TURCK

Your Global Automation Partner

TNSLR-Q130-EN
HF read/write head

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

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
- 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 HF read/write heads:

- TNSLR-Q130-EN

2.2 Scope of delivery

The delivery consists of the following:

- Read/write head
- 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.

For the contact details of our branches worldwide, please see page [▶ 139].

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 HF read/write head with an integrated RFID interface is used as a means of contactless data exchange with the HF tags in the TURCK RFID system. The operating frequency of the device is 13.56 MHz, according to the standard ISO 15693, NFC type 5.

The read/write head uses the integrated RFID interface to communicate directly with the control unit or other higher-level systems. The device can be connected to the Ethernet fieldbus systems PROFINET, Modbus TCP and EtherNet/IP.

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.
- The device meets the EMC requirements for the industrial areas. When used in residential areas, take measures to prevent radio frequency interference.
- Only use the device in compliance with the applicable national and international regulations, standards and laws.
- Any extended stay within the area of radiation of the HF read/write head may be harmful to health. Maintain a minimum distance of 20 cm from the actively radiating surface of the read/write head.

3.3 Notes on EU Directive 2014/53/EU (RED Directive)

For safe and proper use of the device, ensure the following physical and logical safety measures in accordance with DIN EN 18031-1 in the environment:

- Access control: Enable access to security-related data and settings only to authorized persons, devices and services. Especially protect cryptographic keys in the device.
- Authentication: Manage access to security-related data and settings through appropriate authentication mechanisms. This also includes the regular verification and adjustment of passwords and other authentication methods.
- Firmware management: Regularly check the availability of new firmware versions at **www.turck.com** and carry out updates promptly. Check the integrity of firmware updates by comparing them with the hash values provided on the TURCK website.
- Data protection and communication: Protect the data stored in the device for integrity and confidentiality. Secure communication with the device against manipulation, unauthorized access and listening in.
- Attack protection: Take measures to prevent successful replay, denial of service or brute force attacks.
- Vulnerability management: Ensure that known vulnerabilities cannot be exploited.
- Interface control: Only send valid and authorized data to the device interfaces.

4 Product description

4.1 Device overview

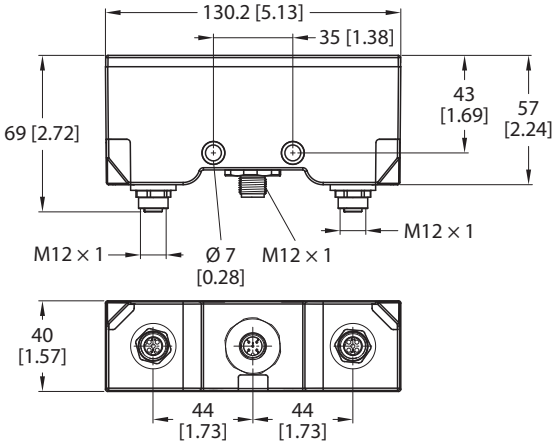


Fig. 1: Dimension drawing

4.1.1 Indication elements

The device has the following LED displays:

- PWR: Power supply
- BUS: Bus connection
- ERR: Diagnostics
- P1/P2: Ethernet
- HF: Air interface
- AT: Autotune
- WINK: Wink command

4.2 Properties and characteristics

- HF read/write head with integrated interface as a PROFINET device, Ethernet/IP device or Modbus TCP server
- ISO 15693, NFC type 5
- Integrated Ethernet switch
- Supports 10 Mbps/100 Mbps
- Glass fiber-reinforced housing
- Shock and vibration tested
- Fully encapsulated module electronics
- Protection class: IP69K front and IP67 rear
- Integration in PLC systems without the use of a special function module
- Up to 128 bytes of user data per read/write cycle per channel as well as use of fragments for larger data volumes
- Data interface for convenient use of the RFID functionality
- Integrated web server
- LEDs and diagnostics

4.3 Functional principle

The read/write heads are used as a means of contactless data exchange with tags. During this process, the control unit sends commands and data to the read/write head via the interface and receives the appropriate response data back from the read/write head. Examples of such commands include reading the UIDs of all RFID tags within the reading area or writing a specific production date to an RFID tag. To communicate with the tag, the data is coded by the read/write head and transferred via an electromagnetic field, which at the same time supplies the tags with power.

A read/write head contains a transmitter and a receiver, a port to the interface and a coupling element (coil antennas) for communicating with the tag. Inductive coupling is used for the transmission process between the read/write head and the tag in devices designed for the HF range.

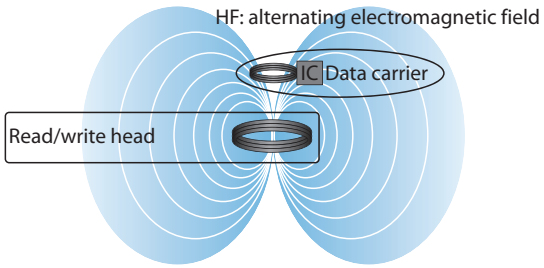


Fig. 2: Functional principle of HF RFID

The coupling element in the read/write head generates an electromagnetic AC field. This produces a transmission window as a so-called air interface in which the data exchange with the tag takes place. The size of the transmission window depends on the combination of read/write heads and tags.

Every TURCK read/write head can communicate with a number of different TURCK tags. To do this, the read/write head and tags must each work within the same frequency range. Depending on their power and the frequency in use, the devices have a range of a few millimeters up to several meters. The specified maximum distance between the read/write heads represents values measured under laboratory conditions, free from any influences caused by surrounding materials. The achievable distances may be different due to component tolerances, mounting location in the application, ambient conditions and the effect of materials (particularly metal).

4.4 Functions and operation modes

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.

The device enables passive HF tags to be read or written in single and multitag operation. For this the device forms a transmission zone that varies in size and range according to the tags used and the operating conditions of the application. Refer to the data sheets for the applicable maximum read/write distances.

4.4.1 Multiprotocol technology

The device can be used in the following Ethernet protocols:

- PROFINET
- EtherNet/IP
- Modbus TCP

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

Automatic protocol detection

A multiprotocol device can be operated without intervention of the user (which means, without changes in the parameterization) in all of the three Ethernet protocols mentioned.

During the system start-up phase (snooping phase), the module detects which Ethernet protocol requests a connection to be established and adjusts itself to the corresponding protocol. After this an access to the device from other protocols is read-only.

Manual protocol selection

The user can also define the protocol manually. In this case, the snooping phase is skipped and the device is fixed to the selected protocol. With the other protocols, the device can only be accessed read-only.

Protocol-dependent functions

The device supports the following Ethernet protocol-specific features:

PROFINET

- Fast Startup (FSU), prioritized startup
- Topology detection
- Address allocation with LLDP
- Media redundancy protocol (MRP)
- S2 redundancy

EtherNet/IP

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

Ethernet ports used

Port	Protocol
00022	SFTP
00053	DNS TCP
00067	DHCP
00080	HTTP
00093	PROFINET DCP
00502	Modbus TCP
58554	TURCK Services

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

Various data interfaces can be selected for the RFID channels:

- HF compact
- HF extended

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

HF compact mode

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

HF extended mode

HF extended mode contains all the functions provided in **HF compact** mode. It is also possible with fragmentation to transfer more than the set data size per write or read cycle (example: 128 bytes). The operating mode is suitable for single-tag and multitag applications.

NOTE
Not all commands are supported in multitag mode.

The user can set a command timeout to define the time for the execution of a command.

HF extended mode enables the use of Continuous mode for the repeated execution of an Inventory, tag info, read or write command. In continuous mode the read/write head executes the command autonomously. In this case, the read data is stored in the internal memory of the device. 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 under "Settings".

- Idle
- Inventory
- Read
- Write
- Write and Verify
- Continuous Mode
- Read buffer (Cont. mode)
- Stop continuous mode
- Read/write head identification
- Tag info
- Direct read/write head command
- Set read/write head password
- Reset read/write head password
- Set tag password
- Set tag protection
- Get HF tag protection status
- Set perma lock
- 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)

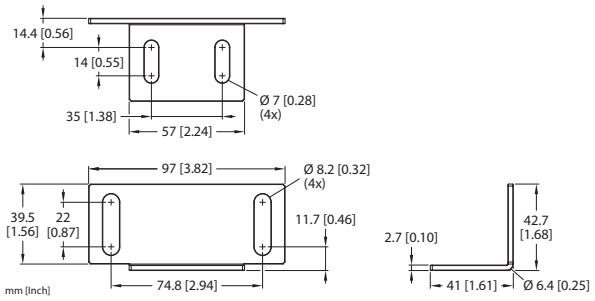
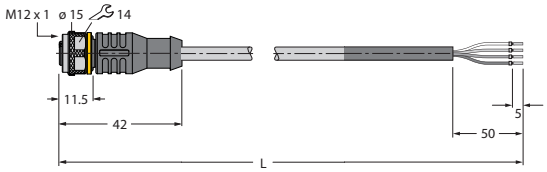
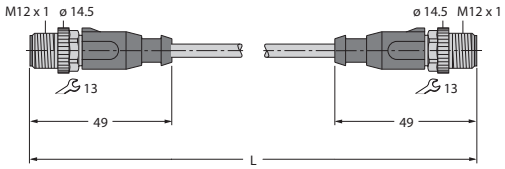
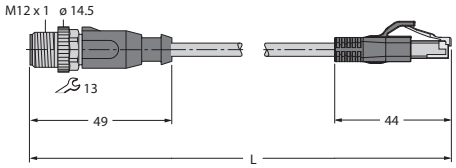
4.4.5 Loop counter function

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 [▶ 134]). 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 Automatic calibration

The read/write head is provided with the “Automatic calibration” function. After power up, the read/write head checks whether its resonance frequency is affected by metal in the environment. If there is an effect caused by metal, the oscillating circuit adjusts its frequency to restore the optimum resonance frequency. If the effect caused by metal is too high, the read/write head can no longer tune the resonance frequency. The metal takes too much energy from the field. Due to the reduce range communication between the read/write head and the tag is no longer possible.

4.5 Technical accessories

Dimension drawing	Type	ID	Description
	MB-Q130WD	A900166	Mounting bracket, see www.turck.com
	RKC4.4T-2/TXL	6625503	Connection cable; M12 female connector, straight, 4-pin, cable length 2 m, jacket material: PUR, black; chemical, UV and oil-resistant, flame-retardant, silicone-, PVC- and LABS-free; halogen-free; spark-resistant; particularly abrasion-resistant; protection class IP67, IP69K; other cable lengths and versions available, see www.turck.com
	RSSD-RSSD-4414-2M	6441405	Extension cable; M12 male connector, straight, D-coded, 4-pin, cable length: 2 m, jacket material: PUR, green; UV-resistant; oil-resistant; flame-retardant; silicone-, PVC- and LABS-free; halogen-free; cULus approval; RoHS-compliant; protection class IP67; other cable lengths and versions available, see www.turck.com
	RSSD-RJ45S-4416-2M	6441631	Extension cable; M12 male connector, straight, D-coded, RJ45 plug, straight, 4-pin, cable length: 2 m, jacket material: PUR, green; oil-resistant; flame-retardant; halogen-free; UL approval; RoHS-compliant; PNO-compliant; other cable lengths and versions available, see www.turck.com

5 Installing

You will need the following mounting accessories for the installation:

- 2 × M6 × 50 screws (DIN 931 A4)
- 2 × serrated lock washers 6.9J (DIN 6798 A4)
- 2 × M6 nuts (DIN 935 A4)

The following accessories are available as options:

- Mounting bracket MB-Q130WD (ID: A900166)

▶ Mount the device using the corresponding mounting accessories.
▶ Maintain a minimum distance of 390 mm between two read/write heads.
▶ Avoid placing the read/write head in close proximity to metal.
▶ Metal objects must not interrupt the transmission zone.
▶ Protect the device from heat radiation, rapid temperature fluctuations, severe contamination, electrostatic charge and mechanical damage.

5.1 Installing devices on metal

When mounted on metal, the read/write heads can interfere with one another (e.g. due to coupling of the electromagnetic field to a metal support).

Interference can be avoided as follows:

- Increase the distance between two read/write heads.
- Fit one or more iron struts between the read/write heads.

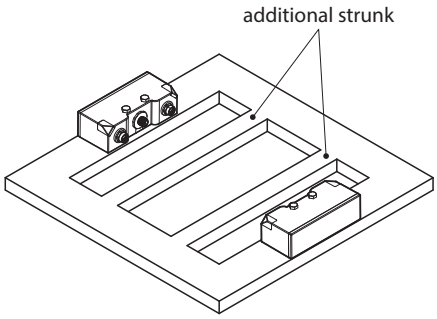


Fig. 3: Mounting with iron struts

- Place non-metallic spacers underneath the read/write heads.

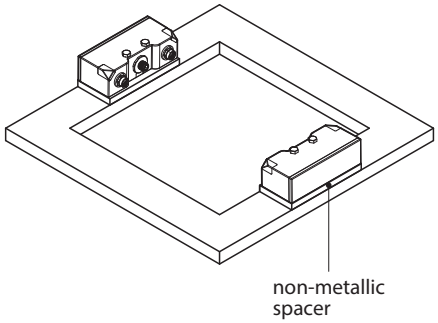


Fig. 4: Mounting with spacers

6 Connection

6.1 Connecting the device to Ethernet

The device has an integrated autocrossing switch with two 5-pin female connectors for connecting to the Ethernet.

Fig. 5: Ethernet connections

- Connect the device to Ethernet in accordance with the pin assignment below (max. tightening torque: 0.8 Nm)

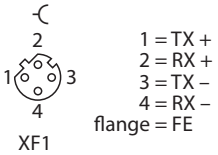


Fig. 6: Ethernet IN pin assignment

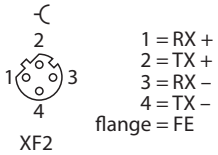


Fig. 7: Ethernet OUT pin assignment

6.1.1 Applications with QuickConnect (QC) and Fast Start Up (FSU)

- Do not use crossover cables in applications with QuickConnect (QC) or Fast Startup (FSU).
- Connect incoming Ethernet cables to XF1.
- Connect outgoing Ethernet cables to XF2.

6.2 Connecting the power supply

The device has a 5-pin M12 connector for connecting to the power supply.

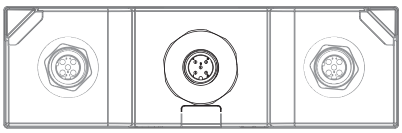
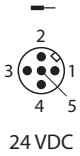


Fig. 8: Power supply connection

- ▶ Connect the device to the power supply in accordance with the pin assignment below (max. tightening torque: 0.8 Nm).



1 = V1
2 = n.c.
3 = GND
4 = n.c.
5 = n.c.

Fig. 9: Pin assignment for the power supply connection

7 Commissioning

7.1 Logging in to the device

To adjust the device settings via TAS or the device's integrated web server, you must log in to the device with a password. TAS can be downloaded free of charge at www.turck.com.

The following factory settings are defined by default and are relevant for logging in:

Device feature	Factory setting	Note
IP address	192.168.1.254	Adjustable, Adjusting network settings_via TAS and web server_introduction
Password	password	The same password is valid for login via TAS and via the web server.
PROFINET device name	–	Not assigned by default

NOTE
TURCK recommends changing the password after the first login to protect against unauthorized access.

7.1.1 Logging in to the device via TAS

✓ The device is connected to the PC via the Ethernet interface.

✓ TAS is installed.

▶ Open TAS.

▶ Click **Scan network**.

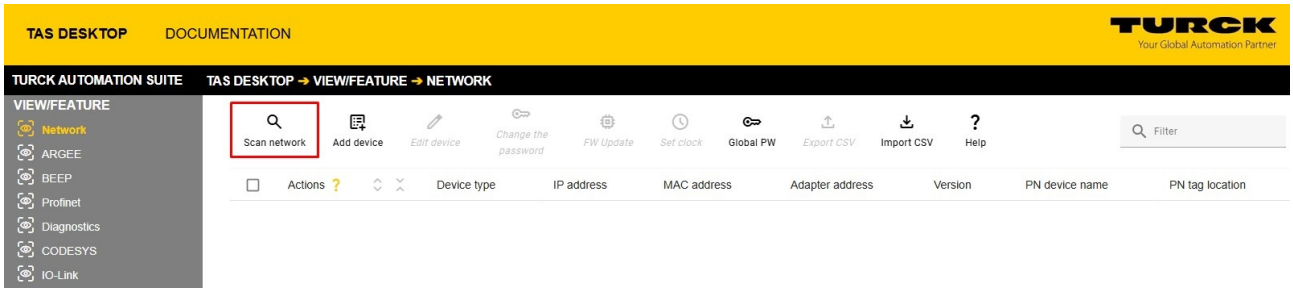


Fig. 10: TAS — home screen

⇨ TAS displays the connected devices.

▶ Click the IP address of the device to which you wish to log in. The device is factory set to IP address 192.168.1.254.

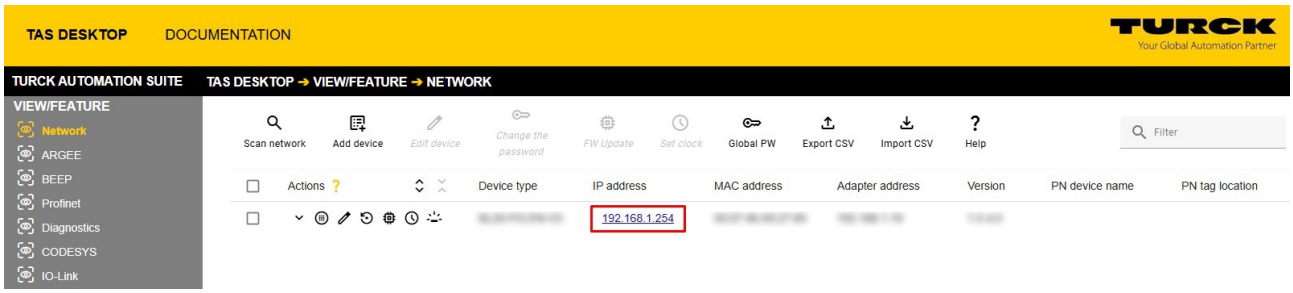


Fig. 11: TAS — network device list

▶ Open **TAS** in the dialog window that appears using the appropriate button.

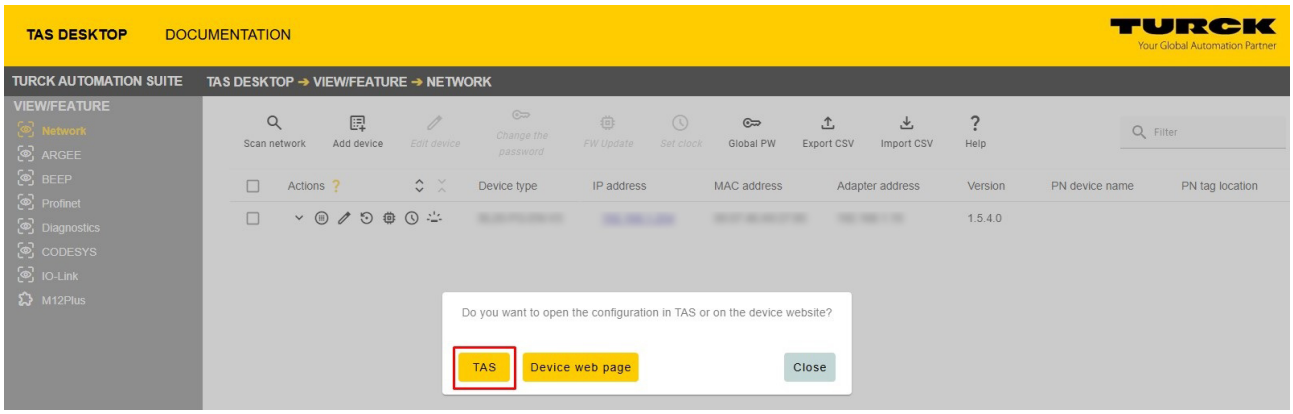


Fig. 12: TAS — dialog window for selecting the configuration tool

▶ Click **Login**.

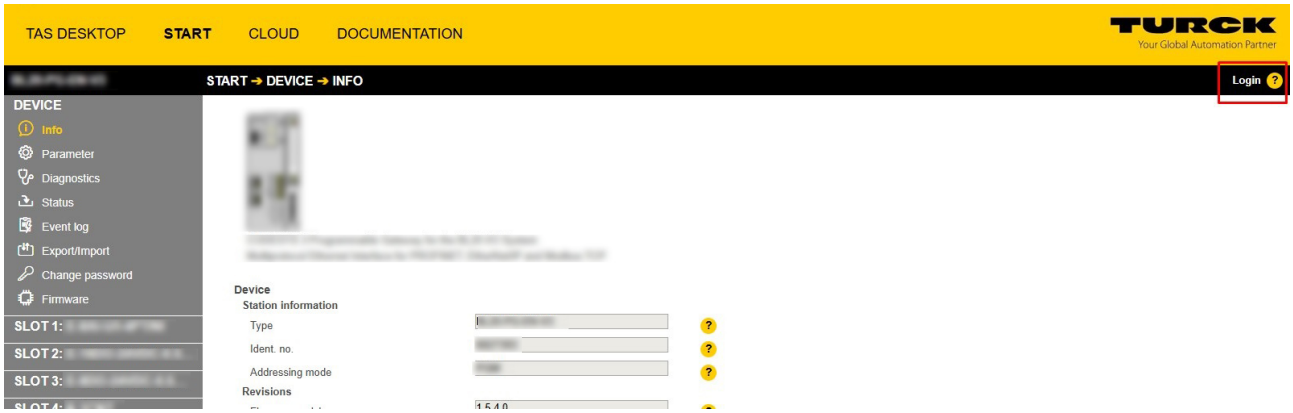


Fig. 13: TAS — starting login

▶ Enter the device password in the dialog window that appears and click **Login**. The default password is "password".

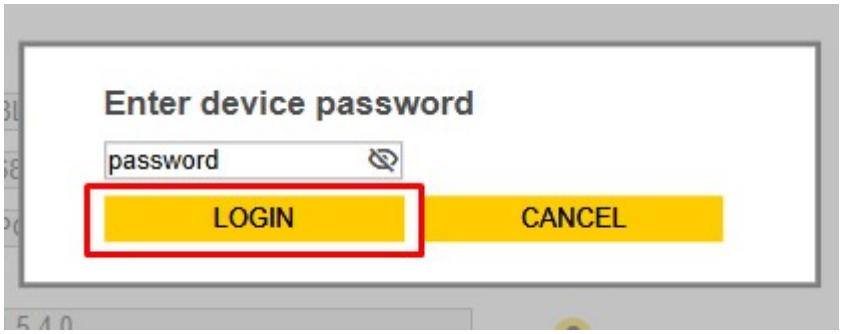


Fig. 14: TAS — password entry dialog box

⇨ The device has been logged in via TAS. Device settings can now be adjusted.

7.1.2 Logging in to the device's integrated web server

NOTE
The following instructions describe how to log in to the web server directly from a web browser. The device's integrated web server can alternatively be reached via TAS. To access the web server from TAS, click **Device web page** when selecting the configuration tool (see figure "TAS — dialog window for selecting the configuration tool" [▶ 19]).

✓ The device is connected to the PC via the Ethernet interface.

▶ Enter http://192.168.1.254 in the address bar of an HTTP-capable browser and press Enter.

⇨ The device's integrated web server is called up in the browser.

▶ Enter the device password in the **LOGIN** text field and confirm with Enter.

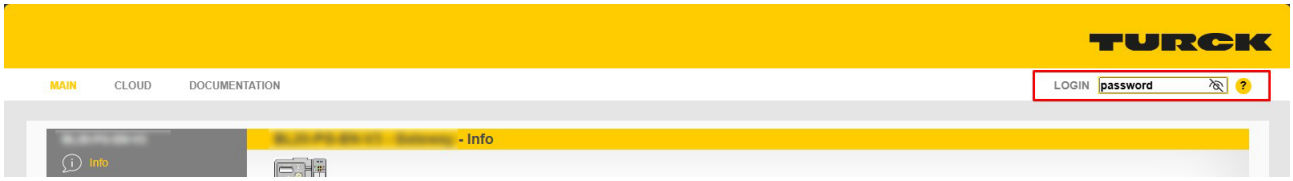


Fig. 15: Web server — login

⇨ The device has been logged in. Device settings can now be adjusted.

7.2 Adjusting network settings

7.2.1 Adjusting network settings via TAS

✓ The device is connected to the PC via the Ethernet interface.

✓ TAS is installed.

▶ Open TAS.

▶ Click **Scan network**.

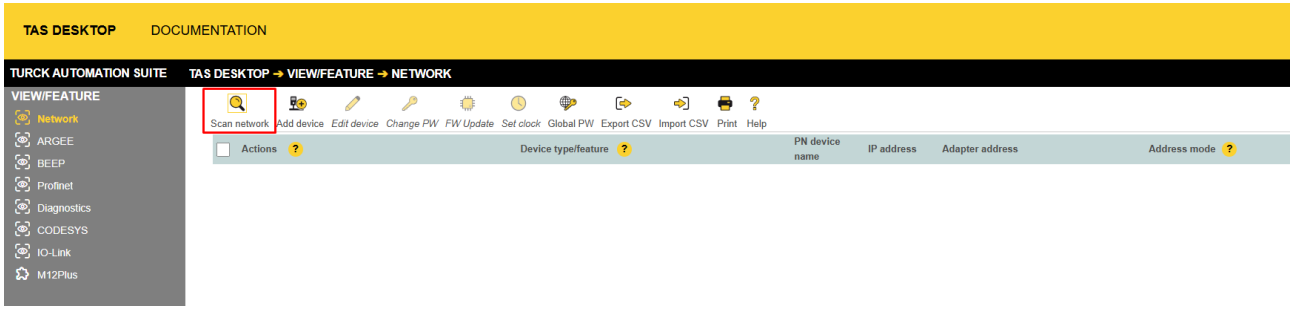


Fig. 16: TAS — home screen

⇨ TAS displays the connected devices.

▶ Select the required device.

- ▶ Click **Edit device**.

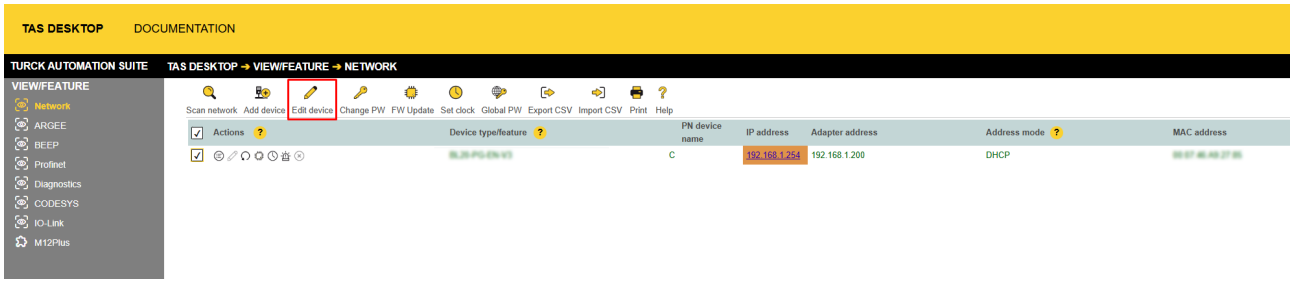


Fig. 17: TAS — selecting a device

- ⇨ The **Edit network settings** window opens.
- ▶ Make the desired changes.
- ▶ Accept the changes by clicking **SET NETWORK DATA**.

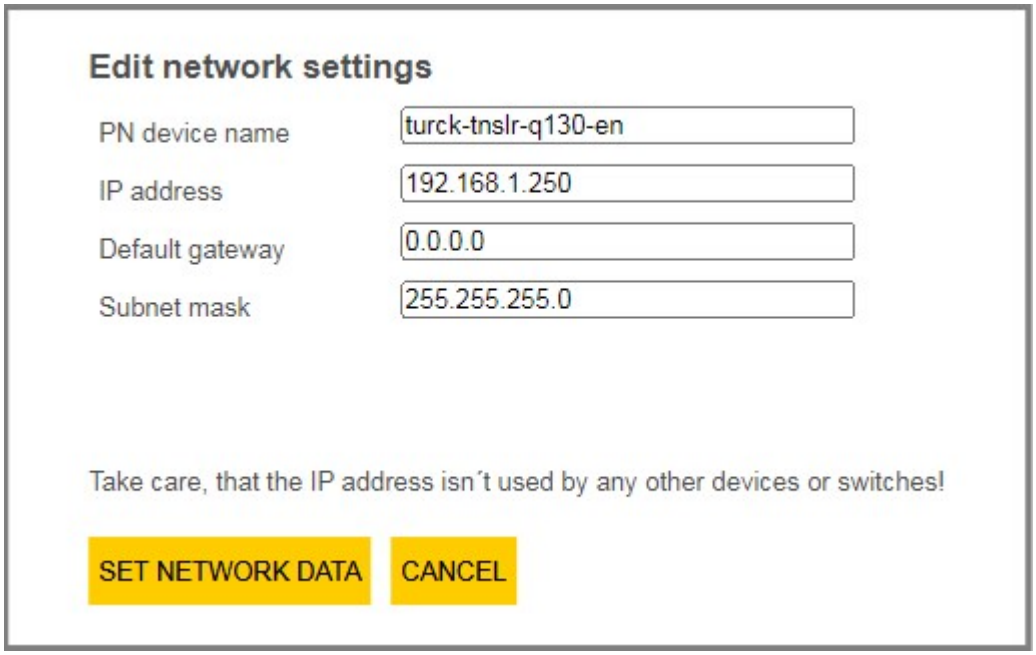


Fig. 18: TAS — editing network settings

7.3 Commissioning support

The function of the read/write head can be checked by scanning tags, see [▷ 100].

The signal strength of the response from the tag to the read/write head (RSSI value) can be read out using the function described under [▷ 102].

