Your Global Automation Partner

TURCK

TXF700
HMI Series in IP67

Instructions for Use

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1 About These Instructions

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

1.1 Target groups

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

1.2 Explanation of symbols used

The following symbols are used in these instructions:

	**DANGER** DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.
	**WARNING** WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.
	**CAUTION** CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.
	**NOTICE** NOTICE indicates a situation which may lead to property damage if not avoided.
	**NOTE** NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.
▶	**CALL TO ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULTS OF ACTION** This symbol denotes relevant results of actions.

1.3 Other documents

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

- Data sheet
- Quick Start Guide

1.4 Feedback about these instructions

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

2 Notes on the Product

2.1 Product identification

These instructions apply to the following IP67 HMIs:

- TXF705-00VPST
- TXF707-00VP20
- TXF710-00VP20
- TXF715-00VP20
- TXF721-00VP20

2.1.1 Type label

The Type label is located on the back of the device.

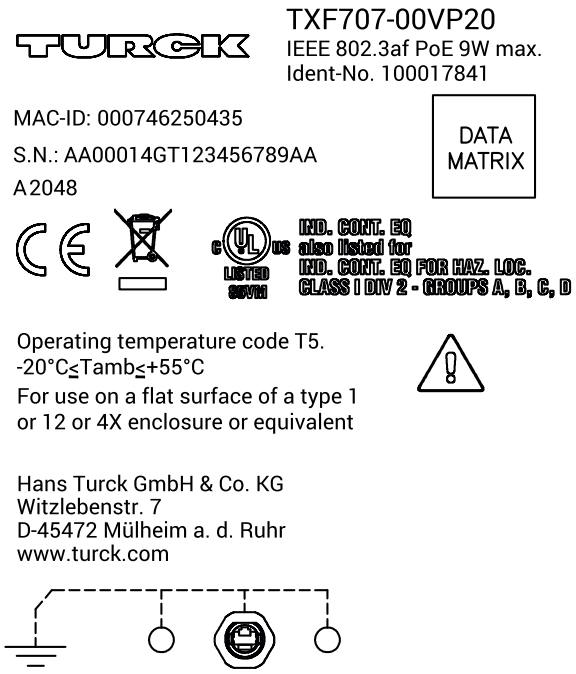


Fig. 1: Type label – TXF707 (example)

Type designation	TXF707-…
Ident No.	100017841
Year/week of production	A2048
Serial number (S.N.)	AA…
Internal version ID of the product (V)	V…

2.1.2 Type code

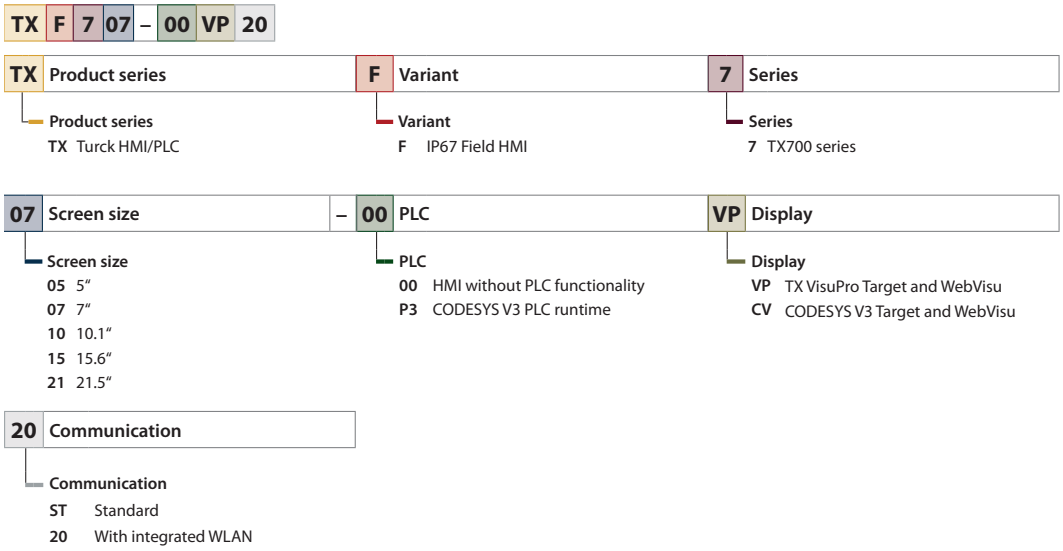


Fig. 2: Type code TX700

2.2 Scope of delivery

- TXF700
- Quick-Start Guide

2.3 Legal requirements

The device is subject to the following EC directives:

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

2.4 Manufacturer and service

Hans Turck GmbH & Co. KG
Witzlebenstraße 7
45472 Mülheim 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**

For further inquiries in Germany contact the Sales and Service Team on:

- Sales: +49 208 4952-380
- Technology: +49 208 4952-390

Outside Germany, please contact your local Turck representative.

3 For Your Safety

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

3.1 Intended use

These devices are designed solely for use in industrial areas.

The HMIs (Human Machine Interfaces) of the TXF family are used to control, operate and monitor machine processes. Due to the IP67 protection class, the devices are suitable for installation on the machine.

The devices may 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 notes

- The device may only be assembled, installed, operated, parameterized and maintained by professionally-trained personnel.
- The device may only be used in accordance with applicable national and international regulations, standards and laws.
- The device only meets the EMC requirements for industrial areas and is not suitable for use in residential areas.
- Do not open the devices under voltage.
- The device is intended for use on a flat surface of a type 1 or 12 or 4X enclosure or equivalent (e. g. mounting flange TXF-MT-…).

