1	CMMT-ST-...-MP - 2
Reactive current braking:	Active	Active
Overvoltage protection regeneration:	Not active	Not active
External braking resistor:	Not active	Active

Tab. 44: Parameterisation example 3

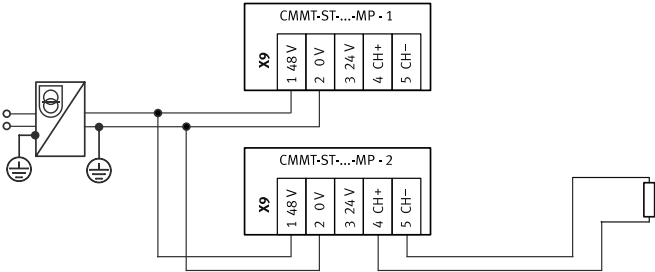


Fig. 15: DC link coupling example 3

Example 4

- DC link recovery is required and enables energy saving in battery systems.
- Servo drive 2 takes over the energy management.
- The sizing of the braking resistor must be checked.

Parameter	CMMT-ST-...-MP - 1	CMMT-ST-...-MP - 2
Reactive current braking:	Not active	Not active
Overvoltage protection regeneration:	Not active	Not active
External braking resistor:	Not active	Active

Tab. 45: Parameterisation example 4

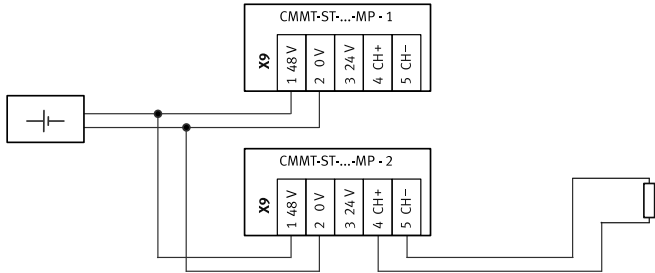


Fig. 16: DC link coupling example 4

8 Malfunctions

8.1 Diagnostics via LED

The device has LEDs for displaying status information on the top and in the RJ45 sockets [XF1 IN], [XF2 OUT] and [X18].

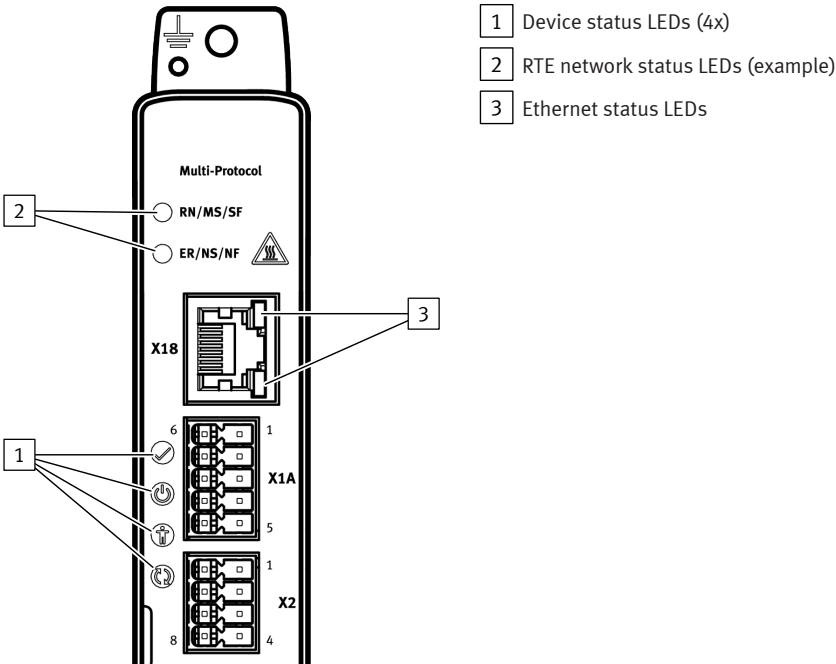


Fig. 17: LEDs on the front

8.1.1 Device status displays

LED	Designation	Brief description
✓	Status LED	Indicates the general device status
⏻	Power LED	Indicates the status of the power supply
⚠	Safety LED	Indicates the status of the safety equipment
↻	Application status LED	Indicates the identification sequence and is reserved for future extensions

Tab. 46: Device status LEDs (status, power, safety and application status LEDs)

LED test

After the device is switched on, it runs through an initialisation phase. During the initialisation phase, the device performs an LED test. During the LED test, the 4 device status LEDs are activated simultaneously. The 4 device status LEDs are yellow for a short time.

