CPX terminal

FESTO

Electronics manual

System description

Installing and commissioning CPX terminals

Manual
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Contents

Designated use

CPX terminals are designed for fitting into a machine or an automated system. Depending on the CPX node used, they can be connected to a special field bus system and serve for interrogating sensor signals and for controlling pneumatic and electric actuators.

The individual CPX modules of the CPX terminal are documented in specific manuals. The safety instructions listed in the manuals must always be observed and the relevant CPX module must only be used as intended. CPX modules and cables are only to be used as follows:

– only for industrial usage.

– in accordance with designated use.

– without any modifications by the user. Only the conversions or modifications described in the documentation supplied with the product are permitted.

– in faultless technical condition.

When used together with commercially available components, such as sensors and actuators, the specified limits for pressures, temperatures, electrical data, torques etc. must be observed. National and local safety regulations must also be observed.

Areas of application and approval by authorities

The product fulfils the requirements of EU directives and bears the CE mark.

CE

Standards and test values, which the product observes and fulfils, can be found in the section “Technical specifications”. The product-relevant EU directive can be found in the conformity declaration.

Certain configurations of the CPX valve terminal fulfil the requirements of:

– Recognized Component Marks for Canada and the United States

  c UL us
  Only for use in Class 2 Circuits.

These configurations bear the above named mark.

Please note
Note the following if your application requires fulfilment of the specifications of the “Recognized Component Marks for Canada and the United States”:

– Rules for observing the UL approval can be found in the UL-specific brief operating instructions. The relevant technical specifications listed there also apply here.
– The technical specifications in this documentation may show different values.

Target group

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

Service

Please consult your local Festo repair service 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.

Please 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.

Notes on the use of this manual

This manual contains general basic information on the method of operation, on fitting, installing and commissioning CPX terminals.

Special information on commissioning, parameterising and diagnosing a CPX terminal with the field bus node you are using can be found in the appropriate manual for the field bus node.

Information on further CPX modules can be found in the manual for the relevant module. The following table provides an overview.

Conventions

The parameters and data of the CPX terminal are described in Appendix B.2. These appear in English on the handheld type CPX-MMI-1.

[.....] In this description, the data and parameters displayed on the handheld in English are framed in the text in brackets, e.g. [Debounce time]. In the text, a fuller description appears next to it, e. g.:

Input debouncing time [Debounce time]

Type	Title	Description
Electronics manual	“System manual” type P.BE-CPX-SYS-... 	Overview of structure, components and method of operation of CPX terminals Installation and commissioning instructions as well as basic principles of parameterisation
	“CPX field bus node” type P.BE-CPX-FB... 	Instructions on fitting, installing, commissioning and diagnosing the relevant field bus node
	“CPX I/O modules” type P.BE-CPX-EA-... 	Notes on connection and instructions on fitting, installing and commissioning input and output modules of type CPX-..., the MPA pneumatic modules as well as of MPA, CPA and Midi/Maxi pneumatic interface
	“CPX analogue I/O modules” type P.BE-CPX-AX-... 	Notes on connection and instructions on fitting, installing and commissioning CPX analogue I/O modules
	“CPX-CP interface” type P.BE-CPX-CP-.. 	Instructions on commissioning and diagnosing CPX terminals with the CP interface type CPX-CP-4-FB
	“Handheld” type P.BE-CPX-MMI-1-... 	Instructions on commissioning and diagnosing CPX terminals with the handheld type CPX-MMI-1
	“CPX-FEC” type P.BE-CPX-FEC-... 	Instructions on fitting, installing, commissioning and diagnos. the CPX Front-End Controller.
Software package	“FST” 	Programming in Statement List and Ladder Diagram for the FEC
Manual pneumatics	“Valve terminals with MPA pneumatics” type P.BE-MPA-... 	Information on fitting, installing and commissioning MPA pneumatics (type 32)
	“Valve terminals with CPA pneumatics” type P.BE-CPA-... 	Information on fitting, installing and commissioning CPA pneumatics (type 12)
	“Valve terminals with Midi/Maxi pneumatics” type P.BE-MIDI/MAXI-03-... 	Instructions on fitting, installing and commissioning Midi/Maxi pneumatics (type 03)

Tab. 0/1: Manuals on the CPX terminal

Term/abbreviation	Meaning
CP	Compact Performance
CPX bus	Data bus via which the CPX modules communicate with each other and are supplied with the required operating voltage.
CPX modules	Common term for the various modules which can be incorporated in a CPX terminal.
CPX terminal	Modular electric terminal type 50
DIL switch	Dual-in-line switches consist of several switch elements with which settings can be made.
Field bus node	Provide the connection to specific field buses. Transmit control signals to the connected modules and monitor their ability to function.
I	Digital input
Input module	CPX input module
I/O diagnostic interface	The I/O diagnostic interface is a bus-independent diagnostic interface at I/O level which permits access to internal data of the CPX terminal.
I/O modules	Common term for the CPX modules which provide digital inputs and outputs (CPX input modules and CPX output modules).
I/Os	Digital inputs and outputs
Manifold base	Lower part of the housing of a module or sub-base for linking the module electrically with the terminal.
O	Digital output
Output module	CPX output module
PLC/IPC	Programmable logic controller/industrial PC
Pneumatic interface	The pneumatic interface is the interface between the modular electric periphery and the pneumatics.
Status bits	Internal inputs which supply coded common diagnostic messages.
Sub-base	Replaceable upper part of module housing with connections

Tab. 0/2: Product-specific terms and abbreviations

Summary of components

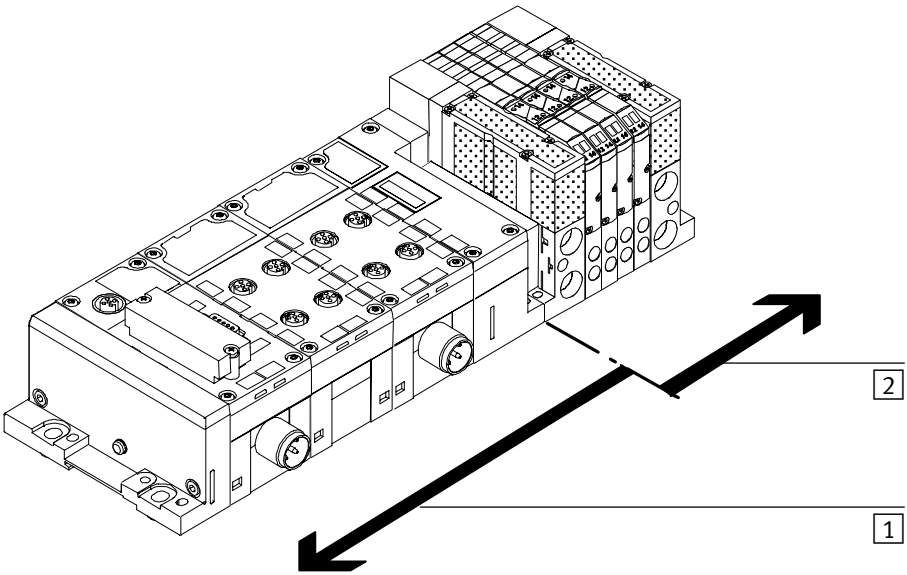
Chapter 1

Contents

Contents of this chapter	This chapter provides an overview of the structure, components and method of operation of CPX terminals. The power supply concept as well as special configuration and commissioning functions of CPX terminals are also briefly explained.
Further information	Information on the pneumatic modules can be found in the appropriate pneumatics manual. Information on the possible connection methods of the I/O modules as well as information on the pneumatic interface can be found in the manual for the CPX I/O modules.

1.1 Structure of the CPX terminal

CPX terminals consist of electric and pneumatic modules for controlling pneumatic actuators and low-current consuming electric devices (further valves, bulbs, etc.). They are usually placed decentrally directly on the machine or system.

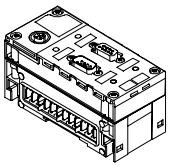
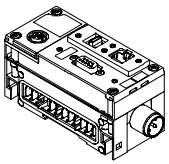
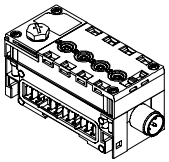
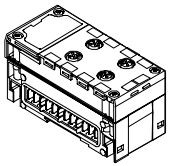
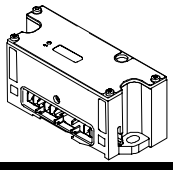


[1] Electric modules (electric side)

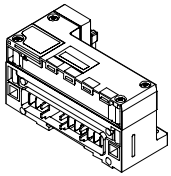
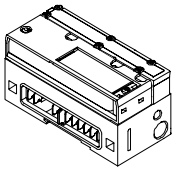
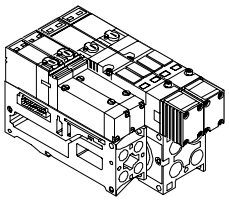
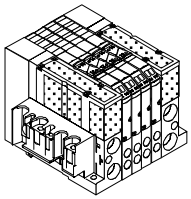
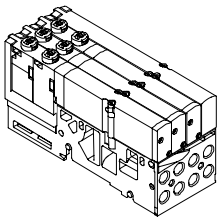
[2] Pneumatic modules (pneumatic side); optional

Fig. 1/1: Structure of a CPX terminal with CPA pneumatics (example)

CPX terminals with field bus connection permit communication with remotely-situated higher-order control systems. CPX terminals are constructed on a modular basis and can consist e.g. of the following modules:

Modules	Brief description
	CPX field bus node for connecting to higher-order control systems via the field bus Connections depend on the design of the node
	CPX Front End Controller for controlling pneumatic and electric actuators; communication via Ethernet (Webserver, e-mail, Modbus TCP, EasyIP etc.)
	CPX-CP interface for connecting decentrally arranged CP I/O modules and CP valve terminals (technology module)
	CPX I/O modules for evaluating processing signals; Connections as desired (here M12 connections)
	CPX pneumatic interface for connecting pneumatic modules: – for Midi/Maxi pneumatics

Tab. 1/1: Modules of a CPX terminal – part 1

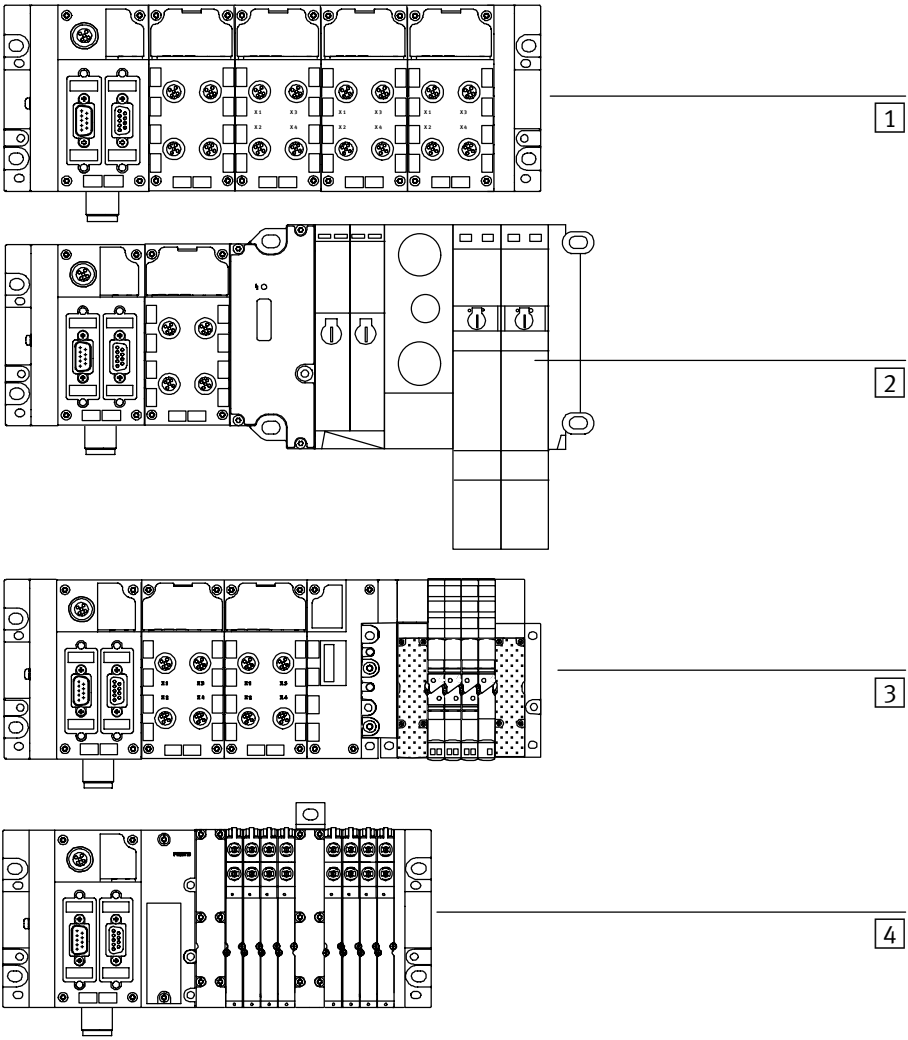
Modules	Brief description
	CPX pneumatic interface for connecting pneumatic modules: – for CPA pneumatics
	– for MPA pneumatics
	Valve terminal pneumatics (pneumatic modules) of type: – Midi/Maxi or
	– CPA
	– MPA

Tab. 1/2: Modules of a CPX terminal – part 2

CPX terminals are fitted with different electric and pneumatic modules (valves) in accordance with the customer's wishes. The equipment fitted on the CPX terminal in this manual may therefore differ from the equipment you are using.

The electric and pneumatic side of the CPX terminal can be adapted to various requirements. The electric side can be fitted with various electric CPX modules, e.g. a CPX field bus node, digital and analogue CPX I/O modules etc.

The pneumatic side can be fitted with pneumatics of type Midi/Maxi or of type CPA. Different sizes of valves are possible here. Pneumatic modules are however not absolutely necessary. CPX terminals can consist exclusively of electric modules.



1 CPX terminal without pneumatics

2 CPX terminal with Midi/Maxi pneumatics

3 CPX terminal with CPA pneumatics

4 CPX terminal with MPA pneumatics

Fig. 1/2: Examples of CPX terminal structure

1.1.1 Method of operation of the CPX terminal

1 Field bus (incoming)

2 Field bus (continuing)

3 Compressed air supply

4 Work air (2/4)

5 Field bus node

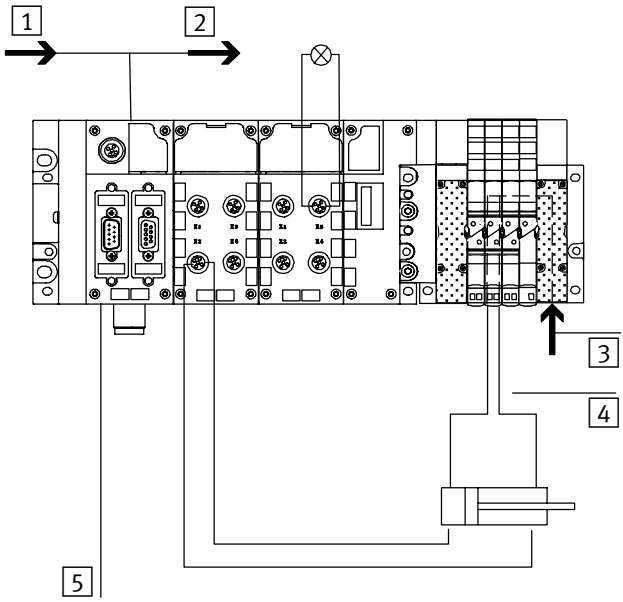


Fig. 1/3: Function overview of CPX terminal (here with CPA pneumatics)

CPX field bus node

The node point of a CPX terminal with field bus connection is the CPX field bus node which controls the following functions:

- the connection of the terminal to the relevant field bus
- the control of data transfer to/from the field bus module of your control system
- read and write access (depending on the field bus node) to system-relevant parameters and diagnostic data (access to internal data and parameters)
- internal control of the terminal.

CPX field bus nodes provide the connection to certain field buses, pass control signals on to the other CPX modules and monitor their ability to function. Basic settings for field bus communication can usually be made by DIL switch directly on the node.

Detailed information on the CPX field bus node you are using can be found in the manual for the relevant field bus node.

CPX Front End Controller (CPX-FEC)

The CPX Front End Controller can be used together with a CPX field bus node or independently of a CPX field bus node. It offers e.g. the following functions:

- Independent control of the CPX valve terminal (Stand Alone)
- Communication via Ethernet (e.g. Webserver, e-mail, EasyIP)
- Ethernet Slave Funktion (via Modbus TCP)
- Communication via field bus (only in conjunction with the appropriate CPX field bus nodes)

CPX I/O modules

Processing signals can be evaluated with the CPX I/O modules. Input modules provide inputs for connecting sensors and enable e.g. cylinder positions to be scanned. Output modules provide universally usable electric outputs for controlling low-current consuming devices (further valves, bulbs, etc.).

Please note
Including the field bus node, maximum 10 electric CPX modules plus a pneumatic interface are permitted on the electric side.

The CPX I/O modules have various types of connections. The connections are on a sub-base which can be removed from the module. This offers the following advantages:

- The CPX terminal can be fitted with the desired connections. It can be adapted easily to various applications and conditions of use.
- When servicing is required, the electronics of the I/O modules can be replaced without the need to dismantle the CPX terminal, or to loosen individual connections on the I/O modules.

For example, the following types of connection can be used:

- M12 connection (protection class IP65)
- M8 connection (protection class IP65)
- Terminal connectors with 4 conductors (protection class IP20).

Further information on the CPX I/O modules can be found in the manual “CPX I/O modules”.

CPX-CP interface

The CPX-CP interface serves for connecting decentrally arranged CP modules (CP valve terminals and CP I/O modules). It transmits control signals to the connected CP modules and monitors their ability to function. Maximum 128 external I/Os are possible per CPX-CP interface.

Detailed information on the CPX-CP interface can be found in the manual for the CPX-CP interface type P. BE-CPX-CP-... .

Pneumatic interface

If the CPX terminal is to be fitted with valves, a pneumatic interface will be required. The pneumatic interface is the interface between the electric and pneumatic periphery. It forms the mechanical connection between the pneumatic and electric modules and transmits the electric signals.

The CPX pneumatic interface is mounted on the right-hand side of the last electric module. Pneumatic interfaces can be used for e.g.:

– pneumatics of type Midi/Maxi (maximum 26 valve coils)

– pneumatics of type CPA (maximum 22 valve coils)

– pneumatics of type MPA (maximum 8 MPA pneumatic modules with a total of up to 64 valve coils).

Pneumatic interfaces for Midi/Maxi pneumatics or CPA pneumatics:

From a technical point of view, the pneumatic interfaces for Midi/Maxi pneumatics or CPA pneumatics represent electrical modules with a variable (configurable) number of digital outputs for triggering the built-in valves.

Pneumatic interface for MPA pneumatics

The pneumatic interface for MPA pneumatics merely produces the mechanical and electrical connection to the MPA pneumatic modules. Therefore, from the point of view of the CPX terminal, the MPA pneumatic interface does not count as an electric module. Instead, the individual MPA pneumatic modules each represent an electric module with digital outputs for triggering the integrated valves.

Detailed information on the CPX pneumatic interfaces and MPA pneumatic modules can be found in the manual for the CPX I/O modules.

Valve terminal pneumatics

The valve terminal pneumatics provide the following:

– the common channels for supply and exhaust air

– the electric signals from all valve solenoid coils.

Work connections 2 and 4 are provided for each valve location on the individual pneumatic modules. The valves are supplied with compressed air via the common channels or via special supply modules. Both the air and auxiliary pilot air from the valves are also exhausted via these common channels. Further modules for pressure supply are also available, e.g. in order to permit work to be carried out with different work pressures.

Valve terminal pneumatics of type Midi/Maxi

Valve terminal pneumatics of type Midi/Maxi are also built up on a modular basis. These valve terminal pneumatics consist of Midi and Maxi valves. Valves of both sizes can be operated together on a CPX terminal. In this way adaptation to the requirements of the machine or system can also be made on the pneumatic side.

The valve locations can be configured in steps of two from 2 to 26 valve locations. Unused valve locations can be sealed with blanking plates.

1 Pneumatic interface for Midi/Maxi

2 Valve terminal pneumatics of type Midi/Maxi

3 Right-hand end plate

4 Maxi valves

5 Midi valves

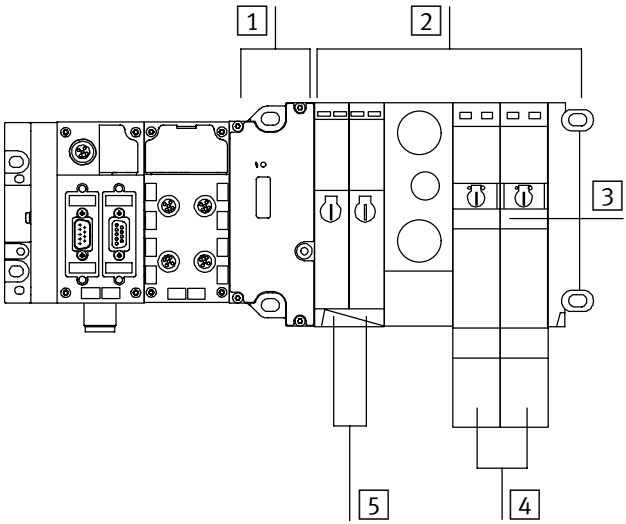


Fig. 1/4: CPX terminal with Midi/Maxi pneumatics

Valve terminal pneumatics of type CPA

Valve terminal pneumatics of type CPA are distinguished by compact exterior dimensions in proportion to the high flow rates. They have replaceable valve plates which are mounted on sub-bases. The sub-bases are connected mechanically by tie rods and have an end plate at the side. Valve plates are available in different sizes.

The valve locations can be configured in single steps from 2 to 22 valve locations.

1 Pneumatic interface for CPA (here CPA10)

2 Valve terminal pneumatics of type CPA

3 End plates

4 Valve plates (here CPA10)

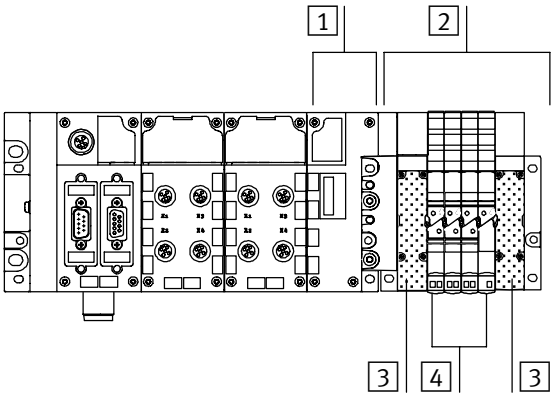


Fig. 1/5: CPX terminal with CPA pneumatics

Valve terminal pneumatics of type MPA

MPA pneumatics consist of serially linked MPA pneumatic modules. From a technical viewpoint, the MPA pneumatic modules in a CPX terminal represent digital output modules for controlling the integrated valves (valve solenoid coils). The pneumatic interface for MPA pneumatics merely produces the mechanical and electrical connection to the MPA pneumatic modules.

Valves in various sizes are also available for CPX valve terminals with MPA pneumatics. 4 to 32 valve locations per CPX valve terminal are possible:

– MPA1 pneumatic modules occupy 8 outputs for max. 4 valves.

– MPA2 pneumatic modules occupy 4 outputs for max. 2 valves.

1 Pneumatic interface for MPA pneumatics

2 Valve terminal pneumatics of type MPA (here with MPA1 pneumatic modules)

3 Right-hand end plate

4 MPA1 pneumatic modules

5 Supply plate

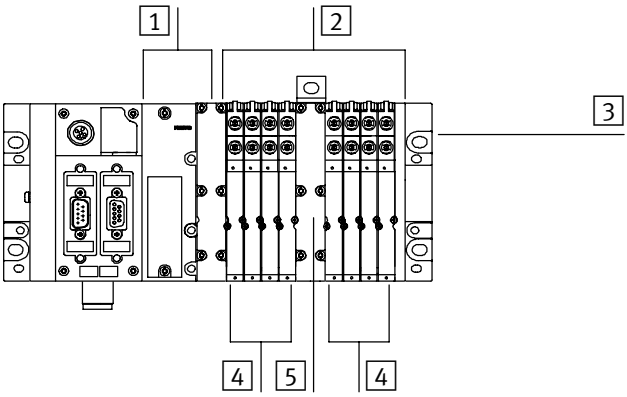


Fig. 1/6: CPX valve terminal with MPA pneumatics

Further information on the pneumatics of your CPX valve terminal can be found in the appropriate Pneumatics Manual.

CPX terminals without pneumatics

CPX terminals without pneumatic modules possess an end plate instead of the pneumatic interface. Such a set up provides digital and analogue inputs and outputs on the relevant field bus. Maximum 10 electric modules including the field bus node are permitted on a CPX terminal.

1 Field bus node

2 I/O modules

3 Right-hand end plate

4 Left-hand end plate

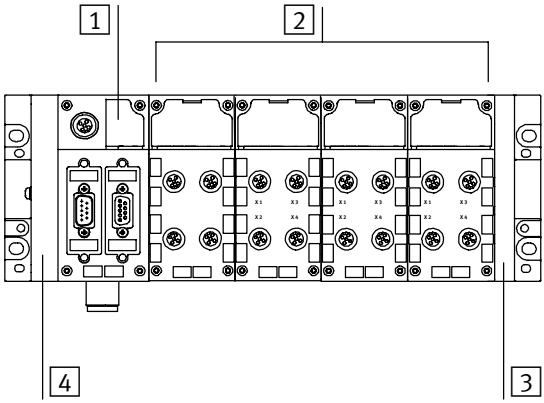


Fig. 1/7: CPX terminal as field bus I/O slave

1.1.2 Structure of the electric CPX modules

An electric CPX module always consists of:

- a manifold sub-base (with system supply, with additional supply for outputs, for valves or without supply)
- an electronic module
- with I/O modules: a sub-base of the user's choice.

1 Sub-base (as desired)

2 Electronic module

3 Manifold sub-base (as desired)

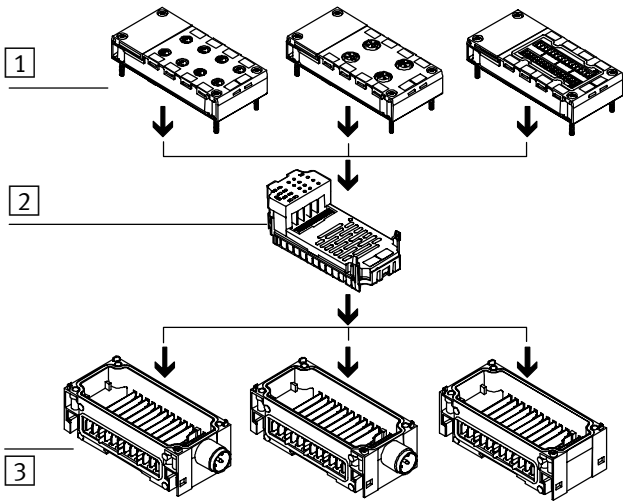


Fig. 1/8: Structure of the CPX modules (example)

Sub-base

The upper part of the housing selected for the CPX I/O modules is called the sub-base. Sub-bases provide the necessary connections for sensors and actuators. CPX I/O modules can be combined with the various sub-bases. In this way, the CPX terminal offers a high degree of flexibility with regard to adaptation to different applications and conditions of use.

