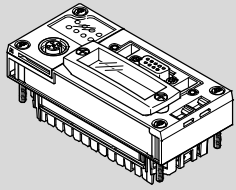


Bus node

CPX-FB23, CPX-FB23-24



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Brief description 8101635
 Translation of the original instructions 2018-11c
 [8101637]

Bus node CPX-FB23, CPX-FB23-24 English

For all available product documentation → www.festo.com/pk

1 Intended use

The bus node type is intended exclusively for use as a participant on a CC-Link fieldbus for CPX terminals.
 The specified limits for technical data must be adhered to. You can find detailed information in the bus node description P.BE-CPX-FB23-24 and in the CPX system description P.BE-CPX-SYS-...

→ Note

- This description refers to the bus nodes
- CPX-FB23 from revision R14 (CC-Link Version 1.1) and
 - CPX-FB23-24 from revision R22 (CC-Link Version 1.1 and 2.0).

The bus node CPX-FB23-24 can be configured as function module **F24 (CC-Link Version 2.0)** or as function module **F23 (CC-Link Version 1.1)**.
 – Generally valid information is described **on this page**.
 – Commissioning with configuration as function module **F24 or F23** is described **on the reverse side**.

The bus node is intended for use in an industrial environment. Outside of industrial environments, e.g. in commercial and mixed-residential areas, actions to suppress interference may have to be taken.

- Only commission a CPX terminal which has been completely mounted and connected.

CC-Link®, LEONI® and TORX® are registered trademarks of the respective trademark owners in certain countries.

→ Note

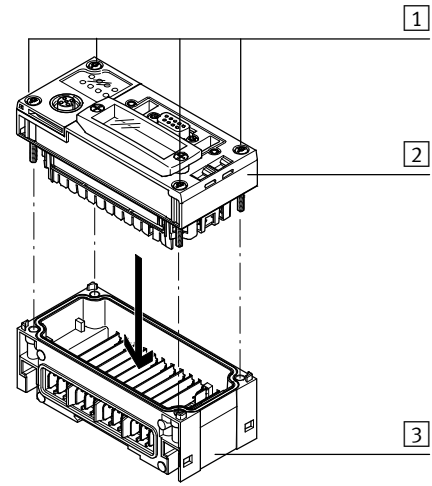
- The bus node includes electrostatically sensitive devices.
- Do not touch any components.
 - Observe the handling specifications for electrostatically sensitive devices.

Warning

- Electric shock
 Injury to people, damage to the machine and system
- Use for the electrical power supply only PELV circuits in accordance with IEC 60204-1 (Protective Extra-Low Voltage, PELV).
 - Observe the general requirements in accordance with IEC 60204-1 for PELV circuits.
 - Use only voltage sources that guarantee a reliable electric disconnection of operating and load voltage in accordance with IEC 60204-1.
 - Always connect all circuits for operating and load voltage supplies $U_{EL/SEN}$, U_{VAL} and U_{OUT} .
 - Connect the earth terminal of the end plates of the CPX terminal with low resistance and impedance (short cable with the largest possible cross section) to the earth potential.

2 Mounting/dismounting

When built-in, the bus node is located in an interlinking block of the CPX terminal.



- 1 TORX® T10 screws
- 2 Bus nodes
- 3 Interlinking block with contact rails

Fig. 1

Warning

- Electric shock
 Injury to people, damage to the machine and system
- Switch off the power supply before assembling or disassembling bus nodes (risk of operative malfunction or damage).

Dismounting:

- Unscrew screws and carefully lift off the bus node.

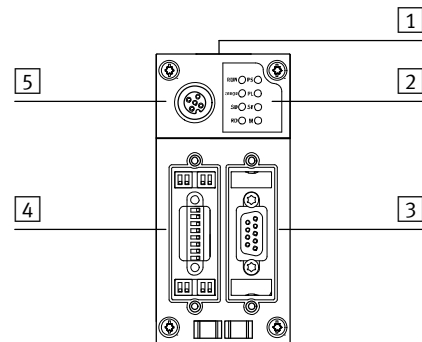
Mounting:

1. Check seal and seal surfaces.
2. Carefully insert manifold block into the interlinking block and press it in.
3. Screws must be set so that the existing threads can be used. Tighten the screws by hand in diagonally opposite sequence.
 Tightening torque: 0.9 ... 1.1 Nm.

→ Note

- Use appropriate screws, dependent on the material of the interlocking block (metal or plastic):
 - **Plastic** interlocking block: thread-cutting tapping screws
 - **Metal** interlocking block: screws with metric thread.

