Your Global Automation Partner

TURCK

TBEN-L…-4RFID-8DXP-CDS…

Compact RFID Interface

Instructions for Use

Contents

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

This document is written for specially trained personnel , and must be read carefully by anyone who is responsible for the mounting, commissioning, operation, maintenance, disassembly or disposal 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:

- Data sheet
- Operating instructions
- Declaration of Conformity

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.

2 Notes on the Product

2.1 Product identification

These instructions apply to the following compact RFID interfaces:

- TBEN-L4-4RFID-8DXP-CDS
- TBEN-L5-4RFID-8DXP-CDS
- TBEN-L4-4RFID-8DXP-CDS-WV
- TBEN-L5-4RFID-8DXP-CDS-WV

2.2 Scope of delivery

- Compact RFID interface
- Closure caps for M12 connectors

2.3 Legal requirements

The device is subject to the following EC directives:

- 2014/30/EU (electromagnetic compatibility)
- 2011/65/EU (RoHS II 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.de/produkte**
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 TBEN-L…-4RFID-8DXP-CDS block module is an RFID interface for use in the Turck RFID system. The device is connected between the controller and the read/write head and transmits commands from the controller to the read/write heads. Read data is sent to the controller via the device. The device can take over autonomous controller and diagnostic functions in order to relieve the load on the controller. The device functions can be programmed in accordance with IEC 61131- 3 using CODESYS V3.
The multiprotocol interfaces can be used as an EtherNet/IP™ device, Modbus TCP Turck slave, or PROFINET RT device. In Modbus TCP systems the devices can also be used as masters.
The devices support the HF read/write heads from firmware version Vx.90 and UHF read/write heads from firmware version FW 1.45.
In normal operation, up to four BL ident® read/write heads can be connected to the device. In Bus mode it is possible to connect up to 32 HF read/write heads per channel for static applications. Eight configurable digital channels are also provided.
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.

4 Product Description

The devices are designed with a fully encapsulated housing with degree of protection IP67/ IP69K. Four RFID channels are provided for connecting read/write heads. It is also possible to connect sensors and actuators via eight digital I/O channels, which can be configured as inputs or outputs as required. The terminals for the read/write heads and for digital I/Os are M12 sockets. An M12 socket is provided for the Ethernet connection. The plug connectors are 4-pin (TBEN-L4) or 5-pin (TBEN-L5) 7/8" female connectors.
The TBEN-L…-4RFID-8DXP-WV block modules are supplied with a complete WebVisu license.

4.1 Device overview

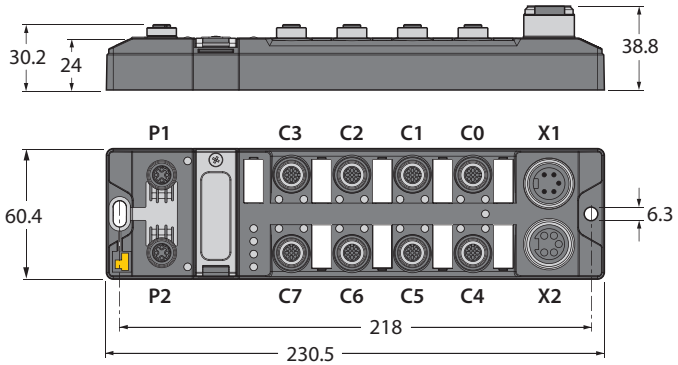


Fig. 1: Dimensions

4.1.1 Indication elements

The devices are provided with multi-color LEDs for displaying information:
- Power supply
- Group and bus errors
- Status
- Diagnostics

4.1.2 Operating elements

The devices are provided with the following operating elements:
- Rotary coding switches and DIP switch for setting the IP address
- SET button for activating the write accesses of the USB Host port functions

4.2 Properties and features

- Glass fiber reinforced housing
- Shock and vibration tested
- Fully encapsulated module electronics
- Degree of protection IP65/IP67/IP69K
- Multiprotocol: EtherNet/IP™ device, Modbus TCP slave or PROFINET device
- Up to 128 bytes of user data per read/write cycle per channel as well as use of fragments for larger data volumes
- Data interface for convenient use of the RFID functions
- 4 or 5-pin 7/8" plug connector for the power supply
- Two 4-pin M12 terminals for Ethernet
- Four channels with an M12 terminal for RFID
- Mixed operation of HF and UHF read/write heads
- Eight digital channels can be configured as 2 A pnp inputs or outputs
- Integrated Ethernet switch enables line topology
- 10 Mbps/100 Mbps transfer rate
- Integrated web server
- LEDs and diagnostics

4.3 Operating principle

When used as slaves, the RFID interfaces connect the RFID system with the higher-level controller system. The interfaces are provided with a fieldbus interface and fieldbus-independent I/O electronics with an RFID interface. The interfaces can also process signals of sensors and actuators via eight configurable digital channels. The interfaces are provided with a multiprotocol fieldbus interface for Modbus TCP, EtherNet/IP™ and PROFINET. The fieldbus interface connects the interface to an (existing) fieldbus system as an EtherNet/IP™ device, Modbus TCP slave or PROFINET device. During operation, the process data is exchanged between the fieldbus and RFID system. The read/write heads are connected to the interfaces via the RFID interfaces.

When used as Modbus TCP master, the RFID interfaces connect the RFID system with other systems communicating via TCP/IP. The interfaces are provide with an Ethernet interface and RFID interfaces.

The RFID system can be linked via the TCP/IP interface to a third-party system, such as an ERP system. The read/write heads are connected to the interfaces via the RFID interfaces. The interfaces can also process signals of sensors and actuators via eight configurable digital channels.

4.4 Functions and operating modes

The compact RFID interfaces transfer the data between the RFID level (read/write head and tag) and the controller level. HF and UHF read/write heads can be connected to the RFID channels. Parallel operation of HF and UHF read/write heads on the same device is also possible.
The devices can be used as an EtherNet/IP™ device, Modbus TCP Turck slave, or PROFINET RT device. The devices can also be used as masters in the Modbus TCP fieldbus system.

The device enables the execution of different commands such as inventory (single-tag and multitag applications), read, write and password protection. Additional functions are provided for optimizing the speed, the self triggering of the system, as well as for backup and restore operations. In every write or read cycle, up to 128 bytes can be transferred on each channel to the controller. The data must be fragmented in order to transfer more than 128 bytes.

Sensors and actuators can be connected to the configurable digital channels. Up to eight 3-wire PNP sensors or four PNP DC actuators with a maximum output current of 2 A can be connected per output.

The device can take over autonomous controller and diagnostic functions in order to relieve the load on the controller. The devices can be programmed using the IEC 61131-3 compliant CODESYS 3 programming software.

The TBEN-L…4RFID- 8DXP-CDS-WV block modules are provided with a complete WebVisu license.

4.4.1 Multiprotocol function

The I/O modules combine three Ethernet protocols in a single device:
- Modbus TCP
- EtherNet/IP™
- PROFINET

The Ethernet protocol used must be selected in the CODESYS project.

Manual protocol selection

The protocol must be defined manually in the CODESYS program. The other protocols only allow read access to the device. Manual protocol selection thus also provides an additional permanent locking feature.

4.4.2 Data transfer to the PLC

In every write or read cycle, up to 128 bytes can be transferred on each channel. The data must be fragmented in order to transfer more than 128 bytes. The amount of data transferred per read or write cycle can be set as follows for different Ethernet protocols:

PROFINET	EtherNet/IP™	Modbus TCP
■ 8 bytes ■ 16 bytes (default setting) ■ 32 bytes ■ 64 bytes ■ 128 bytes	■ 16 bytes ■ 64 bytes ■ 128 bytes (default setting)	■ 128 bytes (permanently set) Adjustable fragment size: ■ 8 bytes ■ 16 bytes (default setting) ■ 32 bytes ■ 64 bytes ■ 128 bytes

4.4.3 RFID channels – Operating modes

Five different data interfaces can be selected for the RFID channels:

- HF compact
- HF extended
- HF bus mode
- UHF compact
- UHF extended

Different functions are available to the user, depending on the selected data interface.

HF compact mode

HF compact mode is suitable for transferring smaller data volumes of up to 128 bytes (e.g. UID) in single-tag applications.

HF extended mode

HF extended mode contains all the functions provided in HF compact mode. It is also possible to transfer more than 128 bytes by fragmenting the data. The operating mode is suitable for single-tag and multitag applications.

NOTE
Not all commands are supported in Multitag mode.

The user can set a command timeout to define the time for the execution of a command. “HF extended” mode enables the use of Continuous mode for the repeated execution of an inventory, tag info, read or write command. In Continuous mode the read/write head executes the commands autonomously. Different data is stored in the internal memory of the interface. The memory operates as a FIFO memory.

HF bus mode

In HF bus mode up to 32 bus-capable read/write heads per RFID channel can be connected to the TBEN module. Depending on the number of connected read/write heads, an addition power supply may be required. A power consumption analysis of the connected read/write heads is required in order to determine the additional power supply required. Every connected read/write head supplies a “Tag present” signal in HF bus mode. The HF bus mode can be used for static applications because a command can only be processed by one read/write head at a time.

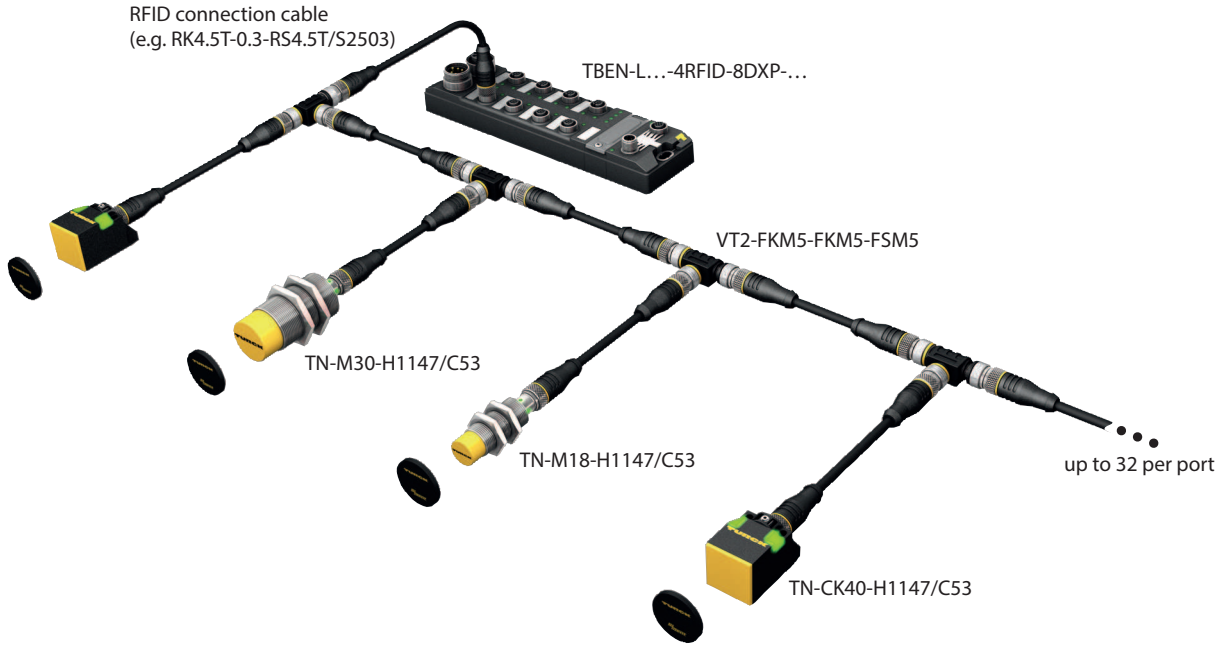


Fig. 2: HF bus mode setup

The following read/write heads can be used for HF bus mode:

- TN-M18-H1147/C53
- TB-M18-H1147/C53
- TN-M30-H1147/C53
- TB-M30-H1147/C53
- TN-CK40-H1147/C53
- TNSLR-Q42TWD-H1147/C53
- TB-Q08-0.15-RS4.47T/C53
- TB-Q08-0.15-RS4.47T/C53
- TN-Q14-0.15-RS4.47T/C53
- TNSLR-Q80WD-H1147/C53

HF bus mode supports the HF read/write heads from firmware version Vx.90.

UHF compact mode

UHF compact mode enables up to 128 bytes of data to be transferred in single-tag applications (e.g. EPC).

UHF extended mode

UHF extended mode contains all the functions provided in UHF compact mode. It is also possible to transfer more than 128 bytes. The operating mode is suitable for single-tag and multi-tag applications. The user can set a command timeout to define the time for the execution of a command.
UHF extended mode enables the use of presence sensing mode for the repeated execution of an inventory, read or write command. In Presence sensing mode the read/write heads are automatically switched on or off and also carry out commands automatically. In this case, the read data is stored in the internal memory of the interface. The memory operates as a FIFO memory.

4.4.4 RFID commands

The device can perform the following commands and functions. A complete description of the commands is provided in the section “Setting”.

- Idle
- Inventory
- Read
- Write
- Write and verify
- Continuous mode
- Get data from buffer (Continuous mode)
- Continuous presence sensing mode (UHF)
- End Continuous (presence sensing) mode
- Read/write head identification
- HF read/write head off
- Tune HF read/write head
- Query HF read/write head address
- Set HF read/write head address
- Direct read/write head command
- Set tag password
- Set read/write head password
- Reset read/write head password
- Set tag protection
- Get HF tag protection status
- Set perma lock
- Tag info
- Kill UHF tag
- Restore settings of the UHF read/write head
- Backup settings of the UHF read/write head
- Query error/status of UHF read/write head
- Reset

4.4.5 Loop counter function

The loop counter function is provided for rapid command processing. The loop counter function only requires two PLC cycles to execute a command repeatedly (flow chart see p. [▶ 232]). This increments the loop counter to execute a command repeatedly. At least four PLC cycles are required in conventional command processing. In order to execute a command repeatedly with conventional command processing, a command has to be reset and then set again. The loop counter function is provided for special commands. If the command was successfully executed, the command code is output in the response data.

4.4.6 Configurable digital channels – Functions

The device is provided with eight digital channels, which can be configured as inputs or outputs according to the application requirements. Up to eight 3-wire PNP sensors or eight PNP DC actuators with a maximum output current of 2 A can be connected per input or output.

4.4.7 USB host port

The device is provided with a USB host port for connecting USB memory sticks. The USB host port is a USB2.0 A socket. The USB functions enable CODESYS applications and user data to be saved, restored and transferred. The firmware of the devices can also be updated via the USB interface. Memory expansion via the USB host port is not possible.

4.4.8 USB device port

The device is provided with a USB device port for connecting USB cables. The USB device port is designed as a mini USB-B socket. The USB device port can be used as a service interface for the device DTM or as a programming interface. The use of the USB device port requires an RNDIS driver. This is automatically installed with the installation of the DTM.

4.4.9 Compatible CODESYS versions

The device is compatible with the following CODESYS versions:

CODESYS programming environment	CODESYS runtime	Firmware update	CODESYS package
3.5.8.10	3.5.8.10	1.0.1.0	1.0.1.0
3.5.12.10	3.5.11.20	1.1.4.0	1.1.4.0

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. The accessories are not part of the scope of delivery.

5 Mounting

Fasten the devices on a level, pre-drilled and grounded mounting surface.

- ▶ Fasten the module on the mounting surface with the two M6 screws. The maximum tightening torque for fastening the screws is 1.5 Nm.

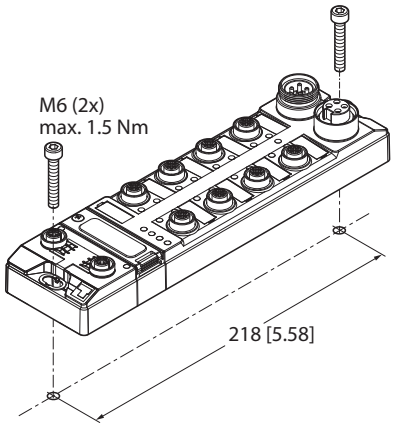


Fig. 3: Fixing a device on a mounting plate

5.1 Grounding the device

5.1.1 Grounding and shielding concept

The grounding and shielding concept of the TBEN-S modules enables the separate grounding of the fieldbus and I/O sections.

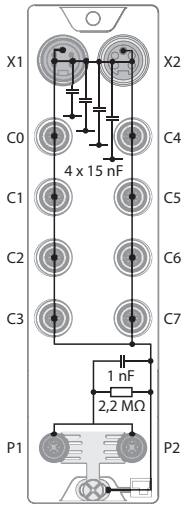


Fig. 4: Equivalent circuit, shielding concept

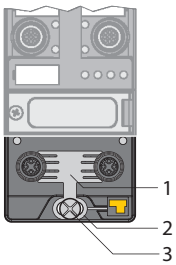


Fig. 5: Grounding components

The grounding clip (1) on the M12 plug connectors for the fieldbus connection (P1, P2) connects the shield of the fieldbus cables. The metal ring (2) is fitted underneath the grounding strip and connects the functional ground of the 7/8" plug connectors (Pin 3) for the power supply with the functional ground of the M12 plug connectors (Pin 5) for connecting the read/write heads, sensors and actuators. A metal screw (3) connects the device with the reference potential of the system.

5.1.2 Grounding the device (FG)

Grounding strip and metal ring are connected to each other. A fixing screw through the bottom mounting hole of the module connects the shield of the fieldbus cables with the functional ground of the power supply and connected devices as well as the reference potential of the system. If a common reference potential is not required, remove the grounding clip to disconnect the fieldbus shield or fasten the module with a plastic screw.

Removing the grounding clip

- ▶ Lever up the grounding strip with a flat slot-head screwdriver and remove.

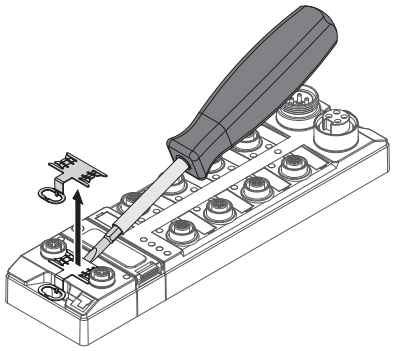


Fig. 6: Removing the grounding clip

Mounting the grounding clip

- ▶ 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.

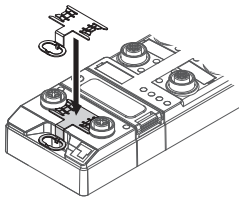


Fig. 7: Mounting the grounding clip

6 Connection

6.1 Connecting modules to Ethernet

The device is provided with an integrated autocrossing switch with two 4-pin M12 Ethernet plug connectors for connecting to an Ethernet system. The maximum tightening torque is 0.6 Nm.

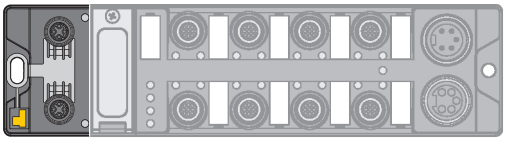


Fig. 8: M12 Ethernet plug connectors for connecting the fieldbus

▶ Connect the device to the fieldbus according to the pin layout below.

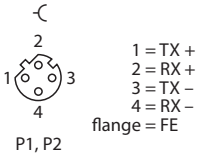


Fig. 9: Pin layout of the Ethernet connections

6.2 Connecting the power supply

The device is provided with two 7/8" pin plug connectors for connecting the power supply. The plug connectors are 4-pin (TBEN-L4) or 5-pin (TBEN-L5) connectors. V1 and V2 are electrically isolated from each other. The maximum tightening torque is 0.8 Nm.

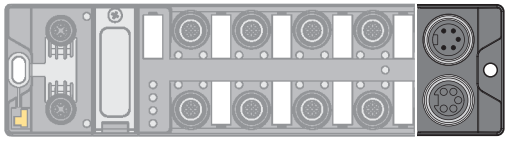


Fig. 10: 7/8" plug connectors for connecting the power supply

▶ Connect the device to the power supply according to the pin layout below.

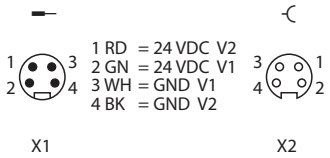


Fig. 11: TBEN-L4… – Pin layout of the power supply connections

Fig. 12: TBEN-L5… – Pin layout of the power supply connections

Connection	Function
X1	Incoming voltage supply
X2	Routing the voltage to the next node
V1	System voltage: Supply voltage 1 (incl. electronics supply)
V2	Load voltage: Power supply 2

NOTE

The system voltage (V1) and the load voltage (V2) are supplied and monitored separately. If the voltage goes below the permissible lower limit, the sockets are disconnected according to the supply concept of the module type. If V2 goes below the permissible minimum voltage, PWR LED changes from green to red. If V1 goes below the permissible minimum, the PWR LED goes out.

6.3 Connecting RFID read/write heads

The device has four 5-pin M12 plug connectors for connecting RFID read/write heads. The maximum tightening torque is 0.8 Nm.

▶ Connect the read/write heads to the device as per the pin layout shown below.

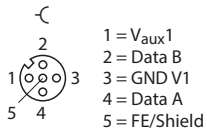


Fig. 13: RS485 – Pin layout of the read/write head connections

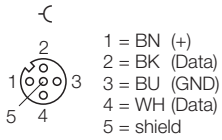


Fig. 14: …/S2500 connection cables – Pin layout of the read/write head connections

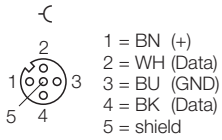


Fig. 15: …/S2501 connection cables – Pin layout of the read/write head connections

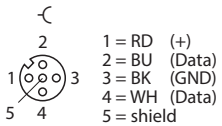


Fig. 16: …/S2503 connection cables – Pin layout of the read/write head connections

6.4 Connecting digital sensors and actuators

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

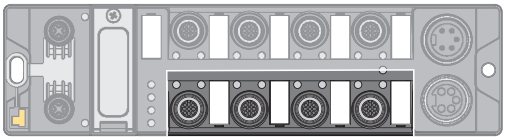


Fig. 17: M12 plug connector for connecting digital sensors and actuators

▶ Connect the sensors and actuators to the device as per the pin layout below.

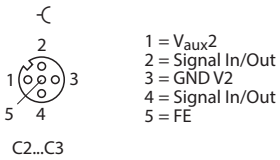


Fig. 18: Connections for digital sensors and actuators – Pin layout

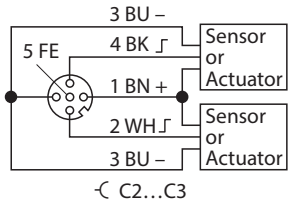


Fig. 19: Connections for digital sensors and actuators – Wiring diagram

The channels are assigned to the slots as follows:

Channel	Slot	Pin
DXP8 Ch8	C4	4
DXP9 Ch9	C4	2
DXP10 Ch10	C5	4
DXP11 Ch11	C5	2
DXP12 Ch12	C6	4
DXP13 Ch13	C6	2
DXP14 Ch14	C7	4
DXP15 Ch15	C7	2

7 Commissioning

Once the cables are connected and the power supply is switched on, the device is operational automatically after a startup delay of 14 s.

The RFID interface can only be operated if an application is running on the device.

7.1 Setting the IP address

The IP address can be set via two decimal rotary coding switches and the DIP switch on the device, via the web server or via the Turck Service tool.

7.1.1 Setting the IP address via switches on the device

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

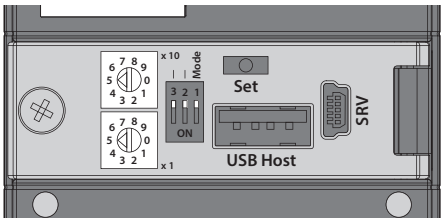


Fig. 20: Switches for setting the IP address

- Open the cover over the switches.
- Set the required rotary coding switches to the required position according to the table below.
- Set the “Mode” DIP switch to the required position according to the table below.
- Carry out a voltage reset.
- NOTICE! IP67 or IP69K protection is not provided when the cover over the rotary coding switches is opened. Device damage through penetrating foreign objects or liquids is possible. Close the cover securely over 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. Setting changes are activated after a voltage reset.

Setting option	"MODE" DIP switch	Rotary coding switch	Description
Default address	0	00	IP address: 192.168.1.100 Subnet mask: 255.255.255.0 Gateway: 192.168.1.1
Rotary mode	0	1…99	In Rotary mode, the last byte of the IP address can be set manually on the gateway. The other network settings can be stored retentively in the gateway memory and cannot be changed in Rotary mode. Addresses 1…99 can be set.
DHCP mode	1	40	In DHCP mode, the complete IP address is assigned automatically by a DHCP server in the network. The subnet mask assigned by the DHCP server and the default gateway address are stored retentively in the gateway memory. DHCP supports three types of IP address assignment: ■ Automatic address assignment: The DHCP server assigns a permanent IP address to the client. ■ Dynamic address assignment: The IP address assigned by the server is always only reserved for a specific period. After this time has elapsed or after the explicit release by a client, the IP address is reassigned. ■ Manual address assignment: A network administrator assigns an IP address to the client. In this case DHCP is only used for the transfer of the assigned IP address to the client.
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 gateway memory. All network settings (IP address, subnet mask, default gateway) are accepted by the internal EEPROM of the module.
PGM-DHCP mode	1	60	In PGM-DHCP mode, the gateway transmits 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.
F_Reset	1	90	The F_Reset mode resets all device settings to the default values and clears all data in the internal flash memory of the device. The following values are reset or deleted: ■ IP address and subnet mask ■ PROFINET device name ■ CODESYS program ■ Parameter
Restore	1	00	IP address: 192.168.1.254

7.1.2 Setting the IP address via the Turck Service Tool

The device is factory set to IP address 192.168.1.100 and does not have a PROFINET device name. The IP address can be set via the Turck Service Tool. The Turck Service Tool is available free of charge from www.turck.com.

- Connect the device to a PC via the Ethernet interface.
- Launch the Turck Service Tool.
- Click “Search” or press F5.

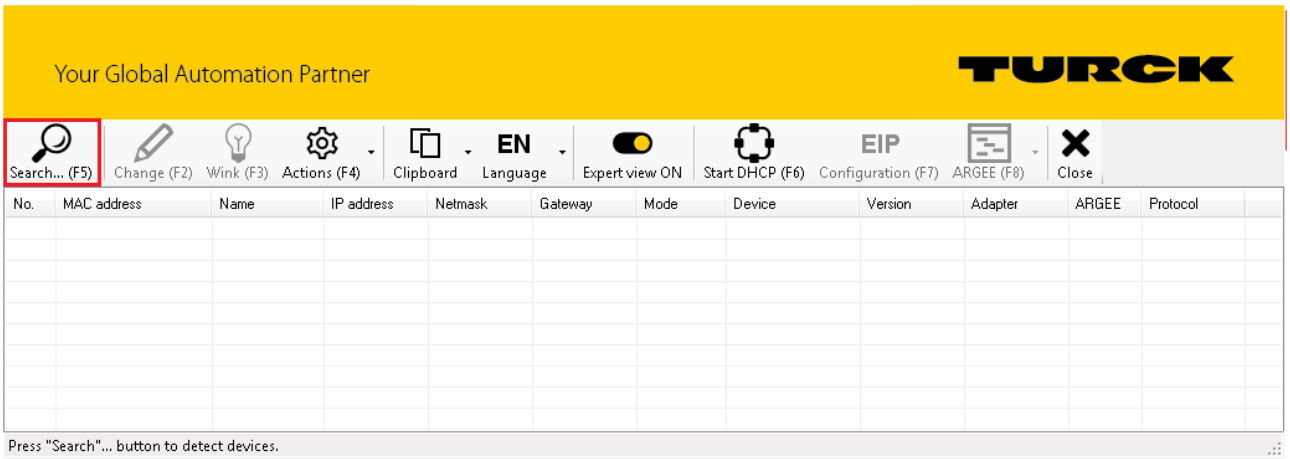


Fig. 21: Turck Service Tool – start screen

The Turck Service Tool displays the connected devices.

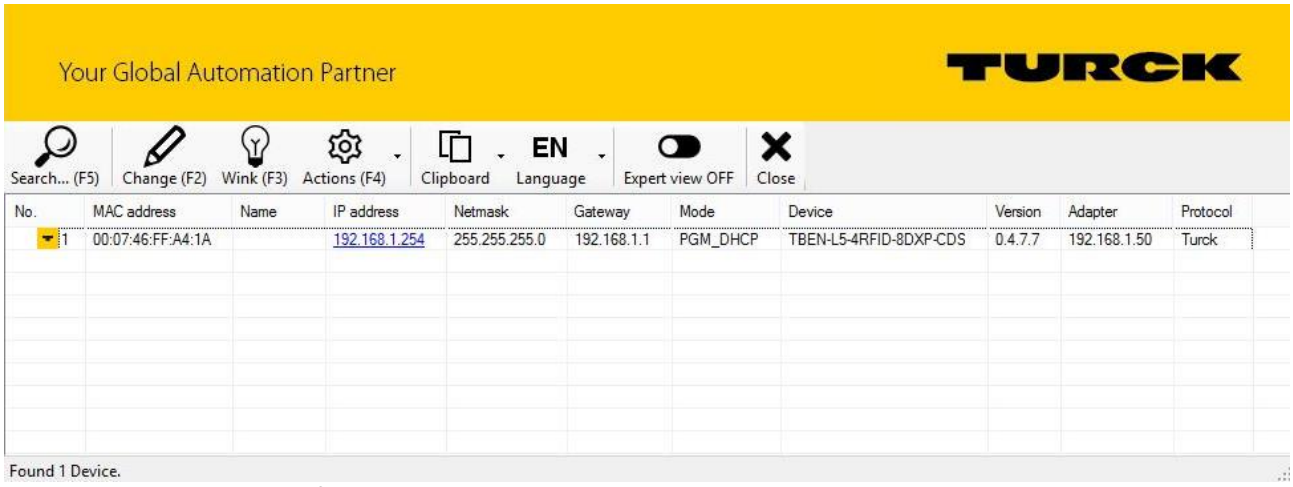


Fig. 22: Turck Service Tool – found devices

- Click the required device.
- Click “Change” or press F2.

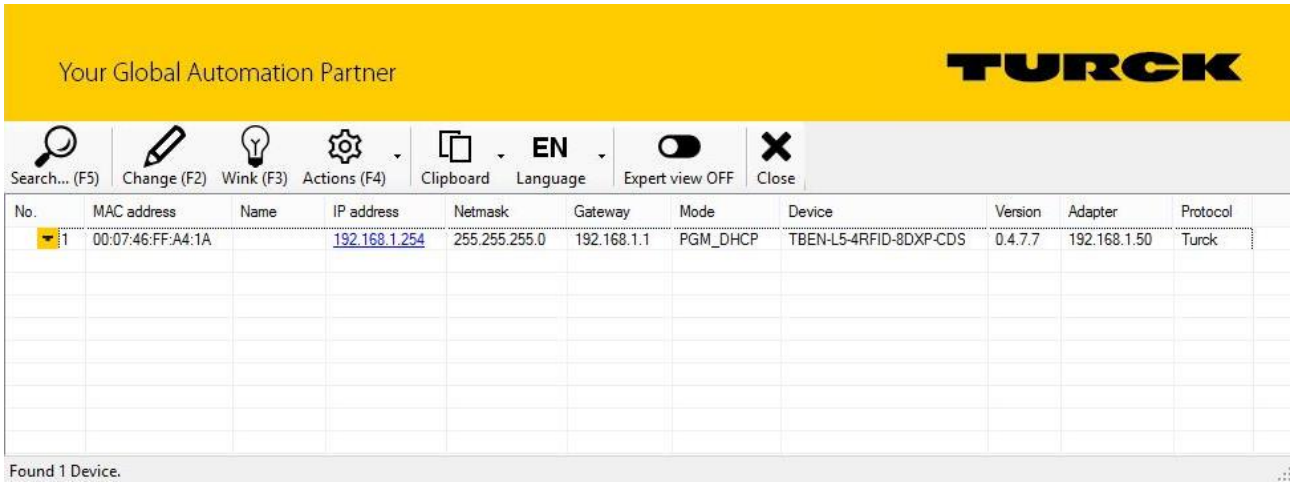


Fig. 23: Turck Service Tool – Selecting the device to be addressed

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

- Change the IP address and if necessary the network mask and gateway.
- Accept the changes by clicking “Set in device”.

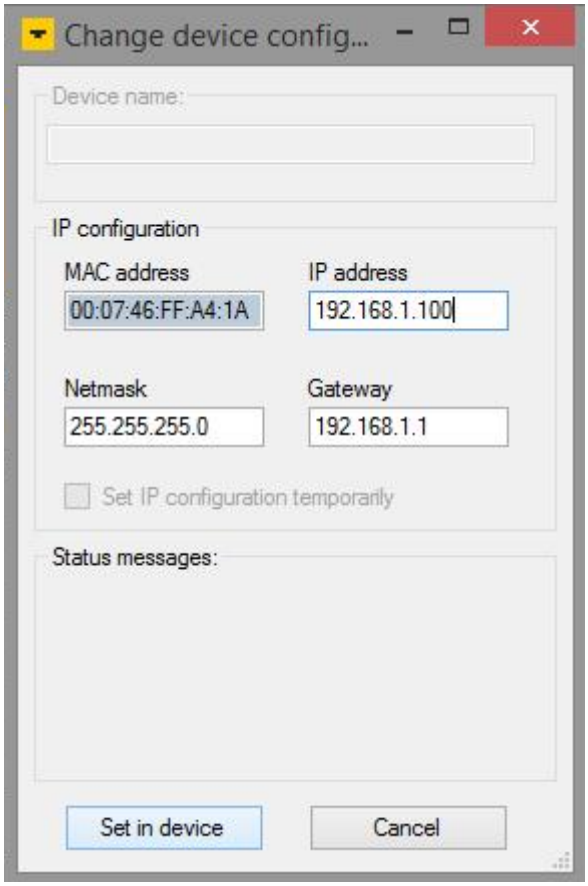


Fig. 24: Turck Service Tool – Changing the device configuration

7.1.3 Setting the IP address via the web server

NOTE
The device must be in PGM mode in order to set the IP address via the web server.

- Open the web server.
- Log into the device as administrator.
- Click “Network configuration”.
- Change the IP address and if necessary also the subnet mask and default gateway.
- Write the new IP address, subnet mask and default gateway via “Submit” to the device.

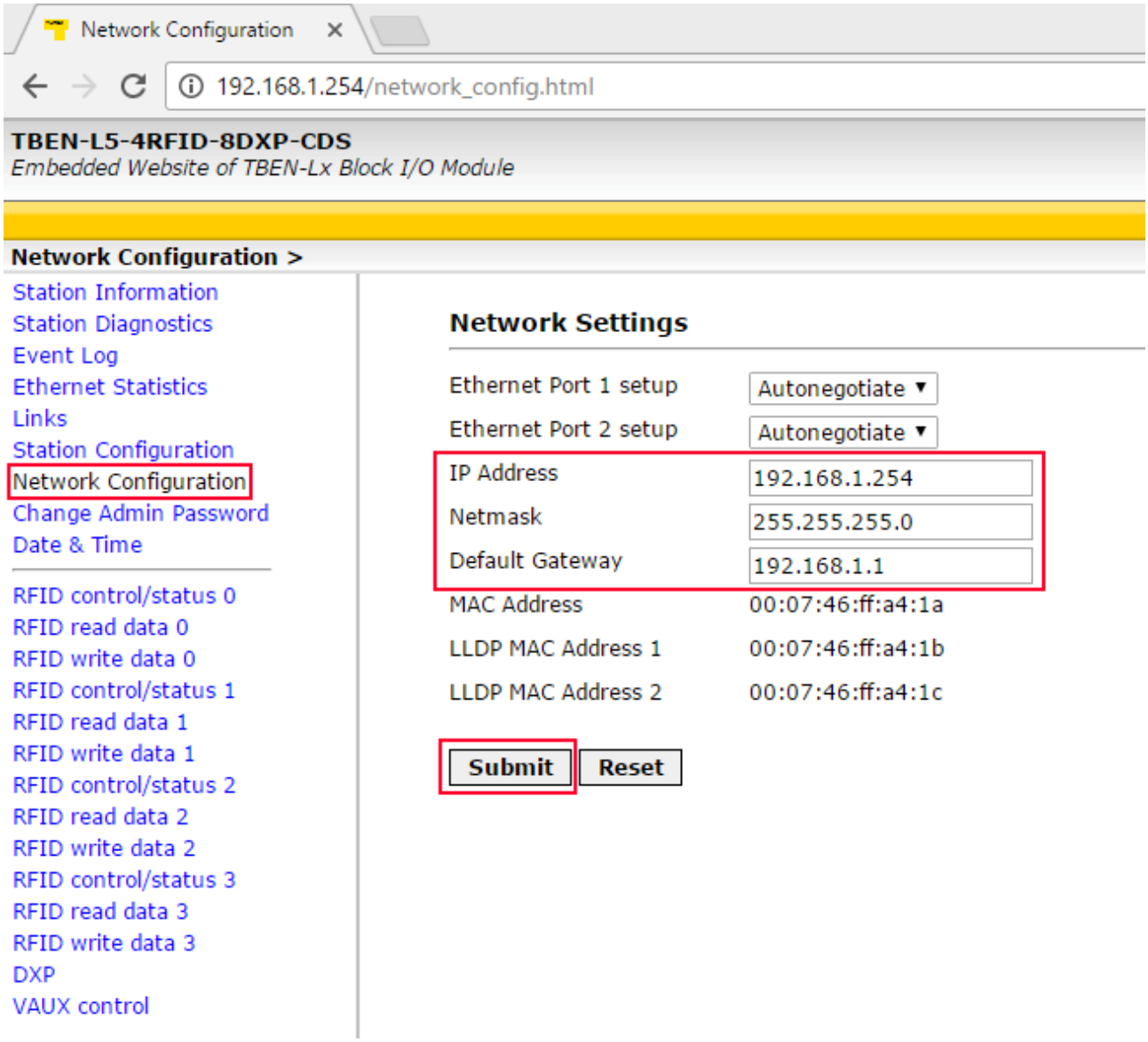


Fig. 25: Setting the IP address via the web server

7.2 Connecting the device to a Modbus master

In this example the “Tag present” bit is queried. This requires the network interface to be set up, the hardware configured and the I/O mapping defined.

Hardware used

This example uses the following hardware components:

- Turck HMI TX507-P3CV01 (Modbus master)
- TBEN-L5-4RFID-8DXP-CDS block module (IP address: 192.168.1.100)
- TN-Q80-H1147 HF read/write head

Software used

This example uses the following software:

- CODESYS 3.5.8.1 (download free of charge from **www.turck.com**)

Prerequisites

- The programming software has been started.
- A new project has been created.
- The PLC has been added to the project.

7.2.1 Connecting the device with the controller

To connect the device to the controller, the following components must be added in CODESYS first of all:

- Ethernet adapter
- Modbus TCP master
- Modbus TCP slave

Adding an Ethernet adapter

▶ Right-click “Device (TX507-P3CV01)” in the project tree.

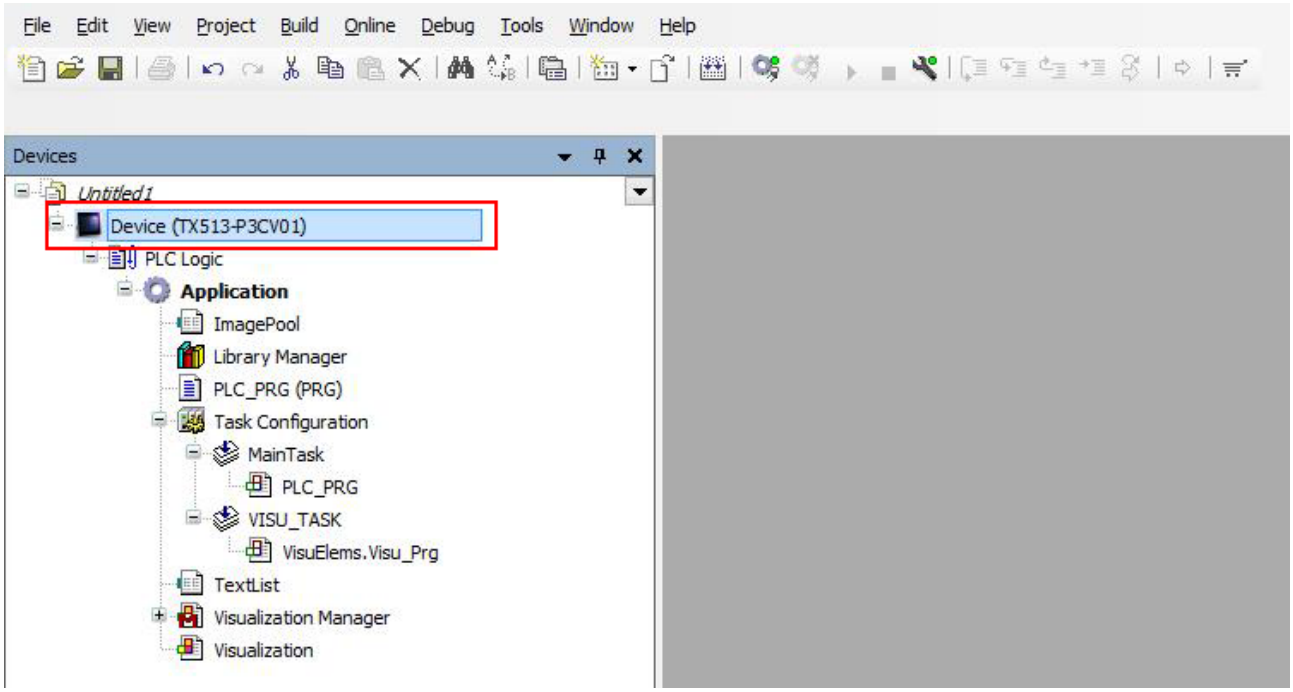


Fig. 26: Project tree

- ▶ Select “Append device”.
- ▶ Select an Ethernet adapter.
- ▶ Click “Append device”.
- ⇨ The Ethernet adapter appears as Ethernet (Ethernet) in the project tree.

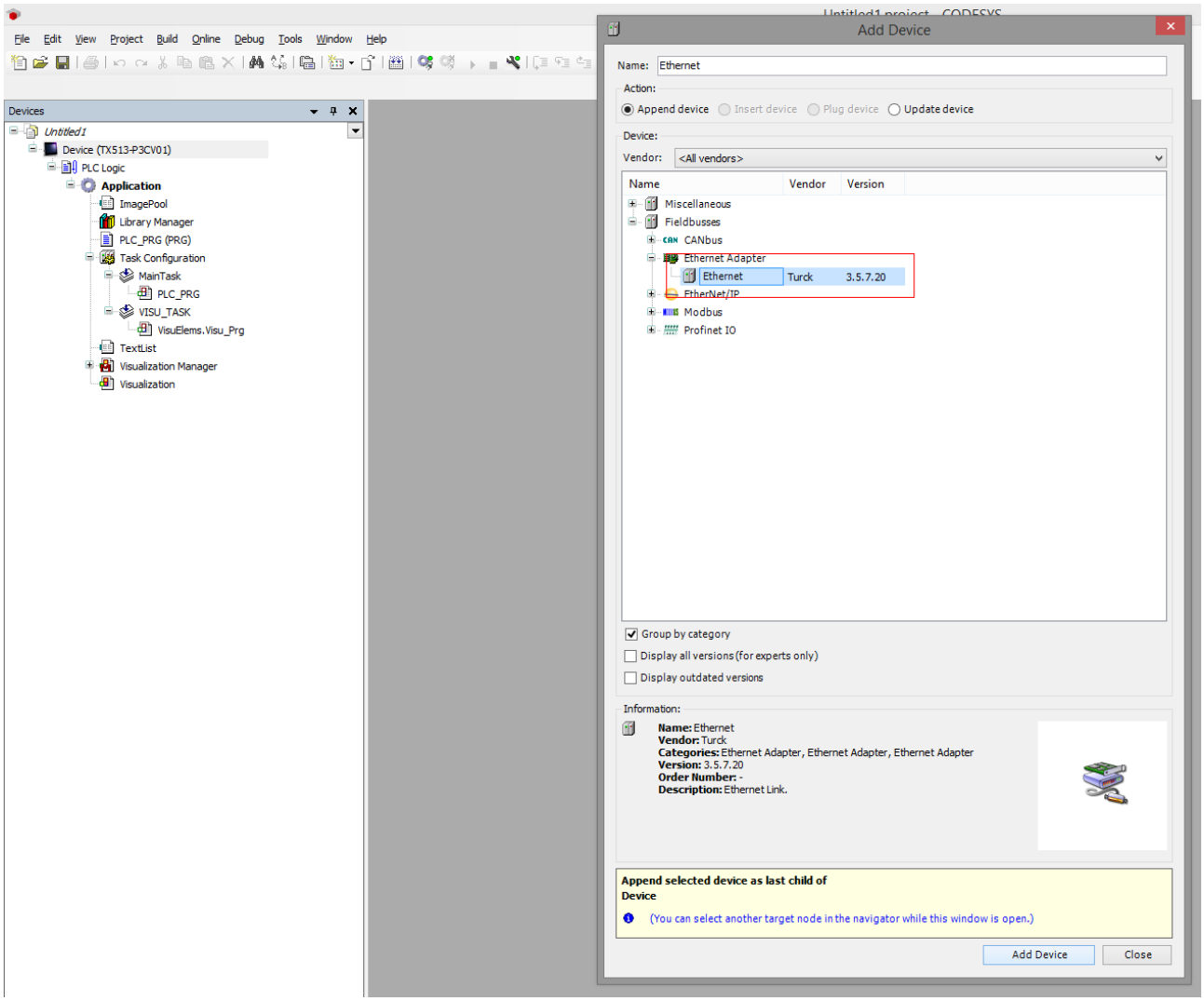


Fig. 27: Adding an Ethernet adapter

Adding a Modbus master

- ▶ Right-click “Ethernet (Ethernet)” in the project tree.
- ▶ Select “Append device”.
- ▶ Double-click “Modbus TCP master”.
- ⇨ The Modbus TCP master appears as “Modbus_TCP_Master” in the project tree.

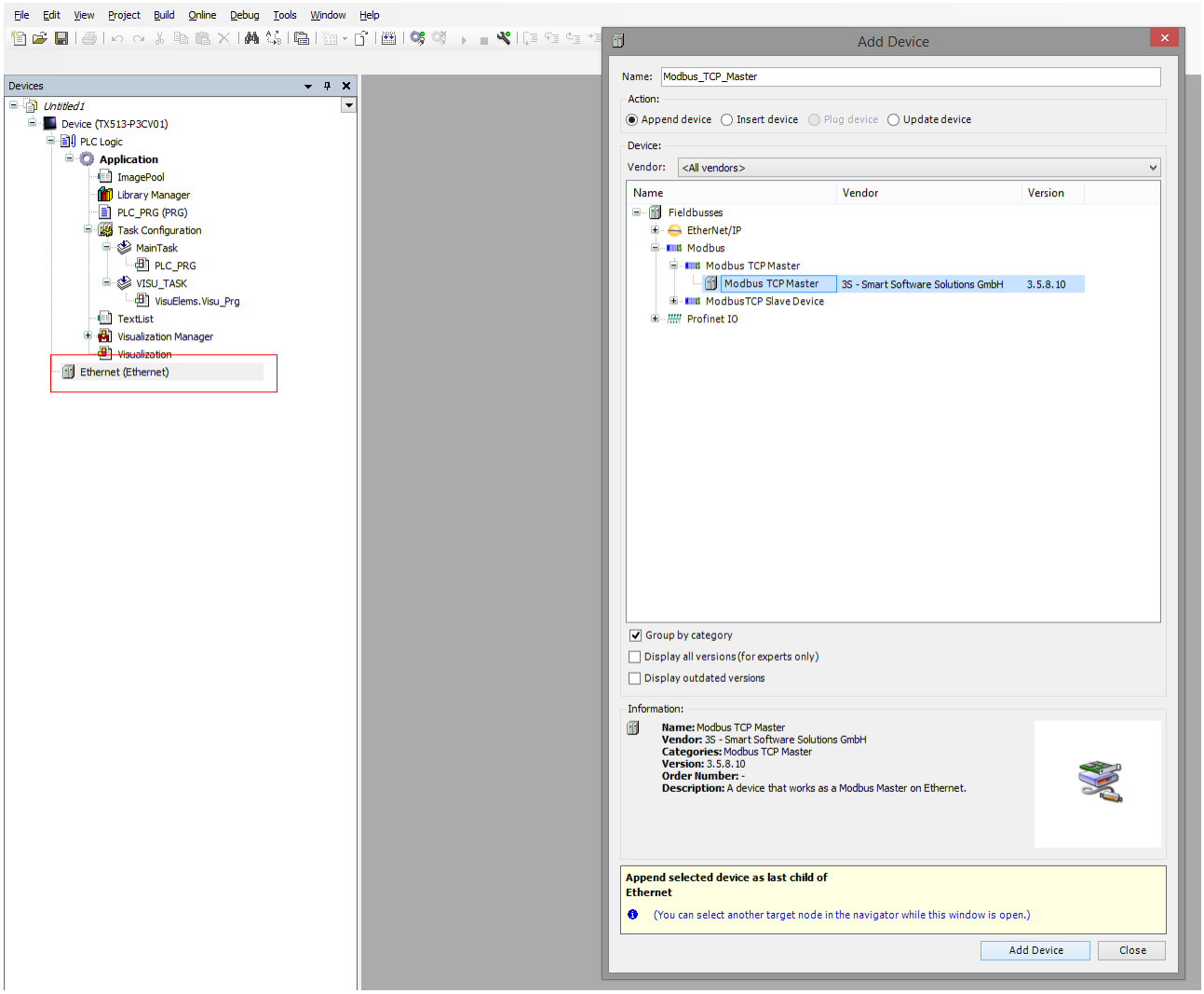


Fig. 28: Adding a Modbus master

Adding a Modbus slave

- ▶ Click Modbus slave in the project tree.
- ▶ Press F2.
- ▶ Enter a new device name (here: TBEN_L5_4RFID_CDS).
- ⇨ The Modbus TCP slave appears as “Modbus_TCP_Slave” in the project tree.

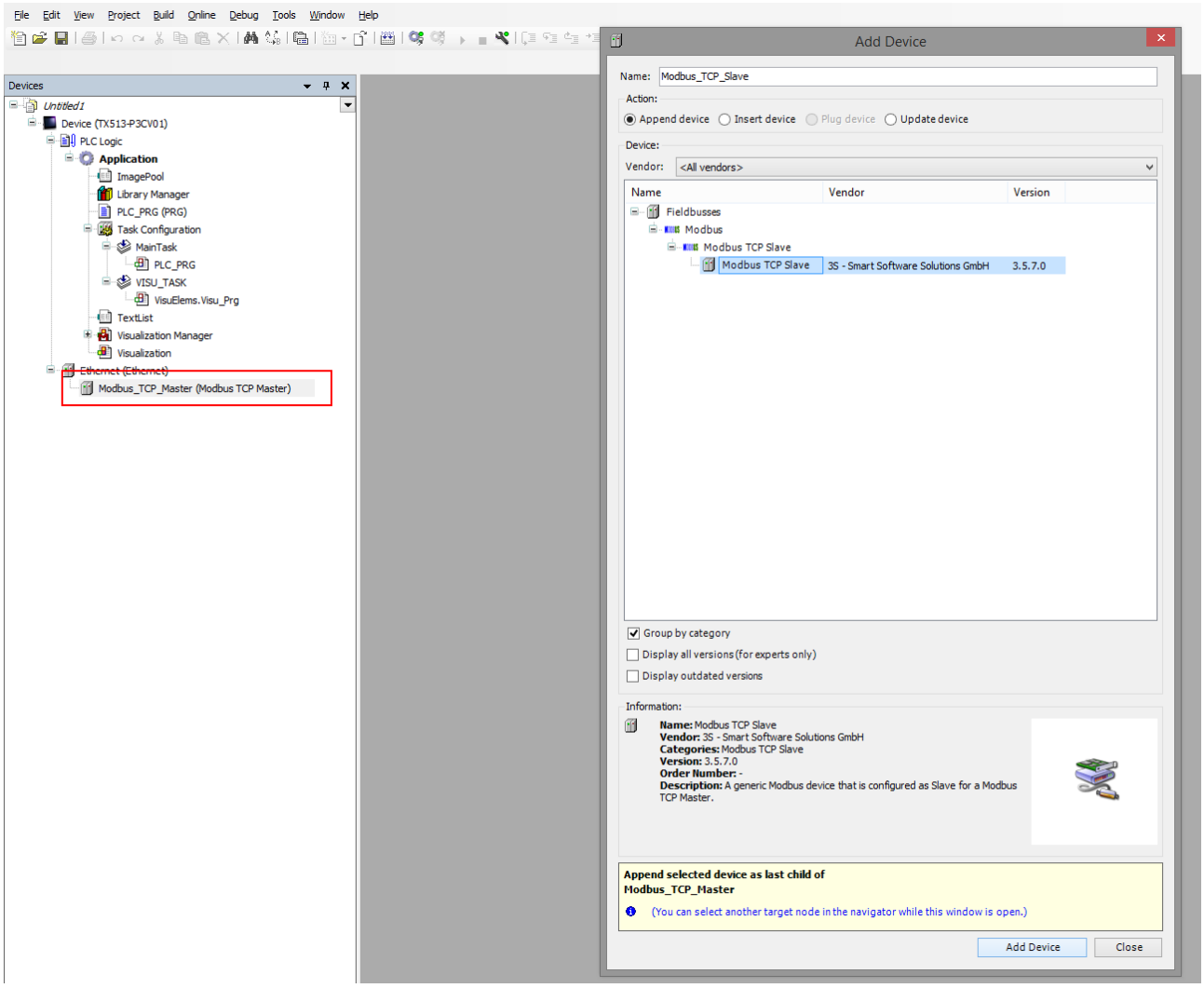


Fig. 29: Adding a Modbus slave

7.2.2 Renaming a Modbus slave

- Click Modbus slave in the project tree.
- Press F2.
- Adapt the name of the slave in the application project tree (here: TBEN_L5_4RFID_CDS).

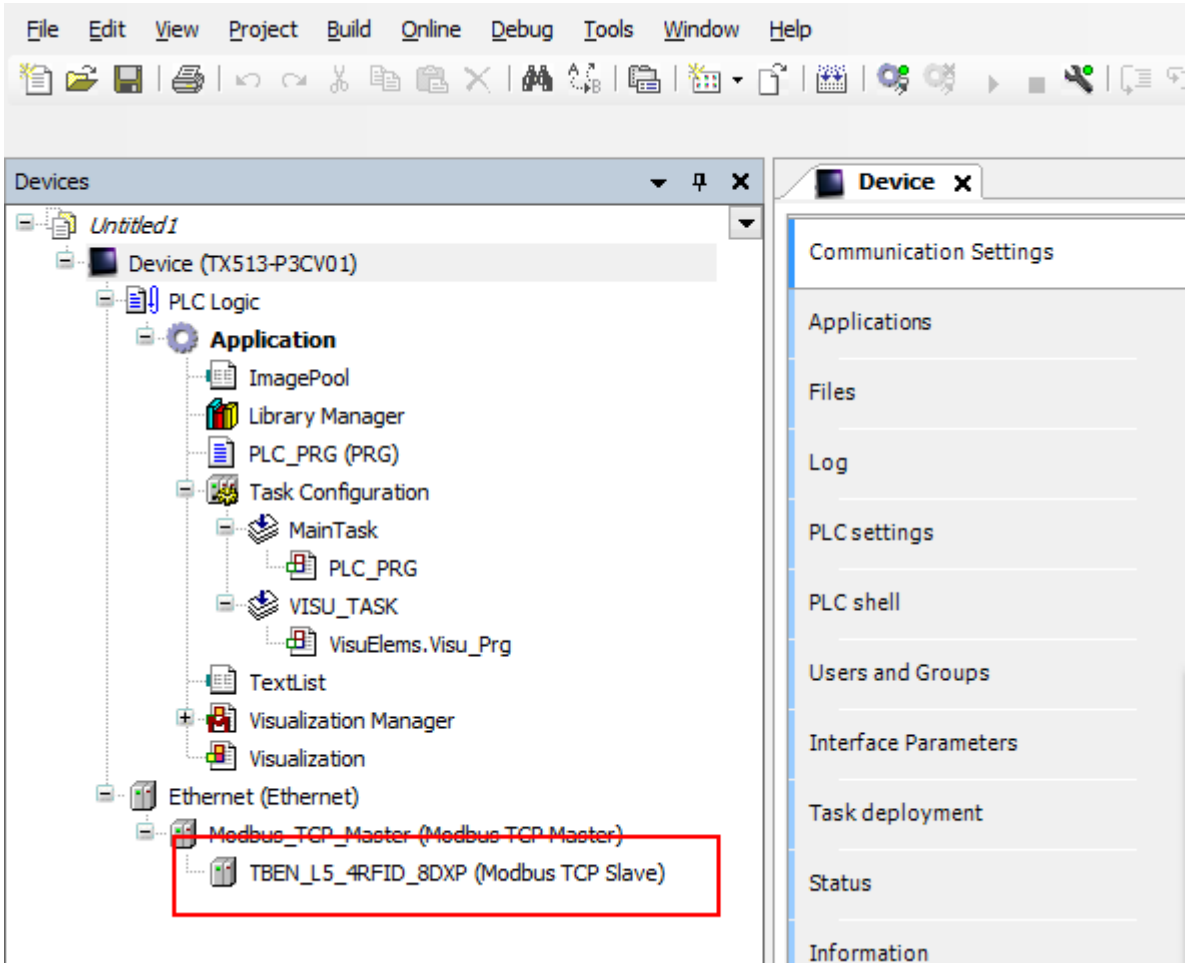


Fig. 30: Renaming a Modbus slave

7.2.3 Setting up network interfaces

- Click “Device” → “Scan network”.
- Select Modbus master (here: TX507-P3CV01) and confirm with OK.

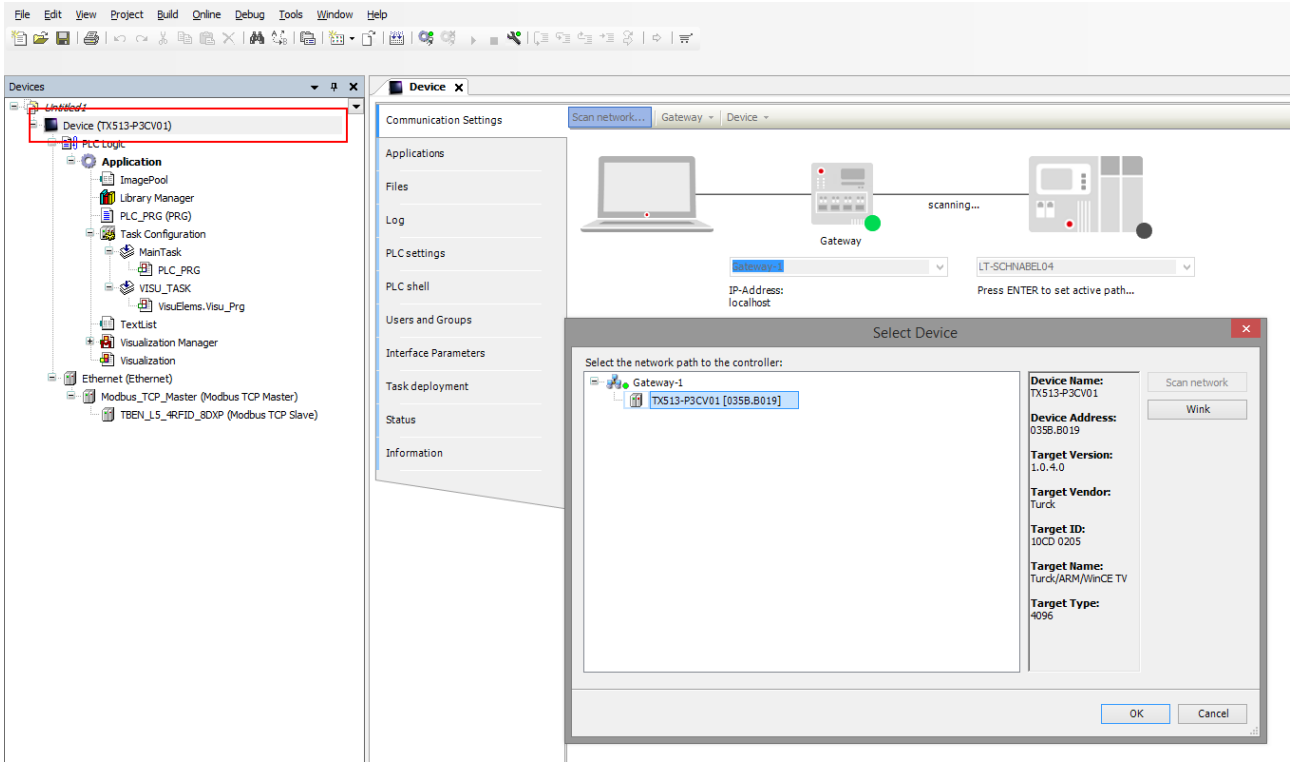


Fig. 31: Setting up a network interface to the Modbus master

- Select the “PLC Settings” tab.
- In the “Always refresh variables” drop-down menu, select “Activate 2 (always in the bus cycle task)”.

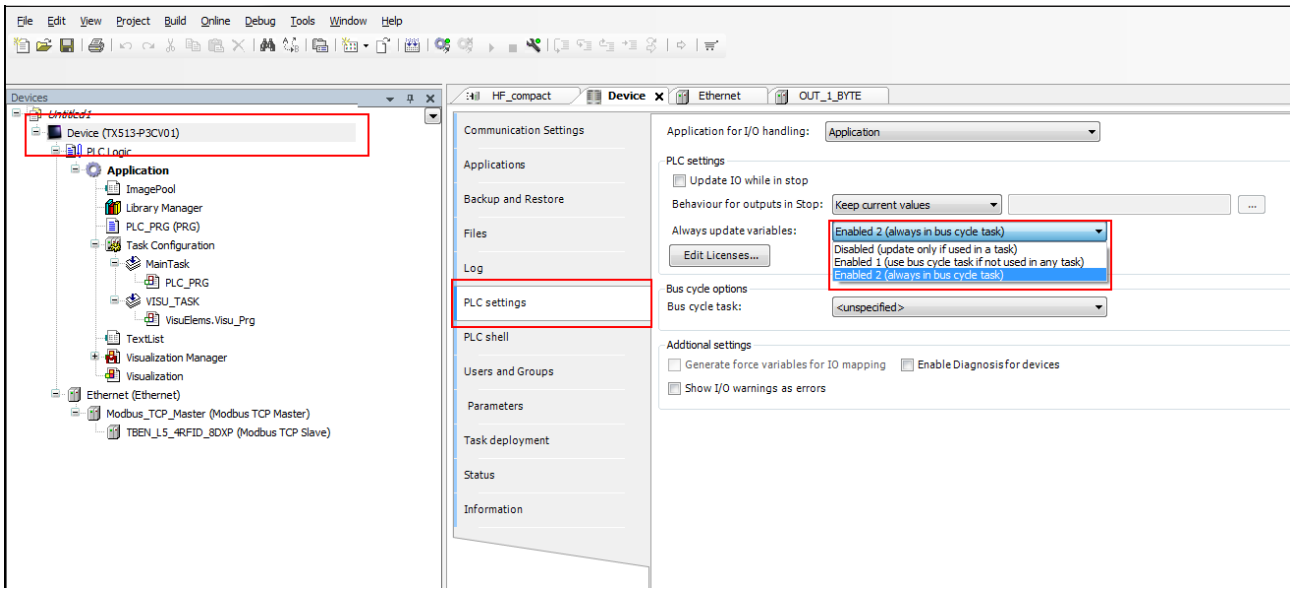


Fig. 32: Selecting the “Always refresh variables” option

- Double-click “Ethernet”.
- Enter the IP address of the Modbus master (here: 192.168.1.25).

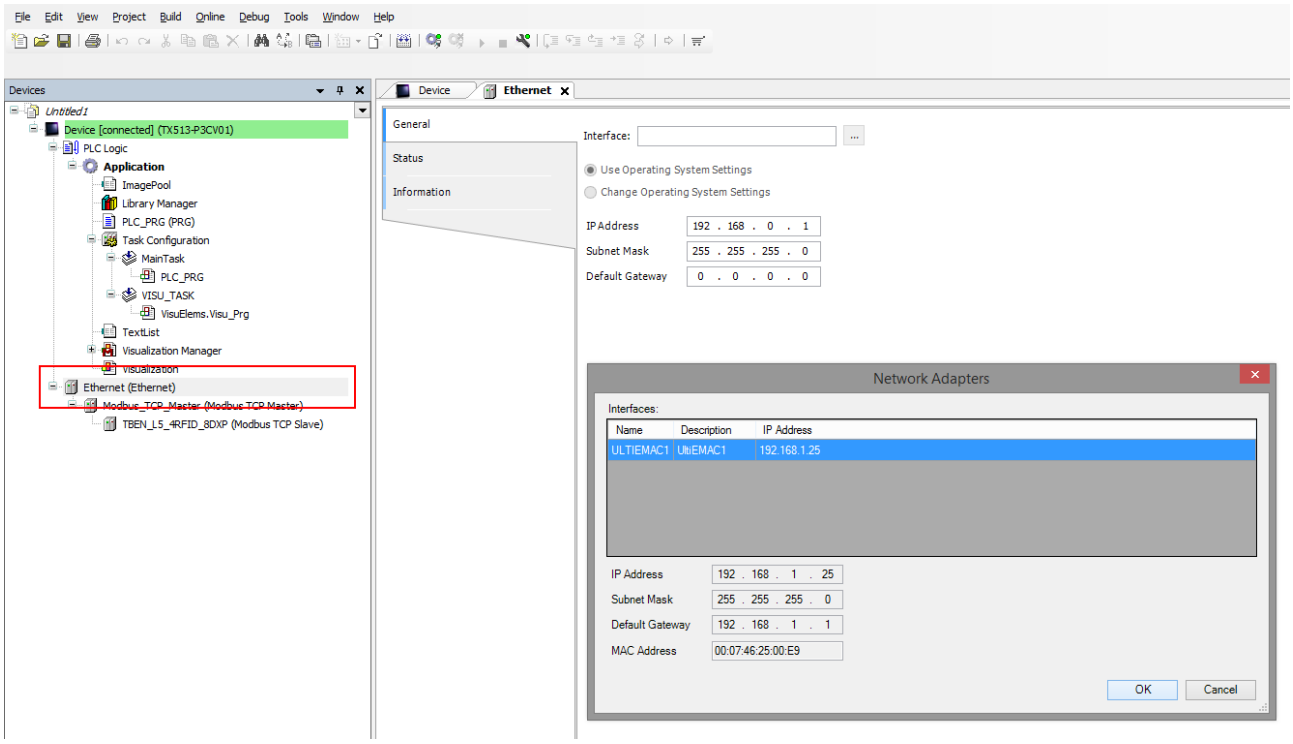


Fig. 33: Modbus master – Entering the IP address

- Double-click the Modbus TCP slave.
- In the “General” tab enter the IP address of the slave (here: 192.268.1,100

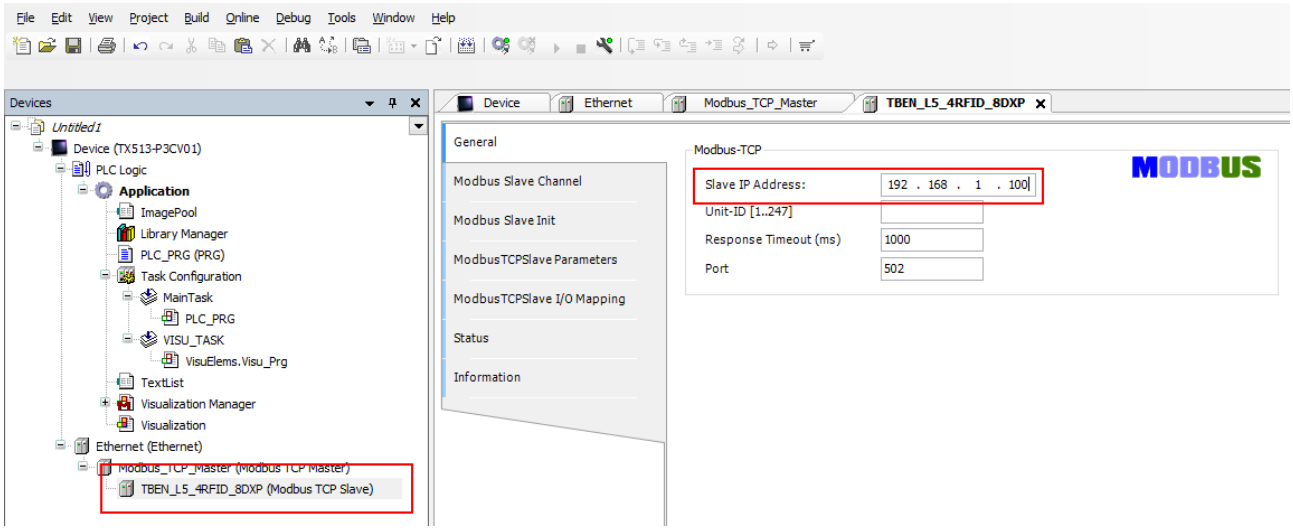


Fig. 34: Modbus slave – Entering the IP address

7.2.4 Setting Modbus channels (registers)

Set channel 0 (input data)

- ▶ Double-click the Modbus TCP slave.
- ▶ In the “Modbus slave channel” tab select → “Add channel”.
- ▶ Enter the following values:
  - Name of channel
  - Access type: Read holding registers
  - Offset: 0x0000
  - Length: 64 registers (128 bytes)
- ▶ Confirm with OK.

