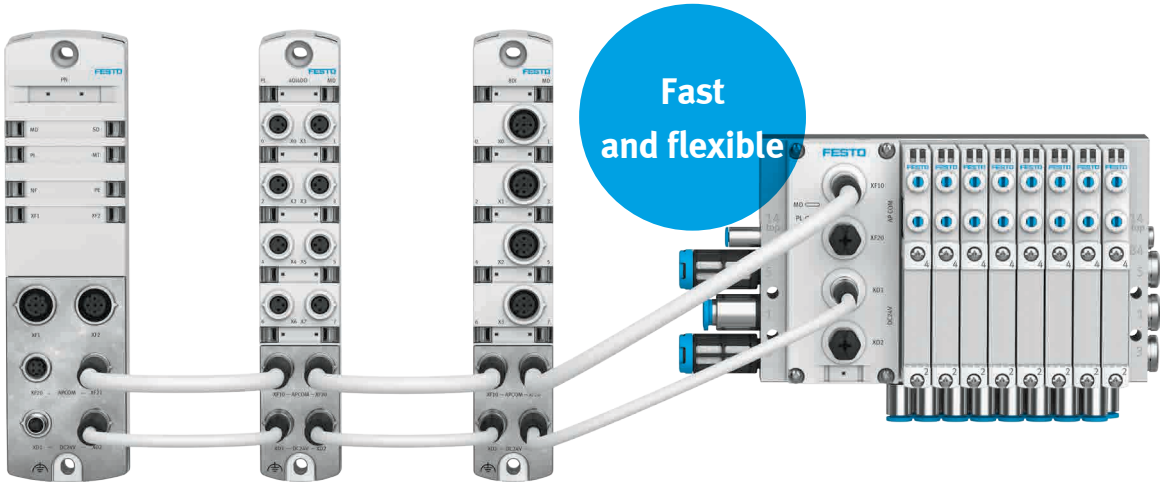
Decentralised remote I/O system CPX-AP-I



Connectivity in real time

Highlights

- Ultra-lightweight and compact, but still very sturdy
- IO-Link master and Festo IO-Link tool
- Short bus cycle times up to 250 µs
- 2 kByte I/O process data
- Up to 80 modules including bus interface in line topology, distributed over one or two lines
- Cable lengths up to 50 m between stations
- Best price/performance ratio by combining valve terminals and decentralised I/Os

The new I/O system to IP65/IP67 allows powerful input/output modules and existing valve terminal interfaces to be integrated into the most important host systems. Based on the innovative AP system communication from Festo and compatible with market standards, CPX-AP-I ensures seamless communication from the workpiece to the cloud – tailored to your needs!

Technological excellence
A bus cycle time of up to 250 µs and a net data rate of 200 Mbit Full Duplex make the CPX-AP-I real-time capable and enable up to 2 kByte I/O process data. This is ideal for fast and synchronous processes. The extremely flexible system is easily scalable with cable lengths up to 50 m. Load and logic voltage supply are galvanically isolated, which means that intermediate supplies, voltage zones or safe switch-off of the load voltage are possible.

Welcome to the world of AP
CPX-AP-I lets you connect up to 80 modules, including a bus interface, to standard bus systems. Even existing valve terminals can be easily integrated in the system. Connection to the IoT gateway, easy integration and parameterisation of IO-Link devices, a web server, and in the future the extended range of functions with the software Festo Automation Suite make your system fit for seamless connectivity!

The CPX-AP-I system

So many advantages for you!

The remote I/O is compatible with all host systems commonly found on the market and, with up to 80 modules, can be flexibly integrated into applications of any scale. With its real-time capability and short bus cycles, the CPX-AP-I is suitable for fast production processes and high-speed data transfer. Its sturdy yet compact and ultra-lightweight design makes it suitable for assembly machines with limited installation space.

