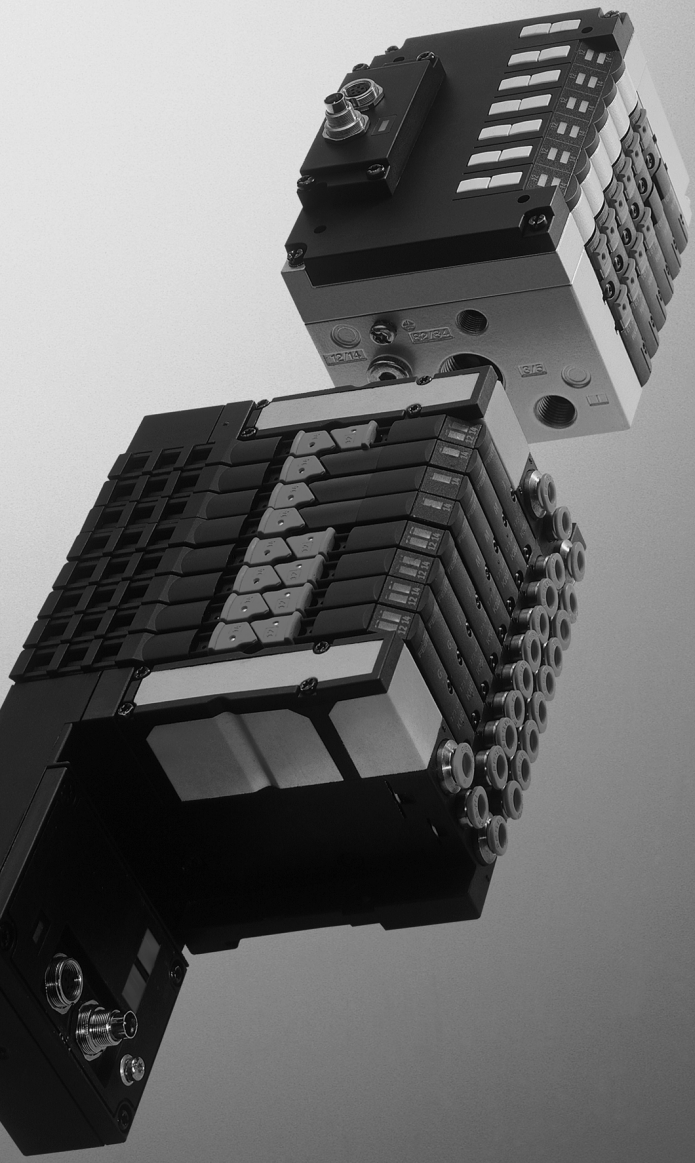
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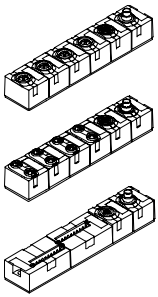
FESTO

Electronics manual

CP modules

Input modules
type CP-E08-M12-CL
type CP-E08-M8-CL
type CP-E16-KL-CL

Output module
type CP-A04-M12-CL



Manual
539 300
en 0404NH
[681 792]

Authors ..... P. Mauch, H. Hohner

Editor ..... M. Holder

Original ..... de

Edition ..... en 0404NH

Designation ..... P.BE-CPEA-CL-EN

Order no. 539 300

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Designated use

The CP modules described in this manual are intended exclusively for use on a CP string on a CP master (e.g. CPX-CP interface, CP field bus node, CPV Direct).

The CP modules may only be used as follows:

– as intended in industrial installations

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

– in faultless technical condition.

If used together with additional commercially available components, such as sensors and actuators, the specified limits for pressures, temperatures, electrical data, torques etc. must be observed.

Observe also the standards specified in the relevant chapters, as well as national and local laws and technical regulations.



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

Target group

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

Service

Please consult your local Festo repair service if you have any technical problems.

Important user instructions

Danger categories

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



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



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



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

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



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

Marking special information

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

Pictograms



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



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



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

Text markings

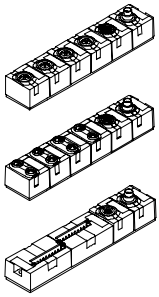
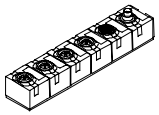
- The bullet indicates activities which may be carried out in any order.

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

– Hyphens indicate general activities.

Notes on the use of this manual

This manual contains information on fitting, installing and commissioning the following CP modules as well as a description of their method of operation:

This manual refers to	
	Input modules PNP: – CP-E08-M12-CL: 8 digital inputs, 4 M12 sockets, 5-pin – CP-E08-M8-CL: 8 digital inputs, 8 M8 sockets, 3-pin – CP-E16-KL-CL: 16 digital inputs, 2 series plugs, 10-pin
	Output modules PNP: – CP-A04-M12-CL 4 digital outputs, 4 M12 sockets, 5-pin

Tab. 0/1: CP-EA modules type CP-...-CL

Input module type CP-E16-KL-CL offers 2 series plugs for screw terminal sockets or tension spring sockets (see section A.5.4).

Information on further CP modules as well as basic information, which must be observed in conjunction with the CP master, can be found in the manuals for the relevant module.

Type	Title	Manual
CP system, Electronics manual	"CP system" type P.BE-CPSYS-... 	General basic information on fitting, installing and commissioning CP systems and on their method of operation.
Modules with CP connection Electronics manual	"CPX-CP interface" type P.BE-CPX-CP-... 	Information on commissioning, progrmming and diagnosing the CPX-CP interface.
	"CPV Direct" type P.BE-CP-DI... 	Instructions on fitting, installing, commissioning and diagnosing the relevant CPV valve terminal with direct connection.
	"CP field bus node" type P.BE-CP-FB... or type P.BE-VIFB...-10... 	Instructions on fitting, installing, commissioning and diagnosing the relevant field bus node.
	"CDVI ..." type P.BE-CDVI-DN-... 	Instructions on fitting, installing, commissioning and diagnosing the relevant CDVI with field bus direct connection "Device Net".
	"CPA-SC/CPV-SC ..." type P.BE-CPASC-CPVSC-DN-... 	Instructions on fitting, installing, commissioning and diagnosing the CPV-SC or CPA-SC valve terminal with field bus direct connection "Device Net."
CP modules, Electronics manual	"CP modules" type P.BE-CPEA-CL-... 	Information on fitting, installing and commissioning compact CP I/O modules type CP-...-CL.
	"CP modules" type P.BE-CPEA-... 	Information on fitting, installing and commissioning CP I/O modules.
Valve terminals, Pneumatics manual	"Valve terminals with CPV pneumatics" type P.BE-CPV-... 	Information on fitting, installing and commissioning CPV valve terminals (type 10).
	"Valve terminals with CPV pneumatics" type P.BE-CPA-... 	Information on fitting, installing and commissioning CPA valve terminals (type 12).

Tab. 0/2: Manuals on the CP system

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

Term/abbreviation	Meaning
CP	Compact Performance
CP cable	Special cable for coupling the various CP modules
CP connection	Plug or socket on the CP modules which enable modules to be connected with the aid of the CP cable.
CP master	Common term for the various modules to which CP strings can be connected.
CP modules	Common term for the various modules which can be incorporated in a CP system.
CP string	All the I/O modules which are connected together to a CP connection on the field bus node.
CP system	Complete system consisting of CP master, CP strings and CP modules
CP system with extended functions	Complete system consisting of CP field bus node, CP strings and CP modules, but with an increased number of CP modules per CP string.
CP valve terminal	CPV valve terminal type 10 or CPA valve terminal type 12
I	Digital input
I module	CP input module
I/O modules	Common term for the CP modules which provide digital inputs and outputs (CP input modules and CP output modules).
I/Os	digital inputs and outputs
Node	CP field bus node with/without field bus connection, to which the I/O modules are connected.
O	Digital output
O module	CP output module
PLC/IPC	Programmable logic controller/industrial PC

Tab. 0/3: Terms and abbreviations

System summary CP system

Chapter 1

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1.1.3 Use of the I/O modules 1-11
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1.1 Setting up CP systems

Festo can assist you in solving your automation task at the machine level with the aid of valve terminals. Due to their modular structure, the CP valve terminals from Festo will enable you to include valve terminals and I/O modules optimally in your machines and systems.

