

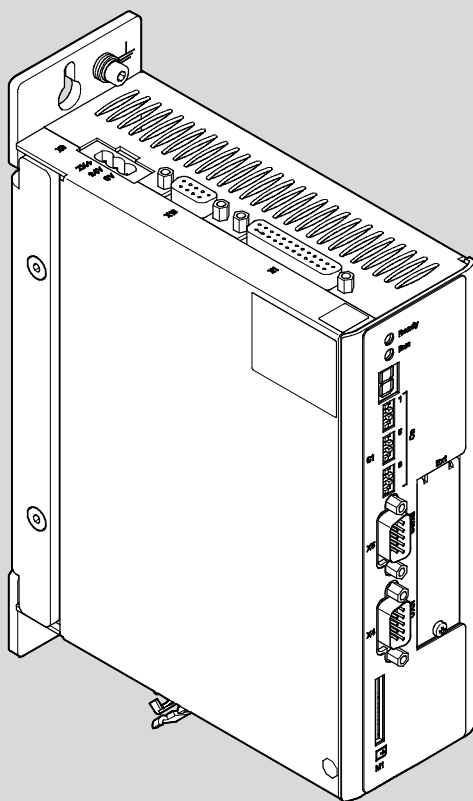
Motor controller

CMMS-ST-C8-7-G2

FESTO

Description

Mounting and
installation



8040101

1404NH

[8034456]

Translation of the original instructions
GDCP-CMMS-ST-G2-HW-EN

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Identification of hazards and instructions on how to prevent them:



Warning

Hazards that can cause death or serious injuries.



Caution

Hazards that can cause minor injuries or serious material damage.

Other symbols:



Note

Material damage or loss of function.



Recommendations, tips, references to other documentation.



Essential or useful accessories.



Information on environmentally sound usage.

Text designations:

- Activities that may be carried out in any order.
- 1. Activities that should be carried out in the order stated.
- General lists.

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Notes on this documentation

This documentation is intended to help you safely work with the motor controller CMMS-ST-C8-7-G2 and describes the functions, commissioning and error messages.

Target group

This documentation is intended exclusively for technicians trained in control and automation technology, who have experience in installation, commissioning, programming and diagnostics of positioning systems.

Versions



This documentation refers to the following versions:

- Motor controller CMMS-ST-C8-7-G2: from Rev 05



Please note

Before using a newer firmware version, check whether a newer version of the FCT plug-in or user documentation is available for it (→ www.festo.com/sp).

servicing

Please consult your regional Festo contact if you have any technical problems.

Product identification

Rating plate CMMS-ST-C8-7-G2	Function	
	Type designation	CMMS-ST-C8-7-G2
	Part number	e.g. 572211
	Revision status	e.g. Rev 06
	Serial number	e.g. CN98 P0021912
	Input (In)	1-phase 48 V DC, 5.5 A
	Output (Out)	2-phase 0 ... Input voltage V DC 0 ... 10 kHz, 8 A

Tab. 1 Rating plate CMMS-ST-C8-7-G2 (example)

Issue status of the specified standards

Standard: issue status	
EN 60204-1:2006/A1:2009-02	EN 61800-3:2004-12 + A1:2012-03
EN 61800-2:1998-04	EN 61800-5-1:2007-09

Tab. 2 Issue statuses

Production time period

On the type plate, the first 2 characters of the serial number indicate the production time period in encrypted form (➔ Tab. 1) The letter specifies the manufacturing year and the character behind it (number or letter) indicates the month of production.

Manufacturing year					
X = 2009	A = 2010	B = 2011	C = 2012	D = 2013	E = 2014
F = 2015	H = 2016	J = 2017	K = 2018	L = 2019	M = 2020

Tab. 3 Manufacturing year (20-year cycle)

Manufacturing month			
1	January	2	February
3	March	4	April
5	May	6	June
7	July	8	August
9	September	0	October
N	November	D	December

Tab. 4 Manufacturing month

Type codes

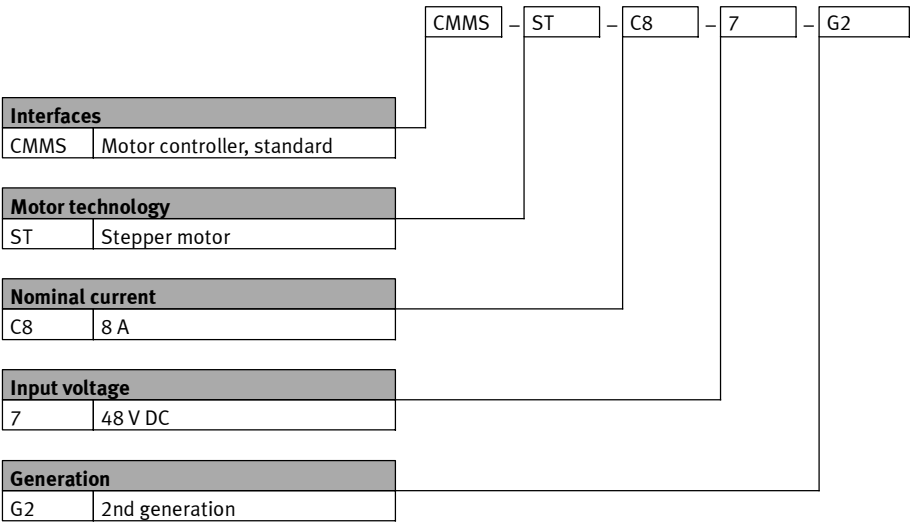


Fig. 1 Type codes

Documentation

Additional information on the motor controllers can be found in the following documentation:

Documentation		Type of equipment	Table of contents
Mounting and installation	GDCP-CMMS-AS-G2-HW-...	CMMS-AS	– Mounting
	GDCP-CMMD-AS-HW-...	CMMD-AS	– Installation (pin allocation)
	GDCP-CMMS-ST-G2-HW-...	CMMS-ST	– Error messages – technical data
Functions and commissioning	GDCP-CMMS/D-FW-...	CMMS-AS CMMD-AS CMMS-ST	– Control interfaces – Operating modes/operational functions – Commissioning with FCT – Error messages
STO safety function	GDCP-CMMS-AS-G2-S1-...	CMMS-AS	– Functional safety engineering with the safety function STO (safe torque off))
	GDCP-CMMD-AS-S1-...	CMMD-AS	
	GDCP-CMMS-ST-G2-S1-...	CMMS-ST	
Device profile FHPP	GDCP-CMMS/D-C-HP-...	CMMS-AS CMMD-AS CMMS-ST	– Description of the interfaces: – CAN bus (CANopen) – Interface CAMC-PB (PROFIBUS) – Interface CAMC-DN (DeviceNet) – Control and parameterisation via the device profile FHPP (Festo profile for handling and positioning) with PROFIBUS, DeviceNet or CANopen.
Device profile CiA 402,	GDCP-CMMS/D-C-CO-...	CMMS-AS CMMD-AS CMMS-ST	– Description of the interface: – CAN bus (CANopen, DriveBus) – Control and parameterisation via device profile CiA 402 (DS 402).
Software help	Help on the CMMS-AS plug-in	CMMS-AS	– Surface and functions in the Festo Configuration Tool for the plug-in
	Help on the CMMD-AS plug-in	CMMD-AS	
	Help for the CMMS-ST plug-in	CMMS-ST	

Tab. 5 Documentation on the motor controllers



The documentation is available on the following media:

- CD-ROM (scope of delivery)
- Support portal: www.festo.com/sp

1 Safety and requirements for product use

1.1 Security

1.1.1 Safety instructions



Caution

Risk of damage to equipment or injury to people from unexpected discharge of condensers in motor controller (power approx. 1 Ws). Short circuits can cause sudden discharge of intermediate circuit condensers and energy buildup:

- When the module or cover plate is not mounted on the card slot [EXT]
- When cables are not mounted to the plugs [X6] and [X9]
- When connecting cables are disconnected when powered.

The product must be installed in a control cabinet. The product must not be used until all safeguardings have been introduced.

Before maintenance, repair and cleaning work and when there have been long service interruptions:

1. Switch off power to the electrical equipment via the mains switch and secure it against being switched on again.
2. After switch-off, wait at least 1 minute discharge time and check that power is turned off before accessing the controller.



Caution

Danger of burns from hot surfaces

Dependent on the load of the motor controller, housing temperatures > 80 °C are possible in operation.

- Protect hot surfaces from contact in operation.
- Touch them only in a switched-off, cooled-off status.



Note

Danger from unexpected movement of the motor or axis

- Make sure that the movement does not endanger anyone.
- Perform a risk assessment in accordance with the EC machinery directive.
- Based on this risk assessment, design the safety system for the entire machine, taking into account all integrated components. This also includes the electric drives. Bypassing of safety equipment is impermissible.

1.1.2 Intended use

The motor controller CMMS-ST-C8-7-G2. is intended for use as a controller for two-phase step motors of the EMMS-ST and MTR-ST series. It enables closed loop control of torque (current), speed and position, as well as positioning control with stored positioning records. The motor controller is designed for installation in a control cabinet.

The product is intended for use in industrial environments. Outside of industrial environments, e.g. in commercial and mixed-residential areas, actions to suppress interference may have to be taken.

Use exclusively:

- In faultless technical condition
- In original status without unauthorised modifications; only the expansions described in the documentation supplied with the product are permitted.
- Within the limits of the product defined by the technical data (➔ Appendix A.1)
- in an industrial environment
- In a control cabinet.

In the event of damage caused by unauthorised manipulation or other than intended use, the guarantee is invalidated and the manufacturer is not liable for damages.

The motor controller supports the following safety function:

- Safe Torque Off – “Safe Torque Off” (STO)



Additional information ➔ STO safety function description, GDCP-CMMS-ST-S1-....

1.2 Requirements for product use

- Make this documentation available to the design engineer, installer and personnel responsible for commissioning the machine or system in which this product is used.
- Make sure that the specifications of the documentation are always complied with. Also consider the documentation for the other components and modules.
- Take into consideration the legal regulations applicable for the destination, as well as:
 - Regulations and standards,
 - regulations of the testing organizations and insurers,
 - National specifications.

1.2.1 Transport and storage conditions

- Protect the product during transport and storage from impermissible burdens, such as:
 - mechanical loads
 - impermissible temperatures
 - moisture
 - aggressive atmospheres
- Store and transport the product in its original packaging. The original packaging offers sufficient protection from typical stresses.

1.2.2 Technical prerequisites

For correct and safe use of the product:

- Comply with the connection and environmental conditions of the product (→ Appendix A) and all connected components specified in the technical data. Compliance with the limit values and load limits permits operation of the product in compliance with the relevant safety regulations.
- Observe the notes and warnings in this documentation.

1.2.3 Qualification of trained personnel

The product may only be placed in operation by a qualified electrotechnician who is familiar with:

- the installation and operation of electrical control systems,
- the applicable regulations for operating safety-engineered systems,
- the applicable regulations for accident protection and occupational safety, and
- the documentation for the product.

1.2.4 Range of application and certifications

The motor controller with integrated STO safety function is a safety-related part of the control systems.

The motor controller carries the CE marking; for standards and test values → Appendix A.1.

The product-relevant EU directives can be found in the declaration of conformity.



For certificates and the declaration of conformity for this product please refer to
→ www.festo.com/sp.