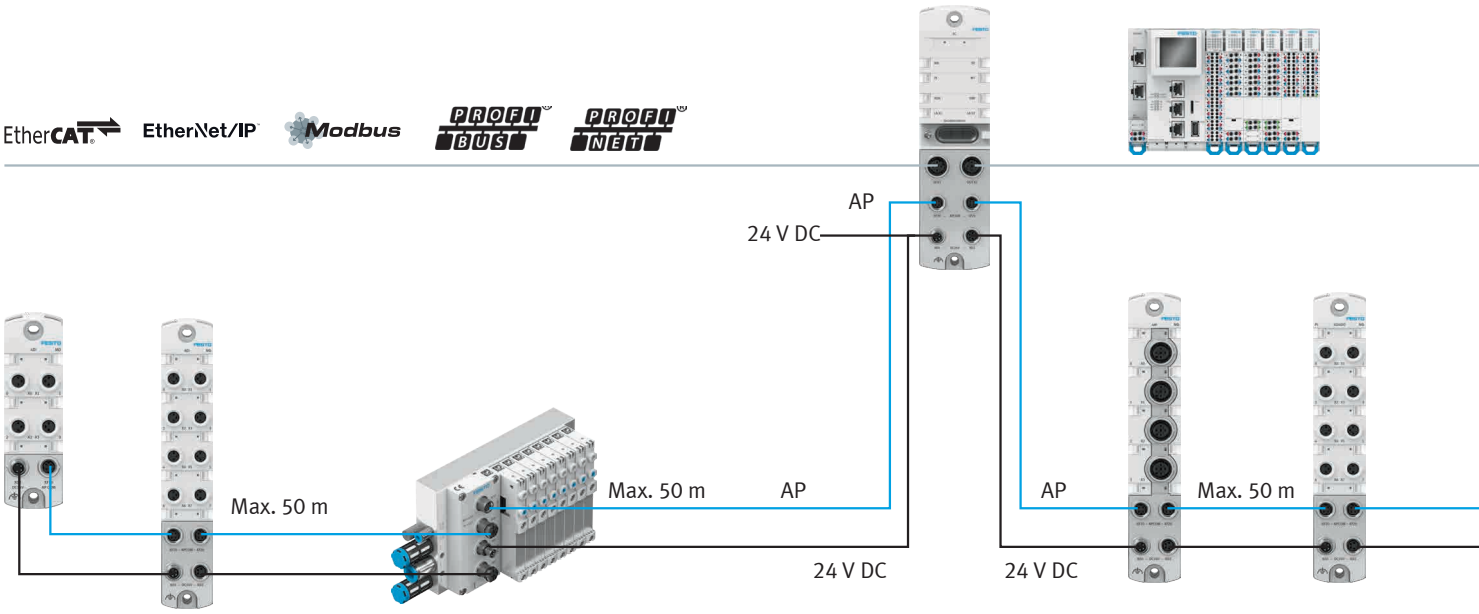
It is also perfect for handling and tool changing systems or in mobile applications, for example at the robot front end, where low weight and minimal installation space are called for. Another outstanding application is in plants and in intralogistics, where large distances matter, with a cable length of up to 50 m between the individual modules.

Fieldbus communication

The bus interface is used to connect the CPX-AP-I to the higher-order controller via Ethernet-based bus protocols as well as EtherCAT or PROFIBUS.

System topology

Starting from the bus interface, one or two lines can be set up using the daisy chain principle. The star and tree topology will also be possible in the future.



AP = AP system communication

AP system communication

The new AP communication technology combines a host PLC with IO-Link devices, digital and analogue inputs and outputs, and data transfer to the cloud in a simple package.

What makes it unique is the direct integration of existing Festo valve terminals into the remote I/O system.

- Simplified engineering without additional software
- Real-time communication to the valve terminal

Power supply concept

The CPX-AP-I automation system has separate cables for communication and power supply as well as two separate circuits.

