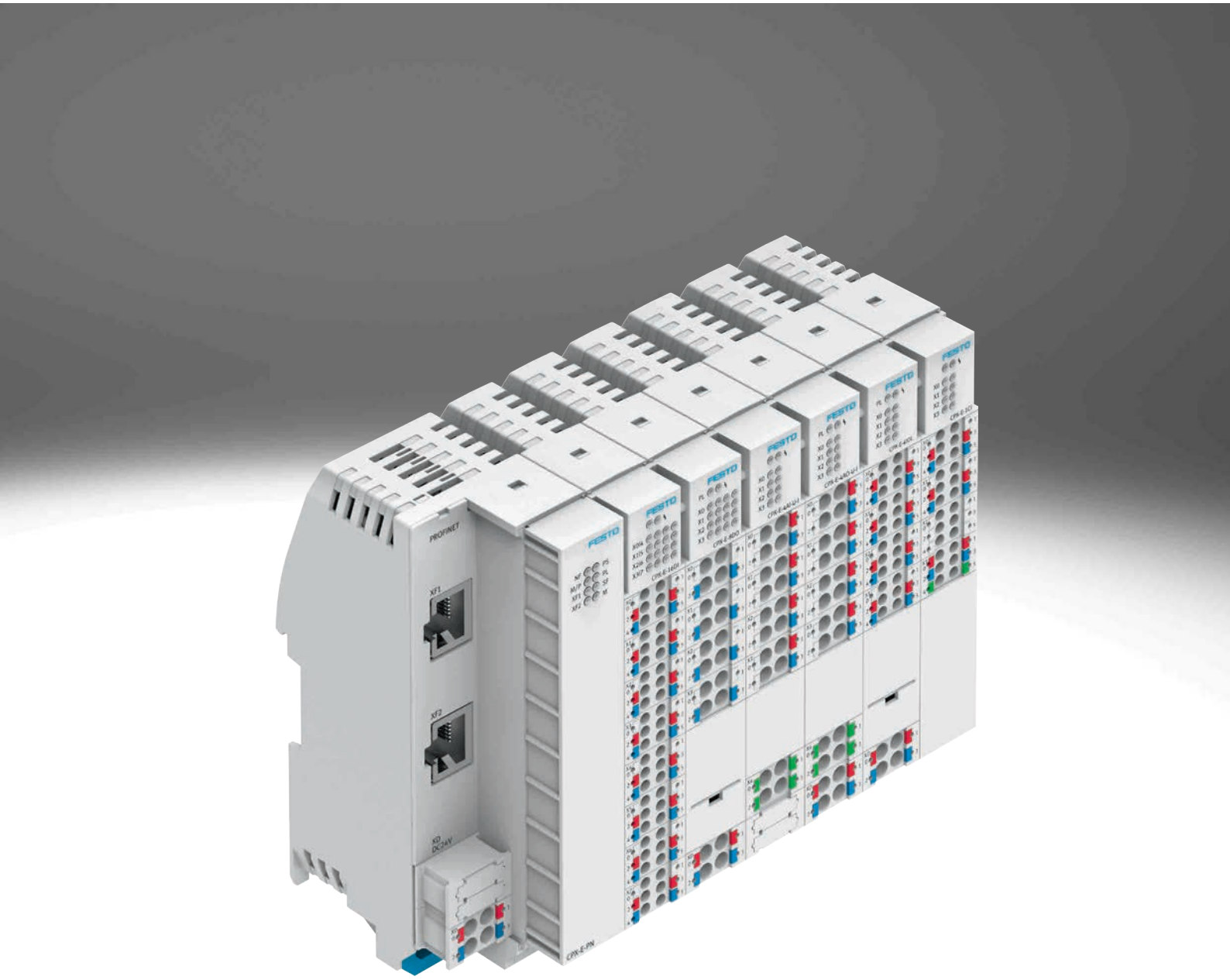
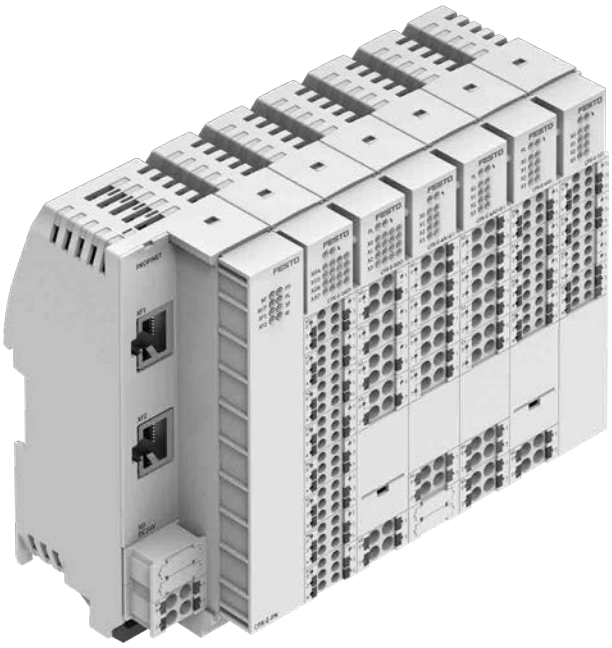
Automation system CPX-E



Key features



Key features

The automation system CPX-E is a high-performance control and automation system focusing primarily on motion control functions for handling technology. It comprises individual function modules that allow a very flexible system structure.
Depending on the combination, the automation system CPE-X can be configured and used purely as a remote I/O system or as a control system. The following modules are available:

- Controller
- Bus modules
- Input/output modules
- Counter modules
- IO-Link master modules

The controllers for the automation system CPX-E are powerful and have comprehensive PLC functions. They have an integrated EtherCAT master for communication with other products such as motor controllers.
There is support for SoftMotion, depending on the variant. SoftMotion is a powerful software library for simple and complex motion control applications.
All controllers have an integrated bus interface; an additional bus module for connection to higher-order controllers is not required.

- Standardised CODESYS programming interface
- Reduced development work through seamless data management
- Extended software functions for seamless integration and simplified control of electric drives
- Standardised, integrated platform combining servo technology and stepper motor technology, enabling mixed operation of the two technologies without problems in the application

Scalable motion control functions:

- Simple movements
- Multi-axis movements (cam discs)
- Contour applications
- Robotics

Handling technology using Festo kinematics (planar surface gantry, linear gantry, Cartesian three-dimensional gantries)

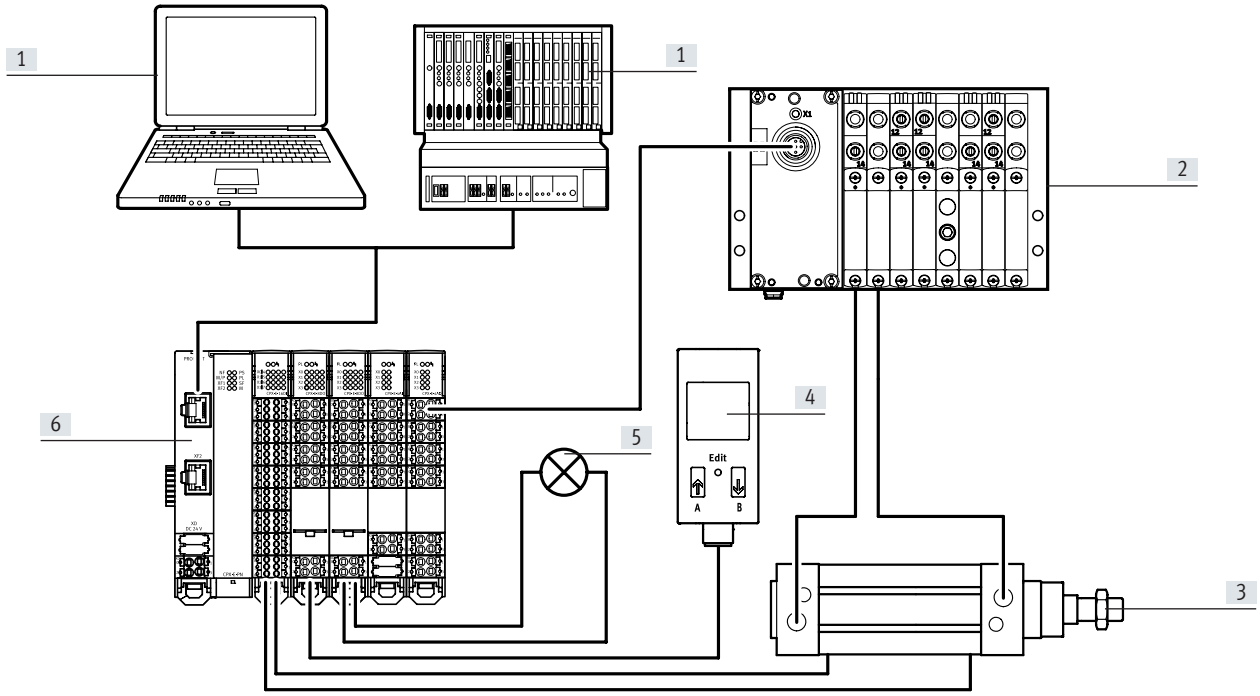
- Parts handling
- Assembly systems
- Palletising
- Gluing, dispensing

Complete automation of machines:

- Packaging machinery
- Palletising systems
- Assembly machines
- Handling systems

Key features

Overview



[1] Higher-order controller
[2] Valve terminal with I-Port interface/device with IO-Link interface
[3] Cylinder with sensors for position sensing
[4] Flow sensor
[5] Visual indicator
[6] Automation system CPX-E

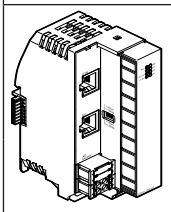
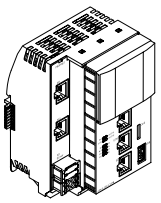
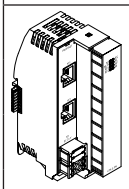
Ordering data – Product options

Configurable product
This product and all its product options can be ordered using the configurator.

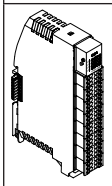
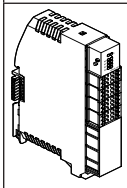
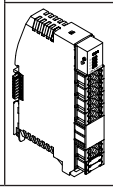
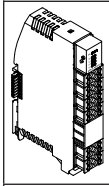
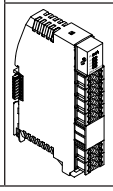
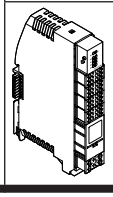
The configurator can be found at
➔ **www.festo.com/catalogue/...**
Enter the part number or the type.

Part no.	Type
5237644	CPX-E

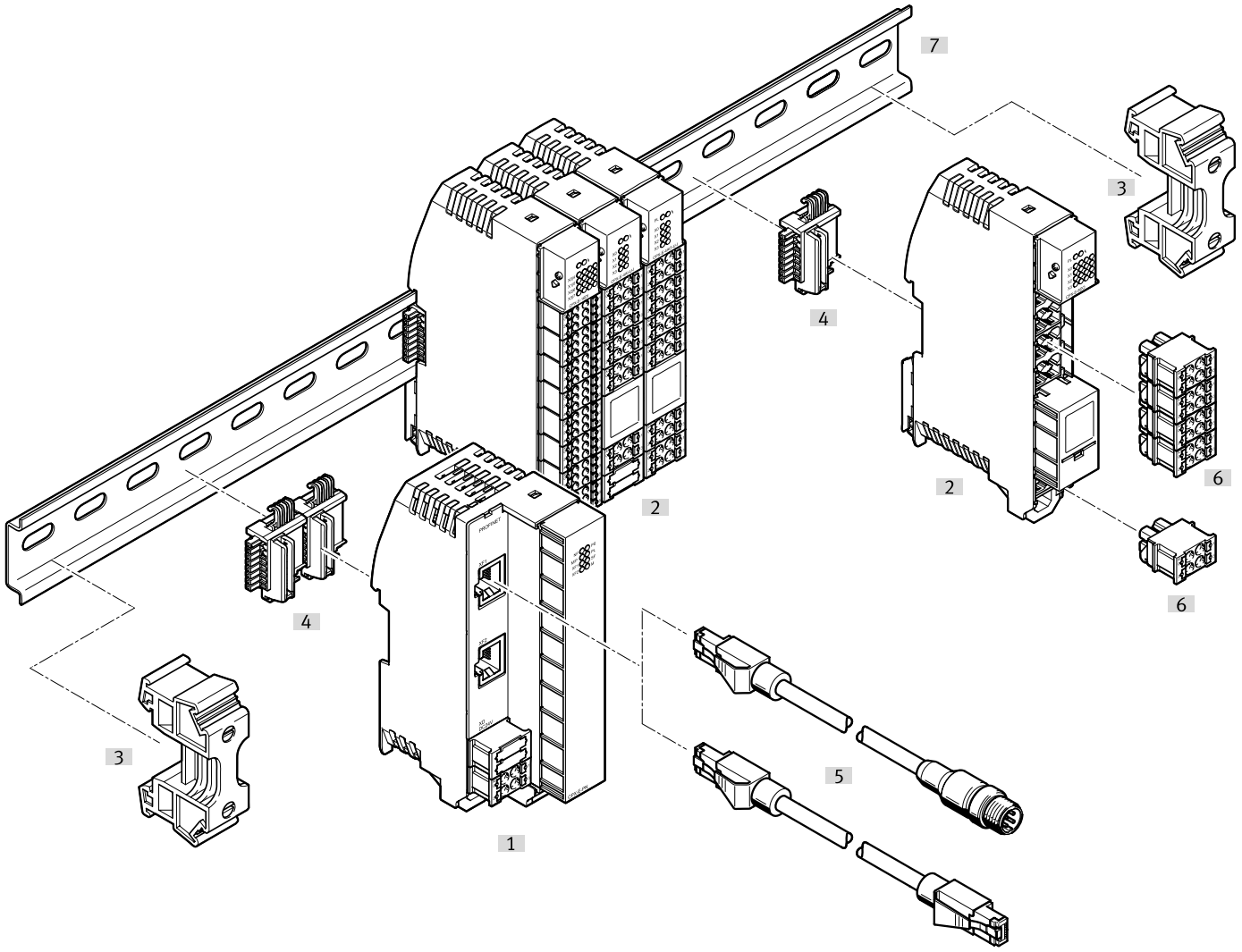
Product range overview

Function	Design		Type		→ Page
Controllers and bus modules	**Controller**				
		CODESYS V3	CPX-E-CEC-C1	• EtherCAT master • Stand-alone controller • Ethernet interface (EasyIP, Modbus TCP, TCP/IP, OPC-UA) • CODESYS	12
			CPX-E-CEC-C1-PN	• EtherCAT master • Communication via PROFINET IRT (Slave), EasyIP, Modbus TCP or TCP/IP • Ethernet interface (EasyIP, Modbus TCP, TCP/IP, OPC-UA) • CODESYS	17
			CPX-E-CEC-C1-EP	• EtherCAT master • Communication via EtherNet/IP (Slave), EasyIP, Modbus TCP or TCP/IP • Ethernet interface (EasyIP, Modbus TCP, TCP/IP, OPC-UA) • CODESYS	25
		CODESYS V3 with SoftMotion	CPX-E-CEC-M1	• EtherCAT master • Stand-alone controller • Ethernet interface (EasyIP, Modbus TCP, TCP/IP, OPC-UA) • CODESYS • SoftMotion functionality	12
			CPX-E-CEC-M1-PN	• EtherCAT master • Communication via PROFINET IRT (Slave), EasyIP, Modbus TCP or TCP/IP • Ethernet interface (EasyIP, Modbus TCP, TCP/IP, OPC-UA) • CODESYS • SoftMotion functionality	17
			CPX-E-CEC-M1-EP	• EtherCAT master • Communication via EtherNet/IP (Slave), EasyIP, Modbus TCP or TCP/IP • Ethernet interface (EasyIP, Modbus TCP, TCP/IP, OPC-UA) • CODESYS • SoftMotion functionality	25
	Bus module				
		PROFINET	CPX-E-PN	• Actuation via PROFINET • Ethernet interface	32
		EtherCAT	CPX-E-EC	• Actuation via EtherCAT • Ethernet interface	36
		EtherNet/IP	CPX-E-EP	• Actuation via EtherNet/IP • Ethernet interface	40
		PROFIBUS	CPX-E-PB	• Activation via PROFIBUS • Sub-D interface	44

Product range overview

Function	Design		Type		→ Page
Input module	**Digital**				
		16 inputs	CPX-E-16DI	• LED display • PNP (positive switching) • 2- and 3-wire sensors to IEC 61131-2	48
		1 counter input	CPX-E-1CI	• LED display • Incremental encoder with two phase-offset signals and optional signal 0 • Pulse generator with or without direction signal • Differential encoder input with 5 V DC operating voltage • Single encoder input (single ended) with 5 V DC or 24 V DC operating voltage	51
	Analogue				
		4 inputs	CPX-E-4AI-U-I	• LED display • Measured variable: current or voltage, can be set • Analogue input can be set up to 10 V/up to 20 mA	58
Output module	**Digital**				
		8 outputs	CPX-E-8DO	• LED display • PNP (positive switching) • Characteristic curve outputs to IEC 61131-2, type 0.5	55
	Analogue				
		4 outputs	CPX-E-4AO-U-I	• LED display • Measured variable: current or voltage, can be set • Analogue input can be set up to 10 V/up to 20 mA	62
Master module	**IO-Link**				
		4 ports	CPX-E-4IOL	• LED display • Protocol version Master V 1.1	66

Peripherals overview



		Type	Description	→ Page/ Internet
[1]	Controller/bus module	CPX-E-CEC CPX-E-PN CPX-E-EC CPX-E-EP CPX-E-PB	Connection of the CPX-E to a higher-order controller	12 32 36 40 44
[2]	Input/output module Counter module IO-Link master module	CPX-E-16DI CPX-E-1CI CPX-E-8DO CPX-E-4AI-U-I CPX-E-4AO-U-I CPX-E-4IOL	Digital and analogue input and output modules	48 51 55 58 62 66
[3]	Retaining bracket	CAFM-X3-HC	Prevents the CPX-E from slipping on the H-rail	–
[4]	Electrical manifold module	VAEA-X3-L	Electrical connection between the individual modules of the CPX-E	–
[5]	Connecting cable	NEBC	For connection to the higher-order controller	–
[6]	Terminal strip	NEKC	Blocks with spring-loaded terminals for connecting sensors and actuators	–
[7]	DIN mounting rail	NRH-35-2000	H-rail to EN 60715	nrh

Key features – Mounting

Mounting

The automation system CPX-E can only be mounted on an H-rail.
Modules can easily be removed, replaced or added at a later date.

