Motor controller

CMMP-AS-...-M3

FESTO

Description

Mounting and installation

for motor controller CMMP-AS-...-M3

760322
1203NH

Translation of the original instructions
GDCP-CMMP-M3-HW-EN

Identification of hazards and instructions on how to prevent them:

Danger
Immediate dangers which can lead to death or serious injuries.

Warning
Hazards that can cause death or serious injury.

Caution
Hazards that can cause minor injury or serious property damage.

Other symbols:

Note
Property damage or loss of functionality.

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 may be carried out in the order stated.
– General lists.

Table of contents – CMMP-AS-...-M3

Product identification, versions

This description refers to the following versions:
- Motor controller from Rev. 01
- FCT plug-in CMMP-AS from Version 2.0.x.

Rating plate (example)	Significance	
CMMP-AS-C2-3A-M3 1501325 XX Rev XX IND. CONT. EQ. LISTED 1UD1 In: 1*(100...230)V AC±10% (50...60)Hz 3A Out:3*(0...270)V AC (0...1000)Hz 2.5A Max surround air temp 40°C	Type designation	CMMP-AS-C2-3A-M3
	Part number	1501325
	Serial number	XX
	Revision	Rev XX
	Input data	100 ... 230 V AC ±10% 50 ... 60 Hz 3A
	Output data	0 ... 270 V AC 0 ... 1000 Hz 2.5 A
	Max. ambient temperature	40 °C

Tab. 1 Rating plate CMMP-AS-C2-3A-M3

Service

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

Documentation

You will find additional information on the motor controller in the following documentation:

User documentation on the motor controller CMMP-AS-...-M3	
Name, type	Contents
Hardware description, GDCP-CMMP-M3-HW-...	Mounting and installation for all variants/power classes (1-phase, 3-phase), pin assignments, error messages, maintenance.
Function descriptions, GDCP-CMMP-M3-FW-...	Instructions on commissioning with FCT + functional description (firmware). Overview of FHPP, fieldbus, safety engineering.
Description FHPP, GDCP-CMMP-M3-C-HP-...	Control and parametrisation of the motor controller through the Festo profile FHPP with the following fieldbusses: CANopen, PROFIBUS, DeviceNet, EtherCAT.
Description CiA 402 (DS 402), GDCP-CMMP-M3-C-CO-...	Control and parametrisation of the motor controller through the device profile CiA 402 (DS402) with the following fieldbusses: CANopen and EtherCAT.
Description CAM-Editor, P.BE-CMMP-CAM-SW-...	Cam disc function (CAM) of the motor controller.
Description safety module, GDCP-CAMC-G-S1-...	Functional safety engineering for the motor controller with the safety function STO.
Help for the CMMP-AS plug-in	User interface and functions of the CMMP-AS plug-in for the Festo Configuration Tool. ➔ www.festo.com

Tab. 2 Documentation on the motor controller CMMP-AS-...-M3

1 Safety and requirements for product use

1.1 Safety

1.1.1 Safety instructions for commissioning, repair and de-commissioning

Warning

Danger of electric shock.

– When modules or cover plates are not mounted on the slots Ext1 ... Ext3.
– When cables are not mounted to the plugs [X6] and [X9].
– When connecting cables are disconnected when powered.

Touching live parts causes severe injuries and can lead to death.

The product may only be operated in a built-in status and when all protective measures have been initiated.

Before touching live parts during 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 5 minutes discharge time and check that power is turned off before accessing the controller.

The safety functions do not protect against electric shock but only against dangerous movements!

Note

Danger from unexpected movement of the motor or axis.

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

1.1.2 Protection against electric shock through protective extra-low voltage (PELV)

Warning

- Use for the electrical power supply only PELV circuits in accordance with IEC DIN EN 60204-1 (Protective Extra-Low Voltage, PELV).
  Also comply with the general requirements for PELV circuits laid down in IEC/DIN EN 60204-1.
- Use only power sources which guarantee reliable electrical disconnection of the operating voltage as per IEC/DIN EN 60204-1.

Protection against electric shock (protection against direct and indirect contact) is guaranteed in accordance with IEC/DIN EN 60204-1 through the use of PELV circuits (Electrical equipment of machines, general requirements).

1.1.3 Intended use

The CMMP-AS-...-M3. is intended for ...

– Use in control cabinets for power supply to AC servo motors and their regulation of torques (current), rotational speed and position.

The CMMP-AS-...-M3. is intended for installation in machines or automated systems and may be used only in the following ways:

– in excellent technical condition,
– in original status without unauthorised modifications,
– within the limits of the product defined by the technical data (➔ appendix A Technical appendix),
– in an industrial environment.

Note

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.

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 Technical requirements

General conditions for the correct and safe use of the product, which must be observed at all times:

- Comply with the connection and environmental conditions specified in the technical data of the product (➔ appendix A) and of all connected components.
  Only compliance with the limit values or load limits permits operation of the product in accordance with the relevant safety regulations.
- Observe the instructions and warnings in this documentation.

1.2.2 Qualification of the specialists (requirements for the 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 operation of safety engineering systems,
– the applicable regulations on accident protection and industrial safety, and
– the documentation for the product.

1.2.3 Range of application and certifications

Standards and test values, which the product complies with and fulfils, can be found in the “Technical data” section (➔ appendix A). The product-relevant EU directives can be found in the declaration of conformity.

Certificates and the declaration of conformity for this product can be found at www.festo.-com.

1.2.4 Repair and waste management

Repair or maintenance of the motor controller is not permissible. If required, replace the motor controller.

Observe the local regulations for the environmentally friendly disposal of electronic components.

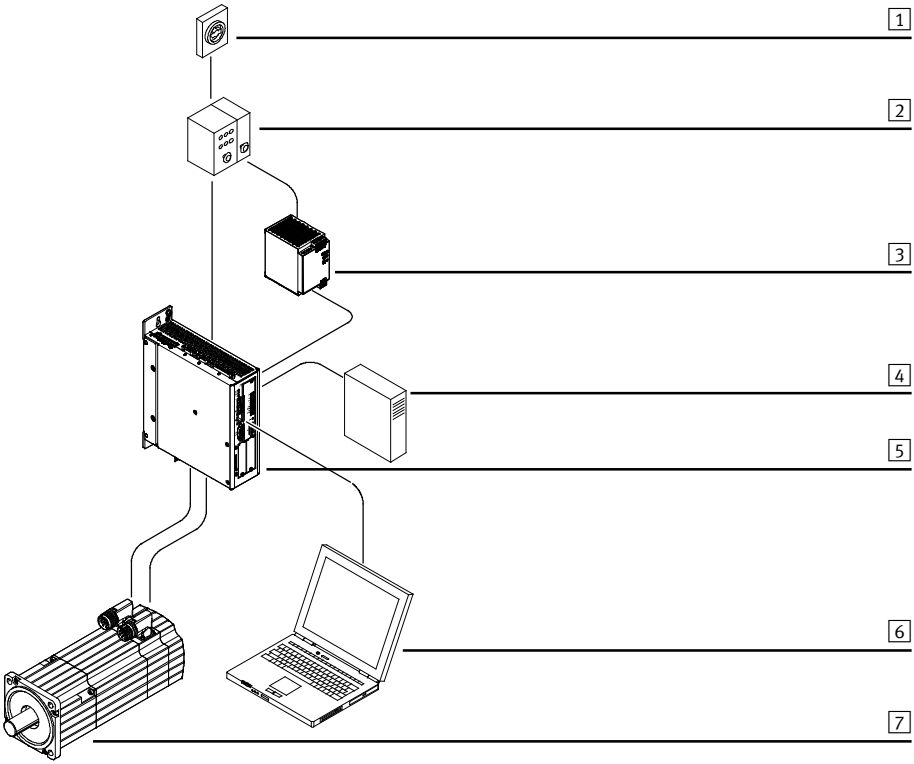
2 Product overview

2.1 The entire system for the CMMP-AS-...-M3

A motor controller CMMP-AS-...-M3 entire system is shown in ➔ Fig. 2.1 ➔ page 12. For operation of the motor controller, the following components are required:

– main power switch
– FI circuit breaker (RCD), all-current sensitive 300 mA
– automatic circuit breaker
– power supply 24 VDC
– motor controller CMMP-AS-...-M3
– motor with motor and encoder cables

A PC with USB or Ethernet connecting cable is required for parametrisation.



1 Power switch
2 Fuse
3 Power pack for logic voltage
4 Optional: external braking resistor
5 Motor controller CMMP-AS-...-M3
6 PC
7 Motor (e.g. EMMS-AS with encoder)

Fig. 2.1 Complete structure CMMP-AS-...-M3 with motor and PC

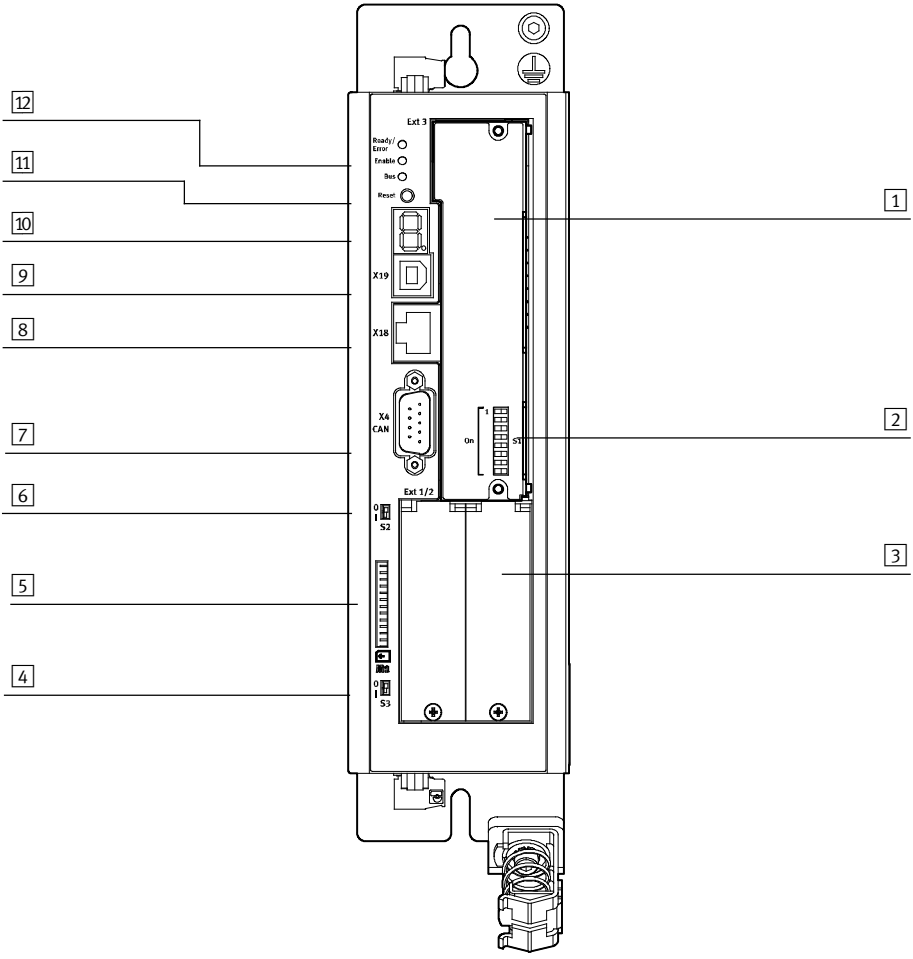
2.2 Scope of delivery

The delivery includes:

Scope of delivery	
Motor controller	CMMP-AS-...-M3
Operator package	CD
	Brief description
Assortment of plugs	NEKM-C-7

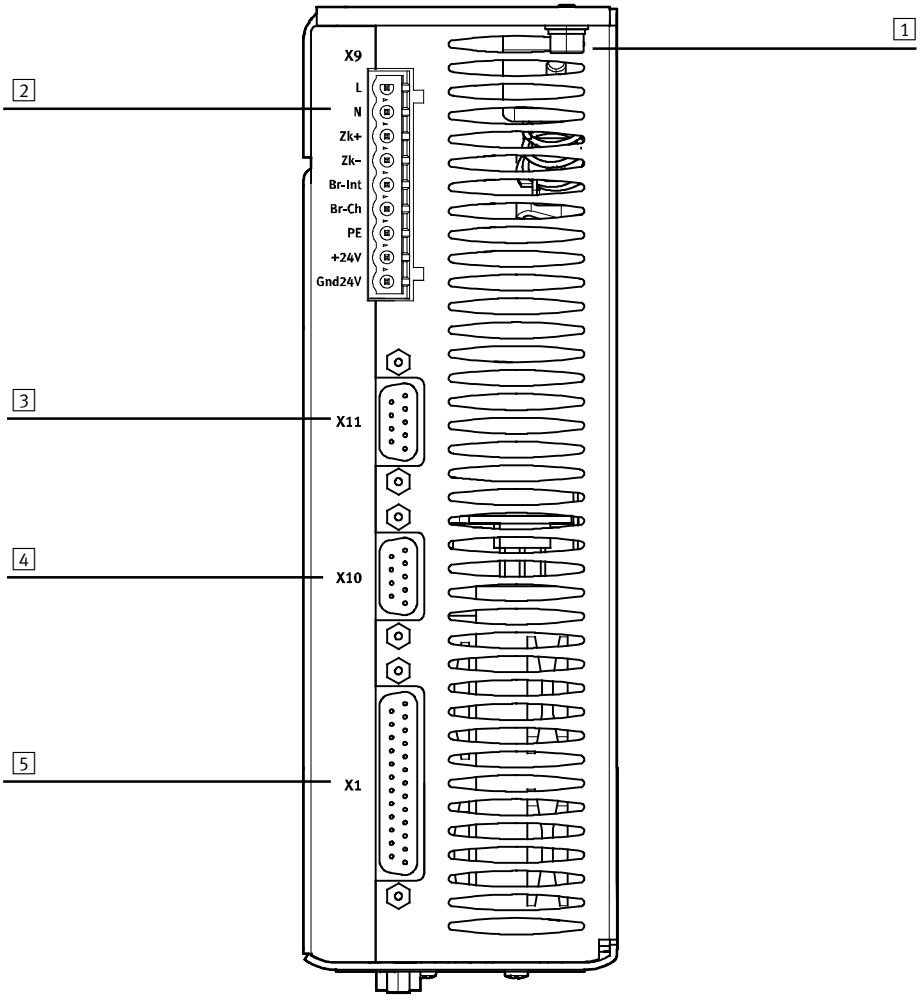
Tab. 2.1 Scope of delivery

2.3 Device view



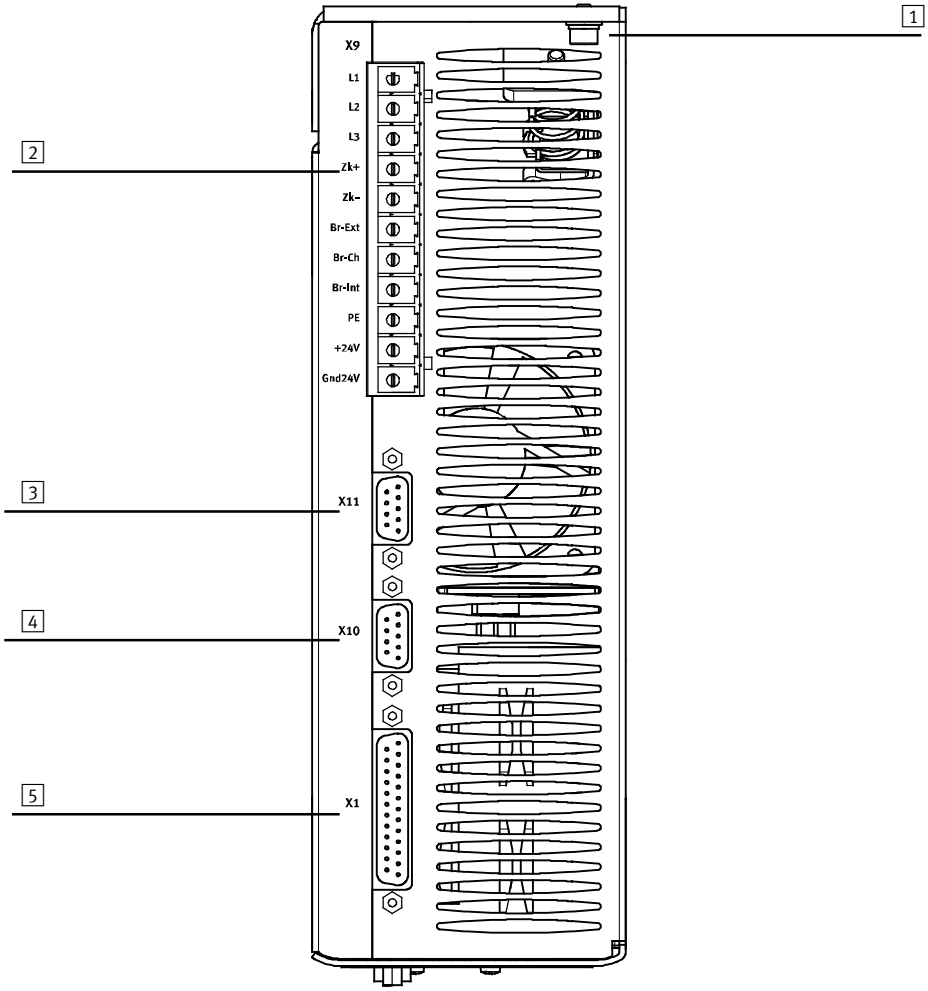
1 Slot for switch or safety module [Ext3]
2 Fieldbus settings [S1]
3 Slots for extension modules [Ext1/Ext2]
4 Activation of firmware download [S3]
5 SD-/MMC card slot [M1]
6 Activation of CANopen terminating resistor [S2]
7 CANopen interface [X4]
8 Ethernet interface [X18]
9 USB interface [X19]
10 7-segment display
11 Reset pushbutton
12 LEDs

Fig. 2.2 Motor controller CMMP-AS-...-M3: front view



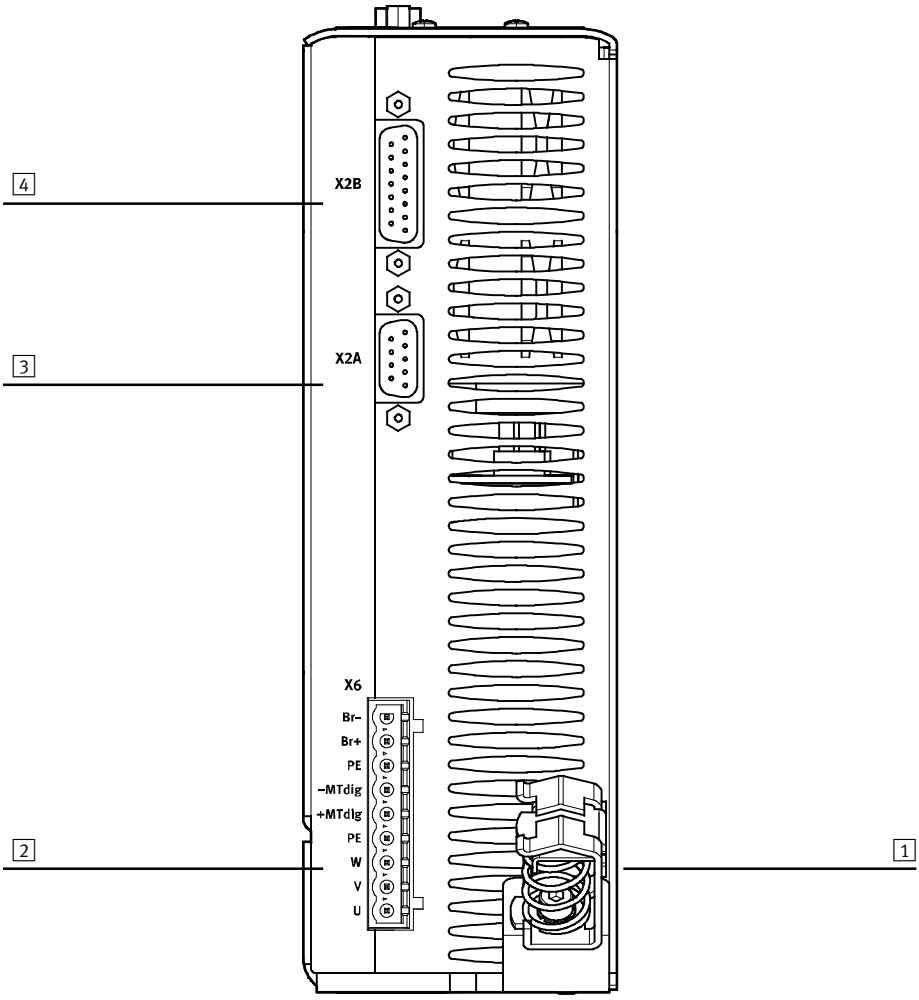
1 PE connection
2 Power supply [X9]
3 Incremental encoder output [X11]
4 Incremental encoder input [X10]
5 I/O communication [X1]

Fig. 2.3 Motor controller CMMP-AS-...-3A-M3: top view



1 PE connection
2 Power supply [X9]
3 Incremental encoder output [X11]
4 Incremental encoder input [X10]
5 I/O communication [X1]

Fig. 2.4 Motor controller CMMP-AS-...-11A-P3-M3: top view



1 Spring-loaded terminal connection for the outer shield of the motor cable
2 Motor connection [X6]
3 Connection for the resolver [X2A]
4 Connection for the encoder [X2B]

Fig. 2.5 Motor controller CMMP-AS-...-M3: bottom view

2.4 Mains fuse

In the mains power supply cable, an automatic circuit breaker [1)] is installed for protection of the line:

Motor controller	Phases	Current	Characteristic
CMMP-AS-C2-3A-M3	1	16	B16
CMMP-AS-C5-3A-M3	1	16	B16
CMMP-AS-C5-11A-P3-M3	3	16	B16
CMMP-AS-C10-11A-P3-M3	3	16	B16

1) The required fuse is dependent, among other things, on the cable cross section, ambient temperature and laying procedure. Observe the following instructions!

