Your Global Automation Partner

TURCK

TBEN-L. . .-EN1/FEN20-EN1
Spanner Modules

Getting Started Guide

Table of Contents

1 About these Instructions

The purpose of this document is to guide customers in installing and commissioning the TBEN-Lx-EN1 and FEN20-EN1 Ethernet spanners.

2 Notes on the Product

2.1 Product Identification

This instruction is valid for the following devices:

- TBEN-L4-EN1
- TBEN-L5-EN1
- FEN20-EN1

2.2 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.com**

Outside Germany, please contact your local Turck representative.

3 Product Description

3.1 Properties and Features

- Two Ethernet ports that can be addressed individually
- Data exchange via a 240 word (480 byte) data table
- Spanner port 1 supports EtherNet/IP™ and Modbus TCP, spanner port 2 supports EtherNet/IP™ and Modbus TCP and PROFINET
- Direct connection of up to 16 digital in- and outputs to the field bus
- Channel-related short-circuit diagnosis of inputs
- Ethernet-connection with two 4-pole, D-coded M12 × 1 connectors
- Rotary switch position settings only apply to port 1
- Address Conflict Detection (ACD) disabled on both ports
- LLDP enabled on port 2 only
- Port 2 IP address can be set via the web server or PROFINET DCP
- Upgrades can only be performed via port 1

3.2 Block I/O Module TBEN-L…-EN1

3.2.1 Device Overview

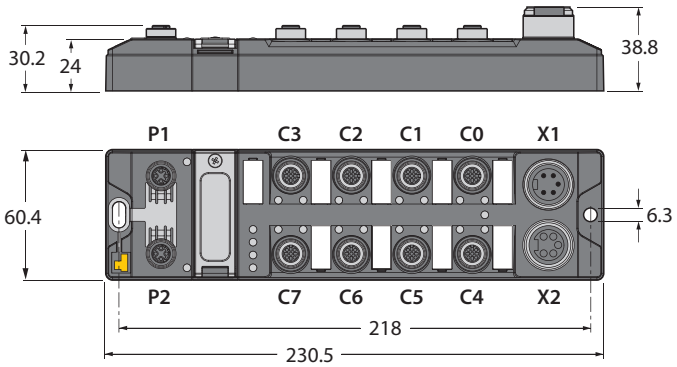


Fig. 1: Dimensions

3.2.2 Technical data

Supply voltage	
Supply voltage	24 VDC
Permissible range	18...30 VDC Total current max. 9 A per voltage group V1
Connection technology voltage supply	
– TBEN-L4-EN1	7/8“ connector, 4-pole
– TBEN-L5-EN1	7/8" connector, 5-pole
Sensor/actuator supply VAUX1	Supply connector C0 - C7 from V1 short-circuit proof, 120 mA per connector
Potential isolation	Galvanic isolation from V1 and V2 voltage group, voltages up to 500 VDC
System data	
Transmission rate	10/100 Mbps
Connection technology	2 × M12, 4-pole, D-coded
Protocol detection	Automatic
Web server	192.168.1.254 (Default)
Service interface	Ethernet via P1

Protocol properties	
Modbus TCP	
Address assignment	Static IP (rotary coding switches), BOOTP, DHCP
Supported Function Codes	FC1, FC2, FC3, FC4, FC5, FC6, FC15, FC16, FC23
Number of connections	8
Input data size	Max. 240 registers
Register start address	12288 (0x3000)
Output data size	Max. 240 registers
Output register start address	13312 (0x3400)
EtherNet/IP™	
Address assignment	According to EtherNet/IP™ standard
Number of connections	3
PROFINET	
Address assignment	DCP
Conformance class	B (RT)
MinCycleTime	1 ms
Fast Start-Up (FSU)	< 150 ms
Diagnostics	According to PROFINET Alarm Handling
Topology detection	Supported
Automatic address assignment	Supported
Inputs	
Number of channels	16
Connection technology inputs	M12, 5-pole
Input type	PNP
Type of input diagnostics	Group diagnostics
Switching threshold	EN 61131-2 type 3, PNP
Low level signal voltage	< 5 V
High-level signal voltage	> 11 V
Low-level signal current	< 1.5 mA
High-level signal current	> 2 mA
Input delay	2.5 ms
Electrical isolation	Galvanic isolation to P1/P2, voltage proof up to 500 VDC
Tests	
Vibration test	According to EN 60068-2-6/ IEC 68-2-47, Acceleration up to 20 g
Drop and topple	According to IEC 60068-2-31/IEC 60068-2-32 1
Shock test	According to EN 60068-2-27
EMC	According to EN 61131-2
Ambient conditions	
Temperature range	
– Operating temperature	- 40 °C…+ 70 °C
– Storage/transport	- 40 °C…+ 85 °C

Operating altitude	Max. 5000 m ASL
Protection class	IP65/IP67/IP69K
Approvals	CE, cULus
Housing	
Dimensions	60.4 × 230.4 × 24 mm (w × l ×h)
Material	Fibre-glass reinforced Polyamide (PA6-GF30)
Window material	Lexan
Screw material	303 Stainless Steel
Halogen-free	Yes

3.3 Block I/O Module FEN20-EN1

3.3.1 Device Overview

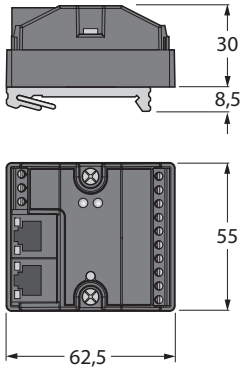


Fig. 2: Dimensions

3.3.2 Technical data

Supply voltage	
Supply voltage	24 VDC
Operating/load voltage	12…30 VDC
Operating current	100 mA
Electrical isolation	500 V galvanic IO to Ethernet
Power loss, typical	≤ 2.4 W
Connection technology voltage supply	screw terminals
Inputs	
Number of channels	8
Input voltage	24 VDC
Supply current	700 mA
Switching threshold	7 V/1,65 mA
Signal voltage, low level	7 VDC
Signal voltage, high level	7…30 VDC
Low-level signal current	< 1.5 mA
High-level signal current	> 2.5 mA
Input delay	2.5 ms
Max. input current	6 mA
System data	
Transmission rate	10/100 Mbps, Full/Half Duplex, Auto Negotiation; Auto Crossing
Address modes Ethernet	via Software
Connection technology	Ethernet 2 x RJ45 sockets

Protocol detection	Automatic
Web server	192.168.1.254 (Default)
Service interface	Ethernet
Device rest	Via push button
Protocol properties	
Modbus TCP	
Address assignment	Static IP (rotary coding switches), BOOTP, DHCP
Supported Function Codes	FC1, FC2, FC3, FC4, FC5, FC6, FC15, FC16, FC23
Number of connections	6
Input data size	Max. 240 registers
Register start address	12288 (0x3000)
Output data size	Max. 240 registers
Output register start address	13312 (0x3400)
EtherNet/IP™	
Address assignment	According to EtherNet/IP™ standard
Quick Connect (QC)	< 150 ms
Device Level Ring (DLR)	Supported
Number of CIP connections	6
PROFINET	
Address assignment	DCP
Conformance class	B (RT)
MinCycleTime	1 ms
Fast Start-Up (FSU)	< 150 ms
Diagnostics	According to PROFINET Alarm Handling
Topology detection	Supported
Automatic address assignment	Supported
Housing	
Dimensions	55 × 62.5 × 30 mm (w × l ×h)
Material	Fibre-glass reinforced Polyamide (PA6-GF30)
Ambient conditions	
Temperature range	
– Operating temperature	- 40 °C…+ 70 °C (- -40 °F…+158 °F)
– Storage/transport	- 40 °C…+ 85°C (- -40 °F…+185 °F)
Protection class	IP20
Approvals	CE, cULus

4 Connecting

4.1 Connecting TBEN-L…-EN1

Connecting the Device to Ethernet

For the connection to Ethernet, the device has an integrated autocrossing switch with two 4-pin M12 Ethernet sockets. The maximum tightening torque is 0.6 Nm.

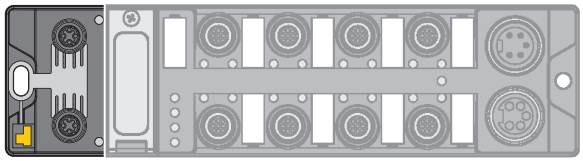


Fig. 3: M12 Ethernet sockets

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

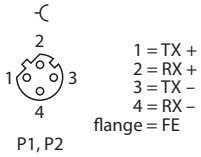


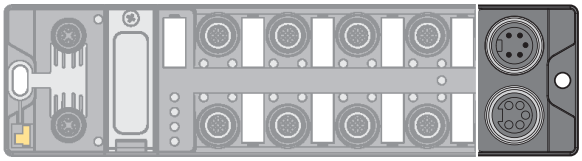
Fig. 4: Pin assignment Ethernet connectors

Connecting the Power Supply

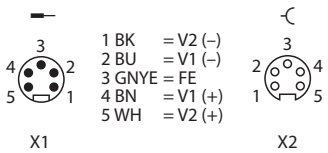
For the connection to the power supply and the feeding through of the power, the device has two 5-pin 7/8" connectors. The power supply connectors are designed as 4-pole (TBEN-L4) or 5-pole (TBEN-L5) 7/8" connectors. V1 and V2 are galvanically isolated. The maximum tightening torque is 0.8 Nm.

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

Supply voltage 7/8“, 5-pole



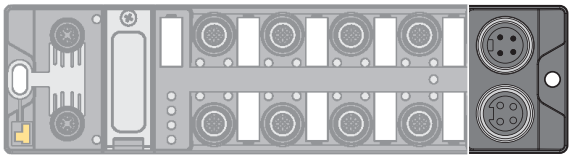
Pin assignment



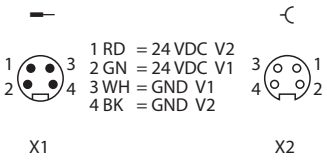
X1= voltage IN
X2 = voltage OUT for supplying the next node

V1 = supply voltage 1 (incl. supply of electronics)
V2 = supply voltage 2

Supply voltage 7/8“, 4-pole



Pin assignment



X1= voltage IN
X2 = voltage OUT for supplying the next node

V1 = supply voltage 1 (incl. supply of electronics)
V2 = supply voltage 2

Connecting Digital Sensors

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

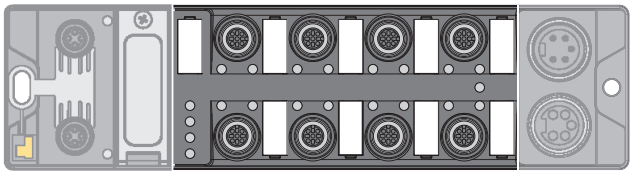


Fig. 5: M12 connector for connecting digital sensors

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

TBEN-L…-EN1

Ground the Device (FE)

The grounding clip and the metal ring are connected to each other. A mounting screw through the bottom mounting hole in the module connects the shielding of the fieldbus lines to the functional ground of the power supply and the connected devices and to the reference potential of the system.

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 standard screwdriver to lever the grounding clip upwards and remove it.

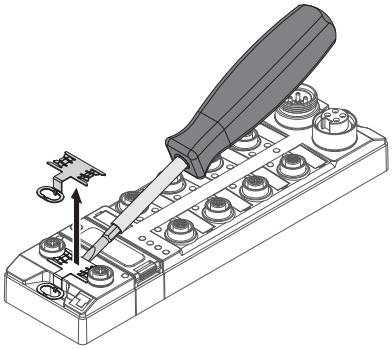


Fig. 6: Removing the grounding clamp

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.

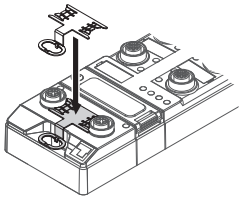


Fig. 7: Mounting the grounding clamp

4.2 FEN20-EN1

Connecting the Devices to Ethernet

For the connection to Ethernet the device has two 2-pin RJ45 ports.

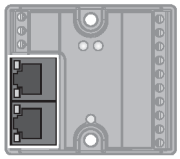


Fig. 8: RJ45-ports

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

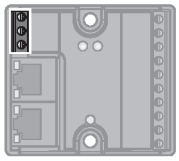
1 = TX +
2 = TX –
3 = RX +
4 = n.c.
5 = n.c.
6 = RX –
7 = n.c.
8 = n.c.

Fig. 9: Pin assignment Ethernet connectors

Connecting Power Supply

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

Supply voltage



Pin assignment

1 = ⏚
2 = V1 –
3 = V1 +

Connecting Digital Sensors

The device provides 10 screw terminals for connecting digital sensors.

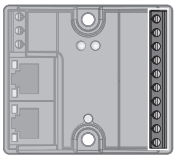
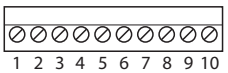


Fig. 10: Screw terminals for connecting digital sensors

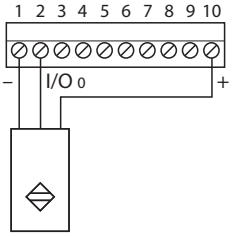
➤ Connect the digital sensors and actuators to the device according to the pin assignment shown below.

FEN20-EN1



1 = V1 –
2 = I/O 0
3 = I/O 1
4 = I/O 2
5 = I/O 3
6 = I 4
7 = I 5
8 = I 6
9 = I 7
10 = V_{OUT}1 +

3-wire connection



5 Address Setting for Spanner Modules

5.1 Address setting at TBEN-L…-EN1

Setting the address mode is done through the 3 rotary coding-switches on the gateway.

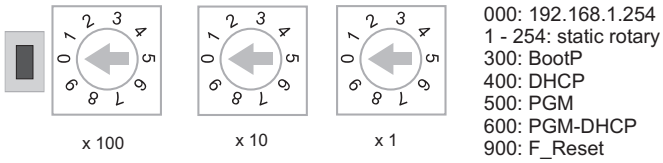


Fig. 11: Decimal rotary coding-switches for address setting

ATTENTION!

Protective cover opened

Protection class IP65/IP67/IP69K not guaranteed

➤ Screw the protective cover over the rotary coding-switches firmly

➤ Check if seal of the protective cover is correctly placed

NOTE

After every change of the address-mode, a voltage reset must be done.

Mode: Static Rotary

When using the rotary-mode, the last byte of the station's IP address can be set via the rotary coding switches.

- Switch position **000**: in TURCK devices used to reset the device to the default IP address (see **Resetting the IP-Address, Switch Position "000" (Seite 19)**).
- Switch position **001**: normally reserved for the default-gateway
- Switch position **002…254**: valid IP address range
- Switch position **255**: normally used for broadcast messages in the subnet.

We therefore recommend addresses in the range of **002…254**.

Mode: BootP (300)

- Switch position: 300

Address setting is carried out by a BootP-server in the network after the start-up of the gateway.

NOTE

The IP address, as well as the default subnet mask assigned to the station by the BootP-server, are stored permanently in the station's EEPROM.

If the station is switched from BootP-mode to rotary- or PGM-mode, the settings carried out in BootP-mode (IP address, subnet mask, etc) will be read from the device's EEPROM.

PROFINET

➤ Please assure, that in PROFINET applications, the address assigned via a BootP server corresponds to the address, which is assigned in the configuration tool.

Mode: DHCP (400)

- Switch position: 400

Address setting is carried out by a DHCP server in the network after the start-up of the device.

NOTE

The IP address, as well as the default subnet mask assigned to the station by the DHCP-server, are stored permanently in the station's EEPROM.

If the station is switched from DHCP-mode to rotary- or PGM-mode, the settings carried out in DHCP-mode (IP address, subnet mask, etc) will be read from the device's EEPROM.

DHCP supports three mechanisms for IP address allocation:

- In "automatic allocation", the DHCP-server assigns a permanent IP address to a client.
- In "dynamic allocation", DHCP assigns an IP address to a client for a limited period of time. After this time, or until the client explicitly relinquishes the address, the address can be re-assigned.
- In "manual allocation", a client's IP address is assigned by the network administrator. In this case, DHCP is only used to transmit the assigned address to the client.

PROFINET

Please assure, that in PROFINET-applications, the address assigned via a BootP-server corresponds to the address, which is assigned in the configuration tool.

Mode: PGM (500)

- Switch position: 500

The PGM-mode enables access of the Turck DTMs to the device's network settings.

NOTE

In the PGM-mode, all network settings (IP address, subnet mask, etc.) are send to the device's internal EEPROM and stored permanently.

Mode: PGM-DHCP (600)

- Switch position: 600

The device sends DHCP-requests until a IP address is assigned (DHCP-server, PROFINET-controller).

The assigned IP address is stored to the device and the DHCP-client is stopped.

Even after a restart of the device, the device sends no further DHCP-requests.

PROFINET

This mode assures a PROFINET-compliant operation of the device.

NOTE

If a DHCP-server is used within the network, problems may occur during IP-assignment.

In this case, both, the DHCP-server as well as the PROFINET-controller (via DCP), try an IP-address-assignment.

Resetting the IP-Address, Switch Position "000"

With this setting the DIP-switches to "000" followed by a voltage reset, the device is set to the address 192.168.1.254 (see **Default Setting of the Device (Seite 19)**).

NOTE

Setting "000" is no operation mode! After having reset the IP address to the default values, the device has to be set to another mode.

Default Setting of the Device

The device's default-settings are as follows:

IP address	192.168.1.254
Subnet mask	255.255.255.0
Default gateway	192.168.1.1

NOTE

The devices can be reset by the user to these default settings at any time.
To reset the module, set the 3 coding-switches on the gateway to "000" followed by a power-on reset.

ATTENTION!

Protective cover opened
Protection class IP65/IP67/IP69K not guaranteed
➤ Screw the protective cover over the rotary coding-switches firmly
➤ Check if seal of the protective cover is correctly placed

Factory Reset (F_Reset), Switch Position "900"

F_Reset (Reset to factory setting)

Switch position: 900

This mode sets all device-settings back to the default values and deletes all data in the device's internal flash.

NOTE

Setting 900 is no operation mode! Please set the device to another mode after having reset the IP address to the default values.

ATTENTION!

Protective cover opened
Protection class IP65/IP67/IP69K not guaranteed
➤ Screw the protective cover over the rotary coding-switches firmly
➤ Check if seal of the protective cover is correctly placed

Set Button

The Set button is placed left to the rotary coding switches under the cover at the device.

Pushing the Set-button causes a device-restart.

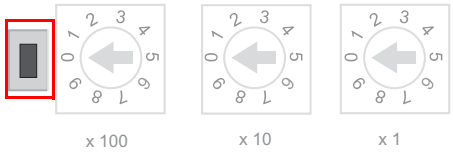


Fig. 12: Set button

ATTENTION!

Protective cover opened
Protection class IP65/IP67/IP69K not guaranteed
➤ Screw the protective cover over the rotary coding-switches firmly
➤ Check if seal of the protective cover is correctly placed

5.2 Address Setting at FEN20-EN1

The FEN20-EN1 is permanently set to mode PGM-DHCP. A factory reset (F_Restet) can be performed by pressing the “Reset” button that is recessed into the front of the device.

5.3 Assign the IP Address with Turck Service Tool (Port 1 only)

The Turck Service Tool can be used to set the IP address of either the TBEN-Lx-EN1 or the FEN20-EN1 in rotary switch mode PGM (500) or PGM_DHCP (600). The tool can also be used to change the first 3 octets of the IP address as well as netmask and gateway in other rotary switch modes.

NOTE

For the TBEN-Lx-EN1 and the FEN20-EN1 Ethernet spanner modules the Ethernet cable must be plugged into port 1 for the Turck Service Tool to work correctly. The address of port 2 can not be set with Turck Service Tool. If the IP addresses for both ports need to be assigned, the web server or PROFINET DCP is recommended and discussed in the following section.

➤ Open Turck Service Tool and click “Search”.

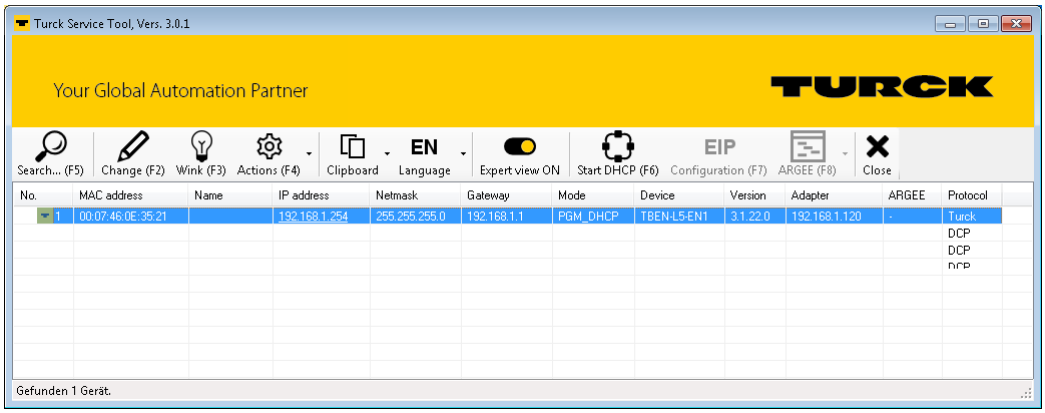


Fig. 13: Turck Service Tool – found devices

➤ Click on the device to be addressed and change the IP configuration via “Change”.

➤ Enter the IP address, netmask and gateway in the following window and click “Write to Device”.

