

Your Global Automation Partner

**TURCK**

TBEN-L...-PLC-....  
Compact  
CODESYS V3 PLC

Instructions for Use



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# 1 About these Instructions

These operating instructions describe the structure, functions and the use of the product and will help you to operate the product as intended. Read these instructions carefully before using the product. This is to avoid possible damage to persons, property or the device. Retain the instructions for future use during the service life of the product. If the product is passed on, pass on these instructions as well.

## 1.1 Target groups

These instructions are aimed a qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

## 1.2 Explanation of symbols used

The following symbols are used in these instructions:



**DANGER**

DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.



**WARNING**

WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.



**CAUTION**

CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.



**NOTICE**

NOTICE indicates a situation which may lead to property damage if not avoided.



**NOTE**

NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.



**CALL TO ACTION**

This symbol denotes actions that the user must carry out.



**RESULTS OF ACTION**

This symbol denotes relevant results of actions.

## 1.3 Other documents

Besides this document the following material can be found on the Internet at [www.turck.com](http://www.turck.com):

- Data sheet
- Operating instructions
- EU Declaration of Conformity
- Approvals

## 1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to [techdoc@turck.com](mailto:techdoc@turck.com).

## 2 Notes on the Product

### 2.1 Product identification

These instructions apply to the compact CODESYS V3 programmable PLCs:

- TBEN-L4-PLC-10
- TBEN-L4-PLC-11
- TBEN-L5-PLC-10
- TBEN-L5-PLC-11

### 2.2 Scope of delivery

- TBEN-L...-PLC-...
- Closure caps for 7/8" connectors
- Closure caps for M12 connectors
- Label clips
- Quick-Start Guide

### 2.3 Legal requirements

The device is subject to the following EC directives:

- 2014/30/EU (electromagnetic compatibility)
- 2011/65/EU (RoHS Directive)

### 2.4 Manufacturer and service

Hans Turck GmbH & Co. KG  
Witzlebenstraße 7  
45472 Muelheim an der Ruhr  
Germany

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats. You can access the product database at the following address: [www.turck.en/products](http://www.turck.en/products)

For further inquiries in Germany contact the Sales and Service Team on:

- Sales: +49 208 4952-380
- Technology: +49 208 4952-390

Outside Germany, please contact your local Turck representative.



## 3 For Your Safety

The product is designed according to state-of-the-art technology. However, residual risks still exist. Observe the following warnings and safety notices to prevent damage to persons and property. Turck accepts no liability for damage caused by failure to observe these warning and safety notices.

### 3.1 Intended use

These devices are designed solely for use in industrial areas.

The CODESYS V3 programmable TBEN-L...-PLC-... can be used as autonomous PLC or as de-central PLC in a network interconnection for a fast preprocessing of signals. The devices allow autonomous control of applications without higher-level control. The TBEN-L...-PLC-... can be used in different Ethernet networks or fieldbus systems as Master/Controller (Modbus TCP, Modbus RTU, PROFINET, EtherNet/IP™, CANopen, SAE J1939) or Slave/Device (Modbus TCP, Modbus RTU, PROFINET, EtherNet/IP™, CANopen) and can communicate with bus nodes or higher-level controllers.

The cloud functionality of the TBEN-L...-PLC-... enables the direct transfer of application data to the Turck Cloud via CODESYS variables for the purpose of data analysis or production monitoring. In Dual MAC mode, the TBEN-L...-PLC-... can be operated as a node in two different Ethernet networks.

The devices may only be used as described in these instructions. Any other use is not in accordance with the intended use. Turck accepts no liability for any resulting damage.

### 3.2 General safety notes

- The device may only be assembled, installed, operated, parameterized and maintained by professionally-trained personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.
- The device only meets the EMC requirements for industrial areas and is not suitable for use in residential areas.
- The programmable devices can be used to control machines. Changes to system or network settings or to the control program can lead to non-defined states of the controlled machines. Changes may only be made if the controlled machine is in a safe stop state and the device is separated from the machine.
- Change the default password of the integrated web server after the first login. Turck recommends using a secure password.

## 4 Product Description

The device is designed in a fully encapsulated housing with degree of protection IP65/IP67/ IP69K. The Ethernet ports serve as interface for programming, configuration and Ethernet/ field bus communication. The Ethernet ports serve as interface for programming, configuration and Ethernet/ field bus communication. Two serial interfaces COM 0 and COM 1 are available for connecting serial RS232 or RS485 devices. CANopen or SAE J1939 devices can be connected to the TBEN-L...-PLC-... via the two CAN interfaces CANout and CANin. To connect digital sensors and actuators, the device has eight digital I/O channels that can be used as inputs or outputs without configuration. The USB device port is designed as a mini USB B socket and can be used as a service interface for the device DTMs and as a programming interface for CODESYS. The USB host port is designed as a USB2.0-A socket and is used to connect USB memory sticks for program backup, program recovery, firmware update and data synchronization.

### 4.1 Device overview

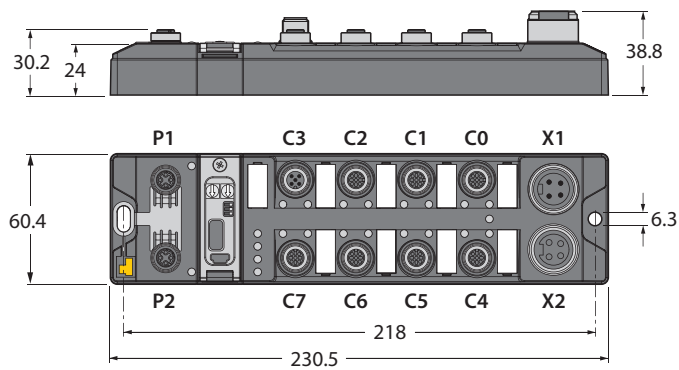


Fig. 1: TBEN-L4 –PLC-... – dimensions

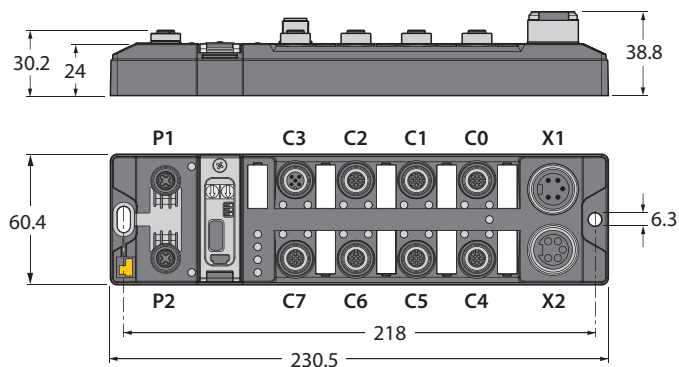


Fig. 2: TBEN-L5 –PLC-... – dimensions

4.1.1 Block diagram

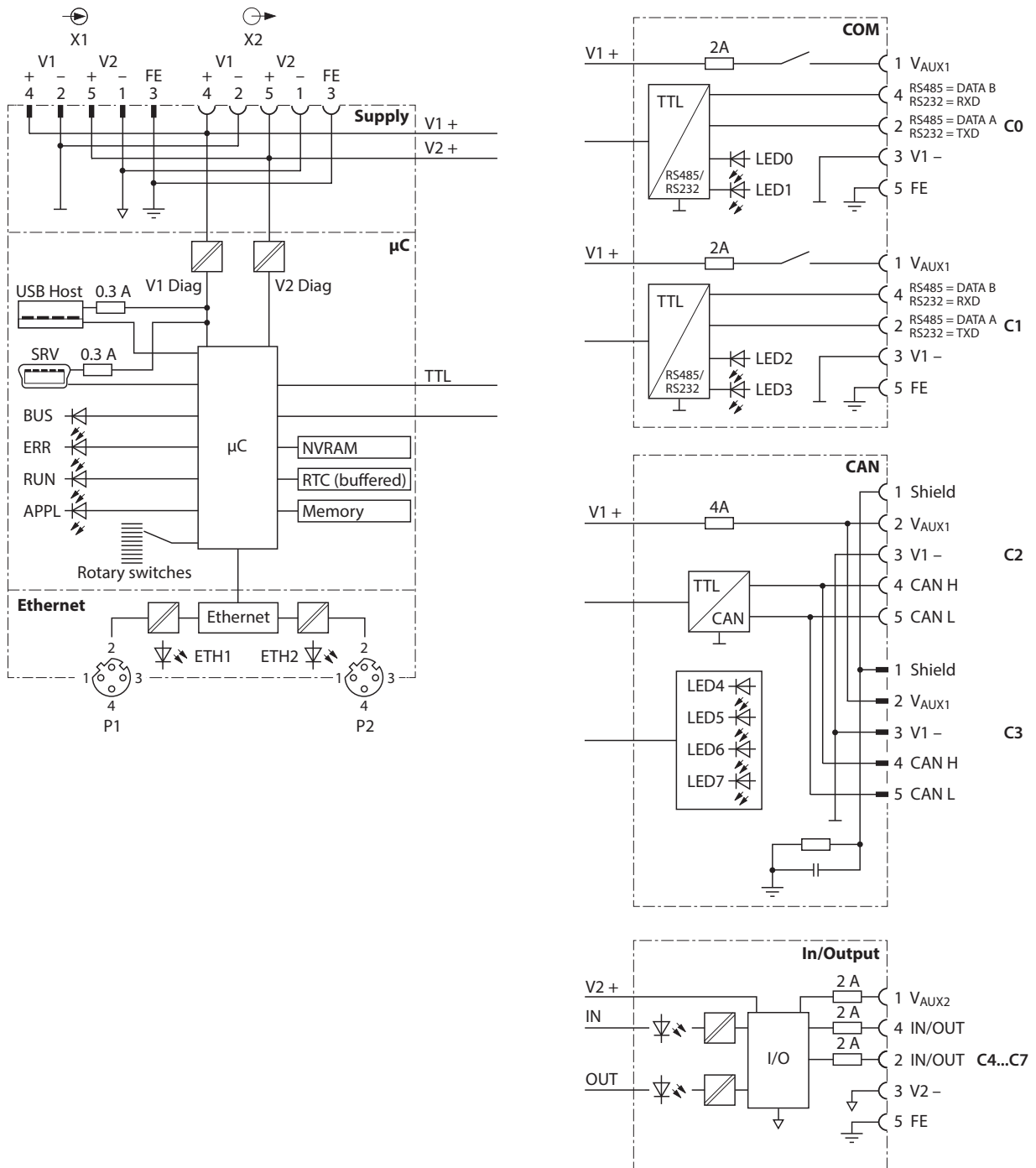


Fig. 3: Block diagrams TBEN-L...- PLC-...

#### 4.1.2 Display Elements

The device has the following LED indicators:

- Power supply
- Group and bus errors
- Status
- Diagnostics

#### 4.2 Properties and Features

- Integrated Cloud functionality ( $\geq$  V1.4.6.0): Transfer of CODESYS variables into the Cloud
- PROFINET IO and EtherNet/IP™ Device, Modbus TCP, Modbus RTU and CANopen slave
- Master functionalities:
  - Modbus TCP /Modbus RTU master
  - PROFINET Controller
  - EtherNet/IP™ Scanner
  - CANopen Manager
  - SAE J1939 Manager
- Ethernet and USB programming interface
- Programmable according to IEC 61131-3 with CODESYS V3 in:
  - IL = Instruction List
  - LD = Ladder Logic
  - FBD = Function Block Diagram
  - SFC = Sequential Function Chart
  - ST = Structured Text
- Integrated Gold CAP buffered Real Time Clock (RTC)
- USB Device port as programming and service interface
- USB Host port for connecting USB memory sticks for firmware-update, program backup, program restore, data synchronization
- Protocol converter - for example from Ethernet to serial communication
- 7/8"-connector for power supply
  - TBEN-L4-PLC-...: 4-pole
  - TBEN-L5-PLC-...: 5-pole
- Two 4-pole M12-connectors for Ethernet
- 8 digital channels configurable as PNP inputs and/or outputs (2 A)
- Several LEDs for status indication
- Switch Mode ( $<$  V1.4.6.0): Integrated Ethernet switch, allows line topology
- Dual MAC Mode ( $\geq$  V1.4.6.0): 2 separate Ethernet ports for connecting different Ethernet networks
- Integrated Webserver
- Transmission rate 10 Mbps and 100 Mbps
- Fibre-glass reinforced housing
- Shock and vibration tested
- Fully potted module electronics
- Degree of protection IP65/IP67/IP69K

### 4.3 Operating principle

The CODESYS-3 controller TBEN- L PLC-... can be used to control smaller or modular machines or for signal preprocessing. The device can be used in various Ethernet networks or fieldbus systems as master/controller (Modbus TCP, Modbus RTU, PROFINET, EtherNet/IP™, CANopen, SAE J1939) or slave/device (Modbus TCP, Modbus RTU, PROFINET, EtherNet/IP™, CANopen) and communicates with bus nodes or higher-level controllers. As a protocol converter between two networks, the TBEN-L...-PLC-... can for example act as a CANopen manager of a machine module networked with CANopen and connect it to a system that is networked with PROFINET. In DUAL MAC mode, the controller transmits data from an internal machine network to the external Turck Cloud Portal as a participant in two separate Ethernet networks, for example.

### 4.4 Functions and operating modes

#### 4.4.1 Switch Mode

In switch mode, the two Ethernet ports of the TBEN-L...-PLC-... are treated as one autocrossing switch with one IP address [▶ 25].



**NOTE**

Devices with a firmware version lower than V1.4.6.0 can only be operated in switch mode.

#### 4.4.2 Dual MAC Mode (firmware version higher than V1.4.6.0)

In Dual MAC mode, the two Ethernet ports of the TBEN-L...-PLC-... are treated as separate Ethernet ports with own MAC and IP addresses. The TBEN-L...-PLC-... can therefore be a participant in two different Ethernet networks in dual MAC mode. The two IP addresses of the separate Ethernet ports must be located in different subnets [▶ 25]

Example:

Port P1 (ETH1):

- IP address: 192.168.1.xxx
- Subnet mask: 255.255.255.0

Port P2 (ETH2):

- IP address: 192.168.2.xxx
- Subnet mask: 255.255.255.0



**NOTE**

To use the TBEN-L...-PLC-... in separate networks with combined master/slave functions (see Master/Slave [▶ 13]), the device must be operated in dual MAC mode.

#### 4.4.3 Master/slave operation modes

The CODESYS 3 programmable TBEN-L...-PLC-... can be used as follows:

Protocol	Master/Controller/Scanner/Manager	Slave/Device
Modbus TCP	x	x
Modbus RTU	x	x
PROFINET	x	x
EtherNet/IP™	x	x
CANopen	x	x
SAE J1939	x	-



**NOTE**

The functions PROFINET device and EtherNet/IP™ slave are only available at Ethernet port P1 (in CODESYS at eth0).

Possible combinations Master/Slave

The following table is valid for combinations of one Master and one Slave.

	<b>Modbus TCP Slave</b>	<b>PROFINET Device</b>	<b>EtherNet/IP™ Device</b>	<b>Modbus RTU Slave</b>	<b>CANopen Device</b>
Modbus TCP Master	x	x	x	x	x
PROFINET Controller	x	x*	x	x	x
EtherNet/IP™ Scanner	x	x	x*	x	x
Modbus RTU Master	x	x	x	x*	x
CANopen Manager	x	x	x	x	-
SAE J1939 Manager	x	x	x	x	-

\* These functions cannot be used together on the same Ethernet port (Dual MAC Mode) or COM port. Each function must be configured separately on an Ethernet or COM port.

Possible combinations Master/Master

	<b>Modbus TCP Master</b>	<b>PROFINET Controller</b>	<b>EtherNet/IP™ Scanner</b>	<b>Modbus RTU Master</b>	<b>CANopen Manager</b>	<b>SAE J1939 Manager</b>
Modbus TCP Master	-	x	x	x	x	x
PROFINET Controller	x	-	-	x	x	x
EtherNet/IP™ Scanner	x	-	-	x	x	x
Modbus RTU Master	x	x	x	(1 Master per COM port)	x	x
CANopen Manager	x	x	x	x	-	-
SAE J1939 Manager	x	x	x	x	-	-

Possible combinations Slave/Slave

	<b>Modbus TCP Slave</b>	<b>PROFINET Device</b>	<b>EtherNet/IP™ Device</b>	<b>Modbus RTU Slave</b>	<b>CANopen Device</b>
Modbus TCP Slave	-	x	x	x	x
PROFINET Device	x	-	x	x	x
EtherNet/IP™ Device	x	x	-	x	x
Modbus RTU Slave	x	x	x	(1 Slave per COM port)	x
CANopen Device	x	x	x	x	-

## Supported CODESYS libraries

<b>3S libraries</b>	<b>Version</b>
Network	SysSocket, 3.5.14.0 (system)
	SysTarget, 3.5.5.0 (system)
File access	SysFile, 3.5.9.0 (system)
	SysDir, 3.5.12.0 (system)
	SysTypes, 3.1.2.0 (system)
EtherNetIP™ Services	EtherNetIP Services, 3.5.14.0
CommFB	CommFB, 3.5.14.0
Serial communication	SysTarget, 3.5.5.0 (system)
Time and date	SysTime, 3.5.9.0 (system)
	SysTimeRtc, 3.5.5.0 (system)
Miscellaneous	SysEvent, 3.5.5.0 (system)
	SysMem, 3.5.12.0 (system)
<b>CAA libraries</b>	<b>Version</b>
Network	CAA Net Base Services, 3.5.14.0
File access	CAA File, 3.5.13.0
	CAA Types Extern, 3.5.13.0
CAN	CAA CiA 405, 3.5.14.0
Serial communication	CAA SerialCom, 3.5.10.0
Time and date	CAA Types Extern, 3.5.12.0
	CAA Real Time Clock Extern, 3.5.10.4

### 4.4.4 COM interfaces

The two serial interfaces COM0 and COM1 can be used flexibly as RS232 or RS485 interfaces and are used to connect RS232 or RS485 devices.

### 4.4.5 CAN interfaces

The CAN interfaces CANin and CANout are used to connect CANopen nodes when the TBEN-L...-PLC-... is operated as a CANopen device, CANopen manager or SAE J1939 manager.

#### 4.4.6 Web server

The integrated web server is used for support during commissioning, maintenance and diagnostics. The web server offers the following functions, among others:

- Displaying device information (firmware version, hardware version, serial number, CODESYS runtime, etc.)
- Parameterizing network settings and device functions
  - Setting Ethernet interface
  - Assigning a PROFINET name
  - Activating the firewall for Ethernet port P2
  - Activating UDB host functions
  - Setting I/O channel parameters
  - etc.
- Displaying status information
  - Network status
  - USB memory status
  - CODESYS application status
  - etc.
- Displaying device and I/O channel diagnostics
- Cloud:
  - Configuring the Cloud access
  - Monitoring CODESYS variables
- Export and import of device configurations
- Executing the firmware update
- Executing a device restart and a network reset
- Resetting the device to factory settings

#### Safety in the web server

In the web server, a default-password is assigned to the Turck devices for the administrator access.

The default user for the web server is "admin", the default password is "password".

We strongly recommend to use an individual password, in order to avoid possible misuse by a third party!

This should be done in the context of the network security concept for the complete facility in which the modules are placed.

The password is transmitted in plain text.

#### 4.5 Technical accessories

Accessories for mounting, connecting and parameterizing can be found in product database or the Accessories List for TBEN (D301367) under [www.turck.com](http://www.turck.com). The accessories are not part of the scope of delivery.



## 5 Mounting

The TBEN-L module can be screwed onto a flat mounting plate.

- ▶ Attach the module to the mounting surface with two M6 screws. The maximum tightening torque for the screws is 1.5 Nm
- ▶ Avoid mechanical stresses.
- ▶ Optional: Ground the device.

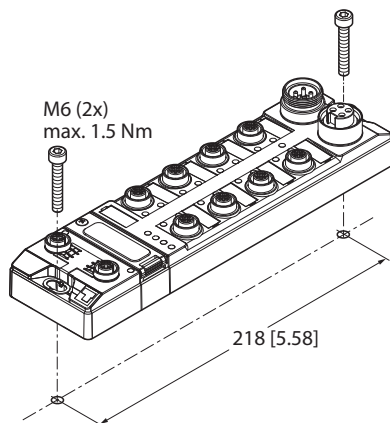


Fig. 4: Mounting the device on a mounting plate

### 5.1 Mounting the device outdoors

The device is UV-resistant according to DIN EN ISO 4892-2. Direct sunlight can cause material abrasion and color changes. The mechanical and electrical properties of the device are not affected.

- ▶ To avoid material abrasion and color changes: Protect the device from direct sunlight, e.g. by using protective shields.

## 5.2 Grounding the device

### 5.2.1 Equivalent wiring diagram and shielding concept

The equivalent circuit diagram and the shielding concept of the TBEN-L...-PLC-... is shown in the following figure:

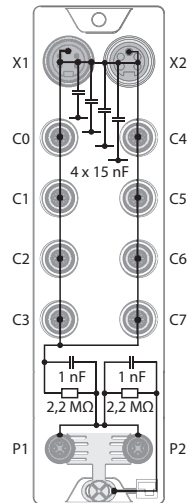


Fig. 5: TBEN-L5-PLC-... – equivalent circuit diagram and shielding concept

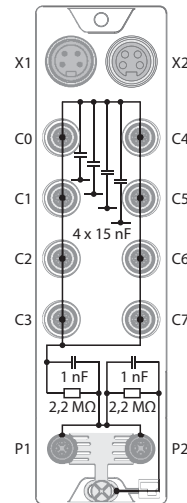


Fig. 6: TBEN-L4-PLC-... – equivalent circuit diagram and shielding concept

## 5.2.2 Shielding of the fieldbus and I/O level

The fieldbus and I/O module level of the TBEN-L modules can be grounded separately.

Fig. 8: Grounding clip (1), grounding ring (2) and metal screw (3)

The grounding ring (2) provides the grounding for the module. The shielding of the I/O level is permanently connected to the module ground. Only by mounting the module is the module ground connected to the reference potential of the installation.

### Grounding concept of the I/O modules (I/O level)

When mounted directly on a mounting plate, the module is connected to the reference potential of the installation via a metal screw (3) in the lower mounting hole. If no module grounding is required, the electrical connection to the reference potential is interrupted, e.g. with a plastic screw.

### Grounding concept of the fieldbus level

The device is factory shipped with a grounding clip provided on the connectors for the fieldbus connection.

When mounted directly on a mounting plate the shielding of the fieldbus cables is routed directly to the module ground via the grounding clip and the metal screw in the lower mounting hole.

If direct grounding of the fieldbus shield is not required, the grounding clip must be removed. In this case, the fieldbus shield is connected to the module ground via an RC element.

## 5.2.3 Grounding the device – I/O level and fieldbus level

The ground of the fieldbus level can either be connected directly and routed via the grounding clip (1) or indirectly via an RC element with the ground of the I/O level. If the fieldbus connection is to be routed via an RC element, the grounding clip must be removed.

Fig. 9: Grounding clip (1)

Removing the grounding clip: Removing the direct grounding of the fieldbus level

- ▶ Push the grounding clip forward with a flat slot-head screwdriver and remove.

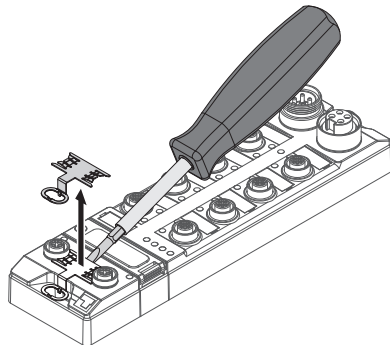


Fig. 10: Use a flat slotted screwdriver to push the grounding clip forwards and remove it.

Mounting the grounding clip: Implementing the direct grounding of the fieldbus level

- ▶ Use a screwdriver to insert the grounding clip between the fieldbus connectors so that contact is made with the metal housing of the plug connectors.
- ▶ The shield of the fieldbus cables is connected to the grounding clip.

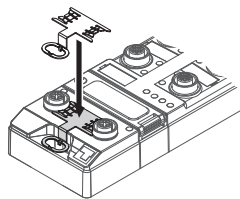


Fig. 11: Mounting the grounding clip

Grounding the device – Mounting on mounting plate

- ▶ When mounting on a mounting plate: Fasten the TBEN-L module with an M6 metal screw through the lower mounting hole.
- ⇒ The shield of the M12 flange for the I/O level is connected via the M6 metal screw with the reference potential of the installation.
- ⇒ With the grounding clip mounted: The shield of the fieldbus is connected to the reference potential of the installation via the module ground of the I/O level.

## 6 Connecting

### 6.1 Connecting the modules to Ethernet

For the connection to Ethernet, the device has two 4-pin D-coded M12 connectors. The maximum tightening torque is 0.6 Nm.

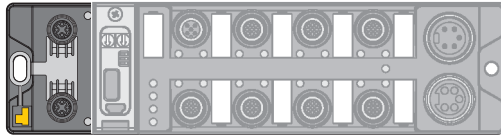


Fig. 12: M12 Ethernet connector

- ▶ Connect the device to the field bus according to the pin assignment shown below.

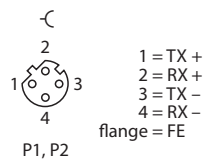


Fig. 13: Pin assignment Ethernet connectors



#### NOTE

The behavior of the Ethernet Interfaces depends on the parameterization of the TBEN-L...-PLC-.... The connectors operate in switch mode as autocrossing switches with one IP address. In Dual MAC Mode, the Ethernet connectors are treated as separate Ethernet ports with two separate MAC and IP addresses. The TBEN-L...-PLC-... can thus be a node in two separate Ethernet networks in Dual MAC mode.

### 6.2 Connecting the power supply

For the connection to the power supply, the device has two 5-pin 7/8" connectors. The power supply connectors are designed as 4-pole (TBEN-L4-PLC) or 5-pole (TBEN-L5-PLC) 7/8" connectors. V1 and V2 are galvanically isolated. The maximum tightening torque is 0.8 Nm.

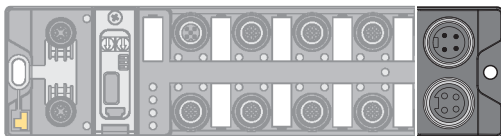


Fig. 14: 7/8" connector for connecting the supply voltage (TBEN-L4-PLC-...)

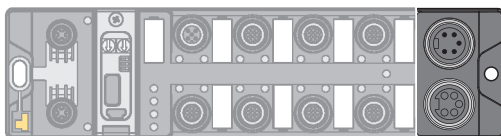


Fig. 15: 7/8" connector for connecting the supply voltage (TBEN-L5-PLC-...)

- ▶ Connect the device to the power supply according to the pin assignment shown below.

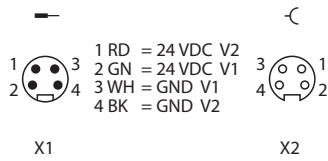


Fig. 16: TBEN-L4-PLC-... – Pin assignment power supply connectors

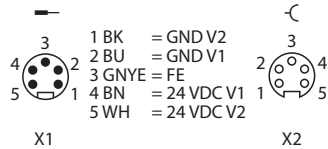


Fig. 17: TBEN-L5-PLC-... – Pin assignment power supply connectors

Connector	Function
X1	Power feed
X2	Continuation of the power to the next node
V1	System voltage: Power supply 1 (incl. supply of electronics)
V2	Load voltage: Power supply 2



#### NOTE

The system voltage (V1) and the load voltage (V2) are fed in and monitored separately. In case of an undercut of the admissible voltage, the connectors are switched-off according to the module's supply concept. In case of an undervoltage at V2, the LED PWR changes from green to red. In case of an undervoltage at V1, the LED PWR is turned off.

### 6.3 Connecting serial devices (COM0 and COM1)

For the connection of serial devices, the device has two serial interfaces. The interfaces are designed as 5-pin M12 connectors. The maximum tightening torque is 0.8 Nm.

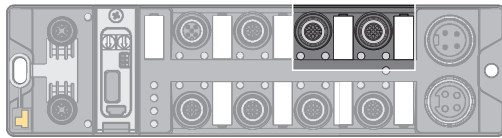


Fig. 18: M12 connector for connecting serial devices

- ▶ Connect the serial devices to the serial interfaces according to the pin assignment shown below.

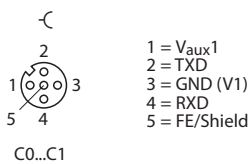


Fig. 19: COM port x in RS232 mode

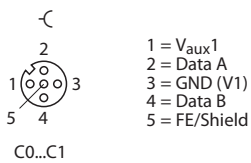


Fig. 20: COM port x in RS485 mode

### 6.4 Connecting CAN devices (CANout and CANin)

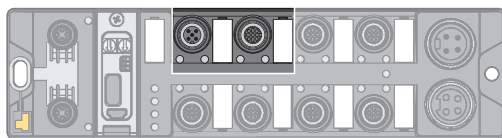


Fig. 21: M12 connector for connecting CANopen nodes

For the connection of CANopen nodes, the device has two CANopen ports. The maximum tightening torque is 0.8 Nm.

- ▶ Connect the CANopen nodes according to the pin assignment shown below.

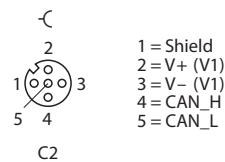


Fig. 22: CANout

## 6.5 Connecting digital sensors and actuators

The device has four 5-pin M12 connectors for connecting digital sensors and actuators. The maximum tightening torque is 0.8 Nm.

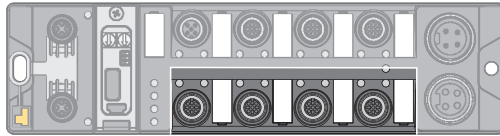


Fig. 23: M12 connector for connecting digital sensors and actuators

- ▶ Connect the sensors and actuators to the device according to the figure shown below.

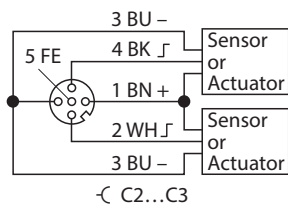


Fig. 24: Connectors for digital sensors and actuators - wiring diagram

## 6.6 Using the USB device port

The USB device port is designed as a mini USB B socket and can be used as a service interface for the device DTMs and as a programming interface for CODESYS.

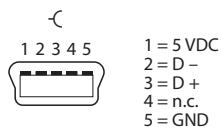


Fig. 25: USB device port

### RNDIS driver

The RNDIS driver for the USB device port is installed automatically during the DTM installation in PACTware™. After the DET installation, the USB device port is shown as additional Ethernet port in the DTM.



### NOTE

Use the interface BL Service Ethernet in the DTM for the connection to the device.

## 6.7 USB host port

The USB host port is designed as a CODESYS 2.0-A socket and is used to connect USB memory sticks for program backup, program recovery, firmware update and data synchronization.

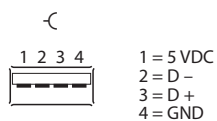


Fig. 26: USB host port



## 7 Commissioning

### 7.1 Setting the Ethernet port mode (firmware version V1.4.6.0 or higher)

The Ethernet port mode is set via DIP switch no. 2 [DMM] under the cover at the device.

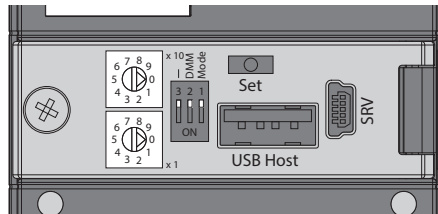


Fig. 27: Switch for setting the Ethernet port mode

It is not possible to change the Ethernet port mode during operation, since the change only becomes effective after a voltage reset.

Position DIP switch no. 2 DMM	Ethernet port mode	Meaning
0	Switch Mode	In switch mode, the two Ethernet ports of the TBEN-L...-PLC-... are treated as autocrossing switch with one IP and one MAC address. The IP address is set as described under "Setting the IP Address" [▶ 26].
1	Dual MAC Mode	In Dual MAC mode, the two Ethernet ports of the TBEN-L...-PLC-... are treated as Ethernet ports with separate IP and MAC addresses. The TBEN-L...-PLC-... can be a participant in two different Ethernet networks in Dual MAC mode. In Dual MAC Mode the IP address at Ethernet port P1 is set as described under "Setting the IP Address" [▶ 26]. The IP address of Ethernet port P2 is set via the web server or via a DHCP server in the network to which the TBEN-L...-PLC-... is connected via Ethernet port P2



**NOTE**

Devices with a firmware version lower than V1.4.6.0 can only be operated in switch mode.

#### 7.1.1 Setting the Switch Mode

- ▶ Open the cover over the switches.
- ▶ Set DIP switch no. 2 [DMM] to 0.
- ⇒ Execute a power reset.
- ▶ **ATTENTION!** If the cover over the rotary coding switches is open, protection class IP67 or IP69K is not guaranteed. Damage to the device due to foreign material or liquids penetrating the device is possible. Tightly close the cover above the switches.

## 7.1.2 Setting the Dual MAC Mode

The dual MAC mode can be activated via DIP switch no. 2 [DMM].

- ✓ The device is connected via Ethernet port P1 (ETH1) to the PC on which the Turck Service Tool is installed.
- ▶ Open the cover over the switches.
- ▶ Set DIP switch no. 2 [DMM] to 1.
- ⇒ Execute a power reset.
- ⇒ The device logs on e.g. in the Turck Service Tool to Ethernet port P1 under the IP address previously used in Switch Mode. The IP address for the second Ethernet port P2 is set to 192.168.2.254 by default.
- ▶ **ATTENTION!** If the cover over the rotary coding switches is open, protection class IP67 or IP69K is not guaranteed. Damage to the device due to foreign material or liquids penetrating the device is possible. Tightly close the cover above the switches.



### NOTE

The Turck Service Tool only detects the Ethernet port (P1 or P2) via which the TBEN-L...-PLC-... is connected to the PC on which the Turck Service Tool is installed.

## 7.2 Setting the IP address

### IP address in Switch mode

In the Switch Mode, the TBEN-L...-PLC-... has one IP address.

### IP address in Dual MAC mode

In Dual MAC Mode, each Ethernet port of the device has one IP address. The IP address for Ethernet port P1 can be set via two decimal rotary coding switches and DIP switches on the device, via the web server or via the Turck Service Tool. The IP address for Ethernet port P2 can only be set via the web server.

### 7.2.1 Setting the IP address via switches at the device

The IP address can be set via two decimal rotary coding switches and the DIP switch [Mode] on the device. The switches are located under a cover together with the USB ports and the SET button.

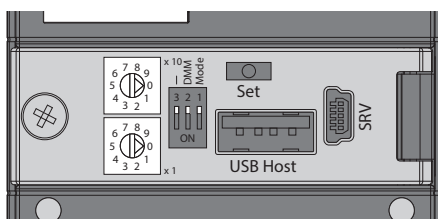


Fig. 28: Switches for setting the IP address

- ▶ Open the cover over the switches.
- ▶ Set the rotary coding switch to the desired position according to the table below.
- ▶ Set DIP switch [Mode] to the desired position according to the table below.
- ▶ Execute a power cycle at the device
- ▶ **ATTENTION!** If the cover over the rotary coding switches is open, protection class IP67 or IP69K is not guaranteed. Damage to the device due to foreign material or liquids penetrating the device is possible. Tightly close the cover above the switches.

## Addressing options

The IP address of the devices can be set in different ways. The following addressing options can be selected via the switches on the device. Changes to the settings become active after a voltage reset.

Setting option	DIP switch "MODE"	Rotary coding switches	Description
Rotary mode	0	1...99	In rotary mode, the last byte of the IP address can be set manually at the gateway. The other network settings are stored in the non-volatile memory of the gateway and cannot be changed in rotary mode. Addresses from 1...99 can be set.
	0	00	IP address: 192.168.1.100 Subnet mask: 255.255.255.0 Gateway: 192.168.1.1
DHCP mode	1	40	In DHCP mode, the IP address is automatically assigned by a DHCP server in the network. The subnet mask assigned by the DHCP server and the default gateway address are stored non-volatile in the memory of the gateway DHCP supports three mechanisms for IP address allocation: <ul style="list-style-type: none"> <li>■ Automatic address assignment: The DHCP server assigns a permanent IP address to the client.</li> <li>■ Dynamic address assignment: The IP address assigned by the server is only reserved for a certain period of time. After this time has elapsed or after the explicit release by a client, the IP address is re-assigned.</li> <li>■ Manual address assignment: A network administrator assigns an IP address to the client. In this case, DHCP is only used to transmit the assigned IP address to the client.</li> <li>■ Default IP address: 192.168.1.254</li> </ul>
PGM Mode	1	50	In PGM mode, the complete IP address is assigned manually via the Turck Service Tool, FDT/DTM or via a web server. In PGM mode, the set IP address and the subnet mask are stored in the memory of the gateway. All network settings (IP address, subnet mask, default gateway) are taken from the internal EEPROM of the module. <ul style="list-style-type: none"> <li>■ Default IP address: 192.168.1.254</li> </ul>
PGM DHCP mode	1	60	In PGM-DHCP mode, the gateway sends DHCP requests until it is assigned a fixed IP address. The DHCP client is automatically deactivated if an IP address is assigned to the gateway via the DTM or a web server. <ul style="list-style-type: none"> <li>■ Default IP address: 192.168.1.254</li> </ul>
F_Reset	1	90	The F_Reset mode sets all device-settings back to the default values and deletes all data in the device's internal flash. The following values are reset or deleted: <ul style="list-style-type: none"> <li>■ IP address: 192.168.1.254</li> <li>■ Parameters</li> </ul>
Restore	1	00	Enter the device name and the device's IP address.

### 7.2.2 Setting the IP address with Turck Service Tool

- ▶ Connect the device to a PC via the Ethernet interface.
- ▶ Open the Turck Service Tool.
- ▶ Click **Search** or press F5.

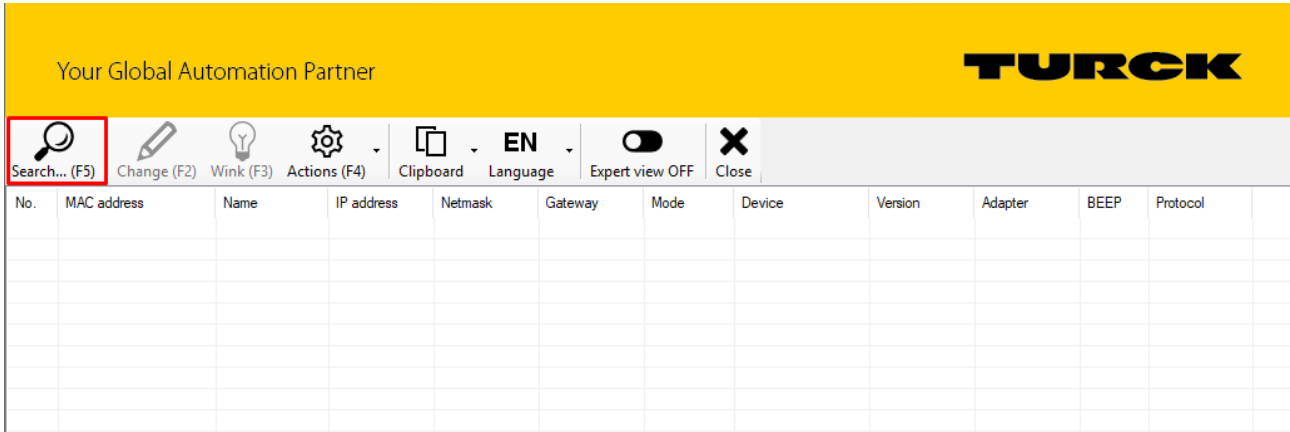


Fig. 29: Turck Service Tool – start dialog

The Turck Service Tool shows the connected devices.

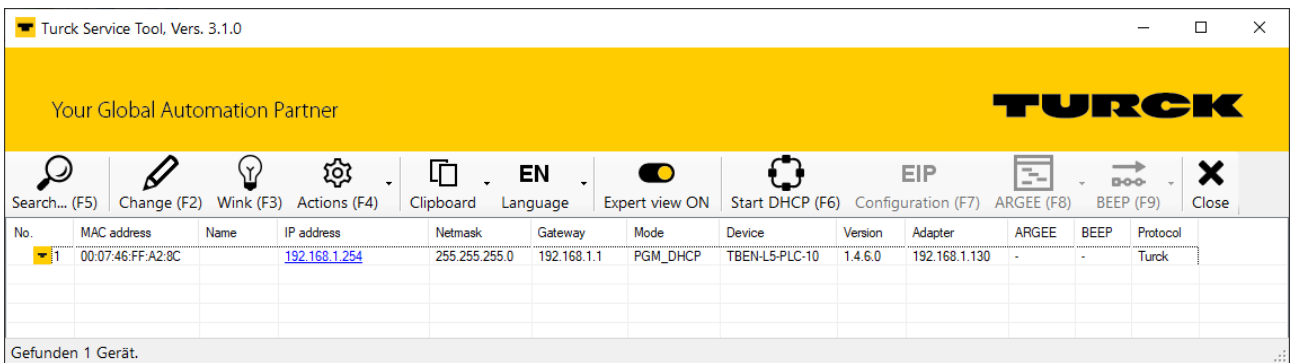


Fig. 30: Turck Service Tool – found devices

- ▶ Click on the desired device.
- ▶ Click **Change** or press [F2].

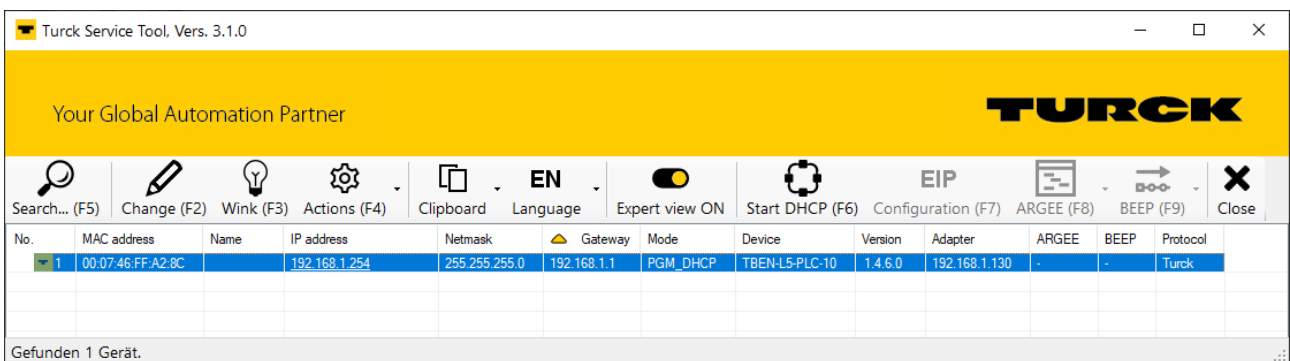


Fig. 31: Turck Service Tool – select the device to be addressed



**NOTE**

Clicking the IP address of the device opens the web server.

- ▶ Change the IP address and the network mask if necessary.

- ▶ Assume the changes by clicking **Set in device**.

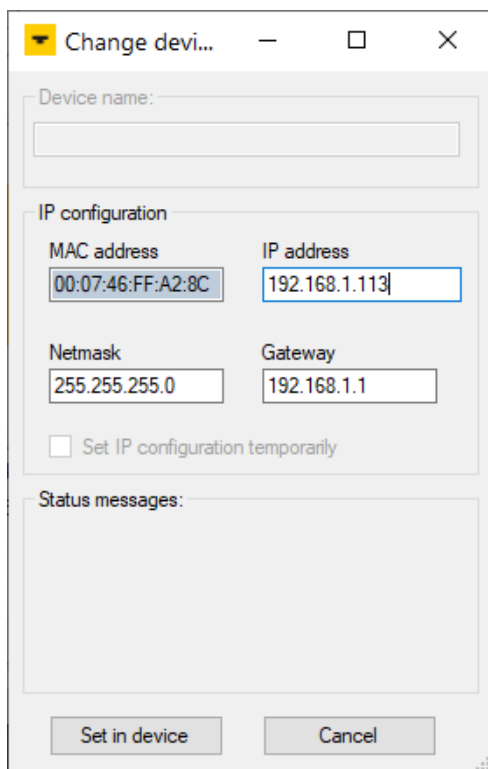


Fig. 32: Turck Service Tool – Change device configuration

### 7.2.3 Setting the IP address via the web server

When the TBEN-L...-PLC-... is operated in Switch Mode, the IP address of the device can be set in the web server.

When the device is operating in Dual MAC Mode, the web server can be used to adjust the two IP addresses of the separate Ethernet ports (P1 and P2).



**NOTE**

To set the IP address via the web server, the device must be in PGM mode.

- ▶ Opening the web server
- ▶ Log-in to the web server as administrator. The default password for the web server is "password".
- ▶ Click **MAIN** → **Parameter** → **Channel view** → **Network**.
- ▶ Change the IP address and subnet mask (if applicable) as well as the default gateway for the respective port.

- ▶ Write the new IP address, subnet mask and default gateway into the device via SET IP ADDRESS.