3.3 Note on explosion protection (USA and Canada only)

- The device is approved for operation in hazardous areas only in the USA and Canada and does not have ATEX approval.
- The device is suitable for the use in Class 1, Division 2, groups A, B, C and D hazardous locations or for the use in non-hazardous locations.
- Use only components that meet Class 1, Division 2 certification.
- Do not disconnect the device in an ignitable atmosphere when energized.
- This equipment is a type 12, 4X and 1 device and is meant to be installed through the wall of an enclosure (e. g. mounting flange TXF-MT-…).
- The connection level of the device must only be accessible by means of a tool.

4 Product Description

The device is designed in protection class IP67.

One Ethernet port is available for connection to Ethernet. The device is supplied via Power-over-Ethernet (PoE). An M22 connector is available for connecting the Ethernet cable. In combination with a special IP67 PoE cable, the protection class IP67 is ensured. The device (except for TXF705) as a built-in WLAN antenna. In addition, temperature and acceleration sensors are integrated.

The following device variants are available:

- TXF705-00VPST: 5'' HMI operator panel, ARM Cortex-A9 dual core 800 MHz, 1 Ethernet port, PoE, 4 GB flash, 1 GB RAM
- TXF707-00VP20: 7'' HMI operator panel, ARM Cortex-A9 dual core 800 MHz, 1 Ethernet port, PoE, 4 GB flash, 1 GB RAM, WLAN
- TXF710-00VP20: 10.1'' HMI operator panel, ARM Cortex-A9 dual core 800 MHz, 1 Ethernet port, PoE, 4 GB flash, 1 GB RAM, WLAN
- TXF715-00VP20: 15.6'' HMI operator panel, ARM Cortex-A9 dual core 800 MHz, 1 Ethernet port, PoE, 8 GB flash, 2 GB RAM, WLAN
- TXF721-00VP20: 21.5'' HMI operator panel, ARM Cortex-A9 dual core 800 MHz, 1 Ethernet port, PoE, 8 GB flash, 2 GB RAM, WLAN

4.1 Device overview

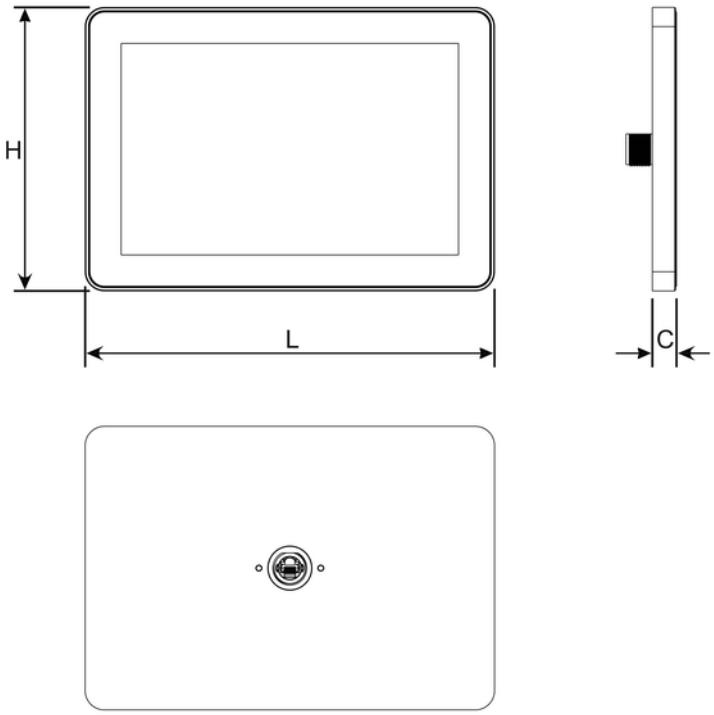


Fig. 3: TXF7…

Device	Height (H)	Width (L)	Depth (C)
TXF705	105.1 mm/04.13"	148.3 mm/05.83"	16.5 mm/0.06"
TXF707	131.6 mm/05.18"	195.2 mm/07.68"	16.5 mm/0.06"
TXF710	183.1 mm/07.20"	264.5 mm/10.41"	16.5 mm/0.06"
TXF715	248 mm/09.76"	398.6 mm/15.69"	26.5 mm/01.04"
TXF721	325.6 mm/12.81"	534.1 mm/21.02"	26.5 mm/01.04"

4.2 Properties and features

- Gateway function with OPC UA Server and Client (with TX VisuPro)
- MQTT for connecting all common cloud systems (with TX VisuPro)
- TX VisuPro HMI protocols for connecting control systems of all common manufactuers

4.3 Functions and operating modes

The devices of the TXF family are IP67 HMI operator panels. With an optional CODESYS license the devices can also be used as CODESYS V3 controllers. Due to the IP67 protection class, the devices are suitable for installation on the machine critical areas. Power is supplied via "Power over Ethernet" (PoE) with standard CAT5 wiring. Special, pre-assembled cables with an IP67 M22 connection ensure IP67 protection. A WLAN antenna is integrated into the housing for wireless communication.

Additional functions

- OPC UA server (with TX VisuPro)
- OPC UA client and MQTT (with TX VisuPro)

4.3.1 Interfaces

The device has the following interfaces:

- Ethernet port:
  - 1 × 10/100 PoE
- USB port:
  A special cable (TXF-M22G-RJ45-5M-USB-1M) is required to use the USB port.

