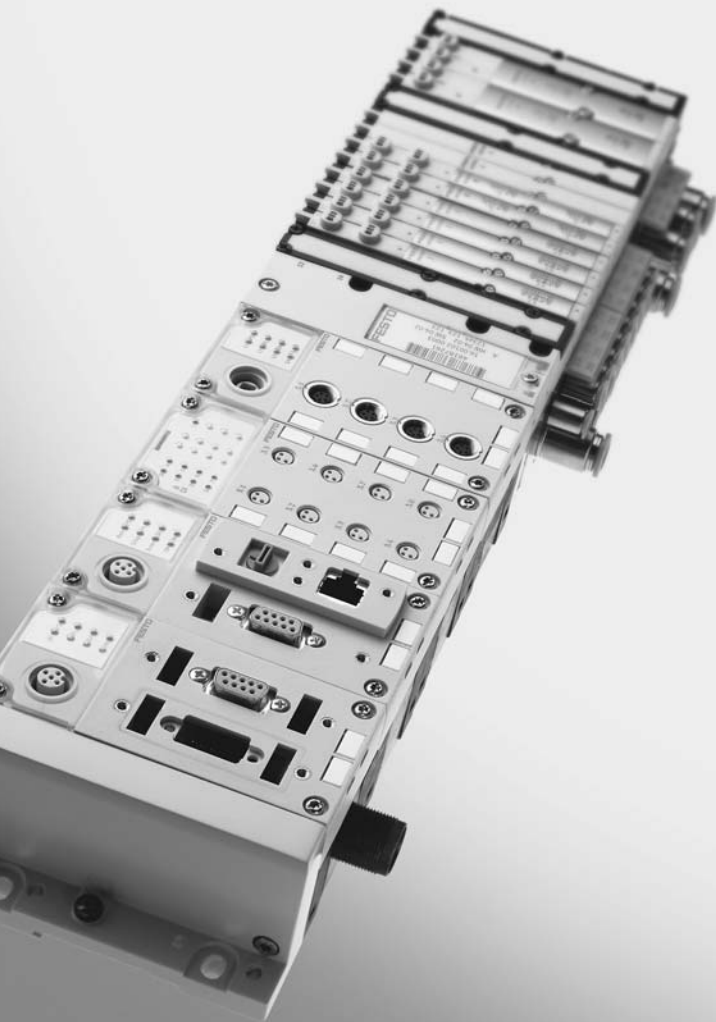


CPX terminal

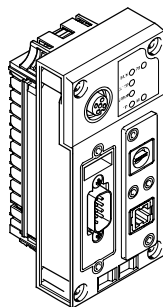


FESTO

**Manual
Electronics**

Multi-axis interface

CPX-CMXX



Manual
564 222
en 0805NH
[737 773]

Contents and general instructions

Original de

Edition en 0805NH

Designation P.BE-CPX-CMXX-EN

Order no. 564 222

© (Festo AG & Co. KG, D-73726 Esslingen, Germany, 2008)

Internet: <http://www.festo.com>

E-Mail: service_international@festo.com

The reproduction, distribution and utilization of this document as well as the communication of its contents to others without express authorization is prohibited. Offenders will be held liable for the payment of damages. All rights reserved in the event of the grant of a patent, utility module or design.

TORX® is a registered trade name of CAMCAR TEXTRON INC.,
Rockford, Ill., USA

Contents

Intended use	VII
Target group	VII
Service	VII
Important user information	VIII
Safety regulations	X
Notes on this manual	XI
Glossary	XIII
1. System summary	1-1
1.1 The CPX-CMXX Multi-axis interface	1-3
1.1.1 Functions and characteristics	1-4
1.1.2 Advantages	1-4
1.1.3 Tasks	1-5
1.1.4 Method of operation	1-5
1.2 Supported drive controllers	1-6
1.3 Control possibilities	1-7
1.4 Design of a multi-axis system	1-9
1.5 System configuration	1-10
1.5.1 Autonomous automation solution	1-10
1.5.2 Control of the CPX terminal through a higher-level PLC	1-11
1.5.3 Autonomous automation solution with communication with a higher-level PLC	1-12
1.6 Connection and display components	1-13

2.	Fitting and installation	2-1
2.1	General notes on installation	2-3
2.2	Dismantling and fitting	2-4
2.2.1	Dismantling	2-5
2.2.2	Assembly	2-5
2.3	Setting the switches	2-6
2.3.1	RUN/STOP rotary switch	2-6
2.3.2	DIL switches	2-7
2.4	Control interface	2-9
2.5	Connecting the CAN bus	2-10
2.5.1	CAN bus line	2-10
2.5.2	Connection with Festo CAN bus plug	2-11
2.5.3	Further connection possibilities for the CAN bus with adapters	2-12
2.6	Ethernet interface	2-15
2.7	Compliance with protection class IP65/IP67	2-16
3.	Commissioning	3-1
3.1	General instructions on commissioning	3-3
3.2	Preparing configuration and parameterization	3-4
3.2.1	Installing FCT and FCT PlugIns	3-4
3.3	Parameterization of the connected drive controllers	3-6
3.3.1	Connecting PC with the drive controllers	3-6
3.3.2	Communication between CPX-CMXX and the drive controllers	3-6
3.3.3	Specific settings for CMMP-AS drive controller	3-8
3.3.4	Specific settings for MTR-DCI drive controller	3-9
3.3.5	Specific settings for SFC-DC drive controller	3-9
3.4	Configuration of the CPX-CMXX	3-10
3.4.1	Connecting PC to CPX-CMXX	3-10
3.4.2	Prepare PC	3-11
3.4.3	Configuring and parameterizing CPX-CMXX	3-13

4.	Diagnosis and error treatment	4-1
4.1	Overview of diagnostic possibilities	4-3
4.2	Errors and warnings	4-4
	4.2.1 Behavior in case of errors and warnings	4-4
	4.2.2 Quitting errors	4-4
	4.2.3 Fault numbers	4-5
4.3	Diagnostics via LEDs	4-10
4.4	Diagnosis at the CPX terminal	4-13
	4.4.1 Status bits in the system status of the CPX terminal	4-13
	4.4.2 I/O diagnostic interface and diagnostic memory	4-14
	4.4.3 Definition of diagnosis channels	4-17
	4.4.4 Other diagnostic information	4-18
A.	Technical appendix	A-1
A.1	Technical data	A-3
A.2	Accessories	A-5
A.3	Device-specific information at the MMI	A-7
B.	Index	B-1

Intended use

The CPX-CMXX multi-axis interface documented in this manual is intended exclusively for use in Festo CPX terminals for installation in a machine or an automation control system.

The multi-axis interface CPX-CMXX permits coordination of axis portals and positioning axes in conjunction with a PLC.

The CPX terminal may only be used with the CPX-CMMX as follows:

- as specified in industrial applications.
- without any modifications by the user. Only the conversions or modifications described in the documentation supplied with the product are permitted.
- in faultless technical condition.
- only in combination with permitted components, i.e. fieldbus node and drive controllers, see section 1.2 and 1.3.

The maximum values specified for pressures, temperatures, electrical data, torques etc. must be observed.

Please comply with national and local safety laws and regulations.

Target group

This manual is directed exclusively at technicians trained in control and automation technology.

Service

Please consult your local Festo Service agent if you have any technical problems.

Important user information

Hazard categories

This manual contains information on possible hazards that can occur if the product is used incorrectly. This information is marked with a signal word (warning, careful, etc.), shaded, and also marked with a pictogram. The following hazard information is differentiated:



Warning

... means that severe personal injury or property damage can occur if not observed.



Caution

... means that personal injury or property damage can occur if not observed.



Please note

... means that property damage can occur if not observed.

In addition, the following pictogram marks texts that describe activities with electrostatically endangered component elements:



Elektrostatically endangered component elements: Improper handling can result in damage to component elements.

Designation of special information

The following pictograms designate texts that contain special information.

Pictograms



Information:
Recommendations, tips and cross-references to other information sources.



Accessories:
Information about necessary or useful accessories for the Festo product.



Environment:
Information on the environmentally friendly use of Festo products.

Text markings

- The list point designates activities that can be performed in any order desired.
- 1. Numerals designate activities that must be performed in the specified order.
- Hyphens designate general lists.

Brackets designate menu entries.
Example: [Configuration], see section 3.3.4.

Arrow brackets mark placeholders for designations.
Example: “Status of <Your Connection>”, see section 3.4.2.

Quotation marks designate names of windows, dialogues and buttons.
Example: “Status of <Your Connection>”, see section 3.4.2.

Safety regulations



Please note

In safety-relevant applications, the CPX-CMMX and all of its design variants may only be used in combination with additional measures according to EN 954-1. A risk analysis by the user/designer is essential.



Warning

- Switch off the power supply before connecting or disconnecting plugs (otherwise this could lead to functional damage).



Use only power units which guarantee reliable isolation of the operating voltage as per IEC 742/EN 60742/VDE 0551 with at least 4 kV isolation resistance (Protected Extra Low Voltage PELV). Switch power packs are permitted, providing they guarantee reliable isolation as per EN 60950/VDE 0805.



The CPX-CMXX contains electrostatically sensitive components. Therefore, do not touch any contacts. Observe the handling specifications for electrostatically sensitive components.



Please note

Commission only a CPX terminal which has been fitted and wired completely.

Notes on this manual



Please note

This manual refers to the multi-axis interface CPX-CMXX from Revision 01.

You will find the revision on the type plate




This manual contains special information on the method of operation, fitting, installing and commissioning the CPX-CMMX multi-axis interface.

You will find additional information on the CPX-CMXX multi-axis interface in the following documentation.

Document	Contents
Online help on the FCT PlugIn CMXX	Description of the configuration, parameterization and commissioning of the multi-axis interface CPX-CMXX
Manual on the Festo handling and positioning profile for multi-axis movements (FHPP-MAX), P.BE-CMXX-FHPP-SW-...	Manual of the Festo data profile FHPP-MAX, which is used for communication between PLC and CPX-CMXX.
Short description of CPX-CMXX, P.BE-K-CPX-CMXX	Information on fitting and installation of the multi-axis interface CPX-CMXX.