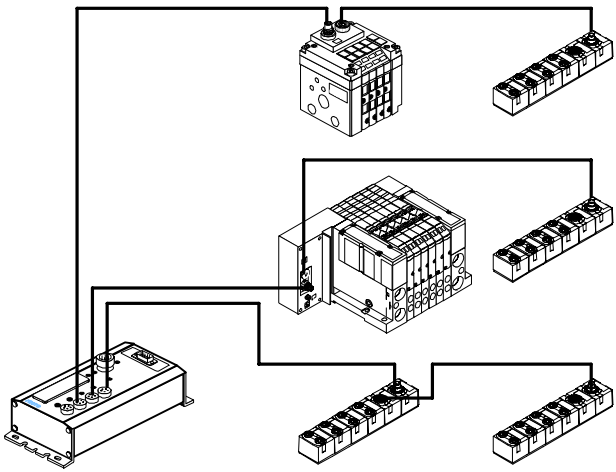


Fig. 1/1: Setting up a CP system
(without extended functions)

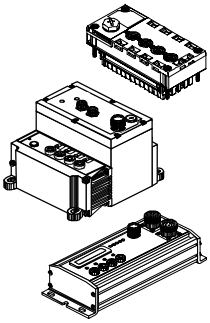
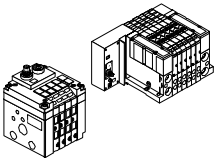
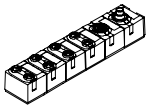
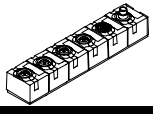
The CP system consists of individual modules which are connected to each other by means of CP cables. In this way it is possible to decentralize the arrangement of the CP system. The compact CP valve terminals can be mounted very close to the cylinders to be controlled. This enables short compressed air tubing to be used.

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

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

1.1.1 Method of operation of the CP system

CP systems are composed of the following modules:

CP modules	Function
CP master 	Special CP field bus nodes and CP modules are available for the various field buses. – These provide the connection to certain field buses. – These offer connections for up to four strings to which I/O modules and CP valve terminals are connected. – These transmit control signals to the connected modules and monitor their functioning.
CP valve terminals 	– These provide different valve functions via valve plates for controlling pneumatic actuators. – Relay plates, pressure zone separation plates and blanking plates can also be fitted.
Input modules 	– These provide inputs for connecting sensors and enable e.g. cylinder positions to be scanned.
Output modules 	– These provide universal electric outputs for controlling low-current consuming devices (further valves, bulbs etc.).

Tab. 1/1: Overview of CP modules

Depending on their design, CP masters control the transfer of data to the different control systems via the various field buses.

1 Field bus (incoming)

2 Field bus (continuing)

3 CP valve terminal

4 CP input module

5 Sensor

6 Cylinder

7 CP output module

8 CP master (here CP field bus node)

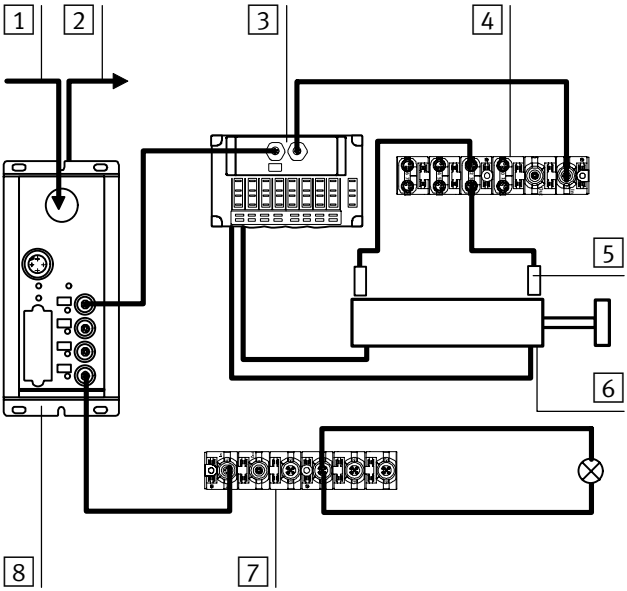


Fig. 1/2: Method of operation of the CP system

1.1.2 Variants of the CP system

Depending on the type of CP master and on the CP modules connected, the CP system will support a different number of modules per CP string.

CP master and CP modules can be placed in two different groups:

– with extended functions

– without extended functions.

CP modules with extended functions are distinguished by the following features:

– incoming and continuing CP interface

– any desired sequence of the modules within the CP string

– maximum 4 modules are possible per CP string.

CP modules without extended functions are distinguished by the following features:

– CP valve terminals and CP output modules possess an incoming and a continuing CP interface.

– CP input modules possess only an incoming CP interface and can therefore only be placed at the end of a CP string.

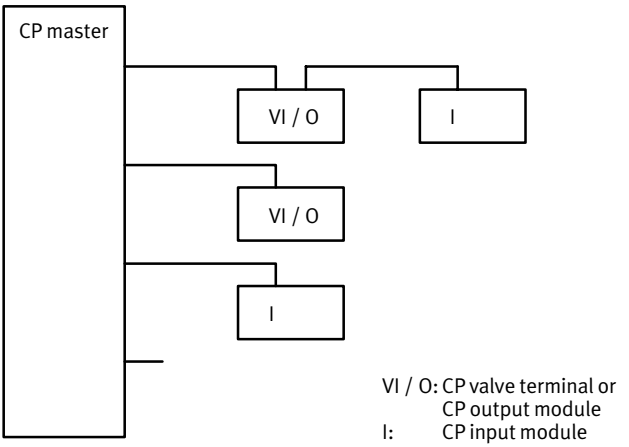


Fig. 1/3: Setting up a CP system (without extended functions), example

In accordance with these rules, all CP modules with extended functions can also be connected to CP masters without extended functions.

A mixture of CP modules with and without extended functions is also possible. However, the following limitations then apply:

– Only one input module without extended functions is then possible per CP string (at the end of the CP string).

– Only one CP valve terminal or an output module without extended functions is then possible per CP string (any position on the CP string).

– “Unused” locations on the CP string can be “filled up” with CP modules with extended functions (maximum 4 modules).

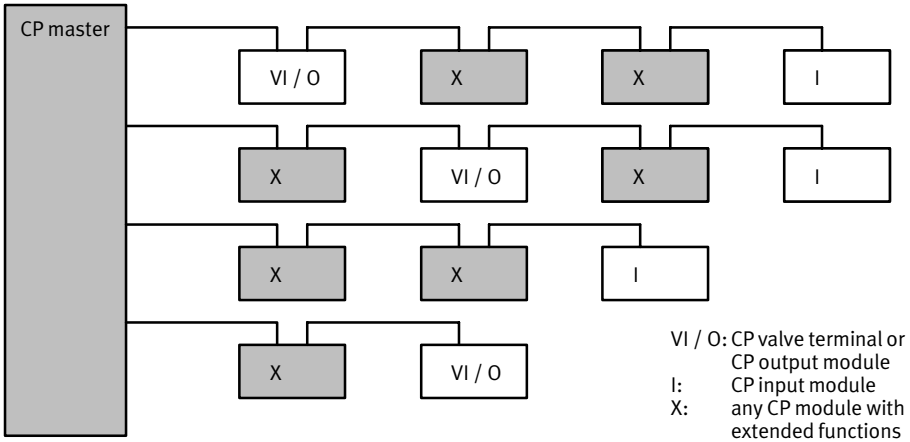
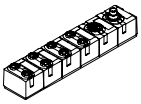
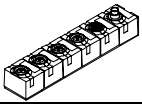


Fig. 1/4: CP master and CP modules with and without extended functions (CP modules with extended functions are represented in grey)

Please note
Irrespective of the type of CP modules (with or without extended functions), not more than 32 inputs and 32 outputs may be connected (sum of all 4 CP modules on a CP string).

The following list of CP modules shows in each case their functions as well as the maximum possible number of inputs or outputs on each CP module.

CP modules			**Assigned I/Os**			
Type	**Type**	**Module supports extended functions**	**on a CP system with extended functions**		**on a CP system without extended functions**	
			I	**O**	**I**	**O**
CP input modules 	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-E08-M8-CL	Yes	8 I	–	16 I	–
	CP-E16-M12x2-5POL	No	16 I	–	16 I	–
	CP-E16N-M12x2	No	16 I	–	16 I	–
	CP-E08-M12-CL	Yes	8 I	–	16 I	–
	CP-E16-KL-IP20-Z	No	16 I	–	16 I	–
	CP-E16-KL-CL	Yes	16 I	–	16 I	–
CP output modules 	CP-A08-M12-5POL	No	–	16 O	–	16 O
	CP-A08N-M12	No	–	16 O	–	16 O
	CP-A04-M12-CL	Yes	–	8 O	–	16 O

Tab. 1/2: Assigned I/Os of the CP modules

1.1.3 Use of the I/O modules

CP I/O modules can be used in conjunction with various CP masters. These are e.g.:

– CPX terminal with CPX-CP interface

– CP field bus node

– CPV Direct

– CPV-SC-DN

– CPA-SC-DN

– CDVI-DN

The CP masters are distinguished by the different number of CP strings made available, by the functions, the maximum number of inputs and outputs to be processed and the number of CP modules per string.

CP master type	**Number of strings**	**Function**	**Max. number of inputs/outputs per string**	**Max. number of modules per string**
CPX with CP interface	4	Extended	32 I + 32 O	4
CP field bus node	4	–	16 I + 16 O	2
CPV Direct	1	– [1)]	16 I + 16 O	2
CPV-SC-DN	1	– [1)]	16 I + 16 O	2
CPA-SC-DN	1	– [1)]	16 I + 16 O	2
CDVI-DN	1	– [1)]	16 I + 16 O	2
[1)] Support of the extended function in preparation, see manual for the relevant module				

Tab. 1/3: Overview of CP masters

The compact CP I/O modules (type CP-...-CL) described in this manual support the extended functions of the CP system. Combinations with other CP modules are possible, but limit the number of CP modules per string. The limitations described in section 1.1.2 apply.