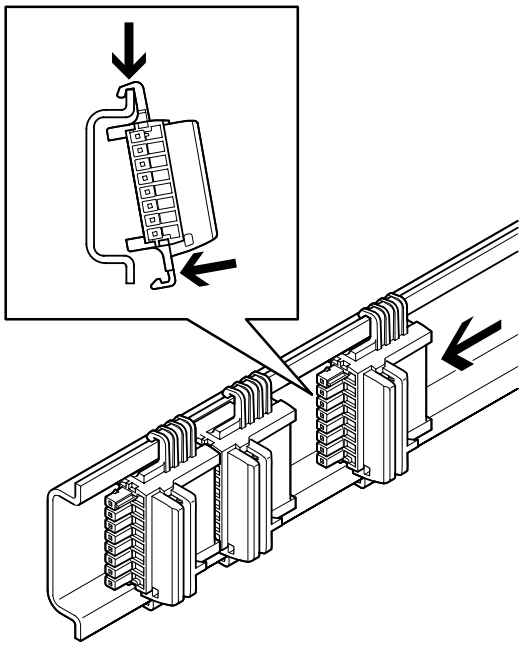
The following mounting clearances are recommended to allow sufficient ventilation of the automation system CPX-E:

- At the top: 4 cm
- At the side: 2 cm
- At the bottom: 3 cm

Note

Assembly must only take place in a de-energised state.

Mounting – Electrical manifold module



The electrical manifold modules are clipped into the H-rail. They can be moved along the H-rail.
The electrical manifold modules connect the individual modules of the automation system CPX-E to one another.
They are used for:

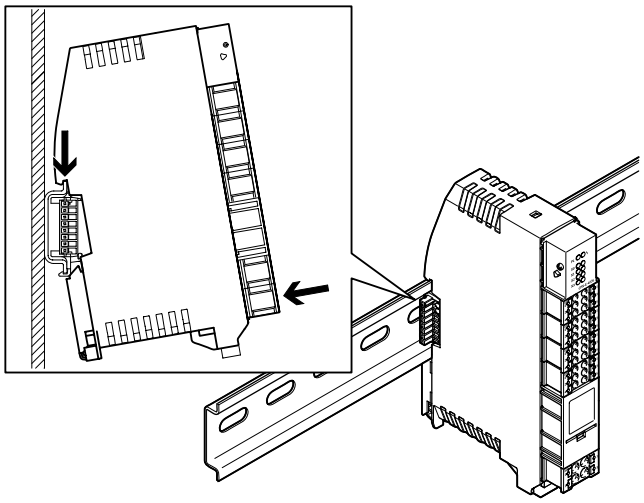
- Data transmission
- Power supply to the module
- Power supply to connected sensors

Output modules have a separate power infeed from which the consumers connected to the module are supplied.

The modules require different numbers of electrical manifold modules (included in the scope of delivery of the module):

- One electrical manifold module per input module
- One electrical manifold module per counter module
- One electrical manifold module per output module
- One electrical manifold module per IO-Link master module
- Two electrical manifold modules per bus module
- Two electrical manifold modules per stand-alone controller
- Four electrical manifold modules per PROFINET controller
- Four electrical manifold modules per EtherNet/IP controller

Assembly – Modules



The module is attached to the H-rail or the electrical manifold module and latched in place.
For removal, a screwdriver is required to undo the fastening clamp.
The automation system CPX-E is prevented from slipping off the H-rail by laterally attaching retainers (included in the scope of delivery).

If a module is to be replaced, the associated electrical manifold module remains on the H-rail.
If a module is missing, this interrupts the connection of the bus module/controller to the downstream input/output modules or IO-Link master modules.

Key features – Mounting

Electrical connections

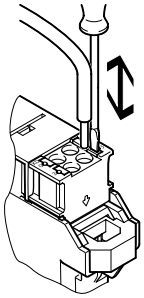
All the electrical connections of the automation system CPX-E are designed as terminal strips with spring-loaded terminals.

Modules can easily be removed, replaced or added at a later date.

Note

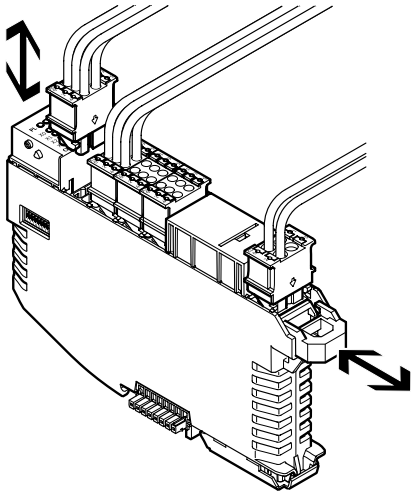
Assembly must only take place in a de-energised state.

Mounting – Single wire



The electrical connection for the inputs and outputs, as well as the power supply, is provided via terminal strips for single strands.

Mounting – Terminal strip



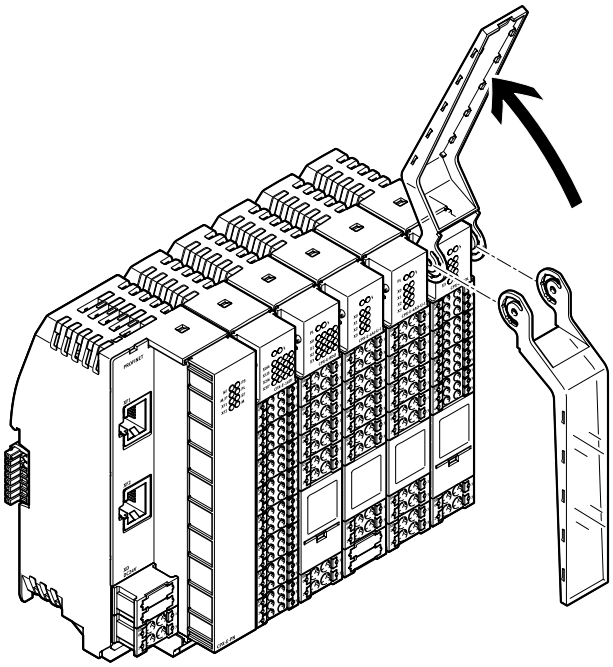
The terminal strips mounted on a module are held in position by a central locking mechanism.
To remove individual terminal strips, the locking mechanism is released using a screwdriver:

- Simple changeover of connected sensors or actuators
- Fast and visible disconnection and reconnection of the power supply
- Simple changeover of an entire CPX-E module, wiring is retained

The terminal strips have a partially coded plug pattern:

- Terminal strips with the same number of pins can be interchanged
- Terminal strips for power supply connections only fit on power supply connections

Labelling

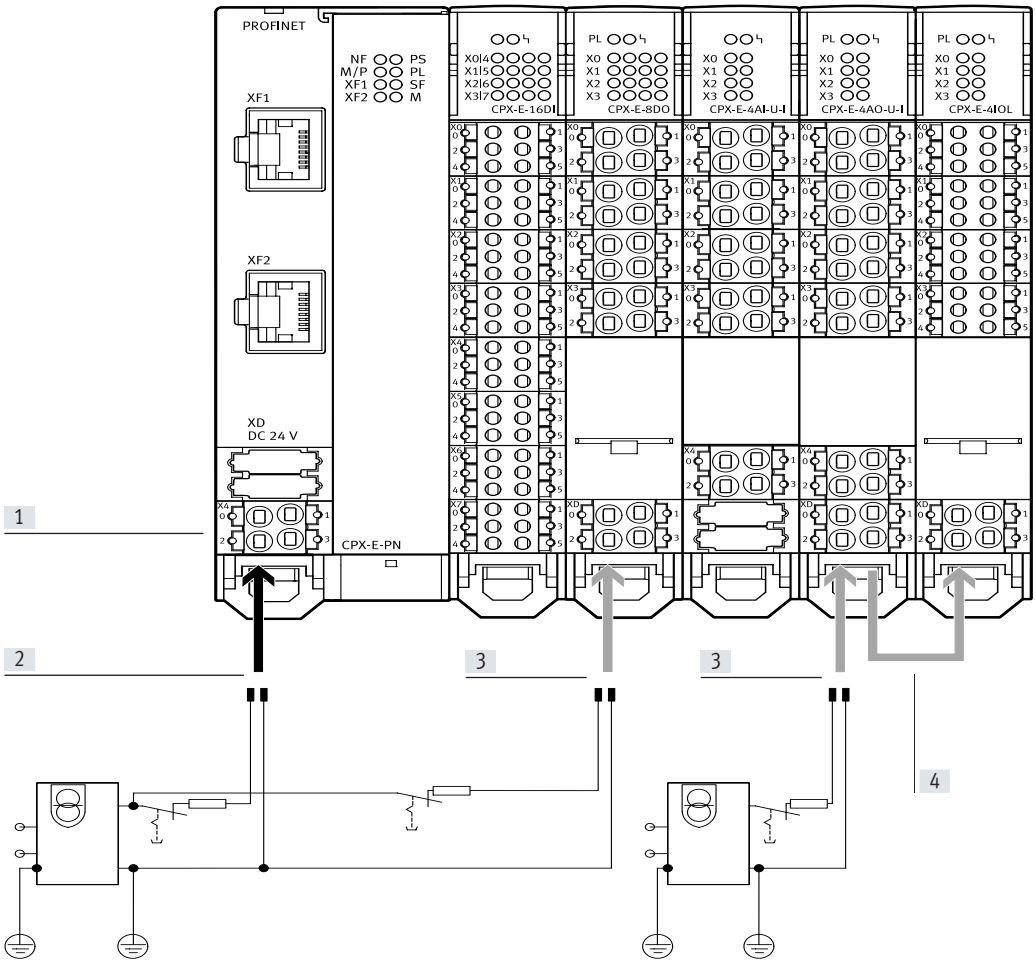


A hinged identification holder is available for the input and output modules and IO-Link master modules.

A matching label strip is inserted into the identification holder for labelling.

Key features – Power supply

Power supply concept



[1] The power supply is provided via a terminal strip with spring-loaded terminals on the module

[2] The power supply for the modules themselves and the connected sensors is provided centrally on the bus module/controller.

[3] The power supply for connected actuators is provided via a terminal strip with spring-loaded terminals on the respective output module/IO-Link master module

[4] The power supply for actuators can be looped through from output module to output module/IO-Link master module

Electrical manifold modules represent the backbone of the automation system CPX-E with all supply cables. They provide the power supply for the modules used on them as well as their bus connections.
For segmentation into voltage zones, the power supply for the outputs is fed in separately at the output module. This creates electrically isolated, all-pin disconnectable potential groups/voltage segments.

Key features – Diagnostics

System performance

Diagnostics

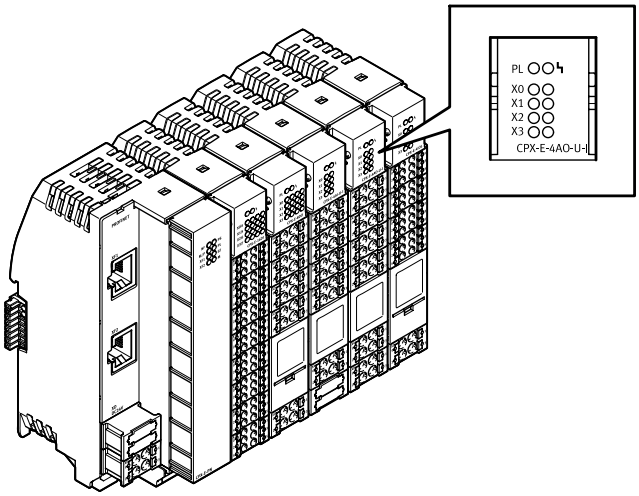
Detailed diagnostic functions are needed in order to quickly locate the causes of errors in the electrical installation and therefore reduce downtimes in production plants.
A basic distinction is made between on-the-spot diagnostics using LEDs or an operator unit and diagnostics using a bus interface.

The automation system CPX-E supports on-the-spot diagnostics via a row of LEDs. This is separate from the connection area and therefore provides good visual access to status and diagnostic information.
The parameters for maximum storage time and recording method for diagnostic messages can be set.

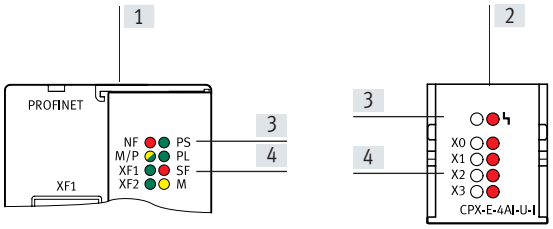
Module and channel-specific diagnostics are supported, for example:
- Undervoltage detection
- Short circuit detection
- Open load detection
- Storage of the 40 most recently occurring errors

Diagnostic messages can be read out via the bus interface in the higher-order controller and visualised for the central recording and evaluation of error causes. This is done using the individual fieldbus-specific channels.
There is also the option of access via the integrated web server (remote maintenance via PC/web applications).

Displays



Each module has a row of LEDs for indicating the operating status of the module and of the connected sensors or actuators.



[1] LED indicators on the bus module/controller
[2] LED indicators on the input/output module, IO-Link master module
[3] System-specific LED indicator (e.g. power supply)
[4] Communication-specific LED indicator (e.g. status of network connection, switching status of sensor)

Parameterisation

Changes to the application are often required during commissioning. The parameterisable characteristics of the CPX-E modules mean that functions can be very easily changed using the configuration software.

It is therefore possible, for example, to reduce the input debounce time for an input module – normally 3 ms – to 0.1 ms on a "fast" input module for faster processes.

Depending on the modules used, parameterisation is performed via the following interfaces:
- Ethernet
- Fieldbus

The following settings are affected by the parameterisation:
- Behaviour in the event of communication errors
- Behaviour on being switched back on
- Debounce times and signal extension
- Force settings (defining the signal status)
- Operating mode of the diagnostic memory

Key features – Addressing

Addressing

The various CPX-E modules occupy a different number of addresses within the CPX-E system. The maximum address space for bus modules depends on the performance of the fieldbus systems.

Maximum system configuration:
- 1 bus module or controller
- 10 input/output/counter modules and IO-Link master modules

The maximum system configuration can be limited in individual cases by exceeding the address space.

Addresses are allocated automatically in ascending order from left to right, as viewed from the bus module/ controller.

Note

Please refer to the detailed description of the configuration/addressing rules in the technical data for CPX-E bus modules.

Overview – Address space for CPX-E bus modules and controller

	Protocol	Max. total		Max. digital		Max. analogue	
		Inputs	Outputs	Inputs	Outputs	Inputs	Outputs
CPX-E-CEC-C1	CODESYS V3	512 bits	512 bits	160 DI	80 DO	32 AI	32 AO
CPX-E-CEC-M1	CODESYS V3 with SoftMotion	512 bits	512 bits	160 DI	80 DO	32 AI	32 AO
CPX-E-CEC-C1-PN	CODESYS V3	4096 bits	4096 bits	1280 DI	360 DO	256 AI	256 AO
CPX-E-CEC-M1-PN	CODESYS V3 with SoftMotion	4096 bits	4096 bits	1280 DI	360 DO	256 AI	256 AO
CPX-E-CEC-C1-EP	CODESYS V3	4096 bits	4096 bits	1280 DI	360 DO	256 AI	256 AO
CPX-E-CEC-M1-EP	CODESYS V3 with SoftMotion	4096 bits	4096 bits	1280 DI	360 DO	256 AI	256 AO
CPX-E-PN	PROFINET	512 bits	512 bits	160 DI	80 DO	32 AI	32 AO
CPX-E-EC	EtherCAT	512 bits	512 bits	160 DI	80 DO	32 AI	32 AO
CPX-E-EP	EtherNet/IP	512 bits	512 bits	160 DI	80 DO	32 AI	32 AO
CPX-E-PB	PROFIBUS	512 bits	512 bits	160 DI	80 DO	32 AI	32 AO

DI = Digital inputs (1 bit)
DO = Digital outputs (1 bit)
AO = Analogue outputs (16 bits)
AO = Analogue outputs (16 bits)
AI = Analogue inputs (16 bits)

Note

The bandwidth of the bus modules can be restricted by the choice of module and the maximum number of modules.

