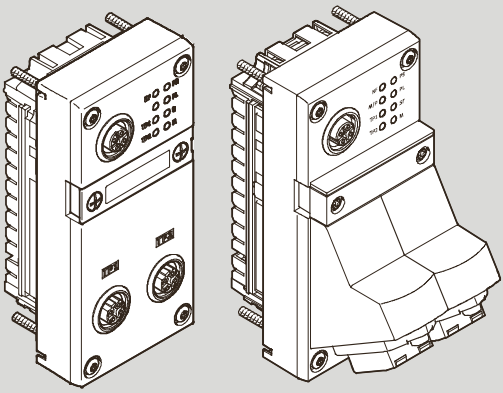
CPX-(M)-FB33/34/35/43/44/45
Bus node



FESTO

Operating instructions

CE

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Translation of the original instructions

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1 About this document

1.1 Applicable Documents

All available documents for the product ➔ www.festo.com/sp.

Document	Contents
CPX system description (CPX-SYS-...)	Detailed information on the CPX terminal
Brief instructions for bus node	Essential information on the product
Operating instructions for bus node	Detailed information on the product

Tab. 1 Applicable Documents

1.2 Product Version

This document refers to the following hardware version of the specified product:

Product	Version
CPX-FB33	Bus node CPX-FB33 from revision 07
CPX-(M)-FB34	Bus node CPX- (M) -FB34 from revision 07
CPX-(M)-FB35	Bus node CPX- (M) -FB35 from revision 07
CPX-FB43	Bus node CPX-FB45 from revision 45
CPX-(M)-FB44	Bus node CPX- (M) -FB45 from revision 45
CPX-(M)-FB45	Bus node CPX- (M) -FB45 from revision 45

Tab. 2 Product versions

Information on the revision levels of the product ➔ 5.2.2 Product variants.

There may be an updated version of this document for these or later product versions ➔ www.festo.com/sp.

2 Safety

2.1 Safety Instructions

- Only use the product in original status without unauthorised modifications.
- Only use the product if it is in perfect technical condition.
- Observe labelling on the product.
- Store the product in a cool, dry, UV-protected and corrosion-protected environment. Ensure that storage times are kept to a minimum.

– Before working on the product, switch off the power supply and secure it against being switched on again.
– This product can generate high frequency malfunctions, which may make it necessary to implement interference suppression measures in residential areas.
– Comply with the handling specifications for electrostatically sensitive devices.

2.2 Intended Use

The bus node is intended exclusively for operation as a station (IO Device) in the industrial Ethernet system PROFINET IO.
The product may only be used in combination with the CPX Terminal in an industrial environment.

2.3 Training of Qualified Personnel

This description is intended exclusively for technicians trained in control and automation technology, who have experience in installation, commissioning, programming and diagnostics of programmable logic controllers (PLC) and fieldbus systems.

3 Further information

– Accessories ➔ www.festo.com/catalogue.
– Spare parts ➔ www.festo.com/spareparts.

4 Service

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

5 Product overview

5.1 Function

The bus node as a device in a PROFINET IO network establishes the connection to the higher-order controller. The PROFINET communicates in real-time with the Real-Time Protocol (RT) or the Isochronous Real-Time Protocol (IRT). The switch integrated in the bus node enables division of the network into several segments. The number of segments in the network can be increased with the use of additional switches and routers.
The bus node can be used in two different operating modes:
– Remote I/O
– Remote controller

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Particular functions are only available from a specific revision➔ 5.2.2 Product variants.

Priority start-up (Fast Start-up)
The Prioritised Start-up function is also referred to as "fast start-up" or "fast restart" and ensures a fast start-up of the CPX terminal.
Requirements for using the function Fast Start-up:
– Intermediate switches and routers must must also support the Fast Start-up function.

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Fast Start-up can be combined with the Remote I/O operating mode.
Deactivation of the crossover function speeds up the Fast Start-up function.

The Fast Start-up function is switched over in the control software at two configuration levels:
– Basic hardware configuration in the properties for the CPX terminal
– CPX terminal configuration with allocation of the configuration table

Identification & Maintenance (I&M)
This function serves as an electronic rating plate and offers uniform, manufacturer-independent access to device-specific online information over the internet.

PROFIenergy
The function supports targeted shut-off of consumers that are not required in order to reduce the power demand.

Media Redundancy Protocol (MRP)
MRP is used to set up redundant PROFINET communication using a ring topology to increase the reliability of fault-tolerant networks.

Media Redundancy for Planned Duplication (MRPD)
MRPD is used to set up redundant PROFINET communication using a ring topology without time delay due to switching times.

S2 system redundancy
The bus node maintains communications with two redundant controllers. In the event of communication faults with the primary controller, the system switches automatically to the standby connection.

