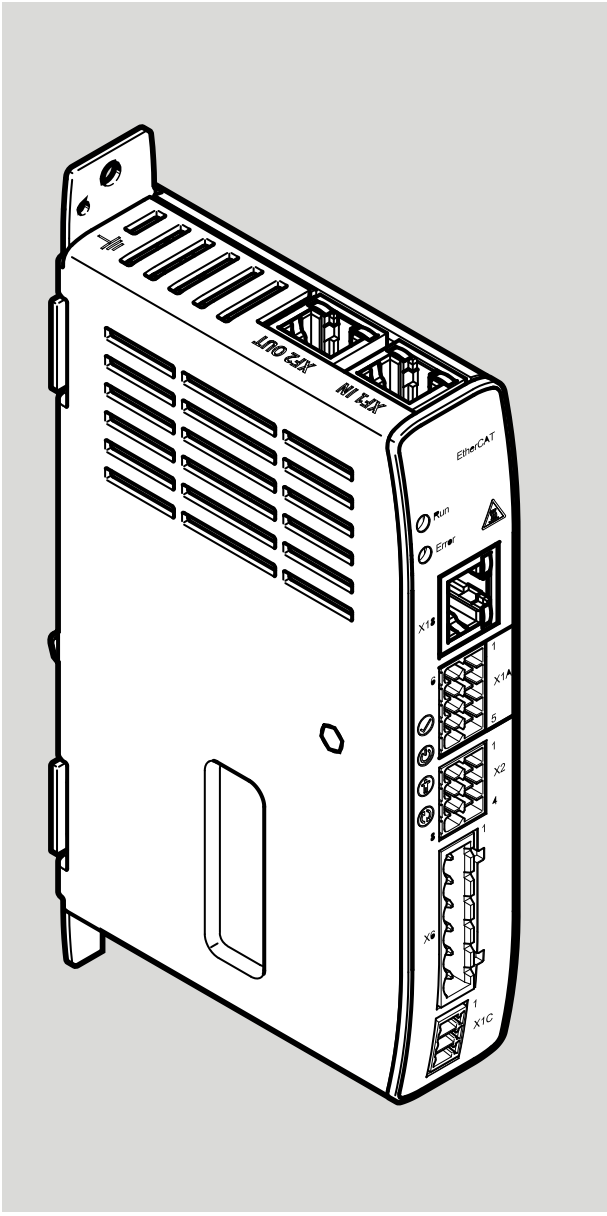
CMMT-ST-C8-1C-...-S0
Servo drive



FESTO

Description |
Assembly, Installation

8113755

8113755
2019-10a
[8113757]

Translation of the original instructions

Table of contents

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/pk.

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

Designation	Contents
Product instruction manual	Installation, safety sub-function
Product descriptions	Detailed description of assembly, installation
	Detailed description of safety sub-function
Description/online help plug-in	Plug-in: – Functions and operation of the software – Initial commissioning assistant 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 product is available in 3 fieldbus variants. The following order code indicates the equipment features of the product variant.

Feature	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

Feature	Order code	Type
Bus protocol/activation	EC-	EtherCAT
	EP-	EtherNet/IP
	PN-	PROFINET
Safety function	S0	Basic safety

Tab. 2 Product variants CMMT-ST-... (e.g. CMMT-ST-C8-1C-EC-S0)

This documentation refers to the following version:

– Servo drive CMMT-ST-...-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
  ➔ www.festo.com/pk.

1.4 Product labelling

- Observe the specifications on the product.

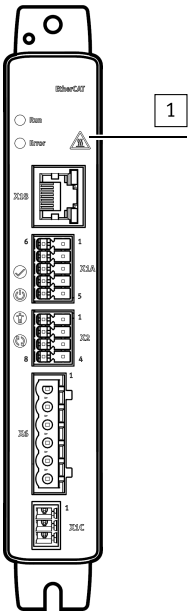
The product labelling is located on the right side of the device. The product labelling enables identification of the product and shows the following information:

Product labelling (example)	Meaning
CMMT-ST-C8-1C-EC-S0	Order Code
8084005 MM-YYYY:XX SNM Rev 01SNW	Part number, serial number (manufacturing month, manufacturing 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 barcode
R-R-FTO-KC-2018-1092	KC mark certificate (test mark for Korea)
01/205/5696.00/19	TÜV certificate number
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

Product labelling (example)	Meaning
Made in Germany	Manufactured in 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:



1 Attention! Hot surface

Fig. 1 Warning symbol on the front of the product (example CMMT-ST-...EC)

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 should only be carried out by qualified personnel.
- Only use the product if it is in perfect technical condition.
- Only use the product in original status without unauthorised modifications.
- Do not carry out repairs on the product. If defective, replace the product immediately.
- Observe labelling on the product.
- This product can generate high frequency malfunctions, which may make it necessary to implement interference suppression measures in residential areas.
- Take into consideration 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 a plug 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 somewhere safe throughout the entire product lifecycle.

In the event of damage caused by unauthorised manipulation or any form of use other than that intended, the warranty is invalidated and the manufacturer is not liable for damages.
In the event of damage caused by using unauthorised software or firmware with the device, the warranty is invalidated, and the manufacturer is not liable for damages.

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Safety instructions for the safety sub-functions of the product ➔ Description Safety sub-function.

2.2 Intended Use

The servo drive CMMT-ST is intended to supply a stepper motor or an EC motor with power, as well as to regulate them. The integrated electronics permit 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 ➔ 11 Technical data
- In an industrial environment

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Intended use of the safety sub-functions for the product ➔ Description 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 or without an integrated holding brake (electrical spring-operated 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 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
– The applicable regulations for operating safety-related systems

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

2.4 CE marking

The product has the CE marking.
The product-related EU directives and standards are listed in the declaration of conformity ➔ www.festo.com/sp.

2.5 Safety engineering approval

The product is a safety device in accordance with the Machinery Directive. For details of the safety-oriented standards and test values that the product complies with and fulfils, see ➔ Description Safety

sub-function, Technical data, safety engineering. Please note that compliance with the named 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 ➔ 11.4 Technical data UL/CSA certification.

3 Additional information

- Accessories ➔ www.festo.com/catalogue.
- Spare parts ➔ www.festo.com/spareparts.
- All available documents for the product and current versions of the firmware and commissioning software ➔ www.festo.com/sp.

4 Service

Contact your regional Festo contact person if you have technical questions ➔ www.festo.com.