Tab. 0/1: Overview of additional documentation on the multi-axis interface CPX-CMXX

You will find additional information on the CPX terminal in the following documentation.

Type	Title	Description
Manual Electronics	“System manual” P.BE-CPX-SYS-... 	Overview of structure, components and method of operation of CPX terminals; installation and commissioning instructions as well as basic principles of parameterising
	“CPX field bus node” P.BE-CPX-FB... 	Instructions for the assembly, installation, commissioning and diagnosis of the relevant fieldbus nodes
	“CPX-FEC” P.BE-CPX-FEC-... 	Instructions for fitting, installing, commissioning and diagnosing the CPX Front End Controller.

Tab. 0/2: Extract from the overview of additional documentation on the CPX terminal

Glossary

The following product-specific terms and abbreviations are used in this manual:

Term/ abbreviation	Meaning
0-signal	Input or output provides 0 V (also LOW, FALSE or logical 0)
1-signal	Input or output provides 24 V (also HIGH, TRUE or logical 1)
0xA0 A0 _h	Hexadecimal numbers are marked by a prefixed “0x” or by a lowered “h”. Example: 0xA0 = A0 _h = 160 decimal
Axis	Drive controller, linear/rotative axis, motor and gears
Axis group	An axis group consists of up to 4 axes. The multi-axis interface can control a maximum of 2 axis groups. The axis group can contain up to 3 gantry axes and up to 4 positioning axes.
Control interface	Interface of the CPX-CMXX for connection of the drive controllers via CAN bus
CPX-FEC	Front-end controller as CPX module PLC integrated into the CPX terminal
CPX module	Collective term for the various modules which can be integrated in a CPX terminal
CPX terminal	Complete system consisting of CPX modules
FE	Functional earth
Fieldbus node	Provides the connection to specific field buses. Transmit control signals to the connected modules and monitor their functioning (as CPX module: CPX fieldbus node).
Gantry axis	Gantry axes are axes with the following characteristics: – Gantry axes run synchronously, see synchronous PtP movement
Handheld / MMI	Hand-operated device for service purposes
I	Digital input
I/Os	Digital inputs and outputs
O	Digital output
OB	Output byte

Term/ abbreviation	Meaning
Parameter	Parameters which must be set so that the system can be operated
PLC	Control of the CPX terminal and the CPX-CMMX is alternatively carried out through: <ul style="list-style-type: none"> – a higher-level PLC: a PLC connected via fieldbus to the CPX terminal – a CPX-FEC: PLC integrated into the CPX terminal
Positioning axis	Positioning axes are axes with the following characteristics: <ul style="list-style-type: none"> – cannot run synchronously with each other. – can be run synchronously only to the gantry axes – the calculated acceleration and braking have the same value
Synchronous PtP movement	The synchronous point-to-point movement is a coordinated multi-axis movement with the following characteristics. <ul style="list-style-type: none"> – The positioning times of the axes are adapted to the axis with the greatest positioning time. – All axes end their movement simultaneously.

Tab. 0/3: Terms and abbreviations

System summary

Chapter 1

1. System summary

Contents

1.	System summary	1-1
1.1	The CPX-CMXX Multi-axis interface	1-3
1.1.1	Functions and characteristics	1-4
1.1.2	Advantages	1-4
1.1.3	Tasks	1-5
1.1.4	Method of operation	1-5
1.2	Supported drive controllers	1-6
1.3	Control possibilities	1-7
1.4	Design of a multi-axis system	1-9
1.5	System configuration	1-10
1.5.1	Autonomous automation solution	1-10
1.5.2	Control of the CPX terminal through a higher-level PLC	1-11
1.5.3	Autonomous automation solution with communication with a higher-level PLC	1-12
1.6	Connection and display components	1-13

1. System summary

1.1 The CPX-CMXX Multi-axis interface

The CPX-CMXX multi-axis interface is an intelligent module in the CPX terminal for controlling electrical drive units from Festo. With it, besides single-axis applications, especially coordinated multi-axis movements can be achieved very easily.

Coordinated movements mean, in connection with the CPX-CMXX, that synchronous PtP movements can be performed.

Programming of the CPX-CMXX is not required for this. Through its user-friendly surface, the Festo Configuration Tool FCT makes it simple to configure, parameterize and commission the CPX-CMXX and the axes. The CPX-CMXX is designed for a total of 2 axis groups with up to 4 axes each. The axes are connected via CANopen.

The CPX-CMXX multi-axis interface is controlled by a higher-level PLC via a CPX fieldbus node or through the CPX-FEC PLC integrated into the CPX terminal. Communication with the CPX-CMXX takes place over the Festo data profile FHPP-MAX. The Festo data profile is based on the Festo data profile FHPP, which was expanded for the multi-axis mode.

1. System summary

1.1.1 Functions and characteristics

- Configuration of 2 axis groups with up to 4 axes each is possible
- Per axis group, 1024 position records are available
- Configuration with the Festo Configuration Tool (FCT)
- Simple input or teaching of positions in a specified record structure
- Operating functions in the FCT for commissioning without connection to the PLC

1.1.2 Advantages

- With the CPX-CMXX, Festo offers holistic solutions (i.e. mechanisms + electrical drive system + motion controller).
- The plug and work concept reduces the engineering effort and commissioning times.
- No programming necessary. In this way, functioning multi-axis handling units can be successfully created faster and more easily.
- Complete advance test of the application is possible without PLC.
- As a decentralised intelligence for movement control, the CPX-CMXX relieves the PLC considerably.
- Different operating modes (record select, direct mode, ...), but also the use of the CPX-CMXX in combination with the CPX-FEC as a control unit in the CPX terminal, ensure universal use of the multi-axis interface.

1. System summary

1.1.3 Tasks

The CPX-CMXX takes over the following tasks:

- Control of the individual axes of the multi-axis system
- Error management
- Management of the position record table

1.1.4 Method of operation

The CPX-CMXX takes over the entire movement sequence of the connected axes. A higher-level PLC, which is connected to the CPX-CMXX via a CPX fieldbus node, or a CPX-FEC control the movement sequence via the Festo data profile FHPP-MAX. The PLC can thereby either specify just the record numbers stored in the CPX-CMXX or separate values for position, velocity and acceleration for each axis.

The axes can be run synchronously with each other or separately. The possibility is also offered to link records.

1. System summary

1.2 Supported drive controllers

Drive controller	from version	Remarks
CMMP-AS	3.5.150.1.1	—
MTR-DCI	1.04	—
SFC-DC	1.39	—
CMMS-AS	—	in preparation
CMMS-ST	—	in preparation
SFC-LAC	—	in preparation

Tab. 1/1: Overview of supported drive controllers

1. System summary

1.3 Control possibilities

The CPX-CMXX can be controlled in two ways:

- control through higher-level PLC, using a CPX field bus node

or

- control through CPX-FEC.

Communication with the PLC takes place with 16-byte input and output data, 8 bytes per axis group.

Communication takes place over the Festo data profile FHPP-MAX, see the manual P.BE-CMXX-FHPP-MAX-SW-...

1. System summary

Certain software versions of the CPX field bus node or CPX-FEC are required to operate the CPX-CMMX interface (as of May 2008):

Field bus node/FEC	Required version ¹⁾	Remarks
CPX-FB6 (Interbus)	—	not available
CPX-FB11 (DeviceNet)	—	in preparation
CPX-FB13 (PROFIBUS)	from Revision 22	—
CPX-FB14 (CANopen)	—	in preparation
CPX-FB23 (CC-Link)	—	in preparation
CPX-FB32 (Ethernet/IP)	—	in preparation
CPX-FB33, 34, 35 (PROFINET)	—	in preparation
CPX-FB38 (Ethercat)	—	in preparation
CPX-FEC	from Revision 16	—
¹⁾ Software status (SW) see type plate		

Tab. 1/2: Overview of CPX fieldbus node / CPX-FEC



Please note

Please also observe the notes on the software status in the documentation for the CPX field bus node or CPX-FEC.

1. System summary

1.4 Design of a multi-axis system

A multi-axis system with CPX -CMXX consists of the following components:

Module	Component	Remarks
PLC		Higher-level PLC or integrated as CPX-FEC in the CPX terminal
Fieldbus		For connection to a higher-level PLC
CPX terminal	CPX fieldbus node	For connection to a higher-level PLC
	CPX-FEC	PLC integrated into the CPX terminal
	CPX-CMXX	For control of the axis groups
	Possibly additional CPX modules	For I/O modules and other electrical components
	Possibly CPX pneumatic interface	For pneumatic drives or other pneumatic components
One or two axis groups	Up to 4 axes	Of which up to 3 gantry axes or up to 4 positioning axis
	One drive controller per axis	
	One drive per axis	
	One translatory or rotatory axis each	

Tab. 1/3: Design of a multi-axis system

The possible system configurations are explained in section 1.5.

1. System summary

1.5 System configuration

1.5.1 Autonomous automation solution

- 1 CPX-FEC
- 2 CPX-CMXX
- 3 CPX terminal
- 4 CAN bus
- 5 Drive controller

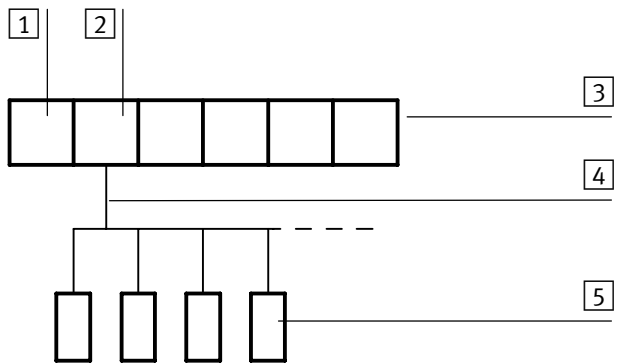


Fig. 1/1: Autonomous automation solution with CPX terminal, CPX-FEC and CPX-CMXX

In this configuration, the sequence control of the CPX terminal is taken over by the CPX-FEC. Programming takes place over the Festo data profile FHPP-MAX.

The CPX-CMXX takes over multi-axis control in combination with the CPX-FEC. Communication between the CPX-CMXX and CPX-FEC is carried out over the CPX terminal.