Electronic module

The electronic module contains the electronic components. It is connected to the manifold and to the sub-base by means of electric plug connectors.

With CPX field bus nodes the connections are fixed components of the module. The CPX I/O modules have various types of connections.

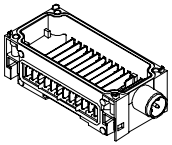
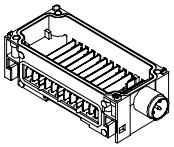
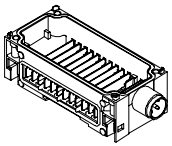
Manifold sub-base

The lower part of the housing of the electric modules is called the manifold sub-base. Manifold sub-bases serve for the electrical and mechanical linking of the modules. They offer e.g. a connection for supplying the operating voltage and/or load voltage and transmit the operating and load voltages to the neighbouring modules (see section 1.1.3). The mechanical link between the electric modules is made via tie rods in the manifold sub-bases.

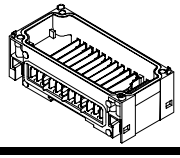
You can replace electronic modules with sub-bases during servicing without the need to dismantle the CPX terminal or loosen individual connections. Instead the complete sub-base is removed, the electronic module replaced and the sub-base placed into position again (see manual for the CPX I/O modules).

1.1.3 The power supply concept of the CPX terminal

The operating and load voltage supplies for the CPX terminal are provided via manifold bases. These transmit the operating and load voltages to the neighbouring modules. A distinction is made between the following designs:

Manifold base	Description
	Type CPX-GE-EV-S... [1] Manifold base with system supply: – Operating voltage for internal electronics and for the internal electronics of the CP modules connected to the CPX-CP interface – Sensor supply for internal input modules and for the CP input modules connected to the CPX-CP interface – Load voltage supply for internal output modules and valves – Load voltage supply for the CP modules connected to the CPX-CP interface
	Type CPX-GE-EV-Z... [2] Manifold base with additional supply for electric outputs: – Load voltage supply for the output module inserted and for the subsequent output modules inserted to the right
	Type CPX-GE-EV-V... [2] Manifold base with additional supply for valves: – Load voltage supply for the pneumatic modules/valves inserted subsequently to the right – Load voltage supply for CP modules which are connected to the fitted CPX-CP interface and to those CPX-CP interfaces subsequently fitted to the right
Manifold sub-bases with a power supply are available with the following connections: – M18 plug, 4-pin – 7/8" plug, 4-pin – 7/8" plug, 5-pin (only as CPX-GE-EV-**S**-7/8... and CPX-GE-EV-**Z**-7/8...) The manifold sub-base with a system supply facilitates electrical isolation of the load voltage for outputs/valves for the operating voltage of electronics/sensors.	
[1] Must be provided exactly once for each CPX valve terminal. [2] Optional – depends on the current consumpt. of the CPX modules and the connected components.	

Tab. 1/3: Manifold bases of the CPX valve terminal - part 1

Manifold base	Description
	Type CPX-GE-EV Manifold base without supply

Tab. 1/4: Manifold bases of the CPX valve terminal - part 2

Manifold sub-base with system supply type CPX-GE-EV-S...

The operating and load voltages for the CPX terminal are supplied via this manifold sub-base. The voltages are supplied via an M18 or 7/8" plug and can be used for further electric modules and for the valves.

If sub-bases with additional supply are not required, the manifold sub-base with the system supply can be fitted in any desired position.

If sub-bases with additional supply are required, these must always be placed to the right of the system supply (see also Fig. 1/9).

Manifold sub-base with additional supply for electric outputs type CPX-GE-EV-Z...

The additional load voltage for the electric outputs is supplied via this manifold sub-base. The load voltage for the output modules is also supplied via an M18 or 7/8" plug and can be switched off separately. This manifold sub-base must always be placed to the right of the system supply.

The use of a manifold sub-base with additional supply for electric outputs causes the following (see also Fig. 1/9):

- The load voltage for electric output modules will be interrupted to the previous module on the left.
- The load voltage supplied will be available to the integrated module and, where applicable, to the following modules on the right.

- The operating and load voltage supplies for the valves will be transmitted further.
- Several additional supplies for electric outputs in a CPX terminal are possible.

Manifold base with additional supply for valves type CPX-GE-EV-V...

This manifold base enables the electrically isolated supply of load voltage for the valves. The load voltage for the valves, which is also supplied via an M18 or 7/8" plug, can be switched off separately. This manifold base must also always be placed to the right of a system supply.

The use of a manifold base with additional supply for valves causes the following (see also Fig. 1/9):

- The load voltage for the valves will be interrupted at the previous module on the left.
- The load voltage supplied is available for the following modules:
  - subsequent pneumatic modules/valves to the right
  - CP modules which are connected to the fitted CPX-CP interface and to those CPX-CP interfaces subsequently fitted to the right
- The operating and load voltage supplies for the electric outputs will be transmitted further.

Note the following warning if you use MPA pneumatics:

Caution
Damage to components and functional damage!
It is **not** permitted to supply voltage to MPA pneumatic modules with electronic modules without electrical isolation via a manifold base for valve supply type CPX-GE-EV-V.

- If your MPA pneumatics are fitted with electronic modules of type VMPA1-FB-EM**S**-8 or VMPA2-FB-EM**S**-8, you must actuate the MPA pneumatics only by means of the system supply module type CPX-GE-EV-S.

Please note that MPA electronic modules may only be fed through the following supply.

MPA electronic module	Permitted supply modules
VMPA...-FB-EM**S**-8 (without electrical isolation)	– System supply (CPX-GE-EV-S)
VMPA...-FB-EM**S**-8 (with electrical isolation)	– System supply (CPX-GE-EV-S) – Valve supply (CPX-GE-EV-V) [1]
[1] If a 4-pin system supply is used, the electrical isolation will no longer be effective.	

Tab. 1/5: Permitted supply modules for MPA electronic modules

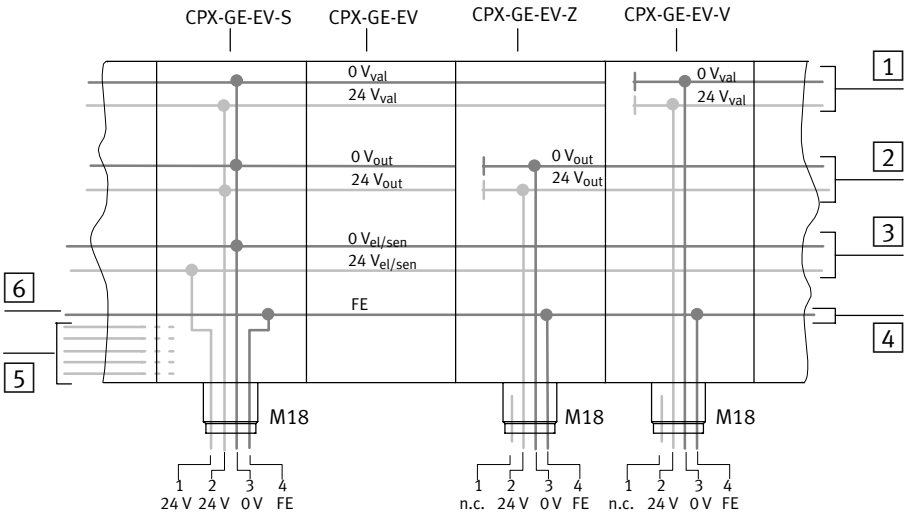
On electronic modules with electrical isolation type VMPA...-FB-EMG-..., $V_{el/sen}$ and V_{val} are completely electrically isolated. In conjunction with a manifold sub-base with valve supply type CPX-GE-EV-V or a 5-pin connector plug (7/8”), it is therefore possible to switch off the valve supply voltage at all poles.

Further information on MPA electronic modules can be found in the manual for the CPX I/O modules.

Manifold sub-base without supply type CPX-GE-EV

This sub-base serves for the electrical linking of modules which do not require a separate load supply.

The operating voltage supplied (internal electronics/inputs) as well as the load voltage (valves/outputs) are transmitted further in the manifold sub-bases via so-called contact rails. The following diagram provides an overview (M18 plug):



1 Load voltage for valves (24 V_{val} and 0 V_{val})

2 Load voltage for digital outputs (24 V_{out} and 0 V_{out})

3 Operating voltage for electronics and sensors (24 $V_{el/sen}$ and 0 $V_{el/sen}$)

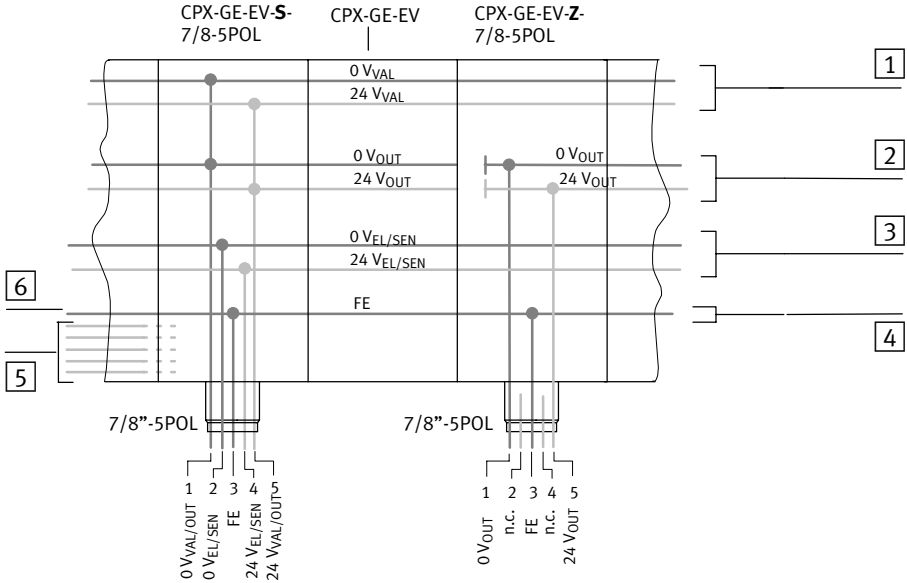
4 Functional earth (FE)

5 Further rails for internal functions

6 Connected to FE connection on end plate

Fig. 1/9: Basic representation of the power supply concept for manifold sub-bases with M18 plugs.

Manifold sub-bases with 7/8” plugs are available with either 4 or 5 pins. The 5-pin plug facilitates electrical isolation of the load voltage supply for outputs/valves for the operating voltage of electronics/sensors. The following diagram gives an overview.



1 Load voltage for valves (24 V_{val} and 0 V_{val})

2 Load voltage for digital outputs (24 V_{out} and 0 V_{out})

3 Operating voltage for electronics and sensors (24 $V_{el/sen}$ and 0 $V_{el/sen}$)

4 Functional earth (FE)

5 Further rails for internal functions

6 Connected to FE connection on end plate

Fig. 1/10: Basic representation of the power supply concept for manifold sub-bases with 5-pin 7/8” plugs.

You can find the pin assignment for connections to the manifold sub-bases in Tab. 3/4.

Special features concerning the use of the CPX-CP interface

The CPX-CP interface connects the internal current rails 0 $V_{el/sen}$ and 0 V_{val} of the CPX valve terminal. This means that the electrical isolation of the operating voltage for the electronics/sensors ($V_{el/sen}$) and the load supply for the valves (V_{val}) will no longer be effective until the next additional supply for valves following the CPX interface.

Further information on the voltage supply for the CPX terminal in conjunction with the CPX-CP interface can be found in the manual for the CPX-CP interface in the chapter “Installation” – section “Voltage supply concept – forming voltage zones”.

1.2 Commissioning, diagnosis and operating functions

The system reaction of the CPX terminal can usually be adapted to the relevant application. For this purpose, the CPX terminal provides extensive functions for commissioning, diagnosis and operation.

Commissioning and operating functions

The reaction of the CPX terminal can be adapted to individual requirements by parameterisation. By means of access to the internal parameters, e.g. the following reactions of the CPX terminal can be influenced:

- the reaction of the outputs and valves to field bus communication faults (fail-safe settings)
- the reaction to fault elimination
- the debouncing times for digital input signals
- the signal extension for digital input signals
- the force settings (force signal status)
- the working method of the diagnostic memory.

The CPX terminal is supplied from the factory with preset parameters.

Caution
A different parameterisation will result in a different reaction. Check especially when replacing CPX terminals to see which settings are necessary and make sure that these settings, where applicable, are carried out (e.g. in the start-up phase by the higher-order PLC/IPC).

Information on the module-specific parameters, which are supported by the module used, can be found in the manual for the relevant module. Basic information on the different parameters can be found in Appendix C in this manual.

Diagnostic functions

Extensive diagnostic information can be accessed depending on the field bus used.

Status bits

Common diagnostic messages (global error messages) are displayed by means of 8 internal inputs (8 status bits).

I/O diagnostic interface

With field buses which do not possess extensive diagnostic functions, the diagnostic information of the CPX terminals is available via the so-called I/O diagnostic interface. The I/O diagnostic interface enables bus-independent access to diagnostic information, data and parameters via internal digital I/Os (16 inputs and 16 outputs).

Diagnostic memory

Faults which occur during operation are entered in a diagnostic memory. The first 40 or the last 40 entries are saved, as well as the relevant time measured from the moment the power supply was switched on.

Field bus specific diagnostic functions

Special diagnostic functions or communication services are available, depending on the field bus used. For example communication services on:

- the DPVI (PROFIBUS)
- the PCP channel (Interbus)
- SDO access (CANopen)
- etc.

Fitting

Chapter 2

Contents

Contents of this chapter

The CPX terminal is already assembled when supplied from the factory. If you wish to add or remove electric modules, you must fit or remove further manifold sub-bases. This chapter describes how to fit and remove manifold sub-bases as well as how to assemble and dismantle a complete CPX terminal.

Further information

Please refer to the following manuals if you wish to replace individual electronic modules or sub-bases, or replace and add pneumatic components:

- "Manual for the I/O modules" for fitting and removing the module electronics and the sub-bases
- "Pneumatics manual" for fitting and removing the pneumatic modules and components
- The fitting instructions supplied with the product in the case of modules and components ordered at a later stage

2.1 General instructions on fitting and dismantling

Warning
Sudden unexpected movement of the connected actuators and uncontrolled movements of loose tubing can cause injury to human beings or damage to property.

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

– the compressed air supply
– the operating and load voltage supplies.

Please note
Handle all modules and components of the CPX terminal with great care. Please note especially the following:

– Screw connections must be fitted free of offset and mechanical tension. Screws must be fitted accurately (otherwise threads will be damaged).
– The specified torques must be observed.
– The modules must not be offset (IP65).
– Contact surfaces must be clean (avoid leakage and contact faults).
– The contacts of the Midi/Maxi valve solenoid coils must not be bent (not resistant to bending, i.e. they will break off if they are bent back).

– Electrostatically sensitive components
  Do not touch the contact surfaces of the plug connectors on the sides of the modules and components.

2.2 Fitting the electric modules

Caution
Modules may be damaged if they are not handled correctly.

- Observe the regulations for handling electrostatically sensitive components.
- Discharge yourself electrostatically before fitting or removing components in order to protect the components against discharges of static electricity.

By adding or removing modules you can adapt the CPX terminal to your requirements. The mechanical link between the electric modules is made via tie rods in the sub-bases. The length of the tie rod is determined by the possible number of sub-bass or electric modules.

Dismantle the CPX terminal before you add or remove sub-bases. If you are using the additional fastenings of type CPX-BG-RW-... for fastening onto a wall, it may be necessary to loosen fastenings (see also Fig. 2/14).

Rules for assembly

– A maximum of 10 electric modules including the field bus node plus a pneumatic interface are permitted on the electrical side.

– For MPA pneumatics:
The MPA pneumatic interface does not count as an electric module. Instead, the individual MPA pneumatic modules each represent an electric module with digital outputs for triggering the integrated valves. A maximum of 8 MPA pneumatic modules are permissible.

– Except for the pneumatic interface, each electric module including the field bus node can be fitted in any position on the electrical side.

The electric modules can be arranged in any sequence in the CPX terminal. Depending on the field bus protocol used, it may however be sensible to arrange modules of the same type one after the other. In these cases, the address assignment and therefore communication between the field bus master and the individual CPX terminals can be optimised.

– The pneumatic interface must be placed on the right-hand side as the last electric module.

– Sub-bases can be used universally for field bus nodes and I/O modules.

– If sub-bases with additional supply are not required, the manifold sub-base with the system supply can be fitted in any desired position.

– If manifold sub-bases with additional supply are required, these must always be placed to the right of the system supply (see also section 1.1.3).

– Sub-bases can be used universally for the different I/O modules.

- The maximum number of pneumatic components supported is as follows:
  - 26 valve coils of type Midi/Maxi
  - 22 valve coils of type CPA

2.2.1 Replacing a complete module or manifold sub-base

The manifold sub-bases are connected to each other mechanically by means of two tie rods. The tie rods are situated in a groove in the housing open at the rear.

1 Tie rod groove

2 Tie rods

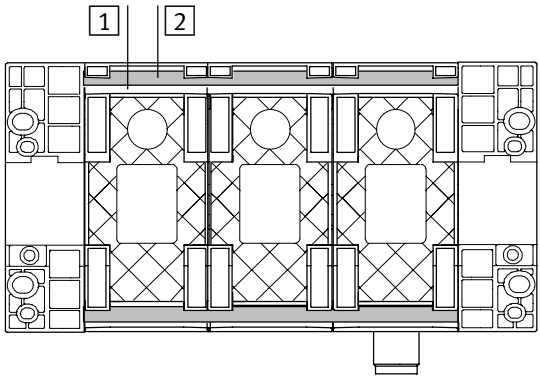


Fig. 2/1: CPX terminal (rear view)

Proceed as follows in order to remove a complete module or a manifold sub-base:

1. Dismantle the CPX terminal

2. Unscrew and remove completely the tie rod screws in the left-hand end plate (see Fig. 2/2). The manifold sub-bases are held together by the electrical plug connectors.

1 Tie rod screw

2 Hexagon socket wrench size 3

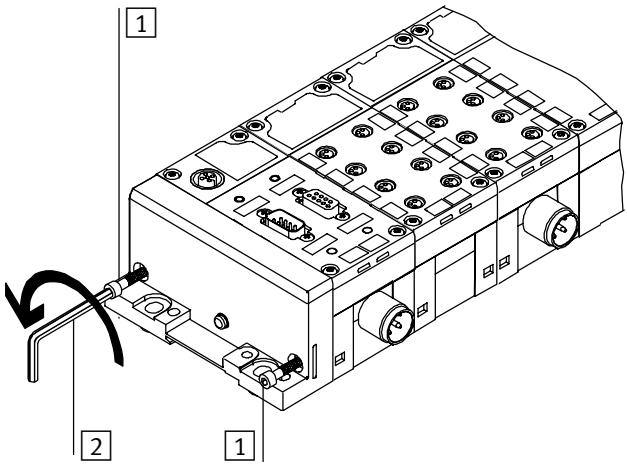


Fig. 2/2: Dismantling electric I/O modules

Caution
Make sure that the electric plug connectors of the manifold sub-bases are **not** bent.

3. Loosen the electrical plug connectors on the relevant manifold sub-base by taking the manifold sub-base apart carefully and without tilting it.
4. Now push the modules to the left of the module to be replaced approx. 3 cm to the left.
5. Now push the module to be replaced approx. 1.5 cm to the left.
6. Make sure that the tie rod lies over the tie rod groove of the module to be replaced by shifting the module accordingly (see arrow A in Fig. 2/3).

1 Tie rods

2 Loosened module

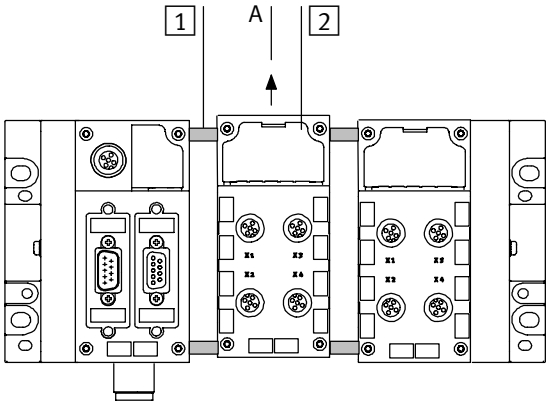


Fig. 2/3: Removing a module or manifold sub-base

7. Carefully remove the loosened module by lifting it upwards.

In order to insert a module or manifold sub-base again, proceed as follows:

1. Insert the module in the desired position (see Fig. 2/3). The tie rod must lie exactly over the tie rod groove.

Caution
When sub-bases are arranged in series:
Make sure that the electric plug connectors of the manifold sub-bases are **not** bent.

2. Align the CPX terminal on a flat surface so that the components are not offset.
   In the case of CPX terminals without pneumatics or with CPA pneumatics, you can place the CPX terminal so that the electrical connections for the system supply and, if applicable, for the additional supply point upwards. The tie rod is held in the tie rod groove by the weight force.

1 The electrical connection of the system supply points upwards

2 Tie rods

3 Tie rod groove

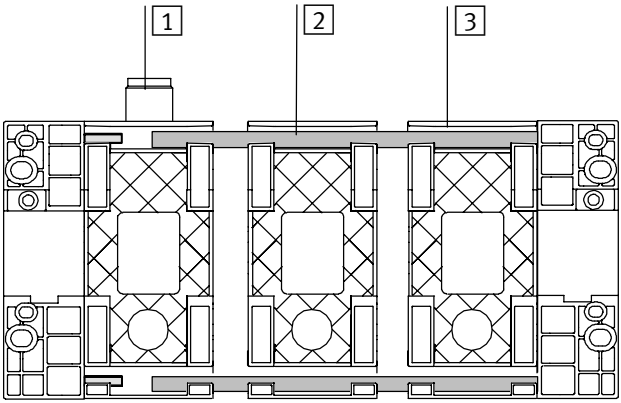


Fig. 2/4: CPX terminal (rear view)

3. Press the manifold sub-bases together carefully and without tilting.
4. Place the end plate on the tie rod.
5. Make sure that the tie rods and plug connectors are correctly seated. Carefully screw the tie rod screws a few turns into the tie rods.
6. Then tighten the screws equally with a hexagon socket wrench size 3 max. 2 Nm ± 0.3 Nm.

2.2.2 Increasing or reducing the number of electric modules

The length of the tie rod is determined by the possible number of sub-bases or electric modules. In order to extend the CPX terminal with a further electric module, you will require a tie rod extension (see Tab. 2/1).

In order to increase or reduce the number of modules by more than one module, you must replace the tie rods by tie rods of the appropriate length. The following table contains a list of the tie rods which you will need in order to adapt the length of the tie rods to the desired number of modules.

Type	Number of modules	Description
CPX-ZA-1 CPX-ZA-2 ... CPX-ZA-9 CPX-ZA-10	1 2 ... 9 10	Tie rod sets (each contains two tie rods of the appropriate length)
CPX-ZA-1-E	+1	Tie rod extension for a further electric module (max. one tie rod extension per tie rod permitted)

Tab. 2/1: Tie rod sets and tie rod extension

Fitting the tie rod extension

Please note
Please observe the following instructions when fitting the tie rod extension in order to avoid damage to the CPX terminal:

- Fit the tie rod extension so that it is flush with the tie rod (it need not be tightened).

– Only one tie rod extension is permitted for each tie rod.

– Maximum 10 electric modules including the field bus node plus a pneumatic interface are permitted for each CPX terminal.

Removing

Remove the electric modules or manifold sub-bases as follows (see also following Fig.):

1. Unscrew and remove completely the tie rod screws in the left-hand end plate (see Fig. 2/2).
2. Remove the left-hand end plate from the tie rods. The manifold sub-bases are now held together only by the electrical plug connectors.
3. Removing manifold sub-bases
   Loosen the electrical plug connectors on the relevant manifold sub-base by taking the manifold sub-base apart carefully and without tilting it.
4. Pull the loosened manifold sub-bases away from the tie rod.
5. Removing a tie rod
   With the aid of a suitable tool, e.g. a screwdriver, remove the appropriate fastening and locking plate in the pneumatic interface or in the right-hand end plate (see following Fig.).

[1] Screwdriver

[2] Fastening plate and locking plate in the pneumatic interface or the right-hand end plate

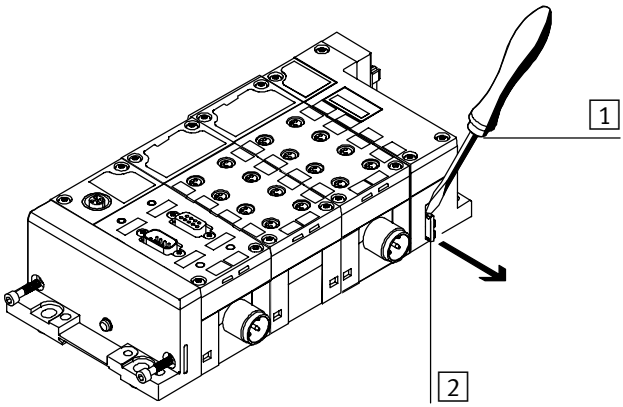


Fig. 2/5: Fastening plate and locking plate in the pneumatic interface

Fitting

Fit the tie rod and the electric modules or manifold sub-bases as follows (see also following Fig.):

Please note

- Place subsequently ordered modules where possible after the last module before the pneumatic interface or in front of the right-hand end plate.
- Do not fit more than 10 electric modules and one pneumatic interface.
- Fit modules of the same type where possible in series (e.g. first all input modules then all output modules). This can be an advantage for the address assignment of the CPX terminal, depending on the field bus used.

1. Fasten the tie rod in the pneumatic interface or the right-hand end plate, by placing the fastening plate over the locking plate and pushing these together into the groove intended for this purpose. The locking plate must lie on the side facing the pneumatics. The hooks on the locking plate must grip into the grooves in the fastening plate.

1 Locking plate

2 Fastening plate

3 Groove for tie rod fastening

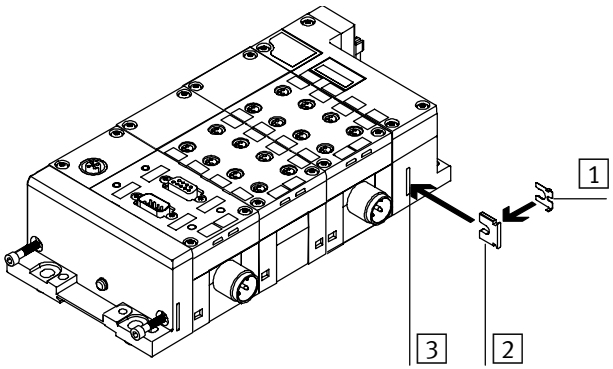


Fig. 2/6: Fastening plate and locking plate in the pneumatic interface (example)

2. Push the manifold sub-bases onto the tie rod carefully and without tilting.

Caution
When sub-bases are arranged in series:
Make sure that the electric plug connectors of the manifold sub-bases are **not** bent.

3. Align the CPX terminal on a flat surface so that the components are not offset.
   In the case of CPX terminals without pneumatics or with CPA pneumatics, you can place the CPX terminal so that the electrical connections for the system supply and, if applicable, for the additional supply point upwards. The tie rod is held in the tie rod groove by the weight force.

