TURCK

Your Global Automation Partner

TBEN-S2-2RFID-4DXP
Compact RFID Interface

Instructions for Use

Contents

1 About these instructions

These instructions describe the setup, functions and use of the product and help you to operate the product according to its intended purpose. Read these instructions carefully before using the product. This will prevent the risk of personal injury and damage to property. Keep these instructions safe during the service life of the product. If the product is passed on, pass on these instructions as well.

1.1 Target groups

These instructions are written for specifically trained personnel and must be read carefully by anyone entrusted with the installation, commissioning, operation, maintenance, disassembly or disposal of the device.

When using the device in Ex circuits, the user must also have an additional knowledge of explosion protection (IEC/EN 60079-14 etc.).

1.2 Explanation of symbols

The following symbols are used in these instructions:

	**DANGER** DANGER indicates a hazardous situation with a high level of risk, which, if not avoided, will result in death or serious injury.
	**WARNING** WARNING indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in death or serious injury.
	**CAUTION** CAUTION indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in moderate or minor injury.
	**NOTICE** CAUTION indicates a situation which, if not avoided, may cause damage to property.
	**NOTE** NOTE indicates tips, recommendations and important information about special action steps and issues. The notes simplify your work and help you to avoid additional work.
▶	**MANDATORY ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULT OF ACTION** This symbol denotes the relevant results of an action.

1.3 Other documents

Besides this document, the following material can be found on the Internet at www.turck.com:

- Data sheet
- Declarations of conformity (current version)
- Approvals

1.4 Naming convention

Read/write devices in the HF are called “read/write heads” and “readers” in the UHF area. “Tag”, “transponder” and “mobile data memory” are common synonyms for “data carriers”.

1.5 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-S2-2RFID-4DXP

2.2 Scope of delivery

The delivery consists of the following:

- Compact RFID interface
- Closure caps for M12 connectors
- Quick Start Guide

2.3 Turck service

Turck supports you in your projects – from the initial analysis right through to the commissioning of your application. The Turck product database at **www.turck.com** offers you several software tools for programming, configuring or commissioning, as well as data sheets and CAD files in many export formats.

The contact data for Turck branches is provided at [▷ 286].

3 For your safety

The product is designed according to state of the art technology. Residual hazards, however, still exist. Observe the following safety instructions and warnings in order to prevent danger to persons and property. Turck accepts no liability for damage caused by failure to observe these safety instructions.

3.1 Intended use

The TBEN-S2-2RFID-4DXP block module is an RFID interface for use in the Turck BL ident system. The device is connected between the controller and the read/write device and transmits commands from the controller to the read/write devices. Read data is sent to the controller via the device.

The device supports the HF read/write heads from firmware version Vx.90 and UHF readers from firmware version FW 1.45.

Up to two BL ident read/write devices can be connected to the device in normal operation. In Bus mode it is possible to connect up to 32 bus-capable HF read/write heads per channel. Four universal digital channels are also provided. The multiprotocol interfaces can be connected to the Ethernet fieldbus systems PROFINET, Modbus TCP and EtherNet/IP.

Installation directly in the field is possible thanks to protection class IP65, IP67 IP67K. Devices with the Ex marking are suitable for use in the Ex area in zone 2 and zone 22.

The device must 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 instructions

- The device must only be fitted, installed, operated, parameterized and maintained by trained and qualified personnel.
- Only use the device in compliance with the applicable national and international regulations, standards and laws.
- The device meets the EMC requirements for the industrial areas. When used in residential areas, take measures to prevent radio frequency interference.
- Change the default password of the integrated web server after the first login. Turck recommends the use of a secure password.

3.3 Notes on Ex protection

- When using the device in Ex circuits, the user must also have knowledge of explosion protection (IEC/EN 60079-14 etc.).
- Observe national and international regulations for explosion protection.
- Only use the device within the permissible operating and ambient conditions (see certification data and Ex approval specifications).

3.4 Requirements for Ex approval

- Only connect and disconnect circuits when no voltage is present.
- Connect the metal protective cover to the equipotential bonding in the Ex area.
- Ensure impact resistance in accordance with EN IEC 60079-0 — alternative measures:
  - Install the device in the TB-SG-S protective housing (ID 100014866).
  - Install the device in an area offering impact protection (e.g. in the robot arm) and attach a warning sign: DANGER Do not connect or disconnect the device under power."
- Do not install the device in areas critically exposed to UV light.
- Prevent risks caused by electrostatic charge.
- Provide unused male connectors with suitable sealing or blanking caps in order to ensure protection class IP65, IP67 or IP69K The tightening torque for the M4 screws is 0.5 Nm.

4 Product description

The devices are designed with a fully potted housing with protection class IP65/ IP67/IP69K. Two RFID channels are provided for connecting read/write devices. Sensors and actuators can also be connected via four digital I/O channels. The terminals for the read/write devices and for digital I/Os are M12 female connectors. An M8 female connector is provided for the fieldbus connection.

4.1 Device overview

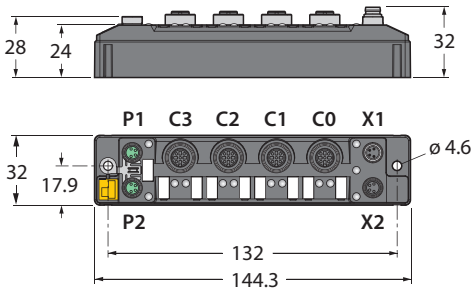


Fig. 1: Dimensions

4.1.1 Indication elements

The device is provided with the following LEDs:

- Power supply voltage
- Group and bus error
- Status
- Diagnostics

4.2 Properties and features

- PROFINET device, EtherNet/IP device or Modbus TCP slave
- PROFINET S2 system redundancy
- Integrated Ethernet switch
- Supports 10 Mbps/100 Mbps
- Glass fiber reinforced housing
- Shock and vibration tested
- Fully potted module electronics
- Protection class IP65/IP67/IP69K
- Integration in PLC systems without special function block
- Up to 128 bytes of user data per read/write cycle per channel as well as the use of fragments for larger data volumes with 16 kB FIFO memory
- Data interface for convenient use of the RFID functions
- HF Continuous bus mode with up to 32 HF read/write heads per channel
- Two channels with M12 connector for RFID
- Mixed operation of HF and UHF read/write heads and UHF readers
- Four universal digital channels as 0.5 A PNP inputs or outputs
- Integrated web server
- LEDs and diagnostics
- Programmable with FLC/ARGEE

4.3 Operating principle

The interfaces are provided with a multiprotocol fieldbus interface for Modbus TCP, EtherNet/IP and PROFINET. The fieldbus interface connects the RFID system to an (existing) fieldbus system as an EtherNet/IP device, Modbus TCP slave or PROFINET device. The interfaces are provided with a fieldbus interface and fieldbus-independent I/O electronics with an RFID interface. During operation the process data is exchanged between the fieldbus and RFID system and also diagnostic information generated for the controller. The read/write devices are connected to the interfaces via the RFID interfaces. The interface signals of up to four sensors and actuators can also be processed via four universal digital channels.

4.4 Functions and operation modes

The compact RFID interfaces transfer data between the RFID level (read/write device and tag) and the control level. HF read/write heads and UHF readers can be connected to the RFID channels. Parallel operation of HF read/write heads and UHF readers on the same device is also possible.

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 to optimize the speed, for the system to self trigger 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 universal digital channels. In all, up to four 3-wire PNP sensors or four PNP DC actuators can be connected per input or output. The maximum output current per channel is 0.5 A.

4.4.1 Multiprotocol technology

The device can be used in the following three Ethernet protocols:

- Modbus TCP
- EtherNet/IP
- PROFINET

The required Ethernet protocol can be detected automatically or selected manually.

Automatic protocol detection

The automatic protocol detection enables the multiprotocol device to run on all three of the above Ethernet systems without any intervention by the user (i.e. without any reprogramming).

The system detects during the startup phase (“snooping”) of the system the Ethernet protocol requested to establish connection. The other protocols can only be used for read access to the device.

Manual protocol selection

The user can also select the protocol manually. In this case the snooping phase is skipped and the device is permanently set to the selected protocol. The other protocols can only be used for read access to the device.

Protocol-dependent functions

The device supports the following Ethernet profile-specific functions:

PROFINET

- FSU (fast startup, prioritized ramp-up)
- Topology detection
- Address allocation with LLDP
- Media redundancy protocol (MRP)

EtherNet/IP

- QC (QuickConnect)
- Device Level Ring (DLR)

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 write or read data transferred per cycle can be set as follows for the 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

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

All functions of the **HF compact** mode are included in **HF extended** mode. It is also possible with fragmentation to transfer more than the set data size per write or read cycle (example: 128 bytes). The operation 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 RFID module. An additional power supply may be required depending on the number and power consumption of connected read/write heads. A power consumption analysis of the connected read/write heads is required in order to determine the additional power supply required. A tool is provided at www.turck.com/hf-busmodus for calculating the power.

Every connected read/write head supplies a " **Tag present**" signal in HF bus mode. HF bus mode is suitable for static applications and very slow dynamic applications because a command can only be processed by one read/write head at a time.

In HF Continuous bus mode a command is performed simultaneously at all read/write heads in a bus topology. The logged data is stored in the ring memory of the module.

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
- TB-Q08-0.15-RS4.47T/C53
- TN-Q14-0.15-RS4.47T/C53
- TN-Q80-H1147/C53
- TN-R42TC-EX/C53
- TN-R42TC-EX/C65
- TNLR-Q80-H1147/C53
- TNSLR-Q42TWD-H1147/C53
- TNSLR-Q80WD-H1147/C53

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

Continuous bus mode supports HF read/write heads from firmware version Vx.93.

Firmware version V3.6.1.0 or higher is also required for Continuous bus mode on the TBEN-S module.

UHF compact mode

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

UHF extended mode

All functions of the **UHF compact** mode are included in **UHF extended** mode. It is also possible to transfer more than 128 bytes of data. The operation mode is suitable for single-tag and multitag 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 UHF readers are automatically switched on or off and also carry out the 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 under "Settings".

- Idle
- Inventory
- Read
- Write
- Change EPC length and write new EPC (UHF)
- Write and Verify
- Continuous Mode
- Read buffer (Cont. mode)
- Stop Continuous (Presence Sensing) Mode
- UHF Continuous Presence Sensing Mode
- HF read/write head off
- Read/write head identification
- Get UHF read/write head status/error
- Tag info
- Direct read/write head command
- Get HF read/write head address
- Set HF read/write head address
- Tune HF Read/write head
- Set read/write head password
- Reset read/write head password
- Set tag password
- Set tag protection
- Get HF tag protection status
- Set perma lock
- Kill UHF tag
- Restore settings UHF read/write head
- Backup settings UHF read/write head
- Reset
- Read AFI from HF tag
- Read DSFID from HF tag
- Write AFI to HF tag
- Write DSFID to HF tag
- Lock AFI in HF tag
- Lock DSFID in HF tag
- Delete Buffer (Cont. mode)

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 [▶ 280]). 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 Universal digital channels — functions

The device is provided with four universal digital channels, which can be used as inputs or outputs without any configuration required. In all, up to four 3-wire PNP sensors or four PNP DC actuators can be connected per input or output. The maximum output current per channel is 0.5 A.

4.4.7 Turck Field Logic Controller function (FLC ARGEE)

The device supports logic processing via the "Turck Field Logic Controller (FLC ARGEE)" function. This enables the device to implement small to medium-sized control tasks in order to reduce the load of the central controller. The FLCs can be programmed in the ARGEE engineering environment.

The device supports ARGEE 3 engineering environment from firmware version 3.6.0.0.

The ARGEE programming software can be downloaded free of charge from www.turck.com.

The "SW_ARGEE_Environment_Vx.x.zip" file also contains the documentation for the programming environment as well as the software.

4.5 Technical accessories

Optionally available accessories for mounting, connecting and parameter setting can be found in the Turck product database at www.turck.com. Accessories are not supplied with the device.

5 Installing

The device can be mounted on a DIN rail according to EN 60715 (TS35) or screwed on a mounting plate. Both combined mounting as well as single mounting are possible.

5.1 Installing a device in zone 2 and zone 22

The devices can be used in combination with the TB-SG-S (ID 100014866) protective housing set in zone 2 and zone 22. Combined mounting is not possible in zone 2 and zone 22

DANGER
Potentially explosive atmosphere
Risk of explosion due to spark ignition
Operation in zone 2 or zone 22:
- ▶ Only install the device if there is no potentially explosive atmosphere present.
- ▶ Observe the requirements for Ex approval.

- ▶ Screw on the housing. Use a Torx T8 screwdriver.
- ▶ Place the device on the base plate of the protective housing fasten both together on the mounting plate, see Attach TBEN-S modules to a mounting plate.
- ▶ Connect the device, see [▷ 23].
- ▶ Fit the housing cover and screw on as shown in the following figure. The tightening torque for the Torx T8 screw is 0.5 Nm.

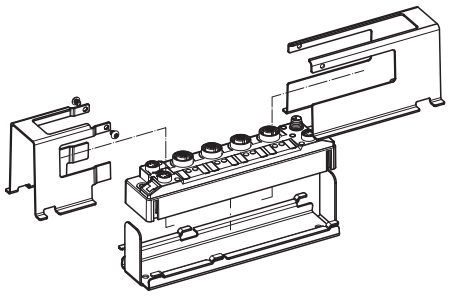


Fig. 3: Installing the device in the TB-SG-S protective housing

5.2 Mounting devices in combination

The TBNN-S0… adapters can be used to form groups of modules for mounting the devices in combination.

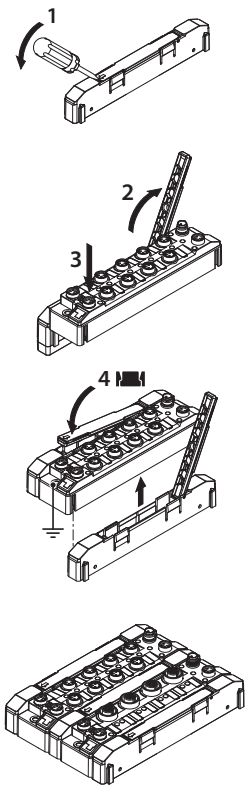


Fig. 4: Module groups for mounting on a mounting plate

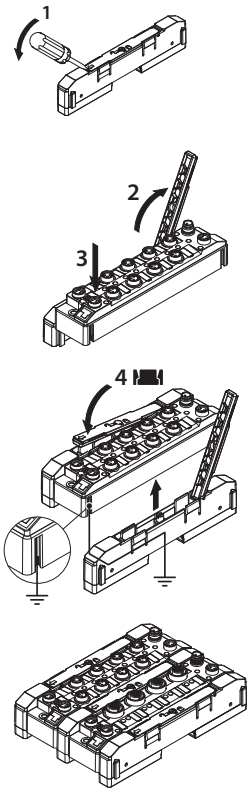


Fig. 5: Module groups for mounting on a DIN rail (TS35)

- Undo locking lever (1) with a flat tool (e.g. screwdriver).
- Fully open the locking lever (2).
- Connect the TBEN-S module and adapter so that the spring of the adapter engages with the groove of the TBEN-S module (3).
- Push down the locking lever and close until the locking lever engages with an audible click (4).
- Repeat steps 1 to 4 until the module group is complete.

5.3 Mounting plate fixing

The devices can be fastened with two M4 screws to a pre-drilled mounting plate. The maximum tightening torque for the M4 screws is 1.0 Nm.

- The module or module cluster is attached as shown in the following figure.

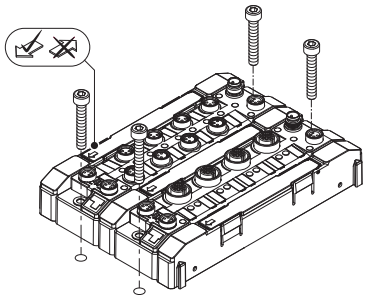


Fig. 6: Attaching the device to the mounting plate

5.4 DIN rail (TS35) mounting

The TBNN-S0-DRS adapters enable the device to be mounted individually or in a combination on a DIN rail (TS35).

NOTICE
Incorrect mounting
Incorrect grounding may cause malfunction

- Align the adapters so that the arrow on the locking lever points in the direction of the M8 Ethernet sockets.
- Connect the grounding contact of the adapter with the grounding contact of the module.

- Mount the adapters to the right and left of the module.
- Position the module or module combination on the DIN rail so that the recesses of the adapter surround the DIN rail (1).
- Close the rotating pin of the adapter with a screwdriver (2).
- Optional: Ground the device.

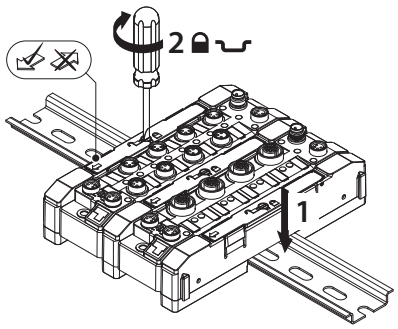


Fig. 7: Mounting the module combination on a DIN rail

NOTE
To increase stability on the DIN rail, end brackets can be mounted on the right and left of the module or the module combination.

5.5 Outdoor device installation

The device is UV resistant in accordance with DIN EN ISO 4892-2. Direct sunlight may cause material wear and changes in color. The mechanical and electrical properties of the device are not impaired.

- ▶ To prevent material wear and color changes: Protect the device from direct sunlight with protective panels.

5.6 Grounding the device

5.6.1 Grounding and shielding concept

The fieldbus and I/O area of the TBEN-S modules can be grounded separately.

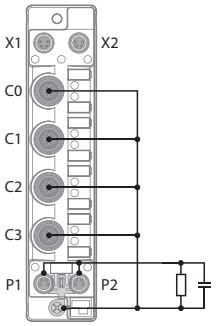


Fig. 8: Equivalent circuit, shielding concept

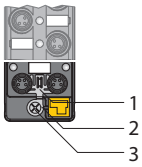


Fig. 9: Grounding clip (1), grounding ring (2) and metal screw (3)

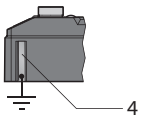


Fig. 10: Grounding contact

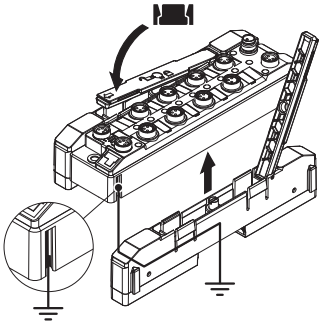


Fig. 11: Grounding the TBNN-S0-DRS… adapters

The grounding clip (1) on the M8 plug connectors for the fieldbus connection (P1, P2) connects the shield of the fieldbus cables.

The grounding ring (2) provides the shield on the flange of the M8 plug connectors for the fieldbus connection via an RC circuit.

When mounting the module on a mounting plate with TBNN-S0-STD connectors, the module is connected to the reference potential of the installation via a metal screw (3) through the lower mounting hole. The TBNN-S0-DRS adapters for mounting the TBEN-S modules on a DIN rail (TS 35) connect the grounding contact (4) of the modules with the DIN rail and thus FG.

5.6.2 Grounding the device (FG)

Grounding clip and grounding ring are connected together.

- ▶ If a common reference potential for I/O level and fieldbus level is not required: remove the grounding clip to disconnect the fieldbus shield.

Grounding the device — mounting on DIN rail

- ▶ When mounting on a DIN rail with the TBNN-S0-DRS adapters fasten the supplied metal screw on the lower mounting hole of the TBEN-S module.
- ⇨ The shield of the fieldbus connection and the M8 flange of the I/O level are connected via the DIN rail with the reference potential of the installation.

Grounding the device — mounting on mounting plate

- ▶ When mounting on a mounting plate, fasten with an M4 metal screw.
- ⇨ The shield of the fieldbus connection and the M8 flange of the I/O level are connected via the DIN rail with the reference potential of the installation.

Removing the grounding clip

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

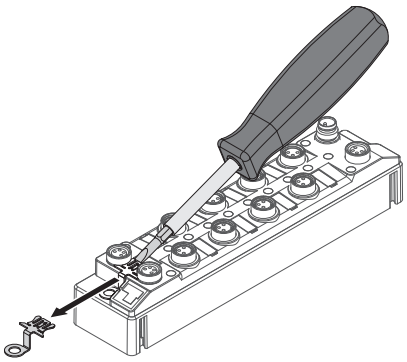


Fig. 12: Removing the grounding clip

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.

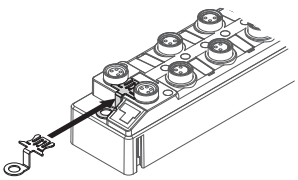


Fig. 13: Mounting the grounding clip

6 Connection

NOTICE
Penetration of liquids or foreign objects due to leaking connections
Loss of protection class IP65/IP67/IP69K possible

- Tighten M8 male connectors with a tightening torque of 0.4 Nm.
- Tighten M12 male connectors with a tightening torque of 0.6 Nm.
- Only use accessories that guarantee the protection class.
- Provide unused male connectors with suitable sealing or blanking caps. The tightening torque for the M4 screws is 0.5 Nm.

6.1 Connecting a device in zone 2 and zone 22

DANGER
Potentially explosive atmosphere
Risk of explosion due to spark ignition
Operation in zone 2 or zone 22:

- Only connect and disconnect circuits when no voltage is present.
- Only use connection cables suitable for use in the potentially explosive areas.
- Use unused male connectors or provide them with suitable sealing or blanking caps. The tightening torque for the M4 screws is 0.5 Nm.
- Observe the requirements for Ex approval.

6.2 Connecting a device to Ethernet

The device is provided with an autocrossing switch with two 4-pin M8 Ethernet plug connectors for connecting to Ethernet.

NOTICE
Reversing the Ethernet and power supply cables
This may destroy the module electronics

- When connecting the Ethernet and supply cables make sure that the correct M8 plug connectors are used:
  - Ethernet: P1 and P2
  power supply: X1 and X2

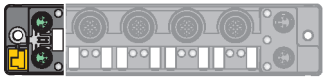


Fig. 14: M8 Ethernet plug connectors for connecting the fieldbus

- Connect the device to the fieldbus according to the pin assignment below.
- Provide unused male connectors with suitable sealing or blanking caps. The tightening torque for the M4 screws is 0.5 Nm.

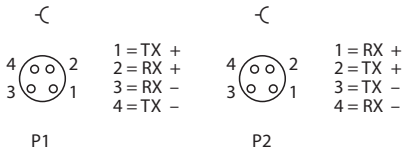


Fig. 15: Ethernet connections — pin assignment of P1 and P2

6.2.1 QuickConnect and Fast Start-Up applications

- Do not use crossover cables in QuickConnect and Fast StartUp applications.
- Connect incoming Ethernet cables to P1.
- Connect outgoing Ethernet cables to P2.

6.3 Connecting the power supply

The device is provided with two 4-pin M8 plug connectors for connecting the power supply. V1 and V2 are electrically isolated from each other.

NOTICE
Reversing the Ethernet and power supply cables
This may destroy the module electronics

- When connecting the Ethernet and supply cables make sure that the correct M8 plug connectors are used:
  - Ethernet: P1 and P2
  - power supply: X1 and X2

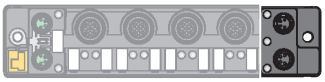


Fig. 16: M8 plug connectors for connecting the power supply

- Connect the device to the power supply according to the pin assignment below.
- Provide unused male connectors with suitable sealing or blanking caps. The tightening torque for the M4 screws is 0.5 Nm.

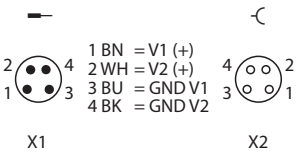


Fig. 17: Pin assignment of the power supply connections

Connection	Meaning
X1	Incoming voltage supply
X2	Routing the voltage to the next node
V1	Supply voltage 1 (incl. electronics supply)
V2	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 LED goes out.

6.4 Connecting RFID read/write devices

The device has two 5-pin M12 plug connectors for connecting RFID read/write devices.

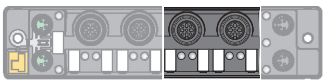


Fig. 18: M12 plug connector for connecting read/write devices

- ▶ Connect the read/write devices to the device as per the pin assignment shown below.
- ▶ Provide unused male connectors with suitable sealing or blanking caps. The tightening torque for the M4 screws is 0.5 Nm.

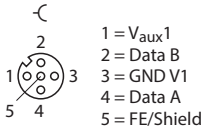


Fig. 19: RS485 — pin assignment of the read/write device connections

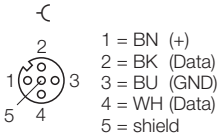


Fig. 20: …/S2500 connection cables — pin assignment of the read/write device connections

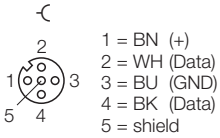


Fig. 21: …/S2501 connection cables — pin assignment of the read/write device connections

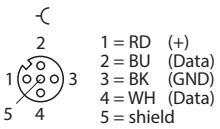


Fig. 22: …/S2503 connection cables — pin assignment of the read/write device connections

6.4.1 Connecting read/write heads for the HF bus mode

In HF bus mode up to 32 bus-capable read/write heads per RFID channel can be connected to the device. The user must determine by means of a power consumption analysis whether an additional power supply is required for the connected read/write heads (see information in the data sheet or tool at www.turck.com/hf-busmodus).

The maximum permissible length of the bus is 50 m.

Connecting read/write heads for HF bus mode in non-Ex areas

The following devices are required for bus mode in non-hazardous areas:

- VT2-FKM5-FKM5-FSM5 junction box (ID 6930573) for connecting several read/write heads to an RFID channel
- RSE57-TR2/RFID bus terminating resistor (ID 6934908)
- Optional: VB2-FKM5-FSM5.205-FSM5.305/S2550 junction box (ID 6936821) for feeding in an additional power supply
- RFID extension cables (e.g. RK4.5T-0.3-RS4.5T/S2503)

▶ Connect the read/write head as per the figure below. The maximum length of the spur line is 2 m.

▶ Make allowance for the power supply, particularly at switch-on (see data sheet), as well as the maximum current carrying capacity of the lines (4 A).

▶ Make allowance for the voltage drop on the line. If necessary provide an additional power supply between the read/write heads using junction box VB2-FKM5-FSM5.205-FSM5.305/S2550.

▶ Connect a terminating resistor (e.g. RSE57-TR2/RFID) after the last read/write head.

Fig. 23: HF bus mode setup

Connecting read/write heads for HF bus mode in Ex areas

NOTE
Information on the maximum cable lengths in Ex areas is provided in the data sheets of the connected read/write heads.

The following devices are required for bus mode in hazardous areas:

- TN-R42TC-EX/C53 read/write head (ID 100020167)
- TN-R42TC-EX/C65 read/write head (ID 100028462) with integrated bus terminating resistor
- …/S2500 RFID extension cables
- Operation in Zone 2/22:
  - VT2-FKM5-FKM5-FSM5 (ID 6930573) junction box for connecting several read/write heads to an RFID port
  - SC-M12/3GD safety clip (ID 6900390)
  - Optional: VB2-FKM5-FSM5.205-FSM5.305/S2550 junction box (ID 6936821) for feeding in an additional power supply
- Operation in Zone 1/21:
  - Ex-e terminal boxes

DANGER
Potentially explosive atmosphere
Risk of explosion due to spark ignition
Operation in Zone 2/22:
- ▶ Only connect the read/write heads if there is no potentially explosive atmosphere present or if the device is in a de-energized state.
- ▶ Protect the M12 male connector against accidental removal during operation using safety clip SC-M12/3GD.
- ▶ Protect the M12 male connector against mechanical damage.

DANGER
Potentially explosive atmosphere
Risk of explosion due to spark ignition
- ▶ When used in Zone 1/21, observe the instructions for use for the connected devices.

- ▶ Operation in Zone 2/22: Connect the read/write heads via VT2-FKM5-FKM5-FSM5 junction boxes as shown in the figure below (for max. tightening torque see the data sheet of the cable used). The maximum length of the spur line is 2 m.
- ▶ Operation in Zone 1/21: Connect the read/write heads via terminal boxes as shown in the figure below. The maximum length of the spur line is 2 m.
- ▶ Make allowance for the power supply, particularly at switch-on (see data sheet), as well as the maximum current carrying capacity of the lines (4 A).
- ▶ Make allowance for the voltage drop on the line. When used in Zone 2/22, provide an additional power supply between the read/write heads using junction box VB2-FKM5-FSM5.205-FSM5.305/S2550 if necessary. Up to 20 read/write heads can be connected without an additional power supply.
- ▶ Use the TN-R42TC-EX/C65 read/write head with an integrated bus terminating resistor as the last device. Do not connect a separate bus terminating resistor.

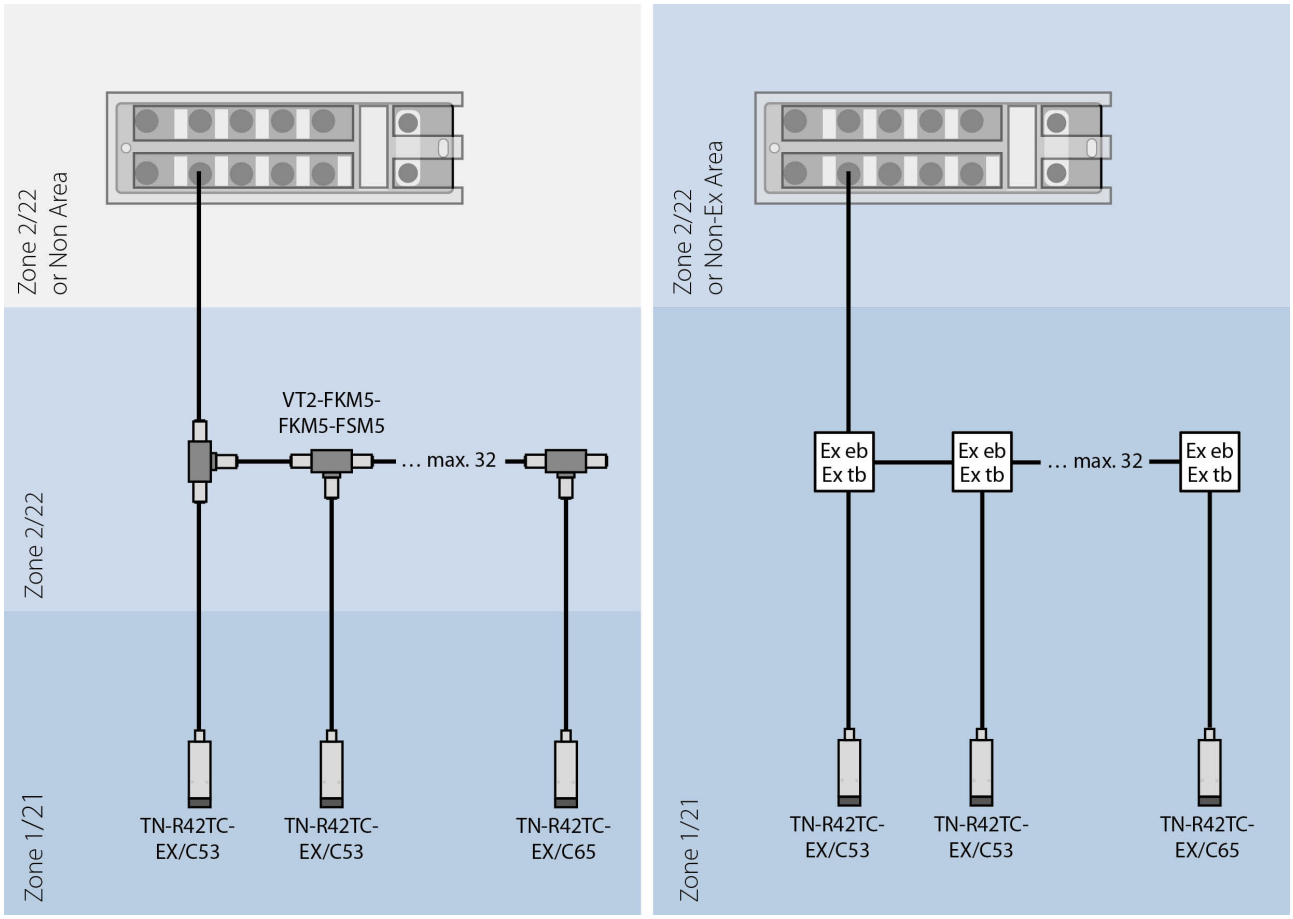


Fig. 24: System design

6.5 Connecting digital sensors and actuators

The device has two 5-pin M12 plug connectors for connecting digital sensors and actuators. Sensors and actuators can be connected to the DXP terminals in the following combinations:

- 2 digital inputs
- 2 digital outputs
- 1 digital input and 1 digital output

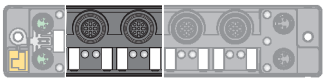


Fig. 25: M12 male connectors for connecting digital sensors and actuators

- ▶ Connect the sensors and actuators to the device as per the pin assignment below.
- ▶ Provide unused male connectors with suitable sealing or blanking caps. The tightening torque for the M4 screws is 0.5 Nm.

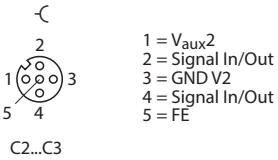


Fig. 26: Connections for digital sensors and actuators — pin assignment

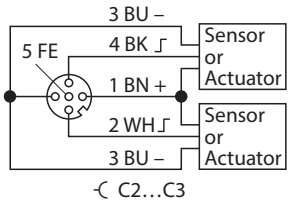


Fig. 27: Connections for digital sensors and actuators — wiring diagram

The channels are assigned to the sockets as follows:

Channel	Socket	Pin
DXP (Ch4)	C2	4
DXP (Ch5)	C2	2
DXP (Ch6)	C3	4
DXP (Ch7)	C3	2

7 Commissioning

The device is operational automatically once the cables are connected and the power supply is switched on.

Connected HF read/write heads are switched on automatically. Connected UHF readers are switched off automatically and are activated automatically when a command is executed (apart from Idle mode).

The Idle command (0x0000) is active in the default configuration. If an HF read/write head is connected and a tag is located in the detection range of the read/write head, the **Tag present** bit is set and the UID is output in the input data.

- Set the IP address of the device in order to carry out further commands.

If a UHF reader is connected, the device must be set:

- Set the IP address.
- Send command to UHF reader.

7.1 Setting the IP address

The device is factory set to IP address 192.168.1.254. A PROFINET device name has not yet been assigned. The IP address can be set via the Turck Service Tool, the DTM, the web server, a DHCP server or PROFINET DCP. The following example shows the setting of the IP address via the Turck Service Tool. The Turck Service Tool can be downloaded free of charge at www.turck.com.

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

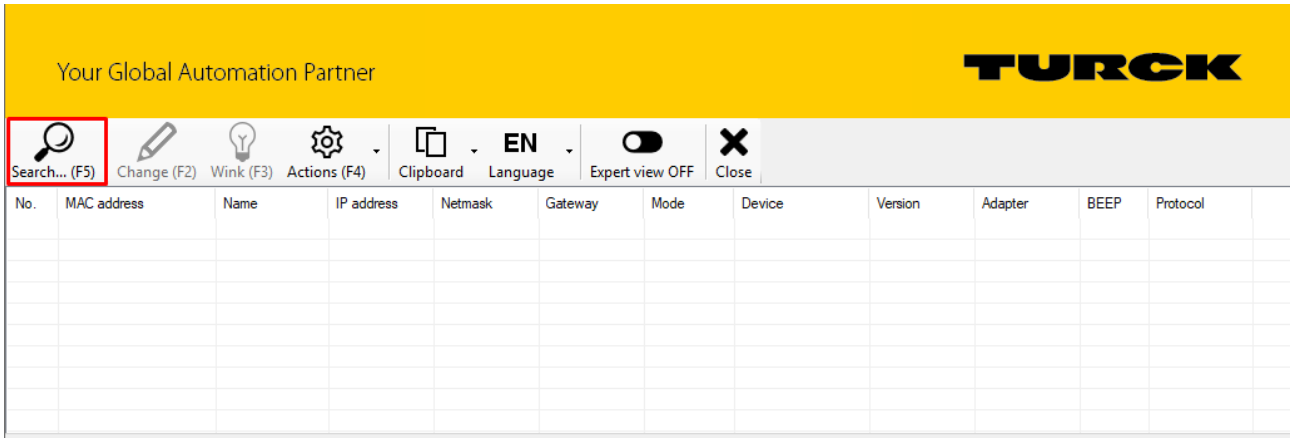


Fig. 28: Turck Service Tool — home screen

The Turck Service Tool displays the connected devices.

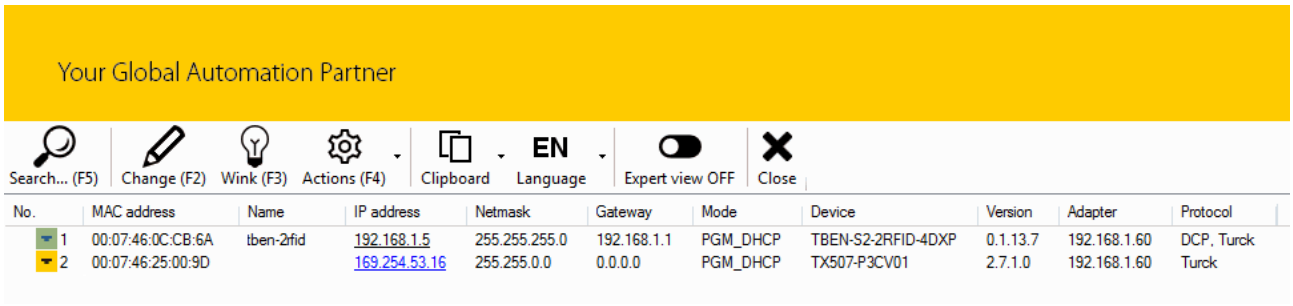


Fig. 29: Turck Service Tool — found devices

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

NOTE
Virtual network adapters can cause communication problems when accessing the found devices.

- ▶ Deactivate virtual network adapters.

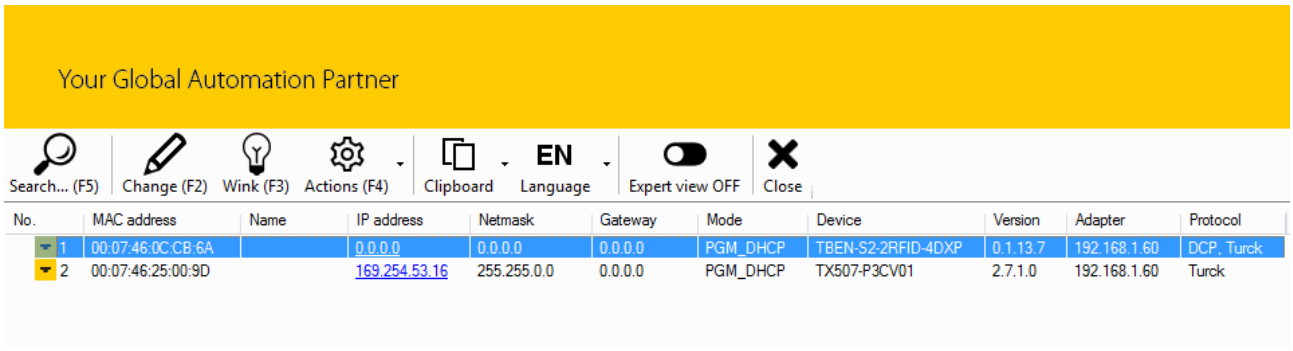


Fig. 30: Turck Service Tool — selecting the device to be addressed

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**.

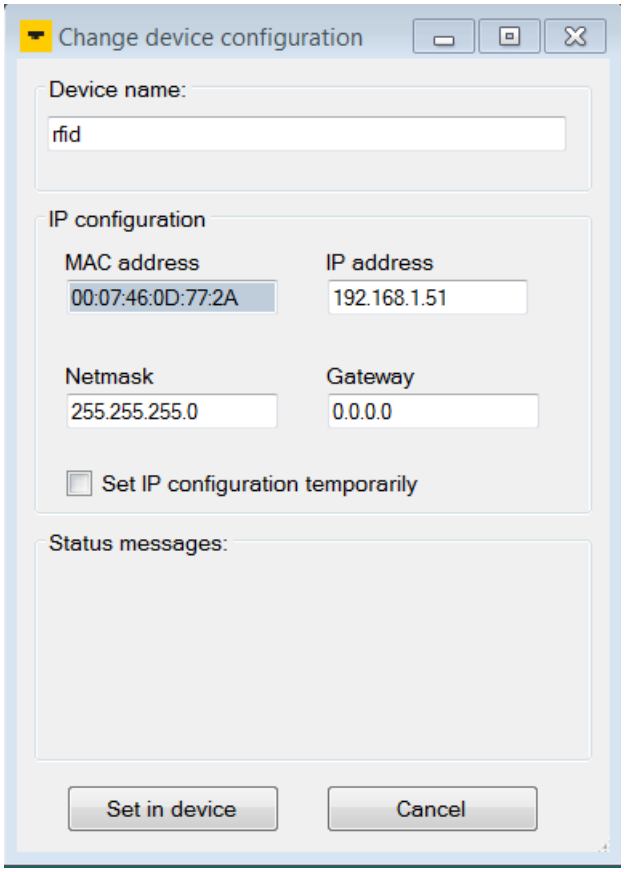


Fig. 31: Turck Service Tool — changing the device configuration

7.1.1 Checking and changing the addressing method in the web server

The addressing method via DHCP or PGM can be displayed and set via the web server.

- ▶ Display the set addressing method: **Parameter → Addressing method**

Addressing via DHCP is the default setting.

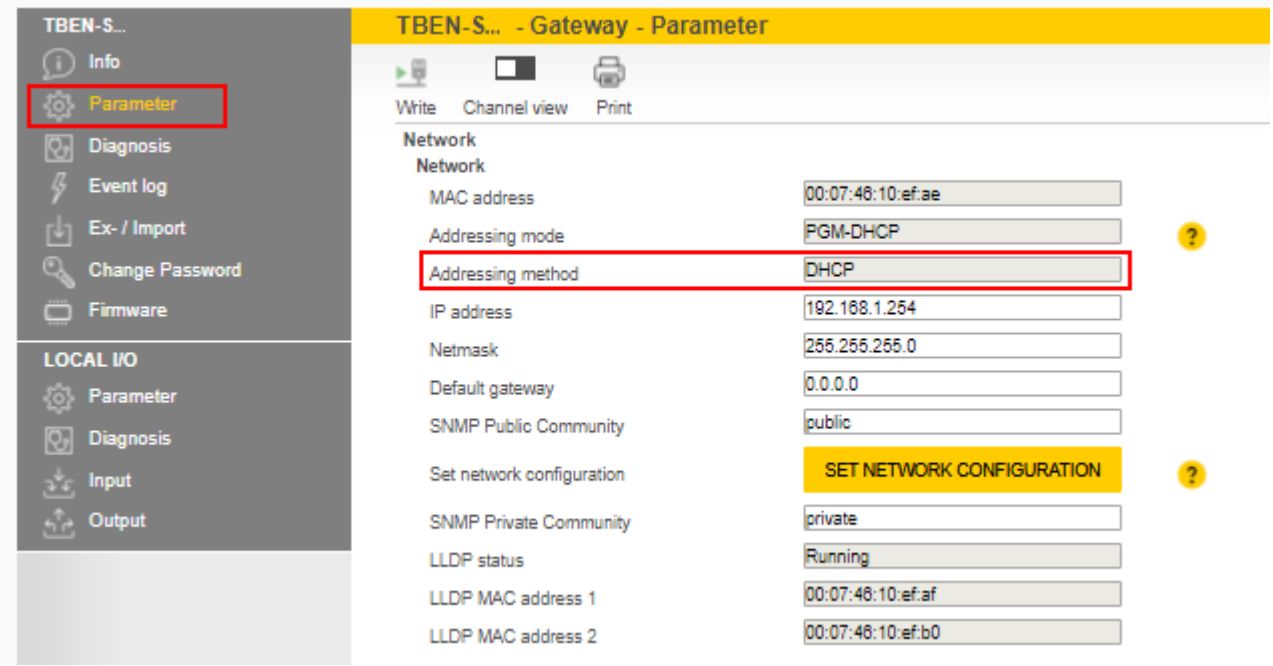


Fig. 32: Displaying the set addressing method

Assigning a static IP address via PGM

If DHCP mode is active, a static IP address can be assigned as follows:

- ▶ Enter the IP address in the **IP address** field.
- ▶ Execute **Set network configuration**.
- ⇨ The IP address is assigned.

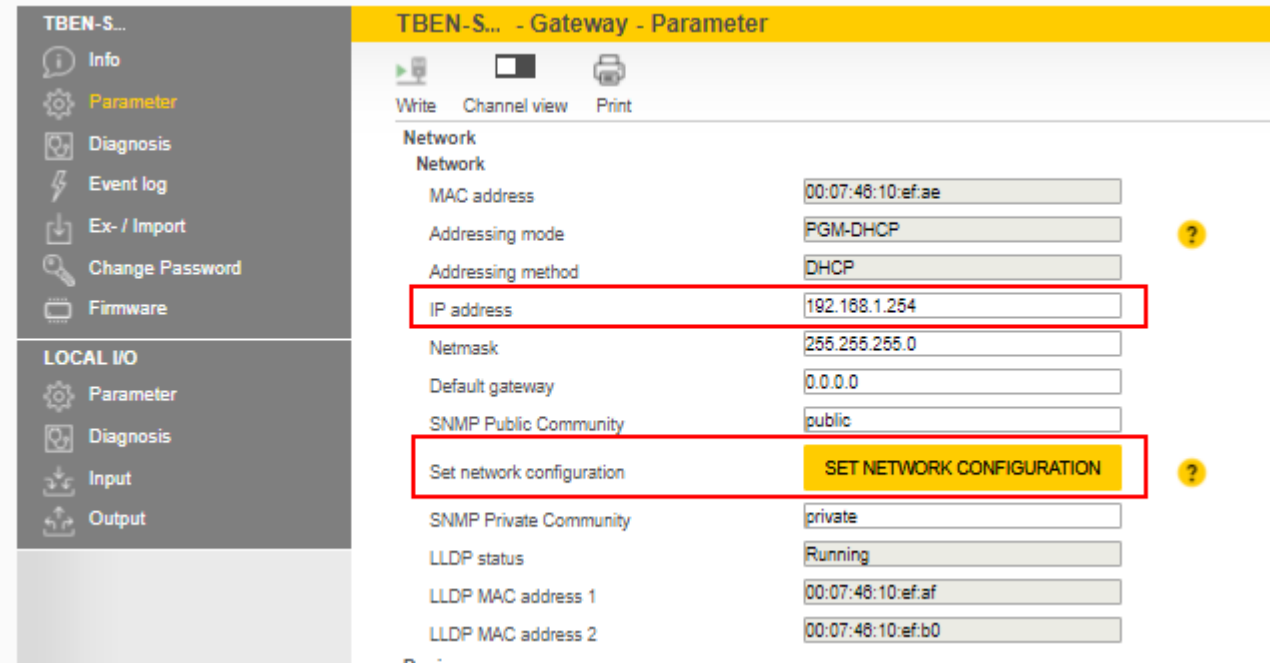


Fig. 33: Assigning the static IP address

Assigning an IP address via DHCP automatically

If the static mode is active, it is possible to switch to DHCP mode as follows:

- ▶ At **Parameter** click **Network reset and reboot** or **Factory reset and reboot**.
- ▶ Confirm the following dialog.
- ⇨ The reset is executed and DHCP mode is activated.

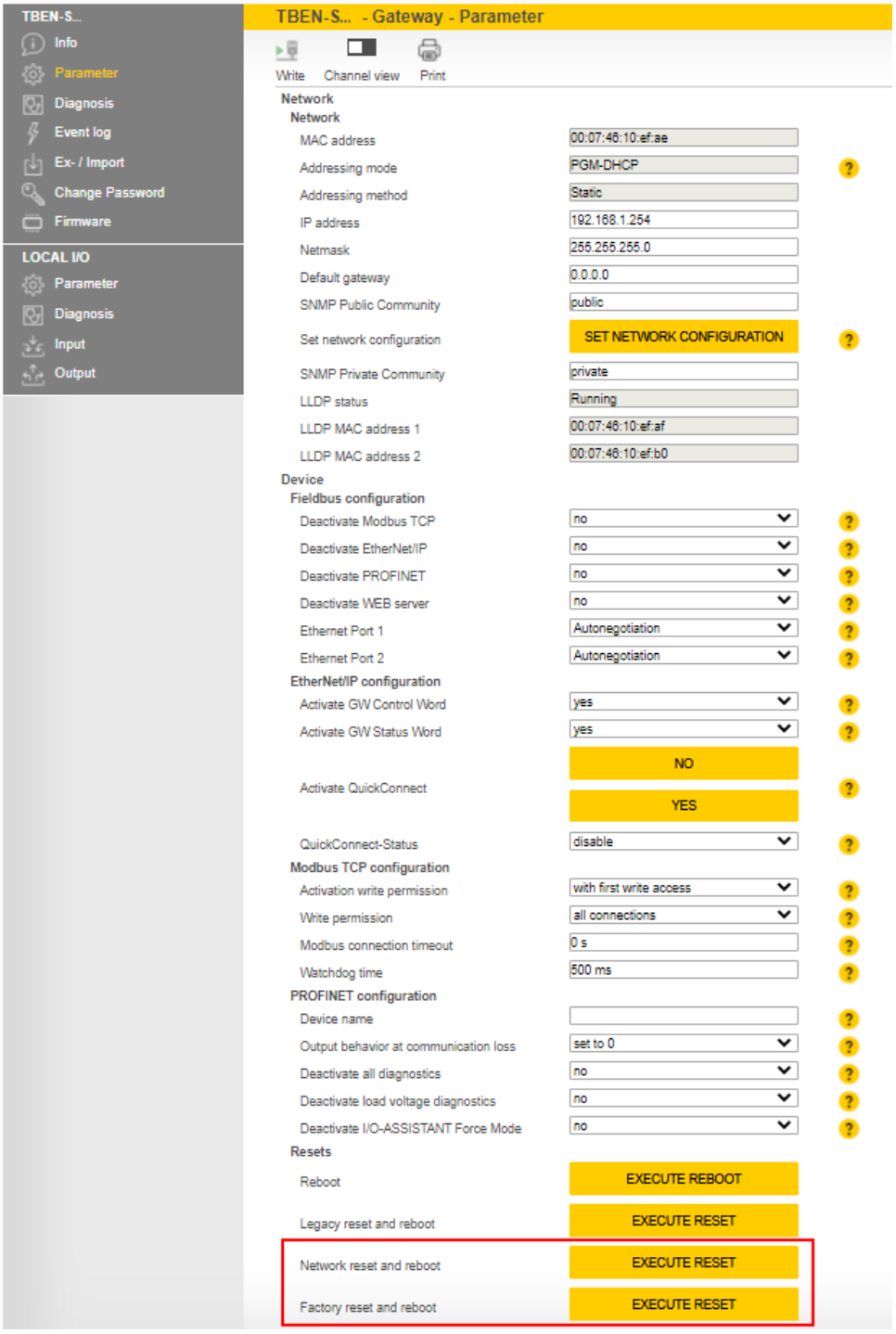


Fig. 34: Activating DHCP mode

7.2 Connecting the device to a Modbus master with CODESYS

Hardware used

This example uses the following hardware components:

- HF read/write head TN-Q80-H1147
- Turck HMI TX507-P3CV01 (Modbus master)
- TBEN-S2-2RFID-4DXP block module (IP address: 192.168.1.61)

Software used

This example uses the following software:

- CODESYS 3.5.8.1 (available as a free download at www.turck.com)

Requirements

- The programming software has been opened.
- A new project has been created.
- The controller 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 first be added in CODESYS:

- Ethernet adapter
- Modbus TCP master
- Modbus TCP slave

Adding an Ethernet adapter

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

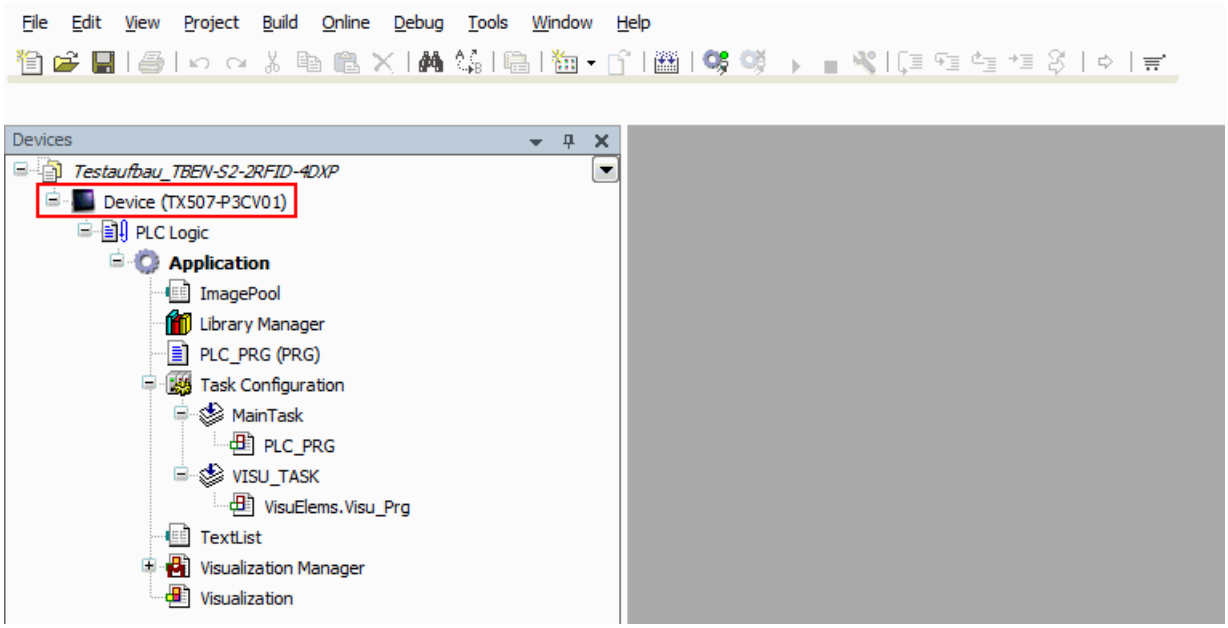


Fig. 35: Project tree

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

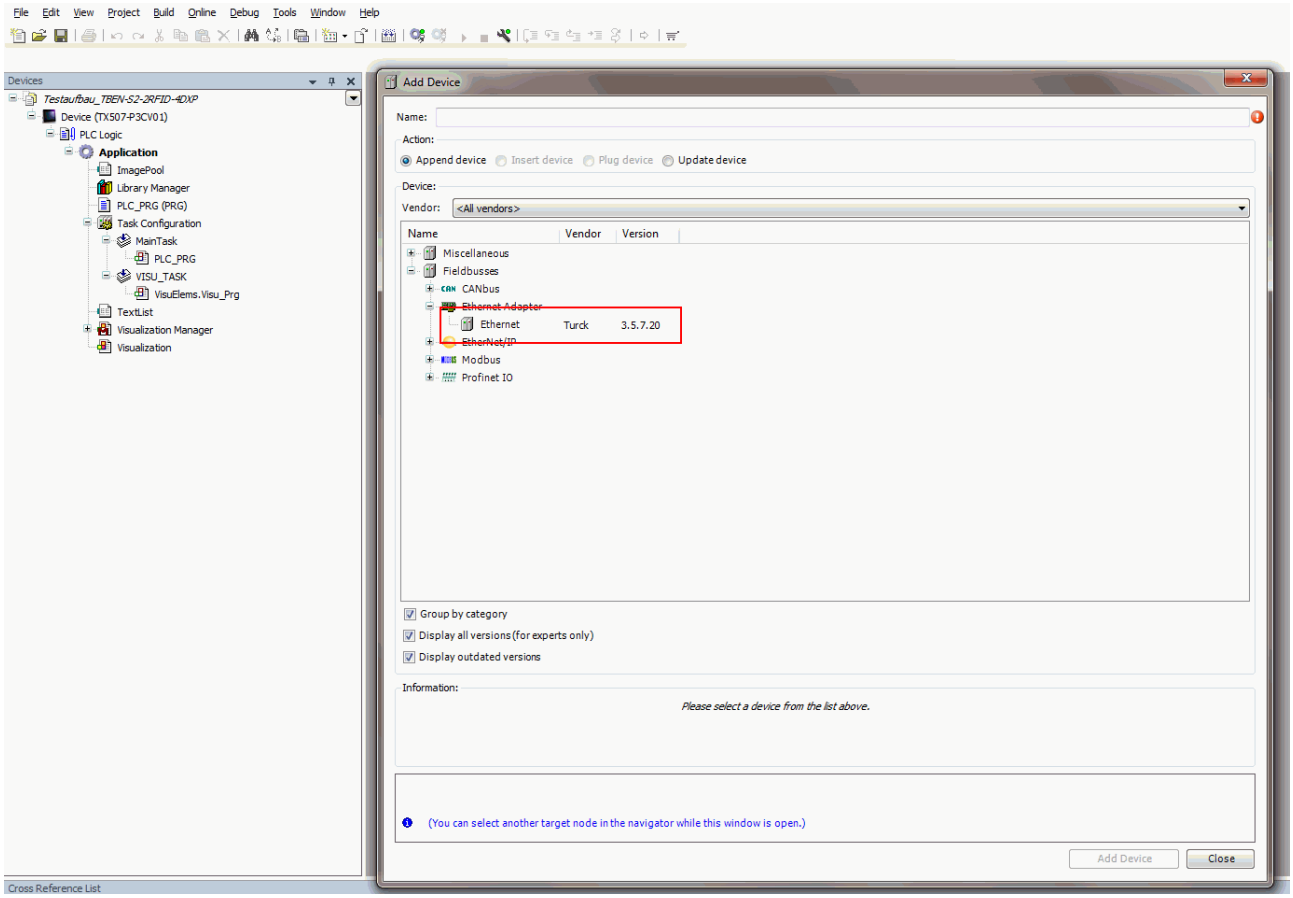


Fig. 36: Adding an Ethernet adapter

Adding a Modbus master

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

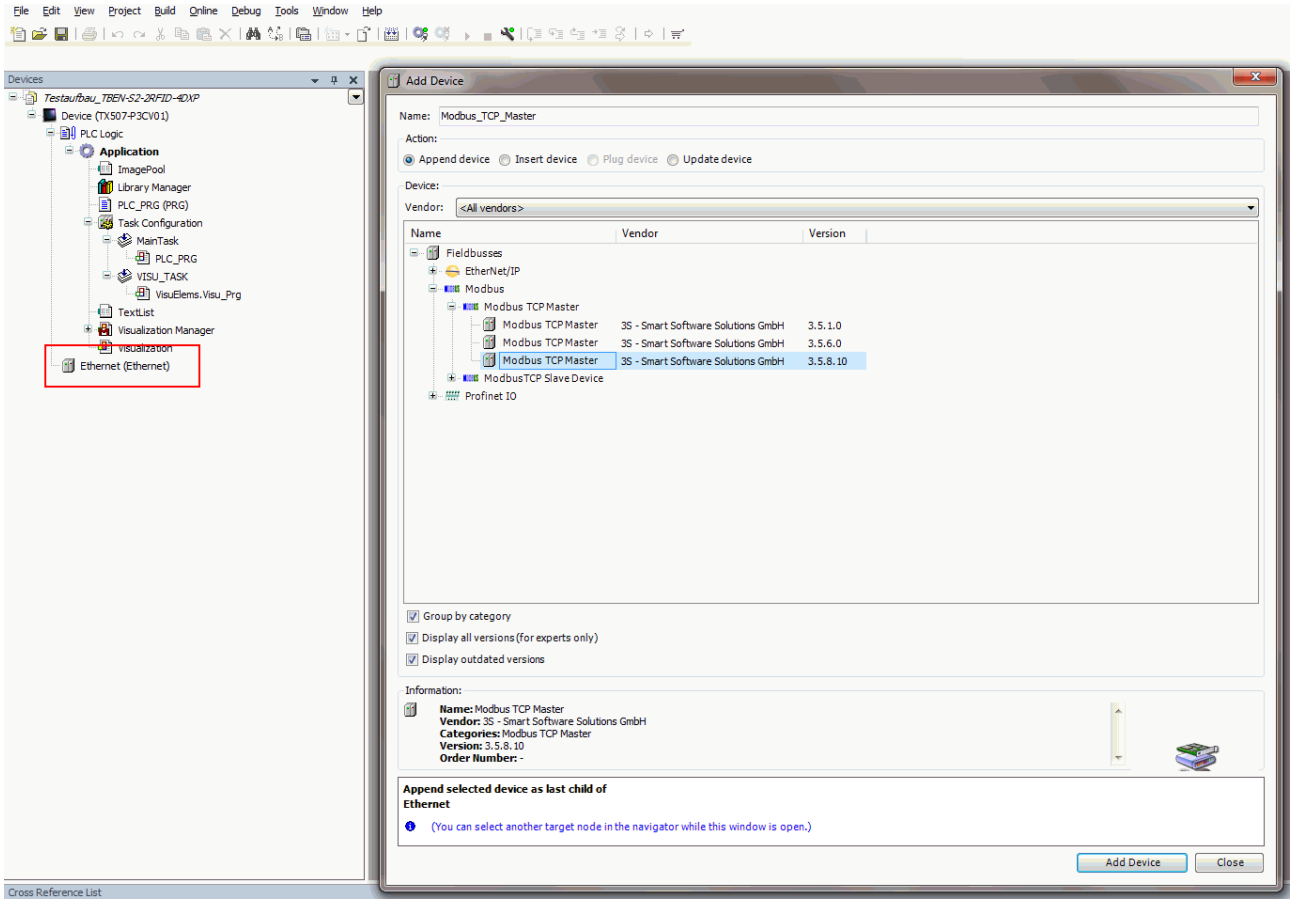


Fig. 37: Adding a Modbus master

Adding a Modbus slave

- ▶ Right-click **Modbus_TCP_Master (Modbus TCP Master)** in the project tree.
- ▶ Select **Append device**.
- ▶ Double-click **Modbus TCP slave**.
- ⇨ The Modbus slave appears as **Modbus_TCP_Slave** in the project tree.

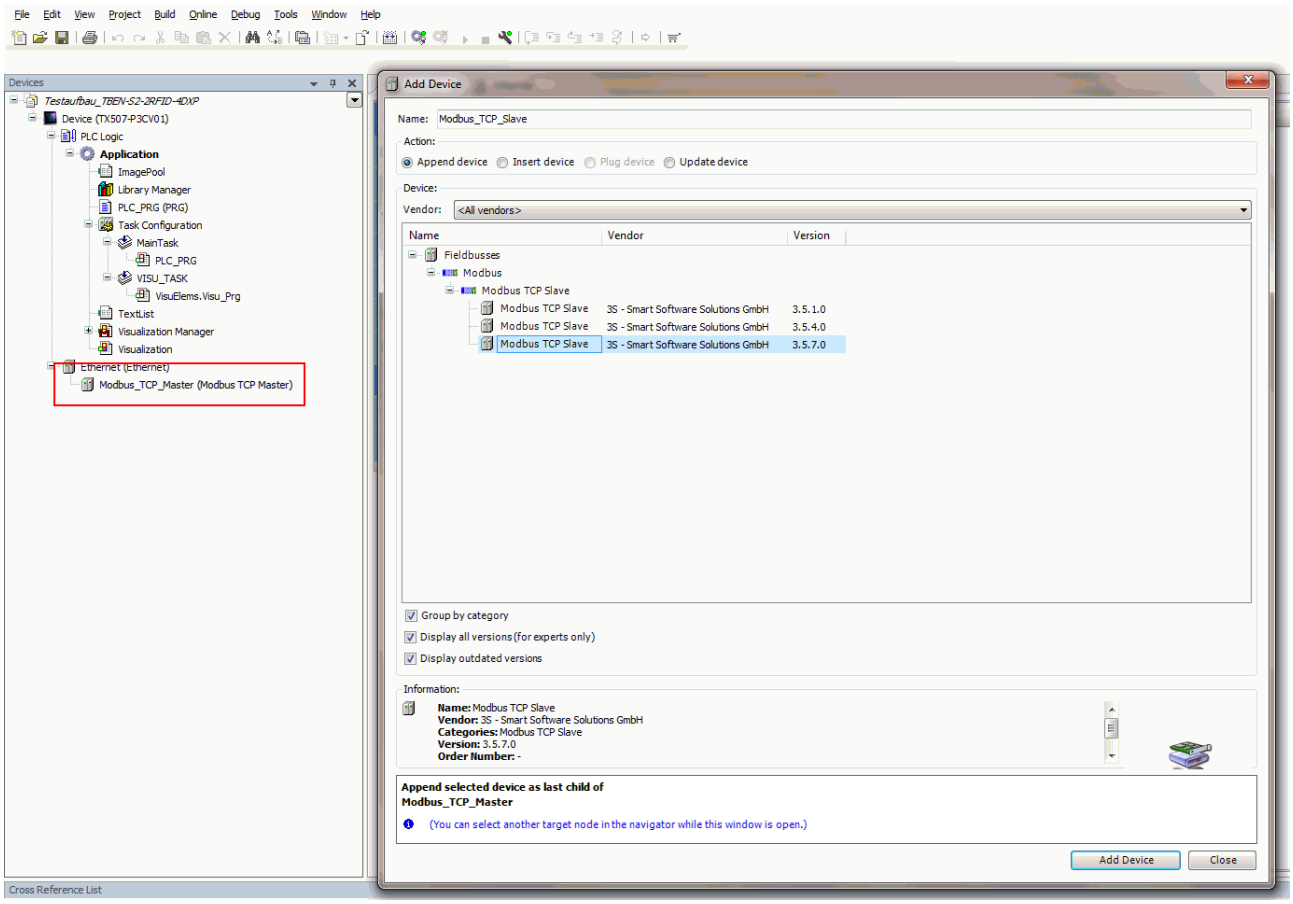


Fig. 38: Adding a Modbus slave

7.2.2 Renaming a Modbus slave

- Click Modbus slave in the project tree.
- Press [F2].
- Adjust the name of the slave in the project tree of the application.

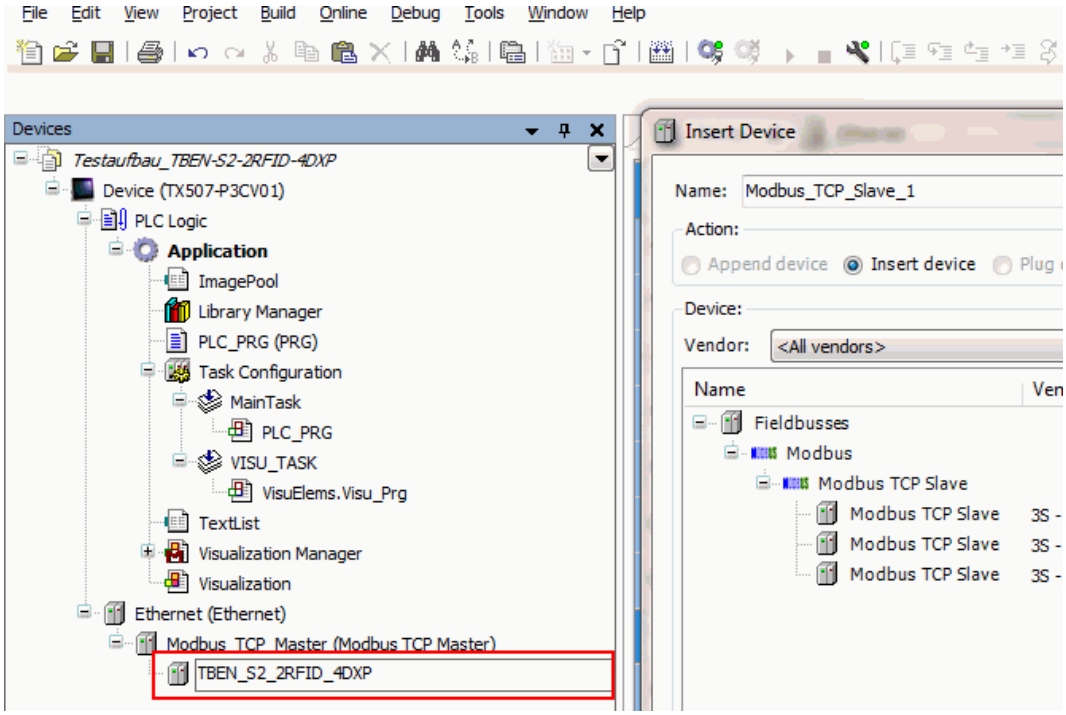


Fig. 39: Assigning a device name (here: TBEN-S2-2RFID_4DXP)

7.2.3 Setting up network interfaces

- Click **Device** → **Scan network**.
- Select Modbus master and confirm with **OK**.

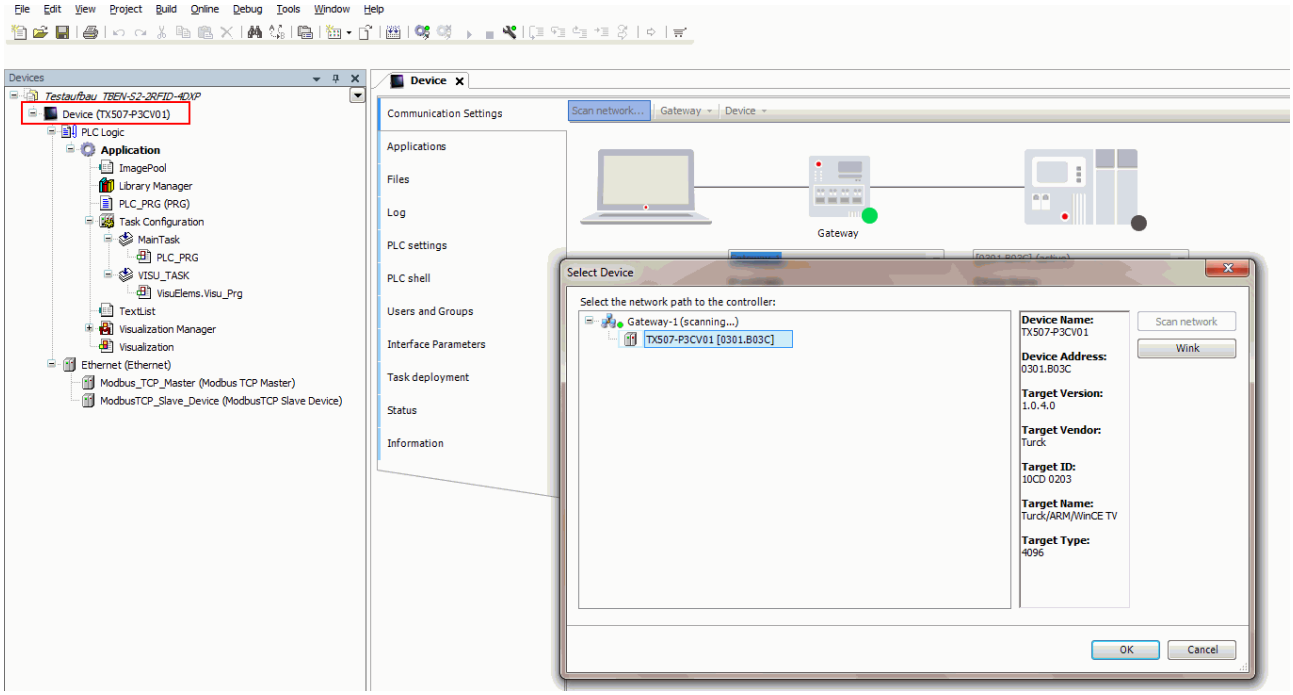


Fig. 40: Setting up a network interface to the Modbus master

- Double-click **Ethernet**.
- Open the **Network Adapter** dialog in the **General** tab via the **…** button.
- Enter the IP address of the Modbus master.

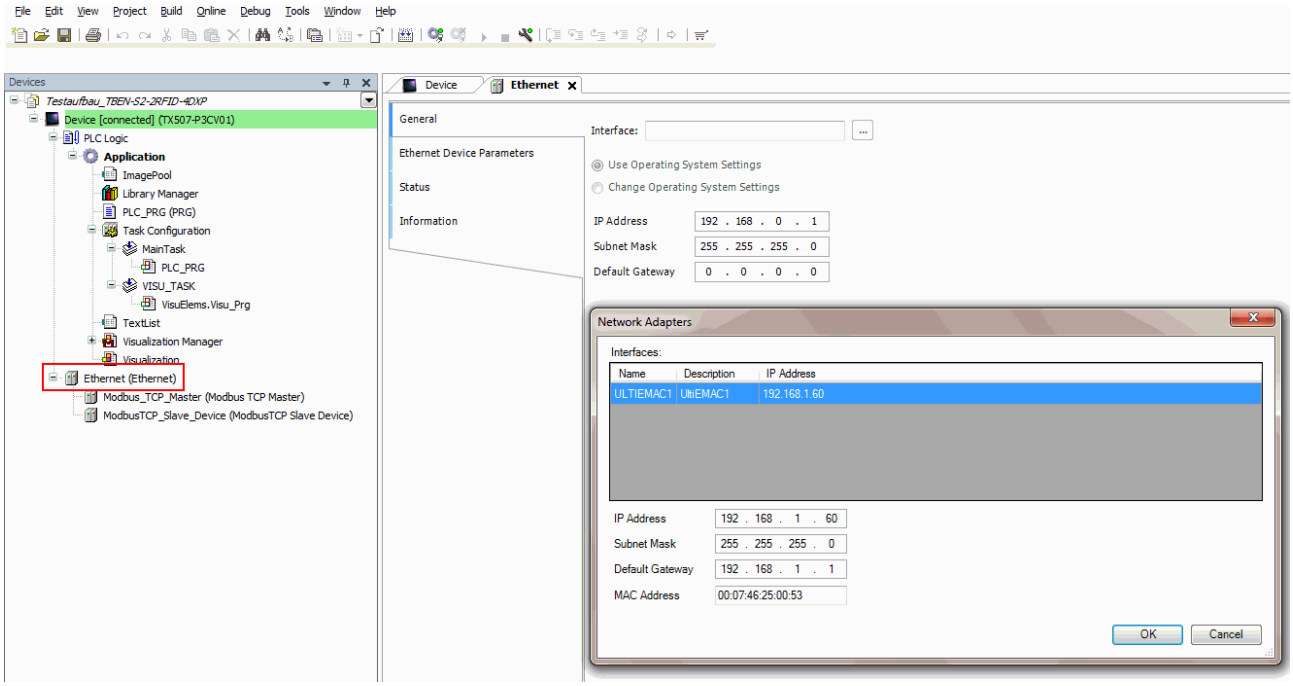


Fig. 41: Modbus master — entering the IP address (here: 192.168.1.60)

7.2.4 Modbus TCP slave — setting the IP address

- Double-click the Modbus TCP slave.
- In the **General** tab enter the IP address of the slave.

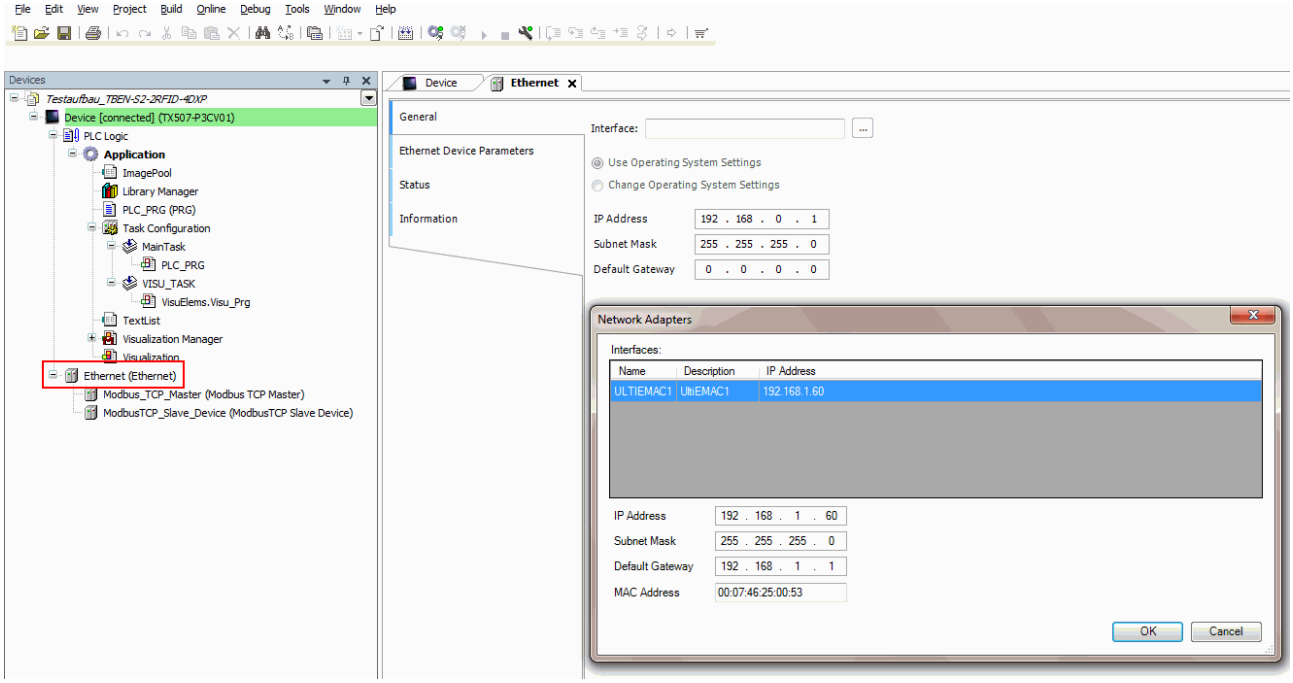


Fig. 42: Modbus slave — entering the IP address (here: 192.268.1.61)

7.2.5 Defining Modbus channels (registers)

Defining 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 register (128 bytes)

- ▶ Confirm with **OK**.

