

TORRIX M12

The magnetostrictive level sensor with PC configuration



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1 Characteristics

The high-precision TORRIX level sensor serves as continuous level measurement of liquid media in containers. The measuring principle used by the sensor exploits the physical effect of magnetostriction and is largely unaffected by temperature. This method is particularly ideal where level measurements are required to be extremely accurate, such as in the chemical industry.

This documentation describes the TORRIX M12 with the M12 connector on the sensor cover. Another version is the TORRIX with side cable connection, see:



Technical documentation TORRIX, art. no. 207074

The TORRIX with M12 connector is available in versions with screw-in unit or with flange as process connection.

There are several TORRIX versions with different interfaces. Probe lengths are possible from 100 mm to 6 m, as Flex version up to 22 m, as well as versions for different temperature and pressure ranges.

There are the following versions:

- TORRIX (HART) C: with 4 ... 20 mA output signal, optionally with digital output signal as HART® protocol, parametrisation via PC, media-contacting probe tube made of stainless steel
- TORRIX RS485: with Modbus ASCII or FAFNIR Universal Device Protocol, media-contacting probe tube made of stainless steel
- TORRIX SC: with FAFNIR protocol for FAFNIR interface, media-contacting probe tube made of stainless steel
- TORRIX ... FLEX: with all interfaces, media-contacting probe tube (flexible) made of stainless steel
- TORRIX ... VT: vibration-resistant version, with all interfaces, media-contacting probe tube made of stainless steel

For information about the TORRIX Flex installation, see:



TORRIX Flex Installation Guide multilingual, art. no. 350118

The TORRIX Ex ... level sensor with Ex approval (ATEX, IECEx) can be installed in potentially explosive areas which require protection level Ga (Ex Zone 0), Ga/Gb (Ex Zone 0/1) or Gb (Ex Zone 1) for electrical equipment.

2 Safety instructions

The TORRIX level sensor is intended 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 must be carried out only 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 user guide.

The safety instructions in this user 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 level sensor.



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

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 fitted in the tank with a screw-in unit (3) for height adjustment. For riser installation, the screw-in unit is not required. A float (5) for measuring the product filling level and an additional float (6) for continuous water detection move on this probe tube. In the case of products having a density greater than 0.9 kg/l, water detection cannot take place and the water float must be removed.

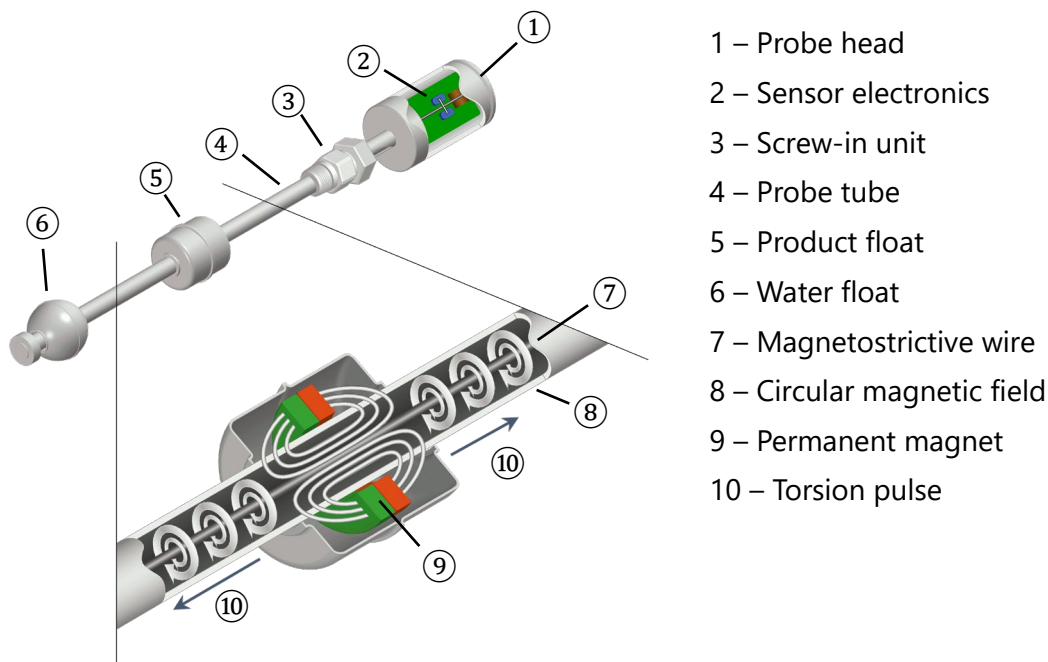


Figure 1: Mode of operation of the magnetostrictive measuring principle

The sensor operates according to the magnetostrictive measuring principle. The probe tube contains a wire (7) made of magnetostrictive material. The sensor electronics (2) transmits 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 water float (6). The magnetic fields of the float magnets (9) axially magnetise 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 water float is calculated by measuring a second pulse.

4 Installation



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.



All applicable local safety and accident prevention regulations not included in this manual must also be observed.

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

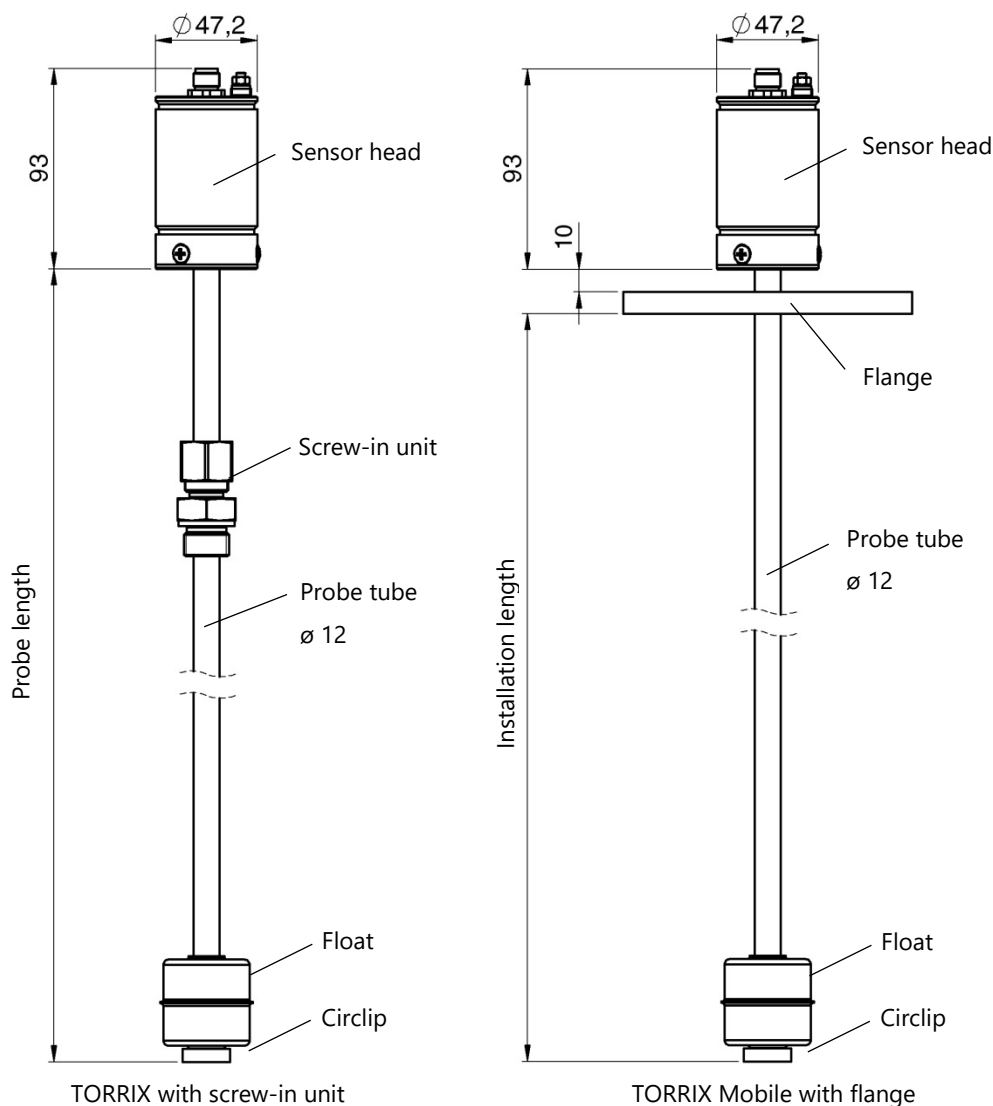


Figure 2: TORRIX M12 versions



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

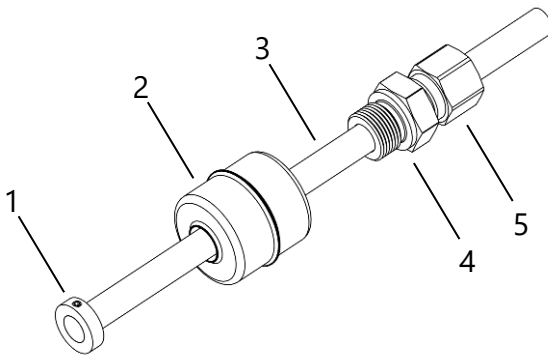


Figure 3: Installation with screw-in unit



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

Insert the level sensor into the container (see Figure 3):

- (1) Loosen both set screws, remove circlip (1) and float (2) from probe tube (3).
- (2) If necessary, slide the screw-in unit (4) onto 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 process connection in its height and tighten the union nut (5) by hand.
- (7) Fix the union nut (5) with a 1 ¼ clockwise turn (see following figure).

