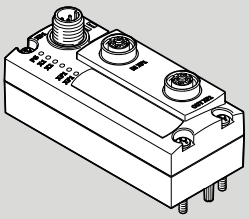
CTEU-VN
Bus node



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Instructions | Operating | Bus node | VARAN-BUS

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[8094071]

Translation of the original instructions

1 Intended use

The bus node type CTEU-VN has been designed exclusively for use as a participant
in VARAN-BUS networks. The bus node may only be used in its original status without unauthorised modifications and only in perfect technical condition.
The maximum limits must not be exceeded.
The product is suitable for industrial purposes only (Class A). Measures for interference suppression may be required in residential areas (Class B).

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Detailed information on commissioning is provided in the documentation for the higher-order control system.
Information on VARAN-BUS:
➔ www.varan-bus.net

All available documents for the product ➔ www.festo.com/pk.

1.1 Training of qualified personnel

The product may only be commissioned by trained, qualified control and automation technology personnel, who are familiar with:
- mounting, installation, operation and diagnostics of control systems, networks and fieldbus systems
- applicable regulations for accident prevention and occupational safety
- the documentation for the product.

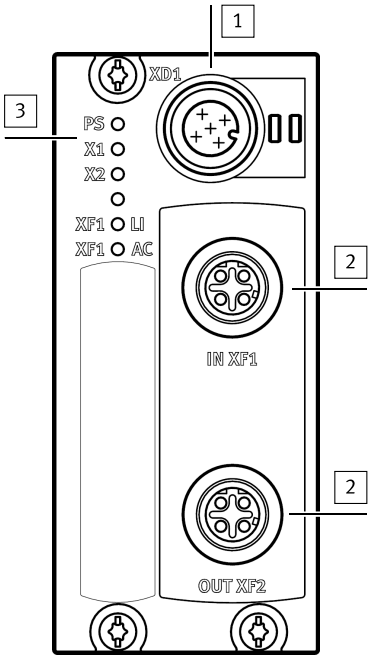
1.2 Service

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

2 Safety

- Prior to assembly or installation work: switch off power supply and secure it against being switched back on.
- For the electrical power supply, use only SELV circuits in accordance with IEC 60204-1/EN 60204-1.
- Observe the handling specifications for electrostatically sensitive devices.
- Seal unused connections with cover caps to achieve the required degree of protection.
- Use connection hardware with the required degree of protection.
- Commission only a completely mounted and wired product.

3 Connections and displays



1 Power supply connection (XD1)
➔ 3.2 Connections
2 Network connections (network ports IN XF1,OUT XF2, fieldbus interface)
➔ 3.2 Connections
3 Status LEDs
➔ 3.3 Displays,
➔ 7 Diagnostics via LEDs

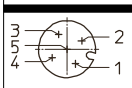
Fig. 1

3.1 I-Port interfaces

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

3.2 Connections

Power supply connection XD1[1)]

Pin allocation					
	1	24 V	Operating voltage for electronics/sensors (power system)	PS	$U_{EL/SEN}$
	2	24 V	Load voltage for valves/outputs (power load)	PL	$U_{VAL/OUT}$
	3	0 V	Operating voltage	PS	$U_{EL/SEN}$
	4	0 V	Load voltage	PL	$U_{VAL/OUT}$
	5	FE	Functional earth [2)]	FE	

1) plug M12, 5-pin, A-coded
2) Secure connection to functional earth over the connected product ➔ Equipotential bonding

Tab. 1

Network connections[1)]

Pin allocation		IN XF1 [2)]	OUT XF2 [2)]
	1	TX+	RX+
	2	RX+	TX+
	3	TX–	RX–
	4	RX–	TX–
	Housing	(Shield/functional earth) [3)]	
TX = transmitted data, RX = received data			

1) 2 sockets M12, 4-pin, D-coded ➔ Observe installation guidelines and line specifications
2) Pin allocation with deactivated crossover detection
3) Secure connection to functional earth over the connected product ➔ Equipotential bonding

Tab. 2

3.3 Displays

Status LEDs

Meaning	
PS	Status of operating and load voltage supplies
X1	System status "I-Port Device 1" or "I-Port Device 2"[1)]
X2	
XF1 LI	Connection status IN XF1 ("Link")[2)]
XF1 AC	Data reception IN XF1 ("Active")

1) Accessories with two I-port interfaces required to connect two products, e.g. the decentralised electric subbase CAPC.
2) VARAN-BUS-Status. When using the Festo Field Device Tools (FFT), e.g. for a firmware update: Ethernet status.

