

TORRIX ... XTS ...

Magnetostrictive Level Sensor with Display



Edition: 2023-04

Version: 1

Art. no.: 350372

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1 Characteristics

The TORRIX ... XTS ... is a high-precision level sensor from the TORRIX series with an additional display (XTS) for showing up to 3 different TORRIX measured values on the sensor head.

The sensor has been developed for continuous level measurement of liquid media in containers. The measuring principle of the sensor uses the physical effect of the magnetostriction and is largely unaffected by the temperature. This method is particularly ideal where level measurements are required to be extremely accurate, such as in the chemical industry.

The TORRIX XTS is available with the following (optional) features:

- Media-contacting probe tube of stainless steel (standard), Hastelloy or titanium
- Straight probe tube with probe tube diameter 12 mm
- Probe lengths from 200 mm to 6 m, as Flex version up to 22 m
- Output signal 4-20 mA and RS-485 serial interface
- Communication via the HART® protocol
- With temperature measurement
- Use in potentially explosive areas with device protection levels Ga (Zone 0 only with intrinsically safe version), Ga/Gb (Zone 0/1) or Gb (Zone 1)
- Process connection as screw-in unit, flange or bypass

The different TORRIX XTS variants are listed in the table on the next page.

For information about the installation of the TORRIX XTS Flex, see:



TORRIX Flex Installation Guide multilingual, art. no. 350118

For the TORRIX device types without a display, see the technical documentation:



TORRIX (with side cable connection), art. no. 350335



TORRIX M12 (with M12 connector), art. no. 350164

1.1 TORRIX XTS Variants

Type	Approval	Electrical version	Design	Measuring accuracy	Mechanical design	Process temperature					
TORRIX						HHT	Maximum temperature	-40 °C	...	+450 °C	
						HT	High temperature	-40 °C	...	+250 °C	
						LT	Low temperature	-65 °C	...	+125 °C	
						NT	Normal temperature	-40 °C	...(+85)	+125 °C	
							Rigid sensor tube with 12 mm diameter				
						B	Sensor tube not centered on the sensor head (Bypass)				
						Flex ...	Flexible sensor tube (... rigid parts: F = 200/ 300 mm; T = 500 mm)				
						HY	Construction for use in the hygiene area				
						PL	Plastic coating against very aggressive media				
							Standard				
						-5T	With five temperature sensors				
						-A5T	Increased measurement accuracy and five temperature sensors				
						-A	Increased measurement accuracy (Advanced)				
							Standard construction				
						VT	Internal structure vibration resistant for portable tanks				
						XTS	RS-485 and 4 ... 20 mA interface with HART protocol and setting button and digital display				
						XTSH	RS-485 and 4 ... 20 mA interface with HART protocol, setting button, digital display and heating (only Exd and without Ex)				
	Without Ex approval										
Ex	With Ex approval intrinsic safety "ia"										
Exd	With Ex approval flameproof enclosure "d" or protection by housing "t" and intrinsic safety "ia" for "... XT..."										
TORRIX		magnetostrictive level sensor with connection terminals or plugs									

Example:

TORRIX Ex XTS B is a TORRIX XTS with Bypass assembly for use in hazardous areas.

2 Safety Instructions

The TORRIX XTS level sensor has been developed for level measurement of liquids in containers. The level sensor must be used exclusively for this purpose. The manufacturer accepts no liability for any form of damage resulting from improper use.

The level sensor has been developed, manufactured and tested in accordance with the latest good engineering practices and generally accepted safety standards. Nevertheless, hazards may arise from its use. For this reason, the following safety instructions must be observed:

- Do not change or modify the level sensor or add any equipment without the prior consent of the manufacturer.
- The installation, operation and maintenance of the level sensor only be carried out by expert personnel. Specialised knowledge must be acquired by regular training.
- Operators, installers and service technicians must comply with all applicable safety regulations. This also applies to any local safety and accident prevention regulations which are not stated in this guide.

The safety instructions in this guide are marked as follows:



If these safety instructions are not observed, it may result in the risk of accident or damages to the TORRIX XTS level sensor.



Useful information which ensures continued and correct operation of the TORRIX XTS level sensor and makes your work easier.

REACH Regulation



The TORRIX sensors contain a lead-titanium-zirconium-oxide, which belongs to the substances of very high concern (SVHC) according to Regulation (EG) No. 1907/2006 (REACH). A corresponding note can be found on our website at: www.fafnir.com.

3 Design and Function

The level sensors consist of a probe head (1) and a probe tube (4) made of stainless steel. The probe tube is height-adjustable with a screw-in body (3) or mounted with a flange in the tank or outside the tank as a bypass. A float (5) for measuring the product filling level and another float (6) for continuous interface measurement move on the probe tube.

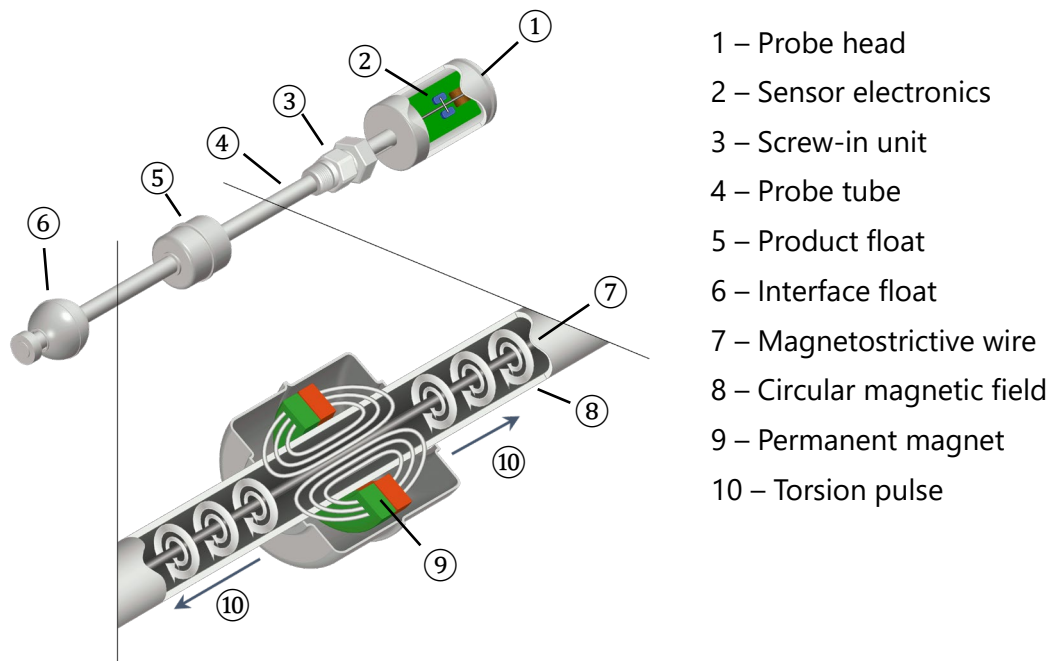


Figure 1: How the magnetostrictive measuring principle works

The sensor operates according to the magnetostrictive measuring principle. The probe tube contains a wire (7) made of magnetostrictive material. The sensor electronics (2) transmit pulses through the wire, which generate a circular magnetic field (8). Permanent magnets (9) are used as filling level sensors which are installed in both the product float (5) and the interface float (6). The magnetic field of the float magnets (9) axially magnetises the wire in this area. The superposition of the two magnetic fields produces a torsional wave (10) at the float position, which then propagates along the wire in both directions. One torsion pulse runs directly to the probe head and the other one is reflected at the bottom end of the probe tube. The time between the current pulse being transmitted and the two torsion pulses arriving at the probe head is measured and the float position calculated. The position of the interface float is calculated by measuring a second pulse.

3.1 TORRIX XTS with Screw Connection

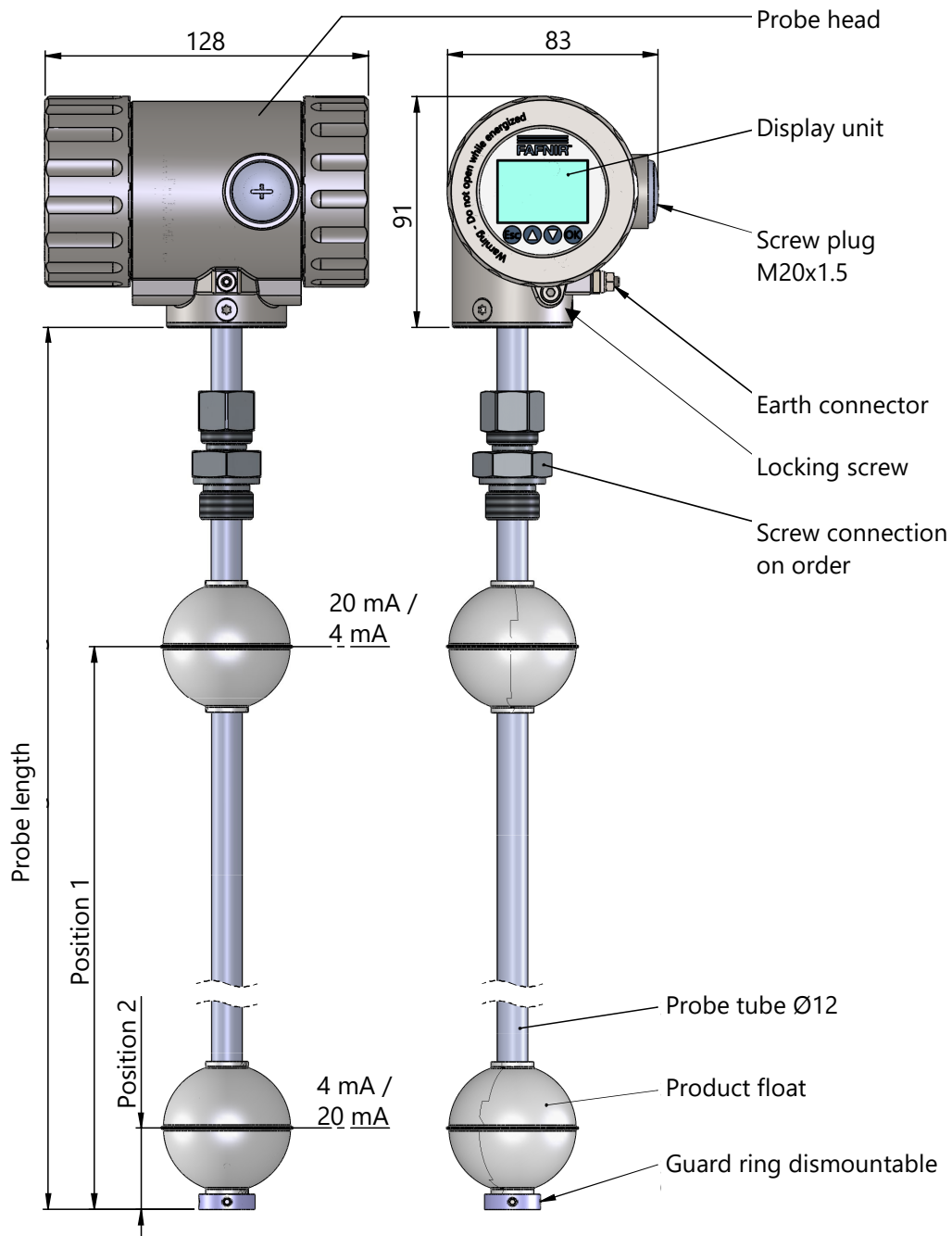


Figure2: TORRIX XTS (with screw connection)