Crossover detection (Crossover Detection)
The function supports the use of patch cables and crossover cables in the same system.

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- The product can be connected to the network or a PC using either a patch cable or crossover cable.
- The crossover detection function must be activated in the control software if patch and crossover cables are used in the same system.

Device Description File
A device description file in XML format (GSDML) is required for configuration and programming of the CPX terminal. The GSDML contains all the information required for setting up and setting the CPX terminal using control software.

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The current GSDML file is required to be able to use all functions of the bus node.
The current GSDML file for CPX terminals is located in the Festo Support Portal:
➔ www.festo.com/sp

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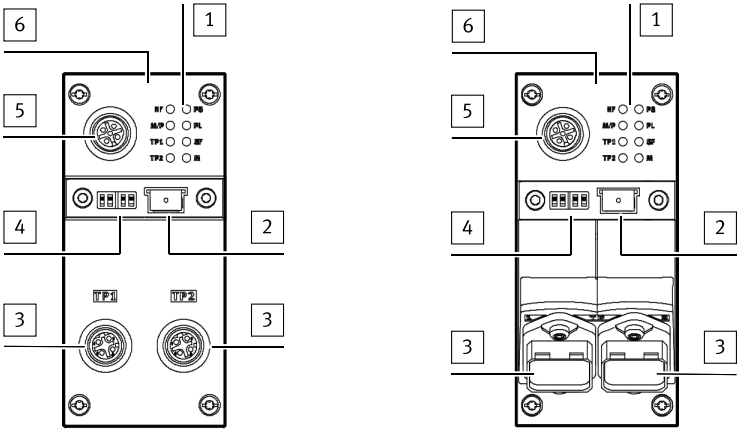
Consult your local Festo repair service if you have any questions or technical problems.

5.2 Configuration

5.2.1 Product design



1 LED Displays
2 Memory card (only for FB33/34/35)
3 Network connection
4 DIL Switch
5 Service interface
6 Product labelling

Fig. 1 Connection and display components

5.2.2 Product variants

The following software and hardware revisions are a prerequisite for using the functions:

Function	Bus bus node revision number	
	Software	Hardware
Priority start-up (Fast Start-up)	From Rev 12	From Rev 11
Identification & Maintenance (I&M)	From Rev 14	From Rev 1
PROFIenergy	From Rev 20	From Rev 1
Media Redundancy Protocol (MRP)	From Rev 20	From Rev 1

Function	Bus bus node revision number	
	Software	Hardware
Media Redundancy for Planned Duplication (MRPD)	From Rev 50	From Rev 45
S2 system redundancy	From Rev 50	From Rev 45
Isochronous real time (IRT)	From Rev 21	From Rev 1

Tab. 3 Required revision numbers for using the functions

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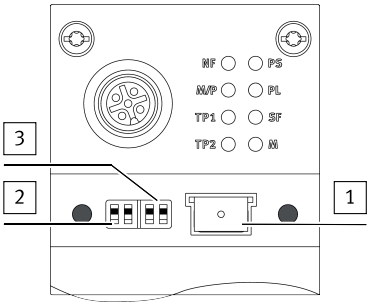
The revision numbers of the hardware and software for the bus node can be checked with the control software, the Festo Maintenance Tool (FMT) or the Festo Field Device Tool (FFT).

5.2.3 LED displays

LED	Network status LEDs		LED	CPX-specific LEDs	
◯	NF	Network Failure (red)	◯	PS	Power System (green)
◯	M/P	Maintenance/PROFIenergy (green or yellow)	◯	PL	Power Load (green)
◯	TP1	Link/Traffic 1 (green)	◯	SF	System Failure (red)
◯	TP2	Link/Traffic 2 (green)	◯	M	Modify (yellow)

Tab. 4 LEDs on the bus node

5.2.4 Control Elements



1 Memory card
2 DIL switch: operating mode
3 DIL switch: diagnostics mode

Fig. 2 Control elements for PROFINET

DIL Switch

A bus node must be operated as a master in the CPX terminal. The "Remote I/O" operating mode must be set on this bus node. The "Remote Controller " operating mode must be set on all other bus nodes.

The 2 DIL switch is used to set the operating mode :

DIL switch 2	**Description**
ON 1 2 1: OFF 2: OFF (factory setting)	Remote I/O operating mode All functions of the CPX terminal are controlled by the PROFINET IO controller.
ON 1 2 1: ON 2: OFF	Remote Controller operating mode A CPX-CEC-xx takes over the I/O open-loop control. Requirement: CPX Terminal with CEC.