2 Product overview

2.1 The entire system for the CMMS-ST-C8-7-G2

- 1 Power switch
- 2 Fuse – dependent on 3 and 4
- 3 24 V power supply unit for control voltage
- 4 Power supply unit for power supply
- 5 Motor controller CMMS-ST-C8-7-G2
- 6 PC with serial connecting cable for parameterisation and commissioning with the Festo Configuration Tool (FCT), CMMS-ST plug-in
- 7 Motor – here EMMS-ST with encoder (motor and encoder cable NEBM)

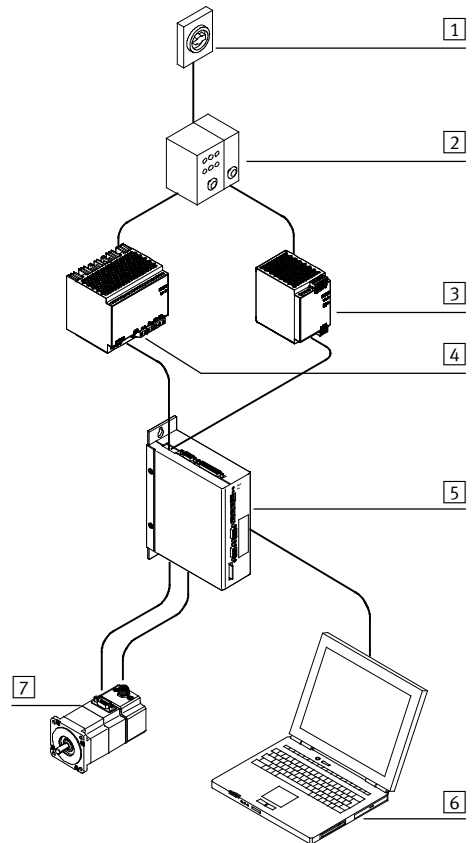


Fig. 2.1 Complete structure CMMS-ST-C8-7-G2 – example

2.2 Scope of delivery

Number	Component
1	Motor controller CMMS-ST-C8-7-G2
1	Operator package <ul style="list-style-type: none"> – Brief description – CD-ROM with following contents: <ul style="list-style-type: none"> – Parameterisation software “Festo Configuration Tool” (FCT) – Documentation on the product – S7 module – Configuration files for the supported bus systems (e.g. device core data for PROFIBUS (GSD), electronic data sheet (EDS) for DeviceNet, etc.) – Firmware
1	Assortment of plugs (plugged into connections)

Tab. 2.1 Scope of delivery



Accessories → www.festo.com/catalogue

2.3 Device view

- 1 LED status display
- 2 Seven-segment display
- 3 [S1]: DIL switches for fieldbus settings and firmware update
- 4 [EXT]: Slot for optional control interfaces (PROFIBUS DP, DeviceNet)
- 5 [M1]: card slot for SD memory card
- 6 [X4]: CAN bus
- 7 [X5]: RS232/RS485
- 8 Earthing screw (central FU connection)

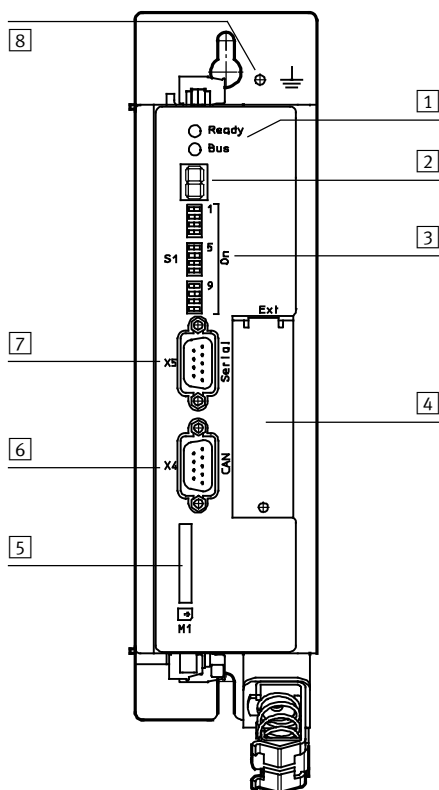


Fig. 2.2 Front view CMMS-ST-C8-7-G2 front

- 1 [X9] Power supply
- 2 [X10] Master/slave (bi-directional interface)
- 3 [X1] I/O interface

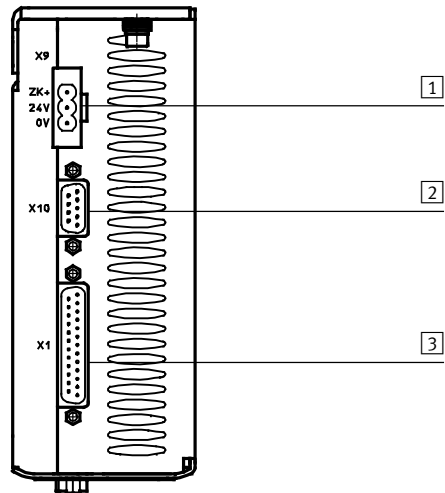


Fig. 2.3 Top CMMS-ST-C8-7-G2 view

- 1 [X3] STO interface
- 2 [X2] Encoder
- 3 [X6] Motor
- 4 Shield connection terminal

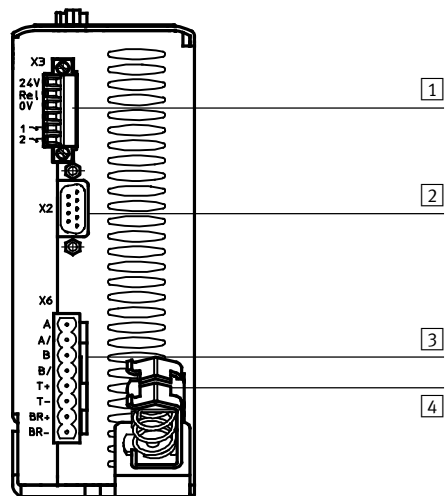









Fig. 2.4 Bottom CMMS-ST-C8-7-G2 view

2.4 Display and control elements

2.4.1 Seven-segment display

Display ¹⁾		Meaning
Starting program		
	Point	Start programme (Bootloader) active
	Flashing point	– Firmware file (memory card) is being read
Operating modes		
	P x x x	Positioning mode, record number x x x
	000	– No positioning record active
	001...063	– Positioning record 001 ... 063 active
	064	– Manual travel via FCT or FHPP direct record (direct operation)
	070/071	– Jog+/jog–
	P H x	Homing phase x
	0	– Searching travel to the primary destination (limit switch or stop)
	1	– Crawl to the reference point
	2	– Travel to the axis zero point
	Rotating outside segments	Speed mode (speed adjustment): Display changes in response to rotor position and speed.
	Middle segment	Controller enable active (motor is energised).
	I	Force/torque mode (current control)
Safety function		
	H	Two-channel safety function requested (DIN4 [X1.21] and Rel [X3.2])
Error/warning messages		
	E x x y	Error (E = error) Number: Two-position main index (x x), single-position sub-index (y) Example: E 0 1 0 → Appendix B.
	– x x y –	Warning Number: Two-position main index (x x), single-position subindex (y). Example: - 1 7 0 - → Appendix B.

1) Several characters are displayed one after the other.

Tab. 2.2 Seven-segment operation and error display (→ Fig. 2.2 [2](#))



Warnings are automatically acknowledged when the cause is no longer present. Error messages are acknowledged via:

- the parameterisation software FCT
- the fieldbus (control word)
- or a decreasing edge at [X1] DIN5.

2.4.2 LED displays

LED	LED colour	Function
Ready	Green	Operating status/controller enable
	Flashing green	Parameter file *.DCO (memory card) is being read/written
Bus	Yellow	Bus status display lights up whenever CAN communication is taking place

Tab. 2.3 LED status display (→ Fig. 2.2 [1])

2.4.3 DIL switch

DIP switch	Function
S1.1 ... 7	Bus address or MAC-ID → Example Tab. 2.5
S1.8	Automatic loading of a new firmware file from the memory card by the starting program (Bootloader): ¹⁾ <ul style="list-style-type: none"> – ON: download from the SD memory card to the motor controller – OFF: no download.
S1.9 ... 10	Setting the bus transmission rate → Example Tab. 2.6
S1.11	Activation of the CAN-bus interface
S1.12	Terminating resistor for CAN-bus

1) Additional information can be found in the firmware download → Description of functions and commissioning, GDCP-CMMS/D-FW-....

Tab. 2.4 Function of the DIL switches (→ Fig. 2.2 [3])

S1.1 ... 7	ON/OFF (example)	Significance ¹⁾
1	ON 1	DIP switch S1.1 is the low-order bit. Example: address = 1011011 = 91
2	ON 1	
3	OFF 0	
4	ON 1	
5	ON 1	
6	OFF 0	
7	ON 1	

1) Additional information → Description of functions and commissioning, GDCP-CMMS/D-FW-....

Tab. 2.5 CAN bus address or MAC-ID

S1.9 ... 10	ON/OFF (example)	Significance ¹⁾
9	ON 1	DIP switch S1.9 is the low-order bit. 00: 125 kBit/s 01: 250 kBit/s (example)
10	OFF 0	10: 500 kBit/s 11: 1000 kBit/s

1) Additional information → Description of functions and commissioning, GDGP-CMMS/D-FW-....

Tab. 2.6 CAN-bus transmission rate

2.4.4 Slot [EXT]

The slot (→ Fig. 2.2 [4]) enables the option of expanding CMMS-ST-C8-7-G2 by other interfaces, e.g.:

- CAMC-PB: interface for PROFIBUS DP
- CAMC-DN: interface for DeviceNet.



For mounting, please observe the mounting instructions for the CAMC interface. If the interface is mounted, it is automatically activated the next time the motor controller is switched on. Information about function can be found in the FHPP device profile description, GDGP-CMMS/D-C-HP-....

2.4.5 Card slot [M1] for SD memory card



A parameter set can be loaded from/saved onto the memory card by using the FCT software. You can find additional information in the Help file of the CMMP-ST FCT plug-in and in the functions and commissioning description, GDGP-CMMS/D-FW-....

SD memory card	Description
Functions	Copying/loading a parameter set from the memory card to the CMMS-ST-C8-7-G2.
	Copying/saving a parameter set from the CMMS-ST-C8-7-G2 to the memory card.
	Copying (loading) firmware from the memory card to the CMMS-ST-C8-7-G2 (Bootloader)
Design on the device	1x12-pin SD card slot
Supported card types	SD ¹⁾ (version 1 and 2)
Supported file systems	FAT16
Format filename	8.3

1) Recommended are industry-suitable memory cards from the Festo accessories programme.

Tab. 2.7 Characteristics of the memory card (→ Fig. 2.2 [5])

3 Mechanical installation

3.1 Installation dimensions

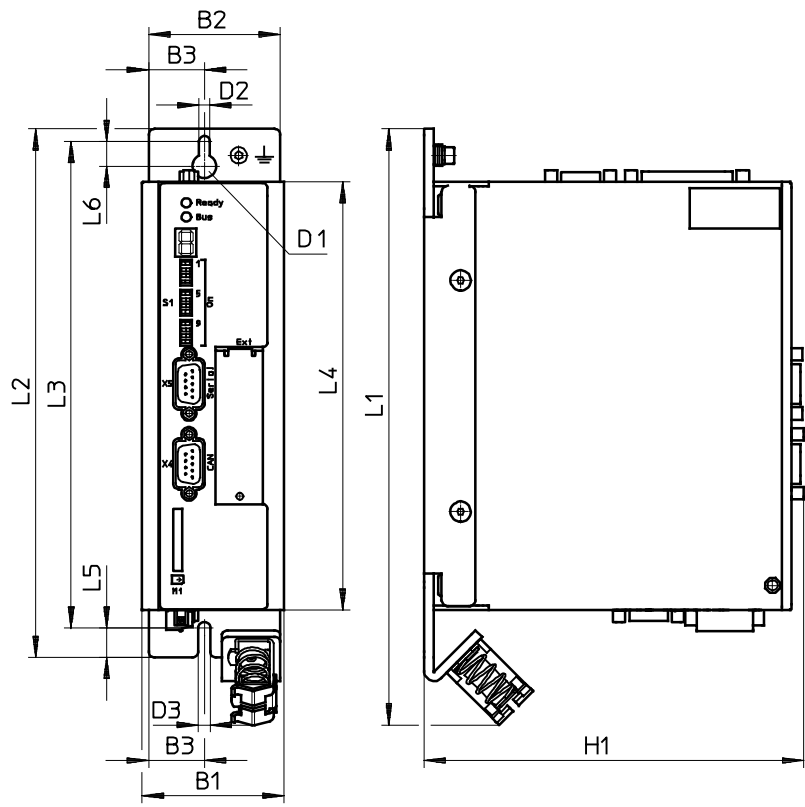


Fig. 3.1 Installation dimensions

Dim.	B1	B2	B3	D1 Ø	D2 Ø	D3 Ø	H1
[mm]	Approx. 60	Approx. 56	24	10	4.5	5	Approx. 161

Dim.	L1	L2	L3	L4	L5	L6
[mm]	Approx. 257	Approx. 224	Approx. 206.25	Approx. 181	12.5	10.5

Tab. 3.1 CMMS-ST-C8-7-G2: Installation dimensions

3.2 Mounting



Caution

Motor controller contains condensers (energy storage)

Do not disconnect connecting cables when powered. Before mounting and installation work:

1. Switch off power to the electrical equipment via the mains switch and secure it against being switched on again.
2. After switch-off, wait at least 1 minute discharge time and check that power is turned off before accessing the controller.