1. System summary

1.5.2 Control of the CPX terminal through a higher-level PLC

- 1 Higher-level PLC
- 2 Fieldbus
- 3 CPX terminal
- 4 CAN bus
- 5 Drive controller
- 6 CPX-CMXX
- 7 CPX fieldbus node

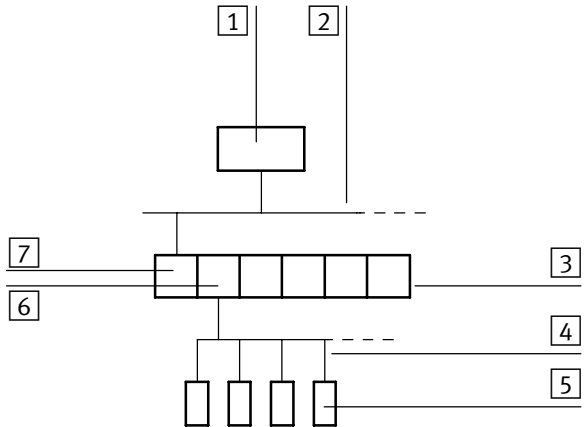


Fig. 1/2: Design of CPX terminal with higher-level PLC

In this configuration, the sequence control of the CPX terminal is taken over by a higher-level PLC. Programming takes place over the Festo data profile FHPP-MAX.

The CPX-CMXX takes over multi-axis control in combination with the higher-level PLC. Communication between the CPX-CMXX and the higher-level PLC is carried out over the CPX field bus node.

1. System summary

1.5.3 Autonomous automation solution with communication with a higher-level PLC

- 1 Higher-level PLC
- 2 Fieldbus
- 3 CPX terminal
- 4 CAN bus
- 5 Drive controller
- 6 CPX-CMXX
- 7 CPX-FEC
- 8 CPX fieldbus node

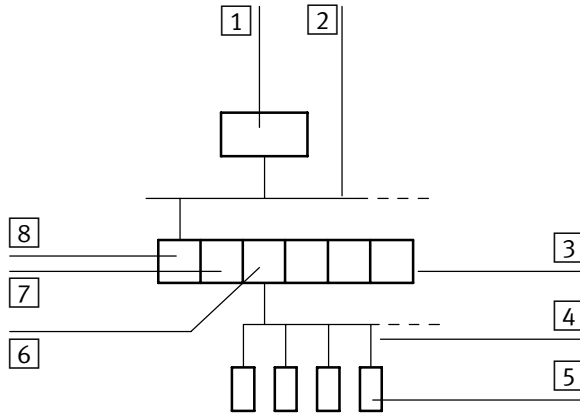


Fig. 1/3: Design of autonomous automation solution with communication with a higher-level PLC

In this configuration, the sequence control of the CPX terminal is taken over by the CPX-FEC. Programming takes place over the Festo data profile FHPP-MAX.

The CPX-CMXX takes over multi-axis control in combination with the CPX-FEC. Communication between the CPX-CMXX and CPX-FEC is carried out over the CPX terminal. The higher-level PLC communicates with the CPX-FEC via the CPX fieldbus node.

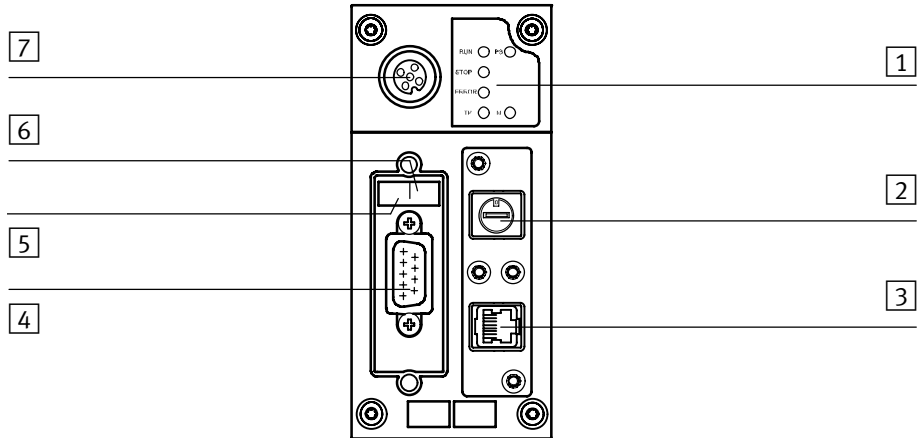


Further information on the FHPP-MAX can be found in the manual P.BE-CMXX-FHPP-MAX-SW-...

1. System summary

1.6 Connection and display components

The following connection and display elements can be found on the CPX-CMXX:



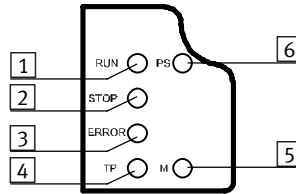
- 1 Status LEDs, see Fig. 1/5
- 2 RUN/STOP rotary switch
- 3 Ethernet interface (10/100BaseT, RJ45)
- 4 Control interface (CAN bus, 9-pin sub-D plug)
- 5 DIL switch 1 (selection of the operating mode)
- 6 DIL switch 2 (CAN bus termination)
- 7 Interface, reserved

Fig. 1/4: Connection and display elements on the CPX-CMXX

1. System summary

Status LEDs

- 1** RUN ¹⁾ CPX-CMXX started (green)
- 2** STOP ¹⁾ CPX-CMXX stopped (yellow)
- 3** ERROR Error (red)
- 4** TP Ethernet connection (green)
- 5** M Control hierarchy is with FCT (yellow)
- 6** PS Power system (green)



¹⁾ The LEDs RUN **1** and STOP **2** show the status of the RUN/STOP rotary switch.

Fig. 1/5: Status LEDs

Fitting and installation

Chapter 2

2. Fitting and installation

Contents

2.	Fitting and installation	2-1
2.1	General notes on installation	2-3
2.2	Dismantling and fitting	2-4
2.2.1	Dismantling	2-5
2.2.2	Assembly	2-5
2.3	Setting the switches	2-6
2.3.1	RUN/STOP rotary switch	2-6
2.3.2	DIL switches	2-7
2.4	Control interface	2-9
2.5	Connecting the CAN bus	2-10
2.5.1	CAN bus line	2-10
2.5.2	Connection with Festo CAN bus plug	2-11
2.5.3	Further connection possibilities for the CAN bus with adapters	2-12
2.6	Ethernet interface	2-15
2.7	Compliance with protection class IP65/IP67	2-16

2. Fitting and installation

2.1 General notes on installation



Warning

Before carrying out installation and maintenance work, switch off the following:

- if applicable, the compressed air supply
- the operating voltage supply for the electronics/sensors
- the load voltage supply for the outputs/valves.

You can thereby avoid:

- uncontrolled movements of loose tubing.
- unexpected movements of the connected actuators
- non-defined switching states of the electronic components.



Caution

The CPX-CMXX contains electrostatically sensitive components.

- Therefore, do not touch any contacts.
- Observe the handling specifications for electrostatically sensitive components.

You will then prevent the electronics from being damaged.

Information about fitting the CPX terminal can be found in the CPX system manual (P.BE-CPX-SYS-...).

Information on mounting the components of the multi-axis system can be found in the related components documentation.

2. Fitting and installation

2.2 Dismantling and fitting

The CPX-CMXX is fitted in a manifold block of the CPX terminal (see Fig. 2/1).

- 1 CPX-CMXX
- 2 Manifold base
- 3 Contact rails
- 4 TORX T10 screws

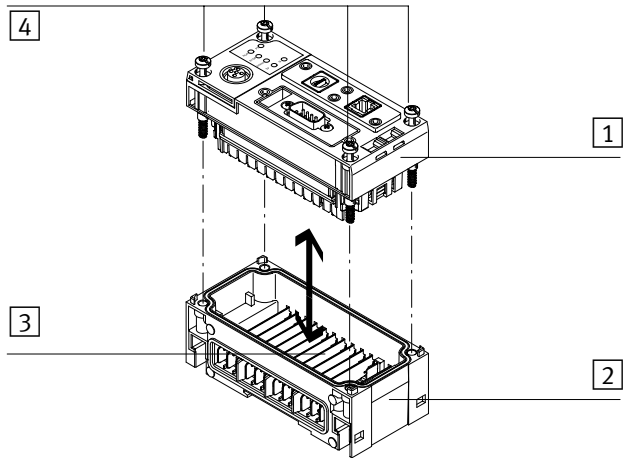


Fig. 2/1: Dismantling/fitting the CPX-CMXX

2. Fitting and installation

2.2.1 Dismantling

Dismantle the CPX-CMMX as follows:

1. Loosen the 4 screws **4** of the CPX-CMXX with a TORX screwdriver of size T10.
2. Pull the CPX-CMXX **1** carefully and without tilting away from the contact rails **3** of the manifold sub-base **2**.

2.2.2 Assembly

Mount the CPX-CMMX as follows:

1. Place the CPX-CMXX **1** in the manifold sub-base **2**. Make sure that the grooves with the terminals for electrical contact on the bottom of the CPX-CMXX **1** lie directly above the contact rails **3**.
2. Then press the CPX-CMXX **1** carefully and without tilting as far as possible into the manifold sub-base **2**.
3. Place the screws **4** so that the self-cutting threads can be used. Tighten the screws **4** at first only by hand.
4. Tighten the screws **4** with a TORX screwdriver size T10 with 0.9 ... 1.1 Nm.

2. Fitting and installation

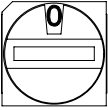
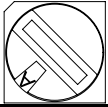
2.3 Setting the switches

2.3.1 RUN/STOP rotary switch

The RUN/STOP rotary switch starts/stops the CPX-CMXX.

Put the RUN/STOP rotary switch at position “0” (STOP) during installation.

Modifications to the position of the RUN/STOP rotary switch are transmitted to the PLC with a delay of 500 ms. In this way, you can switch between two switch positions without the intermediate positions having any effect.

RUN/STOP rotary switch	Setting	Meaning
	0	STOP The CPX-CMXX is stopped when the rotary switch is switched from 1 ... F to 0. The STOP LED lights up yellow.
	1 ... F	RUN CPX-CMXX started. The switch positions 1 ... F have no further function. The RUN LED lights up green.