✓ **Status LED, display of the device status**

LED	Meaning
 flashing red	An error is pending.
 flashing yellow	A warning is pending or the servo drive is currently performing a firmware update.
 yellow light	The servo drive is in the initialisation phase.
 flashing green	The servo drive is ready, and the power stage is switched off (Ready).
 green light	The power stage and the closed-loop controller are enabled.

Tab. 47: Status LED

⏻ **Power LED, status of the power supply**

LED	Meaning
 yellow light	The logic power supply is present, but the load voltage supply is not present or is currently being measured.
 green light	The load voltage supply and the logic power supply are present.

Tab. 48: Power LED

⚠ **Safety LED, functional status of the safety engineering**

Malfunctions of the safety sub-function are detected and displayed in the functional device. The following are detected:

- Safety sub-function STO requested via 1 channel (discrepancy monitoring)
- Plausibility check of STO channel switch-off

Malfunctions are externally reported by the functional part, including via the additional communication interfaces (bus, commissioning software).

LED	Meaning
 flashing red	Error in the safety part or a safety condition has been violated.
 yellow light	The safety sub-function has been requested and is active.
 green light	Ready, a safety sub-function has not been requested.

Tab. 49: Safety LED

() Application status

LED	Meaning
 flashes alternately between red, yellow and green	Identification sequence active (for optical identification of the device in a network), which can be activated via the parameterisation software
 flashing yellow	
 yellow light	
 flashing green	
 green light	reserved for future extensions
 flashing yellow	
 yellow light	
 flashing green	

Tab. 50: Application status LED

Special function of the start program (bootloader) during firmware updates

When the bootloader starts the update procedure, the status LED flashes yellow at half-second intervals. The power LED, safety LED and application status LED remain off.

If an error occurs during a firmware update, the status LED flashes red at one-second intervals. The frequency of flashing corresponds to the error number specified in the following table. After flashing, there is a pause of 3 s. Then the procedure repeats.

Error number	Description
1	The start program has detected a CRC error in the firmware after switching on.
2	The start program has detected a CRC error in the firmware update package after switching on.
3	The start program has detected another fatal error that prevents the device from being started.

Tab. 51: Error messages of the start program (bootloader)

8.1.2 Interface status [X18]

CMMT-...-MP: LEDs on [X18]; connection status of the Ethernet interface

LED	Meaning (top LED)
 off	Interface is deactivated.
 green light	Interface is activated.
 flashing green	Communication activity.

Tab. 52: Top LED at [X18]

LED	Meaning (bottom LED)
 off	reserved

Tab. 53: Bottom LED at [X18]

8.1.3 Device and interface status, EtherCAT

Together with the 2 LEDs on the top, the Run LED and the Error LED on the front display the bus/network status.

EtherCAT, LED RN or Run; operating status

LED	Meaning	Remedy
 off	The device is in the Init status (initialisation).	–
 flashing green	The device is in the pre-operational status.	–

LED	Meaning	Remedy
 flashing green ¹⁾	The device is in the safe-operational status.	–
 green light	The device is in the operational status (normal operating status).	–

1) Single flash: short single flash (1x flash, pause, 1x flash, etc.)