Caution

Danger of burns from hot surfaces

Dependent on the load of the motor controller, housing temperatures $> 80^{\circ}\text{C}$ are possible in operation.

- Touch them only in a switched-off, cooled-off status.



Please note

Make sure that no metal shavings, metal dust or mounting parts (screws, nuts, pieces of wire) fall into the motor controller when mounting and during operation.

For vertical mounting onto a control cabinet mounting plate:
For the motor controller CMMS-ST-C8-7-G2 no mounting brackets are required. The back wall has mounting options. The back wall is part of the radiator profile and transfers heat to the mounting plate.

The motor controllers of the CMMx family are designed in such a way that they can be mounted on a heat-dissipating mounting plate if used as intended and installed correctly.

- Mount motor controller in the control cabinet as follows:
 - The mounting position is vertical with the power supply lines [X9] leading upwards
 - Mounting to retaining bores with 2 M4 screws.

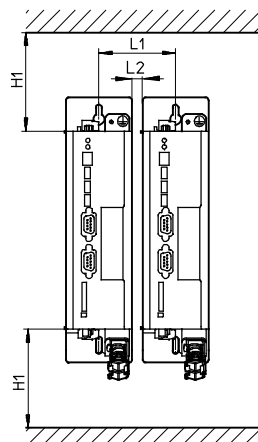


Fig. 3.2 Installation clearance

**Please note**

An excessive temperature increase results in premature aging or damage to the motor controller.

- Observe the specified installation clearances to ensure sufficient ventilation (→ Tab. 3.2).

CMMS-ST	H1 ¹⁾	L1	L2
– Installation clearance [mm]	100	69	9

1) Recommendation for optimum wiring of the motor and encoder cable: Installation clearance H1 at the bottom = 150 mm.

Tab. 3.2 Installation clearance CMMS-ST

3.3 Disassembly

**Caution****Motor controller contains condensers (energy storage)**

Do not disconnect connecting cables when powered. Before mounting and installation work:

1. Switch off power to the electrical equipment via the mains switch and secure it against being switched on again.
2. After switch-off, wait at least 1 minute discharge time and check that power is turned off before accessing the controller.

**Caution****Danger of burns from hot surfaces**

Dependent on the load of the motor controller, housing temperatures > 80 °C are possible in operation.

- Touch them only in a switched-off, cooled-off status.



4 Electrical installation

4.1 Safety instructions



Caution

Risk of damage to equipment or injury to people from unexpected discharge of condensers in motor controller. Short circuits can cause sudden discharge of intermediate circuit condensers and energy buildup:

- When the module or cover plate is not mounted on the card slot [EXT]
- When cables are not mounted to the plugs [X6] and [X9]
- When connecting cables are disconnected when powered.

Before maintenance, repair and cleaning work and when there have been long service interruptions:

1. Switch off power to the electrical equipment via the mains switch and secure it against being switched on again.
2. After switch-off, wait at least 1 minute discharge time and check that power is turned off before accessing the controller.



Caution

Danger from unexpected movement

Faulty pre-assembled lines may destroy the electronics and trigger unexpected movements of the motor.

- When wiring the system, use only the supplied plug connectors and preferably the cables listed in the catalogue as accessories.
→ www.festo.com/catalogue
- Lay all flexible lines so that they are free of kinks and free of mechanical stress; if necessary use chain link trunking.



Please note

ESD (electrostatic discharge) can cause damage to the device or other system parts at plug connectors that are not used.

- Before installation: Earth the system parts and use appropriate ESD equipment (e.g. shoes, earthing straps etc.).
- After installation: Seal unassigned D-sub plug connectors with protective caps (available at authorized dealers).
- Observe the handling specifications for electrostatically sensitive devices.



4.2 Instructions for safe and EMC-compliant installation



The CMMS-ST-C8-7-G2 motor controllers have been approved in accordance with product standard EN 61800-3 that is applicable to electric drives. Components from Festo have been used for this purpose (e.g. motor/encoder cables).

The declaration of conformity for the EMC directive (electromagnetic compatibility) is available at → www.festo.com.

4.2.1 Interference emission and interference immunity

In order to increase the resistance to interference and decrease the emitted interference, the CMMS-ST-C8-7-G2 motor controller already has integrated supply side suppression filters, which means that the motor controller can be operated without additional shielding and filters in most applications. If installed correctly and if all connecting cables are wired correctly (→ Chap. 4.2.2), the motor controller fulfils product standard EN 61800-3 for the following range of application:

Permissible range of application	
Emitted interference	Second environment (industrial) ¹⁾
Resistance to interference	Second environment (industrial) ¹⁾

1) Locations outside of the residential area, or industrial areas that are supplied from the medium-voltage power supply network through their own transformer.

Tab. 4.1 Permissible range of application in accordance with EN 61800-3



Please note

- The maximum permitted length of the motor cable is 25 m.
- With motor cables with a length of > 15 m, only use cables with a capacity lining of < 200 pF/m.

4.2.2 EMC-compliant wiring



Routing cables:

- Make motor and encoder cables as short as possible
- Do not run signal cables parallel to power cables
- The distance between signal cables and power cables should be at least 25 cm
- Avoided crossing power cables or running them at a 90° angle.

Screening:

- Always run motor and encoder cables so they are screened
- Twist unscreened signal cables
- When using screened cables with an unscreened plug housing: the maximum length of the unscreened wires at the end of the cable is 35 mm.

- Observe the permissible cable lengths and the required screening for the cables → Tab. 4.2.

Port	Interface	Cable length [m]	Screening
[X1]	I/O interface	≤ 5	Recommendation: screened
[X2]	Encoder (incremental sensor input)	≤ 25	<ul style="list-style-type: none"> – Screened – Apply the cable screening of the encoder cable flat on the plug housing of the encoder connection [X2] → Chapter 4.4
[X3]	STO interface	≤ 30	When wiring outside the control cabinet: <ul style="list-style-type: none"> – Use screened cable – Guide screening into the control cabinet and attach to the side of the control cabinet.
[X4]	CAN	≤ 40 ¹⁾	–
[X5]	RS232/RS485	≤ 5	Screened
[X6]	Motor	≤ 25 ²⁾	<ul style="list-style-type: none"> – Screened – Apply cable screening to the shield connection terminal of the corresponding motor controller → Chapter 4.8.2
[X9]	Power supply	≤ 2	–
[X10]	Master/slave:		Screened
	as input (slave)	≤ 30	
	as output (master)	≤ 5	

1) Permitted total line length of field bus at a bit rate of 1 Mbit/s. Observe details in the documentation of your control system or bus interface.

2) With motor cables with a length of > 15 m, only use cables with a capacity lining of < 200 pF/m.

Tab. 4.2 EMC-compliant wiring

When using motor cables from other manufacturers:

- Recommendation: Only use motor cables on which the cables for the temperature sensor (M_{T-} , M_{T+}) and the cable for the holding brake ($BR-$, $BR+$) are in twisted pairs and screened (→ Tab. 4.19). Twisting the individual pairs of cables reduces electromagnetic interference factors.

4.2.3 Protective earthing of the motor controller

The motor controller is there to supply power with low-voltage protection (PELV).

- Ensure that your power supply complies with the corresponding requirements of the specification EN 60204-1 fully.

The motor controller has a shared reference potential (0 V) to supply power to the logic unit and the intermediate circuit.

- Ensure that the reference potentials of the power supply are connected to the mains power unit and are earthed.

4.2.4 Protective earthing of the motor



Caution

Interference caused by electromagnetic factors


The connected motor and the motor cable carry increased leakage current. Improper earthing can result in hazardous voltage levels and EMC interference.

- Apply the cable screening of the motor cable to the shield connection terminal of the motor controller → Chapter 4.8.2.
- Apply the cable screening of the encoder cable flat on the plug housing of the connection [X2] → Chapter 4.4.

4.3 I/O interface [X1]

Port	version
[X1] on the motor controller	Sub-D plug connector, 25-pin, sockets
Counterplug	Sub-D plug connector, 25-pin, pins

Tab. 4.3 Connection I/O interface [X1]



Available as accessories: Screened control cable and sub-D connector
→ www.festo.com/catalogue.

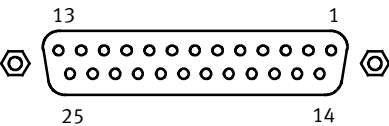


Fig. 4.1 Connection [X1] on the motor controller

Configuration of the I/O interface:

The I/O interface is configured in positioning mode for the following functions via the digital inputs DIN9 (=mode bit 1) and DIN12 (=mode bit 0):

Mode	Function	DIN 9	DIN 12	Pin allocation
0	Positioning (single record) ¹⁾	0	0	→ Tab. 4.5
1	Jog/teach	0	1	→ Tab. 4.6
2	Record linking	1	0	→ Tab. 4.7
3	Synchronisation	1	1	→ Tab. 4.8

1) Standard allocation of the I/O interface

Tab. 4.4 Function-dependent configuration of digital inputs

Pin		Value	Mode 0 – positioning (single record)
1	SGND	0 V	Screening for analogue signals
2	DIN 12	–	Mode bit 0 = “0”
	AIN0	max. 30 V	Differential analogue input (setpoint input 0) ²⁾
3	DIN 10	–	Record selection bit 4 (high active)
4	+VREF	+10 V ±4 %	Reference output for setpoint value potentiometer
5	–	–	–
6	GND24	–	Reference potential for digital I/O modules
7	DIN 1	–	Record selection bit 1 (high active)
8	DIN 3	–	Record selection bit 3 (high active)
9	DIN 5	–	Controller enable (high active)
10	DIN 7	–	Limit switch 1
11	DIN 9	–	Mode bit 1 = “0”
	DIN 9	–	High-speed input (sample) ³⁾
12	DOUT1	24 V 100 mA	Motion complete (high active) ¹⁾
13	DOUT3	24 V 100 mA	Common error (low active) ¹⁾
14	AGND	0 V	Reference potential for analogue signals
15	DIN 13	Ri = 20 kΩ	Stop (low active)
	#AIN0		Reference potential for setpoint input 0 ²⁾
16	DIN 11	–	Record selection bit 5 (high active)
17	AMON0	0 ... 10 V ±4 %	Output: analogue monitor 0
18	+ 24 V DC	24 V 100 mA	Output: 24 V DC, looped through from [X9.2]
19	DIN 0	–	Record selection bit 0 (high active)
20	DIN 2	–	Record selection bit 2 (high active)
21	DIN 4	–	Output stage enable (high active)
22	DIN 6	–	Limit switch 0
23	DIN 8	–	Start for the positioning procedure (high active)
24	DOUT0	24 V 100 mA	Output: Controller ready for operation (high active)
25	DOUT2	24 V 100 mA	Start acknowledged (low active) ¹⁾

1) Default setting, configurable in the Festo Configuration Tool (FCT).