1 The electrical connection of the system supply points upwards

2 Tie rods

3 Tie rod groove

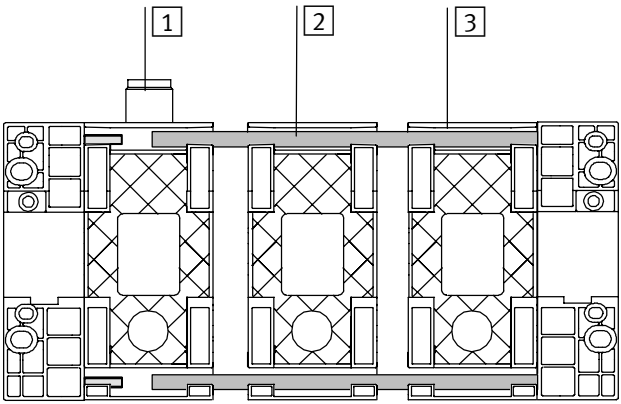


Fig. 2/7: CPX terminal (rear view)

4. Press the manifold sub-bases together carefully and without tilting.

5. Place the end plate on the tie rod.

6. Make sure that the screw connectors are seated correctly and carefully screw the tie rod screws a few turns into the tie rods.

7. Then tighten the screws equally with a hexagon socket wrench size 3 max. 2 Nm ± 0.3 Nm.

2.2.3 Fitting the right-hand end plates with Midi/Maxi valves

Please note
With Midi/Maxi valves, the right-hand end plate is earthed internally when the valve terminal is supplied from the factory. If you undertake extensions/conversions to the valve terminal, earth the right-hand end plate of the terminal as described below.

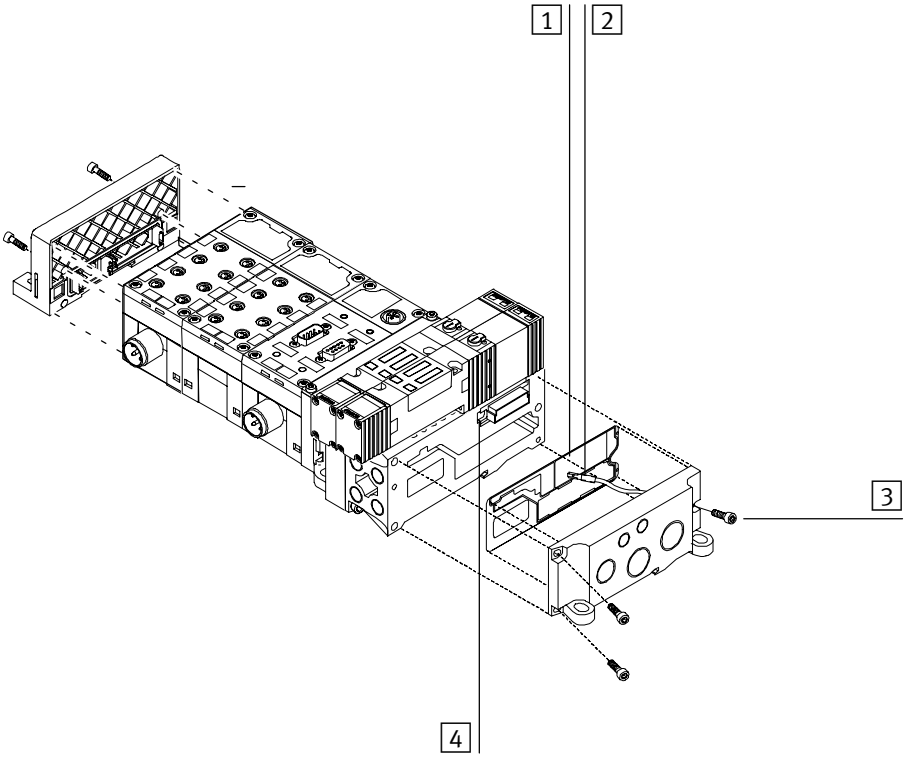
In this way, you will avoid interference caused by electromagnetic influences.

Earth the end plates after extension/conversion as follows:

1. Right-hand end plate (Midi/Maxi):
   In order to earth the right-hand end plate, connect the cable fitted on the inside onto the appropriate contacts of the pneumatic module or the node (see following diagram).

2. Left-hand end plate:
   The left-hand end plate is connected conductively with the other components by means of rails in the sub-base.

Please note:
Instructions on earthing the complete valve terminal can be found in the chapter “Installation”. The following diagram shows you how to fit the right-hand end plates with Midi/Maxi valves.



1 Seal

2 Pre-fitted earth cable

3 Fastening screws max. 1 Nm

4 Contact for earth cable

Fig. 2/8: Fitting the end plates with Midi/Maxi pneumatics

2.3 Fitting the CPX terminal

You can fit the CPX terminal in one of two ways:

Type of fitting	Description
Fitting onto a hat rail	The CPX terminal is suitable for fitting onto a hat rail (support rail as per EN 60715). There is a guide groove on the back for hanging the valve terminal onto the hat rail.
Fitting onto a wall	The end plates and the pneumatic interface contain holes for fitting the terminal onto a wall. In the case of long CPX terminals, additional fastening clips are required on the electric modules.

Tab. 2/2: Methods of fitting the CPX terminal

Please note
Fit the CPX terminal so that there is sufficient space for heat dissipation and ensure that the maximum limits for temperatures are observed (see Technical specifications).

2.3.1 Fitting CPX terminals without pneumatics onto a hat rail

For fitting the CPX terminal without pneumatics onto a hat rail, you will require fitting kit type CPA-BG-NRH. This kit consists of 2 M4x10 screws and 2 clamping elements.

Fitting onto a hat rail is carried out in the same manner as fitting CPX terminals with CPA valves onto a hat rail (see section 2.3.2).

2.3.2 Fitting CPX terminals with CPA or MPA pneumatics onto a hat rail

For fitting the CPX terminal onto a hat rail you will require fitting kit type CPX-CPA-BG-NRH. This kit consists of 3 M4x10 screws and 3 clamping elements.

Caution
Hat rails fitted with CPA14 valve terminals can break if they are subjected to vibration which exceeds the following values:

– 0.15 mm path at 10...58 Hz

– 2 g acceleration at 58...150 Hz

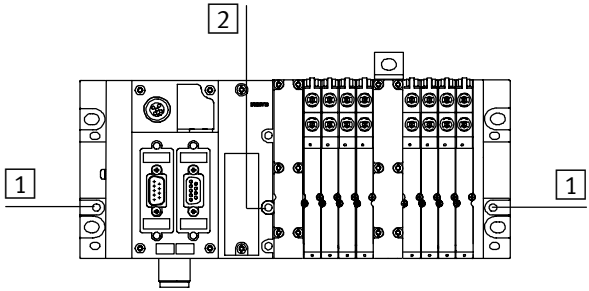
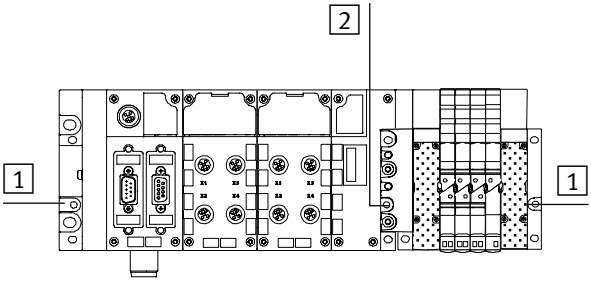
This can cause damage to the CPA valve terminal or to your machine or system.

- Use the wall fitting for CPA14 valve terminals.

Caution

– A hat-rail fitting without a hat-rail clamping unit is not permitted.

- If the terminal is fitted in a sloping position or if it is subjected to vibration, secure the hat-rail clamping unit additionally
  – against sliding down and against unintentional the locking screws (see Fig. 2/9, item 3)
  – with the locking screws intended for this purpose (item 6).

Variants	Fastening possibilities
CPX terminal with MPA pneumatics 	Holes for the hat rail clamping units: 1 in the end plates 2 in the pneumatic interface
CPX terminal with CPA pneumatics 	Holes for the hat rail clamping units: 1 in the end plates 2 in the pneumatic interface

Tab. 2/3: Holes for the hat rail clamping unit

Proceed as follows:

1. Make sure that the fastening surface can support the weight of the CPX terminal.
2. Fit the hat rail (support rail as per EN 60715 – 35x7.5; width 35 mm, height 7.5 mm).
   Make sure there is sufficient space for connecting the compressed air supply tubing.
3. Fasten the hat rail to the fastening surface at intervals of approx. every 100 mm.

4. Fit a hat-rail clamping unit to both the left and the right-hand end plates and the pneumatic interface of the CPX terminal.

5. Hang the CPX terminal onto the hat rail (see Fig. 2/9, arrow A).

1 Hat rail

2 Clamping element of the hat rail clamping unit

3 Locking screw of the hat rail clamping unit

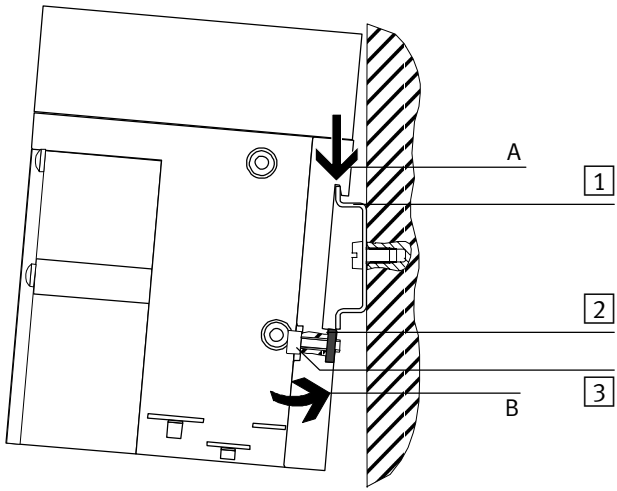


Fig. 2/9: Fitting a CPX terminal (here with CPA pneumatics) onto a hat rail

6. Swing the CPX terminal onto the hat rail (see Fig. 2/9, arrow B). Make sure that the clamping element lies horizontally to the hat rail.

7. Fasten the CPX terminal against tilting or sliding by tightening the locking screws with 1.3 Nm.

1 Hat rail

2 Clamping element of the hat rail clamping unit

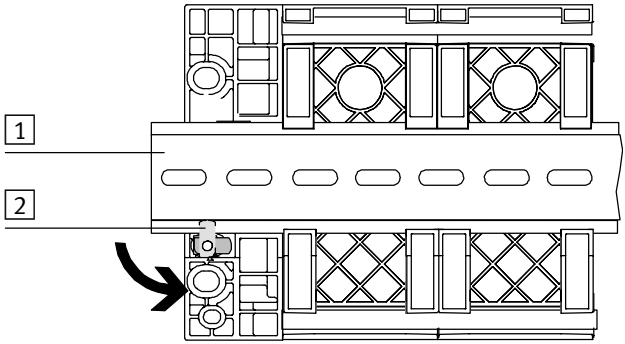


Fig. 2/10: Rear view: Fitting the CPX terminal onto a hat rail

2.3.3 Fitting CPX terminals with Midi/Maxi pneumatics onto a hat rail

For fitting the valve terminal onto the hat rail you will require a hat-rail clamping unit type CPX-03-4,0 (Midi) or type CPX-03-7,0 (Maxi).

Caution
- A hat-rail fitting without a hat-rail clamping unit is not permitted.
- If the terminal is fitted in a sloping position or if it is subjected to vibration, secure the hat-rail clamping unit additionally
  - against sliding down and against unintentional the locking screws (see Fig. 2/12, item 6)
  - with the locking screws intended for this purpose (item 6).

Please note
- If the terminal is fitted in a horizontal position and the load is at rest, it is not necessary to use the screws to secure the hat-rail clamping unit (see Fig. 2/12, item 6).
- If your terminal does not have a hat-rail clamping unit, you can order this and fit it at a later stage.
- Whether Midi or Maxi clamping elements are to be used depends on the end plates fitted (Midi/Maxi).

The CPX terminal has been prepared for fitting onto a wall. To compensate for the difference in height, two spacer rings have therefore been placed on both the right-hand end plate and on the pneumatic interface at the factory.

- Recommendation: Use a suitable tool to remove the upper spacer rings (e.g. scratch them off with a screwdriver). There is then sufficient space to hang the terminal on the hat rail.

[1] Remove the spacer rings

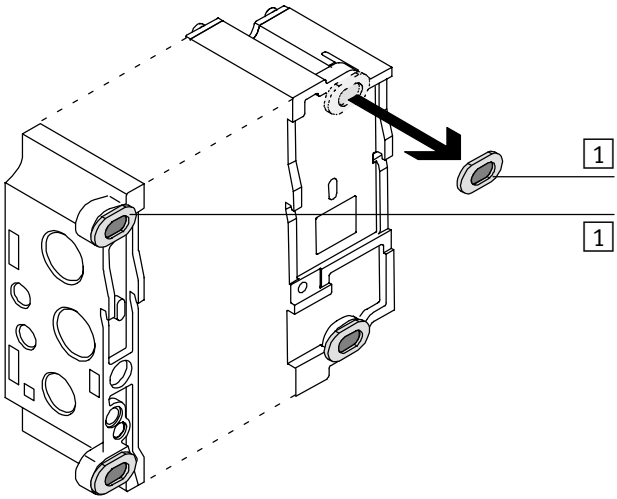


Fig. 2/11: Rear view: Spacer rings on the right-hand end plate and the pneumatics interface

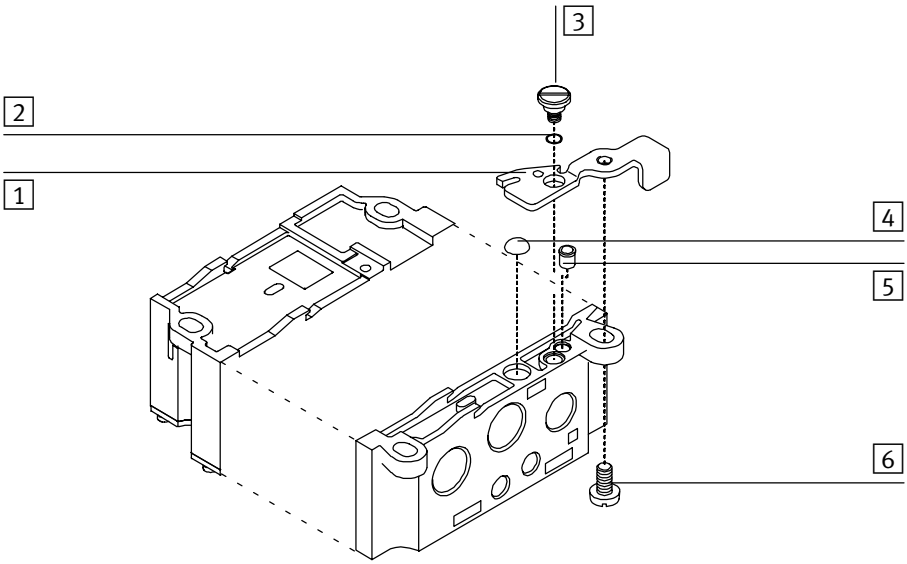
The hat rail clamping unit must be fastened to the rear of the right-hand end plate and the pneumatic interface as shown in the following diagram.

Before fitting

- Glue the rubber feet on. Make sure that the surfaces to be glued are clean (clean with spirit).
- Tighten the flat-head screws (see Fig. 2/12, item 3).
- Make sure that the spacer rings have been removed.

After fitting

- Secure the levers with the aid of the locking screws (see Fig. 2/12, item 6).



1	Lever *)	4	Self-adhesive rubber foot
2	O-ring	5	Clamping elements
3	Flat-head screw	6	Locking screw

*) Different lever lengths with Midi and Maxi

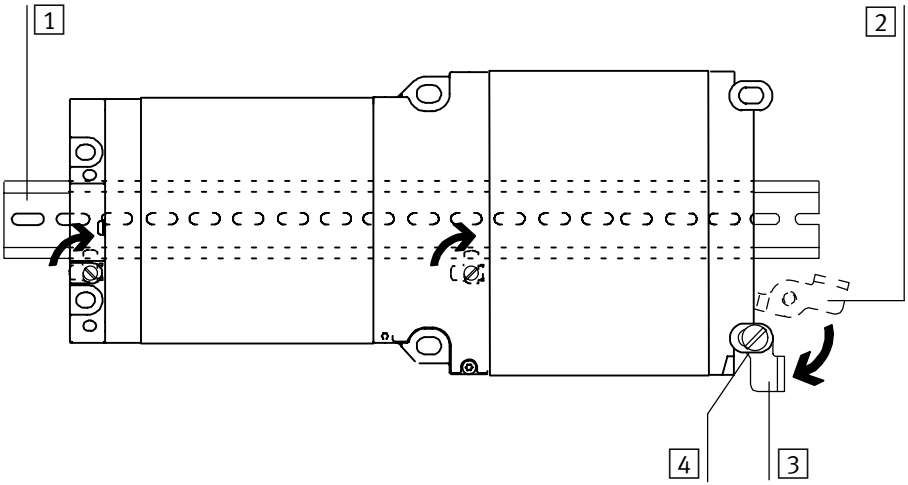
Fig. 2/12: Fitting the hat rail clamping unit

Fit the hat rail as follows:

1. Make sure that the fastening surface can support the weight of the CPX terminal.
2. Fit a hat rail (support rail as per EN 60715 – 35x15; width 35 mm, height 15 mm).
3. Fasten the hat rail at least every 100 mm to the fastening surface.

4. Hang the terminal onto the hat rail. Secure the valve terminal on both sides with the hat-rail clamping unit against tilting or sliding down (see Fig. 2/13).

5. With a vibrating load or if the node is fitted in a sloping position, secure the hat rail clamping unit against unintentional loosening or opening with two locking screws (Fig. 2/13, item 4).



1 Hat rail

2 Hat-rail clamping unit unlocked

3 Hat-rail clamping unit locked

4 Locking screw

Fig. 2/13: Top view: Fitting the valve terminal onto a hat rail

2.3.4 Fitting onto a wall

The end plates and the pneumatic interface contain holes for fitting the terminal onto a wall.

For CPX terminals with Midi/Maxi pneumatics:
To compensate for the difference in height between the pneumatic and the electrical sides of the CPX terminal, spacer rings have been fitted to the pneumatic interface and to the right-hand end plate at the factory.

Caution
When fitted onto a wall, the CPX terminal can bend and be damaged in the following cases:

– when fitted to an uneven, flexible surface
– when fitting CPX terminals with Midi/Maxi pneumatics without spacer rings onto a wall.

Fit the CPX terminal only onto a flat fixed surface. Make sure that the spacer rings are fitted before you mount the CPX terminal with Midi/Maxi pneumatics.

Caution
Overstressing the fastening holes, bending the CPX terminal or internal vibrations can cause damage.

In these cases, use additional fastenings type CPX-BG-RW-10X approx. every 100 or 150 mm.

Fastenings of type CPX-BG-RW-10X can be clipped into two electric modules placed together and offer additional possibilities for fitting onto a wall.

1 Fit the fastenings

2 Clip the fastenings into place

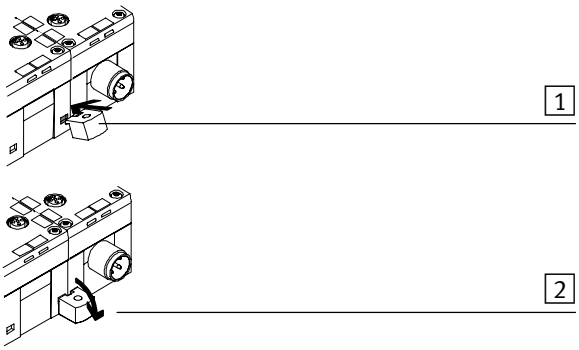
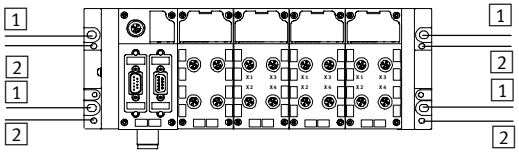
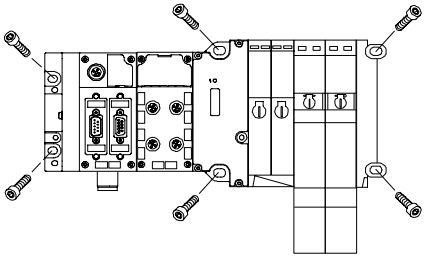
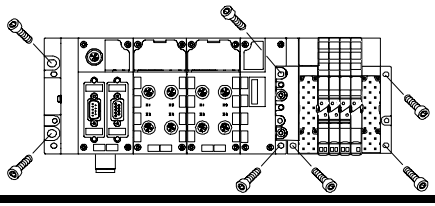


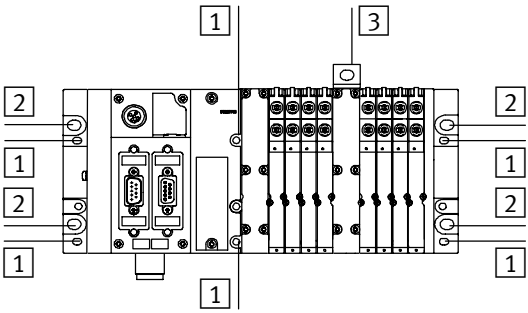
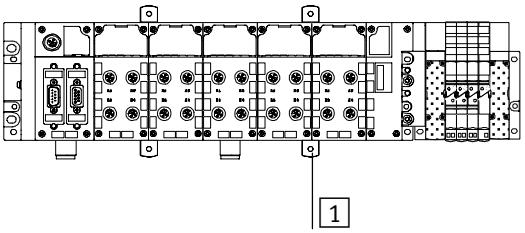
Fig. 2/14: Fitting fastening type CPX-BG-RW-10X

For fitting onto a wall, proceed as follows:

1. Make sure that the fastening surface is flat and can support the weight of the CPX terminal.
2. Check whether you need additional fastenings of type CPX-BG-RW-10X for the I/O module (if applicable, approx. every 100 or 150 mm).
3. With CPX terminals with Midi/Maxi pneumatics: Make sure that the spacer rings have been fitted.
4. With CPX terminals with MPA pneumatics: Check whether you need additional wall supports for the pneumatics module (see MPA pneumatics manual).
5. Fasten the CPX terminal with two screws on both the left and right-hand end plates and with two screws on the pneumatic interface. The valve terminal can be fitted in any position.

Make sure there is sufficient space for connecting the power cables and compressed air tubing.

Variants	Fastening possibilities
	CPX terminal without pneumatics – End plates: 2 screws each of size M4 or M6 1 Hole for M4 2 Hole for M6
	CPX terminal with Midi/Maxi pneumatics Fastening with: – two M6 screws on both the left and right-hand end plates. – two M6 screws on the pneumatic interface.
	CPX terminal with CPA pneumatics Fastening with: – two M6 screws on both the left and right-hand end plates. – three M6 screws on the pneumatic interface.

Variants	Fastening possibilities
	MPA valve terminal with CPX terminal – End plates: two screws each of size M4 or M6 – Pneumatic interface: two M4 screws – Fastening bracket on the supply unit (optional): one M6 screw [1] Hole for M4 screw [2] Hole for M6 screw [3] Hole for M6 screw in the wall bracket (see MPA pneumatics manual)
	Long CPX terminal with additional fastening type CPX-BG-RW-10X (optional) – End plates: two M6 screws each – Pneumatic interface: M6 screws (2 for Midi/Maxi, 3 for CPA). – for each additional fastening ([1]) 1 M4 screw.

Tab. 2/4: Fastening possibilities for fitting onto a wall

Installation

Chapter 3

Contents

Contents of this chapter

This chapter contains general instructions on installing CPX terminals. The following information in particular belongs here:

- Accessories (connecting cables, sockets, power units)
- Calculating the current consumption
- Connecting the operating and load voltage supplies

Further information

Information on the power supply concept of the CPX terminal can be found in section 1.1.3.

Important installation instructions on observing the UL requirements when the product is operated in every region of the United States and Canada, can be found in the UL-specific brief operating instructions. The relevant technical specifications listed there also apply here.

Installation instructions on the field bus node as well as on the I/O modules can be found in the manual for the relevant module or field bus node.

Instructions on installing the pneumatic components can be found in the relevant pneumatics manual.

3.1 General instructions on installation

Please note
Note the following if your application requires fulfilment of the specifications of the “Recognized Component Marks for Canada and the United States”:

– Rules for observing the UL approval can be found in the UL-specific brief operating instructions. The relevant technical specifications listed there also apply here.
– The technical specifications in this documentation may show different values.

Warning
Sudden unexpected movement of the connected actuators and uncontrolled movements of loose tubing can cause injury to human beings or damage to property.

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

– the compressed air supply
– the operating and load voltage supplies.

3.1.1 Connecting cable

Field bus cable

Use a suitable cable for your field bus system. Refer to the manual for your controller for the type of cable to be used. Also take into account here the distance and the field bus baud rate.

Operating voltage cable

Use a cable for the operating voltage with sufficient cross-sectional area. Avoid long distances between the power unit and the CPX terminal. Long operating voltage cables reduce the voltage supplied by the power unit.

If necessary, ascertain the suitable cross-sectional area of the cable and the maximum permitted cable length in accordance with the general rule in section A.2.

Preparing the connecting cable

Caution
The position of the pins on the plug is different from that on the socket.

- Pin assignment of the field bus interface see manual for the “CP field bus node”.
- Pin assignment of the sensor and actuator connections of input and output modules see manual “CPX I/O modules”.
- The operating voltage and load voltage connections are in the form of plugs. The pin assignment can be found in the following chapters.

Use plugs and sockets from the Festo supply programme which match the outer diameter of the cables used.

Preparing the plugs and cables

Connect the plugs and cables as follows (example):

1. Open the plugs/sockets as follows:
   - Power supply socket:
     Insert the mains power socket into the operating voltage connection of the CPX terminal. Unscrew the housing of the socket.
     Then remove the connecting part of the socket which is inserted in the operating voltage connection.
   - Field bus socket and sensor plug (only with PG...):
     Loosen the centre knurled nut.

1 Cable
2 Strain relief
3 Housing
4 Connecting part

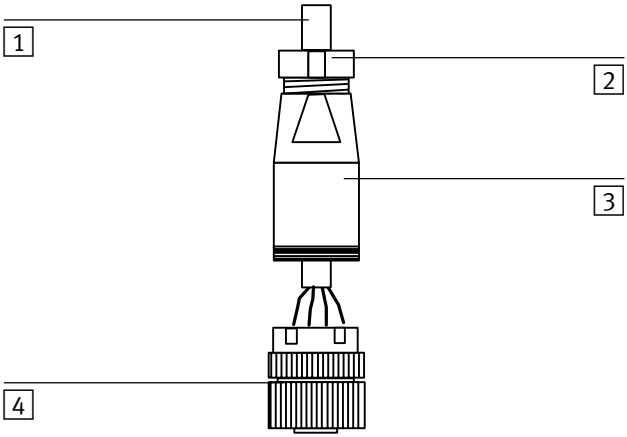


Fig. 3/1: Individual parts of the socket and cable exit

2. Open the strain relief on the rear part of the housing. Then pass the cable through.
3. Remove 5 mm of insulation from the end of the cable and fit end sleeves on the strands.
4. Connect the ends of the conductors.

5. Replace the connecting part on the housing of the plug/socket. Pull the cable back so that there are no loops inside the housing.

6. Tighten the strain relief.

3.1.2 Settings for configuring the CPX field bus node

The reaction of the CPX terminal can be adapted to various requirements. Important application-specific settings can be made here with DIL switches directly on the field bus node.

