Your Global Automation Partner

TURCK

TBEN-S2-2COM-4DXP
Compact I/O Module for Serial Data Transmission

Instructions for Use

Table of Contents

1 About these Instructions

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

1.1 Target Groups

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

1.2 Explanation of symbols used

The following symbols are used in these instructions:

DANGER!

DANGER indicates an immediately dangerous situation, with high risk, the death or severe injury, if not avoided.

WARNING!

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

ATTENTION!

ATTENTION indicates a situation that may lead to property damage, if it is not avoided.

NOTE

In NOTES you find tips, recommendations and important information. The notes facilitate work, provide more information on specific actions and help to avoid overtime by not following the correct procedure.

➤ CALL TO ACTION

This symbol identifies steps that the user has to perform.

↪ RESULTS OF ACTION

This symbol identifies relevant results of steps

1.3 Additional Documents

The following additional documents are available online at **www.turck.com**:

- Data sheet
- TBEN-Accessories list (**D301367**)

1.4 Feedback about these instructions

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

2 Notes on the Product

2.1 Product Identification

These instructions apply for the following compact serial interface modules:

- TBEN-S2-2COM-4DXP

2.2 Scope of Delivery

The delivery scope contains:

- TBEN-S2-2COM-4DXP
- Closure caps for M12 female connectors

2.3 Legal Requirements

The device falls under the following EU directives:

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

2.4 Manufacturer and Service

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

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

Should you have any further questions, please contact the sales and service team in Germany under the following telephone numbers:

Sales: +49 208 4952-380

Technology: +49 208 4952-390

Internet: **www.turck.de**

Outside Germany, please contact your local Turck representative.

3 For Your Safety

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

3.1 Intended Use

The devices are only intended for use in industrial applications.

The block module TBEN-S2-2COM-4DXP offers two serial interfaces for connecting serial RS232 and RS482 data terminal devices.

Besides the raw RS232/RS485-communication, the device supports Modbus RTU. 32 Modbus RTU server can be connected per port.

Additionally, the module provides 4 universal digital channels. The multiprotocol interfaces can be used as EtherNet/IP™ Device, Modbus TCP Slave, oder PROFINET® Device.

The devices may only be used as described in this manual. 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 may only be assembled, installed, operated and maintained by professionally trained personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.
- The device only meets the EMC requirements for industrial areas and is not suitable for use in residential areas.

4 Product Description

The devices are designed in a fully encapsulated housing with degree of protection IP65/IP67/IP69K. Two ports are available for connecting devices with serial interfaces. You can also connect sensors and actuators via 4 digital I/O channels which can be used as inputs and outputs without configuration. The terminals for serial devices and digital I/Os are M12 sockets. Two 4-pole M8 sockets are provided for the Ethernet connection. The supply voltage is also connected using two 4 pole M8 connectors.

4.1 Device Overview

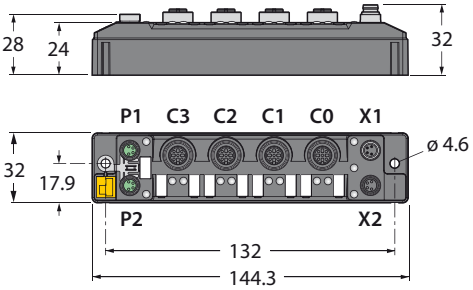


Fig. 1: Dimensions

4.2 Display Elements

The devices have multi-color LEDs with the following functions:

- Supply voltage
- Group and bus errors
- Status
- Wink function

4.3 Properties and Features

- Multiprotocol functionality PROFINET IO Device, EtherNet/IP™ Device, Modbus TCP Slave
- 2x M8, 4-pole, Ethernet connection
- Integrated Ethernet switch, allows line topology
- Transmission speed 10 Mbps/100 Mbps
- 4-pole M8-connectors for voltage supply
- Separated power groups for safety shutdown
- Two serial interface which can be used as RS232 or RS485
- Integrated Modbus RTU Client function for connecting up to 32 Modbus RTU Server per port
- Four universal digital channels as PNP inputs or outputs (0,5 A)
- 192 byes per port per write or read operation
- Integrated web server
- LED displays and diagnostics
- Fibre-glass reinforced housing
- Shock and vibration tested
- Fully potted module electronics
- Degree of protection IP65/IP67/IP69K

4.4 Functional Principle

The devices provide a multiprotocol Ethernet interface for Modbus TCP, EtherNet/IP™ and PROFINET. The device is connected to Ethernet as PROFINET IO Device, EtherNet/IP™ Device or Modbus TCP Slave via the Ethernet interface. Process data between Ethernet and TBEN-S are exchanged during runtime. The RS232/RS485 interfaces are used for connecting devices with RS232 and/or RS485 interface (e.g. barcode readers, printers, drives, light curtains, etc.)

4.5 Functions and Operating Modes

4.5.1 Multi protocol functionality

The compact I/O-stations of the TBEN-S product line combine the three Ethernet-protocols:

- PROFINET
- EtherNet/IP™
- Modbus TCP

A multi-protocol 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 start-up, after a power-on, the module runs in "snooping" mode and detects the Ethernet protocol which requests a link connection by listening the traffic.

If a protocol is detected, the device is set automatically to the respective protocol. After this an access to the device from other protocols is read-only.

Manual Protocol Selection

The protocol can also be determined manually. This skips the snooping-phase and the device is permanently set to the selected protocol. An access to the device from other protocols is read-only.

The explicit protocol selection allows thus an additional locking mechanism.

4.5.2 Serial RS232 or RS485 Data Communication

In the RS232 mode one device can be connected to each serial port. In the RS485 mode up to 32 devices can be connected to one port.

Transmit and receive sequence: s. **Transmit and Receive Data, page 141**

4.5.3 Modbus RTU Data Communication

The Modbus RTU data communication is coordinated by the TBEN-S2-2COM-4DXP and is transparent for PLC programmers. The TBEN-S2-2COM-4DXP functions as a Modbus RTU Client (Modbus RTU Master). The process values of connected Modbus RTU Servers (Modbus RTU Slaves) are directly available. In addition to that, the state of all Modbus connections can be monitored.

Modbus Client Mode

The Modbus Client Mode RS232, allows the connection of up to 8 Modbus RTU Servers. The Modbus Client Mode RS485 allows the connection of up to 32 Modbus RTU Servers without any programming effort. Depending on the connected devices, applications with up to 64 RS485-devices are possible .

- Standard mode (s. p. 124)
  - 1 Modbus RTU Server per Server Configuration Block (SCB)
  - max. 8 Modbus RTU Servers per COM port
- Multi server mode (s. p. 125)
  - Up to 12 identical Modbus RTU Servers per Server Configuration Block (SCB)
  - Max. 32 Modbus RTU Servers per COM port, in total max. 64 per TBEN-S2-2COM-4DXP device.
- Read/ write extension (s. p. 126)
  - Connection of Modbus RTU Servers with more than 12 registers, which have to be read or written.

4.6 Configurable Digital Channels

The device provides four digital channels. The channels can be used as input or output without configuration. Each output is short-circuit proof with 0.5 A.

4.7 Technical Accessories

Accessories for mounting, connecting and parameterizing can be found in the Accessories List for TBEN (D301367) under www.turck.com. The accessories are not part of the scope of delivery.

5 Mounting

The device can be mounted on a DIN rail according to EN 60715 (TS35) or screwed onto a mounting plate. Both composite and individual assembly are possible.

5.1 Mounting Module Composites

The TBNN-S0… adapters can be used to build module composites for group assembly.

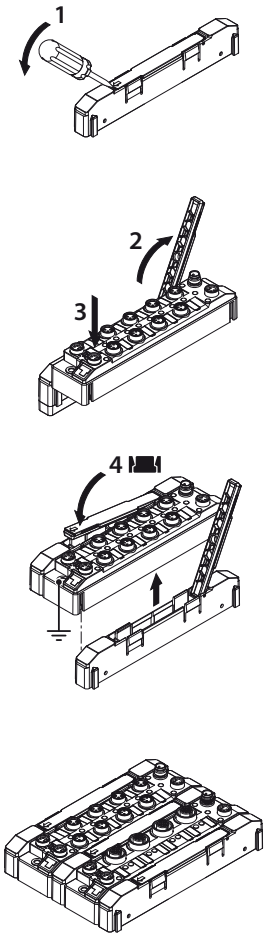


Fig. 2: Build module groups four mounting the devices onto a mounting plate

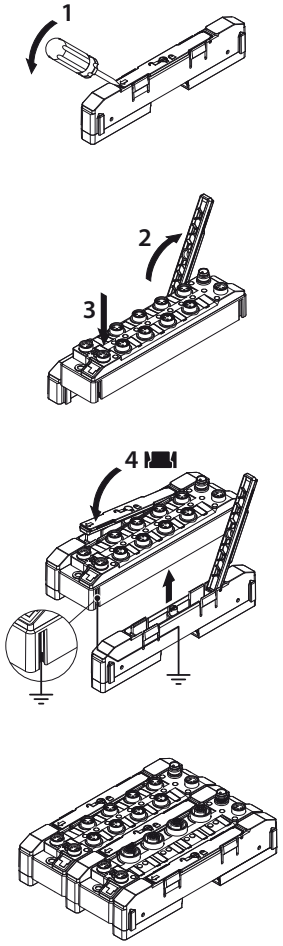


Fig. 3: Build module groups four mounting the devices onto a DIN rail (TS35)

- ➤ Unlock the cover flap with a flat tool (e.g. screw driver) (1).
- ➤ Open the flap completely (2).
- ➤ To join the TBEN-S-module and the spacer, insert the key of the spacer into the slot of the TBEN-S-module (3).
- ➤ Flap back the cover and close it (4). It has to engage audibly.
- ➤ Repeat steps 1 to 4 until the module group in complete.

5.2 Mounting on Mounting Plate

The devices are fixed on a pre-drilled mounting plate with two M4 screws. The spacers TBNN-S0-STD are necessary for mounting module composites.

➤ Mount the modules or the module composites according to **Fig. 4: Fixing the device to the mounting plate**.

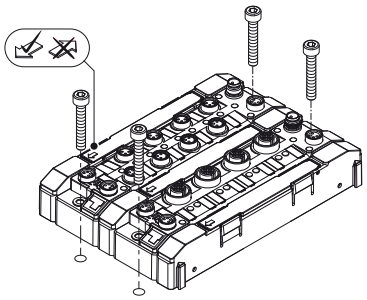


Fig. 4: Fixing the device to the mounting plate

5.3 Mounting on a DIN rail (TS 35)

Single modules or module composites can be mounted on a DIN rail (TS 35) using the spacers TBNN-S0-DRS.

ATTENTION!

Incorrect mounting

Malfunction due to faulty grounding

➤ Orient the spacers so that the arrow in the cover flap of every spacer points in direction to the M8 Ethernet connectors.

➤ Connect the grounding contact of the spacer to the grounding contact of the device.

➤ Mount spacers on the right and the left side of the device.

➤ Place the device or the composite on the DIN rail so that the cut-outs in the spacers enclose the DIN rail (1).

➤ Close the rotating pin in the spacers by means of a screw driver (2)

➤ Ground the device.

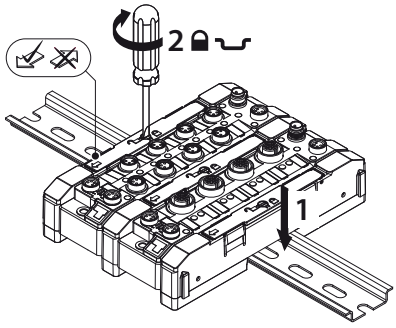


Fig. 5: Mounting the Module Composite on a DIN rail

NOTE

To increase stability on the mounting rail, end brackets can be mounted on the left and right side of the modules/module composites.

5.4 Grounding the Device

5.4.1 Grounding and Shielding Concept

Field bus and I/O part of the TBEN-S modules can be grounded separately.

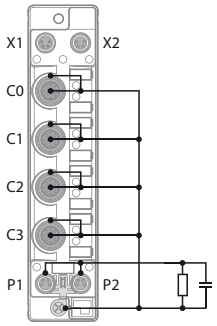


Fig. 6: Replacement wiring diagram, shielding concept

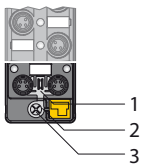


Fig. 7: Grounding clamp (1) Grounding ring (2) and Metal screw (3)

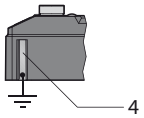


Fig. 8: Grounding contact

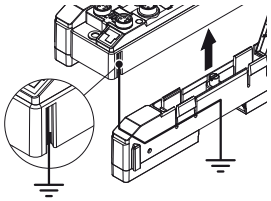


Fig. 9: Grounding of spacers TBNN-S0-DRS

The grounding clamp (1) at the M8 connectors for the fieldbus connection (P1, P2) connects the shield of the fieldbus lines.

The grounding ring (2) leads the shield at the flange of the M8 connectors for the fieldbus connection via an RC-circuit to the outside of the station.

By mounting the module onto a mounting plate through the mounting hole, the module is connected to the reference potential of the installation by a metal screw (3).

The spacers TBNN-S0-DRS for mounting the TBEN-S-modules onto a DIN rail (TS 35) connect the grounding contact (4) of the modules with the DIN rail and thus with FE.

5.4.2 Ground the Device (FE)

Grounding clamp and grounding ring are connected.

- ➤ When mounting on a DIN rail fix the enclosed metal screw at the lower mounting hole.
- ➤ The shield at the flange of the M8 connectors for the field bus connection is connected to the reference potential of the installation.

If a common reference potential is not required, remove the grounding clamp to disconnect the fieldbus shield or fix the module with a plastic screw.

Removing the Grounding Clamp

- ➤ Use a flat screwdriver to slide the grounding clamp forward and remove it.

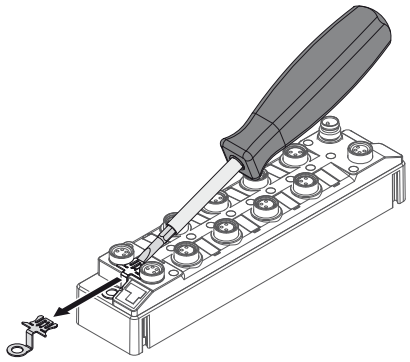


Fig. 10: Removing the Grounding Clamp

Mounting the grounding clamp

- ➤ Insert the grounding clamp between the fieldbus connectors (using a screwdriver if necessary) so that it makes contact with the metal housing of the connector.
- ➥ The shielding of the fieldbus lines is now connected to the grounding clamp.

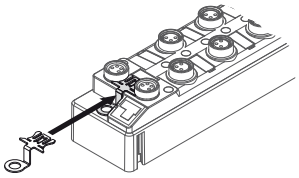


Fig. 11: Mounting the grounding clamp

6 Connecting

6.1 Connecting the Modules to the Ethernet

The TBEN-S2 module is provided with an integrated autocrossing switch with two 4-pin M8 Ethernet plug connectors for connecting to the fieldbus.

ATTENTION!

Interchanging of Ethernet- and power cables

Destruction of module electronic

➤ Observe using the correct M8-connectors when connecting Ethernet- and power cables (Ethernet: P1 and P2, power: X1and X2).

Fig. 12: M8 Ethernet connector

➤ Connect the device to Ethernet according to the pin assignment below.

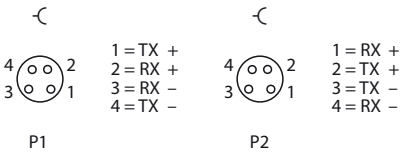


Fig. 13: Pin assignment Ethernet connectors

6.1.1 Ethernet Connection for QC/FSU Applications

NOTE

Please observe the following for QuickConnect (QC)- and Fast Start-Up (FSU)-applications:

– do **not** use a crossover-cable
– ETH1 = connector for **incoming** Ethernet-line
– ETH2 = connector for **outgoing** Ethernet-line

Further information concerning QuickConnect and FSU can be found here:

- EtherNet/IP™: QC – QuickConnect, page 51
- PROFINET: FSU - Fast Start-Up (prioritized startup), page 23

6.2 Connecting Power Supply

The TBEN-S2 module is provided with two 4-pin M8 plug connectors for connecting the power supply. V1 and V2 are galvanically isolated.

ATTENTION!

Interchanging of Ethernet- and power cables
Destruction of module electronic
➤ Observe using the correct M8-connectors when connecting Ethernet- and power cables (Ethernet: P1 and P2, power: X1and X2).

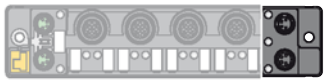
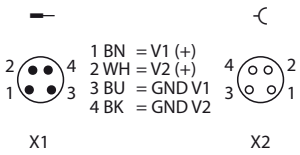


Fig. 14: M8 connector for connecting the supply voltage

➤ Connect the device to the voltage supply according to the pin assignment below.

Pin assignment



X1	Power feed
X2	Continuation of the power to the next node
V1	Power supply 1 (incl. supply of electronics)
V2	Power supply 2

Fig. 15: Pin assignment power supply connectors

NOTE

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

6.2.1 Supply Concept

All TBEN-S1-modules are supplied via two separate voltages V1 and V2.

The I/O-channels are separated into the different potential groups "detachable I/O" (supplied through V2) and "non-detachable" I/O (supplied through V1).

This allows a safety shutdown of parts of an installation via emergency-off circuits.

V1 = supply of module electronics and the respective connectors

V2 = supply of the respective connectors

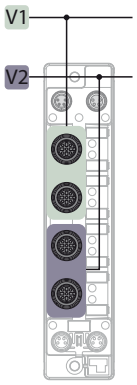


Fig. 16: Power supply of TBEN-S2-2COM-4DXP

6.3 Connecting Serial Devices

The TBEN-S2 module is provided with two 5-pin M12 connectors for connecting serial RS232 or RS485 device.

Fig. 17: M12 connector for connecting serial RS232 and RS485 devices

Connect the device to the voltage supply according to the pin assignment below.

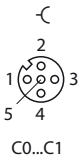
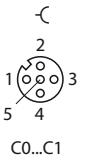
Pin assignment	
RS232 connection	**RS485 connection**
	
1 = $V_{aux}1$ 2 = TXD 3 = GND V1 4 = RXD 5 = FE	1 = $V_{aux}1$ 2 = TX/RX+ 3 = GND V1 4 = TX/RX– 5 = FE

Fig. 18: RS232 connection

Fig. 19: RS485 connection

6.3.1 Activating/Deactivating of RS485 Termination and Biasing

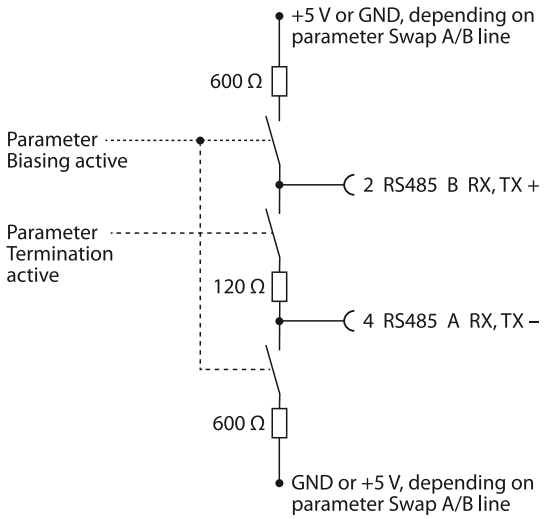


Fig. 20: RS485 termination and biasing

RS485 Termination

The TBEN-S2 module is provided with one internal bus termination resistor per COM port which can be activated or deactivated via the parameter "Termination active" (s. p. 117). In the default setting the internal termination is activated. The termination can also be done externally. The internal termination has to be deactivated if an external termination is used.

The termination at TBEN-S2-2COM-4DXP is necessary, if the device is mounted at the beginning or the end of the RS485 line. When building up an RS485 line topology a terminating resistor (e.g. RSE57-TR2/RFID) has to be set at the other end of the RS485 line.

Accessories for mounting, connecting and parameterizing can be found in the Accessories List for TBEN (D301367) under www.turck.com. The accessories are not part of the scope of delivery.

Biasing

Activating the biasing function suppresses undefined signal levels on both signal lines in the RS485 network by means of a bias resistor.

In the TBEN-S2-2COM-4DXP the biasing is is done with a biasing resistor of 600 W.

The biasing function can be activated or deactivated via the parameter "Biasing active" s. p. 117 In the default setting the biasing function is activated.

We recommend to activate the biasing function, if the TBEN-S2-2COM-4DXP is mounted at the beginning or the end of the RS485.

6.4 Connecting Digital Sensors and Actuators

The TBEN-S2 module is provided with eight 5-pin M12 connectors for connecting digital sensors and actuators. The following combinations of sensors an actuators can be connected:

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

Fig. 21: M12 connector for connecting digital sensors and actuators

➤ Connect the sensors and actuators to the device according to the pin assignment shown below.

Pin assignment

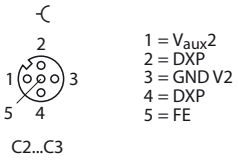


Fig. 22: Pin assignment for digital sensors and actuators

The channels are assigned to the connectors as follows:

Channel	Slot	Pin
DXP4 (Ch4)	C2	4
DXP5 (Ch5)	C2	2
DXP6 (Ch6)	C3	4
DXP7 (Ch7)	C3	2

7 Commissioning

The module automatically starts after the electrical wiring and connecting the supply voltage.

7.1 Setting the IP address

In the delivery state the module has the IP address 192.168.1.254. A PROFINET device name has not yet been assigned. The IP address can be set via the Turck Service Tool, the DTM, the web server, a DHCP server or PROFINET DCP. In the following example, the IP address is set by means of the Turck Service Tool. The tool is available for free under ww.turck.com.

➤ Connect the device to a PC via the Ethernet interface.

➤ Open the Turck Service Tool.

➤ Click "Search" or press F5.

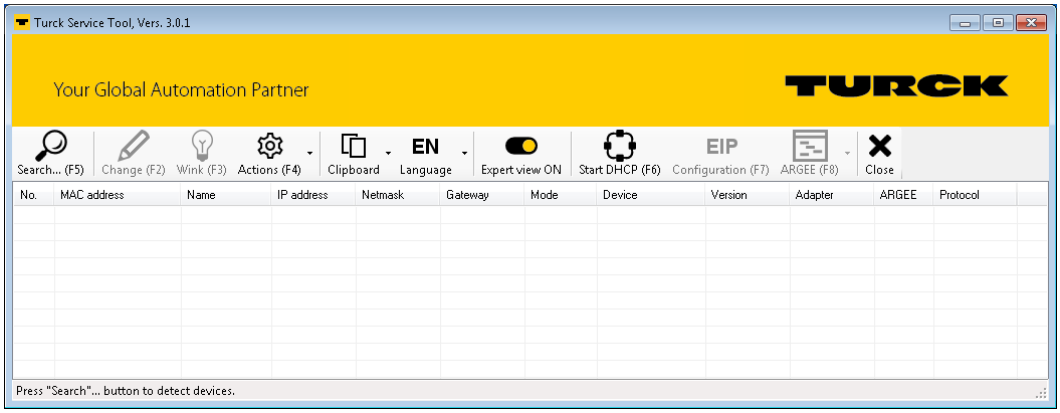


Fig. 23: Turck Service Tool – start dialog

The Turck Service Tool shows the connected devices.

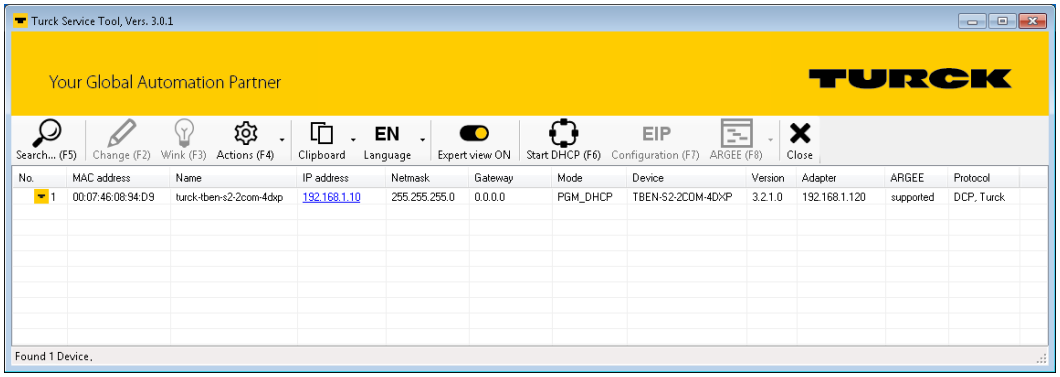


Fig. 24: Turck Service Tool – found devices

➤ Click on the desired device.

➤ Click "Change" or press F2.

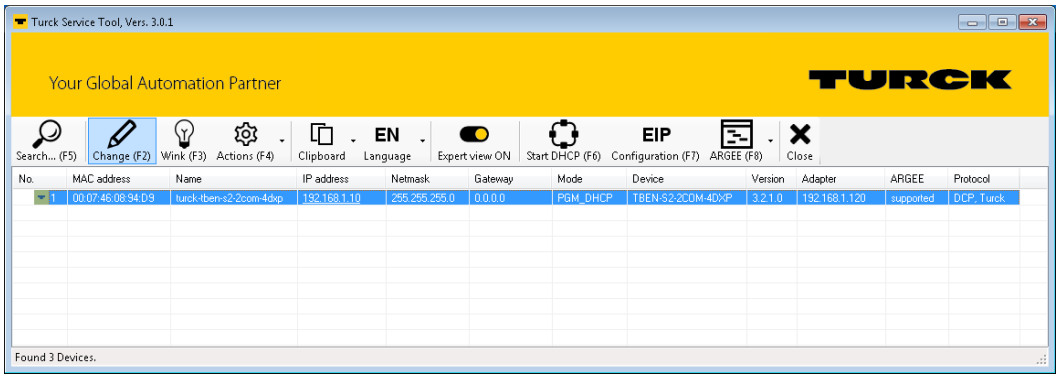


Fig. 25: Turck Service Tool – select the device to be addressed

NOTE

Clicking the IP address of the TBEN-S2-2COM-4DXP opens the device's web server.

➤ Change the IP address and the network mask if necessary.

➤ Assume the changes by clicking "Set in device".

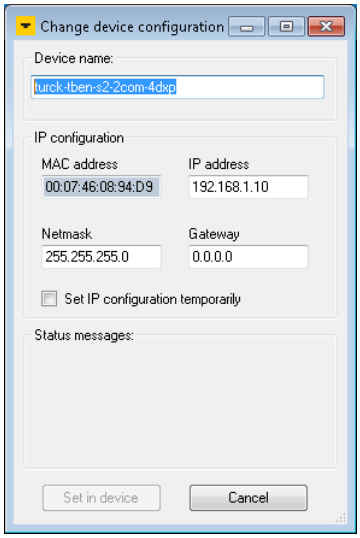


Fig. 26: Turck Service Tool – Change device configuration

7.2 Commissioning the Device in PROFINET

7.2.1 GSDML file

The actual GSDML-file for TBEN-S can be downloaded from the Turck-home page **www.turck.com**.

GSDML-file	Zip-file
GSDML-V2.3-Turck-TBEN_S2_2COM_4DXP-YYYYMMDD-xxxxxx.xml	TBEN-S_PROFINET.zip

7.2.2 FSU - Fast Start-Up (prioritized startup)

FSU enables a PLC to build up connections to PROFINET-nodes in less than 500 ms after switching-on the network power supply. The fast start-up is necessary for fast tool changing applications at robot arms for example in the automobile industry.

The TBEN-S2-2COM-4DXP support FSU, but the function can only be guaranteed for the digital channels.

7.2.3 PROFINET IO Device Model

The technical properties of PROFINET IO devices are defined via their device description file, the GSDML file. A PROFINET IO device consists of 1…n slots, which can also contain 1…n sub slots. Sub slots are placeholders for sub modules and establish the interface to the process. Sub modules can contain parameters, data and diagnostics.

Slot 0 is always reserved as Device Access Point (DAP). The DAP contains the physical interface to the Ethernet network and represents the device. The other slots or sub slots represent the other device functions. The structure is defined by the manufacturer of field devices. It is not necessary that every slot/sub slot is related to physical functions. This device model allows manufacturers to design modular and flexible decentral field devices. User are flexible in configuring decentralized field devices.

7.2.4 TBEN-S2-2COM-4DXP – Slots and Sub slots (Overview)

Besides Slot 0 (DAP) all other slots of TBEN-S2-2COM-4DXP contain only one sub slot. for this reason slots and sublots are described as synonyms in the following.

Slot-no.	Name	Description	Pluggable devices
0	TBEN-S2-2COM-4DXP	This slot represents the access to the device via PROFINET, Device Access Point.	– Device Access Point – Ethernet interface – Ethernet port 0 – Ethernet port 1
1	COM channel 0	This slot defines the function of the first COM port (COM0).	– RS232 simple (s. p. 27) – RS232 advanced (s. p. 28) – RS485 simple (s. p. 29) – RS485 advanced (s. p. 30) – MB Client RS232 (s. p. 32) – MB Client RS485 (s. p. 32)
2…9	Buffer/server channel 0	Slots 2 to 9 are used to configure the data buffer for the in- and output data or to configure server connected via Modbus RTU. The settings relate to COM0.	– RS Data 24Byte IN/24Byte OUT (s. p. 31) – MB-Server 1 Reg. IN/1 Reg. OUT – (s. p. 28) – MB-Server 12 Reg. IN/12 Reg. OUT (s. p. 28)
10	COM channel 1	Slot 10 defines the function of the second COM port (COM1).	– RS232 simple (s. p. 27) – RS232 advanced (s. p. 28) – RS485 simple (s. p. 29) – RS485 advanced (s. p. 30) – MB Client RS232 (s. p. 32) – MB Client RS485 (s. p. 32)
11 -18	Buffer/server channel 1	Slots 11 to 18 are used to configure the data buffer for the in- and output data or to configure server connected via Modbus RTU. The settings relate to COM1.	– RS Data 24Byte IN/24Byte OUT (s. p. 31) – MB-Server 1 Reg. IN/1 Reg. OUT – (s. p. 32) – MB-Server 12 Reg. IN/12 Reg. OUT (s. p. 33)
19	COM diagnostics	Slot 19 is used to map the cyclic diagnostic data.	COM diagnostics (s. p. 34)

Slot-no.	Name	Description	Pluggable devices
20	MB-Server Status	Slot 20 is used to cyclically map the status data of connected Modbus RTU server.	MB-Server Status (s. p. 35)
21	MB-Server Timing	Slot 21 can be used to cyclically map timing data of connected Modbus RTU server.	MB-Server Timing (s. p. 37)
22	DXP	Slot 22 is used to configure and to use the 4 digital in- or output channels (DXP).	DXP (s. p. 37)
23	DXP diagnostics	Slot 22 is used to map the cyclic diagnostic data for the DXP channels.	DXP diagnostics (s. p. 38)
24…27	Ext. DXP functions 4…7	Slots 24…27 are used to configured the input filter times and the pulse stretching for the digital input channels 4…7.	DIF pulses (s. p. 38)
28	Module status	Slot 28 is used to cyclically map module status data.	Module status (s. p. 39)

Sub module "TBEN-S2-2COM-4DXP" (Device Access Point)

The Device Access Point "TBEN-S2-2COM-4DXP" provides device's PROFINET interface.
This module is always plugged in slot 0 and cannot be deleted.

- PROFINET IO

Features	Description
Conformance Class	B
Update time [ms]	1…512
Media Redundancy Protocol (MRP)	MRP Client
Fast Startup (FSU)	< 500 ms
Topology detection though LLDP	yes

- Parameters

Parameters	Value	Meaning	Description
Output behav, at communic. loss	00	set to 0	Depending on the parameterization, the digital outputs switch to 0 or hold the current value, if the PROFINET IO communication between the device and the PLC is disturbed.
	01	hold current value	
Deactivate all diagnostics	0	no	Deactivates all diagnostics
	1	yes	
Deactivate load voltage diagnostics	0	no	Deactivates the under voltage diagnostics for V2.
	1	yes	
Deactivate I/O-ASSISTANT Force Mode	0	no	Deactivates the forcing of output values via DTM.
	1	yes	
Deactivate Modbus	0	no	Deactivates the Modbus protocol
	1	yes	
Deactivate EtherNet/IP	0	no	Deactivates the EtherNet/IP™ protocol
	1	yes	
Deactivate PROFINET	0	no	Deactivates the PROFINET protocol
	1	yes	
Deactivate Web server	0	no	Deactivates the web server
	1	yes	

- Process data
  This sub module has no process data.

Sub module "RS232 simple"

The sub module "RS232 simple" can be plugged into slots 1 (COM 0) and slot 10 (COM 1). It switches the COM port to the RS232 mode, provides parameters for the configuration and process data for control and status data. More detailed information about the transmit and receive sequence can be found under **Transmit and Receive Data, page 141**.

Parameters (**s. p. 118**)

The following functions are preset in this sub module an can not be changed:

Parameters	Value	
EOF detection	Character time-out	The character timeout defines the duration of time within which another character must be received after receiving a character. Exceeding this time is interpreted as the end of the data packet.
Character timeout	100	Character timeout in ms.
Response timeout	0	No timeout

- **Process input data** (**s. p. 130**)

Process value	Offset	Data type
COM – Status bits of the COM port	%IB0	USINT
Transmitter ready	%IX0.0	BOOL
Receive complete	%IX0.1	BOOL
Frame error	%IX0.2	BOOL
Parity/format error	%IX0.3	BOOL
Buffer overflow	%IX0.4	BOOL
Timeout	%IX0.5	BOOL
Invalid TX length	%IX0.6	BOOL
Invalid RX length	%IX0.7	BOOL
Reserved	%IB1	USINT
Received frame length	%IB2	USINT

- **Process output data** (**s. p. 138**)

Process value	Offset	Data type
COM – Control bits of the COM port	%QB0	USINT
Transmit	%QX0.0	BOOL
Receive	%QX0.1	BOOL
Reserved	%QB1	USINT
Transmitter frame length	%QB2	USINT
Reserved	%QB3	USINT
Receiver frame length	%QB4	USINT

Sub module "RS232 advanced"

The sub module "RS232 simple" can be plugged into slots 1 (COM 0) and slot 10 (COM 1). It switches the COM port to the RS232 mode, provides parameters for the configuration and process data for control and status data. More detailed information about the transmit and receive sequence can be found under **Transmit and Receive Data, page 141**.