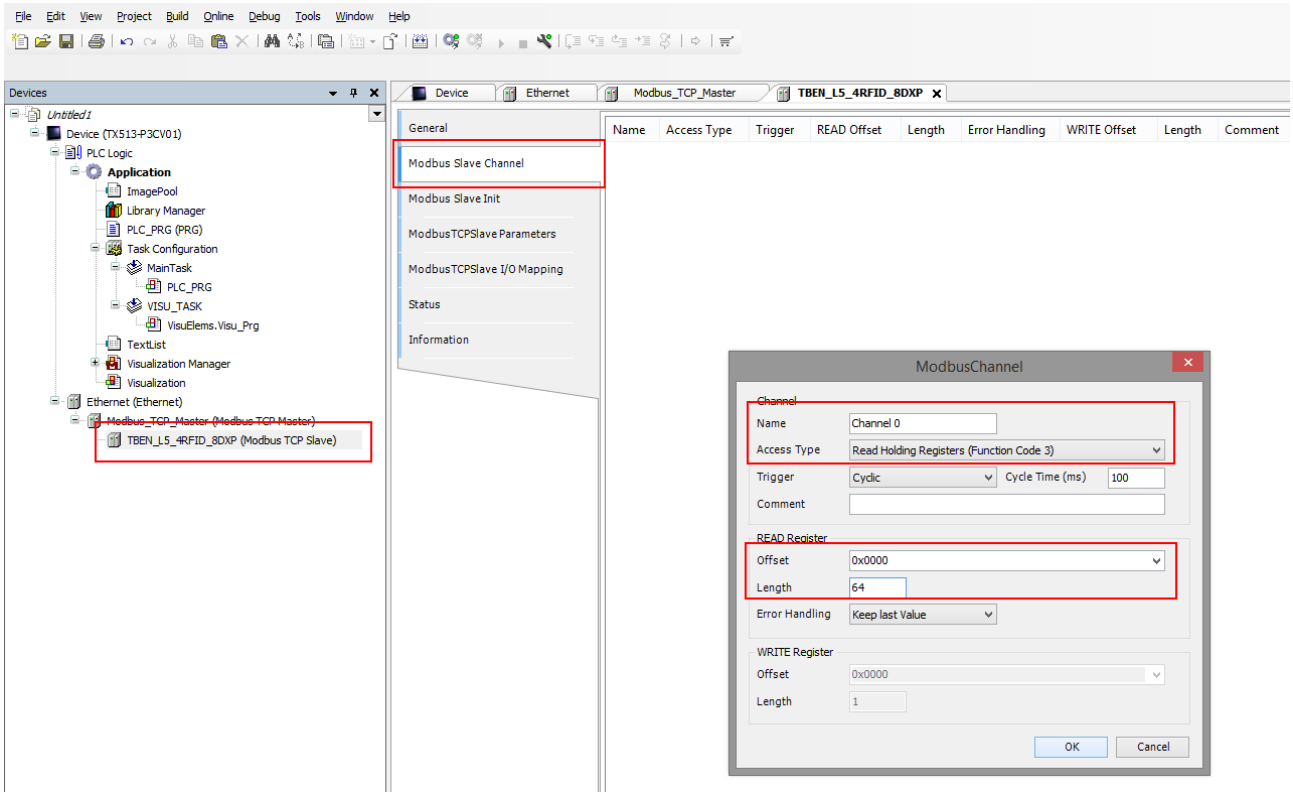


Fig. 35: Setting the READ register

Set channel 1 (output data)

- ▶ Double-click the Modbus TCP slave.
- ▶ In the “Modbus slave channel” tab select → “Add channel”.
- ▶ Enter the following values:
  - Name of channel
  - Access type: Write Holding Registers
  - Offset: 0x0000
  - Length: 64 registers (128 bytes)
- ▶ Confirm with OK.

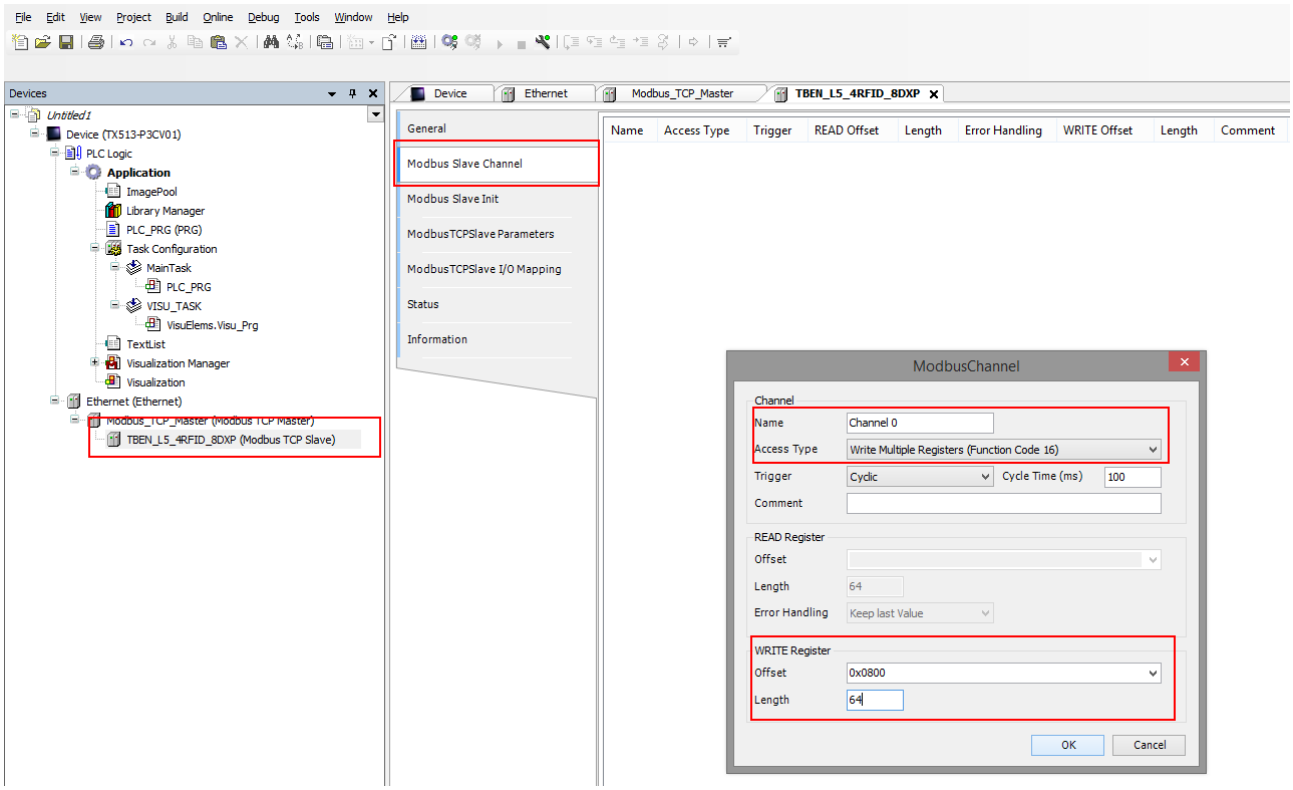


Fig. 36: Setting the WRITE registers

7.2.5 Setting the I/O mapping

To create I/O mapping the local I/Os must be added to the project and connected with the Modbus master.

- ▶ Right-click the name of the project in the project tree.
- ▶ Select “Append device”.
- ▶ Double-click “TBEN-Lx-4RFID-8DXP-CDS”.
- ⇨ The local I/Os appear in the project tree.

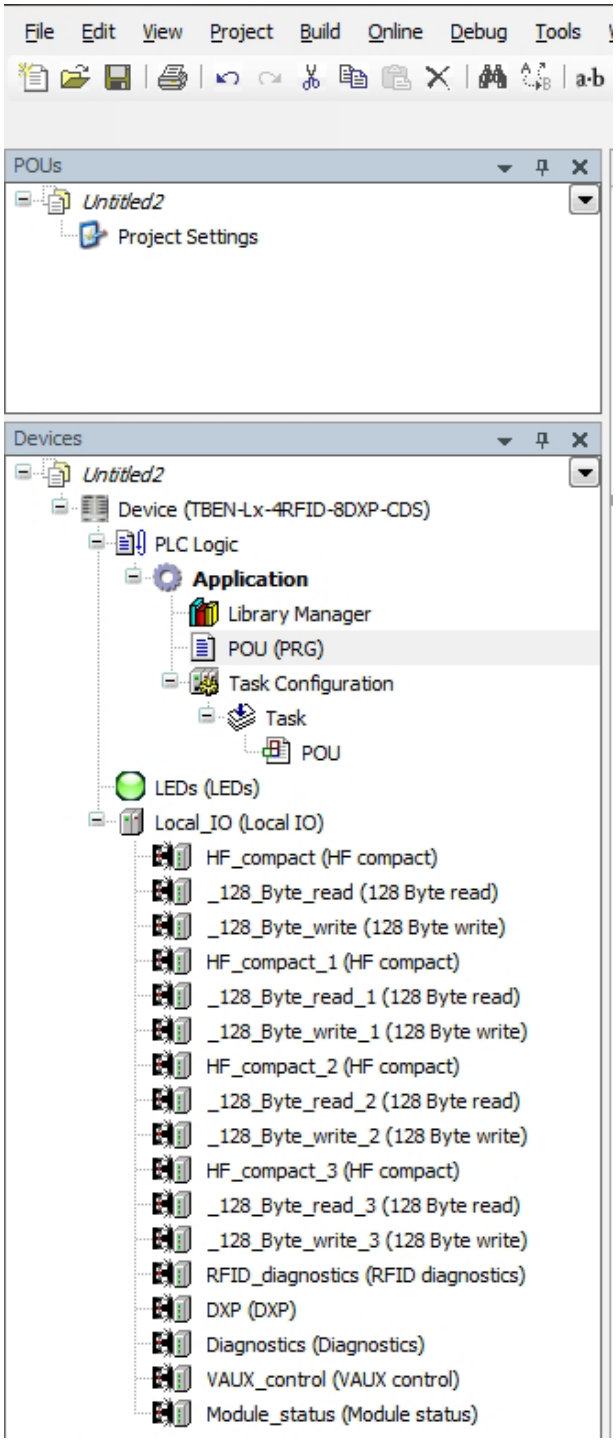


Fig. 37: Adding local I/Os to the project.

Attaching the Ethernet adapter to the local I/Os

- Right-click “TBEN-Lx-4RFID-8DXP” in the project tree.
- Select “Append device”.
- Double-click “Ethernet”.

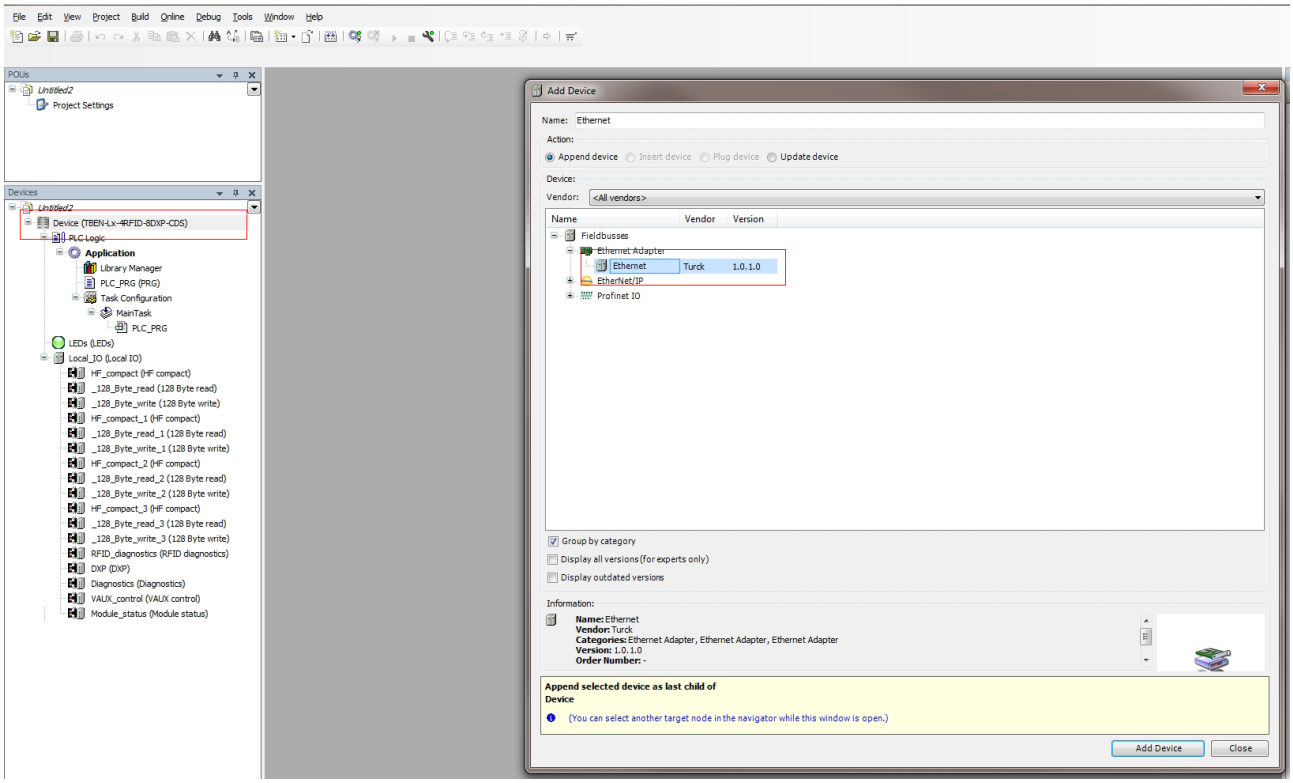


Fig. 38: Attaching the Ethernet adapter to the local I/Os

Attaching the Modbus TCP slave to the local I/Os

- Right-click “Ethernet” in the project tree.
- Select “Append device”.
- Double-click “Modbus TCP slave device”.

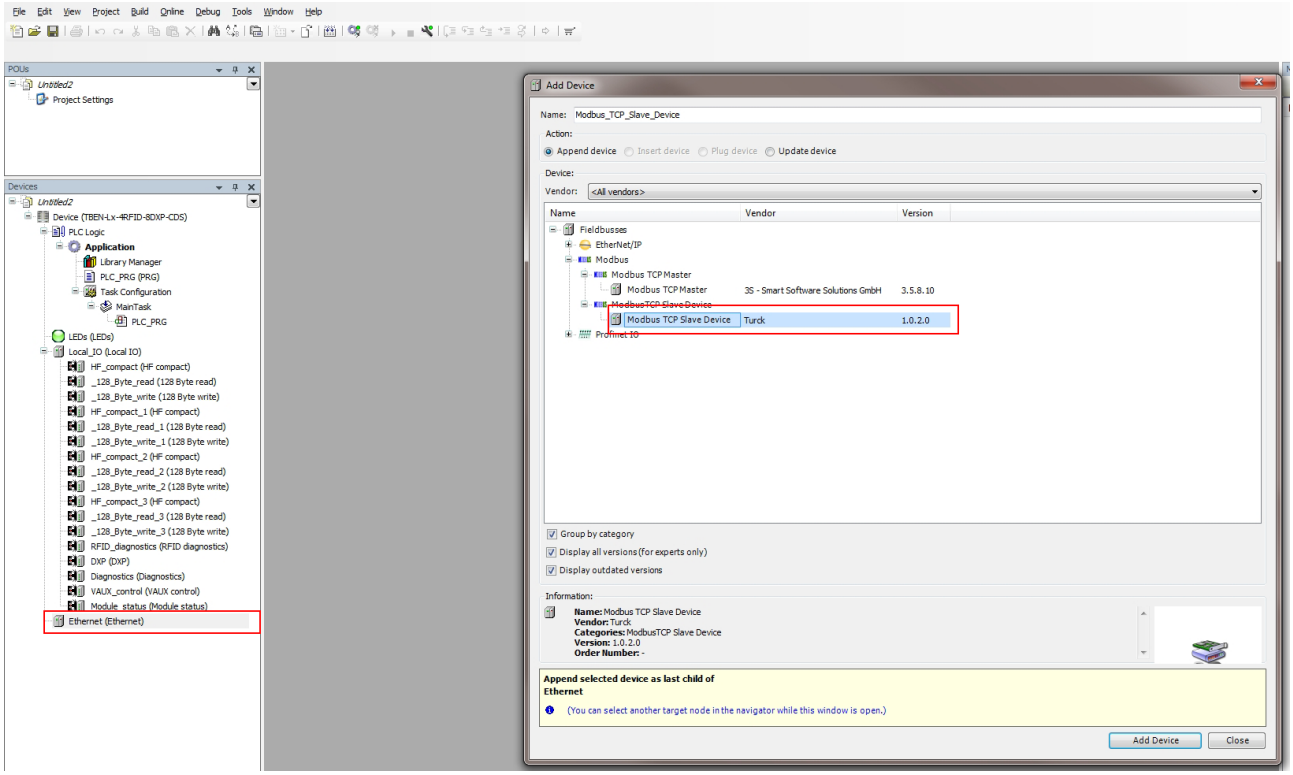


Fig. 39: Attaching the Modbus TCP slave to the local I/Os

Local I/Os – Setting the Ethernet interface

- Double-click “TBEN-Lx-4RFID-8DXP-CDS” in the project tree.
- In the “Communication” tab click the “Scan network” button.
- Select TBEN-L5-4RFID-8DXP-CDS and confirm with “OK”.

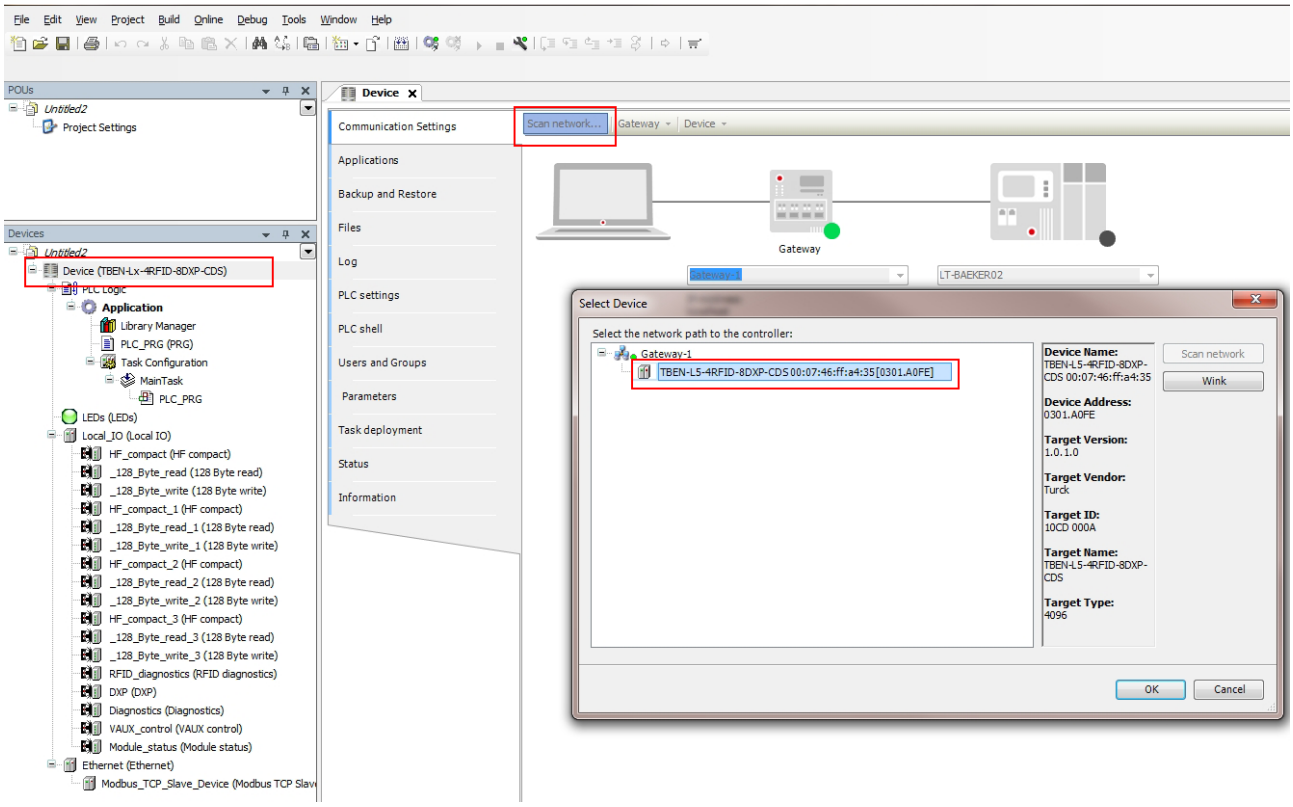


Fig. 40: Setting up the Ethernet interface to the connected TBEN-L5-4RFID-8DXP interface

- Select the “PLC Settings” tab.
- In the “Always refresh variables” drop-down menu, select “Activate 2 (always in the bus cycle task)”.

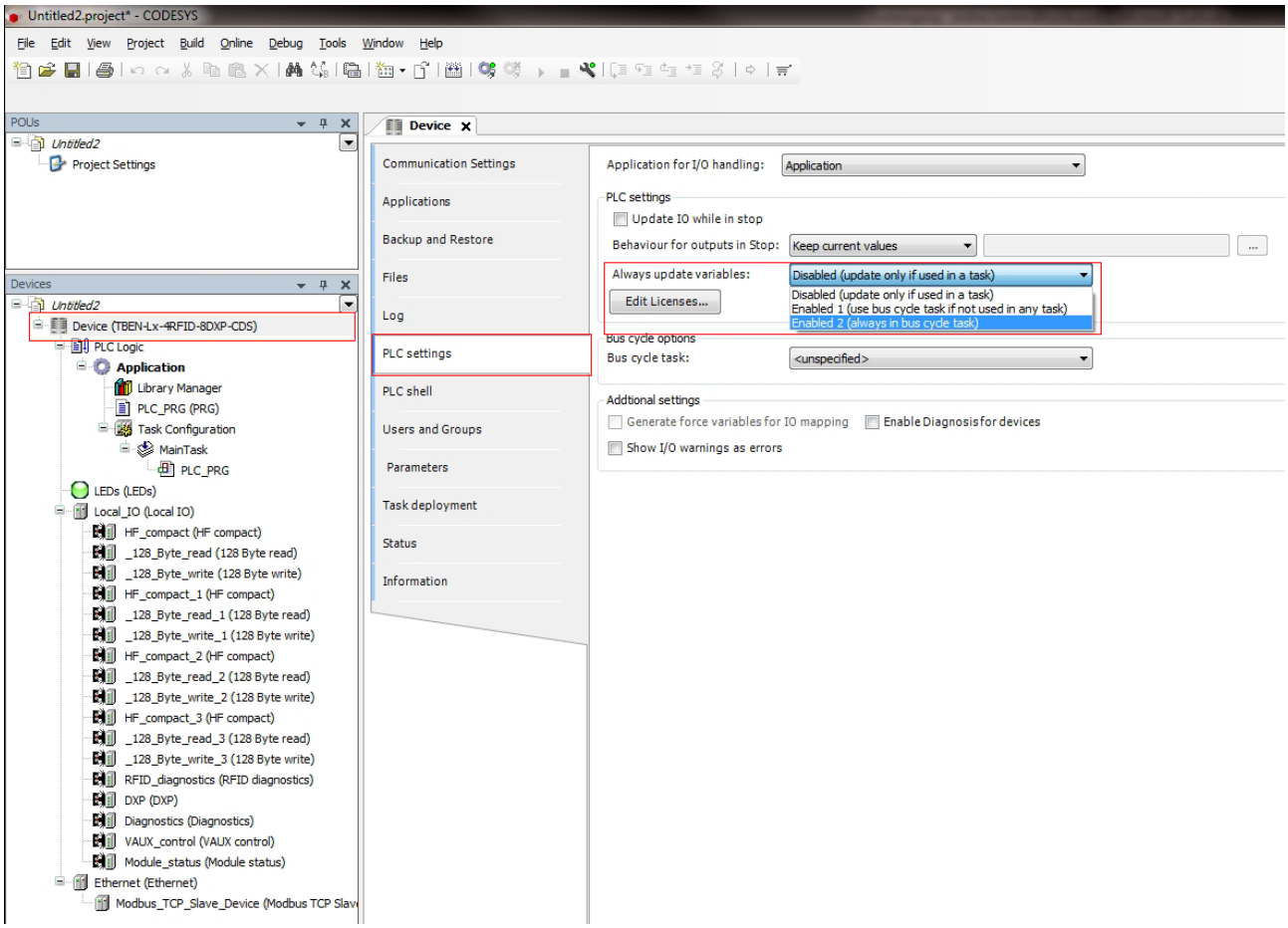


Fig. 41: Setting the “Always refresh variables” option

- ▶ Double-click “TBEN-Lx-4RFID-8DXP-CDS”.
- ▶ Enter the IP address of the Modbus slave (here: 192.168.1.100).

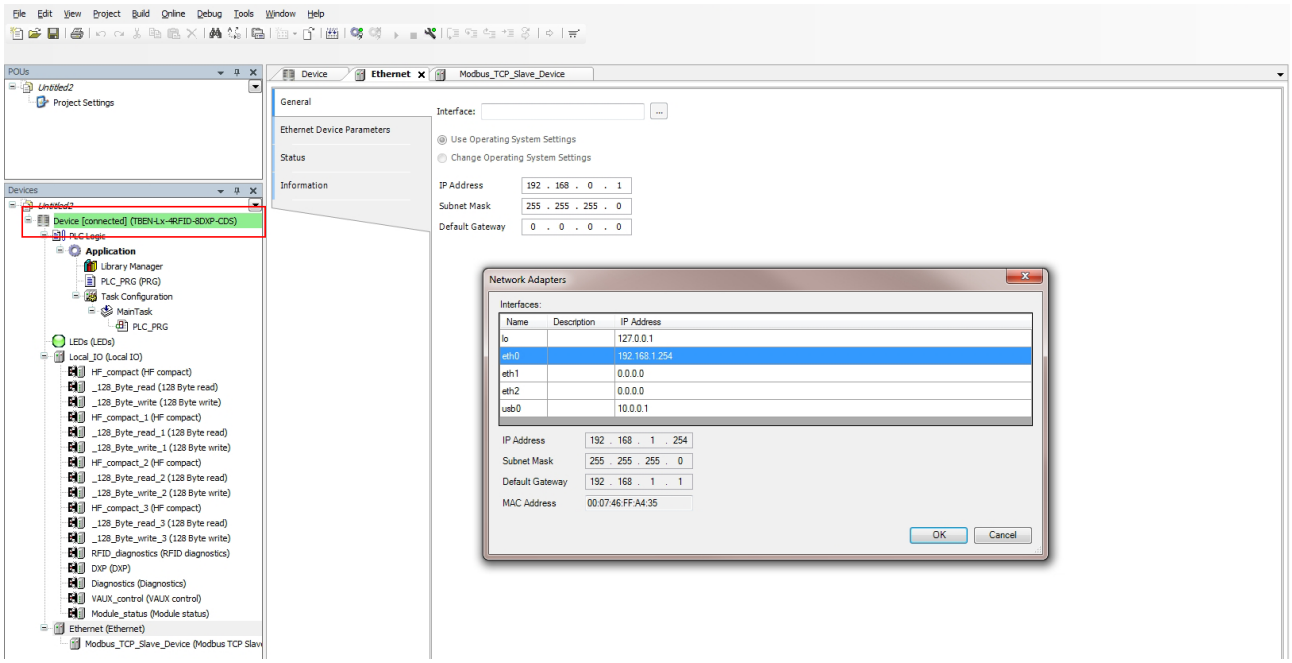


Fig. 42: Modbus master – Entering the IP address

7.2.6 Writing the application to the device

To establish communication between Modbus master and TBEN-L…-4RFID-8DXP-CDS an executable application must be present in the device.

- Right-click “Application” in the project tree.
- Choose “Add object” → “Task configuration” in the context menu.

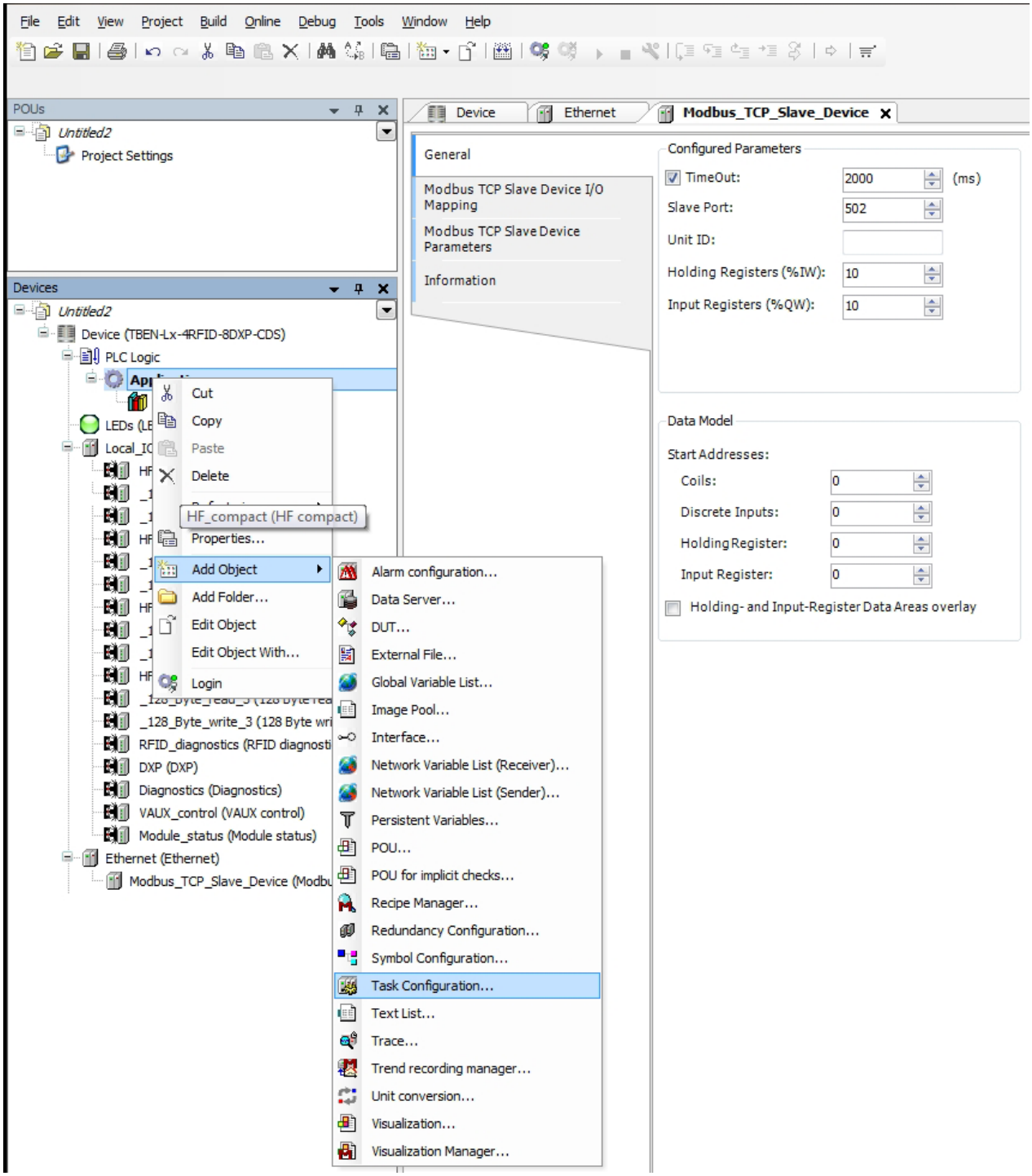


Fig. 43: Adding a task for the application

Adding Program Organization Unit (POU)

This example uses a simple POU to map the “Tag present” bit to the inputs of the Modbus master.

- Right-click “Application” in the project tree.
- Choose “Add object” → “POU...” in the context menu.

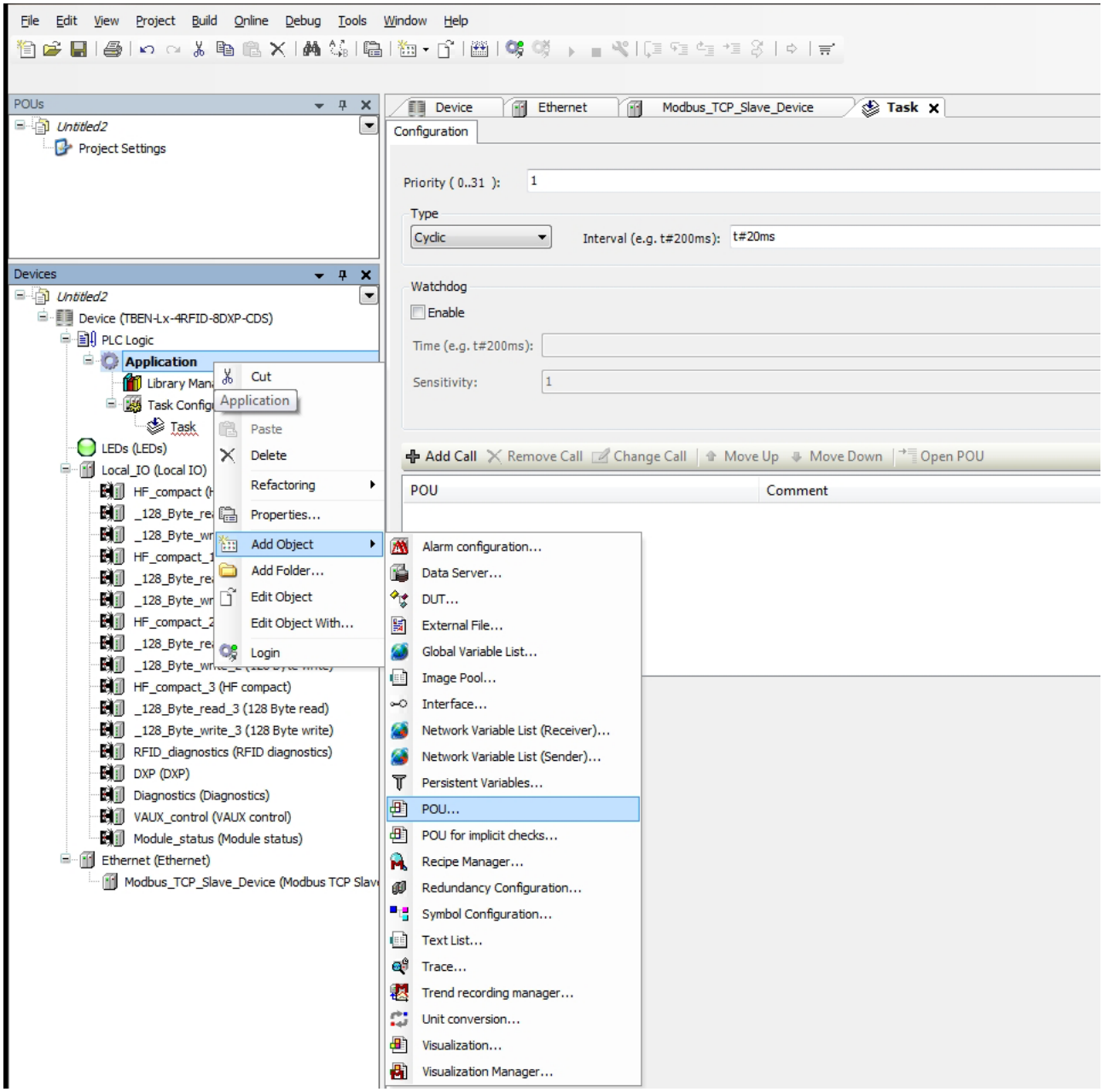


Fig. 44: Adding a POU

▶ Add the POU to the application: Click OK.

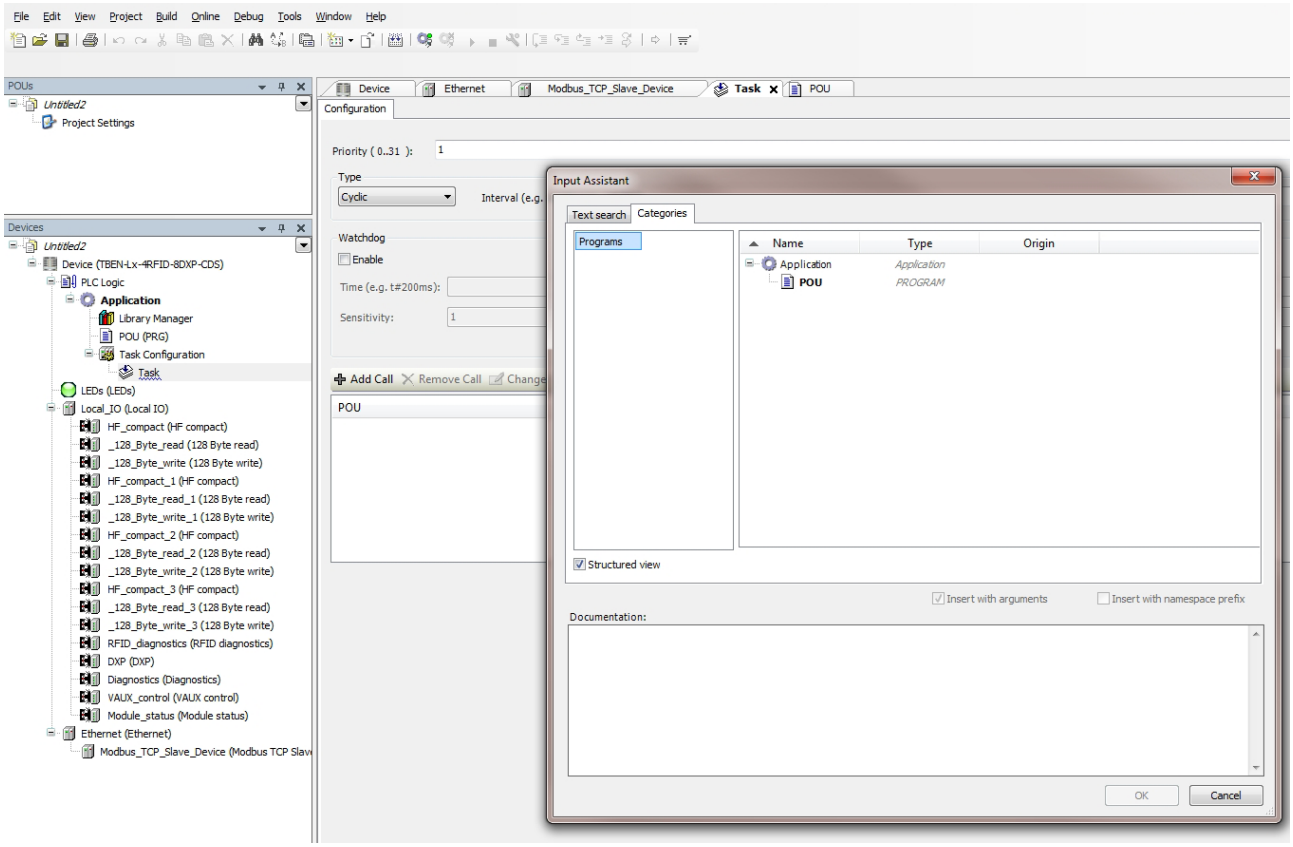


Fig. 45: Adding the POU to the application

Mapping local I/Os of the Modbus master

- ▶ Obtain the address of the “Tag present” bit from the mapping for the selected operating mode (here: HF compact).

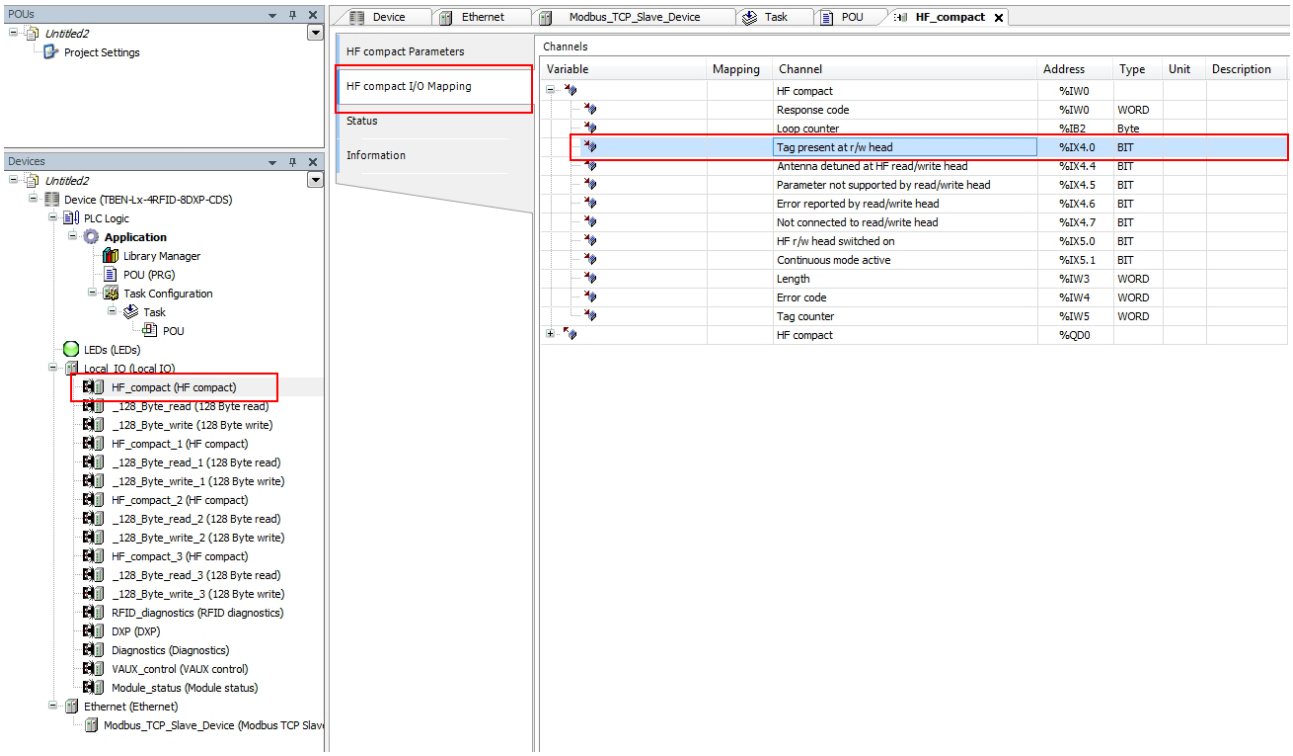


Fig. 46: Address of the “Tag present” input bit in the local I/Os of the RFID interface

- Obtain the address for the “Tag present” output bit from the mapping for the slave device.

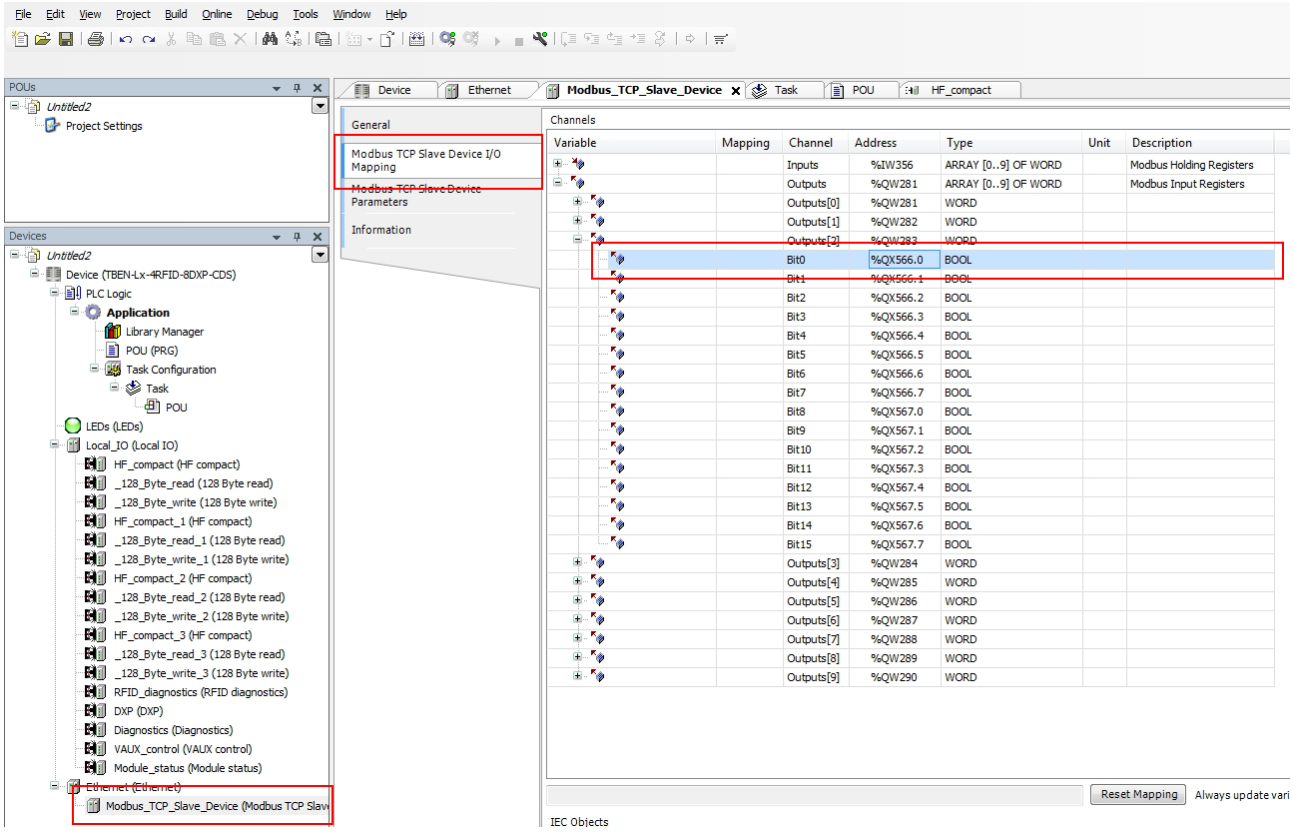


Fig. 47: Address for the output bit

▶ Transferring the mapping to the POU

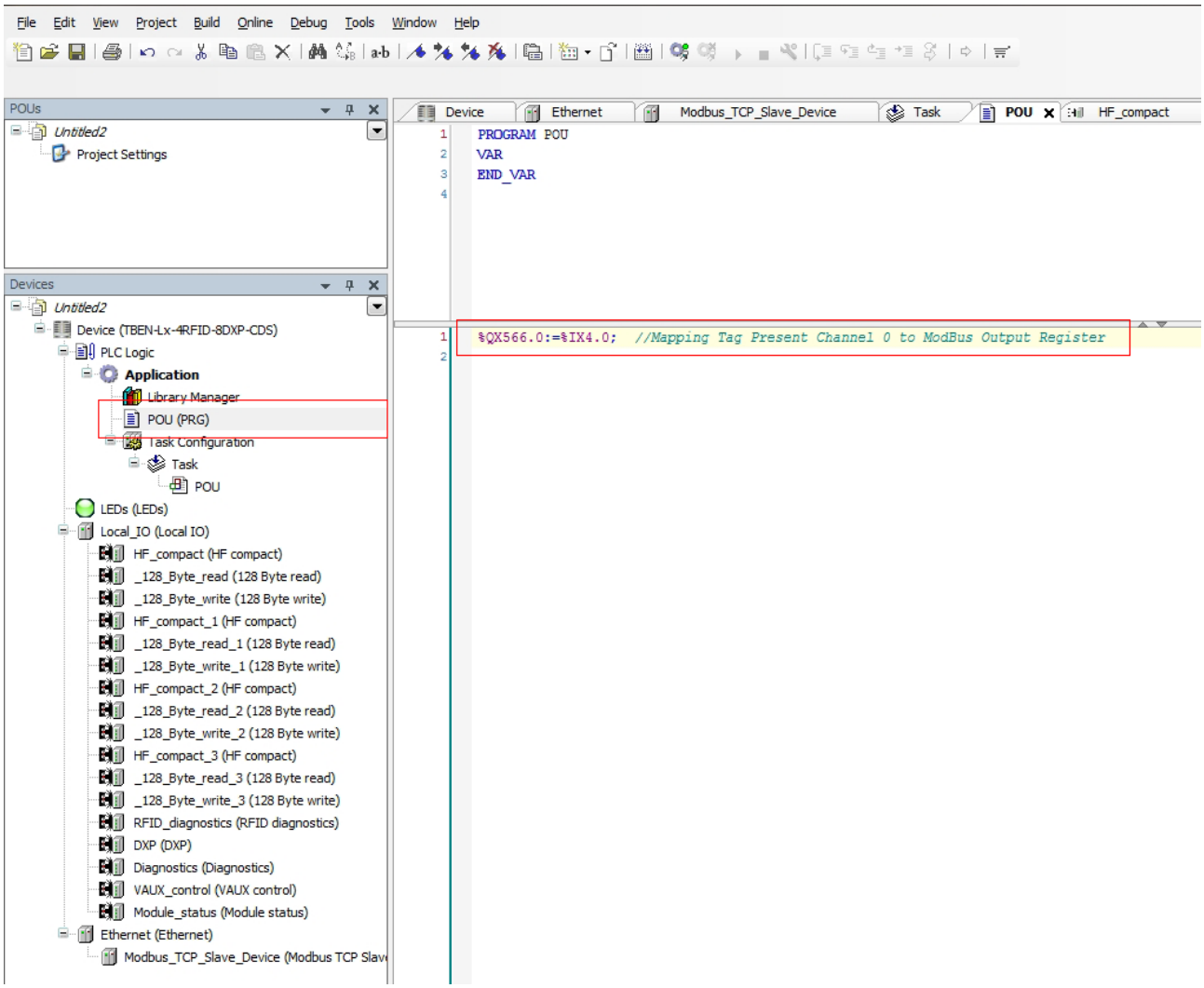


Fig. 48: Transferring the mapping to the POU

7.2.7 Connecting the device online with the controller

- ▶ Select device.
- ▶ Click Online → Login.

7.2.8 Reading out process data

The process data can be interpreted if the device is connected online with the controller.

- ▶ Double-click the Modbus TCP slave.
- ▶ Click the “Modbus TCP Slave I/O image” tab.
- ⇨ The process data is displayed. In this example, the “Tag present” bit is set if a tag is present in the detection range of the read/write head connected to channel 1.

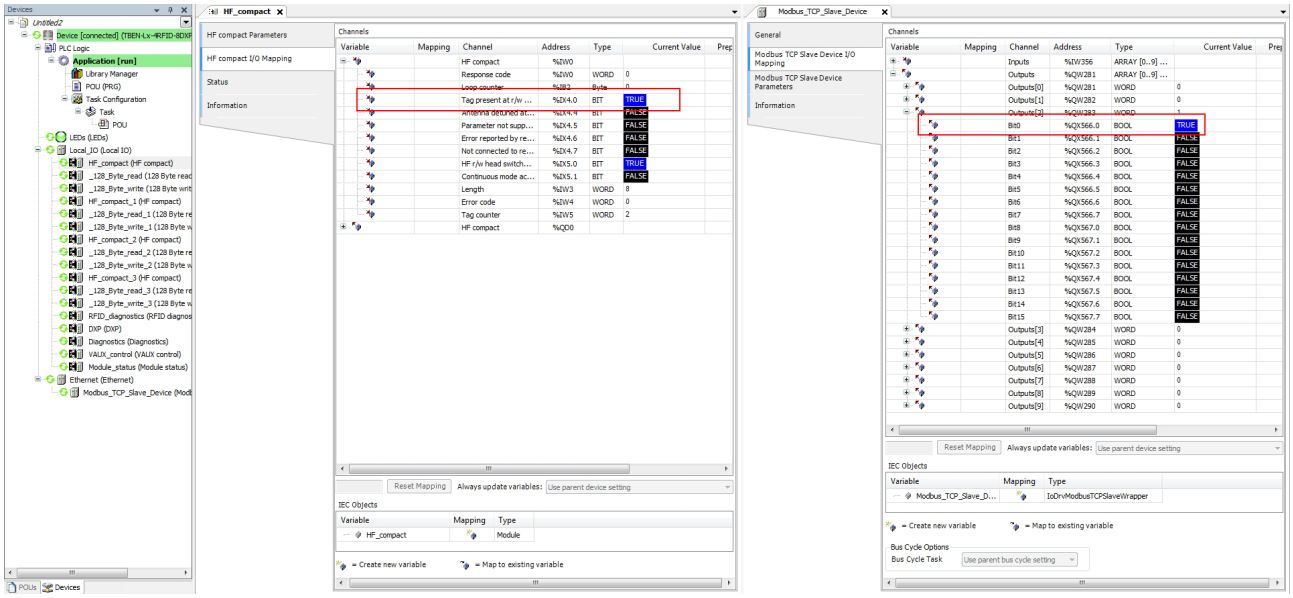


Fig. 49: Example: Process data

7.3 Connecting a device to an EtherNet/IP™ controller

In this example the "Tag present" bit is queried. This requires the network interface to be set up, the hardware configured and the I/O mapping defined.

Hardware used

This example uses the following hardware components:

- Rockwell controller CompactLogix L30ER
- TBEN-L5-4RFID-8DXP-CDS block module (IP address: 192.168.1.100)
- TN-Q80-H1147 HF read/write head

Software used

This example uses the following software:

- Rockwell RS Logix
- CODESYS 3.5.8.1 (download free of charge from **www.turck.com**)
- EDS file for TBEN-4RFID-8DXP-CDS (download free of charge from **www.turck.com**)

Requirements

- The package file for TBEN-L…-4RFID-8DXP-CDS must be installed.
- The generic EDS file CDS_PN_DEVICE must be installed (downloaded free of charge from **www.turck.com**).

7.3.1 Configuring the device in CODESYS as an EtherNet/IP™ slave

- Open CODESYS.
- Create a new standard project.

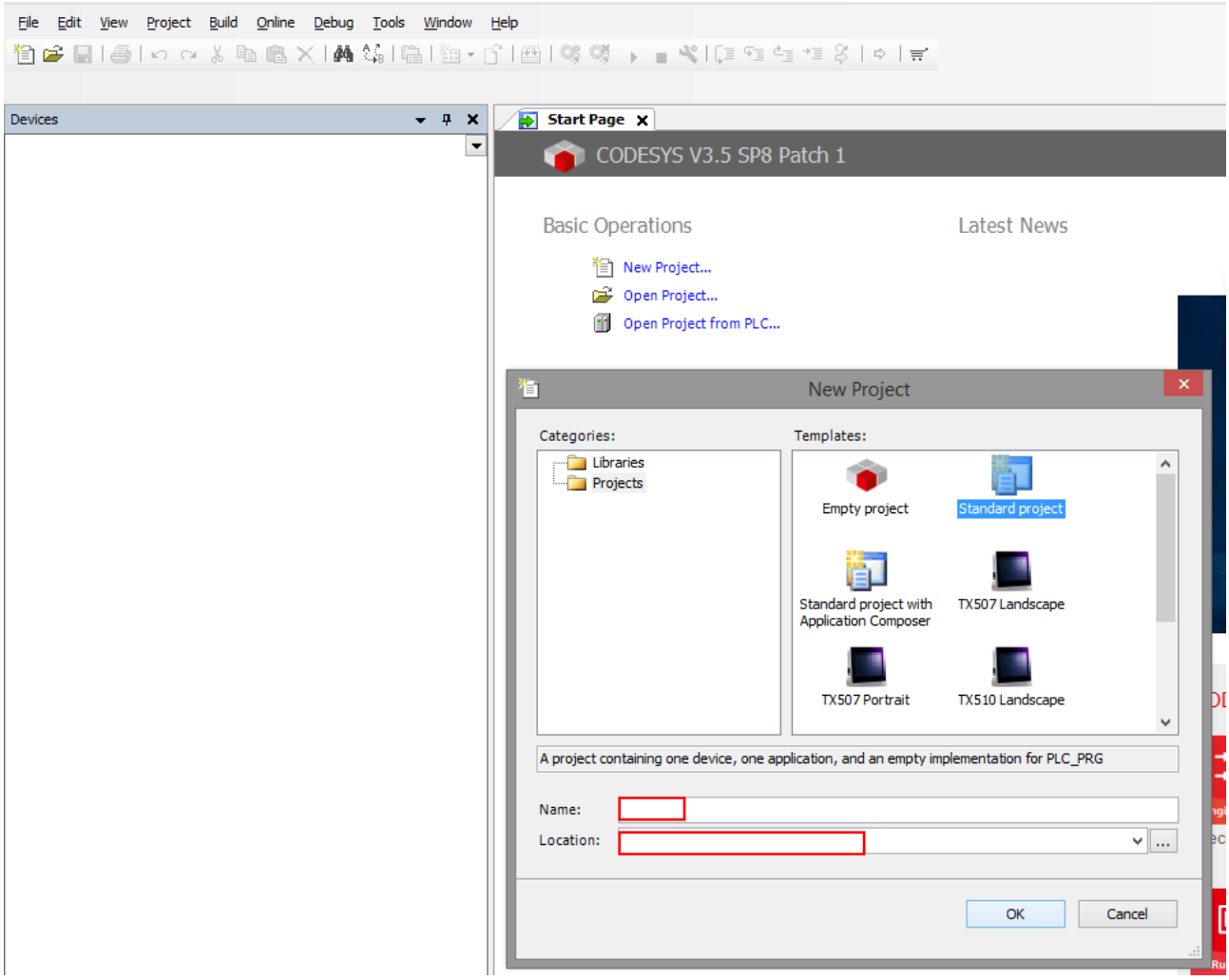


Fig. 50: Creating a new standard project in CODESYS

▶ Select the “TBEN-Lx-4RFID-8DXP-CDS” block module.

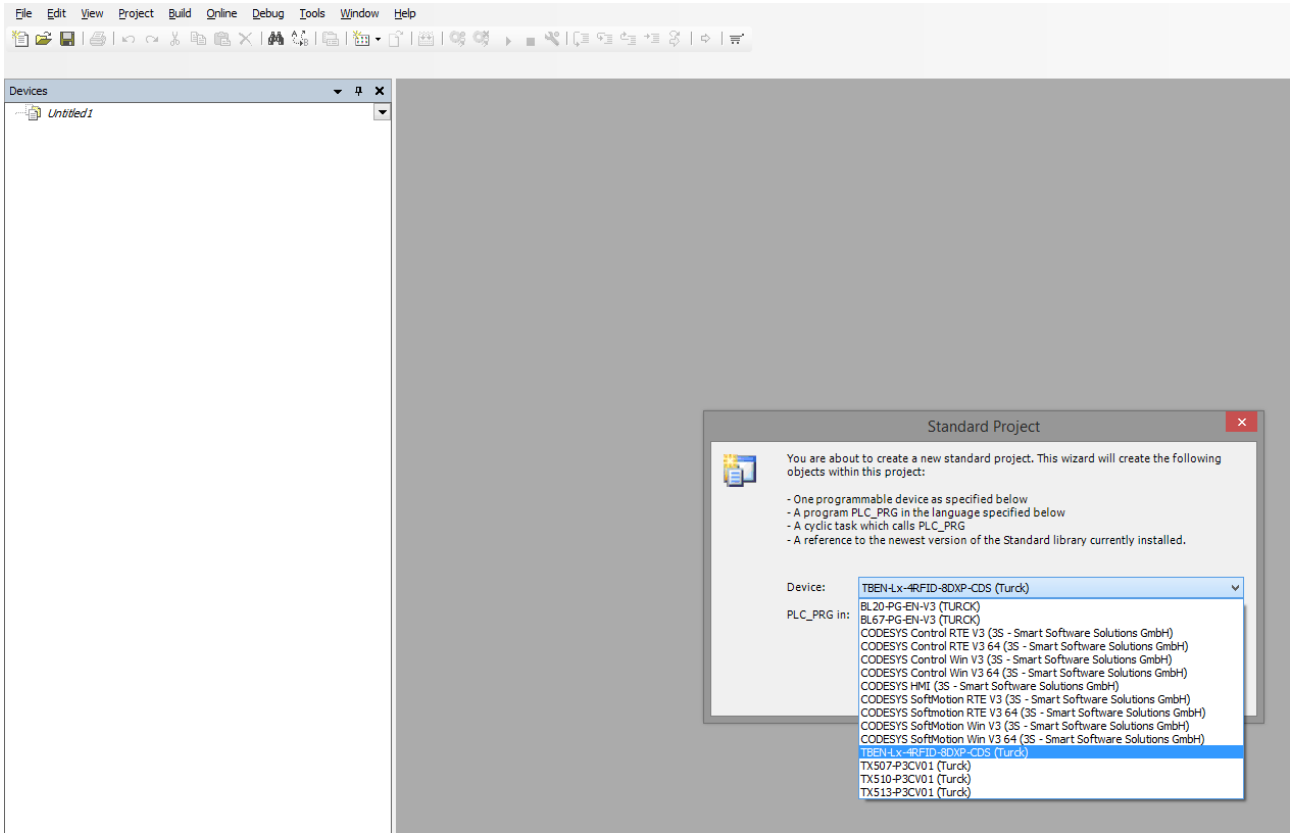


Fig. 51: Selecting TBEN-4RFID-8DXP-CDS

This creates the device in the project tree.

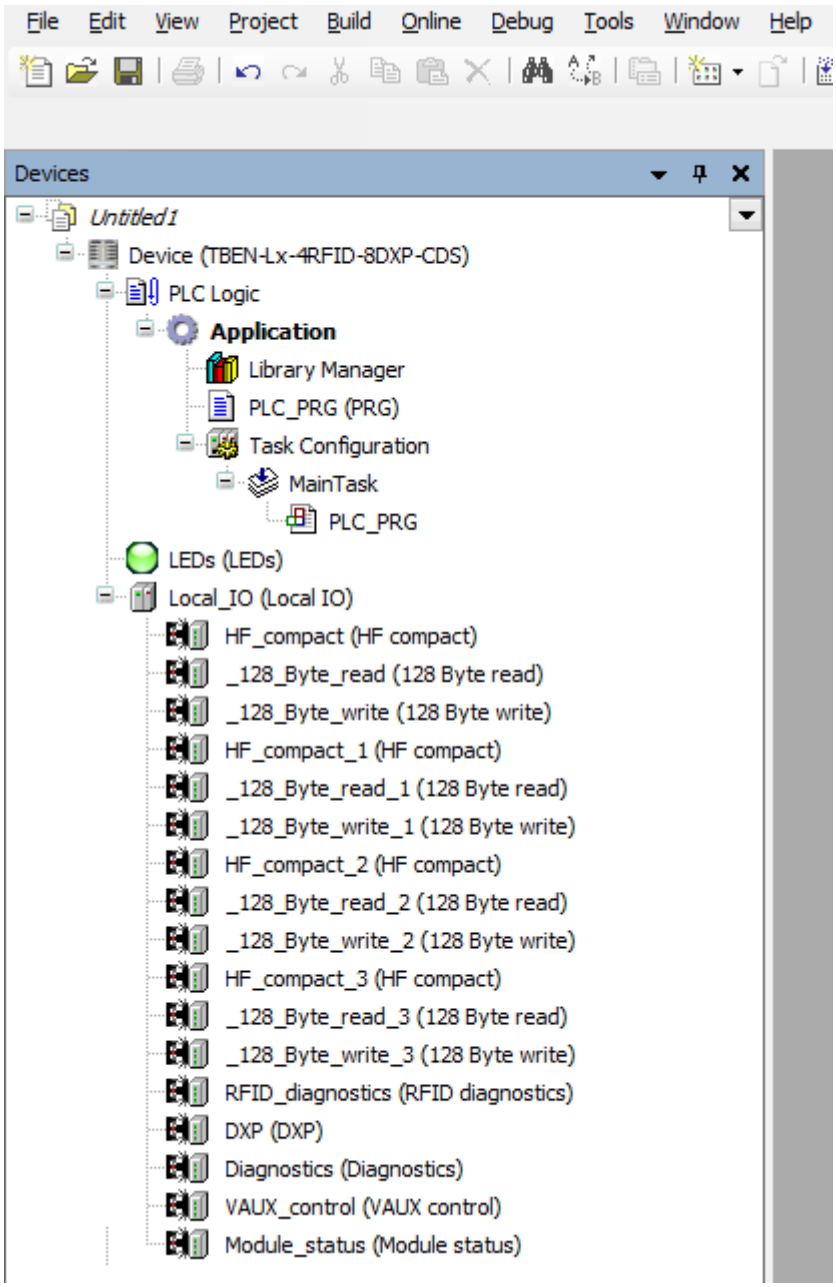


Fig. 52: TBEN-L5-4RFID-8DXP-CDS in the project tree

Adding an Ethernet adapter

- Right-click “Device (TBEN-Lx-4RFID-8DXP-CDS)” in the project tree.
- Select “Append device”.
- Select an Ethernet adapter.
- Click “Append device”.