2) Pin allocation with control via analogue input

3) Pin allocation for flying measurement

Tab. 4.5 Pin allocation of the I/O interface [X1], positioning (single record)

Pin		Value	Mode = 1 - jog/teach
1	SGND	0 V	Screening for analogue signals
2	DIN 12	–	Mode bit 0 = “1”
3	DIN 10	–	Jog: jog + (high active) Teach: record selection bit 4
4	+VREF	+10 V \pm 4 %	Reference output for setpoint value potentiometer
5	–	–	–
6	GND24	–	Reference potential for digital inputs and outputs
7	DIN 1	–	Record selection bit 1 (high active)
8	DIN 3	–	Record selection bit 3 (high active)
9	DIN 5		Controller enable (high active) Teaching: Final saving of the taught positions in the permanent memory takes place with falling edge at DIN5
10	DIN 7	–	Limit switch 1
11	DIN 9	–	Mode bit 1 = “0”
12	DOUT1	24 V 100 mA	Motion complete (high active) ¹⁾
13	DOUT3	24 V 100 mA	Common error (low active) ¹⁾
14	AGND	0 V	Reference potential for analogue signals
15	DIN 13	–	Stop (low active)
16	DIN 11	–	Jog: jog - (high active) Teach: record selection bit 5
17	AMONO	0 ... 10 V \pm 4 %	Analogue monitor output 0
18	+24 V	24 V 100 mA	Output: 24 V DC, looped through from [X9.2]
19	DIN 0	–	Record selection bit 0 (high active)
20	DIN 2	–	Record selection bit 2 (high active)
21	DIN 4	–	Output stage enable (high active)
22	DIN 6	–	Limit switch 0
23	DIN 8	–	Teach (high active)
24	DOUT0	24 V 100 mA	Output: Controller ready for operation (high active)
25	DOUT2	24 V 100 mA	Teach confirmed

1) Default setting, configurable in the Festo Configuration Tool (FCT).

Tab. 4.6 Pin allocation: I/O interface [X1], jog/teach

Pin		Value	Mode = 2 - record linking
1	SGND	0 V	Screening for analogue signals
2	DIN 12	–	Mode bit 0 = “0”
3	DIN 10	–	Next 1
4	+VREF	+10 V \pm 4 %	Reference output for setpoint value potentiometer
5	–	–	–
6	GND24	–	Reference potential for digital inputs and outputs
7	DIN 1	–	Record selection bit 1 (high active)
8	DIN 3	–	Halt record sequence
9	DIN 5	–	Controller enable (high active)
10	DIN 7	–	Limit switch 1
11	DIN 9		Mode bit 1 = “1”
12	DOUT1	24 V 100 mA	Motion complete (high active) ¹⁾
13	DOUT3	24 V 100 mA	Common error (low active) ¹⁾
14	AGND	0 V	Reference potential for analogue signals
15	DIN 13	–	Stop (low active)
16	DIN 11	–	Next 2
17	AMON0	0 ... 10 V \pm 4 %	Analogue monitor output 0
18	24 V	24 V 100 mA	Output 24 V DC, looped through from [X9.2]
19	DIN 0	–	Record selection bit 0 (high active)
20	DIN 2	–	Record selection bit 2 (high active)
21	DIN 4	–	Output stage enable (high active)
22	DIN 6	–	Limit switch 0
23	DIN 8	–	Start record sequence
24	DOUT0	24 V 100 mA	Output: Controller ready for operation (high active)
25	DOUT2	24 V 100 mA	Start confirmed (high active) ¹⁾

1) Default setting, configurable in the Festo Configuration Tool (FCT).

Tab. 4.7 Pin allocation: I/O interface [X1], record linking

Pin		Value	Mode = 3 - synchronisation
1	SGND	0 V	Screening for analogue signals
2	DIN 12	–	Mode bit 0 = “1”
3	DIN 10	–	–
4	+VREF	+10 V \pm 4 %	Reference output for setpoint value potentiometer
5	–	–	–
6	GND24	–	Reference potential for digital inputs and outputs
7	DIN 1	–	–
8	DIN 3	24 V 20 kHz (max)	Direction DIR/control signal CCW
9	DIN 5	–	Controller enable (high active)
10	DIN 7	–	Limit switch 1
11	DIN 9	–	Mode bit 1 = “1”
12	DOUT1	24 V 100 mA	Output: standstill reached (high active)
13	DOUT3	24 V 100 mA	Output: common error (low active) ¹⁾
14	AGND	0 V	Reference potential for analogue signals
15	DIN 13	–	Stop (low active)
16	DIN 11	–	–
17	AMONO	0 ... 10 V \pm 4 %	Output: analogue monitor 0
18	24 V	24 V 100 mA	Output 24 V DC, looped through from [X9.2]
19	DIN 0	–	–
20	DIN 2	24 V 20 kHz (max)	Pulse CLK/control signal CW
21	DIN 4	–	Output stage enable (high active)
22	DIN 6	–	Limit switch 0
23	DIN 8	–	Start synchronization
24	DOUT0	24 V 100 mA	Output: Controller ready for operation (high active)
25	DOUT2	24 V 100 mA	Output: position synchronous (high active)

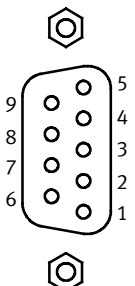
1) Default setting, configurable in the Festo Configuration Tool (FCT).

Tab. 4.8 Pin allocation: I/O interface [X1], synchronisation

4.4 Encoder [X2]

Process valve	version
[X2] on the motor controller	Sub-D plug connector, 9-pin, sockets
Counterplug	Sub-D plug connector, 9-pin, pins

Tab. 4.9 Encoder connection

[X2]	Pin		Value ¹⁾	Description
	1	A+	5 V, $R_i = 120 \text{ Ohm}$	Increment generator signal A, positive polarity
	2	B+	5 V, $R_i = 120 \text{ Ohm}$	Increment generator signal B, positive polarity
	3	N+	5 V, $R_i = 120 \text{ Ohm}$	Increment generator zero pulse N, positive polarity
	4	GND	-	Reference GND for the encoder
	5	VCC	+5 V $\pm 5\%$ 100 mA	Auxiliary supply, max. load 100 mA, short-circuit proof.
	6	A-	5 V, $R_i = 120 \text{ Ohm}$	Increment generator signal A, negative polarity
	7	B-	5 V, $R_i = 120 \text{ Ohm}$	Increment generator signal B, negative polarity
	8	N-	5 V, $R_i = 120 \text{ Ohm}$	Increment generator zero pulse N, negative polarity
	9	GND	-	Internal screen for the connecting cable

1) R_i = Internal resistance

Tab. 4.10 Pin allocation: encoder [X2]

The motor controller supports the activation of Festo two-phase hybrid step motors with an encoder mounted on the motor shaft (see → www.festo.com/catalogue). The encoder is used to control current, speed and position. Commutation of the motor is also controlled with the encoder. Supply voltage for the encoders is taken from the internal +5 V logic supply. (current intake max. 100 mA). The supply voltage tolerance is limited downwards. Voltage drops on the connecting cable are not compensated.



Use of third-party cables

- Double wiring of power supply line:

The voltage loss between motor controller and encoder must be $< 0.25 \text{ V}$.

- Check the cable cross section of your encoder cable and if necessary, route the power supply through a double cable.

Example:

when using encoder wiring that exhibits a cable diameter of 0.25 mm^2 , a cable length of 25 m (50 m supply and return), and a current consumption of 100 mA, the voltage drop for a single wiring configuration is $U_{\text{diff}} \sim 0.36 \text{ V}$. → A double wiring configuration is required ($U_{\text{diff}} \sim 0.18 \text{ V}$).

- Screening:

- Run the encoder cable so it is screened
- Apply the screening to the plug housing on the motor and controller side.

For maximum resistance to interference:

- Use cables with individually twisted and screened pairs
- Ensure that cable screens on screened pairs (inner screens) are galvanically isolated from the outer screens and only place on controller side of connection [X2.9]
- Apply the complete screening to the plug housing on the motor and controller side.

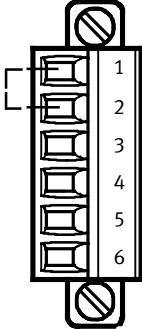


4.5 STO interface [X3]

4.5.1 Pin allocation

Process valve	version
[X3] on the motor controller	Phoenix Contact - MC 1.5/6-GF3.81 BK
Counterplug (plug set NEKM-C-1)	Phoenix Contact - MC 1.5/6-STF3.81 BK

Tab. 4.11 Connection: STO interface [X3]

Ex-factory, pin 1 and pin 2 on connection X3 are bridged (circuitry without use of the STO safety function). That means that the motor controller is prepared ex-factory for use **without** the STO safety function (→ Section 4.5.2).

Plug [X3]	Pin	Designation	Value	Description
	1	24 V	+24 V DC	Voltage output (24 V DC logic supply carried out as auxiliary voltage)
	2	Rel	0V / 24V	Driver supply relay control.
	3	0V	0V	Reference potential for digital inputs and outputs.
	4	—	—	—
	5	1  (NC1)	Max. 25 V AC, 30 V DC, 2 A	Acknowledgment contact for the status “Safe Torque Off” (STO)
	6	2  (NC2)		

Tab. 4.12 Pin allocation: Interface [X3] (Circuitry without use of the STO safety function)

4.5.2 Circuitry without use of the STO safety function [X3]



If you do **not** need the integrated STO safety function in your application, you must bridge Pin 1 and Pin 2 at the X3 interface to operate the motor controller → Tab. 4.12.

This deactivates the integrated safety function!

When using this circuitry for the CMMS-ST-C8-7-G2, safety in the application must be ensured through other appropriate measures.

4.5.3 Circuitry with use of the STO safety function [X3]



The safety function only provides protection against hazardous movements. For intended use of the safety function STO – “Safe Torque Off” (→ Description of STO safety function, GDGP-CMMS-ST-G2-S1-...).

If you need the integrated STO safety function in your application, you must remove the bridge between Pin 1 and Pin 2 at the X3 interface to operate the motor controller → Tab. 4.12.

Recommendation for first commissioning without safety engineering:

Minimum circuitry with emergency stop switching device and two-channel switch-off via the control ports:

- REL [X3.2]
- DIN4 [X1.21].



Please note

Loss of the safety function.

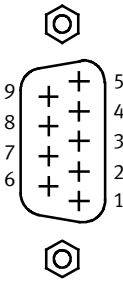
Lack of the safety function can result in serious, irreversible injuries, e.g. due to uncontrolled movements of the connected actuator technology. Bypassing of safety equipment is impermissible.

- Make sure that no jumpers or the like can be used parallel to the safety wiring, e.g. through the use of the maximum wire cross sections or appropriate wire end sleeves with insulating collars.
- Use twin wire end sleeves for looping through lines between neighbouring devices.

4.6 CAN [X4]

Process valve	version
[X4] on the motor controller	Sub-D plug connector, 9-pin, pins
Counterplug	Sub-D plug connector, 9-pin, sockets

Tab. 4.13 CAN connection

[X4]	Pin	Value	Description
	1	–	–
	2	CANL	5 V, Ri = 60 Ω
	3	GND	–
	4	–	–
	5	Screen- ing	–
	6	GND	–
	7	CANH	5 V, Ri = 60 Ω
	8	–	–
	9	–	–

Tab. 4.14 Pin allocation: CAN [X4]

4.7 Serial interface RS232/RS485 [X5]

Process valve	version
[X5] on the motor controller	Sub-D plug connector, 9-pin, pins
Counterplug	Sub-D plug connector, 9-pin, sockets

Tab. 4.15 Connection: RS232/RS485 [X5]



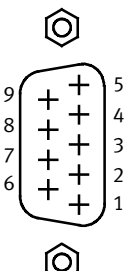
Please note

Transmission fault during simultaneous access.

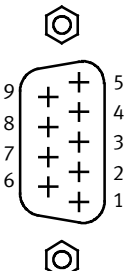
When RS 485 communication is activated, RS232 and RS485 interfaces on the motor controller can accessed at the same time.

To prevent transmission faults caused by signal overlap:

- When communicating via the serial interface only use separate lines that are configured according to the specified pin allocation for RS485 **or** RS232.

[X5] RS232	Pin	Value	Description
	1	–	–
	2	RS232_RxD	10 V, $R_i > 2\text{ k}\Omega$
	3	RS232_TxD	10 V, $R_a < 2\text{ k}\Omega$
	4	RS485_A	Do not connect!
	5	GND	0V
	6	–	–
	7	–	–
	8	–	–
	9	RS485_B	Do not connect!