Please note
CP I/O modules with extended functions, e.g. type CP-...-CL, can also be operated on CP masters without extended functions (see Tab. 1/2).

1.1.4 Basic rules for addressing

Addressing depends on:

- the CP master used
- the field bus protocol used

The following rules apply:

- Addressing is carried out in ascending order beginning on the CP master.
- In the case of CP masters without extended functions, each CP module occupies 16 inputs or 16 outputs, irrespective of the design.
- In the case of CP masters with extended functions, the following difference applies:
  - Modules without extended functions usually occupy 16 inputs or 16 outputs
  - Depending on the type, modules with extended functions occupy 8 or 16 inputs or 8 outputs



Please note
Further information on addressing can be found in the relevant manuals for the CP masters.

Input modules type CP-E08-M...-CL and CP-E16-KL-CL

Chapter 2

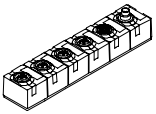
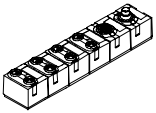
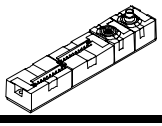
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2.1 Function of the input modules CP-E08-M...-CL and CP-E16-KL-CL

CP input modules provide digital inputs for connecting sensors, thereby enabling e.g. cylinder positions to be scanned. A distinction is made between the following types:

Product illustration	Type	Explanation
Sensor connections via 4 sockets with M12 thread, 5-pin		
	CP-E08-M12-CL	Provides 8 PNP inputs (IP65/IP67).
Sensor connections via 8 sockets with M8 thread, 3-pin		
	CP-E08-M8-CL	Provides 8 PNP inputs (IP65/IP67).
Sensor connections via 2 series plugs, 10-pin and connector sockets in either screw or tension spring design.		
	CP-E16-KL-CL	Provides 16 PNP inputs. Especially suitable for fitting into a control cabinet (IP20).

Tab. 2/1: Overview of input modules

2.1.1 Display and connecting elements

The following diagram shows the display and connecting elements of input module CP-E08-M12-CL.

1 CP connection incoming

2 Status LED short circuit/overload/undervoltage in sensor supply (red)

3 CP connection continuing

4 Status LEDs for inputs (status display, green)

5 Sensor connections (2 inputs per socket)

6 Fastening hole

7 Type plate

8 6 grooves for identification signs (type IBS-8x20)

9 Status LED CP communication (PS, green)

10 Fastening hole with earth connection

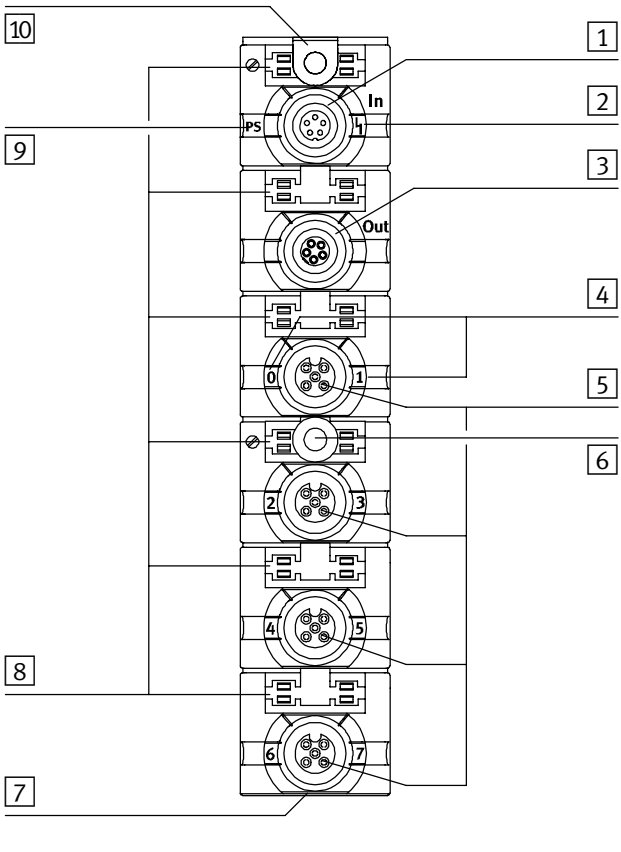


Fig. 2/1: Display and connecting elements type CP-E08-M12-CL

The following diagram shows the display and connecting elements of input module CP-E08-M8-CL.

1 CP connection incoming

2 Status LED short circuit/overload/undervoltage in sensor supply (red)

3 CP connection continuing

4 Status LEDs for inputs (status display, green)

5 Sensor connections (1 input per socket)

6 Fastening hole

7 Type plate

8 6 grooves for identification signs (type IBS-8x20)

9 Status LED CP communication (PS, green)

10 Fastening hole with earth connection

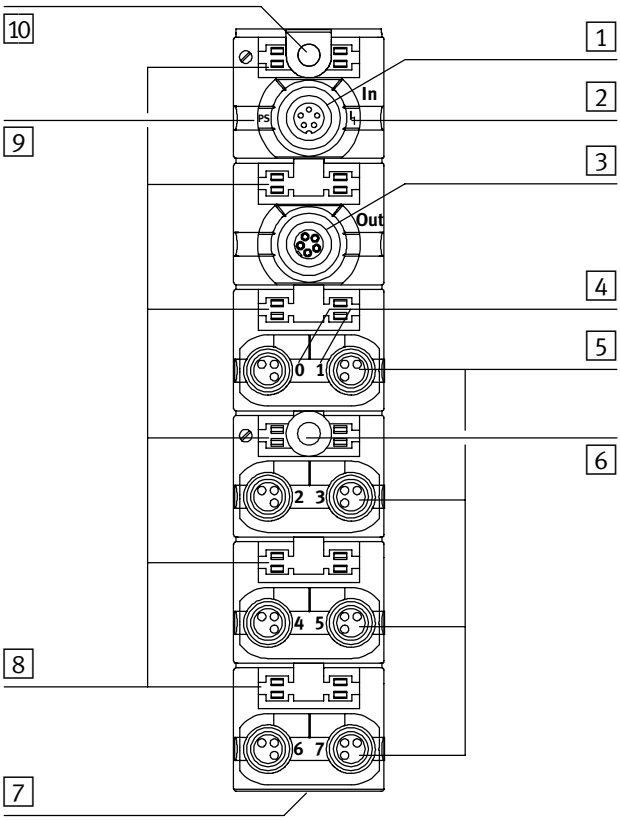


Fig. 2/2: Display and connecting elements type CP-E08-M8-CL

The following diagram shows the display and connecting elements of input module CP-E16-KL-CL.

1 CP connection incoming

2 Status LED short circuit/overload/undervoltage in sensor supply (red)

3 CP connection continuing

4 Sensor connections (8 inputs per plug)

5 Type plate

6 Fastening hole

7 4 grooves for identification signs (type IBS-8x20)

8 Status LED CP communication (PS, green)

9 Fastening hole with earth connection

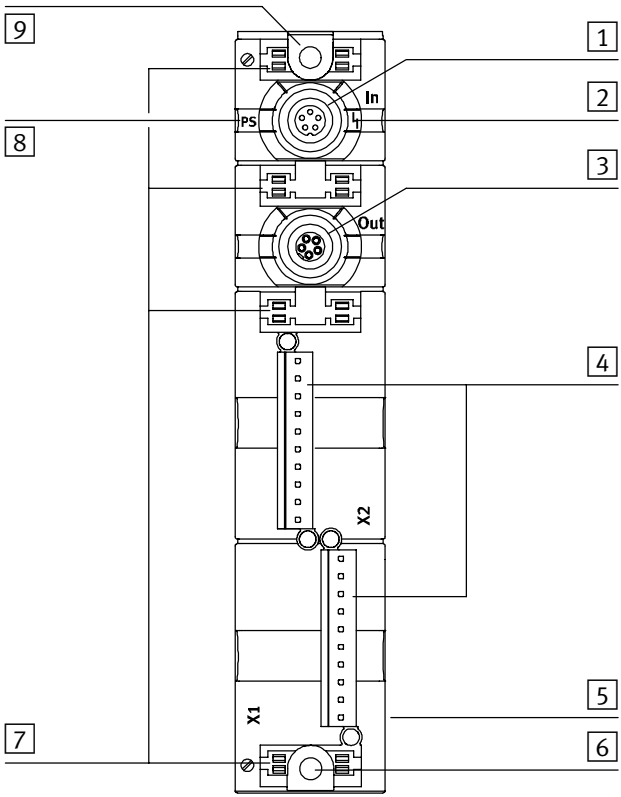


Fig. 2/3: Display and connecting elements type CP-E16-KL-CL

2.2 Fitting

The input modules are intended for fitting onto a wall or onto profiles. Take into account the following dimensions and weights:

Type	Dimensions	Weight
CP-E08-M12-CL	approx. 151 x 30 x 34.5 mm^3	approx. 165 g
CP-E08-M8-CL	approx. 151 x 30 x 34.5 mm^3	approx. 190 g
CP-E16-KL-CL	approx. 151 x 30 x 34.5 mm^3	approx. 145 g

Tab. 2/2: Dimensions of the input module

Fitting onto a wall

The following diagram shows the dimensions for the holes of screw size M4. Always fasten each module with 2 screws and a locking disc.
Tightening torque of the fastening screws: 2 ± 0.5 Nm.