Compatible USB devices

Specification	
Format	FAT, FAT32
Max. size	Limited by FAT32 specifications ≤ 4 GB for a single file ≤ 32 GB

4.4 Accessories

4.4.1 PoE cables

Ident no.	Type	Description
100020099	TXF-M22W-RJ45-5M	5 m, M22 angled, RJ45
100020100	TXF-M22G-RJ45-5M	5 m, M22 straight, RJ45
100020101	TXF-M22G-RJ45-5M-USB-1M	5 m, M22 straight, RJ45, 1 m USB
100020102	TXF-M22G-M22G-5M	5 m, 2 × M22 straight

4.4.2 Mounting flanges

Ident No.	Type	Description
100020090	TXF-MT-01	Mounting flange for mounting on tube brackets (TXF705, TXF707 and TXF710)
100020091	TXF-MT-02	Mounting flange for mounting on tube brackets (TXF715 and TXF72) or wall mounting of all TXF… devices
100020092	TXF-MT-03	Mounting flange for wall mounting (TXF705, TXF707 and TXF710)
100020093	TXF-MT-04	Mounting flange for wall mounting (TXF715 and TXF721)
100022475	TXF-MT-05	Mounting flange for wall mounting (TXF705, TXF707 and TXF710), PG9 cable gland
100022477	TXF-MT-06	Mounting flange for wall mounting (TXF715 and TXF721), PG9 cable gland

4.4.3 Brackets and adapters

Ident No.	Type	Description
100020096	TXF-MV-01	VESA bracket
100020097	TXF-MV-02	VESA adapter
100020098	TXF-TABLE-01	Table stand
100020094	TXF-MG-01	Goose neck bracket

4.4.4 M12 mounting tool

Ident no.	Type	Description
100020103	TXF-M22-TOOL	M22 mounting tool, tool holder: Standard hexagonal bit, 1/4" (6.3 mm)

NOTE
You will find further accessory products under www.turck.com.

5 Installing

NOTE
Suitable mounting accessories and suitable PoE Ethernet cables are available at www.turck.com.

- The equipment shall only be used in an area of not more than pollution degree 2, as defined in IEC/EN 60664- 1.
- The special mounting tool TX-M22-TOOL ensures the safe and IP compliant installation of the devices.
- The IP67 PoE cable (TXF-M22G-RJ45-5M oder TXF-M22G-M22G-5M) for achieving IP67 protection can only be used with a mounting surface thickness of 1.5 to 3 mm.
- The maximum permissible thickness of the mounting surface is 10 mm.
- The maximum surface roughness of the mounting surface for correct seating of the seal is 120 µm.

5.1 Mounting the device on a mounting surface

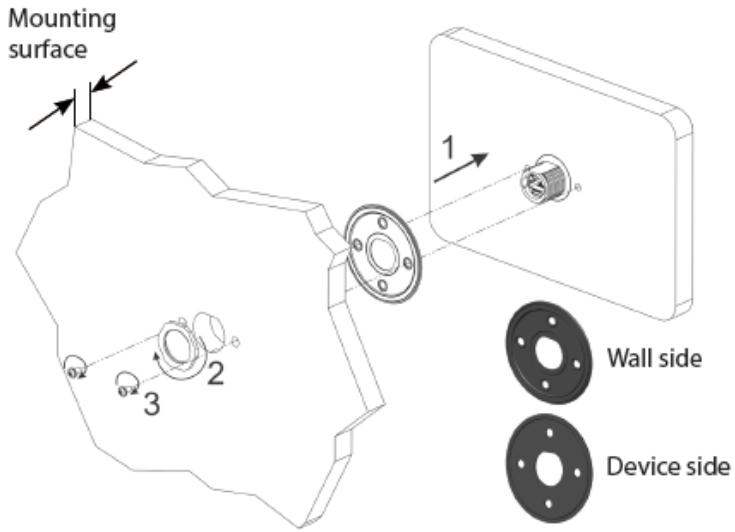


Fig. 4: Mounting TXF700

- ▶ Mount the device directly on the pre-drilled mounting surface or with special mounting adapters, tube brackets, wall brackets or similar accessories. The maximum tightening torque for the for the mounting screws is 130 Ncm, for the mounting nut 1000 Ncm.
- ▶ IP67 applications: Mount the device on the outside of an IP67 housing with appropriate accessories ([▷ 11]) e.g. IP67- PoE Ethernet cable TXF-M22G-RJ45-5M or TXF-M22G-M22G-5M.
- ▶ Make sure that the seal, which is included in the mounting accessories, is correctly seated.
- ▶ Observe IP classification of the accessories according to the corresponding data sheet.

5.2 Grounding the device

The device is grounded via a shielded CAT 5 cable. Alternatively, the device is grounded using screws on the right and left side of the M22 flange on the rear of the device.

General instructions for device grounding

- All the electronic devices in the control system must be properly grounded.
- Carry out grounding according to the applicable regulations.
- Ground the device to minimize noise effects from electromagnetic interference.

6 Connecting

DANGER
Ignitable atmosphere
Explosion by ignitable sparks
- ▶ Do not disconnect the device in an ignitable atmosphere when energized.

6.1 Connecting the device to Ethernet and to the supply voltage

The device has a PoE connector for connection to Ethernet and the power supply.

- ▶ Connect the device to Ethernet using a special IP67 Ethernet cable with M22 connector.