Tab. 2/1: Setting the RUN/STOP rotary switch

2. Fitting and installation


2.3.2 DIL switches

The DIL switches must be accessible in order to set the CPX-CMXX:

- If necessary, dismantle the CAN bus plug from the control interface.

Setting the operating mode, DIL switch 1

With DIL switch 1, you can set the operating mode of the CPX-CMXX.

Operating mode	Setting DIL switch 1	
CMXX		DIL 1.1: OFF DIL 1.2: ON
All further switch settings are reserved.		

Tab. 2/2: Setting the operating mode





Please note

Check that the setting of the DIL switch is correct before commissioning the CPX-CMXX. Modification to the switch setting is not recognized until the power supply is switched off, then on again.

2. Fitting and installation

Setting the CAN bus termination, DIL switch 2

With DIL switch 2, you can switch on the CAN bus termination.

CAN bus termination, 120 Ω	Setting DIL switch 2	
CAN bus termination switched off.	 A diagram of a DIL switch with two positions, labeled 1 and 2. The word "ON" is written above the switch. In this diagram, both switches 1 and 2 are in the OFF position, indicated by a small black rectangle at the bottom of each switch's vertical track.	DIL 2.1: OFF DIL 2.2: OFF
CAN bus termination switched on.	 A diagram of a DIL switch with two positions, labeled 1 and 2. The word "ON" is written above the switch. In this diagram, switch 1 is in the ON position, indicated by a small black rectangle at the top of its vertical track, while switch 2 remains in the OFF position at the bottom.	DIL 2.1: ON DIL 2.2: OFF
All further switch settings are reserved.		

Tab. 2/3: Setting the CAN bus termination

Changes to DIL switch 2 have a direct effect on the CAN bus termination.

2. Fitting and installation

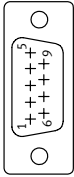
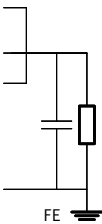
2.4 Control interface

The drive controllers of the multi-axis system are connected via the CAN bus to the control interface of the CPX-CMXX.

CAN bus parameters:

- transmission rate: 1 Mbps
- data profile: DS402
- max. line length: 25 m

The control interface of the CPX-CMMX is designed as a 9-pin sub-D plug:

Plugs	Pin	Signal	Internal contacts	Explanation
	1	n.c.		not connected
	2	CAN_L		CAN Low
	3	CAN_GND		CAN Ground
	4	n.c.		not connected
	5	CAN_SHLD		connection to functional earth (FE) ²⁾
	6	CAN_GND		CAN Ground (optional) ¹⁾
	7	CAN_H		CAN High
	8	n.c.		not connected
	9	n.c.		not connected
	Housing (plug)		the plug housing must be connected to FE ²⁾	

¹⁾ If a drive controller with external voltage supply is connected, CAN Ground (optional), pin 6, on the CPX-CMXX must not be used.
²⁾ FE: Functional earth

Tab. 2/4: Pin assignment of the control interface



The CPX-CMXX does not provide any voltage for the connected CAN bus slaves via the control interface.

2.5 Connecting the CAN bus

2.5.1 CAN bus line



Please note

If installation has not been carried out correctly and if high baud rates are used, data transmission errors may occur as a result of signal reflections and attenuation.

Causes of the transmission faults can be:

- missing or incorrect terminating resistor
- incorrect screening/shield connection
- branches
- large distances
- unsuitable cables.

Use a twisted, screened 4-core cable as CAN bus line. The CPX-CMXX communicates with the drive controllers via the CAN bus line.

If the Festo CAN bus plug is used, a cable diameter of 5 ... 8 mm or 7 ... 10 mm is permitted.



Please note

If the CPX terminal is fitted onto the moving part of a machine, the CAN bus line on the moving part must be provided with strain relief. Please also observe the relevant regulations in EN 60204 part 1.

2. Fitting and installation

2.5.2 Connection with Festo CAN bus plug



Please note

- Use protective caps or blanking plugs to seal unused connections.

You will then comply with protection class IP65/IP67.

- Note the fitting instructions for the CAN bus plug. Tighten the two fastening screws at first by hand and then with max. 0.4 Nm.



You can connect the CPX CMMX easily to the field bus with the CAN bus plug from Festo (FBS-SUB-9-BU-2x5POL-B). You can disconnect the plug from the node without interrupting the bus cable (T-TAP function).



Please note

The clamp strap in the Festo CAN bus plug is connected only capacitively internally with the metal housing of the sub-D plug. This prevents equalizing currents from flowing via the screening of the CAN bus cable (Fig. 2/2).

- Clamp the screening of the CAN bus cable under the clamp strap in the CAN bus plug.

2. Fitting and installation

- 1 Hinged cover with display window
 - 2 Clamp strap for screening connection ¹⁾
 - 3 Protective cap if connection is not used
 - 4 CAN bus outgoing (OUT)
 - 5 CAN bus incoming (IN)
 - 6 Sub-D plug ¹⁾
- ¹⁾ connected capacitively

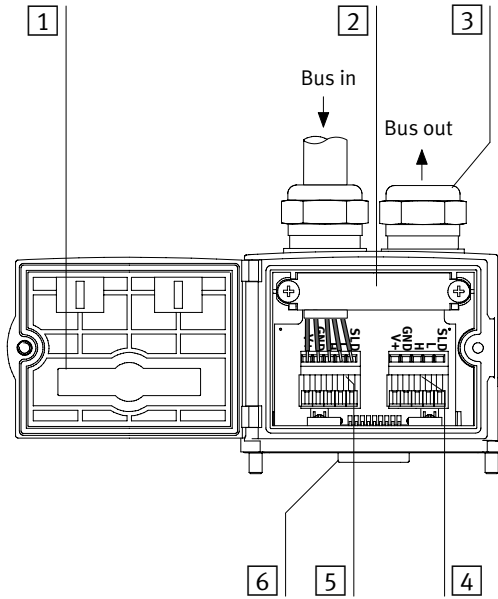


Fig. 2/2: CAN bus plug from Festo, FBS-SUB-9-BU-2x5POL-B

2.5.3 Further connection possibilities for the CAN bus with adapters



Caution

- Make sure of the correct polarity when you connect the CAN bus interface.
- Connect the screening/shield.

There are further possibilities of connecting the CAN bus with adapters, which can be ordered separately from Festo.

- M12 adapter 5-pin (protection class IP65) FBA-2-M12-5POL
- Screw terminal adapter 5-pin (protection class IP20) FBA-1-SL-5POL

2. Fitting and installation

M12 adapter (IP65)

With this adapter the CAN bus is connected via a 5-pin M12 socket with PG9 screw connector. Use the second connection socket for continuation of the CAN bus.



Please note

- Use protective caps or blanking plugs to seal unused connections.

You will then comply with protection class IP65.



Order this adapter from Festo (FBA-2-M12-5POL).

M12 adapter	Pin no.
	<ol style="list-style-type: none"> 1. Screening/shield 2. 24 V DC bus (max. 4 A) 3. 0 V bus 4. CAN_H 5. CAN_L
<p>Protective cap or plug with bus termination resistor if connection is not used.</p>	

Fig. 2/3: Pin assignment of the CAN bus interface (adapter for M12 connection 5-pin)



With the two M12 connections, you can implement a T-adapter.

2. Fitting and installation

Screw terminal adapter (IP20)

With this adapter the bus can be connected to a 2x5-pin terminal strip. Use the second connection socket for continuation of the CAN bus.

The maximum permitted current at the terminals is 4 A. Use cables with a cross sectional area of min. 0.34 mm².

Order this adapter from Festo (FBA-1-SL-5POL) together with the terminal strip FBSD-KL-2x5POL.

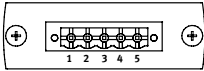
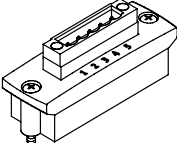
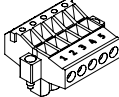
Screw terminal adapter	Pin no.
	<ol style="list-style-type: none">1. 0 V bus2. CAN_L3. Screening/shield4. CAN_H5. 24 V DC bus (max. 4 A)
 	2x5-pin terminal strip

Fig. 2/4: Pin assignment of the CAN bus interface (screw terminal adapter 5-pin)

If you connect the CAN bus via the terminal strip type FBSD-KL-2x5POL from Festo, you can implement a T-adapter function.

Please note

If you use the screw terminal adapter in conjunction with the terminal strip, you achieve protection class IP20.

2. Fitting and installation

2.6 Ethernet interface

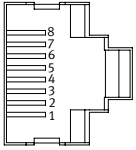
The Ethernet interface is intended only for configuring and parameterizing the CPX-CMXX.



Please note

The Ethernet interface cannot be used as an Ethernet fieldbus node. If the CPX terminal is to be connected to an Ethernet fieldbus, use a CPX-FEC.

The Ethernet connection at the CPX-CMXX is implemented physically with an RJ45 socket:

RJ45 socket	Pin	Signal	Explanation
	1	TD+	Transmitted data +
	2	TD-	Transmitted data -
	3	RD+	Received data +
	4	n.c.	not connected
	5	n.c.	not connected
	6	RD-	Received data -
	7	n.c.	not connected
	8	n.c.	not connected
	Metal covering	Screening/shield	Screening/shield

Tab. 2/5: Pin allocation for the Ethernet interface

If the parameterization interface is not used, close it with the AK-RJ45 cover. You will then comply with protection class IP65/IP67 (see section 2.7).

If the parameterization interface is to be used permanently, use plug FBS-RJ45-8-GS. In this way, you will comply with protection class IP65/IP67, see section 2.7.