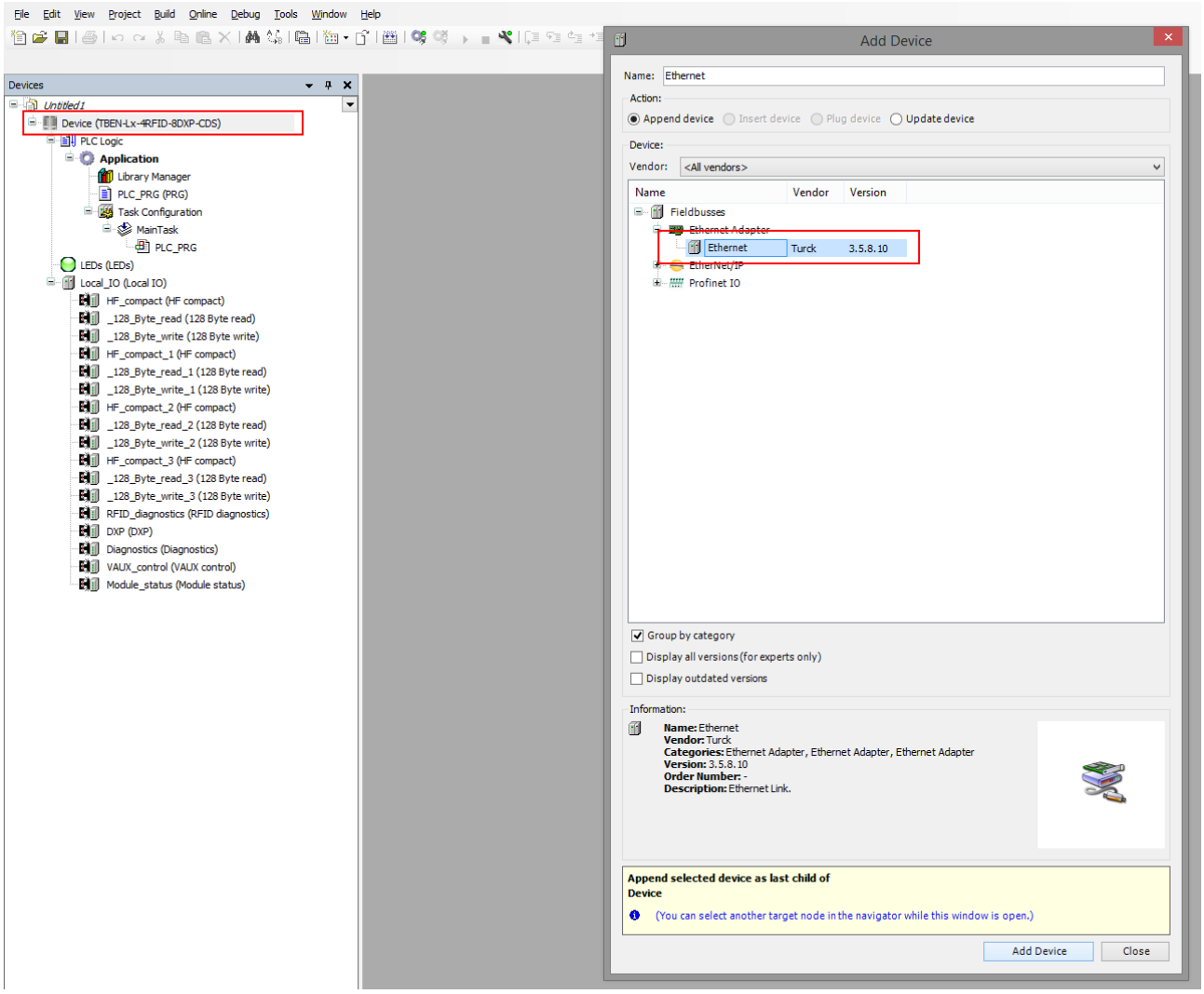


Fig. 53: Adding an Ethernet adapter

Adding the EtherNet/IP™ slave

- Right-click “Ethernet (Ethernet)” in the project tree.
- Select “Append device”.
- Select an “EtherNet/IP™ device”.
- Click “Append device”.

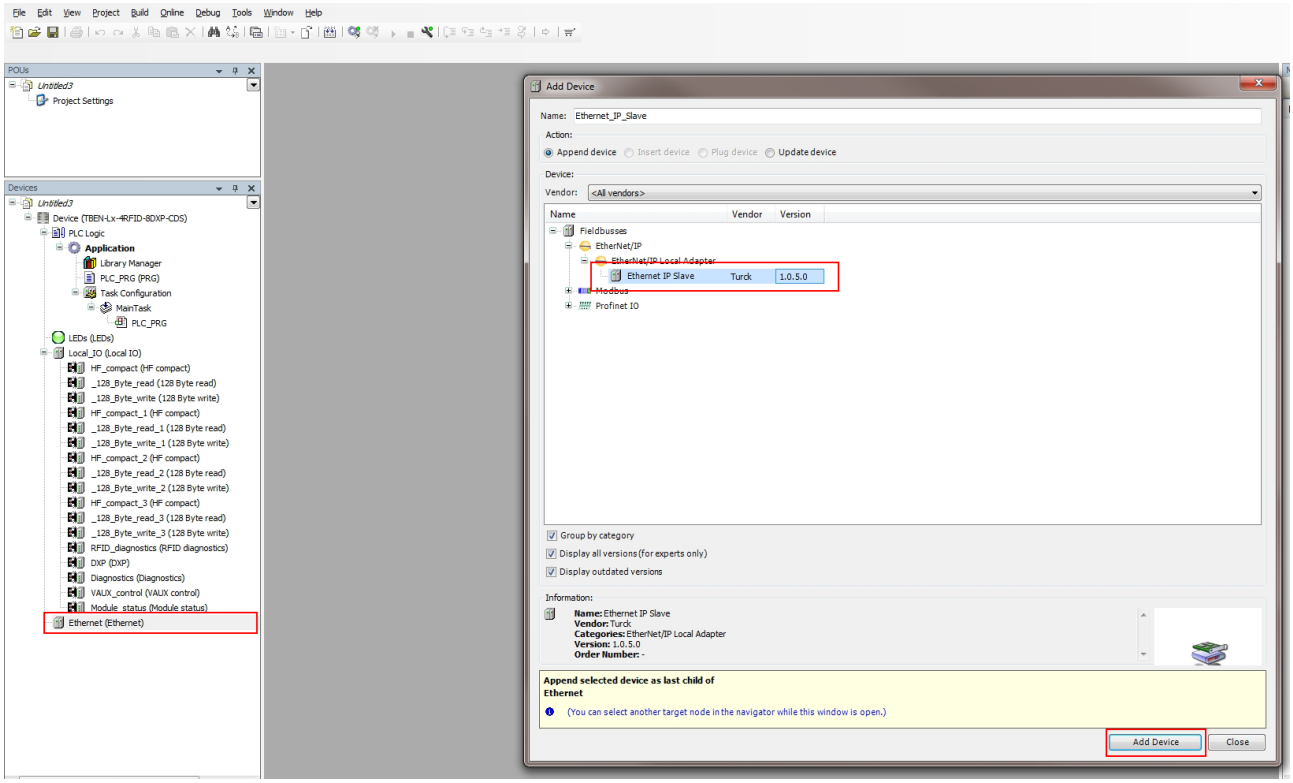


Fig. 54: Adding the EtherNet/IP™ slave

Assigning inputs and outputs

- ▶ Right-click “EtherNet/IP™_Device (EtherNet/IP™ Device)” in the project tree.
- ▶ Select “Append device”.
- ▶ Example: Double-click “IN 1 WORD”.
- ▶ Example: Double-click “OUT 1 WORD”.
- ▶ Click “Append device”.

NOTE
The sockets defined as inputs in CODESYS correspond to the outputs in RS Logix and vice versa.

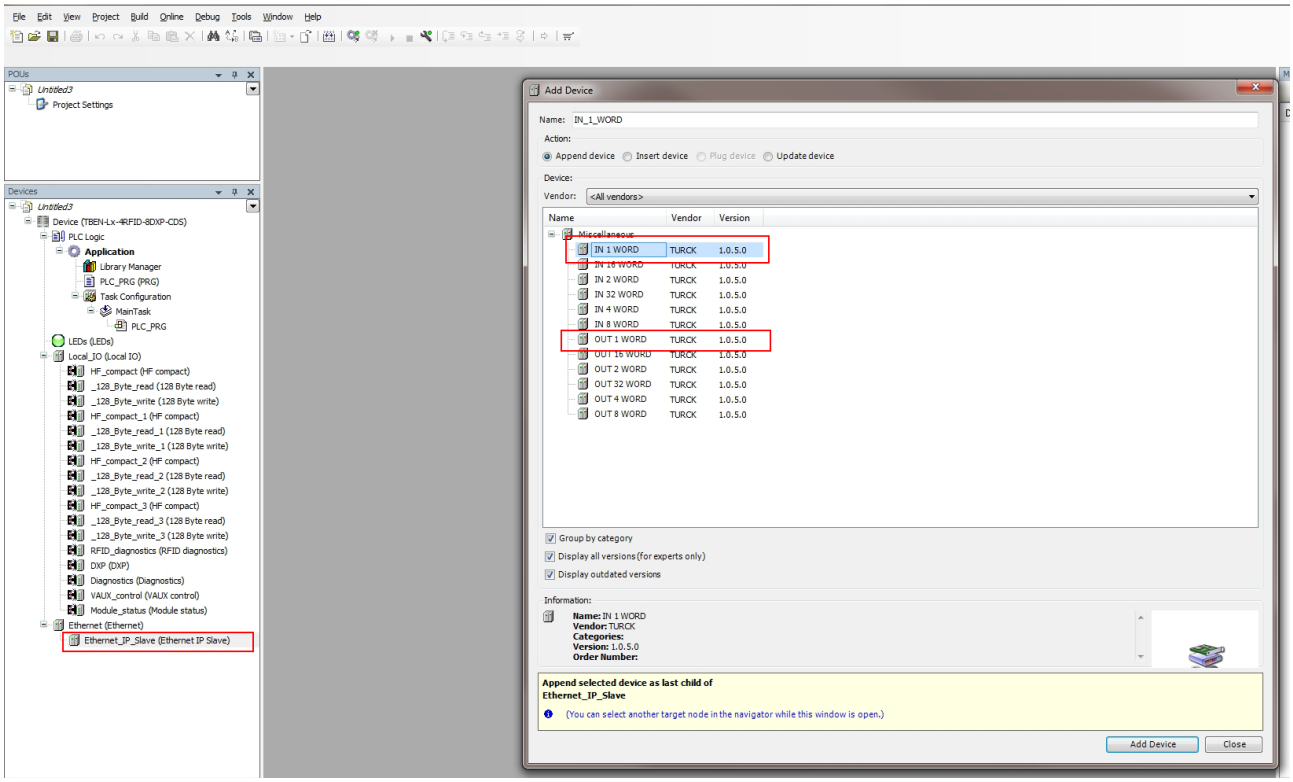


Fig. 55: Assigning inputs and outputs

Example: The “Tag present” bit has to be sent to the controller via an output byte.

- ▶ Double-click the required operating mode in the project tree (here: HF compact).
- ▶ Select the “HF compact I/O image” tab.
- ▶ Find the internal device address of the “Tag present” bit from the I/O image for the selected operating mode (here: HF compact).

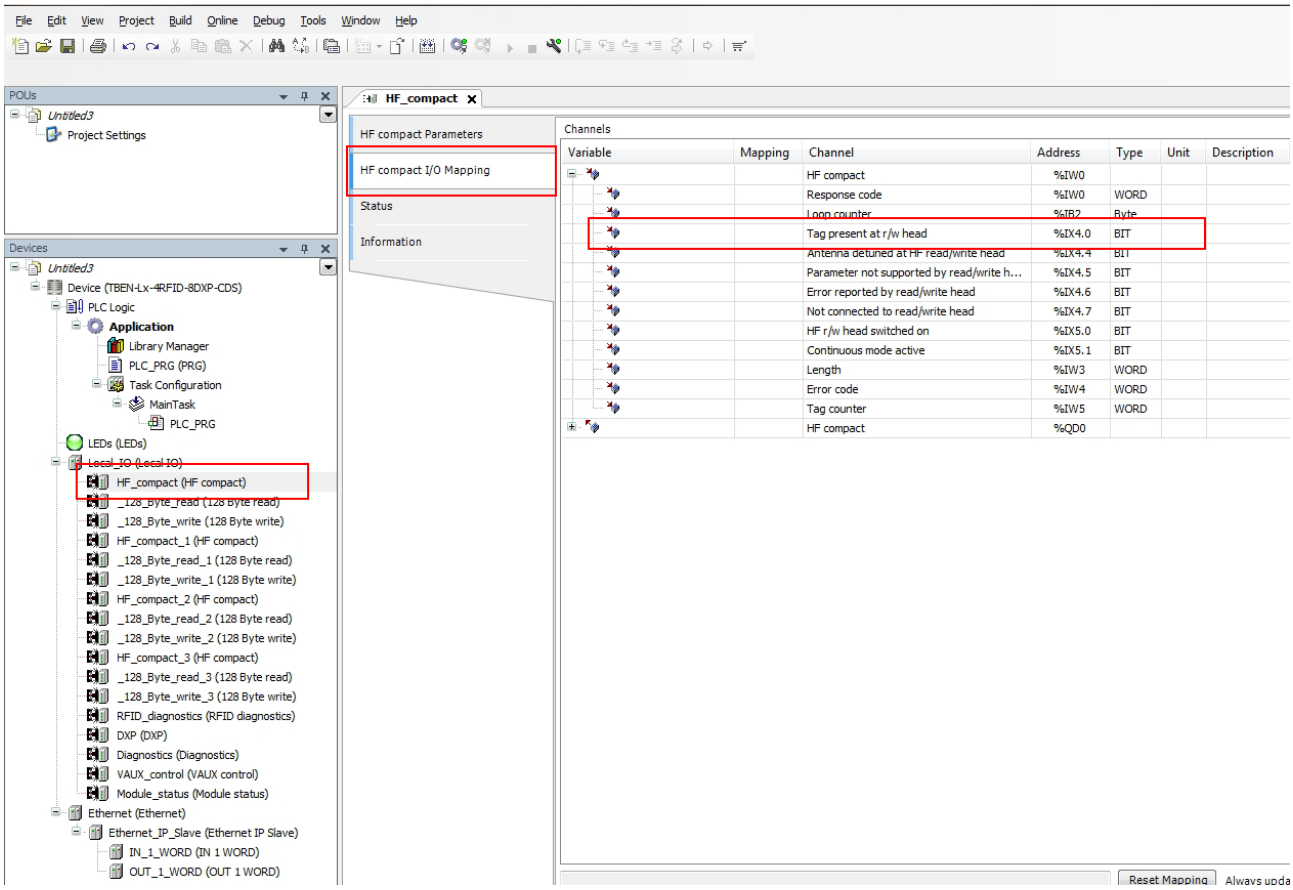


Fig. 56: Internal address for the “Tag present” bit

- ▶ Example: Double-click “OUT_1_WORD” in the project tree.
- ▶ Assign the internal address for the “Tag present” bit to the output byte.

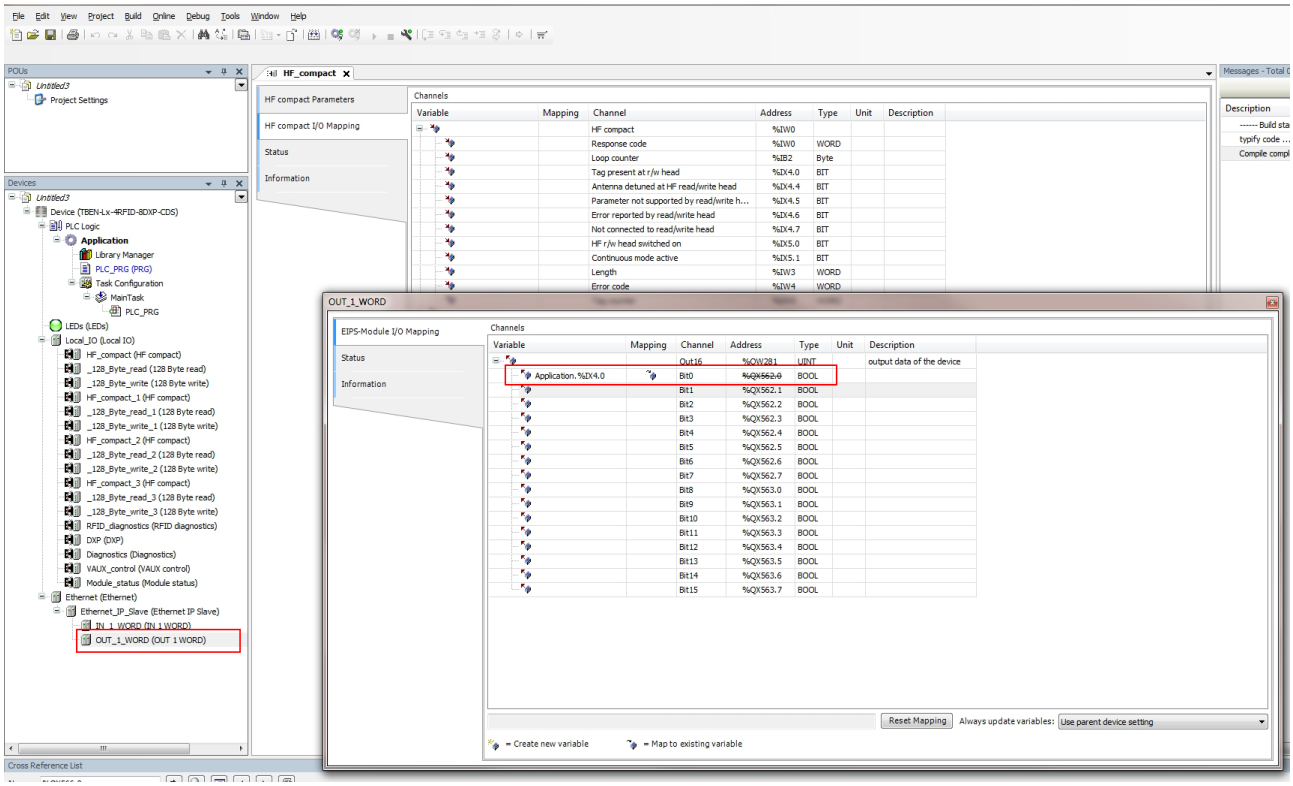


Fig. 57: Mapping the I/O address

7.3.2 Setting up the network interface

- Click “Device” → “Scan network”.
- Select TBEN-L5-4RFID-8DXP-CDS and confirm with OK.

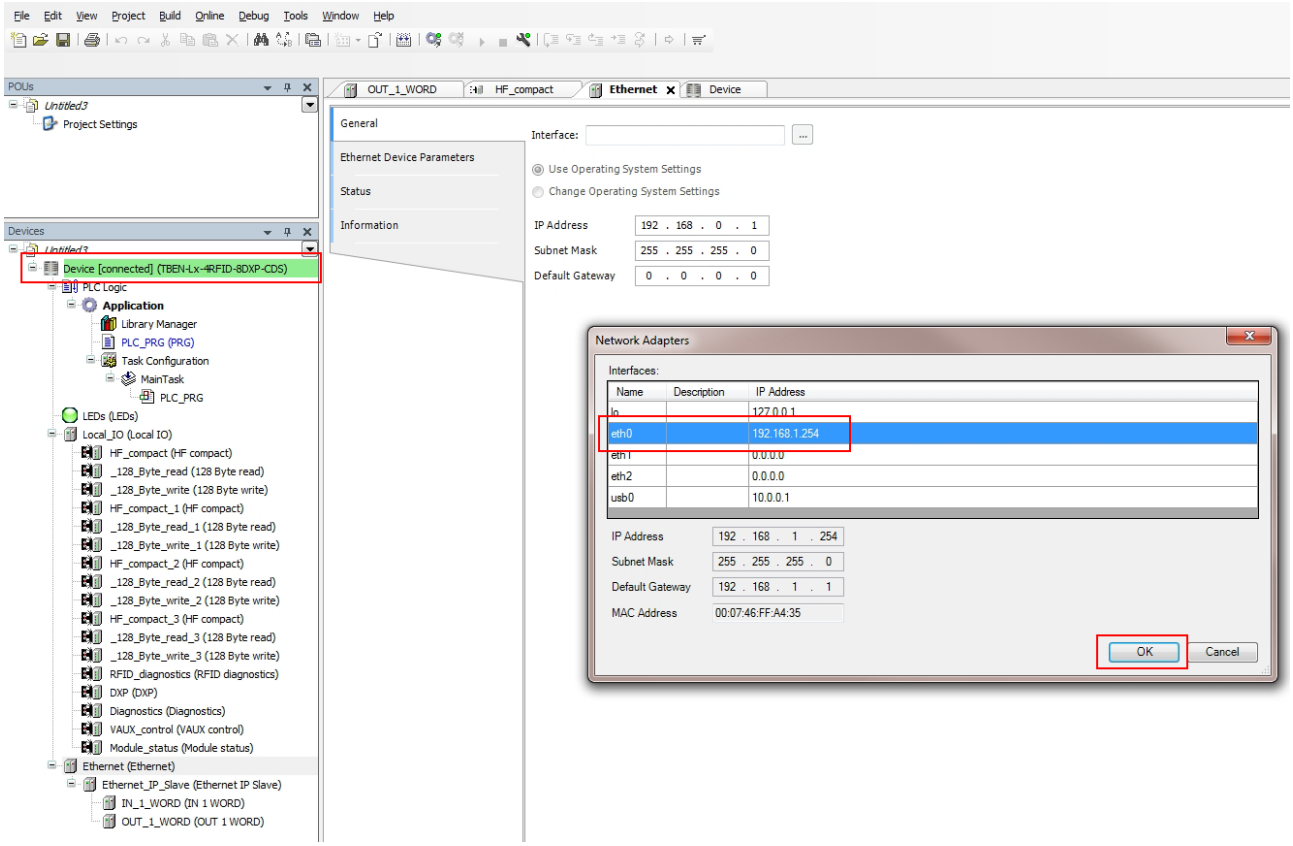


Fig. 58: Setting up the network interface

- ▶ Select the “PLC Settings” tab.
- ▶ In the “Always refresh variables” drop-down menu, select “Activate 1 (always in the bus cycle task)”.

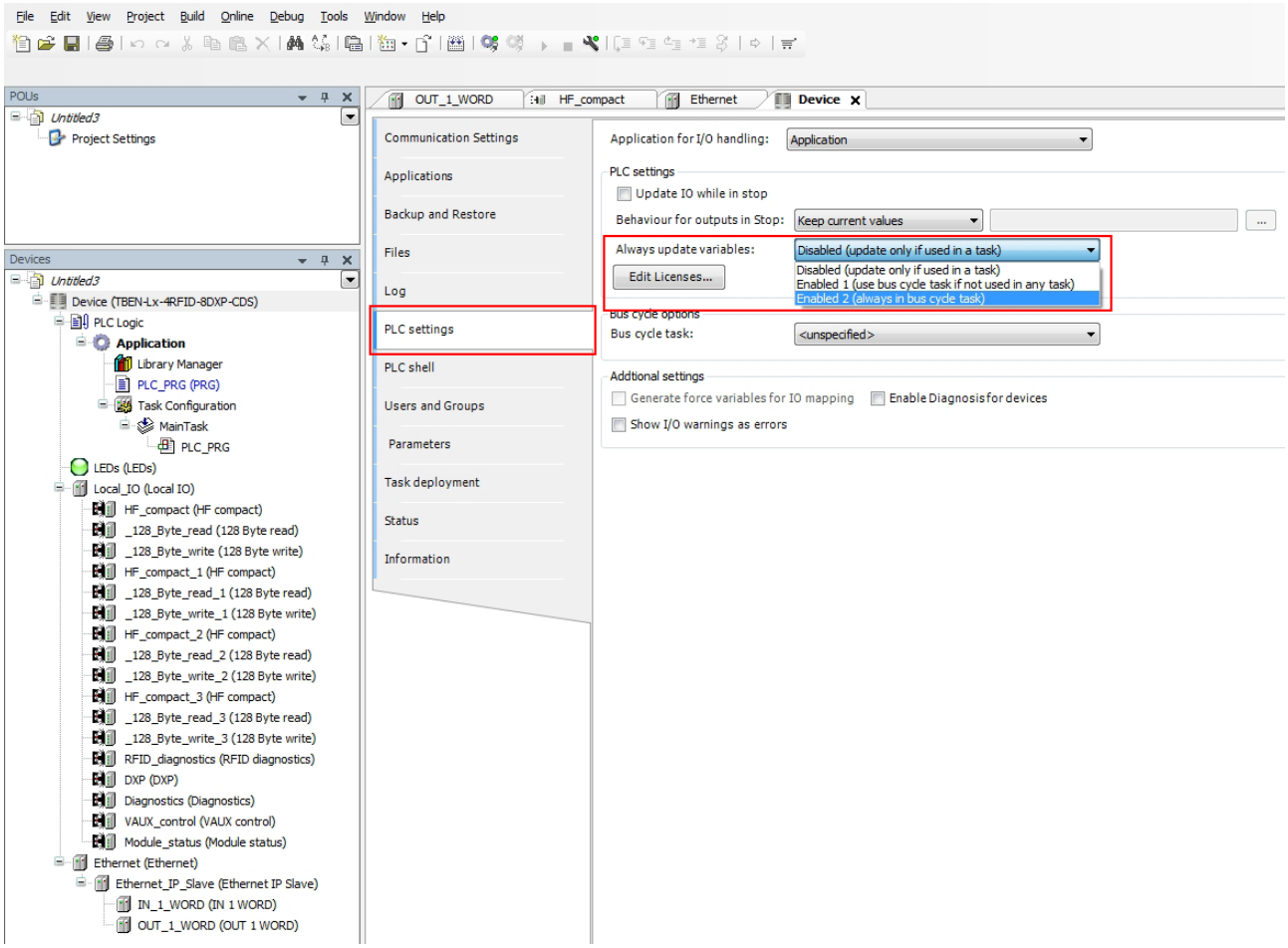


Fig. 59: Setting the “Always refresh variables” option

- Double-click “Ethernet”.
- Select the network interface.
- Enter the address of the EtherNet/IP™ master (here: 192.168.0.100).

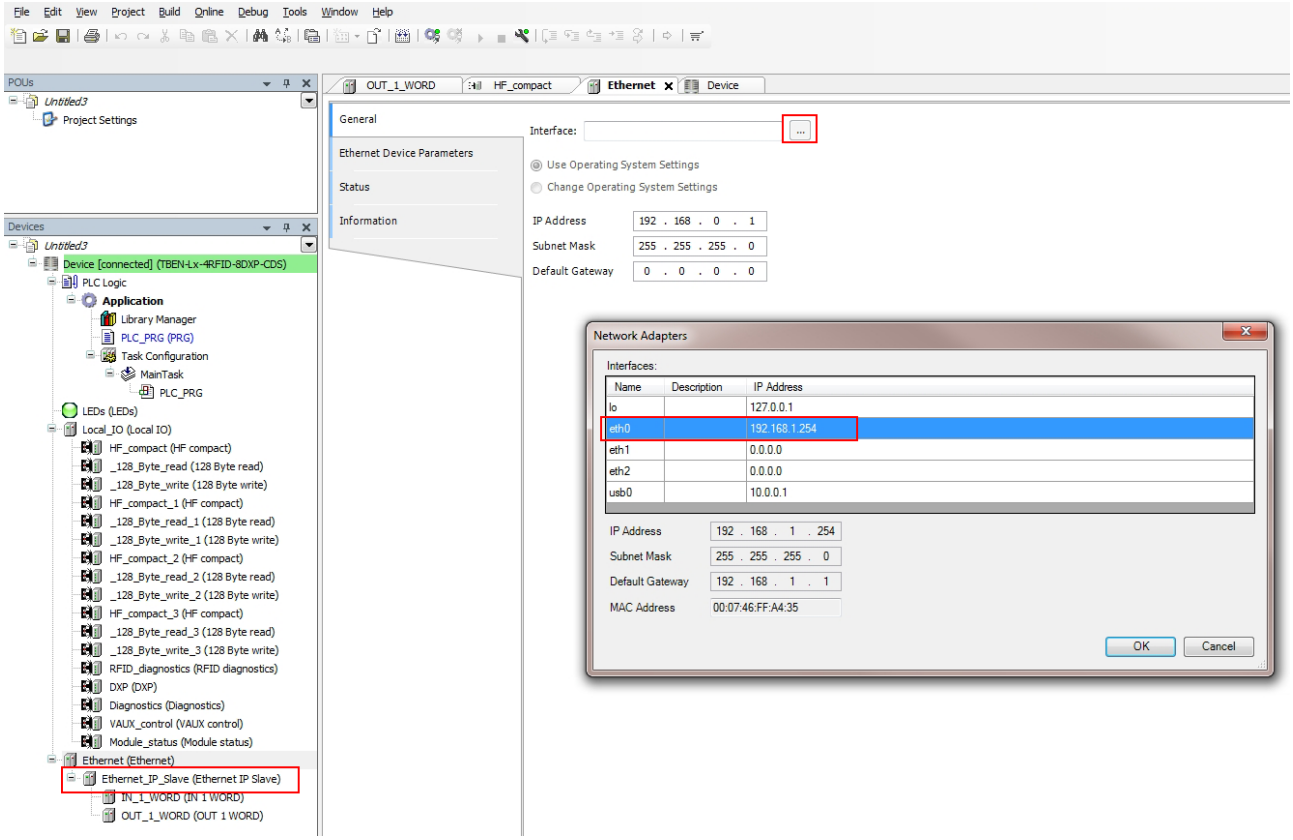


Fig. 60: EtherNet/IP™ master – Entering the IP address

Connecting the device online

- Click Online → Login.
- Click the "Start" button.
- The connection is now displayed in the project tree.

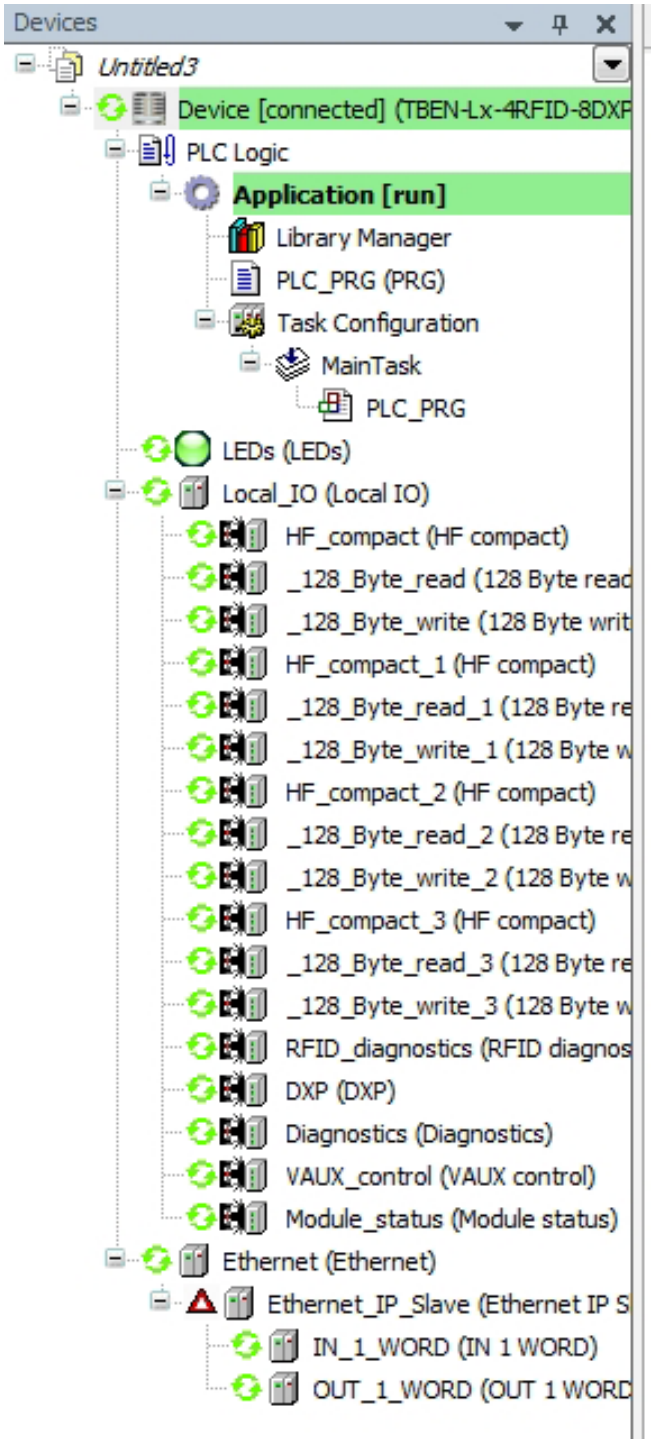


Fig. 61: Display of the connection in CODESYS

7.3.3 Installing an EDS file

The generic EDS file for the device can be downloaded free of charge from www.turck.com in the package for TBEN-L…-CDS.

- ▶ Include an EDS file: Click “Tools” → “EDS Hardware Installation Tool”.

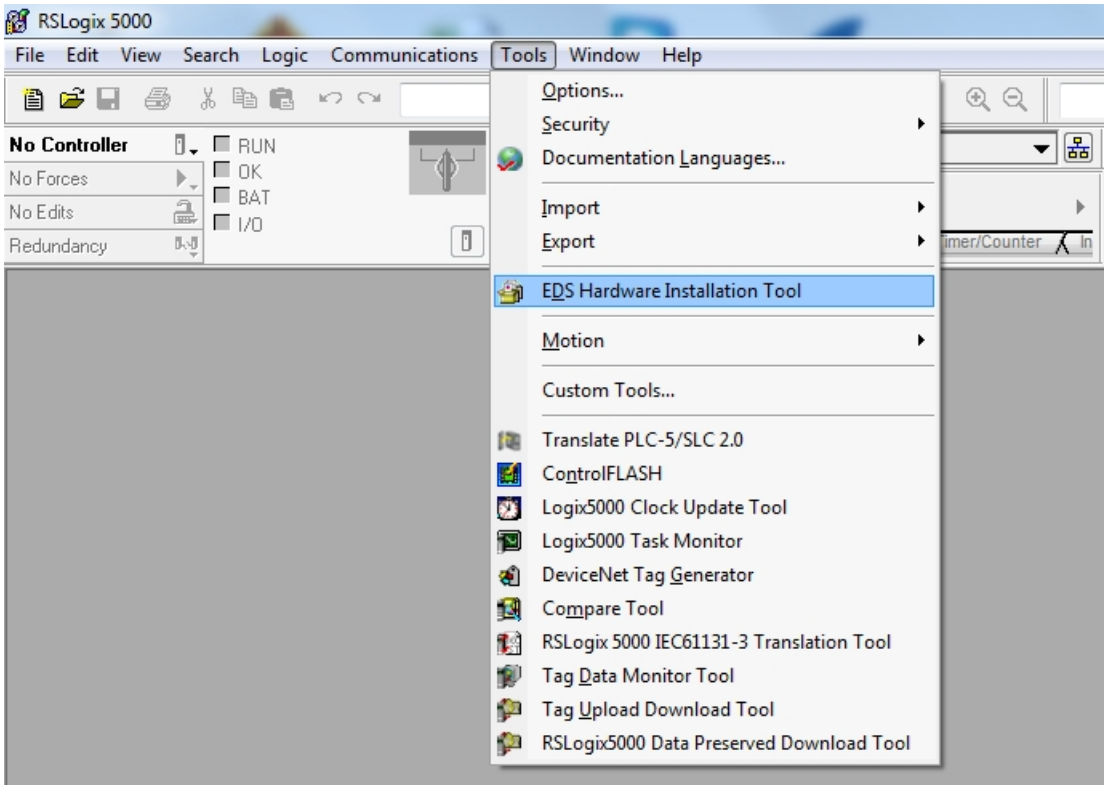


Fig. 62: Installing an EDS file

The wizard for the installation of EDS file is started.

- ▶ Click “Next” to select the EDS file.

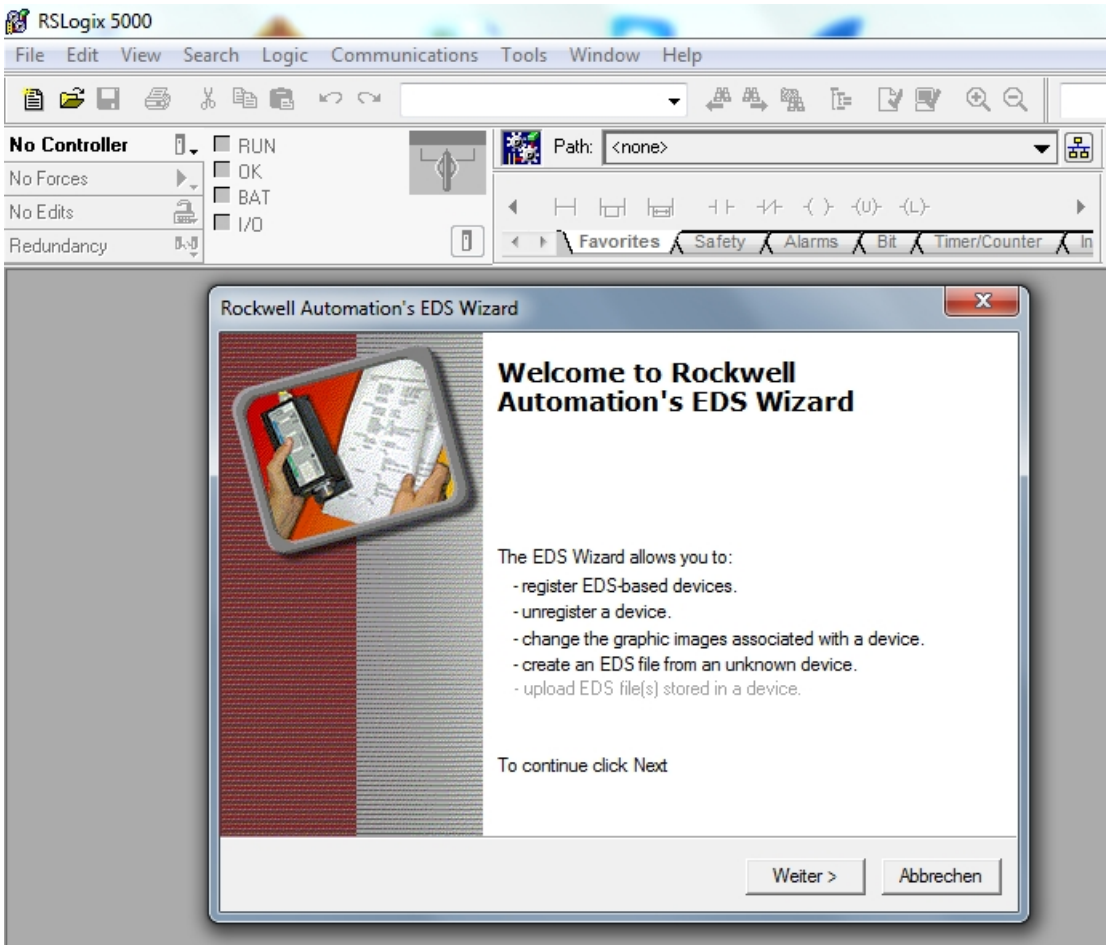


Fig. 63: Wizard for the installation of EDS files

▶ Select the “Register an EDS file(s)” option and confirm with “Next”.

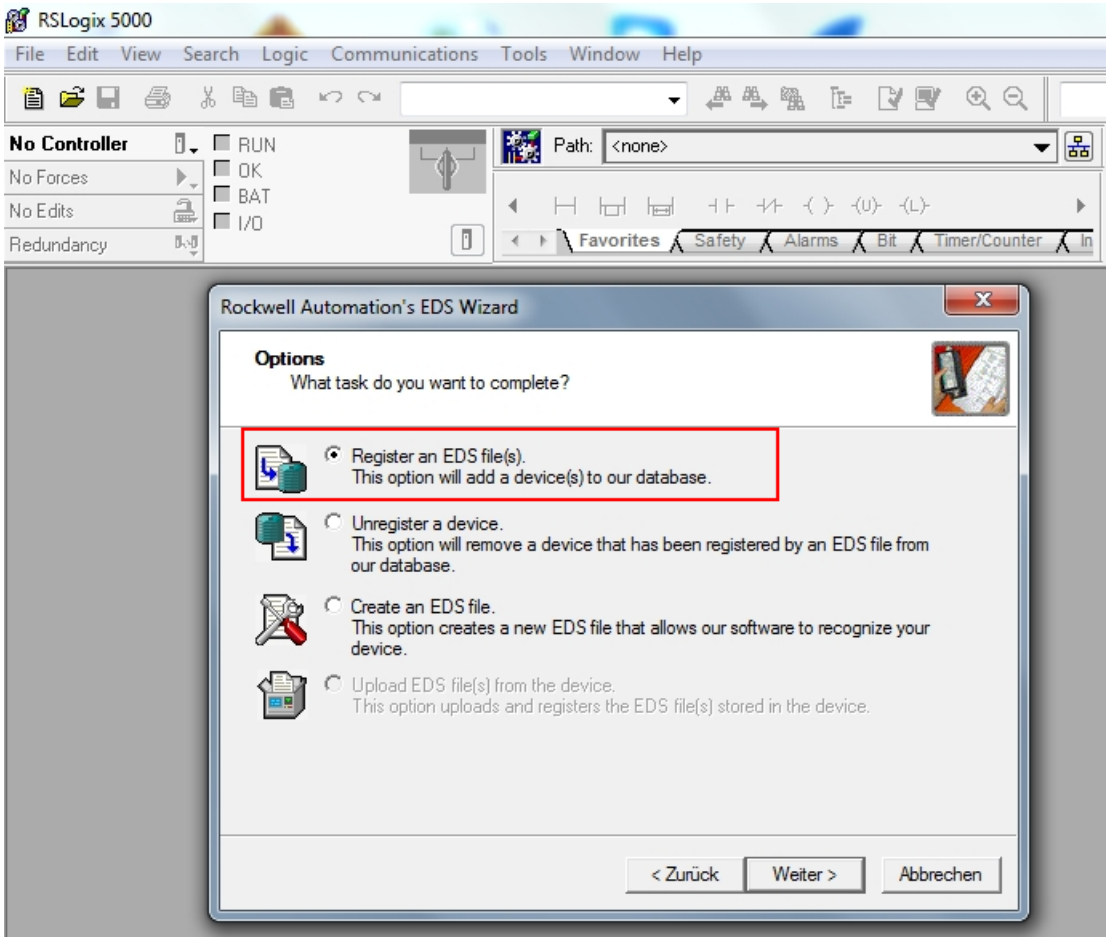


Fig. 64: Selecting the “Register an EDS file(s)” option

- ▶ Select an EDS file: Select a single file or folder (example: single file).
- ▶ Enter a path for the memory location of the EDS file.
- ▶ Confirm with “Next”.
- ⇨ The installation wizard guides you through the further installation.

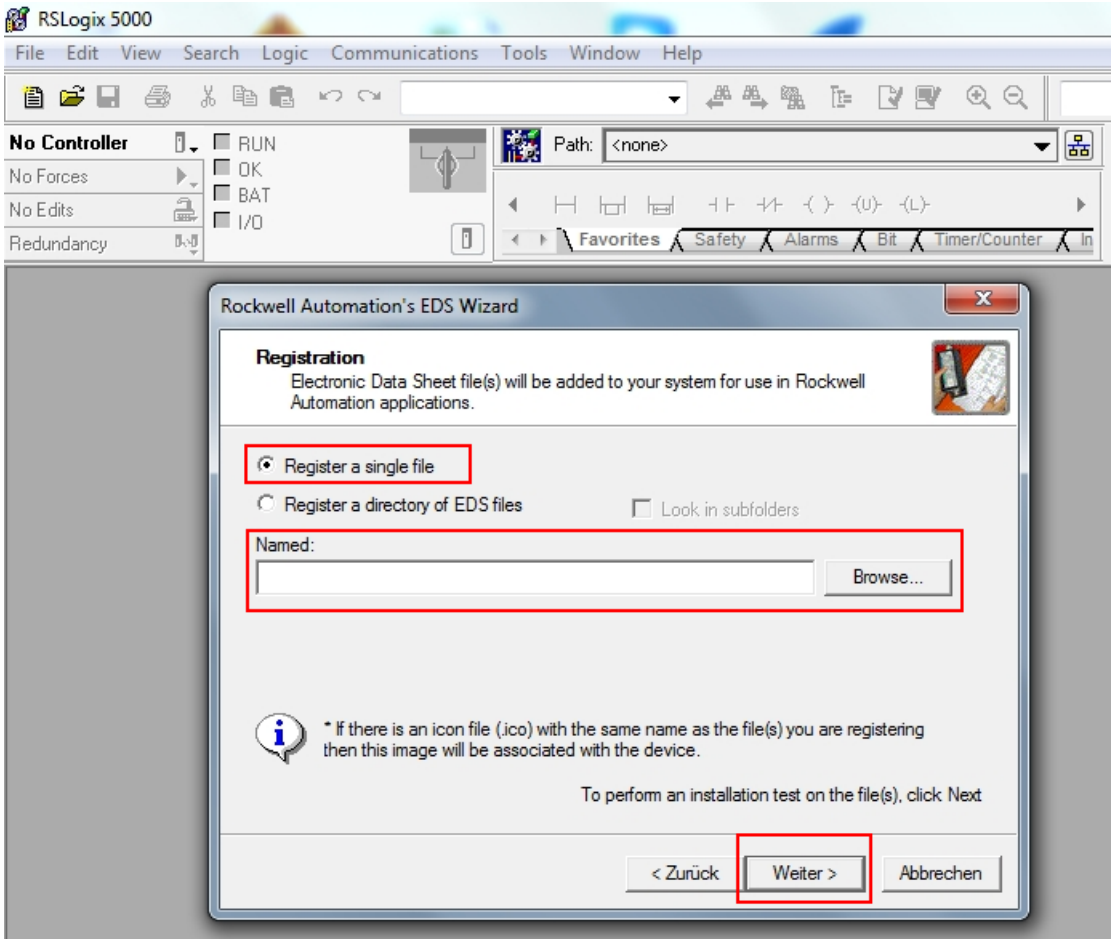


Fig. 65: Selecting an EDS file

7.3.4 Connecting the device with the controller

- Right-click “I/O configuration” → “Ethernet”.
- Click “New Module”.

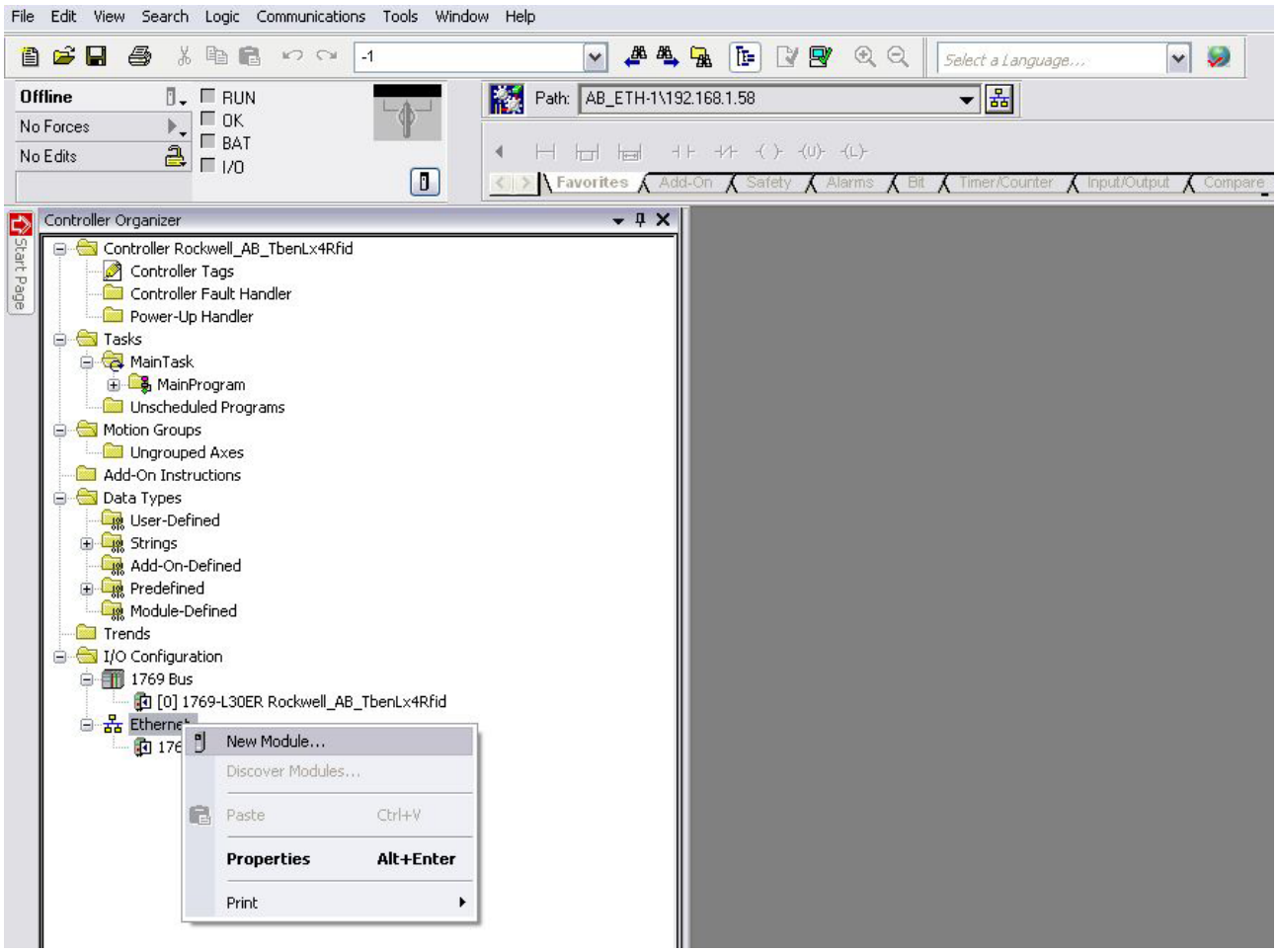


Fig. 66: Adding a new module

- Select Turck under “Module Type Vendor Files”.
- Select the generic ESD file for “CDS3 EtherNet/IP Slave”.
- Confirm selection with “Create”.

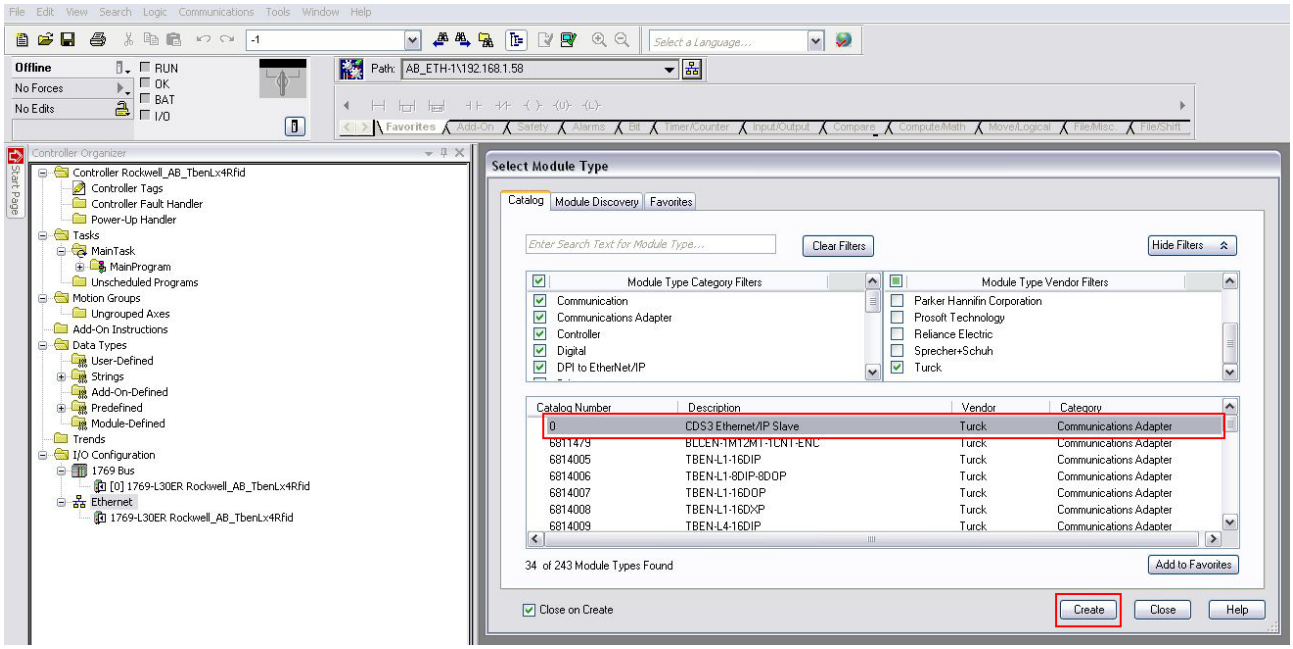


Fig. 67: Selecting the generic ESD file for Turck Codesys-EtherNet/IP™ slave

- Assign a module name.
- Enter the IP address of the device (example: 192.168.1.100).

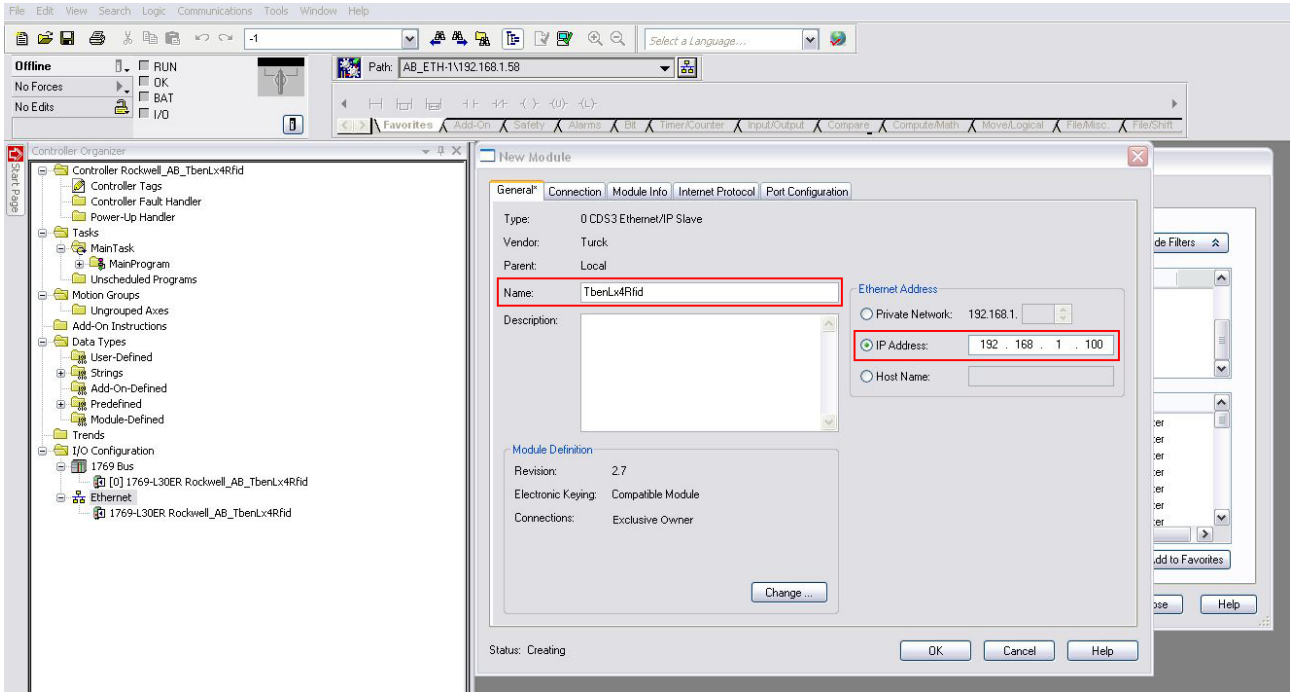


Fig. 68: Setting the module name and IP address

The device appears in the project tree.

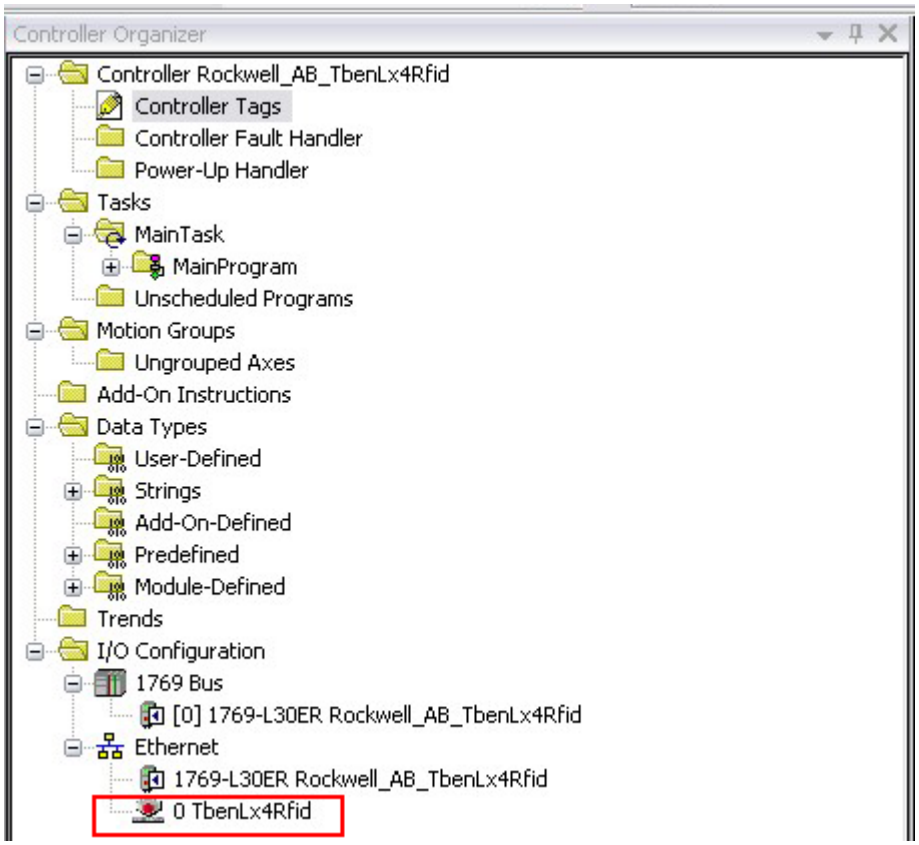
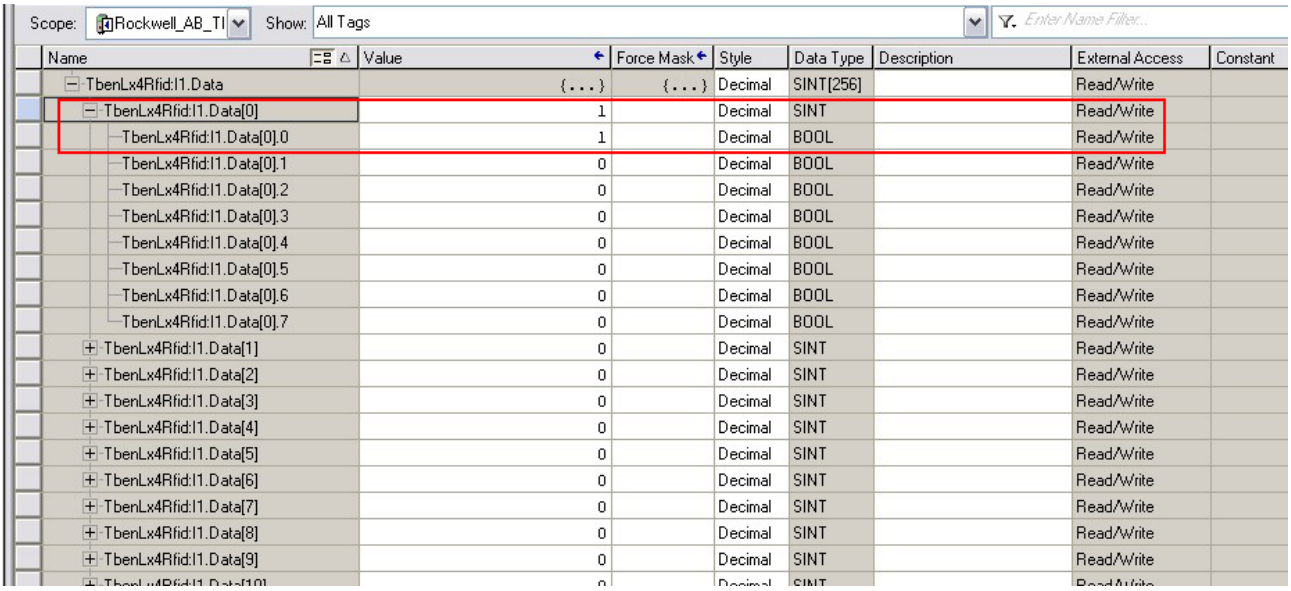


Fig. 69: TBEN-L…-4RFID-8DXP in the project tree

7.3.5 Reading out process data

In online mode, the “Tag present” bit is displayed in the monitoring table.



Name	Value	Force Mask	Style	Data Type	Description	External Access	Constant
TbenLx4Rfid:I1.Data	{...}	{...}	Decimal	SINT[256]		Read/Write	
TbenLx4Rfid:I1.Data[0]	1		Decimal	SINT		Read/Write	
TbenLx4Rfid:I1.Data[0].0	1		Decimal	BOOL		Read/Write	
TbenLx4Rfid:I1.Data[0].1	0		Decimal	BOOL		Read/Write	
TbenLx4Rfid:I1.Data[0].2	0		Decimal	BOOL		Read/Write	
TbenLx4Rfid:I1.Data[0].3	0		Decimal	BOOL		Read/Write	
TbenLx4Rfid:I1.Data[0].4	0		Decimal	BOOL		Read/Write	
TbenLx4Rfid:I1.Data[0].5	0		Decimal	BOOL		Read/Write	
TbenLx4Rfid:I1.Data[0].6	0		Decimal	BOOL		Read/Write	
TbenLx4Rfid:I1.Data[0].7	0		Decimal	BOOL		Read/Write	
TbenLx4Rfid:I1.Data[1]	0		Decimal	SINT		Read/Write	
TbenLx4Rfid:I1.Data[2]	0		Decimal	SINT		Read/Write	
TbenLx4Rfid:I1.Data[3]	0		Decimal	SINT		Read/Write	
TbenLx4Rfid:I1.Data[4]	0		Decimal	SINT		Read/Write	
TbenLx4Rfid:I1.Data[5]	0		Decimal	SINT		Read/Write	
TbenLx4Rfid:I1.Data[6]	0		Decimal	SINT		Read/Write	
TbenLx4Rfid:I1.Data[7]	0		Decimal	SINT		Read/Write	
TbenLx4Rfid:I1.Data[8]	0		Decimal	SINT		Read/Write	
TbenLx4Rfid:I1.Data[9]	0		Decimal	SINT		Read/Write	

Fig. 70: “Tag present” bit in the monitoring table

7.4 Connecting a device to a Siemens controller

In this example the “Tag present” bit is queried. This requires the network interface to be set up, the hardware configured and the I/O mapping defined.

Hardware used

This example uses the following hardware components:

- Siemens S7-1500 controller with CPU 1513-1 PN
- TBEN-L5-4RFID-8DXP-CDS block module (IP address: 192.168.1.100)
- TN-Q80-H1147 HF read/write head

Software used

This example uses the following software:

- CODESYS 3.5.8.1 (download free of charge from **www.turck.com**)
- SIMATIC STEP7 Professional V13 (TIA Portal)
- Generic GSDML file for PROFINET devices (available as download free of charge from **www.turck.com**)

Requirements

- The package file for TBEN-L…-4RFID-8DXP-CDS must be installed.

7.4.1 Configuring the device in CODESYS as a PROFINET device

- Open CODESYS.
- Create a new standard project.

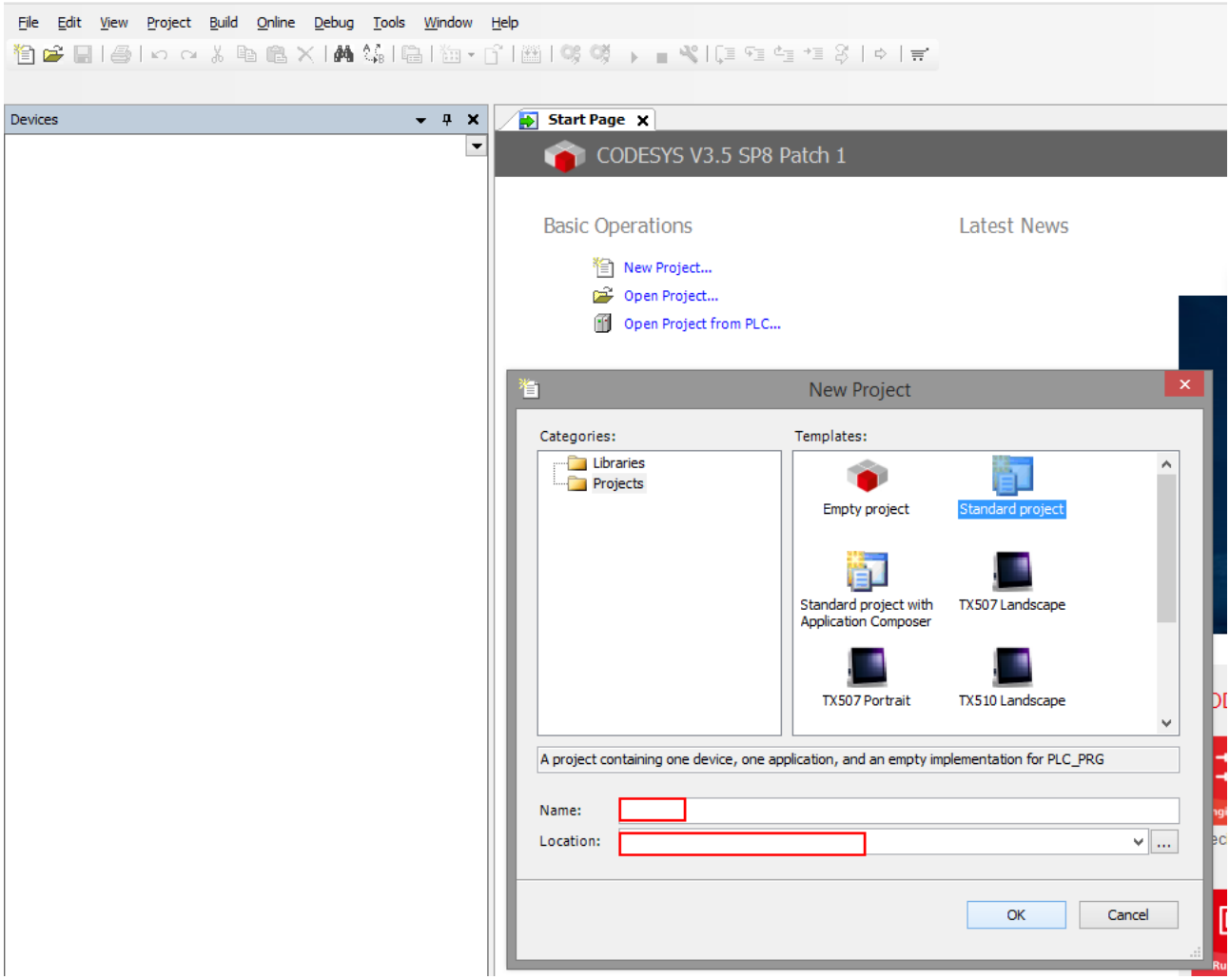


Fig. 71: Creating a new standard project in CODESYS

▶ Select the “TBEN-Lx-4RFID-8DXP-CDS” block module.