Overview – Allocated addresses for CPX-E modules

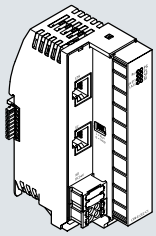
		Inputs [bit]	Outputs [bit]
CPX-E-16DI	Digital input module, 16 inputs	16	–
CPX-E-1CI	Digital counter module, 1 counter input	96	16
CPX-E-8DO	Digital output module, 8 outputs	–	8
CPX-E-4AI-U-I	Analogue input module, 4 inputs	64	–
CPX-E-4AO-U-I	Analogue output module, 4 outputs	–	64
CPX-E-4IOL	IO-Link master module, 4 ports	64 ... 256	64 ... 256

Example of CPX-E-PN (PROFINET)

	Inputs [bit]	Outputs [bit]	Remarks
3x CPX-E-16DI	48	–	• The maximum number of modules is achieved with 10 CPX-E input/output modules • The available address space (512 bits) is not fully used up • No additional modules can be configured
1x CPX-E-8DO	–	8	
6x CPX-E-4AI-U-I	384	–	
Allocated address space	432	8	

Data sheet – Stand-alone controller

Controller for operating the automation system CPX-E as an autonomous unit
Programming and process visualisation take place via CODESYS.
The controller includes the power supply for the modules of the automation system and the connected sensors.



Application

Ethernet connection

The controller can be accessed directly via two Ethernet interfaces.

There is also the option of connecting via Modbus/TCP or standard Ethernet (TCP/IP).

The interfaces support crossover detection, which means that there is a choice of using patch cables or crossover cables.

Motion controller

The controller has an integrated EtherCAT master. EtherCAT is used for communication with other products:
- Motor controllers (CMMP, CMMT)
- Electrical terminal (CPX)
- Valve terminals with I-Port interface via the installation system CTEL (bus node CTEU-EC)

The SoftMotion extension makes it possible to control/execute coordinated multi-axis movements.

Additional functions

- Web server for read access to the most important parameter and diagnostic functions
- FTP server for data exchange
- Real-time clock, can be set and read using CODESYS
- Internal temperature sensor

Data sheet – Stand-alone controller

General technical data		
CPU data		Dual core 650 MHz
		128 MB RAM
Programming software		CODESYS provided by Festo
Program memory		12 MB, user program
Buffering time real-time clock		3 weeks
Processing time		Approx. 200 µs/1 k instruction
Flags		120 kB remanent data
		CODESYS variable concept
Function blocks		Read CPX module diagnostics
		CPX diagnostic status
		Copy CPX diagnostic trace
		And others
IP address setting		DHCP
		Via CODESYS
Control elements		DIL switch for RUN/STOP
Configuration support		CODESYS V3
Maximum number of modules		10
System parameters		Diagnostic memory
		Fail-safe response
		System start
Module parameters		Channel alarms bundling
		Undervoltage diagnostics
		Channel alarms for undervoltage
		Process value representation, analogue modules
Diagnostics via LED		Force mode
		Network status engineering port 1
		Network status EtherCAT
		Run
		Power supply, electronics/sensors
		Power supply load
		System error
Address capacity of internal bus inputs/outputs		
Max. address capacity of outputs	[byte]	64
Max. address capacity of inputs	[byte]	64

Technical data – Interfaces		
Fieldbus interface		
Protocol		EtherCAT master
Function		Bus connection outgoing
Transmission rate	[Mbps]	100
Type		Ethernet
Connection type		Socket
Connection technology		RJ45
Number of pins/wires		8
Galvanic isolation		Yes
Ethernet interface		
Protocol		EasyIP
		Modbus TCP
		TCP/IP
		OPC UA
Function		Diagnostics
Transmission rate	[Mbps]	10
	[Mbps]	100
Connection type		Socket
Connection technology		RJ45
Number of pins/wires		8

Data sheet – Stand-alone controller

Technical data – Electrics		
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Power failure buffering	[ms]	20
Max. power supply	[A]	8
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	Typically 65
Protection against direct and indirect contact		PELV
Electrical connection, power supply		
Function		Electronics and sensors
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm^2]	0.2 ... 1.5
Note on conductor cross section		0.2 ... 2.5 mm^2 for flexible conductor without wire end sleeve

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	145
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	42.2 x 125.8 x 76.5

Materials		
Housing		PA
PWIS conformity		VDMA24364 zone III

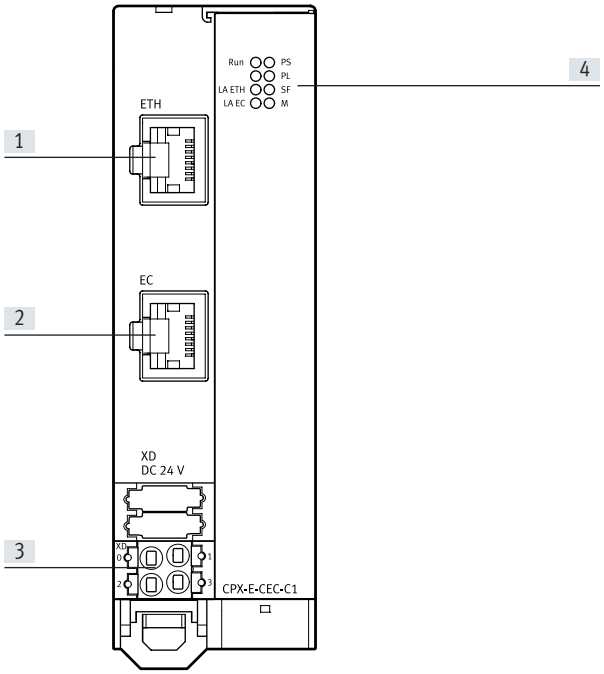
Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +50
Note on ambient temperature	[°C]	–5 ... +60 for vertical installation
Storage temperature	[°C]	–20 ... +70
Corrosion resistance class CRC[1]		0
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) Additional information: www.festo.com/x/topic/kbk
2) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.
3) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

Data sheet – Stand-alone controller

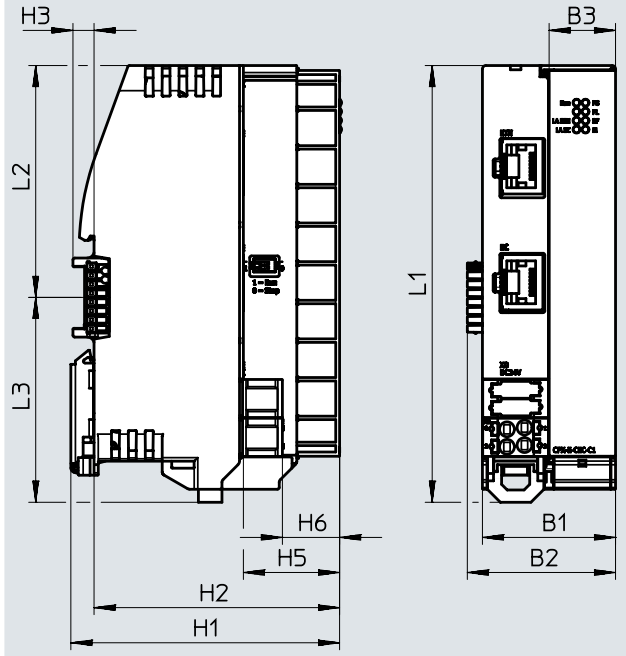
Connection and display components



[1] Ethernet network connection
[2] EtherCAT master network connection
[3] Terminal strip for operating voltage supply
[4] LED indicators

Dimensions

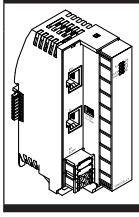
Download CAD data ➔ www.festo.com



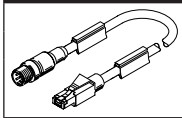
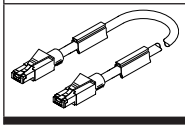
	B1	B2	B3	H1	H2	H3	H4	H5	H6	L1	L2	L3
CPX-E-CEC-C1	37.8	42.2	18.9	76.5	69.9	6	–	27.4	16.3	124.3	66	58.3
CPX-E-CEC-M1												

Data sheet – Stand-alone controller

Ordering data

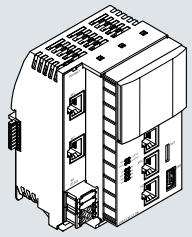
	Bus connection	Additional functions	Part no.	Type
	Stand-alone controller	CODESYS V3	**5226780**	**CPX-E-CEC-C1**
		CODESYS V3 with SoftMotion	**5266781**	**CPX-E-CEC-M1**

Ordering data – Accessories

			Cable length [m]	Part no.	Type
	Straight plug, M12x1, 4-pin, D-coded	Straight plug, RJ45, 8-pin	1	**8040451**	**NEBC-D12G4-ES-1-S-R3G4-ET**
			3	**8040452**	**NEBC-D12G4-ES-3-S-R3G4-ET**
			5	**8040453**	**NEBC-D12G4-ES-5-S-R3G4-ET**
			10	**8040454**	**NEBC-D12G4-ES-10-S-R3G4-ET**
	Straight plug, RJ45, 8-pin	Straight plug, RJ45, 8-pin	1	**8040455**	**NEBC-R3G4-ES-1-S-R3G4-ET**

Data sheet – PROFINET controller

Controller for operating the automation system CPX-E on PROFINET or as an autonomous unit
Programming and process visualisation take place via CODESYS.
The controller includes the power supply for the modules of the automation system and the connected sensors.



Application

Bus connection

The bus connection is provided via RJ45 sockets which meet Ethernet requirements.
Communication with a higher-order controller takes place via PROFINET.
There is also the option of connecting via Modbus/TCP or standard Ethernet (TCP/IP).
The controller can be accessed directly via two Ethernet interfaces. The integrated switch supports star and line topology and enables the network to be divided into segments.
The controller can be operated both as a higher-order device (master) and as a subordinate device (slave) using the communication protocol Modbus/TCP.
The interfaces support crossover detection, which means that there is a choice of using patch cables or crossover cables.

Motion controller

The controller has an integrated EtherCAT master.
EtherCAT is used for communication with other products:

- Motor controllers (CMMP, CMMT)
- Electrical terminal (CPX)
- Valve terminals with I-Port interface via the installation system CTEL (bus node CTEU-EC)

The SoftMotion extension makes it possible to control/execute coordinated multi-axis movements.

Data storage

An SD card slot and a USB interface are provided for reading out and storing data.
The maximum memory size for compatible media is 32 GB in FAT format with a partition.
There is no provision to permanently record data on the external media during operation.
Only USB storage media with a current consumption of less than 0.5 A may be used.

Additional functions

- Web server for read access to the most important parameter and diagnostic functions
- FTP server for data exchange
- Real-time clock, can be set and read using CODESYS
- Internal temperature sensor

Data sheet – PROFINET controller

General technical data		
CPU data		Dual core 766 MHz
		512 MB RAM
Storage medium		Micro SD card up to 32 GB
		USB memory stick up to 32 GB
Programming software		CODESYS provided by Festo
Program memory		100 MB, user program
Buffering time real-time clock		3 weeks
Processing time		Approx. 200 µs/1 k instruction
Flags		120 kB remanent data
		CODESYS variable concept
Function blocks		Read CPX module diagnostics
		CPX diagnostic status
		Copy CPX diagnostic trace
		And others
IP address setting		DHCP
		Via CODESYS
		Optional: via operator unit CDSB
Control elements		DIL switch for RUN/STOP
		Optional operator unit CDSB
Configuration support		Operator unit CDSB
		CODESYS V3
		GSDML file
Maximum number of modules		10
System parameters		Diagnostic memory
		Fail-safe response
		System start
Module parameters		Channel alarms bundling
		Undervoltage diagnostics
		Channel alarms for undervoltage
		Process value representation, analogue modules
Diagnostics via LED		Force mode
		Network errors
		Network status engineering port 1
		Network status engineering port 2
		Network status EtherCAT
		Network status port 1
		Network status port 2
		Run
		Power supply, electronics/sensors
		Power supply load
		System error
		Maintenance required
Address capacity of internal bus inputs/outputs		
Max. address capacity of outputs	[byte]	64
Max. address capacity of inputs	[byte]	64

Data sheet – PROFINET controller

Technical data – Interfaces		
Fieldbus interface 1		
Protocol		PROFINET IO
Function		Bus connection incoming/outgoing
Transmission rate	[Mbps]	100
Type		Ethernet
Connection type		2 x socket
Connection technology		RJ45
Number of pins/wires		8
Galvanic isolation		Yes
Max. address capacity of outputs	[byte]	512
Max. address capacity of inputs	[byte]	512
Fieldbus interface 2		
Protocol		EtherCAT master
Function		Bus connection incoming/outgoing
Transmission rate	[Mbps]	100
Type		Ethernet
Connection type		Socket
Connection technology		RJ45
Number of pins/wires		8
Galvanic isolation		Yes
Ethernet interface		
Protocol		EasyIP
		Modbus TCP
		TCP/IP
		OPC UA
Function		Switch
		Diagnostics
Transmission rate	[Mbps]	10
	[Mbps]	100
Connection type		2 x socket
Connection technology		RJ45
Number of pins/wires		8
USB interface		
USB interface		USB 2.0

Data sheet – PROFINET controller

Technical data – Electrics		
Nominal operating voltage DC	[V DC]	24
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Power failure buffering	[ms]	20
Max. power supply	[A]	8
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	Typically 150
Protection against direct and indirect contact		PELV
Electrical connection, power supply		
Function		Electronics and sensors
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm^2]	0.2 ... 1.5
Note on conductor cross section		0.2 ... 2.5 mm^2 for flexible conductor without wire end sleeve

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	288
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	75.9 x 124.3 x 82.5

Materials	
Housing	PA
PWIS conformity	VDMA24364 zone III

Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +50
Note on ambient temperature	[°C]	–5 ... +60 for vertical installation
Storage temperature	[°C]	–20 ... +70
Corrosion resistance class CRC[1]		0
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) Additional information: www.festo.com/x/topic/kbk
2) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
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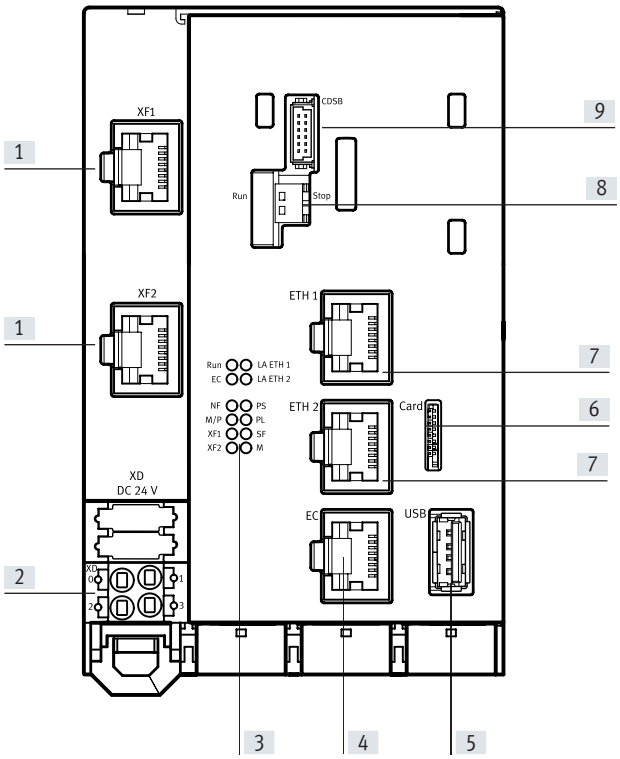
3) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

Data sheet – PROFINET controller

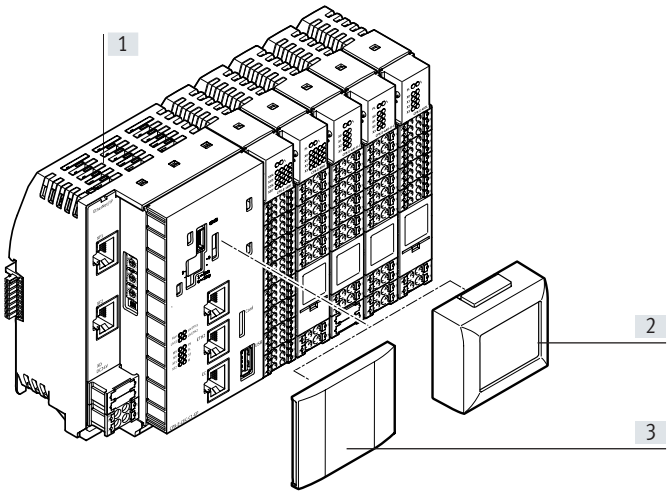
Connection and display components

CPX-E-CEC-...



[1] Network connections 1 and 2, PROFINET IO
[2] Terminal strip for operating voltage supply
[3] LED indicators
[4] EtherCAT master network connection
[5] USB interface
[6] Slot for micro SD memory card
[7] Network connections 1 and 2, Ethernet
[8] DIL switch for holding and starting projects in CODESYS
[9] Slot for operator unit CDSB

Display and operator unit CDSB-A1



The operator unit CDSB-A1 from Festo is a plug-in display and operating panel for the automation system CPX-E. The integrated colour TFT display with touchscreen can be used both for operation and for simple diagnostics of the connected basic unit. User-friendliness is enhanced through fault diagnostics with plain-text error messages.

