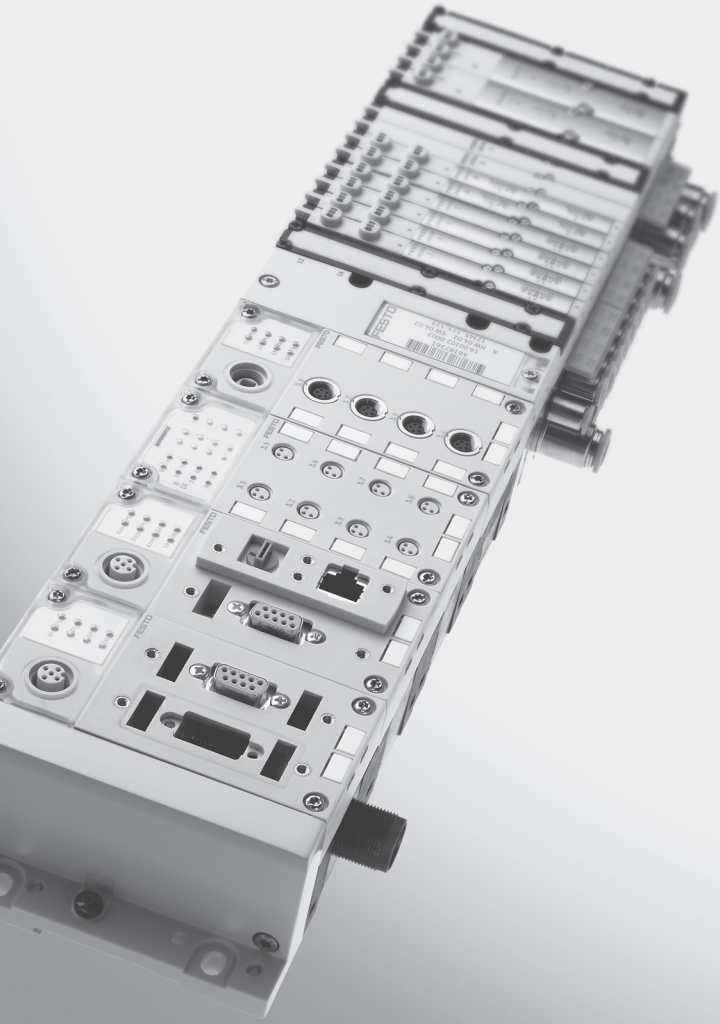
CPX Terminal

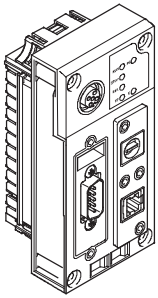


FESTO

Manual
electronics

Multi-Axis Interface

CPX-CMXX



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Contents

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

– In original status without unauthorised alterations. Only the conversions or modifications described in the documentation supplied with the product are permitted.

– In perfect technical condition.

– Only in combination with approved components, e.g. CPX modules and motor controllers (see chapter 1.2 and 1.3).

The limit values specified for pressures, temperatures, electrical data, torques etc. should be observed.

Please comply with national and local safety laws and regulations.

Target group

This manual is intended exclusively for technicians trained in control and automation technology, who have experience in installing, commissioning, programming and diagnosing positioning systems.

Service

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

Important user instructions

Danger categories

This manual contains instructions on the possible dangers which may occur if the product is not used correctly. These instructions are marked (Warning, Caution, etc.), printed on a shaded background and marked additionally with a pictogram. A distinction is made between the following danger warnings:

Warning
This means that failure to observe this instruction may result in serious personal injury or damage to property.

Caution
This means that failure to observe this instruction may result in personal injury or damage to property.

Note
This means that failure to observe this instruction may result in damage to property.

The following pictogram marks passages in the text which describe activities with electrostatically sensitive components.

Electrostatically sensitive components may be damaged if they are not handled correctly.

Marking special information

The following pictograms mark passages in the text containing special information.

Pictograms

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

Accessories:
Information on necessary or sensible accessories for the Festo product.

Environment:
Information on environment-friendly use of Festo products.

Text markings

- The bullet indicates activities which may be carried out in any order.

1. Figures denote activities which must be carried out in the numerical order specified.

– Hyphens indicate general activities.

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

Arrow brackets mark placeholders for designations.
Example: “Status of ‹Your Connection›”, see chapter 3.4.2.

Quotation marks designate names of windows, dialogues and buttons.
Example: “Status of ‹Your Connection›”, see chapter 3.4.2.

Safety regulations

Protection against dangerous movements

Warning
High acceleration forces at the connected actuators!
Undesired movements can cause collisions and severe injuries.

Dangerous movements can occur through faulty controlling of connected actuators, e.g. via:

– unsafe or faulty circuitry or cabling,
– faulty operation of the components,
– errors in the measured value and signal generators,
– faulty or non-EMC-compliant components,
– errors in the higher-order control system,

Simply switching off the compressed air supply or load voltage are not suitable locking procedures. In the event of a malfunction, this could lead to unintentional movement of the drive.

- Before doing mounting, installation and service work, bring the system into a safe condition (e.g. by bringing the drive into a safe position and deactivating the controller).
  Always make sure that the compressed air supply and power supply are switched off and locked when working in the machine area.
- Make sure that no persons are in the operating range of the drive or any other connected actuators.
- Do not switch on the compressed air supply until the system is correctly installed and parametrised.

- Brakes controlled by the drive controller are alone not suitable to ensure personal protection!
  Secure vertical axes from falling or sliding down when the compressed air and load voltage are switched off, as follows:
  – mechanical locking of the vertical axis,
  – external braking/safety catch/clamping device or
  – sufficient counterbalance of the axis.
- Additional measures are required for use in safety-related applications; in Europe, for example, the standards listed under the EC Machinery Directive must be observed. Without additional measures in accordance with statutory minimum requirements, the product is not suitable for use in safety-related sections of control systems.

Protection from pressurised tubing

Caution
Danger of injury through inappropriate handling of pressurised tubing!