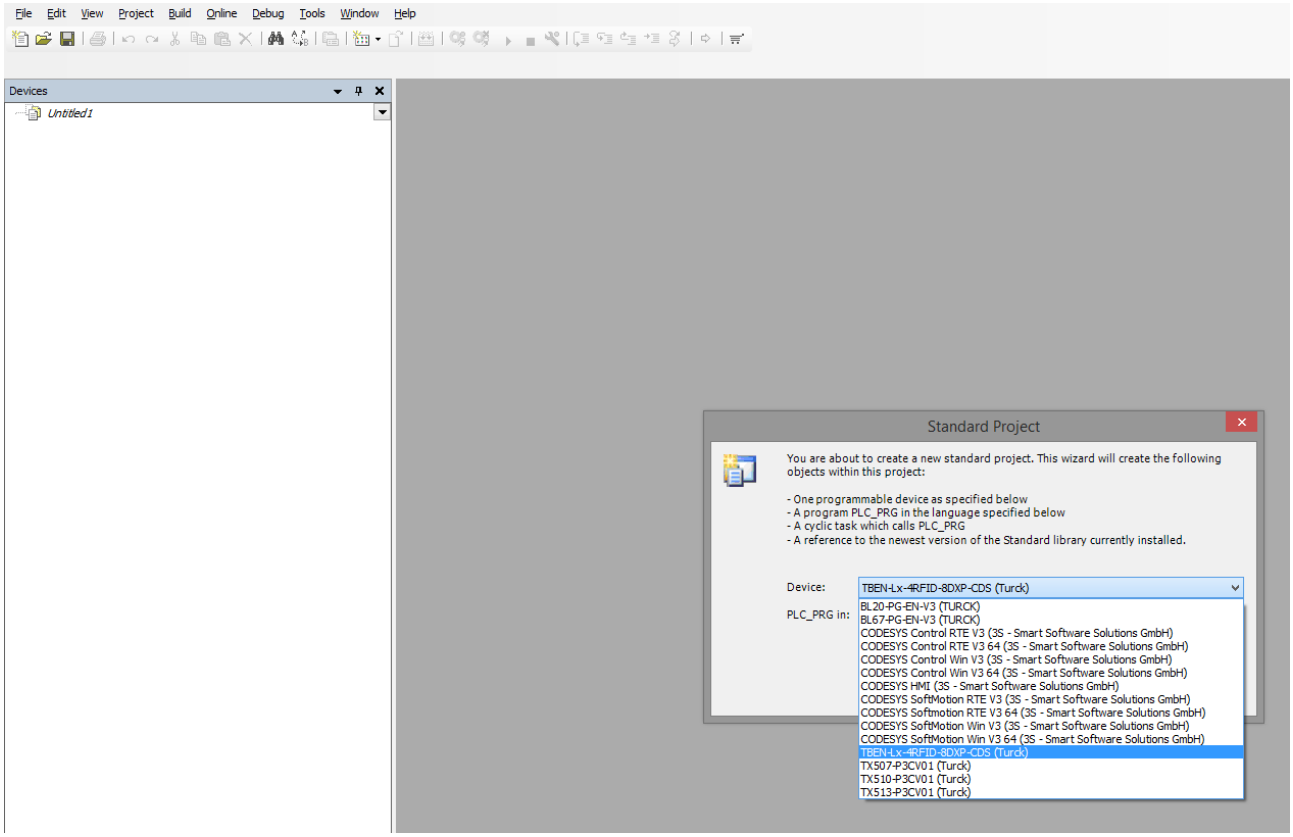


Fig. 72: Selecting the master device

This creates the device in the project tree.

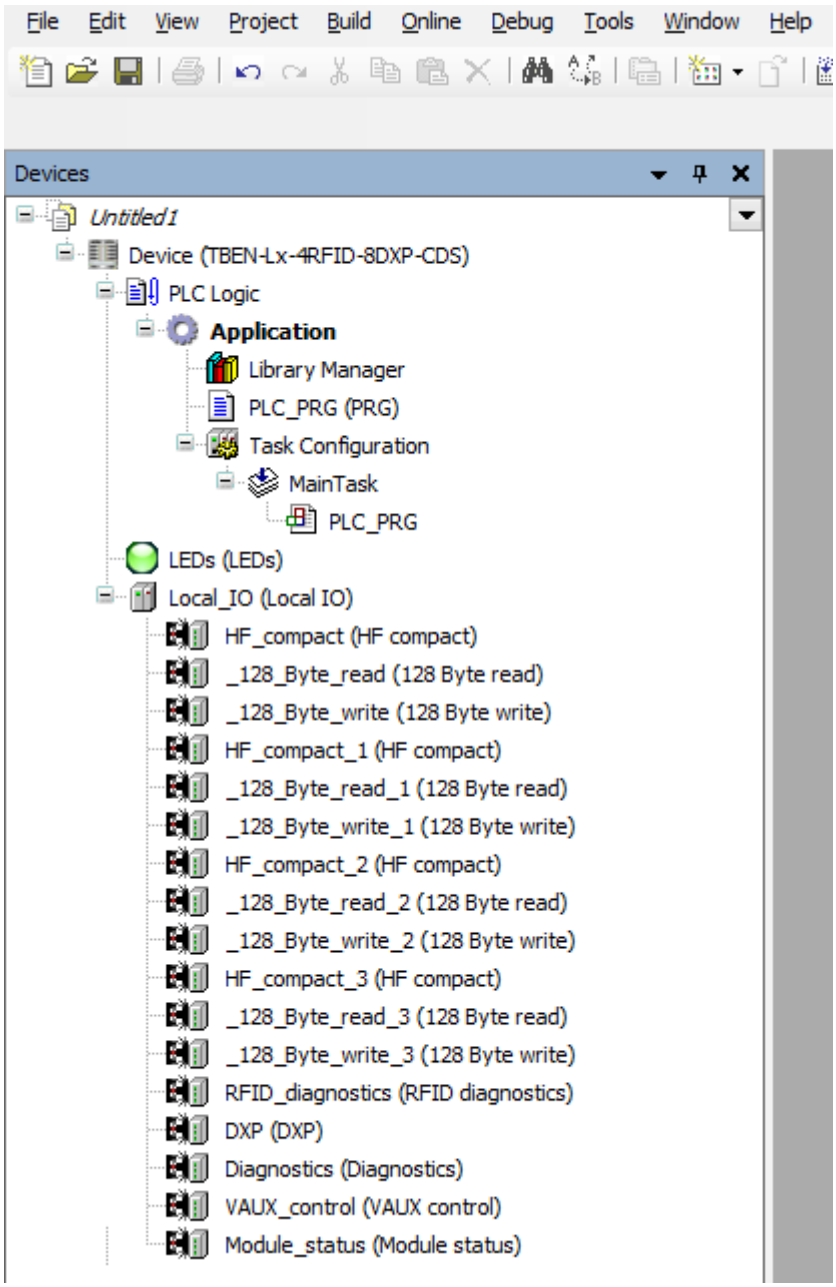


Fig. 73: TBEN-L5-4RFID-8DXP-CDS in the project tree

Adding an Ethernet adapter

- Right-click “Device (TBEN-Lx-4RFID-8DXP-CDS)” in the project tree.
- Select “Append device”.
- Select an Ethernet adapter.
- Click “Append device”.

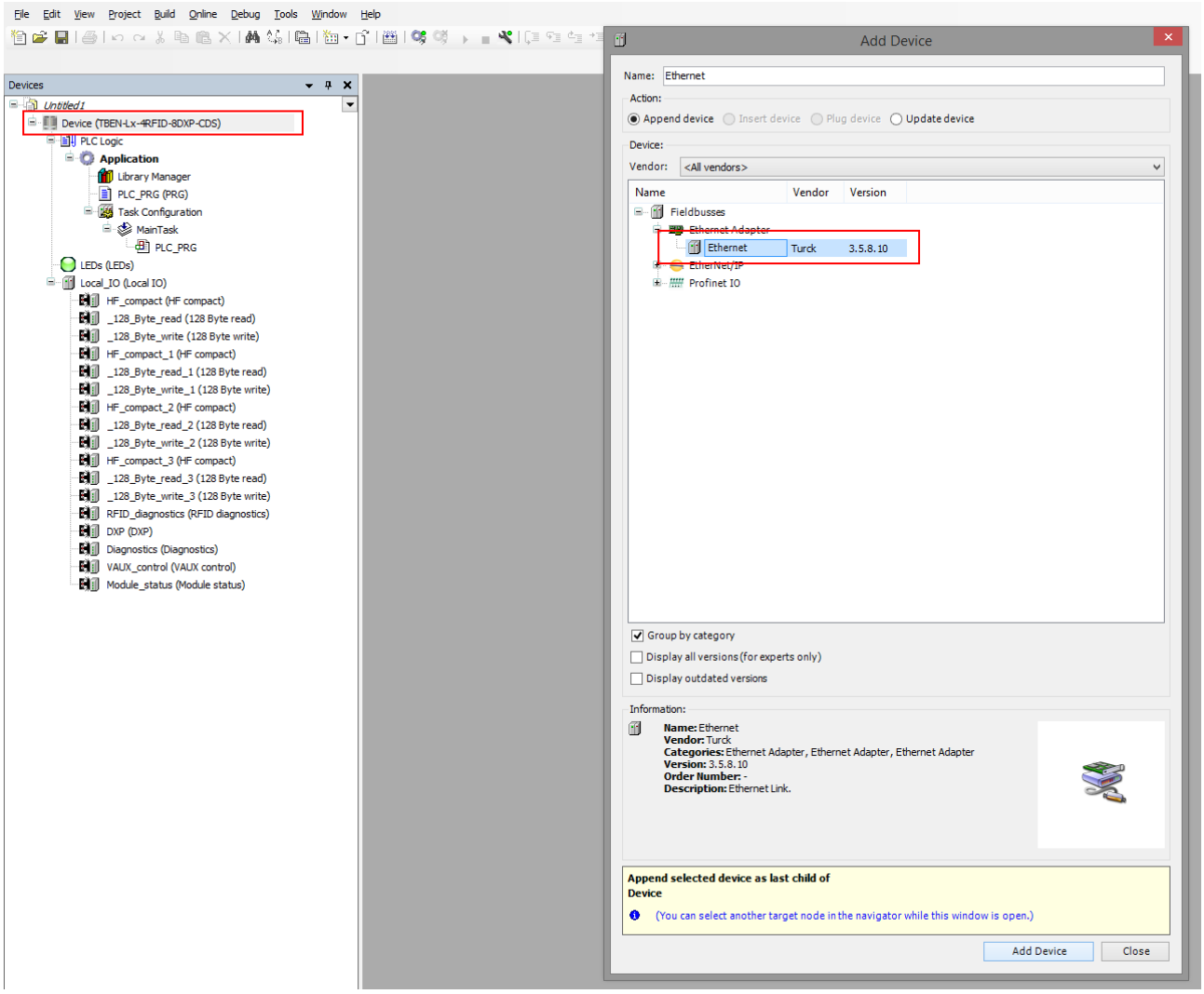


Fig. 74: Adding an Ethernet adapter

Attaching the PROFINET device

- Right-click “Ethernet (Ethernet)” in the project tree.
- Select “Append device”.
- Select “Profinet Device”.
- Click “Append device”.

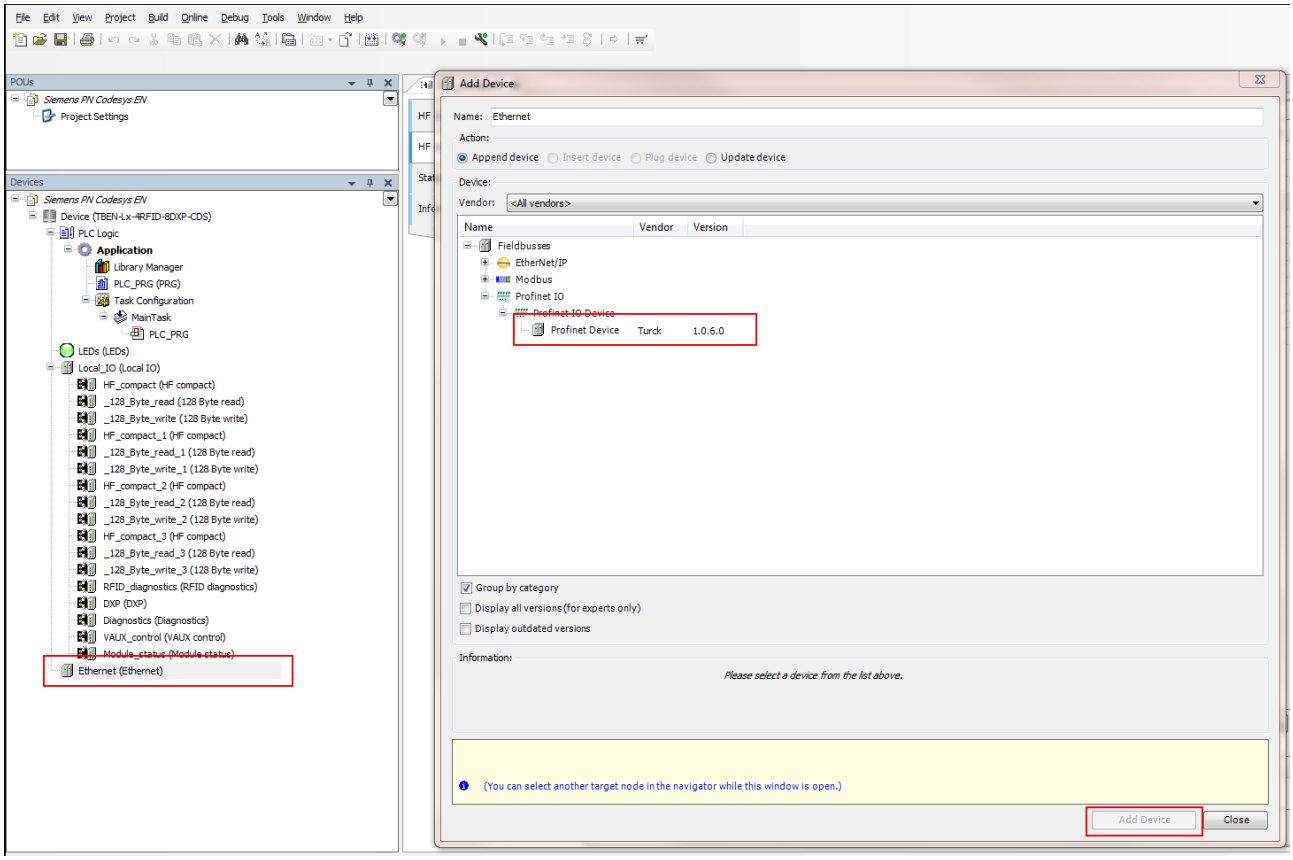


Fig. 75: Attaching the PROFINET device

- Right-click “Profinet_Device (Profinet Device)” in the project tree.
- Select “Append device”.
- Example: Double-click “IN 1 BYTE”.
- Example: Double-click “OUT 1 BYTE”.
- Click “Append device”.

NOTE
The sockets defined as inputs in CODESYS correspond to the outputs in the TIA Portal and vice versa.

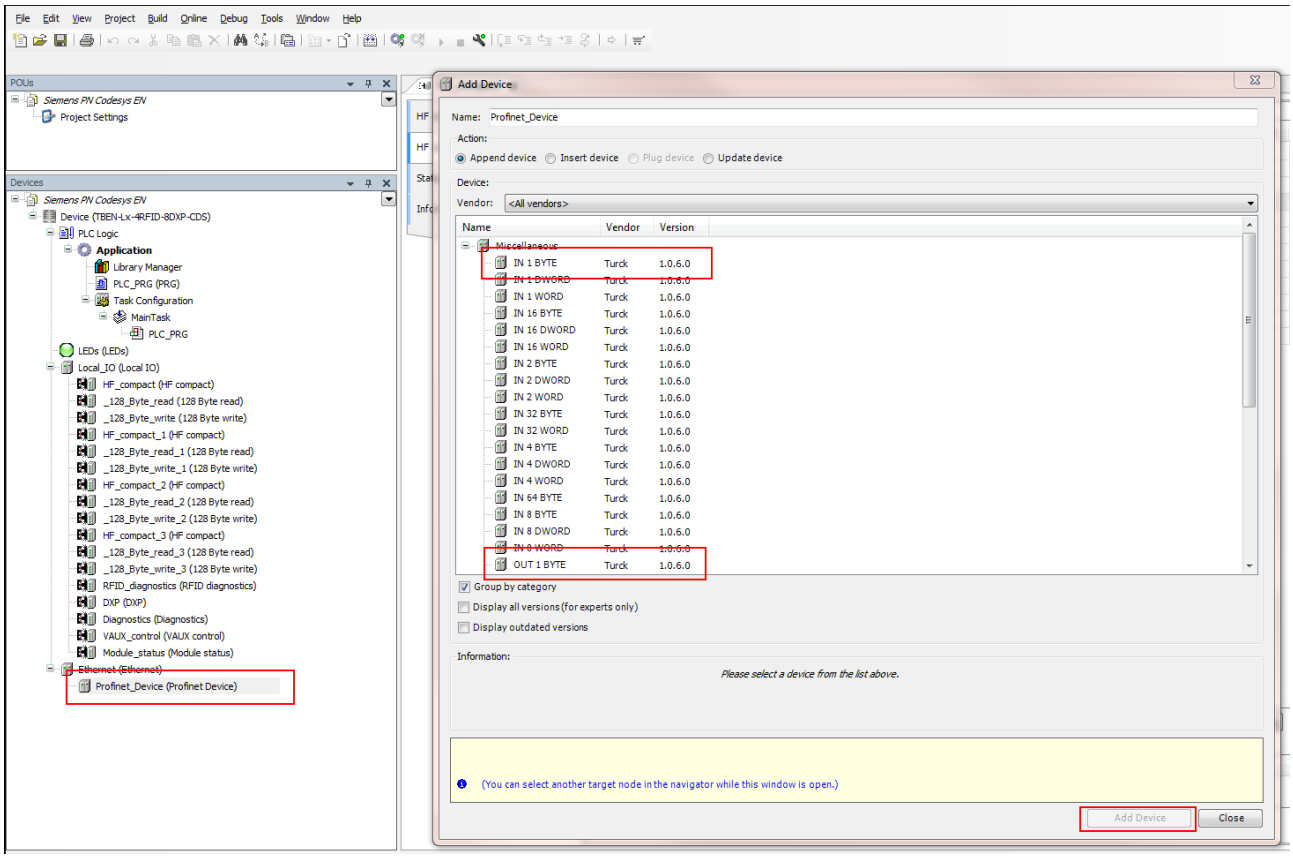


Fig. 76: Attaching inputs and outputs

Inputs and outputs – Creating the mapping

Example: The “Tag present” bit has to be sent to the controller via an output byte.

- ▶ Double-click the required operating mode in the project tree (here: HF compact).
- ▶ Select the “HF compact I/O image” tab.
- ▶ Find the internal device address of the “Tag present” bit from the I/O image for the selected operating mode (here: HF compact).

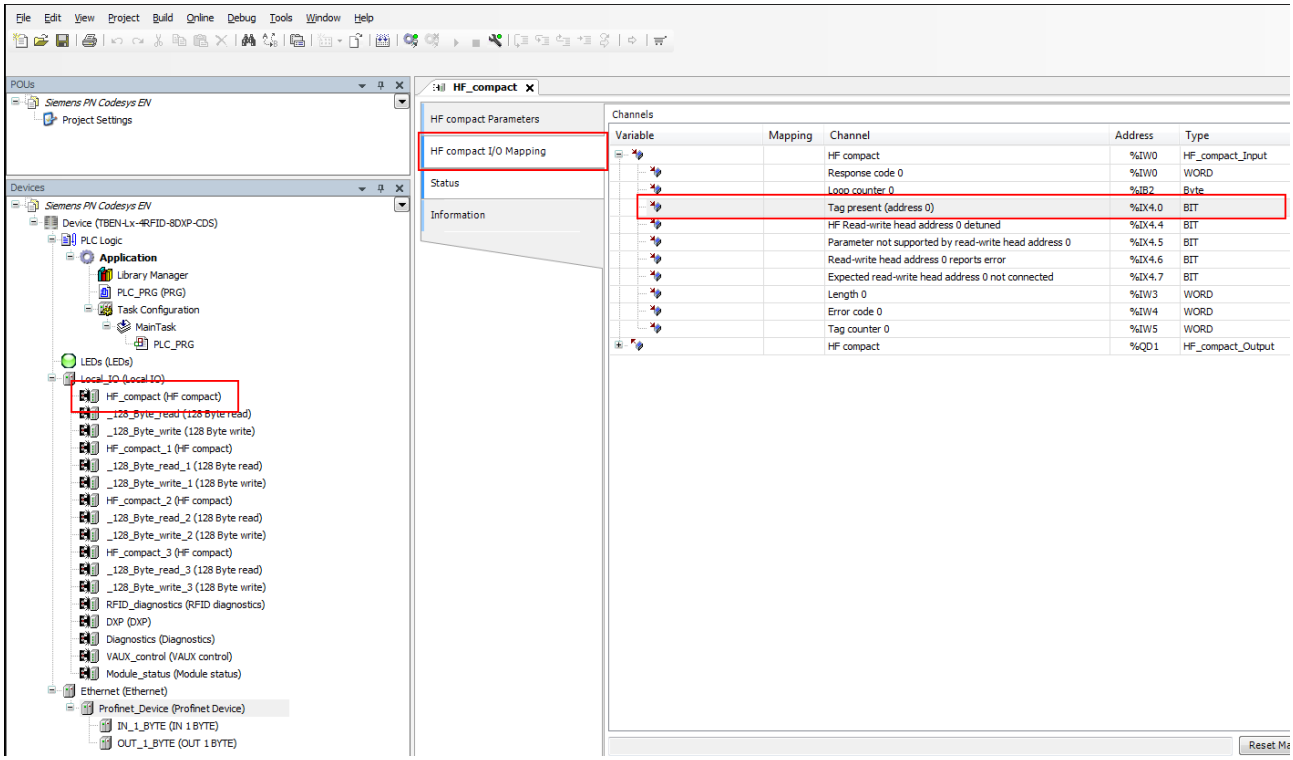


Fig. 77: Internal address for the “Tag present” bit

- Example: Double-click “OUT_1_BYTE” in the project tree.
- Assign the internal address for the “Tag present” bit to the output byte.

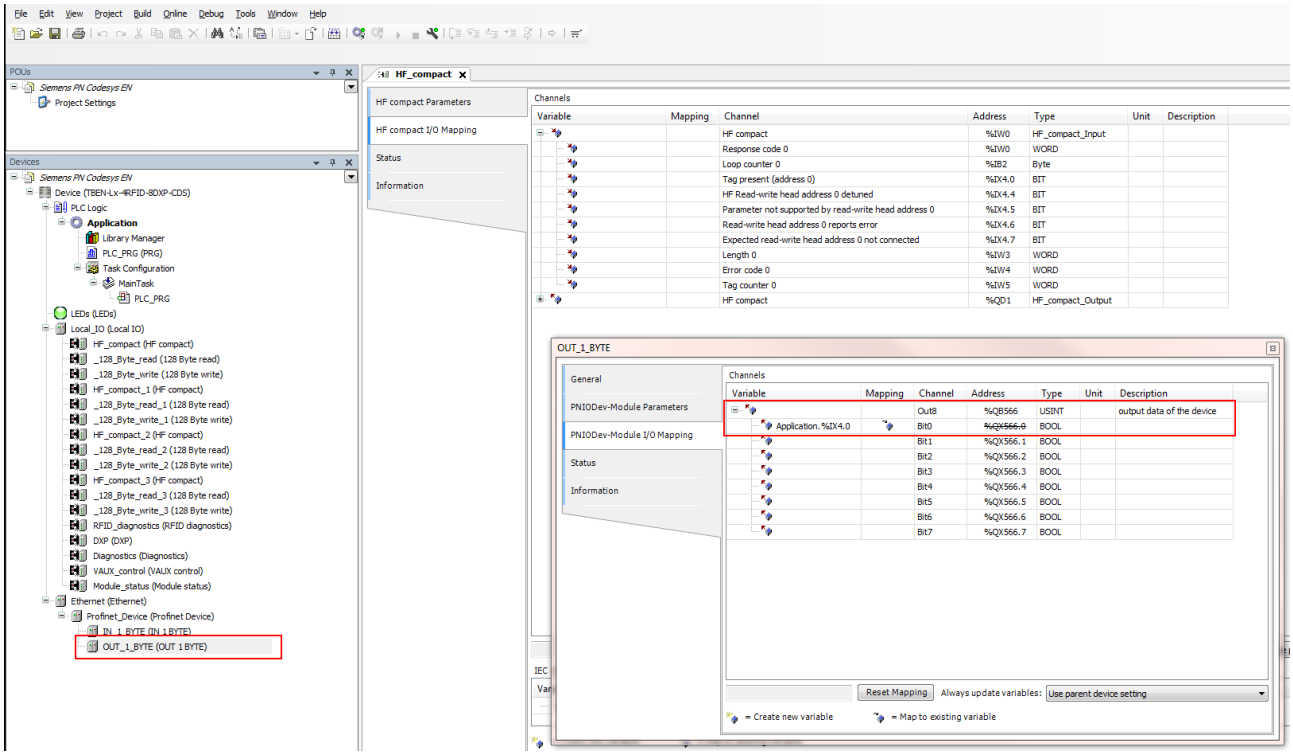


Fig. 78: Mapping the I/O address

7.4.2 Setting up the network interface

- Click “Device” → “Scan network”.
- Select TBEN-L5-4RFID-8DXP-CDS and confirm with OK.

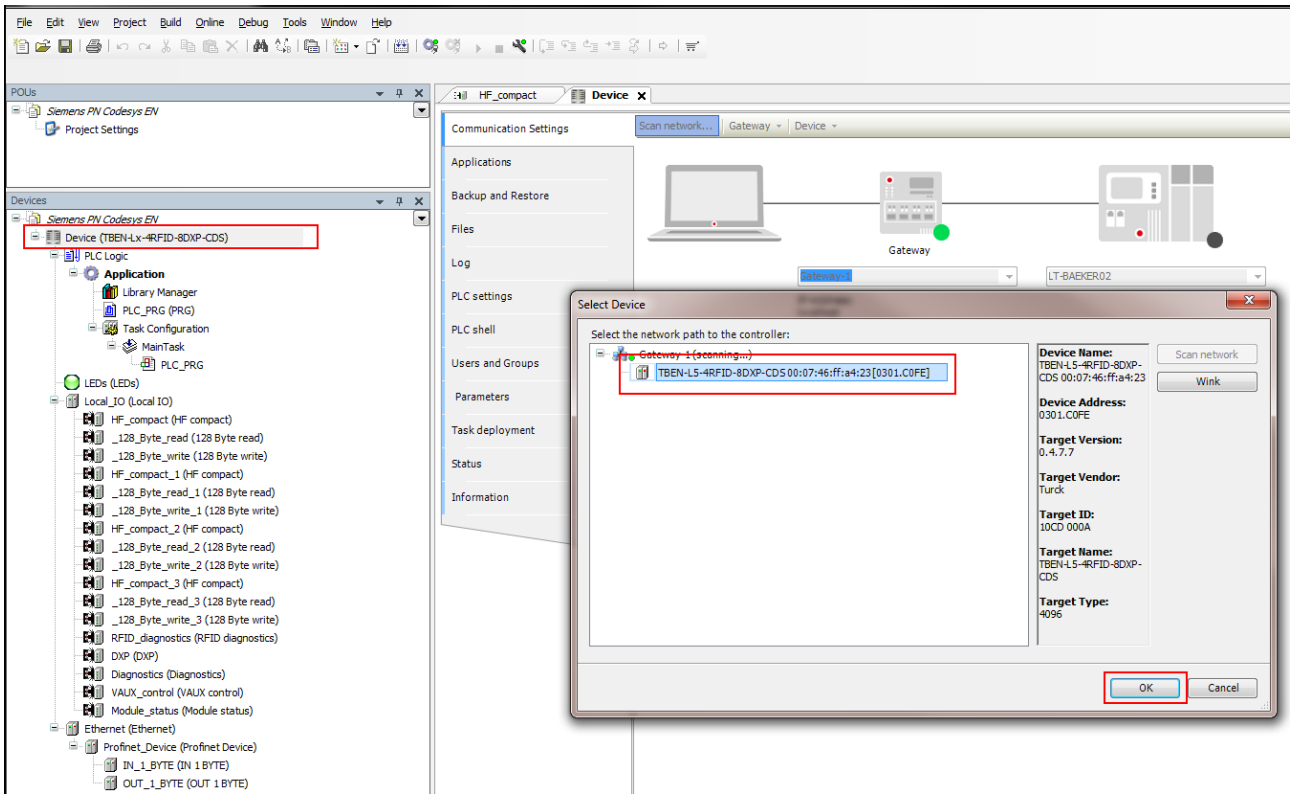


Fig. 79: Setting up the network interface

- Select the “PLC Settings” tab.
- In the “Always refresh variables” drop-down menu, select “Activate 2 (always in the bus cycle task)”.

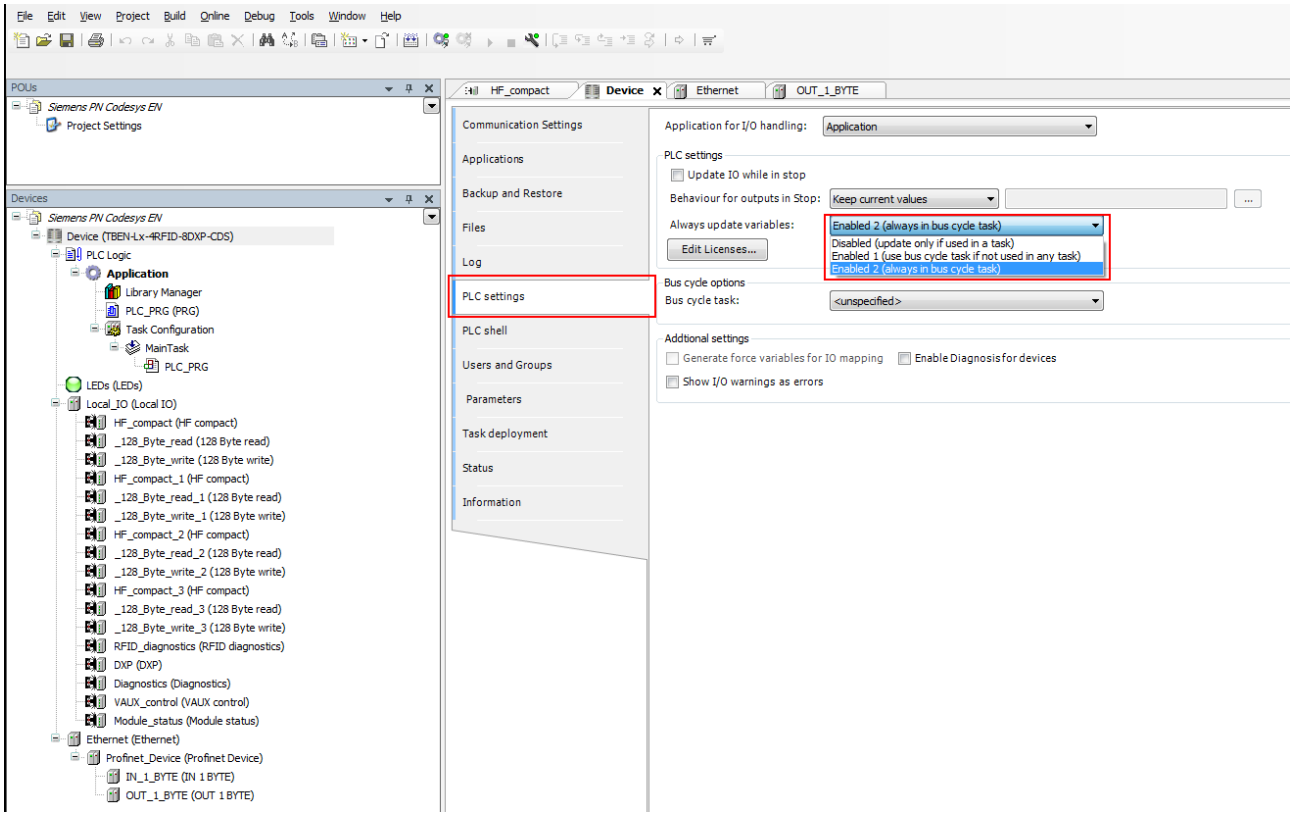


Fig. 80: Setting the “Always refresh variables” option

- Double-click “Ethernet”.
- Select the network interface.
- Enter the IP address of the Modbus master (here: 192.168.0.254).

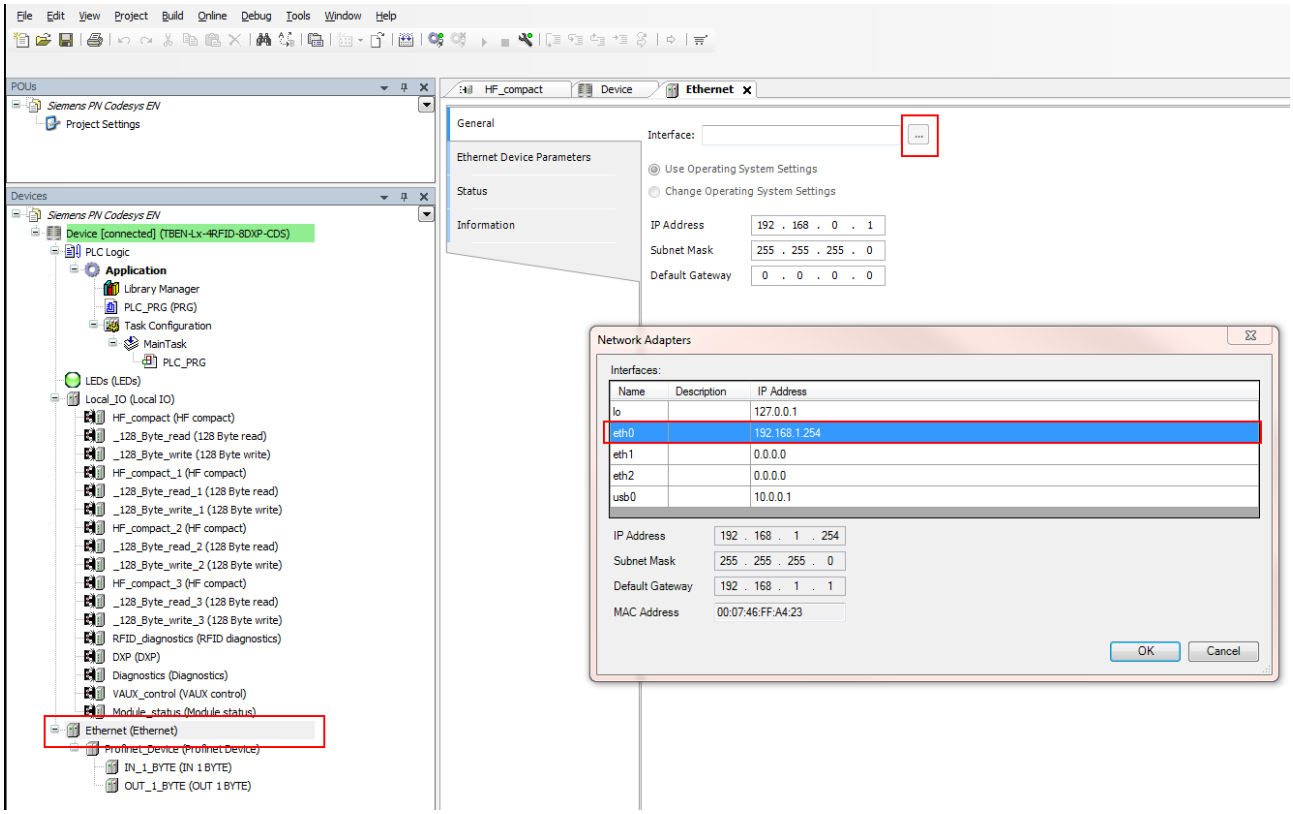


Fig. 81: Modbus master – Entering the IP address

Connecting the device online

- ▶ Click Online → Login.
- ▶ Click the "Start" button.
- ⇨ The connection is now displayed in the project tree.

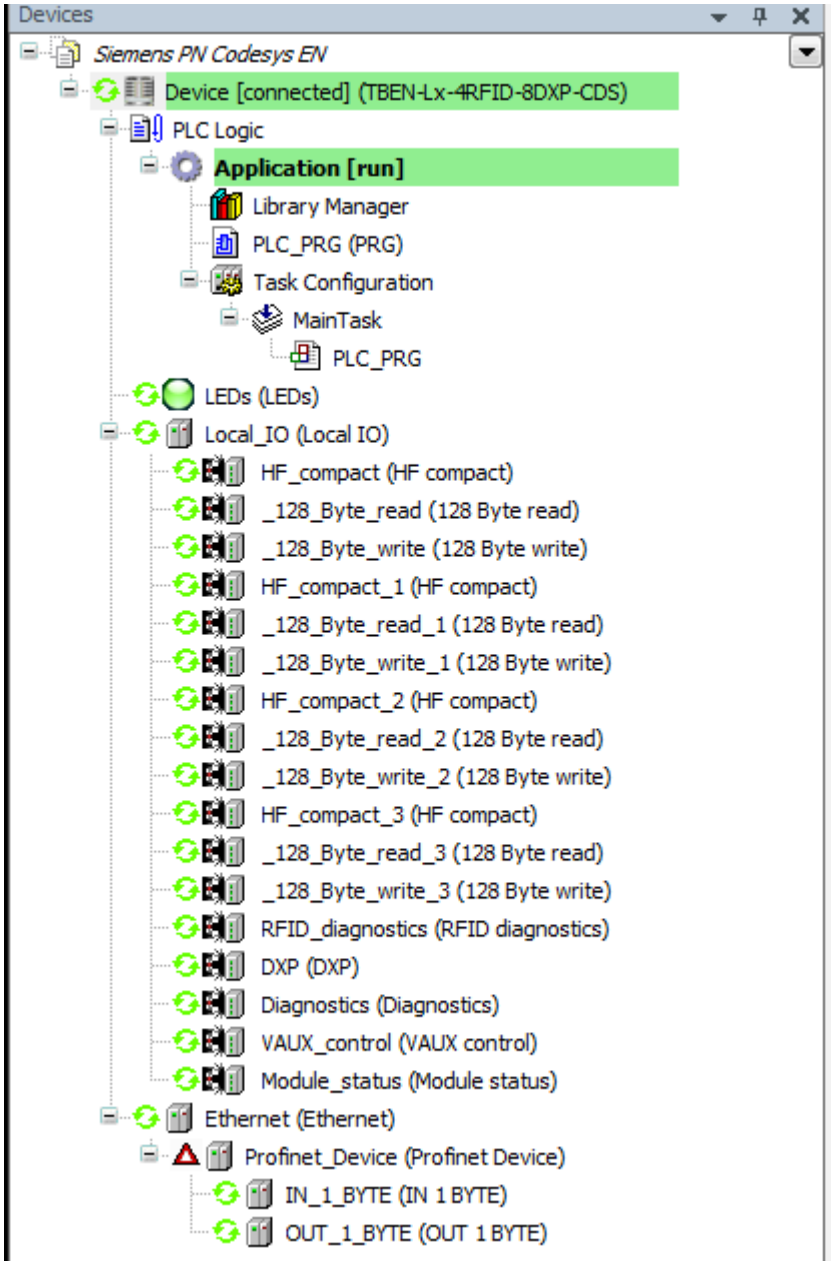


Fig. 82: Display of the connection in CODESYS

7.4.3 Connecting a device to a Siemens controller in the TIA Portal

- ▶ Create a new project TIA Portal.

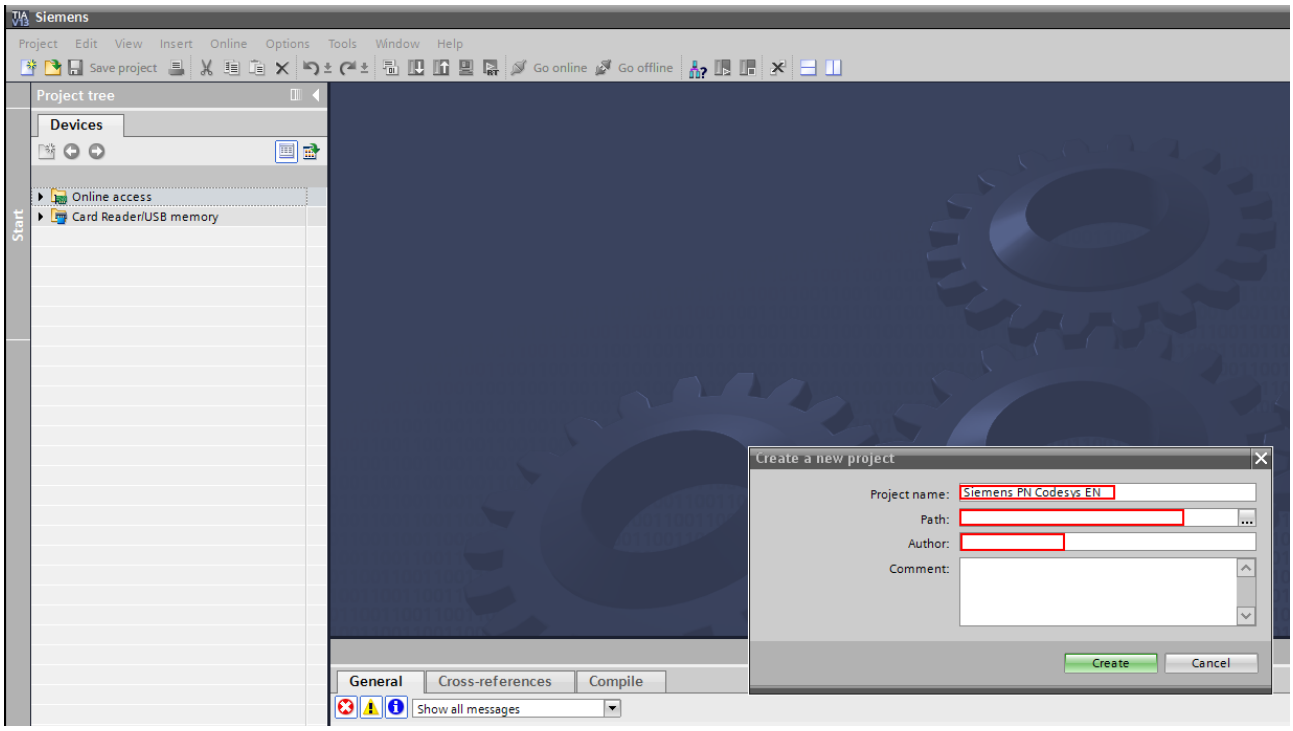


Fig. 83: Creating a new project TIA Portal

- ▶ Add a controller (here: CPU 1513-1 PN).

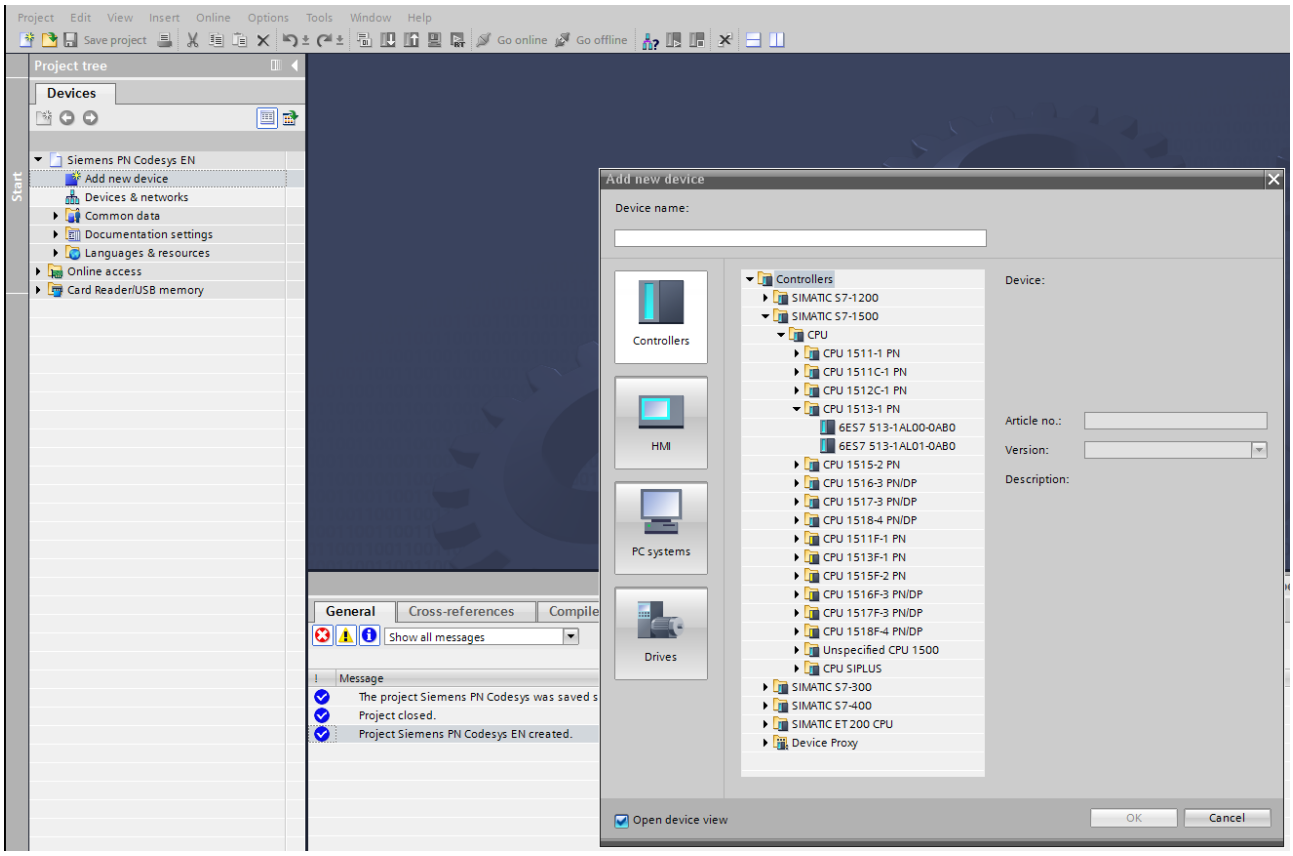


Fig. 84: Adding a controller

- Include the Turck Codesys device in the project. To do this, select the generic GSDML file “CDS3 PN Device” from the “Turck” folder.

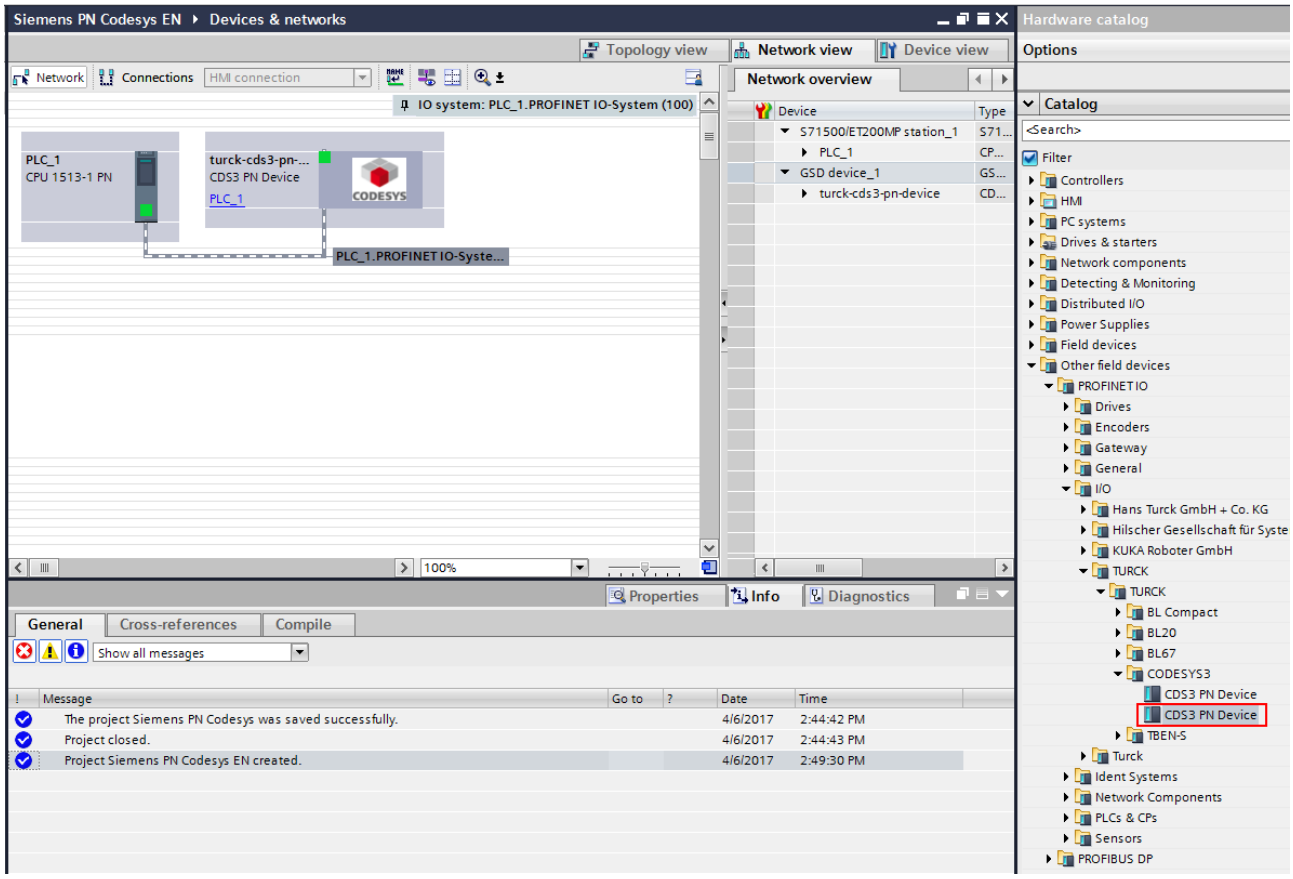


Fig. 85: Adding the Turck Codesys device

TBEN-L…-4RFID-8DXP-CDS – Assigning the IP address and PROFINET device name

- Assign the IP address and PROFINET device name if necessary via the Turck Service Tool.
- Enter IP address and PROFINET name in the TIA Portal (Device configuration → Properties → General → Ethernet address.

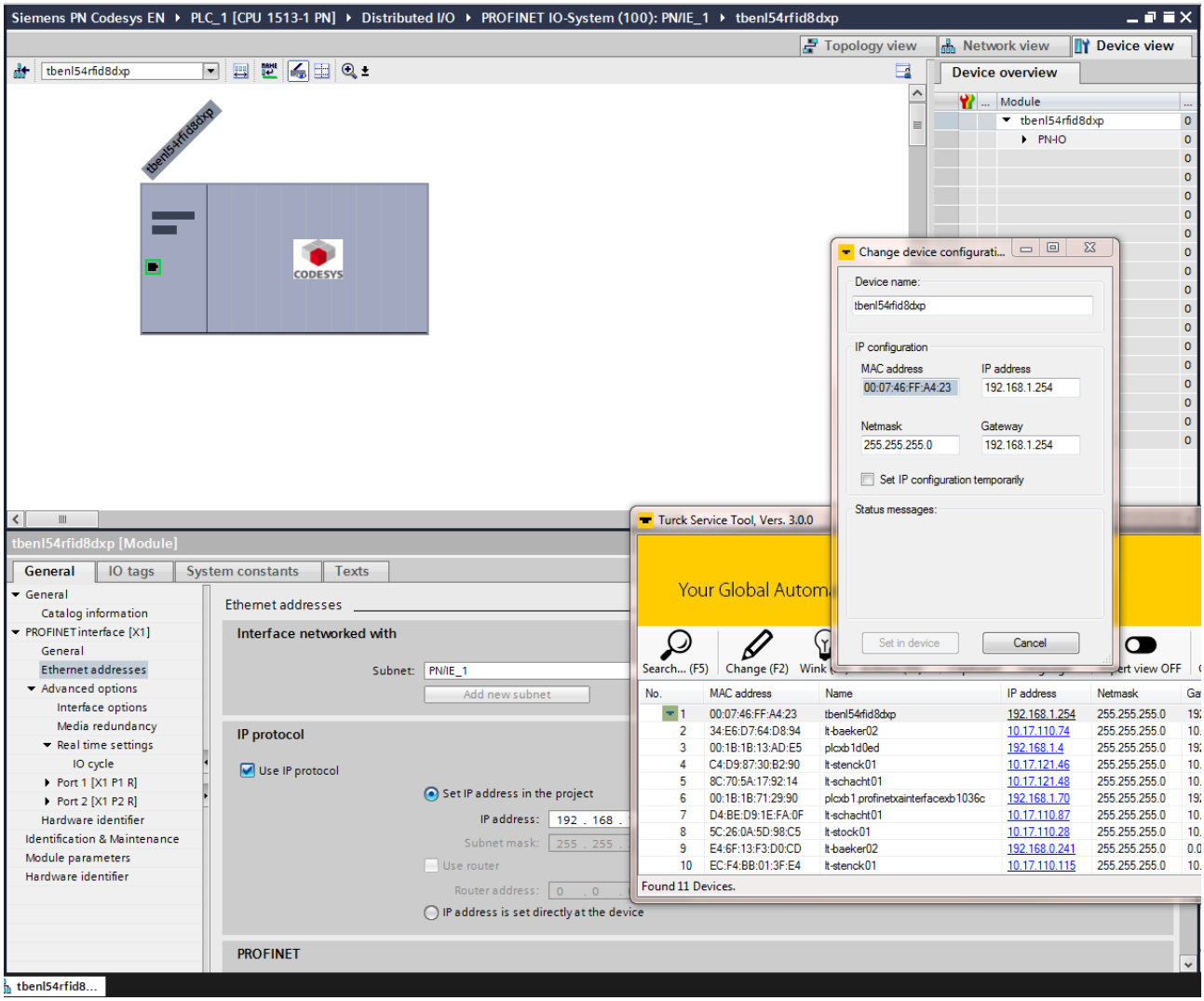


Fig. 86: Assigning the IP address and PROFINET device name in the TIA Portal

NOTE
The sockets defined as inputs in CODESYS correspond to the outputs in the TIA Portal and vice versa.

- Example: Assign IN 1 Byte and OUT 1 Byte from the Hardware catalog to the device.

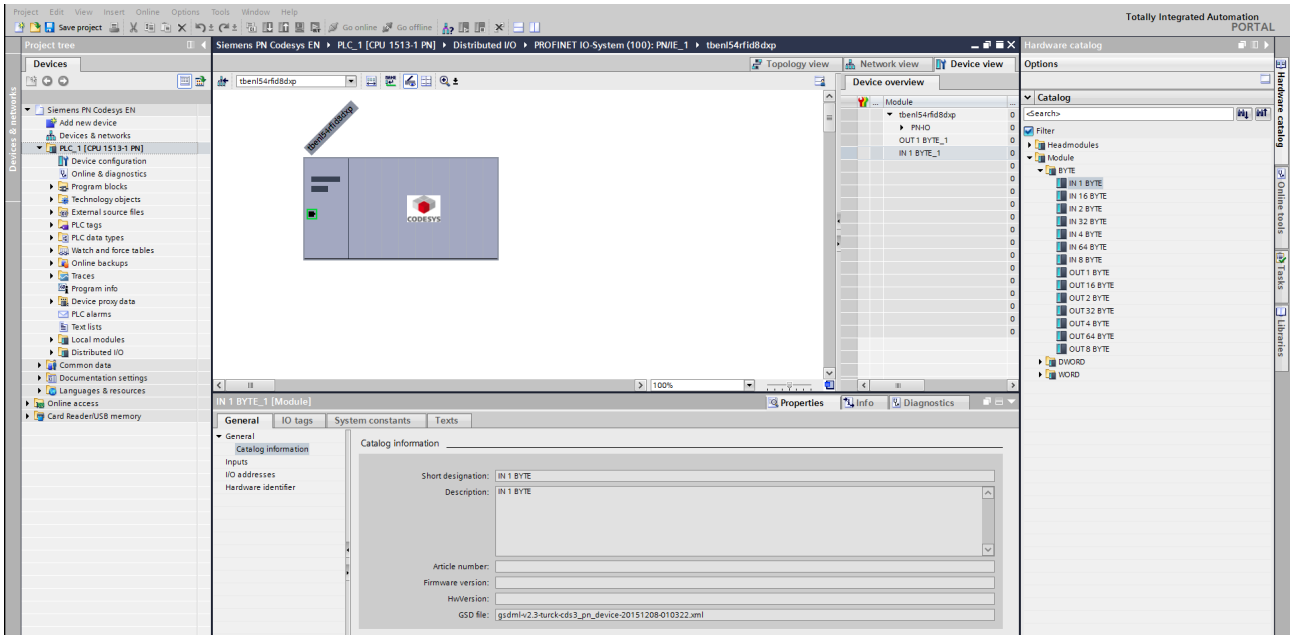


Fig. 87: Assigning the inputs and outputs in the TIA Portal

Creating the monitoring table

The process data (in this case: the set “Tag present” bit) can be visualized via monitoring tables.

- ▶ Creating a new monitoring table.

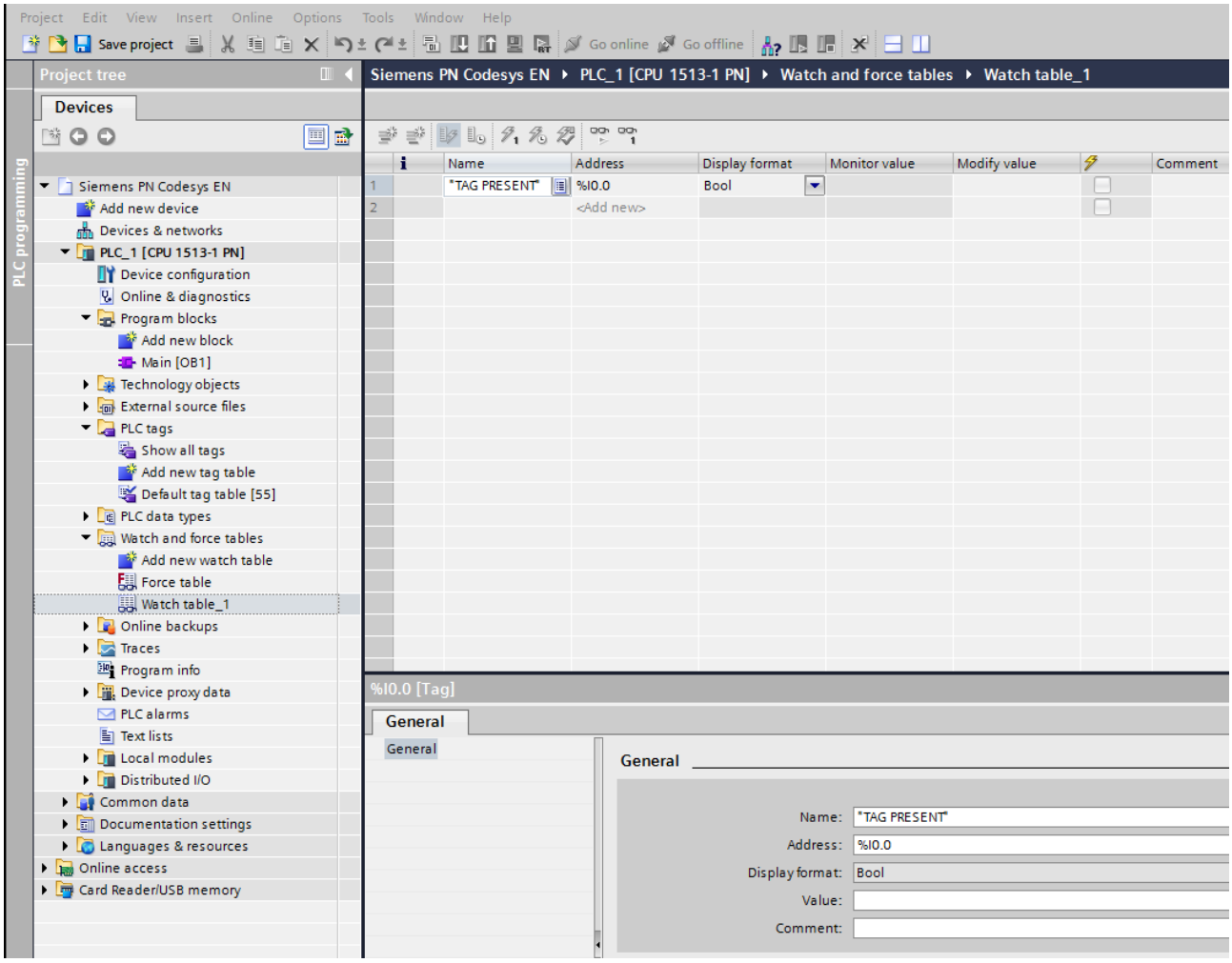


Fig. 88: Creating the monitoring table

Loading the configuration in the controller

- ▶ Load the configuration in the controller.

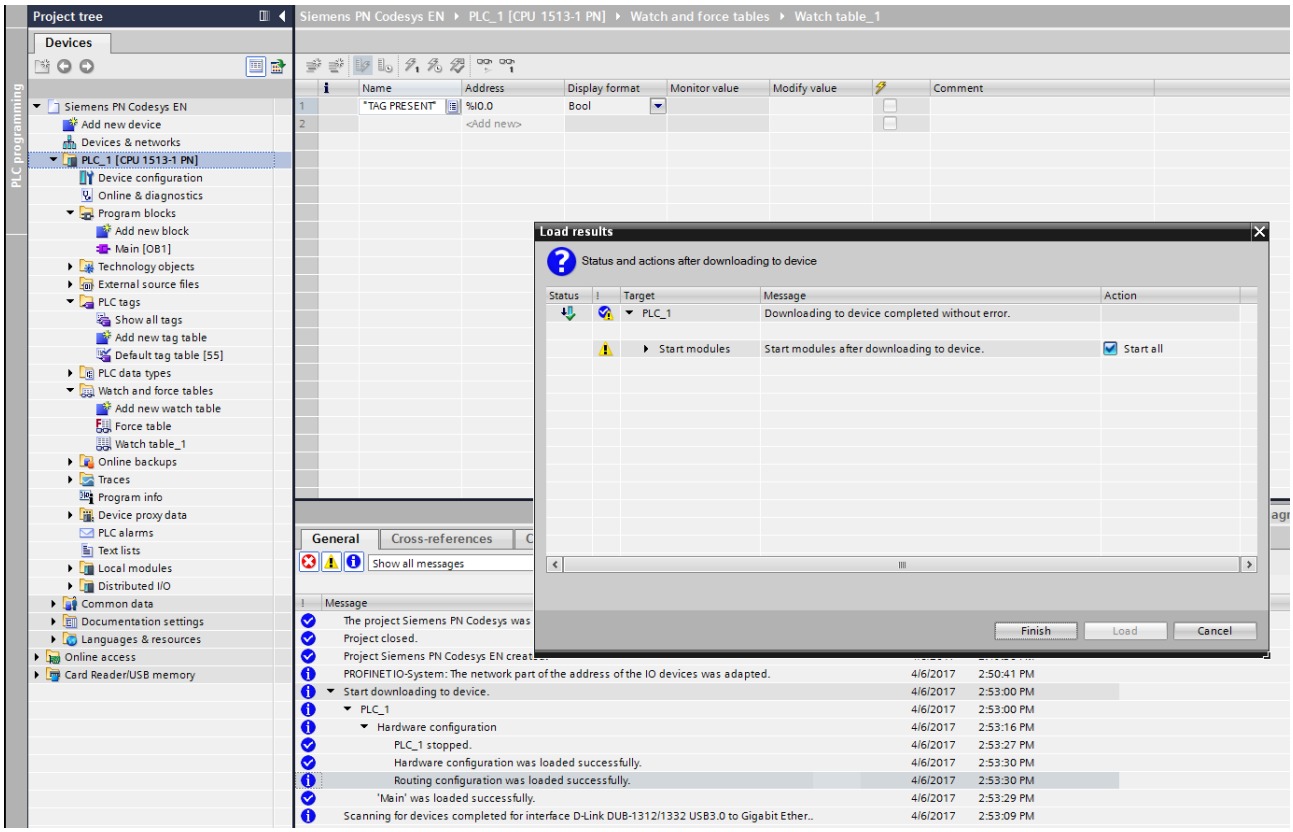


Fig. 89: Loading the configuration in the controller

7.4.4 Reading out process data

In online mode, the “Tag present” bit is displayed in the monitoring table.