2. Fitting and installation

2.7 Compliance with protection class IP65/IP67

In order to comply with protection class IP65/IP67, seal unused sockets and the switch with the appropriate covers:

Connection/ switch	Connection IP65/IP67	Cover IP65/IP67
CAN bus 9-pin sub-D plug	Plugs FBS-SUB-9-BU-2x5POL-B, also covers the DIL switches	–
Ethernet, RJ45	Plugs FBS-RJ45-8-GS	Cover ¹⁾ ²⁾ AK-RJ45
Reserved interface, M12	–	Protective cap ²⁾ ISK-M12
Rotary switch	–	Cover ²⁾ AK-RJ45
DIL switches	–	
¹⁾ If connection is not used ²⁾ Included in scope of delivery		

Tab. 2/6: Connections and covers for protection class IP65/IP67

Commissioning

Chapter 3

Contents

3.	Commissioning	3-1
3.1	General instructions on commissioning	3-3
3.2	Preparing configuration and parameterization	3-4
3.2.1	Installing FCT and FCT PlugIns	3-4
3.3	Parameterization of the connected drive controllers	3-6
3.3.1	Connecting PC with the drive controllers	3-6
3.3.2	Communication between CPX-CMXX and the drive controllers	3-6
3.3.3	Specific settings for CMMP-AS drive controller	3-8
3.3.4	Specific settings for MTR-DCI drive controller	3-9
3.3.5	Specific settings for SFC-DC drive controller	3-9
3.4	Configuration of the CPX-CMXX	3-10
3.4.1	Connecting PC to CPX-CMXX	3-10
3.4.2	Prepare PC	3-11
3.4.3	Configuring and parameterizing CPX-CMXX	3-13

3.1 General instructions on commissioning

**Warning**

Switch on the operating voltage supply for the electronics/ sensors and the compressed air only when installation of the entire CPX terminal and the entire multi-axis system has been completely finished without errors.

You can thereby avoid:

- unexpected movements of the connected actuators
- non-defined switching states of the electronic components
- uncontrolled movements of loose tubing.

**Warning**

When the axes are moving, i.e. when teaching positions, jogging and homing, note that the load voltage supply of the drive controller is switched on and incorrect parameters can lead to undesired movements of the connected actuators.

Information about commissioning the CPX terminal can be found in the CPX system manual (P.BE-CPX-SYS-...).

Information on commissioning the components of the multi-axis system can be found in the related components documentation.

3.2 Preparing configuration and parameterization

To configure and parameterize the CPX-CMXX and drive controller, you need a PC on which the Festo Configuration Tool (FCT) and the respective FCT Plugins are installed.

3.2.1 Installing FCT and FCT Plugins



Please note

Installation of the FCT Plugins of the drive controller is described in the respective online help.

The FCT PlugIn CMXX is installed on your PC with the installation program of the FCT.

The installation program can be obtained over the Internet:

1. Open the Internet browser of your PC system.
2. Enter the following Internet address: “www.festo.com”
3. Choose your choice of country and, if applicable, language.
4. Select the “Automation” field or actuate the “Go” button.
5. Switch to the “Support” area.
6. Choose the “Download Software” field.
7. Enter the FCT PlugIn designation “CMXX” as search term.
8. Note the information and remarks in the file “Read me on FCT – Festo Configuration Tool for CPX-CMXX”.
9. Choose the corresponding program for transfer to your PC.
10. Save the installation program in a directory of your choice.

Administrator rights are required for installing the software.

3. Commissioning



Please note

If applicable, deinstall the old version of the CMXX PlugIn before you install a new version.

Proceed with installation of the CMXX FCT PlugIn as follows:

1. Close all programs.
2. With a file selection program (e.g. in Explorer), switch to the directory with the installation program of the CMXX FCT PlugIn.
3. Start the installation program with a double-click.
4. Select the desired language and confirm your selection with “OK”.
5. Follow the instructions in the installation program. With “Continue” you can move to the next step, with “Return” you can move to the previous step.
 6. Greeting and display of current information on FCT
 7. Selection of installation directory
 8. Start of installation
 9. Display the successful installation
 10. Inquiry and installation of PlugIns
 11. End of installation program

When installation is completed, you will find the FCT entry in the start menu under “Festo software”.

The CMXX PlugIn is available for setting up new projects as Festo components and is activated automatically when an existing CMXX project is selected.

Deinstallation

The CMXX PlugIn and the FCT program are separated in each case with help of the “Software” function in Windows System Control.

- Follow the instructions in your Windows manual.

3.3 Parameterization of the connected drive controllers



The following information takes into account only the specific settings of the drive controllers for use in multi-axis systems with CPX-CMXX. Information on other settings can be found in the documentation and online help for the relevant drive controller.

3.3.1 Connecting PC with the drive controllers

- Connect your PC to the respective drive controller with a serial programming cable.

3.3.2 Communication between CPX-CMXX and the drive controllers

Communication between CPX-CMXX and the drive controllers takes place over the following interface:

Parameter	Setting
Interface	CANopen
Data profile	DS402
Transmission rate	1 Mbps
CAN address	see Tab. 3/2

Tab. 3/1: Communication interface parameters

3. Commissioning

The CAN address of the axes is established as follows:

Axis group	Axis	CAN address
1	1	2
	2	3
	3	4
	4	5
2	1	6
	2	7
	3	8
	4	9

Tab. 3/2: CAN addresses of the axes

3. Commissioning

3.3.3 Specific settings for CMMP-AS drive controller

Menu/Tab	Parameter	Value
[Application Data] [Operating Mode Selection]	Control interface	CANopen
	Operating modes used	Positioning mode Homing mode Speed control
[Controller]	Enable logic Enabled with	DIN5 and fieldbus
[Controller][Fieldbus] [Operating Parameters]	Baud rate	1000 kBaud
	Node number	CAN addresses of the axes, see Tab. 3/2
	Protocol	CANopen DS402
[Controller][Fieldbus] [Factors Group]	Used	Activated
	Unit	mm for linear axes ¹⁾ ° for rotative axes ¹⁾
	Exponent Position	10 ⁻³ ¹⁾
	Exponent Velocity	10 ⁻³ ¹⁾
	Exponent Acceleration	10 ⁻³ ¹⁾
¹⁾ With this setting, during parameterization of the CPX-CMXX for the CMMP-AS the transfer factor must be set to 1000 increments/mm or 1000 increments/°; see online help of the CPX-CMXX FCT PlugIn.		

Tab. 3/3: Specific settings for CMMP-AS drive controller

3. Commissioning

3.3.4 Specific settings for MTR-DCI drive controller

Menu/Tab	Parameter	Value
[Configuration]	Motor type	MTR-DCI-...-CO
[Motor][Control Interface]	CAN address	CAN addresses of the axes, see Tab. 3/2
	Bit rate	1 Mbps
	Data profile	DS402
	Power supply	Only with option “external”: An external power supply must be attached to the CAN bus plug; see section 2.4, Tab. 2/4 and P.BE-MTR-DCI-CO-...

Tab. 3/4: Specific settings for MTR-DCI drive controller

3.3.5 Specific settings for SFC-DC drive controller

Menu/Tab	Parameter	Value
[Configuration]	Controller type	SFC-DC-...-CO
[Controller][Interface]	CAN address	CAN addresses of the axes, see Tab. 3/2
	Bit rate	1 MBit/s
	Data profile	DS402

Tab. 3/5: Specific settings for SFC-DC drive controller

3.4 Configuration of the CPX-CMXX

3.4.1 Connecting PC to CPX-CMXX



Please note

Check with your network administrator beforehand if you wish to connect your PC to the CPX-CMXX via an Ethernet network.

- Connect your PC to the CPX-CMXX via Ethernet. To connect the PC directly to the CPX-CMXX, use alternatively
 - a crossover cable with RJ45 plug
 - a patch cable with RJ45 plug.

The Ethernet interface of the CPX-CMXX recognises which cable is connected and automatically switches over internally.

3. Commissioning

3.4.2 Prepare PC



Please note

Participants in an Ethernet network can communicate with each other only if IP addresses and network mask fit together.

- Choose an IP address and the network mask for your PC suitable for the settings of the CPX-CMXX.

Network setting	Value
IP address of the CPX-CMXX in the delivery condition (default value)	192.168.2.10
Suitable IP address for the PC	192.168.2.11
Subnetwork mask of the CPX-CMXX in the delivery condition (default value)	255.255.0.0
Gateway address of the CPX-CMXX in the delivery condition (default value)	0.0.0.0

Tab. 3/6: IP configuration for PC and CPX-CMXX with CPX-CMXX default settings



Administrator rights are required to configure the network settings of your PC.

- You can modify the network settings of your PC with Windows 2000/XP as follows:
 1. Select the command [Settings][Network Connections] in the Windows start menu. The “Network connections” window opens.
 2. Double click in the “Network connections” window on the network connection intended for connection of the CPX-CMXX. The dialog “Status of <Your Connection>” opens.

3. Commissioning

3. Click the button “Properties” in the register “General”. The dialog “Properties of <Your Connection>” opens.
4. Mark the element “Internet Protocol (TCP/IP)” in the “General” tab of the dialogue “Properties of <Your connection> and click on the “Properties” button. The dialogue “Properties of Internet Protocol (TCP/IP)” opens.

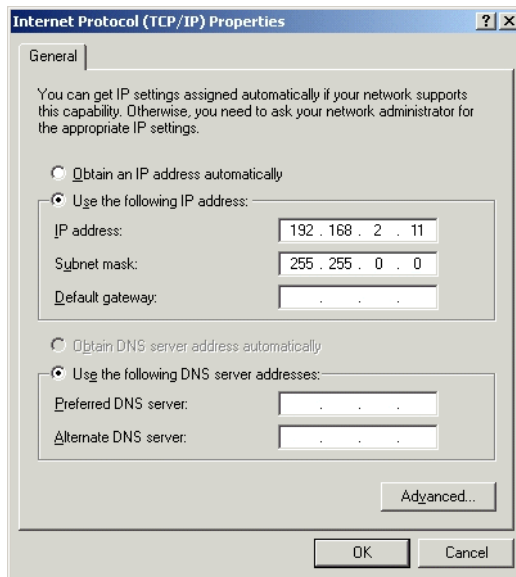


Fig. 3/1: Setting the IP address and subnetwork mask



Please note

Write down the network settings of your PC before you change them.

5. Set the network properties of your PC in the dialogue “Properties of Internet Protocol (TCP/IP)” and confirm with OK.

3. Commissioning

3.4.3 Configuring and parameterizing CPX-CMXX

- Starting the FCT on your PC.

The position record table, among other things, is defined during configuration and parameterization of the CPX-CMXX. You can also teach the individual positions of the position records with the FCT.