Uncontrolled movements of the connected actuators and uncontrolled movements of loose tubing can cause injury to human beings or damage to property.

- Do not connect, disconnect or open pressurised tubing.
- The tubing must always be vented before removal (release compressed air).
- Use suitable protective equipment (e.g. safety goggles, safety shoes, etc.).

Instructions on this manual

Note
This manual refers to the multi-axis interface CPX-CMXX from Revision 03.

You will find the revision number on the name plate

This manual contains special information on the mode of operation, mounting, installation and commissioning of 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 plug-in CMXX	Description of the configuration, parametrisation and commissioning of the multi-axis interface CPX-CMXX
Manual for the Festo handling and positioning profile for multi-axis movements (FHPP-MAX), P.BE-CMXX-FHPP-SW-...	Description for the Festo data profile FHPP-MAX, which is used for communication between the controller and CPX-CMXX.
Short description of CPX-CMXX, P.BE-K-CPX-CMXX	Information on mounting and installation of the multi-axis interface CPX-CMXX.

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

General basic information on the mode of operation, mounting, installation and commissioning of CPX terminals can be found in the CPX system description, type P.BE-CPX-SYS-...

Observe also the user documentation of the components used in the CPX terminal.

Glossary

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

Term/abbreviation	Significance
0xA0 $A0_h$	Hexadecimal numbers are marked by a prefixed “0x” or by a lowered “h”. Example: 0xA0 = $A0_h$ = 160 decimal.
Axis	Motor controller/motor unit, 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	Control of the CPX terminal and the CPX-CMMX is alternatively carried out through: – a higher-level controller: a controller connected via fieldbus to the CPX terminal – a CPX-FEC/CPX-CEC: a controller integrated into the CPX terminal
Control interface	Interface of the CPX-CMXX for connection of the motor controller/motor units via CAN bus.
CPX-FEC	Front-end controller as CPX module. Controller can be integrated into the CPX terminal.
CPX-CEC-...	CoDeSys controller as CPX module. Controller can be 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 earthing
Fieldbus node	Provide the connection to specific fieldbuses. Transmit control signals to the connected modules and monitor their functioning (as a CPX module: CPX fieldbus node).
Gantry axis	Gantry axes are axes with the following characteristics: – Gantry axes run synchronously, see synchronous PtP movement.
Handheld CPX-MMI	Hand-operated device for service purposes

Term/abbreviation	Significance
I	Digital input
I/Os	Digital inputs and outputs
Logic 0	Input or output provides 0 V (also LOW, FALSE or logic 0).
Logic 1	Input or output provides 24 V (also HIGH, TRUE or logic 1).
O	Digital output
OB	Output byte
Parameters	Parameters which must be set so that the system can be operated.
Positioning axis	Positioning axes are axes with the following characteristics: – 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. – The positioning times of the axes are adapted to the axis with the greatest positioning time. – All axes end their movement simultaneously.

Tab. 0/2: Terms and abbreviations

System summary

Chapter 1

Contents

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 interface, the Festo Configuration Tool FCT makes it simple to configure, parametrise and commission the CPX-CMXX and the axes. The CPX-CMXX is designed for a total of two axis groups with up to four axes each. The axes are connected via CANopen.

The CPX-CMXX multi-axis interface is controlled by a higher-order controller via a CPX fieldbus node or through the CPX-FEC/CPX-CEC controller 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.

1.1.1 Functions and characteristics

- Configuration of two axis groups with up to four axes each is possible
- 1,024 position sets available per axis group
- 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 controller

1.1.2 Advantages

- 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 a controller
- As a decentralised intelligence for movement control, the CPX-CMXX relieves the controller considerably
- Different operating modes (record select, direct mode, ...), but also the use of the CPX-CMXX in combination with the CPX-FEC or CPX-CEC as a control unit in the CPX terminal, ensure universal use of the multi-axis interface

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 Mode of operation

The CPX-CMXX takes over the entire movement sequence of the connected axes. A higher-order controller, which is connected to the CPX-CMXX via a CPX fieldbus node, or a CPX-FEC/CPX-CEC control the movement sequence via the Festo data profile FHPP-MAX. The controller 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.

1.2 Supported motor controllers

The following table shows the necessary firmware designs of the supported motor controllers:

Motor controller	from version	Comment
CMMP-AS	3.5.1501.2.1	—
CMMS-AS	1.3.0.1.11	—
CMMS-ST	1.3.0.1.7	Versions 1.3.0.1.10 and 1.3.0.1.12 are not supported
CMMD	1.4.0.3.1	—
Motor unit MTR-DCI	1.04	—
SFC-DC	2.0	Version 1.21 is not supported
SFC-LAC	1.05	—
SFC-LACI	1.00	—

Tab. 1/1: Summary supported motor controllers (Status: February 2011)

With higher software versions, a warning message is displayed, but this does not influence the functioning of the motor controller.

1.3 Control possibilities

The CPX-CMXX can be controlled in two ways.

– Control through higher-order controller, using a CPX fieldbus node

or

– Control through CPX-FEC or CPX-CEC

Communication with the controller 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 manual P.BE-CMXX-FHPP-MAX-SW-...

For operation of the CPX-CMXX, certain software versions of the following CPX modules are required :

CPX modules	Required version [1)]	Comment
CPX-FB6 (Interbus)	—	not available
CPX-FB11 (DeviceNet)	from Revision 22	—
CPX-FB13 (PROFIBUS)	from Revision 22	—
CPX-FB14 (CANopen)	from Revision 24	—
CPX-FB23 (CC-Link)	—	in preparation
CPX-FB32 (Ethernet/IP)	from Revision 15	—
CPX-FB33, 34, 35 (PROFINET)	—	in preparation
CPX-FB38 (Ethercat)	from revision 05	
CPX-FEC	from Revision 16	—
CPX-CEC	from revision 02	—
[1)] Software status (SW) see type plate		

Tab. 1/2: Summary CPX modules (Status: February 2011)

Note
Please also observe the notes on the software status in the documentation of the respective CPX modules.