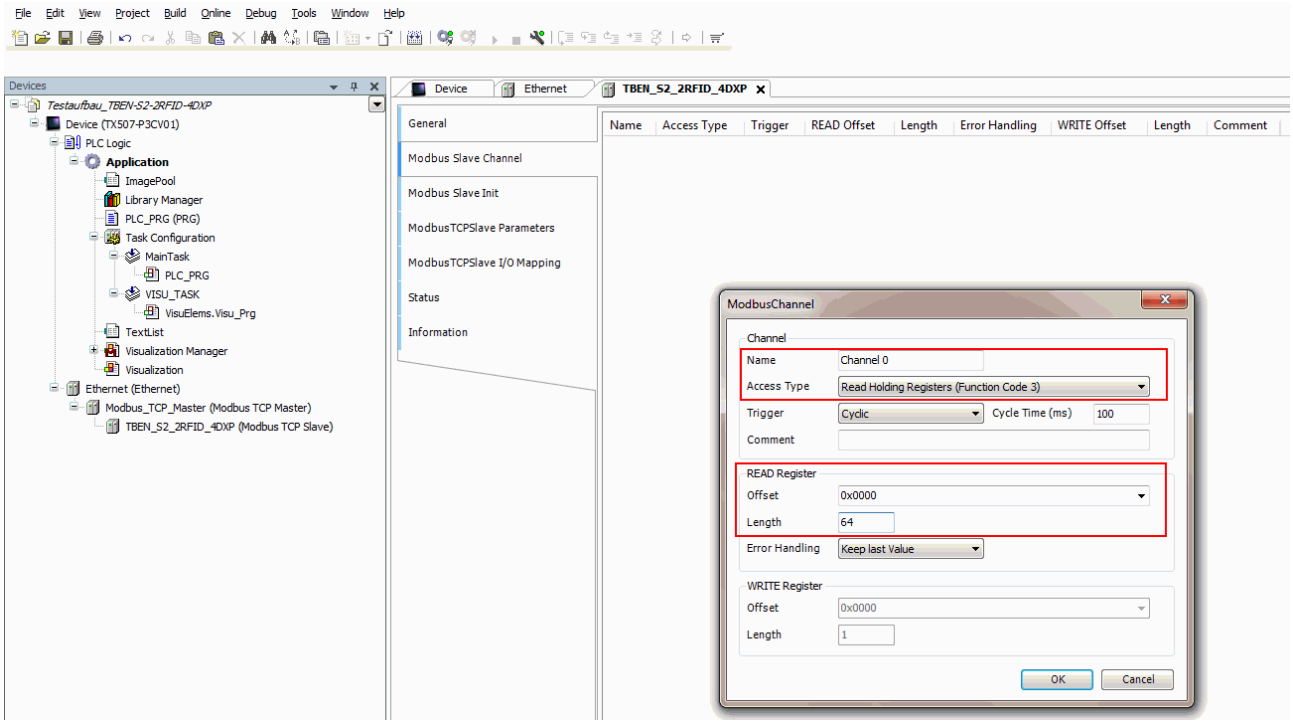


Fig. 43: Defining READ registers

Defining 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 multiple registers
- **Offset**: 0x0800
- **Length**: 64 register (128 bytes)

- Confirm with **OK**.

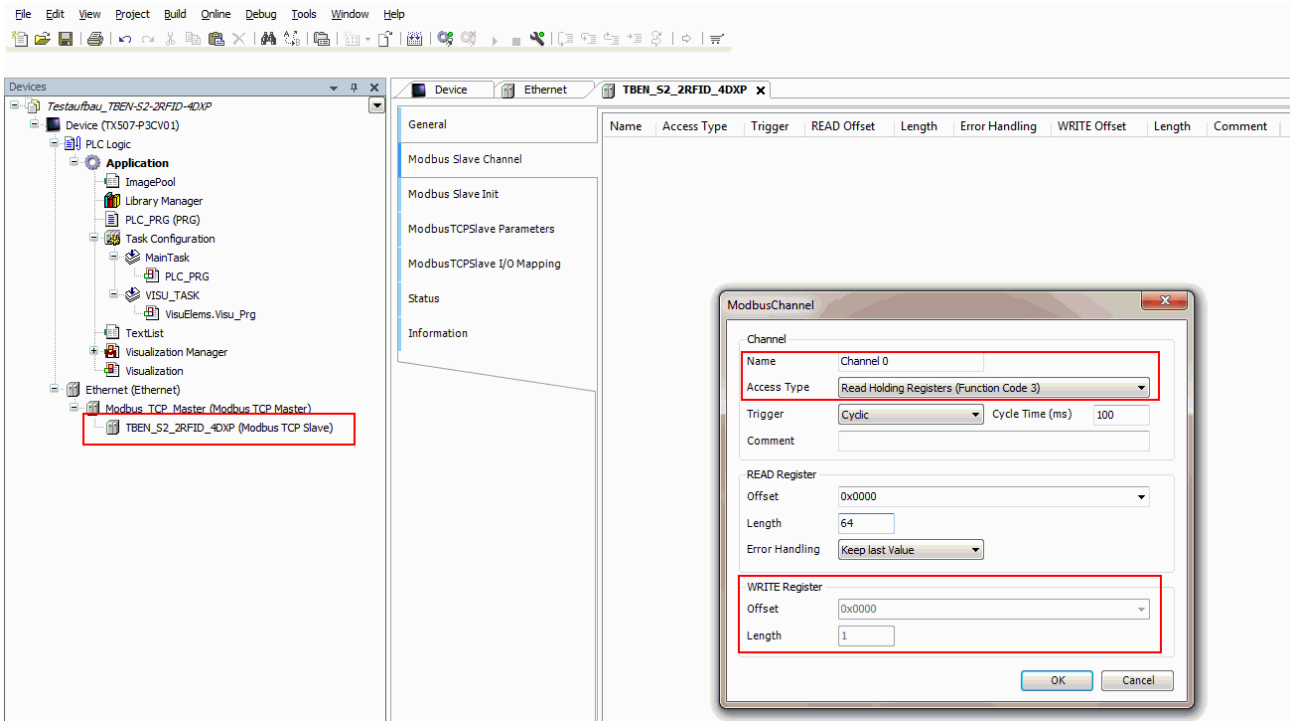


Fig. 44: Setting WRITE registers

Changing channel addresses

- Double-click the Modbus TCP slave.
- Click the **Modbus TCP slave I/O image** tab.
- Enter the address in the corresponding table column.

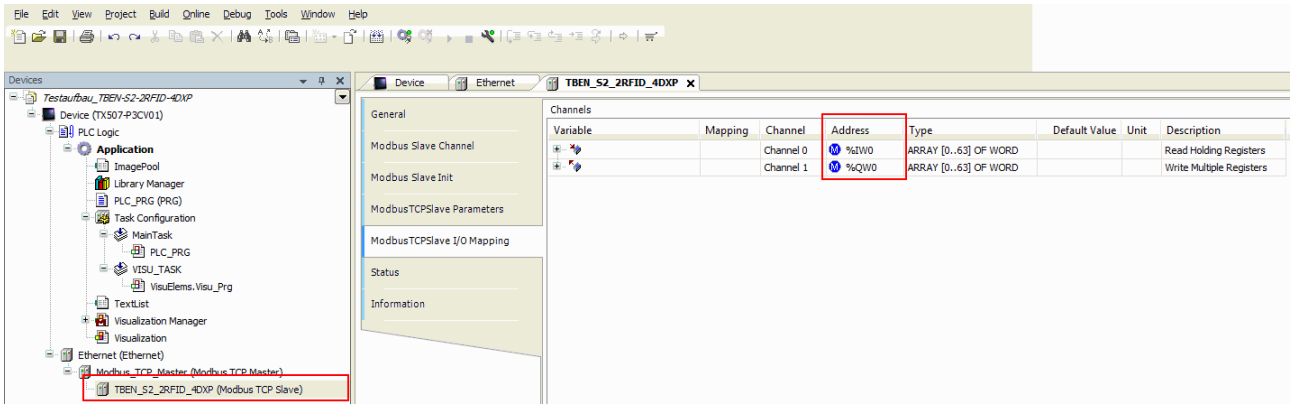


Fig. 45: Changing channel addresses

7.2.6 Connecting the device online with the controller

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

7.2.7 Reading out process data

The process data can be interpreted using mapping 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.

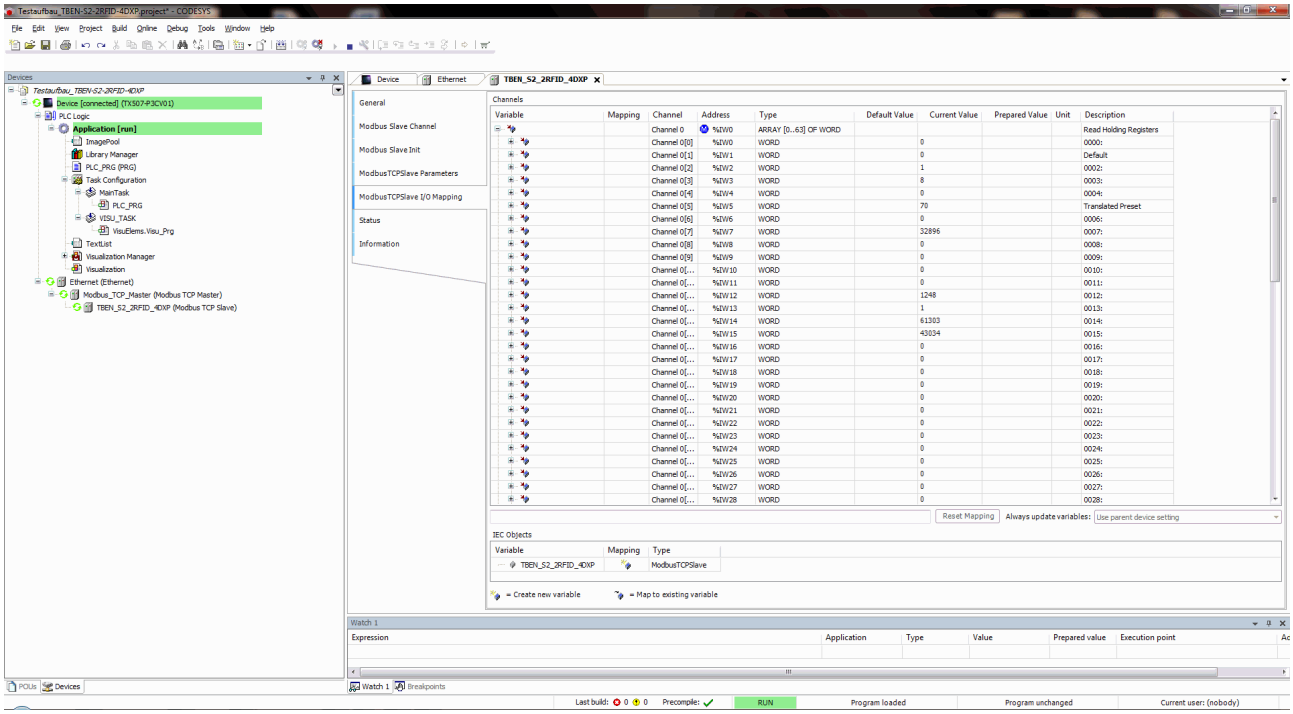


Fig. 46: Process data

7.2.8 Modbus TCP — mapping

RFID channels — parameter data

Description	Register		Bit offset	Bit length
	Channel 0	Channel 1		
Operating mode	0xB000	0xB012	0	8
Select tag type	0xB000	0xB012	8	8
Bypass time	0xB001	0xB013	0	16
HF: Multitag	0xB002	0xB014	4	1
HF: Heartbeat read/write head	0xB002	0xB014	5	1
Cable termination active	0xB002	0xB014	6	1
HF: Automatic tuning of read/write head	0xB002	0xB014	7	1
Deactivate diagnostic HF read/write head tuning	0xB002	0xB014	8	1
Diagnostic input filter	0xB002	0xB014	15	1
HF idle mode	0xB003	0xB015	0	8
Command repetitions in the event of an error	0xB004	0xB016	0	8
HF: Command in Continuous Mode	0xB004	0xB016	8	8
HF: Length in Continuous Mode	0xB005	0xB017	0	16
HF: Address in Continuous Mode	0xB006	0xB018	0	32
Length of read data	0xB010	0xB022	0	16
Length of write data	0xB011	0xB023	0	16
HF bus mode: Activate read/write head 1	0xB00E	0xB020	0	1
…	…	…	…	1
HF bus mode: Activate read/write head 16	0xB00E	0xB020	15	1
HF bus mode: Activate read/write head 17	0xB00F	0xB021	0	1
…	…	…	…	1
HF bus mode: Activate read/write head 32	0xB00F	0xB021	15	1

RFID channels — process input data

Description	Register		Bit offset	Bit length
	Channel 0	Channel 1		
Response code	0x0000	0x004C	0	14
Error	0x0000	0x004C	14	1
Busy	0x0000	0x004C	15	1
Tag in detection range	0x0002	0x004E	0	1
HF read/write head switched on	0x0002	0x004E	8	1
Continuous Mode active	0x0002	0x004E	9	1
Loop counter	0x0001	0x004D	0	8

Description	Register		Bit offset	Bit length
	Channel 0	Channel 1		
Antenna detuned	0x0002	0x004E	4	1
Parameter not supported by read/write head	0x0002	0x004E	5	1
Read/write head reports error	0x0002	0x004E	6	1
Expected read/write head not connected	0x0002	0x004E	7	1
Length	0x0003	0x004F	0	16
Error code	0x0004	0x0050	0	16
Tag counter	0x0005	0x0051	0	16
Data (bytes) available	0x0006	0x0052	0	16
Read fragment No.	0x0007	0x0053	0	8
Write fragment No.	0x0007	0x0053	8	8
Read/write head 1 — Tag in detection range	0x000A	0x0056	0	1
…	…	…	…	1
Read/write head 16 — Tag in detection range	0x000A	0x0056	15	1
Read/write head 17 — Tag in detection range	0x000B	0x0057	0	1
…	…	…	…	1
Read/write head 32 — Tag in detection range	0x000B	0x0057	15	1
Read data Byte 0	0x000C	0x0058	0	8
Read data Byte 1	0x000C	0x0058	8	8
Read data Byte 2	0x000D	0x0059	0	8
Read data Byte 3	0x000D	0x0059	8	8
…	…	…	…	8
Read data Byte 14	0x0013	0x005F	0	8
Read data Byte 15	0x0013	0x005F	8	8
…	…	…	…	8
Read data Byte 64	0x002C	0x007B	0	8
Read data Byte 65	0x002C	0x007B	8	8
…	…	0x0000	…	8
Read data Byte 126	0x004B	0x0097	0	8
Read data Byte 127	0x004B	0x0097	8	8

RFID channels — process output data

Description	Register		Bit offset	Bit length
	Channel 0	Channel 1		
Command code	0x0800	0x084C	0	16
Loop counter	0x0801	0x084D	0	8
Memory area (only UHF)	0x0801	0x084D	8	8
Start address	0x0802	0x084E	0	32
Length	0x0804	0x0851	0	16
Length UID/EPC	0x0805	0x0851	0	8
Antenna No.	0x080A	0x0856	0	8
Timeout	0x0806	0x0852	0	16
Read fragment No.	0x0807	0x0853	0	8
Write fragment No.	0x0807	0x0853	8	8
Write data Byte 0	0x080C	0x0858	0	8
Write data Byte 1	0x080C	0x0858	8	8
…	…	…	…	8
Write data Byte 14	0x0813	0x085F	0	8
Write data Byte 15	0x0813	0x085F	8	8
…	…	…	…	8
Write data Byte 64	0x0813	0x0878	0	8
Write data Byte 65	0x0813	0x0878	8	8
…	…	…	…	8
Write data Byte 126	0x084B	0x0897	0	8
Write data Byte 127	0x084B	0x0897	8	8

RFID diagnostic data

Description	Register		Bit offset	Bit length
	Channel 0	Channel 1		
Overvoltage VAUX	0x0098	0x00AA	7	1
Parameterization error	0x0098	0x00AA	6	1
Configuration via DTM active	0x0098	0x00AA	5	1
Memory full	0x0098	0x00AA	4	1
Read/write head 1 detuned	0x009A	0x00AC	4	1
Read/write head 2 detuned	0x009A	0x00AC	12	1
…	…	…	0	1
Read/write head 31 detuned	0x00A9	0x00BB	4	1
Read/write head 32 detuned	0x00A9	0x00BB	12	1
Parameter not supported by read/ write head 1.	0x009A	0x00AC	5	1
Parameter not supported by read/ write head 2.	0x009A	0x00AC	13	1
…	…	…	…	1
Parameter not supported by read/ write head 31.	0x00A9	0x00BB	5	1
Parameter not supported by read/ write head 32.	0x00A9	0x00BB	13	1
Read/write head 1 reports error	0x009A	0x00AC	6	1
Error reported by read/write head 2	0x09A	0x00AC	14	1
…	…	…	…	1
Error reported by read/write head 31	0x00A9	0x00BB	6	1
Error reported by read/write head 32	0x00A9	0x00BB	14	1
Expected read/write head 1 not connected	0x009A	0x00AC	7	1
Expected read/write head 2 not connected	0x009A	0x00AC	15	1
…	…	…	…	1
Expected read/write head 31 not connected	0x00A9	0x00BB	7	1
Expected read/write head 32 not connected	0x00A9	0x00BB	15	1

Digital channels — input data

Description	Register	Bit offset	Bit length
Input value channel 4	0x00BC	4	1
Input value channel 5	0x00BC	5	1
Input value channel 6	0x00BC	6	1
Input value channel 7	0x00BC	7	1

Digital channels — output data

Description	Register	Bit offset	Bit length
Output value channel 4	0x0898	4	1
Output value channel 5	0x0898	5	1
Output value channel 6	0x0898	6	1
Output value channel 7	0x0898	7	1

Digital channels — diagnostic messages

Description	Register	Bit offset	Bit length
Overvoltage at power supply connection VAUX channel 4/5	0x00BD	2	1
Overvoltage at power supply connection VAUX channel 6/7	0x00BD	3	1
Overvoltage at output (channel 4)	0x00BD	12	1
Overvoltage at output (channel 5)	0x00BD	13	1
Overvoltage at output (channel 6)	0x00BD	14	1
Overvoltage at output (channel 7)	0x00BD	15	1

Module status — diagnostic messages

Description	Register	Bit offset	Bit length
DTM active in Force mode	0x00BE	14	1
Undervoltage V1	0x00BE	9	1
Undervoltage V2	0x00BE	7	1
Module diagnostics available	0x00BE	0	1
Internal error	0x00BE	10	1
ARGEE program active	0x00BE	1	1

7.3 Connecting the device to an EtherNet/IP scanner using RSLogix

Hardware used

This example uses the following hardware components:

- Rockwell controller CompactLogix L30ER
- TBEN-S2-2RFID-4DXP block module
- HF read/write head TN-Q80-H1147

Software used

This example uses the following software:

- Rockwell RSLogix
- EDS file for TBEN-S2-2RFID-4DXP (download free of charge from www.turck.com)

Requirements

- The programming software has been opened.
- A new project has been created.
- The controller has been added to the project.

7.3.1 Installing an EDS file

The EDS file is available free of charge for download from www.turck.com.

▶ Include an EDS file: Click **Tools** → **EDS Hardware Installation Tool**.

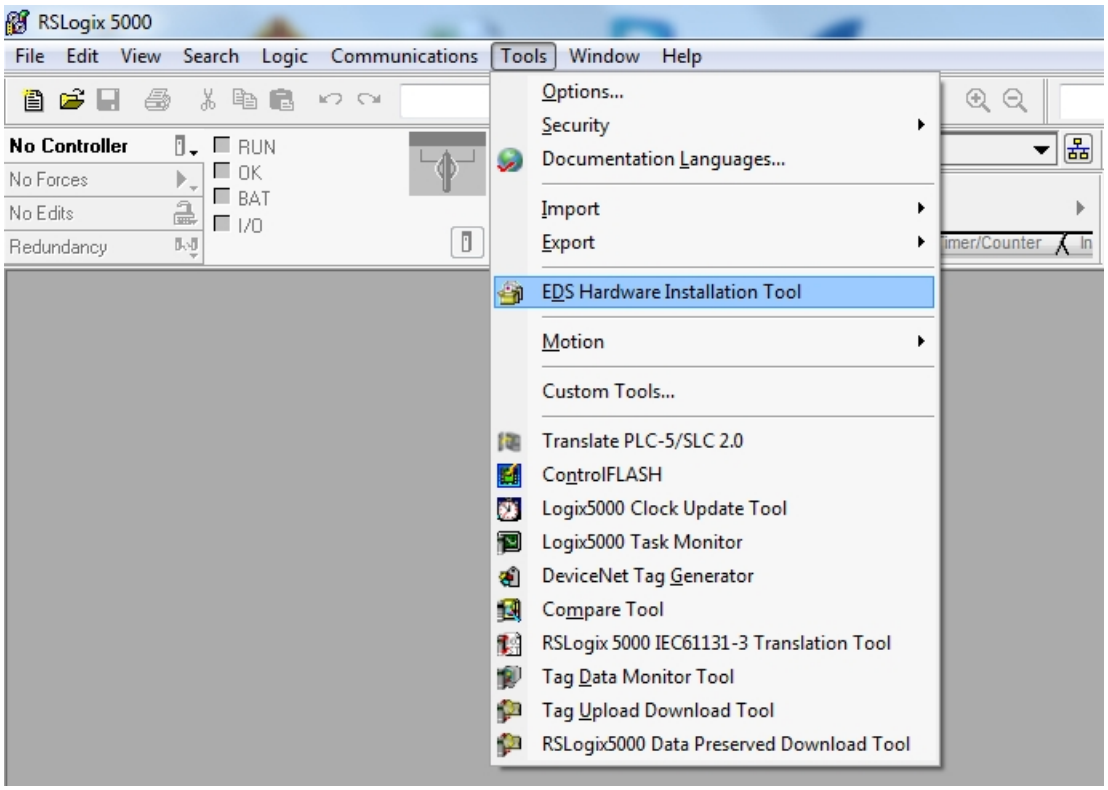


Fig. 47: Opening the EDS Hardware Installation Tool

The wizard for the installation of EDS file opens.

- ▶ Click **Next** to select the EDS file.

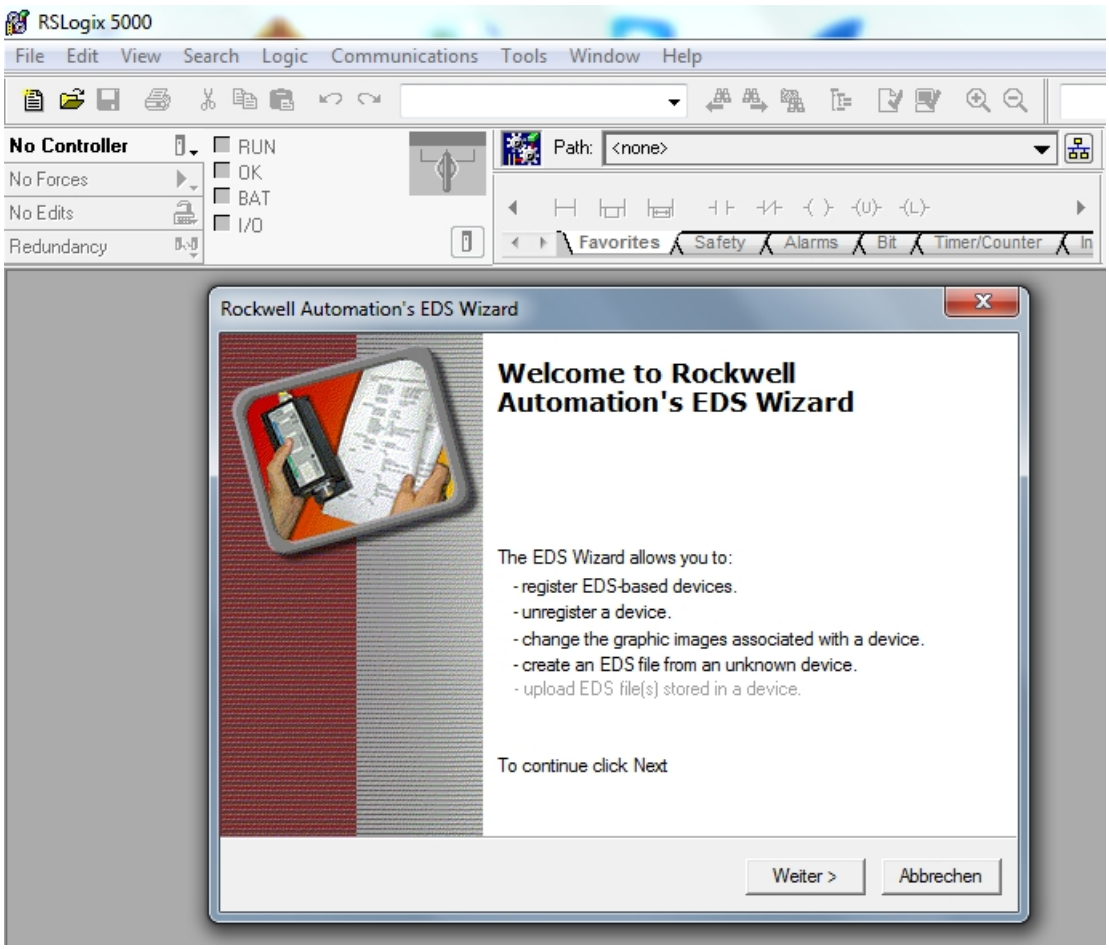


Fig. 48: Starting the EDS Wizard

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

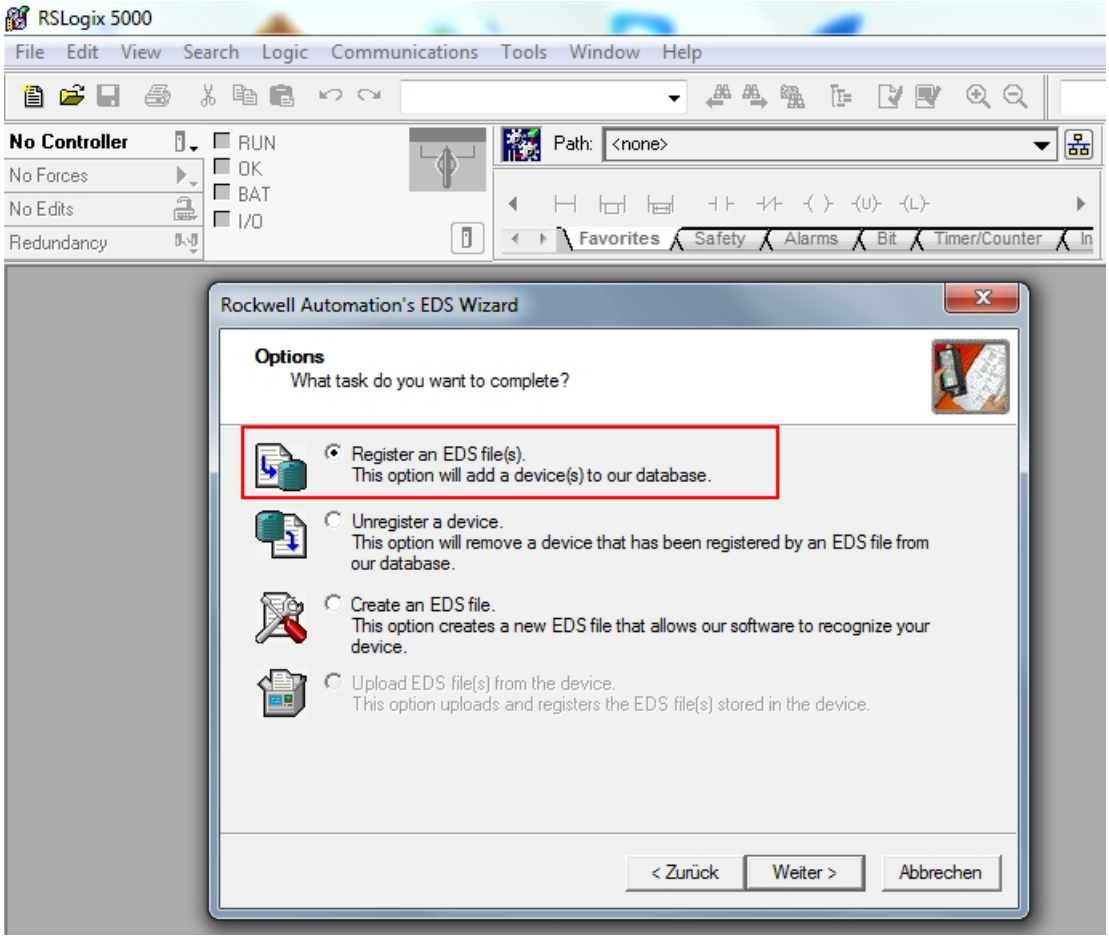


Fig. 49: Option selection — registering an EDS file(s)

- ▶ Select EDS file: Select 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.

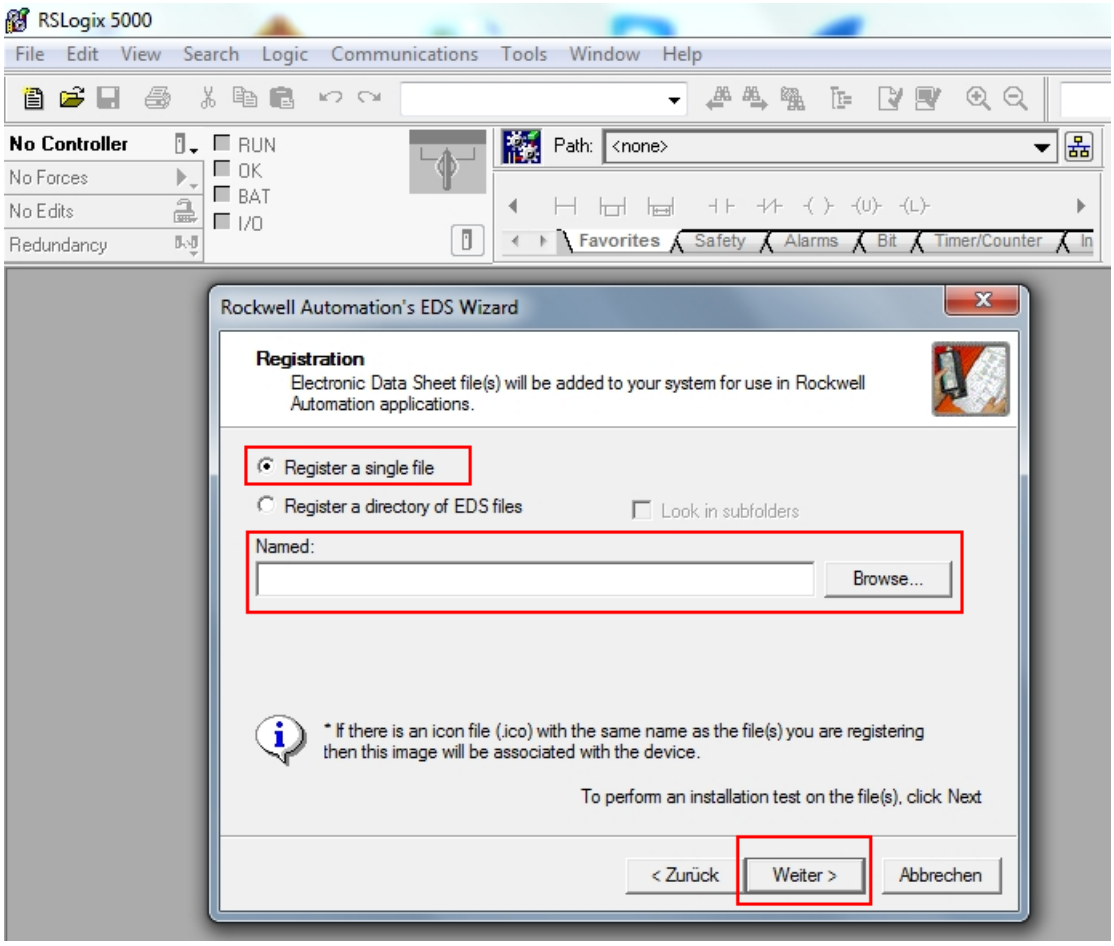


Fig. 50: Selecting an EDS file

7.3.2 Connecting the device with the controller

- Right-click **I/O configuration** → **Ethernet**.
- Click **New module**.

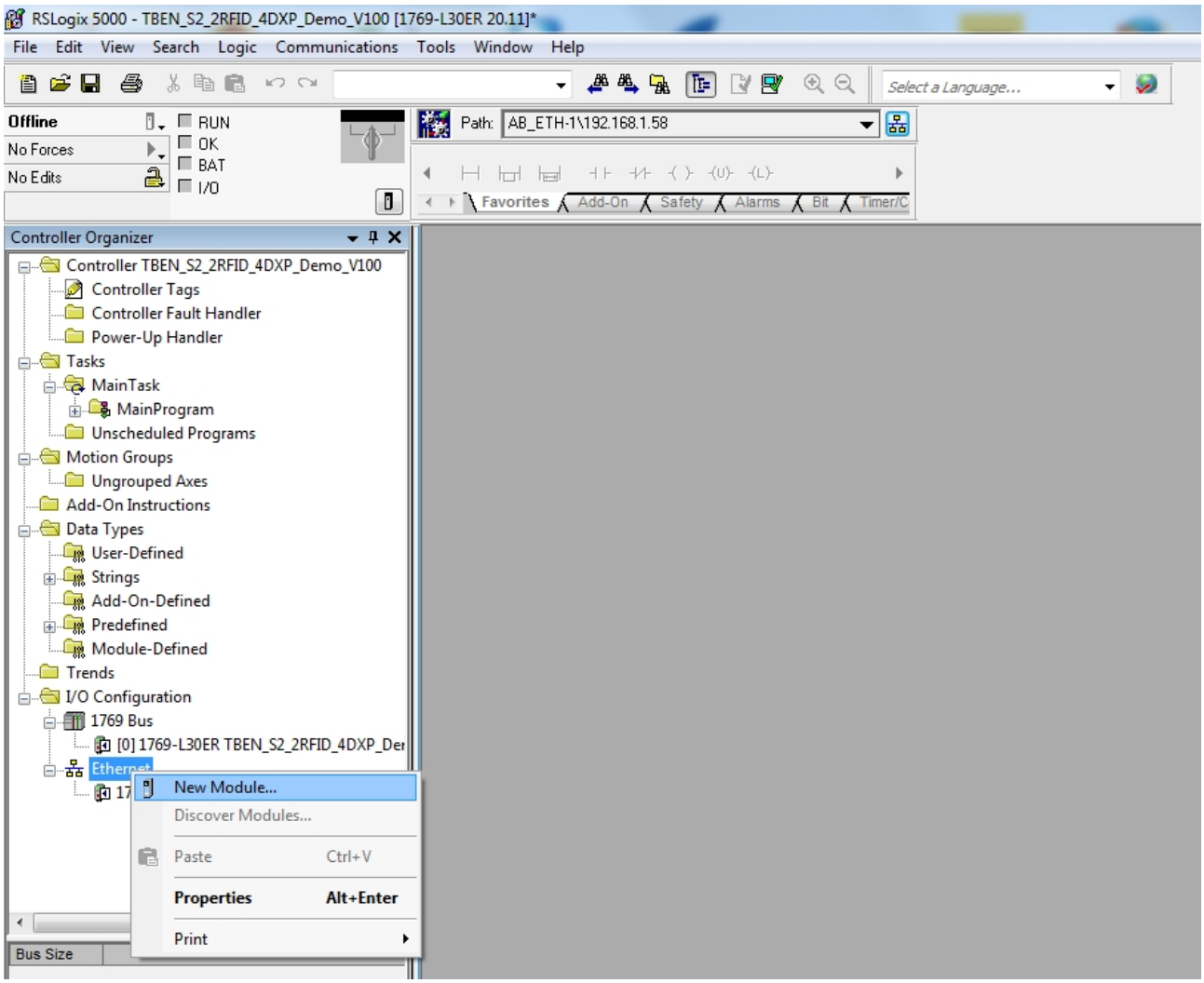


Fig. 51: Adding a new module

- Select Turck under **Module type vendor filters**.
- Select the TBEN-RFID module.
- Confirm the selection with **Create**.

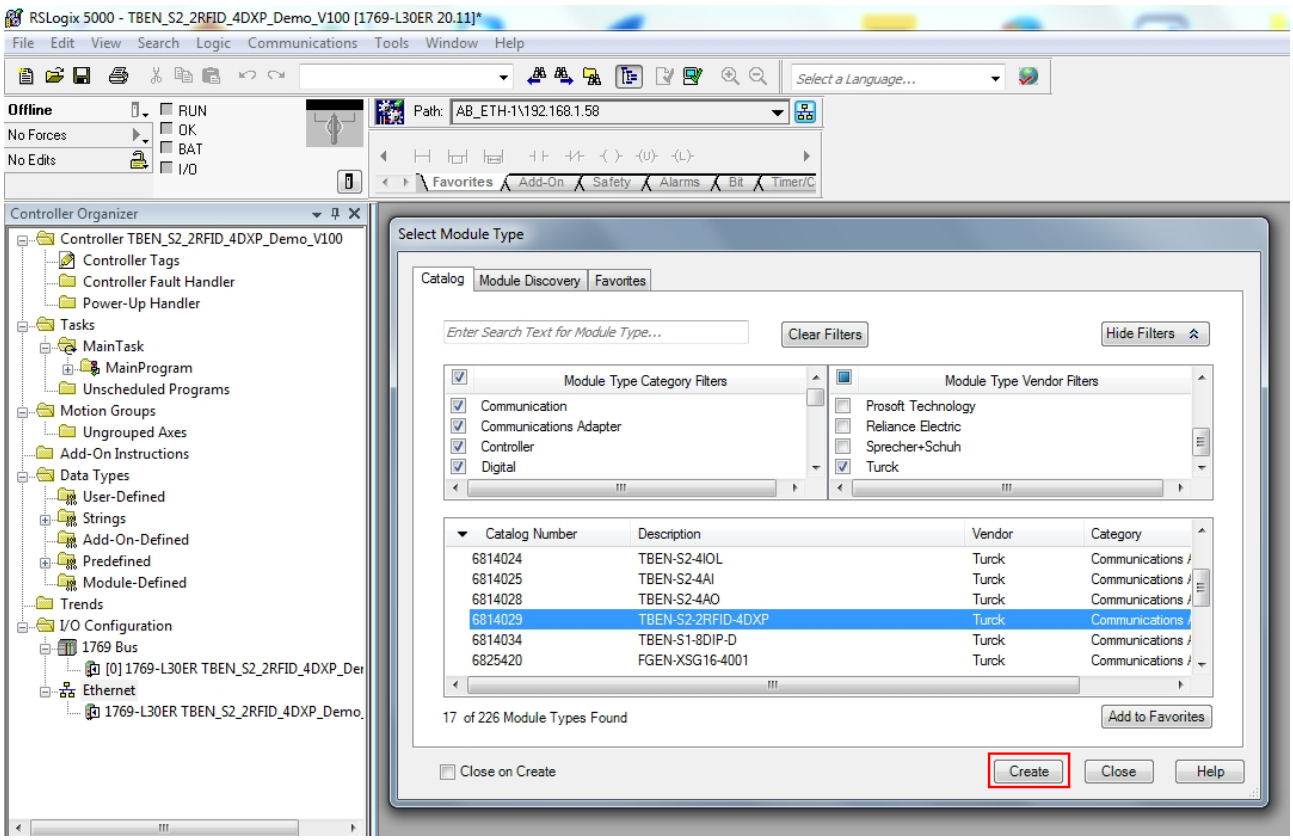


Fig. 52: Selecting an EDS file for TBEN-S2-2RFID-4DXP

- Assign a module name.
- Enter the IP address of the device.

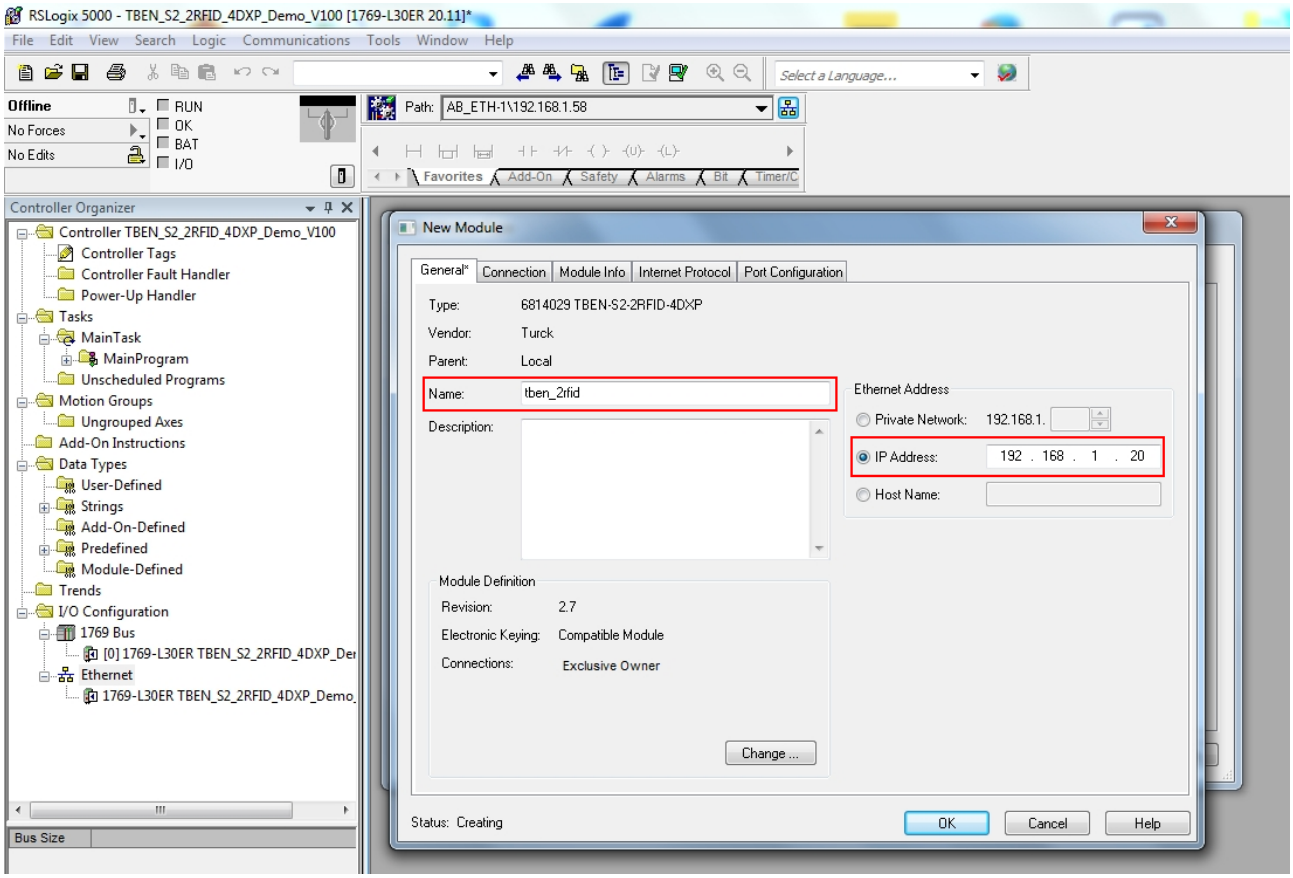


Fig. 53: Setting the module name and IP address

▶ Select an integer as a format for the input data and output data: Click **Change** → In the following window select **INT**.

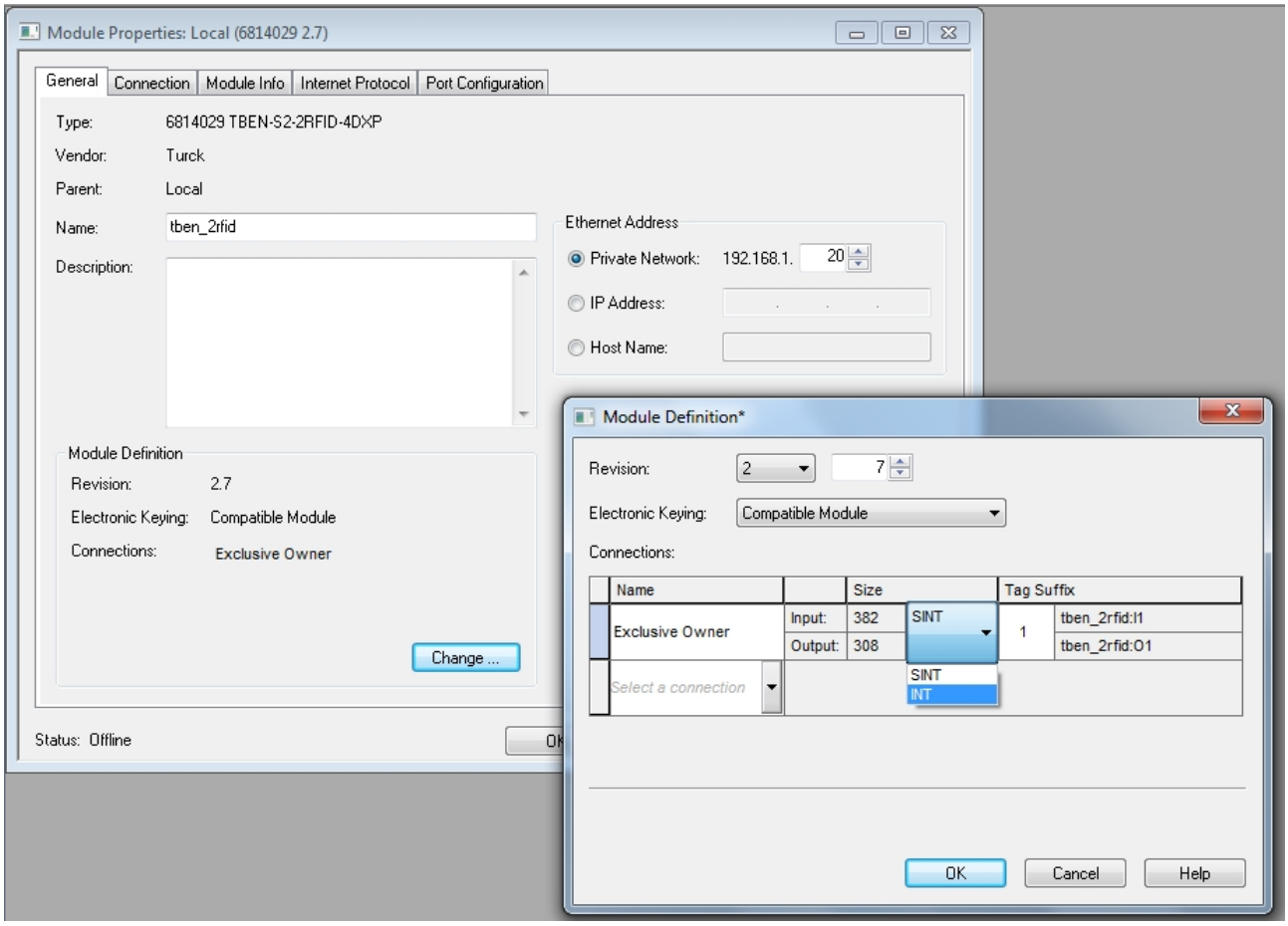


Fig. 54: Selecting an integer as a format for the input data and output data

▶ Optional: Set the connection and port configuration.

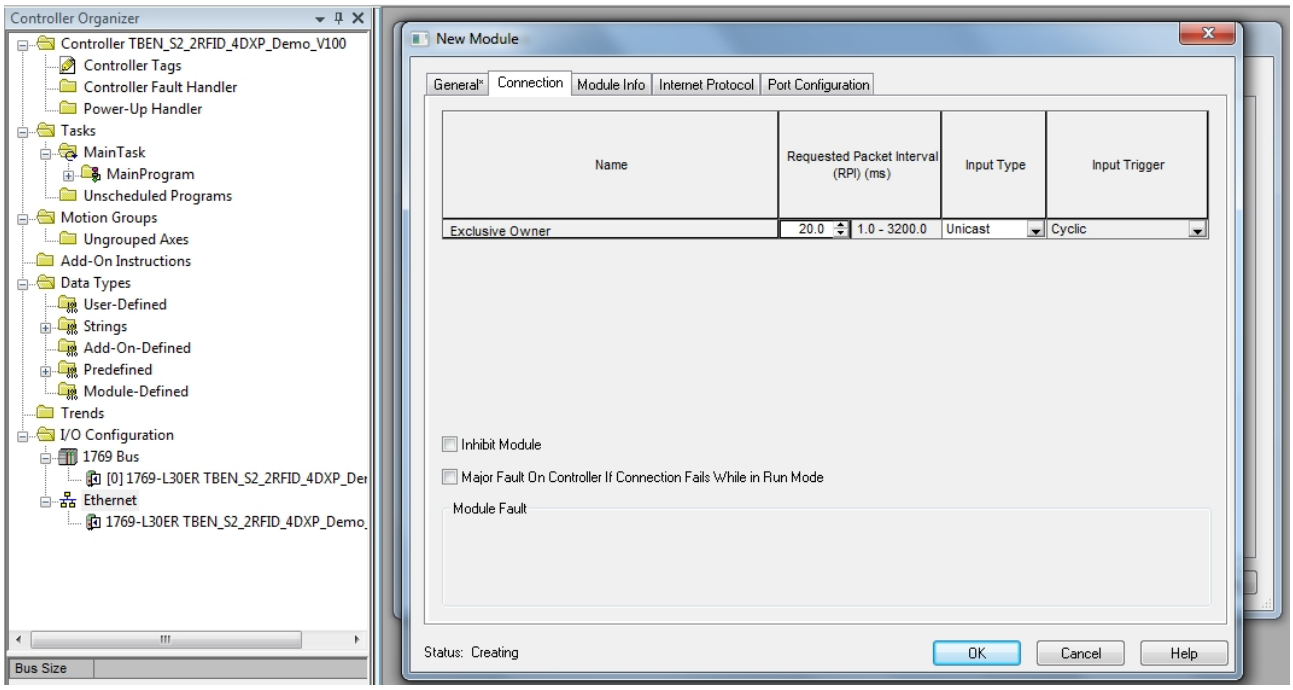


Fig. 55: Setting the connection

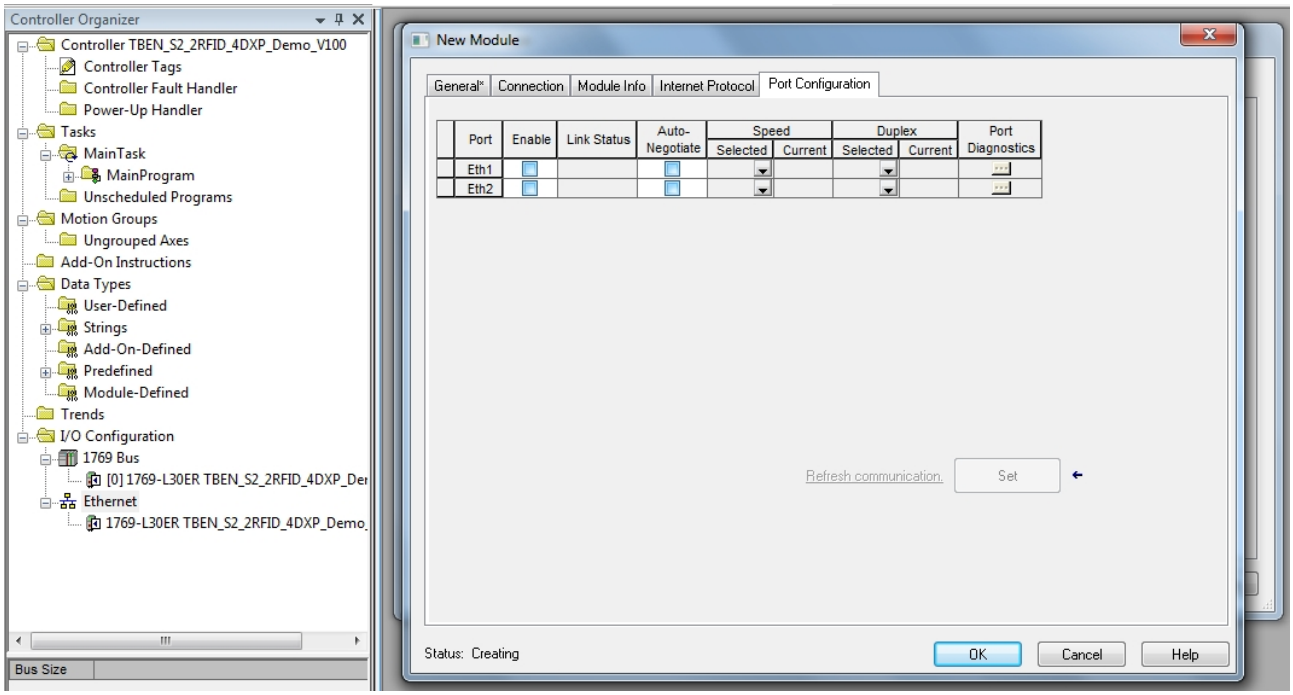


Fig. 56: Setting the port configuration

The device appears in the project tree.

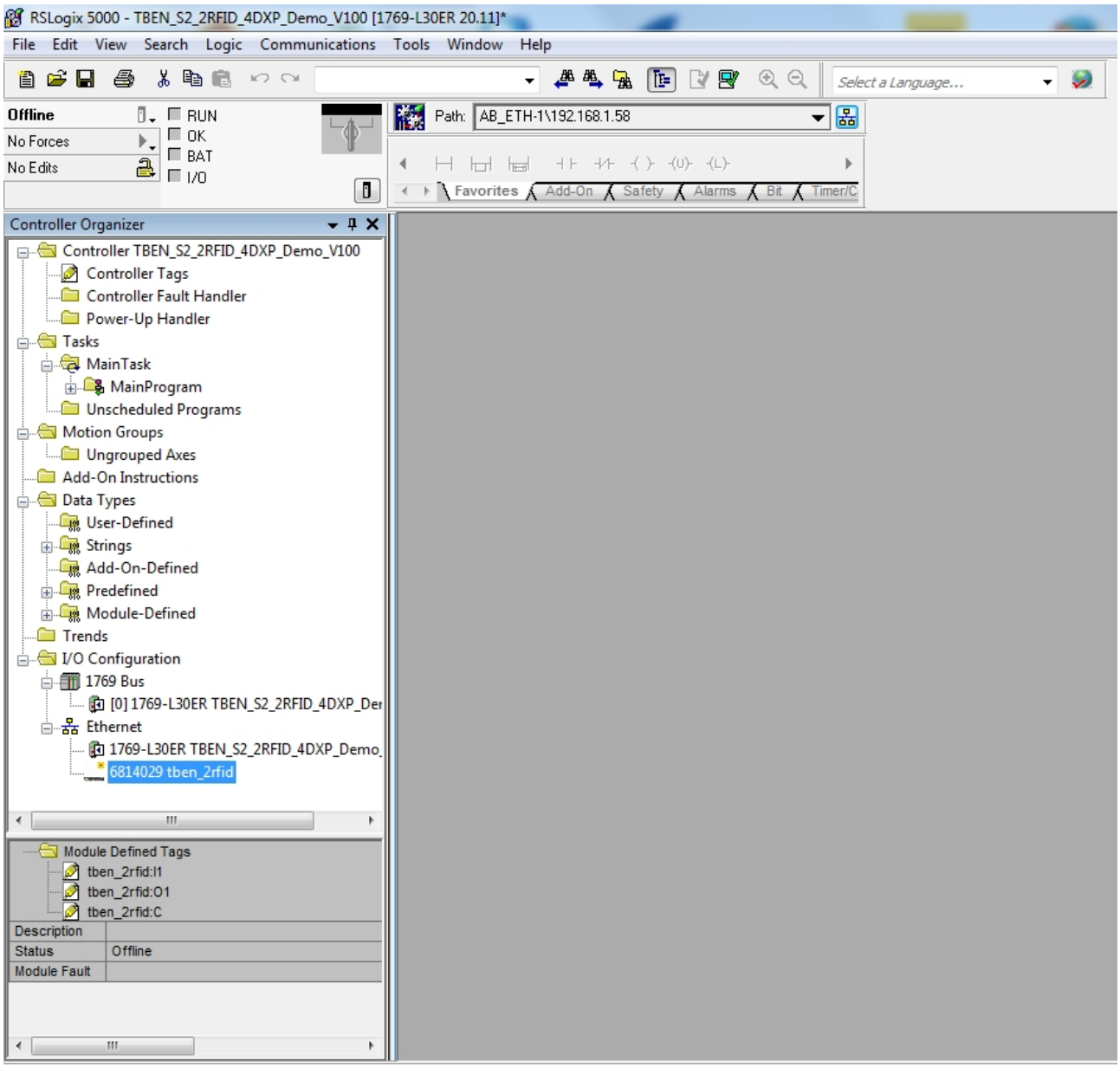


Fig. 57: TBEN-S2-2RFID-4DXP in the project tree

7.3.3 Connecting the device online with the controller

- Select the controller.
- Click **Go online**.

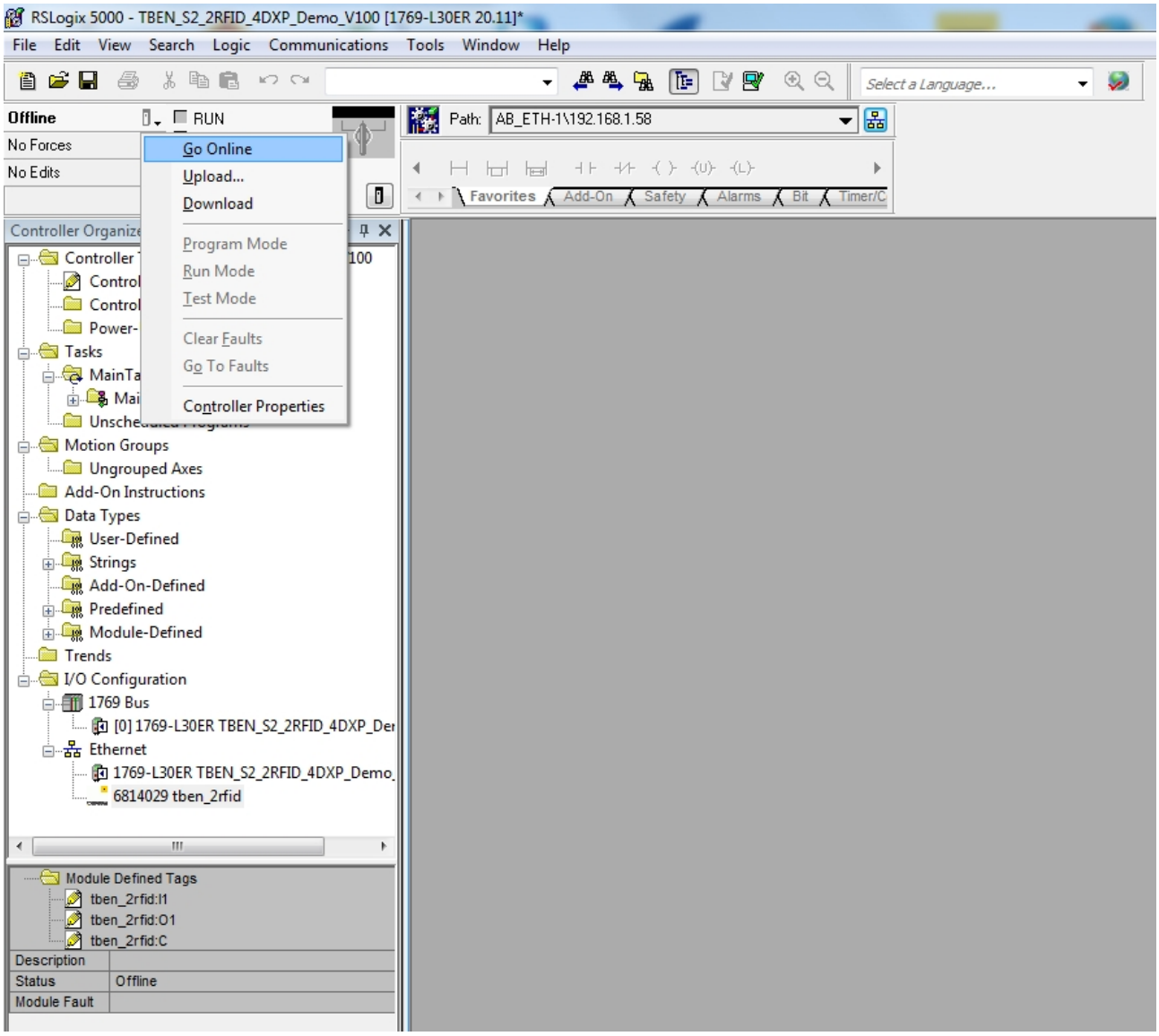


Fig. 58: Connecting the device online

- In the following window click (**Connect to go online**) **Download**.

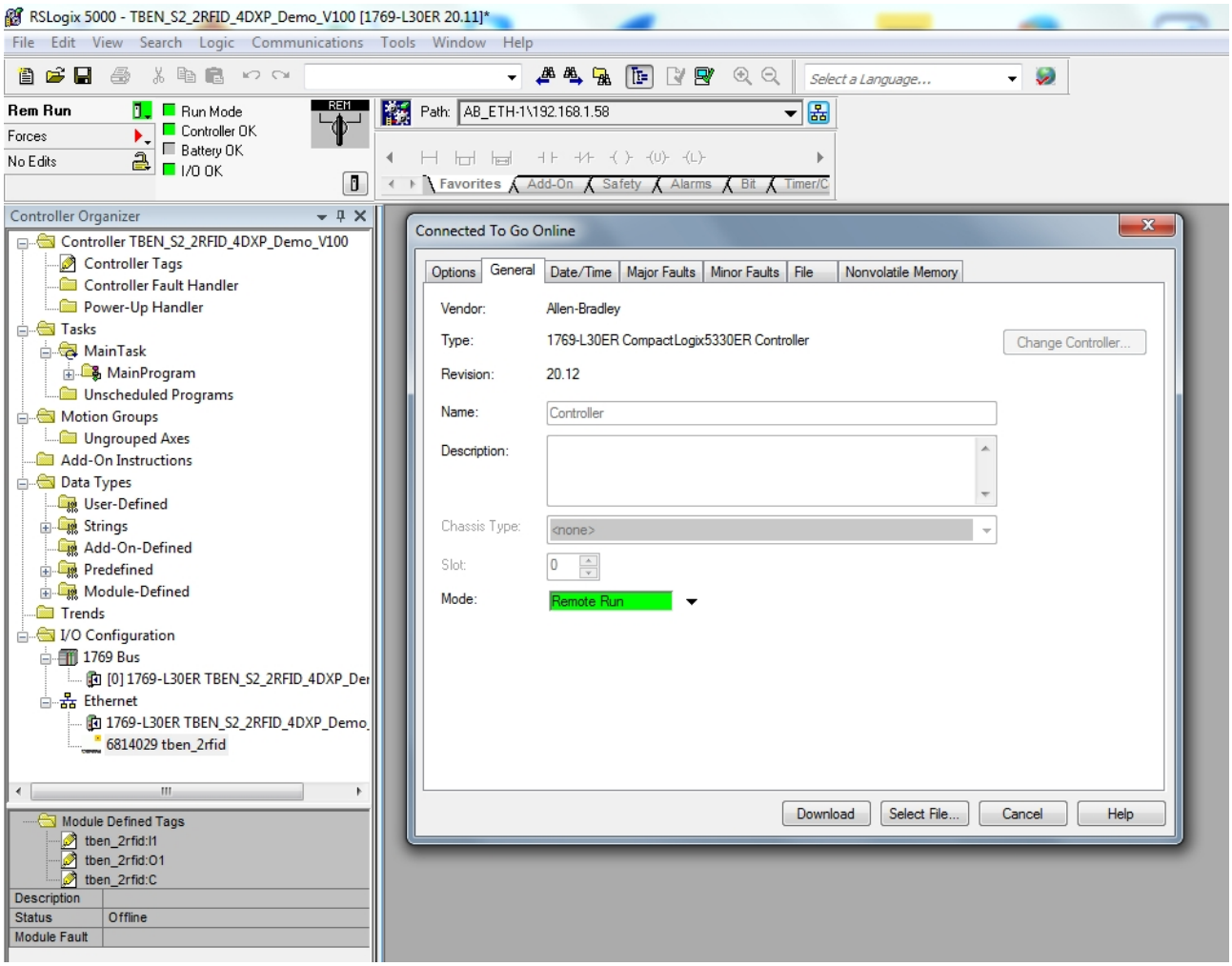


Fig. 59: Click Download

- Confirm all the subsequent messages.

7.3.4 Reading out process data

- Select **Controller tags** in the project tree.

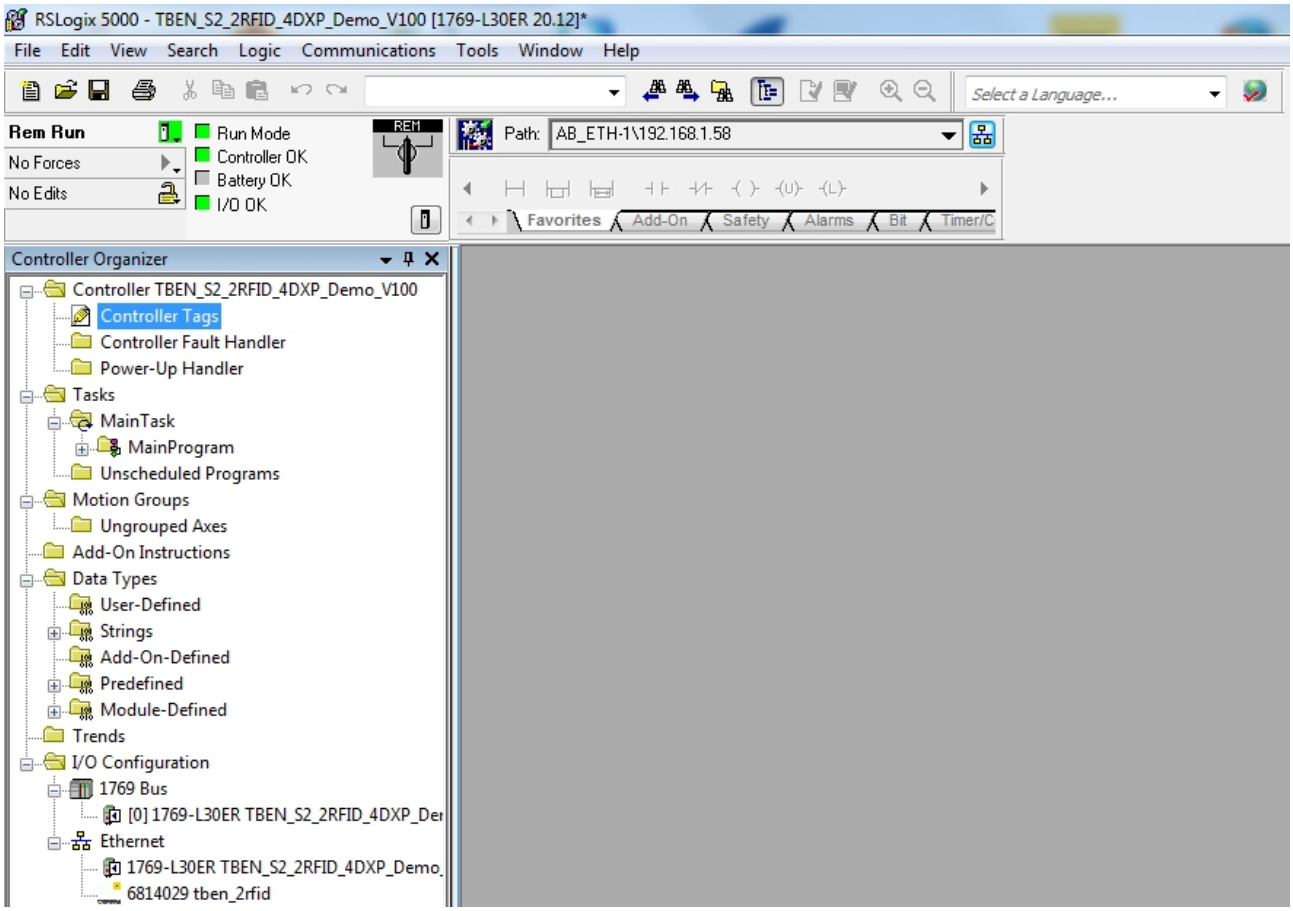


Fig. 60: Controller tags in the project tree

Parameter data (tben_2rfid:C), input data (tben_2rfid:I1) and output data (tben_2rfid:O1) can be accessed.

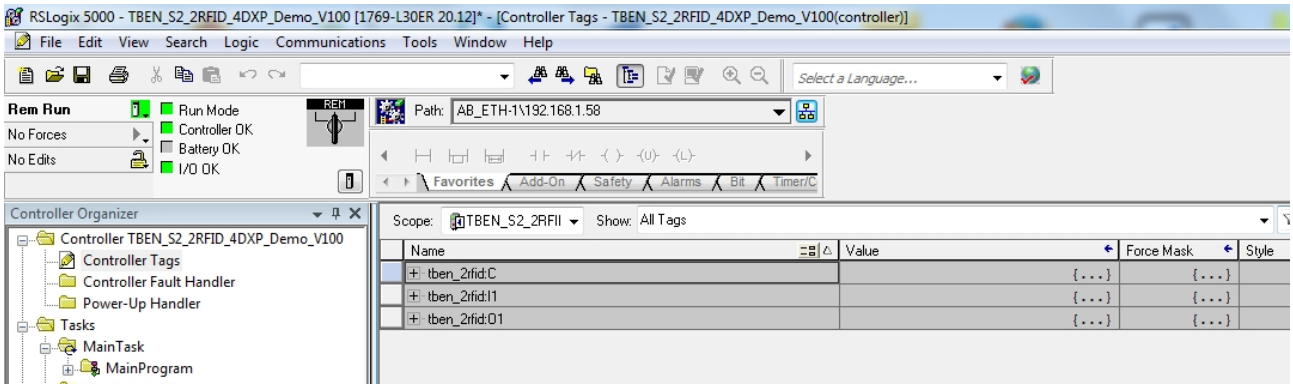


Fig. 61: Access to parameter data, input data and output data

Example: process input data — tag in the detection range of the read/write head

In the following example a tag is located in the detection range of the read/write head. The process data can be interpreted using mapping.