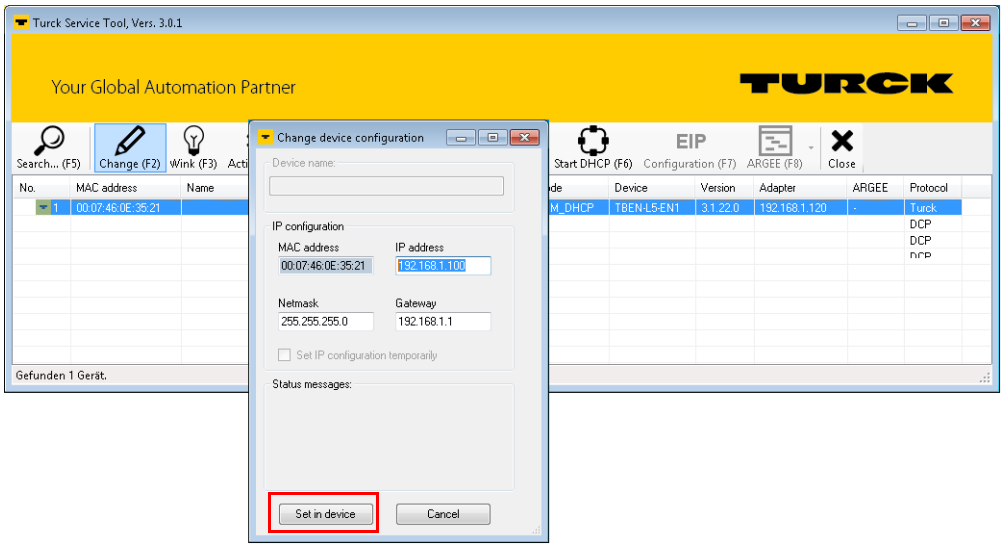


Fig. 14: Turck Service Tool – Change device configuration

➥ The IP address is set.

➤ Close the Turck Service Tool.

6 The Web Server

➤ Configure the device via the web server.

6.1 Security in the Web Server

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

In order to make misuse by third parties more difficult, it can be necessary to change the password. This should be done in the context of the network security concept for the complete facility in which the modules are placed.

In order to disconnect a logged in user/PC with administrator rights from the web server, a logout is necessary. If only the web browser is closed, the last active access is reactivated when opening the web server again from the same PC, which means, possibly with all administrator rights.

6.2 Address Setting via the Web Server

The Webserver of the TBEN-L…-EN1 and the FEN20-EN1 can be used to set the IP address for port 1 and 2 of the devices. Other functionalities of the web server will be discussed in sections to follow.

➤ Enter the IP address of the device into your web browser. If the device is out of the box or has been reset to factory defaults the IP address of both pots have the address 192.168.1.254.

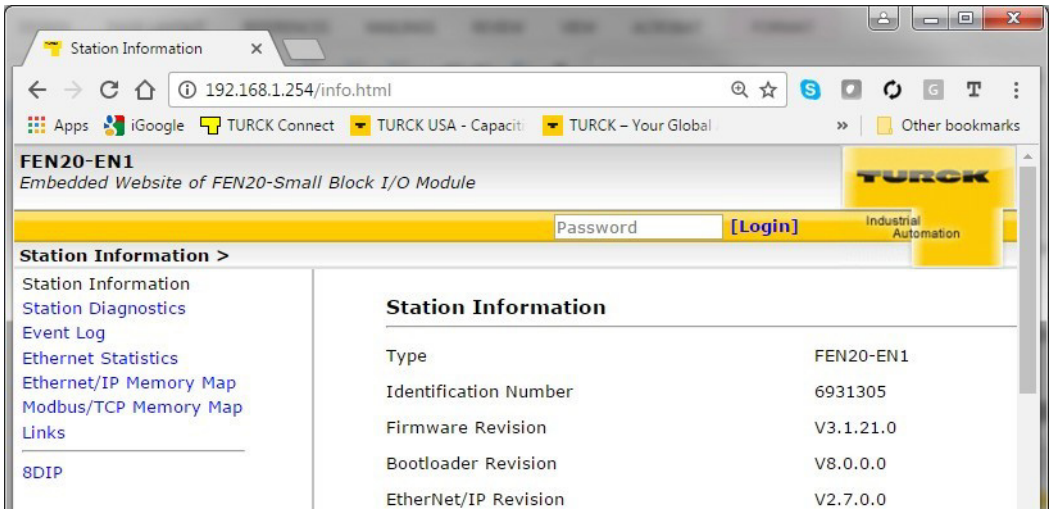


Fig. 15: Web server

Log into the web server with the default password “password”. The password can be reset by performing a factory reset on the device.

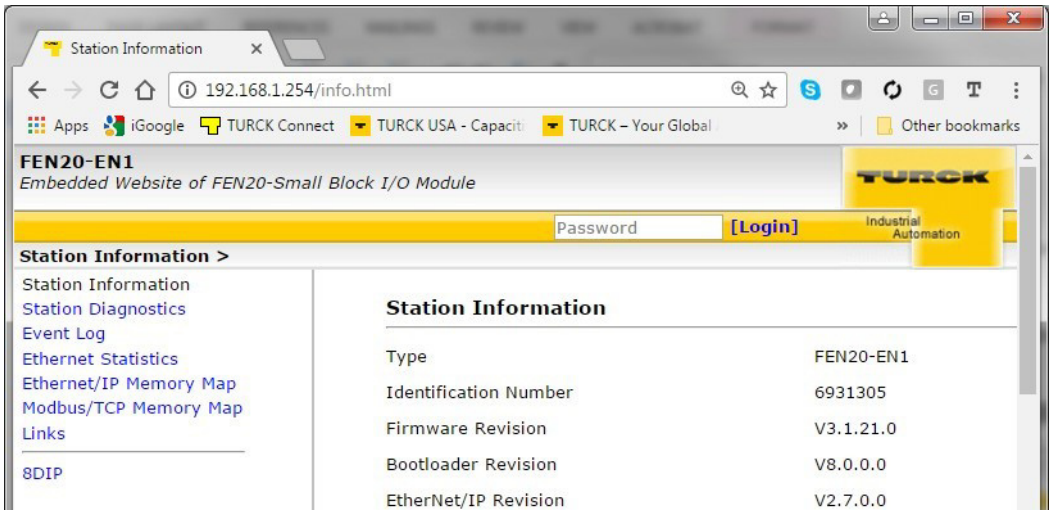


Fig. 16: Web server – Station Configuration

➤ Open the “Network Configuration”.

➤ Enter the IP addresses for port 1 and port 2.

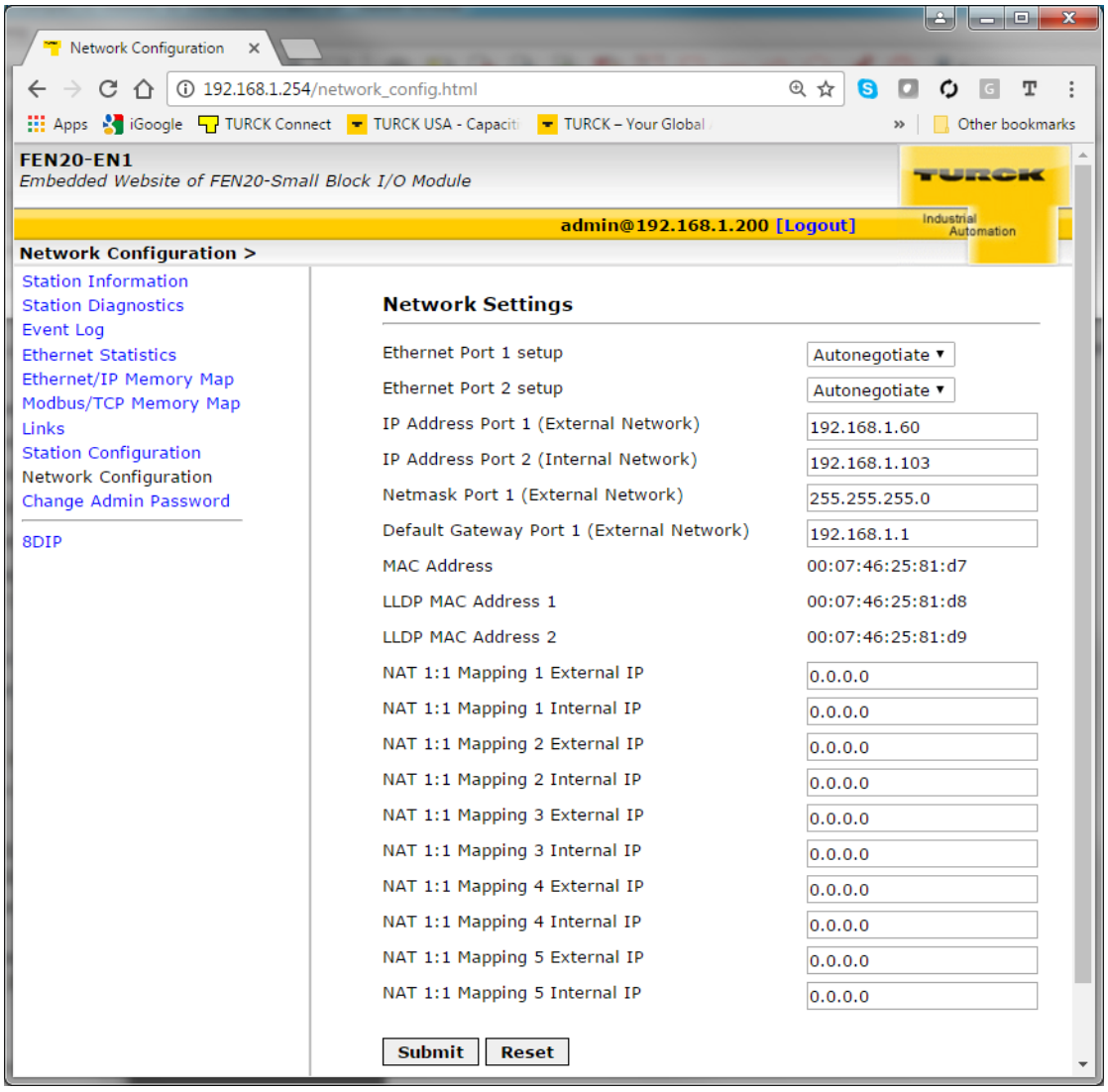


Fig. 17: Web server – Network Configuration

➤ Write the IP addresses into the device via “Submit”.

➥ The IP addresses for port 1 and port 2 are set.

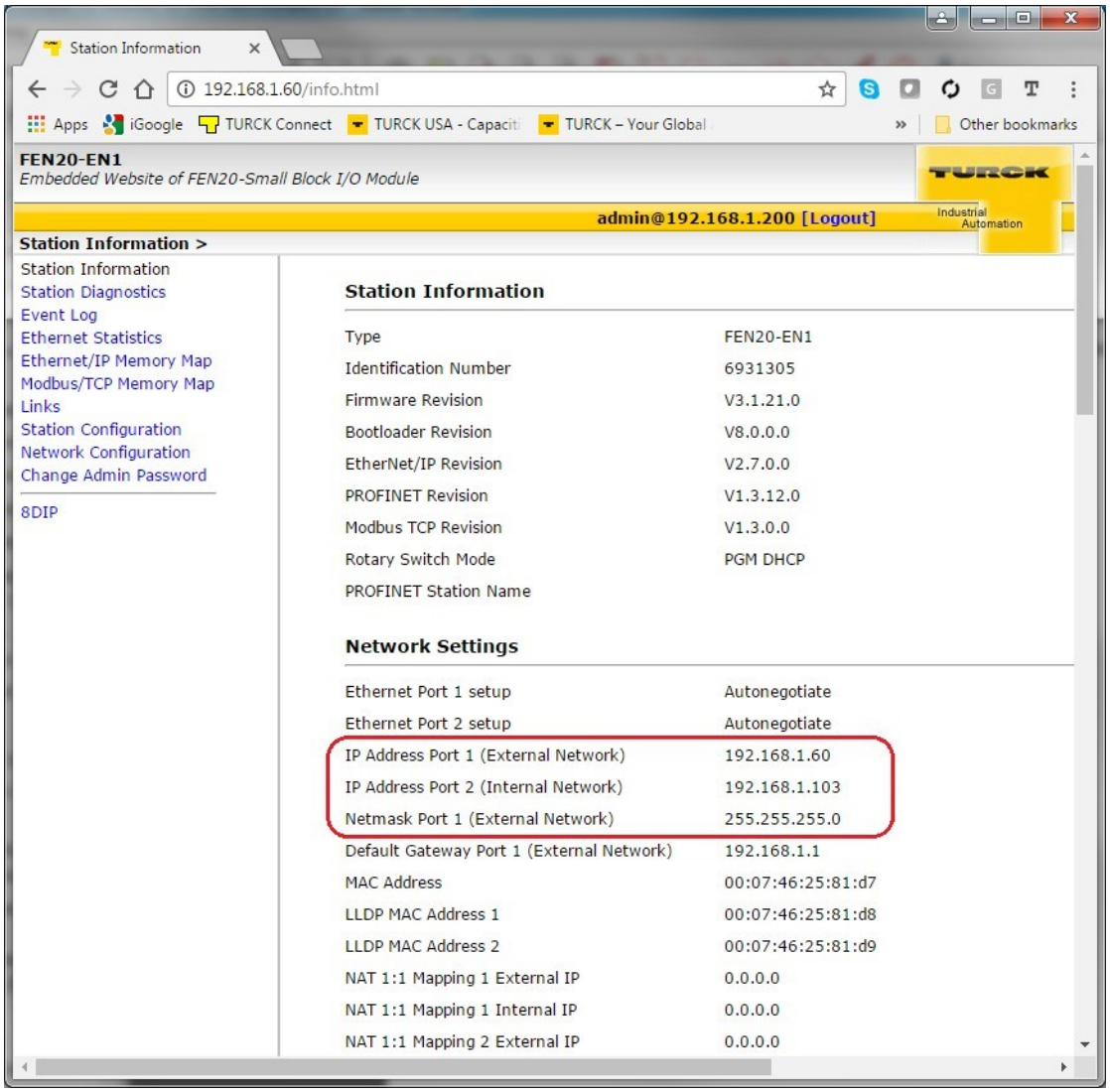


Fig. 18: Web server – changes IP addresses

6.3 Web Server and Spanner Data Mapping

6.3.1 Spanner Data Mapping

The data map of the spanner can be seen on the “Station Information” page of the web server under “Spanner Status”.

Spanner Status

Port 1 spanner data

Offset (d)	00	01	02	03	04	05	06	07	08	09
0	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
10	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
20	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
30	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
40	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
50	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
60	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
70	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
80	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
90	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
100	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
110	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
120	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
130	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
140	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
150	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
160	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
170	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
180	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
190	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
200	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
210	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
220	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
230	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000

Port 2 spanner data

Offset (d)	00	01	02	03	04	05	06	07	08	09
0	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
10	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
20	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
30	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
40	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
50	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
60	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
70	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
80	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
90	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
100	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
110	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
120	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
130	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
140	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
150	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
160	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
170	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
180	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
190	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
200	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
210	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
220	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
230	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000

Fig. 19: Web server – Spanner Status

The data map consists of 240 16-bit words.

The status table for port 1 shows the value of each word that is being written by the device that is mapped to port 1. The status table for port 2 shows the value of each word that is being written by the device that is mapped to port 2.

Data from each port is loaded into the web page every time it is refreshed.

Data mapping of the Status and Input bits of the EN1 spanner vary from protocol to protocol. The following mappings are for EtherNet/IP™ and Modbus TCP. In PROFINET, the spanner function is provided via GSDML file.

6.3.2 Modbus TCP – Status- and Input Data Mapping

8DIP (Input Data Mapping)			
Description	**Register**	**Bit Offset**	**Bit Length**
Channel 0 - Input value	0x0000 (0)	0	1
Channel 1 - Input value	0x0000 (0)	1	1
Channel 2 - Input value	0x0000 (0)	2	1
Channel 3 - Input value	0x0000 (0)	3	1
Channel 4 - Input value	0x0000 (0)	4	1
Channel 5 - Input value	0x0000 (0)	5	1
Channel 6 - Input value	0x0000 (0)	6	1
Channel 7 - Input value	0x0000 (0)	7	1
Station Status Word (Input Data Mapping)			
Description	**Register**	**Bit Offset**	**Bit Length**
Module Diagnostics Available	0x0001 (1)	0	1
Station Configuration Changed	0x0001 (1)	3	1
Overcurrent Isys	0x0001 (1)	5	1
Overvoltage Field Supply Ul	0x0001 (1)	6	1
Undervoltage Field Supply Ul	0x0001 (1)	7	1
Overvoltage Field Supply Usys	0x0001 (1)	8	1
Undervoltage Field Supply Usys	0x0001 (1)	9	1
Modulebus Communication Lost	0x0001 (1)	10	1
Modulebus Configuration Error	0x0001 (1)	11	1
INFO: Spanner connection established on Port 1	0x0001 (1)	12	1
INFO: Spanner connection established on Port 2	0x0001 (1)	13	1
Force Mode Enabled	0x0001 (1)	14	1

Fig. 20: Web server – Modbus TCP data mapping

6.3.3 EtherNet/IP™ – Status- and Input Data Mapping

Station Status Word (Input Data Mapping)			
Description	**Word Offset**	**Bit Offset**	**Bit Length**
Module Diagnostics Available	0	0	1
Station Configuration Changed	0	3	1
Overcurrent Isys	0	5	1
Overvoltage Field Supply Ul	0	6	1
Undervoltage Field Supply Ul	0	7	1
Overvoltage Field Supply Usys	0	8	1
Undervoltage Field Supply Usys	0	9	1
Modulebus Communication Lost	0	10	1
Modulebus Configuration Error	0	11	1
INFO: Spanner connection established on Port 1	0	12	1
INFO: Spanner connection established on Port 2	0	13	1
Force Mode Enabled	0	14	1
8DIP (Input Data Mapping)			
Description	**Word Offset**	**Bit Offset**	**Bit Length**
Channel 0 - Input value	1	0	1
Channel 1 - Input value	1	1	1
Channel 2 - Input value	1	2	1
Channel 3 - Input value	1	3	1
Channel 4 - Input value	1	4	1
Channel 5 - Input value	1	5	1
Channel 6 - Input value	1	6	1
Channel 7 - Input value	1	7	1

Fig. 21: Web server – EtherNet/IP™ data mapping

7 Operating Spanner Modules at Modbus TCP

7.1 Implemented Modbus Functions

TBEN-L…-EN1 and FEN20-EN1 support the following functions for accessing process data, parameters, diagnostics and other services.

Function codes	
No.	**Function**
	Description
3	**Read Holding Registers**
	Reading multiple output registers
4	**Read Input Registers**
	Reading multiple input registers.
6	**Write Single Register**
	Writing a single output register.
16	**Write Multiple Registers**
	Writing multiple output registers.
23	**Read/Write Multiple Registers**
	Reading and writing of multiple registers

7.2 Modbus TCP – Process Data Mapping

Modbus/TCP Input Data Mapping

Output Data Map | Print Version

16DIP (Input Data Mapping)

Description	Register	Bit Offset	Bit Length
Channel 0 - Input value	0x0000 (0)	0	1
Channel 1 - Input value	0x0000 (0)	1	1
Channel 2 - Input value	0x0000 (0)	2	1
Channel 3 - Input value	0x0000 (0)	3	1
Channel 4 - Input value	0x0000 (0)	4	1
Channel 5 - Input value	0x0000 (0)	5	1
Channel 6 - Input value	0x0000 (0)	6	1
Channel 7 - Input value	0x0000 (0)	7	1
Channel 8 - Input value	0x0000 (0)	8	1
Channel 9 - Input value	0x0000 (0)	9	1
Channel 10 - Input value	0x0000 (0)	10	1
Channel 11 - Input value	0x0000 (0)	11	1
Channel 12 - Input value	0x0000 (0)	12	1
Channel 13 - Input value	0x0000 (0)	13	1
Channel 14 - Input value	0x0000 (0)	14	1
Channel 15 - Input value	0x0000 (0)	15	1

Station Status Word (Input Data Mapping)

Description	Register	Bit Offset	Bit Length
Module Diagnostics Available	0x0001 (1)	0	1
Station Configuration Changed	0x0001 (1)	3	1
Overcurrent Isys	0x0001 (1)	5	1
Overvoltage Field Supply V2	0x0001 (1)	6	1
Undervoltage Field Supply V2	0x0001 (1)	7	1
Overvoltage Field Supply V1	0x0001 (1)	8	1
Undervoltage Field Supply V1	0x0001 (1)	9	1
Modulebus Communication Lost	0x0001 (1)	10	1
Modulebus Configuration Error	0x0001 (1)	11	1
INFO: Spanner connection established on Port 1	0x0001 (1)	12	1
INFO: Spanner connection established on Port 2	0x0001 (1)	13	1
Force Mode Enabled	0x0001 (1)	14	1

Spanner Data

Description	Register	Bit Offset	Bit Length
Spanner Data	0x3000 (12288)	0	up to 240 registers

Fig. 22: Web server – Modbus TCP data mapping

7.3 Modbus TCP – Registers

Address (hex.)	Access ro = read only rw = read/ write	Description
0x0000	ro	8 DIP – Input data mapping
0x0001	ro	Status Word
0x3000…0x30EF	ro	Packed process data of inputs
0x3400…0x34EF	rw	Packed process data of outputs
0x1000 …0x1006	ro	Station Identifier
0x100C	ro	Module status
0x1012	ro	Process image length in bit for the digital output modules
0x1013	ro	Process image length in bit for the digital input modules
0x1017	ro	Register mapping revision Register mapping revision (always 1, 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) (Seite 33)**
0x1130	rw	Modbus connection mode register (s. **S. 32)**
0x1131	rw	Modbus connection timeout in sec. (default: 0 = never) (s. **S. 33)**
0x113C…0x113D	rw	Modbus Parameter Restore (s. **S. 33)** (reset of parameters to default values)
0x113E…0x113F	rw	Modbus Parameter Save (s. **S. 33)** (permanent storing of parameters)

7.3.1 Register 0x1130: Modbus Connection Mode

This register defines the behavior of the Modbus connections:

Bit	Name – Description
15 to 2	reserved
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).
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.

7.3.2 Register 0x1131: 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

7.3.3 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.

7.3.4 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.

7.3.5 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, s. S. 32):

- 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 0×1120).

NOTE

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

7.4 Mapping the FEN20-EN1 into a CODESYS V3 Project

➥ Sett the IP addresses for the FEN20-EN1 spanner as follows via the web server.