Remarks

- Change the network settings of your PC to the original values after you have completed configuration and parameterization of the CPX-CMXX.
- After completion of parameterization, place the protective cap on the Ethernet interface to reestablish the Protection class IP65/IP67.

Configuration and parameterization of the CPX-CMXX is described in the online help for the CPX-CMXX FCT PlugIn.

3. Commissioning

Diagnosis and error treatment

Chapter 4

Contents

4.	Diagnosis and error treatment	4-1
4.1	Overview of diagnostic possibilities	4-3
4.2	Errors and warnings	4-4
4.2.1	Behavior in case of errors and warnings	4-4
4.2.2	Quitting errors	4-4
4.2.3	Fault numbers	4-5
4.3	Diagnostics via LEDs	4-10
4.4	Diagnosis at the CPX terminal	4-13
4.4.1	Status bits in the system status of the CPX terminal	4-13
4.4.2	I/O diagnostic interface and diagnostic memory	4-14
4.4.3	Definition of diagnosis channels	4-17
4.4.4	Other diagnostic information	4-18

4. Diagnosis and error treatment

4.1 Overview of diagnostic possibilities

The CPX-CMXX supports various possibilities for diagnosis and error handling. An overview is shown in Tab. 4/1.

Diagnostic option	Brief description	Advantages	Detailed description
Error messages	The CPX-CMXX reports specific errors as error messages (fault numbers) via the data profile FHPP-MAX to the PLC and via the Ethernet to the PC with FCT	The error messages can be directly evaluated at the PLC via the data profile FHPP-MAX or over the Ethernet at the PC with FCT	Section 4.2 and CPX system manual
CPX error categories	The CPX-CMXX reports additional errors in CPX error categories, summarised across the CPX terminal, directly to the CPX master (CPX-FEC or CPX fieldbus node)	The CPX error categories can be evaluated at the CPX master in the I/O diagnostic interface or at the MMI	
LED display	The LEDs directly indicate error states	Fast “on-the-spot” recognition of faults	Section 4.3

Tab. 4/1: Diagnosis possibilities

4. Diagnosis and error treatment

4.2 Errors and warnings

The CPX-CMXX supports a detailed error handling and evaluation.

A list of errors is provided in section 4.2.3, page 4-5.

4.2.1 Behavior in case of errors and warnings

If a warning occurs, the CPX-CMXX then reacts as follows:

- The drive controllers of the axis group are **not** switched off.
- Positioning run is not interrupted.
- Start of a new positioning run is possible.

If an error occurs, the CPX-CMXX then reacts as follows:

- With disturbances of type 1
 - The drive controllers of the axis group are **not** switched off.
 - No new positioning task will be accepted.
- With disturbances of type 2
 - All drive controllers of the axis group are switched off.
 - No new positioning task will be accepted.

4.2.2 Quitting errors

You have the following possibilities to delete errors:

- Acknowledge the error with CCON.Reset.
- Acknowledge the error with the FCT.
- Switch the operating voltage off and then on again.

4. Diagnosis and error treatment

4.2.3 Fault numbers

The error messages of the CPX-CMXX can be found in the following table.

Not all error messages can be displayed in the CPX terminal, and so they are summarised in CPX error categories. Only the CPX error categories are displayed at the MMI.

Fault no.	Disturb. type	Designation (cause)	Fault treatment
Warnings (CPX error category 0, no errors in the CPX terminal, not displayed at the MMI)			
11	Warning	Homing aborted (Positioning task is sent to axis while homing run is active)	<ul style="list-style-type: none">• Send a positioning task only when the homing run has been ended
12	Warning	Moving aborted (Positioning task is sent to axis while position record is active)	<ul style="list-style-type: none">• Send a positioning task only when the current position record has been carried out
13	Warning	Reset aborted (Positioning task is sent to axis while reset is active)	<ul style="list-style-type: none">• Send a positioning task only when reset has been ended
14	Warning	Axis stopped (Positioning task is sent to axis while axis stops)	<ul style="list-style-type: none">• Send a positioning task only when the stop process has been ended
26	Warning	Velocity cannot be reached (Limit values of the axes are incorrect or acceleration path is too short)	<ul style="list-style-type: none">• Check the position record parameters and the axis parameterization
31	Warning	Tracking error (Controller reports contour error: contour error window or time out)	<ul style="list-style-type: none">• Check the position record parameters, drive controller settings and the axes
45	Warning	Warning (Warning bit of drive controller is set. A direction of rotation is blocked, since the limit switch has been actuated)	<ul style="list-style-type: none">• Check the position record parameters and the axis
65	Warning	Warning: detected device not fully supported	The warning serves as information that possibly not all functions of the device are supported; operation is still possible

4. Diagnosis and error treatment

Fault no.	Disturb. type	Designation (cause)	Fault treatment
BUS_OFF errors (CPX error category 71)			
121	2	CAN-Bus offline (No slave was recognised at the CAN bus)	<ul style="list-style-type: none"> • Check the CAN bus line and terminating resistor
125	2	CAN-Bus error passive (Communication errors were determined at the CAN bus)	<ul style="list-style-type: none"> • Check the CAN bus line and terminating resistor
126	2	CAN-Bus node guarding (A CAN bus slave has failed)	<ul style="list-style-type: none"> • Check the slave
Configuration errors (CPX error category 100)			
8	2	Axis not initialized (Either the device is factory-new or an axis could not be initialised)	<ol style="list-style-type: none"> 1. Determine the specific error in the disturbance buffer of the FCT PlugIn 2. Check and correct the configuration in the FCT PlugIn accordingly
56	2	CAN-Device startup timeout	<ul style="list-style-type: none"> • Check the CAN bus line and terminating resistor
57	2	Invalid CAN-ID (No CANopen device with CAN ID of the axis in PLC configuration)	<ul style="list-style-type: none"> • Check the CAN ID
62	2	Detected invalid device type	<ul style="list-style-type: none"> • Check or change the configuration • Close the device configured in the FCT PlugIn
63	2	Detected invalid product code	<ul style="list-style-type: none"> • Check or change the configuration • Close the device configured in the FCT PlugIn
64	2	Detected invalid firmware	<ul style="list-style-type: none"> • Check or change the configuration • Close the device configured in the FCT PlugIn

4. Diagnosis and error treatment

Fault no.	Disturb. type	Designation (cause)	Fault treatment
Execution errors (CPX error category 101)			
1	1	Axis not referenced	<ul style="list-style-type: none"> Reference the axis Non-referenced axes can be <ul style="list-style-type: none"> – moved in the jog mode if PNU 522 bit 6=1 and the drive controller supports the velocity control operating mode; see also manual FHPP-MAX, P.BE-CMXX-FHPP-SW-... – moved by hand, after drive controller enable has been switched off
2	1	Target position invalid (Selected target position lies outside the SW end positions of the axis or selected record was not configured)	<ul style="list-style-type: none"> Check the target position and SW end positions. SW end positions of the FCT PlugIn differentiate themselves from the SW end positions or HW end positions of the axes. Configure the position record
10	2	Error active (Positioning task is sent although another error is active)	<ul style="list-style-type: none"> Acknowledge the error
30	1	Execution timeout (Axis command could not be ended in the specified time)	<ul style="list-style-type: none"> Check the drive controller and the axis
47	2	Command for inactive axis	<ul style="list-style-type: none"> Check the triggering or configuration
48	2	Command for inactive group	<ul style="list-style-type: none"> Check the triggering or configuration
Position record errors (CPX error category 102)			
3	1	Position set invalid (Number of the selected position record outside the range 1 ... 1024)	<ul style="list-style-type: none"> Start a valid position record
Controller errors (CPX error category 103)			
27	1	Velocity < minimum velocity	<ul style="list-style-type: none"> Check the position record parameters and the axis parameterization

4. Diagnosis and error treatment

Fault no.	Disturb. type	Designation (cause)	Fault treatment
System errors A (CPX error category 104)			
4	2	Position list cache not initialized (Position records could not be written from file {permanent memory} into internal cache {random access memory})	<ul style="list-style-type: none"> • Please consult your local Festo service or service_international@festo.com
74	2	Position table open-error (Error when opening file in CPX-CMXX)	<ul style="list-style-type: none"> • Please consult your local Festo service or service_international@festo.com
75	2	Position table read-error (Error when reading file in CPX-CMXX)	<ul style="list-style-type: none"> • Please consult your local Festo service or service_international@festo.com
76	2	Position table close-error (Error when closing file in CPX-CMXX)	<ul style="list-style-type: none"> • Please consult your local Festo service or service_international@festo.com
77	2	Data write-error (Error when writing to file in CPX-CMXX)	<ul style="list-style-type: none"> • Please consult your local Festo service or service_international@festo.com
System error B (CPX error category 105, System_B)			
5	2	Invalid FHPMax command-combination (Two FHPMax commands were set simultaneously, e.g. START and LOAD_R; this is not permitted)	<ul style="list-style-type: none"> • Rework the control program.
58	2	No live signal from FCT (Connection between FCT PlugIn and CPX-CMXX interrupted (network connection, FCT ended))	<ul style="list-style-type: none"> • Check the connection
59	1	SDO send/receive error	<ul style="list-style-type: none"> • Check the CAN bus and drive controller
60	1	SDO status error	<ul style="list-style-type: none"> • Check the portal parameterisation, CAN bus and drive controller

4. Diagnosis and error treatment


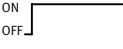

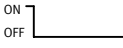
Fault no.	Disturb. type	Designation (cause)	Fault treatment
61	1	SDO timeout	<ul style="list-style-type: none"> • Check the CAN bus and drive controller
66	2	Error on node reset	<ul style="list-style-type: none"> • Check the CAN bus and the configuration of the node involved
Controller errors (CPX error category 107)			
9	2	Axis not enabled	<ul style="list-style-type: none"> • Enable the axis
32	2	Homing error (Interruption of the homing run (stop bit), both limit switches actuated simultaneously, search section traveled larger than positioning space)	<ul style="list-style-type: none"> • Check the drive controller and the axis
36	2	Timeout on stop command	<ul style="list-style-type: none"> • Check the drive controller and the axis
37	2	Timeout on changing the operating mode	<ul style="list-style-type: none"> • Check the drive controller
42	2	Enable timeout	<ul style="list-style-type: none"> • Check the drive controller
43	2	Axis state undefined (DS402)	<ul style="list-style-type: none"> • Check the drive controller
44	1	Axis in the state FAULT(_REACTION_ACTIVE)	<ol style="list-style-type: none"> 1. Check the drive controller condition <ul style="list-style-type: none"> – Additional messages can be found directly at the drive controller: <ul style="list-style-type: none"> – Diagnosis memory – LED – Display 2. Read out the status with FCT PlugIn of the drive controller or via display
46	2	Disable timeout	<ul style="list-style-type: none"> • Check the drive controller.
Licence error (CPX error category 144)			
–	–	CoDeSys license error	<ul style="list-style-type: none"> • Please consult your local Festo service or service_international@festo.com

Tab. 4/2: Error messages of the CMXX




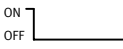
4. Diagnosis and error treatment

4.3 Diagnostics via LEDs

The following LEDs are available on the CPX-CMXX for diagnosing the CPX terminal.


