

Universal bus node
CTEU-EC



Description
Installation and interfaces
Original instructions

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1 Installation
1.1 Instructions on this description
This description contains information for mounting the Bus node on an I-port-compatible device from Festo (e.g. valve terminal with I-port interface) and for installation of this combination in a higher-level control system.

➔ Note
This description is part I of the total product documentation on the bus node. Information on commissioning, diagnostics and error elimination of the Bus node can be found in part II, the description “Universal bus node CTEU-EC – function and maintenance” in the Internet under ➔ www.festo.com ➔ Support Portal ➔ User documentation.
Additional information about EtherCAT can be found in the Internet: ➔ www.ethercat.org.

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

1.2 Intended use
The bus node CTEU-EC documented in this description has been designed exclusively for use as a station (slave) on the EtherCAT fieldbus. It may only be used in its original status without unauthorised modifications and only in perfect technical condition.
The bus node is intended for use in industrial areas. Outside of industrial environments, e.g. in commercial and mixed-residential areas, actions to suppress interference may have to be taken.

1.3 Target group
The target group for this description consists of trained specialists in control and automation technology who have experience with installation of stations on the EtherCAT fieldbus.

⚠ Warning
Danger of injury through uncontrolled movements of connected equipment.
Make sure that electrical and pneumatic equipment are in a de-energised and pressureless state.

Before working on the pneumatics:
• Switch off the compressed air supply
• Vent the valve terminal

Before working on the electrical components, e.g. before installation or maintenance work:
• Switch off power supply

In this way, you can avoid:
– uncontrolled movements of loose tubing
– unexpected and uncontrolled movements of the connected actuators
– undefined switching states of the electronics

➔ Note
The bus node contains electrostatically sensitive devices.
• Do not touch any electrical or electronic components.
• Observe the handling specifications for electrostatically sensitive devices.
They will help you avoid damage to the electronics.

➔ Note
Use protective caps or blanking plugs to seal unused connections. You will then achieve protection class IP65.

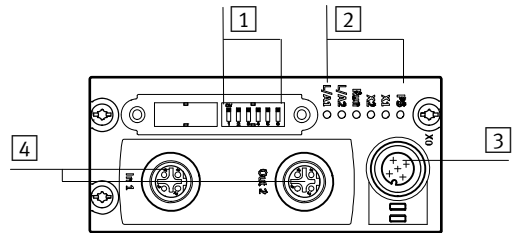
➔ Note
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1.4 Mounting
➔ Note
Information on mounting the bus node on the electrical connection box type CAPC-... can be found in the assembly instructions that accompany the sub-base. For H-rail mounting, you also need the mounting kit CAFM-... (CAPC and CAFM).

For mounting the bus node, a valve terminal from Festo or the electrical connection box, type CAPC-..., with I-port interface is required.
1. Inspect the seals and sealing surfaces on bus node and valve terminal.
2. Plug the bus node onto the valve terminal in the right position and without tilting.
3. First, lightly screw in the three self-tapping screws with a TORX screwdriver (size T10): use existing threads, if applicable.
4. Tighten the screws with 1.0 Nm.

2 Connection and display components
The following electrical connection and display elements can be found on the bus node:



- 1 DIL switch group (➔ chap. 5)
- 2 Status LEDs: bus status LEDs, CTEU-specific LEDs; status indicator and diagnostics (➔ chap. 6)
- 3 Power supply connection for bus node and connected equipment, e.g. valve terminal (➔ chap. 3); M12, 5-pin, A-coded, pin plug connector
- 4 Fieldbus connections (fieldbus interfaces): 2x M12, 4-pin, socket plug connector, D-coded (➔ chap. 4)

On the bottom of the bus node is the I-port interface for connection to an I-port-compatible device, e.g. valve terminal or electrical connection box.

3 Power supply
The bus node has separate operating and load voltage supplies. The bus node also supplies voltage to equipment connected via the I-port interface.

➔ Note
• Use only PELV circuits for the electrical power supply in accordance with IEC/EN 60204-1 (Protective Extra-Low Voltage, PELV).
• Observe also the general requirements for PELV circuits in accordance with IEC/EN 60204-1.
• Use only voltage sources that ensure a reliable electric separation of operating voltage in accordance with IEC/EN 60204-1.
• Always connect both circuits for operating and load voltage supply.

Through the use of PELV circuits, protection against electric shock (protection against direct and indirect contact) is ensured in accordance with IEC/EN 60204-1.