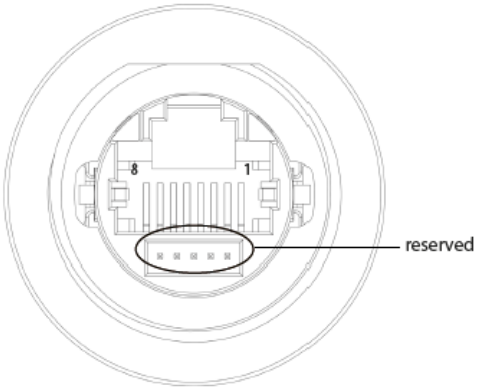


Fig. 5: PoE connector

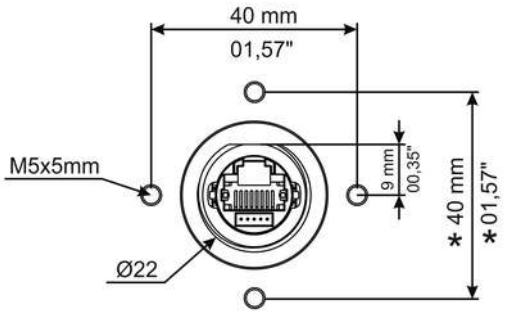


Fig. 6: PoE connector – dimensions

Pin	Signal
1	TX+
2	TX-
3	RX+
4	n. c.
5	n. c.
6	RX-
7	n. c.
8	n. c.

Default settings of the Ethernet ports

ETH0/WAN:	DHCP
WIFI0/WIFI:	DHCP

6.1.1 Power supply

For the power supply of the device a PoE injector (e. g. PSU20-PoE-36W01) is required. In IP67 applications, the connection is made via special, pre-assembled cables with M22 Ethernet connection. In IP20 applications, the connection can also be realized using a standard RJ45 Ethernet cable. The pre-assembled IP67 cables are available in different versions at www.turck.com. The voltage source must be designed to ensure the correct operation of the device (see "Technical data").

7 Commissioning

7.1 Charging the battery

The device is equipped with a rechargeable lithium battery, which is not user replaceable.

The following information is maintained by the battery:

- Hardware real-time clock (date and time)

▶ Charge the battery for at least 48 hours before using the device for the first time.

When the battery is fully charged, it guarantees data backup at 25 °C for three months.

7.2 Using the touchscreen

▶ Before initial operation, check that the touch screen is working properly.
▶ Do not use sharp or pointed objects (screwdrivers, etc.) to operate the touch screen.

7.3 Initial commissioning

The Ethernet ports of the device are set to DHCP by default. During the initial commissioning, the IP address is therefore set via the system settings on the touch screen of the device, via a DHCP server in the network or via the Turck Service Tool.

7.4 Web server login

▶ Open the web server using the device's IP address.
▶ Connect via https://IP.
IP = current IP address of the TX… device
▶ Log on to the device as administrator:
Default user: admin
Default passwort: admin

If the simple link causes a conflict with an already active WebVisu application, the system settings can also be accessed directly via the following link:

https://IP/machine_config

Example access:

https://192.168.1.24/machine_config

Username: admin
Password: admin

7.5 Setting the IP address

The IP address can be set via the system settings on the touch screen of the device, the device's web server or via the Turck Service Tool.

7.5.1 Setting the IP address via the web server

- Log in to the device's web server as described under "Web server login".
- Edit the network setting via **System Settings** → **Network** → **Edit**.

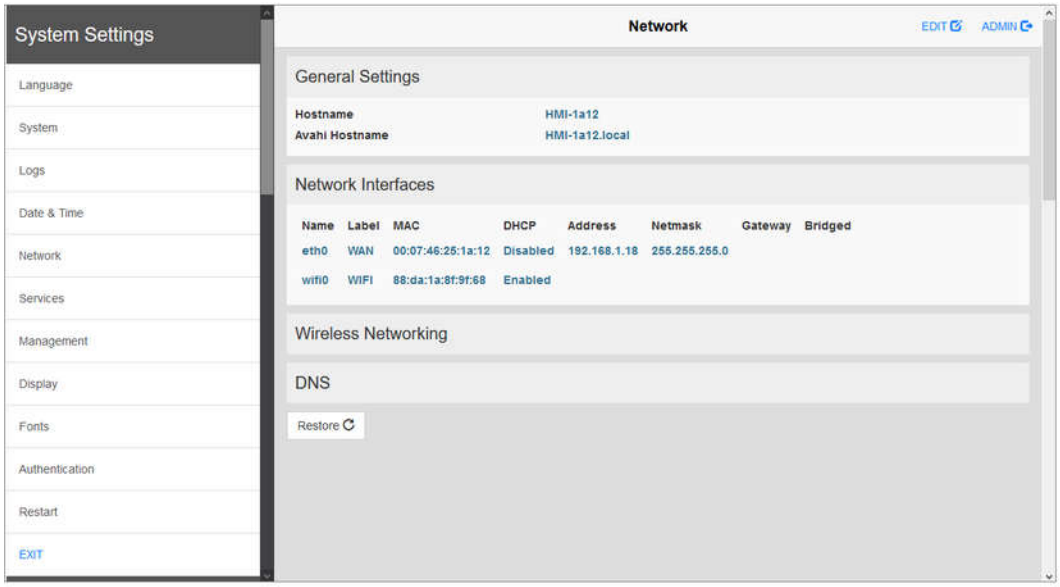


Fig. 7: Webserver – system settings

- Set the IP address, the subnet mask, etc. under **Network interface** and **save** the changes.

