



Your Global Automation Partner

UHF-SYS-TUNNEL... RFID System Solution

Instructions for Use

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1 About these instructions

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

1.1 Target groups

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

1.2 Explanation of symbols

The following symbols are used in these instructions:



DANGER

DANGER indicates a hazardous situation with a high level of risk, which, if not avoided, will result in death or serious injury.



WARNING

WARNING indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in death or serious injury.



CAUTION

CAUTION indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in moderate or minor injury.



NOTICE

CAUTION indicates a situation which, if not avoided, may cause damage to property.



NOTE

NOTE indicates tips, recommendations and important information about special action steps and issues. The notes simplify your work and help you to avoid additional work.



MANDATORY ACTION

This symbol denotes actions that the user must carry out.



RESULT OF ACTION

This symbol denotes the relevant results of an action.

1.3 Other documents

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

- Instructions for Use for the reader
- Data sheet
- Approvals
- Configuration manual

1.4 Naming convention

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

1.5 Feedback about these instructions

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

2 Notes on the product

2.1 Product identification

These instructions apply to the following RFID system solutions:

UHF – **SYS** – **TUNNEL** – **Q660L720** – **EU**

UHF	Frequency range	–	SYS	System solution	–	TUNNEL	Application	–
	Frequency range UHF UHF Frequency range			System solution SYS Standard solution			Application TUNNEL RFID tunnel	

Q660L720	Design	–	EU	Country of deployment
	Design Q...L... RFID-tunnel, opening size H × B in mm			Country of deployment AUS Australia/New Zealand BRA Brazil CHN China EU EU, Turkey, India JPN Japan KOR Korea MYS Malaysia NA North America (USA, Canada, Mexico) SGP Singapore

2.2 Scope of delivery

The scope of delivery includes:

- RFID tunnel
 - 2 side parts
 - Base plate
 - Cover plate
 - Front cover
 - Back
 - 4 × feet
- 1 × TN-UHF-Q180L300...LNx UHF reader
- 4 × UHF antennas TN-UHF-ANT-Q150...
- 5 × aluminum mounting plates for readers and antennas
- Installation material
 - 16 × M6 × 16 fillister head screws (ISO 7380-1)
 - 24 × M8 × 24 fillister head screws (ISO 7380-1)
 - 4 × M8 × 50 hexagon head screws (ISO 4014)
 - 4 × M8 × 70 hexagon head screws (ISO 4014)
 - 8 × M8 nuts (DIN 934 A4)
 - 20 × knurled screws M6
- Extension cables
 - RSSD-RJ45S-4422-5M Ethernet cable for connecting the reader
 - RSC4T-5/TXL supply cable
 - TN-UHF-CBL-HF240-RPTNC-2-SMA coaxial cable for connecting the antennas
 - Voltage
- Installation instructions

2.3 TURCK service

TURCK supports you in your projects — from the initial analysis right through to the commissioning of your application. At www.turck.com, you will find software tools for programming, configuring or commissioning, as well as data sheets and CAD files in many export formats.

For the contact details of our branches worldwide, please see page [▶ 38].

3 For your safety

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

3.1 Intended use

The RFID tunnel is a UHF system for use on conveyor belts or as an independent reading station. Typical applications are:

- Simple industrial conveyor applications in which individual boxes or items are detected with an RFID reader and read errors on the rear side or in the immediate vicinity of the reader are to be limited (e.g. for parallel conveyor belts or in other storage areas)
- Detection of multiple items in boxes or on pallets
- Verification of shipment or package contents

The RFID tunnel consists of a metal housing for self-assembly, a TN-UHF-Q180L300-...-LNX RFID reader, four TN-UHF-ANT-Q150... passive RFID antennas, and connection and installation materials.

The readers with an integrated RFID interface are used for contactless data exchange with the RFID tags in the TURCK UHF RFID system. The following table shows the operating frequency of the devices:

Type designation	Operating frequency	Application area
TN-UHF-Q180L300-AUS-LNX	920...926 MHz	Australia, New Zealand
TN-UHF-Q180L300-BRA-LNX	915...928 MHz	Brazil
TN-UHF-Q180L300-CHN-LNX	920.5...924.5 MHz	China
TN-UHF-Q180L300-EU-LNX	865...868 MHz	Europe, Türkiye, India
TN-UHF-Q180L300-JPN-LNX	916.7...920.9 MHz	Japan
TN-UHF-Q180L300-KOR-LNX	917...920.8 MHz	Korea
TN-UHF-Q180L300-MYS-LNX	919...923 MHz	Malaysia
TN-UHF-Q180L300-NA-LNX	902...928 MHz	North America (USA, Canada, Mexico)
TN-UHF-Q180L300-SGP-LNX	920...925 MHz	Singapore

These devices may only be started up under the following conditions:

- The particular frequency range is permissible for the use of UHF-RFID.
- The operating frequency range of the devices is compliant with the permissible UHF RFID range of the region.
- A valid certification and/or approval is available for the region of use.

The device must only be used as described in these instructions. Any other use is not in accordance with the intended use. TURCK accepts no liability for any resulting damage.

3.2 General safety instructions

- The device meets the EMC requirements for the industrial areas. When used in residential areas, take measures to prevent radio frequency interference.
- The device must only be fitted, installed, operated, parameterized and maintained by trained and qualified personnel.
- Only use the device in compliance with the applicable national and international regulations, standards and laws.

4 Product description

The RFID tunnel consists of a metallic housing that is located directly at the place of use, e.g. fitted above a conveyor belt, a TN-UHF-Q180...LNK UHF reader and four TN-UHF-ANT-Q150-... UHF antennas. The TVSnode software is preinstalled on the UHF reader. Extension cables are included for connecting the reader to the control level and to the power supply, as well as for connecting the external antennas.

The metal outer walls of the RFID tunnel limit the reader transmission zone to the right, left, top and bottom. This prevents erroneous readings outside the tunnel.

The UHF tunnel is supplied for self-assembly and can be assembled directly at the intended location. The feet for the UHF tunnel are adjustable and can be adapted, e.g. to the height of a conveyor belt.

4.1 Device overview

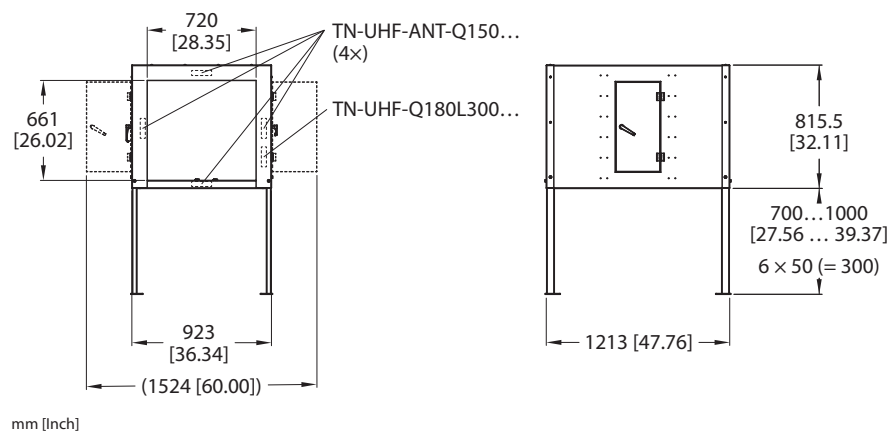


Fig. 1: Dimensions

4.2 Properties and characteristics

- UHF RFID tunnel for (bulk) detection of objects on the conveyor belt
- Preinstalled TVSnode software for commissioning and communication via an integrated REST API
- Recommended distance between objects: > 1.3 m
- Size of the tunnel opening: 720 × 660 mm

4.3 Operating principle

The readers are used for contactless data exchange with tags. For this the controller sends commands and data via the interface to the reader and receives the corresponding response data from the reader. The reading of the IDs of all RFID tags in the read area and the writing of an RFID tag with a specific production date are examples of typical commands. To communicate with the tag, the data of the reader is coded and transferred via an electromagnetic field, which at the same time supplies the tags with power.

A reader contains a transmitter and a receiver, an interface to the interface module and a coupling element (coil and dipole antenna) for communicating with the tag. Electromagnetic wave propagation is used for the transmission between reader and tag on devices for the UHF range.

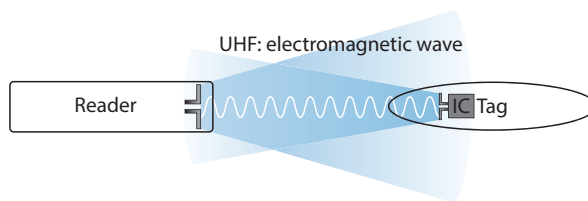


Fig. 2: Operating principle of UHF-RFID

The antenna of the reader generates electromagnetic waves. This produces a transmission window as a so-called air interface in which the data exchange with the tag takes place. The size of the transmission window depends on the combination of readers and tags, as well as on the relevant environmental conditions.

Each reader can communicate with a number of tags. This requires the reader and the tag to operate in the same frequency range. Depending on their power and the frequency in use, the devices have a range of a few millimeters up to several meters. The specified maximum distance between the read/write heads represents values measured under laboratory conditions, free from any influences caused by surrounding materials. Attainable distances may vary due to component tolerances, mounting conditions, ambient conditions and influences caused by surrounding materials (especially metal and liquids).