Power supply connection (M12, A-coded)	Pin	Allocation	Function
	1	24 V _{EL} /SEN	Power supply (PS)
	2	24 V _{VAL} /OUT	Load voltage supply (PL)
	3	0 V _{EL} /SEN	Power supply (PS)
	4	0 V _{VAL} /OUT	Load voltage supply (PL)
	5	FU ¹⁾	Functional earth
¹⁾ The connection to functional earth must be ensured via the connected device or electrical connection box CAPC-...			

For the connection to power supply units or the power supply, use cables with M12 coupling (plug socket), A-coded, in accordance with IEC 61076-2 (➔ Accessories ➔ www.festo.com/catalogue).

➔ Note
Functional test:
– The LED **PS** is illuminated green when the power supply 24 V_{EL}/SEN is present correctly.
– The LED **PS** is illuminated green when the power supply 24 V_{VAL}/OUT is present correctly if supported by the connected device.
– The LEDs **X1** or **X2** are lit green when a device is connected (➔ chap. 6).

4 Connecting the fieldbus
➔ Note
Faulty installation and high transmission rates may cause data transmission errors as a result of signal reflections and attenuations. Transmission errors can be caused by:
– faulty screened connection
– transmission over distances that are too large
– inappropriate cables
• Observe the specifications in the manuals of your control system, in particular regarding the bus lines, cable type, max. length of the connecting cable and the connection technology (network plug, adapter).

M12 plug at the bus node
There are two 4-pin M12 socket plug connectors (D-coded) on the bus node for connection to the fieldbus.

Fieldbus connection (fieldbus interface; M12, 4-pin, D-coded)		
Pin	Allocation (bus signal)	Signal description
1	TD+	Transmission data (Transmit Data, TD) +
2	RD+	Receive data (Receive Data, RD) +
3	TD–	Transmitted data –
4	RD–	Received data –
–	Housing	Shield/Functional Earth FE

Cable specification
• Use shielded industrial Ethernet round cable of category Cat 5 or higher.
• Cable length: max. 100 m between network stations (corresponding to specifications for Ethernet networks, ISO/IEC 11801 and ANSI/TIA/EIA-568-B).
• Wire cross section for max. line length: 22 AWG (for 100 m link length, based on ISO/IEC 11801).

5 Basic setting for fieldbus communication
5.1 Removal of the DIL switch cover
To set the DIL switches, you must remove the cover:
1. Switch off the power supply.
2. Unscrew the two mounting screws of the transparent cover and remove the cover.

5.2 Setting the DIL switches
Proceed as follows:
1. Assign an unused EtherCAT address to the bus node (optional, e.g. for Hot Connect function).
2. Set the diagnostics and fail-state mode.

DIL switches		Function	ON	OFF
1	1 ... 4: EtherCAT address, 0 ... 15, binary-coded (factory setting: 0) ¹⁾	1: 2 ⁰ 2: 2 ¹ 3: 2 ² 4: 2 ³	1 x 2 ⁰ 1 x 2 ¹ 1 x 2 ² 1 x 2 ³	0 x 2 ⁰ 0 x 2 ¹ 0 x 2 ² 0 x 2 ³
2	5: Diagnostics	Diagnostics activated: transmission of diagnostic information into emergency messages (EM) and the diagnostic history.	Diagnostics off (factory setting)	
3	6: Fail-state and idle mode ²⁾	Hold last state	Reset (factory setting)	
¹⁾ Optional, e.g. for Hot Connect function ²⁾ If the PLC is in the stop mode (idle mode) or the fieldbus connection is interrupted (fail state); applies for all outputs Note: The fail-state mode is also designated “fail-safe mode”				

Setting example
for setting the binary-coded EtherCAT address (Device Identification Value) through DIL switch group ➔ see subsequent table:

Example: Set EtherCAT address: 05	Example: Set EtherCAT address: 14

➔ Note
Normal operating status:
– The LED **RUN** lights up green.
– The LED **PS** lights up green.

5.3 Mounting of the DIL switch cover
1. Place the cover carefully on the bus node. Make sure that the seal is seated correctly!
2. Tighten the two mounting screws with max. torque of 0.4 Nm.

6 Status display/diagnostics via LEDs
➔ Note
You will find detailed information on the LEDs as well as on diagnostics and error elimination in the description “Universal bus node CTEU-EC – function and maintenance” in the Internet under ➔ www.festo.com ➔ Support Portal ➔ User documentation.