- Display of full-text messages (errors, warnings, data)
- Easy data backup of parameters and firmware in the unit (e.g. for series commissioning or device replacement)
- 1.77" colour TFT display
- 3 GB user memory

[1] CPX-E-CEC
[2] Operator unit CDSB-A1
[3] Cover (included in the scope of delivery of the CPX-E-CEC)

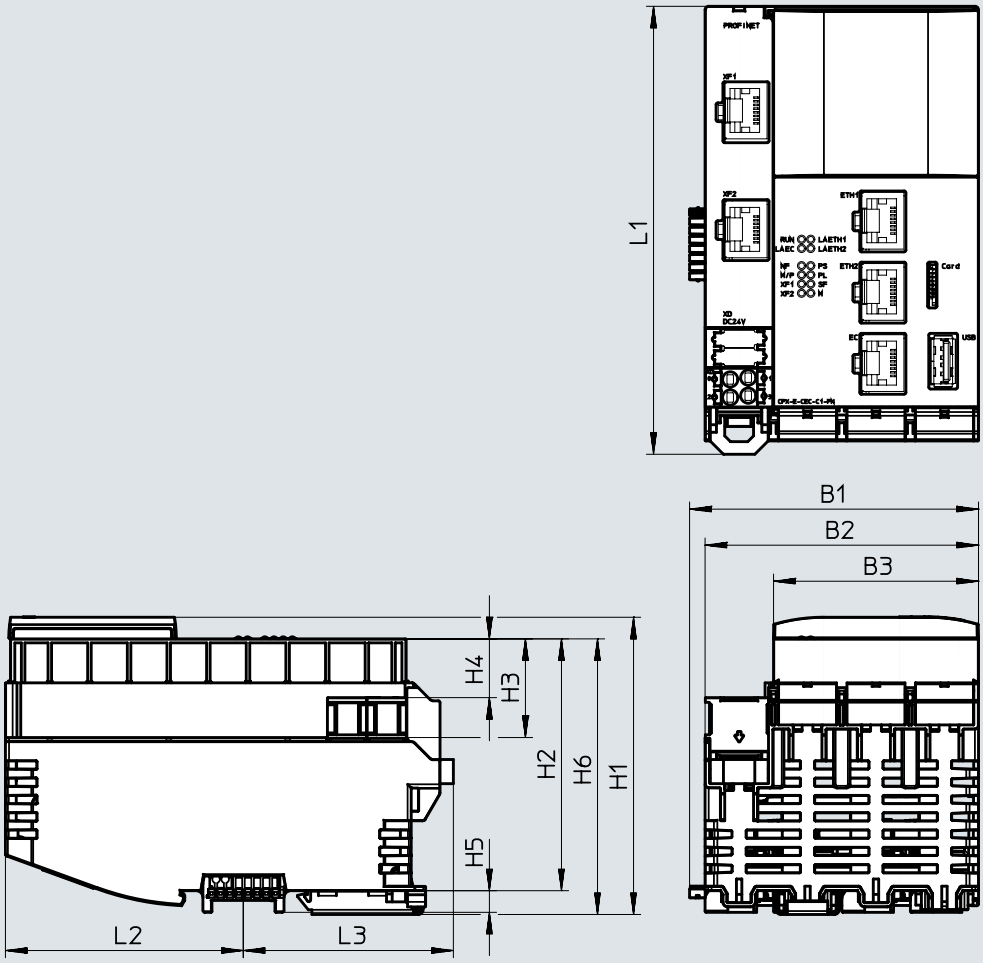
Data sheet – PROFINET controller

Software

Software licences	Licences	Minimum requirement
The "Motion & Robotics" software enables simple configuration and programming of the automation system CPX-E in conjunction with Festo handling systems. Functions: • Support for Festo linear gantries YXCL and EXCT • Support for Festo linear gantries YXCF, EXCH and EXCM • Support for Festo 3-dimensional gantries YXCR • Simple configuration of the kinematics/drives in CODESYS • Web visualisation for easy operation and commissioning • Any required positioning thanks to free programming • Easy-to-understand textual macro programming language • Storage of motion programs in a project structure. • Teach-in programming via graphic dialogue at the handheld terminal • Motion path smoothing with full axis dynamics • Integrated limiters for programmed dynamic values with simultaneous path accuracy • Simple switching points along the contour for switching actions, for example gripper control • Interface between the integrated PLC and FTL programming	2 software licenses are being offered which can be purchased from the Festo App World: PTP licence • Point-to-point interpolation • Actuation of simple kinematic systems • Graphic visualisation for handheld operator unit CDSA-D3-RV • Teach-in function • For simple applications such as pick & place, loading/unloading CP licence • Cartesian linear and circular interpolation • Interpolation of orientation • Contour applications • Graphic visualisation for handheld operator unit CDSA-D3-RV • Teach-in function	• CPX-E with revision 8 or higher • For CPX-E-CEC-M1-PN • CODESYS SP 15 P3 • SoftMotion version 4.6.3.0 • The licences are purchased once and then are then always available

Data sheet – PROFINET controller

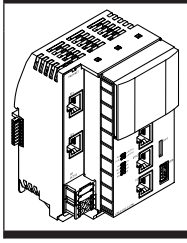
Dimensions Download CAD data ➔ www.festo.com



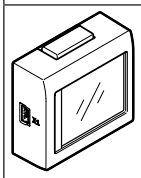
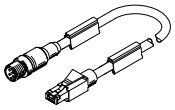
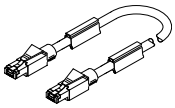
	B1	B2	B3	H1	H2	H3	H4	H5	H6	L1	L2	L3
CPX-E-CEC-...PN	80.2	75.9	56.9	82.5	69.9	27.4	16.3	6	76.5	124.3	66	58.3

Data sheet – PROFINET controller

Ordering data

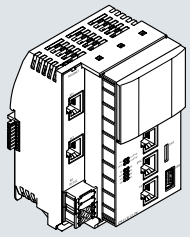
	Bus connection	Additional functions	Part no.	Type
	PROFINET IO	CODESYS V3	**4252741**	**CPX-E-CEC-C1-PN**
		CODESYS V3 with SoftMotion	**4252743**	**CPX-E-CEC-M1-PN**

Ordering data – Accessories

			Cable length [m]	Part no.	Type
	Memory card	32 GB	–	**8094425**	**CAMC-M-MS-G32-G2**
	Display and operator unit	• Colour touchscreen • Diagnostic function • Update function for CPX-E-CEC (in plugged-in state)	–	**8070984**	**CDSB-A1**
	• Software licence for controlling a Festo handling system • For CPX-E-CEC-M1-PN	Point-to-point interpolation	–	**8129269**	**GSAR-C1-L1**
		Cartesian interpolation	–	**8129270**	**GSAR-C1-L2**
	Straight plug, M12x1, 4-pin, D-coded	Straight plug, RJ45, 8-pin	1	**8040451**	**NEBC-D12G4-ES-1-S-R3G4-ET**
			3	**8040452**	**NEBC-D12G4-ES-3-S-R3G4-ET**
			5	**8040453**	**NEBC-D12G4-ES-5-S-R3G4-ET**
			10	**8040454**	**NEBC-D12G4-ES-10-S-R3G4-ET**
	Straight plug, RJ45, 8-pin	Straight plug, RJ45, 8-pin	1	**8040455**	**NEBC-R3G4-ES-1-S-R3G4-ET**

Data sheet – EtherNet/IP controller

Controller for operating the automation system CPX-E on EtherNet/IP or as an autonomous unit
Programming and process visualisation take place via CODESYS.
The controller includes the power supply for the modules of the automation system and the connected sensors.



Application

Bus connection

The bus connection is provided via RJ45 sockets which meet Ethernet requirements.
Communication with a higher-order controller takes place via EtherNet/IP.
There is also the option of connecting via Modbus/TCP or standard Ethernet (TCP/IP).
The controller can be accessed directly via two Ethernet interfaces. The integrated switch supports star and line topology and enables the network to be divided into segments.
The controller can be operated both as a higher-order device (master) and as a subordinate device (slave) using the communication protocol Modbus/TCP.
The interfaces support crossover detection, which means that there is a choice of using patch cables or crossover cables

Motion controller

The controller has an integrated EtherCAT master.
EtherCAT is used for communication with other products:

- Motor controllers (CMMP, CMMT)
- Electrical terminal (CPX)
- Valve terminals with I-Port interface via the installation system CTEL (bus node CTEU-EC)

The SoftMotion extension makes it possible to control/execute coordinated multi-axis movements.

Data storage

An SD card slot and a USB interface are provided for reading out and storing data.
The maximum memory size for compatible media is 32 GB in FAT format with a partition.
There is no provision to permanently record data on the external media during operation.
Only USB storage media with a current consumption of less than 0.5 A may be used.

Additional functions

- Web server for read access to the most important parameter and diagnostic functions
- FTP server for data exchange
- Real-time clock, can be set and read using CODESYS
- Internal temperature sensor

Data sheet – EtherNet/IP controller

General technical data		
CPU data		Dual core 766 MHz
		512 MB RAM
Storage medium		Micro SD card up to 32 GB
		USB memory stick up to 32 GB
Programming software		CODESYS provided by Festo
Program memory		100 MB, user program
Buffering time real-time clock		3 weeks
Processing time		Approx. 200 µs/1 k instruction
Flags		120 kB remanent data
		CODESYS variable concept
Function blocks		Read CPX module diagnostics
		CPX diagnostic status
		Copy CPX diagnostic trace
		And others
IP address setting		DHCP
		Via CODESYS
		Optional: via operator unit CDSB
Control elements		DIL switch for RUN/STOP
		Optional operator unit CDSB
		Rotary switch for address setting
Configuration support		Operator unit CDSB
		CODESYS V3
Maximum number of modules		10
System parameters		Diagnostic memory
		Fail-safe response
		System start
Module parameters		Channel alarms bundling
		Undervoltage diagnostics
		Channel alarms for undervoltage
		Process value representation, analogue modules
Diagnostics via LED		Force mode
Address capacity of internal bus inputs/outputs		
Max. address capacity of outputs	[byte]	64
Max. address capacity of inputs	[byte]	64

Data sheet – EtherNet/IP controller

Technical data – Interfaces		
Fieldbus interface 1		
Protocol		EtherNet/IP
Function		Bus connection incoming/outgoing
Transmission rate	[Mbps]	100
Type		Ethernet
Connection type		2 x socket
Connection technology		RJ45
Number of pins/wires		8
Galvanic isolation		Yes
Max. address capacity of outputs	[byte]	512
Max. address capacity of inputs	[byte]	512
Fieldbus interface 2		
Protocol		EtherCAT master
Function		Bus connection incoming/outgoing
Transmission rate	[Mbps]	100
Type		Ethernet
Connection type		Socket
Connection technology		RJ45
Number of pins/wires		8
Galvanic isolation		Yes
Ethernet interface		
Protocol		EasyIP
		Modbus TCP
		TCP/IP
		OPC UA
Function		Switch
		Diagnostics
Transmission rate	[Mbps]	10
	[Mbps]	100
Connection type		2 x socket
Connection technology		RJ45
Number of pins/wires		8
USB interface		
USB interface		USB 2.0

Data sheet – EtherNet/IP controller

Technical data – Electrics		
Nominal operating voltage DC	[V DC]	24
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Power failure buffering	[ms]	20
Max. power supply	[A]	8
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	Typically 150
Protection against direct and indirect contact		PELV
Electrical connection, power supply		
Function		Electronics and sensors
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm^2]	0.2 ... 1.5
Note on conductor cross section		0.2 ... 2.5 mm^2 for flexible conductor without wire end sleeve

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	288
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	75.9 x 124.3 x 82.5

Materials		
Housing		PA
Note on materials		RoHS-compliant
PWIS conformity		VDMA24364 zone III

Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +50
Note on ambient temperature	[°C]	–5 ... +60 for vertical installation
Storage temperature	[°C]	–20 ... +70
Corrosion resistance class CRC[1]		0
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) Additional information: www.festo.com/x/topic/kbk

2) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

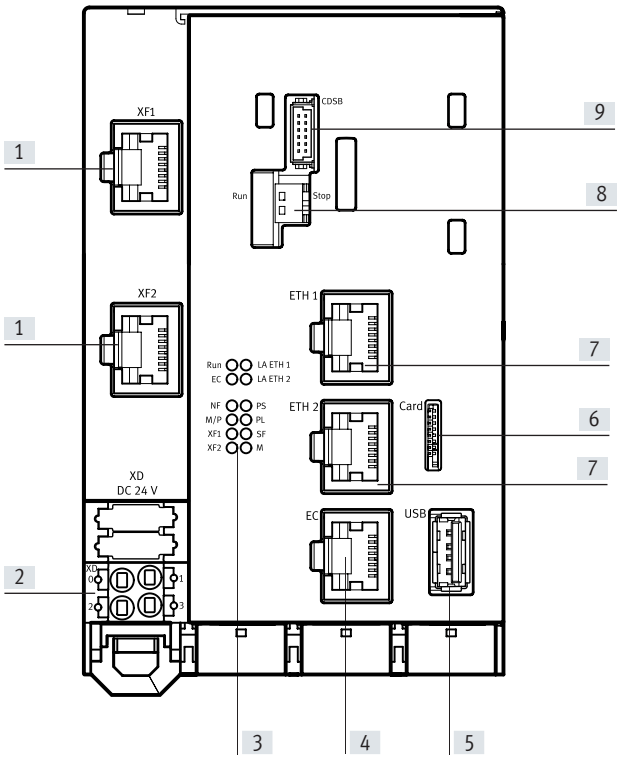
3) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Gc (GB)

Data sheet – EtherNet/IP controller

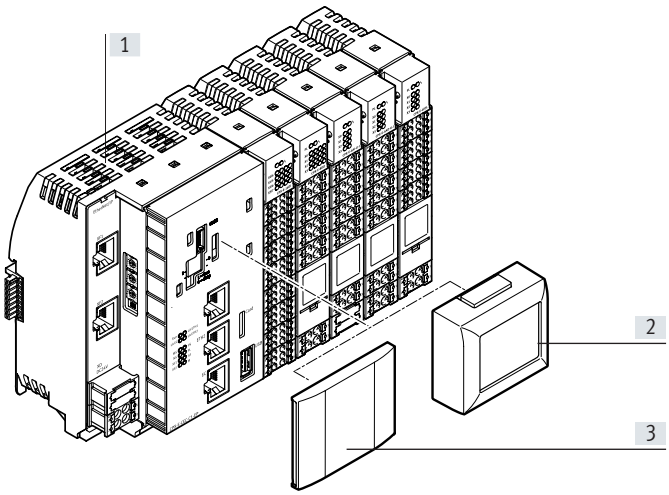
Connection and display components

CPX-E-CEC-...



[1] Network connections 1 and 2, EtherNet/IP
[2] Terminal strip for operating voltage supply
[3] LED indicators
[4] EtherCAT master network connection
[5] USB interface
[6] Slot for micro SD memory card
[7] Network connections 1 and 2, Ethernet
[8] DIL switch for holding and starting projects in CODESYS
[9] Slot for operator unit CDSB

Display and operator unit CDSB-A1



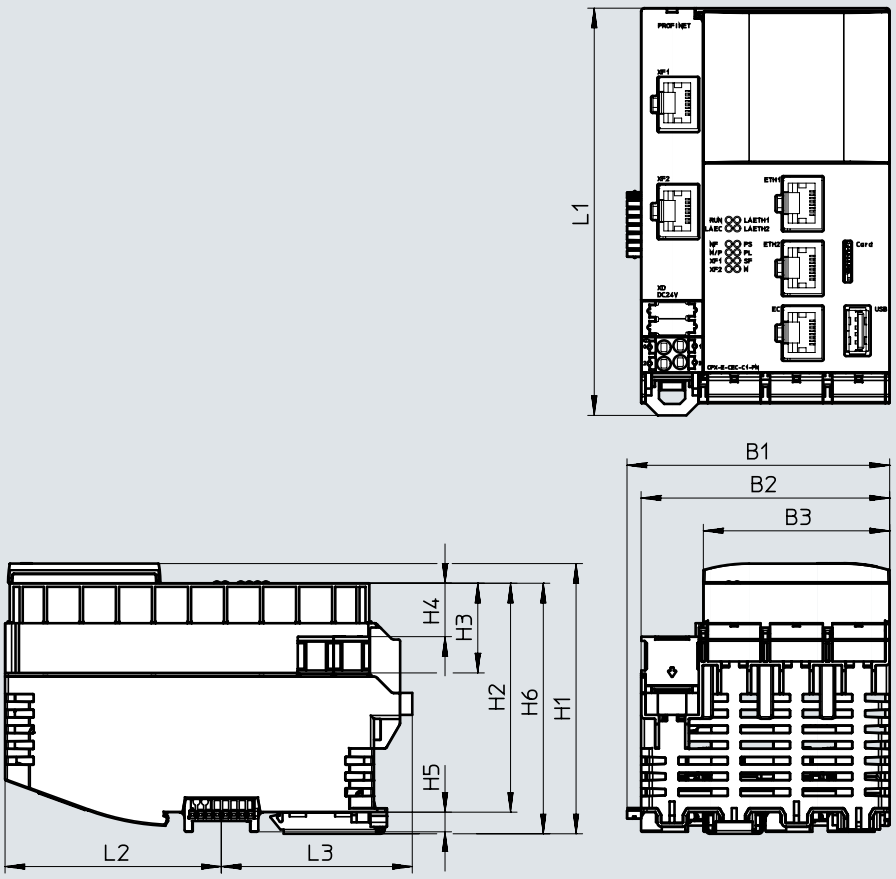
The operator unit CDSB-A1 from Festo is a plug-in display and operator unit for the automation system CPX-E.
The integrated colour TFT display with touchscreen can be used both for operation and for simple diagnostics of the connected basic unit. User-friendliness is enhanced through fault diagnostics with plain-text error messages.