Tab. 5 Setting the operating mode

The diagnostics mode or the data field size is set with the 3 DIL switch depending on the operating mode:

DIL switch 3	**Description**	
	Remote I/O	Remote controller
ON 1 2 1: OFF 2: OFF (factory setting)	Diagnostics switched off.	Data field size: 8 bytes I/8 bytes O
ON 1 2 1: OFF 2: ON	Status bits switched on	Data field size: 16 bytes I/16 bytes O
ON 1 2 1: ON 2: OFF	I/O diagnostics interface switched on	Data field size: 32 bytes I/32 bytes O

DIL switch 3	Description	
	Remote I/O	Remote controller
1: ON 2: ON	Reserved	Reserved

Tab. 6 Setting the diagnostics mode

Reserved DIL switches are blocked for future functions and must not be used.

The setting of the DIL switches for operating mode and diagnostics mode must match the settings in the open-loop control.

Memory card

The bus nodes CPX-(M)-FB43/44/45 do not support memory cards.

The memory card holds configuration data for the PROFINET addressing:
– Fieldbus device name
– IP address
The configuration data can be conveniently transferred to the new bus node with the memory card when replacing a bus node.

The data on the memory card have priority over other configuration data. e.g. data stored in the bus node memory or in the control system.

NOTICE!

Malfunction or Damage to the Memory Card.
Inserting or removing the memory card while the power supply is switched on can result in malfunctions of or damage to the memory card.
- Disconnect the power supply before you insert or remove the memory card.

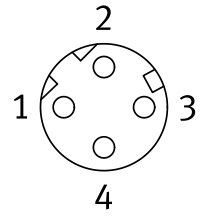
The various bus node revisions are only compatible with the corresponding memory card:

Memory card	Bus bus node revision number
CPX-SK	From Rev 07
CPX-SK-2	From Rev 12
CPX-SK-3	From Rev 30

Tab. 7 Compatibility of the memory cards depending on the bus node revision

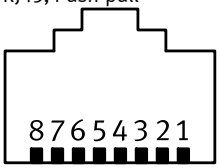
5.2.5 Connecting Elements

Pin allocation of the network interface of the bus node CPX-FB33/43 (M12)

Bushing	Pin	Signal	Explanation
M12, D-coded 	1	TD+	Transmitted data (Transmit Data) +
	2	RD+	Received data (Receive Data) +
	3	TD–	Transmitted data –
	4	RD–	Received data –
	Housing	Shield/FE	Shield/functional earth

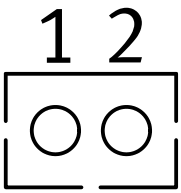
Tab. 8 Network interface of the bus node CPX-FB33/43

Pin allocation of the network interface of the CPX-M-FB34/44 bus node (RJ45)

Bushing	Pin	Signal	Explanation
RJ45, Push-pull 	1	TD+	Transmitted data (Transmit Data) +
	2	TD–	Transmitted data –
	3	RD+	Received data (Receive 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
	Housing	Shield/FE	Shield/functional earth

Tab. 9 Network interface of the bus node CPX-M-FB34/44

Pin allocation of the network interface of the CPX-M-FB35/45 bus node (SCRJ)

Bushing	Pin	Signal	Explanation
SCRJ, Push-pull 	1	TX	Transmitted data
	2	RX	Received data

Tab. 10 Network interface of the bus node CPX-M-FB35/45

Overview of connections and plug

Bus node	Connection technology	Network connectors
CPX-FB33/43	2 x M12, D-coded, female, 4-pin, in accordance with IEC 61076-2	NECU-MS-D12G4-C2-ET
CPX-M-FB34/44	2 x RJ45, push-pull, Cu, AIDA, in accordance with IEC 60603, IEC 61076-3	FBD-RJ45-PP-GS
CPX-M-FB35/45	2 x SCRJ, push-pull, 650 nm, AIDA, in accordance with IEC 61754-24	FBD-SCRJ-PP-GS

Tab. 11 Connection technology and network connectors

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In the following table, the cable lengths were used in accordance with the specifications for PROFINET networks.