Tab. 3

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Additional information ➔ 7 Diagnostics via LEDs.

4 Mounting, disassembly, installation

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 sub-base CAPC.

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Mounting of the bus node on the decentralised electrical sub-base ➔ CAPC assembly instructions.

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

4.2 Dismantling the bus node

1. Switch off the power supply and secure it against being switched on again.
2. Unscrew the screws.
3. Pull the bus node off without tilting it.

4.3 Connecting the power supply

⚠ WARNING!

Risk of injury due to electric shock.

- For the electric power supply, use only SELV circuits that guarantee a reliable electric disconnection from the mains network.
- Observe IEC 60204-1/EN 60204-1.
- Always connect all circuits for operating and load voltage supply.

Fuse protection

The bus node supplies operating and load voltage to the connected products via the I-Port interfaces X1 and X2.

– Protect operating voltage $U_{EL/SEN}$ and load voltage $U_{VAL/OUT}$ separately.
– Take into account 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) ➔ 12 Technical data.
– Ensure correct polarity (no bus node-internal reverse polarity protection for the connected products).

Equipotential bonding (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 Checking the power supply

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Functional test:

- 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 an I-Port interface is connected correctly ➔ 7 Diagnostics via LEDs.

4.5 Connecting to the network

Installation guidelines

NOTICE!

Data transmission faults

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.

- Observe connection and line specification
- Connect screening to all network cables
- Wherever possible, only ground screening once (star-shaped) to prevent ground loops
- Observe installation guidelines for the VARAN-BUSuser organisation (VNO):
- Observe documentation on the control system

Use of crossover cables

No restriction when using patch cables and crossover cables in the same network.

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 mm²; 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 the plug NECU-M-S-D12G4-C2-ET

2) corresponding to specification for VARAN-BUS networks (VARAN-BUS installation guideline) ➔ www.varan-bus.net

Tab. 4

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

NOTICE!

Short circuit as a result of ingress of liquids or foreign matter

Malfunction or damage to the electronics.

- Use connection devices (connecting cables, plugs, adapters) with the required degree of protection, e.g. plug NECU-M-S-D12G4-C2-ET.
- Use cover caps to seal unused connections, e.g. cover cap ISK-M12
- Do **not** remove sealing plug from underside of bus node.
- Only when mounting the bus node on the decentralised electrical sub-base **CAPC**: replace sealing plug on underside of the bus node with the moulded seal provided.

5 Commissioning, configuration and parameterisation

➔ Documentation on the control system

➔ Information on the VARAN-BUS user organisation

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

5.1 Switching on the power supply

⚠ WARNING!

Uncontrolled movements of the actuators and loose tubing lines, undefined switching states of the electronics.

Injury caused by moving parts.

- 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.

If the control system and network participants have separate power 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 Integrating and configuring the bus node as a network participant

5.2.1 Bus node-specific LASAL Class ("LASAL Class")

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Requirement:

Use of a control system from SIGMATEK and the associated controller software.

The integration of the bus node into the control system from SIGMATEK is carried out with a bus node-specific LASAL Class, which is added using a LASAL Class file. The integration of this file can be carried out using a graphical user interface. The LASAL Class file (configuration file) contains all the configuration data for communication with the bus node. Further configuration of the bus node is not required.