- **Parameters** (**s. p. 117**)
  The sub module contains additional parameters:
  - EOF detection: character timeout, 1st end delimiter, 2nd end delimiter, frame length
  - response timeout
- **Process input data** (**s. p. 130**)

Process value	Offset	Data type
COM – Status bits of the COM port	%IB0	USINT
Transmitter ready	%IX0.0	BOOL
Receive complete	%IX0.1	BOOL
Frame error	%IX0.2	BOOL
Parity/format error	%IX0.3	BOOL
Buffer overflow	%IX0.4	BOOL
Timeout	%IX0.5	BOOL
Invalid TX length	%IX0.6	BOOL
Invalid RX length	%IX0.7	BOOL
Reserved	%IB1	USINT
Received frame length	%IB2	USINT

- **Process output data** (**s. p. 138**)

Process value	Offset	Data type
COM – Control bits of the COM port	%QB0	USINT
Transmit	%QX0.0	BOOL
Receive	%QX0.1	BOOL
Reserved	%QB1	USINT
Transmitter frame length	%QB2	USINT
Reserved	%QB3	USINT
Receiver frame length	%QB4	USINT

Sub module "RS485 simple"

The sub module "RS485 simple" can be plugged into slots 1 (COM 0) and slot 10 (COM 1). It switches the COM port to the RS485 mode, provides parameters for the configuration and process data for control and status data. More detailed information about the transmit and receive sequence can be found under **Transmit and Receive Data, page 141**.

- **Parameters** (**s. p. 117**)

The following functions are preset in this sub module an can not be changed:

Parameters	Value	
Swap A/B line	no	Standard configuration, A = pin 2, B = pin 4
Termination active	yes	RS485 termination
Biasing active	yes	Biasing activated
EOF detection	Character timeout	The character timeout defines the duration of time within which another character must be received after receiving a character. Exceeding this time is interpreted as the end of the data packet.
Character timeout	100	Character timeout in ms.
Response timeout	0	no timeout

- **Process input data** (**s. p. 130**)

Process value	Offset	Data type
COM – Status bits of the COM port	%IB0	USINT
Transmitter ready	%IX0.0	BOOL
Receive complete	%IX0.1	BOOL
Frame error	%IX0.2	BOOL
Parity/format error	%IX0.3	BOOL
Buffer overflow	%IX0.4	BOOL
Timeout	%IX0.5	BOOL
Invalid TX length	%IX0.6	BOOL
Invalid RX length	%IX0.7	BOOL
Reserved	%IB1	USINT
Received frame length	%IB2	USINT

- **Process output data** (s. p. 138)

Process value	Offset	Data type
COM – Control bits of the COM port	%QB0	USINT
Transmit	%QX0.0	BOOL
Receive	%QX0.1	BOOL
Reserved	%QB1	USINT
Transmitter frame length	%QB2	USINT
Reserved	%QB3	USINT
Receiver frame length	%QB4	USINT

Sub module "RS485 advanced"

The sub module "RS485 simple" can be plugged into slots 1 (COM 0) and slot 10 (COM 1). It switches the COM port to the RS485 mode, provides parameters for the configuration and process data for control and status data. More detailed information about the transmit and receive sequence can be found under Transmit and Receive Data, page 141.

- **Parameters**
  The sub module contains additional parameters:
  - EOF detection: character timeout, 1st end delimiter, 2nd end delimiter, frame length
  - Termination active
  - Biasing active
  - response timeout
- **Process input data** (s. p. 130)

Process value	Offset	Data type
COM – Status bits of the COM port	%IB0	USINT
Transmitter ready	%IX0.0	BOOL
Receive complete	%IX0.1	BOOL
Frame error	%IX0.2	BOOL
Parity/format error	%IX0.3	BOOL
Buffer overflow	%IX0.4	BOOL
Timeout	%IX0.5	BOOL
Invalid TX length	%IX0.6	BOOL
Invalid RX length	%IX0.7	BOOL
Reserved	%IB1	USINT
Received frame length	%IB2	USINT

■ **Process output data** (s. p. 138)

Process value	Offset	Data type
COM – Control bits of the COM port	%QB0	USINT
Transmit	%QX0.0	BOOL
Receive	%QX0.1	BOOL
Reserved	%QB1	USINT
Transmitter frame length	%QB2	USINT
Reserved	%QB3	USINT
Receiver frame length	%QB4	USINT

Sub module "RS Data 24Byte IN/24Byte OUT"

The sub module "RS Data 24Byte IN/24Byte OUT" can be plugged into slots 2…9 (COM 0) and slot 11…18 (COM 1). The sub module is used to set up the transmit and receive buffer for the serial communication via RS232 or RS485 modularly in steps of 24 bytes. The maximum length for the transmit and receive buffer for one COM port is 8 × 24 bytes = 192 bytes.

This sub module can only be used for COM ports which are used as pure RS232 or RS485 interface.

■ **Parameters**
This sub module requires no configuration and has thus no parameters.

Process input data (s. p. 139)

Process value	Offset	Data type	Description
Byte 0	%IB0	Byte	First byte of the receive buffer block
…	…	…	…
Byte 23	%IB23	Byte	Last byte of the receive buffer block

Process output data (s. p. 131)

Process value	Offset	Data type	Description
Byte 0	%QB0	Byte	First byte of the transmit buffer block
…	…	…	…
Byte 23	%QB23	Byte	Last byte of the transmit buffer block

Sub module "MB-Client RS232"

The sub module "MB-Client RS232" can be plugged into slots 1 (COM 0) and slot 10 (COM 1). It switches the COM port to the RS232 mode and activates the Modbus RTU Client function for this COM port.

- **Parameters** (s. p. 118)
- **Process input data** (s. p. 135)

Process value	Offset	Data type
Reserved - not used for the Modbus RTU Client function	%IB0…%IB3	USINT
MB-Server cycle time (*1 ms)	%IB4	UINT

Sub module "MB-Client RS485"

The sub module "RS485 simple" can be plugged into slots 1 (COM 0) and slot 10 (COM 1). It switches the COM port to the RS485 mode and activates the Modbus RTU Client function for this COM port.

- **Parameters** (s. p. 118)
- **Process input data** (s. p. 135)

Process value	Offset	Data type
Reserved - not used for the Modbus RTU Client function	%IB0…%IB3	USINT
MB-Server cycle time (*1 ms)	%IB4	UINT

Sub module "MB-Server 1Reg. IN/1Reg. OUT"

Sub module "MB-Server 1Reg. IN/1Reg. OUT" can be plugged into slots 2…9 (COM 0) and slot 11…18 (COM 1). This sub module is used to configure connected Modbus RTU-Servers and to exchange data with the connected servers. Eight Modbus RTU servers can be configured for each COM port.

This sub module can only be used for COM ports which are used as Modbus RTU Clients.

- **Parameters** (s. p. 121)
- **Process input data** (s. p. 135)

Process value	Offset	Data type	Description
Input register 0	%IW0	UINT	Input register of the Modbus server

- **Process output data** (s. p. 140)

Process value	Offset	Data type	Description
Output register 0	%QW0	UINT	Output register of the Modbus server

Sub module "MB-Server 12 Reg. IN/12 Reg. OUT"

The sub module "MB-Server 12Reg IN/12Reg. OUT" can be plugged into slots 2…9 (COM 0) and slot 11…18 (COM 1). This sub module is used to configure connected Modbus RTU-Servers and to exchange data with the connected servers. Eight Modbus RTU servers can be configured for each COM port.

This sub module can only be used for COM ports which are used as Modbus RTU Clients.

- **Parameters** (s. p. 121)
- **Process input data** (s. p. 135)

Process value	Offset	Data type	Description
Input register 0	%IW0	UINT	First input register of the Modbus server
…	…	…	…
Input register 11	%IW011	UINT	Last input register of the Modbus server

- **Process output data** (s. p. 140)

Process value	Offset	Data type	Description
Output register 0	%QW0	UINT	First output register of the Modbus server
…	…	…	…
Output register 11	%QW11	UINT	Last output register of the Modbus server

Sub module"COM diagnostics"

The sub module "COM diagnostics" can be plugged into slot 19. This sub module provides diagnostic data for the COM ports via cyclic input data.

- **Parameters**
  This sub module requires no configuration and has thus no parameters.
- **Process input data** (s. p. 145)

Process value	Offset	Data type
Diagnostics for COM 0	%IB0	USINT
Hardware error	%IX0.0	BOOL
Parameterization error	%IX0.1	BOOL
Overcurrent supply VAUX1	%IX0.7	BOOL
Modbus diagnostics for COM 0	%IB1	
Error MB-server 0	%X1.0	BOOL
…	…	…
Error MB-server 7	%X1.7	BOOL
Diagnostics for COM 1	%IB0	USINT
Hardware error	%IX0.0	BOOL
Parameterization error	%IX0.1	BOOL
Overcurrent supply VAUX1	%IX0.7	BOOL
Modbus diagnostics for COM 1	%IB1	
Error MB-server 0	%X1.0	BOOL
…	…	…
Error MB-server 7	%X1.7	BOOL

Sub module "MB-Server Status"

The sub module Sub module "MB-Server Status" can be plugged into slot 20. This sub module cyclically provides status data for the connected Modbus RTU servers.

- **Parameters**
  This sub module requires no configuration and has thus no parameters.
- **Process input data** (s. p. 134)

Process value	Offset	Data type
COM 0 MB-Server Status	%IB0	USINT
Error code bit 0 Ch0	%IX0.1	BOOL
Error code bit 1 Ch0	%IX0.2	BOOL
Error code bit 2 Ch0	%IX0.2	BOOL
Error code bit 3 Ch0	%IX0.3	BOOL
Read error Ch0	%IX0.4	BOOL
Write error Ch0	%IX0.5	BOOL
Parity/format error Ch0	%IX0.6	BOOL
MODBUS timeout Ch0	%IX0.7	BOOL
COM 0 MB-Server Status	%IB1	USINT
Valid read config. K0	%IX1.4	BOOL
Valid write config. Ch0	%IX1.5	BOOL
…	…	…
COM 0 MB-Server Status	%IB14	USINT
Error code Bit 0 Ch7	%IX14.1	BOOL
Error code Bit 1 Ch7	%IX14.2	BOOL
Error code Bit 2 Ch0	%IX14.2	BOOL
Error code Bit 3 Ch7	%IX14.3	BOOL
Read error Ch7	%IX14.4	BOOL
Write error Ch7	%IX14.5	BOOL
Parity/format error Ch7	%IX14.6	BOOL
MODBUS timeout Ch7	%IX14.7	BOOL
COM 0 MB-Server Status	%IB15	USINT
Valid read config. K7	%IX15.4	BOOL
Valid write config. K7	%IX15.5	BOOL
COM 1 MB-Server Status	%IB16	USINT
Error code bit 0 Ch0	%IX16.1	BOOL
Error code bit 1 Ch0	%IX16.2	BOOL

Process value	Offset	Data type
Error code bit 2 Ch0	%IX16.2	BOOL
Error code bit 3 Ch0	%IX16.3	BOOL
Read error Ch0	%IX16.4	BOOL
Write error Ch0	%IX16.5	BOOL
Parity/format error Ch0	%IX16.6	BOOL
MODBUS timeout Ch0	%IX16.7	BOOL
COM 1 MB-Server Status	%IB17	USINT
Valid read config. K0	%IX17.4	BOOL
Valid write config. Ch0	%IX17.5	BOOL
…	…	…
COM 1 MB-Server Status	%IB30	USINT
Error code Bit 0 Ch7	%IX30.1	BOOL
Error code Bit 1 Ch7	%IX30.2	BOOL
Error code Bit 2 Ch0	%IX30.2	BOOL
Error code Bit 3 Ch7	%IX30.3	BOOL
Read error Ch7	%IX30.4	BOOL
Write error Ch7	%IX30.5	BOOL
Parity/format error Ch7	%IX30.6	BOOL
MODBUS timeout Ch7	%IX30.7	BOOL
COM 1 MB-Server Status	%IB31	USINT
Valid read config. K7	%IX31.4	BOOL
Valid write config. K7	%IX31.5	BOOL

NOTE

Description of the Modbus Exceptions Codes
http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b.pdf.

Sub module "MB-Server Timing"

The sub module Sub module "MB-Server Timing" can be plugged into slot 21. This sub module cyclically provides timing data for the connected Modbus RTU servers.

- **Parameters**
  This sub module requires no configuration and has thus no parameters.
- **Process input data** (s. p. 135)

Process value	Offset	Data type
COM 0 MB-Server Timing (*1ms) Ch0	%IW0	UINT
…	…	…
COM 0 MB-Server Timing (*1ms) Ch0	%IW7	UINT
COM 1 MB-Server Timing (*1ms) Ch0	%IW8	UINT
…	…	…
COM 1 MB-Server Timing (*1ms) Ch0	%IW15	UINT

Sub module "DXP"

The sub module "DXP" can be plugged into slot 22. It provides parameters for the configuration as well as process data for the four digital channels (Ch4…Ch7) of the module. The DXP channels can be used as input or output without any configuration.

- Parameters (s. p. 127)
- Process input data (s. p. 135)

Process value	Offset	Data type
DXP	%IB0	USINT
Input value Ch4	%IX0.4	BOOL
Input value Ch5	%IX0.5	BOOL
Input value Ch6	%IX0.6	BOOL
Input value Ch7	%IX0.7	BOOL

- Process output data (s. p. 140)

Process value	Offset	Data type
DXP	%QB0	USINT
Output value Ch4	%QX0.4	BOOL
Output value Ch5	%QX0.5	BOOL
Output value Ch6	%QX0.6	BOOL
Output value Ch7	%QX0.7	BOOL

Sub module "DXP diagnostics"

The sub module "DXP diagnostics" can be plugged into slot 23. The sub module cyclically provides diagnostic data for the four digital channels.

- **Parameters**
  This sub module requires no configuration and has thus no parameters.
- **Process input data** (s. p. 146)

Process value	Offset	Data type
DXP	%IB0	USINT
Overcurrent VAUX2 K4/K5	%IX0.2	BOOL
Overcurrent VAUX2 K4/K5	%IX0.3	BOOL
DXP	%IB1	USINT
Overcurrent output Ch4	%IX1.4	BOOL
Overcurrent output Ch5	%IX1.5	BOOL
Overcurrent output Ch6	%IX1.6	BOOL
Overcurrent output Ch7	%IX1.7	BOOL

Sub module "DIF pulses"

The sub module "DIF pulses" (DIF = Digital Input Filter) can be plugged into slots 24…27. It provides parameters for the configuration as well as process data for the four digital channels (Ch4…Ch7) of the module. One slot is assigned to each digital channel. Slot 24 is assigned to the digital channel 4 and slot 27 is assigned to the digital channel 7. This sub module is used to configure the filter times and the pulse stretching for the digital channels.

- **Parameters** (s. p. 127)
- **Process data**
  This sub module has no process data. The configured parameters affect the input process values of the sub module "DXP" (slot 22).

Sub module "Module status"

The sub module "Module status" can be plugged into slot 28. This sub module cyclically provides module status data.

- **Parameters**
  This sub module requires no configuration and has thus no parameters.
- **Process input data** (s. p. 136)

Process value	Offset	Data type
Module status – byte 0	%IB0	USINT
Undervoltage V1	%IX0.1	BOOL
Internal error	%IX0.2	BOOL
Force Mode active	%IX0.6	BOOL
Module status – byte 1	%IB1	USINT
Module diagnostics pending	%IX1.0	BOOL
Undervoltage V2	%IX1.7	BOOL

7.2.5 PROFINET diagnostics

In addition to the diagnostic information mapped to the process image, the TBEN-S2-2COM-4DXP supports the following event-based PROFINET diagnostics.

Module diagnostics			**PROFINET diagnostics**	
Diagnostics	**Channel**	**Connector**	**Error code**	**Channel/slot**
Undervoltage				
V1	0.0		0x0002	0/0
V2	0.1		0x0002	1/0
DXP diagnostics	**channel**	**Connector**	**Error code**	**Channel/slot**
Overcurrent output	DXP4	C2	0x0001	4/22
	DXP5	C2	0x0001	5/22
	DXP6	C3	0x0001	6/22
	DXP7	C3	0x0001	7/22
Overcurrent VAUX2 K4/K5	DXP4/DXP5	C2	0x0162	4+5/22
Overcurrent VAUX2 K6/K7	DXP6/DXP7	C3	0x0163	6+7/22
COM channel diagnostics			**PROFINET diagnostics**	
Hardware error	COM0	C0	0x0015	0/1
Parameterization error	COM 0	C0	0x0010	0/1
Overcurrent supply VAUX1	COM0	C0	0x0100	0/1
Hardware error	COM1	C1	0x0015	1/10
Overcurrent supply VAUX1	COM1	C1	0x0101	1/10

7.2.6 Description of the User Data for Acyclic Services

The acyclic data exchange is done via Record Data CRs (CR → Communication Relation)

Via these Record Data CRs the reading and writing of the following services is realized:

- Writing of AR data
- Writing of configuration data
- Reading and writing of device data
- Reading of diagnostic data
- Reading of I/O data
- Reading of Identification Data Objects (I&M functions)

Description of the acyclic device user data

Index		Name	Data type	r/w	Comment
Dec.	Hex.				
1	0x01	Module parameters	WORD	r/w	Parameter data of the module (slot 0)
2	0x02	Module designation	STRING	r	Designation assigned to the module (Slot 0)
3	0x03	Module revision	STRING	r	Firmware revision of the module
4	0x04	Vendor ID	WORD	r	Ident no. Turck
5	0x05	Module name	STRING	r	The device name assigned to the module
6	0x06	Module type	STRING	r	Module type
7	0x07	Device ID	WORD	r	Ident no. of the module
8…23	0x08… 0x17	reserved			
24	0x18	Module diagnostics	WORD	r	Diagnostic data of the module (slot 0).
25…31	0x19 … 0x1F	reserved			
32	0x20	Input list	Array of byte	r	List of all input channels in the module
33	0x21	Output list	Array of BYTE	r	List of all output channels in the module
34	0x22	Diag. list	Array of BYTE	r	List of all I/O-channel diagnostics
35	0x23	Parameter list	Array of BYTE	r	List of all I/O-channel parameters
36…45039	0x24… 0xAFEF	reserved			
45040	0xAFF0	I&M0-functions		r	Identification & Maintaining Services
45041	0xAFF1	I&M1-functions	STRING [54]	r/w	I&M tag Function and location

Index		Name	Data type	r/w	Comment
Dec.	Hex.				
45042	0xAFF2	I&M2-functions	STRING [16]	r/w	I&M tag Function and location
45043	0xAFF3	I&M3-functions	STRING [54]		
45044	0xAFF4	I&M4-functions	STRING [54]		
45045… 45055	0xAFF5 - 0xAFFF	I&M5 to I&M15-functions			not supported
28672	0x7000	Module parameters	WORD	r/w	Activate active field bus protocol

Description of the Acyclic I/O Channel User Data

Index		Name	Data type	r/w	Comment
Dec.	Hex.				
1	0x01	Module parameters	specific	r/w	Parameters of the module
2	0x02	Module type	ENUM UINT8	r	Contains the module type
3	0x03	Module version	UINT8	r	Firmware version of the I/O-channels
4	0x04	Module ID	DWORD	r	Ident number of the I/O
5…9	0x05 …0x09	reserved			
10	0x0A	Slave controller Version	UINT8 array [8]	r	Version number of the slave controller.
11…18	0x0B…0 x12	reserved			
19	0x13	Input data	specific	r	Input data of the respective I/O channel
20…22	0x14 … 0x16	reserved			
23	0x17	Output data	specific	r/w	Output data of the respective I/O channel
…	…	reserved			

7.3 Connecting the device to a Siemens PLC in PROFINET

The following example describes the connection of the devices to a Siemens OPLC in PROFINET by means of the programming software SIMATIC STEP7 Professional V13 (TIA-Portal).

7.3.1 Used Hardware

The following hardware components are used in this example:

- Siemens PLC S7-1500
- Block module TBEN-S2-2COM-4DXP
- 8 × Banner K50TGRYS1QP at COM 0 as Modbus server

7.3.2 Used Software

The following software tools are used in this example:

- SIMATIC STEP7 Professional V13 (TIA-Portal)
- GSDML file for TBEN-S2-2COM-4DXP (to be downloaded for free under www.turck.com)

7.3.3 Prerequisites

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

7.3.4 Installing the GSDML-file

The GSDML-file can be downloaded for free from www.turck.com .

Verfügung.

➤ Adding the GSDML-file: Click "Options" → "Manage general station description files (GSD)".

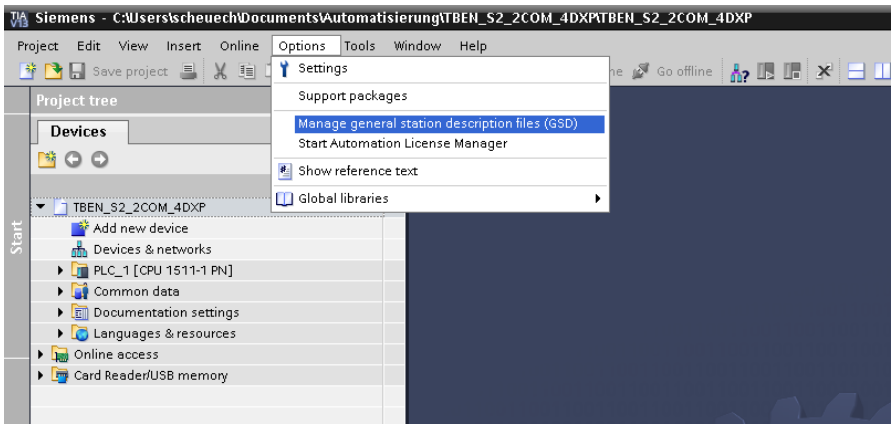


Fig. 27: Adding the GSDML-file

➤ Installing the GSDML-file: Define the source path for the GSDML-file.

➤ Select the GSDML-file to be installed and click "Install".

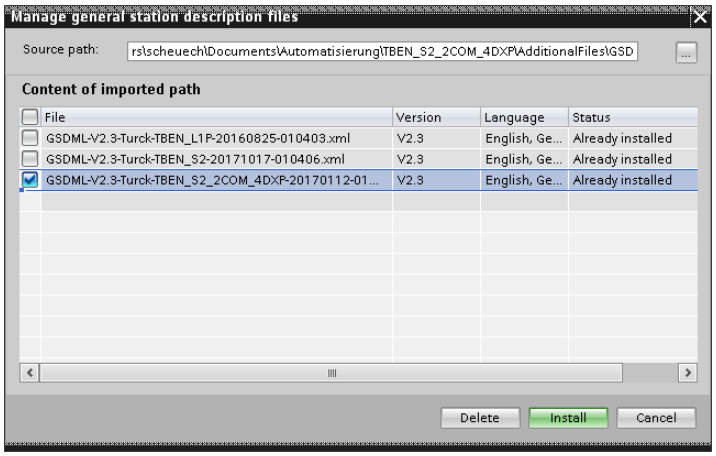


Fig. 28: Installing the GSDML-file

➥ The device is added to the Hardware catalog of the programming software.

7.3.5 Configuring the Device

- ➤ Select the TBEN-S2-2COM-4DXP from the Hardware catalog and drag it into the "Device & networks" editor.
- ➤ Configure the device per drag & drop depending on the application.
- ➤ Define the function of the two COM ports (slot 1 and 10) and define the other slots by assigning the suitable sub modules.

NOTE

The PROFINET device model, the sub module functions as well as the possible configuration options are described under **PROFINET IO Device Model, page 24** and **Structure of the TBEN-S2-2COM-4DXP, page 24**.

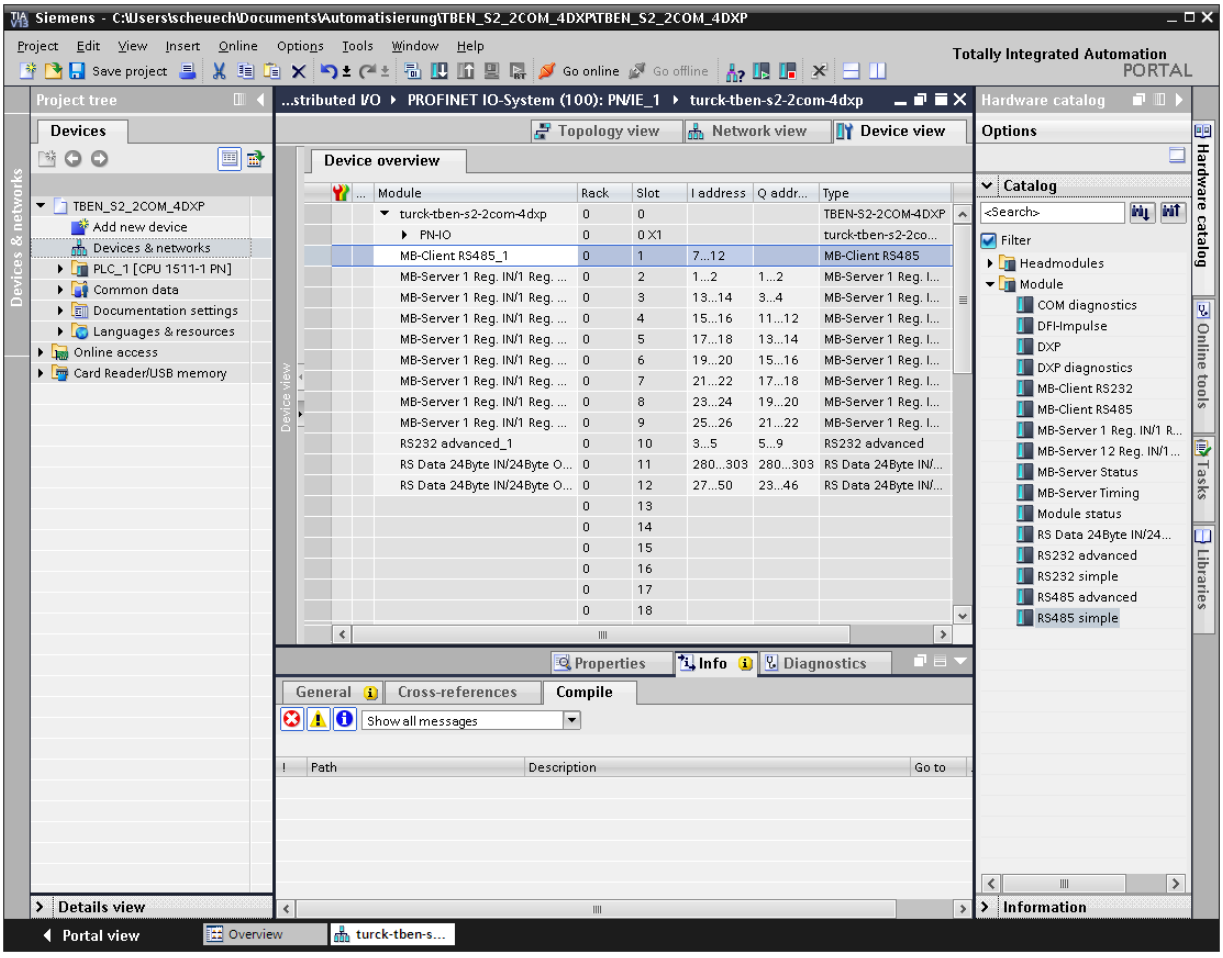


Fig. 29: Configuring the Device

7.3.6 Connecting the device to the PLC

➤ Connect the device to the PLC in the "Devices & networks" editor.

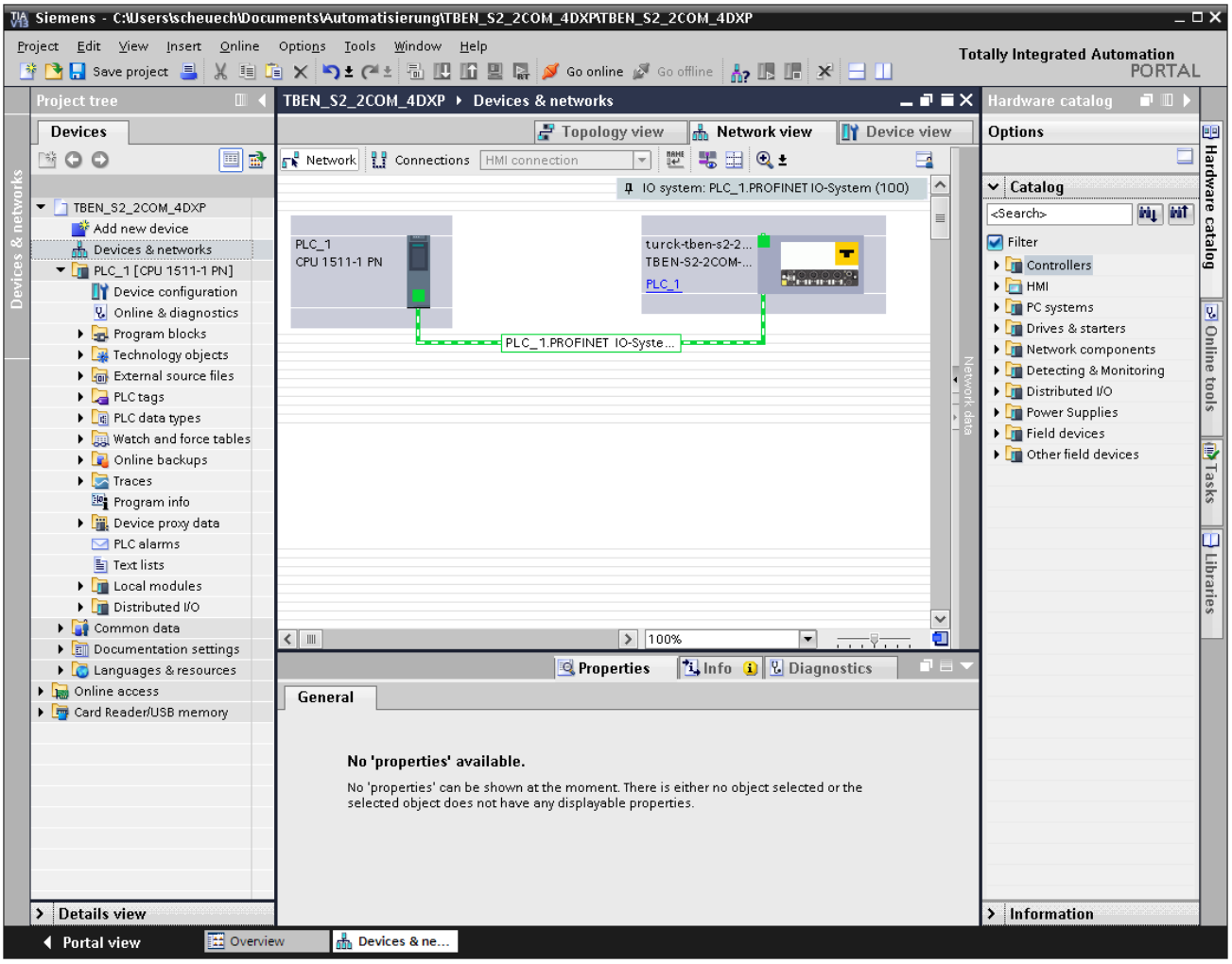


Fig. 30: Connecting the device to the PLC

7.3.7 Assigning PROFINET device name

- ➤ Select "Online access" →…→ "Online & diagnostics".
- ➤ Select "Functions" → „Assign name".
- ➤ Enter the desired PROFINET device name for the device.

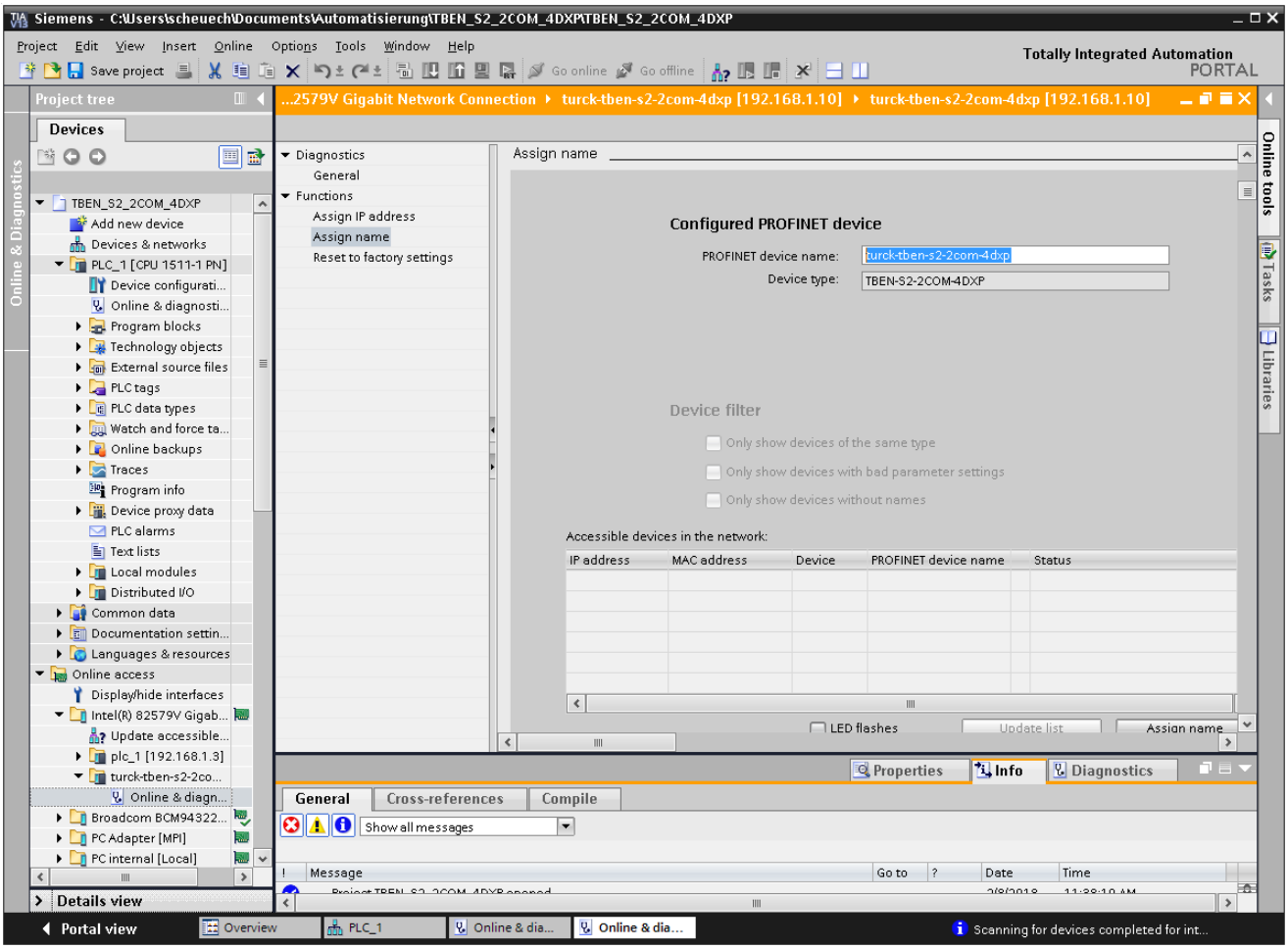


Fig. 31: Assigning PROFINET device name

7.3.8 Setting the IP address in TIA Portal

- ➤ Select the TBEN-S2-2COM-4DXP in the "Device view".
- ➤ Select "Ethernet addresses" → in the register tab "Properties".
- ➤ Assign the desired IP address.