Tab. 2.2 Required mains fuses

In designing the fuses, also observe the following standards:

- EN 60204-1 “Safety of machinery – Electrical equipment of machines – Part 1: General requirements”
- Take into consideration the regulations applicable for the destination, as well as:
  - regulations and standards,
  - regulations of the testing organizations and insurers,
  - national specifications.

3 Mechanical installation

3.1 Important instructions

Note
Proceed carefully when mounting. During mounting and subsequent operation of the drive, ensure that that no metal shavings, metal dust or mounting parts (screws, nuts, pieces of wire) fall into the motor controller.

Note
The motor controllers CMMP-AS-...-M3
- Use only as installed devices for control cabinet assembly.
- Mounting orientation with the power supply [X9] on top.
- Mount it with the clip on the mounting plate.
- Mounting clearance:
  For sufficient ventilation, 100 mm of clearance to other sub-assemblies is required above and below the device.
- An installation clearance of 150 mm underneath the device is recommended for optimum wiring of the motor or encoder cable!
- The motor controllers of the CMMP-AS-...-M3 family are designed so that they can be mounted on a heat-dissipating mounting plate if used as intended and installed correctly. We wish to point out that excessive heating can lead to premature aging and/or damage to the device. With high thermal stress on the motor controller CMMP-AS-...-M3, a mounting distance (➔ Fig. 3.4) is recommended!

3.2 Mounting

Observe the safety instructions ➔ chapter 1 during mounting and installation work.

Note

Damage to the interface or motor controller due to incorrect handling.

- Switch off the supply voltage before mounting and installation work. Switch on supply voltage only when mounting and installation work are completely finished.
- Never unplug modules from the motor controller or plug them in when powered!
- Observe the handling specifications for electrostatically sensitive devices. Do not touch the printed circuit board and the pins of the manifold rail in the motor controller. Grip the interface only on the front panel or on the edge of the board.

3.2.1 Module in slot Ext3

The motor controllers CMMP-AS-...-M3 are supplied without a module in slot Ext3; the slot is covered with foil.

To operate the motor controller, an appropriate module must be mounted in slot Ext3:

– Micro switch module CAMC-DS-M1 or
– Safety module CAMC-G-S...

Mount module

1. Remove foil on slot Ext3.
2. Insert micro switch module CAMC-DS-M1 or safety module CAMC-G-S... into the empty slot Ext3 so that the printed circuit board runs into the lateral guides of the slot.
3. Insert module; when you have reached the rear contact strip within the motor controller, carefully press it into the contact strip until it stops.
4. Then screw the module to the front side of the motor controller housing with the two screws. Tightening torque: approx. 0.35 Nm.

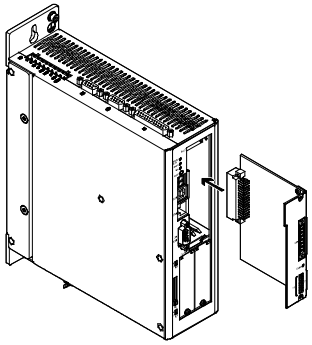


Fig. 3.1 Mounting / dismantling

Remove module

1. Unscrew screws on the module.
2. Loosen the module some millimetres through slight levering on the front plate.
3. Pull module out of the slot.

DIP switches

The eight switches on the plug-in modules (Ext3) are designed as DIP switches.

The status of the DIP switches is read when the control voltage is switched on or upon RESET. The motor controller takes over changes to the switch setting in ongoing operation only at the next switch-on or RESET.

The significance of the DIP switch setting depends on the control interface used.

DIP switches	CANopen/DriveBus	Profibus	DeviceNet	EtherCAT
	Onboard	CAMC-PB plugged in	CAMC-DN plugged in	CAMC-EC plugged in
1	NN bit 0	NN bit 0	NN bit 0	Not used
2	NN bit 1	NN bit 1	NN bit 1	Not used
3	NN bit 2	NN bit 2	NN bit 2	Not used
4	NN bit 3	NN bit 3	NN bit 3	Not used
5	NN bit 4	NN bit 4	NN bit 4	Not used
6	Bit rate	NN bit 5	Bit rate	Not used
7	Bit rate	NN bit 6	Bit rate	Not used
8	Activation of fieldbus			
NN = node number				

Tab. 3.1 Setting of bit rate and node number

DIP switches	1 Mbit/s[1)]	500 kbps	250 kBit/s	125 kBit/s
6	ON	OFF	ON	OFF
7	ON	ON	OFF	OFF

1) Only for CANopen/DriveBus; for DeviceNet, is limited to 500 kBit/s

Tab. 3.2 Setting of bit rate for CANopen and DeviceNet

DIP switch 8	Fieldbus
1	Always activated
0	Always off

Tab. 3.3 Activation of the fieldbus

With DIP switch 8, the fieldbus of the plugged-in interface CAMC-... is activated. If no interface is plugged in, the CAN bus [X4] is activated.

3.2.2 Interface in slot Ext1 or Ext2 (optional)

The motor controllers CMMP-AS-...-M3 are shipped without interfaces in the slots Ext1 and Ext2; the slots are sealed with covers.
Through the interfaces, the motor controller can be extended by digital I/Os and/or fieldbus interfaces.
Tab. 3.4 shows the permissible slots for the interfaces.

Slot	Interface					
	CAMC-F-PN	CAMC-PB	CAMC-F-EP	CAMC-DN	CAMC-EC	CAMC-D-8E8A
Ext1	–[1)]	–[1)]	–[1)]	x	–[1)]	x
Ext2	x	x	x	–[1)]	x	x

1) In addition, CAMC-D-8E8A permissible

Tab. 3.4 Permissible slots Ext1 and Ext2 for the interfaces

Mount interface

1. Unscrew screw with spring washer [1] on the cover of the permissible slot.
2. Lever out and remove cover [2] laterally with a small screwdriver.
3. Guide interface [3] into the empty slot so the printed circuit board runs in the guides [4] of the slot.
4. Insert interface; when you have reached the rear contact strip within the motor controller, carefully press it into the contact strip until it stops.
5. Then screw the interface to the front side of the motor controller housing with the screw with spring washer [1]. Tightening torque: approx. 0.35 Nm.

Dismantle interface

1. Unscrew screw with spring washer at the interface.
2. Loosen the interface some millimetres through slight levering on the front plate.
3. Pull interface out of the slot.
4. Mount other interface or cover.

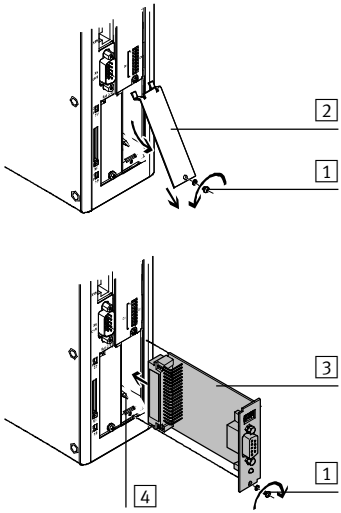


Fig. 3.2 Mounting or dismantling (example CAMC-PB)

3.2.3 Motor controller

At the motor, controller CMMP-AS-...-M3, there are mounting clips at the top and bottom of the device. They are used to attach the motor controller vertically to a mounting plate. The clips are part of the radiator profile, ensuring an optimal heat transfer to the mounting plate.

Please use size M5 screws to attach the motor controller CMMP-AS-...-M3.

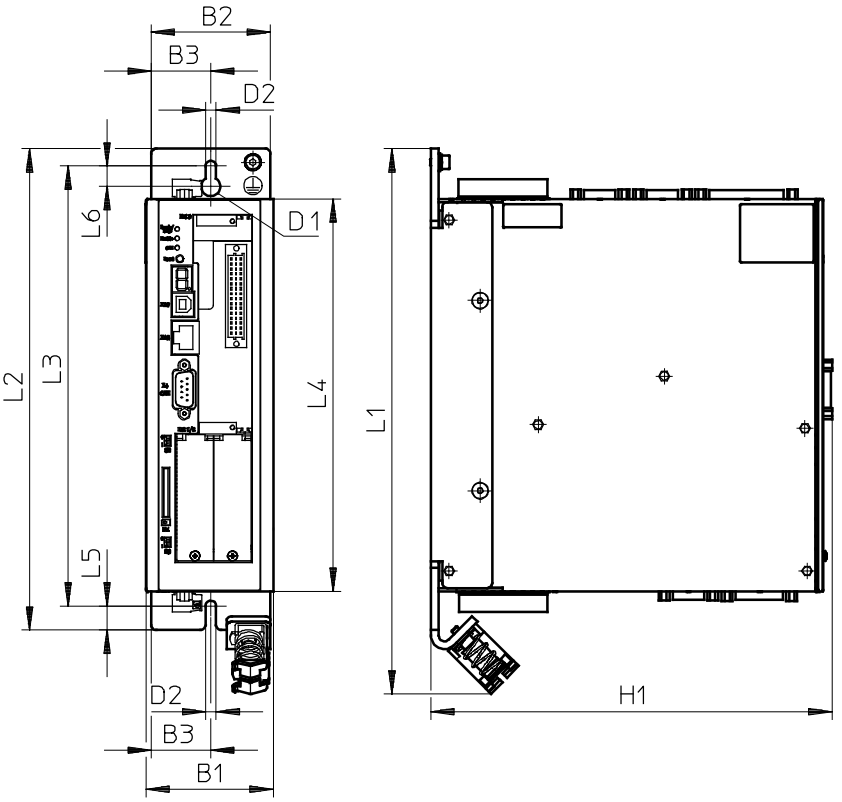


Fig. 3.3 Motor controller CMMP-AS-...-M3: mounting plate

CMMP-AS-...		H1	L1	L2	L3	L4	L5	L6	B1	B2	B3	D1	D2
-3A-M3	[mm]	207	281	248	227	202	12.5	10.5	66	61	30.7	10	5.5
-11A-P3-M3	[mm]	247	330	297	276	252	12.5	10.5	79	75	37.5	10	5.5

Tab. 3.5 Motor controller CMMP-AS-...-M3: dimensions table

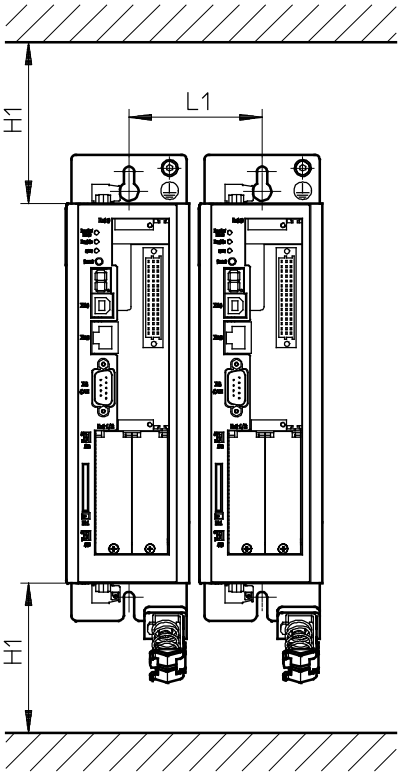


Fig. 3.4 Motor controller CMMP-AS-...-M3: Mounting distance and installation clearance

Motor controller		L1	H1[1)]
CMMP-AS-...-3A-M3	[mm]	71	100
CMMP-AS-...-11A-P3-M3	[mm]	85	100

1) An installation clearance of 150 mm underneath the device is recommended for optimum wiring of the motor or encoder cable!

Tab. 3.6 Motor controller CMMP-AS-...-M3: mounting distance and installation clearance

4 Electrical installation

4.1 Allocation of the plug connectors

The motor controller CMMP-AS-...-M3 is connected to the supply voltage, the motor, the external braking resistor and the holding brake in accordance with the following circuit diagrams.

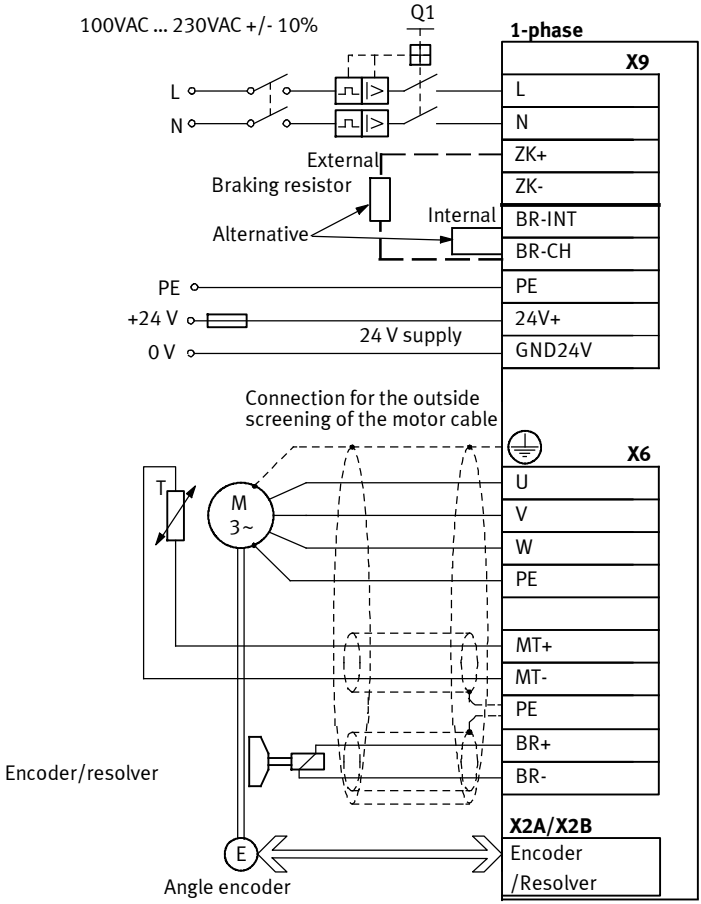


Fig. 4.1 Connection 1-phase to the power supply voltage and the motor

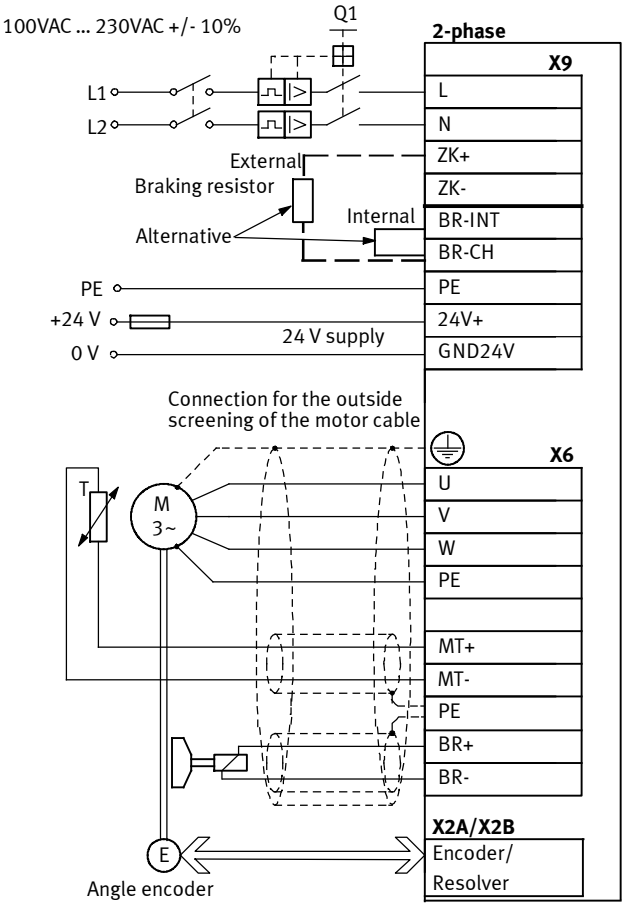


Fig. 4.2 Connection 2-phase to the power supply voltage and the motor

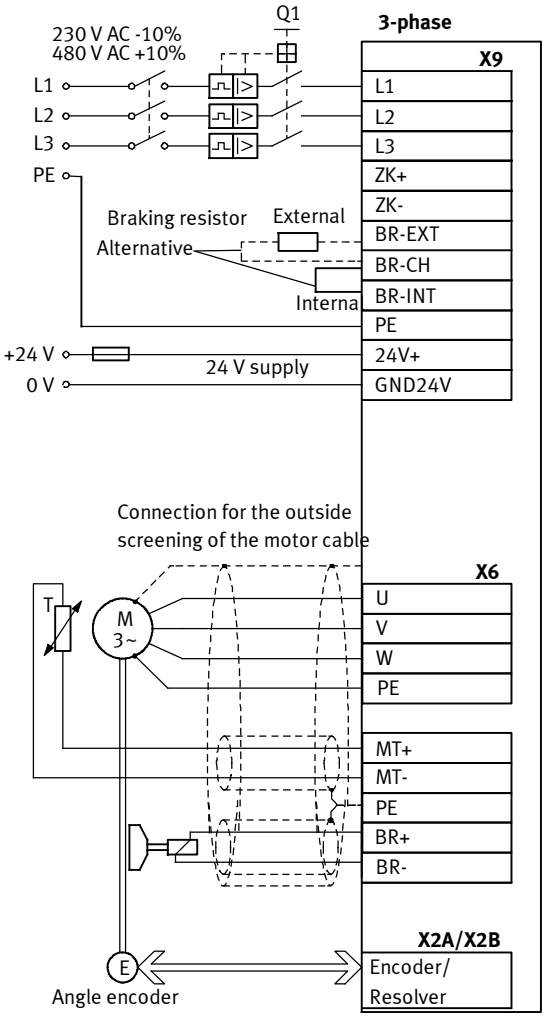


Fig. 4.3 Connection 3-phase to the power supply voltage and the motor

The power supply cables for the power end stage are alternatively connected to the following terminals:

Connection		
Supply (Observe instructions in chapter ➔ 4.7.4)		
AC supply	L, N	for single-phase motor controllers
	L1, L2, L3	for three-phase motor controllers
DC supply	ZK+, ZK–	
Motor temperature switch		
PTC or N/C contact/ N/O contact[1)] (e.g. KTY81)	MT+, MT–; [X6]	if this is carried together with the motor phases in one cable
Analogue temperature sensor[1)]	MT+, MT–; [X2A] or [X2B]	

1) Not for motors of the series EMMS-AS

Tab. 4.1 Connection of power supply cables

The connection of the encoder via the D-SUB plug to [X2A] or [X2B] is roughly shown diagrammatically in ➔ Fig. 4.1, ➔ Fig. 4.2 and ➔ Fig. 4.3.

