

Your Global Automation Partner

TURCK

BEEP

Backplane Ethernet Extension Protocol

Getting Started Guide



Table of Contents

1	About these Instructions	3
1.1	Explanation of symbols	3
1.2	Feedback about these Instructions	3
2	Notes on the Product	5
2.1	Product Identification	5
2.2	Manufacturer and Service	5
3	BEEP	7
3.1	BEEP – Advantages	7
3.2	BEEP – Limitations	7
3.3	BEEP – Devices with BEEP Function	8
3.3.1	BEEP – IP Address Setting	8
3.4	BEEP – LED Displays	9
3.4.1	LED Displays – BEEP Master	9
3.4.2	LED Displays – BEEP Slave	9
4	Configuring the BEEP Network	11
4.1	Configuring the BEEP Line Topology	11
4.2	Alternative Line Topology Configurations	12
4.3	Latency	13
5	The Web Server	15
5.1	Assigning an IP address to the BEEP Master	15
5.2	Login	15
5.3	BEEP Network Configuration	16
5.3.1	BEEP Network Configuration – Functions	16
5.4	Device Information	17
5.5	Node Parameters	17
5.5.1	Failsafe Mode Configuration	18
5.6	Diagnostics in the Web Server	18
6	Configuring the BEEP Master – Ethernet/IP	19

6.1	Used Hardware	19
6.2	Used Software	19
6.3	Assigning an IP Address to the BEEP Master	19
6.4	Configuring the Device in the Web Server	19
6.4.1	Login	19
6.4.2	BEEP Network Configuration	20
6.4.3	Discover or Update Network	20
6.4.4	Ethernet/IP™ Memory Map	21
6.5	Connecting to Allen Bradley PLC via RSLogix	22
7	Configuring the BEEP Master – Modbus TCP	23
7.1	Used Hardware	23
7.2	Used Software	23
7.3	Assigning an IP Address to the BEEP master	23
7.4	Configuring the Device in the Web Server	23
7.4.1	Login	23
7.4.2	BEEP Network Configuration	24
7.4.3	Discover or Update Network	24
7.4.4	Modbus TCP Memory Map	25
7.5	Connecting to Turck HMI/PLC via CODESYS 3	26
8	Configuring the BEEP Master – PROFINET	29
8.1	Used Hardware	29
8.2	Used Software	29
8.3	Assigning an IP Address to the BEEP Master	29
8.4	Configuring the Device in the Web Server	29
8.4.1	Login	29
8.4.2	BEEP Network Configuration	30
8.4.3	Discover or Update Network	30
8.4.4	PROFINET Memory Map	31
8.5	Connecting the device to SIEMENS PLC via TIA Portal Version 13	32
9	Replacing or Adding Additional Devices	33
9.1	Slave Device Replacement	33
9.2	Adding Slave Devices	33
9.3	Master Device Replacement	34

1 About these Instructions

These instructions describe the structure, functions and the use the Backplane Ethernet Extension Protocol (BEEP). The document helps the user to plan, configure and implement the system.

1.1 Explanation of symbols

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.

1.2 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 are valid for Backplane Ethernet Extension Protocol (BEEP).

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.de/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 BEEP

BEEP (Backplane Ethernet Extension Protocol) is a new technology that has been added to many Turck Multiprotocol digital block I/O modules. BEEP allows a network, of up to 33 devices (1 master and 32 slaves) or 480 bytes of data, to appear to the PLC as a single device on a single connection using a single IP address.

3.1 BEEP – Advantages

- Consolidation of IP addressing — BEEP allows a network, of up to 33 devices (1 master and 32 slaves) or 480 bytes of data, to appear to the PLC as a single device on a single connection using a single IP address.
- Less downtime – BEEP supports drop-in replacement of slave devices.
- Cost savings – BEEP allows the user an opportunity to invest in a lower cost PLC that supports less connections.
- Unique selling point – BEEP works with standard Ethernet components and requires no special equipment.
- Unique technology – BEEP technology is built in to each device at no additional cost. It is up to the user if they want to enable BEEP or not.

3.2 BEEP – Limitations

- Network topology – BEEP must be setup in a line topology. BEEP does not support DLR or ring configuration.
- Localized addressing – BEEP master device communicates exclusively with slaves. The PLC will not see the slave devices at all.

3.3 BEEP – Devices with BEEP Function

The following devices are BEEP master and BEEP slave capable:

Ident-no.	Description	Minimum required firmware to support BEEP		
		3.2.2.0	3.3.4.0	3.4.2.0.
6814009	TBEN-L4-16DIP			X
6814010	TBEN-L4-8DIP-8DOP			X
6814011	TBEN-L4-16DOP			X
6814012	TBEN-L4-16DXP			X
6814061	TBEN-L4-16DIN			X
6814063	TBEN-L4-16DON			X
6814064	TBEN-L4-16DXN			X
6814085	TBEN-L5-16DIP			X
6814087	TBEN-L5-16DOP			X
6814088	TBEN-L5-16DXP			X
6814086	TBEN-L5-8DIP-8DOP			X
6814020	TBEN-S1-8DIP		X	
6814021	TBEN-S1-4DIP-4DOP		X	
6814022	TBEN-S1-8DOP		X	
6814023	TBEN-S1-8DXP		X	
6814034	TBEN-S1-8DIP-D		X	
6814073	TBEN-S2-8DIP	X		
6814076	TBEN-S2-8DXP	X		
6931090	FEN20-4DIP-4DXP		X	
6814129	FEN20-4DIN-4DXN		X	

3.3.1 BEEP – IP Address Setting

- A BEEP master must have a static IP address assigned.
- A BEEP slave must have no IP address assigned.

Turck devices come out of the box with no IP address assigned. Factory reset can be performed from the device web server or via the Turck Service Tool.

3.4 BEEP – LED Displays

3.4.1 LED Displays – BEEP Master

LED	Color	State	Description
BUS	Green	On	Station OK
	Red	On	No IP address assigned
	Red	Flashing	Wink active
ERR	Green	On	Station OK
	Red	On	Diagnostics active
	Green/Red	Flashing alternately	Discovery mode active
Power	Green	On	Station OK
	Green	Off	V1 too low (< 18 V DC).
	Red	On	V2 undervoltage error

3.4.2 LED Displays – BEEP Slave

LED	Color	State	Description
BUS	Green	On	Station OK
	Red/Green	Flashing alternately	Waiting for master discovery
	Red	Flashing	Wink active
ERR	Green	On	Station OK
	Red	On	Diagnostics active
Power	Green	On	Station OK
	Green	Off	V1 too low (< 18 V DC)
	Red	On	V2 undervoltage error

4 Configuring the BEEP Network

A BEEP network consists of one master and at least one slave. A BEEP master must have a static IP address assigned. A BEEP slave must have no IP address assigned.

4.1 Configuring the BEEP Line Topology

The following line topology must be observed:

- Port 2 on the BEEP master must go to Port 1 on the first BEEP slave.
- BEEP does not work in a ring or DLR configuration.

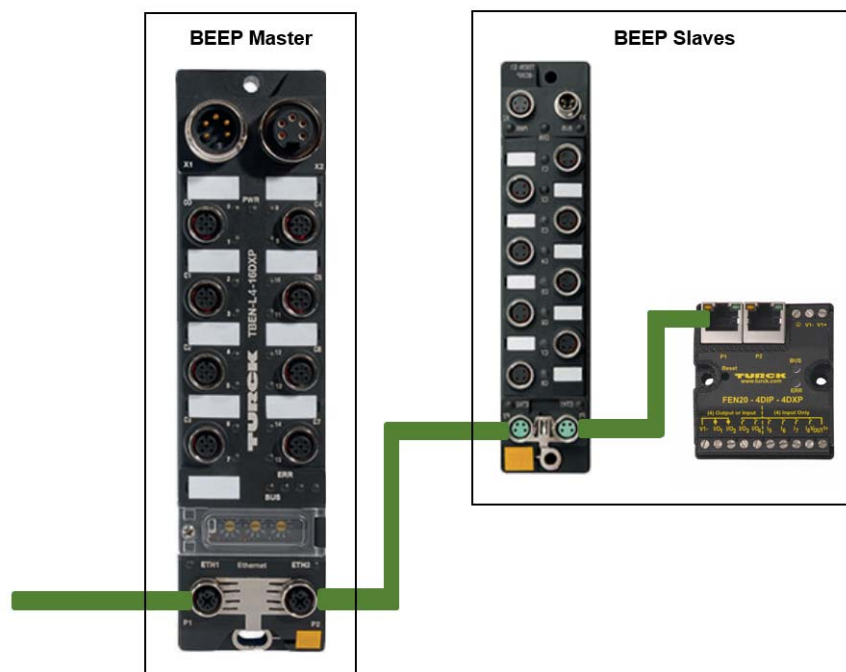


Fig. 1: BEEP Line Topology



NOTE

For a list of the available BEEP devices, see [Chapter 3.3](#).

