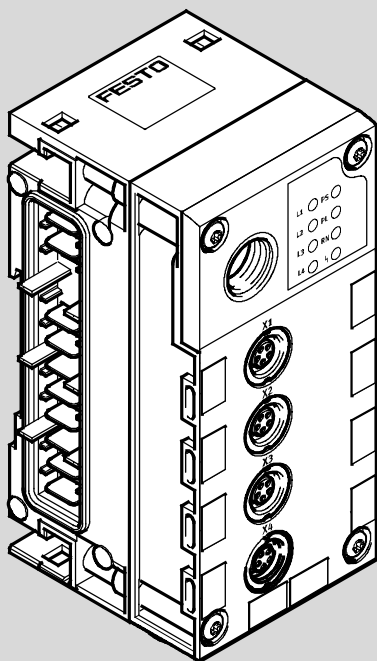


CPX-terminal

Electrical interface CPX-CP-4-FB



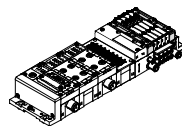
FESTO

CPI System Description

Installing and
commissioning CPI
systems

Electronics Description

CPX-CP interface



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Designated use

The CPX-CP interface described in this description has been designed exclusively for use in combination with CPX terminals from Festo. The designated CP modules from Festo (CP valve terminals and CPI I/O modules) can be connected to the CPX-CP interface. The CPX terminal and the connected CPI modules are only to be used as follows:

- as intended
- without unauthorised modifications
- in excellent technical condition.

If standard ancillary components, such as sensors and actuators, are connected, the specified limits for pressures, temperatures, electrical data, torques, etc. must be complied with.

Comply with the legal rules and regulations and standards, rules of the testing organisations and insurance companies and national specifications applicable for the location.



Warning

- Only use PELV circuits in accordance with IEC/EN 60204-1 (protective extra-low voltage, PELV) for the electrical power supply.
- Also observe the general requirements for PELV circuits in accordance with IEC EN 60204-1.
- Use only voltage sources that guarantee reliable electrical isolation of the operating voltage according to IEC DIN EN 60204-1.

Ranges of application and certifications

The products fulfil the requirements of EU directives and bear the CE certification.

Standards and test values, which the products must comply with and fulfil, can be found in the technical appendix section. The product-relevant EU directives can be found in the declaration of conformity.



Certificates and declarations of conformity for these products can be found at www.festo.com.

Target group

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

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.



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

- Bullet points denote activities that may be carried out in any sequence desired.
- 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 specific information on the method of operation, and on fitting, installing and commissioning the CPX-CP interface.

Special information on commissioning, programming and diagnostics of a CPX terminal with the CPX fieldbus node or CPX-FEC used can be found in the relevant description.

General basic information on the method of operation, on fitting, installing and commissioning CPX terminals can be found in the CPX system manual.



An overview of the structure of the CPX terminal user documentation is contained in the CPX system description.

➔ www.festo.com ➔ Support portal: search term “CPX system description”



Information on the CPI modules and the valve terminals with a CPI connection can be found in the manual for the relevant module. An overview is shown in Tab. 0/1.

Version	Title		Contents
CP modules, Electronics description	“CPI-CL modules, CPI-EL modules” Type P.BE-CPX-EA-CL...		Mounting, installation and commissioning of CP input and output modules, type CP-...-CL and CPI-...-EL
Modules with CP connection, Electronics description	“CPV Direct” Type P.BE-CP-DI...		Instructions on mounting, installation, commissioning and diagnostics for the corresponding CPV valve terminal with direct link
	“CDVI ...” Type P.BE-CDVI-DN-...		Instructions on mounting, installation, commissioning and diagnostics of the CDVI with fieldbus direct link “DeviceNet”
	“CPA-SC / CPV-SC ...” Type P.BE-CPASC-CPVSC-...		Instructions on mounting, installation, commissioning and diagnostics of the CPV-SC or CPA-SC valve terminal with fieldbus direct link for PROFIBUS DP or DeviceNet.
Description Pneumatics	“CPV valve terminal” Type P.BE-CPV-...		Mounting, installation, commissioning, servicing and conversion of the CPV pneumatics (type 10)
	“CPA valve terminals” Type P.BE-CPA-...		Mounting, installation, commissioning, servicing and conversion of the CPA pneumatics (type 12)
	“MPA valve terminal” Type P.BE-MPA-...		Mounting, installation, commissioning, servicing and conversion of the CPA pneumatics (type 32)

Tab. 0/1: Descriptions for CP I/O modules and CP valve terminals from Festo

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

Term/abbreviation	Meaning
CP cable	Special cable for connecting the various CPI/CP modules in a CP string. Colour: black, type KVI-CP1-... and type KVI-CP2-...
CP functionality	Supports the CP protocol without extended functions
CP module	Collective term for modules without extended functions which can be integrated into a CPI/CP system.
CP string	CPI or CP modules which are connected by CPI/CP cable to the CPX-CP interface. For reasons of simplicity, only the term “CP string” is used, even if it has CPI functions.
CP valve terminal	CPV valve terminal (type 10) or CPA valve terminal (type 12), each with CP connection (also regarded as CP modules). Basic electric unit, black.
CP system	Complete electrical installation system consisting of a CP master with one or more CP strings. The system consists of CP modules (without extended functions).
CPI cable	Special cable for connecting the various CPI/CP modules in a CP string. Colour: white, type KVI-CP3-...
CPI connection	Socket or plug on the CPI modules which allows the modules to be connected using the CPI or CP cable.
CPI field bus interface	Term for a CPI capable interface with field bus connection (e.g. combination of CPX field bus node and CPX-CP interface (CPI field bus module) or CPV with CPI string extension (CPV Direct)).
CPI field bus module	Defined combination of a CPX field bus node and a CPX-CP interface. connects a CPI system with a field bus.
CPI functionality	Supports the CPI protocol with extended functions
CPI module	Collective term for modules with extended functions which can be integrated into a CPI/CP system.
CPI system	Also: “CPI installation system” Complete electrical installation system consisting of a CP master with one or more CP strings. The system consists of CPI/CP modules with and without extended functions. The system need not consist exclusively of CPI modules.

Tab. 0/2: Specific terms and abbreviations

Term/abbreviation	Meaning
CPX-CP interface	CPX module with 4 CP strings for connecting CPI/CP modules and CP valve terminals to the CPX terminal.
CPX modules	Collective term for the various modules which can be integrated into a CPX terminal.
CPX terminal	Complete system comprising CPX modules with or without pneumatics
Extended functions	– Additional options in string assignment: Up to 4 modules per string with a maximum of 32 inputs and 32 outputs. Without extended functions, only 1 output and 1 input module is possible. – Revised data communication: Inputs report change in status when data arrive or a diagnostic message is present. Message is queried specifically. Additionally, the system monitors the participants for TimeOut. Without extended functions, the system, queries information from the stations cyclically (so-called polling).
Fieldbus nodes	Provide the connection to specific fieldbuses. Transmit control signals to the connected modules and monitor their operational ability.
I	Digital input
I/O modules	Collective term for the modules which provide digital inputs and outputs (e.g., CPX I/O modules, CPI input modules and CPI output modules)
I/Os	Digital inputs and outputs
Input module	Input module
O	Digital output
Output module	Output module
String allocation	Type and sequence of the CPI/CP modules connected to one or more CP strings.

Tab. 0/3: Specific terms and abbreviations

System summary – CPI system

Chapter 1

Contents

1. **System summary – CPI system** **1-1**

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1. System summary – CPI system

1.1 Overview of the CPI system

Festo can assist you in solving your automation task at the machine level with the aid of valve terminals. Due to its modular structure, the CPI system from Festo enables you to integrate valve terminals and I/O modules optimally in your machines and systems.

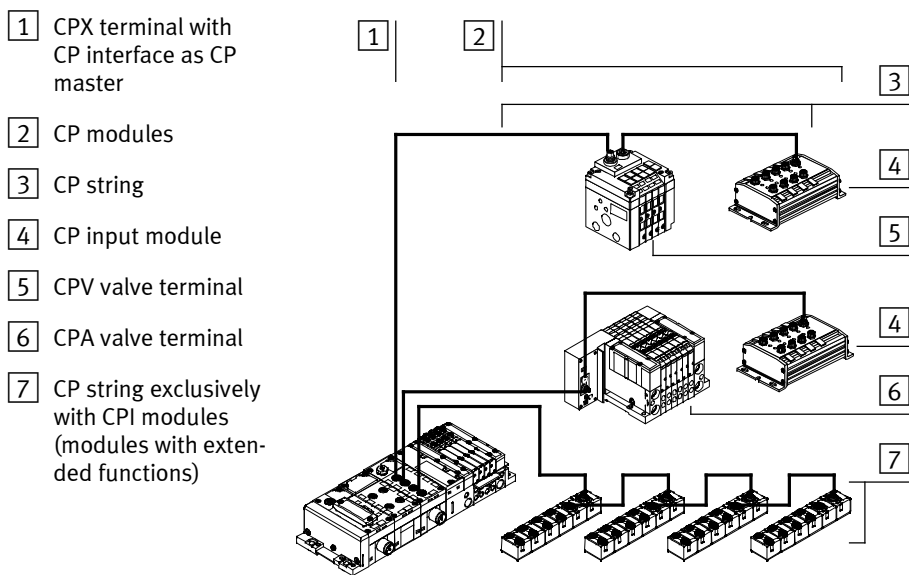


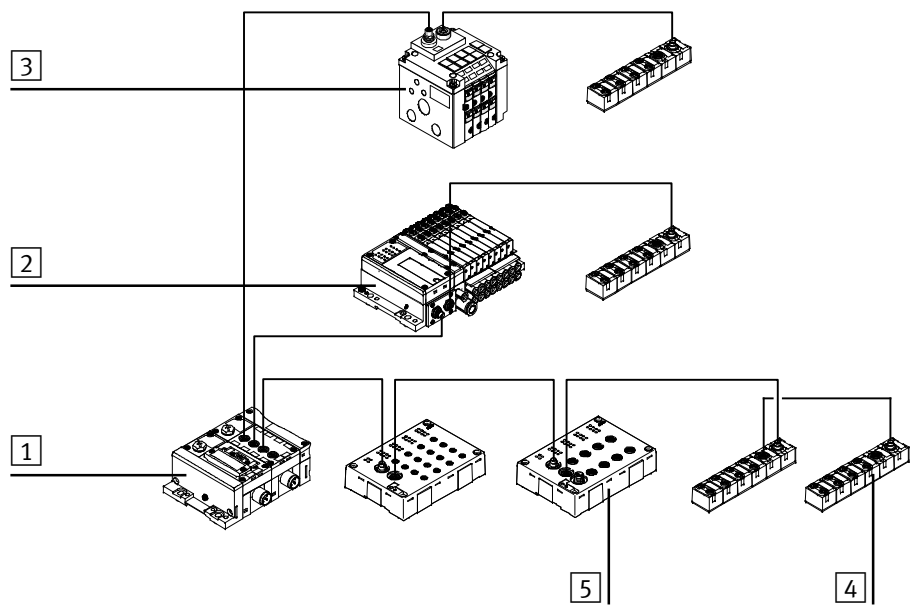
Fig. 1/1: Example 1 for design of a CPI system



Note

Observe that only products from Festo can be connected.

1. System summary – CPI system



- 1 CPI fieldbus node
- 2 MPA-CPI valve terminal
- 3 CPV-CPI valve terminal
- 4 CP-CL module
- 5 CP-EL module

Fig. 1/2: Example 2 for design of a CPI system

1. System summary – CPI system

A CPI system consists of individual modules which are connected to each other by means of CPI cables. In this way it is possible to decentralise the configuration of the CPI modules. The compact CP valve terminals and I/O modules can be mounted very close to the cylinders to be controlled. This enables short compressed air lines to be used.

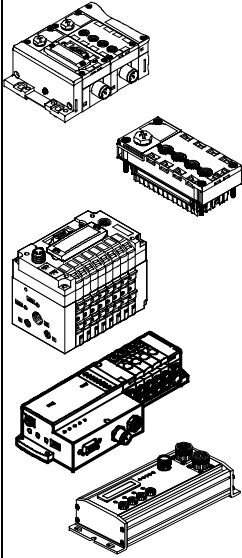
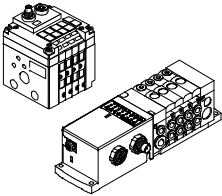
System losses can be minimized if short compressed air tubing is used and the times required for pressurising and exhausting the tubing can be reduced.

This enables smaller valves with sufficient flow to be used, thereby helping to reduce costs.

1. System summary – CPI system

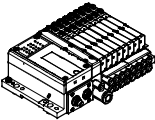
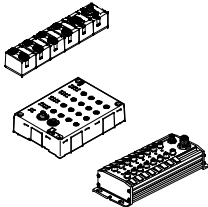
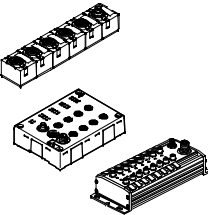
1.1.1 Method of operation of the CPI/CP system

CPI/CP systems are composed of the following modules:

Modules	Function
CPI/CP master 	Special CP fieldbus nodes and CP interfaces are available for the various fieldbuses. – As electrical modules are an integral part of a CPX terminal or a modular valve terminal (CPX-CP interface/CPI interface). – Provide the connection to specific fieldbuses (CPI node, CPV direct) – These offer connections for up to four strings to which I/O modules and CP valve terminals are connected. – They transmit control signals to the connected modules and monitor their functioning
CPV/CPV-SC valve terminals with CPI connection 	– These provide different valve functions via valve sub-bases for controlling pneumatic actuators – Relay plates, pressure zone separation plates and blanking plates can also be integrated

Tab. 1/1: Overview of the CPI modules - Part 1

1. System summary – CPI system

Modules	Function
MPA valve terminals with CPI connection 	– These provide different valve functions via valves for controlling pneumatic actuators.
CP-/CPI input modules (type CL, EL, RL) 	– Provide inputs for connecting sensors and thus enable, for example, cylinder positions to be interrogated
CP-/CPI output modules (type CL, EL, RL) 	– These provide universally effective electric outputs for controlling low-current consuming devices (in addition, valves, lamps, etc.)

Tab. 1/2: Overview of CPI modules - part 2

1. System summary – CPI system

In the capacity of CPI master, each CPX-CP interface controls data transfer to a wide variety of controller systems in a CPX terminal. In principle, several CPX-CP interfaces can be used in a CPX terminal.

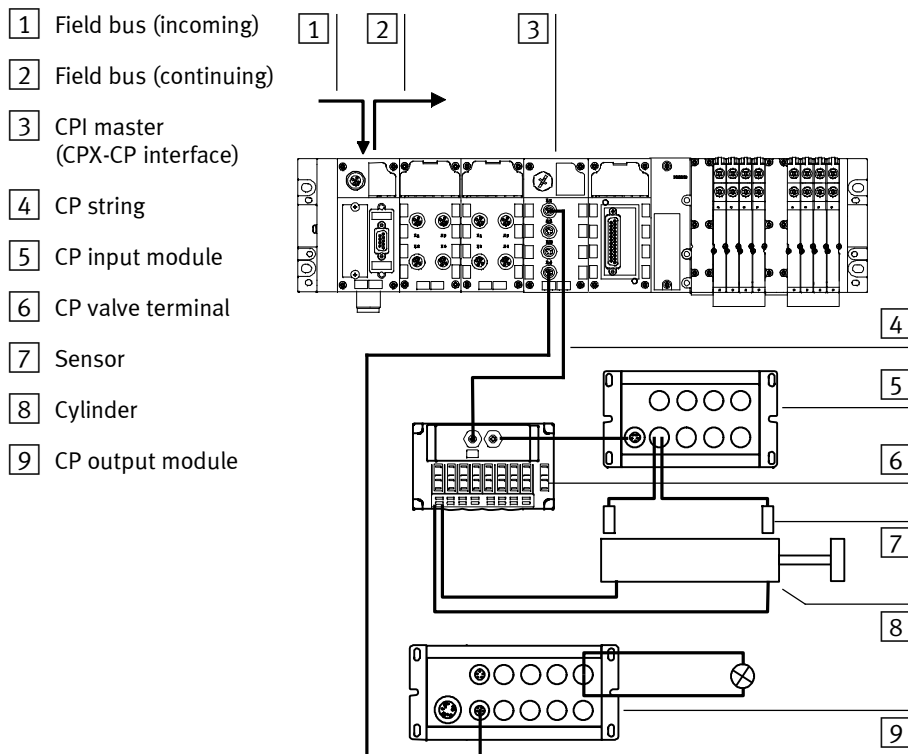


Fig. 1/3: Method of operation of the CPI system

I/O data exchange between the CPX terminal and the modules connected to the CPX-CP interface takes place constantly via the CPX-CP interface.

Cable lengths

The complete length of cable on a string must not exceed 10 m.

1. System summary – CPI system

1.1.2 Variants and extension rules for the CPI-/CP system

Modules can be divided into two groups:

- CPI modules (extended functions)
- CP modules (no extended functions)

Tab. 1/3 shows the number of supported modules and rules dependent on the type of the master and the CPI/CP modules.

	Rules and properties
CPI system	– Max. 4 modules on the CP string – Max. 32 inputs and 32 outputs per CP string
CPI modules	– There is an incoming and continuing interface on all CPI modules and valve terminals – Any sequence of the CPI modules/valve terminals within the CP string
CP modules	– There is an incoming and continuing interface on CP output modules and CP valve terminals – Only incoming interface at CP input modules. They can therefore only be placed at the end of a CP string.
CPI/CP master	The CPX-CP interface and the CPV Direct are CPI masters. A mixture of CPI/CP modules is possible on CPI masters: – Only one CP input module is possible at the end of a string – Per CP string, only one CP valve terminal ¹⁾ or one CP output module ¹⁾ – “Unused” locations on the CP string can be “filled” with CPI modules ²⁾ .
¹⁾ Without extended functions ²⁾ With extended functions	

Tab. 1/3: Rules for extending the CPI system



Note
Independent of the type of CPI/CP modules, not more than 32 inputs and 32 outputs may be connected (sum of all modules on a CP string).
That is, a CP string can be extended with a maximum of 2 CP valve terminals with extended functions, since they always occupy 16 output addresses.