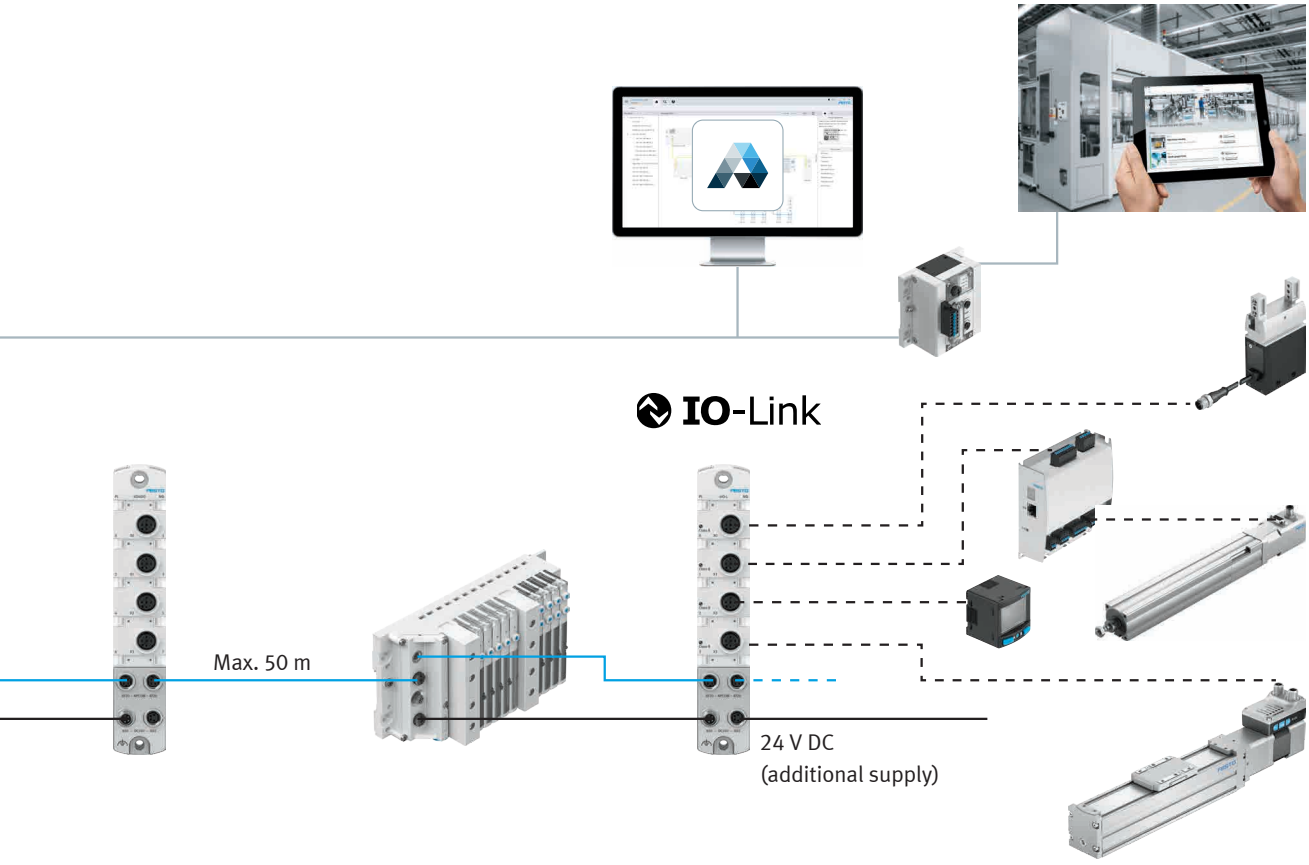
- Power can be supplied separately for each individual module or shared from module to module as a central supply
- Creation of voltage zones possible
- Stable data transfer

Seamless connectivity is automation without any compromises! Everything is interlinked: from pneumatics to electrics, from the workpiece to the cloud.

Festo Automation Suite
The integration into the commissioning software enables firmware updates, smart engineering and enhanced diagnostics.

Digitalisation and Industry 4.0
When connected to the IoT gateway from Festo, CPX-AP-I communicates right up to the cloud via standard cloud protocols such as MQTT and OPC UA.