Tab. 4.16 Pin allocation RS232 [X5]

[X5] RS485	Pin	Value	Description
	1	–	–
	2	RS232_RxD	Do not connect!
	3	RS232_TxD	Do not connect!
	4	RS485_A	–
	5	GND	0V
	6	–	–
	7	–	–
	8	–	–
	9	RS485_B	–

Tab. 4.17 Pin allocation RS485 [X5]

4.8 Motor [X6]

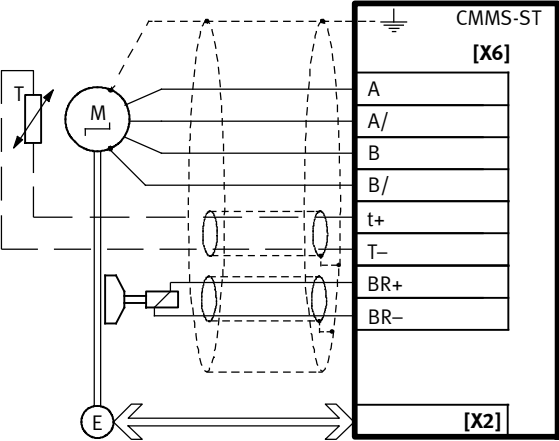


Fig. 4.2 Connection to motor (example of motor without temperature sensor)

4.8.1 Pin allocation

Process valve	version
[X6] on the motor controller	Phoenix Contact - MSTB 2.5/8-G-5.08 BK
Counterplug (plug set NEKM-C-1)	Phoenix Contact - MSTB 2.5/8-ST5.08 BK

Tab. 4.18 Motor connection

[X6]	Pin	Value	Description
	1	A	Connection to motor line A
	2	A/	
	3	B	
	4	B/	
	5	t+	Motor temperature sensor ¹⁾²⁾ either N/C contact / PTC (Rcold < 1 kΩ, Rhot > 10 kΩ) or Si temperature sensor in series KTY81 thru KTY84 (R25 = 1 kΩ or R25 = 2 kΩ)
	6	T-	
	7	BR+	Motor holding brake ²⁾
	8	Br-	

1) Optional with 3rd party motors

2) Recommendation: When using cables made by other manufacturers, only use motor cables on which the cables for the temperature sensor (T-, T+) and the cable for the holding brake (BR-, BR+) are in twisted pairs and screened.

Tab. 4.19 Pin allocation: Motor [X6]

4.8.2 Connecting the screening of the motor cable



If third-party cables are used: Place the complete screening of the motor-side cable flat on the plug or motor housing. Maximum length 40 mm.

- Place the complete screening of the motor cable at the screening connection terminal of the related motor controller so that the leaked current can flow back into the controller causing it.
- Do not use the complete screening as strain relief.

For further instructions regarding EMC-compliant wiring of the motor → Chapter 4.2.2.

4.8.3 Connection of a holding brake



Holding brakes are not appropriate for braking the motor. They only serve functional holding of the motor shaft. Additional measures are required for use in safety-oriented applications.



Warning

The holding brake integrated in the motor, or an external holding brake controlled by the motor controller, is not suitable for protecting personnel!

- Provide additional support to protect vertical axes from falling or slipping down when the motor is switched off through
 - mechanical locking of the vertical axis
 - an external brake/catch/clamping device or
 - sufficient counterbalance of the axis.

- Connect the holding brake to the terminals BR+ [X6.7] and BR- [X6.8]. The brake is supplied from the logic supply of the motor controller.



Please note

If the motor is warm and there is an insufficient supply voltage (outside tolerance values), the holding brake cannot open fully. Result: premature wearing of the brake.

- Make sure the nominal voltage tolerances are maintained at the terminals of the holding brake (→ Tab. A.8, logic supply).

- Observe the maximum output current provided by the motor controller (→ Tab. A.8).

4.9 Power supply [X9]

4.9.1 Protective Extra-Low Voltage (PELV) to protect against electric shock



Warning

Danger of electric shock

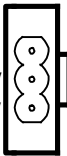
- Use only PELV (protective extra-low voltage) circuits to EN 60204-1 for the electric logic supply.
- Use for the electrical power circuits only PELV circuits in accordance with EN 60204-1 (Protective Extra-Low Voltage, PELV).
- Also observe the general requirements for PELV circuits as per EN 60204-1.
- Ensure that the reference potential for logic and power supply are connected to a central location with FE.
- Use only voltage sources that ensure a reliable electric separation of operating voltage in accordance with EN 60204-1.

Through the use of PELV circuits, protection from electric shock (protection from direct and indirect contact) in accordance with EN 60204-1 is ensured (Electrical equipment of machines. General requirements). A 24 V power supply unit used in the system must meet the requirements of EN 60204-1 for DC power supply units (behaviour in case of voltage interruptions, etc.).

4.9.2 Pin allocation

Process valve	version
[X9] on the motor controller	Phoenix Contact - MSTB 2.5/3-G-5.08 BK
Counterplug (plug set NEKM-C-1)	Phoenix Contact - MSTB 2.5/3-ST-5.08 BK

Tab. 4.20 Connection, power supply

[X9]	Pin		Value	Description
	1	ZK+	12 V DC ... 58 V DC	Intermediate circuit voltage (power)
	2	24V	24 V DC ± 20%	Power supply to control unit (logic)
	3	0 V	-	Common reference potential for the intermediate circuit and the control section

Tab. 4.21 Pin allocation: voltage supply [X9]

4.9.3 Connection to the supply voltage

- Before establishing the connection make sure the power supply is switched off.
- Before commissioning, also for brief measuring and test purposes, connect the PE protective conductor to the earthing screw on the motor controller housing (→ Fig. 2.2, 8).

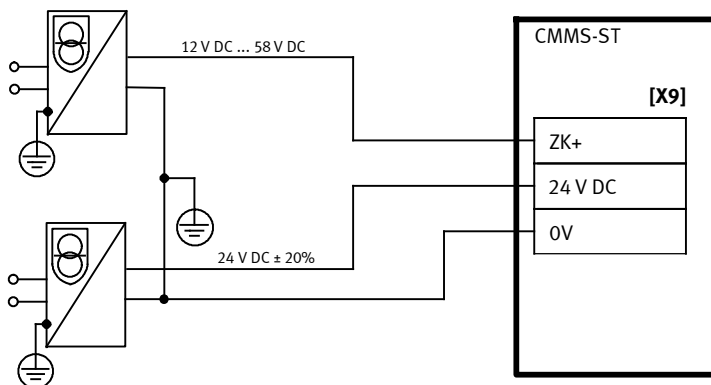


Fig. 4.3 Connection of power supplies



Please note

Note the following if the load (ZK+) and logic are to receive power from a shared 24 V mains source:

- The power unit must be protected against feedback because when braking the axis, power can feed back into the intermediate circuit causing the intermediate circuit voltage to rise.
- Ensure that the intermediate circuit voltage does not continue to rise beyond the level stipulated for logic power supply in the technical data.

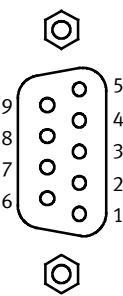
4.10 Master/slave interface [X10]

The master/slave interface is bi-directional and can be configured with the FCT software as an input or as an output for master/slave operation:

- Master (incremental encoder emulation): Output of tracking signals A/B/N of an incremental encoder for actuating a slave controller
- Slave (synchronisation): Input for tracking signals A/B, pulse/direction signals CLK/DIR or forward/backward signals CW/CCW for synchronisation with a master controller.

Process valve	version
[X10] on the motor controller	Sub-D plug connector, 9-pin, sockets
Counterplug	Sub-D plug connector, 9-pin, pins

Tab. 4.22 Connection of master/slave interface

[X10]	Pin	Designation	Value	Description
	1	A CLK CW	5 V DC $R_i = 120 \Omega$ max. 150 kHz	<ul style="list-style-type: none"> – Tracking signal A – Pulse CLK – Pulses clockwise CW – Positive polarity in accordance with RS422
	2	B DIR CCW	5 V $R_i = 120 \Omega$ max. 150 kHz	<ul style="list-style-type: none"> – Tracking signal B – Direction DIR – Pulses counterclockwise CCW – Positive polarity in accordance with RS422
	3	N	5 V $R_i = 120 \Omega$ max. 150 kHz	<ul style="list-style-type: none"> – Incremental encoder zero pulse N – Positive polarity in accordance with RS422
	4	GND ¹⁾	–	Reference GND for incremental encoder
	5	VCC	+5 V $\pm 5 \%$, 100 mA	Auxiliary supply, max. load 100 mA, short-circuit proof
	6	#A #CLK #CW	5 V $R_i = 120 \Omega$ max. 150 kHz	<ul style="list-style-type: none"> – Tracking signal A – Pulse CLK – Pulses clockwise CW – Negative polarity in accordance with RS422
	7	#B #DIR #CCW	5 V $R_i = 120 \Omega$ max. 150 kHz	<ul style="list-style-type: none"> – Tracking signal B – Direction DIR – Pulses counterclockwise CCW – Negative polarity in accordance with RS422
	8	#N	5 V $R_i = 120 \Omega$ max. 150 kHz	<ul style="list-style-type: none"> – Zero pulse N – Negative polarity in accordance with RS422
	9	GND ¹⁾	–	Screening for the connecting cable

1) Pin 4 and pin 9 are connected internally

Tab. 4.23 Pin allocation: Master/slave interface [X10]

5 Commissioning



Note

Danger from unexpected movement of the motor or axis

- Make sure that the movement does not endanger anyone.
- Parameterise the motor controller with the Festo Configuration Tool (FCT) before enabling the controller via DIN5 [X1.9].
- Bypassing of safety equipment is impermissible.
Recommendation for first commissioning without safety equipment:
 - Minimum circuitry with emergency stop switching device at [X3]
 - Two-channel switch-off via control ports REL [X3.2] and DIN4 [X1.21].



Please note

Damage to the motor controller

The motor controller is damaged in case of

- excessive operating voltage
- polarity reversal of the operating voltage connections
- interchange of operating voltage and motor connections
- short circuits in the motor circuit between the motor phases and FE.
- Comply with the specified values for the supply voltage.
- Before switching on, check connections [X9] and [X6].
- Check to ensure there is no FE short in the motor connection circuit.

Before switching on the power supply:

Check the installation of the motor controller:

- Check all connections (→ **Chapter 4**).
- Connect all FE protective conductors, even for brief measuring and test purposes.
- Mounted module or cover plate on the card slot [EXT]. Mounted line on [X9] and [X6].

If activation via a bus connection requires a terminating resistor:

- Check the connection of the terminating resistor.

Implement the following settings:

- Make sure that controller enable is not present at DIN 5 [X1.9]. The I/O interface [X1] is activated when switched on.
- DIP switch [S1.8]:
 - OFF: No firmware download, standard setting
 - ON: Firmware download from the SD memory card to the motor controller.



Additional steps regarding preparation for commissioning → Description, functions and commissioning, GDCP-CMMS/D-FW-....

6 Maintenance, updating, repair and replacement

6.1 Maintenance and care



Caution

Motor controller contains condensers (energy storage)

Do not disconnect connecting cables when powered. Before mounting and installation work:

1. Switch off power to the electrical equipment via the mains switch and secure it against being switched on again.
2. After switch-off, wait at least 1 minute discharge time and check that power is turned off before accessing the controller.



Caution

Danger of burns from hot surfaces

Dependent on the load of the motor controller, housing temperatures > 80 °C are possible in operation.

- Touch them only in a switched-off, cooled-off status.



If used as intended in the operating instructions, the device will be maintenance-free.

- Clean the outside of the product with a soft cloth.

6.2 Repair



Repair or maintenance of the product is not permissible. If necessary, replace the complete product.

6.3 Replacement and disposal

Observe the disassembly instructions in section . 3.3.

6.3.1 Disassembly and installation



Information on removing and installing can be found here:

- Mounting → Section 3.2
- Disassembly → Section 3.3.
- Commissioning → Section 5.

6.3.2 Disposal



Observe the local regulations for environmentally appropriate disposal of electronic modules. The product is RoHS-compliant.