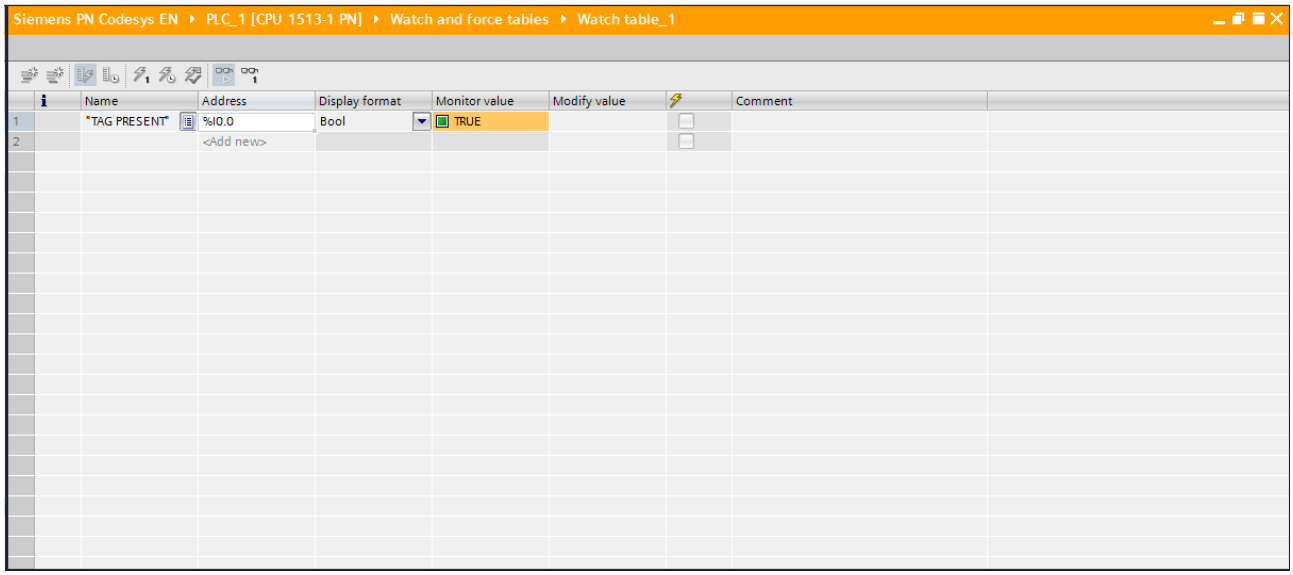


Fig. 90: “Tag present” bit in the monitoring table

The successful connection is now displayed in the project tree in CODESYS.

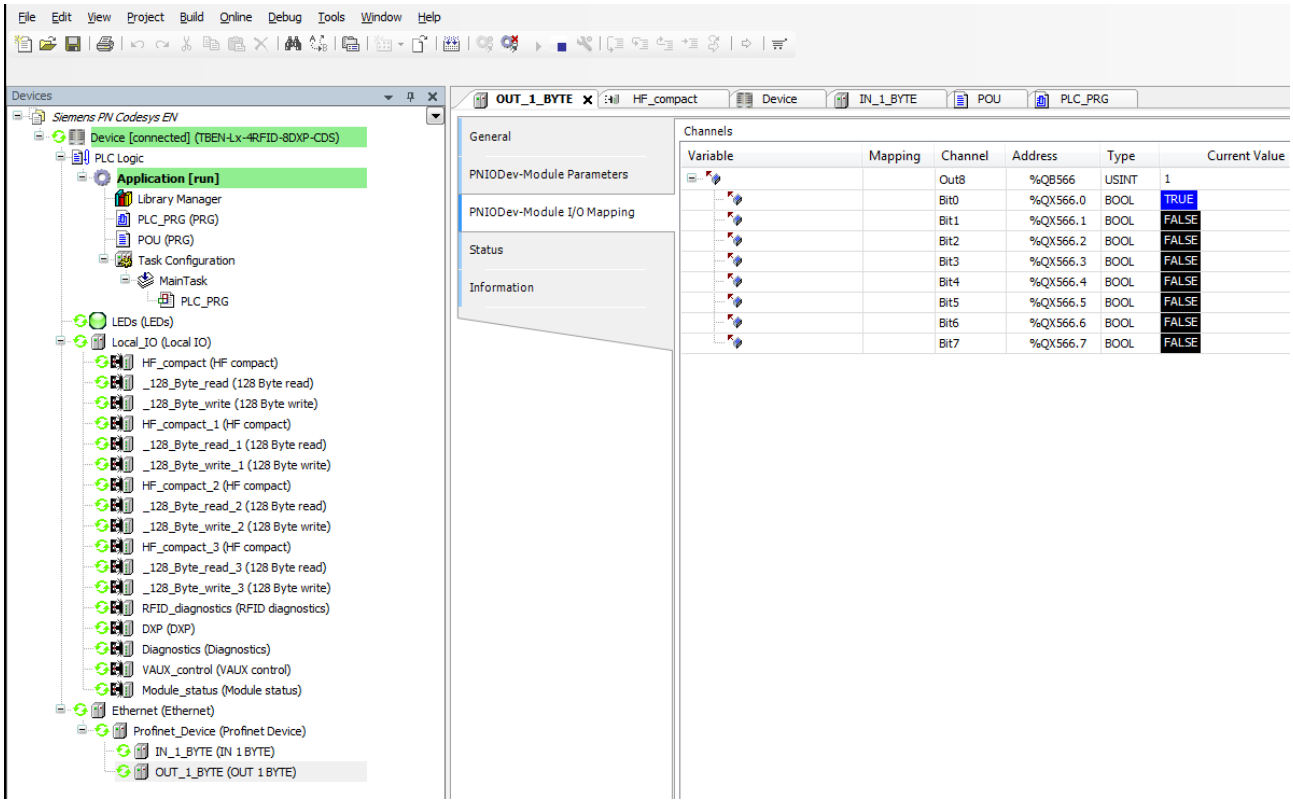


Fig. 91: Successfully established connection – Display in CODESYS

7.5 Starting the device as the Modbus master

In this example the “Tag present” bit is queried. This requires the network interface to be set up, the hardware configured and the I/O mapping defined.

Hardware used

This example uses the following hardware components:

- TBEN-L5-4RFID-8DXP-CDS block module (IP address: 192.168.1.100)
- TBEN-2RFID-4DXP block module (IP address: 192.168.1.20)
- TN-Q80-H1147 HF read/write head

Software used

This example uses the following software:

- CODESYS 3.5.8.1 (download free of charge from **www.turck.com**)

Requirements

- The package file for TBEN-L…-4RFID-8DXP-CDS must be installed.

Defining the device as master in CODESYS

- Open CODESYS.
- Create a new standard project.

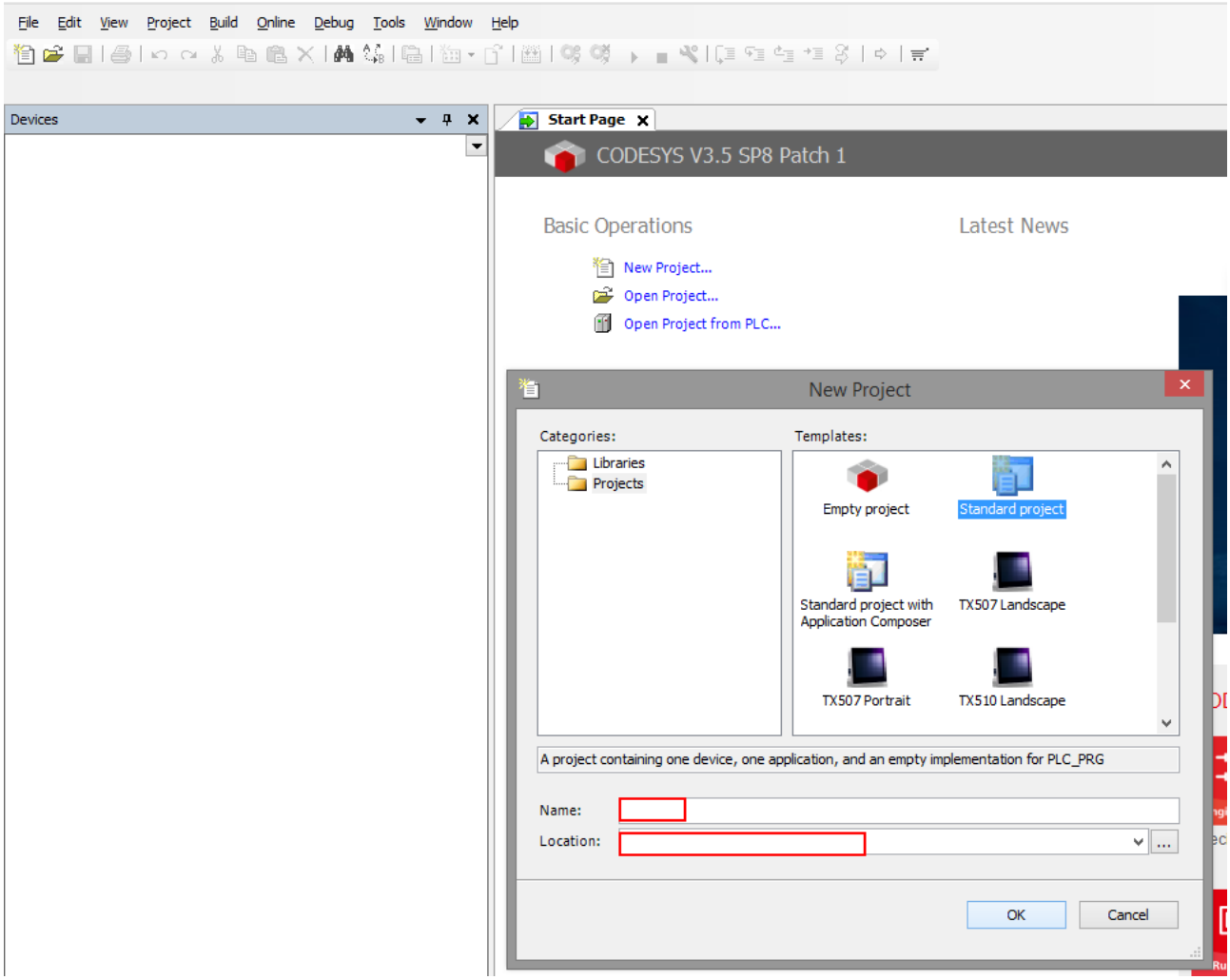


Fig. 92: Creating a new standard project in CODESYS

▶ Select the “TBEN-Lx-4RFID-8DXP-CDS” block module as master device.

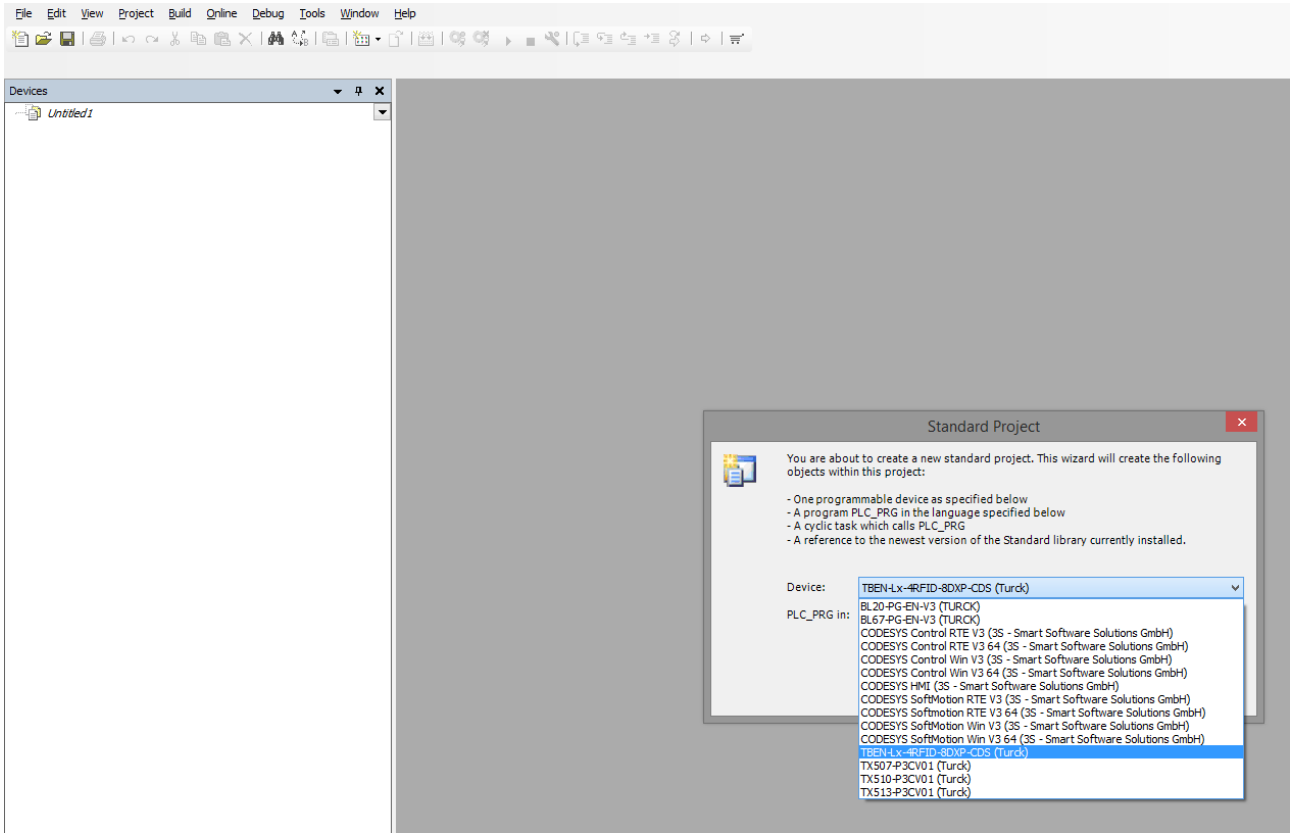


Fig. 93: Selecting the master device

This creates the device in the project tree.

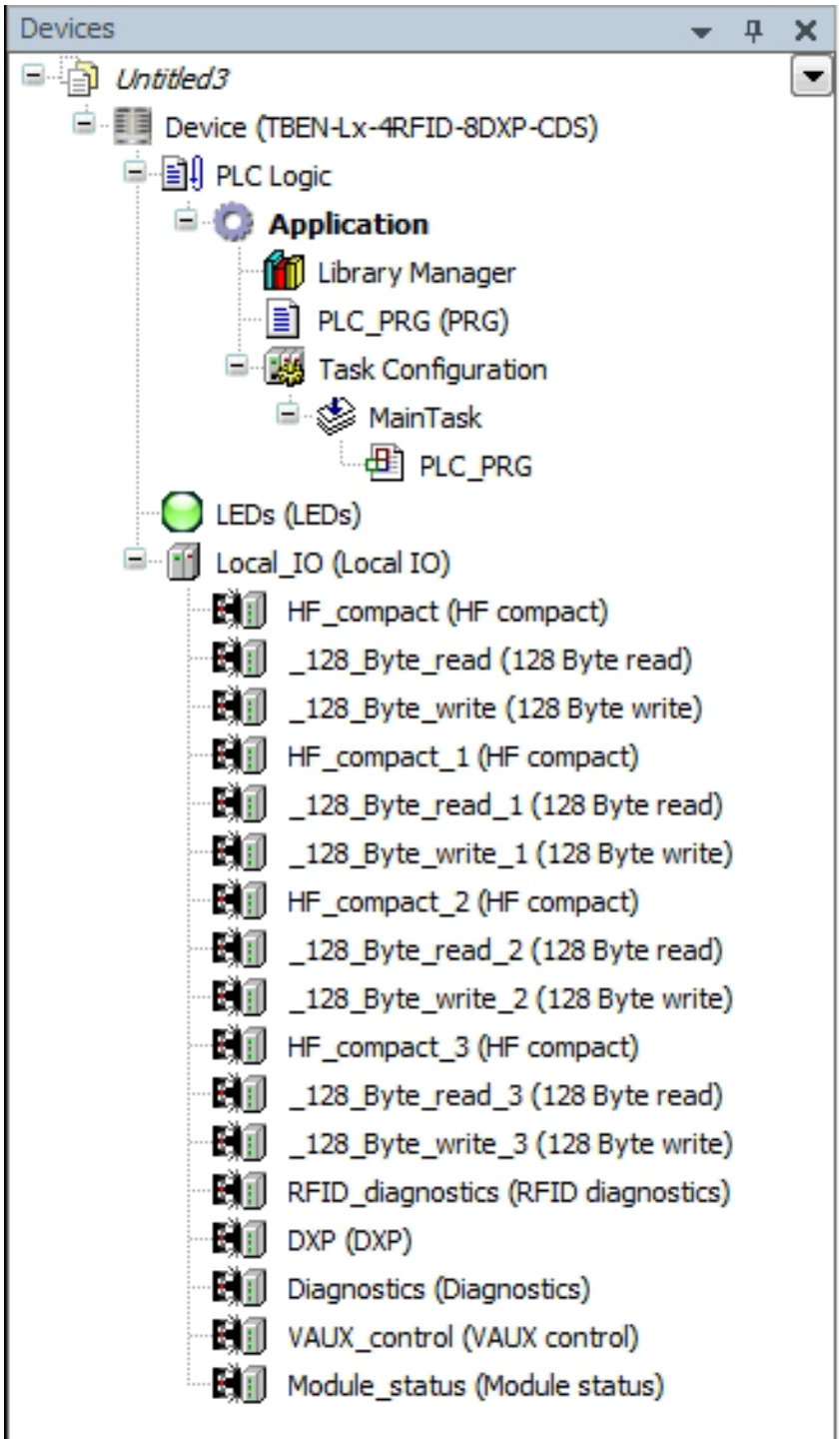


Fig. 94: TBEN-L5-4RFID-8DXP-CDS in the project tree

Adding an Ethernet adapter

- Right-click “Device (TBEN-Lx-4RFID-8DXP-CDS)” in the project tree.
- Select “Append device”.
- Select an Ethernet adapter.
- Click “Append device”.

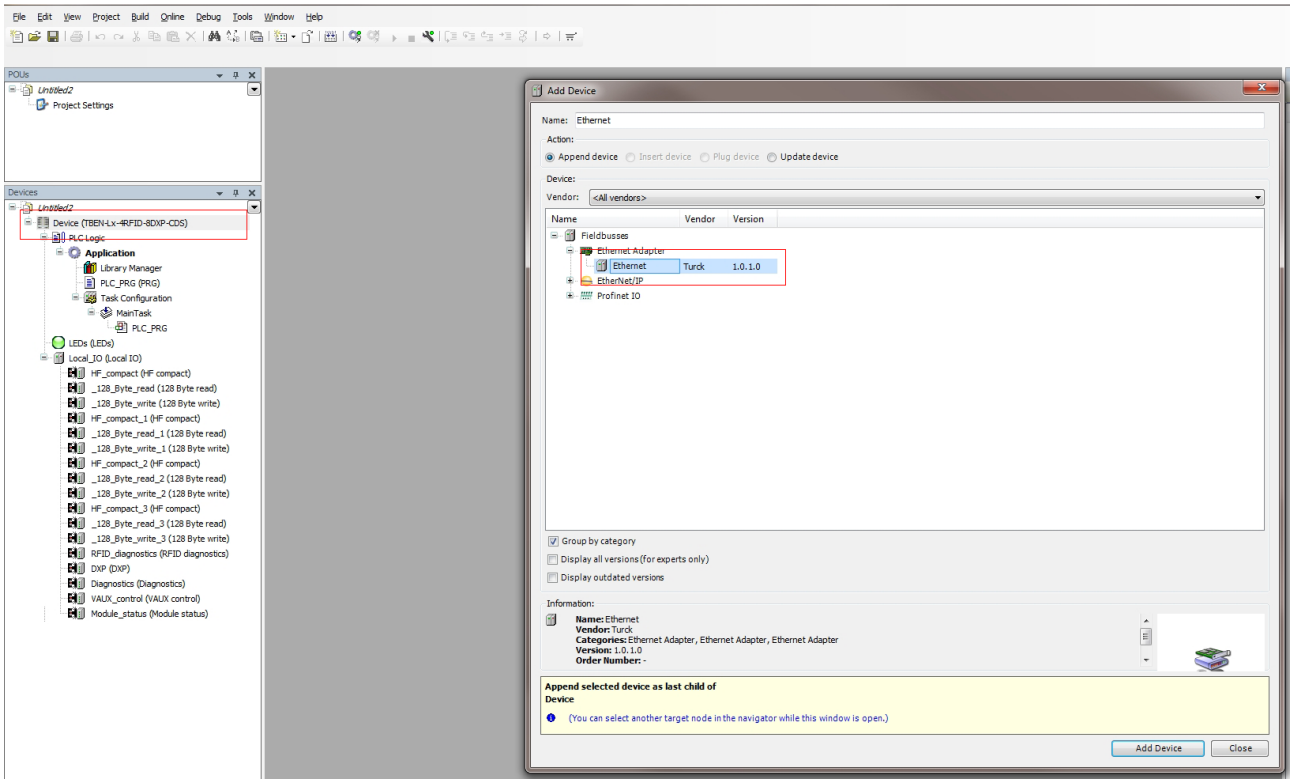


Fig. 95: Adding an Ethernet adapter

Adding a Modbus master

- ▶ Right-click “Ethernet (Ethernet)” in the project tree.
- ▶ Select “Append device”.
- ▶ Double-click “Modbus TCP master”.
- ⇨ The device appears as “Modbus_TCP_Master” in the project tree.
- ⇨ Modbus slaves can be connected to the Modbus master.

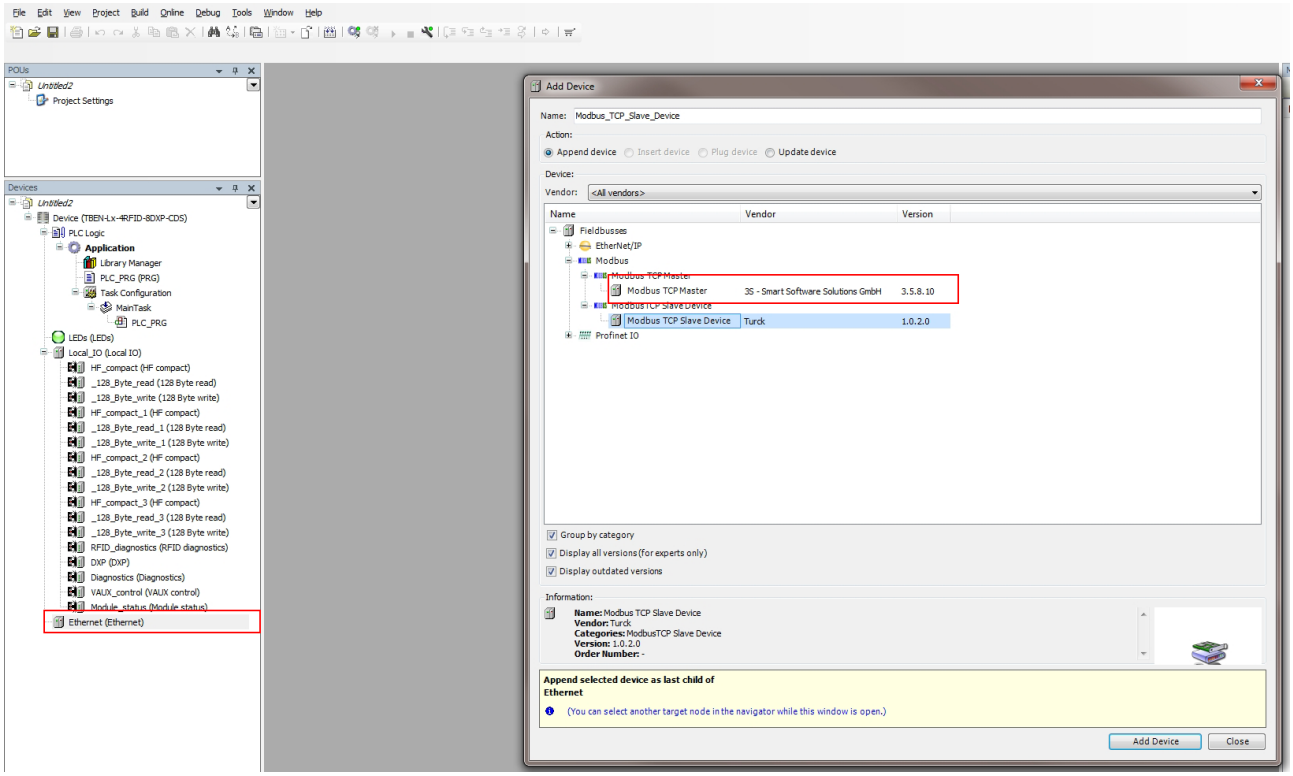


Fig. 96: Adding a Modbus master

7.5.1 Setting up the network interface

- Double-click “Device (TBEN-L5-4RFID-8DXP-CDS” in the project tree.
- Choose the “Communication” tab.
- Click “Scan network”.
- Select TBEN-L and press OK or double-click to confirm.

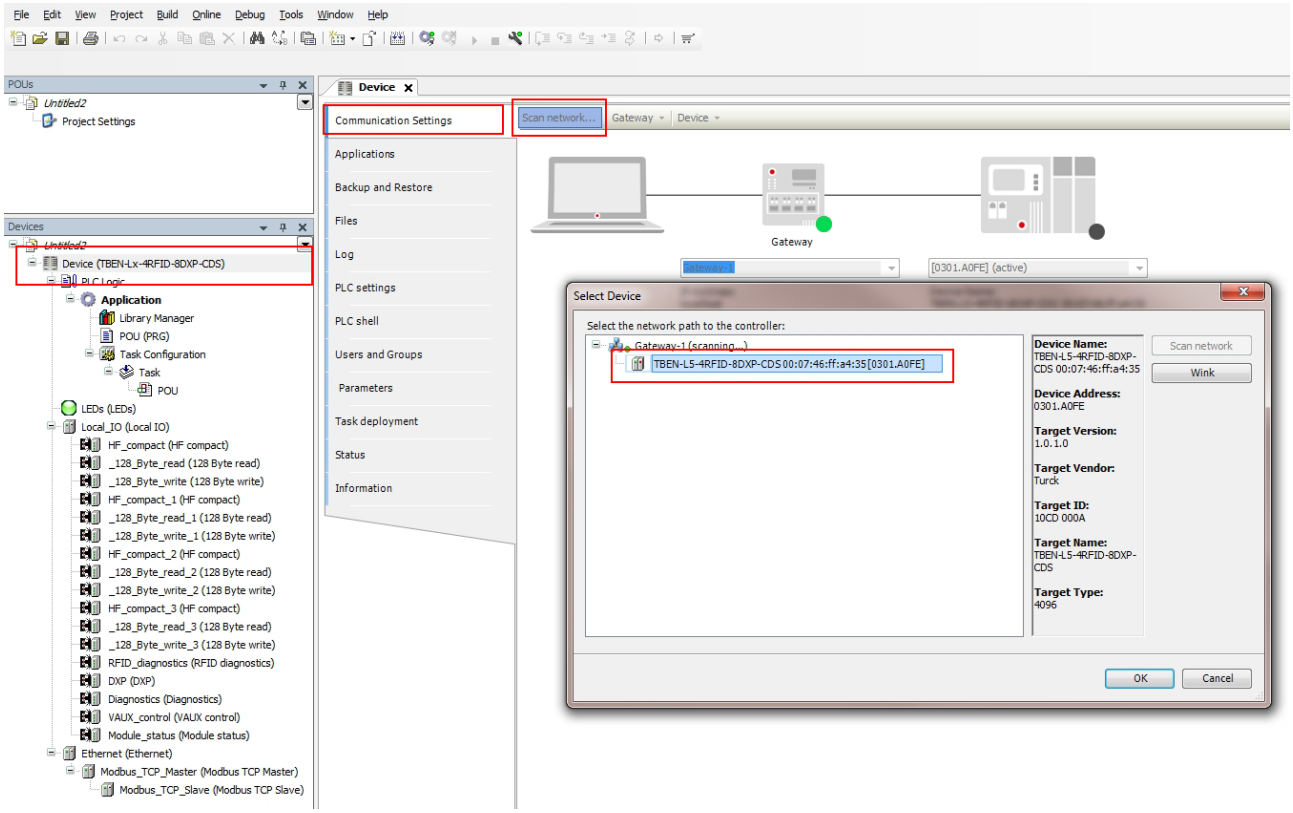


Fig. 97: Adding the network interface

- ▶ Select the “PLC Settings” tab.
- ▶ In the “Always refresh variables” drop-down menu, select “Activate 2 (always in the bus cycle task)”.

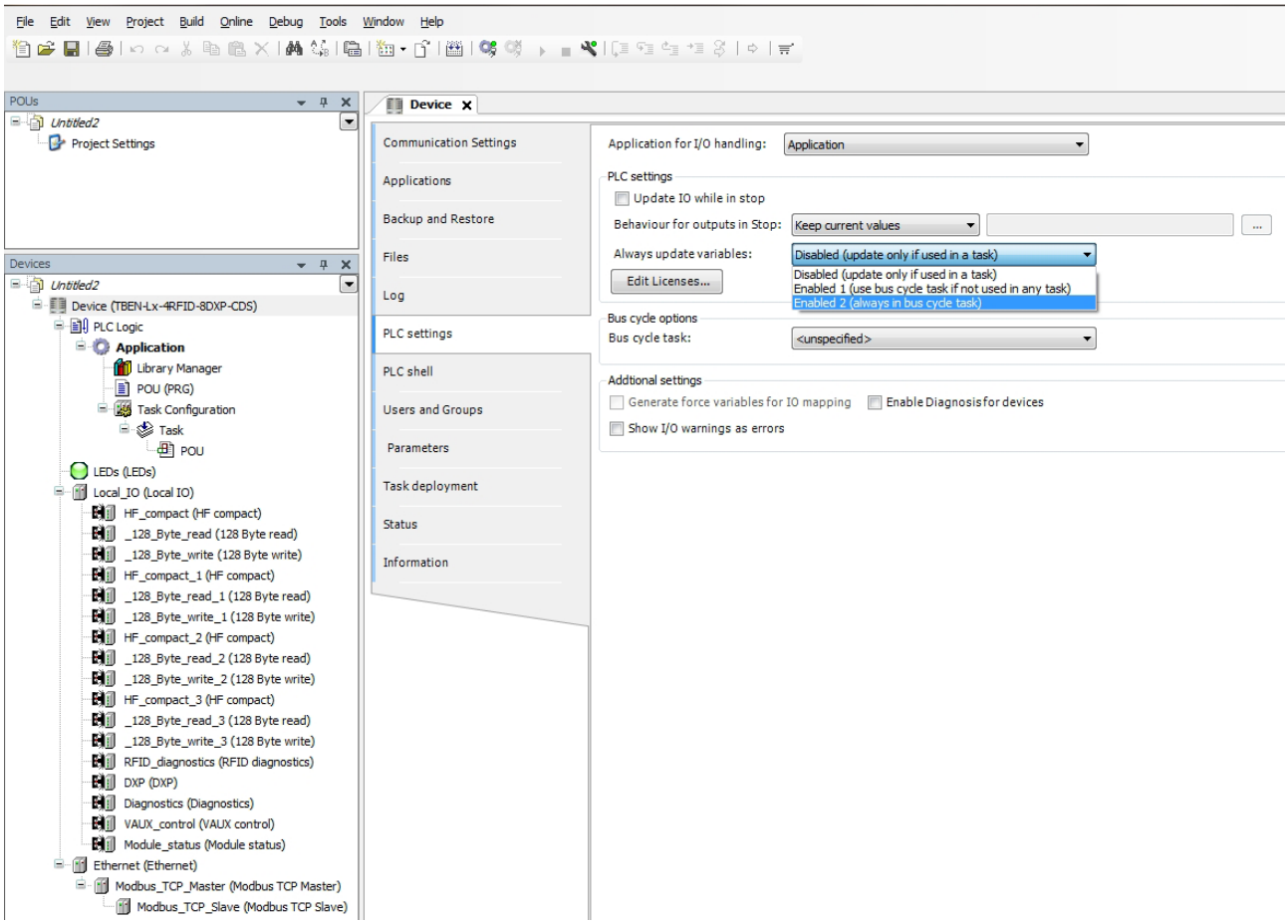


Fig. 98: Selecting the “Always refresh variables” option

- Double-click “Ethernet” in the project tree.
- Enter the IP address of the Modbus master (here: 192.168.1.100).

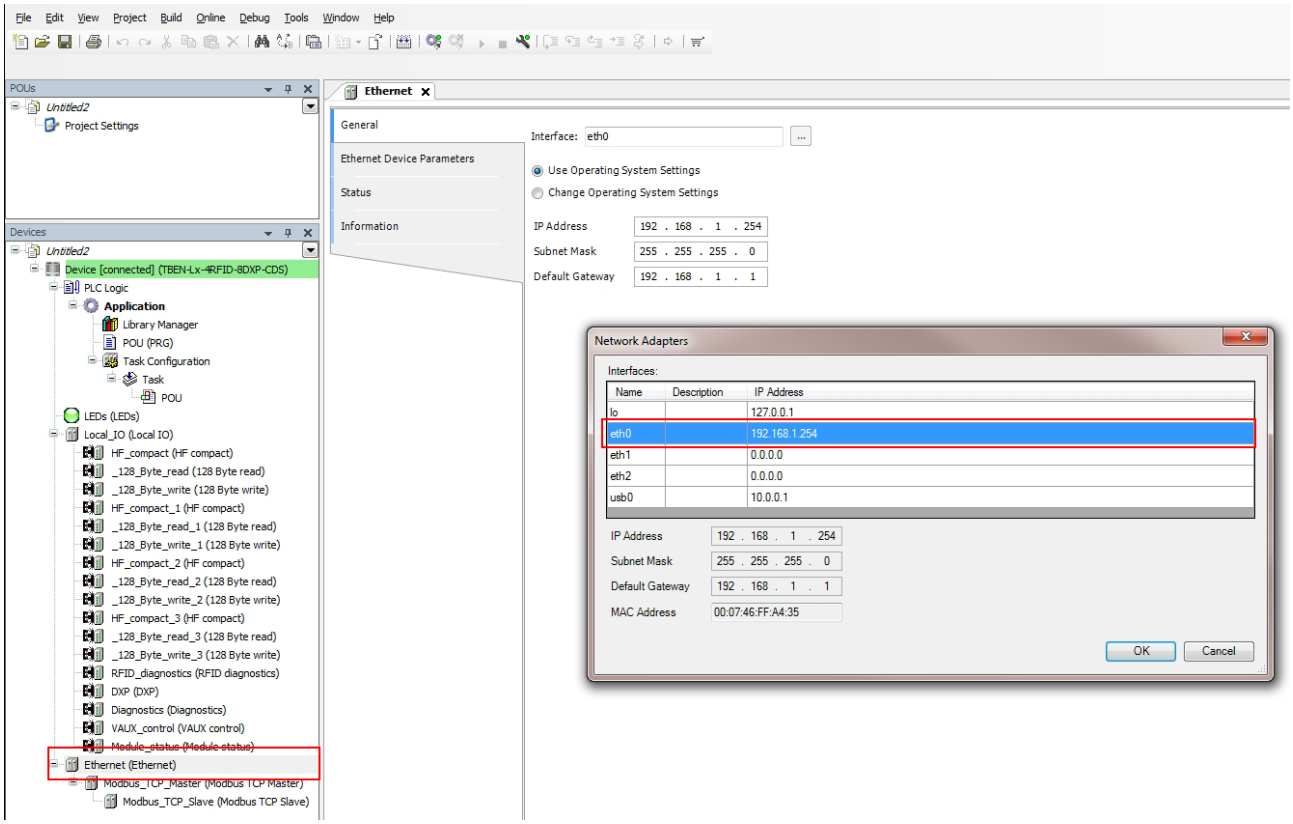


Fig. 99: Modbus master – Entering the IP address

- ▶ Double-click “Modbus_TCP_slave” in the project tree.
- ▶ Enter the IP address of the Modbus slave (here: 192.168.1.20).

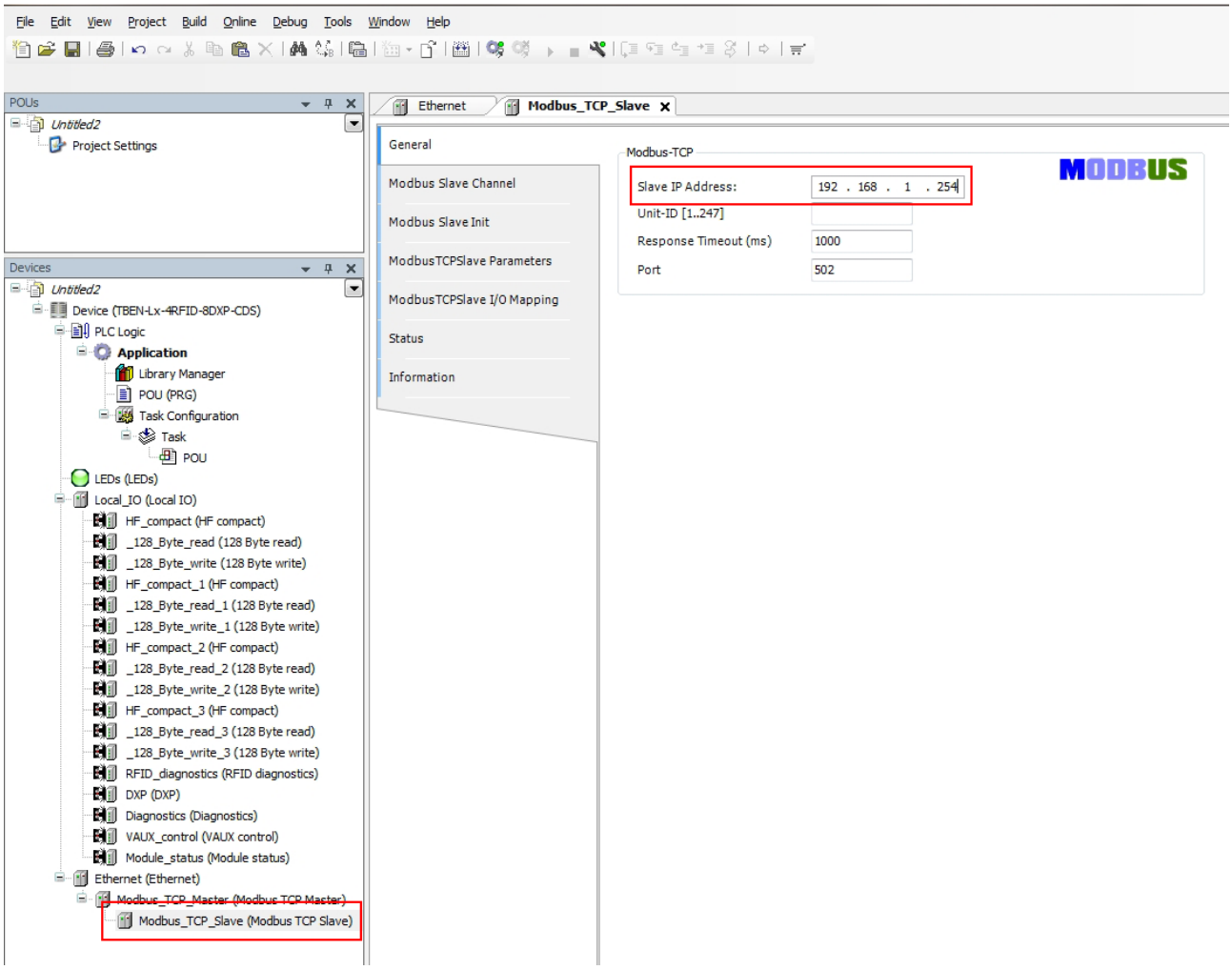


Fig. 100: Modbus master – Entering the IP address

7.5.2 Setting Modbus channels (registers)

Set channel 0 (input data)

- ▶ Double-click “Modbus TCP slave”.
- ▶ In the “Modbus slave channel” tab select → “Add channel”.
- ▶ Enter the following values:
  - Name of channel
  - Access type: Read Input Registers
  - Offset: 0x0000
  - Length: 76 registers (152 bytes)
- ▶ Confirm with OK.

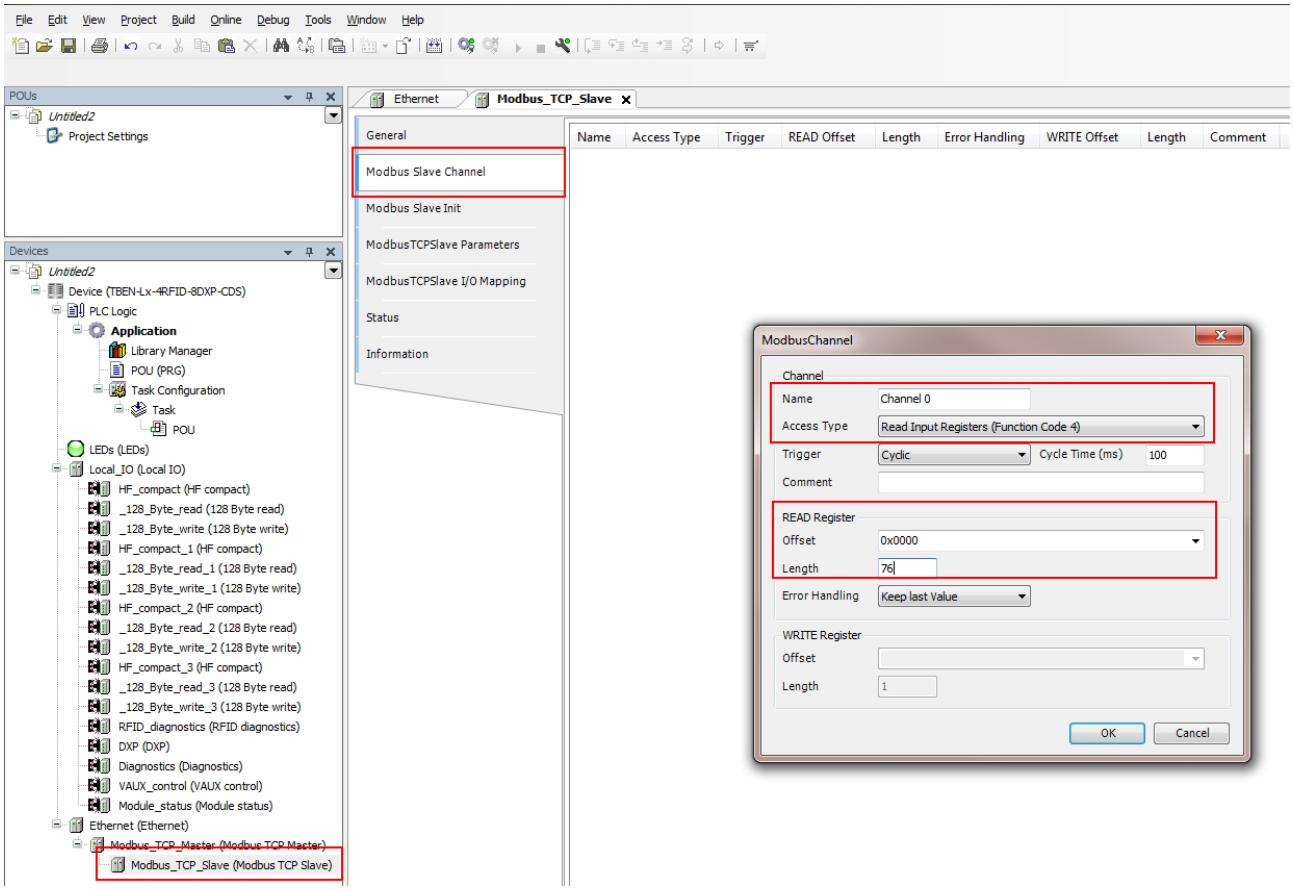


Fig. 101: Setting the READ register

Set channel 1 (output data)

- ▶ Double-click “Modbus TCP slave” in the project tree.
- ▶ In the “Modbus slave channel” tab select → “Add channel”.
- ▶ Enter the following values:
  - Name of channel
  - Access type: Write Multiple Registers
  - Offset: 0x0000
  - Length: 76 registers (152 bytes)
- ▶ Confirm with OK.

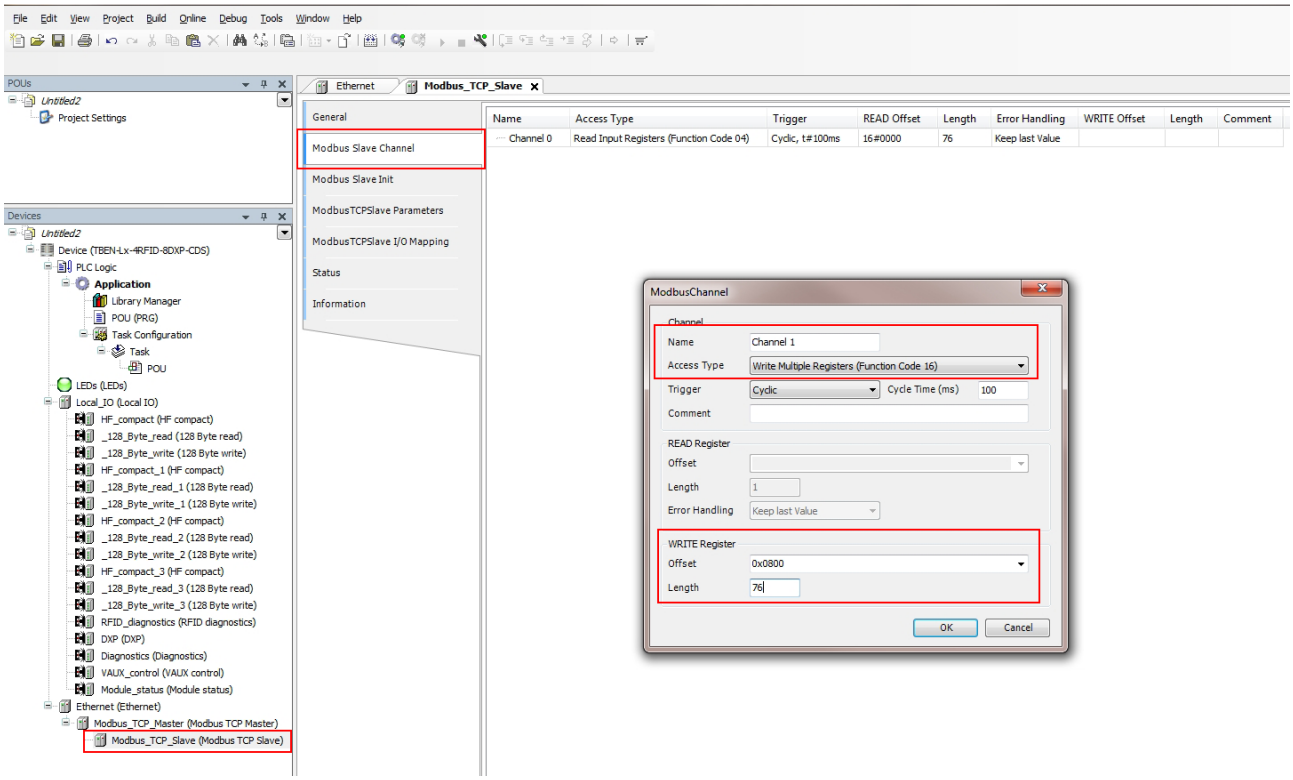


Fig. 102: Setting the WRITE registers

7.5.3 Reading out process data

The I/O image of the slave can be viewed in Online mode.

- ▶ Double-click the Modbus TCP slave.
- ▶ Click the “Modbus TCP Slave I/O image” tab.
- ⇨ The process data is displayed. In this example, the “Tag present” bit is set if a tag is present in the detection range of the read/write head connected to channel 1.

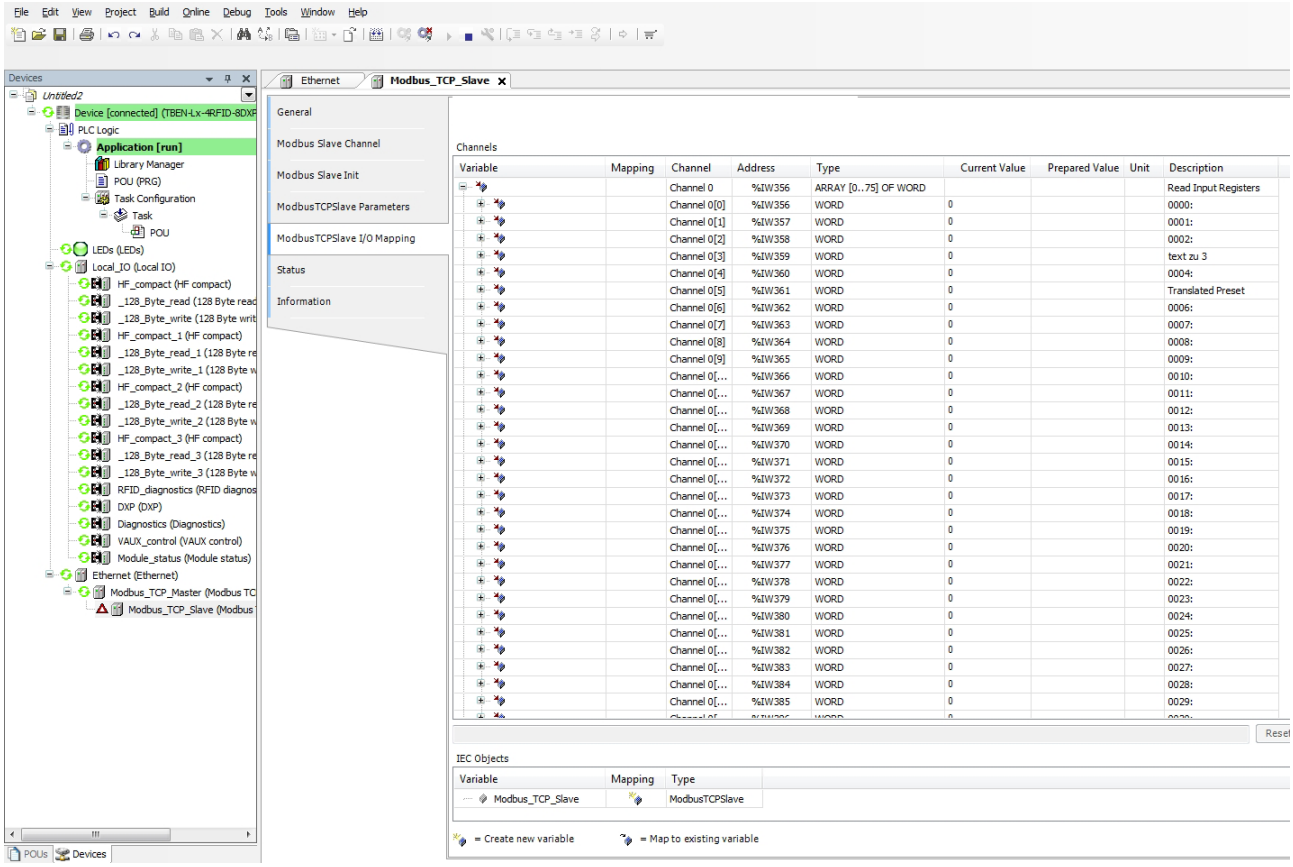


Fig. 103: Example: Process data

Refer to the operating instructions of the connected slave for the mapping the channels (see figure below).

Description	Register		Bit offset	Bit length
	Channel 1	Channel 2		
Response code	0x0000	0x004C	0	14
Error	0x0000	0x004C	14	1
Busy	0x0000	0x004C	15	1
Tag within the detection range	0x0002	0x004E	0	1
Loop counter	0x0001	0x004D	0	8
Read/write head detuned	0x0002	0x004E	4	1

Fig. 104: Example: Extract from the Modbus TCP Mapping for TBEN-L5-4RFID-8DXP-CDS

8 Setting

The device can be controlled, read and set via parameter data, process input data, process output data and diagnostic data. The following table shows the data mapping:

Socket	Channel	Parameter data		Process input data		Process output data		Diagnostic data	
		Bytes	Meaning	Bytes	Meaning	Bytes	Meaning		
0	GW	0…1	GW parameter					0…1	Diagnostics GW
1	0	0…31	RFID parameters	0…23	RFID input data	0…23	RFID output data	0…36	RFID channel diagnostics
2	0	32…33	Length of read data	24…151	Read data				
3	0	34…35	Length of write data			24…151	Write data		
4	1	36…37	RFID parameters	152…175	RFID input data	152…175	RFID output data	36…71	RFID channel diagnostics
5	1	68…69	Length of read data	176…303	Read data				
6	1	70…71	Length of write data			176…303	Write data		
7	2	72…102	RFID parameters	304…327	RFID input data	304…327	RFID output data	72…107	RFID channel diagnostics
8	2	104…105	Length of read data	328…455	Read data				
9	2	106…107	Length of write data			328…455	Write data		
10	3	108…139	RFID parameters	456…479	RFID input data	456…479	RFID output data	108…143	RFID channel diagnostics
11	3	140…141	Length of read data	480…607	Read data				
12	3	142…143	Length of write data			480…607	Write data		
13	Diag CH0			608…643	Diagnostics RFID channel 0				
	Diag CH1			644…679	Diagnostics RFID channel 1				
	Diag CH2			680…715	Diagnostics RFID channel 2				
	Diag CH3			716…751	Diagnostics RFID channel 3				
14	8DXP Basic	144…147	DXP parameters	752…753	DXP input data	608…609	DXP output data	144…147	DXP diagnostics

Socket	Channel	Parameter data		Process input data		Process output data		Diagnostic data
		Bytes	Meaning	Bytes	Meaning	Bytes	Meaning	
15	8DXP Diag			754…757	DXP error messages			
16	VAUX control	148…155	VAUX settings			610…611	VAUX output data	
17	Module status			758…759	Module status			

8.1 RFID channels – Setting parameter data

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	Operating mode (Mode)							
1	Select tag type (TAGTYPE)							
2	Bridging time (BYPASS)							
3								
4	AT	TERM	HB	ANTI				
5	DID							DXD
6	reserved							
7	reserved							
8	Command repetitions (CRET)							
9	HF: Command in Continuous mode (CCM)							
10	HF: Length in Continuous mode (LCM)							
11								
12	HF: Address in Continuous mode (ACM)							
13								
14								
15								
16	reserved							
17	…							
18								
19								
20								
21								
22								
23								
24								
25								
26								
27	reserved							
28	XCVR8	XCVR7	XCVR6	XCVR5	XCVR4	XCVR3	XCVR2	XCVR1
29	XCVR16	XCVR15	XCVR14	XCVR13	XCVR12	XCVR11	XCVR10	XCVR9
30	XCVR24	XCVR23	XCVR22	XCVR21	XCVR20	XCVR19	XCVR18	XCVR17
31	XCVR32	XCVR31	XCVR30	XCVR29	XCVR28	XCVR27	XCVR26	XCVR25
32	Length of write data (WDS)							
33								
34	Length of read data (RDS)							
35								

8.1.1 Meaning of the parameter bits

The default values of the firmware, the DTM and the EDS file are **shown** in bold type. The default values for PROFINET may differ.

Designation	Meaning
Operating mode (OMRFID)	0: deactivated **1: HF compact** 2: HF extended 3: HF bus mode 4: UHF compact 5: UHF extended
Tag type (TAGTYPE)	**0: Automatic detection** 1: NXP I-Code SLI/SL2 2: Fujitsu MB89R118 3: TI Tag-it HFI Plus 4: Infineon SRF55V02P 5: NXP I-CODE SLI S 6: Fujitsu MB89R119 7: TI Tag-it HF-I 8: Infineon SRF55V10P 9: reserved 10: reserved 11: NXP I-CODE SLI L 12: Fujitsu MB89R112 13: EM4233SLIC Read/write heads with firmware from V1.91 also support: 14: NXP SLIX2 15: TI Tag-it HFI Pro 16: Turck Sensor Tag 17: Infineon SRF55V02S 18: Infineon SRF55V10S 19: EM4233 20: EM4237 21: EM4237 SLIC 22: EM4237 SLIX 23: EM4033
Bridging time (BYPASS)	Bridging time in ms, adjustable from 4…1020 ms, default setting: 200 ms
Automatic tuning of read/write head (AT)	**0: Automatic tuning off** 1: Automatic tuning on
RS 485 terminating resistor (TERM)	0: RS485 terminating resistor off **1: RS485 terminating resistor on** In HF bus mode the RS485 bus terminating resistor is activated by default.
HF: Heartbeat read/write head (HB)	The device confirms its operational readiness via a signal which is sent at regular intervals to the controller. NOTE: A heartbeat slows down the system since a heartbeat and another command cannot be executed simultaneously. **0: Heartbeat read/write head off** 1: Heartbeat read/write head on
HF: Multitag mode (ANTI)	**0: Multitag mode off** 1: Multitag mode on
Diagnostic input filter (DID)	**0: All diagnostic messages on** 1: Diagnostic messages off

Designation	Meaning
Deactivate diagnostic HF read/ write head tuning (DXD)	**0: Diagnostic messages of the read/write head on** 1: Diagnostic messages of the read/write head off
Command repetitions in the event of an error (CRET)	Number of command repetitions after an error message, default setting: 2
HF: Command in Continuous mode (CCM)	**0x01: Inventory** 0x02: Read 0x03: Tag info 0x04: Write
HF: Length in Continuous mode (LCM)	Number of bytes that still have to be read or written in Continuous mode, default setting: 8
HF: Address in Continuous mode (ACM)	Start address of the USER memory area on the tag to be read or written, default setting: 0
HF bus mode: Read/write head active (XCVR0…XCVR31)	**0: no read/write head active** 1: Read/write head active In HF bus mode all connected or addressed read/write heads are active by default.
Length of write data (WDS)	Size of the write data, default setting depends on the selected interface and fieldbus
Length of read data (RDS)	Size of the read data, default setting depends on the selected interface and fieldbus

8.1.2 HF applications – Selecting the tag type

- In multitag applications select a tag type for executing the read and write commands. The automatic tag detection is not supported for the read and write commands in multitag mode.

The tag types that can be selected depends on the firmware of the connected read/write head. The firmware version of the read/write head can be read with the "Read/write head identification" command.

NOTE
The firmware version of the interface up to 1.0.1.0 only displays in the web server, in the associated DTM as well as in the catalog and GSDML files those tags that were detected by read/write heads with a firmware version up to 1.90. The tags shown in the table below can be detected irrespective of this.

If a selected tag is not supported by the firmware of the connected read/write head, the RFID interface outputs the "Length out of Tag Specification" error.
The tag type does not have to be selected in single-tag applications and for inventory commands in multitag applications if the read/write head detects the tags automatically.

Tag	Firmware version Read/write head	Firmware version Interface	selectable	Automatic detection possible	Indicated in the web server, DTM, GSDML and catalog files
1: NXP Icode SLIX	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	x	x
2: Fujitsu MB89R118	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	x	x
3: TI Tag-it HFI Plus	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	x	x
4: Infineon SR-F55V02P	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	x	x
5: NXP Icode SLIX-S	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	–	x
6: Fujitsu MB89R119	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	–	x
7: TI Tag-it HF-I	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	–	x
8: Infineon SR-F55V10P	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	–	x

Tag	Firmware version Read/write head	Firmware version Interface	selectable	Automatic detection possible	Indicated in the web server, DTM, GSDML and catalog files
11: NXP Icode SLIX-L	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	–	x
12: Fujitsu MB89R112	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	–	x
13: EM4233SLIC	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	x	x	x
	≤ V1.90	all	x	–	x
14: NXP SLIX2	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	–	x	–
	≤ V1.90	all	–	–	–
15: TI Tag-it HFI Pro	≥ V1.91	≥ V3.4.1.0	–	x	x
	≥ V1.91	≤ V3.3.5.0	–	x	–
	≤ V1.90	all	–	–	–
16: Turck Sensor Tag	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	–	x	–
	≤ V1.90	all	–	–	–
17: Infineon SR-F55V02S	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	–	x	–
	≤ V1.90	all	–	–	–
18: Infineon SR-F55V10S	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	–	x	–
	≤ V1.90	all	–	–	–
19: EM4233	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	–	x	–
	≤ V1.90	all	–	–	–
20: EM4237	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	–	x	–
	≤ V1.90	all	–	–	–
21: EM4237 SLIC	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	–	x	–
	≤ V1.90	all	–	–	–
22: EM4237 SLIX	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	–	x	–
	≤ V1.90	all	–	–	–
23: EM4033	≥ V1.91	≥ V3.4.1.0	x	x	x
	≥ V1.91	≤ V3.3.5.0	–	x	–
	≤ V1.90	all	–	–	–

8.1.3 HF applications – Setting the bridging time

Due to the expansion of the HF transmission zone the tag may drop out momentarily during a write or read operation and then later return again. The period between the drop out and the return to the transmission zone must be bridged so that the write or read operation is completed. The bridging time is the time between the dropout and the return to the detection range. The “Bridging time” parameter takes up 1 word in the parameter data image and is stated in ms.
The bridging time can be set between 4…1020 ms. The bridging time parameter depends on the components used, the write/read distances, the speed of the tag to the read/write head and other external factors.
The following figure shows the typical characteristics of the sensing range and the path covered by the read/write head. A shows the section to be bridged:

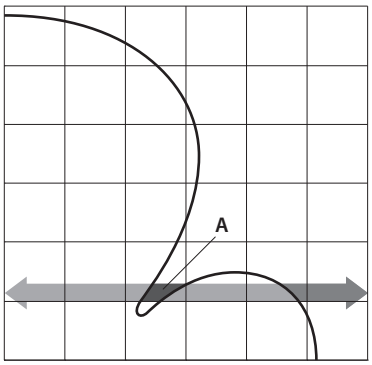


Fig. 105: Detection range of a read/write head

Retaining the default setting

The default setting for the bridging time is 200 ms. In HF bus mode the default value is 48 ms.

- Retaining the default setting: If the commissioning is successful, the parameter does not have to be adjusted to the application. If the commissioning is not successful, an error message will appear.
- If the error message appears, adjust the bridging time. If it is not possible to adjust the bridging time, reduce the speed or data volume.

The information “Recommended distance” and “Maximum distance” is provided in the product-specific data sheet as well as in the RFID engineering manual (D500024).

Adapting the bridging time to the application

- Measure the required bridging time directly on location. The LEDs of the read/write head and the TP status bit indicate whether the read/write head is in the detection range or not.
- Enter the required bridging time.

8.1.4 HF applications – Setting Continuous mode

NOTE
In Continuous mode (HF) the read/write head can read or write up to 64 bytes.

- ▶ Enter the following parameters: Tag type, command in Continuous mode, length in Continuous mode, start address
- ▶ Enter the tag type. Automatic detection is not possible.
- ▶ Select the command in Continuous mode (CCM): Inventory, read, tag info and write are possible.
- ▶ Enter the length in Continuous mode (LCM): Enter the length of the data to be read in bytes.
- ▶ Enter the start address for the command in Continuous mode (ACM). The start address must be a multiple of the block size of the tag used. The addressing of an uneven byte number is not possible.
- ▶ For a write command enter the data to be written in the write data area.
- ▶ Execute the “Continuous mode” command.
- ⇨ The read/write head is switched to Report mode and sends all received data to the interface.
- ▶ The data received from the read/write head is stored in the FIFO memory of the interface.
- ▶ Reset the device via the Idle command (0x0000).
- ▶ To pass on data from the FIFO memory to the controller, execute the “Get data from buffer” (0x0011) command. The length of the data must equal the value of the available data bytes (BYFI).
- ▶ To end Continuous mode and clear the FIFO memory of the interface, send the Reset command (0x0800).

8.1.5 HF applications – Setting HF bus mode

NOTE
In HF bus mode a command is only meant for one read/write head. While the command is being executed, there is no data communication with other read/write heads.

HF bus mode supports the HF read/write heads from firmware version Vx.90. The read/write heads can be addressed as follows:

- Automatic addressing
- Manual addressing via the “Set HF read/write head address” command
- Manual addressing via the Turck Service Tool

The addresses must be assigned per channel from 1 to 32.

Addressing read/write heads automatically

NOTE
Turck recommends making the read/write head address visible on the device.

Read/write heads with the default bus address 68 can be automatically addressed. For this the corresponding XCVR bit must be set in the parameter data.

- ▶ Switch on the RFID interface power supply.
- ▶ Activate the required read/write heads in the parameter data via the appropriate XCVR bit.
- ▶ Connect the read/write heads to the interface in a line one by one.
- ⇨ The read/write heads are automatically assigned addresses in ascending order in the order of connection. The lowest address is automatically assigned to the next connected read/write head with the default address 68.
- ⇨ The addressing is successful if the LED of the read/write head is permanently lit.

Replacing bus-capable read/write heads

- ▶ Remove the faulty read/write head.
- ▶ Connect the new read/write head with default address 68 (factory setting …/C53).
- ⇨ The read/write heads are automatically assigned addresses in ascending order in the order of connection. The lowest address is automatically assigned to the next connected read/write head with the default address 68.
- ⇨ The addressing is successful if the LED of the read/write head is permanently lit.

Addressing read/write heads via the RFID interface

NOTE
Turck recommends making the read/write head address visible on the device.

Information on addressing the read/write heads via the RFID interface with the “Set HF read/write head address” command is provided in the chapter [▶ 158]. With manual addressing via the “Set HF read/write head address” command, the read/write heads must not be activated until the addressing is completed.
Information on addressing the read/write heads via the RFID interface with the “Set HF read/write head address” command is provided in the operating instructions. With manual addressing via the “Set HF read/write head address” command, the read/write heads must not be activated until the addressing is completed.

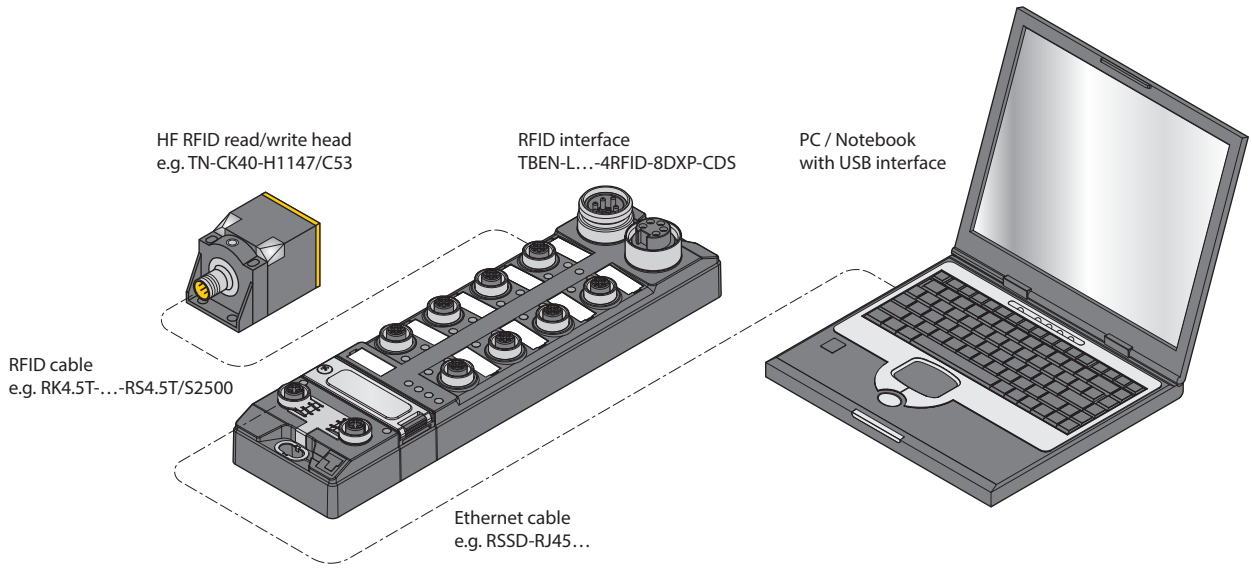


Fig. 106: Connecting the read/write head via the RFID interface with a PC

NOTE
Turck recommends making the read/write head address visible on the device.