4.2 Alternative Line Topology Configurations

- BEEP line topology with a non-BEEP compatible device

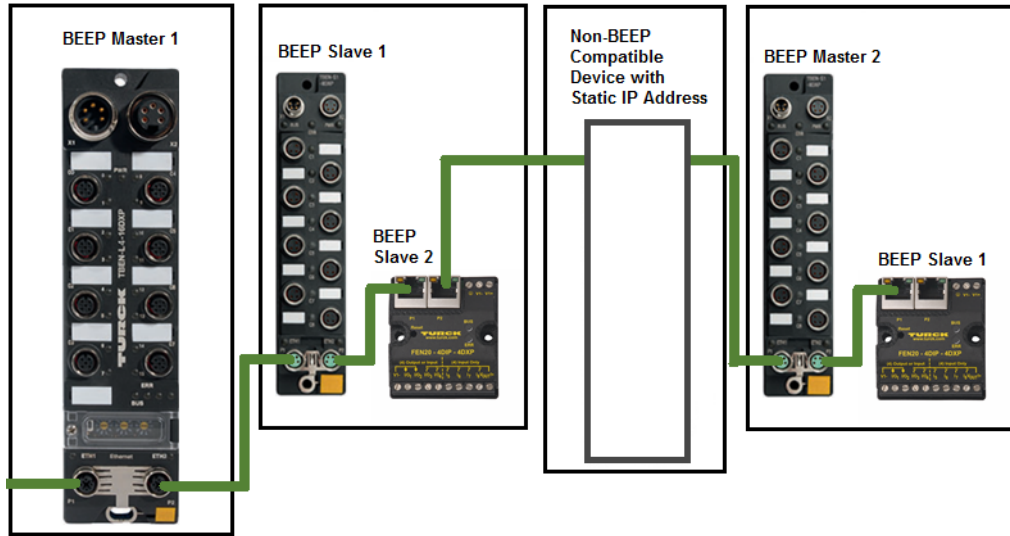


Fig. 2: BEEP line topology with a non-BEEP compatible device

- Line topology using multiple BEEP masters

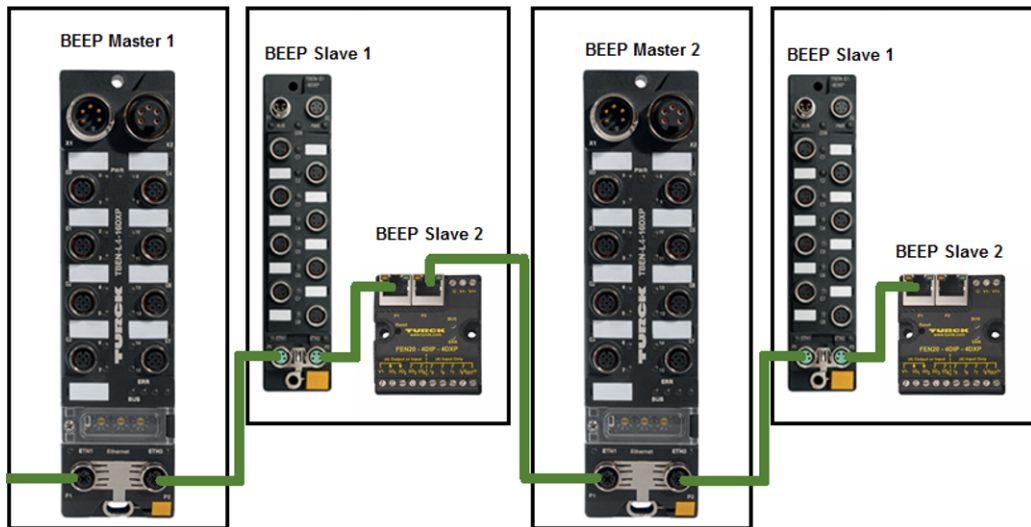


Fig. 3: Line topology using multiple BEEP masters

The BEEP master ignores non-BEEP compatible devices (such as I/O blocks and drives) and looks for Turck devices that have no IP address assigned.

The recommend way to install multiple BEEP masters in a networks is by:

- Installing all the physical devices.
- Assign all the BEEP masters an IP address.
- Enable BEEP master functionality.
- Scan for the BEEP slaves at each master.

4.3 Latency

In a BEEP network, the master cyclically updates the data of its slaves.

The cycle time is defined by the following formula:

$$T_{C[ms]} = 5 + 0,125 \times n$$

n = number of slaves

The BEEP network runs asynchronously to the cycle of the higher-level communication system (PROFINET, Ethernet/IP or Modbus TCP).

Latency corresponding to number of slave devices in the network:

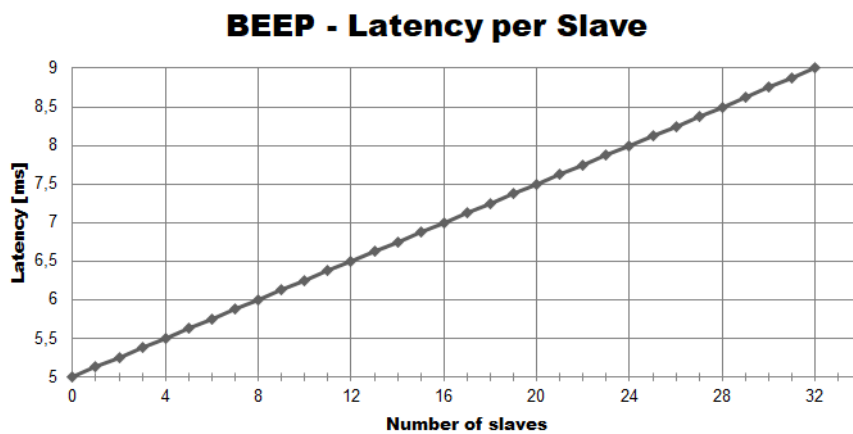


Fig. 4: Latency in the BEEP network

5 The Web Server

5.1 Assigning an IP address to the BEEP Master

- Assign a static IP address to the first device in the BEEP line, which means to the device which has to be the BEEP master, by using the Turck Service Tool for example. A BEEP slave must have no IP address assigned.

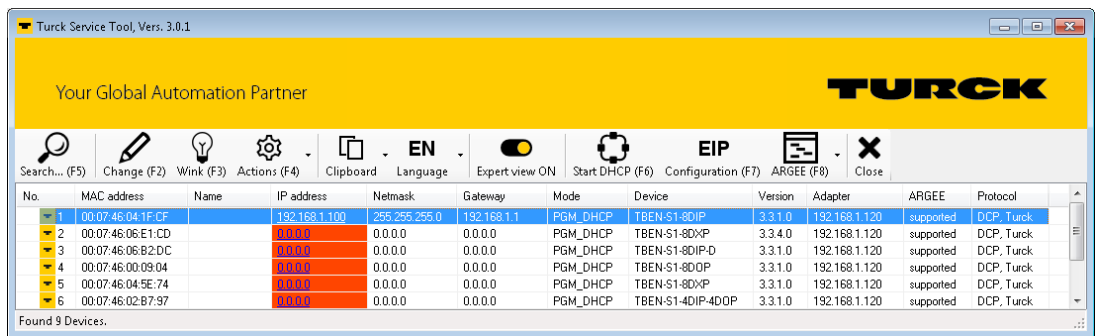


Fig. 5: Turck Service Tool – BEEP-master with static IP address

5.2 Login

Access to the BEEP "Network Configuration" is only possible after a login.

- Log into the web server using the default password "password".

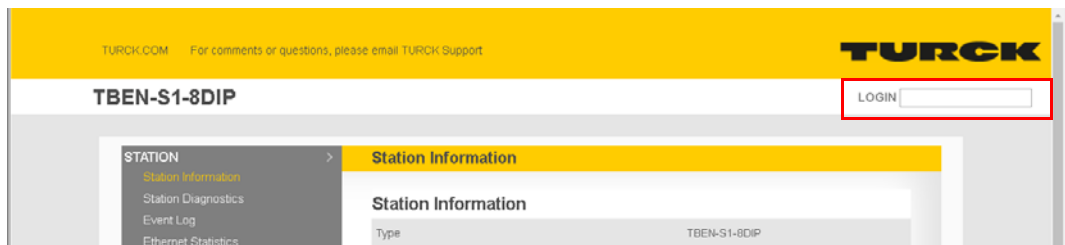


Fig. 6: Web server – Login

5.3 BEEP Network Configuration

- Select "BEEP Network Configuration"
- Select "Enable master".