1. System summary – CPI system

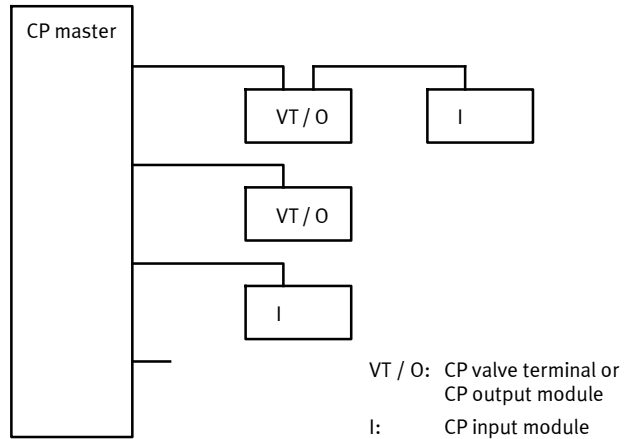


Fig. 1/4: Example: Setting up a CP system
(without extended functions)

All CPI modules (with extended functions) can also be connected to CP masters (without extended functions) as shown in Fig. 1/4.

1. System summary – CPI system

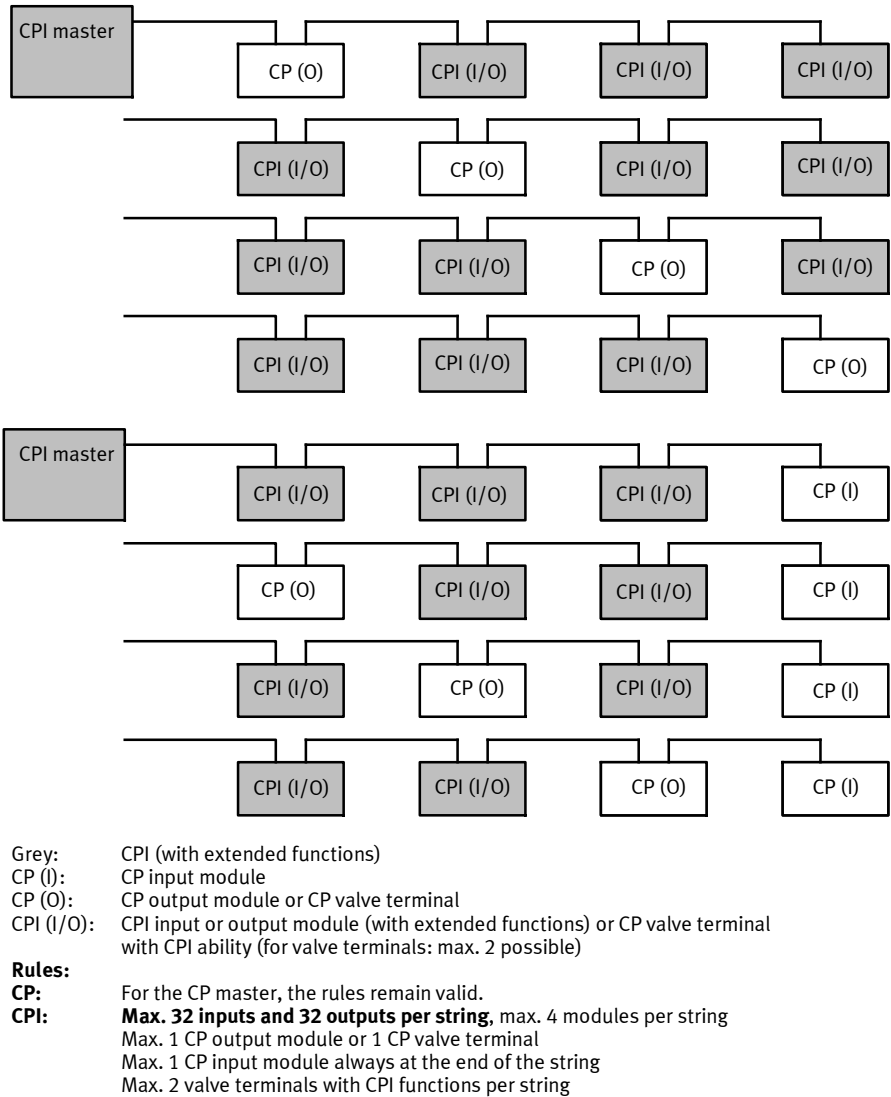
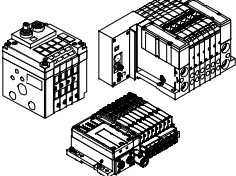
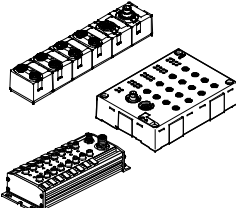
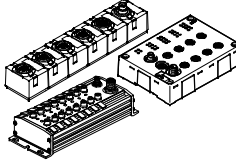


Fig. 1/5: Example: expansion of a CPI/CP system

1. System summary – CPI system

1.1.3 Assigned I/Os of the CPI/CP modules

Tab. 1/4 provides an overview of the assigned addresses for the various CPI/CP modules (status at November 2012).

CPI modules			Assigned I/Os			
Kind	Type	Extended functions	at CPI masters (with extended functions)		at CP masters (without extended functions)	
	CPV...-GE-FB-4	No	–	16 O	–	16 O
	CPV...-GE-FB-4/6/6	Yes		1) ¹⁾		16 O
	CPV...-GE-FB-6	No		16 O		16 O
	CPV...-GE-FB-8	No		16 O		16 O
	CPA10/14-IFB-CP	No		16 O		16 O
	CPI-MPA-S	Yes		2) ²⁾		16 O
	CP-E08-M8-CL	Yes	8 I	–	16 I	–
	CP-E08-M12-CL	Yes	8 I	–	16 I	–
	CP-E16-KL-CL	Yes	16 I	–	16 I	–
	CP-E16-M12-EL	Yes	16 I	–	16 I	–
	CP-E16-M8-EL	Yes	16 I	–	16 I	–
	CP-E32-M8-EL	Yes	32 I	–	– ³⁾	– ³⁾
	CP-E16-M8	No	16 I	–	16 I	–
	CP-E16N-M8	No	16 I	–	16 I	–
	CP-E16-M8-Z	No	16 I	–	16 I	–
	CP-E16-M12x2-5POL	No	16 I	–	16 I	–
	CP-E16N-M12x2	No	16 I	–	16 I	–
	CP-E16-KL-IP20-Z	No	16 I	–	16 I	–
	CP-A04-M12-CL	Yes	–	8 O	–	16 O
	CP-A08-M12-EL-Z	Yes	–	8 O	–	16 O
	CP-A08-M12-5POL	No	–	16 O	–	16 O
	CP-A08N-M12	No	–	16 O	–	16 O

1) Assignment dependent on equipment. CPV...-GE-FB-4/6/6 dynamically occupies 8 or 16 outputs

2) Assignment dependent on equipment. CPI-MPA dynamically occupies 8, 16, 24 or 32 outputs

3) No function on CP master

Tab. 1/4: Assigned I/Os of the CPI/CP modules

1.2 CPI system with the CPX-CP interface

The CPX-CP interface supports CPI systems with extended functions. CPI systems with CP modules with extended functions are distinguished by the following features:

- more I/Os per string are possible (max. 32 I / 32 O)
- up to 4 CPI/CP modules are possible
- modules can be in any order.

The CPX-CP interface, in the capacity of technology module (also termed function module), assigns I/O addresses in the CPX terminal. The number of addresses assigned depends on:

- the field bus node or FEC used and the operating mode of the CPX terminal,
- the saved configuration (string assignment).

Address assignment is carried out as follows:

Field bus node/FEC	Addressing see
CPX field bus node with Remote I/O operating mode, e.g.: – CPX-FB11, DeviceNet – CPX-FB13, PROFIBUS – CPX-FB14, CANopen – CPX-FB23, CC-Link	Section 1.2.2
CPX front end controller with Stand Alone or Remote Controller operating mode: – CPX-FEC	
CPX field bus node for Interbus with operating mode Remote I/O, e.g.: – CPX-FB6	Section B.1.1

Tab. 1/5: Addressing

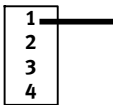
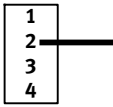
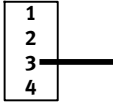
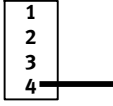
1. System summary – CPI system

1.2.1 Address range of the CPI system with the CPX-CP interface

Size of the assigned address range The following rules apply to the address range occupied by the CPX-CP interface (➔ Tab. 1/6):

- The size of the assigned address range depends on the number of the last string used.
- The assignment for inputs is independent of the assignment for outputs.
- Each string on the CP interface has an address range of 32 bits for inputs and 32 bits for outputs at its disposal.

Unused address range Unused address range is reserved for extensions.

Last string used	Assigned address range		Assigned address range	
	Inputs	Description	Outputs	Description
No string assigned	0 I	No module with inputs connected.	0 O	No module with outputs connected.
String 1 	32 I	At least one input module on string 1. No input modules on strings 2 to 4.	32 O	At least one output module on string 1. No output modules on strings 2 to 4.
String 2 	64 I	At least one input module on string 2. No input modules on strings 3 and 4.	64 O	At least one output module on string 2. No output modules on strings 3 and 4.
String 3 	96 I	At least one input module on string 3. No input modules on string 4.	96 O	At least one output module on string 3. No output modules on string 4.
String 4 	128 I	At least one input module on string 4.	128 O	At least one output module on string 4.

Tab. 1/6: Assigned address range

1.2.2 Address assignment



The assignment of the addresses of the CPI/CP modules depends on the CPX field bus node or CPX-FEC used. The following representation applies to the field bus nodes (e.g. CPX-FB13) as well as for the Front End Controller CPX-FEC, but not for Interbus field bus nodes. The assignment for Interbus field bus nodes (e.g. CPX-FB6) can be found in appendix B.1.

Address assignment of the individual modules takes place according to the following rules:

- A CP interface provides four strings with a total of 128 input addresses and 128 output addresses.
- A used string occupies 32 input addresses and 32 output addresses.
- The addresses are assigned fixed to the individual CP strings and CPI modules in ascending order.

String number	Input addresses	Output addresses
1	I0 ... I31	O0 ... O31
2	I32 ... I63	O32 ... O63
3	I64 ... I95	O64 ... O95
4	I96 ... I127	O96 ... O127

- Address assignment of the individual modules is therefore determined by the string to which they are connected and by the number of I/Os the existing modules occupy on the string.
- Unused address range (due to modules not being available) remains reserved for later CPI extensions.

The diagram below shows as an example the address assignment of a CPI system.

1. System summary – CPI system

PROFIBUS addresses starting at input/output word 45 are used. The CPX-CP interface thus occupies 12 bytes of input addresses and 16 bytes of output addresses.

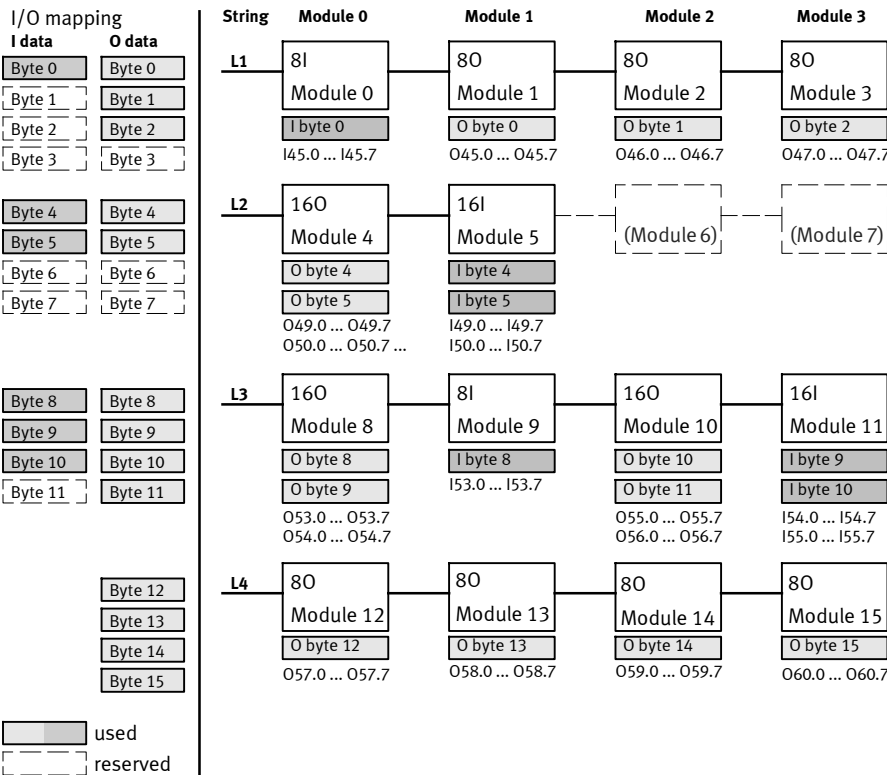


Fig. 1/6: Address assignment of a CPI system, example



The address assignment (method of counting, sequence of the I/Os) within the individual CP valve terminals and CPI/CP modules can be found in the relevant description for the module.

Overview of the address assignments ➔ Appendix A.4.

Installation

Chapter 2

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2.1 General instructions on installation



Warning

Accidental movements of the connected actuators and loose tubing can cause injury to persons and/or damage to property.

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

- Compressed air supply
- Operating voltage supply for the electronics/sensors
- Load voltage supply for the outputs/valves.



Caution

Electrostatically sensitive components!

- Do not therefore touch the contacts of the components.
- Observe the regulations for handling electrostatically sensitive components.

You will then prevent the electronics from being damaged.



Note

Handle all modules and components with great care. Pay particular attention to the following:

- The specified torques must be complied with.

For information on mounting the CPX terminal → CPX system description (P.BE-CPX-SYS-..).

2. Installation

Electrical connecting and display elements

The following connecting and display elements can be found on the CPX-CP interface:

- 1 CPI system and CP string-specific status LEDs
- 2 CPI connections X1 ... X4
- 3 Identification plates (accessories)
- 4 Save key

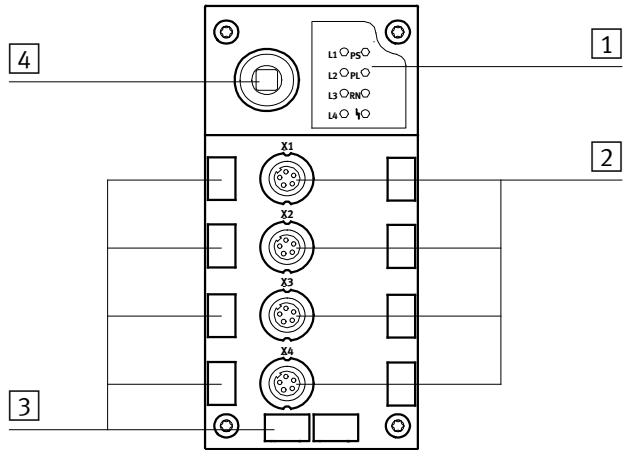


Fig. 2/1: Connecting and display elements on the CPX-CP interface

Dismantling and fitting

The CPX-CP interface is mounted in an interlinking block of the CPX terminal (➔ Fig. 2/2).

Dismantling

Dismantle the CPX-CP interface as follows:

1. Loosen the four screws with a Torx screwdriver size T10.
2. Pull the CPX-CP interface carefully and without tilting away from the contact rails of the manifold block.

2. Installation

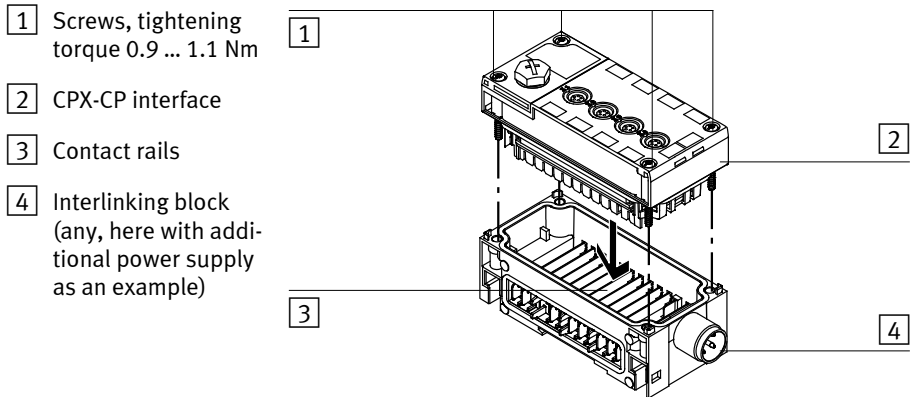


Fig. 2/2: Dismantling/fitting the CPX-CP interface

Fitting

Fit the CPX-CP interface as follows:

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

2.2 CPI connections



Note

Operative malfunction due to impermissible cabling.

- For connecting the CPI/CP modules to the CP string, use only the special CPI/CP cables from Festo (➔ www.festo.com/catalogue).
- Observe that the total cable length on a string must not exceed 10 m.
- Dependent on the CPI/CP modules and CPI/CP cables used as well as the current consumption, the permissible modules and string length per CP string may be limited (➔ section 2.2.1).
- Observe the maximum permissible current consumption per CP string, (➔ section 2.3.2).

In this way, you can avoid:

- Errors in data exchange between the CPX-CP interface and the connected modules.

2. Installation

2.2.1 Permissible CPI/CP modules and string lengths dependent on the CPI cables



Use for CPI systems the special CPI cables **type KVI-CP-3-...** (colour white).



Note

When using the CPI cable **type KVI-CP-3-...** (colour white) the following restriction applies, dependent on the modules used and the current consumption:

- The maximum permissible string length of 10 m may be limited further. An overview shows Tab. 2/1 and Tab. 2/2.



Note

When using the CPI cable **Type KVI-CP-1-...** or **KVI-CP-2-...** (colour black) additional restrictions apply for the string length and max. current consumption (→ Appendix A.6).

Festo recommends the use of CP cable **type KVI-CP-3-...** (colour white).



Tip:

Place CP valve terminals or CP output modules as the first module on the string if possible.