1.4 Design of a multi-axis system

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

Module	Component	Comment
Control		Higher-order controller or integrated as CPX-FEC/CPX-CEC in the CPX terminal
Fieldbus		For connection to a higher-order controller
CPX Terminal	CPX fieldbus node	For connection to a higher-order controller
	CPX-FEC/CPX-CEC	Controller 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 motor 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 chapter 1.5.

1.5 System configuration

1.5.1 Autonomous automation solution

1 CPX-FEC/CPX-CEC
2 CPX-CMXX
3 CPX Terminal
4 CAN bus
5 Motor controller

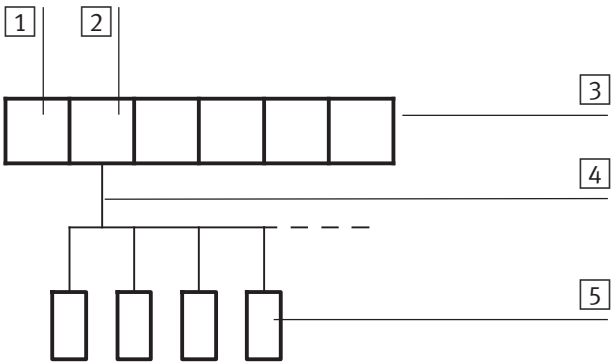


Fig. 1/1: Autonomous automation solution with CPX terminal, CPX-FEC/CPX-CEC and CPX-CMXX

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

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

1.5.2 Control of the CPX terminal through a higher-order controller

1 Higher-order controller
2 Fieldbus
3 CPX Terminal
4 CAN bus
5 Motor controller
6 CPX-CMXX
7 CPX fieldbus node

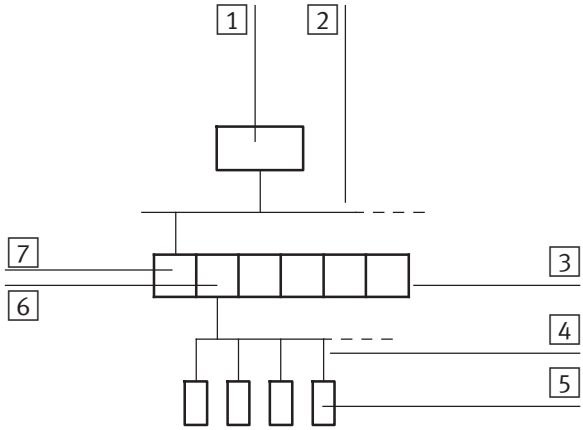


Fig. 1/2: Design of CPX terminal with higher-order controller

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

The CPX-CMXX takes over multi-axis control in combination with the higher-order controller. Communication between the CPX-CMMX and the higher-order controller is carried out over the CPX fieldbus node.

1.5.3 Autonomous automation solution with communication with a higher-order controller

1 Higher-order controller
2 Fieldbus
3 CPX Terminal
4 CAN bus
5 Motor controller
6 CPX-CMXX
7 CPX-FEC/CPX-CEC
8 CPX fieldbus node

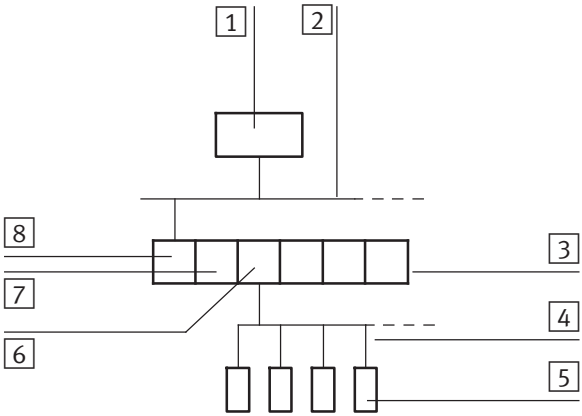


Fig. 1/3: Design of autonomous automation solution with communication with a higher-order controller

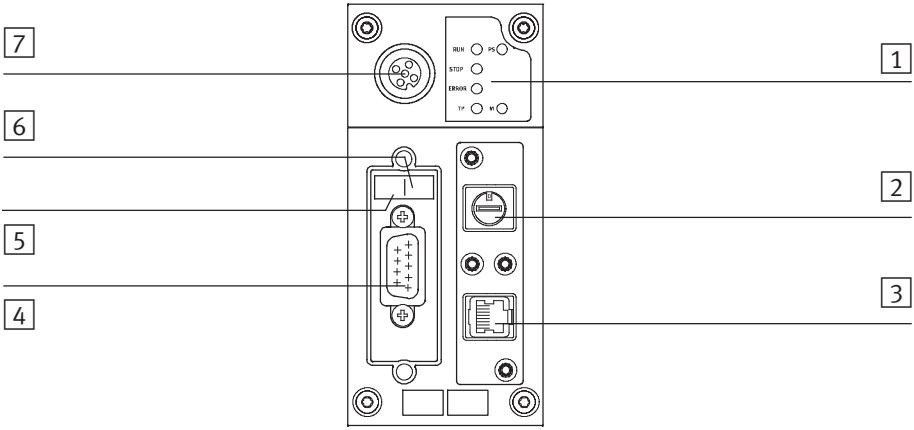
In this configuration, the sequence control of the CPX terminal is taken over by the CPX-FEC/CPX-CEC. Programming takes place over the Festo data profile FHPP -MAX.

The CPX-CMXX takes over multi-axis control in combination with the CPX-FEC/CPX-CEC. Communication between the CPX-CMMX and CPX-FEC/CPX-CEC is carried out over the CPX terminal. The higher-order controller communicates with the CPX-FEC/CPX-CEC via the CPX fieldbus node.