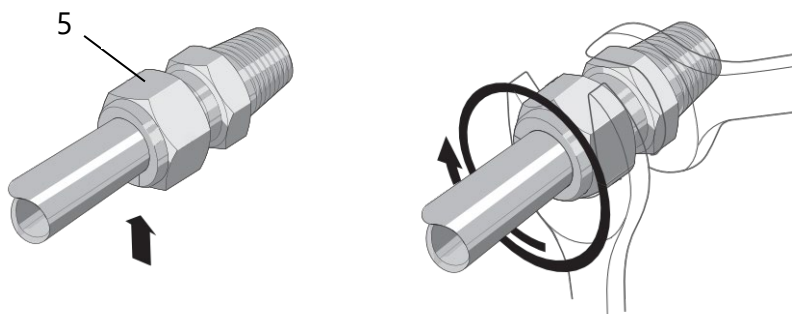


Figure 4: Tightening the compression fitting

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 or nuts. The bolts or nuts and the seals are the responsibility of the operating company and must be selected 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 mounting hole, see installation instructions, chapter 4.1.

5 Electrical connection

5.1 TORRIX (Ex) C

5.1.1 Wiring diagram of the standard version

The level sensor without Ex approval is installed according to the following wiring diagram:

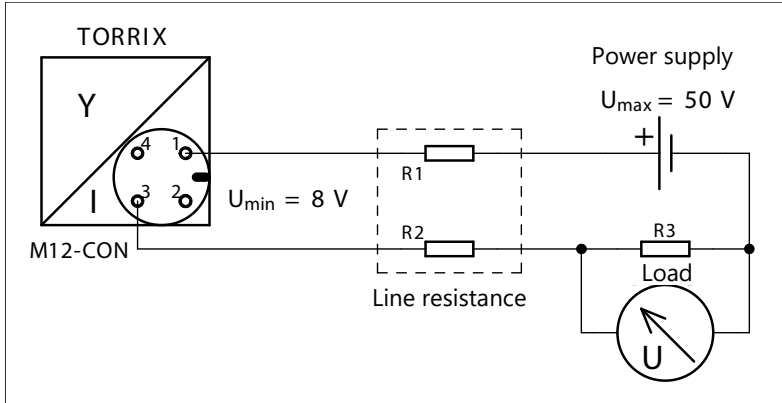


Figure 5: Wiring diagram TORRIX C

Power supply: $U_{\max} = 50 \text{ V DC}$

Minimum supply voltage: $U_{\min} = 8 \text{ V}$

Permissible total resistance (including cable resistance and load):

$$\Sigma R = (U - U_{\min}) / 0.0215 \text{ A}$$

5.1.2 Wiring diagram of the Ex version

The level sensor with Ex approval is installed in potentially explosive atmosphere according to the following wiring diagram:

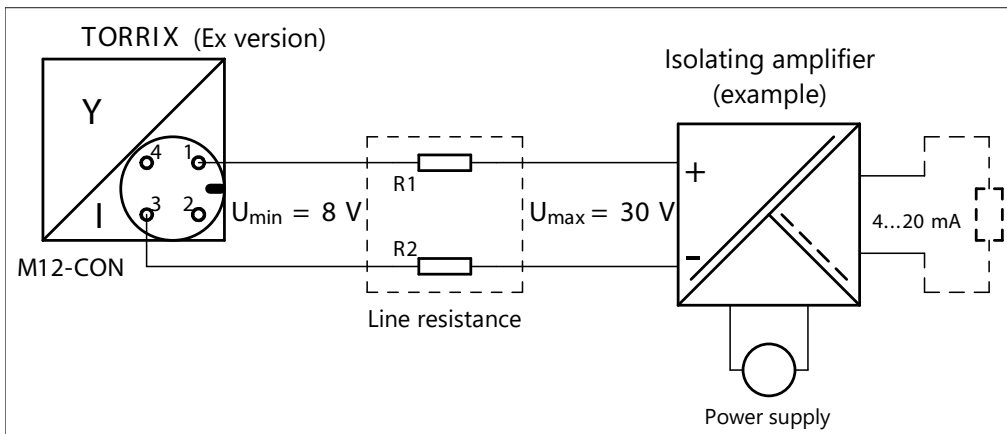



Figure 6: Wiring diagram TORRIX Ex C

Power supply: $U_{\max} = 30 \text{ V DC}$

Minimum supply voltage: $U_{\min} = 8 \text{ V}$

Permissible total resistance (including cable resistance and load):

$$\Sigma R = (U - U_{\min}) / 0.0215 \text{ A}$$


 The intrinsically safe version of the level sensor TORRIX Ex C, when installed in a potentially explosive atmosphere, is permitted to be connected only to associated equipment that have been certified by a recognised inspection authority and offer electrical outputs that meet the following conditions:


$$U_0 \leq 30 \text{ V}$$

$$I_0 \leq 200 \text{ mA}$$

$$P_0 \leq 1 \text{ W}$$

Further data can be found in the EU-Type Examination Certificate (see Annex).

 If the level sensor is to be used in a potentially explosive atmosphere, always make sure that the permissible external capacitance (C_0) and inductance (L_0) of the associated equipment are not exceeded (refer to the electrical data in the EU-Type Examination Certificate).

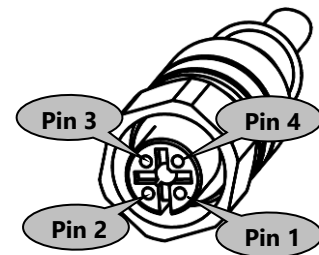
 Used in an explosion-proof application, the connecting cable to the associated equipment must be marked, preferably as a blue cable for intrinsically safe electric circuits.

5.1.3 Wiring

The wiring of the level sensor TORRIX (Ex) C must be carried out with the power disconnected. For wiring, proceed as follows:

- If not already connected, plug the M12 female connector of the FAFNIR connection cable onto the M12 male connector of the probe head. First tighten the union nut of the M12 female connector by hand and then use an open-ended spanner to tighten the nut with a 180° turn. The tightening torque should be between 100 ... 150 Ncm.
- Connect the cable coming from the central unit with the FAFNIR connection cable, for example using an installation sleeve, with the following pin assignment (**pin 2 and 4 are used internally and must not be connected**):

| Signal | | Colour coding of the FAFNIR cable | Pin assignment of the M12 female connector |
|------------------------|---|-----------------------------------|--|
| Voltage | + | brown | Pin 1 |
| used internally | | white | Pin 2 |
| Voltage | - | blue | Pin 3 |
| used internally | | black | Pin 4 |



Pin assignment of the M12 female connector of the FAFNIR connection cable

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

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



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.

5.1.4 Cable length

The maximum cable length depends on the total resistance (see chapter 5.1.1), composed of the line resistances and the load of connected devices.



The cable (length and cross-section) must be selected so that the supply voltage will not fall below the sensor-specific minimum voltage (8 V) in the event of a maximum current consumption (21.5 mA).



If the level sensor is to be used in a potentially explosive atmosphere, always make sure that the permissible external capacitance (C_0) and inductance (L_0) of the associated equipment are not exceeded (refer to the electrical data in the EU-Type Examination Certificate).