3.2 TORRIX XTS with Flange

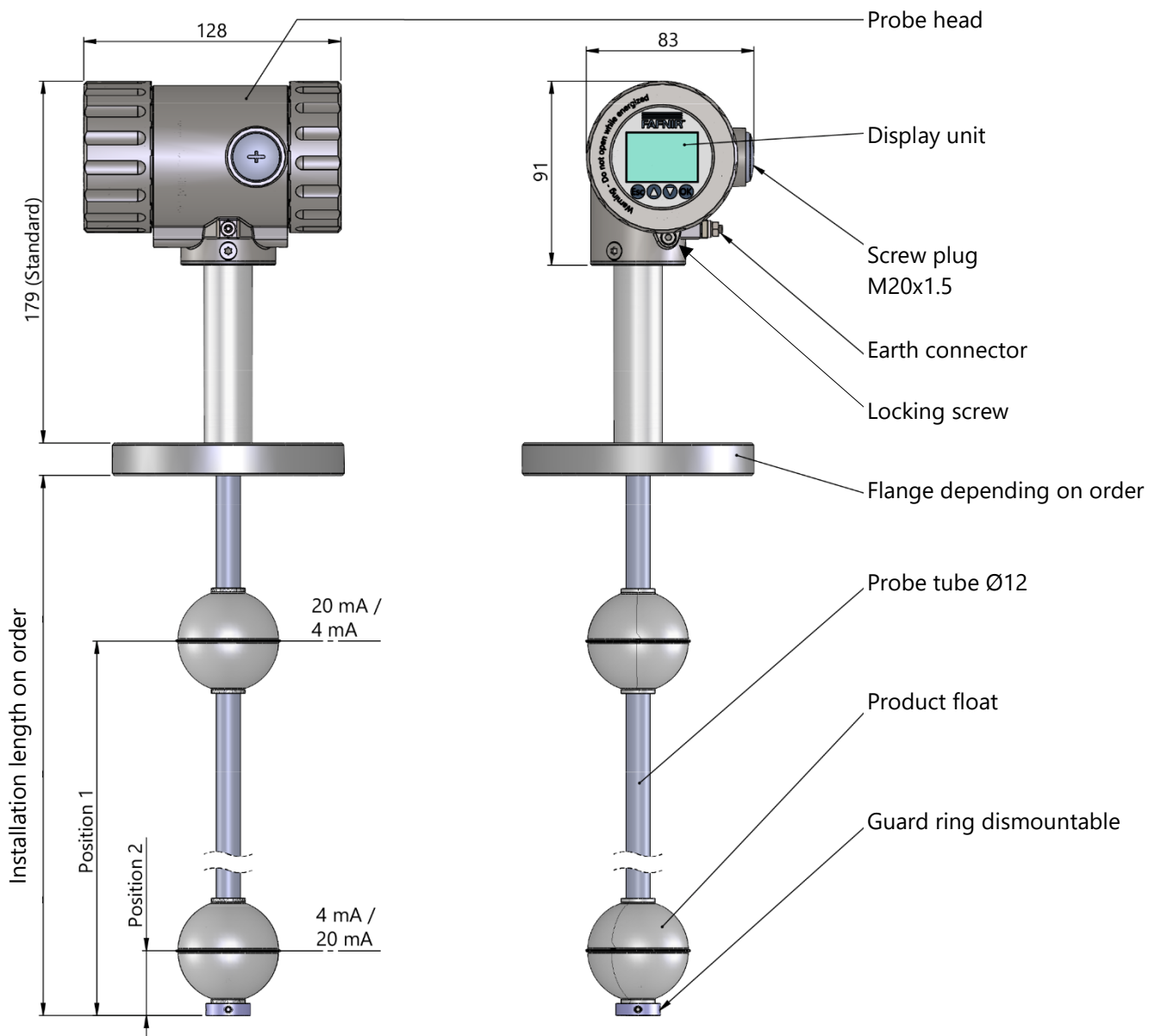


Figure3: TORRIX XTS F (Flange)

3.3 TORRIX XTS for Bypass

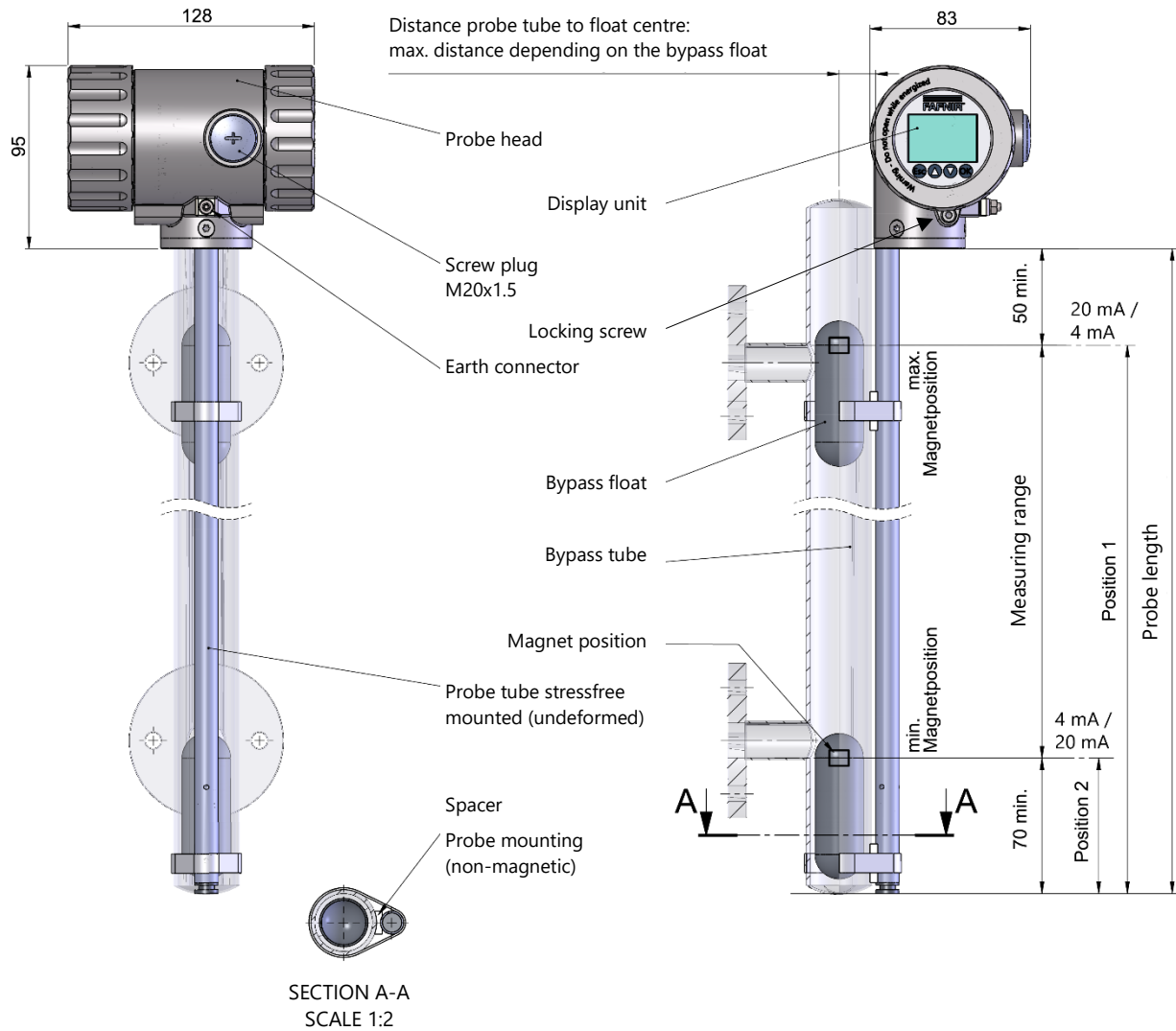


Figure 4: TORRIX XTS B (Bypass)

4 Installation

This section describes how to install the level sensor depending on the type of the device (see the following figures).



When installing and maintaining the level sensor in potentially explosive areas, the national rules must be observed (Explosion Protection Regulations, Industrial Health and Safety Regulations, Equipment Safety Regulations and specific conditions of the EU-Type Examination Certificates). The generally accepted rules of engineering and these operating instructions must be observed.



This also applies to any local safety and accident prevention regulations which are not stated in this manual.



During installation, take great care not to bend the probe tube, and protect the float from shock and impact loads.



Installing a level sensor in areas exposed to a powerful external magnetic field is not permitted because this could impair gauging.



The level sensor can also be fitted into containers from underneath. If the container additionally is pressurized, then the maximum length of the level sensor is 2 m.



If the float was removed during installation, it must be slid back onto the probe tube afterwards with the "TOP" marking oriented towards the probe head to enable correct measurements.

4.1 Installation with screw-in unit

Insert the level sensor into the tank (see following figure):

- (1) Loosen both set screws, remove circlip (1) and float (2) from probe tube (3).

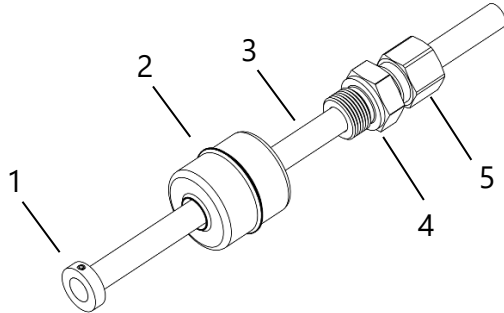


Figure 5: Installation with screw-in unit



Removing the float is required only if it does not fit through the installation opening in the tank. Otherwise, please proceed directly with mounting steps 3, 6 and 7.

- (2) If necessary, slide the screw-in unit (4) on the probe tube.
- (3) Insert the level sensor into the tank, provide the screw-in thread (4) with a suitable sealing material, screw it in and tighten.
- (4) Slide the float (2) back onto the probe tube (3).



For correct gauging, the float must be slid onto the probe tube with the "TOP" marking oriented towards the probe head, to enable a correct measurement.

- (5) Refit the circlip (1) on the tube, align the set screws over the groove and tighten.
- (6) Adjust the height of the process connection and fix the union nut (5) finger tight by hand.
- (7) Fix the union nut (5) with a 1 ¼ clockwise turn (see following figure).

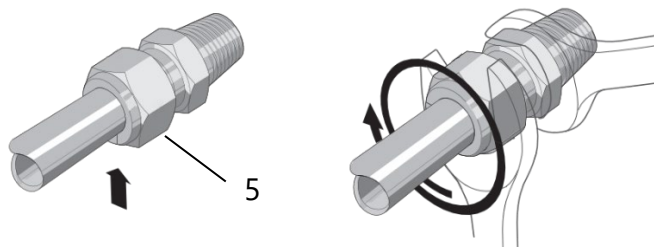


Figure 6: Tightening the compression fitting

4.2 Installation with flange

The probe tube is firmly welded to the flange, so the installation length cannot be changed. Fasten flange and seal with the flange bolts and nuts. The screws or nuts and the seals are the responsibility of the operating company and must be chosen depending on the fluid. The fasteners and seals must comply with the requirements of the standards EN 1092-1, EN 1514 and EN 1515.