7.4 Connecting the device to a Modbus master with CODESYS

Naming convention

TURCK uses the terms "Modbus client" and "Modbus server" according to Modbus Organization. The following description uses the terms "Modbus TCP Master" (client) and "Modbus TCP Slave" (server) only because of the naming in CODESYS.

Hardware used

This example uses the following hardware components:

- HF read/write head TNSLR-Q130-EN-H1147 (IP address 192.168.1.52)
- TURCK HMI TX707-P3CV01 (Modbus master)

Software used

This example uses the following software:

- CODESYS 3.5.12.1 (download free of charge from **www.turck.com**)

Prerequisites

- The software is started.
- A new project has been created.
- The controller has been added to the project.

7.4.1 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 (TX707-P3CV01)** in the project tree.
- ▶ Select **Add device**.

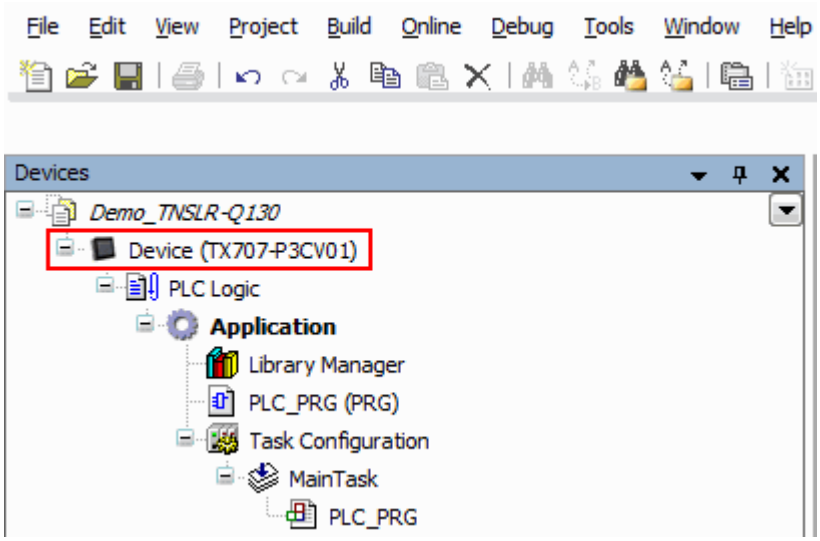


Fig. 19: Project tree

⇨ The **Add device** window opens

- ▶ Select Ethernet adapter.
- ▶ Click **Add device**.

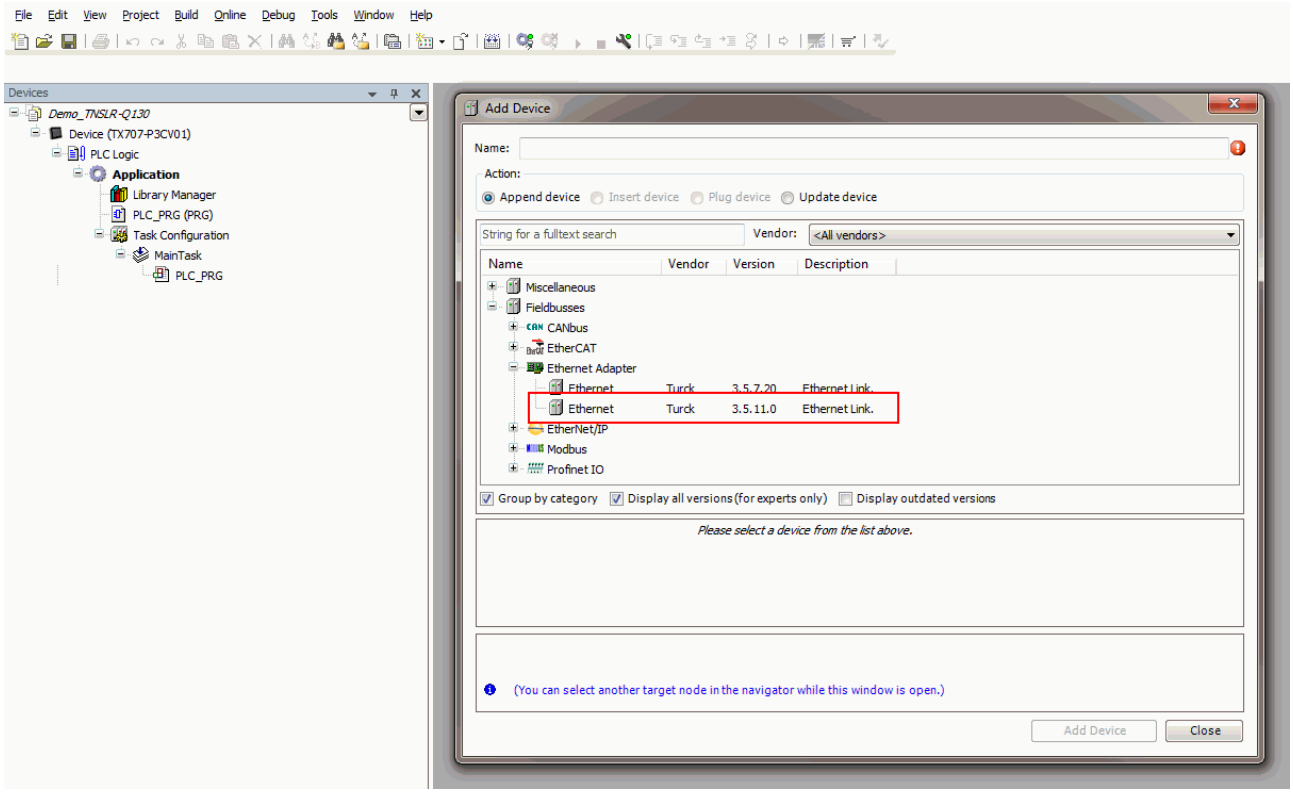


Fig. 20: Adding an Ethernet adapter

⇨ The Ethernet adapter appears as **Ethernet (Ethernet)** in the project tree.

Adding a Modbus master

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

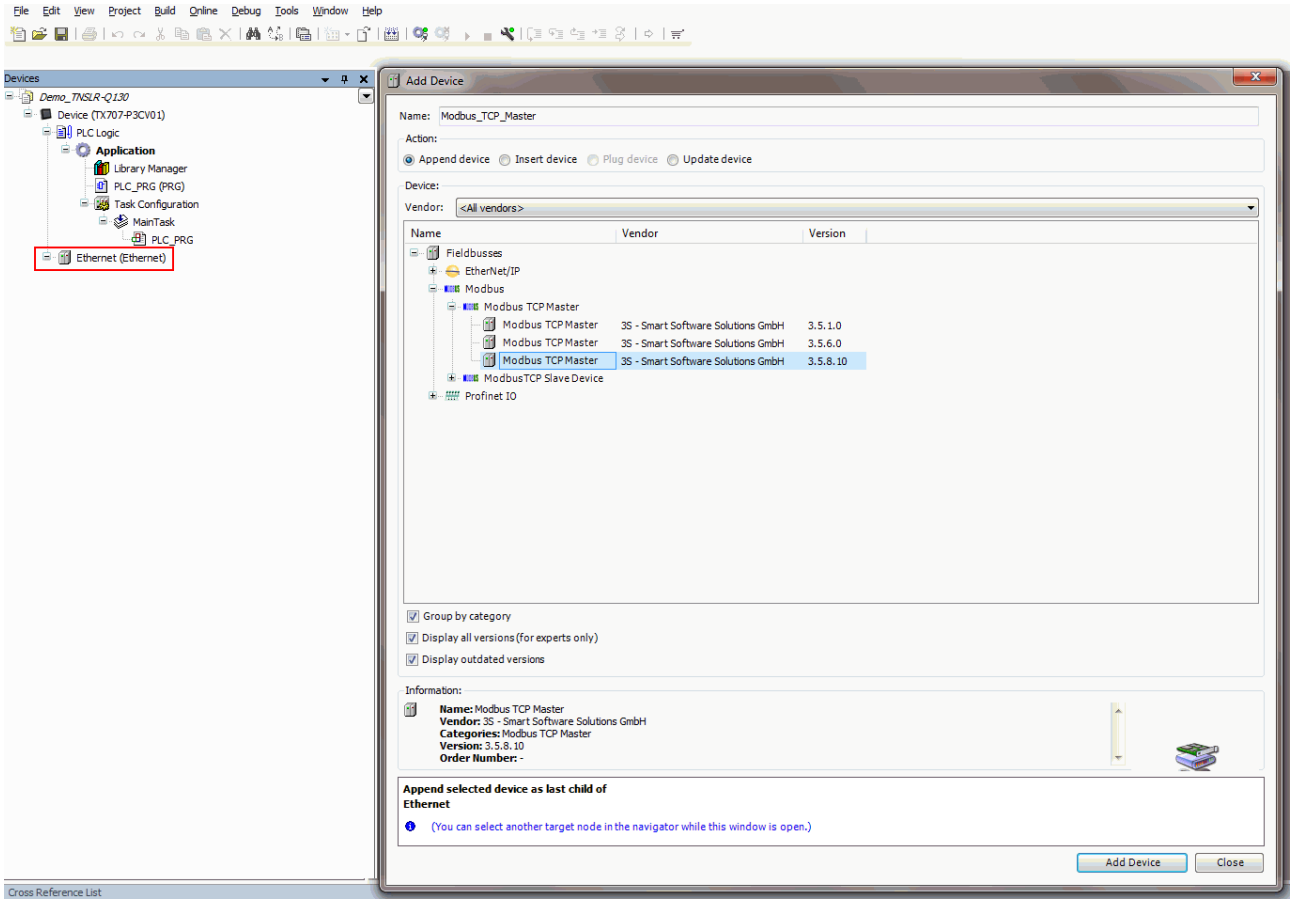


Fig. 21: Adding a Modbus master

Adding a Modbus slave

- ▶ Right-click **Modbus TCP master** in the project tree.
- ▶ Select **Add device**.
- ▶ Double-click **Modbus TCP slave**.
- ⇨ The Modbus slave appears as **Modbus_TCP_Slave** in the project tree.

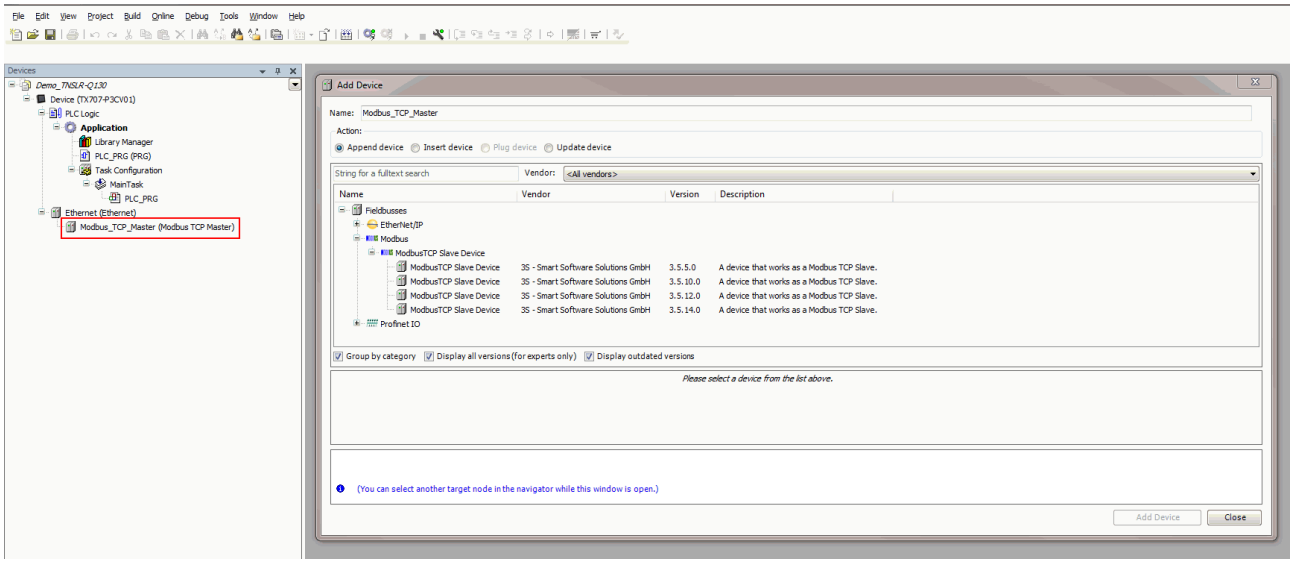


Fig. 22: Adding a Modbus slave

7.4.2 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.

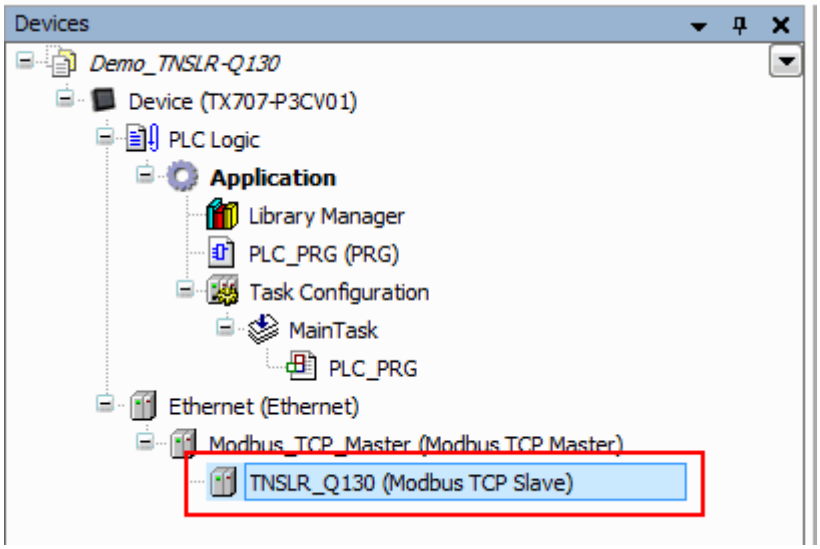


Fig. 23: Renaming a Modbus slave

7.4.3 Setting up network interfaces

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

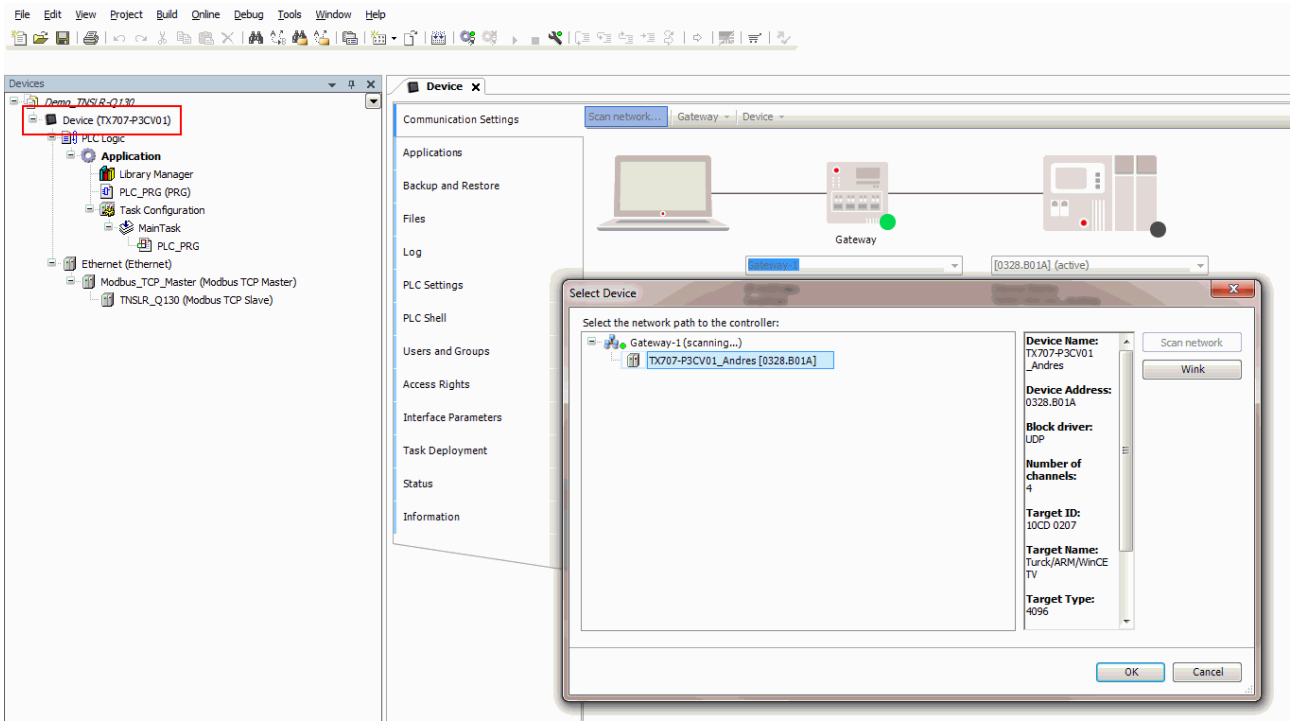


Fig. 24: Setting up a network interface to the Modbus master

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

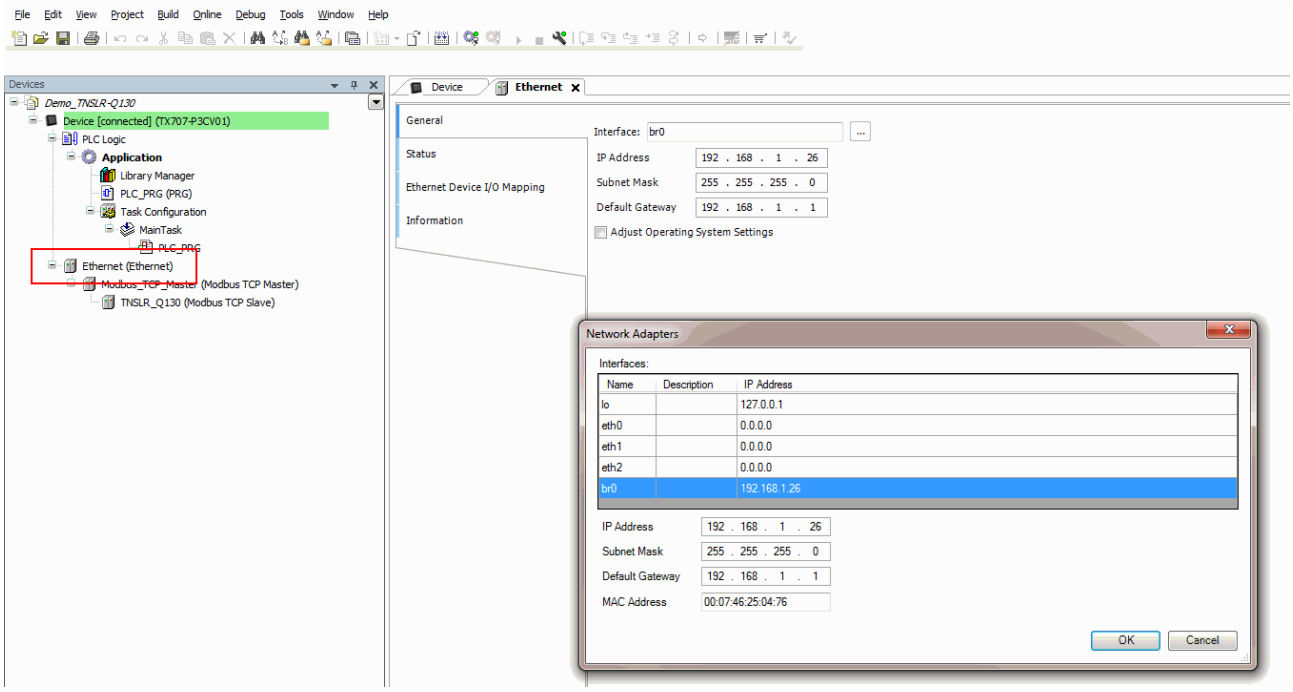


Fig. 25: Modbus master – Entering the IP address (here: 192.168.1.25)

7.4.4 Modbus TCP slave — set up IP address

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

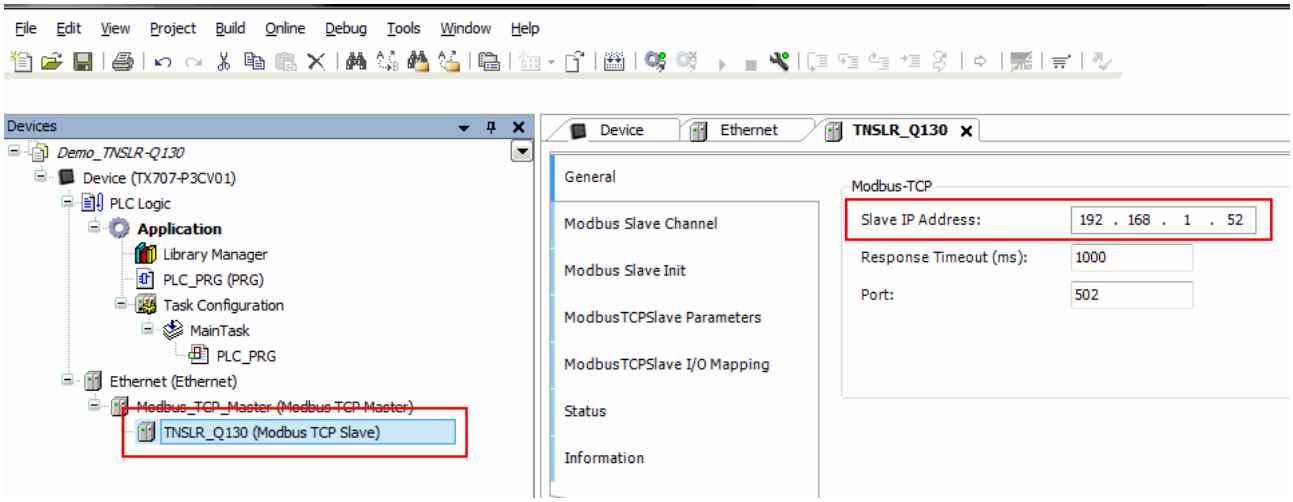


Fig. 26: Modbus slave – Entering the IP address (here: 192.268.1.52)

7.4.5 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 registers (128 bytes)

- ▶ Confirm with **OK**.

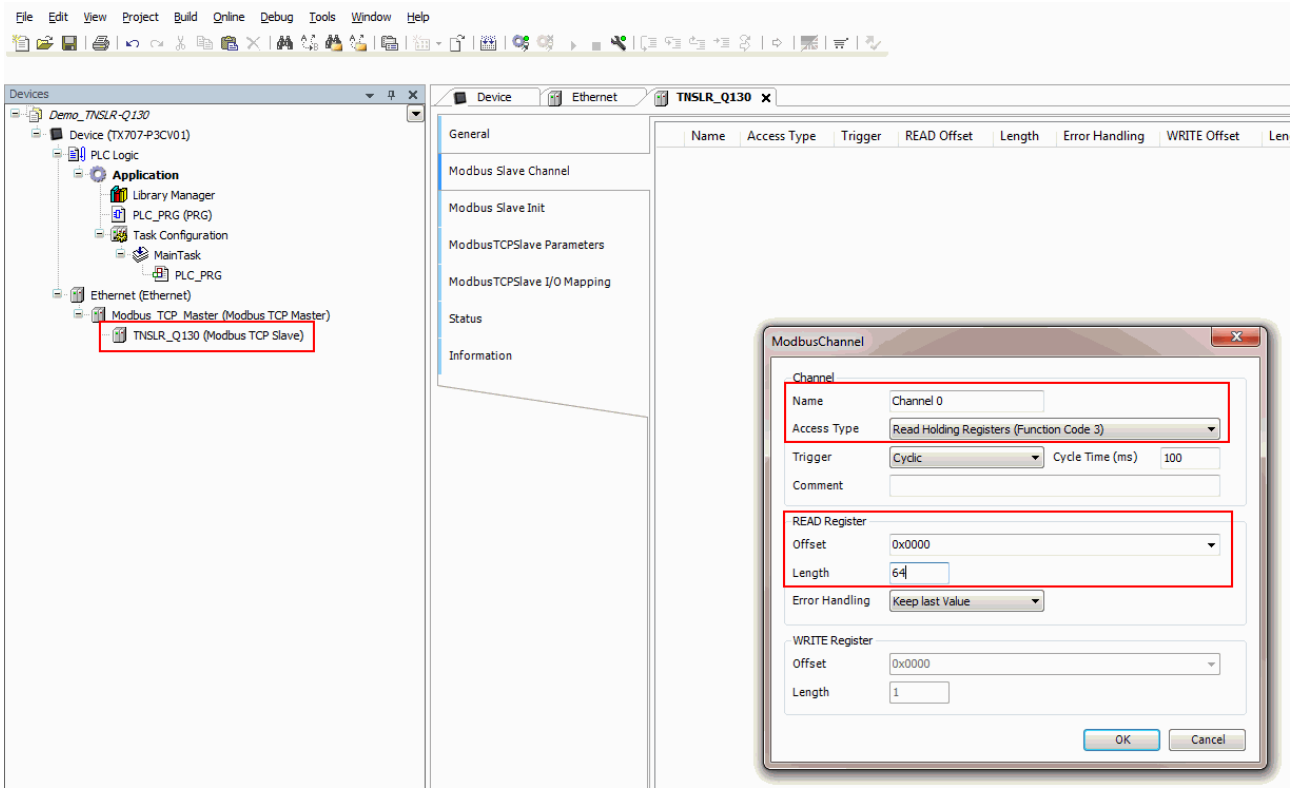


Fig. 27: Defining READ registers

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 registers (128 bytes)

- ▶ Confirm with **OK**.

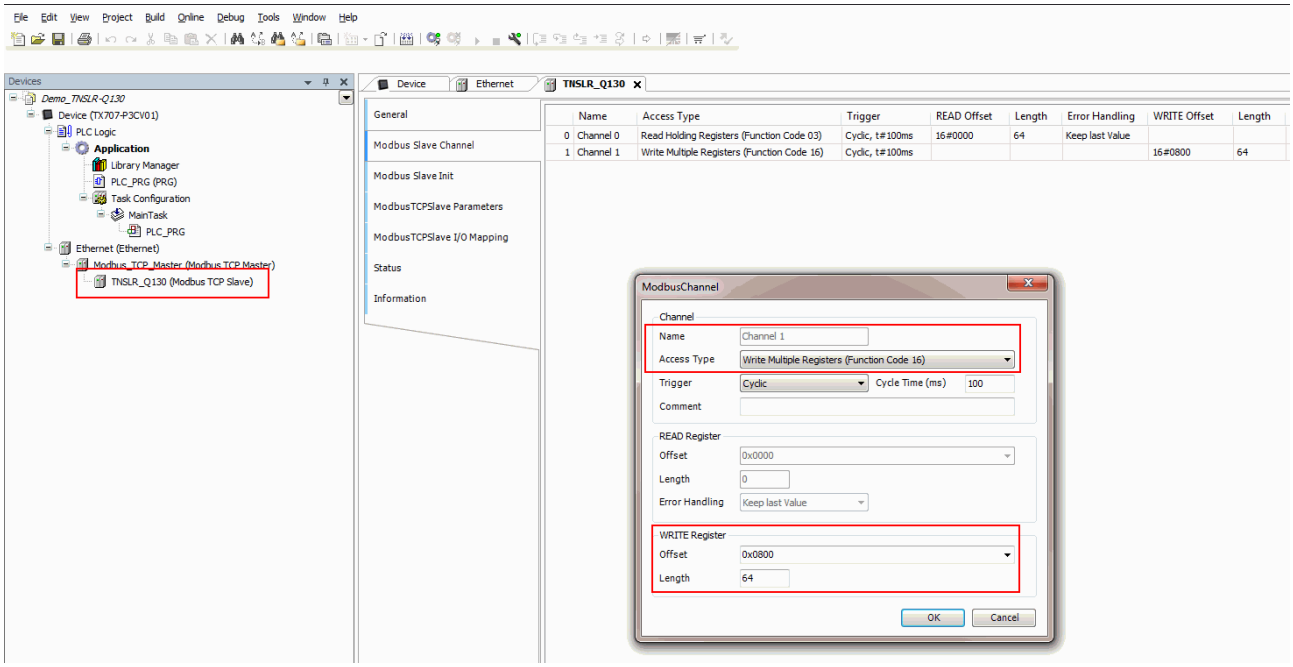


Fig. 28: Setting the WRITE registers

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.

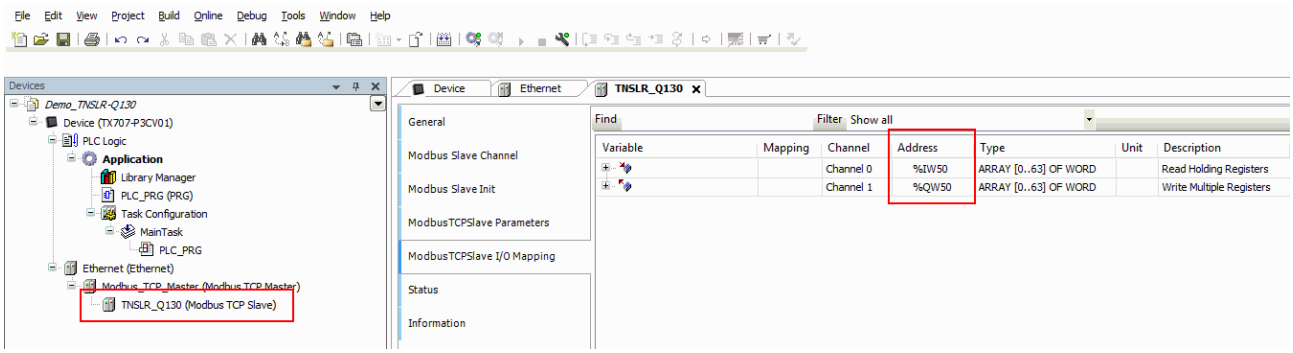


Fig. 29: Changing channel addresses

7.4.6 Connecting the device online with the controller

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

7.4.7 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 mapping** tab.
- ⇨ The process data mapping is displayed.