Note

If the polarity of the operating voltage connections is reversed, or if the operating voltage is too high or the operating voltage and motor connections are reversed, the motor controller CMMP-AS-...-M3 will be damaged.

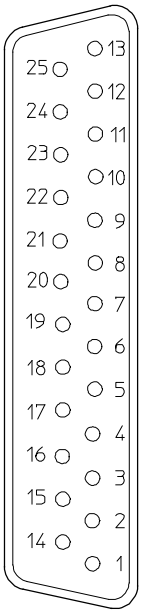
4.2 Connection: I/O communication [X1]

4.2.1 Plug [X1]:

Motor controller	Design on the device	Counterplug
CMMP-AS-...-M3	D-SUB plug, 25-pin, socket	Sub-D plug, 25-pin, pins

Tab. 4.2 Plug design [X1]

4.2.2 Pin assignments [X1]

[X1]	Pin no.		Designation	Specification
		13	DOUT3	Output freely programmable
	25		DOUT2	Output freely programmable
		12	DOUT1	Output freely programmable
	24		DOUT0	Operation status output
		11	DIN9	High-speed input
	23		DIN8	Start positioning task input
		10	DIN7	Limit switch 1 input (blocks n < 0)
	22		DIN6	Limit switch 0 input (blocks n > 0)
		9	DIN5	Controller enable input
	21		DIN4	End stage enable
		8	DIN3	Target selection positioning Bit3
	20		DIN2	Target selection positioning Bit2
		7	DIN1	Target selection positioning Bit1
	19		DIN0	Target selection positioning Bit0
		6	GND24	Reference potential for digital I/Os
	18		+24 V	24 V output
		5	AMON1	Analogue monitor output 1
	17		AMON0	Analogue monitor output 0
		4	+VREF	Reference output for setpoint potentiometer
	16		AIN2	Setpoint inputs 1 and 2, single ended, maximum 30 V input voltage
		3	AIN1	Setpoint inputs 1 and 2, single ended, maximum 30 V input voltage
	15		#AIN0	Setpoint input 0, differential, maximum 30 V input voltage
		2	AIN0	Setpoint input 0, differential, maximum 30 V input voltage
	14		OGND	Reference potential for analogue signals
		1	OGND	Screening for analogue signals, AGND

Tab. 4.3 Pin assignment: I/O communication [X1]

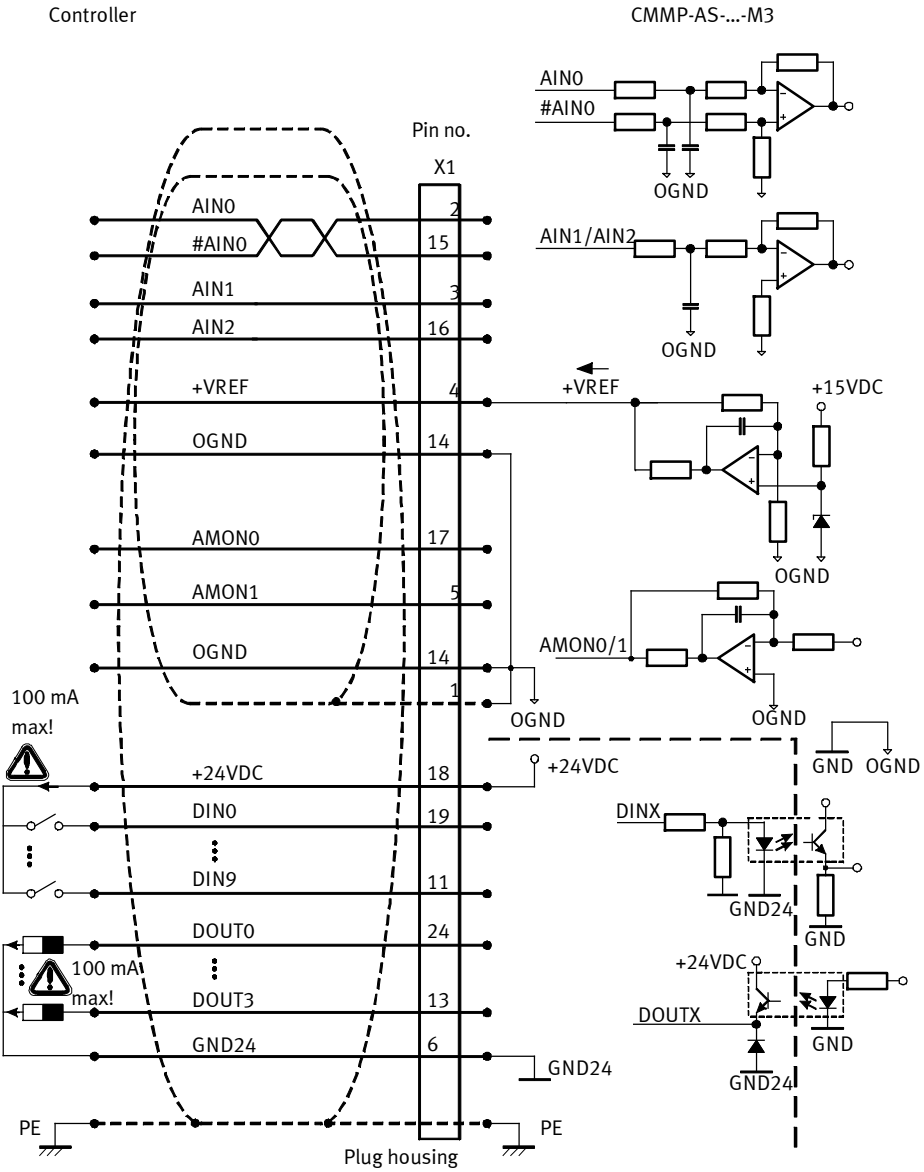


Fig. 4.4 Basic circuit diagram of connection [X1]

Control cable and D-Sub plug ➔ www.festo.com/catalogue.

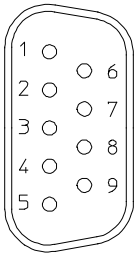
4.3 Connection: resolver [X2A]

4.3.1 Plug [X2A]

Motor controller	Design on the device	Counterplug
CMMP-AS-...-M3	D-SUB plug, 9-pin, socket	Sub-D plug, 9-pin, pins

Tab. 4.4 Plug design [X2A]

4.3.2 Pin assignment [X2A]

[X2A]	Pin no.		Designation	Value	Specification
	1		S2	3.5 V_{eff} 5-10 kHz	SINE tracking signal, differential
		6	S4	R_i > 5 kΩ	
	2		S1	3.5 V_{eff} 5-10 kHz	COSINE tracking signal, differential
		7	S3	R_i > 5 kΩ	
	3		OGND	0 V	Screening for signal pairs (inner screening)
		8	MT-	GND	Reference potential for temperature sensor
	4		R1	7 V_{eff} 5-10 kHz $I_A \leq 150$ mA_{eff}	Carrier signal for resolver
		9	R2	GND	
	5		MT+	+3.3 V R_i = 2 kΩ	Temperature sensor, motor temperature, N/C contact, PTC, KTY ...

Tab. 4.5 Pin assignment [X2A]

The outer screening must always be connected to the PE (plug housing) of the motor controller.
The inner screenings must be placed on one side on the motor controller CMMP-AS-...-M3 on PIN3 of [X2A].

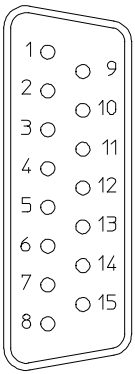
4.4 Connection: encoder [X2B]

4.4.1 Plug [X2B]

Motor controller	Design on the device	Counterplug
CMMP-AS-...-M3	D-SUB plug, 15-pin, socket	D-SUB plug, 15-pin, pins

Tab. 4.6 Plug design [X2B]

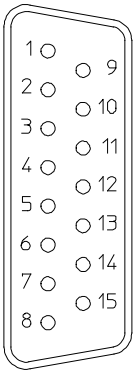
4.4.2 Pin assignment [X2B]

[X2B]	Pin no.		Designation	Value	Specification
	1		MT+	+3.3 V R_i = 2 kΩ	Temperature sensor, motor temperature, N/C contact, PTC, KTY ...
		9	U_SENS+	5 V ... 12 V	Sensor cable for the encoder supply
	2		U_SENS-	R_I ≈ 1 kΩ	
		10	US	5 V/12 V ±10% I_{max} = 300 mA	Operating voltage for high-resolution incremental encoder
	3		GND	0 V	Reference potential of encoder power supply and motor temperature sensor
		11	R	0.2 V_{SS} ... 0.8 V_{SS}	Zero impulse tracking signal (differential) from high-resolution incremental encoder
	4		R#	R_I ≈ 120 Ω	
		12	COS_Z1 1)	1 V_{SS}	COSINE commutation signal (differential) from high-resolution increment generator
	5		COS_Z1# 1)	R_I ≈ 120 Ω	
		13	SIN_Z1 1)	1 V_{SS}	SINE commutation signal (differential) from high-resolution incremental encoder
	6		SIN_Z1# 1)	R_I ≈ 120 Ω	
		14	COS_Z0 1)	1 V_{SS} ±10%	COSINE tracking signal (differential) from high-resolution incremental encoder
	7		COS_Z0# 1)	R_I ≈ 120 Ω	
		15	SIN_Z0 1)	1 V_{SS} ±10%	SINE tracking signal (differential) from high-resolution incremental encoder
	8		SIN_Z0# 1)	R_I ≈ 120 Ω	

1) Heidenhain encoder: A=SIN_Z0; B=COS_Z0, C=SIN_Z1; D=COS_Z1

Tab. 4.7 Pin assignment: analogue incremental encoder – optional

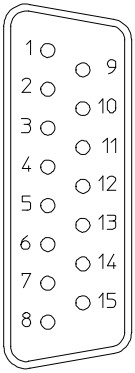
The outer screening must always be connected to the PE (plug housing) of the motor controller.

[X2B]	Pin no.		Designation	Value	Specification
	1		MT+	+3.3 V R_i = 2 kΩ	Temperature sensor, motor temperature, N/C contact, PTC, KTY ...
		9	U_SENS+	5 V ... 12 V	Sensor cable for the encoder supply
	2		U_SENS-	R_I ≈ 1 kΩ	
		10	US	5 V/12 V ±10% I_{max} = 300 mA	Operating voltage for high-resolution incremental encoder
	3		GND	0 V	Reference potential of encoder power supply and motor temperature sensor
		11	–		
	4		–		
		12	DATA	5 V_{SS} R_I ≈ 120 Ω	Bidirectional RS485 data cable (differential)
	5		DATA#		
		13	SCLK	5 V_{SS} R_I ≈ 120 Ω	RS485 clock output (differential)
	6		SCLK#		
		14	COS_Z0 1)	1 V_{SS} ±10% R_I ≈ 120 Ω	COSINE tracking signal (differential) from high-resolution incremental encoder
	7		COS_Z0 1)#		
		15	SIN_Z0 1)	1 V_{SS} ±10% R_I ≈ 120 Ω	SINE tracking signal (differential) from high-resolution incremental encoder
	8		SIN_Z0 1)#		

1) Heidenhain encoder: A=SIN_Z0; B=COS_Z0

Tab. 4.8 Pin assignment: incremental encoder with serial interface, e.g. EnDat – optional

The outer screening must always be connected to the PE (plug housing) of the motor controller.

[X2B]	Pin no.		Designation	Value	Specification
	1		MT+	+3.3 V R_i = 2 kΩ	Temperature sensor, motor temperature, N/C contact, PTC, KTY ...
		9	U_SENS+	5 V ... 12 V	Sensor cable for the encoder supply
	2		U_SENS-	R_I ≈ 1 kΩ	
		10	US	5 V/12 V / ±10%	Operating voltage for high-resolution incremental encoder
	3		GND	I_{max} = 300 mA 0 V	Reference potential of encoder power supply and motor temperature sensor
		11	N	2 V_{SS} ... 5 V_{SS}	Zero impulse RS422 (differential) from digital increment generator
	4		N#	R_I ≈ 120 Ω	
		12	H_U	0V/5V	Phase U Hall sensor for commutation
	5		H_V	R_I ≈ 2 kΩ	Phase V Hall sensor for commutation
		13	H_W	at VCC	Phase W Hall sensor for commutation
	6		–		
		14	A	2 V_{SS} ... 5 V_{SS}	A tracking signal RS422 (differential) from digital incremental encoder
	7		A#	R_I ≈ 120 Ω	
		15	B	2 V_{SS} ... 5 V_{SS}	B tracking signal RS422 (differential) from digital incremental encoder
	8		B#	R_I ≈ 120 Ω	

Tab. 4.9 Pin assignment: digital incremental encoder – optional

The outer screening must always be connected to the PE (plug housing) of the motor controller.

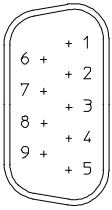
4.5 Connection: CAN bus [X4]

4.5.1 Plug [X4]

Motor controller	Design on the device	Counterplug
CMMP-AS-...-M3	D-SUB plug, 9-pin, pin	D-SUB plug, 9-pin, socket

Tab. 4.10 Plug design [X4]

4.5.2 Pin assignment [X4]

[X4]	Pin no.		Designation	Value	Description
		1	–	–	Unused
	6		CAN-GND	–	Galvanically connected to GND in the motor controller
		2	CAN-L	–	Negative CAN signal (dominant low)
	7		CAN-H	–	Positive CAN signal (dominant high)
		3	CAN-GND	–	Galvanically connected to GND in the motor controller
	8		–	–	Unused
		4	–	–	Unused
	9		–	–	Unused
		5	CAN shield	–	Screening

Tab. 4.11 Pin assignment for CAN interface [X4]

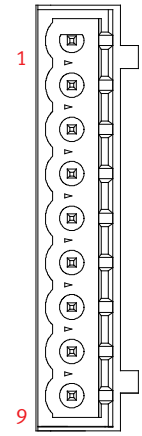
4.6 Connection: motor [X6]

4.6.1 Plug [X6]

Motor controller	Design on the device	Counterplug	Code
CMMP-AS-C2-3A-M3	PHOENIX Contact	PHOENIX Contact	PIN1 (BR-)
CMMP-AS-C5-3A-M3	MSTBA 2.5/9-G-5.08 BK	MSTB 2.5/9-ST-5.08 BK	
CMMP-AS-C5-11A-P3-M3	PHOENIX Power-Combicon	PHOENIX Power-Combicon	–
CMMP-AS-C10-11A-P3-M3	PC 4/9-G-7,62 BK	PC 4 HV/9-G-7,62 BK	

Tab. 4.12 Plug design [X6]

4.6.2 Pin assignment [X6]

[X6][1)]	Pin no.	Designation	Value	Specification
	1	BR-	0 V brake	Holding brake (motor), signal level dependent on switching status, high-side/low-side switch
	2	BR+	24 V brake	
	3	PE	PE	Cable shield for the holding brake and the temperature sensor (with Festo cables: nc)
	4	-MTdig	GND	Motor temperature sensor, N/C contact, N/O contact, PTC, KTY ...
	5	+MTdig	+3.3 V 5 mA	
	6	PE	PE	Protective earth conductor from the motor
	7	W	Technical data ➔ table Tab. A.9	Connection of the three motor phases
	8	V		
	9	U		

1) Example plug from the motor controller CMMP-AS-...-3A-M3

Tab. 4.13 Pin assignment [X6] connection: motor

The shielding for the motor cable must also be attached to the housing of the motor controller (spring clip: Fig. 2.5➔ page 16).

A motor holding brake can be connected to terminals BR+ and BR-. The locking brake is supplied from the logic supply of the motor controller. The maximum output current provided by theCMMP-AS-...-M3 motor controller must be observed.

To release the holding brake, care must be taken to maintain the voltage tolerances at the holding brake connection terminals.
Also observe the specifications in Tab. A.4 ➔ page 56.

It may be necessary to insert a relay between the device and the holding brake, as shown in Fig. 4.5➔ page 36:

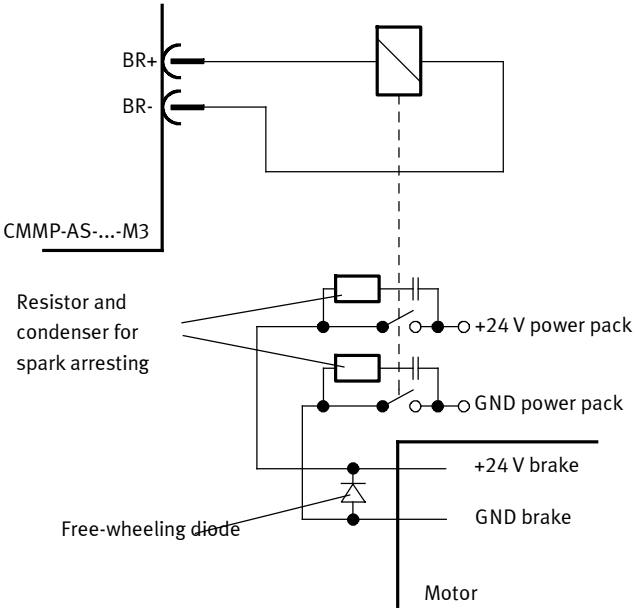


Fig. 4.5 Connecting a high-current holding brake to the device

Switching inductive DC currents via relays causes strong currents and sparks. For interference suppression, we recommend integrated RC interference suppressors, e.g. from Evox RIFA, designation: PMR205AC6470M022 (RC element with 22 Ω in series with 0.47 µF).

4.7 Connection: voltage supply [X9]

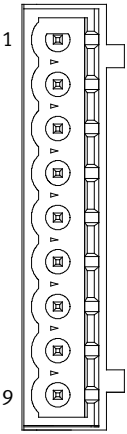
The motor controller CMMP-AS-...-M3 also receives its 24 VDC power supply for the control electronics via plug connector [X9].
The main power supply for the motor controllers CMMP-AS-...-3A-M3 is 1-phase and for the motor controllers CMMP-AS-...-11A-P3-M3 3-phase.