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

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)

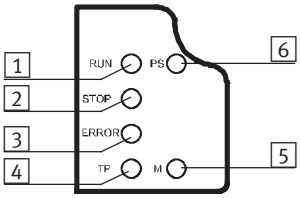
6 DIL switch 2
(CAN bus termination)

7 Interface, reserved

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

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

Contents

2.1 General installation instructions

Caution
Uncontrolled movements of the connected actuators and uncontrolled movements of loose tubing can cause injury to human beings or damage to property.

- Before doing mounting, installation and service work, bring the system into a safe condition (e.g. by bringing the drive into a safe position and deactivating the controller).
  Always make sure that the compressed air supply and power supply are switched off and locked when working in the machine area.
- Make sure that no persons are in the operating range of the drive or any other connected actuators.
- Do not switch on the compressed air supply and the load voltage until the system is correctly installed and parametrised.

Caution
The CPX-CMXX contains electrostatically sensitive components.

- Do not touch the electrical contacts of the modules.
- Observe the handling specifications for electrostatically sensitive devices.

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 documentation of the components.

2.2 Dismantling and mounting

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

1 CPX-CMXX

2 Interlinking block

3 Contact rails

4 TORX T10 screws

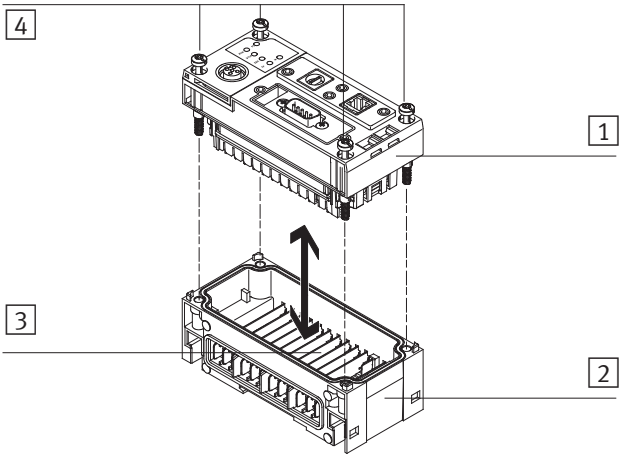


Fig. 2/1: Dismantling/mounting the CPX-CMXX

2.2.1 Dismantling

Dismantle the CPX-CMMX as follows:

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

2.2.2 Mounting

Mount the CPX-CMMX as follows:

1. Check the seal and seal surfaces.
2. Place the CPX-CMXX in the manifold sub-base. Make sure that the corresponding grooves with the power contact terminals on the bottom of the CPX-CMXX lie above the power rails.
3. Press the CPX-CMXX carefully and without tilting as far as possible into the manifold block.
4. Place the screws so that the self-cutting threads can be used. Tighten the screws by hand.
5. Tighten the screws with a size-T10 Torx screwdriver with 0.9 ... 1.1 Nm of torque.

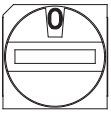
2.3 Setting the switches

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.

Note
Modifications to the position of the RUN/STOP rotary switch are transmitted to the controller 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	Significance
	0	STOP CPX-CMXX stopped 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

2.3.2 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

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.

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.		DIL 2.1: OFF DIL 2.2: OFF
CAN bus termination switched on.		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.

2.4 Control interface

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

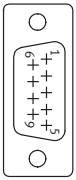
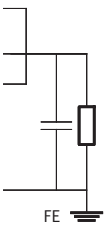
CAN bus parameters:

– Transmission rate: 1 Mbps

– Data profile: DS 402

– 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 2 3 4 5 6 7 8 9 Housing (plug)	n.c. **CAN_L** **CAN_GND** n.c. **CAN_SHLD** **CAN_GND** **CAN_H** n.c. n.c.		Not connected **CAN low** **CAN ground** Not connected **Connection to functional earth (FE)[2]** **CAN ground (optional)[1]** **CAN high** Not connected Not connected The plug housing must be connected to FE [2]

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

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

Note
Faulty installation or high transmission rates may cause data transmission errors as a result of signal reflections and attenuations.
Transmission errors can be caused by:
- missing or incorrect terminating resistor
- faulty screened connection
- branches
- large distances
- inappropriate cables

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

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.

2.5.2 Connection with Festo CAN bus plug

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 a torque of 0.4 Nm.

You can connect the CPX-CMMX easily to the CAN 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).

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.

1 Folding cover with inspection 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

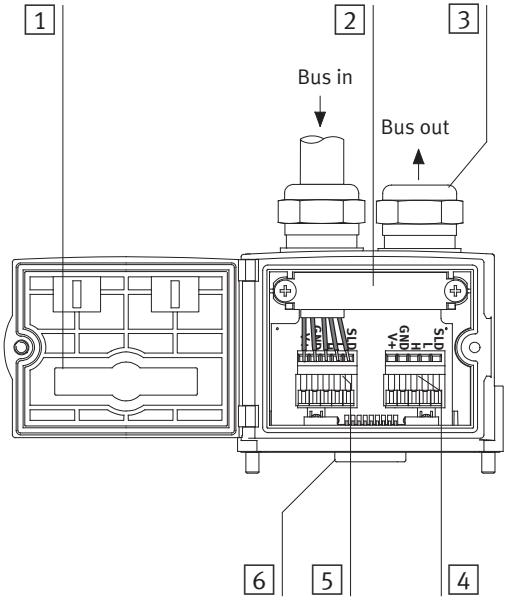


Fig. 2/2: CAN bus plug from Festo, FBS-SUB-9-BU-2x5POL-B

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 screen.

There are further possibilities of connecting the CAN bus with adapters, which can be ordered separately from Festo under: www.festo.com/catalogue

– M12 adapter 5-pin (protection class IP65)
  FBA-2-M12-5POL

– Screw terminal adapter 5-pin (protection class IP20)
  FBA-1-SL-5POL

M12 adapter (IP65)

With the adapter FBA-2-M12-5POL, the CAN bus is connected via a 5-pin M12 socket with PG 9 screw connector. Use the second connection socket for continuation of the CAN bus.

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

You will then comply with protection class IP65.

