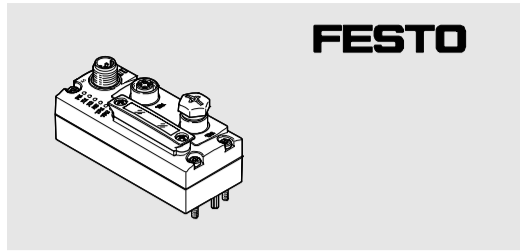


Bus node CTEU-EP



Operating instructions
Network protocol EtherNet/IP or Modbus TCP

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1 Intended use

The bus node type CTEU-EP is intended exclusively for use as a participant in EtherNet/IP or Modbus TCP networks. The bus node may only be used in its original status without unauthorised modifications and only in perfect technical condition. The specified limit values must be observed here. The product is intended for use in industrial environments. Outside of industrial environments, e.g. in commercial and mixed-residential areas, actions to suppress interference may have to be taken.

→ Note
Comply with the legal rules and regulations and standards, rules of the testing organisations and insurance companies and national specifications applicable for the location.

→ Note
Detailed information on commissioning is provided in the documentation for the higher-order control system. Information on EtherNet/IP:
→ www.odva.org
Information on Modbus TCP:
→ www.modbus.org
Information about products from Festo:
→ www.festo.com/sp

→ Note
EtherNet/IP®, MODBUS®, ROCKWELL AUTOMATION®, STUDIO 5000® are registered trademarks of the respective trademark owners in certain countries.

Training of specialized personnel

The product may only be commissioned by trained specialists in control and automation technology who are familiar with:

- mounting, installation, operation and diagnostics of control systems, networks and fieldbus systems
- the applicable regulations for accident prevention and occupational safety
- the documentation for the product.

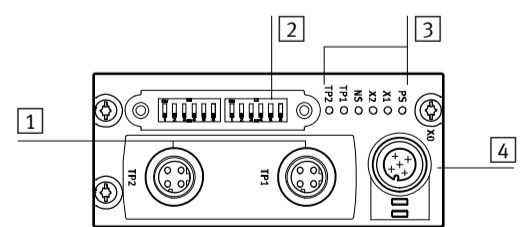
Service

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

2 Safety instructions

- Prior to any assembly or installation work, switch off power supplies, disconnect the compressed air supply and vent the pneumatics.
- For the electrical power supply, only use PELV circuits in accordance with IEC 60204-1/EN 60204-1.
- Observe the handling specifications for electrostatically sensitive devices.
- Use cover caps to seal unused connections to achieve the required degree of protection.
- Always ensure that the connection technology being used has the required degree of protection.

3 Ports and displays



- 1 Network connections (network ports TP1/TP2, fieldbus interface) → 3.1
- 2 DIL switch (with transparent cover) → 5.2
- 3 Status LEDs → 3.2, 7
- 4 Power supply connection (X0) → 3.1.

I-Port-interfaces

The I-Port interfaces (X1/X2) are located on the underside of the bus node.

3.1 Ports

Power supply connection¹⁾

Pin allocation						
3	2	1	24 V	Operating voltage Electronics/sensors (Power System)	PS	U _{EL} /SEN
		2	24 V	Load voltage Valves/outputs (Power Load)	PL	U _{VAL} /OUT
4	1	3	0 V	Operating voltage	PS	U _{EL} /SEN
		4	0 V	Load voltage	PL	U _{VAL} /OUT
		5	FE	Functional earth (Functional Earth) ²⁾	FE	

1) Plug connector M12, 5-pin, A-coded
2) Secure connection to functional earth over the connected product → 4.3 → Potential equalisation

Network connections¹⁾

Pin allocation			TP1 ²⁾	TP2 ²⁾
1	2	1	TX+	RX+
		2	RX+	TX+
		3	TX-	RX-
		4	RX-	TX-
		Housing	Screening/functional earth (Shield/Functional Earth) ³⁾	

TX = transmitted data, RX = received data
1) 2 sockets M12, 4-pin, D-coded; observe installation guidelines and line specification → 4.5
2) Pin activation with deactivated crossover detection
3) Secure connection to functional earth over the connected product → 4.3 → Potential equalisation

3.2 Indicators

Status LEDs¹⁾

Significance		
PS	PS	Status of the operating voltage supply (Power System)
X1	X1	Status of the internal communication between the bus node and the connected product "I-Port Device 1" or "I-Port Device 2" ²⁾
X2	X2	
NS	NS	Network status
TP1	TP1	Connection status "Link 1" or "Link 2"
TP2	TP2	

1) Additional information → 7
2) Accessories with two I-Port interfaces required to connect two products, e.g. the decentralised electrical connection box CAPC → www.festo.com/catalogue

4 Mounting, dismantling, installation

→ Warning
Uncontrolled movement of the actuators, loose tubing, undefined switching statuses of the electronics
Injury caused by moving parts, damage to machine and to system
Before mounting and installation work:
• Switch off the power supply.
• Switch off compressed air supply.
• Vent the pneumatics.