If the float does not fit through the installation opening, see installation instructions, see chapter 4.1.

5.1.2 Wiring diagram TORRIX Ex XTS

The level sensor TORRIX Ex XTS with Ex i approval (intrinsically safe) is installed in a potentially explosive atmosphere according to the following wiring diagram:

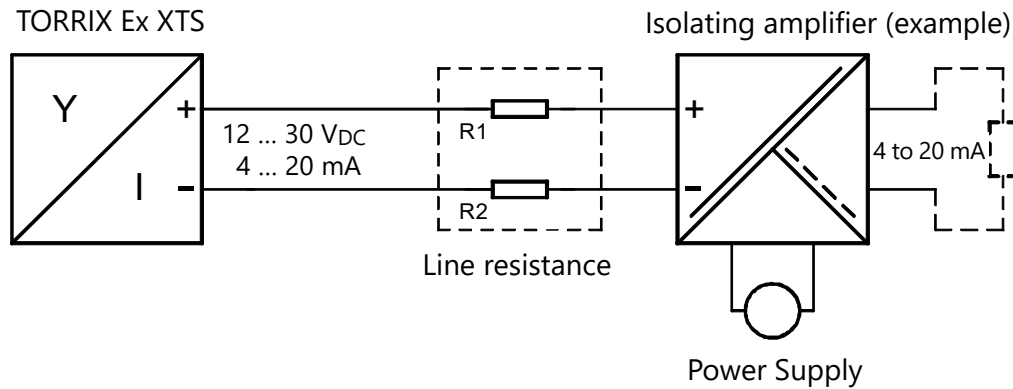


Figure 8: Wiring diagram TORRIX Ex XTS

Maximum power supply $U_{\max} = 30 \text{ V}_{\text{DC}}$
Minimum supply voltage $U_{\min} = 12 \text{ V}_{\text{DC}}$
Permissible total resistance (incl. line resistances and load)
$\Sigma R = (U - U_{\min}) / 0.0215 \text{ A}$



The TORRIX Ex level sensor may be connected in potentially explosive atmospheres in the intrinsically safe version only to associated equipment that have been certified by a recognised inspection authority and whose electrical output data meets the following conditions:

$$U_o \leq 30 \text{ V}_{\text{DC}}$$

$$I_o \leq 100 \text{ mA} / 200 \text{ mA (depending on the ambient temperature } T_a)$$

$$P_o \leq 1 \text{ W}$$



Always make sure that the permissible external capacitance (C_o) and inductance (L_o) of the associated apparatus are not exceeded (refer to the electrical data in the EU-Type Examination Certificate of the apparatus) if used in a potentially explosive atmosphere.



The connecting cable to the associated apparatus must be marked if used in potentially explosive atmosphere, preferably as blue cable for intrinsically safe electric circuits.



Further data of the EU Type Examination Certificate can be found in the appendix of this manual.

5.1.3 Wiring diagram TORRIX Exd XTS

The TORRIX Exd XTS level sensor with Ex d approval is installed in a potentially explosive atmosphere according to the following wiring diagram:

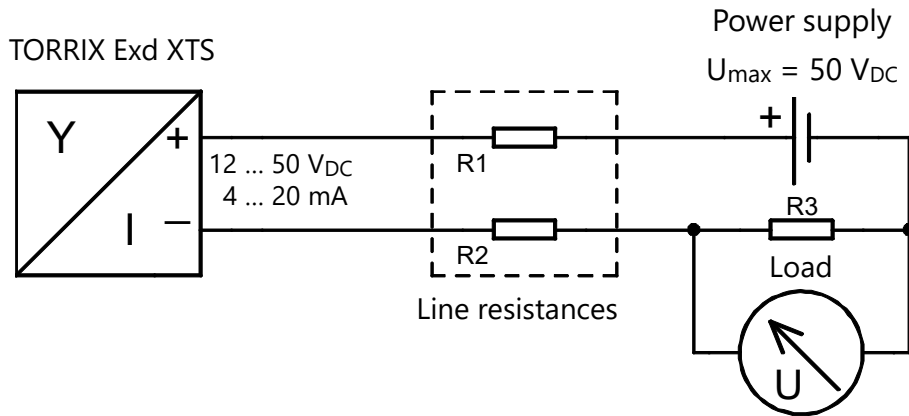


Figure 9: Wiring diagram TORRIX Exd XTS

Maximum power supply $U_{\max} = 50 \text{ V}_{\text{DC}}$
Minimum supply voltage $U_{\min} = 12 \text{ V}_{\text{DC}}$
Permissible total resistance (incl. line resistances and load) $\Sigma R = (U - U_{\min}) / 0.0215 \text{ A}$



The TORRIX Exd XTS level sensor may be connected in potentially explosive atmospheres in this version to all associated equipment whose electrical output data meets the following conditions:

$$U \leq 50 \text{ V}_{\text{DC}}$$

$$U_m = 253 \text{ V}$$

$$I = 4 \text{ mA} \dots 20 \text{ mA}$$

In the event of an error, the current can also be 3.6 or 21.5 mA.



A certified Ex d or Ex t cable gland (depending on the application) must be used for the TORRIX Exd XTS.



Further data of the EU Type Examination Certificate can be found in the appendix of this manual.

5.2 Maximum Length of the Connection Cable

The permissible total resistance of the cable and the load (see chapter 5.1.1) must not be exceeded.



The cable (length and cross-section) must be chosen so that the supply voltage will not fall below the sensor-specific minimum voltage (12 V) in the case of the highest current consumption (21.5 mA).



Always make sure that the permissible external capacitance (C_o) and inductance (L_o) of the associated apparatus are not exceeded (refer to the electrical data in the EU-Type Examination Certificate of the apparatus) if the intrinsically safe level sensor is used in a potentially explosive atmosphere.

The following table shows the resistances of different copper wire cross-sections:

Cable cross-section Q [mm ²]	Cable resistance R _Q per m copper cable [Ω/m]
0.5	0.0356
1.0	0.0178
1.5	0.0119

Example: A 1000 m long, cross-section 0.5 mm² copper cable with outgoing and return lines (2-core) has a cable resistance of approximately 70 Ω.

The maximum cable length is calculated as follows:

$$L = (((U - U_{\min}) / I_{\max}) - R_B) / R_Q$$

L = Cable length [m]

U = Supply voltage [V] (with negative tolerance value -5 %)

U_{min} = Minimum supply voltage [V] = 12 V_{DC}

I_{max} = Maximum power consumption [A] = 0,0215 A

R_B = Load

R_Q = Cable resistance per m cable [Ω/m] for cable cross-section Q [mm²]

Example:

Supply voltage = 24 V_{DC} (± 5 %), supply voltage U = 22.8 V_{DC} (24 V_{DC} - 5 %),

minimum supply voltage U_{min} = 12 V_{DC}, current consumption I_{max} = 0.0215 A,

load R_B = 100 Ω, cable cross-section Q = 0.5 mm², cable resistance R_Q = 0.0356 Ω/m

A copper cable with outgoing and return lines (2-core) could theoretically be up to 5650 m long with the parameters of this example.

5.3 Wiring



The TORRIX XTS level sensors may only be wired with the power disconnected.

The terminal compartment is accessible after removing the rear screw cover from the probe head. To do this, screw the locking screw of the cover into the housing with a 3 mm Allen key.

After the wiring has been completed, the cover must be screwed on again and secured against unintentional loosening.

The electrical connection is made using the push-in PCB terminal clamps.

Fine-wire conductors with wire-end ferrules and single-wire conductors can be plugged in directly. The terminal clamps can be unlocked with a screwdriver to insert or remove the conductors. The blade width should be 3.5 x 0.5 mm.

The permissible cable cross-section for single-wire conductors is in the range of 0.5 to 2.5 mm² (20 to 12 AWG). A cable cross-section in the range of 0.5 to 1.5 mm² is permissible for fine-wire conductors with wire-end ferrules.

For the wiring, continue as follows:

- insert the connection cable through the lateral opening into the terminal compartment, the TORRIX Ex... requires a certified cable gland
- connect the connection cable to the right PCB terminal clamps



The earthing or equipotential bonding must be carried out by the installer in accordance with the respective national installation regulations. The earth connector of the probe head can be used for earthing or equipotential bonding requirements.



Also observe the general installation regulations.

5.3.1 Wiring the TORRIX (Ex) XTS

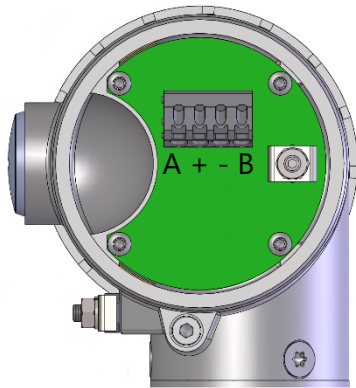


Figure 10: Terminal compartment of TORRIX (Ex) XTS

Signal	Connection
Used internally	A
Sensor voltage	+
Sensor voltage	-
Used internally	B

Pin assignment of the 4-pin PCB terminal clamp in the terminal compartment

The connection cable between the (intrinsically safe) TORRIX (Ex) XTS and the associated equipment must have the following properties:

- 2-wire unshielded cable
- For Ex ia applications the colour blue or marked blue (cable for intrinsically safe power circuits)

5.3.2 Wiring the TORRIX (Exd) XTS with Heater

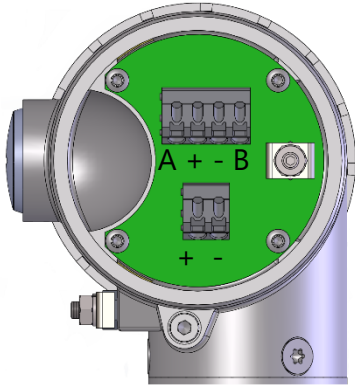


Figure 11: Terminal compartment of TORRIX (Exd) XTS

Signal	Connection
Used internally	A
Sensor voltage	+
Sensor voltage	-
Used internally	B

Pin assignment of the 4-pin PCB terminal clamp in the terminal compartment

For the extended temperature range (-55 °C to +85 °C), the TORRIX (Exd) XTS is additionally equipped with a heater for the display. The supply voltage for the heater is connected to the 2-pin PCB terminal clamp.

Signal	Connection
Heater voltage	+
Heater voltage	-

Pin assignment of the 2-pin PCB terminal clamp in the terminal compartment

6 Indication and adjustment module

The TORRIX XTS is equipped with an indicating and adjustment module to display the measured values and for configuration.

The module for display and adjustment can be rotated to adapt to the conditions at the installation site.

6.1 Rotation of the display and adjustment module

When delivered, the display and adjustment module is aligned with the lower edge towards the probe tube. If this adjustment is to be changed, the housing cover with the viewing window must first be removed. To do this, screw the locking screw of the cover into the housing with a 3 mm Allen key. When the cover is removed, the display and adjustment module can be rotated in a range of almost 360°. Additional detents every 90° make adjustment easier. After alignment, screw the housing cover back on and secure with the locking screw.



Do not turn beyond the end stop, otherwise damage may occur.

6.2 Operation

The TORRIX XTS indicating and adjustment module is operated in two different ways, depending on whether the housing is open or closed. The actions performed by the operator are shown on the display.