2. Installation

CP string without CPI output module with maximum one CP valve terminal type	Maximum sensor current consumption of the CPI modules on the CP string ¹⁾	Maximum string length with CP cable, type KVI-CP-3-...		
		U _{VAL} = 21.6 ... 24 V; 16 valves ²⁾	U _{VAL} = 20.4 V; 8 valves ³⁾	U _{VAL} = 20.4 V; 16 valves ⁴⁾
CPV10-.../CPA10-...	0.5 A ... 1.5 A	10 m	10 m	10 m
CPV14-.../CPA14-...	0.5 A ... 1.5 A	10 m	10 m	10 m
CPV18-...	0.5 A	10 m	10 m	10 m
	1.0 A	10 m	10 m	10 m ⁵⁾ 8 m ⁶⁾
	1.5 A	10 m	10 m	10 m ⁵⁾ 5 m ⁶⁾
¹⁾ Maximum sensor supply current used → section 2.3.2, Tab. 2/5 ²⁾ Nominal voltage or undervoltage of -10 %, 16 valve solenoid coils switched simultaneously (high current phase) ³⁾ Maximum undervoltage of -15 %, 8 valve solenoid coils switched simultaneously (high current phase) ⁴⁾ Maximum undervoltage of -15 %, 16 valve solenoid coils switched simultaneously (high current phase) ⁵⁾ Valve terminal installed at each string beginning ⁶⁾ Valve terminal installed at each string end				

Tab. 2/1: Permissible string lengths with CP cables, type KVI-CP-3- dependent on the CP valve terminal used and the sensor current consumption

CP string without CP valve terminal with maximum of one CPI output module type	Maximum sensor current consumption of the CPI modules on the CP string ¹⁾	Maximum string length with CP cable, type KVI-CP3-...
CP-A04-M12-CL	0,5 A	10 m
CP-A08...-M12-...	1,5 A	10 m
¹⁾ Maximum sensor supply current used → section 2.3.2, Tab. 2/5		

Tab. 2/2: Permissible string lengths with CP cables, type KVI-CP-3- dependent on the CPI output module used and the sensor current consumption

2. Installation

2.2.2 Connecting CP strings

CP connections

There are four CPI connections for the CP strings on the CPX-CP interface (X1 ... X4).

CPI/CP modules can be connected to each CPI connection according to the rules described in section 1.2.

Connecting CP modules

1. Check which address range is intended for the CPI/CP module (➔ section 1.2).
2. Connect the modules with the CPI/CP cables to the string which makes this address range available.
3. Fasten the plug and socket of the CPI/CP cable with the union nut. In this way the electrical contact is guaranteed.
4. Use the identification labels (type IBS 6x10 or IBS 9x20) to indicate the string to which the module is connected. In this way you can avoid confusion during later repair and maintenance work.

2.3 Connecting the power supply

Take the following aspects into consideration when installing a CPI system with the CPX-CP interface:

- Power supply (➔ section 2.3.1)
- Current consumption (➔ section 2.3.2)
- Formation of power zones (➔ section 2.3.3).



Note

It is imperative that you observe the notes in section 2.3.3 when forming power zones in the CPX terminal by means of several manifold blocks with power supply.

Recommendation:

- Provide the load voltage for the valve coils and, if necessary, for the outputs separately if you wish to implement an EMERGENCY STOP function.



Note

Check whether pressure switch-off is also necessary for an EMERGENCY STOP function on your machine/system.



Note

Observe the notes on earthing the CPI/CP modules in the manual for the relevant module.

2. Installation

2.3.1 Power supply

Manifold block
type CPX-EV-S... ($U_{EL/SEN}$)

The power supply for the CPI system with the CPX-CP interface is provided via the following connections on the CPX terminal (manifold blocks with power supply):

The power supply for the following is provided via the operating voltage supply for the electronics/sensors ($U_{EL/SEN}$) of the CPX terminal:

- the internal electronics of the CPX-CP interface
- the internal electronics of all the CPI modules connected
- the 24 V sensor supply of the inputs of the CPI input modules connected.

Manifold block
type CPX-EV-V... or
CPX-EV-S... (U_{VAL})

The power supply for the following is provided via the load supply for the valves (U_{VAL}) of the CPX terminal:

- the 24 V supply for the CP valve terminals and CPI/CP output modules (output modules **without** load supply connection).



Note
Malfunctioning due to power supply outside the tolerance
The module with the lowest tolerance always determines the permitted voltage tolerances.
If the CPX-CP interface is used, special tolerances according to Tab. 2/3 must be observed for the load supply for the valves (U_{VAL}) of the CPX-CP interface.

Load supply for valves (U_{VAL})	Tolerance
CPX-CP interface	20,4 ... 26.4 V ¹⁾
¹⁾ If midi/maxi pneumatics are also supplied via the load supply for the valves: 21.6 ... 26.4 V	

Tab. 2/3: Permitted voltage tolerance

2. Installation

2.3.2 Ascertaining the current consumption

The current consumption of a CPÎ system depends on the number and type of the CPI modules connected.

Recommendation:

- Use a closed-loop controlled power unit.
- When selecting the power unit, check that it has sufficient output. Calculate the total current consumption, if necessary.

Calculation

Tab. 2/5 and Tab. 2/7 show how to calculate the total current consumption for a CPI system. Please refer to the relevant technical specifications for the current consumption of the CP valve terminals and the CPI/CP modules.



Note

Select a power unit which provides sufficient output for later extensions to the CPI system.



If you are using CP output modules with a separate load voltage connection, take into account the appropriate current consumption when selecting a power unit.



Observe the notes on selecting the power unit in the CPX system manual.



Note

Operative malfunctions due to the maximum permitted current consumption on a CP string being exceeded.

- Make sure that the current consumption of all the modules in a CP string does not exceed the maximum permissible value of 1.6 A.
- Observe that the sensor current consumption from $U_{EL/SEN}$ can be additionally restricted dependent on the string assignment, string length and the CPI/CP cables used → section 2.2.1.

2. Installation

Current consumption on CP string x of U _{EL/SEN} of the CPX terminal	
Current consumption for internal electronics of all the CPI/CP modules connected (number of CPI/CP modules x 0.035 A)	_____ A
Current consumption of all sensors connected to the CPI/CP input modules ¹⁾ (max. 1.5 A) ²⁾	+ _____ A
Internal current consumption per input channel of the CPI/CP input modules (number of all inputs x 0.01 A)	+ _____ A
Sum of current consumption on string x (max. 1.6 A)	= _____ A
¹⁾ Refer to manufacturer's specifications ²⁾ Dependent on the string assignment, string length and the CPI/CP cables used, ➔ section 2.2.1	

Tab. 2/4: Current consumption of U_{EL/SEN} of the CPX terminal per CP string

Total current consumption of U _{EL/SEN} of the CPX terminal	
Sum of current consumption on CP string 1 of Tab. 2/4	_____ A
Sum of current consumption on CP string 2 of Tab. 2/4	+ _____ A
Sum of current consumption on CP string 3 of Tab. 2/4	+ _____ A
Sum of current consumption on CP string 4 of Tab. 2/4	+ _____ A
Total current consumption of U_{EL/SEN} of the CPX terminal	= _____ A

Tab. 2/5: Total current consumption of U_{EL/SEN} of the CPX terminal

2. Installation

Current consumption on CP string x of U_{VAL} of the CPX terminal	
Current consumption of all simultaneously energized valve coils of the CP valve terminals ¹⁾	_____ A
Load current of all simultaneously activated outputs of the CPI output modules without load voltage connection	+ _____ A
Sum of current consumption on string x (max. 1.6 A)	= _____ A
¹⁾ Current consumption dependent on valve type (→ Technical data of the valves)	

Tab. 2/6: Current consumption from U_{VAL} of the CPX terminal per CP string

Total current consumption of U_{VAL} of the CPX terminal	
Sum of current consumption on CP string 1 as per Tab. 2/6	_____ A
Sum of current consumption on CP string 2 as per Tab. 2/6	+ _____ A
Sum of current consumption on CP string 3 as per Tab. 2/6	+ _____ A
Sum of current consumption on CP string 4 as per Tab. 2/6	+ _____ A
Total current consumption of U_{VAL} of the CPX terminal	= _____ A

Tab. 2/7: Current consumption of U_{VAL} of the CPX terminal



Note

The 24 V supply of the CP valve terminals **and** of the CPI/CP output modules (output modules **without** load supply connection) takes place within the CPX-CP interface through a shared cable.

- Observe that currents in a shared cable add up.

2.3.3 Power supply arrangement – formation of power zones

The modular power supply arrangement of the CPX terminal facilitates the formation of power zones.

Please note the following:

The internal electronics of the CPI/CP I/O modules are supplied from the operating voltage supply for electronics/sensors ($U_{EL/SEN}$).

The CP valve terminals and the CPI/CP output modules are provided with load supply by the load supply for the valves (U_{VAL}).



Note

The CPX-CP interface connects the internal contact rails 0 $U_{EL/SEN}$ and 0 U_{VAL} of the CPX terminal.

- As a result, the electrical isolation of the operating voltage supply for electronics/sensors ($U_{EL/SEN}$) of the CPX terminal and of the load voltage valves supplying the CPX-CP interface (U_{VAL}) CPX-CP interface cancel each other out.
- Complete electrical isolation (all poles) of the valve supply of the CP valve terminals, even in conjunction with CPX valve supply of type CPX-EV-V, is therefore **not** possible.



Note

The CPX-CP interface must be supplied via the same potential (common power unit) as the operating power supply for the electronics/sensors ($U_{EL/SEN}$) of the CPX terminal (see also Fig. 2/3).



Basic information on the power supply arrangement of the CPX terminal can be found in the CPX system description.

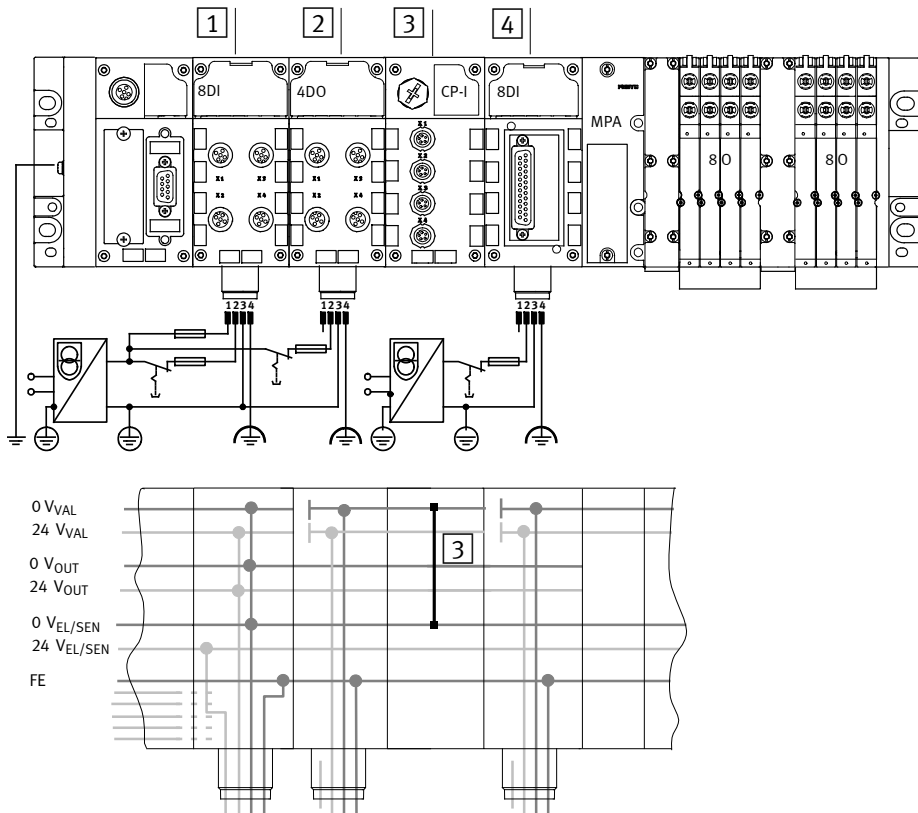
2. Installation

Example CPX terminal with CP interface + system supply and 2 additional power supplies for valves

In the example (➔ Fig. 2/3) the CPX-CP interface and therefore the CP valve terminals and CPI/CP output modules without load voltage connection are supplied via the valve supply [2]. The CP valve terminals can only be switched off at a single pole!

The MPA pneumatics are supplied via the valve supply [3] (only permitted with MPA electronic modules type VMPA...-FB-EMG-...). The MPA pneumatics can be switched off at all poles.

2. Installation



- 1 Interlinking block with system supply
- 2 Interlinking block with additional power supply for valves (supplies CPX-CP interface)
- 3 Interlinking block with CP interface; connects **internally at module level** the rails 0 U_{EL/SEN} and 0 U_{VAL}
- 4 Interlinking block with additional power supply for valves (supplies MPA pneumatics)

Fig. 2/3: Separate power supply for CPX-CP interface and MPA pneumatics (example)

2.4 Complying with protection class IP65/IP67

**Note**

To comply with protection class IP65/IP67:

- Seal unused CPI/CP connections and the Save key with the appropriate protective caps.

If CPI/CP connections are not used, seal them with a protective cap, type FLANSCHDOSE, S712 (included in delivery). You will then comply with protection class IP65/IP67.

2. Installation

Commissioning

Chapter 3

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3. Commissioning

3.1 Procedure for commissioning

In order to avoid connecting and addressing errors, you should carry out commissioning in steps as follows. Proceed as follows:

1. Check the CP strings (➔ section 3.2.1).
2. Save the string assignment of the CPI system (➔ section 3.2.2).
3. Check the saved string assignment (➔ sections 3.3 and 3.4)
4. If required: Parameterise the CPX-CP interface and CPI modules (➔ section 3.6).
5. Check the address assignment (if necessary, without any connected actuators by LED) ➔ Description for the CPX fieldbus node or CPX-FEC.
6. Commission the total system ➔ Description for the CPX fieldbus node or CPX-FEC.

3.2 Prepare the CPI system for commissioning



Note

Do not yet connect the CPX terminal to a higher-order controller for preparing commissioning.

You will thus avoid addressing faults which may occur in various field bus systems when address ranges are modified during operation.

3.2.1 Checking the CP strings

Preparations

Before commissioning a CPX terminal with CPX-CP interface, you should first prepare each individual CPI system for commissioning.

Proceed as follows:

1. Check the pneumatic tubing connections of the connected CP valve terminals with the help of the manual override (➔ pneumatics description).
2. Check the complete electric circuitry of the CP system.
3. Save the current string assignment of the CPI system as the set assignment, as described in section 3.2.2.

3.2.2 Saving the string assignment



Warning

Undesired modification of input and output addresses.

Be very careful if the string assignment of your CPI system is modified at a later stage:

- After saving the string assignment, check the address assignments of your CPI system before starting user programs.

You can thereby avoid:

- addressing faults with incorrectly fitted CPI modules.

String allocation

The CPX-CP interface saves the type and sequence of the connected CPI modules for every string (→ chapter 1). This is also termed string assignment.

The saved string assignment allows the CPX-CP interface to avoid errors in connecting, and thus addressing errors. It checks automatically to see if the current string assignment is the same as the saved assignment. A distinction is made here between the following test phases:

- Testing during the start-up phase (→ section 3.3)
- Testing during operation (→ section 3.4).

After the switch on procedure, the status LEDs indicate the operating status and correct function of the bus node and the fieldbus communication. If the status LEDs on all the CPI/CP modules light up, the CPI system is prepared for configuration. You can find out which indicator displays the normal operating status in the user documentation of the respective CPI module. Different procedures are necessary for configuration of the various fieldbus nodes or the FEC.



Explanations on this can be found in the manual for the CPX field bus node or the CPX-FEC.

3. Commissioning

Saving the string assignment

The desired string assignment is generated and saved for commissioning. In this way the appropriate addresses are assigned to the connected CPI modules.

Save the string assignments as follows:

1. Leave the power supply of the CPX terminal switched off for the time being.
2. Check that each of the CPI/CP modules is connected to the string which provides the address range intended (→ chapter 1).
3. Check that the CPI cables are fastened properly with the union nut.
4. Switch on the power supply of the CPX terminal and, if necessary, of the CPI/CP modules with load voltage connection.
On the CPX-CP interface, the LEDs of strings (L1 ... L4), to which CP modules have been connected or for which the string assignment has been modified, will flash.
5. Use a small screwdriver or similar to press the Save key for at least 1 s (→ section 2.1).
This will save the current string assignment as the target string assignment in the CPX-CP interface.
The LEDs of strings (L1 ... L4), with which the connected CPI/CP modules have been recognised, no longer flash.
The status LEDs of all the recognised CPI/CP modules light up. Wait some seconds before continuing with the next step.
6. Switch off the power supply for the CPX terminal. Wait some seconds. Then switch it back on again.
The current string assignment is now available in the fieldbus node or the CPX-FEC.
7. Depending on the CPX field bus node or CPX-FEC being used, the modified address range of the CPX-CP interface must be accepted:

3. Commissioning

CPX field bus node / CPX-FEC	How to accept the address range
CPX fieldbus node or CPX-FEC with operating mode Remote I/O	System parameter “System start” [System start]: “System start with default parameterisation and up-to-date CPX expansion” [default parameters], (factory setting): – The revised address range of the CPX-CP interface is automatically accepted. “System start with saved parameterisation and saved CPX expansion” [saved parameters]: 1. Change “System start ...” system parameter to “... default parameterisation ...” . 2. Switch off the power supply of the CPX terminal then switch it on again. The address range of the CPX-CP interface will then be accepted. 3. If necessary, you can restore the desired parameterisation.
CPX-FEC with Stand Alone or Remote Controller operating mode	• To accept the address range of the CPX-CP interface, you must save the actual configuration as the set configuration (actual-setpoint comparison). Information on this can be found in the manual for the CPX-FEC or software package FST 4.1.

Tab. 3/1: Saving the string assignment and accepting the address range



Note

After saving the string assignment, check the address assignments of your CPI system before starting user programs.

3.3 Switching-on reaction of the CPI system

When the power supply is switched on, the CPX-CP interface ascertains automatically the current string assignment. It ascertains one after the other which CPI modules are connected to the relevant string.

If the current assignment is the same as the saved assignment, the CPX-CP interface will switch automatically to the ready status.

The RN LED of the CPX-CP interface as well as the status LEDs on the connected CPI/CP modules light up (➔ Fig. 3/1).

If the current assignment is not the same as the saved assignment, the string LEDs (L1 ... L4) of the relevant string will flash on the CPX-CP interface. In this case the CPI system is not ready to operate.

You then have the following possibilities of restoring the readiness to operate:

- Eliminate assignment errors manually or replace individual CPI modules (➔ section 3.4)
- Save the current assignment as the set assignment (➔ section 3.2.2).

Detailed notes on diagnosing the CPX-CP interface using the LEDs can be found in section 4.2.