The following table shows the maximum total resistances at different supply voltages, and cable resistances at various cross-sections:

| Supply voltage [V] | Max. total resistance [Ω] | Cable cross-section [mm^2] | Cable resistance per m copper cable [Ω/m] |
|--------------------|------------------------------------|---------------------------------------|---|
| 12 (-5%) | 158 | 0.5 | 0.0356 |
| | | 1.0 | 0.0178 |
| | | 1.5 | 0.0119 |
| 24 (-5%) | 688 | 0.5 | 0.0356 |
| | | 1.0 | 0.0178 |
| | | 1.5 | 0.0119 |

The max. 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] = 8 V

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

R_B = Load

R_Q = Cable resistance per m copper cable [Ω /m] at cable cross-section Q [mm^2]

Example:

Supply voltage = 12 V (\pm 5%)

Supply voltage U = 11.4 V (12 V - 5%)

Minimum supply voltage U_{\min} = 8 V

Maximum power consumption I_{\max} = 0.0215 A

Load R_B = 86,8 Ω

Cable resistance per m copper cable R_Q = 0.0356 Ω /m with cable cross-section Q = 0.5 mm^2

$$L = (((11,4 - 8) / 0,0215) - 86,8) / 0,0356 = 2000 \text{ m}$$

Thus a cable with forward and return line (2-wire) can be up to 1000 m long.



If the level sensor is to be used in a potentially explosive atmosphere, always make sure that the permissible external capacitance (C_0) and inductance (L_0) of the associated equipment are not exceeded (refer to the electrical data in the EU-Type Examination Certificate).

5.2 TORRIX (Ex) SC



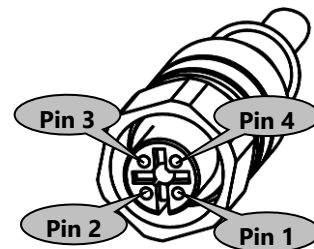
TORRIX Ex SC communicates via the FAFNIR protocol with the FAFNIR central unit. Therefore, it can operate only together with the LOGI-Command, VISY-Command or VPI from FAFNIR.

5.2.1 Wiring

The wiring of the level sensor TORRIX (Ex) SC with the central unit LOGI-Command, VISY-Command or VPI must be carried out with the power disconnected. For wiring, proceed as follows:

- If not already connected, plug the M12 female connector of the FAFNIR connection cable onto the M12 male connector of the probe head. First tighten the union nut of the M12 female connector by hand and then use an open-ended spanner to tighten the nut with a 180° turn. The tightening torque should be between 100 ... 150 Ncm.
- Connect the cable coming from the central unit with the FAFNIR connection cable, for example using an installation sleeve, in the following pin assignment:

| Signal | | Colour coding of the FAFNIR cable | Pin assignment of the M12 female connector |
|---------------|---|-----------------------------------|--|
| Voltage | + | brown | Pin 1 |
| Communication | A | white | Pin 2 |
| Voltage | - | blue | Pin 3 |
| Communication | B | black | Pin 4 |



Pin assignment of the M12 female connector of the FAFNIR connection cable

The connection cable between TORRIX (Ex) SC and LOGI-Command / VISY-Command / VPI must have the following properties:

- 4-wire unshielded cable
- Cable cross-section (4 x 0.5 mm² up to 100m or 4 x 1.0 mm² up to 200 m)
- For Ex applications colour blue or marked blue (cable for intrinsically safe power circuits)
- Maximum diameter 6 to 10 mm for reliable sealing by the cable gland in LOGI- / VISY-Command.



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.



If the level sensor is to be used in a potentially explosive atmosphere, always make sure that the permissible external capacitance (C_0) and inductance (L_0) of the associated equipment are not exceeded (refer to the electrical data in the EU-Type Examination Certificate).



Also observe the general installation regulations.

For connection instructions of TORRIX (Ex) SC to the central unit, see:



Technical documentation LOGI-Command, art. no. 350107



Technical documentation VISY-Command, art. no. 207184



Technical documentation VPI, art. no. 350068

5.3 TORRIX (Ex) RS485

The TORRIX (Ex) RS485 is equipped with an RS 485 interface and is available with various communication protocols.

5.3.1 Wiring diagram of the standard version

The level sensor without Ex approval is installed in accordance with the following wiring diagram:

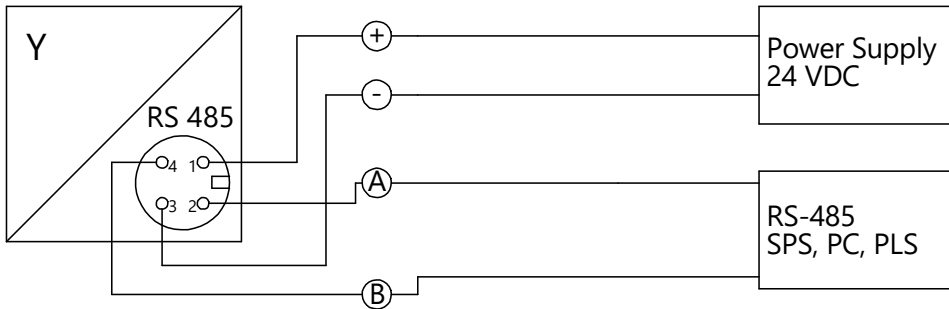


Figure 7: Wiring diagram TORRIX RS485

Power supply: $U_{max} = 50 \text{ V DC}$

Minimum supply voltage: $U_{min} = 8 \text{ V}$

5.3.2 Wiring diagram of the Ex version

The level sensor with Ex approval is installed in potentially explosive atmosphere according to the following wiring diagram:

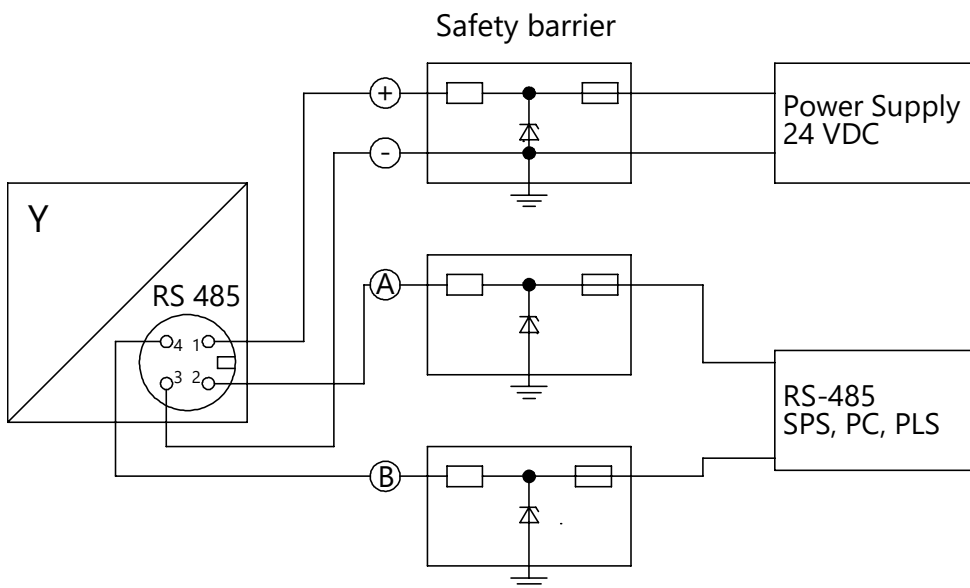


Figure 8: Wiring diagram TORRIX Ex RS485

Power supply: $U_{max} = 30 \text{ V DC}$

Minimum supply voltage: $U_{min} = 8 \text{ V}$



The intrinsically safe version of the level sensor TORRIX Ex RS485, when installed in a potentially explosive atmosphere, is permitted to be connected only to associated equipment that have been certified by a recognised inspection authority and offer electrical outputs that meet the following conditions:

$$U_0 \leq 30 \text{ V}$$

$$I_0 \leq 200 \text{ mA}$$

$$P_0 \leq 1 \text{ W}$$

Further data can be found in the EU-Type Examination Certificate (see Annex).



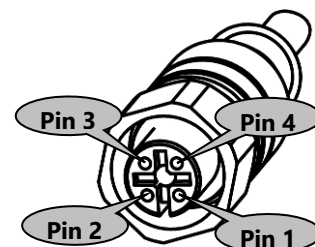
If the level sensor is to be used in a potentially explosive atmosphere, always make sure that the permissible external capacitance (C_0) and inductance (L_0) of the isolating amplifier are not exceeded (refer to the electrical data in the EU-Type Examination Certificate).

5.3.3 Wiring

The wiring of the TORRIX (Ex) RS485 level sensor with the central unit must be carried out with the power disconnected. For the wiring, proceed as follows:

- If not already connected, plug the M12 female connector of the FAFNIR connection cable onto the M12 male connector of the probe head. First tighten the union nut of the M12 female connector by hand and then use an open-ended spanner to tighten the nut with a 180° turn. The tightening torque should be between 100 ... 150 Ncm.
- Connect the cable coming from the central unit with the FAFNIR connection cable, for example using an installation sleeve, in the following assignment:

| Signal | | Colour coding of the FAFNIR cable | Pin assignment of the M12 female connector |
|---------------|---|-----------------------------------|--|
| Voltage | + | brown | Pin 1 |
| Communication | A | white | Pin 2 |
| Voltage | - | blue | Pin 3 |
| Communication | B | black | Pin 4 |



Pin assignment of the M12 female connector of the FAFNIR connection cable



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.