5.2.2 VARAN Client Configuration

Example with controller software LASAL CLASS from SIGMATEK:

1. Connect bus node to the control system:
2. Check the network communication between the control system and the bus node ➔ 5.3 Checking the network communication.
3. Start the controller software.
4. Create a new project or open an existing one.
5. In the "Graphical Hardware Editor" window, open the "Product Catalogue". An overview of the available products opens.
6. Drag and drop the symbol for the control system and, if applicable, other components from the "Product Catalogue" and drop it into the main window.
7. Open the directory "VARAN", sub-directory "Special".
8. Drag the "Festo CTEU-VN" symbol into the main window. The selected components are shown with the available connection and display elements as symbols ➔ Continue from Point 13. If the symbol "Festo CTEU-VN" is not available, ➔ continue from Point 9.
9. Activate the "Class View" window in the main menu and open it.
10. Add LASAL Class ("LASAL Class") "cteu_vn" using the menu function "Import Class/Network".
11. Close the project and re-open it. The symbol "Festo CTEU-VN" will be available in the "Product Catalogue".
12. Drag the symbol "Festo CTEU-VN" into the main window.
13. In the "Graphical Hardware Editor" window, connect the network connections of all components with one another: Using the left mouse button, click on the corresponding symbol; keep the mouse button pressed and drag the symbol to the destination. A green line between the components indicates a successful connection. The bus node is integrated into the VARAN-BUS network.
14. Activate the window "Network View" in the main menu and open it.
15. Open the window "HW_Network": In the window "Network View", double click "HW_Network". The software-based inputs/outputs (connection points) and logic elements and their connections are shown as symbols.
16. Open the window "Class View".

17. Create new LASAL Class under "Task Settings":
    Click on the root node with the right mouse button and in the context menu, select "Create Class".
18. Give the LASAL Class a name, e.g. "ClassCTEU_VN".
19. Switch on "Properties Window".
20. In the "Properties" window under "Task Settings", configure the following characteristics of the LASAL Class:
    – "CyclicTask": true
    – "DefaultCyclic": 10 ms
21. Create client for the new LASAL Class:
    Using the right mouse button, click LASAL Class and select "New Client" in the context menu.
22. Give the client a name, e.g. "ClientCTEU_VN".
23. In the "Properties" window, configure the following characteristics of the client:
    – Type: "ObjectChannel"
    – Class: "cteu_vn"
24. Create the variable for the new LASAL Class:
    Using the right mouse button, click on the LASAL Class and select "New Variable" in the context menu.
25. Give the variable a name, e.g.. "inputs".
26. Select the following characteristic of the variables:
    – Type "cteu_vn::t_cteu_vn_Inputs"
27. Create another variable for the new LASAL Class:
    Using the right mouse button again, click on the LASAL Class and select "New Variable" in the context menu.
28. Give the variable a name, e.g. "outputs".
29. Select the following characteristic of the variables:
    – Type "cteu_vn::t_cteu_vn_Outputs"
30. Add the newly created LASAL Class to the network:
    Drag the LASAL Class "ClassCTEU_VN" out of the window "Class View" and drop it into the window "HW_Network".
31. In the window "HW_Network", connect the LASAL Class with the bus node:
    Using the left mouse button, click on the connection point "ClientCTEU_VN" of the LASAL-Class, keep the mouse button pressed and drag it to the destination, the connection point "State" (Server) of the bus node ("ClassCTEU_VN").
    – The bus node can be controlled via the created LASAL Class.
    – The programming interface, the software API of the bus node, is available through the associated client.
    – Input/output data can be transmitted via the software API.

5.2.3 Functional test (programming example "Transferring input/output data")

1. In the window "Class View", double click the created LASAL Class.
   The editor window opens.
2. Add instruction to transmit input/output data to the function "ClassCTEU_VN::CyWork" (programming example):

```
outputs[0] := 16#aa;
outputs[1] := 16#aa;
outputs[2] := 16#aa;
outputs[3] := 16#aa;
inputs[0] := 16#aa;
inputs[1] := 16#aa;
inputs[2] := 16#aa;
inputs[3] := 16#aa;
ClientCTEU_VN.SetOutputs(Port:=cteu_vn::Port0, Value:=#outputs);
ClientCTEU_VN.GetInputs(Port:=cteu_vn::Port0, Value:=#inputs);
```

3. Create an online connection with the control system, compile project, download and start:
   Click button "Build Changes, Online, Download and Run".
4. Check the transmission of the input/output data (value change) in the control system.

5.3 Checking the network communication

Functional test:
With a fault-free communication between control system and bus node:
- The **LED XF1 LI** lights up green.
- The **LED XF1 AC** flashes green.

Further information on diagnostics via LEDs ➔ 7 Diagnostics via LEDs.