Open housing

When the housing is open, the operation is done via the 4 keys on the membrane keyboard, which are located below the display.

Closed housing

When the housing is closed, the operation is done with a magnetic pen, the *FAFNIR magnetic pen*, effecting through the display glass. For this purpose, 4 magnetic sensors are arranged under the membrane keyboard in the area of the respective keys.

6.2.1 Arrangement of the keys / magnet sensors

The following figure shows the display with a membrane keyboard and the *FAFNIR magnetic pen*.

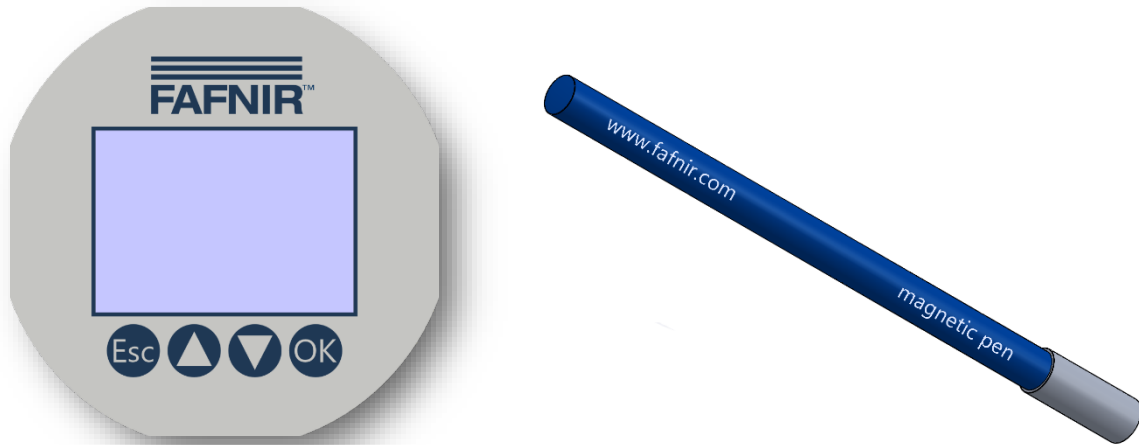


Figure 12: Membrane keyboard and FAFNIR magnetic pen

6.2.2 Function of the keys / magnet sensors

The individual keys / magnet sensors have the following functions:

- 
 - Jump back to the higher menu
 - Back to the previous position, when entering text or multi-digit numbers
 - Cancel without saving
- 
 - Select the previous menu item
 - Increases the value at the current position (e.g. 6 → 7), when entering text or multi-digit numbers
- 
 - Select the next menu item
 - Decreases the value at the current position (e.g. 7 → 6), when entering text or multi-digit numbers
 - Select the display representation for displaying measured values



- Change from the measured value display to the main menu
- Jump to the selected submenu
- Forward to the next position, when entering text or multi-digit numbers
- Select and save value for parameter

6.3 Measured value display

The following information is shown in the measured value display:

- TAG (measuring point)
- Measured value (up to 3 measured values can be displayed)
- Bar graph



When the current is less than 4 mA, the backlight will turn off automatically.

You can switch between 3 display options for the measured value display (1, 2 or 3 measured values) by pressing the down arrow key.

The measured values to be displayed can be selected in the menu under Configuration → Display → Values.

The bar graph shows the recent current on the 4 ... 20 mA interface in percentage.

Measured value display with one measured value:



Figure 13: Measured value display with one measured value

Measured value display with two measured values:

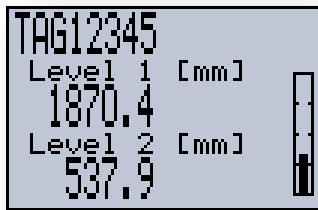


Figure14: Measured value display with two measured values

Measured value display with three measured values:

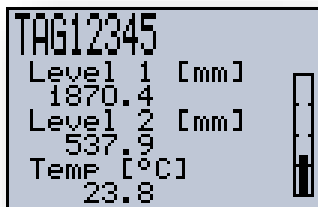


Figure 15: Measured value display with three measured values

6.4 Simulation

A configured simulation is only started when you switch back from the configuration menu to the measured value display.

The active simulation is identified by the "SIM" indicator in the measured value display.

An active simulation is ended either by pressing the "OK" button (change from the measured value display to the configuration menu) or automatically after 5 minutes.

6.5 Error display

Errors detected by the TORRIX XTS are shown as error messages with plain text information on the display.

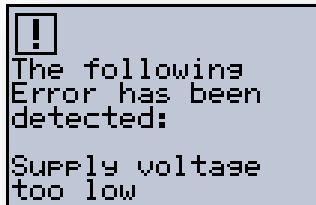


Figure 16: Error display, supply voltage too low

The following error messages can be displayed:

- Signature error
- TORRIX XTS parameter error
- HART parameter error
- Probe internal error
- Probe error communication
- Supply voltage too low

6.6 Icons

The icons described in the following are used by the TORRIX XTS indicating and adjustment module to signal certain states.



Fault

The error display is shown. An error prevents normal function.



Configuration

The configuration is shown. Changes can be made according to the menu structure.



Simulation

The simulation that can be activated via the Diagnosis ► Simulation menu is running. The current on the 4...20 mA interface is simulated and therefore does not follow the process value.

7 Adjustment

7.1 TORRIX XTS Configuration

The configuration is done with the computer using the FAFNIR HART-Setup configuration tool, see technical documentation



FAFNIR HART SETUP art. no. 350225

Configurations for the TORRIX XTS can also be done using the indicating and adjustment module. Pressing the OK button changes the measured value display to the main menu of the configuration.

After closing the configuration menu all changes are automatically stored and remain even after turning off the TORRIX XTS.

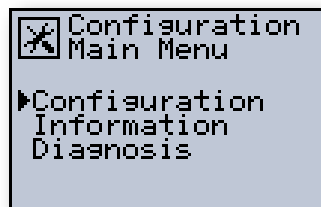


Do not interrupt the power supply with active configuration menu, since the configuration is not completely stored at voltage interruption.



When changing parameters are stored in the controller's data flash, the current on the 4 ... 20 mA interface is briefly set to 12 mA and then returns to the original current.

Display of the main menu

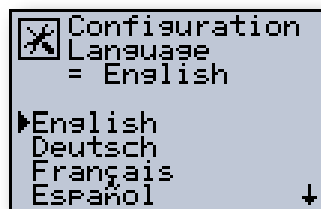


← Main menu

← Menu items available in the main menu

Figure 17: Configuration - Main Menu

Display of the sub-menu (in this case: language selection)



← Sub-menu (in this case: language)

← Active selection for this sub-menu

← Menu items available in the sub-menu

← More menu items available (▼)

Figure 18: Configuration - Language

-  *If there are more than the currently displayed menu items, this is indicated by an arrow in the lower right corner of the display. The menu items that are not visible can be shown by scrolling up or down using the arrow keys.*
-  *The configuration will automatically be exited after 2 minutes if there is no further operation.*

7.2 Menu Structure

Main Menu / Configuration // Display /// Language

The active language is always named above after the equals sign:

► English ► Deutsch ► Français ► Español ► Português ► Italiano ► Русский

Main Menu / Configuration // Display /// TAG

Enter the measuring point designation (8 characters). OK to move to the next character. Arrow keys to select the character. To exit the menu press ESC when the cursor is on the first character.

Main Menu / Configuration // Display /// Values

Value 1, value 2, ...

Selection of the measured value which should be output as value 1, value 2, ...

Possible measured values are:

- None
- DV0 – LEV1 (level of upper float)
- DV1 – LEV2 (level of lower float)
- DV2 – TEMP (temperature)
- DV3 – LEV1-2 (level 1 minus level 2)
- Current
- Percent (Current in percent)

Main Menu / Configuration // Display /// Lighting

Enable or disable the lighting

Main Menu / Configuration // Measurement /// Units

- Level (mm, cm, m, in, ft)
- Temperature (°C, °F)

Main Menu / Configuration // Measurement /// Offset

Float offset adjustment of Level 1, Level 2..

Main Menu / Configuration // Measurement /// Damping

Damping adjustment of Level 1, Level 2, in seconds:

0s, 0.0625 s, 0.125 s, 0.25 s, 0.5 s, 1 s, 2 s, 4 s, 8 s, 16 s, 32 s, 64 s.

Main Menu / Configuration // Output /// Variable

The variable to which to the 4 to 20 mA signal refers is determined here.

Main menu / Configuration // Output /// 4 mA point

Setting the 4 mA point of the probe (in units of length)

Main menu / Configuration // Output /// 20 mA point

Setting the 20 mA point of the probe (in units of length)

Main Menu / Configuration // Output /// Alarm current

Current that is output in the event of an error: 3.6 mA / 21.5 mA.

Main Menu / Information // Device

Device type and device number

Main Menu / Information // Version

Firmware and hardware version of the probe

Main Menu / Information // Properties

Probe length, number of floats, number of temperature sensors.

Main Menu / Information // Communication

Shows which communication option the probe supports

Main Menu / Information // Calibration

Date of the last calibration of the device

Main Menu / Diagnosis // Status

Current status of the device

Main menu / Diagnosis // Min./Max.

Shows the minimum and maximum value that the probe has recorded since restart:

Level 1, Level 2, Temperature.

Main menu / Diagnosis // Simulation /// Operating mode

Off: Simulation disabled

Fixed: the mA value set for "Low" is output

Alternating: the mA value set for "Low" and for "High" are output alternately

Main menu / Diagnosis // Simulation /// Operating Variable

Variable in the simulation (e.g. current 4-20 mA)

Main menu / Diagnosis // Simulation /// Value

mA value for the simulation

Low: Setting the low mA value for the simulation

High: Setting the high mA value for the simulation

Main menu / Diagnosis // Simulation /// Cycle time

Setting the time for the change of the mA value ("**Low**" / "**High**") in the "**Simulation**" operating mode with the "**Alternating**" option.

Main Menu / Diagnosis // Default

Resetting the probe to the factory setting defaults

Main Menu / Diagnosis // Probe

Analysis values of the probe:

- Quality of measurement
- Attenuation length
- Pulse duration
- Pulse height
- Start level

Main Menu / Diagnosis // Restart

Restart the probe

8 Maintenance

8.1 Servicing

The filling level sensor is maintenance-free.

8.2 Return Shipment

Before returning any FAFNIR equipment, the Return Material Authorization (RMA) from FAFNIR customer service is required. Please contact your account manager or the customer service to receive the instructions on how to return goods.



The return of FAFNIR products is only possible after approval by the FAFNIR customer service.