Settings on the CPX node

CPX terminals can be coupled to various field buses. Coupling is made via the CPX node which is adapted to suit the relevant field bus. The following settings can be made depending on the CP node used:

– The field bus configuration (e.g. field bus address)

– Error reaction of the CPX terminal

– Diagnostic reaction of the CPX terminal

Depending on the node used, the settings can be made, if necessary, with DIL switches on the node. The DIL switches are behind an easily accessible cover on the node.

Information on the method of procedure as well as on the setting possibilities on your CPX field bus node can be found in the manual for the field bus node.

3.1.3 Settings for configuring the pneumatics

Pneumatics of type 12 (CPA) and type 03 (Midi/Maxi)

From a technical viewpoint, the pneumatic interfaces for type 03 and type 12 represent electric modules with digital outputs. Detailed information on the pneumatic interfaces can be found in the manual for the CPX I/O modules.

Caution
When the pneumatics have been converted or extended, the number of output addresses occupied by the pneumatics must be set on a DIL switch on the pneumatic interface.

The DIL switch is situated under the transparent cover on the pneumatic interface.

Pneumatics of type 32 (MPA)

From the technical point of view, the individual MPA pneumatic modules each represent an electric module with digital outputs for controlling the valves fitted. In the case of VMPA1-FB-...-8, 8 digital outputs will always be assigned and in the case of VMPA2-FB-...-4, 4 digital outputs will always be assigned.

3.1.4 Selecting the power unit

Warning
- In order to provide the electric supply, use only PELV **circuits** as per IEC/DIN EN 60204-1 (Protective Extra-Low Voltage, PELV).
  Take into account also the general requirements for PELV circuits as per IEC/DIN EN 60204-1.
- Use only **power packs** which guarantee reliable electrical isolation of the operating voltage as per IEC/DIN EN 60204-1.

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

The current consumption of a CPX terminal depends on the number and type of integrated modules and components.

Recommendation:

- Used closed-loop power units.
- When selecting the power units, check that they have sufficient output. If required, ascertain here the current requirement according to the following table.

Please note
Select a power unit which provides sufficient output for later extensions to the CPX terminal.

Information on the power supply concept of the CPX terminal can be found in section 1.1.3.

Calculation

The following tables show how to calculate the current consumption of the system supply and the additional supplies. The values specified have been rounded up. Please refer to the relevant technical specifications for the current consumption of the valves and modules.

System supply type CPX-GE-EV-S or CPX-GE-EV-S-7/8-... Current consumpt. of the operat. voltage supply for the electronics and sensors		
Current consumption of the field bus node	approx. 200 mA	
Maximum current consumption of the CPX modules supplied via the system supply (internal electronics) [1]	+ _____ A	
Current consumption of the sensors supplied via the system supply (see manufacturer's specifications)	+ _____ A	
Current consumption of the technology modules supplied [2]	+ _____ A	
Sum of the current consumption of the operating voltage	= _____ A	_____ A
Current consumption of the the load voltage supply for the valves and outputs		
Current consumption of all simultaneously activated electric outputs which are supplied via the system supply (internal consumption at logic 1) [3]	_____ x _____A	
Load current of simultaneously activated outputs supplied via the system supply.	+ _____ A	
Current consumption of all simultaneously energized valve coils [4]	+ _____ A	
Current consumption of the technology modules supplied [2]	+ _____ A	
Sum of the current consumption of the load voltage	= _____ A	+ _____ A
Total current consumption of the system supply		= _____ A

[1] See technical specifications of the I/O modules, pneumatic modules and MPA modules
[2] Including further modules and components supplied via the technology module
[3] Internal consumption at logical 1 see technical specifications for the output module
[4] Depends on current consumption of valve type (see technical specifications for the valves)

Tab. 3/1: Table for calculating the current consumption of the system supply (Pin assignment, see Tab. 3/4)

Caution
The maximum permitted current per pin on the supply is: 16 A. Note that with system supply via pin 3 (0 V), the sum of both currents from pin 1 and pin 2 flows via pin 2.

– M18 plug: 16A
– 7/8 plug, 4-pin: 12 A*)
– 7/8 plug, 5-pin: 12 A*)

*) limited by the specifications of the connected plug connector.
Please note that with system supply with 4 pin plug via pin **"0 V"**, the sum of both currents of the operating and load voltages flows.

Additional supply for outputs type CPX-GE-EV-Z or CPX-GE-EV-Z-7/8-... (optional) Current consumption of load voltage supply for outputs		
Current consumption of all simultaneously activated electric outputs which are supplied via the additional supply (internal consumption at logic 1) [1]	_____ x _____A	
Load current of simultaneously activated outputs supplied via the additional supply	+ _____ A	
Current consumption of the technology modules supplied [2]	+ _____ A	
Sum of the current consumption of the load voltage	= _____ A	+ _____ A
Total current consumption of the additional supply		= _____ A

[1] Internal consumption at logical 1 see technical specifications for the output module
[2] Including further modules and components supplied via the technology module

Tab. 3/2: Table for calculating the current consumption of the additional supply for the outputs (Pin assignment, see Tab. 3/4)

Additional supply for valves of type CPX-GE-EV-V or CPX-GE-EV-V-7/8-4POL (optional) Current consumption of load voltage supply for valves		
Current consumption of all simultaneously energised valve coils [1)]	_____ A	
Sum of the current consumption of the load voltage	= _____ A	+ _____ A
Total current consumption of the additional supply		= _____ A
[1)] Depends on current consumption of valve type (see technical specifications for the valves)		

Tab. 3/3: Table for calculating the current consumption of the additional supply (Pin assignment, see Tab. 3/4)

Information on the power supply concept of the CPX terminal can be found in section 1.1.3.

3.1.5 Connecting the operating voltage

Please note
Check within the framework of your EMERGENCY STOP circuit, to ascertain the measures necessary for putting your machine/system into a safe state in the event of an EMERGENCY STOP (e.g. switching off the operating voltage for the valves and output modules, switching off the compressed air).

Please note
With CPX terminals with Midi/Maxi pneumatics, CPA pneumatics or CPX-CP interface:

- Note that the lower tolerance range of the pneumatics must be observed when the operating and load voltage supplies are provided by a power unit.

– Tolerance ranges:

Midi/Maxi pneumatics:	± 10 %
CPA pneumatics or CPX-CP interface:	+ 10 /- 15 %
MPA pneumatics:	± 25 %

Check the 24 V load voltage of the outputs while your system is operating. Make sure that the load voltage of the outputs lies within the permitted tolerance even during full-load operation.

Recommendation:
Use a closed-loop power unit.

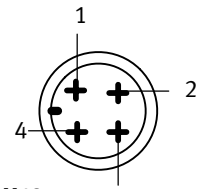
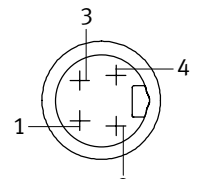
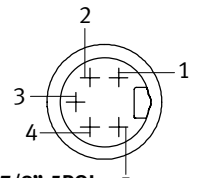
Caution
Short circuits can cause damage. Protect the system supply and the additional supplies each with an external fuse:

– M18 plug, 4-pin: 16 A
– 7/8 plug, 5-pin: 12 A*)
– 7/8 plug, 5-pin: 12 A*)

*) limited by the specifications of the connected plug connector.

Manifold base	Description
System supply type CPX-GE-EV-S...	The following components are supplied with + 24 V DC: – The operating voltage for the internal electronics of the CPX terminal and the sensors connected to the input modules (+ 24 V DC, tolerance + 25/- 25 %). – Load voltage for the outputs of the output modules and, if applicable, valve solenoid coils (+ 24 V DC) Tolerance: – without pneumatics: ± 25 %, – with Midi/Maxi pneumatics: ± 10 %, – with CPA pneumatics or CPX-CP interface: + 10/- 15 %. – with MPA pneumatics: ± 25 %.
Additional supply of the electric outputs type CPX-GE-EV-Z...	The following components are supplied with + 24 V DC: – Load voltage for the integrated output module and, if applicable, for the subsequent output modules on the right (+ 24 V DC, tolerance + 25/- 25 %).
Additional supply of the valves type CPX-GE-EV-V... 1)	The following are supplied with + 24 V DC: – The load voltage for the valve solenoid coils (+ 24 V DC). Tolerance: – with Midi/Maxi pneumatics: ± 10 %, – with CPA pneumatics or CPX-CP interface: + 10/- 15 %. – with MPA pneumatics:1) ± 25 %.

1) Additional supply type CPX-GE-EV-V is not permitted with MPA pneumatic modules with MPA electronic modules type VMPA...-FB-EM**S**-... (see the manual for the CPX I/O modules).

Plug	Pin assignment of manifold base with		
	System supply type CPX-GE-EV-S...	**Additional supply type CPX-GE-EV-Z...**	**Valve supply type CPX-GE-EV-V...**
 **M18**	1: 24 $V_{EL/SEN}$ 2: 24 V_{VAL}/24 V_{OUT} 3: 0 $V_{EL/SEN}$ / 0 V_{VAL}/0 V_{OUT} 4: Earth/ground connection	1: Not connected 2: 24 V_{OUT} 3: 0 V_{OUT} 4: Earth/ground connection	1: Not connected 2: 24 V_{VAL} 3: 0 V_{VAL} 4: Earth/ground connection
 **7/8"-4POL**	1: 24 V_{VAL} / 24 V_{OUT} 2: 24 $V_{EL/SEN}$ 3: Earth/ground connection 4: 0 $V_{EL/SEN}$ / 0 V_{VAL} / 0 V_{OUT} (leading)	1: 24 V_{OUT} 2: not connected 3: Earth/ground connection 4: 0 V_{OUT} (leading)	1: 24 V_{VAL} 2: not connected 3: Earth/ground connection 4: 0 V_{VAL} (leading)
 **7/8"-5POL**	1: 0 V_{VAL} / 0 V_{OUT} 2: 0 $V_{EL/SEN}$ 3: Earth/ground connection (leading) 4: 24 $V_{EL/SEN}$ 5: 24 V_{VAL} / 24 V_{OUT}	1: 0 V_{OUT} 2: Not connected 3: Earth/ground connection (leading) 4: Not connected 5: 24 V_{OUT}	–
$V_{EL/SEN}$ Operating voltage for electronics/sensors V_{OUT} Load voltage for outputs V_{VAL} Load voltage for valves			

Tab. 3/4: Pin assignment system supply, additional supply and valve supply

Potential equalisation

The CPX terminal has two earthing connections for potential equalisation:

– Pin 4 (M18 plug) or pin 3 (7/8" plug) of the power supply connection of the system supply (incoming)

– Pin 4 (M18 plug) or pin 3 (7/8" plug) of the load voltage connection of the additional supply (incoming)

– Earth connection on the left-hand end plate (see Fig. 3/2)

→

Please note

- Always connect the earth potential to pin 4 (M18 plug) or pin 3 (7/8" plug) of the load and operating voltage connections.
- Connect the earth connection of the left-hand end plate to the earth potential with low impedance (short cable with large cross-sectional area).
- With low-impedance connections you can ensure that the earth connection at the left-hand end plate and the earth connection at pin 4 (M18 plug) or pin 3 (7/8" plug) have the same potential and that there are no equalising currents.

In this way you can avoid faults due to electromagnetic influences and ensure electromagnetic compatibility in accordance with EMC guidelines.

Connection example 1

The diagram below shows as an example the connection of a common 24 V supply for pins 1 and 2 (M18 plug). Please note here that:

- The lower tolerance 24 V DC + 10/- 15 % must be observed.
- Both connections for potential equalisation are connected and that equalising currents must be prevented.
- The load voltage at pin 2 of the M18 plug (valves and outputs) can be switched off separately.
- External vibrations depending on application; maximum value in sum for both fuses 16 A.

1 Potential equalisation

2 External fuses

3 The load voltage of the valves and outputs can be switched off separately

4 Earth connection pin 4 is designed for 16 A

5 Connection for system supply type CPX-GE-EV-S

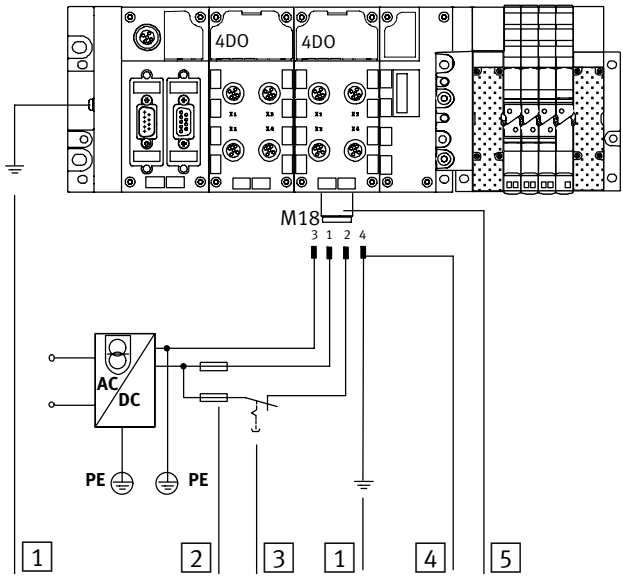
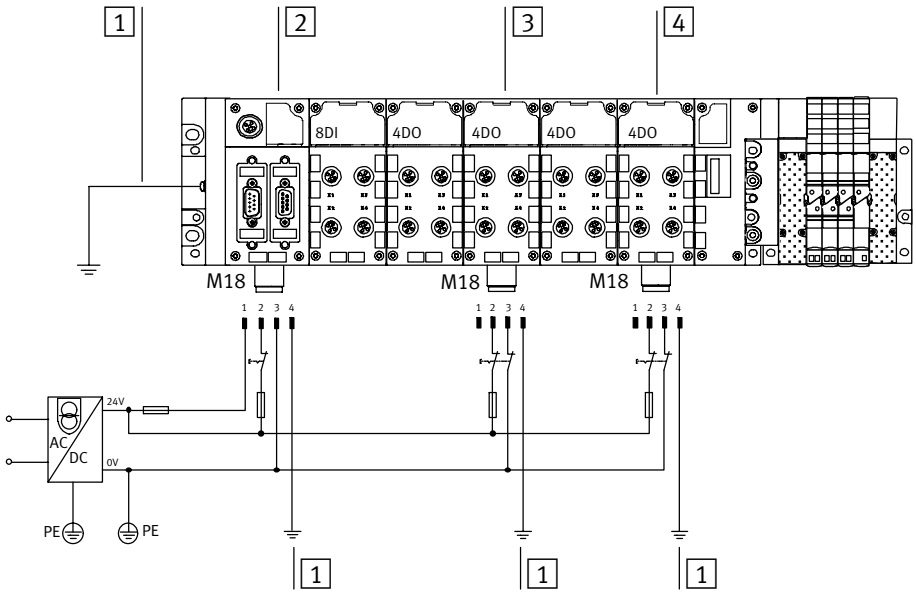


Fig. 3/2: Example – Connecting a common 24 V power supply and the potential equalisation (system supply with M18 plug)

Connection example 2

The following diagram shows the connection with system supply and an additional supply each for electric outputs and valves.



1 Potential equalisation

2 Manifold base with system supply type CPX-GE-EV-S

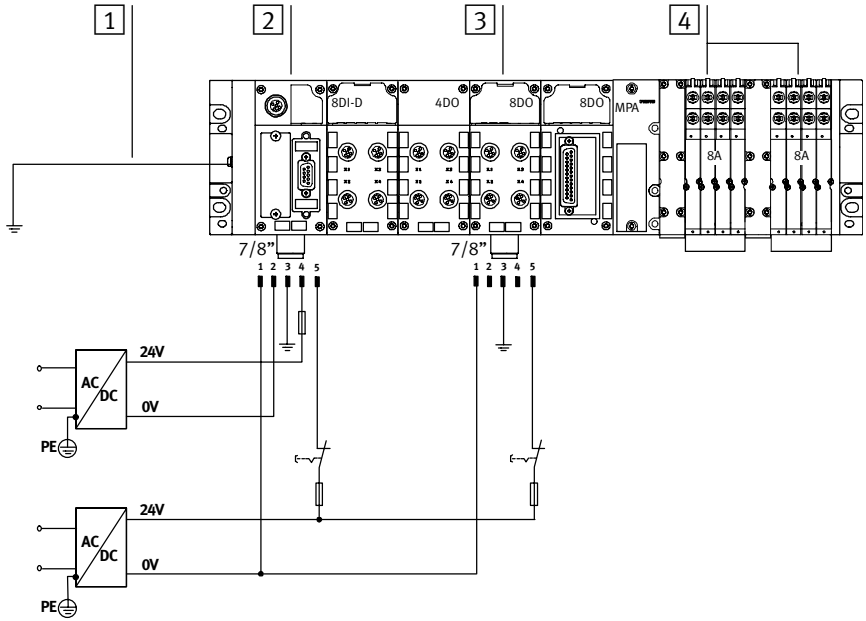
3 Manifold base with additional supply for outputs of type CPX-GE-EV-Z

4 Manifold base with additional supply for outputs of type CPX-GE-EV-V

Fig. 3/3: Example – Additional load supplies with a common 24 V power supply (all supplies with M18 plugs)

Connection example 3

The following diagram shows as an example the connection with electrical isolation of the power supply. Manifold sub-bases with 5-pin 7/8” plugs are used to do this.



1 Potential equalisation

2 Manifold base with system supply type CPX-GE-EV-S-7/8-5POL

3 Manifold base with additional supply for outputs type CPX-GE-EV-Z-7/8-5POL

4 MPA pneumatic modules **with** electrical isolation (type VMPA...-FB-EM**G**-...)

Fig. 3/4: Example - Electrical isolation of the power supply with separate power unit by a manifold sub-base with 5-pin 7/8” plugs (basic circuit diagram)

3.1.6 Connecting the field bus

Please note
A description of the field bus connection of your node can be found in the manual for the appropriate CPX field bus node.

Commissioning

Chapter 4

Contents

Contents of this chapter

This chapter contains general instructions on commissioning CPX terminals. The following information in particular belongs here:

- the parameterisation
- the address assignment
- the start-up reaction.

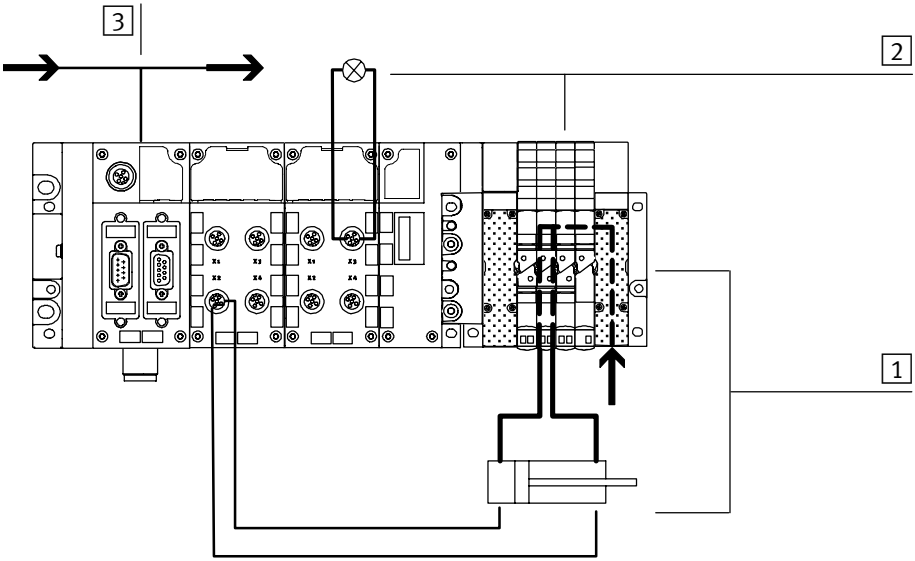
Further information

Instructions on commissioning the field bus node as well as the I/O modules can be found in the manual for the relevant module or field bus node.

Instructions on commissioning the pneumatics can be found in the relevant pneumatics manual.

4.1 Commissioning procedure

In order to avoid connecting and addressing errors, you should carry out commissioning in steps as follows. The individual commissioning steps are shown in the diagram below.



1 Step 1 – Checking the valve/cylinder combinations (see pneumatics manual)

2 Step 2 – Checking the I/O assignment

3 Step 3 – Commissioning the CPX terminal on the field bus and checking the address assignment, if necessary, without connected actuators by means of LED (see manual for CPX field bus node)

Fig. 4/1: Commissioning steps

4.2 Preparing the CPX terminal for commissioning

CPX terminals can be connected to various field buses. Connection is made via the CPX node which is adapted to suit the relevant field bus.

The reaction of the CPX terminal can be adapted to various requirements. You can carry out important settings as follows:

– with the DIL switch directly on the field bus node (see section 3.1.2).

– by parameterisation (see section 4.2.1).

The DIL switch and the parameters are preset at the factory.

Caution
Incorrectly set DIL switches and parameters can cause damage during operation. You must observe the following instructions in order to prevent damage.

- Check the DIL switch settings before using or replacing a CPX terminal.
- Make sure that the desired parameterisation of the CPX terminal in the start-up phase or after field bus interruptions is carried out by the plug-in module or the scanner/bus master, providing this is supported by the field bus protocol used. In this way you can be sure that when a CPX terminal has been replaced, the new terminal is also operated with the desired parameter settings.

Preparations

Before commissioning a field bus system with CPX terminals, you should first prepare each individual CPX terminal for commissioning.

Please note
Do not connect the cables for the field bus when preparing for commissioning.

You will thereby avoid:

– addressing errors which may occur due to the modification of the address range during operation with various field bus systems.

Proceed with preparation as follows:

1. Check the pneumatic tubing of the valve terminals with the aid of the manual override (see pneumatics manual).
2. Check the complete electric circuitry of the CPX terminal.
3. Check the DIL switch settings of your CPX terminals (see manual for the CPX field bus node).

4.2.1 Parameterisation

The parameters are preset at the factory. These pre-settings can be used for a large number of applications. With the aid of parameterisation, the reaction of the CPX terminal or the reaction of the individual modules and I/O channels can be adapted to each particular application.

The possibilities available depend on the field bus protocol used. Explanations on this can be found in the manual for the field bus node.

A distinction is made between the following types of parameters:

Types of parameters	Description
System parameters	Influence the reaction of the complete CPX terminal
Module parameters – module-specific	Influence the reaction of a particular module
– channel-specific	Influence the reaction of a particular input or output channel
Diagnostic memory parameters	Influence the working method of the internal diagnostic memory

Tab. 4/1: Types of parameters

The individual parameters are described in detail in Appendix B.2. Basic principles of using the parameters can be found in Appendix C. The tables below give a brief overview of the most important parameters.

System parameters	Brief description
Diagnostic monitoring with: – Short circuit/overload – Undervoltage in the outputs – Undervoltage in the valve supply	The monitoring of short circuit and overload for the complete CPX terminal can be switched on or off with this parameter.
Signal status when there is a fault (Fail safe parameter)	Defines the status which digital output signals (outputs and valves) are to assume in the event of field bus communication faults.
Signal status in Idle mode	Defines the status which digital output signals (outputs and valves) are to assume when changing into the Idle status. This function is only relevant with certain field bus protocols (see manual for CPX field bus node).
Force signal status (force parameter)	Enables the manipulation of signal states separate from actual operating conditions and independent of the higher-order PLC/IPC.
System start	Determines the start-up behaviour of the CPX terminal

Tab. 4/2: System parameters

Module-specific parameters	Brief description
Diagnostic monitoring with: – Short circuit/overload – Undervoltage – Wire fracture	The monitoring of short circuit/overload and undervoltage on the module can be switched on or off with this parameter.
Reaction after: – Short circuit/overload – Wire fracture	Determines after a short circuit/overload or wire fracture whether the power is to remain switched off or whether it is to be switched on again automatically.
Input debouncing time	Serves for faultless recognition of digital input signals
Signal extension time	Serves for recognising short signals
Data format analogue values	See manual for the relevant analogue module

Tab. 4/3: Module parameters – part 1

Channel-specific parameters	Brief description
Signal extension	Serves for recognising short signals
Monitoring wire fracture	Serves for recognising connection faults
Fault mode	Defines the status which the relevant channel is to assume in the event of field bus communication faults.
Fault state	
Idle mode	Defines the status which digital output signals (outputs and valves) are to assume when the Idle function is accessed. This function is only relevant with certain field bus protocols (see manual for CPX field bus node).
Idle state	
Force mode	Actual signals are replaced in the processing image by the force settings.
Force state	

Tab. 4/4: Module parameters – part 2

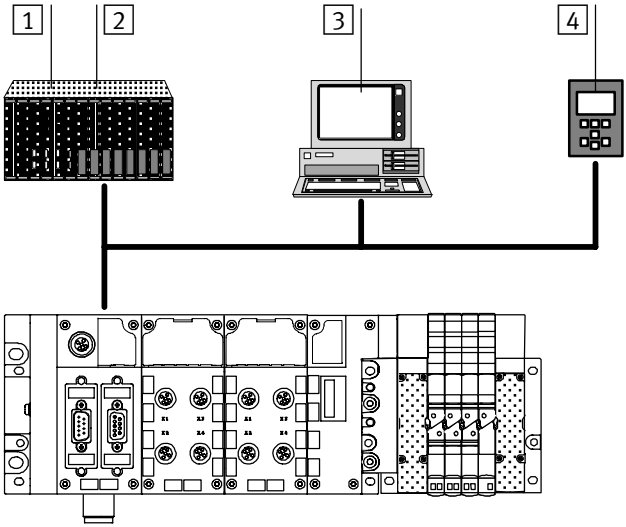
Detailed information on the parameters, which are supported by the module you are using used, can be found in the manual for the relevant module. Basic principles of using the parameters can be found in Appendix C.

Diagnostic memory parameters	Brief description
Entries are remanent	Determines whether the contents of the diagnostic memory are to be retained after new Power on or whether they are to be deleted.
Diagnostic memory filters – Run/Stop filter 1 + 2 – Fault end filter – Fault number filter – Module/channel filter	With the diagnostic memory filters you can suppress the registering of certain error messages and control both the starting and stopping of the fault registering.

Tab. 4/5: Diagnostic memory parameters

4.2.2 Possibilities of parameterisation

The parameterisation of the CPX terminal can be undertaken as follows depending on the field bus protocol used:



1 Plug-in module or scanner/bus master; the desired parameterisation can be guaranteed e.g. in the start-up phase or after field bus interruptions.

2 User program in the higher-order PLC/IPC; parameters can be modified during running time

3 Field bus-specific configurators; parameters can be modified during the commissioning phase or during the search for faults.

4 Handheld; parameters can be modified during the commissioning phase, during the search for faults or during running time.

Fig. 4/2: Possibilities of parameterisation

4.3 Start-up behaviour of the CPX terminal

The desired parameterisation of the CPX terminal should be carried out in the start-up phase or after field businterruptions by the plug-in module or the scanner/bus master, providing this is supported by the field bus protocol used. In this way you can be sure that when a CPX terminal has been replaced, the new terminal is operated with the same parameter settings.

You can influence the start-up behaviour with the aid of the system parameter System start (see section B.2.2). Select the setting "System start with default parameterisation and current CPX equipment status." The desired parameterisation can then be carried out in the start-up phase or after field bus interruptions e.g. by the plug-in module or the scanner/bus master (depending on the field bus used).

If the M-LED lights up permanently after the system start, the parameter "System start with saved parameterisation and saved CPX equipment status" is set.

Caution
In the case of CPX terminals on which the M-LED lights up permanently, parameterisation will not be carried out automatically by the higher-order system if the CPX terminal has been replaced after servicing. In these cases check before replacing to see which settings are required and carry out these settings.