4.4 Functions and operating modes

The metal walls of the RFID tunnel prevent the tags located next to, above or below the RFID tunnel being read. The reader transmission zone extends forwards and backwards out of the tunnel through the openings.

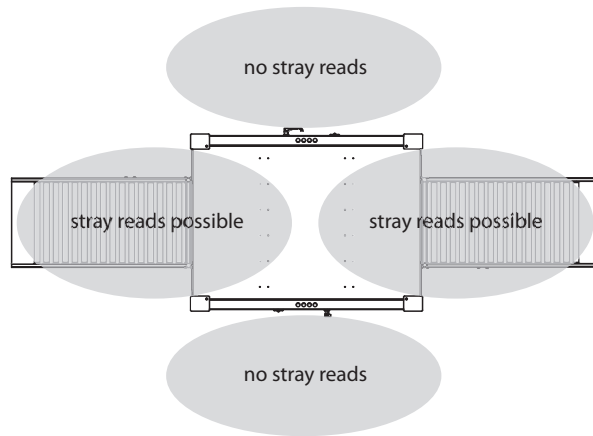


Fig. 3: Transmission zone propagation

Erroneous readings in the areas upstream and downstream of the tunnel can be prevented, for example, by adjusting the output signal or increasing the distance between the objects to be read. For information on preventing erroneous readings, see [► 18].

Metallic objects such as the conveyor belt itself can cause RFID signals reflections. Possible reflections depend on the application. TURCK recommends performing range tests under real operating conditions.

4.4.1 Reader functions

Details of the functions offered by the UHF reader can be found in the device-specific Instructions for Use (available for download at www.turck.com).

4.4.2 Recommended tags

TURCK recommends using UHF tags with a max. antenna length of 10 cm.

Larger tags can cause erroneous readings outside the tunnel.

If metallic objects are to be identified, tags that are suitable for mounting on metal must be used (on-metal tags). There must be no metal between the tag and the reader during the read operation.

Products with ESD materials or ESD boxes can prevent the tag from being read. On-metal tags or special tags for ESD applications are suitable for applications involving ESD materials.

Suitable UHF tags can be found at www.turck.com.

TURCK recommends performing range tests under real operating conditions.

4.4.3 TURCK Vilant Node software

The reader functions can be configured and parameterized using the preinstalled TURCK Vilant Node software. The UHF reader has the Lite version of the software. The paid Pro version of the software offers additional features. The Pro version is available from TURCK on request.

	Lite version	Pro version
REST API	x	x
HTTP interface	x	x
MQTT		x
Visibility manager		x
Device manager		x
GPIO inputs and outputs	x	x
RSSI filter	x	x
Duplicate filter	x	x
EPC filter	x	x
Direction filter		x
Motion filter		x
Read count filter		x
Additional data fields (tag data fields)		x
Connection to external devices (TBEN...)		x

4.5 Technical accessories

Optionally available accessories for installing, connecting, and parameterizing can be found at www.turck.com. Accessories are not supplied with the device.

5 Installing



NOTE

As an alternative to the sequence shown below, the reader and antennas can be installed before assembling the housing.

TURCK recommends setting up the RFID tunnel around the conveyor systems. The required installation time is approx. 45 min.

- Have two people install the RFID tunnel.

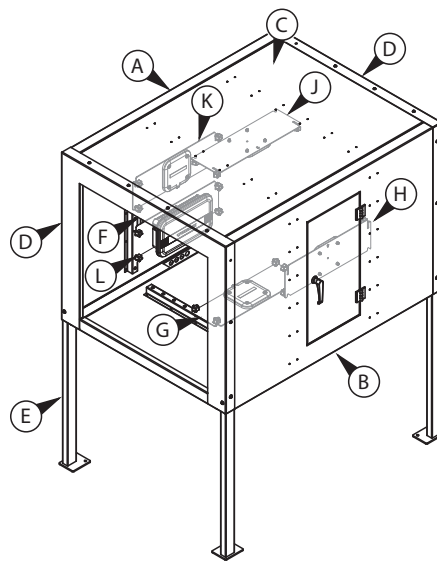


Fig. 4: RFID tunnel installation steps

Component overview

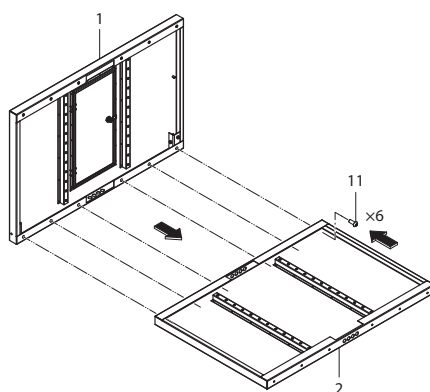
Item	Designation	Quantity
1	Side wall with door	2
2	Base plate	1
3	Cover plate	1
4	Framework	2
5	Foot type 1	2
6	Foot type 2	2
7	Mounting plate	5
8	TN-UHF-ANT-Q150...	4
9	TN-UHF-Q180L300...	1
10	Fillister head screw M8 × 16, hexagon socket	16
11	Fillister head screw M8 × 24, hexagon socket	24
12	Fillister head screw M8 × 50, hexagon socket	4
13	Fillister head screw M8 × 70, hexagon socket	4

Item	Designation	Quantity
14	Nut, M6	16
15	Knurled screw, M6 × 20	20
16	Screw, M4 × 12, hexagon socket	4
17	Screw, M6 × 16, hexagon socket	16

Installing the housing (steps A...E)

- ▶ Mount the side panels to the base plate using six M8 × 24 oval head screws for each side panel (A and B).
- ▶ Attach the cover plate to the side rows using twelve M8 × 24 fillister head screws (C).
- ▶ Install the frame using 16 M8 × 16 fillister head screws (D).
- ▶ Slide feet into the openings in the frame and secure at the desired height using M8 fillister head screws (E).

A



B

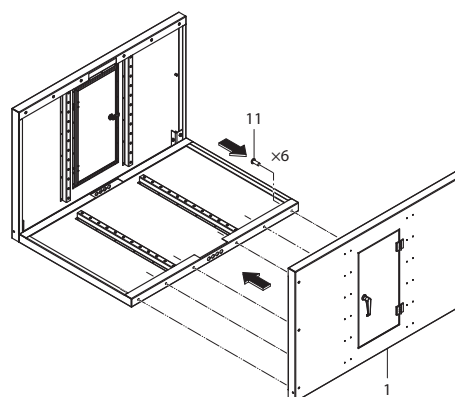
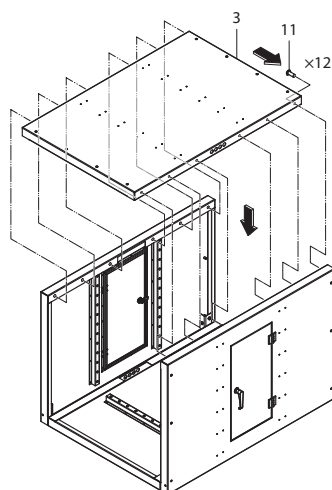


Fig. 5: Attach the first side panel

Fig. 6: Attach the second side panel

C



D

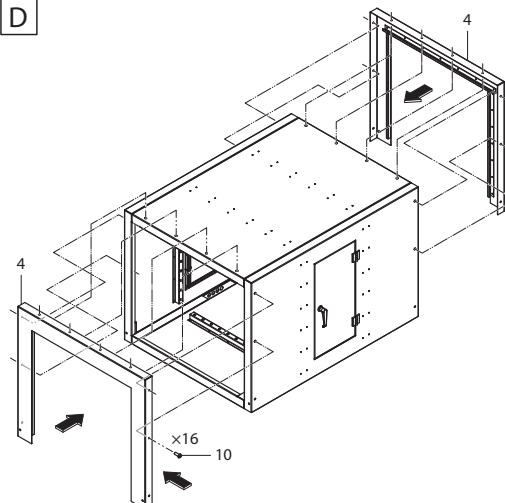


Fig. 7: Install the cover plate

Fig. 8: Install the frame

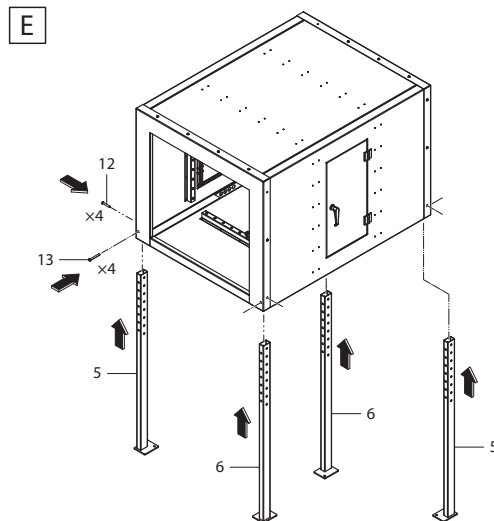


Fig. 9: Install the feet

Installing the reader and antennas (steps F...K)

- ▶ Attach the antennas to the mounting plate using four M6 × 16 screws and M6 nuts for each antenna (F).
- ▶ Attach the antennas with mounting plate to the base plate, the cover plate, and the side panels, using four M6 × 20 screws in each instance (G, H, J, K).
- ▶ Attach the reader to the mounting plate (L) using four M4 × 12 screws.
- ▶ Attach the mounting plate and reader to the desired side panel using four M6 × 20 screws (L).