3. Commissioning

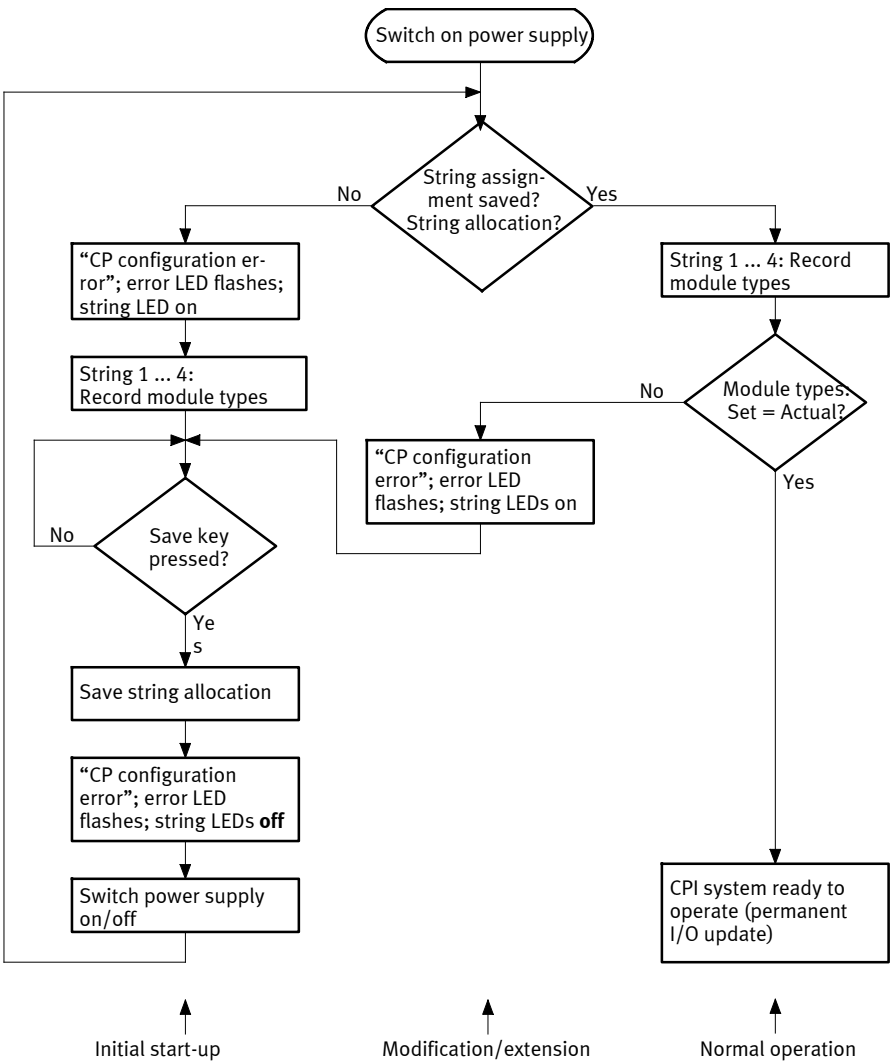


Fig. 3/1: Switching-on reaction of the CPI system

3.4 Reaction of the CPI system to faults in operation

If there is a fault on a CP string during operation, e.g. by cable fracture etc., this will be indicated by the relevant string LED (L1 ... L4) flashing or lighting up. on the CPX-CP interface. The status LED on the relevant module goes out. All modules working without faults remain ready to operate.



Detailed notes on diagnosing the CPX-CP interface using the LEDs can be found in section 4.2.

3.4.1 Eliminating assignment faults

In order to eliminate assignment or connection faults of the CP system:

1. Switch off the power supply for the CPX terminal.
2. Restore the saved assignment by connecting the appropriate CPI/CP modules with the CXP-CP interface again.
3. Switch on the power supply for the CPX terminal again.

3. Commissioning

3.4.2 Replacing CPI/CP modules

Replacement possibilities Only **one** defective CPI/CP module can be replaced with a CPI/CP module of the **same type** without the need to save the string assignment again.



Note

Replacing a CPI/CP module with a CPI/CP module of a different type or replacing several CPI/CP modules will require a new commissioning and new saving of the string assignment (→ section 3.2).

In order to replace a single CP module, proceed as follows:

1. Stop the process controller PLC/Master
2. Switch off the power supply for the CPX terminal.
3. In the case of CPI/CP output modules and CP valve terminals on the CP string concerned:
Switch off the following sources of energy:
 - the compressed air supply for the CP valve terminal
 - the operating voltage supply for the CPI/CP output module.
4. Disconnect all connecting cables and, if necessary, also the tubing.
5. Connect all connecting cables and, if necessary, the tubing with the identically constructed **new module**.
6. Now connect the new module **of the same type** to the same string.
7. In the case of CPI/CP output modules and CP valve terminals:
Switch on the operating voltage supply or the compressed air supply again.
8. Switch on the power supply for the CPX terminal again.
9. Check the addresses of the CPI system.

3.4.3 Replacing CPI/CP modules during operation

In special cases, a single CPI/CP module can be replaced during operation with a CPI module of the same type.

In rare cases, the replacement can produce a short circuit report for the string. Restart the system if there is a short circuit report.



Warning

Undesired modification of I/O states.

- Check whether the design of your machine/system permits replacement of modules during operation.



Warning

Undesired modification of input and output addresses.

Be very careful if the string assignment of your CPI system is modified at a later stage:

- Make sure that modules are not separated from a string and subsequently connected to another string during operation. Use the identification labels (type IBS 6x10 or IBS9x20) in order to identify modules clearly.

You can thereby avoid:

- modified input and output addresses of the modules.

The CPX-CP interface will recognise replacement with a different type of module (e.g., O module replaced with a valve terminal or CP-E16-M8 replaced with CP-E16-M12x2) as a string assignment fault. In this case, therefore, readiness to operate is not restored to the relevant module during operation.

Recommendation:

When replacing CPI/CP modules, always switch off the power supply if possible (➔ section 3.4.2).

3. Commissioning

If the design of your machine/system makes it necessary to replace a CPI/CP module during operation, you should proceed as follows:

1. In the case of CPI/CP output modules and CP valve terminals on the CP string concerned:
Switch off the following sources of energy where applicable:
 - the compressed air supply to the valve terminal
 - the operating voltage supply to the output module.
2. Disconnect all connecting cables and, if necessary, also the tubing.
3. Connect all connecting cables and, if necessary, the tubing with the identically constructed **new module**.
4. Now connect the new module **of the same type** to the same string.
5. In the case of CPI/CP output modules and CP valve terminals:
Switch on the operating voltage supply or the compressed air supply again.

You can thus restore the defective connection during operation, or replace the defective module without impairing operation of the modules in the other strings. When the connection is restored again or replaced, the readiness to operate will be taken up with the appropriate module automatically.

Restriction in recognising the string assignment

Specific modifications to the string assignment cannot be recognised during operation:

- CPI/CP modules or entire strings which are connected to the previously **unassigned** string 2 instead of string 1 or vice versa. This also applies to strings 3 and 4, respectively.

However, these modules will retain their previous addresses until the power supply is switched off and then on again.



Note

Modifications to the string assignment will be recognised reliably after the power has been switched on.

Recommendation:

- If possible, switch the power supply off and then on again after performing conversion work on the CP strings, provided that your system permits this.



Note

After saving the string assignment, check the address assignments of your CPI system before starting user programs.

You can thereby avoid:

- addressing faults with incorrectly fitted CPI/CP modules.

3.5 Notes on operation



Warning

Undesired activation of actuators!

An incorrect status of the valves and outputs can lead to dangerous situations.

- Make sure that valves and outputs are put into a safe state when faults occur.



Note

Please note the following if the outputs of a valve terminal are reset after master stop, field bus interruption or fault:

- Single-solenoid valves move to the basic position.
- Double-solenoid valves remain in the current position.
- Mid-position valves move to the mid-position (depending on valve type: pressurized, exhausted or blocked).



Warning

Undesired modification of input and output addresses.

Be very careful if the string assignment of your CPI system is modified at a later stage:

- Make sure that modules are not separated from one string and accidentally connected to another. Use the identification labels (type IBS 6x10 or IBS9x20) in order to identify modules clearly.
- After saving the string assignment, check the address assignments of your CPI system before starting user programs.

You can thereby avoid:

- modified input and output addresses of the modules.

3. Commissioning

3.5.1 Factory default mark from version 22

**Note**

If defective data segments are discovered on an EEPROM during switch on, they are overwritten with default values. The CPI will then cancel the switch-on procedure and display the error through the LEDs. (→ chapter 4.2) The error number 205 is returned via the C-bus.

3.6 Parametrizing

The reaction of the CPI system with the CPX-CP interface can be parametrized.

- Module parameter (→ Tab. 3/2):
Activates or deactivates error monitoring for the total CPX-CP interface (overview).
- Channel-specific module parameters (→ Tab. 3/3):
Activates or deactivates error monitoring for individual CPI modules.



Further information on parametrizing can be found in the system manual and in the manual for the CPX field bus node or the CPX-FEC.

Function number ¹⁾	Module parameter – CPX-CP interface and CPI/CP modules
$4828 + m * 64 + 0$	Monitoring CPX module – CPX-CP interface
$4828 + m * 64 + 6$	Monitoring CPX module – CPX-CP interface and CPI modules
¹⁾ m = module number (counting from left to right, beginning with 0)	

Tab. 3/2: Overview – module parameters

Function number ¹⁾	Channel-specific module parameters – CPI/CP modules
$4828 + m * 64 + 8 \dots 11$	Monitoring CPI module string 1, module 0 ... 3
$4828 + m * 64 + 12 \dots 15$	Monitoring CPI module string 2, module 0 ... 3
$4828 + m * 64 + 16 \dots 19$	Monitoring CPI module string 3, module 0 ... 3
$4828 + m * 64 + 20 \dots 23$	Monitoring CPI module string 4, module 0 ... 3
– ²⁾	Fail safe channel x
– ²⁾	Idle mode channel x
– ²⁾	Force channel x
¹⁾ m = module number (counting from left to right, beginning with 0)	
²⁾ Access is protocol-specific (→ description of fieldbus node or FEC)	

Tab. 3/3: Overview – channel-specific module parameters (specific to strings and/or modules)

3. Commissioning

Parameter assignment

Parametrisation of the CPX-CP interface applies only to certain CPI/CP modules. An overview shows Tab. 3/4.

CPI module type	CPX-CP module parameter (CPX-CP interface / CPI/CP modules)							Channel-specific param. (CPI/CP modules)	
	Par. byte 0 → Fig. 3/2		Parameter byte 6 → Fig. 3/3					Parameter byte 8 ... 23 → Fig. 3/4	
Parameter	SCS	SCO	CP diag.		Vout	Vval	Vsen	Vsen, Vout, Vval	SCS; SCO
Bit no.	0	1	0	1	2	3	4	0	1
Valve terminals									
CPV...GE-FB-...	-	-	x	x	-	x	-	x	-
CPA...-...	-	-	x	x	-	x	-	x	-
MPA-...	x	x	x	x	x	x	x	x	x
CP input modules									
CP-E16-M8 (-Z)	-	-	x	x	-	-	x	x	-
CP-E16N-M8	-	-	x	x	-	-	x	x	-
CP-E16-12-5-POL	-	-	x	x	-	-	x	x	-
CP-E16N-M12	-	-	x	x	-	-	x	x	-
CP-E16-KL-IP20	-	-	x	x	-	-	x	x	-
CP output modules									
CP-A08-M12-5-POL	-	x	x	x	x	-	-	x	x
CP-A08N-M12	-	x	x	x	x	-	-	x	x
CL input modules									
CP-E08-M12-CL	x	-	x	x	-	-	x	x	x
CP-E08-M8-CL	x	-	x	x	-	-	x	x	x
CP-E08-KL-CL	x	-	x	x	-	-	x	x	x
CL output module									
CP-A04-M12-CL	-	x	x	x	x	-	-	x	x
EL input modules									
CP-E16-M12-EL	-	-	x	x	-	-	x	-	x
CP-E16-M8-EL									
CP-E32-M8-EL									
EL output module									
CP-A08-M12-EL-Z	-	x	x	x	x	-	-	x	x

Tab. 3/4: Module-related parameter assignment

3. Commissioning

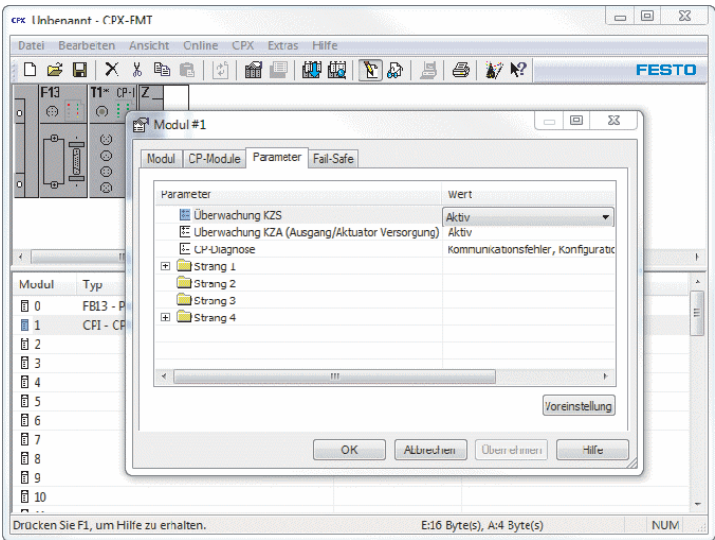


Fig. 3/2: Parameterisation byte 0

3. Commissioning

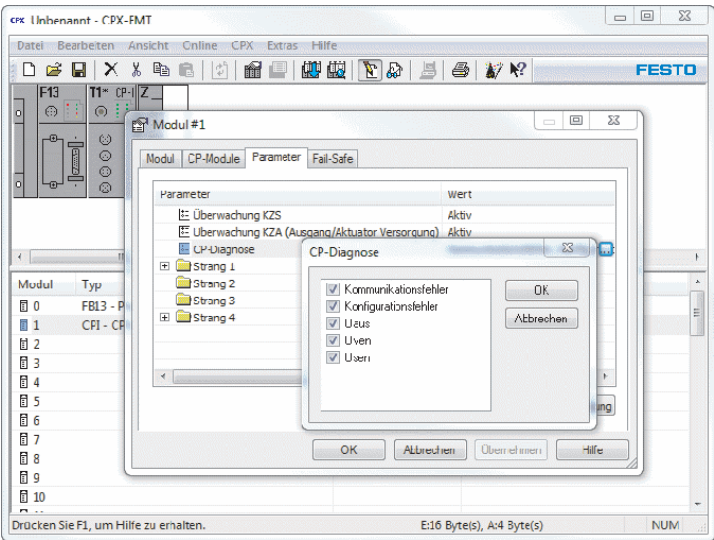


Fig. 3/3: Parameterisation byte 6

3. Commissioning

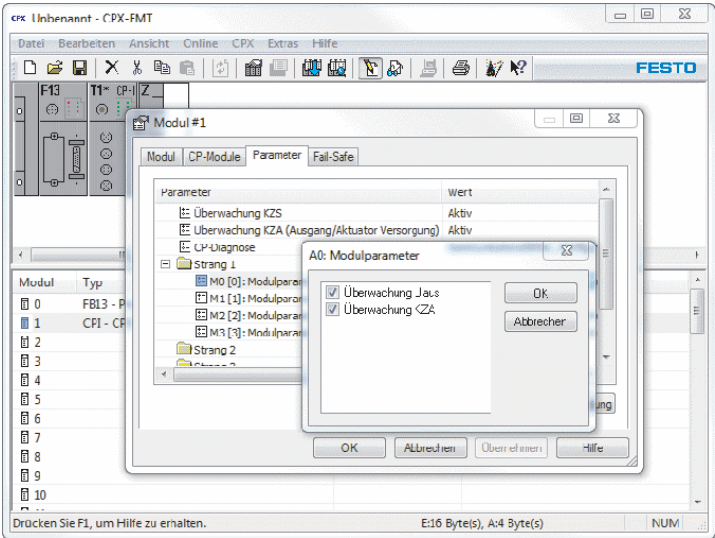


Fig. 3/4: Parameterisation bytes 8 ... 32

3. Commissioning

Description of the module parameters

Module parameters: Monitoring CPX module – CPX-CP interface		
Function no.	4828 + m * 64 + 0 m = module number (0 ... 47)	
Description	Monitoring of the possible faults can be activated or deactivated (suppressed) for each module independently. Active monitoring causes the following: The fault is: – sent to the CPX field bus node – displayed by the module common error LED.	
<u>Bit</u>	<u>Monitoring Description</u>	[Monitor]
0	Short circuit/overload in sensor supply (SCS) ^{1) 2)}	[Monitor SCS]
1	Short circuit/overload at the outputs (SCO) ²⁾	[Monitor SCO]
Values	1 = active (presetting) 0 = inactive	[Active] [Inactive]
Remark	Monitoring can also be set for the complete CPX terminal (see “System parameter monitoring”).	
Note	Monitoring can also be set for the complete CPX terminal (➔ system parameter monitoring).	
¹⁾ Only effective for CPI modules with extended functions		
²⁾ Must be active at the CPX-CP if a connected module is also active		

Tab. 3/5: Monitoring CPX module – CPX-CP interface

Module parameter: monitoring CPX module – CPX-CP interface		
Function no.	4828 + m * 64 + 6	m = module number (0 ... 47)
Description	→ Tab. 3/5	
<u>Bit</u>	<u>Monitoring Description</u>	<u>[Monitor]</u>
0	CP communication fault (fault 34, 36)	[Monitor CAN comm.]
1	CP configuration fault (fault 35)	[Monitor config]
2	CPI/CP modules Load supply for outputs Vout	[Monitor Vout]
3	CPI/CP modules Load supply for valves Vval	[Monitor Vval]
4	CPI/CP modules Load supply for sensors Vsen	[Monitor Vsen]
Values	1 = active (presetting) 0 = inactive	[Active] [Inactive]
Note	→ Tab. 3/5	

Tab. 3/6: Monitoring CPX module – CPX-CP interface and CPI/CP modules

Description of the channel-specific module parameters

The channel-specific module parameters are each permanently assigned to the individual CPI/CP modules on the CP strings → Tab. 3/7).