4.7.1 Plug

Motor controller	Design on the device	Counterplug	Code
CMMP-AS-C2-3A-M3	PHOENIX Contact MSTBA 2,5/9-G-5,08-BK	PHOENIX Contact MSTB 2,5/9-ST-5,08-BK	PIN9 (GND24V)
CMMP-AS-C5-3A-M3			
CMMP-AS-C5-11A-P3-M3	PHOENIX Power-COMBICON PC 4 HV/11-G-7,62-BK	PHOENIX Power-COMBICON PC 4 HV/11-ST-7,62-BK	–
CMMP-AS-C10-11A-P3-M3			

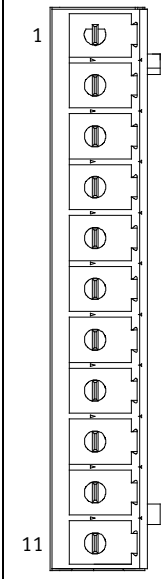
Tab. 4.14 Plug design [X9]

4.7.2 Pin allocation [X9] – 1-phase

[X9]	Pin no.	Designation	Value	Specification
	1	L	100 ... 230 VAC ±10% 50 ... 60 Hz	Mains phase
	2	N		Mains neutral conductor (reference potential)
	3	ZK+	< 440 VDC	Alternative supply: Positive intermediate circuit voltage
	4	ZK-	GND_ZK	Alternative supply: Negative intermediate circuit voltage
	5	BR-INT	< 460 VDC	Internal braking resistor connection (bridge after BR-CH when using the internal resistor).
	6	BR-CH	< 460 VDC	Brake chopper connection for – internal braking resistor toward BR-INT – or – – external braking resistor against ZK+
	7	PE	PE	Connection of protective earth conductor from the mains grid
	8	+24 V	+24 VDC	Supply for control section, holding brake and I/O
	9	GND24 V	GND24 VDC	0 V supply reference potential

Tab. 4.15 Pin allocation [X9] – 1-phase

4.7.3 Pin allocation [X9] – 3-phase

[X9]	Pin no.	Designation	Value	Specification
	1	L1	230 ... 480 VAC ±10% 50 ... 60 Hz	Mains phase 1
	2	L2		Mains phase 2
	3	L3		Mains phase 3
	4	ZK+	< 700 VDC	Alternative supply: positive intermediate circuit voltage
	5	ZK-	GND_ZK	Alternative supply: negative intermediate circuit voltage
	6	BR-EXT	< 800 VDC	Connection of the external braking resistor
	7	BR-CH	< 800 VDC	Brake chopper connection for – internal braking resistor against BR-INT – or – – external braking resistor against BR-EXT
	8	BR-INT	< 800 VDC	Internal braking resistor connection (bridge after BR-CH with use of the internal resistor)
	9	PE	PE	Connection of protective earth conductor from the mains grid
	10	+24 V	+24 VDC	Supply for control section, holding brake and I/O
	11	GND24 V	GND24 VDC	Supply reference potential

Tab. 4.16 Pin allocation [X9] – 3-phase

4.7.4 AC supply

Switch-on behaviour:

– As soon as the motor controller CMMP-AS-...-M3 is provided with mains voltage, the intermediate circuit is charged (< 1 s) via the braking resistors, with the intermediate circuit relay deactivated.
– After the intermediate circuit has been pre-charged, the relay engages and the intermediate circuit without resistors is connected directly to the mains supply.

AC supply with active PFC

The PFC step is available only for 1-phase motor controllers (CMMP-AS-...-3A-M3).

Note
Operation with mains line choke is not permissible, since the control circuit could be stimulated to oscillate.

Note
Operation with isolating transformer is not permissible since no reference potential (N) is available.

Note
When the load voltage is switched on, ensure that the reference potential (N) is switched before the phase (L1). This can be achieved through:
– unswitched reference potential (N)
– use of fuses with leading N when switching of the reference potential is not specified.

DC supply - intermediate circuit coupling
A direct DC power supply can be used for the intermediate circuit as an alternative to AC power or for achieving intermediate circuit coupling.
The intermediate circuits of several motor controllers CMMP-AS-...-M3 can be connected via the ZK+ and ZK- terminals at plug connector [X9]. Coupling of the intermediate circuits is useful in applications where high braking energies occur or where motion must still be performed when the power supply fails.

Note
For 1-phase motor controllers (CMMP-AS-...-3A-M3), the PFC step must be deactivated when the motor controller is coupled through the intermediate circuit.

4.7.5 Braking resistor

If no external braking resistor is used, a bridge to the internal braking resistor must be connected in order for the intermediate circuit quick discharge to function! ➔ Tab. 4.15 or Tab. 4.16.

For larger braking power an external braking resistor must be connected [X9].

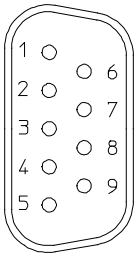
4.8 Connection: incremental encoder input [X10]

4.8.1 Plug [X10]

Motor controller	Design on the device	Counterplug
CMMP-AS-...-M3	D-SUB plug, 9-pin, socket	Sub-D plug, 9-pin, pins

Tab. 4.17 Plug design [X10]

4.8.2 Pin assignment [X10]

[X10]	Pin no.		Designation	Value	Specification
	1		A/CLK/CW	5 V $R_I \approx 120\ \Omega$	Incremental encoder signal A Stepper motor signal CLK Pulses clockwise CW Pos. polarity in accordance with RS422
		6	A#/CLK#/CW#	5 V $R_I \approx 120\ \Omega$	Incremental encoder signal A Step motor signal CLK Pulses clockwise CW Neg. polarity in accordance with RS422
	2		B/DIR/CCW	5 V $R_I \approx 120\ \Omega$	Incremental encoder signal B Step motor signal DIR Pulses counterclockwise CCW Pos. polarity in accordance with RS422
		7	B#/DIR#/CCW#	5 V $R_I \approx 120\ \Omega$	Incremental encoder signal B Step motor signal DIR Pulses counterclockwise CCW Neg. polarity in accordance with RS422
	3		N	5 V $R_I \approx 120\ \Omega$	Incremental encoder zero pulse N Pos. polarity in accordance with RS422
		8	N#	5 V $R_I \approx 120\ \Omega$	Incremental encoder zero pulse N Neg. polarity in accordance with RS422
	4		GND	–	Reference GND for encoder
		9	GND	–	Screening for the connecting cable
	5		VCC	+5 V ±5% 100 mA	Auxiliary supply, maximum load 100 mA, short-circuit proof!

Tab. 4.18 Pin allocation X10: incremental encoder input

When connecting two motor controllers in the master-slave mode via [X11] and [X10], the pins 5 (+5 V - auxiliary supply) must not be connected to each other.

4.8.3 Type and design of the cable [X10]

We recommend using encoder connection cables where the incremental encoder signal is transmitted via twisted pairs, with each pair being individually shielded.

4.8.4 Connection instructions [X10]

Input [X10] can be used for processing incremental encoder signals and also for pulse direction signals as generated by stepper motor controller cards.
The input amplifier at the signal input is designed for processing differential signals as per the RS422 interface standard.

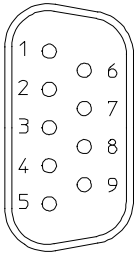
4.9 Connection: incremental encoder output [X11]

4.9.1 Plug [X11]

Motor controller	Design on the device	Counterplug
CMMP-AS-...-M3	D-SUB plug, 9-pin, socket	Sub-D plug, 9-pin, pins

Tab. 4.19 Plug design [X11]

4.9.2 Pin assignment [X11]

[X11]	Pin no.		Designation	Value	Specification
	1		A	5 V RA ≈ 66 Ω[1)]	Incremental encoder signal A
		6	A#	5 V RA ≈ 66 Ω[1)]	Incremental encoder signal A#
	2		B	5 V RA ≈ 66 Ω[1)]	Incremental encoder signal B
		7	B#	5 V RA ≈ 66 Ω[1)]	Incremental encoder signal B#
	3		N	5 V RA ≈ 66 Ω[1)]	Incremental encoder zero pulse N
		8	N#	5 V RA ≈ 66 Ω[1)]	Incremental encoder zero pulse N#
	4		GND	-	Reference GND for encoder
		9	GND	-	Screening for connecting cable
	5		VCC	+5 V ±5% 100 mA	Auxiliary supply, maximum load 100 mA, short-circuit proof!

1) The specification for RA designates the differential output resistance

Tab. 4.20 Pin assignment [X11]: incremental encoder output

The output driver at the signal output provides differential signals (5 V) as per the RS422 interface standard.
Up to 32 other controllers can be addressed by one device.

When connecting two motor controllers in the master-slave mode via [X11] and [X10], the pins 5 (+5 V - auxiliary supply) must not be connected to each other.

4.10 Instructions on safe and EMC-compliant installation

4.10.1 Explanations and terms

Electromagnetic compatibility (EMC) or electromagnetic interference (EMI) involves the following requirements:

Resistance to interference

Sufficient interference immunity of an electrical system or electrical device against external electrical, magnetic or electromagnetic noise via lines or space.

Emitted interference

Sufficiently low emitted interference of electrical, magnetic or electromagnetic interference of an electrical system or an electrical device on other devices in the environment via cables and space.

Warning

All PE protective earth conductors must always be connected prior to commissioning for reasons of safety.

The mains-side PE connection is made to the PE connection points (device rear wall) and [X9] of the CMMP-AS-...-M3.

Make sure that the earth connections between devices and the mounting plate are of sufficiently large dimensions in order to be able to discharge HF interference.

4.10.2 General remarks on EMC

Interference emission and resistance to interference of a motor controller always depend on the complete design of the drive, which consists of the following components:

- Power supply
- Motor controller
- Motor
- Electromechanical components
- Design and type of wiring
- Higher-order controller

In order to increase the resistance to interference and decrease the emitted interference, the CMMP-AS-...-M3 motor controller already has integrated motor chokes and mains filters, which means that the CMMP-AS-...-M3 motor controller can be operated without additional shielding and filters in most applications.

The CMMP-AS-...-M3 motor controllers have been approved in accordance with the valid product standard EN 61800-3 applicable to electric drives. The components from Festo were used for this purpose (e.g. motor, encoder, or resolver cables). These cables must not be extended.

In the majority of cases, no external filter measures are required (➔ table 4.10.3)

The declaration of conformity is available on www.festo.com.

4.10.3 EMC areas: first and second environment

If installed correctly and if all connecting cables are wired correctly, the CMMP-AS-...-M3 motor controllers fulfil the specifications of the related product standard EN 61800-3. This standard no longer refers to limit value classes, but to so-called environments.

Note
The first environment (C2) includes electricity grids connected to residential housing; the second environment (C3) includes grids connected only to industrial plants.

Applicable for the motor controller CMMP-AS-...-M3:

EMC class	Area	Compliance with EMC requirements
Emitted interference	Second environment (industrial)	Motor cable lengths up to 25 m without external filters. A suitable mains filter must be installed when longer motor cables of 25 ... 50 m are used.
Resistance to interference	Second environment (industrial)	Independent of the motor cable length.

Tab. 4.21 EMC requirements

4.10.4 EMC-compliant wiring

The following must be observed for EMC-compliant design of the drive system (see also chapter 4 ➔, page 24):

1. To keep leaked current and losses in the motor cable as low as possible, the motor controller CMMP-AS-...-M3 should be placed as close to the motor as possible (➔ chapter 4.10.5 ➔ page 44).
2. Motor and encoder cable must be screened.
3. The screening of the motor cable is attached to the housing of the motor controller CMMP-AS-...-M3 (screened connection terminals, spring clips). The cable screening is also always attached to the corresponding motor controller to prevent leaked current flowing back to the controller which caused it.
4. The mains-side PE connection is connected to the PE connection point of the power supply [X9] and to the PE connection of the housing.
5. The PE internal conductor of the motor cable is connected to the PE connection point of the motor connection [X6].
6. Signal lines must be separated as far as possible from the power cables. They should not be routed parallel to one another. If crossovers are unavoidable, they should be made as close to vertical (i.e. at a 90° angle) as possible.
7. For unscreened signal and control lines, safe/reliable operation cannot be guaranteed. If they must be used, they should at least be twisted.
8. Even screened lines always have short unscreened parts at both ends (unless a screened plug housing is used).

In general:
– Connect the inner screenings to the pins of the plug connectors provided for the purpose; length maximum 40 mm.
– Length of the unscreened wires with self-made cables, maximum 35 mm.
– Connect entire screening on the controller side flush to the PE terminal; maximum length 40 mm.
– Connect entire screening flush at the motor to the plug or motor housing; length maximum 40 mm (guaranteed with NEBM-...).

Danger
All PE protective earth conductors must always be connected prior to commissioning for reasons of safety.
The regulations of EN 50178 and EN 60204-1 for protective grounding must always be observed during installation!

4.10.5 Operation with long motor cables

For applications in combination with long motor cables and/or if the wrong motor cables are selected with excessive cable capacity, the filters may be subjected to thermal overload. In order to avoid such problems, we strongly recommend the following procedure for applications in which long motor cables are required:
– From a cable length of over 25 m, use only cables with a capacitance between the motor phase and screening of less than 200 pF/m, or better, less than 150 pF/m and also use a mains filter!

Note
Longer cable lengths result in deviations to the current regulator amplification (line resistance).

4.10.6 ESD protection

Caution
Unused D-SUB plug connectors present a danger of damage to the device or to other parts of the system as a result of ESD (electrostatic discharge).

In the design of the motor controller CMMP-AS-...-M3, great importance has been placed on high resistance to interference. For this reason, individual function blocks are galvanically separated from each other. Signal transmission within the device is performed via an optocoupler.

A distinction is made between the following separated areas:
– Output stage with intermediate circuit and mains input
– Control electronics with analogue signal processing
– 24 V supply and digital inputs and outputs

5 Commissioning

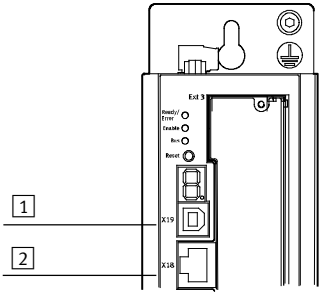
5.1 General connection instructions

As the installation of the connecting cables is critical for EMC, the preceding chapter 4.10.4 ➔ page 43 must be observed!

Warning
DANGER!
Non-compliance with the safety instructions in chapter 1 ➔ page 8 can result in material damage, injury, electric shock, or in extreme cases, fatality.

5.2 FCT interfaces

5.2.1 Overview of interfaces



1 [X19]: USB
2 [X18]: Ethernet

Fig. 5.1 FCT interfaces

5.2.2 USB [X19]

The equipment of the series CMMP-AS-...-M3 have a USB interface for parametrisation. The USB interface is used as a configuration interface for the FCT configuration.
The following functions are supported:
– Simulation of the RS232 interface via USB
– Complete parametrisation of theCMMP-AS-...-M3 via FCT
– Firmware download via FCT

Interface design
The plug connector is designed as a Type B terminal socket. All standard terminal cables up to a length of 5m can be used. If longer cables are required, the corresponding USB repeaters must be used.
The USB interface is designed as a pure slave interface (the CMMP-AS...-M3 is the slave, the PC is the host). It meets the USB specification Rev. USB 1.1.

USB driver for the PC
The FCT connection is made via the standard Kernel Mode driver “WinUsb.sys” and the device configuration and the access to the endpoints via the WinUSB API.
The USB driver package is a component of the FCT installation.
The following operating systems are supported through this:
– Windows XP from Service Pack 2
– Windows Vista
– Windows 7
The WinUsb.sys is installed as equipment function driver.

5.2.3 Ethernet TCP/IP [X18]
The equipment of the series CMMP-AS-...-M3A have a USB interface for parametrisation.
The following functions are supported:
– Point-to-point communication between PC and motor controller for parametrisation
– Complete parametrisation of theCMMP-AS-...-M3 via FCT
– Communication from one PC or one PLC to several CMMP-AS-...-M3 that are located in the same local network for the purpose of monitoring, adaptation of the parametrisation or also process control of the controller.

Interface design
The interface in the device is designed as an 8P8C socket (RJ45).
The connection has two LEDs with the following function:
– Yellow Physical Link Detect (network connection available)
– Green Data Connection (data connection / data exchange)
The interface is designed to conform to the IEEE 802.3u specification. Cables of type FTP5 or high-order must be used with 100Base-TX. The interface supports the autosensing function for automatic identification of the connected cable. Both standard patch cables (1:1) and Crosslink (crossed) cables can be used.

Supported services
The following services are supported by the Ethernet interface:
– TCP/IP
– UDP/IP
– DNS (ARP and BOOTP)
– DHCP
– AutoIP
– TFTP

Address allocation

The network settings (IP address, subnetwork mask, gateway) can either be automatically obtained or manually specified:

– Automatically via DHCP (the automatically obtained IP address lies in the IP range specified by the DHCP server)
– Automatically via Auto IP (if no DHCP server was found, an address between 169.254.1.0 and 169.254.254.255 is selected pseudorandomly)
– Manual IP assignment (manual setting of the network parameters via FCT)

The following sequence applies for connection set-up:

1. DHCP
2. AutoIP
3. Static IP address

If no IP address can be obtained via the higher-level service, the following service is used. Thus if no address can be obtained via DHCP, first an AutoIP and then a static address is used.

5.3 Tool / material

– Slotted head screwdriver size 1
– USB cable or network cable for parametrisation
– Encoder cable
– Motor cable
– Power supply cable
– Control line

5.4 Connecting the motor

1. Connect motor cable on the motor side.
2. Insert the PHOENIX plug into the socket [X6] on the device.
3. Clamp the cable shields to the shield terminals (not suitable as strain-relief).
4. Connect encoder cable on the motor side.
5. Insert the D-SUB plug into socket [X2A] resolver or [X2B] encoder of the device and tighten the locking screws.
6. Check all plug connectors once again.

5.5 Connect motor controller CMMP-AS-...-M3 to the power supply

Warning
Danger of electric shock.
– When modules or cover plates are not mounted on the slots Ext1 ... Ext3.
– When cables are not mounted to the plugs [X6] and [X9].
– When connecting cables are disconnected when powered.
Touching live parts causes severe injuries and can lead to death.
The product may only be operated in a built-in status and when all protective measures have been initiated.
Before touching live parts during maintenance, repair and cleaning work and when there have been long service interruptions:
1. Switch off power to the electrical equipment and secure it against being switched on again.
2. After switch-off, wait at least 5 minutes discharge time and check that power is turned off before accessing the controller.

1. Make sure that the power supply is switched off.
2. Connect the PE cable of the mains supply to the PE earth socket.
3. Insert the PHOENIX plug into the socket [X9] of the motor controller.
4. Connect 24 V connections with appropriate power pack.
5. Make the network power supply connections.
6. Check all plug connectors once again.

5.6 Connect the PC

1. Connect PC via USB ➔ 5.2.2 USB [X19] or Ethernet ➔ 5.2.3 Ethernet TCP/IP [X18] to the motor controller.

5.7 Check operating status

1. Make sure that the controller enable is switched off (controller enable: DIN 5 at [X1]).
2. Switch on the power supplies of all equipment.
   During the boot procedure, the point of the seven-segment display lights up.
   After completion of the boot procedure, the READY LED lights green.

If the READY LED lights up red, there is a malfunction. If the seven-segment display shows a numerical sequence with “E” in front of it, this is an error message. You must eliminate the cause of the message. In this case, continue to read in the chapter A ➔ page 55.
If no indicator lights up on the device, execute the following steps:

No indicator lights up

1. Switch off the power supply.
2. Wait 5 minutes to allow the intermediate circuit to discharge.
3. Check all connecting cables.
4. Check that the 24 V power supply is functional.
5. Switch on the power supply again.
6. If still no indicator lights up, ➔ device is defective.