Network connectors	Cable specification
NECU-MS-D12G4-C2-ET	Ethernet cable, shielded, Cat 5/5e, 6 … 8 mm, 0.14 … 0.75 mm^2 (max. 100 m PROFINET end-to-end link: 22 AWG)
FBD-RJ45-PP-GS	Ethernet cable, shielded, Cat 5/Cat 5e, 5 … 8 mm, 0.13 … 0.36 mm^2 (≙ approx. 26 … 22 AWG) (max. 100 m PROFINET end-to-end link: 22 AWG)
FBD-SCRJ-PP-GS	POF fibre-optic cable, 980/1000 µm, 6.5 … 9.5 mm (max. 50 m PROFINET end-to-end link; ≤ 12.5 dB)

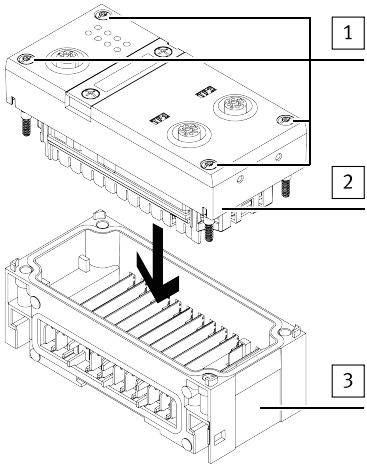
Tab. 12 Cable specification for network connectors

Service interface

An operator unit such as CPX-MMI-1 can be connected to the service interface. Alternatively, the service interface can be connected to a PC via the USB adapter NEFC-M12G5-0.3-U1G5 so that the "Festo Maintenance Tool" software (FMT) can be used.

6 Assembly

The bus node is mounted in an interlinking block of the CPX terminal.



1 Screws
2 CPX bus node
3 Interlinking block

Fig. 3 Mounting the bus node in an interlinking block

– Before working on the product, switch off the power supply and secure it against being switched on again.
– CPX-M-FB35/45 only permissible on metal linking.

Disassembly

1. Unscrew screws.
2. Carefully lift the bus node.

Assembly

1. Check seal and sealing surfaces and insert the bus node.
2. Screws must be placed so that the self-tapping threads are used. Tighten the screws by hand cross-wise.
   Tightening torque: 0.9 ... 1.1 Nm.

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Use suitable screws for the interlinking block.

- Plastic interlinking block: thread-grooving self-tapping screws.
- Metal interlinking block: screws with metric thread.

7 Installation

7.1 General information about installation

Comply with the handling specifications for electrostatically sensitive devices.

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Information on mounting the CPX terminal can be found in the CPX system description (CPX-SYS-...).

7.2 Connecting to the network

Installation guidelines

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Observe the installation guidelines of the PROFINET user organisation (PNO):
➔ www.profibus.com/download/

NOTICE!

Unauthorised Access to the Device Can Cause Damage or Malfunction.

- When connecting the device to a network, protect the network from unauthorised access. Standards for security in information technology can be used for network protection measures, e.g. IEC 62443, ISO/IEC 27001.

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An access password only protects against unintentional modification.
For additional information ➔ Guidelines and standards for security in information technology, e. g. IEC 62443, ISO/IEC 27001.

Use of switches and routers

The switch integrated in the bus node enables division of the network into several segments.
The network can be divided into additional segments with the use of additional switches and routers.
This makes it possible to structure the network and extend it further.
Regardless of the network structure, the expansion of a PROFINET segment must not exceed certain connection lengths:

– Copper connecting cable (Ethernet twisted pair cable, 22 AWG):
  Max. 100 m between network participants (PROFINET end-to-end link)
– Optical connecting cable (POF fibre-optic cable, max. 12.5 dB signal attenuation over the entire connecting section):
  max. 50 m PROFINET end-to-end link.

7.3 Ensuring the degree of protection

– Use connection hardware with the required degree of protection.
– Use cover caps to seal unused connections.

Connection	Connecting hardware	Cover cap
CPX-FB33/43: Network connection (M12)	Plug: NECU-M-S-D12G4-C2-ET	ISK-M12

Connection	Connecting hardware	Cover cap
CPX-M-FB34/44: Network connection (RJ45)	Plug: FBD-RJ45-PP-GS	CPX-M-AK-C
CPX-M-FB35/45: Network connection (SCRJ)	Plug: FBD-SCRJ-PP-GS	
Service interface	Connecting cable: KV-M12-M12-...	ISK-M12

Tab. 13 Connection technology and cover caps for degree of protection

7.4 Power Supply

Bus nodes are supplied with power via the interlinking blocks.
If there are problems with the power supply➔ 10 Diagnostics.

8 Commissioning

NOTICE!

Malfunction due to incorrect switch-on sequence.

- First switch on the operating voltage supply of all network stations and then the operating power supply of the open-loop control.

CPX- M-FB34: cyclical process data exchange can freeze in exceptional cases in applications with increased electrostatic load.

This results in an entry in the diagnostic memory with error number FN150.

- Restart to ensure normal operation.
- Reduce electrostatic charges in the vicinity of the product or use a CPX Terminal with metal interlinking (order code 51E).

1. Define the operating mode and diagnostic mode with the DIL switches of the bus node.
2. Set up an automation project for the higher-order controller using suitable software.
3. Import the device description file into the software ➔ www.festo.com/sp.
4. Configure CPX Terminal in the software:
   – System structure
   – Network addressing
   – Address allocation of the modules
5. Transfer the automation project to the higher-order controller.