1 Input module type CP-E08-M12-CL

2 Input module type CP-E08-M8-CL

3 Input module type CP-E16-KL-CL

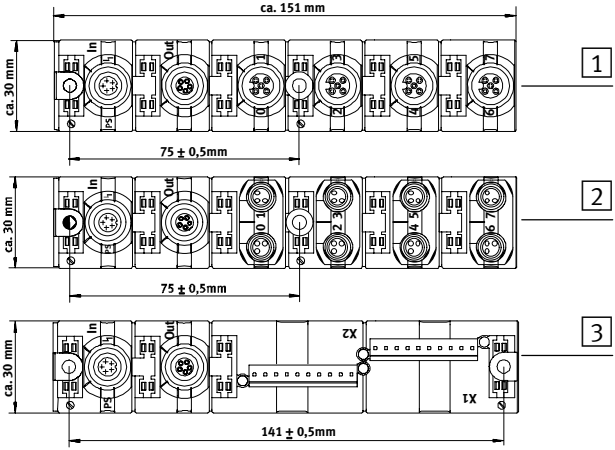


Fig. 2/4: Fitting dimensions CP-E...-CL

Tip:
The position of the fastening screws on clipped-in type plates is marked with the symbol ⊘ .

2.3 Installation



Warning
Sudden unexpected movements of the connected actuators and undefined switching states of the electronics can cause injury to human beings and damage to property.

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

– the operating and load voltage supply on the CP master (e.g. CP field bus node)
– separate power supplies.



Warning
Incorrect or missing earthing measures can cause interference due to electromagnetic influences.

Connect the earthing cable on the housing (screw under type plate, see Fig. 2/1, Fig. 2/2 or Fig. 2/3) at low impedance (short cable with large diameter) to the earth potential. A suitable cable clip is supplied with the module.

2.3.1 Connecting sensors



Caution
Long signal cables reduce the immunity to interference. Make sure that the maximum permitted signal cable length of 30 m is not exceeded.



Use plugs and cables from the Festo range (see Appendix A.5) for connecting sensors.

In the case of CP input modules type CP-E08-M12-CL and CP-E08-M8-CL:

- Fasten the plugs with the aid of the union nut in order to prevent unintentional loosening, e.g. due to shock.
- Seal unused connections with protective caps. Only in this way can you comply with protection class IP65/IP67. Use protective caps from the Festo range (see Appendix A.5).

With CP input module type CP-E16-KL-CL:



Further information on connector sets as well as instructions on handling them can be found in Appendix A.5.4.

Pin assignment (PNP inputs)

The following diagrams show as an example the pin assignment of the sensor connections of the different CP input modules.

Pin assignment

1
- 1: 24 V
- 2: Ix+1
- 3: 0 V
- 4: Ix+0
- 5: Earth/ground connection

Ix = Input x

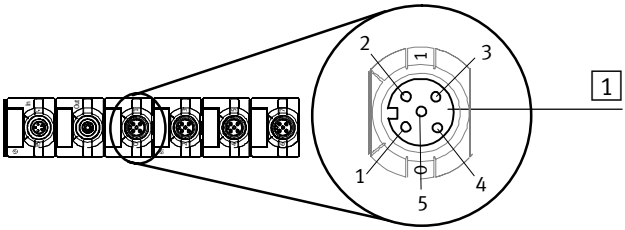


Fig. 2/5: Pin assignment type CP-E08-M12-CL

Pin assignment

1
- 1: 24 V
- 4: Ix+1
- 3: 0 V

2
- 1: 24 V
- 4: Ix+0
- 3: 0 V

Ix = Input x

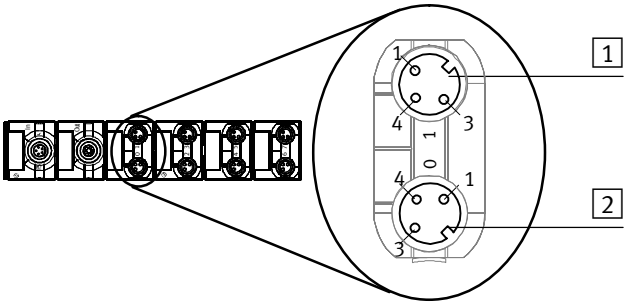


Fig. 2/6: Pin assignment type CP-E08-M8-CL

With input module type CP-E16-KL-CL, eight sensors can be connected to connections X1 and X2. The voltage supplied via the CP string is provided at the terminals + and – of X1 and X2 for supplying the sensors.

Caution
Do **not** connect an external supply to the terminals + and – of X1 and X2. Otherwise the input module will be damaged.

Pin assignment

1 Plug X1
- –: 0 V DC
- 0: Ix+0
- 1: Ix+1
- 2: Ix+2
- ...
- 6: Ix+6
- 7: Ix+7
- +: 24 V DC

2 Plug X2
- –: 0 V DC
- 0: Ix+8
- 1: Ix+9
- 2: Ix+10
- ...
- 6: Ix+14
- 7: Ix+15
- +: 24 V DC

Ix = Input x

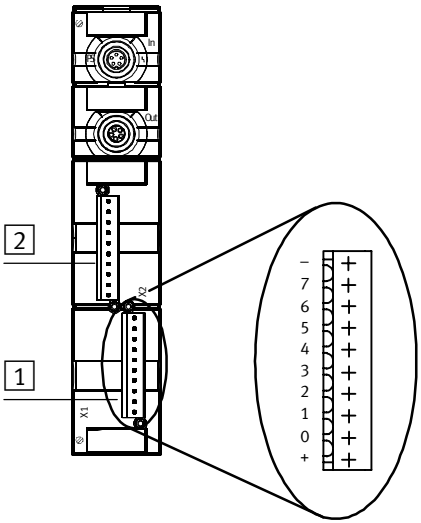


Fig. 2/7: Pin assignment of plugs X1 and X2 on type CP-E16-KL-CL

Use spring tension plugs or screw connector plugs from the Festo range (see Appendix A.5.4) for connecting sensors.

2.3.2 Connect the input module to the CP string



Caution
Fault in data transfer on the CP string.

Note the maximum permitted string lengths in the manual for the CP master used.

You will then avoid faults in data transfer between the input module and the CP master (e.g. CP field bus node).



Caution
Functional damage

Note the maximum permitted string lengths in the manual for the CP master used.

Use only the intended original cable type KVI-CP-... from Festo for connecting the CP modules, see manual for the CP master used.



Please note
Specifications on the current consumption of the different CP modules can be found in the relevant manuals.

The following functions are provided for the module via the CP cable:

– Operating voltage for the internal electronics

– Connection for data exchange

– Operating voltage for the connected sensors

Incoming CP connection

Connect the incoming CP connection of the input modules with one of the following connections:

– the CP connection of the CP master (CP field bus node, CPX-CP interface, CPV Direct, etc.)

– the continuing CP connection of a CP output module

– the CP connection of a CP input module with extended functions

– the continuing CP connection of a CP valve terminal.

Continuing CP connection

Connect the continuing CP connection of the input modules with one of the following connections:

– the incoming CP connection of a CP output module

– the incoming CP connection of a CP input module

– the incoming CP connection of a CP valve terminal.

If the continuing CP connection is not used:

- Seal the CP connection with a protective cap type FLANSCHDOSE SER.712, part no. 356684 (accessories). Only in this way can you comply with protection class IP65/IP67.



Please note
The continuing CP connection can only be used in conjunction with a CP master with extended functions.

2.4 Diagnosis

2.4.1 Diagnosis via LEDs

Status LED CP communication (PS)

The operating status of the input module is shown by means of the status LED CP communication (see Tab. 2/3).

LED PS (green)	**Sequence**	**Operating status**	**Fault treatment**
 LED lights up		Operating voltage applied CP communication OK	None
 LED is out		– Operating voltage not applied or no connection to CP master – CP input module not contained in string assignment of the CP master	• Check the CP cable and the operating voltage connection on the CP master • Save the CP string assignment on the CP master (see manual for the CP master)
 LED flashes		– Test phase when the power supply has been switched on [1)] or – Undervoltage in sensor supply (‹ 17 V)	• None or • Eliminate undervoltage
[1)] Only on CP masters without extended functions			

Tab. 2/3: Status LED CP communication (PS)

Status LED
Short circuit/overload

Short circuit or overload of the sensor supply is shown by means of the status LED short circuit/overload (see Tab. 2/4).

LED (red)	Sequence	Operating status	Fault treatment
○ LED is out	ON / OFF	– No short circuit/overload in sensor supply	• None
☀ LED lights up	ON / OFF	– Short circuit/overload in sensor supply	• Eliminate short circuit and delete the fault

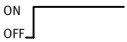
Tab. 2/4: Status LED short circuit/overload

Reaction to short circuit in the sensor supply

If there is a short circuit, the input module will switch off the power supply to the sensors and communicate the fault to the CP master. The status LEDs will be switched off and the inputs of the module supply a 0-signal. The power supply will be switched on again automatically when the short circuit has been eliminated.