6 Service functions and diagnostic messages

6.1 Protective and service functions

6.1.1 Overview

The motor controller CMMP-AS-...-M3 has a complex array of sensors that monitor the controller section, power output stage, motor and external communication to ensure that they function excellently. All diagnostic events which occur are saved in the internal diagnostic memory. Most errors cause the controller section to switch off the motor controller and the power end stage. The motor controller can only be switched on again when the error has been eliminated and then acknowledged.
A complex system of sensors and numerous monitoring functions ensure operational reliability:
– Measurement of the motor temperature
– Measurement of the power output stage temperature
– Earth fault detection (PE)
– Detection of short-circuits between two motor phases
– Detection of overvoltages in the intermediate circuit
– Detection of faults in the internal voltage supply
– Collapse of supply voltage

6.1.2 Phases and mains failure detection

The motor controllers CMMP-AS-...-11A-P3-M3 detect a phase failure in three-phase operation (phase failure detection) or failure of several phases (network failure detection) of the mains supply at the device.

6.1.3 Overload current and short-circuit monitoring

Overload current and short-circuit monitoring detects short circuits between two motor phases and short circuits at the motor output terminals against the positive and negative reference potential of the intermediate circuit and against PE. If the error control detects overload current, the power output stage shuts down immediately, guaranteeing protection against short circuits.

6.1.4 Overvoltage monitoring for the intermediate circuit

The overvoltage monitoring for the intermediate circuit takes effect as soon as the intermediate circuit voltage exceeds the operating voltage range. The power output stage is then deactivated.

6.1.5 Temperature monitoring for the heat sink

The heat sink temperature of the output end stage is measured with a linear temperature sensor. The temperature limit varies from device to device ➔ Tab. A.3 on page 56. A temperature warning is triggered at about 5°C below the limit value.

6.1.6 Monitoring of the motor

The motor controller CMMP-AS-...-M3 has the following protective functions for monitoring the motor and the connected shaft encoder:

Protective function	Description
Monitoring the shaft encoder	An error of the shaft encoder causes the power output stage to be switched off. For the resolver, for example, the tracking signal is monitored. For increment generators, the commutator signals are checked. Generally true for intelligent encoders is that their various error messages are evaluated and reported to the CMMP-AS-...-M3 as common error E 08-8.
Measurement and monitoring of the motor temperature	The motor controller CMMP-AS-...-M3 has a digital and an analogue input for recording and monitoring the motor temperature. The following temperature sensors can be selected: – [X6]: Digital input for PTCs, N/C contacts and N/O contacts. – [X2A] and [X2B]: N/C contact and KTY series analogue sensors. Other sensors (NTC, PTC) require a corresponding software adaptation as needed.

Tab. 6.1 Protective functions of the motor

6.1.7 I^2t monitoring

The motor controller CMMP-AS-...-M3 has I^2t monitoring to limit the average power loss in the power end stage and in the motor. Since the power loss that occurs in the power electronics and the motor can, in the worst case, grow at a rate equal to the square of the flowing current, the squared current value is taken as a measure for the power loss.

6.1.8 Power monitoring for the brake chopper

The braking resistors are monitored on the firmware side through the function I^2t brake chopper. When the output monitoring reaches “I^2t brake chopper” of 100%, the output of the internal braking resistor is switched back to rated output.
As a result of this switch back, the error “E 07-0” “Overvoltage in the intermediate circuit” is generated if the braking process is not yet finished and (too much) energy is fed back to the controller.
In addition, the brake chopper is protected by means of overcurrent detection. If a short circuit is detected via the braking resistor, the brake chopper controller is switched off.

6.1.9 Commissioning status

Motor controllers sent to Festo for servicing are loaded with other firmware and parameters for testing purposes.

Before it is commissioned again at the location of the final customer, the motor controller CMMP-AS-...-M3 must be parametrised. The parametrisation software queries the commissioning status and prompts the user to parametrise the motor controller. At the same time, the device signals that it is ready for operation but has not yet been parametrised by displaying 'A' on the seven-segment display.

6.1.10 Rapid discharge of the intermediate circuit

When a mains supply failure is detected, the intermediate circuit is quickly discharged within the safety time specified in EN 60204-1.
Delayed connection of the brake chopper by power class in parallel operation and when a mains failure occurs ensures that the main energy during rapid discharge of the intermediate circuit is taken over through the braking resistors of the higher power classes.

But the rapid discharge can be ineffective in certain device constellations, especially when several motor controllers are connected in parallel in the intermediate circuit or a brake resistance is not connected. The motor controllers may carry dangerous voltage for up to 5 minutes after being switched off (capacitor residual charge).

6.2 Operating mode and diagnostic messages

6.2.1 Operation and display components

The motor controller CMMP-AS-...-M3 has two LEDs on the front and one seven-segment display for showing the operating statuses.

Component	LED colour	Function
Seven-segment display	–	Displays the operating mode and a coded error number if an error occurs ➔ 6.2.2 Seven-segment display
LED1	Green	Operating status
	Red	Error
LED2	Green	Controller enable
LED3	Yellow	CAN bus status display
RESET button	–	Hardware reset for the processor

Tab. 6.2 Display components and RESET pushbutton

6.2.2 Seven-segment display

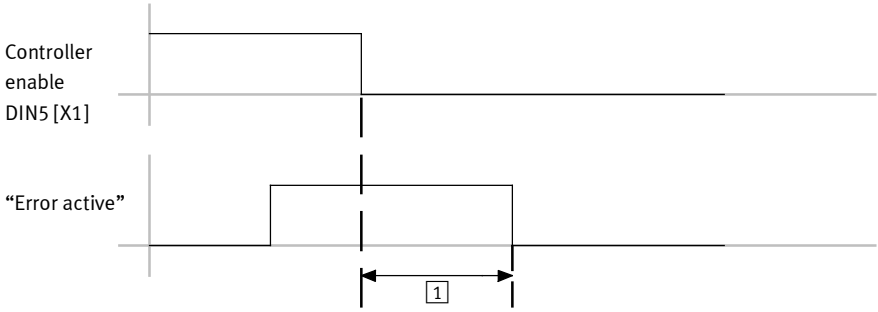
The display and the meaning of the symbols shown are illustrated in the following table:

Display	Significance
	The outer segments “rotate” on the display in the speed control operating mode. The display depends on the current actual position or speed. With active controller enable, the centre bar is also active.
	
	The motor controller CMMP-AS-...-M3 must still be parametrised. (Seven-segment display = “A”)
	Controlled torque mode. (Seven-segment display = “I”)
	“H”: The motor controller is in the “safe status”. This does not mean the same as the information about the status of the safety function STO (Safe Torque Off). This can only be read at the LED of the safety module. For the “unsafe status”, no special display is intended; the standard status displays of the motor controller are depicted.
	“F.”: Signals that firmware is currently being loaded into the flash.
	“.”: Bootloader active
	“d” Signals that a parameter record is currently being loaded from the SD card to the controller.
P xxx	Positioning (“xxx” is the position number) The numerals are shown in succession
PH x	Homing. “x” stands for the respective phase of the homing: x = 0: search phase x = 1: crawl phase x = 2: run to zero position The numerals are shown in succession
E xxy	Error message with main index “xx” and sub-index “y”
-xxy-	Warning message with main index “xx” and sub-index “y”. Warnings are shown at least twice on the seven-segment display.

Tab. 6.3 Operating mode and error display

6.2.3 Acknowledgement of error messages

Error messages can be acknowledged through:
– the parametrisation interface
– via the fieldbus (control word)
– a decreasing edge at DIN5 [X1]



1 ≈ 80 ms

Fig. 6.1 Timing diagram: acknowledge error

Diagnostic events which are parametrised as warnings are automatically acknowledged when the cause is no longer on hand.

6.2.4 Diagnostic messages

The significance and their measures for diagnostic messages are summarised in the following chapter:
➔ chapter A Technical appendix

A Technical appendix

A.1 Technical data CMMP-AS-...-M3

General technical data				
CMMP-AS-	C2-3A-M3	C5-3A-M3	C5-11A-P3-M3	C10-11A-P3-M3
Type of mounting	Screwed onto connecting plate			
Display	Digit representation with 7 segments			
Parametrisation interface	USB 1.1			
	Ethernet TCP/IP			
Certifications				
CE marking (see declaration of conformity)	In accordance with EU Low Voltage Directive			
	In accordance with EU EMC directive			
	In accordance with EU Machinery Directive			
Dimensions and weight				
Dimensions [mm] (HxWxD)[1)]	202x66x207	227x66x207	252x79x247	
Mounting plate dimensions [mm]	248x61		297x75	
Weight [kg]	2.1	2.2	3.5	

1) without plugs, shield screw and screw heads

Tab. A.1 Technical data, general

Transport and storage				
CMMP-AS-	C2-3A-M3	C5-3A-M3	C5-11A-P3-M3	C10-11A-P3-M3
Temperature range [°C]	-25 ... +70			

Tab. A.2 Technical data: Transport and storage

Operating and environmental conditions					
CMMP-AS-		C2-3A-M3	C5-3A-M3	C5-11A-P3-M3	C10-11A-P3-M3
Permissible setup altitude above sea level					
with rated output	[m]	1000			
with power reduction	[m]	1000 ... 2000			
Air humidity	[%]	0 ... 90 (non-condensing)			
Protection class		IP20			
Degree of contamination		2			
Operating temperature	[°C]	0 ... +40			
Operating temperature with power reduction of 2.5% per Kelvin	[°C]	+40 ... +50			
Switch-off temperature, heat sink power section	°C	100	80	80	80

Tab. A.3 Technical data: Operating and environmental conditions

Electrical data logic supply					
CMMP-AS-		C2-3A-M3	C5-3A-M3	C5-11A-P3-M3	C10-11A-P3-M3
Nominal voltage	[V DC]	24 ±20%			
Nominal current[1)]	[A]	0.55	0.65	1	
Maximum current for holding brake	[A]	1		2	
With higher current requirement➔ Fig. 4.5 page 36					

1) plus current consumption from an existing holding brake and I/Os

Tab. A.4 Technical data: logic supply

➔ **Note**

With a warm motor and a supply voltage that is too low (outside of tolerance), the motor's brakes cannot open 100%, which can lead to premature wearing of the brake.

Electrical data load voltage					
CMMP-AS-		C2-3A-M3	C5-3A-M3	C5-11A-P3-M3	C10-11A-P3-M3
Number of phases		1		3	
Voltage range	[V AC]	100 ... 230 ±10%		230 ... 480 ±10%	
Mains frequency	[Hz]	50 ... 60			
Max. nominal current in continuous operation	[A_{eff}]	2.4	4.7	5	9
Intermediate circuit voltage (without PFC)	[V DC]	310 ... 320		560 ... 570	
Intermediate circuit voltage (with PFC)	[V DC]	360 ... 380		–	
Alternative DC supply	[V DC]	60 ... 380		60 ... 700	
Power data of the PFC step with nominal supply voltage of 230 VAC ±10%					
Continuous output	[W]	500	1000	–	
Peak power	[W]	1000	2000	–	

Tab. A.5 Technical data: load voltage

Technical data braking resistor					
CMMP-AS-		C2-3A-M3	C5-3A-M3	C5-11A-P3-M3	C10-11A-P3-M3
Braking resistor, integrated					
Resistance value	[Ω]	60		68	
Pulse power	[kW]	2.8		8.5	
Continuous output	[W]	10	20	110	
Trigger level (without PFC)	[V]	389		760	
Trigger level (with PFC)	[V]	440		–	
Max. voltage (without PFC)	[V]	400		800	
Max. voltage (with PFC)	[V]	460		–	
Braking resistor, external					
Resistance value	[Ω]	≥ 50		≥ 40	
Operating voltage	[V]	≥ 460		≥ 800	
Continuous output	[W]	≤ 2500		≤ 5000	

Tab. A.6 Technical data: braking resistor

Motor cable				
CMMP-AS-	C2-3A-M3	C5-3A-M3	C5-11A-P3-M3	C10-11A-P3-M3
Max. motor cable length for second environment [m]	≤ 25 (without filter)			
Cable capacity of one phase against screening [pF/m]	≤ 200			

Tab. A.7 Technical data: motor cable

Motor temperature monitoring			
Digital sensor	N/C contact:	R_{Cold} < 500 Ω	R_{Hot} > 100 kΩ
Analogue sensor	Silicon temperature sensor, e.g. KTY81, 82 or similar. R25 ≈ 2000 Ω R100 ≈ 3400 Ω		

Tab. A.8 Technical data: motor temperature monitoring

Output data					
CMMP-AS-		C2-3A-M3[1)]	C5-3A-M3[1)]	C5-11A-P3-M3[2)]	C10-11A-P3-M3[2)]
Voltage	[VAC]	0 ... 270		0 ... 360	
Nominal power	[kVA]	0.5	1	3	6
Max. power for 5 seconds	[kVA]	1	2	6	12

1) Data for operation with 1x230 VAC [± 10%], 50 ... 60 Hz

2) Data for operation with 3x400 VAC [±10%], 50 ... 60 Hz

Tab. A.9 Technical data: output data

CMMP-AS-C2-3A-M3					
Cycle time current regulator[1)]	[µs]	62.5		125	
Half end stage frequency[1)]		active	inactive	active	inactive
End stage frequency	[kHz]	8	16	4	8
Nominal output current	[A_{eff}]	2.5	2.2	2.5	2.5
Maximum output current for maximum time					
Maximum output current	[A_{eff}]	5	4.4	5	5
Max. time	[s]	5	5	5	5
Maximum output current	[A_{eff}]	7.5	6.6	7.5	7.5
Max. time	[s]	1.3	1.3	1.3	1.3
Maximum output current	[A_{eff}]	10	8.8	10	10
Max. time	[s]	0.5	0.5	0.5	0.5

1) Option with FCT able to be parametrised

Tab. A.10 Output data CMMP-AS-C2-3A-M3

CMMP-AS-C5-3A-M3					
Cycle time current regulator[1]	[µs]	62.5		125	
Half end stage frequency[1]		active	inactive	active	inactive
End stage frequency	[kHz]	8	16	4	8
Nominal output current	[A_{eff}]	5	4.4	5	5
Maximum output current for maximum time					
Maximum output current	[A_{eff}]	10	8.8	10	10
Max. time	[s]	5	5	5	5
Maximum output current	[A_{eff}]	15	13.2	15	15
Max. time	[s]	1.3	1.3	1.3	1.3
Maximum output current	[A_{eff}]	20	17.6	20	20
Max. time	[s]	0.5	0.5	0.5	0.5

1) Option with FCT able to be parametrised

Tab. A.11 Output data CMMP-AS-C5-3A-M3

CMMP-AS-C5-11A-P3-M3					
Cycle time current regulator[1]	[µs]	62.5		125	
Half end stage frequency[1]		active	inactive	active	inactive
End stage frequency	[kHz]	8	16	4	8
Nominal output current	[A_{eff}]	5	2.5	5	5
Maximum output current for maximum time					
Maximum output current	[A_{eff}]	10	5	10	10
Max. time	[s]	5	5	5	5
Maximum output current	[A_{eff}]	15	7.5	15	15
Max. time	[s]	0.8	1.2	0.8	0.8
Maximum output current	[A_{eff}]	20	10	20	20
Max. time	[s]	0.1	0.15	0.1	0.1

1) Option with FCT able to be parametrised

Tab. A.12 Output data CMMP-AS-C5-11A-P3-M3 with electrical rotation frequency ≤ 5 Hz

CMMP-AS-C5-11A-P3-M3					
Cycle time current regulator[1]	[µs]	62.5		125	
Half end stage frequency[1]		active	inactive	active	inactive
End stage frequency	[kHz]	8	16	4	8
Nominal output current	[A_{eff}]	5	2.5	5	5
Maximum output current for maximum time					
Maximum output current	[A_{eff}]	10	5	10	10
Max. time	[s]	5	5	5	5
Maximum output current	[A_{eff}]	15	7.5	15	15
Max. time	[s]	2	2	2	2
Maximum output current	[A_{eff}]	20	10	20	20
Max. time	[s]	0.5	0.5	0.5	0.5

1) Option with FCT able to be parametrised

Tab. A.13 Output data CMMP-AS-C5-11A-P3-M3 with electrical rotation frequency ≥ 20 Hz

CMMP-AS-C10-11A-P3-M3					
Cycle time current regulator[1]	[µs]	62.5		125	
Half end stage frequency[1]		active	inactive	active	inactive
End stage frequency	[kHz]	8	16	4	8
Nominal output current	[A_{eff}]	8	3.45	10	8
Maximum output current for maximum time					
Maximum output current	[A_{eff}]	16	6.9	20	16
Max. time	[s]	5	5	5	5
Maximum output current	[A_{eff}]	24	10.35	30	24
Max. time	[s]	0.1	0.2	0.1	0.1
Maximum output current	[A_{eff}]	32	13.8	40	32
Max. time	[s]	0.07	0.15	0.07	0.07

1) Option with FCT able to be parametrised

Tab. A.14 Output data CMMP-AS-C10-11A-P3-M3 with electrical rotation frequency ≤ 5 Hz

CMMP-AS-C10-11A-P3-M3					
Cycle time current regulator[1]	[µs]	62.5		125	
Half end stage frequency[1]		active	inactive	active	inactive
End stage frequency	[kHz]	8	16	4	8
Nominal output current	[A_{eff}]	8	3.45	10	8
Maximum output current for maximum time					
Maximum output current	[A_{eff}]	16	6.9	20	16
Max. time	[s]	5	5	5	5
Maximum output current	[A_{eff}]	24	10.35	30	24
Max. time	[s]	2	2	2	2
Maximum output current	[A_{eff}]	32	13.8	40	32
Max. time	[s]	0.5	0.5	0.5	0.5

1) Option with FCT able to be parametrised

Tab. A.15 Output data CMMP-AS-C10-11A-P3-M3 with electrical rotation frequency ≥ 20 Hz

A.1.1 Interfaces

I/O interface [X1]

Digital inputs/outputs			Values	Comment
Inputs DIN0 ... DIN9	Input voltage	[V]	24	Active high, conforming to EN 61131-2
	Voltage range	[V]	8 ... 30	
Outputs DOUT 0 ... DOUT3	Output voltage	[V]	24	Active high, galvanically separated
	Voltage range[1]	[V]	8 ... 30	
+24 V	Output voltage	[V]	24	
	Maximum output current	[mA]	100	
GND24	Voltage	[V]	0	Reference potential for digital I/Os

1) With use as digital input (configuration with FCT)

Tab. A.16 Technical data: digital inputs/outputs [X1]

Analogue inputs/outputs			Values	Comment
AIN0 #AIN0	Input section	[V]	±10 differential	–
	Resolution	Bit	16	
	Time delay	[µs]	< 250	
	Max. input voltage	[V]	30	
	R_I	[kΩ]	30	
AIN1	Input section	[V]	±10 single-ended	This input can be optionally parametrised also as a digital input DIN12 with an 8 V trigger level.[1)]
	Resolution	Bit	10	
	Time delay	[µs]	< 250	
AIN2	Input section	[V]	±10 single-ended	This input can be optionally parametrised also as a digital input DIN13 with an 8 V trigger level.[1)]
	Resolution	[Bit]	10	
	Time delay	[µs]	< 250	
AMON0, AMON1	Output section	[V]	±10	–
	Resolution	[Bit]	9	
	Critical frequency	[kHz]	1	
OGND	Voltage	[V]	0	Reference potential
+VREF	Output section	[V]	0 ... 10	Reference output for setpoint potentiometer

1) Configuration using FCT

Tab. A.17 Technical data: analogue inputs/outputs [X1]