Tab. 54: LED RN or Run

EtherCAT, LED ER or Error; error status

LED	Meaning	Remedy
 off	no error	–
 flashing red	invalid configuration, general configuration error, a status change specified by the master is not possible.	Eliminate configuration error.
 flashing red ¹⁾	Local error, the slave device application has independently changed the EtherCAT status. This can have the following causes: – A host watchdog time-out has occurred. – Synchronisation error, the device switches automatically to the safe-operational status.	–
 flashing red ²⁾	A process data watchdog time-out has occurred.	–

1) Single flash: short single flash (1x flash, pause, 1x flash, etc.)

2) Double flash: short double flash (2x flash, pause, 2x flash, etc.)

Tab. 55: LED ER or Error

EtherCAT, LINK/ACTIVITY LED; connection status at XF1 IN and XF2 OUT

LED	Meaning	Remedy
 off	no network connection	Check network connection.
 flickers green (approx. 10 Hz)	Data traffic activity (traffic).	–
 green light	Network connection is OK (link).	–

Tab. 56: LED at XF1 IN and XF2 OUT

8.1.4 Device and interface status, PROFINET

Together with the 4 LEDs on the top, the NF LED on the front displays the bus/network status. In the case of devices with multi-protocol CMMT-AS-...-MP, the SF LED indicates common errors for PROFINET communication.

CMMT-...-MP: PROFINET, LED NF; bus error

LED	Meaning	Remedy
 off	no error	–
 flashes red (2 Hz)	Network error: – no data transfer – no configuration	Check network configuration and network connection.
 red light	Network error: – no physical connection to the network	Check network connection.

Tab. 57: LED NF with the CMMT-...-MP

CMMT-...-MP: PROFINET, LED SF; common error

LED	Meaning	Remedy
 off	no error	–
 flashing red (1 Hz, 3 s)	DCP signal service is triggered via the bus (Discovery and basic Configuration Protocol).	–
 red light	– At least one station in the network is no longer available for data exchange. – With active PROFIdrive diagnostics (Activate diagnostics): device error of the servo drive	Check devices in the network. Check whether devices in the network are required for operation of the system.

Tab. 58: LED SF with the CMMT-...-MP

PROFINET, LEDs at XF1 IN and XF2 OUT; connection status, data traffic

LED	Meaning of the green LED	Remedy
 off	no network connection	Check network connection.
 green light	Network connection is OK (link).	–

Tab. 59: Green LED at XF1 IN and XF2 OUT

LED	Meaning of the yellow LED	Remedy
 off	no data traffic	–
 flashing yellow	Data traffic activity (traffic).	–

Tab. 60: Yellow LED at XF1 IN and XF2 OUT

8.1.5 Device and interface status, EtherNet/IP

Together with the 4 LEDs on the top (Link/Activity), the MS LED and NS LED on the front display the bus/network status.

EtherNet/IP, MS LED; module status

LED	Meaning	Remedy
 off	No logic voltage supply.	Check logic voltage supply.
 flashing green	Device is not configured.	Perform configuration.
 green light	normal operating status	–
 flashing red/green	Device is performing a self-test.	–
 flashing red	rectifiable error, possibly a configuration error	Check configuration.
 red light	error cannot be rectified	Contact Festo Service ➔ www.festo.com .

Tab. 61: MS LED

EtherNet/IP, NS LED; network status

LED	Meaning	Remedy
 off	The device is switched off or has no IP address.	Switch on device or check IP address.
 flashing green	The device has an IP address but no CIP connection. It may be that the device is not assigned to a master/scanner.	Eliminate configuration error.
 green light	Normal operating status. The device is online and has a CIP connection.	–
 flashing red/green	Device is performing a self-test.	–
 flashing red	One or more I/O connections are in the time-out status.	Check the physical connection to the master/scanner.
 red light	The IP address of the device has already been assigned.	Check and correct IP addresses in the network.

Tab. 62: NS LED

EtherNet/IP, LED at XF1 IN and XF2 OUT; connection status, data traffic

LED	Meaning of the green LED	Remedy
 off	no network connection	Check network connection.
 green light	Network connection is OK (link).	–

Tab. 63: Green LED at XF1 IN and XF2 OUT

LED	Meaning of the yellow LED	Remedy
 off	no data traffic	–
 flickers yellow	Data traffic activity.	–

Tab. 64: Yellow LED at XF1 IN and XF2 OUT

9 Disassembly

 WARNING

Danger of burns from hot housing surfaces.