- Display of full-text messages (errors, warnings, data)
- Easy data backup of parameters and firmware in the unit (e.g. for series commissioning or device replacement)
- 1.77" colour TFT display
- 3 GB user memory

[1] CPX-E-CEC
[2] Operator unit CDSB-A1
[3] Cover (included in the scope of delivery of the CPX-E-CEC)

Data sheet – EtherNet/IP controller

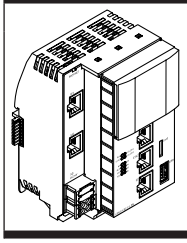
Dimensions Download CAD data ➔ www.festo.com



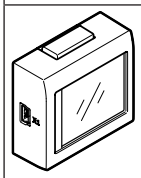
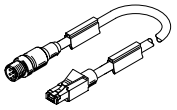
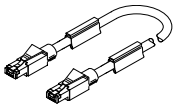
	B1	B2	B3	H1	H2	H3	H4	H5	H6	L1	L2	L3
CPX-E-CEC-...EP	80.2	75.9	56.9	82.5	69.9	27.4	16.3	6	76.5	124.3	66	58.3

Data sheet – EtherNet/IP controller

Ordering data

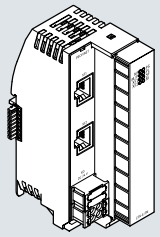
	Bus connection	Additional functions	Part no.	Type
	EtherNet/IP	CODESYS V3	**4252742**	**CPX-E-CEC-C1-EP**
		CODESYS V3 with SoftMotion	**4252744**	**CPX-E-CEC-M1-EP**

Ordering data – Accessories

			Cable length [m]	Part no.	Type
	Memory card	32 GB	–	**8094425**	**CAMC-M-MS-G32-G2**
	Display and operator unit	• Colour touchscreen • Diagnostic function • Update function for CPX-E-CEC (in plugged-in state)	–	**8070984**	**CDSB-A1**
	Straight plug, M12x1, 4-pin, D-coded	Straight plug, RJ45, 8-pin	1	**8040451**	**NEBC-D12G4-ES-1-S-R3G4-ET**
			3	**8040452**	**NEBC-D12G4-ES-3-S-R3G4-ET**
			5	**8040453**	**NEBC-D12G4-ES-5-S-R3G4-ET**
			10	**8040454**	**NEBC-D12G4-ES-10-S-R3G4-ET**
	Straight plug, RJ45, 8-pin	Straight plug, RJ45, 8-pin	1	**8040455**	**NEBC-R3G4-ES-1-S-R3G4-ET**

Data sheet – PROFINET bus module

Bus module for operating the automation system CPX-E on PROFINET. Data is transmitted on the basis of Industrial Ethernet.
The bus module includes the power supply for the modules of the automation system and the connected sensors.



Application

Bus connection

The bus connection is provided via RJ45 sockets which meet Ethernet requirements.
Communication with a higher-order controller takes place via PROFINET with real-time protocol (real time RT or isochronous real time IRT).
The integrated switch supports star and line topology and enables the network to be divided into segments.

Additional functions

- The bus module supports PROFIenergy for reducing the energy requirement through selective switching off of consumers when they are not required
- The bus module has crossover detection, which means that there is the option of using patch cables or crossover cables

Device description file

The bus module is configured using a device description file (GSDML file) which includes all the necessary information for parameterisation.

Web server

The integrated web server enables read access to the most important parameter and diagnostic functions.

General technical data		
Fieldbus interface		
Protocol		PROFINET IRT
		PROFINET IRT
Function		Bus connection incoming/outgoing
Transmission rate	[Mbps]	100
Type		Ethernet
Connection type		2 x socket
Connection technology		RJ45
Number of pins/wires		8
Galvanic isolation		Yes
Max. address volume for outputs	[byte]	64
Max. address capacity inputs	[byte]	64
Address capacity of internal bus inputs/outputs		
Max. address capacity of outputs	[byte]	64
Note on outputs		62 bytes with I/O diagnostic interface
		64 bytes with status bits
		64 bytes without diagnostics
Max. address capacity of inputs	[byte]	64
Note on inputs		62 bytes with I/O diagnostic interface
		62 bytes with status bits
		64 bytes without diagnostics

Data sheet – PROFINET bus module

General data	
Configuration support	GSDML file
Maximum number of modules	10
Additional functions	LLDP
	MRP
	MRPD
	PROFINET FSU
	PROFINET I&MO..3, 1..3 retentive memory possible
	PROFINET Shared device
	S2 system redundancy
	SNMP
System parameters	Diagnostic memory
	Fail-safe response
	Force mode
	System start
Module parameters	Channel alarms bundling
	Undervoltage diagnostics
	Channel alarms for undervoltage
	Process value representation, analogue modules
Diagnostics via LED	Force mode
	Network errors
	Network status connection 1
	Network status connection 2
	Power supply, electronics/sensors
	Power supply load
	System error
	Maintenance required
Diagnostics via the bus	Parameterisation error
	Lower limit value not observed
	Upper limit value not observed
	Wire break
	Short circuit
	PROFIsafe addresses different
	Undervoltage
	Excessive temperature

Technical data – Electrics		
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Power failure buffering	[ms]	20
Max. power supply	[A]	8
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	Typically 75
Protection against direct and indirect contact		PELV
Electrical connection, power supply		
Function		Electronics and sensors
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm^2]	0.2 ... 1.5
Note on conductor cross section	[mm^2]	0.2 ... 2.5 for flexible wire without wire end sleeve

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	145
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	42.2 x 125.8 x 76.5

Data sheet – PROFINET bus module

Materials	
Housing	PA
Note on materials	RoHS-compliant
PWIS conformity	VDMA24364 zone III

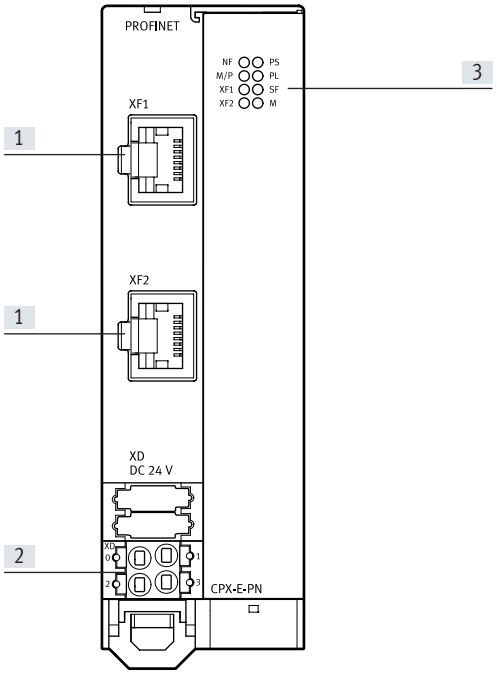
Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +50
Note on ambient temperature		–5 ... +60°C for vertical installation
Storage temperature	[°C]	–20 ... +70
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

2) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6

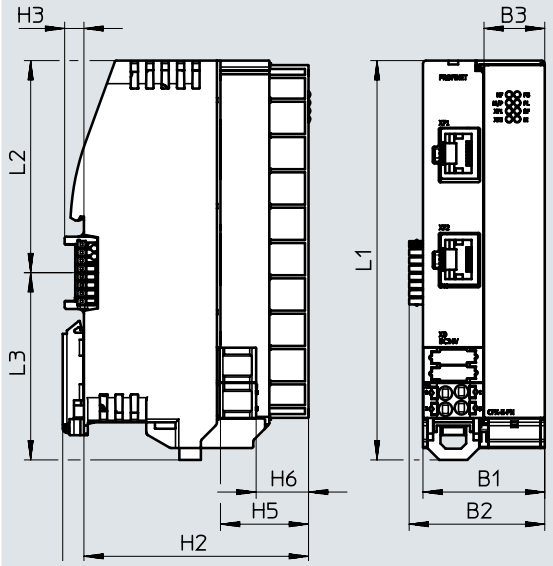
Connection and display components



[1] Network connections 1 and 2, PROFINET
[2] Terminal strip for operating voltage supply
[3] LED indicators

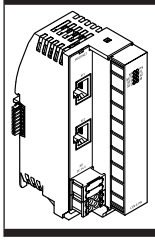
Data sheet – PROFINET bus module

Dimensions Download CAD data ➔ www.festo.com

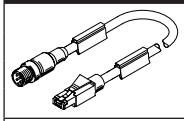
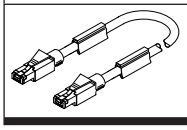


	B1	B2	B3	H1	H2	H3	H5	H6	L1	L2	L3
CPX-E-PN	37.8	42.2	18.9	76.5	69.9	6	27.4	16.3	124.3	66	58.3

Ordering data

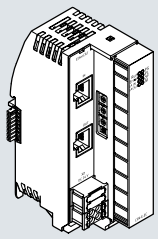
		Part no.	Type
	PROFINET bus module	**4080497**	**CPX-E-PN**

Ordering data – Accessories

	Electrical connection 1	Electrical connection 2	Cable length [m]	Part no.	Type
	Straight plug, M12x1, 4-pin, D-coded	Straight plug, RJ45, 8-pin	1	**8040451**	**NEBC-D12G4-ES-1-S-R3G4-ET**
			3	**8040452**	**NEBC-D12G4-ES-3-S-R3G4-ET**
			5	**8040453**	**NEBC-D12G4-ES-5-S-R3G4-ET**
			10	**8040454**	**NEBC-D12G4-ES-10-S-R3G4-ET**
	Straight plug, RJ45, 8-pin	Straight plug, RJ45, 8-pin	1	**8040455**	**NEBC-R3G4-ES-1-S-R3G4-ET**

Data sheet – EtherCAT bus module

Bus module for operating the automation system CPX-E on EtherCAT. Data is transmitted on the basis of Industrial Ethernet.
The bus module includes the power supply for the modules of the automation system and the connected sensors.



Application

Bus connection

The bus connection is provided via RJ45 sockets which meet Ethernet requirements.
All kinds of topologies are supported.
Manual setting of the EtherCAT address using a rotary coding switch enables the bus to be coupled and decoupled during operation (hot connect).

Additional functions

- The product supports the “distributed clocks” function for the precise synchronisation of participants in an EtherCAT network
- The bus module has crossover detection, which means that there is the option of using patch cables or crossover cables

Device description file

The bus module is configured using a device description file (ESI file) which includes all the necessary information for parameterisation.

Web server

The integrated web server enables read access to the most important parameter and diagnostic functions.

General technical data		
Fieldbus interface		
Protocol		EtherCAT
Function		Bus connection incoming/outgoing
Transmission rate	[Mbps]	100
Type		EtherCAT
Connection type		2 x socket
Connection technology		RJ45
Number of pins/wires		8
Galvanic isolation		Yes
Max. address volume for outputs	[byte]	64
Max. address capacity inputs	[byte]	64
Address capacity of internal bus inputs/outputs		
Max. address capacity of outputs	[byte]	64
Note on outputs		62 bytes with I/O diagnostic interface
		64 bytes with status bits
		64 bytes without diagnostics
Max. address capacity of inputs	[byte]	64
Note on inputs		62 bytes with I/O diagnostic interface
		63 bytes with status bits
		64 bytes without diagnostics

Data sheet – EtherCAT bus module

General technical data	
Configuration support	ESI file
Maximum number of modules	10
System parameters	Diagnostic memory
	Fail-safe response
	Force mode
	System start
Module parameters	Channel alarms bundling
	Undervoltage diagnostics
	Channel alarms for undervoltage
Diagnostics via LED	Connection status
	EtherCAT error
	EtherCAT RUN
	Power supply, electronics/sensors
	Power supply load
	System error
	Maintenance required
Diagnostics via the bus	Parameterisation error
	Lower limit value not observed
	Upper limit value not observed
	Wire break
	Short circuit
	Undervoltage
	Excessive temperature

Technical data – Electrics		
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Power failure buffering	[ms]	20
Max. power supply	[A]	8
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	Typically 64
Protection against direct and indirect contact		PELV
Electrical connection, power supply		
Function		Electronics and sensors
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm^2]	0.2 ... 1.5
Note on conductor cross section	[mm^2]	0.2 ... 2.5 for flexible wire without wire end sleeve

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	145
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	42.2 x 125.8 x 76.5

Materials	
Housing	PA
PWIS conformity	VDMA24364 zone III

Data sheet – EtherCAT bus module

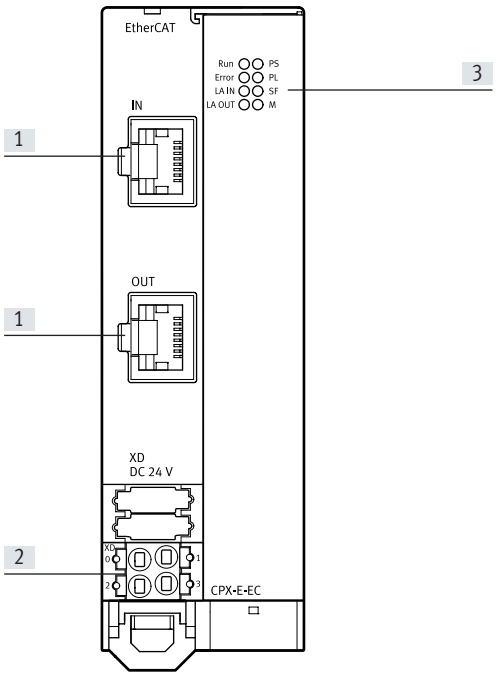
Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +50
Note on ambient temperature		–5 ... +60°C for vertical installation
Storage temperature	[°C]	–20 ... +70
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

2) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

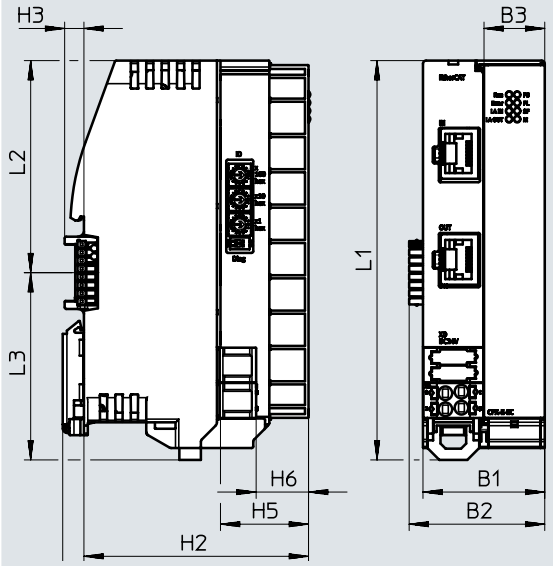
Connection and display components



[1] Network connections 1 and 2, EtherCAT
[2] Terminal strip for operating voltage supply
[3] LED indicators

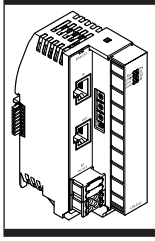
Data sheet – EtherCAT bus module

Dimensions Download CAD data ➔ www.festo.com

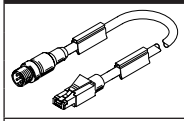
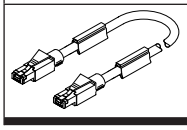


	B1	B2	B3	H1	H2	H3	H5	H6	L1	L2	L3
CPX-E-EC	37.8	42.2	18.9	76.5	69.9	6	27.4	16.3	124.3	66	58.3

Ordering data

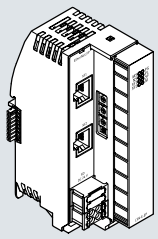
		Part no.	Type
	EtherCAT bus module	**4080498**	**CPX-E-EC**

Ordering data – Accessories

	Electrical connection 1	Electrical connection 2	Cable length [m]	Part no.	Type
	Straight plug, M12x1, 4-pin, D-coded	Straight plug, RJ45, 8-pin	1	**8040451**	**NEBC-D12G4-ES-1-S-R3G4-ET**
			3	**8040452**	**NEBC-D12G4-ES-3-S-R3G4-ET**
			5	**8040453**	**NEBC-D12G4-ES-5-S-R3G4-ET**
			10	**8040454**	**NEBC-D12G4-ES-10-S-R3G4-ET**
	Straight plug, RJ45, 8-pin	Straight plug, RJ45, 8-pin	1	**8040455**	**NEBC-R3G4-ES-1-S-R3G4-ET**

Data sheet – EtherNet/IP bus module

Bus module for operating the automation system CPX-E in an Ethernet network using the protocols EtherNet/IP or Modbus/TCP. Data is transmitted on the basis of Industrial Ethernet.
The bus module includes the power supply for the modules of the automation system and the connected sensors.



Application

Bus connection

The bus connection is provided via RJ45 sockets which meet Ethernet requirements.
The integrated switch supports star and line topology and enables the network to be divided into segments.