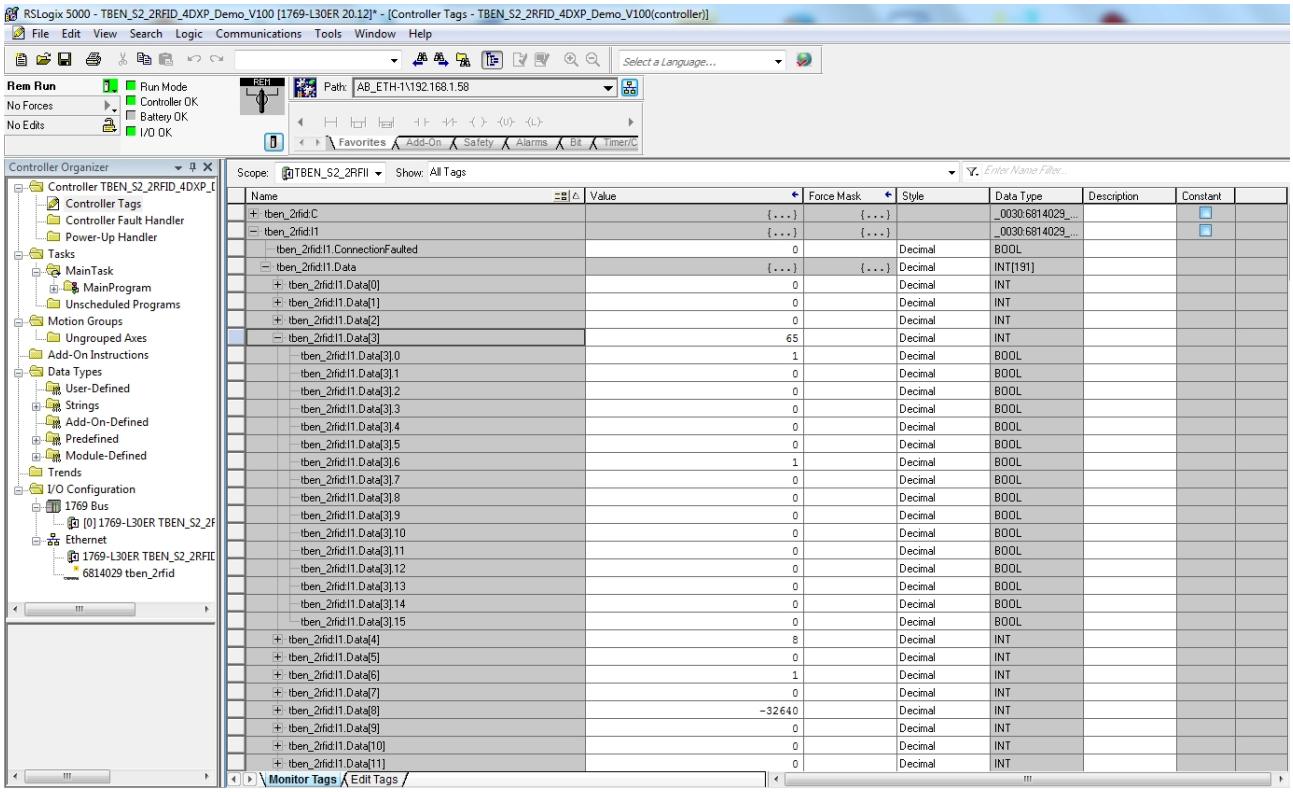


Fig. 62: Process input data — example

7.3.5 EtherNet/IP — mapping

Description	Assembly instance	Value (words)
Input	103	191
Output	104	154

RFID channels — parameter data

Description	Register		Bit offset	Bit length
	Channel 0	Channel 1		
Operating mode	0x000A	0x0041	0	8
Select tag type	0x000B	0x0042	0	8
bypass time	0x000C	0x0043	0	16
HF: Multitag	0x000D	0x0044	0	1
HF: Heartbeat read/write head	0x000E	0x0045	0	1
Cable termination active	0x000F	0x0046	0	1
HF: Automatic tuning of read/write head	0x0011	0x0047	0	1
Deactivate diagnostic HF read/write head tuning	0x0012	0x0048	0	1
Diagnostic input filter	0x0013	0x0049	0	1
Command repetitions in the event of an error	0x0014	0x004A	0	8
HF: Command in Continuous Mode	0x0015	0x004B	0	8
HF: Length in Continuous Mode	0x0016	0x004C	0	16
HF: Address in Continuous Mode	0x0018	0x004E	0	32
Length of read data	0x003C	0x0072	0	16
Length of write data	0x003E	0x0074	0	16
HF bus mode: Activate read/write head 1	0x001C	0x0052	0	1
HF bus mode: Activate read/write head 2	0x001D	0x0053	0	1
HF bus mode: Activate read/write head 3	0x001E	0x0054	0	1
…	…	…	…	1
HF bus mode: Activate read/write head 32	0x003B	0x0071	0	1

RFID channels — process input data

Description	Word offset		Bit offset	Bit length
	Channel 0	Channel 1		
Response code	0x0001	0x004D	0	14
Error	0x0001	0x004D	14	1
Busy	0x0001	0x004D	15	1
Tag in detection range	0x0003	0x004F	0	1
HF read/write head switched on	0x0003	0x004F	8	1

Description	Word offset		Bit offset	Bit length
	Channel 0	Channel 1		
Continuous Mode active	0x0003	0x004F	9	1
Loop counter	0x0002	0x004E	0	8
Antenna detuned	0x0003	0x004F	5	1
Parameter not supported by read/ write head	0x0003	0x004F	5	1
Read/write head reports error	0x0003	0x004F	6	1
Expected read/write head not connected	0x0003	0x004F	7	1
Length	0x0004	0x0050	0	16
Error code	0x0005	0x0051	0	16
Tag counter	0x0006	0x0052	0	16
Data (bytes) available	0x0007	0x0053	0	16
Read fragment No.	0x0008	0x0054	0	8
Write fragment No.	0x0008	0x0055	8	8
Read/write head 1 — Tag in detection range	0x000B	0x0057	0	1
…	…	…	…	1
Read/write head 16 — Tag in detection range	0x000B	0x0057	15	1
Read/write head 17 — Tag in detection range	0x000C	0x0058	0	1
…	…	…	…	1
Read/write head 32 — Tag in detection range	0x000C	0x0058	15	1
Read data Byte 0	0x000D	0x0059	0	8
Read data Byte 1	0x000D	0x0059	8	8
Read data Byte 2	0x000E	0x005A	0	8
Read data Byte 3	0x000E	0x005A	8	8
…	…	…	…	8
Read data Byte 14	0x0014	0x0060	0	8
Read data Byte 15	0x0014	0x0060	8	8
…	…	…	…	8
Read data Byte 64	0x002D	0x0079	0	8
Read data Byte 65	0x002D	0x0079	8	8
…	…	…	…	8
Read data Byte 126	0x004C	0x0098	0	8
Read data Byte 127	0x004C	0x0098	8	8

RFID channels — process output data

Description	Word offset		Bit offset	Bit length
	Channel 0	Channel 1		
Command code	0x0001	0x004D	0	16
Loop counter	0x0002	0x004E	0	8
Memory area (only UHF)	0x0002	0x004E	8	8
Start address	0x0003	0x004F	0	32
Length	0x0005	0x0051	0	16
Length UID/EPC	0x0006	0x0052	0	8
Read/write head address	0x000B	0x0057	0	8
Timeout	0x0007	0x0053	0	16
Read fragment No.	0x0008	0x0054	0	8
Write fragment No.	0x0008	0x0054	8	8
Write data Byte 0	0x000D	0x0059	0	8
Write data Byte 1	0x000D	0x0059	8	8
…	…	…	…	8
Write data Byte 14	0x0014	0x0060	0	8
Write data Byte 15	0x0014	0x0060	8	8
…	…	…	…	8
Write data Byte 64	0x002D	0x0079	0	8
Write data Byte 65	0x002D	0x0079	8	8
…	…	…	…	8
Write data Byte 126	0x004C	0x0098	0	8
Write data Byte 127	0x004C	0x0098	8	8

RFID diagnostic data

Description	Register		Bit offset	Bit length
	Channel 0	Channel 1		
Overvoltage VAUX	0x0099	0x00AB	7	1
Parameterization error	0x0099	0x00AB	6	1
Configuration via DTM active	0x0099	0x00AB	4	1
Buffer full	0x0099	0x00AB	4	1
Read/write head 1 detuned	0x009B	0x00AD	4	1
Read/write head 2 detuned	0x009B	0x00AD	12	1
…	…	…	0	1
Read/write head 31 detuned	0x00AA	0x00BC	4	1
Read/write head 32 detuned	0x00AA	0x00BC	12	1
Parameter not supported by read/ write head 1.	0x009B	0x00AD	5	1
Parameter not supported by read/ write head 2.	0x009B	0x00AD	13	1
…	…	…	…	1
Parameter not supported by read/ write head 31.	0x00AA	0x00BC	5	1
Parameter not supported by read/ write head 32.	0x00AA	0x00BC	13	1
Read/write head 1 reports error	0x009B	0x00AD	6	1
Error reported by read/write head 2	0x009B	0x00AD	14	1
…	…	…	…	1
Error reported by read/write head 31	0x00AA	0x00BC	6	1
Error reported by read/write head 32	0x00AA	0x00BC	14	1
Expected read/write head 1 not connected	0x009B	0x00AD	7	1
Expected read/write head 2 not connected	0x009B	0x00AD	15	1
…	…	…	…	1
Expected read/write head 31 not connected	0x00AA	0x00BC	7	1
Expected read/write head 32 not connected	0x00AA	0x00BC	15	1

DXP channels — parameter data

Description	Register	Bit offset	Bit length
DXP 4 — manual reset of the output after overcurrent	0x0076	0	1
DXP 5 — manual reset of the output after overcurrent	0x0077	0	1
DXP 6 — manual reset of the output after overcurrent	0x0078	0	1
DXP 7 — manual reset of the output after overcurrent	0x0079	0	1
DXP 4 — active output	0x007A	0	1
DXP 5 — active output	0x007B	0	1
DXP 6 — active output	0x007C	0	1
DXP 7 — active output	0x007D	0	1
DXP 4 — advanced digital function	0x007E	0	1
DXP 4 — input filter	0x007E	0	1
DXP 4 — pulse extension (*10 ms)	0x007F	0	8
DXP 5 — advanced digital function	0x0082	0	1
DXP 5 — input filter	0x0083	0	1
DXP 5 — pulse extension (*10 ms)	0x0084	0	8
DXP 6 — advanced digital function	0x0086	0	1
DXP 6 — input filter	0x0087	0	1
DXP 6 — pulse extension (*10 ms)	0x0088	0	8
DXP 7 — advanced digital function	0x008A	0	1
DXP 7 — input filter	0x0139	0	1
DXP 7 — pulse extension (*10 ms)	0x008B	0	8

Digital channels — input data

Description	Word offset	Bit offset	Bit length
Input value channel 4	0x00BD	4	1
Input value channel 5	0x00BD	5	1
Input value channel 6	0x00BD	6	1
Input value channel 7	0x00BD	7	1

Digital channels — output data

Description	Word offset	Bit offset	Bit length
Output value channel 4	0x0099	4	1
Output value channel 5	0x0099	5	1
Output value channel 6	0x0099	6	1
Output value channel 7	0x0099	7	1

Digital channels — diagnostic messages

Description	Word offset	Bit offset	Bit length
Overvoltage at power supply connection VAUX channel 4/5	0x00BE	2	1
Overvoltage at power supply connection VAUX channel 6/7	0x00BE	3	1
Overvoltage at output (channel 4)	0x00BE	12	1
Overvoltage at output (channel 5)	0x00BE	13	1
Overvoltage at output (channel 6)	0x00BE	14	1
Overvoltage at output (channel 7)	0x00BE	15	1

Module status — diagnostic messages

Description	Word offset	Bit offset	Bit length
DTM active in Force mode	0	14	1
Undervoltage V1	0	9	1
Undervoltage V2	0	7	1
Module diagnostics available	0	0	1
Internal error	0	10	1
ARGEE program active	0	1	1

7.3.6 Activating QuickConnect (QC)

The devices support QuickConnect. With QuickConnect, the controller can connect to Ethernet/IP nodes in less than 500 ms after the EtherNet/IP network power supply is switched on. This requires the devices to start up quickly, particularly with fast tool changes on robot arms, e.g. in the automobile industry.

The start-up time for the RFID interfaces is less than 150 ms.

QuickConnect can be activated via the web server of the device or in RSLogix via Configuration Assembly or Class Instance Attribute.

NOTE
Activating QuickConnect will automatically adjust all necessary port properties.

Port property	State
Autonegotiation	Deactivated
Transmission speed	100BaseT
Duplex	Full duplex
Topology	Linear
AutoMDIX	Deactivated

Notes on the correct connection of the Ethernet cables in QuickConnect applications are provided in the chapter [▷ 24].

Activating QuickConnect via configuration assembly

The configuration assembly is part of the assembly class of the device.

- Configure the configuration assembly in RSLogix.
- Activate QuickConnect via byte 9, bit 0 = 1 in the controller tags.

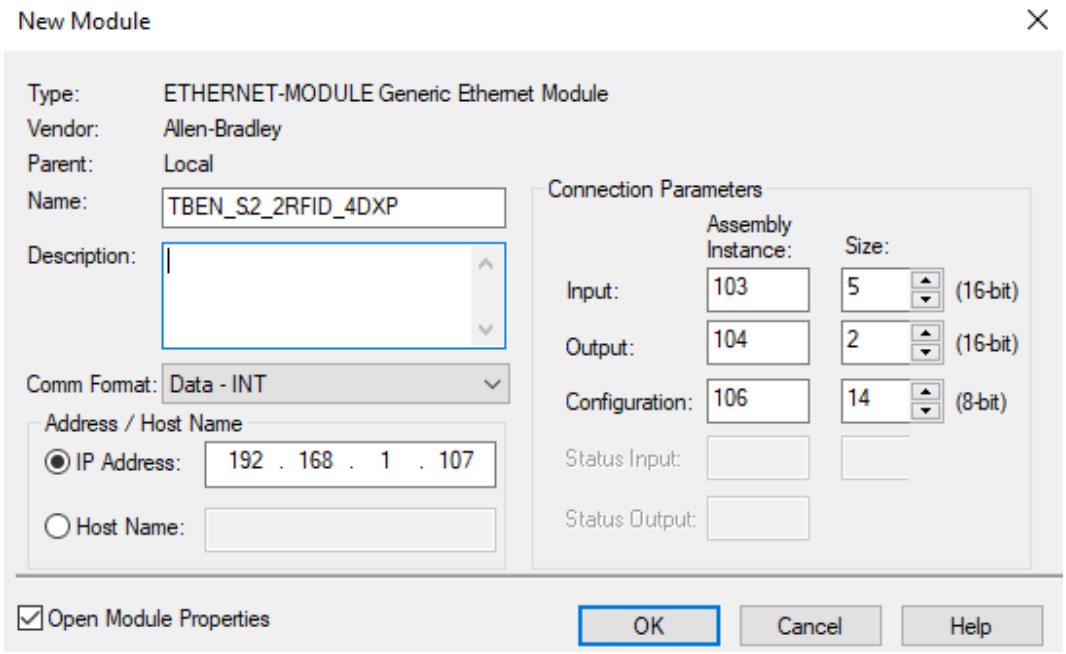


Fig. 63: Configuring the configuration assembly in RSLogix

Activating QuickConnect via the Class Instance Attribute

- Activate QuickConnect via Class Instance Attribute as follows:

Class	Instance	Attribute	Value
0xF5	0x01	0x0C	0: Deactivated (default) 1: Activated

Activating QuickConnect via the web server

- Click **Parameter** → **Activate QuickConnect** → **Yes**.

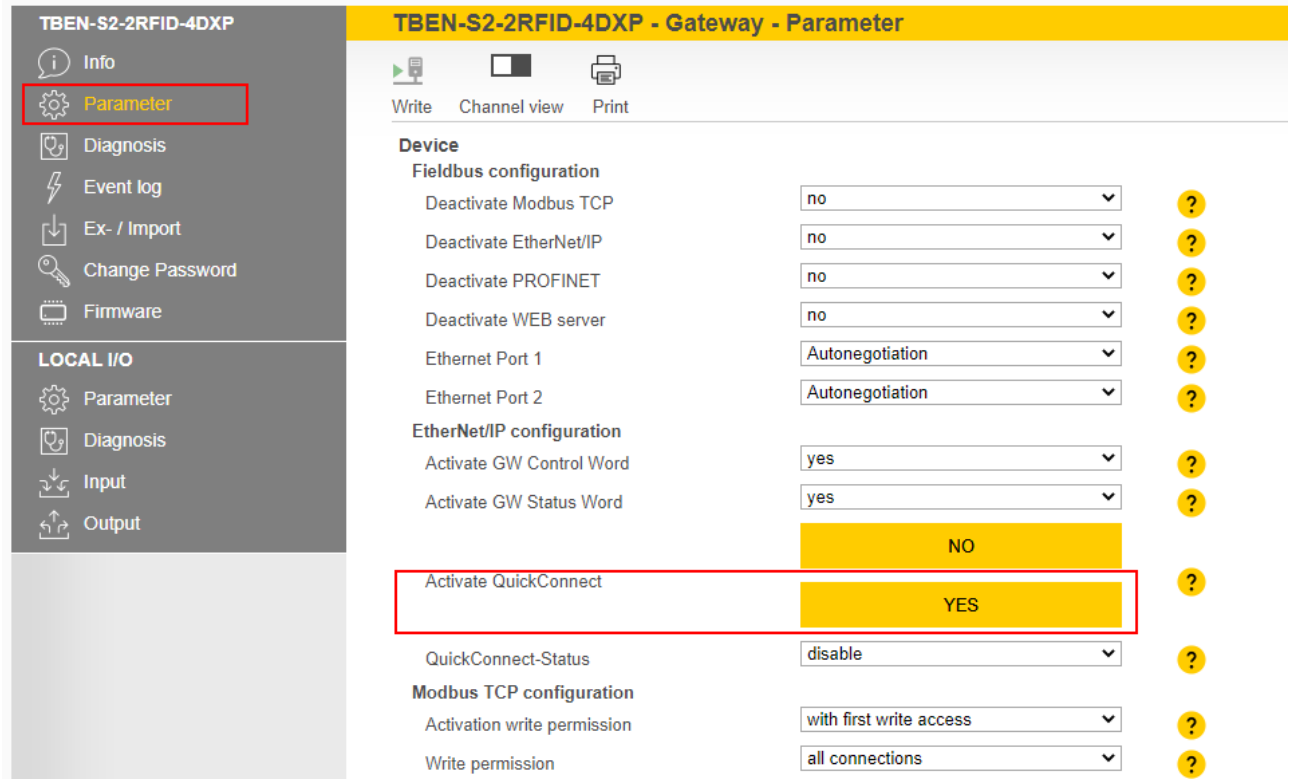


Fig. 64: Setting QuickConnect in the web server

⇨ The settings required for QuickConnect are found under port properties. Unsaved changes are indicated by the pen icon.

▶ Click **Write**.

⇨ The changed parameters are written to the device.

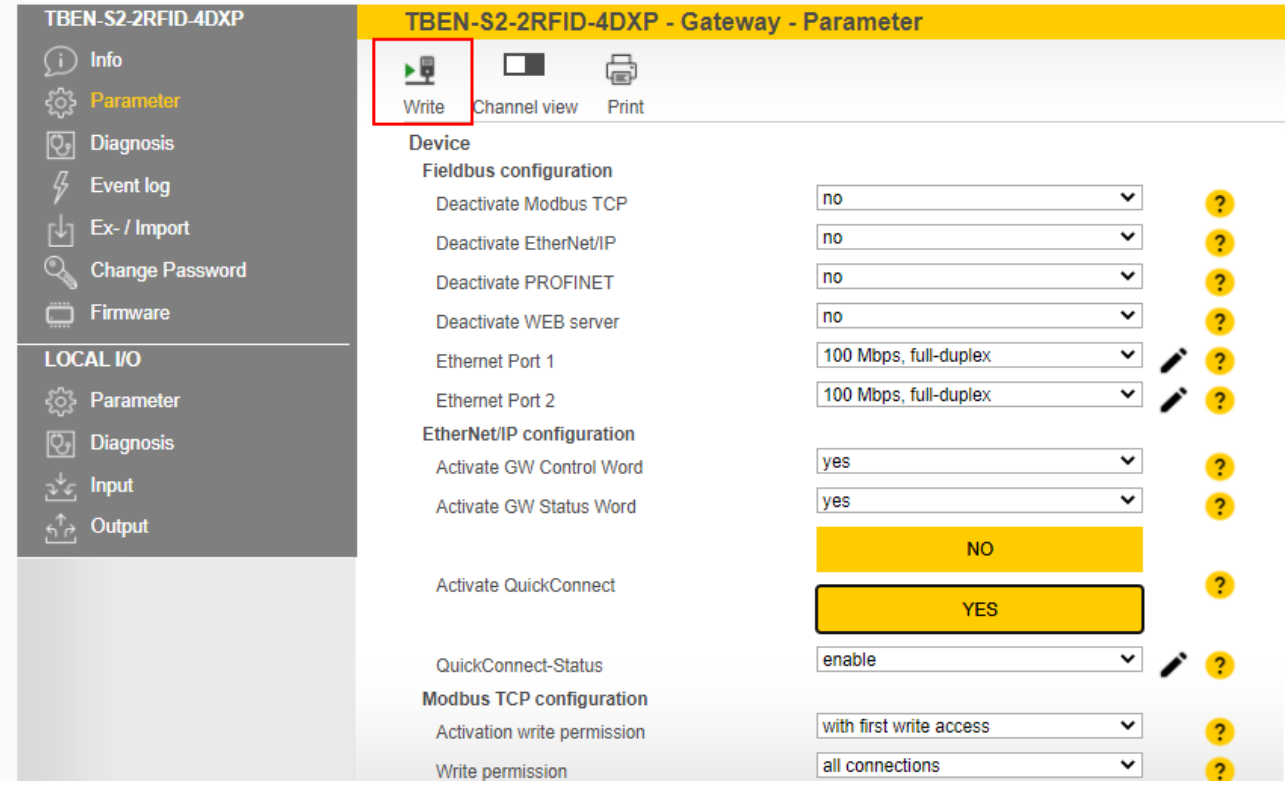


Fig. 65: Activating QuickConnect in the web server

7.4 Connecting the device to a PROFINET master using the TIA Portal

The following example describes the connection of the device to a Siemens controller in PROFINET with the SIMATIC STEP7 Professional V13 programming software (TIA Portal).

Hardware used

This example uses the following hardware components:

- Siemens S7-1500 controller
- TBEN-S2-2RFID-4DXP block module
- HF read/write head TN-Q80-H1147

Software used

This example uses the following software:

- SIMATIC STEP7 Professional V13 (TIA Portal)
- GSDML file for TBEN-S2-2RFID-4DXP (download free of charge from www.turck.com)

Requirements

- The programming software has been opened.
- A new project has been created.
- The controller has been added to the project.

7.4.1 Installing a GSDML file

The GSDML file is available free of charge for download from www.turck.com.

- Include a GSDML file: Click **Options** → **Manage device description files (GSD)**.

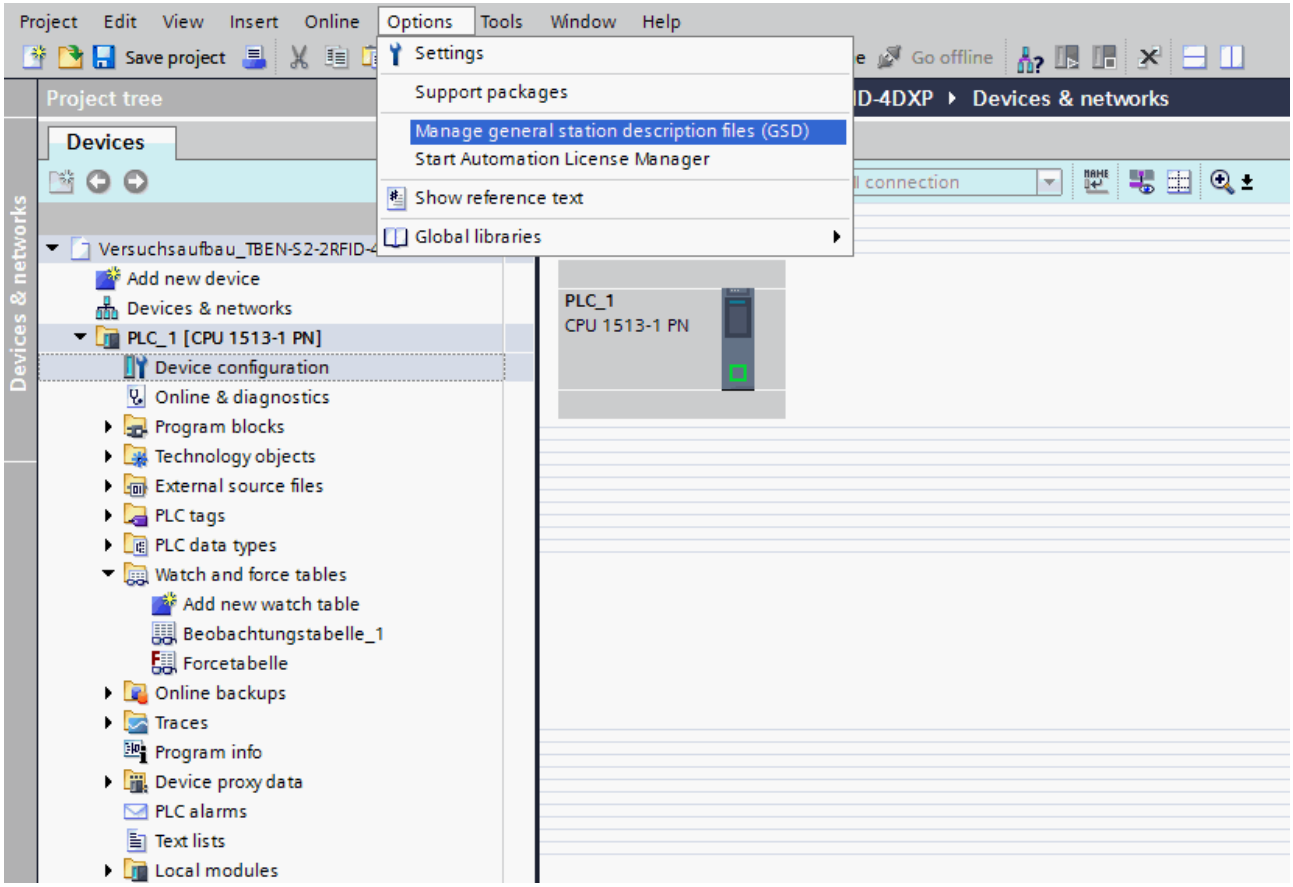


Fig. 66: Include the GSDML file

- ▶ Install a GSDML file: Enter the memory location of the GSDML file and click **Install**.
- ⇨ The device is entered in the hardware catalog of the programming software.

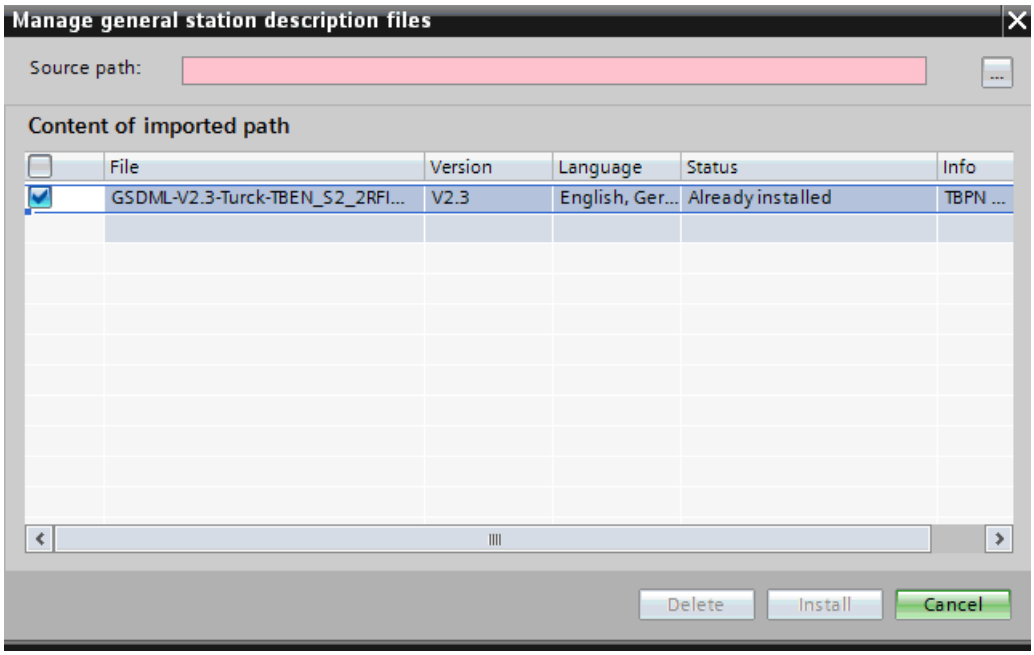


Fig. 67: Installing a GSDML file

7.4.2 Connecting the device with the controller

- Select the RFID interface from the hardware catalog and drag it to the hardware window.
- Connect the device with the controller in the hardware window.

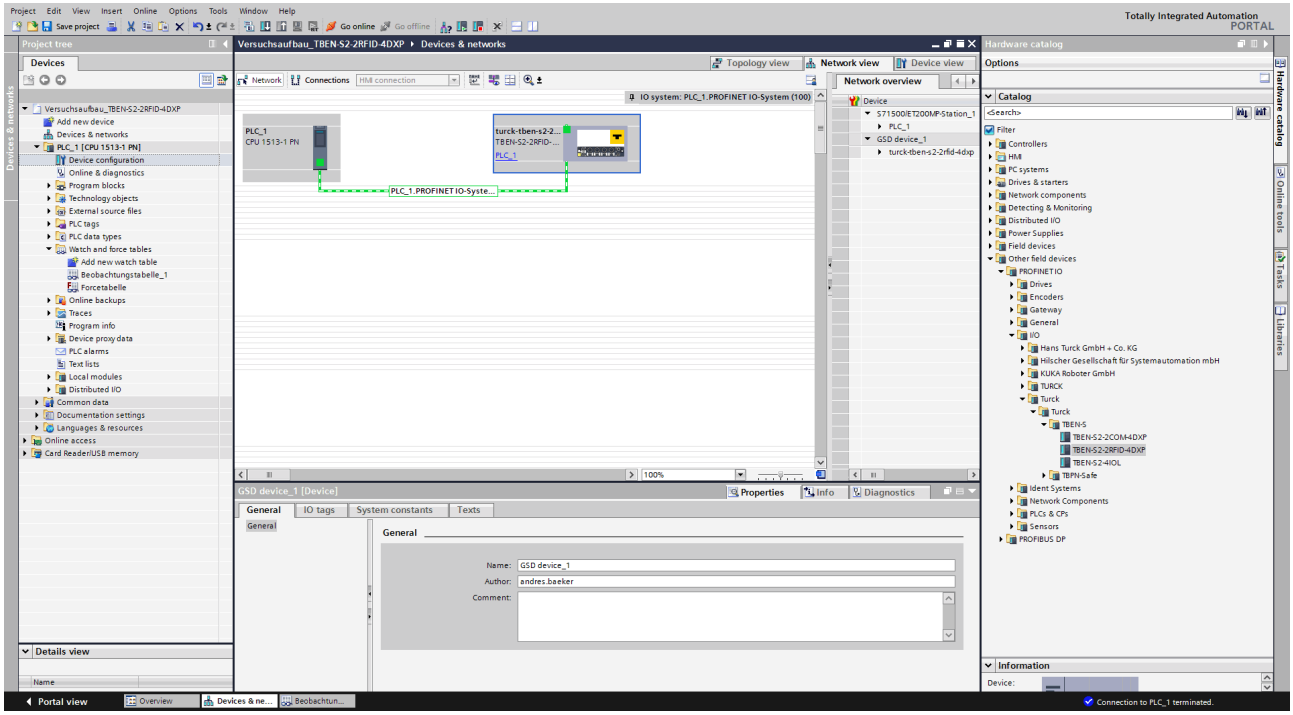


Fig. 68: Connecting the device with the controller

7.4.3 Assigning the PROFINET device name

- Select **Online accesses → Online & diagnostics.**
- Select **Functions → Assign PROFINET device name.**
- Assign the required PROFINET device name.

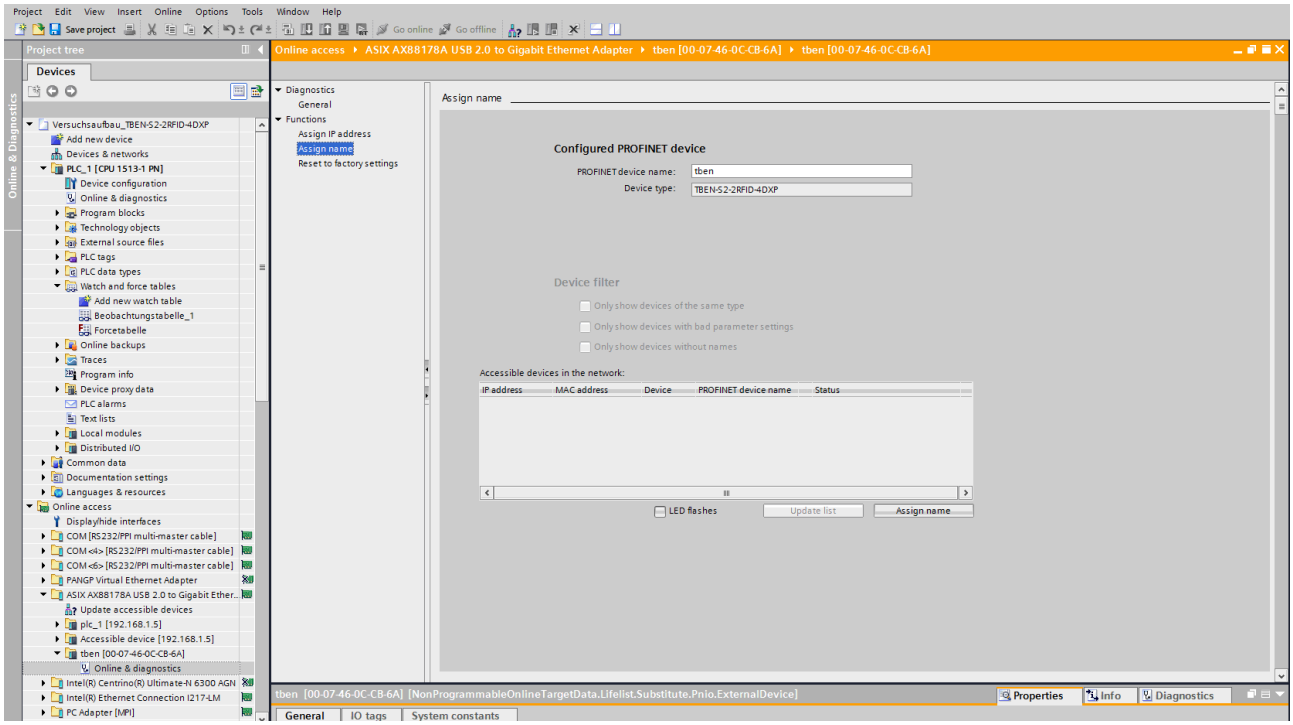


Fig. 69: Assigning the PROFINET device name

7.4.4 Setting the IP address in the TIA Portal

- Select **Device View** → **Properties** tab → **Ethernet addresses**.
- Assign the required IP address.

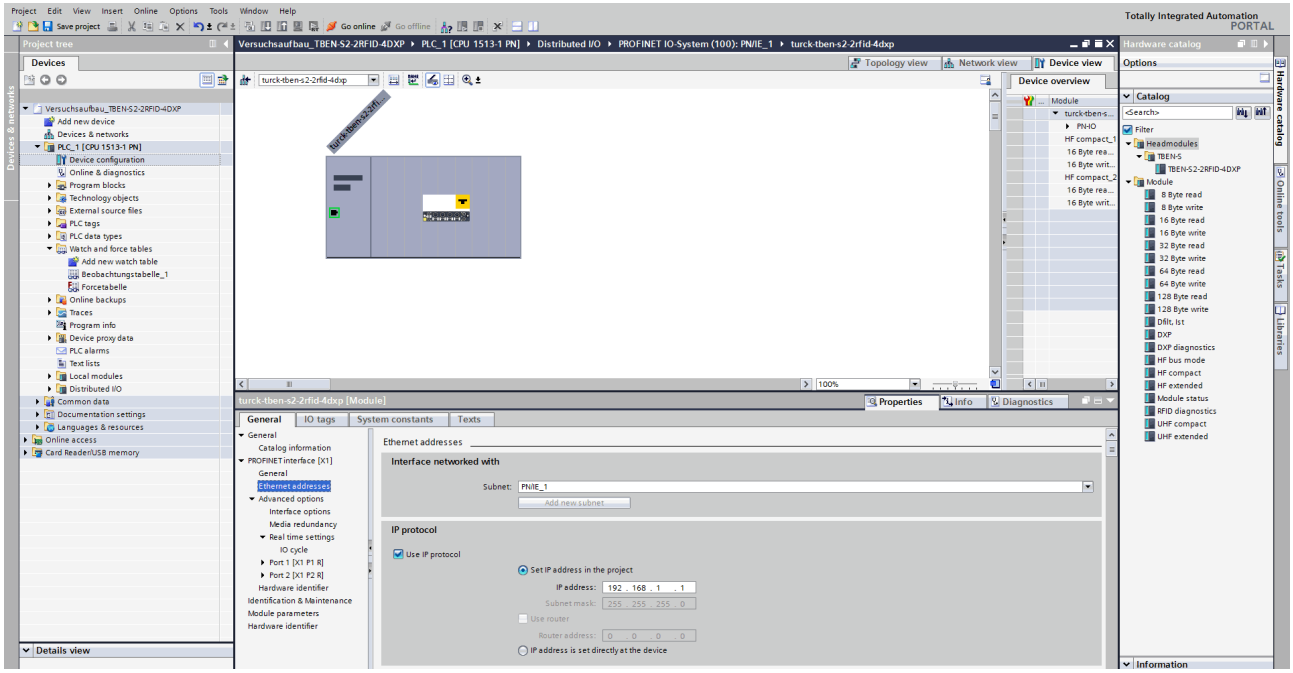


Fig. 70: Assigning the IP address

7.4.5 Connecting the device online with the controller

- ▶ Start online mode (connect online).
- ⇨ The device was successfully connected to the controller.

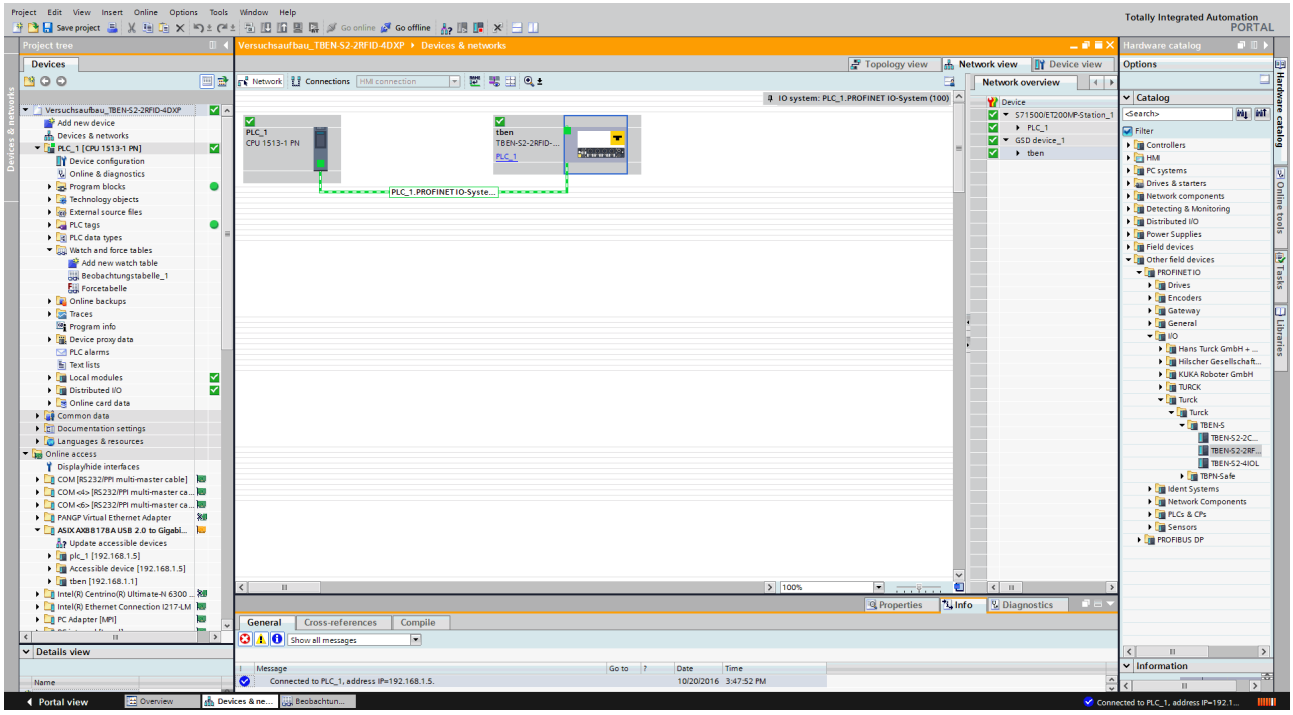


Fig. 71: Online mode

7.4.6 Setting module parameters

- Choose **Device view** → **Device overview**.
- Select the module to be set.
- Click **Properties** → **General** → **Module parameters**.
- Set the **Station parameters**.

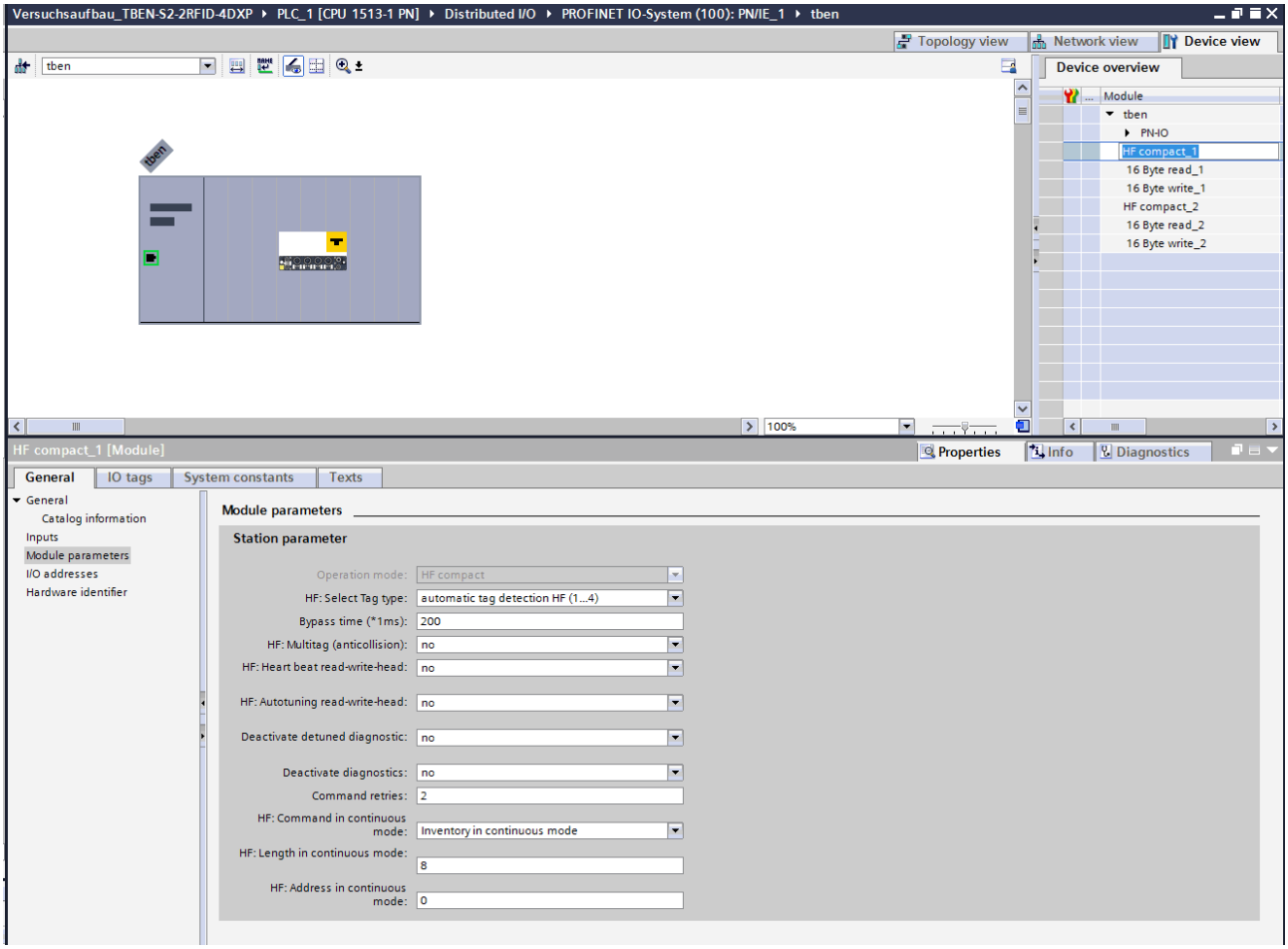


Fig. 72: Setting module parameters

7.4.7 PROFINET mapping

The PROFINET mapping is the same as the data mapping described in the chapter “Setting”.

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:

Slot	Channel	Parameter data		Process input data		Process output data		Diagnostic data	
		Bytes	Meaning	Bytes	Meaning	Bytes	Meaning		
0	GW	0…1	Parameters GW					0…1	Diagnostics GW
1	0	0…31	Parameters RFID	0…23	Input data RFID	0…23	Output data RFID	0…36	RFID diagnostics
2		32…33	Length of read data	24…151	Read data				
3		34…35	Length of write data			24…151	Write data		
4	1	36…67	Parameters RFID	152…175	Input data RFID	152…175	Output data RFID	36…76	RFID diagnostics
5		68…69	Length of read data	176…303	Read data				
6		70…71	Length of write data			176…303	Write data		
7	0			304…339	Diagnostics RFID channel 0				
	1			340…375	Diagnostics RFID channel 1				
8	4…7	72…73	Parameters DXP	376…377	Input data DXP	304…305	Output data DXP	72…73	DXP diagnostics
9	4…7			378…379	Error messages DXP				
10	4	74…75	Extended DXP settings						
11	5	76…77	Extended DXP settings						
12	6	78…79	Extended DXP settings						
13	7	80…81	Extended DXP settings						
14	Module status			380…381	Module status				

8.1 RFID channels — parameter data

Byte no.	Bit							
	7	6	5	4	3	2	1	0
Channel 0								
0	Operation mode (OMRFID)							
1	Select tag type (TAGTYPE)							
2	Bypass time (BYPASS)							
3								
4	AT	TERM	HB	ANTI				
5	DDI							DXD
6	HFIDLEMODE							
7	Reserved							
8	Command retries (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…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 read data (RDS)							
33								
34	Length of write data (WDS)							
35								
Channel 1								
36…71	Assignment identical to channel 0							

8.1.1 Meaning of the parameter bits

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

Designation	Meaning
Operation 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 HF tag detection** 1: NXP Icode SLIX 2: Fujitsu MB89R118 3: TI Tag-it HF-I Plus 4: Infineon SRF55V02P 5: NXP Icode SLIX-S 6: Fujitsu MB89R119 7: TI Tag-it HF-I 8: Infineon SRF55V10P 9: Reserved 10: Reserved 11: NXP Icode SLIX-L 12: Fujitsu MB89R112 13: EM4233SLIC Read/write heads with firmware from Vx.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
Bypass time (BYPASS)	Bypass time in ms, adjustable from 4…1020 ms, default setting: 200 ms
HF: Automatic tuning of read/write head (AT)	**0: No (automatic tuning off)** 1: Yes (automatic tuning on)
Termination active (TERM)	**0: Yes (bus terminating resistor activated)** 1: No (bus terminating resistor deactivated) In HF bus mode the bus terminating resistor is activated by default.
HF: Heartbeat read/write head (HB)	The device confirms its operational readiness with a signal 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: No (heartbeat read/write head off)** 1: Yes (heartbeat read/write head on)
HF: Multitag (ANTI)	**0: No (multitag mode off)** 1: Yes (multitag mode on)
Deactivate all Diags (DDI)	**0: No (all diagnostic messages on)** 1: Yes (all diagnostic messages off)

Designation	Meaning
Deactivate diagnostic HF read/ write head tuning (DXD)	**0: No (diagnostic messages of the read/write head on)** 1: Yes (diagnostic messages of the read/write head off)
HF: Idle mode (HFIDLEMODE)	Defines which data is to be displayed in idle mode (not available in the EDS file) **0: UID** 1: 8 bytes of user memory 2: UID and 8 bytes of user memory 3: UID and 64 bytes of user memory 4: Deactivated
Command repetitions in the event of a fault (CRET)	Number of command repetitions after a fault signal, 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 UID or the USER memory area on the tag to be read or written, default setting: **0**
HF bus mode: Activate read/ write head … (XCVR0…XCVR31)	**0: No (deactivate read/write head)** 1: Yes (activate read/write head) In HF bus mode all connected and addressed read/write heads are deactivated by default and must be activated in the parameters.
Length of read data (RDS)	Size of the read data, default setting depends on the selected interface and fieldbus
Length of write data (WDS)	Size of the write 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. 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
With firmware version of the interface up to 3.3.5.0, tags are only displayed in the web server, in the associated DTM as well as in the catalog and GSDML files that were detected by read/write heads with a firmware version up to Vx.90. The tags shown in the table below can be detected irrespective of this.

If a tag is selected that 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 or when executing inventory commands in multitag applications if the read/write head detects the tags automatically.

Tag	Firmware status Read/write head	Firmware status Interface	Selectable	Automatic detection possible	Indicated in the web server, DTM, GSDML and catalog files
1: NXP Icode SLIX	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	x	x
2: Fujitsu MB89R118	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	x	x
3: TI Tag-it HF-I Plus	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	x	x
4: Infineon SRF55V02P	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	x	x
5: NXP Icode SLIX-S	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	–	x
6: Fujitsu MB89R119	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	–	x
7: TI Tag-it HF-I	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	–	x
8: Infineon SRF55V10P	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	–	x

Tag	Firmware status Read/write head	Firmware status Interface	Selectable	Automatic detection possible	Indicated in the web server, DTM, GSDML and catalog files
11: NXP Icode SLIX-L	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	–	x
12: Fujitsu MB89R112	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	–	x
13: EM4233SLIC	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	x	x	x
	≤ Vx.90	All	x	–	x
14: NXP SLIX2	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	–	x	–
	≤ Vx.90	All	–	–	–
15: TI Tag-it HFI Pro	≥ Vx.91	≥ V3.4.1.0	–	x	x
	≥ Vx.91	≤ V3.3.5.0	–	x	–
	≤ Vx.90	All	–	–	–
16: Turck Sensor Tag	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	–	x	–
	≤ Vx.90	All	–	–	–
17: Infineon SRF55V02S	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	–	x	–
	≤ Vx.90	All	–	–	–
18: Infineon SRF55V10S	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	–	x	–
	≤ Vx.90	All	–	–	–
19: EM4233	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	–	x	–
	≤ Vx.90	All	–	–	–
20: EM4237	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	–	x	–
	≤ Vx.90	All	–	–	–
21: EM4237 SLIC	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	–	x	–
	≤ Vx.90	All	–	–	–
22: EM4237 SLIX	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	–	x	–
	≤ Vx.90	All	–	–	–
23: EM4033	≥ Vx.91	≥ V3.4.1.0	x	x	x
	≥ Vx.91	≤ V3.3.5.0	–	x	–
	≤ Vx.90	All	–	–	–

8.1.3 HF applications — setting the bypass 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 bypass time is the time between the dropout and the return to the detection range. The **Bypass time** parameter takes up one word in the parameter data image and is stated in ms.

The bypass time can be set between 4…1020 ms. The bypass 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:

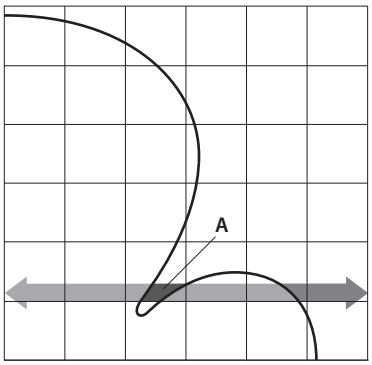


Fig. 73: Detection range of a read/write head

Retaining the default setting

The default setting for the bypass 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 bypass time. If it is not possible to adjust the bypass time, reduce the speed or data volume.

The information “Recommended distance” and “Maximum distance” is provided in the product-specific data sheet.

Adapting the bypass time to the application

- Measure the required bypass 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 bypass time.

8.1.4 HF applications — setting HF bus mode

NOTE
In HF bus mode a command is always 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. Continuous HF bus mode supports the HF read/write heads from firmware version Vx.93. 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 bus address of the read/write head visible on the device. The label on the cable can be used to mark the address on the read/write head. The appropriate labels can be ordered with ID 6936206.

Read/write heads with the default bus address 68 can be addressed automatically. For this to happen, 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 one after the other in a line.
⇨ Addresses are allocated in ascending order to the read/write heads in the order in which the heads were connected. The lowest address is automatically assigned to the next read/write head with the default address 68 that is connected.
⇨ The addressing is successful if the LED of the read/write head is permanently lit.

Manually addressing read/write heads — setting the HF read/write head address command

NOTE
Turck recommends making the bus address of the read/write head visible on the device. The label on the cable can be used to mark the address on the read/write head. The appropriate labels can be ordered with ID 6936206.

For information on addressing the read/write heads via the RFID interface with the **Set HF read/write head address** command see page [▷ 144]. 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.

NOTE
For manual addressing, only one read/write head may be connected to each RFID channel at a time.

▶ Activate the required read/write heads in the parameter data via the appropriate XCVR bit.

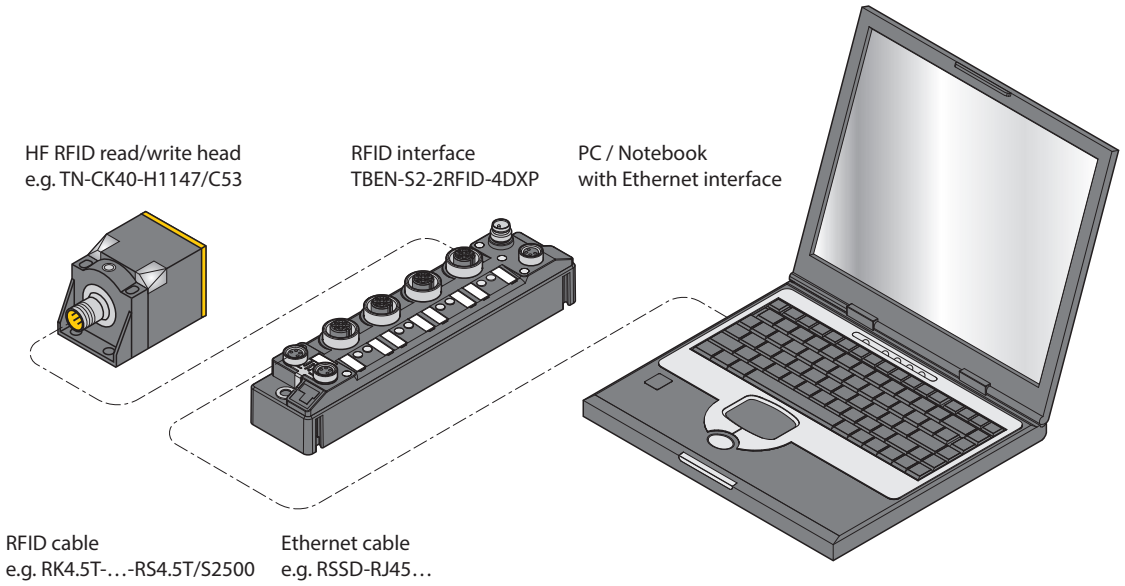


Fig. 74: Connecting the read/write head to a PC via the RFID interface

Manually addressing read/write heads using the Turck Service Tool

NOTE
Turck recommends making the bus address of the read/write head visible on the device. The label on the cable can be used to mark the address on the read/write head. The appropriate labels can be ordered with ID 6936206.

The following accessories are required to address the read/write heads in HF bus mode via the Turck Service Tool. Accessories are not supplied with the device and must be ordered separately.

- Suitable interface converter, e.g. STW-RS485-USB (ID 7030354)
- Suitable power supply unit, e.g. STW-RS485-USB-PS (ID 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.

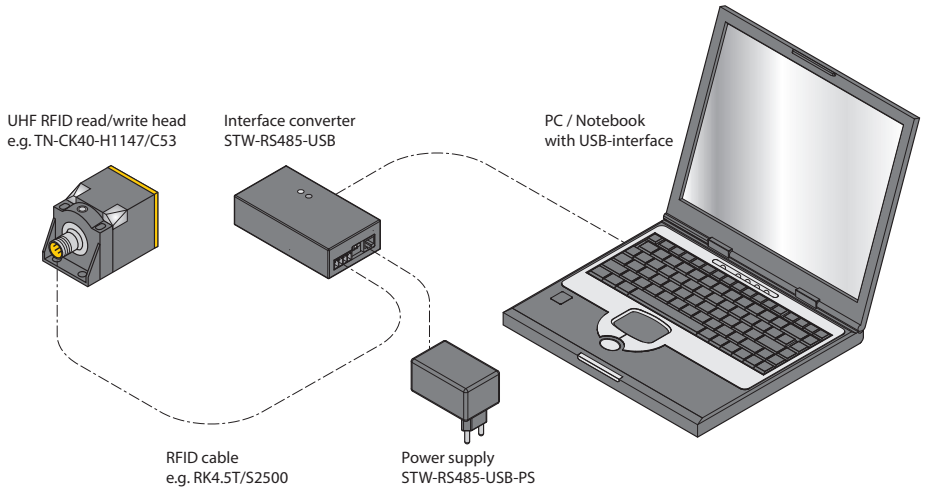


Fig. 75: Connecting the read/write head to a PC via the interface converter

- ▶ Open the Turck Service Tool.
- ▶ Click **Actions** or press [F4].
- ▶ Click **Set HF RFID reader bus address**.

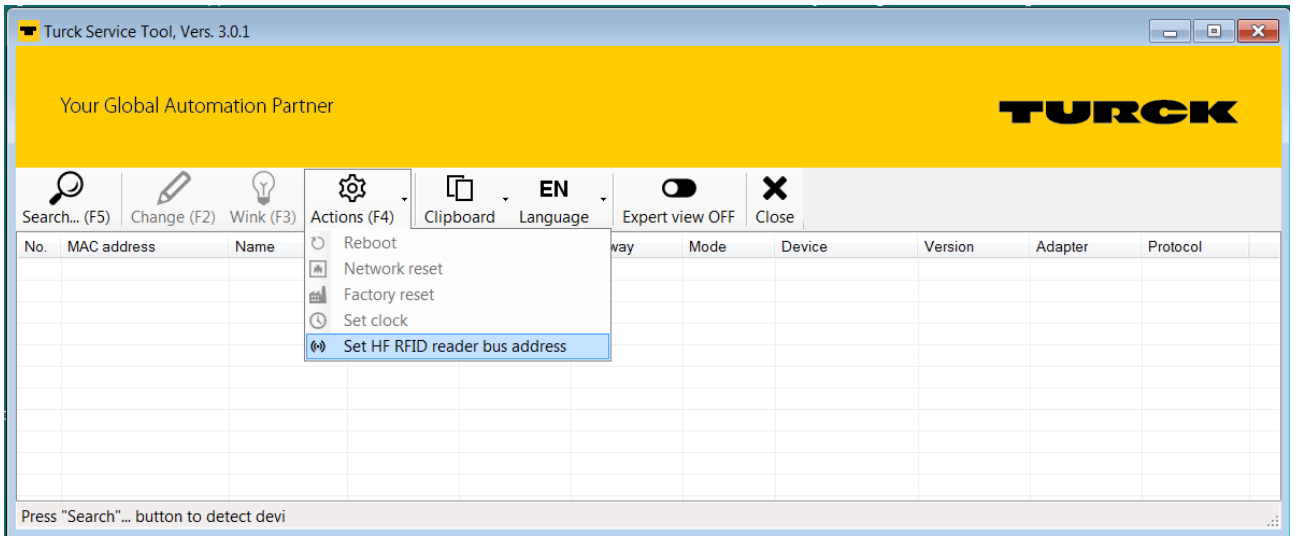


Fig. 76: Selecting a function — set HF RFID reader bus address

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**.

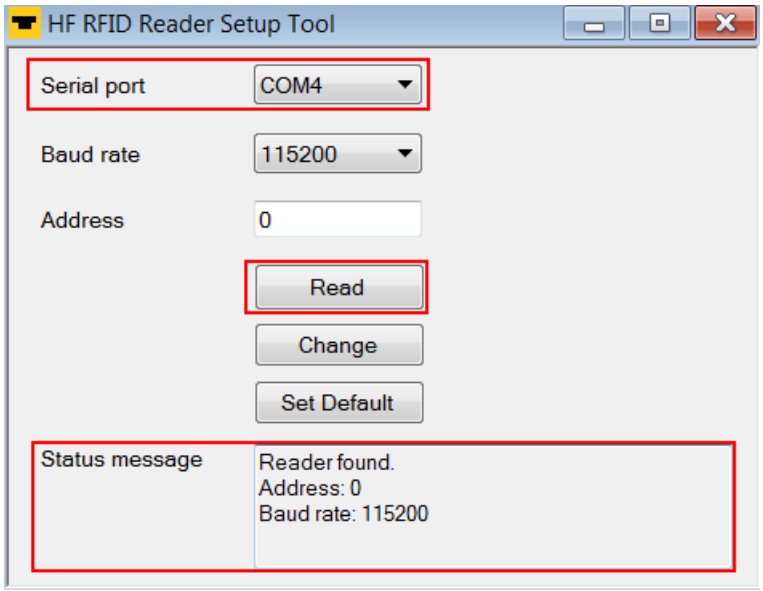


Fig. 77: Window — HF RFID Reader Setup Tool

- ▶ Enter the required **Address**.
- ▶ Click **Change**.
- ⇨ The new set address is displayed in the **Status message**.

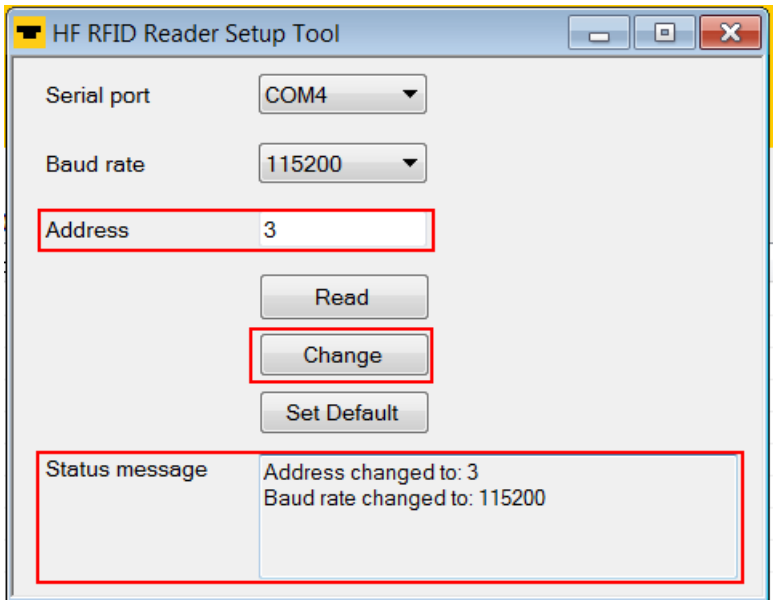


Fig. 78: Changing the read/write head address

- ▶ Activate the required read/write heads in the parameter data via the appropriate XCVR bit.

8.1.5 UHF applications — setting Continuous Presence Sensing Mode

- ▶ Set adaptions to the presence sensing behavior in the DTM.
- ▶ Optional: Set the grouping of the EPCs via the **Start address** parameter:
  0: Grouping inactive
  1: Grouping active (same EPC is not detected, only the counter in the header is incremented)
- ▶ Execute the **Continuous Presence Sensing Mode** command.
- ⇨ The UHF-Reader head is switched to Presence Sensing Mode and sends all received data to the interface as soon as at least one tag is present in the detection range.
- ⇨ The data received by the UHF reader is stored in the FIFO memory of the interface.
- ▶ Send the **Idle** command (0x0000) 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 of the interface to the controller, execute the **Read buffer (Cont. mode)** command (0x0011). 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, the data is no longer used for grouping.

NOTE
With active grouping: Do not read data from the buffer until the number of available bytes is stable. If stable data has been collected, the command can be ended by a reset as the grouping is no longer based on the collected data, meaning that old EPCs are detected again.

- ▶ Do not perform a reset until the data has been read successfully from the buffer.
- ▶ To stop Continuous Presence Sensing Mode and clear the FIFO memory of the interface, send the **Reset** command (0x0800).

8.1.6 UHF applications — transferring reader settings

The backup function enables the settings of a UHF reader to be transferred, e.g. when a device is replaced.

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

8.2 RFID channels — process input data

Process input data — HF compact and UHF compact modes

Byte no.		Bit							
PROFINET	**Modbus EtherNet/ IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Channel 0									
n + 0	0	Response code (RESC) incl. ERROR and BUSY							
n + 1	1								
n + 2	2	Loop counter for rapid processing (RCNT)							
n + 3	3	Reserved							
n + 4	4	TNC1	TRE1	PNS1	XD1				TP
n + 5	5							CMON	TON
n + 6	6	Length (LEN)							
n + 7	7								
n + 8	8	Error code (ERRC)							
n + 9	9								
n + 10	10	Tag counter (TCNT)							
n + 11	11								
n + 12	24	Read data Byte 0							
n + 13	25	Read data Byte 1							
n + 14	26	Read data Byte 2							
n + 15	27	Read data Byte 3							
n + 16	28	Read data Byte 4							
n + 17	29	Read data Byte 5							
n + 18	30	Read data Byte 6							
n + 19	31	Read data Byte 7							
…	…	…							
n + 139	151	Read data Byte 127							
Channel 1									
n + 140… 279	152…303	Assignment identical to channel 0							

Process input data — HF extended and UHF extended modes

Byte no.		Bit							
PROFINET	**Modbus EtherNet/ IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Channel 0									
n + 0	0	Response code (RESC) incl. ERROR and BUSY							
n + 1	1								
n + 2	2	Loop counter for rapid processing (RCNT)							
n + 3	3	Reserved							
n + 4	4	TNC1	TRE1	PNS1	XD1				TP
n + 5	5							CMON	TON
n + 6	6	Length (LEN)							
n + 7	7								
n + 8	8	Error code (ERRC)							
n + 9	9								
n + 10	10	Tag counter (TCNT)							
n + 11	11								
n + 12	12	Data (bytes) available (BYFI)							
n + 13	13								
n + 14	14	Read fragment No. (RFN)							
n + 15	15	Write fragment No. (WFN)							
n + 16	16	Reserved							
n + 17	17	Reserved							
n + 18	18	Reserved							
n + 19	19	Reserved							
n + 20	24	Read data Byte 0							
n + 21	25	Read data Byte 1							
n + 22	26	Read data Byte 2							
n + 23	27	Read data Byte 3							
n + 24	28	Read data Byte 4							
n + 25	29	Read data Byte 5							
n + 26	30	Read data Byte 6							
n + 27	31	Read data Byte 7							
…	…	…							
n + 147	151	Read data Byte 127							
Channel 1									
n + 148… 295	152…303	Assignment identical to channel 0							

Process input data — HF bus mode

Byte no.		Bit							
PROFINET	**Modbus EtherNet/IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Channel 0									
n + 0	0	Response code (RESC) incl. ERROR and BUSY)							
n + 1	1								
n + 2	2	Loop counter for rapid processing (RCNT)							
n + 3	3	Reserved							
n + 4	4	TNC1	TRE1	PNS1	XD1				TP
n + 5	5							CMON	TON
n + 6	6	Length (LEN)							
n + 7	7								
n + 8	8	Error code (ERRC)							
n + 9	9								
n + 10	10	Tag counter (TCNT)							
n + 11	11								
n + 12	12	Data (bytes) available (BYFI)							
n + 13	13								
n + 14	14	Read fragment No. (RFN)							
n + 15	15	Write fragment No. (WFN)							
n + 16	16	Reserved							
n + 17	17	Reserved							
n + 18	18	Reserved							
n + 19	19	Reserved							
n + 20	20	TP8	TP7	TP6	TP5	TP4	TP3	TP2	TP1
n + 21	21	TP16	TP15	TP14	TP13	TP12	TP11	TP10	TP9
n + 22	22	TP24	TP23	TP22	TP21	TP20	TP19	TP18	TP17
n + 23	23	TP32	TP31	TP30	TP29	TP28	TP27	TP26	TP25
n + 24	24	Read data Byte 0							
n + 25	25	Read data Byte 1							
n + 26	26	Read data Byte 2							
n + 27	27	Read data Byte 3							
n + 28	28	Read data Byte 4							
n + 29	29	Read data Byte 5							
n + 30	30	Read data Byte 6							
n + 31	31	Read data Byte 7							
…	…	…							
n + 151	151	Read data Byte 127							
Channel 1									
n + 152… 303	152…303	Assignment identical to channel 0							

8.2.1 Meaning of the status bits

Designation	Meaning
Response code (RESC)	Display of the last command executed Contains in bit 14: ERROR ■ 0: No (the last command was executed successfully) ■ 1: Yes (an error occurred during command execution.) Contains in bit 15: BUSY ■ 0: No (execution of a command completed.) ■ 1: Yes (command active but not yet completed; system is waiting for execution, e.g. on tag within the detection range)
Loop counter for rapid processing (RCNT)	Output of the loop counter for the selected command code
Expected read/write head not connected (TNC1)	0: No (read/write head expected by system connected) 1: Yes (read/write head expected by the system not connected (HF bus mode: At least one read/write head expected by system not connected)
Error reported by read/write head (TRE1)	0: No (no error) 1: Yes (fault signal of the read/write head) (HF bus mode: fault signal from at least one read/write head)
Parameter not supported by read/write head (PNS1)	0: No (no error) 1: Yes (parameter not supported by read/write head) (HF bus mode: Parameter not supported by at least one read/write head)
Read/write head not tuned (XD1)	0: No (no error) 1: Yes (read/write head not tuned) (HF bus mode: at least one of the read/write heads not tuned)
Tag in the detection range of read/write head (TP)	0: No (no tag in the detection range of the read/write head) 1: Yes (tag in the detection range of the read/write head) (HF bus mode: tag in the detection range of at least one read/write head)
HF read/write head switched on (TON)	0: No (read/write head switched off) 1: Yes (read/write head switched on (HF bus mode: at least one read/write head switched on)
Continuous (Presence Sensing) Mode active (CMON)	0: No (Continuous Mode not active) 1: Yes (Continuous Mode active)
Length (LEN)	Display of the length of the read 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, the rising edges of the tags that are read by an Inventory command are counted. In HF single-tag applications, all tags that are detected by the read/write head are counted. A tag that moves along the read/write head is not counted again if it only leaves the detection range momentarily and re-enters it (within the set bypass time). If a tag continuously remains within the detection range, it is also only counted once. Exceptions: Continuous Mode in bus mode is active or Continuous Mode with start address = 3 is active. The tag counter is reset by the following commands: ■ Inventory (exception: HF single-tag applications) ■ Continuous Mode ■ Continuous Presence Sensing Mode ■ Reset

Designation	Meaning
Data (bytes) available (BYFI) (available with HF Advanced and UHF Advanced only)	Shows the number of bytes in the FIFO memory of the interface. Ascending: new data read by a tag or received by the device Descending: command execution completed Fault signal 0xFFFF: memory overfilled, risk of loss of new data
Read fragment No. (RFN) (available with HF Advanced and UHF Advanced only)	If the data to be read exceeds the size of the read data memory, the data is split into max. 256 fragments. The fragments are numbered consecutively from 1 to 255. From fragment number 256, numbering begins again at 1. The sending of a fragment is confirmed by the device if the read fragment No. appears in the process input data. After the confirmation, the next fragment is read. 0: No fragmentation In idle mode, the size of the fragments is specified. When a read command is issued, the current fragment number of the read data is indicated.
Write fragment No. (WFN)	If the data that is to be written exceeds the size of the write data memory, the data is split into max. 256 fragments. The fragments are numbered consecutively from 1 to 255. From fragment number 256, numbering begins again at 1. The sending of a fragment is confirmed by the device if the write fragment No. appears in the process input data. Following confirmation, the next fragment is written. 0: No fragmentation In idle mode, the size of the fragments is specified. When a write command is issued, the current fragment number of the written data is indicated.
TP1…TP32	Tag in the detection range of the connected read/write head (available in HF bus mode only)
Read data	User-defined read data

8.2.2 Tag in detection range (TP) — using bit or pre-loading the command

The **Tag in detection range** bit is set automatically if a read/write device detects a tag.

Apart from with some variants of Continuous Mode, the bit in HF applications is set by default in all operation modes as well as in idle mode.

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 HF read/write head detects a new tag in the detection range, the **Tag present bit** (TP) and the data (UID and/or read data) are set via the **HF: Idle mode** (UID and/or read data) are displayed simultaneously. If two tags are detected in quick succession, the TP bit may remain set. The data of the second tag (UID and/or read data) is displayed.

8.3 RFID channels — process output data

Process output data — HF compact and UHF compact operating modes

Byte no.		Bit							
PROFINET	**Modbus EtherNet/ IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Channel 0									
n + 0	0	Command code (CMDC)							
n + 1	1								
n + 2	2	Loop counter for rapid processing (RCNT)							
n + 3	3	Memory area (DOM) — only available with UHF applications							
n + 4	4	Start address (ADDR)							
n + 5	5								
n + 6	6								
n + 7	7								
n + 8	8	Length (LEN)							
n + 9	9								
n + 10	10	Length of UID/EPC (SOUID)							
n + 11	11	Reserved							
n + 12	24	Write data Byte 0							
n + 13	25	Write data Byte 1							
n + 14	26	Write data Byte 2							
n + 15	27	Write data Byte 3							
n + 16	28	Write data Byte 4							
n + 17	29	Write data Byte 5							
n + 18	30	Write data Byte 6							
n + 19	31	Write data Byte 7							
…	…	…							
n + 139	151	Write data Byte 127							
Channel 1									
n + 140… 279	152…303	Assignment identical to channel 0							

Process output data — HF Advanced and UHF Advanced operating modes

Byte no.		Bit							
PROFINET	**Modbus EtherNet/IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Channel 0									
n + 0	0	Command code (CMDC)							
n + 1	1								
n + 2	2	Loop counter for rapid processing (RCNT)							
n + 3	3	Memory area (DOM) — only available with UHF applications							
n + 4	4	Start address (ADDR)							
n + 5	5								
n + 6	6								
n + 7	7								
n + 8	8	Length (LEN)							
n + 9	9								
n + 10	10	Length of UID/EPC (SOUID)							
n + 11	11	Reserved							
n + 12	12	Timeout (TOUT)							
n + 13	13								
n + 14	14	Read fragment No. (RFN)							
n + 15	15	Write fragment No. (WFN)							
n + 16	16	Reserved							
n + 17	17	Reserved							
n + 18	18	Reserved							
n + 19	19	Reserved							
n + 20	24	Write data Byte 0							
n + 21	25	Write data Byte 1							
n + 22	26	Write data Byte 2							
n + 23	27	Write data Byte 3							
n + 24	28	Write data Byte 4							
n + 25	29	Write data Byte 5							
n + 26	30	Write data Byte 6							
n + 27	31	Write data Byte 7							
…	…	…							
n + 147	151	Write data Byte 127							
Channel 1									
n + 148… 295	152…303	Assignment identical to channel 0							

Process output data — HF bus mode operating mode

Byte no.		Bit							
PROFINET	**Modbus EtherNet/IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Channel 0									
n + 0	0	Command code (CMDC)							
n + 1	1								
n + 2	2	Loop counter for rapid processing (RCNT)							
n + 3	3	Memory area (DOM) — only available with UHF applications							
n + 4	4	Start address (ADDR)							
n + 5	5								
n + 6	6								
n + 7	7								
n + 8	8	Length (LEN)							
n + 9	9								
n + 10	10	Length of UID/EPC (SOUID)							
n + 11	11	Reserved							
n + 12	12	Timeout (TOUT)							
n + 13	13								
n + 14	14	Read fragment No. (RFN)							
n + 15	15	Write fragment No. (WFN)							
n + 16	16	Reserved							
n + 17	17	Reserved							
n + 18	18	Reserved							
n + 19	19	Reserved							
n + 20	20	Read/write head address (ANTN) — only available with HF applications							
n + 21	21	Reserved							
n + 22	22	Reserved							
n + 23	23	Reserved							
n + 24	24	Write data Byte 0							
n + 25	25	Write data Byte 1							
n + 26	26	Write data Byte 2							
n + 27	27	Write data Byte 3							
n + 28	28	Write data Byte 4							
n + 29	29	Write data Byte 5							
n + 30	30	Write data Byte 6							
n + 31	31	Write data Byte 7							
…	…	…							
n + 151	151	Write data Byte 127							
Channel 1									
n + 152… 303	152…303	Assignment identical to channel 0							

8.3.1 Meaning of the command bits

Description	Meaning
Command code (CMDC)	Entering of the command code
Loop counter for rapid processing (LCNT)	Loop counter for repeated processing of a command 0: Loop counter off
Memory area (DOM) — usable for UHF applications only (with HF applications, the setting has no effect)	0: Kill password 1: EPC 2: TID 3: USER area 4: Access password 5: PC (defines the response length of the EPC)
Start address (ADDR)	Specification of the address in bytes from which a command is to be executed in the memory of the tag. Can be used as an alternative to activating the grouping.
Length (LEN)	Entering the length of the data to be read or written
Length of UID/EPC (SOUID) in bytes	**Inventory command:** 0: The actual length (bytes) of the transferred UID or EPC is transferred with an inventory. > 0 in HF applications: ■ 8: Read out or write 8 bytes UID ■ 1…7: Read out or write an abbreviated UID ■ > 8: Fault signal -1: NEXT mode (only available in HF single-tag applications): A HF tag is always only read, written or protected if the UID is different from the UID of the last read or written tag. > 0 in UHF applications: EPC is output in full. **Other commands (e.g. read or write):** The UID or EPC size should be entered in bytes if a particular tag is to be read, written or protected. The UID or EPC must be defined in the write data (start byte: 0). The function of the UID/EPC length 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 device. > 0: EPC length of the tag that is 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 or EPC is different from the UID or EPC of the last read or written tag.
Timeout (TOUT)	Time in ms in which a command is to be executed. If a command is not executed within the specified time, the device outputs a fault signal. 0 (HF applications): 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 is executed once in the specified time (exception: Continuous Mode) UHF inventory: Command remains 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 split into max. 256 fragments. The fragments are numbered consecutively from 1 to 255. From fragment number 256, numbering begins again at 1. The sending of a fragment is confirmed by the device if the read fragment No. appears in the process input data. After the confirmation, the next fragment is read. 0: No fragmentation In idle mode, the size of the fragments is specified. When a read command is issued, the fragment No. of the access to the read data of the next fragment is set.
Write fragment No. (WFN)	If the data that is to be written exceeds the size of the write data memory, the data is split into max. 256 fragments. The fragments are numbered consecutively from 1 to 255. From fragment number 256, numbering begins again at 1. The sending of a fragment is confirmed by the device if the write fragment No. appears in the process input data. Following confirmation, the next fragment is written. 0: No fragmentation In idle mode, the size of the fragments is specified. When a write command is issued, the fragment No. for the next fragment for the data to be written is set.
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 "UID/EPC (SOUID) length" command parameter is greater than 0)

8.4 Digital channels — parameter data

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	SRO7	SRO6	SRO5	SRO4				
1	OE7	OE6	OE5	OE4				

8.4.1 Meaning of the parameter bits

Default values are shown in **bold**.

Designation	Meaning
Manual reset after overcurrent (SRO…)	**0: No (the output automatically switches back on after an overcurrent.)** 1: Yes (the output only switches back on after the overcurrent is removed and the switch signal is reset.)
Activate output (OE…)	**0: No (output deactivated)** 1: Yes (output activated)

8.5 Digital channels — setting extended parameters (EXT LEAN)

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	DIFT	DMOD (Byte 1…7)						
1	IST (Byte 0…8)							

8.5.1 Meaning of the parameter bits

Default values are shown in **bold**.

Designation	Meaning
Input filter (DIFT)	The input filter determines how long a change at the input must be present before it is transferred to the input data. **0: 0.2 ms** 1: 3 ms
Extended digital mode (DMOD)	**0: Deactivated** 1: Digital filter and impulse stretch activated
Impulse stretch (IST)	Impulse stretch: 0…2550 ms (adjustable in 10 ms steps), default value: 10 ms

8.6 Digital channels — process input data

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	DXP7	DXP6	DXP5	DXP4				
1								

8.6.1 Meaning of the status bits

Designation	Meaning
DXP4	0: Off (digital channel 1 not active) 1: On (digital channel 1 active)
DXP5	0: Off (digital channel 2 not active) 1: On (digital channel 2 active)
DXP6	0: Off (digital channel 3 not active) 1: On (digital channel 3 active)
DXP7	0: Off (digital channel 4 not active) 1: On (digital channel 4 active)

8.7 Digital channels — process output data

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	DXP7	DXP6	DXP5	DXP4				
1								

8.7.1 Meaning of the command bits

Default values are shown in **bold**.