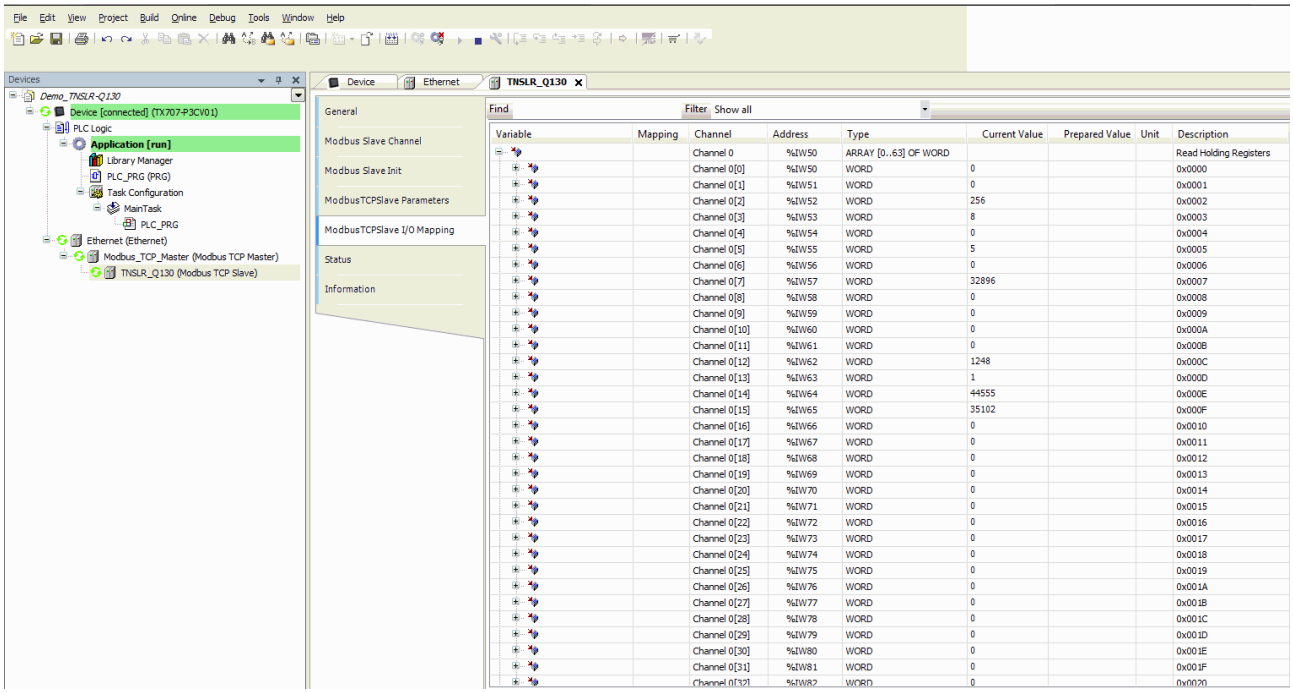


Fig. 30: Process data

7.4.8 Modbus TCP — mapping

RFID — parameter data

Description	Register	Bit offset	Bit length
Operating mode	0xB000	0	8
Select tag type	0xB000	8	8
Bypass time	0xB001	0	16
HF: Multitag mode	0xB002	4	1
HF: Heartbeat read/write head	0xB002	5	1
RS-485 bus terminating resistor	0xB002	6	1
Automatic tuning of read/write head	0xB002	7	1
Deactivate diagnostic HF read/write head tuning	0xB002	8	1
Diagnostic input filter	0xB002	15	1
HF idle mode	0xB003	0	8
Command repetitions in the event of an error	0xB004	0	8
HF: Command in continuous mode	0xB004	8	8
HF: Length in continuous mode	0xB005	0	16
HF: Address in continuous mode	0xB006	0	32
Length of read data	0xB010	0	16

Input

RFID control/status

Description	Register	Bit offset	Bit length
RFID module: Response code	0x0000 (0)	0	16
RFID module: Tag present at reader	0x0002 (2)	0	1
RFID module: HF reader switched on	0x0002 (2)	8	1
RFID module: Continuous (presence sensing) mode active	0x0002 (2)	9	1
RFID module: Loop counter for fast processing	0x0001 (1)	0	8
RFID module: Antenna detuned at HF reader	0x0002 (2)	4	1
RFID module: Parameter not supported by reader	0x0002 (2)	5	1
RFID module: Error reported by reader	0x0002 (2)	6	1
RFID module: Length	0x0003 (3)	0	16
RFID module: Error code	0x0004 (4)	0	16
RFID module: Tag counter	0x0005 (5)	0	16
RFID module: Data (bytes) available	0x0006 (6)	0	16
RFID module: Read fragment no.	0x0007 (7)	0	8
RFID module: Write fragment no.	0x0007 (7)	8	8

RFID read data

Description	Register	Bit offset	Bit length
Input buffer byte 0	0x000C (12)	0	8
Input buffer byte 1	0x000C (12)	8	8
Input buffer byte 2	0x000D (13)	0	8
Input buffer byte 3	0x000D (13)	8	8
…	…	…	…
Input buffer byte 14	0x0013 (19)	0	8
Input buffer byte 15	0x0013 (19)	8	8
…	…	…	…
Input buffer byte 64	0x002C (44)	0	8
Input buffer byte 65	0x002C (44)	8	8
…	…	…	…
Input buffer byte 126	0x004B (75)	0	8
Input buffer byte 127	0x004B (75)	8	8

RFID diagnostics

Description	Register	Bit offset	Bit length
CH0 diagnosis: Buffer full	0x004C (76)	4	1
CH0 diagnosis: Configuration via DTM active	0x004C (76)	5	1
CH0 diagnosis: Parameterization error	0x004C (76)	6	1
CH0 diagnosis: Antenna detuned at HF reader	0x004C (76)	12	1
CH0 diagnosis: Parameter not supported by reader	0x004C (76)	13	1

Module status

Description	Register	Bit offset	Bit length
Module status: I/O-ASSISTANT Force Mode active	0x004D (77)	14	1
Module status: Undervoltage V1	0x004D (77)	9	1
Module status: Module diagnostics available	0x004D (77)	0	1
Module status: Internal error	0x004D (77)	10	1
Module status: ARGEE program active	0x004D (77)	1	1

Output

RFID control/status

Description	Register	Bit offset	Bit length
RFID module: Command code	0x0800 (2048)	0	16
RFID module: Loop counter for fast processing	0x0801 (2049)	0	8
RFID module: Start address	0x0802 (2050)	0	32
RFID module: Length	0x0804 (2052)	0	16
RFID module: Length of UID/EPC	0x0805 (2053)	0	8
RFID module: Command timeout (*1 ms)	0x0806 (2054)	0	16
RFID module: Read fragment no.	0x0807 (2055)	0	8
RFID module: Write fragment no.	0x0807 (2055)	0	8

RFID write data

Description	Register	Bit offset	Bit length
Output buffer byte 0	0x080C (2060)	0	8
Output buffer byte 1	0x080C (2060)	8	8
Output buffer byte 2	0x080D (2061)	0	8
Output buffer byte 3	0x080D (2061)	8	8
…	…	…	…
Output buffer byte 14	0x0813 (2067)	0	8
Output buffer byte 15	0x0813 (2067)	8	8
…	…	…	…
Output buffer byte 64	0x082C (2092)	0	8
Output buffer byte 65	0x082C (2092)	8	8
…	…	…	…
Output buffer byte 126	0x084B (2123)	0	8
Output buffer byte 127	0x084B (2123)	8	8

7.5 Connect the device to an EtherNet/IP scanner using RSLogix

Hardware used

This example uses the following hardware components:

- Rockwell controller CompactLogix L30ER
- HF read/write head TNSLR-Q130-EN

Software used

This example uses the following software:

- Rockwell RSLogix
- EDS file for TNSLR-Q130-EN (download free of charge from www.turck.com)

Prerequisites

- The software is started.
- A new project has been created.
- The controller has been added to the project.

7.5.1 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**.

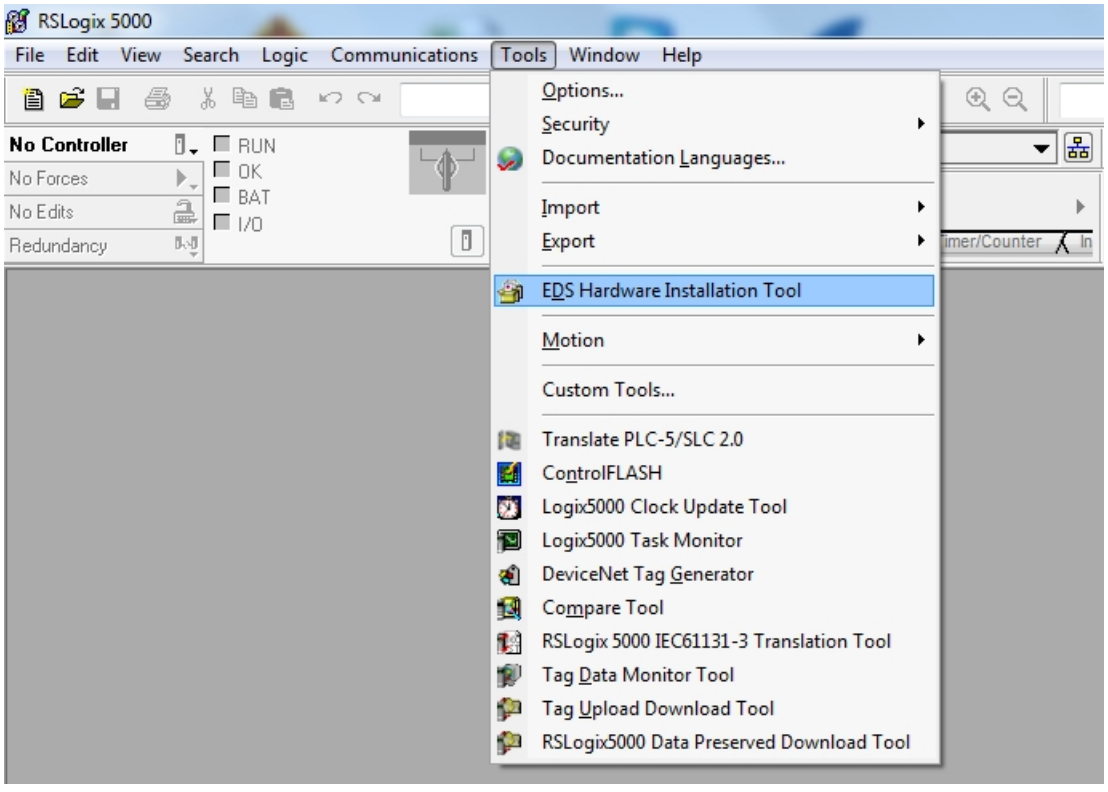


Fig. 31: Opening the EDS Hardware Installation Tool

The wizard for the installation of EDS file opens.

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

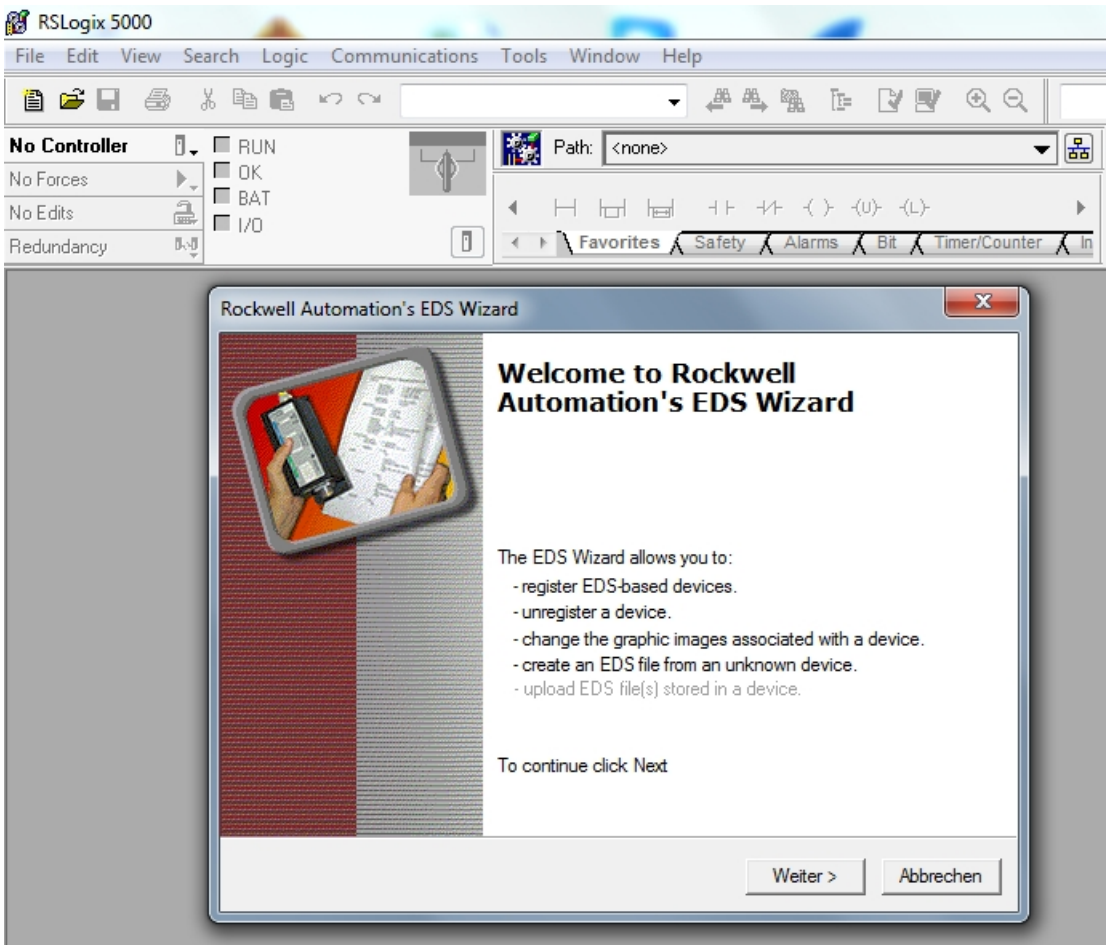


Fig. 32: Starting the EDS Wizard

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

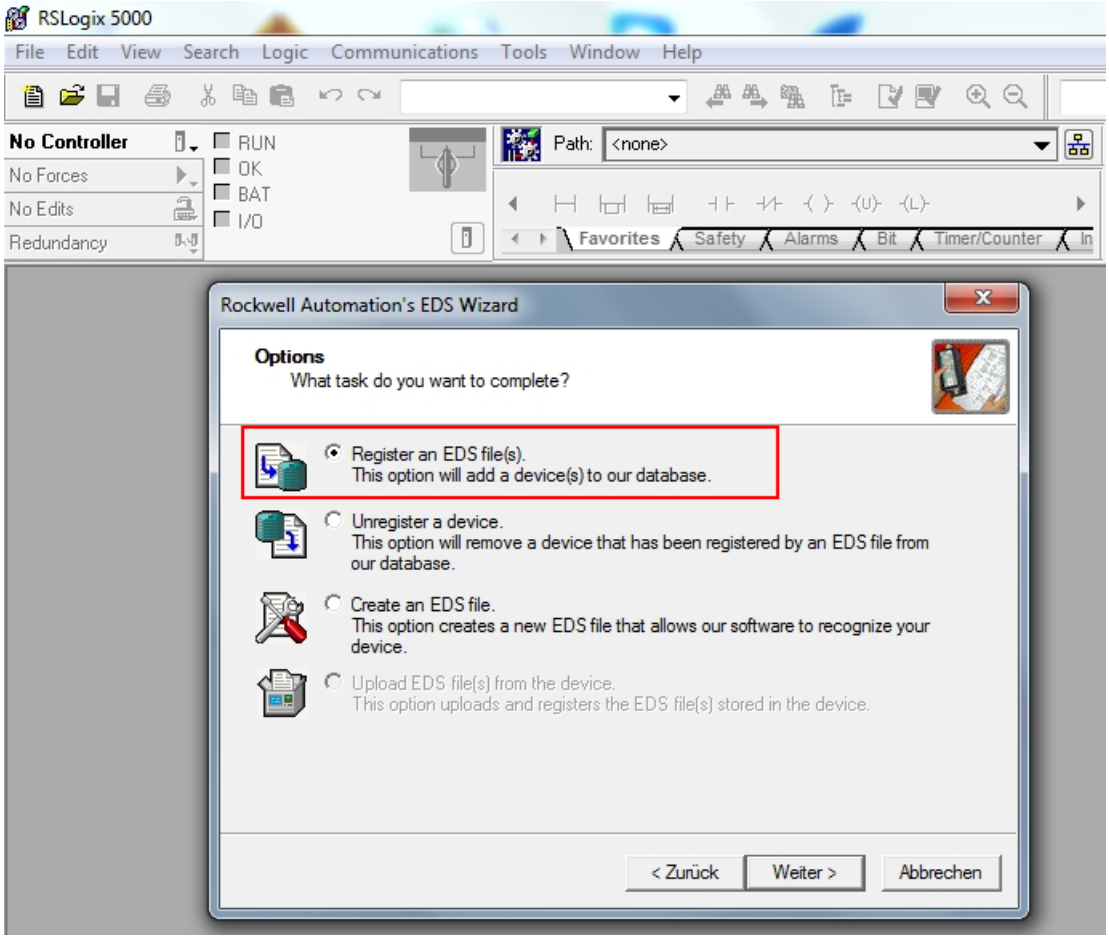


Fig. 33: Option selection — registering an EDS file(s)

- ▶ 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.

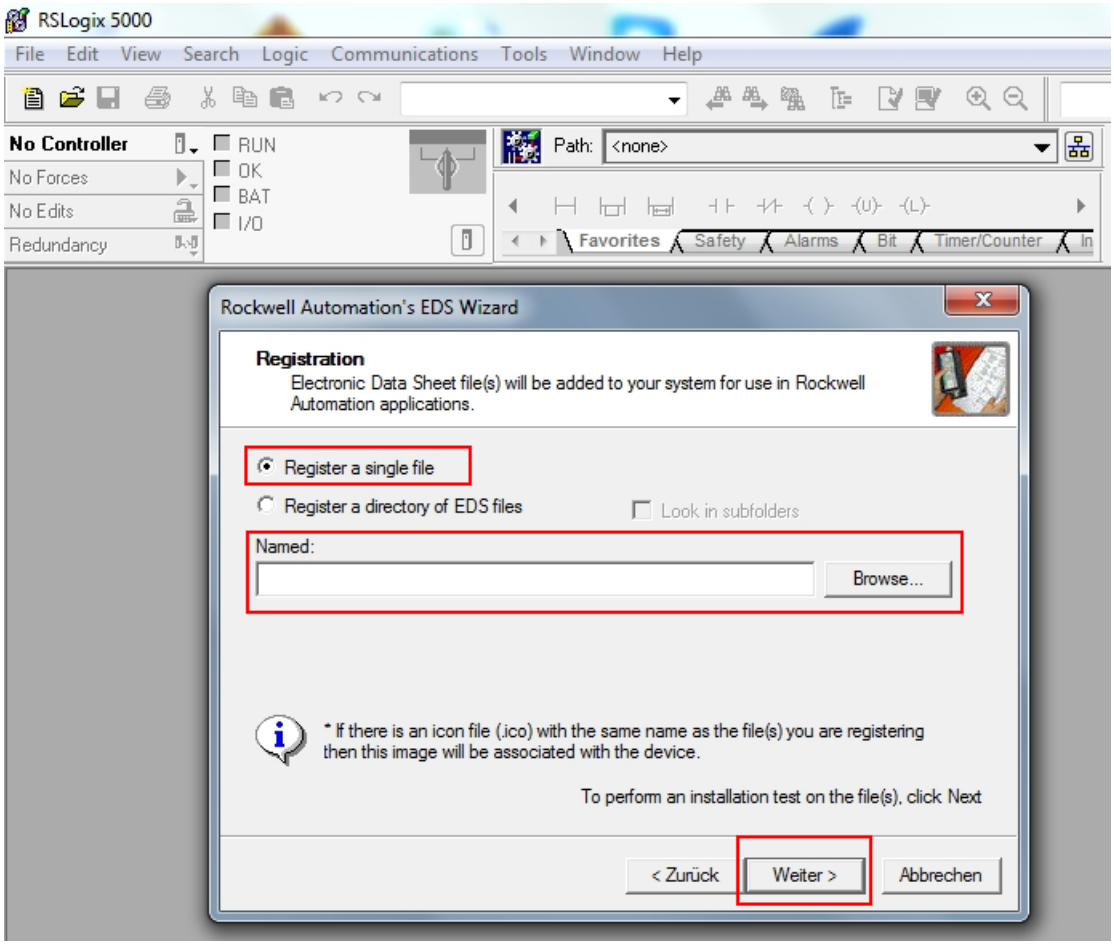


Fig. 34: Selecting an EDS file

7.5.2 Connecting the device with the controller

- ▶ Right-click **I/O configuration** → **Ethernet**.
- ▶ Click **New module**.
- ▶ Select TURCK under **Module type vendor filters**.
- ▶ Select TNSLR-Q130-EN.
- ▶ Confirm the selection with **Create**.
- ▶ Assign a module name.
- ▶ Enter the IP address of the device.
- ▶ Select an integer as a format for the input data and output data: Click **Change** → In the following window select **INT**.
- ▶ Optional: Set the connection and port configuration.

The device appears in the project tree.

7.5.3 Connecting the device online with the controller

- Select the controller.
- Click **Go online**.
- In the following window click (**Connect to go online**) **Download**.
- Confirm all the subsequent messages.

7.5.4 Reading out process data

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

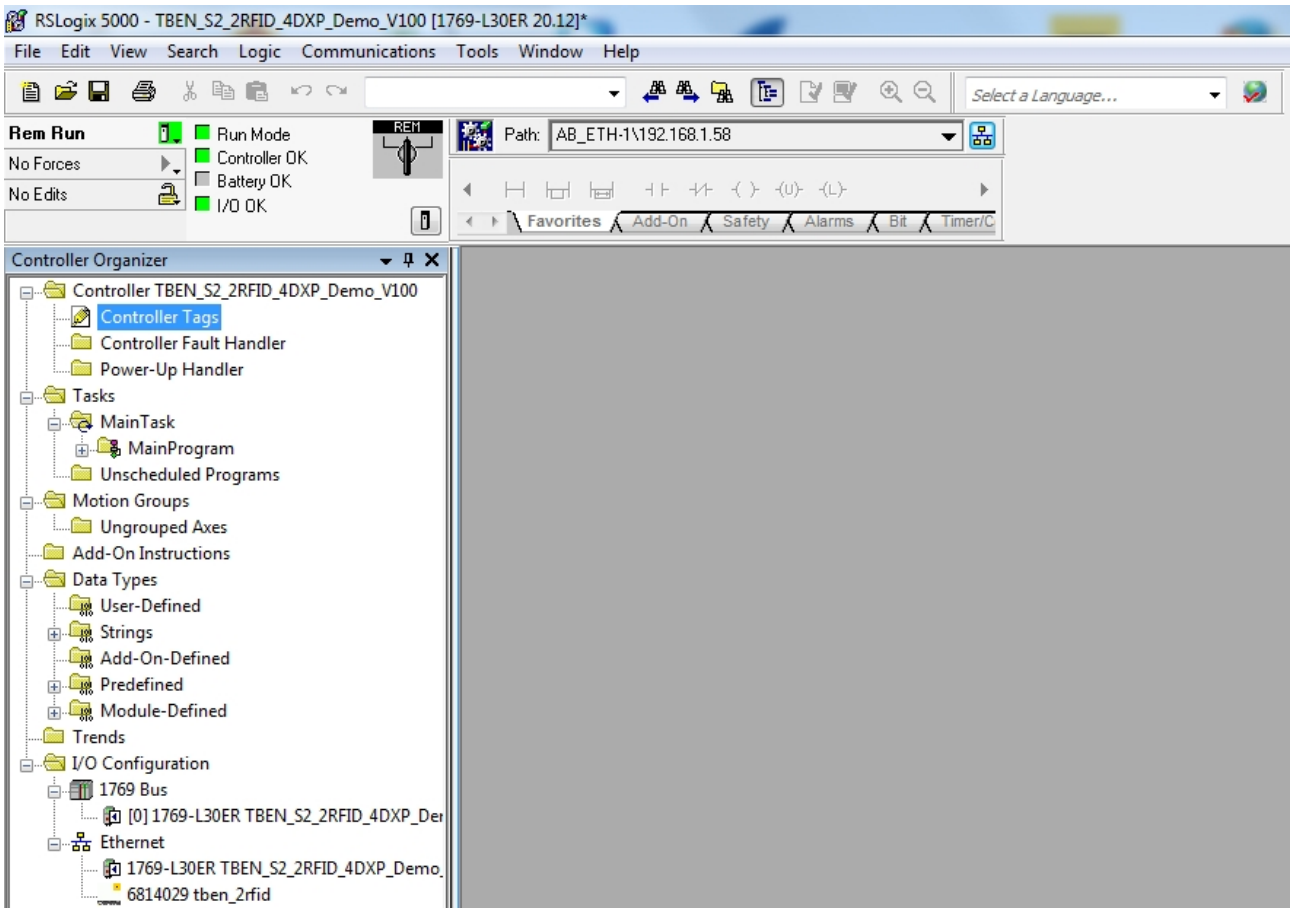


Fig. 35: Controller tags in the project tree

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

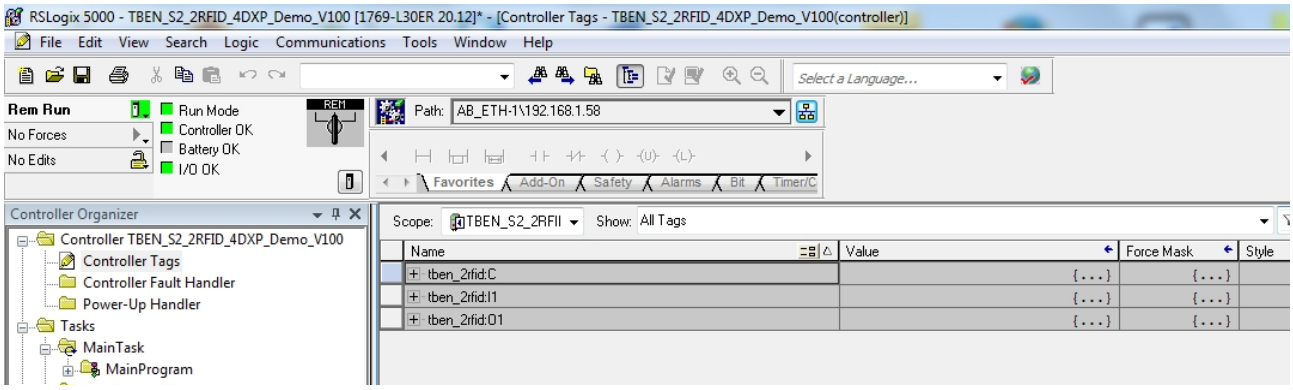


Fig. 36: Access to parameter data, input data and output data

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.

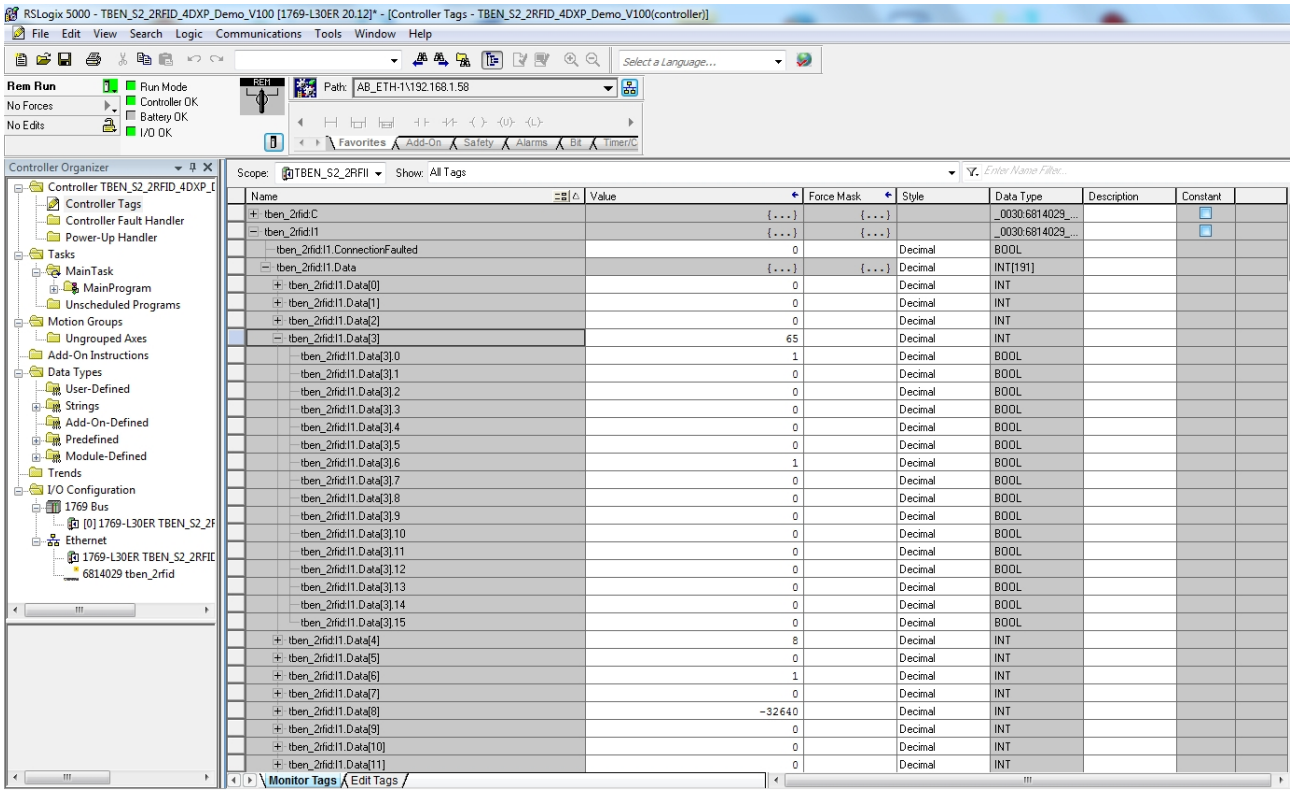


Fig. 37: Process input data — example

7.5.5 EtherNet/IP — mapping

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

7.5.6 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 [▷ 16].