If the level sensor is to be used in a potentially explosive atmosphere, always make sure that the permissible external capacitance (C_0) and inductance (L_0) of the associated equipment are not exceeded (refer to the electrical data in the EU-Type Examination Certificate).



Also observe the general installation regulations.

6 Adjustment

6.1 TORRIX (Ex) C configuration

The configuration is done with the computer via the TORRIX configuration tool.

For further information, see:



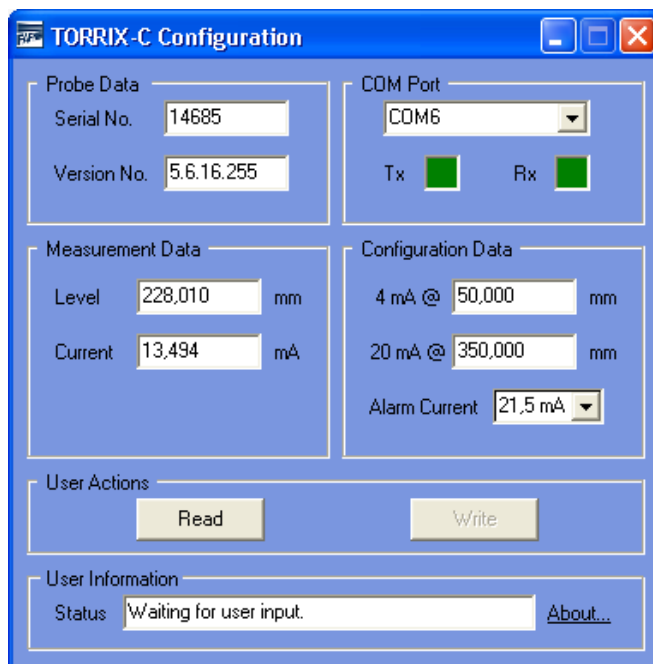
Technical documentation TORRIX Configuration Tool, art. no. 350258



The configuration with the computer must not be carried out within the potentially explosive area.

6.1.1 Failure mode

If a malfunction is preventing the level sensor from recording a plausible float position, i.e. the measured level is incorrect, the sensor will enter the failure mode after a short time. Failure mode signalling conforms to the NAMUR NE43 recommendation. The failure current is set by default to 21.5 mA but this value can also be set to 3.6 mA.



The adjustment of the current consumption in failure mode is done via the configuration tool (see left figure) with the selection box "Alarm Current".

Figure 9: TORRIX Configuration Tool



The adjustment of the current consumption during the failure mode is not saved until the "Write" button has been pressed. The new configuration is retained, even if the level sensor is subsequently disconnected from the power supply.

6.2 TORRIX (Ex) SC configuration

The configuration is done via LOGI-Command, VISY-Command, or in the case of VPI via the host system.

6.2.1 Failure mode

Error messages are output via the protocol.

6.3 TORRIX (Ex) RS485 configuration

For further information, please see:



Technical documentation TORRIX Configuration Tool, art. no. 350258

7 Servicing

7.1 Maintenance

The filling level sensor is maintenance-free.

7.2 Return shipment

Before returning any FAFNIR equipment, the Return Material Authorization (RMA) by the 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 equipment is possible only with authorization by the FAFNIR customer service.

8 Technical Data

8.1 Sensor


| | |
|---|---|
| Electrical connection TORRIX (Ex) C TORRIX (Ex) SC TORRIX (Ex) RS485 | 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 4-wire connection (TTL signals + power supply) 4-wire connection (RS485 signals + power supply) |
| Supply voltage TORRIX C / RS485 TORRIX Ex C / RS485 | 8 ... 50 V DC 8 ... 30 V DC |
| Process connection | Screw-in unit for stepless height adjustment Standard G ½ (compression fitting) Flange (on request) Material see probe tube |
| Sensor head | Height 93 mm Diameter 47.2 mm Protection class IP68 (according to TÜV NORD test report 13 993 120483 of 02.09.2013) Material stainless steel M12 connector Temperature -40 ... +85 °C |
| 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 Minimum temperature (LLT) -200 °C ... +85 °C |
| Communication | TORRIX (Ex) C 4 ... 20 mA TORRIX (Ex) SC FAFNIR protocol TORRIX (Ex) RS485 Modbus ASCII / FDA / FAFNIR UDP Protocol |


| | |
|---|---|
| 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 drift better than ± 0.01 % per K Resolution better than 0.5 μ A (16 bit) |

8.2 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 also be used at a pressure of -1 bar (vacuum).*

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/EU | Limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques | RoHS |
| 2011/65/EU | 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/EU | Compatibilité électromagnétique | CEM |
| 2014/30/EU | 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/EU | Appareils et systèmes de protection destinés à être utilisés en atmosphères explosibles | ATEX |
| 2014/34/EU | 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 50581:2012
EN 61326-1:2013
EN IEC 60079-0:2018
EN 60079-11:2012
EN 60079-26:2015**

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'immunité / 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, 30.03.2020

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:** 02

(4) for the product: Filling Level Sensor type VISY-Stick ... and type TORRIX Ex ...

(5) of the manufacturer: **FAFNIR GmbH**

(6) Address: Schnackenburgallee 149 c, 22525 Hamburg, Germany

Order number: 8003011045

Date of issue: 2020-02-19

(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. 20 203 254816.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN IEC 60079-0:2018 EN 60079-11:2012 EN 60079-26:2015

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 item 15 of the schedule**

TÜV NORD CERT GmbH, Langemarckstraße 20, 45141 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 head of the notified body

Roder

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 02**

(15) Description of product

The filling level sensors 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.

The filling level sensors type VISY-Stick ... and type TORRIX Ex ... may also be manufactured according to the test documents listed in the ATEX test report. The changes affect the internal structure as well as the change of temperature classes. Furthermore, the equipment was assessed according to the latest standards.

The marking is as follows:

Type TORRIX Ex ...

| | | | | |
|---|-----------------------------|-------|----------------------------------|-------|
|  | II 1 G Ex ia IIC T6...T4 Ga | resp. | II 1/2 G Ex ia IIC T6...T4 Ga/Gb | resp. |
| | II 2 G Ex ia IIC T6...T4 Gb | resp. | II 1 D Ex ia IIIC T160 °C Da | |

Type TORRIX Ex ...-A resp. TORRIX Ex ... Flex resp. TORRIX Ex ... PL


| | | | | |
|---|-----------------------------|-------|----------------------------------|-------|
|  | II 1 G Ex ia IIB T6...T4 Ga | resp. | II 1/2 G Ex ia IIB T6...T4 Ga/Gb | resp. |
| | II 2 G Ex ia IIB T6...T4 Gb | resp. | II 1 D Ex ia IIIC T160 °C Da | |

Type VISY-Stick ... resp. VISY-Stick (Flex) Temp resp. TORRIX Ex SC...

| | | | | |
|---|-----------------------------|-------|----------------------------------|-------|
|  | II 1 G Ex ia IIC T6...T5 Ga | resp. | II 1/2 G Ex ia IIC T6...T4 Ga/Gb | resp. |
| | II 2 G Ex ia IIC T6...T4 Gb | resp. | II 1 D Ex ia IIIC T135 °C Da | |


Type VISY-Stick Advanced ... resp. VISY-Stick ... Flex ... resp.

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

| | | | | |
|---|-----------------------------|-------|----------------------------------|-------|
|  | II 1 G Ex ia IIB T6...T5 Ga | resp. | II 1/2 G Ex ia IIB T6...T4 Ga/Gb | resp. |
| | II 2 G Ex ia IIB T6...T4 Gb | resp. | II 1 D Ex ia IIIC T135 °C Da | |

Type VISY-Stick ... RS485 resp. VISY-Stick (Flex) Temp RS485 resp.

TORRIX Ex C... resp. TORRIX Ex RS485... resp. TORRIX Ex TAG...

| | | | | |
|---|-----------------------------|-------|----------------------------------|-------|
|  | II 1 G Ex ia IIC T6...T4 Ga | resp. | II 1/2 G Ex ia IIC T6...T4 Ga/Gb | resp. |
| | II 2 G Ex ia IIC T6...T4 Gb | resp. | II 1 D Ex ia IIIC T125 °C Da | |

Type VISY-Stick ... Advanced RS485 resp. VISY-Stick ... Flex RS485 resp.