Detailed instructions can be found in the manual for your CPX node or the manual for your handheld.

Diagnosis and error treatment

Chapter 5

Contents

Contents of this chapter

This chapter provides an overview of the diagnostic possibilities with the CPX terminal. These include diagnosis with:

- the LED on the electric and pneumatic modules
- the handheld
- the 8 status bits (common diagnostic messages)
- the I/O diagnostic interface (read out detailed diagnostic information)
- field bus specific diagnostic functions.

Further information

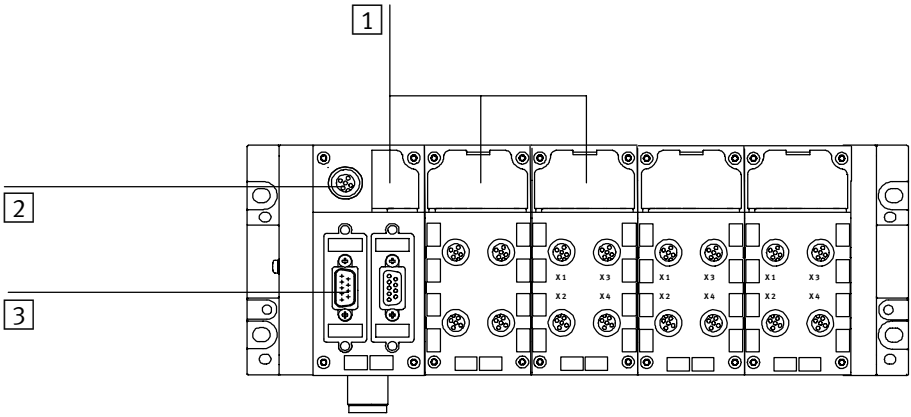
All diagnostic information can be read via the I/O diagnostic interface.

The different field buses support different field bus specific diagnostic functions. Information on this can be found in the manual for the field bus node used.

Instructions on diagnosing with the handheld can be found in the manual for the handheld. Information on on-the-spot diagnosis with the LED on the I/O modules, on the field bus node or on the valves can be found in the manual for the relevant module or in the pneumatics manual.

5.1 General instructions on diagnosis

The CPX terminal offers extensive possibilities of diagnosis and error treatment. The following possibilities are available (see also Tab. 5/1):



1 On-the-spot diagnosis with LED

2 On-the-spot diagnosis with handheld

3 Diagnosis with the field bus

Fig. 5/1: Diagnostic possibilities of the CPX terminal

Diagnostic possibilities		Brief description
1	On-the-spot diagnosis with LED	The LEDs on the electric and pneumatic modules show hardware faults, bus faults, etc.
2	On-the-spot diagnosis with the handheld	The handheld: – shows current error messages in clear text – offers access to the diagnostic memory.
3	System status scanning with the field bus (status bits scanning)	The 8 status bits display common diagnostic messages (global error messages).
	System diagnosis with the field bus (via I/O diagnostic interface)	Internal diagnostic data can be read via the I/O diagnostic interface. In this way detailed diagnostic information can be accessed, even if the field bus used does not offer any extensive field bus specific diagnostic functions. The I/O diagnostic interface offers: – access to the current error message – access to the diagnostic memory – read access to internal parameters and data.
	Field bus specific diagnostic functions	Special diagnostic functions or communication services are available, depending on the field bus used. For example communication services on: – the DPVI (PROFIBUS) – the PCP channel (Interbus) – SDO access (CANopen)

Tab. 5/1: Diagnostic possibilities of the CPX terminal

5.1.1 Possible error numbers

Detailed information on module-specific diagnosis can be found in the manual for the relevant module.

Possible faults of the CPX terminals are divided into three error classes with different priority depending on the seriousness of the fault. If a fault occurs, the system error LED (SF LED) will flash depending on the error class.

Error class	Flashing sequence of the SF LED	Error weighting	Priority
1	1 * flashes, pause time	Simple (e.g. simple user fault)	Low
2	2 * flashes, pause time	Medium (standard diagnosis and extended diagnosis)	Medium
3	3 * flashes, pause time	High (hardware fault/internal fault)	High

Tab. 5/2: Error classification

If several faults occur together, the fault with the highest priority will have precedence. This means that:

– the system error LED flashes according to the higher priority.

– the number of the fault with the higher priority will be entered in the system diagnostic data under function number 1938 (error number).

Within an error class faults of modules with a lower module number have higher priority, e.g. faults of module number 0 have the highest priority within an error class. Faults of module number 1 have the second highest priority, etc.

Faults of fault class 2

No.	Handheld display	Operating status	Fault treatment
0	[No error]	No fault	–
1	[General diagnosis]	General diagnosis (module-specific fault)	See manual for the module
2	[Short circuit]	Short circuit/overload in sensor supply or output	Eliminate short circuit/ overload (see manual for the module)
3	[Wire fracture/idling current I/O]	Break in wire/idling current input/output	Check and, if necessary, replace the cable and connected sensors/ actuators
4	[Short circuit in actuator supply]	Failure in load voltage supply due to short circuit/overload (on output side)	Check connected actuators as well as their connections
5	[Undervoltage in power supply]	Undervoltage in the power supply (on the input side)	Eliminate undervoltage at system supply or additional supply (pin assignment see Tab. 3/4)
6...8	Reserved		
9	[Lower limit exceeded]	Less than rated range	Check signal area and parameterised limit
10	[Upper limit exceeded]	Rated range exceeded	Check signal area and parameterised limit
11	[Short circuit valve]	Short circuit at the valve	Check valve and pneumatic interface
12	Reserved		
13	[Wire fracture (open load)]	Wire break at valve (open load)	Check valve
14	Reserved		
15	[Module/channel failure]	Module/channel has failed	Check module

Faults of fault class 2

No.	Handheld display	Operating status	Fault treatment
16	[Module code incorrect]	Module code not permitted or incorrect module	• Check CPX equipment status or save CPX equipment status again (procedure see parameter System start; function no. 4402)
		With CPX-CP interface: – The saved string assignment of the CPX-CP interface is not the same as the configuration saved in the CPX field bus node or CPX-FEC	With CPX field bus node: • Modify the System Start parameter to “Default parametrizing and current CPX equipment status” With CPX-FEC: • Save the actual configuration as nominal configuration with FST software
17	Reserved		
18	[Address range exceeded]	Number of I/O points exceeded	Check the DIL switch settings.
19...20	Reserved		
21	[Fault in parametrizing data format]	Fault in parameterisation (data format parameter)	Check the parameterisation undertaken and, if necessary, undertake the parameterisation again with the correct parameters.
22	Reserved		
23	[Fault in filter meas.value]	Fault in parameterisation (parameter “measurement value smoothing”)	Check the parameterisation undertaken and, if necessary, undertake the parameterisation again with the correct parameters.
24	[Fault in parametrizing lower limit]	Fault in parameterisation (parameter “lower limit”)	Check the parameterisation undertaken and, if necessary, undertake the parameterisation again with the correct parameters.
25	[Fault in parametrizing upper limit]	Fault in parameterisation (parameter “upper limit”)	Check the parameterisation undertaken and, if necessary, undertake the parameterisation again with the correct parameters.

Faults of fault class 2

No.	Handheld display	Operating status	Fault treatment
26	[Fault in actuator supply]	Fault in actuator supply	1. Eliminate short circuit/overload or check actuator supply, if necessary, check connected actuators
27...29	Reserved		
30	[No new output data (slave)]	Fault in CBUS communication (no new output data)	Module exchange with renewed message after Power Off/On
31	[No bus connection (slave)]	Bus connection interrupted	Make bus connection or check configuration
32	[No STI read access (slave)]	STI read access defective	Repeat STI read access
33	[No parameter access (slave)]	Read access parameter defective	Repeat read access parameter
34	[CP module lost / fault]	– Incorrect string assignment ascertained during operation (e.g. CP module failed or CP cable defective) – More than one module failed during operation – modules are no longer recognized	• Check CP strings (CP modules and CP cables), if necessary replace CP modules or CP cables • Switch power supply off and then on again. If fault still occurs, check and, if necessary, replace CP cables and CP modules
35	[CP configuration failure]	When the power supply is switched on, the string assignment does not match the saved string assignment – or – Incorrect module recognized during operation (different type, see manual for CPX-CP interface)	• Check CP strings (CP modules and CP cables), if necessary replace CP modules or CP cables • With correct string assignment: String assignment must be saved or (see manual for CPX-CP interface) • Check string assignment, if necessary replace CP module
36	[Short circuit CP-Line]	Short circuit CP string – Communication faulty on the CP string	• Check CP string, replace CP cable if necessary
37...39	Reserved		

Faults of fault class 2

No.	Handheld display	Operating status	Fault treatment
40	[CO-Life Guard]	Fault resulting from Life Guard monitoring	Check cabling, check CAN bus load, check Guard Time and Life Factor and adjust if necessary
41	[CO-Heart Beat]	Fault resulting from Heart Beat monitoring	Check cabling, check CAN bus load, check Heart Beat Time, adjust if necessary
42	Reserved		
43	[CO-CAN Overrun (Objects lost)]	Telegrams have been lost	Check CAN bus load
44	[CO-Invalid PDO received]	PDO received with two few data bytes	Possibly correct PDO mapping or increase number of PDO bytes
45	[CO-CAN WarnLimit reached]	Some defective CAN telegrams have been discovered	Check cabling
46	[CO-CAN recovered from BusOff]	Defective CAN telegrams have been increasingly discovered	Check cabling; a CAN participant may be defective
47	[CO-Bus Power lost]	No power supply at the CAN interface	Check power supply at 24 VDC Bus and 0 V Bus
48...63	Reserved		
64	[Number of Modules incorrect]	The number of modules in the current CPX equipment status does not equal the saved equipment status	Correct module equipment status or save new one
65...69	Reserved		
70	[CC-L Station equip. status incorrect]	CPX equipment status is greater than the number of stations set	Check DIL switch setting (increase number of stations)

Faults of fault class 2

No.	Handheld display	Operating status	Fault treatment
71	[CC-L Bus connection lost]	Bus connection interrupted	Check cabling
72...127	Reserved		

Tab. 5/3: Possible faults (fault class 2)

Faults of fault class 3

No.	Handheld texts	Operating status	Fault treatment
128	[Switch unit defective]	Hardware defective	Replace module
129	[CBUS asic not ready]	Fault in the CBUS communication	Check module installation
130	[CPU Hardware Trap]	System error has occurred	Replace module if new message after power off/on
131	[CBUS C-manager not ready]	Fault in the CBUS communication	Replace module if new message after power off/on
132	reserved		
133	[Remanent memory defective]	Hardware defective	Replace module
134	[Flash system memory defective]	Hardware defective	Replace module
135	[Number of mod. params.more than 64]	Fault in the CBUS configuration	Replace module
136	Reserved		
137	[CBUS diagnostic telegram]	An invalid diagnostic telegram was received from a module	Replace module
138	[CBUS init fault (gap)]	Fault in the CBUS configuration	Check module array
139	[Order queue full]	System error has occurred	Replace module if new message after power off/on
140	[CBUS-EEPROM error]	Hardware defective	Replace module

Faults of fault class 3

No.	Handheld texts	Operating status	Fault treatment
141	[CBUS C-timeout error]	Fault in the CBUS communication	Replace module if new message after power off/on
142	[CBUS telegram fault]	Fault in the CBUS communication	Replace module if new message after power off/on
143... 199	Reserved		

Tab. 5/4: Possible faults (fault class 3)

Faults of fault class 1

No.	Handheld texts	Operating status	Fault treatment
200	[Fault param. transfer module n]	Fault in parameterisation (parameter transfer failed)	Replace module if new message after power off/on
201	[Invalid field bus address]	Address incorrect	Check the DIL switch setting.
202	[Protokoll Asic not ready]	Initialisation of the Asics protocol defective	Replace module if new message after power off/on
203... 254	Reserved		
255	[unknown fault]		

Tab. 5/5: Possible faults (fault class 1)

5.1.2 On-the-spot diagnosis with LEDs

The LEDs of the electric modules are situated under the transparent cover on the upper part of the module. The right-hand row of LEDs is identical on the different types of modules (standardised).

Field bus node LEDs

Field bus nodes have field bus specific LEDs and CPX-specific LEDs. The CPX-specific LEDs are to be found on each CPX field bus node:

1 Field bus specific LEDs (see manual for field bus node)

2 CPX-specific LEDs (can be found on every node; see section 5.1.3)

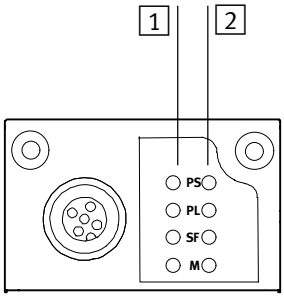
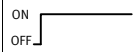
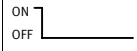


Fig. 5/2: LED display on the field bus node (example)

5.1.3 CPX-specific LEDs

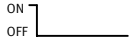
PS (power system) – power sensor/logic supply

LED (green)	Sequence	Status	Meaning/fault treatment
 LED lights up		No fault Operating voltage/ sensor supply applied	–
 LED flashes		Operating voltage/sensor supply outside tolerance range	Eliminate undervoltage
		Internal fuse of the operating voltage/sensor supply has responded	1. Eliminate short circuit/overload on module 2. Depends on the parameterisation of the module (module parameters): • The sensor supply voltage will be switched on again **automatically** when the short circuit is eliminated (default) • Power off/on necessary
 LED is out		Operating voltage/sensor supply not applied	Check operating voltage connection of the electronics

PL (power load) – power load supply (outputs/valves)

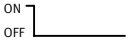
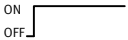
LED (green)	Sequence	Status	Meaning/fault treatment
 LED lights up		No fault Load voltage applied	None
 LED flashes		Load voltage at system supply or additional supply outside the tolerance range	Eliminate undervoltage

SF (system failure) – system fault

LED (red)	Sequence [1]	Status	Meaning/fault treatment
LED is out		No fault	–
LED flashes		Simple fault/information (fault class 1)	See explanation of error numbers in section 5.1.1
LED flashes		Fault (fault class 2)	See explanation of error numbers in section 5.1.1
LED flashes		Serious fault (fault class 3)	See explanation of error numbers in section 5.1.1

[1] The system fault LED flashes depending on the fault class.
Fault class 1 (simple fault): 1 flash, interval
Fault class 2 (fault): 2 flashes, interval
Fault class 3 (serious fault): 3 flashes, interval

M (modify) – parametrizing modified or Force active

LED (yellow)	Sequence	Status	Meaning/fault treatment
○ LED is out		– System Start with default parametrizing (factory setting) and current CPX equipment status is set; external parametrizing is possible (pre-setting) 1)	None
 LED flashes		Force is active 2)	The Force function is enabled (see system parameter “Force mode”; function no. 4402).
 LED lights up		– System start with saved parametrizing and saved CPX equipment status is set; parameters and CPX equipment status are saved remanently; external parametrizing is blocked 1) 2)	Be careful when replacing CPX valve terminals with saved parametrizing. With these CPX valve terminals, parametrizing is not carried out automatically by the higher-order PLC/IPC when the terminal is replaced. In these cases check before replacing to see which settings are required and, if necessary, carry out these settings.

1) With CPX-FEC in the operating modes Stand Alone and Remote Controller (control function active) without meaning.
2) The display of the Force function (LED flashes) has precedence over the display of the setting for System start (LED lights up).

LEDs on electric modules

In addition to the module-specific LEDs, all electric modules usually have a module common error LED for module diagnosis.

1 Module common error LED (red); exists on all I/O modules

2 Status LEDs (e.g. green for digital inputs, yellow for digital outputs)

3 Channel error LED (e.g. with digital outputs)

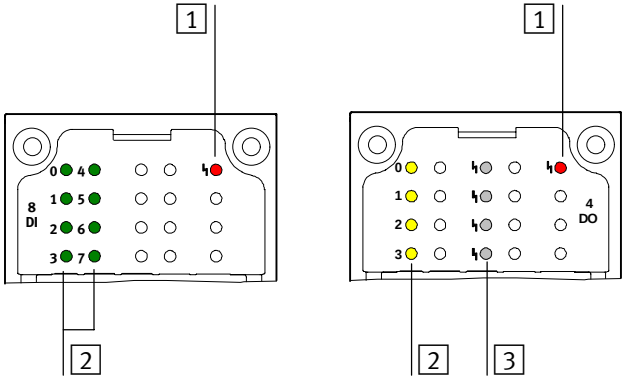


Fig. 5/3: LED display of electric modules (example)

Status LEDs

There is a status LED for each channel. This LED indicates the status of the signal. The LEDs indicate the following:

Status LED (green or yellow)	Sequence	Status
LED lights up *)	ON / OFF	Channel logical 1 (signal present)
LED is out	ON / OFF	Channel logical 0 (no signal)
1) Lights up green for inputs and yellow for outputs		

Module common error LED

The red module common error LED indicates a module fault (e. g. short circuit or overload).

The display of faults can be suppressed by module parameters.

Module common error LED

LED (red)	Sequence	Status	Fault treatment
LED is out	ON / OFF	Faultless operation	None
LED flashes	Error-specific	See manual for the relevant module	See manual for the relevant module
LED lights up	ON / OFF	Module common error (see manual for the module)	e.g. Eliminate short circuit/undervoltage

Channel error LED

Explanations on this can be found in the manual for the relevant CPX module

5.2 Diagnosis via status bits or the I/O diagnostic interface

The CPX terminal offers the following two modes for diagnosis, irrespective of the field bus node used:

Mode	Description
Status bits (system status)	The status bits serve for displaying common diagnostic messages (global error messages). Access to the status bits is made via 8 internal inputs (see section 5.2.1).
I/O diagnostic interface (system diagnosis)	The I/O diagnostic interface is a bus-independent diagnostic interface. With this interface, all internal data and parameters can be read out via 16 internal inputs and 16 internal outputs. All diagnostic information is then also available even if the field bus protocol used does not offer any extensive diagnostic functions (see section 5.2.2).

Tab. 5/6: Field bus independent diagnostic modes

5.2.1 Structure of the status bits

Irrespective of the field bus node used, The CPX terminal provides 8 status bits for displaying common diagnostic messages (global error messages).

Status bits are configured like inputs. The input addresses, which are to be assigned to status bits, depend on the field bus protocol used (see manual for the CPX field bus node).

The status bits supply coded diagnostic information.
Bits 0 to 3 specify the module types in which faults have occurred. Bits 4 to 7 specify the type of fault.

Bit	Diagnostic information with 1-signal	Description
0	Fault at valve	Module type on which a fault has occurred.
1	Fault at output	
2	Fault at input	
3	Fault in analogue module/ function module or technology module	
4	Undervoltage	Type of fault
5	Short circuit/overload	
6	Wire fracture	
7	Other faults	

Tab. 5/7: Structure of the status bits

If all status bits supply a 0-signal, no fault will be registered.

Examples of typical status information

No error registered

	Other faults	Wire fracture	Short circuit	Under-voltage	Funct./ analogue	Input	Output	Valve
Bit	7	6	5	4	3	2	1	0
Status	0	0	0	0	0	0	0	0

Tab. 5/8: Example 1 – no fault

Short circuit/overload at the output

	Other faults	Wire fracture	Short circuit	Under-voltage	Funct./ analogue	Input	Output	Valve
Bit	7	6	5	4	3	2	1	0
Status	0	0	1	0	0	0	1	0

Tab. 5/9: Example 2 – short circuit at the output

Undervoltage in the sensor supply

	Other faults	Wire fracture	Short circuit	Under-voltage	Funct./ analogue	Input	Output	Valve
Bit	7	6	5	4	3	2	1	0
Status	0	0	0	1	0	1	0	0

Tab. 5/10: Example 3 – undervoltage in the sensor supply

If different faults occur simultaneously on different types of modules, faults cannot be distinguished. Use the I/O diagnostic interface in order to distinguish faults clearly.

5.2.2 The I/O diagnostic interface

Organisation of internal data and parameters

Internal data and parameters of the CPX modules and of the CPX terminal are stored in a common memory range. With the I/O diagnostic interface, read access can be made with the aid of the function number to individual bytes of this memory range.

Parameters can be modified with the aid of field bus specific functions (depending on the field bus used) or with the hand-held (see also section 4.2.2).

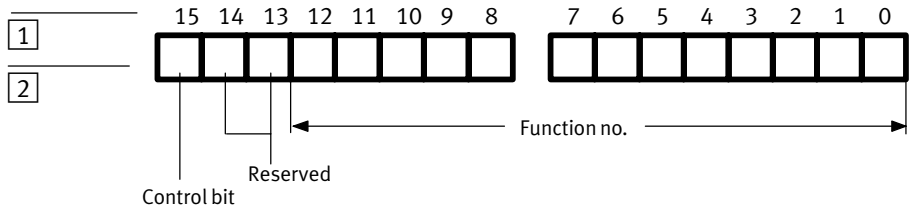
Method of operation of the I/O diagnostic interface

Detailed diagnostic information can be accessed via the I/O diagnostic interface. You can ascertain exactly, e.g. on which module and in which channel a fault has occurred. The system diagnosis can be accessed by means of 16 input bits and 16 output bits, with which all diagnostic data can be read out.

The addresses of the input and output bits of the I/O diagnostic interface depend on the field bus used (see the manual for the CPX field bus node).

Output bits

The function number of the desired data will be specified in binary coded form via the output bits O0...O12 of the I/O diagnostic interface. The function number is accepted when control bit O15 supplies a 1-signal.

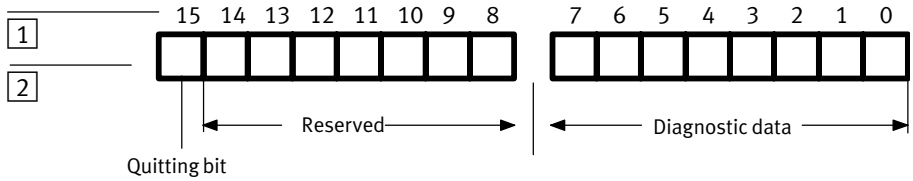


1 Bit number 2 Outputs

Fig. 5/4: Output bits of the I/O diagnostic interface

Input bits

The reply data are output by the CPX terminal via the input bits I0...I7 when quitting bit I15 supplies a 1-signal.



1 Bit number 2 Inputs

Fig. 5/5: Input bits of the I/O diagnostic interface

If control bit O15 supplies a 0-signal, quitting bit I15 will be reset automatically and the status byte will be shown with the diagnostic data bits.

Reading out the diagnostic data flow diagram

The function number is accepted if there is a positive edge at control bit O15. The input bits I0...I7 supply the diagnostic data when the quitting bit supplies a 1-signal.

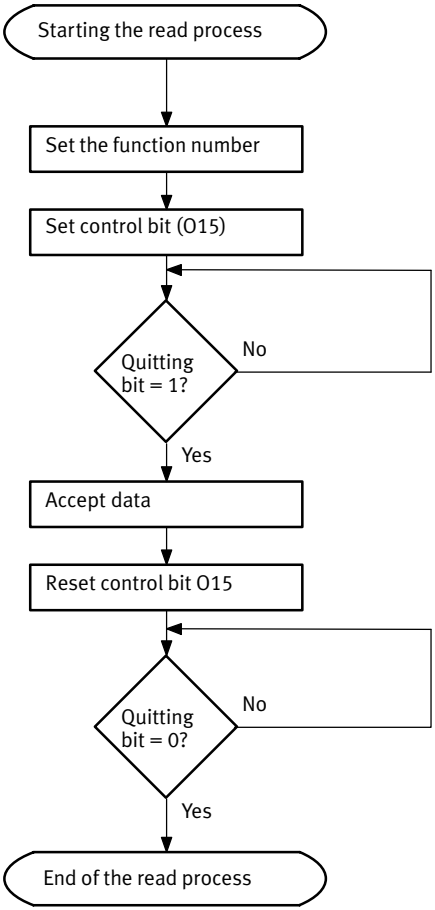
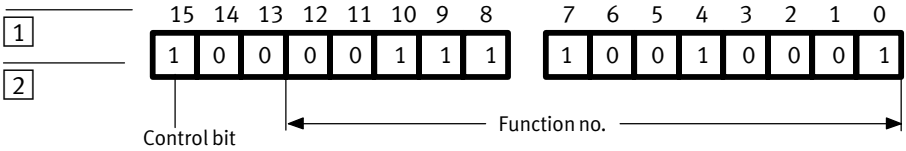


Fig. 5/6: Reading out the diagnostic data flow diagram

Example 1:
Check to see if there are diagnostic data

Function no. 1937 specifies whether there are diagnostic data and contains, where applicable, the number of the first module on which a fault has occurred (see section B.2.6).

Function no. = 1937
1937 dec. = 11110010001 Bin

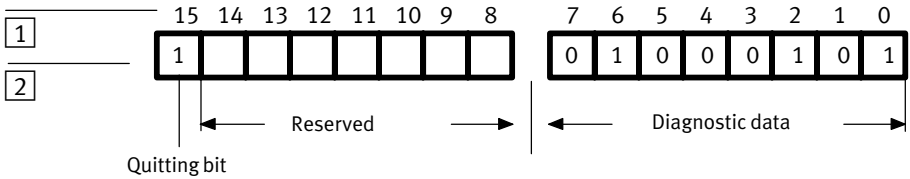


1 Bit number of the outputs

2 Signal status of the outputs

Fig. 5/7: Reading out function no. 1937

There are diagnostic data if bit 6 supplies a 1-signal. Bit 0...5 contain the module number of the first faulty module (see also section B.2.6.). If, for example, there were a fault on module 5 (5 dec. = 101 Bin), the following input data would be available:



1 Bit number of the inputs

2 Signal status of the inputs

Fig. 5/8: Reply data (example)

Example 2:
Read out current fault numbers of module 5

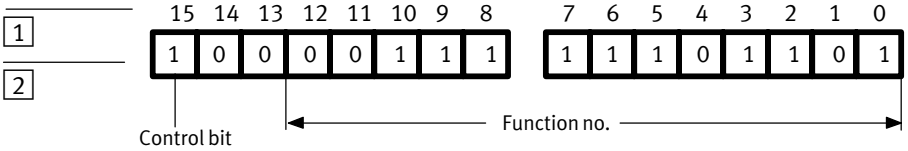
With the aid of the module number of the faulty module you can ascertain the function numbers of the relevant module diagnostic data (see also section B.2.7). Module diagnostic data can be e.g.:

– the number of the faulty channel

– the module fault number.

With the following function number, you can ascertain e.g. the module fault number of module 5:

Function no. = 2008 + 4 * 5 + 1 = 2029
2029 dec. = 11111101101 Bin

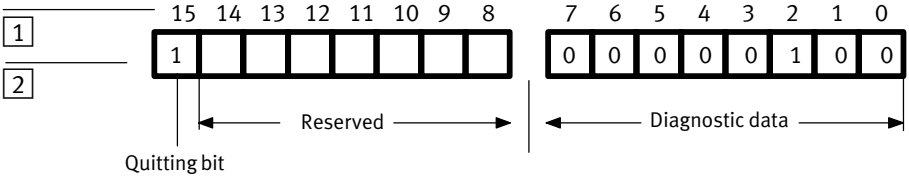


1 Bit number

2 Signal status of the outputs

Fig. 5/9: Reading out the module fault number of module 5

As an example Fig. 5/10 the reply data in the case of fault number 4.