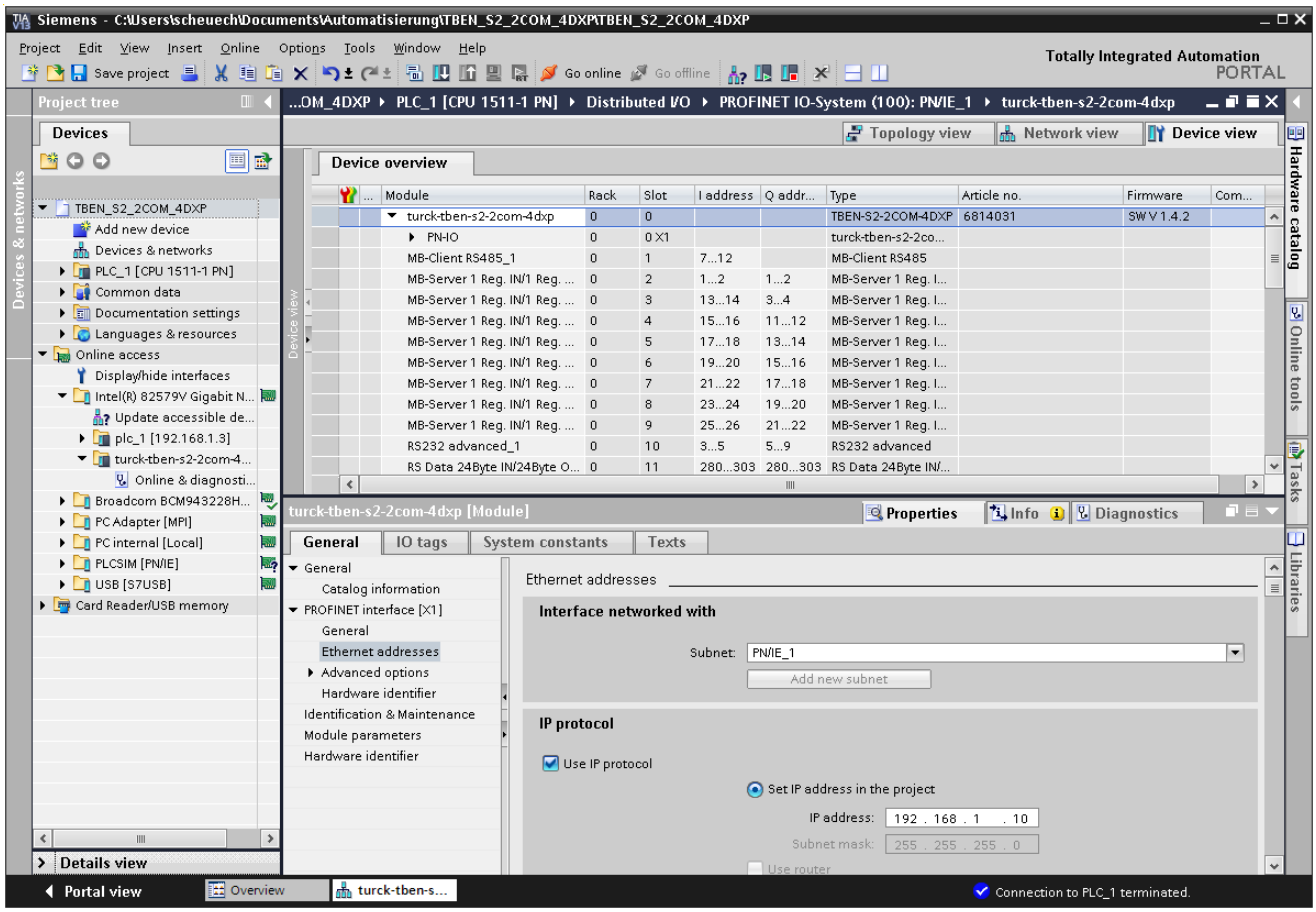


Fig. 32: Assigning the IP address

7.3.9 Going online with the PLC

➤ Start the online mode (Go online).

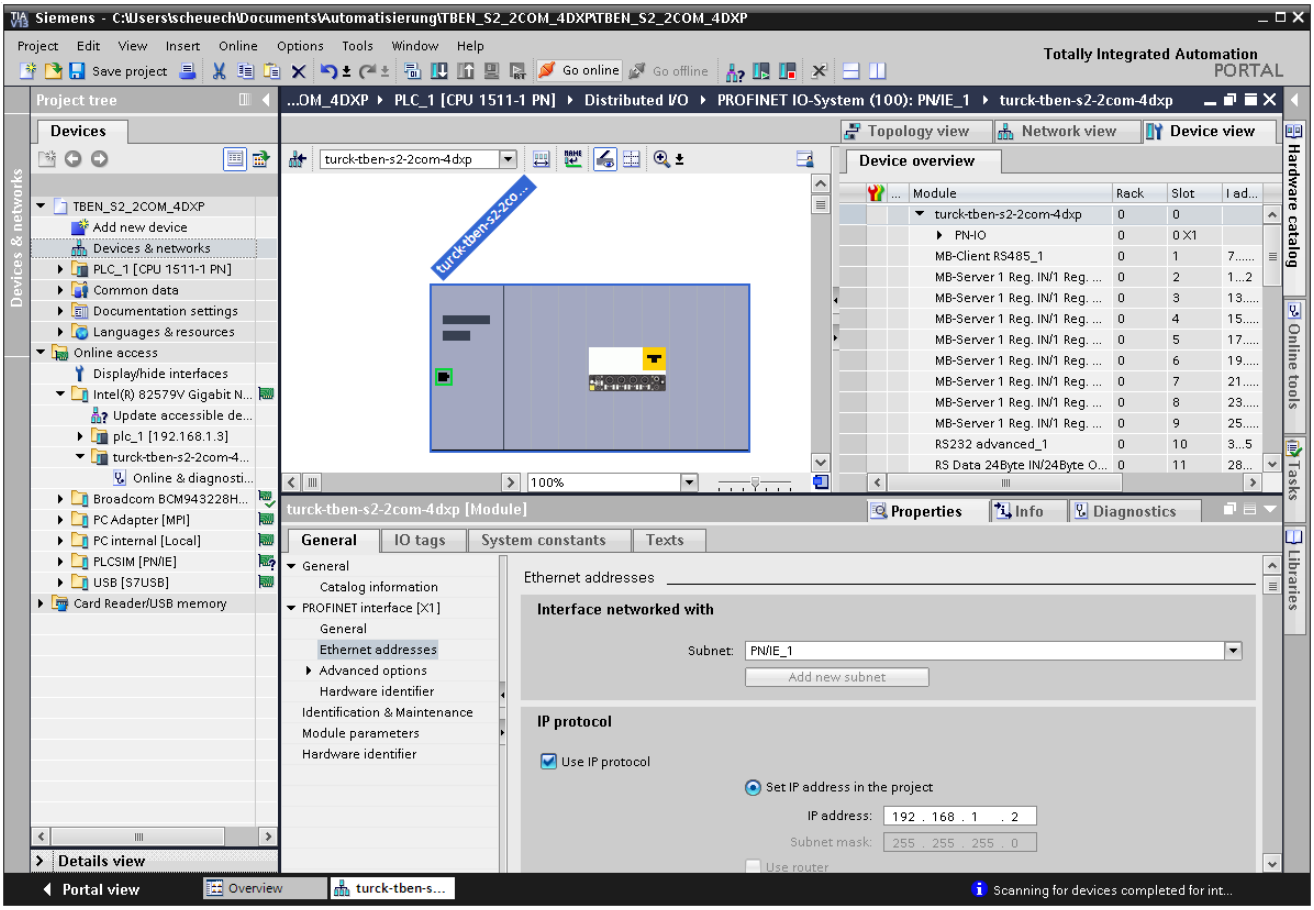


Fig. 33: Starting the online mode

➥ The device has been successfully connected to the PLC.

7.3.10 Setting Module Parameters

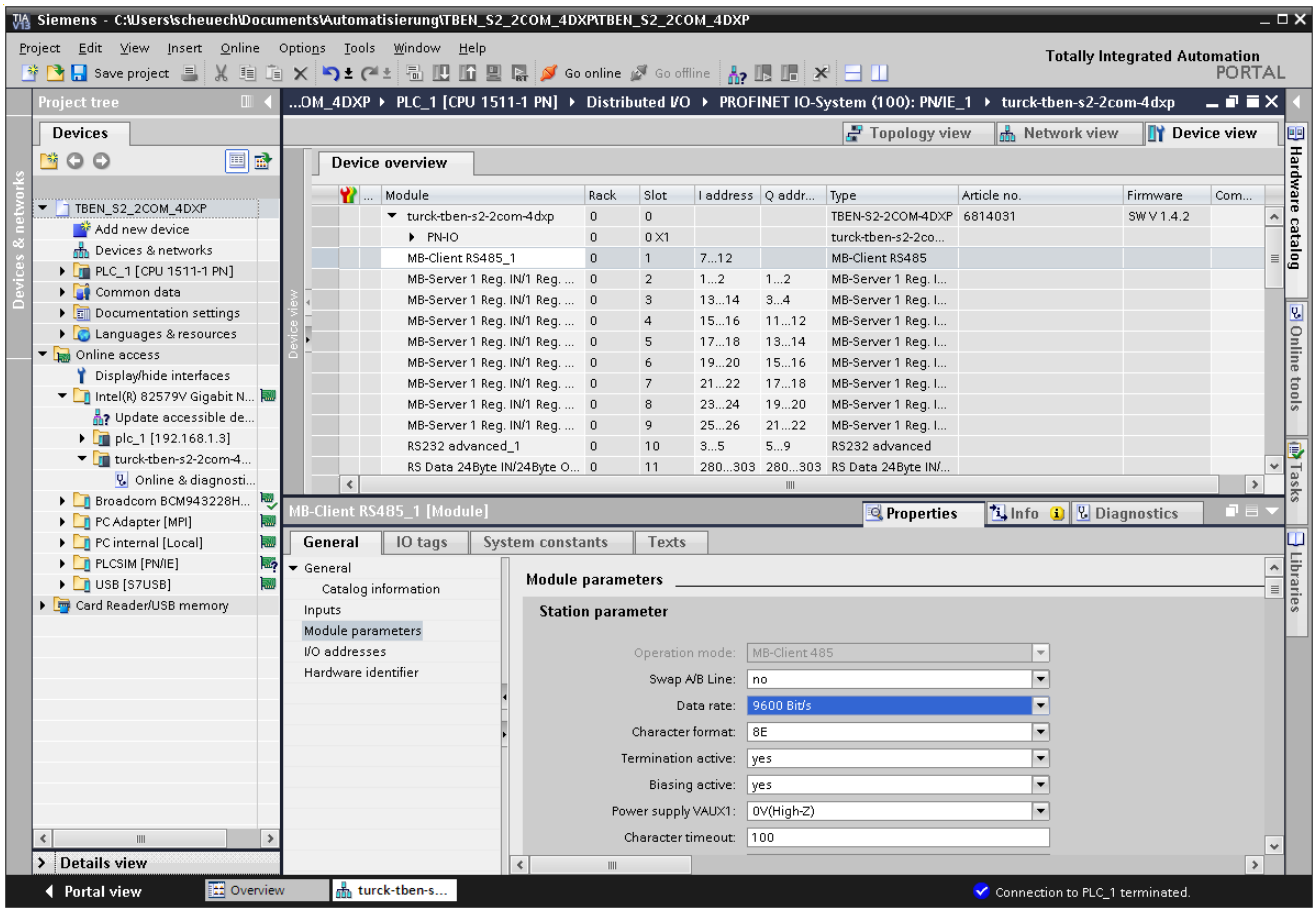


Fig. 34: Setting Module Parameters

- Select "Device view" → "Device overview".
- Select the slot to be parameterized.
- Click "Properties" →"general" →"Module parameters".
- Set the parameters.

7.4 Commissioning the Device in EtherNet/IP™

Features	Description
QuickConnect	< 500 ms
Device Level Ring (DLR)	yes
Number of TCP connections	3
Number of CIP connections	10
Input Assembly Instance	103
Output Assembly Instance	104
Configuration Assembly Instance	106

7.4.1 EDS-file

The actual EDS-files for TBEN-S can be downloaded from the TURCK home page **www.turck.com**.

EDS-file	ZIP-file
TBEN-S2-2COM-4DXP_Rx.x.eds	TBEN-S_ETHERNETIP.zip

7.4.2 QuickConnect (QC)

QuickConnect enables a PLC to build up connections to EtherNet/IP™ nodes in less than 500 ms after switching-on the power supply for the EtherNet/IP™ network. The fast start-up is necessary for fast tool changing applications at robot arms
for example in the automobile industry.

The modules TBEN-S2-2COM-4DXP support QuickConnect, but the function can only be guaranteed for the digital channels.

NOTE

Activating QuickConnect also activated the automatic setting of all necessary port-properties:

Autonegotiation	= deactivated
Transmission speed	= 100BaseT
Duplex	= Full duplex
Topology	= linear
AutoMDIX	= deactivated

Ethernet connection for QC-applications

NOTE

Please read **Ethernet Connection for QC/FSU Applications, page 15** for information about the correct Ethernet-cabling in QC-applications with TBEN-S,

QuickConnect in TBEN-S

Turck TBEN-S devices support QuickConnect.

QuickConnect can be activated via the EDS-file of the device, the Assembly Class, Class Instance Attribute or the web server.

- EDS-fileAssembly Class 0x04, Configuration Assembly 106, Bit 9 = 1 (see s. **p. 57**)

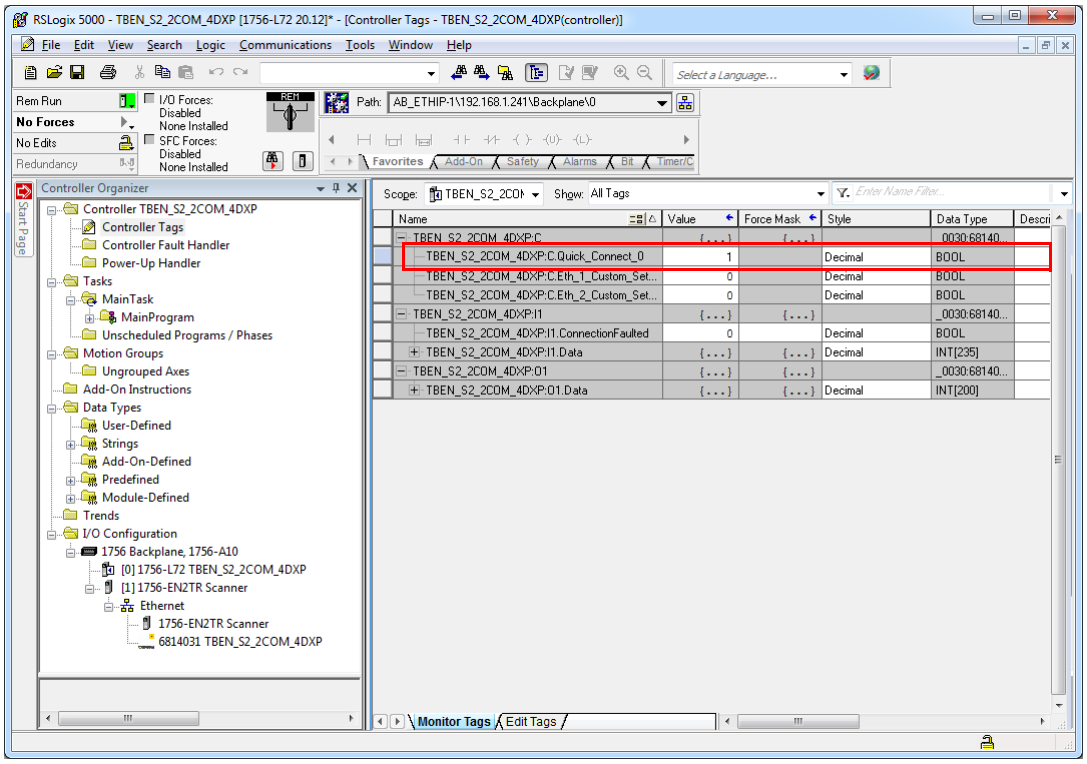


Fig. 35: QuickConnect parameter in the EDS-file

- Class Instance Attribute in the TCP/IP Interface Class

Class	Instance	Attributes	Value
245 (0xF5)	1 (0x01)	12 (0x0C)	0 = activated (default) **1: activated**

- Web server

  QuickConnect can also be activated or deactivated using the device's web server.

7.4.3 Diagnostic messages via process data

The diagnostic messages of the COM and the DXP channels are directly mapped into the process data (see **Process Data Mapping, page 60.**)

Additionally, the device's status word contains the module diagnostics: In the default setting of the device, the status word is mapped before the device's process input data (**s. p. 60**).

Status word The status word contains the module status.

Byte 1 (MSB)								**Byte 0 (LSB)**							
Bit 15	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
res.	Force Mode active	reserved			Internal error	Under-voltage V1	res.	Under-voltage V2	res.					ARGEE Program Running	Module Diagnostics Available

→ **Evaluating Process Input Data –Module Status, page 136**
or
Gateway Class (VSC 100), Object Instance 2, gateway Instance, page 70

Control word

In the default setting of the device, the control word is mapped before the device's process output data (**s. p. 60**).

The control word has no function.

7.4.4 EtherNet/IP™-standard classes

The modules support the following EtherNet/IP™ Standard Classes in accordance with the CIP specification.

Class Code		Object name
Dec.	Hex.	
01	0x01	Identity Object (0x01)
04	0x04	Assembly Object (0x04)
06	0x06	Connection Manager Object (0x06)
245	0xF5	TCP/IP Interface Object (0xF5)
246	0xF6	Ethernet Link Object (0xF6)

Identity Object (0x01)

The following description of the Ethernet Link Object is taken from the CIP specification, Vol. 2, Rev. 2.1 by ODVA & ControlNet International Ltd. and adapted to the Turck products.

Class attributes

Attr. No.		Attribute name	Get/ Set	Type	Value
Dec.	Hex.				
1	0x01	REVISION	G	UINT	1
2	0x02	MAX OBJECT INSTANCE	G	UINT	1
6	0x06	MAX CLASS ATTRIBUTE	G	UINT	7
7	0x07	MAX INSTANCE ATTRIBUTE	G	UINT	7

Instance attributes

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
1	0x01	VENDOR	G	UINT	Contains the vendor ID. Turck = 48
2	0x02	PRODUCT TYPE	G	UINT	Shows the general product type. Communications Adapter 12_{dez} = 0x0C
3	0x06	PRODUCT CODE	G	UINT	Identifier for a specific product of a device type. default: 27247_{dec} = 6A6F
4	0x04	REVISION Major Minor	G	STRUCT OF:USINT USINT	Revision of the item the Identity Object is representing. 0x01 0x06
5	0x05	DEVICE STATUS	G	WORD	See Device Status
6	0x06	SERIAL NUMBER	G	UDINT	Contains the ident-no. of the product (3 last bytes of the MAC-ID).

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
7	0x07	PRODUCT NAME	G	STRUCT OF:	e. g.: TBEN-S2-2COM-4DXP
		LENGTH NAME		USINT STRING [13]	

Device Status

Bit	Name	Definition
0…1	reserved	default = 0
2	Configured	TRUE = 1 The application of the device has been configured (≠ default-settings).
3	reserved	default = 0
4…7	Extended Device Status	0011 = no I/O connection established 0110 = at least one I/O connection in RUN mode 0111 = at least one I/O connection established, all in IDLE mode All other settings = reserved
8…15	reserved	default = 0

Common services

Service code		Class	Instance	Service name
Dec.	Hex.			
01	0x01	yes	yes	Get_Attribute_All Returns a predefined list of the object's attributes.
05	0x05	no	yes	reset Starts the reset service for the device.
14	0x0E	yes	yes	Get_Attribute_Single Returns the contents of a specified attribute.
16	0x10	no	no	Set_Attribute_Single Modifies a single attribute.

7.4.5 Assembly Object (0x04)

Assembly Objects bind attributes of multiple objects to allow data to or from each object to be sent or received over a single connection.

The following description of the Ethernet Link Object is taken from the CIP specification, Vol. 2, Rev. 2.1 by ODVA & ControlNet International Ltd. and adapted to the Turck products.

Class attributes

Attr. No.		Attribute name	Get/ Set	Type	Value
Dec.	Hex.				
1	0x01	REVISION	G	UINT	2
2	0x02	MAX OBJECT INSTANCE	G	UINT	104

Instance attributes

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
3	0x03	DATA	S	ARRAY OF BYTE	
4	0x04	SIZE	G	UINT	Number of bytes in attr. 3 256 or variable

Common services

Service code		Class	Instance	Service name
Dec.	Hex.			
01	0x01	yes	yes	Get_Attribute_All
14	0x0E	no	yes	Get_Attribute_Single

Configuration Assembly (Instance 106)

The modules support Configuration Assembly. It enables an EDS-based configuration/parameterization of the devices in the PLC software (if supported by the PLC).

The Configuration Assembly contains:

10 bytes device configuration data (EtherNet/IP™-specific)

+ 218 bytes (parameter data)

Byte		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Dec.	Hex.								
Device configuration data, see Device configuration data, page 59									
0…9	0x00… 0x09	-					Eth 2 Port Setup	Eth 1 Port Setup	QuickConnect
Parameter data									
		COM0 Setting Parameters, page 117							
10	0x0A	-					Operation mode		
11	0x0B	-							Swap A/B line
12	0x0C	-				Data rate			
13	0x0D	-					Character format		
14	0x0E	-							Stop bits
15	0x0F	-						EOF detection	
16	0x10	-							Termination active
17	0x11	-							Biasing active
18	0x12	-						Power supply VAUX1	
19	0x13	-							
20	0x14	Character timeout							
21	0x15								
22	0x16	Response timeout							
23	0x17								
24	0x18	1st end delimiter							
25	0x19	2nd end delimiter							
26	0x20	MB-Server cycle time (*1ms)							
27	0x1B								
		COM 0 – SCB 0.0 Setting Parameters – COM0/COM1, page 117							
28	0x1C	Server address							
29	0x1D	-				Number reg./server write access			
30	0x1E	-				Number reg./ server read access			
31	0x1F	Read access							
32	0x20	Write access							
33	0x21	-							
34	0x22	Start address for read access							
35	0x23								
36	0x24	Start address for write access							
37	0x25								
38 to 47	0x26 to 0x2F	**COM 0 – SCB 0.1** Assignment (similar to byte 29 to 37)							
		…							
98 to 107	0x62 to 0x6B	**COM 0 – SCB 0.7** Assignment (similar to byte 29 to 37)							

Byte		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Dec.	Hex.								
		COM 1 Setting Parameters – COM0/COM1, page 117							
108	0x6C	-					Operation mode		
109	0x6D	-							Swap A/B line
110	0x6E	-				Data rate			
111	0x6F	-					Character format		
112	0x70	-							Stop bits
113	0x71	-						EOF detection	
114	0x72	-							Termination active
115	0x73	-							Biasing active
116	0x74	-						Power supply VAUX1	
117	0x75	-							
118	0x76	Character timeout							
119	0x77								
120	0x78	Response timeout							
121	0x79								
122	0x7A	1st end delimiter							
123	0x7B	2nd end delimiter							
124	0x7C	MB-Server cycle time (*1ms)							
125	0x7D								
		COM 0 – SCB 1.0 Setting Parameters – Server Configuration Block (SCB), page 121							
126	0x7E	Server address							
127	0x7F	-				Number reg./server write access			
128	0x80	-				Number reg./ server read access			
129	0x81	Read access							
130	0x82	Write access							
131	0x83	-							
132	0x84	Start address for read access							
133	0x85								
134	0x86	Start address for write access							
135	0x87								
136 to 145	0x88 to 0x91	**COM 0 – SCB 1.1** Assignment (similar to byte 29 to 37)							
…		…							
196 to 205	0xC4 to 0xCD	**COM 0 – SCB 1.7** Assignment (similar to byte 29 to 37)							
		DXP channels, Setting Parameters – DXP Channels, page 127							
206	0xCE	-							SRO4
…		…							
209	0xD1	-							SRO7
210	0xD2	-							EN_DO4
…		…							
213	0xD5	-							EN_DO7
214	0xD6	-						DIF pulses (DXP4)	
215	0xD7								Eingangs-filter (DXP4)
216	0xD8	Pulse stretching (DXP4)							
…		…							
226	0xE2	-						DIF pulses (DXP7)	
227	0xE3								Eingangs-filter (DXP7)
228	0xE4	Pulse stretching (DXP7)							

Device configuration data

Default values are marked in bold.

Parameter name	Value	Meaning
QuickConnect	**0 = deactivated**	
	1 = activated	QuickConnect is activated.
ETH x Port Setup	**0 = Autonegotiation**	The port is set to autonegotiation.
	1 = 100BT/FD	Defined setting of communication parameters for the Ethernet port to: – 100BaseT – Full duplex

Process data instances

Instance 103 and Instance 104

In- and output assembly instances with variable assembly sizes. The assembly size is pre-calculated to support the stations I/O-configuration, enabled diagnostics, etc.

The effective size of the Assembly Instance can be determined using the Assembly Object (instance 0×67, attribute 0x04):

- **Input data:**
  Input Assembly Instance: 103
  0…470 bytes
  default: 470 bytes
- **Output data:**
  Output Assembly Instance: 104
  0…400 bytes
  default: 400 bytes

Process Data Mapping

The process data mapping of the TBEN-S2-2COM-4DXP for EtherNet/IIP™ corresponds to the process data mapping described in chapter **Operating**. But, in EtherNet/IP™, the status and the control word are mapped before the process data.

- The mapping of the status and the control word can be deactivated via **Gateway Class (VSC 100)**, **GW Status Word, page 70** or **Gateway Class (VSC 100)**, **GW Control word, page 70**.

ATTENTION!

Activating/deactivating the status and control word in EtherNet/IP™

Changes in the process data mapping

➤ Observe the changes in the process data mapping if the status and control word are activated or deactivated.

IN	Word Offset	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Status word	0	Module status (s. p. 136)															
Input data	1	Process input data (s. p. 129)															
OUT		**Bit 15**	**Bit 14**	**Bit 13**	**Bit 12**	**Bit 11**	**Bit 10**	**Bit 9**	**Bit 8**	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Control word	0	(without function)															
Output data	1	Process output data (s. p. 137)															

7.4.6 Connection Manager Object (0x06)

This object is used for connection and connectionless communications, including establishing connections across multiple subnets.

The following description of the Ethernet Link Object is taken from the CIP specification, Vol. 2, Rev. 2.1 by ODVA & ControlNet International Ltd. and adapted to the Turck products.

Common services

Service code		Class	Instance	Service name
Dec.	Hex.			
84	0x54	no	yes	FWD_OPEN_CMD (Opens a connection)
78	0x4E	no	yes	FWD_CLOSE_CMD (Closes a connection)
82	0x52	no	yes	UNCONNECTED_SEND_CMD

7.4.7 TCP/IP Interface Object (0xF5)

The following description of the Ethernet Link Object is taken from the CIP specification, Vol. 2, Rev. 1.1 by ODVA & ControlNet International Ltd. and adapted to the Turck products.

Class attributes

Attr. No.		Attribute name	Get/ Set	Type	Value
Dec.	Hex.				
1	0x01	REVISION	G	UINT	1
2	0x02	MAX OBJECT INSTANCE	G	UINT	1
3	0x03	NUMBER OF INSTANCES	G	UINT	1
6	0x06	MAX CLASS IDENTIFIER	G	UINT	7
7	0x07	MAX INSTANCE ATTRIBUTE	G	UINT	6

Instance attributes

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
1	0x01	STATUS	G	DWORD	Interface status (s. p. 63, Interface Status)
2	0x02	CONFIGURATION CAPABILITY	G	DWORD	Interface Capability Flag (s. p. 63, Configuration Capability)
3	0x03	CONFIGURATION CONTROL	G/S	DWORD	Interface Control Flag (s. p. 64, Configuration Control)
4	0x04	PHYSICAL LINK OBJECT	G	STRUCT	
		Path size		UINT	Number of 16 bit words: 0x02
		Path:		Padded EPATH	0x20, 0xF6, 0x24, 0x01
5	0x05	INTERFACE CONFIGURATION	G	Structure of:	TCP/IP Network Interface Configuration (s. p. 64)
		IP address	G	UDINT	Actual IP address
		NETWORK MASK	G	UDINT	Actual network mask
		GATEWAY ADDR.	G	UDINT	Actual default gateway
		NAME SERVER	G	UDINT	0 = no server address configured
		NAME SERVER 2		UDINT	0 = no secondary server address configured
		DOMAIN NAME	G	UDINT	0 = no domain name configured
6	0x06	HOST NAME	G	STRING	0 = no Host Name configured (s. p. 64)
12	0x0C	Quick Connect	G/S	BOOL	0 = deactivate 1 = activate

Common services

Service code		Class	Instance	Service name
Dec.	Hex.			
01	0x01	yes	yes	Get_Attribute_All
02	0x02	no	no	Set_Attribute_All
14	0x0E	yes	yes	Get_Attribute_Single
16	0x10	no	yes	Set_Attribute_Single

Interface Status

The Status attribute indicates the status of the TCP/IP network interface.
Refer to the state diagram, **Fig. 36: TCP/IP object state diagram (acc. to CIP Spec., Vol.2, Rev. 1.1)** for a description of object states as they relate to the Status attribute.

Bit	Name	Definition
0-3	Interface Configuration Status	Indicates the status of the Interface Configuration attribute: 0 = The Interface Configuration attribute has not been configured 1 = The Interface Configuration attribute contains valid configuration. 2…15 = reserved
4…31	reserved	

Configuration Capability

The Configuration Capability indicates the device's support for optional network configuration capability.

Bit	Name	Definition	Value
0	BOOTP Client	The device is capable of obtaining its network configuration via BOOTP.	1
1	DNS Client	The device is capable of resolving host names by querying a DNS server.	0
2	DHCP Client	The device is capable of obtaining its network configuration via DHCP.	1

Configuration Control

The Configuration Control attribute is used to control network configuration options.

Bit	Name	Definition
0-3	Startup-Configuration	Determines how the device shall obtain its initial configuration. 0 = The device shall use the interface configuration values previously stored (for example, in non-volatile memory or via hardware-switches, etc). 1…3 = reserved
4	DNS Enable	Always 0
5-31	reserved	Set to 0

Interface Configuration

This attribute contains the configuration parameters required to operate as a TCP/IP node. To modify the Interface Configuration attribute, get the Interface Configuration attribute first, change the desired parameters, then set the attribute.
The TCP/IP Interface Object applies the new configuration upon completion of the Set service. If the value of the Startup Configuration bits (Configuration Control attribute) is 0, the new configuration is stored in non-volatile memory.
The device does not reply to the set service until the values are safely stored to non-volatile memory.
An attempt to set any of the components of the Interface Configuration attribute to invalid values results in an error (status code 0x09) returned from the Set service.

If initial configuration is obtained via BOOTP or DHCP, the Interface Configuration attribute components are all 0 until the BOOTP or DHCP reply is received.
Upon receipt of the BOOTP or DHCP reply, the Interface Configuration attribute shows the configuration obtained via BOOTP/DHCP.

Host Name

This attribute contains the device's host name.
The host name attribute is used when the device supports the DHCP-DNS Update capability and has been configured to use DHCP upon start up.

The mechanism allows the DHCP client to transmit its host name to the DHCP server. The DHCP server then updates the DNS records on behalf of the client.

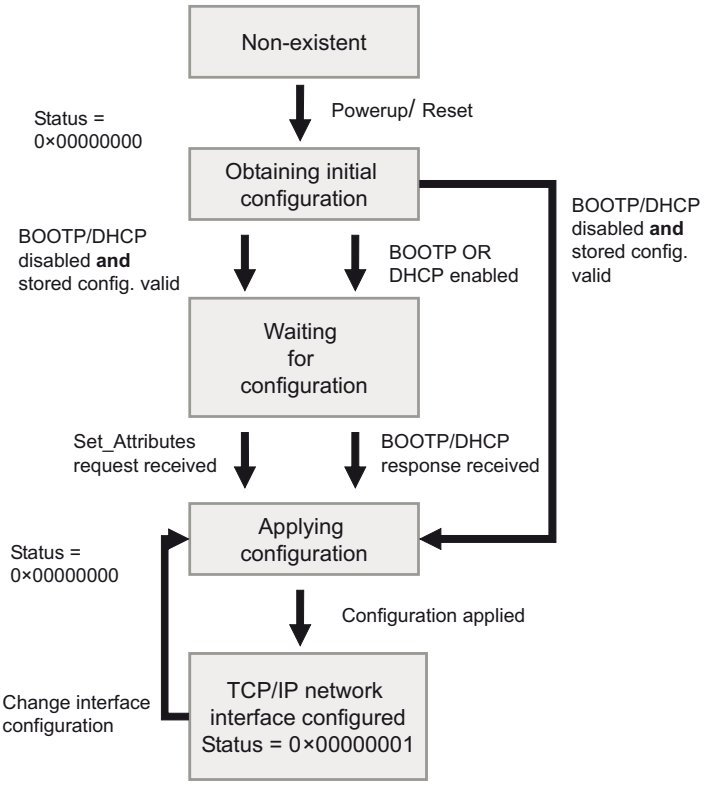


Fig. 36: TCP/IP object state diagram (acc. to CIP Spec., Vol.2, Rev. 1.1)

7.4.8 Ethernet Link Object (0xF6)

The following description of the Ethernet Link Object is taken from the CIP specification, Vol. 2, Rev. 1.1 by ODVA & ControlNet International Ltd. and adapted to the Turck products.

Class attributes

Attr. No.		Attribute name	Get/ Set	Type	Value
Dec.	Hex.				
1	0x01	REVISION	G	UINT	1
2	0x02	MAX OBJECT INSTANCE	G	UINT	1
3	0x03	NUMBER OF INSTANCES	G	UINT	1
6	0x06	MAX CLASS IDENTIFIER	G	UINT	7
7	0x07	MAX INSTANCE ATTRIBUTE	G	UINT	6

Instance attributes

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
1	0x01	INTERFACE SPEED	G	UDINT	Speed in megabit per second. (e. g. 10, 100, 1000, etc.)
2	0x02	INTERFACE FLAGS	G	DWORD	see Interface flags, s. p. 66
3	0x03	PHYSICAL ADDRESS	G	ARRAY OF USINT	Contains the interface's MAC address (Turck: 00:07:46:××:××:××)
6	0x06	INTERFACE CONTROL		2 WORD	Allows port-wise changes of the Ethernet-settings
7	0x07	INTERFACE TYPE			
10	0x0A	INTERFACE LABEL			

Interface flags

Bit	Name	Definition	Default value
0	Link Status	Indicates whether or not the Ethernet communications interface is connected to an active network. 0 = inactive link 1 = active link	Depends on application
1	Half/full duplex	0 = half duplex 1 = full duplex If the Link Status flag is 0, the value of the Half/ Full Duplex flag is indeterminated.	Depends on application

Bit	Name	Definition	Default value
2 to 4	Negotiation Status	Indicates the status of the automatic Autonegotiation 0 = autonegotiation in progress 1 = autonegotiation and speed detection failed Using default values for speed and duplex (10Mbps/half duplex). 2 = autonegotiation failed but detected speed (default: half duplex). 3 = successfully negotiated speed and duplex. 4 = autonegotiation not attempted. Forced speed and duplex.	Depends on application
5	Manual Setting Requires Reset	0 = interface can activate changes to link parameters (auto-negotiate, duplex mode, interface speed) automatically 1 = device requires a Reset service to be issued to its Identity Object in order to adapt the changes	0
6	Local Hardware Fault	0 = interface detects no local hardware fault 1 = local hardware error detected	0

Common services

Service code		Class	Instance	Service name
Dec.	Hex.			
01	0x01	yes	yes	Get_Attribute_All
14	0x0E	yes	yes	Get_Attribute_Single
76	0x4C	no	yes	Enetlink_Get_and_Clear

7.4.9 VSC-Vendor Specific Classes

In addition to supporting the above named CIP Standard Classes, the TBEN-S2-2COM-4DXP modules support the vendor specific classes described in the following.