4.1 Mounting the bus node

To mount the bus node, a product with I-Port interface is required ("I-Port Device"), e.g. a valve terminal with I-Port interface or the decentralised electrical connection box CAPC.

→ Note
Mounting of the bus node on the decentralised electrical connection box → CAPC assembly instructions

1. Check seal and sealing surfaces of the bus node and the product with the I-Port interface. Replace damaged parts.
2. Push the bus node onto the product carefully and without tilting and press up to the stop.
3. Gently tighten down the self-tapping screws, using existing threads.
4. Tighten the screws. Tightening torque: 0.7 Nm ± 10 %.

4.2 Dismantling the bus node

1. Unscrew the screws.
2. Pull the bus node off without tilting it.

4.3 Connecting the power supply

→ Warning
Electric voltage
Injury caused by electric shock, damage to machine and to system
• For the electrical power supply, use only PELV circuits in accordance with IEC 60204-1/EN 60204-1 (Protective Extra-Low Voltage, PELV).
• Observe the general requirements IEC 60204-1/EN 60204-1 of the PELV power circuits.
• Use only voltage sources that ensure a reliable electric separation from the mains network in accordance with IEC 60204-1/EN 60204-1.
• Always connect all circuits for operating and load voltage supplies U_{EL}/SEN and U_{VAL}/OUT.

Fuse protection

The bus node supplies operating and load voltage to the connected products via the I-Port interfaces X1 and X2.
• Secure operating voltage U_{EL}/SEN and load voltage U_{VAL}/OUT separately.
• Take due account of the current consumption of connected products during design and protection of the power supply.
• Observe power rating of the power supply (no bus node-internal overload protection for the connected products) → 11.
• Ensure correct polarity (no bus node-internal reverse polarity protection for the connected products).

Potential equalisation (earthing measures)

- Connect the functional earth (FE) connections of the products connected via X1 and X2 to the earth potential with a short conductor with the greatest possible cross section (≥ 4 mm² Cu).

4.4 Check the power supply

→ Note
Functional testing
- The PS LED lights up when operating voltage is applied (within permitted range).
- The LED X1 or X2 lights up green if a product with I-Port interface is connected correctly (→ 7).

4.5 Connecting to the network

→ Warning
Electric voltage
Injury caused by electric shock, damage to machine and to system
• For the electrical power supply to **all network participants** and other network components (e.g. switches and routers), use only PELV circuits IEC 60204-1/EN 60204-1.

→ Note
Data transmission errors
Malfunction
If installation has not been carried out correctly and high transmission rates are used, data transmission errors may occur, e.g. as a result of signal reflections and attenuations.
• Connect screening to all network cables
• Wherever possible, only ground screening once (star-shaped) to prevent ground loops
• Observe installation guidelines of the EtherNet/IP user organisation (ODVA): → www.odva.org → EtherNet/IP installation guidelines
• Observe port and cable specifications:
→ EtherNet/IP installation guidelines
→ Documentation on the control system
→ 3.1, table of network connections
→ Table of line specifications

→ Note
Unauthorised access to the product can cause damage or malfunctions.
When connecting the product to a network:
• Protect the network from unauthorised access. Measures for protecting the network include:
- Firewall
- Intrusion Prevention System (IPS)
- Network segmentation
- Virtual LAN (VLAN)
- Virtual Private Network (VPN)
- Security at a physical access level (port security).
Further information:
→ Guidelines and standards for security in information technology, e.g. IEC 62443, ISO/IEC 27001.
An access password protects only against accidental changes.

Use of switches and routers

With use of the EtherNet/IP function "QuickConnect":
• Use only switches and routers that support "QuickConnect".
• Use only patch cable.

Use of crossover cables

When using patch cables and crossover cables in the same network:
• Ensure that the crossover detection "Auto-MDI/MDI-X" is activated in the control system
→ Deactivate EtherNet/IP function "QuickConnect" → 5.8.