Status LEDs
Status display for input

Only with types CP-E08-M12-CL and CP-E08-M8-CL:
Next to the sensor connections there is a green LED for every input. This shows the status of the signal at the relevant input.

LED status of input	**Sequence**	**Status**
 LED lights up		Logical 1 (signal present)
 LED is out		Logical 0 (no signal)

Tab. 2/5: Status LEDs for status display of input

2.4.2 Diagnosis via the field bus

Depending on the CP master used, the CP modules type CP-...-CL provide different diagnostic information on fault searching.

CP master	Diagnosis of short circuit/overload in sensor supply	Diagnosis of undervoltage in sensor supply
Without extended functions	Yes	No
With extended functions	Yes	Yes

Tab. 2/6: Diagnostic information



Please note
Instructions on evaluating the diagnostic message can be found in the manual for the relevant CP master.

Output modules type CP-A04-M12-CL

Chapter 3

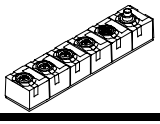
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3.1.1 Display and connecting elements 3-4
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3.1 Function of output module type CP-A04-M12-CL

Output module type CP-A04-M12-CL provides 4 universally-usable digital outputs for controlling low-current consuming devices (e.g. bulbs, further valves, etc.).

Product illustration	**Type**	**Explanation**
Actuator connections via 4 sockets with M12 thread		
	CP-A04-M12-CL	Provides 4 PNP outputs (IP65/IP67).

Tab. 3/1: Overview of output modules

3.1.1 Display and connecting elements

The diagram below shows the display and connecting elements on the output modules.

1 CP connection incoming

2 Status LED Load supply (PL, red)

3 CP connection continuing

4 Status LEDs for outputs (status display, yellow)

5 Status LED short circuit/overload at outputs (red)

6 Fastening hole

7 Actuator connections

8 Type plate

9 6 grooves for identification signs (type IBS-8x20)

10 Status LED CP communication (PS, green)

11 Fastening hole with earth connection

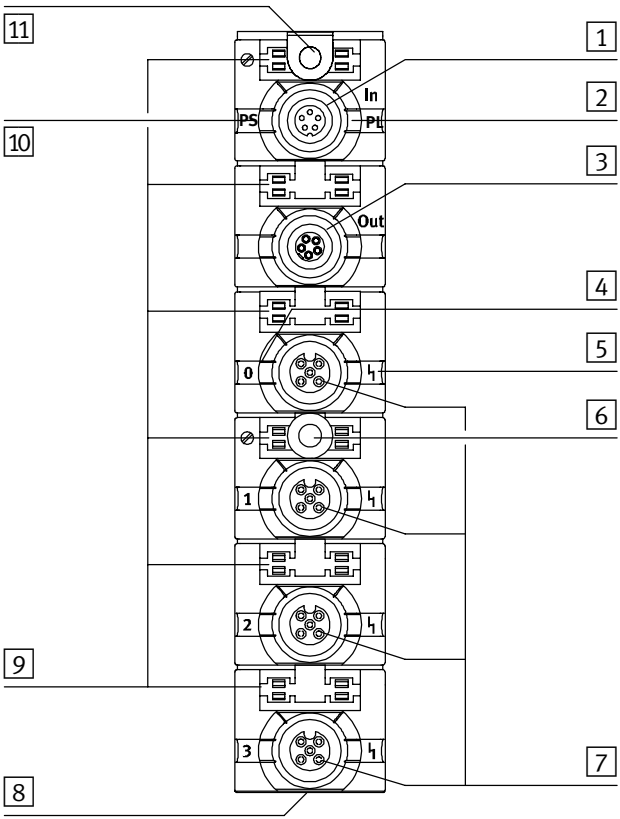


Fig. 3/1: Display and connecting elements type CP-A04-M12-CL

3.2 Fitting

The output module is intended for fitting onto a wall or onto profiles. ake into account the following dimensions and weights:

Type	Dimensions	Weight
CP-A04-M12-CL	approx. 151 x 30 x 34.5 mm3	approx. 165 g

Tab. 3/2: Dimensions of output module

Fitting onto a wall

The following diagram shows the dimensions for the holes of screw size M4. Always fasten each module with 2 screws and a locking disc.
Tightening torque of the fastening screws: 2 ± 0.5 Nm.

[1] Output module type CP-A04-M12-CL

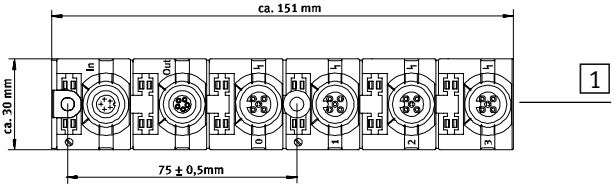


Fig. 3/2: Fitting dimensions CP-A04-M12-CL

Tip:
The position of the fastening screws on clipped-in drawing plates is marked with the symbol ⊘ .

3.3 Installation



Warning
Sudden unexpected movements of the connected actuators and undefined switching states of the electronics can cause injury to human beings and damage to property.

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

– operating and load voltage supply for the CP master (e.g. CP field bus node)
– separate power supplies.



Warning
Incorrect or missing earthing measures can cause interference due to electromagnetic influences.

Connect the earthing cable on the housing (screw under type plate, see Fig. 3/1) at low impedance (short cable with large diameter) to the earth potential.
(A suitable cable clip is supplied with the module.)

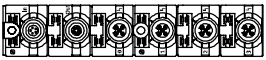
3.3.1 Connecting the actuators

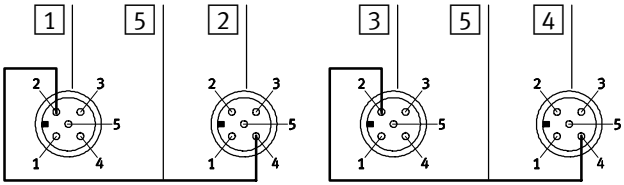
For connecting the actuators, use plugs and cables with union nut and M12 thread from the Festo range (see Appendix A.5).

- Tighten the plugs with the aid of the union nut in order to prevent unintentional loosening, e.g. due to shock.
- Seal unused connections with the protective caps supplied. Only in this way can you comply with protection class IP65/IP67.

Pin assignment

The following diagram shows as an example the pin assignment of the actuator connections on the CP output module.





1 Pin assignment Connection 1	2 Pin assignment Connection 2	3 Pin assignment Connection 3	4 Pin assignment Connection 4
1: n.c.	1: n.c.	1: n.c.	1: n.c.
2: Ox+1	2: n.c.	2: Ox+3	2: n.c.
3: 0 V	3: 0 V	3: 0 V	3: 0 V
4: Ox+0	4: Ox+1	4: Ox+2	4: Ox+3
5: FE	5: FE	5: FE	5: FE

5 Internal connection in the module

n.c.= (not connected)
Ox = output x

Fig. 3/3: Pin assignment type CP-A04-M12-CL

3.3.2 Connect the output module to the CP string



Caution
Fault in data transfer on the CP string.

Note the maximum permitted string lengths in the manual for the CP master used.

You will then avoid faults in data transfer between the input module and the CP master (e.g. CP field bus node).



Caution
Functional damage

Note the maximum permitted string lengths in the manual for the CP master used.

Use only the intended original cable type KVI-CP-... from Festo for connecting the CP modules, see manual for the CP master used.



Please note
Specifications on the current consumption of the different CP modules can be found in the relevant manuals.

The following functions are provided for the module via the CP cable:

– operating voltage for the internal electronics

– connection for data exchange

– operating voltage for the connected actuators.

CP connection incoming

Connect the incoming CP connection of the output modules with one of the following connections:

– the CP connection of the CP master (field bus node, CPX-CP interface, CPV Direct, etc.)

– the CP connection of another CP module with extended functions.

Continuing CP connection

Connect the continuing CP connection of the output modules with one of the following connections:

– the incoming CP connection of a CP input module

– the incoming CP connection of a further CP output module (only permitted in conjunction with a CP master with extended functions)

– the incoming CP connection of a CP valve terminal (only permitted in conjunction with a CP master with extended functions).

If the continuing CP connection is not used:

- Seal the CP connection with a protective cap type FLANSCHDOSE SER.712, part no. 356684 (accessories). Only in this way can you comply with protection class IP65/IP67.



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

3.4 Diagnosis

3.4.1 Diagnosis via LEDs

Status LED CP communication (PS)

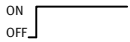
The operating status of the output module is shown by means of the status LED CP communication (see Tab. 3/3).