This will make predictive maintenance and condition monitoring easy in the future.



IO-Link with CPX-AP-I
Up to four IO-Link devices per IO-Link master can be integrated into the CPX-AP-I system and serveral IO-Link masters can be connected to one bus interface.

IO-Link products from Festo:
- Simplified Motion Series
- Servo drives
- Grippers
- Sensors
- Festo valve terminals
- Proportional pressure regulators
- Vacuum generators

CPX-AP-I modules
A CPX-AP-I automation system consists of the bus interface and at least one other input/output module or an IO-Link master. In the system, up to 79 modules can be connected to the bus interface in any combination.

- Bus interface
- IO-Link master
- Digital input/output modules
- Analogue input module

The new AP system communication

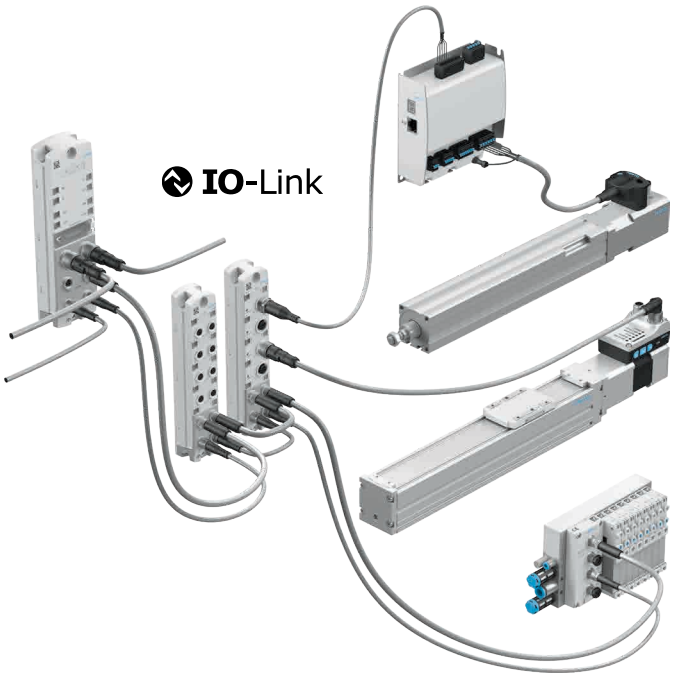
Seamless connectivity with IO-Link

No modern, integrated I/O system is complete without IO-Link connectivity. With CPX-AP-I, the IO-Link master is connected to the bus interface via the AP protocol. This enables seamless digitalisation down to the drives and sensors at the field level. The other way round, data and parameters relating to the automation platform are transferred to the host PLC or, if the IoT gateway from Festo is being used, to the cloud.

Any devices from Festo and third-party suppliers as well as Festo components with I-Port connection can be connected to the CPX-AP-I automation system via the IO-Link master and the Festo IO-Link tool. Up to four IO-Link devices can be connected to the IO-Link master and integrated into the remote I/O system. Theoretically, up to 316 IO-Link devices per bus interface are already possible today.

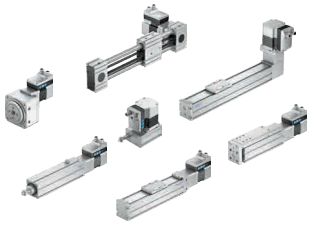
The parameter and master port settings can be conveniently made via a graphical interface with the help of the Festo IO-Link tool. What's more, the IO device descriptions of connected IO-Link devices are automatically loaded from the IODDfinder portal so parameterisation can take place with just a few clicks.

Note: The full functionality of IO-Link is also available without the Festo IO-Link tool, in which case it must be programmed using the control software of your choice. To minimise the engineering effort, Festo provides appropriate functions blocks.