You can order this adapter at:
www.festo.com/catalogue

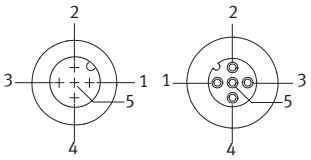
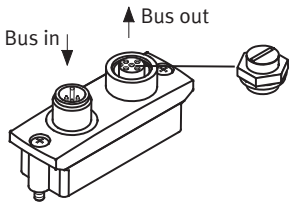
M12 adapter	Pin No.
	1. Screened 2. 24 VDC bus (max. 4 A) 3. 0 V DC bus 4. CAN_H 5. CAN_L
 Protective cap or plug with bus termination resistor if connection is not used.	

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.

Screw terminaladapter (IP20)

With the adapter FBA-1-SL-5POL, 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 mm^2.

You can order this adapter together with the terminal strip FBSD-KL-2x5POL at:
www.festo.com/catalogue

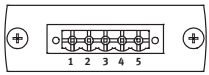
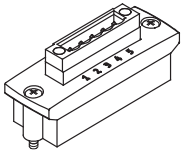
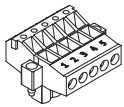
Screw terminal adapter	Pin No.
	1. 0 V DC bus 2. CAN_L 3. Screened 4. CAN_H 5. 24 VDC bus (max. 4 A)
  2x5-pin terminal strip	

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

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

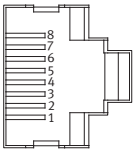
Note
If you use the screw terminal adapter in conjunction with the terminal strip, you achieve protection class IP20.

2.6 Ethernet interface

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

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 or CPX-CEC-...

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	**Screened**	**Screened**

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

- Seal an unused Ethernet interface with the suitable cover (see chapter 2.7).
- Use the suitable plug for the Ethernet interface (see chapter 2.7).

2.7 You will then comply with protection class IP65/IP67

- To ensure protection class IP65/IP67, seal unused sockets and switches with corresponding covers (see also chapter A.2):

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

3.1 General instructions on commissioning

Caution
Danger of personal injury or property damage due to unintended movements of the connected actuators.

- Make sure that no persons are in the operating range of the drive or any other connected actuators.
- Do not switch on the compressed air supply and the load voltage until the system is correctly installed and parametrised.
- Disconnect the Ethernet connection to the CPX-CMXX after you have completed configuration and parametrisation of the system.
- Be very careful when the axes are moving (e.g. when teaching positions, jogging and homing).

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 parametrisation

To configure and parametrise the CPX-CMXX and motor controller, you need a PC on which the Festo Configuration Tool (FCT) and the respective FCT plug-ins are installed.

3.2.1 Installing FCT and FCT plug-ins

Note
Installation of the FCT plug-ins of the motor controller is described in the respective online help.

The FCT plug-in 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. Make 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 plug-in designation “CMXX” as search term.
8. Observe the instructions and notes 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 to install the software.

Note
If applicable, deinstall the old version of the CMXX plug-in before you install a new version.

Proceed with installation of the CMXX FCT plug-in 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 plug-in.
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.
   - Greeting and display of current information on FCT
   - Selection of installation directory
   - Start of installation
   - Display of successful installation
   - Inquiry and installation of plug-ins
   - End of installation program

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

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

Deinstallation

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

- Follow the instructions in your Windows manual.

3.3 Parametrisation of the connected motor controllers

The following information takes into account only the specific settings of the motor 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 respective motor controller.

3.3.1 Connecting PC with the motor controller

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

Warning
Uncontrolled movements of the actuators can cause personal injury.

If the CAN bus malfunctions (DIL2.1 termination OFF or separation of the connection), drives can continue to move and cause collisions with severe injuries.

- Make sure that no persons are in the operating range of the drive or any other connected actuators.

3.3.2 Communication between CPX-CMXX and the motor controllers

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

Parameters	**Setting**
Interface	CANopen
Data profile	DS 402
Transmission rate	1 mbps
CAN address	see Tab. 3/2

Tab. 3/1: Parameters for communication

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

3.3.3 Specific settings for CMMx-xx motor controller

Menu/Tab	Parameters	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 address of the axis, see Tab. 3/2
	Protocol	CANopen DS 402
[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 accel.	10^{-3} 1)

1) With this setting, when parametrising the CPX-CMXX for all CMMx-xx motor controllers, the transmission factor must be set at 1000 increments/mm or 1000 increments/° see Online Help for FCT plug-in CPX-CMXX.

Tab. 3/3: Specific settings for CMMx-xx motor controller

3.3.4 Specific settings for MTR-DCI motor unit

Menu/Tab	Parameters	Value
[Configuration]	Motor type	MTR-DCI-...-CO
[Motor] [Control interface]	CAN address	CAN address of the axis, see Tab. 3/2
	Bit rate	1 mbps
	Data profile	DS 402
	Supply voltage	only with “external” option: An external power supply must be attached to the CAN bus plug; see chapter 2.4, Tab. 2/4 and P.BE-MTR-DCI-CO-...

Tab. 3/4: Specific settings for MTR-DCI motor unit

3.3.5 Specific settings for SFC-DC motor controller

Menu/Tab	Parameters	Value
[Configuration]	Controller type	SFC-DC-...-CO
[Controller] [Interface]	CAN address	CAN address of the axis, see Tab. 3/2
	Bit rate	1 mbps
	Data profile	DS 402

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

3.3.6 Specific settings for SFC-LAC/SFC-LACI motor controller

Menu/Tab	Parameters	Value
[Configuration]	Controller type	SFC-LAC-...-CO (CANopen) or SFC-LACI-...-CO (CANopen)
[Controller] [Interface]	CAN address	CAN address of the axis, see Tab. 3/2
	Bit rate	1 mbps
	Data profile	DS 402
	Supply voltage	only with “external” option: An external power supply must be attached to the CAN bus plug; see chapter 2.4, Tab. 2/4 and P.BE-SFC-LAC-CO-... or P.BE-SFC-LACI-CO-...