PS – Operating voltage supply status (power system)	
LED display	Status and significance
	LED illuminated green: – normal operating status – Operating voltage applied (in the approved range) – Load voltage present (in the approved range) ¹⁾
	LED flashes green (flashing frequency: 1 Hz) – Operating voltage is below the required voltage – Load voltage is below the required voltage ¹⁾
	LED is off: – Operating voltage not applied
¹⁾ Display depends on whether the connected device monitors the load voltage and reports to the bus node	

RUN – EtherCAT operating status	
LED display	Status and significance
	LED illuminated green: – Bus node is in the OPERATIONAL status (normal operating status).
	LED flashes fast green: – Bus node is in the status BOOTSTRAP (firmware update is possible/is being executed)
	LED flashes green slowly: – Bus node is in PRE-OPERATIONAL status (configuration of the EtherCAT network)
	LED flashes green (single flash): – Bus node is in the SAFE-OPERATIONAL status (signal is frozen)
	LED is off: – Bus node is in the the INIT status (after switch-on or after a restart)

L/A1, LA2 – Connection status (coming/going)	
LED display	Status and significance
	LED illuminated green: – Link present and no data transmission (no traffic).
	LED flashes green: – Link present and data transmission (traffic).
	LED is off: – No link present.

7 Technical data	
General properties	
Protection class through housing (in accordance with IEC/EN 60529)	IP65 ^{1) 2)}
Protection against electric shock (protection against direct and indirect contact to IEC/EN 60204-1)	through the use of PELV circuits
Galvanic isolation (EtherCAT interfaces to U _{EL} /SEN)	Galvanically isolated
Vibration and shock resistance (in accordance with EN 60068) ³⁾ – Vibration (part 2 - 6) – Shock (part 2 - 27) – Continuous shock (part 2 – 29)	Severity level (SL) ³⁾ for wall or H-rail mounting – Wall: SG2; H-rail: SG1 – Wall: SG2; H-rail: SG1 – Wall and H-rail: SG1
Temperature range – Storage/transport – Environment/operation	–20 ... +70 °C –5 ... +50 °C
Materials – Housing – Housing cover, cover for DIL switches – Threaded sleeve M12 – Threaded bush M3 – Seals – Screws	RoHS-compliant PA, reinforced PC Brass, galvanically nickel-plated Brass NBR, FPM Galvanized steel
¹⁾ Requirement: Bus node mounted completely, plug connector in the plugged-in status or provided with protective cap ²⁾ Observe that connected equipment (devices) may fulfil a lower protection class or lower temperature range ³⁾ Explanation of the severity level ➔ following table “Explanation on vibration and shock – severity level”	

Power supply	
Power supply to bus node/equipment ¹⁾ – Operating voltage (nominal value/tolerance range, polarity-safe) – Load voltage (maximum value/typical tolerance range, device-dependent) ²⁾	24 V DC ± 25 % (18 ... 30 V DC) max. 30 V DC (18 ... 30 V DC) ²⁾
Intrinsic current consumption of bus node at 24 V – Bus node electronics	max. 60 mA
Load capacity of the operating and load voltage supply ^{1) 3)} – Bus node on device (e.g. valve terminal) – Bus node on electrical connection plate, type CAPC-... (<i>X</i> ₁ u. <i>X</i> ₂)	max. 4 A max. 2 A
Mains buffering time	10 ms
¹⁾ Separate, external fuses are required for operating and load voltage supply ²⁾ Dependent on the connected equipment/devices (e.g. valve terminal) ³⁾ Load capacity with regard to the connected equipment, e.g. the valve terminal, including the bus node	

→

..... **Note**

Technical data of the connected equipment can be found in the respective product documentation.

Explanation on vibration and shock – severity level	
Severity level 1 (SG1, in accordance with EN 60068, part 2 – 29)	Vibration: 0.15 mm path at 10 ... 58 Hz; 2 g acceleration at 58 ... 150 Hz
	Shock: ±15 g at 11 ms duration; 5 shocks per direction
	Continuous shock: ± 15 g at 6 ms duration; 1000 shocks per direction
Severity level 2 (SG2, in accordance with EN 60068, part 2 – 27)	Vibration: 0.35 mm path at 10 ... 60 Hz; 5 g acceleration at 60 ... 150 Hz
	Shock: ± 30 g at 11 ms duration; 5 shocks per direction
	Continuous shock: n. a.