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.

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**.
- ⇨ 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.

7.6 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 V15 programming software (TIA Portal).

Hardware used

This example uses the following hardware components:

- Siemens S7-1500 controller
- HF read/write head TNSLR-Q130-EN

Software used

This example uses the following software:

- SIMATIC STEP7 Professional V15 (TIA Portal)
- GSDML file for TNSLR-Q130-EN (download free of charge from www.turck.com)

Prerequisites

- The software is started.
- A new project has been created.
- The controller has been added to the project.

7.6.1 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)**.

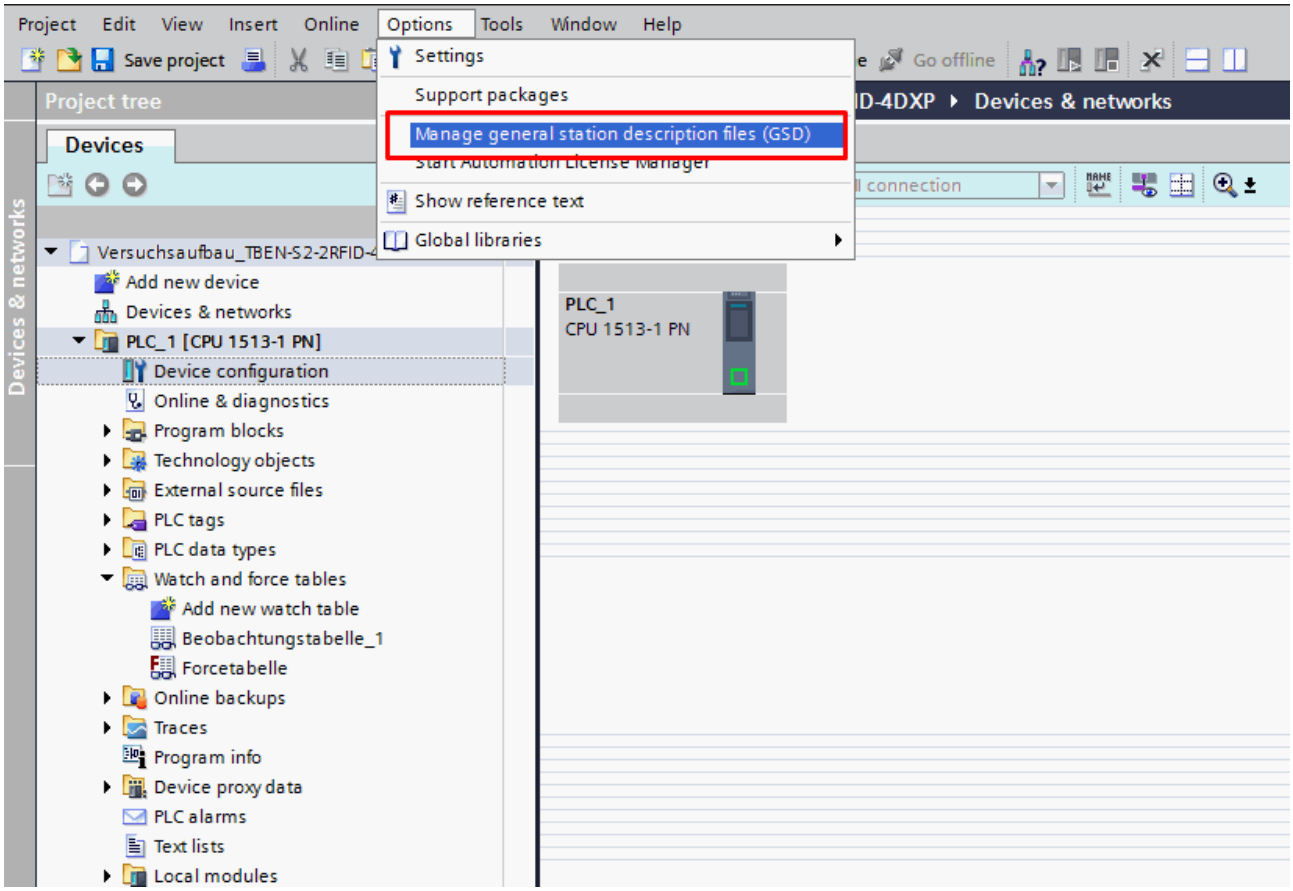


Fig. 38: Installing a GSDML file

- ▶ 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.

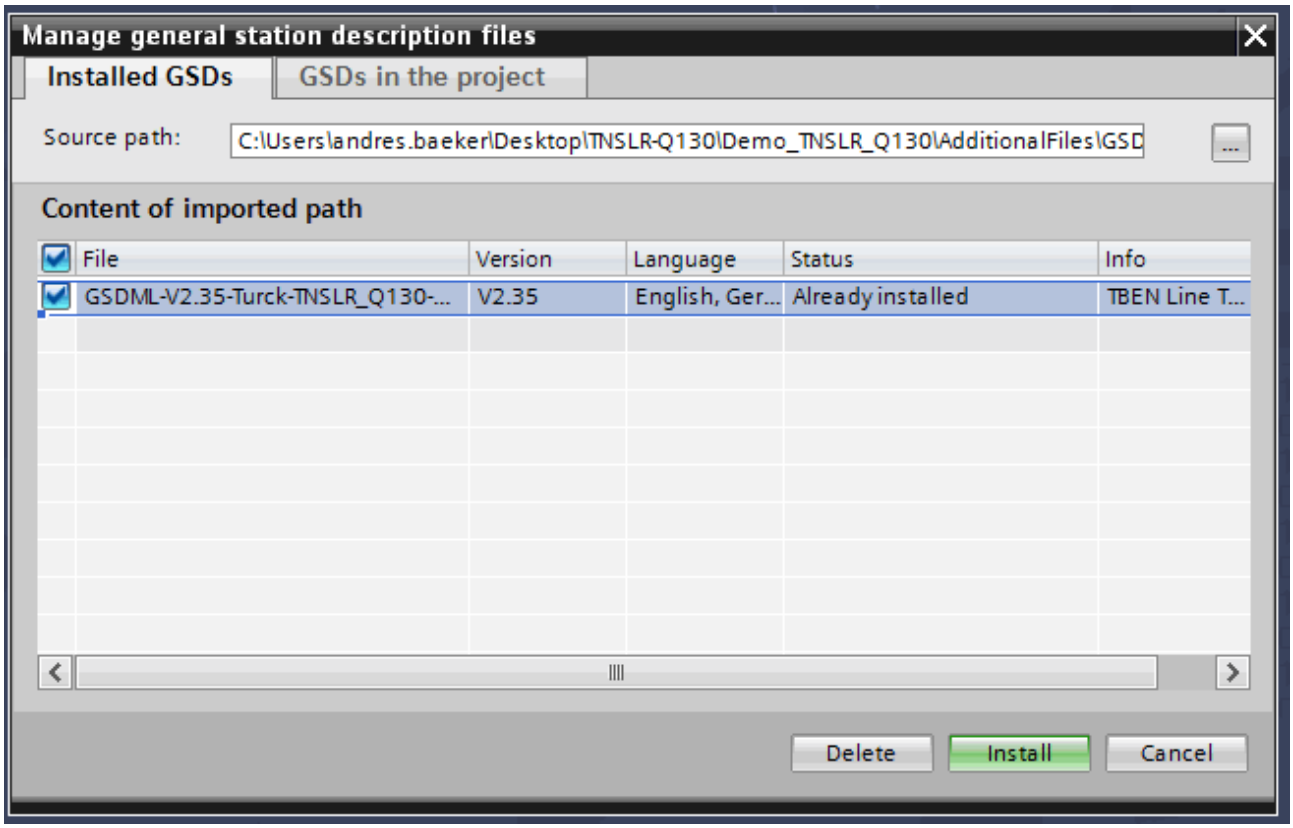


Fig. 39: Select a GSDML file

7.6.2 Connecting the device with the controller

- Select the read/write head from the hardware catalog and drag it into the hardware window.
- Connect the device with the controller in the hardware window.

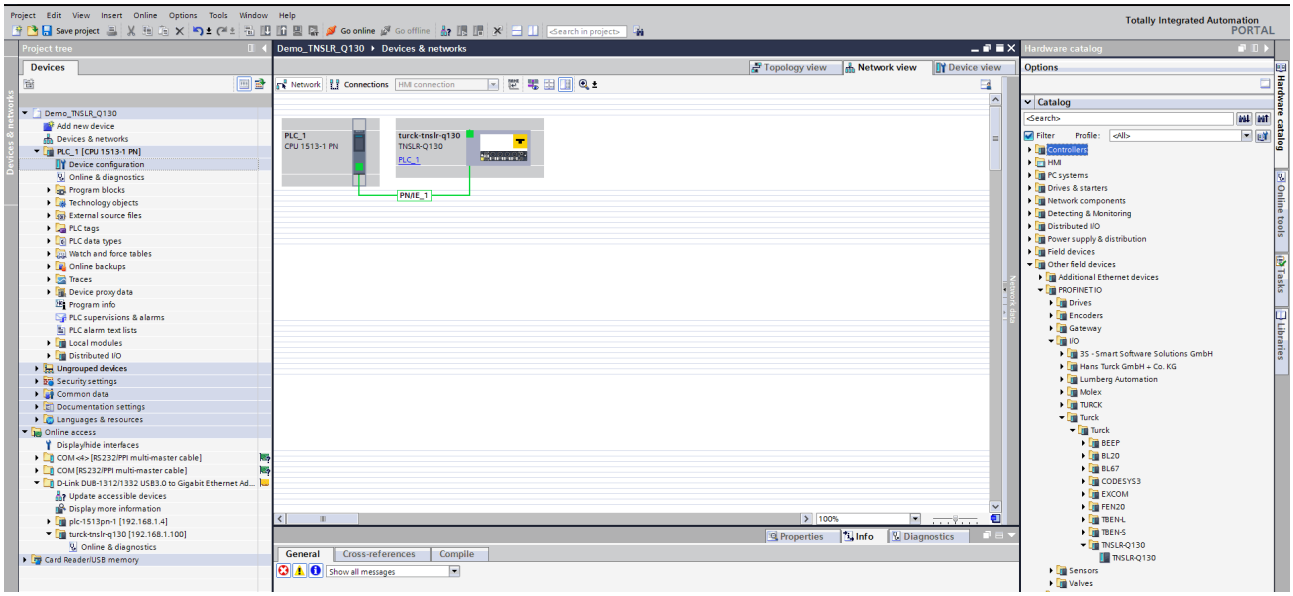


Fig. 40: Connecting the device with the controller

7.6.3 Assigning the PROFINET device name

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

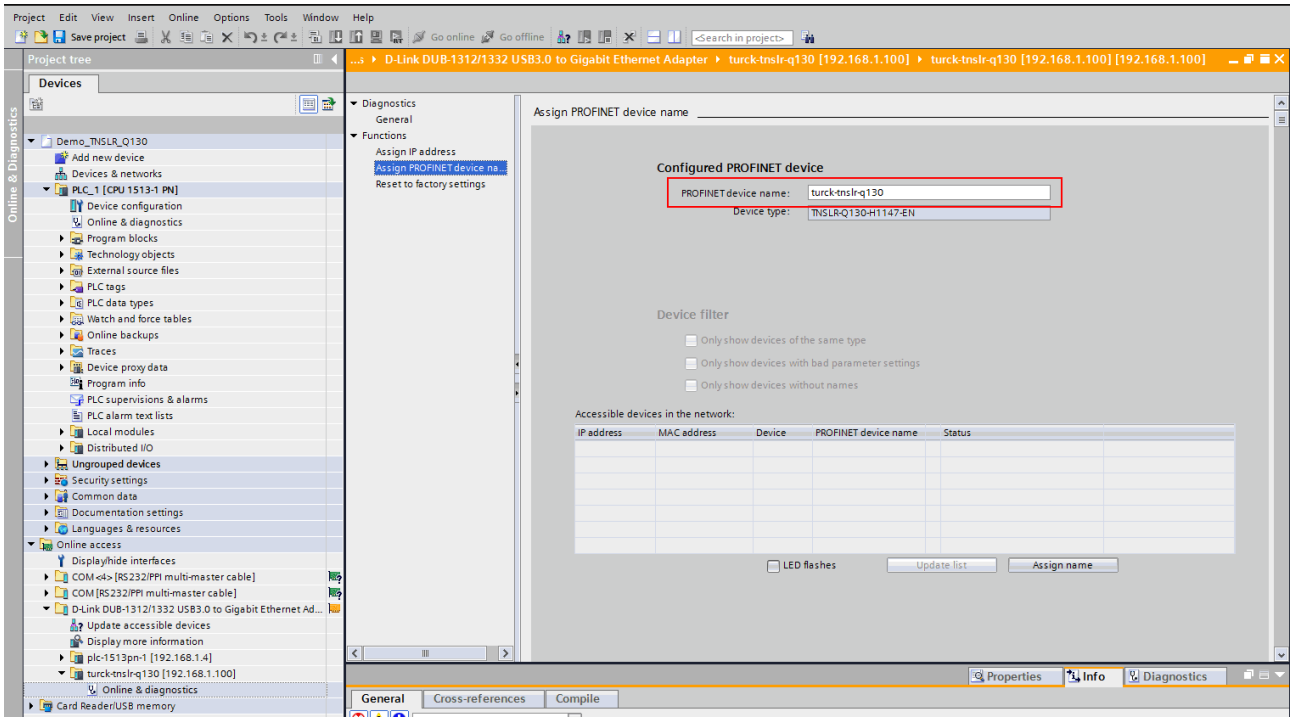


Fig. 41: Assigning the PROFINET device name

7.6.4 Set the IP address in the TIA Portal

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

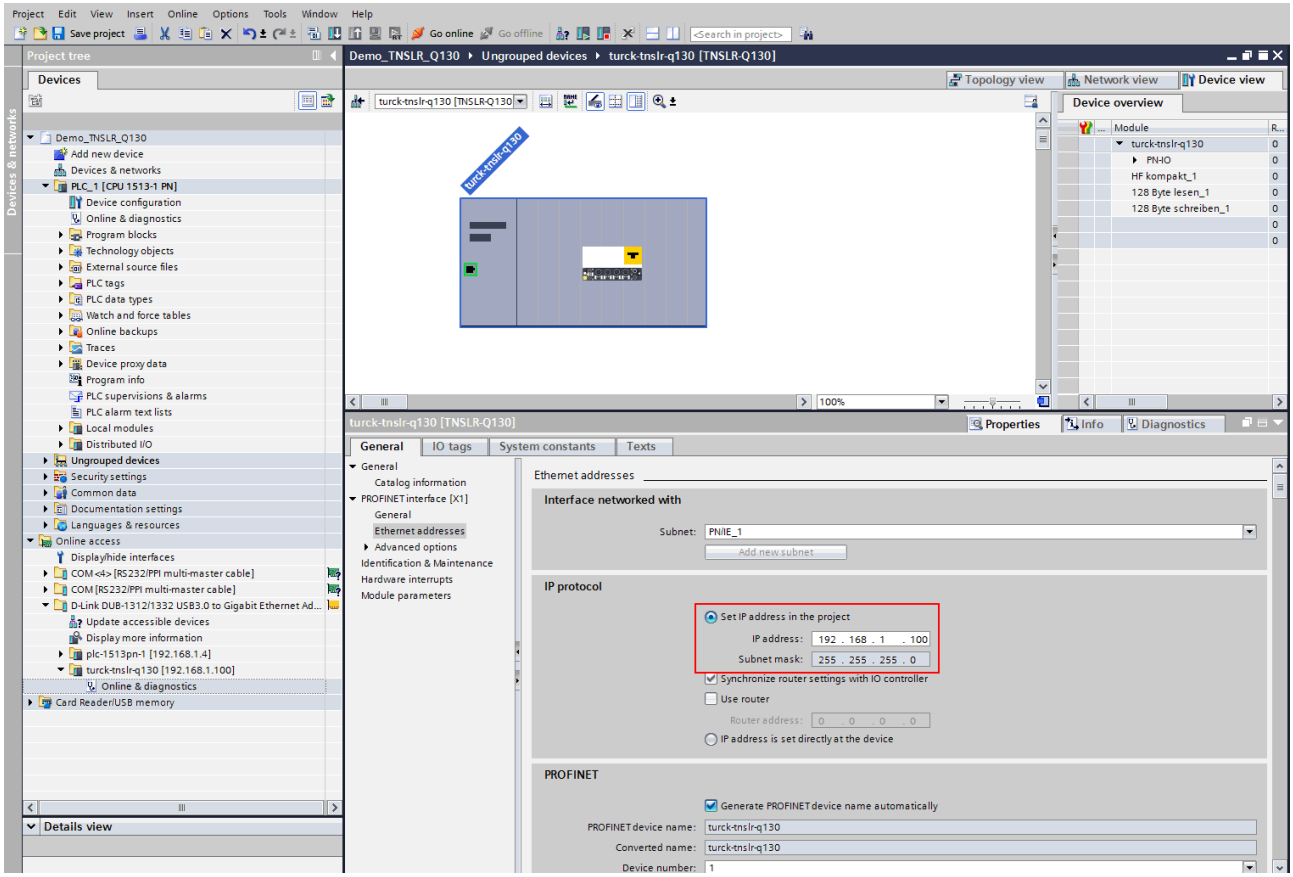


Fig. 42: Assigning the IP address

7.6.5 Connecting the device online with the controller

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

7.6.6 Setting module parameters

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

7.6.7 PROFINET — mapping

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

8 Setting

8.1 Parameter data

Byte no.	Bit							
	7	6	5	4	3	2	1	0
0	Operating mode (Mode)							
1	Select tag type (TAGTYPE)							
2	Bypass time (BYPASS)							
3								
4	AT	TERM	Reserved	ANTI				
5	DID							DXD
6	HFIDLEMODE							
7	Reserved							
8	Command repetitions (CRET)							
9	Command in continuous mode (CCM)							
10	Length in continuous mode (LCM)							
11								
12	Reserved							
13								
14								
15								
16								
17	…							
18								
19								
20								
21								
22								
23								
24								
25								
26								
27	Reserved							
28								
29								
30								
31								
32	Length of write data (WDS)							
33								
34	Length of read data (RDS)							
35								

8.1.1 Meaning of the parameter bits

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

Designation	Meaning
Operating mode (OMRFID)	0: Deactivated **1: HF compact** 2: HF advanced
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 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
Automatic tuning of read/write head (AT)	**0: Automatic tuning off** 1: Automatic tuning on
Multitag mode (ANTI)	**0: Multitag mode off** 1: Multitag mode on
Diagnostic input filter (DID)	**0: All diagnostic messages on** 1: Diagnostic messages off
Deactivate diagnostic HF read/write head tuning (DXD)	**0: Diagnostic messages of the read/write head on** 1: Diagnostic messages of the read/write head off
Idle mode (HFIDLEMODE)	Defines which data is to be displayed (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
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

Designation	Meaning
HF: Length in continuous mode (LCM)	Number of bytes that still have to be read or written in continuous mode, default setting: 8
Length of write data (WDS)	Size of the write data, default setting depends on the selected interface and fieldbus
Length of read data (RDS)	Size of the read data, default setting depends on the selected interface and fieldbus

8.1.2 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.

8.1.3 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:

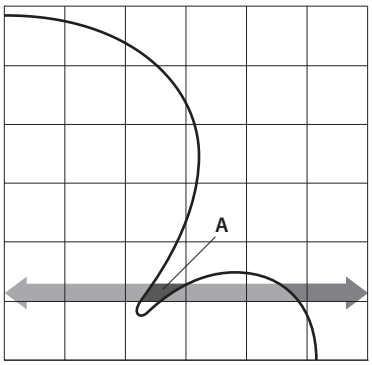


Fig. 43: Detection range of a read/write head

Retaining the default setting

NOTE
The default setting for the bypass time is 200 ms.

- Retaining the default setting: If startup is successful, the parameter does not have to be adjusted to the application. If startup is not successful, a fault signal appears.
- If the fault signal 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 on site. The LEDs of the read/write head and the TP status bit of process input data indicate whether the tag is in the sensing range or not.
- ▶ Enter the required bypass time.

8.2 Process input data

Process input data — HF compact operating mode

Byte no.		**Bit**							
PROFINET	**Modbus EtherNet/ IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	Response code (RESC)							
1	1								
2	2	Loop counter for rapid processing (RCNT)							
3	3	Reserved							
4	4	TNC1	TRE1	PNS1	XD1				TP
5	5							CMON	TON
6	6	Length (LEN)							
7	7								
8	8	Error code (ERRC)							
9	9								
10	10	Tag counter (TCNT)							
11	11								
12	24	Read data byte 0							
13	25	Read data byte 1							
14	26	Read data byte 2							
15	27	Read data byte 3							
16	28	Read data byte 4							
17	29	Read data byte 5							
18	30	Read data byte 6							
19	31	Read data byte 7							

Process input data — HF Advanced operating modes

Byte no.		Bit							
PROFINET	**Modbus EtherNet/IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	Response code (RESC)							
1	1								
2	2	Loop counter for rapid processing (RCNT)							
3	3	Reserved							
4	4	TNC1	TRE1	PNS1	XD1				TP1
5	5							CMON	TON
6	6	Length (LEN)							
7	7								
8	8	Error code (ERRC)							
9	9								
10	10	Tag counter (TCNT)							
11	11								
12	12	Data (bytes) available (BYFI)							
13	13								
14	14	Read fragment no.							
15	15	Write fragment no.							
16	16	Reserved							
17	17	Reserved							
18	18	Reserved							
19	19	Reserved							
20	24	Read data byte 0							
21	25	Read data byte 1							
22	26	Read data byte 2							
23	27	Read data byte 3							
24	28	Read data byte 4							
25	29	Read data byte 5							
26	30	Read data byte 6							
27	31	Read data byte 7							
…	…	…							
146	151	Read data byte 127							

8.2.1 Meaning of the status bits

Default values are shown in **bold**.

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 command code requested by the loop counter
Expected read/write head not connected (TNC1)	**0: Read/write head expected by the system connected** 1: Read/write head expected by the system not connected
Error reported by read/write head (TRE1)	**0: No error** 1: Fault signal of the read/write head
Parameter not supported by read/write head (PNS1)	**0: No error** 1: Parameter is not supported by the read/write head
HF read/write head not tuned (XD1)	**0: No error** 1: Read/write head not tuned
Tag in detection range (TP)	**0: No tag in the detection range of the read/write head** 1: Tag in the detection range of the read/write head
HF read/write head switched on (TON)	**0: Read/write head switched off** 1: Read/write head switched on
Continuous (presence sensing mode) active (CMON)	**0: Continuous mode not active** 1: Continuous mode active
Length (LEN)	Display of the length of the read data
Error code (ERRC)	Display of the specific error code if the error bit (TRE1) is set.
Tag counter (TCNT)	Display of the detected tags. With multitag applications, only tags that are read for an inventory command are counted. In single-tag applications, all tags that are detected by the read/write head are counted. The tag counter is reset by the following commands: ■ Inventory (exception: single-tag applications) ■ Continuous mode ■ Reset
Data (bytes) available (BYFI) (Only available for HF Advanced)	Shows the number of bytes in the FIFO memory of the read/write head. 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) (Only available for HF Advanced)	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. With a read command, the number of fragments that contain data is specified.

Designation	Meaning
Write fragment no. (WFN) (Only available for HF Advanced)	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. With a write command, the number of fragments that contain data is specified.
Read data	User-defined read data

8.2.2 Use "Tag in detection range" bit or preload command

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

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.

8.3 Process output data

Process output data — HF compact operating mode

Byte no.		Bit							
PROFINET	**Modbus EtherNet/ IP**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	0	Command code (CMDC)							
1	1								
2	2	Loop counter for rapid processing (LCNT)							
3	3	Reserved							
4	4	Start address (ADDR)							
5	5								
6	6								
7	7								
8	8	Length (LEN)							
9	9								
10	10	UID (SOUID) length							
11	11	Reserved							
12	24	Write data byte 0							
13	25	Write data byte 1							
14	26	Write data byte 2							
15	27	Write data byte 3							
16	28	Write data byte 4							
17	29	Write data byte 5							
18	30	Write data byte 6							
19	31	Write data byte 7							

Process output data — HF extended operating mode

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

8.3.1 Meaning of the command bits

Description	Meaning
Command code (CMDC)	Entry of the command code
Loop counter for rapid processing (LCNT)	Loop counter for repeated processing of a command 0: Loop counter off
Start address (ADDR) in bytes	Specification of the address to which a command is to be sent (e.g. memory area of a tag)
Length (LEN) in bytes	Specification of the length of the data to be read or written
Length of UID (SOUID) in bytes	**Inventory command:** 0: The actual length (bytes) of the transferred UID is transferred with an inventory. 8: 8-byte UID feedback 1…7: Feedback of an abbreviated UID. > 8: Fault signal -1: NEXT mode (only available in single-tag applications): A tag is only ever read, written or protected if the UID is different from the UID of the last read or written tag. **Other commands:** The UID size should be entered in bytes if a particular tag is to be read, written or protected. The UID must be defined in the write data (start byte: 0). The function of the length of the UID depends on the command used. 0: No specification of a UID/EPC to execute the command. Only one tag may be in the detection range of the read/write head. > 0: UID length of the tag that is to be read, written or protected if a UID is present in the write data. -1: NEXT mode (only available in single-tag applications): A tag is only ever read, written or protected if the UID is different from the UID 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: No timeout, command remains active until it is executed 1: Command is executed once (if there is already a tag in the detection range) > 1…65535: Time in ms Inventory: Command is executed once in the specified time (exception: continuous mode).
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. With a read command, the number of fragments that contain data is specified.
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. With a write command, the number of fragments that contain data is specified.

Description	Meaning
Write data	User-defined write data or entry of a UID to select a specific tag for the command execution (if the **UID (SOUID) length** command parameter is greater than 0).

8.4 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
Idle	0x0000	0	x	x
Inventory	0x0001	1	x	x
Inventory with loop counter	0x2001	8193	x	x
Read	0x0002	2	x	x
Reading with loop counter	0x2002	8194	x	x
Write	0x0004	4	x	x
Writing with loop counter	0x2004	8196	x	x
Writing with validation	0x0008	8	x	x
Continuous mode	0x0010	16	–	x*
Read data from buffer (cont. mode)	0x0011	17	–	x
Read data from buffer (cont. mode) with loop counter	0x2011	8209	–	x
Stop Continuous (Presence Sensing) mode	0x0012	18	–	x*
Delete buffer (cont. mode)	0x0013	19	–	x
Switch off HF read/write head	0x0040	64	x	x
Read/write head identification	0x0041	65	x	x
Tag info	0x0050	80	x	x
Tag info with loop counter	0x2050	8272	x	x
Direct read/write head command	0x0060	96	x	x
Direct read/write head command with loop counter	0x2060	8288	x	x
Tune HF read/write head	0x0080	128	x	x
Read AFI from HF tag	0x0090	144	x	x
Write AFI to HF tag	0x0091	145	x	x
Lock AFI in HF tag	0x0092	146	x	x
Read DSFID from HF tag	0x0094	148	x	x
Write DSFID to HF tag	0x0095	149	x	x
Lock DSFID in HF tag	0x0096	150	x	x
Set read/write head password	0x0100	256	x**	x**
Reset read/write head password	0x0101	257	x**	x**
Set tag password	0x0102	258	x**	x**
Set tag password with loop counter	0x2102	8450	x**	x**
Set tag protection	0x0103	259	x**	x**
Set tag protection with loop counter	0x2103	8451	x**	x**
Get HF tag protection status	0x0104	260	x**	x**

Command	Command code		possible for	
	hex.	dec.	HF compact	HF extended
Set perma lock	0x0105	261	x	x
Set perma lock (lock) with loop counter	0x2105	8453	x	x
Reset	0x8000	32768	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.

8.4.1 Command: Idle

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

Overview of output data

For a description of the output data, see [▶ 55].

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

Overview of input data

For a description of the input data, see [▶ 52].

Response	
Loop counter	See description of the input data
Response code	0x0000 (hex.), 0 (dec.)
Length	Length of the tag UID 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, byte 0…n	UID of the tag in the detection range

8.4.2 Command: Inventory

Using the **Inventory** command, the read/write device searches for tags in the detection range and reads the UID. The inventory command can be executed in single-tag mode and in multi-tag 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.).

For a description of the output data, see [▶ 55].

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
UID length	Not required
Length	0: The actual length (bytes) of the transferred UID is transferred with an inventory. > 0: ■ 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): An HF tag is always only read, written or protected if the UID is different from the UID of the last read or written tag.
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

Response	
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, byte 0…n	UID

8.4.3 Command: Read

The **Read** command is used by the read/write head to read data from tags in the detection range. 128 bytes are transferred by default in a read process. Larger data quantities can be transferred in fragments. If a particular UID is specified, the read/write device reads the corresponding tags only. All other tags in the detection range are ignored in this case.

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

For a description of the output data, see [▶ 55].

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
UID length	The UID size should be entered in bytes if a particular tag is to be read. The UID must be defined in the write data (start byte: 0). The function of the length of the UID depends on the command used. 0: No entry of a UID for executing the command. Only one tag can be located in the detection range of the read/write device. > 0: UID length of the tag to be read if a UID is present in the write data. -1: NEXT mode: A tag is only ever read if the UID is different from the UID of the last read or written tag.
Start address	Start address of the memory area on the tag that is to be read (specification in bytes)
Length	Length of the data to be read in bytes
Command 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 - 1)	UID of the tag to be read
Write data, byte (size of the UID)…127	Not required

For a description of the input data, see [▶ 52].