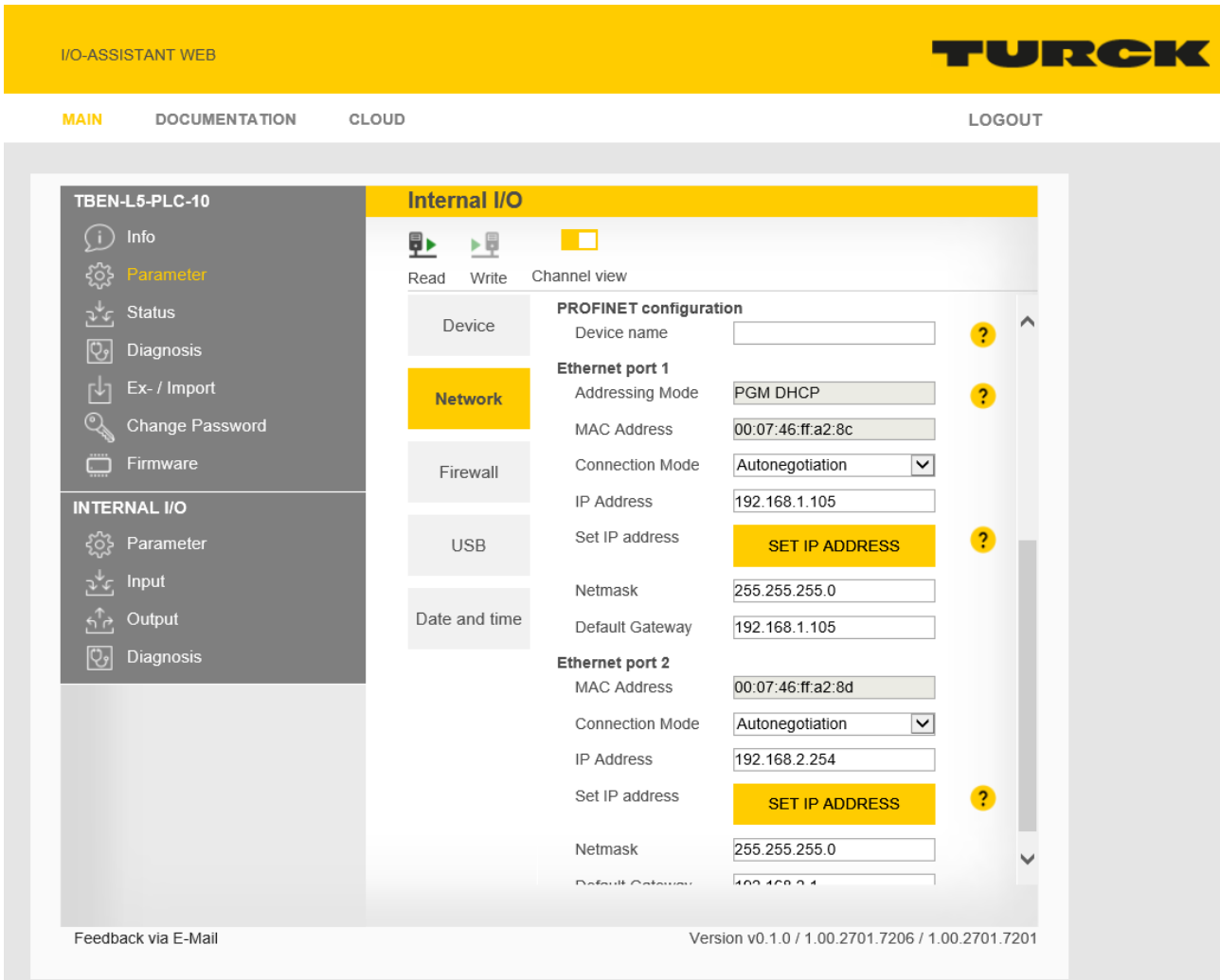


Fig. 33: Setting the IP address via the web server

### 7.3 Put master/slave functions into operation in CODESYS

#### 7.3.1 Installing the devices package

- ▶ Download CODESYS package TBEN-Lx-PLC Vx.x.x.x.package from [www.turck.com](http://www.turck.com).
- ▶ Install the package using the CODESYS via **Tools** → **Package Manager**.

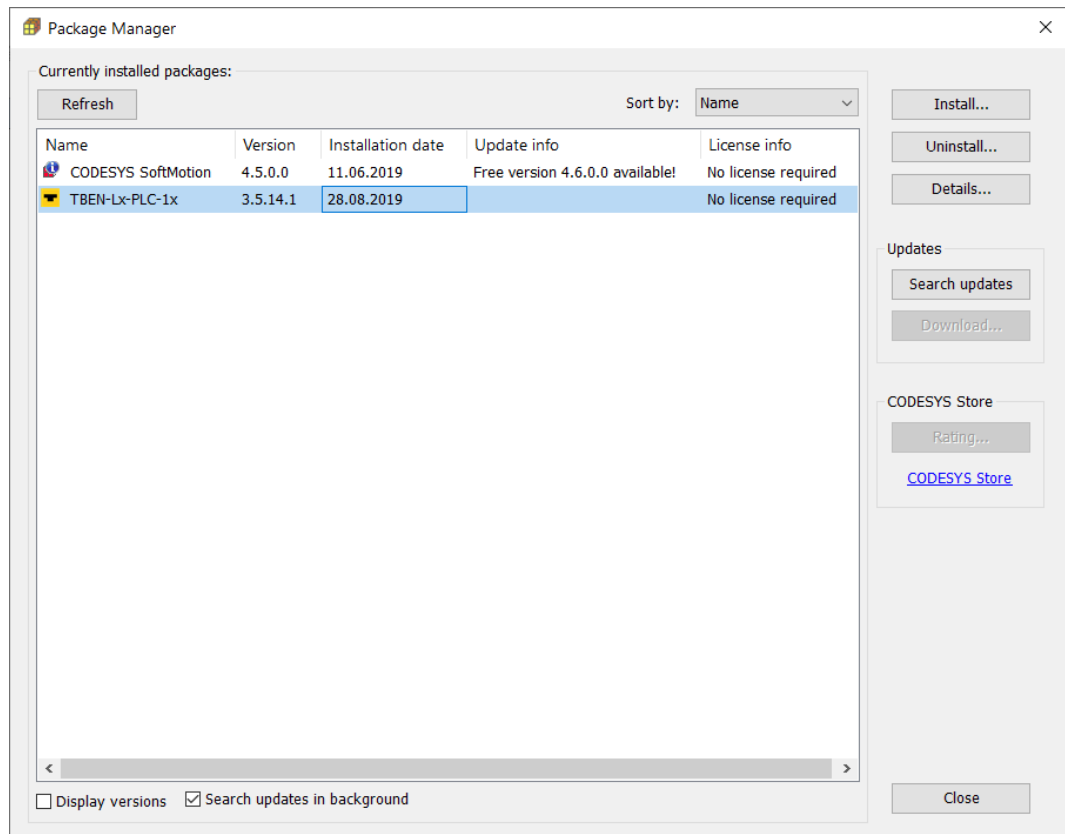


Fig. 34: Package Manager in CODESYS

The device package for CODESYS contains all necessary files

- CODESYS Device Description
- CODESYS libraries
- GSDML-file
- EDS file
- etc.

### 7.3.2 Creating a standard project with TBEN-L...-PLC...

- ▶ Create new standard project with TBEN-L...-PLC-... as CODESYS device.

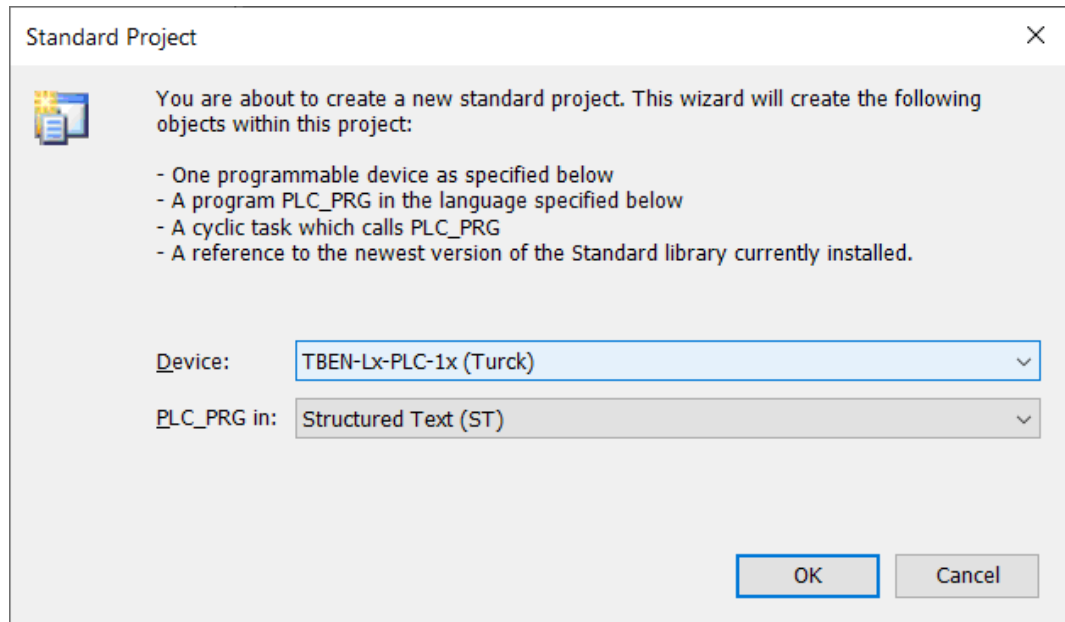


Fig. 35: Selecting the TBEN-L...-PLC-... as CODESYS device

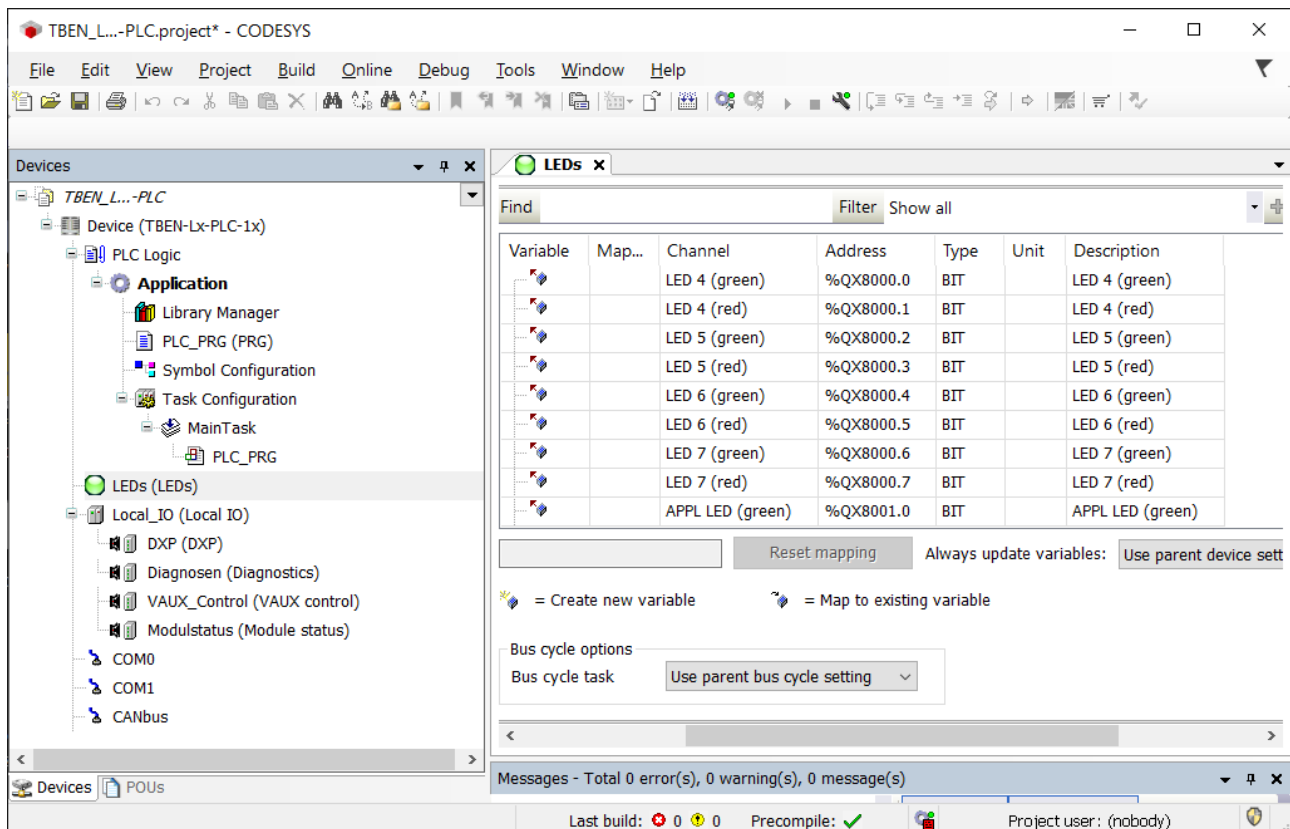


Fig. 36: CODESYS project



Additionally to the PLC logic, the project contains:

- Five LEDs for free use in the program:
  - Each LED uses 2 bit in the process output data of the device. They are automatically mapped to the output bits %QX8000.0 to X8001.1.
- Local\_IO
  - Configuration of the device's local I/Os and the VAUX functionality.
  - Diagnostics of the local I/Os and module status
- Two serial interfaces (COM0 and COM1)
  - Connection of RS232 and RS485 devices
- One CAN interface (CANbus)
  - Using the device as CANopen device, CANopen manager or as SAE J1939 manager

### 7.3.3 Configuring the Network

Double clicking the entry **Device (TBEN-Lx-PLC-1x)** opens the **Device** tab.

- ▶ Scan the network for TBEN-L...-PLC-10 via the **Scan network...** button and select the device.

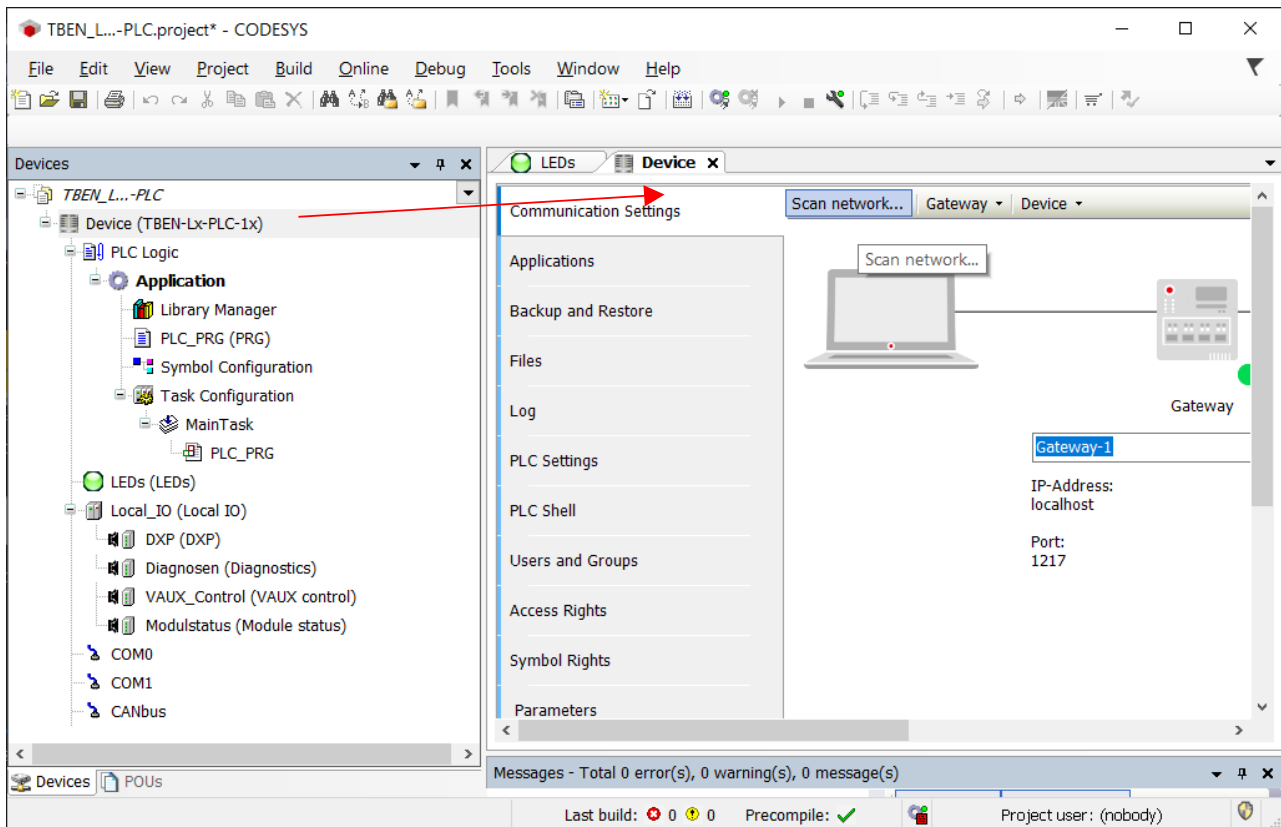


Fig. 37: Scanning the network

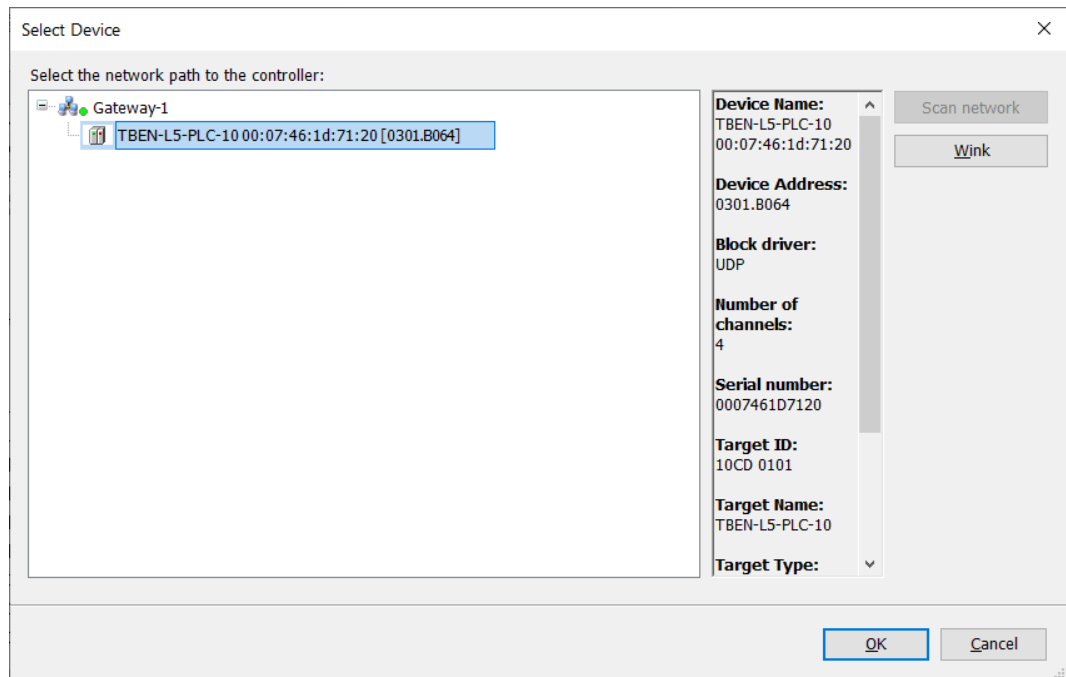


Fig. 38: Selecting the TBEN-L...-PLC-... as device

### 7.3.4 Configuring the Ethernet interfaces



**NOTE**

Devices with a firmware version of V1.4.6.0 or higher provide the Dual MAC Mode function [▶ 26]. In devices with Dual MAC mode, the Ethernet ports P1 (ETH1) and P2 (ETH2) are designed as separate ports. Therefore two Ethernet interfaces can be configured in CODESYS.

- ▶ Append the Ethernet interface via **Add device** to the device.

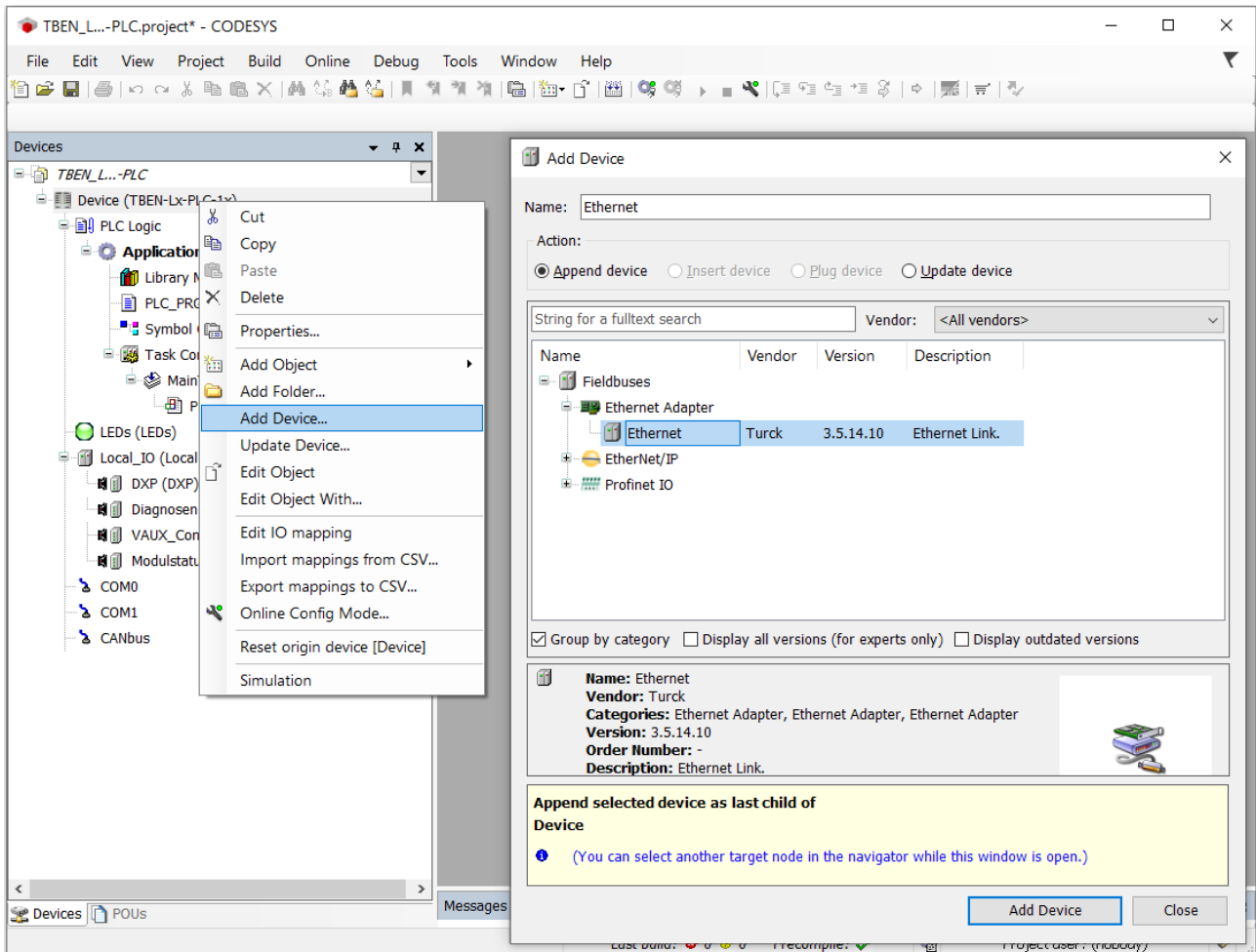


Fig. 39: Adding the Ethernet interface

Interface reference (firmware version V 1.4.6.0 or higher)

Ethernet interface in CODESYS		Designation	
	Module	CODESYS	LED at the module
1	P1	eht0	ETH1
2	P2	eth1	ETH2

- ▶ Configure the Ethernet interface
- ▶ Select **eth0** or **eth1** under **Network adapters**.
- ⇒ The IP address is set automatically.

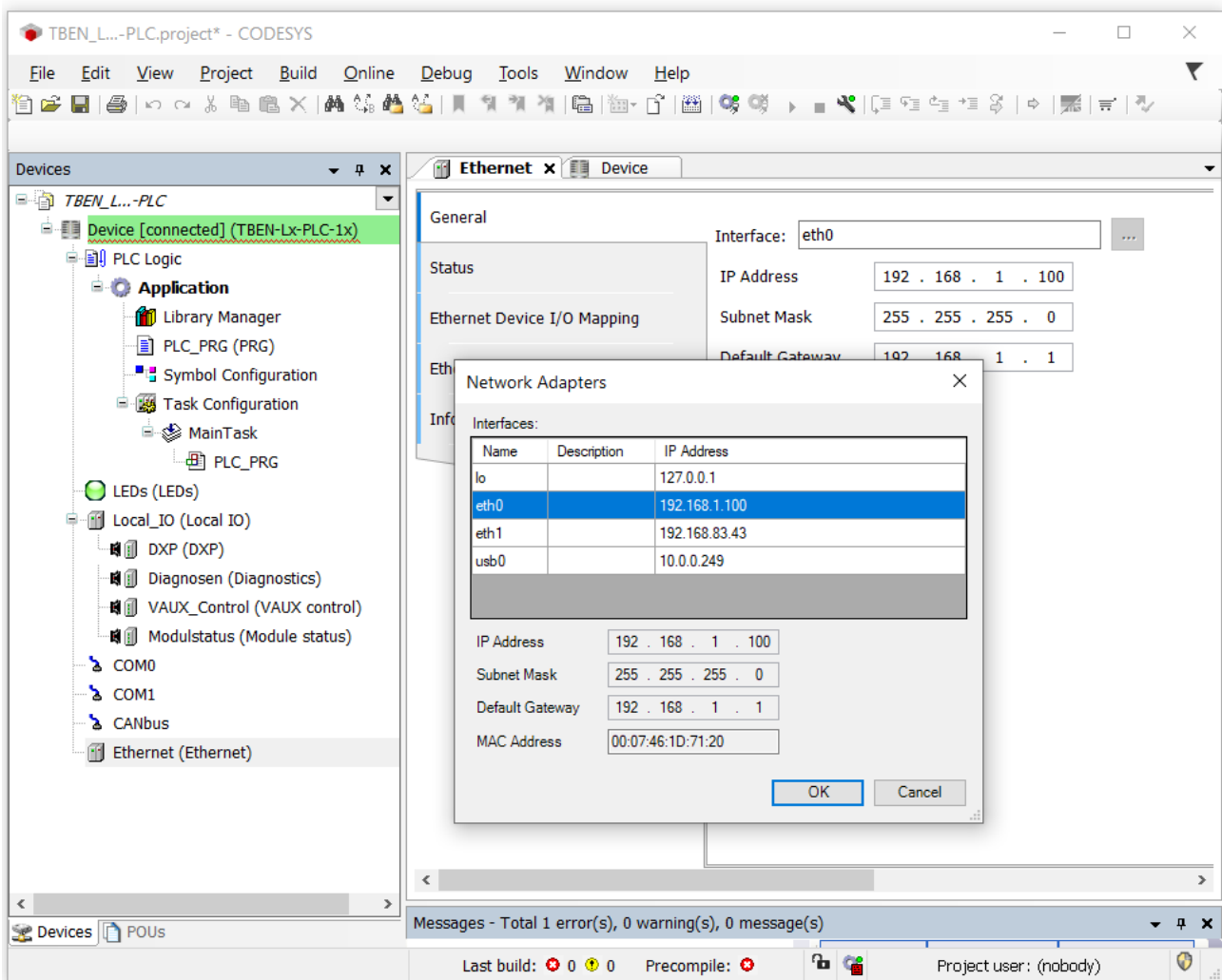


Fig. 40: Configuring the Ethernet interface

- ⇒ The Ethernet interface is added to the project tree.
- TBEN-L...-PLC-... in Switch Mode [▶ 25]:  
IP address of eth0 = IP address of TBEN-L...-PLC-...
- TBEN-L...-PLC-... i Dual MAC Mode [▶ 26]:
  - IP address of eth0 = IP address of Ethernet port P1
  - IP address of eth1 = IP address of Ethernet port P2

### 7.3.5 Commissioning TBEN-L...-PLC... as Modbus TCP Master

Properties	
max. number of TCP slaves	64
Min. cycle time	2 ms
Max. number of slaves at 2 ms	8

#### Configuring the Modbus TCP Master

- ✓ The Ethernet interface is configured.
- ✓ The Modbus TCP Master from 3S - Smart Software Solutions GmbH is used.
- ▶ Add Modbus TCP Master

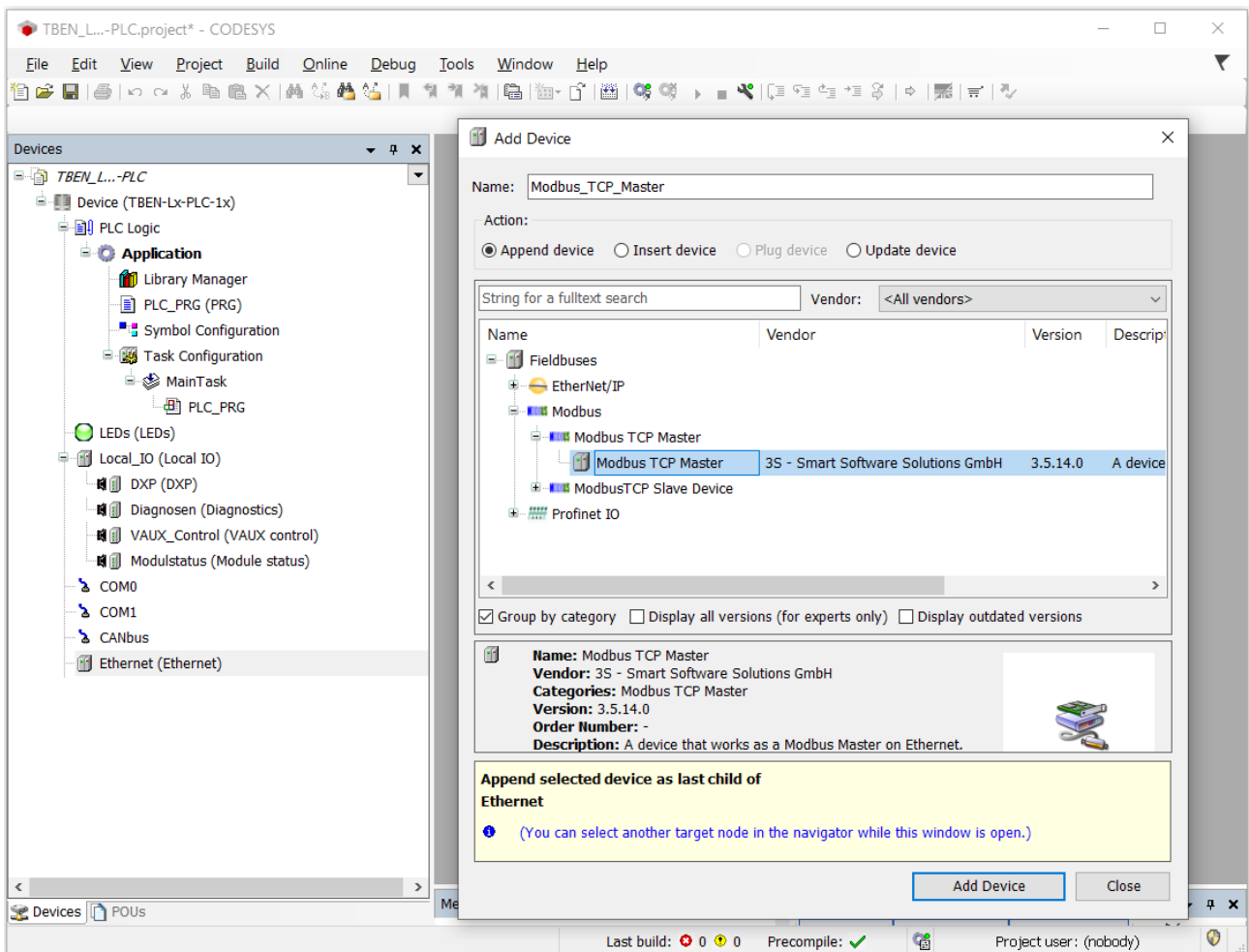


Fig. 41: Add Modbus TCP Master

- ▶ Activate the function „auto-reconnect“ at the Master to assure that CODESYS automatically confirms communication errors and tries to continue with executing Modbus commands instead of interrupting the Modbus communication. Otherwise the error has to be reset using a slave function block.

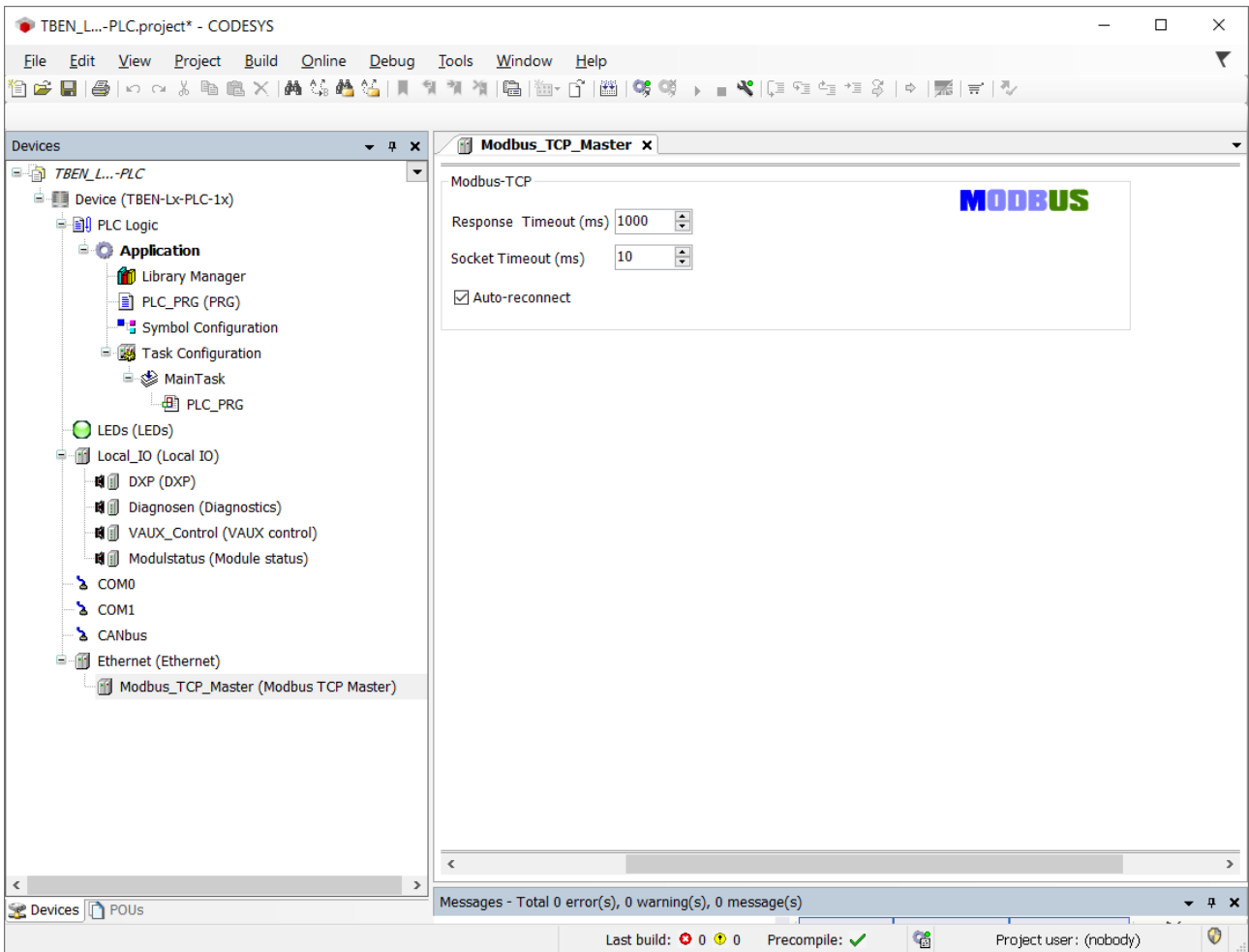


Fig. 42: Configuring the Modbus TCP Master

### Configuring the external Modbus TCP Slave

- ▶ Add an external Modbus TCP Slave using the **Add device** function.

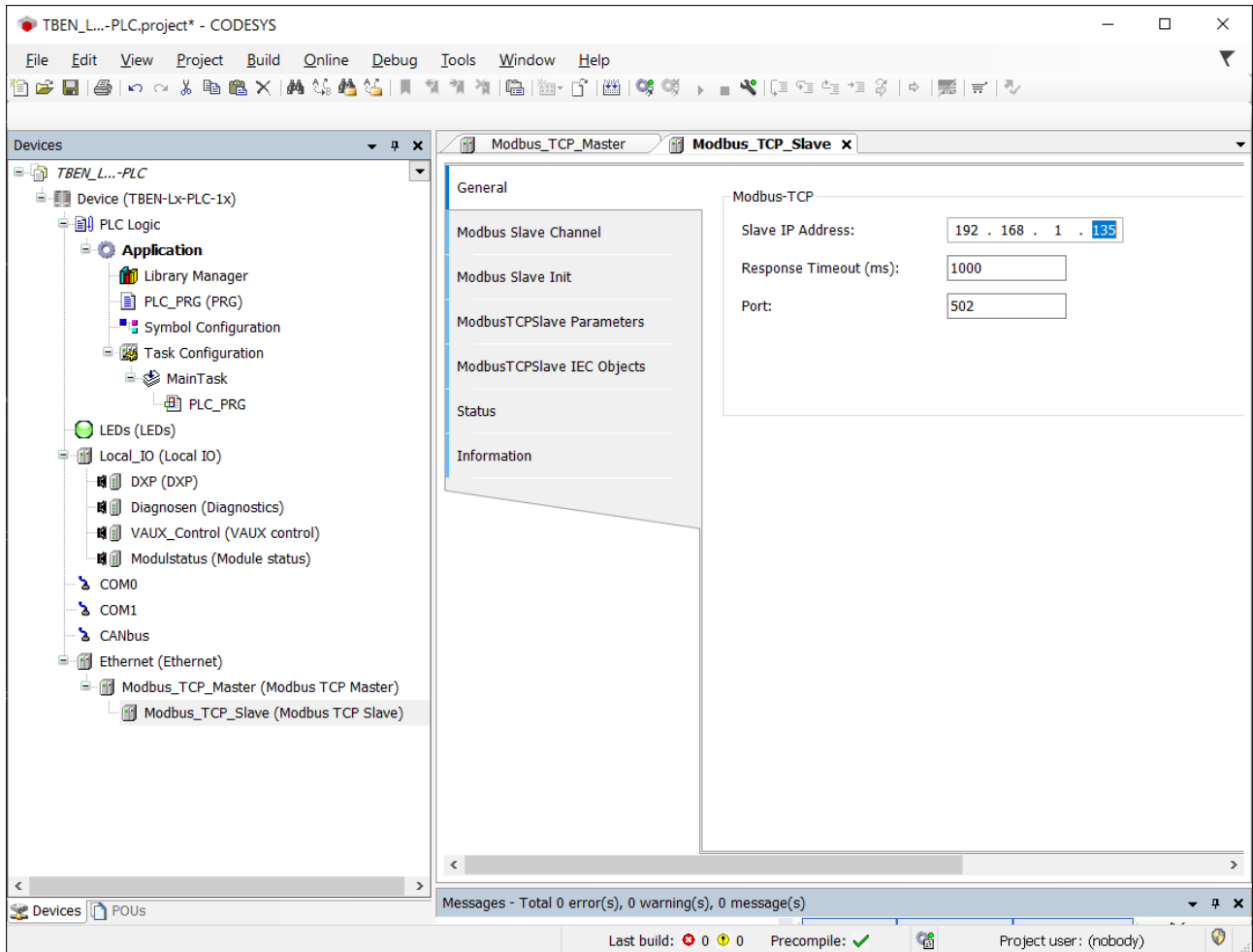


Fig. 43: Configuring the external Modbus TCP Slave

- ▶ Add slave channels for the communication with the Modbus slave.
- ▶ Observe the process data offsets of the slave. In the following example the slave's process output data start with register 0x0800.

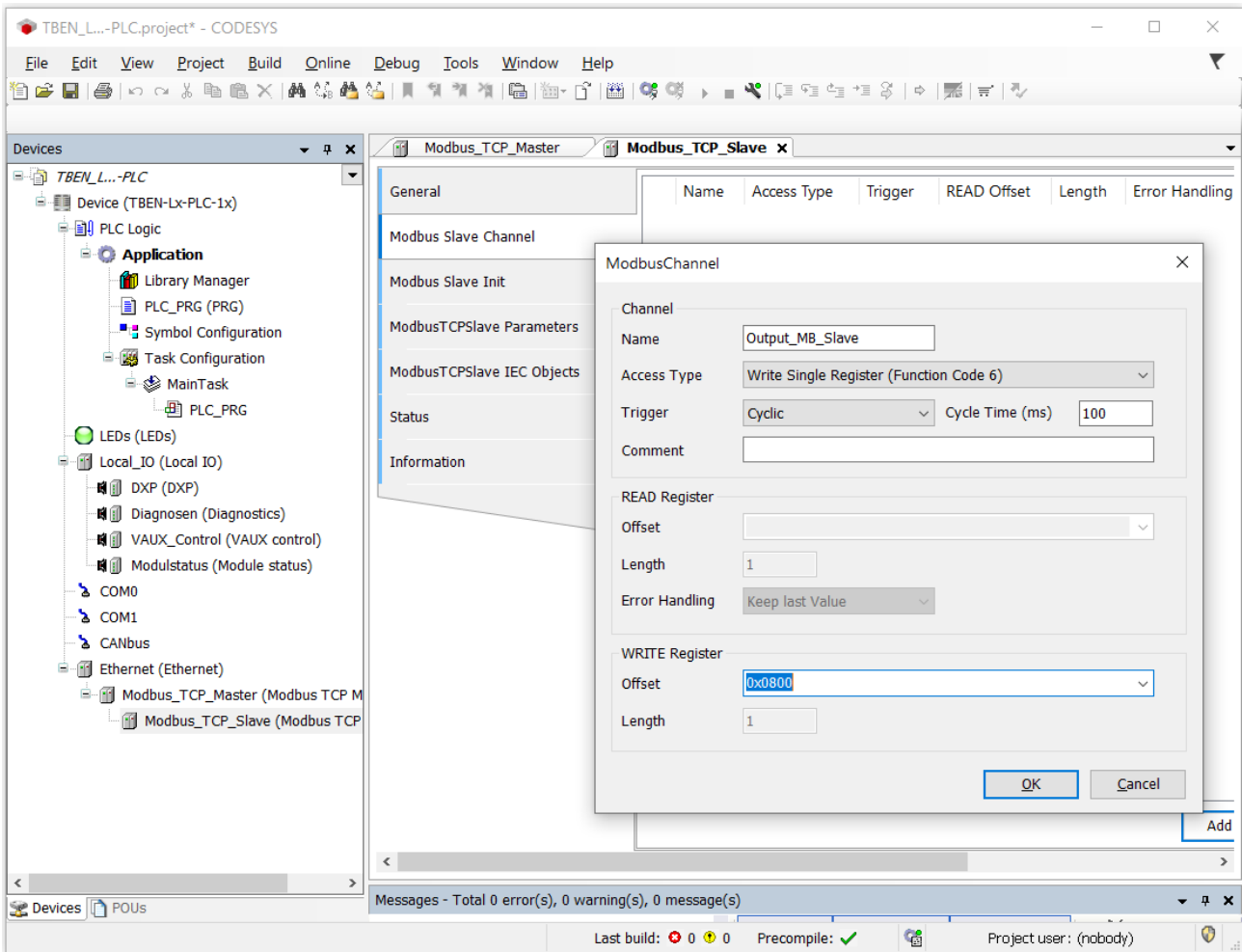


Fig. 44: Adding Modbus slave channels



### 7.3.6 Commissioning TBEN-L...-PLC... as Modbus TCP Slave

Properties	
Max. number of input registers	1024
Max. number of holding registers	1020

#### Configuring the Modbus TCP Slave

The Modbus\_TCP\_Slave\_Device from Turck is used.

- ✓ The Ethernet interface is configured.
  - ▶ Add the Modbus\_TCP\_Slave\_Device to the Ethernet interface using the "Add Device" function and configure it.
  - ▶ Therefore define the number of in- and output registers (input and holding registers) which have to be exchanged with the higher-level Modbus TCP-master.

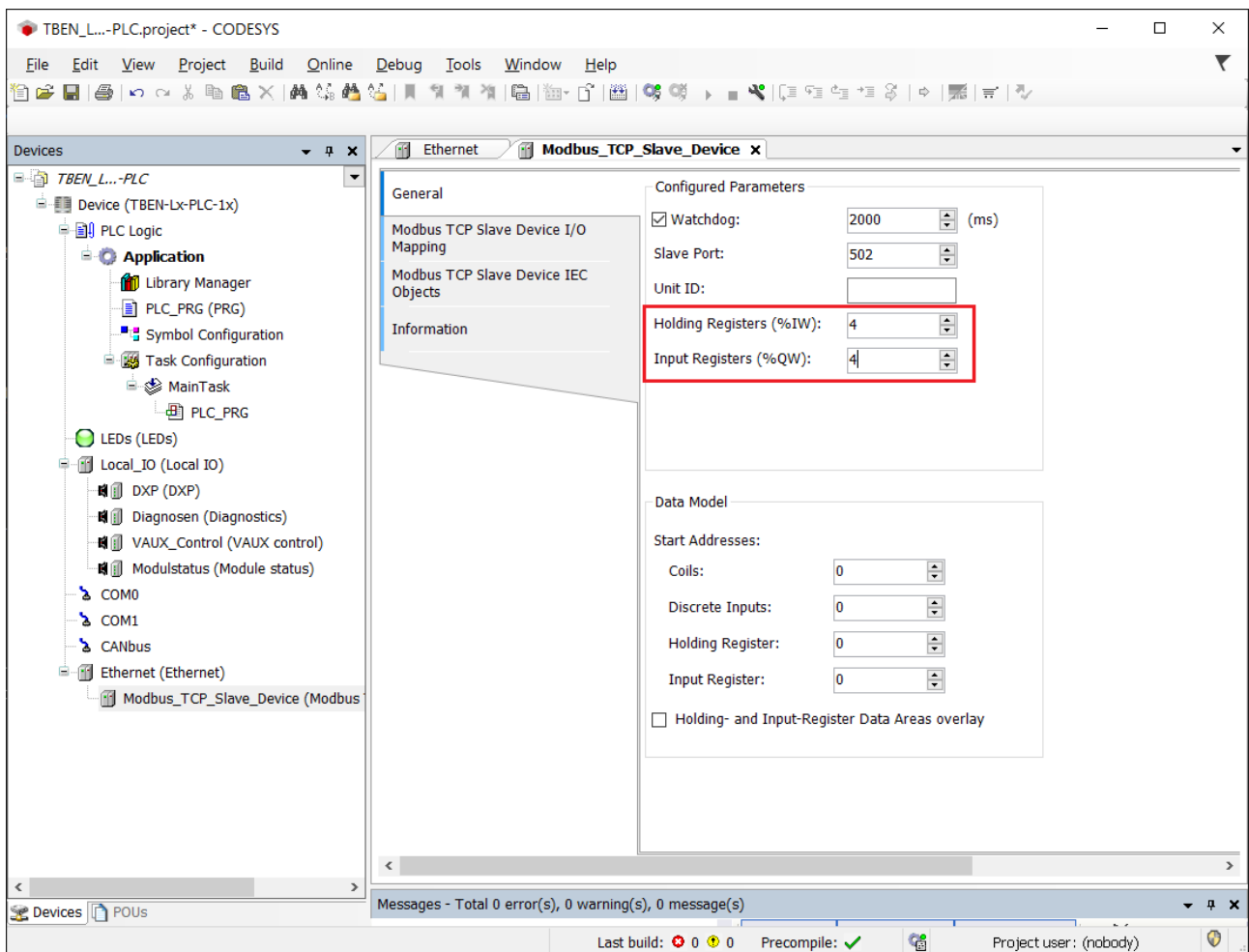


Fig. 45: Configuring the Modbus TCP Slave

Which data will be mapped into the input and holding registers, depends on assignments in the PLC program or in the I/O mapping of the TBEN-L...-PLC-....