Class Code		Name	Description
Dec.	Hex.		
100	0x64	Gateway Class, s. p. 69	Data and parameters for the field bus specific part of the device.
139	0x8B	COM Class s. p. 72	Data and parameters for the COM ports of the device.
140	0x8C	RS Data/SCB Class s. p. 75	Data of the connected serial devices, data and parameters for the connected Modbus servers.
141	0x8D	MB-Server Timing	Timing data for connected Modbus servers.
142	0x8E	DXP Class	Data and parameters for the DXP channels of the device.
164	0xA4	Ext. DXP Functions Class	Parameters for the extended digital functions of the DXP channels.

Class Instance of the VSCs

NOTE

The class instance attributes are the same for each Vendor Specific Class.

The class-specific Object Instances and the corresponding attributes are explained in the paragraphs for the different VSC.

The general VSC - class instance attributes are defined as follows.

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
100	0x64	Class revision	G	UINT	Contains the revision number of the class (maj. rel. *1000 + min. rel.).
101	0x65	Max. instance	G	USINT	Contains the number of the highest instance of an object created on this level in the class hierarchy.
102	0x66	# of instances	G	USINT	Contains the number of Object Instances created in this class.
103	0x67	Max. class attribute	G	USINT	Contains the number of the last class attribute to be implemented.

Gateway Class (VSC 100)

This class contains all information concerning the whole module, not the different channels.

- Class instance

NOTE

Please refer to section Class Instance of the VSCs, page 68 for the description of the class instance for the VSC.

- Object instance 1, boot instance

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
100	0x64	Max object attribute	G	USINT	Contains the number of the last object attribute to be implemented.
101	0x65	Hardware revision	G	STRUCT	Contains the hardware revision number of the module (USINT Maj./USINT Min.).
102	0x66	Firmware revision	G	STRUCT	Contains the revision number of the boot firmware (Maj./Min.).
103	0x67	Service tool ident number	G	UDINT	Contains the BOOT ID number that serves as an identification number for the DTM-software.
104	0x68	Hardware Info	G	STRUCT	Contains device hardware information (UINT): – count (number of the following entries) – CLOCK FREQUENCY (kHz) – MAIN FLASH (in kB) – MAIN FLASH SPEED (ns) – SECOND FLASH (kB) – RAM (kB), – RAM SPEED (ns), – RAM data WIDTH (bit), – SERIAL EEPRPOM (kbit) – RTC SUPPORT (in #) – AUTO SERVICE BSL SUPPORT (BOOL) – HDW SYSTEM

- Object Instance 2, gateway Instance

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
109	0x6D	Status word (Status register 2)	G	STRUCT	The Status Word contains general module status information: **Module** – Bit 15: reserved – Bit 14: Force Mode active, "Force Mode Active Error" (FCE) The Force Mode is activated, no access to the module possible because there is already a connection to the DTM active . – Bit 13…bit 10: reserved **Voltage errors** – Bit 09: V1 too low (< 18 V DC). – Bit 08: reserved – Bit 07: V2 too low (< 14 VDC). – Bit 06…bit 1: reserved **Warnings** – Bit 00: Module diagnostics pending (DIAG). At least 1 channel sends diagnostics.
115	0x73	ON IO CONNECTION TIMEOUT	G/S	ENUM USINT	Reaction to the I/O connection exceeding the time limit. SWITCH IO FAULTED (0): The channels are switched to substitute value. SWITCH IO OFF (1): The outputs are switched to 0. SWITCH IO HOLD (2): No further changes to the I/O-data. The outputs are held.
138	0x8A	GW Status Word	Get/ set	DWORD	Activates or deactivates the mapping of the status word into the device's input data.
139	0x8B	GW Control word	Get/ Set	DWORD	Activates or deactivates the mapping of the control word into the device's output data.
140	0x8C	Disable Protocols	Get/ set	UINT	Deactivation of the used Ethernet protocol. Bit assignment of protocols: Bit 0 = EtherNet/IP™ (can not be deactivated via the EtherNet/IP™ interface) Bit 1 = Modbus TCP Bit 2 = PROFINET Bit 11…bit 14 = reserved Bit 15 = Web server

- Object instance 4, COS/CYCLIC instance

Attr. No.		Attribute name	**G**et/ **S**et	Type	Description
Dec.	Hex.				
104	0x68	COS data mapping	G/S	ENUM USINT	The actual data are loaded to the non-volatile memory of the device. Changes become valid after a start-up. 0 = standard: Data of COS message → input data. 1 = process input data (only the process data input image is transferred to scanner) 2…7: reserved

COM Class (VSC 139)

This class contains 2 object instances, one for COM0 and one for COM1.

NOTE

The chapters **Configuring and Parameterizing** and **Operating** contain detailed information concerning parameters or process data and diagnostics.

The chapter **Operating** contains further information about the transmit and receive sequence (s. **p. 141**).

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
Parameters					
1	0x01	Operation mode	G/S	USINT	Operation mode of the COM0 or COM1 channel: 0 = RS485 1 = RS232 2 = MB-Client RS485 3 = MB-Client RS232
2	0x02	Swap A/B line tauschen	G/S	USINT	Changes the outputs polarity of the A/B lines and switches the bias-level. 0 = no (A = pin 2, B = pin 4) 1 = yes (A = pin 4, B = pin 2)
3	0x03	Data rate	G/S	USINT	Data rate of the serial interface 0…3 = reserved 4 = 2400 bps 5 = 4800 bps 6 = 9600 bps 7 = 14400 bps 8 = 19200 bps 9 = 28800 bps 10 = 38400 bps 11 = 57600 bps 12 = 115200 bps 13 = 230400 bps
4	0x04	Character format	G/S	USINT	Defines the parity and the number of bits per sign. 0 = 7O 1 = 7E 2 = 8N 3 = 8O 4 = 8E N: no parity O: odd parity (1 bit error detection) E: even (1 bit error detection)
5	0x05	Stop bits	G/S	USINT	Defines the number of stop bits. 0 = 1 bit 1 = 2 bit

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
6	0x06	EOF detection	G/S	USINT	0 = character timeout 1 = 1 end delimiter 2 = 2 end delimiter 3 = framelength
7	0x07	Termination active	G/S	USINT	0 = yes 1 = no
8	0x08	Biasing active	G/S	USINT	0 = yes 1 = no
9	0x09	Power supply VAUX1	G/S	USINT	0 = 0 V (High-Z) 1 = V1(24 VDC) 2 = +5 VDC
10	0x0A	Character timeout	G/S	INT	Character timeout in ms
11	0x0B	response timeout	G/S	INT	Response timeout in ms
12	0x0C	1st end delimiter	G/S	USINT	default: 3 Is only interpreted if the parameter "EOF detection" is set to 1 end delimiter or 2 end delimiter.
13	0x0D	2nd end delimiter	G/S	USINT	
14	0x0E	MB-Server cycle time (* 1 ms)	G/S	INT	default: 0 = best update time possible
Diagnostics					
15	0x0F	Hardware error	G	USINT	1 = error
16	0x10	Parameterization error	G	USINT	
17	0x11	Overcurrent supply VAUX1	G	USINT	
18	0x12	Error MB-server 0	G	USINT	
19	0x13	Error MB-server 1	G	USINT	
20	0x14	Error MB-server 2	G	USINT	
21	0x15	Error MB-server 3	G	USINT	
22	0x16	Error MB-server 4	G	USINT	
23	0x17	Error MB-server 5	G	USINT	
24	0x18	Error MB-server 6	G	USINT	
25	0x19	Error MB-server 7	G	USINT	
Status bits					
26	0x1A	Transmitter ready	G	USINT	0 = FALSE 1 = TRUE
27	0x1B	Receive complete	G	USINT	The bit is set to TRUE after a message was sent. The bit remains TRUE until the bit "Receive" is set to FALSE.

Attr. No.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
28	0x1C	Frame error	G	USINT	1 = er8 × Baror
29	0x1D	Parity/format error	G	USINT	1 = error
30	0x1E	Buffer overflow	G	USINT	1 = buffer overflow during receive sequence
31	0x1F	Timeout	G	USINT	1 = response timeout This bit is only used in case of a response time set to > 0.
32	0x20	Invalid TX length	G	USINT	1 = error
33	0x21	Invalid RX length	G	USINT	1 = error
34	0x22	Received frame length	G	USINT	This byte contains the length of the last message received.
35	0x23	MB-Server cycle time (* 1 ms)	G	UINT	Update time [ms] with which the Modbus RTU-Client requests data from all connected Modbus RTU-Servers.
36	0x24	Transmit	G	USINT	1 = transmit sequence started
37	0x25	Receive	G	USINT	1 = receive sequence started
38	0x26	Transmitter frame length	G	USINT	Number of the characters to be send in bytes
39	0x27	Receiver frame length	G	USINT	Number of the characters to be received within the next message.

RS Data/SCB Class (VSC 140)

This class contains 2 object instances, one for COM0 and one for COM1.

NOTE

The chapters **Configuring and Parameterizing** and **Operating** contain detailed information concerning parameters or process data and diagnostics.

Attr. no.		Attribute name	Get/ Set	Type	Description	
Dec.	Hex.				Value	
1	0x01	Server address	G/S	USINT	0… 255	Address of the connected Modbus RTU Servers or Start address of the first connected Modbus RTU Server default: 0x01
2	0x02	Number reg./ server read access	G/S	USINT	0… 12	Number of registers to be read or Number of servers from which data have to be read
3	0x03	Number reg./ server write access	G/S	USINT	0… 12	Number of registers to be written or Number of servers to which data have to be written
4	0x04	Read access	G/S	USINT	0	deactivated
					3	read holding registers (FC3)
					4	read input registers (FC4)
					23	read/write multiple registers (FC23)
					128	Write extension
					151	Multi server mode: read 1 holding registers (FC3)
					132	Multi server mode: read 1 input register (FC 4)
					151	Multi server mode: read/write 1 register (FC 23)
					163	Multi server mode: read 2 holding registers (FC3)
					164	Multi server mode: read 2 input register (FC 4)
					183	Multi server mode: read/write 2 register (FC 23)
					195	Multi server mode: read 3 holding registers (FC3)
4	0x04	Read access	G/S	USINT	196	Multi server mode: read 3 input register (FC 4)
					215	Multi server mode: read/write 3 register (FC 23)
					227	Multi server mode: read 4 holding registers (FC3)
					228	Multi server mode: read 4 input register (FC 4)
					247	Multi server mode: read/write 4 register (FC 23)

Attr. no.		Attribute name	Get/ Set	Type	Description	
Dec.	Hex.				Value	
5	0x05	Write access	G/S	USINT	0	deactivated
					6	write single register (FC6)
					16	write multiple registers (FC16)
					23	read/write multiple registers (FC23)
					128	write extension
					134	Multi server mode: write single register (FC6)
					144	Multi server mode: write 1 registers (FC16)
					151	Multi server mode: read/write 1 register (FC 23)
					176	Multi server mode: write 2 registers (FC16)
					183	Multi server mode: read/write 2 register (FC 23)
					208	Multi server mode: write 3 registers (FC16)
					215	Multi server mode: read/write 3 register (FC 23)
					240	Multi server mode: write 4 registers (FC16)
					247	Multi server mode: read/write 4 register (FC 23)
6	0x06	Start address for Read access	G/S	UINT	0… 65535	Address of the 1st register from which data have to be read
7	0x07	Start address for Write access	G/S	UINT	0… 65535	Address of the 1st register to which data have to be written

Attr. no.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				Value
8	0x08	Input register 0	G	UINT	Input data of the connected serial device (s. p. 131) or the Modbus-Server, 1 or 12 register(s) per server (s. p. 135).
9	0x09	Input register 1			
10	0x0A	Input register 2			
11	0x0B	Input register 3			
12	0x0C	Input register 4			
13	0x0D	Input register 5			
14	0x0E	Input register 6			
15	0x0F	Input register 7			
16	0x10	Input register 8			
17	0x11	Input register 9			
18	0x12	Input register 10			
19	0x13	Input register 11			
20	0x14	Output register 0	G	UINT	Output data of the connected serial device (s. p. 139) or the Modbus-Server, 1 or 12 register(s) per server (s. p. 140).
21	0x15	Output register 1			
22	0x16	Output register 2			
23	0x17	Output register 3			
24	0x18	Output register 4			
25	0x19	Output register 5			
26	0x1A	Output register 6			
27	0x1B	Output register 7			

Attr. no.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				Value
28	0x1C	Output register 8	G	UINT	
29	0x1D	Output register 9			
30	0x1E	Output register 10			
31	0x1F	Output register 11			

MB-Server Timing Class (VSC 141)

NOTE

The chapter **Operating** contains more detailed information concerning the process data.

Attr. no. dec. (hex.)	Attribute name	Get/ Set	Type	Description
1 (0x01)	COM0 – MB-Server Timing, server 0	G	UINT	Update time [ms] of the connected Modbus RTU-Servers at COM0 or COM1.
2 (0x02)	COM1 – MB-Server Timing, server 0	G	UINT	
3 (0x03)	COM0 – MB-Server Timing, server 1	G	UINT	
4 (0x04)	COM1 – MB-Server Timing, server 1	G	UINT	
…	…			
15 (0x0F)	COM0 – MB-Server Timing, server 7	G	UINT	
16 (0x010)	COM1 – MB-Server Timing, server 7	G	UINT	

NOTE

The chapters **Configuring and Parameterizing** and **Operating** contain detailed information concerning parameters or process data and diagnostics.

Attr. no.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
Parameters					
1	0x01	DXP4 – Manual reset after overcurr.	G/S	USINT	0 = no 1 = yes
2	0x02	DXP5 – Manual reset after overcurr.	G/S	USINT	0 = no 1 = yes
3	0x03	DXP6 – Manual reset after overcurr.	G/S	USINT	0 = no 1 = yes
4	0x04	DXP7 – Manual reset after overcurr.	G/S	USINT	0 = no 1 = yes
5	0x05	DXP4 – Activate output	G/S	USINT	0 = no 1 = yes
6	0x06	DXP5 – Activate output	G/S	USINT	0 = no 1 = yes
7	0x07	DXP6 – Activate output	G/S	USINT	0 = no 1 = yes
8	0x08	DXP7 – Activate output	G/S	USINT	0 = no 1 = yes
Status					
9	0x09	Overcurrent VAUX2 Ch4/Ch5	G	USINT	Overcurrent at the supply voltage at C2 (channel 4/5) or C3 (channel 6/7)
10	0x0A	Overcurrent VAUX2 Ch6/Ch7	G	USINT	
11	0x0B	DXP4 – overcurrent output	G	USINT	
12	0x0C	DXP5 – overcurrent output	G	USINT	
13	0x0D	DXP6 – overcurrent output	G	USINT	
14	0x0E	DXP7 – overcurrent output	G	USINT	
15	0x0F	DXP4 – Input value	G	USINT	1 = input signal at DXP channel
16	0x10	DXP5 – Input value	G	USINT	
17	0x11	DXP6 – Input value	G	USINT	
18	0x12	DXP7 – Input value	G	USINT	
19	0x13	Output value	G	BYTE	0 = DXP4 1 = DXP5 2 = DXP6 3 = DXP7

7.4.10 Extended DXP Functions Class (VSC 164)

This class provides four instances, one per DXP-channel.

NOTE

The chapter **Configuring and Parameterizing** contains more detailed information concerning the parameters.

Attr. no.		Attribute name	Get/ Set	Type	Description
Dec.	Hex.				
1	0x01	Extended digital function	G/S	USINT	0 = deactivated 1 = input filter and pulse stretch
2	0x02	Input filter	G/S	USINT	0 = 0,2 ms 1 = 3 ms
3	0x03	Impulse stretch (* 10 ms)	G/S	USINT	0…254

7.5 Connecting the device to an EtherNet/IP™ PLC

7.5.1 Used Hardware

The following hardware components are used in this example:

- Rockwell PLC ControlLogix 1756-L72
- Rockwell Scanner 1756-EN2TR
- Block module TBEN-S2-2COM-4DXP
- 8 × Banner K50TGRYS1QP at COM 0 as Modbus server

7.5.2 Used Software

The following software tools are used in this example:

- Rockwell RS Logix
- EDS file for TBEN-S2-2COM-4DXP (can be downloaded for free under ww.turck.com).

7.5.3 Prerequisites

- The programming software has been started.
- A new project has been created with the PLC and the Scanner mentioned above.
- The PLC has been added to the project.

7.5.4 Installing the EDS-file

The EDS-file can be downloaded for free from www.turck.com .

Adding the EDS-file: Click "Tools" → "EDS Hardware Installation Tool"

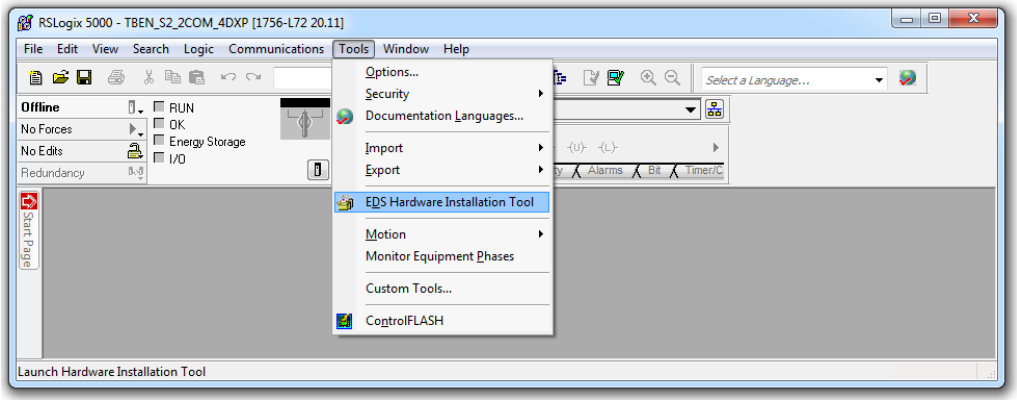


Fig. 37: Opening the "EDS Hardware Installation Tool"

➥ The installation assistant guides you through the installation process.

7.5.5 Connecting the device to the PLC

➤ Right-click "I/O Configuration" → "Ethernet".

➤ Select "New Module"

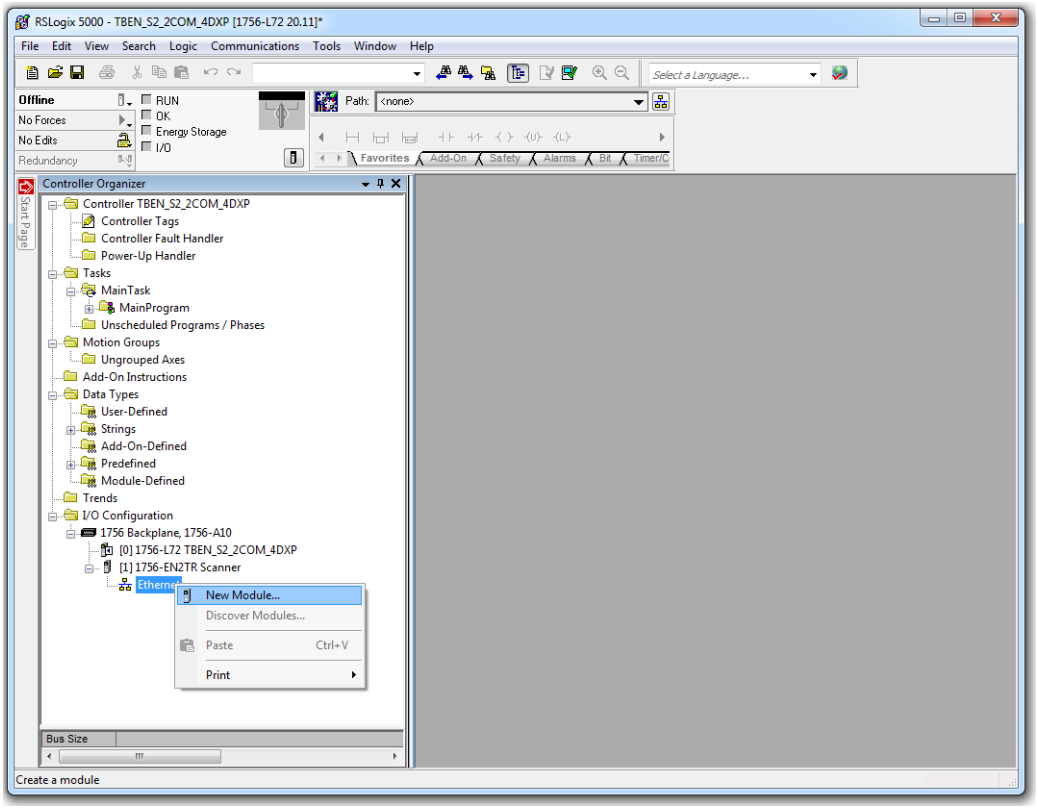


Fig. 38: Adding a new module

➤ Select Turck under "Module Type Vendor Files".

➤ Select TBEN-S2-2COM-4DXP.

➤ Confirm the selection with "Create".

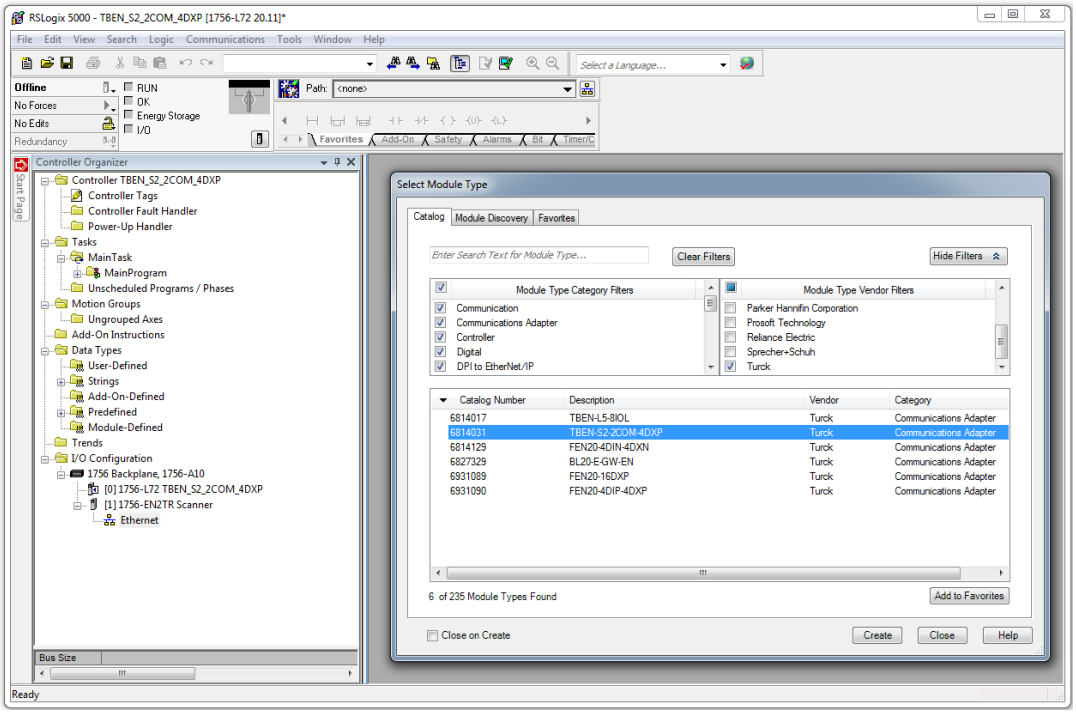


Fig. 39: Select TBEN-S2-2COM-4DXP.

➤ Assign a module name.

➤ Set the IP address of the device (example: 192.168.1.10).

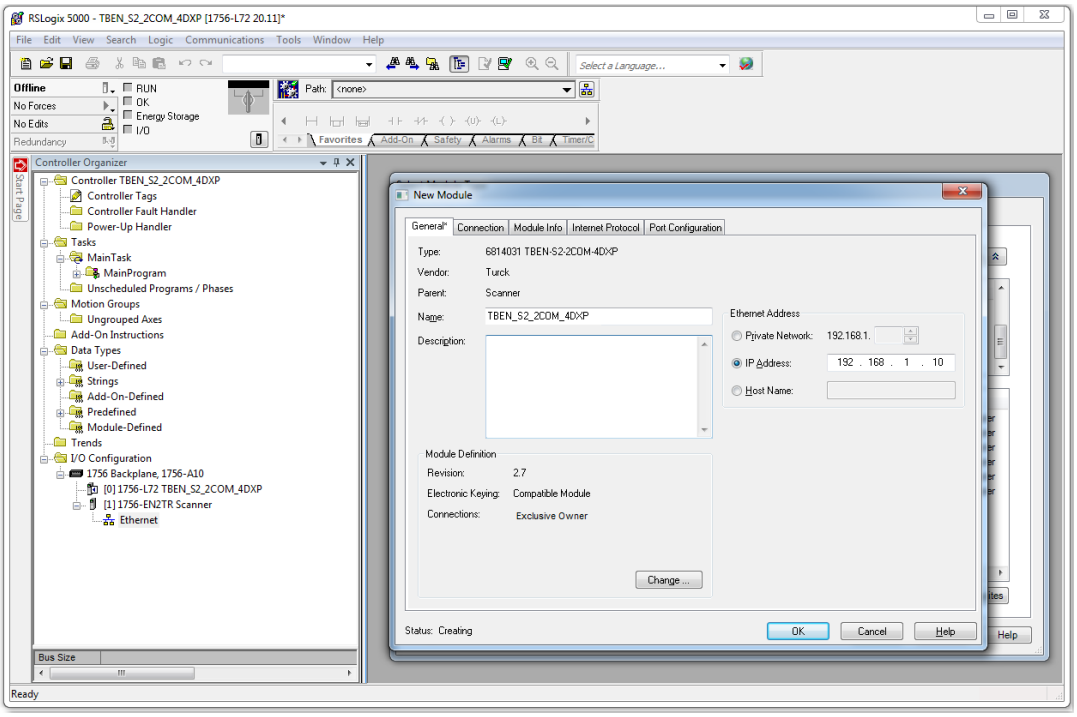


Fig. 40: Setting module name and IP address

➤ Set the Integer data format for in- and output data: Click "Change". → in the following dialog box select "INT".

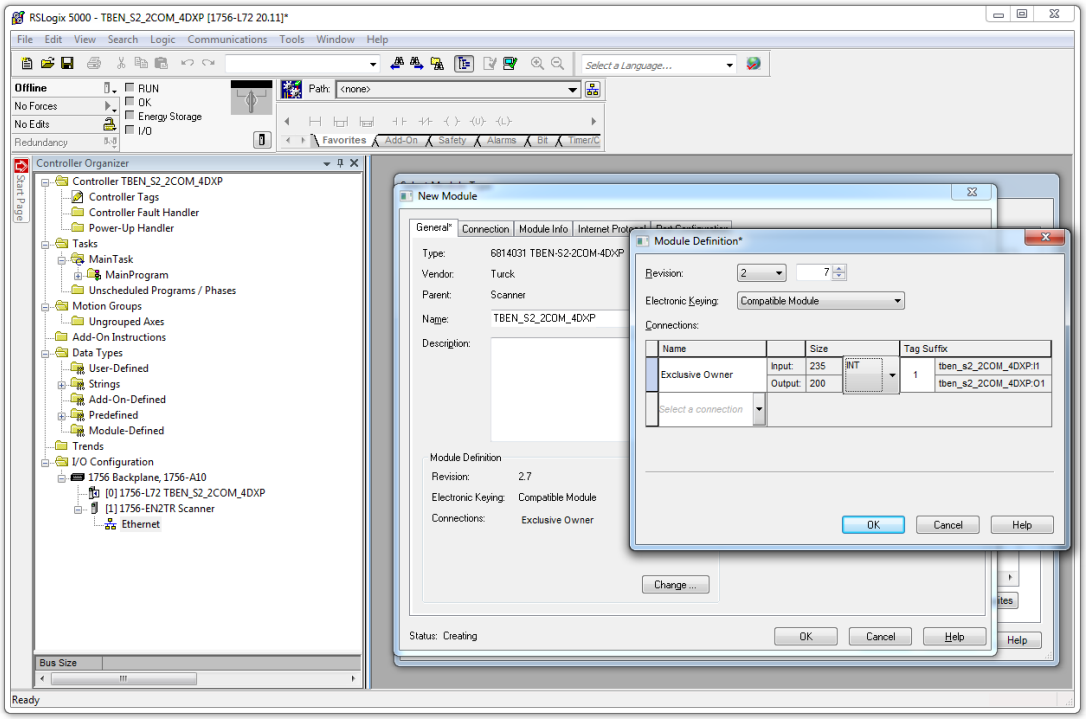


Fig. 41: Setting the Integer data format for in- and output data

➤ Optional: Setting the connection and the port configuration.

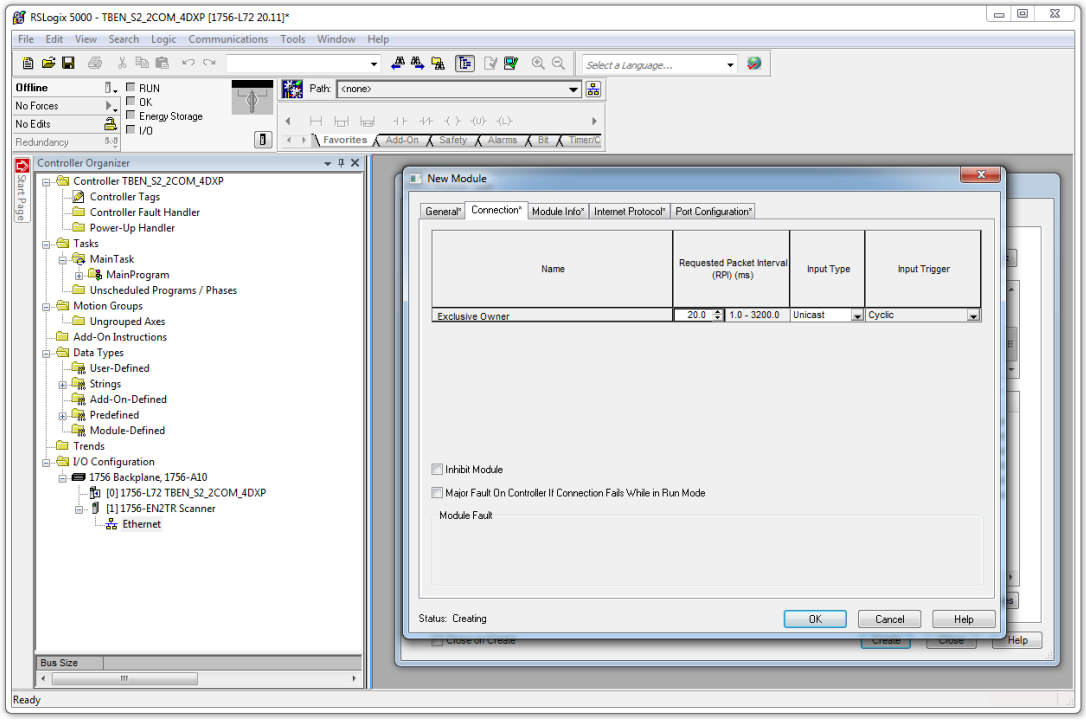


Fig. 42: Setting the connection parameters

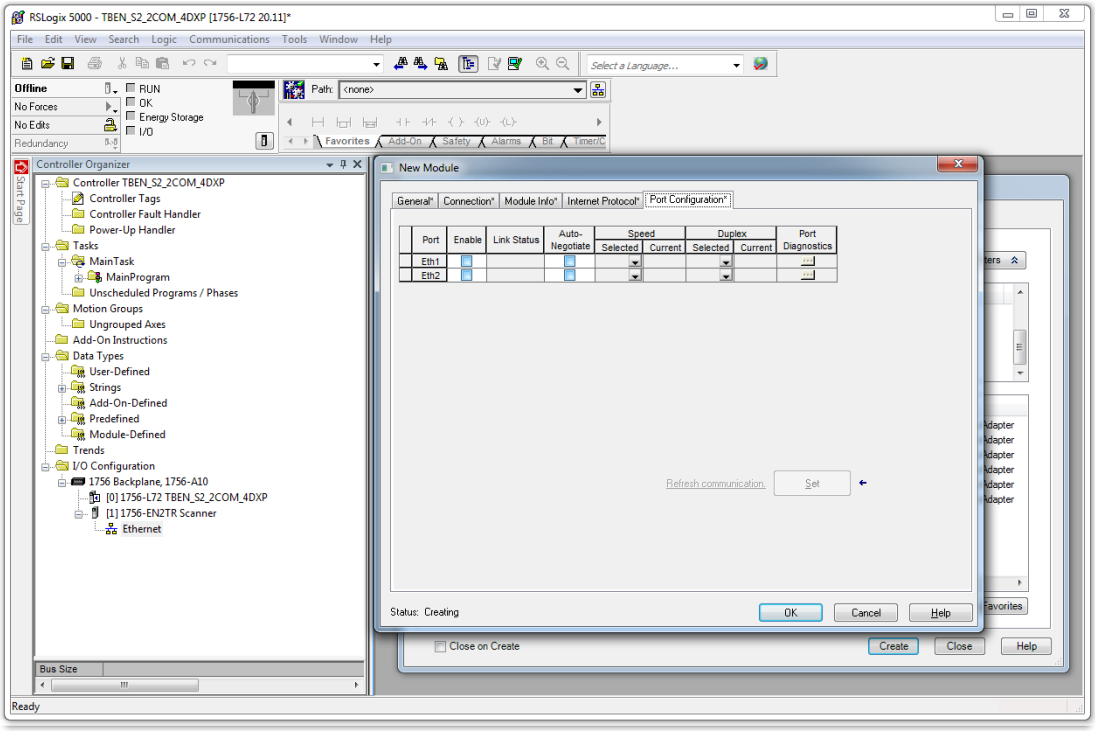


Fig. 43: Setting the port configuration

➥ The device is added to the project tree.