Cable specification	
Cable	Ethernet twisted pair cable, shielded (Shielded Twisted Pair, STP)
Transmission class (Link Class)	Category 5
Cable diameter ¹⁾	6 ... 8 mm
Wire cross section	0.14 ... 0.75 mm ² ; 22 AWG required for max. connection length between network participants (End-to-end-Link)
Connection length ²⁾	Max. 100 m End-to-end-Link
1) When using plug NECU-M-S-D12G4-C2-ET 2) Corresponding to the specification for EtherNet/IP networks (EtherNet/IP installation guideline) → www.odva.org	

Strain relief

When mounting on a moving part of a machine:
• Provide the network cable with strain relief.

4.6 Ensuring the degree of protection

→ Note
Short circuit
Malfunction or damage to the electronics
• Use connection technology (interconnecting cables, push-in connectors, adapters) with the required degree of protection, e.g. plug connector NECU-M-S-D12G4-C2-ET.
• Use cover caps to seal unused connections, e.g. cover cap ISK-M12 → Accessories
• Mount cover of the DIL switches: Check seal, place cover and push it down, tighten screws. Tightening torque: 0.4 Nm ± 20 %.
• Do **not** remove sealing plug from underside of bus node.
• Only when mounting the bus node on the decentralised electrical connection box CAPC: Replace sealing plug on underside of the bus node → Assembly instructions CAPC.

5 Commissioning, configuration and parameterisation
Commissioning, configuration and parameterisation of the bus node depends on the higher-order control system. The basic approach and required configuration data are explained in the following sections.

→ Warning
Uncontrolled movement of the actuators, loose tubing, undefined switching statuses of the electronics
Injury caused by moving parts, damage to machine and to system
• Before commissioning, ensure that the connected products do not perform any uncontrolled movements.
• Observe commissioning notices in the control system documentation.
No automatic checking of configuration and parameterisation: The bus node and the connected products also go into operation if configuration is incorrect.

5.1 Switch on the power supply

If the control system and network participants have separate voltage supplies, the following sequence is recommended for switch-on:
1. Switch on the power supply to all network participants.
2. Switch on power supply to control system.

5.2 Setting the DIL switch

1. Setting IP address → 5.3.
2. Perform additional settings → Table, item 3 ... 5.

Item	DIL switch ¹⁾	Function	
		ON	OFF
DIL switch 1:			
1	1 ... 6: Host ID of the IP address, bit 0 ... 5 ²⁾		
DIL switch 2:			
1	1 ... 2: Host ID of the IP address bit 6 and 7 ²⁾		
2	3: Reserved		
3	4: Network protocol	Modbus TCP	EtherNet/IP ³⁾
4	5: Status bytes → 5.5 → Table "Connection Parameters"	Status information in the input image	No status information in the input image ³⁾
5	6: Behaviour in case of communication errors and for control in the Idle-Mode	All outputs retain their last switching status	All outputs are reset ³⁾

1) Switch setting "ON" = ON, switch is to the left or on top
switch setting "OFF" = OFF, switch is to the right or underneath
2) Binary coding in ascending order from left to right 2⁰, 2¹, 2², ...
3) Factory setting

5.3 Setting IP address

→ Documentation of the control system

→ Note
• Observe the basic addressing rules for the allocation of the IP address, e.g. with respect to the use of private or public address ranges.
• Check that the IP address can be used in the automation network.
• Ensure that there is no duplication of IP addresses in use.
• Use DIL switches 1 for setting the addressing type or for setting the host ID of the bus node.

i The change of IP addressing in the bus node requires a corresponding update in the higher-order control system.

Examples

Host ID = 05	Host ID = 38
2 ⁰ + 2 ² = 1 + 4 = 5 Set IP address: 192.168.1.005	2 ¹ + 2 ² + 2 ⁵ = 2 + 4 + 32 = 38 Set IP address: 192.168.1.038

Dynamic addressing

1. Make sure there is a DHCP server (e.g. BOOTP DHCP server from Rockwell Automation) in the network.
2. Set all switch elements for address setting DIL1 (1...6) and DIL2 (1...2) to "OFF".
3. With Festo Field Device Tool (FFT) or EtherNet/IP Object, activate the "DHCP" option.
4. Switch bus node off and back on.

Saved addressing

1. Set all switch elements for address setting DIL1 (1...6) and DIL2 (1...2) to "OFF".
2. Set the IP address with the Festo Field Device Tool (FFT) or EtherNet/IP Object.
3. Switch bus node off and back on.

Static addressing

1. Set the first three octets of the IP address with the Festo Field Device Tool (FFT) or EtherNet/IP Object.
2. With all switch elements for address setting DIL1 (1...6) and DIL2 (1...2), set the fourth octet (Host-ID) of the IP address.
3. Switch bus node off and back on.