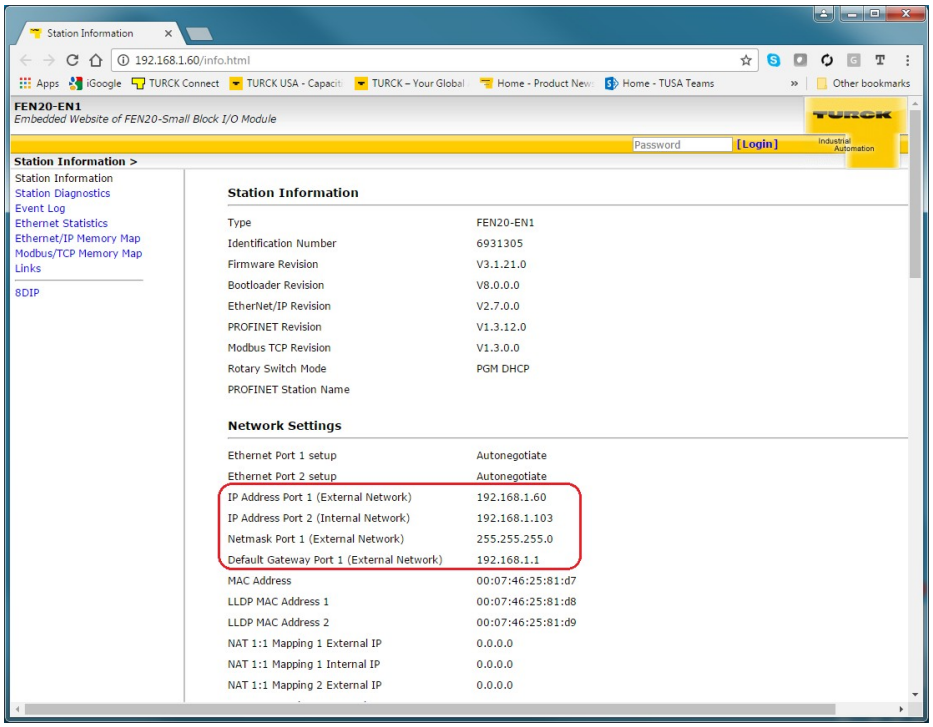


Fig. 23: Webserver – Setting the Addresses at the spanner module

➤ Create a TX507 Portrait project in CODESYS V3.5 (CODESYS V3.5 SP 8 Patch 1).

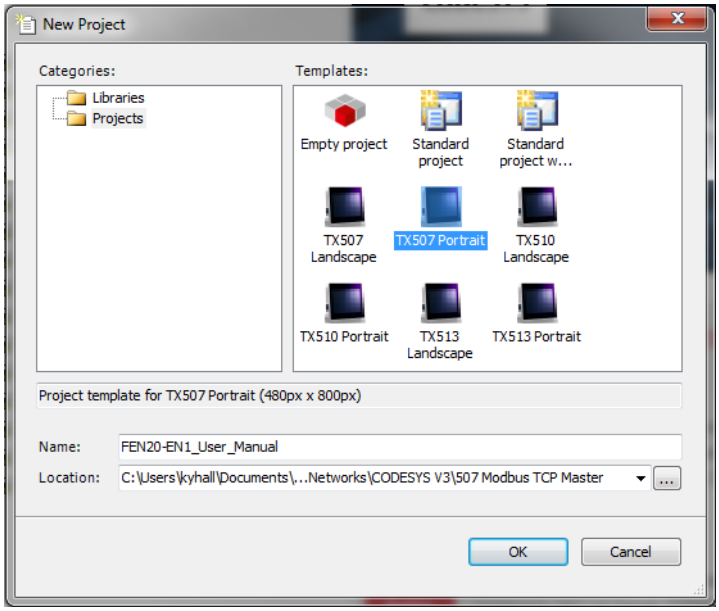


Fig. 24: CODESYS – Create a project with TX507

➤ Scan the network and add the TX507 HMI as Modbus Master.

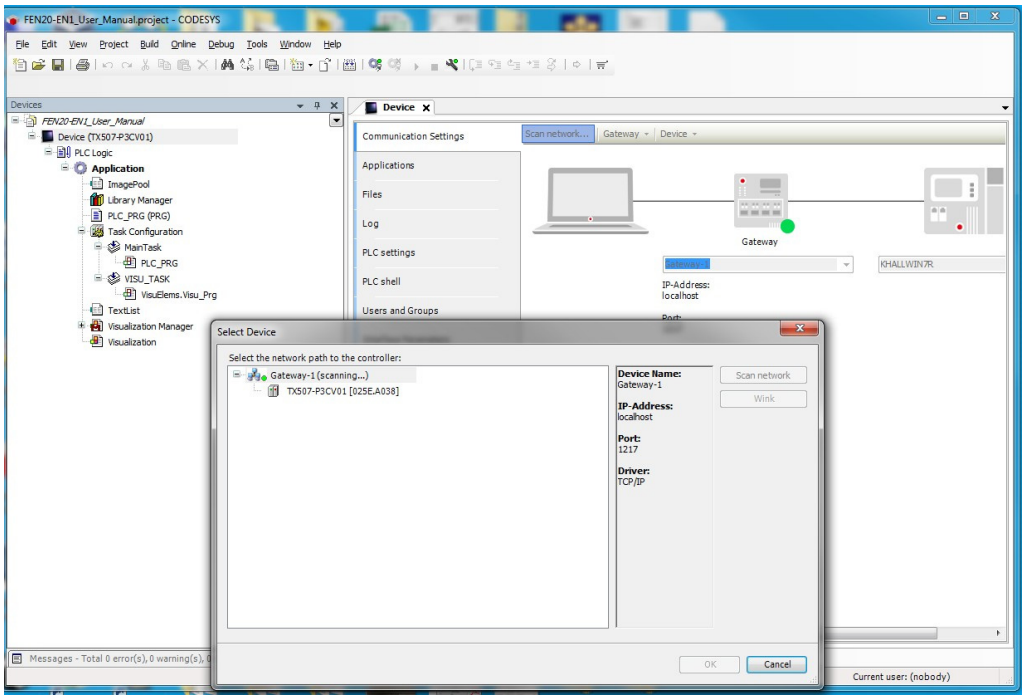


Fig. 25: CODESYS – scanning the network

➤ Right Click the device and add an Ethernet Adapter Card (Turck V3.5.7.20 or newer).

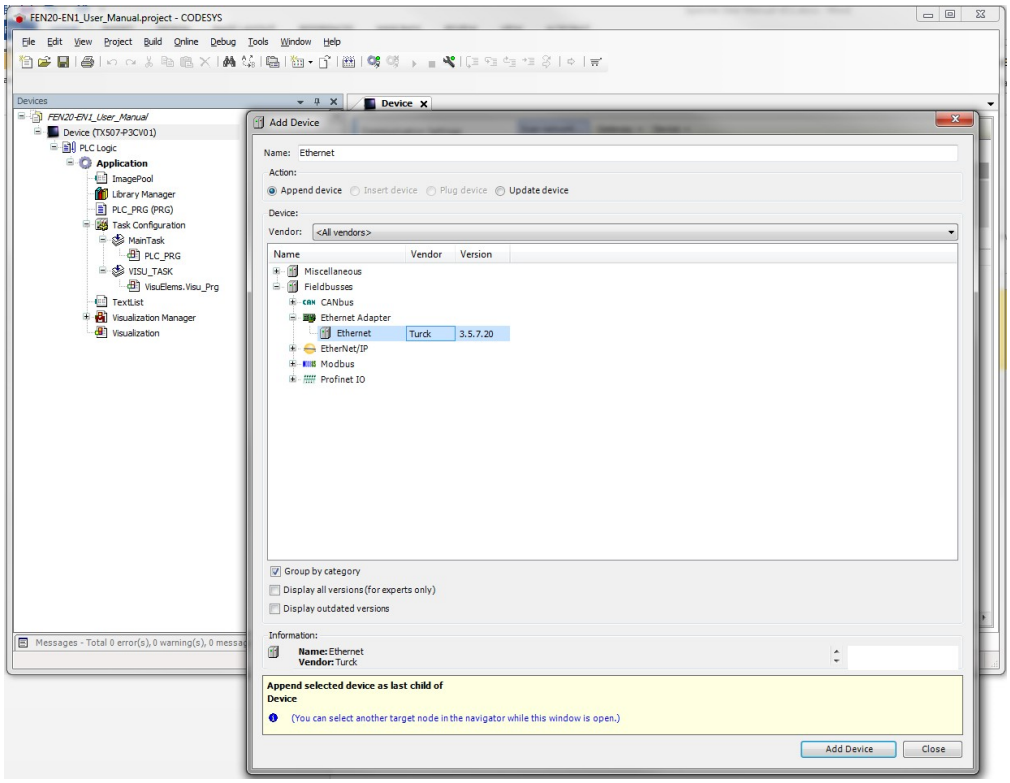


Fig. 26: CODESYS – Adding the Ethernet adapter

➤ Open the Ethernet adapter by double-clicking. Click „…“ and accept the IP address of the HMI with “OK”.

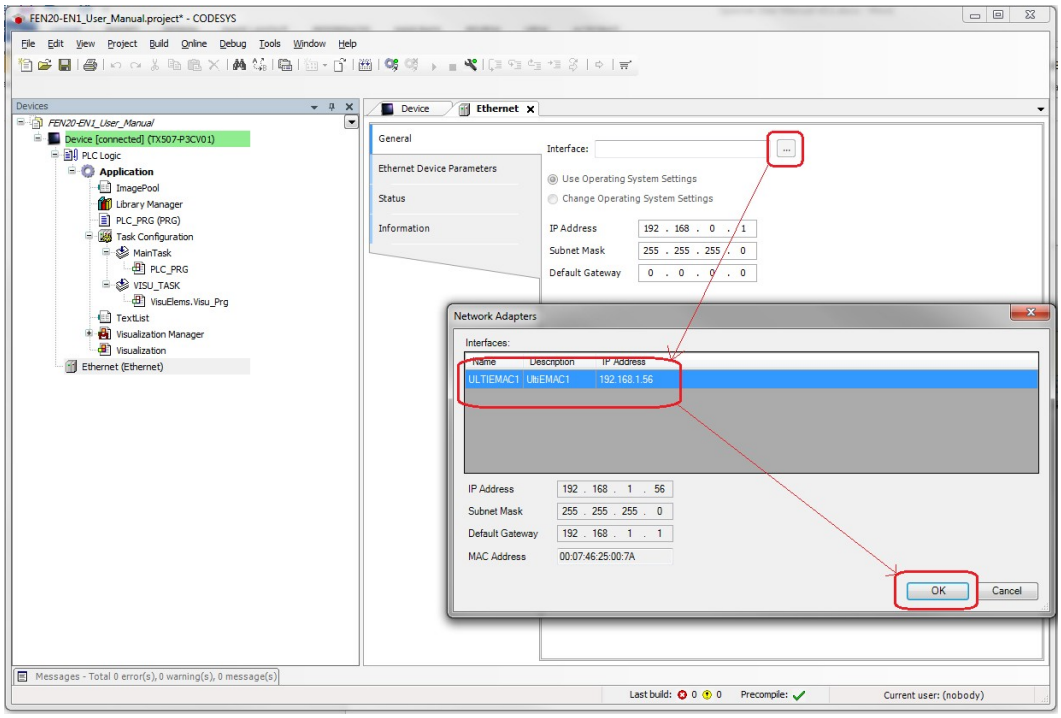


Fig. 27: CODESYS – IP address of HMI

➤ Right click “Ethernet”, click “Add Device…” and add a Modbus TCP Master.

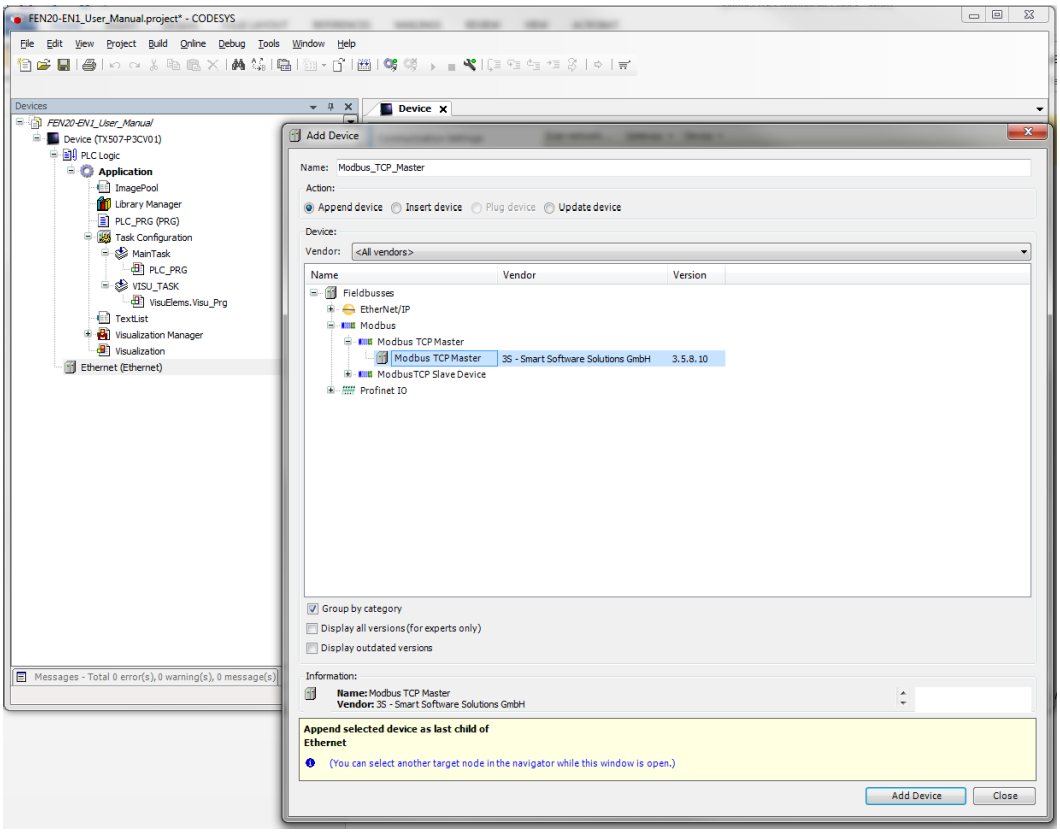


Fig. 28: CODESYS – adding the Modbus TCP Master

➤ Once the “Modbus_TCP_Master” is added, double click on it and check the “Auto-reconnect” box.

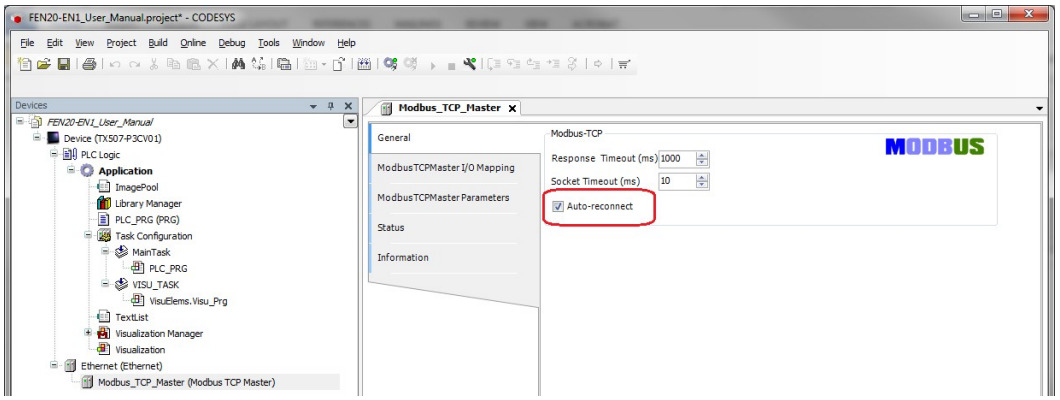


Fig. 29: CODESYS – activating “Auto-reconnect”

➤ Right click the “Modbus_TCP_Master”, click “Add Device…” and add a Modbus TCP Slave.

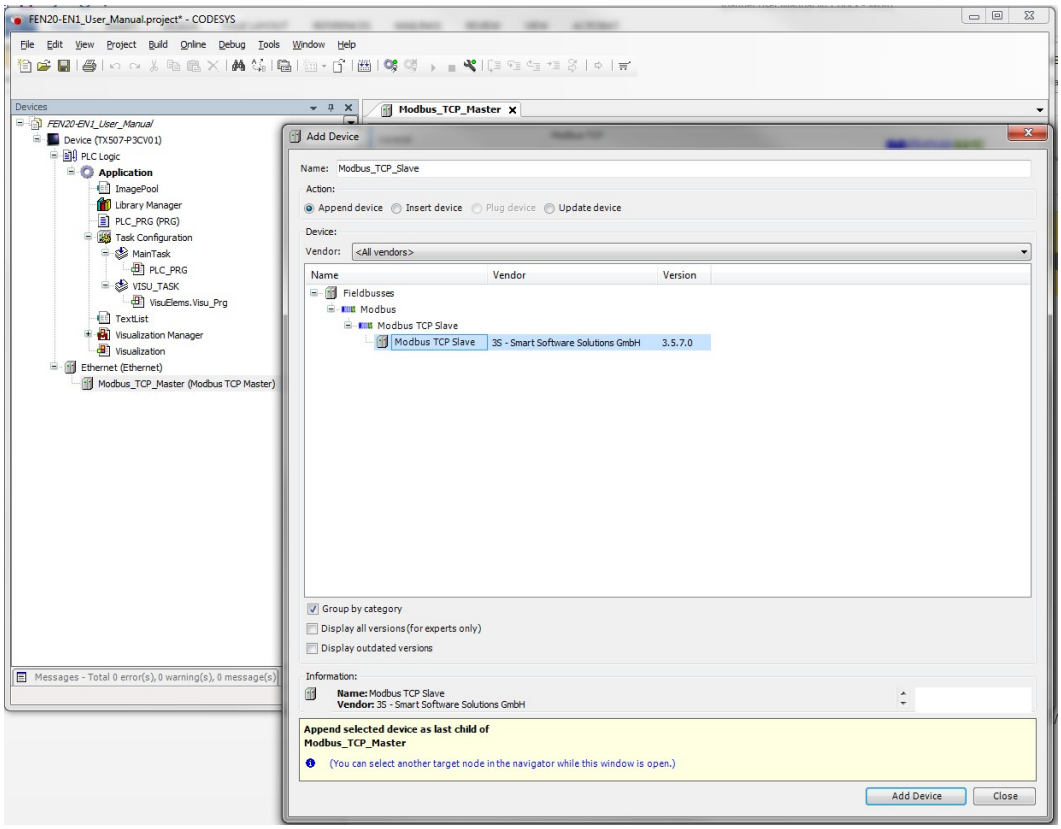


Fig. 30: CODESYS – adding the Modbus TCP slave

➤ Double click on the “ModbusTCP_Slave”, in the “General” tab enter the parameters below to map port 1 of the FEN20-EN1 spanner at IP address 192.168.1.60.

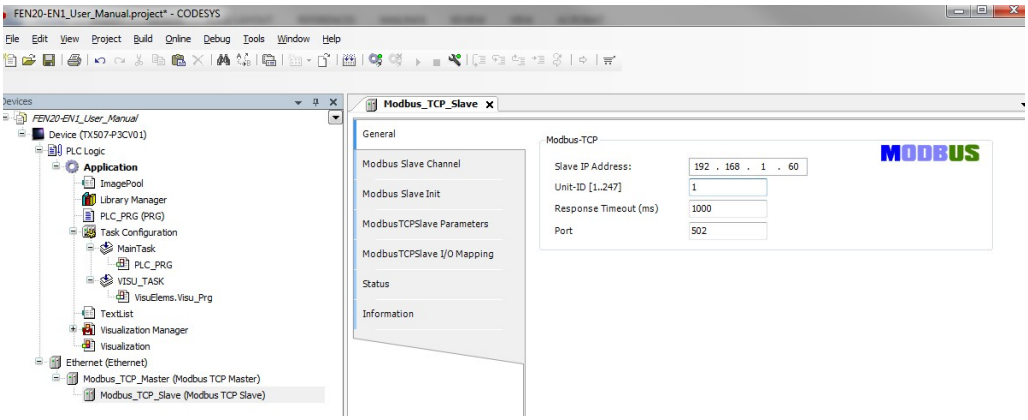


Fig. 31: CODESYS – Mapping of port 1 of FEN20-EN1 to IP address

➤ In the “Modbus Slave Channel” tab enter the parameters below to use all of the 240 I/O words in the FEN20-EN1.

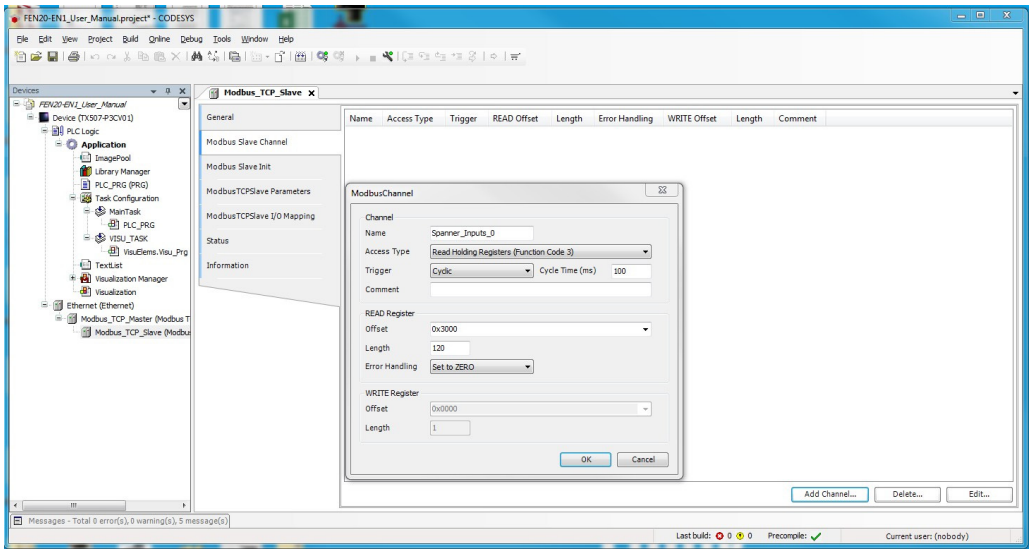


Fig. 32: CODESYS – Modbus TCP Slave channels

➥ The following Modbus Slave channels have been added.