TORRIX Ex C...-A resp. TORRIX Ex RS485...-A resp. TORRIX Ex TAG...-A resp.

TORRIX Ex C... Flex resp. TORRIX Ex RS485... Flex resp. TORRIX Ex TAG... Flex resp.

TORRIX Ex C... PL resp. TORRIX Ex RS485... PL resp. TORRIX Ex TAG... PL

| | | | | |
|---|-----------------------------|-------|----------------------------------|-------|
|  | II 1 G Ex ia IIB T6...T4 Ga | resp. | II 1/2 G Ex ia IIB T6...T4 Ga/Gb | resp. |
| | II 2 G Ex ia IIB T6...T4 Gb | resp. | II 1 D Ex ia IIIC T125 °C Da | |

Schedule to EU-Type Examination Certificate No. TÜV 99 ATEX 1496 X issue 02

Type VISY-Stick ... TLS resp. VISY-Stick (Flex) Temp TLS

| | | | | |
|---|-----------------------------|-------|----------------------------------|-------|
|  | II 1 G Ex ia IIC T4 Ga | resp. | II 1/2 G Ex ia IIC T4...T3 Ga/Gb | resp. |
| | II 2 G Ex ia IIC T4...T3 Gb | resp. | II 1 D Ex ia IIIC T195 °C Da | |

Type VISY-Stick ... Advanced TLS resp. VISY-Stick ... Flex TLS

| | | | | |
|---|-----------------------------|-------|----------------------------------|-------|
|  | II 1 G Ex ia IIB T4 Ga | resp. | II 1/2 G Ex ia IIB T4...T3 Ga/Gb | resp. |
| | II 2 G Ex ia IIB T4...T3 Gb | resp. | II 1 D Ex ia IIIC T195 °C Da | |

Type designation:

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

- 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 ... (only Ex relevant nomenclatures):

- 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 ...-A Advanced precision of measurement and temperature sensors
- TORRIX Ex ... Flex Flexible sensor tube
- TORRIX Ex ... PL With plastic coating against very aggressive media

Technical data:

Type VISY-Stick ... resp. TORRIX Ex SC...

Signal- and power circuit
(terminals +, -, A, B)

in type of protection "Intrinsic Safety" Ex ia IIC/IIB/IIIC
only for the connection to a certified intrinsically safe circuit

Maximum values: $U_i = 15 \text{ V}$
 $I_i = 60 \text{ mA}$
 $P_i = 100 \text{ mW}$
 $L_i = 100 \text{ } \mu\text{H}$
 $C_i = 10 \text{ nF}$

The types VISY-Stick Advanced, VISY-Stick Flex, TORRIX Ex SC...-A, TORRIX Ex SC... Flex and TORRIX Ex SC... PL are only for gas group IIB allowed.

Schedule to EU-Type Examination Certificate No. TÜV 99 ATEX 1496 X issue 02

Type VISY-Stick ... RS485 resp. TORRIX Ex ...

Signal- and power circuit

(terminals +, -, A, B resp. +, -) in type of protection "Intrinsic Safety" Ex ia IIC/IIB/IIIC only for the connection to a certified intrinsically safe circuit

Maximum values: $U_i = 30 \text{ V}$
 $I_i = 200 \text{ mA}$ at $T_a \leq +70 \text{ °C}$ resp.
 $I_i = 100 \text{ mA}$ at $T_a \leq +85 \text{ °C}$
 $P_i = 1 \text{ W}$
 $L_i = 20 \text{ }\mu\text{H}$
 $C_i = 10 \text{ nF}$

The types VISY-Stick Advanced RS485, VISY-Stick Flex RS485, TORRIX Ex ...-A, TORRIX Ex ... Flex and TORRIX Ex ... PL are only for gas group IIB allowed.

Type VISY-Stick ... TLS

Signal- and power circuit

(terminals +, -)

in type of protection "Intrinsic Safety" Ex ia IIC/IIB/IIIC only for the connection to a certified intrinsically safe circuit

Maximum values: $U_i = 13 \text{ V}$
 $I_i = 200 \text{ mA}$
 $P_i = 625 \text{ mW}$
 $L_i = 410 \text{ }\mu\text{H}$
 $C_i = 20 \text{ nF}$

The types VISY-Stick Advanced TLS and VISY-Stick Flex TLS are only for gas group IIB allowed.

Permissible ambient temperature range:

Use as category 1G apparatus

Type VISY-Stick ... resp. TORRIX Ex SC...

| Temperature class | Ambient and Medium temperature range |
|-------------------|--------------------------------------|
| T6 | -20 °C to +50 °C |
| T1 to T5 | -20 °C to +60 °C |

Type VISY-Stick ... RS485 resp. TORRIX Ex ...

| Temperature class | Ambient and Medium temperature range |
|-------------------|--|
| T6 | $I_i \leq 100 \text{ mA}$: -20 °C to +40 °C $I_i \leq 200 \text{ mA}$: -20 °C to +25 °C |
| T5 | $I_i \leq 100 \text{ mA}$: -20 °C to +55 °C $I_i \leq 200 \text{ mA}$: -20 °C to +40 °C |
| T1 to T4 | -20 °C to +60 °C |

The process pressure for the media must be between 0.8 bar and 1.1 bar where explosive vapour-air mixtures are present. If no explosive mixtures are present, the equipment may also be operated outside this area according to the manufacturer's specification.

Schedule to EU-Type Examination Certificate No. TÜV 99 ATEX 1496 X issue 02

Use as category 1/2G apparatus

Type VISY-Stick ... resp. TORRIX Ex SC...

| Temperature class | Ambient temperature range | Medium temperature range |
|-------------------|---------------------------|--------------------------|
| T6 | -40 °C to +50 °C | -20 °C to +50 °C |
| T5 | -40 °C to +65 °C | -20 °C to +60 °C |
| T1 to T4 | -40 °C to +85 °C | -20 °C to +60 °C |

Type VISY-Stick ... RS485 resp. TORRIX Ex ...

| Temperature class | Ambient temperature range | Medium temperature range |
|-------------------|--|--|
| T6 | $I_i \leq 100 \text{ mA}$: -40 °C to +40 °C $I_i \leq 200 \text{ mA}$: -40 °C to +25 °C | $I_i \leq 100 \text{ mA}$: -20 °C to +40 °C $I_i \leq 200 \text{ mA}$: -20 °C to +25 °C |
| T5 | $I_i \leq 100 \text{ mA}$: -40 °C to +55 °C $I_i \leq 200 \text{ mA}$: -40 °C to +40 °C | $I_i \leq 100 \text{ mA}$: -20 °C to +55 °C $I_i \leq 200 \text{ mA}$: -20 °C to +40 °C |
| T1 to T4 | $I_i \leq 100 \text{ mA}$: -40 °C to +85 °C $I_i \leq 200 \text{ mA}$: -40 °C to +70 °C | -20 °C to +60 °C |

Type VISY-Stick ... TLS

| Temperature class | Ambient temperature range | Medium temperature range |
|-------------------|---------------------------|--------------------------|
| T4 | -40 °C to +75 °C | -20 °C to +60 °C |
| T1 to T3 | -40 °C to +85 °C | -20 °C to +60 °C |

The process pressure for the media must be between 0.8 bar and 1.1 bar where explosive vapour-air mixtures are present. If no explosive mixtures are present, the equipment may also be operated outside this area according to the manufacturer's specification.