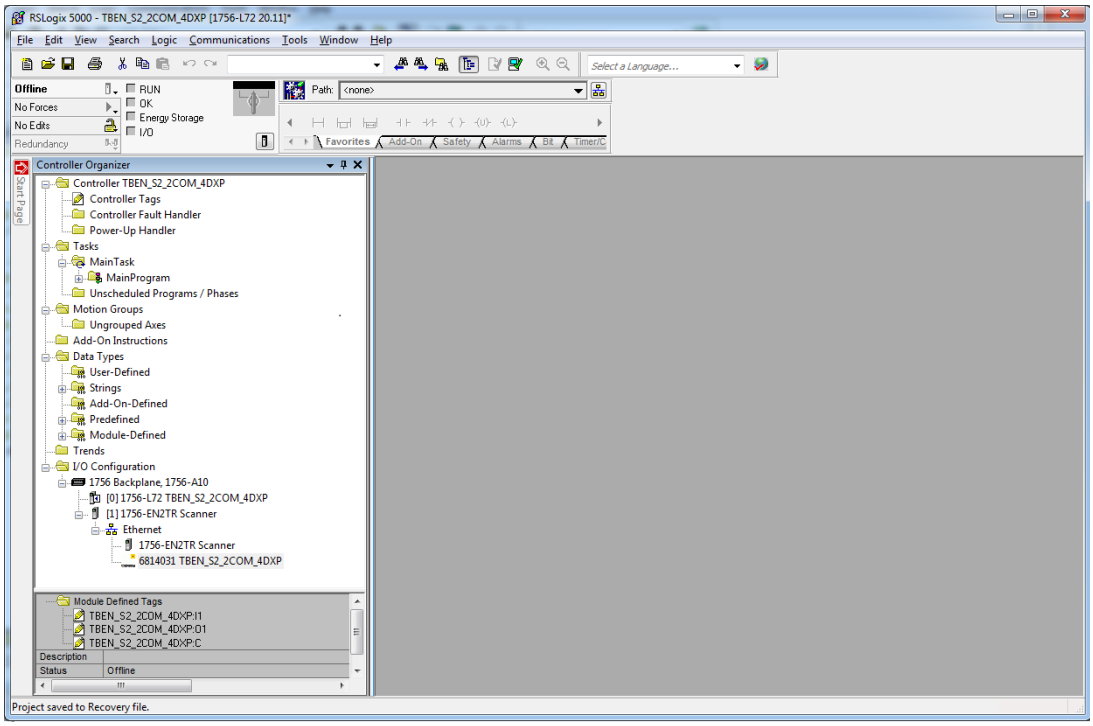


Fig. 44: TBEN-S2-2COM-4DXP in the project tree

7.5.6 Going online with the PLC

➤ Scan the network via the "who active"-button, select the PLC and set the communication path via "Set Project Path".

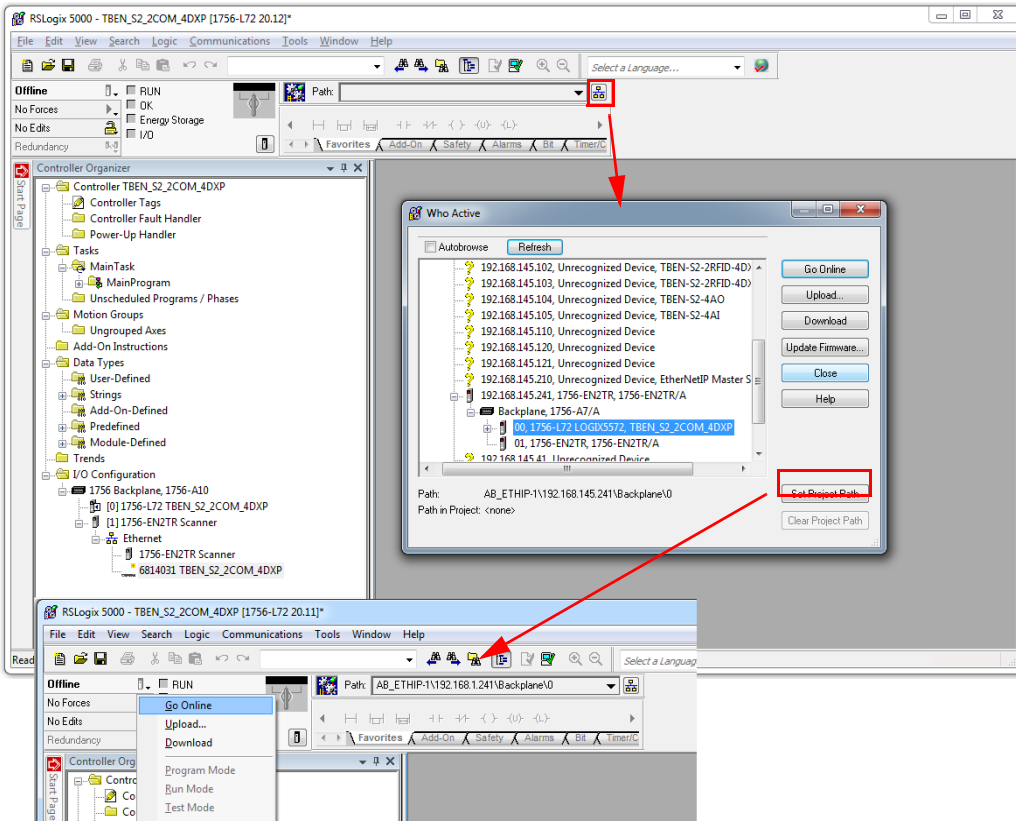


Fig. 45: Setting the communication path

➥ The communication path is set

➤ Select the PLC.

➤ Click "Go online".

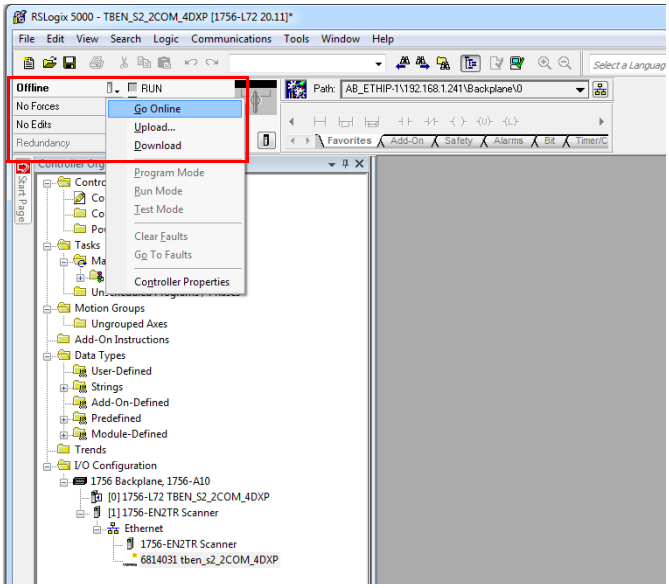


Fig. 46: Going online with the device

➤ Click "Download" In the following dialog (Connect To Go Online).

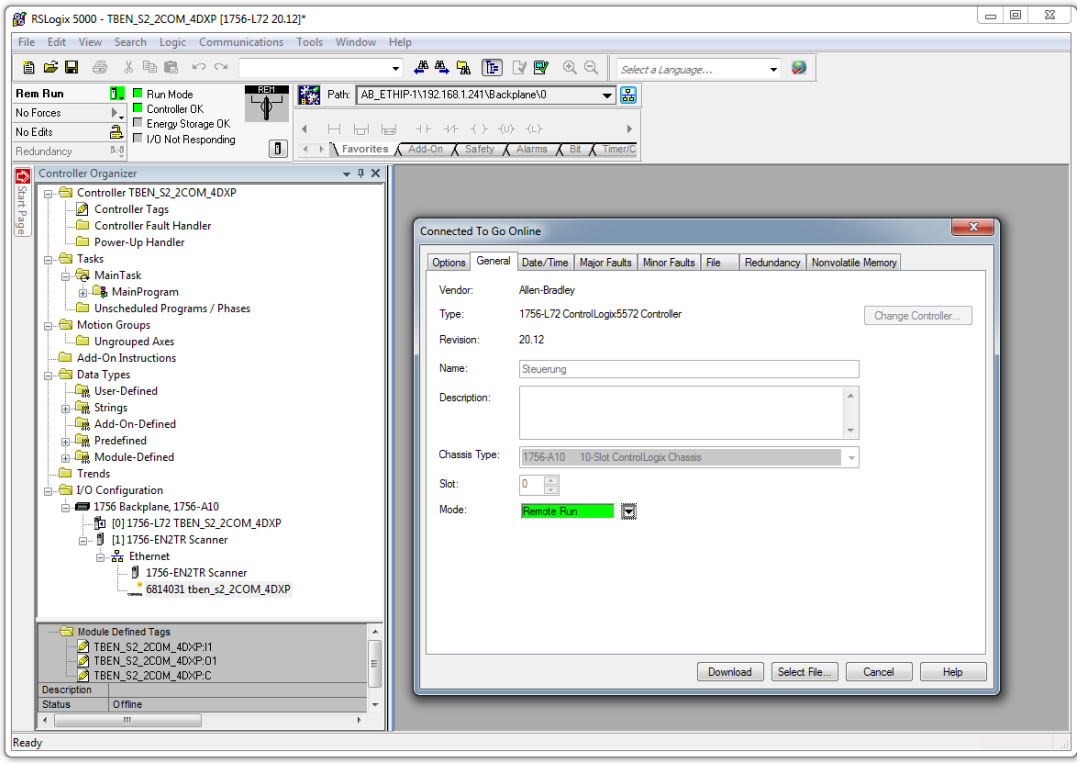


Fig. 47: Clicking "Download"

➤ Confirm all following messages.

7.5.7 Reading Process Data

➤ Open the "Controller Tags" in the project tree by double-clicking the entry.

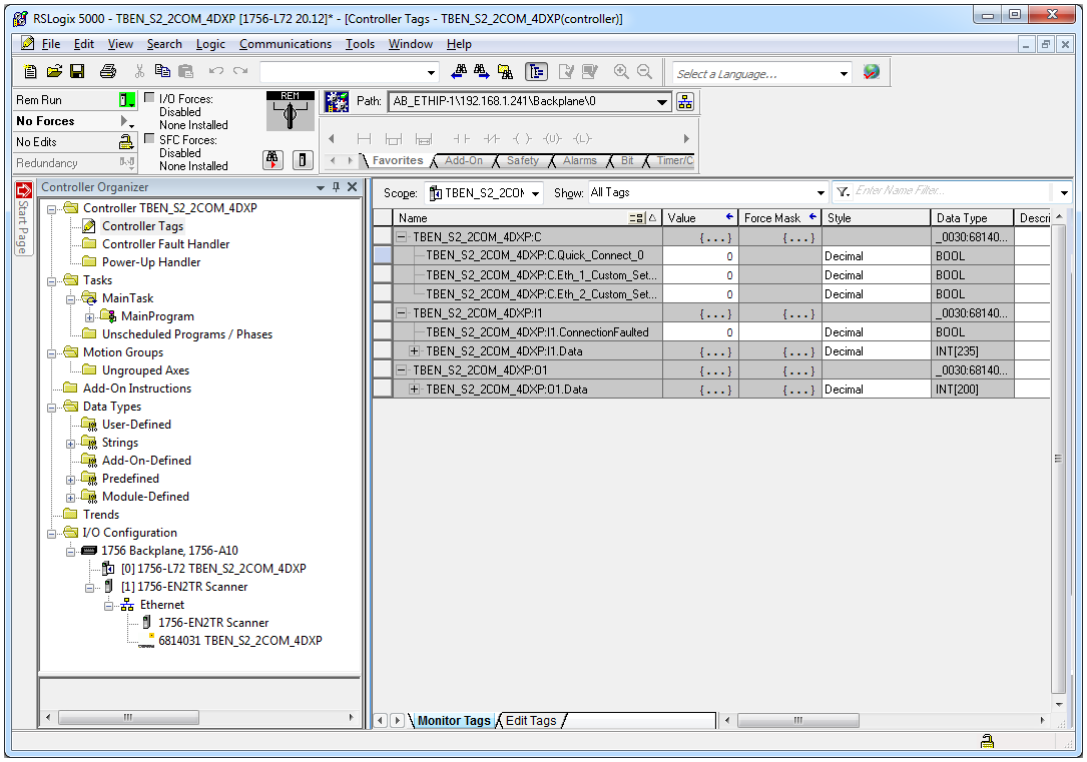


Fig. 48: "Controller Tags" in the project tree

➥ The access to the parameter data (TBEN_S2_2COM_4DXP:C), input data (TBEN_S2_2COM_4DXP:I1) and output data (TBEN_S2_2COM_4DXP:O1) is possible.

Example: Process input data – input signal at Modbus-Server 1 (COM0)

In the following example an input signal at Modbus-Server 1 (COM0) is pending. The process data can be interpreted by means of the mapping (s. p. 60).

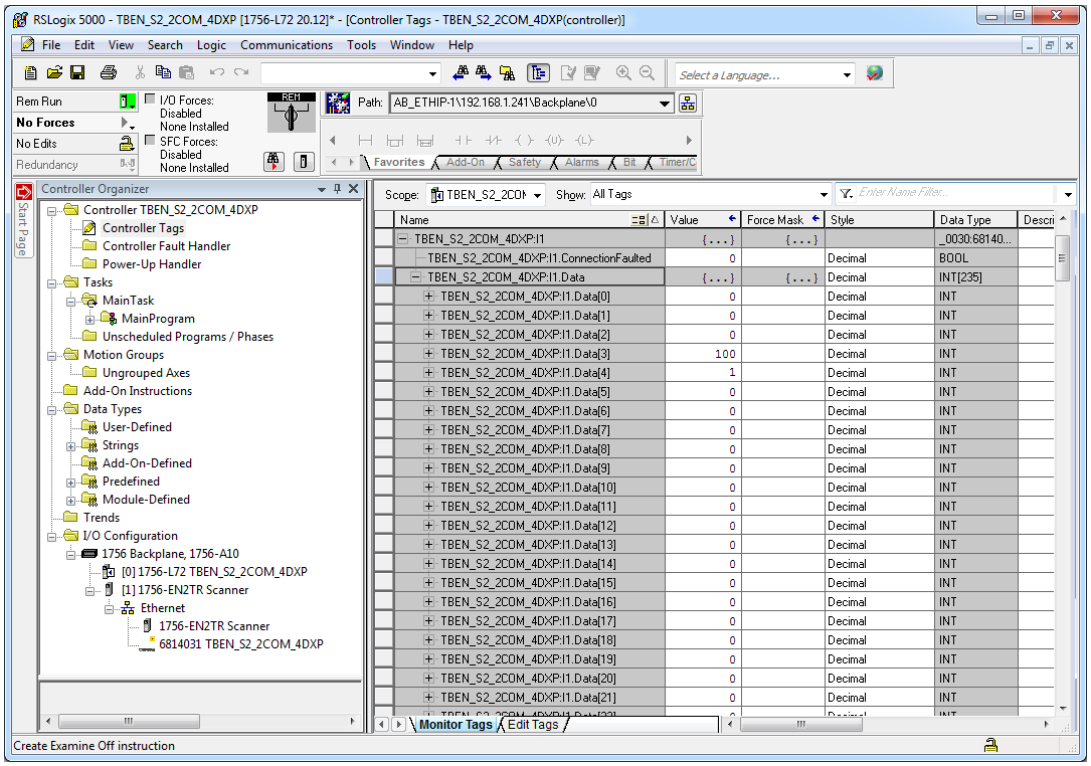


Fig. 49: Process input data – example

7.5.8 Parameterizing Devices via Class Instance Attribute

Prerequisites

- the software tool "RS_NetWorks for Ethernet/IP" runs.

Scanning the Network and Setting the Communication Path

➤ Scan the network using the "Online" button.

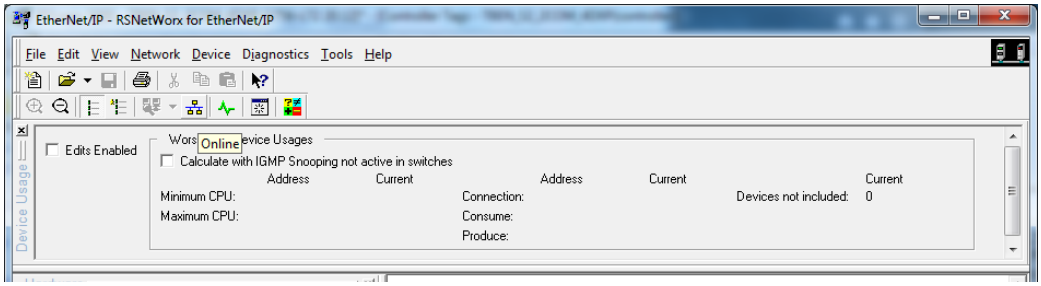


Fig. 50: RS NetWorks – scanning the network

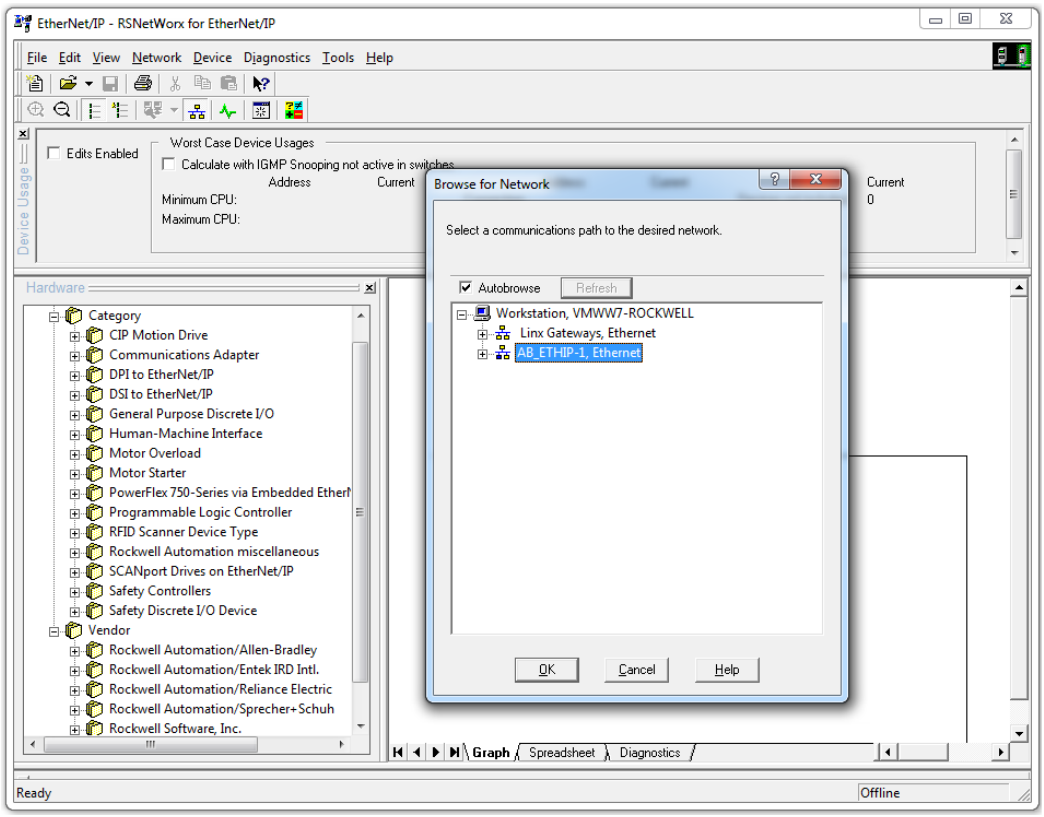


Fig. 51: RS NetWorks – setting the communication path

➤ Right-click the TBEN-S2-2COM-4DXP and click "Class Instance Editor".

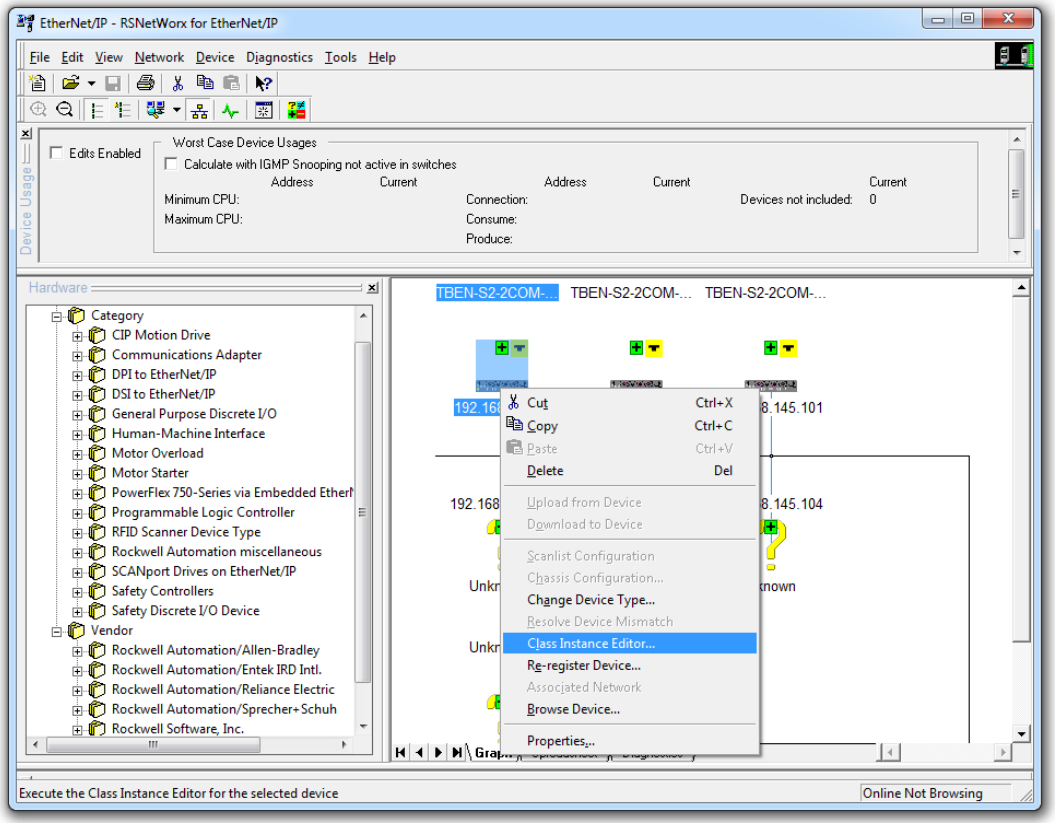


Fig. 52: RS NetWorks – opening the "Class Instance Editor"

➤ Confirm the following dialog with "yes".

➥ The Class Instance Editor is started.

Example: Parameterizing COM0 as "MB-Client RS485"

The description of the vendor specific classes can be found in **chapter 7.4.9, VSC-Vendor Specific Classes**.

Parameters for the example parameterization:

- Class: COM Class 139 (0x**8B**)
- Instance: **1** (for COM0)
- Attribute: 0x**01** = Operation mode
- Value (data): **02** = MB Client 485

➤ Select "Set Single Attribute" under "Service Code" for parameterizing

➤ Define the parameter under "Object Address" by means of "Class – Instance – Attribute".

➤ Enter the value to be written in "Data sent to the device" and confirm the setting with "Execute".

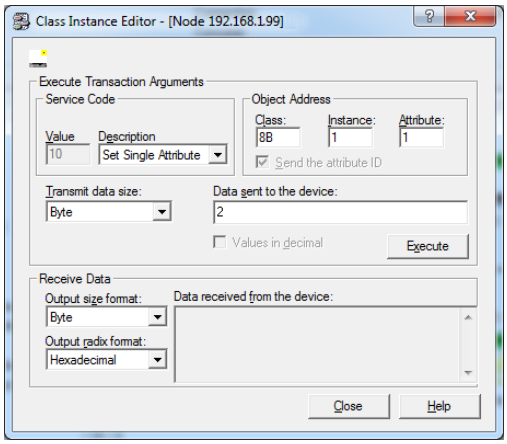


Fig. 53: RS NetWorks – parameterization via Class Instance Editor

➥ The COM port COM0 is now set to "MB Client 485".

NOTE

Besides the parameterization using vendor specific classes (VSC) in RS NetWorks, the DTM or the device internal web server are alternative options for parameterizing the devices (example s. p. 109).

7.6 Commissioning the Device in Modbus TCP

7.6.1 Implemented Modbus functions

The TBEN-S modules with Modbus TCP support the following functions for accessing process data, parameters, diagnostics and other services:

Function codes	
1	Read Coils – reading multiple output bits
2	Read Discrete Inputs – reading multiple input bits
3	Read Holding Registers –reading multiple output registers
4	Read Input Registers –reading multiple input registers
5	Write Single Coil – writing a single output bit
6	Write Single Register – writing a single output register
15	Write Multiple Coils – writing multiple output bits
16	Write Multiple Registers – writing multiple output registers
23	Read/Write Multiple Registers – reading abnd writing multiple registers

7.6.2 Modbus Registers

Address Hex.	Access ro = read only rw = read/write	Description
0x0000…0x01FF	ro	Process data of the inputs incl. diagnostics and module status (identical to registers 0x8000…0x8FFF)
0x0800…0x09FF	rw	Packed process data of outputs (identical to registers 0x9000…0x9FFF)
0x1000…0x100B	ro	Module identifier
0x100C	ro	Module status, see **Evaluating Process Input Data –Module Status, page 136**
0x1010…0x1016	ro	reserved
0x1017	ro	Register-mapping revision (always 2, if not, mapping is incompatible with this description)
0x1020	ro	Watchdog, actual time [ms]
0x1120	rw	Watchdog predefined time [ms] (default: 0) see **Error behavior (watchdog), page 99**
0x1130	rw	Modbus connection mode register, **s. p. 98**
0x1131	rw	Modbus connection timeout in sec. (default: 0 = never) **s. p. 98**

Address Hex.	Access ro = read only rw = read/write	Description
0x113C…0x113D	rw	Modbus parameter restore, s. p. 98 (reset of parameters to default values)
0x113E…0x113F	rw	Modbus Parameter Save,s. p. 99 (permanent storing of parameters)
0x1140	rw	Deactivate protocol Deactivates explicitly the selected Ethernet-protocol: Bit 0 = deactivate EtherNet/IP™ Bit 1 = deactivate Modbus TCP Bit 2 = deactivate PROFINET Bit 15 = deactivate web server
0x1141	ro	Active protocol Bit 0 = EtherNet/IP™ active Bit 1 = Modbus TCP active Bit 2 = PROFINET active Bit 15 = Web server active
0x2400	ro	V1 [mV]: 0 at < 18 V
0x2401	ro	V2 [mV]: 0 at < 18 V
0x8000…0x8FFF	ro	Process data of the inputs incl. diagnostics and module status (identical to registers 0x0000…0x01FF)
0x9000…0x9FFF	rw	Process data of the outputs incl. Control Word (identical to registers 0x0800…0x09FF)
0xA000…0xAFFF	ro	Diagnostics
0xB000…0xBFFF	rw	Parameters

The following table shows the register mapping for the different Modbus addressing methods: Adressierungen:

Description	Hex	Decimal	5-digit	Modicon
Inputs	0x0000 … 0x01FF	0 … 511	40001 … 40512	400001 … 400512
Outputs	0x0800 … 0x09FF	2048 … 2549	42049 … 42560	402049 … 402560
Module identifier	0x1000 … 0x1006	4096 … 4102	44097 … 44103	404097 … 404103
Module status	0x100C	4108	44109	404109
Watchdog, actual time	0x1020	4128	44129	404129
Watchdog, predefined time	0x1120	4384	44385	404385
Modbus connection mode register	0x1130	4400	44401	404401
Modbus connection timeout in sec.	0x1131	4401	44402	404402
Modbus parameter restore,	0x113C… 0x113D	4412…4413	44413… 44414	404413… 404414
Modbus parameter save,	0x113E…0x1 13F	4414…4415	44415… 44416	404415… 404416
Deactivate protocol	0x1140	4416	44417	404417
Active protocol	0x1141	4417	44418	404418
V1 [mV]:	0x2400	9216	49217	409217
V2 [mV]:	0x2401	9217	49218	409218
Process data inputs	0x8000, 0x8001	32768, 32769	-	432769 432770
Process data outputs	0x9000 - 0x9001	36864, 36865	-	436865, 436866
Diagnostics	0xA000 - 00A001	40960, 40961	-	440961, 440962
Parameters	0xB000 - 0xB001	45056, 45057	-	445057, 445058

Register 1130h: Modbus connection mode

This register defines the behavior of the Modbus connections:

Bit	Name Description
0	MB_OnlyOneWritePermission
	– 0: all Modbus-connections receive the write authorization – 1: Only one Modbus-connection can receive the write permission. A write permission is opened until a Disconnect. After the Disconnect the next connection which requests a write access receives the write authorization.
1	MB_ImmediateWritePermission
	– 0: With the first write access, a write authorization for the respective Modbus-connection is requested. If this request fails, an exception response with exception-code 0x01 is generated. If the request is accepted, the write access is executed and the write authorization remains active until the connection is closed. – 1: The write authorization for the respective Modbus-connection is already opened during the connection establishment. The first Modbus-connection thus receives the write authorization, all following connections don't (only if bit 0 = 1).
2… 15	reserved

Register 1131h: Modbus Connection Timeout

This register defines after which time of inactivity a Modbus-connection is closed through a Disconnect.

Behavior of the BUS LED

In case of a Connection Timeout the BUS LED's behavior is as follows:

Connection-Timeout	BUS LED
time-out	green, flashing

Register 0x113C and 0x113D: Restore Modbus-Connection-Parameters

Registers 0x113C and 0x113D serve for resetting the parameter-register 0x1120 and 0x1130 to 0x113B to the default settings.

Follow the following steps in order to reset the parameter register:

➤ Write 0x6C6F to register 0×113C.

➤ To activate the reset of the registers, write 0x6164 ("load") within 30 seconds in register 0x113D.

Both registers can also be written with one single request using the function codes FC16 and FC23. The service resets the parameters without saving them. This can be achieved by using a following "save" service.

Register 0x113E and 0x113F: Save Modbus-Connection-Parameters

Registers 0x113E and 0x113F are used for the non-volatile saving of parameters in registers 0x1120 and 0x1130 to 0x113B.
Follow the following steps in order to store the parameters:

➤ Write 0x7361 to register 0×113E.

➤ To activate the reset of the registers, write 0x7665 ("save") within 30 seconds in register 0x113F.

Both registers can also be written with one single request using the function codes FC16 and FC23.

Error behavior (watchdog)

Behavior of outputs

In case of a failure of the Modbus communication, the outputs' behavior is as follows, depending on the defined time for the Watchdog (register 0x1120):

- Watchdog = 0 ms (default)
  →Outputs hold the momentary value in case of an error at
- Watchdog > 0 ms
  → Outputs switch to **0** after the watchdog time has expired (setting in register 0x1120).

NOTE

Setting the outputs to predefined substitute values is not possible in Modbus TCP. Eventually parameterized substitute values will not be used.

Behavior of the BUS LED

If the Watchdog has tripped, the BUS LED behaves as follows:

Watchdog	BUS LED
tripped	constantly red

7.6.3 Register mapping TBEN-S2-2COM-4DXP

Register	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	MSB								LSB							
0x100C	**Module status** see **Evaluating Process Input Data –Module Status, page 136**															
0x8000… 0x80××	**Process input data** see **Evaluating Process Input data, page 129**															
0x9000… 0x90××	**Process output data** see **Writing Process Output Data, page 137**															
	Diagnostics see **Evaluating Diagnostic Data, page 145**)															
0xA000	COM channel diagnostics COM0															
0xA001	COM channel diagnostics COM1															
0xA002	DXP diagnostics															
	Parameters see **Setting Parameters, page 117**															
0xB000 … 0xB005	COM0 **Setting Parameters – COM0/COM1, page 117**															
	SCBs (Server Configuration Block) **Setting Parameters – Server Configuration Block (SCB), page 121** COM0															
0xB006… 0xB009	SCB0															
…	…															
0xB022… 0xB025	SCB0															
0xB026 … 0xB02B	COM1 **Setting Parameters – COM0/COM1, page 117**															
	SCBs (Server Configuration Block) **Setting Parameters – Server Configuration Block (SCB), page 121** COM1															
0xB02C… 0xB02F	SCB0															
…	…															
0xB048… 0xB04B	SCB0															
0xB04C… 0xB050	DXP channels **Setting Parameters – DXP Channels, page 127**															

7.7 Connecting the Device to a Modbus TCP Master

7.7.1 Used Hardware

The following hardware components are used in this example:

- Turck-HMI TX507-P3CV01 (Modbus TCP Master)
- Block module TBEN-S2-2COM-4DXP (IP address: 192.168.1.10)

7.7.2 Used Software

The following software tools are used in this example:

- CODESYS 3.5.8.1 (can be downloaded for free under **www.turck.com**)

7.7.3 Prerequisites

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

7.7.4 Connecting the device to the PLC

The following components have to be added to CODESYS first, in order to connect the device to the PLC.

- Ethernet Adapter
- Modbus TCP Master
- Modbus TCP Slave

Adding the Ethernet Adapter

Right-click the "Device (TX507-P3CV01)".

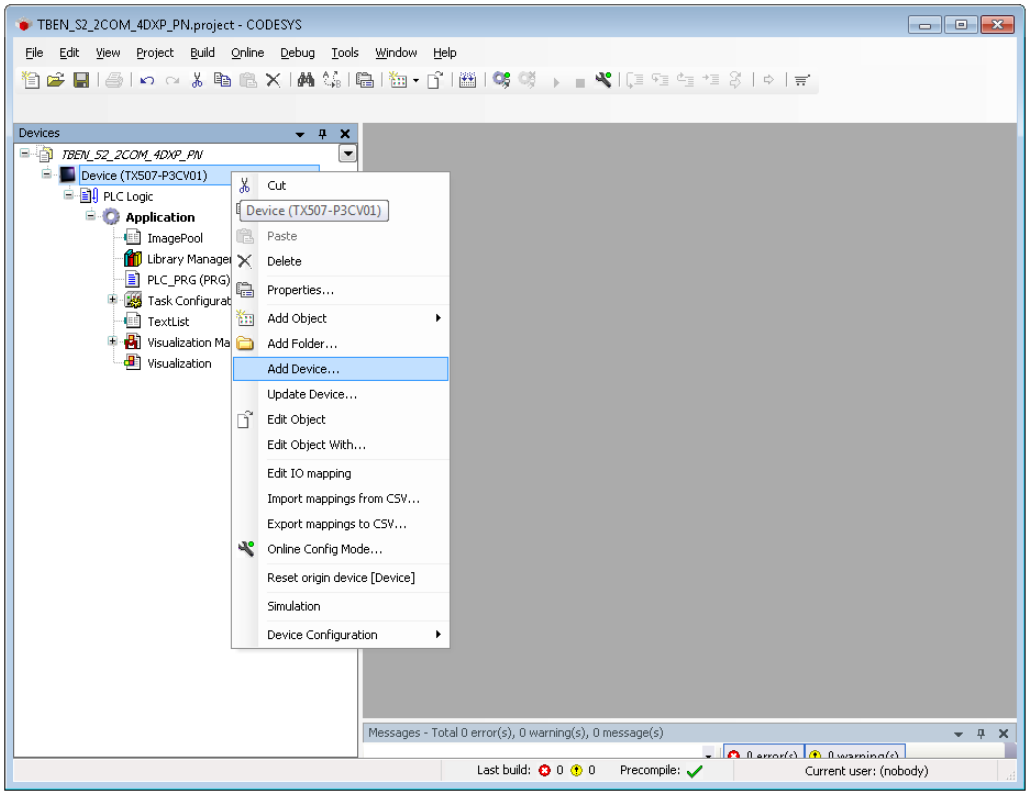


Fig. 54: Project tree

➤ Select "Add Device".