6 Payloads

Input/output addresses, parameters and other product-specific data of the bus node are defined in the LASAL Class as a "Payload".

For the communication between the control system and the bus node, an application programme is required ➔ Documentation on the control system.

6.1 Input and output addresses

The input/output addresses of the bus node are defined in the configuration file under "VARAN Address Offset (Read/Write)" ➔ 6.2 Process data ("I/O Data"). The input/output addresses cannot be changed. The PLC specifies the respective start addresses.

6.2 Process data ("I/O Data")

Process data (input/output data) are transmitted via the Triple Buffer. For the reading and writing of the process data, the same I/O address is used ➔ Table "I/O Addresses".

Initialisation of the process data transmission

1. Find the output data length of the I-Port devices from the device information or the device parameters.
2. Write the value of the start address 16#0008 to the start address 16#4004 ➔ CTEU-VN Triple Buffer Offset Read (Input Data).
3. Write the following total value to the start address 16#4006:
   Value of the start address 16#0008 plus output data lengths of the I-Port devices minus 1 ➔ CTEU-VN Triple Buffer Offset Write (Output Data).

Transmission of input data

– Read data from the above-mentioned start address 16#4004: the bus node transits the input data for as long as data is being read from this start address.

Transmission of output data

– Write data to the above-mentioned start address 16#4006: the bus node transmits and updates the output data after the last byte has been written.

I/O addresses[1]	Start address (Offset)	Data field size
VARAN Address Offsets		
CTEU-VN Parameter Buffer Read: I-Port 1/I-Port 2, Parameters and Diagnostics	16#0000	➔ 6.3 Parameters and diagnostic information
CTEU-VN Parameter Buffer Write: I-Port 1/I-Port 2, Parameters and Diagnostics	16#0100	
I-Port 1, Device Information (Read)	16#0200	➔ 6.4 Device information (participant characteristics)
I-Port 2, Device Information (Read)	16#0400	
CTEU-VN I/O Triple Buffer[2]	16#4000	2 Bytes
CTEU-VN Triple Buffer Offset Read (Input Data)	16#4004	2 Bytes
CTEU-VN Triple Buffer Offset Write (Output Data)	16#4006	2 Bytes
Triple Buffer Offsets		
CTEU-VN Triple Buffer I/O Data Read (Input Data)[3]	16#4008	64 Bytes
CTEU-VN Triple Buffer I/O Data Write (Output Data)[3]		64 Bytes
CTEU-VN Triple Buffer Offset Read	CTEU-VN Triple Buffer I/O Data	2 Bytes
CTEU-VN Triple Buffer Offset Write	CTEU-VN Triple Buffer I/O Data + Output Data Length – 1	2 Bytes

1) The specified start addresses refer to the basic address stipulated by the PLC.

2) Process data (I/O data) are transmitted via the Triple Buffer.

3) The same I/O address is used for the reading and writing of process data.

Tab. 5

6.3 Parameters and diagnostic information

The parameters and diagnostic information of the bus node are defined in the configuration file under "CTEU-VN Input/Output Parameters" ➔ 6 Payloads.
The memory areas for parameters and diagnostic information are sub-divided into a read and write area. The read area reproduces the current values of the bus node, while the values can be changed correspondingly via the write area. An initialisation of the memory areas is not required.

I/O addresses[1]	Start address (Offset)	Data field size
Read area		
I-Port 1 – I-Port Device Parameter	16#0000	8 Bytes
I-Port 1 – IO-Link Mode[2]	16#0008	1 Bytes
I-Port 2 – I-Port Device Parameter	16#0009	8 Bytes
I-Port 2 – IO-Link Mode[2]	16#0011	1 Bytes
I-Port 1 – Diagnostics	16#0012	2 Bytes
I-Port 2 – Diagnostics	16#0014	2 Bytes
Output Failsafe Mode[3]	16#001E	1 Bytes
Write area		
I-Port 1 – I-Port Device Parameter	16#0100	8 Bytes
I-Port 1 – IO-Link Mode[2]	16#0108	1 Bytes
I-Port 2 – I-Port Device Parameter	16#0109	8 Bytes
I-Port 2 – IO-Link Mode[2]	16#0111	1 Bytes
Output Failsafe Mode[3]	16#011E	1 Bytes

1) The specified start addresses refer to the basic address stipulated by the PLC.