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, byte 0…n	Read data

8.4.4 Command: Write

The **Write** command is used by 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 quantities can be transferred in fragments. If a particular UID is specified, the read/write device writes the corresponding tags only. All other tags in the detection range are ignored in this case.

NOTE

▶ For multitag applications, specify the UID of the tag that is to be written.

NOTE

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

For a description of the output data, see [▷ 55].

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
UID length	The UID size should be entered in bytes if a particular tag is to be written. The UID must be defined in the write data (start byte: 0). The function of the length of the UID depends on the command used. 0: No entry of a UID for executing the command. Only one tag can be located in the detection range of the read/write device. > 0: UID length of the tag to be written if a UID is present in the write data. -1: NEXT mode: A tag is only ever written if the UID is different from the UID of the last read or written tag.
Start address	Start address of the memory area on the tag that is to be written to (specification in bytes)
Length	Length of data to be written in bytes
Command timeout	See description of the output data
Write fragment no.	1: Using fragmentation 0: Do not use fragmentation
Read fragment no.	0
Write data, byte 0…(size of the UID -1)	UID of the tag to be written
Write data, byte (size of the UID)…127	Write data

For a description of the input data, see [▷ 52].

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, byte 0…127	Not required

8.4.5 Command: Write and Verify

The **Write with validation** command writes a number of bytes defined by the user. The data written is also sent back to the interface and validated. When writing, up to 128 bytes are transferred by default. Larger data quantities can be transferred in fragments. The data written is validated in the interface only, and not sent back to the controller. If the validation fails, a fault signal is output. If the command is processed without a fault signal, the data has been validated successfully.

NOTE

▶ With multitag applications, specify the UID of the tag that is to be written.

NOTE

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

For a description of the output data, see [▶ 55].

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
UID length	The UID size should be entered in bytes if a particular tag is to be written. The UID must be defined in the write data (start byte: 0). The function of the length of the UID depends on the command used. 0: No entry of a UID for executing the command. Only one tag can be located in the detection range of the read/write device. > 0: UID length of the tag to be written if a UID is present in the write data. -1: NEXT mode: A tag is only ever written if the UID is different from the UID of the last read or written tag.
Start address	Start address of the memory area on the destination tag (specified in bytes)
Length	Length of data to be written in bytes
Command timeout	See description of the output data
Write fragment no.	1: Using fragmentation 0: Do not use fragmentation
Read fragment no.	0
Write data, byte 0…(size of the UID -1)	Optional: UID of the tag to be written
Write data, byte (size of the UID)…127	Write data

For a description of the input data, see [▶ 52].

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

8.4.6 Command: Continuous Mode

NOTE
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). The following commands can be set in the parameters: **Write**, **Read**, **Inventory**, **Tag info**.

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 a restart of continuous mode, all data of 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 data from 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 when the start address is set to 3.

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

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	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
Length	Not required
Command timeout	Not required
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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
Write fragment no.	0
Read fragment no.	See description of the input data
Read data	See description of the input data

8.4.7 Command: Read buffer (Cont. mode)

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

The **Read data from buffer (cont. mode)** command can pass on data stored in the interface to the controller. Up to 16 Kbytes of data can be stored in a ring memory. Retrieved data is deleted from the ring memory. The command is required to transfer read data to the controller in continuous 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 is not divided by fragment limits. If a UID does not fit completely in a fragment, it is automatically moved to the next fragment.

NOTE
The **Read data from buffer (cont. mode)** command does not stop continuous mode.

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Max. length of the data to be read by the device (≤ size of the data that the device has actually stored), entered in bytes
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

Response	
Loop counter	See description of the input data
Response code	0x0011 (hex.), 17 (dec.)
Length	Length of the read data. The data is specified 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 reduced automatically after the 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	Read data

Data format in HF applications

In HF applications, the data is not formatted by a header. Several 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 processes

Example: Successful read command (64 bytes)

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

Example: Successful write command

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

Example: Error when writing data

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

8.4.8 Command: Stop continuous mode

The **Stop continuous mode** command can be used to end continuous mode. The data in the buffer of the interface is not deleted after the command is executed and can still be called up via the **Read data from buffer (cont. mode)** command.

For a description of the output data, see [▶ 55].

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

For a description of the input data, see [▶ 52].

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

8.4.9 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.

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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

8.4.10 Command: HF read/write head off

The **Switch off HF read/write head** command enables HF read/write heads to be switched off until a write or read command is present. 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.

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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

8.4.11 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 summarized in the read/write head in the identification record.

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Start address in the identification record, specification in bytes
Length	Length of the data to be queried 0: Read complete parameter set
Command timeout	Not required
Write fragment no.	Not required
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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
Write fragment no.	0
Read fragment no.	See description of the input data
Read data, byte 0...19	ID: ARRAY [0…19] of BYTE
Read data, byte 20...35	Serial number: ARRAY [0…15] of BYTE
Read data, byte 36...37	Hardware version: INT16 (Little Endian)
Read data, byte 38...41	Firmware status: ARRAY [0…] of BYTE: V (0x56), x, y, z (Vx.y.z)
Read data, byte 42...119	Not required

8.4.12 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 an HF tag to be queried. The command is only available with automatic detection. The data is queried from the GSI record of the tag.

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Start address in the GSI record
Length	Length of the system data read (bytes) 0: All system data is read.
Command timeout	Not required
Write fragment no.	Not required
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

Response	
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, byte 0...7	UID, MSB (always 0xE0)
Read data, byte 8	DSFID (data storage format identifier)
Read data, byte 9	AFI (application identifier)
Read data, byte 10	Memory size: Block number (0x00…0xFF)
Read data, byte 11	Memory size: Byte/block (0x00…0x1F)
Read data, byte 12	IC reference

8.4.13 Direct read/write head command

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

A direct command 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 specially released by TURCK. Questions on the read/write head protocol should be addressed to TURCK.

For a description of the output data, see [▷ 55].

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
UID length	0
Start address	Not required
Length	Length of the description of the direct command in the write data, specification in bytes
Command 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

For a description of the input data, see [▷ 52].

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
UID length	0
Start address	0
Length	2
Command timeout	200
Write fragment no.	0
Read fragment no.	0
Write data	0xE0 (CC), 0x00 (CI) — see BL ident protocol

Response	
Loop counter	0
Response code	0x0060
Length	6
Error code	0
Tag 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).

8.4.14 Command: Tune HF read/write head

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

The **Read/write head tuning** command enables HF read/write heads to be tuned automatically to their ambient conditions. The tuning values are stored in the read/write head until the next voltage reset.

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

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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)

8.4.15 Command: Read AFI from HF tag

The AFI (Application Family Identifier) byte of an HF tag can be read out using the **Read AFI from HF tag** command.

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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, bytes 1…(length -1)	Not required

8.4.16 Command: Write AFI to HF tag

The **Write AFI to HF tag** command writes an AFI (Application Family Identifier) byte to an HF tag.

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

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command 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

For a description of the input data, see [▶ 52].

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

8.4.17 Command: Lock AFI in HF tag

The **Lock AFI in HF tag** command locks the AFI (Application Family Identifier) byte on an HF tag.

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

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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

8.4.18 Command: Read DSFID from HF tag

The **Read DSFID from HF tag** command can be used to read the DSFID (Data Storage Format Identifier) byte of an HF tag.

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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, bytes 1…(length -1)	Not required

8.4.19 Command: Write DSFID to HF tag

The **Write DSFID to HF tag** command writes a DSFID (Data Storage Format Identifier) byte to an HF tag.

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

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command 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

For a description of the input data, see [▶ 52].

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

8.4.20 Command: Lock DSFID in HF tag

The **Lock DSFID in HF tag** command locks the DSFID (Data Storage Format Identifier) byte on an HF tag.

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).

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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

8.4.21 Command: Set read/write head password

NOTE
The command is only available for applications with 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. 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 in the read/write head before a new password can be assigned ([▶ 87]).

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data, byte 0…3	Password: ARRAY [0…3] OF BYTE
Write data, byte 4…127	Not required

For a description of the input data, see [▶ 52].

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

8.4.22 Command: Reset read/write head password

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

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**.

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	Not required
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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

8.4.23 Command: Set tag password

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

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

The **Set tag password** command sets a password in the tag. 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: 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 in the read/write head before a new password can be assigned (Command: Set read/write head password).

For a description of the output data, see [▶ 55].

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
UID length	The UID size should be entered in bytes if a particular tag is to be protected. The UID must be defined in the write data (start byte: 0). The function of the length of the UID depends on the command used. 0: No entry of a UID for executing the command. Only one tag may be in the detection range of the read/write head. > 0: UID length of the tag to be protected if a UID is present in the write data. -1: NEXT mode: A tag is only ever protected if the UID is different from the UID of the last read or written tag.
Start address	Not required
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data, byte 0…3	Password: ARRAY [0…3] OF BYTE
Write data, byte 4…127	Not required

For a description of the input data, see [▶ 52].

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

8.4.24 Command: Set tag protection

NOTE
The command is only available for applications with 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: Multitag 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.

For a description of the output data, see [▶ 55].

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
UID length	The UID size should be entered in bytes if a particular tag is to be protected. The UID must be defined in the write data (start byte: 0). The function of the length of the UID depends 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: UID length of the tag to be protected if a UID is present in the write data. -1: NEXT mode: A tag is only ever protected if the UID is different from the UID of the last read or written tag.
Start address	Not required

Request	
Memory area	Possible values: USER memory (memory areas 1 and 3) 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	8 byte
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data, byte 0	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
Write data, byte 1	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
Write data, byte 2	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
Write data, byte 3	0
Write data, byte 4	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

Request	
Write data, byte 5	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
Write data, byte 6	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
Write data, byte 7	0
Write data, byte 8…127	Not required

For a description of the input data, see [▶ 52].

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

8.4.25 Command: Get HF tag protection status

NOTE
The command is only available for applications with 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 may be 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**.

For a description of the output data, see [▶ 55].

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
UID length	The UID size should be entered in bytes if a particular tag is to be protected. The UID must be defined in the write data (start byte: 0). The function of the length of the UID depends on the command used. 0: The command is executed for the tag that is in the detection range of the read/write head. -1: NEXT mode: A tag is only ever protected if the UID is different from the UID of the last read or written tag.
Start address	Not required
Length	8 byte
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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
Read data, byte 0	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
Read data, byte 1	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
Read data, byte 2	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
Read data, byte 3	0

Response	
Read data, byte 4	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
Read data, byte 5	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
Read data, byte 6	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
Read data, byte 7	0

8.4.26 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 single-tag mode. A fault signal is output with multitag applications. To troubleshoot, set the **HF: Multitag** parameter to **0: Multitag mode off**.

For a description of the output data, see [▶ 55].

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
UID length	0: The command is executed for the tag which is located in the detection range of the read/write device. > 0: UID length of the tag to be locked if a UID is present in the write data. -1: NEXT mode: A tag is only ever protected if the UID is different from the UID of the last read or written tag.
Start address	Address of the first bit in the block that is to be locked (EEPROM tag: 0, 4, 8, …, FRAM tags: 0, 8, 16, …)
Memory area	Possible values: USER memory (memory areas 1… 4) Entry of the memory area not necessary
Length	Length of the data to be locked in bytes. Only multiples of the block size can be specified. 0: 1 Lock block
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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

8.4.27 Command: Reset

The **Reset** command is used to reset the read/write device and interface. The input data, output data and the buffer are cleared.

For a description of the output data, see [▶ 55].

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
UID length	Not required
Start address	0: Software reset
Length	Not required
Command timeout	See description of the output data
Write fragment no.	0
Read fragment no.	See description of the output data
Write data	Not required

For a description of the input data, see [▶ 52].

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

8.5 Editing settings in the web server

A login is required in order to edit settings via the web server (see [▷ 20]).

Example: Setting the operating mode

In the following example, the operating mode is set to **HF extended**.

- Click **Local I/O** → **Parameter** in the navigation bar on the left of the screen.
- Select **HF extended** mode from the **Operation mode** drop-down menu.
- Save settings: Click **Write**.

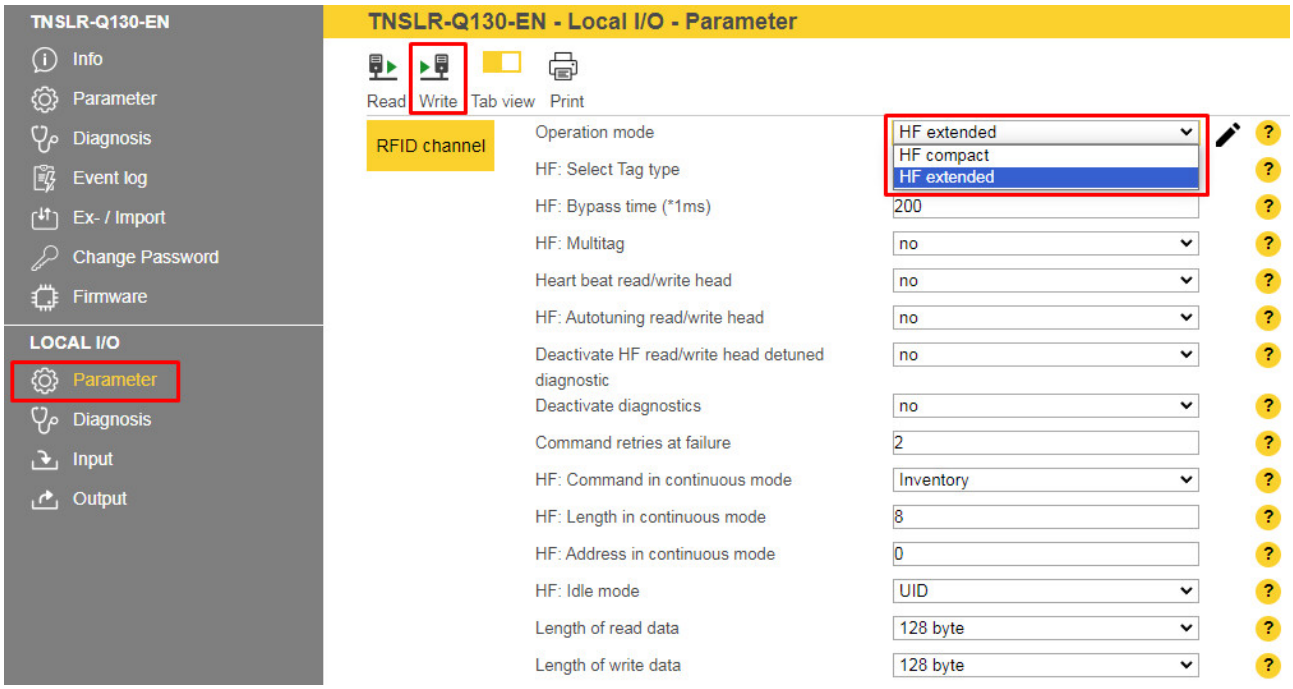


Fig. 44: Setting parameters in the web server

Example: Executing a read command

In the following example, 8 bytes of data are read from a tag.

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

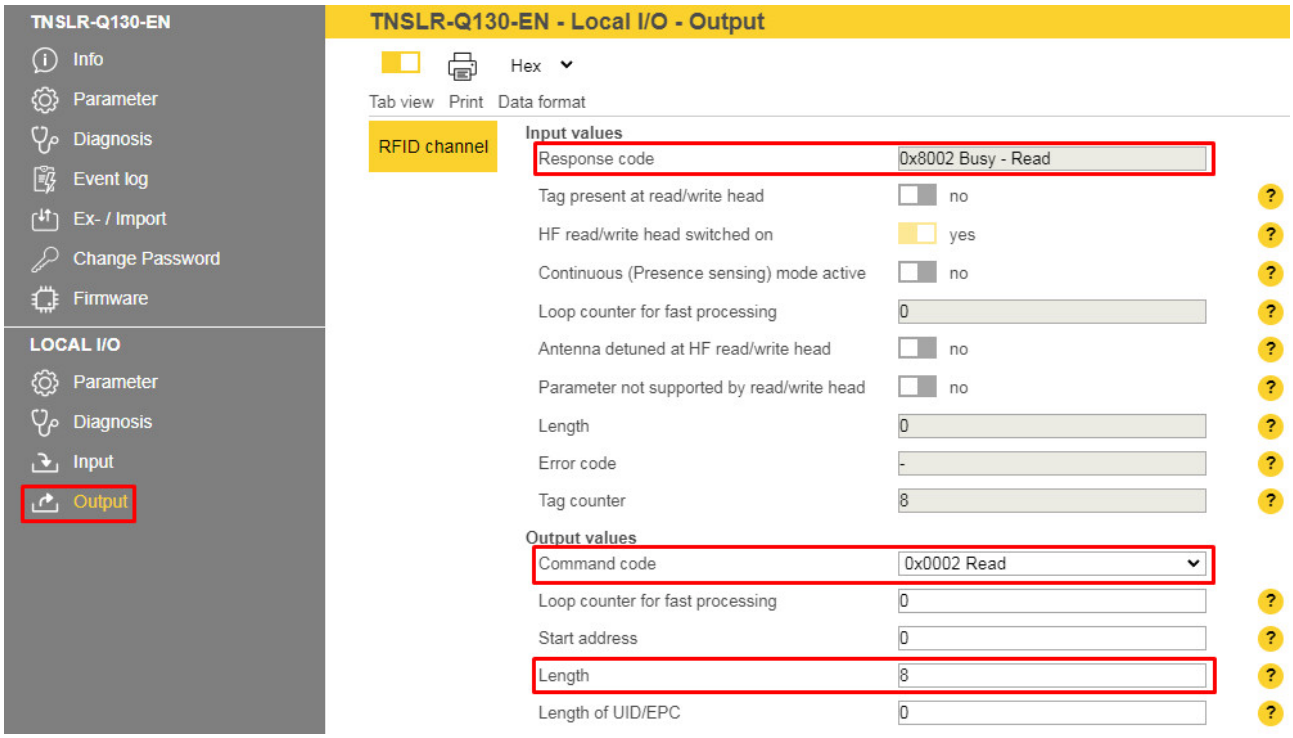


Fig. 45: Setting a read command in the web server

- ⇨ The receipt of the command is confirmed automatically in the input data under **Input values** → **Response code** with **0x8002 Busy — Read**.
- ⇨ The read command is executed as soon as a tag is present in the detection range of the read/write head.
- ⇨ The read data can be called up under **Local I/O** → **Input**.

9 Operation

9.1 Reading out tags via TAS (scanning)

RFID tags can be read out manually via TAS. This function also enables editing of tag information.

- ✓ TAS version v1.11.1.0 or higher
- ✓ Read/write head with TNSLR-Q130-EN with firmware version 1.0.21.0 or higher
- ✓ There is a tag within the detection range of the read/write head.
- ✓ The device was logged in via TAS (see [▶ 18]).
- ▶ Select **RFID READER** in the main navigation bar of TAS.
- ▶ In the navigation area on the left, select **Application**.

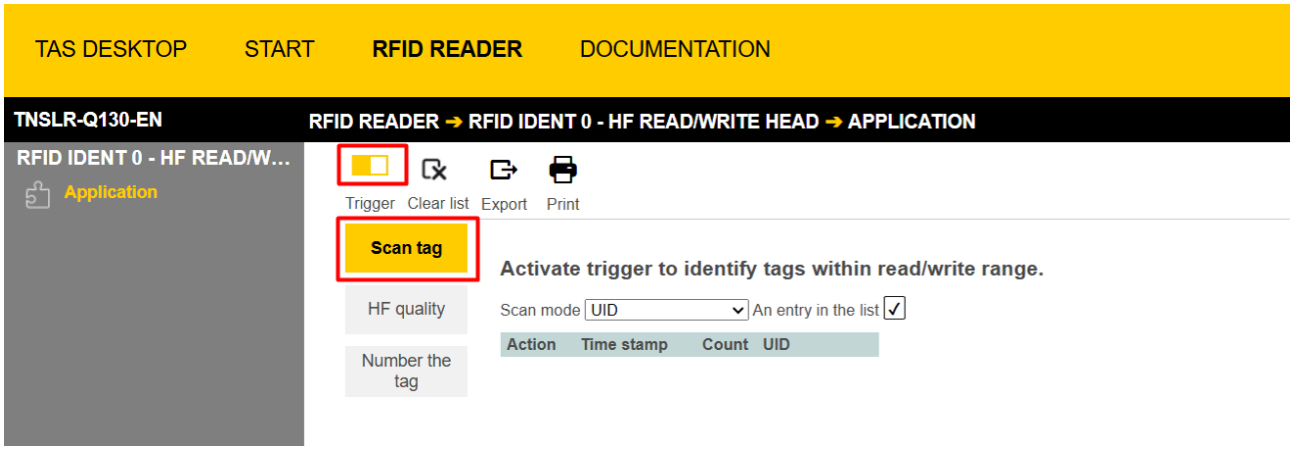


Fig. 46: Scanning a tag

- ▶ Activate **Trigger**.
- ▶ Click **Scan tag**.
- ⇨ The tag in the detection range is read out.

9.1.1 Displaying tag information

After a tag has been scanned, more information can be retrieved.

✓ A tag has been scanned manually.

▶ Click on the information icon for the tag entry.

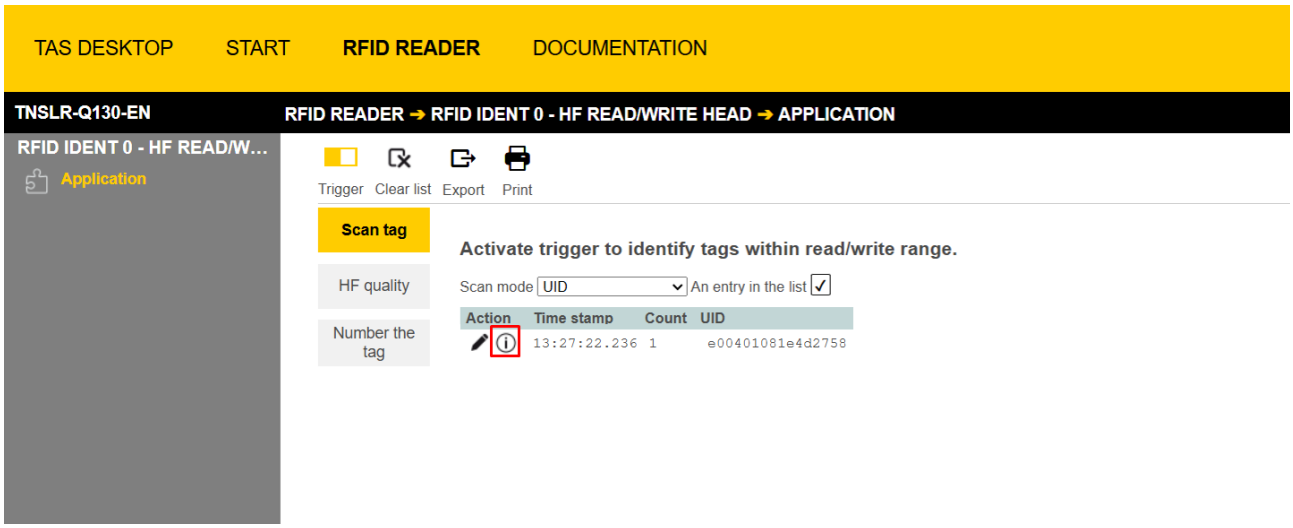


Fig. 47: Scanned tag with detection parameters: displaying tag information

⇨ Tag information is displayed.

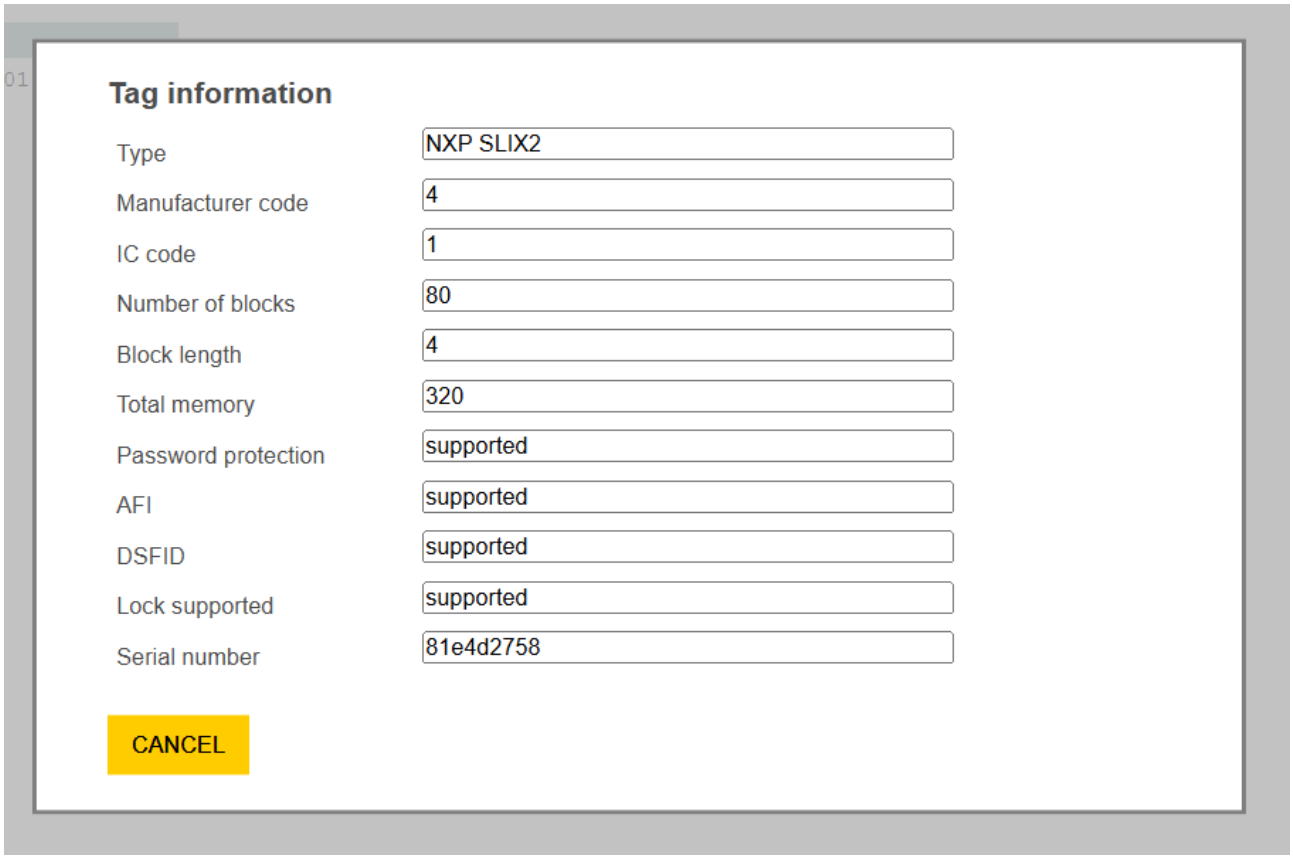


Fig. 48: Tag information

9.1.2 RSSI value output

The RSSI value denotes the signal strength of the response from the tag to the read/write head. The RSSI value is not output as a physical value but as a value on a scale from 0…15. The RSSI value is not linear to the read/write distance.

The RSSI value depends on the following factors:

- Distance between the read/write head and the tag: The shorter the distance between read/write head and the tag, the greater the RSSI value.
- Dimensions of the tag: The larger the tag, the greater the RSSI value.
- Impact of the metal: Metal influences the electromagnetic field of the read/write head and therefore the RSSI value.
- Tolerances: A tolerance of up to 30 % must be calculated for the achievable range of the tags. The 30 % tolerance also applies to the RSSI value.

The following describes how to retrieve the RSSI diagram. The effect of metal on the read/write head is indicated by a bar above the diagram.

- ✓ TAS version v1.11.1.0 or higher.
- ✓ TNSLR-Q130-EN read/write head with firmware version 1.0.21.0 or higher.
- ✓ There is a tag within the detection range of the read/write head.
- ✓ The device was logged in via TAS (see [▷ 18]).
- ▶ Select **RFID READER** in the main navigation bar of TAS.
- ▶ In the navigation area on the left, select **Application**.
- ▶ Click on **HF quality**.
- ▶ Click **Start**.
- ⇨ The effect of metal on the read/write head is indicated by a bar.
- ⇨ The RSSI value is determined continuously and mapped in a diagram.