Additional functions

- The bus module has quick-start capability (quick connect).
- The bus module has crossover detection, which means that there is the option of using patch cables or crossover cables

Device description file

The bus module is configured using a device description file (EDS file) which includes all the necessary information for parameterisation.

Web server

The integrated web server enables read access to the most important parameter and diagnostic functions.

General technical data		
Fieldbus interface		
Protocol		EtherNet/IP
		Modbus/TCP
Function		Bus connection incoming/outgoing
Transmission rate	[Mbps]	100
Type		Ethernet
Connection type		2 x socket
Connection technology		RJ45
Number of pins/wires		8
Galvanic isolation		Yes
Max. address volume for outputs	[byte]	64
Max. address capacity inputs	[byte]	64
Address capacity of internal bus inputs/outputs		
Max. address capacity of outputs	[byte]	64
Note on outputs		62 bytes with I/O diagnostic interface
		64 bytes with status bits
		64 bytes without diagnostics
Max. address capacity of inputs	[byte]	64
Note on inputs		62 bytes with I/O diagnostic interface
		63 bytes with status bits
		64 bytes without diagnostics

Data sheet – EtherNet/IP bus module

General data	
Configuration support	EDS file
Maximum number of modules	10
System parameters	Diagnostic memory
	Fail-safe response
	Force mode
	Idle response
	System start
Module parameters	Channel alarms bundling
	Undervoltage diagnostics
	Channel alarms for undervoltage
Diagnostics via LED	Network status
	Module status
	Connection status
	Power supply, electronics/sensors
	Power supply load
	System error
	Maintenance required
Diagnostics via the bus	Parameterisation error
	Lower limit value not observed
	Upper limit value not observed
	Wire break
	Short circuit
	Undervoltage
	Excessive temperature

Technical data – Electrics		
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Power failure buffering	[ms]	20
Max. power supply	[A]	8
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	Typically 65
Protection against direct and indirect contact		PELV
Electrical connection, power supply		
Function		Electronics and sensors
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm^2]	0.2 ... 1.5
Note on conductor cross section	[mm^2]	0.2 ... 2.5 for flexible wire without wire end sleeve

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	145
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	42.2 x 125.8 x 76.5

Materials	
Housing	PA
PWIS conformity	VDMA24364 zone III

Data sheet – EtherNet/IP bus module

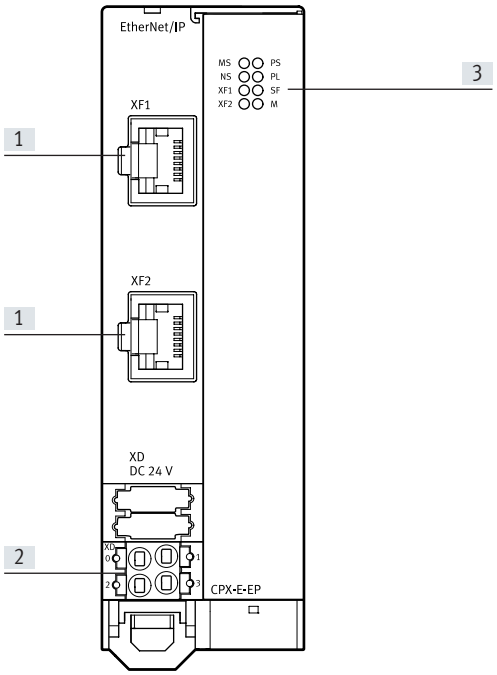
Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +50
Note on ambient temperature		–5 ... +60°C for vertical installation
Storage temperature	[°C]	–20 ... +70
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

2) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

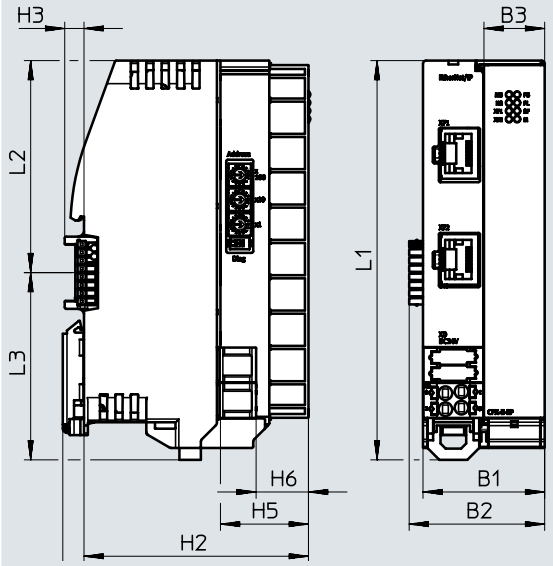
Connection and display components



[1] Network connections 1 and 2, EtherNet/IP
[2] Terminal strip for operating voltage supply
[3] LED indicators

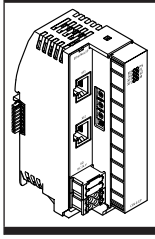
Data sheet – EtherNet/IP bus module

Dimensions Download CAD data ➔ www.festo.com

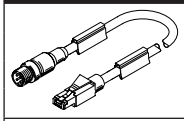
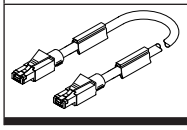


	B1	B2	B3	H1	H2	H3	H5	H6	L1	L2	L3
CPX-E-EP	37.8	42.2	18.9	76.5	69.9	6	27.4	16.3	124.3	66	58.3

Ordering data

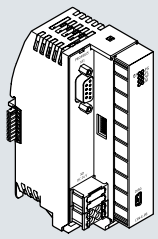
		Part no.	Type
	EtherNet/IP bus module	**4080499**	**CPX-E-EP**

Ordering data – Accessories

	Electrical connection 1	Electrical connection 2	Cable length [m]	Part no.	Type
	Straight plug, M12x1, 4-pin, D-coded	Straight plug, RJ45, 8-pin	1	**8040451**	**NEBC-D12G4-ES-1-S-R3G4-ET**
			3	**8040452**	**NEBC-D12G4-ES-3-S-R3G4-ET**
			5	**8040453**	**NEBC-D12G4-ES-5-S-R3G4-ET**
			10	**8040454**	**NEBC-D12G4-ES-10-S-R3G4-ET**
	Straight plug, RJ45, 8-pin	Straight plug, RJ45, 8-pin	1	**8040455**	**NEBC-R3G4-ES-1-S-R3G4-ET**

Data sheet – PROFIBUS bus module

Bus module for operating the automation system CPX-E on PROFIBUS. Data transmission takes place using an RS485 interface.
The bus module includes the power supply for the modules of the automation system and the connected sensors.



Application

Bus connection

The bus connection is provided via an RS485 interface; the use of an optical adapter makes it possible to transmit data through a fibre-optic cable.
The bus module can be combined with up to 31 other participants in a network.

Additional functions

The bus module has a mini-USB interface via which system data can be read and the bus module can be parameterised.

Parameterisation

The parameterisation data can be sent from the higher-order controller to the bus module via the network.

General technical data

Fieldbus interface						
Protocol		PROFIBUS DP				
Function		Bus connection incoming/outgoing				
Transmission rate	[kbps]	9.6	19.2	93.75	187.5	500
	[Mbps]	1.5	3	6	12	
Type		PROFIBUS				
Connection type		Socket				
Connection technology		Sub-D				
Number of pins/wires		9				
Note on fieldbus interface		Optional connection technology with accessories: plug/socket M12x1 B-coded, 5-pin, degree of protection IP65				
Galvanic isolation		Yes				
Max. address volume for outputs	[byte]	64				
Max. address capacity inputs	[byte]	64				
Service interface						
Function		Diagnostics and parameterisation				
Connection type		Socket				
Connection technology		USB 2.0 type B mini				
Number of pins/wires		5				
Address capacity of internal bus inputs/outputs						
Max. address volume for outputs	[byte]	64				
Note on outputs		62 bytes with I/O diagnostic interface				
		64 bytes with status bits				
		64 bytes without diagnostics				
Max. address capacity inputs	[byte]	64				
Note on inputs		62 bytes with I/O diagnostic interface				
		63 bytes with status bits				
		64 bytes without diagnostics				

Data sheet – PROFIBUS bus module

General data	
Conforms to standard	NAMUR NE 21
Control elements	DIL switch
Configuration support	GSD file
Maximum number of modules	10
System parameters	Diagnostic memory
	Fail-safe response
	Force mode
	System start
Module parameters	Undervoltage diagnostics
	Process value representation, analogue modules
Diagnostics via LED	Bus error
	Force mode
	Power supply, electronics/sensors
	Power supply load
	System error
Diagnostics via the bus	Parameterisation error
	Overflow buffer
	Transmission error
	Requested function not supported
	Not ready for data exchange
	Lower limit value not observed
	Upper limit value not observed
	Wire break
	Short circuit
	Undervoltage
	Watchdog/I/O status

Technical data – Electrics		
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Power failure buffering	[ms]	20
Max. power supply	[A]	8
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	Typically 75
Protection against direct and indirect contact		PELV
Electrical connection, power supply		
Function		Electronics and sensors
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm^2]	0.2 ... 1.5
Note on conductor cross section	[mm^2]	0.2 ... 2.5 for flexible wire without wire end sleeve

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	145
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	42.2 x 125.8 x 76.5

Materials	
Housing	PA
PWIS conformity	VDMA24364 zone III

Data sheet – PROFIBUS bus module

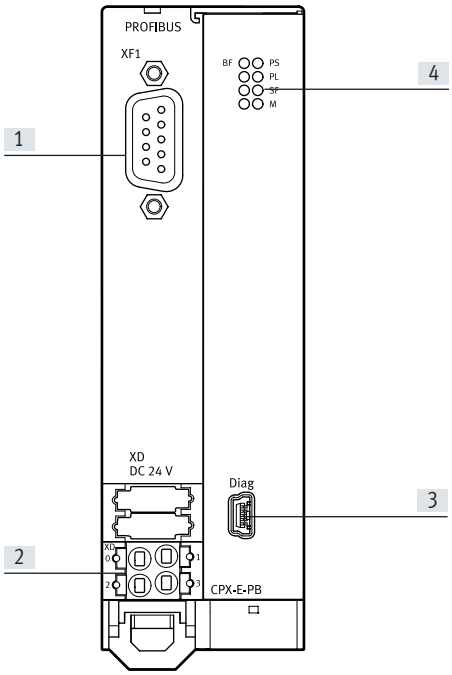
Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +50
Note on ambient temperature		–5 ... +60°C for vertical installation
Storage temperature	[°C]	–20 ... +70
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

2) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

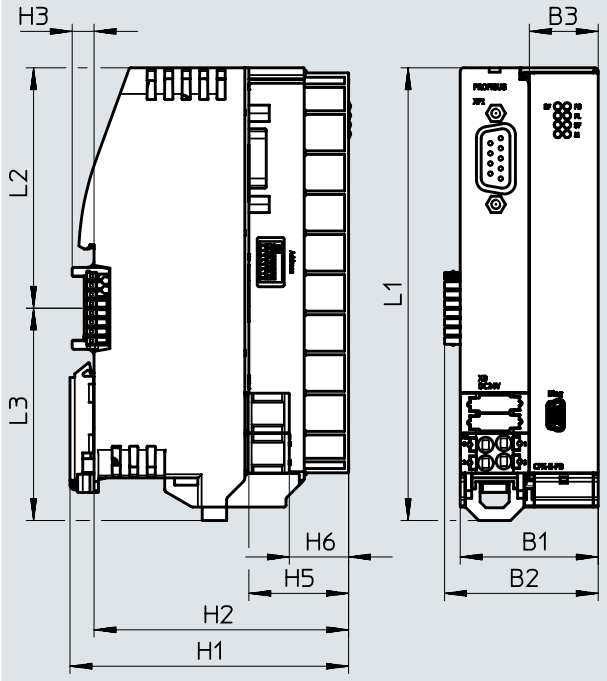
Connection and display components



[1] Network connection, PROFIBUS
[2] Terminal strip for operating voltage supply
[3] USB interface, mini USB
[4] LED indicators

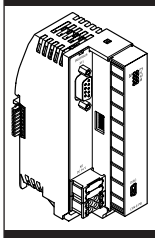
Data sheet – PROFIBUS bus module

Dimensions Download CAD data ➔ www.festo.com

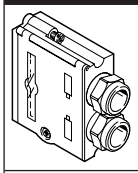
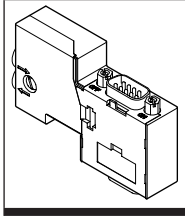


	B1	B2	B3	H1	H2	H3	H5	H6	L1	L2	L3
CPX-E-PB	37.8	42.2	18.9	76.5	69.9	6	27.4	16.3	124.3	66	58.3

Ordering data

		Part no.	Type
	PROFIBUS bus module	**4080496**	**CPX-E-PB**

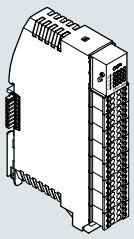
Ordering data – Accessories

		Part no.	Type
	Sub-D plug, straight	**532216**	**FBS-SUB-9-GS-DP-B**
	Sub-D plug, straight, with terminating resistor and programming interface	**574589**	**NECU-S1W9-C2-APB**

Data sheet – Digital input modules

Function
Digital input modules make it easier to connect proximity switches or other 24 V DC sensors (inductive, capacitive, etc.).

Area of application
- Input modules for 24 V DC sensor signals
- Terminal strip
- Display of the input statuses for each input signal via an assigned LED
- Operating voltage supply 24 V DC for all connected sensors
- Diagnostic LED for short circuit/ overload of sensor supply



General technical data					
Number of inputs		16			
Max. address capacity of inputs	[byte]	2			
Input characteristics		To IEC 61131-2, type 3			
Switching logic at inputs		PNP (positive switching)			
		2- and 3-wire sensors to IEC 61131-2			
Fuse protection (short circuit)		Internal electronic fuse per module			
Electrical isolation between channel and internal bus		No			
Electrical isolation between channels		No			
Switching level	Signal 0	≤5 V			
	Signal 1	≥11 V			
Input debounce time	[ms]	0.1	3	10	20

General data	
Module parameters	Diagnostics of sensor supply short circuit
	Behaviour after short circuit/overload
	Input debounce time
	Signal extension time
Channel parameters	Signal extension
Diagnostics via LED	Errors per module
	Status per channel
Diagnostics via the bus	Short circuit/overload in sensor supply

Technical data – Electrics		
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	15
Max. residual current of inputs per module	[A]	1.8
Electrical connection, input		
Function		Digital input
Connection type		8x terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		6
Conductor cross section	[mm²]	0.2 ... 1.5
Note on conductor cross section	[mm²]	0.2 ... 2.5 for flexible wire without wire end sleeve

Data sheet – Digital input modules

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	102
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	18.9 x 76.6 x 124.3

Materials	
Housing	PA
PWIS conformity	VDMA24364 zone III

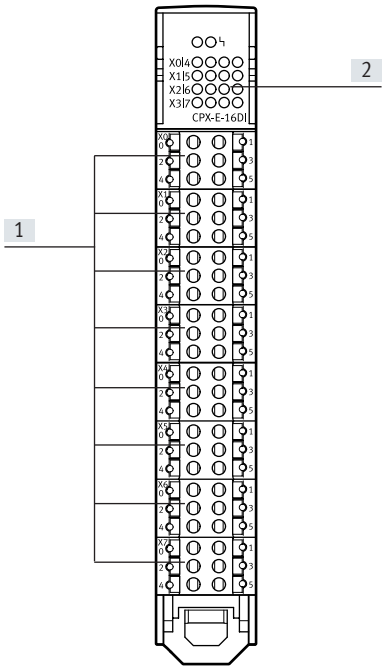
Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +50
Note on ambient temperature		–5 ... +60°C for vertical installation
Storage temperature	[°C]	–20 ... +70
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

2) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

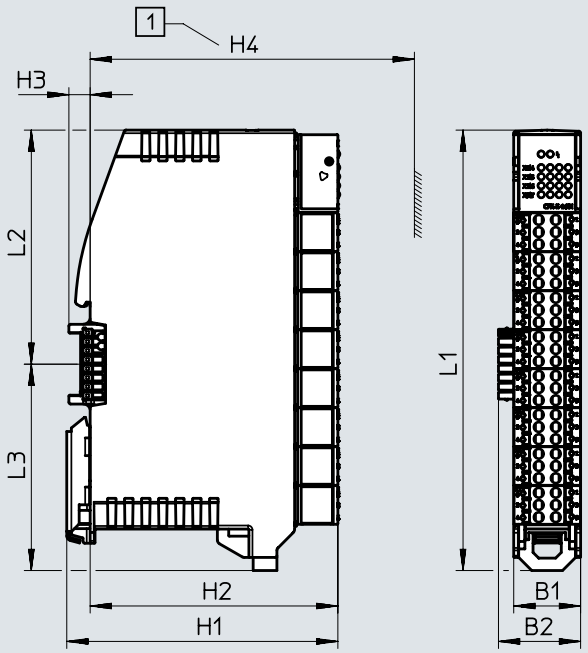
Connection and display components



[1] Digital inputs, 8 terminal strips with 2 inputs each
[2] LED indicators

Data sheet – Digital input modules

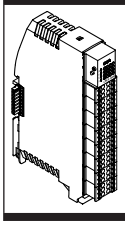
Dimensions Download CAD data ➔ www.festo.com



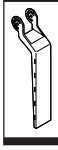
[1] Height with identification holder

	B1	B2	H1	H2	H3	H4	L1	L2	L3
CPX-E-16DI	18.9	23.2	76.5	69.9	6	91.5	124.3	66	58.3

Ordering data

		Part no.	Type
	Digital input module with 16 inputs	**4080492**	**CPX-E-16DI**

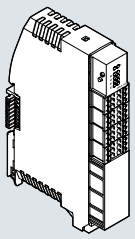
Ordering data – Accessories

		Part no.	Type
	Identification holder, 5 pieces	**4080500**	**CAFC-X3-C**

Data sheet – Digital counter modules

Function
Digital counter modules support the connection of encoders for detecting pulses.