5 Product overview

5.1 Scope of delivery

Component	Number
Servo drive CMMT-ST-...	1
Assortment of plugs NEKM-C-22	1
H-rail clamp (premounted)	1
Instruction manual CMMT-ST-...	1

Tab. 7 Scope of delivery

Below are some examples of the available accessories:

- Patch cable for linkage of the RTE interface

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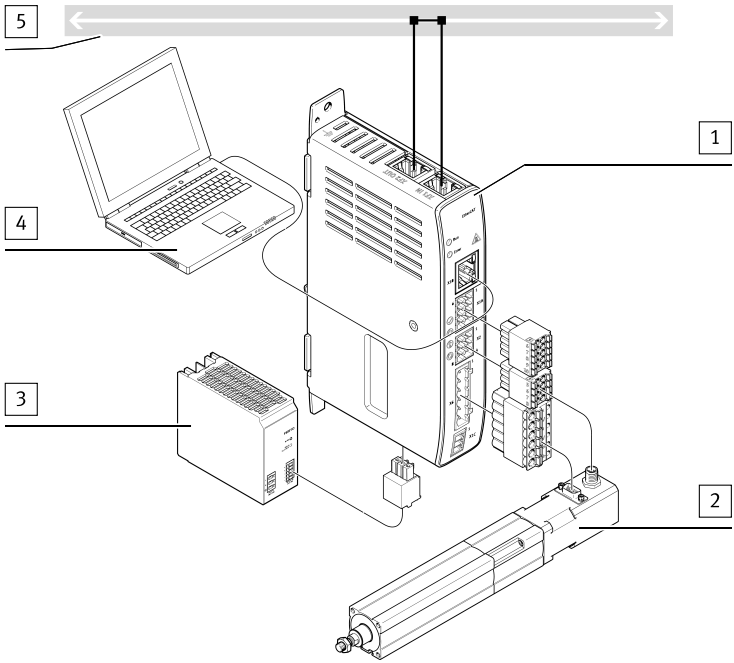
Up-to-date information on the accessories ➔ www.festo.com/catalogue.

5.2 System structure

The servo drive CMMT-ST is a 1-axis servo drive for controlling a stepper motor or an EC motor with connected mechanisms, e.g. an axis from Festo. The device is controlled by a higher-level controller using the bus protocol EtherCAT, EtherNet/IP or PROFINET, depending on the product version, via a real time Ethernet interface.
The device can be parameterised via a PC using either the real-time Ethernet interface or the separate standard Ethernet interface.

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

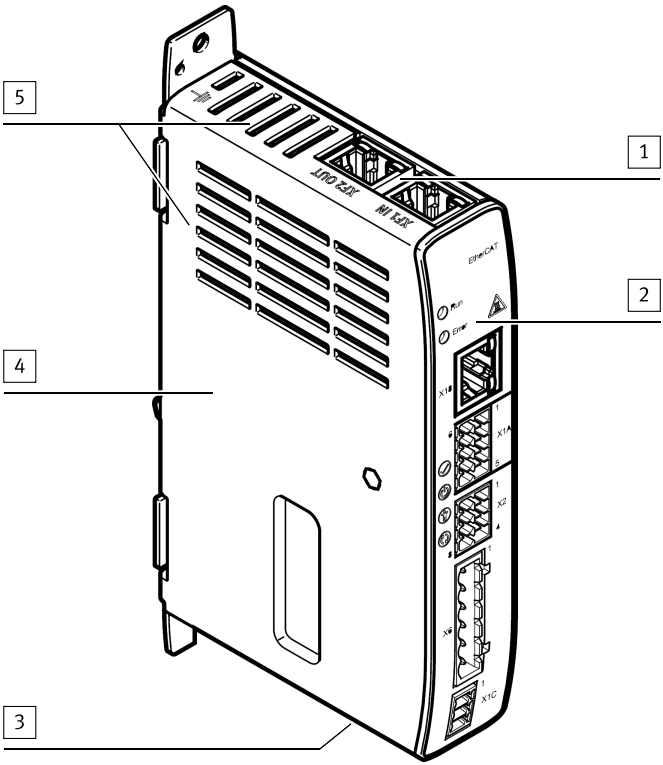


1 Servo drive CMMT-ST
2 Stepper motor or EC motor with drive
3 Fixed power supply (or supplies) for logic and load voltage (PELV)
4 PC with Ethernet connection for parametrisation
5 Bus/network

Fig. 2 System structure (example)

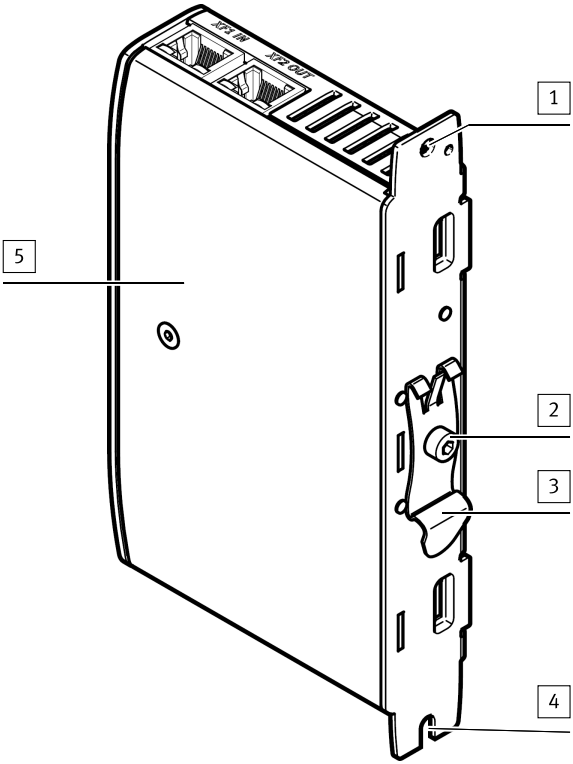
5.2.1 Product design

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 forms the cooling elements. Heat is also dissipated to the surroundings via the cooling elements. The device does not have a fan.



1 Top
2 Front side
3 Bottom
4 Cooling element (metal housing parts, top, bottom left side and back of housing)
5 Ventilation slots

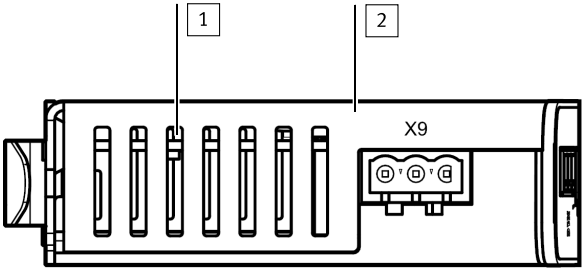
Fig. 3 Servo drive CMMT-ST



1 top hole for wall mounting
2 Retaining screw for t-rail clamp
3 T-rail clamp
4 Bottom slot for wall mounting
5 Hood (right side of housing)

Fig. 4 Elements on the back

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

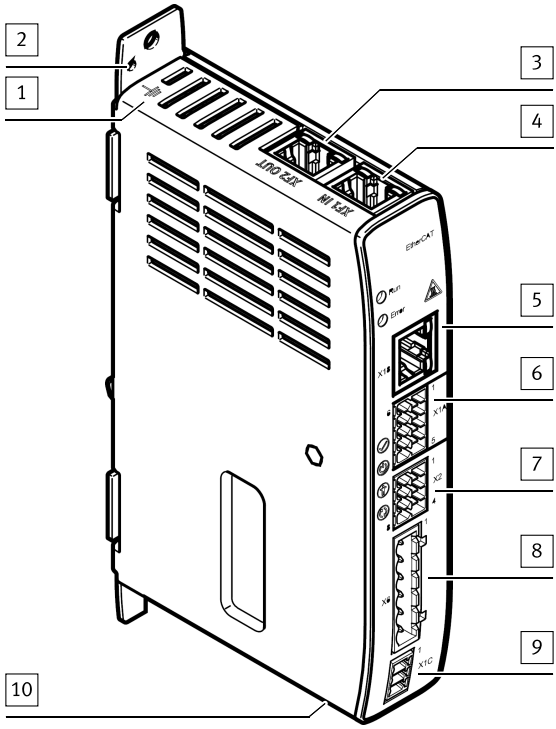


1 Ventilation slots

2 Bottom of the CMMT-ST

Fig. 5 Bottom

5.2.2 Overview of connection technology



1 Functional earth marking
2 Functional earth connection
3 [XF2 OUT] RTE interface port 2
4 [XF1 IN] RTE interface port 1
5 [X18] Standard Ethernet
6 [X1A] I/O interface
7 [X2] Encoder connection
8 [X6] Motor connection
9 [X1C] Connection for the reference switch or limit switch
10 [X9] Load and logic voltage (underneath)

Fig. 6 Connections of the CMMT-ST (example CMMT-ST-C8-1C-EC)

6 Transport and storage

- Protect the product during transport and storage from excessive stress factors. 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.