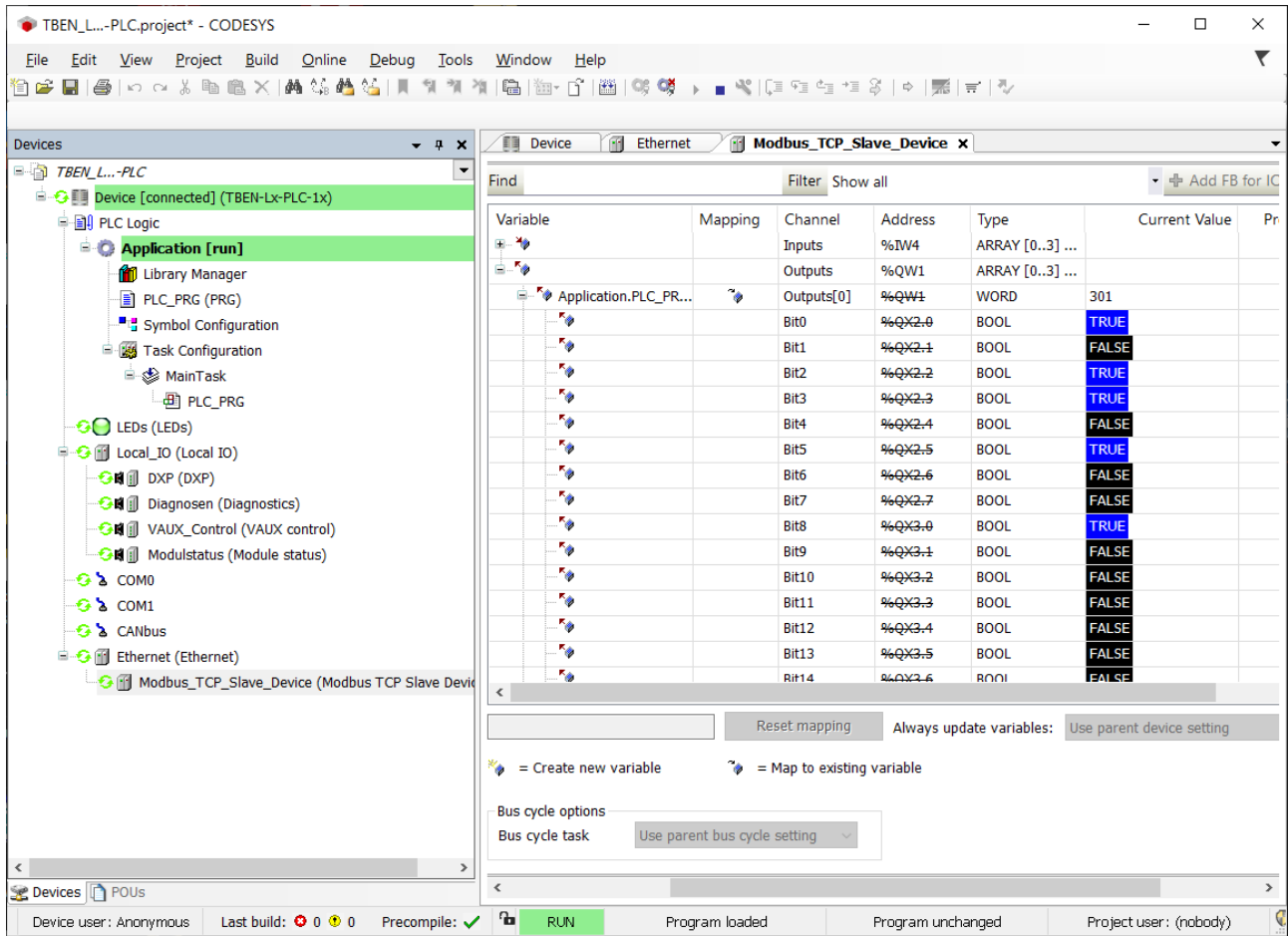


Fig. 46: Data mapping: Modbus TCPslave Device

### 7.3.7 Commissioning TBEN-L...-PLC... as Modbus RTU Master

Properties	
Max. number of slaves	32
Min. cycle time	5 ms
Max. number of slaves at 5 ms	8

The serial Modbus Master from 3S - Smart Software Solutions GmbH is used.

- ▶ Add the serial **Modbus Master, COM Port** to the COM interface.
- ▶ Activate function **Auto-restart communication** at the Master to assure that CODESYS automatically confirms communication errors, and tries to continue with executing Modbus commands instead of interrupting the Modbus communication. Otherwise the error has to be reset using a slave function block.

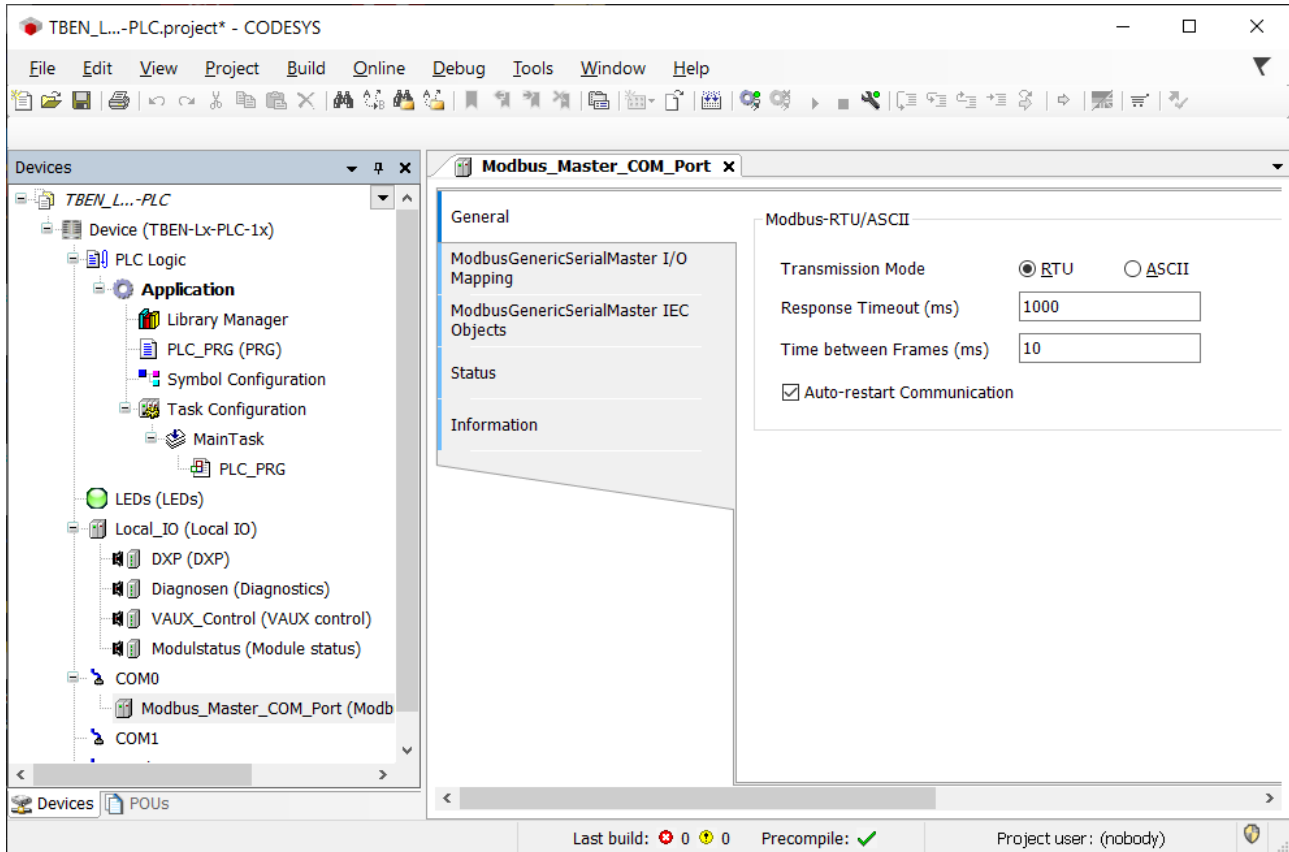


Fig. 47: Add Modbus RTU Master

Configuring the external Modbus RTU Slave

- ▶ Add the external Modbus RTU slave **Modbus Slave, COM Port** to the **Modbus Master, COM Port** using the **Add Device** function and configure it. In this example the Turck multiprotocol device **TBEN-S2-2COM-4DXP** is used as Modbus Slave.
- ▶ Add Modbus Slave Channels for the communication with the Slave. Observe the process data offsets of the slave. In the example the slave's process output data start with register **0x0800**.

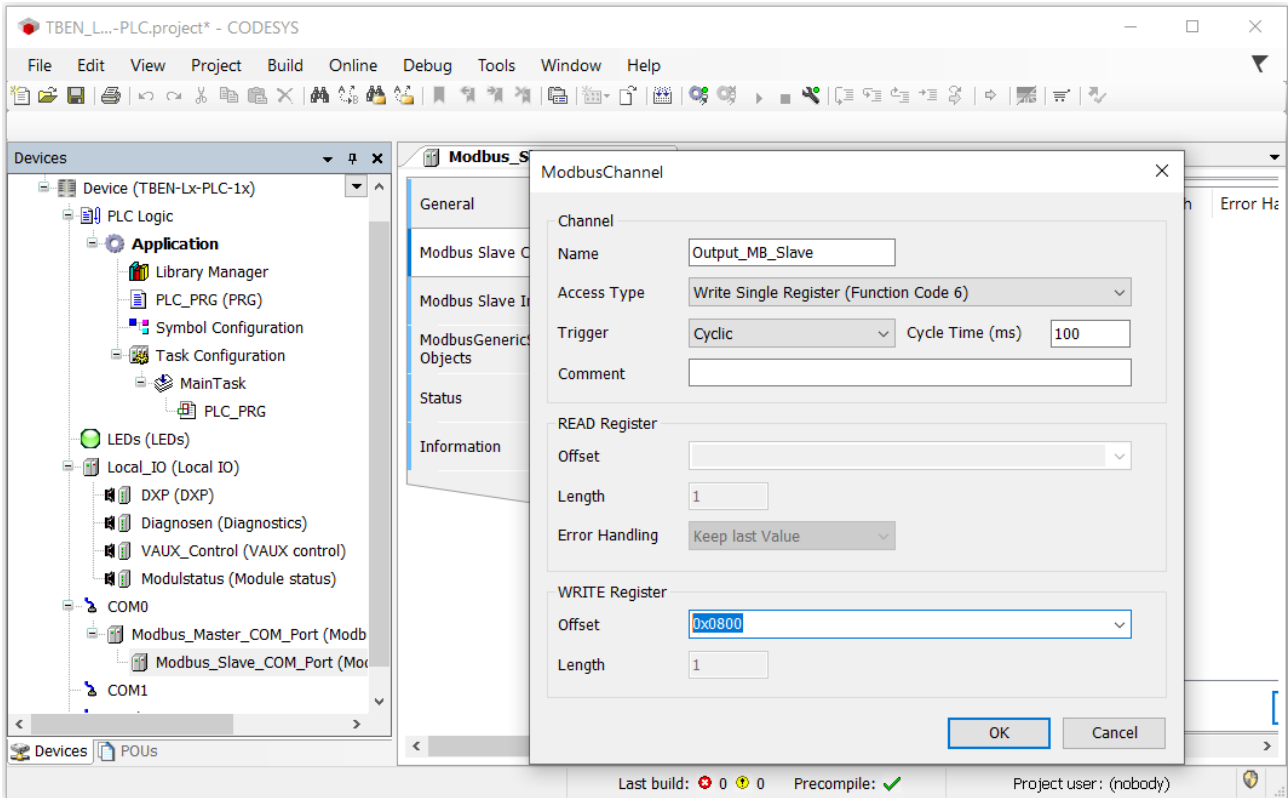


Fig. 48: Configuring the external Modbus RTU Slave

### 7.3.8 Commissioning TBEN-L...-PLC... as Modbus RTU Device

Properties	
Max. number of input registers	500
Max. number of holding registers	500

#### Configuring the Modbus RTU Device

The Modbus\_Serial\_Device from 3S - Smart Software Solutions GmbH is used.

- ▶ Add the Modbus\_Serial\_Device to the Ethernet port using the **Add Device** function and configure it.
- ▶ Therefore define the number of in- and output registers (input and holding registers) which have to be exchanged with the higher-level Modbus TCP-master.

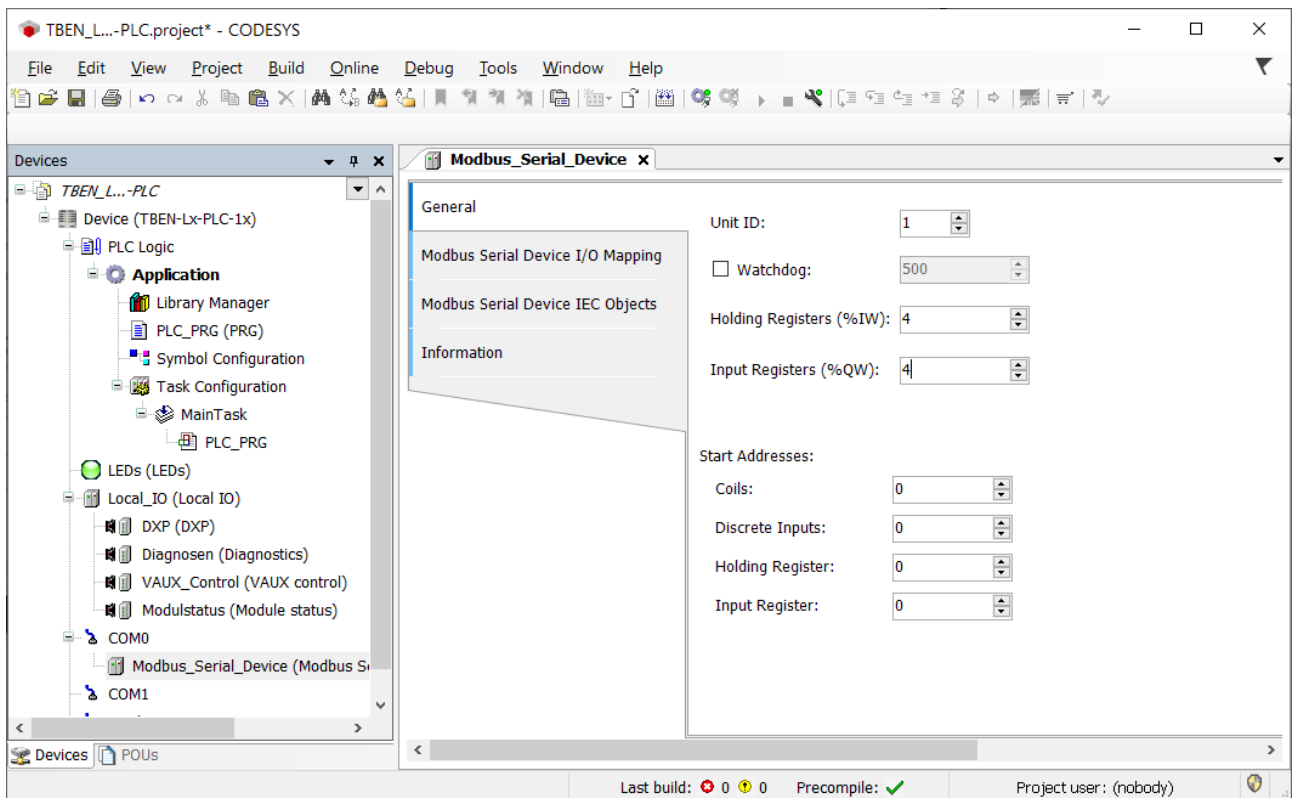


Fig. 49: Configuring the Modbus\_Serial\_Device

Which data will be mapped into the input and holding registers, depends on assignments in the PLC program or in the I/O mapping of the TBEN-L...-PLC-....

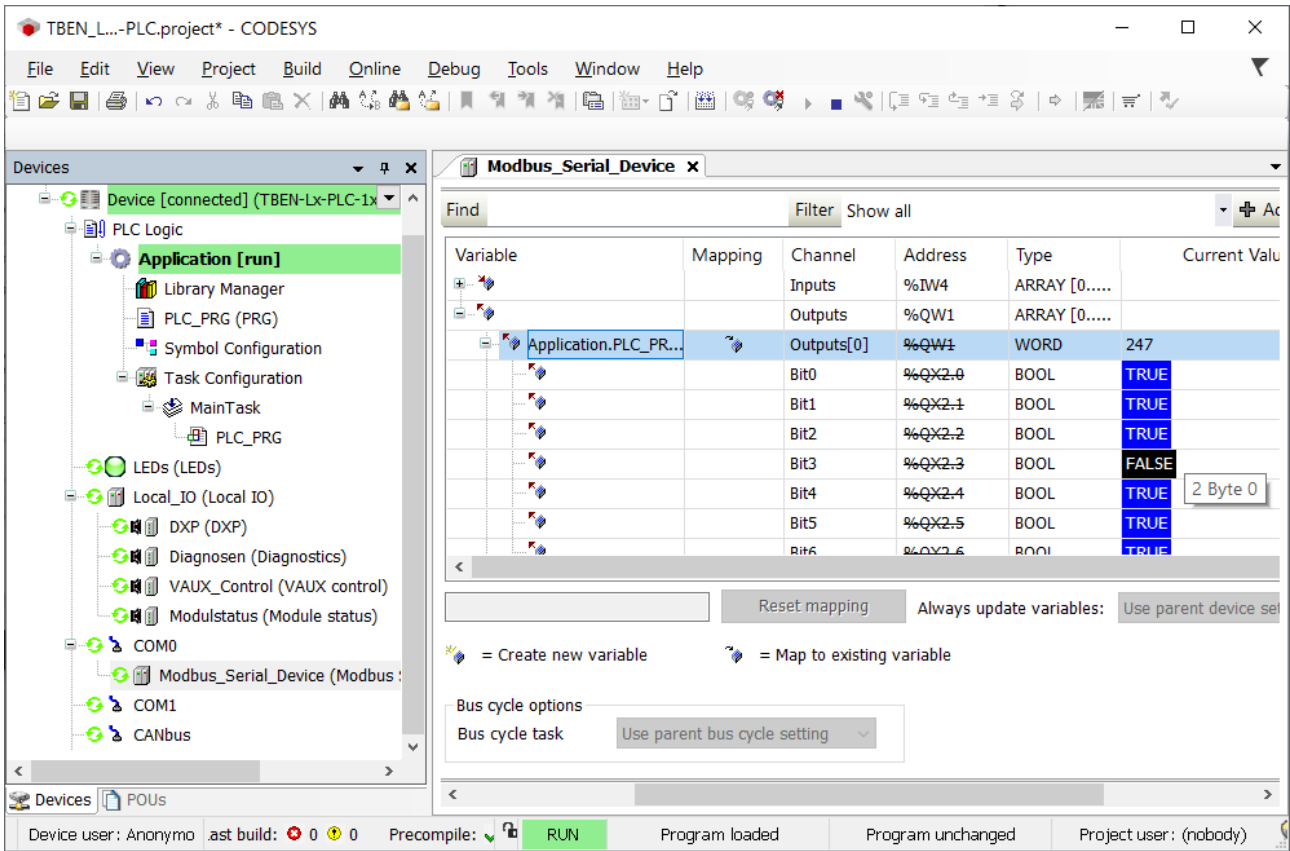


Fig. 50: Data mapping: Modbus\_Serial\_Device

7.3.9 Commissioning TBEN-L...-PLC... as PROFINET Controller



**NOTE**

The Getting Started document „PROFINET-Controller/-Device – Commissioning in CODESYS 3“ is available under [www.turck.com](http://www.turck.com) and contains a detailed description of the Commissioning of TBEN-L...-PLC-... as PROFINET-Controller/-Device.

**Properties**

Max. number of devices	64
Min. cycle time	1 ms
Max. number of devices at 1 ms	8

Configuring the PROFINET Controller

- ✓ The Ethernet interface is configured.
- ✓ The PN Controller from 3S – Smart Software Solutions GmbH is used.
- ▶ Add the PN Controller to the Ethernet interface using the **Add Device** function.

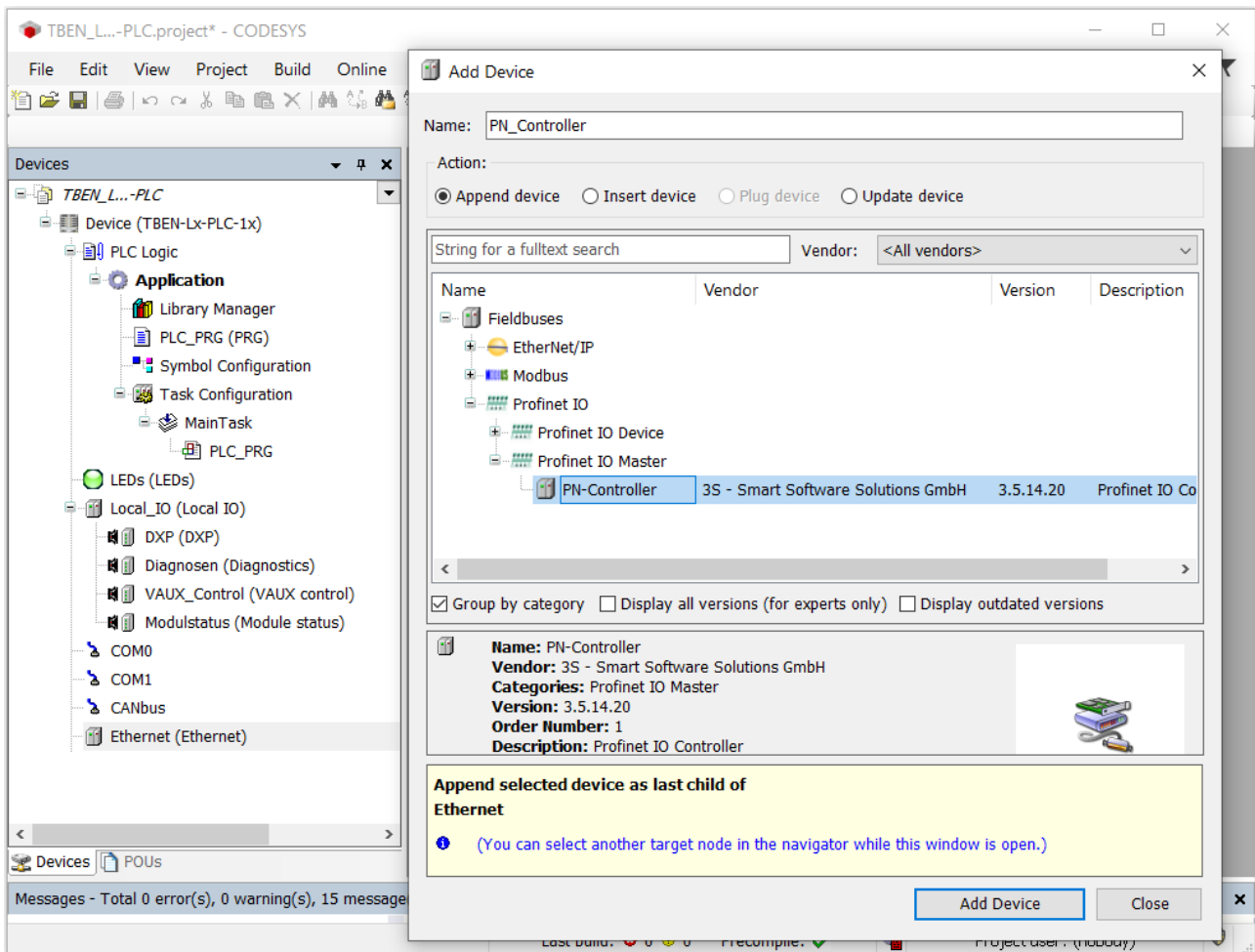


Fig. 51: Adding the PN Controller

► Configure the PN Controller.

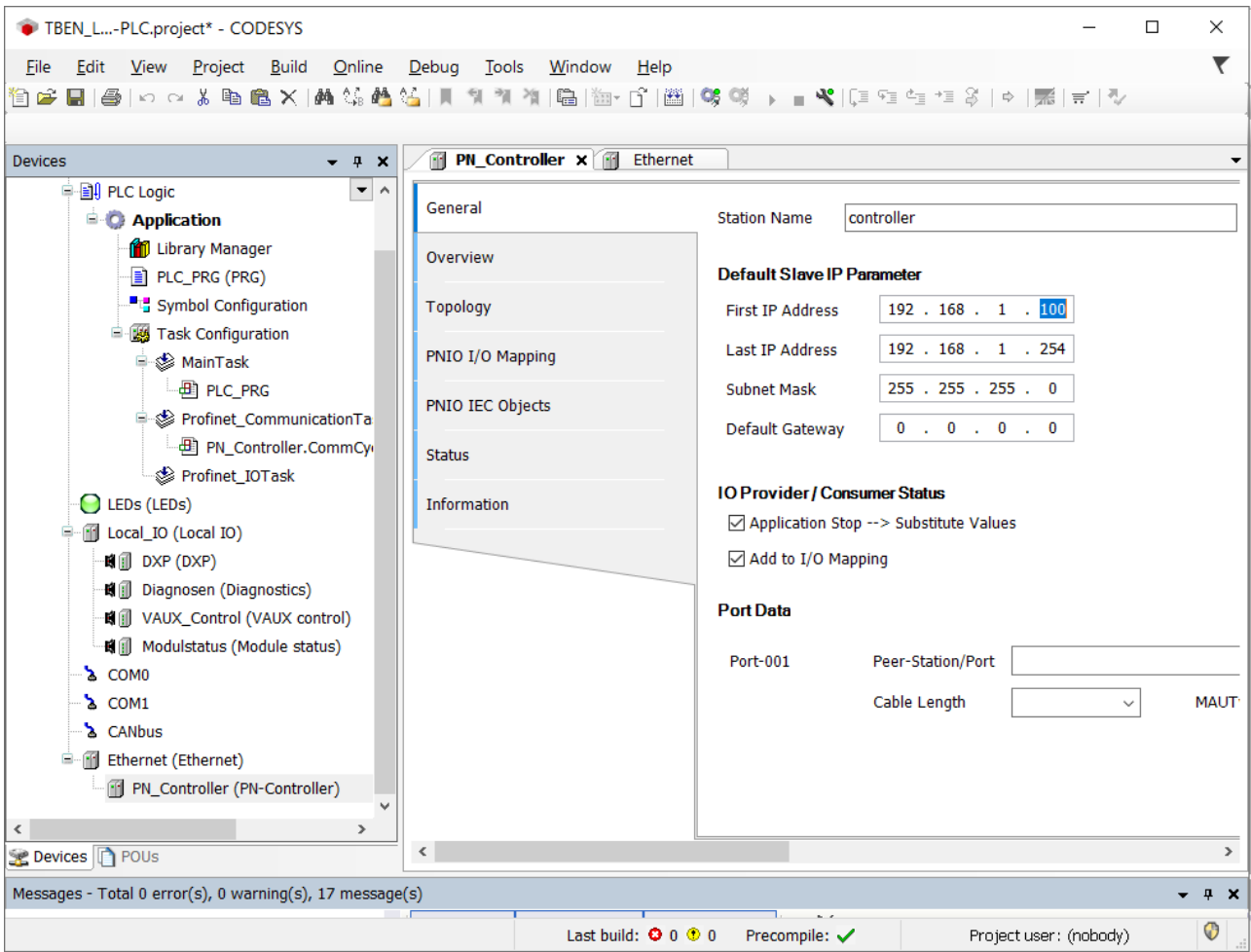


Fig. 52: Configuring the PN Controller.



**NOTE**

The Device addresses under **Default Slave IP Parameter** and the Ethernet interface of the TBEN-L...-PLC-... have to be in the same subnet.



### Configuring an external PROFINET Device

- ▶ Add an external PROFINET Device to the PN Controller using the **Add Device** function and configure it. In this example the Turck multiprotocol device TBEN-S1-4DIP-4DOP is used as PROFINET Device.

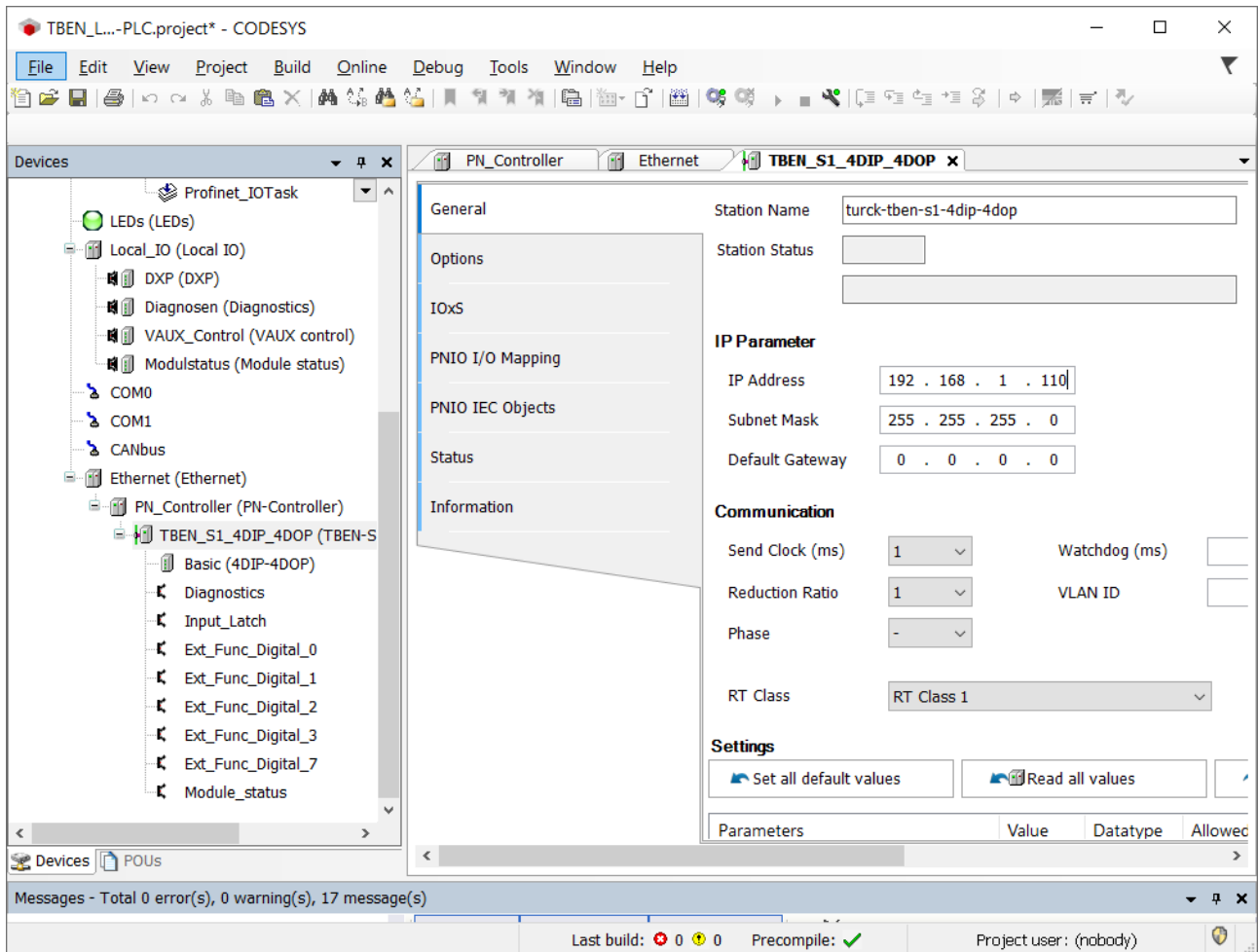


Fig. 53: Configuring an external PROFINET Device



**NOTE**

The IP addresses of the PROFINET Devices and the PN Controller have to be in the same subnet.

### 7.3.10 Commissioning TBEN-L...-PLC... as PROFINET Device

#### Configuring the PROFINET Device



#### NOTE

In Dual MAC mode, the PROFINET Device function is only available on Ethernet port P1 (eth0 in CODESYS).

- ✓ The Ethernet interface **eth0** is configured.
- ✓ The Profinet\_Device from Turck is used.
  - ▶ Add the Profinet\_Device to Ethernet using the **Add Device** function.
  - ▶ Configure the in- and output data lengths which have to be exchanged with the higher-level PROFINET Master.

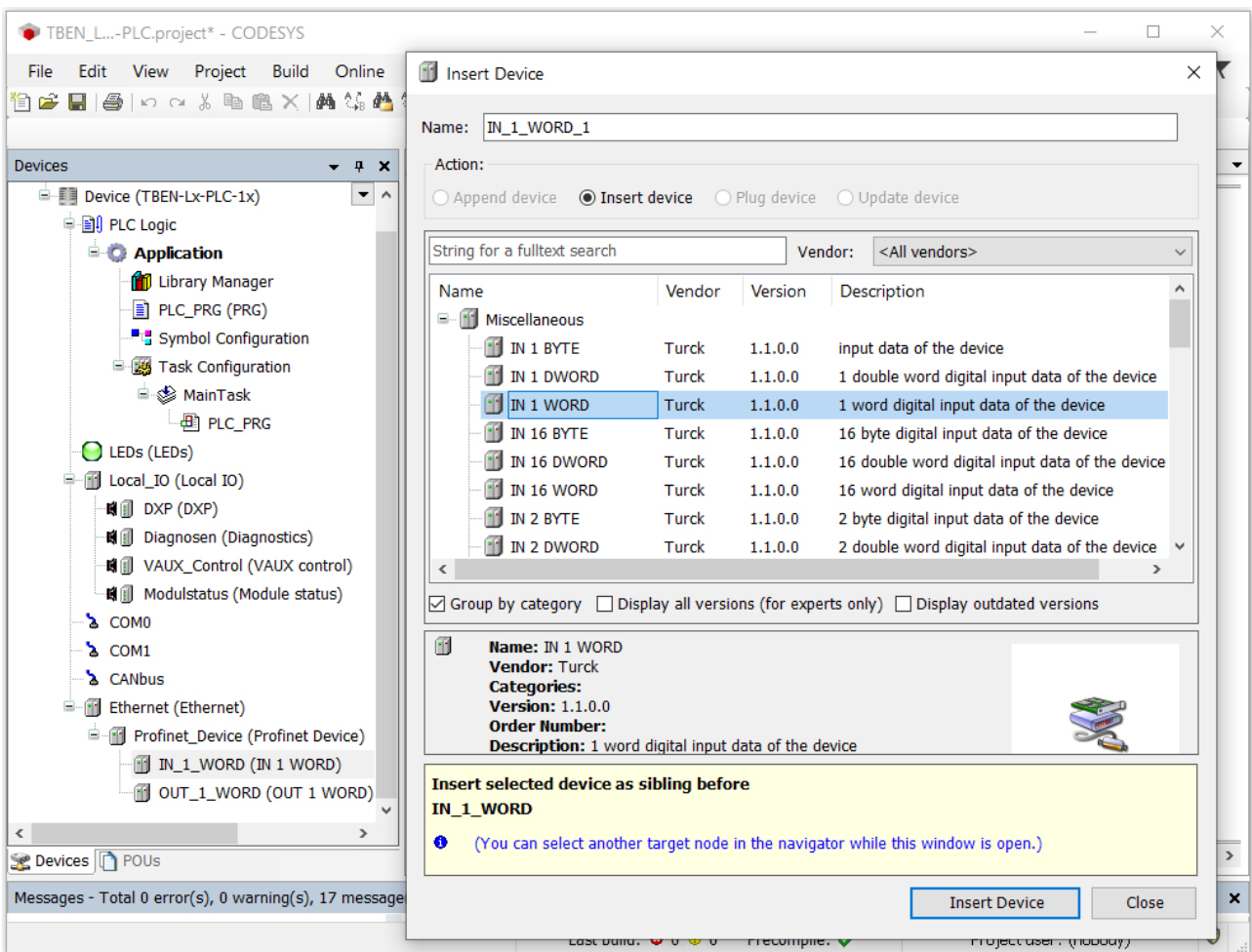


Fig. 54: Configuring the PROFINET Device



**NOTE**

The CODESYS input data have to be configured as output data in the PROFINET Controller configuration, the output data in CODESYS have to be configured as input data. The data thus have to be configured in reverse order in the PROFINET Controller configuration.

Which data will be mapped into the configured input and output data, depends on assignments in the PLC program or in I/O mapping of the TBEN-L...-PLC-....

Configuring the PROFINET Device in the PROFINET Controller

The following example describes the configuration of the PROFINET device with the Siemens programming software tool SIMATIC STEP7 Professional V13 (TIA Portal). The PROFINET CODESYS device is configured as standard PROFINET Device in TIA Portal.

**Installing the GSDML file**

- ▶ Install the device's GSDML-file (GSDML-V2.3-TURCK-CDS3\_PN\_Device-...-....xml) in the PROFINET configuration software. It can be downloaded from [www.turck.com](http://www.turck.com).
- ⇒ The device is added to the hardware catalog **CDS 3 PN Device**.

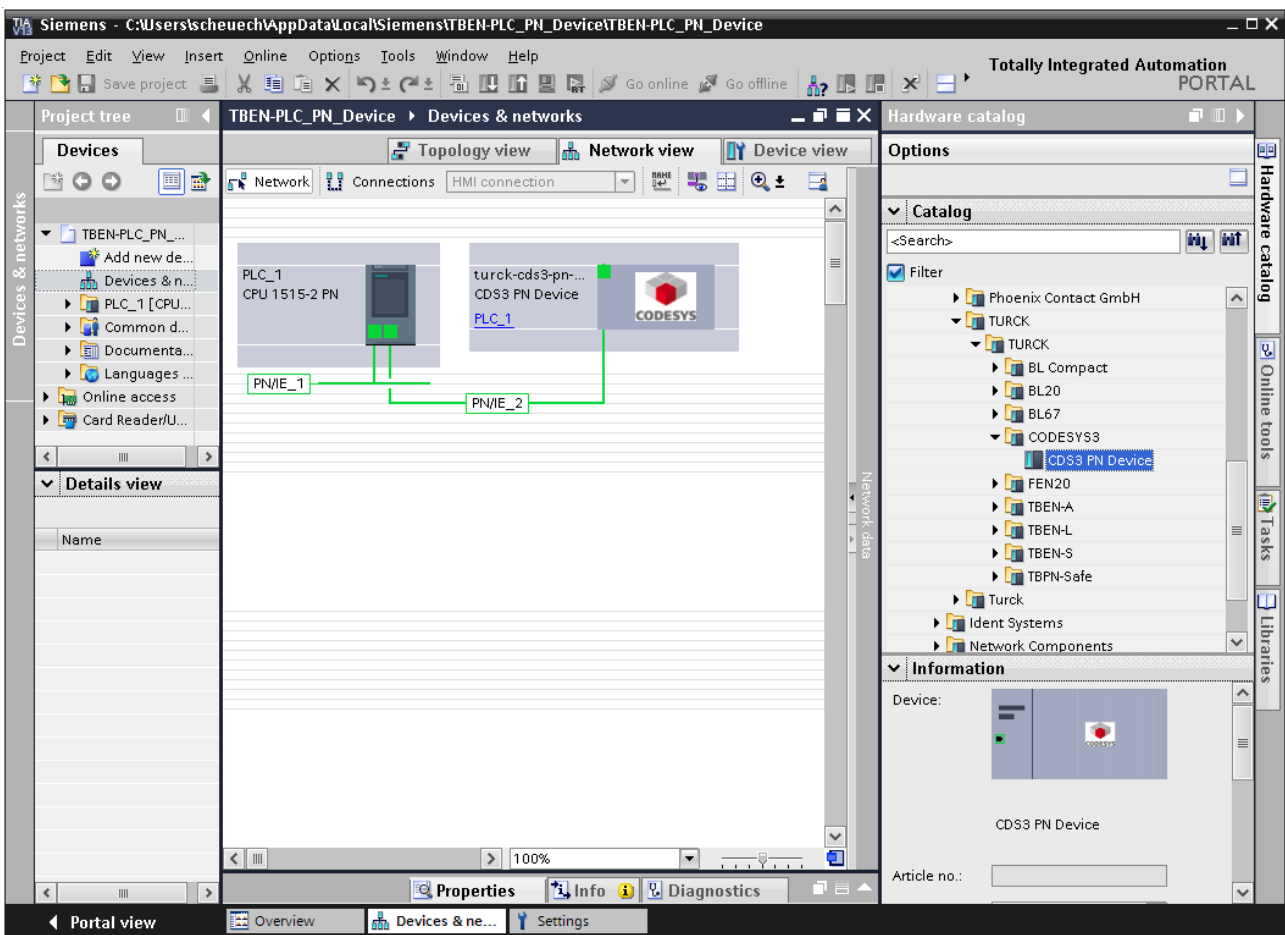


Fig. 55: Configuring the PROFINET Device in TIA Portal

**Configuring the PROFINET parameters**

Like for all other PROFINET Device the PROFINET-interface has to be configured for the CDS3 PN-Device in the project.

- ▶ Set necessary IP-settings and assign PROFINET device name or use the device name which has already been assigned to the device.

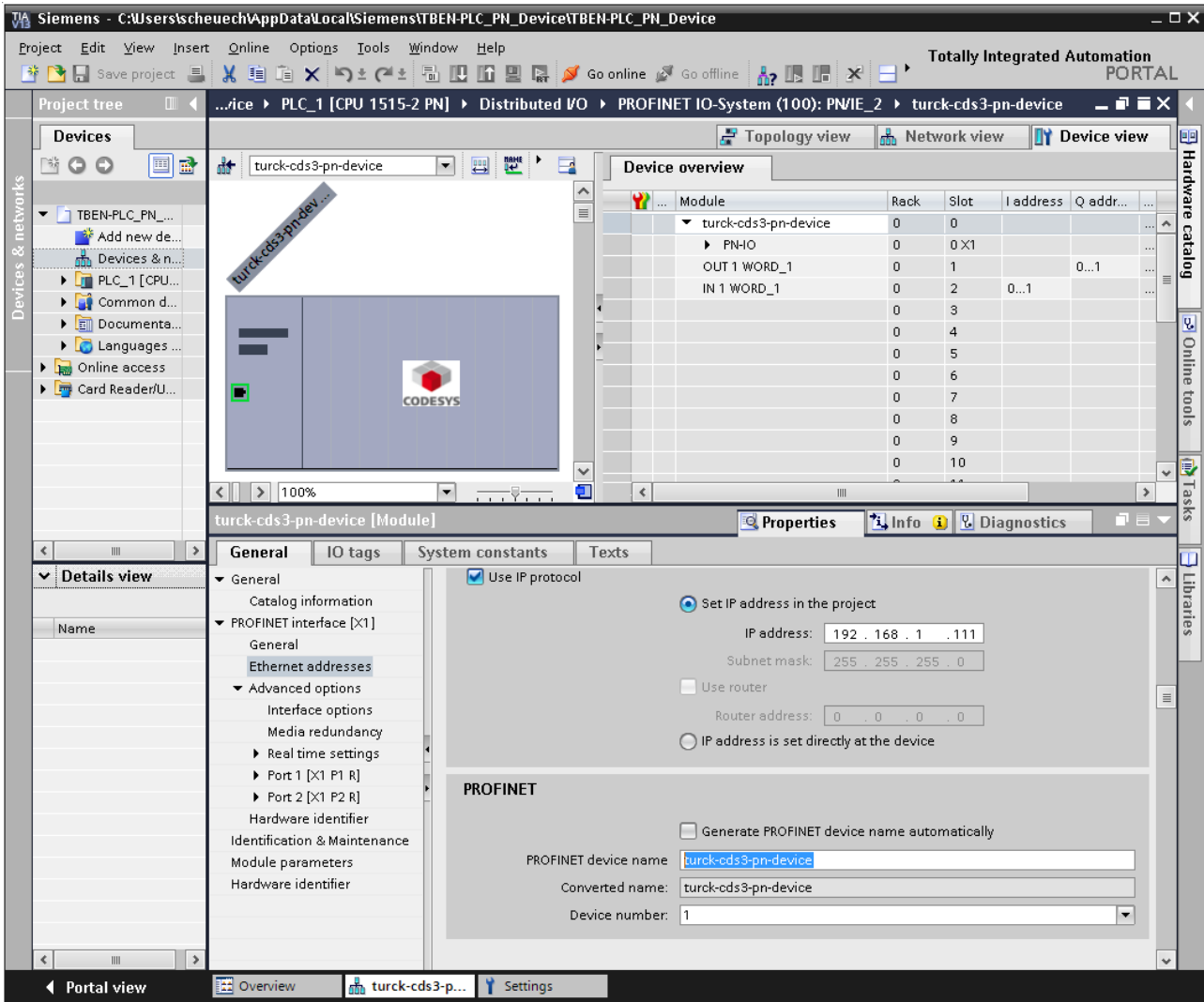


Fig. 56: Settings PROFINET-interface (CDS3 PN Device)

### Configuring the in- and output data

- Configure the in- and output data, which have to be exchanged with the CODESYS-device.