1 Bit number of the inputs

2 Signal status of the inputs

Fig. 5/10: Reply data with fault number 4 (4 dec. = 100 Bin)

Detailed information on the module diagnostic data can be found in section B.2.7.

Technical appendix

Appendix A

Contents

A.1 Technical specifications

General information	
Temperature range – Operation – Storage/transport	 - 5 ... + 50 °C - 20 ... + 70 °C
Relative humidity	95 %, non-condensing
Protection against electric shock (protection against direct and indirect contact as per EN 60204-1/IEC 204)	By means of PELV power units (Protected Extra-Low Voltage)
Protection class as per EN 60 529 (plug connector inserted or provided with protective cap)	Depending on the connections and configuration used. The lowest protection class of the weakest components used is always valid for the complete device (see manual for the relevant module) – e.g. terminal connections: IP20 – e.g. M8 and M12 connections: IP65 and IP67
Electromagnetic compatibility – Interference emitted – Immunity against interference	 Tested as per EN 61000-6-4 (industry) [1] Tested as per EN 61000-6-2 (industry)
Vibration and shock [3] – Vibration – Shock – Resistance to continuous shock	 – Tested as per DIN/IEC 68/EN 60068 part 2-6; when fitted on a wall [2]: severity class 2 when fitted on a hat rail [2]: severity class 1 – Tested as per DIN/IEC 68/EN 60068 part 2-27; when fitted on a wall [2]: severity class 2 when fitted on a hat rail [2]: severity class 1 – Tested as per DIN/IEC 68/EN 60068 part 2-29; fitting onto a wall or hat rail: severity class 1

1) The component is intended for industrial use.
2) For MPA valve terminals, the vibration and shock resistance depends on the number of installed sub-bases (see pneumatic description).
3) Explanations on the severity classes see following table.

Severity class	Vibration	Shock	Continuous shock
1	0.15 mm path at 10...58 Hz 2 g acceleration at 58...150 Hz	± 15 g at 11 ms duration 5 shocks per direction	± 15 g at 6 ms duration; 1000 shocks per direction
2	0.35 mm path at 10...60 Hz 5 g acceleration at 60...150 Hz	± 30 g at 11 ms duration 5 shocks per direction	–

Operating voltage for the bus interface	
– Rated value – Tolerance	See manual for the CPX field bus node

Caution
The maximum permitted current per pin on the supply is: 16 A. Note that with system supply via pin 3 (0 V), the sum of both currents from pin 1 and pin 2 flows via pin 2.

– M18 plug: 16A
– 7/8 plug, 4-pin: 12 A*)
– 7/8 plug, 5-pin: 12 A*)

*) limited by the specifications of the connected plug connector.
Please note that with system supply with 4 pin plug via pin "0 V", the sum of both currents of the operating and load voltages flows.

Operating voltage for electronics/sensor supply	
Power supply – Rated value – Tolerance	 24 V DC (protected against incorrect polarity) 18...30 V
Current consumption	Sum of the current consumption of all modules without sensor supply; max. 1.5 A; see also the manual for the modules
Residual ripple	4 Vpp (within tolerance)

Load voltage for outputs	
Power supply – Rated value – Tolerance	 24 V DC (protected against incorrect polarity) 18...30 V
Current consumption	Sum of all switched-on outputs (see manual for output modules)
Residual ripple	4 Vpp (within tolerance)

Load voltage for the valves	
Power supply – Rated value – Tolerance *)	 24 V DC (protected against incorrect polarity) – Without pneumatics: 18...30 V – With pneumatics of type Midi/Maxi: 21.6...26.4 V – With pneumatics of type CPA: 20.4...26.4 V – With pneumatics of type MPA: 18...30 V – With CPX-CP interface: 20.4...26.4 V
Current consumption	Current consumption of the pneumatic interface: See manual for the CPX I/O modules Sum of all switched-on valve solenoid coils; see Pneumatics Manual
Residual ripple	4 Vpp (within tolerance)
*) The module with the lowest tolerance is always decisive for the permitted voltage tolerances (see manual for relevant module or for relevant pneumatics).	

Special technical specifications on the pneumatics used, on CPX modules, sub-bases and the field bus node can be found in the relevant manuals.

A.2 Cable length and cross-sectional area

Please note
The following information assumes that the reader is familiar with the facts contained in the chapter “Installation” in this manual, and is for the exclusive use of personnel trained in electrotechnology.

A load-dependent drop in voltage occurs on all three cables of theoperating voltage supply to a node. This can cause the voltage at pin 1 or pin 2 of the operating voltage connection to be outside the permitted tolerance.

Recommendation:

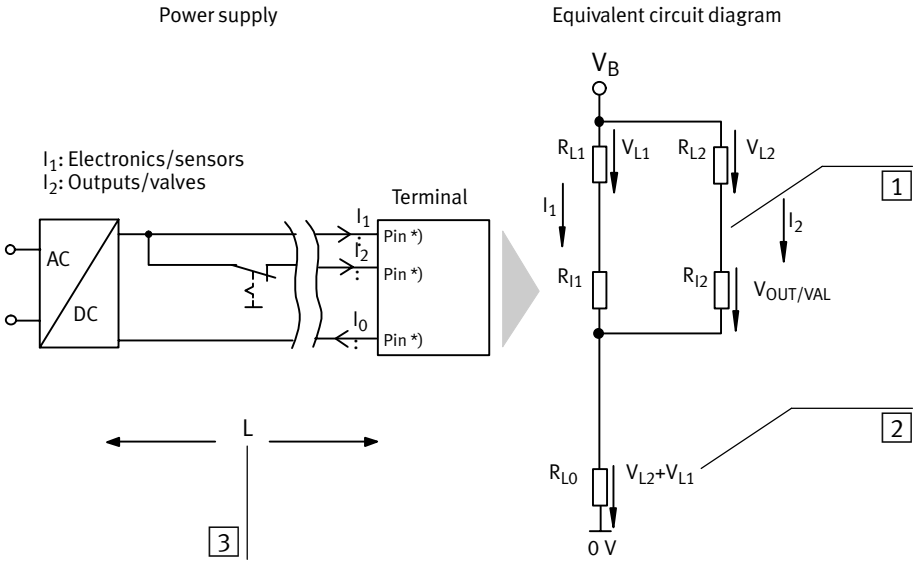
- Avoid long distances between the power unit and the node.
- Ascertain the most suitable cross-sectional area and the maximum cable length for the operating voltage cable in accordance with the following formula.

Please note
The following formula assumes that the cross-sectional areas of the operating voltage supply are the same.

Ascertain by formula

Proceed as follows:

1. Calculate the maximum current consumption of the inputs and electronics (I_1) as well as of the outputs and valves (I_2).
2. Ascertain the lowest voltage to be expected during operation (V_{Bmin}) on the power unit. Take the following into account:
   - the load dependency of the power unit
   - the fluctuations in the primary mains voltage
   - the operating temperature of the devices.
3. Enter the values in the relevant formula. The equivalent circuit diagram as well as the example explain the correlations.



*) Pin assignment, see Tab. 3/4

1 Line resistor (outgoing) $R_{L1} + R_{L2}$

2 Line resistor (returning) R_{L0}

3 L = distance (cable length)

Fig. A/1: Equivalent circuit diagram for power supply

Formula for maximum cable length:

$$L \leq \frac{\left\{\left(V_{Bmin} - V_{OUT/VALmin}\right) \cdot A \cdot \kappa_{CU}\right\}}{\{2 \cdot I_2 + I_1\}}$$

Meaning

- Without pneumatics: $V_{OUT/VALmin} \geq 18$ V
  With Midi/Maxi pneumatics: $V_{OUT/VALmin} \geq 21.6$ V
  With CPA pneumatics: $V_{OUT/VALmin} \geq 20.4$ V
- V_{Bmin} = minimum operating voltage supply (on the power unit)
- Current I_1 = current for electronics and sensors
- Current I_2 = current for valves and outputs
- A = cross-sectional area (uniform e.g. 1.5 mm^2)
- κ = conductance value of the cables

  (uniform e.g. $\kappa_{CU} = 56 \quad \frac{m}{mm^2 \cdot \Omega}$)

Example:

I1	= 1 A
I2	= 5 A
V_{Bmin}	= 24 V
CPA pneumatics:	$V_{OUT/VALmin}$ = 20.4 V

$$\kappa_{CU} = 56 \ \frac{m}{mm^2 \cdot \Omega}$$

Result:
$L \leq 27.49$ m for A = 1.5 mm^2
$L \leq 45.81$ m for A = 2.5 mm^2

Parameters and data of the CPX terminal

Appendix B

Contents

Contents of this appendix

This appendix describes the composition of all parameters and data of theCPX terminal. By means of the specified function number you can:

- have read access to the parameters and data via the I/O diagnostic interface
- establish a reference to parameters and data in other manuals.

Further information

General basic principles of parameterisation can be found in Appendix C.

Information on the parameters and data which are supported by the field bus used, can be found in the manual for the field bus node used.

Instructions on parameterisation via the handheld can be found in the manual for the handheld.

B.1 Access to internal parameters and data

The CPX terminal permits access to internally saved data and parameters. The ways in which you can access these data and parameters depend on the field bus protocol used. For example access can be made via:

– the plug-in module or scanner/bus master; e.g. for guaranteeing the desired parameterisation of the CPX terminal in the start-up phase or after field bus interruptions.

– field bus specific configurators, e.g. during the commissioning phase or during a search for faults

– the user program in the higher-order PLC/IPC, e.g. for modifying parameters or system features during operation

– the handheld, e.g. during the commissioning phase or during a search for faults

– the I/O diagnostic interface, e.g. for reading out diagnostic data.

Data can be read. Parameters can be read and modified.

Only read access to parameters and data by means of the relevant function number is possible via the I/O diagnostic interface (see section 5.2.2).

B.2 Description of the parameters and data

A distinction is made between the following parameters and data:

Parameters	Description
System parameters	Determine global system functions for the complete CPX terminal, e.g.: – diagnostic monitoring – system start etc.
Module parameters	Determine module-specific and channel-specific functions for the relevant module, e.g.: – input debouncing time – signal extension times etc.
Diagnostic memory parameters	Determine the working method of the diagnostic memory.

Tab. B/1: CPX parameters

Data	Description
System-Diagnostic data	Global information on the system status (e.g. common diagnostic message)
Module diagnostic data	Information on locating faults (e.g. error number, number of the first faulty channel etc.)
Diagnostic memory data	Entries in the diagnostic memory (max. 40)
System data	Information on global system settings
Module data	Series number, revision code and module code of the modules used

Tab. B/2: CPX data

B.2.1 Overview of the function numbers

Function no. [1]	**CPX data and CPX parameters**	**See**
0	CPX operating mode (system data)	Tab. B/47
0	CPX equipment fitted (system data)	Tab. B/48
0	Handheld (system data)	Tab. B/49
0	Force mode (system data)	Tab. B/50
0	System start (system data)	Tab. B/51
1	Fail safe (system data)	Tab. B/52
1	System idle mode (system data)	Tab. B/53
2	Monitoring CPX terminal (system data)	Tab. B/54
16 +16m + 0	Module code (module data)	Tab. B/58
16 +16m + 13	Revision code (module data)	Tab. B/60
784 + m * 4 + 0 784 + m * 4 + 1 784 + m * 4 + 2 784 + m * 4 + 3	Series number (module data)	Tab. B/61
1936	Status bits (system diagnostic data)	Tab. B/38
1937	Module number and diagnostic status (system diagnostic data)	Tab. B/39
1938	Error number (system diagnostic data)	Tab. B/40
2008 + m * 4 + 0	Number of the first faulty channel (module diagnostic data)	Tab. B/42
2008 + m * 4 + 1	Module error number (module diagnostic data)	Tab. B/43
2008 + m * 4 + 2	Information 2 (module diagnostic data)	Tab. B/44
2008 + m * 4 + 3	Information 3 (module diagnostic data)	Tab. B/45
3480	Entries remanent with Power ON (diagnostic memory parameters)	Tab. B/23
3480	Run/Stop filter 1 (diagnostic memory parameters)	Tab. B/24

[1] m = module number (counting on the modules from left to right, beginning with 0)

Function no. [1]	CPX data and CPX parameters	See
3482	Number of entries in the diagnostic memory (diagnostic memory data)	Tab. B/33
3483	Overrun (diagnostic memory data)	Tab. B/34
3483	Status (diagnostic memory data)	Tab. B/35
3484	Run/Stop filter 2 (diagnostic memory parameters)	Tab. B/25
3484	End of fault filter (diagnostic memory parameters)	Tab. B/26
3484	Error number filter (diagnostic memory parameters)	Tab. B/27
3484	Module/channel filter (diagnostic memory parameters)	Tab. B/28
3485	Module number MN (diagnostic memory parameters)	Tab. B/29
3486	Channel number CN (diagnostic memory parameters)	Tab. B/30
3487	Error number FN (diagnostic memory parameters)	Tab. B/31
3488 + n	Diagnostic memory data (diagnostic memory data)	Tab. B/36
4401	Monitoring (system parameters)	Tab. B/4
4402	Fail safe (system parameters)	Tab. B/5
4402	Force mode (system parameters)	Tab. B/6
4402	System idle mode (system parameters)	Tab. B/7
4402	System start (system parameters)	Tab. B/8
4828 + m * 64 + 0	Monitoring the CPX module (module parameter)	Tab. B/11
4828 + m * 64 + 1	Reaction after short circuit/overload (module parameter)	Tab. B/12
4828 + m * 64 + 1	Input debouncing time (module parameters)	Tab. B/13
4828 + m * 64 + 1	Signal extension time (module parameters)	Tab. B/14
4828 + m * 64 + 3	Data format for analogue value of inputs (module parameters)	Tab. B/15
4828 + m * 64 + 3	Data format for analogue value of outputs (module parameters)	Tab. B/16

[1] m = module number (counting on the modules from left to right, beginning with 0)

Function no.	Channel-specific module parameters	See
- [1]	Signal extension channel x	Tab. B/17
- [1]	Monitoring wire fracture channel x	Tab. B/18
- [2]	Fail safe channel x	Tab. B/19
- [2]	Idle mode channel x	Tab. B/20
- [2]	Force channel x	Tab. B/21

[1] Function number see manual for CPX modules
[2] Access is protocol-specific (see manual for field bus node)

Function no.	Field-bus specific system data	See
–	Number of input bytes (Rx size) [1]	Tab. B/55
–	Number of output bytes (Tx size) [1]	Tab. B/56

[1] Only relevant with certain field bus protocols (see manual for CPX field bus node)

B.2.2 System parameters

The system parameters refer to global functions of the CPX terminal. The following system parameters are available:

Function no.	System parameters
4400	Reserved
4401	Monitoring (active/inactive)
4402	Fail safe (reaction to communication faults)
4402	Force mode (enable/block force)
4402	System Idle mode (reaction when changing into the Idle status) 1)
4402	System start
1) Only relevant with certain field bus protocols (see manual for CPX field bus node)	

Tab. B/3: Overview – System parameters

[.....] In this description, the data and parameters displayed on the handheld in English are framed in the text in brackets, e.g. [Debounce time]. In the text, a fuller description appears next to it, e.g.:

input debouncing time [Debounce time]

System parameters: Monitoring		
Function no.	4401	
Description	The monitoring of short circuit/overload and undervoltage for the complete CPX terminal can be activated or deactivated (suppressed). Active monitoring causes the following: A fault registered by the module will be: – sent to the higher-order field bus master – entered, if applicable, in the diagnostic memory (depending on filter settings) – entered in the module diagnostic data and, if applicable, in the status bits – displayed by the module common error LED – displayed by the red SF LED on the node	
	Monitoring	[Monitor]
Bit	Description	
0	Short circuit/overload in sensor supply	[Monitor SCS]
1	Short circuit/overload at the outputs	[Monitor SCO]
2	Undervoltage at the outputs (V_{OUT})	[Monitor V_{OUT}]
3	Undervoltage at valves (V_{VAL})	[Monitor V_{VAL}]
4	Short circuit at the valve	[Monitor SCV]
5...7	Reserved	
Values	1 = Active (presetting) 0 = Inactive	[Active] [Inactive]
Note	The method of operation of the channel fault LED remains unaltered. Monitoring can also be set separately for each module (see module parameter monitoring CPX module).	

Tab. B/4: Monitoring short circuit/overload/undervoltage

System parameters: Fail safe (reaction to communication faults)		
Function no.	4402	
Description	Determines the signal status which the outputs/valves are to assume in the event of field bus communication faults, e.g. in the event of: – communication failure (bus interruption, PLC/IPC failure) – communication stop. In the following case, the channel-orientated Fail safe settings (module parameters Fault mode and Fault state) are reset automatically for safety reasons in order to avoid undesired signal states. – When changing from “Accept fault mode” to “Reset all outputs” or to “Hold last state”.	
Bit	Bits 0, 1	
Values Bit 1 0 0 0 0 1 1 0	Fail safe Description Reset all outputs (presetting) Hold last state (retain signal status) Assume fault mode	[Fail safe] [Reset outputs] [Hold last state] [Assume fault mode]
Note	The Fault mode status is set with the channel-specific module parameters. Further information on this parameter can be found in section C.3.	

Tab. B/5: Fail safe

System parameters: Force mode		
Function no.	4402	
Description	Determines for the complete CPX terminal whether the Force function is blocked or enabled. By changing these parameters, in the following cases the channel-orientated Force settings (module parameters Force mode and Force state) are reset automatically for safety reasons in order to avoid undesired signal states. – Change over handheld: When changing from “enabled” to “blocked”. – Change over field bus: When changing from “blocked” to “enabled”.	
Bit	Bits 2, 3	
Values Bit 3 2 0 0 0 1	Force mode Description Blocked (presetting) Enabled	[Force mode] [Disabled] [Enabled]
Note	Force signals have precedence over Fail safe signals.	

Tab. B/6: Force mode

System parameters: System Idle mode		
Function no.	4402	
Description	Defines the signal status which outputs/valves are to assume when the CPX terminal changes into the Idle status. In the following case, the channel-orientated Idle mode settings (module parameters Idle mode and Idle state) are reset automatically for safety reasons in order to avoid undesired signal states: – When changing from “Accept Idle mode” to “Reset all outputs” or to “Hold last state”.	
Bit	Bits 4, 5	
Values Bit 5 4 0 0 0 1 1 0	System Idle mode Description Reset all outputs (presetting) Hold last state (retain signal status) Assume Idle mode	[Idle mode] [Reset outputs] [Hold last state] [Assume idle mode]
Note	Only relevant for certain field bus protocols Explanations on this can be found in the manual for the relevant CPX field bus node.	

Tab. B/7: Idle mode

System parameters: System start *)		
Function no.	4402	
Description	With this parameter you can determine the start-up reaction of the CPX terminal and save all current parameter settings and the current CPX equipment status.	
Bit	Bit 6	
Values Bit 6	System start *) Description	[System start]
0	System start with default parametrizing (factory setting) and current CPX equipment status; external parametrizing is possible (presetting)	[Default parameters]
1	System start with saved parametrizing and saved CPX equipment status; parameters and CPX equipment status are saved remanently; external parametrizing is blocked; the M-LED on the field bus node lights up.	[Saved parameters]
Note	If bit 6 is set to 1, the current parameter settings will be “frozen” (write-protected) and the current CPX equipment status will be saved, except for bit 6 itself and the module parameter “Force channel X”. Recommendation: Select “System start with default parametrizing and current CPX equipment status”. The desired parametrizing can then be created in the start-up phase or after field bus interruptions e.g. by the plug-in module or the scanner/bus master (depending on the field bus used). If “System start with default parametrizing and current CPX equipment status” is active, the factory settings for all module and system parameters will become valid after Power On.	
*) This parameter does **not** exist with the CPX-FEC in the operating modes Stand Alone and Remote Controller (control function active).		

Tab. B/8: System start

B.2.3 Module parameters

Module parameters refer to module-specific or channel-specific functions. 64 bytes are available for parameters in each module. Detailed information on the module parameters, which are supported by the module used, can be found in the manual for the relevant module. There you will find information on possible parameters and their settings.

Function number 1)	**Module parameters**
4828 + m * 64 + 0	Monitoring the CPX module
4828 + m * 64 + 1	Reaction after short circuit/overload
4828 + m * 64 + 1	Input debouncing time
4828 + m * 64 + 1	Signal extension time
4828 + m * 64 + 3	Data format analogue value inputs
4828 + m * 64 + 3	Data format analogue value outputs
1) m = module number (counting on the modules from left to right, beginning with 0)	

Tab. B/9: Overview of module parameters for module-specific functions

Function no.	**Example of some channel-specific module parameters**
4828 + m * 64 + 6	Signal extension channel x
- 1)	Monitoring wire fracture channel X
- 2)	Fail safe channel x
- 2)	Idle mode channel x
- 2)	Force channel x
1) Function number see manual for CPX modules 2) Access is protocol-specific (see manual for field bus node)	

Tab. B/10: Overview – Example of some channel-specific module parameters

Module parameters: Monitoring the CPX module		
Modules	Depending on the monitoring function for modules with digital and analogue inputs and outputs (see description on the respective module)	
Function no.	4828 + m * 64 + 0 m = module number (0...47)	
Description	For each module the monitoring of the possible faults can be activated or deactivated (suppressed) independently of each other. Active monitoring causes the following: The fault is: – sent to the CPX field bus node – displayed by the module common error LED.	
	Monitoring	[Monitor]
	Bit Description	
	0 Short circuit/overload in sensor supply	[Monitor SCS]
	1 Short circuit/overload at the outputs	[Monitor SCO]
	2 Undervoltage at outputs/valves ($V_{OUT/VAL}$)	[Monitor $V_{OUT/VAL}$]
	3 Short circuit at the valve	[Monitor SCV]
	4 Reserved	–
	5 Reserved	–
	6 Reserved	–
	7 Monitoring parameterisation faults	[Monitor parameters]
Values	1 = Active (presetting) 0 = Inactive	[Active] [Inactive]
Note	Monitoring can also be set for the complete CPX terminal (see system parameter “Monitoring”).	

Tab. B/11: Monitoring the CPX module

For parametrizing the “Monitoring CP modules” on the CPX-CP interface see the manual for the CPX-CP interface typeP. BE-CPX-CP-... .

Module parameters: Reaction after short circuit/overload		
Modules	Depending on the function for modules with digital and analogue inputs and outputs (see description on the respective module)	
Function no.	4828 + m * 64 + 1 m = module number (0...47)	
Description	Determines after a short circuit in the sensor supply or the outputs whether the power is to remain switched off or whether it is to be switched on again automatically.	
	Reaction after short circuit/overload Bit Description 0 Short circuit/overload in sensor supply 1 Short circuit/overload at the outputs 3 Short circuit/overload at the analogue signal	[Behaviour after] [Behaviour after SCS] [Behaviour after SCO] [Behaviour after SCA]
Values	0 = Voltage/current remains switched off 1 = Switch voltage/current on again	[Leave switched off] [Resume]
Note	With the setting “voltage/current remains switched off”, you must switch the power off/on or set/reset the relevant signals in order to apply power again. Ascertain the setting which is necessary for reliable operation of your machine or system. Further information can be found in the manual for the CPX I/O modules.	

Tab. B/12: Reaction after short circuit/overload

Module parameters: Input debouncing time		
Modules	For modules with digital inputs (see manual for the module)	
Function no.	4828 + m * 64 + 1 m = module number (0...47)	
Description	Determines when a change of edge of the sensor signal on this module is to be accepted as a logical input signal.	
Bit	Bits 4, 5	
Typical values Bit 5 4 0 0 0 1 1 0 1 1	Input debouncing time Description 0.1 ms 3 ms (typical presetting) 10 ms 20 ms	[Debounce time]
Note	Input debouncing times are specified in order to eliminate interfering changes of signal edge during switching procedures (bouncing of the input signal). Further information on this parameter can be found in section C.1.	

Tab. B/13: Input debouncing time

Module parameters: Signal extension time		
Modules	For modules with digital inputs (see manual for the module)	
Function no.	4828 + m * 64 + 1 m = module number (0...47)	
Description	Determines the signal extension time for the relevant module. Signal states accepted as logical input signals usually remain valid at least until the specified signal extension time (minimum signal duration) has expired. Changes of edge within the extension time are ignored.	
Bit	Bits 6, 7	
Typical values Bit 7 6 0 0 0 1 1 0 1 1	Signal extension time Description 0.5 ms 15 ms (typical presetting) 50 ms 100 ms	[Signal extension]
Note	There is a danger here that short signals are not “recognized” due to long cycle times of the higher-order controller. In order that such signals are taken into consideration in the control sequence, a signal extension time can be specified (see section C.2). The signal extension time can be activated by channel-by-channel (see channel-specific module parameters).	

Tab. B/14: Signal extension time

Module parameters: Data format for analogue value inputs		
Modules	For modules with analogue inputs (see manual for the module)	
Function no.	4828 + m * 64 + 3 m = module number (0...47)	
Description	Determines the data format with which the relevant analogue values are processed internally.	
Bit	Bits 0, 1	
Values	Data format analogue value inputs See manual for the relevant analogue module	[Input format]
Note	The choice of data format depends on the field bus or field bus master used and simplifies evaluation of the analogue values.	

Tab. B/15: Data format analogue value inputs

Module parameters: Data format for analogue value outputs		
Modules	For modules with analogue outputs (see manual for the module)	
Function no.	4828 + m * 64 + 3 m = module number (0...47)	
Description	Determines the data format with which the relevant analogue values are processed internally.	
Bit	Bits 4, 5	
Values	Data format analogue value outputs See manual for the relevant analogue module	[Output format]
Note	The choice of data format depends on the field bus or field bus master used and simplifies evaluation of the analogue values.	

Tab. B/16: Data format analogue value outputs

Example of some channel-specific module parameters

Module parameters: Signal extension channel x		
Modules	For modules with digital inputs (see manual for the module)	
Function no.	4828 + m * 64 + 6 m = module number (0...47)	
Description	Determines whether the signal extension for the relevant input channel is enabled or blocked.	
Bit	Bit 0...7 (channel 0...7)	
Values	Signal extension input channel ... 0 = Blocked 1 = Enabled	[Signal extension Inp Ch ...] [Disabled] [Enabled]
Note	The signal extension time can be specified separately for each module (see function no. 4828 + n; n = m * 64 + 1).	

Tab. B/17: Signal extension channel x (channel-specific)

Module parameters: Monitoring wire fracture channel x (only for CPA pneumatics)		
Modules	For CPA pneumatic interface (see description for pneumatic interface)	
Function no. – Channel 0...7 – Channel 8...15 – Channel 16...23 – Channel 24...31	 4828 + m * 64 + 6 4828 + m * 64 + 7 4828 + m * 64 + 8 4828 + m * 64 + 9	 m = module number (0...47)
Description	Determines whether monitoring of the wire fracture for the relevant channel is active or inactive (CPA: channel 0...21).	
	Monitoring wire fracture output channel ... 0 = Inactive 1 = Active	[Monitor open circuit Out CH ...] [Inactive] [Active]
Note	With monitoring wire fracture, a missing valve or a wire fracture (connection fault between the pneumatic interface and the valve coil) is recognised.	

Tab. B/18: Monitoring wire fracture channel x (channel-specific)

Module parameters: Fail safe channel x		
Modules	For modules with digital and analogue outputs (see manual for the module)	
Function no.	Access to these module parameters is made via protocol-specific functions (see the manual for the field bus node).	
Description	Fault mode channel x: Fault state channel x:	Hold last state Fault state (presetting) Set output Reset output (presetting)
Note	With the aid of the so-called Fail safe parameterisation, the signal status which the outputs are to assume in the event of field bus communication faults can be specified (see also section C.3).	