Behaviour of the display elements of the bus node during commissioning in the CPX Terminal

LED		Status	LED		Status
○	NF	off	☀	PS	lights up

LED		Status	LED		Status
○	M/P	off		PL	lights up
	TP1	lights up	○	SF	off
	TP2	lights up	○	M	off

Tab. 14 Behaviour of the display components after error-free commissioning

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Information on troubleshooting in the event of incorrect behaviour ➔ 10 Diagnostics.

9 Parameterisation

The behaviour of the CPX terminal can be set individually by parameterisation. The following parameterisation variants are distinguished:

– System parameterisation, e.g. deactivating error messages
– Module parameterisation (module-specific and channel-specific), e.g. module monitoring, settings for errors, adjustment of debouncing times for inputs
– Parameterisation of the diagnostic memory

The following parameterisation options are available:

– Parameterisation of the CPX terminal with PROFINET engineering software
– Parameterisation with the operator unit
– Parameterisation via the Festo Maintenance Tool

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Detailed description of the specific parameters and basic principles for application ➔ CPX system description (CPX-SYS-...).
Parameter lists of the various CPX modules ➔ Descriptions of the modules.

9.1 Bus node parameters

Bus node parameters	Description/setting options
Standard CPX parameters	
– SCS monitoring – SCO monitoring – Monitoring U_{OUT} – Monitoring U_{VAL} – SCV monitoring – Fail-safe – Force mode – System start with external parameters or default parameters or with saved parameters – Diagnostic memory	Standard CPX parameters – for further information ➔ CPX system description (CPX-SYS-...) **Note** The parameters of the diagnostic memory can only be set via the CPX-MMI or CPX-FMT.
Device-specific parameters	
Diagnostic message filter Undervoltage U_{OUT}/U_{VAL} – Only available for bus nodes from Rev 14. – Displayed in the hardware configuration (HW Config) as "Filter Alarm U_{off}/U_{ven}".	– Inactive: Undervoltage is reported via the network – Active: Undervoltage messages are filtered and not reported over the network ➔ the undervoltage is only indicated by the flashing SF LED on the bus node
Channel alarm filter Undervoltage U_{OUT}/U_{VAL} – Only available for bus nodes from Rev 20. – Displayed in the hardware configuration (HW Config) as "Filter channel alarms U_{off}/U_{ven}".	– Inactive: Undervoltage is reported via the network – Active: Undervoltage messages are filtered ➔ a maximum of one message per module is sent over the network; the undervoltage is additionally displayed by the flashing SF LED on the bus node
Filter for combining channel alarms (channel bundling) – Only available for bus nodes from Rev 20.	– Inactive: Channel alarms are reported individually via the network – Active: Channel alarms (e.g. short circuit or undervoltage) are summarised and transmitted as a common message over the network; the error is also displayed by the corresponding flashing LED on the bus node

Bus node parameters	Description/setting options
Analogue process value representation (byte sequence)	Special bus node parameter in Intel/Motorola format - defines the representation of process values of the analogue modules - setting options: – Intel byte sequence (LSB-MSB, “Little Endian”; factory setting): process values are displayed in the Intel format (least significant bit left, most significant bit right) – Motorola byte sequence (MSB-LSB, “Big Endian”): process values are displayed in the Motorola format (most significant bit left, least significant bit right) This parameter can also be set via the I/O diagnostic interface using function number 4402 in bit 7: – Value “0”: Intel (LSB-MSB; factory setting) – Value "1": Motorola (MSB-LSB) The setting of the byte sequence depends on the control system and the associated user programs: select the byte sequence used in the control system.

Tab. 15 Bus node parameters

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Also consider the set bus node parameters in the user programs, in particular the byte sequence.

If the bus node of an earlier revision is used, the parameters are displayed in the software, but cannot be set.

10 Diagnostics

10.1 Diagnostics Options

Depending on the configuration the following options for diagnostics are available in the context of PROFINET:

– LED display
– Status bits
– I/O Diagnostics Interface
– Diagnostics via CPX-MMI
– Diagnostics via CPX-FMT
– Diagnostics via PROFINET

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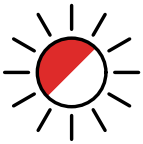
The displayed diagnostic information is dependent on the settings on the bus node (➔ DIL Switch) as well as on the parameterisation of the CPX terminal or the controller.

10.2 Diagnostics via LED displays

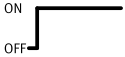
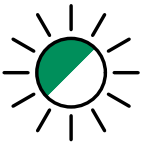
Various status LEDs are available for diagnostics at the bus node. They show hardware errors, configuration errors and bus errors directly on site, which enables fast error detection.