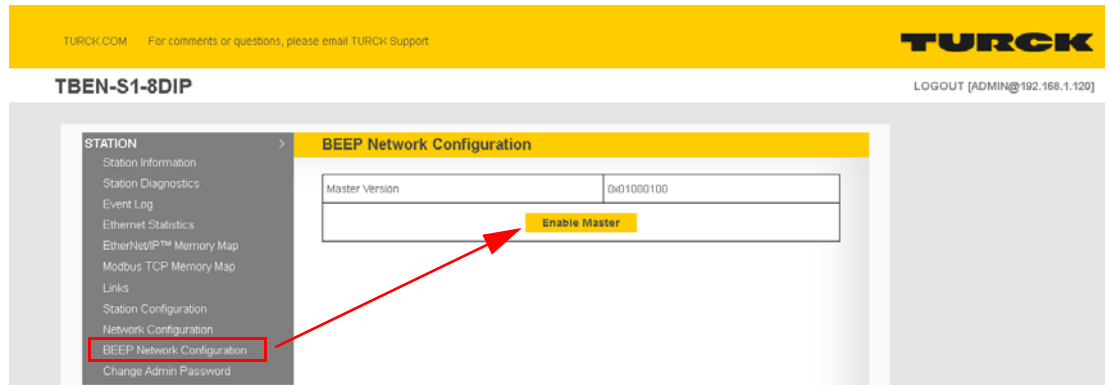


Fig. 7: Web server – BEEP Network Configuration

5.3.1 BEEP Network Configuration – Functions

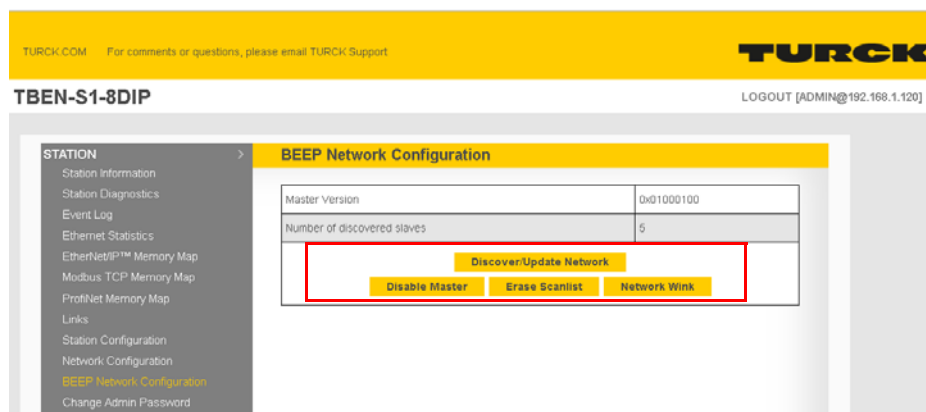


Fig. 8: Web server – BEEP Network Configuration – Functions

- Discover/Update Network: Discovers a new network or updates current network.
- Disable master: Disables the master functionality.
- Erase Scanlist: Clears the BEEP master Scanlist.
- Network Wink: master and all slave BUS LEDs will flash.

5.4 Device Information

- Select "Device Information".

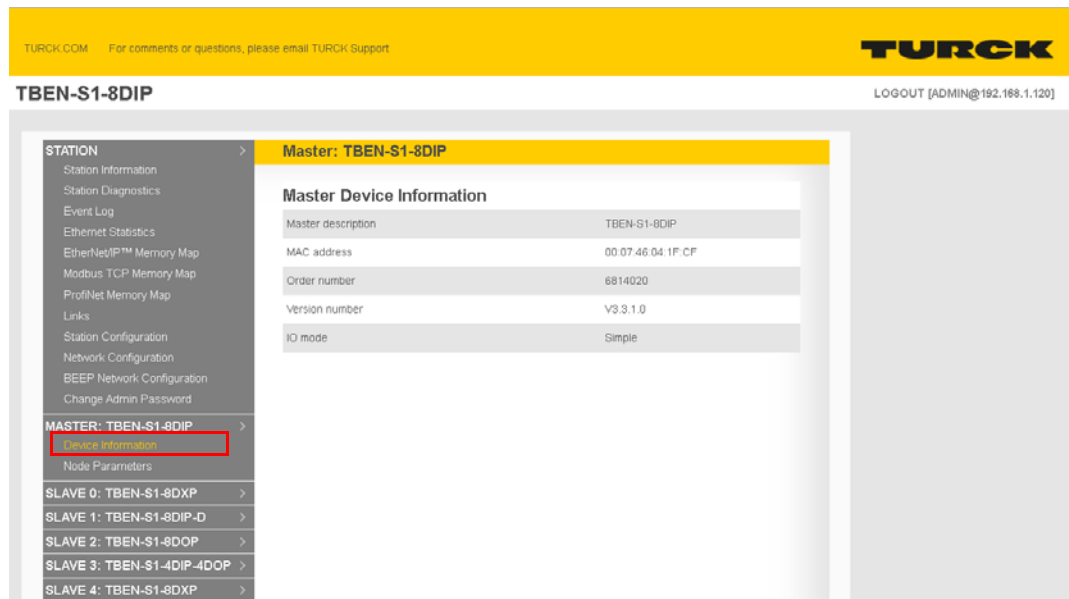


Fig. 9: Web server – BEEP-master – Device Information

The device used in this example was a TBEN-S1-8DIP. The user may see different product numbers depending on what product they are using.

5.5 Node Parameters

- Select "Node Parameters".

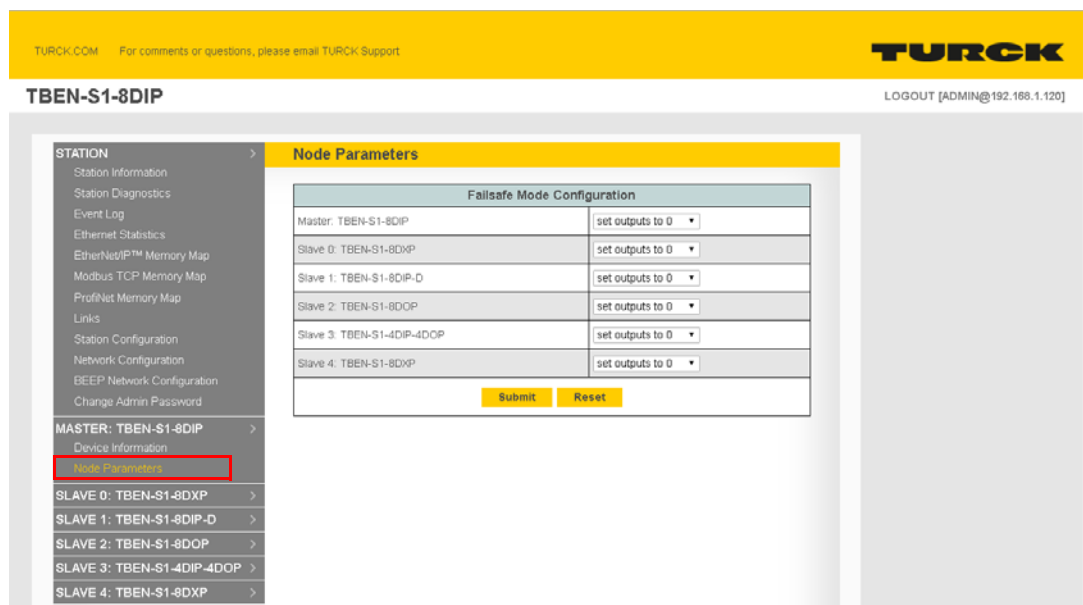


Fig. 10: Web server – BEEP-master – Node Parameters

5.5.1 Failsafe Mode Configuration

Failsafe Mode Configuration determines how the outputs of the BEEP slaves connected to the BEEP master will respond when fieldbus connection is lost.

BEEP masters and slaves can each have their own individual Failsafe Mode Configuration.

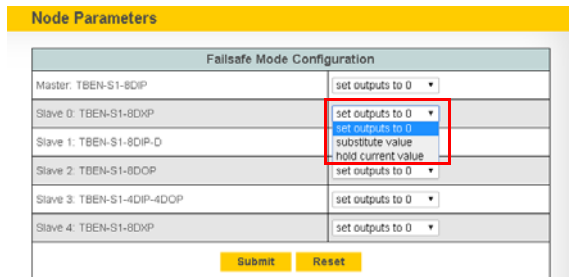


Fig. 11: Web server – Failsafe Mode Configuration

- Set outputs to 0: Outputs are set to zero.
 - Substitute value: Use a substitute value. (only valid for analog modules)
 - Hold current value: Outputs hold the momentary value in case of an error at
- Select the desired I/O condition for each device, then click "Submit". "Reset" only resets the changes done in the web server mask back to the original values.