The following accessories are required to address the read/write heads in HF bus mode. Accessories are not supplied with the device and must be ordered separately.
- STW-RS485-USB interface converter (Ident no. 7030354)
- STW-RS485-USB-PS power supply unit (Ident no. 7030355),

▶ Connect the read/write head to the interface converter using a suitable connection cable (e.g. RK4.5T-2/S2500) according to the following color coding:

STW-RS485-USB	.../S2500 plug connectors	.../S2501 plug connectors	.../S2503 plug connectors
VCC	Brown (BN)	Brown (BN)	Red (RD)
GND	Blue (BU)	Blue (BU)	Black (BK)
RS485-A	White (WH)	Black (BK)	White (WH)
RS485.B	Black (BK)	White (WH)	Blue (BU)

▶ Connect a USB cable to the interface converter (USB1.1 type B).
▶ Connect the open end of the USB cable to a free USB port on the PC (USB1.1 type A).
▶ Set the switches on the side of the interface converter for the termination to “ON”.
▶ Connect the interface converter via the STW power supply unit to a power supply.

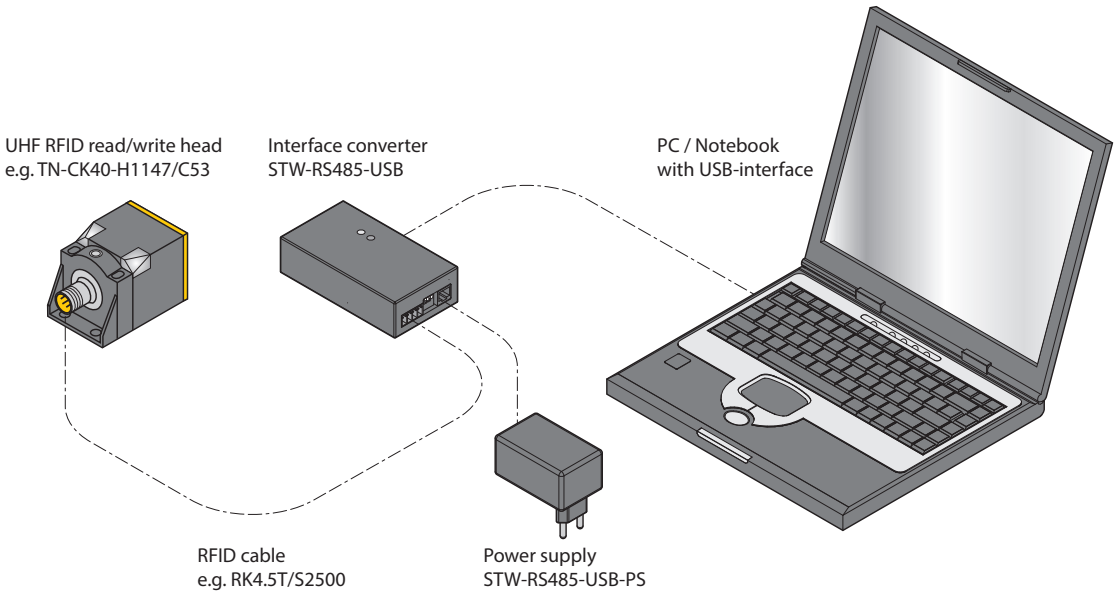


Fig. 107: Connecting the read/write head via the interface converter with a PC

- ▶ Launch the Turck Service Tool.
- ▶ Click “Actions” or press F4.
- ▶ Click “Set HF RFID reader bus address”.

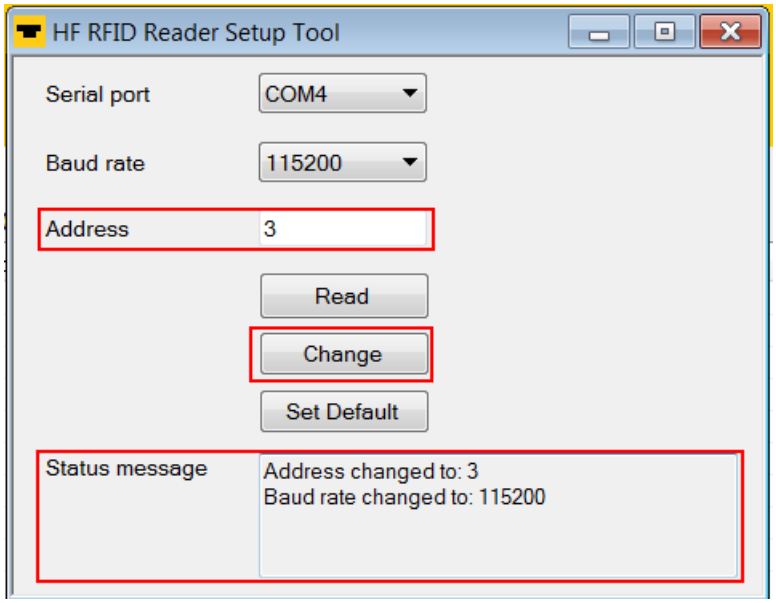


Fig. 108: Selecting “Set HF RFID reader bus address”

The “HF-RFID Reader Setup Tool” window opens.

- ▶ Select the COM port to which the interface converter is connected.
- ▶ Click “Read”.
- ⇨ The found read/write head is displayed in the status message.

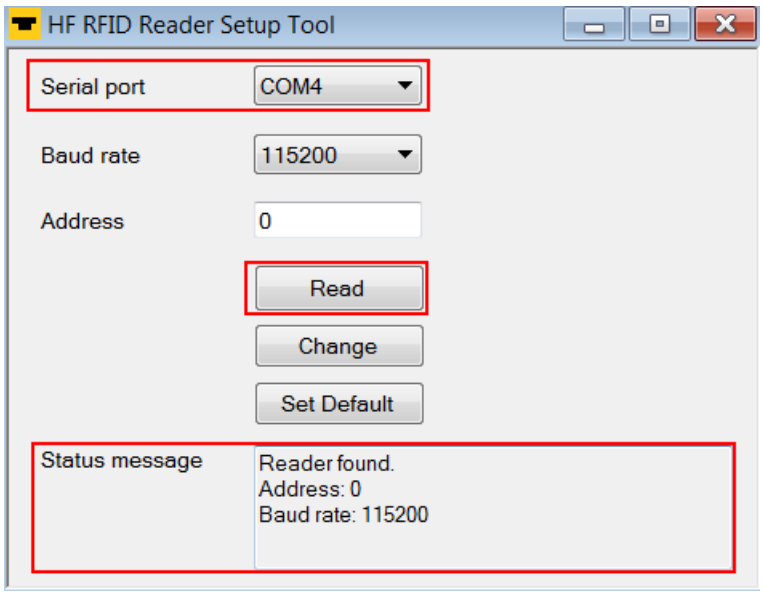


Fig. 109: “HF-RFID-Reader Setup Tool” window

- ▶ Enter the required address.
- ▶ Click “Change”.
- ⇨ The new set address is displayed in the status message.

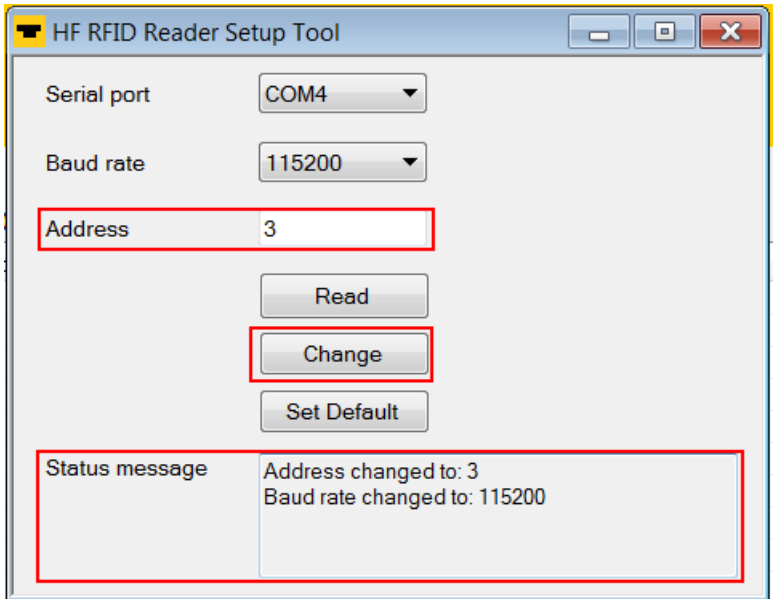


Fig. 110: Changing the read/write head

8.1.6 UHF applications – Setting Continuous presence sensing mode

- ▶ Set adaptions to the Presence Sensing behavior in the DTM.
- ▶ Optional: Set the grouping the EPCs via the “Start address” parameter:
  0: Grouping inactive
  1: Grouping active (same EPC is not recorded again, only the counter incremented in the header)
- ▶ Execute the “Continuous presence sensing mode” command.
- ⇨ The read/write head is switched to Presence sensing mode and sends all received data to the interface as soon as at least one tag is located in the detection range.
- ⇨ The data received from the read/write head is stored in the FIFO memory of the interface.
- ▶ Send the Idle command (0x0000) in order to then read data from the buffer of the interface.

NOTE
The “Continuous presence sensing mode” command also stays active after the Idle command is sent.

- ▶ To pass on data from the FIFO memory to the controller, execute the “Get data from buffer” (0x0011) command. The length of the data must be less than or equal to the value of the available data bytes (BYFI). Depending on the length of the data, it is no longer used for grouping.

NOTE
If Grouping is active: Only read data from the buffer if the number of available bytes is stable. If stable data was fetched, the command can be terminated by means of a reset since the grouping is no longer based on the fetched data and therefore old EPCs can be detected again.

- ▶ Do not carry out the reset until the data has been successfully read from the buffer.
- ▶ To end Continuous mode and clear the FIFO memory of the interface send the Reset command (0x0800).

8.1.7 UHF applications – Transferring read/write head settings

The Backup function enables the settings of a UHF read/write head to be transferred, e.g. when swapping a device.

- ▶ Execute the “Backup settings UHF read/write head” command.
- ⇨ The settings of the read/write head are stored in the interface.
- ▶ Replace the read/write head.
- ▶ Execute the “Restore settings UHF read/write head” command.
- ⇨ The data stored in the interface is transferred to the read/write head.

8.2 RFID channels – Evaluating process input data

Evaluating process input data – HF compact and UHF compact modes

Byte no.		**Bit**							
PROFINET	**Modbus EtherNet/ IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	Response code (RESC)							
1	1	BUSY	ERROR	Response code (RESC)					
2	2	Loop counter for rapid processing (RCNT)							
3	3	reserved							
4	4	TNCx	TREx	PNSx	XDx				TP1
5	5							CMON	TON
6	6	Length (LEN)							
7	7								
8	8	Error code (ERRC)							
9	9								
10	10	Tag counter (TCNT)							
11	11								
12	24	Read data Byte 0							
13	25	Read data Byte 1							
14	26	Read data Byte 2							
15	27	Read data Byte 3							
16	28	Read data Byte 4							
17	29	Read data Byte 5							
18	30	Read data Byte 6							
19	31	Read data Byte 7							
…	…	…							
139	151	Read data Byte 127							

Evaluating process input data – HF compact and UHF compact modes

Byte no.		**Bit**							
PROFINET	**Modbus EtherNet/ IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	Response code (RESC)							
1	1	BUSY	ERROR	Response code (RESC)					
2	2	Loop counter for rapid processing (RCNT)							
3	3	reserved							
4	4	TNCx	TREx	PNSx	XDx				TPx
5	5							CMON	TON
6	6	Length (LEN)							
7	7								
8	8	Error code (ERRC)							
9	9								
10	10	Tag counter (TCNT)							
11	11								
12	12	Data (bytes) available (BYFI)							
13	13								
14	14	Read fragment no.							
15	15	Write fragment no.							
16	16	reserved							
17	17	reserved							
18	18	reserved							
19	19	reserved							
20	24	Read data Byte 0							
21	25	Read data Byte 1							
22	26	Read data Byte 2							
23	27	Read data Byte 3							
24	28	Read data Byte 4							
25	29	Read data Byte 5							
26	30	Read data Byte 6							
27	31	Read data Byte 7							
…	…	…							
146	151	Read data Byte 127							

Evaluating process input data – HF bus mode

Byte no.	Bit							
PROFINET	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	Response code (RESC)							
1	BUSY	ERROR	Response code (RESC)					
2	Loop counter for rapid processing (RCNT)							
3	reserved							
4	TNCx	TREx	PNSx	XDx				TP1
5							CMON	TON
6	Length (LEN)							
7								
8	Error code (ERRC)							
9								
10	Tag counter (TCNT)							
11								
12	Data (bytes) available (BYFI)							
13								
14	Read fragment no.							
15	Write fragment no.							
16	reserved							
17	reserved							
18	reserved							
19	reserved							
20	TP8	TP7	TP6	TP5	TP4	TP3	TP2	TP1
21	TP16	TP15	TP14	TP13	TP12	TP11	TP10	TP9
22	TP24	TP23	TP22	TP21	TP20	TP19	TP18	TP17
23	TP32	TP31	TP30	TP29	TP28	TP27	TP26	TP25
24	Read data Byte 0							
25	Read data Byte 1							
26	Read data Byte 2							
27	Read data Byte 3							
28	Read data Byte 4							
29	Read data Byte 5							
30	Read data Byte 6							
31	Read data Byte 7							
…	…							
151	Read data Byte 127							

8.2.1 Meaning of the status bits

Default values are shown in bold type.

Designation	Meaning
Response code (RESC)	Display of the last command executed
BUSY	0: Execution of a command completed. 1: The system is currently executing a command.
Error (ERROR)	0: The last command was executed successfully. 1: An error occurred, during command execution.
Loop counter for rapid processing (RCNT)	Output of the command code requested by the loop counter
Expected read/write head not connected with address x (TNCx)	**0 : Read/write head expected by system connected** 1 : Read/write head expected by the system not connected (HF bus mode: read/write head at address x)
Read/write head at address x reports error (TREx)	**0: No error** 1: Error message of the read/write head (HF bus mode: Read/write head at address x)
Parameter not supported by read/write head at address x (PNSx)	**0: No error** 1: Parameter not supported by read/write head (HF bus mode: read/write head at address x)
HF read/write head at address x detuned (XDx)	**0: No error** 1: Read/write head detuned (HF bus mode: read/write head at address x)
Tag within the detection range (TPx)	**0 : No tag in detection range of read/write head** 1: Tag in detection range of read/write head
HF read/write head switched on (TON)	**0: Read/write head switched off** 1: Read/write head switched on
Continuous (presence sensing mode) active (CMON)	**0: Continuous mode not active** 1: Continuous mode active
Length (LEN)	Display of length of the read or written data
Error code (ERRC)	Display of the specific error code, if the error bit (ERROR) is set.
Tag counter (TCNT)	Display of the detected tags. With HF multitag applications and UHF only tags are counted that are read with an Inventory command. In HF single-tag applications all tags are counted that are detected by the read/write head. The tag counter is reset by the following commands: ■ Inventory (exception: HF single-tag applications) ■ Continuous mode ■ Continuous presence sensing mode ■ Reset
Data (bytes) available (BYFI) (only available with HF extended and UHF extended modes)	Shows the number of bytes in the FIFO memory of the interface. Ascending: New data from a tag received or received by the device Descending: Execution of a command completed Error message 0xFFFF: Memory overfilled, data loss of new data likely
Read fragment no. (RFN) (only available with HF extended and UHF extended modes)	If the data to be read exceeds the size of the read data memory, the data is divided in max. 256 fragments. The fragments are numbered consecutively from 1…255. From fragment number 256 numbering starts again at 1. The sending of a fragment is confirmed by the device if the read fragment number appears in the process input data. After the confirmation the next fragment is read. 0: No fragmentation In Idle mode the size of fragments is stated. With a read command the number of the fragments containing data is stated.

Designation	Meaning
Write fragment no. (WFN)	If the data to be written exceeds the size of the write data memory, the data is divided in max. 256 fragments. The fragments are numbered consecutively from 1…255. From fragment number 256 numbering starts again at 1. The sending of a fragment is confirmed by the device if the write fragment number appears in the process input data. After the confirmation the next fragment is written. 0: No fragmentation In Idle mode the size of fragments is stated. With a write command the number of the fragments is stated that contain data.
TP1…TP32	Tag in detection range of the connected read/write head (only available in HF bus mode)
Read data	User-defined read data

8.2.2 Using “Tag in detection range” bit (TP) or "pre-loading" the command

The “Tag in detection range” bit is set automatically if a read/write head detects a tag.

In HF applications the bit is set by default in all operating modes and in Idle mode. To set the bit in Idle mode in UHF applications, the read/write head must be set to Presence sensing mode via the DTM.

All commands can be sent irrespective of whether the “Tag in detection range” bit (TP) is set. If no tag is present in the detection range when the command is sent, the command is executed by a rising edge at TP. A command is executed immediately if there is a tag in the detection range at the time of sending.

NOTE
If the read/write head detects a new tag in the detection range, the “Tag in detection range” bit is set in Idle mode and the UID are indicated at the same time. If two tags are detected in quick succession, the TP bit may remain set. The UID of the second tag is displayed.

8.3 RFID channels – Writing process output data

Writing process output data – HF compact and UHF compact modes

Byte no.		**Bit**							
PROFINET	**Modbus EtherNet/ IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	Command code (CMDC)							
1	1								
2	2	Loop counter for rapid processing (RCNT)							
3	3	Memory area (DOM) – only available with UHF applications							
4	4	Start address (ADDR)							
5	5								
6	6								
7	7								
8	8	Length (LEN)							
9	9								
10	10	Length UID/EPC (SOUID)							
11	11	reserved							
12	24	Write data Byte 0							
13	25	Write data Byte 1							
14	26	Write data Byte 2							
15	27	Write data Byte 3							
16	28	Write data Byte 4							
17	29	Write data Byte 5							
18	30	Write data Byte 6							
19	31	Write data Byte 7							
…	…	…							
139	151	Write data Byte 127							

Writing process output data – HF extended and UHF extended modes

Byte no.		Bit							
PROFINET	**Modbus EtherNet/ IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	Command code (CMDC)							
1	1								
2	2	Loop counter for rapid processing (RCNT)							
3	3	Memory area (DOM) – only available with UHF applications							
4	4	Start address (ADDR)							
5	5								
6	6								
7	7								
8	8	Length (LEN)							
9	9								
10	10	Length UID/EPC (SOUID)							
11	11	reserved							
12	12	Timeout (TOUT)							
13	13								
14	14	Read fragment number (RFN)							
15	15	Write fragment number (WFN)							
16	16	reserved							
17	17	reserved							
18	18	reserved							
19	19	reserved							
20	24	Write data Byte 0							
21	25	Write data Byte 1							
22	26	Write data Byte 2							
23	27	Write data Byte 3							
24	28	Write data Byte 4							
25	29	Write data Byte 5							
26	30	Write data Byte 6							
27	31	Write data Byte 7							
…	…	…							
139	151	Write data Byte 127							

Writing process output data – HF bus mode

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	Command code (CMDC)							
1								
2	Loop counter for rapid processing (RCNT)							
3	Memory area (DOM) – only available with UHF applications							
4	Start address (ADDR)							
5								
6								
7								
8	Length (LEN)							
9								
10	Length UID/EPC (SOUID)							
11	reserved							
12	Timeout (TOUT)							
13								
14	Read fragment number (RFN)							
15	Write fragment number (WFN)							
16	reserved							
17	reserved							
18	reserved							
19	reserved							
20	Read/write head address (ANTN) – only available with HF applications							
21	reserved							
22	reserved							
23	reserved							
24	Write data Byte 0							
25	Write data Byte 1							
26	Write data Byte 2							
27	Write data Byte 3							
28	Write data Byte 4							
29	Write data Byte 5							
30	Write data Byte 6							
31	Write data Byte 7							
…	…							
139	Write data Byte 127							

8.3.1 Meaning of the command bits

Description	Meaning
Command code (CMDC)	Enter the command code
Loop counter for rapid processing (LCNT)	Loop counter for repeated processing of a command 0: Loop counter off
Memory area (DOM) – only useful for UHF applications (with HF applications the setting has no effect)	0: Kill password 1: EPC 2: TID 3: USER area 4: Access password 5: PC (size of EPC)
Start address (ADDR) in bytes	Enter the address where a command is to be sent (e.g. memory area of a tag)
Length (LEN) in bytes	Enter the length of the data to be read or written
Length UID/EPC (SOUID) in bytes	**Inventory command:** 0: Transfer the actual length (bytes) of the transferred UID or EPC with an inventory. > 0 in HF applications: ■ 8: Return message 8 bytes UID ■ 1…7: Return message of an abbreviated UID. ■ > 8: Error message > 0 in UHF applications: EPC completely output. -1: NEXT mode (only available in HF single-tag applications): An HF tag is always only read, written or protected if the UID is different to the UID of the last read or written tag. **Other commands:** Enter UID or EPC size in bytes, if a particular tag is read, written or protected. The UID or EPC must be defined in the write data (start byte: 0). The function of the length of the UID/EPC depends on the command used. 0: No entry of a UID/EPC for executing the command. Only one tag can be located in the detection range of the read/write head. > 0: EPC length of the tag to be read, written or protected if an EPC is present in the write data. -1: NEXT mode (only available in HF single-tag applications): A tag is always only read, written or protected if the UID/EPC is different to the UID/EPC of the last read or written tag.
Timeout (TOUT)	Time in ms in which one command is to be executed. If a command is not executed within the entered time, the device outputs an error message. 0 : No timeout, command stays active until it is executed 0 (UHF applications): No timeout, command stays active until the first tag was read. 1: Command is executed once (if there is already a tag in the detection range) > 1…65535: Time in ms HF Inventory: Command executed once in the specified time (exception: Continuous mode). UHF inventory: Command active for the entire specified time

Description	Meaning
Read fragment no. (RFN)	If the data to be read exceeds the size of the read data memory, the data is divided in max. 256 fragments. The fragments are numbered consecutively from 1…255. From fragment number 256 numbering starts again at 1. The sending of a fragment is confirmed by the device if the read fragment number appears in the process input data. After the confirmation the next fragment is read. 0: No fragmentation In Idle mode the size of fragments is stated. With a read command the number of the fragments containing data is stated.
Write fragment no. (WFN)	If the data to be written exceeds the size of the write data memory, the data is divided in max. 256 fragments. The fragments are numbered consecutively from 1…255. From fragment number 256 numbering starts again at 1. The sending of a fragment is confirmed by the device if the write fragment number appears in the process input data. After the confirmation the next fragment is written. 0: No fragmentation In Idle mode the size of fragments is stated. With a write command the number of the fragments is stated that contain the data.
Read/write head address	HF bus mode: Address of the read/write head, if several bus-capable read/write heads are connected UHF: Values are ignored or set automatically
Write data	User-defined write data or entry of a UID or EPC to select a specific tag for the command execution (if the Length of UID/EPC (SOUID) command parameter is greater than 0).

8.4 Digital channels – Setting parameter data

Byte no.	Bit							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	reserved							
1	SRO15	SRO14	SRO13	SRO12	SRO11	SRO10	SRO9	SRO8
2	reserved							
3	OE15	OE14	OE13	OE12	OE11	OE10	OE9	OE8

8.4.1 Meaning of the parameter bits

Default values are shown in bold type.

Designation	Meaning
Manual reset of the output after an overcurrent (SRO…)	**0: The output automatically switches back on after an overcurrent.** 1: The output only switches back on after the overcurrent after the overcurrent is removed and the switch signal is reset.
OEx…	**0: Output deactivated** 1: Output activated

8.5 Digital channels – Evaluating process input data

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	reserved							
1	DXP15	DXP14	DXP13	DXP12	DXP11	DXP10	DXP9	DXP8

8.5.1 Meaning of the status bits

Default values are shown in **bold** type.

Designation	Meaning
DXP8	**0: Digital channel 1 not active** 1: Digital channel 1 active
DXP9	**0: Digital channel 2 not active** 1: Digital channel 2 active
DXP10	**0: Digital channel 3 not active** 1: Digital channel 3 active
DXP11	**0: Digital channel 4 not active** 1: Digital channel 4 active
DXP12	**0: Digital channel 5 not active** 1: Digital channel 5 active
DXP13	**0: Digital channel 6 not active** 1: Digital channel 6 active
DXP14	**0: Digital channel 7 not active** 1: Digital channel 7 active
DXP15	**0: Digital channel 8 not active** 1: Digital channel 8 active

8.6 Digital channels – Writing process output data

Byte no.	Bit							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	reserved							
1	DXP15	DXP14	DXP13	DXP12	DXP11	DXP10	DXP9	DXP8

8.6.1 Meaning of the command bits

Default values are shown in **bold** type.

Designation	Meaning
DXP8	**0: Switch off digital channel 1** 1: Switch on digital channel 1
DXP9	**0: Switch off digital channel 2** 1: Switch on digital channel 2
DXP10	**0: Switch off digital channel 3** 1: Switch on digital channel 3
DXP11	**0: Switch off digital channel 4** 1: Switch on digital channel 4
DXP12	**0: Switch off digital channel 5** 1: Switch on digital channel 5
DXP13	**0: Switch off digital channel 6** 1: Switch on digital channel 6
DXP14	**0: Switch off digital channel 7** 1: Switch on digital channel 7
DXP15	**0: Switch off digital channel 8** 1: Switch on digital channel 8

8.7 Digital channels – Setting switchable VAUX power supply

8.7.1 VAUX switchable power supply – Parameter data

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	reserved							
1	reserved							
2	reserved							
3	reserved							
4	reserved						VAUX2P1C4Ch8Ch9	
5	reserved						VAUX2P1C5Ch10Ch11	
6	reserved						VAUX2P1C6Ch12Ch13	
7	reserved						VAUX2P1C7Ch14Ch15	

Meaning of the parameter bits

Default values are shown in **bold** type.

Designation	Meaning
VAUX2P1C4Ch8Ch9	0: VAUX2 24 VDC power supply at Pin 1 of channel 8 and channel 9 off **1: VAUX2 24 VDC power supply at Pin 1 of channel 8 and channel 9 on** 2: VAUX2 24 VDC power supply at Pin 1 of channel 8 and channel 9 switchable via the process data
VAUX2P1C5Ch10Ch11	0: VAUX2 24 VDC power supply at Pin 1 of channel 10 and channel 11 off **1: VAUX2 24 VDC power supply at Pin 1 of channel 10 and channel 11 on** 2: VAUX2 24 VDC power supply at Pin 1 of channel 10 and channel 11 switchable via the process data
VAUX2P1C6Ch12Ch13	0: VAUX2 24 VDC power supply at Pin 1 of channel 12 and channel 13 off **1: VAUX2 24 VDC power supply at Pin 1 of channel 12 and channel 13 on** 2: VAUX2 24 VDC power supply at Pin 1 of channel 12 and channel 13 switchable via the process data
VAUX2P1C7Ch14Ch15	0: VAUX2 24 VDC power supply at Pin 1 of channel 14 and channel 15 off **1: VAUX2 24 VDC power supply at Pin 1 of channel 14 and channel 15 on** 2: VAUX2 24 VDC power supply at Pin 1 of channel 14 and channel 15 switchable via the process data

8.7.2 VAUX switchable power supply – Output data

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	Ch8Ch9	Ch10Ch11	Ch12Ch13	Ch14Ch15	reserved	reserved	reserved	reserved
1	reserved	reserved	reserved	reserved	reserved	reserved	reserved	reserved

Meaning of the command bits

Default values are shown in **bold** type.

Designation	Meaning
Ch8Ch9	0: VAUX2 24 VDC power supply at Pin 1 of channel 8 and channel 9 off **1: VAUX2 24 VDC power supply at Pin 1 of channel 8 and channel 9 on** 2: VAUX2 24 VDC power supply at Pin 1 of channel 8 and channel 9 switchable via the process data
Ch10Ch11	0: VAUX2 24 VDC power supply at Pin 1 of channel 10 and channel 11 off **1: VAUX2 24 VDC power supply at Pin 1 of channel 10 and channel 11 on** 2: VAUX2 24 VDC power supply at Pin 1 of channel 10 and channel 11 switchable via the process data
Ch12Ch13	0: VAUX2 24 VDC power supply at Pin 1 of channel 12 and channel 13 off **1: VAUX2 24 VDC power supply at Pin 1 of channel 12 and channel 13 on** 2: VAUX2 24 VDC power supply at Pin 1 of channel 12 and channel 13 switchable via the process data
Ch14Ch15	0: VAUX2 24 VDC power supply at Pin 1 of channel 14 and channel 15 off **1: VAUX2 24 VDC power supply at Pin 1 of channel 14 and channel 15 on** 2: VAUX2 24 VDC power supply at Pin 1 of channel 14 and channel 15 switchable via the process data

8.8 RFID channels – Overview of commands

RFID commands are initiated via the command code in the process output data of an RFID channel. The commands can be executed with or without a loop counter function. The loop counter must be set individually for each new command.

NOTE

After commands are executed without the loop counter function, the device must be reset to the Idle state before a new command is sent.

▶ After a command is executed, send an idle command to the device.

Command	Command code		possible for				
	hex.	dec.	HF compact	HF extended	HF bus mode	UHF compact	UHF extended
Idle	0x0000	0	x	x	x	x	x
Inventory	0x0001	1	x	x	x	x	x
Fast inventory	0x2001	8193	x	x	x	x	x
Read	0x0002	2	x	x	x	x	x
Fast read	0x2002	8194	x	x	x	x	x
Write	0x0004	4	x	x	x	x	x
Fast write	0x2004	8196	x	x	x	x	x
Write and verify	0x0008	8	x	x	x	x	x
Continuous mode	0x0010	16	–	x*	x	–	x
Get data from buffer (Continuous mode)	0x0011	17	–	x	x	–	x
Get data from buffer with fast command processing (Continuous mode)	0x2011	8209	–	x	x	–	x
Continuous presence sensing mode	0x0020	32	–	–	–	–	x
Shut down Continuous (presence sensing) mode	0x0012	18	–	x*	x	–	x
Read/write head identification	0x0041	65	x	x	x	x	x
HF read/write head off	0x0040	64	x	x	x	–	–
Tune HF read/write head	0x0080	128	x	x	x	–	–
Query HF read/write head address	0x0070	112	–	–	x	–	–
Set HF read/write head address	0x0071	113	–	–	x	–	–
Direct read/write head command	0x0060	96	x	x	x	x	x
Direct read/write head command with fast command processing	0x2060	8288	x	x	x	x	x
Set tag password	0x0102	258	x**	x**	x**	x	x
Set tag password with fast command processing	0x2102	8450	x**	x**	x**	x	x
Set read/write head password	0x0100	256	x**	x**	x**	x	x
Reset read/write head password	0x0101	257	x**	x**	x**	x	x
Set tag protection	0x0103	259	x**	x**	x**	x	x
Set tag protection with fast command processing	0x2103	8451	x**	x**	x**	x	x

Command	Command code		possible for				
	hex.	dec.	HF compact	HF extended	HF bus mode	UHF compact	UHF extended
Get HF tag protection status	0x0104	260	x**	x**	x**	x	x
Set perma lock	0x0105	261	x	x	x	x	x
Set permanent lock with fast command processing	0x2105	8453	x	x	x	x	x
Tag info	0x0050	80	x	x	x	x	x
Tag info with fast command processing	0x2050	8272	x	x	x	x	x
Kill UHF tag	0x0200	512	–	–	–	x	x
Kill UHF tag with fast command processing	0x2200	8704	–	–	–	x	x
Restore settings of the UHF read/write head	0x1000	4096	–	–	–	x	x
Backup settings of the UHF read/write head	0x1001	4097	–	–	–	x	x
Query error/status of UHF read/write head	0x0042	66	–	–	–	x	x
Reset	0x8000	32768	x	x	x	x	x

* With automatic tag type detection Continuous mode only supports the inventory command.
** The command is only supported by the TW-R…-M-B146 tags.

8.8.1 Idle command

The Idle command switches the interface to Idle mode. The command execution is aborted. If a tag is in the detection range of an HF read/write head and single-tag mode is set, the "Tag in detection range" bit is set and the UID of the tag is indicated in the read data area. The read data is overwritten with the next tag in the detection range. In UHF applications the EPC is indicated if the read/write head is set directly in Presence sensing mode via the DTM.

NOTE
If the read/write head detects a new tag in the detection range, the "Tag in detection range" bit is set in Idle mode and the UID are indicated at the same time. If two tags are detected in quick succession, the TP bit may remain set. The UID of the second tag is displayed.

Request	
Loop counter	not required
Command code	0x0000 (hex.), 0 (dec.)
Read/write head address	not required
Length UID/EPC	not required
Start address	not required
Length	not required
Command timeout	not required
Write fragment no.	not required
Read fragment no.	not required
Write data	not required

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0000 (hex.), 0 (dec.)
Length	Length of the UID/EPC of the tag in the detection range
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	Size of the fragments
Read fragment no.	Size of the fragments
Read data, Bytes 0…n	UID/EPC of the tag in the detection range

8.8.2 Inventory command

The “Inventory” command causes the read/write head to search for tags in the detection range and read the UID, EPC or RSSI of the tags, if activated in the UHF read/write head. The inventory command can be executed in single-tag mode and in Multitag mode. NEXT mode is only possible in single-tag mode.

NOTE
The command code for fast processing with the loop counter is 0x2001 (hex.) or 8193 (dec.).

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0001 (hex.), 1 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	1: Grouping of the EPCs active (only UHF) 0: Grouping of the EPCs inactive (only UHF)
Length	0: Transfer the actual length (bytes) of the transferred UID or EPC with an inventory. > 0 in HF applications: ■ 8: Return message 8 bytes UID ■ 1…7: Return message of an abbreviated UID. ■ > 8: Error message > 0 in UHF applications: EPC completely output. -1: NEXT mode (only available in HF single-tag applications): An HF tag is always only read, written or protected if the UID is different to the UID of the last read or written tag.
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required
Response (HF)	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0001 (hex.), 1 (dec.)
Length	Length of the read data in bytes
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	Ascending
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data, Bytes 0…n	UID

Response (UHF)	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0001 (hex.), 1 (dec.)
Length	Length of the read data
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	Ascending
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data, Bytes 0…n	See example: UHF read data

Data format in UHF applications

The UHF read data is formatted by means of a header. The header has the following structure:

Type	Name	Meaning
uint8_t	Size	Data size
uint8_t	Block type	1: UID/EPC/RSSI etc. 2: Read data other values : reserved
uint8_t	Data [size]	EPC/RSSI etc. or read data

The size of EPC/RSSI etc. depends on the settings of the read/write head.

Reading out the RSSI value

The RSSI value is output in binary code in 2 bytes and corresponds to the two's complement of the output binary code. Mapped to a signed integer, the 2 bytes output correspond to ten times the actual RSSI value. Refer to the following table for an example of the RSSI value:

MSB…LSB (decimal)	MSB…LSB (binary)	Two's complement	RSSI (dBm)
252 253	11111100 11111101	-771	-77.1

Example: UHF read data (header and EPC, grouping deactivated)

Type	Name	Meaning
uint8_t	Size	12
uint8_t	Block type	1
uint8_t	Data [14]	uint8_t EPC [12]

Example: UHF read data (header and EPC, grouping activated)

Type	Name	Meaning
uint8_t	Size	14
uint8_t	Block type	1
uint8_t	Data [14]	uint8_t EPC [12] uint16_t Number of the read operations (LSB → MSB) [2]

Example: UHF read data (header and EPC, grouping with RSSI activated)

Type	Name	Meaning
uint8_t	Size	18
uint8_t	Block type	1
uint8_t	Data [18]	uint8_t Header [2] uint8_t EPC [12] uint16_t RSSI [2] uint16_t Number of the read operations (LSB → MSB) [2]

Byte	Content	Meaning
0	Data size (EPC + number of read operations)	2 byte header
1	UHF memory range	
3…13	EPC	12 bytes EPC
14	LSB	2 bytes RSSI
15	MSB	
16	LSB	2 bytes number of read operations
17	MSB	

Example: UHF read data (header, EPC, grouping with RSSI, socket, time, phase activated)

Type	Name	Meaning
uint8_t	Size	24
uint8_t	Block type	1
uint8_t	Data [24]	uint8_t EPC [12] uint16_t RSSI (LSB → MSB) uint16_t Socket (LSB → MSB) uint32_t Time (LSB → MSB) uint16_t Phase (LSB → MSB) uint16_t Number of the read operations (LSB → MSB)

8.8.3 Read command

The Read command causes the read/write head to read the data of tags in the detection range. 128 bytes are transferred in a read operation by default. Larger data volumes can be transferred in fragments. If a particular UID or EPC is entered, the read/write head only reads the appropriate tags. All other tags in the detection range are ignored in this case.

NOTE
The command code for fast processing with the loop counter is 0x2002 (hex.) or 8194 (dec.).

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0002 (hex.), 2 (dec.)
Memory area	see description of the output data, [▶ 129]
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	Enter UID or EPC size in bytes, if a particular tag is to be read. The UID or EPC must be defined in the write data (start byte: 0). The function of the length of the UID/EPC depends on the command used. 0: No entry of a UID/EPC for executing the command. Only one tag can be located in the detection range of the read/write head. > 0: EPC length of the tag to be read if an EPC is present in the write data. -1: NEXT mode: A tag is always only read if the UID/EPC is different to the UID/EPC of the last read or written tag.
Start address	Start address of the memory area on the tag to be read (entry in bytes)
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	Length of the data to be read in bytes
Read fragment no.	see description of the output data, [▶ 129]
Write data, Byte 0…(size of the UID/EPC-1)	UID or EPC of the tag to be read
Write data, Byte (size of the EPC) …127	not required

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0002 (hex.), 2 (dec.)
Length	Length of the read data
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	Increases during command execution
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data, Bytes 0…n	Read data

8.8.4 Write command

The Write command causes the read/write head to write data to tags in the detection range. 128 bytes are transferred in a write operation by default. Larger data volumes can be transferred in fragments. If a particular UID or EPC is entered, the read/write head only writes the appropriate tags. All other tags in the detection range are ignored in this case.

NOTE

▶ With multitag applications enter the UID or EPC of the tag to be written.

NOTE

The command code for fast processing with the loop counter is 0x2004 (hex.) or 8196 (dec.).

Request	
Loop counter	see description of the output data, [▷ 129]
Command code	0x0004 (hex.), 4 (dec.)
Memory area	see description of the output data, [▷ 129]
Read/write head address	see description of the output data, [▷ 129]
Length UID/EPC	Enter UID or EPC size in bytes, if a particular tag is to be written. The UID or EPC must be defined in the write data (start byte: 0). The function of the length of the UID/EPC depends on the command used. 0: No entry of a UID/EPC for executing the command. Only one tag can be located in the detection range of the read/write head. > 0: EPC length of the tag to be written if an EPC is present in the write data. -1: NEXT mode: A tag is always only written if the UID/EPC is different to the UID/EPC of the last read or written tag.
Start address	Start address of the memory area on the tag to be written (entry in bytes)
Length	Length of the data to be written in bytes
Command timeout	see description of the output data, [▷ 129]
Write fragment no.	1: Using fragmentation 0: Do not use fragmentation
Read fragment no.	0
Write data, Byte 0…(size of the UID/EPC-1)	UID or EPC of the tag to be written
Write data, Byte (size of the EPC) …127	Write data

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0004 (hex.), 4 (dec.)
Length	Length of the read data
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	Increases during command execution
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	see description of the input data, [▶ 124]
Read fragment no.	0
Read data, Byte 0...127	not required

8.8.5 Write and verify command

The “Write and verify” command writes a number of bytes defined by the user. The written data is also sent back to the interface and verified. 128 bytes are transferred by default in a write operation. Larger data volumes can be transferred in fragments. The written data is only verified in the interface and is not sent back to the controller. If the verification fails, an error message is output. If the command is processed without an error message, the data was verified successfully.

NOTE

▶ With multitag applications enter the UID or EPC of the tag to be written.

NOTE

The command code for fast processing with the loop counter is 0x2008 (hex.) or 8200 (dec.).

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0008 (hex.), 8 (dec.)
Memory area	see description of the output data, [▶ 129]
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	Enter UID or EPC size in bytes, if a particular tag is to be written. The UID or EPC must be defined in the write data (start byte: 0). The function of the length of the UID/EPC depends on the command used. 0: No entry of a UID/EPC for executing the command. Only one tag can be located in the detection range of the read/write head. > 0: EPC length of the tag to be written if an EPC is present in the write data. -1: NEXT mode: A tag is always only written if the UID/EPC is different to the UID/EPC of the last read or written tag.
Start address	Start address of the memory area on the tag to be written (entry in bytes)
Length	Length of the data to be written in bytes
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	1: Use fragmentation 0: Do not use fragmentation
Read fragment no.	0
Write data, Byte 0…(size of the UID/EPC-1)	optional: UID or EPC of the tag to be written
Write data, Byte (size of the EPC) …127	Write data

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0008 (hex.), 8 (dec.)
Length	Length of the read data
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	Increases during command execution
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	see description of the input data, [▶ 124]
Read fragment no.	0
Read data, Byte 0…MIN(127, set length-1)	not required

8.8.6 Continuous mode

NOTE
The continuous mode is only available in HF applications for single-tag applications.

In Continuous mode, a user-defined command is sent to the read/write head and saved in the read/write head. With HF the following values can be set: Write, read, inventory, tag info. With UHF the commands write, read and inventory can be executed in Continuous mode. With UHF applications the parameters for Continuous mode must be set directly in the read/write head. The command is continuously executed until the user terminates Continuous mode. Continuous mode can be terminated with a reset command.

NOTE
The reset command resets all read data.

Read/write heads in Continuous mode send all command related data to the interface. The data is stored in the FIFO memory of the interface and can be scanned by the controller via the "Get Data from FIFO" command.
Commands in Continuous mode are triggered if the read/write head detects a tag. If there is a tag in the detection range of the read/write head, the command sent in Continuous mode is executed with the next tag.

NOTE
In Continuous mode the "Tag in detection range signal" is not updated.
Start address and length cannot be changed during the execution of Continuous mode.
After continuous mode is restarted, all data of the already running continuous mode is deleted.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0010 (hex.), 16 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	1: Grouping of the EPCs active (only UHF inventory) 0: Grouping of the EPCs inactive (only UHF inventory) >1: not defined
Length	not required
Command timeout	not required
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0010 (hex.), 16 (dec.)
Length	0
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	Increases during command execution
Tag counter	Increases with each read or written UID/EPC
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	see description of the input data, [▶ 124]

8.8.7 "Get data from buffer" command (Continuous mode/"Continuous presence sensing mode")

NOTE
The command code for fast processing with the loop counter is 0x2011 (hex.) or 8209 (dec.).

The "Get data from buffer" command passes on data stored in the interface to the controller. The command is required to transfer read data to the controller in Continuous mode or in Continuous presence sensing mode. The data is transferred to the controller in fragments of up to 128 bytes. The size of the fragments can be set by the user. A UID or EPC is not divided by fragment limits. If a UID or EPC does not fit completely in a fragment, it is automatically moved to the next fragment.

NOTE
The "Get data from buffer" command does not end Continuous mode.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0011 (hex.), 17 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	not required
Length	max. length of the data to be read by the device (≤ size of the data that the device has actually stored), entered in bytes
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0011 (hex.), 17 (dec.)
Length	Length of the read data. The data is stated in complete blocks.
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	is automatically decreased after the execution of the command
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	Read data

Data format in UHF applications

The UHF read data is formatted by means of a header. The header has the following structure:

Type	Name	Meaning
uint8_t	Size	Data size
uint8_t	Block type	1: UID/EPC/RSSI etc. 2: Read data other values : reserved
uint8_t	Data [size]	EPC/RSSI etc. or read data

The size of EPC/RSSI etc. depends on the settings of the read/write head.

Example: UHF read data (header and EPC, grouping deactivated)

Type	Name	Meaning
uint8_t	Size	12
uint8_t	Block type	1
uint8_t	Data [14]	uint8_t EPC [12]

Example: UHF read data (header and EPC, grouping activated)

Type	Name	Meaning
uint8_t	Size	14
uint8_t	Block type	1
uint8_t	Data [14]	uint8_t EPC [12] uint16_t Number of the read operations (LSB → MSB) [2]

Example: UHF read data (header, EPC, grouping with RSSI, socket, time, phase activated)

Type	Name	Meaning
uint8_t	Size	24
uint8_t	Block type	1
uint8_t	Data [24]	uint8_t EPC [12] uint16_t RSSI (LSB → MSB) uint16_t Socket (LSB → MSB) uint32_t Time (LSB → MSB) uint16_t Phase (LSB → MSB) uint16_t Number of the read operations (LSB → MSB)

Data format in HF applications

In HF applications the data is not formatted by means of a header. Some examples of HF data are listed below.

Example: UID, grouping deactivated

Type	Name	Meaning
uint8_t	Data [8]	uint8_t UID [8]

Example: UID, grouping activated

Type	Name	Meaning
uint8_t	Data [10]	uint8_t UID [8] uint16_t Number of the read operations

Example: Successful read command (64 bytes)

Type	Name	Meaning
uint8_t	Data [64]	uint8_t Read data [64]

Example: Successful write command

Type	Name	Meaning
uint8_t	Data [2]	uint16_t Error code 0x0000

Example: Error when writing data

Type	Name	Meaning
uint8_t	Data [2]	uint16_t Error code 0x0201

8.8.8 "Continuous presence sensing mode" command (UHF)

In Continuous presence sensing mode, a user-defined command (write, read, inventory) is sent to the UHF read/write head and saved in the read/write head. The read/write heads are automatically switched on in Continuous presence sensing mode as soon as a tag is located in the detection range. The duration of the scan interval and the on time can be adjusted in the settings of the UHF read/write head. The command is continuously executed until the user terminates Continuous presence sensing mode by executing a reset command.

NOTE
The reset command resets all read data.

Read/write heads in Continuous presence sensing mode send all command related data to the interface. The data is stored in the buffer of the interface and can be scanned by the controller via the "Get Data from buffer" command. In "Continuous presence sensing mode" the "Tag in detection range" signal is not permanently updated.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0020 (hex.), 32 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	0: Grouping inactive 1: Grouping active >1: not defined
Length	not required
Command timeout	not required
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0020 (hex.), 32 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	Increases during command execution
Tag counter	Increases with each read or written UID/EPC
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	see description of the input data, [▶ 124]

8.8.9 "Stop continuous (presence sensing) mode" command

Continuous (presence sensing) mode can be stopped via the "Stop continuous (presence sensing) mode" command. The data in the buffer of the interface is not deleted after the command is executed and can still be scanned by the controller via the "Get data from buffer" command.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0012 (hex.), 18 (dec.)
Read/write head address	not required
Length UID/EPC	not required
Start address	not required
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0012 (hex.), 18 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.10 Read/write head identification command

The Read/write head identification command scans the following parameters of the connected read/write head:

- Ident no.
- Serial number
- Hardware version
- Firmware status

The parameters are contained in the read/write head in the identification record.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0041 (hex.), 65 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	Start address in the identification record, stated in bytes
Length	Length of the data to be scanned 0: Read complete parameter set
Command timeout	not required
Write fragment no.	not required
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0041 (hex.), 65 (dec.)
Length	see description of the input data, [▶ 124]
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	Increases with each read or written UID/EPC
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data, Byte 0...19	Ident no.: ARRAY [0…19] of BYTE
Read data, Byte 20...35	Serial number: ARRAY [0…15] of BYTE
Read data, Byte 36...37	Hardware version: INT16 (Little Endian)
Read data, Byte 38...41	Firmware status: ARRAY [0…] of BYTE: V (0x56), x, y, z (Vx.y.z)
Read data, Byte 42...119	not required

8.8.11 Switch off HF read/ command

The “Switch off HF read/write head” command enables HF read/write heads to be switched off until a write or read command is present. The switching on and off of the read/write heads may be necessary if the devices are mounted very closely together and the detection ranges overlap. When a command is executed the read/write head is automatically reactivated. After the command is executed, the read/write head is switched off again.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0040 (hex.), 64 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	not required
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0040 (hex.), 64 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.12 Tune read/write head command

NOTE
The command is only available for the TNLR-… and TNSLR-… HF read/write heads.

The “Tune read/write head” command enables HF read/write heads to be tuned automatically to their ambient conditions. The tuning values are saved until the next voltage reset in the read/write head.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0080 (hex.), 128 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	not required
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0080 (hex.), 128 (dec.)
Length	2
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data, Byte 0	Tuning value: TNLR-…: 0x00…0x0F TNSLR-…: 0x00…0x1F
Read data, Byte 1	Received voltage value (0x00…0xFF)

8.8.13 "Get HF read/write head address" command

NOTE
The command is only available in HF bus mode.

The interface can query the addresses of all connected HF read/write heads via the "Get HF read/write head address" command. If a non-bus-compatible read/write head is connected, the device outputs an error message.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0070 (hex.), 112 (dec.)
Read/write head address	not required
Length UID/EPC	not required
Start address	not required
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0070 (hex.), 112 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data, byte 0…[number of the connected read/write heads]	Addresses of the connected read/write heads (uint8_t)
Read data, byte [number of the connected read/write heads] ...127	not required

8.8.14 "Set HF read/write head address" command

NOTE
The command is only available in HF bus mode.
Only one bus-compatible read/write head can be connected to the interface during command execution.
Deactivate read/write heads before manual addressing via the parameter data so that automatic address assignment is not executed.

The address of HF bus-compatible read/write heads can be set via the "Set HF read/write head address". Command execution does not depend on activation or an already set address of a read/write head. An already existing read/write head address is overwritten.

Permissible values are 0, 68, 1…32.

If a non-bus-compatible read/write head is connected, the device outputs an error message.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0071 (hex.), 113 (dec.)
Read/write head address	not required
Length UID/EPC	not required
Start address	not required
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data, Byte 0	New read/write head address (uint8_t), permissible values: 0, 1…32, 68
Write data, Byte 1...127	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0071 (hex.), 113 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.15 Direct read/write head command

NOTE
The command code for fast processing with the loop counter is 0x2060 (hex.) or 8288 (dec.).

A direct command enables commands from the read/write head protocol to be sent directly to the read/write head. The commands are defined and interpreted by the entries in the write and data.

NOTE
The read/write head protocol is not part of this documentation and must be requested from Turck and specially released. Send any inquiries about the read/write head protocol to Turck.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0060 (hex.), 96 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	0
Start address	not required
Length	Length of the description of the direct command in the write data, entry in bytes
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	Description of the direct command

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0060 (hex.), 96 (dec.)
Length	Length of the description of the direct command in the write data
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	Response to the direct command

Example: Direct command in HF applications (scan read/write head)

Request	
Loop counter	0
Command code	0x0060
Read/write head address	0
Length UID/EPC	0
Start address	0
Length	2
Command timeout	200
Write fragment no.	0
Read fragment no.	0
Write data	0xE0 (CC), 0x00 (CI) – see BL ident® protocol
Response	
Loop counter	0
Response code	0x0060
Length	6
Error code	0
Tag within the detection range	0
Data (bytes) available	0
Tag counter	0
Write fragment no.	0
Read fragment no.	0
Read data	0xE0 (CC), 0x00 (CI), 0x04, 0x06, 0xA1, 0x77

The BL ident® protocol enables the following information to be scanned with the described bytes:

- Byte 5 – read/write head ID: 4
- Byte 6 – Hardware version: 6
- Byte 7 – Software version: x.y, x (A1)
- Byte 8 – Software version x.y, y (0x77)
- The entire software version information consists of Byte 7 and Byte 8 (A1v77)

Example: Direct command in UHF applications (scan read/write head version)

Request	
Loop counter	0
Command code	0x0060
Read/write head address	0
Length UID/EPC	0
Start address	0
Length	2
Command timeout	200
Write fragment no.	0
Read fragment no.	0
Write data	0x02 (CMD), 0x00 (application) – see debus protocol
Response	
Loop counter	0
Response code	0x0060
Length	12
Error code	0
Tag within the detection range	0
Data (bytes) available	0
Tag counter	0
Write fragment no.	0
Read fragment no.	0
Read data	0x02, 0x00, 0x01, 0x02, 0x03, 0x04, 0x8B, 0x20, 0x00, 0x01, 0x00, 0x01

The debus protocol enables the read data to be interpreted as follows:

MSG	ERR	SNR0	SNR1	SNR2	SNR3	GTYP	VERS	HW
0x02	0x00	0x01	0x02	0x03	0x04	0x8B 0x20	0x00 0x01	0x00 0x01

- Serial number: 0x01020304
- Device type: 0x208B
- Software version: v1.00
- Hardware version: v1.00

Example: Direct command not supported in UHF applications (set output power)

▶ Read the set power from the RAM of the read/write head.

Request	
Loop counter	0
Command code	0x0060
Read/write head address	0
Length UID/EPC	0
Start address	0
Length	5
Command timeout	200
Write fragment no.	0
Read fragment no.	0
Write data	0x09 8A 4A 03 01

▶ Changing the output power: Write “30 dBm” in the RAM and flash memory of the read/write head. The sixth byte of the write data sets the power in dBm as a hexadecimal value.

Request	
Loop counter	0
Command code	0x0060
Read/write head address	0
Length UID/EPC	0
Start address	0
Length	6
Command timeout	200
Write fragment no.	0
Read fragment no.	0
Write data	0x09 8A 3C 03 01 1E

The following table supports you in the conversion of power values from dBm to mW.

dBm	mW	dBm	mW
1	1.25	16	40
2	1.6	17	50
3	2	18	63
4	2.5	19	80
5	3	20	100
6	4	21	125
7	5	22	160
8	6	23	200
9	8	24	250
10	10	25	316
11	13	26	400
12	16	27	500
13	20	28	630
14	25	29	800
15	32	30	1000

8.8.16 Set tag password command

NOTE
The command is only available for applications with UHF tags and the HF tags TW-R…-M-B146.

NOTE
The command code for fast processing with the loop counter is 0x2102 (hex.) or 8450 (dec.).

The “Set tag password” command sets a password in the tag. When sending the command only one tag can be located in the detection range of the read/write head. After the password is sent, other commands (e.g. Set tag protection) can be sent to the tag. The Set tag password command prevents a Kill password from being set in the tag.

The password function is only available in HF applications in single-tag mode. An error message is output with multitag applications. For troubleshooting set the “HF” parameter: Multitag mode parameter to “0: Multitag mode off”.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0102 (hex.), 258 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	Enter UID or EPC size in bytes, if a particular tag is to be protected. The UID or EPC must be defined in the write data (start byte: 0). The function of the length of the UID/EPC depends on the command used. 0: No entry of a UID/EPC for executing the command. Only one tag can be located in the detection range of the read/write head. > 0: EPC length of the tag to be protected if an EPC is present in the write data. -1: NEXT mode: A tag is always only protected if the UID/EPC is different to the UID/EPC of the last read or written tag.
Start address	not required
Length	4 bytes
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data, Byte 0...3	Password: ARRAY [0…3] OF BYTE
Write data, Byte 4...127	not required

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0102 (hex.), 258 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.17 Set read/write head password command

NOTE
The command is only available for applications with UHF tags and the HF tags TW-R…-M-B146.

The Set read/write head password command directly sets a password for write access, read access or a kill command in the tag. The password is stored temporarily in the memory of the read/write head. After the voltage of the read/write head is reset, the password must be set again in the read/write head. With UHF applications, the password is stored in the memory of the interface.

The password function is only available in HF applications in single-tag mode. An error message is output with multitag applications. For troubleshooting set the "HF" parameter: Multitag mode parameter to "0: Multitag mode off".

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0100 (hex.), 256 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	not required
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data, Byte 0...3	Password: ARRAY [0…3] OF BYTE
Write data, Byte 4...127	not required

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0100 (hex.), 256 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.18 Reset read/write head password command

NOTE
The command is only available for applications with UHF tags and the HF tags TW-R…-M-B146.

The Reset read/write head password command directly sets a password for write access, read access or a kill command in the tag. The password function is switched off, there is no password exchange between the read/write head and the tag.

The password function is only available in HF applications in single-tag mode. An error message is output with multitag applications. For troubleshooting set the “HF” parameter: Multitag mode parameter to “0: Multitag mode off”.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0101 (hex.), 257 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	not required
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0101 (hex.), 257 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.19 Set tag protection command

NOTE
The command is only available for applications with UHF tags and the HF tags TW-R…-M-B146.

NOTE
The command code for fast processing with the loop counter is 0x2103 (hex.) or 8451 (dec.).

The Set tag protection command defines password protection for the tag with a direct command. For this it has to be specified whether a write protection or a read protection should be set and the area of the tag to which the password applies. Protection for all areas is defined with one command. When sending the command only one tag can be located in the detection range of the read/write head.

The password function is only available in HF applications in single-tag mode. An error message is output with multitag applications. For troubleshooting set the "HF" parameter: Multitag mode parameter to "0: Multitag mode off".

Write protection is always also contained in a read protection.

NOTE
A write protection for UHF tags cannot be undone.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0103 (hex.), 259 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	Enter UID or EPC size in bytes, if a particular tag is to be protected. The UID or EPC must be defined in the write data (start byte: 0). The function of the length of the UID/EPC depends on the command used. 0: The command is executed for the tag which is located in the detection range of the read/write head. > 0: EPC length of the tag to be protected if an EPC is present in the write data. -1: NEXT mode: A tag is always only protected if the UID/EPC is different to the UID/EPC of the last read or written tag.
Start address	not required
Memory area	Possible values: ■ HF: USER memory (memory areas 1 and 3) ■ UHF: PC and EPC (memory area 1), USER memory (memory area 3) UHF: The entire memory area selected is protected with a password. HF: Entry of the memory area not necessary. The pages of the memory area are selected via Byte 0 of the write data. A page consists of 4 blocks (16 bytes).
Length	UHF: 0 bytes HF: 8 bytes
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0

Request	
Read fragment no.	see description of the output data, [▶ 129]
Write data, Byte 0	HF: ■ Bit 0: Write protection, Page 0 ■ Bit 1: Write protection, Page 1 ■ Bit 2: Write protection, Page 2 ■ Bit 3: Write protection, Page 3 ■ Bit 4: Write protection, Page 4 ■ Bit 5: Write protection, Page 5 ■ Bit 6: Write protection, Page 6 ■ Bit 7: Write protection, Page 7 UHF: not required
Write data, Byte 1	0
Write data, Byte 2	0
Write data, Byte 3	0
Write data, Byte 4	HF: ■ Bit 0: Read protection, Page 0 ■ Bit 1: Read protection, Page 1 ■ Bit 2: Read protection, Page 2 ■ Bit 3: Read protection, Page 3 ■ Bit 4: Read protection, Page 4 ■ Bit 5: Read protection, Page 5 ■ Bit 6: Read protection, Page 6 ■ Bit 7: Read protection, Page 7 UHF: not required
Write data, Byte 5	0
Write data, Byte 6	0
Write data, Byte 7	0
Write data, Byte 8...127	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0103 (hex.), 259 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.20 Get HF tag protection status command

NOTE
The command is only available for applications with HF tags and the HF tags TW-R…-M-B146.

The Get HF tag protection status command scans with a direct command whether a specific area of the tag is password protected. When sending the command only one tag can be located in the detection range of the read/write head.

The password function is only available in HF applications in single-tag mode. An error message is output with multitag applications. For troubleshooting set the “HF” parameter: Multitag mode parameter to “0: Multitag mode off”.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0104 (hex.), 260 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	Enter UID or EPC size in bytes, if a particular tag is to be protected. The UID or EPC must be defined in the write data (start byte: 0). The function of the length of the UID/EPC depends on the command used. 0: The command is executed for the tag which is located in the detection range of the read/write head. > 0: EPC length of the tag to be protected if an EPC is present in the write data. -1: NEXT mode: A tag is always only protected if the UID/EPC is different to the UID/EPC of the last read or written tag.
Start address	not required
Length	8 bytes
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0104 (hex.), 260 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]

Response	
Read data, Byte 0	HF: ■ Bit 0: Write protection, Page 0 ■ Bit 1: Write protection, Page 1 ■ Bit 2: Write protection, Page 2 ■ Bit 3: Write protection, Page 3 ■ Bit 4: Write protection, Page 4 ■ Bit 5: Write protection, Page 5 ■ Bit 6: Write protection, Page 6 ■ Bit 7: Write protection, Page 7 UHF: not required
Read data, Byte 1	0
Read data, Byte 2	0
Read data, Byte 3	0
Read data, Byte 4	HF: ■ Bit 0: Read protection, Page 0 ■ Bit 1: Read protection, Page 1 ■ Bit 2: Read protection, Page 2 ■ Bit 3: Read protection, Page 3 ■ Bit 4: Read protection, Page 4 ■ Bit 5: Read protection, Page 5 ■ Bit 6: Read protection, Page 6 ■ Bit 7: Read protection, Page 7 UHF: not required
Read data, Byte 5	0
Read data, Byte 6	0
Read data, Byte 7	0

8.8.21 Set perma lock command

NOTE
The command code for fast processing with the loop counter is 0x2105 (hex.) or 8453 (dec.).

The Set perma lock command permanently sets a complete memory block of the tag with a direct command and permanently locks it. When sending the command only one tag can be located in the detection range of the read/write head.

The function is only available in HF applications in single-tag mode. An error message is output with multitag applications. For troubleshooting set the “HF” parameter: Multitag mode parameter to “0: Multitag mode off”.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0105 (hex.), 261 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	0: The command is executed for the tag which is located in the detection range of the read/write head. > 0: EPC or UID length of the tag to be locked if an EPC or UID is present in the write data. -1: NEXT mode: A tag is always only protected if the UID/EPC is different to the UID/EPC of the last read or written tag.
Start address	UHF: not required HF: Address of the first bit in the block to be locked (EEPROM tag: 0, 4, 8, …, FRAM tag: 0, 8, 16, …)
Memory area	Possible values: ■ HF: USER memory (memory areas 1... 4) ■ UHF: Kill password (memory area 1), PC and EPC (memory area 1), USER memory (memory area 3) Access password (memory area 4) UHF: The entire memory area selected is permanently locked. HF: Entry of the memory area not necessary.
Length	HF: Length of the data to be locked in bytes. Only multiples of the block size can be specified. 0: 1 Lock block UHF: not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0105 (hex.), 261 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.22 Tag info command

NOTE
The command code for fast processing with the loop counter is 0x2050 (hex.) or 8272 (dec.).

The Tag info command enables the chip information of an HF tag to be scanned. For HF applications the command is only available with automatic detection. In UHF applications the allocation class identifier, tag mask designer identifier and tag model number are scanned. The data is scanned from the GSI record of the tag.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0050 (hex.), 80 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	Start address in the GSI record
Length	Length of the system data read (bytes) 0: All system data is read
Command timeout	not required
Write fragment no.	not required
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required

Response (HF)	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0050 (hex.), 80 (dec.)
Length	see description of the input data, [▶ 124]
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data, Byte 0...7	UID, MSB (always 0xE0)
Read data, Byte 8	DSFID (data storage format identifier)
Read data, Byte 9	AFI (application identifier)
Read data, Byte 10	Memory size: Block number (0x00…0xFF)
Read data, Byte 11	Memory size: Byte/block (0x00…0x1F)
Read data, Byte 12	IC reference

Response (UHF)	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0050 (hex.), 80 (dec.)
Length	see description of the input data, [▶ 124]
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data, Byte 0...3	First 32 bytes of the TID (tag class, manufacturer and chip type)
Read data, Bytes 4…n	EPC (length variable)

Chip information on the UHF tags

Name	TID memory			Size (Bits)		
	Allocation class identifier	Tag mask designer	Tag model number	EPC	TID	USER
Alien Higgs-3	0xE2	0x003	0x412	96…480	96	512
Alien Higgs-4	0xE2	0x003	0x414	16…128	96	128
NXP U-Code G2XM	0xE2	0x006	0x003	240	64	512
NXP U-Code G2XL	0xE2	0x006	0x004	240	64	–
NXP U-Code G2iM	0xE2	0x006	0x80A	256	96	512
NXP U-Code G2iM+	0xE2	0x006	0x80B	128…448	96	640…320
NXP U-Code G2iL	0xE2	0x006	0x806, 0x906, 0xB06	128	64	–
NXP U-Code G2iL+	0xE2	0x006	0x807, 0x907, 0xB07	128	64	–
NXP U-Code7	0xE2	0x006	0x810	128	96	–
Impinj Monza 4E	0xE2	0x001	0x10C	496	96	128
Impinj Monza 4D	0xE2	0x001	0x100	128	96	32
Impinj Monza 4QT	0xE2	0x001	0x105	128	96	512
Impinj Monza 5	0xE2	0x001	0x130	128	96	–
Impinj Monza R6	0xE2	0x001	0x160	96	96	–
RFMicron Magnus S2	0xE2	0x024	0x401, 0x402, 0x403			

8.8.23 Kill UHF tag

NOTE
The command is only available for UHF applications.

NOTE
The command code for fast processing with the loop counter is 0x2200 (hex.) or 8704 (dec.).

The Kill UHF tag command makes the tag memory unusable. After a kill command, the tag can neither be read nor written. A Kill command cannot be undone.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x0200 (hex.), 512 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	Enter UID or EPC size in bytes if a particular tag is to be deleted. The UID or EPC must be defined in the write data (start byte: 0). The function of the length of the UID/EPC depends on the command used. 0: No entry of a UID/EPC for executing the command. Only one tag can be located in the detection range of the read/write head. > 0: EPC length of the tag to be deleted if an EPC is present in the write data. -1: NEXT mode: A tag is always only deleted if the UID/EPC is different to the UID/EPC of the last read or written tag.
Start address	not required
Length	1 bytes
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data, Byte 0...3	Password: ARRAY [0…3] OF BYTE
Write data, Byte 4...127	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x0200 (hex.), 512 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.24 Restore settings UHF read/write head command

NOTE
The command is only available for UHF applications.

The Restore settings UHF read/write head command restores the parameters of a connected UHF read/write head from a backup (e.g. after a device swap). Type and firmware version must be identical for both read/write heads. To execute the command, a backup must be created via the Backup settings UHF read/write head command.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x1000 (hex.), 4096 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	not required
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x1000 (hex.), 4096 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.25 Backup settings UHF read/write head command

NOTE
The command is only available for UHF applications.

The Backup settings UHF read/write head command saves the current settings of the connected read/write head in the memory of the interface. The backup is retained also after the voltage of the interface is reset. The Restore command can restore the backup data when a device is swapped. Type and firmware version must be identical for both read/write heads.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x1001 (hex.), 4097 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	not required
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x1001 (hex.), 4097 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.8.26 "Get UHF read/write head error/status" command

NOTE
The command is only available for UHF applications.