Tab. B/19: Fail safe channel x (channel-specific)

Module parameters: Idle mode channel x	
Modules	For modules with digital and analogue outputs (see manual for the module)
Function no.	Access to these module parameters is made via protocol-specific functions (see the manual for the field bus node).
Description	Only relevant for certain field bus protocols Idle mode channel x: Hold last state / Idle state (presetting) Idle state channel x: Set output / Reset output (presetting)
Note	With the aid of the so-called Idle mode parameterisation, the signal status which the outputs/valves are to assume during a change into the Idle status can be determined (see also section C.3.3).

Tab. B/20: Idle mode channel x (channel specific)

Module parameters: Force channel x	
Modules	For modules with digital and analogue inputs and outputs (see manual for the module)
Function no.	Access to these module parameters is made via protocol-specific functions (see the manual for the field bus node).
Description	Force mode inputs channel x: Blocked (presetting) / Force state Force state inputs channel x: Set signal / Reset signal (presetting) Force mode outputs channel x: Blocked (presetting) / Force state Force state outputs channel x: Set signal / Reset signal (presetting)
Note	The function Force permits the manipulation of signal states independent of actual operating conditions (see also section C.3.1).

Tab. B/21: Force channel x (channel-specific)

For additional channel-specific module parameters as well as detailed information, see manual for the relevant module.

B.2.4 Diagnostic memory parameters

The working method of the diagnostic memory can be adapted to individual requirements by means of the diagnostic parameters.

The diagnostic memory parameters retain their last setting after power off/on. They are saved securely against power outages. The parameter values marked with presetting correspond to the factory condition. Further information on the working method of the diagnostic memory can be found in section C.4.

The following parameters can be influenced:

Function no.	Diagnostic memory parameters
3480	Entries remanent with Power ON
3480	Run/Stop filter 1
3484	Run/Stop filter 2
3484	Fault end filter
3484	Fault number filter
3484	Module/channel filter
3485	Module number MN
3486	Channel number CN
3487	Error number FN

Tab. B/22: Overview – Diagnostic parameters

Diagnostic memory parameters: Entries remanent with Power on		
Function no.	3480	
Description	Determines whether the contents of the diagnostic memory are to be retained after new power on or whether they are to be deleted.	
Bit 0	Entries remanent with new power ON	[Entries remanent at Power ON]
Values	1 = Inactive 0 = Active (presetting)	[Inactive] [Active]
Note	The diagnostic memory will be deleted if the mode is changed.	

Tab. B/23: Entries remanent with Power on

Diagnostic memory parameters: Run/Stop filter 1		
Function no.	3480	
Description	Diagnostic memory filter with which you can determine whether the first 40 faults or the last 40 faults are to be saved.	
Bit	Bit 1	
Values Bit 1 0 1	Run/Stop filter 1: Save the first 40 entries (stop after 40 entries); Save the last 40 entries (overwrite old entries, presetting)	[Run/Stop 1] [Save the first 40 entries] [Save the last 40 entries]
Note	The diagnostic memory will be deleted if the mode is changed.	

Tab. B/24: Run/Stop filter 1

Diagnostic memory parameters: Run/Stop filter 2		
Function no.	3484	
Description	Diagnostic memory filter with which you can determine when the registering of faults is to be started or stopped.	
Bit	Bits 0...2	
Values Bit2 1 0	Run/Stop filter 2 MN = module number, CN = channel number, FN = fault number Description	[Run/Stop 2]
0 0 0	Run/Stop filter 2 inactive (presetting)	[Inactive]
0 0 1	Register up to the defined FN	[Rec. up to def. FN]
0 1 0	Register up to the defined FN + MN	[Rec. up to def. FN + MN]
0 1 1	Register up to the defined FN + MN + CN	[Rec. up to def. FN + MN + CN]
1 0 0	Register as from the defined FN	[Rec. as of def. FN]
1 0 1	Register as from the defined FN + MN	[Rec. as of def. FN + MN]
1 1 0	Register as from the defined FN + MN + CN	[Rec. as of def. FN + MN + CN]
1 1 1	Reserved	–
Note	The numbers are determined by means of the diagnostic memory parameters “Module, channel and fault numbers” (function nos. 3485...3487).	

Tab. B/25: Run/Stop filter 2

Diagnostic memory parameters: Fault end filter		
Function no.	3484	
Description	Diagnostic memory filter with which you can determine whether running faults are to be registered or not.	
Bit	Bit 3	
Values Bit 3 0 1	Fault end filter Description Register running faults (end of fault) (filter inactive, presetting) Do not register running faults (end of fault) (filter active)	[Fault end filter] [Rec. outg. faults] [Do not rec. outg. faults]
Note	By registering the outgoing fault, you can ascertain how long the fault has existed. Incoming and running faults each represent one entry. With running faults the fault number “0” is entered. Maximum 40 entries are saved together.	

Tab. B/26: Fault end filter

Diagnostic memory parameters: Fault number filter		
Function no.	3484	
Description	With this diagnostic memory filter you can: – suppress the registering of a desired fault message – register exclusively a desired fault message	
Bit	Bits 4, 5	
Values Bit 5 4 0 0 0 1 1 0 1 1	Fault number filter FN = fault number Description Fault number filter inactive (presetting) Register only defined FN Do not register defined FN Reserved	[Fault numbers filter] [Inactive] [Rec. only def. FN] [Do not rec. def. FN] –
Note	The fault number is determined by means of the diagnostic memory parameter “Fault number” (function no. 3487).	

Tab. B/27: Fault number filter

Diagnostic memory parameters: Module/channel filter		
Function no.	3484	
Description	With this diagnostic memory filter, the registering of faults of other modules or channels can be suppressed in order that faults in a particular module or channel can be analysed.	
Bit	Bits 6, 7	
Values	Module/channel filter FN = fault number	[Module/channel filter]
Bit 7 6	Description	
0 0	Module/channel filter inactive (presetting)	[Inactive]
0 1	Register only the FN of a module	[Rec. FN of a mod.]
1 0	Register only the FN of a channel	[Rec, FN of a ch.]
1 1	Reserved	
Note	The numbers are determined by means of the diagnostic memory parameters “Module and channel numbers” (function nos. 3485...3486).	

Tab. B/28: Module/channel filter

Diagnostic memory parameters: Module number (MN)		
Function no.	3485	
Description	Module number for the diagnostic memory filter	
Bit	0...7 (1 byte)	
Values	Module number (MN) 0...47 Module number (0 = presetting)	[Module number MN]
Note	Is only effective if an appropriate diagnostic memory filter is active.	

Tab. B/29: Module number (MN)

Diagnostic memory parameters: Channel number (CN)		
Function no.	3486	
Description	Channel number for the diagnostic memory filter	
Bit	0...7 (1 byte)	
Values	Channel number (CN) 0...63 Channel number (0 = presetting)	[Channel number CN]
Note	Is only effective if an appropriate diagnostic memory filter is active.	

Tab. B/30: Channel number (CN)

Diagnostic memory parameters: Fault number (FN)		
Function no.	3487	
Description	Fault number for the diagnostic memory filter	
Bit	0...7 (1 byte)	
Values	Fault number (FN) 0...255 Fault number (0 = presetting)	[Fault number FN]
Note	Is only effective if an appropriate diagnostic memory filter is active.	

Tab. B/31: Fault number (FN)

B.2.5 Diagnostic memory data

The following diagnostic memory data is available:

Function no.	Diagnostic memory data
3482	Number of entries in the diagnostic memory
3483	Overflow
3483	Status
3488 + n	Diagnostic memory data (10 bytes per diagnostic entry, max. 40 entries)

Tab. B/32: Overview – Diagnostic memory data

Diagnostic memory data: Number of entries in the diagnostic memory		
Function no.	3482	
Description	Specifies the number of entries in the diagnostic memory	
Bit	0...7 (1 byte)	
Values	Number of entries in the diagnostic memory 0...40	[recorded faults ...]
Note	Can be used as a loop counter if the complete diagnostic memory is to be read out by PLC program.	

Tab. B/33: Number of entries in the diagnostic memory

Diagnostic memory data: Overflow		
Function no.	3483	
Description	Specifies whether the diagnostic memory has overflowed.	
Bit	0	
Values Bit 0 0 1	Overflow Description No overflow Overflow	 [no overflow] [overflow]
Note	The overflow is displayed when the first 40 faults are registered as well as when the last 40 faults are registered. Overrun means that more than 40 faults have occurred.	

Tab. B/34: Overflow

Diagnostic memory data: Status		
Function no.	3483	
Description	Specifies whether the error display is active or inactive.	
Bit	1	
Values Bit 1 0 1	 Description Registering active Registering inactive	 [Recording active] [Recording inactive]
Note	The fault registering can be stopped and started with the run/stop filters.	

Tab. B/35: Status

Structure of thediagnostic memory

The diagnostic memory contains up to 40 diagnostic entries. a diagnostic entry consists of 10 bytes. The first five bytes contain information on the fault time. The last five bytes contain information on the fault. The following table shows the structure of diagnostic entries.

Diagnostic memory data (10 bytes per entry, max. 40 entries)				**Function no. 1)**
Byte no.	**Title**	**Description**	**Value**	**3488 + n**
1	Days [day]	Number of days 2)	0...255	n = 10 * d + 0
2	Hours [h]	Number of hours 2)	0...23	n = 10 * d + 1
3	Minutes [m]	Number of minutes 2)	0...59	n = 10 * d + 2
4	Seconds [s]	Number of seconds 2)	0...59	n = 10 * d + 3
5	Milliseconds [ms]	Number of 10 msec 2) Additionally: bit 7 is set if it is the first entry after Power ON.	0...99 or 128...227	n = 10 * d + 4
6	Module code 3)	Module code of the module which registered the fault.	0...255	n = 10 * d + 5
7	Module position [Pos]	Module number of the module which registered the fault; 63 = fault not module-related	0...47, 63	n = 10 * d + 6
8	Channel number 3)	Bit 7 6 5...0: Description 0 0 0...63: No. of the 1st defective A channel 1 0 0...63: No. of the 1st defective Input channel 0 1 0...63: Module error 1 1 0...63: Reserved	0...255	n = 10 * d + 7
9	Fault number [FN]	0...255: Error number (possible error messages see section 5.1.1)	0...255	n = 10 * d + 8
10	Subsequent channels 3)	Number of subsequent channels with the same fault	0...63	n = 10 * d + 9

1) d (diagnostic event) [NB] = 0...39; most current diagnostic event = 0
2) Measured from the moment the power supply is switched on.
3) If the fault number = 0, the contents of these bytes are also 0. If the fault number lies between 128...199 (error class 3), the contents of these bytes are not relevant (servicing required).

Tab. B/36: Diagnostic memory data

B.2.6 System-Diagnostic data

The following system diagnostic data is available:

Function no.	System diagnostic data
1936	Status bits (error type and error source)
1937	Module number and diagnostic status
1938	Fault number

Tab. B/37: Overview – Diagnostic data

System diagnostic data: Status bits		
Function no.	1936	
Description	The 8 status bits display common diagnostic messages (global error messages). Bits 0...3 display the source of the fault and bits 4...7 display the type of the fault.	
Bit	Status bits Fault source: Bit 0: valve Bit 1: output Bit 2: input Bit 3: analogue/function module *) Fault type: Bit 4: undervoltage Bit 5: short circuit/overload Bit 6: wire fracture Bit 7: other faults	[System diagnostics] [Valve] [Output] [Input] [Analogue/function module] [Undervoltage] [Short circuit/overload] [Wire fracture] [Other error]
Values	1 = there is a fault; 0 = no fault	
*) Function modules are also known as technology modules (e.g. CPX-CP interface).		

Tab. B/38: Status bits

System diagnostic data: Module number and diagnostic status		
Function no.	1937	
Description	Function no. 1937 specifies whether there are diagnostic data and contains, where applicable, the number of the first module on which a fault has occurred. With the aid of the module number of the faulty module you can ascertain the function numbers of the relevant diagnostic data.	
Bit	Bit 0...5: Module number of the first faulty module Bit 6: Diagnostic status Bit 7: Reserved	[First faulty module]
Values	Bits 0...5: 0...47 (module number) Bit 6: 1 = there are diagnostic data 0 = there are no diagnostic data	
Note	Function no. 1938 contains the relevant error number. Examples see Fig. 5/7 and Fig. 5/9.	

Tab. B/39: Module number and diagnostic status

System diagnostic data: Fault number		
Function no.	1938	
Description	Contains the current fault number	
Bit	Bit 0...7 Error number	[Fault number]
Values	0...255 Fault number	
Note	Possible error messages see section 5.1.1) Function no. 1937 specifies whether there are diagnostic data and contains, where applicable, the number of the first module on which the fault occurred.	

Tab. B/40: Fault number

B.2.7 Module diagnostic data

The module diagnostic data are assigned to the function numbers 2008 to 2199. There are 4 diagnostic information items in 4 consecutive bytes for each module. The function numbers of the diagnostic data of the faulty module are therefore calculated as follows:

Function no. = 2008 + (4 * module number) + information no.

You can ascertain the module number of the first faulty module with the aid of the system diagnostic data (function no. 1937).

The following module diagnostic data is available:

Function no. [1)]	**Module diagnostic data**
2008 + m * 4 + 0	Number of the first faulty channel
2008 + m * 4 + 1	Module fault number
2008 + m * 4 + 2	Information 2 (reserved)
2008 + m * 4 + 3	Information 3 (reserved)
1) m = module number (0...47)	

Tab. B/41: Overview – Module diagnostic data

Module diagnostic data for CP modules on the CPX-CP interface see the manual for the CPX-CP interface type P.BE-CPX-CP-... .

Module diagnostic data: Number of the first faulty channel	
Function no.	2008 + m * 4 + 0 m = module number (0...47)
Description	Specifies the number of the faulty channel (bits 0...5)
Bit	Bit 7 6 5 ... 0 : Description 0 0 0 ... 63 : No. of the 1st defective A channel 1 0 0 ... 63 : No. of the 1st defective Input channel 0 1 0 ... 63 : Module error 1 1 0 ... 63 : Reserved
Values	Bits 0...5 0...63 (channel number) Bit 6 0...1 Bit 7 0...1
Note	With the aid of the module number of the faulty module (see system diagnostic data, byte address 1937) you can ascertain the function numbers of the relevant diagnostic data.

Tab. B/42: Number of the first faulty channel

Module diagnostic data: Module fault number	
Function no.	2008 + m * 4 + 1 m = module number (0...47)
Description	Fault number
Bit	Bit 0...7 Error number
Values	0...255 (Fault number)
Note	Possible error messages see section 5.1.1

Tab. B/43: Module fault number

Module diagnostic data: Information 2 (reserved)	
Function no.	2008 + m * 4 + 2 m = module number (0...47)
Description	Reserved

Tab. B/44: Information 2 (reserved)

Module diagnostic data: Information 3 (reserved)		
Function no.	2008 + m * 4 + 3	m = module number (0...47)
Description	Reserved	

Tab. B/45: Information 3 (reserved)

B.2.8 System data

System data give information on global system settings and system states. They will be lost after Power Off (non-remanent). The following system data is available:

Function no.	System data
0	CPX operating mode
0	CPX equipment status
0	Handheld
0	Force mode
0	System start
1	Fail safe
1	System Idle mode [1]
2	Monitoring the CPX terminal
–	Number of input bytes (Rx size) [1]
–	Number of output bytes (Tx size) [1]
[1] Only relevant for certain field bus protocols	

Tab. B/46: Overview – System data

System data: CPX operating mode		
Function no.	0	
Description	Specifies the CPX operating mode which is currently active. In the operating mode “Remote I/O” all functions are controlled via the protocol implemented in the field bus node. In the operating mode “Remote Controller” the FEC takes complete control of the I/Os. 8 I/O bytes are intended for communication with the field bus node.	
Bit	Bits 0...3	
Values Bit 3 2 1 0 0 0 0 1 0 0 1 0 0 1 0 0 1 0 0 0	CPX operating mode Description Remote I/O without FEC Remote I/O with FEC Remote Controller without field bus node Remote Controller with field bus node	[CPX mode] [Remote I/O] [Remote I/O with FEC] [Remote controller] [Remote control with FB]
Note	The CPX operating mode is ascertained and entered during the start-up phase.	

Tab. B/47: CPX operating mode

System data: CPX equipment status		
Function no.	0	
Description	Specifies whether the current equipment fitted to the CPX corresponds to the saved CPX equipment status.	
Bit	Bit 4	
Values Bit 4 0 1	CPX equipment status Description equal not equal	[CPX structure] [equal] [unequal]
Note	See also system parameter “System start”.	

Tab. B/48: CPX equipment status

System data: Handheld		
Function no.	0	
Description	Specifies whether a handheld is connected or not.	
Bit	Bit 5	
Values Bit 5 0 1	Handheld Description Handheld not connected Handheld connected	[Handheld] – [connection OK]
Note	Information for the higher-order controller If necessary for test purposes, a parameterisation carried out by handheld is to be cancelled by reloading the parameters, or forcing by higher-order PLC/IPC is to be blocked whilst a handheld is connected.	

Tab. B/49: Handheld

System data: Force mode		
Function no.	0	
Description	Specifies whether Force is blocked or enabled.	
Bit	Bit 6	
Values Bit 6 0 1	Force mode Description Blocked Enabled	[Force mode] [Disabled] [Enabled]
Note	See also system parameter “Force mode”.	

Tab. B/50: Force mode

System data: System start		
Function no.	0	
Description	Specifies how the system start of the CPX terminal is to be carried out.	
Bit	Bit 7	
Values Bit 7 0 1	System start Description System start with default parameterisation (factory setting) and current CPX equipment status System start with saved parameterisation and saved CPX equipment status	[System start] [Default parameters] [Saved parameters]
Note	See also system parameter “System start”.	

Tab. B/51: System start

System data: Fail safe		
Function no.	1	
Description	Specifies whether Fail safe is active or inactive.	
Bit	Bits 0, 1	
Values Bit 1 0 0 0 0 1 1 1	Fail safe Description Reset all outputs Hold last state (retain signal status) Assume fault mode	[Fail safe] [Reset outputs] [Hold last state] [Assume fault mode]

Tab. B/52: Fail safe

System data: Idle mode		
Function no.	1	
Description	Specifies whether Idle mode is active or inactive.	
Bit	Bits 2, 3	
Values Bit 3 2 0 0 0 1 1 1	Idle mode Description Reset all outputs Hold last state (retain signal status) Assume Idle mode	[Idle mode] [Reset outputs] [Hold last state] [Assume idle mode]

Tab. B/53: Idle mode

System data: Monitoring the CPX terminal		
Function no.	2	
Description	Specifies whether the monitoring of short circuit/overload and undervoltage is active or inactive.	
Bit 0 1 2 3 4 5 6 7	Monitoring Description Short circuit/overload in sensor supply Short circuit/overload at the outputs Undervoltage outputs (V_{OUT}) Undervoltage at valves (V_{VAL}) Short circuit at the valve Reserved Reserved Reserved	[Monitor] [Monitor SCS] [Monitor SCO] [Monitor Vout] [Monitor Vval] [Monitor SCV] – – –
Values	1 = Active 0 = Inactive	
Note	See system parameter “Diagnostic monitoring”.	

Tab. B/54: Monitoring the CPX terminal

System data: Number of input bytes (Rx size)	
Function no.	–
Description	Specifies the number of input bytes of the CPX terminal.
Note	Only relevant with certain field bus protocols (see manual for CPX field bus node)

Tab. B/55: Number of input bytes

System data: Number of output bytes (Tx size)	
Function no.	–
Description	Specifies the number of output bytes of the CPX terminal.
Note	Only relevant with certain field bus protocols (see manual for CPX field bus node)

Tab. B/56: Number of output bytes

B.2.9 Module data

The following module data is available for identifying modules:

Function no.	Module data
16 +16m + 0	Module code
16 +16m + 13	Revision code
784 + m * 4 + 0 784 + m * 4 + 1 784 + m * 4 + 2 784 + m * 4 + 3	Series number
m = module number	

Tab. B/57: Overview of module data

Module data: Module code		
Function no.	16 + 16m + 0 m = module number (0...47)	
Description	Specifies the module code of the module (see also Tab. B/59).	
Bit	0...7	
Values	Module code 0 Reserved 1...63 Digital modules 64...79 Pneumatic interfaces 80...127 Pneumatic modules 128...152: Analogue modules 153...196: Function or technology modules 197...201: Special modules 202...245: Field bus node 246...255: Reserved	[Module code]
Note	See manual for the relevant module	

Tab. B/58: Module code

Module code *)	**Module type**	**Handheld display**
1	Input module CPX-4DE	[4DI input module]
2	Input module CPX-8DE	[8DI input module]
3	Output module CPX-4DA	[4DO output module]
4	Multi I/O module CPX-8DE-8DA	[8DI/8DO multi I/O module]
66	Pneumatic interface CPX-GP-CPA-...	[CPA10/14 pneumatic interface]
67	Pneumatic interface CPX-GP-03-4.0	[Type3 pneumatic interface]
80	MPA electronic module VMPA1-FB-EMG-8	[MPA1G valve module]
81	MPA electronic module VMPA2-FB-EMG-4	[MPA2G valve module]
82	MPA electronic module VMPA1-FB-EMS-8	[MPA1S valve module]
83	MPA electronic module VMPA2-FB-EMS-4	[MPA2S valve module]
128	Inut module CPX-2AE-U-I	[2AI analogue input]
129	Output module CPX-2AA-U-I	[2AO analogue output]
153	Bus node CPX-FB13; Remote Controller	[FB13-RC PROFIBUS bus node]
154	Bus node CPX-FB06; Remote Controller	[FB6-RC Interbus bus node]
155	Bus node CPX-FB11; Remote Controller	[FB11-RC DeviceNet bus node]
156	Bus node CPX-FB14; Remote Controller	[FB14-RC CANopen bus node]
157	Bus node CPX-FB23; Remote Controller	[FB23-RC CC-Link bus node]
15...	Bus node CPX-FB...; Remote Controller	[FB...-RC ... bus node]
195	Technology module CPX-CP-4-FB	[CPI CP interface]
202	Bus node CPX-FB13; Remote I/O	[FB13-RIO PROFIBUS remote I/O]
203	Bus node CPX-FB6; Remote I/O	[FB6-RIO Interbus remote I/O]
204	Bus node CPX-FB11; Remote I/O	[FB11-RIO DeviceNet remote I/O]
205	Bus node CPX-FB14; Remote I/O	[FB14-RIO CANopen remote I/O]
206	Bus node CPX-FB23; Remote I/O	[FB23-RIO CC-Link remote I/O]
20...	Bus node CPX-FB...; Remote I/O	[FB...-RIO ... remote I/O]
208	CPX-FEC (Stand Alone and Remote Controller)	[FEC controller]
210	CPX-FEC (Remote I/O)	[FEC Modbus TCP]
*)	*)	*)
*) Further modules in preparation – module code see technical specifications for the relevant module		

Tab. B/59: List of the module codes

Module data: Revision code		
Function no.	16 + 16m + 13 m = module number (0...47)	
Description	Specifies the output status of the module.	
Bit	0...7	
Values	Revision code 0...255	[Revision]
Note	See type plate	

Tab. B/60: Revision code

Module data: Series number	
Function no.	784 + m * 4 + 0 (byte 0) 784 + m * 4 + 1 (byte 1) 784 + m * 4 + 2 (byte 2) 784 + m * 4 + 3 (byte 3) m = module number (0...47)
Description	Specifies the series number of the module. In byte 0 one nibble (4 bits) contains the year and the other nibble contains the month of the series (hexadecimal coding). Of bytes 1...3 each nibble contains a figure of the series number (BCD coded 1)).
1) BCD = binary coded decimal number (example see following table)	

Function no.	**Bit number**								**Example 1)**							
	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
	Nibble				Nibble				Nibble				Nibble			
784 + m * 4 + 0	Year 2)				Month 3)				0	0	0	1	1	1	0	0
784 + m * 4 + 1	100,000				10,000				0	1	1	0	0	1	0	1
784 + m * 4 + 2	1 000				100				0	1	0	0	0	0	1	1
784 + m * 4 + 3	10				1				0	0	1	0	0	0	0	1

1) Example: Series number 1C654321
2) 0001 (1) = year 2001; 0010 (2) = year 2002 etc.
3) 0001 (1) = January; 0010 (2) = February ... 1011 (B) = November; 1100 (C) = December

Tab. B/61: Series number

General information on parametrizing

Appendix C

Contents

Contents of this appendix

This appendix contains general information on parameterising the following:

- input debouncing times
- signal extension times
- the signal status in the event of a fault (Fail safe)
- the function forces
- the diagnostic memory
- the monitoring of faults.

Further information

Information on the structure of all the parameters and data of the CPX terminal can be found in appendix A.

Information on the parameters and data which are supported by the field bus used, can be found in the manual for the field bus node used.

Instructions on parameterisation via the handheld can be found in the manual for the handheld.

C.1 Input debouncing time

Basic information

Input debouncing times are specified in order to eliminate interfering changes of signal edge during switching procedures (bouncing of the input signal). For example, mechanical switches generate brief undesired signal edges during switching procedures. The signal states which are thereby produced can cause interference in the control sequence and should therefore frequently be suppressed.

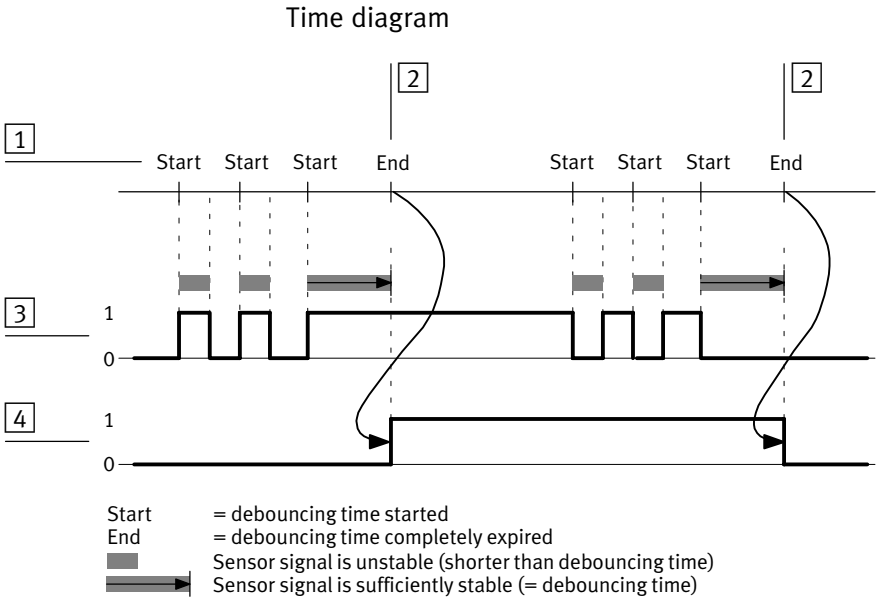
Interfering, undesired signal edges can be suppressed by a PLC program in the higher-order controller. Interference can therefore be avoided. With the CPX terminals, undesired signal edges can be suppressed simply by parameterisation.

CPX parameterisation

With the CPX terminals, the input debouncing time can be set with an appropriate module parameter. The possible input debouncing times therefore depend on the particular type of module. Typical input debouncing times are: 0.1 ms, 3 ms (typical presetting), 10 ms and 20 ms.