Metallic housing parts can reach high temperatures during operation.
Contact with metal housing parts can cause burn injuries.

- Do not touch metallic housing parts.
- After the power supply is switched off, let the device cool down to room temperature.

Disassemble in reverse order of mounting.

Before disassembly

1. Switch off the power supply at the main switch.
2. Secure the system against accidental reactivation.
3. Let the device cool down to room temperature.
4. Disconnect all electrical cables.

Disassembly for wall mounting

- Loosen retaining screws (2x) and remove the device from the mounting surface.

Disassembly for H-rail mounting

- Press the servo drive slightly downwards, then carefully tilt it upwards and remove it from the H-rail.

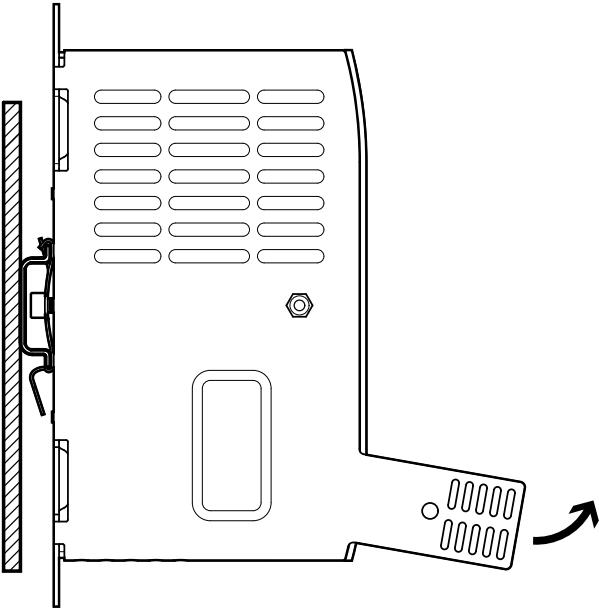


Fig. 18: Removal from the H-rail

10 Technical data

10.1 Technical data, general

General technical data		
Certificates, declaration of conformity	➔ www.festo.com/sp	
Type ID code	CMMT-ST	
Type of mounting	Mounting plate, attached with screws H-rail mounting	
Mounting position	vertical, free convection with unhindered air flow from bottom to top	
Dimensions (H*W*D)	➔ 6 Assembly	
Product weight	[kg]	approx. 0.35
Displays	- Device status display: 4 LEDs - Bus-specific status: 2 LEDs - RTE network status LEDs [X1F IN], [X1F OUT]: 4 LEDs - Ethernet status LEDs [X18]: 2 LEDs	

General technical data	
Parameterisation interface	– [X18], Ethernet; parameterisation and configuration with commissioning software – [XF1 IN], [XF2 OUT], RT Ethernet; parameterisation and configuration with bus protocol
RT Ethernet protocol	EtherCAT EtherNet/IP, Modbus TCP PROFINET

Tab. 65: General technical data

Ambient conditions, transport in original packaging or in control cabinet	
Transport temperature [°C]	–25 ... +70
Relative humidity [%]	5 ... 95 (non-condensing)
Max. transportation duration [d]	56 at 70 °C
Permissible altitude [m]	12000 (above sea level) for 12 h
Vibration resistant	Vibration test and free fall in packaging in accordance with EN 61800-2

Tab. 66: Ambient conditions, transport

Ambient conditions, storage in original packaging or in control cabinet	
Storage temperature [°C]	–25 ... +55
Relative humidity [%]	5 ... 95 (non-condensing)
Permissible altitude [m]	3000 (above sea level)

Tab. 67: Ambient conditions, storage

Ambient conditions, operation	
Ambient temperature [°C]	0 ... +50
Cooling	via ambient air in the control cabinet
Relative humidity [%]	5 ... 90 (non-condensing) corrosive media not permitted in the vicinity of the device
Permissible setup altitude above mean sea level [m]	0 ... 2000 Operation above 2000 m is not permitted!
Degree of protection	IP20 Use in a control cabinet with at least IP54, design as “closed electrical operating area” in accordance with EN 61800-5-1, Chap. 3.5