LED PS (green)	**Sequence**	**Operating status**	**Fault treatment**
 LED lights up		Operating voltage applied CP communication OK	None
 LED is out		– Operating voltage not applied or no connection to CP master – CP output module not contained in string assignment of the CP master	• Check the CP cable and the operating voltage connection on the CP master • Save the CP string assignment on the CP master (see manual for the CP master)
 LED flashes		– Test phase when the power supply has been switched on [1]	• None
[1] Only on CP masters without extended functions			

Tab. 3/3: Status LED CP communication (PS)

Status LED
Load supply (PL)

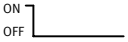
Short circuit or overload of the actuator supply is shown by means of the status LED short circuit/overload (see Tab. 3/4).

LED PL (green)	Sequence	Operating status	Fault treatment
 LED lights up		Load supply OK	None
 LED flashes		– Undervoltage in actuator supply (‹ 17 V)	• Check the CP cable and the operating voltage connection on the CP master
 LED is out		– Load supply missing	• Check the CP cable and the operating voltage connection on the CP master

Tab. 3/4: Status LED load supply (PL)

Status LEDs
Status display of output

Next to the actuator connections there is a yellow LED for every output. This shows the status of the signal at the relevant output.

LED status of output	Sequence	Status
 LED lights up		Output supplies 1-signal
 LED is out		Output supplies 0-signal

Tab. 3/5: Status LEDs for status display of output

Status LEDs
Short circuit/overload Output

Next to the actuator connections there is a red LED for each output. This shows a short circuit or overload at the output.

LED ϟ (red)	Sequence	Operating status	Fault treatment
○ LED is out	ON / OFF	– No short circuit/overload	• None
☀ LED lights up	ON / OFF	– Short circuit/overload at output	• Eliminate short circuit and delete the fault [1]
[1] Fault will not be deleted automatically.			

Tab. 3/6: Status LED short circuit/overload at output

Reaction to short circuit in the load supply

Short circuit/overload

If there is a short circuit/overload, the output module will switch off the output self-holding and communicate the fault to the CP master. After eliminating the short circuit, delete this fault as follows:

- Reset the output (e.g. by user program).

3.4.2 Diagnosis via the field bus

Irrespective of the CP master used, the CP output module type CP-...-CL provides diagnostic information on fault searching.

CP master	Diagnosis of short circuit/overload in actuator supply	Diagnosis of undervoltage in actuator supply
Without extended functions	Common fault message	
With extended functions	Yes	Yes

Tab. 3/7: Diagnostic information



Please note
Instructions on evaluating the diagnostic message can be found in the manual for the relevant CP master.

Technical appendix

Appendix A

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A.1 Technical specifications

A.1.1 General technical specifications

General technical specifications of the CP I/O modules	
Temperature range – Operation – sStorage/transport	 - 5 ... + 50 °C - 20 ... + 70 °C
Relative humidity	95 %, non-condensing
Protection against electric shock as per EN 60204-1/IEC 204 (protection against direct and indirect contact)	By connection to a PELV power unit (Protected Extra Low Voltage)
Electromagnetic compatibility – Interference emitted – Immunity against interference	 Tested as per EN 61000-6-4 (industry) 1) Tested as per EN 61000-6-2 (industry) 1)
Vibration and shock – Vibration – Shock	 Tested as per DIN/IEC 68/EN 60068 part 2-6; 0,35 mm path at 10...60 Hz; 5 g acceleration at 60...150 Hz Tested as per DIN/IEC 68/EN 60068 parts 2-27; ± 30 g at 11 ms duration; 5 shocks per direction
1) The maximum permitted signal cable length is 30 m.	

Tab. A/1: Technical specifications of CP I/O modules (general)

A.1.2 Technical specifications of the input modules

Special technical specifications	**Type CP-E08-M12-CL, type CP-E08-M8-CL**
General technical specifications	See section A.1.1
Protection class as per EN 60529; plug connector inserted or fitted with protective cap	IP65/IP67
Digital inputs – Design	8 inputs as per IEC 1131-2 type 2, 24 V DC, positive-switching (PNP)
– Logic level 1-signal 0-signal	 > 11 V < 5 V
– Current consumption (at 24 V) (input current from sensor to input)	At “logical 1” typ. 8 mA
– Response delay (at 24 V)	Typ. 3 ms
Sensor voltage supply – Rated value – Tolerance	Via the CP connection 24 V DC See manual for CP master
– Internal current consumption of the electronics via the CP connection (all inputs 0-status)	< 35 mA
Load capacity	Sum › 0.8 A (electronic short-circuit protection)
Electrical isolation	None

Tab. A/2: Technical specifications type CP-E08-M12-CL and type CP-E08-M8-CL

Special technical specifications	Type CP-E16-KL-CL
General technical specifications	See section A.1.1
Protection class as per DIN 60529	IP20
Digital inputs – Design	16 inputs as per IEC 1131-2 type 2, 24 V DC, positive or negative-switching
– Logic level 1-signal 0-signal	 ≥ 8.6 V ≤ 6 V
– Current consumption (at 24 V) (input current from sensor to input)	At “logical 1” typ. 8 mA
– Response delay (at 24 V)	Typ. 3 ms
Sensor voltage supply – Rated value (protected against incorrect polarity) – Tolerance	Via the CP connection 24 V DC See manual for CP master
– Internal current consumption of the electronics via the CP connection (all inputs 0-status)	< 35 mA
Load capacity	Sum > 0.8 A (electronic short-circuit protection)
Electrical isolation	None

Tab. A/3: Technical specifications type CP-E16-KL-CL

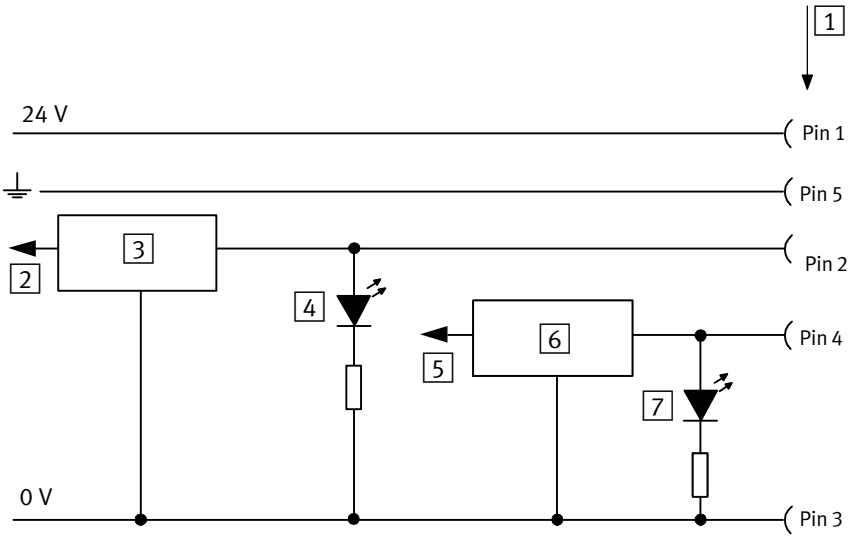
A.1.3 Technical specifications of the output modules

Special technical specifications	**Type CP-A04-M12-CL**
General technical specifications	See section A.1.1
Protection class as per EN 60529; plug connector inserted or fitted with protective cap	IP65/IP67
Electrical isolation	None
Digital outputs – Design	4 outputs as per IEC 1131-2; 24 V DC positive-switching
– Load capacity per digital output	0.5 A
– Electronic fuse (short circuit/overload) Trigger current Response time	 min. 750 mA max. 1.5 ms
Internal current consumption of the electronics via the CP connection	< 35 mA