10.2.1 Network status LEDs

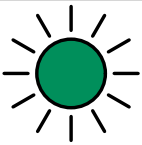
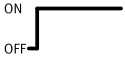
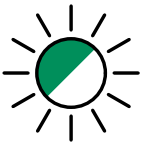
NE – Network Status/Network Error			
LED	Sequence	Status	Error handling
LED is off		No error (if the PS LED is green)	–
 LED flashes		Network connection not OK - possible causes: – Only before initial start-up: Configuration defective, e.g. MAC-ID not configured – Device name or device number not correct – IO controller defective – Network connection interrupted, short-circuited or disturbed	Check: – Configuration – Device name – Device number – IO controller – Network connection

Tab. 16 Network status LED NE

M/P – Maintenance/PROFIenergy			
LED	Sequence	Status	Error handling
LED is off		Maintenance action not required, PROFIenergy function not activated	–

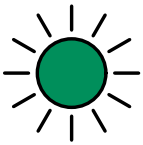
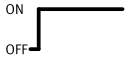
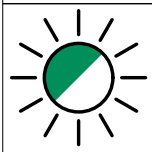
M/P – Maintenance/PROFIenergy			
LED	Sequence	Status	Error handling
LED illuminated yellow		Maintenance action required	Check: – Operating voltage – Plugs – Fibre optic cable
 LED flashes green		PROFIenergy activated	–

Tab. 17 Network status LED – M/P

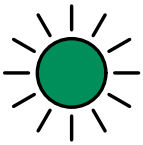
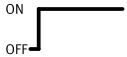
TP1, TP2 – Connection Status			
LED	Sequence	Status	Error handling
LED is off		No physical network connection	Check network connection/network cable.
 LED illuminated		Network connection OK	–
 LED flashes		– Both LEDs flashing synchronously: module location, e.g. for troubleshooting or during configuration	–

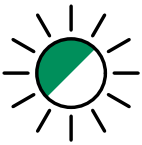
Tab. 18 Network status LEDs - TP1 and TP2

10.2.2 CPX terminal status - LEDs

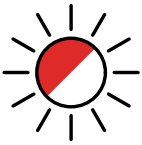
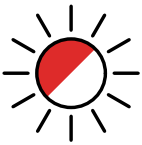
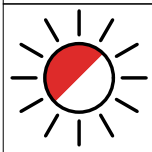
PS – power supply status for electronics/sensors			
LED	Sequence	Status	Error handling
 LED illuminated		No error, operating voltage for electronics and sensors is present	–
 LED flashes		Operating voltage for electronics and sensors outside the tolerance range	1. Check operating voltage. 2. Rectify short circuit/overload. 3. Depending on the parameterisation: – The sensor supply voltage will be switched on again automatically after the short circuit has been eliminated (default). – Switch the power supply off and on (power off/on).
LED is off		Operating voltage for electronics and sensors is not on	Check the operating voltage connection of the electronics.

Tab. 19 CPX terminal status LED - PS

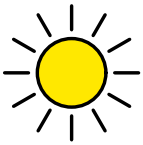
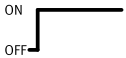
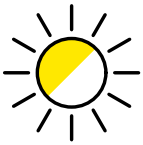
PL – load voltage supply for the outputs/valves			
LED	Sequence	Status	Error handling
 LED illuminated		No error, load voltage is present	–

PL – load voltage supply for the outputs/valves			
LED	Sequence	Status	Error handling
 LED flashes		Load voltage outside the tolerance range	1. Rectify undervoltage. 2. Depending on the parameterisation: – The load voltage supply will be switched on again automatically after the undervoltage has been eliminated (default). – Switch the power supply off and on (power off/on).

Tab. 20 CPX terminal status LED - PL

SE: System Error			
LED	Sequence	Status	Error handling
LED is off		No error	–
 LED flashes 1x		Information or minor error (error class 1)	➔ Description of error numbers in the CPX system description (CPX-SYS-...)
 LED flashes 2x		Error (error class 2)	
 LED flashes 3x		Serious error (error class 3)	➔ Description of error numbers in the CPX system description (CPX-SYS-...)

Tab. 21 CPX terminal status LED – SE

M – parameterisation modified or forcing active			
LED	Sequence	Status	Significance/error handling
LED is off		– System start with factory setting (default parameterisation) and current CPX configuration – External parameterisation possible (default)	–
 LED illuminated		– System start with saved parameterisation and saved CPX configuration – Parameters and CPX configuration are stored permanently; external parameterisation is blocked	Caution when replacing a CPX terminal with saved parameterisation (LED M on): In case of servicing, such as with replacement of the CPX terminal, parameterisation is not created automatically by the PLC or the higher-order system. In this case, before replacing check which settings are required and adjust them if necessary.
 LED flashes		– Forcing active	The Forcen function is enabled; Force mode, function no. 4402 ➔ CPX system description (CPX-SYS-...)