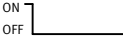







RUN – CPX-CMXX started				
LED (green)	Sequence	Status	Fault number	Fault treatment
 LED lights up	ON OFF 	CPX-CMXX started (RUN/STOP switch is in position 1 ... F)	–	None
 LED is off	ON OFF 	CPX-CMXX not started (RUN/STOP switch is in position 0)	–	<ul style="list-style-type: none">• Set the RUN/STOP switch to 1 ... F

Tab. 4/3: RUN LED






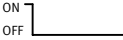
STOP – CPX-CMXX stopped				
LED (yellow)	Sequence	Status	Fault number	Fault treatment
 LED lights up	ON OFF 	CPX-CMXX stopped (RUN/STOP switch is in position 0)	–	None
 LED is off	ON OFF 	CPX-CMXX not stopped (RUN/STOP switch is in position 1 ... F)	–	<ul style="list-style-type: none">• Set the RUN/STOP switch to 0

Tab. 4/4: STOP LED

4. Diagnosis and error treatment





ERROR – Fault				
LED (red)	Sequence	Status	Fault number	Fault treatment
 LED is off		No error	–	None
 LED flashes		CPX system error, CPX error category 3	see CPX system manual	
		CPX-CMXX error, CPX error category 2	see section 4.2.3	
		CPX system error, CPX error category 1	see CPX system manual	
		Software update (flash programming) active	–	None
 LED lights up		CPX-CMXX is initialised	–	None

Tab. 4/5: ERROR LED






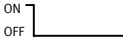
TP – Ethernet connection				
LED (green)	Sequence	Status	Fault number	Fault treatment
 LED lights up		Ethernet connection OK	–	None
 LED flashes		Data transfer active (LED flashes irregularly)	–	None
 LED is off		Ethernetconnection to the parameterization PC not OK	–	<ul style="list-style-type: none"> • Check: <ul style="list-style-type: none"> – the connection – the IP address

Tab. 4/6: TP LED

4. Diagnosis and error treatment

M – Control hierarchy FCT				
LED (yellow)	Sequence	Status	Fault number	Fault treatment
 LED lights up	ON OFF 	Control hierarchy over the CPX-CMXX is with the FCT	–	<ul style="list-style-type: none"> Deactivate the control hierarchy in the FCT
 LED is off	ON OFF 	The control hierarchy over the CPX-CMXX is with the PLC	–	<ul style="list-style-type: none"> Activate the control hierarchy in the FCT

Tab. 4/7: M LED

PS (power system) – Power supply for logic and sensors				
LED (green)	Sequence	Status	Fault number	Fault treatment
 LED lights up	ON OFF 	No error. Power supply is on	–	None
 LED flashes	ON OFF 	Power supply longer than 10 ms below the threshold of 17 V	–	<ul style="list-style-type: none"> Eliminate the low voltage
 LED is off	ON OFF 	Power supply is not on	–	<ul style="list-style-type: none"> Check the operating voltage connection.

Tab. 4/8: PS LED

4.4 Diagnosis at the CPX terminal

Errors of the CPX-CMMX or connected axes are reported as CPX error category to the CPX master (CPX field bus node or CPX-FEC). One diagnosis channel is available for this per group and per axis; see Tab. 4/9. The following sections contain the special features of the representation for the CPX-specific diagnostic possibilities.

- Status bits (see section 4.4.1)
- Diagnosis memory with CPX error categories (I/O diagnosis interface, see section 4.4.2).

4.4.1 Status bits in the system status of the CPX terminal

A CPX-CMXX error is always specified in the system status of the CPX terminal as follows:

Module type in which an error has occurred:

- Bit 0 ... 2 = 0
- Bit 3 = 1: error in analogue/function or technology module

Type of error

- Bit 4 ... 6 = 0
- Bit 7 = 1: other error



Further instructions on the structure of the status bits can be found in the CPX system manual P.BE-CPX-SYS-...

4. Diagnosis and error treatment

4.4.2 I/O diagnostic interface and diagnostic memory

The CPX-CMXX reports the CPX error category to the CPX master (CPX fieldbus node or CPX-FEC).

Diagnosis of the CPX error categories can be made via the I/O diagnostic interface and the diagnostic memory of the CPX terminal.

Diagnostic memory data (I/O diagnostic interface)

The specific representation of diagnostic messages of the CPX-CMXX in the diagnostic memory of the CPX terminal occurs as shown in Tab. 4/9.

4. Diagnosis and error treatment

Diagnostic memory data (10 bytes per entry, max. 40 entries)				Function no. ¹⁾
Byte no.	Designation	Description	Value	3488 + n
1 ... 5	Days [day] Hours [h] Minutes [m] Seconds [s] Milliseconds [ms]	Time information for the reported error, measured from the point when the power supply was switched on (CPX standard)	0 ... 255 0 ... 23 0 ... 59 0 ... 59 0 ... 99 (128 ... 227)	$n = 10 * d + 0$
6	Module code	Module code of the CPX-CMXX 162	0 ... 255	$n = 10 * d + 5$
7	Module position [Pos]	Module code of the CPX module that signaled the error	0 ... 47	$n = 10 * d + 6$
8	Channel number	<u>Bit</u> 76543210 <u>Description</u> 10000000 Group error Gr. 1 10000001 Group error Gr. 2 00000000 Axis error Gr. 1 / A 1 00000001 Axis error Gr. 1 / A 2 00000010 Axis error Gr. 1 / A 3 00000011 Axis error Gr. 1 / A 4 00000100 Axis error Gr. 2 / A 1 00000101 Axis error Gr. 2 / A 2 00000110 Axis error Gr. 2 / A 3 00000111 Axis error Gr. 2 / A 4	0 ... 255	$n = 10 * d + 7$
9	Fault number [FN]	CPX error category (see section 4.2)	100 ... 109	$n = 10 * d + 8$
10	Following channels	Always 0 for the CMXX	0 ... 63	$n = 10 * d + 9$
¹⁾ d (diagnostic event) [NB] = 0 ... 39; most current diagnostic event = 0				

Tab. 4/9: Diagnostic memory data of the CPX-CMXX



Instructions on diagnosis with the I/O diagnostic interface can be found in the CPX system manual.

4. Diagnosis and error treatment

Diagnostic data of the module (I/O diagnostic interface)

The specific representation of module diagnostic data (error messages) of the CPX-CMXX occurs as shown in Tab. 4/10 and Tab. 4/11.

Module diagnostic data: Location where error arose	
Function no.	$2008 + m * 4 + 0;$ $m = \text{module number (0 ... 47)}$
Description	Describes where the relevant fault occurred.
Bit	Bit 0 ... 7 Location where error arose <u>Bit</u> <u>76543210</u> <u>Description</u> 10000000 Group error Gr. 1 10000001 Group error Gr. 2 00000000 Axis error Gr. 1 / A 1 00000001 Axis error Gr. 1 / A 2 00000010 Axis error Gr. 1 / A 3 00000011 Axis error Gr. 1 / A 4 00000100 Axis error Gr. 2 / A 1 00000101 Axis error Gr. 2 / A 2 00000110 Axis error Gr. 2 / A 3 00000111 Axis error Gr. 2 / A 4

Tab. 4/10: Location where error arose

Module diagnostic data: Module fault number	
Function no.	$2008 + m * 4 + 1;$ $m = \text{module number (0 ... 47)}$
Description	CPX error category
Bit	Bit 0 ... 7 Value range: 0 ... 255
Note	The CPX error categories of the CPX-CMXX are described in section 4.2.

Tab. 4/11: Module fault number

4. Diagnosis and error treatment

4.4.3 Definition of diagnosis channels

The address volume of the inputs and outputs represents the complete process diagram of the CPX-CMXX in the CPX system.

Classification of the channels into 8 input channels and 8 output channels defines the number of diagnosis channels available in the CPX system.

The two used diagnosis channels of the input channels report errors of the respective axis group.

The eight diagnosis channels of the output channels report errors of the respective axis. As a result, for example, the MMI can determine with which axis in which axis group an error is present.

The following tables show the definition of the diagnosis channels:

	Channel number	Axis group	Axis
Input channel	0	1	–
	1	–	–
	2	–	–
	3	–	–
	4	2	–
	5	–	–
	6	–	–
	7	–	–

Tab. 4/12: Definition Diagnosis channels, part 1

4. Diagnosis and error treatment

	Channel number	Axis group	Axis
Output channel	0	1	1
	1		2
	2		3
	3		4
	4	2	1
	5		2
	6		3
	7		4

Tab. 4/13: Definition Diagnosis channels, part 2

4.4.4 Other diagnostic information

Module code

Entry in CPX parameter table: function no: $16 + m * 16 + 0$

Module code: 162

Revision code

Shows the module version: function no: $16 + m * 16 + 13$

Values: 0 ... 255 according to the name plate of the module

Serial number

Specifies the series number of the module. One nibble contains the production year and one nibble the month of the series.

In byte 1 ... 3, each nibble contains one digit of the serial number (BCD encoded).