A Technical appendix

A.1 Technical data

General technical data	
Type of mounting	Screwed to a mounting plate
Fault signal	7-segment display (error code)
Parameterisation interface	RS232 (9600 ... 115 000 bit/s)
Parameterisation software	Festo Configuration Tool (FCT)
Control interfaces	
fieldbus,	<ul style="list-style-type: none"> – integrated: CANopen, RS485 – optional: PROFIBUS DP, DeviceNet
Digital I/O	– DINO ... 13, DOUT0 ... 3
Analogue I/O	– AMON/AGND, AINO/#AINO
Protective functions	<ul style="list-style-type: none"> – I²t monitoring – Following error monitoring – Voltage failure detection – Current monitoring – Temperature monitoring
Dimensions and weight	
Dimensions	→ Fig. 3.1 and Tab. 3.1
Weight [kg]	approx. 1
Product conformity and certifications	
CE marking (Declaration of conformity → www.festo.com)	In accordance with EU Machinery Directive 2006/42/EC
	In accordance with EU EMC Directive 2004/108/EC ¹⁾
Additional certifications	UL/RCM mark/BIA

1) The device is intended for use in an industrial environment. Outside of industrial environments, e.g. in commercial and mixed-residential areas, actions to suppress interference may have to be taken.

Tab. A.1 Technical data, general

Operating and Environmental Conditions		
Permissible setup altitude above sea level		
with rated output	[m]	1000
with power reduction: 10 % every 1000 m	[m]	1000 ... 3000 (max.)
Relative air humidity	[%]	0 ... 90 (non-condensing)
Degree of protection		IP20
Electrical protection class		III
Overvoltage category		III
Degree of contamination		2
Ambient temperature		
with nominal power	[°C]	0 ... +40
with power reduction: 4 % per [K]	[°C]	+40 ... +50
Storage temperature	[°C]	-25 ... +70
Cooling		Passive
Switch-off temperature, heat sink	[°C]	≥ 85
Power section		
Vibration and shock resistance		
Operation		in accordance with EN 61800-5-1, section 5.2.6.4
Transport		in accordance with EN 61800-2, section 4.3.3

Tab. A.2 Technical data: Operating and ambient conditions

A.2 Connection data

A.2.1 I/O interface [X1]

I/O interface [X1]		
cable	[m]	$l < 5$, recommendation: screened
Digital inputs		
Number		14
Nominal voltage	[V DC]	24 (related to 0V)
Voltage range	[V DC]	19.2 ... 28.8
Signal level	[V DC]	0 ... 28.8 (PNP logic)
Nominal current	[mA]	typical: 2.5 maximum: 3
Voltage threshold		
High	[V DC]	≥ 13.1
Low	[V DC]	≤ 3.4
Input impedance	[k Ω]	10.5 ... 13.5
Reaction time to input	[ms]	< 5
Reaction time to sample input	[μ s]	< 100
Response time DIN2 and DIN3 (CLK/DIR) in the operating mode Synchronize	[μ s]	< 500 ; $f_{\text{max}} < 20$ kHz
Protective function		Against polarity reversal
Digital outputs		
Number		4
Signal level	[V DC]	24 (from logic supply)
Nominal current	[mA]	≤ 100
Voltage threshold		
High	[V DC]	$> (U_{\text{Logic}} - 1.0)$
Low	[V DC]	< 0.8
Output reaction time	[ms]	≤ 3
Protective function		Against polarity reversal, feedback, automatic shutdown of the output in the event of an over- load; automatic restart when the short circuit has been remedied

I/O interface [X1]		
Analogue input		
Number		1
Signal level	[V]	−10 ... +10
version		Differential input
Resolution	[bit]	12
Input reaction time	[μs]	< 250
Protective function		Overvoltage to ±30 V
Analogue output		
Number		1
Signal level	[V DC]	0 ... 10
version		Single-ended against AGND
Resolution	[bit]	9
Output reaction time	[μs]	< 250
Protective function		Short circuit against AGND

Tab. A.3 Connection data: I/O interface [X1]

A.2.2 Encoder [X2]

Encoder [X2]		
cable	[m]	l ≤ 25 m, screened
Signal level of tracking signals A, B, N	[V]	5 V differential, RS422
Angle resolution	[bit]	Max. 12
Number of lines		1000, 500, 400, 200
Critical frequency	[kHz]	> 100
Encoder supply (from the controller)		
Voltage	[V DC]	5 (-5 % ... +5 %)
Current	[mA]	≤ 100

Tab. A.4 Connection data: Encoder [X2] (input)

A.2.3 STO interface [X3]



Technical data for interface STO [X3] → Description safety functions STO, GDCP-CMMS-ST-G2-S1-....

A.2.4 CAN [X4]

CAN [X4]	
Communication profile	CANopen CiA 301, CiA 402 and FHPP Rev.13
Bus connection	9-pin, pin, sub-D
Cable length - dependent on the bit rate [m]	≤ 40 at 1 Mbit/s ≤ 130 at 500 Kbit/s ≤ 270 at 250 Kbit/s ≤ 530 at 125 Kbit/s
Max. fieldbus transmission rate [Mbit/s]	1
Terminating resistor [Ω]	120 (active via DIP switch)

Tab. A.5 Connection data: CAN-Bus [X4]

A.2.5 RS232/RS485 [X5]

Serial interface [X5]	
cable [m]	$l \leq 5$, screened
Signal level	In accordance with RS232/RS485 specification
Transmission rate [bps]	9600...115200
Factory setting	
Transmission rate [bps]	9600
Data bits	8
Parity	none
Stop bit	1
ESD protection	Driver protected against electrostatic discharge up to 16 kV

Tab. A.6 Connection data: RS232/RS485 [X5]

A.2.6 Motor [X6]

Motor [X6]		
Cabling		
Thermal rated value	[°C]	60/75 class 1
cable		Screened
without external filters	[m]	$l \leq 25$
Cable capacitance of one phase against screen or between two lines	[pF/m]	≤ 200
Conductor cross-section (plug connector)		
Flexible conductor	[mm²]	0.25 ... 2.5
– Wire end sleeve without insulating collar	[mm²]	0.25 ... 2.5
– Wire end sleeve with insulating collar	[mm²]	0.25 ... 2.5
Terminal tightening torque	[Nm]	0.5 ... 0.6
Output data		
Nominal current I_{eff}	[A]	8
Peak current I_{eff}	[A]	12
Max. peak current duration	[s]	2
Output frequency	[Hz]	0 ... 2000
PWM frequency	[kHz]	50
Holding brake		
Voltage range	[V DC]	18 ... 30
Output current	[A]	1 A
Voltage loss	[V]	≤ 1
Short circuit/overcurrent protection	[A]	> 4
Temperature protection T_j	[°C]	> 150
Load		
Ohmic	[Ω]	> 24
Inductive	[H]	10 (typical)
Capacitive	[nF]	< 10
Switching delay	[ms]	< 1
Motor temperature monitoring		
Digital sensor (N/C contact)		
R_{Cold}	[kΩ]	< 1
R_{Hot}	[kΩ]	> 10
Analogue sensor (Silicon temperature sensor, e.g. KTY81 ... 84)		
R25	[kΩ]	1 or 2

Tab. A.7 Connection data: Motor connection [X6]

A.2.7 Power supply [X9]

Power supply [X9]		
Cabling		
cable	[m]	$l \leq 2$, unshielded
Conductor cross-section (plug connector)		
Flexible conductor		
– Wire end sleeve without insulating collar	[mm ²]	0.25 ... 2.5
– Wire end sleeve with insulating collar	[mm ²]	0.25 ... 2.5
Terminal tightening torque	[Nm]	0.5 ... 0.6
Load supply		
Nominal voltage, load supply	[V DC]	48
Alternative load voltage	[V DC]	24, 48 (Nominal value can be parametrised via FCT)
Voltage range	[V DC]	12 ... 58
Nominal current	[A]	8 (with nominal motor current)
End stage power loss	[W]	approx. 15 ... 20
Own power loss control section	[W]	approx. 5 ... 7
PWM switching frequency	[kHz]	50 (permanently set)
Logic supply		
Nominal voltage	[V DC]	$24 \pm 20\%$
Max. ripple in input voltage	[V]	1.0 at 100 Hz
Nominal current	[A]	0.2
– Outputs load-free		
– Without current for holding brake		
Max. current (incl. holding brake)	[A]	1.5

Tab. A.8 Connection data: Power supply [X9]

Brake-Chopper and braking resistor		
Brake chopper		
Response threshold ¹⁾		
at FCT settings load voltage 48 V	[V DC]	≤ 58
at FCT settings load voltage 24 V	[V DC]	≤ 33
Maximum current	[A]	< 4
Hysteresis	[V]	Approx. 3
Integrated braking resistor		
Braking resistor	[Ω]	17
Pulse power (for 50 ms)	[W]	500
Rated output	[W]	10

1) If the threshold is exceeded by more than 10%, a corresponding error message is displayed.

Tab. A.9 Technical data: braking resistor



The connection of an additional external braking resistor is not provided.

A.2.8 Master/slave interface [X10]

Master/slave interface		
Bi-directional operation		
as input		Slave function (synchronisation)
as output		Master function (incremental encoder emulation)
cable		Screened
Slave function	[m]	l ≤ 30
Master function	[m]	l ≤ 5
Interface		According to RS422 standard
Input signals		A/B, CW/CCW, CLK/DIR
Output signals		A/B/N
Angle resolution/number of lines		1 ... 2048
Output impedance	[Ω]	120
Critical frequency	[kHz]	> 150

Tab. A.10 Connection data: Master/slave interface [X10]

B Diagnostic messages

B.1 Explanations of the diagnostic messages

The following table summarises the significance of the diagnostic messages and the actions to be taken in response to them:

Terms	Meaning
no.	Main index (error group) and sub-index of the diagnostic message. Indication via the 7-segments display, in FCT or in the diagnostic memory via FHPP.
Code	The Code column includes the error code (Hex) via CiA 301.
Message	Message that is displayed in the FCT.
Cause	Possible causes for the message.
Action	Action by the user.
Reaction	The Reaction column includes the error response (default setting, partially configurable): <ul style="list-style-type: none"> – PS off (block output stage), – MCStop (fast stop with maximum current), – QStop (fast stop with parameterised edge), – Warn (warning), – Entry (entry in diagnostic memory), – Ignore.

Tab. B.1 Explanations of the diagnostic messages

For a complete list of the diagnostic messages that correspond to the firmware versions used at the time of printing this document, please refer to section B.2.

Under section B.3, you will find the error codes in accordance with CiA301/402 and the error bit numbers with allocation to the error numbers of the diagnostic messages.

Under section B.4, you will find the PROFIBUS diagnostic bits with allocation to the error numbers of the diagnostic messages.

B.2 Diagnostic messages with instructions for fault clearance

Error group 01		Internal faults	
no.	Code	Message	Reaction
01-0	6180h	Stack overflow (internal error)	
		Cause	<ul style="list-style-type: none"> – Incorrect firmware? – Sporadic high processor load due to special compute-bound processes (save parameter set, etc.).
		Action	<ul style="list-style-type: none"> • Load approved firmware. • Contact Technical Support.

Error group 02		Intermediate circuit	
No.	Code	Message	Reaction
02-0	3220h	Undervoltage in intermediate circuit	
		Cause	– Intermediate circuit voltage falls below the parameterised threshold.
		Action	<ul style="list-style-type: none"> • Quick discharge due to switched-off mains supply. • Check mains voltage (mains voltage level or network impedance too high?). • Check intermediate circuit voltage (measure). • Check undervoltage monitor (threshold value). • Check travel profile: If travel with lower acceleration and/or travel speeds is possible, this reduces power consumption from the mains.

Error group 03		Temperature monitoring, motor	
no.	Code	Message	Reaction
03-1	4310h	Temperature monitoring, motor	
		Cause	Motor overloaded, temperature too high. <ul style="list-style-type: none"> – Motor too hot. – Sensor defective?
		Action	<ul style="list-style-type: none"> • Check parameters (current regulator, current limits). If the error persists when the sensor is bypassed: Device defective.

Error group 04		Temperature monitoring, electronics	
no.	Code	Message	Reaction
04-0	4210h	Excess/low temperature of power electronics	
		Cause	Motor controller is overheated. – Motor controller overloaded? – Temperature display plausible?
		Action	<ul style="list-style-type: none"> • Check installation conditions, cooling through the housing surface, integrated heat sink and back wall. • Check the drive layout (due to possible overloading in continuous operation).