String	Module	x 1)	Function no.	String	Module	x 1)	Function no.
L1	M0	8	$4828 + m * 64 + 8$	L3	M0	16	$4828 + m * 64 + 16$
L1	M1	9	$4828 + m * 64 + 9$	L3	M1	17	$4828 + m * 64 + 17$
L1	M2	10	$4828 + m * 64 + 10$	L3	M2	18	$4828 + m * 64 + 18$
L1	M3	11	$4828 + m * 64 + 11$	L3	M3	19	$4828 + m * 64 + 19$
L2	M0	12	$4828 + m * 64 + 12$	L4	M0	20	$4828 + m * 64 + 20$
L2	M1	13	$4828 + m * 64 + 13$	L4	M1	21	$4828 + m * 64 + 21$
L2	M2	14	$4828 + m * 64 + 14$	L4	M2	22	$4828 + m * 64 + 22$
L2	M3	15	$4828 + m * 64 + 15$	L4	M3	23	$4828 + m * 64 + 23$
1) x = Parameter byte in the function number, → Tab. 3/8							

Tab. 3/7: Assignment of the channel-specific module parameters to the CPI/CP modules

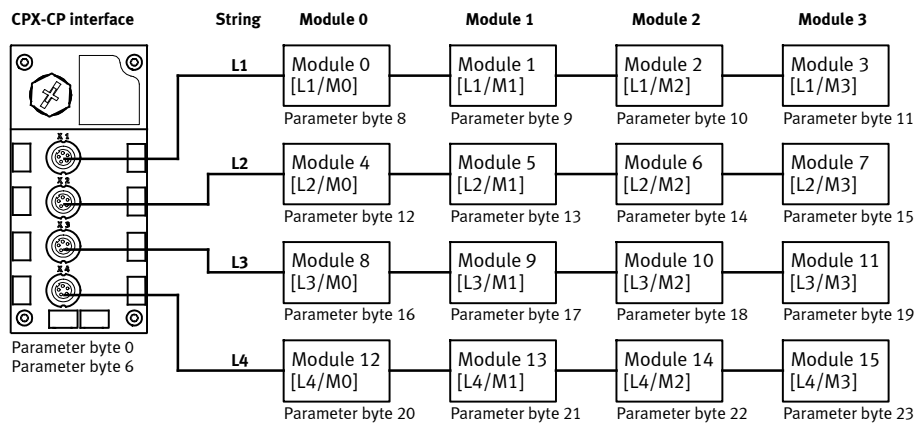


Fig. 3/5: Parameter assignment of the CPI system

3. Commissioning



Note

If you connect a module or valve terminal to a string, the remaining address space of the string is reserved until you connect additional equipment. This also applies if the parameterisation of the connected device takes up less than 4 bytes.

Module parameters: Monitoring CPX module – CPI/CP modules		
Function no.	$4828 + m * 64 + x$ m = module number (0 ... 47) x = dependent on string no. and module no. of the CPI/CP module, → Tab. 3/7	
Description	Monitoring of the possible faults can be activated or deactivated (suppressed) for CP each module independently. Active monitoring causes the following: The fault is: – sent to the CPX field bus node – displayed by the module common error LED.	
Bit 0 1	<u>Description</u> Power failure/undervoltage for: – CPI/CP input modules (Vsen): Power failure (or short circuit) of the sensor supply for modules with additional supply – CPI/CP output modules (Vout): Power failure of the load supply for modules with additional supply – CP valve terminals (Vval): Power failure of the load supply of the valves Short circuit/overload on: – CPI/CP output modules Output	[Monitor ...] [Monitor Vsen/Vout/Vval] [Monitor SC]
Values	1 = active (presetting) 0 = inactive	[Active] [Inactive]
Note	Monitoring can also be set for the total CPX terminal (→ system parameter monitoring).	

Tab. 3/8: Monitoring CPX module – CPI/CP modules

3. Commissioning

Module parameters: Fail safe channel x	
Function no.	These module parameters are accessed via protocol-specific functions (➔ description of fieldbus node).
Description	Fault mode channel x: Hold last state Fault state (presetting) Fault state channel x: 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 fieldbus communication errors can be specified (➔ CPX system description).

Tab. 3/9: Fail safe channel x (channel-specific)

Module parameters: Idle mode channel x	
Function no.	These module parameters are accessed via protocol-specific functions (➔ description of fieldbus 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 when changing into the Idle state can be specified (➔ CPX system description). This parameter is not available with all fieldbus protocols.

Tab. 3/10: Idle mode channel x (channel-specific)

3. Commissioning

Module parameters: Force channel x	
Function no.	These module parameters are accessed via protocol-specific functions (➔ description of fieldbus node).
Description	Force mode of inputs channel x: Blocked (presetting) Force state of inputs channel x: Force state Force mode of outputs channel x: Set signal Force state of outputs channel x: Reset signal (presetting) Force mode of outputs channel x: Blocked (presetting) Force state of outputs channel x: Force state Force state of outputs channel x: Set signal Force state of outputs channel x: Reset signal (presetting)
Note	The Force function permits the manipulation of signal statuses independent of actual operating statuses (➔ CPX system description).

Tab. 3/11: Force channel x (channel-specific)

3.7 Commissioning functions with the handheld

The universal Handheld type CPX-MMI-1 offers user-friendly and extended functions which will support you in commissioning the CPX-CP interface.

This section contains an overview of the specific commissioning functions for the CPX-CP interface.

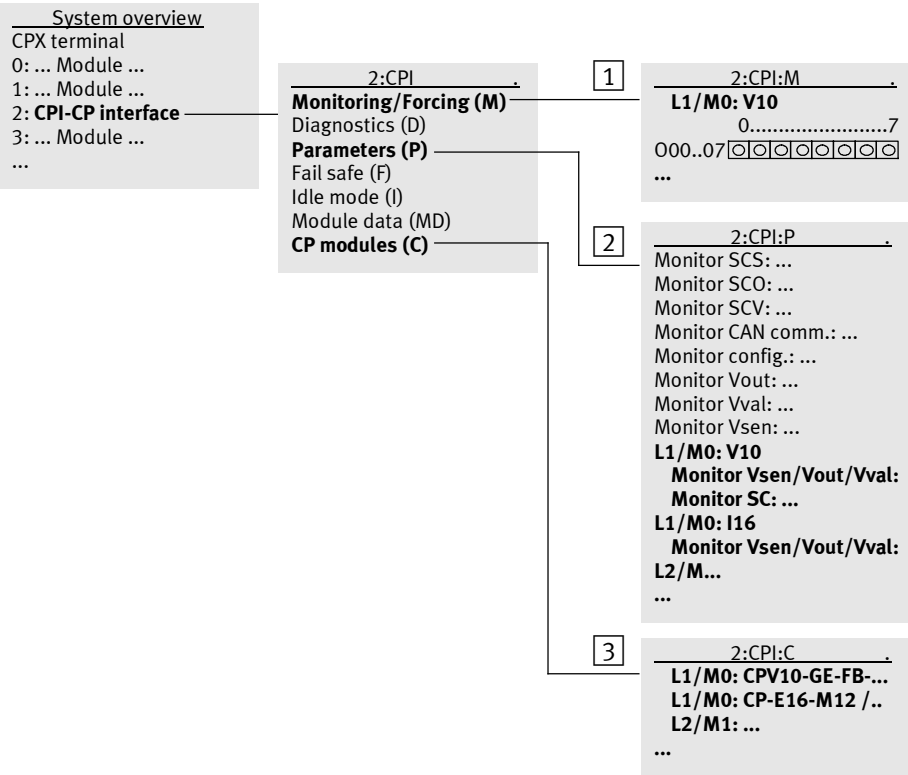
- General information on the representation, ➔ sections 3.7.1 and 3.7.2
- Display of the string assignment, ➔ section 3.7.3
- Display of the signal statuses, ➔ section 3.7.4
- Parameterisation, ➔ section 3.7.5



General information on operating the Handheld and on commissioning the CPX terminal using the Handheld can be found in the manual for the Handheld, type P.BE.CPX-MMI-1-... .

3.7.1 Menu commands of the CPX-CP interface on the Handheld

Fig. 3/6 shows as an example the special menu structure for the CPX-CP interface. For reasons of clarity only the parameter name is shown for the parameters.



- 1 “Monitoring/Forcing” menu (also “Fail safe”, “Idle mode”), ➔ section 3.7.4
- 2 “Parameters” menu, ➔ section 3.7.5
- 3 “CP modules” menu, ➔ section 3.7.3

Fig. 3/6: Menus of the CPX-CP interface on the Handheld

3. Commissioning

3.7.2 Representation of the CPI/CP modules

In the various menus of the handheld (➔ section 3.7.1, Fig. 3/6) the CPI/CP modules on the CPX interface are displayed with either a long name or a short name (➔ Tab. 3/12 status at January 2012).

Long name / type	Short name
Valve terminals CPV10-GE-FB-4, CPV10-GE-FB-6, CPV10-GE-FB-8 CPV14-GE-FB-4, CPV14-GE-FB-6, CPV14-GE-FB-8 CPV18-GE-FB-4, CPV18-GE-FB-6, CPV18-GE-FB-8 CPA10/14-IFB-CP MPA-CPI-VI	V10 V14 V18 V10/14 MPA-CPI
CP input modules CP-E16-M8, CP-E16-M12x2 CP-E16-KL-IP20-Z, CP-E16-M12x2-Z, CP-E16-M8-Z CP-E16N-M8, CP-E16N-M12x2	E16 E16Z E16N
CP output modules CP-A8-M12 CP-A8N-M12	A8 A8N
CL input modules CP-E08-M8-CL, CP-E08-M12-CL CP-E16-KL-CL	E08CL E16CL
CL output module CP-A04-M12-CL	A04CL
EL output modules CP-E16-M12-EL, CP-E16-M8-EL CP-E32-M8-EL	E16EL E32EL
EL output modules CP-A08-M12-EL-Z	A08EL

Tab. 3/12: Representation of the CPI/CP modules on the Handheld

3. Commissioning

3.7.3 Displaying the string assignment

To display the string assignment currently recognised by the CPX-CP interface, in the module submenu of the CPX-CP interface (➔ Fig. 3/6) select the entry for the CPI/CP modules [CP modules (C)] and confirm with OK.

```
2:CPI:C
L1 /M0: CPV10-GE-FB>
L1 /M 1 : CP-E16-M12 >
L2/M0: CPV10-GE-FB>
L4/M0: CPV10-GE-FB>
```

Back OK

All the CPI/CP modules of the recognised string assignment are now each displayed with string number (e.g. L1), module number on the string (e.g. M0) and their long name.

If no modules are recognised on the strings, the message “No CP modules” will be displayed.

```
2:CPI:C
x L1 /M0: CPV10-GE-FB>
x L1 /M 1 : CP-E16-M12 >
L2/M0: CPV10-GE-FB>
L4/M0: CP-A8-M12
```

Back OK

The following CPI/CP modules are marked with “x”:

- Modules recognised after the power supply has been switched on but not included in the saved string assignment.
- Modules contained in the saved string assignment but no longer recognised.
In this case the CPX-CP interface will report a configuration error.

```
2:CPI:C
L1 /M0: CPV10-GE-FB>
L1 /M 1 : CP-E16-M12 >
L2/M0: CPV10-GE-FB>
! L4/M0: CP-A8-M12
```

Back OK

Malfunctioning CPI/CP modules (modules reporting an error, e.g. short circuit) are marked with “!”. Diagnostic information about each of these modules can be displayed.



Note

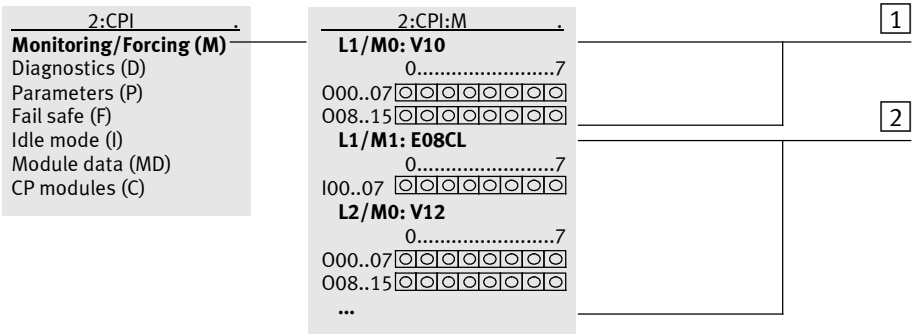
Always watch for error messages of the CPX-CP interface when the string assignment is displayed.

This will also provide you with information about CPI/CP modules that are not recognised.

3.7.4 Observing signal states (monitoring)

You can use the Handheld to observe the signal states of the connected (and recognised) CPI/CP modules.

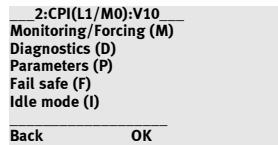
- To do this, select the entry [Monitoring/Forcing (M)] in the module submenu of the CPX-CP interface (➔ Fig. 3/7).



- 1 Inputs and outputs of the first CPI/CP module
- 2 Inputs and outputs of further CPI/CP modules

Fig. 3/7: Module submenu – Observing the signal states of all CPI/CP modules

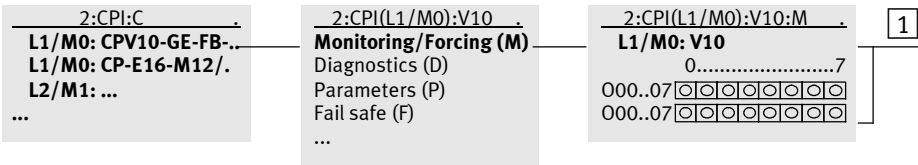
When you select one of the modules in the menu of the CPI/CP modules and confirm with OK, a further module submenu is displayed.



All the special entries for the CPI/CP module selected are available in this module submenu.

The display and function correspond basically to the module submenu for normal CPX modules.

- In order to display the signal status for the selected CPI/CP module, in the relevant module submenu select the entry [Monitoring/Forcing (M)] ➔ Fig. 3/8.



1 Inputs and outputs of the selected CPI module

Fig. 3/8: Module submenu – Observing the signal states of a specific CPI/CP module

“Forcing”, “Idle mode” and “Fail safe”



Warning

The actuators connected can move unexpectedly. Modification to the signal states and parameters with the Handheld can trigger dangerous movements of the connected actuators.

- Make sure that nobody is in the positioning range of the connected actuators and be very careful with the parametrizing and manipulation of signal states.
- It is imperative that you observe the notes on Forcing, Idle mode and Fail safe in the CPX system manual and in the manual for the Handheld.

You can also call up the “Forcing” function via the “Monitoring ...” menu. This function allows you to force signal statuses during the commissioning phase for test purposes.

The same representation of the CPI/CP modules applies accordingly to the functions “Idle mode” and “Fail safe”.

3. Commissioning

3.7.5 Parametrizing with the Handheld

For test purposes in the commissioning phase, for troubleshooting or for fieldbus protocols which do not support parameterisation via the fieldbus, you can use the Handheld for parameterisation (➔ Fig. 3/9 and Fig. 3/10).

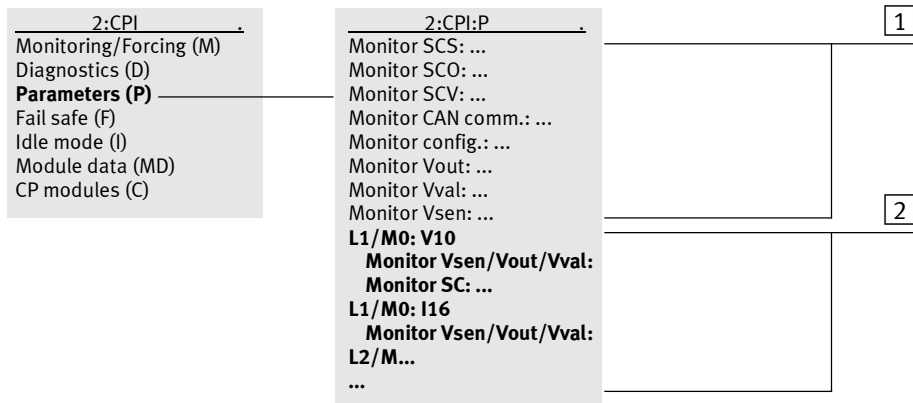


Warning

The actuators connected can move unexpectedly.

Modification to the signal states and parameters with the Handheld can trigger dangerous movements of the connected actuators.

- Make sure that nobody is in the positioning range of the connected actuators and be very careful with the parametrizing and manipulation of signal states.
- It is imperative that you observe the notes on parametrizing in the CPX system manual and in the manual for the Handheld.

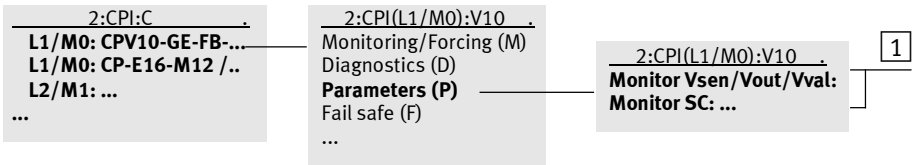


1 Module parameters (CPX-CP interface)

2 Parameters of the individual CPI/CP modules (channel-specific module parameters)

Fig. 3/9: Module submenu – Parameterisation in the “Parameters” menu

3. Commissioning



1 Parameters of the CPI/CP modules selected (channel-specific module parameters)

Fig. 3/10: Module submenu – Channel-specific parametrizing

Diagnosis and error treatment

Chapter 4

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4. Diagnosis and error treatment

4.1 Overview of diagnostic possibilities

The CPX-CP interface supports the following diagnostic and error handling options in the CPX terminal (Tab. 4/1):

Diagnostic possibility	Brief description	Advantages	Detailed description
LED display	The LEDs directly display configuration errors, hardware errors, bus errors, etc.	Fast “on-site” error detection	Section 4.2
Error messages	The CPX-CP interface reports specific malfunctions as error messages (error numbers) to the CPX bus node or CPX-FEC.	The error messages can be evaluated via the CPX bus node or CPX-FEC as well as with the Handheld	Section 4.3 and CPX system description
Status bits, I/O diagnostic interface and specific diagnostic functions	The errors recognised by the CPX-CP interface are reported in some cases to the CPX bus node or CPX-FEC with special additional information.	Fast access to error messages via the field-bus, etc.	Section 4.4, CPX system description and description for the CPX bus node or CPX-FEC
Diagnostics via the Handheld	Diagnostic information can be shown on the CPX Handheld in a user-friendly and menu-driven manner.	Fast “on-site” error detection	Section 4.5 and description for the Handheld

Tab. 4/1: Diagnostics options of the CPX-CP interface



Note

Observe that the available diagnostic information may depend on the settings of the CPX bus node or CPX-FEC or on the parameterisation settings.

4.2 Diagnosis via LEDs

LEDs for diagnosing the CPX terminal are available on the CPX-CP interface as well as on the individual CPI/CP modules.



The meaning of the LEDs on the CPI/CP modules can be found in the manual for the relevant module.

LEDs on the CPX-CP interface

The LEDs on the cover indicate the operating status of the CPX-CP interface.