Tab. 3/6: Specific settings for SFC-LAC / SFC-LACI motor controller

3.4 Configuration of the CPX-CMXX

3.4.1 Connecting PC to CPX-CMXX

Note
- Contact your network administrator before connecting your PC to the CPX-CMXX over 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.

3.4.2 Prepare PC

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. 3/7: 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. Click the button “Properties” in the “General” tab. 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.

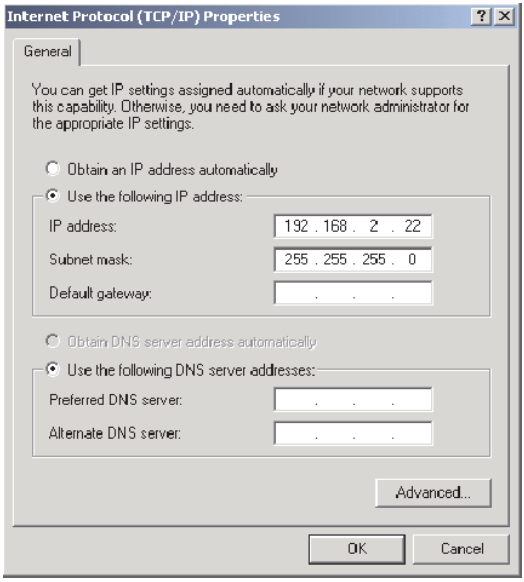


Fig. 3/1: Setting the IP address and subnetwork mask

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.

3.4.3 Configuring and parametrising CPX-CMXX

- Start the FCT on your PC.

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

Configuration and parametrisation of the CPX-CMXX is described in the online help for the CPX-CMXX FCT plug-in.

After you complete configuration and parametrisation, do the following:

1. Change the network settings of your PC to the original values.
2. Disconnect the Ethernet connection to the CPX-CMXX.
3. Place a suitable protective cap (see chapter A.2) on the Ethernet interface to reestablish the protection class IP65/67.

Diagnosis and error treatment

Chapter 4

Contents

4.1 Overview of diagnostics options

The CPX-CMXX supports various options for diagnosis and error handling. An overview shows Tab. 4/1.

Diagnostics option	Brief description	Advantages	Detailed description
Error messages	The CPX-CMXX reports specific malfunctions as error messages (error numbers) via the data profile FHPP-MAX to the controller and via the Ethernet to the PC with FCT.	The error messages can be directly evaluated at the controller via the data profile FHPP-MAX or over the Ethernet at the PC with FCT.	Chapter 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/CPX-CEC or CPX fieldbus node)	The CPX error categories can be evaluated at the CPX master in the I/O diagnostic interface or on the CPX-MMI handheld	
LED display	The LEDs directly indicate error states.	Fast “on-the-spot” recognition of errors	Chapter 4.3

Tab. 4/1: Diagnostics options

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 Behaviour in case of errors and warnings

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

- The motor 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 reacts as follows:

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

4.2.2 Acknowledging 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.

4.2.3 Error 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 CPX-MMI handheld.

Error no.	Malfunction type	Designation (cause)	Error handling
Warnings (CPX error category 0, no error in the CPX terminal, is not displayed at the CPX-MMI handheld)			
11	Warning	Homing interrupted (Positioning task is sent to axis while homing is active)	• Send a positioning task only when the homing run has been ended.
12	Warning	Positioning interrupted (Positioning task is sent to axis while position record is active)	• Send a positioning task only when the current positioning record has been carried out.
13	Warning	Reset interrupted (Positioning task is sent to axis while reset is active)	• Send a positioning task only when reset has been ended.
14	Warning	Axis stopped (Positioning task is sent to axis while axis stops)	• Send a positioning task only when the stop process has been ended.

Error no.	Malfunction type	Designation (cause)	Error handling
26	Warning	Speed cannot be achieved (Limit values of the axes are incorrect or acceleration path is too short)	• Check the position record parameters and the axis parametrisation.
27	Warning	Speed ‹ minimum speed	• Check the position record parameters and the axis parametrisation.
28	Warning	Axis acceleration ‹ minimum acceleration	• Check the position record parameters and the axis parametrisation.
29	Warning	Axis deceleration ‹ minimum deceleration	• Check the position record parameters and the axis parametrisation.
31	Warning	Following error (Controller reports following error: following error window or time out)	• Check the position record parameters, motor controller settings and the axes.
45	Warning	Warning (Warning bit of motor controller is set. A direction of rotation is blocked, since the limit switch has been actuated)	• Check the position record parameters and the axis.
65	Warning	Warning: Recognised device is not completely supported	The warning serves as information that possibly not all functions of the device are supported; operation is still possible.

Error no.	Malfunction type	Designation (cause)	Error handling
BUS_OFF (CPX error category 71, BUS_OFF)			
121	2	CAN bus offline (No slave was recognised at the CAN bus)	• Check the CAN bus line and terminating resistor.
125	2	CAN bus error switch-off (Communication errors were determined at the CAN bus)	• Check the CAN bus line and terminating resistor.
126	2	CAN bus node monitoring (A CAN bus slave has failed)	• Check the slave.
Configuration error (CPX error category 100, Configuration)			
8	2	Axis not initialised (Either the device is factory-new or an axis could not be initialised)	1. Determine the specific error in the malfunction buffer of the FCT plug-in. 2. Check and correct the configuration in the FCT plug-in accordingly.
56	2	Time overrun when starting the CAN node	• Check the CAN bus line and terminating resistor.
57	2	CAN ID not present (No CANopen device with CAN ID of the axis in controller configuration)	• Check the CAN ID.
62	2	Invalid device type recognised	• Check or change the configuration. • Close the device configured in the FCT plug-in.
63	2	Invalid product code recognised	• Check or change the configuration. • Close the device configured in the FCT plug-in.
64	2	Invalid firmware recognised	• Check or change the configuration. • Close the device configured in the FCT plug-in.