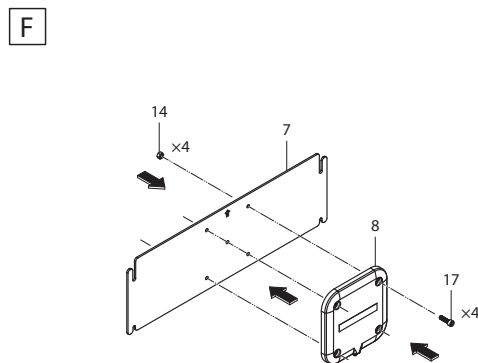


Fig. 10: Attach the antennas to the mounting plate

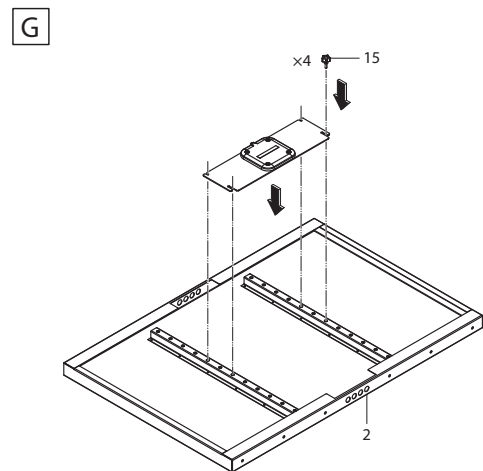


Fig. 11: Install the antenna on the base plate

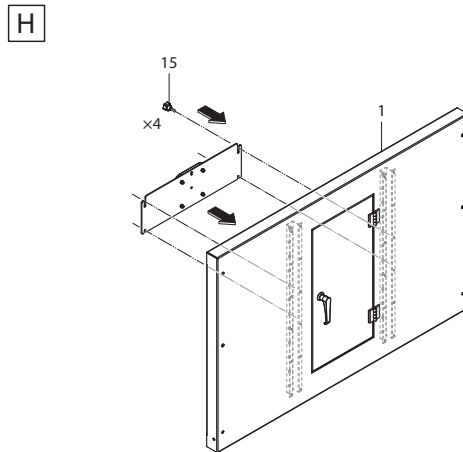


Fig. 12: Install the antenna on the first side panel

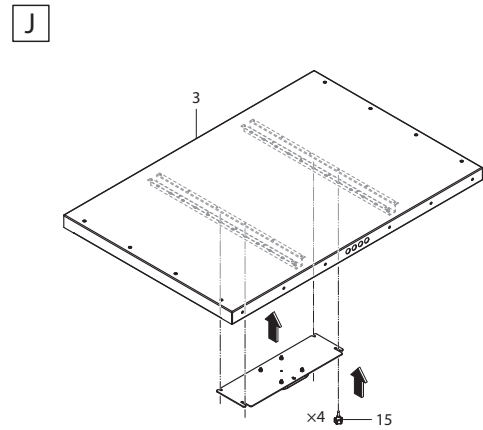


Fig. 13: Install the antenna on the cover plate

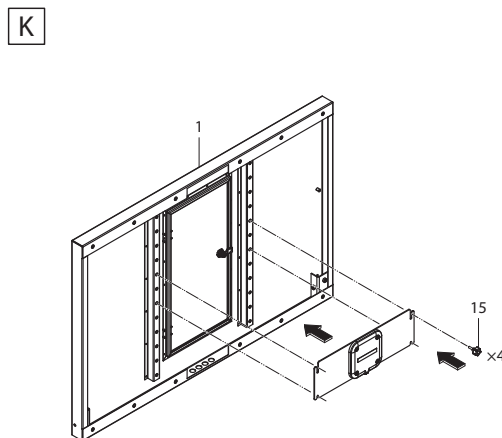


Fig. 14: Install the antenna on the second side panel

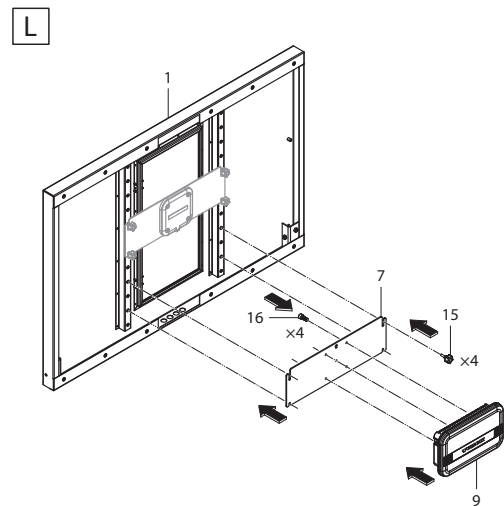


Fig. 15: Install the reader panel

6 Connection

6.1 Connecting the UHF reader

6.1.1 Connecting devices to Ethernet

The device has a 4-pin M12 female connector for connection to an Ethernet system.

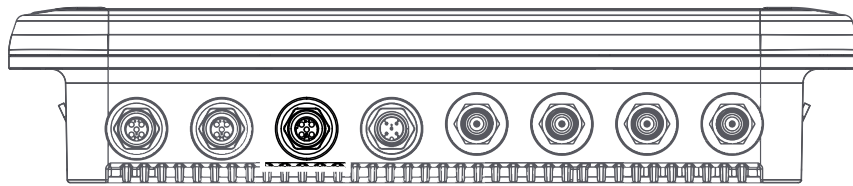


Fig. 16: M12 Ethernet connector

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

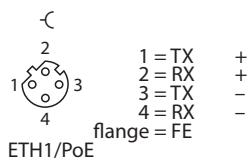


Fig. 17: Pin assignment for Ethernet connections



NOTE

With PoE, the supply voltage is transmitted via PoE Mode A with 4-wire cables.
The use of PoE and 24 VDC simultaneously is not supported.

6.1.2 Connecting the power supply

The device is provided with a 5-pin M12 plug connectors for connecting the power supply.

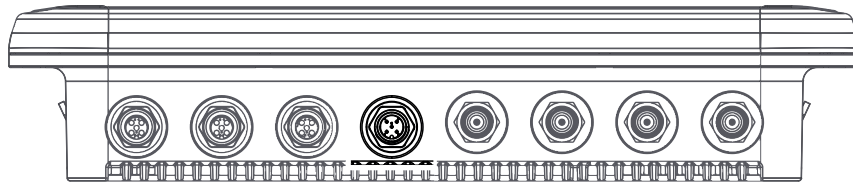


Fig. 18: M12 plug connector for connecting the power supply

- Connect the device to the power supply as per the following pin assignment (max. tightening torque 0.8 Nm).

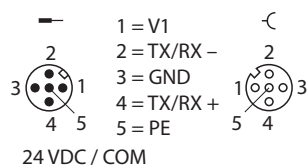


Fig. 19: Pin assignment of the power supply terminals

6.1.3 Connecting external antennas

The device is provided with four RP-TNC sockets for connecting up to four external antennas. The input impedance is 50 Ω .

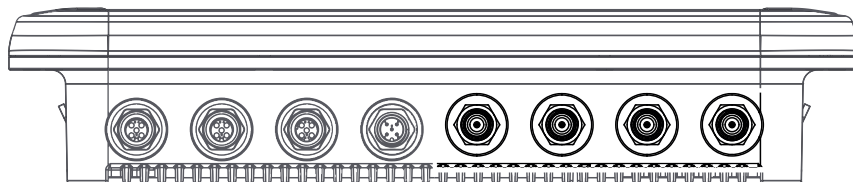


Fig. 20: RP-TNC sockets for connecting external antennas

- Connect external antennas with an RP-TNC antenna cable to the device (max. tightening torque 0.8 Nm).

7 Commissioning

7.1 Avoiding erroneous readings

The RFID tunnel cannot completely prevent tags outside the tunnel from being read. Unwanted read operations can be limited or prevented as follows:

- Reduce transmission power: Set the transmission power to the lowest level that is required to read all desired tags within the tunnel.
- Determine the required transmission power with example objects and worst-case scenarios under real operating conditions: The largest possible number of tags, reading on metallic objects or testing with other materials that interfere with the read process can be considered as worst-case scenarios.
- Increase the distance between objects on the conveyor belt
- Set filters via TURCK Vilant Node: The advanced version of TURCK Vilant Node offers the following filters, for example:
 - RSSI filter
 - EPC filter
 - Filter for the number of read operations
 - Filter for tag movements
 - Direction detection
 - Duplicate filter

7.2 TURCK Vilant Node: Starting the software



NOTICE

Insufficiently secured devices

Unauthorized access to sensitive data

- Change the password after the first login. TURCK recommends the use of a secure password.

- Enter the IP address of the browser and port number 8080 in the address bar of a browser.
- Log onto the reader with a username and password. The default username is **admin**. The default password is **vilantnode**.

Fig. 21: Entering the IP address

► Open the **Configuration** area.