7 Assembly

Dimensions

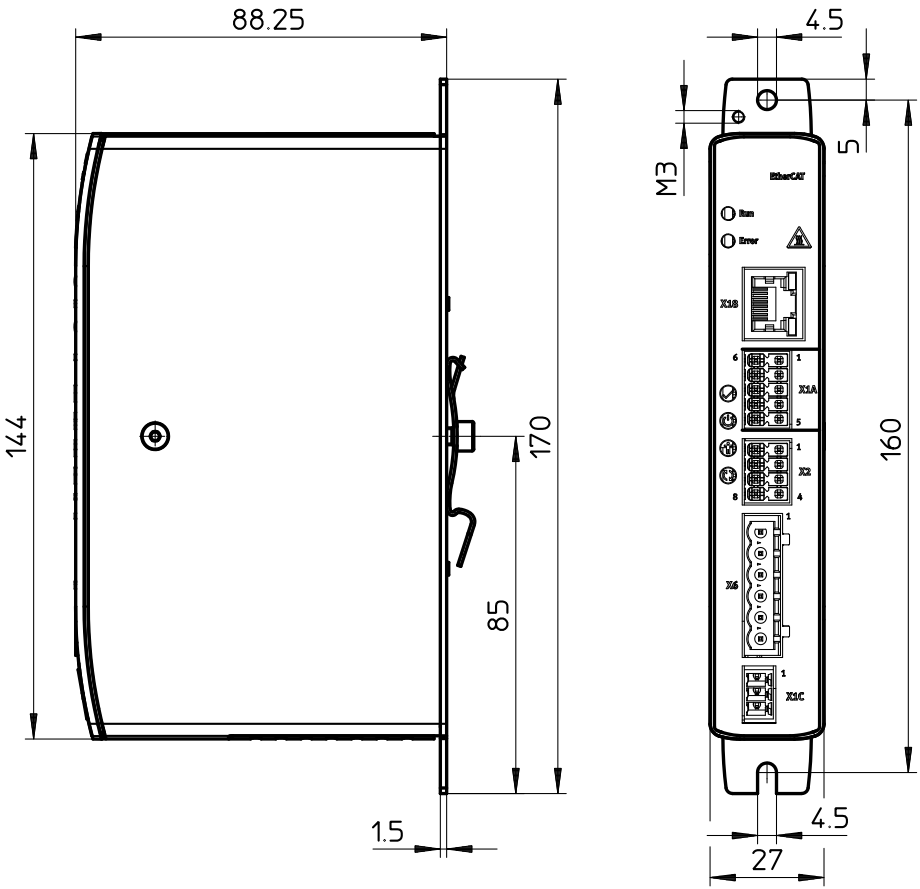


Fig. 7 Dimensions [mm]

7.1 Mounting clearances

The servo drives of the series CMMT-ST can be arrayed next to each other.
For effective output currents › 4.5 A, mounting clearances may be required on both sides so that the heat generated during operation can be removed by allowing sufficient air to flow.
Detailed information about the required mounting clearances and any derating that may be necessary as a function of the ambient temperature ➔ Fig.15

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. 8 Required mounting clearances (examples)

In order for the device to reach its specified service life, the maximum housing interior temperature must be restricted. The specified derating serves to restrict the housing interior temperature.
The necessary clearances are determined by the temperature in the control cabinet and the required effective current. The PositioningDrives software from Festo can help to calculate the effective current. If the clearances are set too low, the device will be switched off by the I^2t or temperature monitoring function of the output stage. The maximum device current can be parameterised in the plug-in irrespective of the nominal current of the connected motor ➔ description of or 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

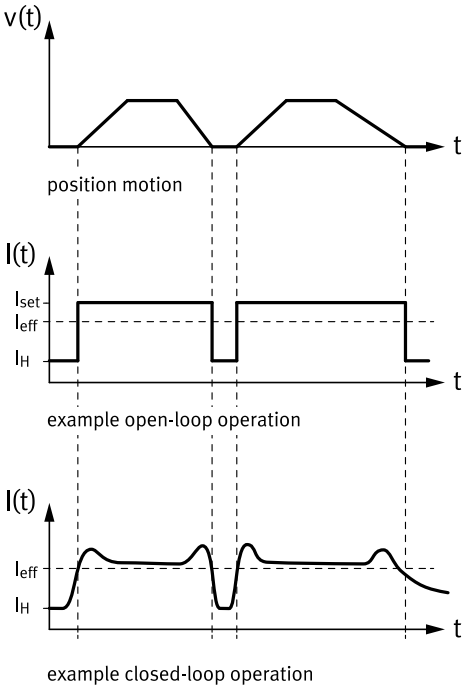


Fig. 8 Effective current timing graph (example)

Name	Description
I_{eff}	Effective current
I_{set}	Set 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. 9 Legend for effective current timing graph

7.2 Installation

The servo drive is intended to be installed in a control cabinet with at least IP54 degree of protection.
The servo drive can be screwed onto the backwall of the control cabinet or mounted on an H-rail.

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 ➔ Fig.15.
- 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 function ➔ 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 backwall of the control cabinet: screw the device on vertically and flat to the mounting surface.

Mounting 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.

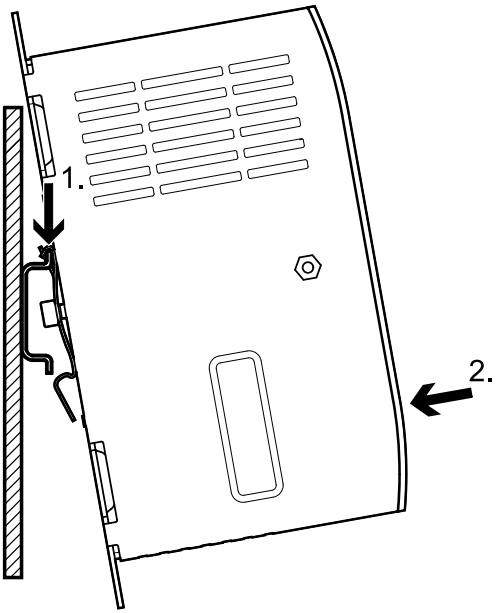


Fig. 9 Mounting on an H-rail

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 flat to 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.

8 Installation

8.1 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.

8.2 EMC-compliant installation

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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 standard EN 60204-1.
– Comply with 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)]	Not required but twisted in pairs[2)]
[X6]	Motor phase connection	25	Not required but twisted in pairs[2)]
[X9]	Logic power supply and load voltage supply	30	Not required

Connection		Max. cable length [m]	Cable shield
[X18]	Standard Ethernet	30	Double shielded (CAT 5)
[XF1 IN]	RTE (port 1)		
[XF2 OUT]	RTE (port 2)		

1) Adhere to the maximum permissible cable length for the encoder used.
2) Shielded cables from Festo can be used. The shield can only be connected on the motor side.