9 Technical Data

9.1 Sensor

Electrical connection TORRIX (Ex) XTS	2-wire connection 4 ... 20 mA (3.8 ... 20.5 mA) current consumption for level indication 21.5 mA or 3.6 mA current consumption in the event of a fault
Supply voltage TORRIX (Exd) XTS TORRIX Ex XTS Heating	12 ... 50 V _{DC} 12 ... 30 V _{DC} 24 V _{DC} (+/- 10 %)
Process connection	Screw-in unit for stepless height adjustment Standard G ½ (compression fitting) Flange (on request) Material see probe tube
Sensor head	Height 91 ... 95 mm (depending on version) Diameter 83 mm Depth 128 mm Protection class IP68 Material stainless steel Cable gland Temperature -20 ... +85 °C Temperature -55 ... +85 °C (with heating)
Probe tube	Probe lengths from 100 mm to 6 m, as Flex version up to 22 m Diameter 12 mm (other diameters on request) Material stainless steel 1.4571 (316Ti) or 1.4301 (304) (Hastelloy, or other materials on request) Standard temperature -40 °C ... +85 °C Normal temperature (NT) -40 °C ... +125 °C High temperature (HT) -40 °C ... +250 °C Maximum temperature (HHT) -40 °C ... +450 °C Low temperature (LT) -65 °C ... +125 °C
Communication	TORRIX (Ex...) XTS 4 ... 20 mA / HART

Measuring accuracy Digital component HT/HHT	Linearity better than ± 1 mm or ± 0.05 %, better than ± 0.01 % per K Repetition accuracy better than 0.1 mm Resolution better than 50 μ m
Measuring accuracy Digital component NT/LT (on request)	Linearity better than ± 0.2 mm or ± 0.01 %, better than ± 0.001 % per K Repetition accuracy better than 0.05 mm Resolution better than 10 μ m
Measuring accuracy Analogue component	Linearity better than ± 0.01 % Temperature coefficient better than 0.01% per K Resolution better than 1 μ A (15 bit)

9.2 Float

The float is an essential component of the level sensor that must be matched to the medium in respect of density, pressure resistance and material durability.

The following floats are exchangeable and can be ordered separately. Other float types and materials are available on request.



The density and magnet position of floats of the same type may vary slightly, so that a readjustment may be necessary.



All floats can be used at a pressure of 1 bar (vacuum) up to the maximum operating pressure.

Excerpt from the product range of floats:

Min. density of medium [g/cm ³]	Material	Max. operating pressure [bar] at 20 °C *)	Shape [mm]
0.5	Titanium	20	Ball $\varnothing$ 50
0.6	1.4571 / 316 Ti	20	Ball $\varnothing$ 52
0.7	1.4571 / 316 Ti	16	Cylinder $\varnothing$ 53
0.7	C276	10	Cylinder $\varnothing$ 46
0.7	1.4571 / 316 Ti	40	Ball $\varnothing$ 52
0.85	1.4571 / 316 Ti	20	Ball $\varnothing$ 43
0.95	1.4571 / 316 Ti	50	Ball $\varnothing$ 43

*) above 50 °C the maximum operating pressure decreases



Pressure resistance is guaranteed for undamaged floats only. Even the most minor and invisible dents, which can occur if, for example, the float is dropped from a bench onto a stone floor, are sufficient to cause a significant deterioration in pressure resistance.

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EU-Konformitätserklärung
EU Declaration of Conformity
Déclaration UE de Conformité
Dichiarazione di Conformità UE



FAFNIR GmbH, Deutschland / Germany / Allemagne / Germania

erklärt als Hersteller in alleiniger Verantwortung, dass die Produkte
declares as manufacturer under sole responsibility that the products
déclare sous sa seule responsabilité en qualité de fabricant que les produits
dichiara sotto la sola responsabilità del produttore, che i prodotti sono

Füllstandsensoren / Filling Level Sensors / Capteurs de Niveau / Sensori di livello
TORRIX ... / VISY-Stick ...

den Vorschriften der europäischen Richtlinien
comply with the regulations of the European directives
sont conformes aux réglementations des directives européennes suivantes
rispetta i regolamenti delle direttive europee

2011/65/EU	Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten	RoHS
2011/65/EU	Restriction of the use of certain hazardous substances in electrical and electronic equipment	RoHS
2011/65/UE	Limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques	RoHS
2011/65/UE	Restrizione dell'uso di determinate sostanze pericolose nelle apparecchiature elettriche ed elettroniche	RoHS
2014/30/EU	Elektromagnetische Verträglichkeit	EMV
2014/30/EU	Electromagnetic compatibility	EMC
2014/30/UE	Compatibilité électromagnétique	CEM
2014/30/UE	Compatibilità elettromagnetica	CEM
2014/34/EU	Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen	ATEX
2014/34/EU	Equipment and protective systems intended for use in potentially explosive atmospheres	ATEX
2014/34/UE	Appareils et systèmes de protection destinés à être utilisés en atmosphères explosibles	ATEX
2014/34/UE	Apparecchi e sistemi di protezione destinati a essere utilizzati in atmosfera potenzialmente esplosiva	ATEX

durch die Anwendung folgender harmonisierter Normen entsprechen
by applying the harmonised standards
par l'application des normes
applicando le norme armonizzate

RoHS / RoHS / RoHS / RoHS
EMV / EMC / CEM / CEM
ATEX / ATEX / ATEX / ATEX

EN IEC 63000:2018
EN 61326-1:2013
EN IEC 60079-0:2018 **EN 60079-1:2014** **EN 60079-11:2012**
EN 60079-26:2015 **EN 60079-31:2014**

Die Produkte sind bestimmt als Elektro- und Elektronikgeräte der RoHS-
The products are determined as electrical and electronic equipment of RoHS
Les produits sont déterminés comme des équipements électriques et électroniques de RoHS
I prodotti sono determinati come apparecchiature elettriche ed elettroniche della RoHS

Kategorie / Category / Catégorie / Categoria

Überwachungs- und Kontrollinstrumenten in der Industrie /
Industrial Monitoring and Control Instruments /
Instruments de contrôle et de surveillance industriels /
Strumenti di monitoraggio e controllo industriali

Die Produkte entsprechen den EMV-Anforderungen
The products comply with the EMC requirements
Les produits sont conformes aux exigences CEM
I prodotti sono conformi ai requisiti CEM

Störaussendung / Emission / Émission / L'emissione
Störfestigkeit / Immunity / D'immunità / Immunità

Klasse B / Class B / Classe B / Classe B
Industrielle elektromagnetische Umgebung /
Industrial electromagnetic environment /
Environnement électromagnétique industriel /
Ambiente elettromagnetico industriale

Die notifizierte Stelle TÜV NORD CERT GmbH, 0044 hat eine EU-Baumusterprüfung durchgeführt und folgende Bescheinigung ausgestellt
The notified body TÜV NORD CERT GmbH, 0044 performed a EU-type examination and issued the certificate
L'organisme notifié TÜV NORD CERT GmbH, 0044 a effectué examen UE de type et a établi l'attestation
L'organismo notificato TÜV NORD CERT GmbH, 0044 ha effettuato esame UE del tipo e rilasciato il certificato

TORRIX Ex ... / VISY-Stick ...

TÜV 99 ATEX 1496 X

Hamburg, 2023-04-14

Ort, Datum / Place, Date / Lieu, Date / Luogo, data

Geschäftsführer / Managing Director / Gérant / Direttore Generale: René Albrecht



Translation

(1) EU-Type Examination Certificate

(2) Equipment and protective systems intended for use in potentially explosive atmospheres, **Directive 2014/34/EU**

(3) **Certificate Number** TÜV 99 ATEX 1496 X **Issue:** 03
 (4) for the product: Filling level sensors type VISY-Stick ... and type TORRIX Ex...
 (5) of the manufacturer: **FAFNIR GmbH**
 (6) Address: Schnackenburgallee 149 c
 22525 Hamburg
 Germany

Order number: 8003035365
 Date of issue: See date of signature

(7) The design of this product and any acceptable variation thereto are specified in the schedule to this EU-Type Examination Certificate and the documents therein referred to.

(8) The TÜV NORD CERT GmbH, Notified Body No. 0044, in accordance with Article 17 of the Directive 2014/34/EU of the European Parliament and the Council of 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive. The examination and test results are recorded in the confidential ATEX Assessment Report No. 22 203 302211.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN IEC 60079-0:2018/AC:2020-02 **EN 60079-1:2014/AC:2018-09** **EN 60079-11:2012**
EN 60079-26:2015 **EN 60079-31:2014**

except in respect of those requirements listed at item 18 of the schedule.

(10) If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions for Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design, and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the product shall include the following:

 **See „Type code and Marking“**

TÜV NORD CERT GmbH, Am TÜV 1, 45307 Essen, notified by the central office of the countries for safety engineering (ZLS), Ident. Nr. 0044, legal successor of the TÜV NORD CERT GmbH & Co. KG Ident. Nr. 0032

The deputy of the head of the notified body

 Digital
 unterschrieben von
 Meyer Andreas
 Datum: 2023.04.04
 19:55:26 +02'00'

Hanover office, Am TÜV 1, 30519 Hannover, Tel. +49 511 998-61455, Fax +49 511 998-61590

This certificate may only be reproduced without any change, schedule included.
 Excerpts or changes shall be allowed by the TÜV NORD CERT GmbH

(13) SCHEDULE

(14) EU-Type Examination Certificate No. TÜV 99 ATEX 1496 X

Issue 03

(15) **Description of product:**

The filling level sensors type VISY-Stick ... and type TORRIX Ex... are used for continuous measurement of liquid levels within potentially explosive areas. Floaters are used to detect the fluid levels. These slide on a sensor tube. For interface or water detection, a second float can be mounted on the sensor tube. In addition, the density of the liquid can be determined by means of a density module.

The temperature measuring chain VISY-Stick ... Temp ... is used to measure temperatures at different heights and does not use any floats.

Type code and Marking:

Type VISY-Stick ... (Ex-relevant designations only):

VISY-Stick Sump ...	Environmental sensor (Leakage control)
VISY-Stick Advanced ...	Advanced precision of measurement and temperature sensors
VISY-Stick Flex ...	Flexible sensor tube
VISY-Stick ...	Serial communication
VISY-Stick ... RS485	RS-485 interface
VISY-Stick ... Temp ...	Temperature measuring chain
VISY-Stick ... TLS	TLS interface

Type TORRIX Ex... (Ex-relevant designations only):

TORRIX Ex...	4...20 mA interface (with configuration buttons) optionally with HART protocol
TORRIX Ex C...	4...20 mA interface (without configuration buttons) optionally with HART protocol
TORRIX Ex RS485...	RS-485 interface
TORRIX Ex SC...	Serial communication
TORRIX Ex TAG...	TAG interface (communication in accordance with EN 14116)
TORRIX Ex XT...	RS-485- or 4...20 mA interface optionally with display (Ex i)
TORRIX Exd XT...	RS-485- or 4...20 mA interface optionally with display (Ex d+t+i)
TORRIX Ex...-A	Advanced precision of measurement and temperature sensors
TORRIX Ex... Flex	Flexible sensor tube
TORRIX Ex... PL	With plastic coating against very aggressive media