Designation	Meaning
DXP4	**0: Off (switch off digital channel 1)** 1: On (switch on digital channel 1)
DXP5	**0: Off (switch off digital channel 2)** 1: On (switch on digital channel 2)
DXP6	**0: Off (switch off digital channel 3)** 1: On (switch on digital channel 3)
DXP7	**0: Off (switch off digital channel 4)** 1: On (switch on digital channel 4)

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
Inventory with loop counter	0x2001	8193	x	x	x	x	x
Read	0x0002	2	x	x	x	x	x
Read with loop counter	0x2002	8194	x	x	x	x	x
Write	0x0004	4	x	x	x	x	x
Write with loop counter	0x2004	8196	x	x	x	x	x
Change EPC length and write new EPC (UHF)	0x0007	7	–	–	–	x	x
Write and Verify	0x0008	8	x	x	x	x	x
Continuous Mode	0x0010	16	–	x*	x***	–	x
Read buffer (Cont. mode)	0x0011	17	–	x	x***	–	x
Read buffer (Cont. mode) with loop counter	0x2011	8209	–	x	x***	–	x
Stop Continuous (Presence Sensing) Mode	0x0012	18	–	x*	x***	–	x
Delete Buffer (Cont. mode)	0x0013	19	-	x	x	-	x
UHF Continuous Presence Sensing Mode	0x0020	32	–	–	–	–	x
HF read/write head off	0x0040	64	x	x	x	–	–
Read/write head identification	0x0041	65	x	x	x	x	x
Get UHF read/write head status/error	0x0042	66	–	–	–	x	x
Get UHF read/write head error/status with loop counter	0x2042	8258	–	–	–	x	x
Tag info	0x0050	80	x	x	x	x	x
Tag info with loop counter	0x2050	8272	x	x	x	x	x
Direct read/write head command	0x0060	96	x	x	x	x	x
Direct read/write head command with loop counter	0x2060	8288	x	x	x	x	x
Get HF read/write head address	0x0070	112	–	–	x	–	–
Set HF read/write head address	0x0071	113	–	–	x	–	–
Tune HF read/write head	0x0080	128	x	x	x	–	–
Read AFI from HF tag	0x0090	144	x	x	x	-	-

Command	Command code		possible for				
	hex.	dec.	HF compact	HF extended	HF bus mode	UHF compact	UHF extended
Write AFI to HF tag	0x0091	145	x	x	x	-	-
Lock AFI in HF tag	0x0092	146	x	x	x	-	-
Read DSFID from HF tag	0x0094	148	x	x	x	-	-
Write DSFID to HF tag	0x0095	149	x	x	x	-	-
Lock DSFID in HF tag	0x0096	150	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 password	0x0102	258	x**	x**	x**	x	x
Set tag password with loop counter	0x2102	8450	x**	x**	x**	x	x
Set tag protection	0x0103	259	x**	x**	x**	x	x
Set tag protection with loop counter	0x2103	8451	x**	x**	x**	x	x
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 loop counter	0x2105	8453	x	x	x	x	x
Kill UHF tag	0x0200	512	–	–	–	x	x
Kill UHF tag with loop counter	0x2200	8704	–	–	–	x	x
Restore settings UHF read/write head	0x1000	4096	–	–	–	x	x
Backup settings UHF read/write head	0x1001	4097	–	–	–	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 chip types EM42 and NXP SLIX2 tags.

*** The command is supported in HF Continuous bus mode.

8.8.1 Command: Idle

HF

The **Idle** command switches the interface to Idle mode. A previously executed command is reset. If a tag is in the detection range of a 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 by default in the read data area.

The existing data is overwritten with the next tag in the detection range.

The data read and displayed by the tag can be set via the web server, DTM, PROFINET or Modbus register.

The following options are possible:

- UID
- 8 bytes of user memory
- UID and 8 bytes of user memory
- UID and 64 bytes of user memory
- Deactivated

In HF bus mode, the address of the read/write head that reads the data is also output.

NOTE
If the HF read/write head detects a new tag in the detection range, the **Tag present bit** (TP) and the data (UID and/or read data) are set via the **HF: Idle mode** (UID and/or read data) are displayed simultaneously. If two tags are detected in quick succession, the TP bit may remain set. The data of the second tag (UID and/or read data) is displayed.

UHF

The **Idle** command switches the interface to Idle mode. A previously executed command is reset. By default, the UHF reader is switched off when the Idle command is activated and does not perform any action. If a tag is within the detection range of a UHF reader and Presence Sensing Mode is active, the **Tag in detection range** bit is set and the EPC and/or user data of the tag is displayed in the read data area.

The existing data is overwritten with the next tag in the detection range.

The configuration of the UHF reader can be used via the web server or DTM to set which data is read out and displayed from the tag.

The following options are possible:

- EPC
- User memory or part of the user memory
- EPC and user memory or part of the user memory
- Deactivated

Overview of output data

See description of the output data, p. [▶ 105].

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
Timeout	Not required
Write fragment No.	Not required
Read fragment No.	Not required
Write data	Not required

Overview of input data

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
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
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	Size of the fragment
Read fragment No.	Size of the fragment
Read data, bytes 0…n	UID/EPC of the tag in the detection range

Example: UID, HF bus mode

Type	Name	Meaning
uint8_t	Data [8]	uint8_t UID [8]
uint8_t	Reserved	Reserved
uint8_t	Address	Address of the read/write head

Example: successful read command (64 bytes), HF bus mode

Type	Name	Meaning
uint8_t	Data [64]	uint8_t read data [64]
uint8_t	Reserved	Reserved
uint8_t	Address	Address of the read/write head

8.8.2 Command: Inventory

The **Inventory** command triggers the read/write device to search for tags in the detection range and to read the UID, EPC or, if activated in the UHF reader, the RSSI of the tags. 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 rapid processing with the loop counter is 0x2001 (hex.) or 8193 (dec.).

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0001 (hex.), 1 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	1: Grouping of the EPCs active (UHF only) 0: Grouping of the EPCs inactive (UHF only)
Length	0: The actual length (bytes) of the transferred UID or EPC is transferred with an inventory. > 0 in HF applications: ■ 8: 8-byte UID feedback ■ 1…7: Feedback of an abbreviated UID ■ > 8: Fault signal -1: NEXT mode (only available in HF single-tag applications): A HF tag is always only read, written or protected if the UID is different from the UID of the last read or written tag. > 0 in UHF applications: EPC is output in full.
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response (HF)	
Loop counter	See description of the input data
Response code	0x0001 (hex.), 1 (dec.)
Length	Length of the read data in bytes
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	Ascending
Write fragment No.	0
Read fragment No.	See description of the input data
Read data, bytes 0…n	UID

Response (UHF)	
Loop counter	See description of the input data
Response code	0x0001 (hex.), 1 (dec.)
Length	Length of the read data
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	Ascending
Write fragment No.	0
Read fragment No.	See description of the input data
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 reader.

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 read operations (LSB → MSB) [2]

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

Type	Name	Meaning
uint8_t	Size	16
uint8_t	Block type	1
uint8_t	Data [18]	uint8_t EPC [12] uint16_t RSSI [2] uint16_t Number of read operations (LSB → MSB) [2]

Status bit	Contents	Meaning
0	Data size (EPC + number of read operations)	2 bytes 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 Slot (LSB → MSB) uint32_t Time (LSB → MSB) uint16_t Phase (LSB → MSB) uint16_t Number of read operations (LSB → MSB)

8.8.3 Command: Read

The **Read** command causes the read/write device 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 device 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.).

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0002 (hex.), 2 (dec.)
Memory area	See description of the output data
Read/write head address	See description of the output data
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 UID/EPC length is dependent 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 device. > 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	Length of the data to be read in bytes
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
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

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0002 (hex.), 2 (dec.)
Length	Length of the read data
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	Increases during command execution
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data, bytes 0…n	Read data

8.8.4 Command: Write

The **Write command** causes the read/write device 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 device 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.).

See description of the output data, p. [▷ 105].

Request	
Loop counter	See description of the output data
Command code	0x0004 (hex.), 4 (dec.)
Memory area	See description of the output data
Read/write head address	See description of the output data
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 UID/EPC length is dependent 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 device. > 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
Timeout	See description of the output data
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)	UID or EPC of the tag to be written
Write data, Byte (size of the EPC)…127	Write data

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0004 (hex.), 4 (dec.)
Length	Length of the read data
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	Increases during command execution
Tag counter	See description of the input data
Write fragment No.	See description of the input data
Read fragment No.	0
Read data, bytes 0…127	Not required

8.8.5 Command: Change EPC length and write new EPC (UHF)

NOTE
The maximum EPC length of a tag depends on the chip type. Refer to the appropriate data sheet for the length.

The **Change EPC length and write new EPC (UHF)** command causes the RFID module to automatically adapt the length for the EPC response set in the tag (change of the PC in the tag) and writes the EPC with this length to the tag. If a particular EPC is entered, the UHF reader only writes the appropriate tags. All other tags in the detection range are ignored in this case.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0007 (hex.), 7 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Reserved bytes in the write data for the EPC 0: Do not address the tag, read any tags in the air interface
Start address	Not required
Length	Length of the data to be written in bytes; must be even and ≤ 62
Timeout	Not required
Write fragment No.	See description of the output data
Read fragment No.	0
Write data, Byte 0…(length of the UID/EPC - 1)	EPC of the tag to be written
Write data, Byte (length of the UID/EPC)…127	New EPC with new length

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0007 (hex.), 7 (dec.)
Length	0
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	See description of the input data
Read fragment No.	See description of the input data
Read data, bytes 0…127	Not required

8.8.6 Command: Write and Verify

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. Up to 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.).

See description of the output data, p. [▷ 105].

Request	
Loop counter	See description of the output data
Command code	0x0008 (hex.), 8 (dec.)
Memory area	See description of the output data
Read/write head address	See description of the output data
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 UID/EPC length is dependent 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 device. > 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
Timeout	See description of the output data
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

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0008 (hex.), 8 (dec.)
Length	Length of the read data
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	Increases during command execution
Tag counter	See description of the input data
Write fragment No.	See description of the input data
Read fragment No.	0
Read data, Byte 0…MIN (127, set length - 1)	Not required

8.8.7 Command: Continuous Mode

NOTE
In HF applications, Continuous mode is only available for single-tag applications. Automatic tag detection cannot be used in Continuous Mode. A specific tag type must be selected in the parameters.

In Continuous Mode, a user-defined command is sent to the read/write device and saved in the read/write device. The command is executed continuously if a tag enters the detection field of the read/write device (self-triggered). In HF bus mode, all activated bus-capable read/write heads continuously execute the command simultaneously. With HF, the following commands can be set in the parameters: **Write**, **Read**, **Inventory**, **Tag info**. With UHF, the **Write**, **Read** and **Inventory** commands can be executed in Continuous Mode. For UHF applications, the parameters for Continuous Mode must be set via the DTM directly in the UHF reader.

The command is executed continuously until the user stops Continuous Mode. Continuous Mode can be stopped with a reset command.

NOTE
The reset command resets all read data. After Continuous Mode is restarted, all data from the Continuous Mode already running is deleted.

Read/write devices 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 queried by the controller via the **Read buffer (Cont. mode)** command.

Commands in Continuous Mode are triggered if the read/write device detects a tag. If there is a tag in the detection range of the read/write device when Continuous Mode is started, the command sent in Continuous Mode will not be executed until the next tag is present.

In Continuous Mode, the **Tag in detection range** signal is updated in the following cases:

- In Continuous Mode (HF), if 3 is set as the start address
- In HF Continuous bus mode, if 0 or 1 is set as the start address

The **Tag in detection range** signal is not updated in Continuous Mode for UHF readers.

NOTE
The HF parameters: Address in Continuous Mode (ACM) and HF: Length in Continuous Mode (LCM) cannot be changed while Continuous Mode is running.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0010 (hex.), 16 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	**UHF inventory** 0: Grouping of the EPCs inactive, continuous detection 1: Grouping of the EPCs active, continuous detection >1: not defined **HF inventory** 0: Grouping of the UIDs or USER data inactive, edge-triggered detection 1: Grouping of the UIDs or USER data active, edge-triggered detection 2: Not defined 3: Grouping of the UIDs or USER data active, continuous detection (time-triggered via bypass time), tag in detection range supported > 3: Not defined **HF bus mode** 0: Grouping of the UIDs or USER data inactive, continuous detection (time-triggered via bypass time), tag in detection range supported 1: Grouping of the UIDs or USER data active, continuous detection (time-triggered via bypass time), tag in detection range supported >2: not defined
Length	Not required
Timeout	Not required
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0010 (hex.), 16 (dec.)
Length	0
Error code	See description of the input data
Tag in detection range	See description of the input data
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
Read data	See description of the input data

8.8.8 Command: Read buffer (Cont. mode)

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

The **Read buffer (Cont. mode)** command can pass on data stored in the interface to the controller. Up to 16 Kbyte of data can be stored in a ring memory. Fetched data is deleted from the ring memory. 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 **Read buffer (Cont. mode)** command does not stop Continuous Mode.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0011 (hex.), 17 (dec.)
Read/write head address	See description of the output data
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
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
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
Tag in detection range	See description of the input data
Data (bytes) available	Is automatically decreased after the execution of the command
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
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 reader.

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 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 Slot (LSB → MSB) uint32_t Time (LSB → MSB) uint16_t Phase (LSB → MSB) uint16_t Number of 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 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

Example: UID, grouping deactivated, HF bus mode

Type	Name	Meaning
uint8_t	Data [8]	uint16_t UID [8]
uint8_t	Reserved	Reserved
uint8_t	Address	Address of the read/write head

Example: UID, grouping deactivated, HF bus mode

Type	Name	Meaning
uint8_t	Data [64]	uint16_t UID [64]
uint8_t	Reserved	Reserved
uint8_t	Address	Address of the read/write head

8.8.9 Command: Stop Continuous (Presence Sensing) Mode

Continuous and Presence Sensing Mode can be stopped via the **Stop Continuous (Presence Sensing) Mode** command. The data stored in the buffer memory of the interface is not deleted and can still be queried by the controller via the **Read buffer (Cont. Mode)** command.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0012 (hex.), 18 (dec.)
Read/write head address	Not required
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0012 (hex.), 18 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.10 Command: Delete Buffer (Cont. mode)

Using the **Delete Buffer (Cont. mode)** command, all data stored in the interface can be deleted.

NOTE
The **Delete Buffer (Cont. mode)** command does not stop Continuous Mode.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0013 (hex.), 19 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0013 (hex.), 19 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.11 Command: UHF Continuous Presence Sensing Mode

In Continuous Presence Sensing Mode, a user-defined command (**Write**, **Read**, **Inventory**) can be sent to the UHF reader and saved there. In Continuous Presence Sensing Mode, the readers are automatically switched on 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 reader. 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.

Readers in Continuous Presence mode send all command related data to the interface. The data is stored in the FIFO memory of the interface and can be queried by the controller via the **Read buffer (Cont. mode)** command. In Continuous Presence Sensing Mode the **Tag in detection range** signal is not permanently updated.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0020 (hex.), 32 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	0: Grouping inactive 1: Grouping active >1: not defined
Length	Not required
Timeout	Not required
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0020 (hex.), 32 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
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
Read data	See description of the input data

8.8.12 Command: HF read/write head off

The **HF read/write head off** command enables HF read/write heads to be switched off until a write or read command is present. It may be necessary to switch the read/write heads on and off to save energy or if the devices are fitted very close to one another and the detection ranges overlap. When a command is executed, the read/write heads are reactivated automatically. After the command has been executed, the read/write head needs to be switched off again.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0040 (hex.), 64 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0040 (hex.), 64 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.13 Command: Read/write head identification

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

- ID
- Serial number
- Hardware version
- Firmware status

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

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0041 (hex.), 65 (dec.)
Read/write head address	See description of the output data
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
Timeout	Not required
Write fragment No.	Not required
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0041 (hex.), 65 (dec.)
Length	See description of the input data
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	Increases with each read or written UID/EPC
Write fragment No.	0
Read fragment No.	See description of the input data
Read data, bytes 0…19	ID: ARRAY [0…19] of BYTE
Read data, bytes 20…35	Serial number: ARRAY [0…15] of BYTE
Read data, bytes 36…37	Hardware version: INT16 (Little Endian)
Read data, bytes 38…41	Firmware status: ARRAY [0…] of BYTE: V (0x56), x, y, z (Vx.y.z)
Read data, bytes 42…119	Not required

8.8.14 Command: Get UHF read/write head status/error

NOTE
The command is only available for UHF applications.

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

NOTE
The command code for fast processing with the loop counter is 0x2042 (hex.) or 8258 (dec.).

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0042 (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
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x042 (hex.), 66 (dec.)
Length	See description of the input data
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
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, two's complement) ■ PA temperature: 1 byte, PA temperature in °C (data format: 8 bit, two's complement) ■ RF antenna temperature: 1 byte, antenna temperature in °C (data format: 8 bit, two's complement) ■ Transmit power: 2 bytes, output power of the reader in 1/10 dBm steps, LSB…MSB (data format: 16 bit, two's complement) ■ Reverse power: 2 bytes, returned reverse power in 1/10 dBm steps, LSB…MSB (data format: 16 bit, two's 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, two's 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 too 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

8.8.15 Command: Tag info

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

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

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0050 (hex.), 80 (dec.)
Read/write head address	See description of the output data
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.
Timeout	Not required
Write fragment No.	Not required
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response (HF)	
Loop counter	See description of the input data
Response code	0x0050 (hex.), 80 (dec.)
Length	See description of the input data
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data, bytes 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
Response code	0x0050 (hex.), 80 (dec.)
Length	See description of the input data
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data, bytes 0…3	First 32 bytes of the TID (tag class, manufacturer and chip type)
Read data, bytes 4…n	EPC (variable length)

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-Code 7	0xE2	0x806	0x890	128	96	–
NXP U-Code 7xm (2k)	0xE2	0x806	0xF12	448	96	2048
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	–
Impinj Monza R6-P	0xE2	0x001	0x170	128	96	64

8.8.16 Direct read/write head command

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

A direct command can be used to send commands directly to the read/write device from the read/write head protocol. The commands are defined and interpreted via specifications in the read and write data.

NOTE
The read/write head protocol is not part of this documentation and has to be requested from and released specially by Turck. Questions on the read/write head protocol should be addressed to Turck.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0060 (hex.), 96 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	0
Start address	Not required
Length	Length of the description of the direct command in the write data, specification in bytes
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Description of the direct command

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
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
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Response to the direct command

Example: Direct command in HF applications (query 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
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 in 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 can be used to query the following information with the bytes written to:

- 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 (query 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
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 in 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 read data can be interpreted via the debus protocol 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 in UHF applications (set output power)

▶ Read the set power from the RAM of the reader.

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

▶ Change output power: Write "30 dBm" power to the reader's RAM and flash memory. 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
Timeout	200
Write fragment No.	0
Read fragment No.	0
Write data	0x09 8A 3C 03 01 1E

The following table provides assistance in converting the 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

8.8.17 Command: Get HF read/write head address

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 a fault signal.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0070 (hex.), 112 (dec.)
Read/write head address	Not required
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0070 (hex.), 112 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
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

8.8.18 Command: Set HF read/write head address

NOTE
The command is only available in HF bus mode.
Only one single 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 **Set HF read/write head address** command can be used to set the address of bus-compatible HF read/write heads. Command execution is independent of the activation of or the address set for a read/write head. Any existing read/write head addresses are overwritten.

Permissible values are 1, 2…32, 68.

NOTE
68 is the default address of the read/write head.
A bus-compatible read/write head with this address cannot be activated.

If a non-bus-compatible read/write head is connected, the device outputs a fault signal.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0071 (hex.), 113 (dec.)
Read/write head address	Not required
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data, byte 0	New read/write head address (uint8_t), permissible values: 0, 1…32, 68
Write data, bytes 1…127	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0071 (hex.), 113 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.19 Command: Tune HF read/write head

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.

HF read/write head tuning is carried out automatically by default after each voltage reset.

See description of the output data, p. [▷ 105].

Request	
Loop counter	See description of the output data
Command code	0x0080 (hex.), 128 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▷ 100].

Response	
Loop counter	See description of the input data
Response code	0x0080 (hex.), 128 (dec.)
Length	2
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data, byte 0	Tuning value: TNLR-…: 0x00…0x0F TNSLR-…: 0x00…0x1F
Read data, byte 1	Received voltage value (0x00…0xFF)

8.8.20 Command: Read AFI from HF tag

The AFI byte of an HF tag can be read out using the **Read AFI from HF tag** command.

NOTE
The command is supported by HF read/write heads revision xV99 or later.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0090 (hex.), 144 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0090 (hex.), 144 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data, byte 0	AFI
Read data, Byte 1…(Length - 1)	Not required

8.8.21 Command: Write AFI to HF tag

The **Write AFI to HF tag** command writes an AFI byte to a HF tag.

NOTE
The command is supported by HF read/write heads revision xV99 or later.

NOTE
It is not possible to write a locked AFI byte.
The fault signal 0xF102 will appear
(air interface error: timeout).

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0091 (hex.), 145 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data, byte 0	AFI
Write data, byte 1…(length - 1)	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0091 (hex.), 145 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.22 Command: Lock AFI in HF tag

The **Lock AFI in HF tag** command locks the AFI byte on a HF tag.

NOTE
The command is supported by HF read/write heads revision xV99 or later.

NOTE
It is not possible to lock an already locked AFI byte.
The fault signal 0xF102 will appear
(air interface error: timeout).

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0092 (hex.), 146 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0092 (hex.), 146 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.23 Command: Read DSFID from HF tag

The **Read DSFID from HF tag** command can be used to read the DSFID byte of an HF tag.

NOTE
The command is supported by HF read/write heads revision xV99 or later.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0094 (hex.), 148 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0094 (hex.), 148 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data, byte 0	DSFID
Read data, Byte 1…(Length - 1)	Not required

8.8.24 Command: Write DSFID to HF tag

The **Write DSFID to HF tag** command writes a DSFID byte to an HF tag.

NOTE
The command is supported by HF read/write heads revision xV99 or later.

NOTE
It is not possible to write a locked DSFID byte.
The fault signal 0xF102 will appear
(air interface error: timeout).

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0095 (hex.), 149 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data, byte 0	DSFID
Write data, byte 1…(length - 1)	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0095 (hex.), 149 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.25 Command: Lock DSFID in HF tag

The **Lock DSFID in HF tag** command locks the DSFID byte on an HF tag.

NOTE
The command is supported by HF read/write heads revision xV99 or later.

NOTE
It is not possible to lock a DSFID byte that has already been locked.
The fault signal 0xF102 will appear
(air interface error: timeout).

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0096 (hex.), 150 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0096 (hex.), 150 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.26 Command: Set read/write head password

NOTE
The command is only available for applications with UHF tags and the HF tags with chip types EM42… and NXP SLIX2.

The **Set read/write head password** command is a direct command used to set a password for read access, write access or a kill command. The password is stored temporarily in the memory of the read/write device. After the voltage of the read/write device is reset, the password must be set again in the read/write device. With UHF applications, the password is stored in the memory of the interface. The password stored in the read/write device is automatically sent with a write command, a read command or a kill command so that the command can be executed on a protected tag.

In HF applications, the password function is available in single-tag mode only. A fault signal is output with multitag applications. To troubleshoot, set the **HF: multitag** parameter to **0: multitag mode off**. In order to use the password function in HF applications, the password in the tag and the read/write head must match. The default password is 0000 and must be set first of all in the read/write head before a new password can be assigned ([▶ 154]). The command is supported for chip type NXP SLIX2 of HF read/write heads with firmware version Vx.98 or higher.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0100 (hex.), 256 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data, bytes 0…3	Password: ARRAY [0…3] OF BYTE
Write data, bytes 4…127	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0100 (hex.), 256 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.27 Command: Reset read/write head password

NOTE
The command is only available for applications with UHF tags and the HF tags with chip types EM42… and NXP SLIX2.

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

In HF applications, the password function is available in single-tag mode only. A fault signal is output with multitag applications. To troubleshoot, set the **HF: multitag** parameter to **0: multi-tag mode off**.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0101 (hex.), 257 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0101 (hex.), 257 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.28 Command: Set tag password

NOTE
The command is only available for applications with UHF tags and the HF tags with chip types EM42… and NXP SLIX2.

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

The **Set tag password** command sets a password in the tag. Tag protection is not activated until the **Set tag protection** command has also been carried out. When sending the command, only one tag can be located in the detection range of the read/write device. 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.

In HF applications, the password function is available in single-tag mode only. A fault signal is output with multitag applications. To troubleshoot, set the **HF: multitag** parameter to **0: multi-tag mode off**. In order to use the password function in HF applications, the password in the tag and the read/write head must match. The default password is 0000 and must be set first of all in the read/write head before a new password can be assigned ([▶ 152]. The command is supported for chip type NXP SLIX2 of HF read/write heads with firmware version Vx.98 or higher.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0102 (hex.), 258 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	The UID or EPC size should be entered 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 UID/EPC length is dependent 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 only ever protected if the UID/EPC differs from the UID/EPC of the tag last read or written to.
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data, bytes 0…3	Password: ARRAY [0…3] OF BYTE
Write data, bytes 4…127	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0102 (hex.), 258 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.29 Command: Set tag protection

NOTE
The command is only available for applications with UHF tags and the HF tags with chip types EM42… and NXP SLIX2.

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

The **Set tag protection** command is a direct command used to define the password protection for the tag. To do this, it must be specified whether read protection and/or write protection is to be set, and to which area of the tag 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 device.

In HF applications, the password function is available in single-tag mode only. A fault signal is output with multitag applications. To troubleshoot, set the **HF: multitag** parameter to **0: multi-tag mode off**.

Read protection also always includes write protection.

The following restrictions apply to NXP-SLIX2 tags:

- The bits for the read and write protection must either be the same for the particular page or all read protection bits must be zero or all write protection bits must be zero.
- The bits must be set ensuring that there are no gaps between the bits or pages until the last bit or last page (page 19).

  Example: Bit 4 in the first byte to bit 3 in the third byte are set, i.e. page 4…19 (block 16…79) are protected, page 0…3 (block 0…15) are not protected.

  Examples: FF FF 0F 00 FF FF 0F 00: all protected, FE FF 0F 00 FE FF 0F 00: all protected apart from page 0, 00 00 08 00 00 00 08 00: only last page protected
- Page size: 1 page = 4 blocks = 128 bits, exception: Page 19 only has 3 blocks = 96 bits (block 79 is excluded from protection).

The error code 0x2502 is sent if the restrictions are not observed.

NOTE
Write protection for UHF tags cannot be reversed.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0103 (hex.), 259 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	The UID or EPC size should be entered 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 UID/EPC length is dependent on the command used. 0: The command is executed for the tag which is located in the detection range of the read/write device. > 0: EPC length of the tag to be protected if an EPC is present in the write data -1: NEXT mode: A tag is only ever protected if the UID/EPC differs from the UID/EPC of the tag last read or written to.
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: Specification of memory area not required. The pages of the memory area are selected via byte 0…7 of the write data. A page consists of 4 blocks (16 bytes).
Length	UHF: 0 byte HF: 8 byte
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data, byte 0	HF: EM4233 SLIC/NXP SLIX2: ■ 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

Request	
Write data, byte 1	HF: EM4233 SLIC: 0 NXP SLIX2: ■ Bit 0: Write protection, page 8 ■ Bit 1: Write protection, page 9 ■ Bit 2: Write protection, page 10 ■ Bit 3: Write protection, page 11 ■ Bit 4: Write protection, page 12 ■ Bit 5: Write protection, page 13 ■ Bit 6: Write protection, page 14 ■ Bit 7: Write protection, page 15 UHF: not required
Write data, byte 2	HF: EM4233 SLIC: 0 NXP SLIX2: ■ Bit 0: Write protection, page 16 ■ Bit 1: Write protection, page 17 ■ Bit 2: Write protection, page 18 ■ Bit 3: Write protection, page 19 ■ Bit 4: Reserved ■ Bit 5: Reserved ■ Bit 6: Reserved ■ Bit 7: Reserved UHF: not required
Write data, byte 3	0
Write data, byte 4	HF: EM4233 SLIC/NXP SLIX2: ■ 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	HF: EM4233 SLIC: 0 NXP SLIX2: ■ Bit 0: Read protection, page 8 ■ Bit 1: Read protection, page 9 ■ Bit 2: Read protection, page 10 ■ Bit 3: Read protection, page 11 ■ Bit 4: Read protection, page 12 ■ Bit 5: Read protection, page 13 ■ Bit 6: Read protection, page 14 ■ Bit 7: Read protection, page 15 UHF: not required

Request	
Write data, byte 6	HF: EM4233 SLIC: 0 NXP SLIX2: ■ Bit 0: Read protection, page 16 ■ Bit 1: Read protection, page 17 ■ Bit 2: Read protection, page 18 ■ Bit 3: Read protection, page 19 ■ Bit 4: Reserved ■ Bit 5: Reserved ■ Bit 6: Reserved ■ Bit 7: Reserved UHF: not required
Write data, byte 7	0
Write data, bytes 8…127	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0103 (hex.), 259 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.30 Command: Get HF tag protection status

NOTE
The command is only available for applications with the HF tags with chip types EM42… and NXP SLIX2.

The **Get HF tag protection status** command queries 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.

In HF applications, the password function is available in single-tag mode only. A fault signal is output with multitag applications. To troubleshoot, set the **HF: multitag** parameter to **0: multitag mode off**.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0104 (hex.), 260 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	The UID or EPC size should be entered 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 UID/EPC length is dependent 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 only ever protected if the UID/EPC differs from the UID/EPC of the tag last read or written to.
Start address	Not required
Length	8 byte
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0104 (hex.), 260 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data

Response	
Read data, byte 0	HF: EM4233 SLIC/NXP SLIX2: ■ 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	HF: EM4233 SLIC: 0 NXP SLIX2: ■ Bit 0: Write protection, page 8 ■ Bit 1: Write protection, page 9 ■ Bit 2: Write protection, page 10 ■ Bit 3: Write protection, page 11 ■ Bit 4: Write protection, page 12 ■ Bit 5: Write protection, page 13 ■ Bit 6: Write protection, page 14 ■ Bit 7: Write protection, page 15 UHF: not required
Read data, byte 2	HF: EM4233 SLIC: 0 NXP SLIX2: ■ Bit 0: Write protection, page 16 ■ Bit 1: Write protection, page 17 ■ Bit 2: Write protection, page 18 ■ Bit 3: Write protection, page 19 ■ Bit 4: Reserved ■ Bit 5: Reserved ■ Bit 6: Reserved ■ Bit 7: Reserved UHF: not required
Read data, byte 3	0
Read data, byte 4	HF: EM4233 SLIC/NXP SLIX2: ■ 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

Response	
Read data, byte 5	HF: EM4233 SLIC: 0 NXP SLIX2: ■ Bit 0: Read protection, page 8 ■ Bit 1: Read protection, page 9 ■ Bit 2: Read protection, page 10 ■ Bit 3: Read protection, page 11 ■ Bit 4: Read protection, page 12 ■ Bit 5: Read protection, page 13 ■ Bit 6: Read protection, page 14 ■ Bit 7: Read protection, page 15 UHF: not required
Read data, byte 6	HF: EM4233 SLIC: 0 NXP SLIX2: ■ Bit 0: Read protection, page 16 ■ Bit 1: Read protection, page 17 ■ Bit 2: Read protection, page 18 ■ Bit 3: Read protection, page 19 ■ Bit 4: Reserved ■ Bit 5: Reserved ■ Bit 6: Reserved ■ Bit 7: Reserved UHF: not required
Read data, byte 7	0

8.8.31 Command: Set perma lock

NOTE
The command code for rapid 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 device.

The function is only available in HF applications in single-tag mode. A fault signal is output with multitag applications. To troubleshoot, set the **HF: multitag** parameter to **0: multitag mode off**.

See description of the output data, p. [▷ 105].

Request	
Loop counter	See description of the output data
Command code	0x0105 (hex.), 261 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	0: The command is executed for the tag which is located in the detection range of the read/write device. > 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 only ever protected if the UID/EPC differs from the UID/EPC of the tag last read or written to.
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 locked irrevocably from write access. Kill password and access password are also locked irrevocably from read access. 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
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0105 (hex.), 261 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.32 Command: Kill UHF tag

NOTE
The command is only available for UHF applications.

NOTE
The command code for rapid 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 reversed. A Kill password must be set beforehand in order to execute a Kill command (see [▶ 229]).

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x0200 (hex.), 512 (dec.)
Read/write head address	See description of the output data
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 UID/EPC length is dependent 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 device. > 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	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data, bytes 0…3	Password: ARRAY [0…3] OF BYTE
Write data, bytes 4…127	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x0200 (hex.), 512 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.33 Command: Restore settings UHF read/write head

NOTE
The command is only available for UHF applications.

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

See description of the output data, p. [▷ 105].

Request	
Loop counter	See description of the output data
Command code	0x1000 (hex.), 4096 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▷ 100].

Response	
Loop counter	See description of the input data
Response code	0x1000 (hex.), 4096 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.34 Command: Backup settings UHF read/write head

NOTE
The command is only available for UHF applications.

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

See description of the output data, p. [▷ 105].

Request	
Loop counter	See description of the output data
Command code	0x1001 (hex.), 4097 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	Not required
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▷ 100].

Response	
Loop counter	See description of the input data
Response code	0x1001 (hex.), 4097 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
Read data	Not required

8.8.35 Command: Reset

The **Reset** command resets the read/write device and the interface. The input, output data and the buffer are cleared.

See description of the output data, p. [▶ 105].

Request	
Loop counter	See description of the output data
Command code	0x8000 (hex.), 32768 (dec.)
Read/write head address	See description of the output data
Length UID/EPC	Not required
Start address	0: Software reset 1: Voltage reset
Length	Not required
Timeout	See description of the output data
Write fragment No.	0
Read fragment No.	See description of the output data
Write data	Not required

See description of the input data, p. [▶ 100].

Response	
Loop counter	See description of the input data
Response code	0x8000 (hex.), 32768 (dec.)
Length	Not required
Error code	See description of the input data
Tag in detection range	See description of the input data
Data (bytes) available	See description of the input data
Tag counter	See description of the input data
Write fragment No.	0
Read fragment No.	See description of the input data
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 “Adjusting network settings”.

The device is factory set to IP address 192.168.1.254. To open the web server via a web browser, enter **http://129.168.1.254** in the address bar of the web browser.

Status information and network settings are displayed on the home page.

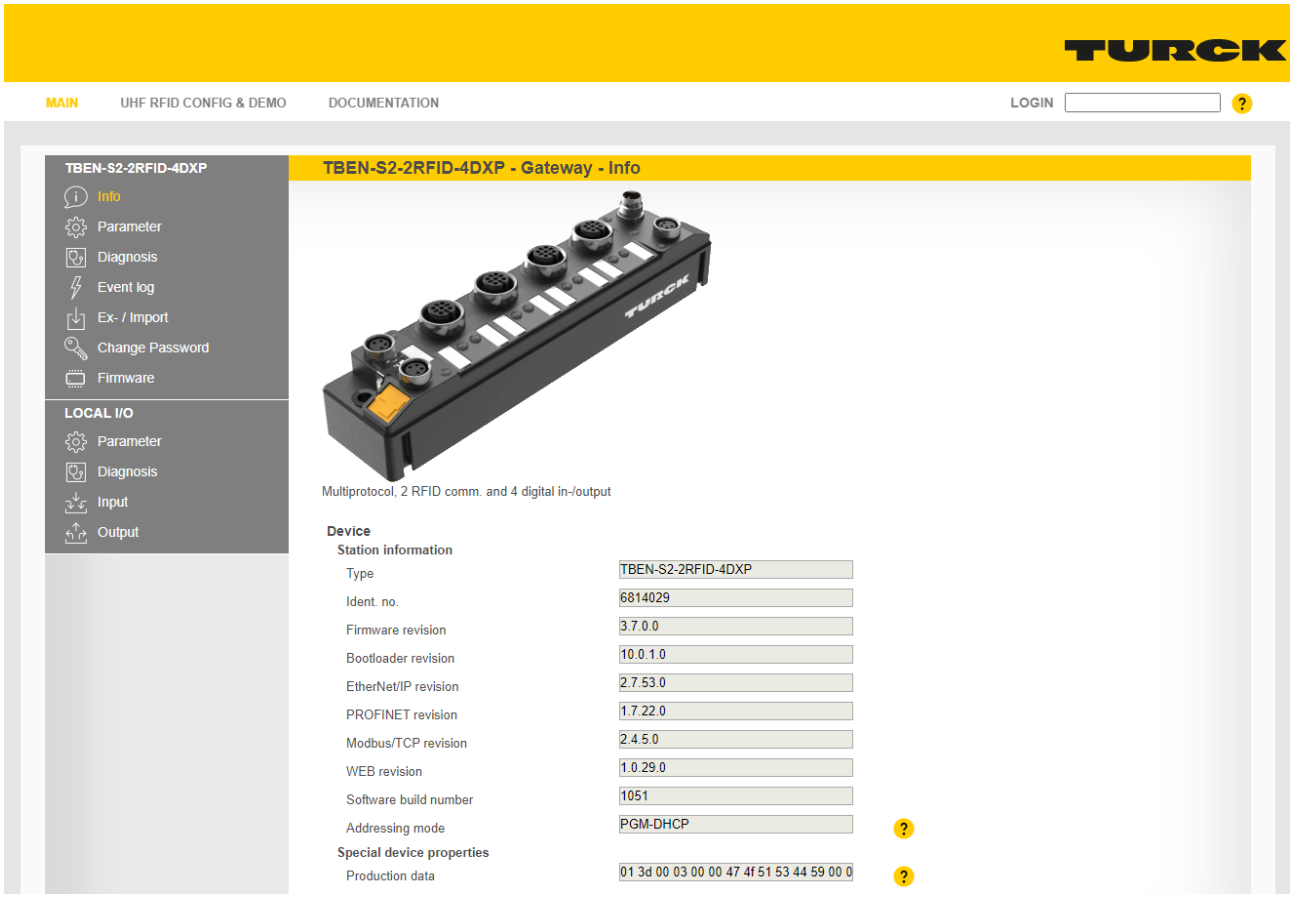


Fig. 79: Example: Web server — home page

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 home page of the web server.
- ▶ Click **Login**.

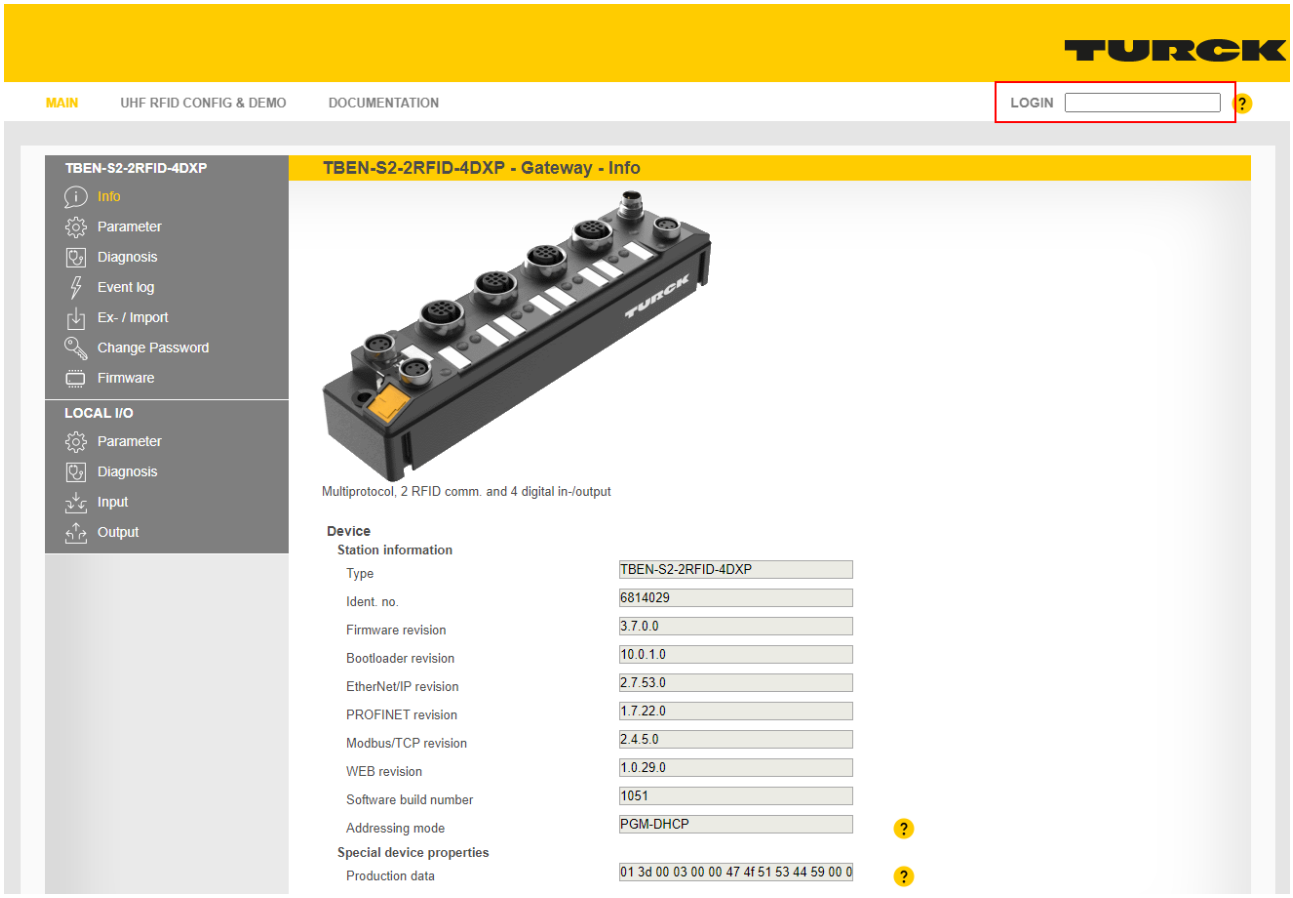


Fig. 80: Login field on the home page of the web server (marked in red)

▶ After the login, you have write access to input and output data and to parameter data.

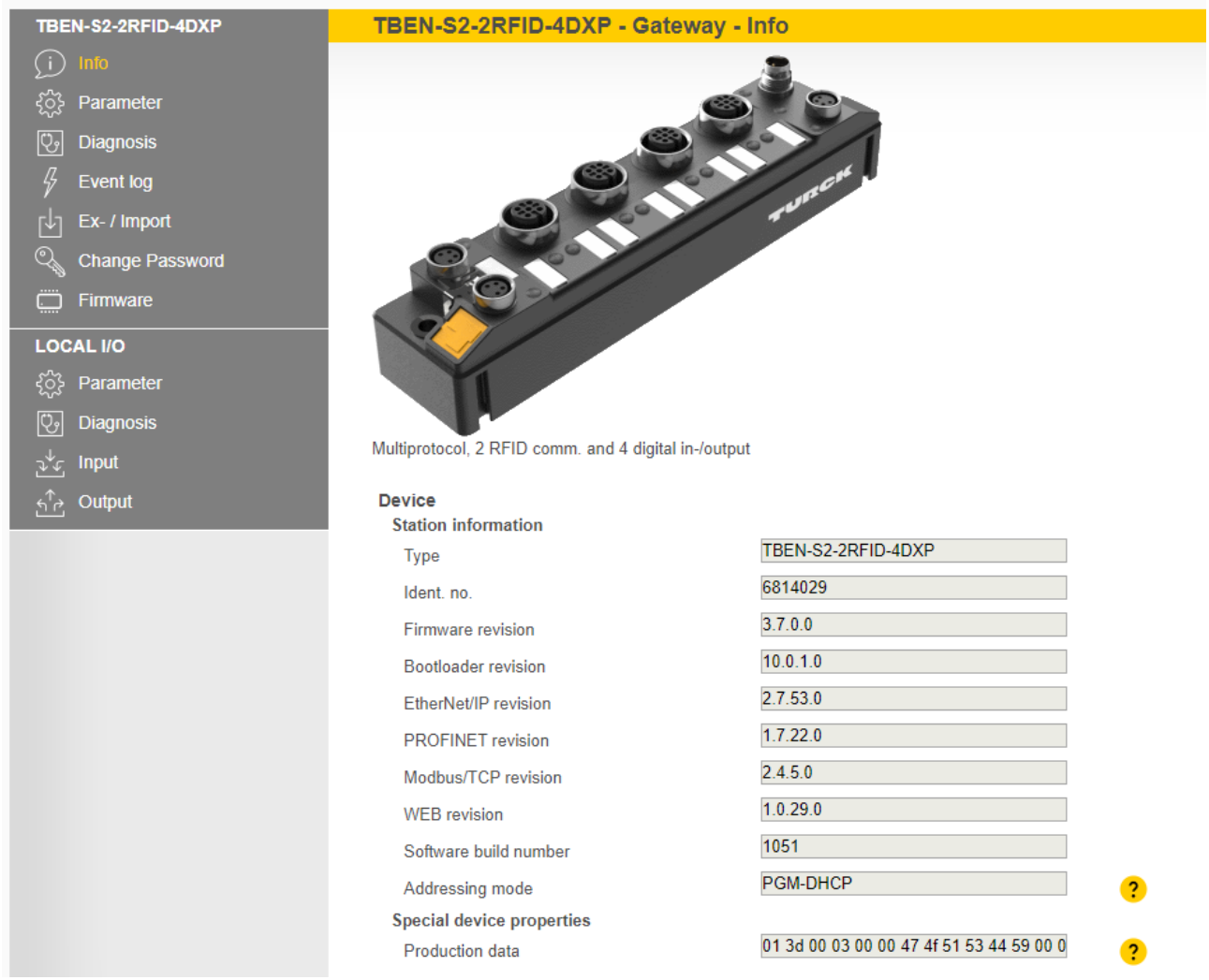


Fig. 81: Web server — home page after the login

Example: Setting the operation mode for channel 0

In the following example, the operating mode of channel 0 is set to **RF extended**.

- Click **Local I/O** → **Parameter** in the navigation bar on the left of the screen.
- Select the RFID channel (here: **RFID channel 0**).

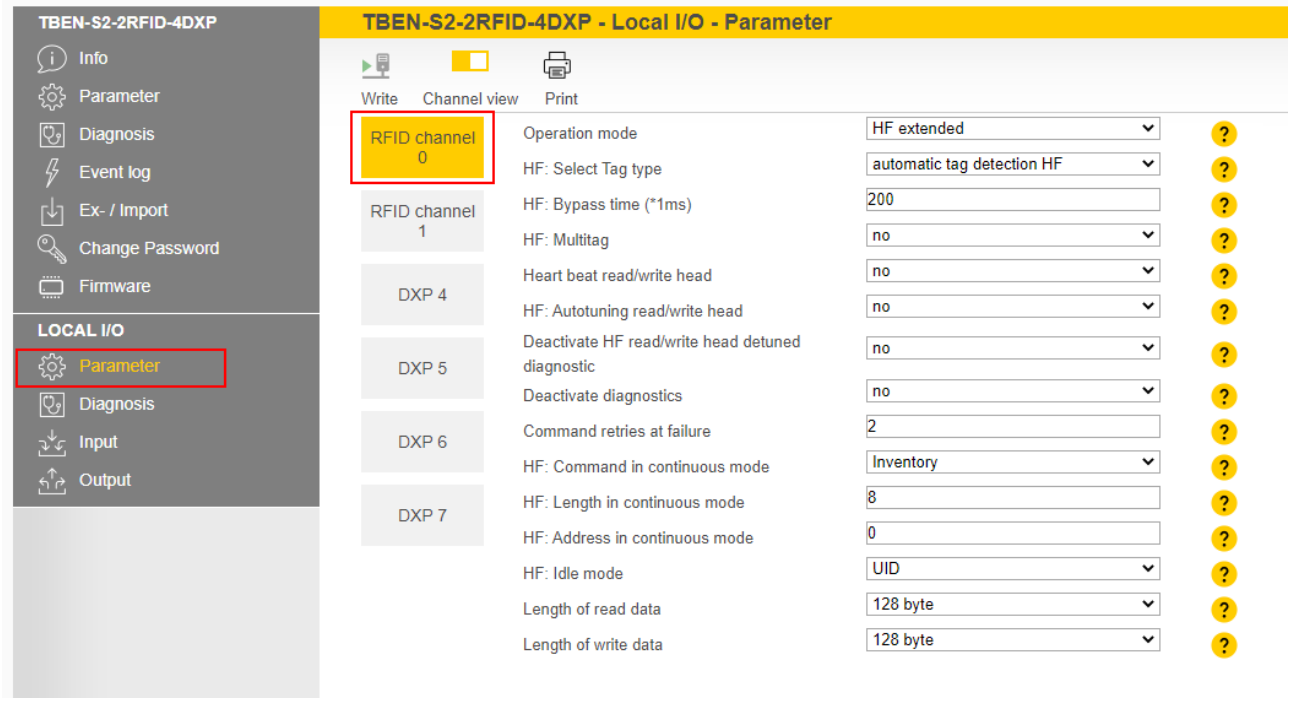


Fig. 82: Setting parameters in the web server

- ▶ Select **HF extended** mode from the **Operation mode** drop-down menu.
- ▶ Save settings: Click **Write**.

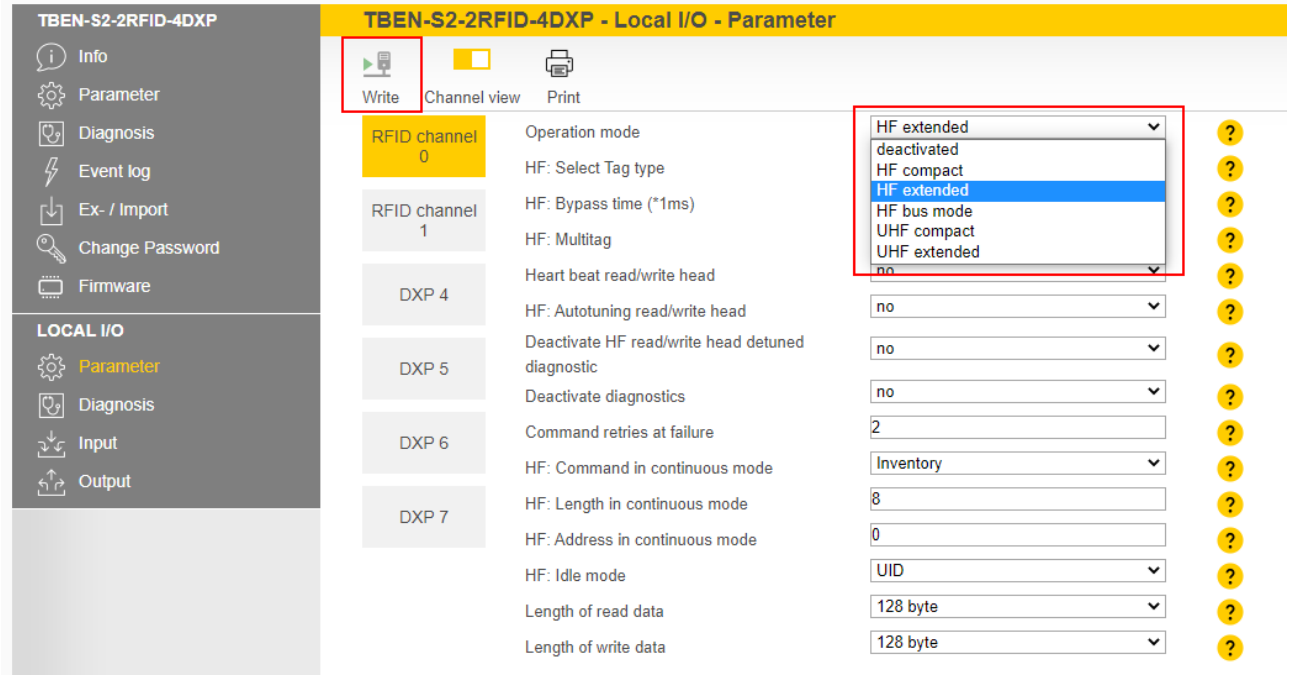


Fig. 83: Drop-down menu — operation mode

- ▶ If necessary, print the station report using the **Print** button.

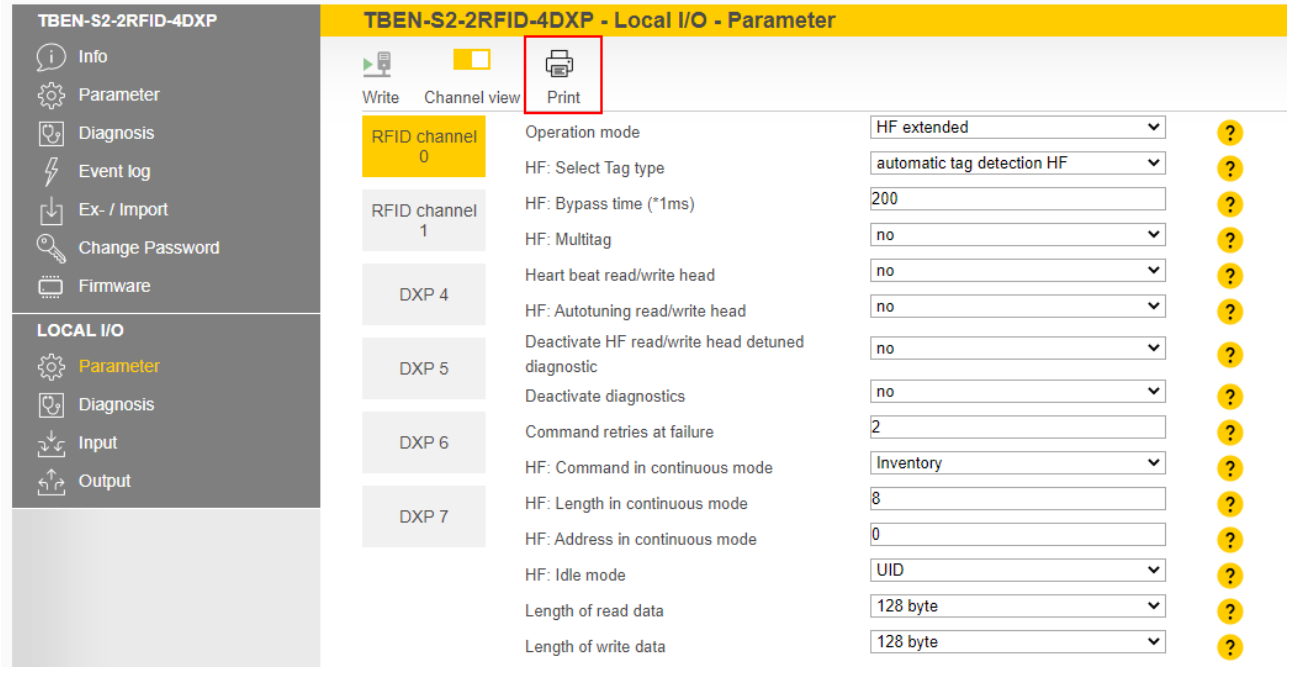


Fig. 84: Print station report

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 **Local I/O** → **Output** in the navigation bar on the left of the screen.
- ▶ Select **RFID channel 0**.
- ▶ Enter the number of bytes to be read in the **Length** entry field (here: **8**).
- ▶ Select the read command via the **Command code** drop-down menu: **0x0002 Read.**
- ⇨ The read command is sent.

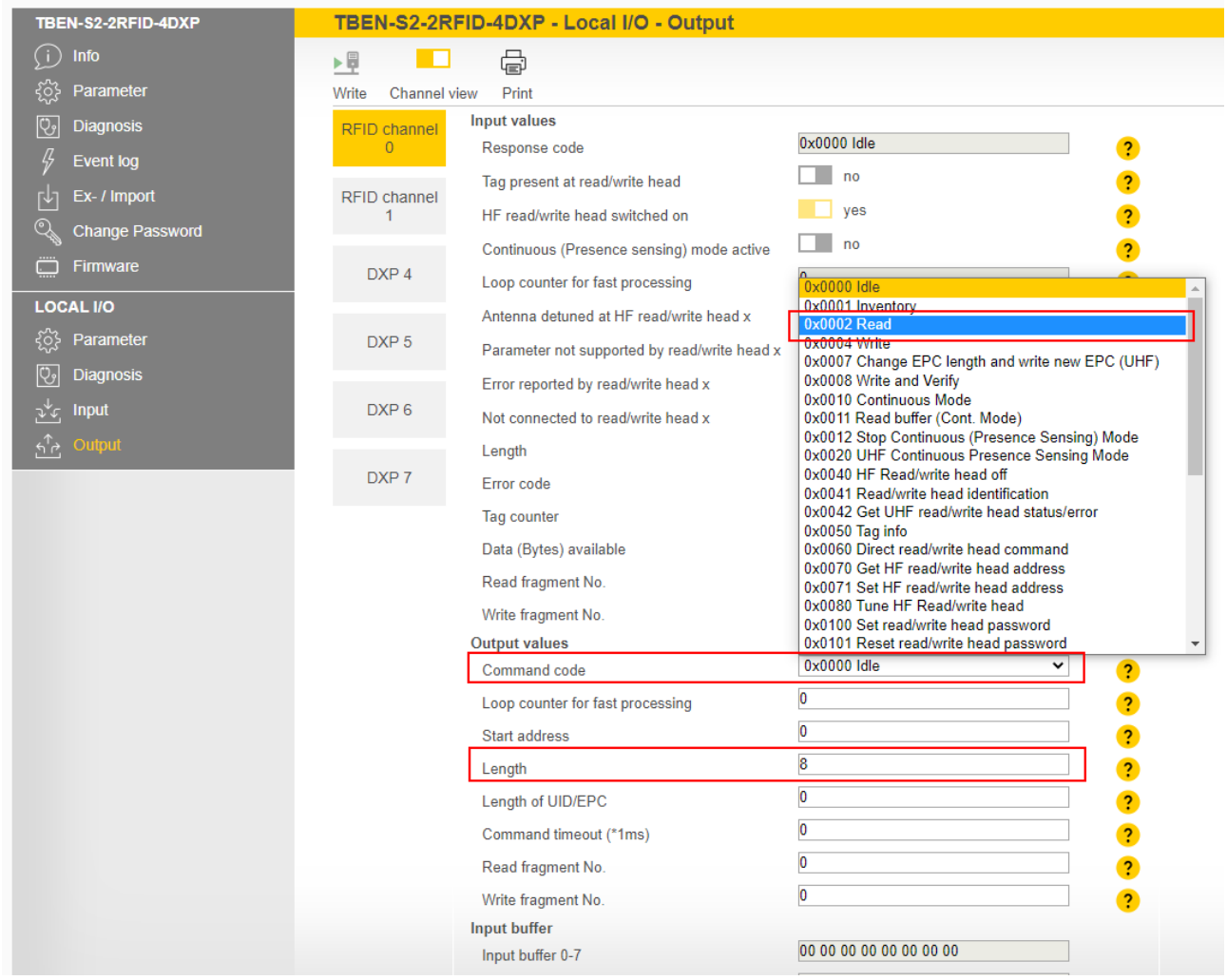


Fig. 85: Setting the read command in the web server

The receipt of the command is confirmed automatically in the input data under **Input values** → **Response code** with **0x8002 Busy – Read**.

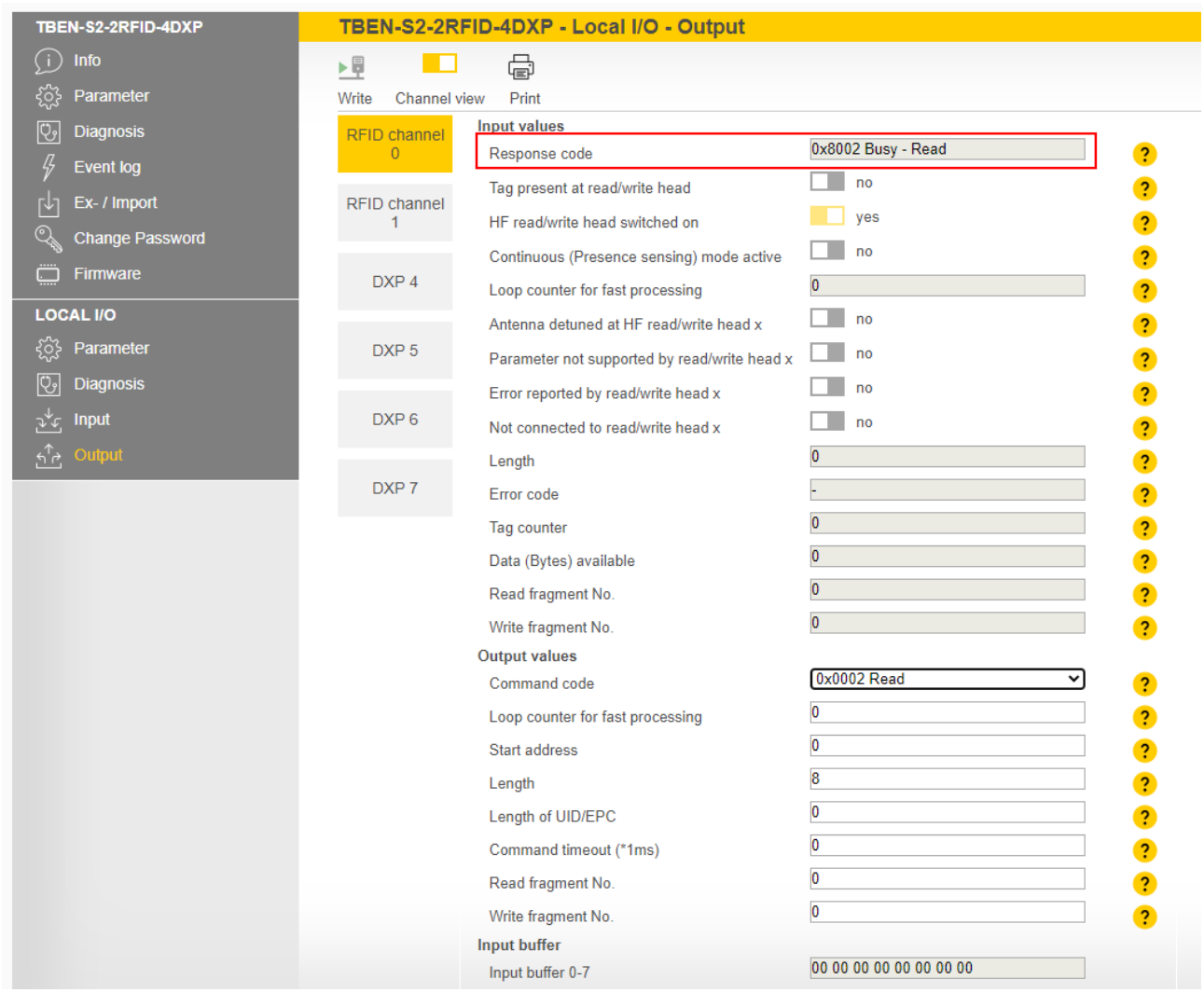


Fig. 86: Input data

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

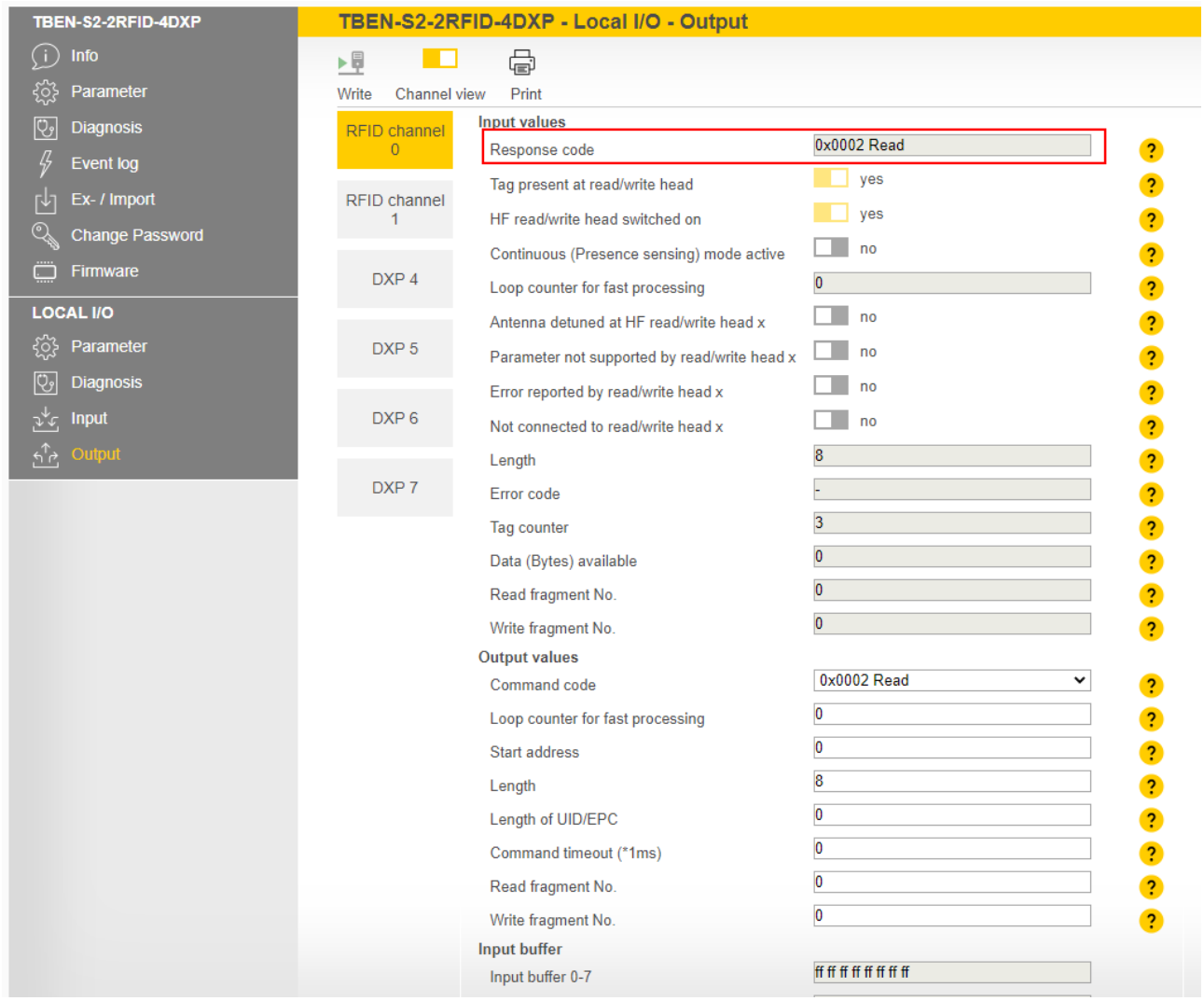


Fig. 87: Input data with successfully executed read command

The read data can be called at **Local I/O → Input**.

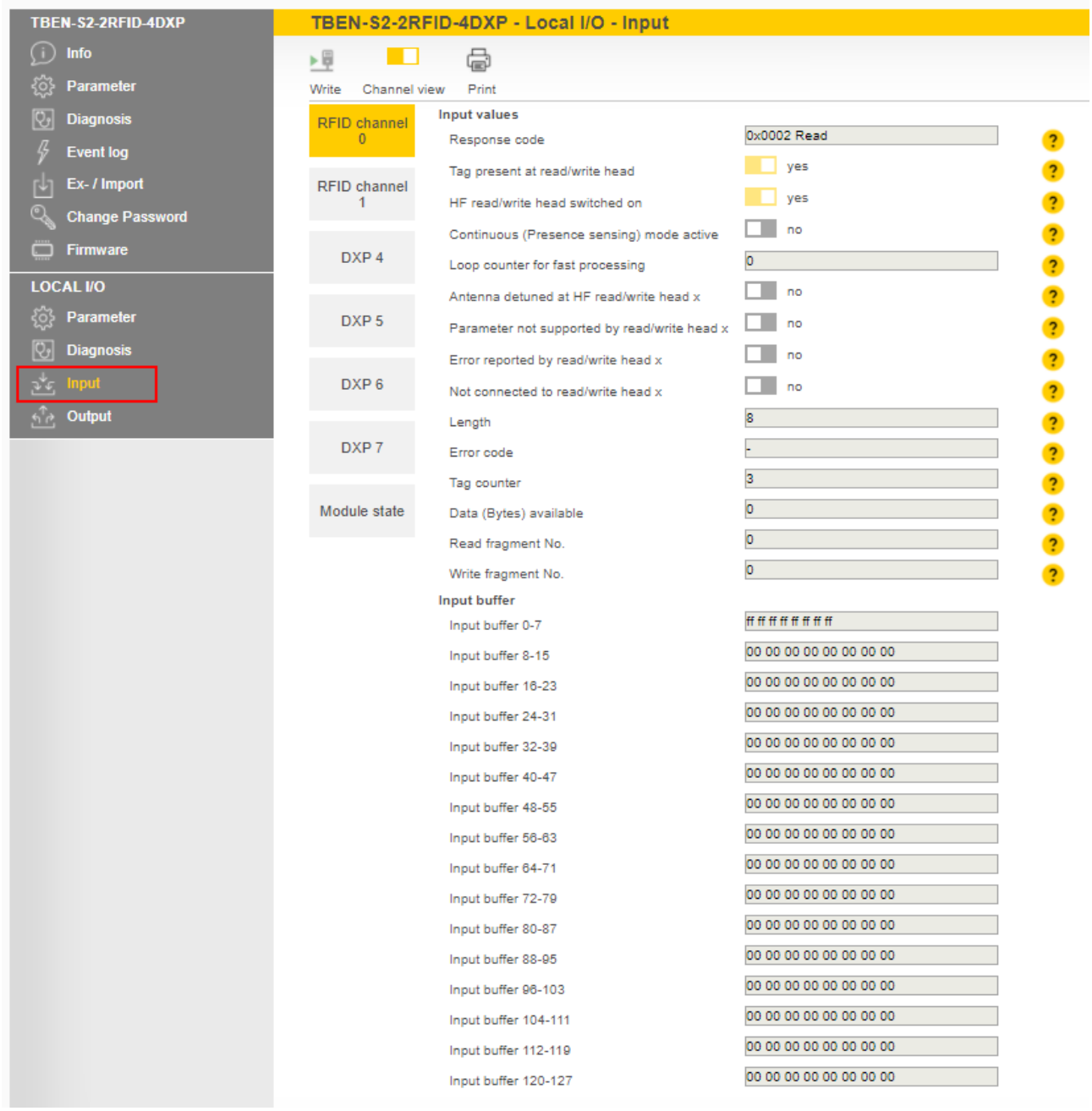


Fig. 88: Read data

Example: Executing a command in bus mode

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

- Click **Local I/O** → **Parameter** in the navigation bar on the left of the screen.
- Select **RFID channel 0**.
- Select **HF bus mode** from the **Operation mode** drop-down menu.
- Activate connected read/write heads 1 and 2.
- Click **Write** to write the set parameters to the device.

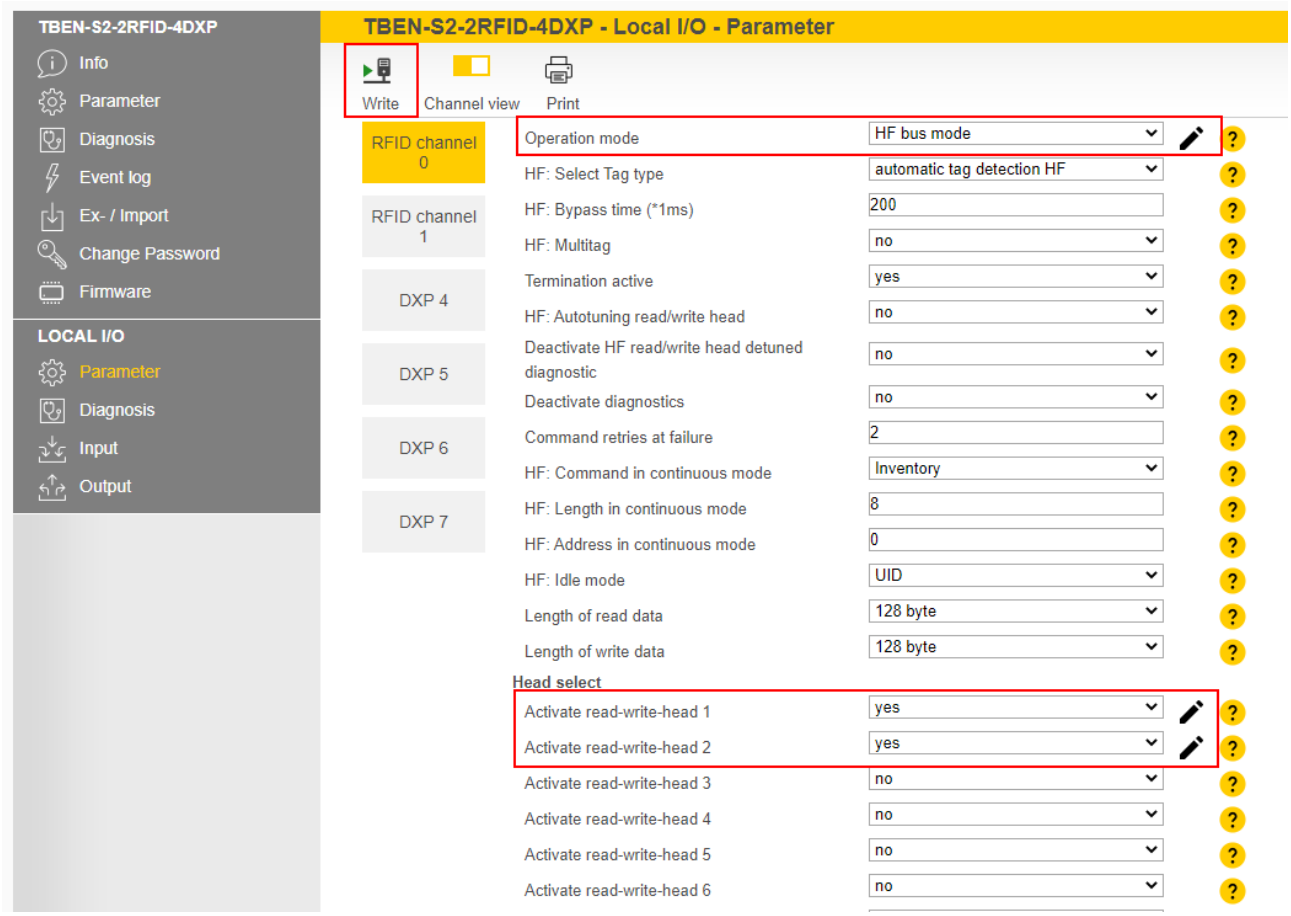


Fig. 89: Reading tags in HF bus mode — parameters

- Under **Output values**, select the read command (**0x002 Read**) from the **Command code** drop-down menu.
- Specify the length of the read data in the **Length** input field (here: **8**).
- Specify the read/write head address in the **Read/write head address** parameter (here: **2**).

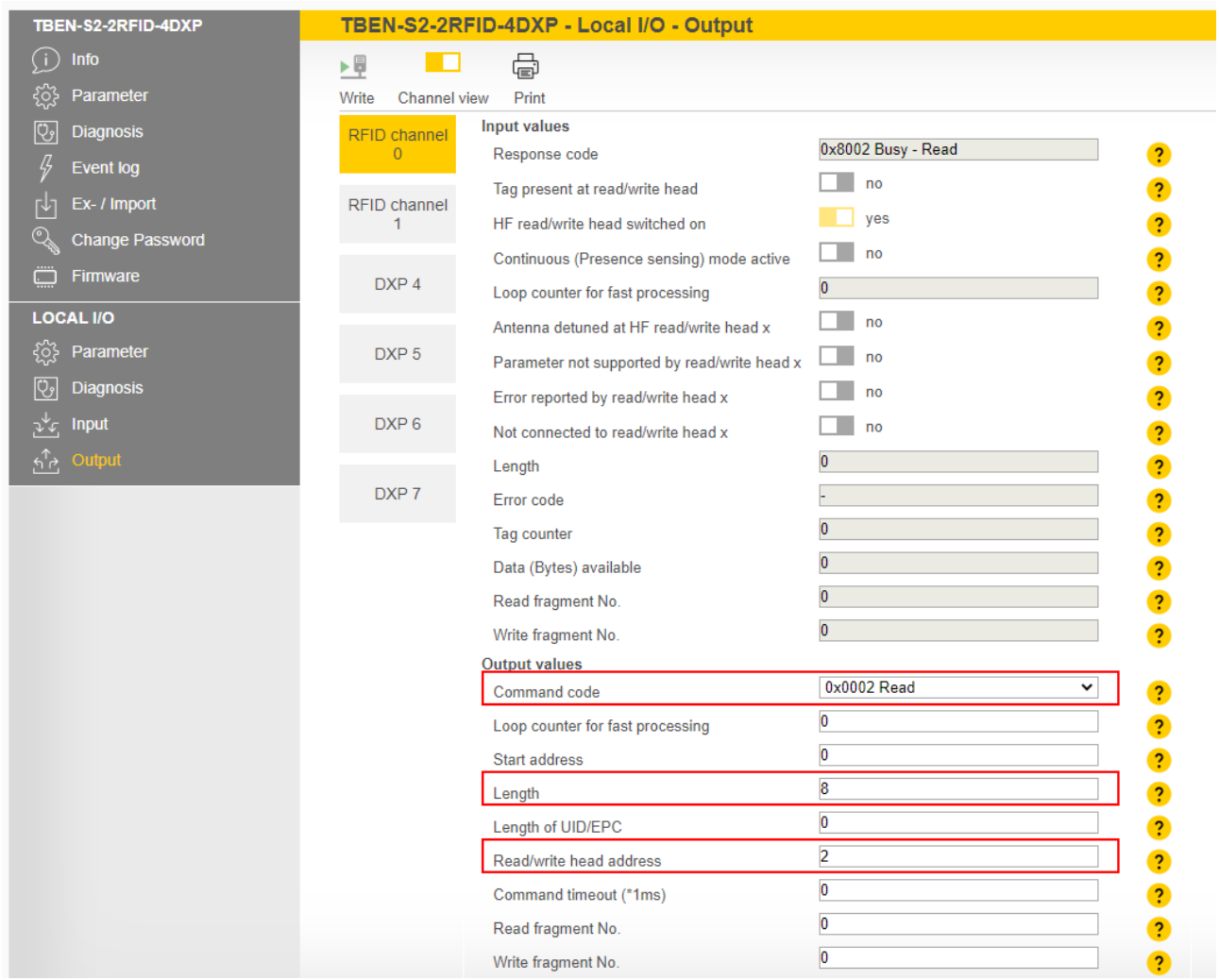


Fig. 90: Reading tags in HF bus mode — process output data

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

- ▶ Open PACTware.
- ▶ Right-click **Host PC** in the project tree.
- ▶ Click **Add device**.
- ▶ Select **BL Service Ethernet**.
- ▶ Confirm the selection with **OK**.