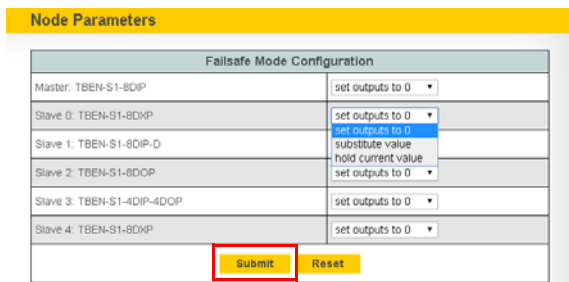


Fig. 12: Web server – Failsafe Mode Configuration – submit values

5.6 Diagnostics in the Web Server

BEEP diagnostics can be viewed from the BEEP master’s web server.

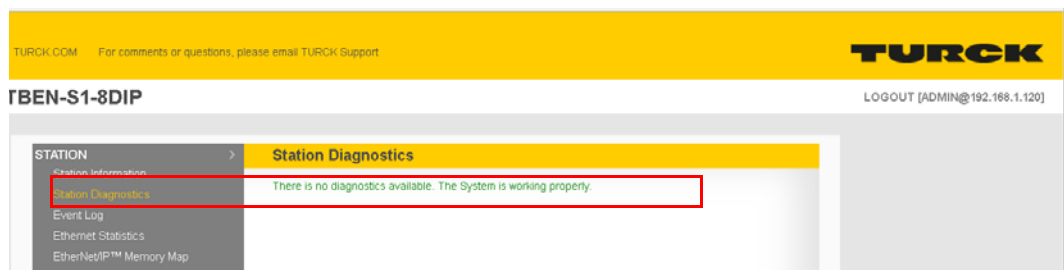


Fig. 13: Web server – Station Diagnostics

6 Configuring the BEEP Master – Ethernet/IP

6.1 Used Hardware

- TBEN-S1-8DXP
- Compact Logix L16ER

6.2 Used Software

- BEEP Web Server
- Studio 5000, Version 28

6.3 Assigning an IP Address to the BEEP Master

- Assign a static IP address to the first device in the BEEP line, which means to the device which has to be the BEEP master, by using the Turck Service Tool for example. A BEEP slave must have no IP address assigned.

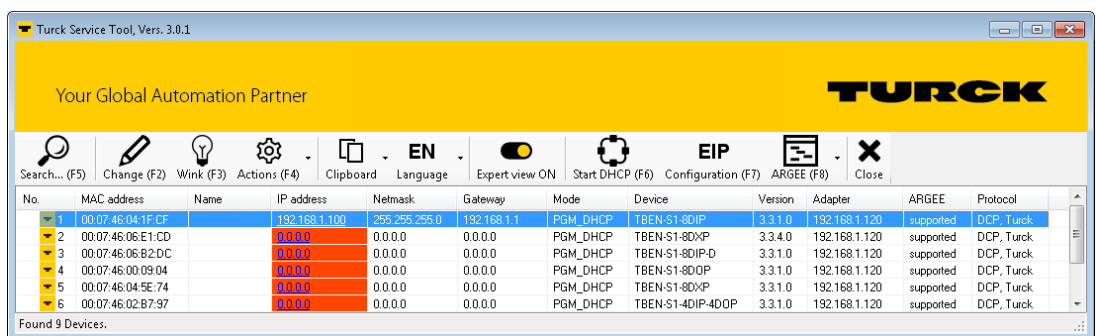


Fig. 14: Turck Service Tool – BEEP-master with static IP address

6.4 Configuring the Device in the Web Server

6.4.1 Login

Access to the BEEP Network Configuration is only possible after a login.

- Log into the web server using the default password "password".

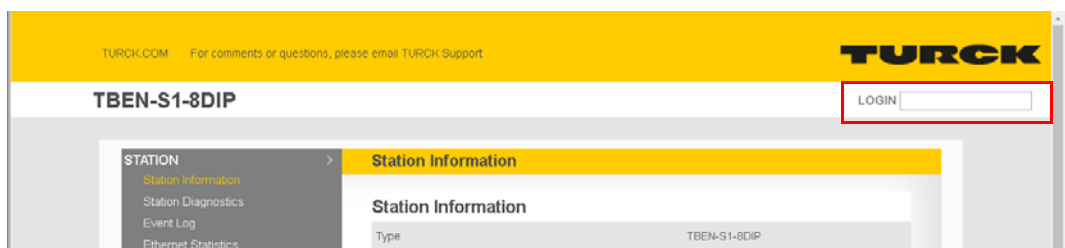


Fig. 15: Web server – Login

6.4.2 BEEP Network Configuration

- Select "BEEP Network Configuration"
- Enable the BEEP master in the device. Select "Enable master".

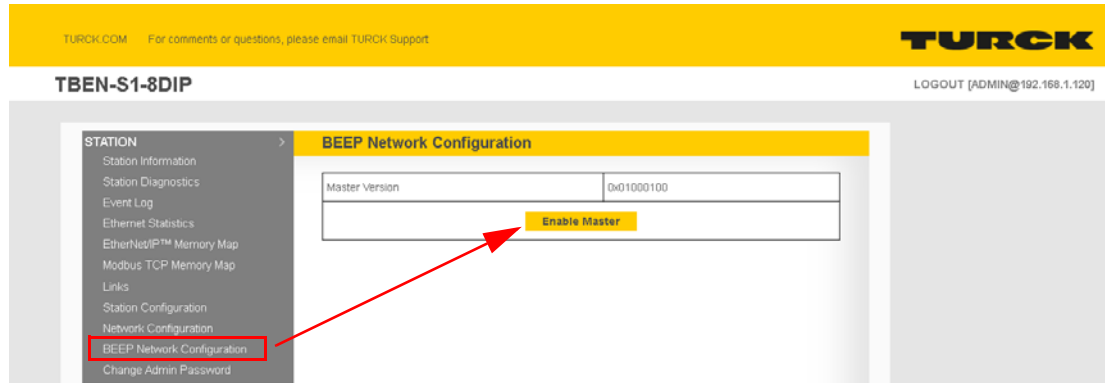


Fig. 16: Web server – BEEP Network Configuration – Enable master

6.4.3 Discover or Update Network

- Select "Discover/Update Network" to scan for slaves.

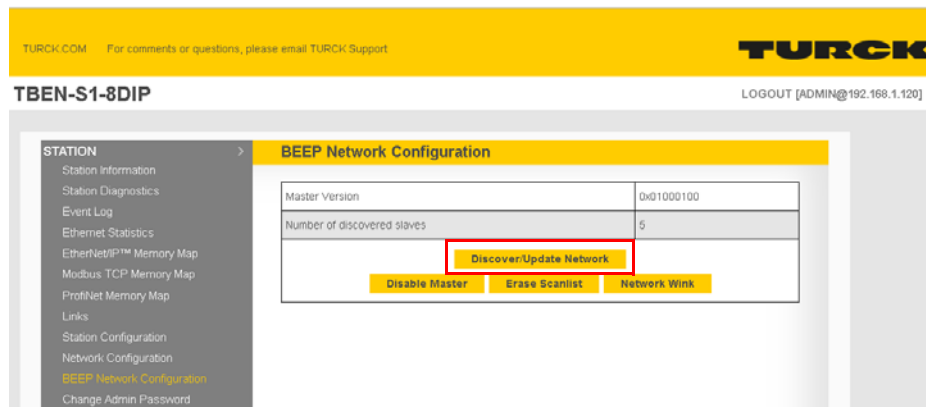


Fig. 17: Web server – BEEP Network Configuration – Discover/Update Network

➔ The found devices are listed in the order they are mounted in the BEEP line.