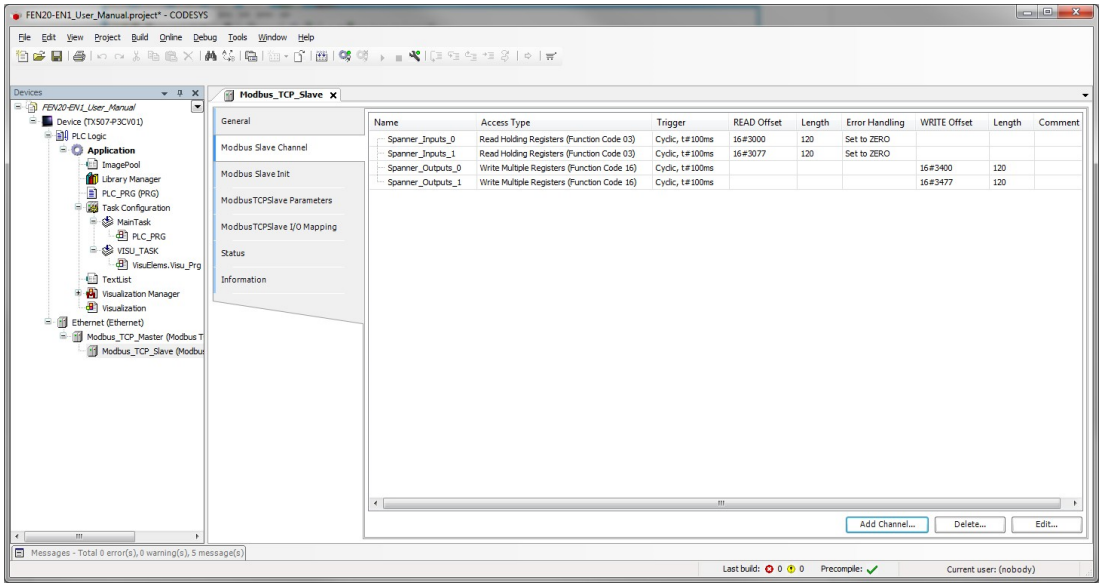


Fig. 33: CODESYS – Modbus TCP Slave channels

➤ In the ”Modbus TCP Slave I/O Mapping” tab, change the value of the “Always Update Variables” drop down box to “Enabled 2 (Always in Bus Cycle)”.

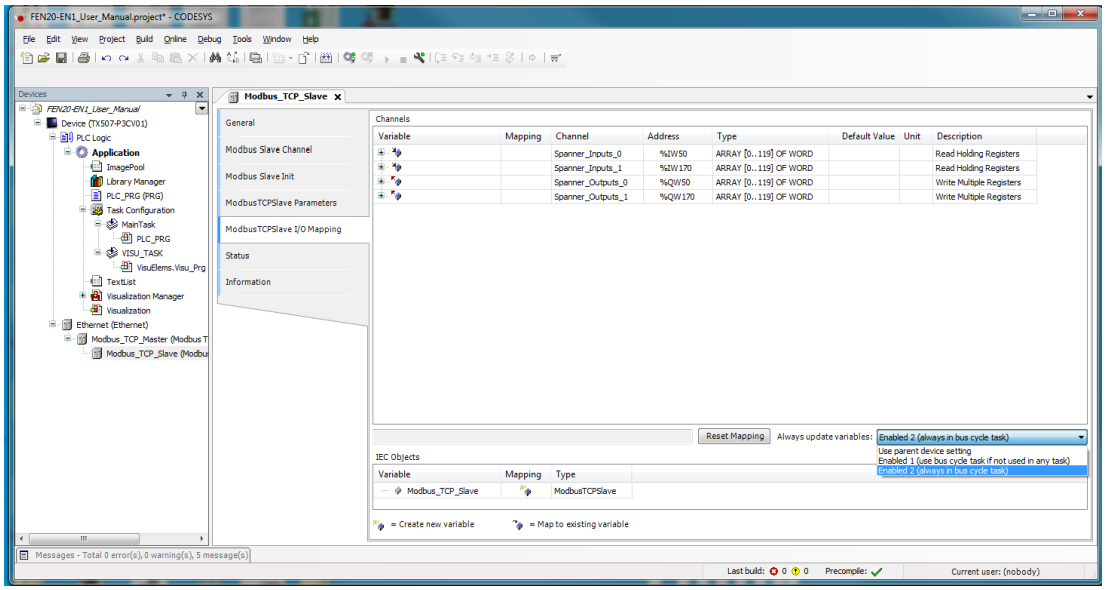


Fig. 34: CODESYS – update variables

NOTE

If the PLC supports the function, it is reasonable to use Function Code FC23 „read/write multiple register“ in order to read or write all of the 240 data words in one channel. The read-write access should start at the beginning of the data segment to be read or written in order to guarantee a consistent data transmission between PLCs. It is up to the user to test data transfer consistency when multiple blocks of I/O data are read from and written to a single spanner port.

➤ Click “Online” → “Login” and download the program to the TX507.

➤ Follow the prompts.

➤ Click “Start” to start the program.

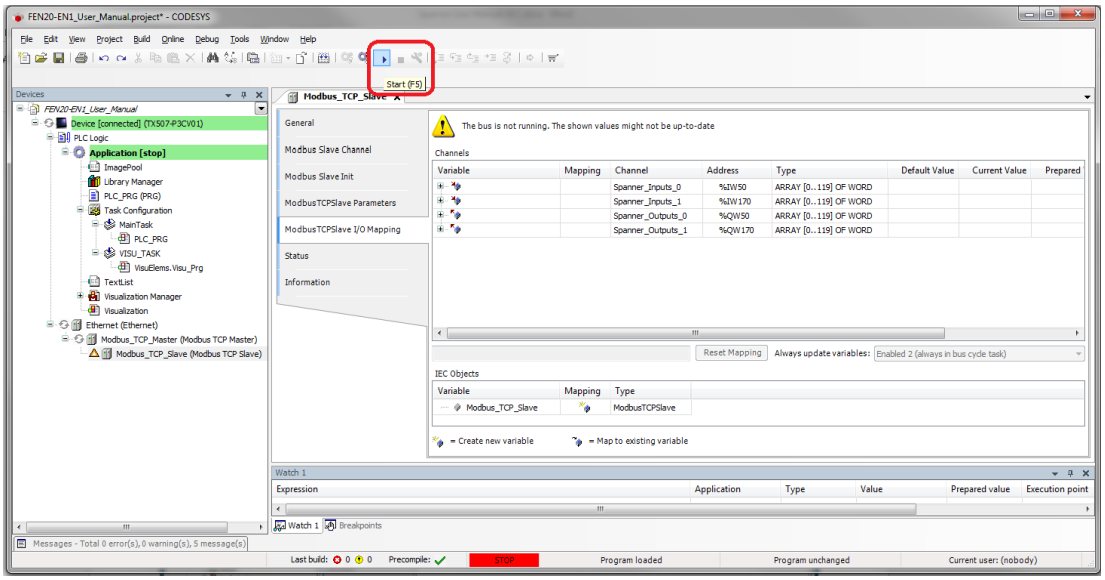


Fig. 35: CODESYS – Starting the program

➥ Port 1 is scanned.

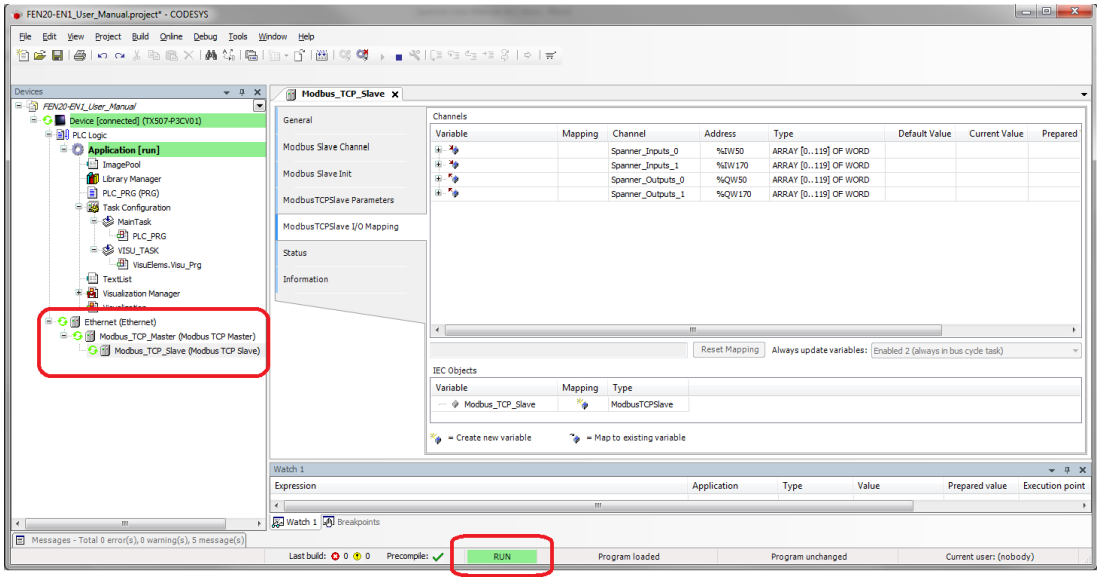


Fig. 36: CODESYS – spanner port1

Port 1 Spanner Data in the Web Server

Writing values to the outputs (QWs) will be reflected in the “Port 1 Spanner data map” in the web server. These values can also be read in as inputs by a device hooked to port 2 of the spanner.

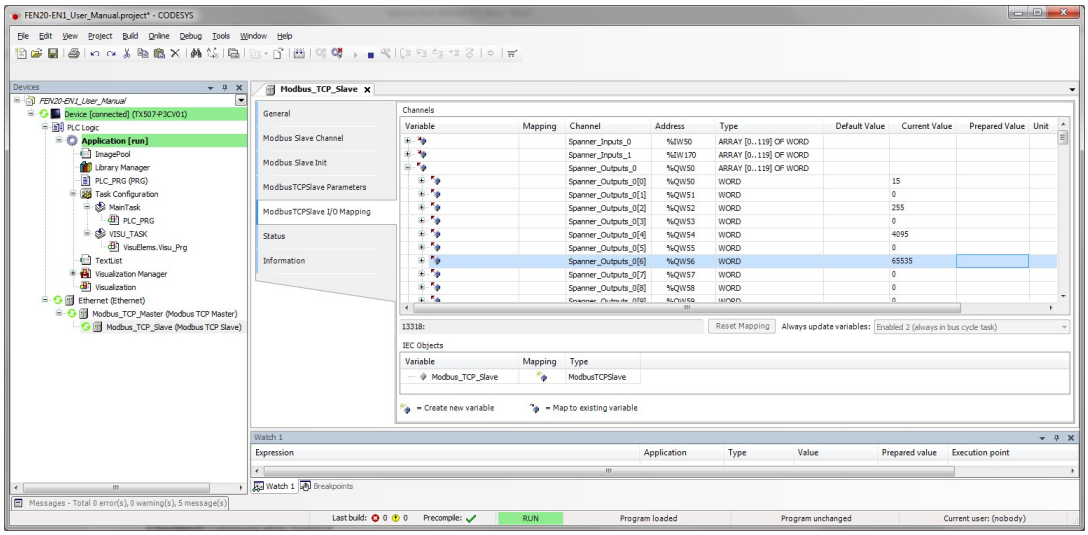


Fig. 37: Web server – port 1 spanner data

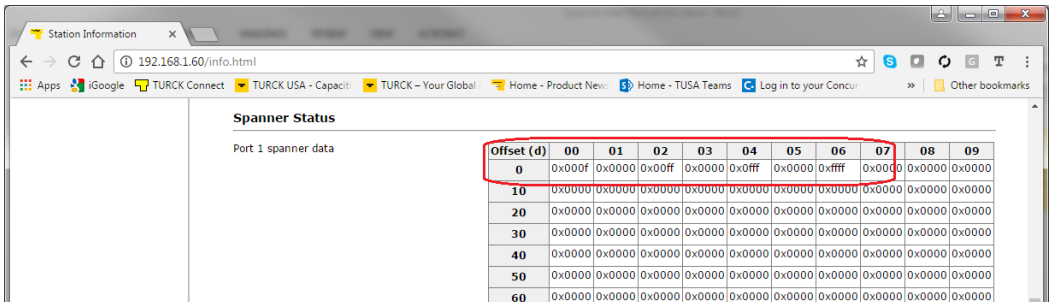


Fig. 38: Web server – port 1 spanner data

Port 2 Spanner Data in the Web Server

Input values (IWs) for port 1 will be reflected in the “Port 2 Spanner data map” in the web server. These values need to be written by a device connected to port 2.

Connecting the Modbus Server Tester to Port 1 (192.168.1.103) and writing inputs 0…9 generates the following data words on port 2 of the spanner.

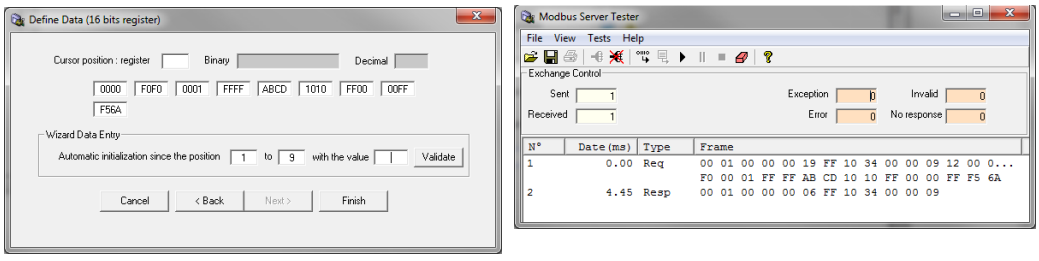
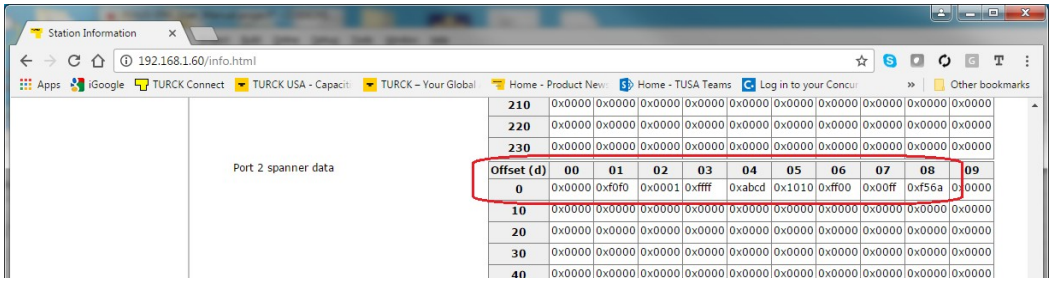


Fig. 39: Modbus Server Tester – writing of data at port 2



210	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
220	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
230	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000

Offset (d)	00	01	02	03	04	05	06	07	08	09
0	0x0000	0xf0f0	0x0001	0xffff	0xabcd	0x1010	0xff00	0x00ff	0xf56a	0x0000
10	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
20	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
30	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
40	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000

Fig. 40: Web server – port 2 spanner data

This data is now reflected in the input words (IWs) of the TX507 CODESYS V3 HMI.

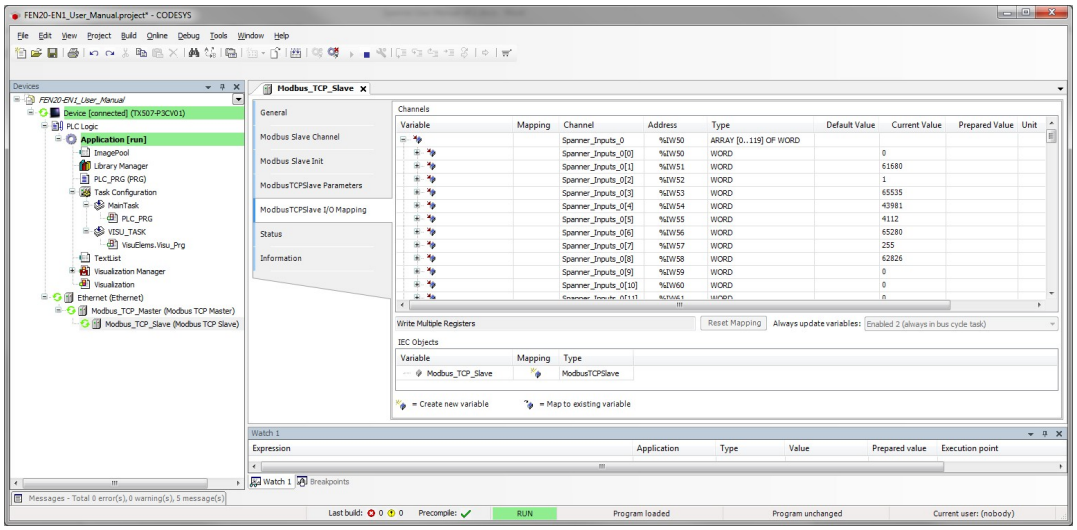


Fig. 41: CODESYS – input data of TX507

8 Operating Spanner Modules at EtherNet/IP™

8.1 EtherNet/IP™ Standard Classes

Class Code	Object name
01 (0x01)	Identity Objekt (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)

8.2 Ethernet/IP™ EN1 – Process Data Mapping

Connection	Assembly Instance	Size (in words)
Input	103	244
Output	104	244

Ethernet/IP Input Data Mapping

Station Status Word (Input Data Mapping)			
Description	**Word Offset**	**Bit Offset**	**Bit Length**
Module Diagnostics Available	0	0	1
Station Configuration Changed	0	3	1
Overcurrent Isys	0	5	1
Overvoltage Field Supply Ul	0	6	1
Undervoltage Field Supply Ul	0	7	1
Overvoltage Field Supply Usys	0	8	1
Undervoltage Field Supply Usys	0	9	1
Modulebus Communication Lost	0	10	1
Modulebus Configuration Error	0	11	1
INFO: Spanner connection established on Port 1	0	12	1
INFO: Spanner connection established on Port 2	0	13	1
Force Mode Enabled	0	14	1
8DIP (Input Data Mapping)			
Description	**Word Offset**	**Bit Offset**	**Bit Length**
Channel 0 - Input value	1	0	1
Channel 1 - Input value	1	1	1
Channel 2 - Input value	1	2	1
Channel 3 - Input value	1	3	1
Channel 4 - Input value	1	4	1
Channel 5 - Input value	1	5	1
Channel 6 - Input value	1	6	1
Channel 7 - Input value	1	7	1
Spanner Data			
Description	**Word Offset**	**Bit Offset**	**Bit Length**
Spanner Data	4	0	up to 240 words

Fig. 42: Ethernet/IP™ EN1 – process data mapping

NOTE

The spanner data start at word offset 4 for both the input and output I/O data map.

8.3 Mapping the FEN20-EN1 into a RSLogix project „Ethernet/IP Generic Device“

➥ Sett the IP addresses for the FEN20-EN1 spanner as follows via the web server.

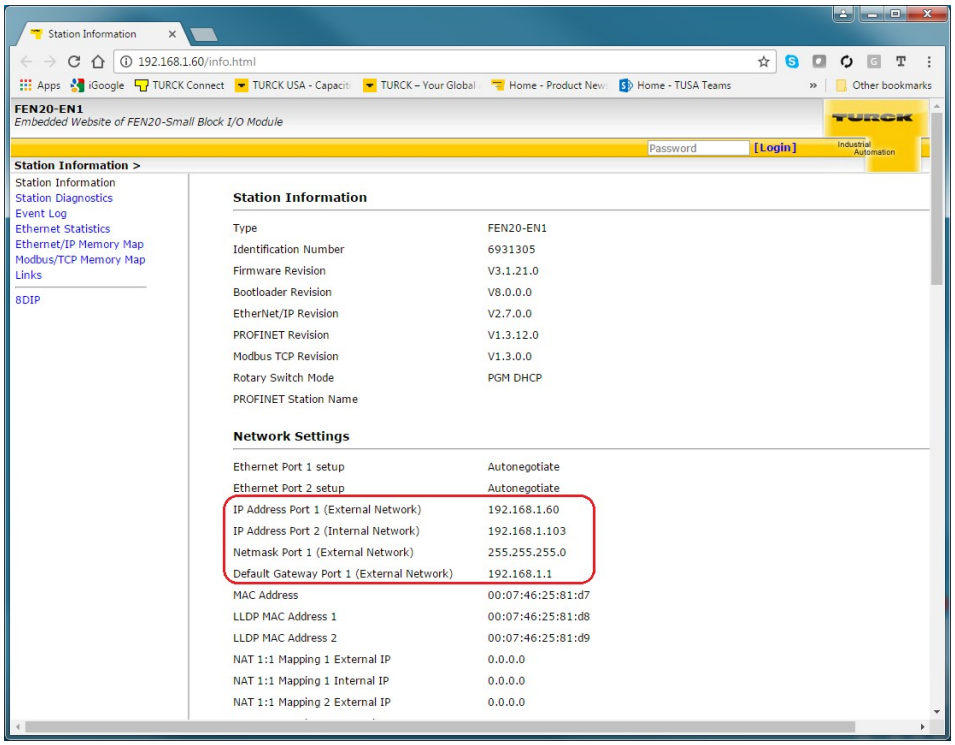


Fig. 43: Webserver – setting the addresses at FEN20-EN1

➤ Right-click "Ethernet" and click "New Module…".