Resolver connection [X2A]

Resolver connection			Values	Significance
S1 S3	Input voltage	[Veff]	3.5	COSINE+ COSINE-
	Input frequency	[kHz]	5 ... 10	
	Internal resistance R_i:	[kΩ]	> 5	
S2 S4	Input voltage	[Veff]	3.5	SINE+ SINE-
	Input frequency	[kHz]	5 ... 10	
	Internal resistance R_i:	[kΩ]	> 5	
R1	Voltage	[Veff]	7	Carrier signal
	Frequency	[kHz)	5 ... 10	
	Output current	[mAeff]	I_A < 150	
R2				GND
MT+	Voltage	[V]	+ 3.3	Motor temperature sensor, N/C contact, PTC, KTY...
MT-	Internal resistance R_i:	[kΩ]	2	Reference potential for temperature sensor

Tab. A.18 Technical data: resolver [X2A]

Parameters		Values
Transmission ratio		0.5
Carrier frequency	[kHz]	5 ... 10
Excitation voltage	[Veff]	7, short circuit proof
Excitation impedance (at 10 kHz)	[Ω]	≥ (20 + j20)
Stator impedance	[Ω]	≤ (500 + j1000)

Tab. A.19 Technical data: resolver [X2A]

Parameters		Values
Resolution	[Bit]	16
Signal detection time delay	[µs]	< 200
Speed resolution	[min^{-1}]	Approx. 4
Absolute accuracy of angle acquisition	[']	< 5
Max. rotational speed	[min^{-1}]	16000

Tab. A.20 Technical data: resolver [X2A]

Encoder connection [X2B]

Parameters			Value	Comment
Encoder line count		[Lines/R]	1 ... 262144	Can be parameterised
Angular resolution/Interpolation		[Bit/period]	10	
Tracking signals				
	A, B	[Vss]	1	differential; 2.5 V offset
	N	[Vss]	0.2 ... 1	differential; 2.5 V offset
Commutator tracks A1, B1 (optional)		[Vss]	1	differential; 2.5 V offset
Track signal input impedance		[Ω]	120	Differential input
Critical frequency f_{Crit}				
High-resolution track		[kHz]	>300	
Commutation track		[kHz]	Approx. 10	
Additional communication interface			EnDat (Heidenhain) and HIPERFACE (Stegmann)	
Output supply			Current-limited, regulation via sensor cable	
	Voltage	[V]	5 or 12	Switchable via software
	Current	[mA]	max. 300	

Tab. A.21 Technical data: encoder connection [X2B]

CAN bus [X4]

Communication interface	Values
CANopen controller	ISODIS 11898, Full CAN controller, max. 1M Baud
CANopen protocol	in accordance with CiA301 and CiA402

Tab. A.22 Technical data: CAN bus [X4]

Increment encoder input [X10]

Characteristic			Value	Comment
Number of lines		[Lines/R]	1 ... 2^{28}	Can be parameterised
Track signals A, A#,B, B#, N, N#			in accordance with RS422 specification	
Maximum input frequency		[kHz]	1000	
Pulse direction interface CLK, CLK#, DIR, DIR#, RESET, RESET#			in accordance with RS422 specification	
Output				
	Voltage	[V]	5	
	Current	[mA]	max. 100	

Tab. A.23 Technical data: incremental encoder input [X10]

Incremental encoder output [X11]

Characteristic			Value	Comment
Number of output lines		[Lines/R]	1 ... 8192, 16384	
Connection level			Differential in accordance with RS422 specification	
Track signals A, B, N			In accordance with RS422 specification	N track can be switched off
Output impedance $R_{o,diff}$		[Ω]	66	
Critical frequency f_{Crit}		[MHz]	> 1.8	Lines/s
Output supply				
	Voltage	[V]	5	
	Current	[mA]	max. 100	

Tab. A.24 Technical data: incremental encoder output [X11]

A.2 Technical data CAMC-...

CAMC-		D-E8A8	PB	EC	DN
Storage temperature	[°C]	-25 ... +75			
Operating temperature	[°C]	0 ... +50			
Air humidity, non-condensing	[%]	0 ... 90			
Permissible setup altitude above sea level	[m]	≤ 2000			
Dimensions (LxWxH)	[mm]	87x65x19	92x65x19	87x65x19	
Weight	[g]	50		55	50

Tab. A.25 CAMC-... ambient conditions, dimensions and weight

CAMC-D-E8A8 – Digital inputs		
Number of inputs		8
Nominal voltage	[V DC]	24
Voltage range	[V DC]	-30 ... +30
Detection “high”	[V DC]	> 8
Detection “low”	[V DC]	< 2
Hysteresis	[V DC]	> 1
Input impedance	[kΩ]	≥ 4.7
Polarity protection up to	[V DC]	-30
Switching delay up to Portpin (low-high transition)	[µs]	< 100

Tab. A.26 CAMC-D-E8A8 – Digital inputs

CAMC-D-E8A8 – Digital outputs		
Number of outputs		8
Switch type		High-side switch
Nominal voltage	[V DC]	24
Voltage range	[V DC]	+18 ... +30
Nominal output current	[mA]	100
Voltage loss at nominal output current	[V DC]	≤ 1
Residual current with switch OFF	[µA]	< 100
Short circuit/overcurrent protection approx.	[mA]	> 500
Switch-off temperature	[°C]	> 150
Switching delay up to Portpin (low-high transition)	[µs]	< 100

Tab. A.27 CAMC-D-E8A8 – Digital outputs

A.3 Supported encoders

Resolver			
Type	Protocol	Interface	Comment
Standard	–	[X2A]	Transmission ratio 0.5 ±10%, excitation voltage 7 Vrms

Tab. A.28 Supported resolvers

Digital encoders			
Type	Protocol	Interface	Comment
Yaskawa Σ-encoder	Yaskawa OEM-protocol	[X2B]	Yaskawa Sigma-1 Type A

Tab. A.29 Supported digital encoders

Analogue encoders			
Type	Protocol	Interface	Comment
ROD 400 ERO 1200, 1300, 1400 ERN 100, 400, 1100, 1300	–	[X2B]	Heidenhain, encoder with zero impulse and reference signal

Tab. A.30 Supported analogue encoders

EnDat encoders			
Type	Protocol	Interface	Comment
ROC 400 ECI 1100, 1300 ECN 100, 400, 1100, 1300	EnDat 2.1 (01/21) EnDat 2.2 (22)	[X2B]	Heidenhain single-turn absolute encoder with/ without analogue signal
ROQ 400 EQI 1100, 1300 EQN 100, 400, 1100, 1300	EnDat 2.1 (01/21) EnDat 2.2 (22)	[X2B]	Heidenhain multi-turn absolute encoder with/ without analogue signal
LC 100, 400	EnDat 2.1 (01) EnDat 2.2 (22)	[X2B]	Heidenhain absolute length measurement equipment

Tab. A.31 Supported EnDat encoders

HIPERFACE encoders			
Type	Protocol	Interface	Comment
SCS60, 70 SCM60, 70	HIPERFACE	[X2B]	Stegmann single-/multi-turn encoder with analogue incremental signal sine/cosine periods 512. Max. revolutions multi-turn: ±2048 R
SRS 50, 60, 64 SCKxx SRM 50, 60, 64 SCLxx	HIPERFACE	[X2B]	Stegmann single-/multi-turn encoder with analogue incremental signals. Sine/cosine periods 1024. Max. revolutions multi-turn: ±2048 R
SKS36 SKM36	HIPERFACE	[X2B]	Stegmann single-/multi-turn encoder with analogue incremental signals. Sine/cosine periods 128. Max. revolutions multi-turn: ±2048 R
SEK37, 52 SEL37, 52	HIPERFACE	[X2B]	Stegmann single-/multi-turn encoder with analogue incremental signals. Sine/cosine periods 16. Max. revolutions multi-turn: ±2048 R
L230	HIPERFACE	[X2B]	Stegmann absolute linear encoder with analogue incremental signal measurement step: 156.25 µm. Measuring length max. approx. 40 m.

Tab. A.32 Supported HIPERFACE encoders

A.4 Components of the USB driver

The FCT installation package contains the following components of the USB driver:

- The “WinUSB co installer”, in order to install WinUSB on the target system, if necessary. The Windows Driver Kit (WDK) contains separate DLLs (WinUSBCoInstaller.dll) for x86 and x64 systems.
- The KMDF (WDF kernel-mode driver framework) co installer, in order to install the correct version of the KMDF on the target system, if necessary.
- A Festo-specific INF-file in order to install the “WinUsb.sys” as a device function driver with the following specific entries:
  - DEVICEMANAGERCATEGORY = WinUSB devices (group in the Device Manager)
  - DeviceDesc = “‹DEVICE_TYPE›” (Device designation under the group in the Device Manager) ProviderName=“Festo AG & Co. KG”
- A signed “catalog file” in order to be able to install on x64 systems.

B Diagnostic messages

If an error occurs, the motor controller CMMP-AS-...-M3 shows a diagnostic message cyclically in the seven-segment display of the motor controller CMMP-AS-...-M3. An error message consists of an E (for Error), a main index and sub-index, e.g.: E 0 1 0.
Warnings have the same number as an error message. In contrast to error messages, however, warnings are preceded and followed by hyphens, e.g. **- 1 7 0 -**.
The following table summarises the significance of the diagnostic messages and the actions to be taken in response to them:

Column	Significance
Code	The Code column includes the error code (Hex) via CiA 402.
No.	Main index and sub-index of the diagnostic message.
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): – PS off (switch off output stage), – MCStop (fast stop with maximum current), – QStop (fast stop with parametrised ramp), – Warn (Warning), – Entry (Entry in diagnostic memory) – Ignore (Ignore),

Tab. B.1 Explanations on the table “Diagnostic messages of the CMMP-AS-...-M3”

The Reaction column includes the error responses of the default parameter set.
After configuration of the motor controller with FCT, the standard values defined in the FCT or the self-configured reactions apply.

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
00-0	Invalid error	Information: An invalid error entry (corrupted) was found in the diagnostic memory marked with this error number. The system time entry is set to “0”.	–	Entry
00-1	Invalid error detected and corrected	Information: An invalid error entry (corrupted) was found in the diagnostic memory and corrected. The supplemental information contains the original error number. The system time entry contains the address of the corrupted error number.	–	Entry
00-2	Error deleted	Information: Active errors were acknowledged.	–	Entry
01-0	Stack overflow	Incorrect firmware? Sporadic high processor load due to cycle time being too short and special compute-bound processes (save parameter set, etc.).	• Load an approved firmware. • Reduce the processor load. • Contact Technical Support.	PS off
02-0	Undervoltage in intermediate circuit	Intermediate circuit voltage falls below the parametrised threshold. [1)] Error priority set too high?	• Quick discharge due to switched-off mains supply. • Check power supply. • Couple intermediate circuits if technically permissible. • Check intermediate circuit voltage (measure).	Configurable

1) Supplemental information in PNU 203/213:
Top 16 bits: Status number of internal state machine
Bottom 16 bits: Intermediate circuit voltage (internal scaling approx. 17.1 digit/V).

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
03-0	Analogue motor overtemperature	Motor overloaded, temperature too high. – Suitable sensor or sensor characteristics parametrised? – Sensor defective?	If there is overloading: • Check parametrisation (current regulator, current limits). • Check the parametrisation of the sensor or the sensor characteristics. If the error persists when the sensor is bypassed: device defective.	QStop
03-1	Digital motor overtemperature	Motor overloaded, temperature too high. – Suitable sensor or sensor characteristics parametrised? – Sensor defective?	If there is overloading: • Check parametrisation (current regulator, current limits). • Check the parametrisation of the sensor or the sensor characteristics. If the error persists when the sensor is bypassed: device defective.	Configurable
03-2	Analogue motor overtemperature: broken wire	The measured resistance value is above the threshold for wire break detection.	• Check the connecting cables of the temperature sensor for wire breaks. • Check the parametrisation (threshold value) for wire break detection.	Configurable
03-3	Analogue motor overtemperature: short circuit	The measured resistance value is below the threshold for short circuit detection.	• Check the connecting cables of the temperature sensor for wire breaks. • Check the parametrisation (threshold value) for short circuit detection.	Configurable
04-0	Power section over-temperature	Device is overheated – Temperature display plausible? – Device fan defective? – Device overloaded?	• Check installation conditions; are the control cabinet fan filters dirty? • Check the drive layout (due to possible overloading in continuous duty).	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
04-1	Intermediate circuit overtemperature	Device is overheated – Temperature display plausible? – Device fan defective? – Device overloaded?	• Check installation conditions; are the control cabinet fan filters dirty? • Check the drive layout (due to possible overloading in continuous duty).	Configurable
05-5	Voltage failure interface Ext1/Ext2	Defect on the plugged-in interface	Interface replacement ➔ Repair by the manufacturer.	PS off
05-6	Voltage failure [X10], [X11]	Overloading through connected peripherals	• Pin allocation of the connected periphery. • Short circuit?	PS off
05-7	Safety module internal voltage failure	Defect on the safety module	Interface replacement ➔ Repair by the manufacturer.	PS off
05-8	Failure of internal voltage 3	Defect in the motor controller	Internal defect ➔ Repair by the manufacturer.	PS off
05-9	Encoder supply defective	Back measurement of the encoder voltage not OK.	Internal defect ➔ Repair by the manufacturer.	PS off
05-0	Failure of internal voltage 1	Monitoring of the internal power supply has detected undervoltage. Either an internal defect or overload/ short circuit from connected peripherals.	• Separate device from the entire peripheral equipment and check whether the error is still present after reset. If yes, then there is an internal defect ➔ Repair by the manufacturer.	PS off
05-1	Failure of internal voltage 2	Monitoring of the internal power supply has detected undervoltage. Either an internal defect or overload/ short circuit from connected peripherals.	• Separate device from the entire peripheral equipment and check whether the error is still present after reset. If yes, then there is an internal defect ➔ Repair by the manufacturer.	PS off

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
05-2	Failure of driver supply	Monitoring of the internal power supply has detected undervoltage. Either an internal defect or overload/ short circuit from connected peripherals.	• Separate device from the entire peripheral equipment and check whether the error is still present after reset. If yes, then there is an internal defect ➔ Repair by the manufacturer.	PS off
05-3	Undervoltage dig. I/O	Defective peripheral equipment?	• Check connected peripherals for short circuit / rated loads. • Check connection of the brake (connected incorrectly?).	PS off
05-4	Overcurrent dig. I/O	Defective peripheral equipment?	• Check connected peripherals for short circuit / rated loads. • Check connection of the brake (connected incorrectly?).	PS off

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
06-0	Short circuit in output stage	– Faulty motor, e.g. winding short circuit due to motor overheating or short to PE inside motor. – Short circuit in the cable or the connecting plugs, i.e. short circuit between motor phases or to the screening/PE. – Output stage defective (short circuit). – Incorrect parametrisation of the current regulator.	Dependent on the status of the system ➔ footnote 2), cases a) ... f)	PS off
06-1	Overload current brake chopper	Overload current at the brake chopper output.	• Check external braking resistor for short circuit or insufficient resistance value. • Check circuitry of the brake chopper output at the motor controller (bridge, etc.).	PS off

2) Actions:
Case a) Error only with active brake chopper: Check external braking resistor for short circuit or insufficient resistance value. Check circuitry of the brake chopper output at the motor controller (bridge, etc.).
Case b) Error message immediately when the power supply is connected: internal short circuit in the output stage (short circuit of a complete half-bridge). The motor controller can no longer be connected to the power supply; the internal (and possibly external) fuses are tripped. Repair by the manufacturer is necessary.
Case c) Short circuit error message only when the output stage or controller enable is issued.
Case d) Disconnection of motor plug [X6] directly on the motor controller. If the error still occurs, there is a defect in the motor controller. Repair by the manufacturer is necessary.
Case e) If the error only occurs when the motor cable is connected: check the motor and cable for short circuits, e.g. with a multimeter.
Case f) Check parametrisation of the current regulator. Oscillations in an incorrectly parametrised current regulator can generate currents up to the short circuit threshold, usually clearly audible as a high-frequency whistling. Verification, if necessary, with the trace in the FCT (actual active current value).

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
07-0	Overvoltage in the intermediate circuit	Braking resistor is overloaded; too much braking energy which cannot be dissipated quickly enough. – Resistor incorrectly dimensioned? – Resistor not connected correctly?	• Check the design of the braking resistor; resistance value may be too great. • Check the connection to the braking resistor (internal/external).	PS off
08-0	Resolver angular encoder error	Resolver signal amplitude is faulty	Step-by-step approach ➔ footnote [3], a) ... c):	Configurable
08-1	Unequal rotational direction of incremental position sensing	Only encoder with serial position transmission combined with an analogue SIN/COS signal track: The direction of rotation of encoder-internal position determination and incremental evaluation of the analogue track system in the motor controller are the wrong way around. ➔ Footnote [4]	• Swap the following signals on the [X2B] angle encoder interface (the wires in the connecting plug must be changed around), observing the technical data for the angle encoder where applicable: – Swap SIN/COS track. – Swap the SIN+/SIN- or COS+/COS- signals, as applicable.	Configurable

3) a) If possible, test with a different (error-free) resolver (replace the connecting cable too). If the error still occurs, there is a defect in the motor controller. Repair by manufacturer required.
b) If the error occurs only with a special resolver and its connecting cable: Check resolver signals (carrier and SIN/COS signal), see specification. If the signal specification is not maintained, the resolver must be replaced.
c) If the error recurs sporadically, check the screening connection or check whether the resolver simply has an insufficient transmission ratio (standard resolver: A = 0.5).

4) The encoder counts internally, for example positively in clockwise rotation while the incremental evaluation counts in negative direction with the same mechanical rotation. The interchange of the rotational direction is detected mechanically at the first movement of over 30° and the error is triggered.

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
08-2	Error in incremental encoder tracking signal Z0	Signal amplitude of the Z0 track at [X2B] is faulty. – Angle encoder connected? – Angle encoder cable defective? – Angle encoder defective?	Check configuration of angle encoder interface: a) Z0 evaluation activated, but no track signals connected or on hand. [5)] b) Encoder signals faulty? c) Test with another encoder. ➔ Tab. B.3, Page 110.	Configurable
08-3	Error in incremental encoder track signals Z1	Signal amplitude of the Z1 track at X2B is faulty. – Angle encoder connected? – Angle encoder cable defective? – Angle encoder defective?	Check configuration of angle encoder interface: a) Z1 evaluation activated but not connected. b) Encoder signals faulty? c) Test with another encoder. ➔ Tab. B.3, Page 110.	Configurable
08-4	Digital incremental encoder track signals error [X2B]	Faulty A, B, or N track signals at [X2B]. – Angle encoder connected? – Angle encoder cable defective? – Angle encoder defective?	Check the configuration of the angle encoder interface. Proceed according to a) and b): a) Encoder signals faulty? b) Test with another encoder. ➔ Tab. B.3, Page 110.	Configurable
08-5	Error in incremental encoder of Hall encoder signals	Hall encoder signals of a dig. inc. at [X2B] faulty. – Angle encoder connected? – Angle encoder cable defective? – Angle encoder defective?	Check the configuration of the angle encoder interface. Proceed according to a) and b): a) Encoder signals faulty? b) Test with another encoder. ➔ Tab. B.3, Page 110.	Configurable

5) e.g. EnDat 2.2 or EnDat 2.1 without analogue track.
Heidenhain encoder: order codes EnDat 22 and EnDat 21. With these encoders, there are no incremental signals, even when the cables are connected.