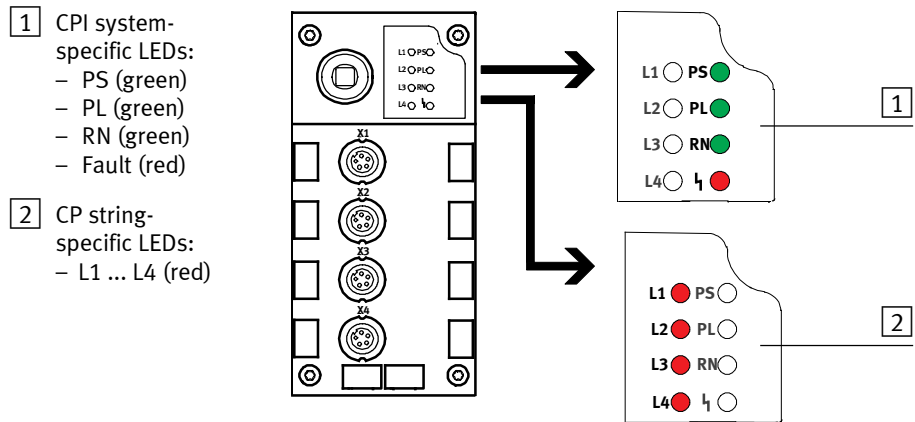


Fig. 4/1: LEDs on the CPX-CP interface

An overview of the LED functions is shown in Tab. 4/2.

4. Diagnosis and error treatment

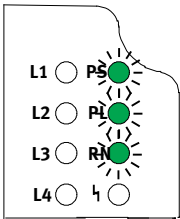
LED		Description
PS	Power sensors	Lights up if the sensor power supply on the CP string is correct. Flashes if there is a voltage fault. ¹⁾
PL	Power load	Lights up if the load power supply on the CP string is correct for outputs and valves. Flashes if there is a voltage fault. ¹⁾
RN	Run	Lights up if data exchange is running on the CP strings.
	Fault LED	Flashes or lights up if there are faults on the CPX-CP interface. The flash pulses indicate the type of fault .
L1 ... L4	String fault	Flashes or lights up if there are faults on the assigned CP string. The flash pulses indicate the location of the fault on the CP string.
¹⁾ The power supplies are monitored by the CPI/CP modules		

Tab. 4/2: Function overview of the LEDs on the CPX-CP interface

4. Diagnosis and error treatment

4.2.1 Normal operating status

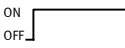
In the normal operating status all green LEDs light up.
The red LEDs do not light up.

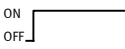
LED display		Operating status
	All green LEDs light up: – PS – PL – RN The red LEDs do not light up: – Fault – L1 ... L4	Standard

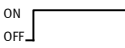
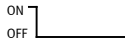
Tab. 4/3: LED display – normal operating status

4. Diagnosis and error treatment

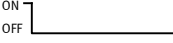
4.2.2 CPI system-specific LEDs

PS (power system) – power sensor supply of CPI/CP modules				
LED (green)	Sequence	Status	Fault number	Fault treatment
 LED lights up	ON OFF 	No fault. Sensor power supply applied	–	–
 LED flashes	ON OFF 	Short circuit/undervoltage in the sensor supply of a CPI/CP input module	2 5	➔ Error numbers in section 4.3, Tab. 4/6

PL (Power load) – power load supply for CPI/CP modules				
LED (green)	Sequence	Status	Fault number	Fault treatment
 LED lights up	ON OFF 	No fault. Load voltage applied	–	None
 LED flashes	ON OFF 	Undervoltage in the load supply of a CPI/CP module with additional power supply	5	➔ Error numbers in section 4.3, Tab. 4/6

RN (Run) – CPI/CP communication active				
LED (green)	Sequence	Status	Fault number	Fault treatment
 LED lights up	ON OFF 	No error Communication OK Saved string assignment corresponds to the recognised string assignment	–	None
 LED not illuminated	ON OFF 	Malfunction in the CPI system – Communication error – Configuration error – String assignment error	36 34, 35 34, 35	➔ Error numbers in section 4.3, Tab. 4/6

4. Diagnosis and error treatment

4 (Fault) – CPI system fault (location of the fault)				
LED (red)	Sequence	Status	Fault number	Fault treatment
 LED is out	ON  OFF	No fault.	–	–
 LED flashes	ON  OFF	Malfunction in the CPI/CP communication	34	➔ Error numbers in section 4.3, Tab. 4/6
	ON  OFF	– Short circuit/overload – Undervoltage On one CP string or one CPI/CP module: – Module missing / faulty – CP configuration fault – Short circuit in CP string	2 5 34 35 36	
	ON  OFF	On several CP strings or several CPI/CP modules: – Module missing / faulty – CP configuration fault – Short circuit in CP string	34 35 36	
	ON  OFF	– Recognised string assignment does not correspond to saved string assignment; Save key was not pressed – String assignment cannot be saved (configuration not capable of being saved)	35 35	
	ON  OFF	Unknown fault	255	• Switch power supply off then on again, replace module if necessary
 LED illuminated	ON  OFF	Internal CPX communication – Switch on phase – C-bus error	– 131	None. ➔ CPX system description

4. Diagnosis and error treatment

4.2.3 CP string-specific LEDs

L1 ... L4 – CP string fault (type of fault)				
LED (red)	Sequence	Status	Fault number	Fault treatment
 LED is out		– No fault or – Save key pressed after string assignment was modified	– –	– Switch power supply off then on again, replace module if necessary
 LED flashes		Error on module of the relevant assigned string L1, L2, L3 or L4: ¹⁾	2, 5, 34, 35	→ assigned error numbers in section 4.3, Tab. 4/6
		Fault on module 0	2, 5, 34, 35	
		Fault on module 1		
		Fault on module 2		
		Fault on module 3		
		During operation: – Revised string assignment, e.g. due to an additional module connected (at least 2 LEDs flash – L1+L2 and/or L3+L4). After switching on: – Invalid string assignment (only the LEDs of the CP strings concerned flash).	35	
 LED illuminated		Short circuit on the relevant assigned CP string	36	→ Section 4.3, Tab. 4/6
¹⁾ If there are faults on several modules, the lowest module number in each case is shown.				

4.2.4 Special system error (starting with software version Rev. 22)

These special system errors occur in very rare cases. The CP interface has detected an error that requires a software stop. The error is displayed through flashing of all CPI-specific LEDs (PS, PL, RN, 4). In addition, an error message is shown encoded through flashing of the LEDs L1 ... L4 (➔ Tab. 4/4 and Tab. 4/5).

- In the event of error, restart the CPX terminal with POWER OFF/ON and observe the instructions in the tables Tab. 4/4 and Tab. 4/5.
If the error still exists: service matter.

Special system errors			
LED (red)	Status/error handling	LED (red)	Status/error handling
1  L1, L2 flash	Malfunction of communication on one CP string. Error handling: • Check CP cables for damage • Check earthing of the CPI/CP system (EMC load)	3  L1, L2, L3 flash	Time-out when writing from EE-PROM. Error handling: • Save the string assignment again with the SAVE button (3.2.2)
2  L2, L3 flash	Time-out when reading from EE-PROM. Error handling: • Save the string assignment again with the SAVE button (3.2.2)	4  L4 flashing	Unstable clock signal detected. Error handling: • Restart system • Servicing required

Tab. 4/4: Special system errors - Part 1

4. Diagnosis and error treatment

Special system errors			
LED (red)	Status/error handling	LED (red)	Status/error handling
5  L1, L4 flash	Critical timeouts in internal timing. Possibly to high bus load or external diagnostic requests, or similar Error handling: - Restart system - Reduce bus load, if necessary	8  L1, L3, L4 flash	EEPROM defective. Error handling: - Restart system; if successful, save the string assignment again with the SAVE button (3.2.2) - Servicing required
6  L1, L2, L4 flash	Incorrect access lower boundary data exchange buffer. Error handling: Restart system	9  L1, L2, L3, L4 flash	Undefined error message. Error handling: - Restart system - Servicing required
7  L1, L2 flash	Incorrect access upper boundary data exchange buffer. Error handling: Restart system	–	–

Tab. 4/5: Special system errors – Part 2

4. Diagnosis and error treatment

4.3 Error messages of the CPX-CP interface

A CPX-CP interface can report the following errors (Tab. 4/6 and Tab. 4/7):

Error number	Description	Error handling
2	Short circuit/overload (Handheld: [Short circuit]) – Short circuit/overload at output or – Short circuit/overload, sensor supply (only for I/O modules with extended functions)	• Check the connected actuators, eliminate short circuit/overload and delete errors ¹⁾ • Check the connected sensors, eliminate short circuit/overload and delete errors, if necessary ²⁾
5	Undervoltage in the power supply (Handheld: [Undervoltage in power supply]) – Load voltage of the valves (U_{VAL}) not applied or too low. or – Load voltage supply (V_{out}) not applied or too low (only for CPI/CP output modules with a separate power supply) or – Power supply of the CPI/CP modules ($V_{sen}/V_{out}/V_{val}$) via the CP string not applied or too low (only for CPI/CP modules without a separate power supply) or – Short circuit/overload, sensor supply (only for CP input modules without extended functions)	• Check the load voltage • Check the load voltage • Check the load voltage, Check CPI/CP cables • Eliminate short circuit/overload, check connected sensors, delete errors, if necessary ²⁾

¹⁾ Dependent on the CPI/CP module: All the outputs of the module are switched off in the event of an error. The error must be deleted by resetting all the outputs.

²⁾ Dependent on the CPI/CP module: The error is automatically deleted or must be deleted by disconnecting the module from the CP string or by switching the power supply off then on again.

Tab. 4/6: Error messages of the CPX-CP interface - Part 1

4. Diagnosis and error treatment

Error number	Description	Error handling
34	CPI/CP module missing / faulty (Handheld: [CP module lost / fault]) – Incorrect string assignment discovered during operation (e.g. CPI/CP module failed or CPI/CP cables defective) – More than one module failed during operation – modules are no longer recognised.	• Check CP strings (CPI/CP modules and cables), if necessary replace modules or cables • Switch power supply off then on again, check cables and modules if error occurs repeatedly, replace if necessary
35	CP configuration error (Handheld: [CP configuration failure]) – When the power supply is switched on, the string assignment does not match the saved string assignment or – The wrong module is recognised during operation (different type, → chapter 3)	• Check CP strings (modules and cables), if necessary replace modules or cables • With correct string assignment: String assignment must be saved (→ chapter 3) • Check string assignment, if necessary replace module
36	Short circuit in CP string (24 V _{EL/SEN} or 24 V _{Val}) (Handheld: [Short circuit CP-Line]) – Communication on CP string malfunctioned	• Check CP strings, if necessary replace cable

Tab. 4/7: Error messages of the CPX-CP interface - Part 2

In addition, the following error can occur during the commissioning phase for the CPX bus node with the parameter “System start” = “saved parameterisation and CPX system expansion” or with the CPX-FEC:

4. Diagnosis and error treatment

Error number	Description	Error handling
16	Module code not permitted or incorrect module (Handheld: [Module code incorrect]) – The saved string assignment of the CPX-CP interface is not the same as the configuration saved in the CPX bus node or in the CPX-FEC	• For the CPX bus node: Change parameter “System start ...” to “... default parameterisation and current CPX expansion” • With the CPX-FEC: Save the actual configuration as setpoint configuration with FST software
205	NVRAM reset to default values (Handheld: [Module set to default values]) – EEPROM has valid content, but no valid configuration.	• No need for action. This is information and not an error

Tab. 4/8: Additional error message of the CPX terminal

Specific monitoring of the CPX-CP interface can be activated or deactivated by means of parameterisation. Parameterisation of the CPX-CP interface applies only to certain CPI/CP modules. An overview shows Tab. 4/9 (status at January 2012).

4. Diagnosis and error treatment

Module type	Monitoring			
	Undervoltage / short circuit in sensor supply Usen	Short circuit/ overload SCO/SCS	Undervoltage in actuator supply Uout	Undervoltage in valve supply Uval
Error number	5	2	5	5
Valve terminals				
CPV...GE-FB-...	-	-	-	X
CPA...-...	-	-	-	X
MPA...-...	X	X	X	X
CP input modules				
CP-E16-M8	X	-	-	-
CP-E16N-M8	X	-	-	-
CP-E16-M8-Z	X	-	-	-
CP-E16-12-5-POL	X	-	-	-
CP-E16N-M12	X	-	-	-
CP-E16-KL-IP20	X	-	-	-
CP output modules				
CP-A08-M12-5-POL	-	X	X	-
CP-A08N-M12	-	X	X	-
CL input modules				
CP-E08-M12-CL	X	X	-	-
CP-E08-M8-CL	X	X	-	-
CP-E08-KL-CL	X	X	-	-
CL output module				
CP-A04-M12-CL	-	X	X	-
EL input modules				
CP-E16-M12-EL	X	-	-	-
CP-E16-M8-EL	X	-	-	-
CP-E32-M8-EL	X	-	-	-
EL output module				
CP-A08-M12-EL-Z	-	X	X	-

Tab. 4/9: CPI/CP module-related error assignment

4.4 Diagnostics via the CPX-FEC or CPX bus node

Malfunctions of the CPX-CP interface or of the connected CPI/ CP modules are reported to the CPX bus node or CPX-FEC as CPX error messages. The following sections include the special features of the representation for the CPX-specific diagnostics options.

- Status bits (→ Section 4.4.1)
- Diagnostics memory
(I/O diagnostics interface, → Section 4.4.2)

4.4.1 Status bits of the CPX terminal

Tab. 4/10 shows the effect of the CPX-CP interface on the status bits of the CPX terminal.

Bit	Diagnostic information with 1-signal	Description	Cause of the fault on the CPX-CP interface
0	Fault at valve	Module type on which a fault has occurred.	–
1	Fault at output		–
2	Fault at input		–
3	Fault at analogue module/technology module (function module)		Bit 3 is set for all faults of the CPX-CP interface.
4	Undervoltage	Type of fault	Fault number 5 ¹⁾
5	Short circuit/overload		Fault number 2 ¹⁾
6	Wire fracture		–
7	Other faults	Type of fault	Fault number 34, 35, 36 ¹⁾
¹⁾ → Tab. 4/6			

Tab. 4/10: Overview of status bits



Further instructions on the function and content of the status bits can be found in the CPX system manual.

4.4.2 I/O diagnostic interface and diagnostic memory

The CPX-CP interface reports specific diagnostic information to the CPX-FEC or CPX bus node.

It is possible to apply the diagnosis to individual CPI/CP modules via the I/O diagnostic interface and the diagnostic memory of the CPX terminal. The CPI/CP modules connected to a CPX-CP interface are treated as input or output channels within the CPX terminal.

Assigning CPI/CP modules – diagnostic channels



The assignment of the CPI/CP modules to the I/O channels takes place independently of the CPX bus node or CPX-FEC used. The following representation applies to the bus nodes (e.g. CPX-FB13) as well as for the Front End Controller CPX-FEC, but not for Interbus bus nodes. The assignment for Interbus bus nodes (e.g. CPX-FB6) can be found in Appendix B.2.

The diagnostics channels are each permanently assigned to the individual CPI/CP modules on the CP strings, ➔ Fig. 4/2.

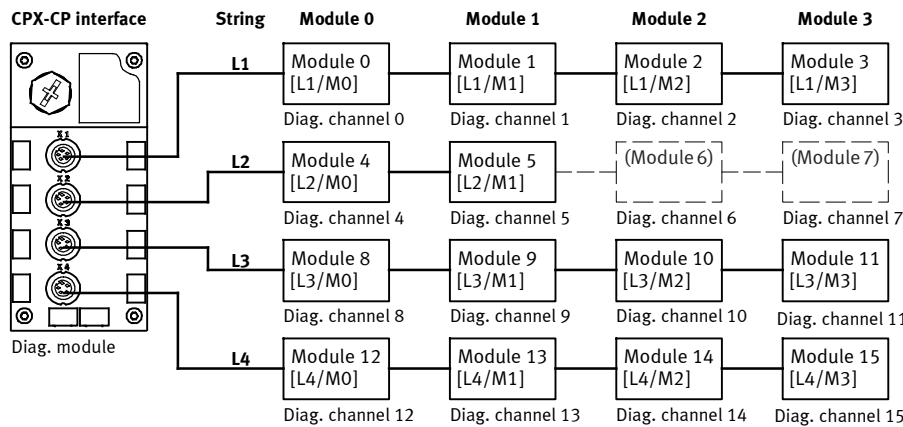


Fig. 4/2: Diagnostic channel assignment of a CPI system

4. Diagnosis and error treatment

Diagnostic memory data (Handheld and I/O diagnostic interface)

The specific representation of diagnostic messages of the CPX-CP interface in the diagnostic memory of the CPX terminal takes place as shown in Tab. 4/11.

Diagnostic memory data (10 bytes per entry, max. 40 entries)				Function no. 1)
Byte no.	Designation	Description	Value	3488 + n
1 ... 5	Days [day] Hours [h] Minutes [m] Seconds [s] Milliseconds [ms]	Time value of the fault reported, measured from the point when the power supply is switched on (CPX standard)	0 ... 255 0 ... 23 0 ... 59 0 ... 59 0 ... 99 (128...227)	$n = 10 * d + 0$
6	Module code	Module code of the CPX-CP interface: 195	0 ... 255	$n = 10 * d + 5$
7	Module position [Pos]	Module number of the CPX-CP interface in the CPX terminal which reported the fault	0 ... 47	$n = 10 * d + 6$
8	Channel number 2)	<u>Bit 7 6 5 ... 0: Description</u> 0 0 0 ... 63: No. of the 1st. faulty O channel (here CPI/CP output module) 2) 1 0 0 ... 63: No. of the 1st. faulty I channel (here CPI/CP input module) 2) 0 1 0 ... 63: Module fault 1 1 0 ... 63: Reserved	0 ... 255	$n = 10 * d + 7$
9	Error number [FN]	Error number (→ Section 4.3)	0 ... 255	$n = 10 * d + 8$
10	Subsequent channels 2)	Number of subsequent channels (CPI/CP modules) with the same fault	0 ... 63	$n = 10 * d + 9$
1) d (diagnostic event) [NB] = 0 ... 39 ; most current diagnostic event = 0 2) Assignment of the CPI/CP modules to the diagnostics channels → Section 4.4.2.				

Tab. 4/11: Diagnostic memory data of the CPX-CP interface



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

4. Diagnosis and error treatment

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

The specific representation of module diagnostic data (error messages) of the CPX-CP interface takes place as shown in Tab. 4/12 and Tab. 4/13.