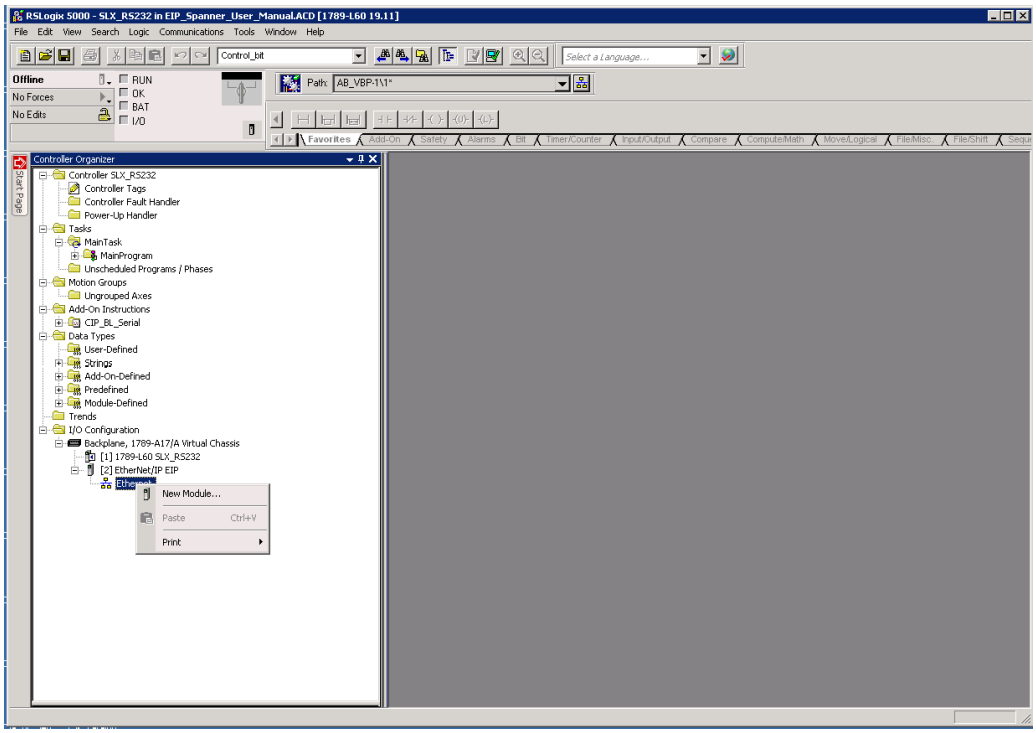


Fig. 44: RSLogix – adding a new module

➤ Select “Generic Ethernet Module” and click “OK”.

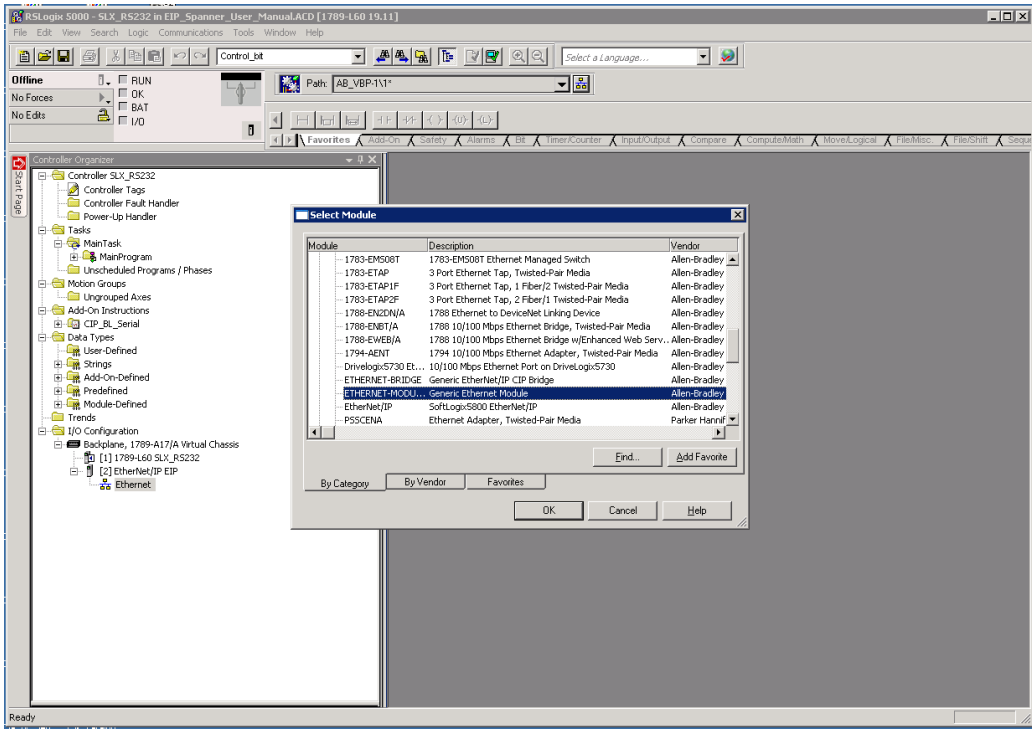


Fig. 45: RSLogix – select “Generic Ethernet Module“

- Enter a name for the spanner module.
- For “Comm Format” select “Data – INT”.
- Enter the desired IP Address under “IP Address” (here Ethernet/IP is mapped to port 2 of the spanner module). Enter the “Connection Parameters” as pictured below and click “OK”.

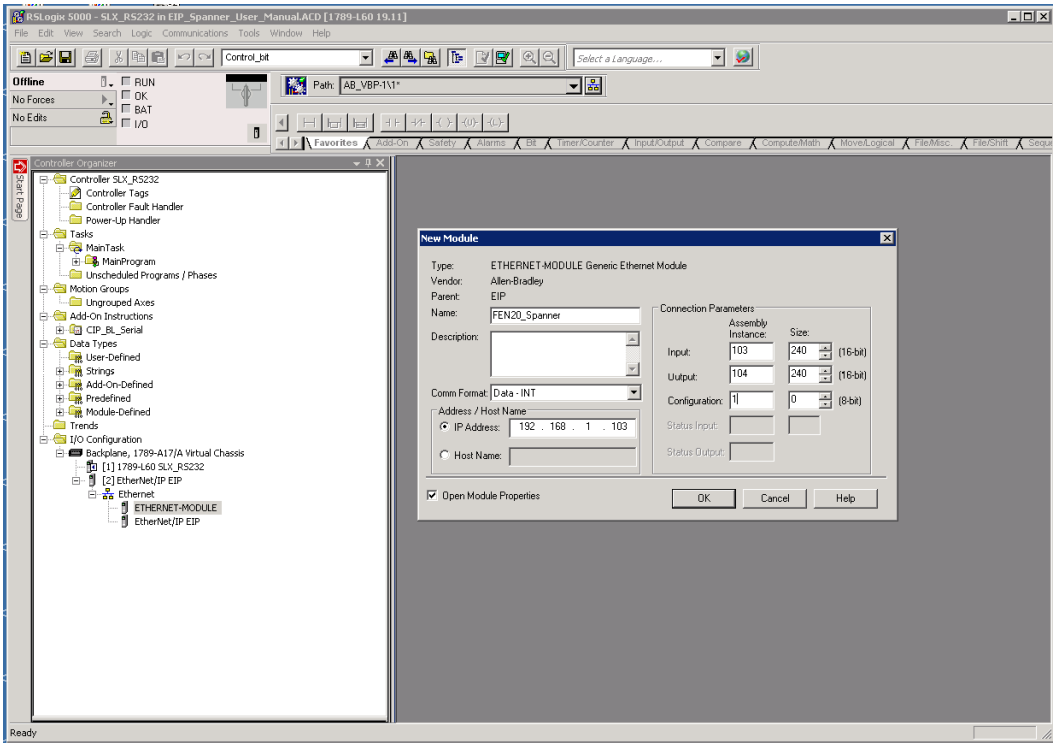


Fig. 46: RSLogix – settings “New Module”

- Set the desired RPI (Requested Packet Interval) and check the “Use Unicast Connection over EtherNet/IP™” check box. Click “OK”.

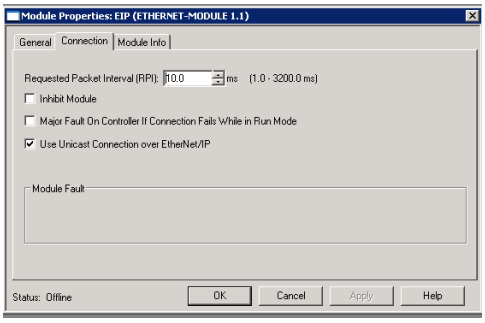


Fig. 47: RSLogix – settings “Connection”

- Go online and download the project to the controller. Set the controller to “RUN Mode”.

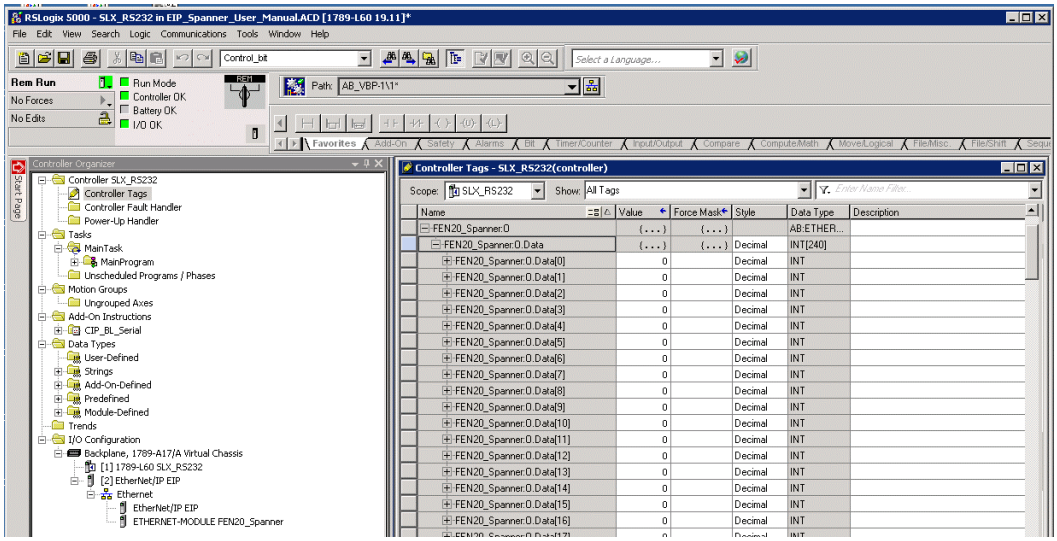


Fig. 48: RSLogix – output data

Writing values to the output data tags of the FEN20 spanner module will be reflected in the “Port 2 Spanner Data map” in the web server. These values can also be read in as inputs by a device hooked to port 1 of the spanner.

NOTE

Spanner output data is offset by 4 words in the EtherNet/IP™ data mapping.

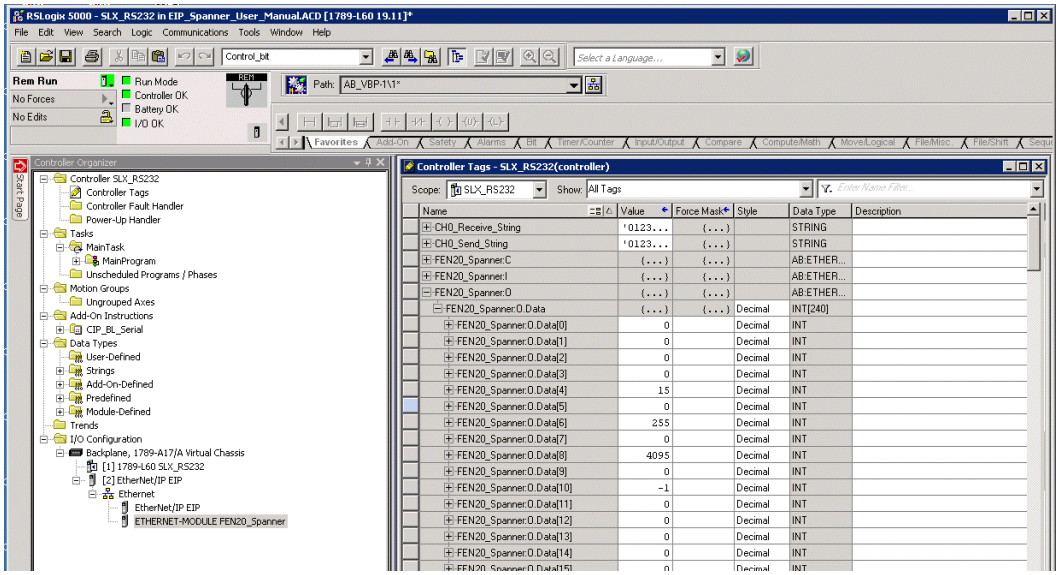


Fig. 49: RSLogix – output data

Port 2 Spanner Data in the Web Server

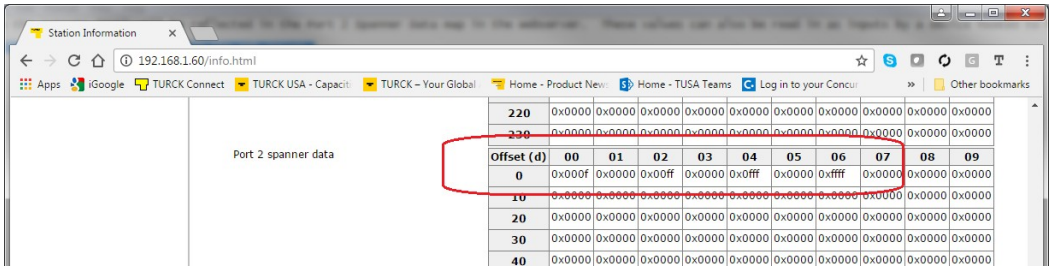


Fig. 50: Web server – port 2 spanner data

Input values (IWs) for port 2 will be reflected in the “Port 1 Spanner data map” in the Webserver. These values need to be written by a device connected to Port 1. Connecting the Modbus Server Tester to port 1 (192.168.1.103) and writing inputs 0…9 generates the following data words on port 1 of the spanner.

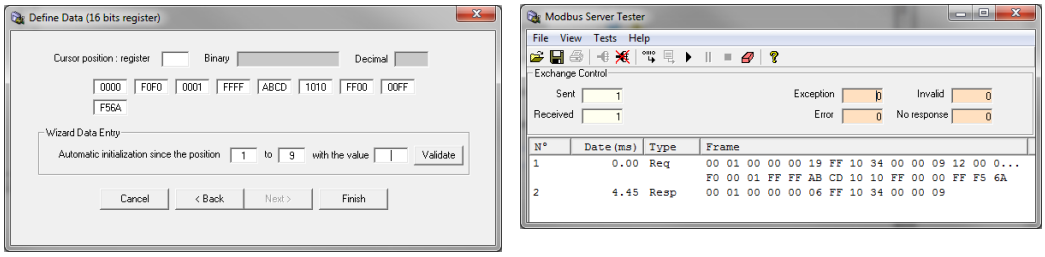


Fig. 51: MODBUS Server Tester – Writing the inputs

Corresponding Port 1 Spanner data in the web server

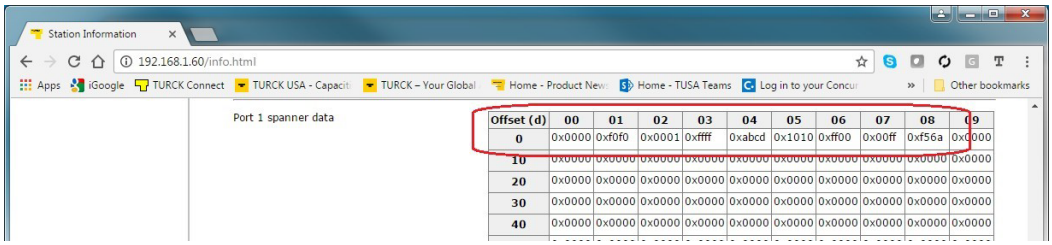


Fig. 52: Web server – port 1 spanner data

This data is now reflected in the Input tags of the EtherNer/IP™ PLC.

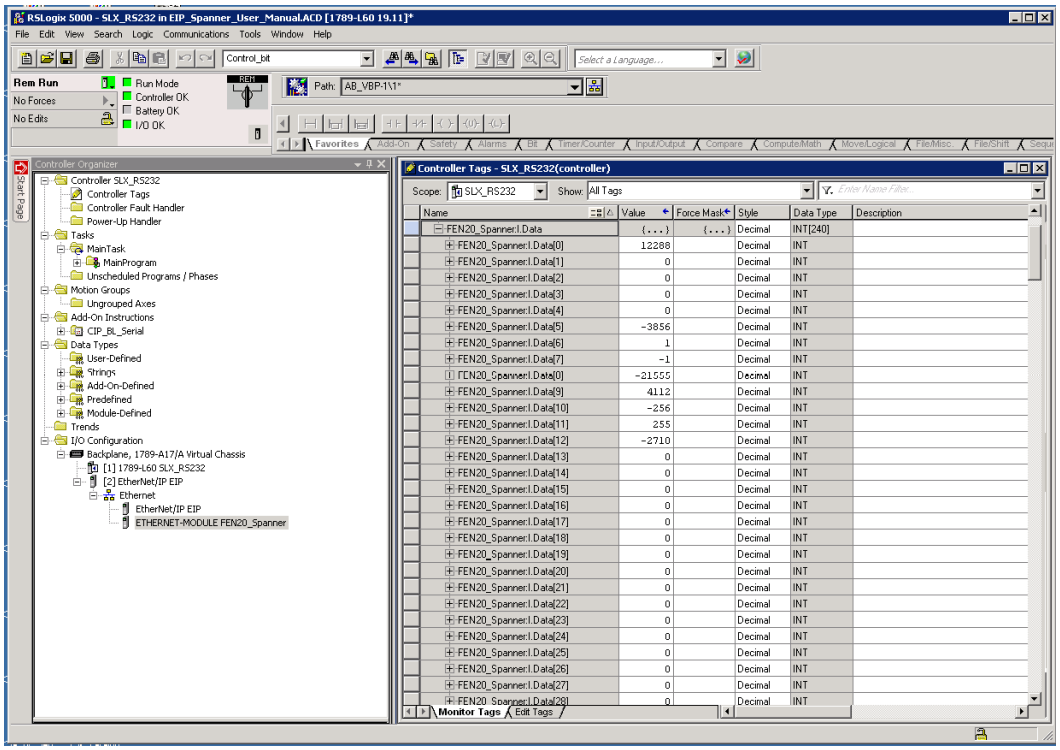


Fig. 53: RSLogix – input tags

Mapping the FEN-20-EN1 Spanner into a RSLogix Project via EDS File

➤ Add a “new module” to the project.

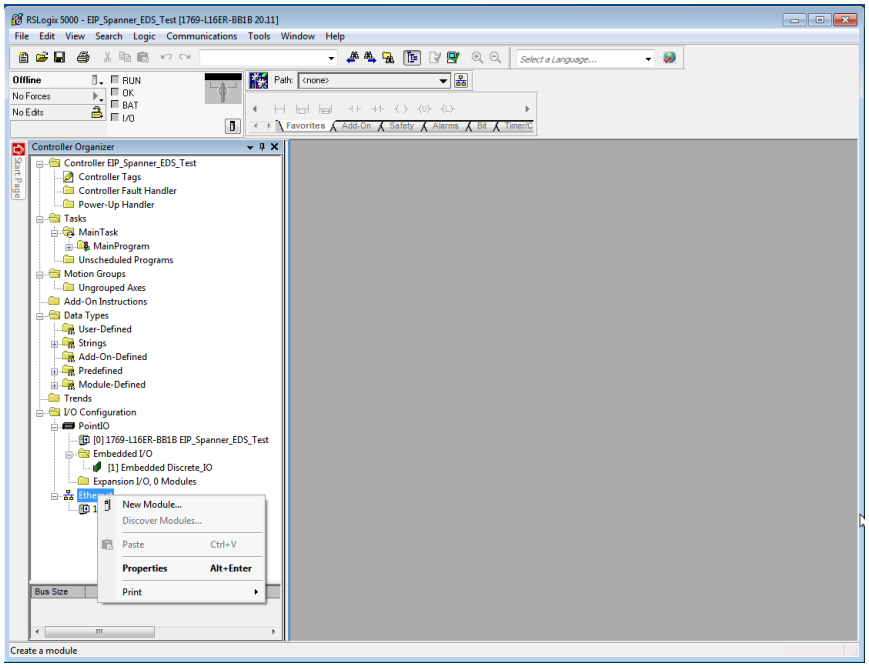


Fig. 54: RSLogix – New Module

➤ Select FEN20-EN1.

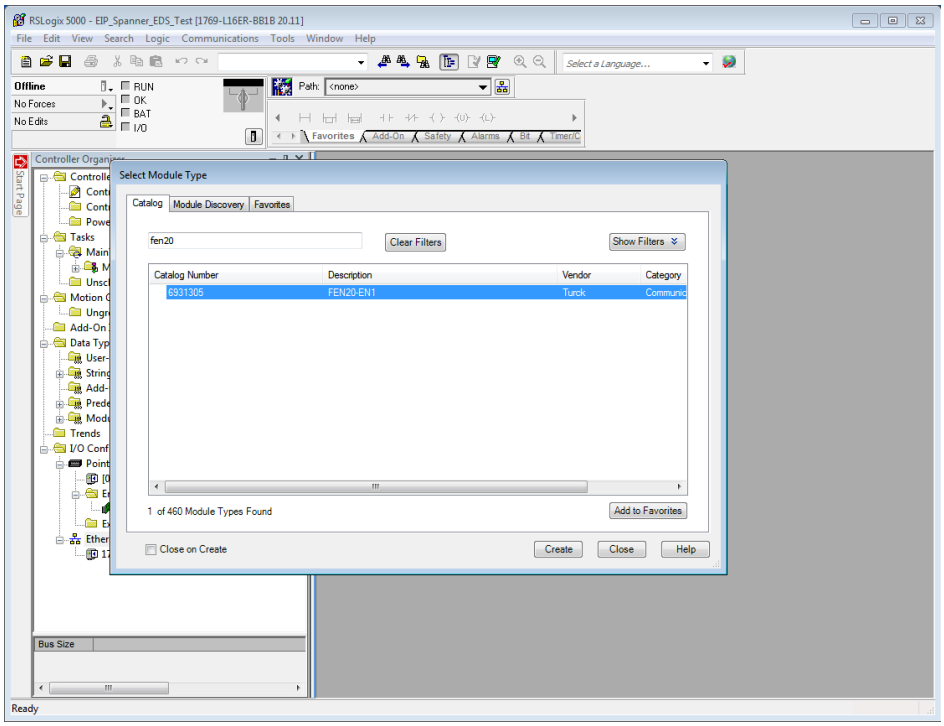


Fig. 55: RSLogix – select FEN20-EN1

➤ Assign a name.

➤ Select the number of 16 bit words to use with the spanner. The recommended data size is INT. Add the IP address and click “OK”.