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
08-6	Angle encoder communication fault	Communication to serial angle encoders is disrupted (EnDat encoders, HIPERFACE encoders, BiSS encoders). – Angle encoder connected? – Angle encoder cable defective? – Angle encoder defective?	Check configuration of the angle generator interface: procedure corresponding to a) ... c): a) Serial encoder parametrised but not connected? Incorrect serial protocol selected? b) Encoder signals faulty? c) Test with another encoder. ➔ Tab. B.3, Page 110.	Configurable
08-7	Signal amplitude of incremental tracks faulty [X10]	Faulty A, B, or N track signals at [X10]. – Angle encoder connected? – Angle encoder cable defective? – Angle encoder defective?	Check the configuration of the angle encoder interface. Proceed according to a) and b): a) Encoder signals faulty? b) Test with another encoder. ➔ Tab. B.3, Page 110.	Configurable
08-8	Internal angle encoder error	Internal monitoring of the angle encoder [X2B] has detected a fault and forwarded it via serial communication. – Declining illumination intensity with visual encoders – Excess rotational speed – Angle encoder defective?	If the error occurs repeatedly, the encoder is defective. ➔ Replace encoder.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
08-9	Angle encoder at [X2B] is not supported	Angle encoder type read at [X2B], which is not supported or cannot be used in the desired operating mode. – Incorrect or inappropriate protocol type selected? – Firmware does not support the connected encoder variant?	Depending on the additional information of the error message ➔ footnote [6]: • Load appropriate firmware. • Check/correct the configuration for encoder analysis. • Connect an appropriate encoder type.	Configurable
09-0	Old angle encoder parameter set	Warning: An encoder parameter set in an old format was found in the EEPROM of the connected encoder. This has been converted and saved in the new format.	No action necessary at this point. The warning should not re-appear when the 24V supply is switched back on.	Configurable

6) Additional information (PNU 203/213):
0001: HIPERFACE: encoder type is not supported by the firmware -› connect another encoder type or load more recent firmware, if applicable.
0002: EnDat: The address space in which the encoder parameters would have to lie does not exist with the connected EnDat encoder -› check the encoder type.
0003: EnDat: encoder type is not supported by the firmware -› connect another encoder type or load more recent firmware, if applicable.
0004: EnDat: Encoder rating plate cannot be read from the connected encoder. -› Change encoder or load more recent firmware, if applicable.
0005: EnDat: EnDat 2.2 interface parametrised, connected encoder supported but only EnDat2.1. -› Replace encoder type or reparametrise to EnDat 2.1.
0006: EnDat: EnDat2.1 interface with analogue track evaluation parametrised, but according to rating plate the connected encoder does not support track signals. -› Replace encoder or switch off Z0 track signal evaluation.
0007: Code length measuring system with EnDat2.1 connected, but parametrised as a purely serial encoder. Purely serial evaluation is not possible due to the long response times of this encoder system. Encoder must be operated with analogue track signal evaluation -› connect to analogue Z0 track signal evaluation.

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
09-1	Angle encoder parameter set cannot be decoded	Data in the EEPROM of the angle encoder could not be read completely, or access to it was partly refused.	The EEPROM of the encoder contains data (communication objects) which is not supported by the loaded firmware. The data in question is then discarded. • The parameter set can be adapted to the current firmware by writing the encoder data to the encoder. • Alternatively, load appropriate (more recent) firmware.	Configurable
09-2	Unknown version of angle encoder parameter set	The data saved in EEPROM are not compatible with the current version. A data structure was found which is unable to decode the loaded firmware.	• Save the encoder parameters again in order to delete the parameter set in the encoder and replace it with a readable set (this will, however, delete the data in the encoder irreversibly). • Alternatively, load appropriate (more recent) firmware.	Configurable
09-3	Defective data structure in angle encoder parameter set	Data in EEPROM do not match the stored data structure. The data structure was identified as valid but may be corrupted.	• Save the encoder parameters again in order to delete the parameter set in the encoder and replace it with a readable set. If the error still occurs after that, the encoder may be faulty. • Replace the encoder as a test.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
09-4	EEPROM data: Erroneous custom specific configuration	Only for special motors: The plausibility check returns an error, e.g. because the motor was repaired or replaced.	• If motor repaired: Carry out homing again and save in the angle encoder, after that (!) save in the motor controller. • If motor replaced: Parametrise the controller again, then carry out homing again and save in the angle encoder, after that (!) save in the motor controller.	Configurable
09-7	Write-protected angle encoder EEPROM	Data cannot be saved in the EEPROM of the angle encoder. Occurs with Hiperface encoders.	A data field in the encoder EEPROM is read-only (e.g. after operation on a motor controller of another manufacturer). No solution possible, encoder memory must be unlocked with an appropriate parametrisation tool (from manufacturer).	Configurable
09-9	Angle encoder's EEPROM too small	It is not possible to save all the data in the EEPROM of the angle encoder.	• Reduce the number of data records to be saved. Please read the documentation or contact Technical Support.	Configurable
10-0	Overspeed (spinning protection)	– Motor has overrun because the commutation angle offset is incorrect. – Motor is parametrised correctly but the limit for spinning protection is set too low.	• Check the commutation angle offset. • Check the limit value setting in the parameters.	Configurable
11-0	Error when homing is started	Controller enable missing.	Homing can only be started when closed-loop controller enable is active. • Check the condition or sequence.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
11-1	Error during homing	Homing was interrupted, e.g. by: – Withdrawal of controller enable. – Reference switch is beyond the limit switch. – External stop signal (a phase was aborted during homing).	• Check homing sequence. • Check arrangement of the switches. • If applicable, lock the stop input during homing if it is not desired.	Configurable
11-3	Homing: timeout	The parametrised maximum time for the homing run was exceeded before the homing run was completed.	• Check the time setting in the parameters.	Configurable
11-4	Homing: wrong / invalid limit switch	– Relevant limit switch not connected. – Limit switches swapped? – No reference switch found between the two limit switches. – Reference switch is at the limit switch. – Method “current position with zero impulse”: limit switch active in the area of the zero pulse (not permissible). – Both limit switches active at the same time.	• Check whether the limit switches are connected in the correct direction of travel or whether the limit switches have an effect on the intended inputs. • Reference switch connected? • Check arrangement of the reference switch. • Move the limit switch so that it is not in the area of the zero pulse. • Check limit switch parametrisation (N/C contact/ N/O contact).	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
11-5	Homing: I^2t / following error	– Acceleration ramps inappropriately parametrised. – Reversing due to premature triggering of following error; check parametrisation of following error. – No reference switch reached between the end stops. – Zero pulse method: end stop reached (here not permissible).	• Parametrise the acceleration ramps to make them flatter. • Check connection of a reference switch. • Method appropriate for the application?	Configurable
11-6	Homing: End of search path	The maximum permissible path for the homing run has been travelled without reaching the reference point or the homing target.	Malfunction in switch detection. • Switch for homing is defective?	Configurable
11-7	Homing: error in encoder difference monitoring	Deviation between the actual position value and commutation position is too great. External angle encoder not connected or defective?	• Deviation fluctuates, e.g. due to gear backlash; cut-off threshold may need to be increased. • Check connection of the actual value encoder.	Configurable
12-0	CAN: double node number	Node number assigned twice.	• Check the configuration of the CAN bus stations	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
12-1	CAN: Communication error, bus OFF	The CAN chip has switched off communication due to communication errors (BUS OFF).	• Check cabling: cable specification adhered to, cable break, maximum cable length exceeded, correct terminating resistors, cable screening earthed, all signals connected? • Replace device on a test basis. If a different device works without errors with the same cabling, send the device to the manufacturer for checking.	Configurable
12-2	CAN: communication error during transmission	The signals are corrupted when transmitting messages. Device boot up is so fast that no other nodes on the bus have yet been detected when the boot-up message is sent.	• Check cabling: cable specification adhered to, cable break, maximum cable length exceeded, correct terminating resistors, cable screening earthed, all signals connected? • Replace device on a test basis. If a different device works without errors with the same cabling, send the device to the manufacturer for checking. • Check the start sequence of the application.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
12-3	CAN: communication error during reception	The signals are corrupted when receiving messages.	• Check cabling: cable specification adhered to, cable break, maximum cable length exceeded, correct terminating resistors, cable screening earthed, all signals connected? • Replace device on a test basis. If a different device works without errors with the same cabling, send the device to the manufacturer for checking.	Configurable
12-4	CAN: node guarding	Node guarding telegram not received within the parametrised time. Signals corrupted?	• Compare the cycle time of the remote frames with that of the controller • Check: failure of the controller?	Configurable
12-5	CAN: RPDO too short	A received RPDO does not contain the parametrised number of bytes.	The number of parametrised bytes does not match the number of bytes received. • Check the parametrisation and correct.	Configurable
12-9	CAN: Protocol error	Faulty bus protocol.	• Check the parametrisation of the selected CAN bus protocol.	Configurable
13-0	CAN bus timeout	Error message from manufacturer-specific protocol.	• Check the CAN parametrisation	Configurable
14-0	Insufficient power supply for identification	Current regulator parameters cannot be determined (because of insufficient supply).	The available intermediate circuit voltage is too low to carry out the measurement.	PS off

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
14-1	Identification of current regulator: measurement cycle insufficient	Too few or too many measurement cycles required for the connected motor.	Automatic determination of parameters has supplied a time constant outside the parametrisable value range. • The parameters must be manually optimised.	PS off
14-2	Output stage enable could not be issued	Output stage enable has not been issued.	• Check the connection of DIN4.	PS off
14-3	Output stage was switched off early	Power stage enable was switched off while identification was in progress.	• Check the sequence control.	PS off
14-5	Zero pulse could not be found	The zero pulse could not be found following execution of the maximum permissible number of electrical revolutions.	• Check zero pulse signal. • Angle encoder parametrised correctly?	PS off
14-6	Hall signals invalid	Hall signals faulty or invalid. The pulse train or segmenting of the Hall signals is inappropriate.	• Check connection. Refer to the technical data to check whether the encoder shows three Hall signals with 120° or 60° segments; if necessary, contact Technical Support.	PS off
14-7	Identification not possible	Angle encoder at a standstill.	• Ensure sufficient intermediate circuit voltage. • Encoder cable connected to the correct motor? • Motor blocked, e.g. holding brake does not release?	PS off
14-8	Invalid number of pairs of poles	The calculated number of pole pairs lies outside the parametrisable range.	• Compare result with the technical data specifications of the motor. • Check the parametrised number of lines.	PS off

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
15-0	Division by 0	Internal firmware error. Division by 0 when using the Math Library.	• Load factory settings. • Check the firmware to make sure that approved firmware has been loaded.	PS off
15-1	Range exceeded	Internal firmware error. Overflow when using the Math Library.	• Load factory settings. • Check the firmware to make sure that approved firmware has been loaded.	PS off
15-2	Counter underrun	Internal firmware error. Internal correction factors could not be calculated.	• Check the setting of the factor group for extreme values and change if necessary.	PS off
16-0	Error in program execution	Internal firmware error. Error during program execution. Illegal CPU command found in the program sequence.	• In case of repetition, load firmware again. If the error occurs repeatedly, the hardware is defective.	PS off
16-1	Illegal interrupt	Error during program execution. An unused IRQ vector was used by the CPU.	• In case of repetition, load firmware again. If the error occurs repeatedly, the hardware is defective.	PS off
16-2	Initialisation error	Internal firmware error.	• In case of repetition, load firmware again. If the error occurs repeatedly, the hardware is defective.	PS off
16-3	Unexpected status	Error during periphery access within the CPU or error in the program sequence (illegal branching in case structures).	• In case of repetition, load firmware again. If the error occurs repeatedly, the hardware is defective.	PS off

Diagnostic messages of the CMMP-AS-...-M3

No.	Message	Causes	Actions	Reaction
17-0	Contouring error limit value exceeded	Comparison threshold for the limit value of the contouring error exceeded.	• Enlarge error window. • Acceleration parametrised too large. • Motor overloaded (current limitation from i²t monitoring is active?).	Configurable
17-1	Encoder difference monitoring	Deviation between the actual position value and commutation position is too great. External angle encoder not connected or defective?	• Deviation fluctuates, e.g. due to gear backlash; cut-off threshold may need to be increased. • Check connection of the actual value encoder.	Configurable
18-0	Analogue motor temperature	Motor temperature (analogue) greater than 5° below T_max.	• Check parametrisation of current regulator and/or speed regulator. • Motor permanently overloaded?	Configurable
21-0	Error 1 current measurement U	Offset for current measurement 1 phase U is too great. The closed-loop controller carries out offset compensation of the current measurement every time its controller enable is issued. Tolerances that are too large result in an error.	If the error occurs repeatedly, the hardware is defective.	PS off
21-1	Error 1 current measurement V	Offset for current measurement 1 phase V is too great.	If the error occurs repeatedly, the hardware is defective.	PS off
21-2	Error 2 current measurement U	Offset for current measurement 2 phase U is too great.	If the error occurs repeatedly, the hardware is defective.	PS off
21-3	Error 2 current measurement V	Offset for current measurement 2 phase V is too great.	If the error occurs repeatedly, the hardware is defective.	PS off
22-0	PROFIBUS: defective initialisation	Faulty initialisation of the PROFIBUS interface. Interface defective?	• Replace interface. Repair by the manufacturer may be an option.	Configurable
22-2	Communication error PROFIBUS	Errors in communication.	• Check the set slave address. • Check bus termination. • Check wiring.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
22-3	PROFIBUS: invalid slave address	Communication was started with slave address 126.	• Select a different slave address.	Configurable
22-4	PROFIBUS: value range error	During conversion with the factor group, the value range was exceeded. Mathematical error in the conversion of the physical units.	The value ranges of the data and the physical units do not match. • Check and correct.	Configurable
25-0	Invalid device type	Device coding not recognised or invalid	The error cannot be rectified automatically. • Send motor controller to the manufacturer.	PS off
25-1	Device type not supported	Device coding valid, but not supported by the loaded firmware.	• Load up-to-date firmware. • If newer firmware is not available, the problem may be a hardware defect. Send motor controller to the manufacturer.	PS off
25-2	Hardware revision not supported	The controller's hardware version is not supported by the loaded firmware.	• Check the firmware version; update the firmware to a more recent version if necessary.	PS off
25-3	Device function restricted!	Device is not enabled for this function	Device is not enabled for the desired functionality and may need to be enabled by the manufacturer. The device must be sent to Festo for this purpose.	PS off
25-4	Invalid power stage type	– Power sub-section in the EEPROM is unprogrammed – Power sub-section is not supported by the firmware	Load appropriate firmware.	PS off

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
26-0	Missing user parameter set	No valid user parameter set in the flash memory	• Load factory settings. If the error remains, the hardware may be defective.	PS off
26-1	Checksum error	Checksum error of a parameter set	• Load factory settings. If the error remains, the hardware may be defective.	PS off
26-2	Flash: Write error	Error when writing the internal flash memory	• Execute the last operation again. If the error occurs again, the hardware may be faulty.	PS off
26-3	Flash: Error during deletion	Error during deletion of the internal flash memory	• Execute the last operation again. If the error occurs again, the hardware may be faulty.	PS off
26-4	Flash: Internal flash error	The default parameter set is corrupted / data error in the FLASH area where the default parameter set is located.	• Load firmware again. If the error occurs again, the hardware may be faulty.	PS off
26-5	Missing calibration data	Factory-set calibration parameters incomplete/corrupted.	The error cannot be rectified automatically.	PS off
26-6	Missing user position data records	Position data records incomplete or corrupt.	• Load factory settings or • save the current parameters again so that the position data is written again.	PS off
26-7	Error in the data tables (CAM)	Data for the cam disc is corrupted.	• Load factory settings • Reload the parameter set if necessary. If the error persists, contact Technical Support.	PS off

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
27-0	Following error warning threshold	Motor overloaded? Check motor capacity. Acceleration or braking ramps are set too steep. Motor blocked? Commutation angle correct?	• Check the parametrisation of the motor data. • Check parametrisation of the following error.	Configurable
28-0	Hours-run meter missing	No record for an hours-run meter could be found in the parameter block. A new hours-run meter has been created. Occurs during initial start-up or a processor change.	Warning only, no further action required.	Configurable
28-1	Hours-run meter: write error	The data block in which the hours-run meter is stored could not be written to. Cause unknown; possibly problems with the hardware.	Warning only, no further action required. If the error occurs again, the hardware may be faulty.	Configurable
28-2	Hours-run meter corrected	The hours-run meter has a backup copy. If the controller's 24V power supply fails precisely when the hours-run meter is being updated, the written record may be corrupted. In such cases, the controller restores the hours-run meter from the intact backup copy when it switches back on.	Warning only, no further action required.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
28-3	Hours-run meter converted	Firmware was loaded in which the hours-run meter has a different data format. The next time the controller is switched on, the old hours-run meter record is converted to the new format.	Warning only, no further action required.	Configurable
29-0	MMC/SD card not available	This error is triggered when an action should be carried out on the memory card (load or create DCO file, firmware download), but no memory card is plugged in.	Insert appropriate memory card in the slot. Only if expressly desired!	Configurable
29-1	MMC/SD card: initialisation error	This error is triggered in the following cases: – The memory card could not be initialised. Card type may not be supported! – File system not supported – Error in connection with the shared memory	• Check card type used. • Connect memory card to a PC and format again.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
29-2	MMC/SD card: parameter set error	This error is triggered in the following cases: – A load or storage process is already running, but a new load or storage process is requested. DCO file ›› Servo – The DCO file to be loaded has not been found. – The DCO file to be loaded is not suitable for the device. – The DCO file to be loaded is defective. Servo ›› DCO file – The memory card is write protected. – Other error while saving the parameter set as a DCO file. – Error in creating the file “INFO.TXT”	• Execute load or storage process again after waiting 5 seconds. • Connect memory card to a PC and check the files included. • Remove write protection from the memory card.	Configurable
29-3	MMC/SD card full	– This error is triggered while saving the DCO or “INFO.TXT” file if the memory card is discovered to be already full. – The maximum file index (99) already exists. That is, all file indexes are assigned. No filename can be issued!	• Insert another memory card. • Change filenames.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
29-4	MMC/SD card: firmware download	This error is triggered in the following cases: – No firmware file on the memory card – The firmware file is not appropriate for the device. – Other error during firmware download, e.g. checksum error with an SRecord, error with flash memory, etc.	• Connect memory card to PC and transfer firmware file.	Configurable
30-0	Internal mathematical error	Range exceeded for internal scaling factors, which are dependent on the parametrised controller cycle times.	• Check whether extremely short or extremely long cycle times were parametrised.	PS off
31-0	Motor I^2t	– Motor blocked? – Motor under-sized?	• Check power dimensioning of drive package.	Configurable
31-1	Servo controller I^2t	The I^2t monitoring is responding frequently. – Motor controller does not have the required capacity? – Mechanics sluggish?	• Check project engineering of the motor controller, • possibly use a more powerful type. • Check the mechanical system.	Configurable
31-2	PFC I^2t	PFC power rating exceeded.	• Parametrise operation without PFC (FCT).	Configurable
31-3	Braking resistor I^2t	– Overloading of the internal braking resistor.	• Use external braking resistor. • Reduce resistance value or use resistor with higher pulse load.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
32-0	Intermediate circuit charging time exceeded	The intermediate circuit could not be charged after the mains voltage was applied. – Fuse possibly defective or – Internal braking resistor defective or – In operation with external resistor, the resistor is not connected.	• Check interface to the external braking resistor. • Alternatively, check whether the jumper for the internal braking resistor is in place. If the interface is correct, the internal braking resistor or the built-in fuse is probably faulty. On-site repair is not possible.	Configurable
32-1	Undervoltage for active PFC	The PFC cannot be activated at all until an intermediate circuit voltage of about 130 VDC is reached.	• Check power supply.	Configurable
32-5	Brake chopper overload. Intermediate circuit could not be discharged.	The extent of utilisation of the brake chopper when quick discharge began was already in the range above 100%. Quick discharge took the brake chopper to the maximum load limit and was prevented/aborted.	No actions required	Configurable
32-6	Intermediate circuit discharge time exceeded	Intermediate circuit could not be quickly discharged. The internal braking resistor may be faulty or, in the case of operation with an external resistor, the resistor is not connected.	• Check interface to the external braking resistor. • Alternatively, check whether the jumper for the internal braking resistor is in place. If the internal resistor has been activated and the jumper has been positioned correctly, the internal braking resistor is probably faulty. On-site repair is not possible.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
32-7	No power supply for controller enable	Controller enable was issued when the intermediate circuit was still in its charging phase after mains voltage was applied and the mains relay was not yet activated. The drive cannot be enabled in this phase, because the drive is not yet firmly connected to the mains (through the mains relay).	• In the application, check whether the mains supply and controller enable signals were sent correspondingly quickly one after the other.	Configurable
32-8	Power supply failure during controller enable	Interruptions/failure in the power supply while the controller enable was activated.	• Check power supply.	QStop
32-9	Phase failure	Failure of one or more phases (only in the case of three-phase supply).	• Check power supply.	QStop
33-0	Encoder emulation following error	The critical frequency for encoder emulation was exceeded (see manual) and the emulated angle at [X11] was no longer able to follow. Can occur when very high numbers of lines are programmed for [X11] and the drive reaches high speeds.	• Check whether the parametrised number of lines may be too high for the speed being represented. • Reduce the number of lines if necessary.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
34-0	No synchronisation via fieldbus	When activating the interpolated position mode, the controller could not be synchronised to the fieldbus. – The synchronisation messages from the master may have failed or – the IPO interval is not correctly set to the synchronisation interval of the fieldbus.	• Check the settings for the controller cycle times.	Configurable
34-1	Fieldbus synchronisation error	– Synchronisation via fieldbus messages during ongoing operation (interpolated position mode) has failed. – Synchronisation messages from the master failed? – Synchronisation interval (IPO interval) parametrised too small/too large?	• Check the settings for the controller cycle times.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
35-0	Linear motor spinning protection	Encoder signals are corrupt. The motor may be racing (“spinning”) because the commutation position has been shifted by the faulty encoder signals.	• Check installation for EMC recommendations. • In the case of linear motors with inductive/optical encoders with separately mounted measuring tape and measuring head: check the mechanical clearance. • In the case of linear motors with inductive encoders, make sure that the magnetic field of the magnets or the motor winding does not leak into the measuring head (this effect usually occurs when high accelerations = high motor current).	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
35-5	Error during the determination of the commutation position	The rotor position could not be identified clearly. – The selected method may be inappropriate. – The selected motor current for the identification may not be set appropriately.	Check the method for determining the commutation position. ➔ Footnote 7)	Configurable
36-0	Parameter was limited	An attempt was made to write a value which was outside the permissible limits, so the value was limited.	• Check the user parameter set.	Configurable
36-1	Parameter was not accepted	An attempt was made to write to an object which is “read only” or is not write-capable in the current status (e.g. with controller enable active).	• Check the user parameter set.	Configurable
40-0	Negative software limit switch	The position setpoint has reached or exceeded the respective software limit switch.	• Check target data. • Check positioning range.	Configurable
40-1	Positive software limit switch reached	The position setpoint has reached or exceeded the positive software limit switch.	• Check target data. • Check positioning range.	Configurable