Ambient conditions, operation	
Protection class	III (safety extra-low voltage)
Overvoltage category	I
Pollution degree	2
Vibration resistance in accordance with	EN 61800-5-1 and EN 61800-2
Shock resistance in accordance with	EN 61800-2
EMC in accordance with	EN 61800-5-2

Tab. 68: Ambient conditions, operation

Service life	
Service life of the device at rated load [h]	25000 Dependent on the required current and the ambient temperature in compliance with the necessary mounting clearances and derating → 10.3 Characteristic curves

Tab. 69: Service life

Materials	
Housing	Hood: plastic AKULON K223-KMV6 Cooling profile: sheet steel

Tab. 70: Materials

10.2 Technical data, electrical

10.2.1 Load and logic voltage supply, braking resistor [X9]

Electrical data, load voltage supply [X9], pin 1		
Voltage range	[V DC]	24 – 15% ... 48 + 15%
Nominal operating voltage	[V DC]	24 ... 48
Nominal current	[A]	8
Peak current	[A]	20 for 3 s
Nominal power	[W]	300 at 48 V
Load efficiency	[%]	96.5 at nominal power 300 W

Electrical data, load voltage supply [X9], pin 1		
Short circuit current rating [A] (SCCR)		5000
Protective functions	– Protection against polarity reversal – Overcurrent protection input (20 A fuse, cannot be reset) – Adjustable protection against feedback on DC link rise	

Tab. 71: Load voltage supply

Electrical data, logic power supply [X9], pin 3		
Logic voltage range [V DC]		24 ± 15 %
Nominal voltage [V DC]		24
Current consumption [A] (without holding brake)		1
Current consumption (with holding brake) [A]		2
Logic efficiency [%]		82
Protective functions	– Protection against polarity reversal – Overvoltage protection (from approx. 31 V) – Overcurrent protection input (4 A fuse, cannot be reset) – Overcurrent protection + 24 V DC output [X1A] pin 1 and [X1C] pin 1 (0.5 A fuse, can be reset, PTC)	

Tab. 72: Logic supply

Requirements on external braking resistor [X9], pin 4 and pin 5		
Max. resistance [Ω]		50
Min. resistance [Ω]		6 ± 10%
Nominal power [W]		60
Permissible pulse energy (for the brake chopper) [Ws]		2300
Operating voltage [V DC]		≥ 100
Thermal protection	Yes, possible to monitor the power in the braking resistor in the device firmware	

Tab. 73: Braking resistor

10.2.2 Power specifications, motor connection [X6]

Power specifications during operation		
Nominal output current	[A]	8

Tab. 74: Power specifications during operation

Any derating that may be necessary as a function of the ambient temperature → Fig. 19.

The CMMT-ST does not have integrated electronic overload and overtemperature protection functions for the motor. An I²t monitoring function can be parameterised for the motor current in order to protect the motor, such as by using the device-specific plug-in.

Power unit temperature monitoring (parameterisable)		
Warning	[°C]	85
Shutdown	[°C]	> 95

Tab. 75: Temperature monitoring

Output of holding brake at [X6]	
Design	High-Side-Switch
Max. continuous output current	[A] 1 (parameterisable holding current reduction)
Max. voltage drop from + 24 V input at connection [X9] to brake output at [X6]	[V DC] 1
Protective functions	Short-circuit and overload-protected

Tab. 76: Output of holding brake at [X6]

10.2.3 Encoder interfaces [X2]

Digital incremental encoder at [X2]	
Parameterisable no. of encoder pulses	1 ... 262144 periods/revolution (18 bit)
Angle resolution/interpolation	4-fold evaluation as 4 steps (2 bits) per period
Tracking signals A/B/N	RS422/485
Input impedance A/B/N	[Ω] 120 (differential input)
Output supply	[V] 5.25
	[A] max. 0.5, unregulated (no Sense cable)
Support: mechanical multiturn encoder	no