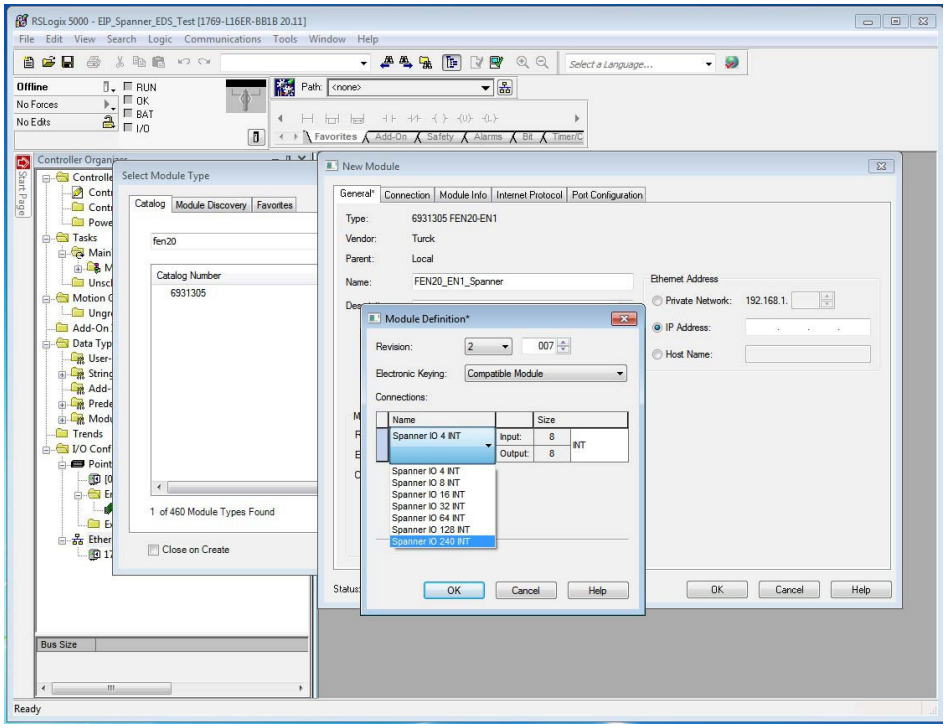


Fig. 56: RSLogix – configuring FEN20-EN1

➥ The spanner can now be used as in the sample above.

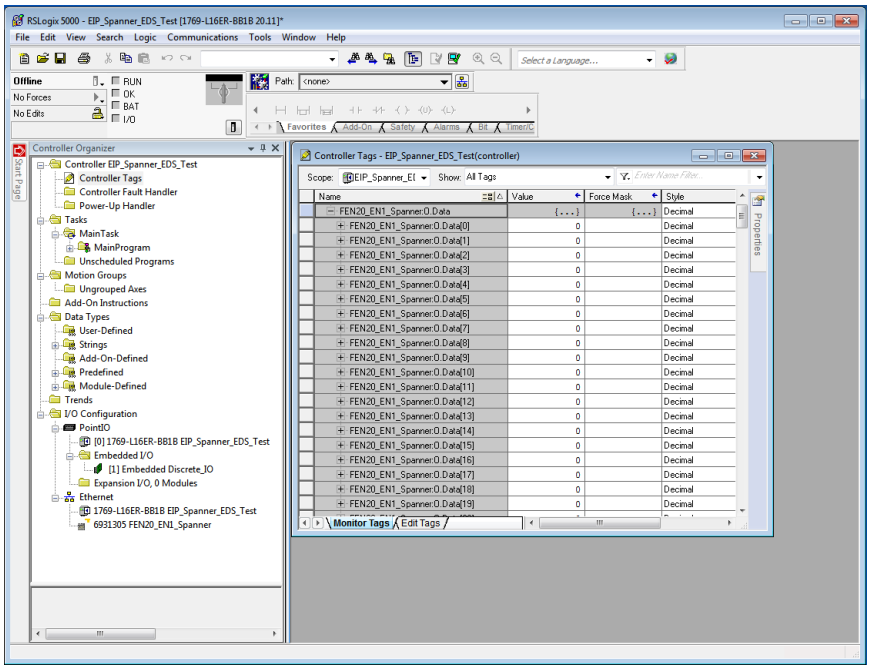


Fig. 57: RSLogix – FEN20-EN1 in the project

9 Operating Spanner Modules at PROFINET (Port 2 only)

9.1 PROFINET – Process Data Mapping

The PROFINET process data map is defined in the PROFINET project by the GSDML file. Download the appropriate GSDML file www.turck.com.

➤ Download and install the GSDML file for the spanner module.

9.2 Mapping the TBEN-L5-EN1 into a TIA Portal V13 Project

Set the IP addresses for the TBEN-L5-EN1 spanner as follows via the web server.

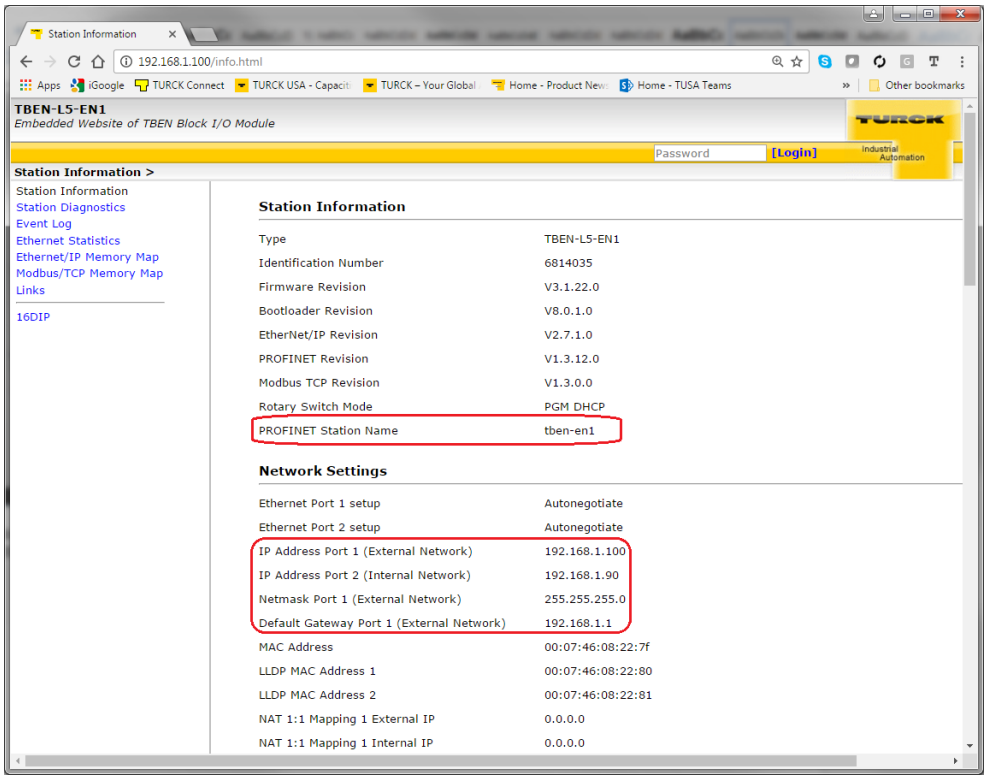


Fig. 58: Web server – setting the addresses at TBEN-L5-EN1

➤ Create a project in TIA Portal.

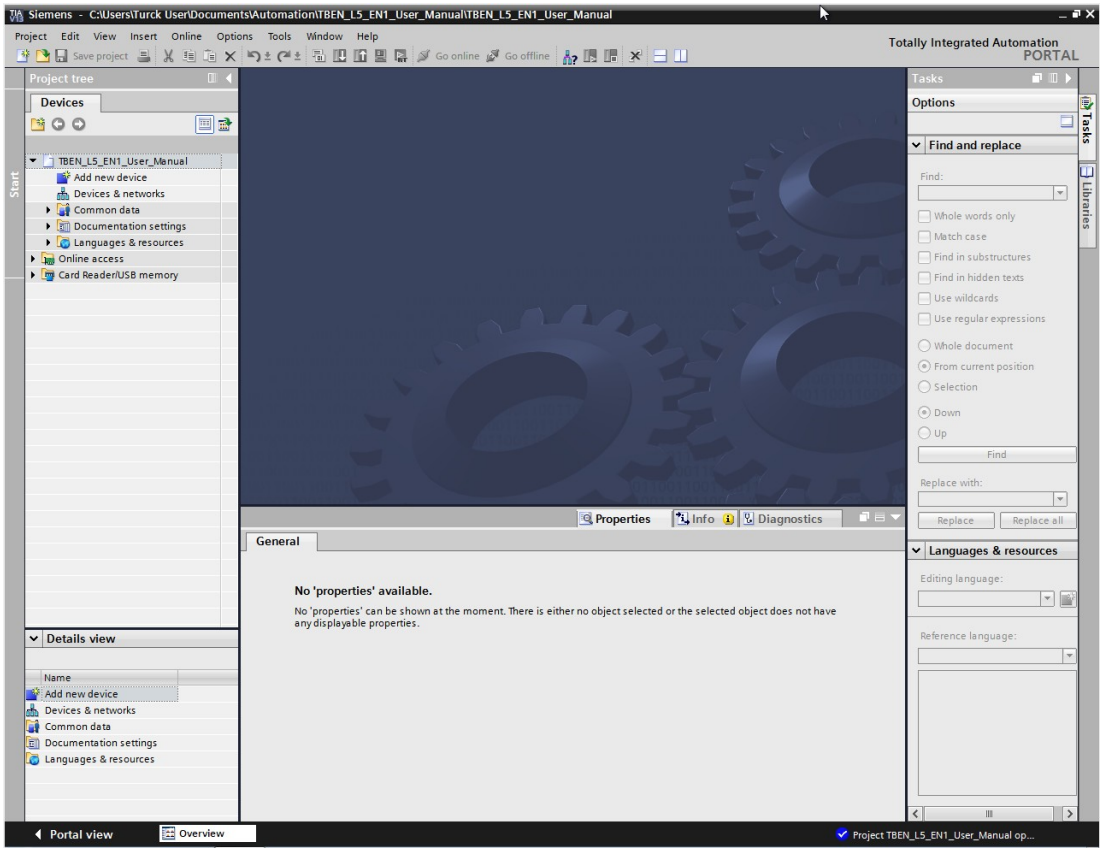


Fig. 59: TIA-Portal – new project

➤ Use the Hardware catalog to add a PLC to the project.

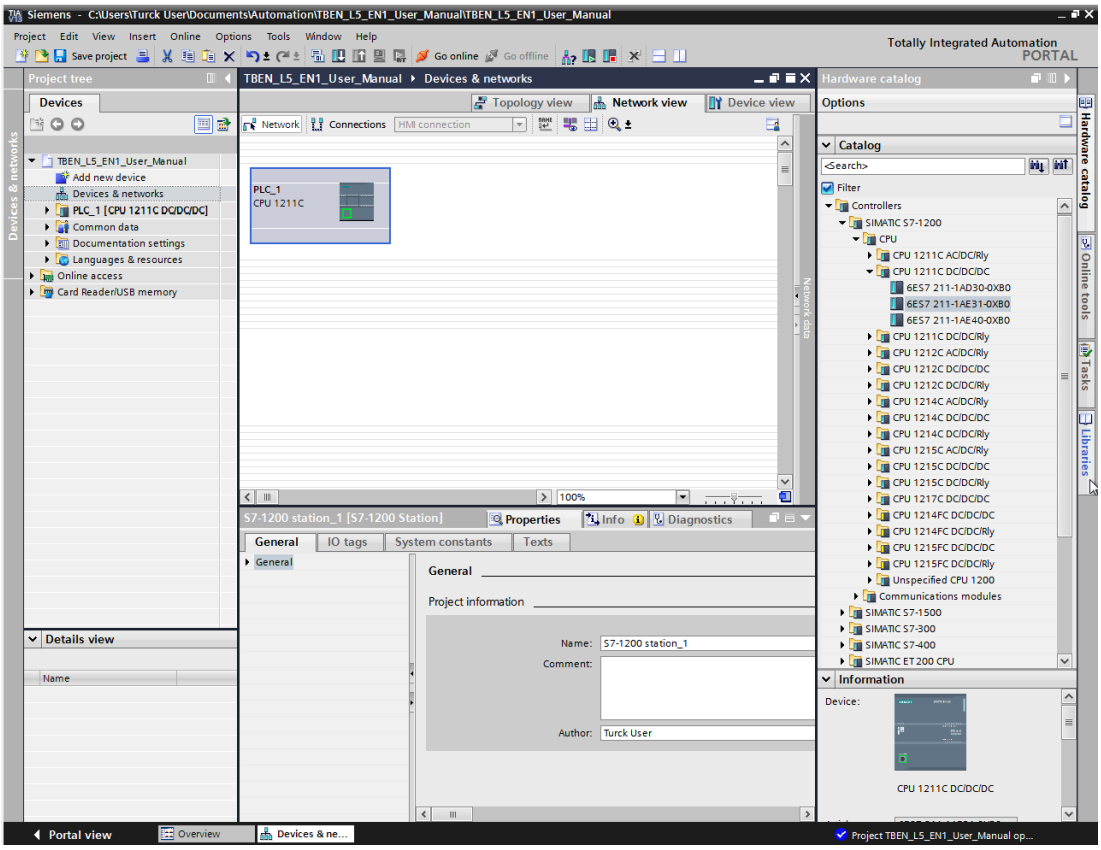


Fig. 60: TIA-Portal – adding the PLC

➤ Use the “Properties” → “PROFINET Interface” tab to assign the IP address and PROFINET device Name to the PLC.

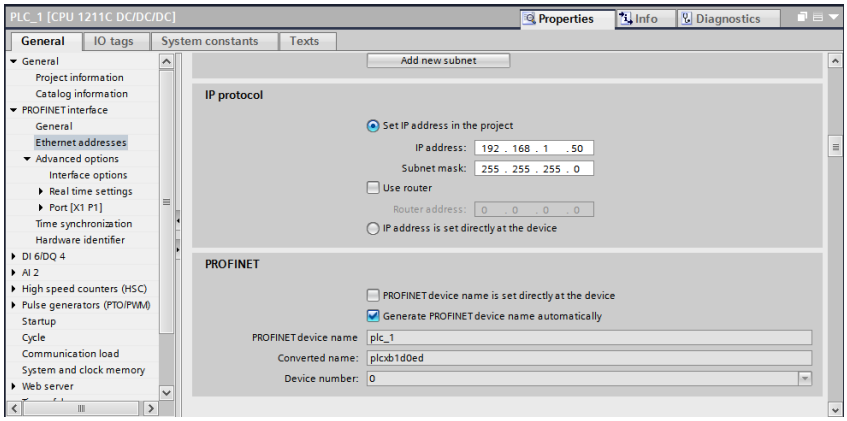


Fig. 61: TIA-Portal – properties of the PLC

➤ Use the Hardware catalog to add a spanner module to the project.

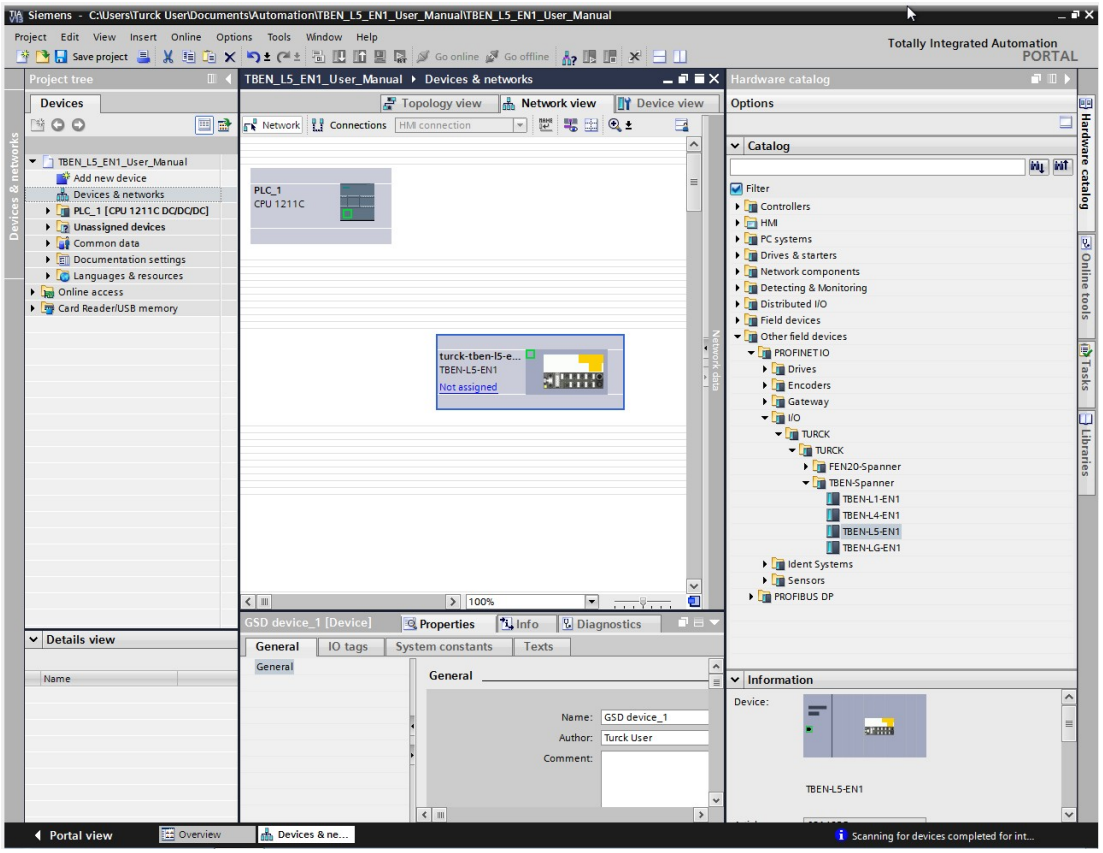


Fig. 62: TIA-Portal – adding the spanner module

➤ Use the “Properties” → “PROFINET Interface” tab to assign the IP address and PROFINET device name to the spanner module.

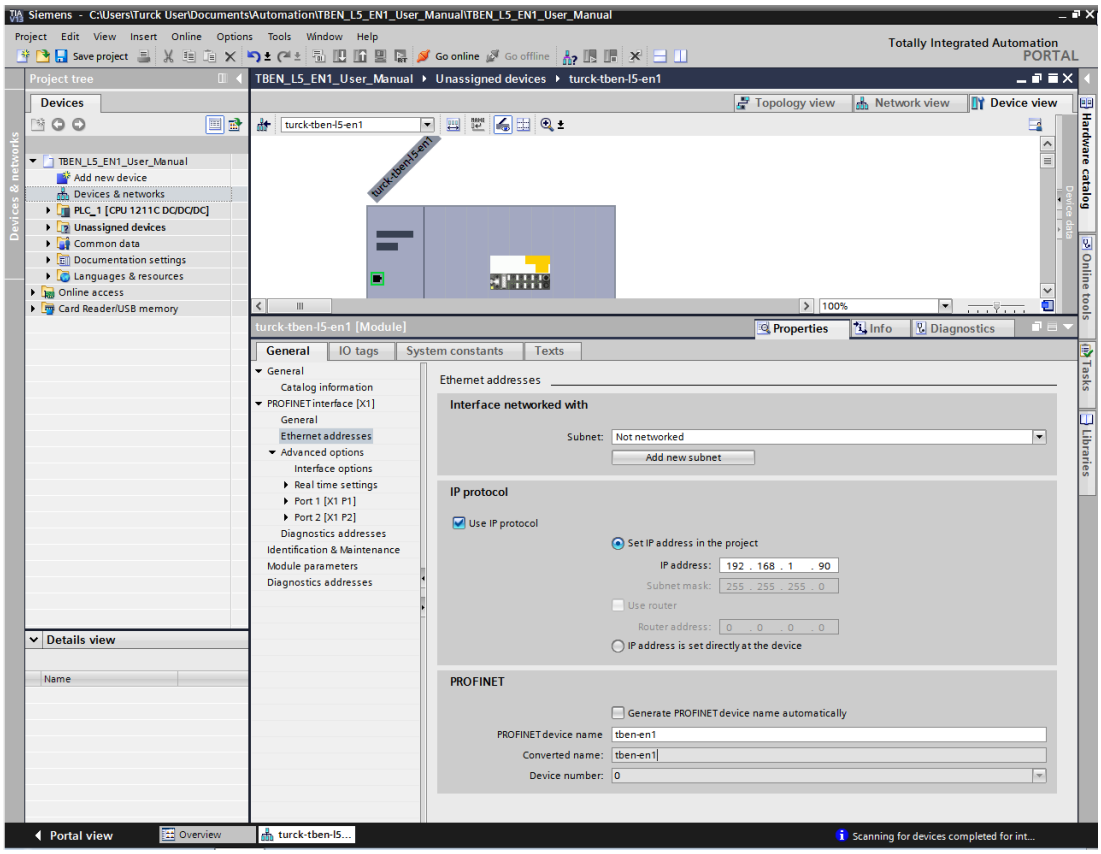


Fig. 63: TIA-Portal – assigning properties to the spanner module

NOTE

PROFINET is only supported on port 2 of the spanner module. Beim Anschluss der
If the PROFINET cable is hooked to port 1 the spanner module will not respond to the PROFINET PLC.

➤ Select the number of IO words to be used from the Hardware catalog and add them to the spanner module.