The "Get UHF read/write head error/status" command enables error/status messages of a connected UHF read/write head to be read.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x042 (hex.), 66 (dec.)
Read/write head address	not required
Length UID/EPC	not required
Start address	Address in the "Get Status response" record
Length	Length of the data to be read from the "Get Status response" record 0: Read entire "Get Status response" record
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required

Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x042 (hex.), 66 (dec.)
Length	see description of the input data, [▶ 124]
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]

Response	
Read data, Byte 0...(Length-1)	■ Status general: 1 byte general status ■ RF status: 1 byte status of the RF module ■ Device status: 1 byte device-specific status information ■ RF mode: 1 byte, defines the reason for starting the read operation ■ Trigger status: 1 byte, trigger number of the RF mode ■ I/O status: 1 byte, status of the inputs and outputs (0 = low, 1 = high) ■ Ambient temperature: 1 byte, ambient temperature in °C (data format: 8 bit, twos' complement) ■ PA temperature: 1 byte, PA temperature in °C (data format: 8 bit, twos' complement) ■ RF antenna temperature: 1 byte, ambient temperature in °C (data format: 8 bit, twos' complement) ■ Transmit power: 2 bytes, output power of the read/write head in 1/10 dBm steps, LSB…MSB (data format: 16 bit, twos' complement) ■ Reverse power: 2 bytes, returned reverse power in 1/10 dBm steps, LSB…MSB (data format: 16 bit, twos' complement) ■ Antenna DC resistance: 4 bytes, resistance at the antenna port in Ω, LSB…MSB ■ Jammer power: 2 bytes, input power at the RX port in 1/10 dBm steps, LSB…MSB (data format: 16 bit, twos' complement) ■ Channel: Number of the currently used channel (offset from the next available channel)
Read data, byte (Length)...127	not required

Evaluating read data – General status

Bit	Meaning
7	Read/write head was reset (after reset)
6	Read/write head configuration damaged, default settings are used
5	Test mode active
1	Tag present

Evaluating read data – RF status

Bit	Meaning
4	Limit value for radiated power exceeded
3	No free channel present
2	Antenna resistance too high or tool low
1	Reverse power too high
0	PLL not locked

Evaluating read data – Device status

Bit	Meaning
4	Error in message generation (in Polling mode outside of memory area)
3	Temperature warning
2	Temperature too high
1	Communication error
0	Configuration invalid. Command execution not possible.

Evaluating read data – RF mode

Value	Meaning
0x00	None (tag off)
0x01	Mode 1: Trigger is digital signal (edge), Timeout
0x02	Mode 2: Trigger is digital signal (edge), Timeout
0x03	Mode 3: Trigger is digital signal (level), Timeout
0x04	Trigger is a command
0x08	Reserved
0x10	DCU controlled read operation
0x20	Continuous mode
0x80	automatic trigger (presence sensing mode)

Evaluating read data – I/O status

Value	Meaning
7	Output 4
6	Output 3
5	Output 2
4	Output 1
3	Input 4
2	Input 3
1	Input 2
0	Input 1

8.8.27 Reset command

The Reset command resets the read/write head and interface.

Request	
Loop counter	see description of the output data, [▶ 129]
Command code	0x8000 (hex.), 32768 (dec.)
Read/write head address	see description of the output data, [▶ 129]
Length UID/EPC	not required
Start address	0: Software reset 1: Voltage reset
Length	not required
Command timeout	see description of the output data, [▶ 129]
Write fragment no.	0
Read fragment no.	see description of the output data, [▶ 129]
Write data	not required
Response	
Loop counter	see description of the input data, [▶ 124]
Response code	0x8000 (hex.), 32768 (dec.)
Length	not required
Error code	see description of the input data, [▶ 124]
Tag within the detection range	see description of the input data, [▶ 124]
Data (bytes) available	see description of the input data, [▶ 124]
Tag counter	see description of the input data, [▶ 124]
Write fragment no.	0
Read fragment no.	see description of the input data, [▶ 124]
Read data	not required

8.9 Setting RFID interfaces via the web server

NOTE
The web server always shows all setting options. All values are shown as decimal values.

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

8.9.1 Opening a web server

The web server can either be opened via a web browser or via the Turck Service Tool. The call of the web server via the Turck Service Tool is described in the section “Setting the IP address”.

The device is factory set to IP address 192.168.1.100. To open the web server via a web browser, enter http://192.168.1.100 in the address bar of the web browser.
The start page shows status information and network settings.

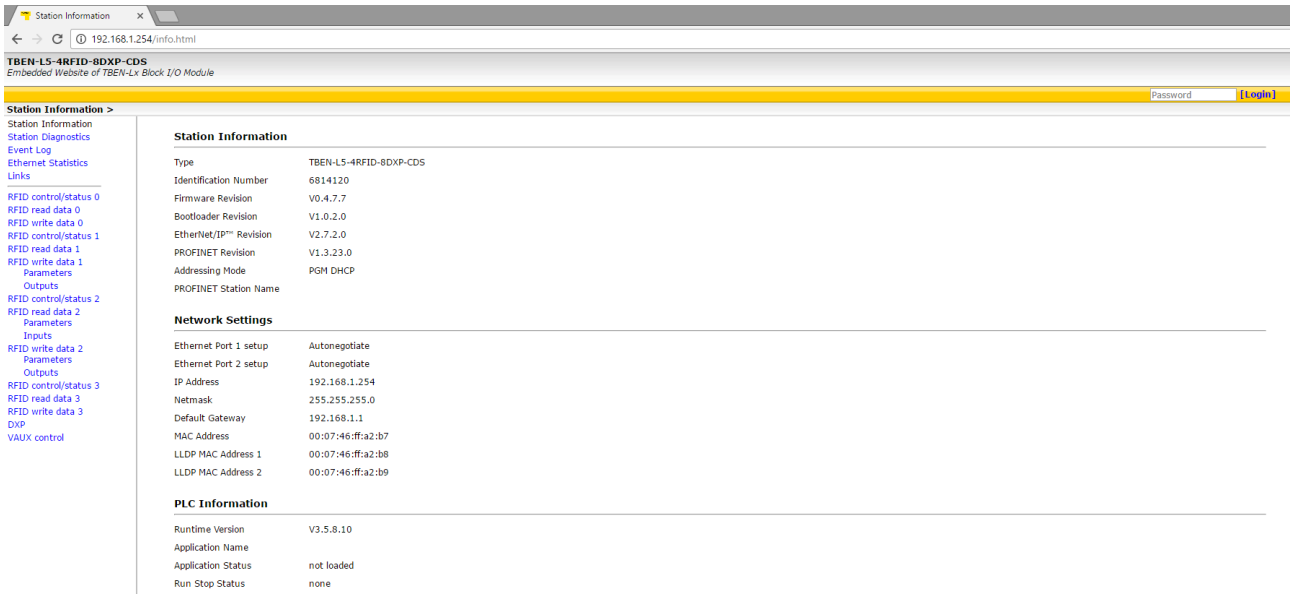


Fig. 111: Example: Web server – Start pages (device IP address: 192.168.1.254)

8.9.2 Editing settings in the web server

A login is required in order to edit settings via the web server. The default password is “password”.

NOTE
To ensure greater security, 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”.

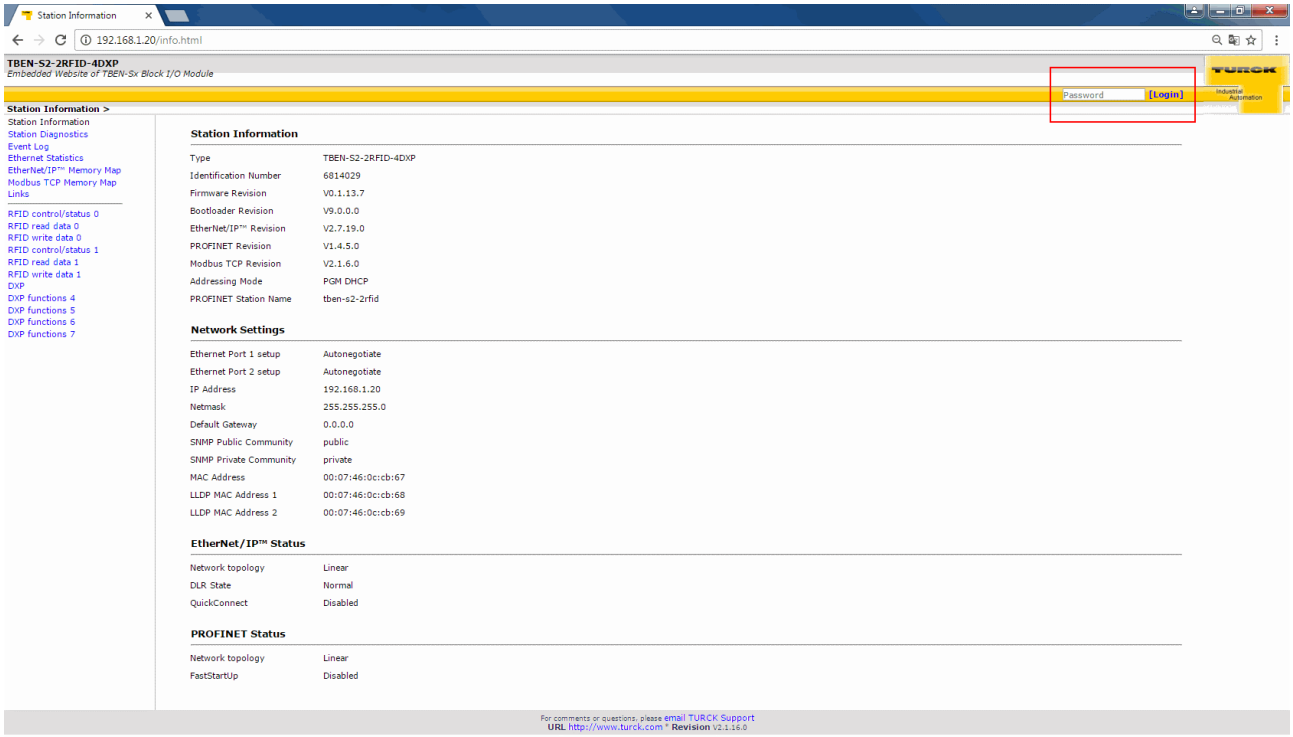


Fig. 112: Login field on the start page of the web server (marked in red)

▶ After the login, write access to input, output and parameter data is possible.

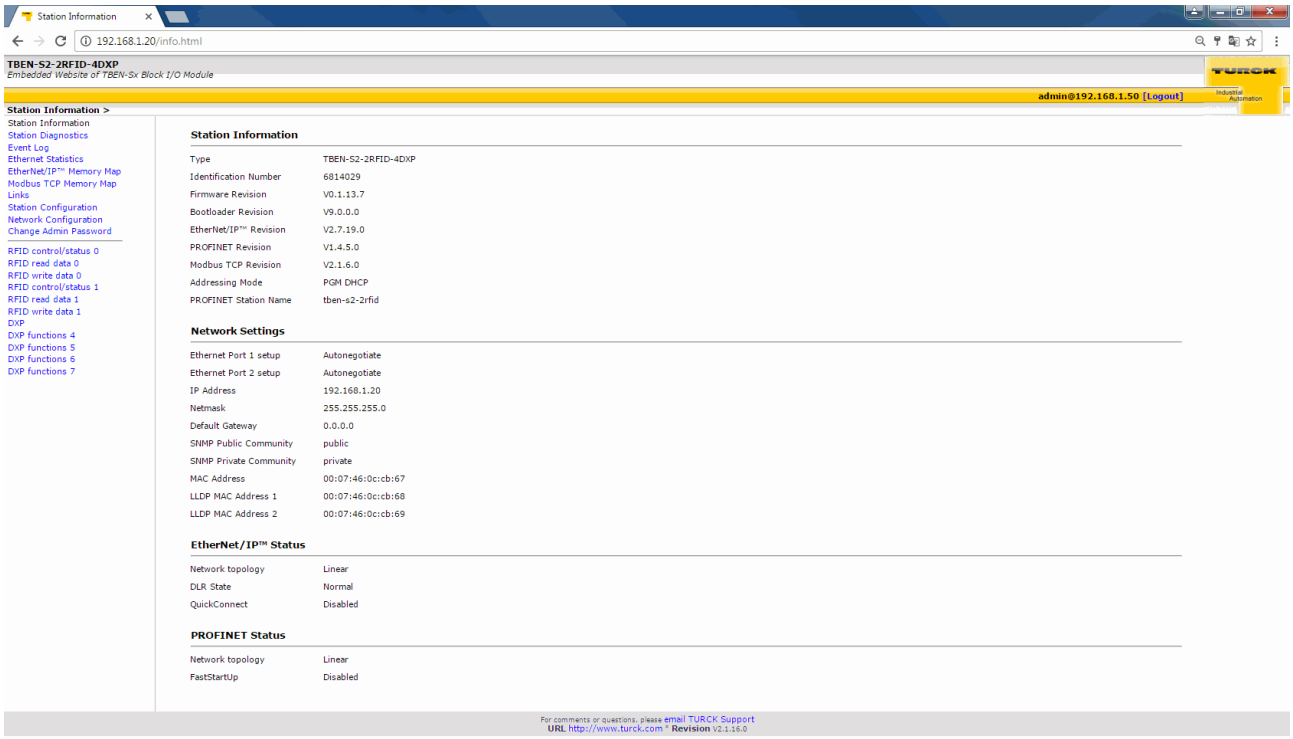


Fig. 113: Web server – Start page after the login

Example: Setting the operating mode for channel 0

The operating mode of channel 0 is set to “HF compact” in the following example.

- ▶ Click “RFID control/status 0” in the navigation bar at the top left of the screen.
- ▶ Select “Parameters”.

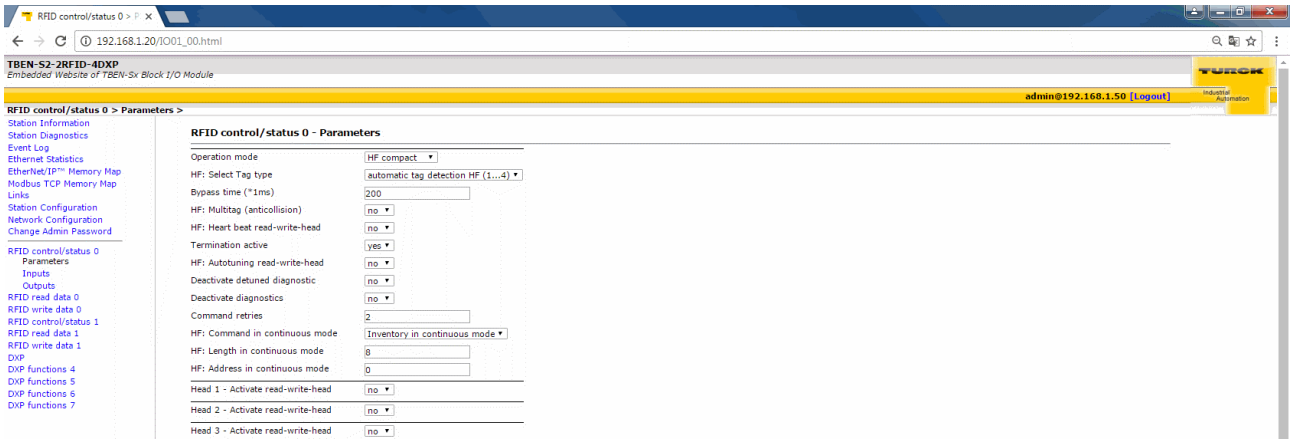


Fig. 114: Setting parameters in the web server

- ▶ Select the operating mode via the “Operating Mode” drop-down menu.

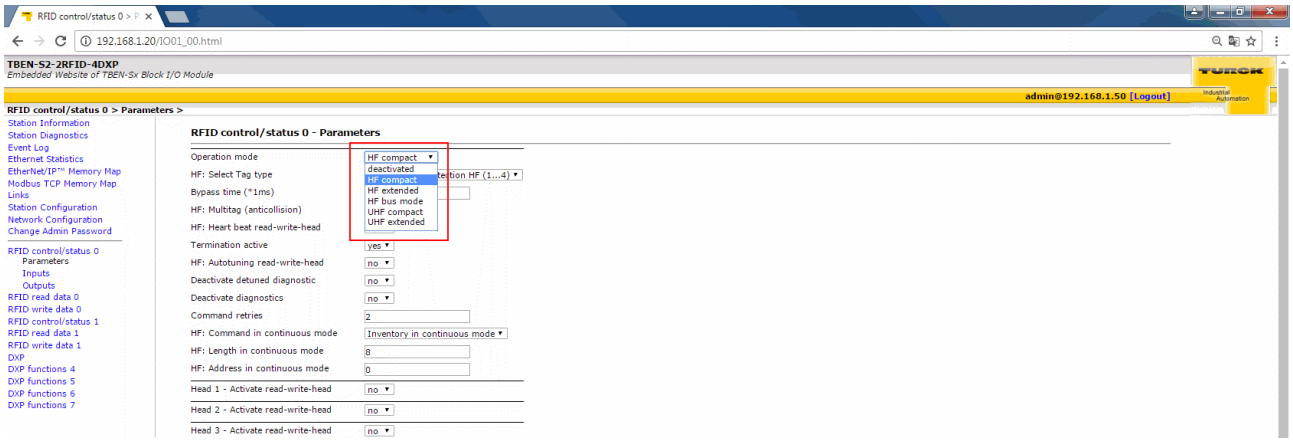


Fig. 115: “Operating Mode” drop-down menu

- ▶ Save the settings: Click “Submit”.

Example: Executing a read command

In the following example 8 bytes of a tag are read by a read/write head connected to channel 0 of the interface.

- ▶ Click “RFID control/status 0” in the navigation bar at the top left of the screen.
- ▶ Click “Outputs”.
- ▶ Select the read command via the “Command Code” drop-down menu: 0x0002 (read)
- ▶ Enter in the “Length” entry field the number of bytes to be read.
- ▶ Send the read command: Click “Submit”.

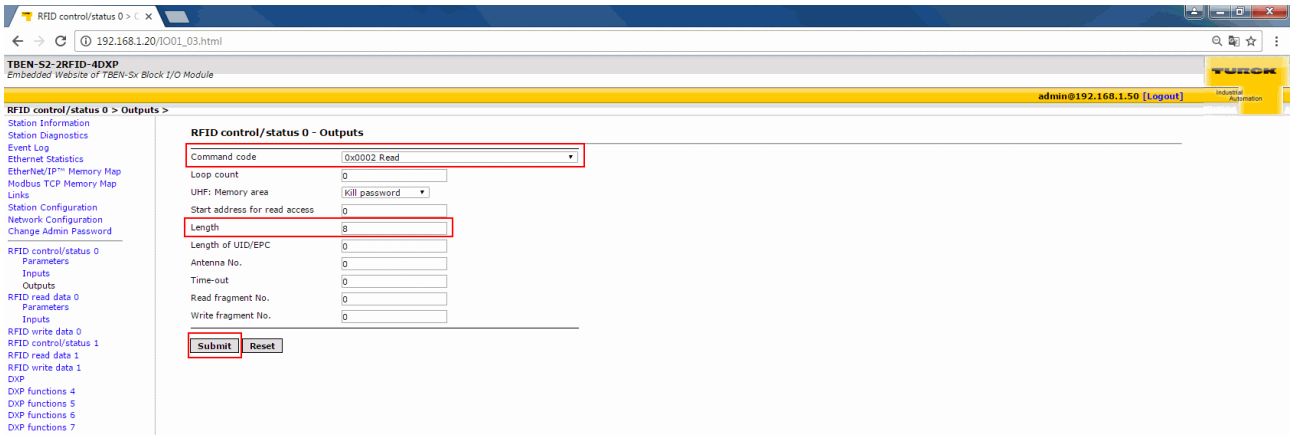


Fig. 116: Setting the read command in the web server

The receipt of the command is confirmed in the input data at “Response code”.

- ▶ Call the input data: Click “Inputs” in the navigation bar at the top left of the screen.

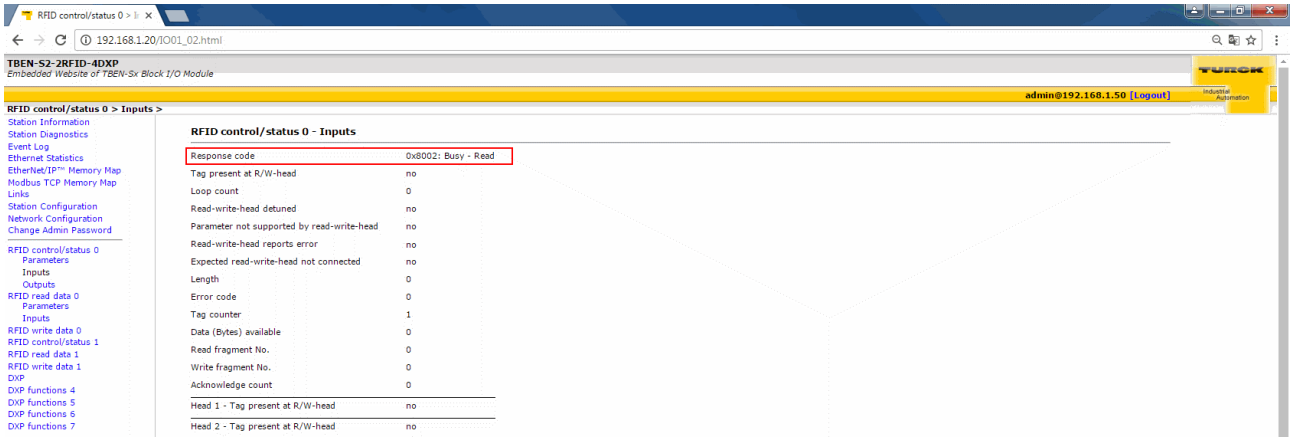


Fig. 117: Input data

▶ Refresh the page manually to display the latest status.

The read command is executed as soon as there is a tag in the detection range of the read/ write head.

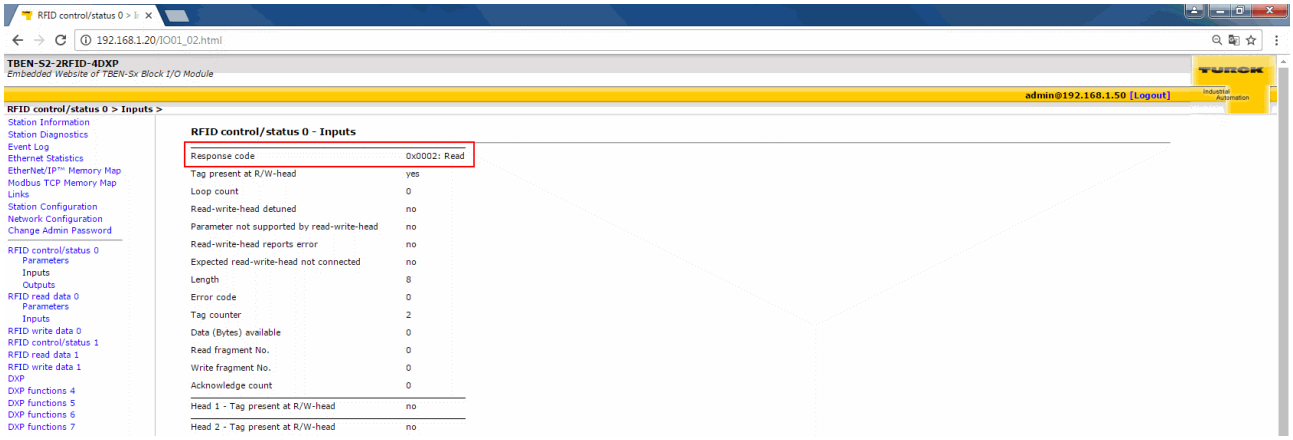


Fig. 118: Input data with successfully executed read command

The read data can be called at “RFID Read Data” → “Inputs”.

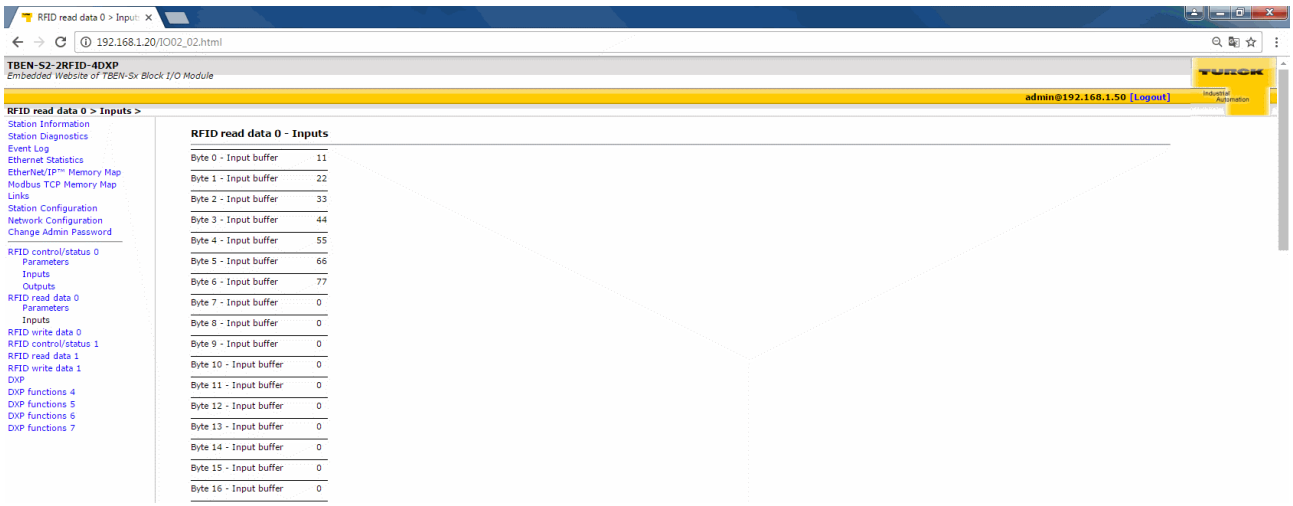


Fig. 119: Read data

Example: Executing a command in Bus mode

In the following example, the read/write head with address 2 is required in HF bus mode to read 8 bytes of a tag. Three read/write heads are connected to channel 0 of the interface.

- Click “RFID control/status 0” in the navigation bar at the top left of the screen.
- Select “Parameters”.
- Set HF bus mode.
- Activate connected read/write heads.

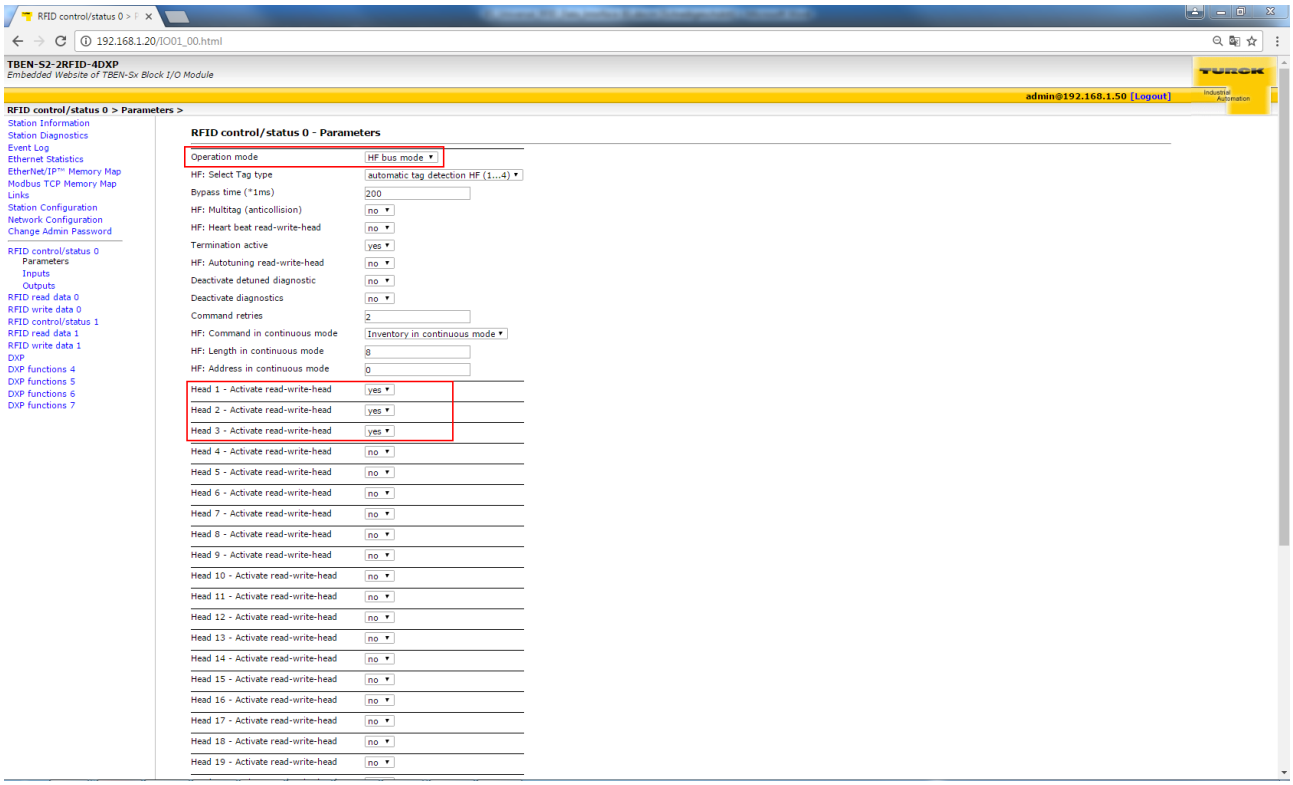


Fig. 120: Reading tags in HF bus mode – Parameters

- Click “RFID control/status 0” in the navigation bar at the top left of the screen.
- Click “Outputs”.
- Select the read command (0x0002 Read).
- Enter the length of the read data.
- Enter the read/write head address in the “Antenna no.” parameter.

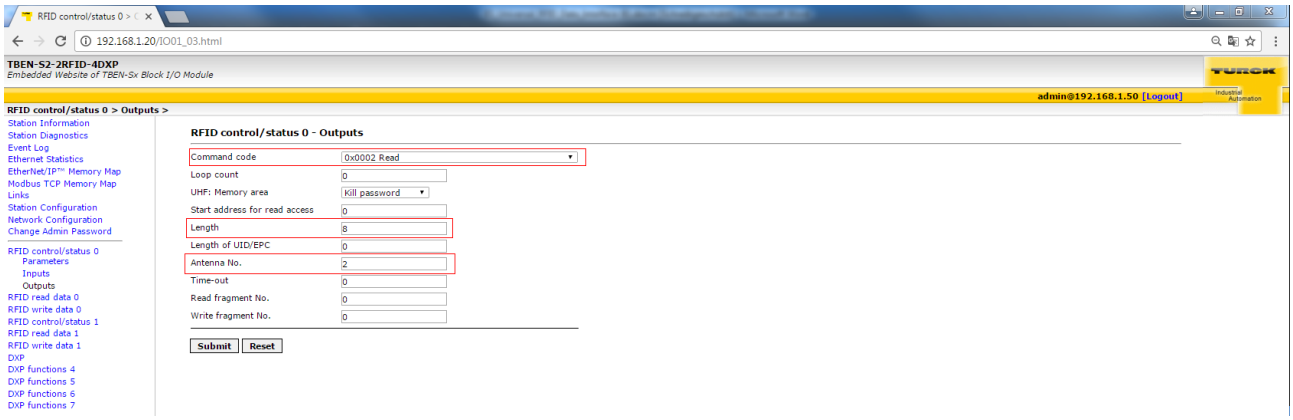


Fig. 121: Reading tags in HF bus mode – Process output data

8.10 Testing and parameterizing RFID interfaces via the DTM

The device can be tested and assigned parameters with the DTM (Device Type Manager) via PACTware™.
The different functions of the DTM are displayed by right-clicking the device in the project tree.
You can start the following functions:

- Parameters: Adapt parameters to the actual application
- Measured values: Display of the data read by the RFID interface
- Simulation: Set output parameter of the device for the function test
- Diagnostics: Display of the diagnostic messages of the device or the entire RFID system

8.10.1 Connecting the device with the PC

- ▶ Launch PACTware™.
- ▶ Right-click Host PC in the project tree.
- ▶ Click “Add device”.
- ▶ Select BL Service Ethernet.
- ▶ Confirm selection with OK.

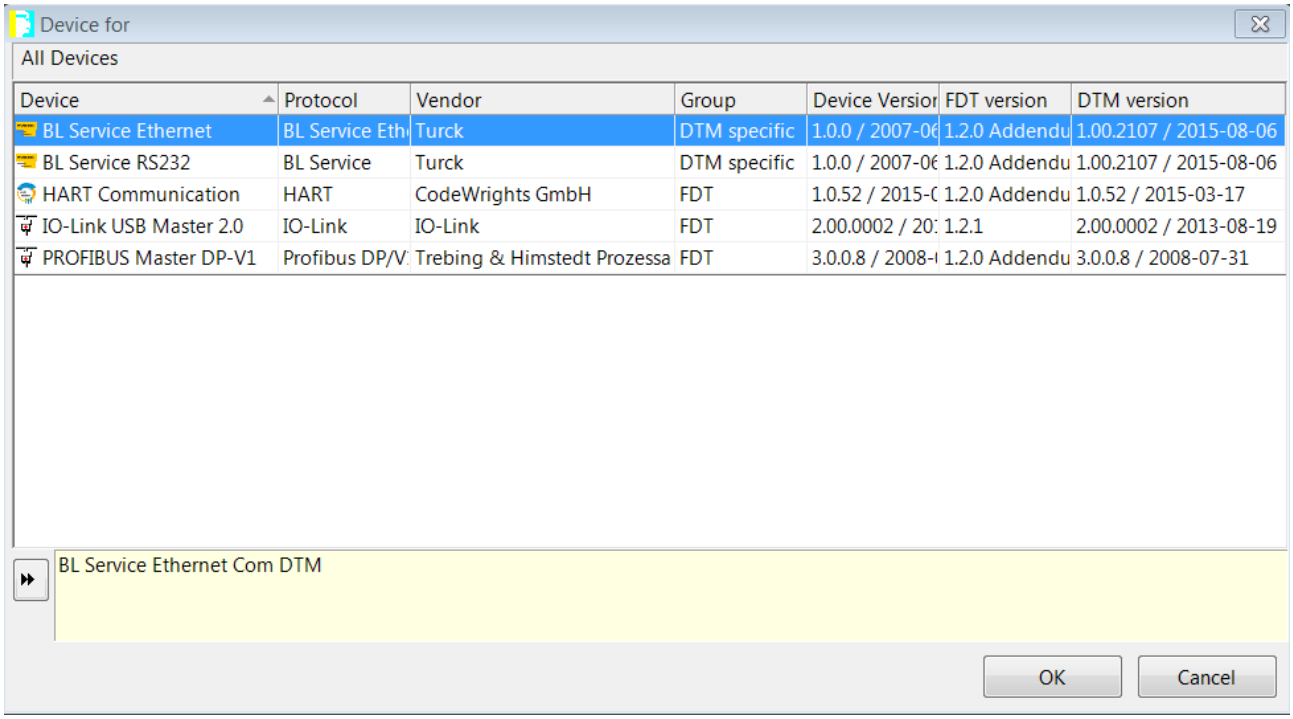


Fig. 122: Selecting an Ethernet adapter

- Right-click the Ethernet adapter in the project tree.
- Click “Add device”.
- Select TBEN-L5-4RFID-8DXP-CDS.
- Confirm selection with OK.

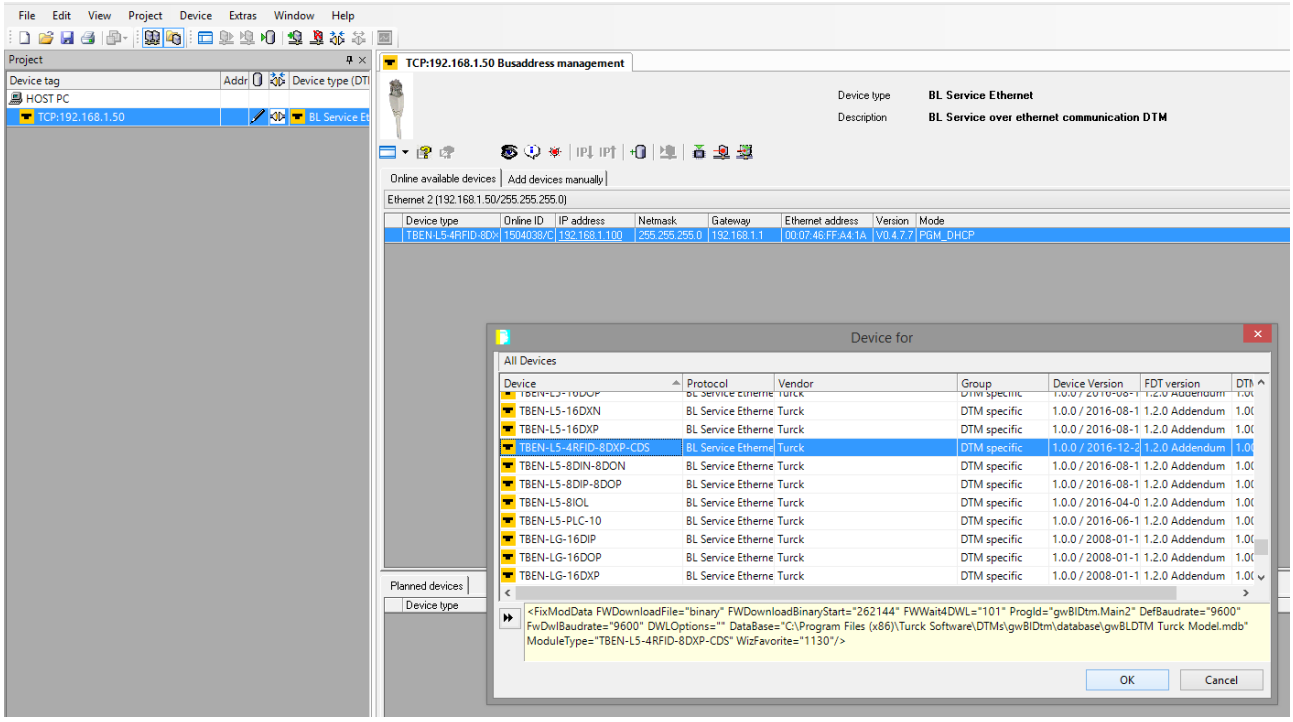


Fig. 123: Selecting TBEN-4RFID-8DXP-CDS

- ▶ Enter the IP address of the device (example: 192.168.1.254)
- ▶ Optional: Enter designation and device description.
- ▶ Confirm entries with OK.

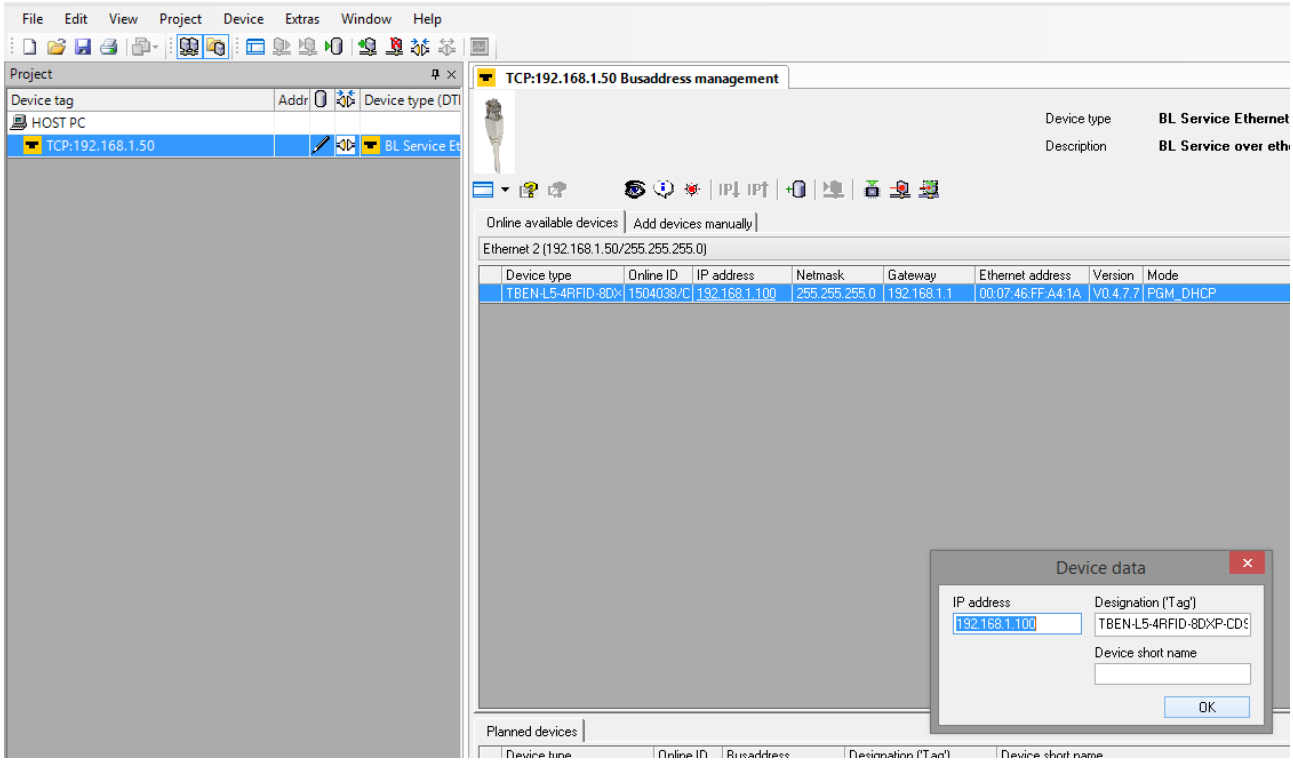


Fig. 124: Entering the IP address

✓ The setup of the project tree is complete.

- ▶ Right-click the device in the project tree.
- ▶ Click “Connect”.

⇨ After connecting, read and write access to input, output and parameter data is possible.

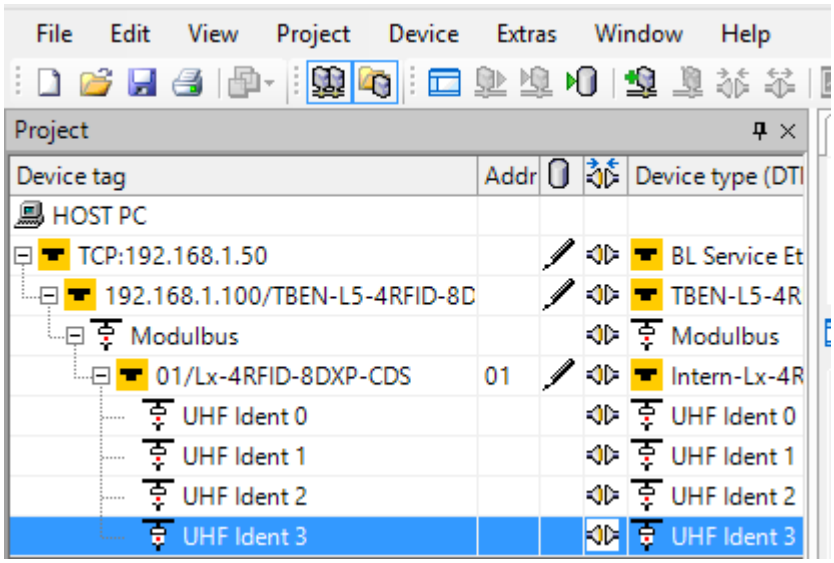


Fig. 125: Complete project tree

8.10.2 Editing parameter data with the DTM – Online parameterization

The online parameterization function enables parameter data to be changed and written to the device.

- ▶ Right-click the device in the project tree.
- ▶ Click “Online parameterization”.

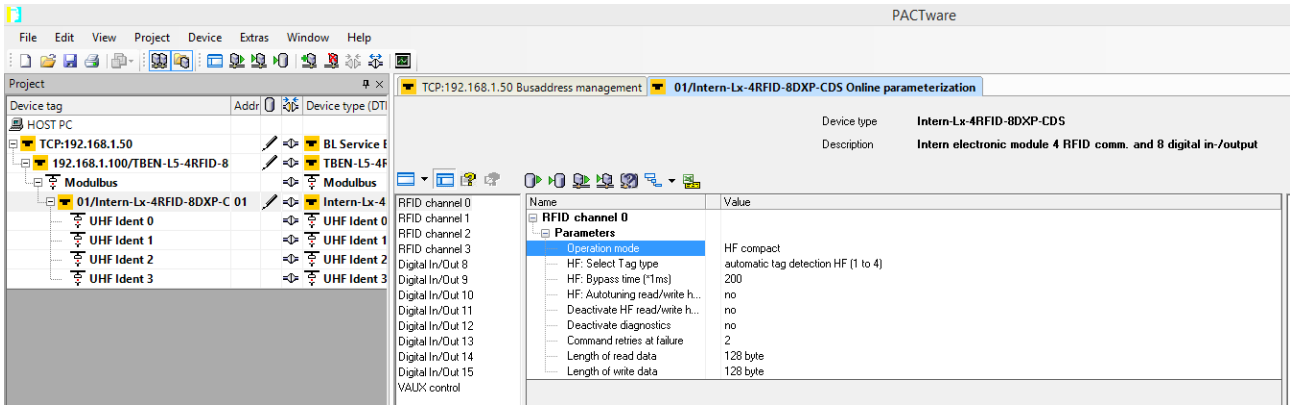


Fig. 126: Online parameterization

Example: Selecting the operating mode

- ▶ Click the operating mode in the “Online parameterization” window.
- ▶ Select the required operating mode from the drop-down menu.

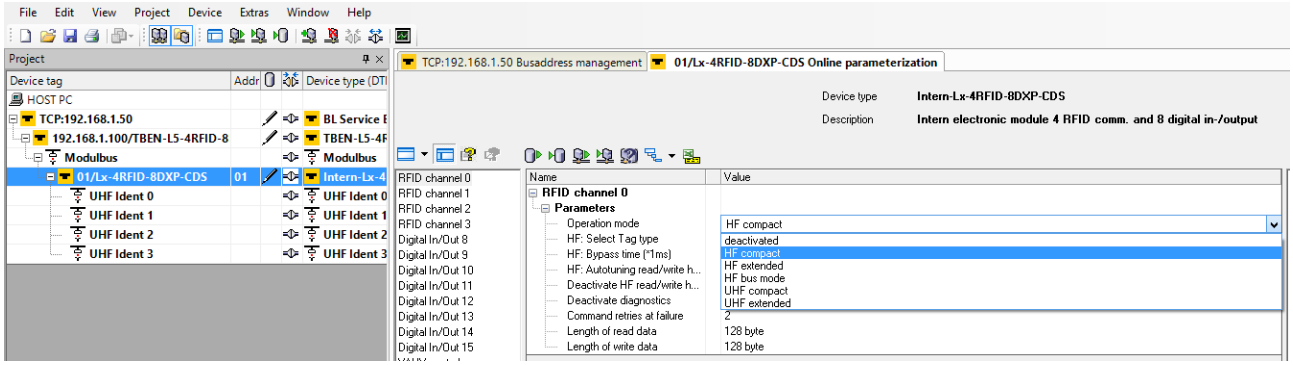


Fig. 127: Example – Selecting the operating mode

8.10.3 Reading process input data with the DTM – Measured value

The measured value function of the DTM enables the reading of the process input data.

- ▶ Right-click the device in the project tree.
- ▶ Click “Measured value”.
- ▶ Select the required channel in the central window.
- ⇨ The process input data is displayed in the window on the right-hand side (example: the device is in Idle mode).

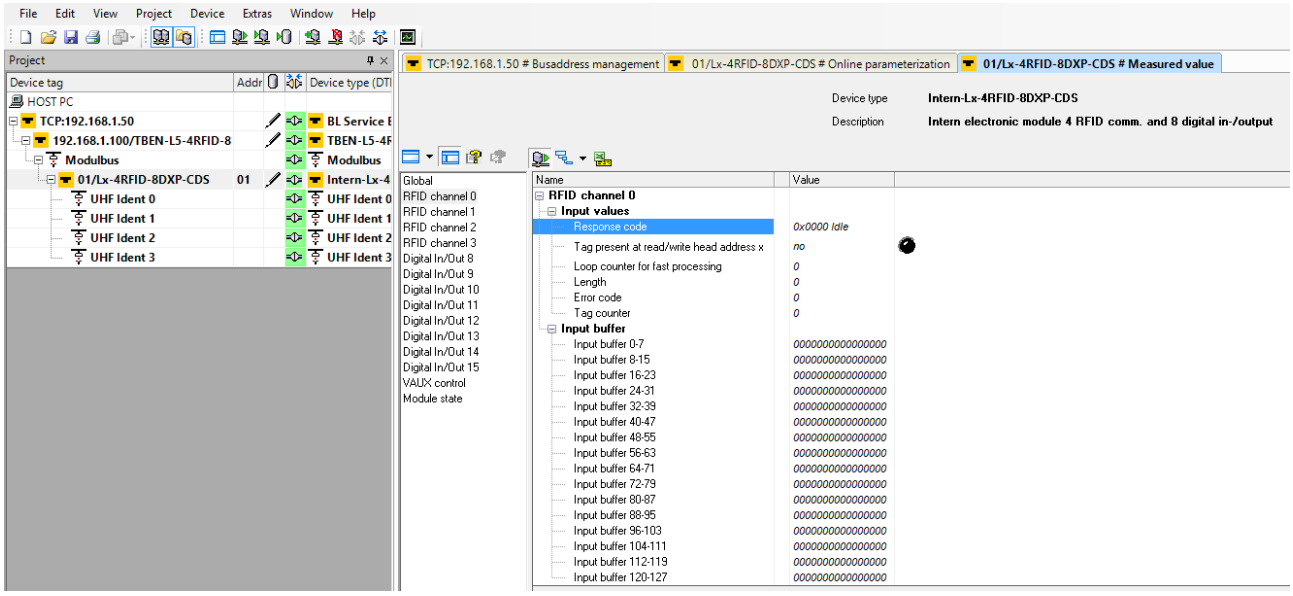


Fig. 128: Measured value function of the DTM

8.10.4 Changing process output data with the DTM – Simulation

The Simulation function of the DTM enables the process output data to be changed.

- ▶ Right-click the device in the project tree.
- ▶ Click “Simulation”.
- ▶ Select the required channel in the central window.
- ⇨ The process output data is displayed in the window on the right-hand side (example: the device is in Idle mode).

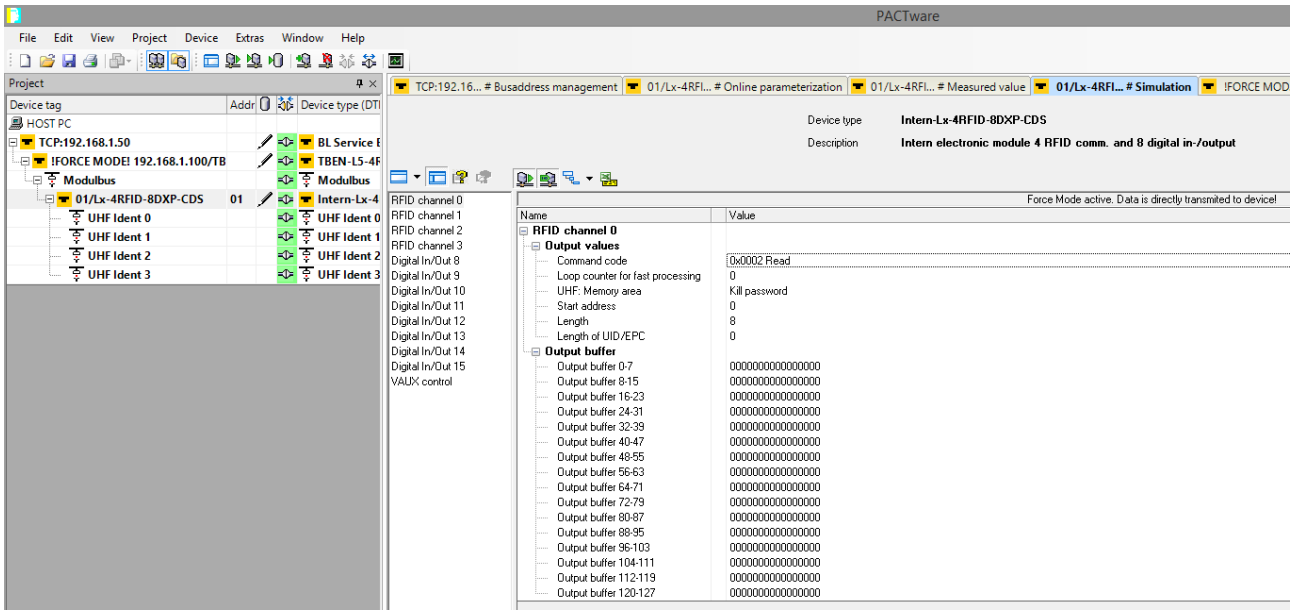


Fig. 129: Simulation function of the DTM

8.10.5 Evaluating diagnostics with the DTM

The Diagnostics function of the DTM enables the diagnostics of all channels to be called.

- ▶ Right-click the device in the project tree.
- ▶ Click “Diagnostics”.
- ▶ Select the required channel in the central window.
- ⇨ The process output data is displayed in the window on the right-hand side (example: the device is in Idle mode).

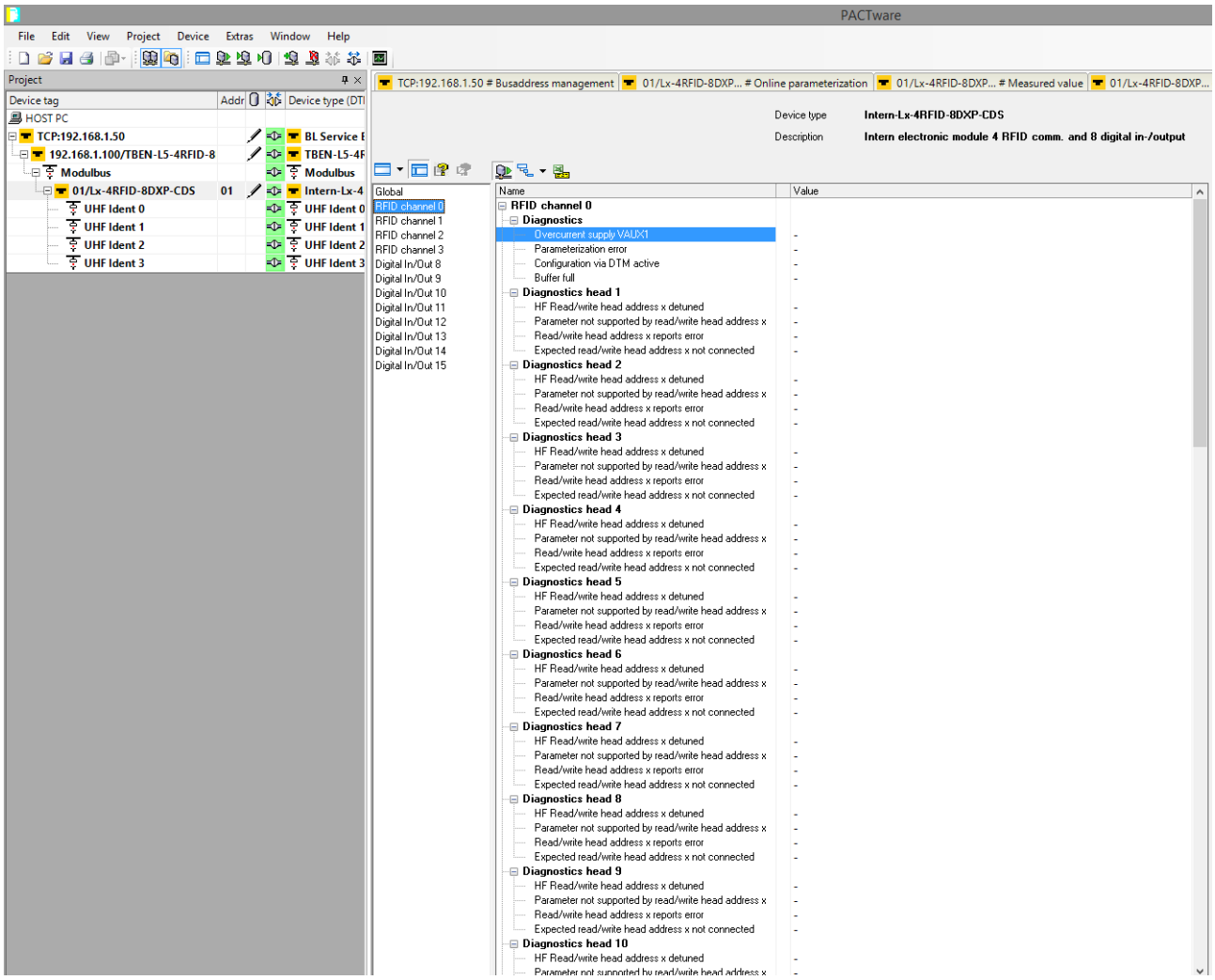


Fig. 130: Diagnostics function of the DTM

8.10.6 Example: Executing a read command with the DTM

In the following example 8 bytes of a tag are read by an HF read/write head connected to channel 0 of the interface.

- ▶ Right-click the device in the project tree.
- ▶ Click “Simulation”.
- ▶ Select RFID channel 0 in the central window.
- ▶ Set the length: Double-click the current value.
- ▶ Confirm all subsequent messages.
- ⇨ The DTM starts Force mode. In Force mode all entered values are written directly to the connected device.
- ▶ Enter the length in bytes (example: 8).
- ▶ Select the command code from the drop-down menu (example: 0x0002 read).

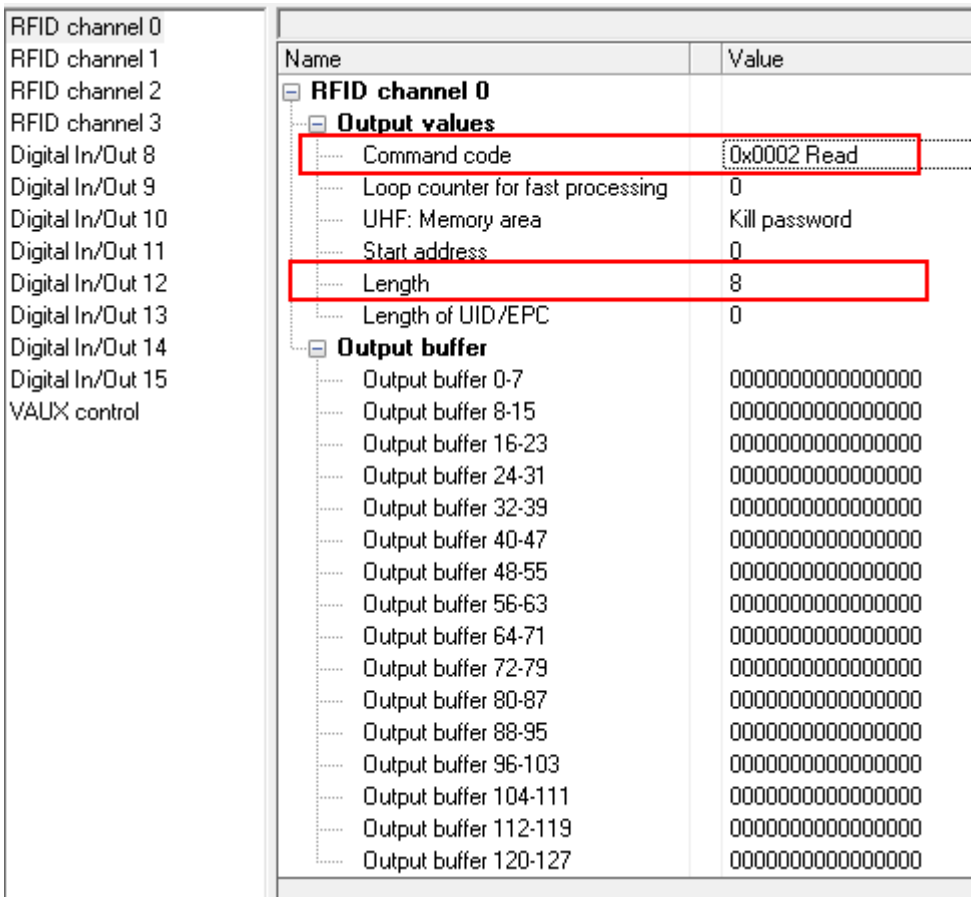


Fig. 131: Executing a read command – “Simulation” window

The read data is displayed in the “Measured value” window. The data format is hexadecimal.

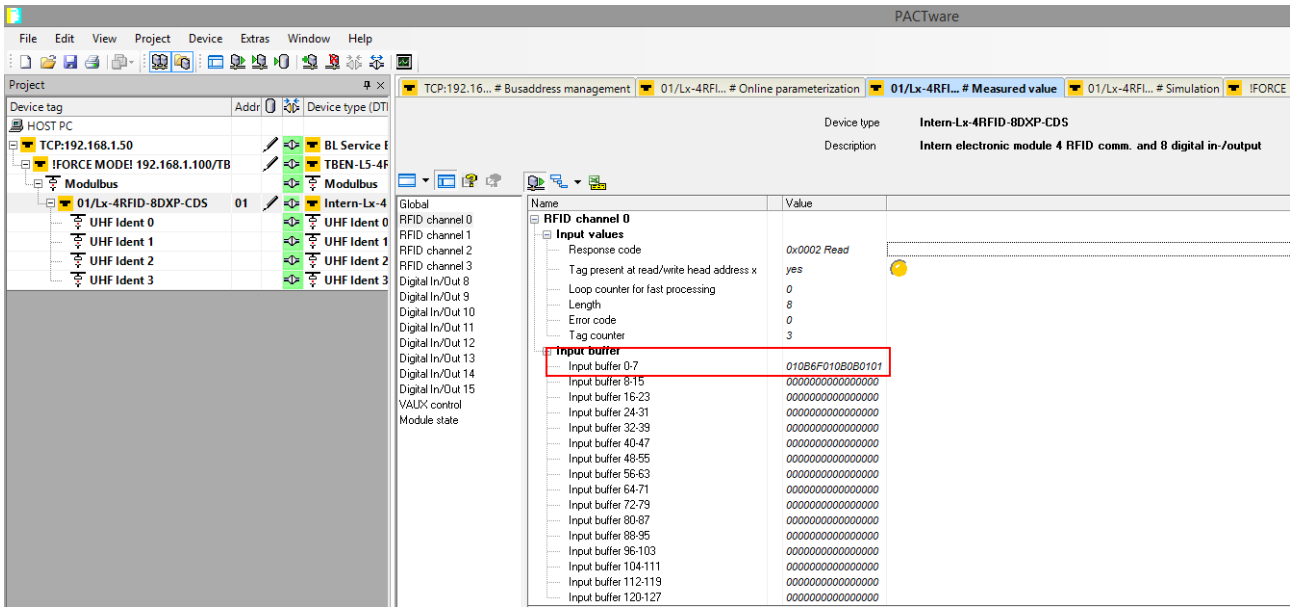


Fig. 132: Executing a read command – “Measured value” window

8.11 Setting UHF read/write heads

UHF read/write heads can be assigned additional parameters via a DTM. No parameters can be set in UHF read/write heads via the parameter data of the interface. The DTM for the specific device is available for download from www.turck.com.

A comprehensive description of the settings for UHF read/write heads is provided in the operating instructions for the specific device.

8.12 Opening WebVisu

The TBEN-L…4RFID- 8DXP-CDS-WV block modules are provided with a complete WebVisu license.

- To open WebVisu enter the IP address of the device with the suffix ":8080/webvisu.htm" in the address bar of a browser.
  Example: 192.168.1.254:8080/webvisu.htm

8.13 Using SFTP access

The user can access the device with SFTP via an FTP client program (e.g. FileZilla).

Server (SFTP protocol)	IP address of the device
User name	sftpuser
Password	password
Port	22

NOTE
The password for the SFTP access and the password in the web server are synchronized. A change to the password for SFTP access also causes a change to the password in the web server.

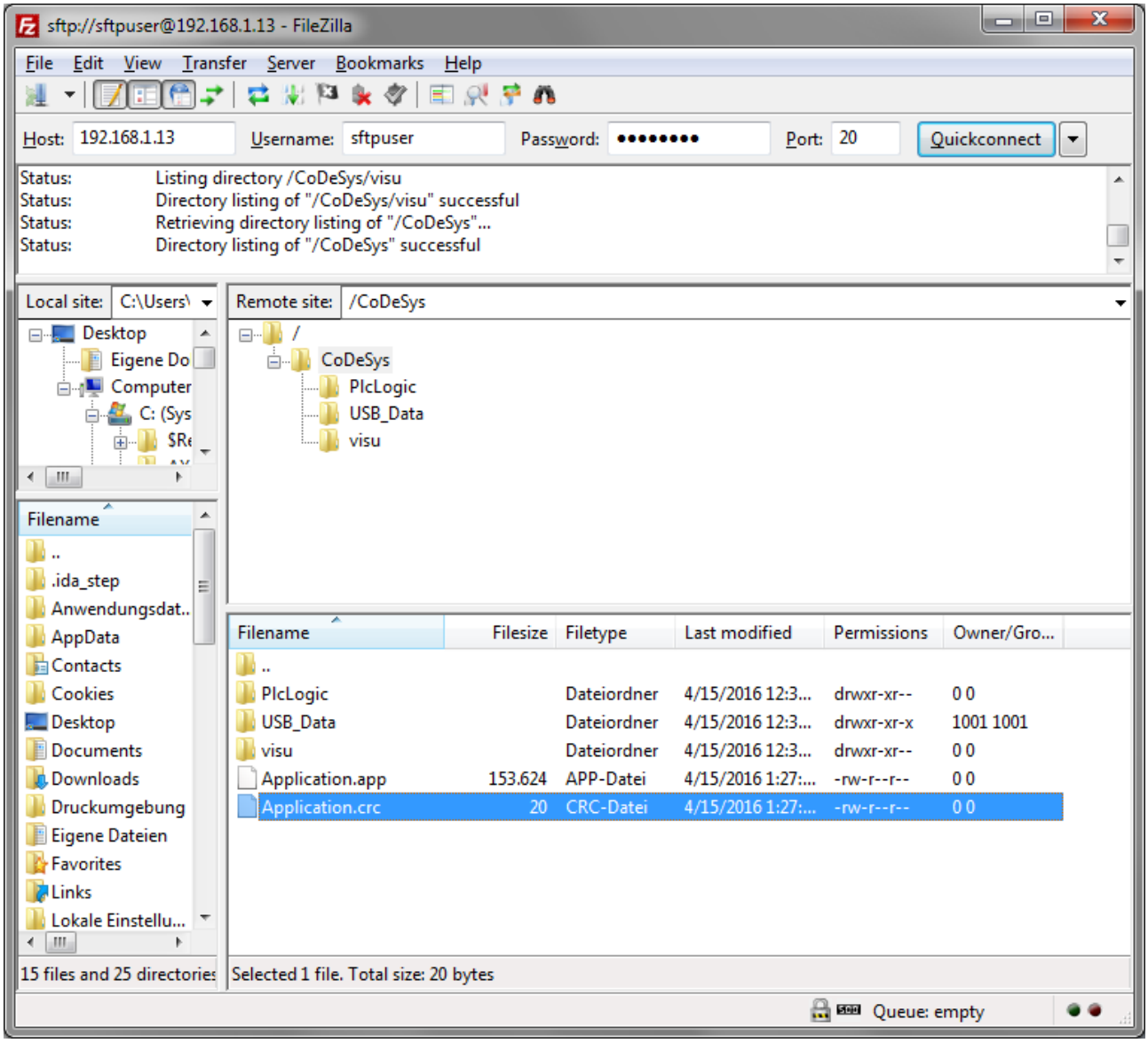


Fig. 133: SFTP access via FileZilla (example)

9 Operation

NOTE
The read and write data stored in the module is reset after a power reset.