3 Connection and display components



- 1 Rating plate
- 2 Fieldbus- and CPX-specific LEDs
- 3 Fieldbus connection¹⁾
- 4 Cover for DIL switches
- 5 Service interface for operator unit (CPX-MMI) or Festo Maintenance Tool (CPX-FMT)²⁾

1) Connection: Sub-D socket, 9 pin

2) Connection: M12 socket, 5 pin

Fig. 1

3.1 LED display component - standard operating status

Characteristics of the LED display components in standard operating status:

- All green LEDs are illuminated (Run, PS and PL).
- The yellow LEDs light up or flash, dependent on the data communication or configuration (SD, RD and M).
- The red LEDs do not light up (error, SF).

CC-Link-specific LEDs		CPX-specific LEDs ²⁾	
Run (green)	Data communication OK ¹⁾	PS (green)	Power system
Error (red)	Data communication faulty ¹⁾	PL (green)	Power load
SD (yellow)	Send data	SF (red)	System failure ³⁾
RD (yellow)	Receive data	M (yellow)	Modify ⁴⁾

1) Detailed information → Bus node description P.BE-CPX-FB23-24
 2) Detailed information → CPX system description P.BE-CPX-SYS-...
 3) Flashes in case of error, error diagnostics → CPX system description P.BE-CPX-SYS-...
 4) Parameterisation revised or "Force" active.

Fig. 2

3.2 Pin allocation and specification of the fieldbus interface

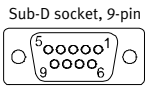
Connection	Pin	Signal	Explanation
	2	DA	Data A
	3	DG	Data reference potential (data ground)
	7	DB	Data B
	Housing	SLD/FG	Screening/functional earth (shield/functional earth, here designated as functional ground)

Fig. 3

Connection technology	Achievable degree of protection
Festo plug connector FBS-SUB-9-GS-2x4POL-B	IP65/IP67
Festo bus connection FBA-1-KL-5POL	IP20
Other sub-D plug connectors	

Fig. 4

Cable specification		
Cable type	CC-110, CC-110-5, CS-110, CM-110-5, 20 AWG x 3 ¹⁾ FANC-110SBH, 20 AWG x 3 ²⁾ L45467-Y19-C15, 20 AWG x 3 ³⁾	
Length of cable between the participants	> 0.2 m (for all baud rates)	
Maximum cable length (dependent on the baud rate)	156 kBd	1200 m
	625 kBd	900 m
	2.5 MBd	400 m
	5 MBd	160 m
	10 MBd	100 m
Terminating resistor between pin 2 and pin 7	110 Ω ± 5 %, 0.5 W	

- 1) DYDEN Corporation
 2) KURAMO ELECTRIC Co., Ltd.
 3) LEONI protec cable systems GmbH

Fig. 5

4 Parameterisation



Note

The CPX terminal and the related bus node can be parameterised by means of the Festo operator unit (CPX-MMI) or Festo Maintenance Tool (CPX-FMT).



Further information on parameterisation, module replacement and start-up behaviour of the CPX terminal can be found in the bus node description P.BE-CPX-FB23-24

You can find information on the fieldbus CC-Link in the documentation of your CC-Link Master and the related control system or in the internet (→ www.cc-link.org).

5 Start-up behaviour of the CPX terminal

If the Modify LED M lights up or flashes permanently after the system start, "System start with saved parameterisation and saved CPX expansion" is set or "Force" is active.

6 Note on module replacement



Caution

For CPX terminals with a continuously illuminated or flashing M LED, the parameterisation is not automatically created by the higher-level system when the CPX terminal is replaced during servicing.

- Before replacement, note required settings and make them again after replacement.

7 Power supply of the CPX terminal

The operating and load voltage supply for the CPX terminal is fed in via interlinking blocks. These conduct the operating and load voltages to the neighbouring modules (→ CPX system description P.BE-CPX-SYS-...).

8 Technical data

Bus node	CPX-FB23, CPX-FB23-24	
Function module	F24	F23
General technical data	→ CPX system description P.BE-CPX-SYS-...	
Degree of protection through housing¹⁾ completely mounted in accordance with IEC 60529, plug connector inserted or provided with cover cap ²⁾ With plug connector FBS-SUB-9-GS-2X4POL-B With bus connection FBA-1-KL-5POL or other plug connectors for the bus connection	IP65/IP67 IP20	
Protection against electric shock Protection against direct and indirect contact in accordance with IEC 60204-1	through the use of PELV circuits	
Intrinsic current consumption bus node from operating voltage supply for electronics/sensors ($U_{EL/SEN}$)	typ. 70 mA at 24 V (internal electronics)	
Separation Fieldbus connection at $U_{EL/SEN}$	Galvanically separated	
Mains buffering time	10 ms	
Module code (CPX-specific) Remote I/O Remote controller Module identifiers (CPX-MMI, CPX-FMT) Remote I/O Remote controller	206 – – FB24-RIO CC-Link V2 remote I/O –	206 157 – FB23-RIO CC-Link remote I/O FB23-RC
Fieldbus-specific characteristics Protocol Version Vendor code Machine type	CC-Link Version 1.1 and 2.0 0x0177 0x3C	CC-Link Version 1.1 0x0177 0x3C
Data transmission rate (baud rate)	156 kBd 625 kBd 2.5 MBd 5 MBd 10 MBd	

1) Observe that connected devices may only satisfy a lower degree of protection or a smaller temperature range, etc.