Tab. 10 Cable lengths and cable shield

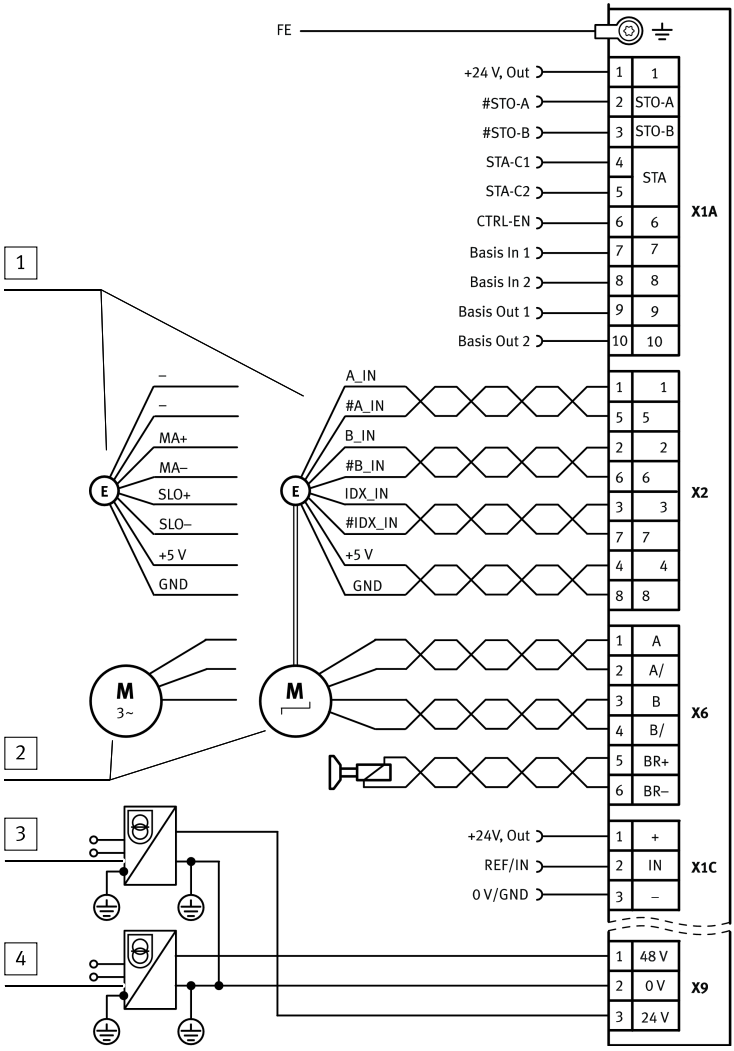
Laying cables

Comply with general guidelines for EMC-compliant installation, e.g.:

– Do not run signal cables parallel to power cables.
– Comply with required minimum distances between signal cables and power cables dependent on the installation conditions. Signal cables must be physically separated from the power cables to the maximum possible extent.
– Wherever possible, avoid crossing signal cables with power cables or running them at only a 90° angle in relation to one another.

The encoder cable is e.g. a signal line and the motor cable is a power cable. These lines must therefore be installed separately.

8.3 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 (24 V ... 48 V)

Fig. 10 Connection example

8.4 Interfaces

8.4.1 [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 (parameterisable switching logic, PNP logic or NPN logic)
– 2 freely configurable digital inputs (parameterisable switching logic, PNP logic or NPN 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 (parameterisable switching logic, PNP logic or NPN logic)
– 2 inputs for the circuitry of the safety sub-function STO (#STO-A, #STO-B)
– 2 contacts for the circuitry of the diagnostic contact of the safety sub-function STO (STA-C1, STA-C2)

Detailed information on the circuitry of the product safety sub-functions can be found in the Description Safety sub-function ➔ 1.2 Applicable documents.
The functional inputs and outputs of this I/O interface are used for coupling to a higher-order PLC, for example. The devices connected to the CMMT-ST all need to have the same switching logic (PNP/NPN). The configuration

PNP and NPN logic
– PNP logic means that a potential is switched.
– NPN logic means that earth is switched.

The required switching logic can be parameterised using the CMMT-ST plug-in ➔ description of or online help for the CMMT-ST plug-in.

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. 11 PNP logic

Signal	Level	Input	Output
Logic 0	24 V	Internal via pull-up resistor	Internal via pull-up resistor
Logic 1	0 V	–	Via low-side driver (consumes current)