Error group 05		Internal power supply	
no.	Code	Message	Reaction
05-0	5114h	5 V electronics supply fault	
		Cause	Monitoring of the internal power supply has recognised under-voltage. This is either due to an internal defect or an overload/short circuit caused by connected peripherals.
		Action	<ul style="list-style-type: none"> • Separate device from the entire peripheral equipment and check whether the error is still present after reset. If so, an internal defect is present → Repair by the manufacturer.
05-1	5115h	Error in 24 V supply	
		Cause	Monitoring of the internal power supply has recognised under-voltage.
		Action	<ul style="list-style-type: none"> • Check 24 V logic supply. • Separate device from the entire peripheral equipment and check whether the error is still present after reset. If so, an internal defect is present → Repair by the manufacturer.
05-2	5116h	12 V electronics supply fault	
		Cause	Monitoring of the internal power supply has recognised under-voltage. This is either due to an internal defect or an overload/short circuit caused by connected peripherals.
		Action	<ul style="list-style-type: none"> • Separate device from the entire peripheral equipment and check whether the error is still present after reset. If so, an internal defect is present → Repair by the manufacturer.

Error group 06		Intermediate circuit	
No.	Code	Message	Reaction
06-0	2320h	Over-current of the intermediate circuit/output stage	
		Cause	<ul style="list-style-type: none"> – Motor defective. – Short circuit in the cable. – Output stage defective.
		Action	<ul style="list-style-type: none"> • Check motor, cable and motor controller.

Error group 07		Intermediate circuit	
No.	Code	Message	Reaction
07-0	3210h	Overvoltage in intermediate circuit	
		Cause	Braking resistor is overloaded; too much braking energy which cannot be dissipated quickly enough.
		Action	<ul style="list-style-type: none"> • Check application

Error group 08		Angle encoder	
no.	Code	Message	Reaction
08-0	7380h	Error in encoder supply	
		Cause	Encoder supply outside the allowed range (too high/too low).
		Action	<ul style="list-style-type: none"> • Test with another encoder. • Test with another encoder cable. • Test with another motor controller.

Error group 11		Homing	
no.	Code	Message	Reaction
11-1	8A81h	Homing error	
		Cause	Homing was interrupted, e.g. by: <ul style="list-style-type: none"> – withdrawal of controller enable. – reference switch located beyond the limit switch. – external stop signal (termination of a homing phase).
		Action	<ul style="list-style-type: none"> • Check homing sequence. • Check arrangement of the switches. • If applicable, lock the STOP input during homing if it is not desired.

Error group 12		CAN		
no.	Code	Message	Reaction	
12-0	8181h	CAN: general error		configurable
		Cause	Other CAN error. Triggered by the CAN controller itself and is used as a common error for all further CAN errors.	
		Action	<ul style="list-style-type: none">• Re-start CAN controller.• Check CAN configuration in the controller.• Check wiring.	
12-1	8181h	CAN: error bus off		configurable
		Cause	Errors can occur if the CAN control malfunctions or is deliberately requested by the controller of the bus-off status.	
		Action	<ul style="list-style-type: none">• Re-start CAN controller.• Check CAN configuration in the controller.• Check wiring.	
12-2	8181h	CAN: Error when transmitting		configurable
		Cause	Error when sending a message (e.g. no bus connected).	
		Action	<ul style="list-style-type: none">• Re-start CAN controller• Check CAN configuration in the controller• Check wiring	
12-3	8181h	CAN: Error when receiving		configurable
		Cause	Error receiving a message.	
		Action	<ul style="list-style-type: none">• Re-start CAN controller.• Check CAN configuration in the controller.• Check wiring: Cable specification adhered to, broken cable, maximum cable length exceeded, correct terminating resistors, cable screening earthed, all signals terminated?	
12-4	8130h	CAN: Time-out nodeguarding		configurable
		Cause	Node guarding telegram not received within the parametrised time. Signals corrupted?	
		Action	<ul style="list-style-type: none">• Compare cycle time of the remote frames with that of the controller.• Check: Failure of the controller?	
12-5	8181h	CAN: Error in the IPO mode		configurable
		Cause	Over a period of 2 SYNC intervals, the SYNC telegram or the PDO of the controller has failed.	
		Action	<ul style="list-style-type: none">• Re-start CAN controller.• Check CAN configuration in the controller (SYNC telegram must be parameterised).• Check wiring.	

Error group 14		Motor identification	
no.	Code	Message	Reaction
14-9	6197h	Error, motor identification	
		PS off	
		Cause	Error in automatic determination of the motor parameters.
		Action	<ul style="list-style-type: none">• Ensure sufficient intermediate circuit voltage.• Encoder cable connected to the right motor?• Motor blocked, e.g. holding brake does not release?

Error group 16		Initialization	
no.	Code	Message	Reaction
16-2	6187 h	Initialization fault	
		Cause	Error in initialising the default parameters.
		Action	<ul style="list-style-type: none">In case of repetition, load firmware again. If the error occurs repeatedly, the hardware is defective.
16-3	6183h	Unexpected status / programming error	
		Cause	The software has taken an unexpected status. For example, unknown status in the FHPP state machine.
		Action	<ul style="list-style-type: none">In case of repetition, load firmware again. If the error occurs repeatedly, the hardware is defective.

Error group 17		Following error monitoring	
no.	Code	Message	Reaction
17-0	8611h	Following error monitoring	
		configurable	
		Cause	Comparison threshold for the limit value of the following error exceeded.
		Action	<ul style="list-style-type: none">• Enlarge error window.• Parameterise acceleration to be less.• Motor overloaded (current limiter from the I²t monitoring active?).

Error group 18		Output stage temperature monitoring	
no.	Code	Message	Reaction
18-1	4280h	Output stage temperature 5 °C below maximum	
		configurable	
		Cause	The output stage temperature is greater than 90 °C.
		Action	<ul style="list-style-type: none">• Check installation conditions, cooling through the housing surface, integrated heat sink and back wall.

Error group 19		I²t monitoring	
no.	Code	Message	Reaction
19-0	2380h	I²t at 80 %	
		configurable	
		Cause	Of the maximum I²t workload of the controller or motor, 80 % has been achieved.
		Action	<ul style="list-style-type: none">Check whether motor/mechanics are blocked or sluggish.

Error group 21		Current measurement	
no.	Code	Message	Reaction
21-0	5210h	Error, offset current measurement	
		PS off	
		Cause	The controller performs offset compensation of the current measurement. Tolerances that are too large result in an error.
		Measure	If the error occurs repeatedly, the hardware is defective. <ul style="list-style-type: none">Send motor controller to the manufacturer.

Error group 22		PROFIBUS	
no.	Code	Message	Reaction
22-0	7500h	Error in PROFIBUS initialization	
		Cause	Fieldbus interface defective.
		Action	<ul style="list-style-type: none">• Please contact Technical Support.
22-2	7500h	PROFIBUS communication error	
		Cause	<ul style="list-style-type: none">– Faulty initialisation of the Profibus interface.– Interface defective.
		Action	<ul style="list-style-type: none">• Check the set slave address.• Check bus termination.• Check wiring.
			configurable

Error group 25		Firmware	
no.	Code	Message	Reaction
25-1	6081 h	Incorrect firmware	
		PS off	
		Cause	Motor controller and firmware are not compatible.
		Action	<ul style="list-style-type: none">Update the firmware.

Error group 26		Data flash	
no.	Code	Message	Reaction
26-1	5581h	Checksum error	
		PS off	
		Cause	Checksum error of a parameter set.
		Action	<ul style="list-style-type: none">• Load factory setting.• If the error is still present, the hardware is defective.

Error group 29		SD card	
no.	Code	Message	Reaction
29-0	7680h	No SD available	
		configurable	
		Cause	An attempt was made to access a missing SD card.
		Action	Check: <ul style="list-style-type: none">• whether the SD card is inserted properly,• whether the SD card is formatted,• whether a compatible SD card is plugged in.
29-1	7681h	SD initialization error	
		configurable	
		Cause	<ul style="list-style-type: none">– Error during initialization.– Communication not possible.
		Action	<ul style="list-style-type: none">• Plug card back in.• Check card (file format FAT 16).• If necessary, format card.
29-2	7682h	SD parameter set error	
		configurable	
		Cause	<ul style="list-style-type: none">– Checksum incorrect.– File not present.– File format incorrect.– Error saving the parameter file on the SD card.
		Action	<ul style="list-style-type: none">• Check content (data) of the SD card.

Error group 31		I²t monitoring	
no.	Code	Message	Reaction
31-0	2312h	I²t error motor (I²t at 100%)	
		configurable	
		Cause	I²t monitoring of the controller has been triggered. – Motor/mechanical system blocked or sluggish. – Motor under-sized?
	Action	• Check motor and mechanical system.	
31-1	2311h	I²t error controller (I²t at 100%)	
		configurable	
		Cause	I²t monitoring of the controller has been triggered.
	Action	• Check power dimensioning of drive package.	

Error group 32		Intermediate circuit	
No.	Code	Message	Reaction
32-8	3285h	Power supply failure during controller enable	
		PS off	
		Cause	Interruption/power failure while the controller enable was active.
		Action	• Check mains voltage/power supply.

Error group 35		Fast stop	
no.	Code	Message	Reaction
35-1	6199h	Time out with fast stop	
		PS off	
		Cause	The parameterised time for fast stop was exceeded.
		Action	<ul style="list-style-type: none">Check parameterisation.

Error group 40		Software limit	
sorNo.	Code	Message	Reaction
40-0	8612h	Negative software limit switch reached	
		Cause	The position setpoint value has reached or exceeded the negative software limit switch.
		Action	<ul style="list-style-type: none">• Check the target data.• Check positioning area.
40-1	8612h	Positive software limit switch reached	
		Cause	The position setpoint value has reached or exceeded the positive software limit switch.
		Action	<ul style="list-style-type: none">• Check the target data.• Check positioning area.
40-2	8612h	Target position lies behind the negative software limit switch	
		Cause	Start of a positioning task was suppressed because the target lies behind the negative software limit switch.
		Action	<ul style="list-style-type: none">• Check the target data.• Check positioning area.
40-3	8612h	Target position lies behind the positive software limit switch	
		Cause	The start of a positioning task was suppressed because the target lies behind the positive software limit switch.
		Action	<ul style="list-style-type: none">• Check the target data.• Check positioning area.

Error group 41		Path program	
no.	Code	Message	Reaction
41-8	6193h	Path program error, unknown command	
		Cause	Unknown command found during record continuation.
		Action	<ul style="list-style-type: none">Check parameterisation.
41-9	6192h	Error in path program jump destination	
		Cause	Jump to a positioning record outside the permitted range.
		Action	<ul style="list-style-type: none">Check parameterisation.

Error group 42		Positioning	
no.	Code	Message	Reaction
42-1	8681h	Positioning: Error in pre-computation	
		Cause	Positioning cannot be reached through the options of the positioning (e.g. final speed) or parameters.
		Action	• Check parameterisation of the position records in question.
42-4	8600h	Message, homing required	
		Cause	– Positioning not possible without homing. – Homing must be carried out.
		Action	• Reset optional parameterisation “Homing required”. • Carry out a new homing run after acknowledgement of an angle encoder error.
42-9	6191h	Error in position data record	
		Cause	– An attempt is being made to start an unknown or deactivated position record. – The set acceleration is too small for the permissible maximum speed. – (Danger of a calculation overflow in the trajectory calculation).
		Action	• Check parameterisation and sequence control and correct, if necessary.

Error group 43		Limit switch error	
no.	Code	Message	Reaction
43-0	8612h	Negative limit switch error	
		configurable	
		Cause	Negative hardware limit switch reached.
		Action	• Check parameterisation, wiring and limit switches.
43-1	8612h	Positive limit switch error	
		configurable	
		Cause	Positive hardware limit switch reached.
		Action	• Check parameterisation, wiring and limit switches.
43-9	8612h	Error in limit switch	
		configurable	
		Cause	Both hardware limit switches are active simultaneously.
		Action	• Check parameterisation, wiring and limit switches.