Method of operation

Changes of edge in the sensor signal will be accepted as a logical input signal (see Fig. C/1) only when the specified debouncing time has expired.



1 Start and end (sequence) of the debouncing time

2 Debouncing time has expired

3 Sensor signal

4 Logical CPX signal

Fig. C/1: Input debouncing

C.2 Signal extension

Basic information

Signal extension times are specified when very short signals are to be taken into account in the control process. Short signals can occur, e.g. when an intermediate position is exceeded and evaluation is necessary in order to produce a time-optimised consequent process before an end position is reached.

Depending on the type of sensor, the length of the signal, which is generated when the intermediate position is exceeded, can fluctuate according to the positioning speed. There is a danger here that the short signals are not always “recognized” due to long cycle times of the higher-order controller.

With CPX terminals, a signal extension time can be defined by parameterisation of the appropriate input signal. Short signals will then also be recognised reliably by the higher-order controller.

CPX parameterisation

With the CPX terminals, the signal extension time for the module is set with the appropriate module parameter. The possible signal extension times depend on the type of module. Typical signal extension times are: 0.5 ms, 15 ms, 50 ms and 100 ms.

The signal extension time for each channel can be activated or deactivated with a further channel-orientated module parameter. When preset, the signal extension time is inactive.

Method of operation

Signal states accepted as logical input signals usually remain valid at least until the specified minimum signal duration has expired. Change of edge within the minimum signal duration are ignored (see Fig. C/2). Fixed debouncing times remain effective.

Case 1: Change of edge within the signal extension time

The logical CPX signal is supplied when the signal extension time and, if applicable, the debouncing time has expired.

1 Sensor signal

2 Logical CPX signal

3 Change of edge within the signal extension time

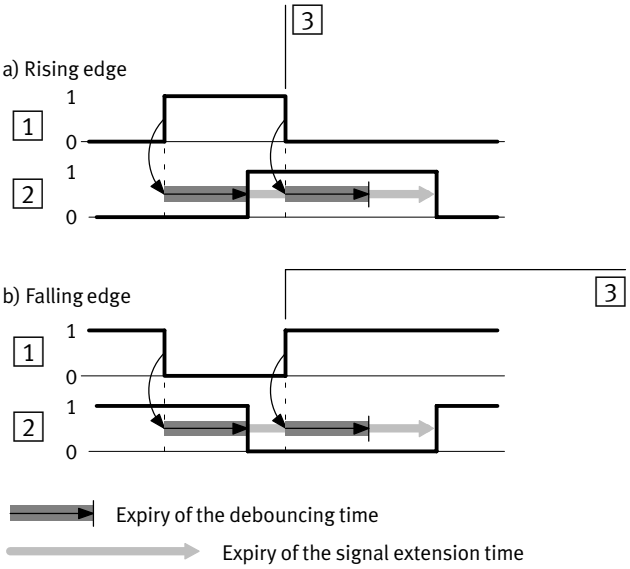


Fig. C/2: Change of edge within the signal extension time

Case 2: Change of edge after expiry of the signal extension time

The logical CPX signal follows the input signal and is supplied after it. If a debouncing time has been defined, the logical CPX signal is supplied when the debouncing time has expired.

1 Sensor signal

2 Logical CPX signal

3 Change of edge after expiry of the signal extension time

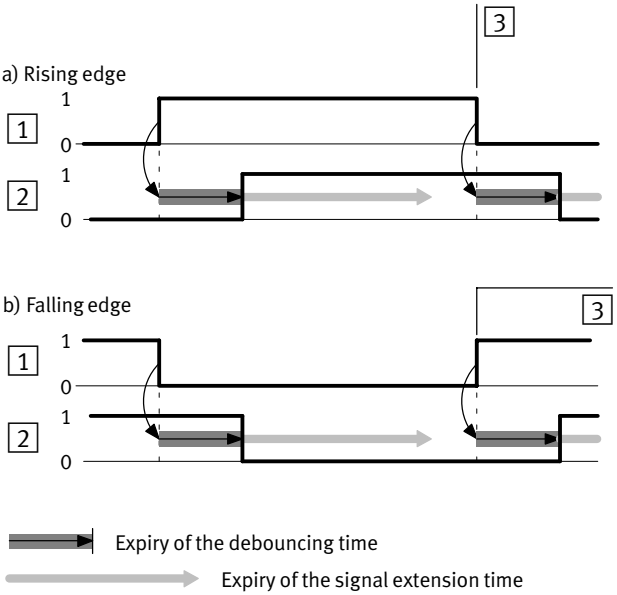


Fig. C/3: Change of edge after expiry of the signal extension time

C.3 Influence of signal states

You can influence the signal states of the CPX terminal through the following functions:

Function	Priority	Brief description	Signals able to be influenced
Forces [2]	1	Influences signal states independently of actual signal states (see also section C.3.1).	I/O signals
Fail safe	2	Determines signal states that become effective with field bus communication faults (see also section C.3.2).	O signals
Idle mode [1]	3	Determines signal states that become effective when changing into the Idle status (see also section C.3.3).	O signals

[1] Only relevant for certain field bus protocols.
[2] Mainly used for test purposes in the commissioning phase.

Tab. C/1: Functions for influencing signal states

If several functions are active simultaneously, the following applies:

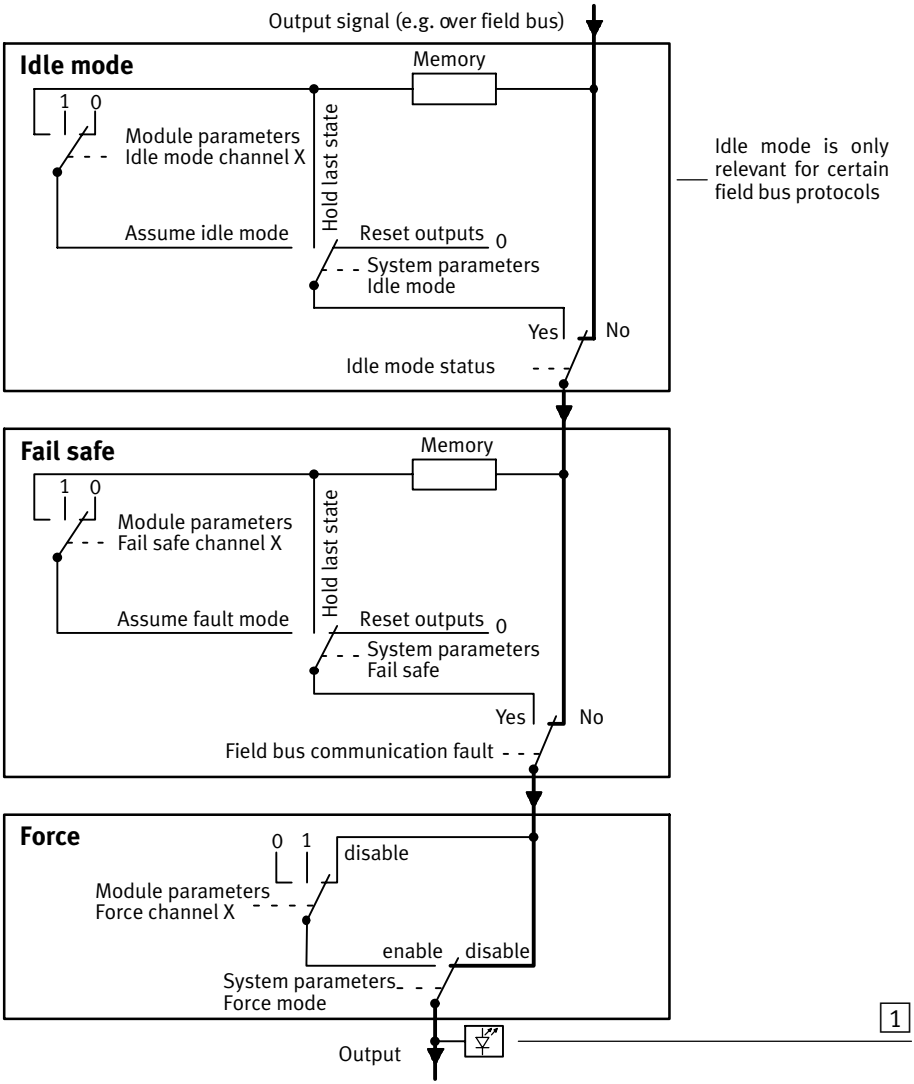
– Force signals have the highest priority.

– Fail safe signals have precedence over Idle mode signals.

Overview on the Force, Fail safe and Idle mode functions

Influencing output signals

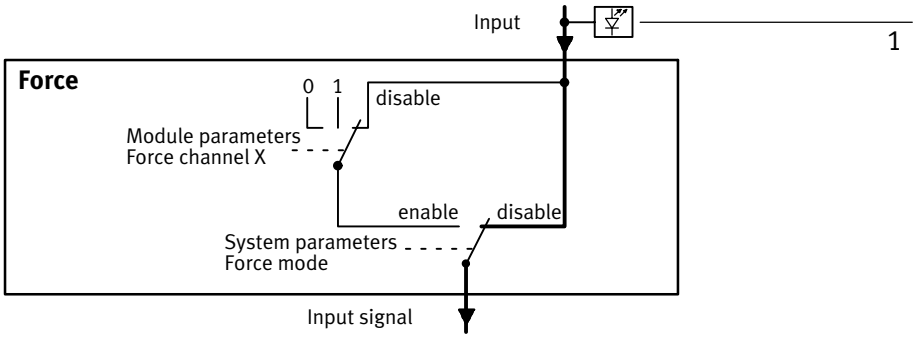
With system parameters, you enter the fundamental settings for the respective function. With appropriate setting of the system parameter, you can determine, through channel-specific module parameters, the desired signal state for each channel individually. The following diagrams give an overview of this:



1 Status LED of the respective output

Fig. C/4: Influencing output signals

Influencing input signals



1 Status LED of the respective input

Fig. C/5: Influencing input signals

Forcing of an input does **not** change the input signal and can also **not** be observed on the corresponding situation LED. The logical status of the input only changes internally and may be effective programme technically.

Obtain further information on Idle mode, Fail safe and Forcing from the following sections.

C.3.1 Force

Basic information

The function Force permits the manipulation of signal states independent of actual operating conditions. Force enables input and output signals to be overwritten, Input signals actually present or changes of status by program will be ignored. The input signals actually present and the output signals generated by the user program only become valid again when the function Force is deactivated.

Warning
Depending on the function of the machine/system, the manipulation of signal states can cause serious injury to human beings and damage to property.

Use the Force function very carefully, in order to avoid damage.

The “Force” function is used mainly in the commissioning phase in order to set certain signals to the desired status for test purposes even if the wiring is not complete.

CPX parameterisation

With CPX terminals, Force parameterisation can be used for:

- digital inputs
- digital outputs
- valves
- I/Os of the I/O diagnostic interface and status bits
- analogue inputs
- analogue outputs.

By means of a system parameter, Force is enabled globally for the CPX terminal or blocked.

System parameters	Settings	Description
Force mode	Blocked (presetting)	Force is blocked for the complete CPX terminal
	Enabled	Force is enabled for the complete CPX terminal

Tab. C/2: System parameter Force mode

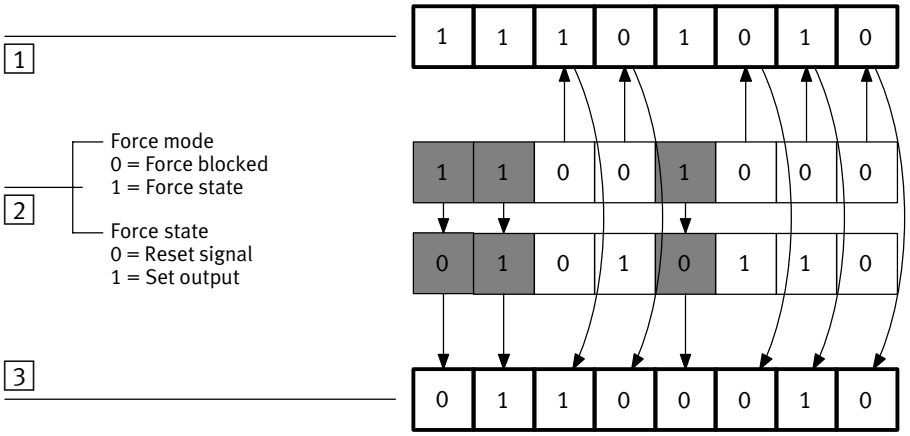
The signal status can be determined channel-orientated (output/valve/input) for each module (see following table).

Module parameters	Settings	Description
Force mode	Blocked (presetting)	Force is blocked for the channel
	Force state	Accept the signal status defined by Force state
Force state – Digital signal	Rest signal (presetting)	Reset input/output signal
	Set signal	Set input/output signal
– Analogue signal	Analogue value (0 = presetting)	Value of the analogue signal

Tab. C/3: Module parameters “Force mode” and “Force state”

Method of operation

Input information actually present will be replaced by the values entered in the Force table in the process image inputs. Information actually present in the process image outputs will be replaced by the values entered in the Force table and transmitted to the physical outputs.

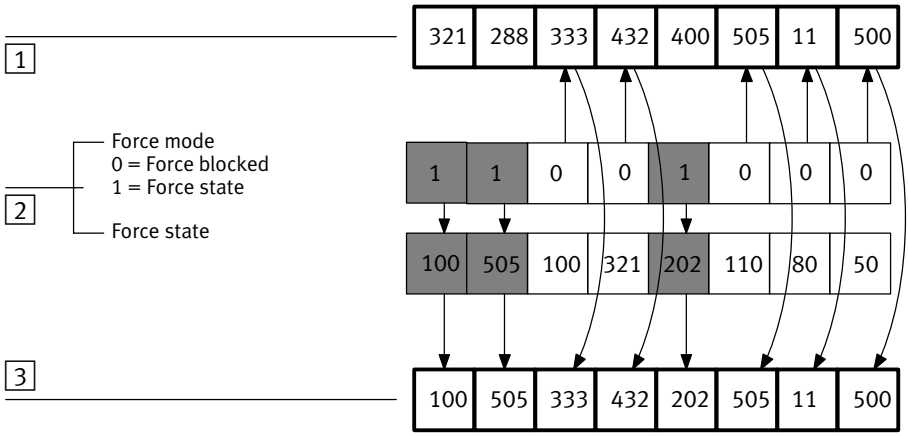


1 Signal status previously

2 Module parameter (channel-orientated)

3 Signal status afterwards

Fig. C/6: Force parameterisation – Example for binary signals



1 Analogue signal previously

2 Module parameter (channel-orientated)

3 Analogue signal afterwards

Fig. C/7: Force parameterisation – Example for analogue signals

C.3.2 Signal status in the event of a fault (Fail safe)

Basic information

With the aid of the so-called Fail safe parameterisation, the signal status which the outputs are to assume in the event of field bus communication faults, can be determined (Fail safe status). In this way, a defined machine/system status should be created in the event of field bus communication faults (e.g. failure of the higher-order PLC/IPC).

Warning
Depending on the function of the machine/system, the manipulation of signal states can cause serious injury to human beings and damage to property.

Use the Fail safe parameterisation very carefully, in order to avoid damage.

CPX parameterisation

With CPX terminals, Fail safe parameterisation can be used for:

- digital outputs
- analogue outputs
- valves.

By means of the system parameter Fail safe, you can globally determine the signal status which the outputs/valves are to assume in the event of field bus communication faults, e.g. in the event of:

- communication failure (bus interruption, PLC failure)
- communication stop.

System parameters	Settings	Description
Fail safe	Reset outputs (presetting)	Reset all outputs/valves
	Hold last state	Retain current signal status for all outputs/ valves
	Assume Fault mode value	Accept the signal status defined for the relevant channel

Tab. C/4: System parameter “Fail safe”

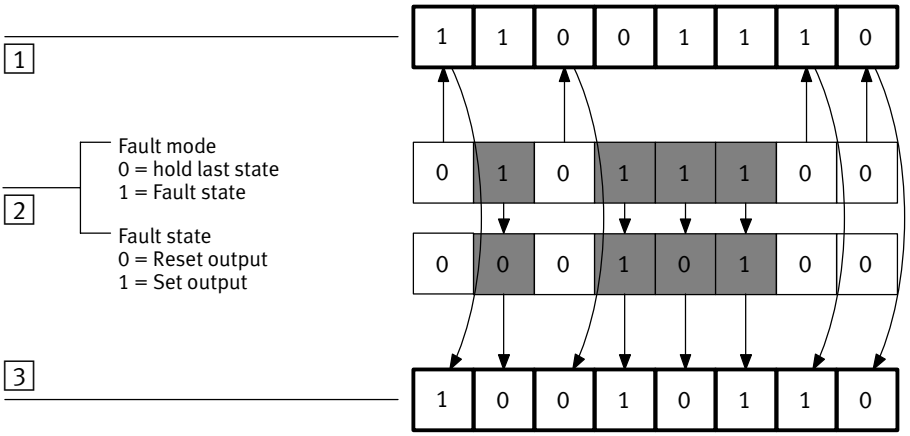
If “Accept fault mode value” is activated, the signal states defined by module parameter for the relevant channel will become effective (see Fig. C/8).

Module parameters	Settings	Description
Fault mode	Hold last state	Retain current signal status
	Fault state (presetting)	Accept the signal status defined by Fault state
Fault state – Digital signal	Reset output (presetting)	Reset output signal (output/valve)
	Set output	Set output signal (output/valve)
– Analogue signal	Analogue value	Value of the analogue signal

Tab. C/5: Module parameters “Fault mode” and “Fault state”

Method of operation

The “Fault mode” parameter is used to determine whether the current signal status is to be retained or whether the signal status defined by “Fault state” is to be accepted.

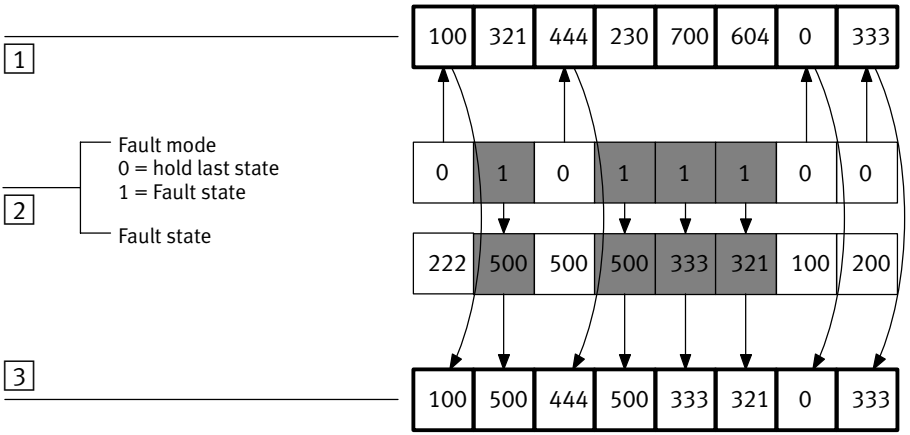


1 Signal status before the fault

3 Signal status after the fault

2 Module parameter (channel-orientated)

Fig. C/8: Fail safe parameterisation – Example for binary signals



1 Signal status before the fault

3 Signal status after the fault

2 Module parameter (channel-orientated)

Fig. C/9: Fail safe parameterisation – Example for analogue signals

C.3.3 Signal status in Idle status (Idle mode)

This function is only relevant with certain field bus protocols (see manual for CPX field bus node).

Basic information

The so-called Idle mode parameterisation helps determine which signal status outputs/valves should take when changing into the Idle status. In this way a defined machine/system status should be created.

Warning
Depending on the function of the machine/system, the manipulation of signal states can cause serious injury to human beings and damage to property.

Use the Idle mode parameterisation very carefully, in order to avoid damage.

CPX parameterisation

With CPX terminals, Idle mode parameterisation can be used for:

– digital outputs

– analogue outputs

– valves.

By means of the system parameter Idle mode, you can globally determine the signal status which the outputs/valves are to assume when changing into the Idle status.

System parameters	Settings	Description
System Idle mode	Reset outputs (presetting)	Reset all outputs/valves
	Hold last state	Retain current signal status for all outputs/ valves
	Assume Idle mode value	Accept the signal status defined for the relevant channel

Tab. C/6: System parameter System Idle mode

If “Accept Idle mode value” is activated, the signal states defined by module parameter for the relevant channel will become effective (see Tab. C/7).

Module parameters	Settings	Description
Idle mode	Hold last state	Retain current signal status
	Idle state (presetting)	Accept the signal status defined by the Idle state
Idle state – Digital signal	Reset output (presetting)	Reset output signal (output/valve)
	Set output	Set output signal (output/valve)
– Analogue signal	Analogue value	Value of the analogue signal

Tab. C/7: Module parameters “Idle mode” and “Idle state”

Method of operation

Is functionally identical with the Fail safe parameterisation (see also Fig. C/8 and Fig. C/9).

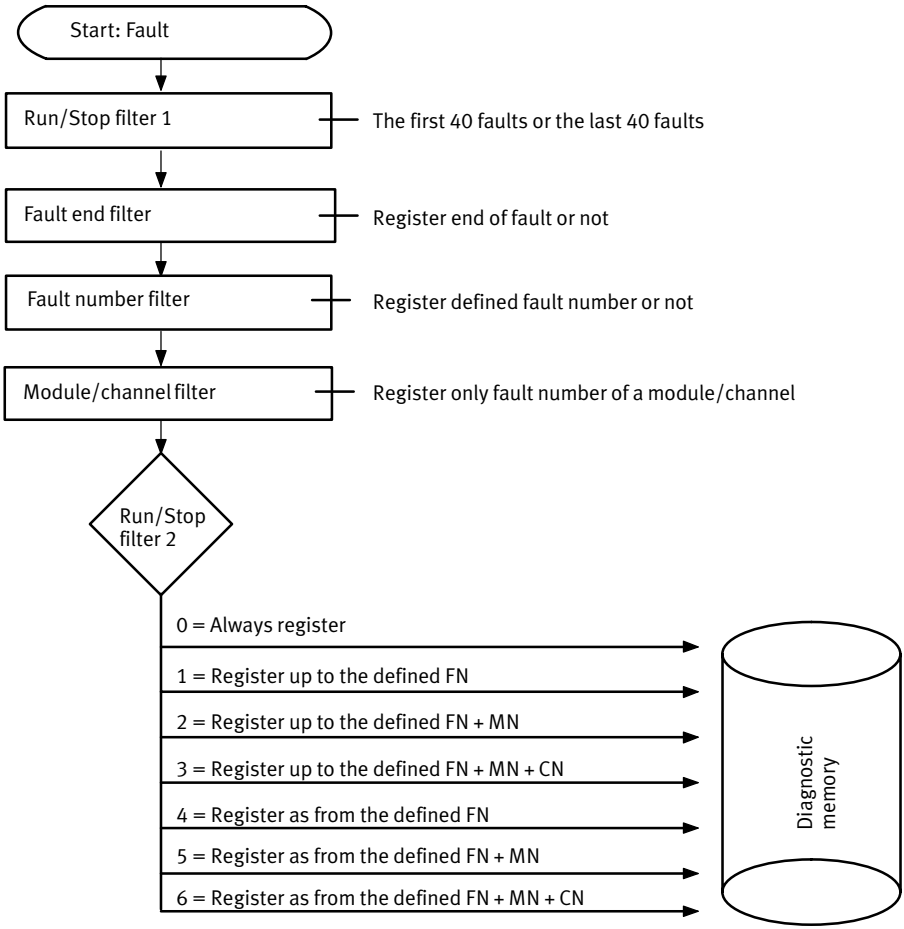
C.4 Diagnostic memory

Basic information

A diagnostic memory serves for protocolling fault states. If the time when faults occur and if fault sequences are registered, this will facilitate the search for the cause of the faults which are otherwise difficult to locate. If the causes are eliminated, faults can be avoided over long periods.

CPX parameterisation

Various diagnostic memory filters can be parameterised by means of diagnostic memory parameters (see section B.2.4). With these filters the registering of certain system states can be suppressed, and both starting and stopping can be controlled. The method of operation of the diagnostic memory filters is shown in Fig. C/10.



MN = module number, CN = channel number, FN = fault number

Fig. C/10: The method of operation of the diagnostic memory filters

Method of operation

With the CPX terminals the start and end of a fault can be protocolled in the internal diagnostic memory. The diagnostic memory contains up to 40 entries. In addition to information on localising the fault, the relevant time point is saved, measured from the moment the power supply is switched on. a diagnostic entry consists of 10 bytes. The first five bytes contain information on the time point. The last five bytes contain information on the fault (see section B.2.5).

With the aid of the function number, entries in the diagnostic memory can be read out via the I/O diagnostic interface irrespective of the field bus protocol used. The various field bus protocols provide, where applicable, further possibilities for reading out and configuring the CPX diagnostic memory (see the manual for the CPX field bus node).

C.5 Monitoring faults

Basic information

Monitoring functions which run automatically can be activated and deactivated by parameterisation.

The activation of monitoring functions helps to guarantee the functionality of the machine/system and to avoid unnecessary idle periods. The deactivation of monitoring functions helps to avoid disturbing error messages, e.g.:

– during commissioning.

– during an EMERGENCY STOP, if the EMERGENCY STOP concept of the machine/system requires that the load voltage for the valves and output modules be switched off. The error messages (e.g undervoltage), which are triggered when the load voltage is switched off, should be frequently suppressed here.

CPX parameterisation

The CPX terminal permits the monitoring of various types of fault (e.g. short circuit, wire fracture, undervoltage, etc.). The different monitoring functions can be activated or deactivated globally by system parameters for the complete CPX terminal and by module parameters for a single CPX module or an individual channel. Activation of a monitoring function causes the following:

Monitoring	Reaction to activation
Module parameters Monitoring	A fault on the module will be: – passed on to the CPX field bus node – displayed by the module common error LED
System parameters Monitoring	A fault registered by the module will be: – sent to the higher-order field bus master – displayed by the red SF LED on the node – entered in the module diagnostic data and, if applicable, in the status bits – entered, if applicable, in the diagnostic memory

Tab. C/8: Monitoring

The reaction of the channel fault LED will be controlled normally by hardware functions and does not therefore depend on the setting of the monitoring functions.

The following monitoring functions can be activated or deactivated globally:

System parameter monitoring	Description
Undervoltage in valves	Monitors the load voltage supply for the valves
Undervoltage in the outputs	Monitors the load voltage supply for the outputs
Short circuit/overload at the outputs	Monitors whether outputs are overloaded or short circuited
Short circuit/overload in sensor supply	Monitors whether sensor supply is overloaded or short circuited

Tab. C/9: System parameter monitoring

The following monitoring functions can be activated or deactivated by modules, providing the module supports the relevant monitoring function:

Module parameter monitoring	Description
Short circuit/overload in sensor supply	Monitors whether sensor supply is overloaded or short circuited
Short circuit/overload at the outputs	Monitors whether outputs are overloaded or short circuited
Undervoltage for outputs/valves	Monitors the load voltage supply for the valves/outputs
Short circuit/overload at the valve	Monitors whether valve outputs are overloaded or short circuited
Upper/lower limit	Monitors the upper/lower limit
Parameterisation fault	Monitors the parameterisation module (plausibility check)
Monitoring wire fracture (channel-specific)	Monitoring can be activated and deactivated for each channel (0 = inactive; 1 = active).

Tab. C/10: Module parameter monitoring

The meaning of the module parameter depends on the module used. Detailed information can be found in the manual for the relevant module.

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