Digital incremental encoder at [X2]	
Support: battery-buffered multiturn encoder	no
Support: encoder parameter memory	no
Encoder signal monitoring	no, no direct encoder signal monitoring
Protective function	no overload protection

Tab. 77: Digital incremental encoder at [X2]

Absolute encoders with BiSS C protocol		
Supply	[V]	5.25
	[A]	0.5
Resolution	can be parameterised - default: 16 bit	
Support: mechanical multiturn encoder	no	
Support: battery-buffered multiturn encoder	no	
Support: encoder parameter memory	yes	
Encoder signal monitoring	yes	
Protective function	no overload protection	

Tab. 78: Encoder with BiSS C protocol

10.2.4 Digital inputs and outputs [X1A]

Control inputs #STO-A and #STO-B at [X1A]		
Nominal voltage	[V DC]	24; relative to 0 V at X9
Permissible voltage range ¹⁾	[V DC]	−3 ... 30
Max. input voltage, high level ($U_{H \max}$)	[V]	28.8
Min. input voltage, high level ($U_{H \min}$)	[V]	20
Max. input voltage, low level ($U_{L \max}$)	[V]	5

Control inputs #STO-A and #STO-B at [X1A]		
Min. input voltage, low level ($U_{L \min}$)	[V]	–3
Max. input current with high level ($I_{H \max}$)	[mA]	15
Min. input current with high level ($I_{H \min}$)	[mA]	8
Max. input current with low level ($I_{L \max}$)	[mA]	0.5
Tolerance for low test pulses		
Tolerated low test pulses ($t_{STO,TP}$) up to max.	[ms]	1
Min. time between low test pulses	[ms]	50
Tolerance for high test pulses ²⁾		
Tolerated high test pulses ($t_{STO,TP}$) up to max.	[ms]	1
Min. time between high test pulses at $U_{STO-A/B} < U_{L \max}$	[ms]	50

1) Every channel has a separate overvoltage monitor for the power supply at the input. If the voltage at the input exceeds the permissible maximum value, the channel is shut down.

2) High test pulses must never occur simultaneously at inputs #STO-A and #STO-B but only with a time offset.

Tab. 79: Control inputs #STO-A and #STO-B at [X1A]

Diagnostic contact STA at [X1A]		
Design		Potential-free contact
Voltage range	[V DC]	18 ... 30
Max. current	[mA]	100; not short-circuit proof
Max. internal resistance	[Ω]	< 6
Off-state current (contact open)	[μA]	< 2
Closing reaction time $t_{STA,Rise}$	[ms]	< 30
Opening reaction time $t_{STA,Fall}$	[ms]	< 20
Galvanic isolation		Via optocoupler
Protective functions		Overvoltage-resistant up to 60 V DC

Tab. 80: Diagnostic contact STA-C1/C2 at [X1A]

Digital inputs without safety inputs at [X1A]		
Specification		Based on type 3 in accordance with EN 61131-2; deviating current consumption
Nominal voltage	[V DC]	24
permissible voltage range	[V DC]	–3 ... 30
Min. input current in transition range ($I_{T \min}$)	[mA]	1.5
Max. input voltage ($U_{H \max}$), high level	[V]	30
Min. input voltage ($U_{H \min}$) high level	[V]	Typically 11 Max. 13
Max. input voltage ($U_{L \max}$), low level	[V]	5
Min. input voltage ($U_{L \min}$), low level	[V]	–3
Max. input current ($I_{H \max}$) with high level	[mA]	15
Min. input current ($I_{H \min}$) with high level	[mA]	5
Max. input current ($I_{L \max}$) with low level	[mA]	15
Data for Basic In 1 and Basic In 2 inputs (Capture)		
Delay time in the hardware	[μs]	< 2
Min. permissible pulse length (high or low)	[μs]	10
Time resolution/accuracy (high or low)	[μs]	< 1
Data for the CTRL-EN input (power stage enable/acknowledge error)		
Delay time in the hardware	[μs]	< 10