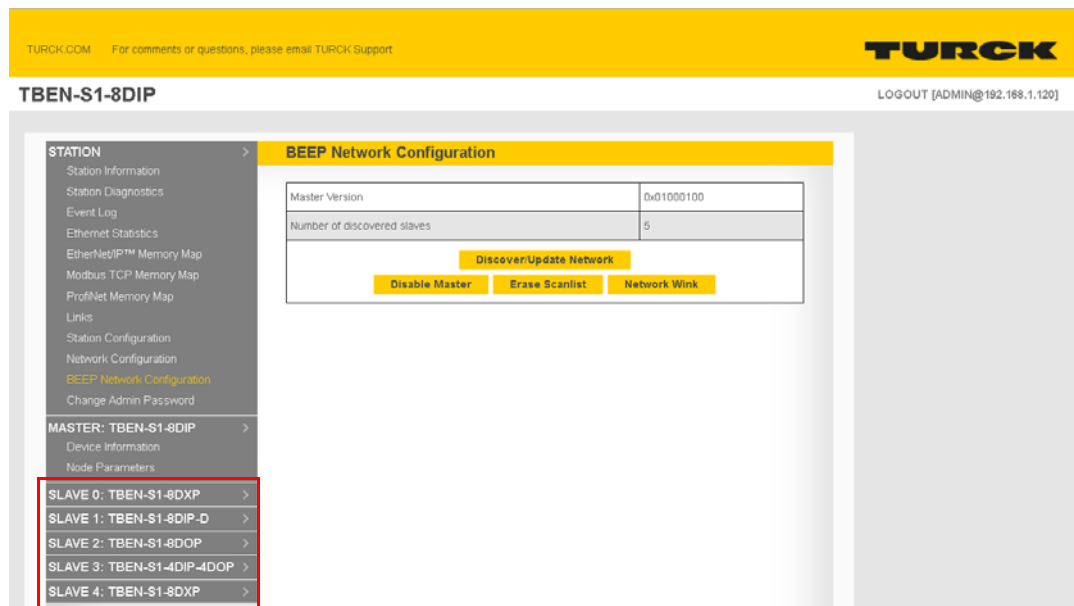


Fig. 18: Web server – BEEP Network Configuration – Discover/Update Network

6.4.4 Ethernet/IP™ Memory Map

The "Ethernet/IP Memory Map" shows the Assembly Instance and the size of the BEEP network.

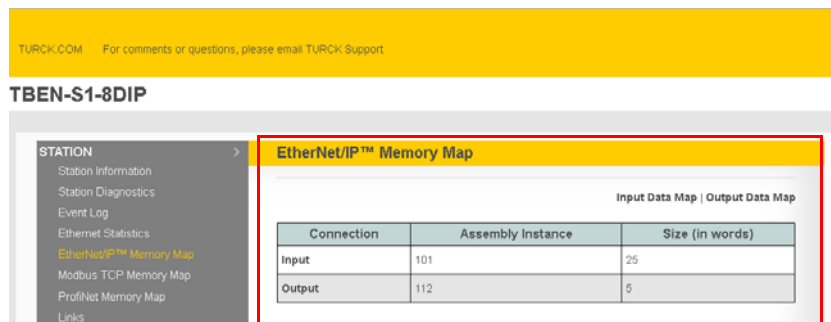


Fig. 19: Web server – EtherNet/IP™ Memory Map

➔ The web server is updated with a new I/O data map which includes all slave devices.

- The new input connection point: Input Assembly: 101 (0x65), Size: 25 words
- The new output connection point: Output Assembly: 112 (0x70), Size: 5 words



NOTE

More memory can be allocated in the PLC for the input and output data sizes. Doing this allows for additional slave devices to be added later without having to take the PLC offline to reallocate space.

6.5 Connecting to Allen Bradley PLC via RSLogix

- Create a "Generic Ethernet Module" in RSLogix.

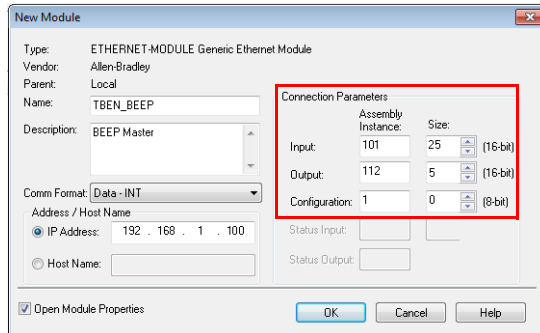


Fig. 20: RSLogix – Generic Ethernet Module



NOTE

Due to all the BEEP network configuration being done in the web server of the BEEP master, the Configuration Assemble Instance can be set to 1 and the Size can be set to 0.

Use the Ethernet/IP Memory Map from web server to identify tags in RSLogix.

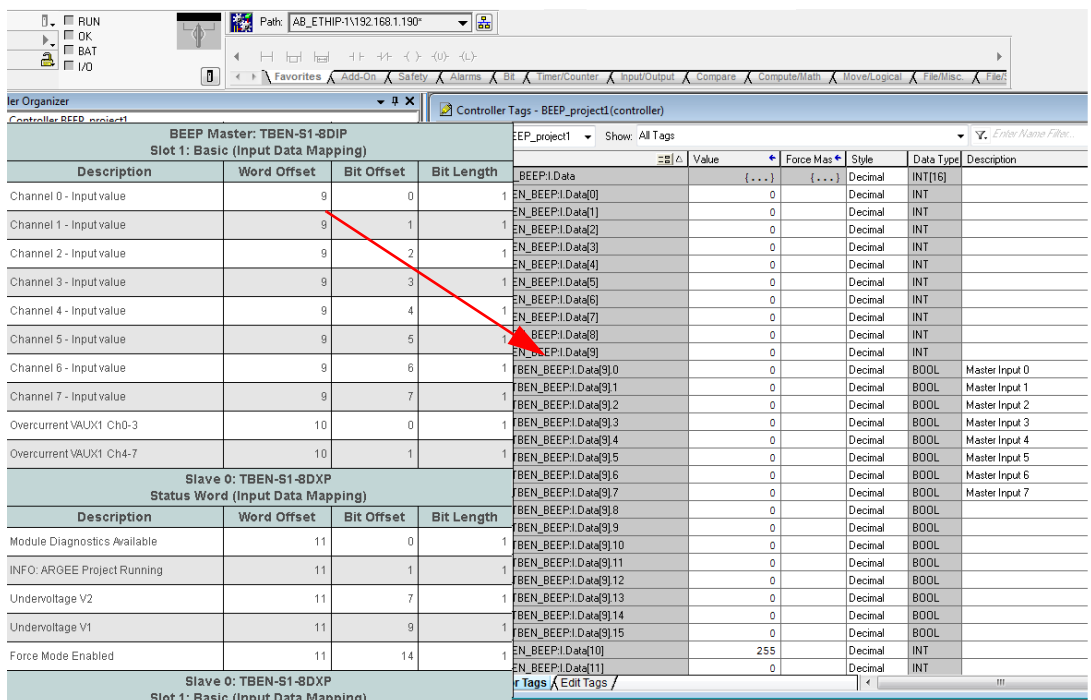


Fig. 21: Interpretation of Controller Tags

7 Configuring the BEEP Master – Modbus TCP

7.1 Used Hardware

- TBEN-S1-8DXP
- Turck TX507 HMI

7.2 Used Software

- BEEP Web Server
- CODESYS Version 3.5

7.3 Assigning an IP Address to the BEEP master

- Assign a static IP address to the first device in the BEEP line, which means to the device which has to be the BEEP master, by using the Turck Service Tool for example. A BEEP slave must have no IP address assigned.

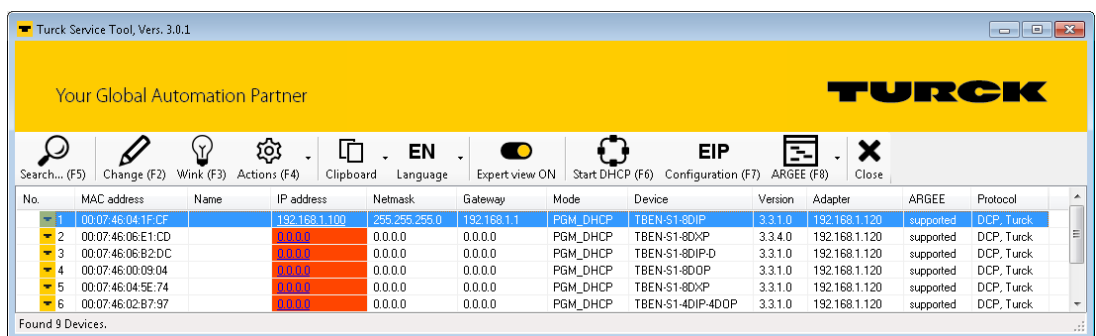


Fig. 22: Turck Service Tool – BEEP-master with static IP address

7.4 Configuring the Device in the Web Server

7.4.1 Login

Access to the BEEP Network Configuration is only possible after a login.

- Log into the web server using the default password "password".