Schedule to EU-Type Examination Certificate No. TÜV 99 ATEX 1496 X

Issue 03

• VISY-Stick ... • VISY-Stick (Flex) Temp • VISY-Stick ... RS485 • VISY-Stick (Flex) Temp RS485 • TORRIX Ex... • TORRIX Ex C... • TORRIX Ex RS485... • TORRIX Ex SC... • TORRIX Ex TAG... • TORRIX Ex XT...	- II 1 G Ex ia IIC T6...T1 Ga - II 1/2 G Ex ia IIC T6...T1 Ga/Gb - II 2 G Ex ia IIC T6...T1 Gb - II 2 D Ex ia IIIC TX°C Db (see thermal data)
• VISY-Stick Advanced ... • VISY-Stick ... Flex ... • VISY-Stick ... Advanced RS485 • VISY-Stick ... Flex RS485 • TORRIX Ex ...-A • TORRIX Ex ... Flex • TORRIX Ex ... PL • TORRIX Ex C...-A • TORRIX Ex C... Flex • TORRIX Ex C... PL • TORRIX Ex RS485...-A • TORRIX Ex RS485... Flex • TORRIX Ex RS485... PL • TORRIX Ex SC...-A • TORRIX Ex SC... Flex • TORRIX Ex SC... PL • TORRIX Ex TAG...-A • TORRIX Ex TAG... Flex • TORRIX Ex TAG... PL • TORRIX Ex XT...-A • TORRIX Ex XT... Flex • TORRIX Ex XT... PL	- II 1 G Ex ia IIB T6...T1 Ga - II 1/2 G Ex ia IIB T6...T1 Ga/Gb - II 2 G Ex ia IIB T6...T1 Gb - II 2 D Ex ia IIIC TX°C Db (see thermal data)
• VISY-Stick ... TLS • VISY-Stick (Flex) Temp TLS	- II 1 G Ex ia IIC T4...T1 Ga - II 1/2 G Ex ia IIC T4...T1 Ga/Gb - II 2 G Ex ia IIC T4...T1 Gb - II 2 D Ex ia IIIC TX°C Db (see thermal data)
• VISY-Stick ... Advanced TLS • VISY-Stick ... Flex TLS	- II 1 G Ex ia IIB T4...T1 Ga - II 1/2 G Ex ia IIB T4...T1 Ga/Gb - II 2 G Ex ia IIB T4...T1 Gb - II 2 D Ex ia IIIC TX°C Db (see thermal data)
• TORRIX Exd XT...	- II 1/2 G Ex ia/db IIC T6...T1 Ga/Gb - II 2 G Ex db ia IIC T6...T1 Gb - II 2 D Ex ia tb IIIC TX°C Db (see thermal data)
• TORRIX Exd ...-A • TORRIX Exd ... Flex • TORRIX Exd ... PL	- II 1/2 G Ex ia/db IIB T6...T1 Ga/Gb - II 2 G Ex db ia IIB T6...T1 Gb - II 2 D Ex ia tb IIIC TX°C Db (see thermal data)

Schedule to EU-Type Examination Certificate No. TÜV 99 ATEX 1496 X

Issue 03

Electrical data:

VISY-Stick ...; VISY-Stick (Flex) Temp; TORRIX Ex SC...; VISY-Stick Advanced ...;
VISY-Stick ... Flex ...; TORRIX Ex SC...-A; TORRIX Ex SC... Flex and TORRIX Ex SC... PL;

Signal and power supply
 (Terminals +, -, A, B) or (M12-Plug)

In type of protection intrinsic safety Ex ia IIC/IIB/IIIC
 Only for connection to certified intrinsically safe circuits.

Maximum values:

$$U_i = 15 \text{ V}$$

$$I_i = 60 \text{ mA}$$

$$P_i = 100 \text{ mW}$$

$$\text{Effective internal capacitance } C_i = 10 \text{ nF}$$

$$\text{Effective internal inductance } L_i = 100 \text{ }\mu\text{H}$$

VISY-Stick ... RS485; VISY-Stick (Flex) Temp RS485; TORRIX Ex...; TORRIX Ex C...;
TORRIX Ex RS485...; TORRIX Ex TAG...; TORRIX Ex XT...; VISY-Stick ... Advanced RS485;
VISY-Stick ... Flex RS485; TORRIX Ex ...-A; TORRIX Ex ... Flex; TORRIX Ex ... PL;
TORRIX Ex C...-A; TORRIX Ex C... Flex; TORRIX Ex C... PL; TORRIX Ex RS485...-A;
TORRIX Ex RS485... Flex; TORRIX Ex RS485... PL; TORRIX Ex TAG...-A;
TORRIX Ex TAG... Flex; TORRIX Ex TAG... PL; TORRIX Ex XT...-A; TORRIX Ex XT... Flex
and TORRIX Ex XT... PL;

Signal and power supply
 (Terminals +, -, A, B resp. +, -) or
 (M12-Plug)

In type of protection intrinsic safety Ex ia IIC/IIB/IIIC
 Only for connection to certified intrinsically safe circuits.

Maximum values:

$$U_i = 30 \text{ V}$$

$$I_i = 200 \text{ mA at } T_a \leq +70 \text{ }^\circ\text{C}$$

$$I_i = 100 \text{ mA at } T_a \leq +85 \text{ }^\circ\text{C}$$

$$P_i = 1 \text{ W}$$

$$\text{Effective internal capacitance } C_i = 10 \text{ nF}$$

$$\text{Effective internal inductance } L_i = 20 \text{ }\mu\text{H}$$

VISY-Stick ... TLS; VISY-Stick (Flex) Temp TLS; VISY-Stick ... Advanced TLS and
VISY-Stick ... Flex TLS;

Signal and power supply
 (Terminals +, -) or (M12-Plug)

In type of protection intrinsic safety Ex ia IIC/IIB/IIIC
 Only for connection to certified intrinsically safe circuits.

Maximum values:

$$U_i = 13 \text{ V}$$

$$I_i = 200 \text{ mA}$$

$$P_i = 625 \text{ mW}$$

$$\text{Effective internal capacitance } C_i = 20 \text{ nF}$$

$$\text{Effective internal inductance } L_i = 410 \text{ }\mu\text{H}$$

Schedule to EU-Type Examination Certificate No. TÜV 99 ATEX 1496 X

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TORRIX Exd XT...; TORRIX Exd ...-A; TORRIX Exd ... Flex and TORRIX Exd ... PL:

Signal and power supply
(Terminals +, -, A, B)

For connection to non-intrinsically safe circuits with the following values:

$U = 12 V_{d.c.} \dots 50 V_{d.c.}; I = 4 \text{ mA} \dots 20 \text{ mA}$
 $U_m = 253 \text{ V}$

Heating circuit
(Terminals -, +)

For connection to non-intrinsically safe circuits with the following values:

$U = 24 V_{d.c.} \pm 10 \%$
 $I = 160 \text{ mA}$

Thermal data:

VISY-Stick ...; VISY-Stick (Flex) Temp; TORRIX Ex SC...; VISY-Stick Advanced ...;

VISY-Stick ... Flex ...; TORRIX Ex SC...-A; TORRIX Ex SC... Flex and TORRIX Ex SC... PL:

For EPL Ga or EPL Ga/Gb or EPL Gb, the permissible temperature range depending on the variant and the temperature class can be taken from the following table:

Temperature class	Ambient temperature range	Medium temperature range
T6	-40 °C ... +50 °C	-40 °C ... +75 °C
T5	-40 °C ... +65 °C	-40 °C ... +90 °C
T4	-40 °C ... +85 °C	-40 °C ... +125 °C
T3	-40 °C ... +85 °C	-40 °C ... +190 °C
T2	-40 °C ... +85 °C	-40 °C ... +285 °C
T1	-40 °C ... +85 °C	-40 °C ... +435 °C

For EPL Db applications, the permissible ambient temperature range depending on the permissible surface temperature can be taken from the following table:

Maximum surface temperature		Ambient temperature range T_a
Dust layer $\leq 5 \text{ mm}$ $T_5 X^\circ\text{C}$	With total immersion $T X^\circ\text{C}$	
$X^\circ\text{C} = T_a + 30^\circ\text{C}$	$X^\circ\text{C} = 135^\circ\text{C}$	-40 °C ... +85 °C

The equipment is suitable for dusts with an ignition temperature of more than 190 °C under a dust layer of 5 mm (glow temperature).

Schedule to EU-Type Examination Certificate No. TÜV 99 ATEX 1496 X

Issue 03

VISY-Stick ... RS485; VISY-Stick (Flex) Temp RS485; TORRIX Ex ...; TORRIX Ex C...;
 TORRIX Ex RS485...; TORRIX Ex TAG...; TORRIX Ex XT...; VISY-Stick ... Advanced RS485;
 VISY-Stick ... Flex RS485; TORRIX Ex ...-A; TORRIX Ex ... Flex; TORRIX Ex ... PL;
 TORRIX Ex C...-A; TORRIX Ex C... Flex; TORRIX Ex C... PL; TORRIX Ex RS485...-A;
 TORRIX Ex RS485... Flex; TORRIX Ex RS485... PL; TORRIX Ex TAG...-A;
 TORRIX Ex TAG... Flex; TORRIX Ex TAG... PL; TORRIX Ex XT...-A; TORRIX Ex XT... Flex
 and TORRIX Ex XT... PL;

For EPL Ga or EPL Ga/Gb or EPL Gb, the permissible temperature range depending on the variant and the temperature class can be taken from the following table:

Temperature class	Ambient temperature range	Medium temperature range
T6	$I_i \leq 100 \text{ mA}$: -40 °C ... +40 °C $I_i \leq 200 \text{ mA}$: -40 °C ... +25 °C	-40 °C ... +75 °C
T5	$I_i \leq 100 \text{ mA}$: -40 °C ... +55 °C $I_i \leq 200 \text{ mA}$: -40 °C ... +40 °C	-40 °C ... +90 °C
T4	$I_i \leq 100 \text{ mA}$: -40 °C ... +85 °C $I_i \leq 200 \text{ mA}$: -40 °C ... +70 °C	-40 °C ... +125 °C
T3	$I_i \leq 100 \text{ mA}$: -40 °C ... +85 °C $I_i \leq 200 \text{ mA}$: -40 °C ... +70 °C	-40 °C ... +190 °C
T2	$I_i \leq 100 \text{ mA}$: -40 °C ... +85 °C $I_i \leq 200 \text{ mA}$: -40 °C ... +70 °C	-40 °C ... +285 °C
T1	$I_i \leq 100 \text{ mA}$: -40 °C ... +85 °C $I_i \leq 200 \text{ mA}$: -40 °C ... +70 °C	-40 °C ... +435 °C

For EPL Db applications, the permissible ambient temperature range depending on the permissible surface temperature can be taken from the following table:

Maximum surface temperature		Ambient temperature range T_a
Dust layer $\leq 5 \text{ mm}$ $T_5 \text{ X}^\circ\text{C}$	With total immersion $T \text{ X}^\circ\text{C}$	
$I_i \leq 100 \text{ mA}$: $X^\circ\text{C} = T_a + 40^\circ\text{C}$	Observe EN 60079-14	-40 °C ... +85 °C
$I_i \leq 200 \text{ mA}$: $X^\circ\text{C} = T_a + 55^\circ\text{C}$	Observe EN 60079-14	-40 °C ... +70 °C

The equipment is suitable for dusts with an ignition temperature of more than 200 °C under a dust layer of 5 mm (glow temperature).