### NOTE

The configuration of the data in TIA Portal has to be done in reverse order compared to the configuration in CODESYS. Input data in TIA Portal are output-data in CODESYS, and vice versa. The configured data widths must match.

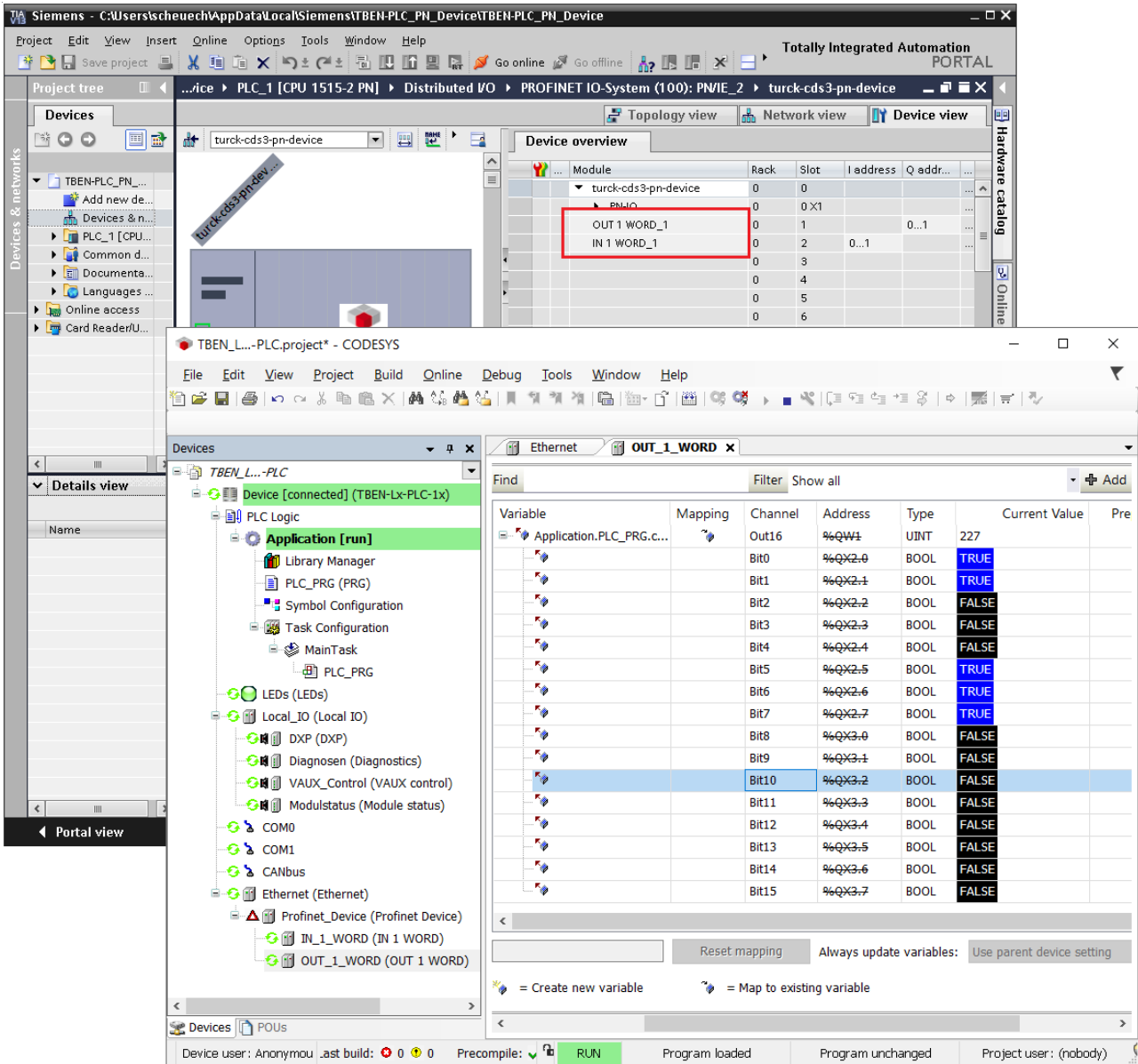


Fig. 57: Configuration of in- and output data in TIA Portal/CODESYS

### 7.3.11 Commissioning TBEN-L...-PLC... in parallel as PROFINET controller and device

If the device is used simultaneously as both a PROFINET controller and a PROFINET device, a second Ethernet interface must be added to the device. The assignment of the Ethernet ports in CODESYS is as follows:

Ethernet port	Function
eth0	PROFINET Device
eth1	PROFINET Controller

#### Configuring the PROFINET Controller

- ✓ The Ethernet interface eth1 is configured as described under "Configuring the Ethernet interfaces" [▶ 35].
- ✓ The PN Controller from 3S – Smart Software Solutions GmbH is used.
  - ▶ Add the PN Controller to the Ethernet interface **eth1** using the **Add Device** function.

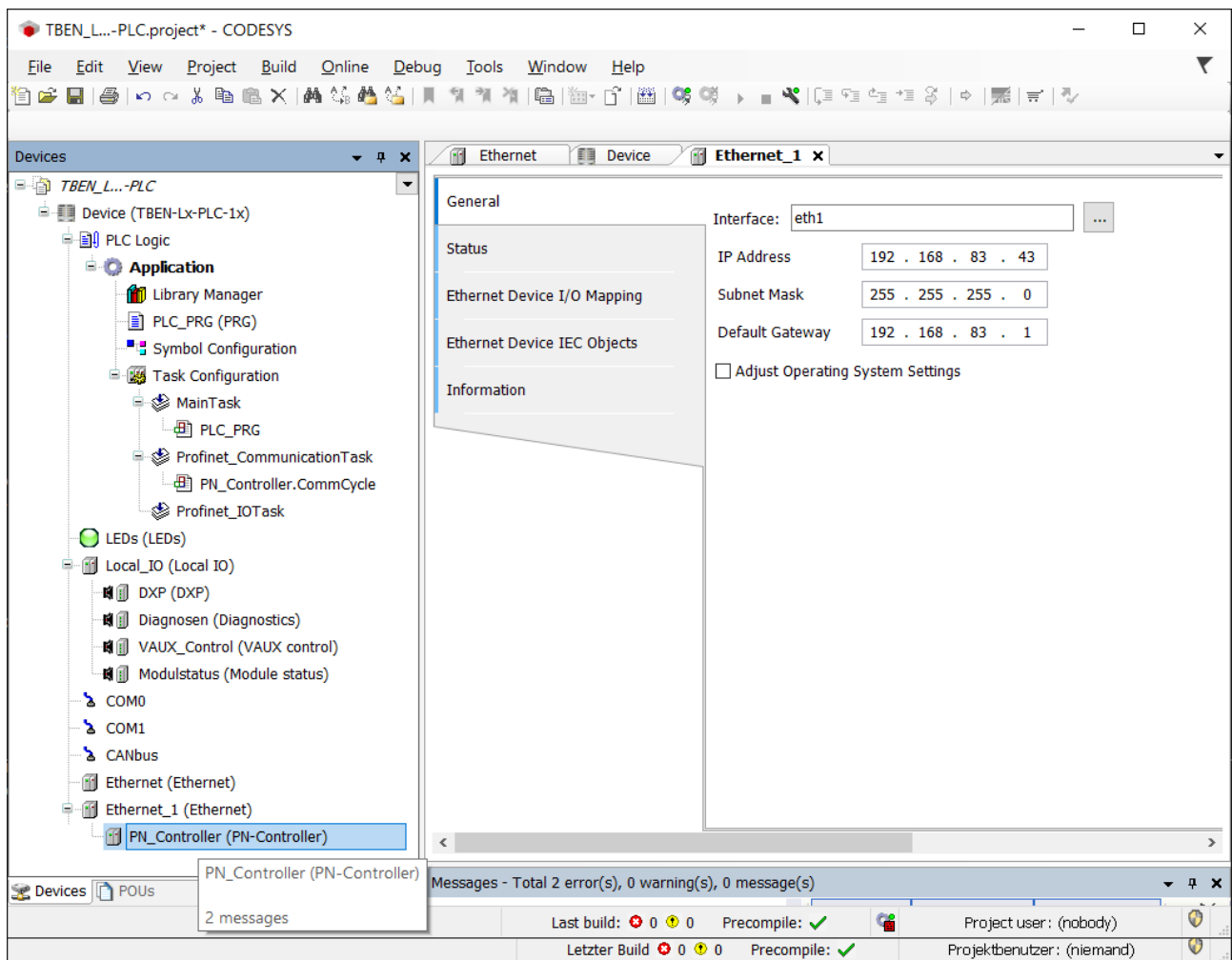


Fig. 58: Adding the PN Controller to eth1

► Configure the PN Controller.

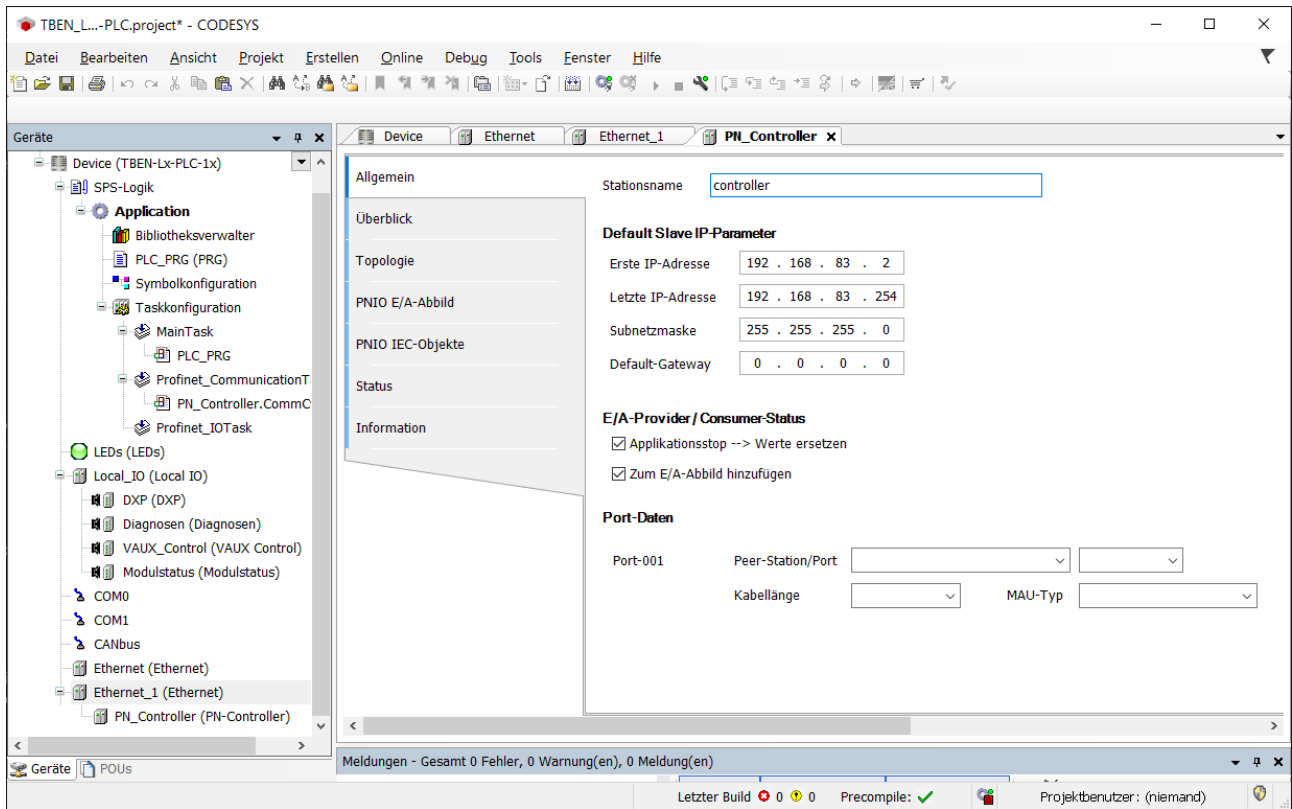


Fig. 59: Configuring the PN Controller.



**NOTE**

The Device addresses under **Default Slave IP Parameter** and the Ethernet interface of the TBEN-L...-PLC-... have to be in the same subnet.

Configuring the PROFINET Device

- ▶ Configure PROFINET device at interface eth0 as described under "Commissioning TBEN-L...-PLC-... as PROFINET Device" [▶ 50].

7.3.12 Commissioning TBEN-L...-PLC-... as EtherNet/IP™ Scanner

Properties	
Max. number of devices	64
Input data	Max. 8 KB
Output data	Max. 8 KB
Max. number of devices at 10 ms	8

Configuring the Ethernet/IP™ Scanner

- ✓ The Ethernet interface is configured.
- ✓ The EtherNet/IP Scanner from 3S - Smart Software Solutions GmbH is used.
- ▶ Add the EtherNet/IP™ Scanner to Ethernet using the **Add Device** function and configure it.

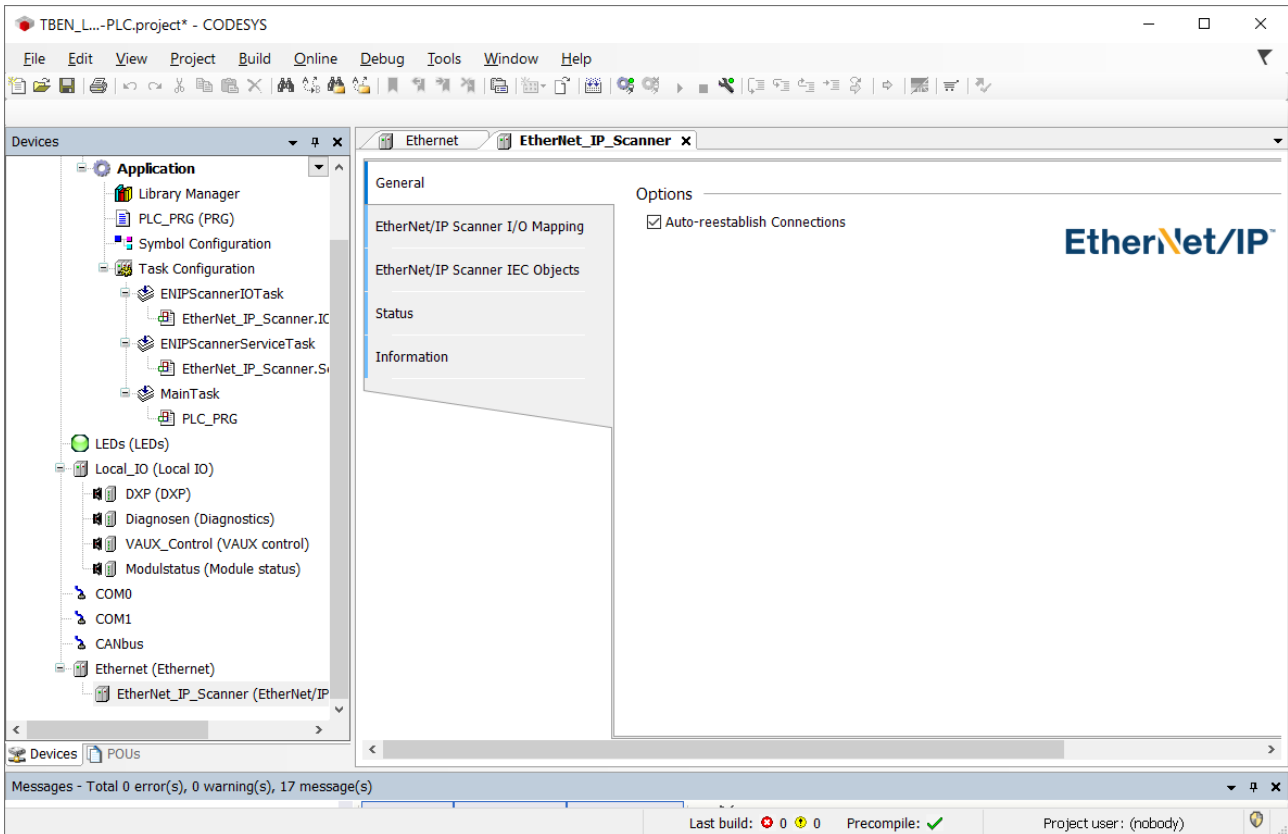


Fig. 60: EtherNet/IP™ scanner



Configuring an external EtherNet/IP™ device

- ▶ Add an external EtherNet/IP™ device to the EtherNet/IP™ Scanner using the **Add Device** function and configure it.  
In this example the Turck multiprotocol device TBEN-L5-8IOL is used as EtherNet/IP™ device.

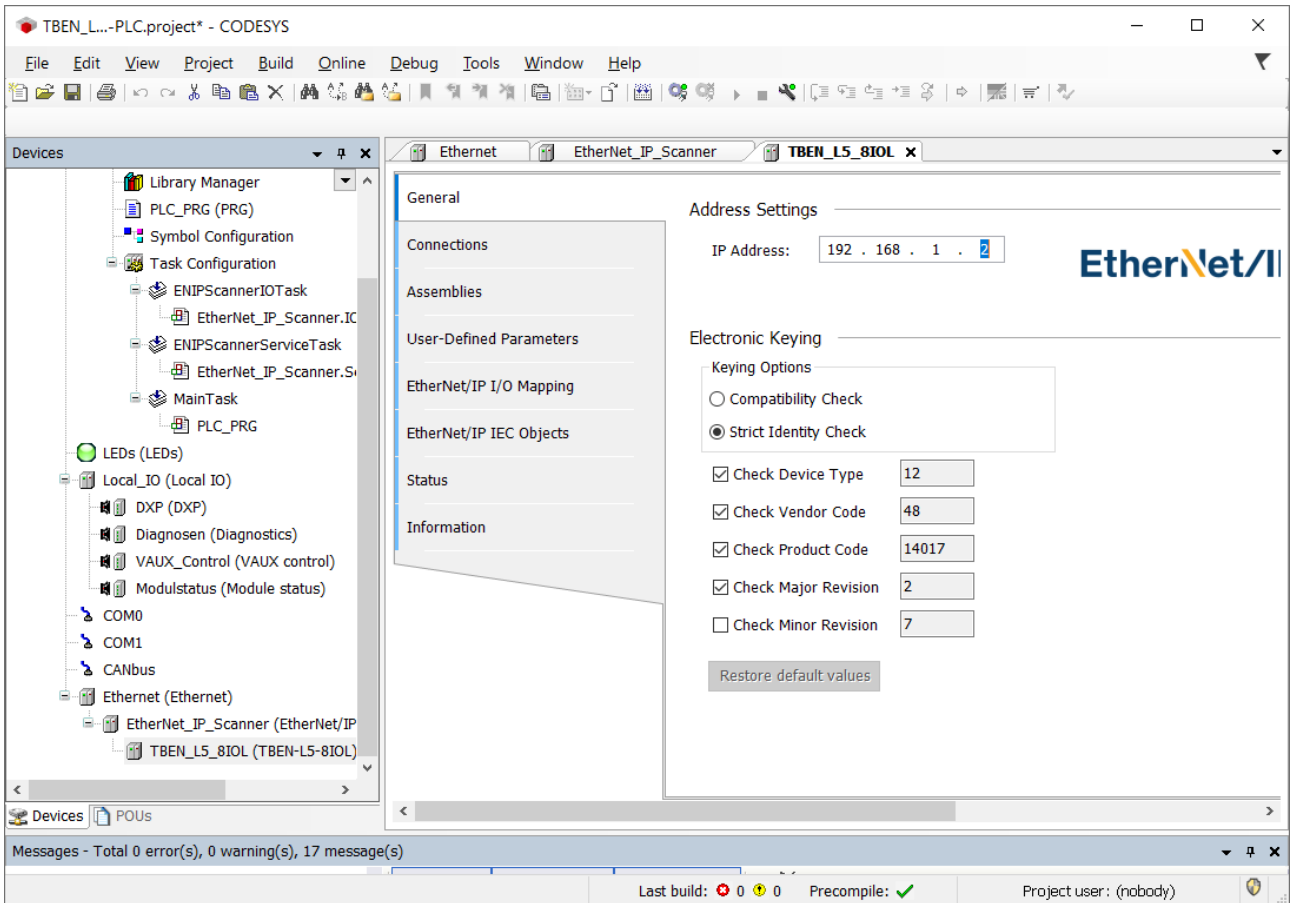


Fig. 61: External EtherNet/IP™ device

### 7.3.13 Commissioning TBEN-L...-PLC... as EtherNet/IP™ Slave (Device)



#### NOTE

In Dual MAC mode, the PROFINET Device function is only available on Ethernet port P1 (eth0 in CODESYS).

#### Properties

max. number of I/O data	496 byte IN
	492 byte IN

#### Configuring an EtherNet/IP™ device

- ✓ The Ethernet interface **eth0** is configured.
- ✓ The **Ethernet IP Slave** from Turck is used.
  - ▶ Add the EtherNet/IP™ device to the Ethernet interface using the **Add Device** function.
  - ▶ Configure the in- and output data lengths which have to be exchanged with the higher-level PLC.

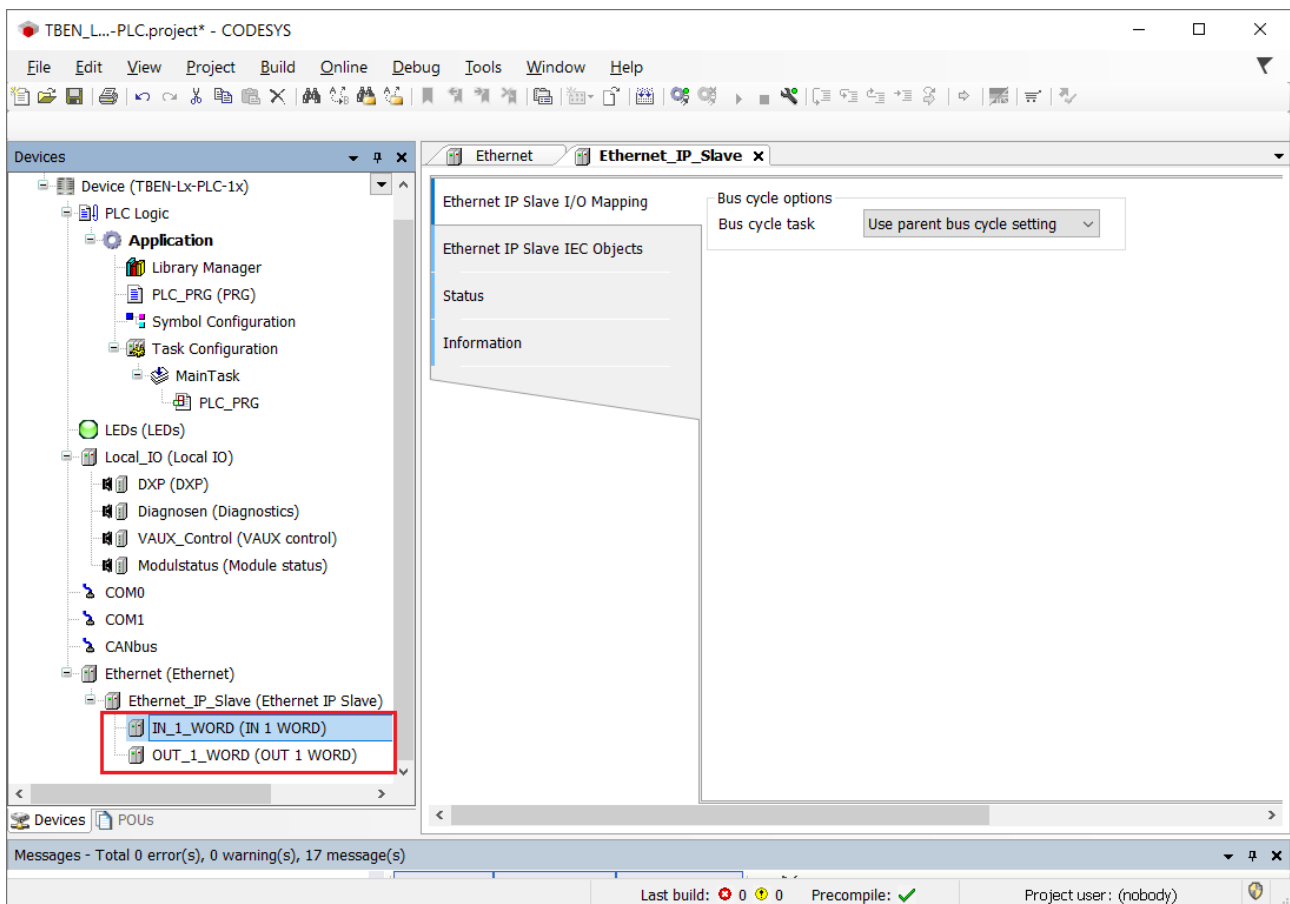


Fig. 62: Configuring an EtherNet/IP™ device

Which data will be mapped into the configured input and output data, depends on assignments in the PLC program or in the I/O mapping of the TBEN-L...-PLC-....

The screenshot shows the CODESYS software interface for a TBEN-L...-PLC project. The main window displays the data mapping for the EtherNet/IP Slave. The table below represents the data shown in the interface:

Variable	Mapping	Channel	Address	Type	Current Value	Prepared Value
Application.PLC_PRG.c...		Out16	%QW1	UINT	156	
		Bit0	%QX2-0	BOOL	FALSE	
		Bit1	%QX2-1	BOOL	FALSE	
		Bit2	%QX2-2	BOOL	TRUE	
		Bit3	%QX2-3	BOOL	TRUE	
		Bit4	%QX2-4	BOOL	TRUE	
		Bit5	%QX2-5	BOOL	FALSE	
		Bit6	%QX2-6	BOOL	FALSE	
		Bit7	%QX2-7	BOOL	TRUE	
		Bit8	%QX3-0	BOOL	FALSE	
		Bit9	%QX3-1	BOOL	FALSE	
		Bit10	%QX3-2	BOOL	FALSE	
		Bit11	%QX3-3	BOOL	FALSE	
		Bit12	%QX3-4	BOOL	FALSE	
		Bit13	%QX3-5	BOOL	FALSE	
		Bit14	%QX3-6	BOOL	FALSE	
		Bit15	%QX3-7	BOOL	FALSE	

The interface also shows a device tree on the left with the following structure:

- TBEN-L...-PLC
  - Device [connected] (TBEN-Lx-PLC-1x)
    - PLC Logic
      - Application [run]
        - Library Manager
        - PLC\_PRG (PRG)
        - Symbol Configuration
        - Task Configuration
          - MainTask
            - PLC\_PRG
      - LEDs (LEDs)
      - Local\_IO (Local IO)
        - DXP (DXP)
        - Diagnosen (Diagnostics)
        - VAUX\_Control (VAUX control)
        - Modulstatus (Module status)
      - COM0
      - COM1
      - CANbus
      - Ethernet (Ethernet)
        - Ethernet\_IP\_Slave (Ethernet IP Slave)
          - IN\_1\_WORD (IN 1 WORD)
          - OUT\_1\_WORD (OUT 1 WORD)

The status bar at the bottom shows: Device user: Anonymous, Last build: 0 0, Precompile: ✓, RUN, Program loaded, Program unchanged, Project user: (nobody).

Fig. 63: EtherNet/IP™ Slave data mapping

### Configuring the EtherNet/IP™ device in EtherNet/IP™ Scanner

The following example describes the configuration of the EtherNet/IP™ device in Rockwell RSLogix5000 V20.01.

The EtherNet/IP™ device is configured as standard EtherNet/IP™ device (Communications Adapter) in RSLogix.

Hardware in the example:

- Controller: Logix 5572™ (Allen Bradley)
- EtherNet/IP™-Bridge 1756EN2TR (Allen Bradley)
- TBEN-L...-PLC-...

#### Installing the EDS file

- ▶ Install the device's EDS file (Turck CDS3.eds) in the configuration software. It can be downloaded from [www.turck.com](http://www.turck.com)
- ⇒ The device is added as **CDS 3 Ethernet/IP Slave** to the device catalog in RSLogix.

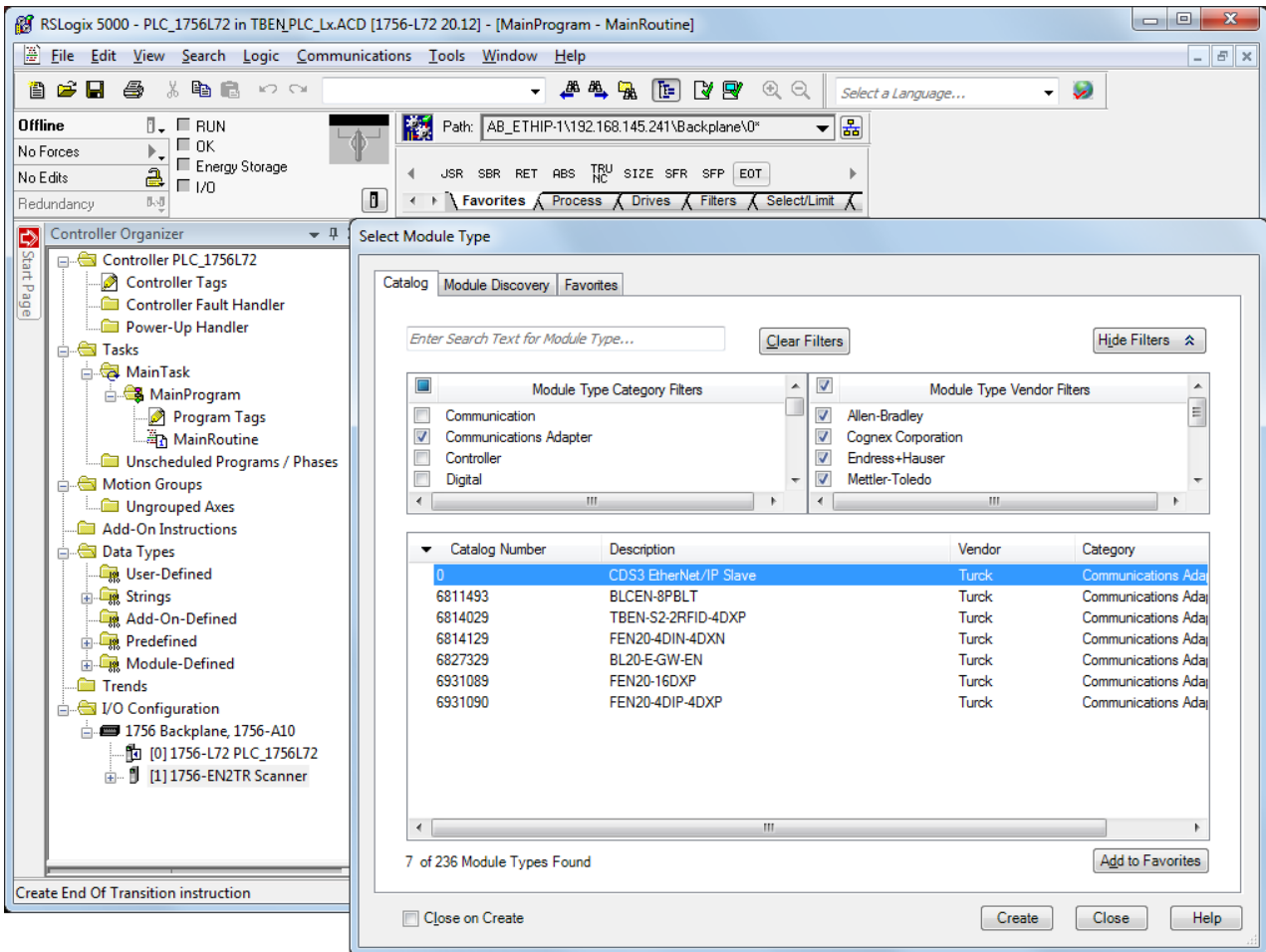


Fig. 64: RSLogix5000: Device catalog with EtherNet/IP Slave CDS 3

### Configuring the device

- ▶ Enter the device name and the device's IP address.

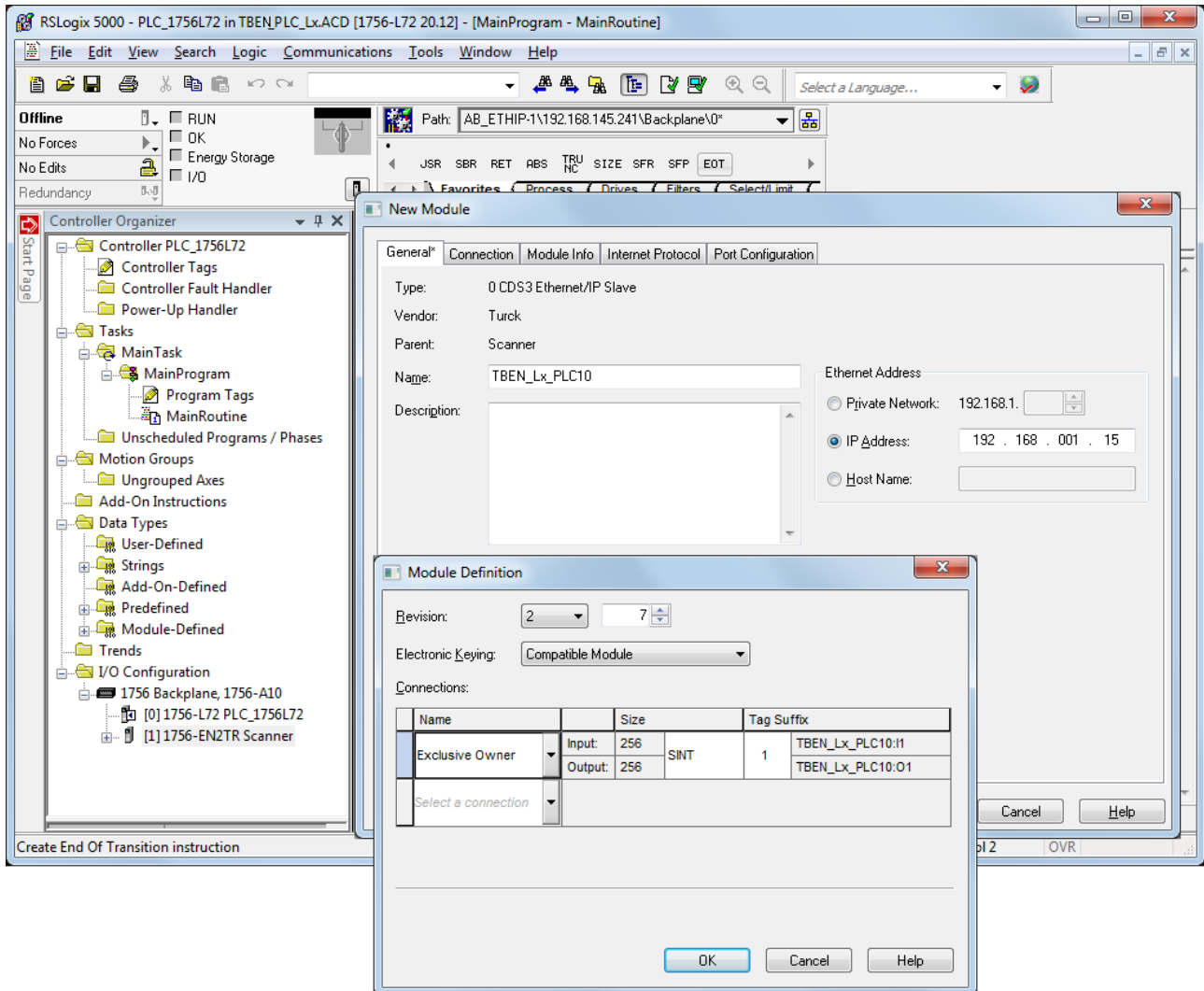


Fig. 65: Settings at the CDS3 Ethernet/IP Slave

### Configuring the in- and output data

The device is automatically configured with a data width of 256 byte in- and 256 byte output data.

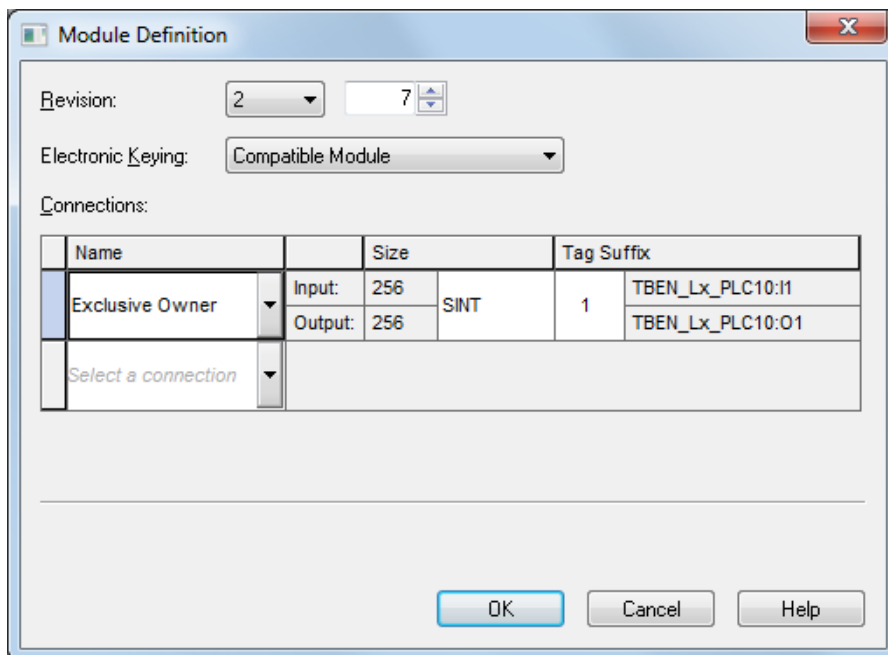


Fig. 66: EtherNet/IP™ Connection CDS3 Ethernet/IP Slave



#### NOTE

The EDS file limits the maximum number of in- and output data for the device to 256 Byte each. If the device is configured as generic device, than up to 496 Byte input data and 492 Byte output data are possible.

Configuring the in- and output data which have to be exchange with the CODESYS device is not necessary. The Controller Tags are created automatically.

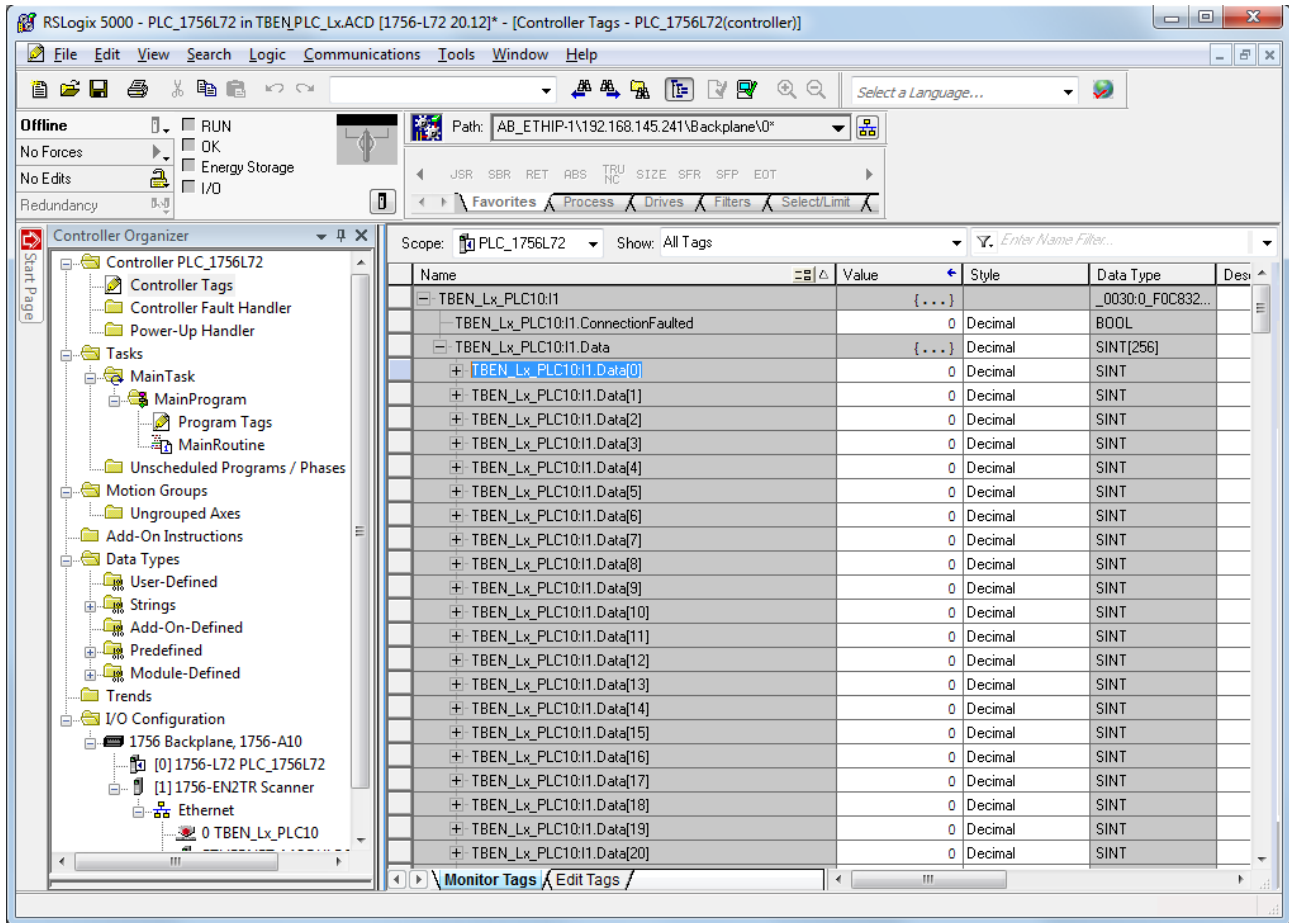


Fig. 67: Automatically created Controller Tags of the CDS 3 Ethernet/IP Slave

7.3.14 Commissioning TBEN-L...-PLC... parallel as EtherNet/IP™ Scanner and Slave (Device)

If the device is used simultaneously as both a EtherNet/IP™ Scanner and a EtherNet/IP™ Slave (Device), a second Ethernet interface must be added to the device. The assignment of the Ethernet ports in CODESYS is as follows:

Ethernet interface in CODESYS	Function
eth0	Ethernet/IP™ Slave (Device)
eth1	EtherNet/IP™ Scanner

Adding and configuring the second Ethernet interface

Configuring the Ethernet/IP™ Scanner

- ✓ The Ethernet interface eth1 is configured as described under "Configuring the Ethernet interfaces" [▶ 35].
- ✓ The EtherNet/IP Scanner from 3S - Smart Software Solutions GmbH is used.
- ▶ Add the EtherNet/IP™ Scanner to Ethernet using the **Add Device** function and configure it.

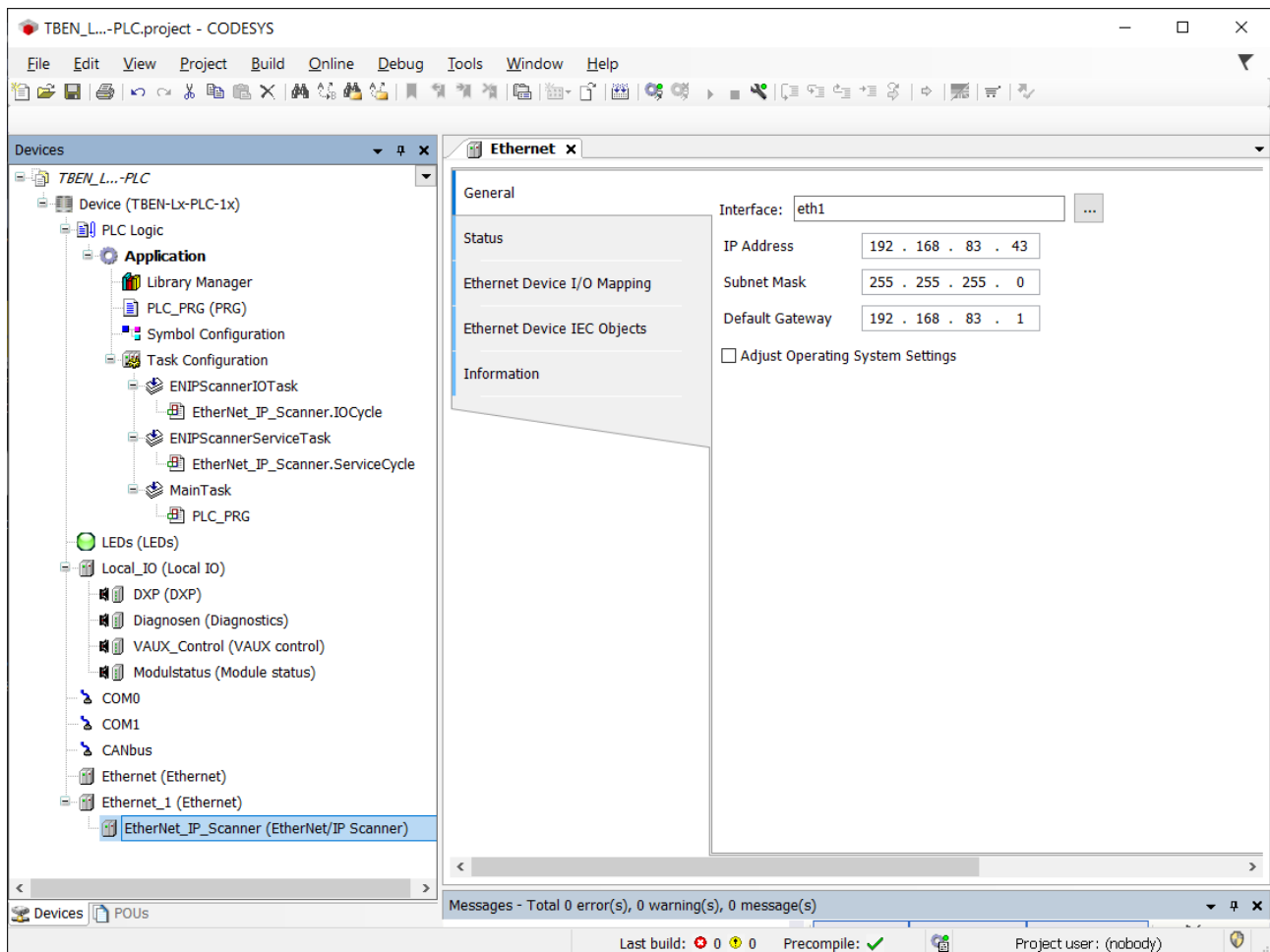


Fig. 68: Ethernet/IP™ Scanner at eth1



Configuring the EtherNet/IP™ Slave (Device)

- ▶ Configure EtherNet/IP™ Slave device at interface **eth0** as described under "Commissioning TBEN-L...-PLC-... as Ethernet PROFINET Device" [▶ 58].