Error group 45		STO error		
no.	Code	Message	Reaction	
45-0	8000h	Error in driver supply		PS off
		Cause	Driver supply is still active despite the STO requirement.	
		Action	The internal logic for the STO requirement may be disturbed due to high-frequency switching operations at the input. <ul style="list-style-type: none">• Check activation; the error must not recur.• If the error occurs repeatedly when the STO is called:• Check firmware (approved version?). If all the above options have been excluded, the hardware of the motor controller is defective.	
45-1	8000h	Error in driver supply		PS off
		Cause	The driver supply is active again, although STO is still required.	
		Action	The internal logic for the STO requirement may be disturbed due to high-frequency switching operations at the input. <ul style="list-style-type: none">• Check activation; the error must not recur.• If the error occurs repeatedly when the STO is called:• Check firmware (approved version?). If all the above options have been excluded, the hardware of the motor controller is defective.	
45-2	8000h	Error in driver supply		PS off
		Cause	The driver supply is not active again, although STO is no longer required.	
		Action	If the error occurs again after the STO requirement is ended, the hardware of the motor controller is defective.	
45-3	8087h	DIN4 plausibility error		PS off
		Cause	Output stage no longer switches off → Hardware defective.	
		Action	Repair by the manufacturer.	

Error group 64		DeviceNet error	
no.	Code	Message	Reaction
64-0	7582h	DeviceNet communication error	
		Cause	Node number exists twice.
		Action	<ul style="list-style-type: none">• Check the configuration.
64-1	7584h	DeviceNet general error	
		Cause	The 24 V bus voltage is missing.
		Action	<ul style="list-style-type: none">• In addition to the motor controller, the DeviceNet interface must also be connected to 24 V DC.
64-2	7582h	DeviceNet communication error	
		Cause	<ul style="list-style-type: none">– Receive buffer overflow.– Too many messages received within a short period.
		Action	<ul style="list-style-type: none">• Reduce the scan rate.

Error group 64		DeviceNet error	
no.	Code	Message	Reaction
64-3	7582h	DeviceNet communication error	
		Cause	<ul style="list-style-type: none">– Send buffer overflow.– Insufficient free space on the CAN bus to transmit messages.
		Action	<ul style="list-style-type: none">• Increase the baud rate.• Reduce the number of nodes.• Reduce the scan rate.
64-4	7582h	DeviceNet communication error	
		Cause	IO-message could not be sent
		Action	<ul style="list-style-type: none">• Check that the network is connected correctly and does not malfunction.
64-5	7582h	DeviceNet communication error	
		Cause	Bus off.
		Action	<ul style="list-style-type: none">• Check that the network is connected correctly and does not malfunction.
64-6	7582h	DeviceNet communication error	
		Cause	Overflow in the CAN controller.
		Action	<ul style="list-style-type: none">• Increase the baud rate.• Reduce the number of nodes.• Reduce the scan rate.

Error group 65		DeviceNet error	
no.	Code	Message	Reaction
65-0	7584h	DeviceNet general error	
		configurable	
		Cause	<ul style="list-style-type: none">– Communication is activated, even though no interface is plugged in.– The DeviceNet interface is attempting to read an unknown object.– Unknown DeviceNet error.
		Action	<ul style="list-style-type: none">• Check whether the DeviceNet interface is plugged in correctly.• Check that the network is connected correctly and does not malfunction.
65-1	7582h	DeviceNet communication error	
		configurable	
		Cause	<p>I/O connection timeout. No I/O message received within the expected time.</p>
		Action	<ul style="list-style-type: none">• Please contact Technical Support.

Error group 70		Operating mode error	
no.	Code	Message	Reaction
70-2	6195h	General arithmetic error	
		PS off	
		Cause	The fieldbus factor group cannot be calculated correctly.
		Action	<ul style="list-style-type: none">Check the factor group.
70-3	6380h	Operating mode error	
		configurable	
		Cause	This operating mode change is not supported by the motor controller.
		Action	<ul style="list-style-type: none">Check your application. <p>Not every change is permissible.</p>

Error group 79		RS232 error	
no.	Code	Message	Reaction
79-0	7510h	RS232 communication error	
		configurable	
		Cause	Overflow when receiving RS232 commands.
		Action	<ul style="list-style-type: none">• Check wiring.• Check the transmitted data.

B.3 Error codes via CiA 301/402

Diagnostic messages				
Code	no.	No. Bit	Message	Reaction
2311h	31-1	19	I ² t error controller (I ² t at 100%)	configurable
2312h	31-0	18	I ² t error motor (I ² t at 100%)	configurable
2320h	06-0	13	Over-current of the intermediate circuit/output stage	PS off
2380h	19-0	25	I ² t at 80 %	configurable
3210h	07-0	15	Overvoltage in intermediate circuit	PS off
3220h	02-0	14	Undervoltage in intermediate circuit	configurable
3285h	32-8	17	Power supply failure during controller enable	PS off
4210h	04-0	3	Excess/low temperature of power electronics	configurable
4280h	18-1	27	Output stage temperature 5 °C below maximum	configurable
4310h	03-1	2	Temperature monitoring, motor	configurable
5114h	05-0	8	5 V electronics supply fault	PS off
5115h	05-1	10	Error in 24 V supply	PS off
5116h	05-2	9	12 V electronics supply fault	PS off
5210h	21-0	12	Error, offset current measurement	PS off
5581h	26-1	62	Checksum error	PS off
6081h	25-1	11	Incorrect firmware	PS off
6180h	01-0	61	Stack overflow (internal error)	PS off
6183h	16-3	60	Unexpected status / programming error	PS off
6187h	16-2	63	Initialization fault	PS off
6191h	42-9	56	Error in position data record	PS off
6192h	41-9	42	Error in path program jump destination	configurable
6193h	41-8	43	Path program error, unknown command	configurable
6195h	70-2	58	General arithmetic error	PS off
6197h	14-9	39	Error, motor identification	PS off
6199h	35-1	34	Time out with fast stop	PS off
6380h	70-3	57	Operating mode error	configurable
7380h	08-0	4	Error in encoder supply	PS off
7500h	22-0	47	Error in PROFIBUS initialization	PS off
	22-2	53	PROFIBUS communication error	configurable
7510h	79-0	55	RS232 communication error	configurable

Diagnostic messages				
Code	no.	No. Bit	Message	Reaction
7582h	64-0	52	DeviceNet communication error	PS off
	64-2	52	DeviceNet communication error	PS off
	64-3	52	DeviceNet communication error	PS off
	64-4	52	DeviceNet communication error	PS off
	64-5	52	DeviceNet communication error	PS off
	64-6	52	DeviceNet communication error	PS off
	65-1	52	DeviceNet communication error	configurable
7584h	64-1	44	DeviceNet general error	PS off
	65-0	44	DeviceNet general error	configurable
7680h	29-0	48	No SD available	configurable
7681h	29-1	49	SD initialization error	configurable
7682h	29-2	50	SD parameter set error	configurable
8087h	45-3	22	DIN4 plausibility error	PS off
8130h	12-4	23	CAN: Time-out nodeguarding	configurable
8181h	12-0	54	CAN: general error	configurable
	12-1	54	CAN: error bus off	configurable
	12-2	54	CAN: Error when transmitting	configurable
	12-3	54	CAN: Error when receiving	configurable
	12-5	54	CAN: Error in the IPO mode	configurable
8600h	42-4	29	Message, homing required	configurable
8611h	17-0	28	Following error monitoring	configurable
8612h	40-0	31	Negative software limit switch reached	configurable
	40-1	31	Positive software limit switch reached	configurable
	40-2	31	Target position lies behind the negative software limit switch	configurable
	40-3	31	Target position lies behind the positive software limit switch	configurable
	43-0	30	Negative limit switch error	configurable
	43-1	30	Positive limit switch error	configurable
	43-9	30	Error in limit switch	configurable
8681h	42-1	59	Positioning: Error in pre-computation	configurable
8A81h	11-1	35	Homing error	PS off

B.4 Profibus diagnostics

Diagnostic messages					
Unit_Diag_Bit			no.	Message	Reaction
00	E429	“Position dataset”	42-9	Error in position data record	PS off
01	E703	“Operating mode”	70-3	Operating mode error	configurable
02	E702	“Arithmetic error”	70-2	General arithmetic error	PS off
03	E421	“Position precomputation”	42-1	Positioning: Error in pre-computation	configurable
04	E163	“Unexpected state”	16-3	Unexpected status / programming error	PS off
05	E010	“Stack overflow”	01-0	Stack overflow (internal error)	PS off
06	E261	“Checksum error”	26-1	Checksum error	PS off
07	E162	“Initialization”	16-2	Initialization fault	PS off
08	E290	“No SD available”	29-0	No SD available	configurable
09	E291	“SD initialization”	29-1	SD initialization error	configurable
10	E292	“SD parameter set”	29-2	SD parameter set error	configurable
13	E222	“PROFIBUS communication”	22-2	PROFIBUS communication error	configurable
14	-	“unknown”	12-0	CAN: general error	configurable
			12-1	CAN: error bus off	configurable
			12-2	CAN: Error when transmitting	configurable
			12-3	CAN: Error when receiving	configurable
			12-5	CAN: Error in the IPO mode	configurable
15	E790	“RS232 communication error”	79-0	RS232 communication error	configurable
18	E418	“Record seq. Unknown cmd”	41-9	Error in path program jump destination	configurable
19	E419	Record seq. Invalid dest.”	41-8	Path program error, unknown command	configurable
20		“unknown”	64-1	DeviceNet general error	PS off
			64-2	DeviceNet communication error	PS off
			64-3	DeviceNet communication error	PS off
			64-4	DeviceNet communication error	PS off
			64-5	DeviceNet communication error	PS off
			64-6	DeviceNet communication error	PS off
			65-0	DeviceNet general error	configurable
			65-1	DeviceNet communication error	configurable
23	E220	“PROFIBUS assembly”	22-0	Error in PROFIBUS initialization	PS off
26	E351	“Time out: Quick stop”	35-1	Time out with fast stop	PS off
27	E111	“Error during homing”	11-1	Homing error	PS off
31	E149	“Motor identification”	14-9	Error, motor identification	PS off
33	E190	“I2t at 80 %”	19-0	I2t at 80 %	configurable

Diagnostic messages				
Unit_Diag_Bit		no.	Message	Reaction
35	E181 "Outp. stage temp. 5 < max."	18-1	Output stage temperature 5 °C below maximum	configurable
36	E170 "Following error"	17-0	Following error monitoring	configurable
37	E424 "Enforce homing run"	42-4	Message, homing required	configurable
38	E43x "limit switches"	43-0	Negative limit switch error	configurable
		43-1	Positive limit switch error	configurable
		43-9	Error in limit switch	configurable
39	E40x "Software limit"	40-0	Negative software limit switch reached	configurable
		40-1	Positive software limit switch reached	configurable
		40-2	Target position lies behind the negative software limit switch	configurable
		40-3	Target position lies behind the positive software limit switch	configurable
41	E328 "Fail. power supply ctr.ena."	32-8	Power supply failure during controller enable	PS off
42	E310 "I ² t-error motor"	31-0	I ² t error motor (I ² t at 100%)	configurable
43	E311 "I ² t-error controller"	31-1	I ² t error controller (I ² t at 100%)	configurable
46	E453 "Plausibility DIN 4"	45-3	DIN4 plausibility error	PS off
47	E124 "Time out Nodeguarding"	12-4	CAN: Time-out nodeguarding	configurable
49	E052 "12V - Internal supply"	05-2	12 V electronics supply fault	PS off
48	E050 "5V - Internal supply"	05-0	5 V electronics supply fault	PS off
50	E051 "24V - Internal supply"	05-1	Error in 24 V supply	PS off
51	E251 "Hardware error"	25-1	Incorrect firmware	PS off
52	E210 "Offset current metering"	21-0	Error, offset current measurement	PS off
53	E060 "Overcurrent output stage"	06-0	Over-current of the intermediate circuit/output stage	PS off
54	E020 "Undervoltage power stage"	02-0	Undervoltage in intermediate circuit	configurable
55	E070 "Overvoltage output stage"	07-0	Overvoltage in intermediate circuit	PS off
58	E03x "Overheating error (motor)"	03-1	Temperature monitoring, motor	configurable
59	E040 "Overtemperature power stage"	04-0	Excess/low temperature of power electronics	configurable
60	E080 "Encoder supply"	08-0	Error in encoder supply	PS off

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