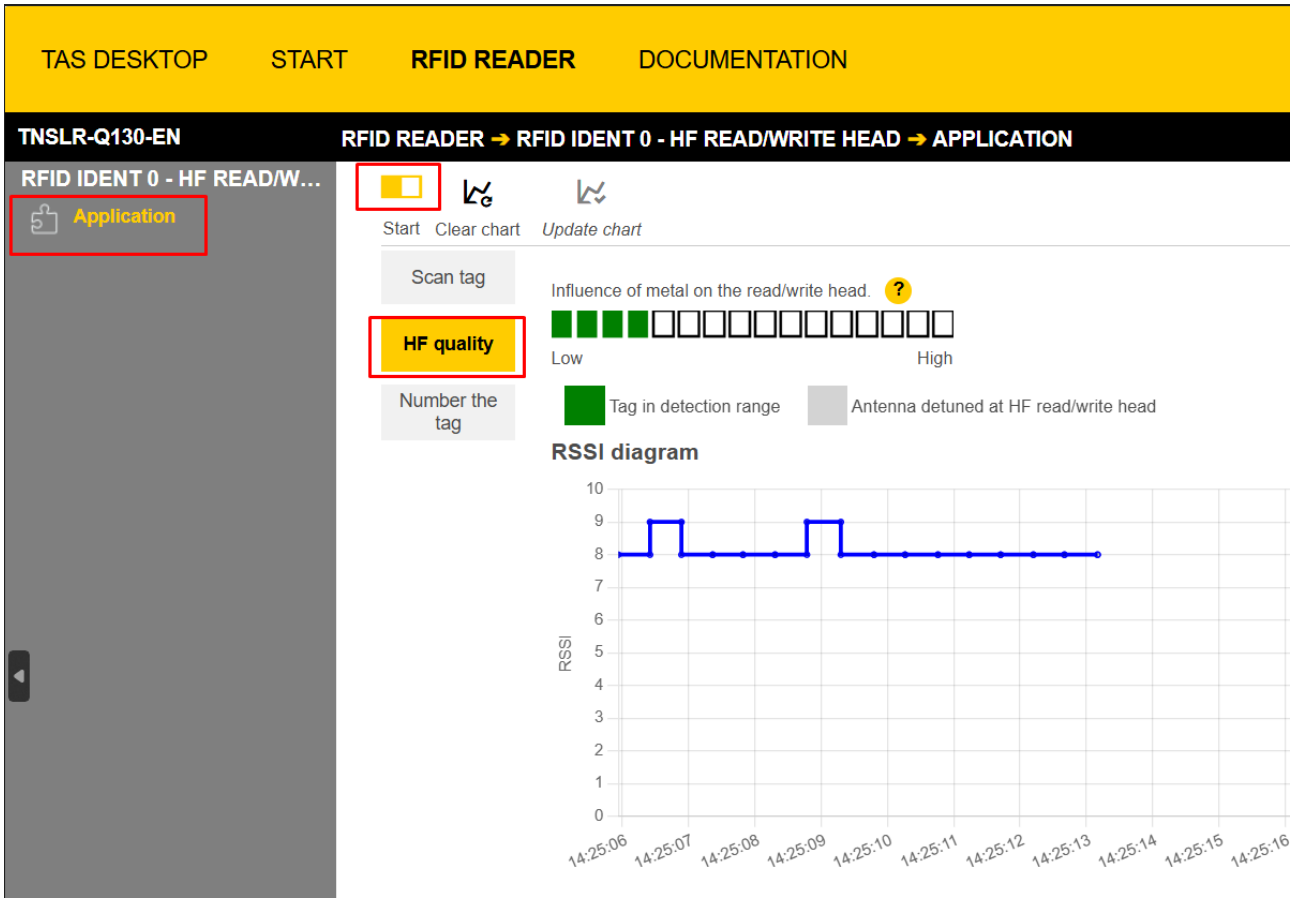


Fig. 49: Diagram of RSSI reception signal strength and effect of metal

9.1.3 Editing raw data on tag

The raw data on a tag can be changed manually.

✓ A tag was scanned manually as described under [▶ 100].

✓ The scanned tag is still in the detection range for the write process.

▶ Click on the pen icon for the tag data entry

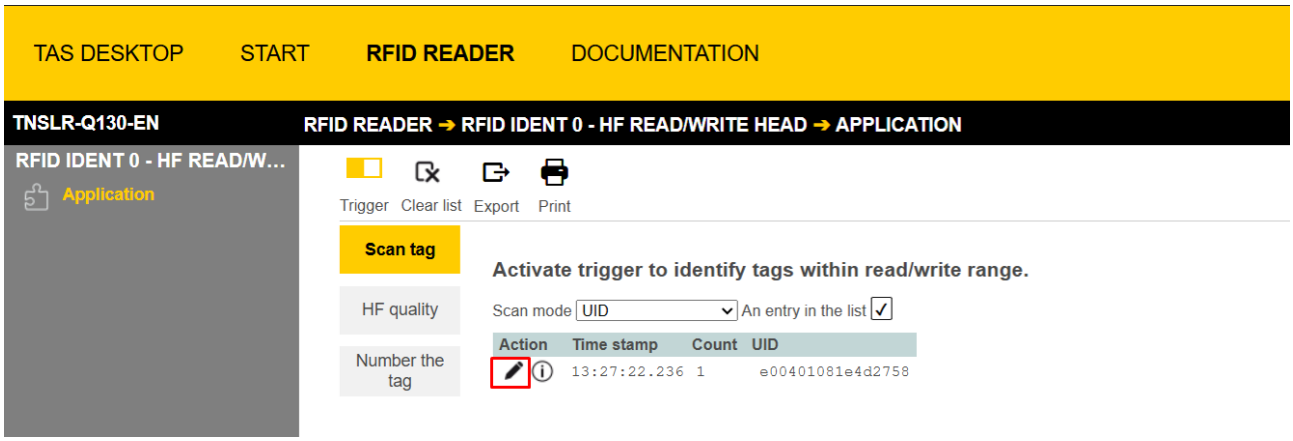


Fig. 50: Scanned tag with detection parameters: editing raw data

⇨ A window for editing the raw data opens.

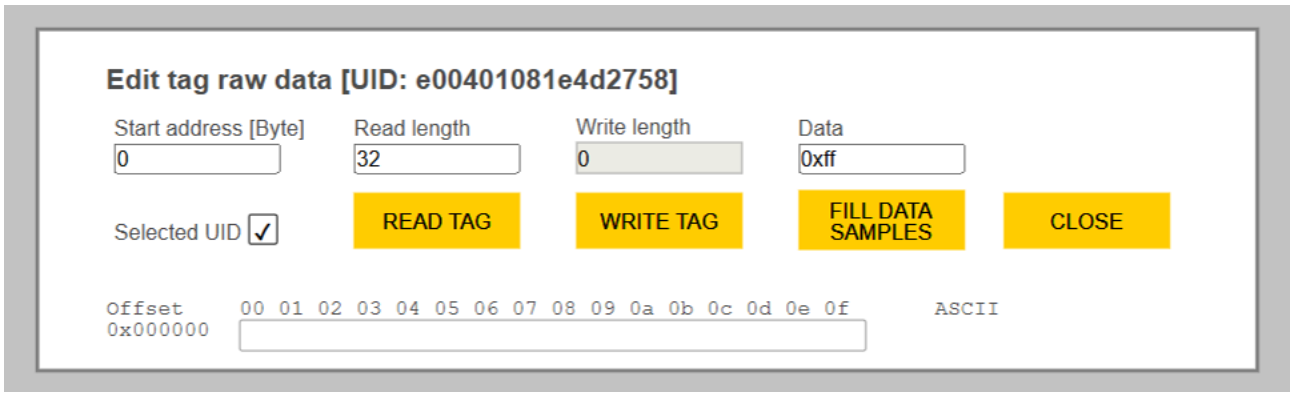


Fig. 51: Editing raw data on tag

▶ Click **READ TAG**.

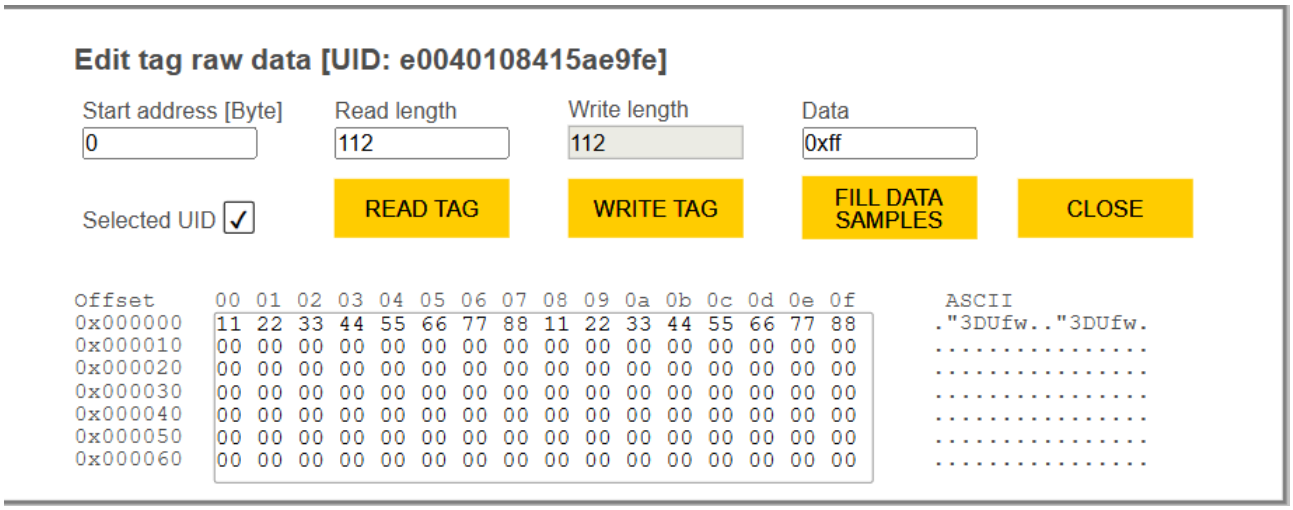


Fig. 52: Editing raw data on tag: read-out tag

⇨ The raw data on the tag can be edited. Further information is provided in the list below.

Object name	Object type	Description
Selected UID	Check box	Checkmark set: Only the tag with the displayed UID is written to when using **WRITE TAG**. Checkmark not set: All tags within the detection range of the read/write head are written to when using **WRITE TAG**.
Start address [Byte]	Text field	Defines the start address of the read and write data in bytes.
Read length	Text field	Specifies the length of the read data in bytes.
Write length	Text field	Displays the length of the write data in bytes. This value matches the length of the read data and cannot be set directly.
Data	Text field	The value to be written to the data mapping table via the **FILL DATA SAMPLES** button is entered here. The value can be specified as a hexadecimal value starting with the character string **0x**. Alternatively, the value can be specified as an integer (0…255).
Read tag	Button	Reads tags in the detection range, taking into account the information in the **Start address** and **Length of read data** text fields.
Write tag	Button	Transfers the data from the data mapping table to the tag(s) in the detection range (see **Selected UID**).
Fill data samples	Button	Writes the value specified in the **Data** text field to each position in the data mapping table.
Close	Button	Closes the raw data editing window.
Data mapping table	Text field (multiple rows)	In this table, the raw data can be edited individually by clicking on it. A complete overwrite is possible via **FILL DATA SAMPLES**. The data can be transferred to the tag by clicking **WRITE TAG**.

9.1.4 Numbering the tag

The **Number tag** function can be used to number tags consecutively.

A read-out tag cannot be numbered twice in succession. This prevents numbering errors caused by a tag briefly leaving the detection range.

- ✓ TAS version v1.11.1.0 or higher.
- ✓ TNSLR-Q130-EN read/write head with firmware version 1.0.21.0 or higher.
- ✓ The device was logged in via TAS (see [▷ 18]).
- ▶ Select **RFID READER** in the main navigation bar of TAS.
- ▶ In the navigation area on the left, select **Application**.
- ▶ Click **Number the tag**.

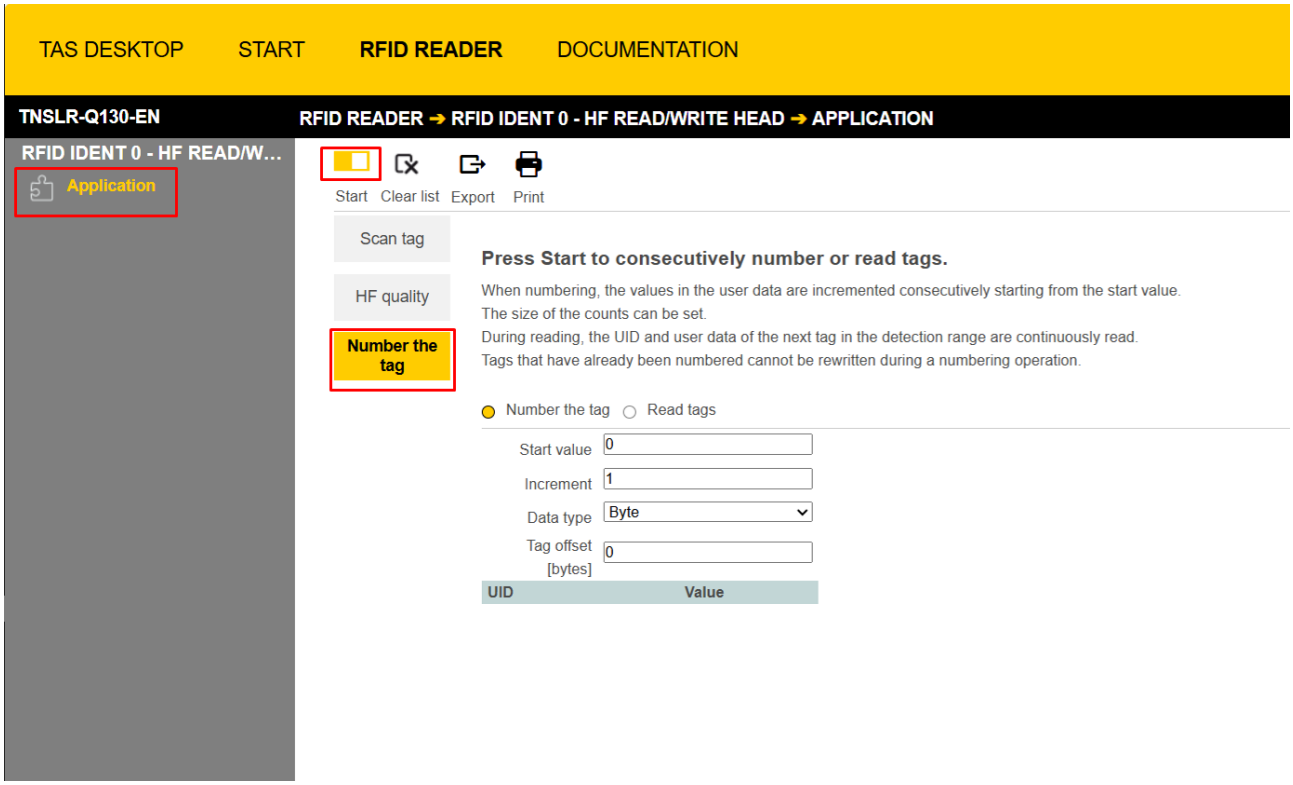


Fig. 53: Number the tag

▶ Adjust the required settings according to the following table:

Setting	Type	Description
Number the tag/Read tags	Radio button	**Number the tag:** Tags that enter the detection range are issued with sequential numbers. **Read tag:** The assigned numbers created with **Number the tag** are read out and displayed in the UID value table.
Start value	Text field	Value at which numbering is to begin.
Increment	Text field	Number spacing between two consecutive numbers (e.g. entering **2** generates the number sequence 1, 3, 5… for numbering).
Data type	Drop-down menu	Preset to **Bytes**.
Tag offset	Text field	Memory offset in bytes with which the numbering is to be written to the tag.

▶ Click **Start**.
⇨ The numbering process begins. Tags that enter the detection range of the read/write head are assigned a number or are read out. To end the process, click **Start** again.

9.2 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.

9.3 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.

9.3.1 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** → **Parameter** → set **Operation mode** to **HF extended**.
- Click **Write** to save.

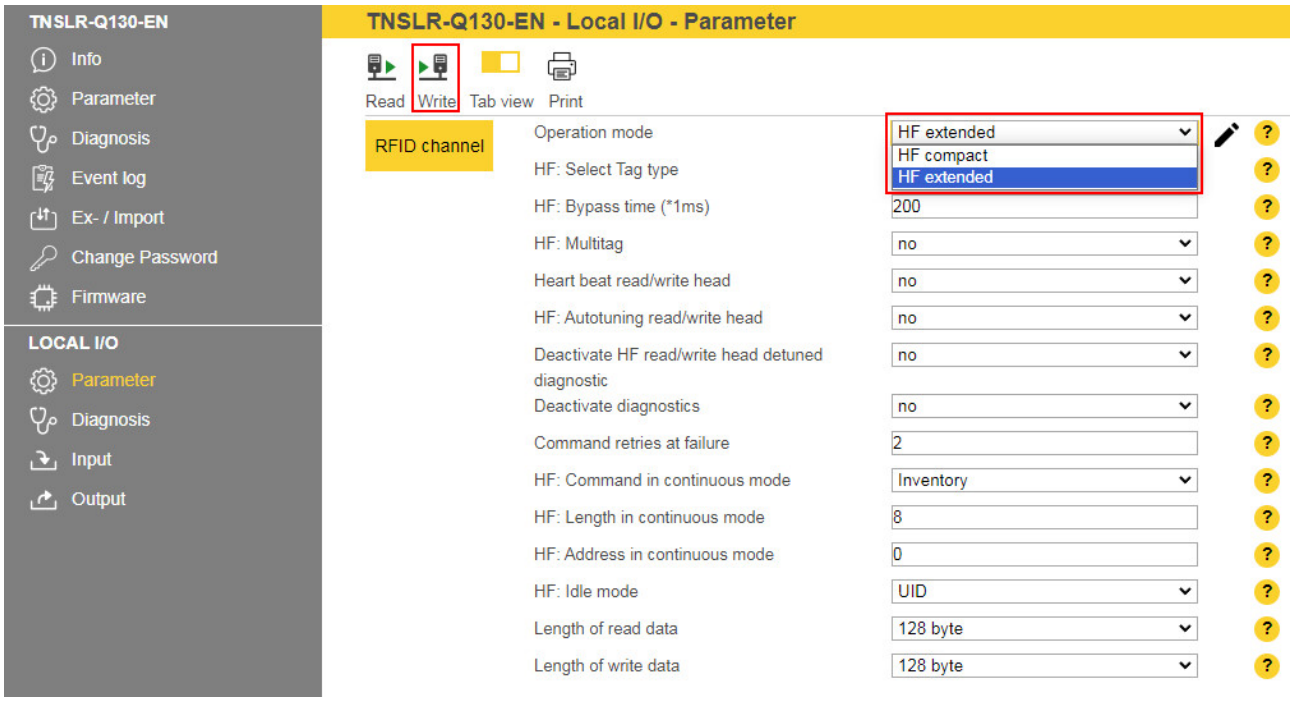


Fig. 54: Fragmentation – selecting the operating mode

- ▶ 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.

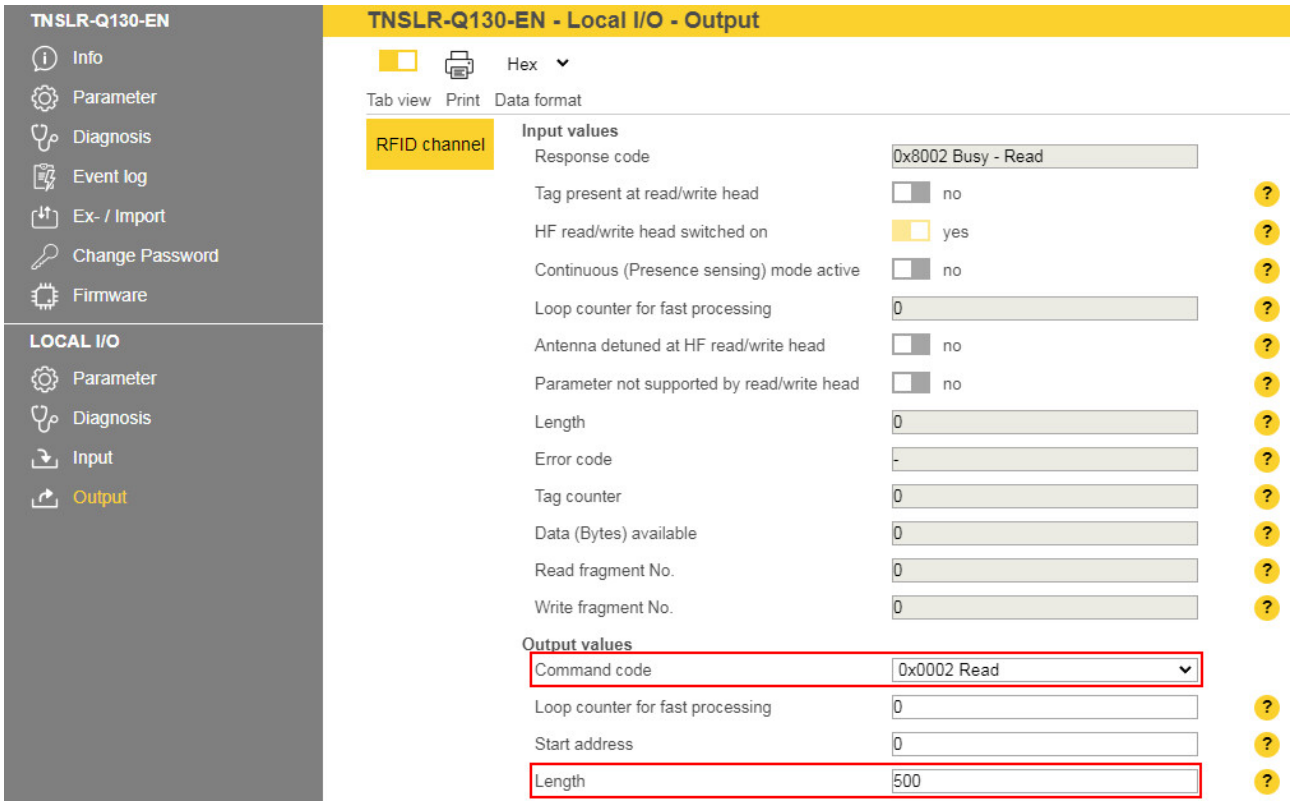


Fig. 55: Fragmentation – setting the read command

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 in the read/write head 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**.

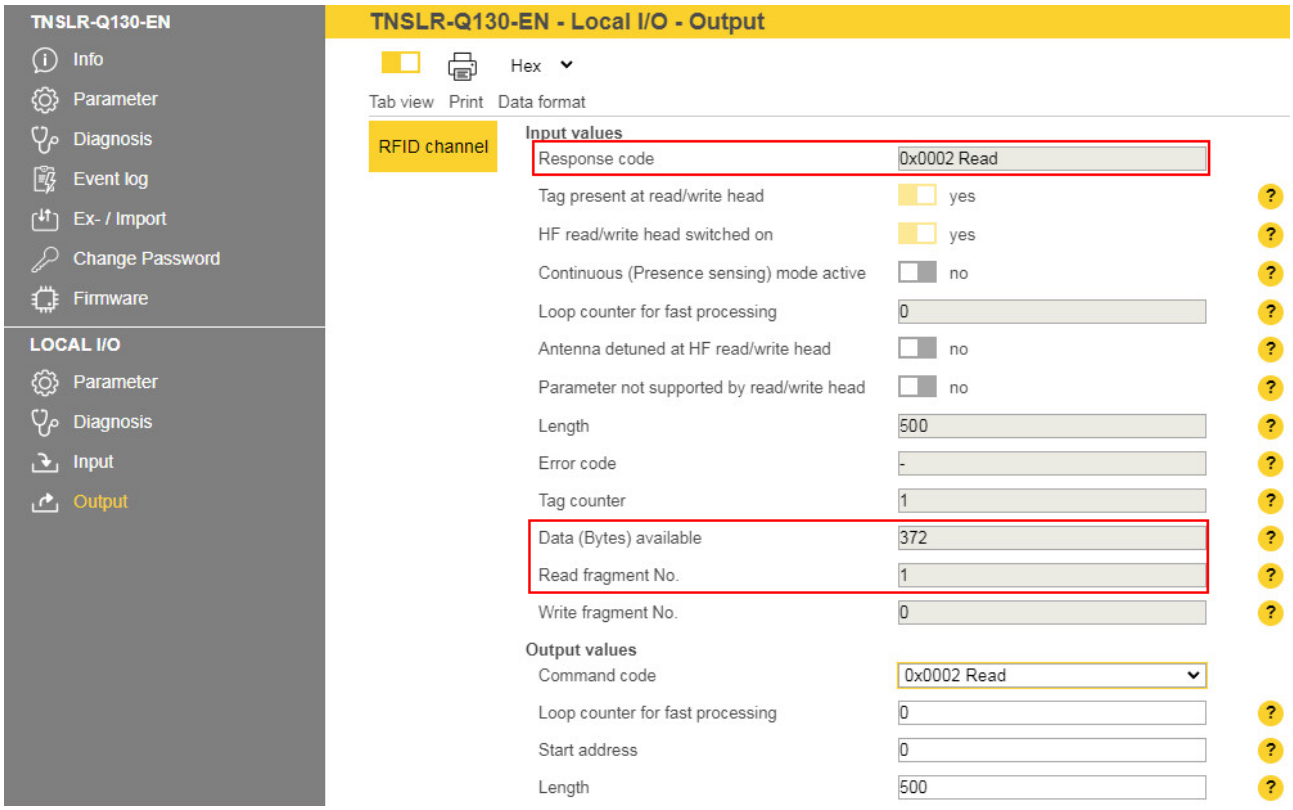


Fig. 56: Fragmentation – input data

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

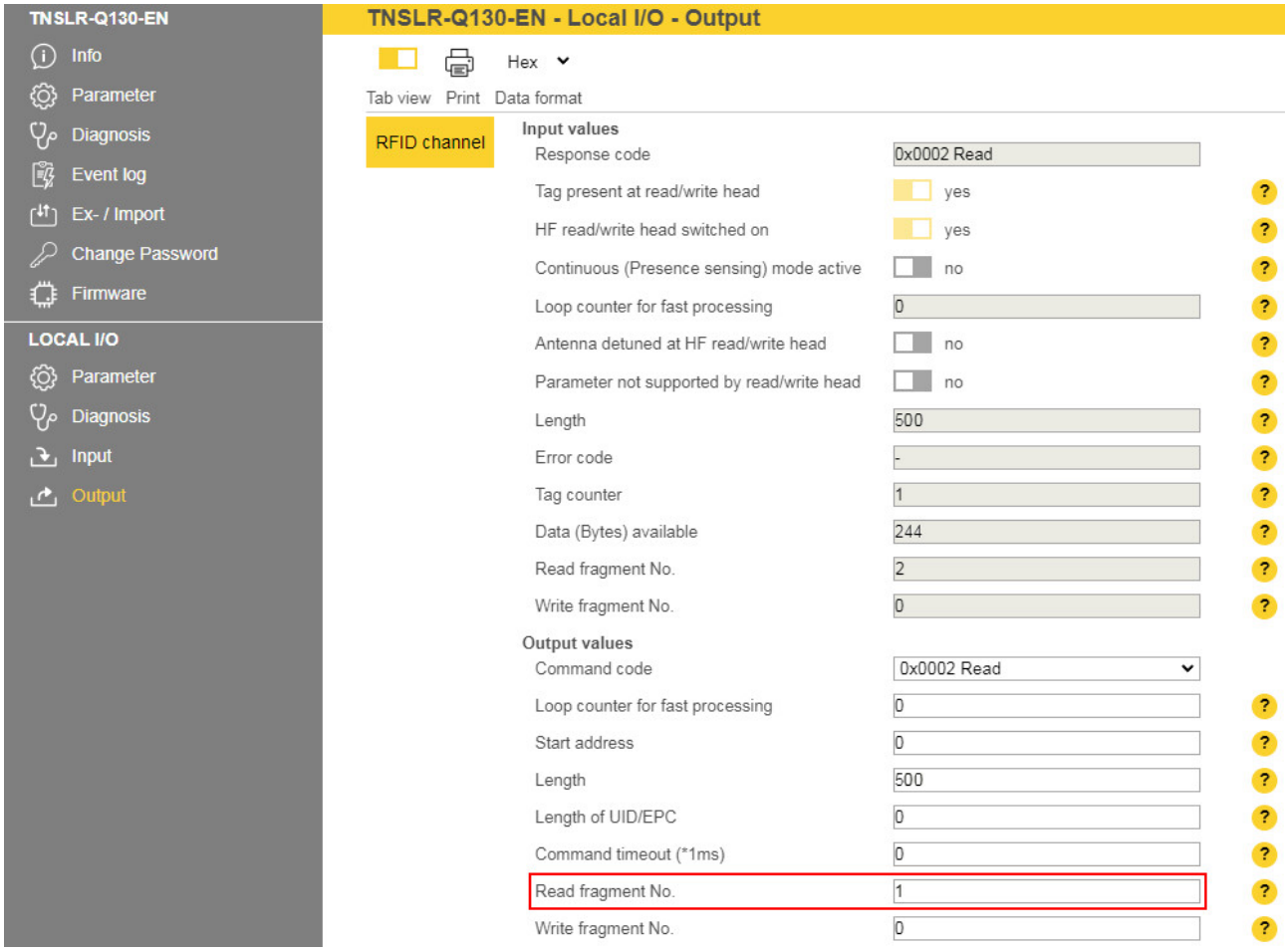


Fig. 57: Fragmentation – read second fragment

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 in the read/write head 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**.

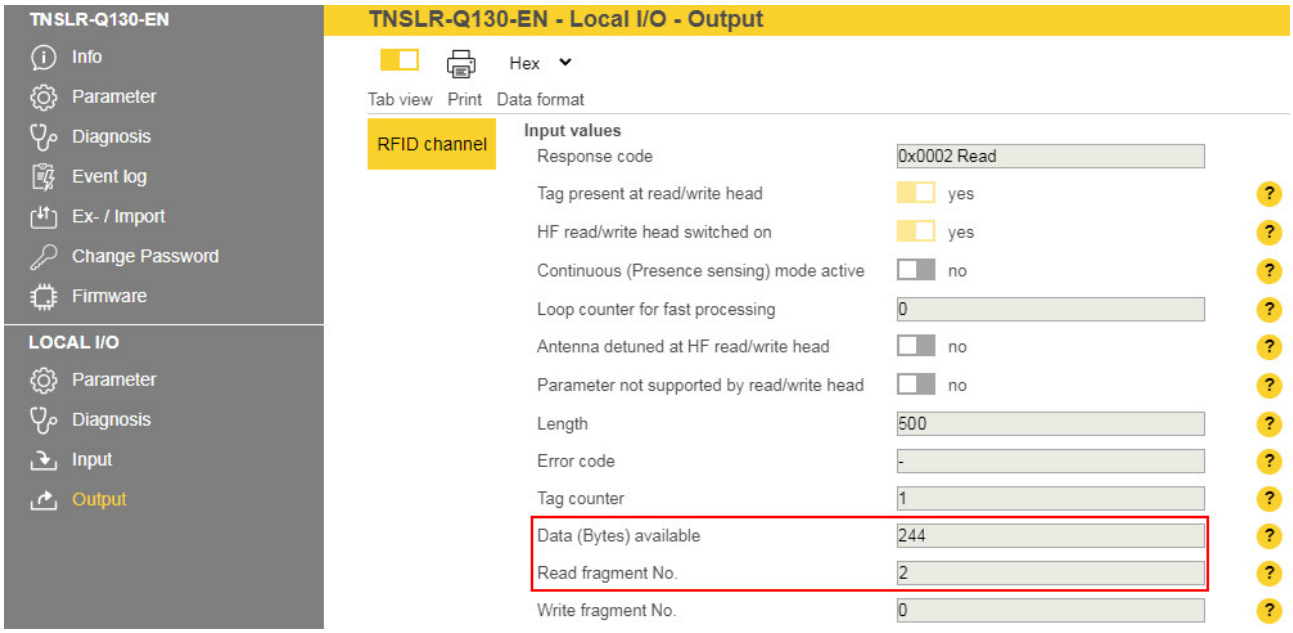


Fig. 58: Fragmentation – input data of the second fragment

▶ Repeat the operation until no more data is present in the read/write head.