7.3.15 Commissioning TBEN-L...-PLC-... as CANopen Manager

Properties	
Max. number of devices	127
Input data	max. 8 kB
Output data	max. 8 kB

Configuring the CANopen Manager

- ✓ The CANopen Manager from 3S - Smart Software Solutions GmbH is used.
- ▶ Add the CANopen Manager to the CANbus using the **Add Device** function and configure it.

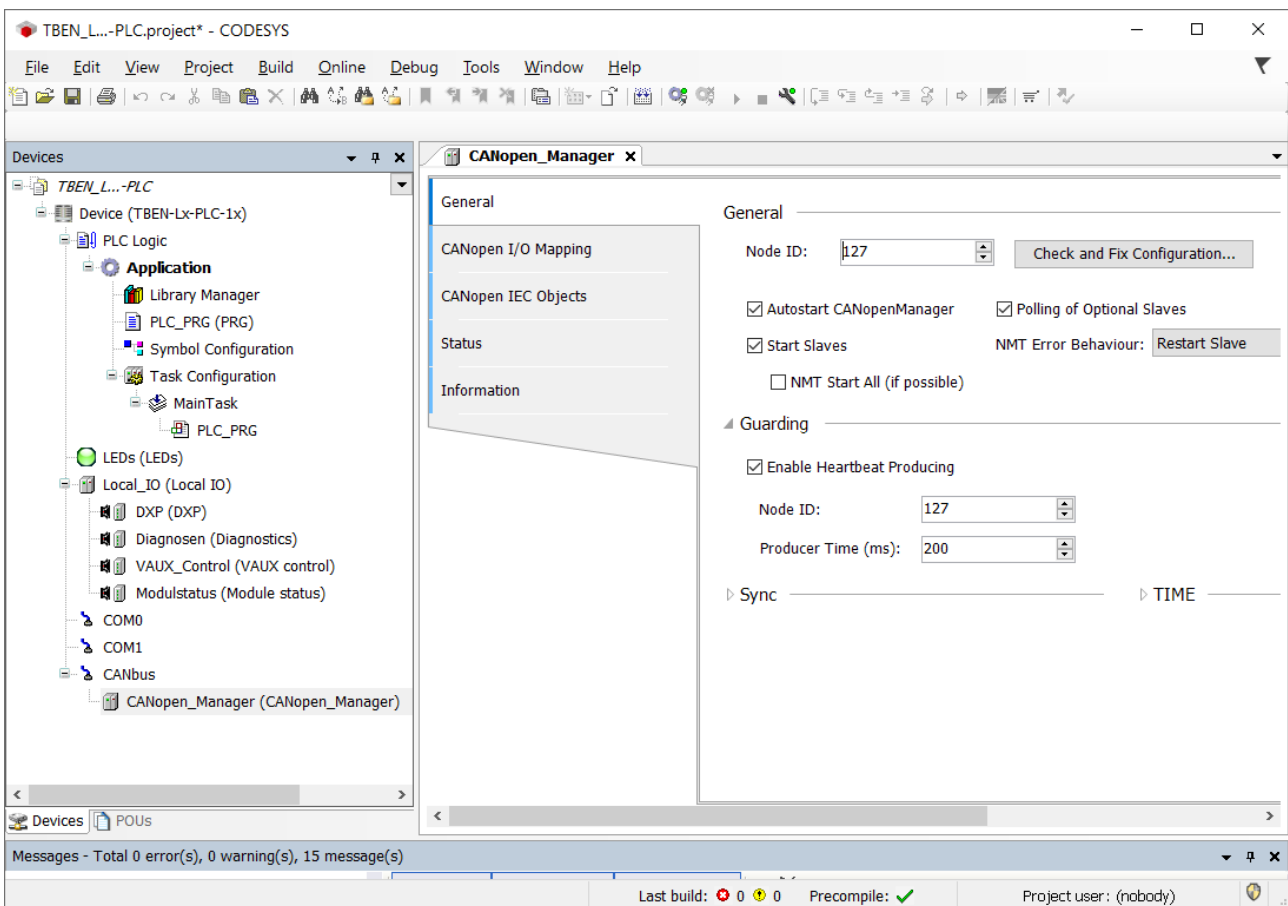


Fig. 69: Adding the CANopen Manager

Configuring an external CANopen Device

- ▶ Add an external CANopen Device to the CANopen Manager using the **Add Device** function and configure it.  
In this example the Turck BL67-CANopen gateway BL67-GW-CO is used as CANopen device.

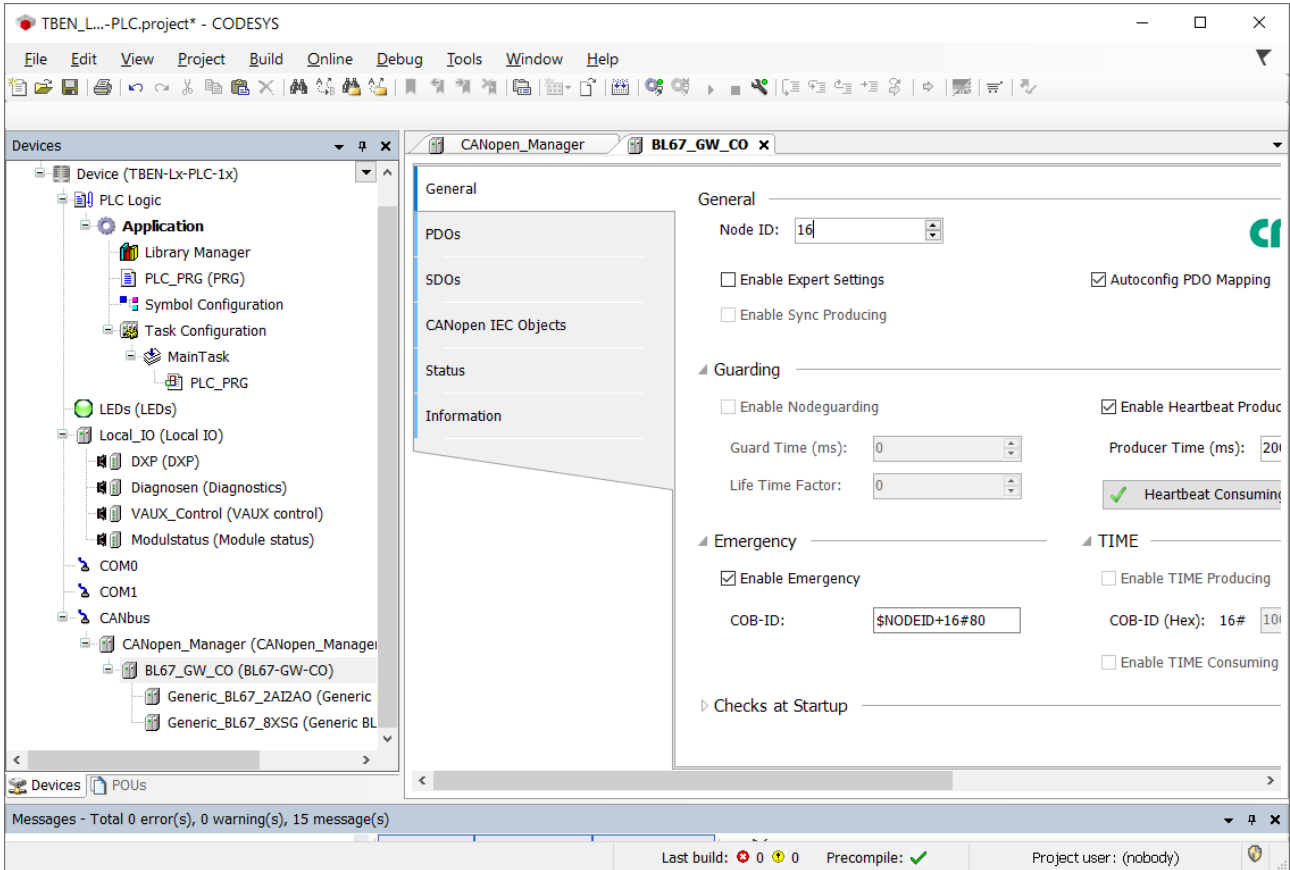


Fig. 70: Configuring the CANopen Device

### 7.3.16 Commissioning TBEN-L...-PLC... as CANopen Device

Properties	
max. number of I/O data	max. 512 RxPDOs max. 512 TxPDOs

#### Configuring the CANopen Device

- ✓ The CANopen Device from 3S - Smart Software Solutions GmbH is used.
- ▶ Add the CANopen Device to the CANbus using the **Add Device** function.
- ▶ Configure the Node ID etc.
- ▶ Add input and output areas for the Device via the **Edit I/O Area** function.

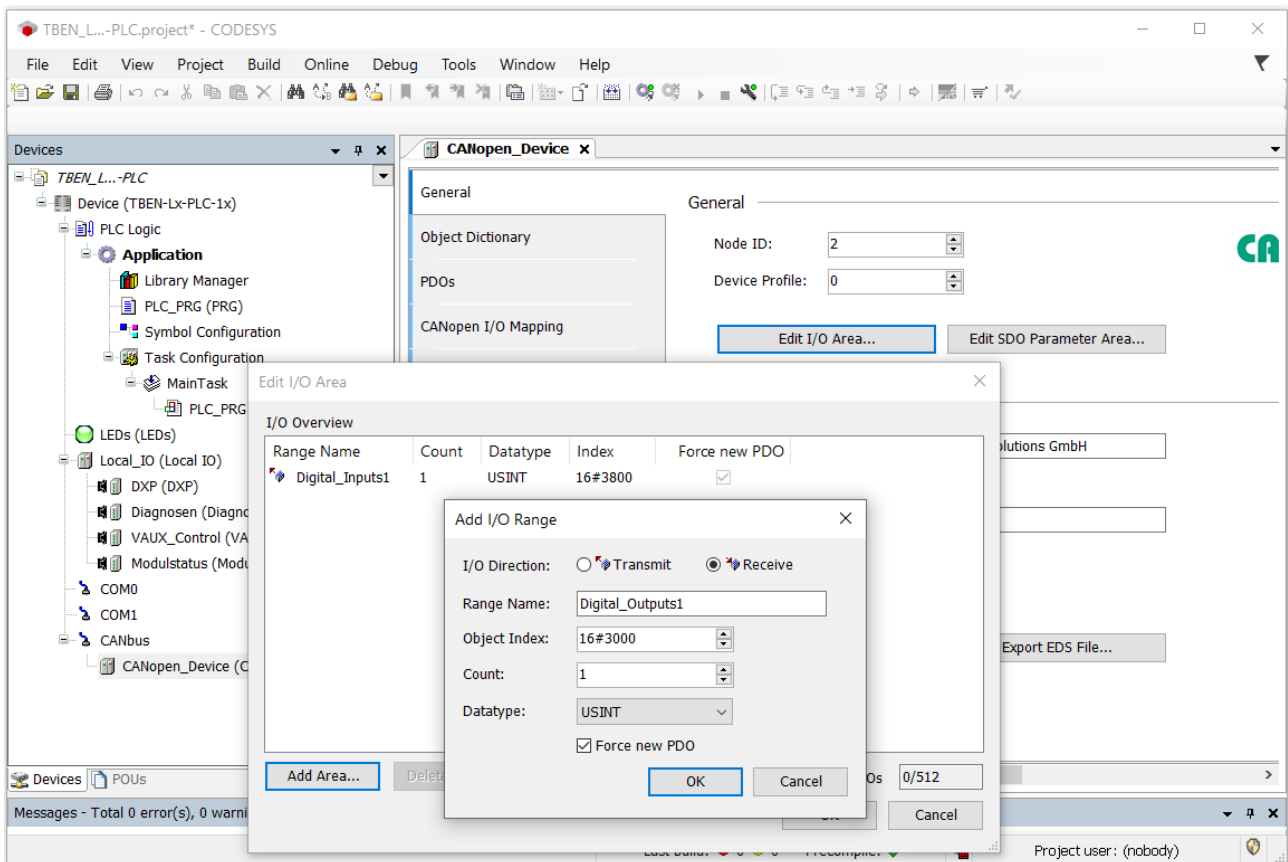


Fig. 71: Configuring the CANopen Device

Which data will be mapped into the configured input and output data, depends on assignments in the PLC program or in the I/O mapping of the TBEN-L...-PLC-....

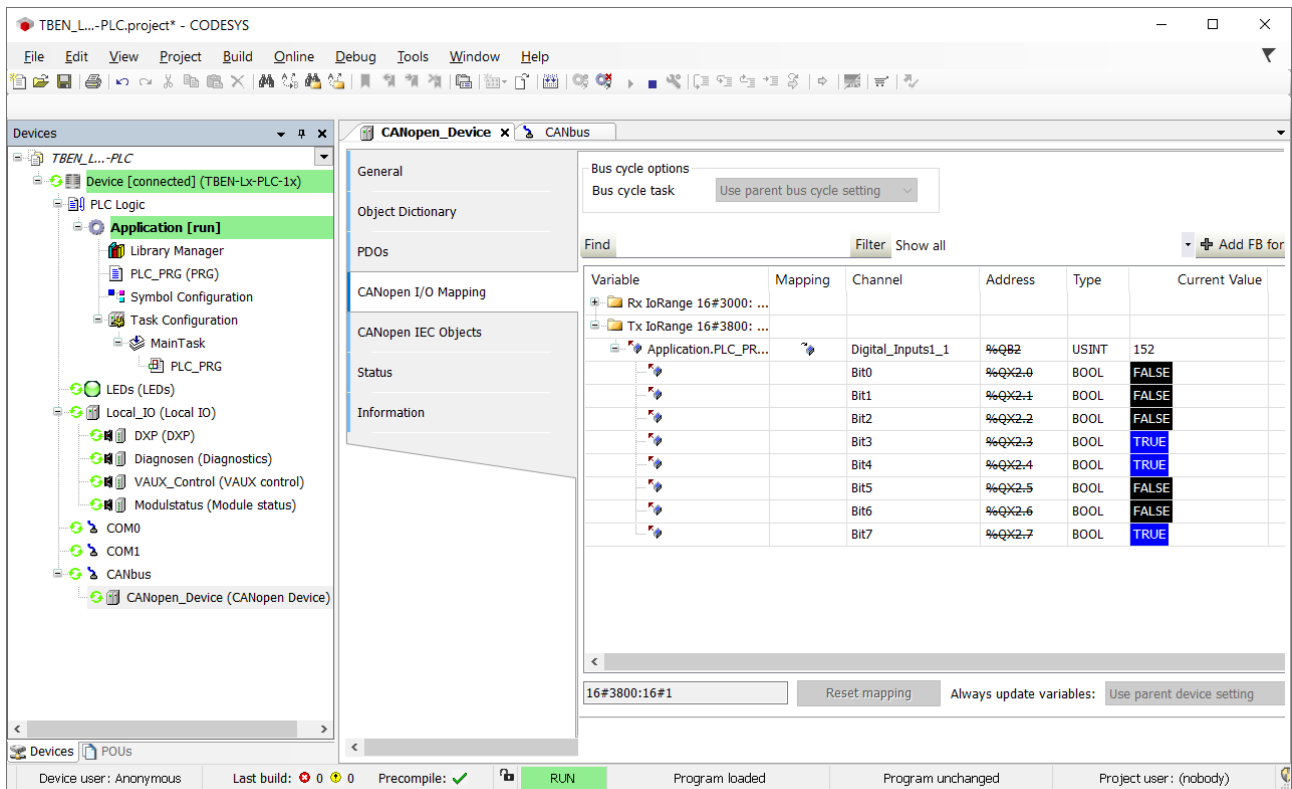


Fig. 72: Data mapping: CANopen Device

### Export an EDS file for the CANopen Device

Use the **Export EDS File** function to create and export a device specific EDS file for the use in a higher-level CANopen PLC.

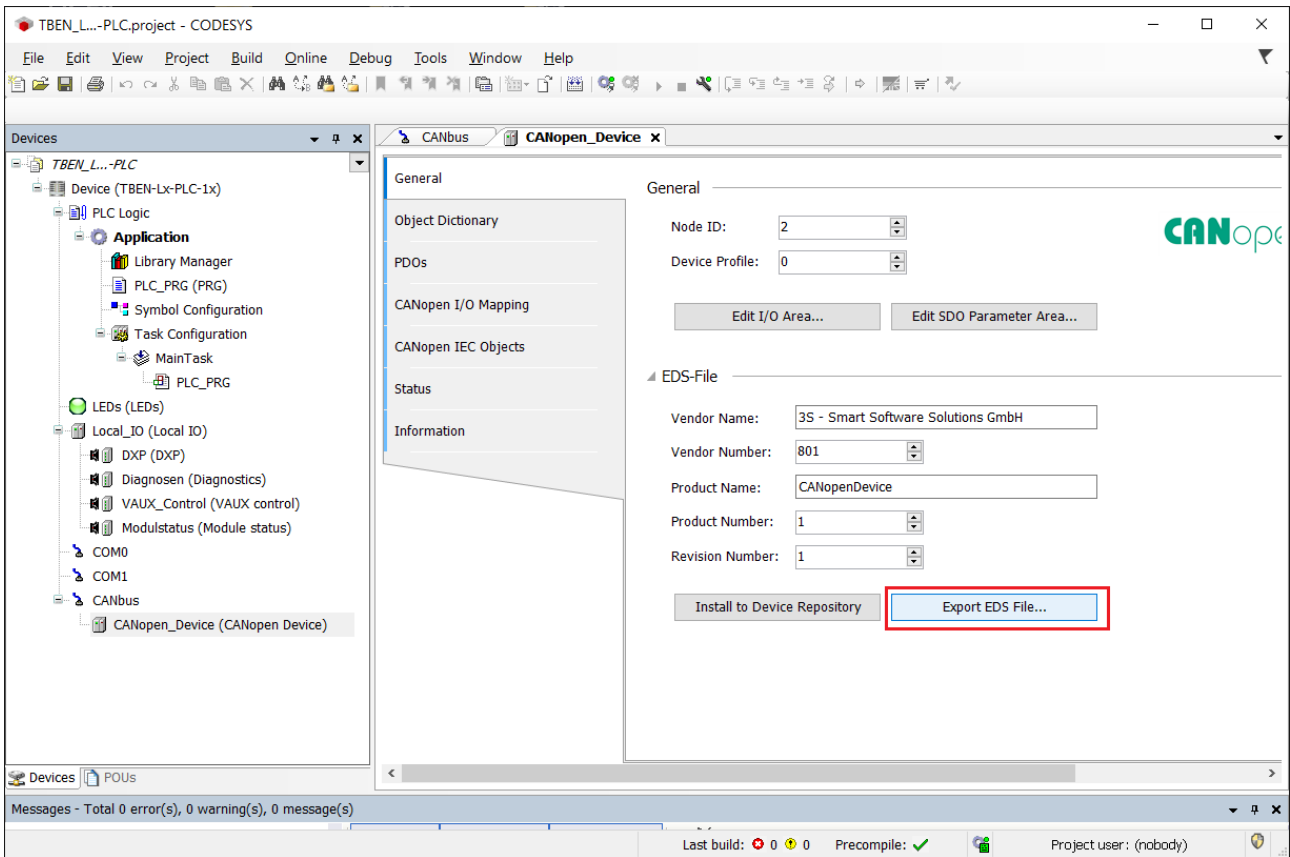


Fig. 73: Exporting the EDS file

### 7.3.17 Commissioning TBEN-L...-PLC... as SAE J1939 Manager

Properties	
Max. number of devices	254
Input data	max. 8 KB
Output data	max. 8 KB

#### Configuring the SAE J1939 Manager

The J1939 Manager from 3S - Smart Software Solutions GmbH is used.

- ▶ Add the SAE J1939 Manager to the CANbus using the **Add Device** function and configure it.

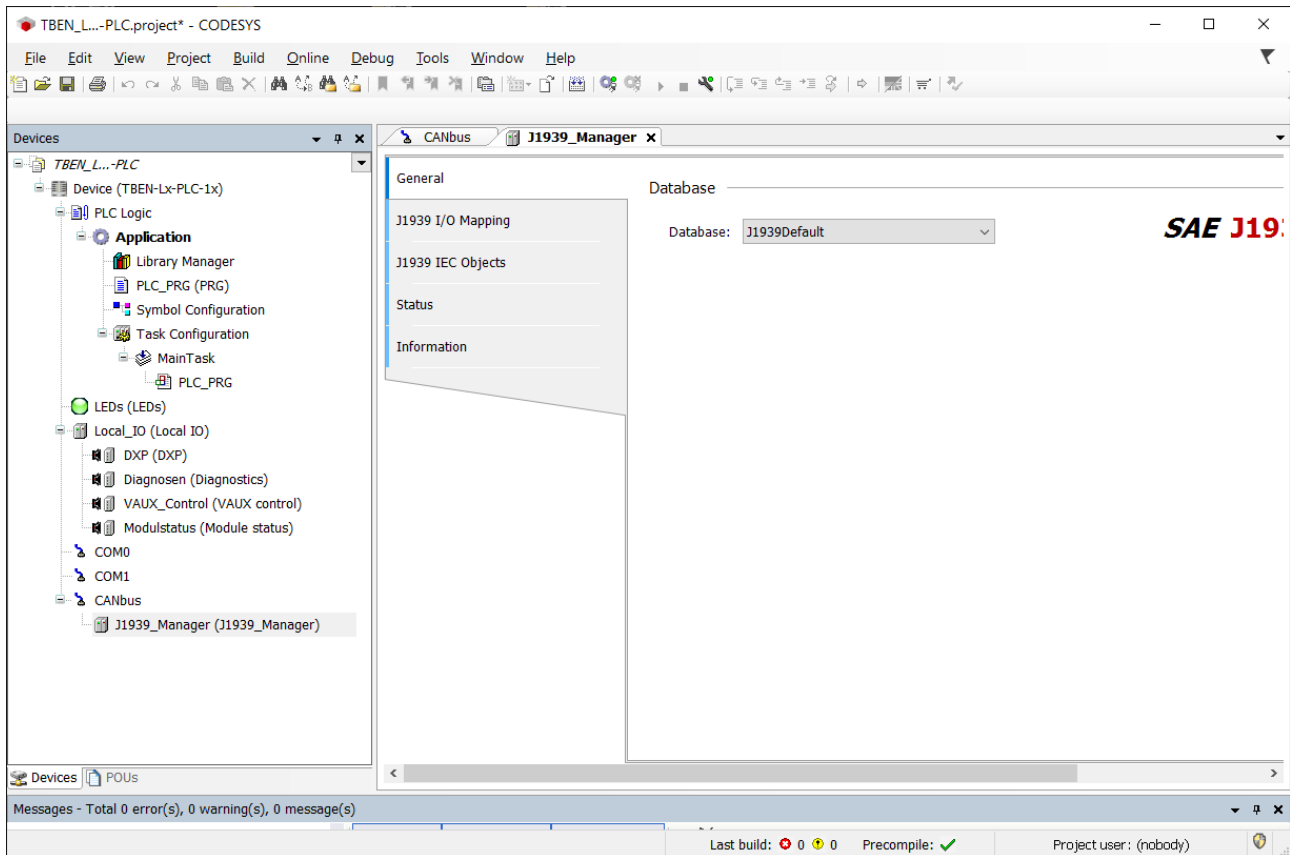


Fig. 74: Adding the SAE J1939 Manager

### Configuring an external SAE J1939-Device (ECU)

- ▶ Add **J1939\_ECU** from 3S - Smart Software Solutions GmbH to the J1939-Manager via the **Add Device** function and configure it according to the manufacturer's specifications of the connected J1939 device.

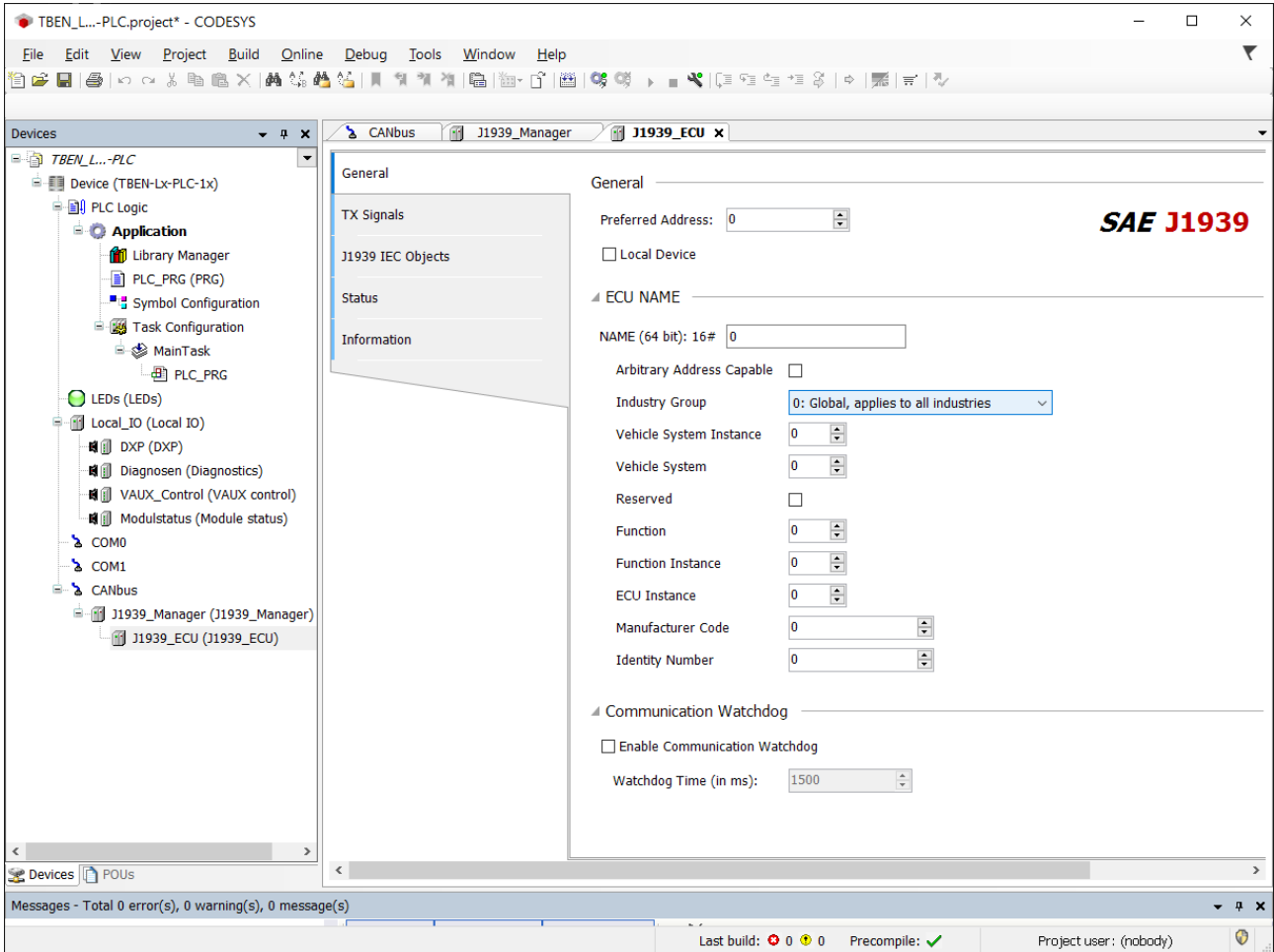


Fig. 75: Configuring the J1939\_ECU

### 7.3.18 Displaying task and processor information

#### Displaying the average cycle time

The average cycle time for the task with the highest priority should not be higher than 80 % of the cycle time set for this task.

In the following example the Profinet\_IOTask has the highest priority, the cycle time is set to 1 ms:

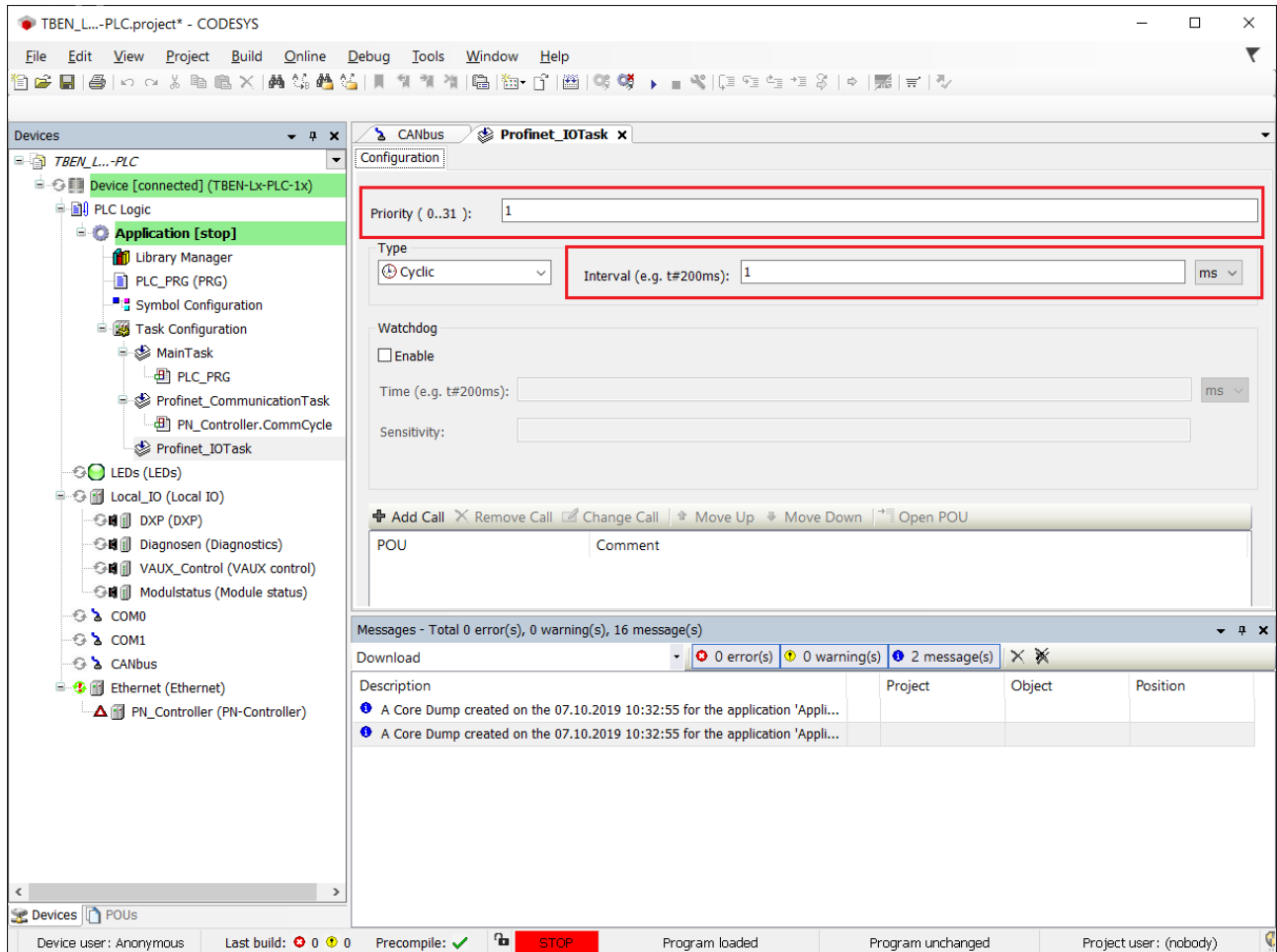


Fig. 76: Profinet\_IOTask, priority1, cycle time 1 ms

The maximum average cycle time recommended for the example is calculated as follows:  
 $1 \text{ ms} \times 80 \% = 800 \mu\text{s}$ .

An average cycle time of 800  $\mu\text{s}$  should not be exceeded for this example.

The Average Cycle Time is shown in the register tab **Monitor** of the Task Configuration.



The screenshot shows the CODESYS interface for monitoring task configuration. The 'Task Configuration' window is active, displaying a table with the following data:

Task	Status	IEC-Cycle Co...	Cycle Co...	Last Cycle Tim...	Average Cycle Ti...	Max. Cycle Tim...	Min.
MainTask	Valid	564	621	22	22	94	
Profinet_Communi...	Valid	5637	6211	169	74	1073	
Profinet_IOTask	Valid	56372	62114	73	47	3731	

The 'Average Cycle Ti...' value for 'Profinet\_IOTask' is 47, which is circled in red in the original image. The status of all tasks is 'Valid'.

Fig. 77: Monitoring the task configuration

In the example, the average cycle time is 47  $\mu$ s.

## Displaying processor information

Information about the processor load can be displayed in the PLC Shell of the TBEN-L...-PLC-... using the function **plcload**.

- ▶ Call the function **plcload** in the device's PLC Shell.

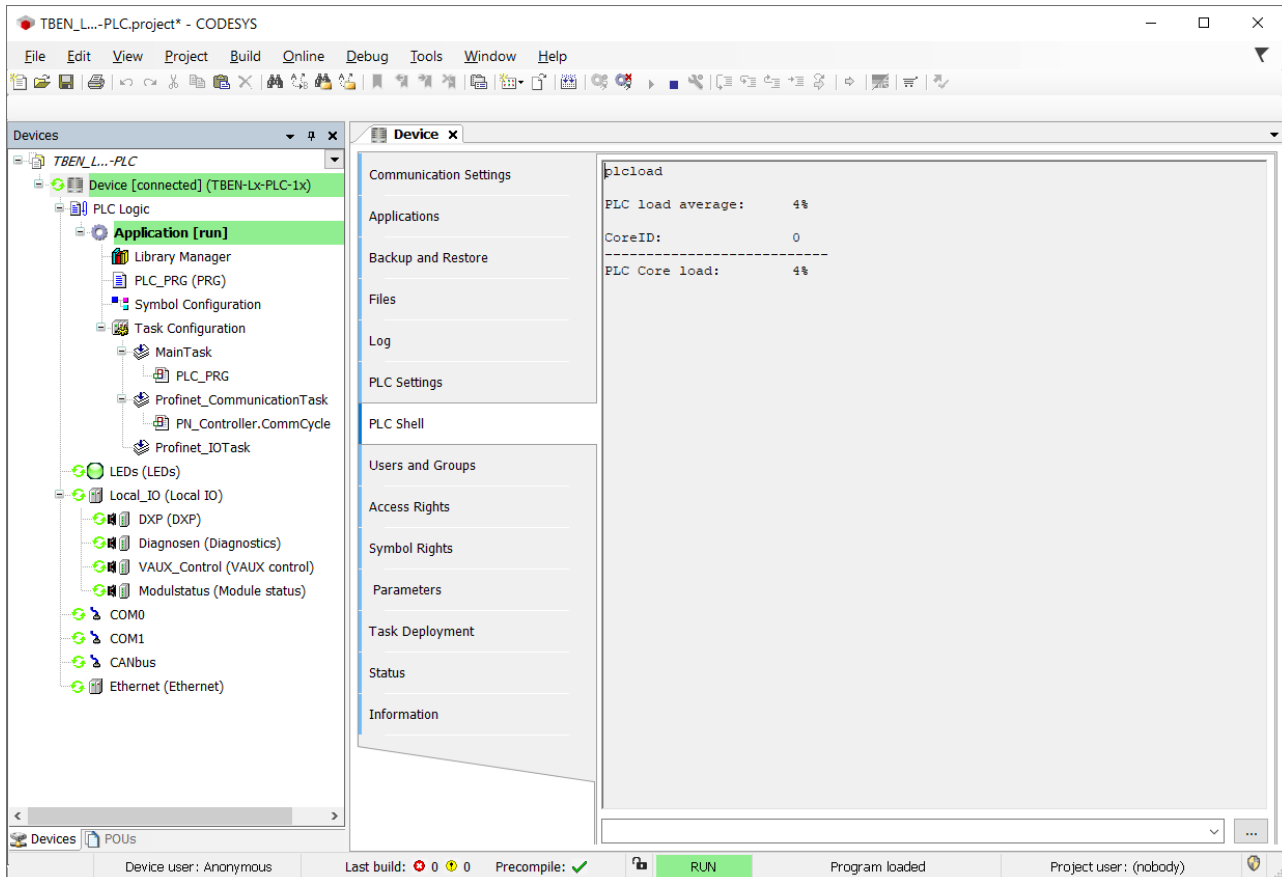


Fig. 78: Call the function **plcload**.

- ⇒ The PLC load for the TBEN-L...-PLC-... is displayed in %.

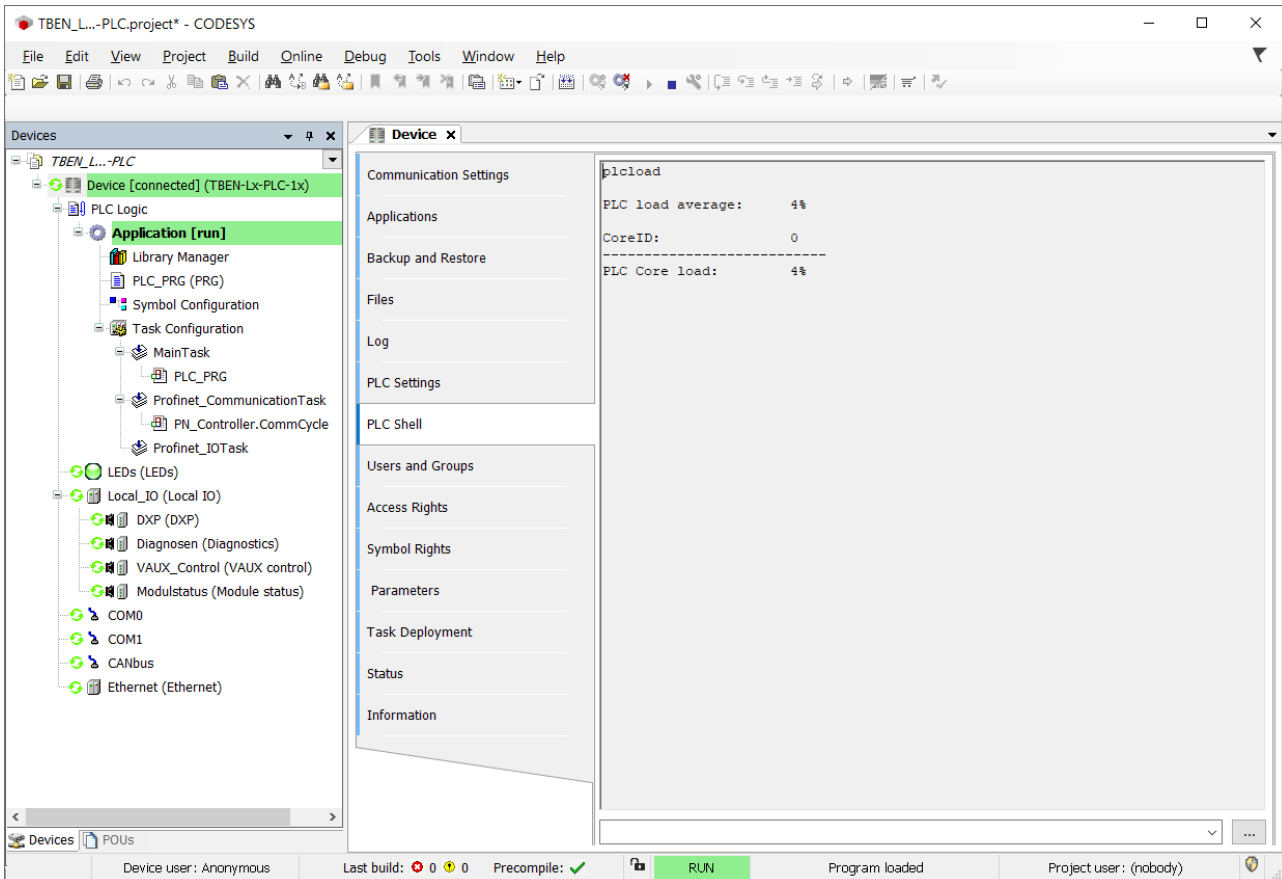


Fig. 79: Processor load in %

### CODESYS-exception "ProcessorLoadWatchdog"

In case of a PLC load of approximately 80 %, CODESYS generates the exception **ProcessorLoad-Watchdog**. The TBEN-L...-PLC-... remains in Stop.

Reasons for the processor overload of the TBEN-L...-PLC-... may be:

- Max. number of Devices/Slaves exceeded
- Max. number of process data exceeded
- Too low cycle times set for the number of connected devices .

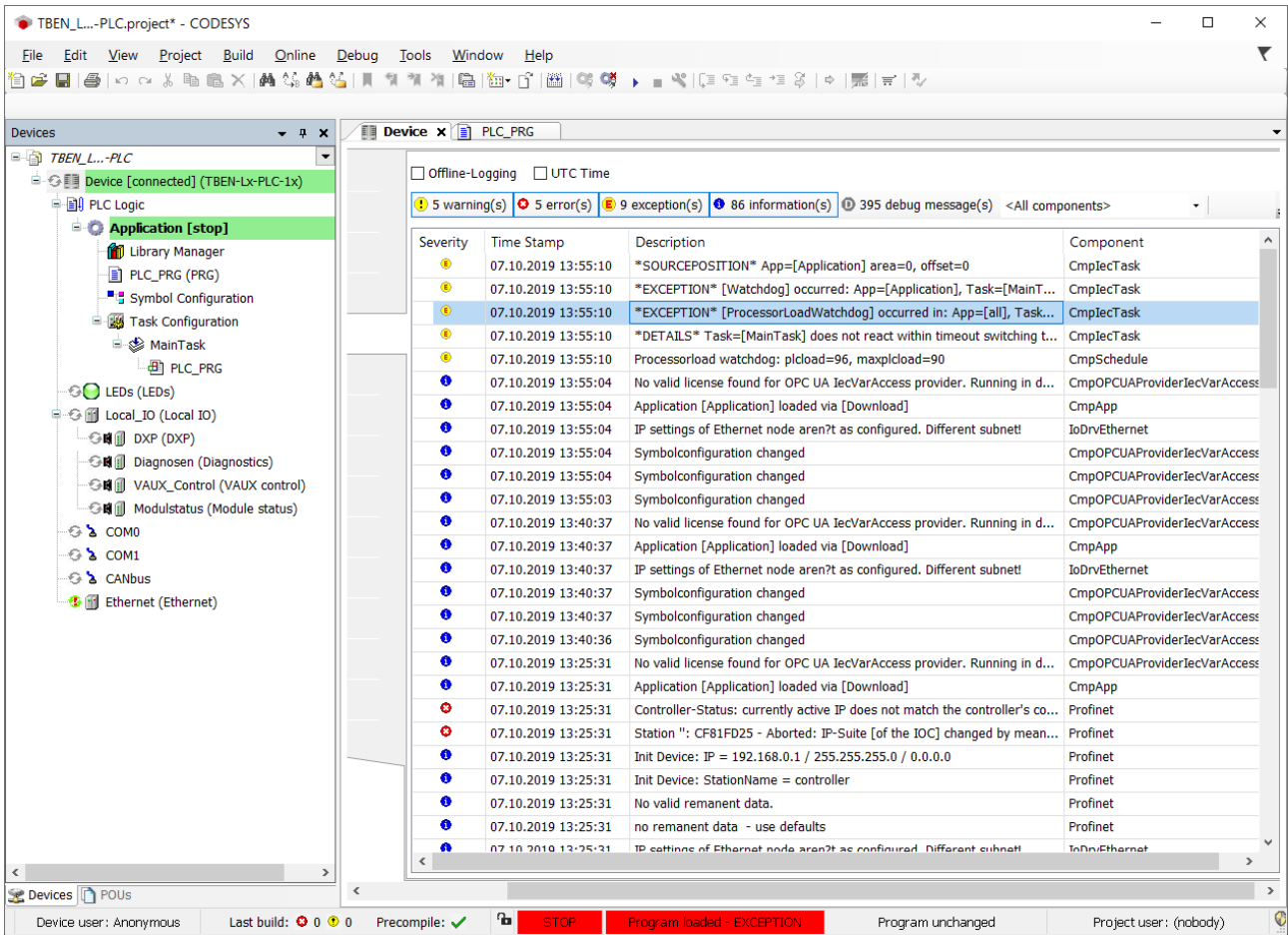


Fig. 80: Exception in CODESYS in case of processor overload

## 7.4 Commissioning TBEN-L...PLC-... as Cloud gateway

To transmit data to the Turck Cloud, the TBEN-L...PLC-... must be integrated into an Ethernet network with Internet access. Access can be via any Internet router. Port 443 (SSL) must be enabled in the Internet router for the connection with the Turck Cloud.

### Application example



**NOTE**

In Dual MAC mode, the connected networks are separated from each other by separating the Ethernet ports. For security reasons, Turck therefore recommends operating the TBEN-L...PLC-... in Dual MAC mode in cloud applications in order to separate the automation network from the Internet.