Tab. 12 NPN logic

Connection examples

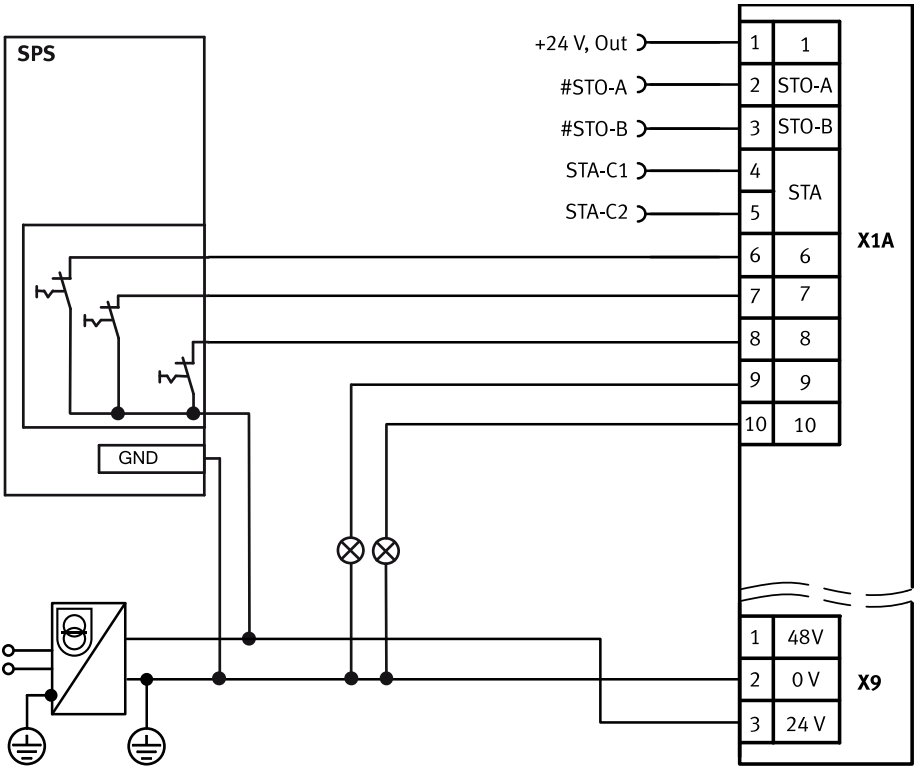


Fig. 11 Connection example, PNP logic

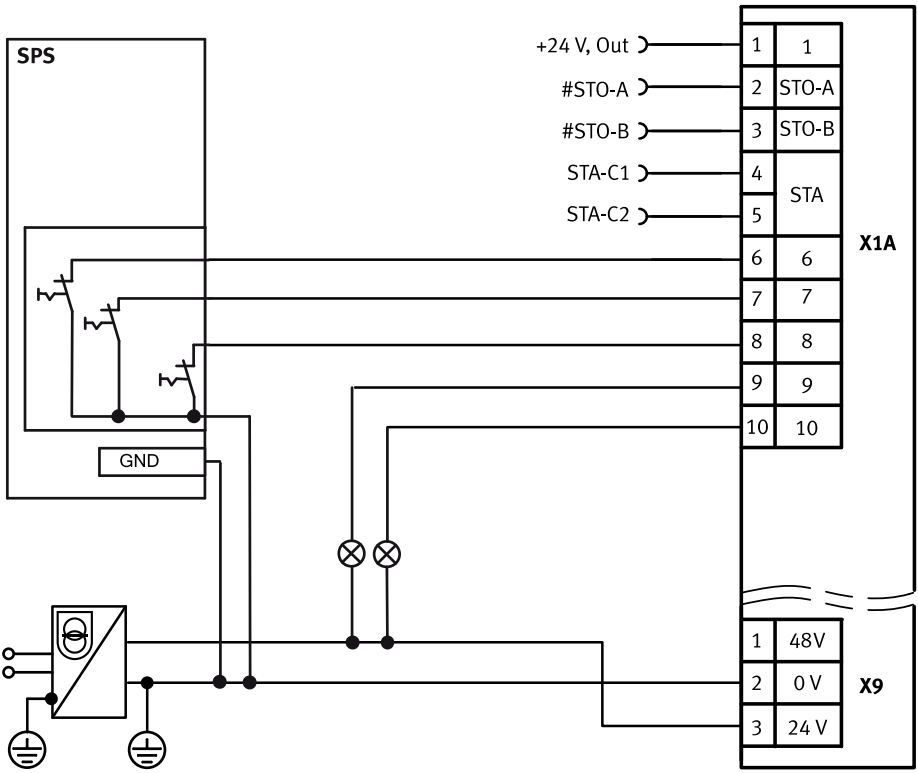
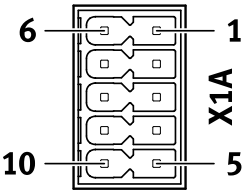


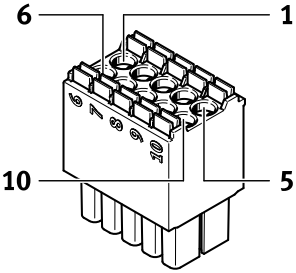
Fig. 12 Connection example, NPN logic

[X1A]	Pin	Function	Description	Mating plug labelling
	1	+ 24 V, out	+ 24 V DC output (fused)	1
	2	#STO-A	Control input Safe torque off, channel A	STO-A
	3	#STO-B	Control input Safe torque off, channel B	STO-B
	4	STA-C1	Diagnostic contact STA 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	Basic out 01	Configurable output	9
	10	Basic out 02	Configurable output	10

Tab. 13 Inputs and outputs for the higher-order PLC

The inputs and outputs are configured using the CMMT-ST plug-in ➔ description of or online help for the CMMT-ST plug-in.

The signals of inputs STO-A/B are low active, so they are marked with #.

Mating plug requirements		
	Identifier	Based on Phoenix Contact DFMC 1,5/ 5-ST-3,5 Included in assortment of plugs NEKM-C-22 (enclosed 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. 14 Mating plug requirements

Requirements for the connecting cable	
Shielding	Not required

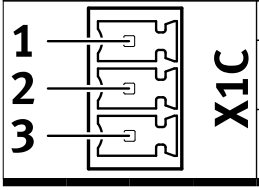
Requirements for the connecting cable	
Min. conductor cross section incl. plastic wire end sleeve[1)]	0.2 mm²
Max. conductor cross section incl. plastic wire end sleeve	1.5 mm²
Max. length	25 m

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

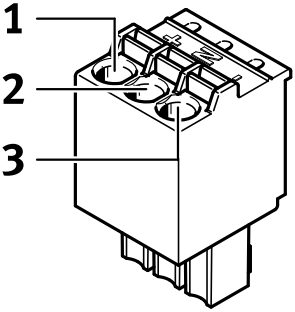
Tab. 15 Requirements for the connecting cable

8.4.2 [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. The switching logic of the input can be parameterised (PNP logic or NPN logic).

[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. 16 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-22 (enclosed with the product)
	Signal contacts	3
	Nominal current	8 A
	Grid dimension	3.5 mm
	Strip length	9 mm
	UL Use Group	D

Tab. 17 Mating plug requirements

Cable requirements	
Shielding	Not required
Min. conductor cross section incl. plastic cable end sleeve[1)]	0.14 mm²
Max. conductor cross section incl. plastic cable end sleeve	1.5 mm²

Cable requirements	
Max. length	25 m

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

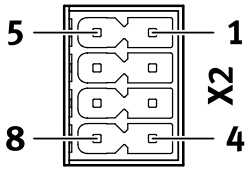
Tab. 18 Cable requirements

8.4.3 [X2], encoder interface

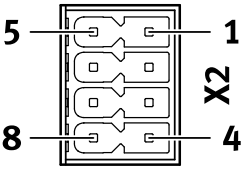
The encoder interface [X2] is located on the front of the device. Communication with the encoder is performed via this interface. The encoder signals are received, and the encoder is supplied with voltage.

The following encoders are supported:

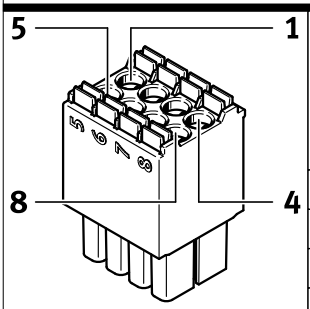
– Incremental encoders with AB signals (quadrature encoder)
– Absolute encoders with BiSS C protocol

[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. 19 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. 20 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-22 (enclosed with the product)
	Number of pins	8
	Nominal current	8 A
	Grid dimension	3.5 mm
	Strip length	10 mm
	UL Use Group	D

Tab. 21 Mating plug requirements

Connecting cable requirements	
Shielding	Not required but twisted in pairs[1)]
Min. conductor cross section[2)]	0.2 mm²
Max. conductor cross section	1.5 mm²

Connecting cable requirements	
Max. length	25 m

1) Shielded cables from Festo can be used. The shield can only be connected on the motor side.
2) The conductor cross section used must be suitable for the currents that arise. If flexible flying leads are used with plastic cable end sleeves, minimum cross sections of 0.14 mm² are possible.

Tab. 22 Connecting cable requirements

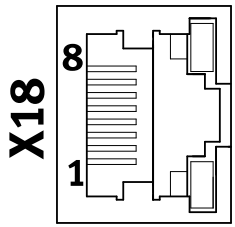
8.4.4 [X18], standard Ethernet

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

– Diagnostics
– Parameterisation
– Control
– Firmware update

The interface fulfils the requirements of standard 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 bushing. 2 LEDs are integrated into the RJ45 bushing. The green LED lights up if the interface is activated. The yellow LED flashes when communication activity is detected.

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. 23 Standard Ethernet

Mating plug requirements	
Design	VS-08-RJ45-5-Q/IP20 from Phoenix Contact or compatible
Number of pins	8

Mating plug requirements	
Shielded	Yes
Degree of protection	IP20

Tab. 24 Mating plug requirements

Connecting cable requirements	
Characteristics	CAT 5, patch cable, double shielded
Max. cable length	30 m

Tab. 25 Connecting cable requirements

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. 26 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 your network. This method is suitable for networks in which a DHCP server already exists.
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. 27 Options for IP configuration

Shield connection requirements

- 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.