7) Instructions for determining the commutation position:
a) The alignment procedure is inappropriate for locked or sluggish drives or drives that can oscillate at low frequencies.
b) The micro-step procedure is appropriate for non-ferrous and iron-core motors. As only very small movements are carried out, it works even when the drive is on elastic stops or is locked but can still be moved elastically to some extent. Due to the high excitation frequency, however, the method is very susceptible to oscillations in the case of poorly damped drives. In this case, you can attempt to reduce the excitation current (%).
c) The saturation procedure uses local saturation appearances in the iron of the motor. Recommended for locked drives. Non-ferrous drives are basically inappropriate for this method. If the (iron-core) drive moves too much when locating the commutation position, the measurement result may be adulterated. If this is the case, reduce the excitation current. In the opposite case, if the drive does not move, the excitation current may not be strong enough, causing the saturation to be insufficient.

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
40-2	Target position behind the negative software limit switch	Start of a positioning task was suppressed because the target lies behind the negative software limit switch.	• Check target data. • Check positioning range.	Configurable
40-3	Target position behind the positive software limit switch	The start of a positioning task was suppressed because the target lies behind the positive software limit switch.	• Check target data. • Check positioning range.	Configurable
41-0	Position set forwarding: synchronisation error	Start of synchronisation without prior sampling pulse	• Check the parametrisation of the pre-stop path.	Configurable
42-3	Start positioning rejected: wrong mode of operation	Switching of the operating mode by means of the position record was not possible.	• Check parametrisation of the position records in question.	Configurable
42-4	Start positioning rejected: homing required	A normal positioning record was started, but the drive needs a valid reference position before starting.	• Execute new homing.	Configurable
42-5	Modulo positioning: Rotation direction not permitted	– The positioning target cannot be reached through the positioning or edge condition options. – The calculated direction of rotation is not permitted for the modulo positioning in the set mode.	• Check the chosen mode.	Configurable
42-9	Error when starting the positioning task	– Acceleration limit value exceeded – Position record blocked.	• Check parametrisation and sequence control, correct if necessary.	Configurable
42-0	Positioning: no follow-up positioning: stop	The positioning target cannot be reached through the positioning or edge condition options.	• Check parametrisation of the position records in question.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
42-1	Positioning: reversing not allowed: stop	The positioning target cannot be reached through the positioning or edge condition options.	• Check parametrisation of the position records in question.	Configurable
42-2	Positioning: reversing after halt not allowed	The positioning target cannot be reached through the positioning or edge condition options.	• Check parametrisation of the position records in question.	Configurable
43-0	Limit switch: negative setpoint value blocked	Negative hardware limit switch reached.	• Check parametrisation, wiring and limit switches.	Configurable
43-1	Limit switch: positive setpoint value blocked	Positive hardware limit switch reached.	• Check parametrisation, wiring and limit switches.	Configurable
43-2	Limit switch: positioning suppressed	– The drive has exited the intended range of motion. – Technical defect in the system?	• Check the intended range of motion.	Configurable
44-0	Error in the cam disc tables	Cam disc to be started not available.	• Check transferred cam disc no. • Correct parametrisation. • Correct programming.	Configurable
44-1	Cam disc: general error homing	– Start of a cam disc, but the drive is not yet referenced. – Start of homing with active cam disc.	• Execute homing. • Deactivate cam disc. Then restart cam disc if necessary.	Configurable
47-0	Error in setting-up: timeout expired	The speed did not drop below that required for setting-up on time.	Check processing of the request on the control side.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
48-0	Homing required	An attempt is being made to switch in the “speed control” or “torque control” operating mode or to issue controller enable in these operating modes, although the drive requires a valid reference position for this.	• Execute homing.	QStop
50-0	Too many synchronous PDOs	More PDOs have been activated than can be processed in the underlying SYNC interval. This message also appears if only one PDO is to be transmitted synchronously, but a high number of other PDOs with a different transmission type have been activated.	• Check the activation of PDOs. If the configuration is appropriate, the warning can be suppressed using error management. • Extend the synchronisation interval.	Configurable
50-1	SDO errors have occurred	An SDO transfer has caused an SDO abort. – The data exceed the range of values – Access to non-existent object.	• Check the command sent.	Configurable
51-0	No / unknown safety module (Error cannot be acknowledged)	– No safety module detected or unknown module type. – Internal voltage error of the safety module or micro switch module.	• Install safety or switch module appropriate for the firmware and hardware. • Load firmware appropriate for the safety or micro switch module, see type designation on the module. • Module presumably defective. If possible, replace with another module.	PS off

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
51-2	Safety module: unequal module type (Error cannot be acknowledged)	Type or revision of the module does not fit the project engineering.	• With module replacement: module type not yet designed. Take over currently installed safety or micro switch module as accepted.	PS off
51-3	Safety module: unequal module version (Error cannot be acknowledged)	Type or revision of the module is not supported.	• Install safety or switch module appropriate for the firmware and hardware. • Load firmware appropriate for the module, see type designation on the module.	PS off
52-1	Safety module: discrepancy time expired	– Control ports STO-A and STO-B are not actuated simultaneously. – Control ports STO-A and STO-B are not wired in the same way.	• Check discrepancy time. • Check discrepancy time.	PS off
52-2	Safety module: driver supply failure with active pulse-width modulation control	This error message does not occur with equipment delivered from the factory. It can occur with use of a customer-specific CMMP-AS-...-M3 device firmware.	• The safe status was requested with approved power end stage. Check inclusion in the safety-oriented interface.	PS off
62-0	EtherCAT: General bus error	No EtherCAT bus present.	• Switch on the EtherCAT master. • Check wiring.	Configurable
62-1	EtherCAT: Initialisation error	Error in the hardware.	• Replace the interface and send it to the manufacturer for checking.	Configurable
62-2	EtherCAT: CAN: Protocol error	CAN over EtherCAT is not in use.	• Incorrect protocol. • EtherCAT bus cabling malfunctioning.	Configurable
62-3	EtherCAT: Invalid RPDO length	Sync manager 2 buffer size is too large.	• Check the RPDO configuration of the motor controller and the controller.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
62-4	EtherCAT: Invalid TPDO length	Sync manager 3 buffer size is too large.	• Check the TPDO configuration of the motor controller and the controller.	Configurable
62-5	EtherCAT: Cyclic data transmission defective	Emergency shut-down due to failure of cyclic data transmission.	• Check the configuration of the master. Synchronous transmission is unstable.	Configurable
63-0	EtherCAT: Defective module	Error in the hardware.	• Replace the interface and send it to the manufacturer for checking.	Configurable
63-1	EtherCAT: Invalid data	Faulty telegram type.	• Check wiring.	Configurable
63-2	EtherCAT: TPDO data were not read	The buffer for sending the data is full	The data were sent faster than the motor controller could process it. • Reduce the cycle time on the EtherCAT bus.	Configurable
63-3	EtherCAT: No distributed clocks active	Warning: firmware is synchronising with the telegram, not with the distributed clocks system. When the EtherCAT was started, no hardware SYNC (distributed clocks) was found. The firmware now synchronises with the EtherCAT frame.	• If necessary, check whether the master supports the distributed clocks feature. • Otherwise: Ensure that the EtherCAT frames are not interrupted by other frames if the “interpolated position mode” is to be used.	Configurable
63-4	A SYNC message is missing in the IPO cycle	Telegrams are not being sent in the time slot pattern of the IPO.	• Check the station responsible for distributed clocks.	Configurable
64-0	DeviceNet: Duplicate MAC ID	The duplicate MAC-ID check has found two nodes with the same MAC-ID.	• Change the MAC-ID of one of the nodes to a value which is not already used.	Configurable
64-1	DeviceNet: Bus voltage missing	The DeviceNet module is not supplied with 24 V DC.	• In addition to the motor controller, the DeviceNet interface must also be connected to 24 V DC.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
64-2	DeviceNet: Receive buffer overflow	Too many messages received within a short period.	• Reduce the scan rate.	Configurable
64-3	DeviceNet: Send buffer overflow	Not enough free space on the CAN bus for sending messages.	• Increase the baud rate • Reduce the number of nodes • Reduce the scan rate.	Configurable
64-4	DeviceNet: IO message not sent	Error in sending I/O data.	Check that the network is connected correctly and has no errors.	Configurable
64-5	DeviceNet: Bus Off	The CAN controller is BUS OFF.	Check that the network is connected correctly and has no errors.	Configurable
64-6	DeviceNet: CAN controller reports overrun	The CAN controller has an overrun.	• Increase the baud rate • Reduce the number of nodes • Reduce the scan rate.	Configurable
65-0	DeviceNet activated, but no module	The DeviceNet communication is activated in the parameter set of the motor controller, but no interface is available.	• Deactivate the DeviceNet communication • Connect an interface.	Configurable
65-1	IO connection timeout	Interrupting an I/O connection	No I/O message received within the expected time.	Configurable
70-1	FHPP: Mathematical error	Overrun/underrun or division by zero during calculation of cyclic data.	• Check the cyclic data • Check the factor group.	Configurable
70-2	FHPP: Factor group invalid	Calculation of the factor group leads to invalid values.	Check the factor group.	Configurable
70-3	FHPP: Invalid operating mode change	Changing from the current to the desired operating mode is not permitted.	Check your application. It may be that not every change is permissible.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
71-1	FHPP: Invalid receive telegram	Too little data is being transmitted by the control system (data length too short).	• Check the data length parametrised in the control system for the controller's received telegram • Check the configured data length in the FHPP+ Editor of the FCT.	Configurable
71-2	FHPP: Invalid response telegram	Too much data is set to be transmitted from the CMMP-AS-...-M3 to the control system (data length too great)	• Check the data length parametrised in the control system for the controller's received telegram • Check the configured data length in the FHPP+ Editor of the FCT.	Configurable
80-0	Current regulator IRQ overflow	The process data could not be calculated in the set current/speed/position interpolator cycle.	Please contact Technical Support.	PS off
80-1	Speed regulator IRQ overflow	The process data could not be calculated in the set current/speed/position interpolator cycle.	Please contact Technical Support.	PS off
80-2	Overflow position controller IRQ	The process data could not be calculated in the set current/speed/position interpolator cycle.	Please contact Technical Support.	PS off
80-3	Interpolator IRQ overflow	The process data could not be calculated in the set current/speed/position interpolator cycle.	Please contact Technical Support.	PS off

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
81-4	Low-level IRQ overflow	The process data could not be calculated in the set current/speed/position interpolator cycle.	Please contact Technical Support.	PS off
81-5	MDC IRQ overflow	The process data could not be calculated in the set current/speed/position interpolator cycle.	Please contact Technical Support.	PS off
82-0	Sequence control	IRQ4 overflow (10 ms low-level IRQ).	Internal process control: process was interrupted. For information only - no action required.	Configurable
82-1	Multiply started CO write access	Parameters in the cyclical and acyclical mode are used concurrently	Only one parametrisation interface can be used (USB or Ethernet)	Configurable
83-0	Invalid option module	– The plugged-in interface could not be detected – The loaded firmware is not known. – A supported interface might be plugged into the wrong slot (e.g. SERCOS 2, EtherCAT).	• Check firmware whether interface is supported. If yes, • Check that the interface is in the right place and is plugged in correctly. • Replace interface and/or firmware.	Configurable
83-1	Option module not supported	The plugged-in interface could be detected but is not supported by the loaded firmware.	• Check firmware whether interface is supported. • If necessary, replace the firmware.	Configurable

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
83-2	Option module: hardware revision not supported	The plugged-in interface could be detected and is basically also supported. However, in this case the current hardware version is not supported (because it is too old). Example is the PROFIBUS interface and the EA88 interface, which was produced in a first 5V version (Version 1.0), but cannot run on the current motor controller.	The interface must be replaced. If necessary, contact Technical Support. In the case of PROFIBUS or EA88 interface, hardware version 2.0 or higher.	Configurable
84-0	Conditions for controller enable not fulfilled	One or more conditions for controller enable are not fulfilled. These include: – DIN4 (output stage enable) is off – DIN5 (controller enable) is off – Intermediate circuit not yet loaded – Encoder is not yet ready for operation – Angle encoder identification is still active – Automatic current regulator identification is still active – Encoder data are invalid – Status change of the safety function not yet completed – Firmware or DCO download via Ethernet (TFTP) active – DCO download onto memory card still active – Firmware download via Ethernet active	• Check status of digital inputs • Check encoder cables • Automatic identification • Wait for completion of the firmware or DCO downloads	Warn

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
90-0	Missing hardware components (SRAM)	External SRAM not detected / not sufficient.	Hardware error (SRAM component or board is defective).	PS off
90-2	Error at FPGA boot-up	The FPGA cannot be booted. The FPGA is booted serially when the device is started, but in this case it could not be loaded with data or it reported a checksum error.	Switch on the device again (24V). If the error occurs repeatedly, the hardware is faulty.	PS off
90-3	Error at SD-ADU start	SD-ADUs cannot be started. One or more SD-ADUs are not supplying any serial data.	Switch on the device again (24V). If the error occurs repeatedly, the hardware is faulty.	PS off
90-4	SD-ADU synchronisation error after start	SD-ADU not synchronous after starting. During operation, the SD-ADUs for the resolver signals continue running with strict synchronisation once they have been initially started synchronously. The SD-ADUs could not be started at the same time during that initial start phase.	Switch on the device again (24V). If the error occurs repeatedly, the hardware is faulty.	PS off
90-5	SD-ADU not synchronous	SD-ADU not synchronous after starting. During operation, the SD-ADUs for the resolver signal continue running with strict synchronisation once they have been initially started synchronously. This is checked continually during operation and an error may be triggered.	Severe EMC interference could theoretically also cause this effect. Switch on the device again (24V). If the error appears again, the hardware is faulty (almost certainly one of the three SD-ADUs).	PS off
90-6	IRQ0 (current controller): trigger error	The output stage does not trigger the software IRQ, which then operates the current regulator. Very likely to be a hardware error on the board or in the processor.	Switch on the device again (24V). If the error occurs repeatedly, the hardware is faulty.	PS off

Diagnostic messages of the CMMP-AS-...-M3				
No.	Message	Causes	Actions	Reaction
90-9	DEBUG firmware loaded	A development version compiled for the debugger was loaded as normal.	Check the firmware version, and update the firmware if necessary.	PS off
91-0	Internal initialisation error	Internal SRAM too small for the compiled firmware. Can only occur with development versions.	Check the firmware version, and update the firmware if necessary.	PS off
91-1	Memory error when copying	Firmware parts were not copied correctly from the external FLASH into the internal RAM.	Switch on the device again (24V). If the error occurs repeatedly, check the firmware version and update the firmware if necessary.	PS off
91-2	Error when reading the controller/power section coding	The ID-EEPROM in the controller or power section could either not be addressed at all or does not have consistent data.	Switch on the device again (24V). If the error occurs repeatedly, the hardware is faulty. No repair possible.	PS off
91-3	Software initialisation error	One of the following components is missing or could not be initialised: a) Shared memory not available or defective b) Driver library not available or defective	Check firmware version, update if necessary	PS off

Tab. B.2 Diagnostic messages CMMP-AS-...-M3

Instructions on actions with the error messages 08-2 ... 08-7	
Action	Instructions
• Check whether encoder signals are faulty.	– Check the wiring, e.g. are one or more phases of the track signals interrupted or short-circuited? – Check that installation complies with EMC recommendations (cable screening on both sides?). – Only with incremental encoders: With TTL single-ended signals (HALL signals are always TTL single-ended signals): Check whether there might be an excessive voltage drop on the GND line; in this case = signal reference. Check whether there might be an excessive voltage drop on the GND line; in this case = signal reference. – Check the level of supply voltage on the encoder. Sufficient? If not, change the cable diameter (connect unused lines in parallel) or use voltage feedback (SENSE+ and SENSE-).
• Test with other encoders.	– If the error still occurs when the configuration is correct, test with a different (error-free) encoder (replace the connecting cable as well). If the error still occurs, there is a defect in the motor controller. Repair by the manufacturer is necessary.

Tab. B.3 Instructions on error messages 08-2 ... 08-7

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