2) Cover cap from Festo, type ISK-M12, included in the scope of delivery

Fig. 6

9 Commissioning as function module F24

9.1 Setting the DIL-switches

DIL switches	Setting	Function			
	1.1	OFF (factory setting) ON	Operating mode: remote I/O For F24 not possible		
	1.2	1.2	2.1	2.2	Baud rate:
	2.1	OFF	OFF	OFF	156 kBd
	2.2	ON	OFF	OFF	625 kBd
		OFF	ON	OFF	2.5 MBd
		ON	ON	OFF	5 MBd
		OFF	OFF	ON	10 MBd (factory setting)
	3.8	OFF ON (factory setting)			Function module F23 Function module F24
	3.7 to 3.1	3.7: 2 ² x 10 = 40 3.6: 2 ¹ x 10 = 20 3.5: 2 ⁰ x 10 = 10 3.4: 2 ³ = 8 3.3: 2 ² = 4 3.2: 2 ¹ = 2 3.1: 2 ⁰ = 1			CC-Link slave address Address range: 1 ... 64 Factory setting: 1
	5.2	OFF (factory setting) ON			No system diagnostics With system diagnostics
5.1	OFF (factory setting) ON			CLEAR HOLD	
4.2	OFF (factory setting) ON			Mapping: cycle-time-optimised Mapping: station-optimised	
4.1	OFF (factory setting) ON			No function	

Fig. 7

9.2 Useful data volume at different mapping optimisations

The number of stations and cycles required is automatically determined by the bus node corresponding to the selected type of optimisation (cycle-time-optimised or station-optimised).

Assigned stations	Transmitted data ²⁾	Cycle setting			
		Single ¹⁾	2-fold	4-fold	8-fold
1 station	Inputs in bit area	2 bytes	2 bytes	6 bytes	14 bytes
	Outputs in bit area	2 bytes	2 bytes	6 bytes	14 bytes
	Inputs in word area	8 bytes	16 bytes	32 bytes	64 bytes
	Outputs in word area	8 bytes	16 bytes	32 bytes	64 bytes
2 stations	Inputs in bit area	6 bytes	10 bytes	22 bytes	46 bytes
	Outputs in bit area	6 bytes	10 bytes	22 bytes	46 bytes
	Inputs in word area	16 bytes	32 bytes	64 bytes	64 bytes
	Outputs in word area	16 bytes	32 bytes	64 bytes	64 bytes
3 stations	Inputs in bit area	10 bytes	18 bytes	38 bytes	64 bytes
	Outputs in bit area	10 bytes	18 bytes	38 bytes	64 bytes
	Inputs in word area	24 bytes	48 bytes	64 bytes	64 bytes
	Outputs in word area	24 bytes	48 bytes	64 bytes	64 bytes
4 stations	Inputs in bit area	14 bytes	26 bytes	54 bytes	–
	Outputs in bit area	14 bytes	26 bytes	54 bytes	–
	Inputs in word area	32 bytes	64 bytes	64 bytes	–
	Outputs in word area	32 bytes	64 bytes	64 bytes	–
		Station-optimised			

1) Setting requires configuration of the bus node in the master as CC-Link 1.1 slave.

2) Digital modules (incl. valves) are mapped into the bit area; analogue and function modules are mapped parallel to that into the word area.

Fig. 8

Emphases in table Fig. 8

- Light-grey shaded: single cycle setting requires configuration of the bus node in the master as CC-Link 1.1 slave, otherwise communication error.
- Light-grey background: additionally limited by CPX system limit.
- Dark-grey background: configuration not possible.

Note

- The bus node automatically determines the number of inputs and outputs of the modules installed in the CPX terminal.
- According to the set mapping optimisation (cycle-time- or station-optimised), the cycle setting and the required number of stations is automatically configured.
- Depending on the required address volume, the CPX terminal occupies one or several stations (address space) in the CC-Link system.
- For an activated system diagnostics function, the 1st word in the word area is assigned to station 1 (16 input and 16 output addresses). If the I/O diagnostics interface of the system diagnostics is not used, the first 8 inputs represent the status bits.