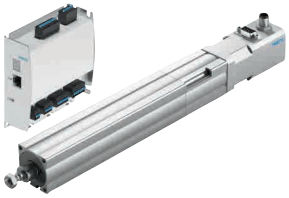


Festo offers the widest IO-Link product portfolio on the market

Electric parallel gripper EHPS



Simplified Motion Series

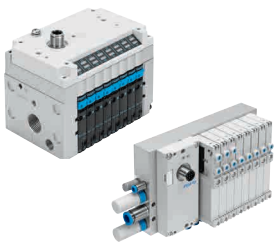


Motor controller CMMO-ST and electric cylinder EPCO

Proportional pressure regulator VPPM

Third-party products with IO-Link

Sensors for position, pressure and flow rate

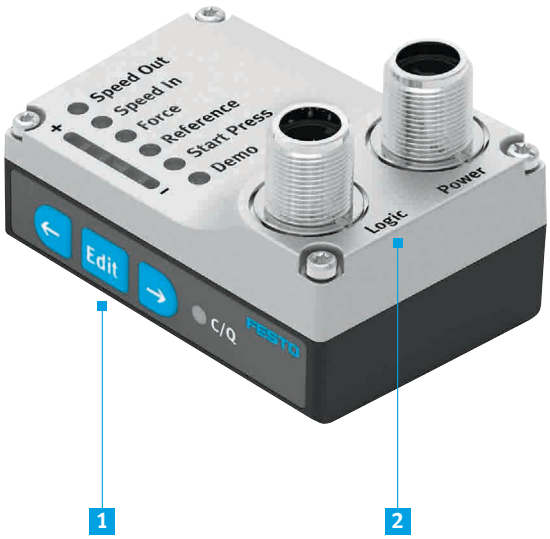


Valve terminal

Vacuum generator OVEM

Easy electric automation with Simplified Motion Series and communication with IO-Link

Simplified Motion Series combines the simplicity of pneumatics with the advantages of electric automation. The integrated drives are the perfect electric alternative for simple linear and rotary movements between two mechanical end positions and do not require the usual commissioning process for traditional electric drive systems, which can often be quite complex. There is no need for any software since operation is based on the plug and work principle.



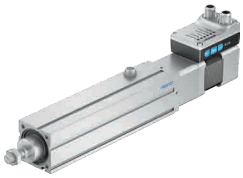
The integrated drive is connected directly to the controller via IO-Link and offers flexible control including additional functions. Control is also possible via digital I/O (DIO) directly from the controller; however, remote configuration or the additional functions are not then available.

Commissioning can be performed quickly and easily without software, computer or other accessories, and without the drive having to be connected to the controller. A 24 V DC power supply is all that is needed, and all parameters are set manually directly on the drive.

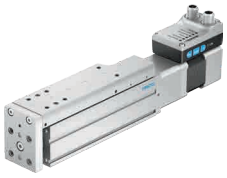
1 For commissioning, simply configure all relevant parameters directly on the drive:
- Speed for “out” and “in” movement
- Force of the drive in the “out” position
- Setting the reference end position
- Setting the position “Start force-controlled movement”
- Manual start (similar to manual override)

2 Extended functions via IO-Link possible:
- Remote configuration of the movement parameters
- Copy and backup function for transferring parameters
- Read functions of the central process parameters

Electric cylinder EPCE

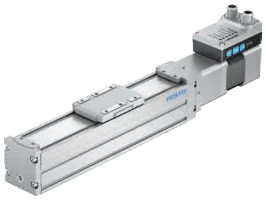


Electric cylinder EPCS



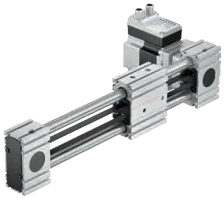
Mini slide EGSS

Rotary drive ERMS



Spindle axis ELGS-BS

Toothed belt axis ELGS-TB



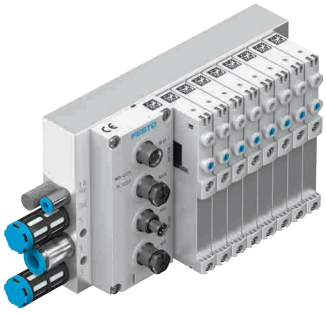
Toothed belt axis ELGE

Simplified Motion Series was developed for movements between two end positions (end to end) and is not suitable for flexible positioning applications.