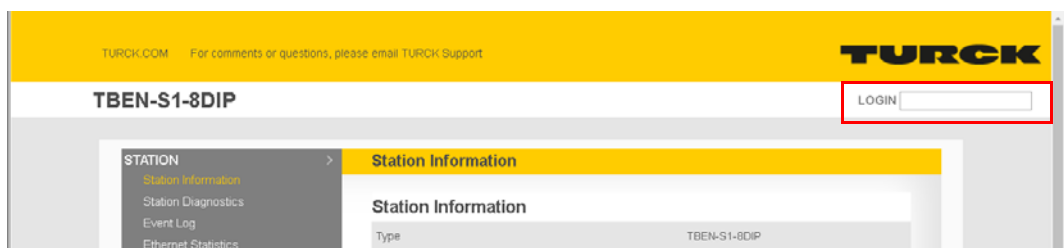


Fig. 23: Web server – Login

7.4.2 BEEP Network Configuration

- Select "BEEP Network Configuration"
- Enable the BEEP master in the device. Select "Enable master".

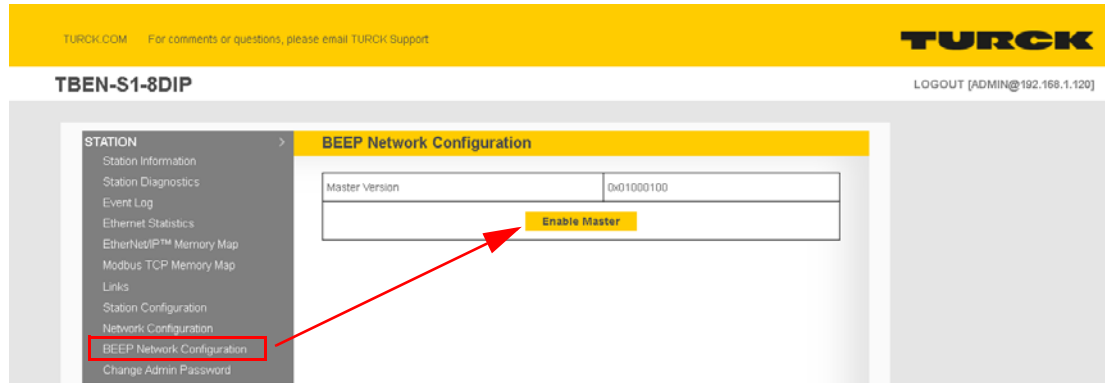


Fig. 24: Web server – BEEP Network Configuration – Enable master

7.4.3 Discover or Update Network

- Select "Discover/Update Network" to scan for slaves.

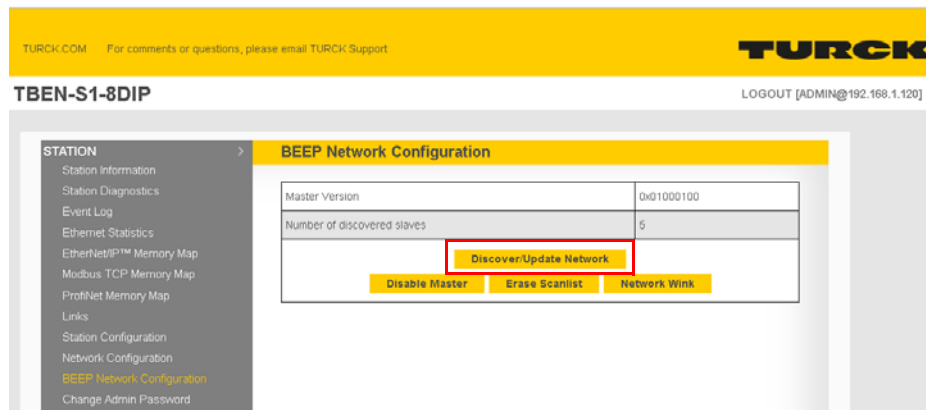


Fig. 25: Web server – BEEP Network Configuration – Discover/Update Network

➔ The found devices are listed in the order they are mounted in the BEEP line.

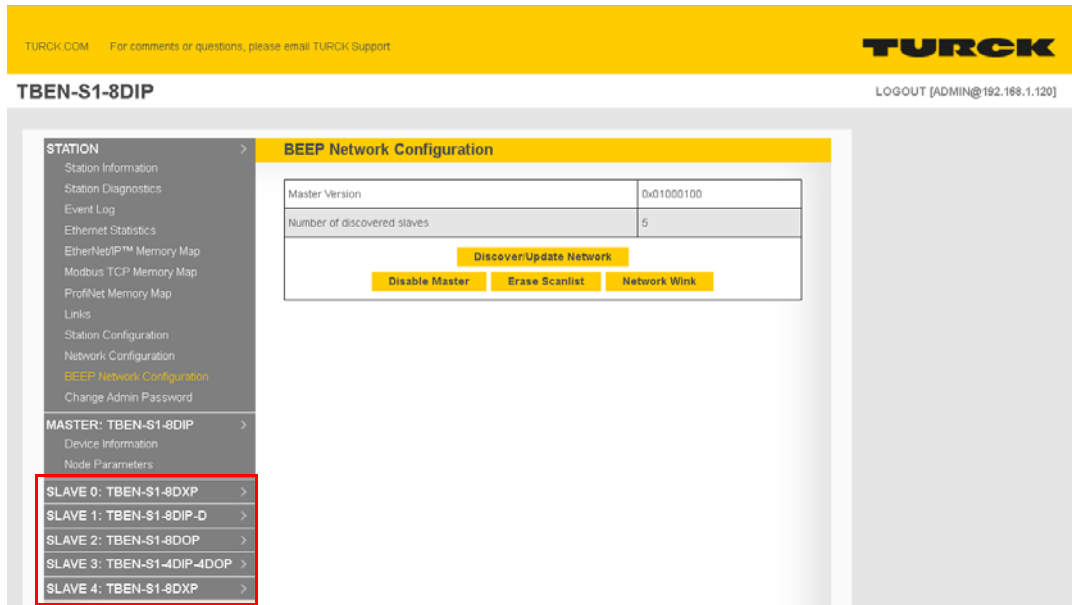


Fig. 26: Web server – BEEP Network Configuration – Discover/Update Network

7.4.4 Modbus TCP Memory Map

Select "Modbus TCP Memory Map" to see the size of the BEEP network.

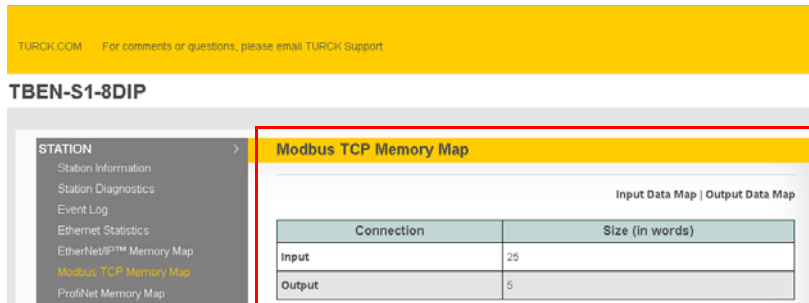


Fig. 27: Web server – Modbus TCP Memory Map

➔ The web server is updated with a new I/O data map which includes all slave devices.

- Modbus input registers start at 0x4800 (18432).
- Modbus output registers start at 0x4C04 (19456).



NOTE

More memory can be allocated in the PLC for the input and output data sizes. Doing this allows for additional slave devices to be added later without having to take the PLC offline to reallocate space.

7.5 Connecting to Turck HMI/PLC via CODESYS 3

- Enter the IP address of the BEEP master

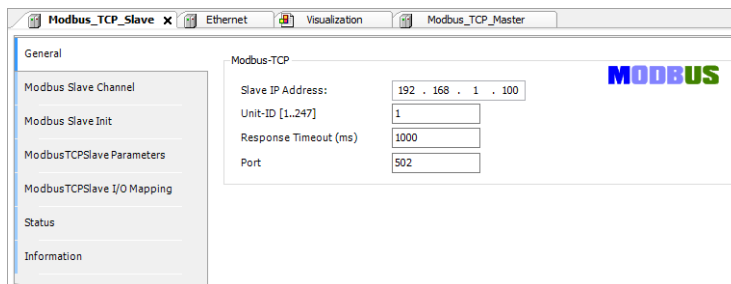


Fig. 28: CODESYS – assigning the IP address of BEEP master

- Enter read and write registers and length.

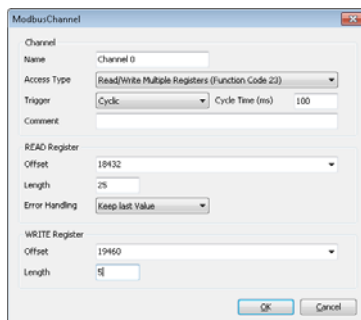


Fig. 29: CODESYS – adding a Modbus channel

Use the Modbus TCP Memory Map from web server to label inputs and outputs in project.