Schedule to EU-Type Examination Certificate No. TÜV 99 ATEX 1496 X

Issue 03

VISY-Stick ... TLS; VISY-Stick (Flex) Temp TLS; VISY-Stick ... Advanced TLS and VISY-Stick ... Flex TLS:

For EPL Ga or EPL Ga/Gb or EPL Gb, the permissible temperature range can be taken from the following tables, depending on the variant and the temperature class:

Temperature class	Ambient temperature range	Medium temperature range
T4	-40 °C ... +75 °C	-40 °C ... +125 °C
T3	-40 °C ... +85 °C	-40 °C ... +190 °C
T2	-40 °C ... +85 °C	-40 °C ... +285 °C
T1	-40 °C ... +85 °C	-40 °C ... +435 °C

For EPL Db applications, the permissible ambient temperature range depending on the permissible surface temperature can be taken from the following table:

Maximum surface temperature		Ambient temperature range T_a
Dust layer ≤ 5 mm $T_5 X^\circ C$	With total immersion $T X^\circ C$	
$X^\circ C = 135^\circ C$	$X^\circ C = 135^\circ C$	-40 °C ... +77 °C
$X^\circ C = T_a + 110^\circ C$	Observe EN 60079-14	-40 °C ... +85 °C

The equipment is suitable for dusts with an ignition temperature of more than 270 °C under a dust layer of 5 mm (glow temperature).

TORRIX Exd XT...; TORRIX Exd ...-A; TORRIX Exd ... Flex and TORRIX Exd ... PL:

For EPL EPL Ga/Gb or EPL Gb, the permissible temperature range can be taken from the following tables, depending on the variant and the temperature class:

Temperature class	Ambient temperature range	Medium temperature range
T6	-55 °C ... +50 °C	-55 °C ... +75 °C
T5	-55 °C ... +65 °C	-55 °C ... +90 °C
T4	-55 °C ... +85 °C	-55 °C ... +125 °C
T3	-55 °C ... +85 °C	-55 °C ... +190 °C
T2	-55 °C ... +85 °C	-55 °C ... +285 °C
T1	-55 °C ... +85 °C	-55 °C ... +435 °C

For EPL Db applications, the permissible ambient temperature range depending on the permissible surface temperature can be taken from the following table:

Maximum surface temperature		Ambient temperature range T_a
Dust layer ≤ 5 mm $T_5 X^\circ C$	With total immersion $T X^\circ C$	
$X^\circ C = T_a + 30^\circ C$	Observe EN 60079-14	-55 °C ... +85 °C

The equipment is suitable for dusts with an ignition temperature of more than 190 °C under a dust layer of 5 mm (glow temperature).

- (16) Drawings and documents are listed in the ATEX Assessment Report No. 22 203 302211

(17) Specific Conditions for Use:

1. The permissible temperature range depending on temperature classes resp. on the maximum surface temperature is to be taken from the operating instructions.
2. A reverse heat flow from the process, e.g. by heat dissipation from components of the system, beyond the permissible ambient temperature of the filling level sensor is not permissible. This can be avoided, for example, by suitable thermal insulation of these components or by mounting the pressure transmitter at a greater distance (cooling distance).
3. The medium tangent materials of the filling level sensor have to be resistant to the media.
4. For the uses in potentially explosive gas atmospheres and when using plastic floats, the filling level sensors have to be installed and used in such a way, that electrostatic charging from operation, maintenance and cleaning is excluded.
For the uses in potentially explosive dust atmospheres and when using plastic floats process-related electrostatic charges, e.g. due to passing media have to be excluded.
5. When using titanium floats or the Sump Environmental Sensor, the ignition hazard caused by impact or friction has to be excluded.
6. For EPL Ga/Gb applications the whole device filling level type VISY-Stick ... resp. type TORRIX Ex has to be mounted in a way that allows an installation that results in a sufficiently tight joint (IP66 or IP67) or a flameproof joint (IEC 60079-1) in the direction of the less endangered area.
7. In case of hazards due to pendulum or swinging, the corresponding parts of the level sensor type VISY-Stick ... resp. type TORRIX Ex... have to be effectively secured against these hazards.
8. The cable glands for the filling level sensors type TORRIX Exd XT...; TORRIX Exd ...-A; TORRIX Exd ... Flex and TORRIX Exd ... PL have to be separately assessed and certified in accordance with EN 60079-0; EN 60079-1 and EN 60079-31. In the end-use application the degree of protection min. IP6X shall be maintained in accordance with EN 60079-0 and in compliance with EN 60529.
9. The flameproof joints at type TORRIX Exd... are not intended to be repaired.

(18) Essential Health and Safety Requirements:

No additional ones.

- End of EU-Type Examination Certificate -

**I Range of application**

The filling level sensors are designed for continuous measurement of liquid levels. Floats are used to measure the liquid levels. These slide on a sensor tube. For interface or water detection, a second float can be mounted on the sensor tube. In addition, the density of the liquid can be determined via a density module. The temperature measuring chain VISY-Stick ... Temp ... is used to measure temperatures at different heights and does not use any floats.

The power supply for the devices VISY-Stick ... and the forwarding of the measured data to a superordinate evaluation system is provided by isolating amplifier VP-... or VPI or, in the case of the sensor VISY-Stick ... TLS, e. g. by the TLS-... console from Veeder-Root. If an RS-485 interface is used, the sensor VISY-Stick ... RS485 can be used.

The filling level sensors TORRIX Ex ... can be produced with different interfaces. These are, for example, interfaces "4 ... 20 mA" (TORRIX Ex ... and TORRIX Ex C...), "RS-485" (TORRIX Ex RS485...) or TAG (TORRIX Ex TAG...). The TORRIX Ex... XT... level sensors can be operated either on a 4 ... 20 mA or RS 485 interface. The filling level sensors TORRIX Ex SC... are connected to the isolating amplifier VP-... or VPI.

II Standards

The device is designed according to the following European standards

EN IEC 60079-0:2018	Equipment – General requirements
EN 60079-1:2014	Equipment protection by flameproof enclosures "d"
EN 60079-11:2012	Equipment protection by intrinsic safety "i"
EN 60079-26:2015	Equipment with Equipment Protection Level (EPL) Ga
EN 60079-31:2014	Equipment dust ignition protection by enclosure "t"

III Instructions for safe ...**III.a ... use**

The approval applies to equipment types VISY-Stick ... and TORRIX Ex...

The devices are designed either as intrinsically safe equipment or as flameproof enclosures resp. protection by enclosures with an intrinsically safe part and are suitable for use in potentially explosive atmospheres. The "advanced" (TORRIX Ex...-A, VISY-Stick Advanced ...) and "flexible" filling level sensors (TORRIX Ex... Flex, VISY-Stick ... Flex ...) as well as types with plastic coating against very aggressive media (TORRIX Ex... PL) can be used for all gases of groups IIA and IIB. The temperature measuring chain VISY-Stick ... Temp ... and all other filling level sensors can be used for all gases of groups IIA, IIB and IIC. In addition, all devices can be used for dust groups IIIA, IIIB and IIIC.

With the level sensor in flameproof enclosure respectively with protection by enclosure (TORRIX Exd ...) there is the possibility of using a heater for the display when used in very low ambient temperatures.

To use a non-conductive plastic floats in potentially explosive areas with gases of group IIC the hazard of static charging must be prevented. Here a few conditions need to be observed:

- The use of the float in strongly flowing, non-conductive liquids is forbidden;
- There must be no agitator/mixer in the tank;
- Frictions on non-conductive components are to be avoided;
- The float must not be cleaned in a dry state.

The materials of the sensors that come into contact with the media must be resistant to these media.



III.b ... assembling and dismantling

The assembly and disassembly must solely be carried out with the power disconnected!

Prior to the installation, it may be necessary that the float/s or the density module is disassembled. During the assembly it must be ensured that the float/s or the module is/are mounted the right way on the sensor tube.

Only with the TORRIX Ex ... with screw terminals the opening of the sensor head is planned. Further disassembly may damage the filling level sensor and void its approval.

With the TORRIX Exd ... a certified cable gland must be installed in the flameproof enclosure according to the manufacturer's instructions. The covers of the connection compartment and of the display can be opened after switching off both circuits (sensor and heating) with a four-minute waiting time, whereby the M4 hexagon socket locking screw must first be loosened (screw into the enclosure). To close the cover, screw it back on completely and then secure it with the M4 screw (screw it out of the enclosure against the cover).

III.c ... installation

All wiring operations must solely be carried out with the power disconnected. Special rules and regulations, including EN 60079-14 and local installation regulations, must be observed.

If a device is supplied with screw-in unit, the thread of the screw-in unit must be fitted with a suitable sealing material, screwed into the existing sleeve and tightened. In case of a riser installation the plastic centring aid is plugged onto the sensor head. Then allow the sensor to slide into the riser tube until it stands firmly on the bottom. If the filling level sensor is supplied without process fitting, the installer is responsible for compliance with the Ex requirements.

General information (see also EN 60079-26, Clause 4.3):

If a device is installed into the boundary wall between zone 0 and zone 1, it is essential to ensure that a minimum protection of IP66 or IP67 is achieved after installation.

Through the process connection, there may be an opening in the boundary wall to the area requiring EPL Ga. There is then the risk of the release of flammable gas and the flame entrance.

A heat return flow from the process, e.g. by heat radiation, beyond the permissible ambient temperature is not permissible. This can be avoided, for example, by suitable thermal insulation or by mounting the sensor head of the sensor at a greater distance (cooling distance).

In case of hazards due to oscillation or swinging, the corresponding parts of the sensor must be effectively secured against these hazards.

Flexible filling level sensor (TORRIX Ex... Flex ..., VISY-Stick ... Flex ...)

This type can be produced with different sensor bases to serve for stabilizing the sensor. A base can be a magnetic base. The magnet is then encapsulated in an electricity conducting plastic and can therefore be used in potentially explosive areas.

If this version is manufactured without a fixture, it may only be used in non-flowing liquids or it must be ensured that it does not turn, e.g. by a protective tube or by a weight as a sensor foot.

LPG filling level sensor VISY-Stick ... LPG ...

The adjustable installation kit for LPG tanks was developed to allow the sensor to be installed and removed at any time without any additional work and without having to open the tank. The adjustable installation kit for LPG tanks consists of a jacket pipe with special LPG float made of BUNA and a ¾" NPT cutting ring fitting. In the case of installation with a cutting ring fitting, the position of the sensor can no longer be altered after the union nut has been tightened.

Environmental sensor VISY-Stick Sump ...

This environmental sensor can be fixed with the mounting kit.

When wiring the intrinsically safe sensor to the associated apparatus (preferably blue coloured cable), the approved inductance and capacitance of the associated apparatus must not be exceeded. The terminals of the sensor must be connected to the same terminals of the isolating amplifier.



For the filling level sensors with connection terminals, the terminal designation are "+" and "-" and additionally "A" and "B" for the type TORRIX Ex... XT... ("+" and "-" are added for the type TORRIX Exd ... for the terminal block "Heater"). For devices with M12 plug, the pin assignments are as follows:

Pin	TORRIX Ex SC ... VISY-Stick ...	TORRIX Ex C ... TORRIX Ex TAG ... VISY-Stick ... TLS	TORRIX Ex RS485 ... VISY-Stick ... RS485	M12 cable (female)
1	+	+	+	
2	A		A (+)	
3	-	-	-	
4	B		B (-)	

Table 1: Pin assignment of the sensors

The sensors must be integrated into the potential equalization of the hazardous area. A PA connecting terminal on the sensor head is available for integration of the devices into the potential equalization.

General information (see also EN 60079-14:2013, clause 6.4.1):

Exposed conductive parts need not be separately connected to the equipotential bonding system if they are firmly secured to and are in conductive contact with structural parts or piping which are connected to the equipotential bonding system.