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

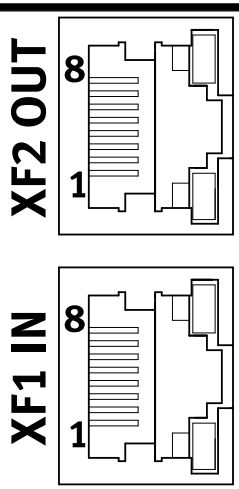
The real-time Ethernet interface [XF1 IN] and [XF2 OUT] is located on the top of the device. The interface permits RTE communication. The following protocols are supported, depending on the product version:

Product variant	Supported protocol
CMMT-ST-...-EC	EtherCAT
CMMT-ST-...-EP	EtherNet/IP
CMMT-ST-...-PN	PROFINET

Tab. 28 Supported 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. Use is not always made of both LEDs.

Real-time Ethernet (RTE) port 1 and port 2			
[XF2 OUT] and [XF1 IN]	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. 29 [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. 30 Mating plug requirements

Connecting cable requirements	
Characteristics	CAT 5, patch cable, double shielded
Max. cable length	30 m

Tab. 31 Connecting cable requirements

Shield connection requirements

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

8.5 Motor connection

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

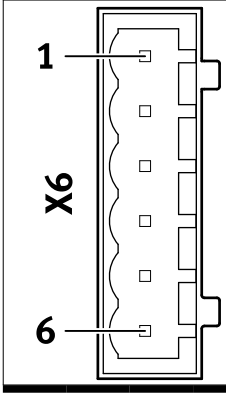
– Supply motor coils with current
– Actuate optional holding brake of the motor

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 to be stopped. Holding brakes are not usually suitable for braking moving masses or loads.

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

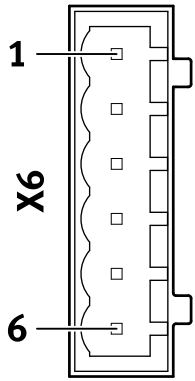
The servo drive controls the output for the holding brake automatically. Information about brake control ➔ Online help for the CMMT-ST plug-in.

Pin allocation for connecting a stepper motor:

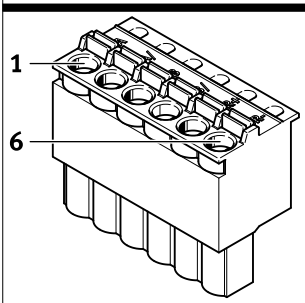
[X6]	Pin	Function	Description	Mating plug labelling
	1	A	String A	A
	2	A/	String A/	A/
	3	B	String B	B
	4	B/	String B/	B/
	5	Br+	Brake +24 V	Br+
	6	Br-/0 V	Brake 0 V	Br-/

Tab. 32 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. 33 Motor phase connection for connecting an EC motor

Mating plug requirements		
	Designation	Based on Phoenix Contact FKC 2,5/6-ST-5,08 Included in assortment of plugs NEKM-C-22 (enclosed with the product)
	Signal contacts	6
	Nominal current	CE: 12 A cUL: 10 A[1]
	Grid dimension	5.08 mm
	Strip length	10 mm
	UL Use Group	D

1) Only 10 A are permissible for the cUL approval.

Tab. 34 Mating plug requirements

Connecting cable requirements	
Shielding	Not required but twisted in pairs[1]
Min. conductor cross section[2] incl. plastic cable end sleeve	0.2 mm²
Max. conductor cross section without cable end sleeve	2.5 mm²

Connecting cable requirements	
Max. length	25 m

1) Shielded cables from Festo can be used. The shield can only be connected on the motor side.
2) The conductor cross section used must be suitable for the currents that arise.

Tab. 35 Connecting cable requirements

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

8.6 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 voltage 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!

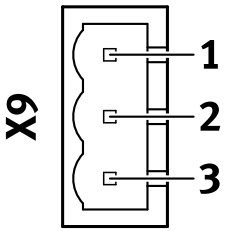
Power supply

⚠ WARNING!

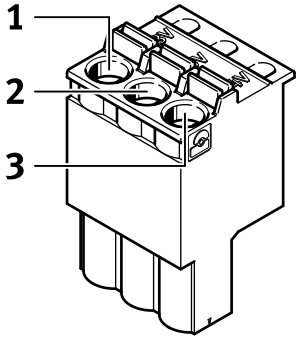
Risk of injury due to electric shock.

- 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

Tab. 36 Power supply

Mating plug requirements		
	Identifier	Based on Phoenix Contact FKC 2,5/3-ST-5,08 Included in assortment of plugs NEKM-C-22 (enclosed 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 are permissible for the cUL approval.

Tab. 37 Mating plug requirements

Requirements for the connecting cable	
Shielding	Not required
Min. conductor cross section[1)] incl. plastic wire end sleeve	0.2 mm^2
Max. conductor cross section incl. plastic wire end sleeve	2.5 mm^2
Max. length	30 m

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

Tab. 38 Requirements for the connecting cable

8.7 Cross-wiring of several servo drives

Cross-wiring enables a device compound to be created.

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

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

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 several 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 ➔ Description Safety sub-function.

It is not recommended to perform mixed cross-wiring of diagnostic contacts and diagnostic outputs.

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 mating plug data sheet, conductor cross sections of maximum 2x 1 mm² per contact are possible using twin wire end sleeves. 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 mm²	1.5 mm²
Max. permissible current with heat-resistant cable	19 A	24 A, according to mating plug data sheet max. 10 A for cUL

Tab. 39 Max. permissible current

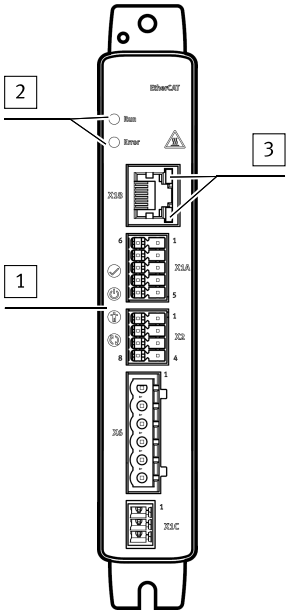
Recommendation:

– 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.

9 Malfunctions

9.1 Diagnostics via LEDs

The device has LEDs for displaying status information on the top and in the RJ45 bushings [XF1 IN], [XF2 OUT] and [X18].
The following image shows an example of the LEDs on the front of product variant CMMT-ST-...-EC. The functions of the RTE network status LEDs [2] differ by product version.



1 Device status LEDs (4x)
2 RTE network status LEDs (example)
3 Ethernet status LEDs

Fig. 13 LEDs on the front (example CMMT-ST-...-EC)

9.1.1 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. 40 Device status LEDs (status, power, safety and application status LEDs)

LED test

After the device is switched on, it runs through an initialisation phase. When the initialisation phase is complete, the device performs an LED test. During the LED test, the 4 device status LEDs are activated simultaneously. The 4 device status LEDs light up yellow for approx. 300 ms.

✓ Status LED, display of the device status

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

Tab. 41 Status LED

⏻ Power LED, status of the power supply

LED	Meaning
 Illuminated yellow	The logic power supply is present, but the load voltage supply is lacking or is currently being measured.
 Illuminated green	The load voltage supply and the logic power supply are present.