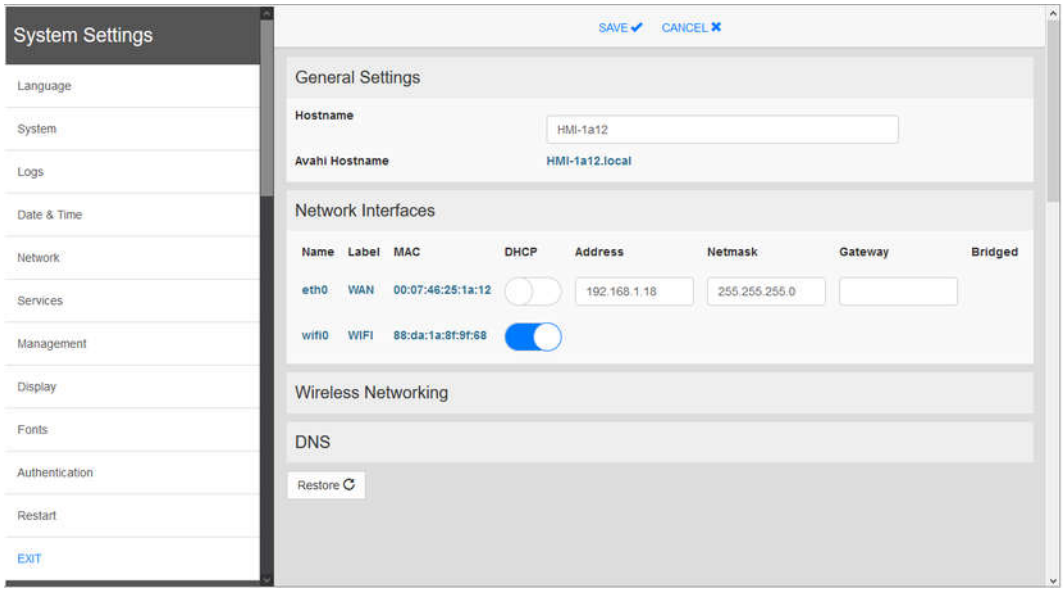


Fig. 8: Webserver – network interface

7.5.2 Setting the IP address via Turck Service Tool

- Connect the device to the PC via the Ethernet interface.
- Open Turck Service Tool.
- Click **Search** or press [F5].

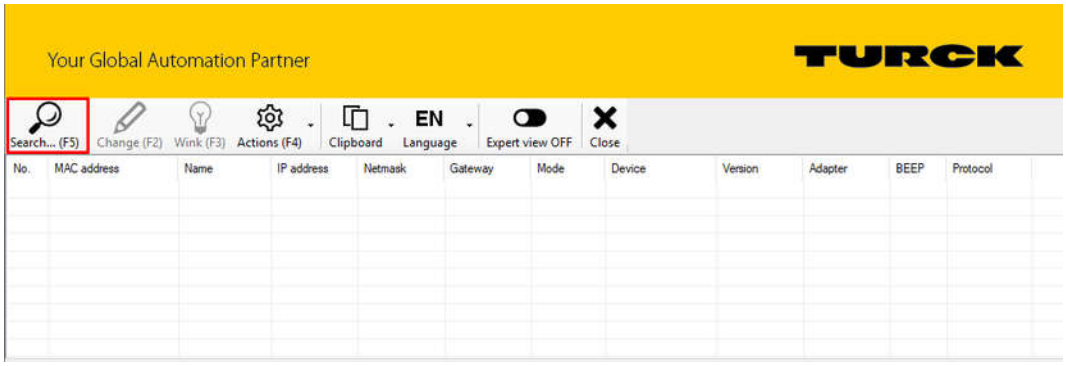


Fig. 9: Turck Service Tool – home screen

⇨ Turck Service Tool shows the connected devices.

NOTE
Clicking the device's IP address opens the web server.

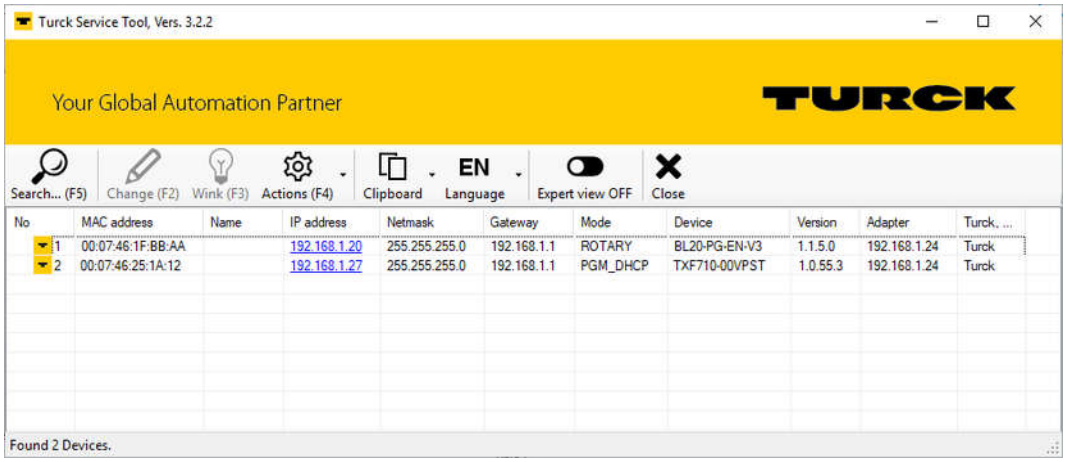


Fig. 10: Turck Service Tool – found devices

- ▶ Click on the desired device.
- ▶ Click **Change** or press [F2].
- ▶ Change the IP address and the net mask, if necessary.
- ▶ Accept the changes with **Set in device**.