Module diagnostic data: Type of fault and location where fault arose	
Function no.	2008 + m * 4 + 0 m = module number (0 ... 47)
Description	Describes where the relevant fault occurred.
Bit	Bit 0 ... 7 Type of fault and location where fault arose
Values	<u>Bit 7 6 5 ... 0</u> : <u>Description</u> 0 0 0 ... 63 : Error in O channel, bit 0 ... 5: Location of fault, see below 1 0 0 ... 63 : Error in I channel, bit 0 ... 5: Location of fault, see below 0 1 0 ... 63 : Module error (not channel specific) x 1 0 ... 63 : Channel-specific error <u>Bit 1 0</u> <u>Description</u>¹⁾ 0 0 Error in the CPI/CP module M0 0 1 Error in the CPI/CP module M1 1 0 Error in the CPI/CP module M2 1 1 Error in the CPI/CP module M3 <u>Bit 3 2</u> <u>Description</u>¹⁾ 0 0 Faulty module in string L1 0 1 Faulty module in string L2 1 0 Faulty module in string L3 1 1 Faulty module in string L4 <u>Bit 4, 5</u> Reserved <u>Bit 6</u> <u>Description</u> 0 No module error of the CPX-XP interface (channel-specific error → Bit 0 ... 3) 1 Module error of the CPX-CP interface (not channel-related) <u>Bit 7</u> <u>Description</u> 0 Error in an O module 1 Error in an I module
¹⁾ Does not apply with Interbus bus node. In the case of Interbus, bit 0 ... 3 binary coded corresponds to the number of the I of O diagnostics channel (0 ... 15, → Section B.2) of the faulty module and not the module number or string number.	

Tab. 4/12: Type of fault and location where fault arose

4. Diagnosis and error treatment

Module diagnostic data: Module fault number	
Function no.	$2008 + m * 4 + 1$ $m = \text{module number (0 ... 47)}$
Description	Fault number
Bit	Bit 0 ... 7 fault number
Values	0 ... 255 (fault number)
Note	Error messages of the CPX-CP interface → Section 4.3.

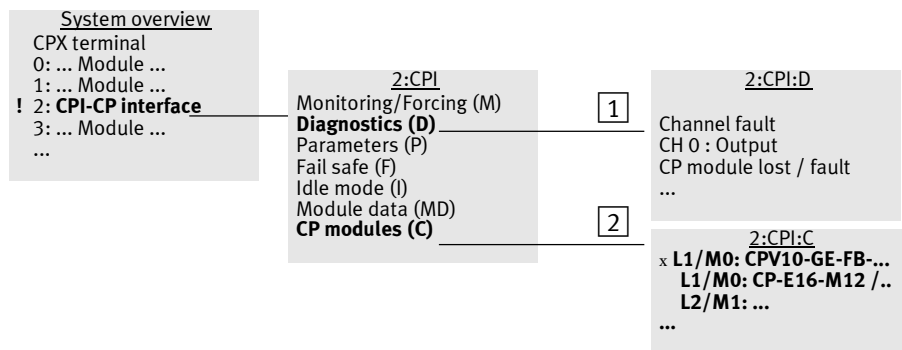
Tab. 4/13: Module fault number

4.5 Diagnostic functions with the Handheld

The universal Handheld type CPX-MMI-1 provides convenient extended functions that assist you in diagnostics and troubleshooting with the CPX-CP interface.



Additional diagnostic functions of the Handheld have already been described in the “Commissioning” chapter, section 3.7. The display of CP module-specific information can be found in the appendix, section A.3



1 “Diagnostics” menu

2 “CP modules” menu (→ also section 3.7.3)

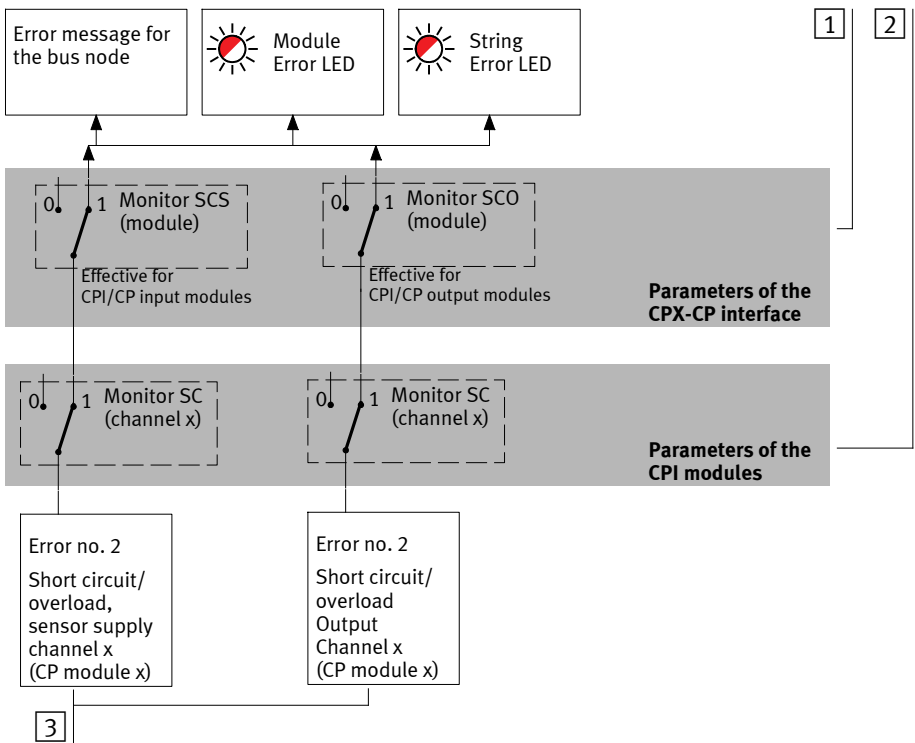
Fig. 4/3: Diagnostics of the CPX-CP interface with the Handheld (“CPI” here is an abbreviation for the CPX-CP interface)



General information on operating and commissioning the CPX terminal using the Handheld can be found in the description for the Handheld, type P.BE.CPX-MMI-1-... .

4.6 Error handling and parameterisation

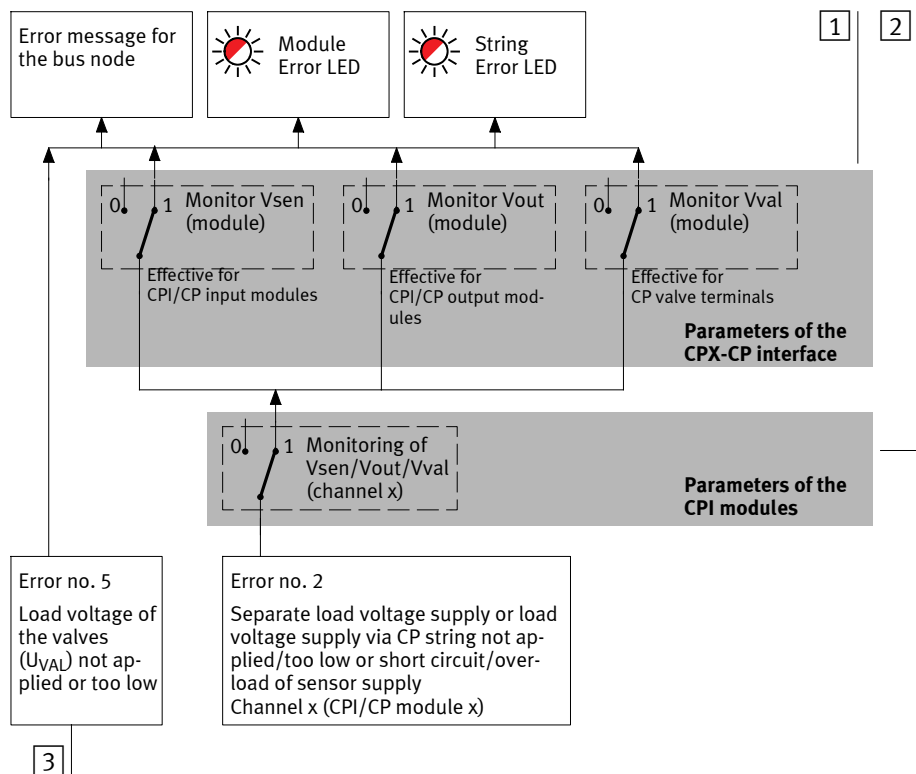
The following diagrams show error handling in the CPX-CP interface. Further registering and display of the errors can be suppressed as desired with the appropriate module parameters, represented in the diagram as switches. The parameters are described in section 3.6.



- 1 Module parameter (switch position represented = default)
- 2 Channel-specific module parameters (switch position represented = default)
- 3 Error

Fig. 4/4: Principle of error handling and parameterisation of the CPX-CP interface – part 1

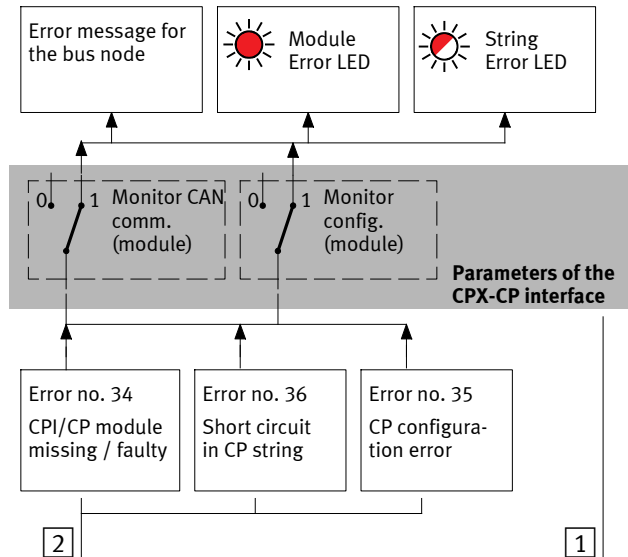
4. Diagnosis and error treatment



- 1 Module parameter (switch position represented = default)
- 2 Channel-specific module parameters (switch position represented = default)
- 3 Error

Fig. 4/5: Principle of error handling and parameterisation of the CPX-CP interface – part 2

4. Diagnosis and error treatment



1 Module parameter
(switch position represented = default setting)

2 Error

Fig. 4/6: Principle of error handling and parameterisation of the CPX-CP interface – part 3

Technical appendix

Appendix A

Contents

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A.1 Technical specifications of CPX-CP interface, type CPX-CP-4-FB

General information	
General technical data	→ CPX system description: – Description P.BE-CPX-SYS-...
Protection class as per EN 60529	IP65/IP67: CPX-CP interface fitted completely, plug complies with protection class IP65/IP67 when inserted, unused connections fitted with protective caps.
Protection against electric shock (protection against direct and indirect contact as per EN 60204-1/IEC 204)	Through PELV power supply unit (Protected Extra Low Voltage)
Module code (CPX-specific)	195d (C3h)
Module identifier (in the Handheld)	CPI

Power supply	
Operating voltage / load voltage The following special features apply: – Permissible tolerance in load voltage supply for valves (U_{VAL})	→ CPX system description – Description P.BE-CPX-SYS-... 20.4 ... 26.4 V
Current consumption of CPX-CP interface (only CPX-CP interface, without CP modules) – of operating voltage supply for electronics/sensors ($U_{EL/SEN}$) – of load voltage supply for valves (U_{VAL})	typ. 75 mA at 24 V typ. 5 mA at 24 V
Maximum current consumption per CP string – of operating voltage supply for electronics/sensors ($U_{EL/SEN}$) – of load voltage supply for valves (U_{VAL})	1.6 A at 24 V 1.6 A at 24 V
Electrical isolation – between the operating voltage supply for the electronics/sensors ($U_{EL/SEN}$) and the load voltage supply for the valves (U_{VAL})	None

A. Technical appendix

CPI system	
Design – no. of CP strings – cable length per CP string – number of CPI/CP modules per CP string – number of inputs / outputs per CP string – update time – all CP strings assigned exclusively with modules with extended functions – mixed string assignment – supports the extended functions of the CPI system	4 max. 10 m max. 4 32 I / 32 O max. 2 ms max. 4 ms Yes
Voltage drop of system supply or additional supply up to CP connection... – of operating voltage supply for electronics/sensors ($U_{EL/SEN}$) – of load voltage supply for valves (U_{VAL})	max. 1 V max. 1 V
Short-circuit protection for CPX-CP interface – to CPI/CP sensor supply – to CPI/CP load voltage supply – reaction after short circuit – eliminating faults	> 1.8 A per string, slow-blowing > 1.8 A per string, slow-blowing Power is switched off Power Off/On necessary (power does not return automatically)

A.2 Accessories

→ www.festo.com/catalogue

A.3 Displaying CPI/CP module-specific information with the Handheld

You can use the Handheld to display special module-specific information for the CPI/CP modules (→ section 3.7.1).

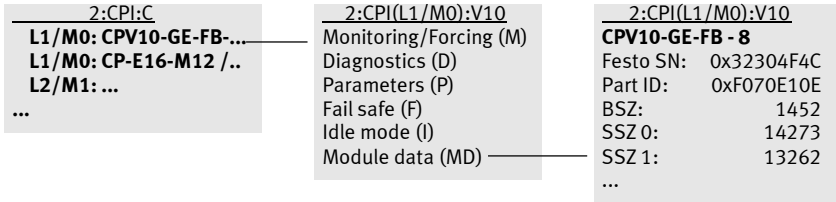


Fig. A/1: Module data for the CPI/CP module selected

Module data (example)	Description
CPV10-GE-FB - 8	Long name (type) of the CP module, → section 3.7.2, Tab. 3/12
Prod.Data: 0x32304F4C	Manufacturing data of the CPI/CP module
Part ID: 0x66000DB0	Identifying the CPI/CP module
OP. time: 1235	Operating time counter of the CPI/CP module ¹⁾
Cond.Cnt.: 1234545 Cond.Cnt.: 547848 ...	Switching counter for each coil (only for valve terminals) ¹⁾
¹⁾ Not supported by all modules (displayed as '0')	

Tab. A/1: Module data of the CPI/CP modules

A.4 Address assignment of the CP valve terminals and CPI/CP modules

CPV valve terminal

- The address assignment on the CPV valve terminal is from left to right and on the individual valve locations from the front to the rear.

- 1 LED series for pilot solenoid 12
- 2 LED series for pilot solenoid 14

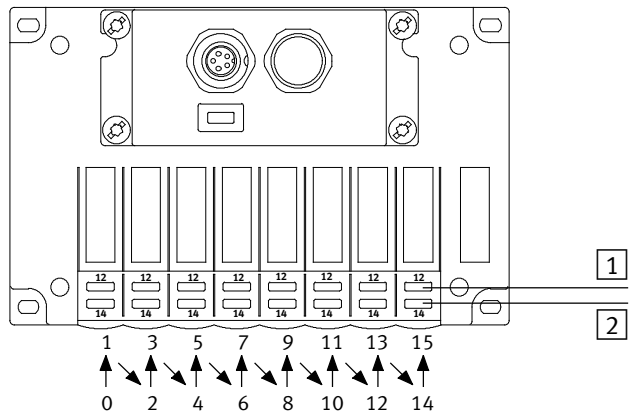


Fig. A/2: Address assignment of the CPV valve terminal

- A valve location on the CPV valve terminal always occupies 2 addresses, even if it is fitted with a blanking plate or pressure-separator plate. If a valve location is fitted with a double-solenoid valve, the following applies:
 - pilot solenoid 14 occupies the lower-value address;
 - pilot solenoid 12 occupies the higher-value address.
- With single-solenoid valves the higher-value address remains unused.

CPA valve terminal

- With the CPA valve terminal a valve location occupies 1 or 2 addresses, depending on the manifold block.

Manifold block	Number of assigned outputs
Type ...EV1	1 output
Type ...EV2	2 outputs

- If a manifold block remains unused (reserve location, pressure supply), the relevant addresses will still be occupied.
- Addresses are assigned from left to right on the CPA valve terminal and from the rear to the front on the individual valve locations.
- With manifold block type CPA..EV2, the following assignment applies:
 - pilot solenoid 14 occupies the lower-value address;
 - pilot solenoid 12 occupies the higher-value address.

CPI/CP modules



The address assignment of the CPI/CP modules can be found in the manual for the relevant module.

A.5 Parametrizing with the FST software (CPX-FEC)

With the CPX-FEC, it is possible to parametrize the CPX-CP interface using the FST software.

In the module configuration, a new “CP Module” tab appears.

- For each assigned module position of all strings, select the respective CP module from the list field. (→ Fig. A/3).

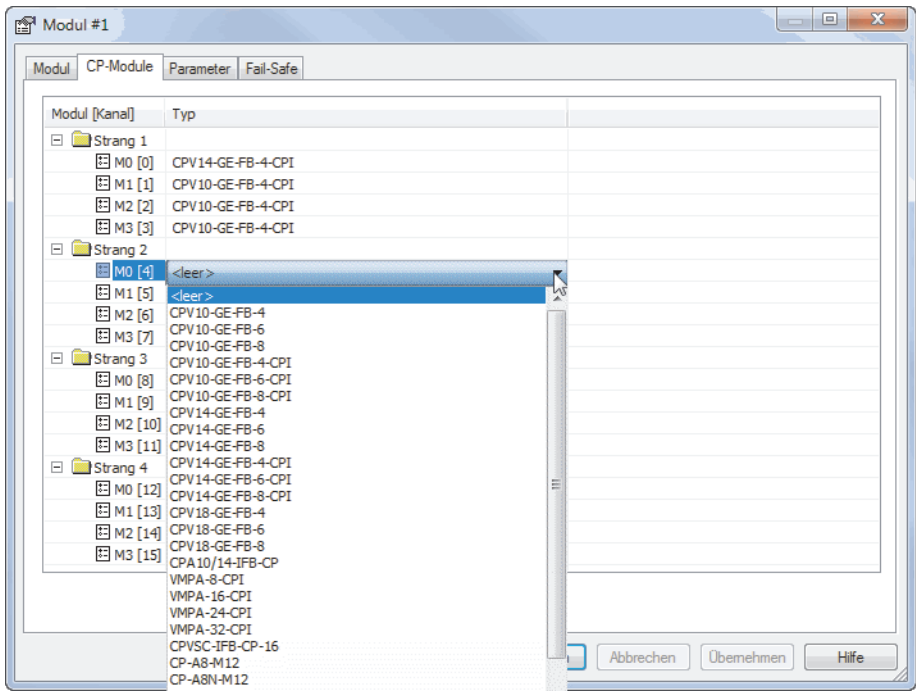


Fig. A/3: Parametrizing with the CPX-FEC

- Switch to the “Parameters” tab. Here you can activate or deactivate the related module parameters for each CP module. To do this, click on the button with the three full stops (...). In the following dialogue, activate or deactivate the module parameters as desired. (→ Fig. A/4)

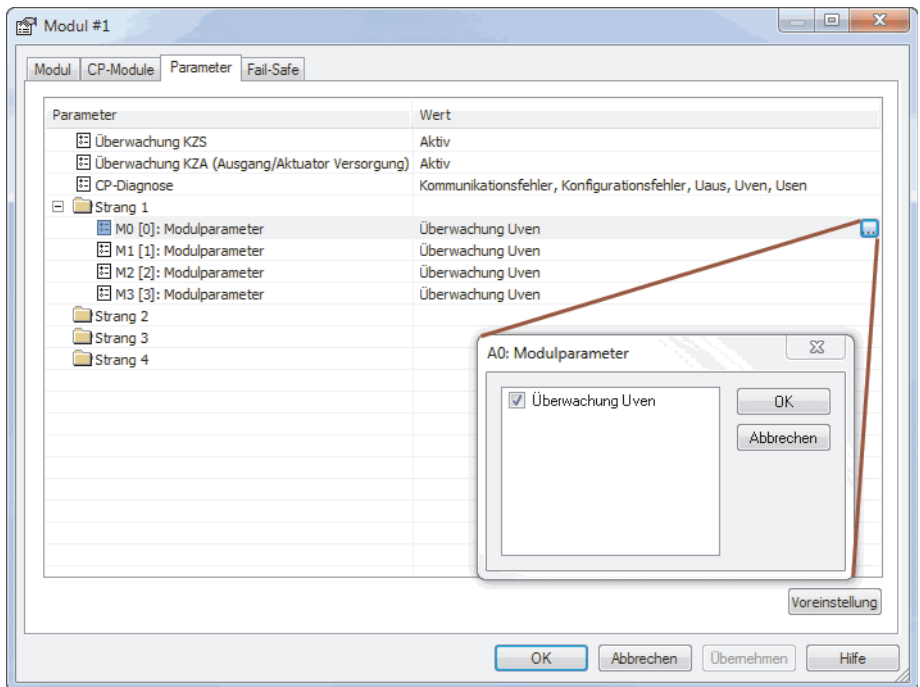


Fig. A/4: Parameterisation of the module parameters

A.6 Permissible CPI/CP modules and string lengths dependent on the CPI cables



Note
With use of the CP cable **Type KVI-CP-1-...** or **KVI-CP-2-...** (colour black) The following restrictions apply, dependent on the modules and cables used and the current consumption:

- Per CP string only **one** CP valve terminal **or one** CPI output module is permissible
- The maximum permissible string length of 10 m can additionally be limited further. An overview shows Tab. A/1 and Tab. A/2.