Tab. 22 CPX terminal status LED – M

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The display of the Forcen function (LED M flashing) has priority over the display of the setting for the system start (LED M on).

10.3 Diagnostics via status bits

The CPX terminal provides 8 status bits - depending on the hardware configuration of the controller. The status bits are used to display common diagnostic messages (global error messages). 8 status bits are configured like inputs, the address can be freely selected during configuration. The status bits are transmitted cyclically to the controller with all other inputs. If all status bits return logic 0, no error will be registered.
Diagnostics via status bits enables fast access to error messages in the PLC user program.

Bit	Diagnostic information with logic 1	Description
0	Error at valve	Module type in which an error has occurred
1	Error at output	
2	Error at input	
3	Error at analogue module/technology module	
4	Undervoltage	Type of error
5	Short circuit/overload	
6	Wire break	
7	Other error	

Tab. 23 Status Bits

10.4 Diagnostics via the I/O diagnostics interface (STI)

The CPX terminal provides a bus-independent 16-bit I/O diagnostic interface - provided the controller has the appropriate hardware configuration. This interface enables access to internal data of the CPX terminal, which enables internal parameters and data to be read out at the I/O level.
Additional information ➔ CPX system description (CPX-SYS-...).

10.5 Diagnostics via CPX-MMI

The operator unit CPX-MMI enables a menu-driven display of diagnostic information. Errors can be read out locally in plain text.
Additional information ➔ Description of the operator unit (CPX-MMI-...).

10.6 Diagnostics via CPX-FMT

The Festo Maintenance Tool (FMT) offers PC-based diagnostic functions via a graphical representation of the CPX terminal, e.g. status display, parameterisation.
Additional information ➔ Online documentation for the Festo Maintenance Tool (CPX-FMT-...).

10.7 Diagnostics via PROFINET

PROFINET forms the basis for comprehensive diagnostic functions and information via the automation network, e.g. detailed module-related and channel-related status information and error detection in the online mode of the control software.

Error characteristics

In the case of the following malfunctions the behaviour of the CPX terminal depends on the configured behaviour of the controller and the parameterised fail-safe setting:

– Telegram failure
– Stop the controller
– Network interruption

The fail-safe parameterisation is used to specify the signal status of the outputs in the event of field-bus communication errors in the network (fail-safe status).

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Additional information on the fail-safe setting ➔ CPX system description (CPX-SYS-...).

Error numbers and types

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A list of all CPX-specific error numbers and types ➔ CPX system description (CPX-SYS-...).

Additional diagnostic information is made available via the error types.
With the exception of the CPX error numbers in the following table, the CPX error numbers in theP-ROFINET network are sent with offset 1000:
CPX error number + 1000 = PROFINET error number.
Example:
Error in the measuring system: CPX error number 108 + 1000 = PROFINET error number 1108.

CPX error number	PROFINET error number	Error type
2	1	Short circuit
3	6	Wire break
4	2	Undervoltage
5	2	Undervoltage
9	8	Lower critical limit undershot
10	7	Upper critical limit exceeded
11	1	Short circuit at valve
13	6	Wire break at valve
65	64	PROFIsafe addresses (F_Dest_Add)
69	72	Parameterisation error ➔ error in "safe parameterisation"

Tab. 24 PROFINET-specific error numbers and types

11 Disposal

ENVIRONMENT!

Send the packaging and product for environmentally sound recycling in accordance with the current regulations ➔ www.festo.com/sp.

12 Technical data

12.1 General

Characteristics	Bus node
General Technical Data	➔ CPX system description (CPX-SYS-...)
Degree of protection by housing, in accordance with IEC 60529, completely mounted, plug connector inserted or cover cap installed	IP65/IP67
Protection against electric shock	by PELV circuits (Protected Extra-Low Voltage)