Error no.	Malfunction type	Designation (cause)	Error handling
Execution error (CPX error category 101, Execution)			
1	1	Axis not referenced	• Reference the axis. Non-referenced axes can be – moved in the jog mode if PNU522 bit 6=1 and the motor controller supports the speed control operating mode; see also description FHPP-MAX, P.BE-CMXX-FHPP-SW-... – moved by hand, after the motor controller enable has been switched off.
2	1	Target position outside the permitted positioning range (Selected target position lies outside the SW end positions of the axis or selected record was not configured)	• Check the target position and SW end positions. SW end positions of the FCT plug-in differentiate themselves from the SW end positions or HW end positions of the axes. • Configure the positioning record.
10	2	Error active (Positioning task is sent although another error is active)	• Acknowledge the error.
30	1	Time overrun during command execution (Axis command could not be ended in the specified time)	• Check the motor controller and the axis.
47	2	Command for inactive axis	• Check the triggering or configuration.
48	2	Command for inactive group	• Check the triggering or configuration.

Error no.	Malfunction type	Designation (cause)	Error handling
Position record error (CPX error category 102)			
3	1	Positioning record invalid (Number of the selected positioning record outside the range 1 ... 1024)	• Start a valid positioning record.
System error A (CPX error category 104, System_A)			
4	2	Positioning record memory not initialised (Positioning records could not be written from file {permanent memory} into internal cache {random access memory})	• Please consult your local Festo service or service_international@festo.com
74	2	Opening of positioning records failed (Error when opening file in CPX-CMXX)	• Please consult your local Festo service or service_international@festo.com
75	2	Reading of positioning records failed (Error when reading file in CPX-CMXX)	• Please consult your local Festo service or service_international@festo.com
76	2	Closing of positioning records failed (Error when closing file in CPX-CMXX)	• Please consult your local Festo service or service_international@festo.com
77	2	Writing of data failed (Error when writing to file in CPX-CMXX)	• Please consult your local Festo service or service_international@festo.com

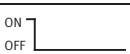
Error no.	Malfunction type	Designation (cause)	Error handling
System error B (CPX error category 105, System_B)			
5	2	Invalid FHPP-MAX command combination (Two FHPP-MAX commands were set simultaneously, e.g. START and LOAD_R; this is not permitted)	• Rework the control program.
58	2	No live signal from FCT (Connection between FCT plug-in and CPX-CMXX interrupted (network connection, FCT ended))	• Check the connection.
59	1	Error when sending/receiving from SDO	• Check the CAN bus and motor controller.
60	1	Status error when sending/receiving from SDO	• Check the gantry parametrisation, CAN bus and motor controller.
61	1	Time overflow when sending/receiving from SDO	• Check the CAN bus and motor controller.
66	2	Error when resetting a node	• Check the CAN bus and the configuration of the node involved.
67	2	Internal error at node start	• Please consult your local Festo service or service_international@festo.com
68	2	Serious internal error	• Please consult your local Festo service or service_international@festo.com

Error no.	Malfunction type	Designation (cause)	Error handling
Error in the controller (CPX error category 107, Controller)			
9	2	Axis is not enabled	• Enable the axis.
32	2	Error in homing run (Interruption of the homing run (Halt bit), both limit switches actuated simultaneously, search section traveled larger than positioning space)	• Check the motor controller and the axis.
36	2	Timeout with Stop command	• Check the motor controller and the axis.
37	2	Timeout when changing the operating mode	• Check the motor controller.
42	2	Time overrun during activation	• Check the motor controller.
43	2	Axis status undefined (DS402)	• Check the motor controller.
44	1	Axis in the FAULT condition (_REACTION_ACTIVE)	1. Check the motor controller condition - Additional messages can be found directly at the motor controller: – Diagnosis memory – LED – Display 2. Read out the status with FCT plug-in of the motor controller or via display.
46	2	Time overrun during deactivation	• Check the motor controller.
49	2	Error during activation of the “Interpolated position mode”	• Check the motor controller.
Licence error (CPX error category 144, Licence Error)			
–	–	CoDeSys licence error	• Please consult your local Festo service or service_international@festo.com

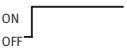
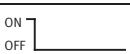
Tab. 4/2: Error messages of the CMXX

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)	**Procedure**	**Status**	**Error number**	**Error handling**
 LED lights up		CPX-CMXX started (RUN/STOP switch is in position 1 ... F).	–	None
 LED is off		CPX-CMXX not started (RUN/STOP switch is in position 0).	–	• Set the RUN/STOP switch to 1 ... F.

Tab. 4/3: LED RUN

STOP – CPX-CMXX stopped				
LED (yellow)	**Procedure**	**Status**	**Error number**	**Error handling**
 LED lights up		CPX-CMXX stopped (RUN/STOP switch is in position 0).	–	None
 LED is off		CPX-CMXX not stopped (RUN/STOP switch is in position 1 ... F.	–	• Set the RUN/STOP switch to 0.

Tab. 4/4: LED STOP

ERROR				
LED (red)	**Procedure**	**Status**	**Error number**	**Error handling**
 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: LED ERROR

TP – Ethernet connection				
LED (green)	**Procedure**	**Status**	**Error number**	**Error handling**
 LED lights up		Ethernet connection OK	–	None
 LED flashes		Data transfer active (LED flashes irregularly)	–	None
 LED is off		Ethernet connection to the parametrisation PC not OK	–	• Check: – the connection – the IP address

Tab. 4/6: LED TP

M – Control hierarchy FCT				
LED (yellow)	**Procedure**	**Status**	**Error number**	**Error handling**
 LED flashes		Control hierarchy over the CPX-CMXX is with the FCT.	–	• Deactivate the control hierarchy in the FCT
 LED is off		The control hierarchy over the CPX-CMXX is with the PLC.	–	• Activate the control hierarchy in the FCT

Tab. 4/7: LED M

PS (power system) – Power supply for logic and sensors				
LED (green)	**Procedure**	**Status**	**Error number**	**Error handling**
 LED lights up		No error. Power supply is on.	–	None
 LED flashes		Power supply longer than 10 ms below the threshold of 17 V.	–	• Eliminate the low voltage
 LED is off		Power supply is not on	–	• Check the operating voltage connection.