Tab. A/4: Technical specifications type CP-A04-M12-CL

A.2 Internal structure of the inputs

A.2.1 Internal structure type CP-E08-M12-CL



1 Pin assignment
1: + 24 V
2: Ix+1
3: 0 V
4: Ix+0
5: FE

2 PLC/I-PC Ix+1 (via field bus)

3 Logic recognition Ix+1

4 Green LED Ix+1

5 PLC/I-PC Ix (via field bus)

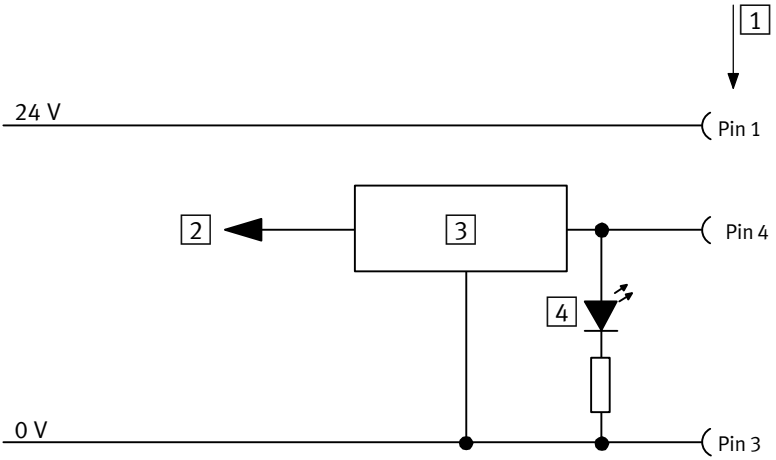
6 Logic recognition Ix+0

7 Green LED Ix+0

Ix = Input x

Fig. A/1: Internal structure type CP-E08-M12-CL

A.2.2 Internal structure type CP-E08-M8-CL



1 Pin assignment
1: 24 V
4: Ix
3: 0 V

2 PLC/IPC Ix (e.g. via field bus)

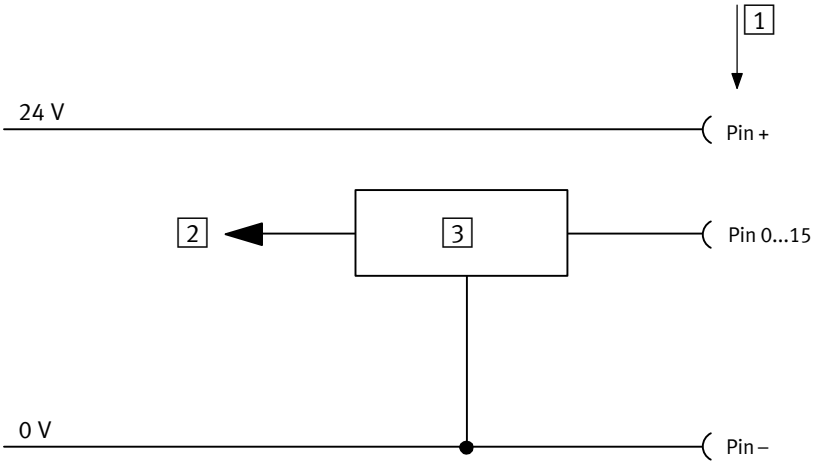
3 Logic recognition Ix

4 Green LED Ix

Ix = Input x

Fig. A/2: Internal structure type CP-E08-M8-CL

A.2.3 Internal structure type CP-E16-KL-CL



1 Pin assignment
+: 24 V
0...15: Ix+n
–: 0 V

2 PLC/IPC Ix (e.g. via field bus)

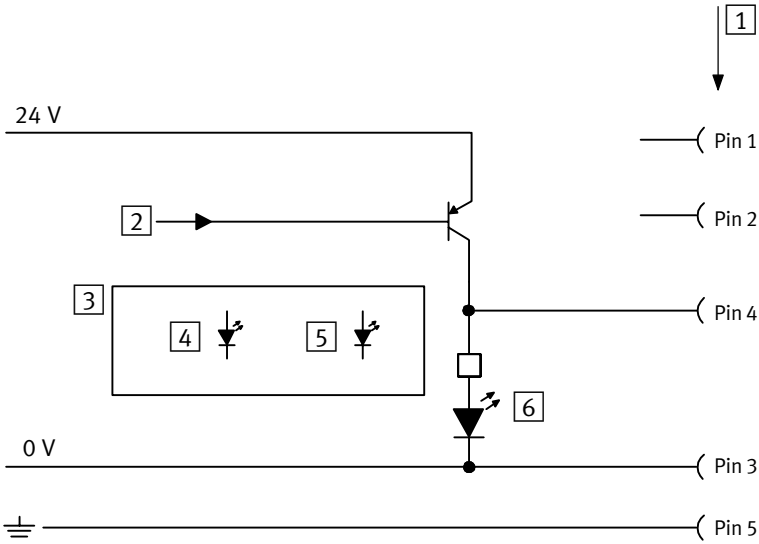
3 Logic recognition Ix

Ix =Input x

Fig. A/3: Internal structure type CP-E16-KL-CL

A.3 Internal structure of the outputs

A.3.1 Internal structure type CP-A04-M12-CL



1 Actuator connection
- 1: n.c.
- 2: Connection 1 (3): x+1 (x+3)
  Connection 2 (4): n.c. (not connect.)
- 3: 0 V
- 4: Connection 1: x+0
  Connection 3: x+2
- 5: FE

2 PLC/IPC Ox (e.g. via field bus)

3 Diagnosis
- short circuit/overload
- load voltage failure

4 Green LED (PL)

5 Red LED (fault symbol)

6 Yellow LED (output)

Ox = Output x

Fig. A/4: Internal structure type CP-A04-M12-CL

A.4 Examples of circuitry

A.4.1 Circuitry examples for inputs

Circuitry example type CP-E08-M12-CL

1 Pin assignment
- 1: 24 V
- 2: Ix+1
- 3: 0 V
- 4: Ix
- 5: Earth/ground connection

2 Dual distributor (T-piece)

3 Sensor 2 (Ix+1)

4 Sensor 1 (Ix)

Ix = Input x

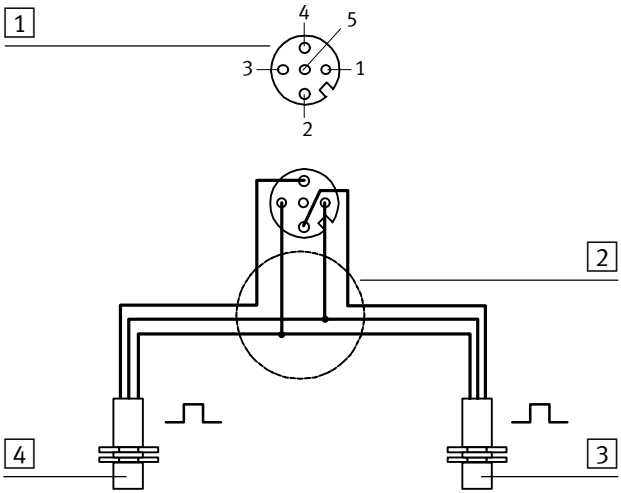


Fig. A/5: Circuitry example type CP-E08-M12-CL

Circuitry example type CP-E08-M8-CL

1 Pin assignment
1: 24 V
4: Ix
3: 0 V

2 Three-wire sensor (positive-switching)

3 Two-wire sensor (positive-switching)

4 Contact

Ix = Input x

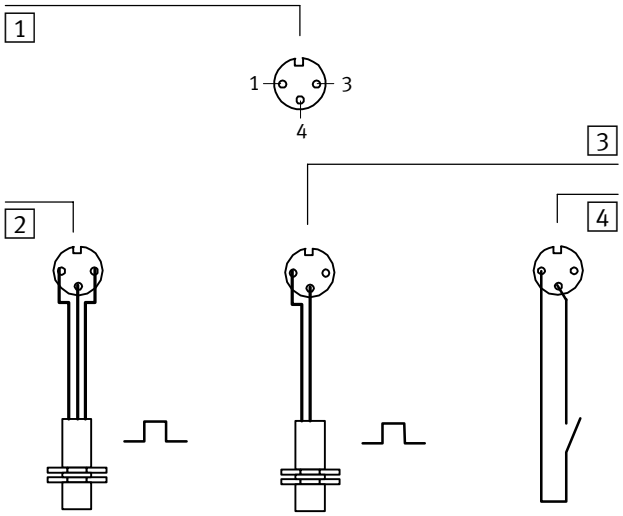


Fig. A/6: Circuitry example type CP-E08-M8-CL

Circuitry example type CP-E16-KL-CL

Two rows of the three-row connector socket are intended as distributor boards for the sensor supply. These rows are each connected internally. The upper row (blue push buttons) is intended for the 0 V distributor; the centre row (red push buttons) is intended for the 24 V distributor. The relevant voltage must be supplied by means of an external bridge from the terminals + and – (lower row).

1 External bridge for potential distribution (24 V)

2 External bridge for potential distribution (0 V)

3 Pin assignment
+: 24 V
0...7: Ix+n
–: 0 V

4 Contact

5 Two-wire sensor (positive-switching)

6 Three-wire sensor (positive-switching)

Ix = Input x

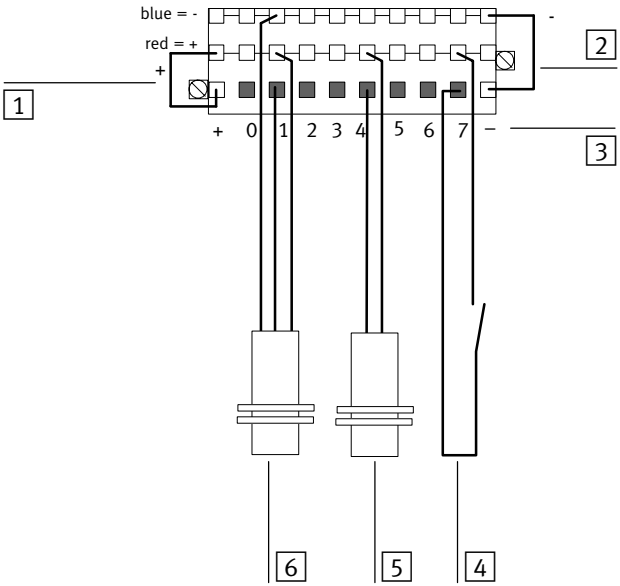


Fig. A/7: Circuitry example type CP-E16-KL-CL
with 3-row connector set type CP-E16-KL-CL