The new AP system communication

Valve terminals integrated directly into the CPX-AP-I system

The AP system communication, included in all future valve terminals from Festo, makes it easy to incorporate these valve terminals into your application. Right now, existing valve terminal series like VTUG or MPA-L can already be easily integrated directly into the system via their AP interface. Additionally upgraded with new functions like a switching cycle counter or load voltage monitoring. It will also be possible to connect them to the cloud. This will pave the way for the use of intelligent tools such as dashboards for preventive maintenance and condition monitoring in the future.



Valve terminal VTUG with electrical interface VAEM-AP

VTUG is a modern valve terminal with numerous valve functions and options as well as with up to 24 valve positions. It is compact yet has a very high flow rate. In addition to the option of control with IO-Link, the electrical interface (AP interface) VAEM-AP also allows the valve terminal VTUG to be operated as an integral component of the CPX-AP-I automation system.

Electrical interface (AP interface) VAEM-AP
- Synchronous real-time connection to the controller
- Temperature and load voltage monitoring
- Error state parameterisation and short circuit shutdown
- Separate load voltage supply for connected valves, can be shut down separately

Valve terminal VTUG
- Up to 24 valve positions with up to 48 solenoid coils
- Three valve sizes for flow rates from 220 to 1300 l/min
- Reversible 3-way and 5-way piston spool valves
- Semi in-line and sub-base valves

Valve terminal MPA-L with electrical interface VMPAL-AP

The valve terminal MPA-L with its sub-bases made from polymer technology is highly modular and attractively priced as well as very robust and resistant to corrosion. The flexible system is made up of 4-way plates and individual sub-bases and can be extended as required in single increments. Aside from IO-Link and a variety of fieldbus interfaces, a particularly striking feature of MPA-L is the electrical interface (AP interface) VMPAL-AP, which enables the direct integration into the CPX-AP-I automation system.

Electrical interface (AP interface) VMPAL-AP
- Synchronous real-time connection to the controller
- Load voltage monitoring and error state parameterisation
- Separate load voltage supply for connected valves, can be shut down separately
- Short circuit shutdown, short circuit diagnostics and switching cycle counter

Valve terminal MPA-L
- Up to 32 valve positions with up to 32 solenoid coils
- Three valve sizes for flow rates up to 850 l/min, mix of sizes possible
- Piston spool valves for high flow rate and non-overlapping switching
- Poppet valves for even shorter switching times and without internal lubricant

All valve terminals with IO-Link interface such as VTOC, VTUB and CPV can be connected to the IO-Link master of CPX-AP-I via IO-Link.

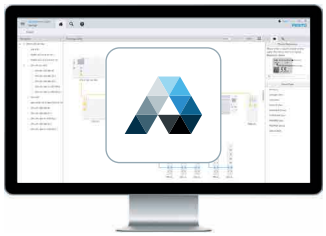
The new AP system communication

Ready for digitalisation in the age of Industry 4.0

- Predictive maintenance
- Condition monitoring

When connected to the IoT gateway from Festo, CPX-AP-I will communicate via standard cloud protocols such as OPC UA and MQTT in the future. The data provided by this for cloud/edge applications can be used for enhanced diagnostic options, optimised maintenance and reduced downtimes as well as to increase the overall equipment effectiveness (OEE). The great thing about it is that the system's real-time capability is not affected by handling big data. Smart predictive maintenance features are already available, for example switching cycle counter, cable length indication and load voltage monitoring.

The diagnostic portfolio is continuously extended, for example with helpful features such as cable quality and actuator travel time monitoring, additional commissioning aids as well as extended connectivity functionalities.