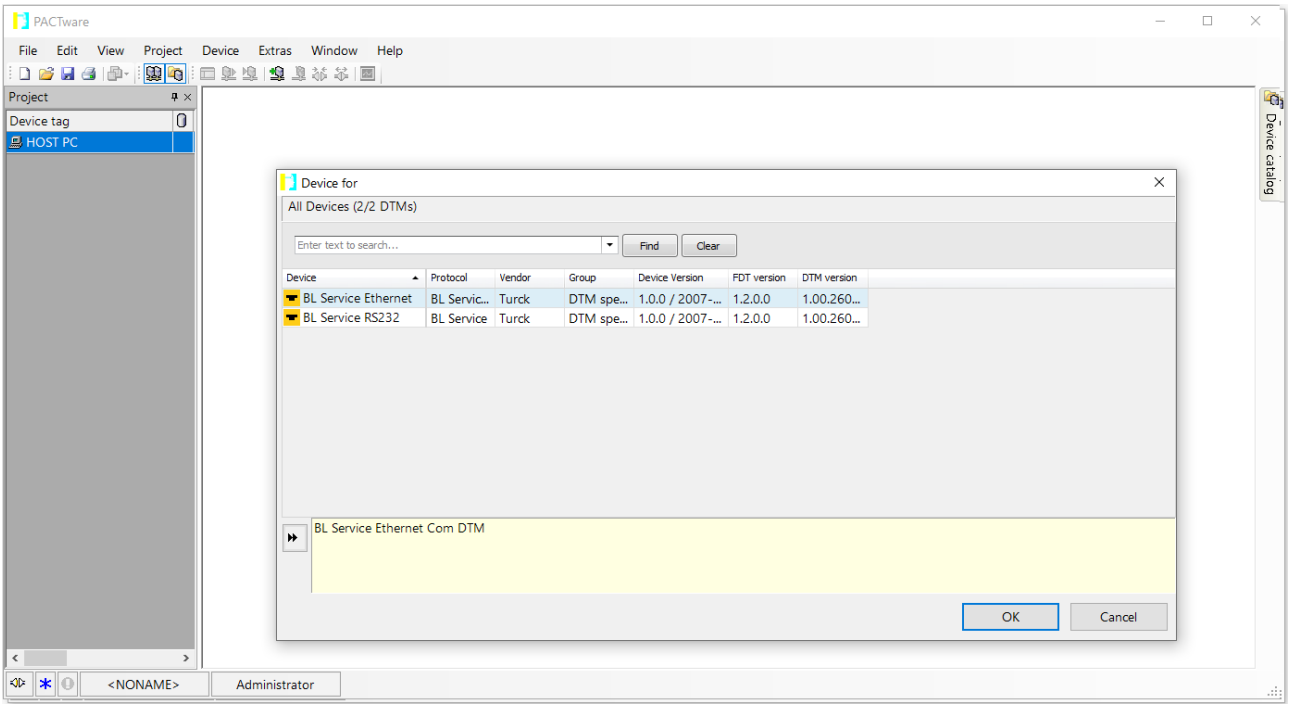


Fig. 91: Selecting an Ethernet adapter

- Right-click the Ethernet adapter in the project tree.
- Click **Add device**.
- Select TBEN-S2-2RFID-4DXP.
- Confirm the selection with **OK**.

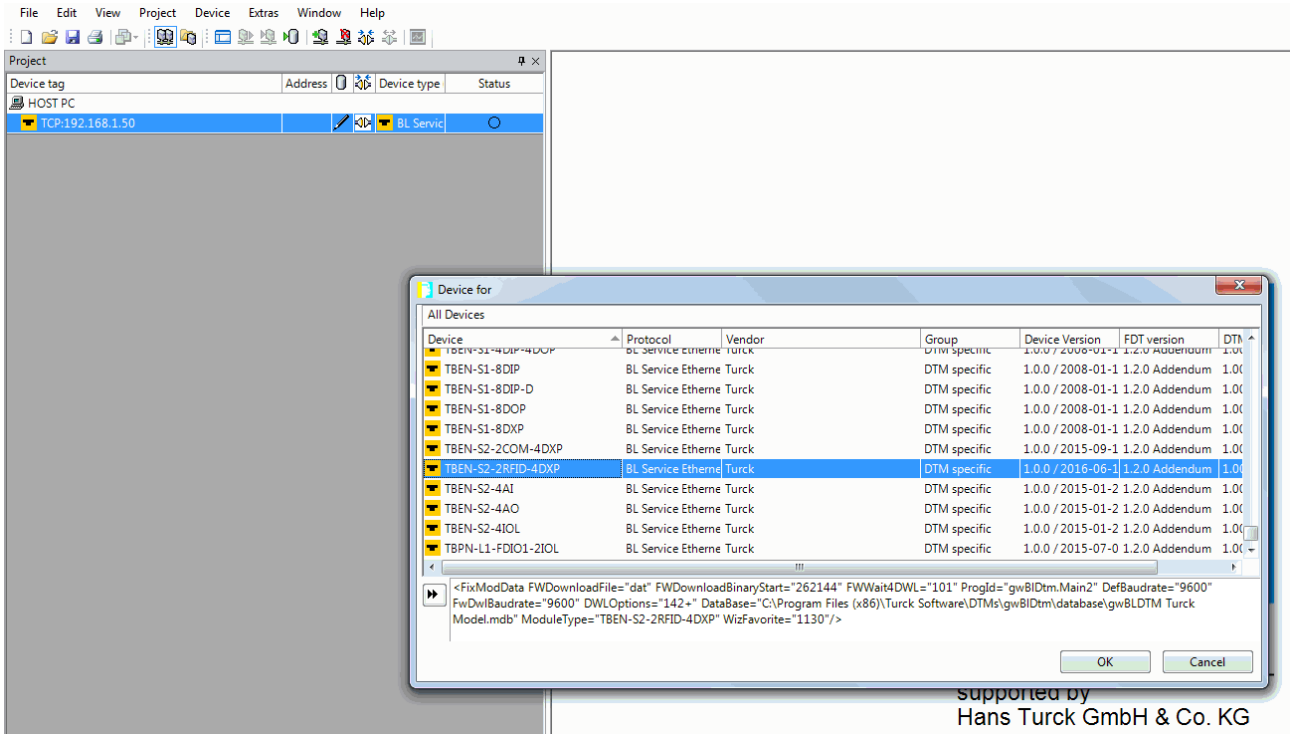


Fig. 92: Selecting TBEN-S2-2RFID-4DXP

- ▶ Enter the **IP address** of the device (example: 192.168.1.20).
- ▶ Enter the **IP address** of the device (example: 192.168.1.254).
- ▶ Optional: Enter the **designation** and **device description**.
- ▶ Confirm entries with **OK**.

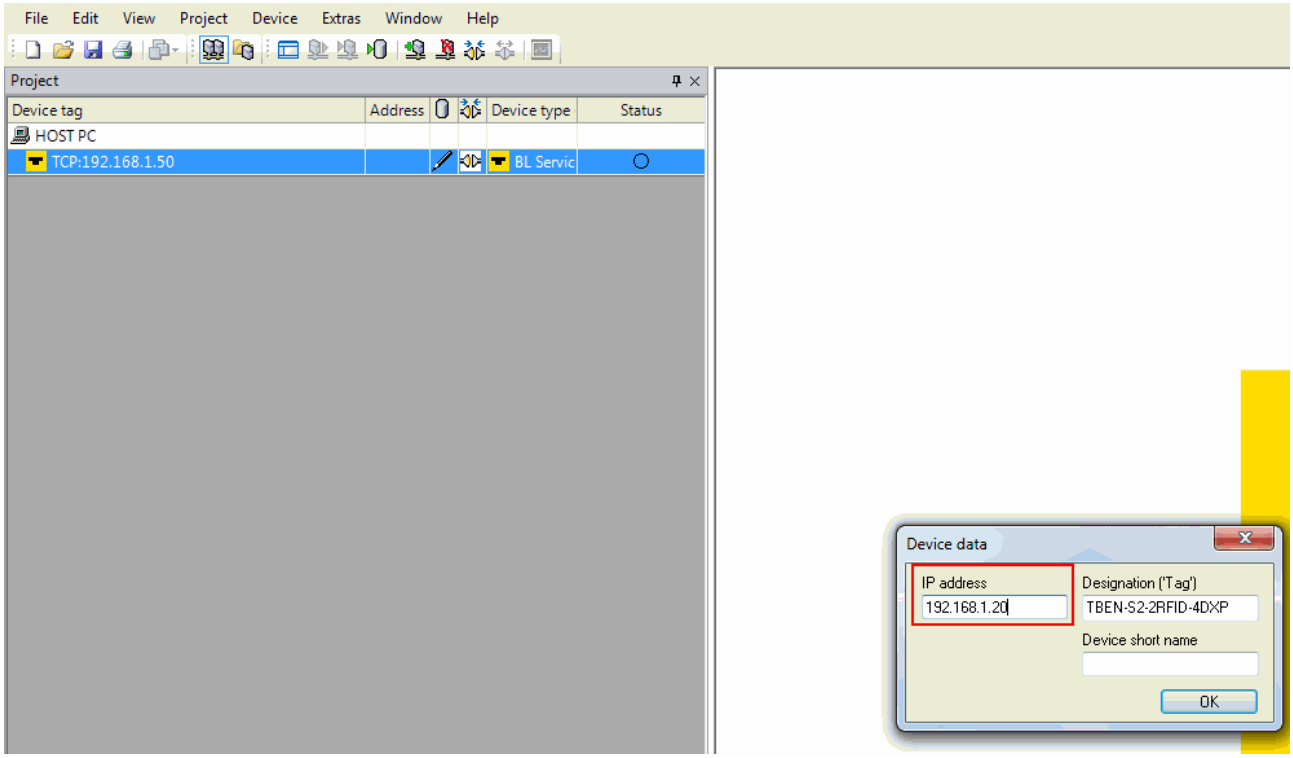


Fig. 93: Entering the IP address

✓ The project tree is complete.

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

⇨ Once connected, you have read and write access to input and output data and to parameter data.

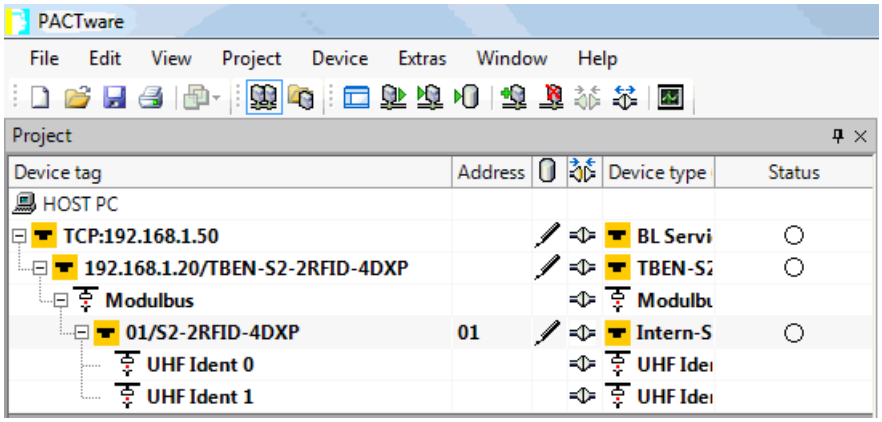


Fig. 94: Complete project tree

8.10.2 Editing parameter data with the DTM — online parameterization

The parameter data can be changed and written to the device via the online parameterization.

- Right-click the device in the project tree.
- Click **Online parameterization**.

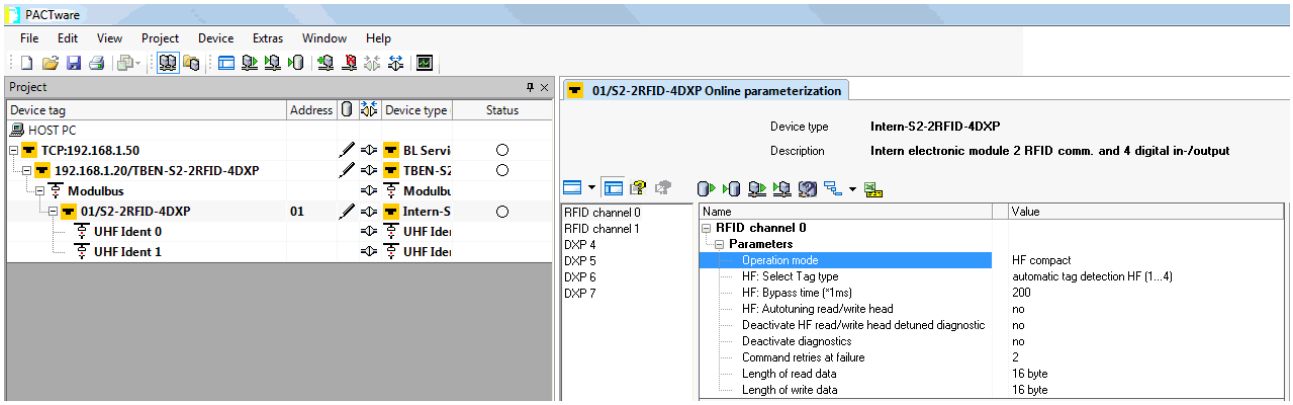


Fig. 95: Online parameterization

Example: Selecting an operating mode

- In the **Online parameterization** window, click the operating mode.
- Select the required operating mode from the drop-down menu.

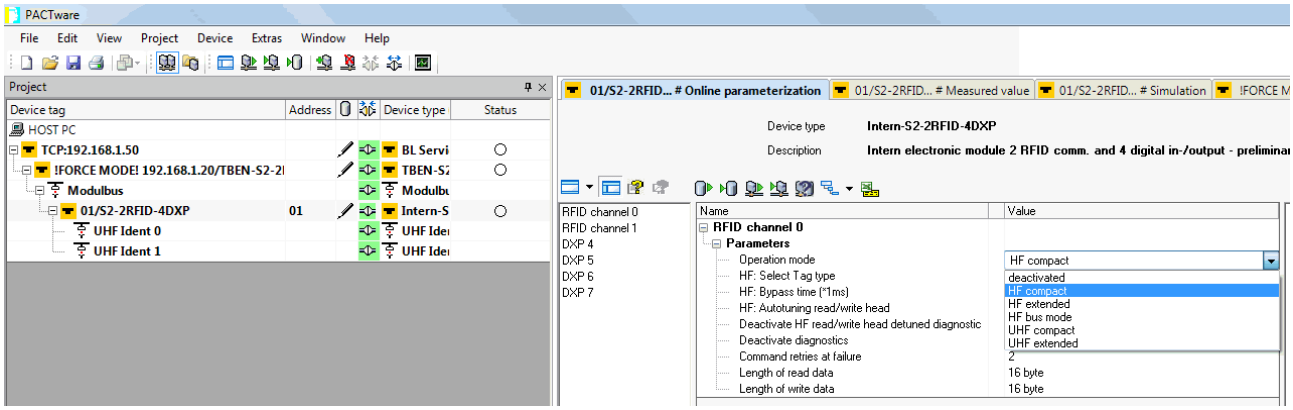


Fig. 96: Example — selecting an operation mode

8.10.3 Reading process input data with the DTM — measured value

The measured value function of the DTM allows the process input data to be read.

- ▶ Right-click the device in the project tree.
- ▶ Click **Measured value**.
- ▶ In the central window, select the required channel.
- ⇨ The process input data is displayed in the window on the right-hand side (example: The device is in idle mode).

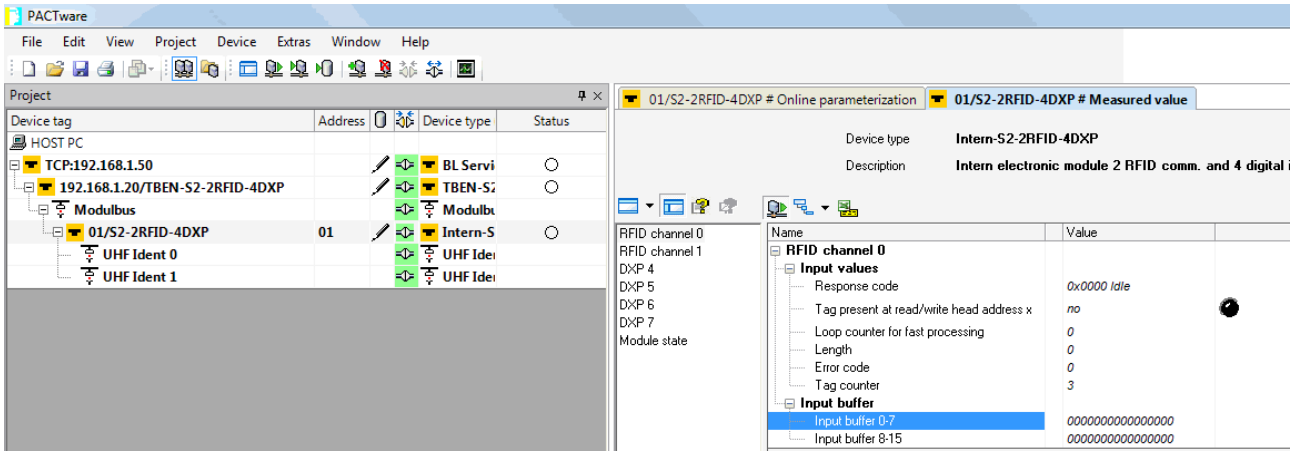


Fig. 97: Measured value function of the DTM

8.10.4 Changing process output data with the DTM — simulation

The simulation function of the DTM allows the process output data to be changed.

- ▶ Right-click the device in the project tree.
- ▶ Click **Simulation**.
- ▶ In the central window, select the required channel.
- ⇨ The process output data is displayed in the window on the right-hand side (example: The device is in idle mode).

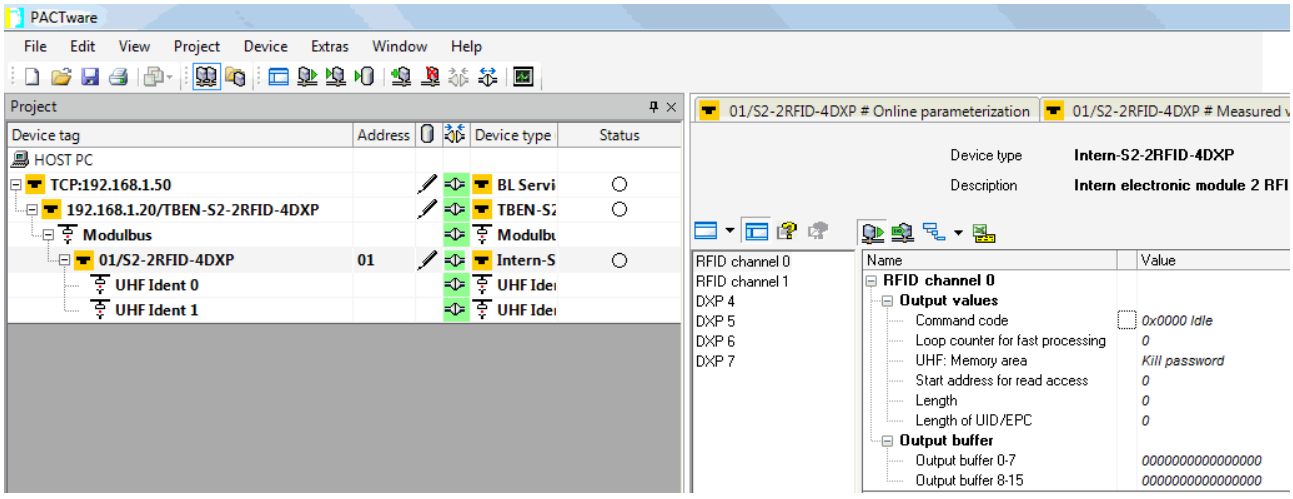


Fig. 98: Simulation function of the DTM

8.10.5 Evaluating diagnostics with the DTM

The diagnostics function of the DTM allows the diagnostics of all channels to be called up.

- ▶ Right-click the device in the project tree.
- ▶ Click **Diagnostics**.
- ▶ In the central window, select the required channel.
- ⇨ The process output data is displayed in the window on the right-hand side (example: No diagnostics available).

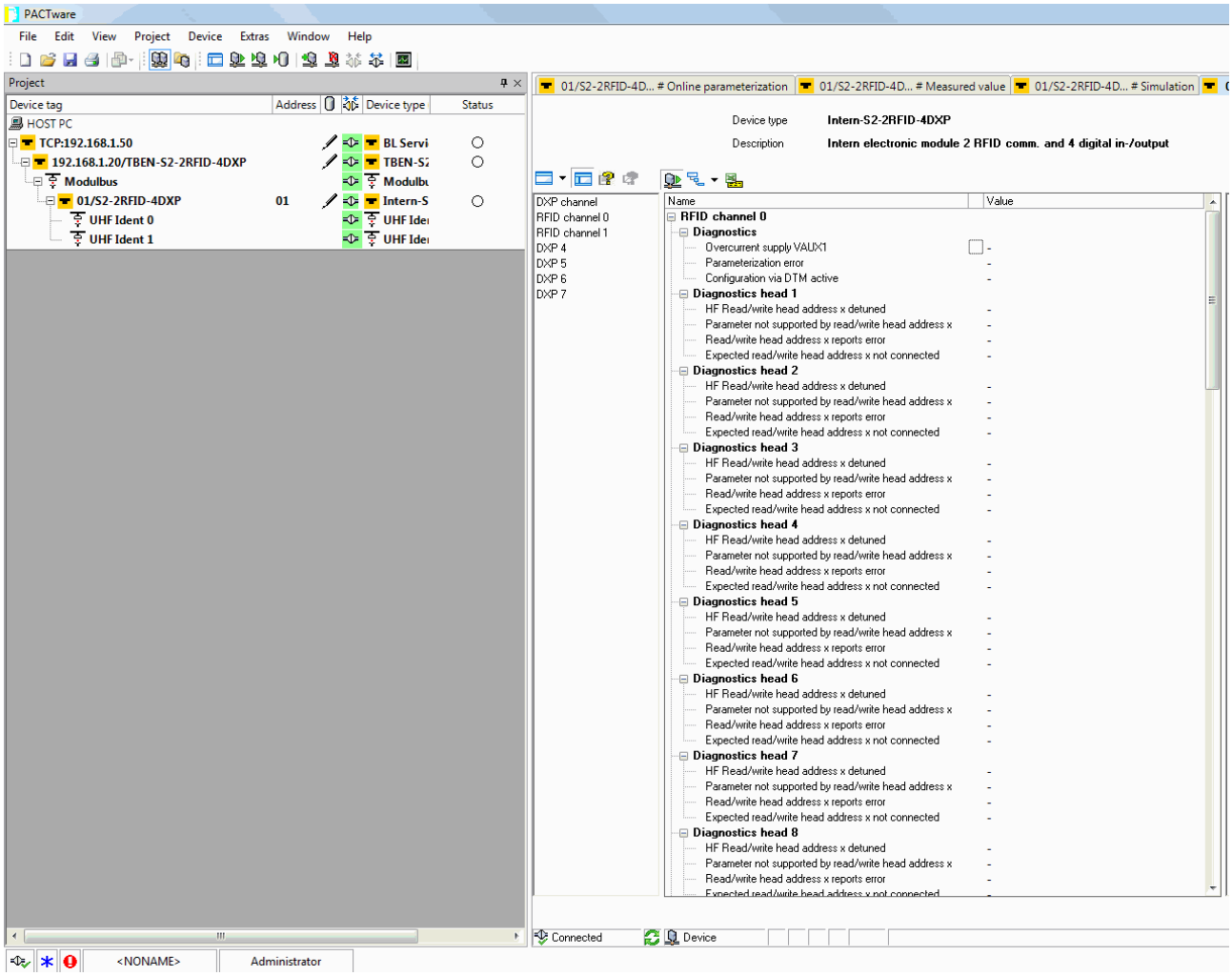


Fig. 99: Diagnostics function of the DTM

8.10.6 Example: Executing a read command with the DTM

In the following example, 8 bytes of a tag are read by a 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.
- ▶ Setting the length: Double-click current value.
- ▶ Confirm all the subsequent messages.
- ⇨ The DTM starts force mode. In force mode, all input 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).

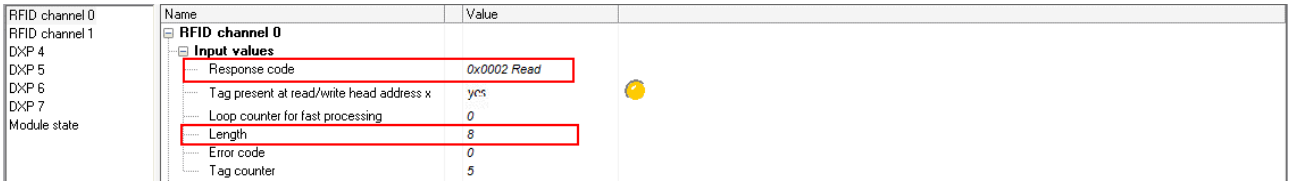


Fig. 100: Executing a read command — window: Simulation

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

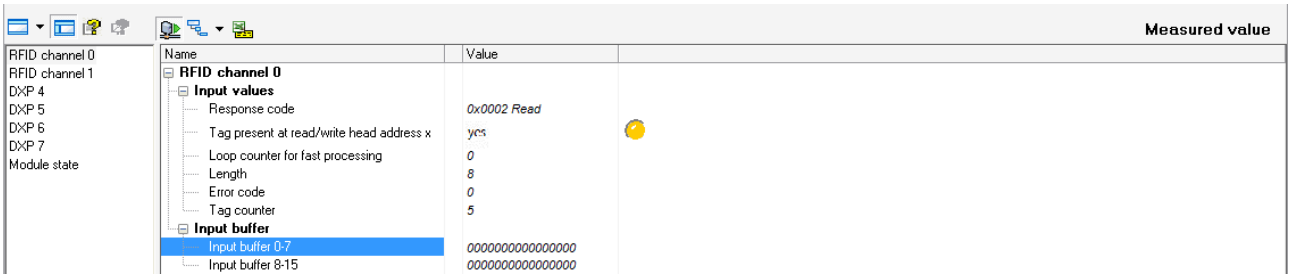


Fig. 101: Executing a read command — window: Measured value

8.11 Setting RFID interfaces with the RFID PC Demo software for Modbus TCP

The devices can be set and commands sent to the devices via the RFID PC Demo software for Modbus TCP. To be able to adjust the settings with a PC, the device and the PC must be on the same IP network.

The RFID PC Demo software for Modbus TCP is available free of charge for download at www.turck.com.

8.11.1 Establishing a connection

- ▶ Enter the IP address of the device on the home page.
- ▶ Click **Connect**.
- ⇨ The connection is established.

Write access to input, output and parameter data is possible after the connection has been established.

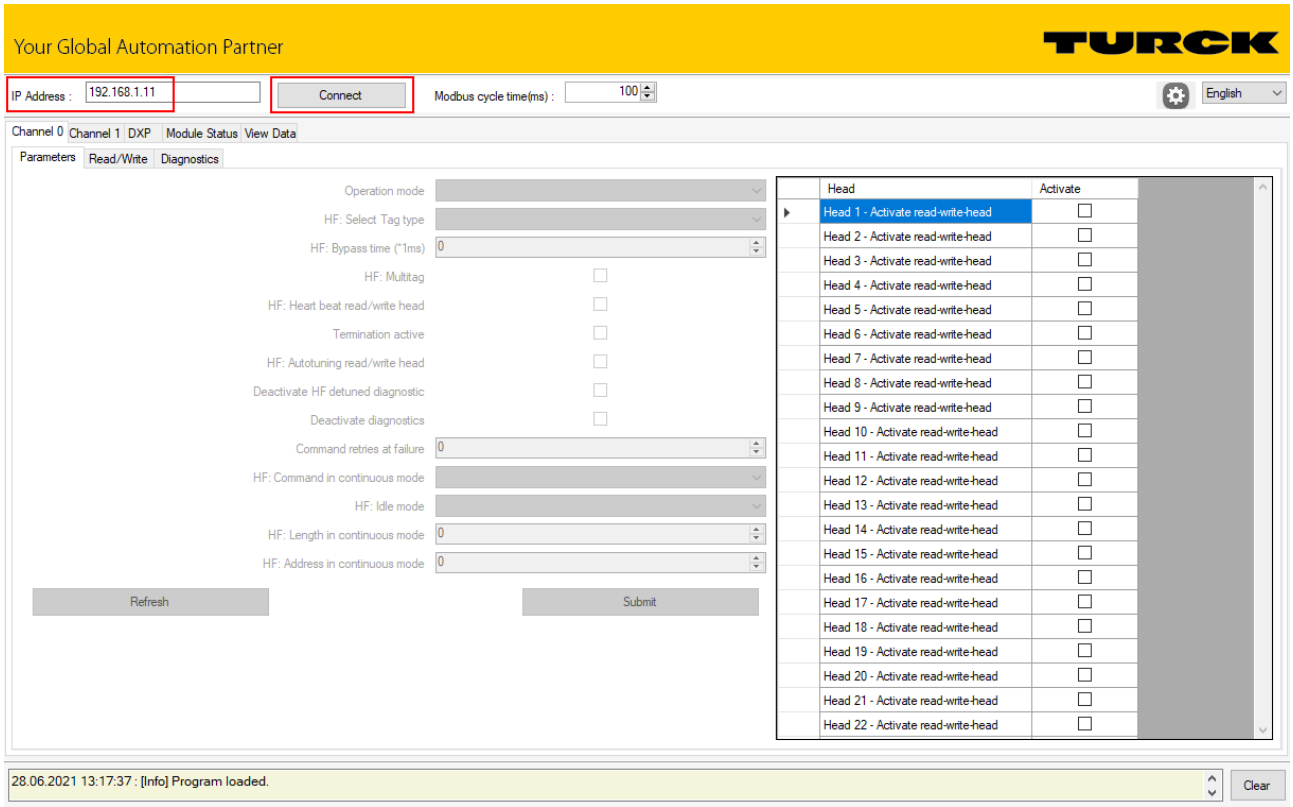


Fig. 102: Launching RFID PC Demo for Modbus TCP

8.11.2 Editing settings

Example: setting the operation mode for channel 0

In the following example, the operating mode of channel 0 is set to **RF extended**.

- ▶ **Channel 0** → **Parameters** → **Operating mode**: From drop-down menu **2:** Select **HF extended**.
- ▶ Click **Confirm**.
- ⇨ The settings are saved.

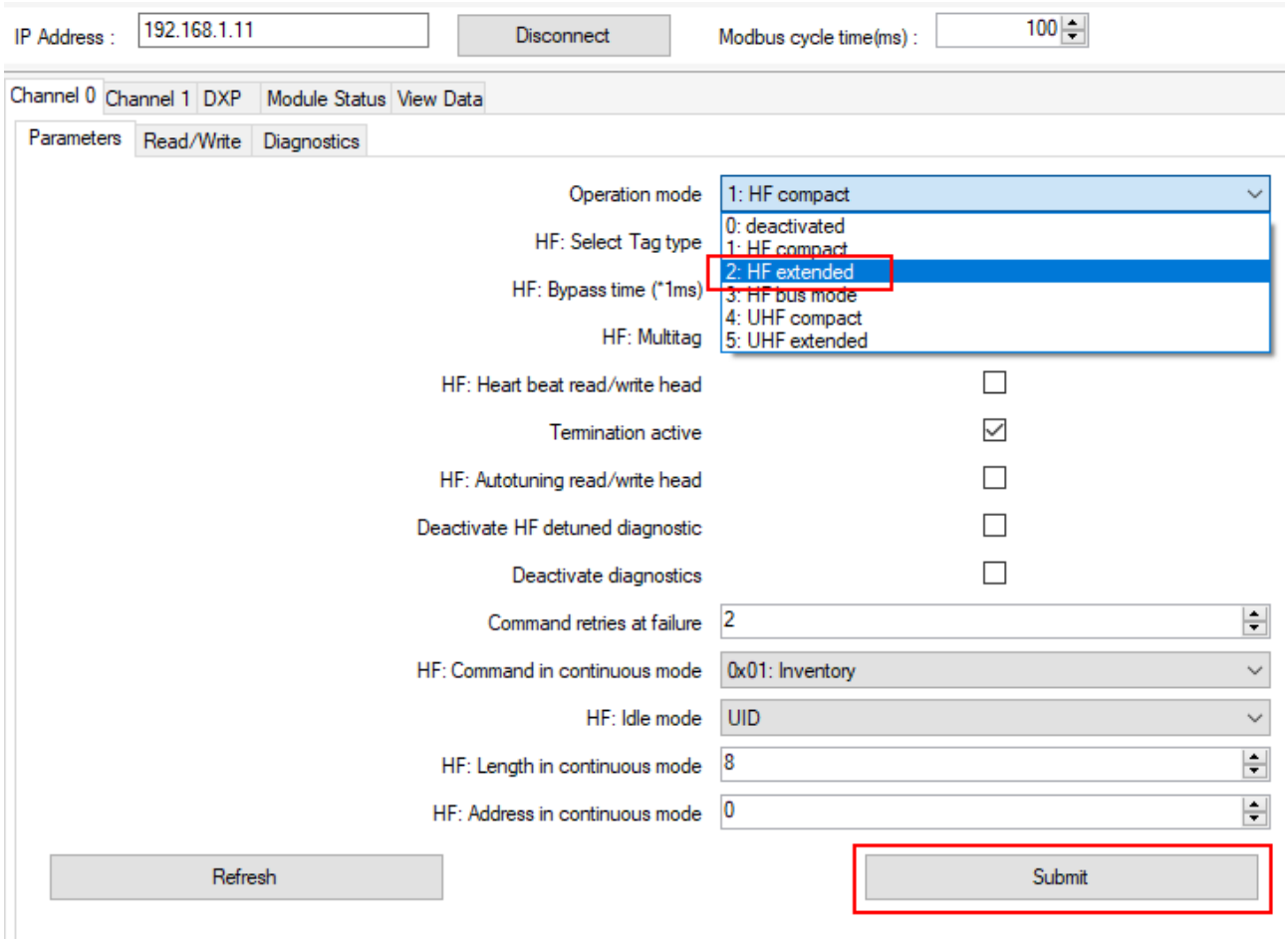


Fig. 103: Setting the operation mode

Example: executing a read command

In the following example, 16 bytes of a tag are read by a read/write head connected to channel 0 of the interface.

- **Channel 0** → **Read/Write** → **Command code**: Select the read command via the drop-down menu (**0x0002 Read**).
- Enter the number of bytes to be read in the **Length** entry field (here: **16**).
- Sending a read command: In the **Command** tab, click the **Confirm** button.

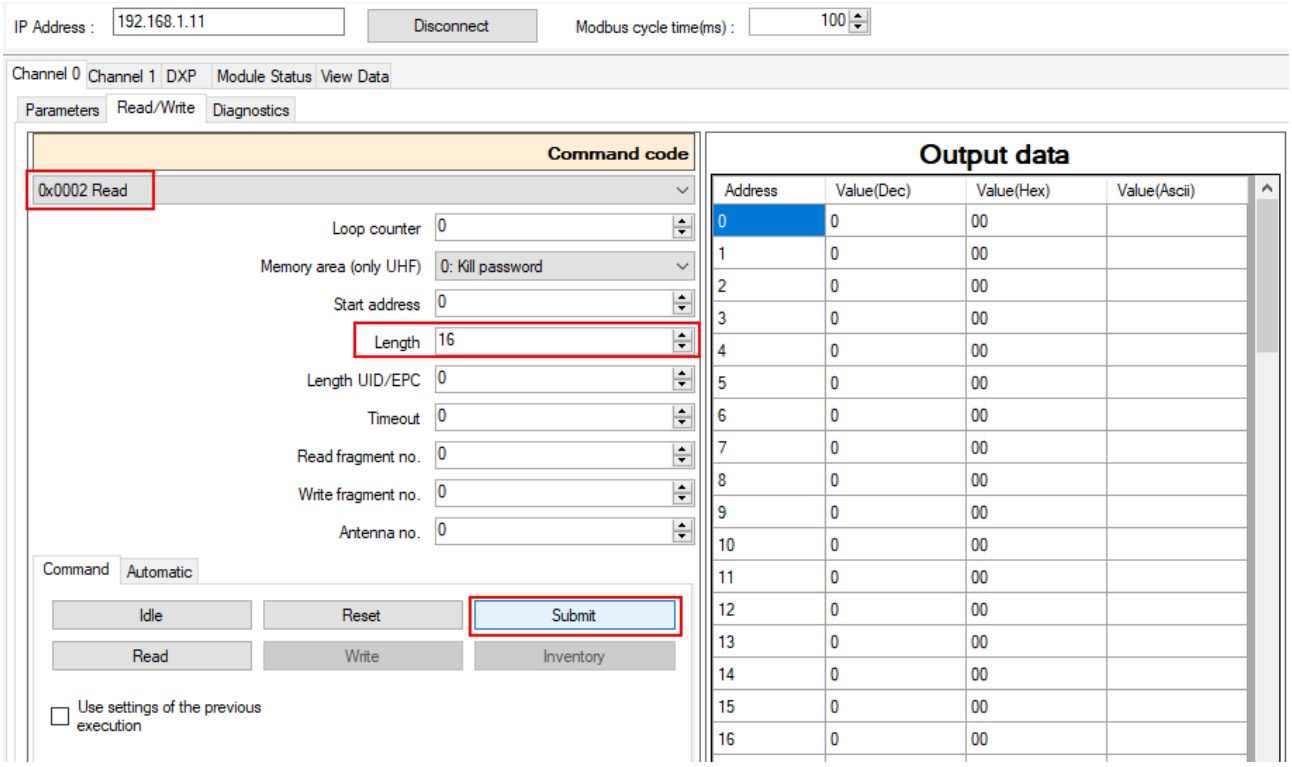


Fig. 104: Setting a read command

⇨ The receipt of the command is confirmed under **Response code** with **(0x8002) Busy**.

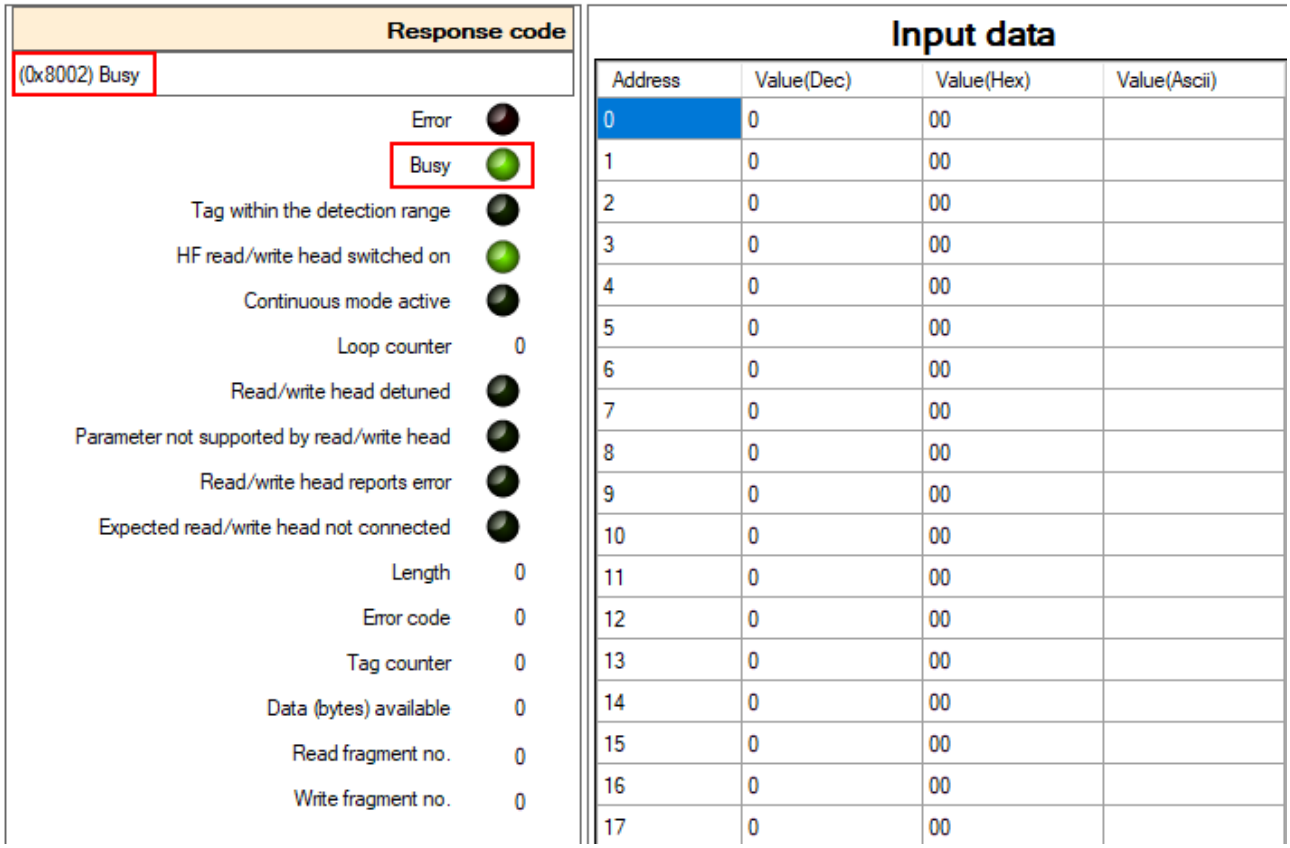


Fig. 105: Receiving a read command

The read command is executed when there is a tag in the detection range of the read/write head. The read data is displayed in the **Input data** window.

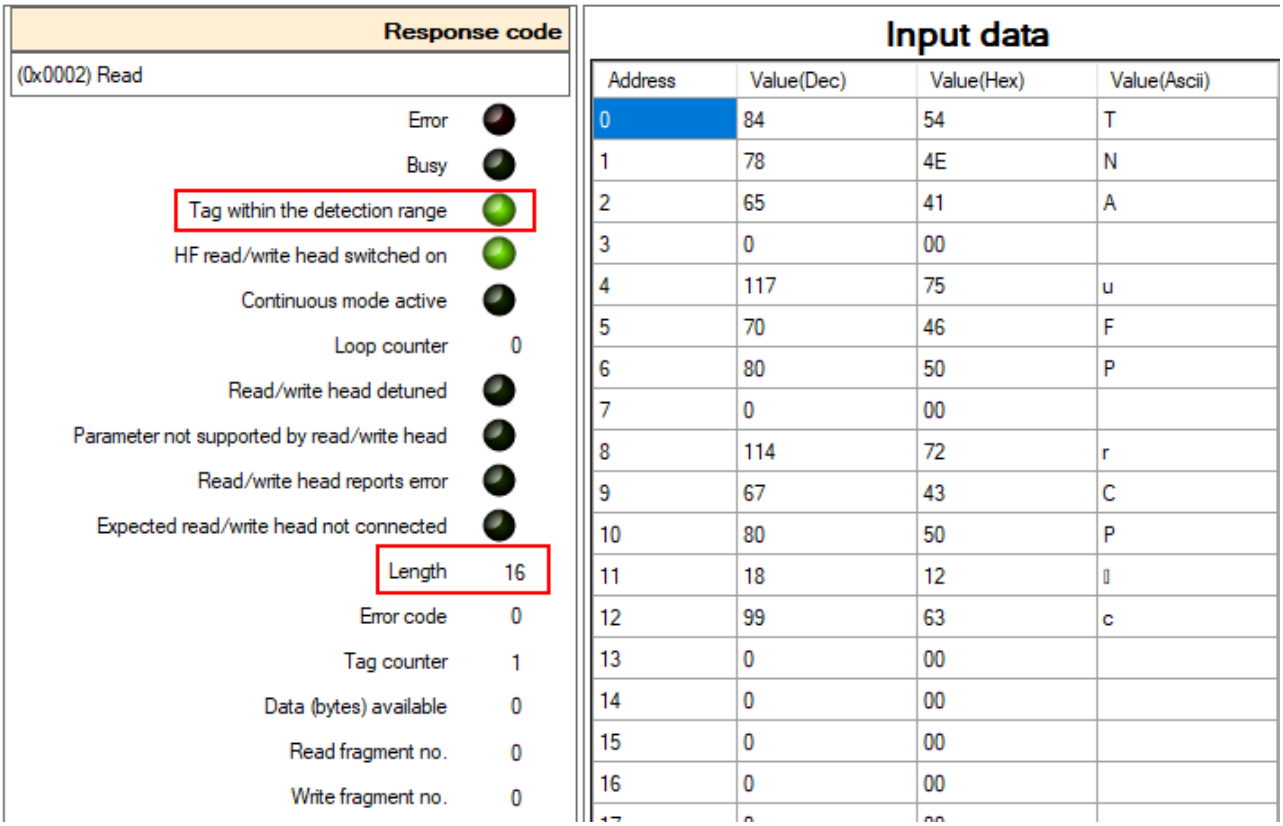


Fig. 106: Input data for a successful read command

Example: Executing a command in bus mode

In the following example, the read/write head with address 1 is to read 8 bytes from a tag in HF bus mode. Two read/write heads are connected to channel 0 of the interface.

- **Channel 0** → **Parameters** → **Operating mode**: From drop-down menu **3:** Select **HF bus mode**.
- Click **Confirm**.

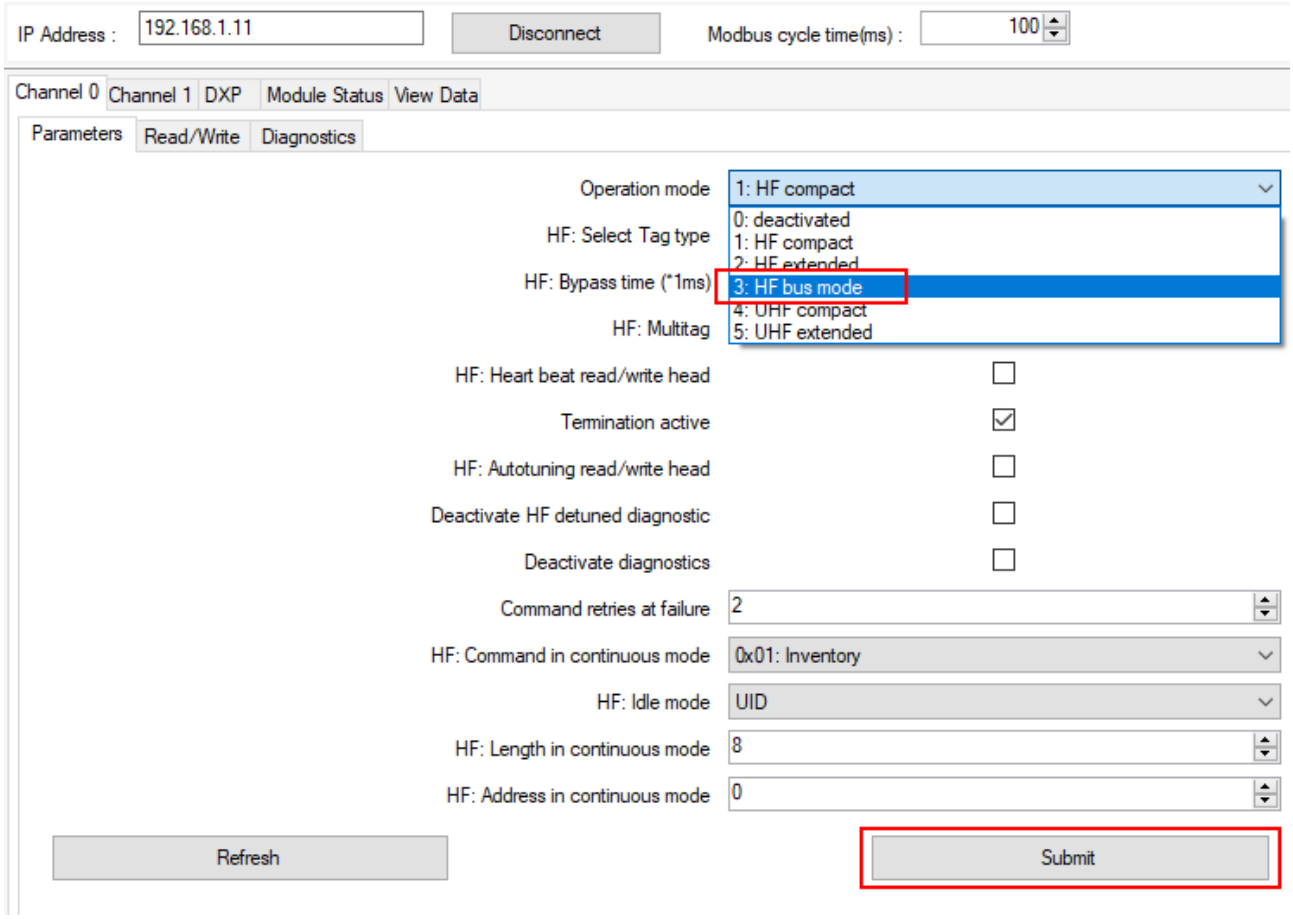


Fig. 107: Setting HF bus mode

- **Channel 0 → Read/Write → Command code**: Select the **0x0070 Get HF read/write head address** command via the drop-down menu.

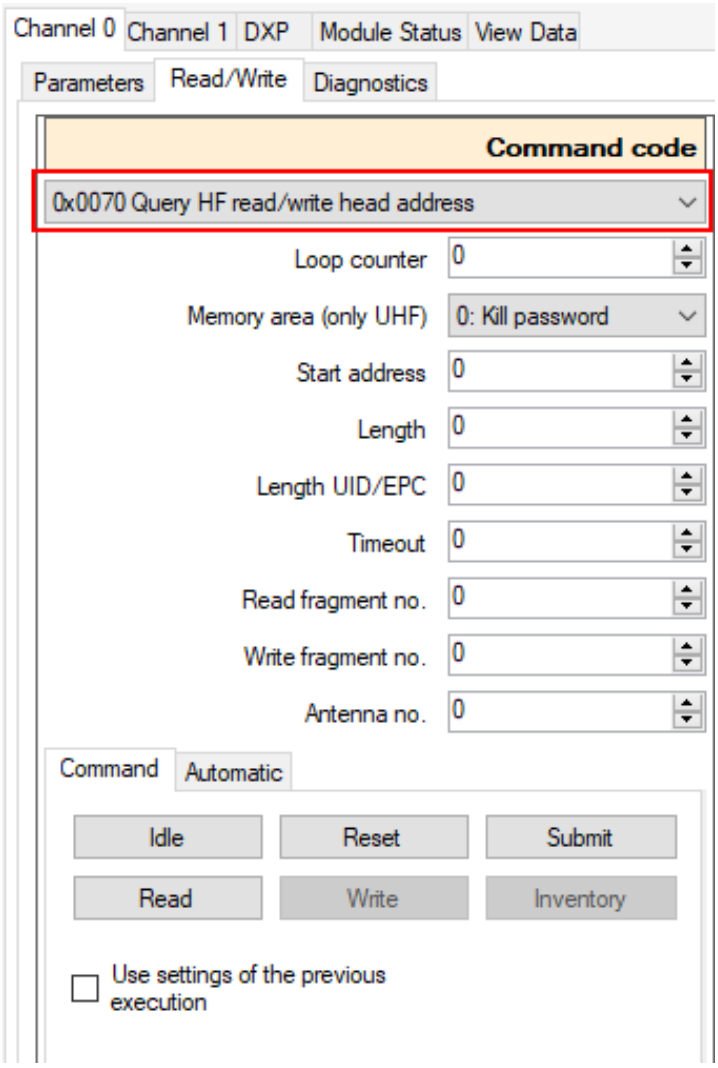


Fig. 108: Getting HF read/write head addresses

⇨ The addresses of the connected read/write heads are displayed in the input data.

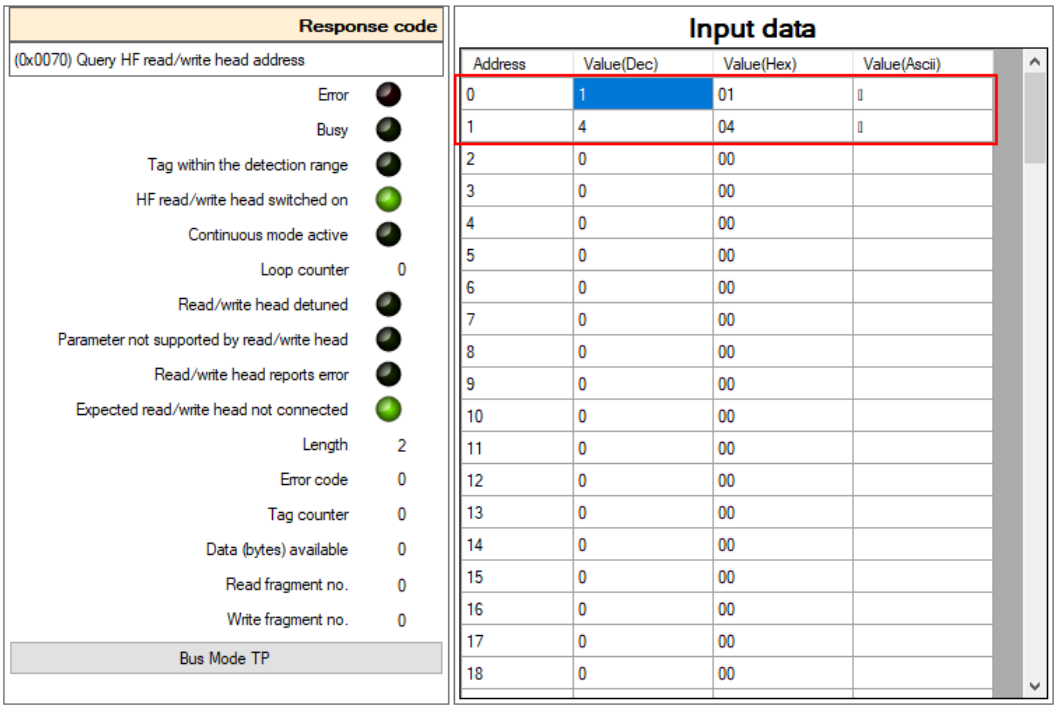


Fig. 109: HF read/write head addresses

- **Channel 0** → **Parameter**: Activate the connected read/write heads in the right window (here: read/write heads 1 and 4).
- Click **Confirm**.

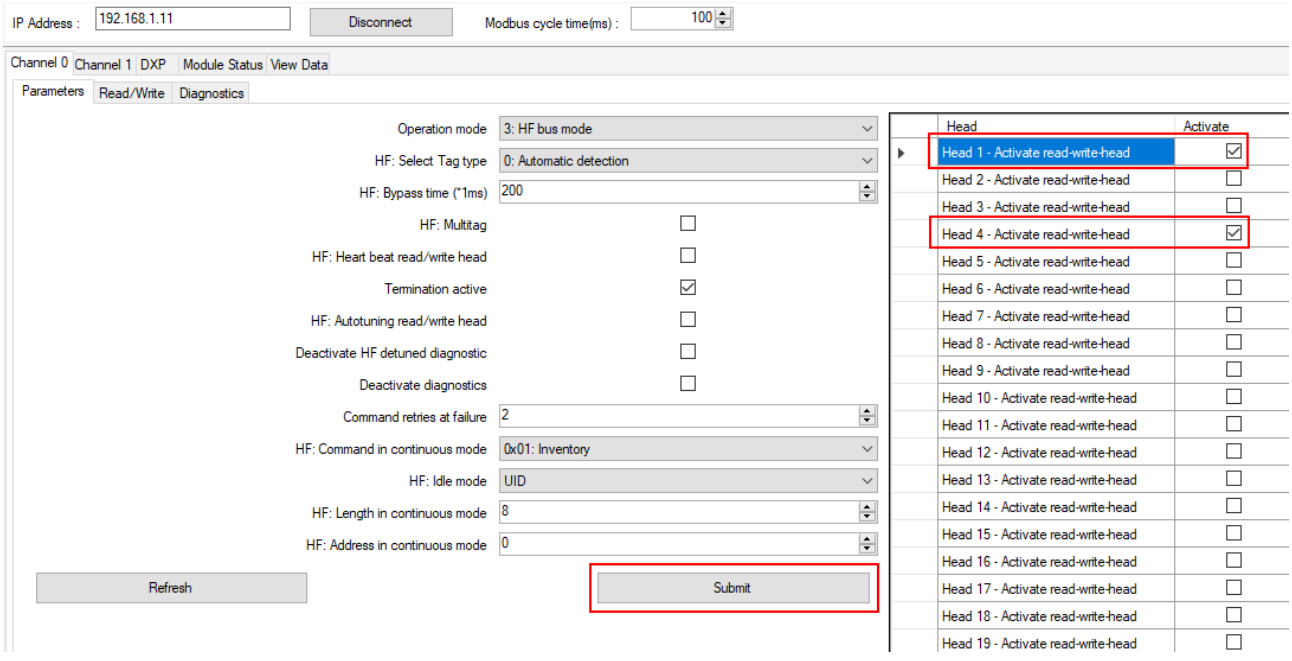


Fig. 110: Activating HF read/write heads

- **Channel 0** → **Read/Write** → **Command code**: Select the read command (**0x0002 Read**).
- Enter the length of the read data (here: **8**).
- Enter the read/write head address in the **Antenna number** field (here: **1**).
- Click **Confirm**.

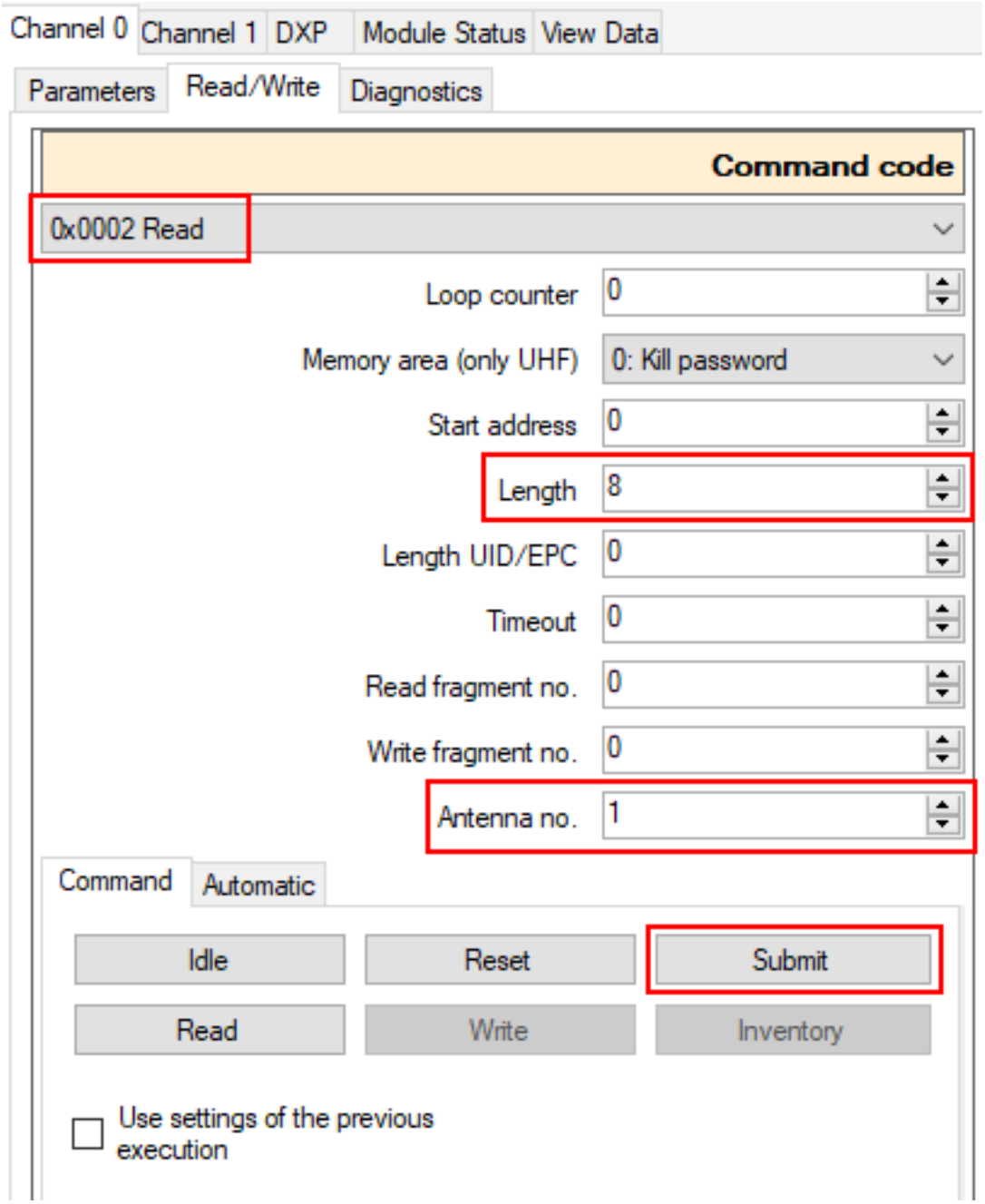


Fig. 111: HF bus mode — setting a read command

➪ If a tag is present in the detection range of the set read/write head, the virtual LED in the **Bus mode – TP** window is lit green and the read data is displayed in the input data.

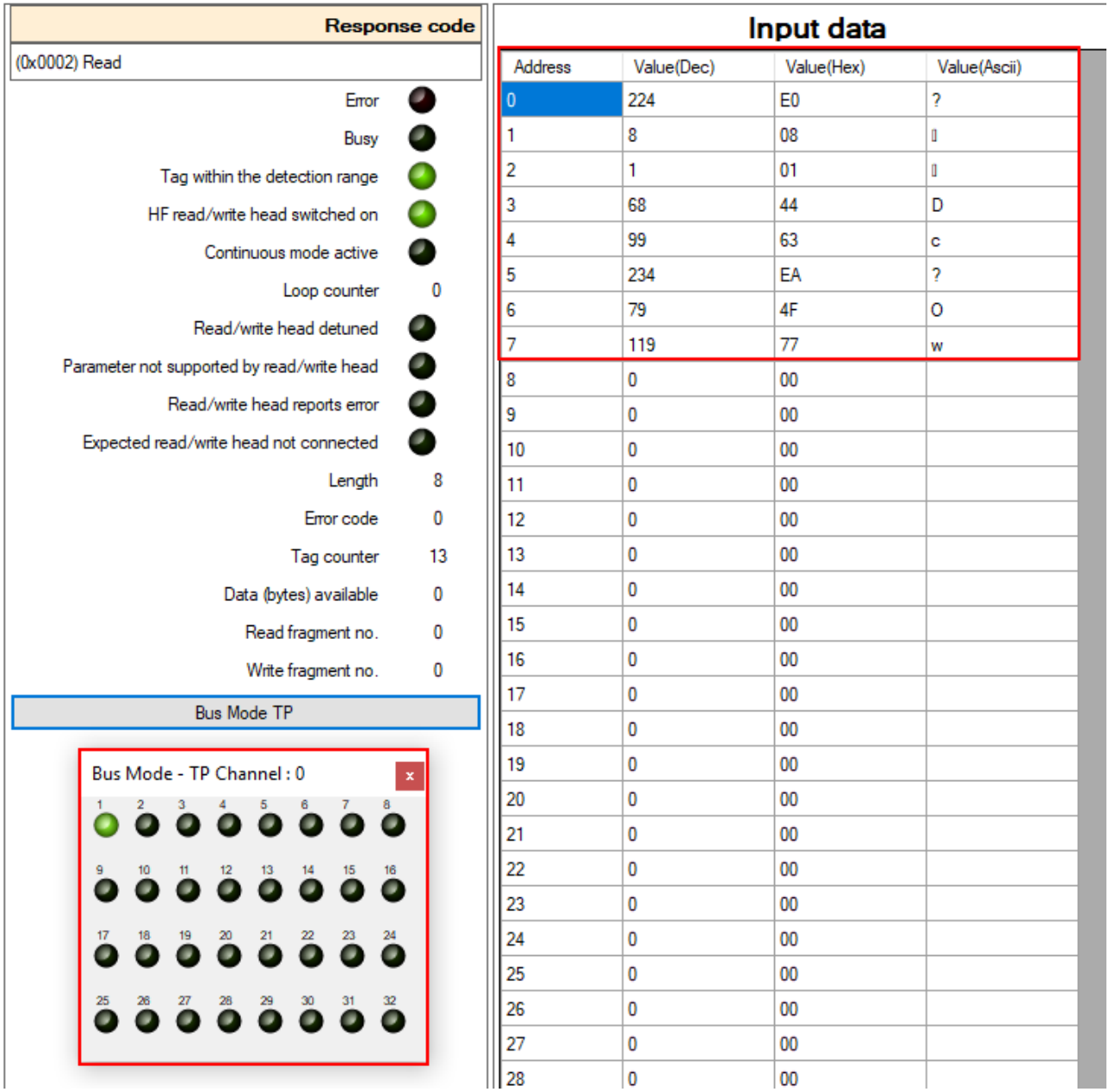


Fig. 112: HF bus mode — tag in the detection range of read/write head 1

Example: Using automatic mode for command repetition

In automatic mode, commands are repeated by the Modbus master or a connected DXP. In the following example, 16 bytes of a tag are read cyclically in automatic mode by a read/write device connected to channel 0 of the interface.

- Click **Channel 0** → **Read/Write** → **Automatic** → **Read**.

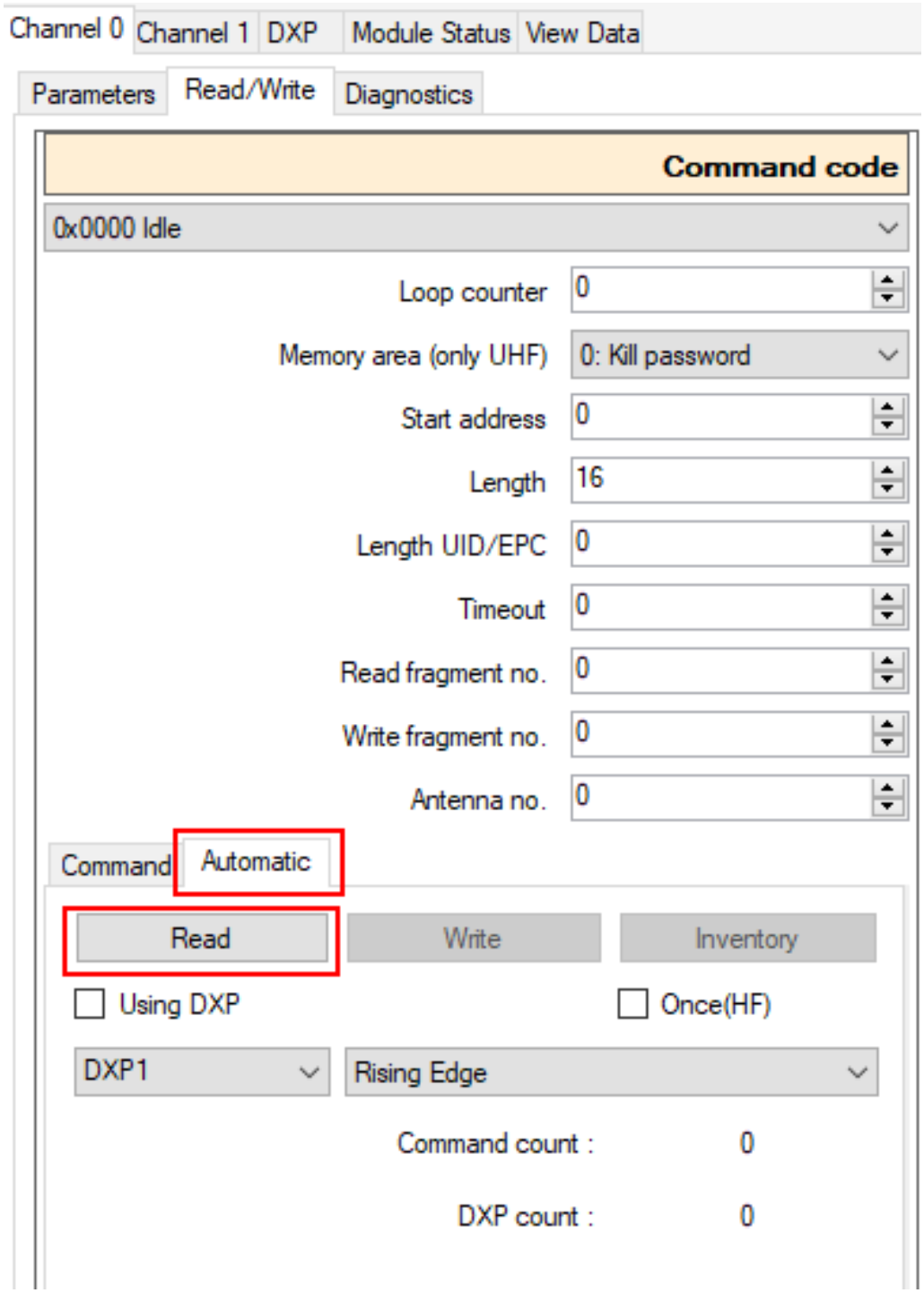


Fig. 113: Automatic mode — read

- ⇨ The read command is executed permanently or cyclically depending on the set Modbus cycle time.
- ⇨ The read data is shown in the input data.

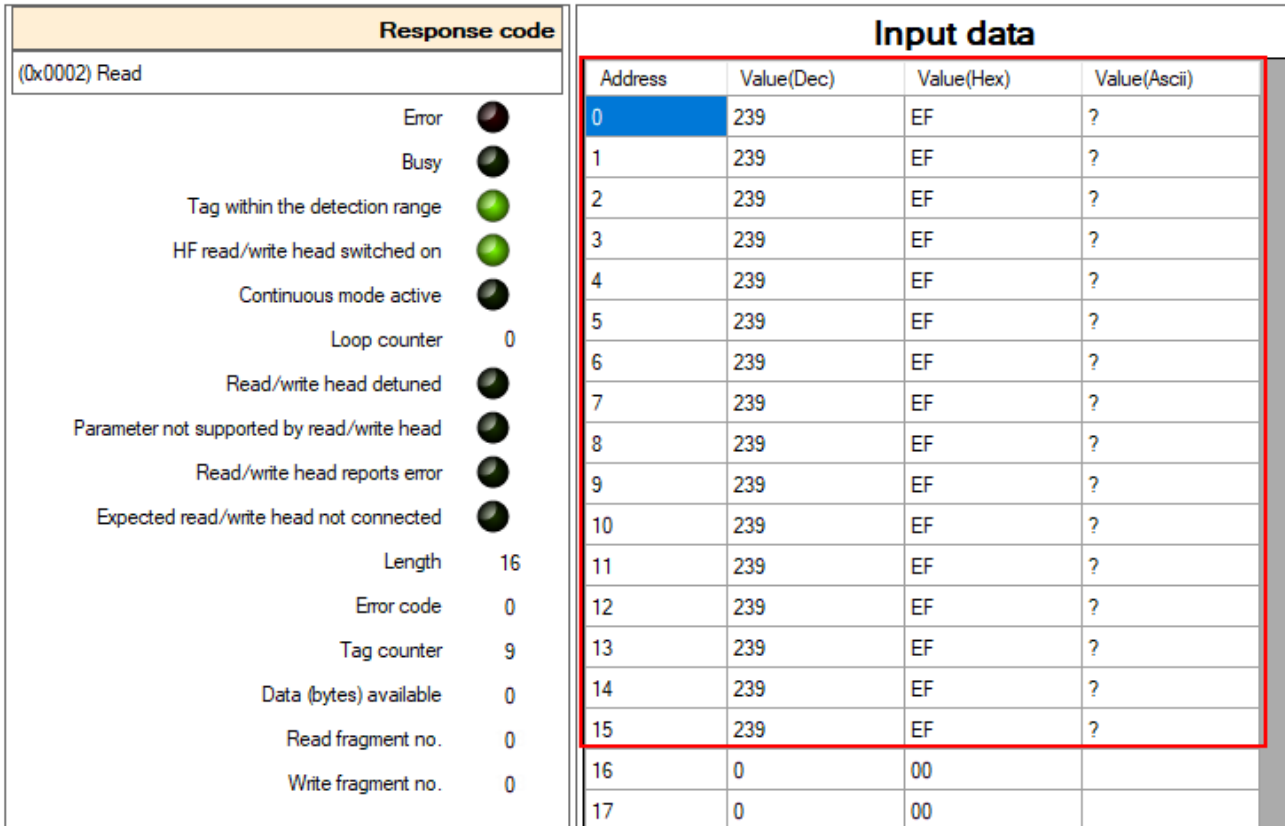


Fig. 114: Automatic mode — input data

- Stopping the read command: Click **Channel 0** → **Read/Write** → **Automatic** → **Stop**.