III.d ... adjustment

For the operation the sensors, no Ex-relevant adjustments are necessary.

III.e ... putting into service

Before putting into service, all devices must be checked for correct connection and installation. The electrical supply, including the connected devices, must be checked. For the level sensors type TORRIX Exd ..., the cable entry and the covers must be checked for correct installation.

III.f ... maintenance (servicing and emergency repair)

The apparatus is generally maintenance-free. In the case of a defect, this must be returned to the manufacturer FAFNIR or one of its representatives.

For equipment that is completely intrinsically safe, there is compliance in the dielectric strength test between the intrinsically safe circuit and the chassis of the equipment with a voltage of 500 V_{AC} in accordance with EN 60079-11, Clause 6.3.13. For level sensors type TORRIX Exd ... there is no compliance.

With the type TORRIX Ex... XTS... the display may be replaced. To do this, the cover of the display must first be removed (see section III.b). By pushing in the flaps of the display, it can be levered out bit by bit. Particularly with the TORRIX Exd ... version, care must be taken during this procedure not to damage the enclosure and especially the thread for the cover. The connections (plugs and sockets) on the back of the indicator must be disconnected. Now the new unit can be connected. The number of poles and the polarity reversal protection of the connectors determine the correct connection. After the electrical connection, the unit is placed in the grooves with the snap-in mechanism (the orientation can be changed later, as the unit can be rotated in the enclosure. By pressing the flaps in again, the display can be lowered into the enclosure until it clicks into place. After aligning the new indicator, refit the cover (see section III.b).

Warning: The type VISY-Stick Sump ... and floats made of non-conductive plastic must only be cleaned with a damp cloth, to minimize the risk of electrostatic charging.

Warning: The TORRIX Exd ... version may only be opened without voltage.



IV Equipment marking

1 Manufacturer: FAFNIR GmbH, 22525 Hamburg

2 Type designation: TORRIX Ex ... / VISY-Stick ...

3 Certificate number: TÜV 99 ATEX 1496 X

4 Ex marking:

*TORRIX Ex ... / TORRIX Ex C... / TORRIX Ex RS485... / TORRIX Ex SC... / TORRIX Ex TAG... / TORRIX Ex XT... /
VISY-Stick ... / VISY-Stick RS485... / VISY-Stick (Flex) Temp / VISY-Stick (Flex) Temp RS485*

	II 1 G	Ex ia IIC T6...T1 Ga
	II 1/2 G	Ex ia IIC T6...T1 Ga/Gb
	II 2 G	Ex ia IIC T6...T1 Gb
	II 2 D	Ex ia IIIC TX °C Db

TORRIX Ex ...-A / TORRIX Ex ... Flex / TORRIX Ex ... PL /

TORRIX Ex C...-A / TORRIX Ex C... Flex / TORRIX Ex C... PL /

TORRIX Ex RS485...-A / TORRIX Ex RS485... Flex / TORRIX Ex RS485... PL /

TORRIX Ex SC...-A / TORRIX Ex SC... Flex / TORRIX Ex SC... PL /

TORRIX Ex TAG...-A / TORRIX Ex TAG... Flex / TORRIX Ex TAG... PL /

TORRIX Ex XT...-A / TORRIX Ex XT... Flex / TORRIX Ex XT... PL /

VISY-Stick Advanced ... / VISY-Stick ... Flex ... / VISY-Stick Advanced ... RS485 / VISY-Stick ... Flex ... RS485

	II 1 G	Ex ia IIB T6...T1 Ga
	II 1/2 G	Ex ia IIB T6...T1 Ga/Gb
	II 2 G	Ex ia IIB T6...T1 Gb
	II 2 D	Ex ia IIIC TX °C Db

TORRIX Exd ...

	II 1/2 G	Ex ia/db IIC T6...T1 Ga/Gb
	II 2 G	Ex db ia IIC T6...T1 Gb
	II 2 D	Ex ia tb IIIC TX °C Db

TORRIX Exd ...-A / TORRIX Exd ... Flex / TORRIX Exd ... PL

	II 1/2 G	Ex ia/db IIB T6...T1 Ga/Gb
	II 2 G	Ex db ia IIB T6...T1 Gb
	II 2 D	Ex ia tb IIIC TX °C Db

VISY-Stick ... TLS / VISY-Stick (Flex) Temp TLS

	II 1 G	Ex ia IIC T4...T1 Ga
	II 1/2 G	Ex ia IIC T4...T1 Ga/Gb
	II 2 G	Ex ia IIC T4...T1 Gb
	II 2 D	Ex ia IIIC TX °C Db

VISY-Stick Advanced ... TLS / VISY-Stick ... Flex ... TLS

	II 1 G	Ex ia IIB T4...T1 Ga
	II 1/2 G	Ex ia IIB T4...T1 Ga/Gb
	II 2 G	Ex ia IIB T4...T1 Gb
	II 2 D	Ex ia IIIC TX °C Db

5 Warning marking: *WARNING – Potential electrostatic charging hazard – See instructions

**WARNING – AFTER DE-ENERGIZING, DELAY 4 MINUTES BEFORE OPENING

6 CE marking:

7 Ex d thread: **Cable entry, e.g. M20 × 1.5

8 Technical data: See instructions for technical data

* Marking only applies to sensors type VISY-Stick Sump ...

** Marking only applies to sensors type TORRIX Exd ...

**V Technical data**

The following electrical input values apply to the filling level sensors:

Electrical variable	TORRIX Ex SC... VISY-Stick ...	TORRIX Ex ... TORRIX Ex C... TORRIX Ex RS485... TORRIX Ex TAG... TORRIX Ex XT... VISY-Stick ... RS485	VISY-Stick ... TLS
$U_i \leq$	15 V	30 V	13 V
$I_i \leq$	60 mA	100 mA / 200 mA*	200 mA
$P_i \leq$	100 mW	1 W	625 mW
$C_i <$	10 nF	10 nF	20 nF
$L_i <$	100 μ H	20 μ H	410 μ H

Table 2: Electrical input data of intrinsic safe filling level sensors

The voltage for the type TORRIX Exd ... is from 12 V to 50 V ($U_m = 253$ V). The current is from 4 mA to 20 mA (Error mode: 3.6 mA / 21.5 mA) respectively 10 mA when using RS-485. The supply voltage of the heater is $24 \text{ V} \pm 10 \%$ with a current of 160 mA.

When using the equipment in potentially explosive atmospheres please consult table 3 to table 6 for the maximum temperatures depending on the equipment protection level and temperature class resp. surface temperature.

TORRIX Ex SC... / VISY-Stick ...

For use in EPL Ga, EPL Ga/Gb and EPL Gb		
Temperature class	T _a	T _F
T6	-40 °C ... +50 °C	-40 °C ... +75 °C
T5	-40 °C ... +65 °C	-40 °C ... +90 °C
T4	-40 °C ... +85 °C	-40 °C ... +125 °C
T3		-40 °C ... +190 °C
T2		-40 °C ... +285 °C
T1		-40 °C ... +435 °C
For use in EPL Db		
Maximum surface temperature		Ambient temperature T _a
dust layer ≤ 5 mm	immersed in dust	
X°C = T _a + 30 °C	X°C = 135 °C	-40 °C ... +85 °C

Table 3: Service temperatures of the filling level sensors in basic version (without interface board)

The equipment is suitable for dusts whose ignition temperature under a dust layer of 5 mm is greater than 190 °C (glow temperature).

* The permissible input current I_i depends on the ambient temperature T_a


TORRIX Ex ... / TORRIX Ex C... / TORRIX Ex RS485... / TORRIX Ex TAG... / TORRIX Ex XT... / VISY-Stick ... RS485

For use in EPL Ga, EPL Ga/Gb and EPL Gb		
Temperature class	T _a	T _F
T6	I _i ≤ 100 mA: -40 °C ... +40 °C I _i ≤ 200 mA: -40 °C ... +25 °C	-40 °C ... +75 °C
T5	I _i ≤ 100 mA: -40 °C ... +55 °C I _i ≤ 200 mA: -40 °C ... +40 °C	-40 °C ... +90 °C
T4	I _i ≤ 100 mA: -40 °C ... +85 °C I _i ≤ 200 mA: -40 °C ... +70 °C	-40 °C ... +125 °C
T3		-40 °C ... +190 °C
T2		-40 °C ... +285 °C
T1		-40 °C ... +435 °C
For use in EPL Db		
Maximum surface temperature		Ambient temperature T _a
dust layer ≤ 5 mm	immersed in dust	
I _i ≤ 100 mA: X°C = T _a + 40 °C	Consider EN 60079-14	-40 °C ... +85 °C
I _i ≤ 200 mA: X°C = T _a + 55 °C		-40 °C ... +70 °C

Table 4: Service temperatures of the filling level sensors with 4 ... 20 mA, RS-485 or TAG interface

The equipment is suitable for dusts whose ignition temperature under a dust layer of 5 mm is greater than 200 °C (glow temperature).

VISY-Stick ... TLS

For use in EPL Ga, EPL Ga/Gb and EPL Gb		
Temperature class	T _a	T _F
T4	-40 °C ... +75 °C	-40 °C ... +125 °C
T3	-40 °C ... +85 °C	-40 °C ... +190 °C
T2		-40 °C ... +285 °C
T1		-40 °C ... +435 °C
For use in EPL Db		
Maximum surface temperature		Ambient temperature T _a
dust layer ≤ 5 mm	immersed in dust	
X°C = 135 °C	X°C = 135 °C	-40 °C ... +77 °C
X°C = T _a + 110 °C	Consider EN 60079-14	-40 °C ... +85 °C

Table 5: Service temperatures of the filling level sensors with TLS interface

The equipment is suitable for dusts whose ignition temperature under a dust layer of 5 mm is greater than 270 °C (glow temperature).

**TORRIX Exd ...**

For use in EPL Ga/Gb and EPL Gb		
Temperature class	T _a	T _F
T6	-55 °C ... +50 °C	-55 °C ... +75 °C
T5	-55 °C ... +65 °C	-55 °C ... +90 °C
T4	-55 °C ... +85 °C	-55 °C ... +125 °C
T3		-55 °C ... +190 °C
T2		-55 °C ... +285 °C
T1		-55 °C ... +435 °C
For use in EPL Db		
Maximum surface temperature		Ambient temperature T _a
dust layer ≤ 5 mm	immersed in dust	
X°C = T _a + 30 °C	Consider EN 60079-14	-55 °C ... +85 °C

Table 6: Service temperatures of the Ex d+t+i version

The equipment is suitable for dusts whose ignition temperature under a dust layer of 5 mm is greater than 190 °C (glow temperature).

It must be ensured through appropriate measures that the temperature (T_a) for the respective temperature class is not exceeded at any point on the sensor head.

The filling level sensors achieve a degree of protection:

Protection rating IP68

VI Special conditions of use

1. When using plastic floats, the level sensors must be installed and used in such a way that electrostatic charges caused by operation, maintenance and cleaning are excluded.
For use in dust explosion hazardous areas, process-related electrostatic charges, e.g. due to media flowing past, must be excluded.
2. When using Titanium Floats or Sump Environmental Sensors, the risk of ignition due to impact or friction shall be avoided.
3. The flameproof joints at type TORRIX Exd ... are not intended to be repaired.

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