Use as category 2G apparatus

Type VISY-Stick ... resp. TORRIX Ex SC...

| Temperature class | Ambient temperature range | Medium temperature range |
|-------------------|---------------------------|--------------------------|
| T6 | -40 °C to +50 °C | -40 °C to +85 °C |
| T5 | -40 °C to +65 °C | -40 °C to +100 °C |
| T4 | -40 °C to +85 °C | -40 °C to +135 °C |
| T3 | -40 °C to +85 °C | -40 °C to +200 °C |
| T2 | -40 °C to +85 °C | -40 °C to +300 °C |
| T1 | -40 °C to +85 °C | -40 °C to +450 °C |

Type VISY-Stick ... RS485 resp. TORRIX Ex ...

| Temperature class | Ambient temperature range | Medium temperature range |
|-------------------|--|--------------------------|
| T6 | $I_i \leq 100 \text{ mA}$: -40 °C to +40 °C $I_i \leq 200 \text{ mA}$: -40 °C to +25 °C | -40 °C to +85 °C |
| T5 | $I_i \leq 100 \text{ mA}$: -40 °C to +55 °C $I_i \leq 200 \text{ mA}$: -40 °C to +40 °C | -40 °C to +100 °C |
| T4 | $I_i \leq 100 \text{ mA}$: -40 °C to +85 °C $I_i \leq 200 \text{ mA}$: -40 °C to +70 °C | -40 °C to +135 °C |
| T3 | $I_i \leq 100 \text{ mA}$: -40 °C to +85 °C $I_i \leq 200 \text{ mA}$: -40 °C to +70 °C | -40 °C to +200 °C |
| T2 | $I_i \leq 100 \text{ mA}$: -40 °C to +85 °C $I_i \leq 200 \text{ mA}$: -40 °C to +70 °C | -40 °C to +300 °C |
| T1 | $I_i \leq 100 \text{ mA}$: -40 °C to +85 °C $I_i \leq 200 \text{ mA}$: -40 °C to +70 °C | -40 °C to +450 °C |

Schedule to EU-Type Examination Certificate No. TÜV 99 ATEX 1496 X issue 02

Type VISY-Stick ... TLS

| Temperature class | Ambient temperature range | Medium temperature range |
|-------------------|---------------------------|--------------------------|
| T4 | -40 °C to +75 °C | -40 °C to +135 °C |
| T3 | -40 °C to +85 °C | -40 °C to +200 °C |
| T2 | -40 °C to +85 °C | -40 °C to +300 °C |
| T1 | -40 °C to +85 °C | -40 °C to +450 °C |

Use as category 1D apparatus

Type TORRIX Ex ...

| Maximum surface temperature | | Ambient temperature T_a |
|-----------------------------|---------------------|---------------------------|
| Dust layer ≤ 5 mm | Immersed in dust | |
| $T_a + 75$ °C | Observe EN 60079-14 | -40 °C to +85 °C |

Type VISY-Stick ... resp. TORRIX Ex SC...

| Maximum surface temperature | | Ambient temperature T_a |
|-----------------------------|------------------|---------------------------|
| Dust layer ≤ 5 mm | Immersed in dust | |
| $T_a + 30$ °C | 135 °C | -40 °C to +85 °C |

Type VISY-Stick ... TLS

| Maximum surface temperature | | Ambient temperature T_a |
|-----------------------------|---------------------|---------------------------|
| Dust layer ≤ 5 mm | Immersed in dust | |
| 135 °C | 135 °C | -40 °C to +77 °C |
| $T_a + 110$ °C | Observe EN 60079-14 | -40 °C to +85 °C |

Type VISY-Stick ... RS485 resp. TORRIX Ex C... resp. TORRIX Ex RS485... resp. TORRIX Ex TAG...

| Maximum surface temperature | | Ambient temperature T_a |
|----------------------------------|---------------------|---------------------------|
| Dust layer ≤ 5 mm | Immersed in dust | |
| $I_i \leq 100$ mA: $T_a + 40$ °C | Observe EN 60079-14 | -40 °C to +85 °C |
| $I_i \leq 200$ mA: $T_a + 55$ °C | Observe EN 60079-14 | -40 °C to +70 °C |

All further data are valid unchanged.

(16) Drawings and documents are listed in the ATEX Assessment Report No. 20 203 254816

(17) Specific Conditions for Use

1. When using Titanium Floats or Sump Environmental Sensors, the risk of ignition due to impact or friction shall be avoided.
2. When using plastic floats, there is a danger of ignition due to electrostatic discharge. The manufacturer's instructions must be observed.

(18) Essential Health and Safety Requirements

no additional ones

- End of Certificate -



Instructions in accordance with directive 2014/34/EU

TÜV 99 ATEX 1496 X

Filling Level Sensors type VISY Stick ... and type TORRIX Ex ...

Version: 02.2020

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 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 60079-11:2012 | Equipment protection by intrinsic safety "i" |
| EN 60079-26:2015 | Equipment with Equipment Protection Level (EPL) Ga |

III Instructions for safe ...

III.a ... use

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

The devices are designed as intrinsically safe apparatuses and are approved for use in potentially explosive areas. 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.

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.

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.



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.

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 3/4" 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 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 screw terminals type TORRIX Ex ... and TORRIX Ex HART ... the terminal designation is "+" and "-" 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.


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.

In accordance with the requirements for dielectric strength according to EN 60079-11, Clause 6.3.13 there is compliance with the insulation test between the intrinsically safe circuit and the chassis of the device with a voltage of 500 V_{AC}.

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.

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:
- 4a according to directive:
 II 1 GD
II 1/2 G
II 2 G
- 4b according to standards:
TORRIX Ex ...

Ex ia IIC T6...T4 Ga
Ex ia IIC T6...T4 Ga/Gb
Ex ia IIC T6...T4 Gb
Ex ia IIIC T160 °C Da

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

Ex ia IIB T6...T4 Ga
Ex ia IIB T6...T4 Ga/Gb
Ex ia IIB T6...T4 Gb
Ex ia IIIC T160 °C Da

TORRIX Ex SC... / VISY-Stick ... / VISY-Stick (Flex) Temp

Ex ia IIC T6...T5 Ga
Ex ia IIC T6...T4 Ga/Gb
Ex ia IIC T6...T4 Gb
Ex ia IIIC T135 °C Da



*TORRIX Ex SC...-A / TORRIX Ex SC... Flex / TORRIX Ex SC... PL /
VISY-Stick Advanced ... / VISY-Stick ... Flex ...*

Ex ia IIB T6...T5 Ga
Ex ia IIB T6...T4 Ga/Gb
Ex ia IIB T6...T4 Gb
Ex ia IIIC T135 °C Da

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

Ex ia IIC T6...T4 Ga
Ex ia IIC T6...T4 Ga/Gb
Ex ia IIC T6...T4 Gb
Ex ia IIIC T125°C Da

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


Ex ia IIB T6...T4 Ga
Ex ia IIB T6...T4 Ga/Gb
Ex ia IIB T6...T4 Gb
Ex ia IIIC T125°C Da

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

Ex ia IIC T4 Ga
Ex ia IIC T4...T3 Ga/Gb
Ex ia IIC T4...T3 Gb
Ex ia IIIC T195°C Da

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

Ex ia IIB T4 Ga
Ex ia IIB T4...T3 Ga/Gb
Ex ia IIB T4...T3 Gb
Ex ia IIIC T195°C Da

- | | | |
|---|-------------------|--|
| 5 | *Warning marking: | WARNING – Potential electrostatic charging hazard – See instructions |
| 6 | CE marking: |  0044 |
| 7 | Technical data: | See instructions for technical data |



V Technical data

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

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

Table 2: Electrical input data of filling level sensors

When using the equipment in potentially explosive gas atmospheres please consult table 3 to table 5 for the maximum temperatures depending on temperature classes and category respectively equipment protection levels.

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

| Temperature class | T_a | T_F |
|---|-------------------|--------------------|
| Category 1G resp. EPL Ga (filling level sensor completely installed in zone 0) | | |
| T6 | -20 °C ... +50 °C | |
| T5, T4, T3, T2, T1 | -20 °C ... +60 °C | |
| Category 1/2G resp. EPL Ga/Gb (sensor head installed in zone 1, Sensor pipe in zone 0) | | |
| T6 | -40 °C ... +50 °C | -20 °C ... +50 °C |
| T5 | -40 °C ... +65 °C | -20 °C ... +60 °C |
| T4, T3, T2, T1 | -40 °C ... +85 °C | |
| Category 2G resp. EPL Gb (filling level sensor completely installed in Zone 1) | | |
| T6 | -40 °C ... +50 °C | -40 °C ... +85 °C |
| T5 | -40 °C ... +65 °C | -40 °C ... +100 °C |
| T4 | -40 °C ... +85 °C | -40 °C ... +135 °C |
| T3 | | -40 °C ... +200 °C |
| T2 | | -40 °C ... +300 °C |
| T1 | | -40 °C ... +450 °C |