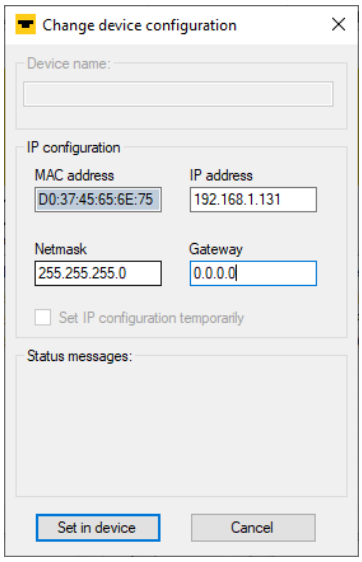


Fig. 11: Turck Service Tool – changing the IP configuration

7.6 Programming with TX VisuPro

Prerequisites

- For programming the HMI/PLCs with TX VisuPro, the software tool has to be installed on a PC computer running Microsoft Windows.

7.6.1 Transferring TX VisuPro to the device

There are two options to transfer a TX VisuPro runtime project to a device:

- Via Ethernet
- Via a USB stick

Project transfer via Ethernet

- ▶ Connect the HMI device to the computer with an Ethernet network.
- ▶ Execute the command **Run/Download** in TX VisuPro. You may have to ensure that the proper firewall policy has been configured in the computer to allow TX VisuPro to access the network.

Project transfer via a USB stick

- ▶ Create an update package with TX VisuPro and copy it to a USB stick.
- ▶ Connect the USB stick to the device using a suitable Y-splitter PoE cable with USB port (TXF-M22G-RJ45-5M-USB-1M [▶ 11]).

8 Configuring

The devices have an integrated User interface and a web server for configuring the system. The user interface is based on HTML pages accessible via port 443 using a Web browser (Firefox V.79 Chrome V.44 or higher). Alternatively, the system settings can be called and operated via a VNC client. To use the VNC client, the VNC service must be activated in the system settings.

Initial commissioning is done by local access to the system settings via the touch screen on the device. If the "System Settings" button is not displayed on the home screen, the device must be restarted in "Tap-Tap mode" (see "Recovery operation" in the "Adapting the system settings" [▷ 19]).

8.1 Configuring the system settings

The available options can be selected from the navigation menu on the left side of the screen.

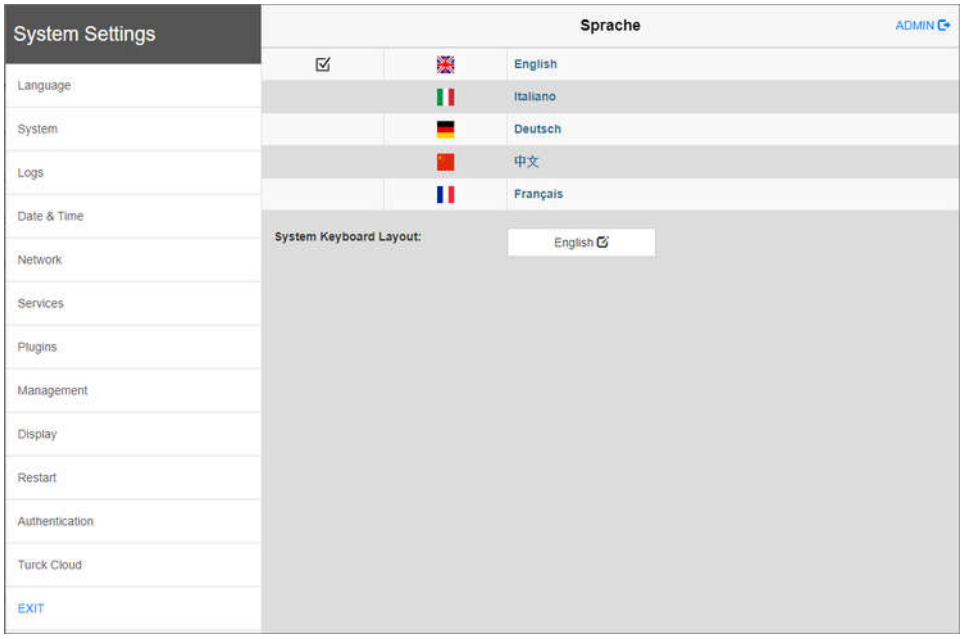


Fig. 12: System settings

System settings has two operating modes:

Mode	Usage
User mode	■ Device with TX VisuPro runtime ■ Device in delivery state
System Mode	In addition to the options in user mode, the system mode includes additional commands for system upgrade and recovery. ■ Device without TX VisuPro runtime ■ Device with software error

Edit system settings in user mode

Status device	Description
Factory default status	▶ Open the **system settings**.
TX VisuPro runtime running	▶ Press and hold the unused area of the touch screen for at least 2 s. ▶ Open the context menu and select **System Settings**.

Edit the system settings in system mode

Status device	Description
Standard	If no TX VisuPro runtime is running on the device: **User mode** ▶ Open the **System Settings**. **System Mode** ▶ Device without TX VisuPro runtime: Restart the device via **Restart → Config. OS**. ▶ Device with TX VisuPro runtime: Open the context menu and select **System Settings**. ▶ To open the context menu: Press and hold the unused area of the touch screen for at least 2 s. ▶ Restart the device via **Restart → Config. OS**.
Recovery operation	If the device is not responsive, use the so-called “tap-tap” procedure. ▶ Touch the surface of the touch screen several times with a typing frequency of at least 2 Hz immediately after switching on the device. ⇨ When the sequence is detected, the message "Tap Tap detected, Going to Config Mode" will appear on the display.