Function no: $784 + m * 4 + 0$
 $784 + m * 4 + 1$
 $784 + m * 4 + 2$
 $784 + m * 4 + 3$

Technical appendix

Appendix A

Contents

A.	Technical appendix	A-1
A.1	Technical data	A-3
A.2	Accessories	A-5
A.3	Device-specific information at the MMI	A-7

A.1 Technical data

Type	CPX-CMXX
General technical specifications of the CPX terminal	See CPX system manual P.BE-CPX-SYS-...
Total number of axes	8
Distribution of axes	2 groups with max. 4 axes
Supported kinematics	2-axis portals X-Z / Y-Z / X-Y 3-axis portals X-Y-Z
Device-specific diagnostics	<ul style="list-style-type: none"> – Channel and module-oriented diagnostics – Undervoltage/short-circuit modules – Diagnostic memory
Configuration support	Festo Configuration Tool (FCT)
Additional functions	System status can be represented using process data Additional diagnostic interface for FCT
LED display (bus-specific)	RUN: Program is carried out STOP: Program stopped ERR: Error in the program execution TP: Status Ethernet connection
LED display (product-specific)	M: Modify, parameterisation PS: Electronic supply, sensor supply
Protocol	Festo handling and positioning profile for multi-axis motion (FHPP-MAX)
Control interface – Data profile – Baud rate – Interface – Max. line length	CAN bus DS402 1 Mbps Sub-D plug, 9-pin 25 m
Ethernet interface – Connections – Baud rate – MAC-ID CPX-CMXX	Only for configuration RJ45 socket, 8-pin 10/100 MBit/s according to IEEE 802.3 (10BaseT) or 802.3u (100BaseTX) from 000E-F00B-0000 to 000E-F00B-FFFF
IP address (for parameterization)	192.168.2.10
Module code (CPX-specific)	162


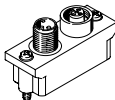
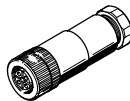
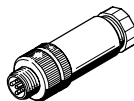

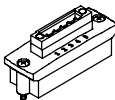
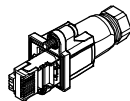

A. Technical appendix

Type	CPX-CMXX
Max. address capacity – Inputs – Outputs	16 bytes 16 bytes
Protection class Only in conjunction with plugs and covers in protection class IP65/IP67	IP65/IP67
Rated operating voltage	24 V DC
Operating voltage range	18 ... 30 V DC
Intrinsic current consumption – at rated voltage	typ. 85 mA
Power failure buffering	10 ms
Product weight	155 g
Dimensions W x L x H	50 mm x 107 mm x 55 mm

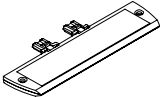
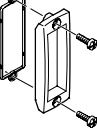
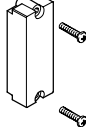
A.2 Accessories



The following table provides an overview of necessary and useful accessories for the CPX-CMMX.

Accessory	Type	Description
	FBS-SUB-9-BU-2x5POL-B	Plug Sub-D Protection class IP65/67
	FBA-2-M12-5POL	Bus connection micro style 2xM12, 5-pin Protection class IP65
	FBSD-GD-9-5POL	Bus socket for Micro Style connection, M12, 5-pin Protection class IP65/67
	FBS-M12-5GS-PG9	Plug for Micro Style connection, M12, 5-pin Protection class IP65/67
	FBSD-KL-2x5POL	Terminal strip for screw terminal adapter FBA-1-SL-5POL Protection class IP20
	FBA-1-SL-5POL	Terminal strip adapter for terminal strip FBSD-KL-2x5POL Protection class IP40
	FBS-RJ45-8-GS	RJ45 plug Protection class IP65/67
	AK-RJ45	Cover for RJ45 connection or RUN/STOP rotary switch Protection class IP65/67

A. Technical appendix

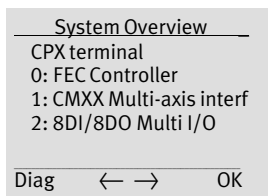
Accessory	Type	Description
	CPX-ST-1	Inscription label holder for connection block
	AK-SUB-9/15-B	Inspection cover, transparent Use only to store the CPX-CMXX Protection class IP65/67
	AK-SUB-9/15	Cover Use only to store the CPX-CMXX Protection class IP65/67



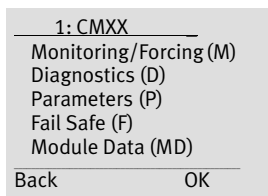
Information on accessories for the CPX terminal can be found in the CPX system manual or in the manual for the CPX modules used.

A.3 Device-specific information at the MMI

Some information of the CPX-CMXX is specially depicted at the MMI. This information is explained in the following by means of some examples.



The CPX-CMXX is displayed at the MMI as “CMXX Multi-axis interface” module. The complete name is displayed with the button “←→”.



The CPX-CMXX supports the following functions:

- Monitoring/Forcing (M)
- Diagnostics (D)
- Module Data (MD)

The following functions are available, but are not recommended:

- Force mode in the Monitoring/Forcing (M) menu
- Fail Safe (F)



Warning

Incorrect entries in the Force Mode or with the Fail safe function can cause undesired movements and severe personal injury and property damage!

The Parameters (P) function is not supported.

1: CMXX: M

Process state

I-Group1Axis1:0x00
I-Group1Axis2:0x00
I-Group1Axis3:0x00
I-Group1Axis4:0x00
I-Group2Axis1:0x00
I-Group2Axis2:0x00
I-Group2Axis3:0x00
I-Group2Axis4:0x00
O-Group1Axis1:0x00
O-Group1Axis2:0x00
O-Group1Axis3:0x00
O-Group1Axis4:0x00
O-Group2Axis1:0x00
O-Group2Axis2:0x00
O-Group2Axis3:0x00
O-Group2Axis4:0x00

Back Force Mode

The current values of the input and output channels are depicted with Function monitoring. There are 8 input and 8 output channels with 2 bytes each. These reflect the complete process diagram of the CPX-CMXX. While an evaluation of the 128 bit input and output data is theoretically possible, it is practically not able to be implemented.



Warning

Incorrect entries in the Force mode can cause undesired movements and severe personal injury and property damage!

The Force mode function is available, but not recommended.

1: CMXX: D

Channel fault
CH1: Output
Controller error

Back OK

The diagnosis channel and the CPX error categories of the CPX-CMXX are displayed with the Diagnostics function.

The diagnosis channel gives the error location, see section 4.4.3.

The CPX error categories are described in section 4.2.3.

A. Technical appendix

<u>1: CMXX: MD</u>	
CMXX Multi-axis interface	
Type Code:	162
Revision:	1
Serial no.:	0x5001FFD1
IP address:	192.168.2.10
IP Netmask:	255.255.0.0
IP address gateway:	0.0.
Startup:	via saved IP par
Back	OK

With the Module Data (MD) function, the following information is displayed by the CPX-CMXX (example).

- Module designation: Multi-axis interface
- Module type: 162
- Revision: 1
- Series number 0x5001FFD1
- IP address: 192.168.2.10
- IP net mask: 255.255.0.0
- IP address gateway: 0.0.0.0
- Startup: via saved IP parameters

<u>Diag overview</u>	
System Diagnostics	
Trace data	
1: CMXX Multi-axis interf	
Back	OK

The Diag function in the main menu displays the Diag overview menu.

<u>System diagnostics</u>	
Source of error	
O Valve	
O Output	
O Input	
• Analogue / function mo	
Type of error	
O Undervoltage	
O Short circuit / overload	
O Wire fracture	
• Other error	
Back	← → First error

Selecting System diagnostics displays the error source and type of the current error. The First error function displays the following screen.

A. Technical appendix

System Diagnostics
First faulty module
1: CMXX Multi-axis interf
Fault number: 107
Controller error

Back OK

The First Error function displays the following additional information on the current error.

- Module position and designation
- Number of the CPX error category
- Designation of the CPX error category

Trace data
NB-FN-Pos-Day-h-m-s-ms
√ 0 107 1 000:0:2:57:13

Back ← → Detail

The Trace Data function in the Diag overview menu displays the error memory.

- Number of the entry (NB)
- Number of the CPX error category (FN)
- Module position (Pos)
- Time stamp in the format Days:Hours:Minutes:Seconds:Milliseconds (Day-h-m-s-ms) since the CPX terminal was switched on

Trace data number 0
Out fault Ch 1
Controller error
Module position 1
CMXX Multi-axis interface
Days: 0
Hours: 0
Minutes: 2
Seconds: 57
Milliseconds: 13

Back ← → OK

The Detail function displays the following additional information on the current error.

- Channel number
- Designation of the CPX error category
- Module position
- Module designation
- Time stamp in the format Days:Hours:Minutes:Seconds:Milliseconds since switch-on



Please note

Further information on the MMI can be found in the documentation P.BE-CPX-MMI-1-...

Index

Appendix B

B. Index

Contents

B. Index B-1

0-signal	XIII
1-signal	XIII

A

Abbreviations, product-specific	XIII
Assembly	2-4

C

CAN bus	
Connecting	2-10, 2-12
Line	2-10
M12 adapter	2-13
Screw terminal adapter	2-14
Connection and display elements	1-13
Control interface	XIII, 2-9
CPX field bus node/CPX-FEC	1-8

D

Designated use	VII
Diagnosis	
CPX terminal	4-13
Diagnosis channels	4-17
Diagnostic memory	4-14
I/O diagnostic interface	4-14, 4-16
LEDs	4-10
Other diagnostic information	4-18
Overview of diagnostic possibilities	4-3
Status bits	4-13
Dismantling	2-4
Drive controller	1-6

E

Errors and warnings	
Acknowledge fault	4-4
Fault numbers	4-5
Overview	4-4
Reaction	4-4
Ethernet interface	2-15

I

Installation	2-3, 3-3
IP65/IP67	2-16

M

MMI	A-7
Module diagnostic data	
Module fault number	4-16
Number of the first faulty channel	4-16

N

Notes on the manual	XI
---------------------------	----

O

Operating mode	2-7, 2-8
----------------------	----------

P

Pictograms	IX
Protection class IP65/IP67	2-16

Q

Quitting faults 4-4

S

Safety instructions X

Service VII

Setting

 Operating mode 2-7, 2-8

Strain relief 2-10

T

Target group VII

Technical specifications A-3

Text markings IX

U

User information VIII

B. Index