Festo Automation Suite
- Smart engineering
- Enhanced diagnostics

Parameterisable I/O modules help to ensure that each application is individually optimised with CPX-AP-I. Cross-communication between the modules opens up entirely new options for fast applications and decisions. When you integrate the platform into the Festo Automation Suite commissioning software in the future, engineering, condition monitoring and diagnostics will also be easier for you. Seamless communication with all common host environments is possible at any time – even without engineering tools from Festo!

Technical data for the decentralised remote I/O system CPX-AP-I at a glance

CPX-AP-I	
Net data rate	200 Mbit Full Duplex (400 Mbaud)
Process data	2 kB input/output
No. of AP modules in the system	Up to 500, from market launch: 80 including bus interface
Connecting cables	Pre-assembled, standard CAT6e, 4-pin, D-coded M8 connectors for communication and power Cable length: up to 50 m, from market launch: up to 15 m
Topology	Daisy chain as line (from market launch, later also star and tree topology)
Assembly/installation	Mounting: Assembly from above or on the side of the module Any mounting position: lying or sideways/inverted
Power supply	24 V DC, additional supply possible at each module 2 x 4 A, separate load/logic supply
Diagnostics	Module- and channel-specific diagnostics on site via LED or via bus interface: Network error, module status monitoring, monitoring of system communication, IO-Link events Voltage monitoring, power supply to electronics/sensors and load Overvoltage/undervoltage of load, short circuit, overload
IP protection	IP65/IP67

Decentralised remote I/O system CPX-AP-I

Bus interface

CPX-AP-I-PN-M12
- Web server
- Isochronous real time (IRT)
- Fast start-up (FSU)
- Redundancy mechanisms MRP, MRPD, S2
- Support for LLDP, DCP, CiR, SNMP, SNTP
- Dimensions (W x L x H) 45 x 170 x 35 mm
- Product weight 186 g

CPX-AP-I-PB-M12
- Class 1 and Class 2 capable
- Dimensions (W x L x H) 45 x 170 x 35 mm
- Product weight 186 g

CPX-AP-I-EP-M12
- Web server
- QuickConnect
- Redundancy mechanism DLR
- Modbus TCP
- CIP Sync (in future)
- Dimensions (W x L x H) 45 x 170 x 35 mm
- Product weight 186 g

CPX-AP-I-EC-M12
- EtherCAT profiles: CoE, EoE, FoE
- Fast Hot Connect, distributed clocks
- Dimensions (W x L x H) 45 x 170 x 35 mm
- Product weight 194 g

IO-Link master and I/O modules

IO-Link master
CPX-AP-I-4IOL-M12
- IO-Link master class B
- Festo IO-Link tool
- 2 A output current per port (4 A resultant current of all ports)
- M12 connection technology
- Dimensions (W x L x H) 30 x 170 x 35 mm
- Product weight 126 g

Digital input modules
CPX-AP-I-4DI-M8-3P
- 4-way compact module
- M8 connection technology
- Smallest and lightest I/O module on the market
- Dimensions (W x L x H) 30 x 102.5 x 35 mm
- Product weight 81 g

CPX-AP-I-8DI-M8-3P/-M12-5P
- 8-valve module
- M12 and M8 connection technology
- Parameterisation of input debounce time
- Dimensions (W x L x H) 30 x 170 x 35 mm
- Product weight 126 g

Analogue input module
CPX-AP-I-4AI-U-I-RTD-M12
- Measuring range/method:
  - 0/4 ... 20 mA, 0 ... 10 V,
  - 1 ... 5 V, +/- 5 V, +/- 10 V
  - PT100/Ni100, 500 ohm
- 16-bit analogue value
- 1 ms cycle time
- Linear scaling
- M12 connection technology
- Dimensions (W x L x H) 30 x 170 x 35 mm
- Product weight 166 g

Digital input/output modules
CPX-AP-I-4DI4DO-M8-3P/ -M12-5P
- Isolated outputs
- 0.5 A nominal current per output
- M8 and M12 connection technology
- Dimensions (W x L x H) 30 x 170 x 35 mm
- Product weight 129 g

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