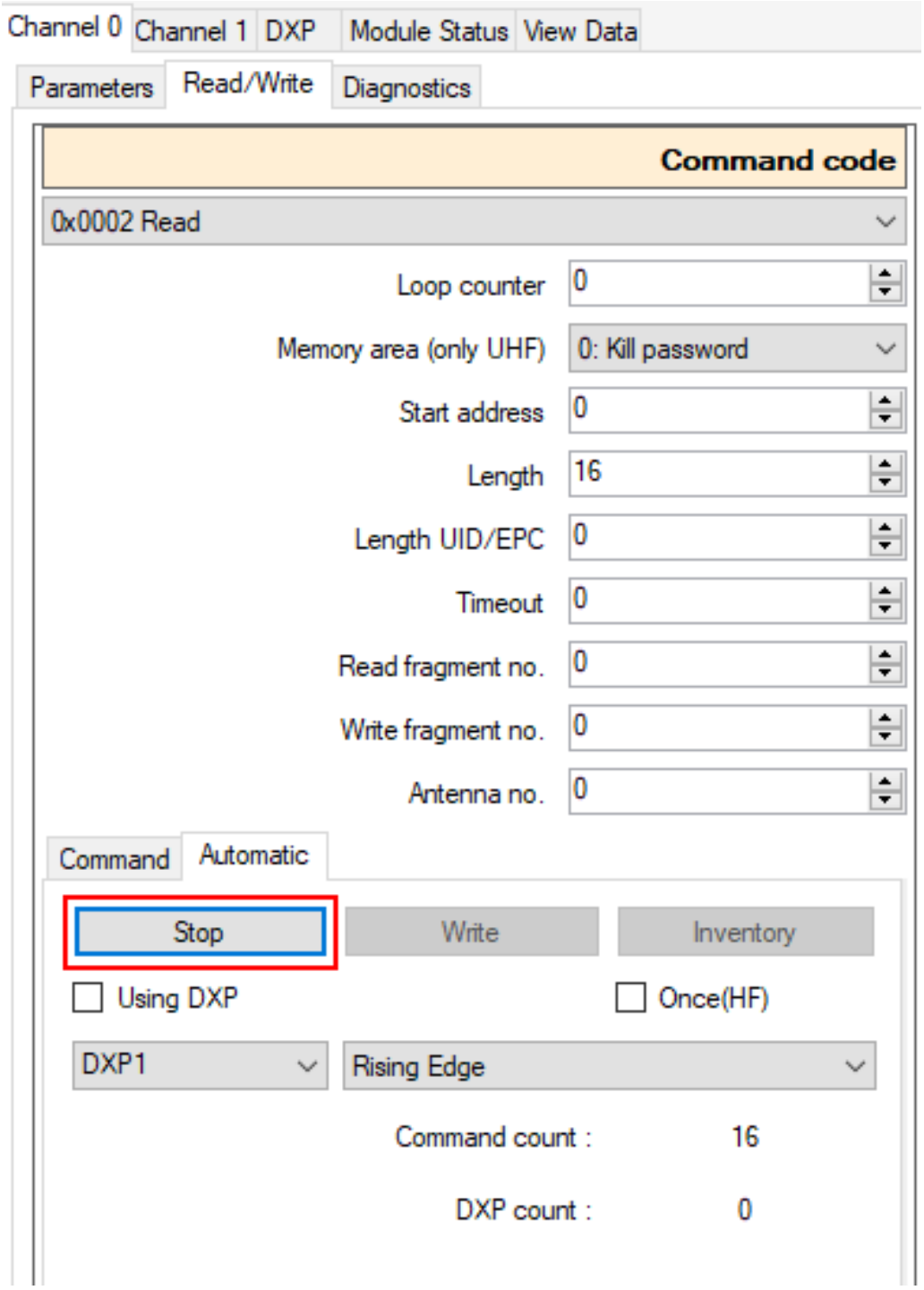


Fig. 115: Automatic mode — stop read command

Example: Triggering RFID commands via a connected DXP

- **Channel 0** → **Read/Write** → **Automatic**: Activate the **Use DXP** option.
- Set the required DXP channel in the drop-down menu (here: **DXP1**).
- In the drop-down menu, select the required edge trigger:
  - **Rising edge**: Change the DXP value from 0 to 1
  - **DXP to 1:** as long as the DXP is 1
  - **Falling edge**: Change the DXP value from 1 to 0

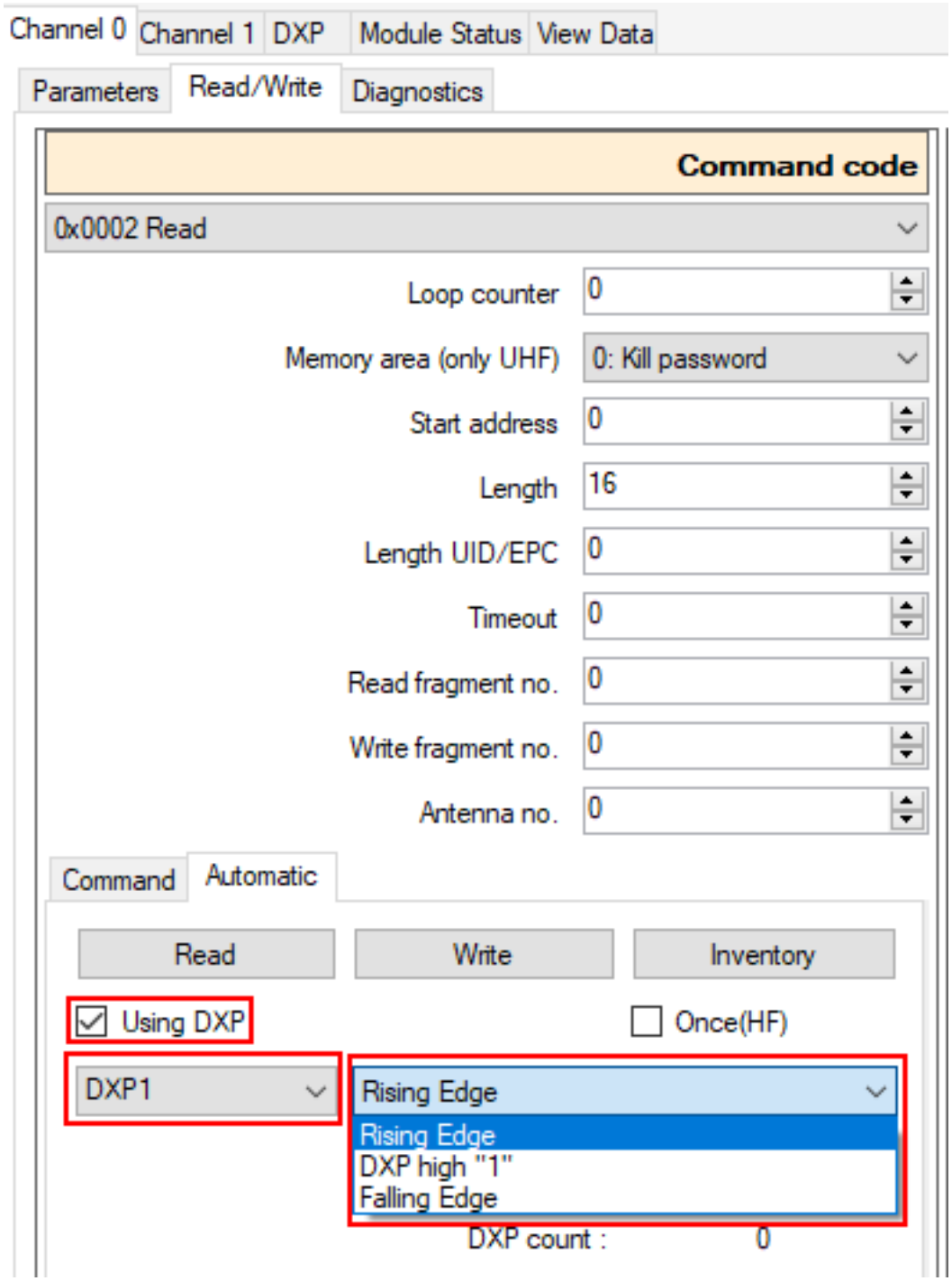


Fig. 116: Automatic mode — using the DXP channel with a rising edge

8.11.3 Logging actions and data

Activating logging

- ▶ Click the Log button at the top right.
- ▶ Select the option.
- ▶ Click **Apply**.
- ⇨ All data is saved in a log file.

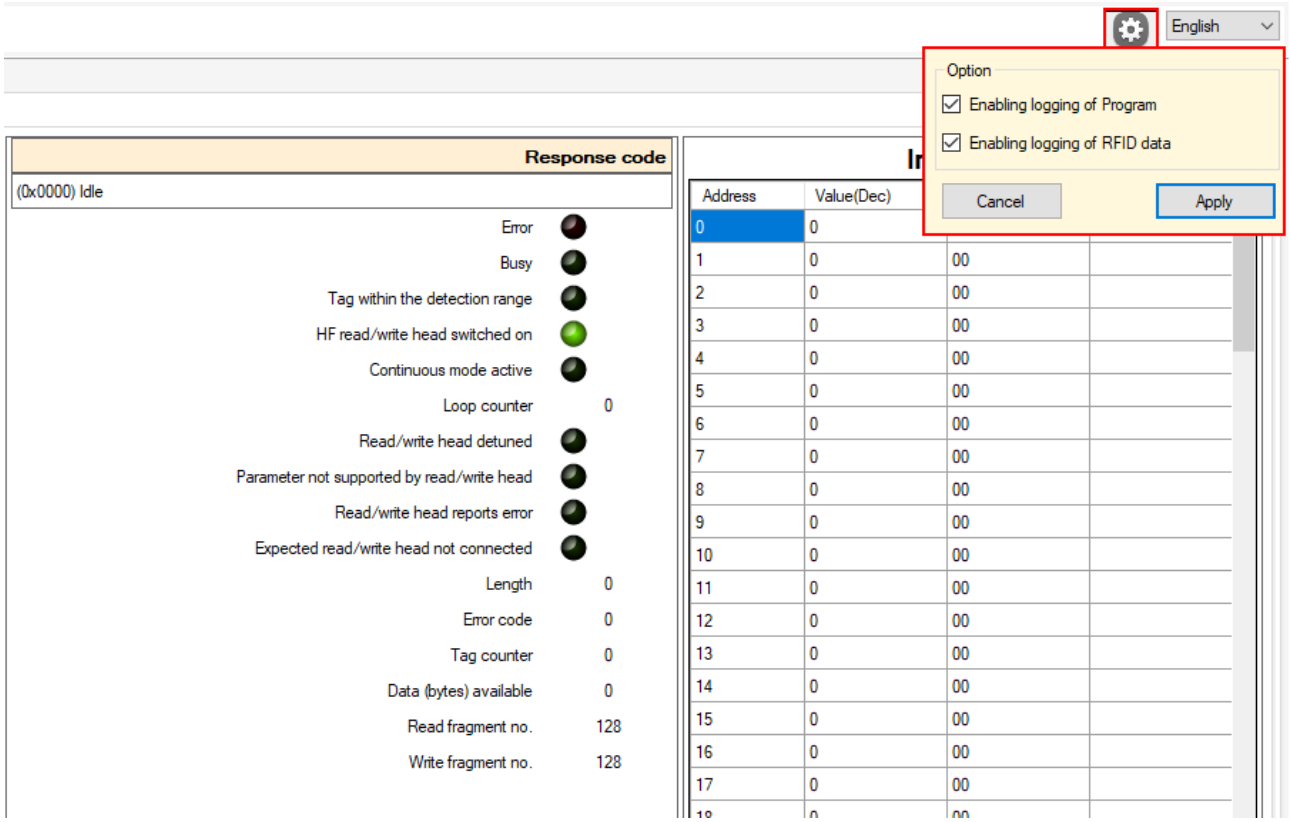


Fig. 117: Activating logging

Opening the log

- In the **Log file** tab, click the **Open** button.
- Select the file.
- Click **Open**.

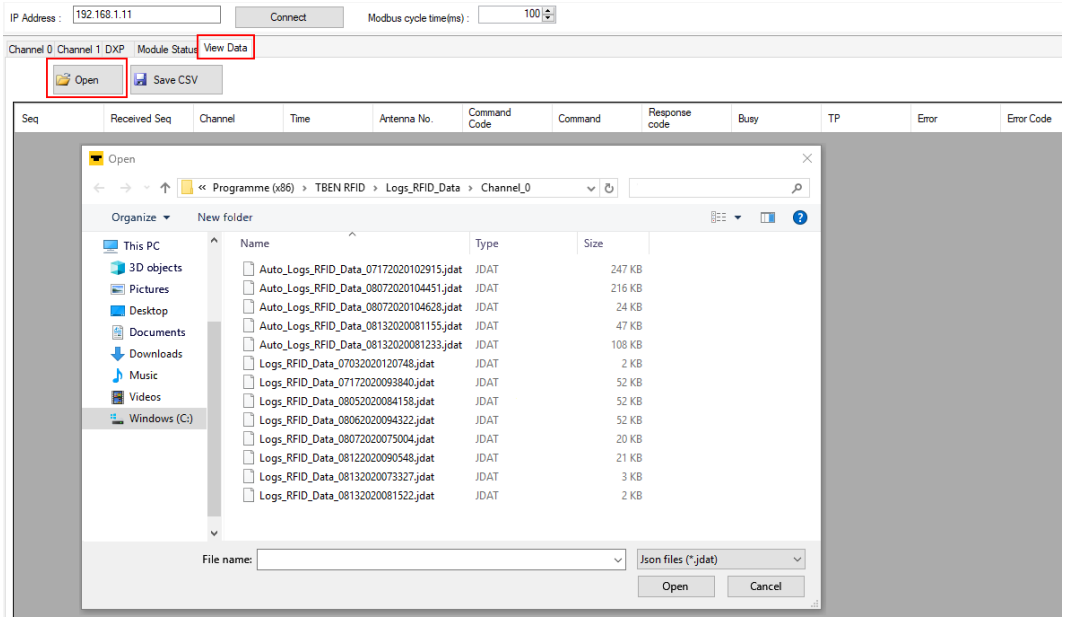


Fig. 118: Opening the log file

➪ The log data is displayed.

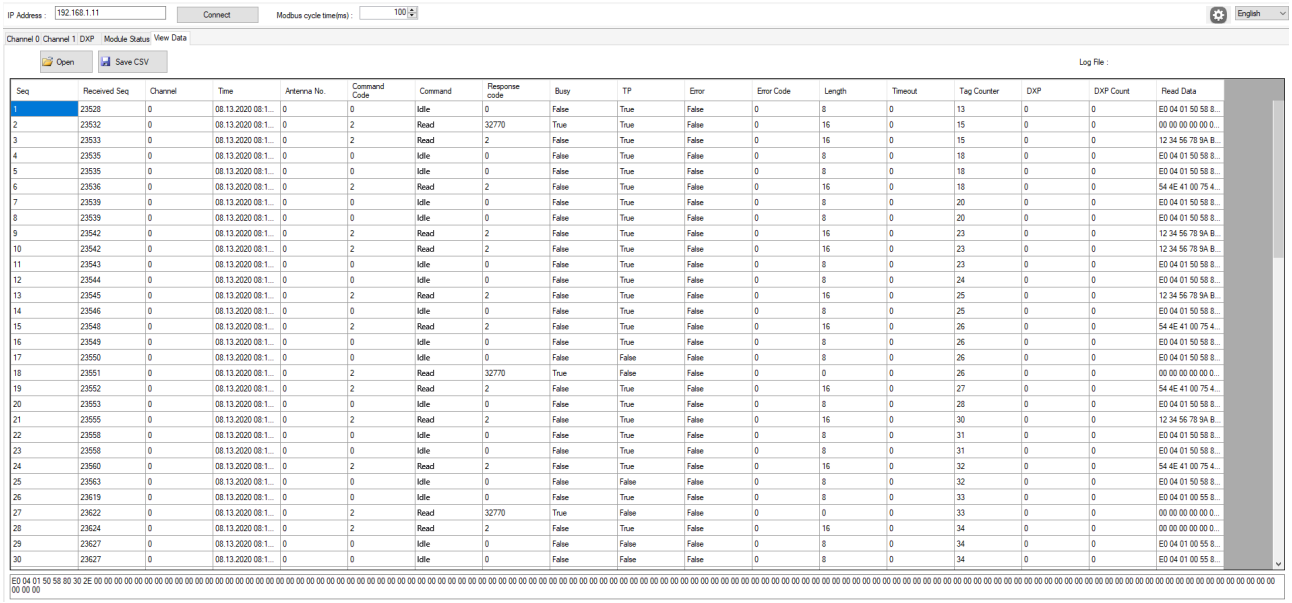


Fig. 119: Example: Log data

8.12 Setting UHF readers

8.12.1 Setting UHF readers via the DTM

UHF readers can be assigned additional parameters via a DTM. No parameters can be set in UHF readers 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 readers is provided in the instructions for use of the specific device.

8.12.2 Setting UHF readers via the web server

UHF readers can be set and commands sent to the readers via the web server.

- Open the web server and log in.
- Click **UHF RFID CONFIG & DEMO** to display and set the device parameters.

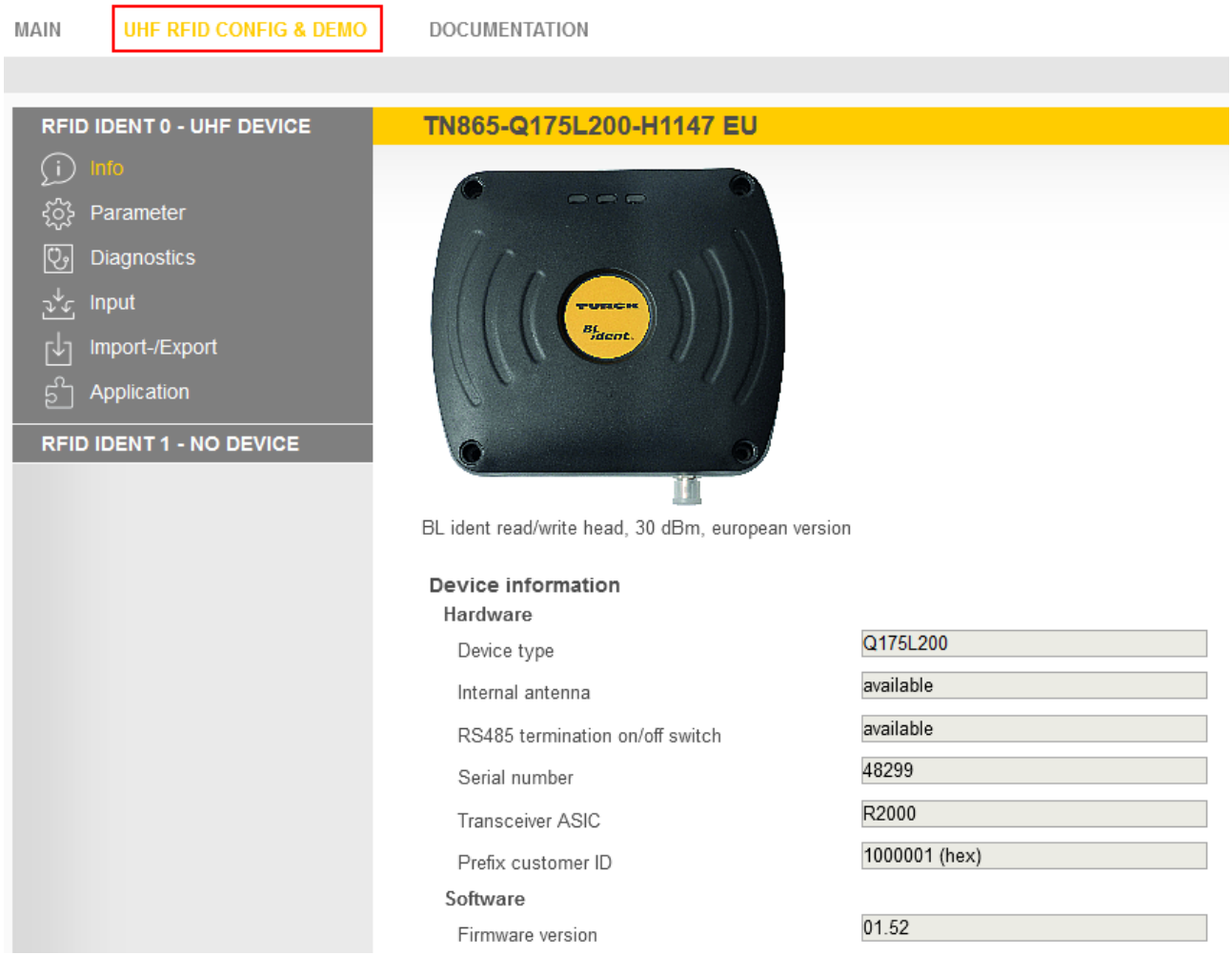


Fig. 120: Web server — home page UHF reader

▶ Click **Parameter** in the navigation bar on the left of the screen.
⇨ All parameters of the device are displayed.

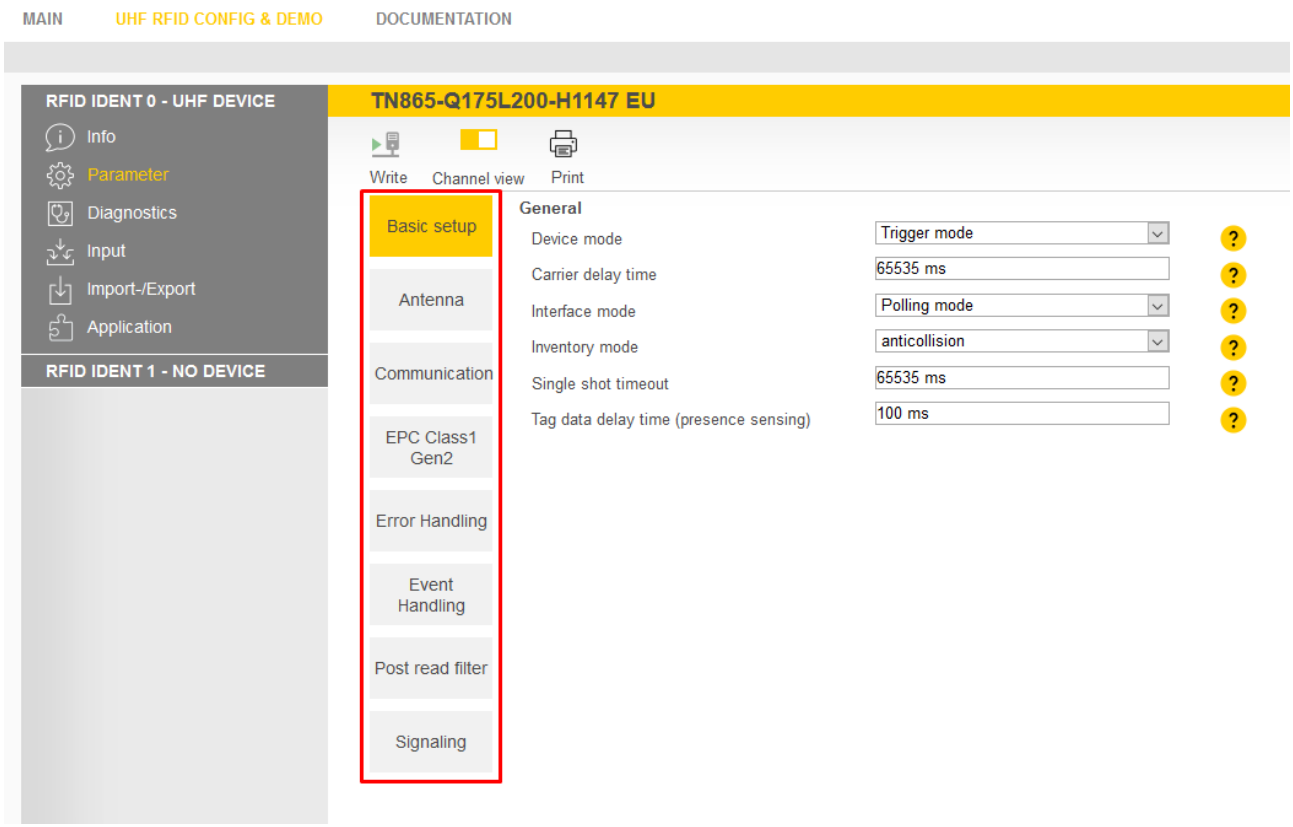


Fig. 121: Web server — UHF reader parameters

NOTE
The parameters are arranged in the web server in the same way as in the UHF DTM. The access level displayed in the web server corresponds to the Advanced level in the DTM.

8.12.3 Testing UHF readers via the web server

The UHF readers can be tested using the web server via the **Application** function.

▶ Click **UHF RFID CONFIG & DEMO** → **Application**.

⇨ The **RFID test**, the **UHF diagnostics** and the **command builder** are provided in the **application** area:

- **RFID test**: If the trigger is set to ON, the RF field is activated and tags can be read.
- **UHF diagnostics**: The diagrams show the interference frequencies of all channels used.
- **Command builder**: Use of the command builder is reserved for Turck Support and is not designed for setting device parameters or device operation.

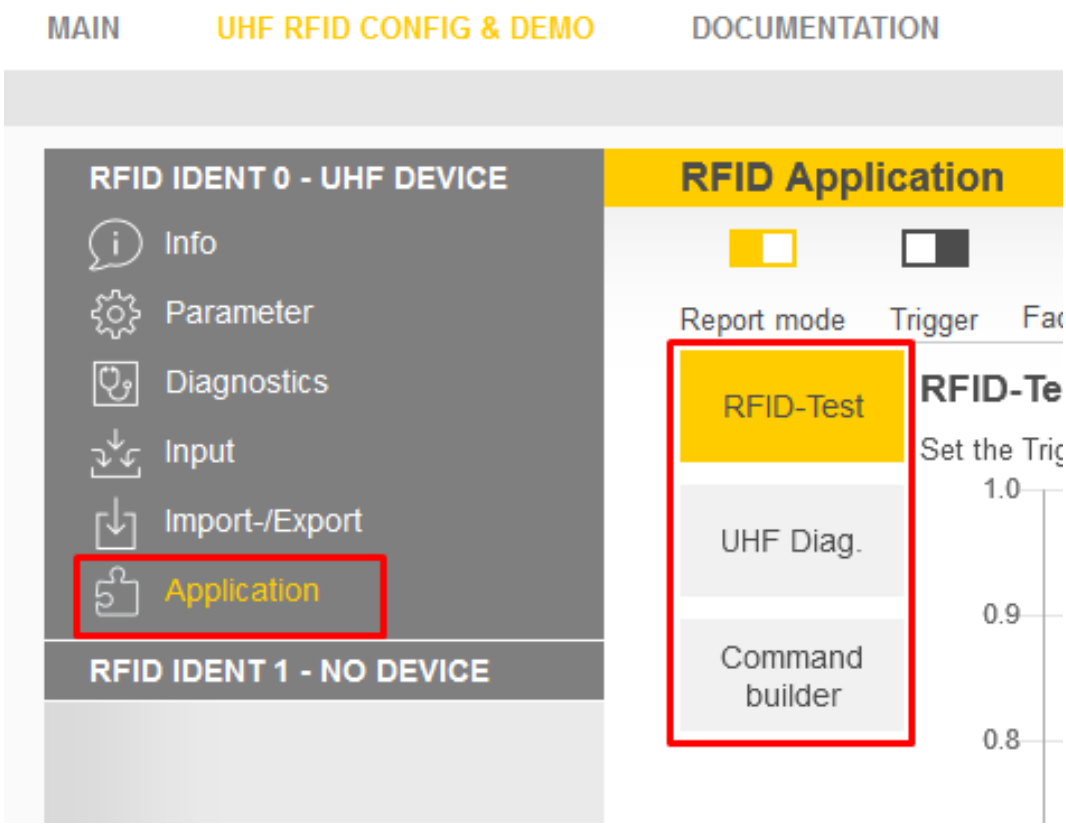


Fig. 122: Web server — RFID application

RFID test allows EPC information from tags to be displayed and read out in single-tag and multitag mode. The received RSSI values are displayed as a curve in relation to time.

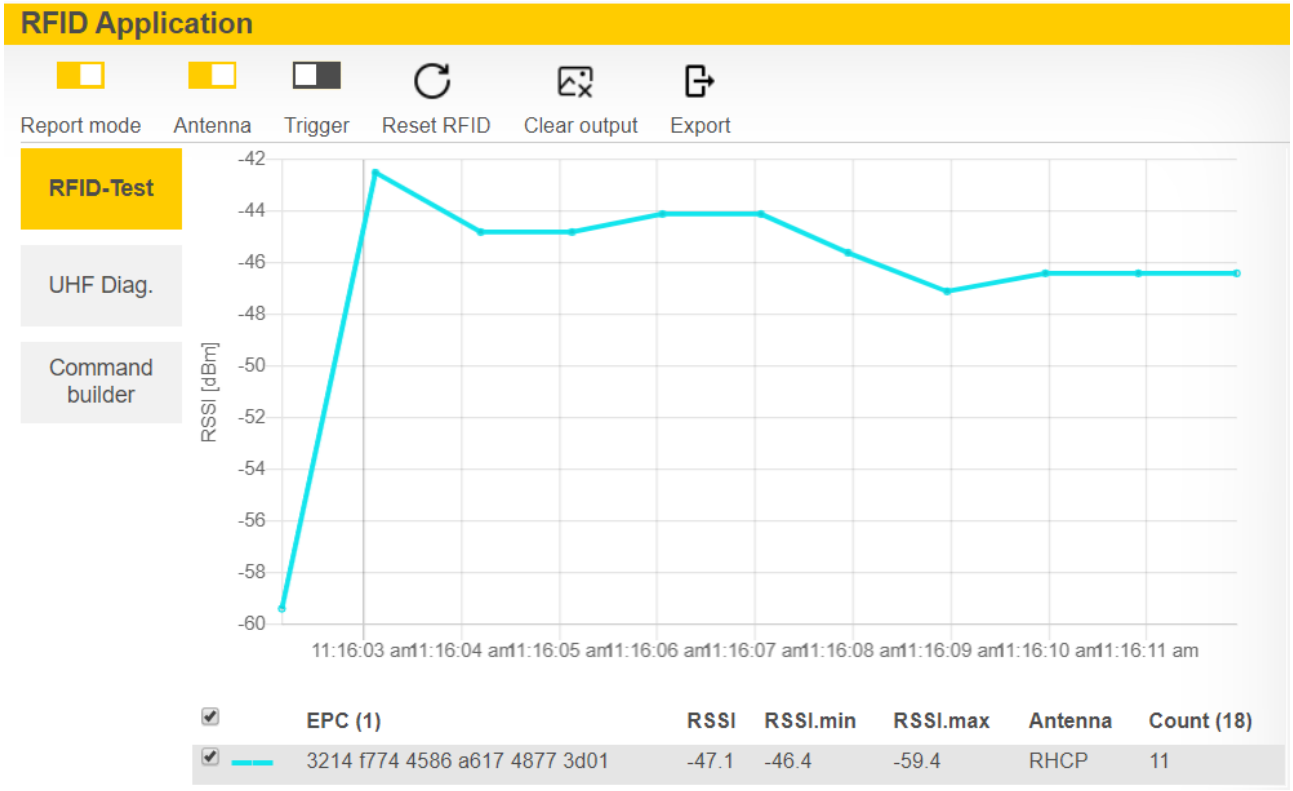


Fig. 123: Example of RFID test: Detection a tag with the received RSSI values over time and the number of read operations

The **UHF diagnostics** display the currently received power level per channel of the reader.

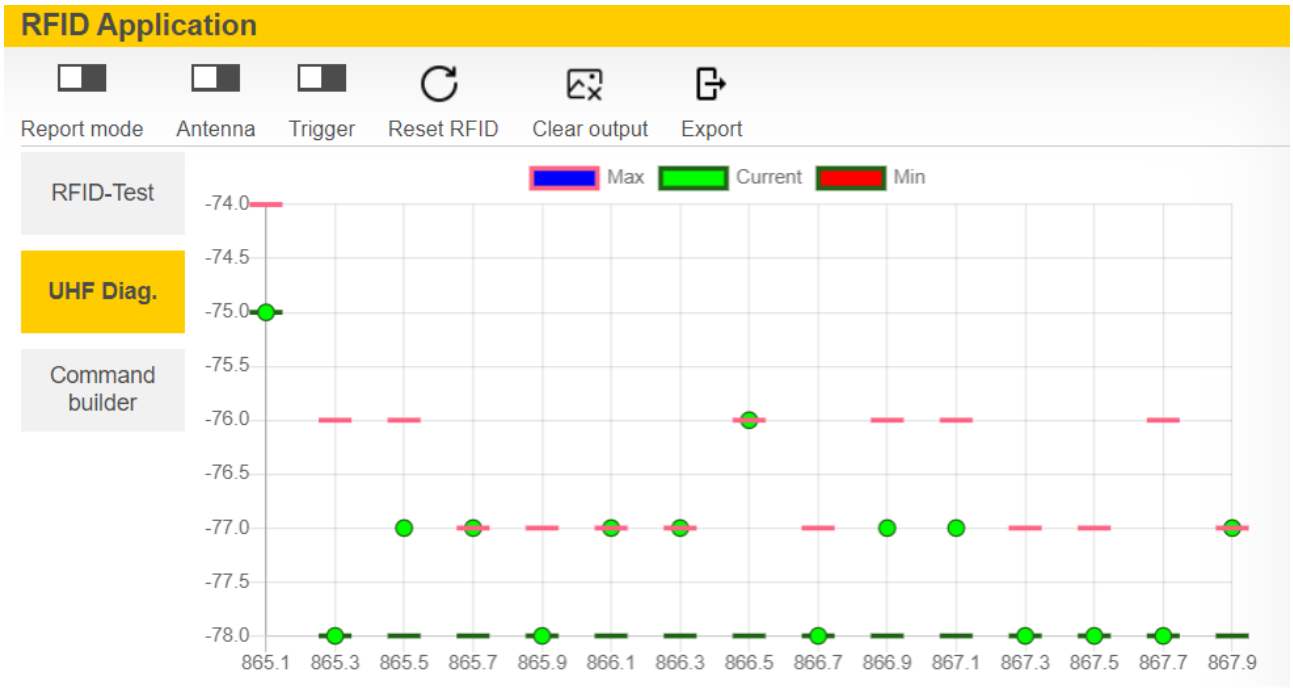


Fig. 124: Example of UHF diagnostics: received power levels per channel

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

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

- ▶ Set the parameters for the command.
- ▶ Set command code.
- ⇨ Set the command code. The command is successful when the response code is the same as the command code and no error message is present.

9.1.1 Typical times for command processing via a controller

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 Use fragmentation

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

- To read more data: increase the fragment counter in the output data.
- Repeat the process until the read or write fragment No. in the input data equals 0.

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

9.2.1 Example: Using fragmentation in the web server — read

The following example describes the reading of 500 bytes in fragments of 128 bytes each.

- Open the web server of the device.
- Log into the device as administrator.
- **Local I/O** → **Parameters** → **Operation mode**: Desired channel (here: Set **RFID channel 0**) to **HF extended**.
- Click **Write** to save.

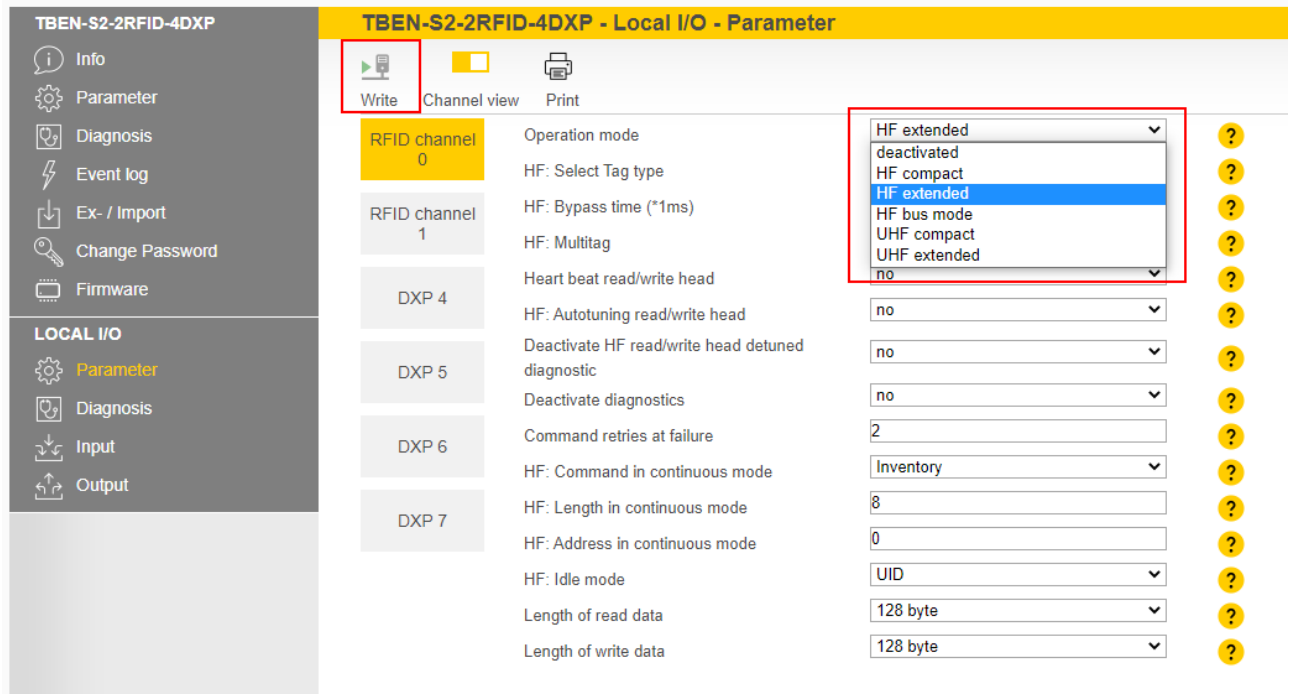


Fig. 125: Fragmentation — selecting the operating mode

- ▶ Click **Local I/O** → **Output** in the navigation bar on the left of the screen.
- ▶ **Output values** → **Length**: Enter the total number of bytes to be read (here: **500**). Observe the size of the tag.
- ▶ Select the read command via the **Command code** drop-down menu: **0x0002 Read**.
- ⇨ The read command is executed as soon as a tag is present in the detection range of the read/write head.

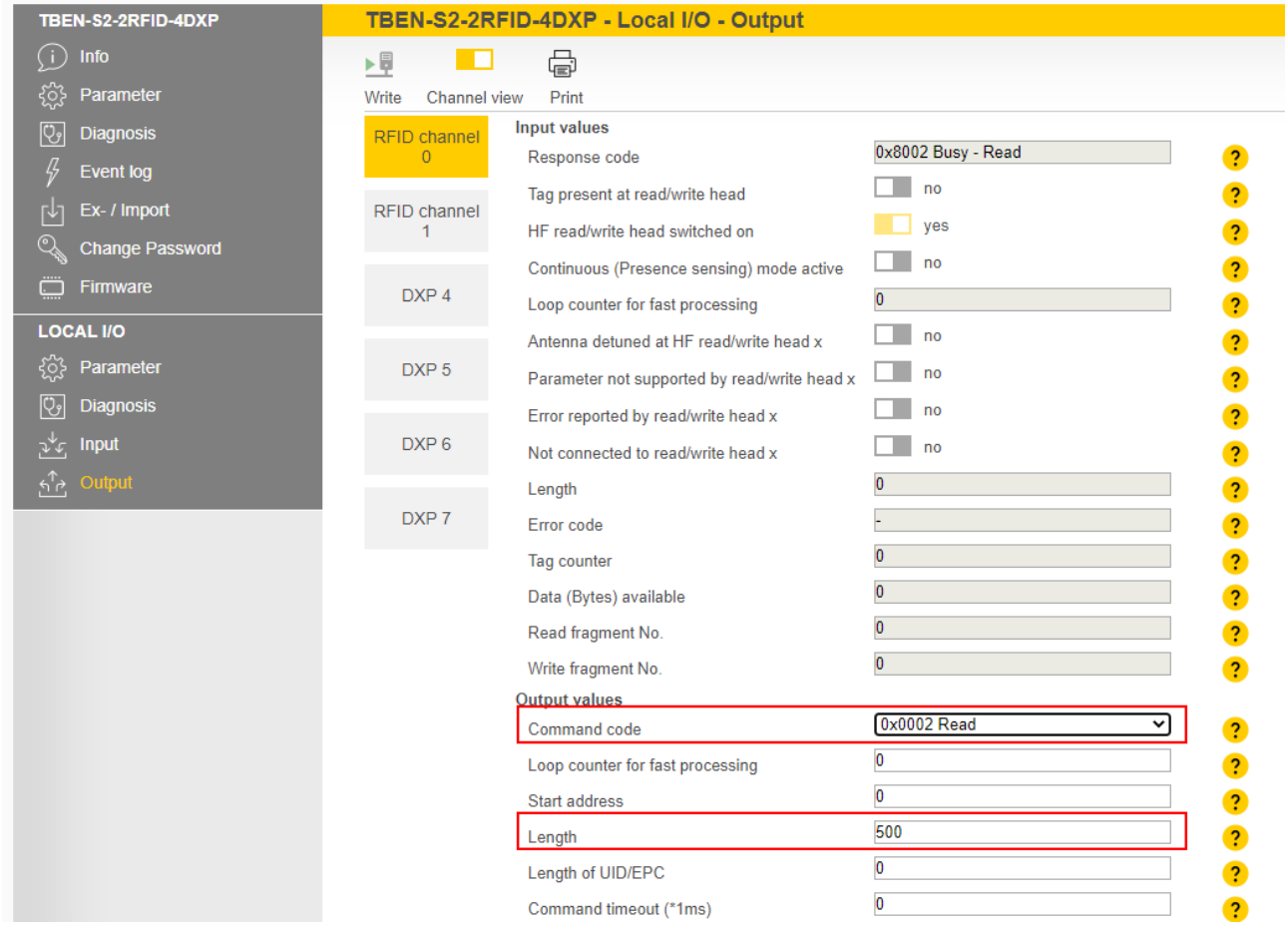


Fig. 126: Fragmentation — setting the read command

The following information is displayed in the input data (**Input values**):

- **Response code**: Read command successfully executed
- **Data (bytes) available**: Number of bytes that are still stored on the TBEN module and are not yet displayed in the read data (here: **372**)
- **Read fragment No.**: Sequential number of the next fragment to be read (here: **1**)

The first 128 bytes of the input data are displayed under **Input buffer**.

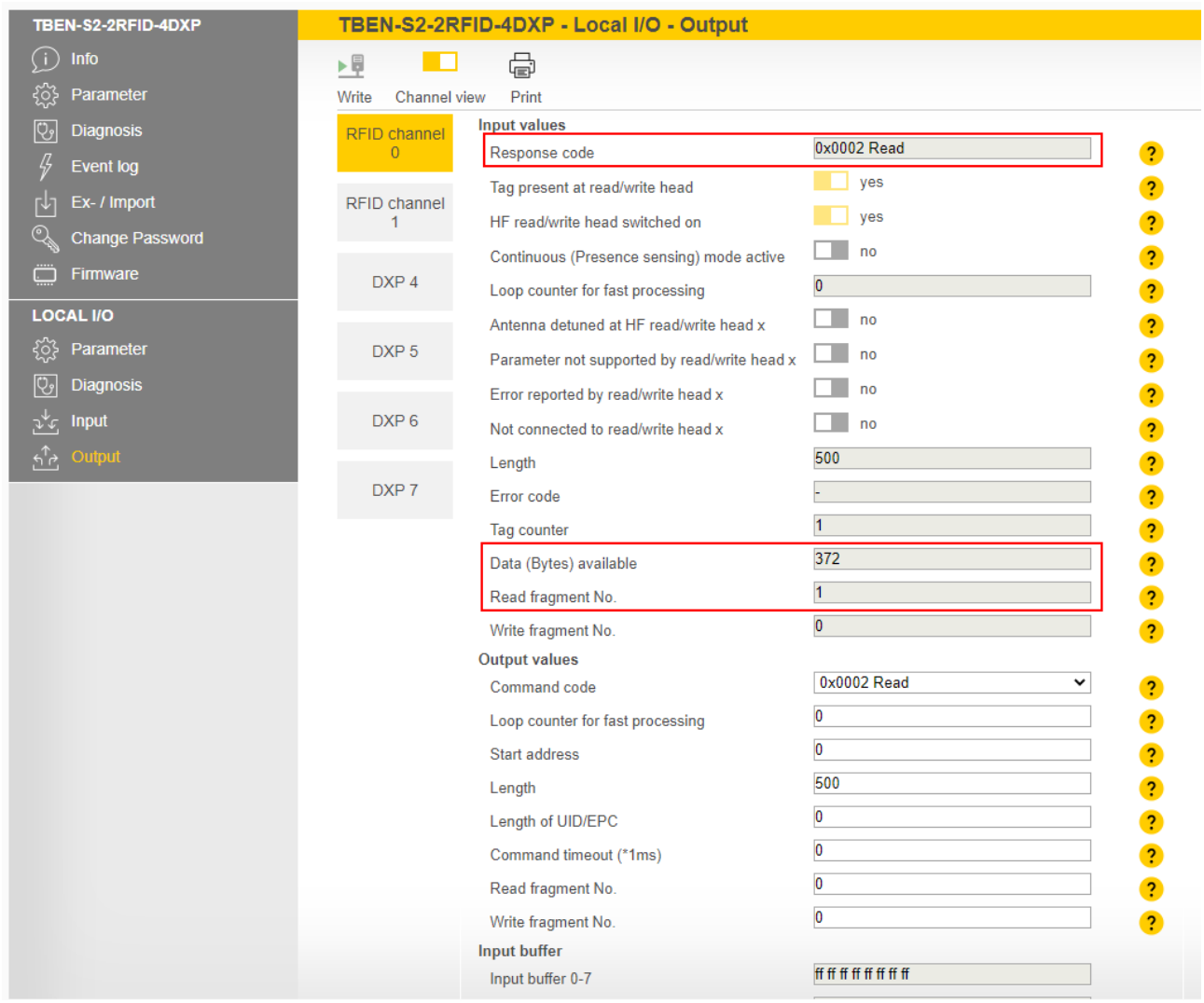


Fig. 127: Fragmentation — input data

▶ At **Read fragment No.**, enter the sequential number of the next fragment to be read (here: **1**).

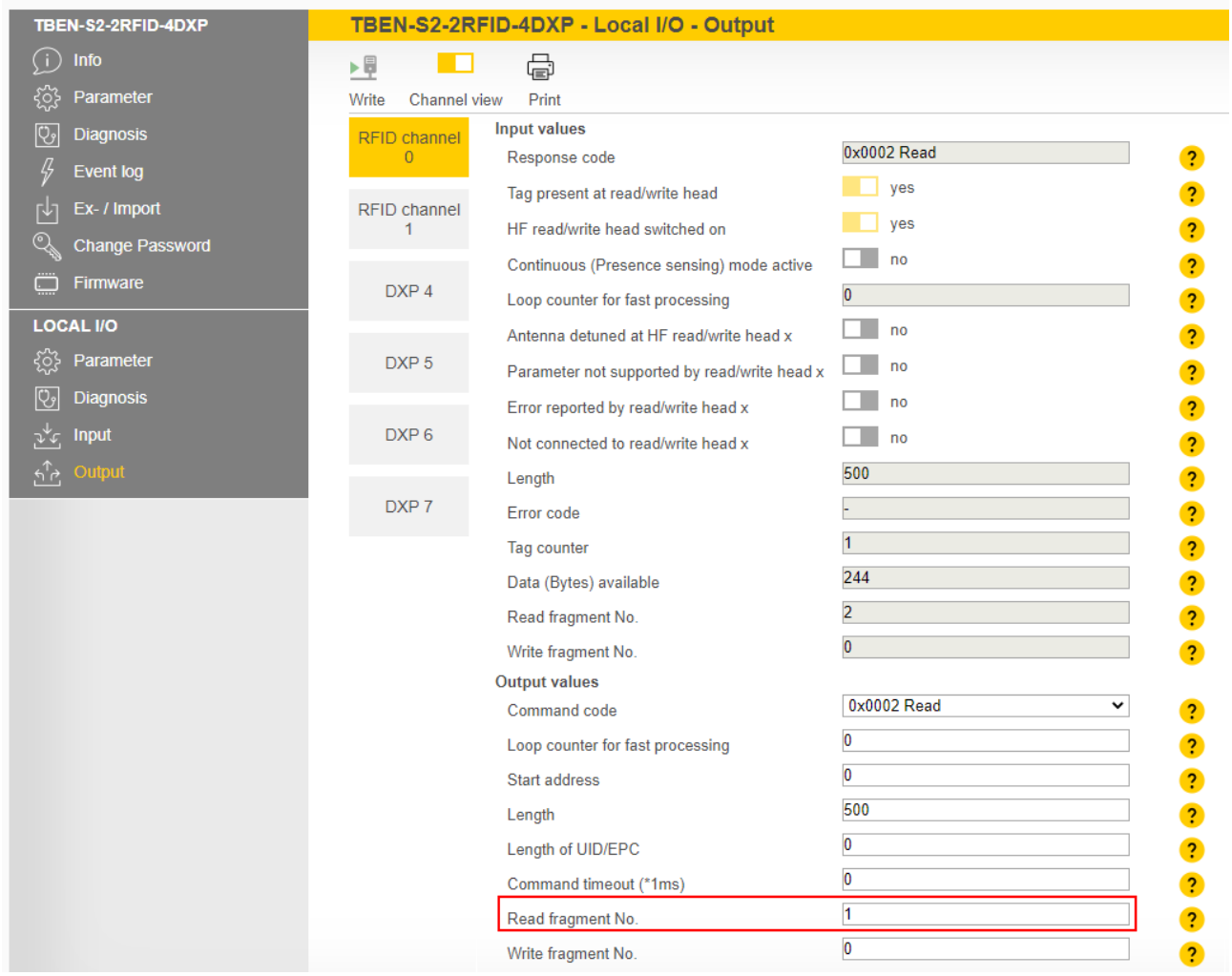


Fig. 128: Fragmentation — read second fragment

The following information is displayed in the input data (**Input values**):

- **Response code**: Read command successfully executed
- **Data (bytes) available**: Number of bytes that are still stored on the TBEN module and are not yet displayed in the read data (here: **244**)
- **Read fragment No.**: Sequential number of the next fragment to be read (here: **2**)

The second 128 bytes of the input data are displayed under **Input buffer**.

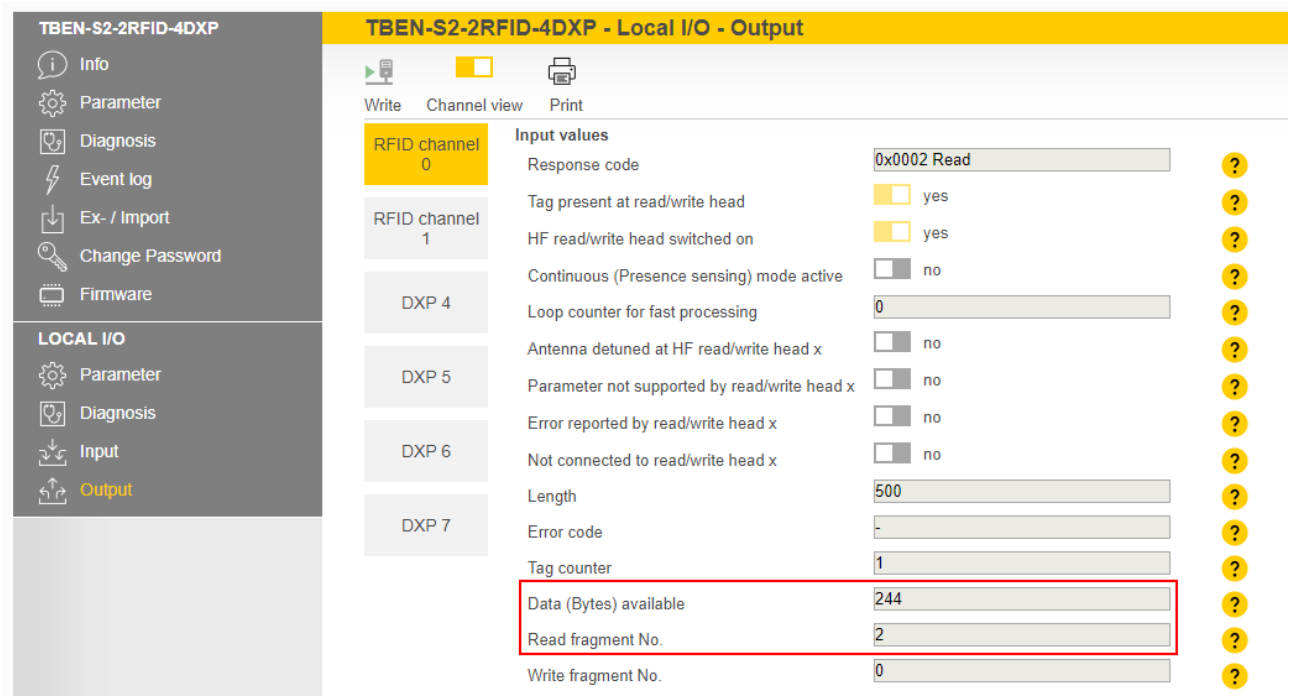


Fig. 129: Fragmentation — input data of the second fragment

- ▶ Repeat the operation until no more data is present on the TBEN module.
- ⇨ If no more data is present on the TBEN module, **Read fragment No.** will show the value **0**.

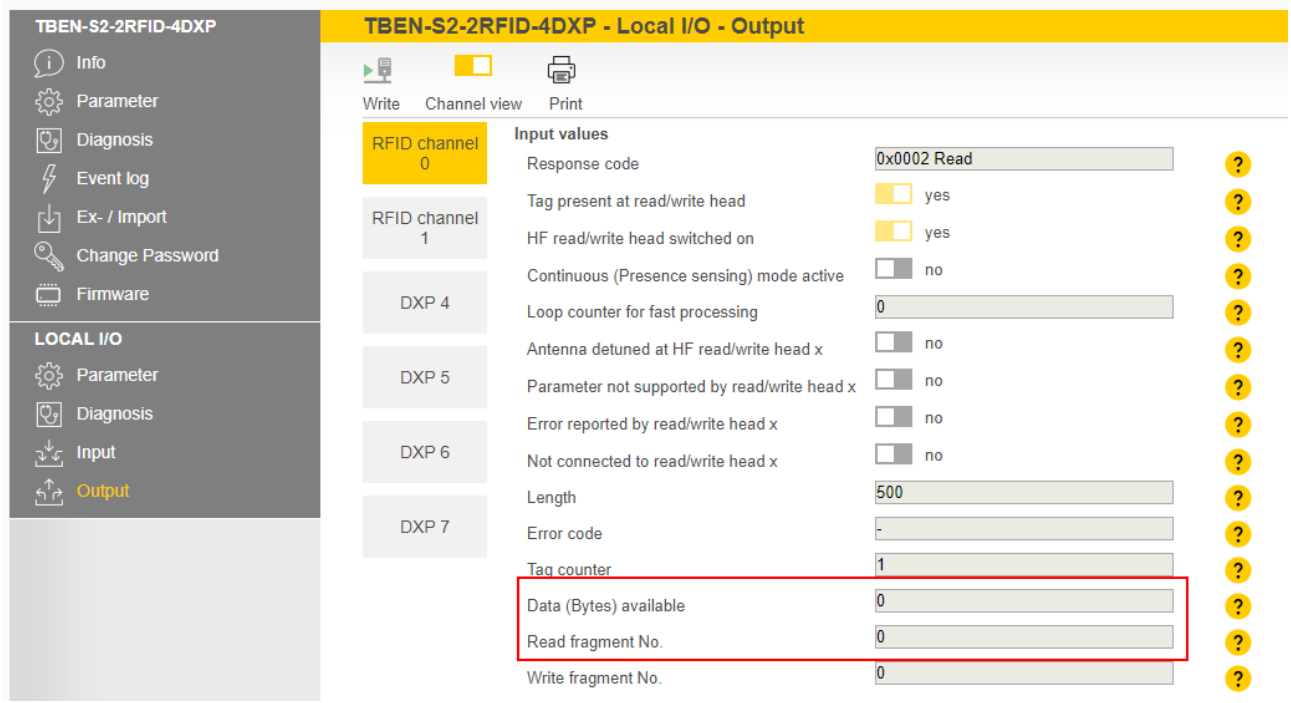


Fig. 130: Fragmentation — no more data present

9.2.2 Example: Using fragmentation in the web server — write

The following example describes the writing of 500 bytes in fragments of 128 bytes each.

- Open the web server of the device.
- Log into the device as administrator.
- **Local I/O → Parameters → Operation mode**: Desired channel (here: Set **RFID channel 0**) to **HF extended**.
- Save the set operating mode by clicking on **Write**.

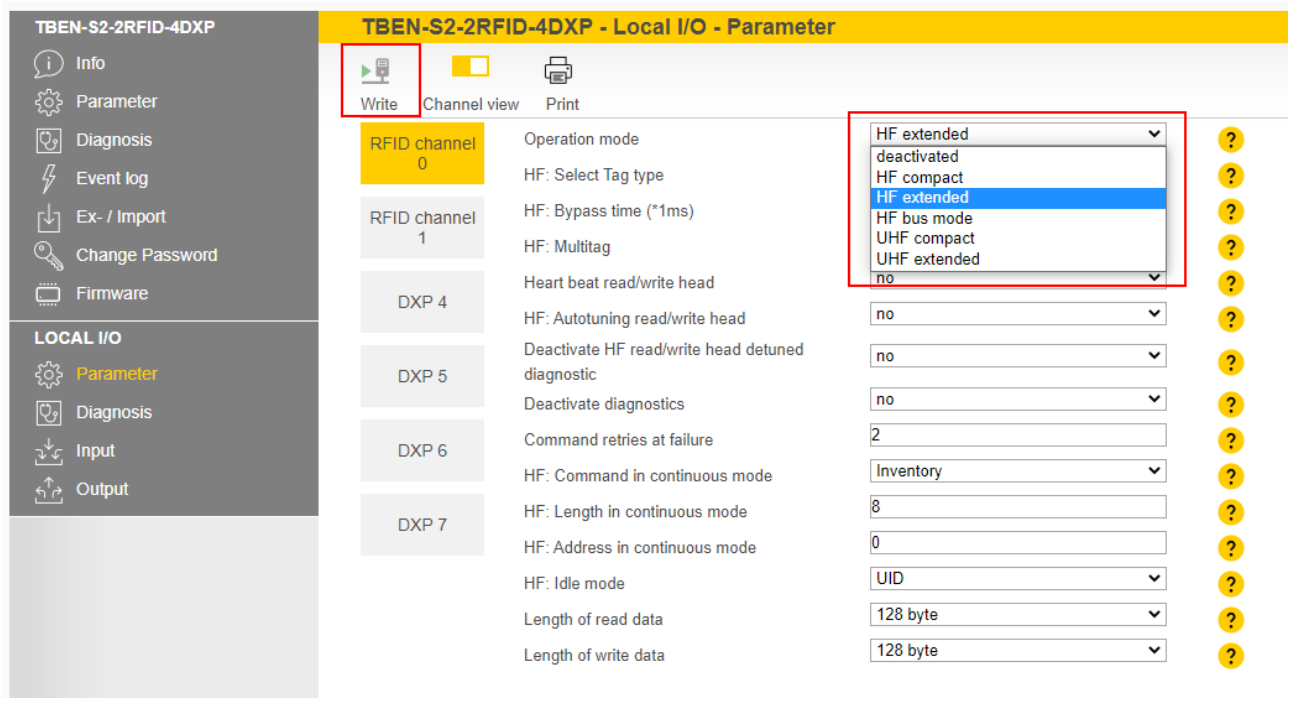


Fig. 131: Fragmentation — selecting the operating mode

NOTE
The tag must not leave the detection range of the read/write head during the write operation.
The write fragment number must always start with 1.

- ▶ Enter the first 128 bytes of write data under **Output buffer**.
- ▶ Click **Local I/O** → **Output** in the navigation bar on the left of the screen.
- ▶ **Output values** → **Length**: Enter the total number of bytes to be written (here: **500**). Observe the size of the tag.
- ▶ Under **Write fragment No.**, enter the sequential number of the fragment with the write data (here: **1** to enable the write data fragmentation).
- ▶ Select the write command via the **Command code** drop-down menu: **0x0004 Write**.
- ⇨ The write command is executed as soon as a tag is present in the detection range of the read/write head. If a tag is already present in the detection range of the read/write head, the data is written directly and not stored on the TBEN module.

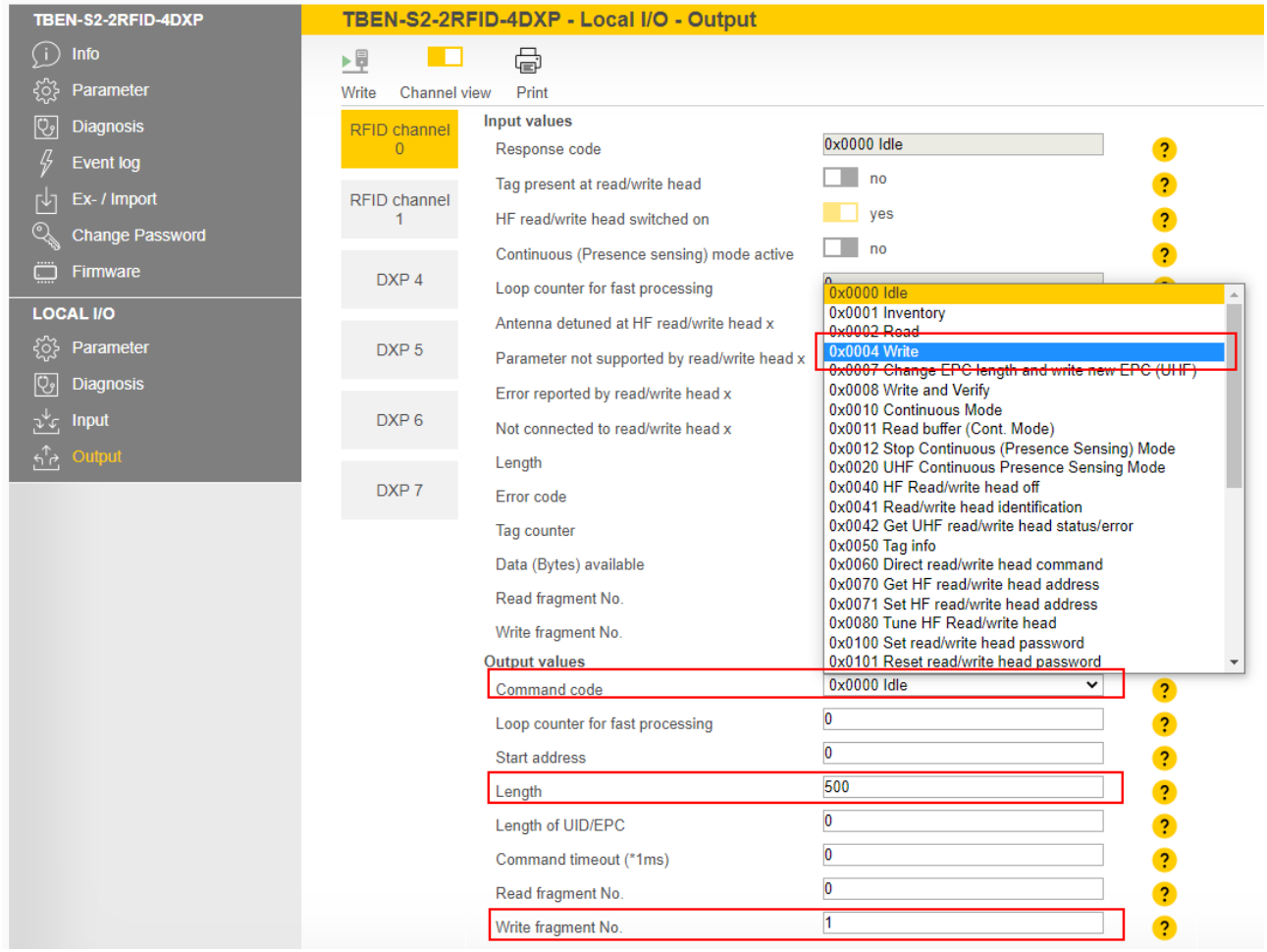


Fig. 132: Fragmentation — executing a write command

The following information is displayed in the input data (**Input values**):

- **Response code**: **0x8004 Busy — write** (write command active)
- **Data (bytes) available**: Number of bytes that are still stored on the TBEN module and were not yet written to the tag
- **Write fragment No.**: Sequential number of the fragment with the write data (here: **1**)

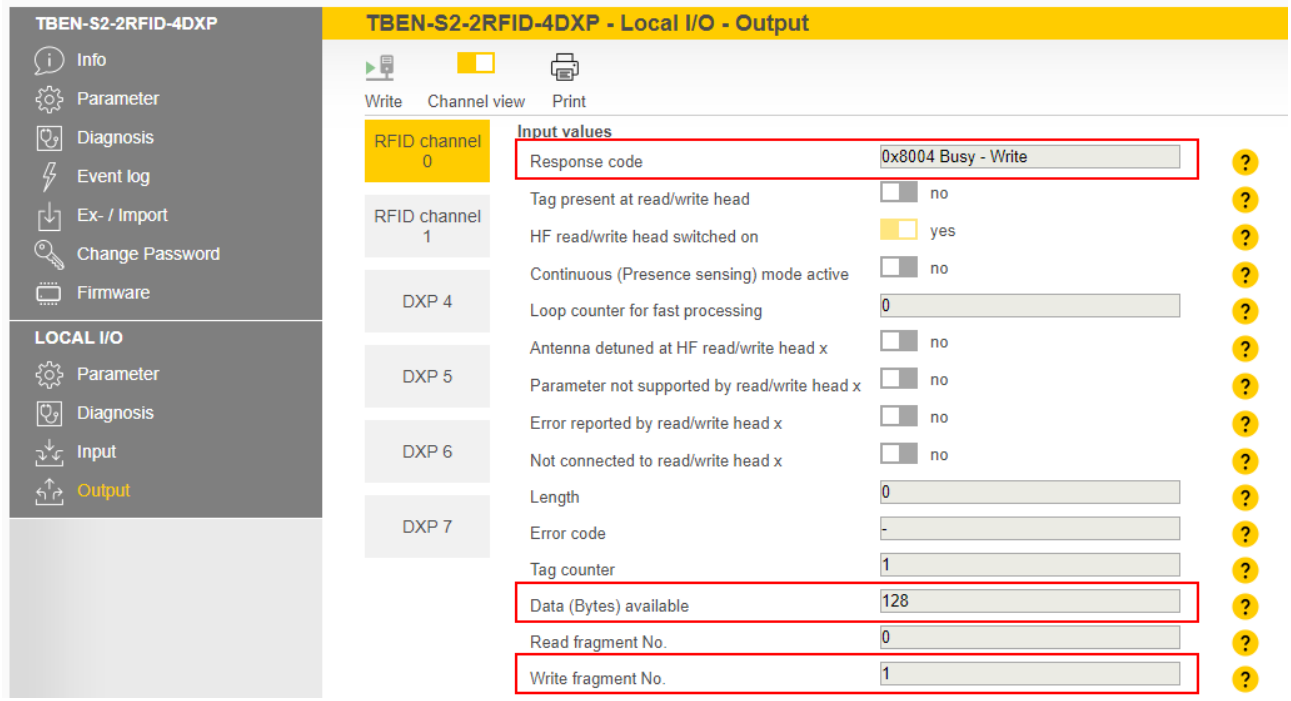


Fig. 133: Fragmentation — input data

- Enter the second 128 bytes of write data under **Output buffer**.
- Under **Write fragment No.**, enter the sequential number of the next fragment with the write data (here: **2**).

It is written directly if a tag is in the detection range. The data is stored in the TBEN module if there is no tag in the detection range.

The tag must stay in the detection range until the command is fully executed. The device outputs a fault signal if the tag is removed from the detection range before the command has been completed.

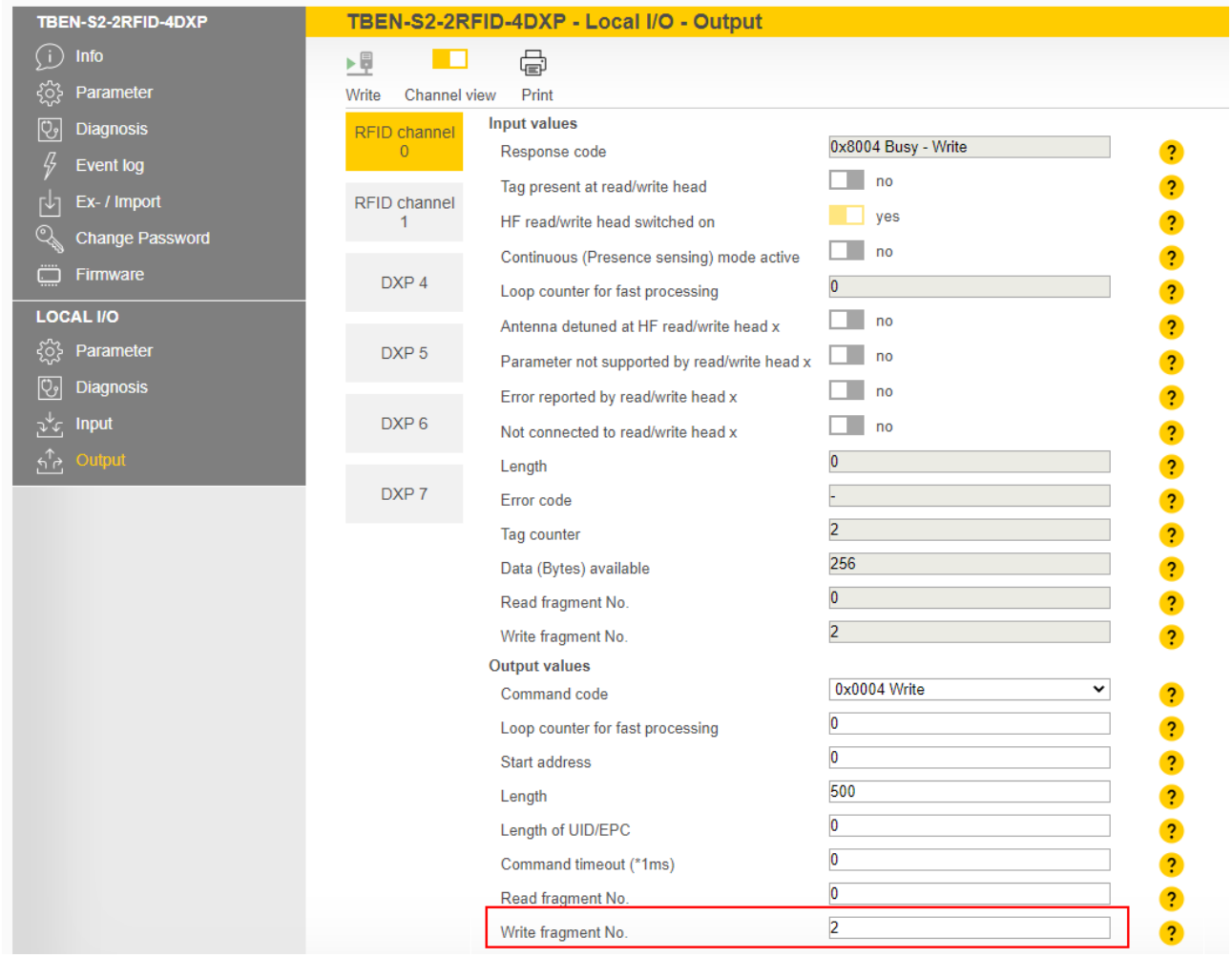


Fig. 134: Fragmentation — write second fragment

- ▶ Repeat the operation until all data is present on the TBEN module.
- ⇨ If the data was successfully written to the tag, the **Response code** changes to **0x0004 Write**.

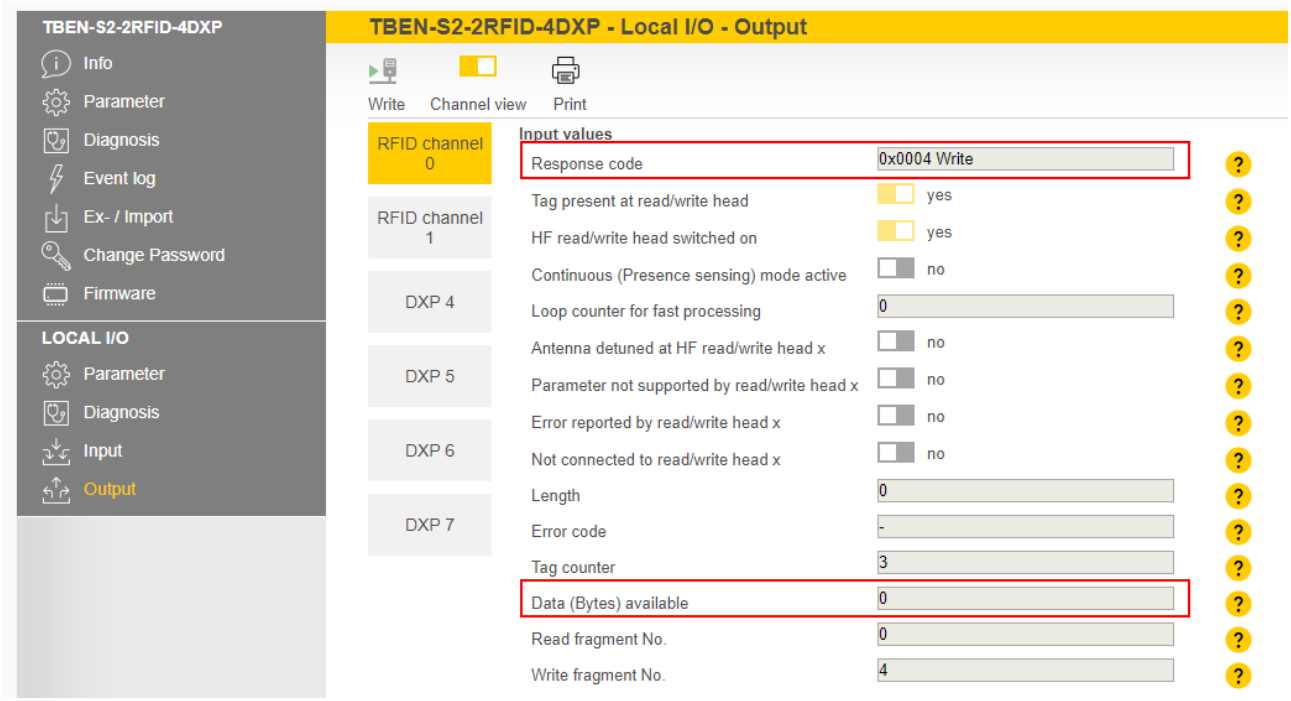


Fig. 135: Fragmentation — no more data present on the TBEN module

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: Increase 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: Enter the new command code and set the loop counter to 0.

9.4 HF applications — using Continuous Mode

In Continuous Mode (HF) the read/write head can read or write up to 64 bytes (see the table for user data areas of the HF tags).

The following parameters must be set in Continuous Mode:

- Tag type
- Command in Continuous Mode
- Length in Continuous Mode
- Start address
- Optional: Start address in the process output data for activating the grouping

- ▶ With read or write command: Enter the tag type. Automatic tag 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. The length must be a multiple of the block size of the tag used. The addressing of an odd byte number is not possible.
- ▶ 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 odd 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 set command is preloaded and carried out for all active read/write heads as soon as a tag is in the field.
- ▶ The data received from the read/write head is queried cyclically and stored in the FIFO memory of the interface.
- ▶ Execute the **Idle** command (0x0000).
- ▶ To pass on data from the FIFO memory of the interface to the controller, execute the **Read buffer (Cont. mode)** command (0x0011). The length of the data must equal the value of the available data bytes (BYFI).
- ▶ To stop Continuous Mode, execute the **Stop Continuous Mode** command (0x0012).

or

- ▶ To stop Continuous Mode and clear the FIFO memory of the interface, send the **Reset** command (0x0800).

9.5 Using HF bus mode

9.5.1 Executing a command in HF bus mode

Set parameter data:

- ▶ Select **HF bus mode**.
- ▶ Activate connected read/write heads.

Set the output data:

- ▶ Set the start address for the command.
- ▶ Set the required read/write head address.
- ▶ Enter the command code.
- ▶ Send the command to the read/write head.

9.5.2 Replacing bus-capable read/write heads

- ▶ Remove the faulty read/write head.
- ▶ Connect a new read/write head with the default address 68 or 0 (factory setting …/C53).
- ▶ If multiple read/write heads are being replaced: Connect the read/write heads in the order of the connection, i.e. connect the read/write head with the lowest address first.
- ⇨ Addresses are allocated in ascending order to the read/write heads in the order in which the heads were connected. The lowest address is automatically assigned to the next read/write head with the default address 68 that is connected.
- ⇨ If the LED on the read/write head is permanently lit, this indicates that the addressing is complete.

9.5.3 HF Continuous bus mode — data query and speed

All activated read/write heads are triggered within a bypass time + wait time. The command is permanently stored once in the activated read/write heads. The set command (e.g. Inventory, Read, Write) in Continuous Mode is processed within this time. Only one read/write head sends data to the RFID interface during command execution of all activated read/write heads. The other read/write heads store the read data for a later query within the bus cycle of Continuous Mode. When the same read/write head detects a new tag, the data in the buffer of a read/write head is overwritten if it was not yet sent to the RFID interface. The time must therefore be allowed until the data of all read/write heads has been fetched. The maximum time required for this is based on the formula **(bypass time + wait time) × number of activated read/write heads**.

Possibilities of optimizing the speed of HF Continuous bus mode:

- Reduce the bypass time to suit the application
- Arrange the read/write heads into two channels or over several modules
- Reduce the data to the relevant part

NOTE
The repeated reading of the same tag is time-triggered. The grouping in the process output data can be activated in order to prevent the storing of the same UID or user data multiple times.

The read/write heads do not detect any tags between two queries and when sending data to the RFID interface. The following table describes the required wait times:

Command	Wait time
Inventory	15 ms
Read	25 ms
Write	35 ms

The default bypass time in HF Continuous bus mode is 48 ms.

The following table shows when commands (CMD) are executed and data is exchanged (DATA).

- CMD: Command is executed.
- DATA: Data exchange
- DATA or CMD: If data is stored on the read/write head, the data is sent to the RFID module. If no data is stored on the read/write head, the command is executed.

Read/write head	Pass 1		Pass 2		Pass 3		Pass n	
Address 1	DATA or CMD	No action	CMD	No action	CMD	No action	CMD	No action
Address 2	CMD	No action	DATA or CMD	No action	CMD	No action	CMD	No action
Address 3	CMD	No action	CMD	No action	DATA or CMD	No action	CMD	No action
Address n	CMD	No action	CMD	No action	CMD	No action	DATA or CMD	No action
Time	Bypass time	Wait time	Bypass time	Wait time	Bypass time	Wait time	Bypass time	Wait time

9.6 HF applications — using HF Continuous Bus Mode

In HF Continuous Mode the read/write head can read or write up to 64 bytes (see the table for user data areas of the HF tags).

The following parameters must be set in Continuous Mode:

- Tag type
- Command in Continuous Mode
- Length in Continuous Mode
- Start address for the command in Continuous Mode
- Optional: Start address in the process output data for activating the grouping

▶ With read or write command: Enter the tag type. Automatic tag 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. The length must be a multiple of the block size of the tag used. Odd bytes cannot be addressed.