Vilant Node

Reader status

VILANT SYSTEMS

Status

Configuration

Modules

Tag reads

Send queue

Log

Readme

Third Party Libraries

RF firmware

Restart

General

Reader name	
Device Unique ID	46a74b62
License	Activated Pro License
Vilant Node version	1.0.1.cdec4df1
Device	TN-UHF-Q180-EU-LNX, 0180 / 00:07:46:a7:4b:62
Reader local time	2021-01-06 23:44:20 GMT+01:00
Reader uptime	5 days 22 hours 44 minutes 12 seconds

Components

Component	State	Description
DEVICE	ERROR	Component(s) with errors: Clock, Modules
Ambient temperature	OK	
Ant 1 Jammer power	OK	1.70 dBm
Ant 1 Reverse power	OK	10.00 dBm
Ant 1 Transmit power	OK	12 dBm
Ant 2 Jammer power	OK	4.70 dBm
Ant 2 Reverse power	OK	13.20 dBm
Ant 2 Transmit power	OK	12 dBm
Ant 3 Jammer power	OK	3.20 dBm
Ant 3 Reverse power	OK	11.40 dBm
Ant 3 Transmit power	OK	12 dBm
Ant 4 Jammer power	OK	0.10 dBm

Fig. 22: Opening the Configuration area in TURCK Vilant Node

► Configure the reader (here: Set transmission zone).

The screenshot shows the 'Configuration' page for a 'Vilant Node'. The 'BASIC' tab is selected, displaying a table of configuration parameters. On the left, there is a sidebar with icons for Status, Configuration, Tag reads, Send queue, Log, Readme, RF firmware, and Restart. At the bottom left, there are buttons for SAVE, DOWNLOAD, and UPLOAD.

Name	Value	Description
DEBUS_PASSTHRU_ENABLED	Off ☐ On ☒	If set do not start reading but only pass through data to debus reader
DEBUS_PASSTHRU_PORT	9102	If set do not start reading but only pass through data to debus reader
DIM_ENABLED	Off ☐ On ☒	Enables Device Manager features, including sending of device status updates, remote configuration and software updates.
DIM_URL		Device Manager server URL, HTTP(S). Include authentication credentials in URL, if needed.
GPIO_TRIGGER	Example: 1,0 (Device 1 port 0) 0,1	Defines IO device and port used for controlling RFID reader. Requires two number values separated with comma. The first value defines the device and the second defines the port. Example: value '0,1' will use device 0 and port 1 for triggering RFID reading. RFID reader is device 0.
MY_NAME	VilantNode	Reader name/Location ID. TVVMSENDER tagfilter uses this in asset events.
RFID_ENABLED_ANTENNAS	Bitmask 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐	Which antennas to read from, bitmask, up to 31 antennas, 0=all
RFID_POPULATION	64	Gen2 population size
RFID_POWER	2000 Edit	Transmit power. Either single number in mBm or for each antenna separated with comma. (supported power levels 500 - 2800, 1000 mBm = 10 dBm).
RFID_SESSION	2	Gen2 session
RFID_TRIGGERED_READING	Off ☐ On ☒	Controls whether RFID reader is started and stopped with triggers or RFID reading is always reading. ON = Use triggers, OFF = Use always active reading
SITE		The site reader in which reader operates at. TVVMSENDER tagfilter uses this in asset events.
TAGFILTER	DUPLICATE=60000	Instructions on how to configure tagfilters are provided in the Readme.

Fig. 23: Configuring the reader in TURCK Vilant Node

7.3 Setting the transmission zone

The reader transmission zone can be adapted to the specific application using the following parameters. Default values are shown in bold.

Setting	Meaning
RFID_SESSION	Single target, Session 1 With a smaller number of tags, dual-target mode can be used to activate software filters such as tag movement, read count and direction.
RFID_POPULATION	The setting depends on the number of expected tags - Low number of tags: 10 - Medium number of tags: 20 - Large number of tags: 50 Default settings: 64
Antenna transmit time	The setting depends on the number of expected tags - Low number of tags: 250 ms - Medium number of tags: 500 ms - Large number of tags: 500...1000 ms Default settings: 65535 ms

7.4 Typical read times

The values given below are approximate. The typical read times depend, among other things, on the following factors:

- Number of tags to be read
- The transmission zone configuration
- Movement of the objects (static or dynamic reading)

Number of tags	Typical read time
1...100	< 1 s
101...300	< 2 s
More than 300	> 2 s

7.5 Maximum speed of the conveyor belt

The maximum speed of the conveyor belt is 1 m/s. If the speed of the conveyor belt is above 1 m/s, the tags cannot be processed reliably.

7.6 Aligning tags

The alignment of the tags depends on the antenna polarization and the alignment of the detection range.

- Align the tag according to the following table:

Antenna polarization	Circular	Linear	Linear
Detection range alignment	Left/right	Vertical	Horizontal
Antenna	+		—
Tag alignment	Not required	Vertical	Horizontal
			
			
			
			
			
			

8 Parameterizing and configuring

The TN-UHF-Q300-LNX reader can be parameterized and configured using the preinstalled TURCK Vilant Node software.

8.1 Activating and deactivating the transmission zone: RFID Reading Control

The reader transmission zone can either be continuously active or controlled using triggers.

In the default configuration, the reader transmission zone is active. The reader automatically reads tags located in the field.

Triggers for starting the read operation can be defined using TURCK Vilant Node. The reader only reads tags after the trigger has been triggered. Activation and deactivation of the transmission zone can be controlled by several triggers at the same time. TURCK Vilant Node supports the following triggers via RFID_TRIGGERED_READING:

Configuration	Description
GPI	GPI_TRIGGER can be used to define a GPI signal to activate or deactivate the transmission zone. The signal source can be either a reader or an external sensor. The expected signal status for activating and deactivating the transmission zone can be inverted via GPI_INVERTED .
REST	The transmission zone can be activated and deactivated using the / rfid/start and / rfid/stop REST interfaces.

8.2 JSON data format

The read data is displayed in JSON format in TURCK Vilant Node. Data in JSON format is also used for the internal reader functions and kept in STORE. Empty fields and default fields are omitted in JSON.

```

```json
{
 "EPC": "301588F858009D4473D8D797", // EPC in hexadecimal format
 "URI": "urn:epc:id:sgtin:6438422.000629.19123459991", //
Decrypted URN format
 "userdata": "01234567FFFF", // Read data in hexadecimal format:
TID or user memory
 "direction": "OUT", // Result of direction detection, if used
 "filterchain": 0, // Internal filter chain
 "readcount": 1, // Indicates how often a tag was read (normally
1, as the read operations are processed individually).
 "rssi": -39, // Received signal strength in dBm
 "antenna": 1, // Antenna that read the tag
 "freq": 3, // Frequency that was used during the read operation
(hardware-dependent)
 "phase": 3732, // Phase angle (hardware-dependent)
 "dopplerfreq": 7, // Doppler frequency
 "timestamp": "2024-09-23T07:40:05.520Z" // Time stamp of the
read operation
}
```

```

8.3 Antenna status

The `RFID_ENABLED_ANTENNAS` configuration parameter consists of a bit mask for activating the individual antennas.

- ▶ Activate antennas via the following inputs:
 - 1: Activate external antenna 1
 - 2: Activate external antenna 2
 - 3: Activate external antenna 3
 - 4: Activate external antenna 4
 - Combinations (e.g. 1,2): Activate multiple external antennas (e.g. antenna 1 and antenna 2)

8.4 Interfaces: HTTP and REST

TURCK Vilant Node includes an HTTP server. The reader can be accessed via ports 8080 and 8081 (SSL). The port addresses that are used for access can be configured via `HTTPD_PORT` and `HTTPSD_PORT`.



NOTICE

Insufficiently secured devices

Unauthorized access to sensitive data

- ▶ Change the password after the first login. TURCK recommends the use of a secure password.

- ▶ Open TURCK Vilant node: Enter `http://<reader_IP_address>:8080` in the address bar of a browser window.
- ▶ Log into the reader using the following access data:
User name: admin
Password: vilantnode

TURCK Vilant Node supports the following commands:

| Command | Function |
|-------------------|--|
| POST /rfid/start | Starts the read operation |
| POST /rfid/stop | Ends the read operation |
| POST /rfid/write | Writes an EPC to a tag |
| GET /rfid/store | Shows a list of tags currently in the STORE module |
| GET /rfid/status | Queries the reader status |
| POST /rfid/gpo | Controls the reader status or the connected GPIO devices |
| GET /kill | Changes the reader status with URL query arguments |
| POST /inject | Changes the format for the read data |
| GET /rfid/config | Queries the reader configuration |
| POST /rfid/config | Overwrites the reader configuration |

A comprehensive explanation of the commands can be found in TURCK Vilant Node under **Readme**.

8.5 MQTT



NOTE

In the following descriptions, <id> is used as a placeholder for the reader ID. The individual ID can be found in the information on license activation.

The Pro version of TURCK Vilant Node includes some standard functions via MQTT. No MQTT functions can be used with the Lite version. To purchase the Pro license, please reach out to your contact person at TURCK.

The MQTT functions can be adapted to specific applications.

- ▶ Establish a connection to the MQTT server using the MQTT_SERVER configuration in a URL format. Examples: `mqtt://server` or `mqtt://server:8886`
- ▶ Log on to the MQTT server using MQTT_USERNAME and MQTT_PASSWORD. If no username and password are specified, an unauthenticated connection is established.