Tab. 81: Digital inputs without safety inputs

Digital outputs at [X1A] (X1A.9 and X1A.10)		
Design		PNP operation: High-Side-Switch
Characteristics		– Freely configurable – Not galvanically isolated
Voltage range	[V DC]	0 ... 30

Digital outputs at [X1A] (X1A.9 and X1A.10)		
Permissible output current	[mA]	100
Max voltage loss	[V]	< 3
Protective function	– Short-circuit proof – Feedback-proof – Overvoltage-resistant up to 60 V – Automatic switch-off at overtemperature	

Tab. 82: Digital outputs at [X1A]

Voltage for supplying external components at [X1A.1]		
Output voltage	[V DC]	+24 (internal logic voltage)
Use	Supply of potential-free outputs of the PLC, e.g. a potential-free relay contact for the CTRL-EN input	
Max. output current	[mA]	100
Protective function	– Short circuit to 0 V – Feedback-proof	

Tab. 83: Voltage for supplying external components at [X1A]

10.2.5 Reference switch [X1C]

Digital inputs for the reference switch/limit switch		
Specification	Based on type 3 in accordance with EN 61131-2; deviating current consumption	
Nominal voltage	[V DC]	24
permissible voltage range	[V DC]	–3 ... 30
Min. input current in transition range ($I_{T \min}$)	[mA]	1.5
PNP logic		
Delay time in the hardware during switch-on	[μs]	< 30
Delay time in the hardware during switch-off	[μs]	< 4000
Max. input voltage ($U_{H \max}$), high level	[V]	30
Min. input voltage ($U_{H \min}$), high level	[V]	typically 11 max. 13

Digital inputs for the reference switch/limit switch		
Max. input voltage ($U_{L \max}$), [V] low level		5
Min. input voltage ($U_{L \min}$), [V] low level		–3
Max. input current ($I_{H \max}$), [mA] high level		15
Min. input current ($I_{H \min}$), [mA] high level		5
Max. input current ($I_{L \max}$), [mA] low level		15

Tab. 84: Digital input for reference switch/limit switch

Voltage for supply of external components at [X1C.1]		
Output voltage [V DC]		+24 (internal logic voltage)
Use		Supply of axis peripheral modules, e.g. reference switch or limit switch
Max. output current [mA]		100
Protective function		– Short circuit to 0 V – Feedback-proof

Tab. 85: Voltage for supply of external components at [X1C]

10.2.6 Standard Ethernet [X18], parameterisation interface

Standard Ethernet [X18], parameterisation interface	
Design	To IEEE 802.3:2012-00 ¹⁾
Connection design	RJ45
Transmission rate [Mbit/s]	10/100 (full/half duplex)
Supported protocols	TCP/IP
IP address set at factory (presetting)	192.168.0.1

1) Restriction: The interface is galvanically isolated and intended for use with limited cable lengths.

Tab. 86: Standard Ethernet [X18]

10.2.7 Real-time Ethernet [XF1 IN], [XF2 OUT]

Real-time Ethernet [XF1 IN], [XF2 OUT]	
Design	RTE communication, physical level in accordance with IEEE 802.3: 2012-00 ¹⁾
Bus connection design [XF1 IN]	RJ45
Bus connection design [XF2 OUT]	RJ45
Max. transmission rate [Mbps]	100
EtherCAT bus protocol	
Protocol	– CoE (CANopen over EtherCAT) – EoE (Ethernet over EtherCAT) – FoE (file access over EtherCAT)
Communication profile	– CiA 402
EtherNet/IP, Modbus TCP bus protocol	
Protocol	– Implicit messaging – Explicit messaging
PROFINET bus protocol	
Protocol	– PROFINET RT – PROFINET IRT
Drive profile	– PROFIdrive

1) Restriction: the interface is galvanically isolated and intended for use with limited cable lengths.