Circuitry example type CP-E16-KL-CL with single-row connector socket

1 External potential distribution (24 V)

2 Pin assignment
+: 24 V
0...7: Ix+n
–: 0 V

3 External potential distribution (0 V)

4 Contact

5 Two-wire sensor (positive-switching)

6 Three-wire sensor (positive-switching)

Ix = Input x

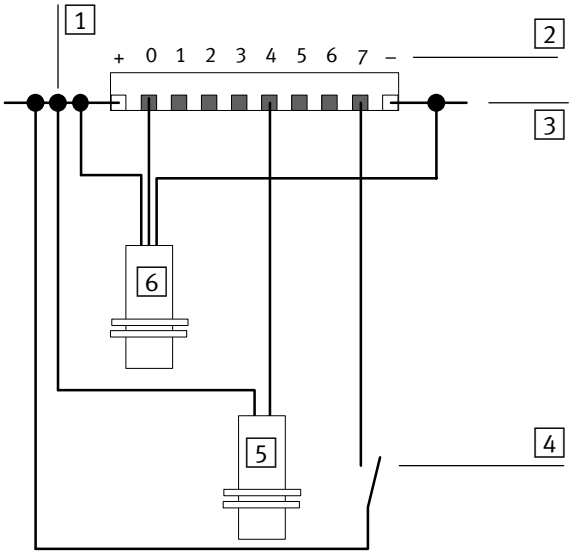
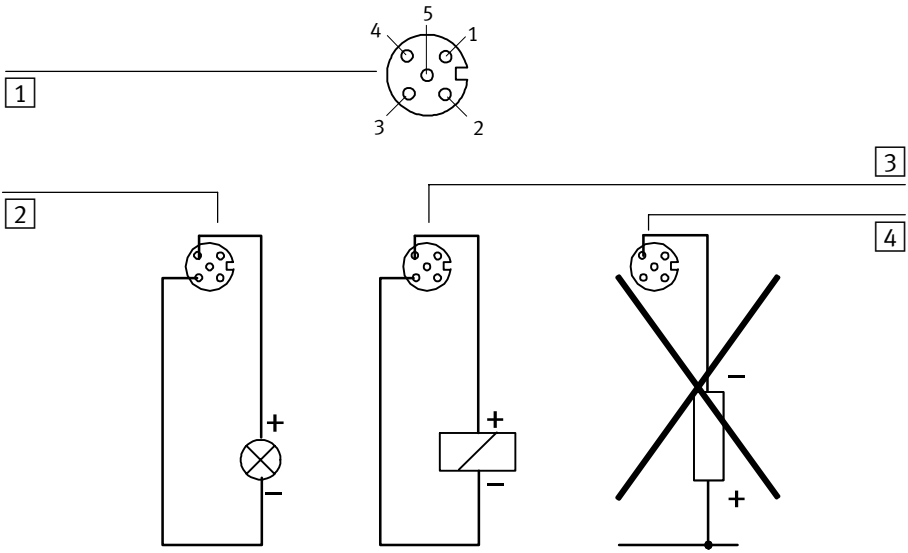


Fig. A/8: Circuitry example type CP-E16-KL-CL with single-row connector socket

A.4.2 Circuitry example for outputs

Circuitry example type CP-A04-M12-CL



1 Pin assignment
- 1: n.c.
- 2: *)
- 3: 0 V
- 4: Ox+1
- 5: Earth/ground connection

*) – connection 0, 2: Ox+1
– connection 1, 3: n.c. (not connected)

2 Example 1

3 Example 2

4 not permitted

Ox = Output x
n.c. = not connected

Fig. A/9: Circuitry examples of output module type CP-A04-M12-CL

Circuitry example type CP-A04-M12-CL

[1] Pin assignment
Connection 0 (2):
1: n.c.
2: Ox+1 (Ox+3)
3: 0 V
4: Ox+0 (Ox+2)
5: Earth/ground connection

Connection 1, 3: not used

[2] Solenoid valve

Ox = Output x

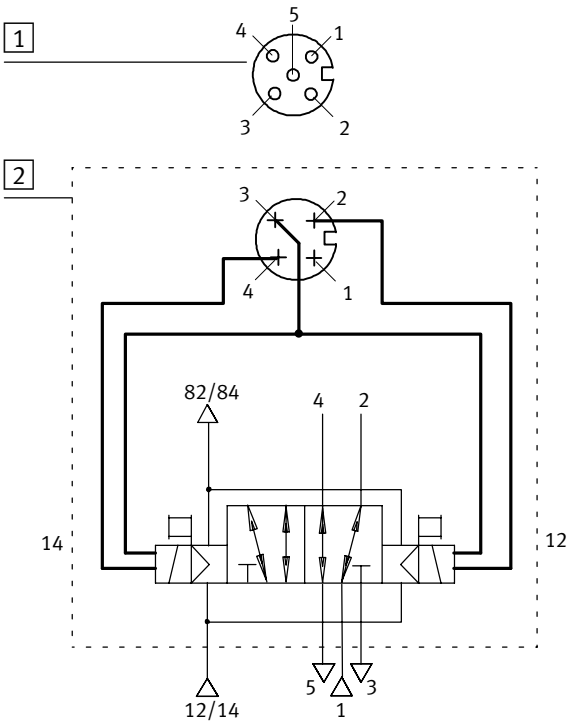
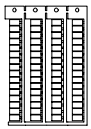


Fig. A/10: Circuitry examples type CP-A04-M12-CL with solenoid valve, e.g. type JMEBH-5/2-D-...-ZSR-C

A.5 Accessories

A.5.1 General accessories

Acces-sories	Type	Description
	ISB-8x20	64 identification signs 8 x 20
	FLANSCHDOSE SER.712	– Protective caps for sealing unused CP connector sockets

A.5.2 Accessories for modules with M12 connection

Acces-sories	Type	Description
	SEA-G-S-7 SEA-4GS-7-2,5 SEA-GS-9 SEA-GS-11-DUO	M12 plug for connecting sensors and actuators, straight, 4-pin – PG7 screw connector, for cable diameter 4...6 mm – PG7 screw connector, for cable diameter 2.5...2.9 mm – PG9 screw connector – PG11 screw connector, 2 cable exits (DUO)
	SEA-M12-5GS-PG7 SEA-5GS-11-DUO	M12 plug for connecting sensors and actuators, straight, 5-pin – PG7 screw connector – PG11 screw connector
	KM12-DUO-M8-GDGD KM12-DUO-M8-GDWD KM12-DUO-M8-WDWD	DUO cable with 2 M8 plugs for modules with M12 connection – straight/straight – straight/angled – angled/angled

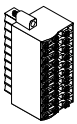
Acces-sories	Type	Description
	KM12-M12-GSGD-2,5 KM12-M12-GSGD-5,0 KM12-M12-GSWD-1-4	Extension cable for Duo cable – length 2.5 m, straight/straight – length 5.0 m, straight/straight – length 1.0 m, straight/angled
	ISK-M12	– 10 protective caps for sealing unused M12 connector sockets

A.5.3 Accessories for modules with M8 connection

Acces-sories	Type	Description
	SEA-GS-M8 SEA-3GS-M8-S	M8 plug for connecting sensors, straight, 3-pin, PG7 screw connector – can be soldered – can be screwed
	KM8-M8-GSGD-0,5 KM8-M8-GSGD-1 KM8-M8-GSGD-2,5 KM8-M8-GSGD-5	Connecting cable with plug and socket, M8, 3-pin, straight/straight – length 0.5 m – length 1.0 m – length 2.5 m – length 5.0 m
	ISK-M8	– 10 protective caps for sealing unused M8 connector sockets

A.5.4 Connector sets for input module type CP-E16-KL-CL

Recommendation: Use the connector sockets type PS1-SAC31-30POL+LED for input module type CP-E16-KL-CL.

Sockets type PS1-SAC31-30POL+LED	Number	Connection cross section	Recommended for connection
Tension spring sockets, 3-row + LED 	2	See leaflet with product	X1, X2

Two rows of the three-row connector socket are intended as distributor boards for the sensor supply. These rows are each connected internally (see Fig. A/7).

- Fasten the sockets with the screws provided.
  The maximum tightening torque is 0.2 Nm.

Instructions on wiring the connector sockets

Solid wires and cables with end sleeves can be inserted easily in the desired tension spring terminal. For inserting flexible wires, you must use a suitable tool (e.g. screwdriver) to press down the coloured push button for the relevant tension spring terminal.

1 Tension spring socket

2 Cable

3 Screwdriver

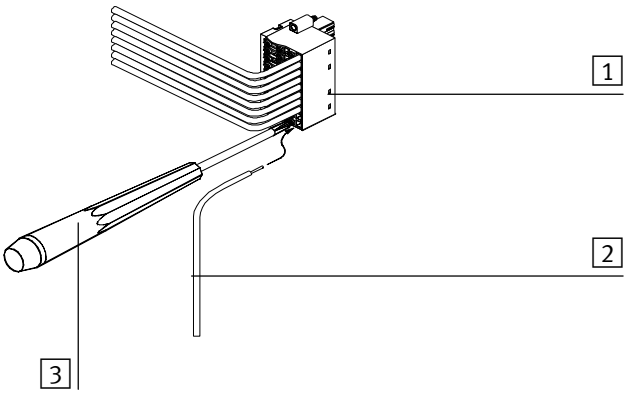


Fig. A/11: Wiring the connector socket

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