TURCK Vilant Node supports the following commands:

| Command | Function |
|---|--|
| App Status:
/tvs/<id>/status | If an MQTT subscriber has been configured, the software sends status updates to the MQTT broker. |
| Tag Events:
/tvs/<id>/reads | If an MQTT broker is available, the subscriber system receives messages for each tag event. |
| Config Data:
/tvs/<id>/config | Receives the reader configuration when this is requested via cmd/config/get |
| Config Get Request:
/tvs/<id>/cmd/config/get | Sends a GET command to the reader to provide the configuration |
| Config Set Request:
/tvs/<id>/cmd/config/set | Writes configuration data (Config Data) to the reader |
| RFID Reader Start:
/tvs/<id>/cmd/rfid/start | Starts the read operation |
| RFID Reader Stop:
/tvs/<id>/cmd/rfid/stop | Ends the read operation |
| GPIO Events Data:
/tvs/<id>/gpio | Queries GPIO events |
| GPIO Event Request:
/tvs/<id>/cmd/gpio | Controls the GPIO ports |

A comprehensive explanation of the commands can be found in TURCK Vilant Node under **Readme**.

8.6 Function blocks: Modules

TURCK Vilant Node contains preprogrammed function blocks to process reader data. The function blocks can be linked under **Modules** to create simple programs.

To process data, the **RFID_READER** and **STORE** modules are required as a minimum. A comprehensive explanation of the modules can be found in TURCK Vilant Node under **Readme**.

| Module | Function |
|---|---|
| RFID_READER | Module for the RFID reader |
| DUPLICATE | Duplicate filter |
| EVENTSENDER | Sends events to a defined end point |
| STORE | Module for storing data and events |
| RSSI | Sends events based on the received RSSI value |
| EPCHEX | EPC-based filter function |
| DIRECTION
(Pro license required) | Direction detection for tags |
| ANTENNA | Antenna-based filter function |
| INPUT | Receives input data from an external I/O device |
| OUTPUT | Sends output data to an external I/O device |
| EPCMANGLE | Changes the data during the read operation |
| SEEN | Sends events when a tag is detected |
| MQTT SENDER
(Pro license required) | Sends events via MQTT |
| TIMEOUT | Enables timeout-based triggers |
| DELAY | Allows a trigger signal to be delayed |
| AND & OR | Allows functions and modules to be logically connected |
| MIN_READCOUNT
(Pro license required) | Enables filter functions depending on the number of read operations |
| TAGDATA | Supplements the read data with an additional Info field |

Fig. 24: TURCK Vilant Node: Readme

8.6.1 Example: Creating modules

In the following example, the RFID_READER and STORE modules are created in TURCK Vilant Node.

- Open the module configuration feature in TURCK Vilant Node: Click on **Modules**.

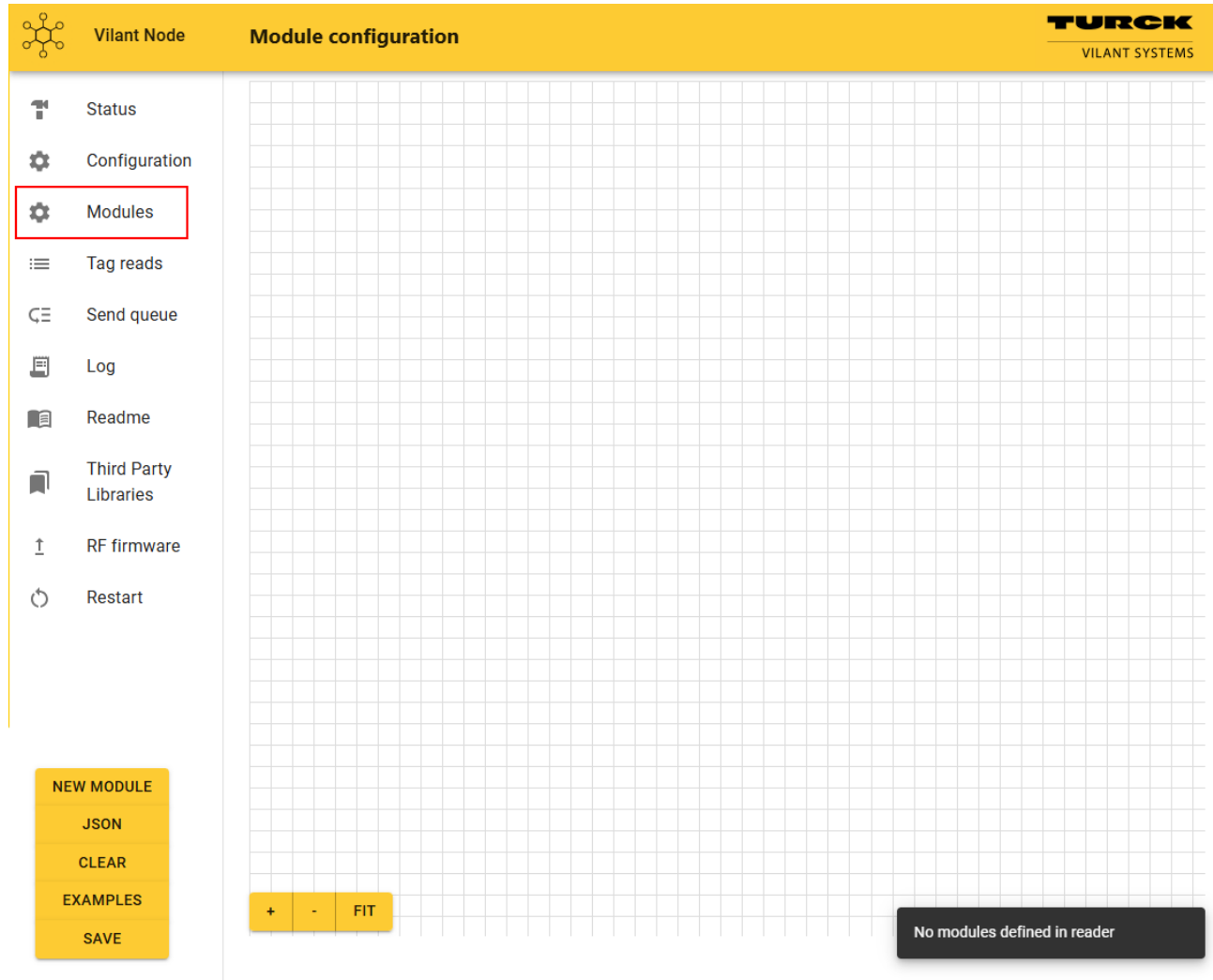


Fig. 25: Opening the Modules area

- Add modules: Click on **New Module** and drag and drop the desired module into the configuration area (in this case: RFID_READER).

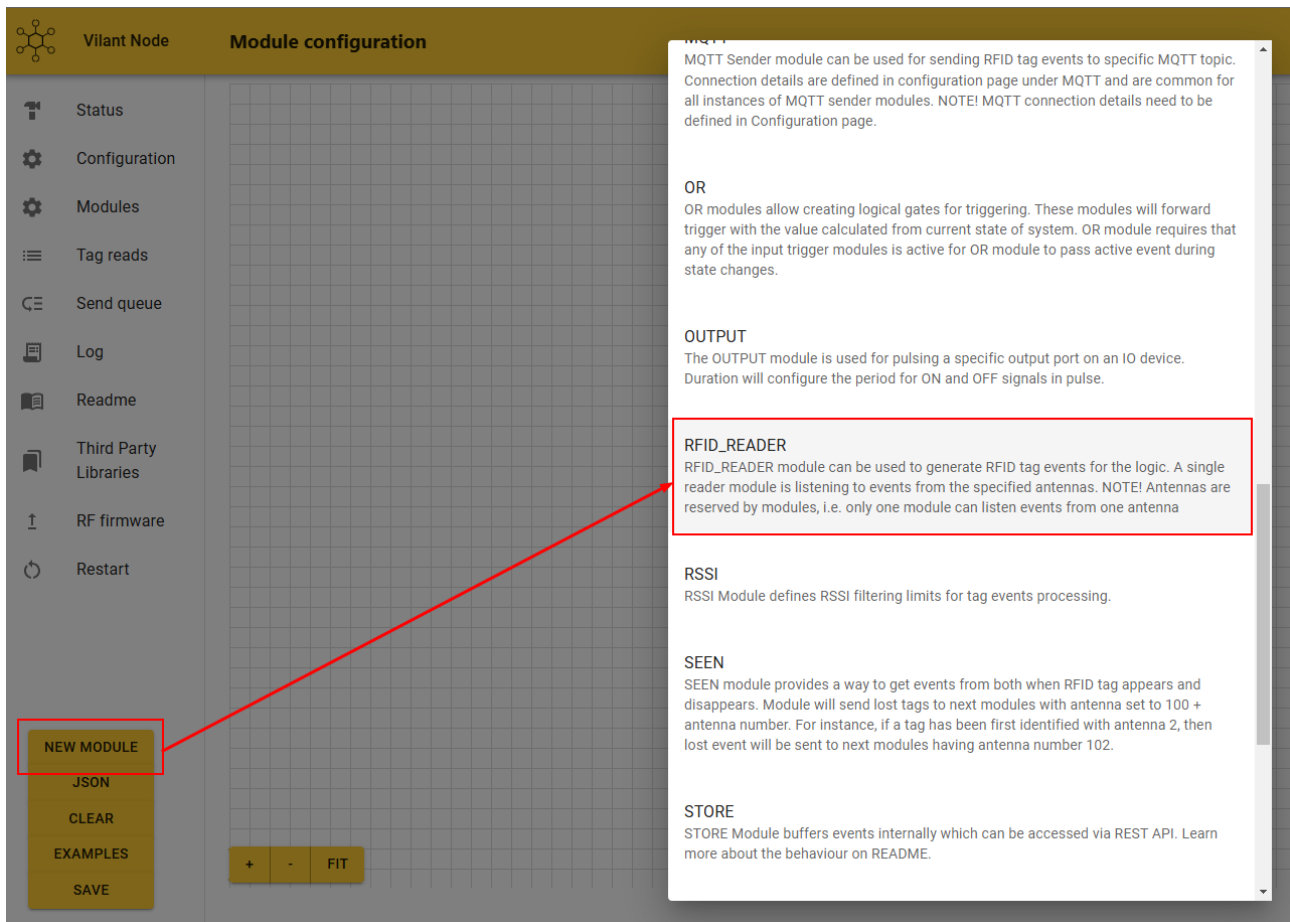


Fig. 26: Adding the RFID_READER module

- ▶ Add additional modules. The RFID_READER and STORE modules must always be present.
- ▶ Connect the inputs and outputs of the modules using drag-and-drop.