The screenshot shows the CODESYS Modbus TCP Slave configuration interface. The main table is titled "BEEP Master: TBEN-S1-8DIP Slot 1: Basic (Input Data Mapping)". It lists channels and their corresponding registers, bit offsets, and bit lengths. A red arrow highlights the mapping from the "Bit Offset" column of the first row to the "Description" column of the second row. Below this, a section for "Slave 0: TBEN-S1-8DXP Status Word (Input Data Mapping)" is shown, listing various status words and their register addresses.

Description	Register	Bit Offset	Bit Length
Channel 0 - Input value	0x4009 (10441)	0	1
Channel 1 - Input value	0x4809 (10441)	1	1
Channel 2 - Input value	0x4009 (10441)	2	1
Channel 2 - Input value	0x4809 (10441)	3	1
Channel 4 - Input value	0x4009 (10441)	4	1
Channel 5 - Input value	0x4809 (10441)	5	1
Channel 6 - Input value	0x4009 (10441)	6	1
Channel 7 - Input value	0x4809 (10441)	7	1
Overcurrent VALX1 Ch0-3	0x400A (10442)	0	1
Overcurrent VALX1 Ch4-7	0x480A (10442)	1	1

Description	Register	Bit Offset	Bit Length
Module Diagnostics Available	0x480B (10443)	0	1
INFO: AR0EE Project Running	0x480B (10443)	1	1
Undervoltage V2	0x480B (10443)	7	1
Undervoltage V1	0x480B (10443)	9	1
Force Mode Enabled	0x480B (10443)	14	1

Fig. 30: CODESYS – Modbus mapping

8 Configuring the BEEP Master – PROFINET

8.1 Used Hardware

- TBEN-S1-8DXP
- SIEMENS S7-1200

8.2 Used Software

- BEEP Web Server
- TIA Portal Version 14

8.3 Assigning an IP Address to the BEEP Master

- Assign a static IP address to the first device in the BEEP line, which means to the device which has to be the BEEP master, by using the Turck Service Tool for example. A BEEP slave must have no IP address assigned.

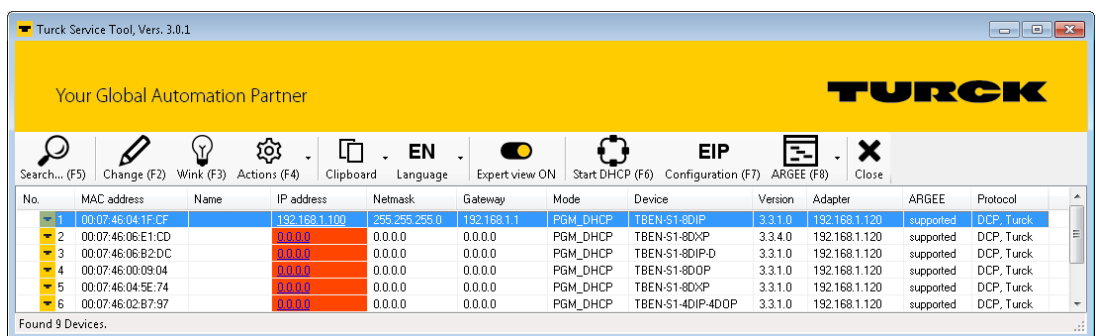


Fig. 31: Turck Service Tool – BEEP master with static IP address

8.4 Configuring the Device in the Web Server

8.4.1 Login

Access to the BEEP Network Configuration is only possible after a login.

- Log into the web server using the default password "password".

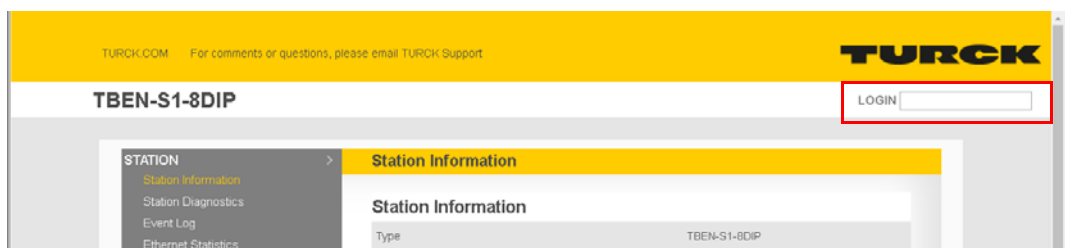


Fig. 32: Web server – Login

8.4.2 BEEP Network Configuration

- Select "BEEP Network Configuration"
- Enable the BEEP master in the device. Select "Enable master".

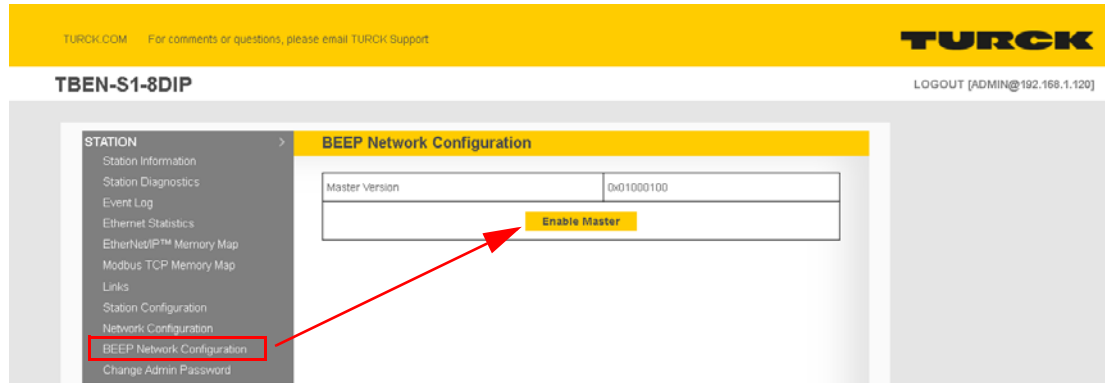


Fig. 33: Web server – BEEP Network Configuration – Enable master

8.4.3 Discover or Update Network

- Select "Discover/Update Network" to scan for slaves.

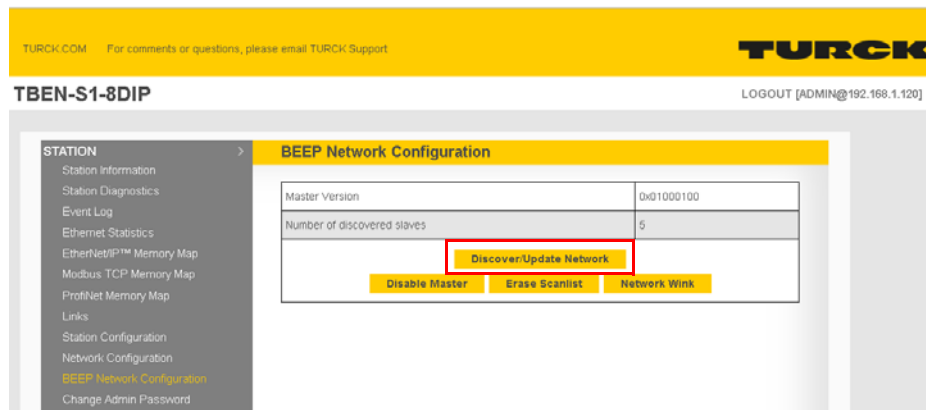


Fig. 34: Web server – BEEP Network Configuration – Discover/Update Network

➔ The found devices are listed in the order they are mounted in the BEEP line.