9.1 Executing a command and calling data

- ▶ Set the parameters for the command.
- ▶ Set the command code.
- ⇨ The busy bit is set during command execution.
- ⇨ The command is successful when the response code is the same as the command code and the error bit is not set.

NOTE
A command is successful when the response code is the same as the command code.

9.1.1 Typical times for command processing

The values shown in the following table are approximate values. The typical times for command execution depend on the following factors:

- Hardware configuration
- Software configuration
- Number of bus stations
- Bus cycle times

HF applications

Command	System cycle time	Required time	Dependence on factors such as protocol, system etc.
Read 8 bytes	4 ms	10 ms	≤ 20 %
Write 8 bytes	4 ms	10 ms	≤ 20 %
Read 8 bytes	20 ms	60 ms	≤ 20 %
Write 8 bytes	20 ms	60 ms	≤ 20 %
Read 128 bytes	4 ms	40 ms	≤ 20 %
Write 128 bytes	4 ms	50 ms	≤ 20 %
Read 1 kByte	4 ms	700 ms	≤ 20 %
Write 1 kByte	4 ms	800 ms	≤ 20 %
Inventory (4 tags)	4 ms	300 ms	≤ 10 %

HF bus mode

The time required for the cyclical processing of a command depends on the time in which the tag is located in the detection range of the read/write head (bypass time). The default setting is 48 ms. The bypass time can be set by the user. If a different bypass time is set, the difference to the time required for processing the command must be added to or deducted from it.

The time in which all read/write heads can be addressed once by the interface is calculated as follows:
Number of read/write heads × bypass time
This time corresponds to the update rate for the "Tag in detection range" bit and must be taken into account when calculating the total time for processing the command.

The inventory command must be executed separately for all read/write heads.

Command	System cycle time	Required time	Dependence on factors such as protocol, system etc.
Read UID at a read/write head when rising edge TP, tag in detection range	4 ms	24 ms	The bypass time must be added, depending on the system cycle time.
Read UID at a read/write head when rising edge TP, tag in detection range	20 ms	80 ms	
Read 112 bytes of different read/write heads sequentially, default bypass time (48 ms)	4 ms	180 ms per read/write head	The time for accessing the individual read/write heads varies.

UHF applications

Command	System cycle time	Required time	Dependence on factors such as protocol, system etc.
Read 12 bytes EPC	4 ms	120…220 ms	not detectable
Write 12 bytes EPC	4 ms	260…400 ms	not detectable
Read 1 kByte	4 ms	2500 ms	≤ 20 %
Write 1 kByte	4 ms	7300 ms	≤ 20 %
Inventory (100 tags, read/write head in report mode, dynamic application)	4 ms	5500 ms	≤ 20 %

9.2 Using fragmentation

If more data is read than the set size of the data interface, the fragment counter is incremented in the input data.

- ▶ To read more data, increase the fragment counter in the output data.
- ▶ Repeat process until the read or write fragment no. in the input data equals zero.

If less data is read than the set size of the data interface, the fragment counter stays at 0.

9.3 Using commands with a loop counter function

NOTE
The loop counter is only supported for fast execution commands.

- ▶ Setting the command: Enter the command code.
- ▶ Set the loop counter to 1.
- ⇨ The command was successfully executed if the same command code appears in the process input data as in the process output data. The RFID data is stored in the buffer of the interface.

- ▶ Repeating the command: Increment the loop counter in the output data by 1.
- ⇨ The command was successfully executed if the same loop counter value appears in the process input data as in the process output data. The RFID data is stored in the buffer of the interface.

- ▶ Setting a new command: Set the new command code and set the loop counter to 0.

9.4 Using NEXT mode

NEXT mode can only be used in HF single-tag applications. An HF tag is always only read, written or protected if the UID is different to the UID of the last read or written tag.

9.4.1 Example: Using NEXT mode for a read command

✓ Requirement: Tag A and tag B have a different UID.

▶ Set read command in the process output data.

▶ Set Next mode: Enter the value -1 in the process output data under “UID/EPC length”.

Tag A is located in the detection range of the read/write head. The controller sends a read command in NEXT mode to the RFID interface. The read command tag is transferred from the interface to the read/write head. The read/write head reads the data of tag A once.

The controller sends a second read command in NEXT mode to the RFID interface. The read command is not transferred from the interface to the read/write head as long as tag A is in the detection range of the read/write head.

The read command is transferred from the interface to the read/write head if tag B is in the detection range of the read/write head. The read/write head reads the data of tag B.

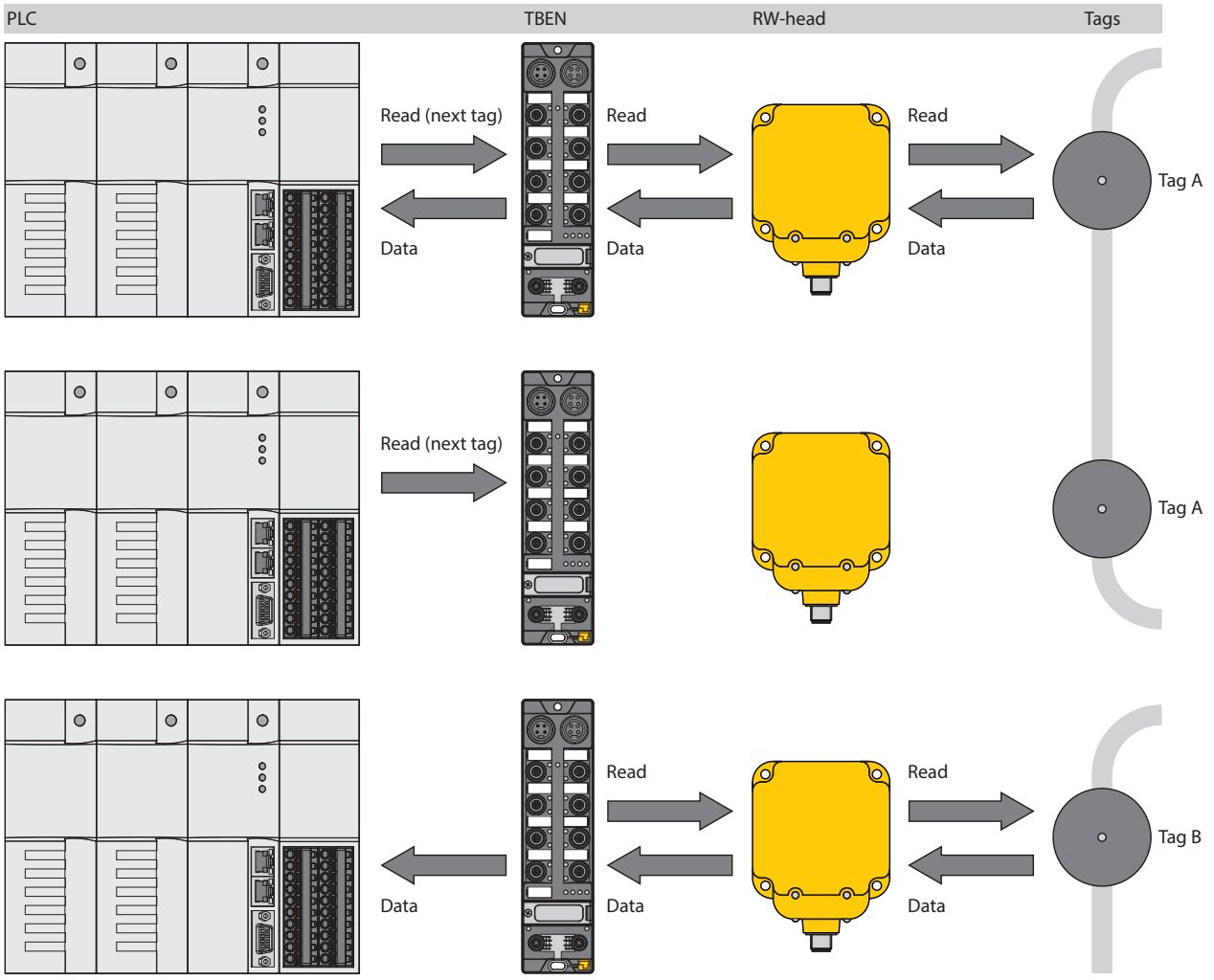


Fig. 134: NEXT mode (layout)

9.5 Using Inventory command and Continuous (presence sensing) mode

Inventory command and Continuous (Presence Sensing) mode have different data transfer methods to the PLC. The Continuous mode is suitable for fast applications in which a command (e.g. read or write operation) has to be repeated. A repeated execution of the same command by the controller is not required.

The following shows the most important differences between an Inventory command and Continuous mode.

Inventory	**Continuous mode**	**Continuous presence sensing mode**
triggered reading of UID or EPC	■ repeated reading the UIDs or EPCs ■ automatic repetition of the same command (e.g. Inventory, read, write)	■ UHF read/write head switches on as soon as a tag is detected ■ repeated reading the UIDs or EPCs ■ automatic repetition of the same command (e.g. Inventory, read, write)
Data is shown in the read data after the command is ended	Data must be read via a separate command from the memory of the interface	Data must be read via a separate command from the memory of the interface
Grouping of EPCs possible	Grouping of EPCs possible	Grouping of EPCs possible
No buffering at the read/write head	No buffering at the read/write head	No buffering at the read/write head
End the command: 1. Timeout 2. automatically after command execution	End the command: 1. Timeout 2. Separate command	End the command: 1. Timeout 2. Separate command

9.6 Executing commands in HF bus mode

- ▶ Set parameter data.
- ▶ Select “HF Bus Mode”.
- ▶ Activate connected read/write heads.
- ▶ Set input data.
- ▶ Enter the command code.
- ▶ Set the start address for the command.
- ▶ Set the required read/write head address.
- ▶ Send the command to the read/write head.

9.7 LEDs

The devices are provided with multi-color LEDs for displaying information:

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

The APPL LED can be programmed in CODESYS according to the application.

PWR LED	Meaning
off	No voltage or undervoltage at V1
lit green	Voltage at V1 ok
lit red	No voltage or undervoltage at V2

BUS LED	Meaning
off	No voltage present
lit green	Connection to a master active
flashing green (1 Hz)	Device is operational (slave)
lit red	IP address conflict, Restore mode active or F_Reset active
flashing red	Wink command active
flashing red/green (1 Hz)	Autonegotiation and/or wait for IP address allocation in DHCP or BootP mode

ERR LED	Meaning
off	No voltage present
lit green	No diagnostics
lit red	Diagnostics present

LED RUN	Meaning
lit green	Program active
green flashing	Valid memory stick on USB-A
lit red	Program stopped
flashing red	No program present
flashing red (double, 1 Hz)	F_Reset active

ETH1 and ETH2 LEDs	Meaning
off	No Ethernet connection
lit green	Ethernet connection established, 100 Mbit/s
green flashing	Data transfer, 100 Mbit/s
lit yellow	Ethernet connection established, 10 Mbit/s
yellow flashing	Data transfer, 10 Mbit/s

LEDs TP0…TP3	Meaning
off	No tag within the detection range
lit green	Tag within the detection range
green flashing	Tag in the detection range, command is processed
flashing (1 Hz) red/ green	Connection with DTM. No connection to controller active.
lit red	Diagnostics present

LEDs CMD0…CMD3	Meaning
off	Read/write head off
lit green	Read/write head on
green flashing	BUSY (command active)
flashing (1 Hz) red/ green	Interface memory full
lit red	Error in the data interface

RFID channel LEDs	
TP… and CMD… flash simultaneously	Overload of the auxiliary voltage
TP… and CMD… flash alternately	Parameter error

DXP channel LEDs	Meaning (input)	Meaning (output)
off	Input level below max. input level	Output not active
lit green	Input level above min. input level	Output active (max. 2 A)
lit red	–	Actuator overload
flashing red (1 Hz)	Overload of sensor supply	

APPL LED (programmable)	
flashing white	Wink command active

9.8 Software diagnostic messages

9.8.1 Diagnostic messages – Gateway functions

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	V2							DIAG
1		FCE				COM	V1	

Meaning of the diagnostic bits

Designation	Meaning
V2	Undervoltage at power supply terminal V2
DIAG	Module diagnostics present
FCE	Force mode in the DTM active
COM	Internal error
V1	Undervoltage at power supply terminal V1

9.8.2 Diagnostic messages – RFID channels

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	VAUX	PRMER	DTM	FIFO				
1	reserved							
2	reserved							
3	reserved							
4	TNC1	TRE1	PNS1	XD1				
5	TNC2	TRE2	PNS2	XD2				
6	TNC3	TRE3	PNS3	XD3				
…	…	…	…	…				
35	TNC32	TRE32	PNS32	XD32				

Meaning of the diagnostic bits

Designation	Meaning
VAUX	Overvoltage at power supply terminal VAUX
PRMER	Parameter error
DTM	Configuration via the DTM active
FIFO	Buffer full
TNC…	Expected read/write head not found
TRE…	Read/write head reports error
PNS…	Parameter not supported by read/write head
XD…	Read/write head detuned

9.8.3 Diagnostic messages – Digital channels

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	VAUXC7	VAUXC6	VAUXC5	VAUXC4	reserved			
1	reserved							
2	reserved							
3	ERR15	ERR14	ERR13	ERR12	ERR11	ERR10	ERR9	ERR8

Meaning of the diagnostic bits

Designation	Meaning
VAUXC4	Overvoltage at power supply terminal VAUX at socket 7 (channels 8 and 9)
VAUXC5	Overvoltage at power supply terminal VAUX at socket 7 (channels 10 and 11)
VAUXC6	Overvoltage at power supply terminal VAUX at socket 7 (channels 12 and 13)
VAUXC7	Overvoltage at power supply terminal VAUX at socket 7 (channels 14 and 15)
ERRx	Error message on channel x

9.8.4 Diagnostic messages – Module status

Meaning of the diagnostic bits

Designation	Meaning
V2	Undervoltage at power supply terminal V2
DIAG	Module diagnostics present
FCE	Force mode in the DTM active
COM	Internal error
V1	Undervoltage at power supply terminal V1

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	V2							DIAG
1		FCE				COM	V1	

9.9 Reading error codes

The error codes are part of the process input data.

Error code (hex)	Error code (dec)	Meaning
0x8000	32768	Channel not active
0x8001	32769	Read/write head not connected
0x8002	32770	Memory full
0x8003	32771	Block size of the tag not supported
0x8004	32772	Length larger than the size of the read fragment
0x8005	32773	Length larger than the size of the write fragment
0x8006	37774	Read/write head does not support HF bus mode
0x8007	32775	Only one read/write head should be connected for addressing.
0x8100	33024	Parameter undefined
0x8101	33025	“Operating mode” outside of the permissible range
0x8102	33026	“Tag type” parameter outside of the permissible range
0x8103	33027	“Operating mode” parameter in Continuous mode outside of the permissible range
0x8104	33028	“Length” parameter in Continuous mode outside of the permissible range
0x8105	33029	Size of the write fragment outside of the permissible range
0x8106	33030	Size of the read fragment outside of the permissible range
0x81FD	33021	“Bridging time” parameter outside of the permissible range
0x81FE	33022	“Address” parameter in Continuous mode outside of the permissible range
0x81FF	33023	No read/write head selected
0x8200	33280	Command code unknown
0x8201	33281	Command not supported
0x8202	33282	Command not supported in HF applications
0x8203	33283	Command not supported in UHF applications
0x8204	33284	Command for multitag application with automatic tag detection not supported

Error code (hex)	Error code (dec)	Meaning
0x8205	33285	Command for applications with automatic tag detection not supported
0x8206	33286	Command only supported for applications with automatic tag detection
0x8207	33287	Command not supported for multi-tag application
0x8208	33288	Command not supported in HF bus mode
0x8209	33289	"Length" parameter outside of the permissible range
0x820A	33290	Address outside of the permissible range
0x820B	33291	Length and address outside of the permissible range
0x820C	33292	No tag found
0x820D	33293	Timeout
0x820E	33294	Next command not supported in multitag mode
0x820F	33295	Length of the UID outside of the permissible range
0x8210	33296	Length outside of the tag specification
0x8211	33297	Address outside of the tag specification
0x8212	33298	Length and address outside of the tag specification
0x8213	33299	Memory area of the tag outside of the permissible range
0x8214	33300	Read/write head address outside of the permissible range
0x8215	33301	Value for timeout outside of the permissible range
0x8216	33302	Command only possible in HF bus mode
0x8217	33303	HF read/write head address invalid
0x8300	33536	Continuous mode command not activated
0x8301	33537	Grouping not supported in HF applications
0x8302	33538	Grouping not supported with read commands
0x8304	33540	Grouping not supported with write commands
0x8305	33541	HF: Length in Continuous mode violates the block limits

Error code (hex)	Error code (dec)	Meaning
0x8306	33542	HF: Address in continuous mode violates the block limits
0x8307	33543	HF: Length in Continuous mode outside of the permissible range
0x0801	2049	Write or read error
0x2000	8192	Kill command not successful
0x2200	8704	Automatic tuning active
0x2201	8705	Automatic tuning failed
0x2202	8706	Read/write head detuned
0x2500	9472	Password function of the tag not supported
0x2501	9473	Password function not supported by read/write head
0x2900	10496	Address outside of the block limits
0x2901	10497	Length outside of the block limits
0xC000	49152	Internal error (response of the read/write head too short)
0xC001	49153	Command not supported by read/write head version
0xB0…	45…	HF read/write head reports error
0xB048	45128	Error when switching on the HF read/write head
0xB049	45129	Error when switching off the HF read/write head
0xB060	45152	Error with the extended parameter setting of the HF read/write head
0xB061	45153	Error with the parameter setting of the HF read/write head
0xB062	45154	Read/write head error when executing an inventory command
0xB067	45159	Read/write head error when executing a lock block command
0xB068	45160	Read/write head error when executing a read multiple block command
0xB069	45161	Read/write head error when executing a write multiple block command
0xB06A	45162	Error when reading the system information
0xB06B	45163	Error when reading the protection status of the tags

Error code (hex)	Error code (dec)	Meaning
0xB0AD	45229	Error when setting the read/write head address
0xB0BD	45245	Error when setting the transfer rate
0xB0DA	45274	Error with the “Tag in detection range” function
0xB0E0	45280	Error when reading the read/write head version
0xB0E1	45281	Error when reading the extended read/write head version
0xB0F1	45297	Error with automatic read/write head tuning
0xB0F8	45304	Error when resetting a command in Continuous mode
0xB0FA	45306	Error when outputting the response code
0xB0FF	45311	Error when resetting the read/write head
0xB0B3	45235	Error when setting the tag password
0xB0B6	45238	Error when setting the write or read protection
0xB0B8	45240	Error when reading the protection status of the memory area on the tag
0xB0C3	45251	Error when setting the password in the read/write head
0xD0…	53…	UHF read/write head reports error
0xD001	53249	Error when resetting the UHF read/write head
0xD002	53250	Error when reading the read/write head version
0xD003	53251	Error when reading the read/write head version when a tag is in the detection range
0xD004	53252	Error when setting the read/write head address
0xD009	53257	Error with the parameter setting of the UHF read/write head
0xD00A	53258	Error when setting the transfer speed and the operating mode of the UHF read/write head
0xD00B	53259	Error when polling
0xD00D	53261	Error when reading the device status
0xD00E	53262	Error when resetting the internal status bit

Error code (hex)	Error code (dec)	Meaning
0xD00F	53263	Error when setting the read/write head outputs and/or LEDs
0xD011	53265	Error when reading the internal malfunctions
0xD014	53268	Diagnostics error
0xD016	53270	Error with the heartbeat message
0xD017	53271	Error when outputting the user settings
0xD01B	53275	Error when emptying the message memory in Polling mode
0xD081	53377	Error when switching the UHF tag on or off
0xD083	53379	Error when reading from a tag
0xD084	53380	Error when writing to a tag
0xD085	53381	Software trigger error
0xD088	53384	Error when outputting a command according to EPC Class1 Gen2
0xD100	53504	Error with the Backup function
0xD101	53505	Error with the Backup function (required memory not available)
0xD102	53506	Error when restoring a backup
0xD103	53507	Error when restoring a backup (no backup present)
0xD104	53508	Error when restoring a backup (backup data damaged)
0xD105	53509	Error when restoring the default settings
0xD106	53510	Error with the tag function
0xF0…	61…	ISO 15693 error
0xF001	61441	ISO 15693 error: Command not supported
0xF002	61442	ISO 15693 error: Command not detected, e.g. incorrect input format
0xF003	61443	ISO 15693 error: Command option not supported
0xF00F	61455	ISO 15693 error: undefined error
0xF010	61456	ISO 15693 error: Addressed memory area not available
0xF011	61457	ISO 15693 error: Addressed memory area locked
0xF012	61458	ISO 15693 error: Addressed memory area locked and not writable
0xF013	61459	ISO 15693 error: Write operation not successful

Error code (hex)	Error code (dec)	Meaning
0xF014	61460	ISO 15693 error: Addressed memory area could not be locked
0xF0A0…0xF0DF	61600…61663	Air interface error
0xF101	61697	Air interface error: CRC error
0xF102	61698	Air interface error: Timeout
0xF103	61699	Air interface error: UHF tag error
0xF108	61704	Air interface error: UHF tag outside of the detection range, before all commands could be executed
0xF110	61712	Air interface error: Tag does not have the expected UID
0xF201	61953	HF read/write head faulty
0xF202	61954	HF read/write head: Error in command execution
0xF204	61956	HF read/write head: Transmission error, check syntax
0xF208	61960	Power supply of the HF read/write head too low
0xF20A	61962	HF read/write head: Command code unknown
0xF8…	63…	UHF read/write head error
0xF820	63520	UHF read/write head: Command not supported
0xF821	63521	UHF read/write head: Unspecified error
0xF822	63522	UHF read/write head: A valid password is expected before the command is accepted.
0xF824	63524	UHF read/write head: Read operation not possible (e.g. invalid tag)
0xF825	63525	UHF read/write head: Read operation not possible (e.g. tag can only be read)
0xF826	63526	UHF read/write head: Write or read error
0xF827	63527	UHF read/write head: Access to unknown address (e.g. memory area outside of range)
0xF828	63528	UHF read/write head: The data to be sent is not valid
0xF82A	63530	UHF read/write head: The command requires a long time for execution.

Error code (hex)	Error code (dec)	Meaning
0xF82C	63532	UHF read/write head: The requested object is not in the persistent memory.
0xF82D	63533	UHF read/write head: The requested object is not in the volatile memory.
0xF835	63541	UHF read/write head: The command is temporarily not permissible.
0xF836	63542	UHF read/write head: The opcode is not valid for this type of configuration memory.
0xF880	63616	UHF read/write head: No tag in the field
0xF881	63617	UHF read/write head: The EPC of the command does not match the EPC in the detection range
0xF882	63618	UHF read/write head: Incorrect tag type specified
0xF883	63619	Write command to a block failed
0xFFFE	65534	Timeout on the RS485 interface
0xFFFF	65535	Command aborted

9.10 Using the USB Host port

The USB functions enable CODESYS applications to be saved, restored and transferred. The firmware of the devices can also 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-formated USB sticks can be connected to the USB Host port. The connection of NTFS-formatted sticks as well as USB devices such as external hard disks, keyboards, PC mice etc. is not possible.
Compatibility problems may occur, depending on the power consumption of the USB stick. In order to ensure error-free data exchange, Turck recommends the use of the industrially robust USB stick USB 2.0 Industrial Memory Stick (Ident No. 6827348).

9.10.1 USB Host port – Function overview

Both a read as well as write access to the device is possible via the USB Host port.

NOTICE
Use of recipes in CODESYS
Corrupt files when files are manipulated in the USB_Data directory
▶ When using recipes only make 1:1 copies with Backup_2/Restore_2.

Read access – Functions

The following table shows the executable functions:

Function	Folder name	Description	CODESYS program status	Automatic device restart
Backup 1	BACKUP_1	Save CODESYS application of device on the USB stick. The following files are saved on the USB stick: ■ – All *.app and *.crc files ■ PlcLogic folder Existing files with the same name are overwritten. All other files remain unchanged.	RUN	no
Backup 2	BACKUP_2	Save CODESYS application and device data on the USB stick. The following files are saved on the USB stick: ■ – All *.app and *.crc files ■ PlcLogic folder ■ USB_Data folder ■ IP address ■ PROFINET device name ■ Retain data (retain.bin) Existing files with the same name are overwritten. All other files remain unchanged.	RUN	no
Read user data	USB_DATA	Save “USB_Data” folder of device on the USB stick. The following files are saved on the USB stick: ■ CODESYS recipes and/or log files Existing files with the same name are overwritten. All other files remain unchanged.	RUN	no

Write access – Functions

The following table shows the executable functions:

Function	Folder name	Description	CODESYS program status	Automatic device restart
Restore 1	RESTORE_1	Load CODESYS application from the USB stick to the device. The following files are loaded from the memory medium into the device: ■ – All *.app and *.crc files ■ PlcLogic folder The folder must only contain one application file (*.app). All previous applications on the device are deleted without further warning. After the USB stick is removed from the USB port, the device automatically carries out a restart.	STOP	yes
Restore 2	RESTORE_2	Load CODESYS application and the device data from the USB stick to the device. The following files are loaded from the USB stick: ■ – All *.app and *.crc files ■ PlcLogic folder ■ USB_Data folder ■ IP address ■ PROFINET device name ■ Retain data (retain.bin) The folder must only contain one application file (*.app). All previous applications on the device are deleted without further warning. After the USB stick is removed from the USB port, the device automatically carries out a restart.	STOP	yes
Firmware update	FW_UPDATE	Update of the device firmware. The IP address, the PROFINET device name and the CODESYS application are not overwritten. File name: TBEN-Lx-4RFID-8DXP-CDS_01504038_V….bin After the USB stick is removed from the USB port, the device automatically carries out a restart.	STOP	yes
Write user data	USB_DATA_WRITE	Load “USB_Data” folder from the memory medium to the device. Existing files with the same name are overwritten. All other files remain unchanged.	STOP	yes

9.10.2 Executing USB functions

Execute Backup_1 and Backup_2

- ▶ Insert the USB stick in the device.
- ⇨ The RUN LED flashes green at 4 Hz.
- ⇨ The backup is executed.
- ⇨ The backup is completed when the RUN LED flashes orange at 1 Hz.
- ▶ Remove the USB stick.

Save user data (USB_DATA function)

- ▶ Insert the USB stick in the device.
- ⇨ The RUN LED flashes green at 2 Hz.
- ⇨ The data is saved on the USB stick.
- ⇨ The backup is completed when the RUN LED flashes orange at 1 Hz.
- ▶ Remove the USB stick.

Loading data into the device (RESTORE_1 or RESTORE_2 function)

- ▶ Insert the USB stick in the device.
- ⇨ The RUN LED flashes green at 0.5 Hz.
- ▶ Within 30 seconds hold down the Set button for at least 3 seconds.
- ⇨ The RUN LED flashes in the sequence 2 x green - pause (1 Hz) - 2 × green - pause (1 Hz) - ….
- ⇨ The data is loaded into the device.
- ⇨ The loading of the data is completed when the RUN LED flashes orange at 1 Hz.
- ▶ Remove the USB stick.
- ⇨ The device restarts.

Executing the firmware update (FW_UPDATE function)

- ▶ Create the “FW_UPDATE” folder on a USB stick.
- ▶ Save the firmware as a bin file in the “FW_UPDATE” folder.
- ▶ Insert the USB stick in the device.
- ⇨ The RUN LED flashes green at 0.5 Hz.
- ▶ Hold down the Set button for at least 3 seconds within 30 segments.
- ⇨ The RUN LED flashes in the sequence 3 x green - pause (1 Hz) - 3 × green - pause (1 Hz) - ….
- ⇨ The data is loaded into the device.
- ⇨ The firmware update is completed when the RUN LED flashes orange at 1 Hz.
- ▶ Remove the USB stick.
- ▶ Carry out a voltage reset.
- ⇨ The device restarts.

Writing the user data to the device (USB_DATA_WRITE)

- ▶ Insert the USB stick in the device.
- ⇨ The RUN LED flashes green at 0.5 Hz.
- ▶ Within 30 seconds hold down the Set button for at least 3 seconds.
- ⇨ The RUN LED flashes green at 2 Hz.
- ⇨ The data is saved on the device.
- ⇨ The backup is completed when the RUN LED flashes orange at 1 Hz.
- ▶ Remove the USB stick.
- ⇨ The device restarts.

9.10.3 USB functions – Behavior of the RUN LED in the event of an error

In the event of an error, when executing USB functions the RUN LED behaves as follows:

LED indication	Error	Meaning
red/green flashing (1 Hz)	Timeout	■ SET button not actuated within 30 seconds after the USB stick is inserted.
	Invalid folder	■ The USB stick contains a folder with an invalid name. ■ The memory medium contains several folders.
	Empty folder	■ The USB stick contains an empty folder with a valid name.
red/green flashing (1 Hz)	USB deactivated	■ The USB Host function was deactivated by a web server or CODESYS program

9.11 Reset device (Reset)

The device can be reset to the factory settings via the rotary coding switches, the Turck Service Tool and the web server via the F_Reset function. In the event of a fault, the device can be reset via a reboot or the Reset command. The settings are retained if a restart was carried out or the device was reset via the Reset command.

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

11.1 Executing the 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 latest firmware can be downloaded free of charge from 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.

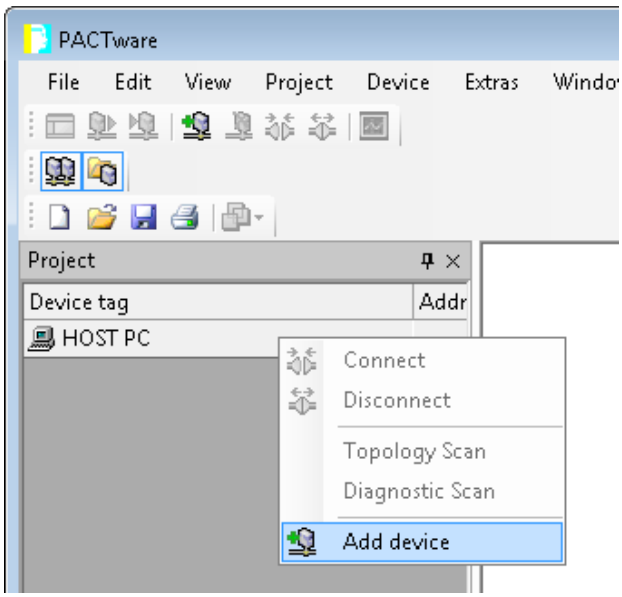


Fig. 135: Adding a device in PACTware™

▶ Select BL Service Ethernet and confirm with OK.

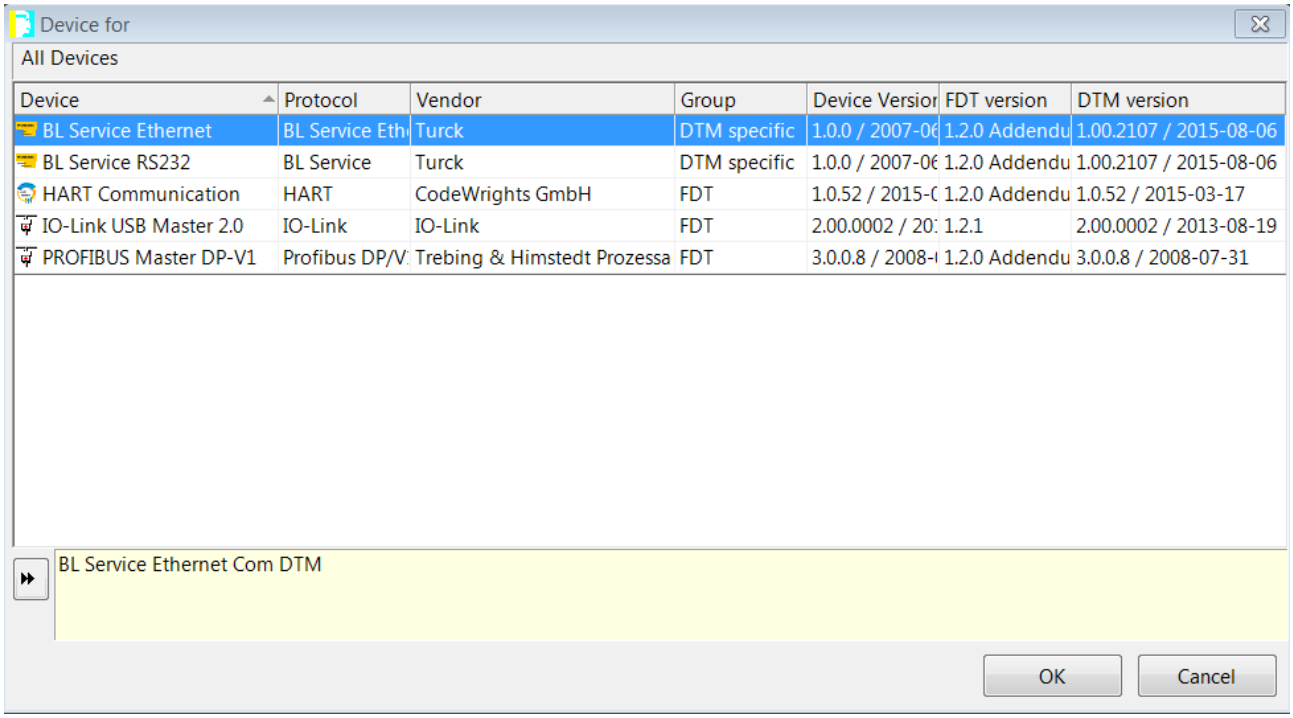


Fig. 136: Select the Ethernet interface

▶ Double-click the connected device.

⇨ PACTware™ opens the bus address management.

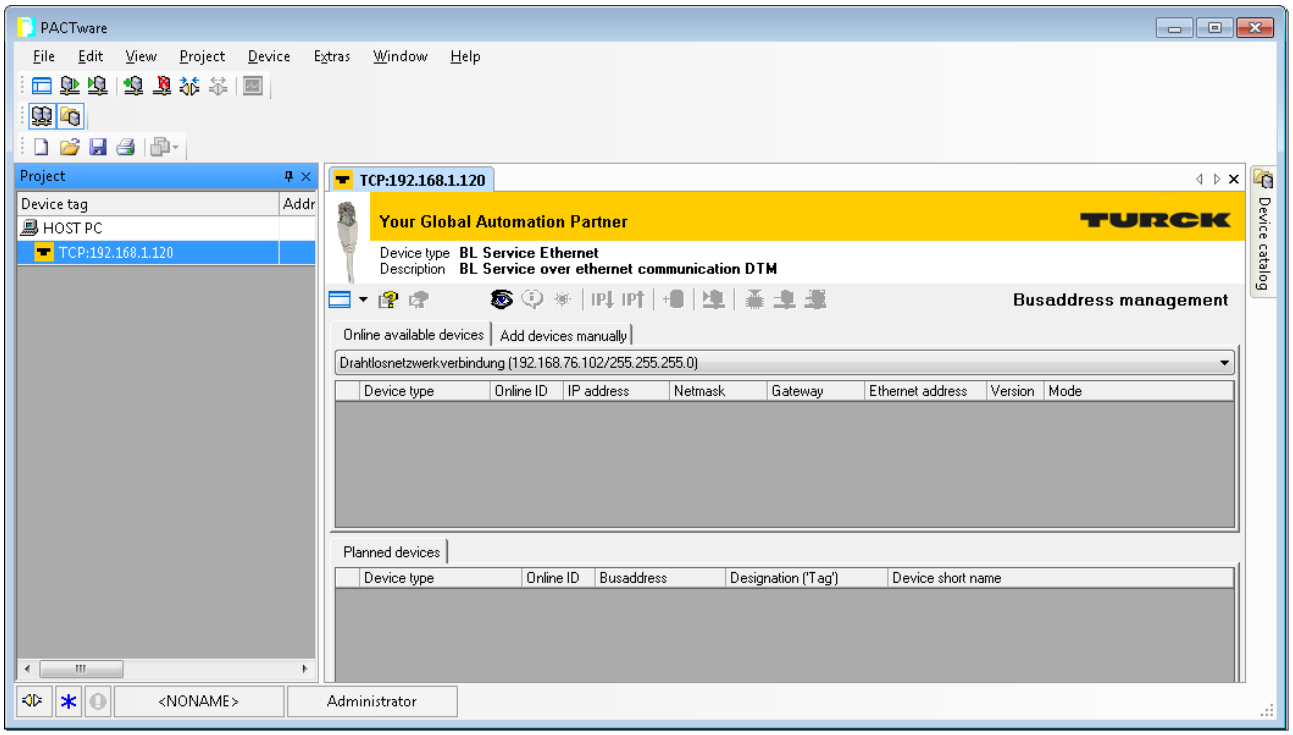


Fig. 137: Opening Bus Address Management

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

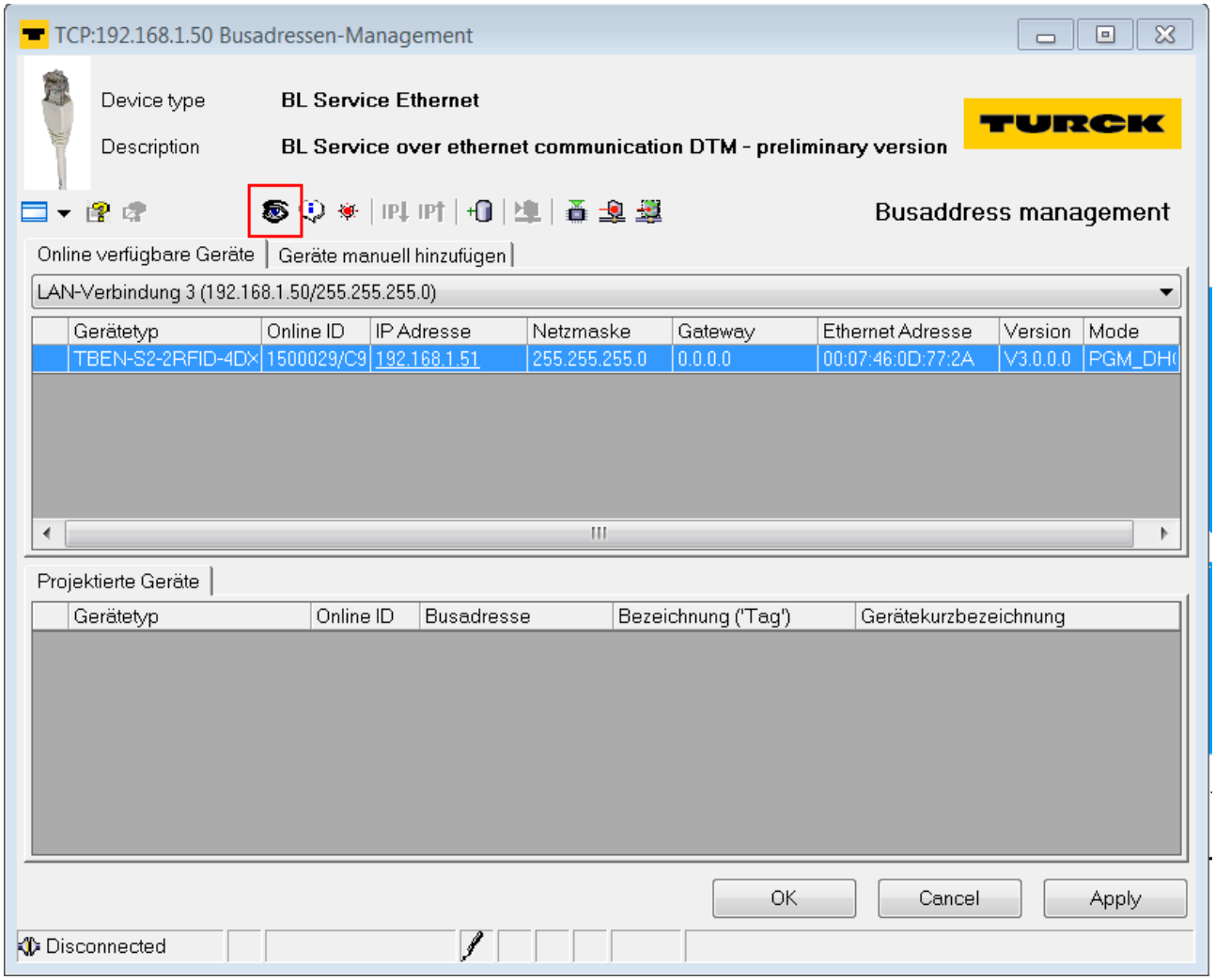


Fig. 138: Selecting the device

▶ Click “Firmware Download” to start the firmware update.

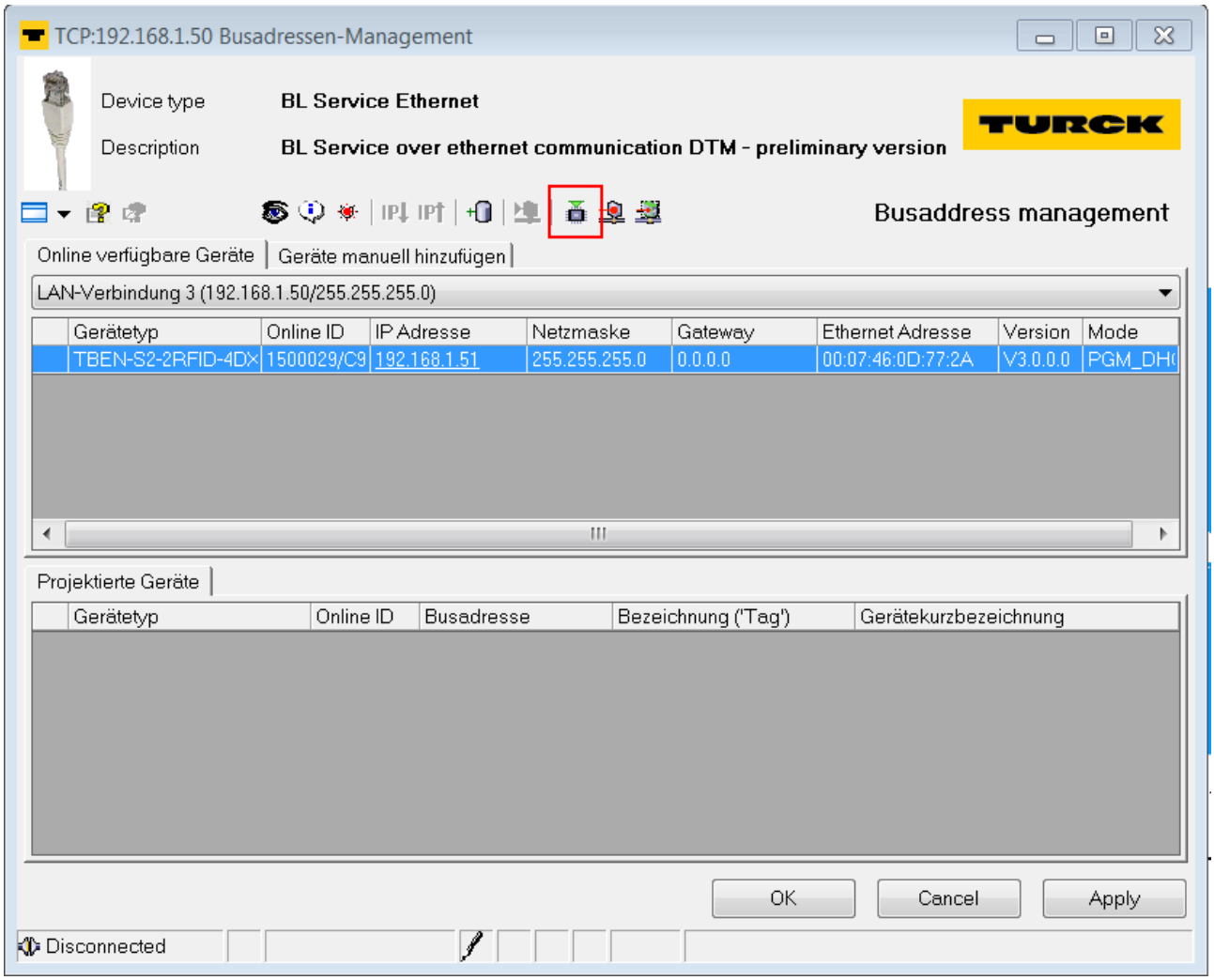


Fig. 139: Starting the firmware update

- ▶ 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.

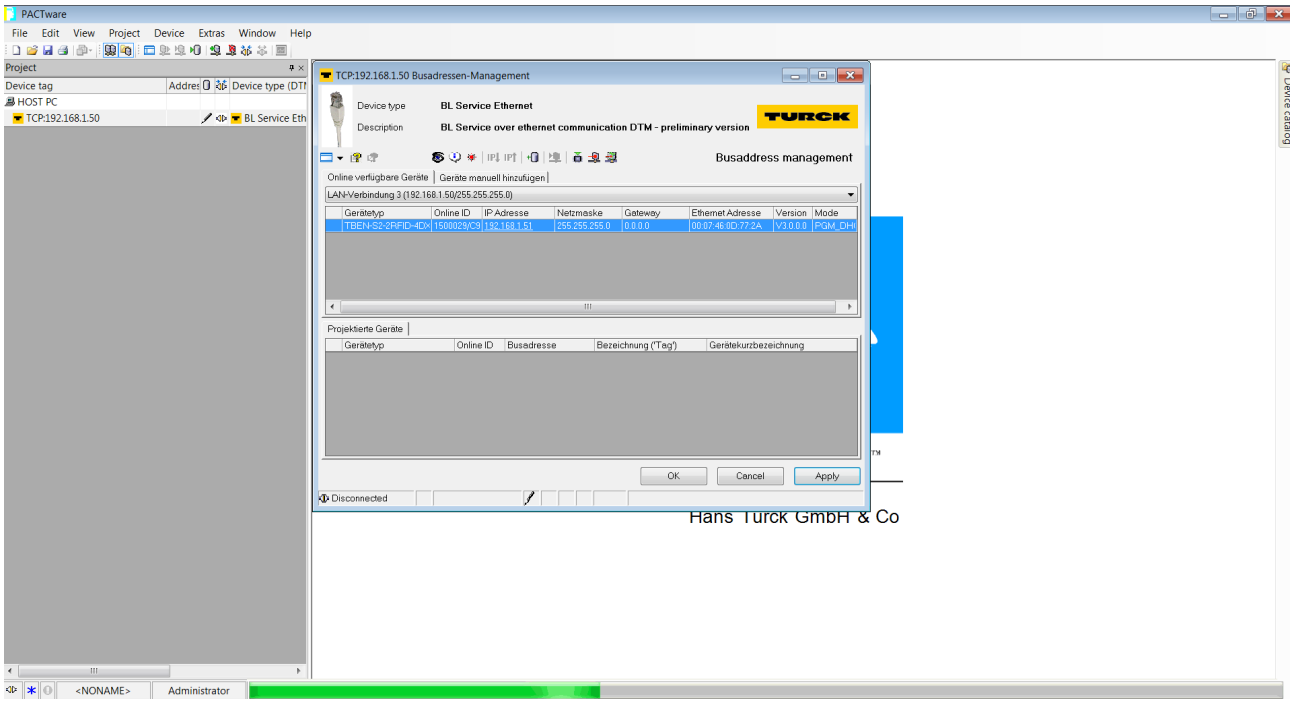


Fig. 140: Firmware update in progress

11.2 Executing the firmware update via the USB interface

- ▶ Create the “FW_UPDATE” folder on a USB stick.
- ▶ Save the firmware as a bin file in the “FW_UPDATE” folder.
- ▶ Insert the USB stick in the device.
- ⇨ The RUN LED flashes green at 0.5 Hz.
- ▶ Hold down the Set button for at least 3 seconds within 30 segments.
- ⇨ The RUN LED flashes in the sequence 3 x green - pause (1 Hz) - 3 × green - pause (1 Hz) - ….
- ⇨ The data is loaded into the device.
- ⇨ The firmware update is completed when the RUN LED flashes orange at 1 Hz.
- ▶ Remove the USB stick.
- ▶ Carry out a voltage reset.
- ⇨ The device restarts.

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

If a device has to be returned, bear in mind that only devices with a decontamination declaration will be accepted. The decontamination declaration can be downloaded from
http://www.turck.de/de/produkt-retoure-6079.php
and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Disposal

The devices must be disposed of correctly and must not be included in normal household garbage.

14 Technical Data

Technical data	
Power supply	
Power supply voltage	24 VDC
Permissible range	18…30 VDC
Total current	V1 max. 8 A, V2 max. 9 A at 70 °C per module
RFID power supply	2 A per channel at 70 °C
Sensor/actuator supply	2 A per socket at 70 °C
Potential isolation	Potential isolation of V1 and V2 voltage group
Dielectric strength	up to 500 VDC V1 and V2 to Ethernet
Power dissipation	typically ≤ 5 W
System description	
Processor	ARM Cortex A8, 32-bit, 800 MHz
Memory	256 MB Flash ROM; 512MB DDR3 RAM
Memory expansion	1 × USB Host port
Real-time clock	yes
Operating system	Linux
PLC data	
Programming	CODESYS V3
Released for CODESYS version	V 3.5.8.10
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Application tasks	10
Number of POUs	1024
Programming interface	Ethernet, USB
Cycle time	< 1 ms for 1000 IL commands (without I/O cycles)
Input data	8 Kbyte
Output data	8 Kbyte
System data	
Transfer rate	Ethernet 10 Mbit/s / 100 Mbit/s
Connection technology	2 × M12, 4-pin, D-coded
Web server	Default: 192.168.1.100
Service interface	Ethernet via P1 or P2
Modbus TCP	
Addressing	Static IP, BOOTP, DHCP
Supported function codes	FC1, FC2, FC3, FC4, FC5, FC6, FC15, FC16, FC23
Number of TCP connections	8
EtherNet/IP™	
Addressing	as per EtherNet/IP™ specification
Device Level Ring (DLR)	supported
Number of TCP connections	3
Number of CIP connections	10
Input assembly instance	103

Technical data	
Output assembly instance	104
Configuration Assembly Instance	106
PROFINET	
Addressing	DCP
MinCycle TIme	4 ms
Diagnostics	as per PROFINET alarm handling
Automatic addressing	supported
Media redundancy protocol (MRP)	supported
RFID	
No. of channels	4
Connection technology	M12
Power supply	2 A per channel at 70 °C, short-circuit-proof
Operation per channel	1 × HF or UHF read/write head, up to 32 bus-capable HF read/write heads with suffix /C53 (for static applications, additional power supply possibly required)
RFID data interface	HF and UHF
Cable length	max. 50 m
Digital inputs	
No. of channels	8
Connection technology	M12, 5-pin
Input type	PNP
Type of input diagnostics	Channel diagnostics
Switch threshold	EN 61131-2 type 3, pnp
Signal voltage Low signal	< 5 V
Signal voltage High signal	> 11 V
Signal current Low signal	<1.5 mA
Signal current High signal	> 2 mA
Potential isolation	Galvanic isolation at P1/P2
Dielectric strength	up to 500 VDC (V1 and V1 compared to Ethernet)
Digital outputs	
No. of channels	8
Connection technology of outputs	M12, 5-pin
Output type	PNP
Type of output diagnostics	Channel diagnostics
Output voltage	24 VDC from potential group
Output current per channel	2.0 A, short-circuit proof, max. 4.0 A per socket
Utilization factor	0.56
Load type	EN 60947-5-1: DC-13
Short-circuit protection	yes
Potential isolation	Galvanic isolation at P1/P2
Dielectric strength	up to 500 VDC (V1 and V1 compared to Ethernet)

Technical data	
Conformity with standard/directive	
Vibration test	acc. to EN 60068-2-6
Acceleration	up to 20 g
Shock testing	acc. to EN 60068-2-27
Drop and topple	acc. to IEC 60068-2-31/IEC 60068-2-32
EMC (electromagnetic compatibility)	acc. to EN 61131-2
Approvals and certificates	CE
UL cond.	cULus LISTED 21 W2, Encl.type 1 IND.CONT.EQ.
General information	
Dimensions (W × L × H)	60.4 × 230.4 × 39 mm
Operating temperature	-40…+70 °C
Storage temperature	-40…+70 °C
Operating height	max. 5000 m
Protection class	IP65/IP67/IP69K
MTTF	75 years acc. to SN 29500 (Ed. 99) 20 °C
Housing material	PA6-GF30
Housing color	Black
Material of window	Lexan
Material of screw	303 stainless steel
Material of label	Polycarbonate
Halogen-free	yes
Mounting	2 fixing holes, Ø 6.3 mm

15 Appendix: Flow charts showing the operation of the device

The flow charts explain the operation of the device as well as the processing of commands.

15.1 Flow chart: Command processing

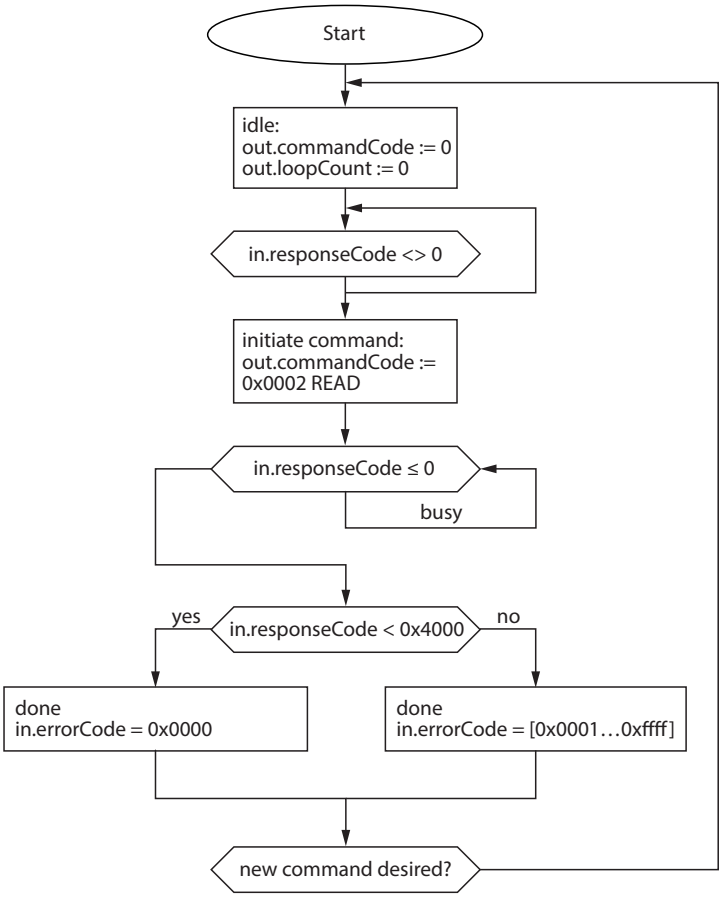


Fig. 141: “Command processing” flow chart

15.2 Flow chart: Rapid command processing with loop counter

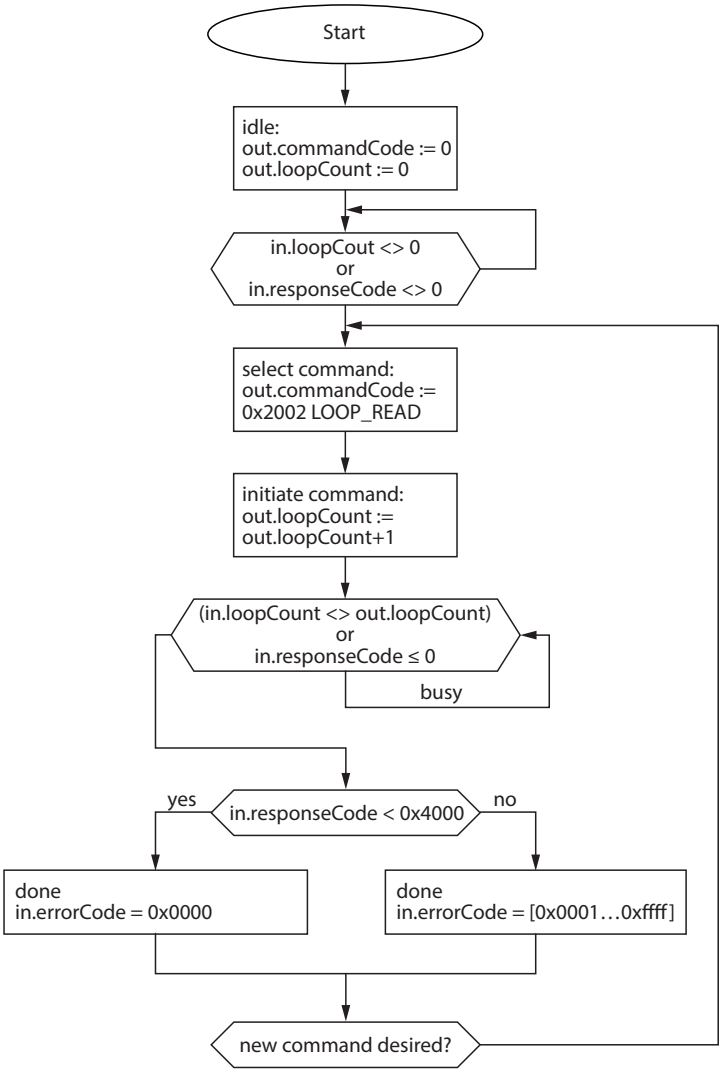


Fig. 142: Flow chart: Rapid command processing with loop counter

15.3 Flow chart: Command processing with fragmentation

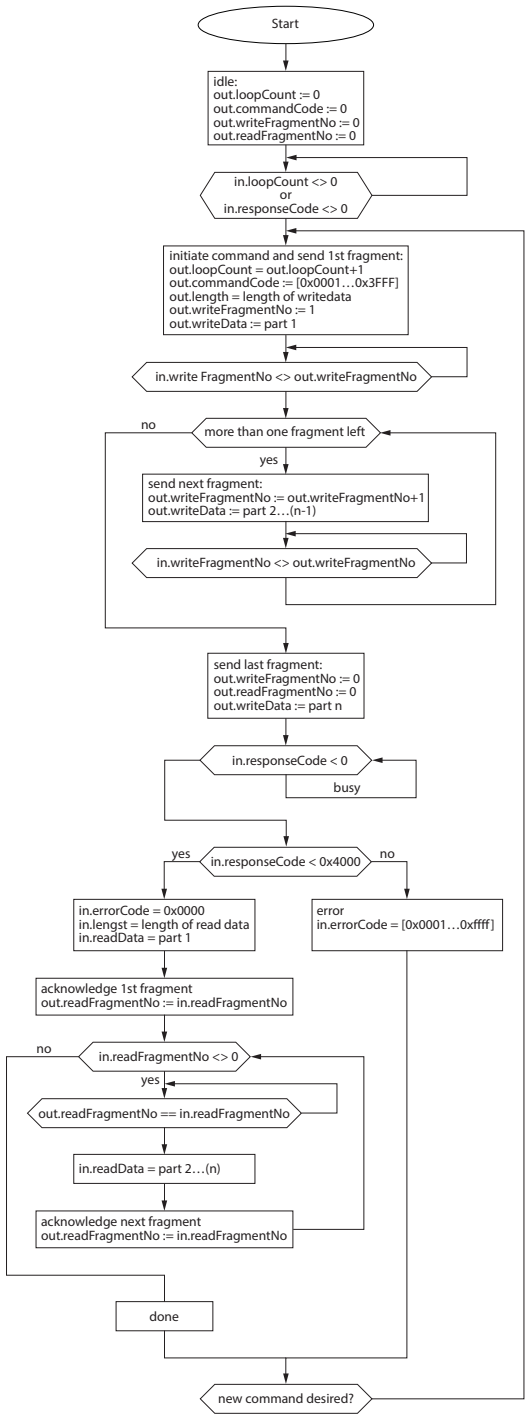


Fig. 143: Flow chart: Command processing with fragmentation

15.4 Flow chart: Continuous mode with interruption before reading data

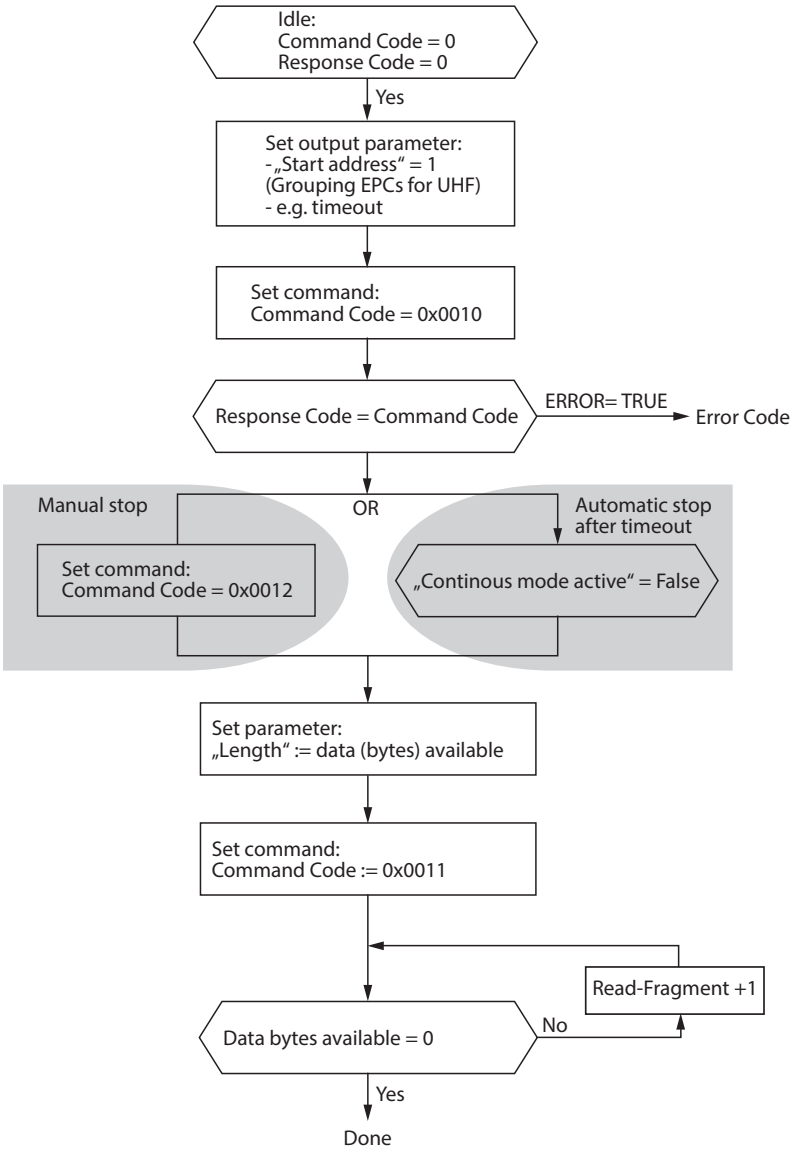
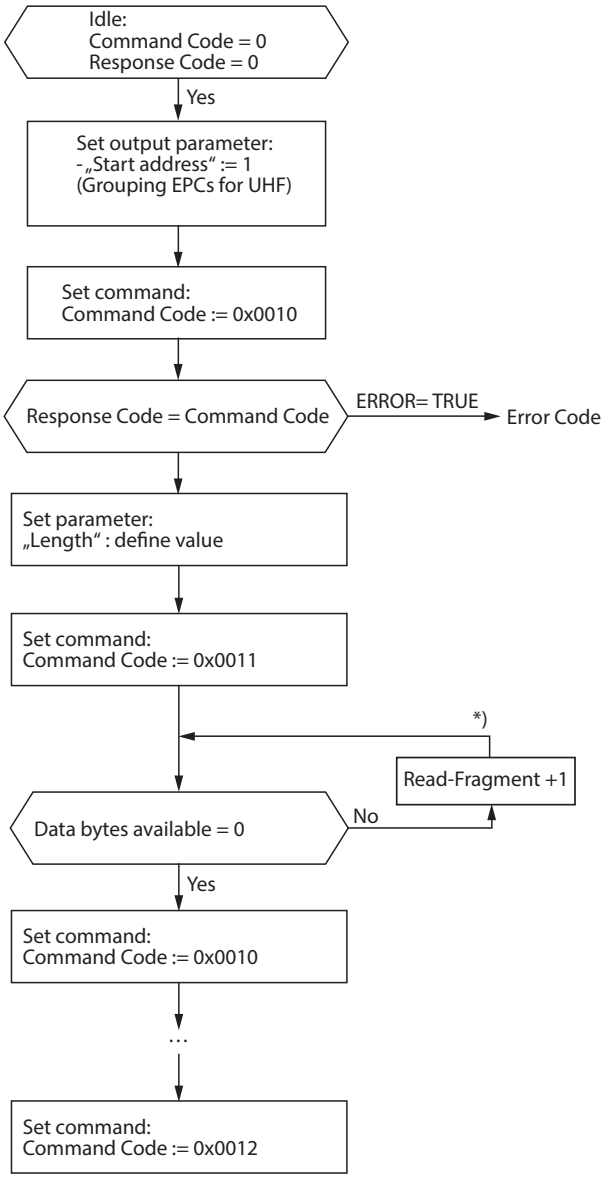


Fig. 144: Flow chart: Continuous mode with interruption before reading data

15.5 Flow chart: Continuous mode without interruption before reading data



*) After increasing the Read Fragment No., the new data will be shown in the read data input.

Fig. 145: Flow chart: Continuous mode without interruption before reading data

16 Appendix: EU conformity declaration

EU-Konformitätserklärung Nr.: 5035-1M
EU Declaration of Conformity No.:

TURCK

Wir/ We: HANS TURCK GMBH & CO KG
WITZLEBENSTR. 7, 45472 MÜLHEIM A.D. RUHR

erklären in alleiniger Verantwortung, dass die Produkte
declare under our sole responsibility that the products

Kompakte I/O Module in IP20/IP67:
Compact I/O modules in IP20/IP67:
Typen / types: FDN20-*, FDNL-*, FDNP-*, FDP20-*, FGDP-*, FGEN-*, FLDP-*, FLIB-*, FXEN-*, SDPX-*, TBDP-*, TBEN-*, TBIL-*, TBPN-*

auf die sich die Erklärung bezieht, den Anforderungen der folgenden EU-Richtlinien durch Einhaltung der folgenden Normen genügen:
to which this declaration relates are in conformity with the requirements of the following EU-directives by compliance with the following standards:

EMV - Richtlinie /EMC Directive EN 61131-2:2007 (Abschnitte / section 8, 9, 10)	2014 / 30 / EU	26.02.2014
RoHS – Richtlinie /RoHS Directive	2011 / 65 / EU	08.06.2011

Weitere Normen, Bemerkungen:
additional standards, remarks:

Zusätzliche Informationen:
Supplementary infomation:

Mülheim, den 07.08.2017

Ort und Datum der Ausstellung /
Place and date of issue

i.V. Dr. M. Linde, Leiter Zulassungen /Manager Approvals
Name, Funktion und Unterschrift des Befugten /
Name, function and signature of authorized person

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Over 30 subsidiaries and over
60 representations worldwide!

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