The basic settings for the device are made in the system settings.

Setting	Description
Language	Configuration of the language used for the **System Settings** menu.
System	Information about platform, status and timers (“like System on time, “backlight on time”)
Logs	Activating and exporting persistent log for BSP
Date & Time	Date and time, including time zone and NTP Server
Network	Configuration of the IP address of the Ethernet interface and the other network settings like DNS, gateway, DHCP, host name, routing and bridging.
Services	Activate/deactivate services (e.g. OpenSSH server, bridge, cloud, router, SNMP, logging)
Management	Update of BSP components (Main OS, Config OS, Boot loader, XLoader), check for partitions consistence, update of splash screen, information about usage and size of partitions. The update of Main OS is available only in System Mode, the update of Config OS is only in User Mode.
Display	Configuring the automatic backlight, adjusting the brightness, changing the display orientation
Restart	Restarts the device By default, the device is restarted in user mode via the "Main OS" option. The "Configuration OS" option restarts the device directly in **System Settings** in system Mode.
Authentication	Configuration ot the password for the administrator ("admin") and for the standard user ("user”). The administrator has full access to the system settings (updates of the BSP and other system components). The standard user has some restrictions.

9 Operating



DANGER
Changing components
Explosion hazard – Suitability for Class 1, Division 2 possibly impaired

- When replacing components, make sure that the suitability of the device for Class 1, Division 2 is not affected.
- Only use components that are suitable for use in Class 1, Division 2.
- If necessary, take measures to restore suitability for Class 1, Division 2.

9.1 LED displays

The device has the following LED displays:

- Status of the Ethernet ports

LED red (left LED)	Meaning
off	No Ethernet connection
On	Ethernet connection established

LED green (right LED)	Meaning
On	No data transfer
Blinking	Data transfer

10 Troubleshooting

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

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

11 Maintenance

Dust layers on the display can lead to static electricity.

- To avoid dust layers on the display: Clean the device at regular intervals with a soft cloth and a neutral soap product.
- Do not use solvents.

12 Repair

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

12.1 Returning devices

Returns to Turck can only be accepted if the device has been equipped with a Decontamination declaration enclosed. The decontamination declaration can be downloaded from
https://www.turck.de/en/retoure-service-6079.php
and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Disposal

The device is equipped with a rechargeable lithium battery, which is not user replaceable.

- For disposal, open the back of the device and remove the battery.



The device the lithium battery must be disposed of properly in accordance with WEEE Directive 2012/19/EU and does not belong in normal household waste.

14 Technical Data

	TXF705-P3CV01	TXF707-P3CV01	TXF710-P3CV01
Device			
Ident no.	100017839	100017841	100017845
Display/touch			
Display	TFT color	TFT color	TFT color
Touch	Capacitive	Capacitive	Capacitive
Active image area	5"	7"	10.1"
Resolution (pixels)	800 × 480	1024 × 600	1280 × 800
Format	16:9	16:9	16:9
Brightness	300 Cd/m² typ.	400 Cd/m² typ.	400 Cd/m² typ.
Dimmable	Yes (up to 0 %)	Yes (up to 0 %)	Yes (up to 0 %)
Viewing angle horizontal	typ. 70°	typ. 75°	typ. 85°
Viewing angle vertical	■ From above: 50° ■ From below: 70°	typ. 75°	typ. 85°
System			
CPU	ARM Cortex-A9, dual core 800 MHz	ARM Cortex-A9, dual core 800 MHz	ARM Cortex-A9, dual core 800 MHz
Operating system	Linux RT	Linux RT	Linux RT
Flash	4 GB	4 GB	4 GB
RAM	1 GB	1 GB	1 GB
Real Time Clock	Yes (battery-backed)	Yes (battery-backed)	Yes (battery-backed)
Accuracy RTC (at 25 °C)	< 100 ppm	< 100 ppm	< 100 ppm
Buzzer	Yes	Yes	Yes
Interfaces			
Ethernet ports	1 × PoE, 10/100 PoE	1 × PoE, 10/100 PoE	1 × PoE, 10/100 PoE
USB Host port	1 × Host V 2.0, special PoE connection cable required (TXF-M22G-RJ45-5M-USB-1M, Ident-No. 100020101)		
WLAN	-	IEEE 802.11a/b/g	IEEE 802.11a/b/g
WiFi	-	2.4 GHz	2.4 GHz
■ Minimum distance to body	-	2 cm	2 cm
Sensors	Temperature, 3 axis acceleration sensor		
Voltage supply			
Power supply	IEEE 802.3af PoE	IEEE 802.3af PoE	IEEE 802.3af PoE
Power consumption	6 W	9 W	12 W
Dimensions			
Housing (H ×W × D)	105.1 × 148.3 × 16.5 mm	131.6 × 195.2 × 16.5 mm	183.1 × 264.5 × 16.5 mm
Weight	0.5 kg	0.7 kg	1.2 kg