- TBEN-L...PLC-... (firmware version ≥ 1.4.6.0):  
DUAL MAC mode activated [▶ 26], the TBEN-L PLC is a member of 2 separate Ethernet networks
- IP addresses:
  - Ethernet port P1 (locale network):  
**192.168.1.100**, assigned via Turck Service Tool [▶ 28]
  - IP address for Ethernet port P2 (internet):  
**192.168.83.43**, assigned via DHCP server in the network

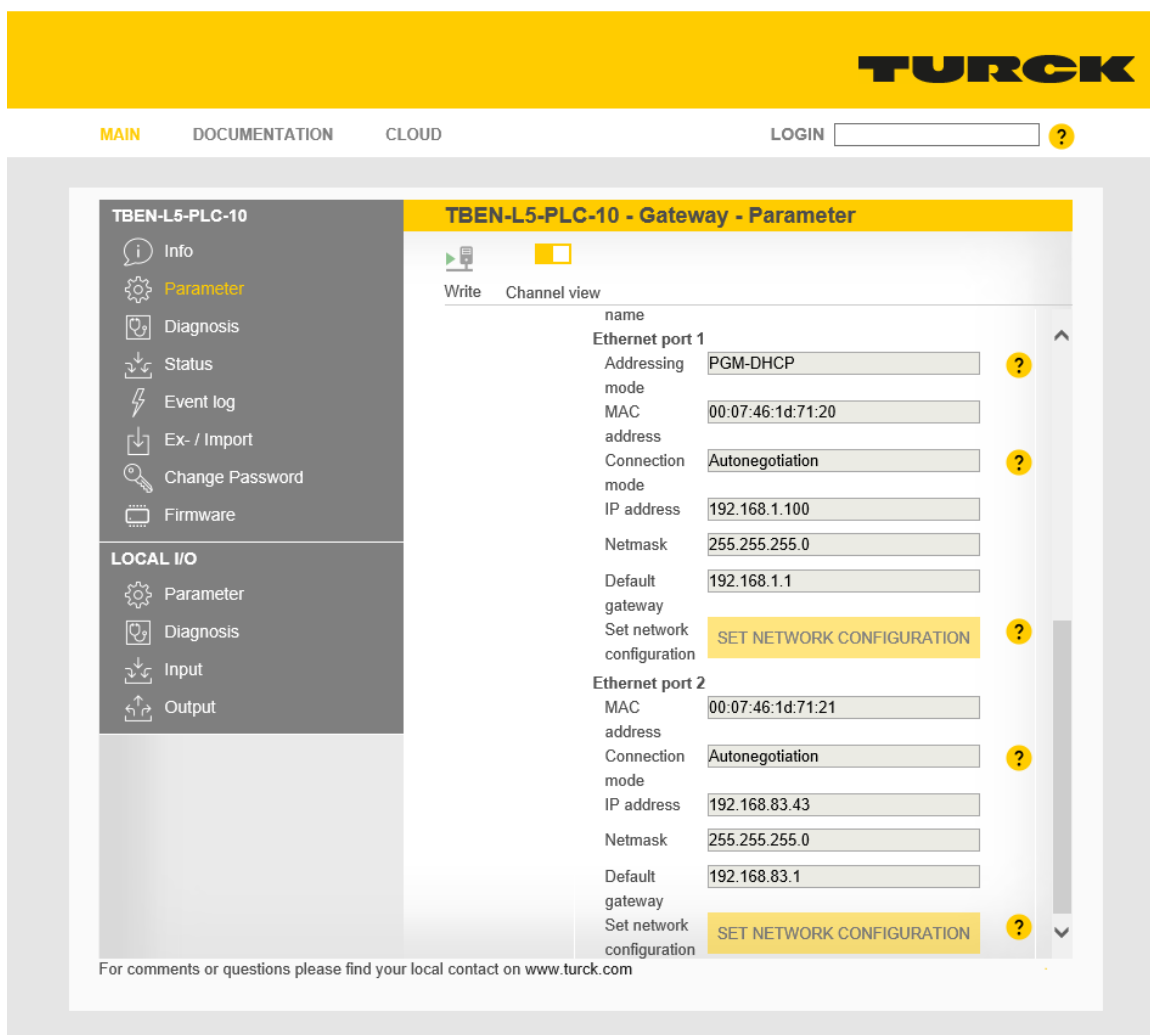


Fig. 81: Webserver – Ethernet port settings

## DNS server

A DNS server must be available for Internet access. The DNS server can be configured automatically via DHCP or manually.

Example DNS server: 8.8.8.8 (Google)

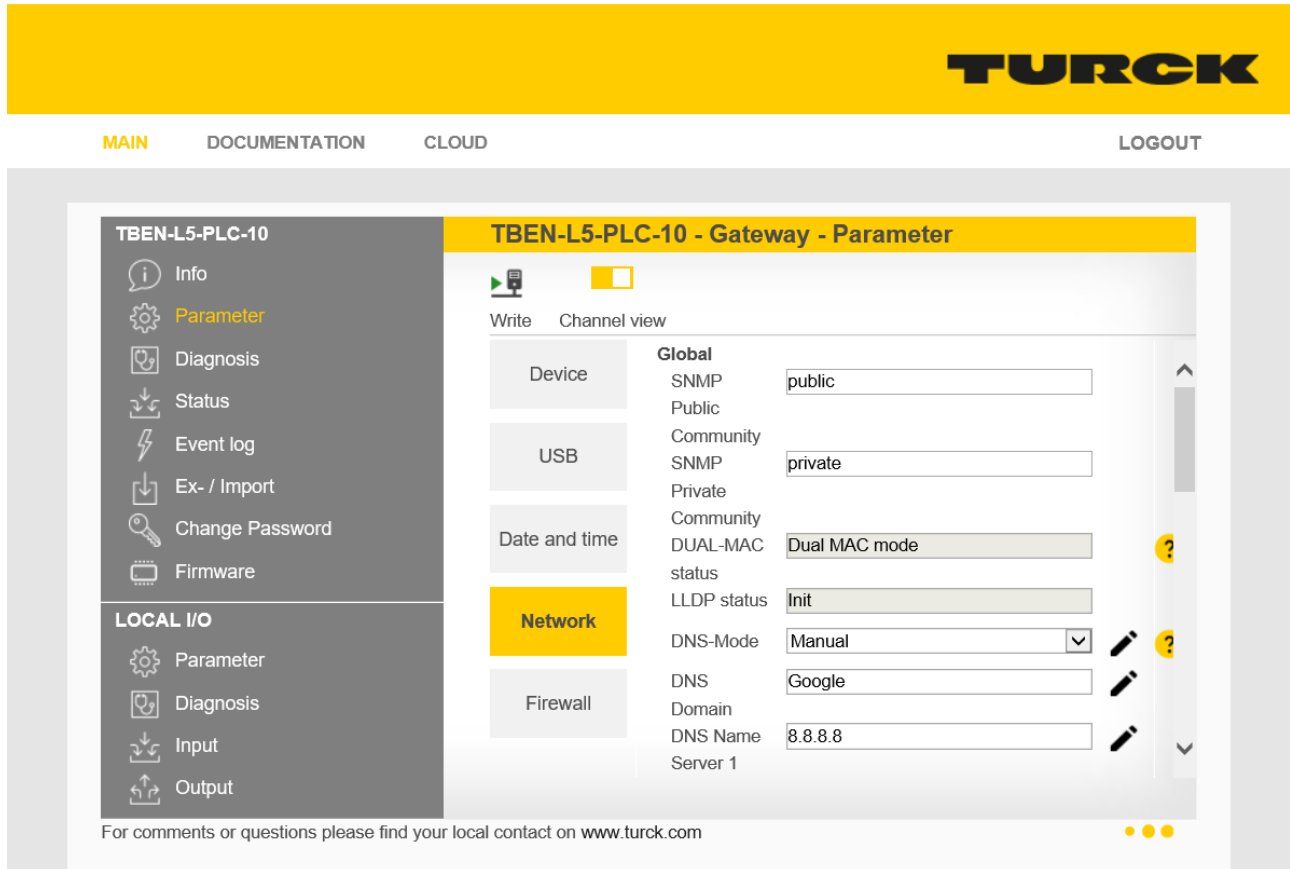


Fig. 82: Web server – Set up DNS server

### 7.4.1 Register or login user and project in the cloud

In order to use the TBEN-L...PLC-... as a cloud gateway in the Turck Cloud, a cloud user account with a cloud project must exist. In the customer project, the TBEN-L...PLC-... can then be activated as a cloud gateway.

- ▶ No user account available:  
Create a new user account in the Turck Cloud [www.turck.cloud](http://www.turck.cloud) by clicking Register.
- ▶ User account available: Request user data from the cloud administrator. Newly created users will receive a confirmation e-mail.
- ▶ Follow the link to the new user account in the e-mail and assign your own user password.

7.4.2 Creating a Cloud project

- ▶ Create a project via **MANAGE** → **PROJECTS** → **Create a project**.
- ▶ Assign a project name under **Project** and select a Service user.
- ▶ Confirm the entries via **Check input**.

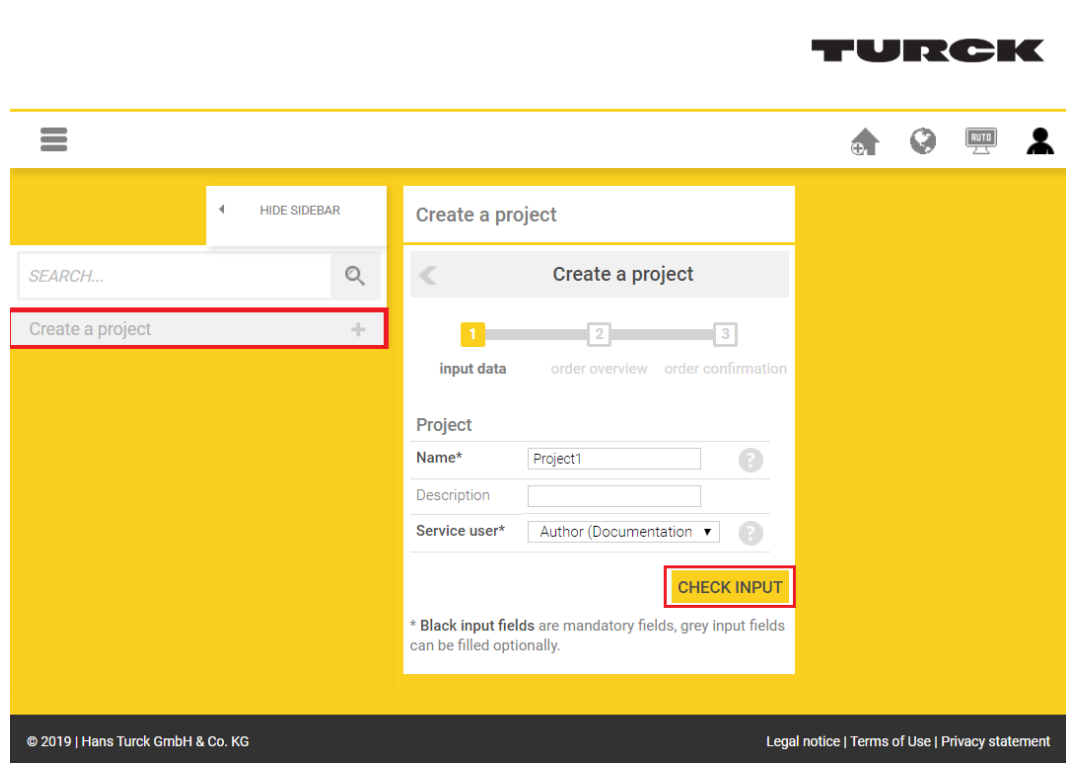


Fig. 83: Creating a Cloud project

In the 2nd step of the process, the costs resulting from creating a new project are displayed.

- ▶ Click the button **Order and activate with costs** to create a project.

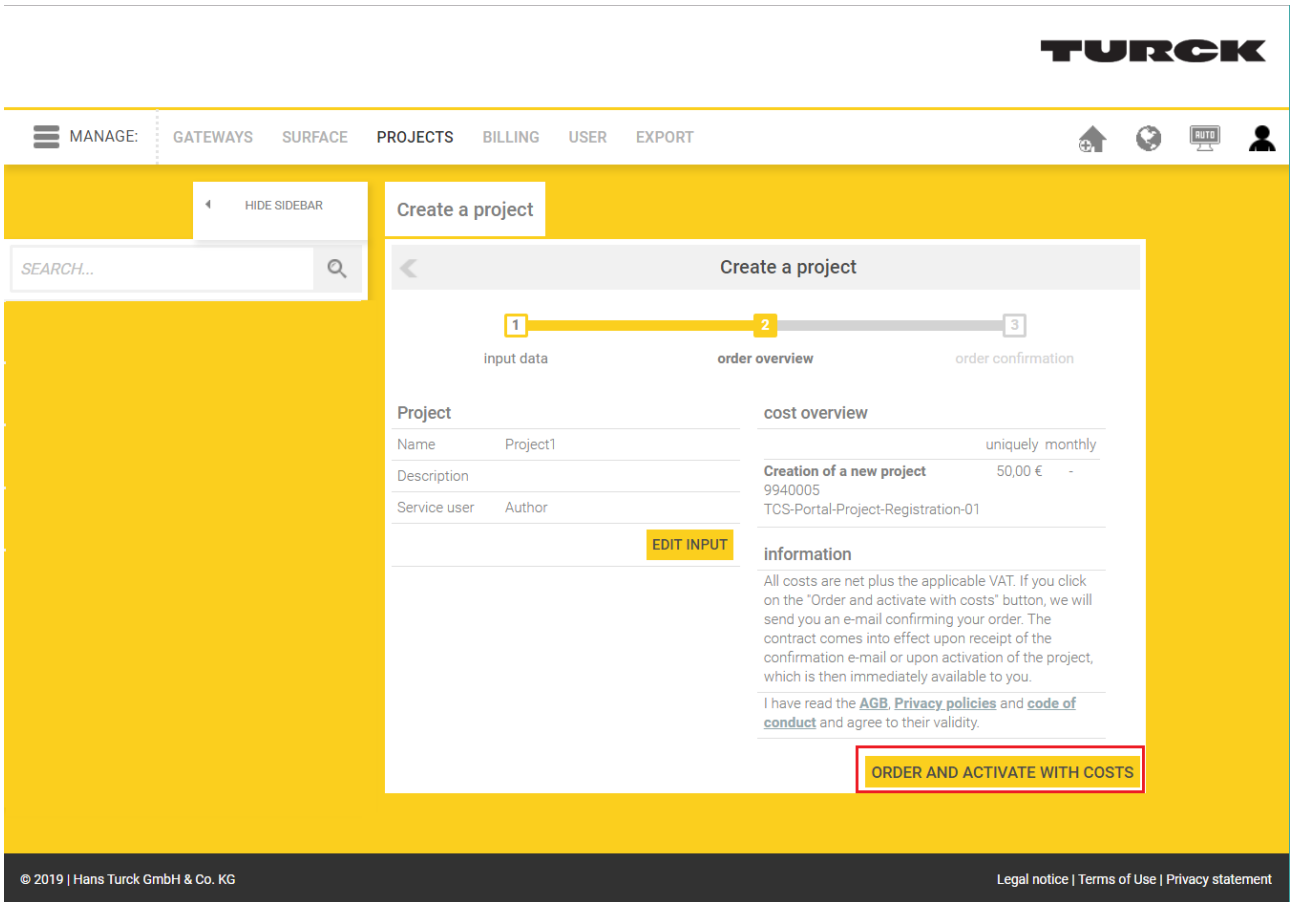


Fig. 84: Turck Cloud – order and activate project with costs

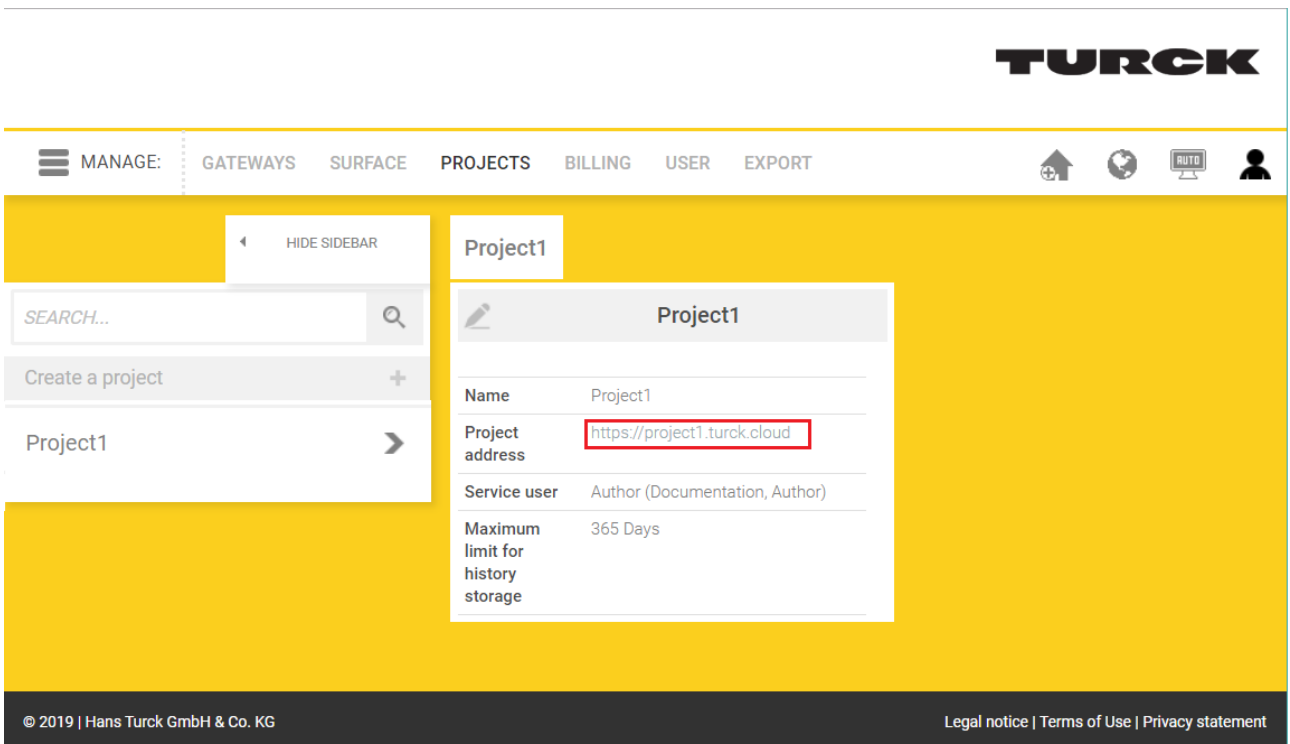


Fig. 85: Turck Cloud – project created, link to project URL



- ⇒ After the project has been created, the specified service user receives an e-mail as order and order confirmation. The e-mail also contains a link to the project URL.

### 7.4.3 Activate a device as Cloud gateway in Turck Cloud Portal

- ✓ Gateways can only be added to projects for which the user has appropriate rights. The Turck Cloud manual contains further information on user rights.
- ▶ Open the project URL and log in to the project.
- ▶ Add the gateway to the project via MANAGE → GATEWAYS → Activate gateway.

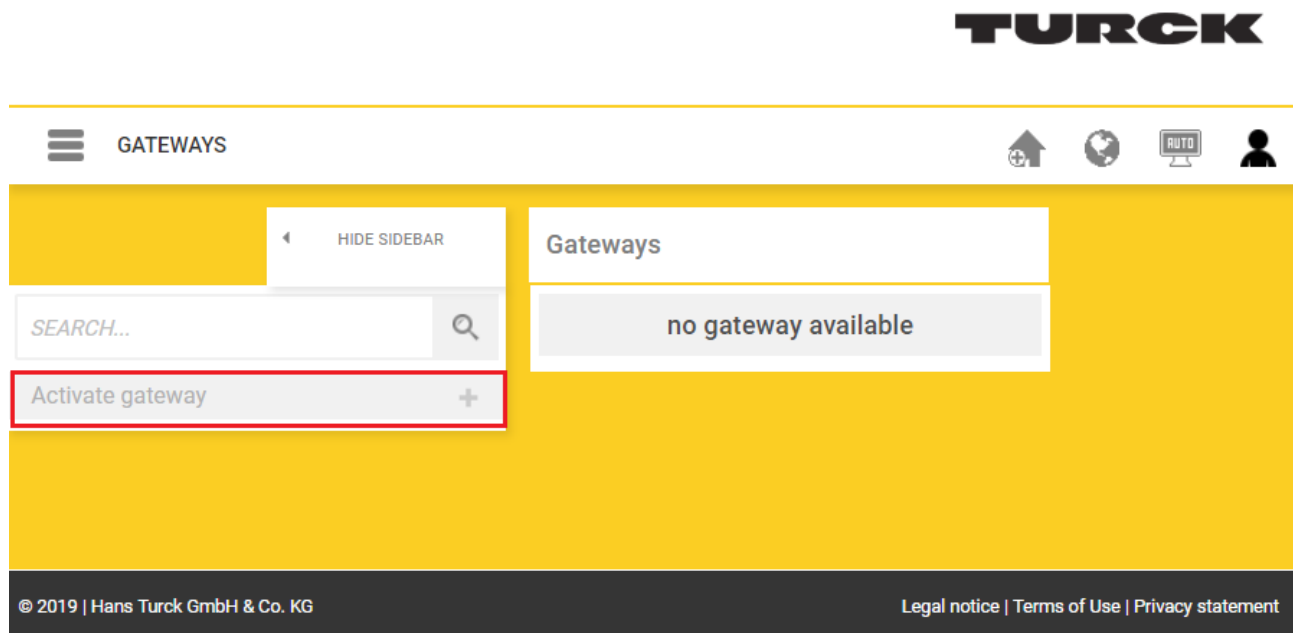


Fig. 86: Turck Cloud – activate gateway

- ▶ In the 1st step of **Activate gateway** select the TBEN-L...-PLC-... as gateway and enter the MAC address of the device.
- ▶ Assign a **Scope** (gateway name in cloud interface), a gateway user name under **User** and a password under **Password**.
- ▶ Confirm the entries via **Check input**.



**NOTE**

The gateway user name should be unique in the project. It is not associated with the user's user name.

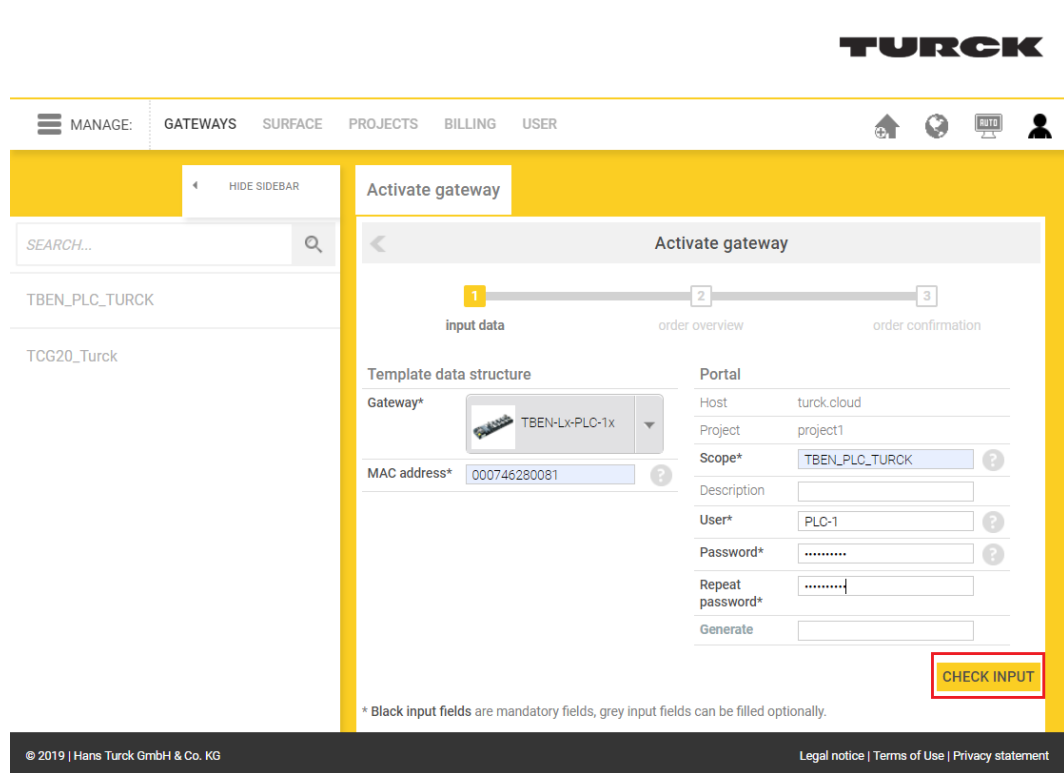


Fig. 87: Turck Cloud Portal – activate TBEN-L...-PLC-... as Cloud gateway (step 1)

In the 2nd step of the process **Activate gateway**, the costs resulting activate a new Gateways are displayed.

- ▶ Click the button **Order and activate with costs** to create a gateway.

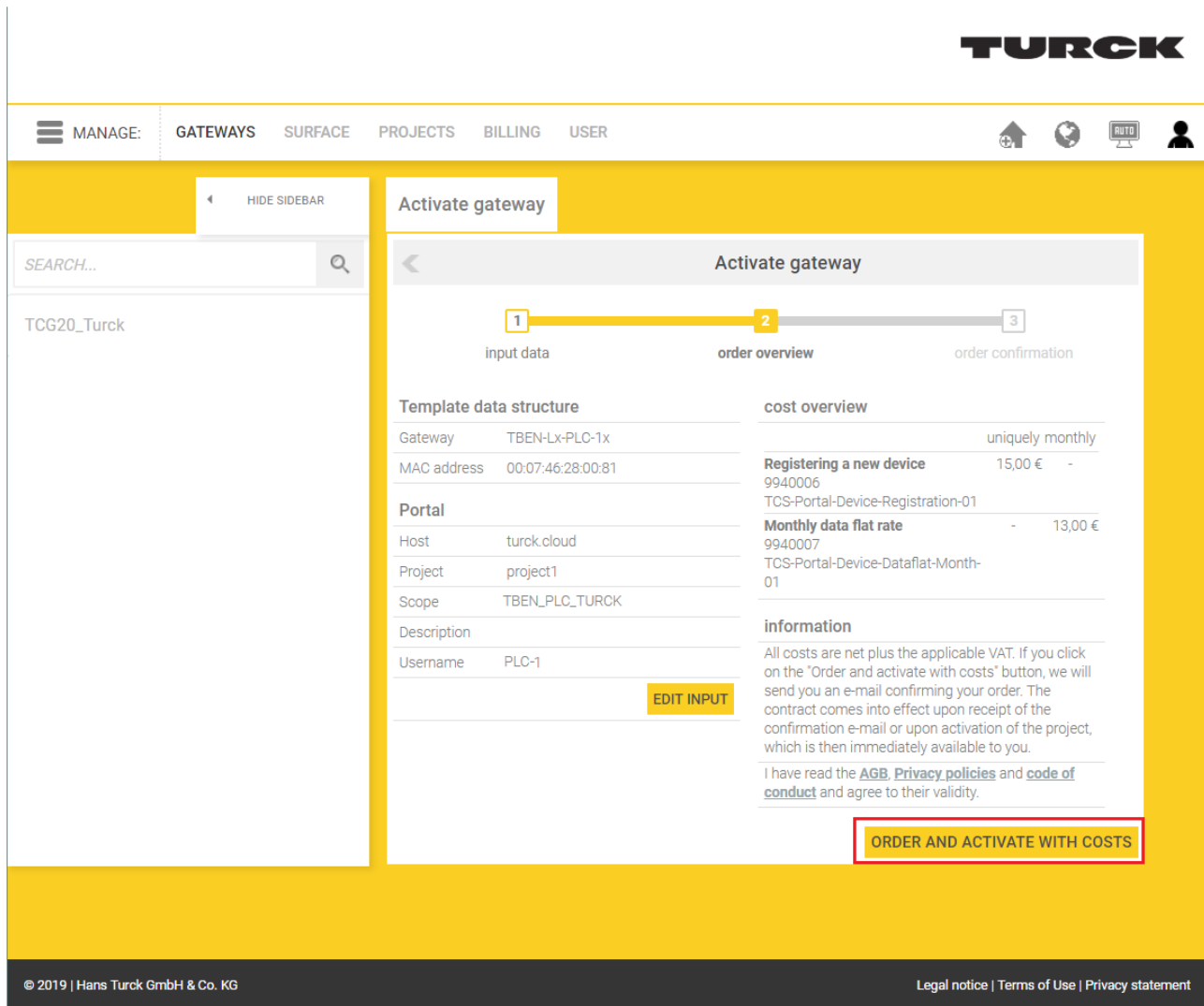


Fig. 88: Turck Cloud Portal – order and activate Gateway with costs

- ⇒ After the project has been created, the specified project responsible receives an e-mail as order and order confirmation. The e-mail also contains a link to the project URL.

### 7.4.4 Configuring the Cloud access in the web server

Enter Cloud access data (credentials)

In the web server, the access data for the Turck Cloud are entered under **CLOUD** → **Credentials**.

- ▶ Activate the portal access via **Turck Cloud Portal** → **Enable**
- ▶ Enter the Turck Cloud access data. The access data are displayed in the cloud under **Manage** → **Gateways** at the **TBEN-L...-PLC-...** entry.
- ▶ If necessary, configure a proxy server.
- ▶ Write the access data to the **TBEN-L...-PLC-...** via the **Write** button.

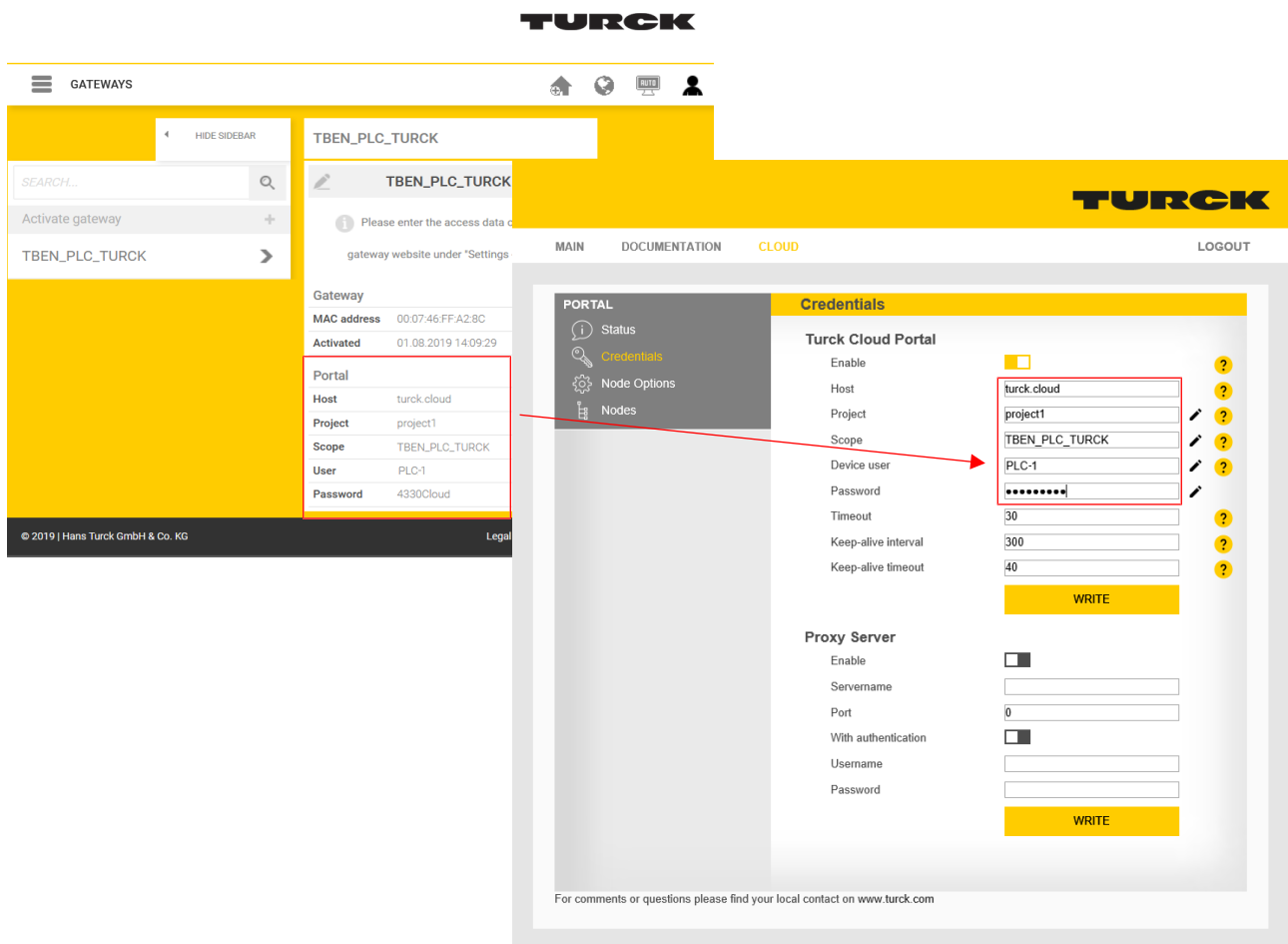


Fig. 89: Webserver – Transfer access data from the Turck Cloud

- ▶ Restart the device.
- ⇒ The cloud connection status (Status) shows that the TBEN-L...-PLC-... is connected to the cloud.

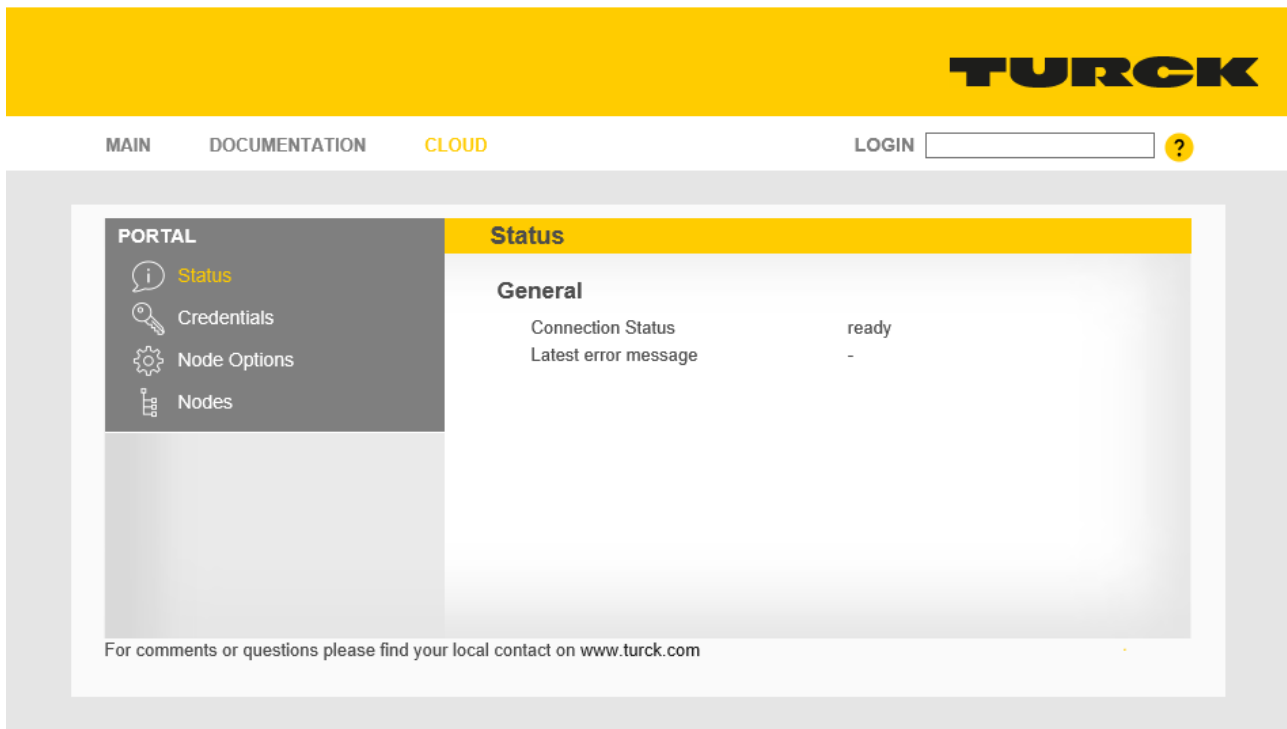


Fig. 90: Webserver – TBEN-L...-PLC-... – Cloud connection established (Status)

#### 7.4.5 Transfer process data from CODESYS to the cloud

The transfer of the process data of the TBEN-L...-PLC-... from a CODESYS project into the Turck Cloud takes place via a symbol configuration in the CODESYS project.

- ▶ Add a symbol configuration to the project CODESYS project via **Application** → **Add Object** → **Symbol Configuration**. The symbol configuration contains all variables used in the project.
- ▶ Mark variables to be displayed in the web server and in the cloud and in the Access Rights column define whether the variables should only be read, written or read and written in the cloud. The web server only allows read access under **CLOUD** → **Portal** → **Nodes** see "Clean Data Nodes (Nodes)" [▶ 114].

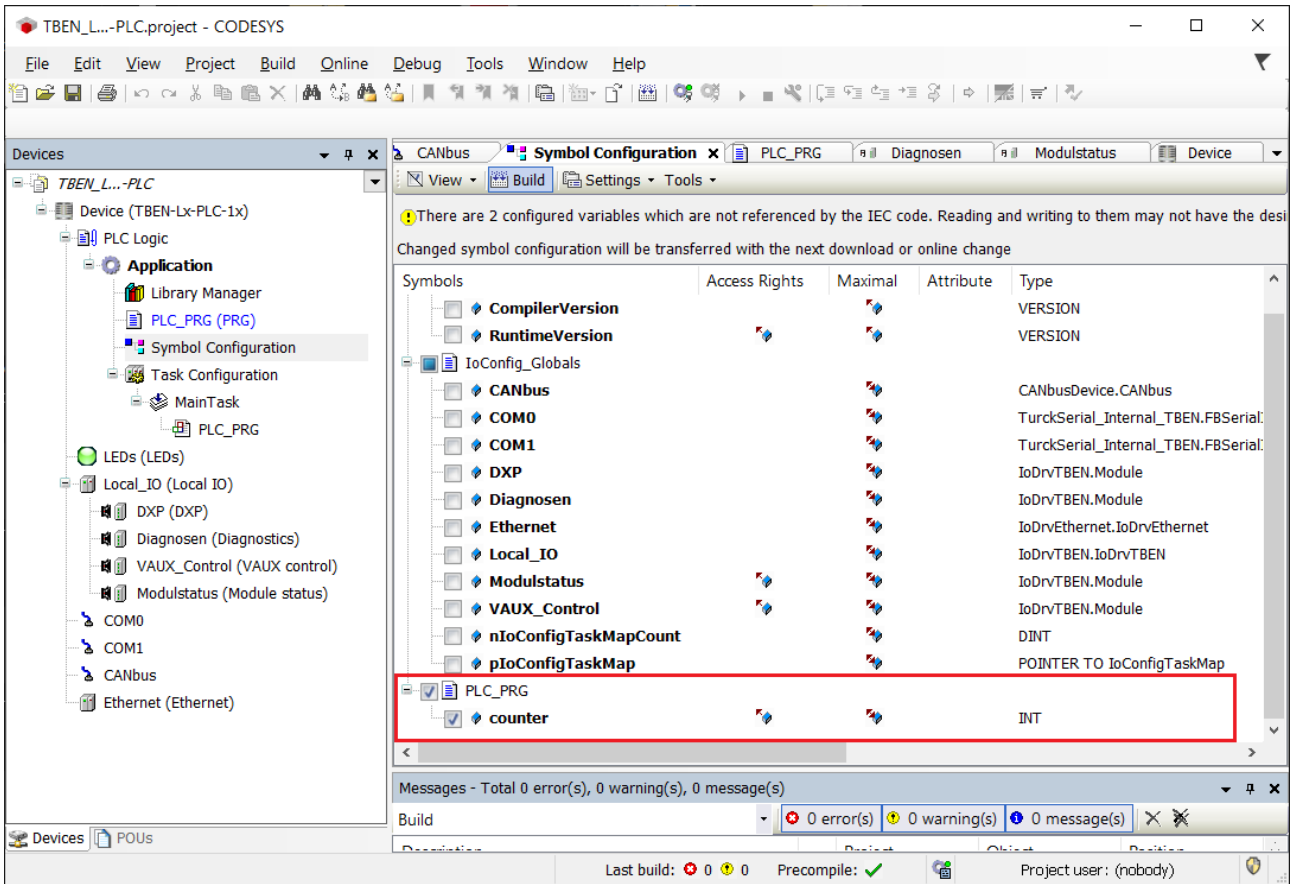


Fig. 91: Symbol configuration



**NOTE**

If access rights have been defined in CODESYS, then the respective access data have to be entered in the web server [▶ 114].

### 7.4.6 Setup firewall for Ethernet port P2

A firewall can be set up for the Ethernet port P2 in the area **Parameter** → **Firewall**.

- ▶ Activate the firewall for P2 via **Activate Firewall for Port 2**.
- ▶ Define **Fix Firewall rules** or define own firewall rules under **User firewall rules x**.
- ▶ Write the changes into the device via the **Write**.
- ▶ Apply firewall rules via the **Apply** button.

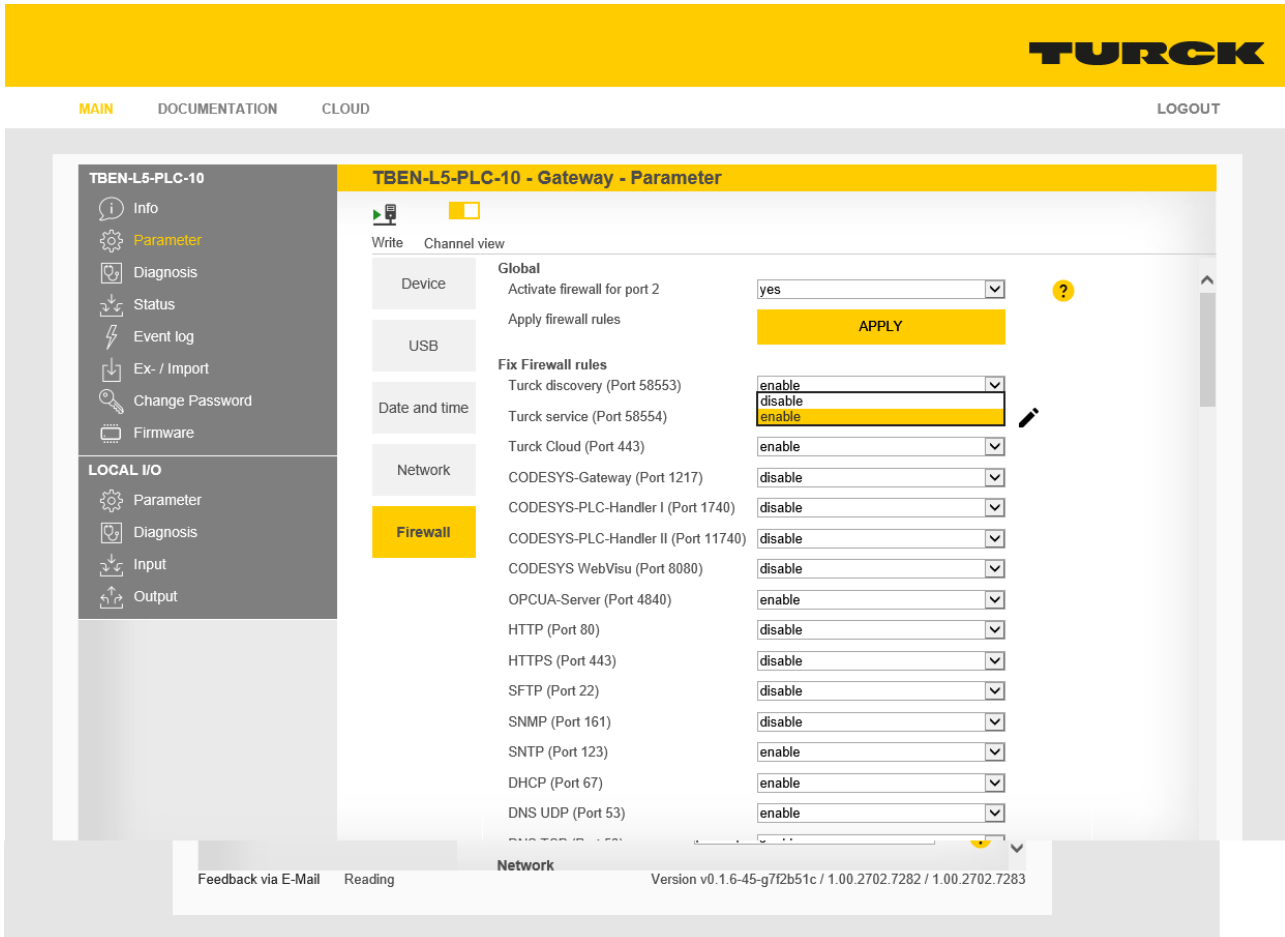


Fig. 92: Web server – setting up the firewall



#### NOTE

If the firewall on port 2 is activated and the TBEN-L...-PLC-... is to be connected to the Turck Cloud via port 2, the firewall rule Turck Cloud (port 443) must be deactivated.



## 8 Parameterizing and Configuring

### 8.1 Parameters

The general PLC parameters as well as the parameters of the local I/Os can be set via the device's web server. In addition, CODESYS and the DTM also offer the setting of many parameters. Parameters like the IP address of the device (in Dual MAC mode only for port P1) as well as functions like restart, network reset etc. can also be executed via the Turck Service Tool. The **Deactivate Voltage Diagnostics** parameter is a special CODESYS parameter and can only be set there. In addition, the parameters of the serial interfaces COM0 and COM1 and the parameters of the CAN interface can only be set via CODESYS.



#### NOTICE

Parameter settings in CODESYS overwrite parameter settings of other programs  
**Unwanted parameter settings**

- ▶ Parameter settings that can also be made in CODESYS can only be made in other programs for test purposes.

The following table contains an overview of the parameters and the setting options.