Area of application
- Incremental encoder with two phase-offset signals and optional signal 0
- Pulse generator with or without direction signal
- Differential encoder input with 5 V DC operating voltage
- Single encoder input (single ended) with 5 V DC or 24 V DC operating voltage
- Operating voltage supply for all connected encoders/sensors
- Diagnostics LED



General technical data				
Number of inputs		4		
Max. address capacity of inputs	[byte]	12		
Input characteristics		To IEC 61131-2, type 3		
Switching logic at inputs		PNP (positive switching)		
		2- and 3-wire sensors to IEC 61131-2		
Max. address capacity of outputs	[byte]	2		
Fuse protection (short circuit)		Internal electronic fuse per module		
Electrical isolation between channel and internal bus		No		
Electrical isolation between channels		No		
Switching level	Signal 0	≤5 V		
	Signal 1	≥11 V		
Input debounce time	[ms]	0.02	0.1	3

General data	
Module parameters	Signal type/encoder type
	Signal evaluation
	Monitoring of cable break
	Monitoring of tracking error
	Monitoring of zero pulse
	Pulse/zero pulse
	Latch signal
	Latch event
	Latch response
	Upper count limit
	Lower count limit
	Load value
	Debounce time for digital inputs
	Integration time for speed measurement
	Internal revision ID
Channel parameters	Signal extension

Data sheet – Digital counter modules

General data	
Diagnostics via LED	Errors per module
	Status per channel
	Encoder supply error
	Encoder error
	Encoder normal operation
	Encoder supply normal operation
Diagnostics via the bus	Short circuit/overload in sensor supply
	Measuring system error
	Parameter error
	Monitoring wire break
	Monitoring of zero pulse
	Monitoring of tracking error

Technical data – Electrics		
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	Typically 15
Max. residual current of inputs per module	[A]	1.8
Power failure buffering	[ms]	10
Electrical connection input 1		
Function		Digital input
Connection type		2x terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		6
Conductor cross section	[mm²]	0.2 ... 1.5
Note on conductor cross section	[mm²]	0.2 ... 2.5 for flexible wire without wire end sleeve
Electrical connection input 2		
Function		Counting input
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		6
Conductor cross section	[mm²]	0.2 ... 1.5
Note on conductor cross section	[mm²]	0.2 ... 2.5 for flexible wire without wire end sleeve
Power supply		
Function		Encoder supply
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		6
Conductor cross section	[mm²]	0.2 ... 1.5
Note on conductor cross section	[mm²]	0.2 ... 2.5 for flexible wire without wire end sleeve

Data sheet – Digital counter modules

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	88
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	18.9 x 76.6 x 124.3

Materials	
Housing	PA
PWIS conformity	VDMA24364 zone III

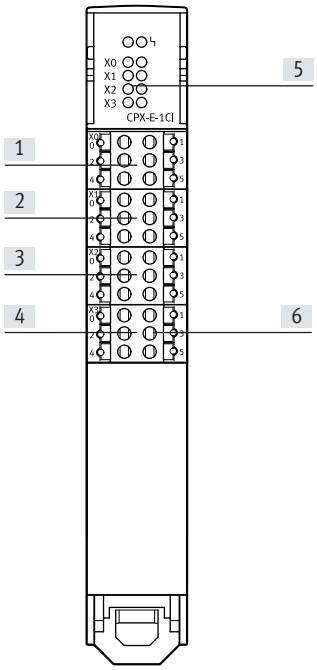
Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +50
Note on ambient temperature		–5 ... +60°C for vertical installation
Storage temperature	[°C]	–20 ... +70
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

2) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

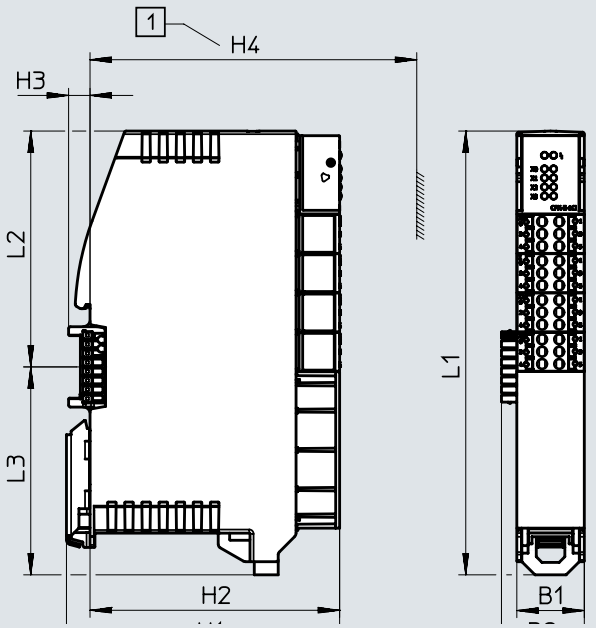
Connection and display components



[1] Transmit count/block count transmission control inputs
[2] Set counter/block counter control inputs
[3] Counter input, 1 terminal strip
[4] 24 V DC supply voltage for encoder
[5] LED indicators
[6] 5 V DC supply voltage for encoder

Data sheet – Digital counter modules

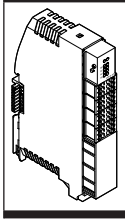
Dimensions Download CAD data ➔ www.festo.com



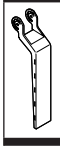
[1] Height with identification holder

	B1	B2	H1	H2	H3	H4	L1	L2	L3
CPX-E-1CI	18.9	23.2	76.5	69.9	6	91.5	124.3	66	58.3

Ordering data

		Part no.	Type
	Digital counter module with 1 input	**4827505**	**CPX-E-1CI**

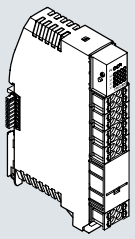
Ordering data – Accessories

		Part no.	Type
	Identification holder, 5 pieces	**4080500**	**CAFC-X3-C**

Data sheet – Digital output modules

Function
Digital output modules make it possible to connect electrical consumers in accordance with IEC 1131-2 type 0.5 (valves, contactors or display components) with an operating voltage of 24 V DC.

Area of application
- Output modules for 24 V DC operating voltage
- Terminal strip
- Electronic fuse protection against short circuit or overload with automatic resetting
- Error display via LED
- Slow response; possible short-term increase in current requirement



General technical data		
Number of outputs		8
Max. address capacity of outputs	[byte]	1
Characteristic curve outputs		To IEC 61131-2, type 0.5
Switching logic at outputs		PNP (positive switching)
Fuse protection (short circuit)		Internal electronic fuse per channel
Electrical isolation between channel and internal bus		Yes
Electrical isolation between channels		No

General data	
Module parameters	Diagnostics of short circuit at output
	Behaviour after short circuit/overload
	Diagnostics for undervoltage in load supply
Channel parameters	Force channel x
Diagnostics via LED	Errors per module
	Error per channel
	Status per channel
Diagnostics via the bus	Short circuit/overload at output
	Undervoltage in load supply
	Module error

Technical data – Electrics		
Nominal operating voltage DC load	[V DC]	24
Permissible voltage fluctuations, load	[%]	±25
Intrinsic current consumption at nominal operating voltage, load	[mA]	34
Max. residual current outputs per module	[A]	4
Protection against direct and indirect contact		PELV
Electrical connection, output		
Function		Digital output
Connection type		4x terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm²]	0.2 ... 1.5
Note on conductor cross section	[mm²]	0.2 ... 2.5 for flexible wire without wire end sleeve
Power supply		
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm²]	0.2 ... 1.5
Note on conductor cross section	[mm²]	0.2 ... 2.5 for flexible wire without wire end sleeve

Data sheet – Digital output modules

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	93
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	18.9 x 76.6 x 124.3

Materials	
Housing	PA
PWIS conformity	VDMA24364 zone III

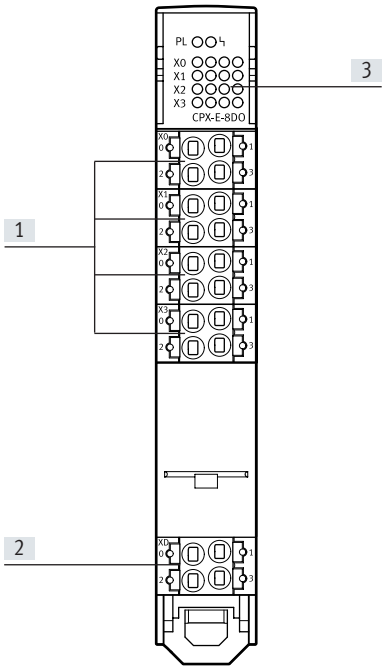
Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +50
Note on ambient temperature		–5 ... +60°C for vertical installation
Storage temperature	[°C]	–20 ... +70
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

2) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

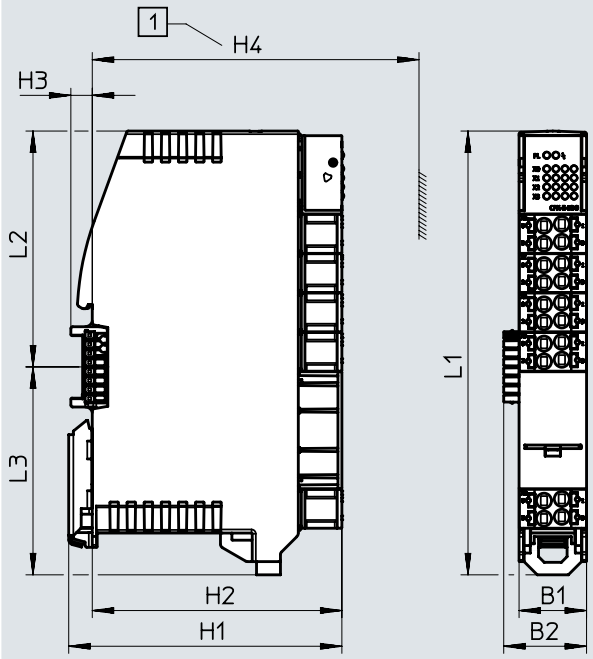
Connection and display components



[1] Digital outputs, 4 terminal strips with 2 outputs each
[2] Terminal strip for operating voltage supply
[3] LED indicators

Data sheet – Digital output modules

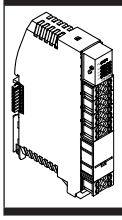
Dimensions Download CAD data ➔ www.festo.com



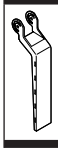
[1] Height with identification holder

	B1	B2	H1	H2	H3	H4	L1	L2	L3
CPX-E-8DO	18.9	23.2	76.5	69.9	6	91.5	124.3	66	58.3

Ordering data

		Part no.	Type
	Digital output module with 8 outputs	**4080491**	**CPX-E-8DO**

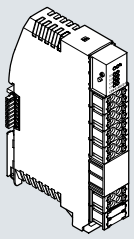
Ordering data – Accessories

		Part no.	Type
	Identification holder, 5 pieces	**4080500**	**CAFC-X3-C**

Data sheet – Analogue input modules

Function
Analogue input modules make it possible to detect analogue input signals such as current or voltage.

Area of application
- Measurement ranges, limit values, measured value smoothing and diagnostic behaviour can be set
- Terminal strip
- Electronic fuse protection against short circuit or overload with automatic resetting
- Error display via LED
- Slow response; possible short-term increase in current requirement



General technical data								
Number of inputs		4						
Max. address capacity of inputs	[byte]	8						
Measured variable		Voltage				Current		
Signal range	[V]	–10 ... +10	–5 ... +5	0 ... +10	+1 ... +5	–	–	–
	[mA]	–	–	–	–	–20 ... +20	0 ... +20	+4 ... +20
Repetition accuracy	[%]	±0.1 at 25°C						
Data format		15 bits + prefix						
		Linear scaling						
Basic fault limit	[%]	±0.2 at 25°C						
Operating error limit related to the ambient temperature range	[%]	±0.3						
Fuse protection (short circuit)		Internal electronic fuse per module						
Maximum cable length	[m]	30						
		Shielded						
Electrical isolation between channel and internal bus		Yes						
Electrical isolation between channels		No						

General data	
Module parameters	Diagnostics of sensor supply short circuit
	Parameterisation error diagnostics
	Diagnostics of overload at analogue inputs
	Behaviour after short circuit/overload
	Behaviour after overload on analogue inputs
	Data format analogue inputs
	Hysteresis limit monitoring
	Deactivate sensor supply
Channel parameters	Signal range per channel
	Diagnostics for lower limit
	Diagnostics for upper limit
	Wire break diagnostics
	Underflow/overflow diagnostics
	Parameter error diagnostics
	Smoothing factor
	Lower/upper limits
Diagnostics via LED	Errors per module
	Error per channel
Diagnostics via the bus	Short circuit/overload in sensor supply
	Parameterisation error
	Parameter error
	Overload at analogue inputs
	Upper/lower limit value exceeded
	Wire break
	Underflow/overflow

Data sheet – Analogue input modules

Technical data – Electrics		
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Power failure buffering	[ms]	10
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	70
Max. residual current of inputs per module	[A]	1.4
Electrical connection, input		
Function		Analogue input
Connection type		4x terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm²]	0.2 … 1.5
Note on conductor cross section	[mm²]	0.2 … 2.5 for flexible wire without wire end sleeve

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	96
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	18.9 x 76.6 x 124.3

Materials	
Housing	PA
PWIS conformity	VDMA24364 zone III

Operating and environmental conditions		
Ambient temperature	[°C]	–5 … +50
Note on ambient temperature		–5 … +60°C for vertical installation
Storage temperature	[°C]	–20 … +70
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

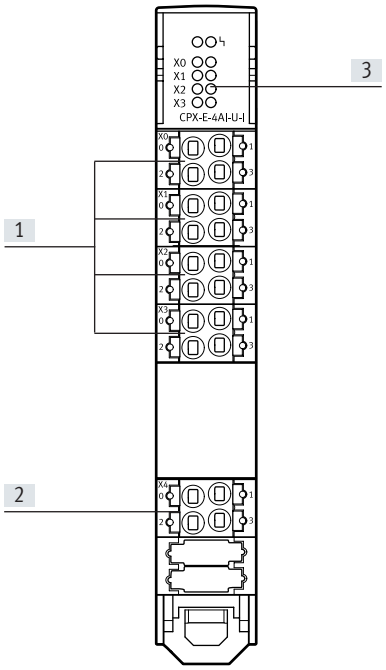
1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

2) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

Data sheet – Analogue input modules

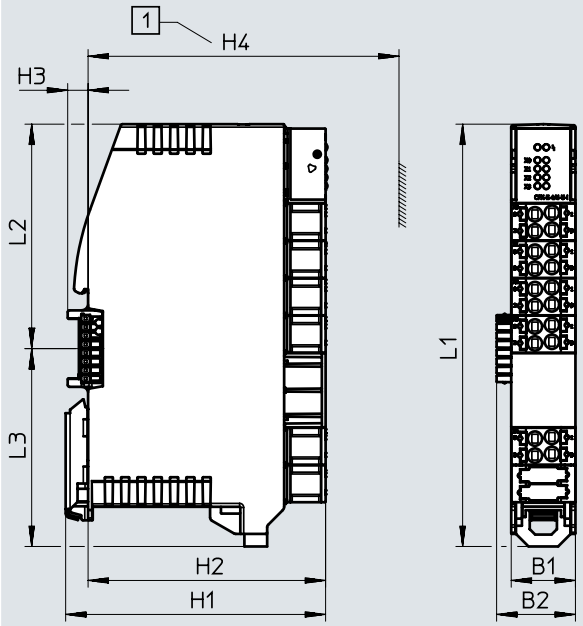
Connection and display components



[1] Analogue inputs, 4 terminal strips each with one input
[2] Terminal strip for operating voltage supply
[3] 4 connections for functional earth (FE)

Dimensions

Download CAD data ➔ www.festo.com

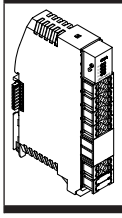


[1] Height with identification holder

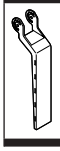
	B1	B2	H1	H2	H3	H4	L1	L2	L3
CPX-E-4AI-U-I	18.9	23.2	76.5	69.9	6	91.5	124.3	66	58.3

Data sheet – Analogue input modules

Ordering data

		Part no.	Type
	Analogue input module with 4 inputs	**4080493**	**CPX-E-4AI-U-I**

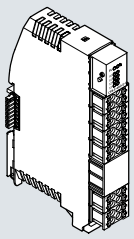
Ordering data – Accessories

		Part no.	Type
	Identification holder, 5 pieces	**4080500**	**CAFC-X3-C**

Data sheet – Analogue output modules

Function
The module converts the value specified by the controller (15-bit value with prefix) and transfers it to a connected actuator as an analogue current or voltage value.