▶ 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. Refer to the table below for the block size of the tags. Odd bytes cannot be addressed.

▶ Set the grouping function via the **Start address in the process output data** parameter if required: Set the value for the **Start address** parameter to **1**. If the grouping function is activated and a UID or user data is still stored in the FIFO memory of the module, a UID or the same user data after the first read is no longer stored as a new read. With subsequent read operations only the address of the read/write head that has last read the tag and the number of read operations is updated.

▶ For a write command enter the data to be written in the write data area.

▶ Execute the **Continuous Mode** command.

⇨ The set command is preloaded and carried out for all active read/write heads as soon as a tag is in the field.

▶ With the read command and when querying UIDs, the data received by the read/write head is polled cyclically and stored in the FIFO memory of the interface:

Type	Name	Meaning
uint8_t	data[8]	uint8_t UID [8]
uint8_t	Reserved	
uint8_t	Address	Read/write head address
uint16_t		Number of read operations (only if grouping is activated)

▶ Execute the **Idle** command (0x0000). The **Idle** command does not stop Continuous Mode.

▶ To pass on data from the FIFO memory of the interface to the controller, execute the **Read buffer (Cont. Mode)** command (0x0011). The address of the read/write head used is also transferred in addition to the read data. The length of the available data in the FIFO memory is displayed in the input data at **Data (bytes) available (BYFI)**. The length of the data must be consistent. Example: If UID, reserved byte and read/write head address are written to the FIFO memory for each tag, at least 10 bytes of data must be read from the buffer.

NOTE
Data in the FIFO memory is not overwritten until it was transferred to the controller. New read operations are appended in the FIFO memory of the interface.

- To stop Continuous Mode, execute the **Stop Continuous Mode** command (0x0012).

or

- To stop Continuous Mode and clear the FIFO memory of the interface, send the **Reset** command (0x0800).

NOTE
The data must be passed on regularly from the device to the parent level. No other data can be stored if the 16 Kbyte ring memory is full. The device outputs an error message.

User data areas of HF tags

Refer to the data sheets of the tags for the relevant chip types.

Chip type	User data area			Access	Bytes per block
	First block	Last block	Total memory in bytes		
NXP SLIX2	0x00	0x4E	316	Read/write	4
NXP Icode SLIX	0x00	0x1B	112	Read/write	4
NXP Icode SLIX-S	0x00	0x27	160	Read/write	4
NXP Icode SLIX-L	0x00	0x07	32	Read/write	4
Fujitsu MB89R118 Fujitsu MB89R118B	0x00	0xF9	2000	Read/write	8
Fujitsu MB89R112	0x00	0xFF	8192	Read/write	32
TI Tag-it HF-I Plus	0x00	0x3F	256	Read/write	4
TI Tag-it HF-I	0x00	0x07	32	Read/write	4
Infineon SRF55V02P	0x00	0x37	224	Read/write	4
Infineon SRF55V10P	0x00	0xF7	992	Read/write	4
EM4233	0x00	0x33	208	Read/write	4
EM4233 SLIC	0x00	0x1F	128	Read/write	4

9.7 Possibilities for command execution in HF bus mode

There are three ways of querying the UID in HF bus mode.

- Using HF bus mode in Idle
- Using HF bus mode with any command
- Use HF Continuous bus mode with **Inventory**, **Read** or **Write**

The following tables describe the benefits of the particular applications.

Application	Functions	Notes
Using HF bus mode in Idle Mode **Inventory** and/or **Read**	■ No command via the controller required ■ UID and/or data with read/write head address is automatically displayed in the input data.	■ If the cycle time of the controller is the longer than the time until a new tag is in the detection range of a read/write head: Data loss possible. ■ Grouping of UIDs or user data only possible via the controller ■ Read/write heads are active in succession
Using HF bus mode with any command	■ Commands must be sent to a read/write head individually. ■ UID or data are displayed in the input data.	■ Can only be used for static applications because only one read/write head can execute a command. ■ Grouping of UIDs or user data only possible via the controller ■ No overwriting of data: Only one read/write head performs the particular command. ■ Fragmenting of the data possible (max. 128 bytes per fragment)
Use HF Continuous bus mode with **Inventory**, **Read** or **Write**	■ The command must be activated once by the controller. The read/write heads then execute the command simultaneously and continuously. ■ The read data is stored with the read/write head address in the 16 Kbyte ring memory of the RFID module ■ The **Read buffer (Cont. Mode)** command transfers the data to the controller.	■ The bus cycle time in Continuous Mode must be shorter than the time until a new tag is in the detection range of the same read/write head. If a tag enters the detection range of a different read/write head, this has no effect. ■ Grouping in the RFID interface possible as long as the data was not yet sent to the controller ■ All read/write heads are activated and save data (max. 64 bytes per read/write head.

9.8 Using NEXT mode

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

9.8.1 Example: using NEXT mode for a read command

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

▶ Set read command in the process output data.

▶ Set NEXT mode: Enter the value -1 in the process output data at **Length UID/EPC**.

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.

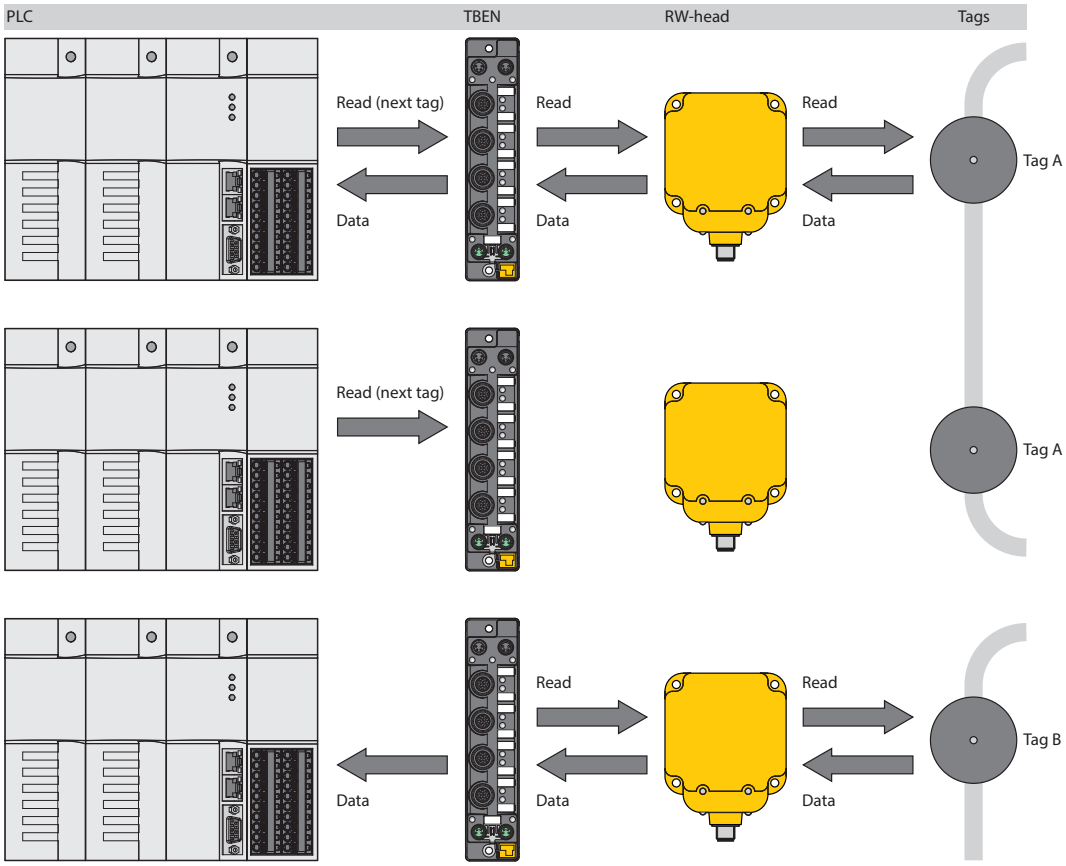


Fig. 136: NEXT mode (layout)

9.9 Using the UHF password function

A write protection for EPC and USER memory area can be set with an access password. If a Kill password is set, the UHF tag can be mechanically destroyed with a Kill command. The access password and the Kill password can also be protected from read or write accesses.

9.9.1 Setting the access password

An access password can be used to set a temporary or permanent write protection for the EPC and USER memory areas.

Setting temporary write protection for the EPC and USER memory areas

- Write an access password with the following parameters to the tag:
  - Command code 0x0102 (**Set tag password**)
  - Password: 4 bytes in the output data
- Set an access password with the following parameters in the UHF reader:
  - Command code 0x0100 (**Set read/write head password**)
  - Password: 4 bytes in the output data
- Protect individual memory areas with the following parameters:
  - Command code 0x0103 (**Set tag protection**)
  - Memory area: EPC or USER
- Protect the access password from read access:
  - Command code 0x0105 (**Set perma lock**)
  - Memory area: Access

NOTE
If an incorrect access password is used during write attempts, the corresponding area cannot be written because the tag will not respond to the write command. The device does not output a fault signal.

Setting permanent write protection for the EPC and USER memory areas

- Write an access password with the following parameters to the tag:
  - Command code 0x0102 (**Set tag password**)
  - Password: 4 bytes in the output data
- Set an access password with the following parameters in the UHF reader:
  - Command code 0x0100 (**Set read/write head password**)
  - Password: 4 bytes in the output data
- Permanently protect EPC or USER memory with the following parameters:

NOTE
After the **Set perma lock** (0x0105) command is set to the EPC or USER memory area, the data can no longer be changed.

  - Command code 0x0105 (**Set perma lock**)
  - Memory area: EPC or USER
- Protect the access password from read access:
  - Command code 0x0105 (**Set perma lock**)
  - Memory area: Access

9.9.2 Setting the Kill password

The **Kill UHF tag** command is used to make the tag unusable. After a kill command, the tag can neither be read nor written. A kill command cannot be reversed. A kill password must be set beforehand in order to execute a kill command.

- Transfer the kill password to the relevant memory area of the tag:
  - Password: Write data (0…3) with 4 bytes
  - Command code 0x0004 (**Write**)
  - Memory area: Kill password
- Deactivate the tag irrevocably:
  - Command code 0x0200 (**Kill UHF tag**)

NOTE
The tag can also be protected with an access password [▷ 228], so that a Kill command can only be executed with a valid access password in tag and reader.

9.10 Using the UHF password function

A write or read protection for the USER memory can be set with a password.

- Set a default password (0000) in the read/write head:
  - Command code 0x0100 (**Set read/write head password**)
  - Password: 0000
- Write a password with the following parameters to the tag:
  - Command code 0x0102 (**Set tag password**)
  - Password: 4 bytes in the output data
- Set a password with the following parameters in the read/write head:
  - Command code 0x0100 (**Set read/write head password**)
  - Password: 4 bytes in the output data
- Select individual pages of the memory area via bytes 0…7 of the write data and protect with the following parameters:
  - Command code 0x0103 (**Set tag protection**)
  - Memory area: USER

9.11 Use CODESYS function blocks

Three function blocks are provided for the simple integration in (existing) CODESYS programs:

- FB_Compact
- FB_Extended
- FB_BusMode

Function block	Operation mode
FB_Compact	HF compact UHF compact
FB_Extended	HF extended UHF extended
FB_BusMode	HF bus mode

The function blocks are part of the CODESYS package.

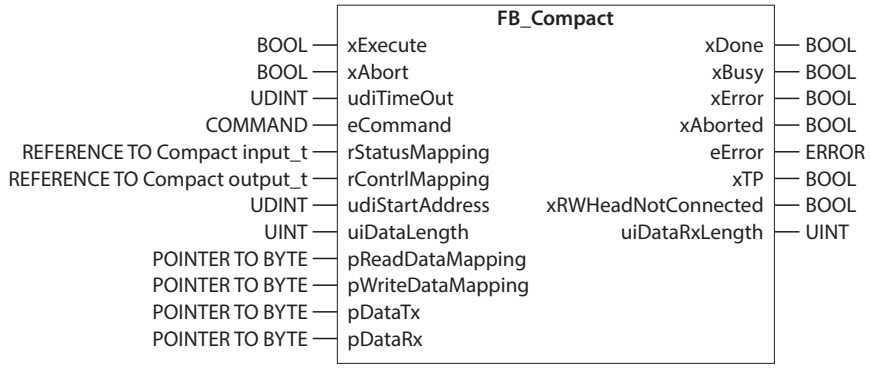


Fig. 137: FB_Compact function block

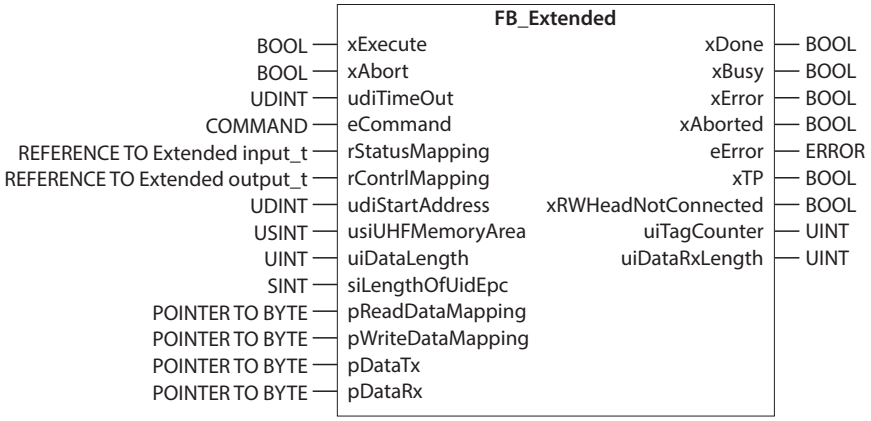


Fig. 138: FB_Extended function block

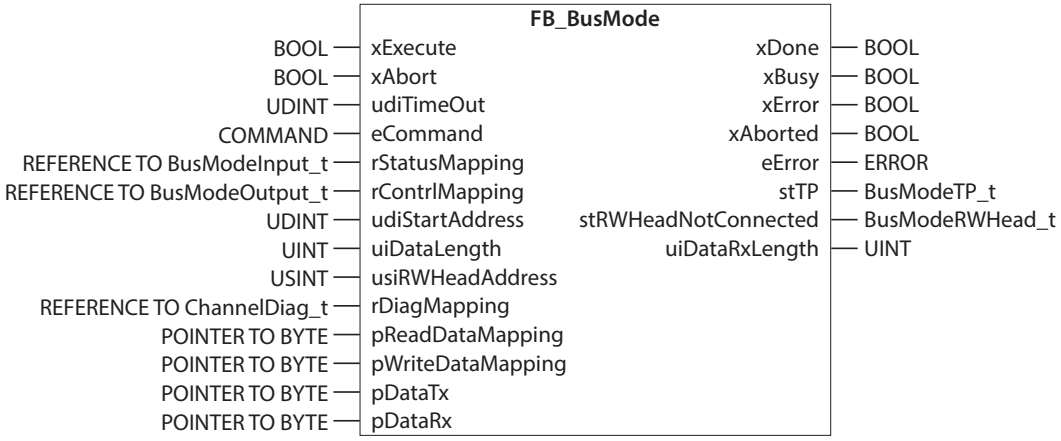


Fig. 139: FB_BusMode function block

Function blocks — input variables

Name	Data type	Meaning
xExecute	BOOL	0 → 1 → 0: Execute command 1 → 0 → 1: Reset outputs The outputs can only be reset if an action was stopped, aborted by the user or if an error occurred beforehand.
xAbort	BOOL	0 → 1 → 0: Abort command execution. All outputs are reset to the initial value.
udiTimeOut	UDINT	Time in µS, after which the function block automatically stops command execution
eCommand	COMMAND	Command code in hexadecimal format, [▶ 109]
rStatusMapping	REFERENCE TO Compact Input_t or Extended Input_t or BusMode Input_t	Start address of the process input data
rContrlMapping	REFERENCE TO Compact Output_t or Extended Output_t or BusMode Output_t	Start address of the process output data
udiStartAddress	UDINT	Start address for the selected command, e.g. start address in the memory of the tag

Name	Data type	Meaning
usiUHFMemoryArea	USINT	HF applications: ■ Domain 0…5: User area of the tag ■ Other: Reserved UHF applications: ■ Domain 0: Kill password ■ Domain 1: EPC ■ Domain 2: TID ■ Domain 3: User memory ■ Domain 4: Access password ■ Domain 5: PC (size of EPC) ■ Other: Reserved
uiDataLength	UINT	Length for the selected command, e.g. length of the data to be read or written
usiRWHeadAdress	USINT	Address of the read/write head that executes the command
siLengthOfUidEpc	SINT	Entry for the EPC or UID length for addressing a specific tag to be read or written. The UID or EPC must be defined in the write data. 0: Size of the EPC or UID not checked -1: NEXT mode: A tag is always only read if the UID or EPC is different from the UID or EPC of the last read or written tag. Only the values 0, -1 and 8 are possible in HF applications.
rDiagMapping	REFERENCE TO ChannelDiag_t	RFID diagnostic data
pReadDataMapping	POINTER TO BYTE	Start address in the input data (ARRAY[…] OF BYTE)
pWriteDataMapping	POINTER TO BYTE	Start address in the output data (ARRAY[…] OF BYTE)
pDataTx	POINTER TO BYTE	Write data (ARRAY[…] OF BYTE)
pDataRx	POINTER TO BYTE	Read data (ARRAY[…] OF BYTE)

Function blocks — output variables

Name	Data type	Meaning
xDone	BOOL	1: Command successfully executed 0: Command not executed
xBusy	BOOL	1: Command active but not yet completed; system is waiting for execution, e.g. on tag in the detection area 0: No command active
xError	BOOL	1: Error detected, command execution aborted 0: No error detected
xAborted	BOOL	1: Command execution aborted by user 0: Command execution not aborted
eError	ERROR	Error code, [▶ 250]
xTP	BOOL	1: Tag in detection range 0: No tag within the detection range

Name	Data type	Meaning
stTP	BusModeTP_t	1: Tag in detection range 0: No tag within the detection range Each bit corresponds to a tag on an individual read/write head (max. 32 tags simultaneously).
xRWHeadNotConnected	BOOL	1: No read/write head connected 0: Read/write head connected
stRWHeadNotConnected	BusModeRW-Head_t	1: No read/write head connected 0: Read/write head connected Each bit corresponds to a read/write head (max. 32 read/write heads simultaneously).
uiTagCounter	UINT	Displays the number of detected tags. In HF multitag applications and in UHF applications, tags are only counted with an inventory command. In HF single-tag applications. all tags are counted by the detected read/write head. The tag counter is reset after the following commands: ■ Inventory (exception: single-tag applications) ■ Continuous Mode ■ Continuous Presence Sensing Mode ■ Reset
uiDataRxLength	UINT	Length for the selected command, e.g. length of the data read or written
siLengthOfUidEpc	SINT	Entry for the EPC or UID length for addressing a specific tag to be read or written. The UID or EPC must be defined in the write data. 0: Size of the EPC or UID not checked -1: NEXT mode: A tag is always only read if the UID or EPC is different from the UID or EPC of the last read or written tag. Only the values 0, -1 and 8 are possible in HF applications.
pReadDataMapping	POINTER TO BYTE	Start address in the input data (ARRAY[…] OF BYTE)
pWriteDataMapping	POINTER TO BYTE	Start address in the output data (ARRAY[…] OF BYTE)
pDataTx	POINTER TO BYTE	Write data (ARRAY[…] OF BYTE)
pDataRx	POINTER TO BYTE	Read data (ARRAY[…] OF BYTE)

Example: Incorporating the function block

In order to run the function block, the package file for RFID interfaces must be installed.

- Call the Package Manager in CODESYS: Click **Tools** → **Package Manager**.

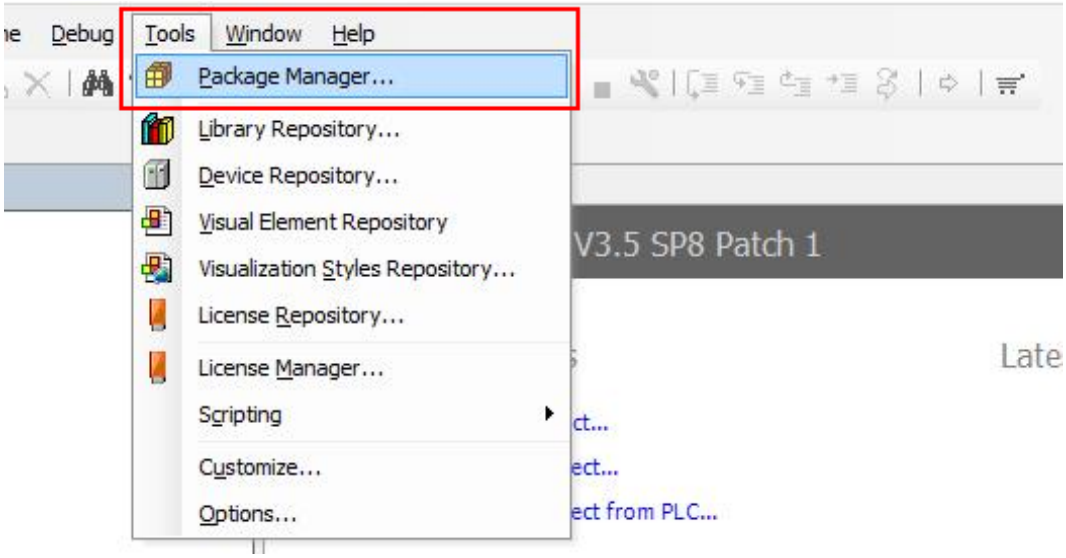


Fig. 140: Opening the Package Manager

- Select the package file for RFID interfaces and install.

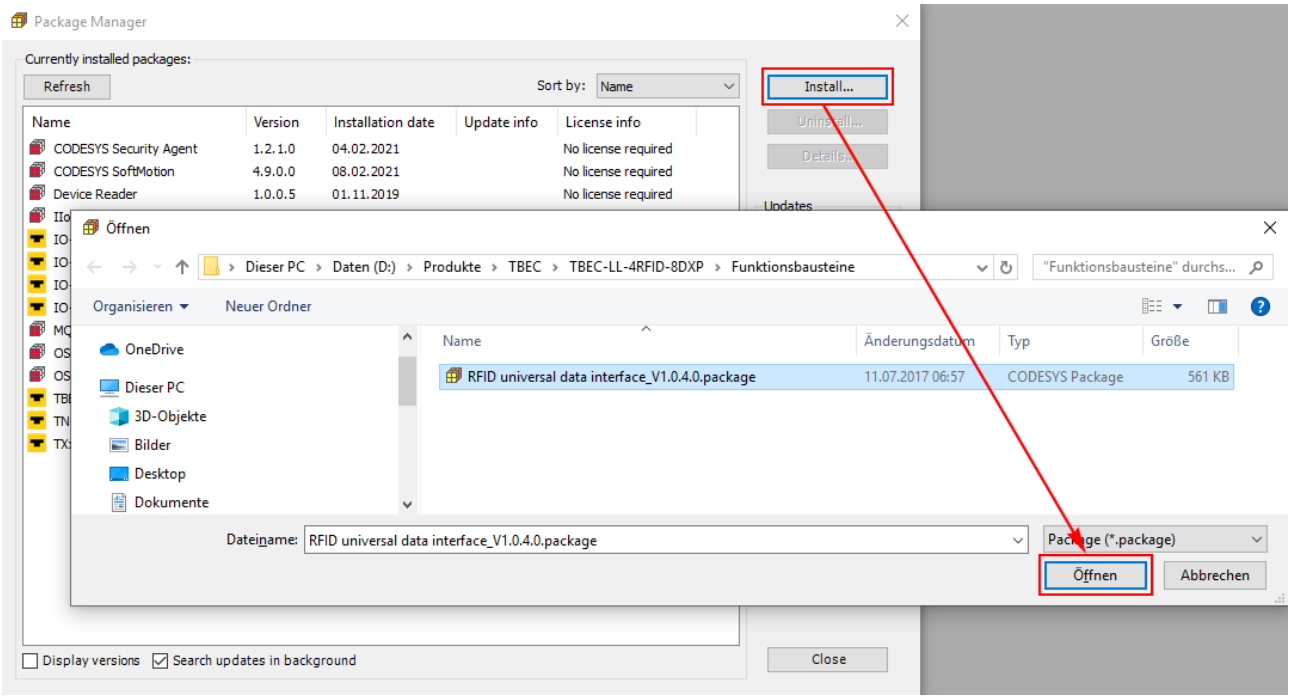


Fig. 141: Installing a Package file

After the installation has been successfully completed, the Package file is displayed as follows in the Package Manager:

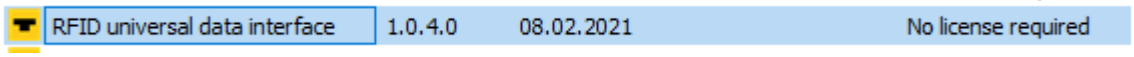


Fig. 142: Display of the Package file in the Package Manager

- Add the CODESYS library: Choose **Add Library** → **Turck** → **Application** → **RFID** → **RFID universal data interface**.
- Click **OK** to add the library to the project.

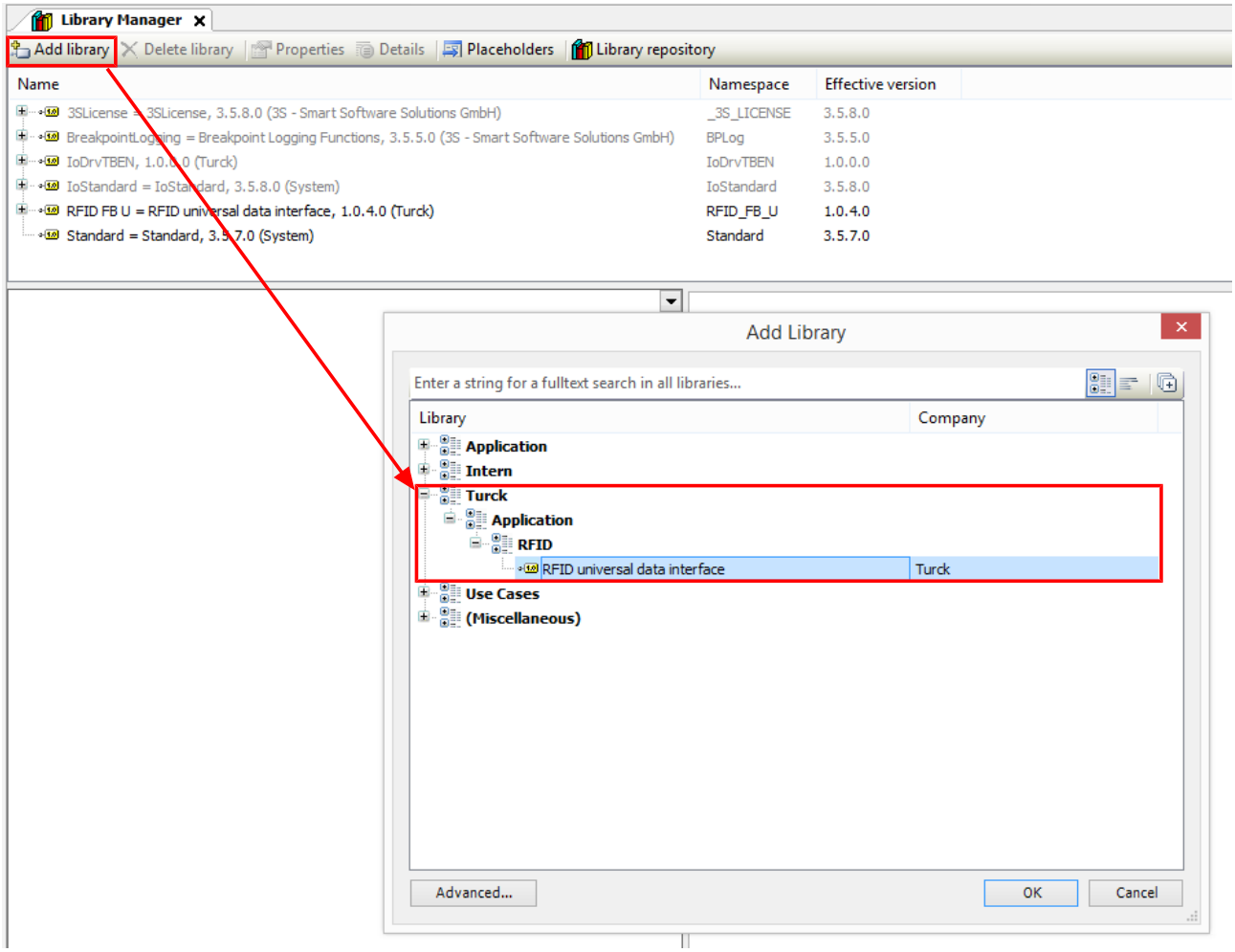


Fig. 143: Installing a CODESYS library

- Create program in which the function block can be called.
- Add **Box** from the CODESYS ToolBox to the project.
- Add **FB_BusMode**, **FB_Compact** or **FB_Extended** function block.

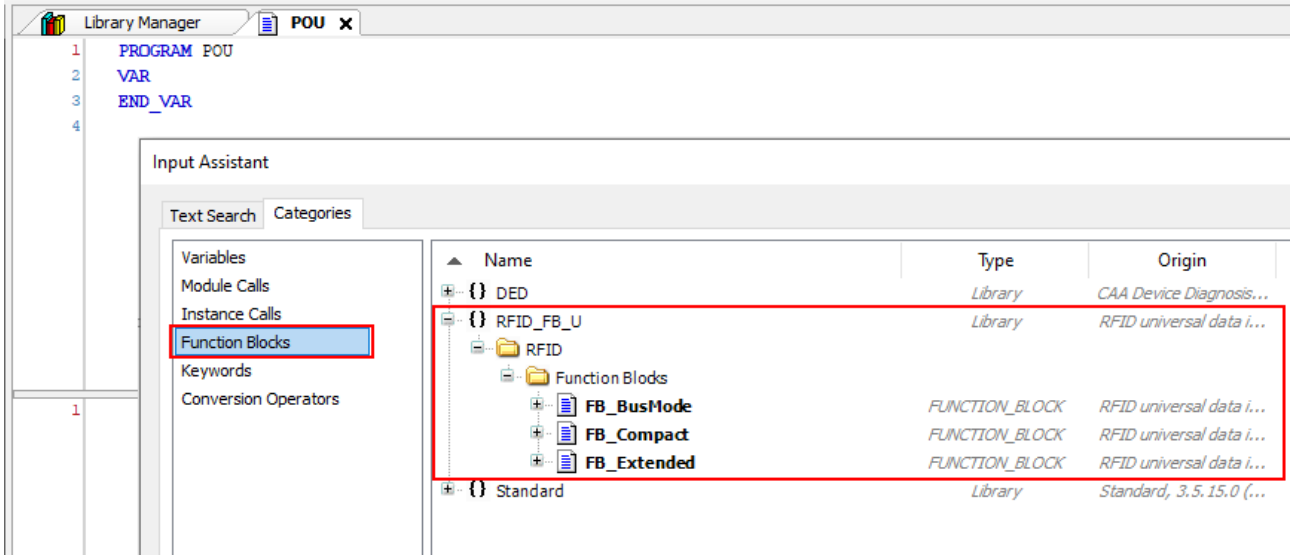


Fig. 144: Calling the CODESYS function block

Example: Connecting the FB_Extended function block (Ch0, read or write 128 bytes)

- Create the required instances for the function block: Map inputs and outputs directly to the addresses of the corresponding module registers.
- Activate the function block.

In the following example 128 bytes can be read or written from or to Ch0 via the function block. The input and output data and the write and read data is assigned in the example as follows:

Status bit	Meaning
IB100	Start address of the process input data
QB100	Start address of the process output data
IB116	Address of the read data as array
QB116	Address of the write data as array

PRG_RFID_CH0

```
1  PROGRAM PRG_RFID_CH0
2  VAR
3          // initialise object of function block
4          fb_Ch0_RFID_U               : FB_Extended;
5          fb_Ch0_RFID_Error           : fbRfidErrCodeMessage;
6
7          //create arrays for read/write data
8          abyCh0_ReadData             : ARRAY[0..127] OF BYTE;
9          abyCh0_WriteData            : ARRAY[0..127] OF BYTE;
10
11         //create mapping to the I/O data of the corresponding channel
12         stCh0_ExtendedInputMapping      AT %IB100 : ExtendedInput_t;
13         stCh0_ExtendedOutputMapping     AT %QB100 : ExtendedOutput_t;
14         abyCh0_RxDataMapping            AT %IB116 : ARRAY[0..127] OF BYTE;
15         abyCh0_TxDataMapping            AT %QB116 : ARRAY[0..127] OF BYTE;
16
17 END_VAR
18
```

Fig. 145: Activate the FB_Extended function block (example: Ch0, read or write 128 bytes)

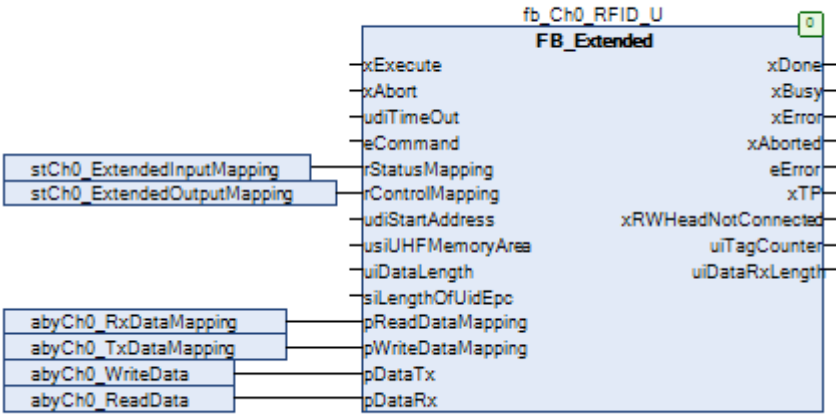


Fig. 146: FB_Extended function block — overview of inputs and outputs

NOTE
When using function blocks, the UID is not automatically displayed in Idle mode. The device does not have to be reset to Idle mode between two identical commands.

The FB_BusMode and FB_Compact function blocks must be connected in the same way as the FB_Extended function block. Further information is provided in the documentation in the CODESYS package.

9.12 Using function blocks for Siemens TIA portal

Three function blocks are provided for the simple integration in (existing) programs in the TIA Portal:

- RFID_COMPACT_Mode
- RFID_EXTENDED_Mode
- RFID_HF_Busmode

Function block	Operation mode
RFID_COMPACT_Mode	HF compact UHF compact
RFID_EXTENDED_Mode	HF extended UHF extended
RFID_HF_Busmode	HF bus mode

The function blocks can be downloaded as elements of example programs free of charge at www.turck.com. The example programs are available for TIA V15 and TIA V16 and the Siemens S7-1200 and S7-1500 controllers.

The required command can be selected via the FC10 and FC20 functions. Further parameters can be set at the function blocks FB10 (Compact), FB11 (Extended) and FB12 (HF bus mode).

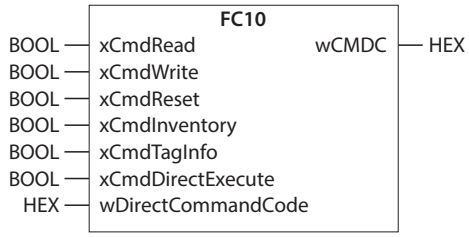


Fig. 147: FC10 function block

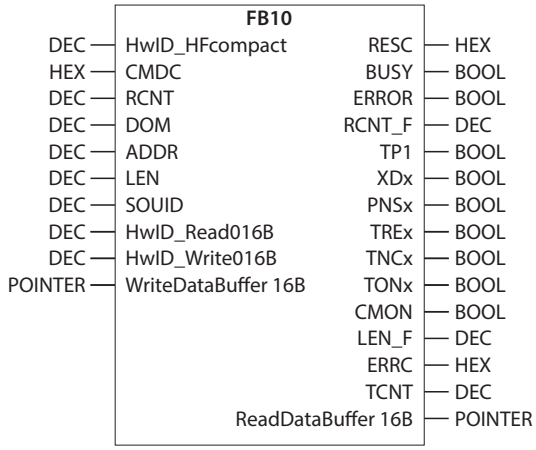


Fig. 148: FB10 function block

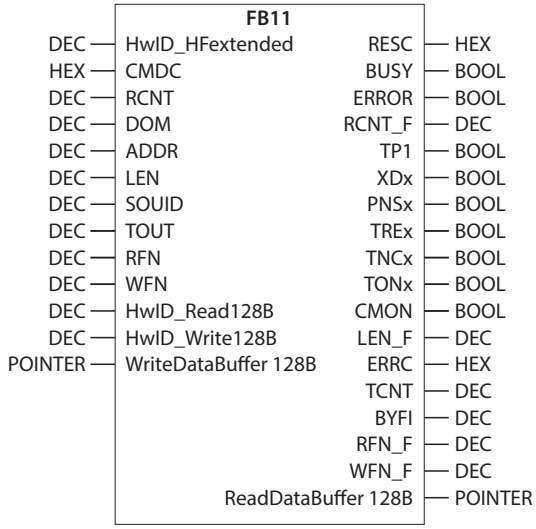


Fig. 149: FB11 function block

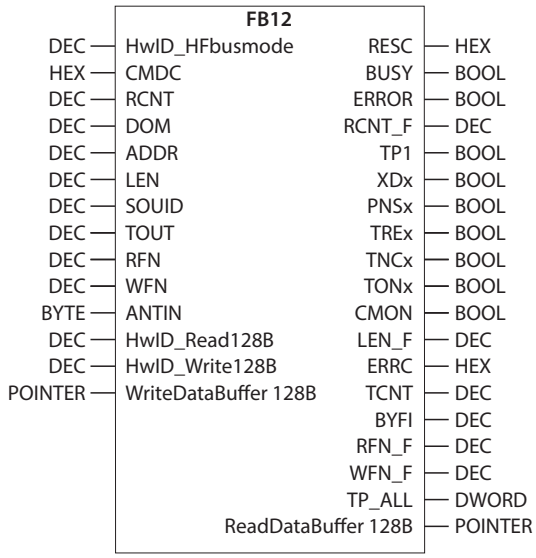


Fig. 150: FB12 function block

Input variables — FC10 and FC11

Name	Data type	Meaning
xCmdRead	BOOL	0 → 1 → 0: Executing a read command
xCmdWrite	BOOL	0 → 1 → 0: Execute write command
xCmdReset	BOOL	0 → 1 → 0: Reset command
xCmdInventory	BOOL	0 → 1 → 0: Executing the Inventory command
xCmdTagInfo	BOOL	0 → 1 → 0: Execute **Tag info** command
xCmdDirectExecute	BOOL	0 → 1 → 0: Execute direct command
wDirectCommandCode	HEX	Command code of the direct command

Input variables — FB10, FB11 and FB12

Name	Data type	Meaning
HwID_HFcompact HwID_HFextended HwID_HFbusmode	DEC	Hardware identifier of the module
CMDC	HEX	Command code, see the description of the output data, [▶ 105]
RCNT	DEC	Loop counter for fast processing, see description of the output data, [▶ 105]
DOM	DEC	Memory area (can only be used with UHF applications), see description of the output data, [▶ 105]
ADDR	DEC	Start address in bytes, see description of the output data, [▶ 105]
LEN	DEC	Length in bytes, see description of the output data, [▶ 105]
SOUID	DEC	Length of UID/EPC in bytes, see description of the output data, [▶ 105]
TOUT	DEC	Timeout, see description of the output data, [▶ 105]
RFN	DEC	Read fragment No., see description of the output data, [▶ 105]
WFN	DEC	Write fragment No., see description of the output data, [▶ 105]
ANTIN (RFID_HF_Busmode)	BYTE	Read/write head address of the head to be addressed, [▶ 105]
HwID_Read016B (RFID_COMPACT_Mode) HwID_Read128B (RFID_EXTENDED_Mode) (RFID_HF_Busmode)	DEC	Hardware identifier for the read data
HwID_Write016B (RFID_COMPACT_Mode) HwID_Write128B (RFID_EXTENDED_Mode) (RFID_HF_Busmode)	DEC	Hardware identifier for the write data
WriteDataBuffer16B (RFID_COMPACT_Mode) WriteDataBuffer128B (RFID_EXTENDED_Mode) (RFID_HF_Busmode)	POINTER	Write data

Output variables — FB10 and FB11

Name	Data type	Meaning
RESC	HEX	Response code, see description of the input data, [▶ 100]
BUSY	BOOL	Status of the command execution, see description of the input data, [▶ 100]
ERROR	BOOL	Error, see description of the input data, [▶ 100]
RCNT_F	DEC	Loop counter for fast processing, see description of the input data, [▶ 100]
TP1	BOOL	Tag present, see description of the input data, [▶ 100]
XDx	BOOL	HF read/write head at address x detuned, see description of the input data, [▶ 100]
PNSx	BOOL	Parameter of read/write head at address x not supported, see description of the input data, [▶ 100]
TREx	BOOL	Read/write head at address x reports error, see description of the input data, [▶ 100]
TNCx	BOOL	Expected read/write head with address x not connected, see description of the input data, [▶ 100]
TONx	BOOL	HF read/write head switched on, see description of the input data, [▶ 100]
CMON	BOOL	Continuous (Presence Sensing Mode) active, see description of the input data, [▶ 100]
LEN_F	DEC	Length, see description of the input data, [▶ 100]
ERRC	HEX	Error code, see description of the input data, [▶ 100]
TCNT	DEC	Tag counter, see description of the input data, [▶ 100]
BYFI (RFID_EXTENDED_Mode)	DEC	Data (bytes) available, see description of the input data, [▶ 100]
RFN_F (RFID_EXTENDED_Mode)	DEC	Read fragment No., see description of the input data, [▶ 100]
WFN_F (RFID_EXTENDED_Mode)	DEC	Write fragment No., see description of the input data, [▶ 100]
TP_ALL (RFID_HF_Busmode)	DWORD	Tag in the detection range of the connected read/write head, [▶ 100]
ReadDataBuffer 16B (RFID_COMPACT_Mode) ReadDataBuffer 128B (RFID_EXTENDED_Mode) (RFID_HF_Busmode)	DEC	Read data

9.13 Using Inventory command and Continuous (Presence Sensing) Mode

The Inventory command and Continuous (Presence Sensing) Mode transfer data to the PLC in different ways. Continuous Mode is suitable for high-speed applications, in which a command (e.g. read or write) is to be performed repetitively. Repeated execution of the same command by the controller is unnecessary.

The following lists the most important differences between an Inventory command and Continuous Mode:

Inventory	**Continuous Mode**	**Continuous Presence Sensing Mode**
Triggered reading of UIDs or EPCs	■ Repeated reading of UIDs or EPCs ■ Automatic repetition of the same command (e.g. inventory, read, write)	■ UHF reader switches on as soon as a tag is detected ■ Repeated reading of UIDs or EPCs ■ Automatic repetition of the same command (e.g. inventory, read, write)
Data is displayed in the read data after the command has ended.	Data must be read from the memory of the interface with a separate command.	Data must be read from the memory of the interface with a separate command.
Grouping of EPCs possible	Grouping of EPCs possible	Grouping of EPCs possible
No buffering on the read/write device	No buffering on the read/write device	No buffering on the read/write device
Terminate command: 1. Timeout 2. Automatically after command execution	Terminate command: 1. Timeout 2. Stopping the **Continuous (Presence Sensing) Mode command** or **Reset**	Terminate command: 1. Timeout 2. Stopping the **Continuous (Presence Sensing) Mode command** or **Reset**

9.14 LEDs

The device is provided with the following LEDs:

- Power supply voltage
- Group and bus error
- Status
- Diagnostics

PWR LED	Meaning
Off	No voltage or undervoltage at V1
Green	Voltage at V1 and V2 ok
Red	No voltage or undervoltage at V2

BUS LED	Meaning
Off	No voltage present
Green	Connection to a master active
Flashing 3 × green in 2 s	ARGEE active
Green flashing (1 Hz)	Device is operational
Red	IP address conflict, Restore mode active, F_Reset active or Modbus connection timeout
Red flashing	Wink command active
Red/green (1 Hz)	Autonegotiation and/or wait for IP address allocation in DHCP or BootIP mode

ERR LED	Meaning
Off	No voltage present
Green	No diagnostics
Red	Diagnostics present

ETH1 and ETH2 LEDs	Meaning
Off	No Ethernet connection
Green	Ethernet connection established, 100 Mbit/s
Green flashing	Data transfer, 100 Mbit/s
yellow	Ethernet connection established, 10 Mbit/s
Yellow flashing	Data transfer, 10 Mbit/s

CMD0 and CMD1 LEDs	Meaning
Off	Read/write device off
Green	Read/write device on
Green flashing	BUSY (command active)
Red flashing	Interface memory full
Red	Error in the data interface

TP0 and TP1 LEDs	Meaning
Off	No tag within the detection range
Green	Tag present at read/write head
Green flashing	Tag present at read/write head, command is processed
Flashing (1 Hz) red/ green	Connection with DTM. No connection to controller active.
Red	Diagnostics present

RFID channel LEDs	Meaning
TP… and CMD… flash simultaneously	Auxiliary power overload
TP… and CMD… flash alternately	Parameter error

DXP channel LEDs	Meaning (input)	Meaning (output)
Off	No input signal	Output not active
Green	Input signal present	Output active (max. 0.5 A)
Red	–	Actuator overload
Flashing red (1 Hz)	Auxiliary power overload	
Flashing white (DXP7 only)	Wink command active	

9.15 Software diagnostic messages

9.15.1 Diagnostic messages — gateway functions

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

Meaning of the diagnostic bits

Designation	Meaning
V2	Undervoltage V2
ARGEE	ARGEE program active
DIAG	Module diagnostics available
FCE	DTM active in Force mode
COM	Internal error
V1	Undervoltage V1

9.15.2 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 VAUX
PRMER	Parameterization error
DTM	Configuration via DTM active
FIFO	Buffer full
TNC…	Expected read/write head not connected (only functions in bus mode or with activated parameter **HF: Heartbeat read/write head**) is activated
TRE…	Read/write head reports error
PNS…	Parameter not supported by read/write head
XD…	Antenna detuned

9.15.3 Diagnostic messages — digital channels

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0					VAUX	VAUX		
1	ERR7	ERR6	ERR5	ERR4				

Meaning of the diagnostic bits

Designation	Meaning
VAUX	Overvoltage VAUX
ERR…	Error message on channel x

9.15.4 Diagnostic messages — module status

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

Meaning of the diagnostic bits

Designation	Meaning
V2	Undervoltage V2
ARGEE	ARGEE program active
DIAG	Module diagnostics available
FCE	DTM active in Force mode
COM	Internal error
V1	Undervoltage V1

9.16 Example: Activating diagnostics via the PLC software

The following example describes the activation of diagnostic messages with CODESYS 3 in PROFINET.

- Include the device in an existing project and connect to the controller (example: Turck TX510-P3CV01 HMI).
- Right-click an empty slot.
- Click **Insert device**.

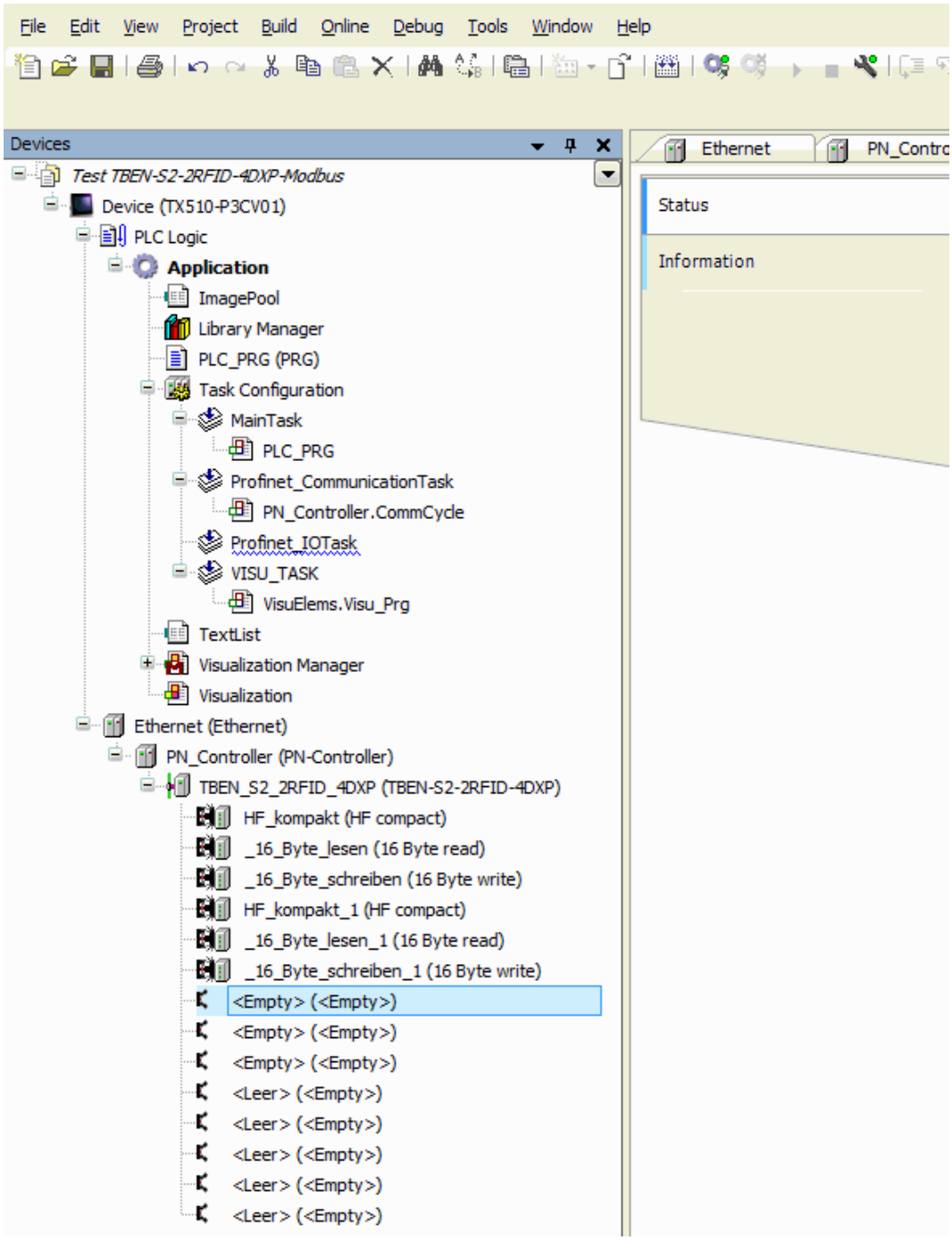


Fig. 151: Selecting an empty slot for diagnostics

▶ Click **RFID diagnostics**.

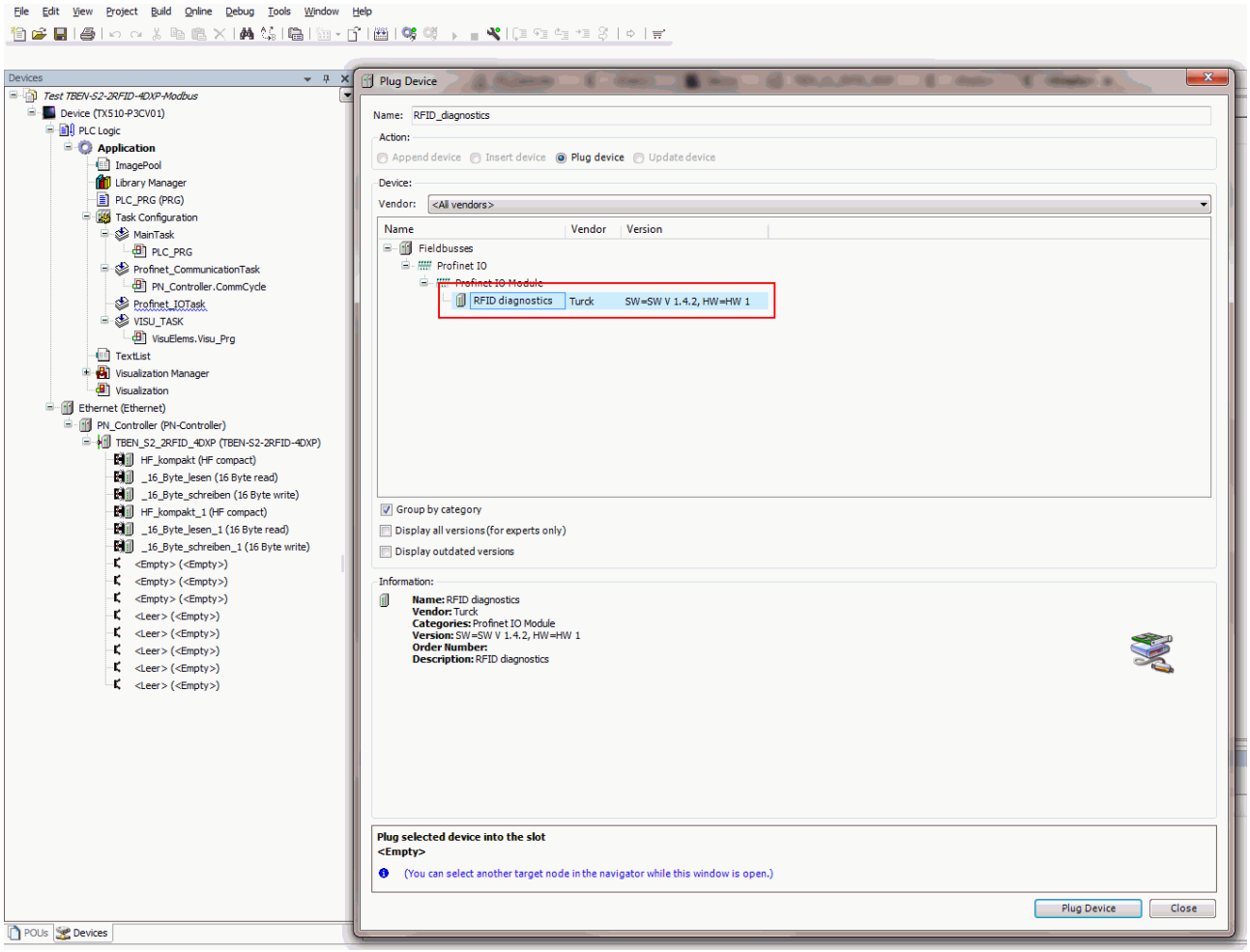


Fig. 152: Selecting RFID diagnostics

- Do not close the window.
- Select the next free slot.
- Select **DXP diagnostics** and confirm with **Insert device**.

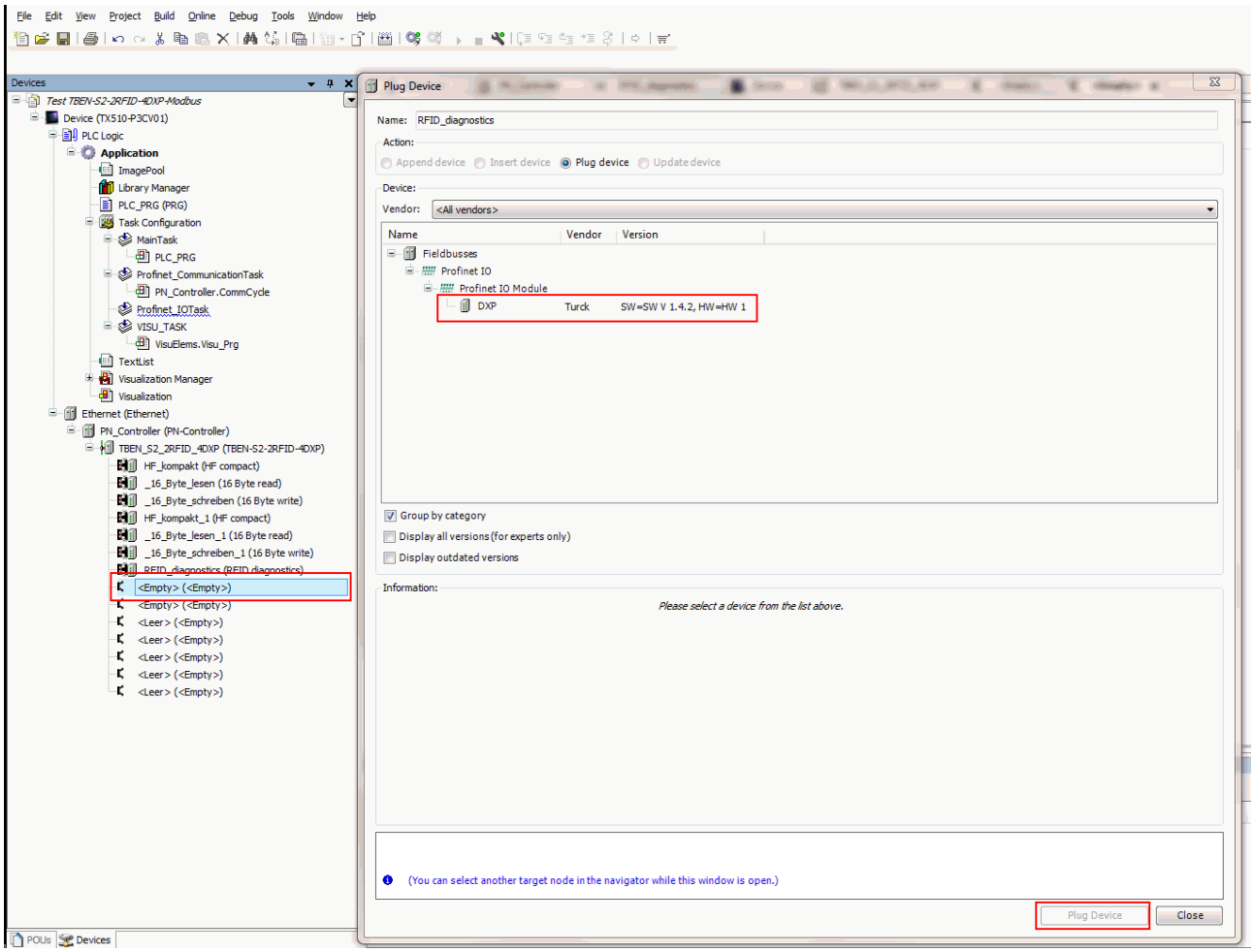


Fig. 153: Selecting DXP diagnostics

The diagnostics can be read via the PLC program.

9.17 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 exceeds 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.
0x8008	32776	Fragmentation must always start with write fragment No. 1
0x8009	32777	Fragmentation incomplete. Write fragment No. > 0 expected
0x8100	33024	Parameter undefined
0x8101	33025	**Operation mode** parameter outside of the permissible range
0x8102	33026	**Tag type** parameter outside of the permissible range
0x8103	33027	**Operation 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
0x8107	33031	**Bypass time** parameter outside of the permissible range
0x8108	33032	**Address in Continuous Mode** parameter outside of permissible range
0x8200	33280	Command code unknown
0x8201	33281	The command is not implemented in this device
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
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 multitag 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

Error code (hex.)	Error code (dec.)	Meaning
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 for read commands
0x8304	33540	Grouping not supported for write commands
0x8305	33541	HF: Length in Continuous Mode violates the block limits
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	Verify after write operation failed
0x2000	8192	Kill command not successful
0x2200	8704	Autotuning active
0x2201	8705	Autotuning failed
0x2202	8706	Antenna detuned at HF read/write head
0x2500	9472	Password function of the tag not supported
0x2501	9473	Password function not supported by read/write head
0x2502	9474	Tag protection bit pattern not supported
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 advanced 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
0xB0AD	45229	Error when setting the read/write head address

Error code (hex.)	Error code (dec.)	Meaning
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 advanced 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 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
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 turning on/off UHF-carrier
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

Error code (hex.)	Error code (dec.)	Meaning
0xD106	53510	Error with the tag function
0xF0…	61…	ISO -15693 error
0xF001	61441	ISO -15693 error: The command is not implemented in this device
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
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
0xF104	61699	Air interface error: HF tag error
0xF108	61704	Air interface error: HF 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 window, 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: The command is not implemented in this device
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: Write operation not possible (e.g. tag can only be read)
0xF826	63526	UHF read/write head: Verify after write operation failed
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.
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.

Error code (hex.)	Error code (dec.)	Meaning
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: No tag type specified in the command
0xF883	63619	Write command to a block failed
0xFFFE	65534	Timeout on the RS485 interface
0xFFFF	65535	Command aborted

9.18 Using extended diagnostics — RFID channels

The extended diagnostics in the web server are used for specific troubleshooting for Turck Service technicians.

Displaying extended diagnostics in the web server:

- ▶ Open the web server and log in on the device.
- ▶ Select **LOCAL I/O** → **Diagnosis** → Select RFID channel (here: **RFID channel 0**).

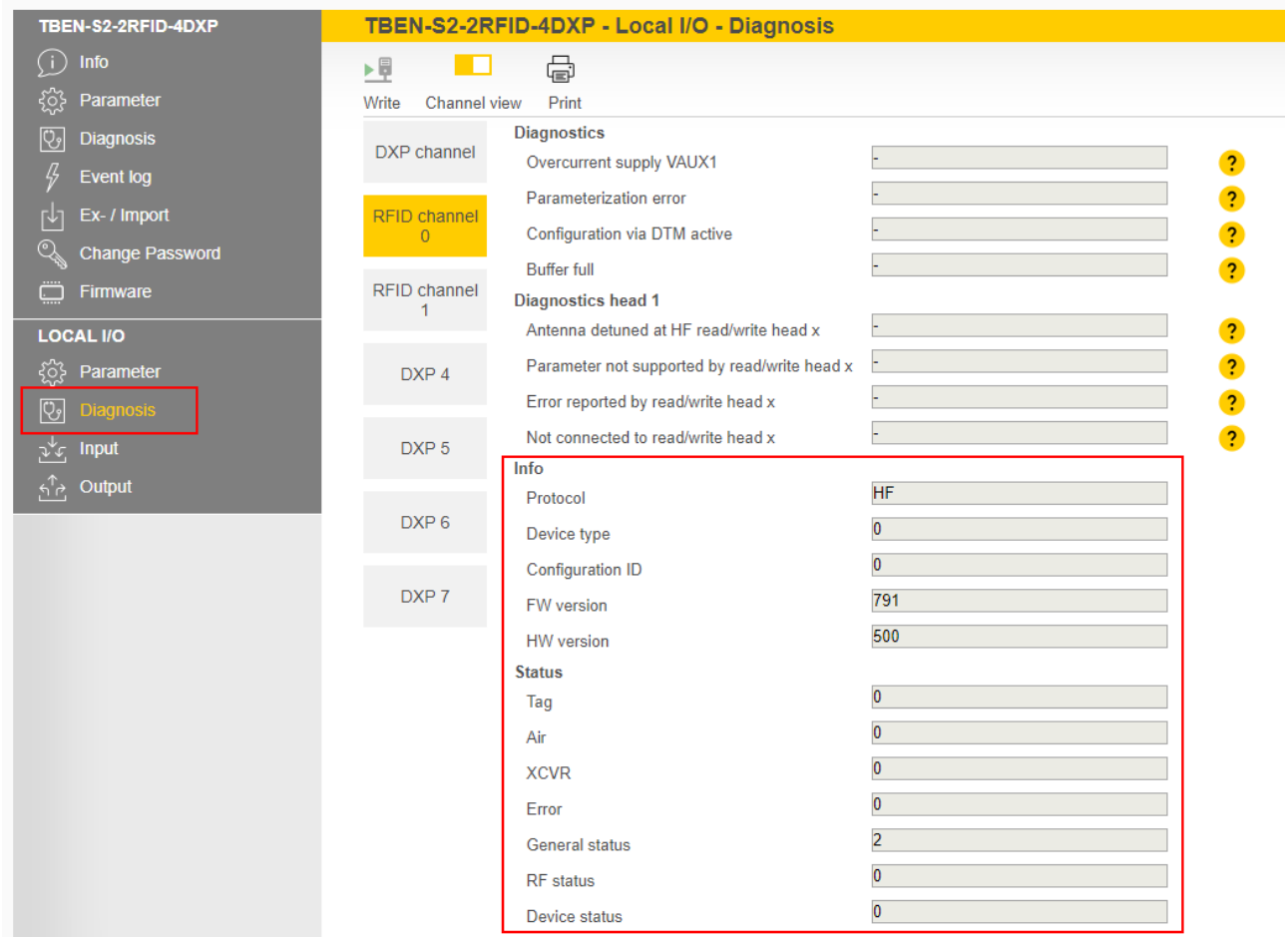


Fig. 154: Example: extended diagnostics of RFID channel 0

Info	Description
Protocol	Technology of the connected read/write device (HF or UHF)
Device type	ID number for the device type of the connected read/write device
Configuration ID	ID number for the configuration of the connected read/write device
FW version	Firmware version of the connected read/write device
HW version	Hardware version of the connected read/write device

Status	Description	Values
Tag	Error code of HF tag	1: The command is not implemented in this device 2: Command not detected, e.g. incorrect input format 3: Command option not supported 15: Undefined error 16: Addressed memory area not available 17: Addressed memory area locked 18: Addressed memory area locked and not writable 19: Write operation not successful 20: Addressed memory area could not be locked 160…223: User-specific error code
Air	Error code of HF air interface	1: CRC error 2: Timeout 4: HF tag error 8: HF tag outside of the detection range, before all commands could be executed 16: Tag does not have the expected UID.
XCVR	Error code of HF read/write head	1: HF read/write head faulty 2: Error in command execution 4: Transmission window, check syntax 8: Power supply of the HF read/write head too low 16: Command code unknown
Error	Error code of UHF reader	32: The command is not implemented in this device 33: Unspecified error 34: A valid password is expected before the command is accepted. 36: Read operation not possible (e.g. invalid tag) 37: Write operation not possible (e.g. tag can only be read) 38: Verify after write operation failed 39: Access to unknown address (e.g. memory area outside of range) 40: The data to be sent is not valid. 42: The command requires a long time for execution. 44: The requested object is not in the persistent memory. 45: The requested object is not in the volatile memory. 53: The command is temporarily not permissible. 54: The opcode is not valid for this type of configuration memory. 128: No tag in the field 129: The EPC of the command does not match the EPC in the detection range. 130: Incorrect tag type specified in the command 131: Write command to a block failed
General status	General status of UHF reader	The displayed values are based on the following bit structure: Bit 1: Tag present Bit 5: Test mode active Bit 6: Read/write head configuration damaged, default settings are used. Bit 7: Read/write head was reset (after reset).
RF status	Status of the RF module UHF reader	The displayed values are based on the following bit structure: Bit 0: PLL not locked Bit 1: Reverse power too high Bit 2: Antenna resistance too high or too low Bit 3: No free channel present Bit 4: Limit value for radiated power exceeded

Status	Description	Values
Device status	Device specific information	The displayed values are based on the following bit structure: Bit 0: Configuration invalid. Command execution not possible. Bit 1: Communication error Bit 2: Temperature too high Bit 3: Temperature warning Bit 4: Error in message generation (in Polling mode outside of memory area)

9.18.1 Using extended diagnostics — time measurement for commissioning an application

The time of the transmission from the tag to the interface is taken as the time measurement. The transmission of data to a controller is not taken into account.

If a particular tag is selected in the **HF: Select tag type** parameter, the time measurement for the write command is already started when it is activated. The time measurement is carried out irrespective of whether a tag is present in the detection range. The time measurement function is available for read/write heads from firmware version Vx.91.

The following values can be displayed for advanced diagnostics and system tests. Actual as well as minimum and maximum values are available.

- Time in which the **Tag present** bit is set
- Duration of an inventory command
- Duration of a read command
- Duration of a write command
- Cycle time of HF bus mode
- Cycle time of HF Continuous bus mode

Example: Opening extended diagnostics with the PACTware FDT/DTM frame application

- ▶ Open diagnostics in PACTware.
- ▶ Select the RFID channel (here: **Channel 0**).
- ⇨ The **Expert mode on/off** button is displayed in the menu bar.
- ▶ Activate expert mode.
- ▶ The time measurement is shown.

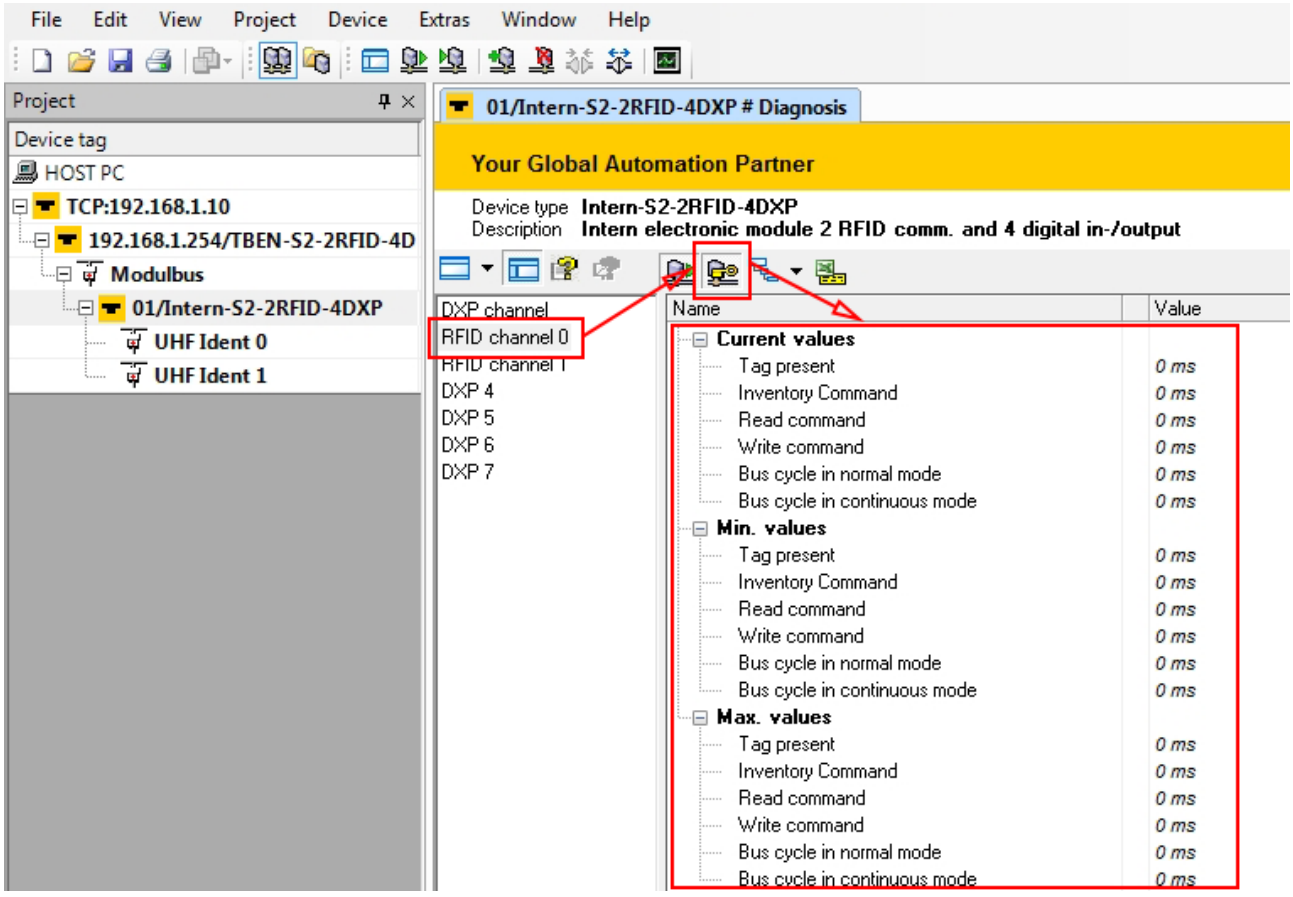


Fig. 155: Time measurement in the DTM

Example: Opening extended diagnostics in the web server

- ▶ Open the web server.
- ▶ Log into the device.
- ▶ Select **LOCAL I/O** → **Diagnosis** → Select RFID channel (here: **RFID channel 0**).
- ⇨ The time measurement is shown.

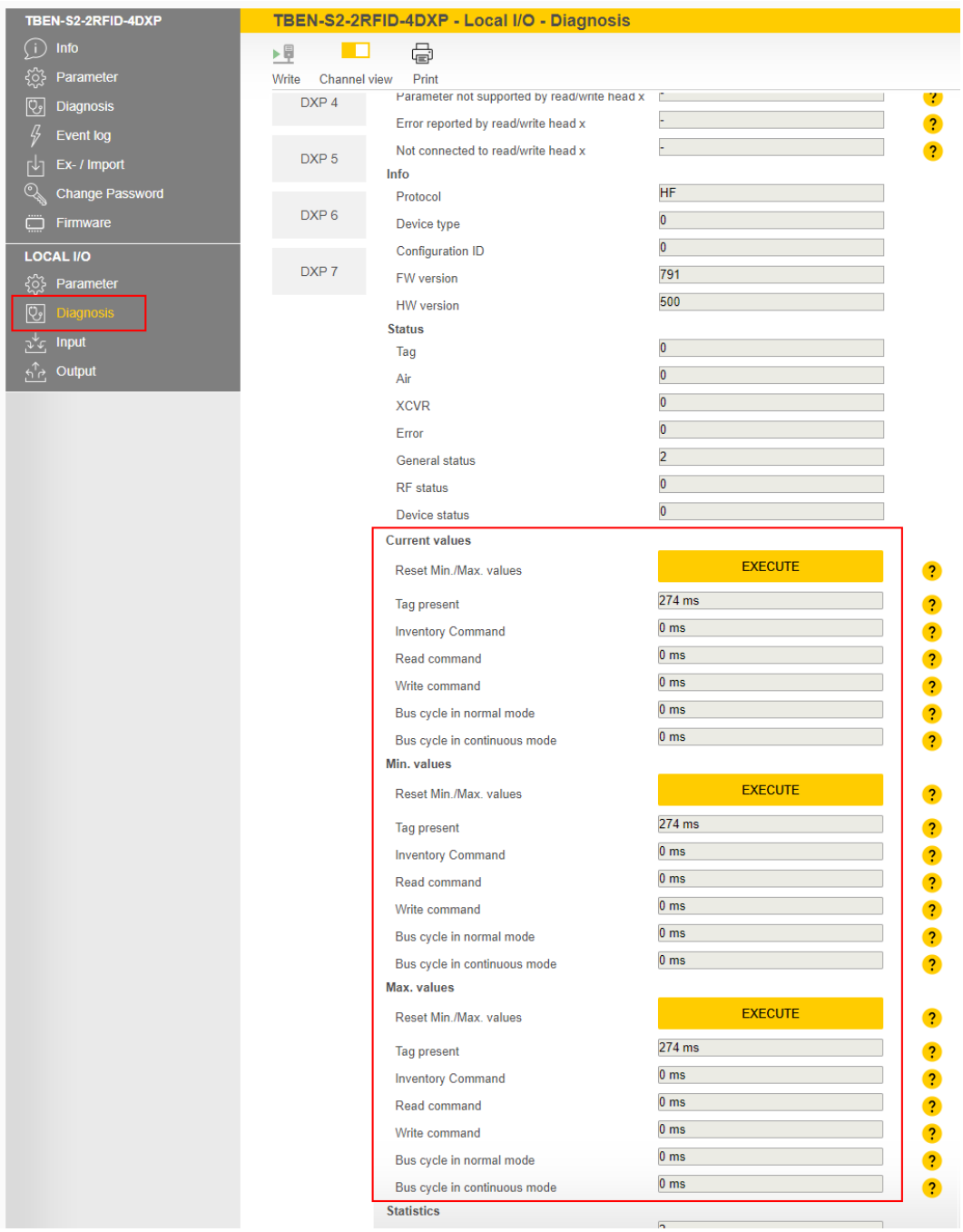


Fig. 156: Time measurement in the web server

9.19 HF Applications — firmware update of connected HF read/write heads via the web server

9.19.1 Prepare the firmware update

NOTE
In order to perform the firmware update via the PC and the web server, the device and the PC must be on the same IP network and the location of the new firmware file must be known.

9.19.2 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 “Adjusting network settings”.

The device is factory set to IP address 192.168.1.254. To open the web server via a web browser, enter **http://129.168.1.254** in the address bar of the web browser.

Status information and network settings are displayed on the home page.