Tab. 87: Real-time Ethernet [XF1 IN], [XF2 OUT]

10.3 Characteristic curves

Required derating

Mounting clearances may be required at output currents > 4.6 A to ensure the device reaches its specified service life. The required mounting clearances depend on the ambient temperature and the output current.

Mounting clearances from 0 mm are possible for a device compound consisting of several servo drives CMMT-ST. The following characteristic curves show the maximum permissible effective currents for the lateral mounting clearances 0 mm, 3 mm, 10 mm and 15 mm → 6.1 Mounting clearances.

CMMT-ST

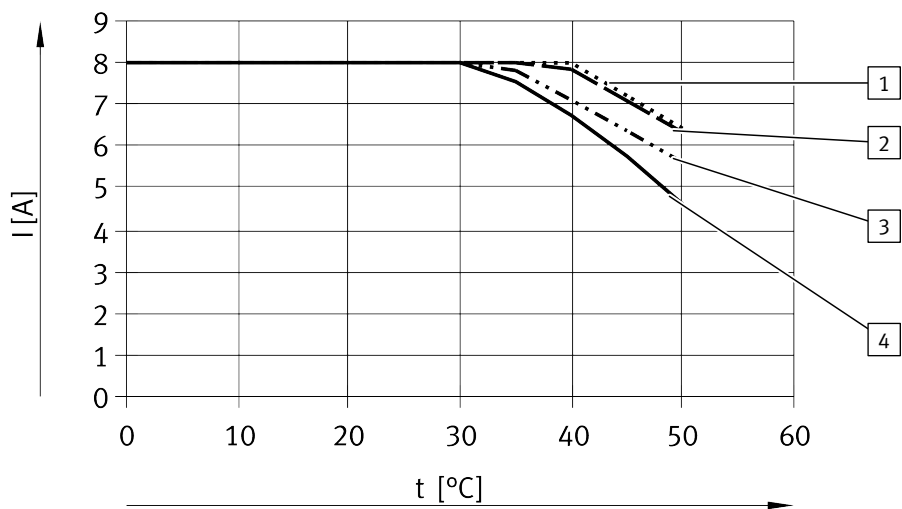


Fig. 19: Power reduction as a function of the ambient temperature and mounting clearance

- 1

Mounting clearance 15 mm
- 2

Mounting clearance 10 mm
- 3

Mounting clearance 3 mm
- 4

Mounting clearance 0 mm

10.4 Technical data UL/CSA certification

In combination with the UL inspection mark on the product, the information in this section must also be observed in order to comply with the certification conditions of Underwriters Laboratories Inc. (UL) for USA and Canada.

UL/CSA certification information	
Product category code	NMMS / NMMS7 (Power Conversion Equipment)
File number	E331130_Vol-3_Sec-1
Considered standards	UL 61800-5-1 Adjustable Speed Electrical Power Drive Systems CSA C22.2 No. 274-17 – Adjustable Speed Drive
UL mark	
UL control number	4PU8

Tab. 88: UL/CSA certification information

Electrical Data and Ambient Conditions UL	
Overvoltage category	II
Pollution degree	2 (or better)
Protection class	Class III (SELV/PELV)
Installation site	for indoor use only
Max. installation height	2000 m
SCCR (short circuit current rating)	5000 A

Tab. 89: Electrical Data and Ambient Conditions UL/CSA

- Use 60/75 °C copper conductors only:
 - [X6], motor connection
 - [X9], load and logic voltage
- Use in an environment with pollution degree 2 (or better).
- Maximum surrounding air temperature: 50 °C
- With correct parameterisation of the nominal motor current, the motor is protected against overloading by the I²t monitoring function.
- For the load voltage supply, the use of a suitable fuse is recommended in accordance with the following table.

Fuse requirements	
Overcurrent protective device	UL Listed JDDZ class K5
Max. permissible rated current [A]	30
Min. short circuit current rating SCCR of mains fuse [kA]	5
Min. rated voltage [V DC]	125

Tab. 90: Fuse requirements for load voltage supply

Example: Littelfuse NLN 30, Bussmann NON-30

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