Area of application
- Output signal (current/voltage) can be set
- Terminal strip
- Electronic fuse protection against short circuit or overload with automatic resetting
- Error display via LED
- Slow response; possible short-term increase in current requirement



General technical data

Number of outputs		4					
Max. address capacity of outputs	[byte]	8					
Measured variable		Voltage			Current		
Signal range	[V]	–10 ... +10	–5 ... +5	0 ... +10	–	–	–
	[mA]	–	–	–	–20 ... +20	0 ... +20	+4 ... +20
Repetition accuracy	[%]	±0.05 at 25°C					
Data format		15 bits + prefix					
		Linear scaling					
Basic fault limit	[%]	±0.1 at 25°C					
Operating error limit related to the ambient temperature range	[%]	±0.3					
Fuse protection (short circuit)		Internal electronic fuse per module					
Maximum cable length	[m]	30					
		Shielded					
Electrical isolation between channel and internal bus		Yes					
Electrical isolation between channels		No					

General data

Module parameters	Short circuit diagnostics for actuator supply
	Parameterisation error diagnostics
	Diagnostics for undervoltage in load supply
	Behaviour after short circuit/overload in actuator supply
	Behaviour after short circuit/overload at analogue output
	Data format for analogue outputs
	Deactivate actuator supply
Channel parameters	Signal range per channel
	Enable overload/short circuit diagnostics
	Enable wire break/idling diagnostics
	Release for parameterisation error diagnostics
	Force channel x
Diagnostics via LED	Errors per module
	Error per channel
Diagnostics via the bus	Short circuit/overload in actuator supply
	Parameterisation error
	Nominal range exceeded
	Nominal range not reached
	Short circuit/overload at analogue output
	Undervoltage in load supply
	General error

Data sheet – Analogue output modules

Technical data – Electrics		
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Nominal operating voltage DC load	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Permissible voltage fluctuations, load	[%]	±25
Power failure buffering	[ms]	10
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	60
Intrinsic current consumption at nominal operating voltage, load	[mA]	15
Max. residual current outputs per module	[A]	2
Protection against direct and indirect contact		PELV
Electrical connection, output		
Function		Analogue output
Connection type		4x terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm²]	0.2 … 1.5
Note on conductor cross section	[mm²]	0.2 … 2.5 for flexible wire without wire end sleeve
Power supply		
Connection type		2x terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm²]	0.2 … 1.5
Note on conductor cross section	[mm²]	0.2 … 2.5 for flexible wire without wire end sleeve

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	96
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	18.9 x 76.6 x 124.3

Materials	
Housing	PA
PWIS conformity	VDMA24364 zone III

Operating and environmental conditions		
Ambient temperature	[°C]	–5 … +50
Note on ambient temperature		–5 … +60°C for vertical installation
Storage temperature	[°C]	–20 … +70
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

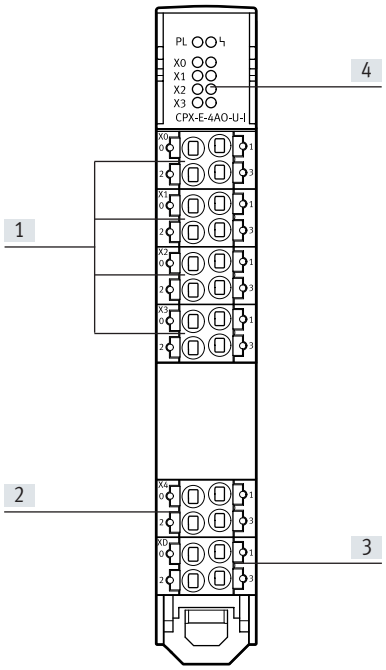
1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E → Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

2) Additional information: www.festo.com/catalogue/CPX-E → Support/Downloads.

Data sheet – Analogue output modules

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

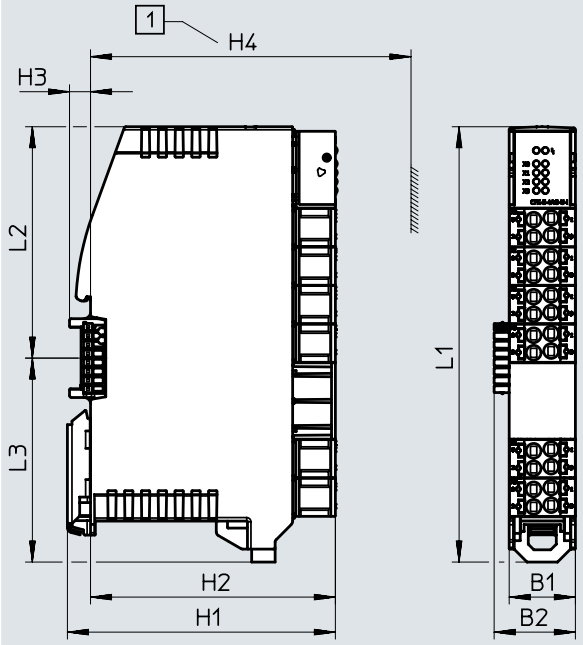
Connection and display components



[1] Analogue outputs, 4 terminal strips each with one output
[2] 4 connections for functional earth (FE)
[3] Terminal strip for operating voltage supply
[4] LED indicators

Dimensions

Download CAD data ➔ www.festo.com

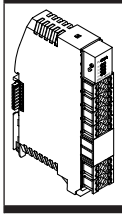


[1] Height with identification holder

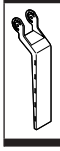
	B1	B2	H1	H2	H3	H4	L1	L2	L3
CPX-E-4AO-U-I	18.9	23.2	76.5	69.9	6	91.5	124.3	66	58.3

Data sheet – Analogue output modules

Ordering data

		Part no.	Type
	Analogue output module with 4 outputs	**4080494**	**CPX-E-4AO-U-I**

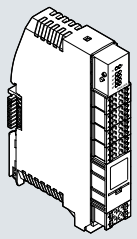
Ordering data – Accessories

		Part no.	Type
	Identification holder, 5 pieces	**4080500**	**CAFC-X3-C**

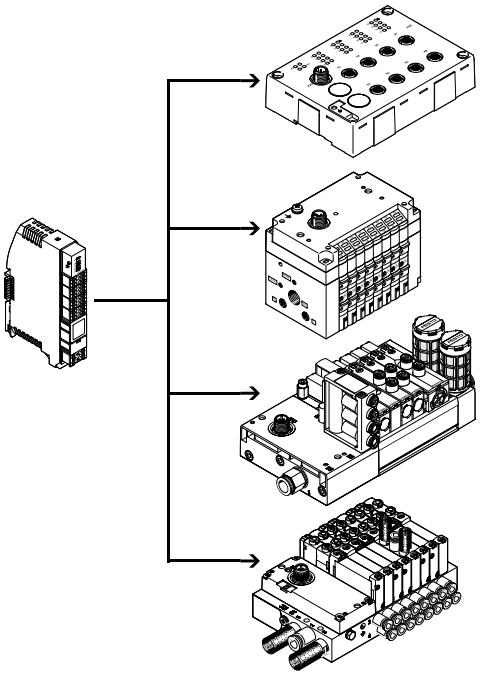
Data sheet – IO-Link master modules

Function
The IO-Link master module establishes the connection to modules that have an IO-Link interface (device). The I/O data from the connected devices is transmitted to the connected CPX-E bus module and thus to the higher-order controller via fieldbus.

Area of application
- Address space can be set
- Terminal strip
- Electronic fuse protection against short circuit or overload with automatic resetting
- Error display via LED
- Slow response; possible short-term increase in current requirement



Application – Example configuration



The IO-Link master module provides 4 external IO-Link interfaces.
As well as transmitting the communication data, the IO-Link interfaces also transmit the power supply to the connected sensors and the load supply to the valves (or outputs). Both circuits are supplied separately with 24 V, using a separate reference potential. The load voltage supply is fed directly into the module.

The address space provided by the IO-Link master module to the IO-Link interfaces (ports) is set using DIL switches.
It can be set from 2 ... 32 bytes per port. Since the address space for the module is limited to a total of 32 bytes, there is the following gradation:
- For 2, 4 or 8 bytes per port, all 4 ports are active
- For 16 bytes per port, 2 ports are active
- For 32 bytes per port, just 1 port is active

The behaviour of the master module is defined using parameters.

General technical data			
Protocol			IO-Link
IO-Link	No. of ports		4
	Port class		B
	Communication mode		SIO, COM1 (4.8 kBaud), COM2 (38.4 kBaud), COM3 (230.4 kBaud)
			Configurable via software
	Communication		C/Q green LED
	Minimum cycle time		Depending on minimally supported cycle time of connected IO-Link device
	Protocol version		Master V 1.1
	Process data width IN	[byte]	8 ... 32, parameterisable
	Process data width OUT	[byte]	8 ... 32, parameterisable
Fuse protection (short circuit)			Internal electronic fuse, sensor for each module
			Internal electronic fuse, load per channel
Electrical isolation between channel and internal bus			No
Electrical isolation between channels			No

Data sheet – IO-Link master modules

General data	
Module parameters	Short circuit diagnostics for actuator supply
	Behaviour after short circuit/overload
	Deactivate sensor supply
Channel parameters	Deactivate actuator supply
	Device error code
	Channel mode
	Channel status
	Force channel x
Diagnostics via LED	Errors per module
	Status per channel
Diagnostics via the bus	Short circuit
	Parameter error
	Wire break
	Module error
	Device missing/failed
	Underflow/overflow
	Undervoltage
	General error

Technical data – Electrics		
Nominal operating voltage DC for electronics/sensors	[V DC]	24
Nominal operating voltage DC load	[V DC]	24
Permissible voltage fluctuations for electronics/sensors	[%]	±25
Permissible voltage fluctuations, load	[%]	±25
Intrinsic current consumption at nominal operating voltage for electronics/sensors	[mA]	50
Intrinsic current consumption at nominal operating voltage, load	[mA]	15
Protection against direct and indirect contact		PELV
Electrical connection, IO-Link		
Connection type		4x terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		6
Conductor cross section	[mm²]	0.2 ... 1.5
Note on conductor cross section	[mm²]	0.2 ... 2.5 for flexible wire without wire end sleeve
Power supply		
Connection type		Terminal strip
Connection technology		Spring-loaded terminal
Number of pins/wires		4
Conductor cross section	[mm²]	0.2 ... 1.5
Note on conductor cross section	[mm²]	0.2 ... 2.5 for flexible wire without wire end sleeve

Technical data – Mechanical components		
Type of mounting		With H-rail
Product weight	[g]	96
Grid dimension	[mm]	18.9
Dimensions W x L x H	[mm]	18.9 x 76.6 x 124.3

Materials	
Housing	PA
PWIS conformity	VDMA24364 zone III

Data sheet – IO-Link master modules

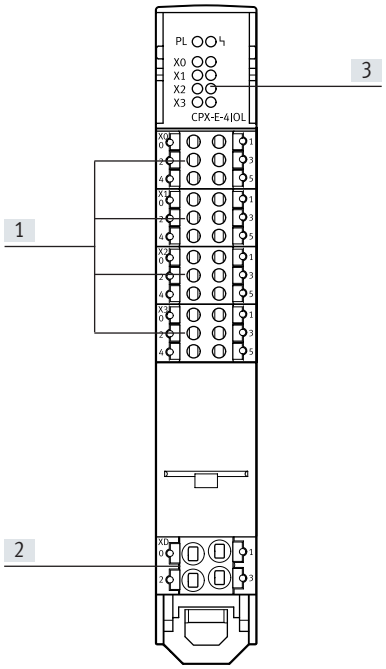
Operating and environmental conditions		
Ambient temperature	[°C]	–5 ... +60
Note on ambient temperature		–5 ... 50°C for horizontal installation
Storage temperature	[°C]	–20 ... +70
Relative humidity	[%]	95
		Non-condensing
CE marking (see declaration of conformity)[2]		To EU EMC Directive[1]
		To EU RoHS Directive
		To EU Explosion Protection Directive (ATEX)
UKCA marking (see declaration of conformity)[2]		To UK instructions for EMC
		To UK RoHS instructions
		To UK EX instructions
KC mark		KC EMC
Certification		RCM
		c UL us-Listed (OL)
Certificate issuing authority		UL E239998
Degree of protection		IP20

1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

2) Additional information: www.festo.com/catalogue/CPX-E ➔ Support/Downloads.

Safety characteristics	
Shock resistance	Shock test with severity level 1 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6
Explosion protection certification outside the EU	EPL Da (GB)

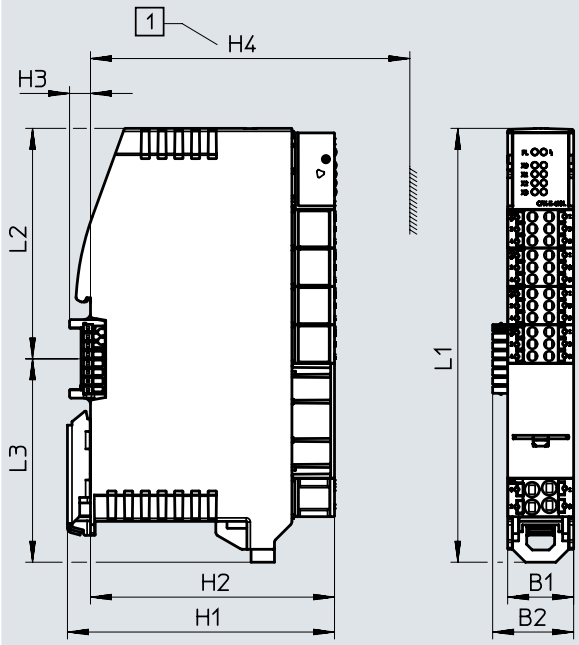
Connection and display components



[1] IO-Link ports, 4 terminal strips each with one port
[2] Terminal strip for operating voltage supply, load voltage
[3] LED indicators

Data sheet – IO-Link master modules

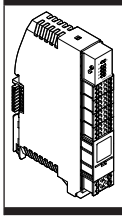
Dimensions Download CAD data ➔ www.festo.com



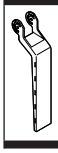
[1] Height with identification holder

	B1	B2	H1	H2	H3	H4	L1	L2	L3
CPX-E-4IOL	18.9	23.2	76.5	69.9	6	91.5	124.3	66	58.3

Ordering data

		Part no.	Type
	IO-Link master module with 4 ports	**4080495**	**CPX-E-4IOL**

Ordering data – Accessories

		Part no.	Type
	Identification holder, 5 pieces	**4080500**	**CAFC-X3-C**

Ordering data – Modular product system

Ordering table

		Condi-tions	Code		Enter code
Module no.	**5237644**				
Product type	System CPX-E	[1]	**60E**		60E
Electrical control	PROFIBUS bus module	[1]	**-PB**		
	PROFINET bus module	[1]	**-PN**		
	EtherNet/IP bus module	[1]	**-EP**		
	EtherCAT bus module	[1]	**-EC**		
	Controller CODESYS V3, PROFINET	[1]	**-CPN**		
	Controller CODESYS V3 with SoftMotion, PROFINET	[1]	**-MPN**		
	Controller CODESYS V3, EtherNet/IP	[1]	**-CEP**		
	Controller CODESYS V3 with SoftMotion, EtherNet/IP	[1]	**-MEP**		
	Controller CODESYS V3	[1]	**-CB**		
	Controller CODESYS V3 with SoftMotion	[1]	**-MB**		
Input/output modules	Digital input module with 16 inputs	[1]	**M**		
	Digital output module with 8 outputs	[1]	**L**		
	Analogue input module with 4 inputs (current/voltage)	[1]	**NI**		
	Analogue output module with 4 outputs (current/voltage)	[1]	**NO**		
	IO-Link master module	[1]	**T51**		
	Counter module	[1]	**T53**		
Module configuration for IO-Link master module	DIL1 ... 8: OFF (64 bit consumption) 4 active ports,16-bit I/O per port		**OO**		
	DIL 1: ON (128 bit consumption) 4 active ports, 32-bit I/O per port		**IO**		
	DIL 2: ON (256 bit consumption) 4 active ports, 64-bit I/O per port		**OI**		
	DIL 1: ON, DIL 2: ON, DIL4: ON (256 bit consumption) 2 active ports, 128-bit I/O per port		**II**		
	DIL 3: ON, DIL 5: ON (256 bit consumption) 1 active port, 256-bit I/O per port		**III**		
Accessories	Module cover including label strips		**+MH**		
	32 GB memory card		**+SK**		
	Display and operating unit		**+AB**		

1) A maximum of one bus module or one controller and 10 input/output modules can be included.

Festo - Your Partner in Automation

1 Festo Inc.

5300 Explorer Drive
Mississauga, ON L4W 5G4
Canada

Festo Customer Interaction Center
Tel: 1 877 463 3786
Fax: 1 877 393 3786
Email: customer.service.ca@festo.com

2 Festo Pneumatic

Av. Ceylán 3,
Col. Tequesquináhuac
54020 Tlalnepantla,
Estado de México

Multinational Contact Center
01 800 337 8669

ventas.mexico@festo.com

3 Festo Corporation

1377 Motor Parkway
Suite 310
Islandia, NY 11749

4 Regional Service Center

7777 Columbia Road
Mason, OH 45040

Festo Customer Interaction Center
1 800 993 3786
1 800 963 3786
customer.service.us@festo.com

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Subject to change