➤ Select the Ethernet Adapter

➤ Click "Add Device".

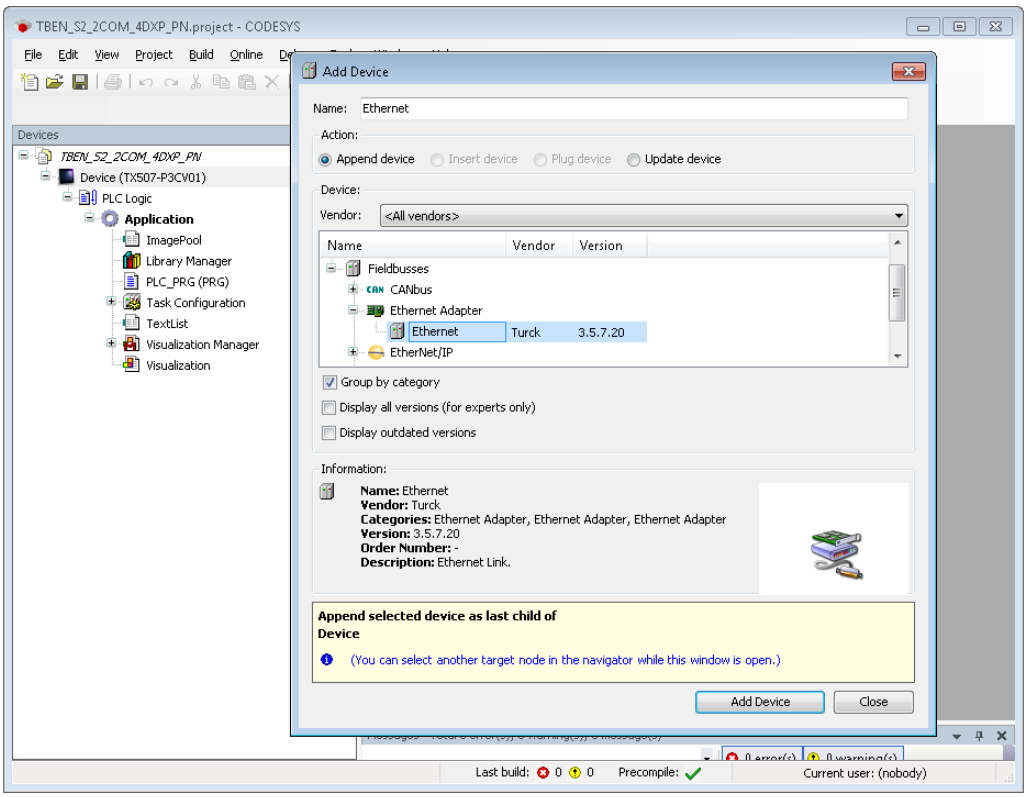


Fig. 55: Adding the Ethernet Adapter

➥ The Ethernet Adapter is added to the project tree as "Ethernet (Ethernet)".

Adding the Modbus Master

- ➤ Right-click the "Ethernet (Ethernet)" in the project tree.
- ➤ Select "Add Device".
- ➤ Double-click the Modbus TCP Master.

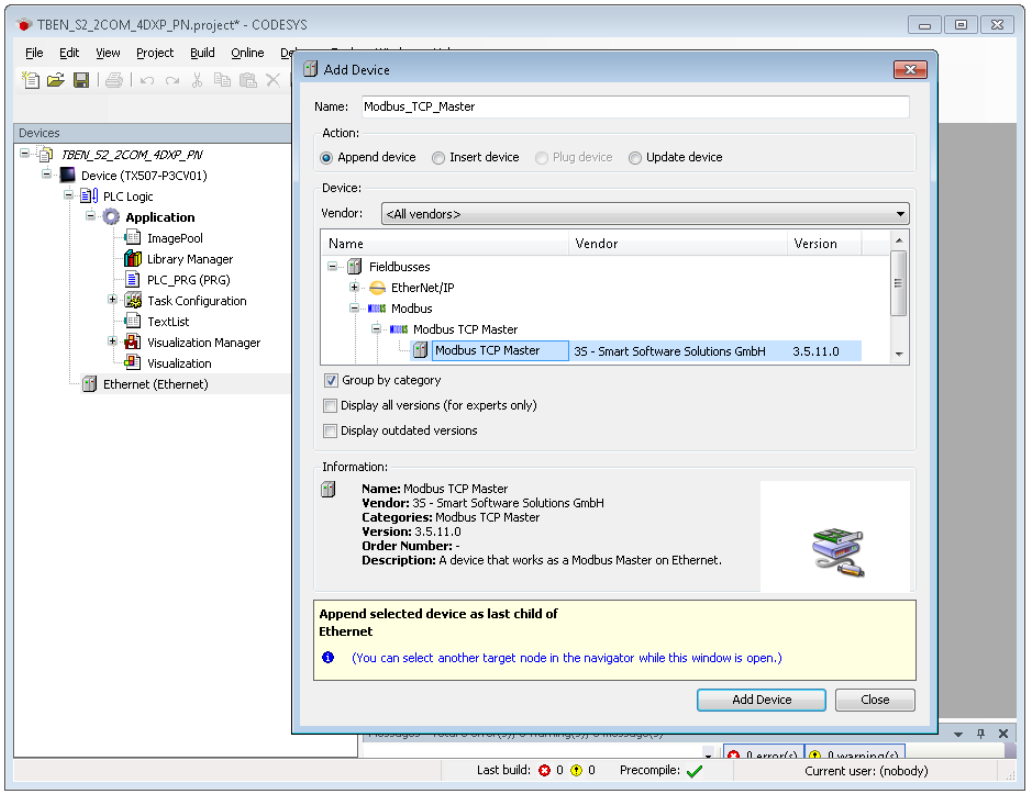


Fig. 56: Adding the Modbus Master

➥ The Modbus Master is added to the project tree as "Modbus_TCP_Master".

Adding a Modbus Slave

- ➤ Right-click the "Modbus TCP Master" in the project tree.
- ➤ Select "Add Device".
- ➤ Double-click the Modbus TCP Slave.

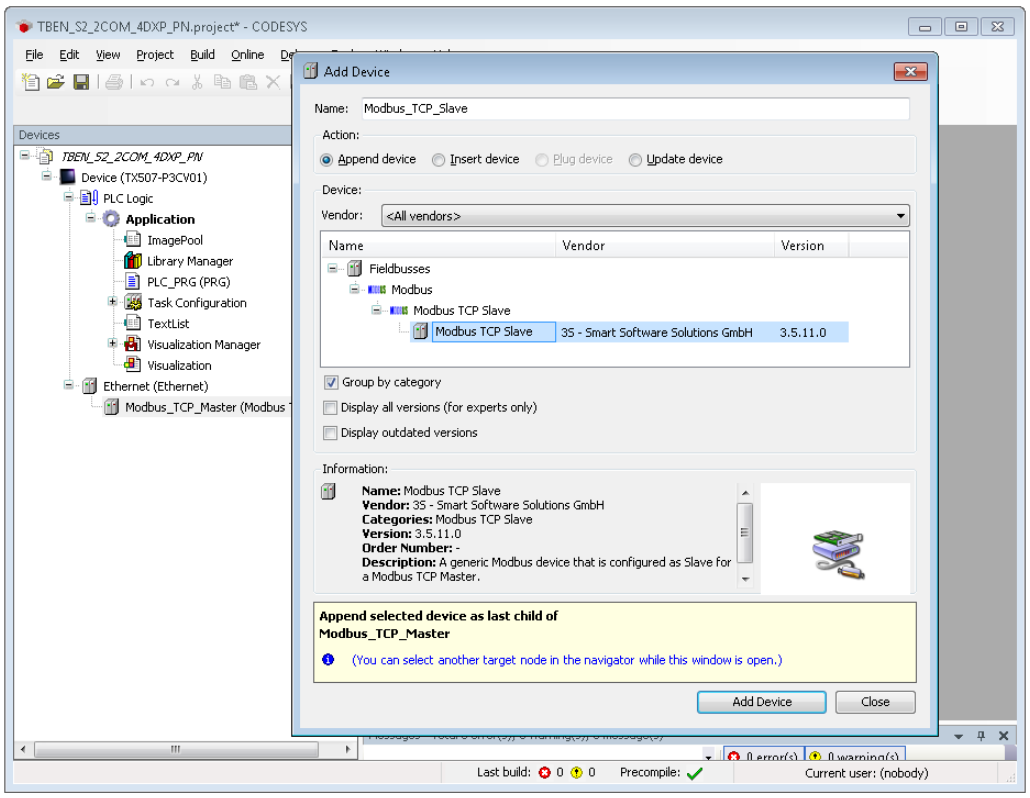


Fig. 57: Adding the Modbus TCP-Slave

➥ The Modbus Slave is added to the project tree as "Modbus_TCP_Slave".

➤ If necessary adapt the slave name in the project tree to the application (here: TBEN_S2_2COM_4DXP).

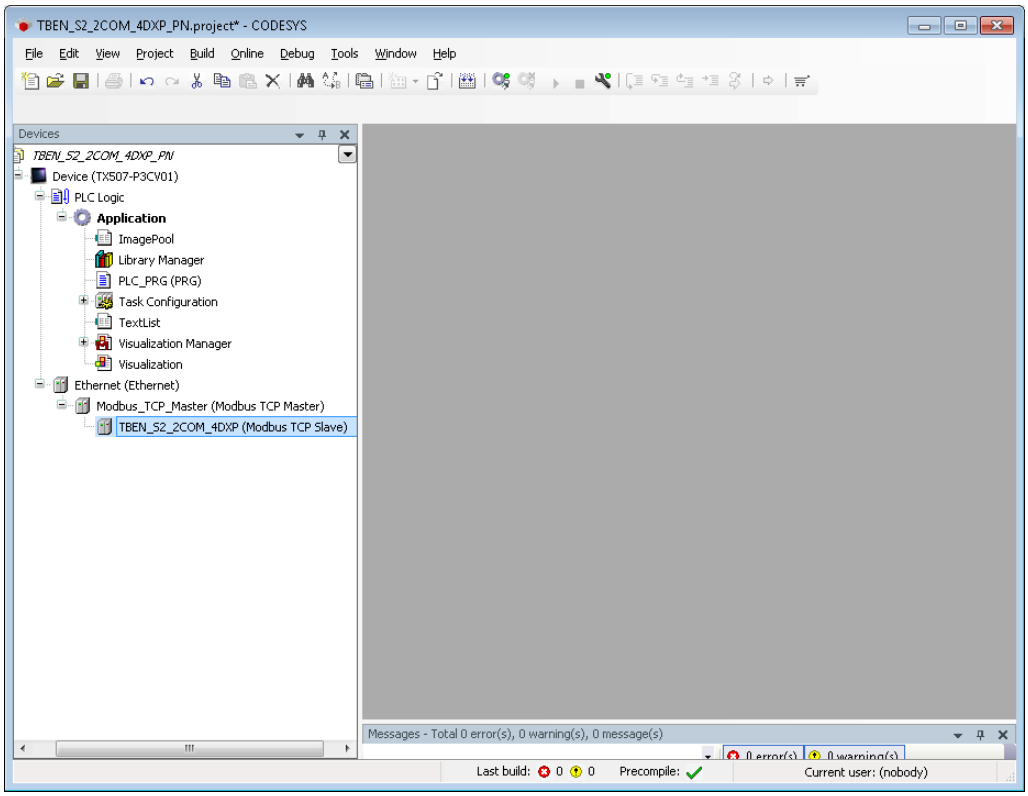


Fig. 58: Adapting the slave name in the project tree

- ➤ Double-click the "Device (TX507-P3CV01)".
- ➤ Click "Scan Network".
- ➤ Select „Device TCP-Master (here: TX507-P3CV01) and confirm with OK.

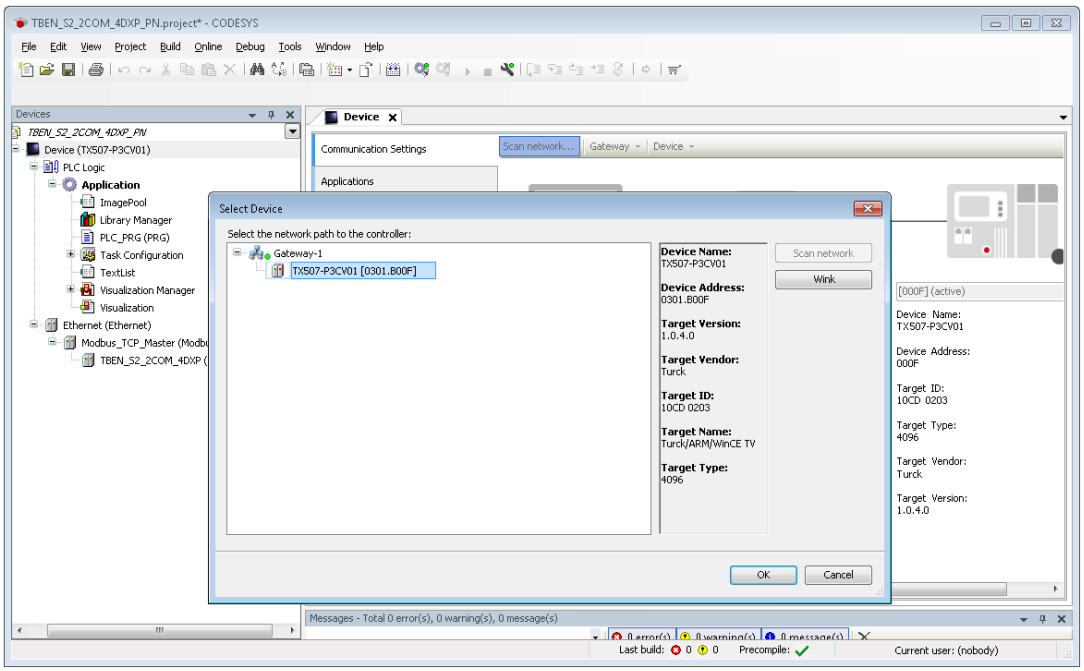


Fig. 59: Configuring the Network Interface to the Modbus Master

➤ Double-click "Ethernet".

➤ Open the dialog box "Network Adapters" by clicking the "…" button in the register tab "General".

➤ Select the IP address of the Modbus TCP Master (here: 192.168.1.15).

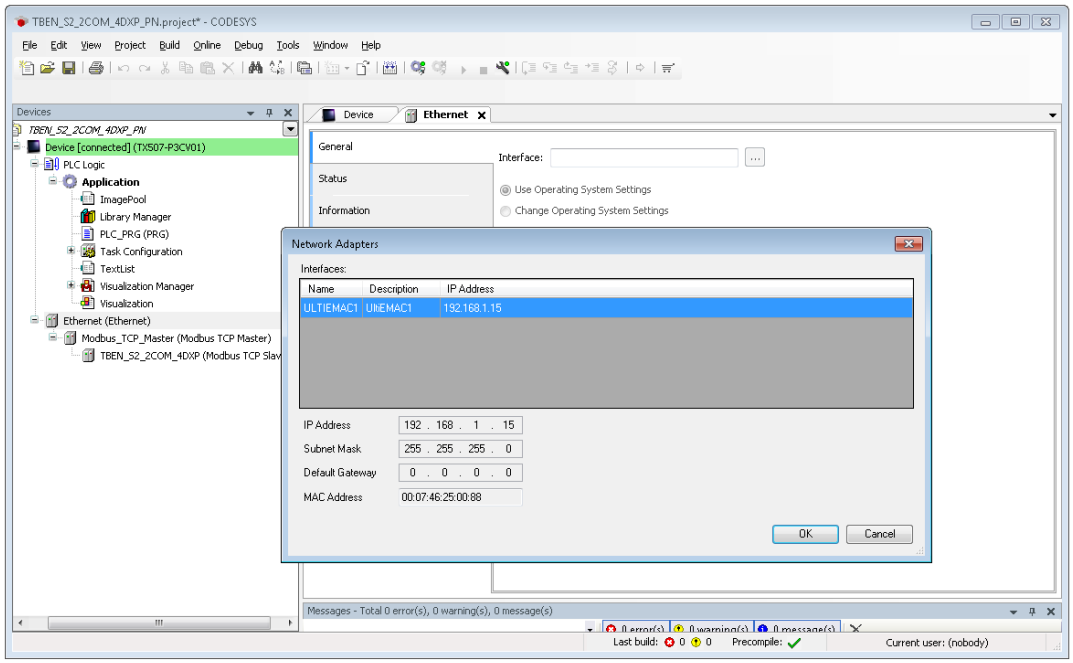


Fig. 60: Modbus-Master – selecting the IP address

➤ Double-click the Modbus TCP Slave.

➤ Enter the slave's IP address in the "General" register tab (here: 192.168.1.10).

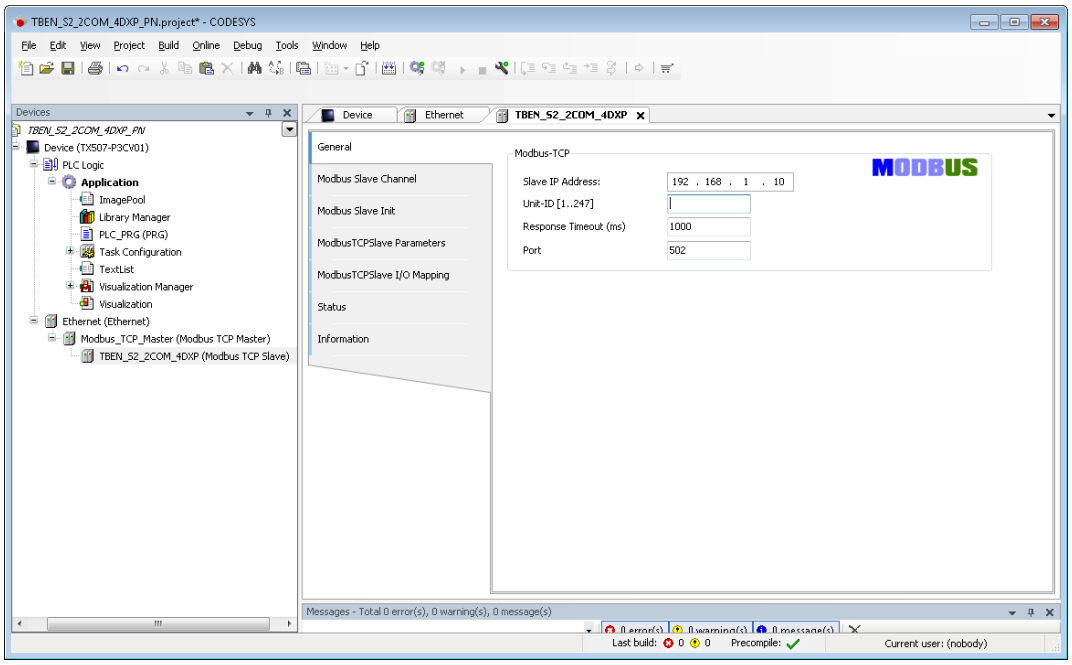


Fig. 61: Modbus TCP-Slave – entering the IP address

7.7.5 Parameterizing the Device

The parameterization of the device can be done via Modbus by means of a Modbus Slave Init channel, via the Turck DTM or via the device's web server.

We recommend the parameterization via the DTM or the web server.

7.7.6 Parameterizing the Device via Web Server

The device's web server is accessed via the device IP address in the web browser. If the IP address is not known, then the device can also be searched using the Turck Service Tool, see also **Setting the IP address, page 21**.

The device can only be parameterized via the web server after a login.

➤ Enter the password "password“ under "Login" an click „Login“.

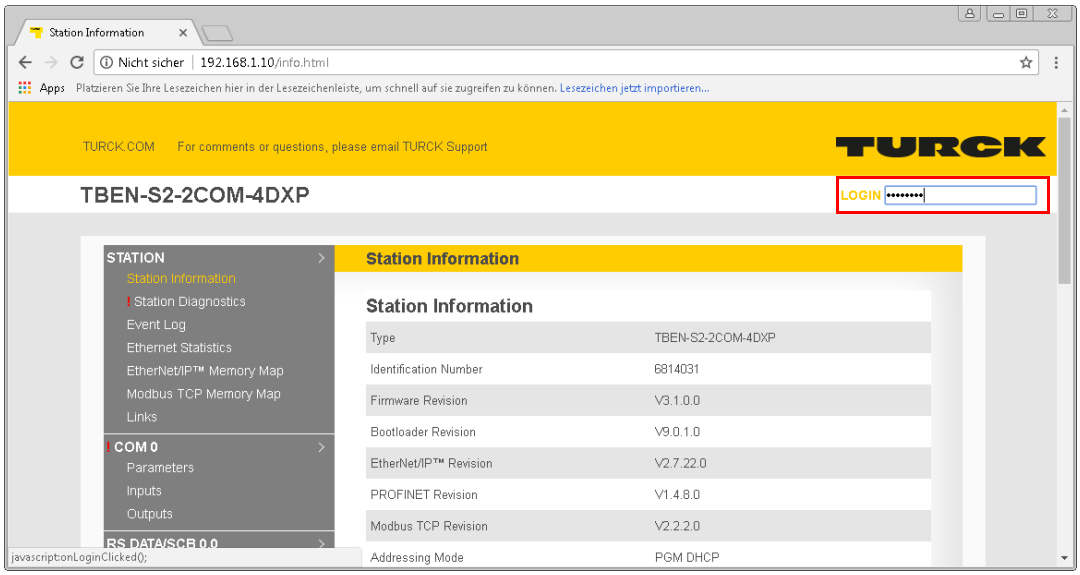


Fig. 62: Web server – Login

Example: Setting COM0 as "Modbus Client RS485"/Configuring Modbus-Servers

Used Hardware

- 1 x TBEN-S2-2COM-4DXP, COM0 is used as Modbus RTU-Client RS485
- 8 × Banner K50TGRYS1QP at COM 0 as Modbus server

➤ Set the following parameters for COM0:

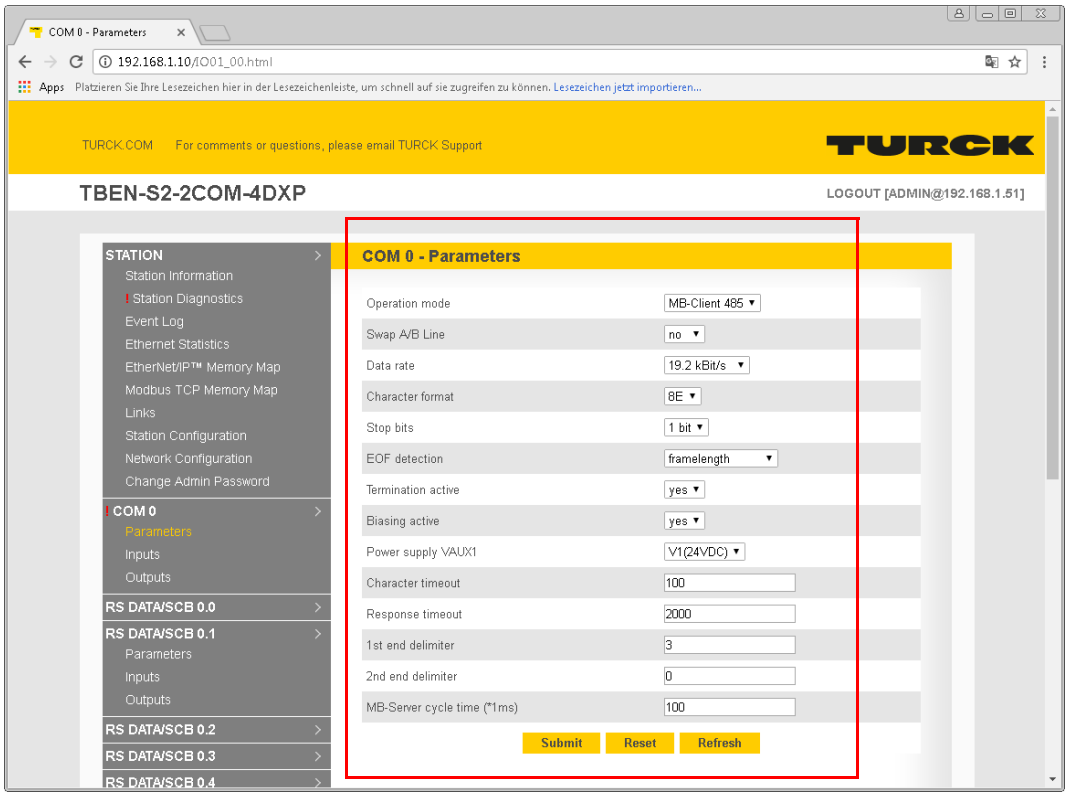


Fig. 63: Web server – parameterizing COM0

➤ Click "submit" and send the parameters to the device.

↪ COM0 is set up as "MB-Client RS485" with the behavior mentioned above.

➤ Set the following parameters for the connection to the Modbus RTU-Servers under "RS Data/SCB0.x".

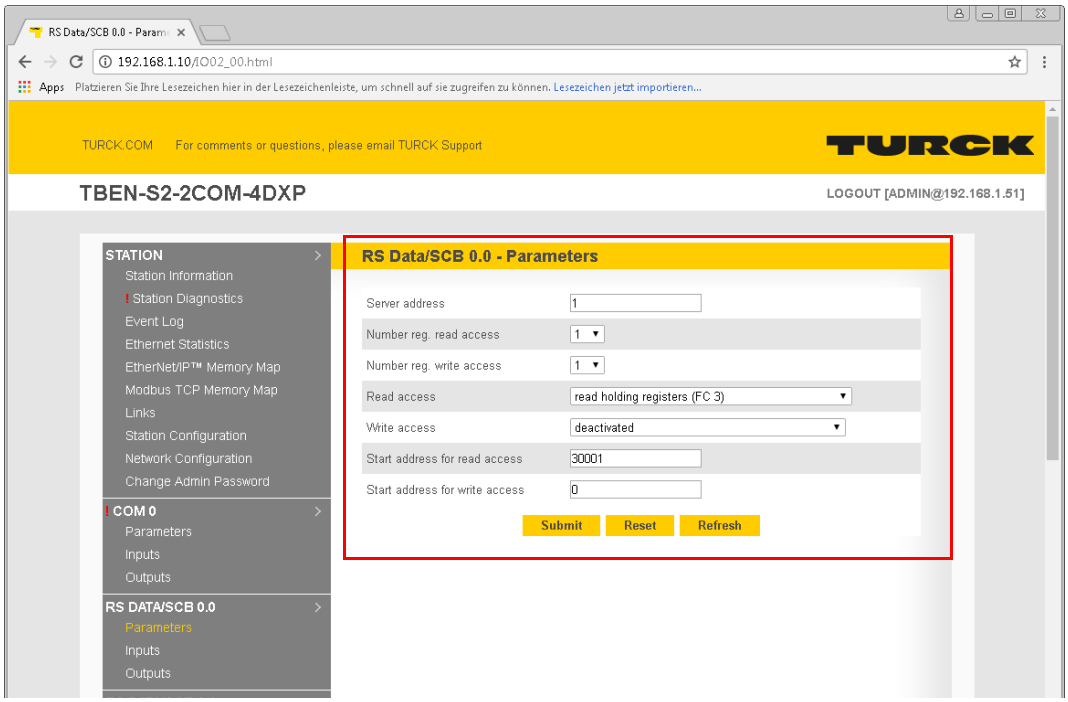


Fig. 64: Parameterizing the Modbus-Server (Example at RS Data/SCB0.0)

NOTE

The number of the registers to be read/written ("Number reg. read/write access") as well as the start addresses for the read/write access ("Start address for read/write access") depend on the application and the register mapping of the connected Modbus-Servers (here: Banner K50TGRYS1QP).

➤ Click "submit" and send the parameters to the device.

➥ The set-up of the connection to the first Modbus-Server at RS Data/SCB0.0 is completed.

➤ Configure other connections respectively.

➥ The process data of the connected Modbus-Servers can be read or set in the respective entry under "RS Data/SCB0.x".

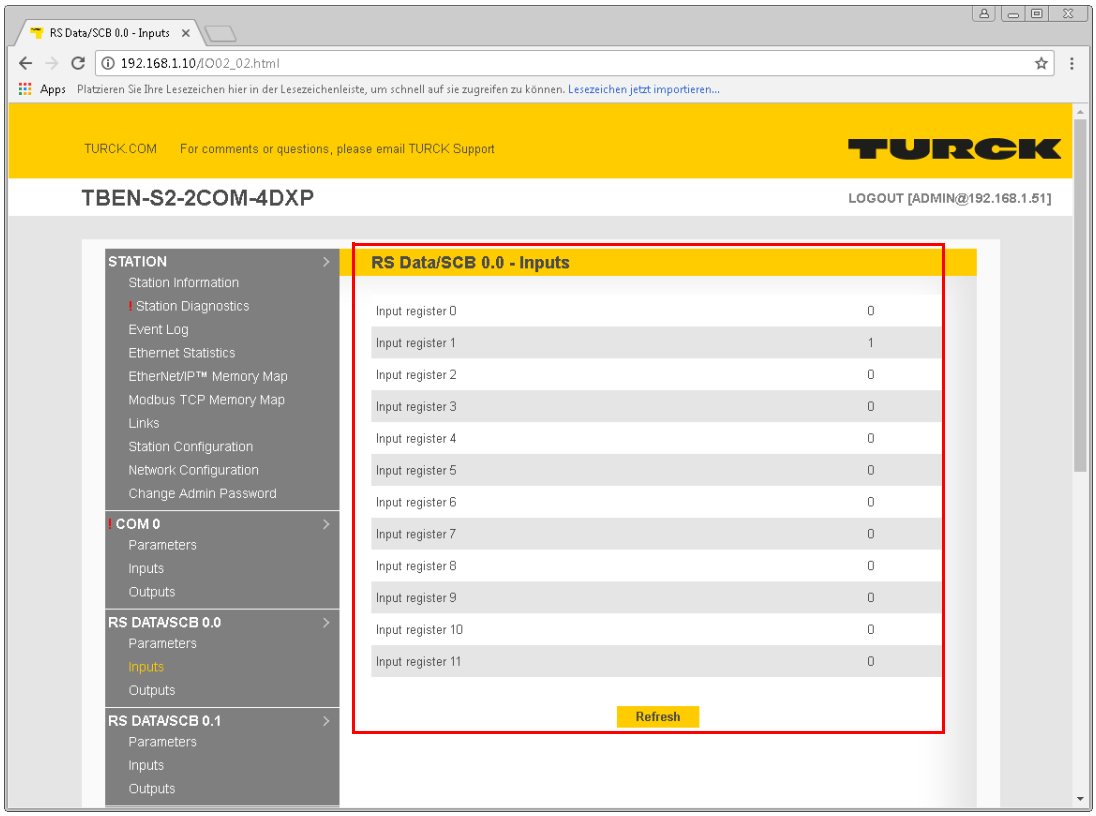


Fig. 65: Modbus-Server – input signal at the first RTU-Server (RS Data/SCB0.0)

7.7.7 Reading Process Data in CODESYS

NOTE

The table under **Register mapping TBEN-S2-2COM-4DXP, page 100** shows the Modbus register mapping for the device.
The chapter **Operating** contains more detailed information concerning the parameters **Transmit and Receive Data, page 141**.

Defining a Channel (Input Data – COM0, Modbus-Server 1)

- Double-click the Modbus TCP Slave.
- In the register tab "Modbus Slave Channel" select "Add Channel".
- Enter the following values:
  - Name
  - Access Type Read Holding Registers
  - Offset: 0x0003
  - Length: 2 registers (4 bytes, max.: 12 registers)
- Confirm with OK.

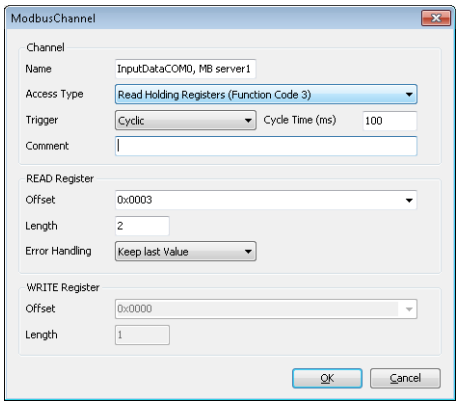


Fig. 66: Defining the channel for input data COM0

Defining a Channel (Input Data – COM0, Modbus-Server 2)

- ➤ Double-click the Modbus TCP Slave.
- ➤ In the register tab "Modbus Slave Channel" select "Add Channel".
- ➤ Enter the following values:
  - Name
  - Access Type Read Holding Registers
  - Offset: 0x000F
  - Length: 2 registers (4 bytes, max.: 12 registers)
- ➤ Confirm with OK.

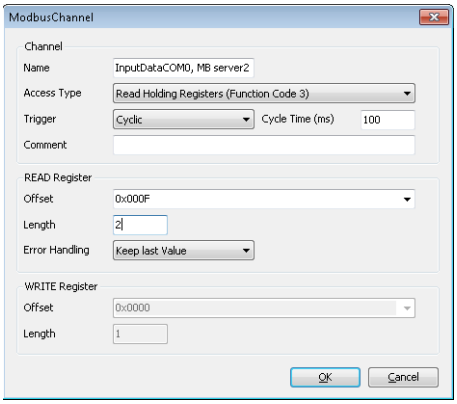


Fig. 67: Defining the channel for input data COM0

7.7.8 Going online with the PLC

➤ Select the device.

➤ Click Online → Login.

Reading Process Data

The process data can be interpreted by means of the mapping (s. p. 100) if the device is connected to the PLC.

➤ Double-click the Modbus TCP Slave.

➤ Click onto register tab "ModbusTCP Slave I/O Mapping".

➥ The process data are displayed in the defined channels.