Parameter name	Settable via			
	Web server	Turck Service Tool	CODESYS	DTM
<b>General PLC parameter</b>				
Deactivate WEB server	x	-	x	x
Reboot	x	x	-	-
Legacy reset and reboot	x	-	-	-
Network reset and reboot	x	x	-	-
Factory reset and reboot	x	x	-	-
Deactivate voltage diagnostics	-	-	x	-
Activate USB Host support	x	-	x	x
Activate permanent mount support	x	-	-	x
Actual time (UTC)	x	-	-	-
Set time from host	x	-	-	-
Time zone	x	-	-	x
Time server – activate SNTP	x	-	-	x
Time server – NTP server address	x	-	-	x
SNMP Public Community	x	-	-	x
SNMP Private Community	x	-	-	x
DNS mode	x	-	-	x
IP Forwarding	x	-	-	x
Device name	x	-	-	x
Ethernet port 1/2 – connection mode	x	-	-	x
Ethernet port 1 – IP address	x	x	-	x
Ethernet port 1 – net mask	x	x	-	x

Parameter name	Settable via			
	Web server	Turck Service Tool	CODESYS	DTM
Ethernet port 1 – default gateway	x	x	-	x
Activate firewall for port2	x	-	-	x
Fix firewall rules	x	-	-	x
User firewall rules 1...16	x	-	-	x
<b>Parameters of the local I/Os</b>				
Activate output	x	-	x	x
Manual output reset after overcurrent	x	-	x	x
<b>VAUX Control</b>				
VAUX2 pin 1 Cx (chy - z)	x	-	x	x
<b>Interface parameters COM0/COM1</b>				
Data rate	-	-	x	-
Data bits	-	-	x	-
Stopp bits	-	-	x	-
Termination active	-	-	x	-
Biasing active	-	-	x	-
Voltage supply VAUX1	-	-	x	-
Swap A/B line	-	-	x	-
Operation mode	-	-	x	-
Parity	-	-	x	-
<b>Interface parameters CAN</b>				
Baud rate	-	-	x	-

### 8.1.1 General PLC parameters



#### NOTE

Parameter changes become only valid after a device restart.

The TBEN-L...-PLC-... provides the following device parameters: Default parameters are displayed in bold.

Parameter name	Value	Description
<b>Device</b>		
Deactivate WEB server	<b>No</b>	Activates the web server in the device.
	yes	Deactivated the web server in the device.
Reboot		The device is rebooted.
Legacy reset and reboot		The legacy reset resets the network and parameter settings of the device to factory defaults and restarts the device. A CODESYS program on the device is not affected by the legacy reset.

Parameter name	Value	Description
Network reset and reboot		The network reset resets the network settings of the device to factory defaults and restarts the device. Parameter settings and a CODESYS program on the device are not affected by the network reset.
Factory reset and reboot		The factory reset resets all settings of the device to factory defaults and restarts the device. A CODESYS program existing on the device is deleted.
Deactivate voltage diagnostics		CODESYS parameters: The load voltage diagnostics can be deactivated in CODESYS if the device is operated outside the specification. This is the case, for example, with 12 V DC applications in mobile work machines.
	No	Activates the voltage diagnostics for V1 and V2
	yes	Deactivates the voltage diagnostics for V1 and V2
<b>USB</b>		
Activate USB Host support	yes	Activates the USB Host port support for the device. The USB Host port functions can be executed.
	No	Deactivates the USB Host port support for the device. The USB Host port functions can not be executed.
Activate permanent mount support	No	Write and read access to the USB storage device is disabled.
	yes	Enables direct write and read access to the inserted USB storage device.
<b>Date and time</b>		
Actual time (UTC)		
Set time from host		Date and time are taken from the PC.
Time zone		Sets the time zone in which the unit is used.
Time server – activate SNTP	No	Time synchronization via an NTP time server is deactivated.
	yes	Time synchronization via an NTP time server is activated.
Time server – NTP server address		Address of the NTP time server.
<b>Network</b>		
SNMP Public Community		
SNMP Private Community		
DNS mode	Automatic	The DNS domain and IP addresses of the DNS name servers are determined automatically.
	manual	The DNS domain and IP addresses of the DNS name servers have to be entered manually.

Parameter name	Value	Description
IP Forwarding	<b>deactivate</b>	The forwarding of IP packets between the two Ethernet networks (on port 1 and port 2) is not possible.
	activate	The forwarding of IP packets between the two Ethernet networks (on port 1 and port 2) is activated.
Device name		Device name to be assigned to the PROFINET device.
Ethernet port 1/2		
Connection mode	<b>Auto negotiation</b>	Sets the Ethernet port to Auto-negotiation or to a fixed value for transmission rate and transmission mode.
	10 Mbps, half duplex	
	10 Mbps, full duplex	
	100 Mbps, half duplex	
	100 Mbps, full duplex	
IP address	Default setting: Port1: 192.168.1.254 Port 2: 192.168.2.254	Network settings for the relevant Ethernet port on the device. If the device is operated in switch mode, only the setting for port 1 can be made here. In Dual MAC mode, the Ethernet ports are set independently of each other.
	Net mask	Default setting: 255.255.255.0
Default gateway	Default setting: Port1: 192.168.1.1 Port 2: 192.168.2.1	
	Firewall (can only be set via web server)	
Activate firewall for port2	<b>No</b>	No firewall activated for port 2
	yes	Activates the firewall for Ethernet port P2 in the Dual MAC mode.
Fix firewall rules		The firewall rules for port 2 can be customized to meet application requirements.
User firewall rules 1...16		To apply the firewall rules, you must first activate the firewall itself using the <b>Firewall for Port 2</b> parameter. If the firewall is activated, proceed as follows: <ul style="list-style-type: none"> <li>▶ Define fixed or user firewall rules.</li> <li>▶ Write firewall rules to the device using the <b>Write</b> button.</li> <li>▶ Apply firewall rules via the <b>Apply</b> button.</li> </ul>

### 8.1.2 Parameters of the local DXP channels (Local I/O)

Default values are shown in **bold**.

Parameter name	Value	Description
Activate output	No	The output is deactivated.
	<b>yes</b>	The output is activated.
Manual output reset after overcurrent	<b>No</b>	The output switches on automatically after an overload.
	yes	The output is manually switched-off and on again.

### 8.1.3 Parameter VAUX Control

Parameter VAUX Control (for sensor/actuator supply)

Default values are shown in **bold**.

Parameter name	Value	Description
VAUX2 Pin 1 Cx (Chy - z)	<b>24 VDC</b>	The 24 VDC sensor/actuator supply at Pin1 of the connector is switched on.
	switchable	The 24 VDC sensor/actuator supply at pin1 of the respective connector is switchable via the process data.
	off	The 24 VDC sensor/actuator supply at Pin1 of the connector is switched off.

### 8.1.4 Interface parameters – COM0/COM1

The parameters can only be set in CODESYS.

Default values are shown in **bold**.

Parameter name	Value	Description
Data rate	<b>9600 bps</b>	Data rate of the serial interface
	19.2 kbps	
	38.4 kbps	
	57.6 kbps	
	115.2 kbps	
	230.4 kbps	
Data bits	7 bit	Defines the number of data bits per telegram
	<b>8 bit</b>	
Stopp bits	<b>1 bit</b>	Defines the number of stop bits
	2 bit	
Termination active	<b>No</b>	No line termination active
	yes	Line termination activated (only valid for operation mode RS485)
Biasing active	<b>No</b>	Deactivates the biasing resistor
	yes	Activates the biasing resistor
Voltage supply VAUX1	<b>off</b>	VAUX1 is switched off
	V1 (24 VDC)	VAUX1 from V1 (24 VDC) is switched on

Parameter name	Value	Description
Swap A/B line	No	
	yes	The polarity of the A and B lines of the serial interface is reversed (only applies to the RS485 operating mode).
Operation mode	RS232	The interface is operated as RS232 interface.
	RS485	The interface is operated as RS485 interface.
Parity	none	No parity
	odd	Odd parity (1 bit error detection)
	even	Even (1 bit error detection)

### 8.1.5 Interface parameters – CAN

The parameter can only be set in CODESYS.

Parameter name	Value	Description
Baudrate (kBit/s)	10	Defines the baudrate for the connected CAN network.
	20	
	50	
	100	
	125	
	500	
	800	
	1000	

### 8.1.6 Parameterizing and configuring the device via the web server



**NOTE**

The web server always displays all setting options. All values are displayed as decimal numbers.

The devices can be set and commands can be sent to the devices via the integrated web server. To be able to open the web server with a PC, the device and the PC must be in the same IP network.

#### Opening the web server

The web server can be opened via a web browser or via the Turck Service Tool. The procedure for accessing the web server via the Turck Service Tool is described in the section "Setting the IP address".

The Home screen displays status information and network settings.

#### Edit settings on the web server

A login is required to edit settings via the web server. The default password is "password".



**NOTE**

For security reasons, Turck recommends changing the password after the first login.

- ▶ Enter the password in the login field on the start page of the web server.
- ▶ Click **Login**.

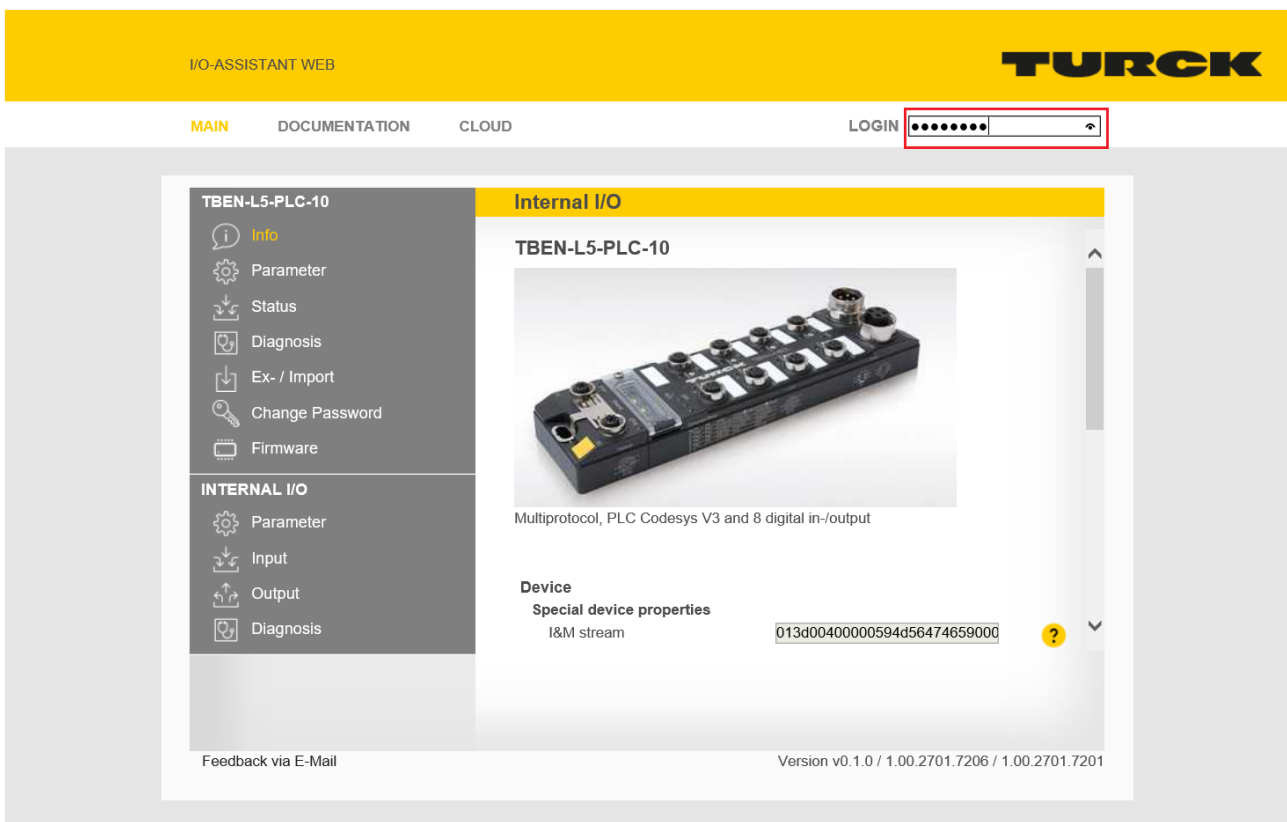


Fig. 93: Web server – Login

After login, write access to input and output data, network status, diagnostics, parameter data, etc. is possible.

Example: Deactivate output

In the following example, the DO8 output on connector C4 is deactivated via the **Activate output** parameter.

- ▶ Click on **Internal I/O** in the navigation bar on the left side of the screen.
- ▶ Select **Parameters**

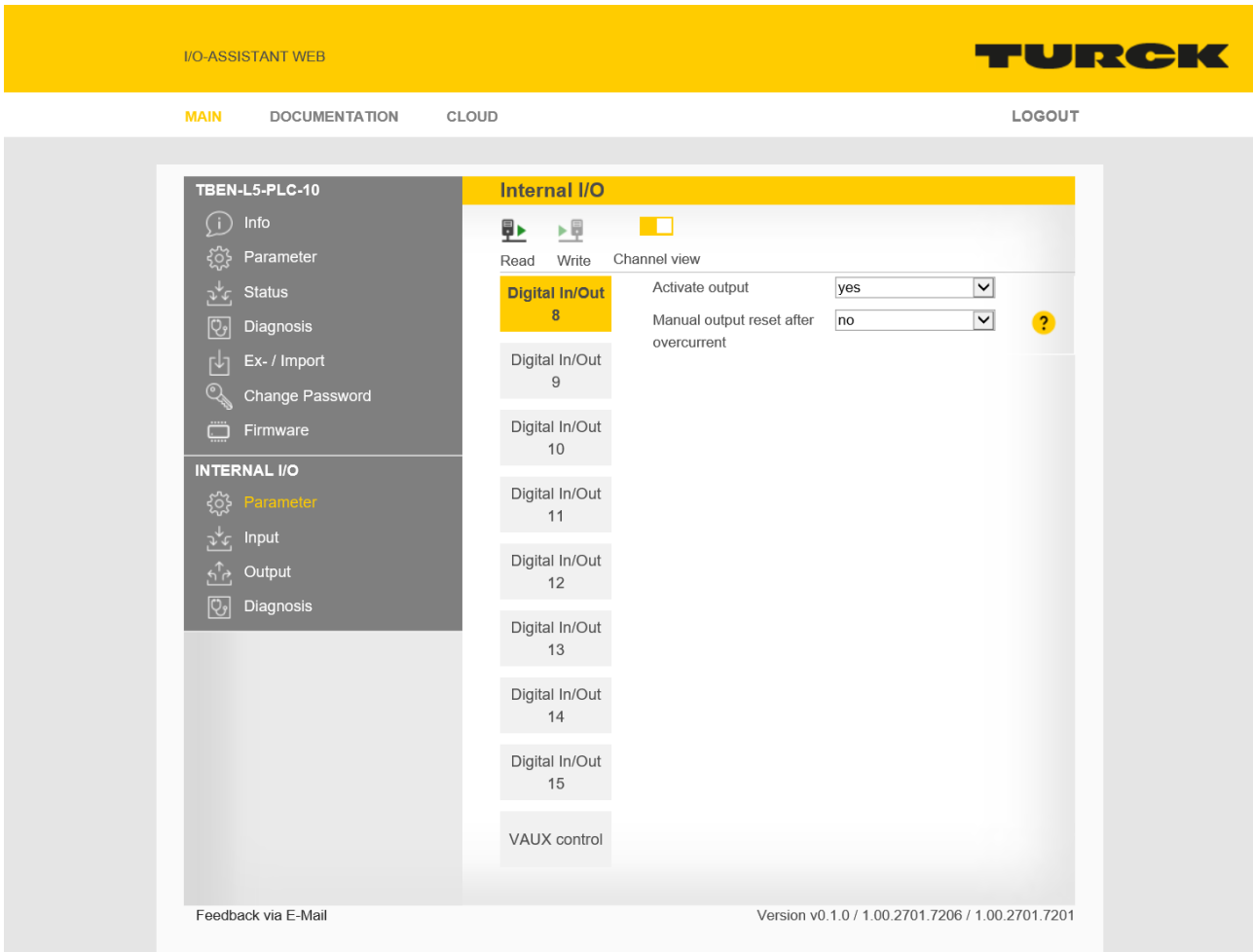


Fig. 94: Web server – Parameters



- ▶ Set parameter **Activate output** to **No**.
- ▶ Write the settings to the device: Click **Write**.

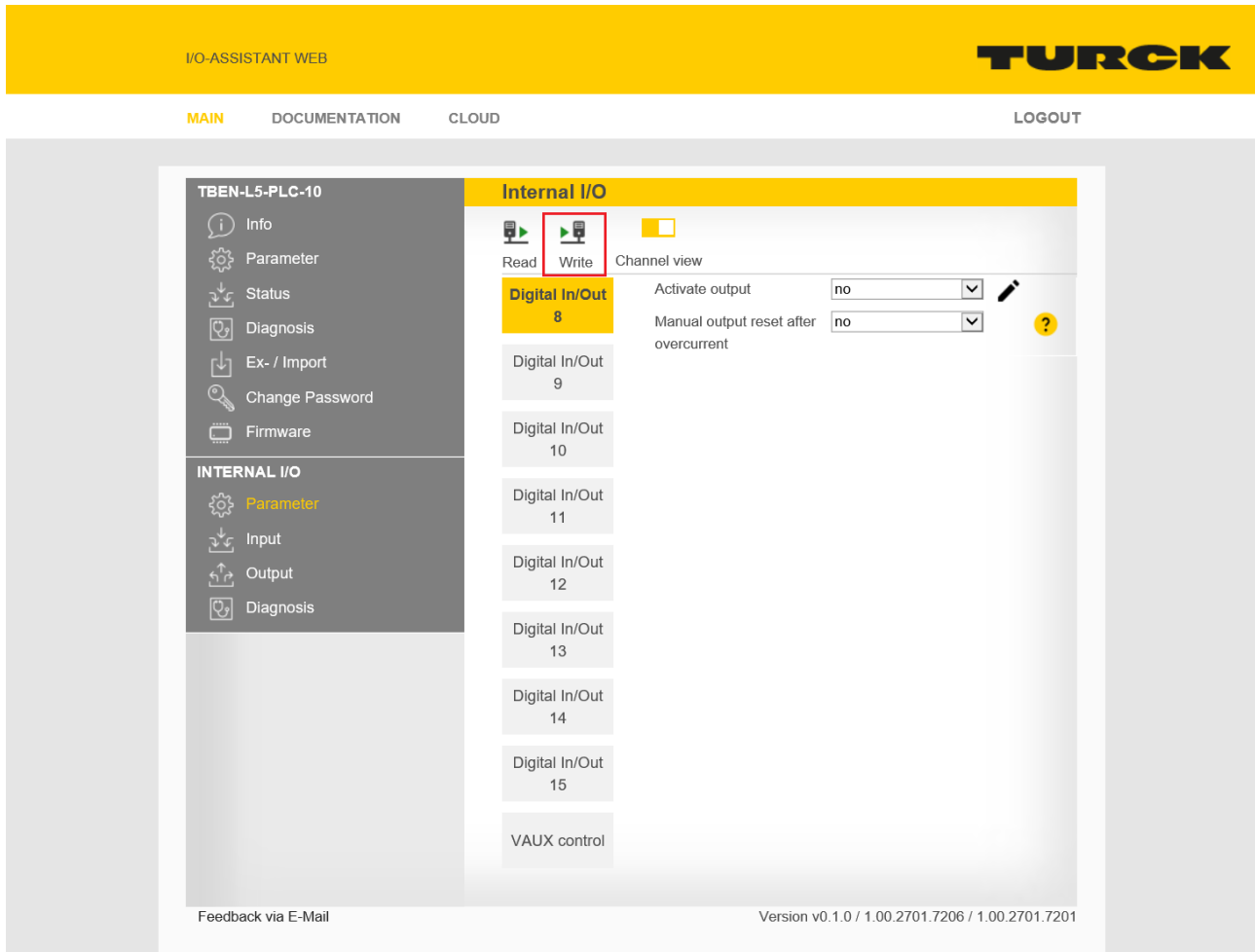


Fig. 95: Webserver – deactivate output

### Export and import of parameter settings

The settings of the station and I/O channel parameters can be exported via the web server and saved for reuse. The parameterization of a device can, for example, be imported into a new device of identical type for the purpose of duplication or in the event of module replacement.

#### Export

- ▶ Enter a file name under **MAIN** → **Ex-/Import**.
- ▶ Click **EXPORT**, select a storage location for the parameter file and save it.

#### Import

- ▶ Select the parameter file (\*.json) under **MAIN** → **Ex-/Import** → **SELECT FILE**.
- ▶ Define which parameters (station parameters and/or I/O parameters) have to be imported.
- ▶ Click **IMPORT** and import the parameter file.

## 8.2 Configuring the real-time clock (RTC)

The real-time clock can be set using by the Turck Service Tool, the device's web server or via CODESYS.

### Properties of the RTC:

Buffering	Via Gold CAP
Charging time for 95 % charging	min. 10 minutes
Buffer time at ambient temperature	
23 °C	4 weeks
Up to 60 °C	168 hours
Up to 70 °C	36 hours

### 8.2.1 Setting the RTC with Turck Service Tool

The turck Service Tool sets the RTC depending on the system time of the PC. based on the Co-ordinated Universal Time UTC.

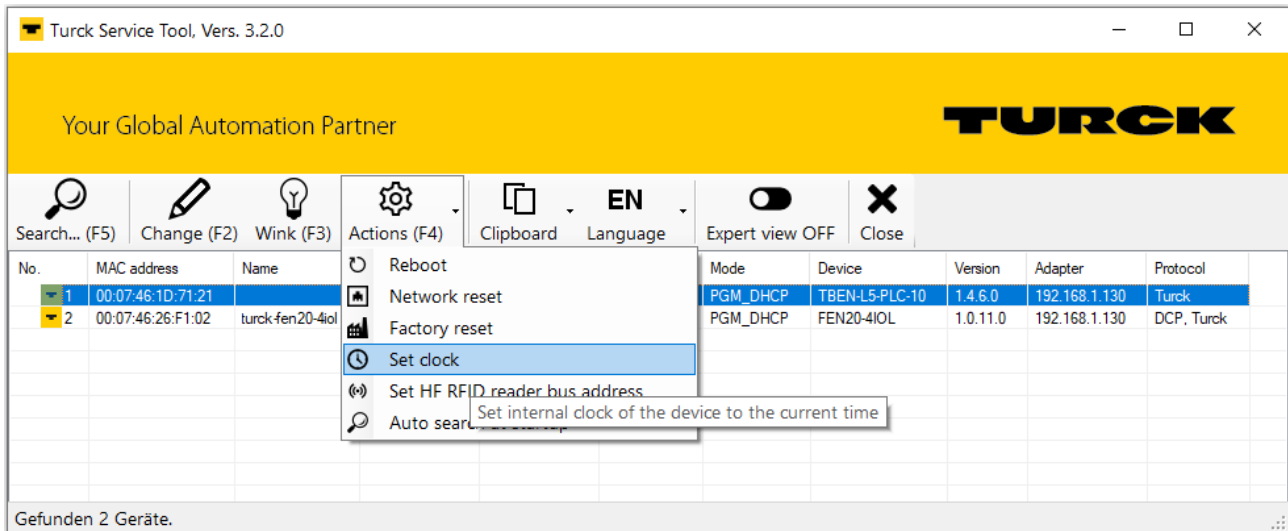


Fig. 96: Setting the RTC with Turck Service Tool

8.2.2 Setting the RTC via the web server

The real-time clock can be set either in the web server or by activating an NTP server via SNTP.

Setting the RTC via the web server

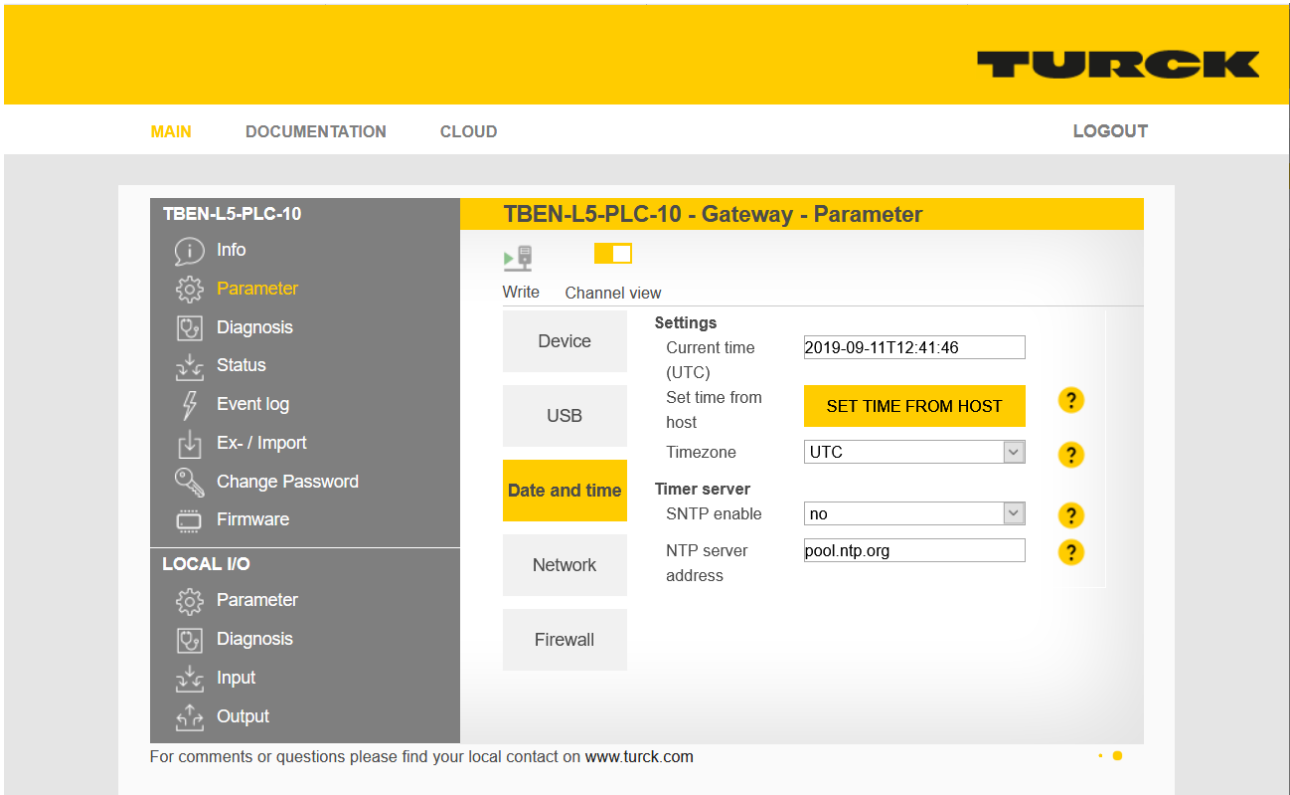


Fig. 97: Setting the RTC via the web server

## Setting the RTC via SNTP

### Prerequisites:

- The device has to be placed in a network with access to the SNTP server.



### NOTE

If the real-time clock is set via SNTP and the device has a connection to the SNTP server, changes of the real-time clock via the Turck Service Tool or the CODESYS library have no effect.

- ▶ Activate the SNTP server via **SNTP enable = yes** and enter the server address under NTP server.
- ▶ Restart the device.
- ⇒ The device receives Time and date from the defined SNTP server.

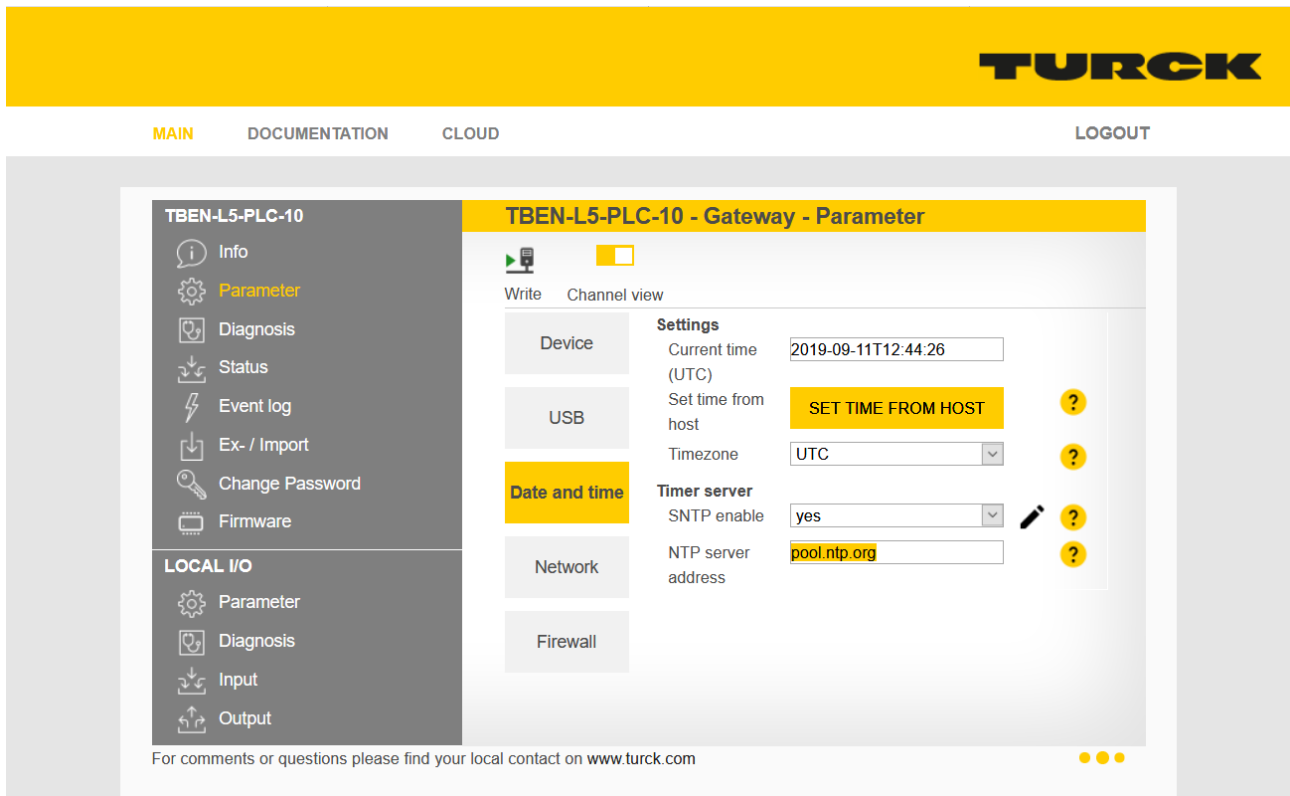


Fig. 98: Activate the SNTP server

### 8.2.3 Setting the RTC via CODESYS

In CODESYS the RTC is set in the device for example using the CODESYS library „CAA Real time Clock Extern“.

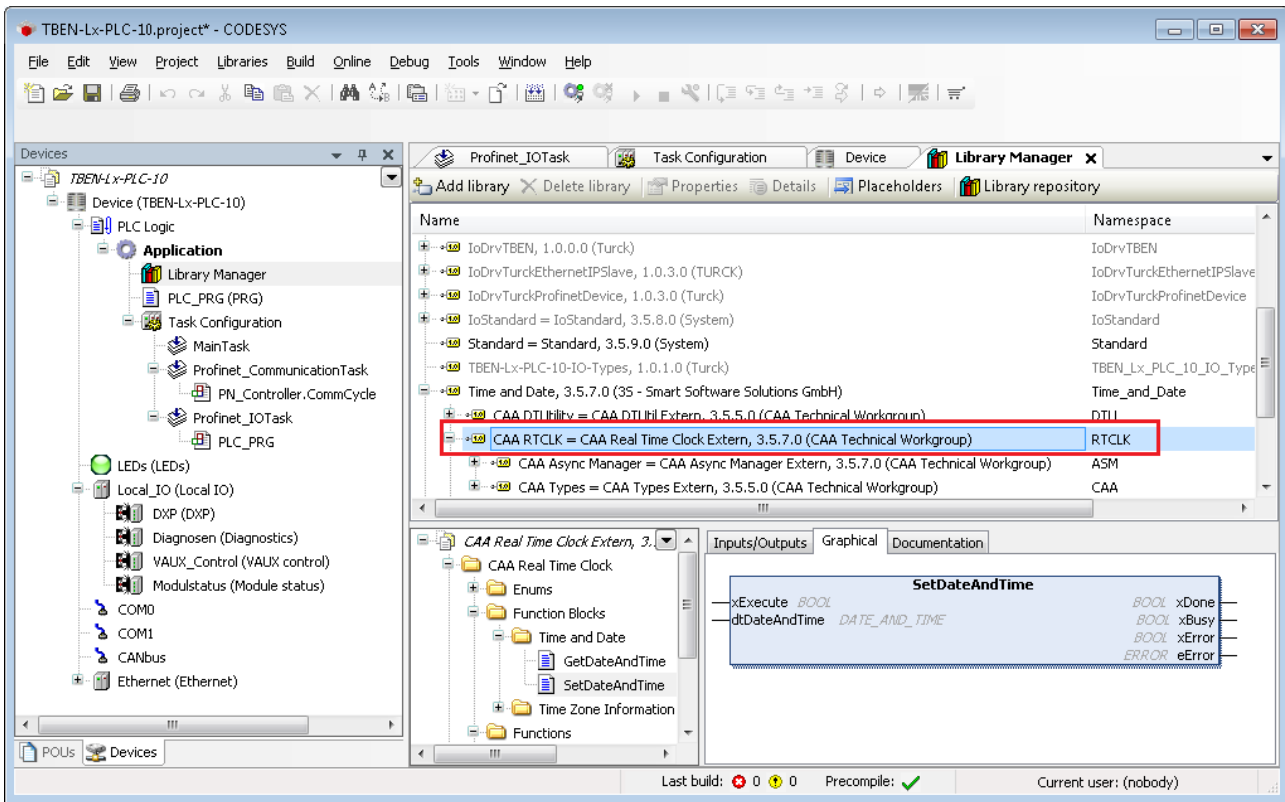


Fig. 99: CAA Real time Clock Extern in CODESYS

## 9 Operating

### 9.1 LED displays

Every device displays the following statuses via LEDs:

- PLC status
- Application specific displays (freely CODESYS-programmable LED)
- Supply voltage
- Group and bus errors
- Ethernet communication
- Status
- Diagnostics

<b>PWR LED</b>	<b>Meaning</b>
Off	No voltage or undervoltage at V1
Green	Voltage at V1 and V2 ok
Red	No voltage or undervoltage at V2
Flashing white	Wink command active

<b>LEDs ETH1 and ETH2</b>	<b>Meaning</b>
Off	No Ethernet connection
Green	Ethernet connection established, 100 Mbps
Green flashing	Ethernet traffic, 100 Mbps
Yellow	Ethernet connection established, 10 Mbps
Yellow blinking	Ethernet traffic, 10 Mbps

<b>LED BUS</b>	<b>Meaning</b>
Off	No voltage connected
Green	Active connection to a master
green flashing (1 Hz)	Device is ready for operation
Red	IP address conflict, Restore mode active, F_Reset active or Modbus connection timeout
Red flashing	Wink command active
Red/green (1 Hz)	Autonegotiation and/or waiting for DHCP-/BootP-address assignment

<b>LED RUN</b>	<b>Meaning</b>
Off	No voltage connected
Green	PLC status: RUN
Green flashing	USB Host port function active, blinking pattern depends on the executed function
Red	PLC status: STOP
Red flashing	No PLC program loaded
Red flashing (2 × 1 Hz)	Factory reset running

<b>LED APPL</b>	<b>Meaning</b>
Off	This LED is controlled by the CODESYS program and can be freely programmed by the user.
Green	
Green flashing	

<b>LED APPL</b>	<b>Meaning</b>	
White	Blink-/wink-command active	
Red flashing	No PLC program loaded	
Red flashing (2 × 1 Hz)	Factory reset running	
<b>LED 0 (COM 0)</b>	<b>Meaning</b>	
Off	No TX data transmission	
on	TX data transmission	
<b>LED 1 (COM 0)</b>	<b>Meaning</b>	
Off	No RX data transmission	
on	RX data transmission	
<b>LED 2 (COM 1)</b>	<b>Meaning</b>	
Off	No TX data transmission	
on	TX data transmission	
<b>LED 3 (COM 1)</b>	<b>Meaning</b>	
Off	No RX data transmission	
on	RX data transmission	
<b>LED 4...7</b>	<b>Meaning</b>	
Off	This LED is controlled by the CODESYS program and can be freely programmed by the user.	
Green		
Green flashing		
<b>LED 8...15 (DXP channels)</b>	<b>Meaning (input)</b>	<b>Meaning (output)</b>
Off	Input not active	Output not active
Green	Input active	Output active (max. 2 A)
Red	–	Actuator overload
red flashing (1 Hz)	Overload at the sensor supply	

## 9.2 Software diagnostic messages

The diagnostic messages of the I/O channels and the module status are displayed in plain text both in CODESYS and in the web server.

### 9.2.1 Diagnostics

Diagnostics	Description
Overcurrent VAUX2 pin 1 Cx (Chy - z)	Overcurrent VAUX2 at pin 1 of the channel
Overcurrent output Chx	Overcurrent at the respective output

The screenshot shows the CODESYS interface for a project named 'TBEN\_L...-PLC.project'. The 'Diagnosen' window is open, displaying a table of diagnostic variables. The table has the following columns: Variable, Mapping, Channel, Address, and Type. The variables listed are:

Variable	Mapping	Channel	Address	Type
		Diagnostics	%IB1	Diagnostics_
		Overcurrent VAUX2 Pin1 C4 (Ch8-9)	%IX1.4	BIT
		Overcurrent VAUX2 Pin1 C5 (Ch10-11)	%IX1.5	BIT
		Overcurrent VAUX2 Pin1 C6 (Ch12-13)	%IX1.6	BIT
		Overcurrent VAUX2 Pin1 C7 (Ch14-15)	%IX1.7	BIT
		Overcurrent output Ch8	%IX4.0	BIT
		Overcurrent output Ch9	%IX4.1	BIT
		Overcurrent output Ch10	%IX4.2	BIT
		Overcurrent output Ch11	%IX4.3	BIT
		Overcurrent output Ch12	%IX4.4	BIT
		Overcurrent output Ch13	%IX4.5	BIT
		Overcurrent output Ch14	%IX4.6	BIT
		Overcurrent output Ch15	%IX4.7	BIT

The 'Diagnosen' window also includes a 'Find' field, a 'Filter' dropdown, and a 'Show all' button. Below the table, there are controls for 'Reset mapping' and 'Always update variables: Use parent device setting'. The status bar at the bottom shows 'Last build: 0 0 0' and 'Precompile: ✓'.

Fig. 100: CODESYS – I/O channel diagnostics



MAIN
DOCUMENTATION
CLOUD
LOGOUT

**TBEN-L5-PLC-10**

- Info
- Parameter
- Diagnosis
- Status
- Event log
- Ex- / Import
- Change Password
- Firmware

---

**LOCAL I/O**

- Parameter
- Diagnosis**
- Input
- Output

TBEN-L5-PLC-10 - Local I/O - Diagnosis

▶ □

Write Channel view

**Global**

**Groupe diagnosis**

Overcurrent VAUX2 Pin1 C4 (Ch8/9)	<input type="text" value="-"/>	?
Overcurrent VAUX2 Pin1 C5 (Ch10/11)	<input type="text" value="-"/>	?
Overcurrent VAUX2 Pin1 C6 (Ch12/13)	<input type="text" value="-"/>	?
Overcurrent VAUX2 Pin1 C7 (Ch14/15)	<input type="text" value="active"/>	?

**Digital In/Out 8**

Overcurrent output	<input type="text" value="-"/>	?
--------------------	--------------------------------	---

**Digital In/Out 9**

Overcurrent output	<input type="text" value="-"/>	?
--------------------	--------------------------------	---

**Digital In/Out 10**

Overcurrent output	<input type="text" value="-"/>	?
--------------------	--------------------------------	---

**Digital In/Out 11**

Overcurrent output	<input type="text" value="-"/>	?
--------------------	--------------------------------	---

**Digital In/Out 12**

Overcurrent output	<input type="text" value="-"/>	?
--------------------	--------------------------------	---

**Digital In/Out 13**

Overcurrent output	<input type="text" value="-"/>	?
--------------------	--------------------------------	---

**Digital In/Out 14**

Overcurrent output	<input type="text" value="-"/>	?
--------------------	--------------------------------	---

**Digital In/Out 15**

Overcurrent output	<input type="text" value="-"/>	?
--------------------	--------------------------------	---

For comments or questions please find your local contact on [www.turck.com](http://www.turck.com) ● ● ●

Fig. 101: Webservice – I/O channel diagnostics

## 9.2.2 Module status

Status message	Description
Module diagnostics pending	Group diagnostics of the device. At least 1 channel sends diagnostics.
Undervoltage V2	V2 is below the nominal range (< 18 V).
Undervoltage V1	V1 is below the nominal range (< 18 V)
Internal error	Error in the device, the internal communication is disturbed.
I/O-ASSISTANT Force Mode active	The force mode of the DTM is activated, i.e. the output states may no longer correspond to the specifications sent by the fieldbus or resulting from the PLC program.

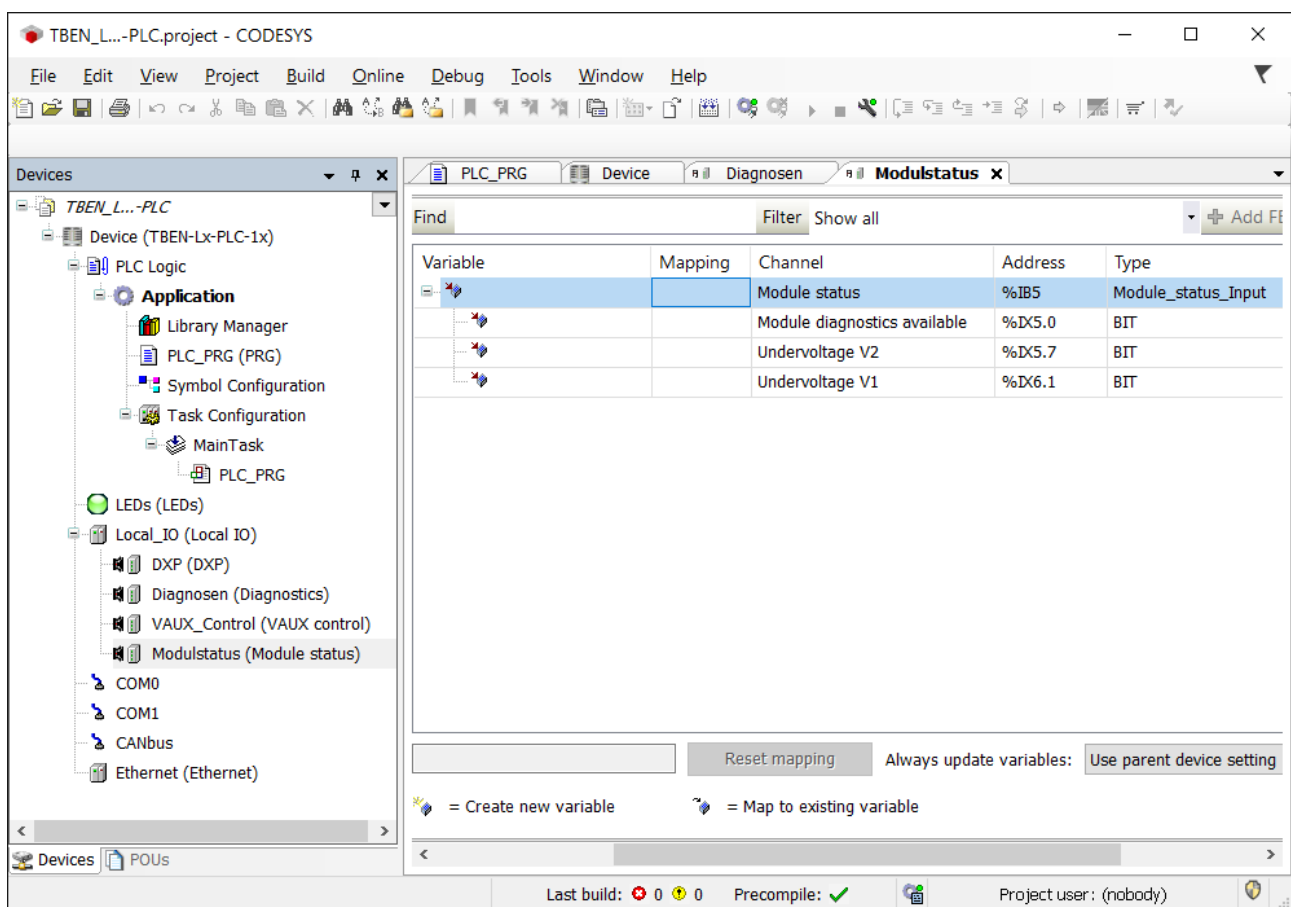


Fig. 102: CODESYS – module status

The screenshot shows a webserver interface for a TBEN-L5-PLC-10 Gateway. The interface is divided into a sidebar and a main content area.

**Sidebar:**

- TBEN-L5-PLC-10**
  - Info
  - Parameter
  - Diagnosis
  - Status
  - Event log
  - Ex- / Import
  - Change Password
  - Firmware
- LOCAL I/O**
  - Parameter
  - Diagnosis
  - Input
  - Output

**Main Content Area: TBEN-L5-PLC-10 - Gateway - Diagnosis**

Write Channel view

**Device**

**Current diagnosis**

I/O-ASSISTANT Force Mode active	-	?
Undervoltage V1	-	?
Undervoltage V2	active	?
Module diagnostics available	-	?
Internal error	-	?

Fig. 103: Webservice – module status

## 9.3 Using the USB host port

CODESYS applications can be backed up, restored and transferred via the USB functions. In addition, the device firmware can be updated via the USB interface.



### NOTE

The USB host function can be deactivated via the web server or the CODESYS program.

FAT or FAT32 formatted USB sticks can be connected to the USB host port. It is not possible to connect NTFS-formatted sticks or USB devices such as external hard disks, keyboards, PC mice etc.

Depending on the power consumption of the USB stick, compatibility problems may occur. To ensure error-free data exchange, Turck recommends using the industrial USB stick USB 2.0 Industrial Memory Stick (Ident-No. 6827348).

### 9.3.1 USB host port – function overview

Both read and write access to the device is possible via the USB host port.