⇨ If no more data is present in the read/write head **Read fragment No.** will show the value **0**.

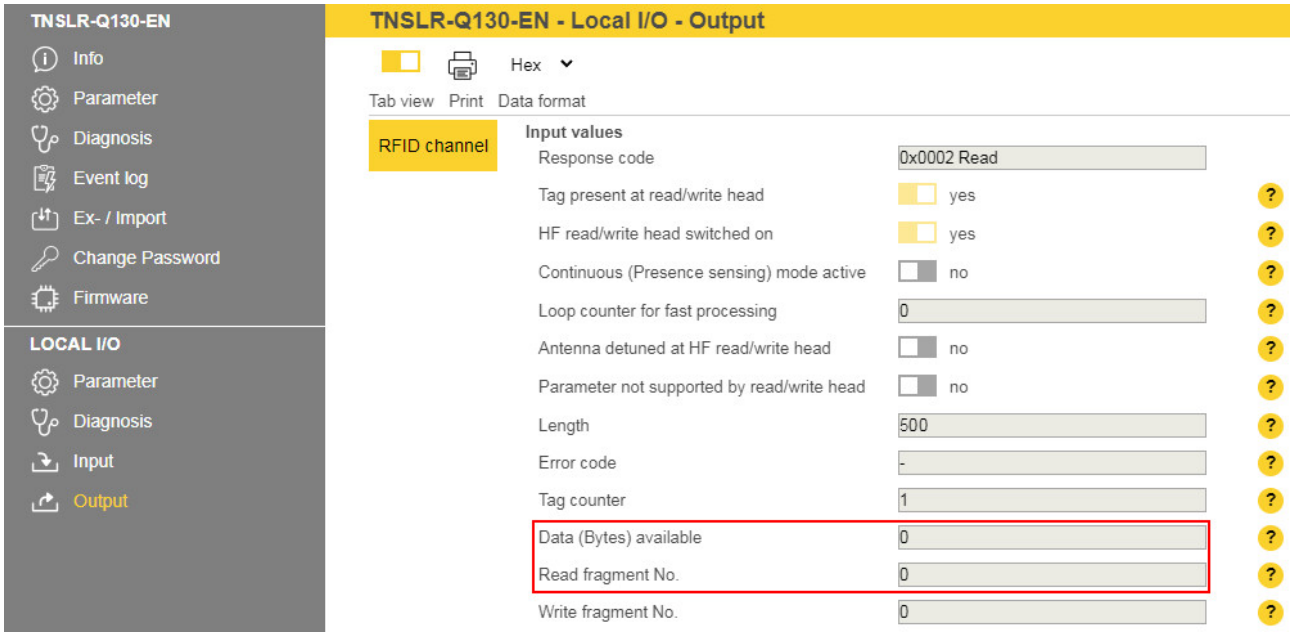


Fig. 59: Fragmentation – no more data present

9.3.2 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** → **Parameter** → set **Operation mode** to **HF extended**.
- Save the set operating mode by clicking on **Write**.

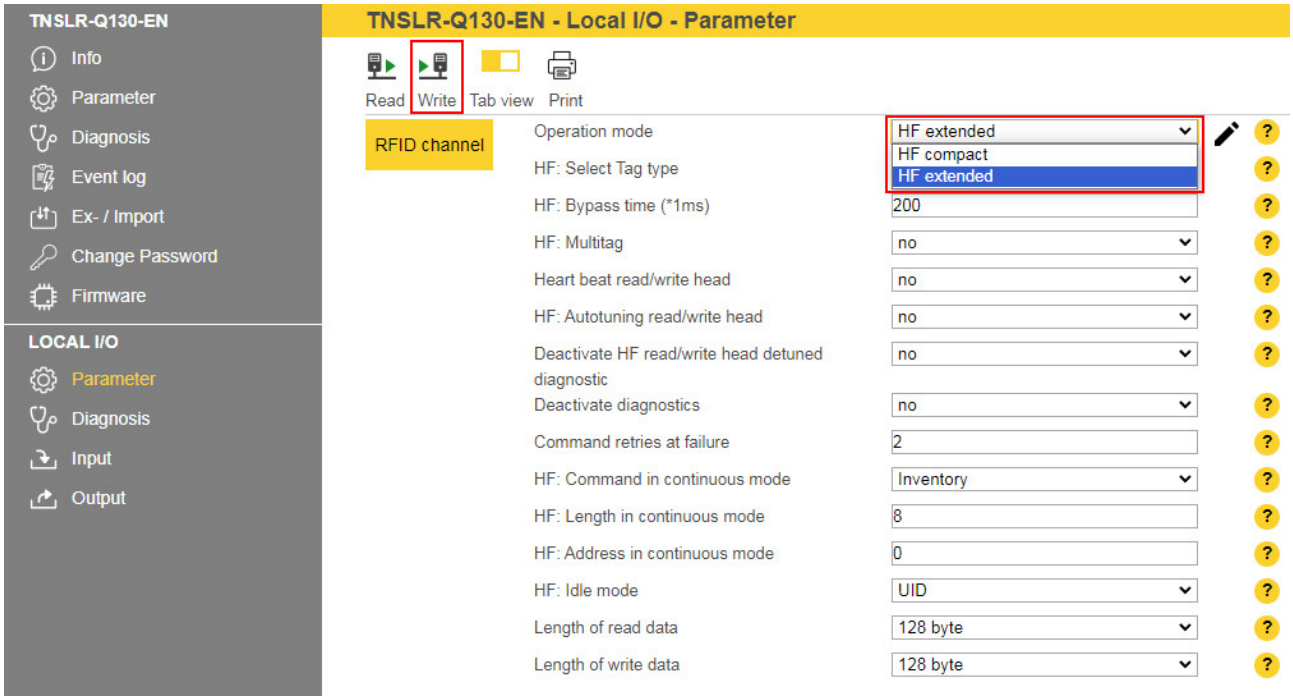


Fig. 60: Fragmentation – selecting the operating mode

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 in the read/write head.

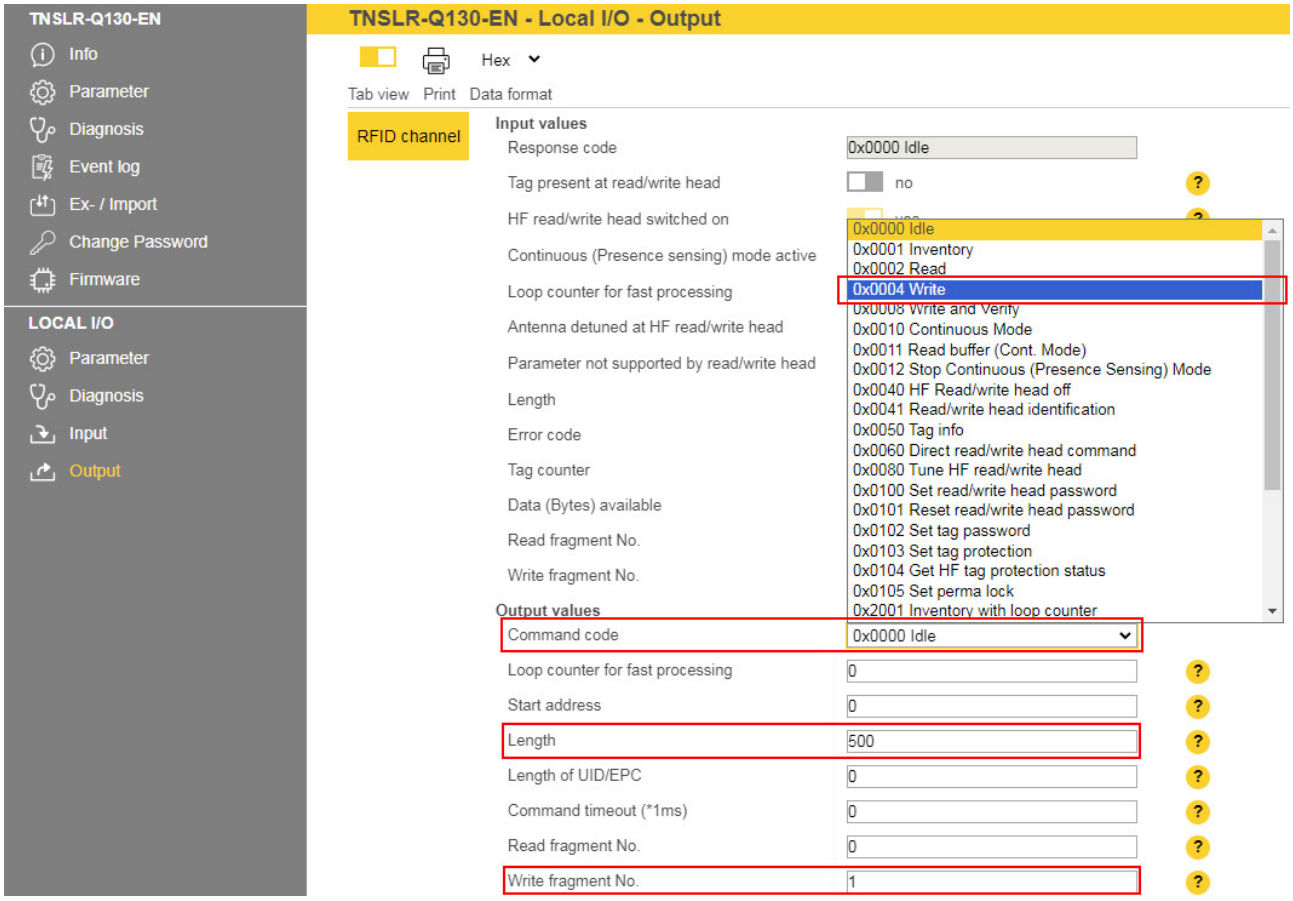


Fig. 61: Fragmentation – executing a write command

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 in the read/write head and were not yet written to the tag
- **Write fragment No.**: Sequential number of the fragment with the write data (here: **1**)

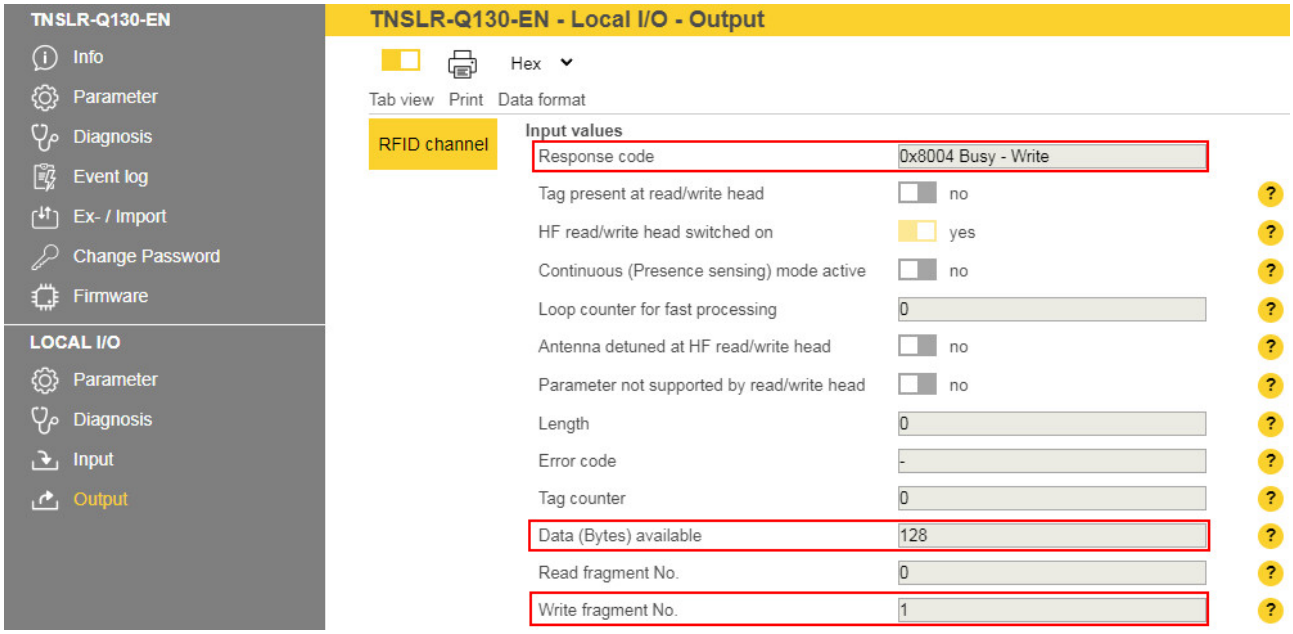


Fig. 62: Fragmentation – input data

- 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 read/write head 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.

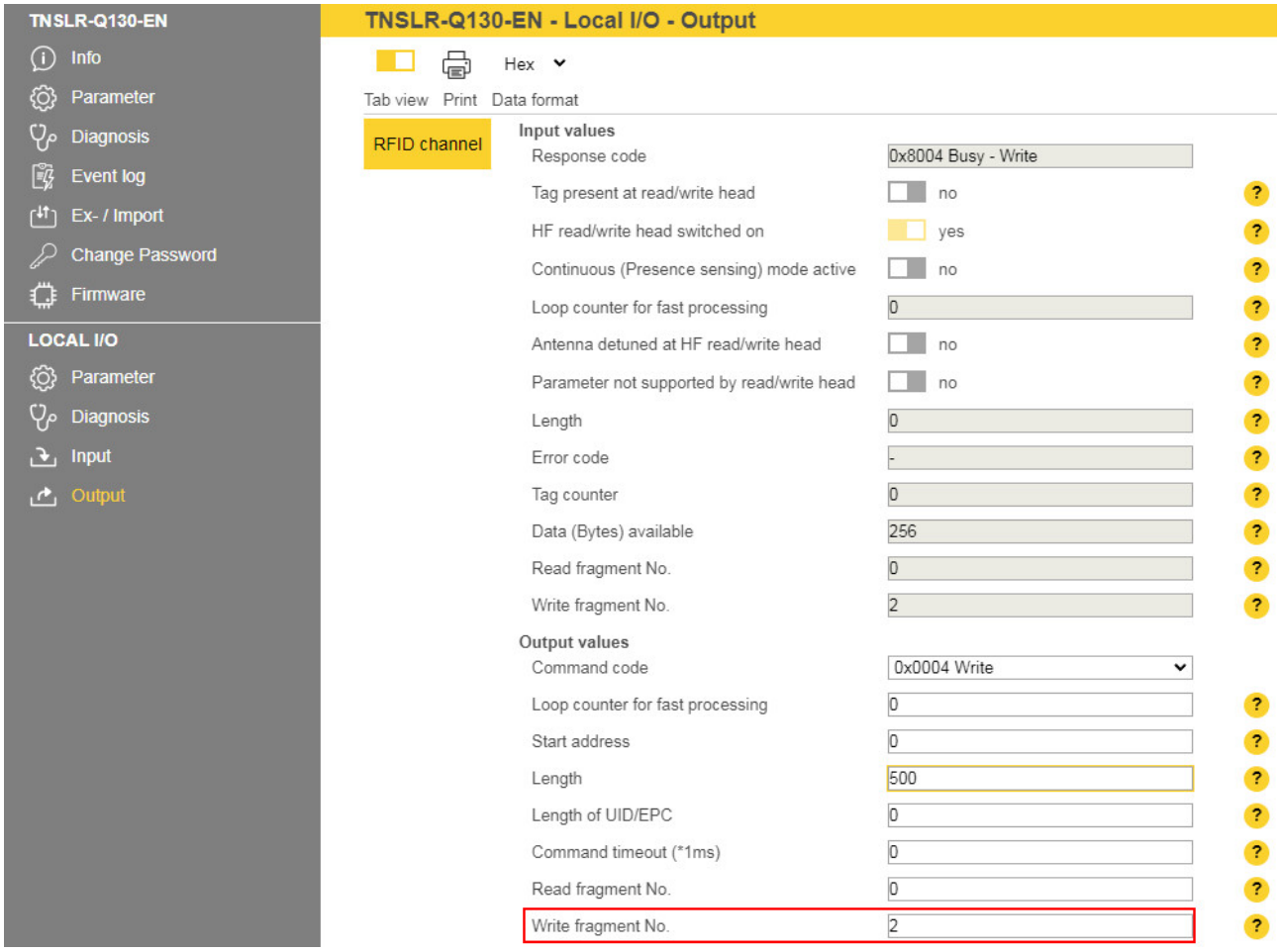


Fig. 63: Fragmentation – write second fragment

▶ Repeat the operation until all data is present on the read/write head.

⇨ If the data was successfully written to the tag, the **Response code** changes to **0x0004 Write**.

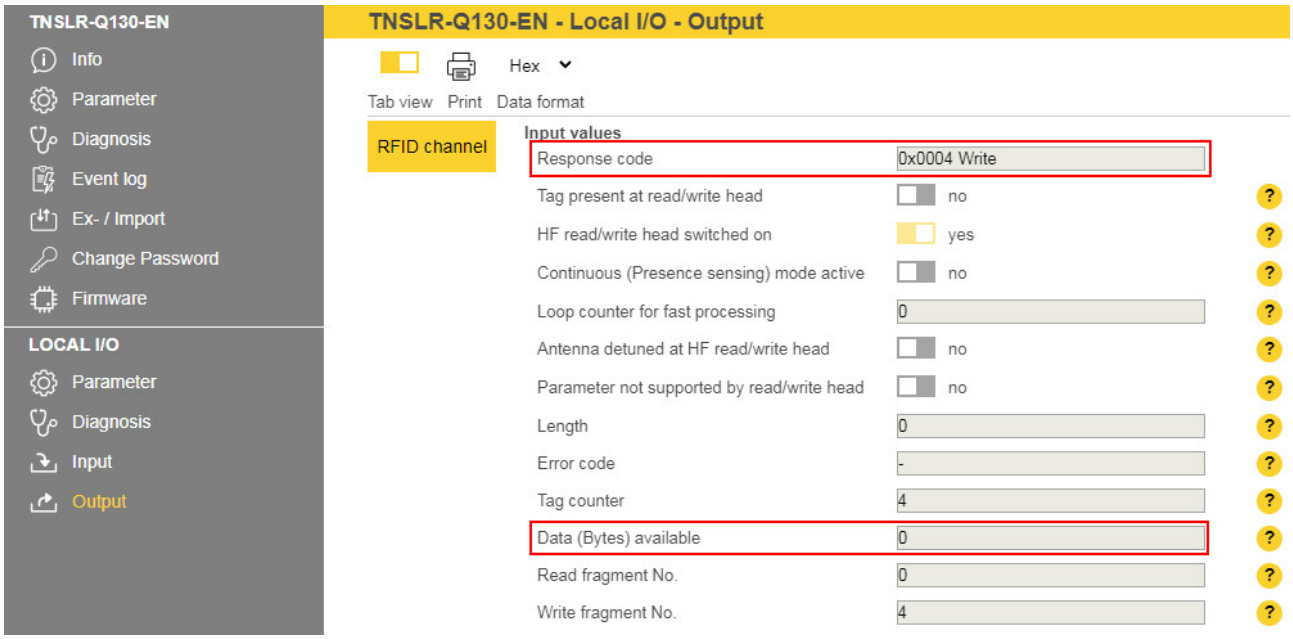


Fig. 64: Fragmentation — no more data present in the read/write head

9.4 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.

9.4.1 Example: using NEXT mode for a read command

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

▶ Set the read command in the process output data.

▶ Set NEXT mode: Specify the value -1 in the process output data under **UID Length**.

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

The controller sends a second read command to the read/write head in NEXT mode. The read/write head will not read data when tag A is within the read/write head detection range.

The read/write head reads data from tag B when tag B is within the read/write head detection range.

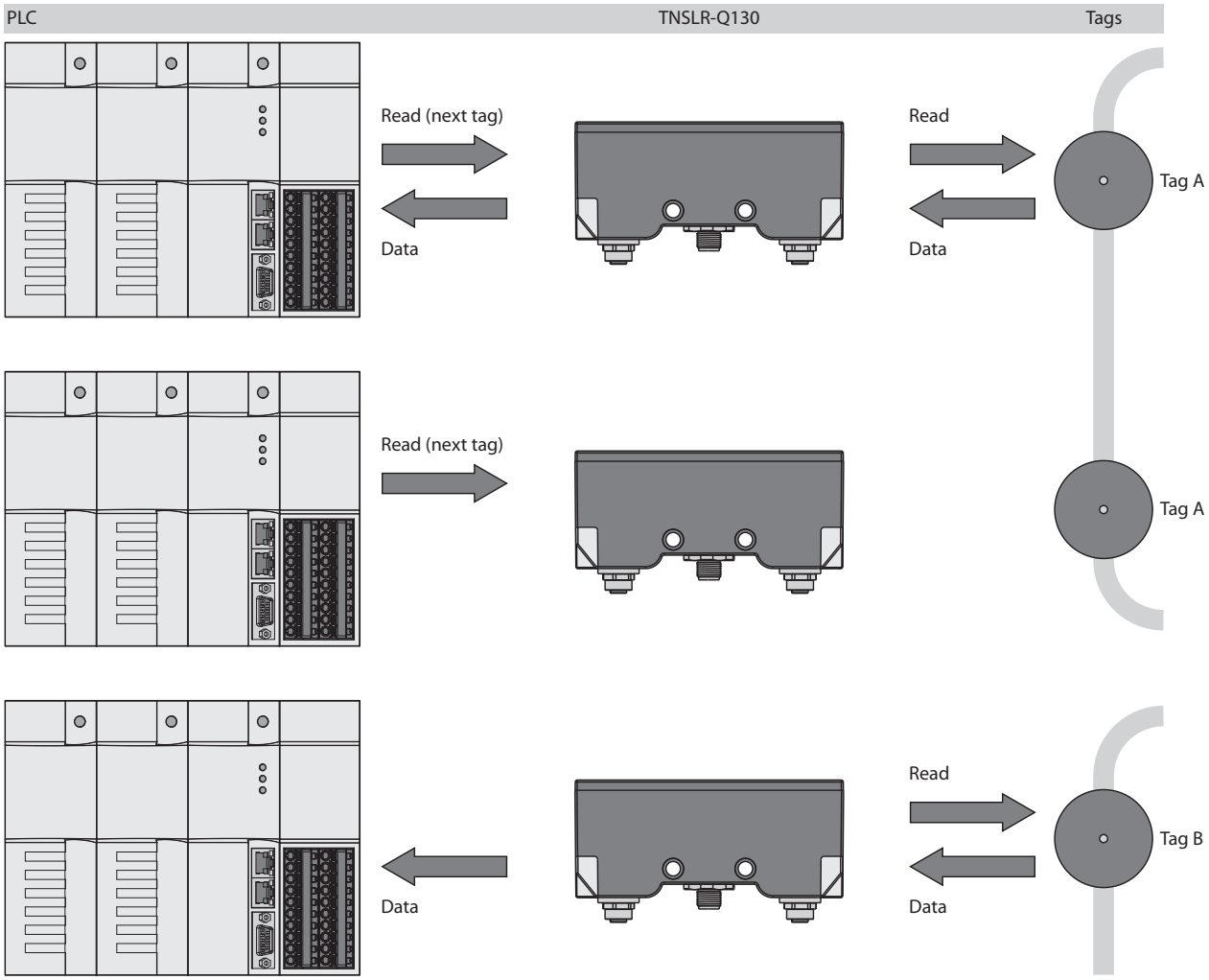


Fig. 65: NEXT mode (layout)

9.5 Using the Inventory command and continuous mode

Inventory command and continuous mode differ in terms of their data transfer to the PLC system. Continuous mode is suitable for high-speed applications, in which a command (e.g. read or write) is to be performed repeatedly. 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**
Triggered reading of UID	■ Repeated reading of UIDs ■ 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.
No buffering on the read/write head	No buffering on the read/write head
Terminate command: 1. Timeout 2. Automatically after command execution	Terminate command: 1. Timeout 2. Separate command

9.6 LEDs

PWR LED	Meaning
off	No voltage or undervoltage at V1
green	Voltage at V1 error-free

BUS LED	Meaning
off	No voltage present
green	Connection to a master present
Green flashing	Device is operational
red	IP address conflict or Modbus connection timeout
Red flashing	Wink command active
Red/green flashing	Auto-negotiation and/or DHCP/BootP search of the settings

ERR LED	Meaning
off	No voltage present
green	No diagnostics, device free of errors
red	Diagnostics present

P1 and P2 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

HF LED	Meaning
green	Ready for operation
Green flashing (1 Hz)	HF field (read/write head antenna) switched off
Green flashing (2 Hz)	Tag in detection range

AT LED	Meaning
Yellow flashing (2 Hz)	Too much metal in the vicinity of the read/write head, range significantly reduced

Wink LED	Meaning
White flashing	Wink command active

9.7 Software Diagnostics Messages

9.7.1 Diagnostic messages — gateway functions

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

Meaning of the diagnostic bits

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

9.8 Reading error codes

The error codes are part of the process input data.

Error code (hex)	Error code (dec)	Meaning
0x8000	32768	Channel not active
0x8001	32769	Read/write head not connected
0x8002	32770	Memory full
0x8003	32771	Block size of the tag not supported
0x8004	32772	Length larger than the size of the read fragment
0x8005	32773	Length larger than the size of the write fragment
0x8100	33024	Parameter undefined
0x8101	33025	"Operating mode" parameter outside of the permissible range
0x8102	33026	"Tag type" parameter outside of the permissible range
0x8103	33027	"Operating mode" parameter in continuous mode outside of the permissible range
0x8104	33028	"Length" parameter in continuous mode outside of the permissible range
0x8105	33029	Size of the write fragment outside of the permissible range
0x8106	33030	Size of the read fragment outside of the permissible range
0x81FD	33021	"Bypass time" parameter outside of the permissible range
0x81FE	33022	Address parameter in continuous mode outside of the permissible range
0x81FF	33023	No read/write head selected
0x8200	33280	Command code unknown
0x8201	33281	Command not supported
0x8202	33282	Command not supported in HF applications
0x8204	33284	Command for multitag applications 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
0x8212	33298	Length and address outside of the tag specification

Error code (hex)	Error code (dec)	Meaning
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
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 infringes the block limits
0x8306	33542	HF: Address in continuous mode infringes the block limits
0x8307	33543	HF: Length in continuous mode outside of the permissible range
0x0801	2049	Write or read error
0x2200	8704	Automatic tuning active
0x2201	8705	Automatic tuning failed
0x2202	8706	Read/write head not tuned
0x2500	9472	Password function of the tag not supported
0x2501	9473	Password function not supported by read/write head
0x2900	10496	Address outside of the block limits
0x2901	10497	Length outside of the block limits
0xC000	49152	Internal error (response of the read/write head too short)
0xC001	49153	Command not supported by read/write head version
0xB0…	45…	HF read/write head reports error
0xB048	45128	Error when switching on the HF read/write head
0xB049	45129	Error when switching off the HF read/write head
0xB060	45152	Error with the 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
0xB0BD	45245	Error when setting the transmission rate
0xB0DA	45274	Error with the "Tag in detection range" function
0xB0E0	45280	Error when reading the read/write head version

Error code (hex)	Error code (dec)	Meaning
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
0xD106	53510	Error with the tag function
0xF0…	61…	ISO 15693 error
0xF001	61441	ISO 15693 error: Command not supported
0xF002	61442	ISO 15693 error: Command not detected, e.g. incorrect input format
0xF003	61443	ISO 15693 error: Command option not supported
0xF00F	61455	ISO 15693 error: undefined error
0xF010	61456	ISO 15693 error: Addressed memory area not available
0xF011	61457	ISO 15693 error: Addressed memory area locked
0xF012	61458	ISO 15693 error: Addressed memory area locked and not writable
0xF013	61459	ISO 15693 error: Write operation not successful
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
0xF110	61712	Air interface error: Tag does not have the expected UID
0xF201	61953	HF read/write head faulty
0xF202	61954	HF read/write head: Error in command execution
0xF204	61956	HF read/write head: Transmission error, check syntax
0xF208	61960	Power supply of the HF read/write head too low
0xF20A	61962	HF read/write head: Command code unknown
0xFFFE	65534	Timeout on the RS485 interface
0xFFFF	65535	Command aborted

10 Troubleshooting

If the device does not function as expected, first check whether ambient interference is present. If there is no ambient interference present, check the connections of the device for faults.

If there are no faults, there is a device malfunction. In this case, decommission the device and replace it with a new device of the same type.

If the device does not work as expected, proceed as follows:

- Exclude environmental disturbances.
- Check the connections of the device for errors.
- Check device for parameterization errors.

If the malfunction persists, the device is faulty. In this case, decommission the device and replace it with a new device of the same type.

11 Maintenance

11.1 Updating the firmware via TAS

NOTICE
Interruption of the power supply during the firmware update
Risk of device damage due to faulty firmware update
- ▶ Do not interrupt the power supply during the firmware update.
- ▶ During the firmware update do not reset the power supply.
- ▶ Do not interrupt the Ethernet connection during the firmware update.

NOTE
The firmware update function in TAS is locked when the controller connection is active. The device must first be disconnected from the controller before performing the update.