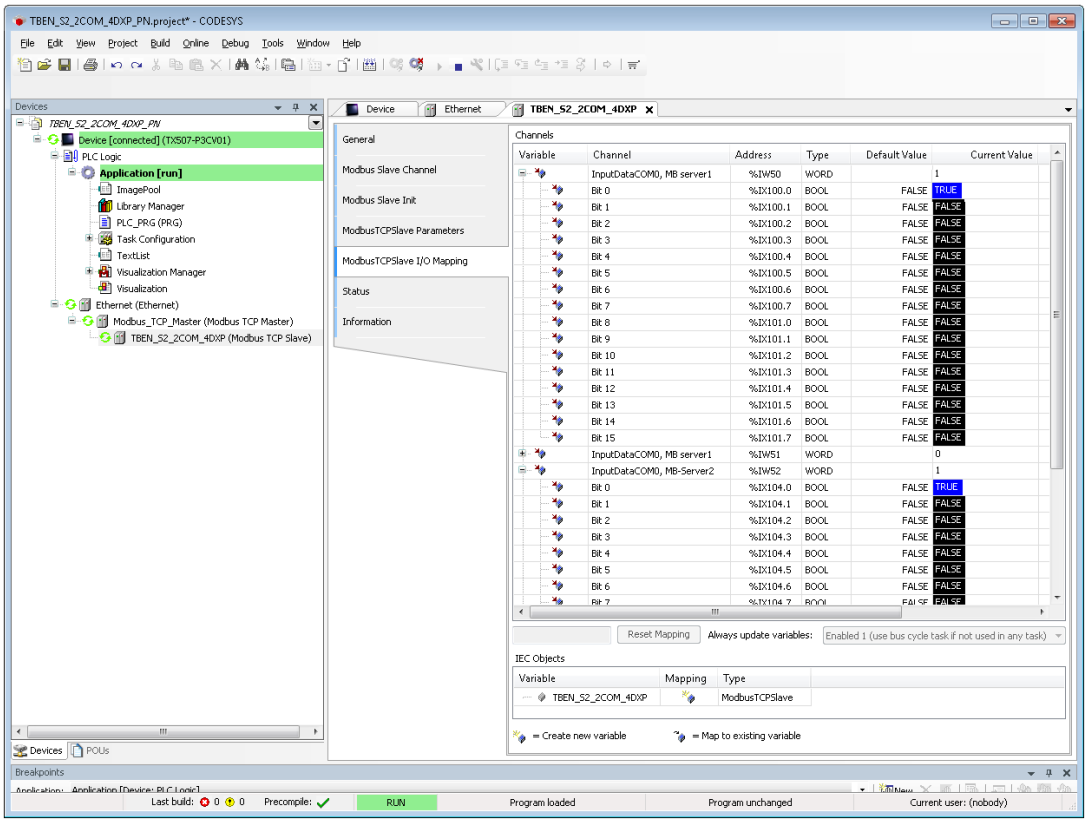


Fig. 68: Reading process data through input channels.

8 Configuring and Parameterizing

8.1 Setting Parameters

8.1.1 Setting Parameters – COM0/COM1

Byte		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Dec.	Hex.	**COM0** (s. p. 121)							
0	0x0000	Data rate				Swap A/B line	Operation mode		
1	0x0001	Biasing active	Termination active	EOF detection		Stop bits	Character format		
2	0x0002	reserved						Power supply VAUX1	
3	0x0003	reserved							
4	0x0004	Character timeout							
5	0x0005								
6	0x0006	Response timeout							
7	0x0007								
8	0x0008	1st end delimiter							
9	0x0009	2nd end delimiter							
10	0x000A	MB-Server cycle time (*1ms)							
11	0x000B								
		SCB (Server Configuration Block) COM0 (s. p. 121)							
12…19	0x000C … 0x0013	SCB0							
…	…	…							
68…75	0x0044 … 0x004B	SCB7							
		COM1 (s. p. 121)							
76…87	0x004C … 0x0057	Parameters COM1 (assignment acc. to COM0, byte 0…11)							
88… 151	0x0058 … 0x0097	SCB0 to SCB7, COM1 (assignment acc. to COM0, byte 12…75)							
		DXP channels (s. p. 127)							
152	0x0098	SRO7	SRO6	SRO5	SRO4	reserved			
153	0x0099	EN_DO7	EN_DO6	EN_DO5	EN_DO4	reserved			
154	0x009A	reserved				Input filter (DXP4)	DIF pulses (DXP4)		
155	0x009B	Pulse stretching (DXP4)							
…		...							
160	0x00A0	reserved				Input filter (DXP7)	DIF pulses (DXP7)		
161	0x00A1	Pulse stretching (DXP7)							

Meaning of parameter bits

The default values are written in bold.

Parameters	Value		Description	
	Dec.	**Hex.**		
Mode	**0**	**0x00**	**RS485**	Operation mode of the COM0 or COM1 channel.
	1	0x01	RS232	
	2	0x02	MB-Client RS485	
	3	0x03	MB-Client RS232	
Swap A/B line	Changes the outputs polarity of the A/B lines and switches the bias-level.			
	0	**0x00**	**no**	Standard configuration, A = pin 2, B = pin 4
	1	0x01	yes	A = pin 4, B = pin 2
Data rate	0…3	0x0 … 0x3	reserved	Data rate of the serial interface
	4	0x4	2400	
	5	0x5	4800 bps	
	6	**0x6**	**9600 bps**	
	7	0x7	1440 bps	
	8	0x8	19200 bps	
	9	0x9	28800 bps	
	10	0xA	38400 bps	
	11	0xB	57600 bps	
	12	0xC	115200 bps	
	13	0xD	230400 bps	
	14…15	0xE… 0xF	reserved	
Character format	0	0x00	7O	Defines the parity and the number of bits per sign. – N: no parity – O: odd parity (1 bit error detection) – E: even (1 bit error detection)
	1	0x01	7E	
	2	0x02	8N	
	3	0x03	8O	
	4	**0x04**	**8E**	
Stop bits	**0**	**0x00**	**1 bit**	Defines the number of stop bits.
	1	0x01	2 bit	

Parameters	Value		Description	
	Dec.	Hex.		
EOF detection	0	0x00	Character timeout	– Character timeout: The character timeout defines the duration of time within which another character must be received after receiving a character. Exceeding this time is interpreted as the end of the data packet. – 1 end delimiter: The end of the frame is detected, as soon as the end delimiter was received. – 2 end delimiter: The end of the frame is detected, as soon as the 2 end delimiters were received. – Framelength: The end of the frame is detected, as soon as the defined frame-length was received.
	1	0x01	1 end delimiter	
	2	0x02	2 end delimiter	
	3	**0x03**	**frame length**	
Termination active	**0**	**0x00**	**yes**	Activates or deactivates the termination resistor of the RS485-line. If the termination resistor is deactivated, the module can be operated inside a RS485-line.
	1	0x01	no	
Biasing active	**0**	**0x00**	**yes**	Activates the biasing resistor.
	1	0x01	no	Deactivates the biasing resistor.
Power supply VAUX1	**00**	**0x00**	**0 V (High-Z)**	Defines the voltage level at pin 1 referred to GND at pin 3.
	01	0x01	V1 (24 VDC)	
	10	0x02	+5 VDC	
Character timeout	0… 65535	0x0000 … 0xFFF	default: **0x0064**	Character timeout in ms.
Response timeout	0… 65535	0x0000 … 0xFFF	0: no timeout **default: 0x03E8 (1000 ms)**	The response timeout is used to configure a timeout for the receiving of a frame. The timeout starts whenever the receive sequence for the COM port is activated via the control bit "receive". The status bit "timeout" is set to TRUE for one cycle whenever the the response time expires. The LED "RX" shortly flashes red. The receive sequence has to be restarted.
1st end delimiter	0…255	0x00 …0xFF	default: 0x0**3**	Defines the 1st end delimiter for the end-of-frame detection. Is only interpreted if the parameter "EOF detection" is set to 1 end delimiter or 2 end delimiter.
2nd end delimiter	0…255	0x00 … 0xFF	default: **0**	Defines the 2nd end delimiter for the end-of-frame detection. Is only evaluated if the parameter "EOF detection" is set to 2 end delimiters.

Parameters	Value		Description	
	Dec.	Hex.		
Time between frames	0… 65535	0x0000 … 0xFFF	default: 0 = best update time possible	Time between Modbus client requests to the Modbus server [ms]. In exceptional cases, Modbus servers cannot process requests that are too fast. This leads to communication errors. In this case, the time hast be be increased.

8.1.2 Setting Parameters – Server Configuration Block (SCB)

Byte	Bit							
	7	6	5	4	3	2	1	0
n	Server address							
n + 1	Number reg. read access				Number reg. write access			
n + 2	Read access							
n + 3	Write access							
n + 4	Start address for read access							
n + 5								
n + 6	Start address for write access							
n + 7								

Meaning of the Parameter Bits – Server Configuration Block (SCB)

The default values are written in bold.

Parameters	Value		Description	
	Dec.	Hex.		
Server address	0…255	0x00… 0x0F	Standard mode: Address of the connected Modbus RTU Servers Multi Server Mode: Start address of the first connected Modbus RTU Server default: **0x01**	
Number reg./ server Read access	0…12	0x0… 0xC	Standard mode: Number of registers to be read Multi Server Mode: Number of servers from which data have to be read	
Number reg./ server Write access	0…12	0x0 … 0xC	Standard mode: Number of registers to be written Multi Server Mode: Number of servers to which data have to be written	
Read access	**0**	**0x00**	**deactivated**	Standard mode: Defines the read access to the configured Modbus-Server.
	3	0x03	read holding registers (FC3)	
	4	0x04	read input registers (FC4)	
	23	0x17	read/write multiple registers (FC23)	
	128	0x80	Write extension	Read/ Write Extension: Extension of the read command for the connection of Modbus RTU Servers with more than 12 registers. The write extension provides up to 12 further registers for process input data and can only be selected as an extension of a "MB_Sever" in the preceding slot (Server Configuration Block).

Parameters	Value		Description	
	Dec.	**Hex.**		
Read access	131	0x83	Multi server mode: read 1 holding registers (FC3)	1, 2, 3 or 4 registers are read or read and written per connected Modbus RTU Server.
	132	0x84	Multi server mode: read 1 input register (FC 4)	
	151	0x97	Multi server mode: read/write 1 register (FC 23)	
	163	0xA3	Multi server mode: read 2 holding registers (FC3)	
	164	0xA4	Multi server mode: read 2 input register (FC 4)	
	183	0xB7	Multi server mode: read/write 2 register (FC 23)	
	195	0xC3	Multi server mode: read 3 holding registers (FC3)	
	196	0xC4	Multi server mode: read 3 input register (FC 4)	
	215	0xD7	Multi server mode: read/write 3 register (FC 23)	
	227	0xE3	Multi server mode: read 4 holding registers (FC3)	
	228	0xE4	Multi server mode: read 4 input register (FC 4)	
	247	0xF7	Multi server mode: read/write 4 register (FC 23)	
Write access	**0**	**0x00**	**deactivated**	Defines the write access to the configured Modbus-Server.
	6	0x06	write single register (FC6)	
	16	0x10	write multiple registers (FC16)	
	23	0x17	read/write multiple registers (FC23)	

Parameters	Value		Description	
	Dec.	Hex.		
Write access	128	0x80	write extension	Read/ Write Extension: Extension of the write command for the connection of Modbus RTU Servers with more than 12 registers. The write extension provides up to 12 further registers for process output data and can only be selected as an extension of a "MB_Sever" in the preceding slot (Server Configuration Block).
	134	0x86	Multi server mode: write single register (FC6)	1, 2, 3 or 4 registers are written or read and written per connected Modbus RTU Server.
	144	0x90	Multi server mode: write 1 registers (FC16)	
	151	0x97	Multi server mode: read/write 1 register (FC 23)	
	176	0xB0	Multi server mode: write 2 registers (FC16)	
	183	0xB7	Multi server mode: read/write 2 register (FC 23)	
	208	0xD0	Multi server mode: write 3 registers (FC16)	
	215	0xD7	Multi server mode: read/write 3 register (FC 23)	
	240	0xF	Multi server mode: write 4 registers (FC16)	
	247	0xF7	Multi server mode: read/write 4 register (FC 23)	
Start address for Read access	**0**… 65535	**0x0000** … 0xFFF		Address of the 1st register from which data have to be read
Start address for write access	**0**… 65535	**0x0000** … 0xFFF	default: 0x000	Address of the 1st register to which data have to be written

Standard mode

Use case:

- 1 Modbus RTU Server per Server Configuration Block (SCB)
- max. 8 Modbus RTU Servers per COM port

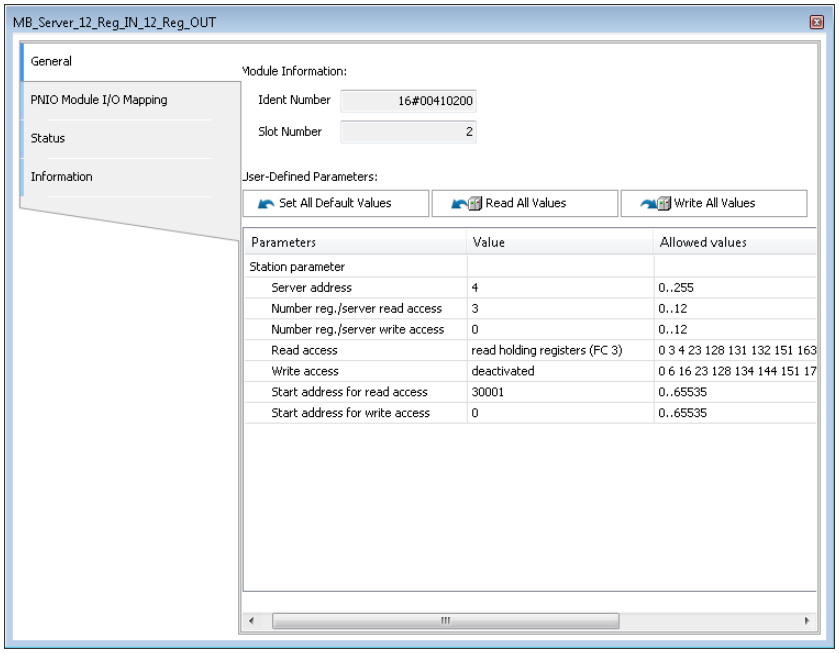


Fig. 69: Example – standard mode

Parameters	Value	Meaning
Server address	4	Data of the Modbus RTU Server with address 4 are read
Number reg. read access	3	Reading of 3 registers of the addressed Modbus RTU Server
Number reg. write access	0	Not defined as the write access is deactivated in the example
Read access	Read one holding register (FC3)	Reading of holding registers of the addressed Modbus RTU Server
Write access	deactivated	Can be used in parallel with the read access
Start address for read access	30001	Address of the 1st register of the Modbus RTU Server from which data have to be read
Start address for read access	0	Not defined as the write access is deactivated in the example

Multi Server Mode

Recommended for applications with more than 8 **identical** Modbus RTU Servers per port.

Use case:

- Up to 12 identical Modbus RTU Servers per Server Configuration Block (SCB)
- Max. 32 Modbus RTU Servers per COM port, in total max. 64 per TBEN-S2-2COM-4DXP device Depending on the technical characteristics of the Modbus RTU Servers, the connection of up to 64 Modbus RTU Servers per port (128 per device) is possible.
- The parameters “Read access” and “Write access” have both to be set to the Multi Server Mode or unused functions have to be deactivated. Mixing of standard and multi-server mode is not permitted.

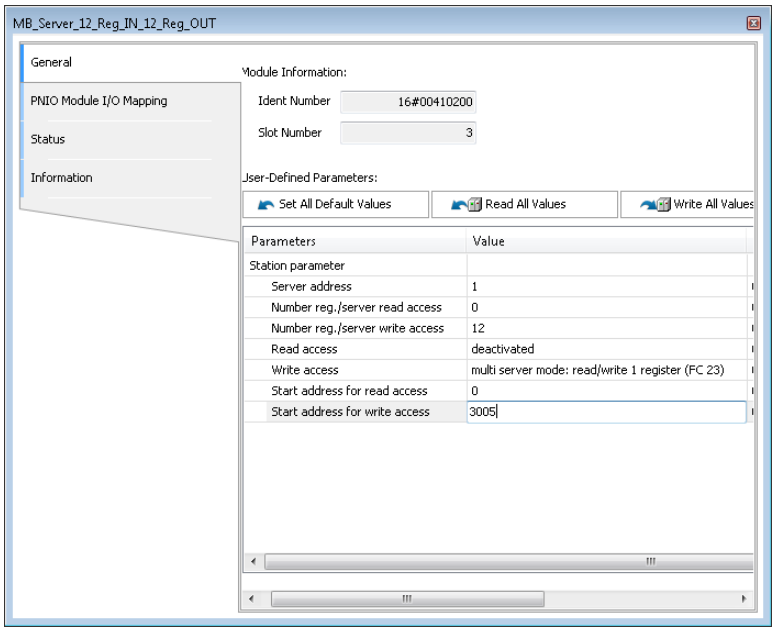


Fig. 70: Example – Multi Server Mode

Parameters	Value	Meaning
Server address	1	Address of the 1st Modbus RTU Server in the RS485 line
Number server read access	0	Not defined as the read access is deactivated in the example
Number server write access	12	Number of Modbus RTU Servers from which data have to be read
Read access	deactivated	Can be used in parallel with the write access, but the setting has to correspond to the multi server mode (example: “Multi server mode: read 4 input registers“)
Write access	Multi server mode: read/write 1 register (FC 23)	1 register is read from each of the 12 Modbus RTU Servers (server 1 to server 12 in the RS485 line)
Start address for read access	0	Not defined as the read access is deactivated in the example
Start address for read access	30005	Address of the 1st register of all connected identical Modbus RTU Servers

Read/ Write Extension

Use case:

- Connection of Modbus RTU Servers with more than 12 registers, which have to be read or written.
- Extension of the read or write command to a Modbus RTU Server, which has been configured in the preceding SCB.

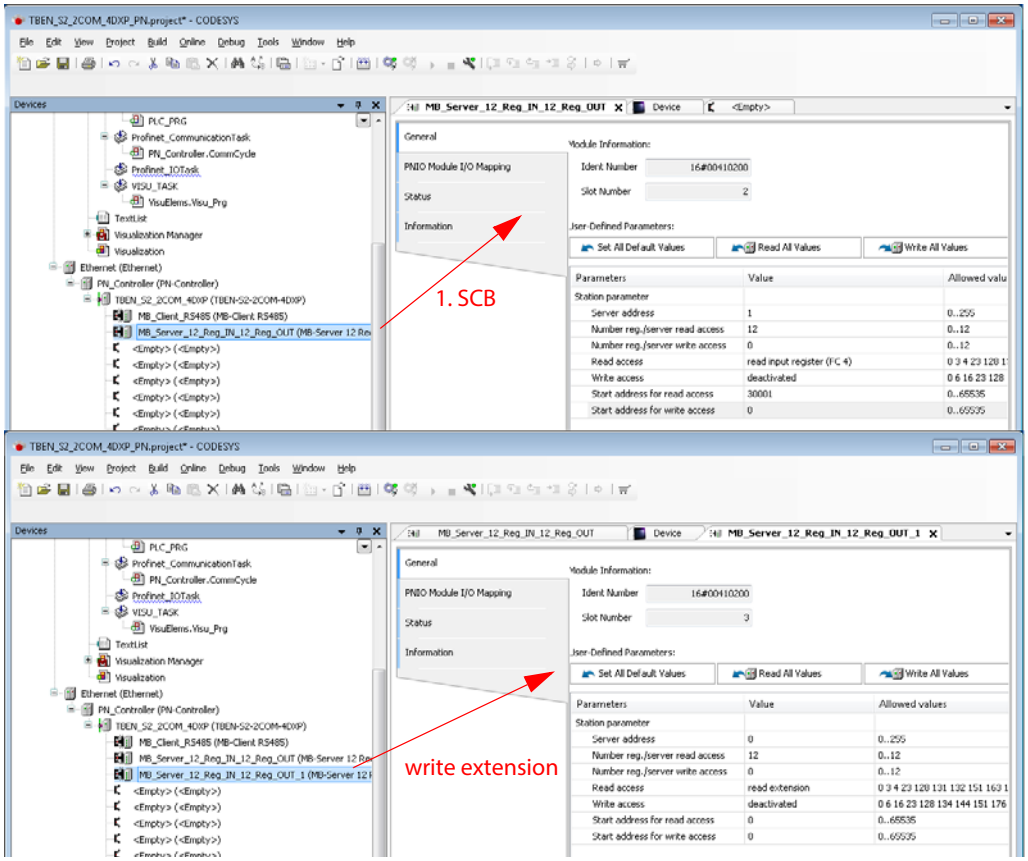


Fig. 71: Example – write extension

Parameters 1st SCB	Value	Meaning
Server address	1	Address of the Modbus RTU Server from which data have to be read
Number reg. read access	12	Number of registers to be read
Read access	read input registers (FC 4)	
Start address for read access	30001	Address of the 1st register which has to be read.
Parameters 2nd SCB	**Value**	**Meaning**
Server address	0	Not defined, automatically set
Number reg. read access	12	Number of registers to be read additionally
Read access	Write extension	Defines this SCB as extension for the preceding SCB.
Start address for read access	0	Not defined, automatically set
Start address for read access	0	

8.1.3 Setting Parameters – DXP Channels

Byte	Bit							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
152	SRO7	SRO6	SRO5	SRO4	reserved			
153	EN_DO7	EN_DO6	EN_DO5	EN_DO4	reserved			
154	reserved				Input filter (DXP4)	DIF pulses (DXP4)		
155	Pulse stretching (DXP4)							
156	reserved				Input filter (DXP5)	DIF pulses (DXP5)		
157	Pulse stretching (DXP4)							
158	reserved				Input filter (DXP6)	DIF pulses (DXP6)		
159	Pulse stretching (DXP4)							
160	reserved				Eingangs-filter (DXP7)	DIF pulses (DXP7)		
161	Pulse stretching (DXP7)							

Meaning of Parameter Bits – DXP Channels

The default values are written in bold.

Parameters	**Value**		**Description**	
	Dec.	**Hex.**		
Manual reset after overcurr. chx (SRO)	**0**	**0x00**	**no**	Defines, if a manual reset is necessary after an overcurrent occurred at the channel.
	1	0x01	yes	
Activate output Chx (EN_DO)	**0**	**0x00**	**yes**	Activates or deactivates the output function of the digital channel.
	1	0x01	no	
DIF pulses (DXPx)	**0**	**0x00**	**deactivated**	Activates or deactivates the extended functions (input filter and impulse stretch) for the respective digital channel.
	1	0x01	Input filter and pulse stretch	
Input filter (DXPx)	**0**	**0x00**	**0.2 ms**	Configuration ot he filter time for digital inputs.
	1	0x01	3 ms	
Pulse stretch (DXPx) (* 10 ms)	0…254	0x00…0 xFF	default: **0**	Defines the duration of the pulse stretching for digital input edges in multiples of 10 ms. This function in used to detect short signals in longer PLC cycle times.

9 Operating

9.1 Evaluating Process Input data

Byte		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Dec.	hex.	**COM0**							
0	0x0001	**Status Data**							
…	…	RS232/RS485 Mode (s. p. 130)							
5	0x0005	Modbus Client Mode (s. p. 132)							
6	0x0006	**Process input data**							
…	…	192 bytes, depending on the configuration of COM0							
197	0x00C5	(s. p. 131)							
		COM1							
198	0x00C6	**Status Data**							
…	…	RS232/RS485 Mode (s. p. 130)							
203	0x00CB	Modbus Client Mode (s. p. 132)							
204	0x00CC	**Process input data**							
…	…	192 bytes, depending on the configuration of COM1							
395	0x018B	(s. p. 131)							
396	0x018C	**COM channel diagnostics**							
…	…	(s. p. 144)							
399	0x018F								
400	0x0190	**Modbus-Server-Status**							
…	…	(s. p. 133)							
431	0x01AF	(depending on the parameterization, only valid for the Modbus Client Mode)							
432	0x01B0	**MB Server Timing**							
…	…	(s. p. 132)							
463	0x01CF								
464	0x01D0	**DXP status**							
		(s. p. 139)							
465	0x01D1	reserved							
466	0x01D2	**DXP channel diagnostics**							
467	0x01D3	(s. p. 145)							
468	0x01D4	**Module status**							
469	0x01D5	(s. p. 135)							

9.1.1 Evaluating Process Input Data - RS232/RS485 Mode

Byte		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Dec.	Hex.	**COM0**							
0	0x0000	Invalid RX length	Invalid TX length	Timeout	Buffer overflow	Parity/ format error	Frame error	Receive complete	Trans-mitter ready
1	0x0001	reserved							
2	0x0002	Received frame length							
3…5	0x0003 … 0x0005	reserved							
6	0x0006	Receive data (COM0) maximum Length 8 x 24 bytes							
…	…								
197	0x00C5								
		COM1							
198	0x00C6	Invalid RX length	Invalid TX length	Timeout	Buffer overflow	Parity/ format error	Frame error	Receive complete	Trans-mitter ready
199	0x00C7	reserved							
200	0x00C8	Received frame length							
201	0x00C9	Receive data (COM1) maximum Length 8 x 24 bytes							
…	…								
203	0x00CB								

Meaning of the Status Bits – RS232/RS485 mode

Process value	Value	Description
Transmitter ready	0	The transmitter is ready.
	1	The bit is set to TRUE after a message was sent. It indicates that the transmission was completed and that he next send sequence can be started. The bit remains TRUE until the bit "send" has been reset to FALSE (acknowledgment).
Receive complete	0	No valid message received.
	1	The bit is set to TRUE after a message was sent. The bit remains TRUE until the bit "Receive" is set to FALSE. A new receive sequence (Bit "Receive" FALSE ® TRUE) resets the bit.
Frame error	**0**	No error
	1	Frame error Possible causes: – 1st or 2nd end delimiter not valid. – The effective frame length does not match the parameterized frame length. A new receive sequence (Bit "Receive" FALSE ® TRUE) resets the bit.
Parity/format error	0	No error
	1	Parity/format error A new receive sequence (Bit "Receive" FALSE ® TRUE) resets the bit.

Process value	Value	Description
Buffer overflow	**0**	No error
	1	Buffer overflow during receive sequence A new receive sequence (Bit "Receive" FALSE ® TRUE) resets the bit.
Timeout	0	No error
	1	Response timeout This bit is only used in case of a response time set to > 0. A new receive sequence (Bit "Receive" FALSE ® TRUE) resets the bit.
Invalid TX length	0	No error
	1	Invalid transmit length, permissible length: 1 to 192 bytes
Invalid RX length	0	No error
	1	Invalid receive length, permissible length: 1 to 192 bytes
Received frame length	0…192	This byte contains the length of the last message received.

Receive Data – RS232/RS485-Mode for COM0/COM1

Byte		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Dec.	Hex.								
n	n	Byte 0 of the 1st receive buffer block							
…	…	…							
n + 23	n + 17	Byte 23 of the 1st receive buffer block							
n + 24	n + 18	Byte 0 of the 2nd receive buffer block							
…	…	…							
n + 47	n + 2F	Byte 23 of the 2nd receive buffer block							
…	…	…							
n + 167	n + A7	Byte 0 of the 8th receive buffer block							
…	…	…							
n + 191	n + BF	Byte 23 of the 8th receive buffer block							

9.1.2 Evaluating Process Input Data – Modbus Client Mode

Byte		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Dec.	Hex.	**COM0**							
0	0x0000	reserved							
…	…								
3	0x0003								
4	0x0004	MB-Server cycle time COM0 (s. p. 133)							
5	0x0005								
6	0x0006	Receive data of the Modbus Servers COM0 maximum Length 8 x 12 registers, (s. p. 134)							
…	…								
197	0x00C5								
		COM1							
198		reserved							
…	0x00C6								
201	0x00C9								
202	0x00CA	MB-Server cycle time COM0 (s. p. 133)							
203	0x00CB								
204	0x00CC	Receive data of the Modbus Servers COM1 maximum Length 8 x 12 registers (s. p. 134)							
…	…								
395	0x018B								
		Modbus-Server-Status (s. p. 134)							
		Server 0, COM0							
400	0x0190	MODBUS timeout Ch0	Parity/ format error Ch0	Write error Ch0	Read error Ch0	Error code Ch0			
401	0x0191	reserved		Valid write config. Ch0	Valid read config. K0	reserved			
		Server 1, COM0							
402	0x0192	MODBUS timeout Ch1	Parity/ format error Ch1	Write error Ch1	Read error Ch1	Error code Ch1			
403	0x0193	reserved		Valid write config. Ch1	Valid read config. K1	reserved			
404… 415	0x0194 … 0x019F	Server 2, COM0 to Server 7, COM0							
416… 431	0x0120 … 0x01AF	Server 0, COM1 to Server 7, COM1							
		MB-Server Timing (s. p. 134)							
432	0x01B0	Server 0, COM0							
433	0x01B1								
…	…	…							
446	0x01BE	Server 7, COM1							
447	0x01BF								
448	0x01C0	Server 0, COM1							
449	0x01C1								
…	…	…							
462	0x01CE	Server 7, COM1							
463	0x01CF								

Meaning of the Status Bits – Modbus Client mode

Process value	Value	Description
MB-Server cycle time (*1 ms)		Update time [ms] with which the Modbus RTU-Client requests data from all connected Modbus RTU-Servers.
Modbus-Server-Status		
Error code		Modbus Exception Code
Read error Chx	0	No error
	1	Modbus read error
Write error Chx	0	No error
	1	Modbus write error
Parity/format error Chx	0	No error
	1	Modbus parity or format error
MODBUS timeout Chx	0	No error
	1	The Modbus-Server did not respond within the defined time.
Valid read config. Chx	0	Invalid read configuration
	1	Read configuration valid
Valid write config. Chx	0	Invalid write configuration
	1	Write configuration valid

NOTE

Description of the Modbus Exceptions Codes:
http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b.pdf.

Receive Data of the Modbus Servers COM0/COM1

Depending on the parameterization, 1 or 12 registers are received per Modbus-Server.

Register		Bit 15... Bit 0		
Dec.	Hex.	MSB		LSB
n	n	Input register 0 of the 1st Modbus-Server		
…	…	…		
n + 11	n + 0x0B	Input register 11 of the 1st Modbus-Server		
n + 12	n + 0x0C	Input register 0 of the 2nd Modbus-Server		
…	…	…		
n + 23	n + 0x17	Input register 11 of the 2nd Modbus-Server		
…	…	…		
n + 84	n + 0x54	Input register 0 of the 8th Modbus-Server		
…	…	…		
n + 95	n + 0x5F	Input register 11 of the 8th Modbus-Server		

MB-Server Timing

Process value	Description
MB-Server Timing (*1 ms)	Update time [ms] of the connected Modbus RTU-Servers at COM0 or COM1.

9.1.3 Evaluating Process Input Data –DXP Channels

Byte		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Dec.	Hex.								
464	0x01D0	Input value Ch7	Input value Ch6	Input value Ch5	Input value Ch4	reserved			

Meaning of the Status Bits – DXP Channels

Process value	Value	Description
Input value Chx	0	no input signal
	1	input signal at DXP channel

9.1.4 Evaluating Process Input Data –Module Status

Byte		Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Dec.	Hex.								
468	0x01D4	Under-voltage V2	reserved					ARGEE program active	Module diagnostics pending
469	0x01D5	reserved	Force Mode active	res.			Internal error	Under-voltage V1	reserved

Meaning of the Status Bits – Module Status

Process value	Value	Description
Module diagnostics pending	0	No error
	1	Diagnostic message active
ARGEE program active	0	No error
	1	The device contains an active ARGEE program,(s. p. 163)
Undervoltage V2	0	No error
	1	System power supply V2 too low (< 18 V DC).
Undervoltage V1	0	No error
	1	System power supply V1 too low (< 18 V DC).
Internal error	0	No error
	1	Internal error, device-internal communication disturbed
Force Mode active	0	No error
	1	Force-Mode in DTM active The Force Mode is activated, no process data exchange The output states may not correspond to the settings send from the field bus.

9.2 Writing Process Output Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	COM0							
0 … **5**	Control data RS232/RS485 Mode (s. **p. 137**) Modbus Client Mode (s. **p. 138**)							
6 … **197**	Process output data 192 bytes, depending on the configuration of COM0 RS232/RS485 Mode (s. **p. 138**) Modbus Client Mode (s. **p. 138**)							
	COM1							
198 **199** **203**	Control data RS232/RS485 Mode (s. **p. 137**) Modbus Client Mode (s. **p. 138**)							
204 … **395**	Process output data 192 bytes, depending on the configuration of COM1 RS232/RS485 Mode (s. **p. 138**) Modbus Client Mode (s. **p. 138**)							
	DXP channels (s. **p. 139**)							
396	DXP7	DXP6	DXP5	DXP4	reserved			
397	reserved							

9.2.1 Writing Process Output Data – RS232/RS48 Mode

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	COM0							
0	reserved						Receive	Transmit
1	reserved							
2	Transmitter frame length							
3	reserved							
4	Receiver frame length							
5	reserved							
6 … 197	Transmit data COM0 maximum Length 8 x 24 bytes (s. p. 138)							
	COM1							
198	reserved						Receive	Transmit
199	reserved							
200	Transmitter frame length							
201	reserved							
202	Receiver frame length							
203	reserved							
204 … 395	Transmit data COM1 maximum Length 8 x 24 bytes (s. p. 138)							

Meaning of the Control Bits – RS232/RS485 mode

Process value	Value	Description
Transmit	0	New transmit sequence possible
	1	The bit is set to TRUE to start the transmission.
Receive	0	Preparation for new receive sequence
	1	The bit is set to TRUE to start the receive sequence. This bit has to be set to FALSE after every received frame until the status bit "Receive complete" is FALSE.
Transmitter frame length	1… 192	Number of the characters to be send in bytes
Receiver frame length	1… 192	Defines the number of characters to be received for the next message. Is only evaluated if the parameter "EOF detection" is set to the value "framelength".

Transmit Data – RS232/RS485-Mode for COM0/COM1

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n	Byte 0 of the 1st transmit buffer block							
…	…							
n + 23	Byte 23 of the 1st transmit buffer block							
n + 24	Byte 0 of the 2nd transmit buffer block							
…	…							
n + 47	Byte 23 of the 2nd transmit buffer block							
…	…							
n + 167	Byte 0 of the 8th transmit buffer block							
…	…							
n + 191	Byte 23 of the 8th transmit buffer block							

9.2.2 Writing Process Output Data – Modbus Client Mode

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	COM0							
0	reserved							
…								
5								
6	Transmit data, Modbus-Servers, maximum Length 8 x 24 bytes (s. p. 139)							
…								
197								
	COM1							
198	reserved							
…								
203								
204	Transmit data, Modbus-Servers, maximum Length 8 x 24 bytes (s. p. 139)							
…								
395								

Transmit Data – Modbus Servers COM0/COM1

Depending on the parameterization, 1 or 12 registers are transmitted per Modbus-Server.