	TXF715-P3CV01	TXF721-P3CV01
Device		
Ident no.	100017847	100017849
Display/touch		
Display	TFT color	TFT color
Touch	Capacitive	Capacitive
Active image area	15.6"	21.1"
Resolution (pixels)	1366 × 768	1920 × 1080
Format	16:9	16:9
Brightness	400 Cd/m² typ.	400 Cd/m² typ.
Dimmable	Yes (up to 0 %)	Yes (up to 0 %)
Viewing angle horizontal	typ. 80°	typ. 89°
Viewing angle vertical	typ. 80°	typ. 89°
System		
CPU	ARM Cortex-A9, quad core 800 MHz	ARM Cortex-A9, quad core 800 MHz
Operating system	Linux RT	Linux RT
Flash	8 GB	8 GB
RAM	2 GB	2 GB
Real Time Clock	Yes (battery-backed)	Yes (battery-backed)
Accuracy RTC (at 25 °C)	< 100 ppm	< 100 ppm
Buzzer	Yes	Yes
Interfaces		
Ethernet ports	1 × PoE, 10/100 PoE	1 × PoE, 10/100 PoE
USB Host port	1 × Host V 2.0, special PoE connection cable required (TXF-M22G-RJ45-5M-USB-1M, Ident-No. 100020101)	
WLAN	IEEE 802.11a/b/g	IEEE 802.11a/b/g
WiFi	2.4 GHz	2.4 GHz
■ Minimum distance to body	2 cm	2 cm
Sensors	Temperature, 3 axis acceleration sensor	
Voltage supply		
Power supply	IEEE 802.3at PoE+	IEEE 802.3bt 4PPoE
Power consumption	19 W	32 W
Dimensions		
Housing (H ×W × D)	248 × 398.6 × 26.5 mm	325.6 × 534.1 × 26.5 mm
Weight	4.0 kg	6.0 kg

Environmental conditions		
Operating temperature (surrounding air temperature)	-20…+55 °C (vertical installation)	EN 60068-2-14
Storage temperature	-30…+80 °C	EN 60068-2-1 EN 60068-2-2 EN 60068-2-14
Operating and storage humidity	5…85 % RH, non condensing	EN 60068-2-30
Vibrations	5…9 Hz, 7 mmp-p 9…150 Hz, 1 g	EN 60068-2-6
Shock	± 50 g, 11 ms, 3 pulses per axis	EN 60068-2-27
Protection class		
Complete device	IP67 (only in combination with appropriate accessories)	EN 60529
Electromagnetic Compatibility (EMC)		
Radiation interference	Class A	CISPR 22, CISPR 16-2-3
Immunity		EN 61000-4-2
Electrostatic discharge	8 kV (air electrostatic discharge) 4 kV (contact electrostatic discharge)	
Radiation, high frequency, electromagnetic fields	80 MHz …1 GHz, 10 V/m 1.4 GHz … 2 GHz, 3 V/m 2 GHz … 2.7 GHz, 1 V/m	EN 61000-4-3
Burst	± 2 kV DC power port ± 1 kV signal line	EN 61000-4-4
Overvoltage	± 0.5 kV DC power port (line to earth) ± 0.5 kV DC power port (line to line) ± 1 kV signal line (line to earth)	EN 61000-4-5
Interference from high-frequency fields	0.15…80 MHz, 1 V	EN 61000-4-6
Power frequency magnetic field immunity test	Housing: 50/60Hz, 30A/m	EN 61000-4-8
Voltage dips, short interruptions, voltage fluctuations	Port: AC mains; Level: 100 % duration: 1 cycle and 250 cycles (50 Hz) 40 % duration: 10 cycles (50 Hz) 70 % duration: 25 cycles (50 Hz) phase: 0°…180°	
Test executed on the 230 VAC side of the power supply		EN 61000-4-11
	Port: DC mains 0 % duration: 10 ms 20 fields × 1 s	
Test executed on the 24 VDC of the EUT		EN 61000-4-29

Display durability

Backlight service life		
Durability at 25 °C, continuous operation	Time to darken the display to 50 % of the nominal value	min. 40000 hours (LED type)

NOTE
Prolonged use at an ambient temperature of 40 °C or higher may result in a deterioration in the quality, reliability and durability of the backlight.

Display viewing angles

The viewing angles are included in the technical data of the respective device and are specified for the horizontal and vertical axis in relation to the vertical axis of the display. The specified angles always refer to the standard mounting orientation (landscape format).

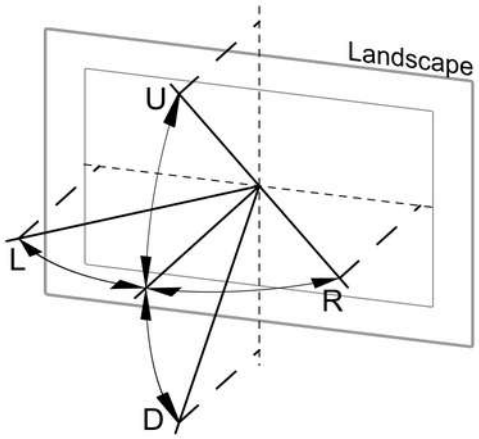


Fig. 13: Viewing angle

	Viewing angle
U	From the top
D	From the bottom
L	From the left
R	From the right

15 Appendix: Approvals and markings

Approvals	
CE	Immunity/emission ■ For industrial environments: EN 61000-6-2 EN 61000-6-4 ■ For residential, business and commercial areas and small businesses: EN 61000-6-1 EN 61000-6-3 ■ For marine environments: EN 60945
	EN 611312
UL	cULus (UL File No. E484727) ■ UL 61010-1, 3rd Edition and UL 61010-2-201, 2nd Edition ■ CAN/CSA C22.2 No. 61010-1, 3rd Edition and CAN/CSA C22.2 No. 61010-2-201:18
	cULus (UL File No. E484803) ■ Class I, Division 2, Groups A, B, C and D

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