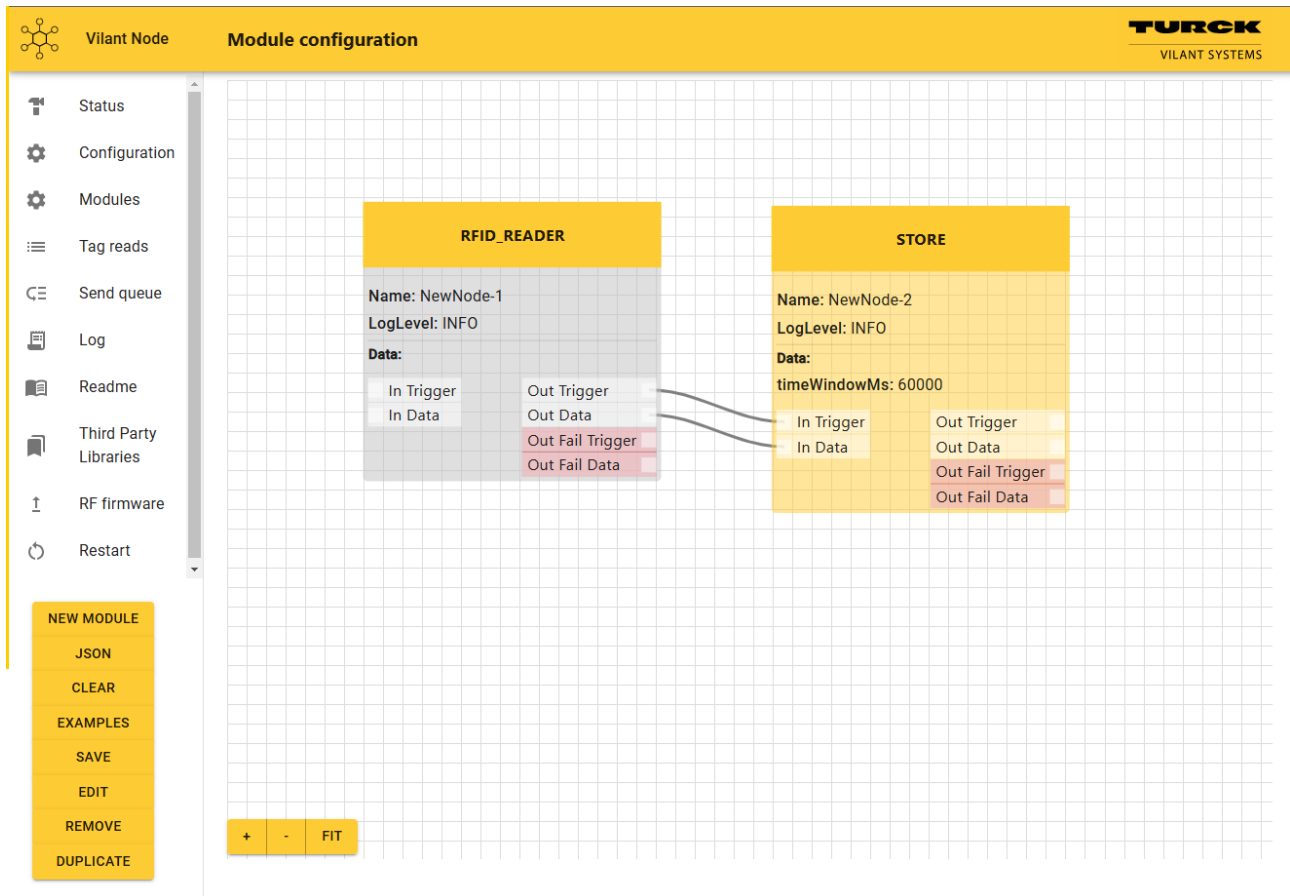


Fig. 27: Adding additional modules (in this case: STORE)

► Save the module configuration.

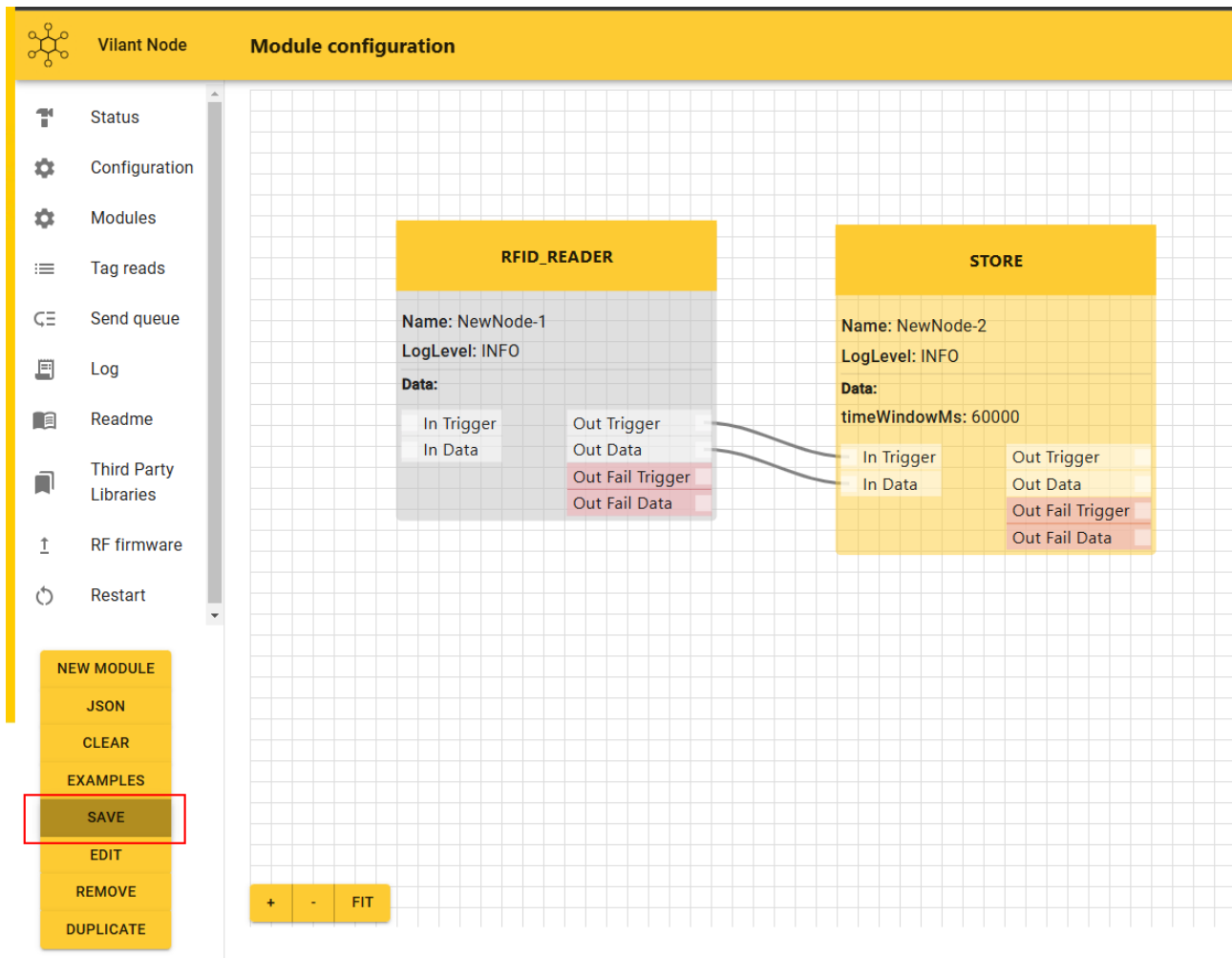


Fig. 28: Saving the module configuration

8.6.2 Creating a JSON file

For support purposes, the programs created in the Modules area can be opened in JSON format.

- ▶ Click **JSON** in the selection menu.
- ⇒ The module configuration is displayed in JSON format.