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

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



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

| Temperature class | T _a | T _F |
|---|--|--|
| Category 1G resp. EPL Ga (filling level sensor completely installed in zone 0) | | |
| T6 | $I_i \leq 100 \text{ mA: } -20 \text{ °C ... } +40 \text{ °C}$ $I_i \leq 200 \text{ mA: } -20 \text{ °C ... } +25 \text{ °C}$ | |
| T5 | $I_i \leq 100 \text{ mA: } -20 \text{ °C ... } +55 \text{ °C}$ $I_i \leq 200 \text{ mA: } -20 \text{ °C ... } +40 \text{ °C}$ | |
| T4, T3, T2, T1 | -20 °C ... +60 °C | |
| Category 1/2G resp. EPL Ga/Gb (sensor head installed in zone 1, Sensor pipe in zone 0) | | |
| T6 | $I_i \leq 100 \text{ mA: } -40 \text{ °C ... } +40 \text{ °C}$ $I_i \leq 200 \text{ mA: } -40 \text{ °C ... } +25 \text{ °C}$ | $I_i \leq 100 \text{ mA: } -20 \text{ °C ... } +40 \text{ °C}$ $I_i \leq 200 \text{ mA: } -20 \text{ °C ... } +25 \text{ °C}$ |
| T5 | $I_i \leq 100 \text{ mA: } -40 \text{ °C ... } +55 \text{ °C}$ $I_i \leq 200 \text{ mA: } -40 \text{ °C ... } +40 \text{ °C}$ | $I_i \leq 100 \text{ mA: } -20 \text{ °C ... } +55 \text{ °C}$ $I_i \leq 200 \text{ mA: } -20 \text{ °C ... } +40 \text{ °C}$ |
| T4, T3, T2, T1 | $I_i \leq 100 \text{ mA: } -40 \text{ °C ... } +85 \text{ °C}$ $I_i \leq 200 \text{ mA: } -40 \text{ °C ... } +70 \text{ °C}$ | -20 °C ... +60 °C |
| Category 2G resp. EPL Gb (filling level sensor completely installed in Zone 1) | | |
| T6 | $I_i \leq 100 \text{ mA: } -40 \text{ °C ... } +40 \text{ °C}$ $I_i \leq 200 \text{ mA: } -40 \text{ °C ... } +25 \text{ °C}$ | -40 °C ... +85 °C |
| T5 | $I_i \leq 100 \text{ mA: } -40 \text{ °C ... } +55 \text{ °C}$ $I_i \leq 200 \text{ mA: } -40 \text{ °C ... } +40 \text{ °C}$ | -40 °C ... +100 °C |
| T4 | $I_i \leq 100 \text{ mA: } -40 \text{ °C ... } +85 \text{ °C}$ $I_i \leq 200 \text{ mA: } -40 \text{ °C ... } +70 \text{ °C}$ | -40 °C ... +135 °C |
| T3 | | -40 °C ... +200 °C |
| T2 | | -40 °C ... +300 °C |
| T1 | | -40 °C ... +450 °C |

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

| Temperature class | T _a | T _F |
|---|-------------------|--------------------|
| Category 1G resp. EPL Ga (filling level sensor completely installed in zone 0) | | |
| T4, T3, T2, T1 | -20 °C ... +60 °C | |
| Category 1/2G resp. EPL Ga/Gb (sensor head installed in zone 1, Sensor pipe in zone 0) | | |
| T4 | -40 °C ... +75 °C | -20 °C ... +60 °C |
| T3, T2, T1 | -40 °C ... +85 °C | |
| Category 2G resp. EPL Gb (filling level sensor completely installed in Zone 1) | | |
| T4 | -40 °C ... +75 °C | -40 °C ... +135 °C |
| T3 | -40 °C ... +85 °C | -40 °C ... +200 °C |
| T2 | | -40 °C ... +300 °C |
| T1 | | -40 °C ... +450 °C |

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

For use in category 1G resp. 1/2G, the following applies:

The process pressure for the media must be between 0.8 bar and 1.1 bar where explosive vapour-air mixtures are present. If no explosive mixtures are present, the equipment may also be operated outside this area according to the manufacturer's specification.



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.

General information (see also EN IEC 60079-0, Clause 1):

Zone 0 exists only under atmospheric conditions:

Temperature range: -20 °C ... +60 °C
 Pressure range: 0.8 bar ... 1.1 bar
 Oxidants: Air (oxygen content about 21 %)

When using the equipment in potentially explosive dust atmospheres please consult table 6 for the maximum ambient temperatures depending on the maximum surface temperature and dust layer.

Category 1D resp. equipment protection level Da (filling level sensor installed in zone 20)

| Maximum surface temperature | | Ambient temperature T_a |
|--|----------------------|---------------------------|
| dust layer ≤ 5 mm | immersed in dust | |
| Types TORRIX Ex SC... / VISY-Stick ... | | |
| $T_a + 30$ °C | 135 °C | -40 °C ... +85 °C |
| Types VISY-Stick ... TLS | | |
| 135 °C | | -40 °C ... +77 °C |
| $T_a + 110$ °C | Observe EN 60079-14* | -40 °C ... +85 °C |
| Types TORRIX Ex C... / TORRIX Ex RS485... / TORRIX Ex TAG... / VISY-Stick ... RS485 | | |
| $I_i \leq 100$ mA: $T_a + 40$ °C | Observe EN 60079-14* | -40 °C ... +85 °C |
| $I_i \leq 200$ mA: $T_a + 55$ °C | | -40 °C ... +70 °C |
| Types TORRIX Ex ... | | |
| $T_a + 75$ °C | Observe EN 60079-14* | -40 °C ... +85 °C |

Table 6: Service temperatures for potentially explosive dust atmospheres

The filling level sensors achieve a degree of protection:

Protection rating IP68

VI Special conditions of use

1. When using Titanium Floats or Sump Environmental Sensors, the risk of ignition due to impact or friction shall be avoided.
2. When using plastic floats, there is a danger of ignition due to electrostatic discharge.

* For the assessment of the temperature clause 5.6.3.3 of EN 60079-14:2013 can consult
 Page 7/7

ZERTIFIKAT CERTIFICATE

Hiermit wird bescheinigt, dass das unten beschriebene Produkt der Firma
This certifies that the product mentioned below from company

FAFNIR GmbH
Schnackenburgallee 149 c
22525 Hamburg
Deutschland

die Anforderungen der folgenden Prüfunterlage(n) erfüllt.
fulfills the requirements of the following test regulations.

Geprüft nach: **EN 61508:2010, SIL 2**
Tested in accordance with:

Beschreibung des Produktes: **Magnetostriktiver Füllstandsensor**
(Details s. Anlage 1) *Magnetostrictive Level Sensor*
Description of product:
(Details see Annex 1)

Typenbezeichnung: **TORRIX ... (Version 4 & 5)**
Type Designation: **VISY-Stick ...**

Bemerkung: **Bitte beachten Sie auch die Hinweise in der Anlage**
Remark: **Please also pay attention to the Annex**

Dieses Zertifikat bescheinigt das Ergebnis der Prüfung an dem vorgestellten Prüfgegenstand. Eine allgemein gültige Aussage über die Qualität der Produkte aus der laufenden Fertigung kann hieraus nicht abgeleitet werden.
This certifies the result of the examination of the product sample submitted by the manufacturer. A general statement concerning the quality of the products from the series manufacture cannot be derived there from.

Registrier-Nr. / Registered No. 44 799 13752002
Prüfbericht Nr. / Test Report No. 3523 3926
Aktenzeichen / File reference 8000490968

Gültigkeit / Validity
von / from 2019-11-13
bis / until 2024-11-12



Zertifizierungsstelle der
TÜV NORD CERT GmbH

Essen, 2019-11-13

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.de technology@tuev-nord.de

Bitte beachten Sie auch die umseitigen Hinweise
Please also pay attention to the information stated overleaf

Hinweise zum TÜV NORD- Zertifikat

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Jedes Produkt muss deutlich einen Hinweis auf den Hersteller oder Importeur und eine Typenbezeichnung tragen, damit die Identität des geprüften Baumusters mit den serienmäßig in den Verkehr gebrachten Produkten festgestellt werden kann.

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Bei Änderungen am geprüften Produkt ist die Zertifizierungsstelle umgehend zu verständigen.

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Für das TÜV NORD - Zertifikat gelten außer den vorgenannten Bedingungen auch alle übrigen Bestimmungen des allgemeinen Vertrages. Es hat solange Gültigkeit, wie die Regeln der Technik gelten, die der Prüfung zu Grunde gelegt worden sind, sofern es nicht auf Grund der Bedingungen des allgemeinen Vertrages früher zurückgezogen wird.

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Hints to the TÜV NORD - Certificate

This TÜV NORD - certificate only applies to the firm stated overleaf and the specified product. It may only be transferred to third parties by the certification body.

Each product must be accompanied by the instructions which are necessary for its operation and installation.

Each product must bear a distinct indication of the manufacturer or importer and a type designation so that the identity of the tested sample may be determined with the product launched on the market as a standard.

The bearer of the TÜV NORD - Certificate undertakes to regularly supervise the manufacturing of products for compliance with the test specifications and in particular properly carry out the checks which are stated in the specifications or required by the test laboratory.

In case of modifications of the tested product the certification body must be informed immediately.