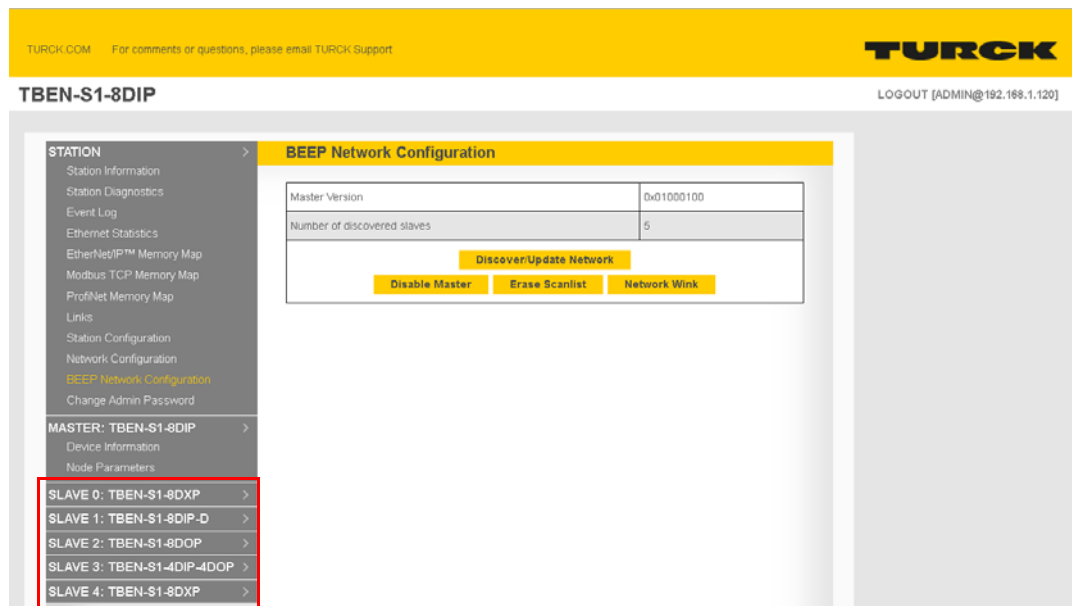


Fig. 35: Web server – BEEP Network Configuration – Discover/Update Network

8.4.4 PROFINET Memory Map

Select "PROFINET Memory Map" to see the size of the BEEP network.

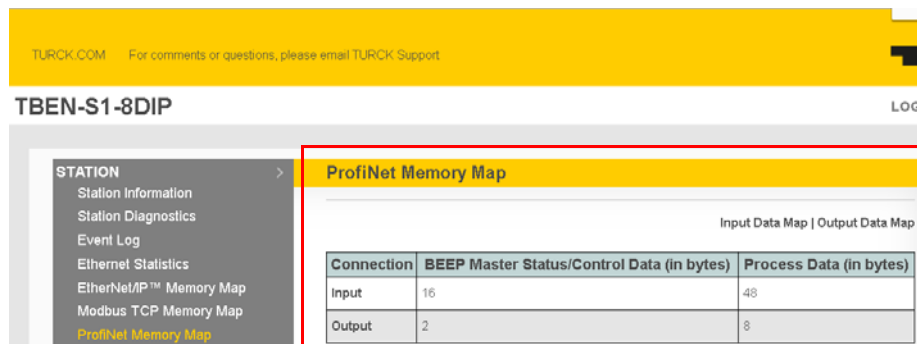


Fig. 36: Web server – PROFINET Memory Map

➔ The web server is updated with a new I/O data map which includes all slave devices.

PROFINET integration will have one generic GSDML file, which will be the same for all BEEP master nodes.

The BEEP GSDML will provide generic data length modules that can be dragged and dropped in multiple slots.



NOTE

More memory can be allocated in the PLC for the input and output data sizes. Doing this allows for additional slave devices to be added later without having to take the PLC offline to reallocate space.

8.5 Connecting the device to SIEMENS PLC via TIA Portal Version 13

- In TIA Portal, install BEEP GSDML.
- Select input and output size from the hardware catalog.

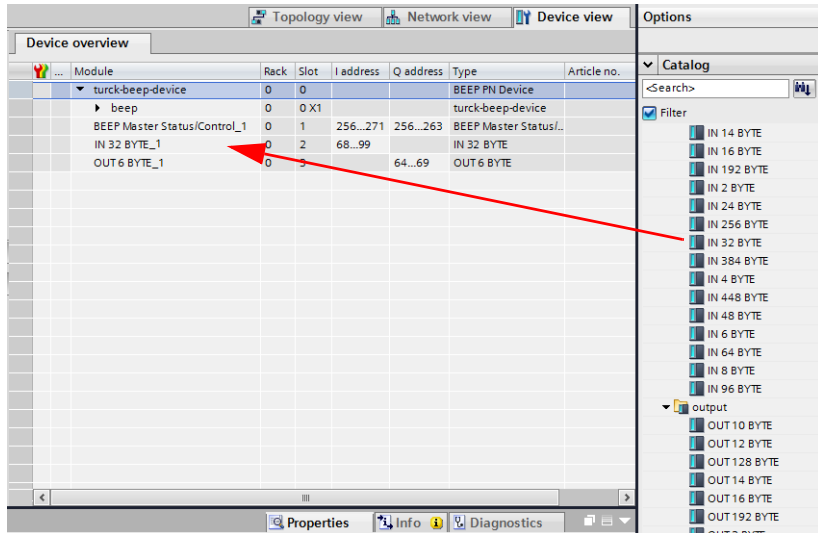


Fig. 37: TIA Portal – configuring the in- and output data

- In the device properties, select "IP address is set directly at the device".

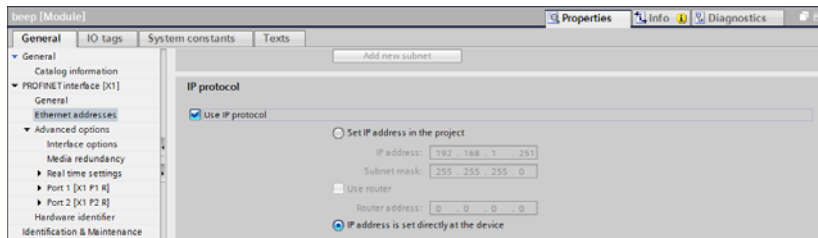


Fig. 38: TIA Portal – IP address is set directly at the device



NOTE

The IP address is not set in the project. The IP address of the BEEP master must be set in the web server only.

9 Replacing or Adding Additional Devices

9.1 Slave Device Replacement

BEEP supports drop-in replacement of slave devices. If a slave device goes bad, the user will see the following diagnostics message in the web server:

Station Diagnostics			
Device	Slot	Source	Diagnostics
Master: TBEN-S1-8DIP	0	Gateway	BEEP Status Word: Slave communication lost Diagnostic summary Slave 2 communication lost Slave 3 communication lost Slave 4 communication lost

Fig. 39: Web server – failure of a slave

- Simply remove the bad device and replace it with an identical device.
- ➡ The BEEP master will sense the new device and update the network. Station Diagnostics will automatically clear after the device is replaced.



NOTE

A BEEP slave must have no IP address assigned. Turck devices come out of the box with no IP address assigned. Factory reset can be performed from the device web server or via the Turck Service Tool.

9.2 Adding Slave Devices

- Connect the new slave device(s) at the end of the BEEP line.
- Log into the BEEP web server.
- Under the "BEEP Network Configuration" select "Discover/Update Network".

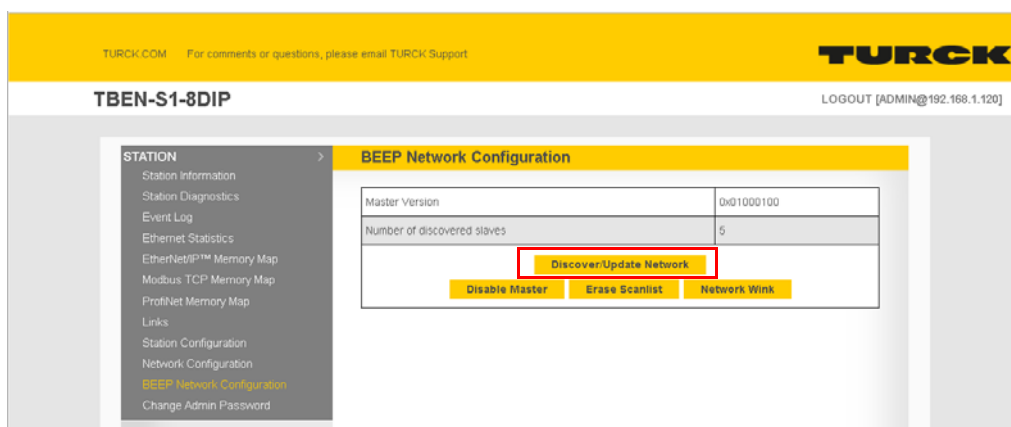


Fig. 40: Web server – Discover Network

- ➡ The BEEP master will see the new device(s), and automatically update the network.

➔ BEEP devices get auto-mapped according to their position on the network.



NOTE

More memory can be allocated in the PLC for the input and output data sizes. Doing this allows for additional slave devices to be added later without having to take the PLC offline to reallocate space.

9.3 Master Device Replacement

Drop-in master replacement is not supported in this release of BEEP. If the user needs to replace a BEEP master, they will need to set the IP address on the device, log-in to the device web server, enable the device to be a BEEP master and then rescan the network.

TURCK

Over 30 subsidiaries and over
60 representations worldwide!

100002454 | 2018/03



www.turck.com