Example:

```
{
  "modules":
    { "Node-1737019719831":
      { "type": "RFID_READER", "logLevel": 6, "data":
        { "reader": 0, "antennas": [1], "readingActive": false } },
      "Node-1737019737044": { "type": "STORE", "logLevel": 6, "data":
        { "timeWindowMs": 60000, "keep": true } } },
  "connections":
    [
      { "source": "Node-1737019719831", "target": "Node-1737019737044",
        "type": "TRIGGER", "fail": false },
      { "source": "Node-1737019719831", "target": "Node-1737019737044",
        "type": "DATA", "fail": false }
    ]
}
```

8.7 Digital I/O channels

TURCK Vilant Node supports control of external I/O devices using GPIOs. In TURCK Vilant Node, under **Readme**, you will find further information on controlling external I/O modules as well as simple programming examples.

9 Operation

9.1 UHF reader: LEDs

The meaning of the LED displays on the reader can be found in the device-specific Instructions for Use.

10 Troubleshooting

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

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

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

11 Maintenance

11.1 Installing TURCK Vilant Node retrospectively

The TURCK Vilant Node software is preinstalled when the system solution is delivered. Retrospective installation is only necessary if a reader has been reset to the factory settings or if a reader has been replaced. The software must be installed using the web server's firmware update function.

Installing the software via the web server

- ▶ Connect the device to a PC via the Ethernet interface.
- ▶ Open the device web server: Enter the IP address of the device in the address bar of the browser or start the web server using TAS.
- ▶ Click **Firmware** in the web server.

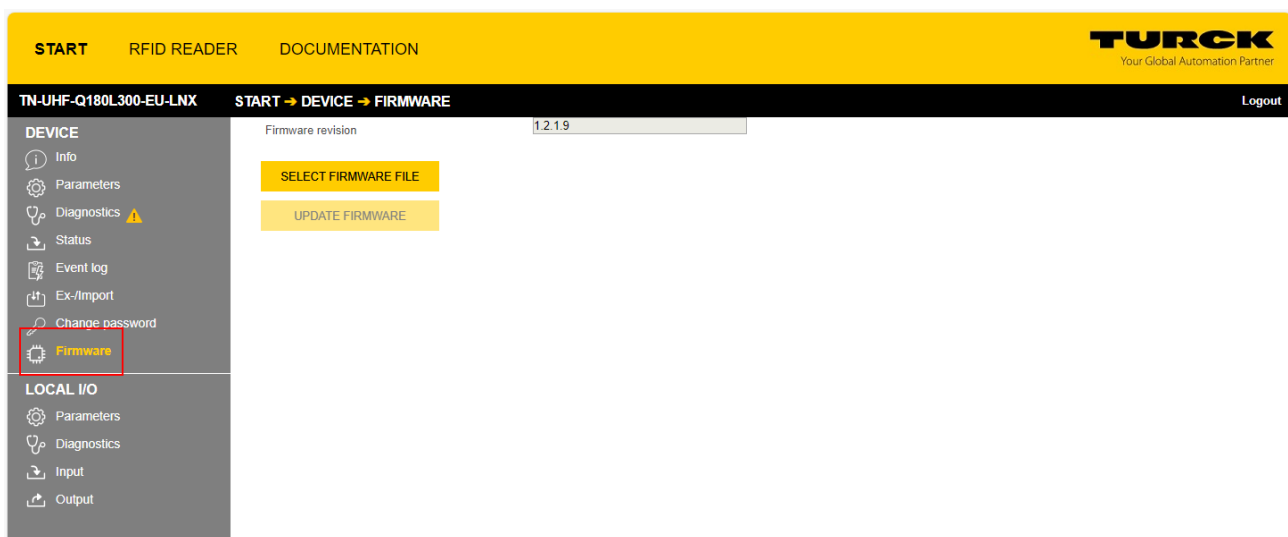


Fig. 29: Opening the firmware update function in the web server

- Select the update file.

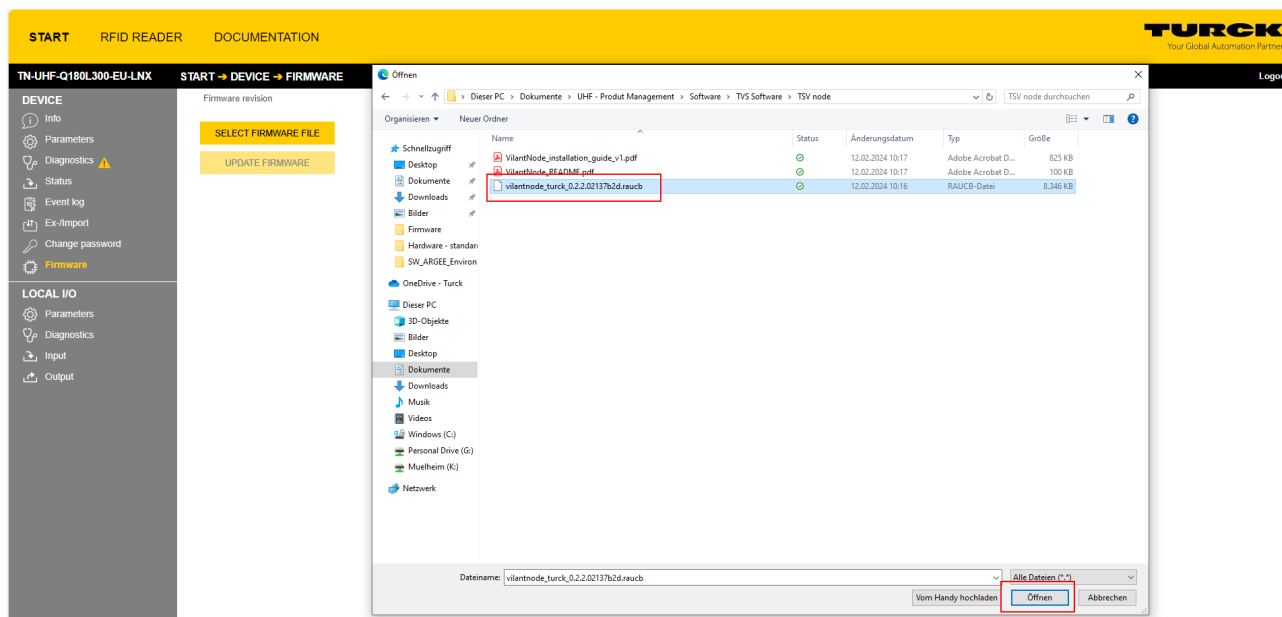


Fig. 30: Update file

- Start installing the update using the **UPDATE FIRMWARE** button.

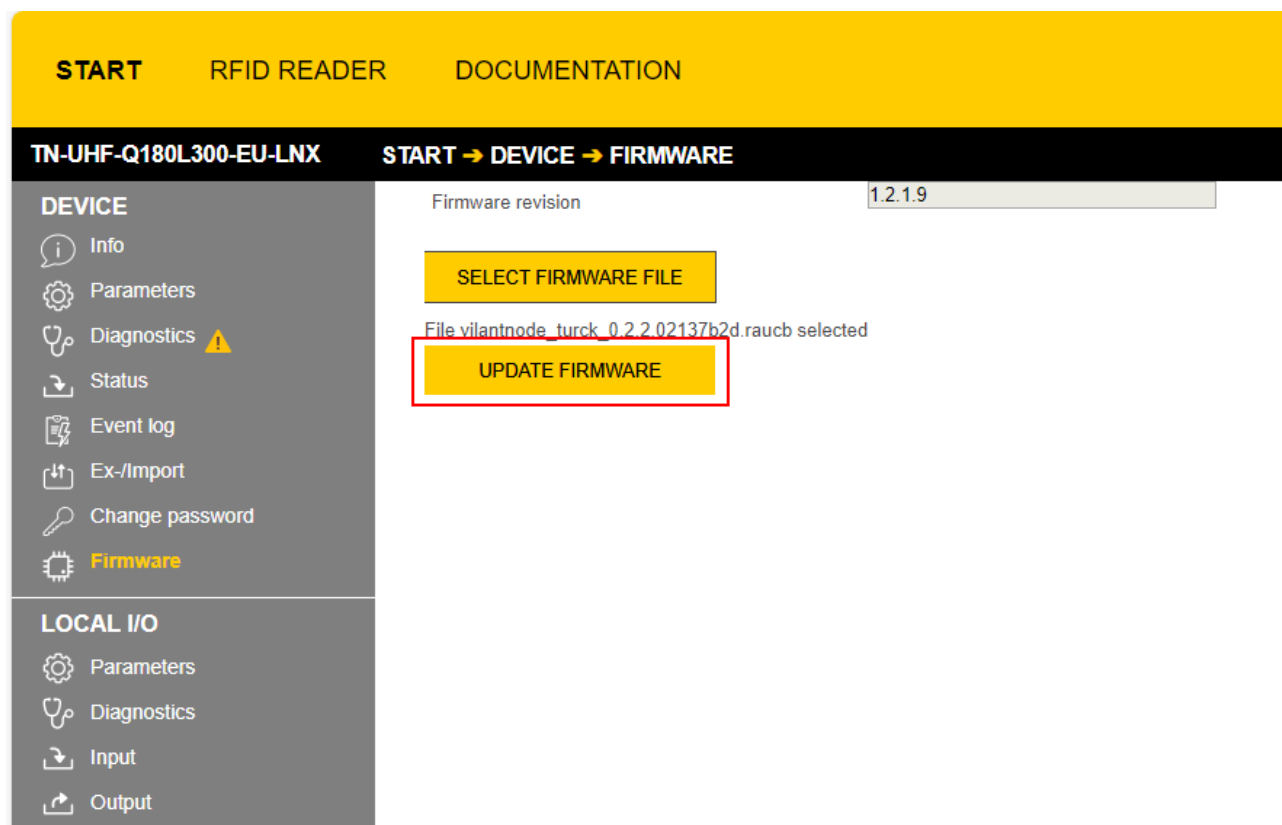


Fig. 31: Starting the update

- Confirm installation by clicking **OK**.