2) IO-Link compatibility mode: no full support of the IO-Link functionality; "0" = "I-Port Mode", "1" = "IO-Link Mode".

3) Set "Output Failsafe Mode" to "0": outputs are set to zero ("Reset Outputs"); set "Output Failsafe Mode" to "1": the last state of the outputs is retained ("Hold Last State").

Tab. 6

6.4 Device information (participant characteristics)

In the initialisation of the bus node, the I-Port device information is written to the following memory areas:

I/O addresses[1]	Start address (Offset)	Data field size
I-Port 1		
Input data length	16#0200	1 Byte
Output data length	16#0201	1 Byte
IO-Link Vendor ID[2]	16#0202	2 Bytes
IO-Link Device ID[2]	16#0204	4 Bytes
Product Name [String]	16#0208	65 Bytes
Order Code [String]	16#0249	65 Bytes
Product Text [String]	16#028A	65 Bytes
Serial Number [String]	16#02CB	17 Bytes
Hardware Revision [String]	16#02DC	65 Bytes
Firmware Revision [String]	16#031D	65 Bytes
I-Port 2		
Input data length	16#0400	1 Byte
Output data length	16#0401	1 Byte
IO-Link Vendor ID[2]	16#0402	2 Bytes
IO-Link Device ID[2]	16#0404	4 Bytes
Product Name [String]	16#0408	65 Bytes
Order Code [String]	16#0449	65 Bytes
Product Text [String]	16#048A	65 Bytes
Serial Number [String]	16#04CB	17 Bytes
Hardware Revision [String]	16#04DC	65 Bytes
Firmware Revision [String]	16#051D	65 Bytes

1) The specified start addresses refer to the basic address stipulated by the PLC.

2) "IO-Link Vendor ID" and "IO-Link Device ID" ae dependent on the connected product.

Tab. 7

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"Vendor ID" and "Device ID" of the bus node CTEU-VN in the VARAN-BUS network:

- Vendor ID: 15
- Device ID: 1281

7 Diagnostics via LEDs

PS – Status of the operating and load voltage supplies	
LED status and meaning	
	LED lights up green: – Normal operating status – Operating voltage is present (within the permissible range) – Load voltage is present (within the permissible range)[1]
	LED flashes green (flashing frequency: 1 Hz): – Operating voltage is below the required voltage – Load voltage is below the required level[1] – Short circuit at the I-Port[1]
	LED is off: – Operating voltage is not present – Operating voltage is below the minimum voltage required for diagnostic functions

1) This display only relates to the status of the load voltage if the connected product is monitoring the load voltage and reports its status to the bus node.

Tab. 8

X1 and X2 – System status "I-Port Device 1" or "I-Port Device 2"[1]	
LED status and meaning	
	LED lights up green: – Normal operating status – I-Port device 1 or 2 is connected correctly – Operating and load voltages are present (within the permitted range)[2]
	LED flashes green: – Status of diagnostics – Undervoltage at system or additional supply – Connection between the bus node and the I-Port device is OK
	LED lights up red: – I-Port device is connected correctly, but the internal communication is malfunctioning – After commissioning, I-Port Device removed
	LED flashes red: – Error in the bus node

X1 and X2 – System status "I-Port Device 1" or "I-Port Device 2"[1]	
LED status and meaning	
	Both LEDs light up orange: – Firmware update active
	Both LEDs flash orange: – To locate the bus node (“module location”), e.g. during hardware configuration in the control system or for troubleshooting
	LED is off: – No product connected to the bus node

1) Accessories with two I-Port interfaces required for connecting two products

2) This display only relates to the status of the load voltage if the connected product is monitoring the load voltage and reports its status to the bus node.