Tab. 42 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
 Flashes red	Error in the safety part, or a safety condition has been violated.
 Illuminated yellow	The safety sub-function has been requested and is active.
 Illuminated green	Ready, no safety sub-function has been requested.

Tab. 43 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
 Flashes yellow	Reserved for future extensions
 Lights up yellow	
 Flashes green	
 Lights up green	

Tab. 44 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 dark.
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 start program after switching on.
3	The start program is supposed to update the firmware but has detected an error in the system update file.
4	The start program is supposed to update itself and the firmware but has detected a defective start program in the system update file.
5	The start program cannot access the file system or the system update file, or the system update file is defective.

Tab. 45 Error messages of the start program (bootloader)

9.1.2 Interface status [X18]

LEDs at [X18]; connection status of the Ethernet interface

LED		Meaning (upper LED)
○	Off	Interface is deactivated.
	Lights up green	Interface is activated.

Tab. 46 Upper LED at [X18]

LED		Meaning (lower LED)
○	Off	No communication activity
	Flashes yellow	Communication activity detected.

Tab. 47 Lower LED at [X18]

9.1.3 Device and interface status, EtherCAT

EtherCAT LED displays (CMMT-ST-...-EC only)

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

EtherCAT, Run LED; operating status

LED	Meaning	Remedy
 Off	The device is in the Init status (initialisation).	–
 Flashes green	The device is in the pre-operational status.	–
 Flashes green[1)]	The device is in the safe-operational status.	–
 Lights up green	The device is in the operational status (normal operating status).	–

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

Tab. 48 Run LED

EtherCAT, error LED; error status

LED	Meaning	Remedy
 Off	No error	–
 Flashes red	Invalid configuration, general configuration error, a status change specified by the master is not possible.	Eliminate configuration error.
 Flashes 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.	–

LED	Meaning	Remedy
 Flashes red[2)]	A process data watchdog time-out has occurred.	–

1) Single flash: single short flashing (1x flash, pause, 1x flash, etc.)
2) Double flash: double short flash (2x flash, pause, 2x flash, etc.)

Tab. 49 Error LED

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).	–
 Lights up green	Network connection is OK (link).	–

Tab. 50 LED at XF1 IN and XF2 OUT

9.1.4 Device and interface status, ProfiNet

PROFINET LED displays (CMMT-ST-...-PN only)

Together with the 4 LEDs on the top, the NF LED on the front displays the bus/network status.

PROFINET, NF LED; bus error

LED	Meaning	Remedy
○ Off	No error	–
 Flashes red (2 Hz)	Network error – No data transmission – No configuration – No network connection or network connection is malfunctioning	Check network configuration and network connection.

Tab. 51 NF LED

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.
 Lights up green	Network connection is OK (link).	–

Tab. 52 Green LED at XF1 IN and XF2 OUT

LED	Meaning of the yellow LED	Remedy
 Off	No data traffic	–
 Flashes/lights up yellow[1)]	Data traffic activity (traffic).	–

1) The LED flashes during the transmission of an Ethernet packet. If packets are constantly being transmitted, the flashing changes to a steady light.

Tab. 53 Yellow LED at XF1 IN and XF2 OUT

9.1.5 Device and interface status, EtherNet/IP

EtherNet/IP LED displays (CMMT-ST-...-EP only)

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	Logic voltage supply lacking.	Check logic voltage supply.
 Flashes green	Device is not configured.	Perform configuration.
 Lights up green	Normal operating status	–

LED	Meaning	Remedy
 Flashes red/green	Device performs a self-test.	–
 Flashes red	Rectifiable error, possibly a configuration error	Check configuration.
 Lights up red	Error cannot be rectified	Contact Festo Service ➔ www.festo.com.

Tab. 54 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.
 Flashes 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.
 Lights up green	Normal operating status. The device is online and has a CIP connection.	–
 Flashes red/green	Device performs a self-test.	–
 Flashes red	One or more I/O connections are in the time-out status.	Check the physical connection to the master/scanner.
 Lights up red	The IP address of the device has already been assigned.	Check and correct IP addresses in the network.

Tab. 55 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.

LED	Meaning of the green LED	Remedy
 Lights up green	Network connection is OK (link).	–

Tab. 56 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. 57 Yellow LED at XF1 IN and XF2 OUT

10 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 installation.

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
- Carefully tilt the servo drive upwards and remove it from the H-rail.

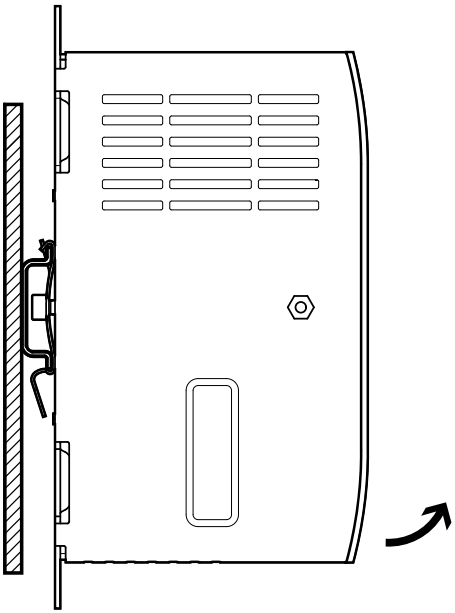


Fig. 14 Disassembly from the H-rail

11 Technical data

11.1 Technical data, general

Product conformity	
CE marking (declaration of conformity ➔ www.festo.com/sp)	In accordance with EU EMC Directive[1)] In accordance with EU Machinery Directive In accordance with EU RoHS Directive

1) The component is intended for industrial use.

Tab. 58 Product conformity

General technical data	
Type name 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)	➔ Fig.7

General technical data		
Product weight	[kg]	Approx. 0.35

Displays		– Device status display: 4 LEDs
		– Bus-specific status:
		  – CMMT-ST-...-EC: 2 LEDs (Run, Error)
		  – CMMT-ST-...-EP: 2 LEDs (MS, NS)
		  – CMMT-ST-...-PN: 1 LED (NF)
		– RTE network status LEDs [X1F IN], [X1F OUT]:
		  – CMMT-ST-...-EC: 2 LEDs
		  – CMMT-ST-...-EP: 4 LEDs
		  – CMMT-ST-...-PN: 4 LEDs
		– Ethernet status LEDs [X18]: 2 LEDs

Parameterisation interface		– [X18], Ethernet; parameterisation and configuration via commissioning software (➔ www.festo.com/sp) – [XF1 IN], [XF2 OUT], RT Ethernet; parameterisation and configuration via bus protocol
RT Ethernet protocol		CMMT-ST-...-EC: EtherCAT CMMT-ST-...-EP: EtherNet/IP CMMT-ST-...-PN: PROFINET

Tab. 59 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]	12,000 (above sea level) for 12 h
Vibration resistance		Vibration test and free fall in packaging in accordance with EN 61800-2

Tab. 60 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. 61 Ambient conditions, storage

Ambient conditions, operation		
Ambient temperature	[°C]	0 … +50
Cooling		Through ambient air in the control cabinet
Relative humidity	[%]	5 … 90 (non-condensing) No corrosive media permitted near the device
Permissible setup altitude above 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
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. 62 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 ➔ Fig.15