Starting a firmware update for a device

- ▶ Open TAS.
- ▶ Open the network view and scan the network.
- ▶ Select the device.
- ▶ Click **Firmware update**.
- ▶ In the following dialog: Click **Select file** and open the directory of the firmware file.
- ▶ Select the new firmware file and load it via **Open**.
- ▶ Click **Start** to start the firmware update.
- ▶ Enter the device password and click **Login**

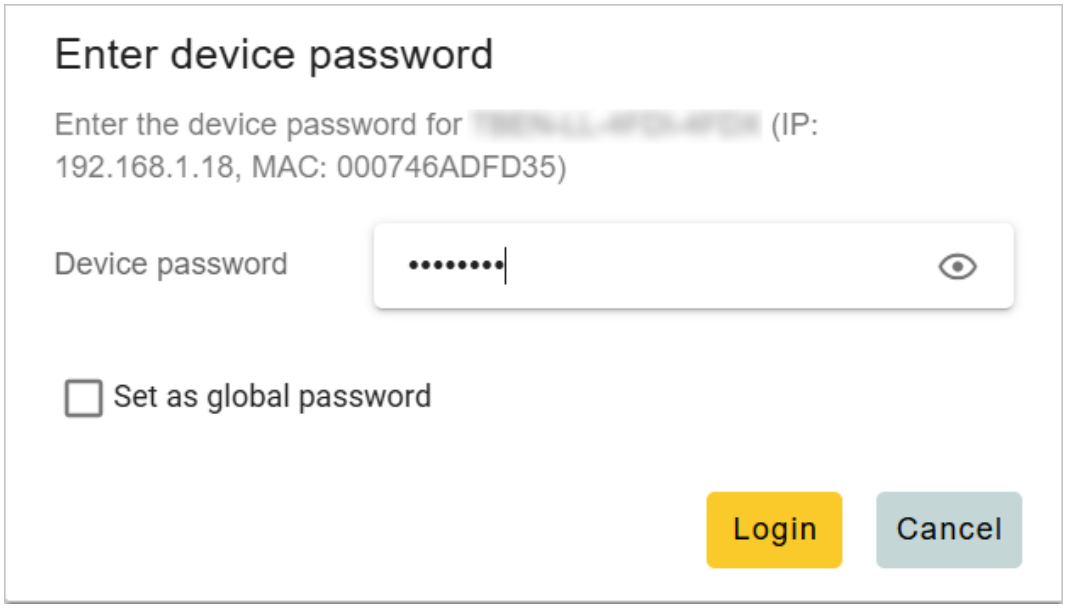


Fig. 66: Entering the device password

⇨ The progress of the firmware update is displayed.

NOTE
TAS makes it possible to set a global password with which all devices can be unlocked. This requires that all selected devices have the same device password and are in the same TCP network.

As an alternative to selecting a single device, it is also possible to select multiple devices. To do so, all devices to be updated must correspond to the same device type and be in the same TCP network.

This enables a firmware update to be performed for multiple devices at once.

Starting a firmware update for multiple devices

- Select all desired devices in the network view using the checkbox.
- Click **FW Update** in the header.

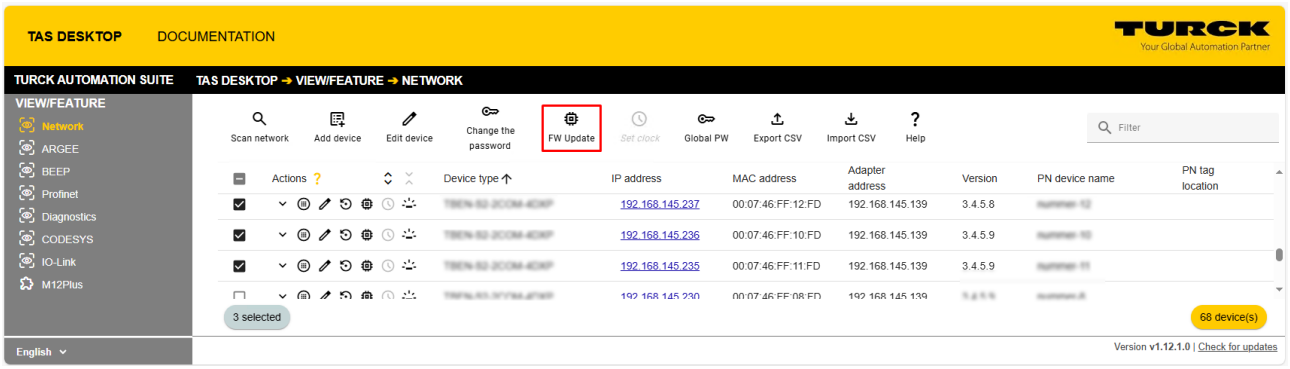


Fig. 67: Firmware update network view multiple devices

- In the following dialog: Click **Select file** and open the directory of the firmware file.
- Select the new firmware file and load it via **Open**.
- Click **Start** to start the firmware update.
- If a global password has not yet been defined: Enter the password and activate the **Set as global password** option.
  Note: If a global password has not yet been defined and the **Set as global password** option is not activated, the password is requested individually for each device.
- Click **Login**.

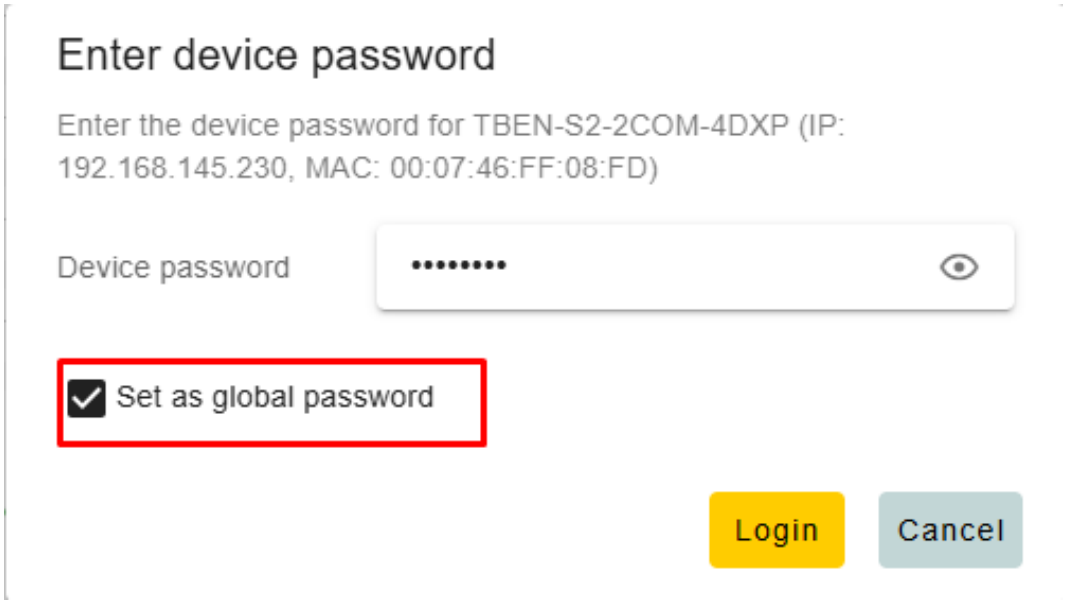


Fig. 68: Entering the device password and setting it as global password

➪ The progress of the firmware update is displayed.

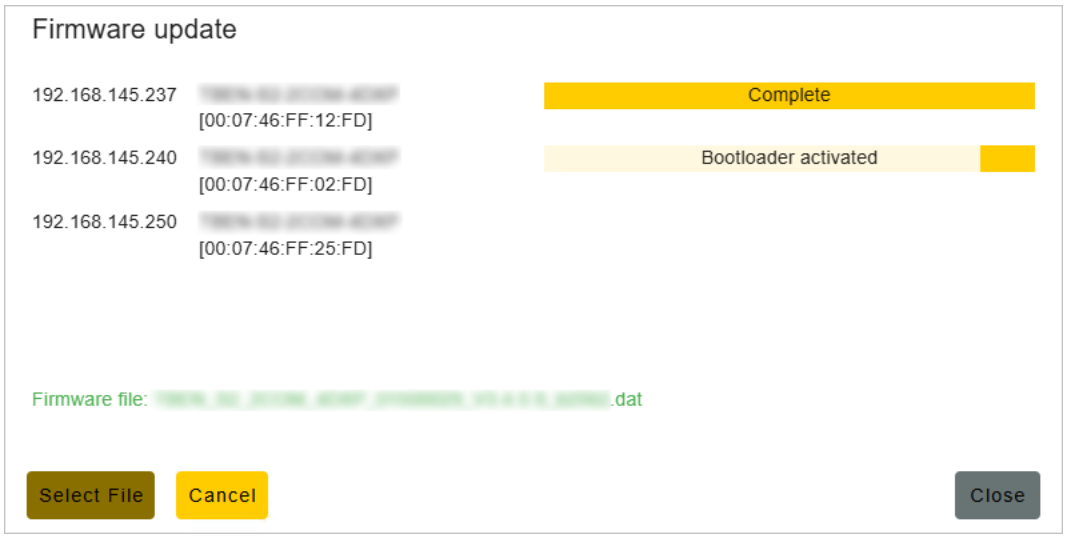


Fig. 69: Firmware update, progress

11.2 Updating the firmware via web server

NOTICE
Interruption of the power supply during the firmware update
Risk of device damage due to faulty firmware update
- ▶ Do not interrupt the power supply during the firmware update.
- ▶ During the firmware update do not reset the power supply.
- ▶ Do not interrupt the Ethernet connection during the firmware update.

- ▶ Open the web server.
- ▶ Log into the device as administrator. The default password for the web server is "password".
- ▶ Click **Firmware** → **SELECT FIRMWARE FILE**.
- ▶ Select a new firmware file and load it by clicking **Open**.

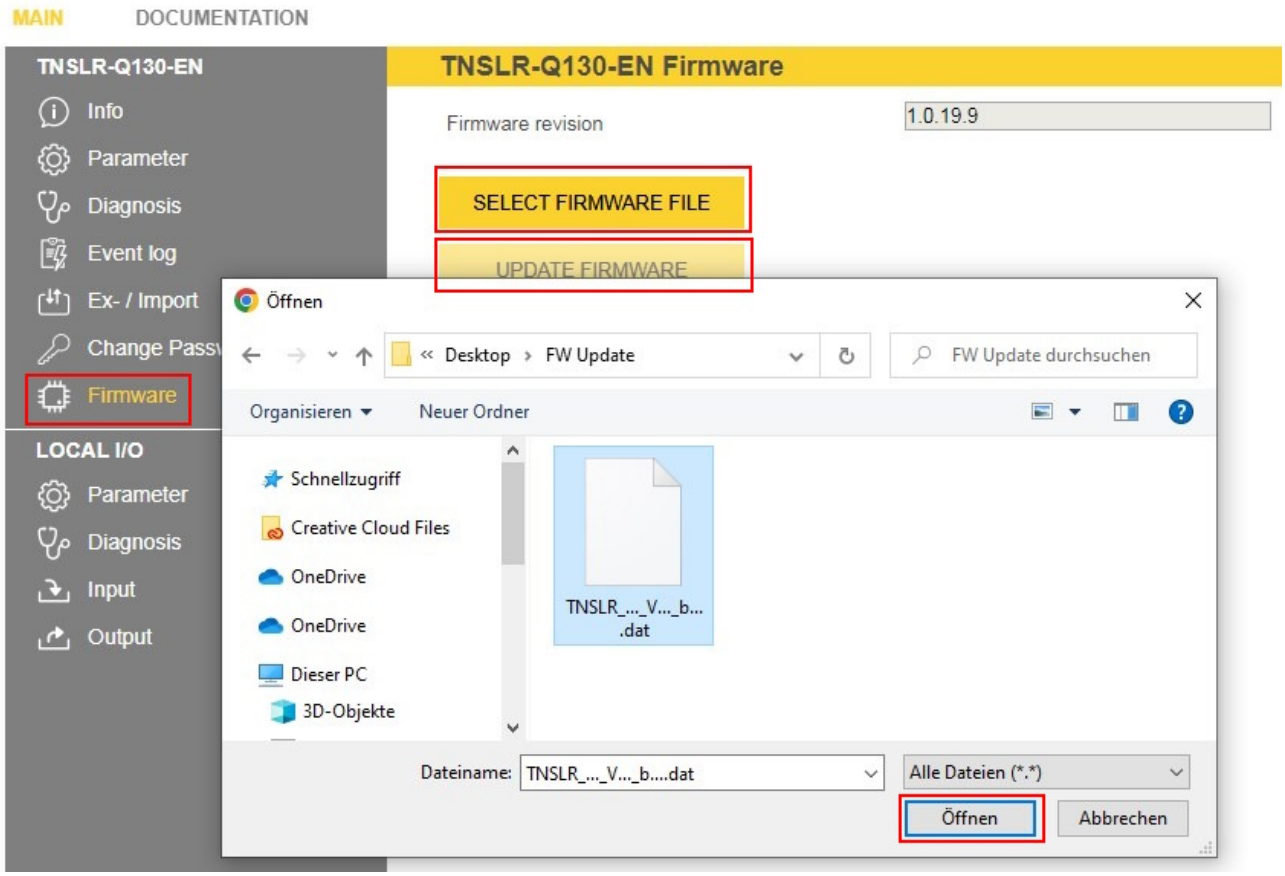


Fig. 70: Web server — firmware update

- ▶ Click **UPDATE FIRMWARE** and start the firmware update.
- ▶ Restart the device after the update process is complete by clicking **OK**.

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
https://www.turck.de/en/return-service-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	
Electrical data	
Operating voltage	18…30 VDC
Data transfer	Inductive coupling
Operating frequency	13.56 MHz
Radio communication and protocol standards	ISO 15693, NFC type 5
Output function	Read/write
Mechanical data	
Mounting condition	Non-flush
Ambient temperature	-40…+70 °C
Storage temperature	-40…+85 °C
Housing material	Plastic, PPS-GF30, black
Material of active face	Plastic, PPS-GF30, black
Vibration resistance	55 Hz (1 mm)
Shock resistance	30 g (11 ms)
Protection class	IP69K front, IP67 rear
System data	
Ethernet transmission rate	10 Mbps/100 Mbps
Web server	Default: 192.168.1.254
Modbus TCP	
Addressing	Static IP, BOOTP, DHCP
Supported function codes	FC1, FC2, FC3, FC4, FC5, FC6, FC15, FC16, FC23
Number of TCP connections	8
EtherNet/IP	
Addressing	Acc. to EtherNet/IP specification
Device level ring (DLR)	Supported
Input Assembly Instance	103
Number of input data (PAE)	248
Output Assembly Instance	104
Number of output data (PAA)	248
Class1 connections	10
Class3 connections	3
Configuration Assembly Instance	106
PROFINET	
Addressing	DCP
MinCycleTime	4 ms
Diagnostics	Acc. to PROFINET alarm handling
Automatic addressing	Supported
Media Redundancy Protocol (MRP)	Supported
Number of input data (PAE)	Max. 512
Number of output data (PAA)	Max. 512

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

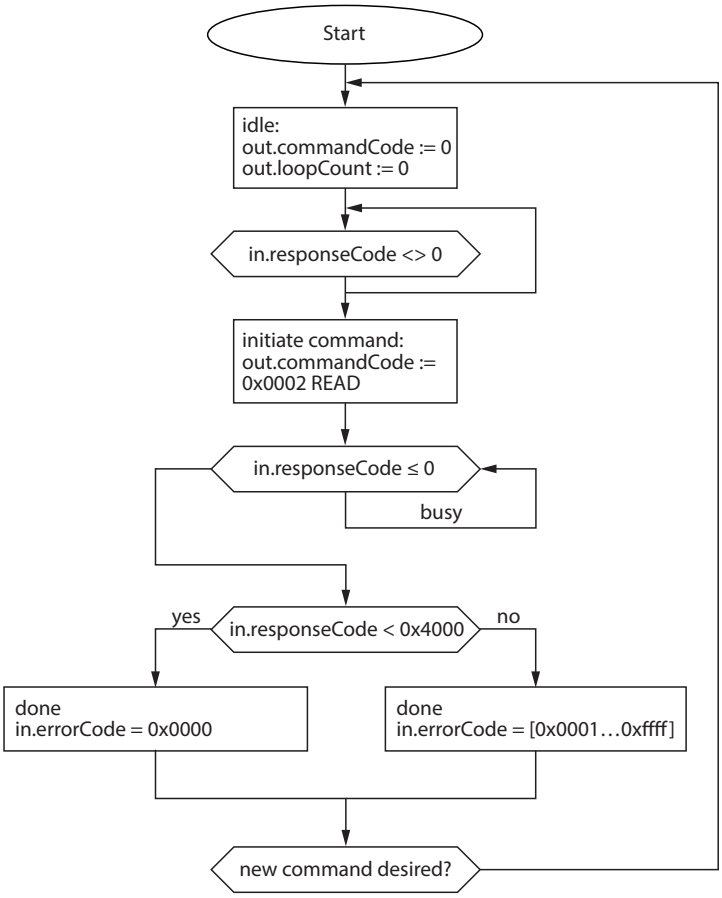


Fig. 71: Flow chart for command processing

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

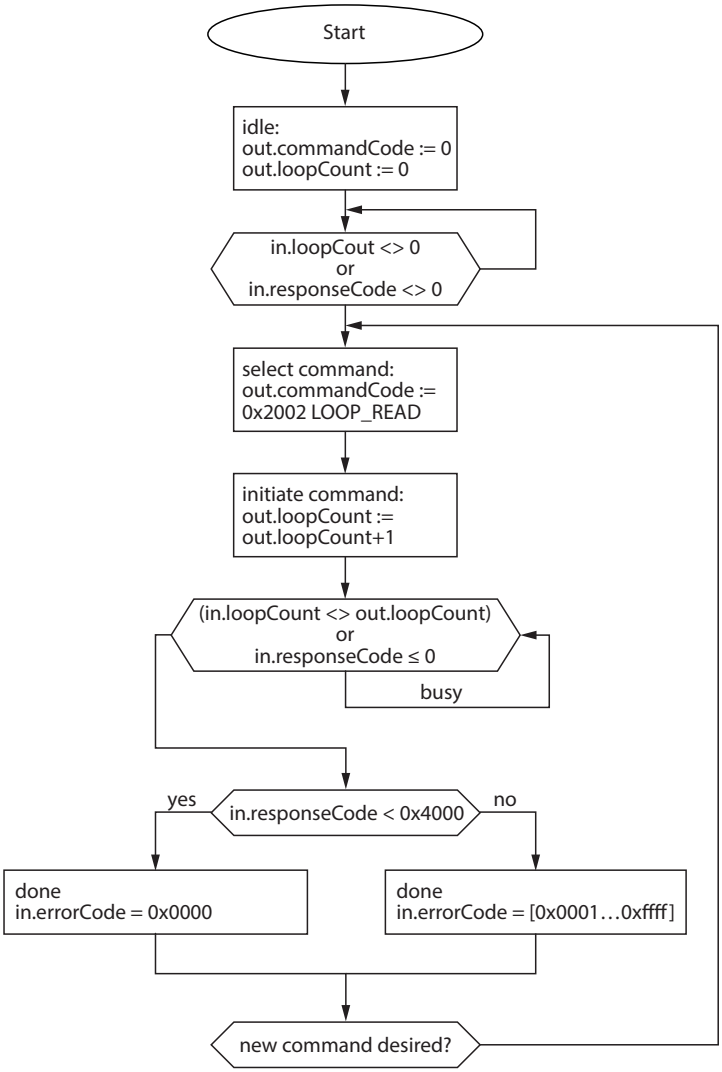


Fig. 72: Flow chart for fast command processing with loop counter

15.3 Flow chart: command processing with fragmentation

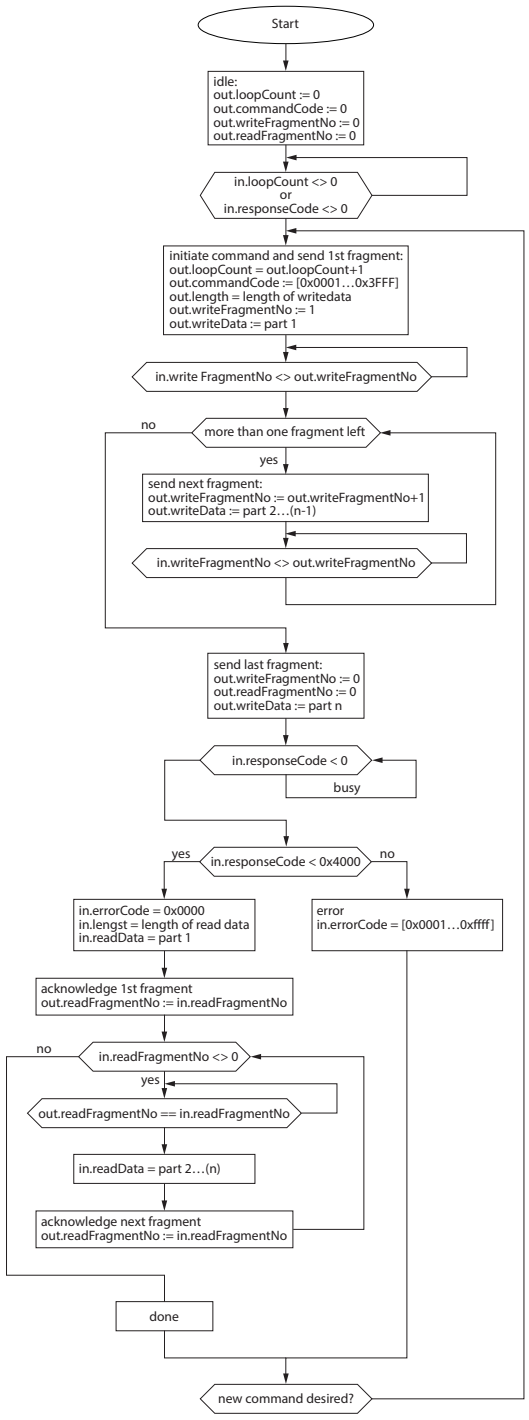


Fig. 73: Flow chart for command processing with fragmentation

15.4 Flow chart: Continuous Mode with interruption before reading data

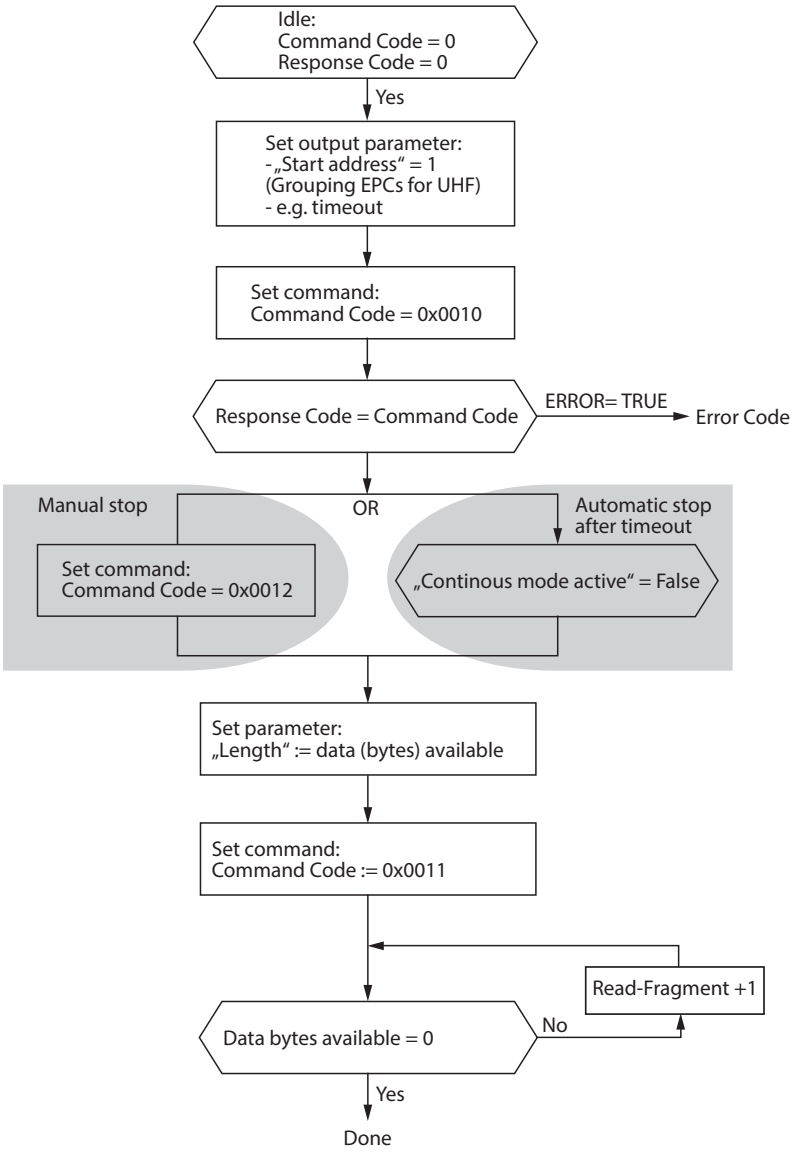
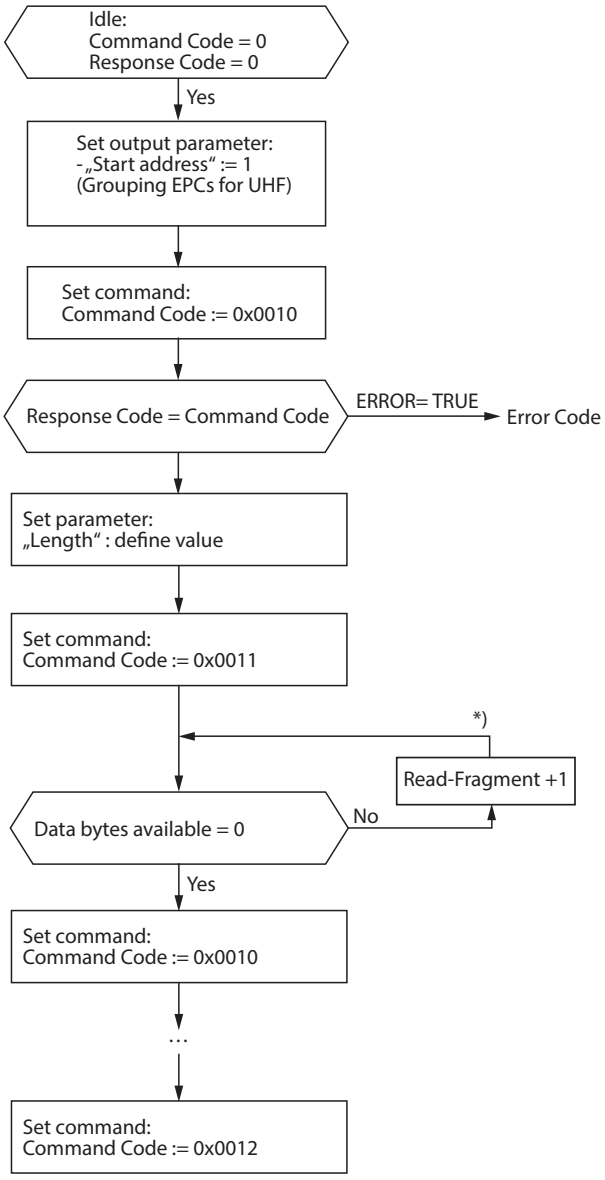


Fig. 74: Flow chart for Continuous Mode with interruption before reading data

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. 75: Flow chart for Continuous Mode without interruption before reading data

15.6 Flow chart: programming tags with a password

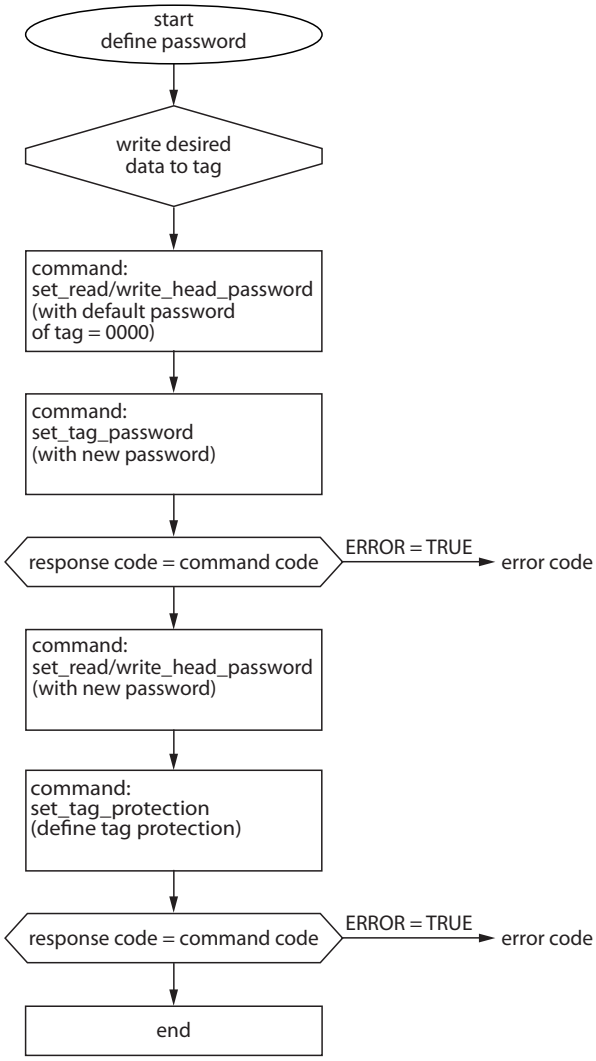


Fig. 76: programming tags with a password

16 TURCK branches — contact data

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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 N. V. 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
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Japan	TURCK Japan Corporation ISM Akihabara 1F, 1-24-2, Taito, Taito-ku, 110-0016 Tokyo www.turck.jp

Korea	Turck Korea Co, Ltd. A605, 43, Iljik-ro, Gwangmyeong-si 14353 Gyeonggi-do www.turck.kr
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