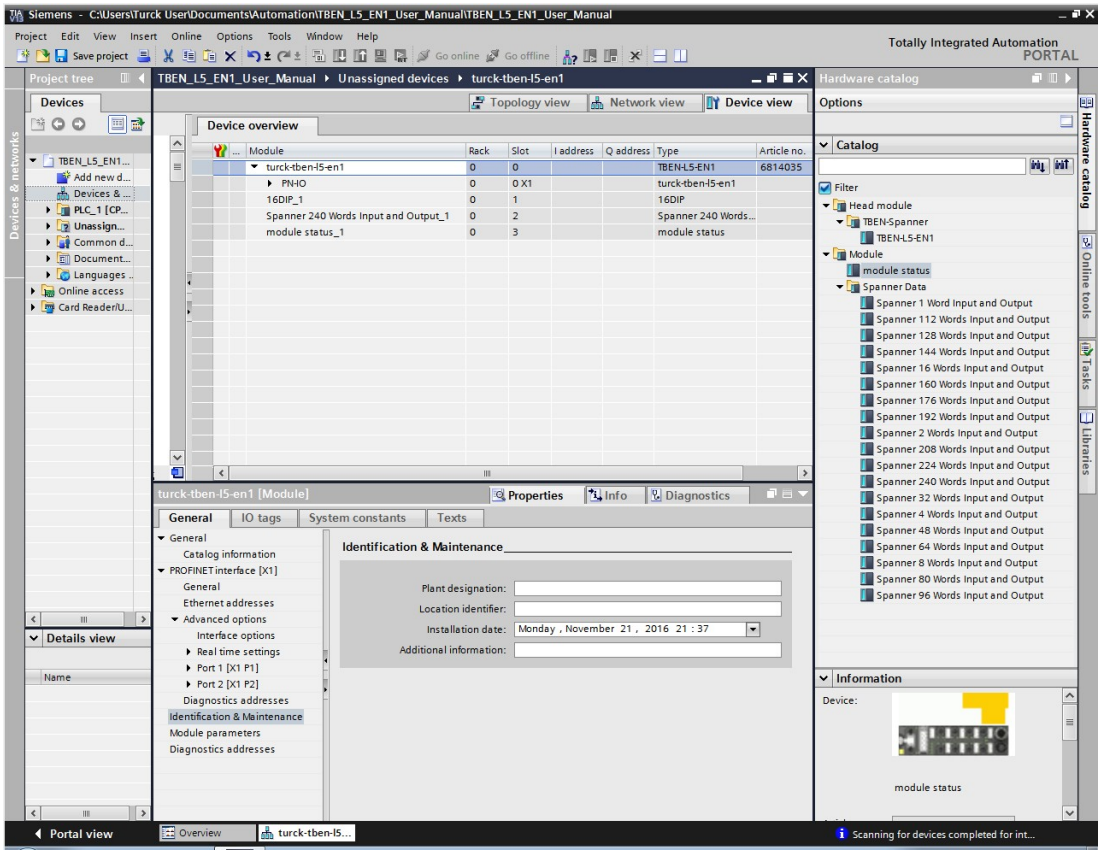


Fig. 64: TIA-Portal – defining the number of IO words to be used

NOTE

The default setting is “4 Words Input and Output”. Delete the entry if a different amount of I/O words is used.

In the example 240 word of I/O data are used. Additionally, the module status is added.

➤ In the Project Tree, open the “Online Access” tab at the used network interface and update the list off connected devices via “Update accessible devices”.

➤ Verify that the IP address and PROFINET name match for the connected device.

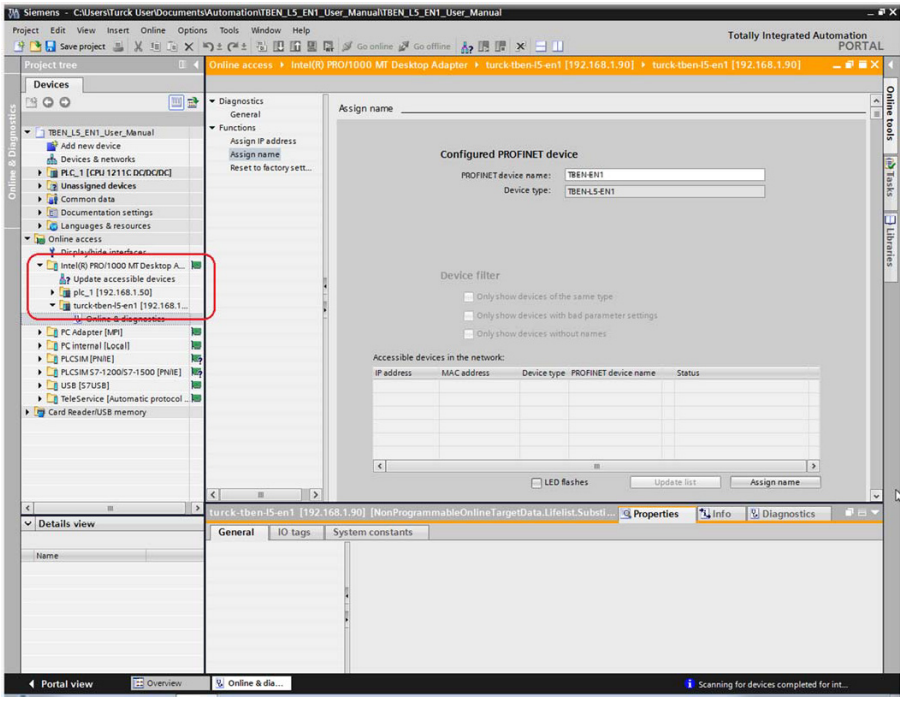


Fig. 65: TIA-Portal – accessible devices

Above you can see the PROFINET name of the TBEN-L5-EN1 does not match the name we programmed into the project “TBEN-EN1”.

➤ Reassign the PROFINET name.

➤ In the Project Tree, click “Online and Diagnostics” under the IP address 192.168.1.90.

➤ Go to the “General” tab → “Functions” → “Assign Name” and assign the correct PROFINET name to the spanner module.

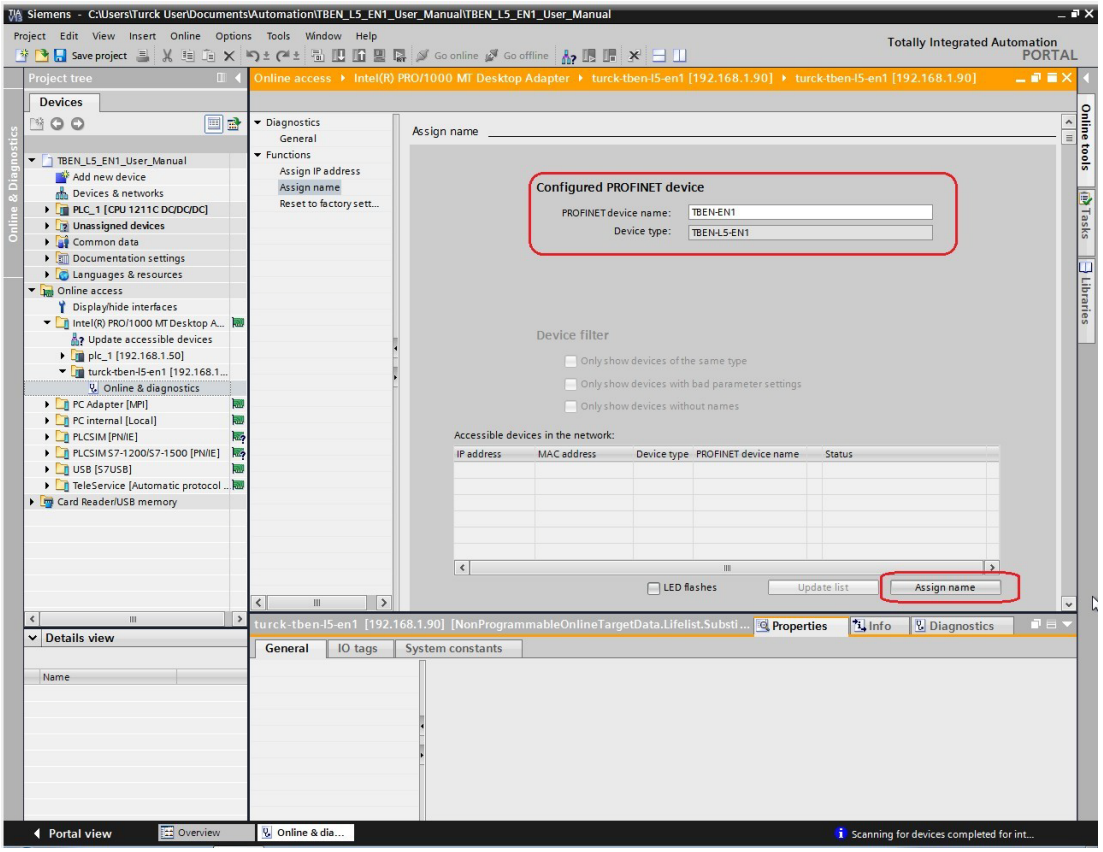


Fig. 66: TIA-Portal – assigning a PROFINET name

➤ In the Project Tree, open the “Online Access” tab at the used network interface and update the list off connected devices via “Update accessible devices”.

➤ Verify that the PROFINET name of the spanner module was changed.

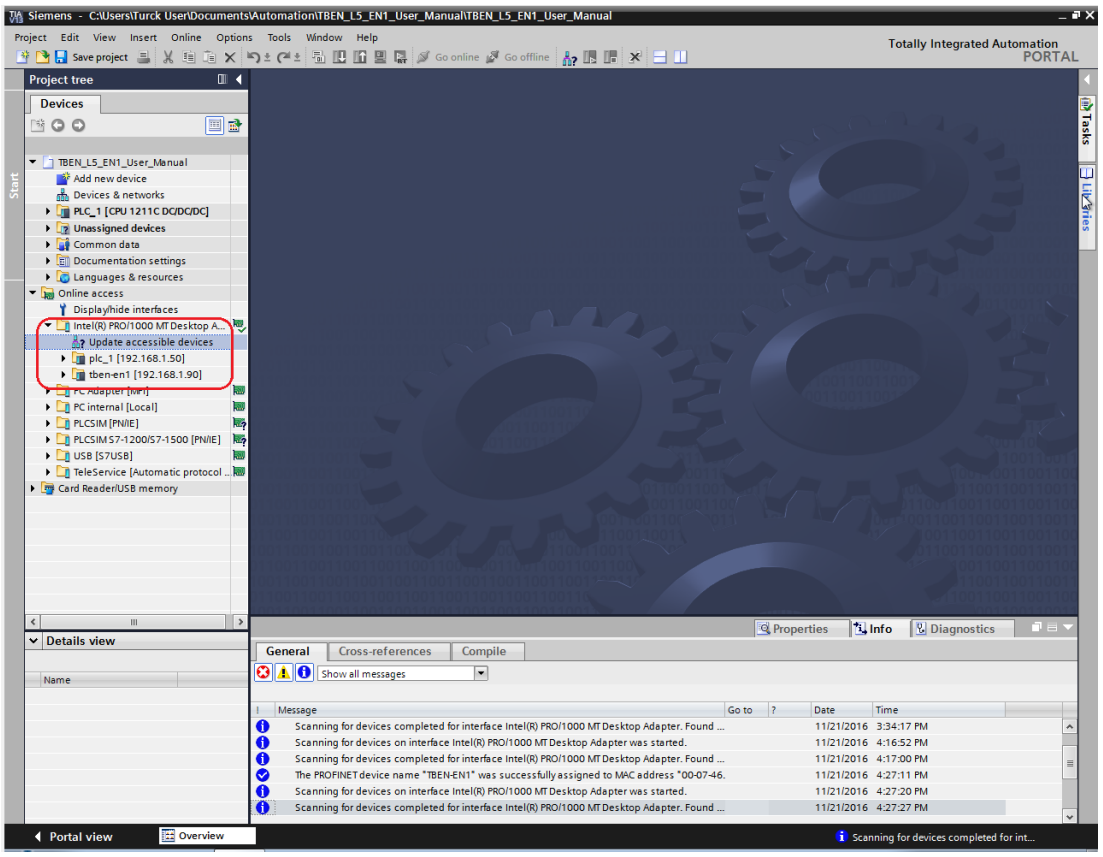


Fig. 67: TIA-Portal – updated accessible devices

➤ In the “Network View” make the network connection from the PLC to the spanner module.

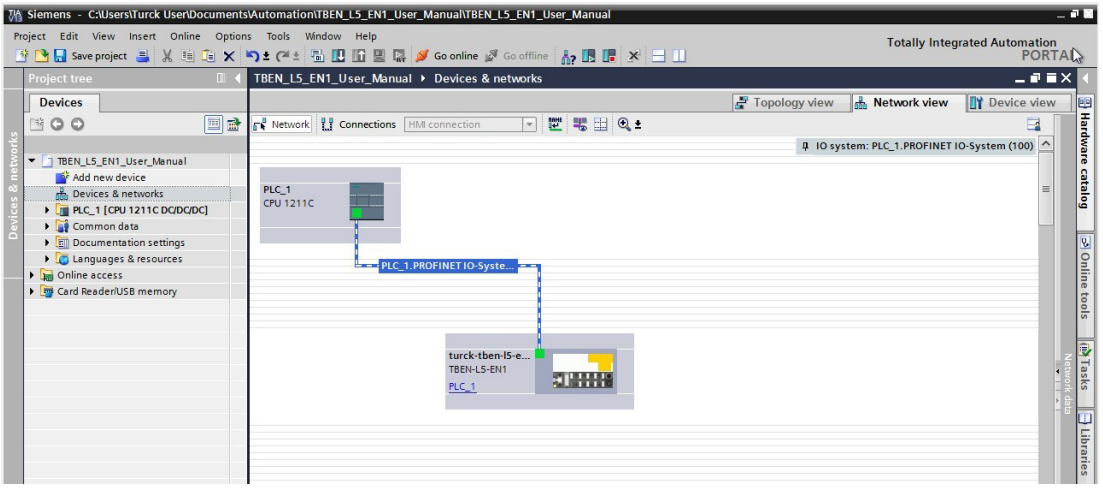


Fig. 68: TIA-Portal – connection between PLC and spanner module

➤ Click “Online→Download to Device” to download the program.

➤ Select the correct PLC and click “Load”.

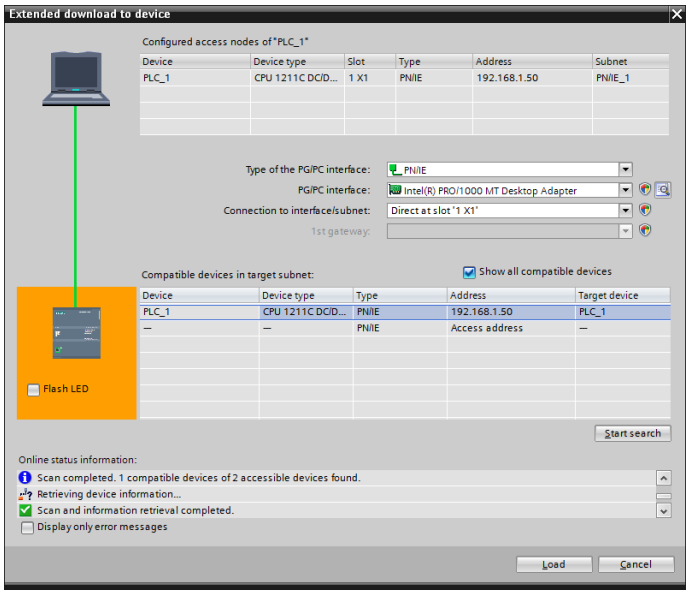


Fig. 69: TIA-Portal – downloading the project

➤ Follow the prompts.

➤ Once the “Load results” window is loaded check the “Start all” radio button and click “Finish”.

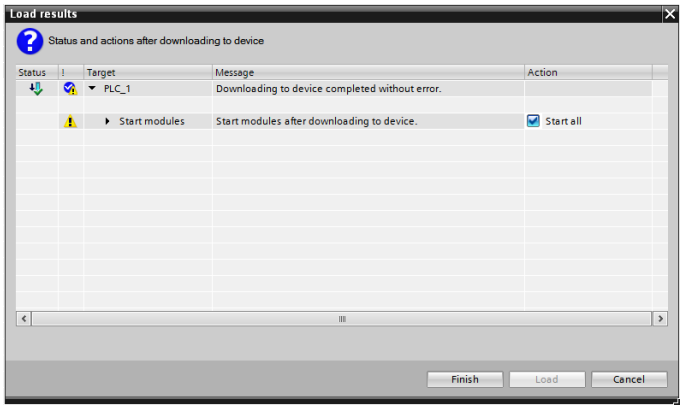


Fig. 70: TIA-Portal – Load results

➤ Click "Go online".

➥ The module is now connected to the PLC and the PLC is running.

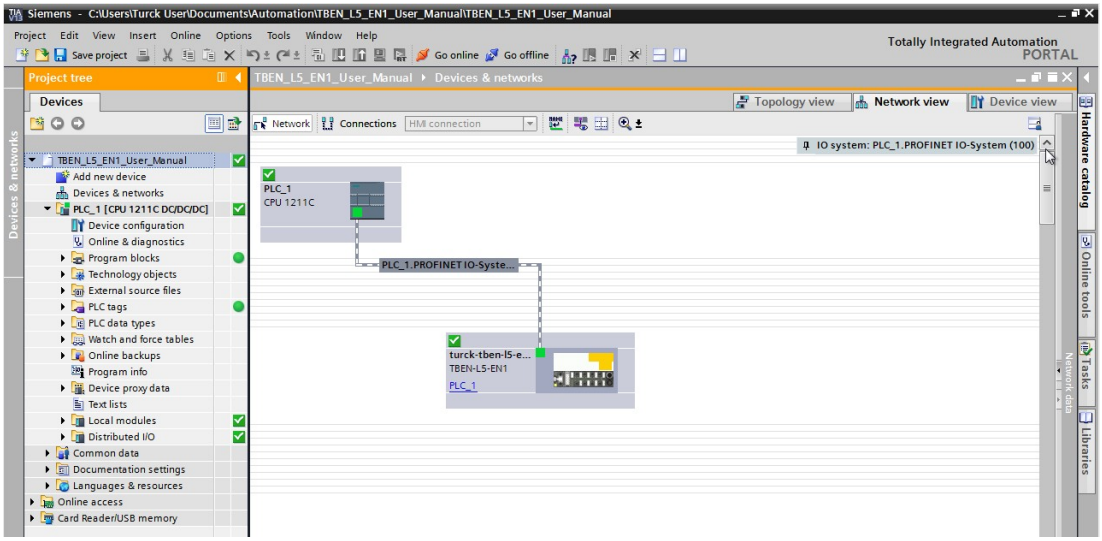


Fig. 71: TIA-Portal – PLC running

➥ In the project tree, under “Watch and force tables”, select “Add New Watch Table”.

➤ Add I/O to the watch table.

➤ Click the “Monitor all” icon to monitor the selected I/O.

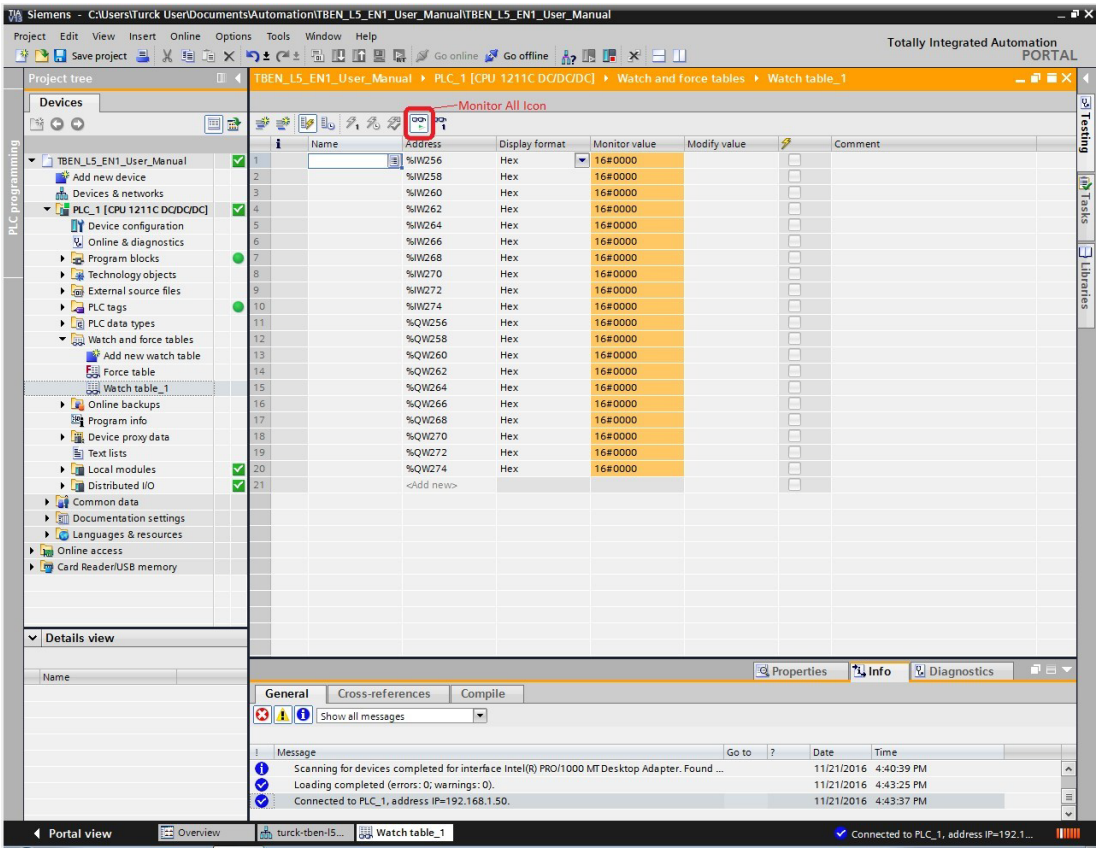


Fig. 72: TIA-Portal – watch table

NOTE

Spanner I/O mapping can be found by selecting the spanner module from the “Network view” and going to the “Device view” tab.

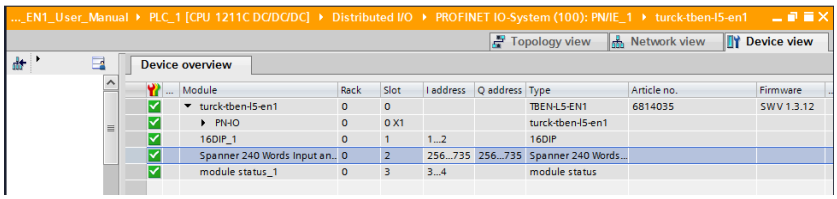


Fig. 73: TIA-Portal – device view spanner module

Writing values to the outputs (QWs) will be reflected in the “Port 2 Spanner data map” in the web server. These values can also be read in as inputs by a device hooked to port 1 of the spanner.