Tab. 4/8: LED PS

4.4 Diagnosis at the CPX terminal

Malfunctions of the CPX-CMMX or connected axes are reported as CPX error category to the CPX master (CPX field bus node or CPX-FEC/CPX-CEC). 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 presentation for the CPX-specific diagnostics options.

– 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-...

4.4.2 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/CPX-CEC).

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.

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 number of the CPX module that signaled the error.	0 ... 47	n = 10 * d + 6
8	Channel number	Bit 76543210 Description 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	Error number [FN]	CPX error category (see chapter 4.2)	100 ... 109	n = 10 * d + 8
10	Following channels	Always 0 for the CPX-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.

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 = module number (0 ... 47)
Description	Describes where the relevant error occurred.
Bit	Bits 0 ... 7 Location where error arose Bit 76543210 Description 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 error number	
Function no.	2008 + m * 4 + 1; m = module number (0 ... 47)
Description	CPX error category
Bit	Bits 0 ... 7 Range of values: 0 ... 255
Remark	The CPX error categories of the CPX-CMXX are described in chapter 4.2.

Tab. 4/11: Module error number

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 CPX-MMI handheld can determine for which axis in which axis group a malfunction 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 of diagnostic channels, part 1

	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 of diagnostic 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 serial 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.1 Technical data

Type	CPX-CMXX
General technical data of the CPX terminal	See CPX system description: – Manual P.BE-CPX-SYS-...
Total number of axes	8
Breakdown of the axes	2 groups with max. 4 axes
Supported kinematic systems	2-axis gantries X-Z / Y-Z / X-Y 3-axis gantries X-Y-Z
Device-specific diagnostics	– Channel and module-oriented diagnostics – Undervoltage/short-circuit modules – Diagnostic memory
Configuration support	FCT (Festo Configuration Tool)
Additional functions	System status can be represented using process data Additional diagnostic interface for FCT
LED display (bus-specific)	RUN: Program is executed STOP: Program is stopped ERR: Error in the program execution TP: Status Ethernet connection
LED display (product-specific)	M: Modify, parameterisation PS: Electronic supply, sensor supply
Protocol	FHPP-MAX (Festo Handling and Positioning Profile for Multi-Axis Movements)
Control interface – Data profile – Baud rate – Interface – Max. line length	CAN bus DS 402 1 Mbps Sub-D plug, 9-pin 25 m
Ethernet interface – Connection technology – Baud rate – MAC-ID CPX-CMXX	Only for configuration RJ45 socket, 8-pin 10/100 MBit/s according to IEEE802.3 (10BaseT) or 802.3u (100BaseTX) from 000E-F00B-0000 to 000E-F00B-FFFF

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
Nominal operating voltage	24 V DC
Operating voltage range	18 ... 30 VDC
Intrinsic current consumption – at nominal operating voltage	 typ. 85 mA
Power failure buffering	10 ms
Product weight	approx. 155 g
Dimensions W x L x H	50 mm x 107 mm x 55 mm

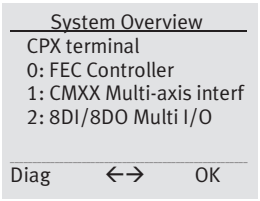
A.2 Accessories

Please select the appropriate accessories from our catalogue www.festo.com/catalogue/cpx-cmxx.

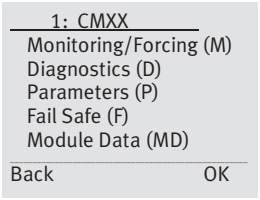
Information on accessories for the CPX terminal can be found in the CPX system manual or in the description for the CPX modules used.

A.3 Device-specific information on the handheld unit CPX-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!

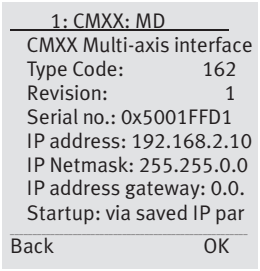
The Force Mode function is available, but not recommended.

```
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.

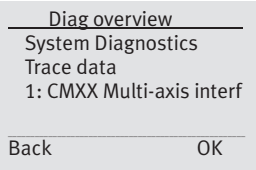
The diagnosis channel gives the error location, see section 4.4.3

The CPX error categories are described in section 4.2.3.

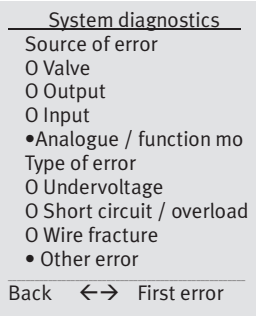


With the Module Data (MD) function, the following information is displayed by the CPX-CMXX (example).

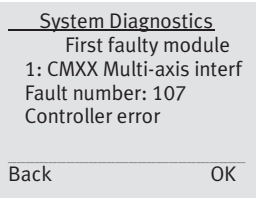
- Module designation: Multi-axis interface
- Module type: 162
- Revision: 1
- Series number 0x5001FFD1
- IP address: 192.168.2.10
- IP net mask: 255.255.0.0
- IP address gateway: 0.0.0.0
- Startup: via saved IP parameters



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

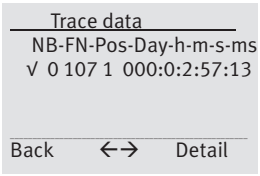


Selecting System diagnostics displays the error source and type of the current error. The First error function displays the following screen



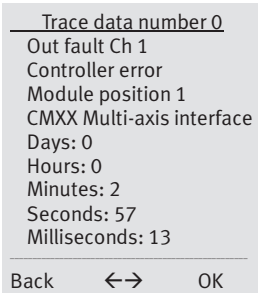
The First Error function displays the following additional information on the current error.

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



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



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

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

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Appendix B

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