Tab. 9

XF1 LI – Connection status IN XF1 ("Link")	
LED status and meaning	
	LED lights up green: – Normal operating status – Network connection is OK
	LED is off: – No network connected

Tab. 10

XF1 AC – Data reception IN XF1 ("Active")	
LED status and meaning	
	LED flashes green: – Data traffic
	LED is off: – No data reception

Tab. 11

8 Firmware update

A firmware update can only be performed by the Festo Field Device Tool (FFT)
➔ www.festo.com/sp

8.1 Preparation of Firmware update

For the Firmware update, the bus node must be connected with the Ethernet connection of a PC or with the LAN via the network connection IN XF1.
The bus node independently detects the Ethernet connection and changes the connection protocol correspondingly from VARAN-BUS to Ethernet communication. The Ethernet connection is addressed as part of the preparation via DHCP ➔ 8.2 Dynamic addressing via DHCP server. Alternatively, a static IP address can be assigned➔ 8.3 Static addressing.

8.2 Dynamic addressing via DHCP server

The automatic assignment of an IP address (DHCP) can be set via the FFT.

1. Connect the bus node with LAN.
2. Install and start the FFT on a Personal Computer.
3. If the device search does not start independently:
   Call up the FFT function "Search for devices".
   Devices available in the LAN are displayed.
4. If the PC is not in the same LAN sub-network ➔ Online help or description of "FFT".
5. Select the bus node CTEU-VN.
6. In the network settings or using the command line mode, activate the automatic assignment of an IP address (DHCP).
7. Switch bus node off and back on.
   The IP address is assigned automatically.

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   The assignment of an IP address via DHCP can take several seconds. Until a DHCP address has been successfully assigned, the address 0.0.0.0 is displayed in the FFT. If necessary, call up the FFT function "Search for devices" again ➔ Point 3.

8. Call up the FFT function "Search for devices" again.
   Devices available in the LAN are displayed.
9. Select the bus node CTEU-VN.

Then carry out the Firmware update ➔ Online help or description of "FFT".

8.3 Static addressing

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- 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 network.
- Ensure that IP addresses are not used more than once.

The allocation of a static IP address can be adjusted via the FFT.

1. Connect the bus node with LAN.
2. Install and start the FFT on a Personal Computer.
3. If the device search does not start independently:
   Call up the FFT function "Search for devices".
   Devices available in the LAN are displayed.
4. If the PC is not in the same LAN sub-network ➔ Online help or description of "FFT".
5. Select the bus node CTEU-VN.
6. In the network settings or via the command line mode, enter a static address and subnet mask.
7. Switch bus node off and back on.
   The IP address is assigned.
8. Call up the FFT function "Search for devices" again.
   Devices available in the LAN are displayed.
9. Select the bus node CTEU-VN.

Then carry out the Firmware update ➔ Online help or description of "FFT".

8.4 Processing the Firmware update

➔ Online help or description of "FFT"

9 Maintenance

Check the bus node regularly for Firmware updates. No further action.

10 Accessories

➔ www.festo.com/catalogue

11 Glossary

Term/abbreviation	Meaning
LASALClass file	The LASAL Class file (configuration file, also known as "LASAL component") is available in the "Product Catalogue" of the controller software "LASAL CLASS" and contains all configuration data for communication with the bus node.
PLC	Programmable logic controller, also referred to as system controller or controller for short (“Programmable Logic Controller”, PLC)
VARAN	Versatile Automation Random Access Network: network protocol based on Ethernet technology in automation technology for the data exchange between a higher-order control system (industry PC, PLC or I/O controller), network participants and field devices/modules, e.g. valve terminals or drives ➔ www.varan-bus.net

Tab. 12

12 Technical data

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Technical data for the connected products can be obtained from the product documentation.

Electrical characteristics	
Degree of protection through housing	IP65/IP67[1)2)]
Protection against electric shock (protection against direct and indirect contact)	Through the use of SELV circuits
Disconnection of network connections for operating voltage power supply $U_{EL/SEN}$	Electrically isolated, by means of transformer (up to 500 V)
CE marking[3)] (see declaration of conformity) ➔ www.festo.com	In accordance with EU EMC Directive

1) Requirement: bus node mounted completely, plug connector in the plugged-in status or provided with cover cap.

2) Connected products may only fulfil a lower degree of protection.

3) The product is suitable for industrial purposes only (Class A). Measures for interference suppression may be required in residential areas (Class B).