CP string without output module with maximum of one CP valve terminal type... ¹⁾	Maximum sensor current consumption of the modules on the CP string ²⁾	Maximum string length with CP cable, type KVI-CP-1-... or KVI-CP-2-...		
		U _{VAL} = 21.6 ... 24 V; 16 valves ³⁾	U _{VAL} = 20.4 V; 8 valves ⁴⁾	U _{VAL} = 20.4 V; 16 valves ⁵⁾
CPV10-.../CPA10-...	0.5 A	10 m	10 m	10 m
	1.0 A	10 m	10 m	9 m
	1.5 A	10 m	8.5 m	6.5 m
CPV14-.../CPA14-...	0.5 A	10 m	10 m	8.5 m
	1.0 A	10 m	9.5 m	6 m
	1.5 A	10 m	7 m	4 m

CP string without output module with maximum of one CP valve terminal type... ¹⁾	Maximum sensor current consumption of the modules on the CP string ²⁾	Maximum string length with CP cable, type KVI-CP-1-... or KVI-CP-2-...		
		$U_{VAL} = 21.6 \dots 24 \text{ V};$ 16 valves ³⁾	$U_{VAL} = 20.4 \text{ V};$ 8 valves ⁴⁾	$U_{VAL} = 20.4 \text{ V};$ 16 valves ⁵⁾
CPV18-...	0.5 A	10 m	10 m	5.5 m
	1.0 A	10 m	7 m	4 m
	1.5 A	– ⁶⁾	5.5 m	– ⁶⁾
¹⁾ Valve terminal installed at each string end, no CPI output module on the string ²⁾ Maximum sensor supply current used → section 2.3.2, Tab. 2/5 ³⁾ Nominal voltage or undervoltage of -10 %, 16 valve solenoid coils switched simultaneously (high current phase) ⁴⁾ Maximum undervoltage of -15 %, 8 valve solenoid coils switched simultaneously (high current phase) ⁵⁾ Maximum undervoltage of -15 %, 16 valve solenoid coils switched simultaneously (high current phase) ⁶⁾ Not permissible				

Tab. A/1: Permissible string lengths with CP cables, type KVI-CP-1-... and KVI-CP-2-... dependent on the CP valve terminal used and the sensor current consumption

CP string without valve terminal with maximum of one CPI output module type	Maximum sensor current consumption of the CPI modules on the CP string ¹⁾	Maximum string length with CP cable, type KVI-CP-1-... or KVI-CP-2-...
CP-A04-M12-CL	0.5 A	10 m
CP-A08-...-M12-...	1.5 A	10 m
¹⁾ Maximum sensor supply current used → section 2.3.2, Tab. 2/5		

Tab. A/2: Permissible string lengths with CP cables, type KVI-CP-1-... and KVI-CP-2-... dependent on the CPI output module used and the sensor current consumption

CPX-CP interface with Interbus field bus node

Appendix B

Contents

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B.1 Addressing with Interbus

Interbus fieldbus nodes (e.g. CPX-FB6) can manage a maximum of 96 inputs and 96 outputs. The I/O addresses of the CPI system are therefore “packed” in CPX terminals with Interbus fieldbus nodes.

B.1.1 Address range with Interbus field bus nodes

Size of the assigned address range

The following rules apply to the address range occupied by the CPX-CP interface:

- The number of addresses that can be used by the CP interface is limited by the addresses available in the field bus node (96 I / 96 O or 80 I / 80 O with PCP channel). The field bus node reports a fault if this number is exceeded.
- The size of the address range occupied by the CP interface depends only the total number of input and output addresses occupied by the CPI/CP modules connected.

B.1.2 Address assignment with Interbus field bus nodes

Address assignment of the individual modules takes places according to the following rules:

- The input and output addresses of the CPI/CP modules are arranged one next to the other without any gaps, irrespective of the string to which the relevant module is connected.
- The addresses of the inputs do not depend on the addresses of the outputs.

The diagram below shows as an example the address assignment of the CPI system.

B. CPX-CP interface with Interbus field bus node

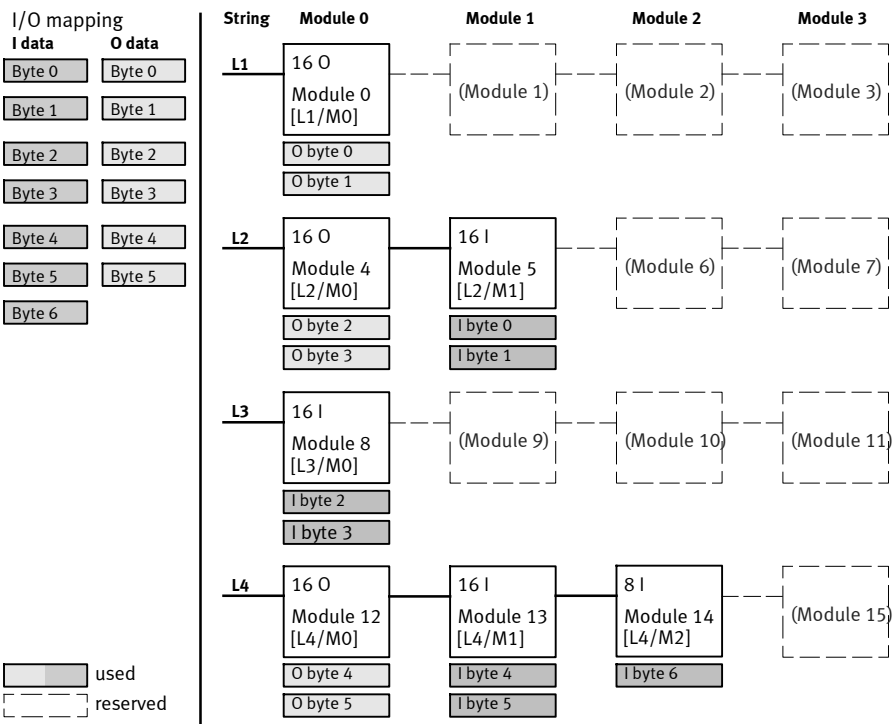


Fig. B/1: Address assignment of a CPI system with Interbus field bus nodes, example

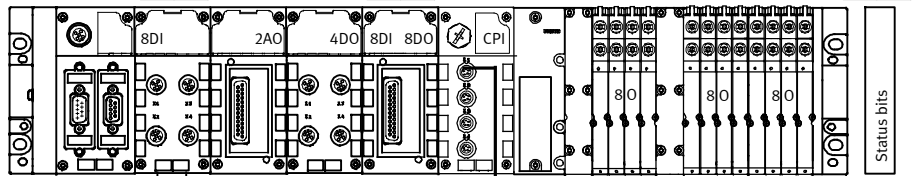
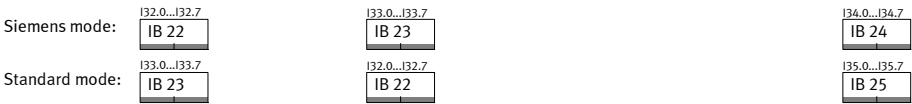


Note
General addressing examples for the field bus protocol you are using can be found in the relevant field bus node manual.

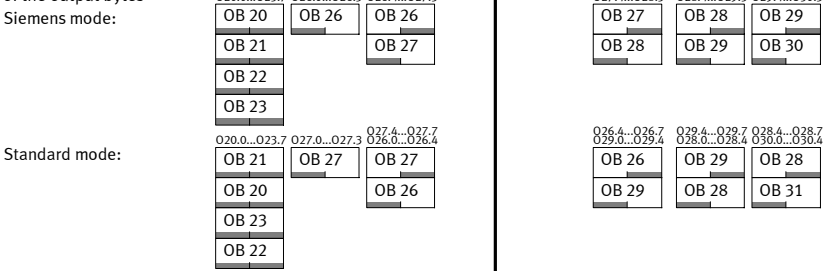
The following examples show the address assignment on the Interbus of a CPX terminal with the CPX-CP interface, in each case with the input address: IB20, output address OB20.

B. CPX-CP interface with Interbus field bus node

Byte assignment of the input bytes



Byte assignment of the output bytes



Byte assignment of the output bytes CP string L1



Byte assignment of the output bytes CP string L1



IB = input byte; OB = output byte; status bits optional

Fig. B/2: Example 1 – Analogue outputs, 1 CP string, status bits (without PCP channel)

B. CPX-CP interface with Interbus field bus node

Byte assignment of the input bytes

Siemens mode:

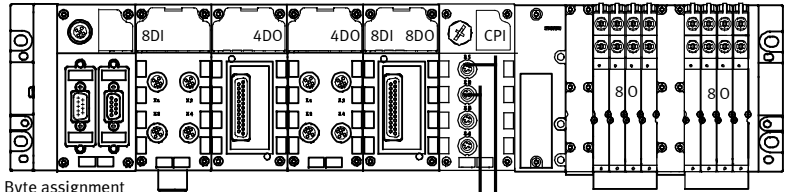
I24.0...I24.7
IB 24

I25.0...I25.7
IB 25

Standard mode:

I25.0...I25.7
IB 25

I24.0...I24.7
IB 24



Byte assignment of the output bytes

Siemens mode:

Q23.0...Q23.3
OB 23

Q23.4...Q23.7
OB 23

Q24.0...Q24.7
OB 24

Q25.0...Q25.7
OB 25

Q26.0...Q26.7
OB 26

Standard mode:

Q22.0...Q22.3
OB 22

Q22.4...Q22.7
OB 22

Q25.0...Q25.7
OB 25

Q24.0...Q24.7
OB 24

Q27.0...Q27.7
OB 27

Byte assignment of the output bytes CP string L1

Siemens mode:

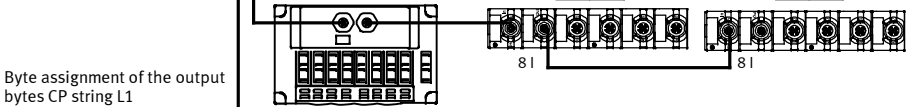
I20.0...I20.7
IB 20

I21.0...I21.7
IB 21

Standard mode:

I21.0...I21.7
IB 21

I20.0...I20.7
IB 20



Byte assignment of the output bytes CP string L1

Siemens mode:

Q20.0...Q20.7
OB 20

Q21.0...Q21.7
OB 21

Standard mode:

Q21.0...Q21.7
OB 21

Q20.0...Q20.7
OB 20

Byte assignment of the input bytes CP string L2

Siemens mode:

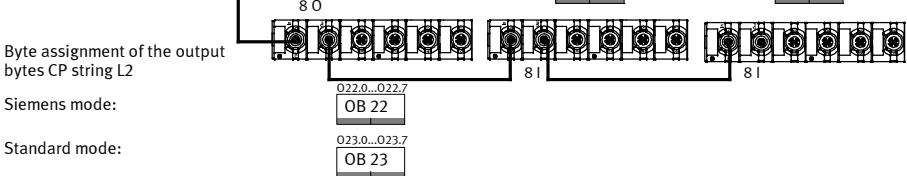
I22.0...I22.7
IB 22

I23.0...I23.7
IB 23

Standard mode:

I23.0...I23.7
IB 23

I22.0...I22.7
IB 22



Byte assignment of the output bytes CP string L2

Siemens mode:

Q22.0...Q22.7
OB 22

Standard mode:

Q23.0...Q23.7
OB 23

IB = input byte; OB = output byte

Fig. B/3: Example 2 – 2 CP strings, PCP channel active

B.2 Diagnosing with Interbus

The diagnostic channels of the CPX-CP interface (CPI/CP module-specific) are assigned to the respective input or output bytes. The “packed” address allocation for Interbus fieldbus nodes also results in a special assignment of the diagnostic channels, ➔ Fig. B/4 and Fig. B/5.

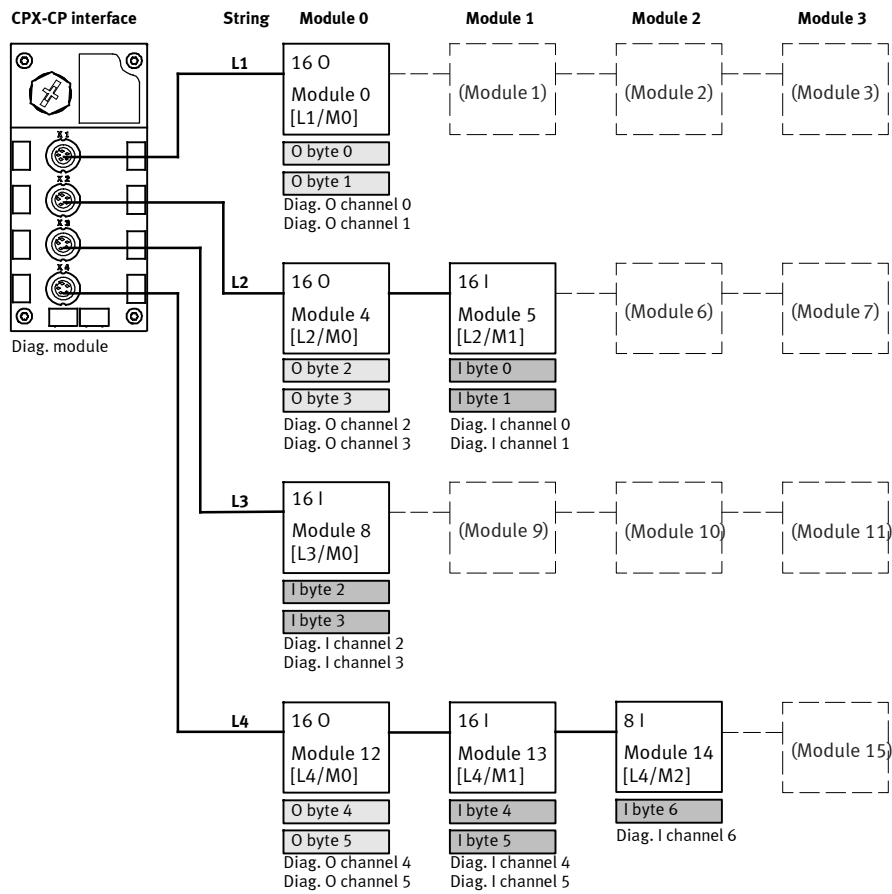


Fig. B/4: Diagnostic channel assignment of a CPI system (Interbus), example 1

B. CPX-CP interface with Interbus field bus node

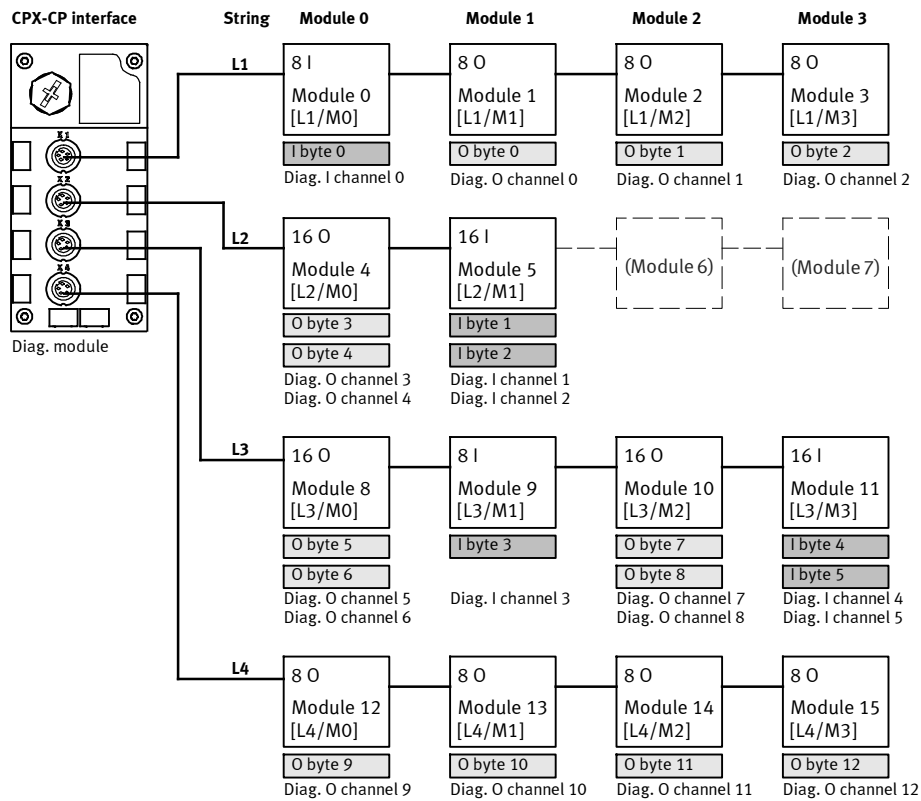


Fig. B/5: Diagnostic channel assignment of a CPI system (Interbus), example 2

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Appendix C

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