Tab. 63 Service life

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

Tab. 64 Materials

11.2 Technical data, electrical

11.2.1 Load and logic power supply [X9]

Electrical data, load power 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]	10 for 3 s
Nominal power	[W]	300 at 48 V
Load efficiency	[%]	96.5 at nominal power 300 W
Short circuit current rating (SCCR)	[A]	5000
Protective functions		– Protection against polarity reversal – Overcurrent protection input (15 A fuse, cannot be reset) – Adjustable protection against feedback on intermediate circuit rise

Tab. 65 Load power supply

Electrical data, logic power supply [X9], pin 3		
Logic voltage range	[V DC]	24 ± 15 %
Nominal voltage	[V DC]	24
Current consumption (without holding brake)	[A]	1
Current consumption (with holding brake)	[A]	2
Logic efficiency	[%]	82
Protective functions		– Protection against polarity reversal – Overvoltage protection (from approx. 32 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. 66 Logic supply

11.2.2 Power specifications, motor connection [X6]

Power specifications during operation		
Nominal output current	[A]	8

Tab. 67 Power specifications during operation

Any derating that may be necessary as a function of the ambient temperature ➔ Fig.15.
The CMMT-ST does not have any built-in 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, using the device-specific plug-in, for example.

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

Tab. 68 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. 69 Output of holding brake at [X6]

11.2.3 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)

Digital incremental encoder at [X2]	
Support: mechanical multiturn encoder	No
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. 70 Digital incremental encoder at [X2]

Absolut encoder 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. 71 Encoder with BiSS-C protocol

11.2.4 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

Control inputs #STO-A and #STO-B at [X1A]		
Min. input voltage, high level ($U_{H\ min}$)	[V]	20
Max. input voltage, low level ($U_{L\ max}$)	[V]	5
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) Each 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. 72 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

Diagnostic contact STA at [X1A]		
Off-state current (contact open)	[µA]	< 2
Closing reaction time $t_{STA,Rise}$	[ms]	< 80 (typ. 20)
Opening reaction time $t_{STA,Fall}$	[ms]	≤ 50 (typ. 30)
Galvanic isolation		Via optocoupler
Protective functions		Overvoltage-resistant up to 60 V DC

Tab. 73 Diagnostic contact STA-C1/C2 at [X1A]

Digital inputs without safety inputs at [X1A]			
Specification		Based on type 3 to 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	
Logic		PNP	NPN
Max. input voltage ($U_{H\ max}$), high level	[V]	30	5
Min. input voltage ($U_{H\ min}$), high level	[V]	Typically 11 max. 13	Typically 0
Max. input voltage ($U_{L\ max}$), low level	[V]	5	30
Min. input voltage ($U_{L\ min}$), low level	[V]	–3	11
Max. input current ($I_{H\ max}$) with high level	[mA]	15	–4
Min. input current ($I_{H\ min}$) with high level	[mA]	5	–10
Max. input current ($I_{L\ max}$) with low level	[mA]	15	3.43
Data for inputs Basic In 1 and Basic In 2 (Capture)			
Delay time in the hardware	[µs]	< 2	

Digital inputs without safety inputs at [X1A]		
Min. permissible pulse length (high or low)	[µs]	10
Time resolution/accuracy (high or low)	[µs]	< 1
Data for the input CTRL-EN (power stage enable/acknowledge error)		
Delay time in the hardware	[µs]	< 10

Tab. 74 Digital inputs without safety inputs – part 1

Digital outputs at [X1A] (X1A.9 and X1A.10)		
Design		PNP operation: high-side switch NPN operation: low-side switch
Characteristics		– Freely configurable – Not galvanically isolated
Voltage range	[V DC]	0 … 30
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 in event of excessive temperature

Tab. 75 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. 76 Voltage for supplying external components at [X1A]

11.2.5 Reference switch [X1C]

Digital inputs for the reference switch/limit switch			
Specification		Based on type 3 to 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	
Logic		PNP	NPN
Delay time in the hardware during switch-on	[µs]	< 30	< 4000
Delay time in the hardware during switch-off	[µs]	< 4000	< 30
Max. input voltage ($U_{H\ max}$), high level	[V]	30	5
Min. input voltage ($U_{H\ min}$) high level	[V]	Typically 11 Max. 13	Typically 0
Max. input voltage ($U_{L\ max}$), low level	[V]	5	30
Min. input voltage ($U_{L\ min}$), low level	[V]	–3	11
Max. input current ($I_{H\ max}$), high level	[mA]	15	–4
Min. input current ($I_{H\ min}$), high level	[mA]	5	–10
Max. input current ($I_{L\ max}$), low level	[mA]	15	3.43

Tab. 77 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 or limit switch
Max. output current	[mA]	100
Protective function		– Short circuit to 0 V – Feedback-proof

Tab. 78 Voltage for Supply of External Components at [X1C]

11.2.6 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. 79 Standard Ethernet [X18]

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

Real-time Ethernet [XF1 IN], [XF2 OUT]	
Design	RTE communication, physical level toIEEE 802.3:2012-00[1)]
Bus connection design [XF1 IN]	RJ45
Bus connection design [XF2 OUT]	RJ45
Max. transmission rate [Mbit/s]	100
Bus protocol EtherCAT: CMMT-ST-...-EC	
Protocol	– CoE (CANopen over EtherCAT) – EoE (Ethernet over EtherCATEtherCAT) – FoE (File Access over EtherCAT)
Communication profile	– CiA 402
Bus protocol EtherNet/IP: CMMT-ST-...-EP	
Protocol	– Implicit messaging – Explicit messaging
Bus protocol PROFINET: CMMT-ST-...-PN	
Protocol	– PROFINET RT – PROFINET IRT
Drive profile	– PROFIdrive – PROFIenergy

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

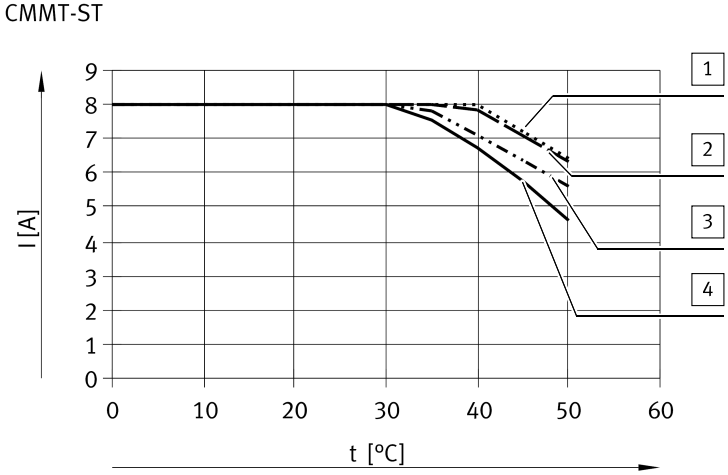
Tab. 80 Real-time Ethernet [XF1 IN], [XF2 OUT]

11.3 Characteristic curves

Required power reduction

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.



1 Mounting clearance 15 mm
2 Mounting clearance 10 mm
3 Mounting clearance 3 mm
4 Mounting clearance 0 mm

Fig. 15 Power reduction as a function of the ambient temperature and mounting clearance

11.4 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/CSA certification information	
UL mark	
UL control number	4PU8

Tab. 81 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. 82 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 I^2t 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. 83 Fuse requirements for load voltage supply

Example: Littelfuse NLN 30, Bussmann NON-30

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