### NOTICE

Use of recipes in CODESYS

#### Corrupted files when manipulating files in USB\_Data directory

- ▶ When using recipes, only make 1:1 copies with Backup\_2/Restore\_2.

#### Read access – functions

The following table describes the executable functions:

Function	Folder name	Description	Status CODESYS program	Automatic device restart
Backup 1	BACKUP_1	<p>Save the CODESYS application from the device on the USB stick.</p> <p>The following files are stored on the USB stick:</p> <ul style="list-style-type: none"> <li>■ All *.app and *.crc files</li> <li>■ PlcLogic folder</li> </ul> <p>Existing files with the same name are overwritten. All other files remain unchanged.</p> <p>The names of the CODESYS application and the file names of the boot application (*.app and *.crc) must be the same. If the names are different or have been changed, the application cannot be started.</p>	RUN	No

Function	Folder name	Description	Status CODESYS program	Automatic device restart
Backup 2	BACKUP_2	<p>Save the CODESYS application and device data from the device on the USB stick.</p> <p>The following files are stored on the USB stick:</p> <ul style="list-style-type: none"> <li>■ All *.app and *.crc files</li> <li>■ PlcLogic folder</li> <li>■ Folder USB_Data</li> <li>■ IP address</li> <li>■ PROFINET Device Name</li> <li>■ Retain data (retain.bin)</li> </ul> <p>Existing files with the same name are overwritten. All other files remain unchanged.</p> <p>The names of the CODESYS application and the file names of the boot application (*.app and *.crc) must be the same. If the names are different or have been changed, the application cannot be started.</p>	RUN	No
Read user data	USB_DATA	<p>Save the "USB_Data" folder from the device on the USB stick.</p> <p>The following files are stored on the USB stick:</p> <ul style="list-style-type: none"> <li>■ CODESYS recipes and/or log files</li> </ul> <p>Existing files with the same name are overwritten. All other files remain unchanged.</p> <p>The names of the CODESYS application and the file names of the boot application (*.app and *.crc) must be the same. If the names are different or have been changed, the application cannot be started.</p>	RUN	No

Write access – functions

The following table describes the executable functions:

Function	Folder name	Description	Status CODESYS program	Automatic device re-start
Restore 1	RESTORE_1	<p>Load the CODESYS application from the USB stick into the device.</p> <p>The function can only be used if the data on the USB stick comes from a device with identical firmware version.</p> <p>The following files are loaded from the storage device to the device:</p> <ul style="list-style-type: none"> <li>■ All *.app and *.crc files</li> <li>■ PlcLogic folder</li> </ul> <p>The folder may only contain one application file (*.app). All previous applications on the device will be deleted without further warning.</p> <p>The names of the CODESYS application and the file names of the boot application (*.app and *.crc) must be the same. If the names are different or have been changed, the application cannot be started.</p> <p>The device automatically restarts when the USB stick is removed from the USB port.</p>	STOPP	yes

Function	Folder name	Description	Status CODESYS program	Automatic device re- start
Restore 2	RESTORE_2	<p>Load the CODESYS application and the device data from the USB stick into the device.</p> <p>The function can only be used if the data on the USB stick comes from a device with identical firmware version.</p> <p>The following files are loaded on the USB stick:</p> <ul style="list-style-type: none"> <li>■ All *.app and *.crc files</li> <li>■ PlcLogic folder</li> <li>■ Folder USB_Data</li> <li>■ IP address</li> <li>■ PROFINET Device Name</li> <li>■ Retain data (retain.bin)</li> </ul> <p>The folder may only contain one application file (*.app). All previous applications on the device will be deleted without further warning.</p> <p>The names of the CODESYS application and the file names of the boot application (*.app and *.crc) must be the same. If the names are different or have been changed, the application cannot be started.</p> <p>The device automatically restarts when the USB stick is removed from the USB port.</p>	STOPP	Yes
Firmware Update	FW_UPDATE	<p>Update of the device firmware. The IP address, the PROFINET device name and the CODESYS application are not overwritten.</p> <p>File name: TBEN-Lx-..._V...bin</p> <p>The device automatically restarts when the USB stick is removed from the USB port.</p>	STOPP	yes
Write user data	USB_DATA_WRITE	<p>Load the <b>USB_Data</b> folder from the storage medium into the device.</p> <p>Existing files with the same name are overwritten. All other files remain unchanged.</p>	STOPP	Yes

### 9.3.2 Executing USB functions



**NOTICE**

Restart or reset of the device with plugged storage device  
**Destruction of the running application possible!**

- ▶ Remove the storage device from in normal operation.

When using the USB functions, observe the following:

- ▶ Define the function to be performed using the folder name on the USB stick.
- ▶ Create only one file folder on the USB stick. If the storage device contains more than one folder enthält, not function is executed.
- ▶ Only remove the storage device from the device when the RUN LED is orange (read or write completed) or alternately flashing red/green (error).

#### Performing Backup\_1 and Backup\_2

- ▶ Insert the USB stick with the folder BACKUP\_1 or BACKUP\_2 into the device.
- ⇒ The RUN-LED flashes green with 4 Hz.
- ⇒ The backup is executed.
- ⇒ When the RUN LED blinks orange at 1 Hz, the backup is complete.
- ▶ Remove the USB stick.

#### Saving user data (USB\_DATA function)

- ▶ Insert the USB stick with the folder USB\_DATA into the device.
- ▶ Insert the USB stick into the device.
- ⇒ The RUN-LED flashes green with 2 Hz.
- ⇒ The Data are stored on the USB stick:
- ⇒ When the RUN LED blinks orange at 1 Hz, the data has been successfully saved.
- ▶ Remove the USB stick.

#### Load data into the device (function RESTORE\_1 or RESTORE\_2)

The **RESTORE** function can only be used if the data on the USB stick comes from a device with the same firmware version.

- ▶ Insert the USB stick with the folder RESTORE\_1 or RESTORE\_2 into the device.
- ⇒ The RUN-LED flashes green with 0.5 Hz.
- ▶ Press the SET-button within the next 30 seconds for at least 3 seconds.
- ⇒ The RUN LED flashes in the sequence 2 × green - pause (1 Hz) - 2 × green - pause (1 Hz) - ....
- ⇒ The data is loaded into the device.
- ⇒ When the RUN LED blinks orange at 1 Hz, the data loading is complete.
- ▶ Remove the USB stick.
- ⇒ The device restarts.

#### Perform firmware update (function FW\_UPDATE)

- ▶ Create the folder FW\_UPDATE on a USB stick.
- ▶ Store the firmware as bin file in the folder FW\_UPDATE.
- ▶ Insert the USB stick into the device.
- ⇒ The RUN-LED flashes green with 0.5 Hz.
- ▶ Press the SET-button within the next 30 seconds for at least 3 seconds.
- ⇒ The RUN LED flashes in the sequence 3 × green - pause (1 Hz) - 3 × green - pause (1 Hz) - ....
- ⇒ The data is loaded into the device.
- ⇒ When the RUN LED blinks orange at 1 Hz, the firmware update is complete.
- ▶ Remove the USB stick.
- ▶ Execute a power cycle.
- ⇒ The device restarts.

#### Write user data to the device (function USB\_DATA\_WRITE)

- ▶ Insert the USB stick with the **USB\_DATA\_WRITE** folder into the device.
- ⇒ The RUN-LED flashes green with 0.5 Hz.
- ▶ Press the SET-button within the next 30 seconds for at least 3 seconds.
- ⇒ The RUN-LED flashes green with 2 Hz.
- ⇒ The data are stored to the device.
- ⇒ When the RUN LED blinks orange at 1 Hz, the data has been successfully saved.
- ▶ Remove the USB stick.
- ⇒ The device restarts.



### 9.3.3 USB functions – behavior of the RUN-LED in case of an error

In case of errors when performing the USB functions, the RUN LED reacts as follows:

LED display	Error	Meaning
Red/green flashing (1 Hz)	Time out	<ul style="list-style-type: none"> <li>■ SET-button not pressed within the 30 seconds after the plugging of the the USB stick device.</li> </ul>
	Invalid folder	<ul style="list-style-type: none"> <li>■ The USB stick contains a folder with an invalid name.</li> <li>■ The storage medium contains multiple folders.</li> </ul>
	Empty folder	<ul style="list-style-type: none"> <li>■ The USB stick contains an empty folder with a valid name.</li> </ul>
Red/green flashing (1 Hz)	USB deactivated	<ul style="list-style-type: none"> <li>■ The USB Host function has been deactivated using via web server or CODESYS program.</li> </ul>

## 9.4 Operating the device with the web server

### 9.4.1 Changing the web server password

#### Changing the default password

The password for the web server is set under **MAIN → Change Password**.

The password should be used in conjunction with the network security concept of the overall system in which the devices are installed.

- ▶ Enter the current password under **Current password**.
- ▶ Enter new password under **New password** and repeat new password under **Repeat new password**.
- ▶ Accept new password via **CHANGE PASSWORD**.



#### NOTE

The password must consist of 6 to 15 characters and contain upper and lower case letters as well as at least one numeric character.

## 9.4.2 Manage data node points from CODESYS symbol table

### Options for CODESYS Symbols in the Web Server (Node Options)

#### CODESYS symbols

In CODESYS it is possible to restrict user rights for projects and to link them to individual users.

- ▶ Enter access data for the CODESYS project, from which symbols are to be displayed in the web server, under **CODESYS Symbols**. If no access rights have been assigned in the CODESYS project, no data must be entered here.

#### Settings - Automatic Node delete

Activated

Deactivating CODESYS symbols in the symbol configuration automatically deletes the corresponding data nodes in the Turck Cloud Portal and on the web server interface. Historical data can no longer be displayed.

deactivated

Data nodes in the Turck Cloud Portal and on the web server interface are not automatically deleted. Historical data is still displayed. You can only delete data manually in the web server (see **Clean Data Nodes (Nodes)**).

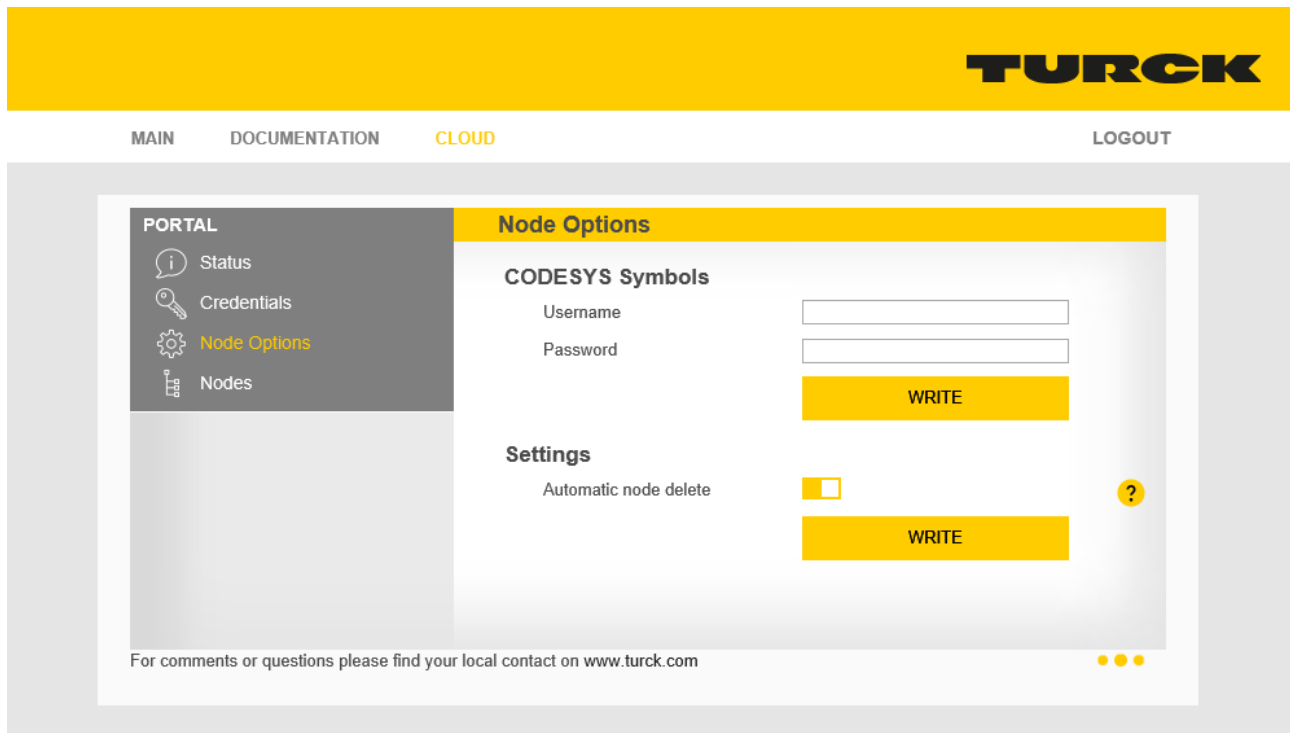


Fig. 104: Webserver – Cloud – Node Options

### Clean Data Nodes (Nodes)

This dialog shows the data nodes of the device imported from the CODESYS symbol configuration [▶ 86].

The data node points can be deleted manually here if **Node Options** → **Settings – Automatic Node delete** is deactivated.

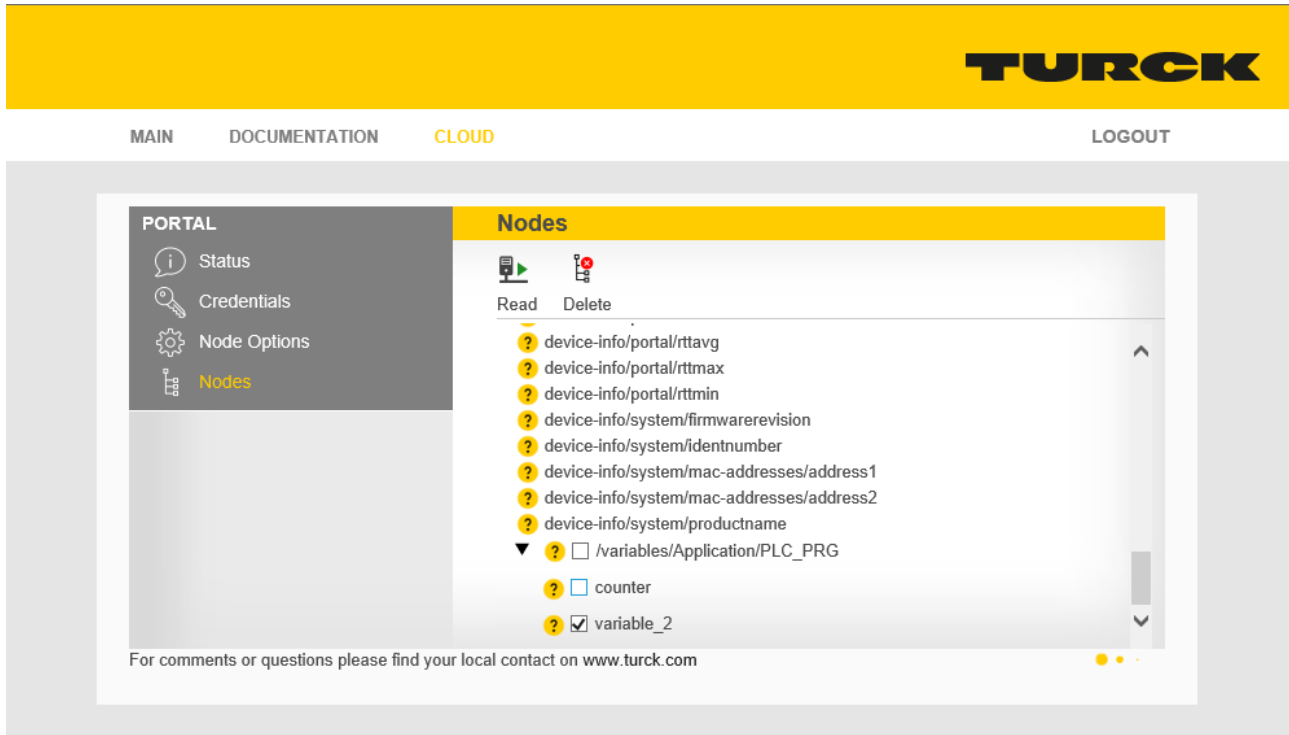


Fig. 105: Webserver – Cloud – Clean data nodes (Nodes)

- ▶ Select data nodes to be deleted.
- ▶ Delete marked data nodes via the **Delete** button
- ⇒ The data nodes including the historical data are also deleted in the Turck Cloud Portal.

## 10 Troubleshooting

If the device does not function as expected, first check whether ambient interference is present. If there is no ambient interference present, check the connections of the device for faults. If there are no faults, there is a device malfunction. In this case, decommission the device and replace it with a new device of the same type.

## 11 Maintenance

Ensure that the plug connections and cables are always in good condition.  
The devices are maintenance-free, clean dry if required.

### 11.1 Executing the firmware update

#### 11.1.1 Executing the firmware update via USB storage medium

Proceed as follows to update the firmware via a USB storage medium:

- ▶ Create the folder FW\_UPDATE on a USB stick.
- ▶ Store the firmware as bin file in the folder FW\_UPDATE.
- ▶ Insert the USB stick into the device.
- ⇒ The RUN-LED flashes green with 0.5 Hz.
- ▶ Press the SET-button within the next 30 seconds for at least 3 seconds.
- ⇒ The RUN LED flashes in the sequence 3 × green - pause (1 Hz) - 3 × green - pause (1 Hz) - ....
- ⇒ The data is loaded into the device.
- ⇒ When the RUN LED blinks orange at 1 Hz, the firmware update is complete.
- ▶ Remove the USB stick.
- ▶ Execute a power cycle.
- ⇒ The device restarts.

#### 11.1.2 Carry out firmware update via FDT/DTM

The firmware of the device can be updated via FDT/DTM. The PACTware™ FDT frame application, the DTM for the device and the current firmware are available as downloads free of charge from [www.turck.com](http://www.turck.com).



#### **NOTICE**

Interruption of the power supply during the firmware update  
**Risk of device damage due to faulty firmware update**

- ▶ Do not interrupt the power supply during the firmware update.
  - ▶ During the firmware update do not reset the power supply.
-

Example: update the firmware with the PACTware™ FDT frame application

- ▶ Launch PACTware™.
- ▶ Right-click **Host PC** → **Add device**.

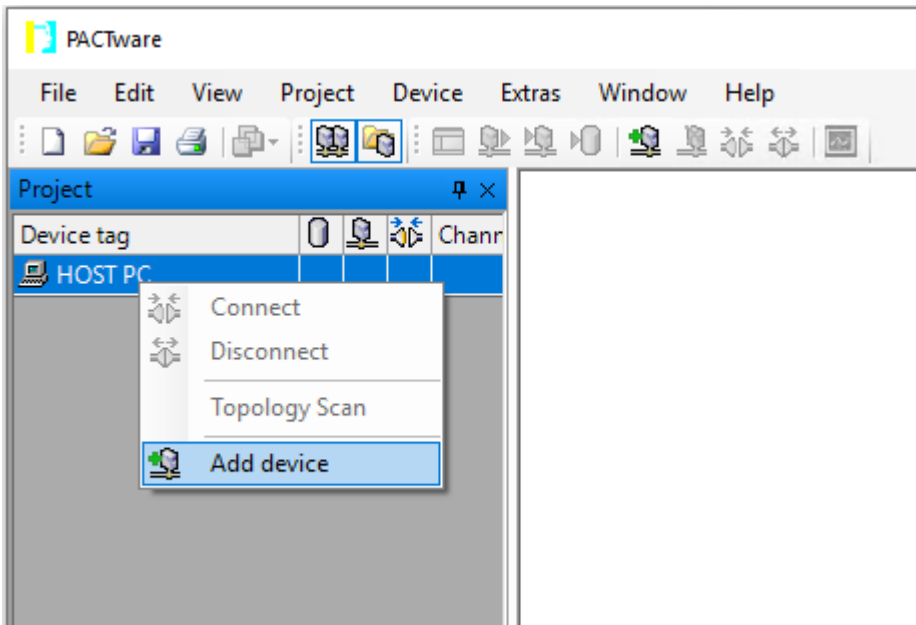


Fig. 106: Adding a Device in PACTware™

- ▶ Select **BL Service Ethernet** and confirm with **OK**.

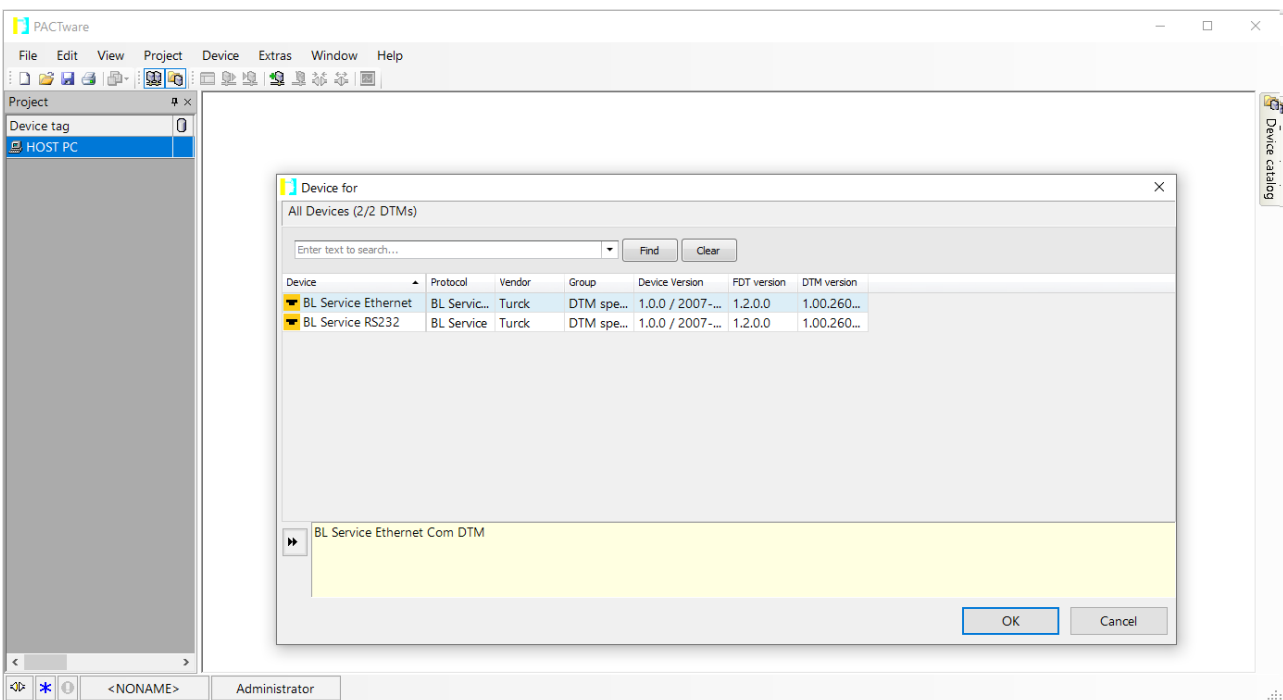


Fig. 107: Selecting the Ethernet interface

- ▶ Double-click the connected device.
- ⇒ PACTware™ opens the bus address management.

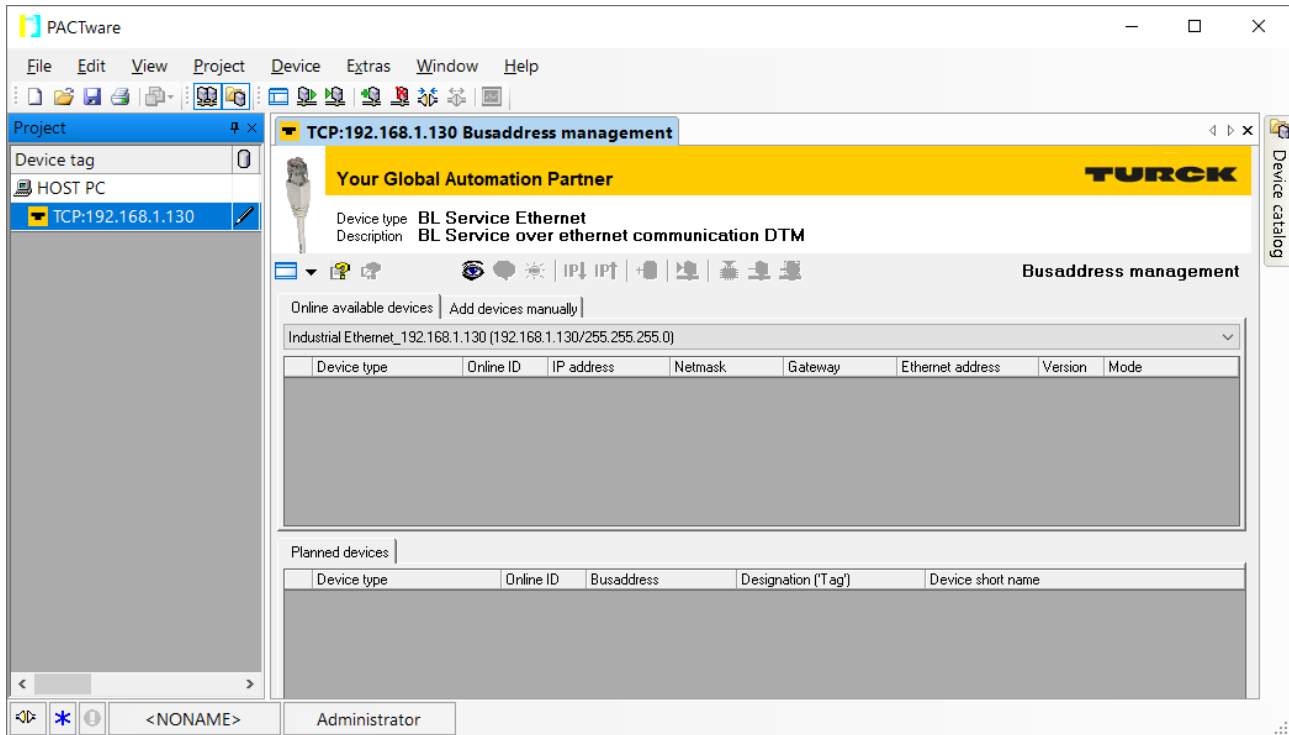


Fig. 108: Opening the busaddress management

- ▶ Search for connected Ethernet devices: Click the **Search** icon.
- ▶ Select the required device.

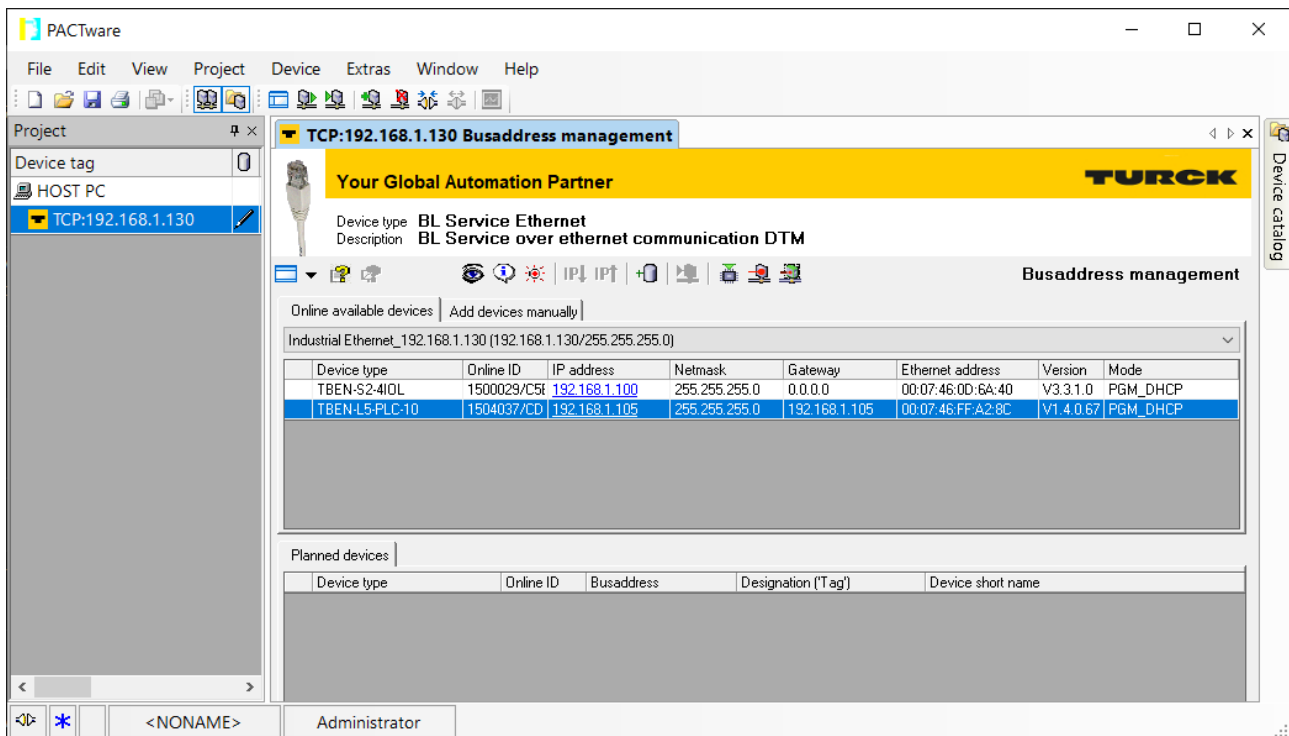


Fig. 109: Selecting the device

- ▶ Click **Firmware Download** to start the firmware update.

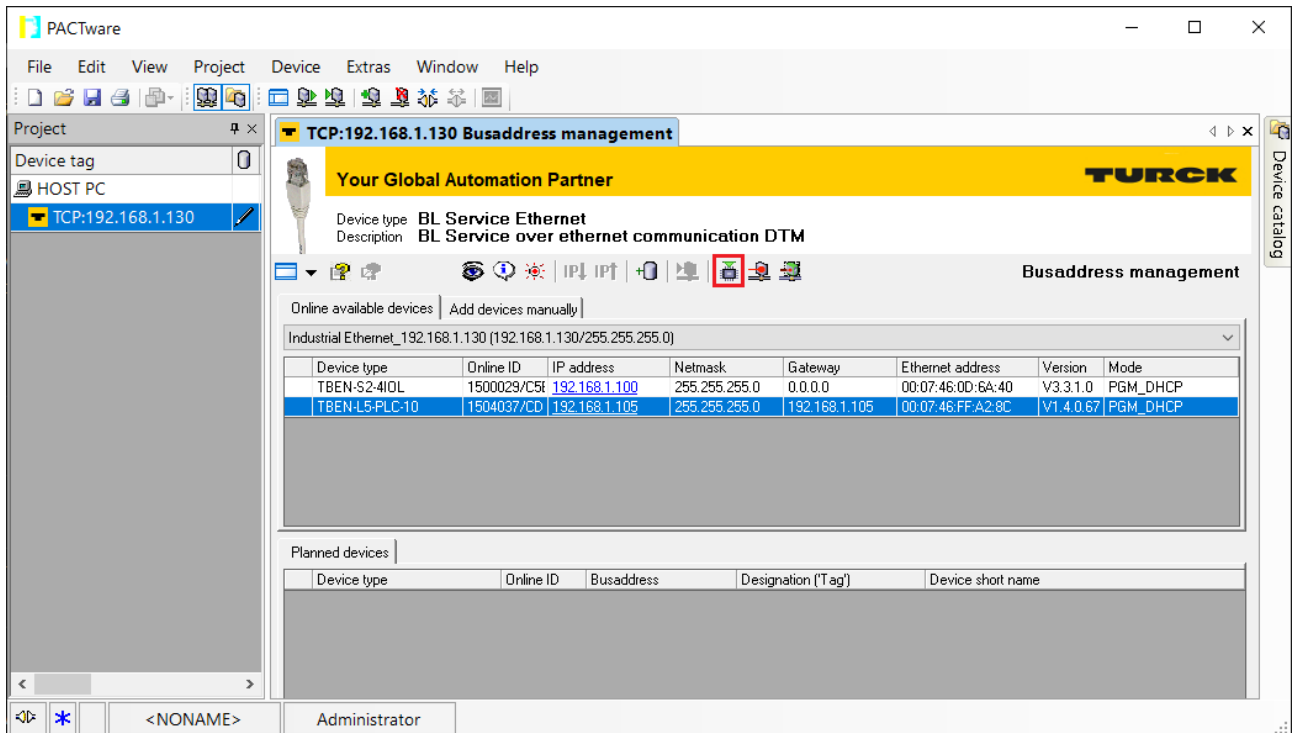


Fig. 110: Starting the firmware update

- ▶ Select the storage location and confirm with **OK**.
- ⇒ PACTware™ shows the progress of the firmware update with a green bar at the bottom of the screen.

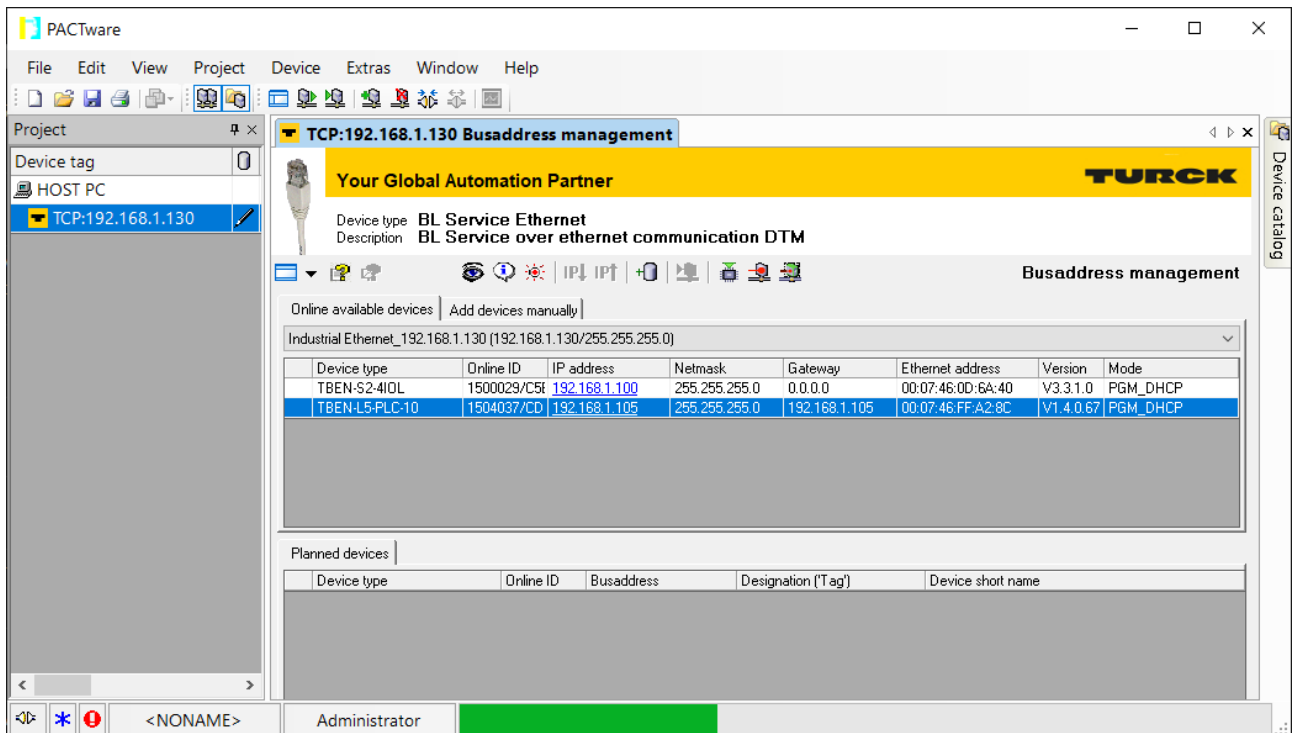


Fig. 111: Firmware update in progress



### 11.1.3 Executing the firmware update via the web server

- ▶ Open the web server and log in.
- ▶ Under **MAIN** → **Firmware** click the **SELECT FIRMWARE FILE** button.
- ▶ Select the storage location of the file and select file.
- ▶ Start the firmware update via the **UPDATE FIRMWARE** button.
- ▶ Restart the device after the firmware update has been completed.

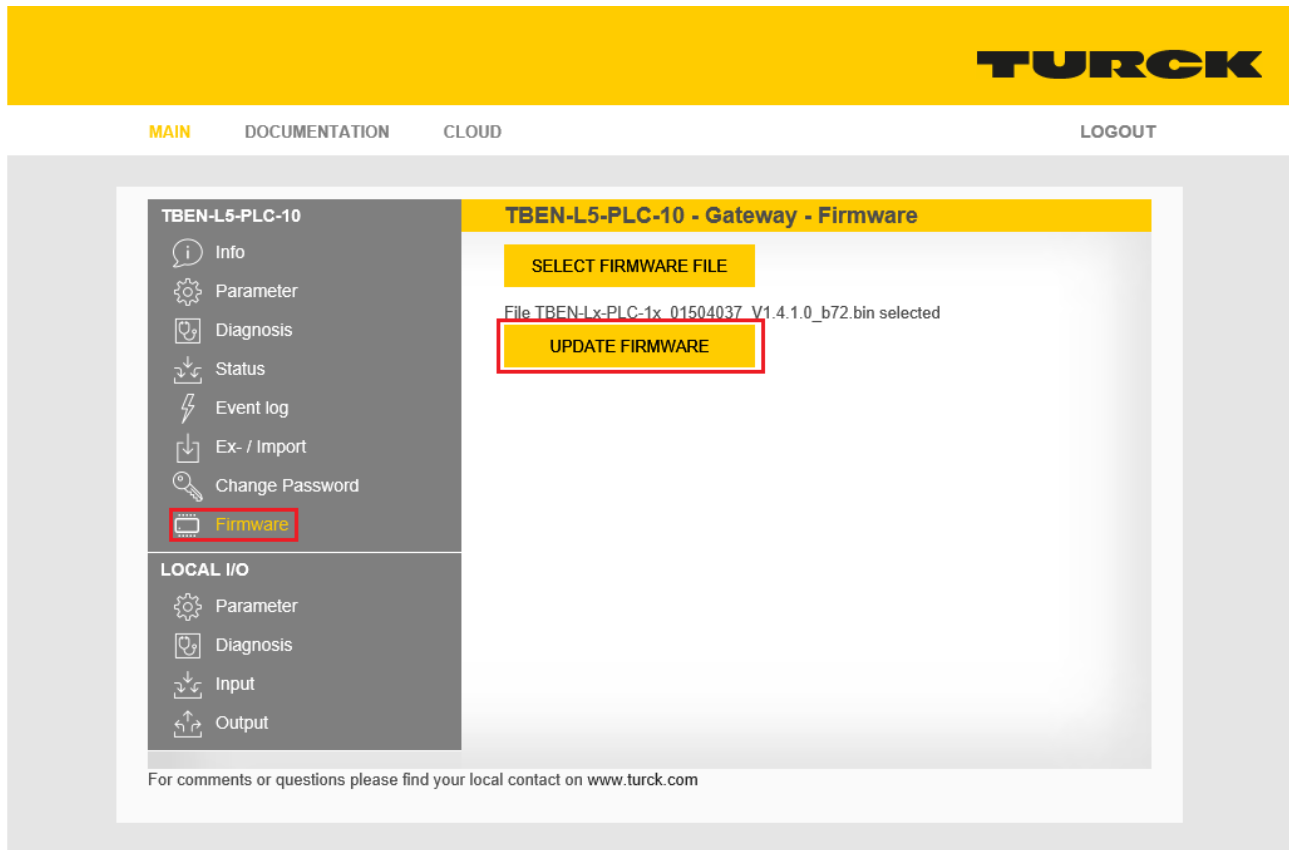


Fig. 112: Web server – executing the firmware update

## 12 Repair

The device must not be repaired by the user. The device must be decommissioned if it is faulty. Observe our return acceptance conditions when returning the device to Turck.

### 12.1 Returning devices

Returns to Turck can only be accepted if the device has been equipped with a Decontamination declaration enclosed. The decontamination declaration can be downloaded from <https://www.turck.de/en/retoure-service-6079.php> and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

## 13 Technical data

<b>Technical data</b>	
<b>Power supply</b>	
Supply voltage	24 VDC
Permissible range	18...30 VDC
Total current	Max. 9 A per voltage group V1 + V2 max. 11 A
Operating current	< 280 mA
Sensor/actuator supply $V_{AUX1}$	Supply of connectors C0 to C3 from V1, C0 + C1: 2 A per connector, C2 + C3: 4 A for both connectors
Sensor/actuator supply $V_{AUX2}$	Supply of connectors C4 to C7 from V2, 2 A per connector
Potential isolation	Galvanic isolation of V1 and V2 voltage groups
Voltage proof	Up to 500 VDC V1 and V2 to Ethernet
Power loss	Typical $\leq 5$ W
<b>System description</b>	
Processor	ARM Cortex A8, 32 bit, 800 MHz
Program and data memory	20 MB
Remanent memory	64 kB
Add-on memory	1 × USB Host port
Real Time Clock	Yes
Operating system	Linux
<b>PLC data</b>	
Programming	CODESYS V3
Released for CODESYS version	
FW $\geq$ V1.3.0.0	V 3.5.12.10
FW $\geq$ V 1.4.6.0	V 3.5.14.20
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
OPC	yes
OPC UA	Yes
Application tasks	10
Number of POUs	1024
Programming interface	Ethernet, USB
Cycle time	< 1ms for 1000 IL- commands (without I/O cycle)
Input data	8 kB
Output data	8 kB
<b>System data</b>	
Transmission rate	Ethernet 10 Mbps/100 Mbps
Connection technology	2 x M12, 4-pin, D coded
Web server	default: 192.168.1.254
Service interface	Ethernet via P1, P2 or Mini USB port
<b>Modbus TCP Slave</b>	
Address assignment	Static IP, BOOTP, DHCP

<b>Technical data</b>	
Supported function codes	FC1, FC2, FC3, FC4, FC5, FC6, FC15, FC16, FC23
Input registers	Max. 1024 registers
Input register start address	0x0000
Holding Registers	Max. 1024 registers
Output register start address	0x0000
<b>Modbus RTU Slave</b>	
Input registers	Max. 500 registers
Input register start address	0x0000
Holding Registers	Max. 500 registers
Output register start address	0x0000
<b>EtherNet/IP™ Device</b>	
Address assignment	according to EtherNet/IP™ standard
Number of process data	Max. 248 words input data, max 246 word output data
<b>PROFINET Device</b>	
Address assignment	DCP
Conformance Class	B (RT)
MinCycle Time	1 ms
Diagnostics	according to PROFINET Alarm Handling
Automatic address setting	Supported
Topology detection	Supported
Number of process data	<ul style="list-style-type: none"> <li>■ Up to firmware version V1.2.1.0: max. 512 byte input data/max. 512 byte output data</li> <li>■ From firmware version V1.3.0.0: max. 1024 byte input data/max. 1024 byte output data</li> </ul>
<b>CAN Device</b>	
Baud rate	Up to 1 Mbps
Power supply	Internal from V1 (no external power supply allowed)
Number of PDOs	Max. 512 RxPDOs max. 512 TxPDOs
<b>Modbus TCP Master</b>	
Max. number of devices	64
Min. cycle time	2 ms
Max. number of devices at 2 ms	8
<b>EtherNet/IP™ Scanner</b>	
Input data	max. 8 kB
Output data	max. 8 kB
Max. number of devices at 10 ms	8
<b>PROFINET Controller</b>	
Max. number of devices	64
Min. cycle time	1 ms
Max. number of devices at 1 ms	8
<b>Modbus RTU Master</b>	
Max. number of devices	32
Min. cycle time	5 ms

<b>Technical data</b>	
Max. number of devices at 5 ms	8
<b>CANopen Manager</b>	
Input data	max. 8 kB
Output data	max. 8 kB
Max. number of devices	127
<b>SAE J1939 Manager</b>	
Input data	max. 8 kB
Output data	max. 8 kB
Max. number of devices	254
<b>Digital inputs</b>	
Number of channels	8
Connection technology	M12, 5-pole
Input type	PNP
Type of input diagnostics	Short-circuit diagnostic of sensor supply per connector
Switching threshold	EN 61131-2 type 3, PNP
Signal voltage, low level	< 5 V
Signal voltage, high level	> 11 V
Low level signal current	<1,5 mA
High level signal current	> 2 mA
Sensor supply	2 A, short-circuit proof, from V2, optionally switchable via process data
Potential isolation	Galvanic isolation to P1/P2
Voltage proof	Up to 500 VDC (V1 and V2 to Ethernet)
<b>Digital outputs</b>	
Number of channels	8
Connection technology outputs	M12, 5-pole, a-coded
Output type	PNP
Type of output diagnostics	Short-circuit diagnostic per channel
Output voltage	24 VDC from V2
Output current per channel	2 A, short-circuit proof, max. 4.0 A per connector
Simultaneity factor	0.56
Load type	Ohmic, inductive lamp load
Short-circuit protection	Yes
Actuator supply	2 A, short-circuit proof, from V2, optionally switchable via process data
Potential isolation	Galvanic isolation to P1/P2
Voltage proof	Up to 500 VDC (V1 and V2 to Ethernet)
<b>Standard/Directive conformity</b>	
Vibration test	According to EN 61131
Shock test	According to EN 60068-2-27
Drop and topple	According to IEC 60068-2-31/IEC 60068-2-32
Electro-magnetic compatibility	According to EN 61131-2
Approvals and certificates	CE, FCC

<b>Technical data</b>	
UL cond.	cULus LISTED 21 W2, Encl.Type 1 IND.CONT.EQ.
<b>General information</b>	
Dimensions (B × L × H)	60.4 × 230.4 × 39 mm
Operating temperature	-40...+70 °C
Storage temperature	-40...+85 °C
Operating height	max. 5000 m
Protection class	IP65/IP67/IP69K
MTTF	80 years acc. to SN 29500 (Ed. 99) 20 °C
Housing material	PA6-GF30
Housing color	Black
Material window	Lexan
Material label	Polycarbonate
Halogen-free	Yes
Mounting	2 mounting holes, Ø 6,3 mm

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