Tab. 25 General characteristics

Characteristics	CPX-FB33	CPX-M-FB34	CPX-M-FB35
Module code in the CPX Terminal			
– Remote I/O	215	216	217
– Remote Controller	164	165	166
Module identification			
– Remote I/O	FB33-RIO PROFINET remote I/O	FB34-RIO PROFINET RJ45 remote I/O	FB35-RIO PROFINET LWL remote I/O
– Remote Controller	FB33-RC PROFINET I/O bus node	FB34-RC PROFINET RJ45 bus node	FB35-RC PROFINET LWL bus node
Power Supply			
Operating voltage/load voltage	➔ CPX system description (CPX-SYS-...)		
Intrinsic current consumption at nominal operating voltage 24 V DC, from operating voltage supply for electronics/sensors ($U_{EL/SEN}$)	typ. 85 mA (internal electronics)	typ. 85 mA (internal electronics)	typ. 155 mA (internal electronics)
Separation of the PROFINET interfaces to $U_{EL/SEN}$	electrically isolated by transformer (up to 1500 V)	electrically isolated by transformer (up to 1500 V)	electrically isolated by fibre-optic cable
Mains buffering time	10 ms	10 ms	10 ms

Tab. 26 Special characteristics of CPX-(M)-FB33/34/35

Characteristics	CPX-FB43	CPX-M-FB44	CPX-M-FB45
Module code in the CPX Terminal			
– Remote I/O	215	216	217
– Remote Controller	164	165	166
– Sub-module code	32	32	32
Module identification			
– Remote I/O	FB43-RIO PROFINET remote I/O	FB44-RIO PROFINET RJ45 remote I/O	FB45-RIO PROFINET LWL remote I/O
– Remote Controller	FB43-RC PROFINET I/O bus node	FB44-RC PROFINET RJ45 bus node	FB45-RC PROFINET LWL bus node
Power Supply			
Operating voltage/load voltage	➔ CPX system description (CPX-SYS-...)		
Intrinsic current consumption at nominal operating voltage 24 V DC, from operating voltage supply for electronics/sensors ($U_{EL/SEN}$)	typ. 75 mA (internal electronics)	typ. 75 mA (internal electronics)	typ. 150 mA (internal electronics)
Separation of the PROFINET interfaces to $U_{EL/SEN}$	electrically isolated by transformer (up to 1500 V)	electrically isolated by transformer (up to 1500 V)	electrically isolated by fibre-optic cable
Mains buffering time	10 ms	10 ms	10 ms
Accuracy of voltage measurement (operating voltage/load voltage)	≤ 5%	≤ 5%	≤ 5%

Tab. 27 Special characteristics of CPX-(M)-FB43/44/45

12.2 Network

Characteristics	Bus node
Network protocol	PROFINET IO (PN IO): – based on Industrial Ethernet – based on the standard Ethernet protocol (IEEE 802.3)

Characteristics	Bus node
Supported protocol characteristics and protocol functions (selection)	– Cyclical data exchange "in real-time", without isochronous mode (Real-Time, RT) or over LAN with isochronous mode (Isochronous Real Time, IRT) – Link Layer Discovery Protocol (LLDP) – Simple Network Management Protocol (SNMP) – Fast Start-up (FSU) – PROFIenergy – PROFIsafe – Shared Device – Media Redundancy Protocol (MRP, MRPD) – S2 system redundancy
Supported CPX characteristics and CPX functions (selection)	– CPX-terminal configuration via CPX-FMT – Export/import of the CPX-terminal configuration via CPX-FMT and control system (export function) – CPX terminal diagnostics via the fieldbus and control system – Web server functionality: Representation of the PROFINET network structure, CPX terminal configuration with diagnostic information, PROFINET I&M data, Ethernet statistics
Specification	Selection of directives and standards with reference to PROFINET: – PROFINET installation guidelines (PROFINET Installation Guide, Installation Guideline PROFINET Part 2 ...) – IEC 61158 – IEC 61784 – IEC 61918 Additional information: ➔ www.profinet.com ➔ www.profibus.com/download/
Transmission technology	Switched Fast Ethernet; 100BaseTX execution in accordance with IEEE 802.3

Tab. 28 General network characteristics

Characteristics	CPX-FB33/43	CPX-M-FB34/44	CPX-M-FB35/45
Transmission rate	100 Mbit/s	100 Mbit/s	100 Mbit/s
Wavelength	–	–	650 nm (suitable for POF fibre-optic cable)

Characteristics	CPX-FB33/43	CPX-M-FB34/44	CPX-M-FB35/45
Network connections	2 x M12 bushings, D-coded, 4-pin	2 x RJ45 bushings, push-pull, AIDA-conforming	2 x SCRJ bushings, push-pull, AIDA-conforming
Crossover detection	Auto MDI	Auto MDI	–
Max. addressing volume of outputs/inputs, operating mode-independent	64 bytes I, 64 bytes O	64 bytes I, 64 bytes O	64 bytes I, 64 bytes O

Tab. 29 Special network characteristics CPX-(M)-FB33/34/35/43/44/45

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Copyright:
Festo SE & Co. KG
Ruiter Straße 82
73734 Esslingen
Germany

Phone:
+49 711 347-0

Internet:
www.festo.com