Register	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
n	Output register 0 of the 1st Modbus Server							
…	…							
n + 11	Output register 11 of the 1st Modbus Server							
n + 12	Output register 0 of the 2nd Modbus Server							
…	…							
n + 23	Output register 11 of the 2nd Modbus Server							
…	…							
n + 84	Output register 0 of the 8th Modbus Server							
…	…							
n + 95	Output register 11 of the 8th Modbus Server							

9.2.3 Writing Process Input Data – DXP Channels

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
396	Output value Ch7	Output value Ch6	Output value Ch5	Output value Ch4	reserved			
397	reserved							

Meaning of the Control Bits – DXP Channels

Process value	Value	Description
Output value Chx	0	Output at channel inactive
	1	Output at channel active

9.3 Transmit and Receive Data

9.3.1 Transmit Data

The following flow diagram describes the transmit sequence.

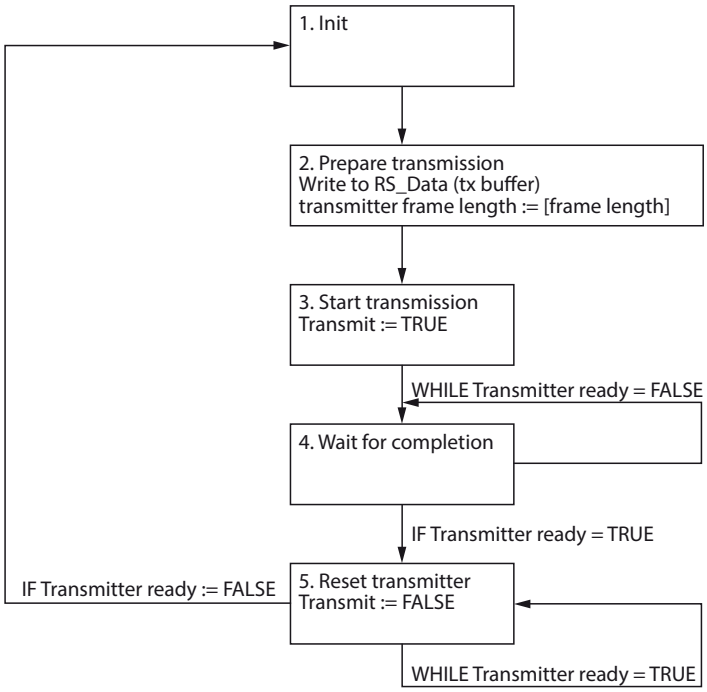


Fig. 72: Transmit sequence

Transmit sequence

Initial state "Transmitter ready" is FALSE (1.).

- ➤ Write transmit data (RS_Data) to the transmit buffer (TX buffer) (2.).
- ➤ Write the transmit data length in bytes to the process output value "Transmitter frame length" (2.).
- ➤ Set the process output value "Transmit" to TRUE (3.).
- ➤ Wait until the process input value "Transmitter ready" = TRUE (4.).
- ➤ Set the process output value "Transmit" to FALSE (5.).
- ➤ Go back to 1 for the next transmit sequence.

NOTE

The chapters **Configuring and Parameterizing** and **Operating** contain detailed information concerning parameters or process data and diagnostics.

9.3.2 Receive Data

The following flow diagram describes the receive sequence.

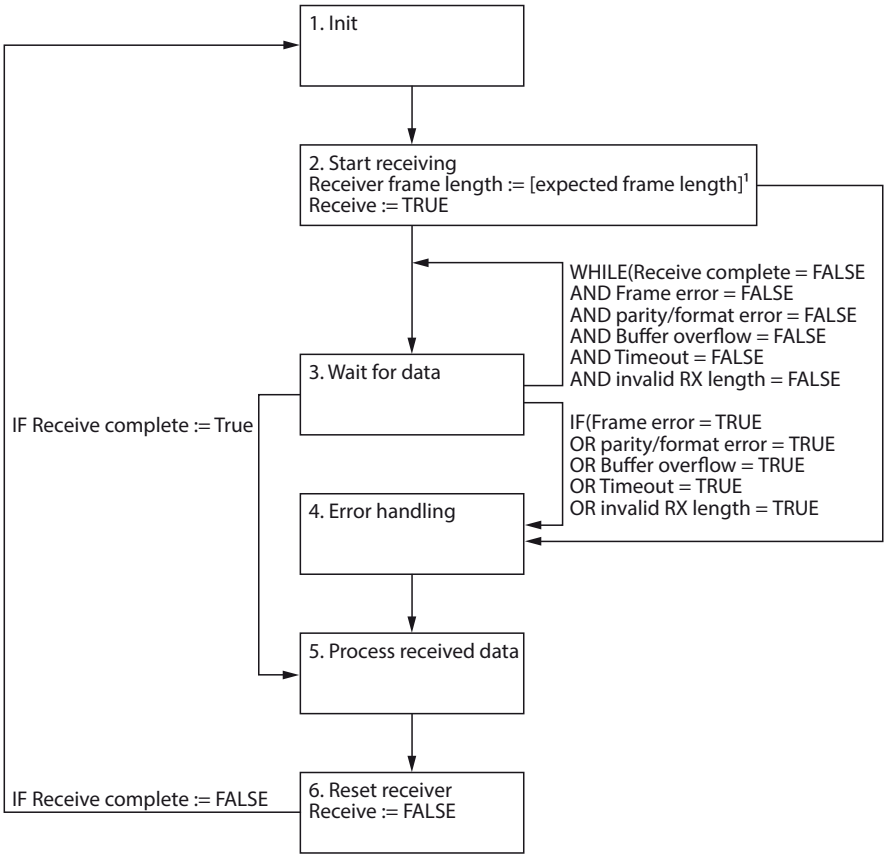


Fig. 73: Receive sequence

Receive sequence

Initial state "Receive complete" is FALSE (1).

- ➤ Set the process output value "Receive" to TRUE (starts the receiver) (2.).
- ➤ Wait until the process input value "Receive complete" = TRUE or until an error is signaled (3.).
- ➤ Perform an error handling. If no error is signaled continue with (5.).
- ➤ Read and process the data received from the receive buffer (5.).
- ➤ Set the process output value "Receive" to FALSE (stops the receiver) (6.).
- ➤ Wait until the process input value "Receive complete" = FALSE.
- ➤ Go back to 1 for the next receive sequence.

The following must be observed for receiving data:

- The receiver temporarily has to be deactivated between two transmit sequences (refer to steps 5…8). The duration for the deactivation depends on the update time set and the PLC cycle time. During this time, no data can be received.
- The data reception is limited to 192 bytes per telegram.

9.4 Evaluating LED Displays

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

- Supply voltage
- Group and bus errors
- Status
- Diagnostics

LED PWR

LED green	LED red	Meaning
off	off	No voltage connected or under voltage at V1
on	off	Voltage V1 and V2 OK
off	on	No voltage connected or under voltage at V2

LED BUS

LED green	LED red	Meaning
off	off	No voltage connected
on	off	Connection to a Master/Controller established
flashing (1 Hz)	off	Device ready for operation
off	on	IP address conflict or Modbus Connection Timeout
off	flashing (1 Hz)	Wink command active The wink command is used to identify nodes in an Ethernet network. If an Ethernet node receives a wink command, it responds visually (e.g. flashing LED).
flashing (1 Hz)	flashing (1 Hz)	Autonegotiation and/or DHCP/BootP-searching for settings

LED ERR

LED green	LED red	Meaning
off	off	No voltage connected
on	off	No diagnostic message, device is operating in normal condition.
off	on	Diagnostic message pending

LEDs ETH1 and ETH2

LED green	LED yellow	Meaning
off	off	No Ethernet connection
on	off	Ethernet connection established, 100 Mbps
flashing	off	Ethernet traffic, 100 Mbps
off	on	Ethernet connection established, 10 Mbps
off	flashing	Ethernet traffic, 10 Mbps

COM Channel LEDs TX0/Rx0 and TX1/RX1

LED TX green	LED TX red	Meaning
off	off	No serial communication
flashing	off	Device sends serial data
LED RX green	**LED RX red**	**Meaning**
off	off	No serial communication
flashing	off	Device receives serial data
off	flashing	Device receives serial data, parity or format error
off	on	Overflow at receive buffer or timeout
LED TX/RX red		
TX and RX blink simultaneously red (1 Hz)		Overload of auxiliary voltage
TX and RX blink alternately red (1 Hz)		Parameterization error

DXP Channel LEDs

LED green	LED red	Meaning (input)	Meaning (output)
off	off	Input not active	Output not active
on	off	Input active	Output active (max. 0,5 A)
off	on	–	Output active with overload/ short circuit
off	flashing (1 Hz)	Overload at the auxiliary voltage	

LED DXP7 flashes white during a Wink command.

9.5 Evaluating Diagnostic Data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	COM channel diagnostics COM0							
1								
2	COM channel diagnostics COM1							
3								
4	DXP diagnostics							
5								

9.5.1 Evaluating Diagnostic Data – COM channel diagnostics

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	COM0							
0	Overcurrent supply VAUX1	reserved					Parameterization error	Hardware error
1	Error MB-server 7	Error MB-server 6	Error MB-server 5	Error MB-server 4	Error MB-server 3	Error MB-server 2	Error MB-server 1	Error MB-server 0
	COM1							
2	Overcurrent supply VAUX1	reserved					Parameterization error	Hardware error
3	Error MB-server 7	Error MB-server 6	Error MB-server 5	Error MB-server 4	Error MB-server 3	Error MB-server 2	Error MB-server 1	Error MB-server 0

Meaning of Diagnostic Bits

Process value	Value	Description
Hardware error	0	No error
	1	Hardware error, device replacement may be necessary
Parameterization error	0	No error
	1	Parameterization error Possible causes: – Parameter "Termination active" activated in operation mode "RS232" – Parameter "Biasing active" activated in operation mode "RS232" – Invalid parameterization
Overcurrent supply VAUX1	0	No error
	1	Overcurrent at COM port supply (pin 1)
Error MB-Server x	0	No error
	1	Error at Modbus-Server x at respective COM port or Modbus-Server not accessible

9.5.2 Evaluating Diagnostic Data – DXP Diagnostics

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	reserved				Overcurrent VAUX2 Ch6/Ch7	Overcurrent VAUX2 Ch4/Ch5	reserved	
1	Overcurrent output Ch7	Overcurrent output Ch6	Overcurrent output Ch5	Overcurrent output Ch4	reserved			

Meaning of Diagnostic Bits

Process value	Value	Description
Overcurrent VAUX2 Chx/Chy	0	No error
	1	Overcurrent at the supply voltage at connector C2 (channel 4 or channel 5) or at connector C3 (channel 6 or channel 7).
Overcurrent output Chx	0	No error
	1	Overcurrent at output of channel x

10 Troubleshooting

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

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

11 Maintenance

Ensure that the plug connections and cables are always in good condition.
The devices are maintenance-free. Clean the devices if required with a dry cloth.

11.1 Executing the firmware update

The firmware of the device can be updated via FDT/DTM. The PACTware™ FDT frame application, the DTM for TBEN-S2-2COM-4DXP and the current firmware
are available as downloads free of charge from www.turck.com.

ATTENTION!

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.

11.1.1 Example: Update the firmware with the PACTware™ FDT frame application

➤ Launch PACTware™.

➤ Right-click Host PC → Add device.

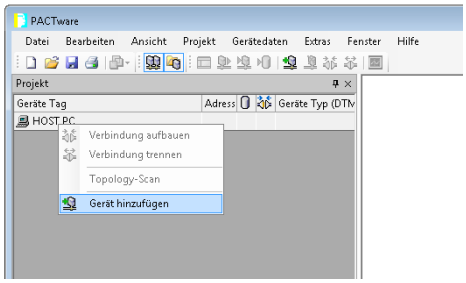


Fig. 74: Adding a device in PACTware™

➤ Select "BL Service Ethernet" and confirm with OK.

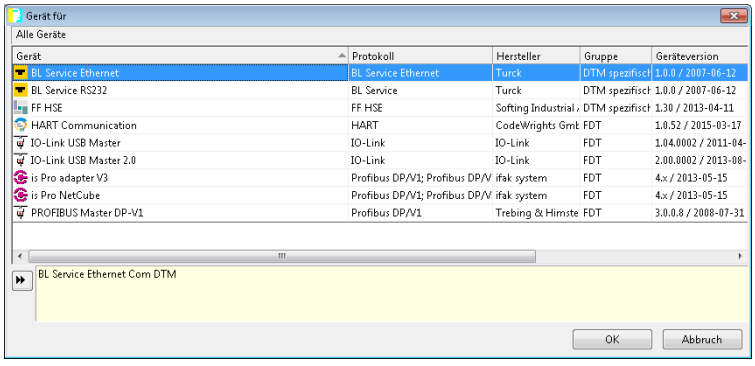


Fig. 75: Selecting the Ethernet interface

➤ Double-click the connected device.

➤ PACTware™ opens the bus address management.

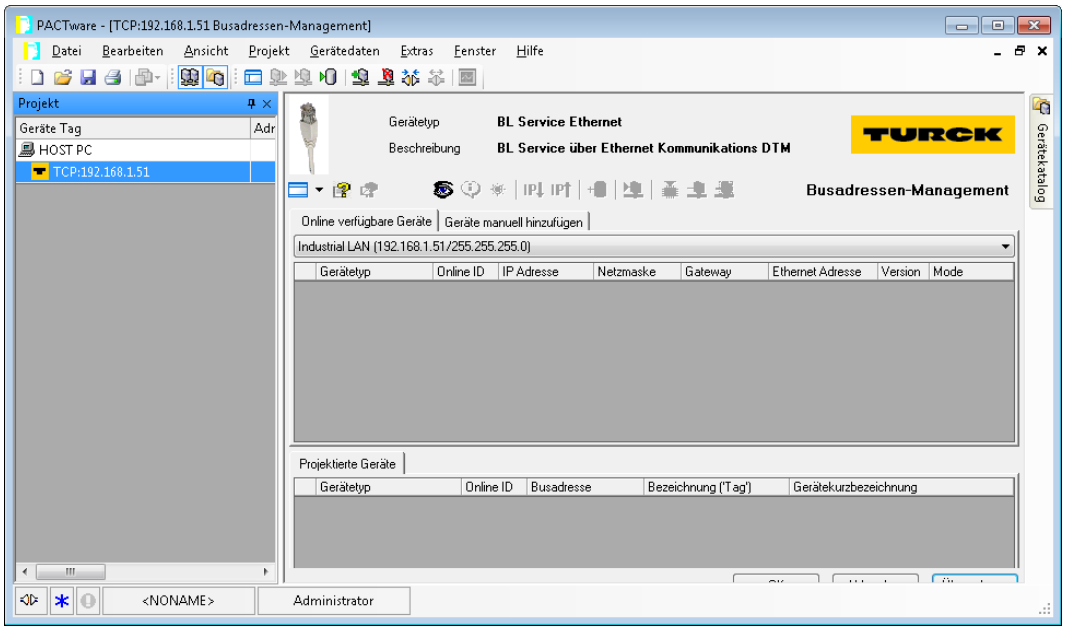


Fig. 76: Opening the bus address management

➤ Search for connected Ethernet devices: Click the “Search” icon.

➤ Select the required device.

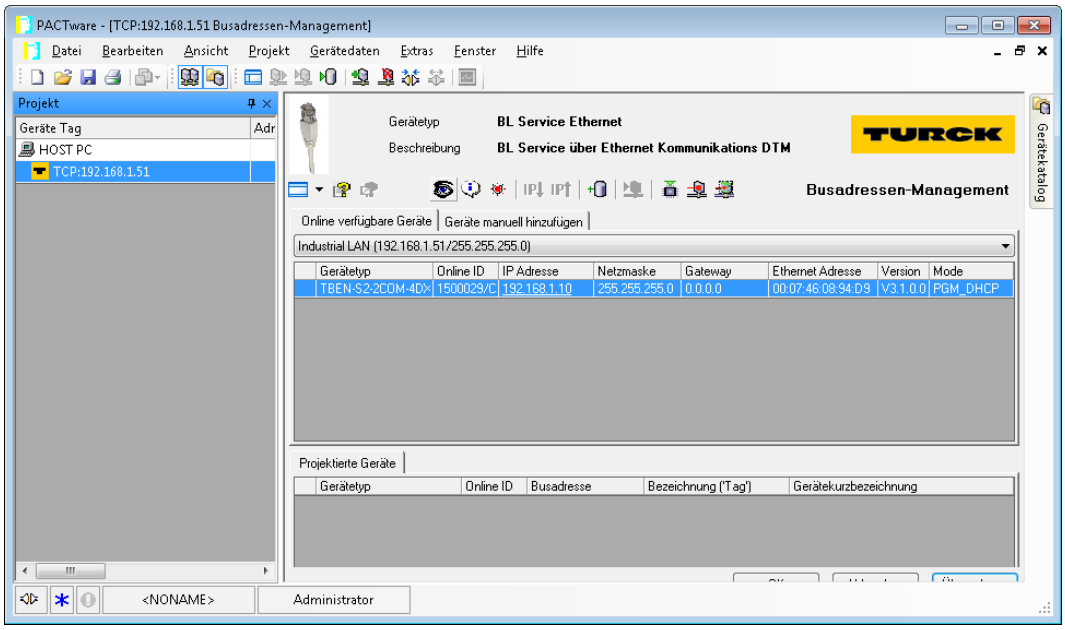


Fig. 77: Selecting the device

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

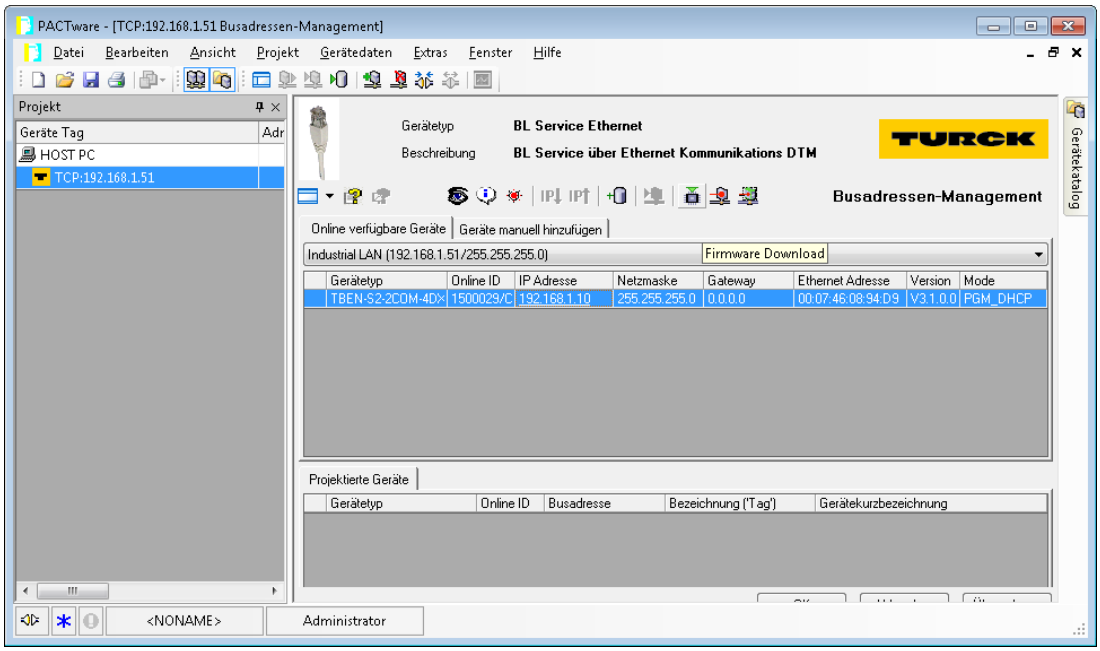


Fig. 78: Starting the firmware update

➤ Select the storage location and confirm with OK.

↪ PACTware™ show the progress of the firmware update with a green bar at the bottom of the screen.

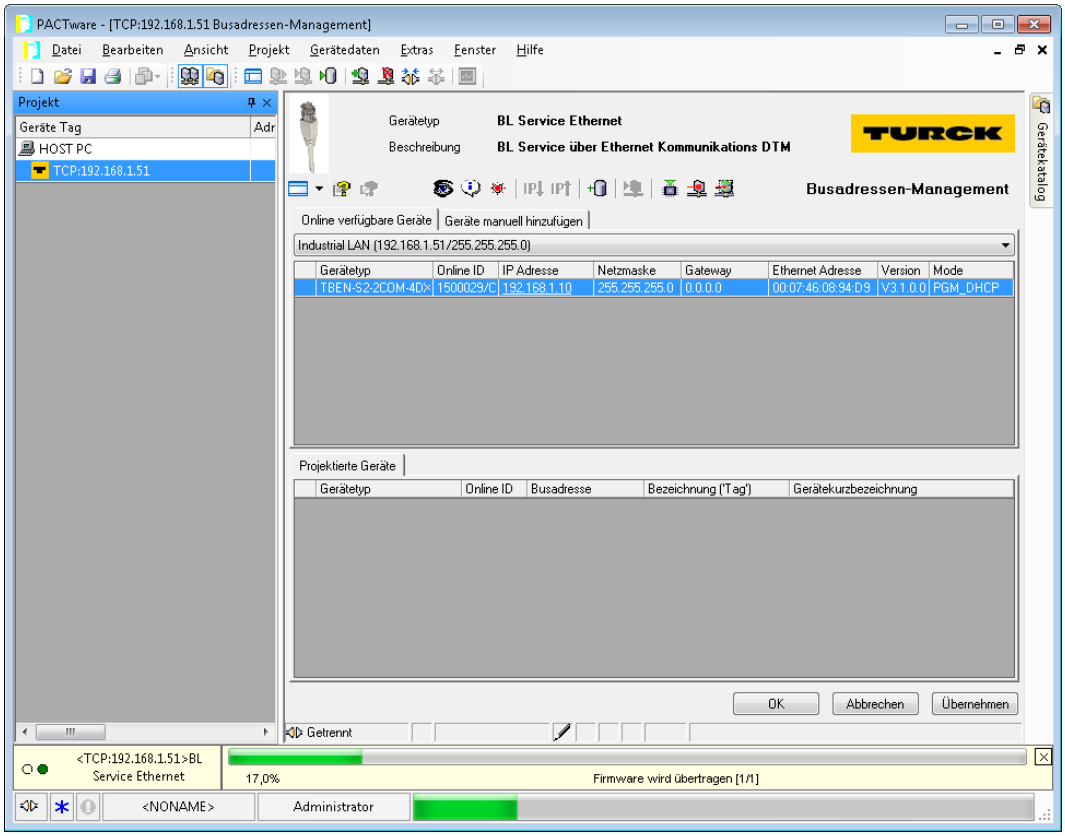


Fig. 79: Firmware update in progress

12 Repair

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

12.1 Returning devices

If a device has to be returned, bear in mind that only devices with a decontamination declaration will be accepted. This is available for download at

http://www.turck.de/static/media/downloads/01_Dekontaminationserklaerung_DE.pdf

and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Disposal

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

14 Technical Data

Technical Data	
Power supply	
Supply voltage	24 VDC
Permissible range	18…30 VDC Total current max. 4 A per voltage group Total current V1 + V2 max. 5,5 A at 70 °C per module
Sensor/actuator supply V_{AUX1}	Connectors C0…C1 from V1, short-circuit proof, ≤ 55 °C: – 24 V: ≤ 1,2 A per port – 5 V: 0,5 A per port > 55 °C: – 24 V: 0,5 A per port – 5 V: 0,5 A per port
Sensor/actuator supply V_{AUX2}	Connectors C2…C3 from V2, short-circuit proof, ≤ 55 °C: ≤ 0,14 A per port > 55 °C: 0,05 A per port
Potential isolation	Galvanic isolation of V1 and V2 voltage groups voltage proof up to 500 VDC
System data	
Transmission Ethernet	10 Mbps 100 Mbps
Connection to Ethernet	2 x M8, 4-pin, D coded
Protocol detection	automatic
Web server	default: 192.168.1.254
Service interface	Ethernet via P1 oder P2
Modbus TCP	
Address assignment	Static IP, BOOTP, DHCP
Supported Function Codes	FC1, FC2, FC3, FC4, FC5, FC6, FC15, FC16, FC23
Number of TCP connections	8
Input register start address	0 (0x0000)
Output register start address	2048 (0x8000)
EtherNet/IP™	
Address assignment	according to EtherNet/IP™ standard
QuickConnect (QC)	< 500 ms
Device Level Ring (DLR)	supported
Number of TCP connections	3
Number of CIP connections	10
Input Assembly Instance	103
Output Assembly Instance	104
Configuration Assembly Instance	106
PROFINET	

Address assignment	DCP
Conformance class	B (RT)
MinCycleTime	1 ms
Fast Start-Up (FSU)	< 500 ms
Diagnostics	according to PROFINET Alarm Handling
Topology discovery	supported
Automatic address assignment	supported
Media Redundancy Protocol (MRP)	supported
Cable length	max. 30 m
Serial interface	
Signal type	RS232 or RS485
Number of channels	2
Operation mode RS232	
Signal low level	-18…-3 VDC
Signal high level	3…18 VDC
Transmission signals	TxD, RxD
Transmission rate	300… 230400 bps
Transmission type	Full duplex
Cable length	15 m at 19200 baud (max. line capacity < 2000 pF)
Operation mode RS485	
Transmission signals	TX/RX+, TX/RX
Transmission rate	300… 230400 bps
Transmission type	2-wire half-duplex
Termination	internal or external, s. p. 18
Biasing	internal or external, s. p. 18
Line impedance	120 Ω
Cable length	Twisted Pair up to 1000 m
Digital inputs	
Number of channels	4
Connection technology inputs	M12, 5-pole
Input type	PNP
Type of input diagnostics	channel diagnostics
Switching threshold	EN 61131-2 type 3, PNP
Signal voltage, low level	< 5 V
Signal voltage, high level	> 11V
Low-level signal current	< 1.5 mA
High-level signal current	> 2 mA
Input delay	0.05 ms
Electrical isolation	galvanic isolation to P1/P2, voltage proof up to 500 VDC

Digital outputs	
Number of channels	4
Connection technology outputs	M12, 5-pole
Output type	PNP
Type of input diagnostics	channel diagnostics
Output voltage	24 VDC from potential group V2
Output current per channel	0.5 A, short-circuit-proof
Simultaneity factor	1 (0.03 > 55 °C)
Load type	ohmic, inductive, lamp load
Short circuit protection	yes
Potential isolation	galvanic isolation to P1/P2, voltage proof up to 500 VDC
Standard/directive conformity	
Vibration test	according to EN 60068-2-6, acceleration up to 20 g
Shock test	according to EN 60068-2-27
Drop and topple	according to IEC 60068-2-31/IEC 60068-2-32
Electro-magnetic compatibility	according to EN 61131-2
Approvals and certificates	CE
UL cond.	cULus LISTED 21 W2, Encl.Type 1 IND.CONT.EQ.
General Information	
Dimensions (w × l × h)	32 × 144 × 31 mm
Operating temperature	-40…+70 °C
Storage temperature	-40…+70 °C
Operating altitude	max. 5000 m
Protection class	IP65/IP67/IP69K
MTTF	179 years according to SN 29500 (Ed. 99) 20 °C
Housing material	PA6-GF30
Housing color	black
Halogen-free	yes
Mounting	2 mounting holes, Ø 4,6 mm

15 Appendix

15.1 Possible Network Structures (Examples)

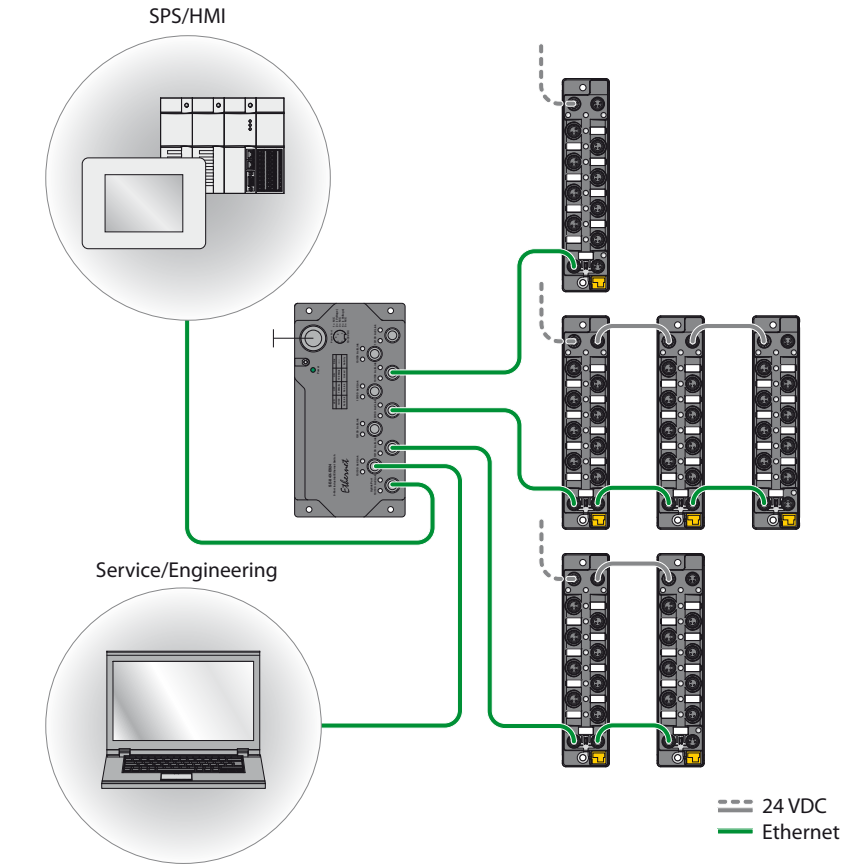


Fig. 80: Network structure, example 1

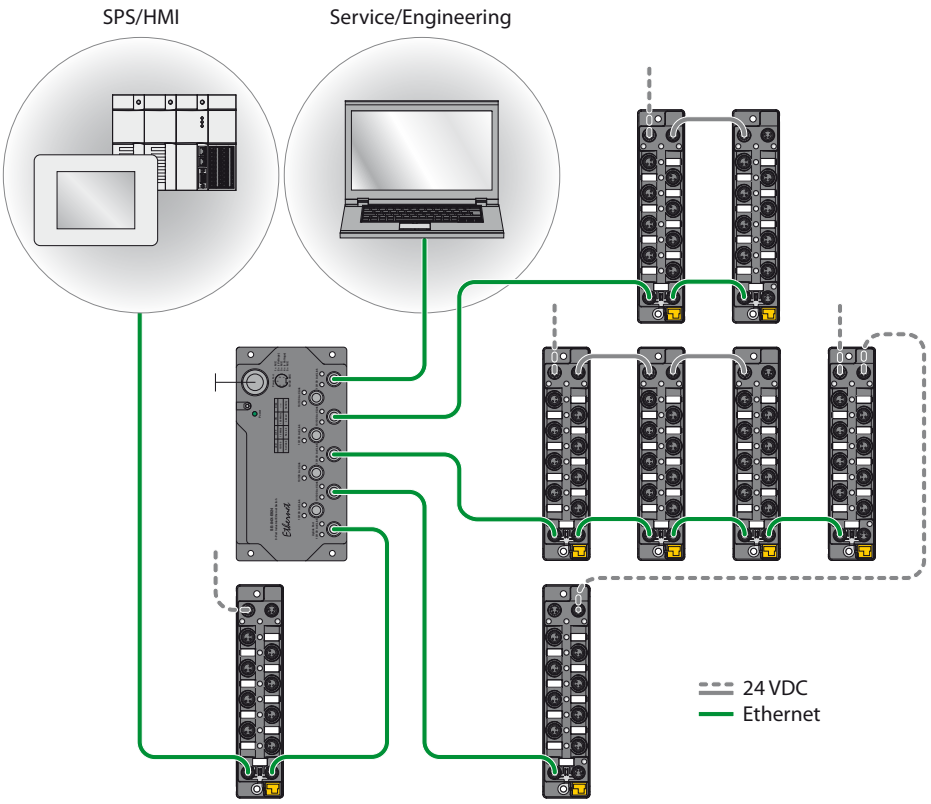


Fig. 81: Network structure, example 2

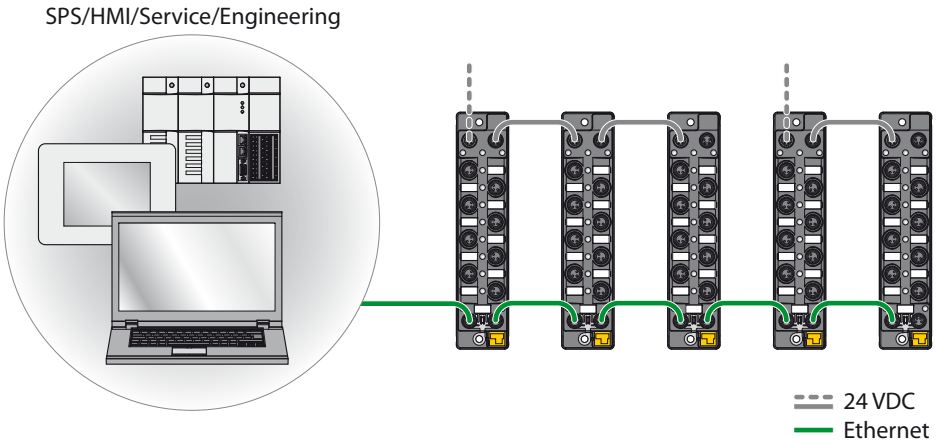


Fig. 82: Network structure, example 3

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15.1.1 Daisy Chain - Maximum Number of Connected Modules

Prerequisites:

- optimized network
- only TBEN-S-modules in the daisy chain, no additional switches, no third-party devices
- exchange of pure process data, no acyclic data
- cable length between the TBEN-S-modules max. 50 m

Cycle time	Maximum number of TBEN-S-modules
1 ms	21
2 ms	42

NOTE

Deviations from the specification above may lead to a reduction of possible TBEN-S-modules connected to one daisy chain.

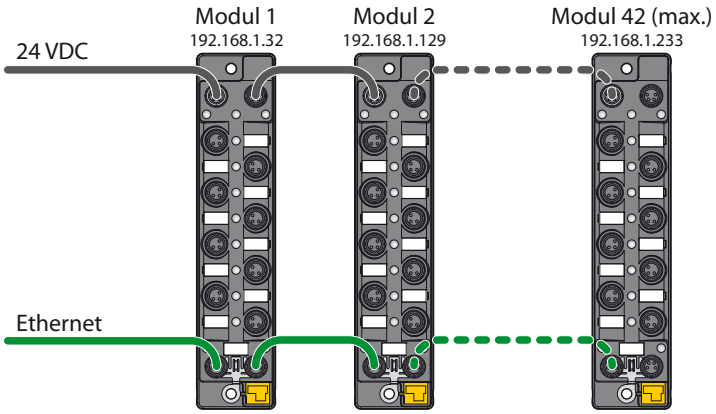

Fig. 83: Daisy Chain

15.2 ARGEE/FLC

The ARGEE/FLC programming software can be downloaded from the download area at the Turck homepage.

The Zip archive "SW_ARGEE_Environment_Vx.x.zip" contains the software and the respective software documentation.

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