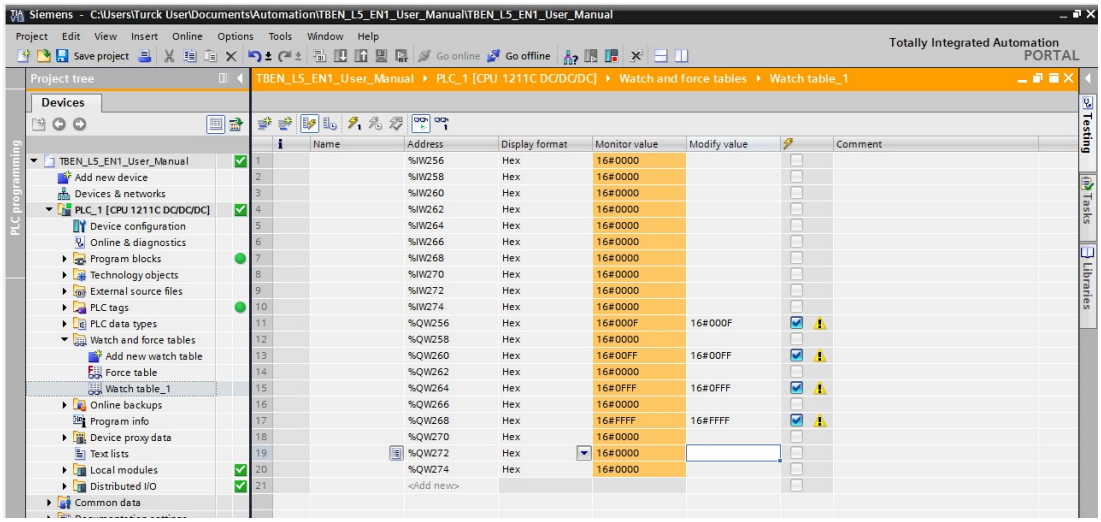
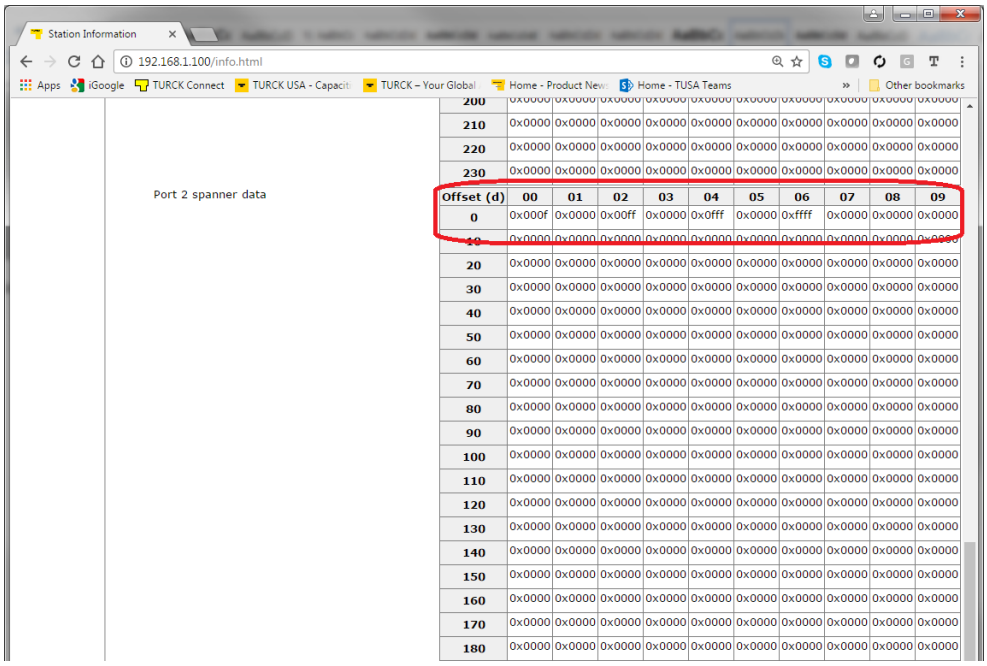


Fig. 74: TIA-Portal – watch table

Corresponding port 2 spanner data in the web server:



Offset (d)	00	01	02	03	04	05	06	07	08	09
0	0x000f	0x0000	0x00ff	0x0000	0x0fff	0x0000	0xffff	0x0000	0x0000	0x0000
10	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
20	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
30	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
40	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
50	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
60	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
70	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
80	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
90	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
100	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
110	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
120	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
130	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
140	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
150	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
160	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
170	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
180	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000

Fig. 75: Web server – port 2 spanner data

Input values (IWs) for port 1 will be reflected in the “Port 1 Spanner data map” in the Webserver. These values need to be written by a device connected to port 1. Connecting the Modbus Server Tester to port 1 (192.168.1.100) and writing inputs 0…9 generates the following data words on port 1 of the spanner module.

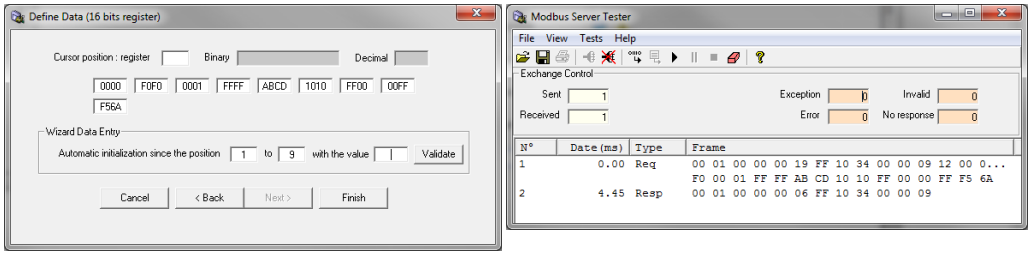
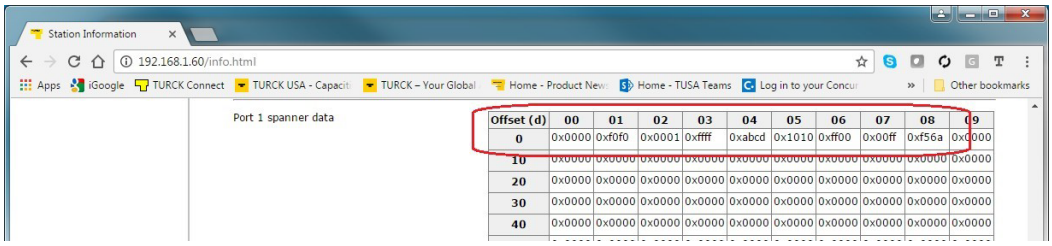


Fig. 76: Modbus Server Tester – input data

Corresponding port 1 spanner data in the web server:



Offset (d)	00	01	02	03	04	05	06	07	08	09
0	0x0000	0xf0f0	0x0001	0xffff	0xabcd	0x1010	0xff00	0x00ff	0xf56a	0x0000
10	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
20	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
30	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000
40	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000	0x0000

Fig. 77: Web server – port 1 spanner data

This data is now reflected in the Input words (IWs) of the PROFINET PLC.

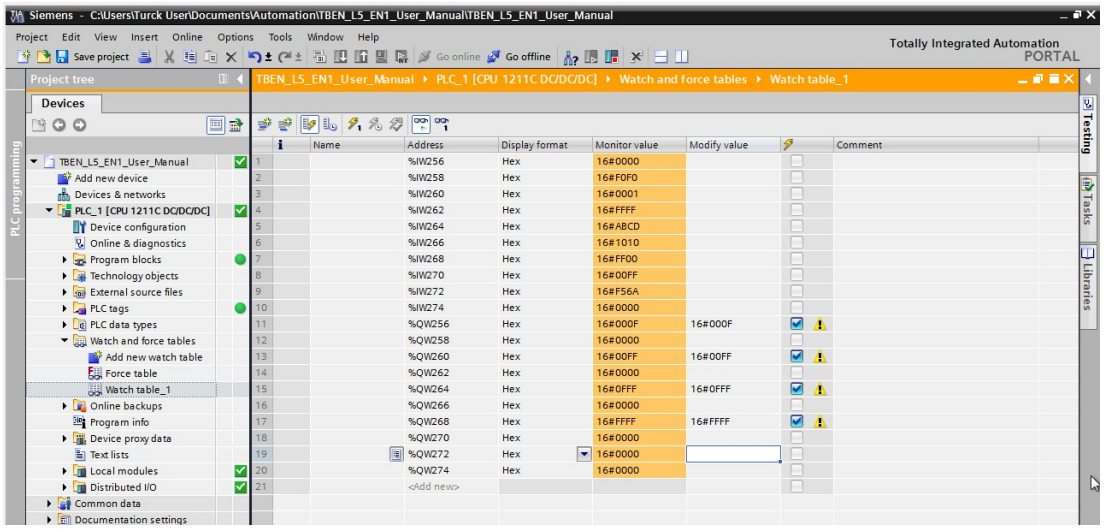


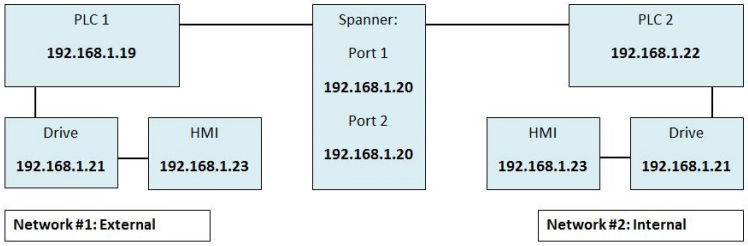
Fig. 78: TIA-Portal – watch table

10 Appendix

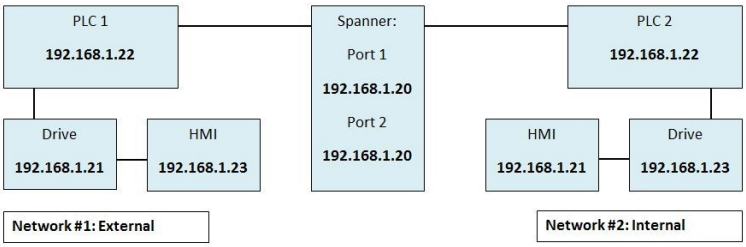
10.1 Spanner Mode

The spanner has multiple applications for spanning different networks.

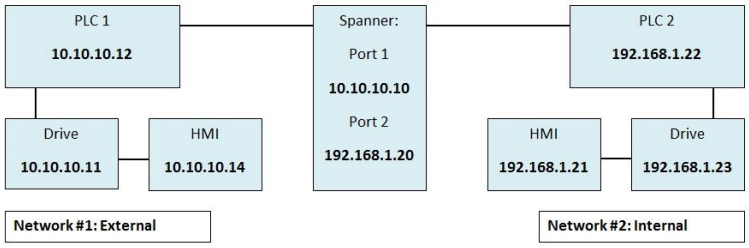
1 Communication between two different Ethernet networks. The use of the spanner module avoids conflicting IP addresses.



2 Bidirectional data exchange between identical controllers



3 Connection of 2 PLCs (with different subnets) without router



10.2 1:1 NAT-Router Mode

In the 1:1 NAT Router mode, an IP address range of an internal network (at port 2) is mapped to an IP address range of an external network (at port 1). This guarantees complete separation, e. g. of a machine-internal network, to which participants (e. g. PLCs) can still access from the outside. The NAT device operates protocol-independently and transports IP frames between two networks, changing the IP header in some cases.

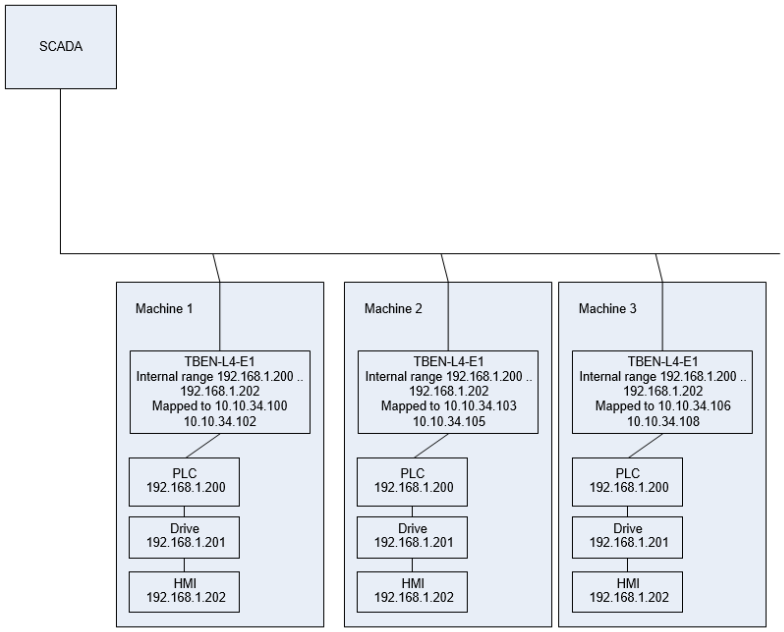


Fig. 79: 1:1 NAT mode

Configuring the spanner module for 1:1 NAT router mode

➤ Set IP addresses for Port1, Port2 and the default gateway in the spanner module.

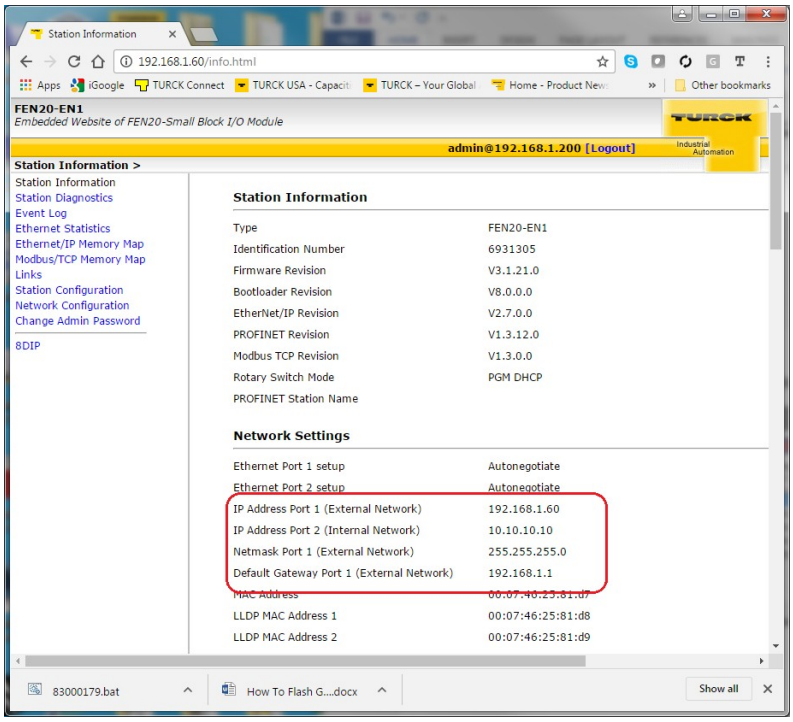


Fig. 80: Web server - Setting IP addresses

The following 4 blocks are mapped to the internal network of the spanner module:

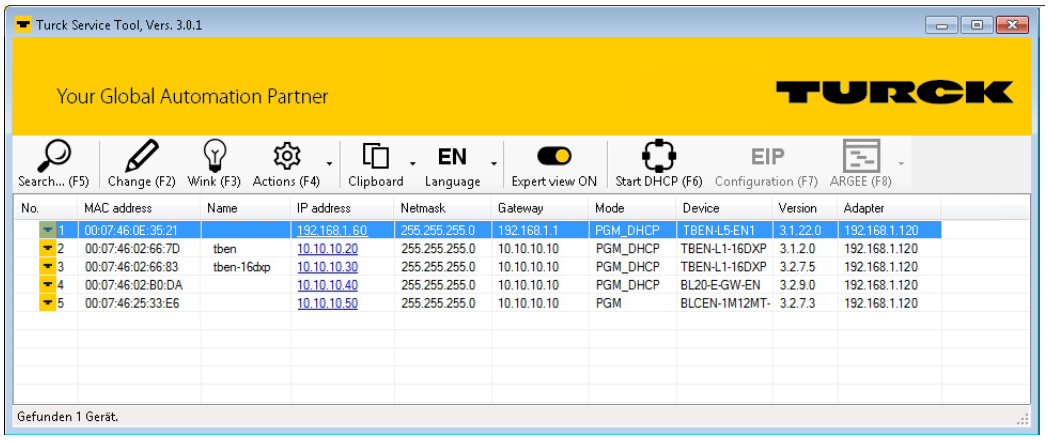


Fig. 81: Web server - Setting IP addresses

NOTE

The default gateway of each device must be the IP address of port 2 (internal port) of the spanner module.

The address blocks from the internal network are mapped to IP addresses of the external network in the web server of the spanner module.

The mappings are entered after logging in to the web server under "Network Configuration".

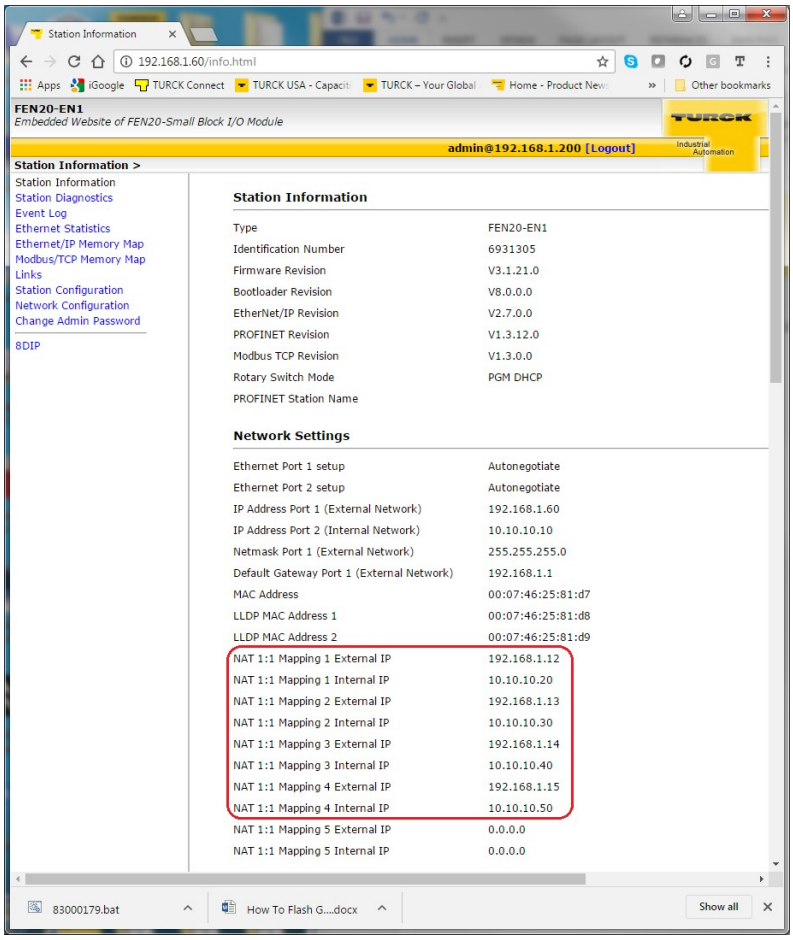


Fig. 82: Web server – mapping

➥ The connected devices now respond to requests from the external network. These devices can be mapped into a PLC or SCADA (Supervisory Control and Data Acquisition) on the external network.

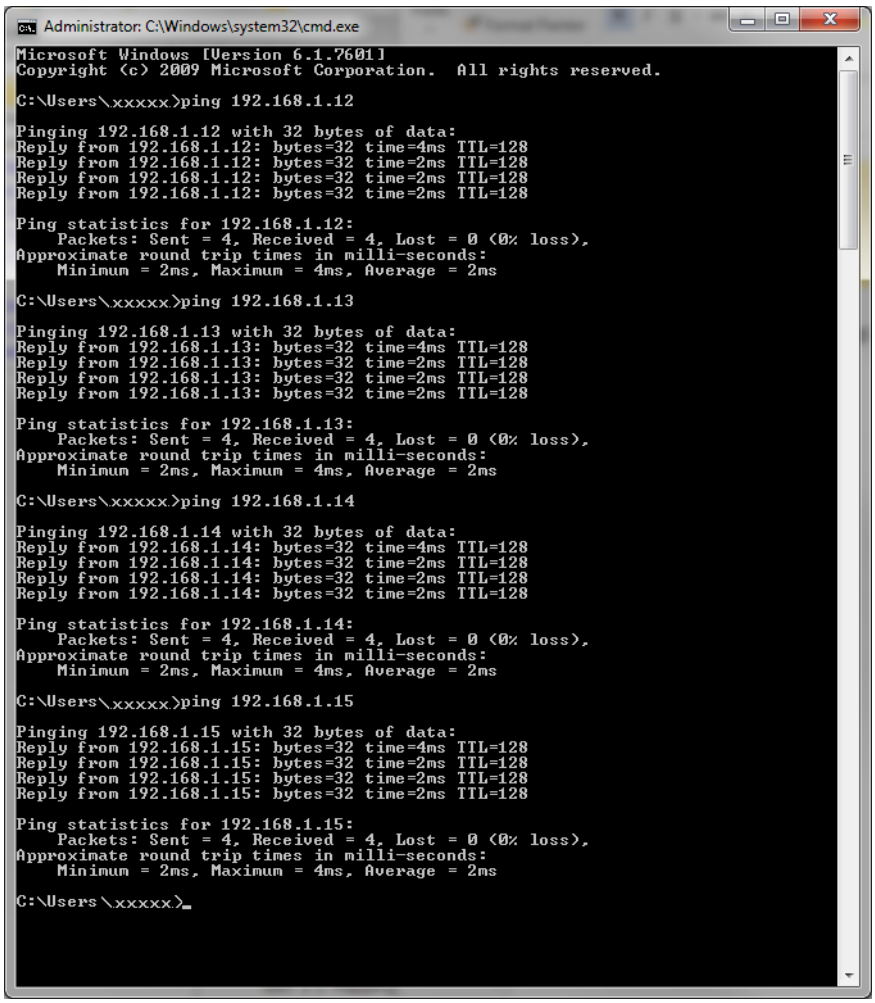


Fig. 83: Web server – mapping

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