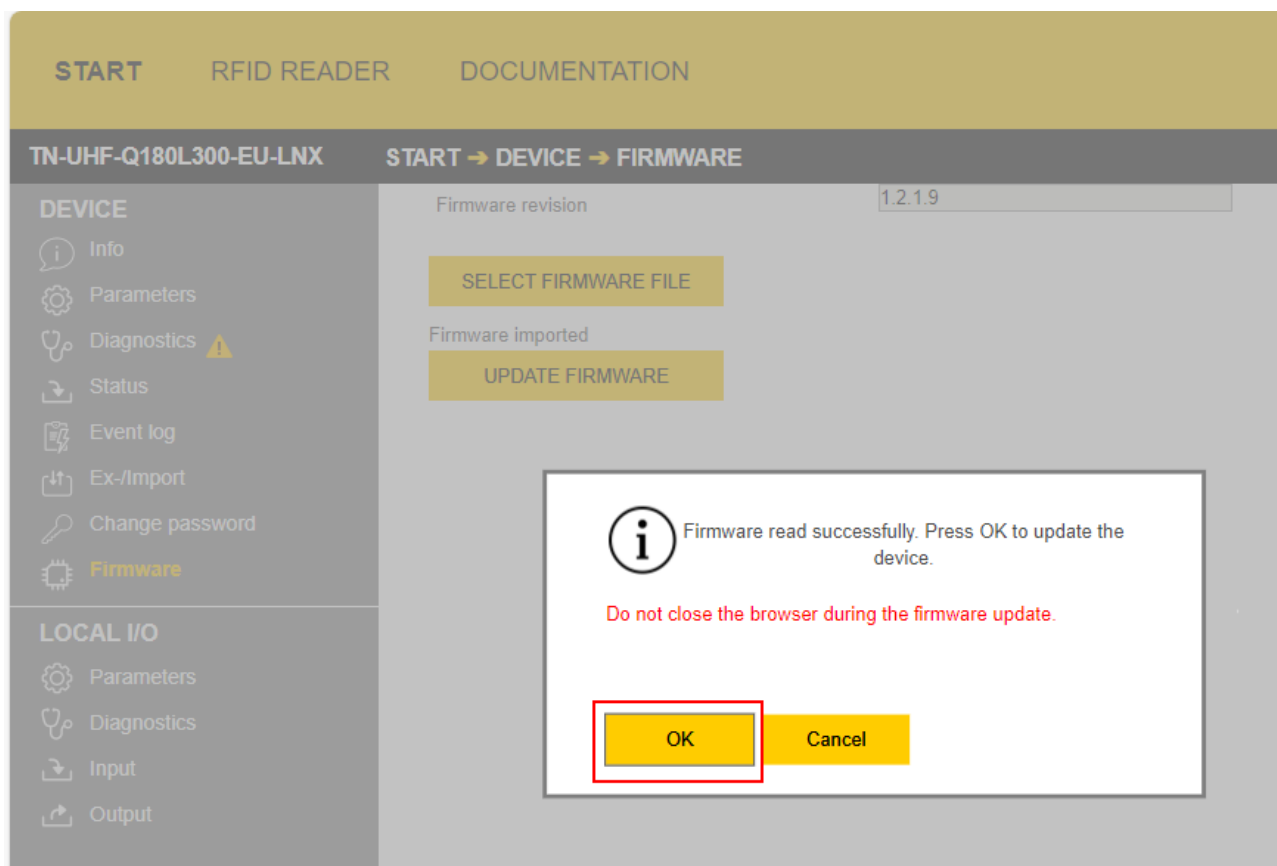


Fig. 32: Confirming installation

11.2 Updating the reader

Information on updating the reader can be found in the device-specific Instructions for Use.

12 Repair

The device is not intended for repair by the user. The device must be decommissioned if it is faulty. Observe our return acceptance conditions when returning the device to TURCK.

12.1 Returning devices

If a device has to be returned, bear in mind that only devices with a decontamination declaration will be accepted. This is available for download at <https://www.turck.de/en/return-service-6079.php> and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Disposal



The devices must be disposed of properly and do not belong in the domestic waste.

14 Technical data

| UHF-SYS-TUNNEL... | |
|--|---------------------------------|
| Electrical data | |
| Operating voltage U_B | 12...30 VDC |
| DC rated operating current I_e | ≤ 1200 mA |
| PoE standard | IEEE 802.3at (PoE+) |
| Data transfer | Electromagnetic AC field |
| Technology | UHF-RFID |
| Radio communication and protocol standards | ISO 18000-63
EPCglobal Gen 2 |
| Mechanical data | |
| Ambient temperature | -30...+50 °C |
| Dimensions | 1213 × 923 × 1515 mm |
| Housing material | Metal, yellow |
| Type of protection | IP67 |
| System description | |
| Network protocol | TCP/IP
REST API |
| Programming interface | Ethernet |
| System data | |
| Web server | Default: 192.168.1.254:8080 |

15 TURCK branches — contact data

| | |
|-----------------------|---|
| Germany | TURCK GmbH
Witzlebenstraße 7, 45472 Mülheim an der Ruhr
www.turck.de |
| Australia | Turck Australia Pty Ltd
Building 4, 19-25 Duerdin Street, Notting Hill, 3168 Victoria
www.turck.com.au |
| Austria | Turck GmbH
Graumannsgasse 7/A5-1, A-1150 Vienna
www.turck.at |
| Belgium | Turck Multiprox N. V.
Lion d'Orweg 12, B-9300 Aalst
www.multiprox.be |
| Brazil | Turck do Brasil Automação Ltda.
Rua Anjo Custódio Nr. 42, Jardim Anália Franco, CEP 03358-040 São Paulo
www.turck.com.br |
| Canada | Turck Canada Inc.
140 Duffield Drive, CDN-Markham, Ontario L6G 1B5
www.turck.ca |
| China | Turck (Tianjin) Sensor Co. Ltd.
18,4th Xinghuazhi Road, Xiqing Economic Development Area, 300381 Tianjin
www.turck.com.cn |
| Czech Republic | TURCK s.r.o.
Na Brně 2065, CZ-500 06 Hradec Králové
www.turck.cz |
| France | TURCK BANNER S.A.S.
11 rue de Courtalin Bat C, Magny Le Hongre, F-77703 MARNE LA VALLEE Cedex 4
www.turckbanner.fr |
| Hungary | TURCK Hungary kft.
Árpád fejedelem útja 26-28., Óbuda Gate, 2. em., H-1023 Budapest
www.turck.hu |
| India | TURCK India Automation Pvt. Ltd.
401-403 Aurum Avenue, Survey. No 109 /4, Near Cummins Complex, Baner-Balewadi Link Rd., 411045 Pune - Maharashtra
www.turck.co.in |
| Italy | TURCK BANNER S.R.L.
Via San Domenico 5, IT-20008 Bareggio (MI)
www.turckbanner.it |
| Japan | TURCK Japan Corporation
ISM Akihabara 1F, 1-24-2, Taito, Taito-ku, 110-0016 Tokyo
www.turck.jp |

| | |
|-----------------------|--|
| Korea | Turck Korea Co, Ltd.
A605, 43, Iljik-ro, Gwangmyeong-si
14353 Gyeonggi-do
www.turck.kr |
| Malaysia | Turck Banner Malaysia Sdn Bhd
Unit A-23A-08, Tower A, Pinnacle Petaling Jaya, Jalan Utara C,
46200 Petaling Jaya Selangor
www.turckbanner.my |
| Mexico | Turck Comercial, S. de RL de CV
Blvd. Campestre No. 100, Parque Industrial SERVER, C.P. 25350 Arteaga,
Coahuila
www.turck.com.mx |
| Netherlands | Turck B. V.
Ruiterlaan 7, NL-8019 BN Zwolle
www.turck.nl |
| Poland | TURCK sp.z.o.o.
Wroclawska 115, PL-45-836 Opole
www.turck.pl |
| Romania | Turck Automation Romania SRL
Str. Siriului nr. 6-8, Sector 1, RO-014354 Bucuresti
www.turck.ro |
| Sweden | Turck AB
Fabriksstråket 9, 433 76 Jonsered
www.turck.se |
| Singapore | TURCK BANNER Singapore Pte. Ltd.
25 International Business Park, #04-75/77 (West Wing) German Centre,
609916 Singapore
www.turckbanner.sg |
| South Africa | Turck Banner (Pty) Ltd
Boeing Road East, Bedfordview, ZA-2007 Johannesburg
www.turckbanner.co.za |
| Turkey | Turck Otomasyon Ticaret Limited Sirketi
Inönü mah. Kayisdagi c., Yesil Konak Evleri No: 178, A Blok D:4,
34755 Kadiköy/ Istanbul
www.turck.com.tr |
| United Kingdom | TURCK BANNER LIMITED
Blenheim House, Hurricane Way, GB-SS11 8YT Wickford, Essex
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| USA | Turck Inc.
3000 Campus Drive, USA-MN 55441 Minneapolis
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