Tab. 13

General mechanical characteristics	
Vibration and shock resistance (to IEC 60068)[1)] – Vibration (part 2-6) – Shock (part 2 – 27) – Continuous shock (part 2 – 27)	Severity level (SG)[1)] For wall or H-rail mounting – Wall: SG2; H-rail: SG1 – Wall: SG2; H-rail: SG1 – Wall and H-rail: SG1
Temperature range [2)] – Storage/transport – Operation	 –20 ... +70 °C –5 ... +50 °C
Corrosion protection	The product is intended for indoor use in a typical industrial atmosphere. – Avoid condensation.

General mechanical characteristics	
Materials – Housing – Cover – Fibre-optic cables – Threaded bush M12 – Threaded bush M3 – Seals – Screws	RoHS-compliant PA-reinforced PA PC Nickel-plated brass Brass NBR Galvanised steel
Dimensions – Width – Length – Height	 40 mm 91 mm 39.7 mm[3)]
Weight (bus node without cables and sub-assembly)	98 g

1) Explanation of the severity level ➔ Table "Explanation on vibration and shock – severity level"

2) Connected products may only cover a less extensive temperature range.

3) Height of the product: without guide pin, without cover cap

Tab. 14

Power supply	
Operating voltage for bus node and connected products[1)] – Nominal value – Tolerance range	 24 V DC 18 ... 30 V DC[2)]
Load voltage for bus nodes and connected products[1)] – Tolerance range	 18 ... 30 V DC[2)]
Intrinsic current consumption at nominal operating voltage 24 V DC Operating voltage supply for the electronics/sensors ($U_{EL/SEN}$)	typ. 65 mA (internal electronics)
Power rating of operating and load voltage power supplies [1)3)] – Bus node on the connected product (e.g. valve terminal) – Bus node on the decentralised electrical sub-base CAPC	 max. 4 A max. 2 A per I-Port Device[4)]
Power failure buffering	10 ms

1) Separate, external fuses are required for the operating and load voltage power supplies (no bus node-internal overload and reverse polarity protection for the products connected via X1 and X2).

2) The tolerance range is dependent on the connected products.

3) Total power rating of operating and load voltage power supplies PS and PL (residual current), maximum permitted current consumption of bus node and connected products

4) Total power rating of operating and load voltage power supplies PS and PL (residual current), maximum permitted current consumption per I-Port device

Tab. 15

Explanation of vibration and shock – severity level

Vibration load

Frequency range [Hz]		Acceleration [m/s²]		Deflection [mm]	
SG1	SG2	SG1	SG2	SG1	SG2
2 ... 8	2 ... 8	–	–	±3.5	±3.5
8 ... 27	8 ... 27	10	10	–	–
27 ... 58	27 ... 60	–	–	±0.15	±0.35
58 ... 160	60 ... 160	20	50	–	–
160 ... 200	160 ... 200	10	10	–	–

Tab. 16

Shock load

Acceleration [m/s²]		Duration [ms]		Shocks per direction	
SG1	SG2	SG1	SG2	SG1	SG2
±150	±300	11	11	5	5

Tab. 17

Continuous shock load

Acceleration [m/s²]	Duration [ms]	Shocks per direction
±150	6	1000

Tab. 18

Network-specific characteristics	
Network protocol	VARAN-BUS
Network-specific functions and general protocols	– Cyclic data exchange – Real-time data transmission (RT)
System-specific functions	– Integrated VARAN splitter – System status via image table – Firmware update – Identification of network participants (electronic rating plate)

Network-specific characteristics	
Product-specific functions	– Diagnostic information (system diagnostics, under-voltage, communication errors) – Parameterisation (Failsafe response, IO-Link mode)
Transmission technology	Ethernet technology, Design 100BaseTX, "Integrated VARAN Splitter"
Transmission rate	100 Mbit/s
Bus cycle time	≥ 100 µs
Isochrone access time	≥ 2.18 µs/Byte (Read/Write)
Protocol Time, tP [1)]	≥ 80 ns/Byte
Jitter	≥ 100 ns
Network connections	2 x socket, M12, D-coded, 4-pin
Crossover detection	Auto-MDI/MDI-X[1)]
VARAN-BUS address volume	4 GB
I-Port address volume inputs/outputs (Input Size/Output Size)	64 bytes E, 64 bytes A (32 bytes I/O per I-Port)

1) VARAN-BUS Timing ➔ www.varan-bus.net

Tab. 19