9.3 Addressing rules

I/O counting mode

- The address assignment of the inputs is independent of the address assignment of the outputs.
- The counting mode is independent of the position of the bus node in the CPX terminal.
- Counting from left to right, corresponding to the installation position in the CPX terminal and dependent on the module type.
- Digital I/Os, analogue I/Os and I/Os of technology modules occupy their address volume ascending respectively without gaps in the corresponding address space.
- Digital I/Os are mapped in the bit area, analogue I/Os and I/Os of technology modules are mapped parallel in the word area, starting from the 1st station to be mapped.
- Remote ready (RR, CC-Link-specifically reserved) always lies in the bit area at the end in the respectively last-occupied station or last-used cycle. The last 16 inputs and outputs (2 bytes each) in the bit range (RX, RY) of the last assigned station are CC-Link-specifically reserved.
- The status bits and the I/O diagnostics interface of the system diagnostics occupy, if activated, the first 2 bytes respectively of the inputs and outputs of the word area of the 1st station. The system diagnostics occupy the first 16 inputs and outputs (2 bytes each) in the word range (RWr, RWW) of the 1st station.

9.4 Address assignment after extension/conversion

If the machine requirements change, the CPX terminal can be adapted as required due to its modular design.



Caution

If the CPX terminal is extended or converted at a later stage, input/output addresses may be shifted.

This applies in the following cases:

- Additional modules are inserted between existing modules.
- Existing modules are removed or replaced by other modules, which have fewer or more input/output addresses.
- Interlinking blocks or pneumatic manifold blocks for monostable valves are replaced by interlinking blocks/manifold blocks for bistable valves – or vice versa.
- Additional interlinking blocks and/or manifold blocks are inserted between existing ones.
- The configured addresses of the pneumatic interface are modified.

10 Commissioning as function module F23

10.1 Setting the DIL-switches

DIL switches	Setting	Function	
	1.1	OFF (factory setting) ON	Operating mode: remote I/O Operating mode: remote controller
	1.2	1.2 2.1 2.2	Baud rate:
	2.1	OFF OFF OFF	156 kBd
	2.2	ON OFF OFF	625 kBd
		OFF ON OFF	2.5 MBd
		ON ON OFF	5 MBd
		OFF OFF ON	10 MBd (factory setting)
	3.8	OFF ON (factory setting)	Function module F23 Function module F24
	3.7 to 3.6: 3.1	3.7: $2^2 \times 10 = 40$ 3.6: $2^1 \times 10 = 20$ 3.5: $2^0 \times 10 = 10$ 3.4: $2^3 = 8$ 3.3: $2^2 = 4$ 3.2: $2^1 = 2$ 3.1: $2^0 = 1$	CC-Link slave address Address range: 1 ... 64 Factory setting: 1
	5.2	OFF (factory setting) ON	No system diagnostics ¹⁾ With system diagnostics ¹⁾
5.1	OFF (factory setting) ON	CLEAR HOLD	
4.2 4.1	4.1 4.2 OFF OFF ON OFF OFF ON ON ON	Number of stations per slave: Remote I/O Remote controller 1 1 2 Impermissible 3 Impermissible 4 Impermissible Factory setting: 1	

1) Only for remote I/O operating mode.

Fig. 9



Note

- For an activated system diagnostics function, the 1st word in the word area is assigned to station 1 (16 input and 16 output addresses). If the I/O diagnostics interface of the system diagnostics is not used, the first 8 inputs represent the status bits.

10.2 Addressing rules

Address type	Area	Addressing rules
Remote ready (RR)	Bit area	– The last 16 inputs and outputs (2 bytes each) in the bit area (RX, RY) of the last assigned station are CC-Link-specifically reserved.
System diagnostics ¹⁾ (Status bits and I/O diagnostics interface)	Word area	– The system diagnostics occupy the first 16 inputs and outputs in the word area (RW _r , RW _w) of station 1 ¹⁾ .
Digital I/O modules or Pneumatic interfaces or Pneumatic modules	Bit area	– Addresses are assigned in the free bit area (RX/RY). – Arrangement from left to right corresponding to the address range one next to the other beyond the station limits (ascending without gaps).
Analogue I/O modules	Word area	– Addresses are assigned in the word area (RW _r /RW _w). – The first module lies on a new station address. – Addresses are assigned in the address space after digital I/O modules and pneumatic modules.
Technology modules		– Arrangement from left to right corresponding to the address range, one next to the other.

1) Only with activated system diagnostics

Fig. 10

10.3 Address assignment after extension/conversion

If the machine requirements change, the CPX terminal can be adapted as required due to its modular design.



Caution

If the CPX terminal is extended or converted at a later stage, input/output addresses may be shifted.

This applies in the following cases:

- Additional modules are inserted between existing modules.
- Existing modules are removed or replaced by other modules which have fewer or more input/output addresses.
- Interlinking blocks or pneumatic manifold blocks for monostable valves are replaced by interlinking blocks/manifold blocks for bistable valves – or vice versa.
- Additional interlinking blocks and/or manifold blocks are inserted between existing ones.
- The configured addresses of the pneumatics interface are modified.