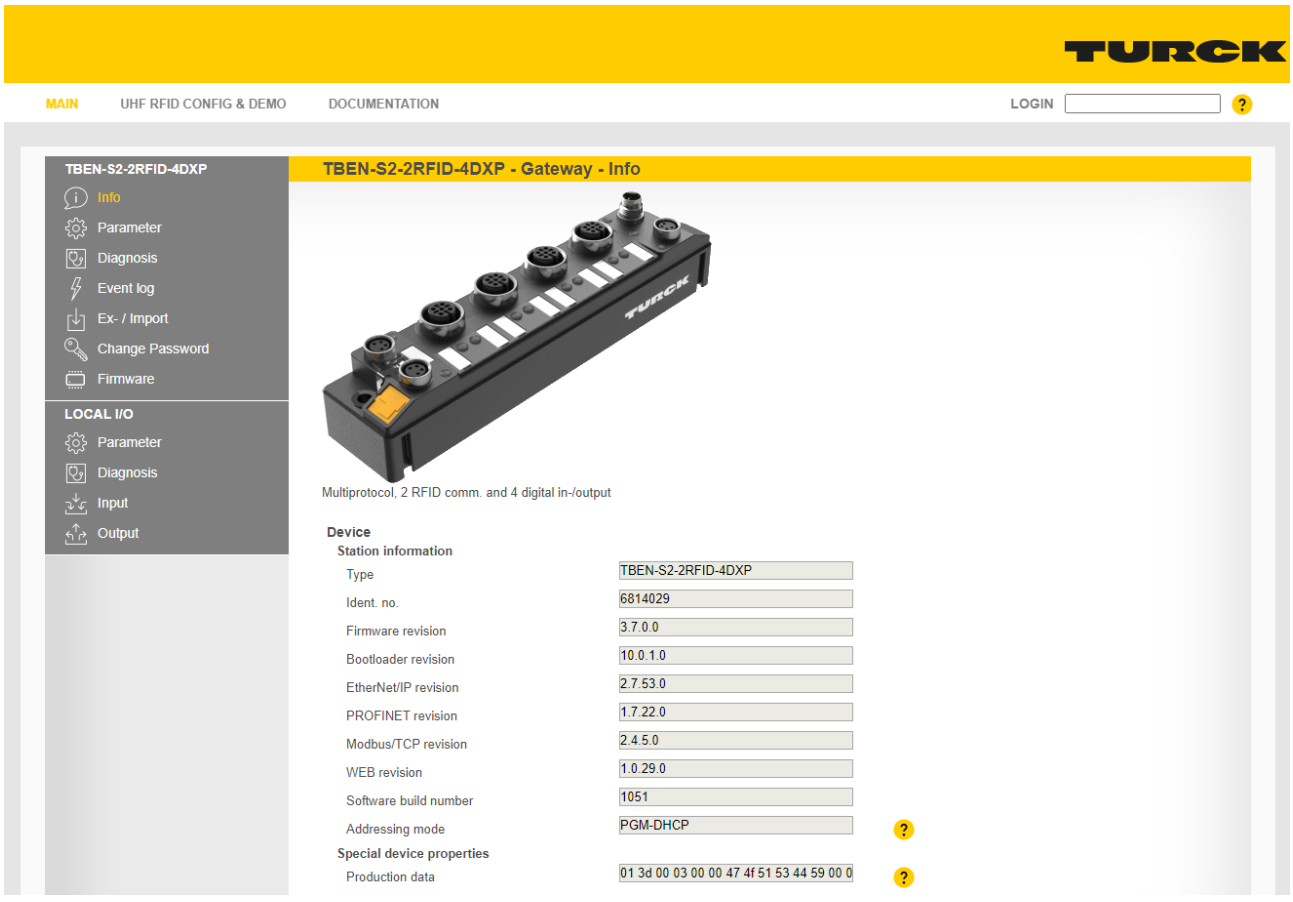


Fig. 157: Example: Web server — home page

9.19.3 Performing a firmware update

NOTICE
Interruption of the power supply during the firmware update
Device damage due to faulty firmware update
- ▶ Do not interrupt the power supply to the device during the firmware update.
- ▶ Do not reset the power supply during the firmware update.

To perform the firmware update, proceed as follows:

▶ Call up the web server

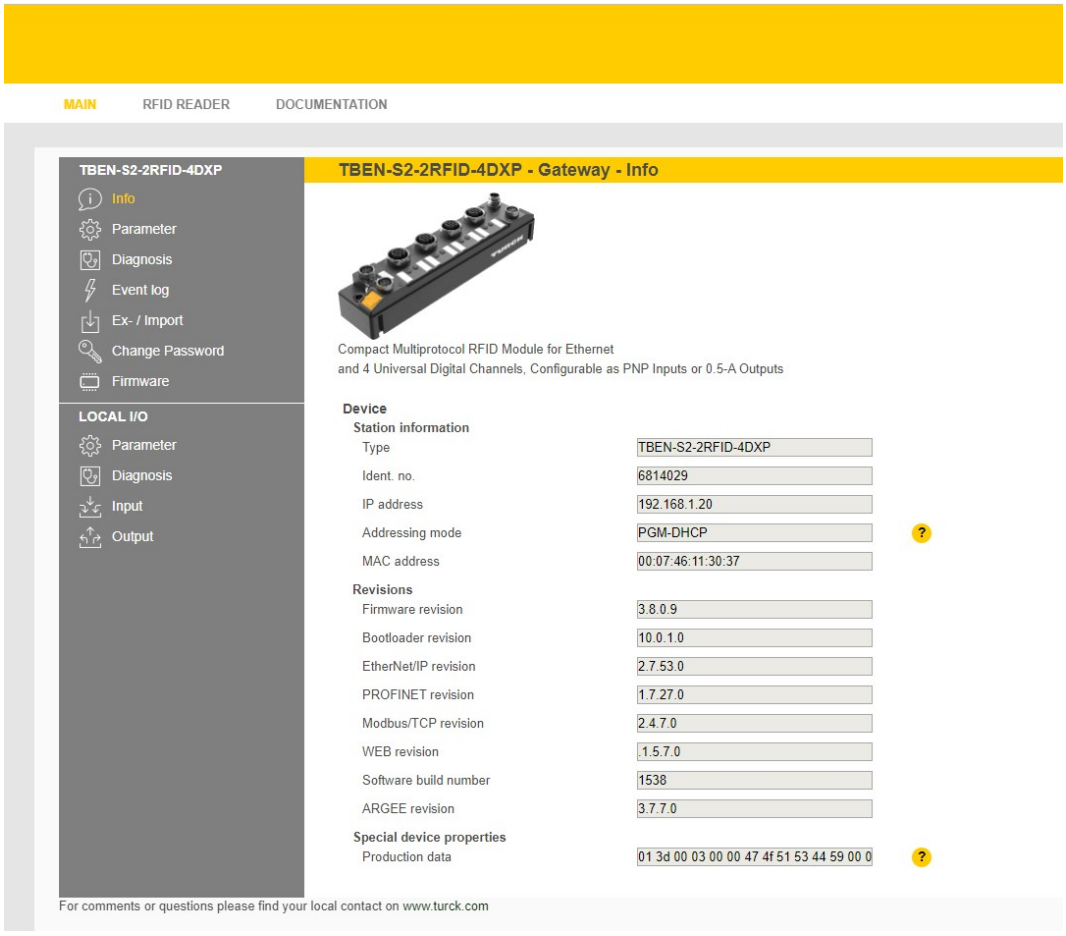


Fig. 158: Web server home page

- Select the **RFID reader** area and then, in the left column, select the **Firmware** point of the device on which you want to perform the firmware update

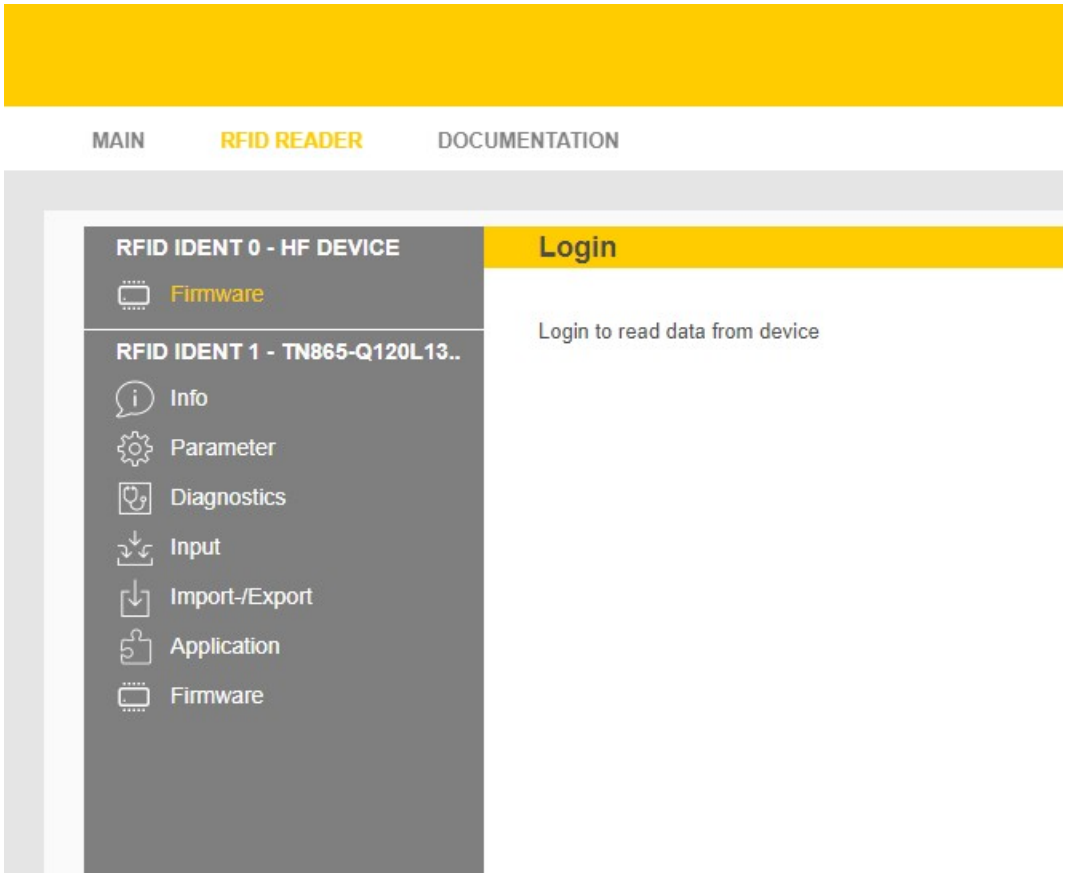


Fig. 159: RFID reader

- Log into the device if you have not already done so

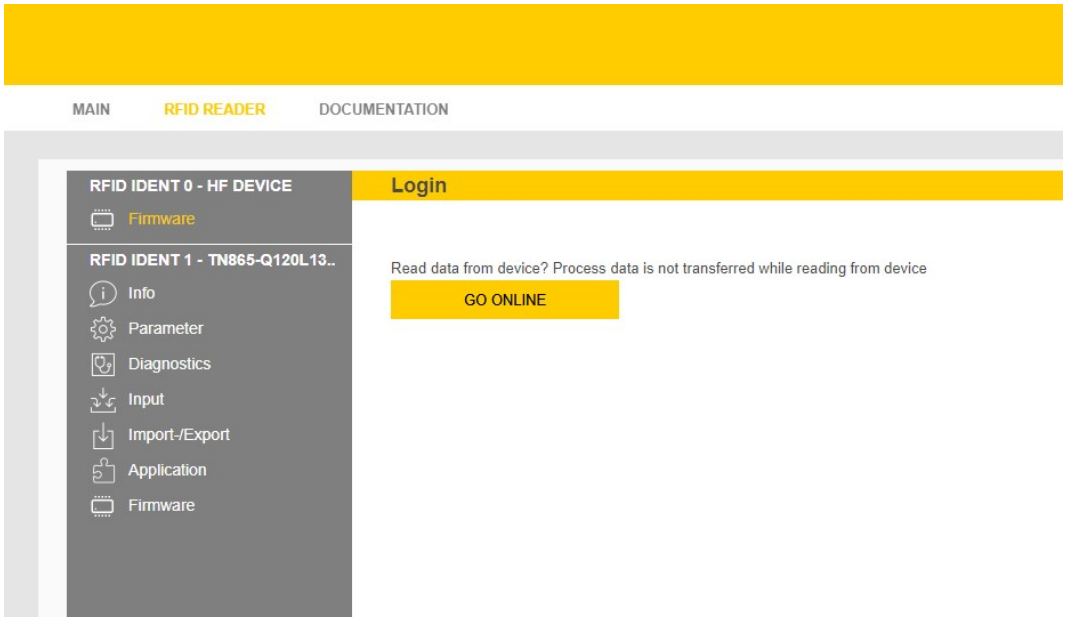


Fig. 160: Login

▶ Select the appropriate firmware file using the **Select firmware file** button

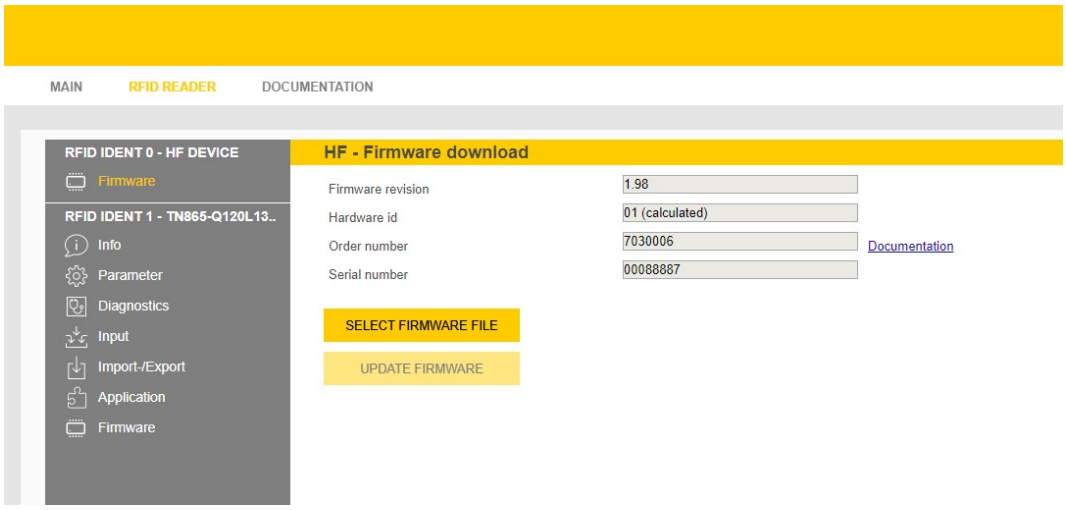


Fig. 161: Select firmware

⇨ Firmware file is loaded

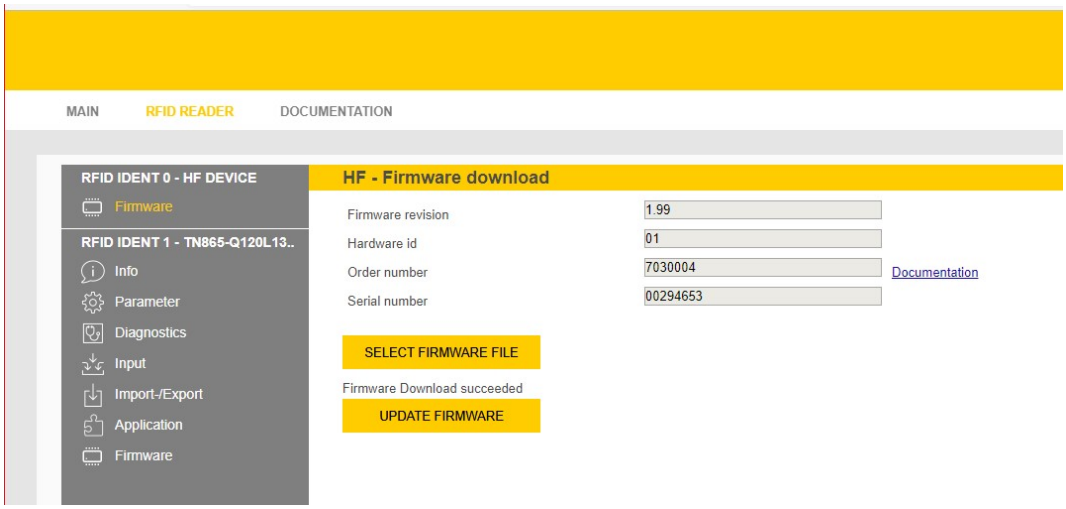


Fig. 162: Download the firmware

▶ Start the update via the **Update firmware** button

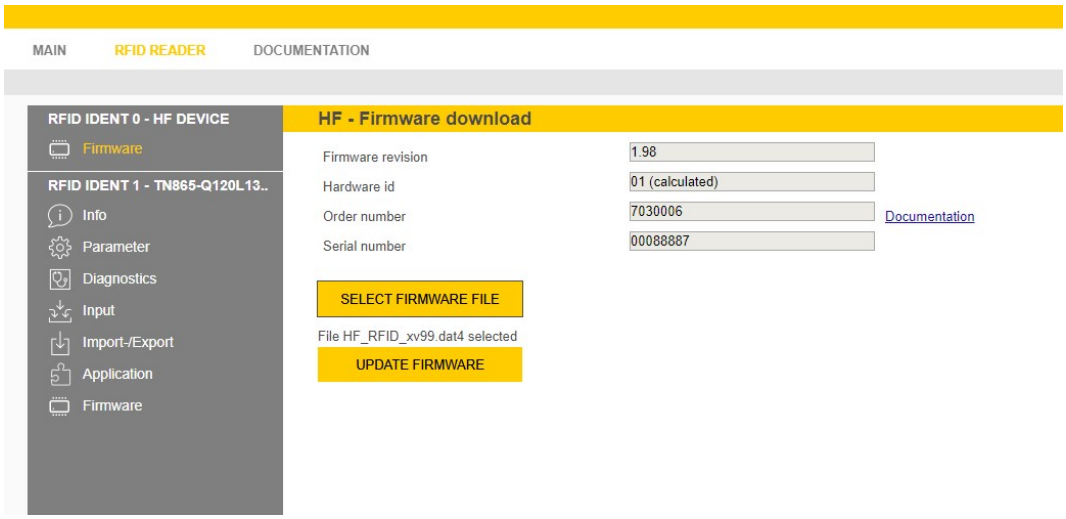


Fig. 163: Firmware file selected

▶ Confirm with **OK**

Fig. 164: Start the update

⇨ Firmware update starts

Fig. 165: Update in progress

➪ After a successful update, you will receive a corresponding message.

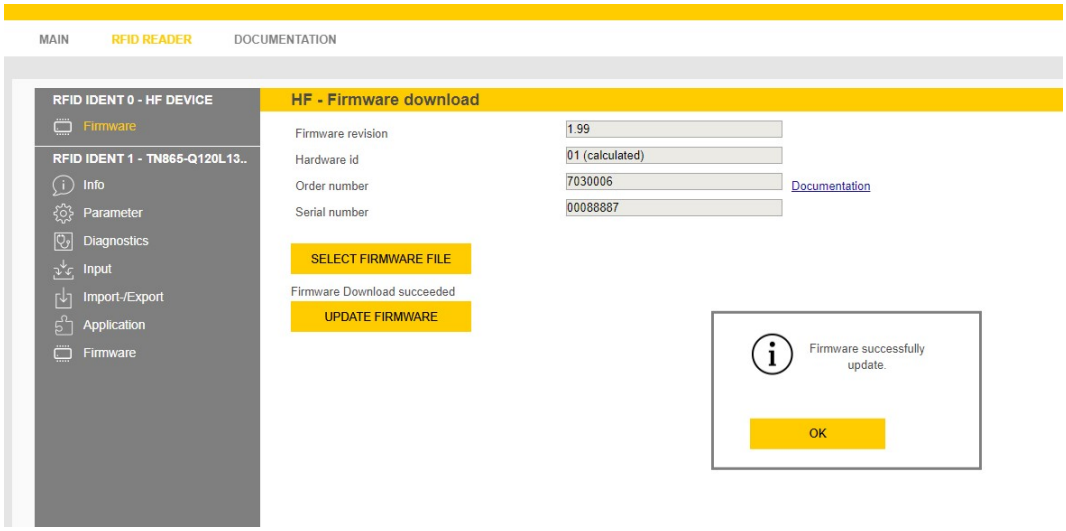


Fig. 166: Update successful

10 Troubleshooting

Proceed as follows if the device does not operate as expected:

- Exclude environmental interference.
- Check the terminals of the device for faults.
- Check the device for parameter errors.

A device fault is present if the malfunction continues. In this case, decommission the device and replace it with a new device of the same type.

10.1 Rectify parameter errors

DXP channels

Error	Possible causes	Measure
DXP output not switching	The output is deactivated in the default setting of the device.	▶ Activate the output function via the **Activate output** parameter (DXP_EN_DO = 1).

11 Maintenance

Ensure regularly that the plug connections and cables are in good condition.

The devices are maintenance-free, clean dry if required.

11.1 Performing a firmware update

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
Device damage due to faulty firmware update

- ▶ Do not interrupt the power supply to the device during the firmware update.
- ▶ Do not reset the power supply during the firmware update.

NOTE
Before updating firmware version ≤ 3.6.1.0 to version ≥ 3.7.0.0 the bootloader must be updated to version ≥ 10.0.1.0.

Example: Updating the firmware with the PACTware FDT frame application

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

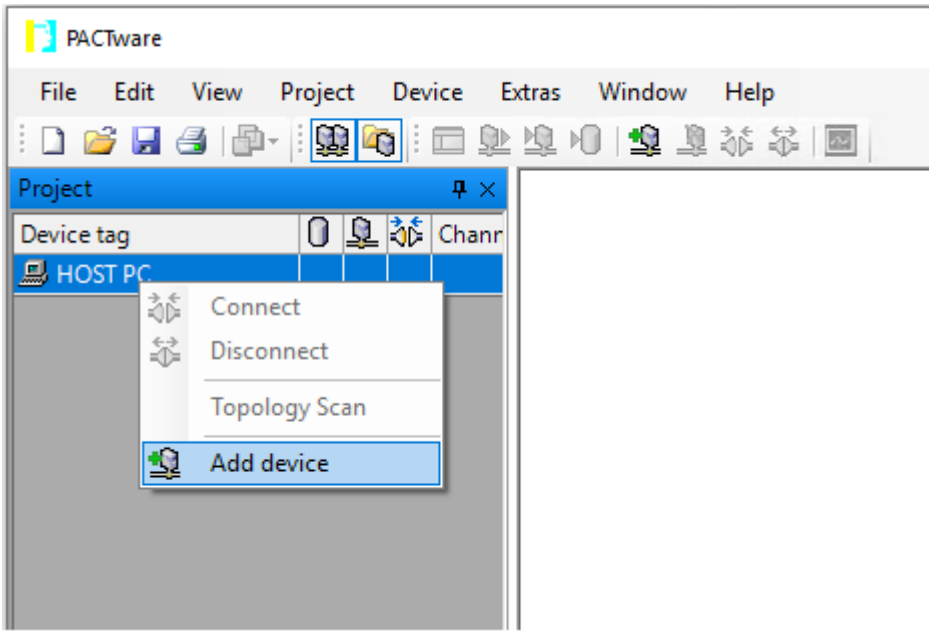


Fig. 167: Adding a device in PACTware

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

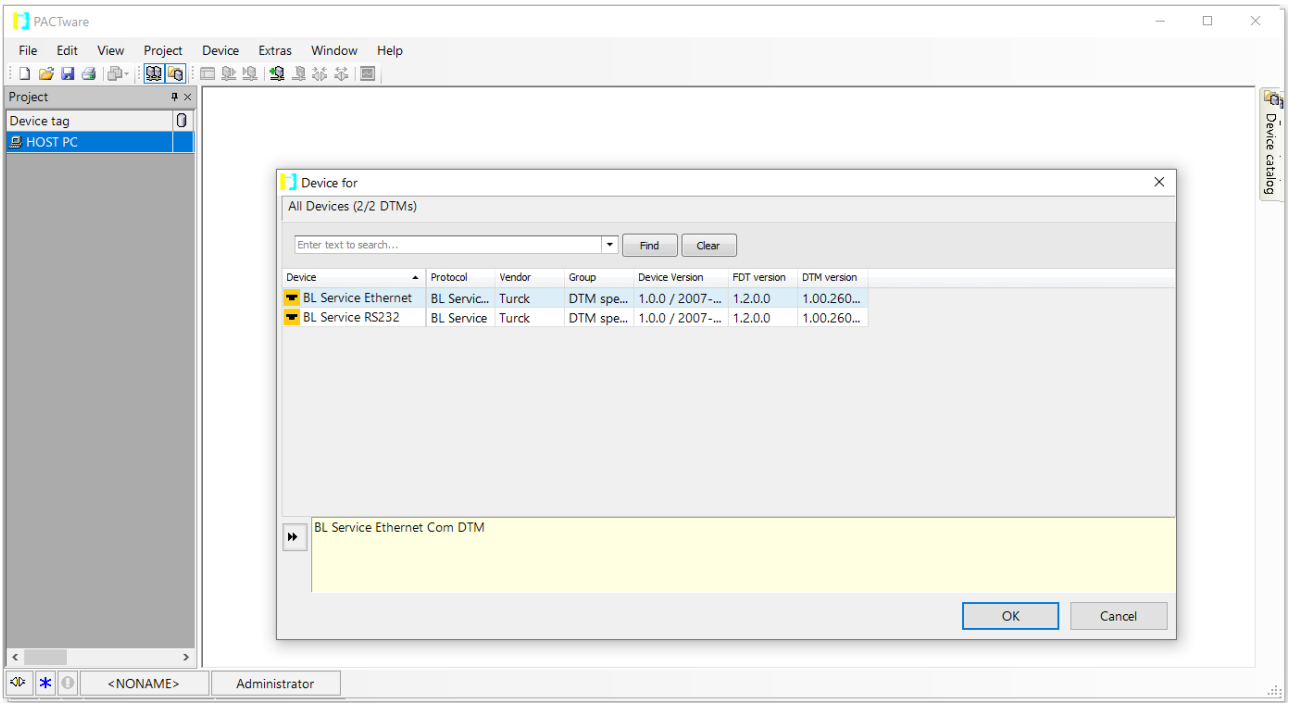


Fig. 168: Selecting the Ethernet interface

▶ Double-click the connected device.
⇨ PACTware opens the Bus Address Management function.

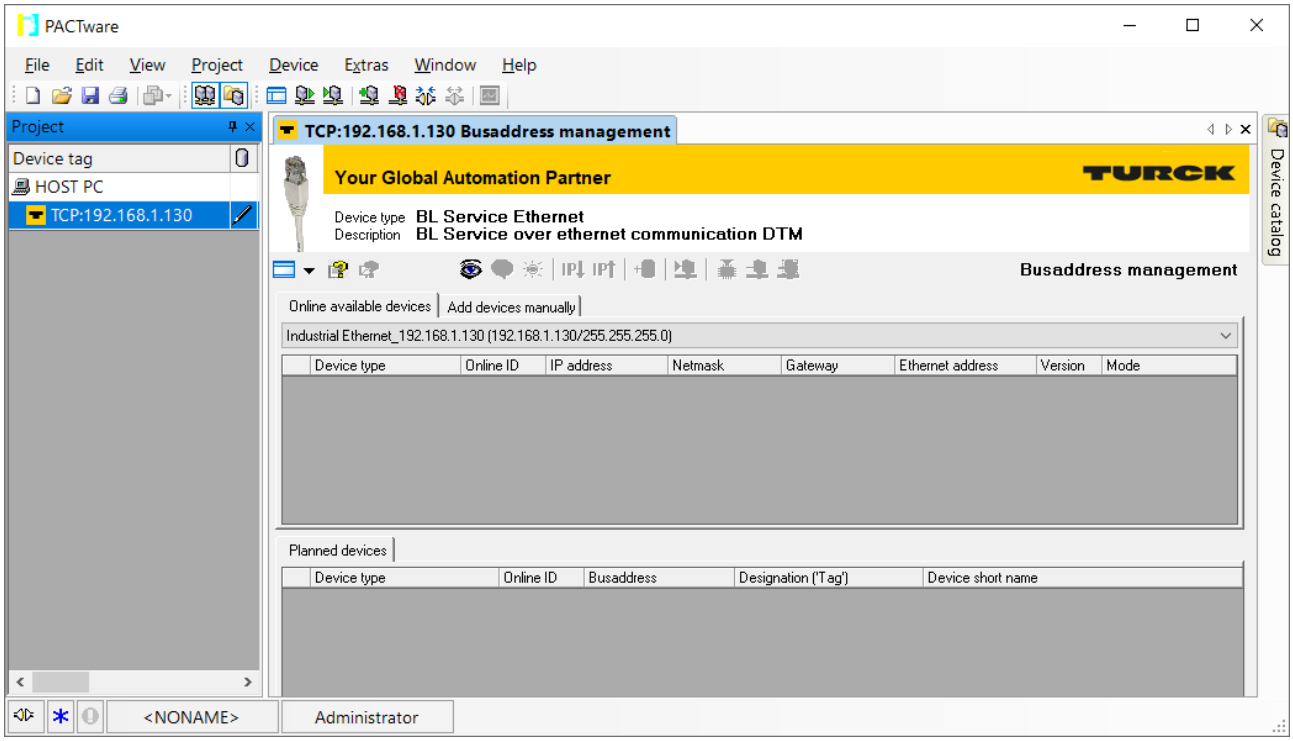


Fig. 169: Opening Bus Address Management

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

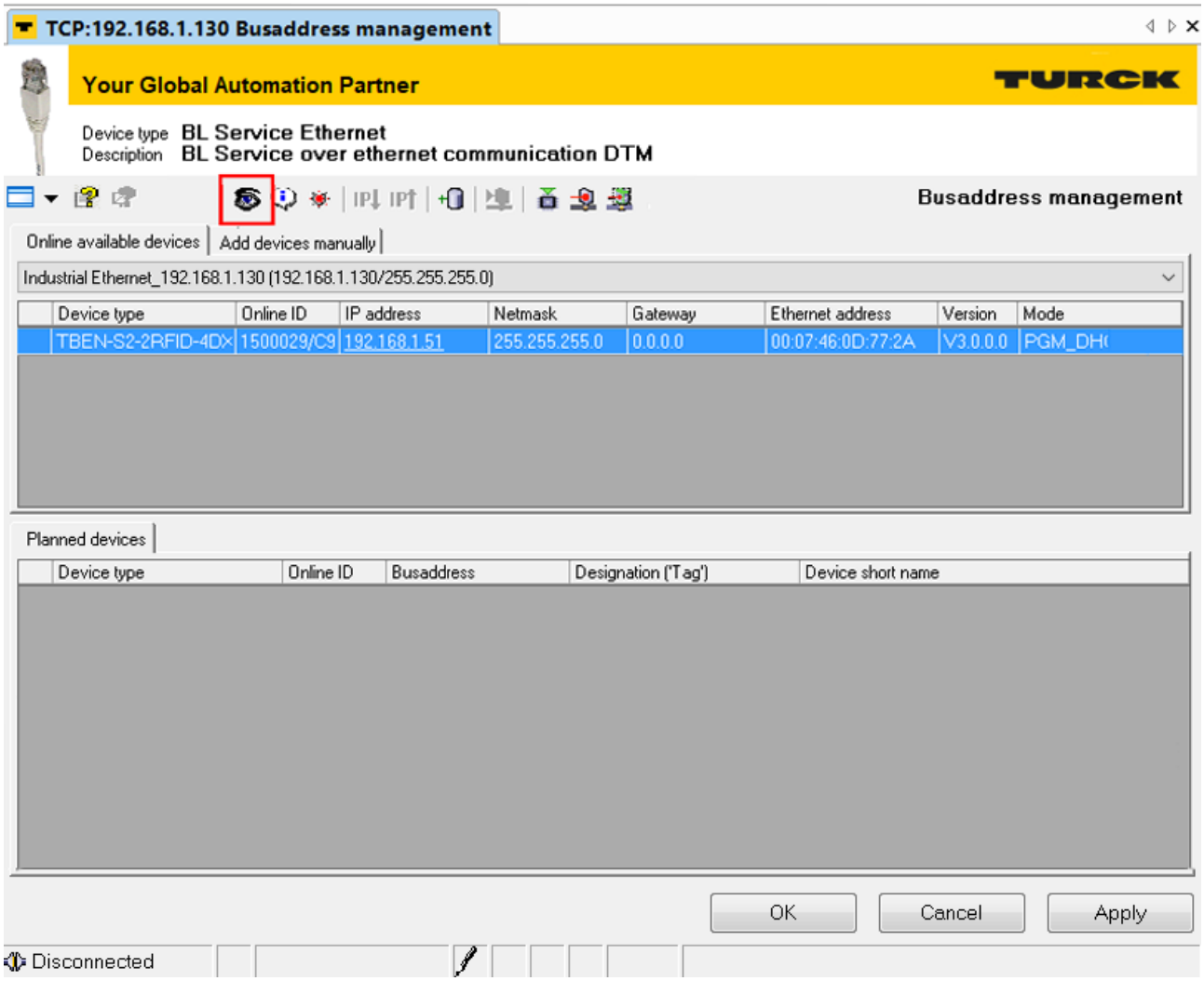


Fig. 170: Selecting the device

NOTICE
Faulty firmware update
Restricted device functions due to missing web server
- ▶ Upload bootloader to version ≥ 10.0.1.0.

Checking the bootloader version

- Open the web server via a web browser or via the Turck Service Tool.
- Check the bootloader version in the status information on the home page.

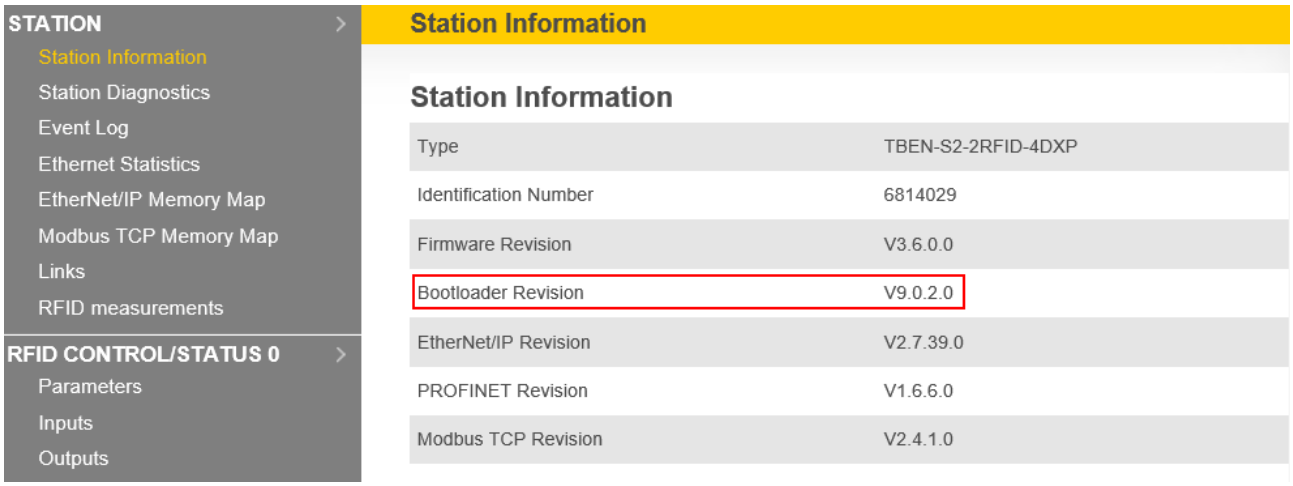


Fig. 171: Checking the bootloader version

- The bootloader must be updated before the firmware update if the bootloader version is < 10.0.1.0.
- If the bootloader version is ≥ 10.0.1.0, continue with the firmware update (see [▶ 272]).

Updating the bootloader

- ▶ Click the **Firmware Download** button.
- ▶ Select the displayed bootloader and click **Open**.

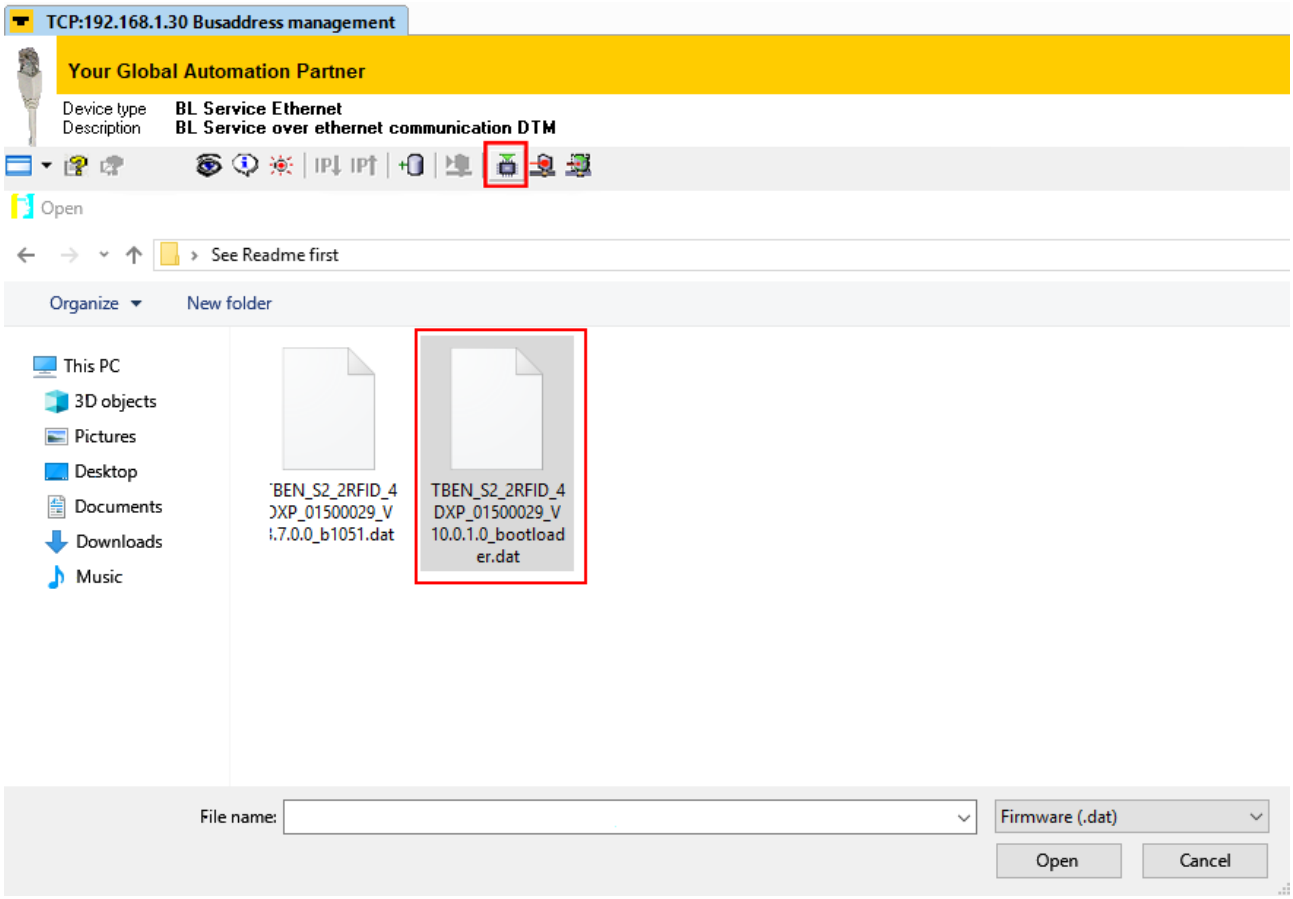


Fig. 172: Selecting the bootloader

➪ PACTware displays a green bar at the bottom of the screen to indicate the progress of the bootloader update.

Updating the firmware

- Click the **Firmware Download** button.
- Select firmware and click **Open**.

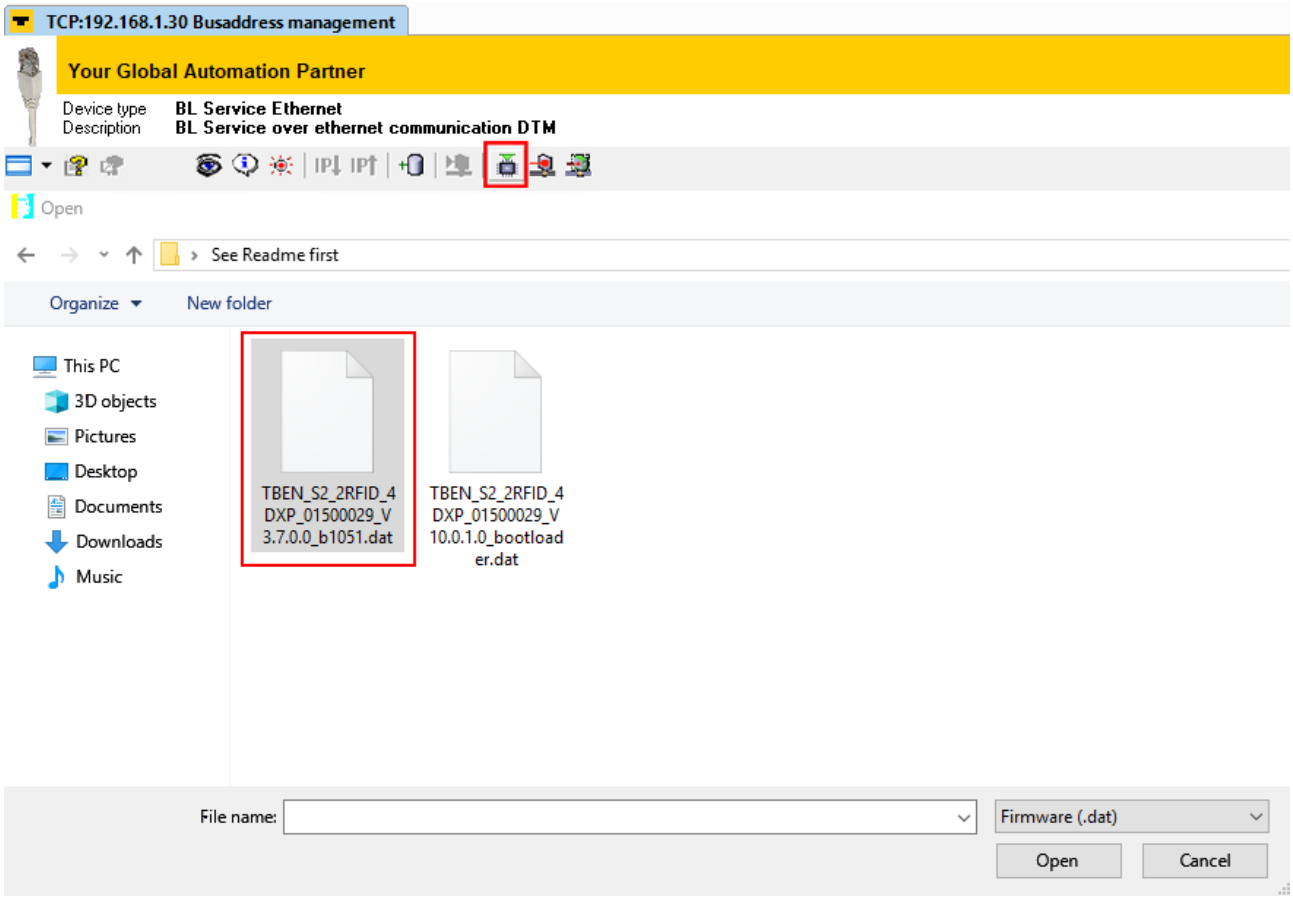


Fig. 173: Starting the firmware update

➪ PACTware displays a green bar at the bottom of the screen to indicate the progress of the bootloader update.

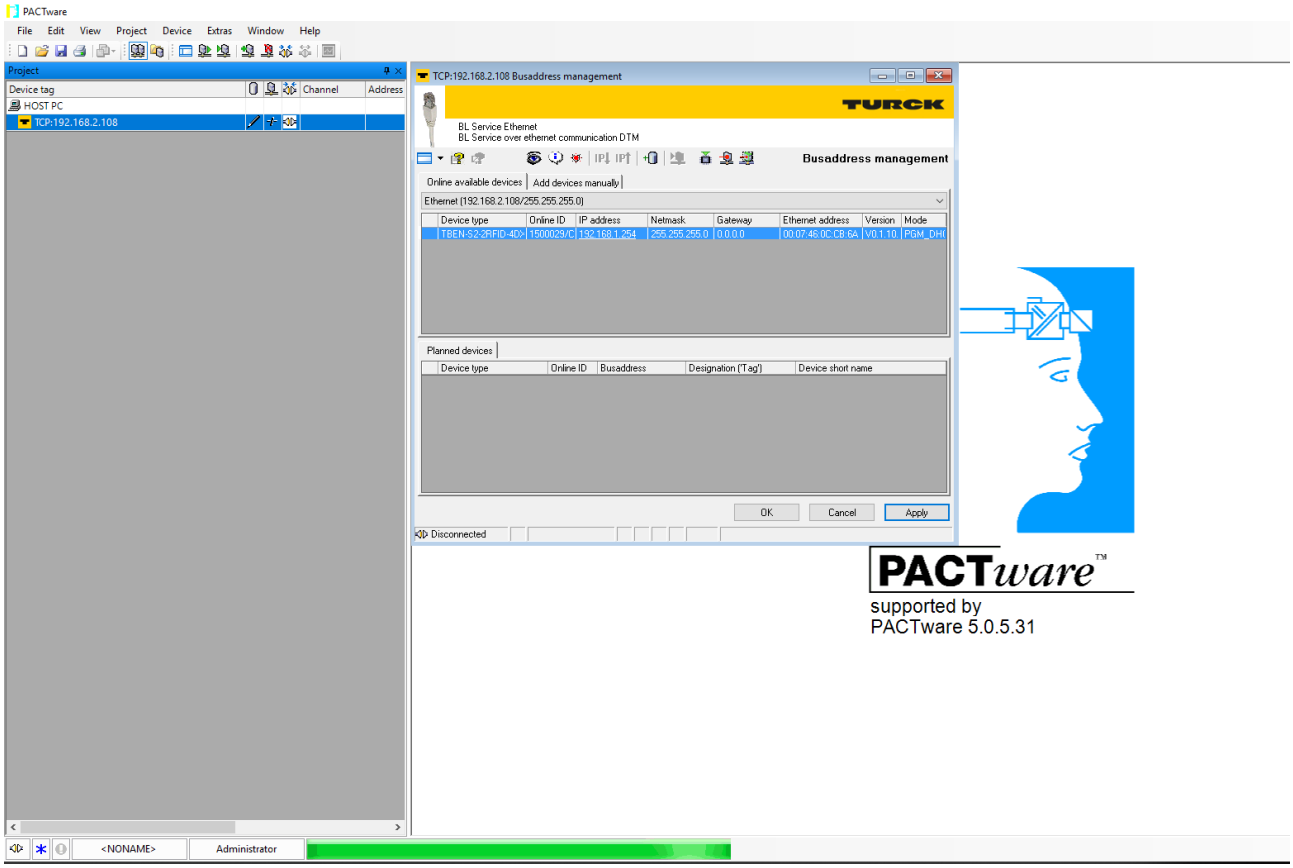


Fig. 174: Firmware update in progress

12 Repair

The device is not intended for repair 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. This is available for download at
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 properly and do not belong in the domestic waste.

14 Technical Data

Technical Data	
Power supply	
Power supply voltage	24 VDC
Permissible range	18…30 VDC Total current max. 4 A per voltage group Total current V1 + V2 max. 5.5 A at 70 °C per module
Voltage supply connection	2 × M8, 4-pin
Operating current	V1: max. 120 mA V2: max. 30 mA
RFID power supply	Sockets C0…C1 from V1 short-circuit proof, 1.2 A ≤ 55 °C, 55 °C < 0.5 A ≤ 70 °C per channel
Sensor/actuator supply	Sockets C2…C3 from V2 short-circuit proof, 0.14 A < 55 °C, 55 °C < 0.05 A < 70 °C
Potential isolation	Potential isolation of V1 and V2 voltage group Voltage proof up to 500 VDC
System data	
Ethernet transfer rate	10 Mbit/s / 100 Mbit/s
Ethernet connection technology	2 × M8, 4-pin, D-coded
Protocol detection	automatic
Web server	Default: 192.168.1.254
Service interface	Ethernet via P1 or P2
Field Logic Controller (FLC)	
ARGEE firmware version	3.3.5.0
ARGEE engineering version	2.0.26.0
Modbus TCP	
Addressing	Static IP, BOOTP, DHCP
Supported function codes	FC1, FC2, FC3, FC4, FC5, FC6, FC15, FC16, FC23
Number of TCP connections	8
Input register start address	0 (0x0000)
Output register start address	2048 (0x0800)
EtherNet/IP	
Addressing	As per EtherNet/IP specification
Quick Connect (QC)	< 500 ms
Device Level Ring (DLR)	Supported
Class 3 connections (TCP)	3
Class 1 connections (CIP)	10
Input assembly instance	103
Output assembly instance	104
Configuration assembly instance	106

Technical Data	
PROFINET	
Addressing	DCP
Conformity class	B (RT)
MinCycleTime	1 ms
Fast startup (FSU)	< 500 ms
Diagnostics	According to PROFINET Alarm Handling
Topology detection	Supported
Automatic addressing	Supported
Media redundancy protocol (MRP)	Supported
System redundancy	S2
RFID	
No. of channels	2
Connection technology	M12
Power supply	1.2 A ≤ 55 °C, 55 °C < 0.5 A ≤ 70 °C per channel, short-circuit proof
Operation per channel	1 × HF or read/write head or UHF reader, up to 32 bus-capable HF read/write heads with suffix / C53 (if necessary, additional power feed required)
RFID data interface	HF and UHF
Cable length	Max. 50 m
Digital inputs	
No. of channels	4
Connection technology of inputs	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	> 11V
Signal current Low signal	< 1.5 mA
Signal current High signal	> 2 mA
Input delay	0.05 ms
Potential isolation	Galvanic isolation from the fieldbus, voltage proof up to 500 VDC
Digital outputs	
No. of channels	4
Connection technology of outputs	M12, 5-pin
Output type	PNP
Type of input diagnostics	Channel diagnostics
Output voltage	24 VDC from potential group V2
Output current per channel	0.5 A, short-circuit resistance
Utilization factor	1 (0.03 > 55 °C)
Load type	EN 60947-5-1: DC-13
Short-circuit protection	yes

Technical Data	
Potential isolation	Galvanic isolation from the fieldbus, voltage proof up to 500 VDC
Conformity with standard/directive	
Vibration test	According 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 FCC UV resistant acc. to DIN EN ISO 4892-2A (2013)
UL certificate	cULus LISTED 21 W2, Encl.type 1 IND.Cont.EQ.
General information	
Dimensions (W × L × H)	32 × 144 × 31 mm
Operating temperature	-40…+70 °C
Storage temperature	-40…+70 °C
Operating height	Max. 5000 m
Protection class	IP65/IP67/IP69K
MTTF	179 years acc. to SN 29500 (Ed. 99) 20 °C
Housing material	PA6-GF30
Housing color	Black
Material of label	Polycarbonate
Halogen-free	yes
Mounting	2 fixing holes, Ø 4.6 mm

Note on FCC

NOTE
This device complies with the limit values for a Class A digital device in accordance with Part 15 of the FCC regulations. Operation of this device in a residential area may cause harmful interference. In this case users must rectify the interference at their own cost.

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

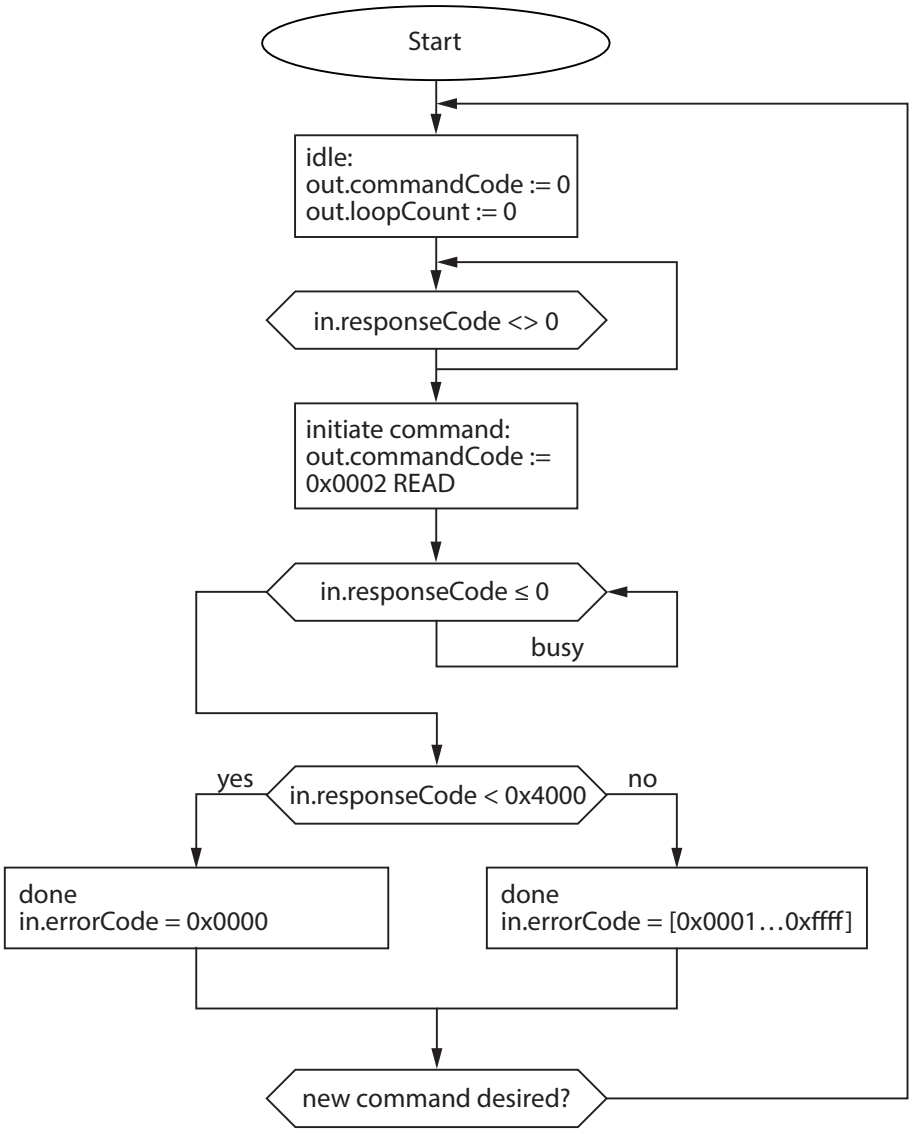


Fig. 175: Flow chart for command processing

15.1.1 Handling command execution with Busy and Error — sample code in CODESYS

The following is a sample code for evaluation in the PLC program.

```
commandCode: INT;
responseCode: INT;
responseCodePrevious: INT;

commandCode:= 0x0002; (* READ *)

(* … PLC cycle … *)

IF (responseCode <> responseCodePrevious) THEN
IF (responseCode < 0) THEN
(* BUSY *)
ELSE
IF (responseCode == commandCode) THEN
(* success *)
ELSIF (0x8000 == commandCode) AND (0x0000 == responseCode) THEN
(* reset success *)
ELSE
(* error *)
END_IF;
END_IF;
responseCodePrevious:= responseCode;
END_IF;
```

15.2 Flow chart: rapid command processing with loop counter

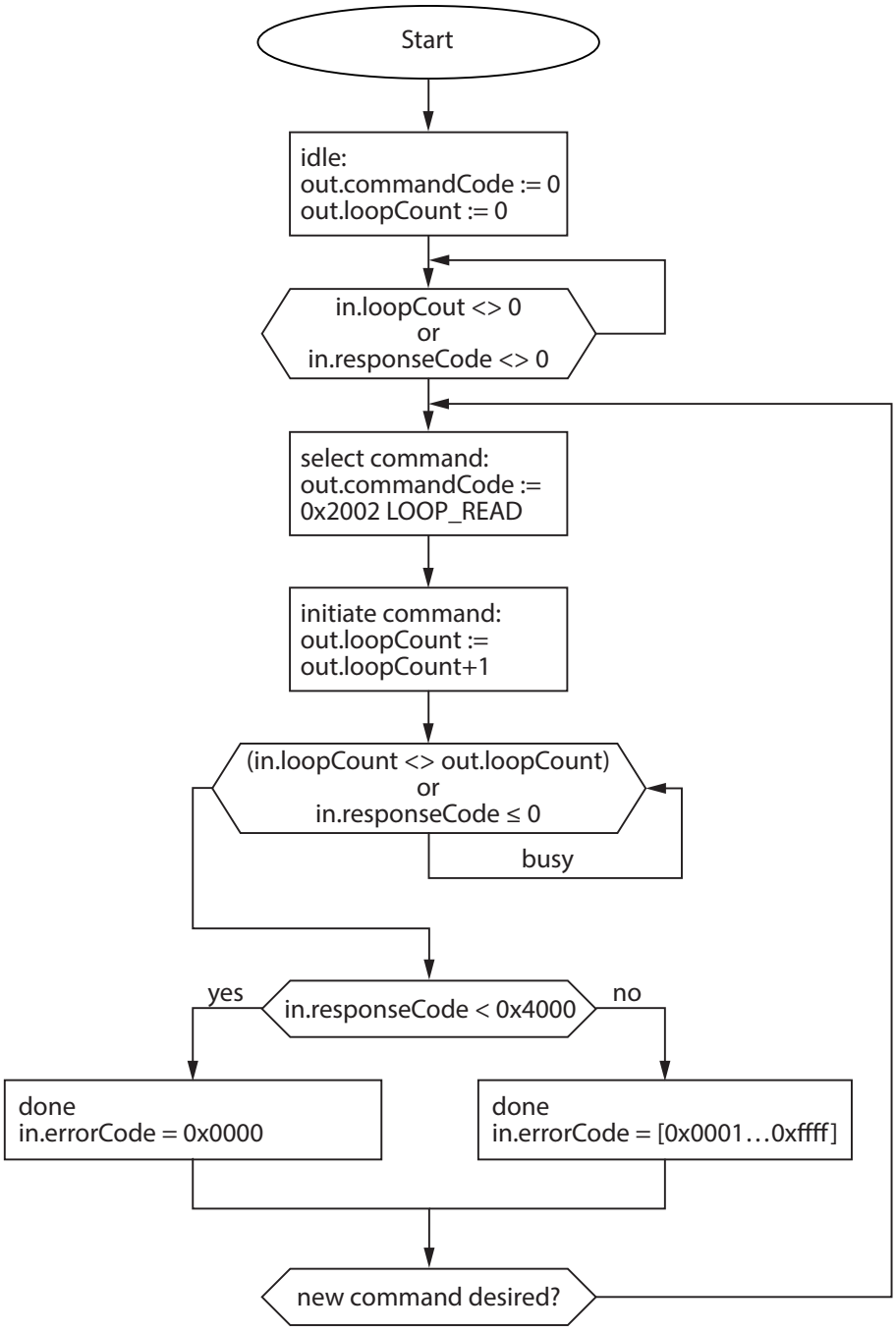


Fig. 176: Flow chart for fast command processing with loop counter

15.3 Flow chart: command processing with fragmentation

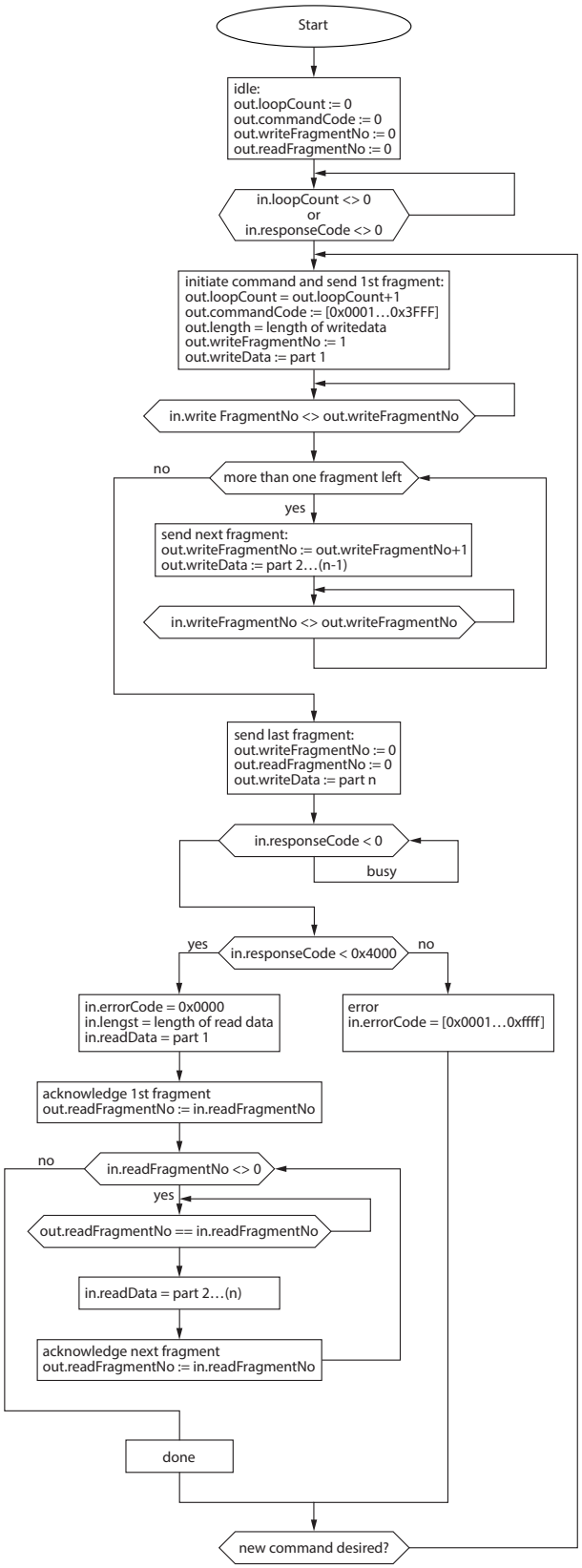


Fig. 177: Flow chart for command processing with fragmentation

15.4 Flow chart: Continuous Mode with interruption before reading data

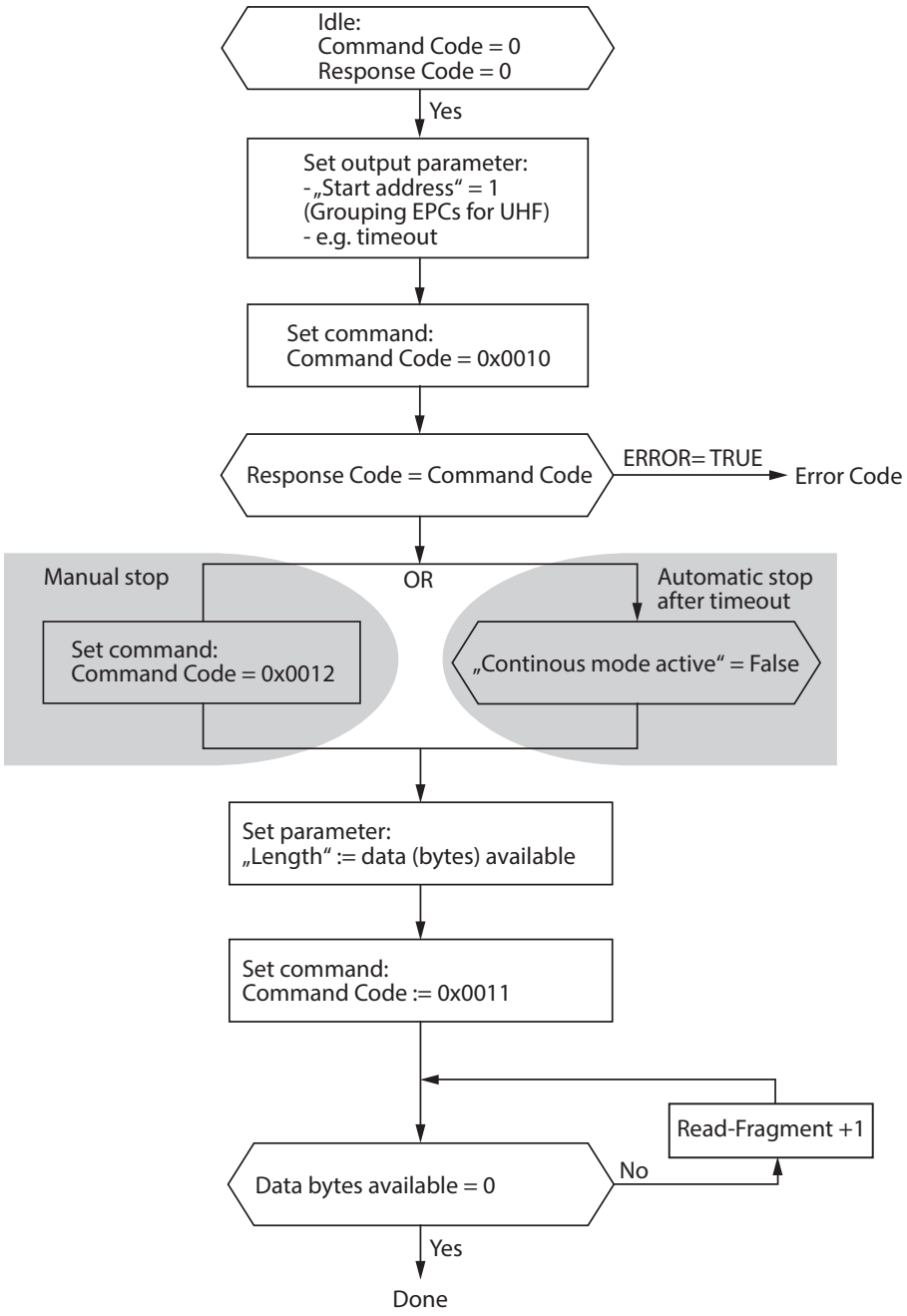
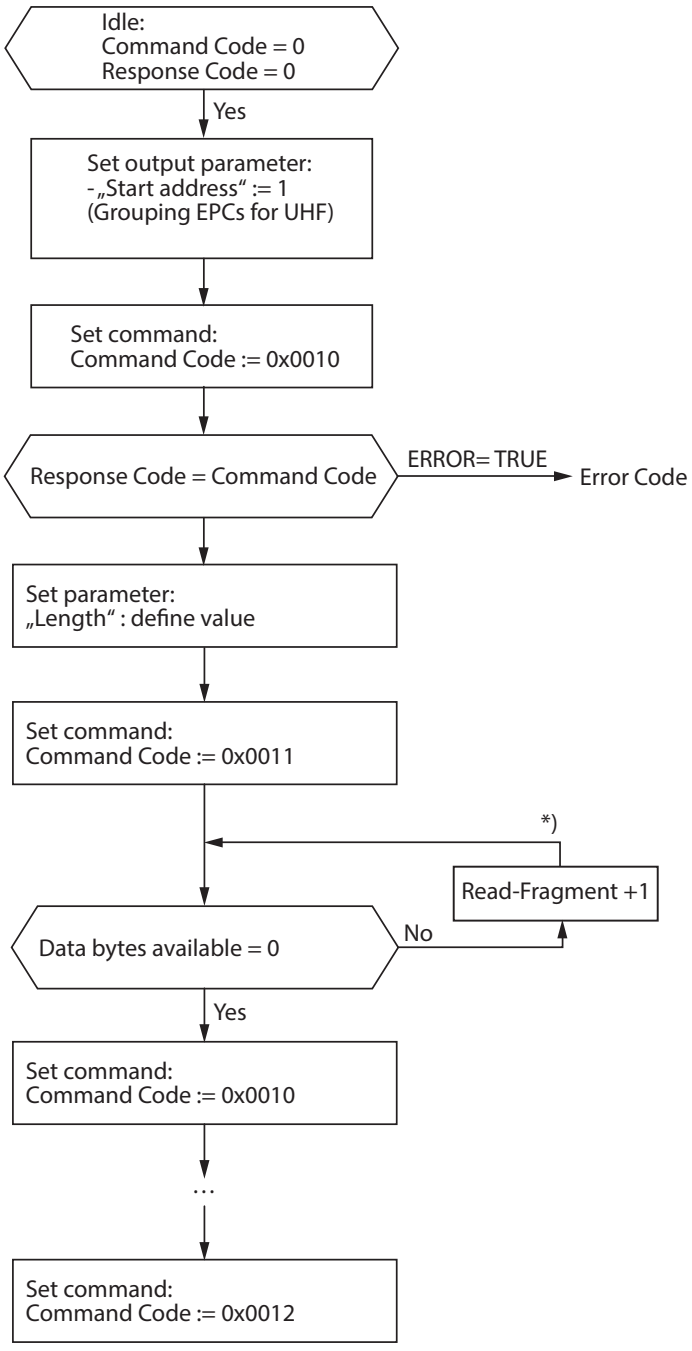


Fig. 178: Flow chart for Continuous Mode with interruption before reading data

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. 179: Flow chart for Continuous Mode without interruption before reading data

15.6 Flow chart: programming tags with a password

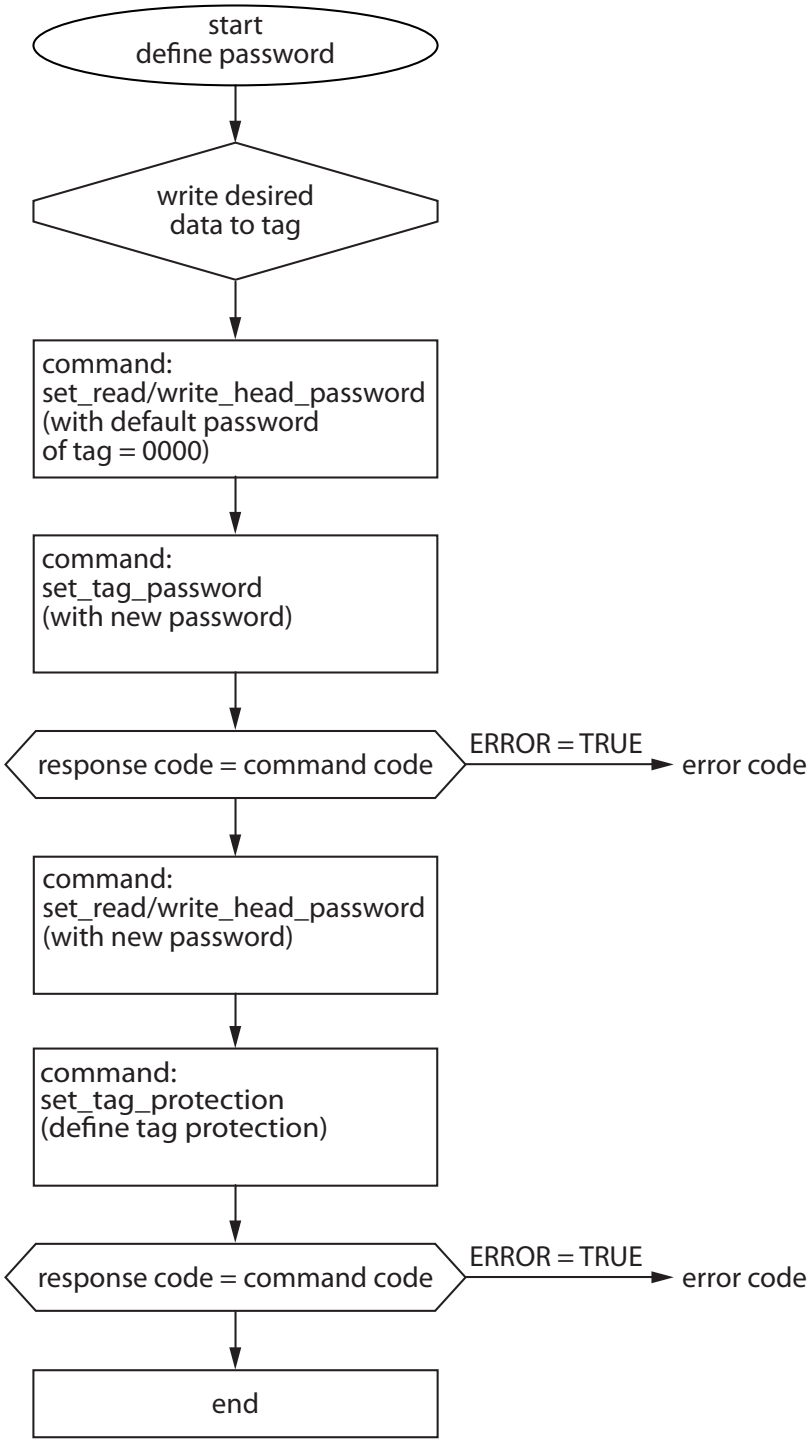


Fig. 180: programming tags with a password

16 Appendix: approvals and markings

Approvals	
TÜV 20 ATEX 264795 X CE 0102	Ex II 3 G Ex ec IIC T4 Gc
TURCK Ex-20002HX UKCA 2503	Ex II 3 D Ex tc IIIC T115 °C Dc
IECEx TUN 20.0010X	Ex ec IIC T4 Gc Ex tc IIIC T115 °C Dc

Ambient temperature T_{amb}: -25 °C…+60 °C

Type code	TBEN-S2-2RFID-4DXP…
Power supply voltage	24 VDC ±10 %
Input current I_{max}	5.5 A (total current per module)
Output current I_{max}	0.5 A (per output)

17 Turck branches — contact data

Germany	Hans Turck GmbH & Co. KG Witzlebenstraße 7, 45472 Mülheim an der Ruhr www.turck.de
Australia	Turck Australia Pty Ltd Building 4, 19-25 Duerdin Street, Notting Hill, 3168 Victoria www.turck.com.au
Austria	Turck GmbH Graumanngasse 7/A5-1, A-1150 Vienna www.turck.at
Belgium	TURCK MULTIPROX Lion d'Orweg 12, B-9300 Aalst www.multiprox.be
Brazil	Turck do Brasil Automação Ltda. Rua Anjo Custódio Nr. 42, Jardim Anália Franco, CEP 03358-040 São Paulo www.turck.com.br
Canada	Turck Canada Inc. 140 Duffield Drive, CDN-Markham, Ontario L6G 1B5 www.turck.ca
China	Turck (Tianjin) Sensor Co. Ltd. 18,4th Xinghuazhi Road, Xiqing Economic Development Area, 300381 Tianjin www.turck.com.cn
Czech Republic	TURCK s.r.o. Na Brne 2065, CZ-500 06 Hradec Králové www.turck.cz
France	TURCK BANNER S.A.S. 11 rue de Courtalin Bat C, Magny Le Hongre, F-77703 MARNE LA VALLEE Cedex 4 www.turckbanner.fr
Hungary	TURCK Hungary kft. Árpád fejedelem útja 26-28., Óbuda Gate, 2. em., H-1023 Budapest www.turck.hu
India	TURCK India Automation Pvt. Ltd. 401-403 Aurum Avenue, Survey. No 109 /4, Near Cummins Complex, Baner-Balewadi Link Rd., 411045 Pune - Maharashtra www.turck.co.in
Italy	TURCK BANNER S.R.L. Via San Domenico 5, IT-20008 Bareggio (MI) www.turckbanner.it
Japan	TURCK Japan Corporation ISM Akihabara 1F, 1-24-2, Taito, Taito-ku, 110-0016 Tokyo www.turck.jp

Korea	Turck Korea Co, Ltd. B-509 Gwangmyeong Technopark, 60 Haan-ro, Gwangmyeong-si, 14322 Gyeonggi-Do www.turck.kr
Malaysia	Turck Banner Malaysia Sdn Bhd Unit A-23A-08, Tower A, Pinnacle Petaling Jaya, Jalan Utara C, 46200 Petaling Jaya Selangor www.turckbanner.my
Mexico	Turck Comercial, S. de RL de CV Blvd. Campestre No. 100, Parque Industrial SERVER, C.P. 25350 Arteaga, Coahuila www.turck.com.mx
Netherlands	Turck B. V. Ruiterlaan 7, NL-8019 BN Zwolle www.turck.nl
Poland	TURCK sp.z.o.o. Wroclawska 115, PL-45-836 Opole www.turck.pl
Romania	Turck Automation Romania SRL Str. Siriului nr. 6-8, Sector 1, RO-014354 Bucuresti www.turck.ro
Sweden	Turck AB Fabriksstråket 9, 433 76 Jonsered www.turck.se
Singapore	TURCK BANNER Singapore Pte. Ltd. 25 International Business Park, #04-75/77 (West Wing) German Centre, 609916 Singapore www.turckbanner.sg
South Africa	Turck Banner (Pty) Ltd Boeing Road East, Bedfordview, ZA-2007 Johannesburg www.turckbanner.co.za
Turkey	Turck Otomasyon Ticaret Limited Sirketi Inönü mah. Kayisdagi c., Yesil Konak Evleri No: 178, A Blok D:4, 34755 Kadiköy/ Istanbul www.turck.com.tr
United Kingdom	TURCK BANNER LIMITED Blenheim House, Hurricane Way, GB-SS11 8YT Wickford, Essex www.turckbanner.co.uk
USA	Turck Inc. 3000 Campus Drive, USA-MN 55441 Minneapolis www.turck.us

TURCK

Your Global Automation Partner

Over 30 subsidiaries and
60 representations worldwide!

D500064 | 2022/09

www.turck.com