In case of modifications and expiration of validity the original certificate must be returned to the certification body immediately. The certification body decides if the certificate can be supplemented or whether a new certification is required.

In addition to the conditions stated above, all other provisions of the General Agreement are applicable to the TÜV NORD - Certificate. It will be valid as long as the rules of technology on which the test was based are valid, unless revoked previously pursuant to the provisions of the General Agreement.

This TÜV NORD - Certificate will become invalid and shall be returned to the certification body immediately in the event that it shall expire without delay when it has expired or revoked.

ANLAGE ANNEX

Anlage 1, Seite 1 von 2
Annex 1, page 1 of 2

zum Zertifikat Registrier-Nr. / to Certificate Registration No. 44 799 13752002

| | |
|--|--|
| Produktbeschreibung: <i>Product description:</i> | Siehe auch Seite 1 des Zertifikats <i>See also page 1 of the certificate</i> |
| Typbezeichnung: <i>Type designation:</i> | TORRIX ... (Version 4 & 5) VISY-Stick ... |
| Technische Daten: <i>Technical data:</i> | Versorgungsspannung: 8 V _{DC} ... 50 V _{DC} <i>Supply voltage:</i> |
| | Umgebungstemperatur: -40 °C ... +85 °C <i>Ambient temperature:</i> |
| | Schutzart: IP68 <i>Degree of Protection:</i> |
| Sicherheitsfunktion: <i>Safety function:</i> | Füllstandsmessung <i>Level Measurement</i> |



Zertifizierungsstelle der
TÜV NORD CERT GmbH

Essen, 2019-11-13

ANLAGE ANNEX

Anlage 1, Seite 2 von 2
Annex 1, page 2 of 2

zum Zertifikat Registrier-Nr. / to Certificate Registration No. 44 799 13752002

Technische Daten:

Technical data:

- 1. Der Einsatz der Sensoren TORRIX ... (Version 4 & 5) und VISY-Stick ... hat unter Beachtung der durch den Hersteller vorgegebenen Sicherheitshinweise in der Technischen Dokumentation und im Sicherheitshandbuch der jeweils aktuellen Fassung zu erfolgen.**
The safety instructions of the manufacturer in the technical documentation / safety manual in its current valid version must be taken into consideration when using TORRIX ... (Version 4 & 5) and VISY-Stick... .
- 2. Für eine vollständige Beurteilung der funktionalen Sicherheit des Gesamtsystems müssen alle Anforderungen der EN 61508 auf alle Teilsysteme – und somit auf die gesamte Sicherheitsfunktion – angewendet werden.**
To accomplish a complete functional safety assessment of the whole system, all requirements of EN 61508 must be applied to all subsystems – and therefore to the overall safety function.
- 3. Die Gültigkeit der Bewertung ist ausschließlich für die im technischen Bericht 3523 3926, vom 08.11.2019 beschriebenen Hard- und Softwareversionen gegeben.**
The validity of the assessment is only given for the hard- and software versions described in technical report 3523 3926 as of 08.11.2019.



Zertifizierungsstelle der
TÜV NORD CERT GmbH

Essen, 2019-11-13

Safety manual in accordance with series of standards EN 61508

Level sensor type TORRIX ... and type VISY-Stick ...

Edition: 11.2019

I Range of application

The level sensors are suitable for areas in which a safety-related subsystem according to EN 61508 with SIL 2 is mandatory.

II Standards

The level sensors are designed in accordance with the following standards

EN 61508:2010, all parts Functional safety of electrical/electronic/programmable electronic safety-related systems

III Instructions for safe ...

III.a ... use

This safety manual applies to all level sensors from hardware version 4 and from firmware version 4.9 upwards. The version numbers can be read with differences:

TORRIX ... HART ...: The version numbers can be read out using the configuration program FAFNIR HART-Setup.

TORRIX ... RS485 ...: The firmware version can be read out using the MODBUS ASCII protocol.

TORRIX ... SC ... and VISY-Stick ...: The version numbers can be read out using the configuration program VISY-Setup or the FAFNIR protocol Universal Device Protocol (UDP). The respective technical documentation is to be consulted for the use of the named options.

TORRIX ... TAG ...: The firmware version is issued at regular intervals in the identification message. The field name is "Firmware Version" and has a length of two bytes.

In principle, the level sensor indicates the correct fill level (plausibility check) and / or, in the case of a detected error, an error value (safe state), which corresponds to a mode of operation with a continuous requirement. The safe state is reached within ten seconds. The safety function is ensured differently depending on the level sensor.

It must be ensured that there are no strong magnetic fields in the area of the probe tube. In addition, the safe use with adhering liquids is not guaranteed.

| Type | Approval | Electrical design | Structure | Measuring accuracy | Mechanical design | Temperature range |
|------|----------|-------------------|-----------|--------------------|---|--|
| | | | | | | HHT Maximum temperature -40 °C ... +450 °C HT High temperature (HT) -40 °C ... +250 °C LLT Minimum temperature -200 °C ... +80 °C LT Low temperature -65 °C ... +125 °C NT Normal temperature -40 °C ... (+85) +125 °C |
| | | | | | <i>n</i> Rigid sensor tube with 12 mm diameter <i>n</i> = sensor tube Ø, e.g. 6 (mm) <i>nB</i> <i>n</i> = sensor tube Ø; Sensor tube not centered on the sensor head 90B Sensor tube bent 90° in front of the sensor head and Bypass B Sensor tube not centered on the sensor head (Bypass) Flex ... Flexible sensor tube (... Ø _{sensor tube} : F = 13 mm; T = 12 mm) PL Plastic coating against very aggressive media SP Sampling tube, e.g. for sampling | |
| | | | | | 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 | |
| | | | | | 4 ... 20 mA interface with internal setting button C 4 ... 20 mA interface without internal setting button HART 4 ... 20 mA interface with HART protocol internal setting button HART C 4 ... 20 mA interface with HART protocol and without internal setting button RS485 RS-485 interface SC Serial communication (for connection to isolating amplifier VP-... or VPI) TAG TAG interface; signal transmission based on EN 14116 | |
| | | | | | Without Ex approval Ex With Ex approval | |

TORRIX Magnetostrictive level sensor (from version 5) with terminals or connection plug

Type code III.a1: Level sensor TORRIX ...

| System | Type | Accuracy | Sensor tube | Usage | Interface |
|--------|------|----------|-------------|--|---|
| | | | | | For connection to isolating amplifier VP-... or VPI RS485 For connection to an RS-485 interface TLS For connection to a TLS (Veeder-Root) |
| | | | | Standard level sensor Biodiesel Level sensor; Biodiesel E15 Level sensor; Ethanol admixture up to 15 % Ethanol Level sensor; Ethanol Interstitial Device for monitoring intermediate chambers in double-walled tanks LPG Level sensor; LPG N Level sensor; AdBlue Sump Environmental sensor for monitoring the dispenser sump with liquid distinction (product / water) Dispenser Sump Environmental sensor for monitoring the manhole with liquid distinction (product / water) Manhole Temp Temperature measuring chain with up to 32 temperature sensors | |
| | | | | Rigid sensor tube Flex Flexible sensor tube | |
| | | | | Standard Advanced Increased accuracy | |
| | | | | Stick Magnetostrictive level and environmental sensor with up to five temperature sensors in the sensor tube | |

VISY- Volume Information System

Type code III.a2: Level sensor VISY-Stick ...

III.b ... assembling and dismantling

For level sensors with connection board, only the cover of the connection housing may be removed for electrical installation and - by means of push buttons - for adjusting the level sensor. After installation, the connection housing must be closed again.

Also, the floats may be removed from the probe tube. When mounting the floats, pay attention to the correct orientation.

III.c ... installation

To integrate the devices in the equipotential bonding, a PA terminal is provided on the sensor head. For functional safety, it is relevant that the probes are integrated in the equipotential bonding. For the level sensors with screw terminals, the terminal designation is "+" and "-". For level sensors with M12 male connectors, the pin assignments are as follows:

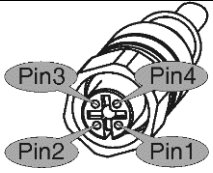
| Pin | TORRIX ... SC ... VISY-Stick ... | TORRIX ... C ... TORRIX ... TAG ... VISY-Stick ... TLS | TORRIX ... RS485 ... VISY-Stick ... RS485 | M12 Cable (Female) |
|-----|-------------------------------------|--|--|---|
| 1 | + | + | + |  |
| 2 | A | | A (+) | |
| 3 | - | - | - | |
| 4 | B | | B (-) | |

Table III.c: Terminal assignment of the sensors

III.d ... adjustment

No SIL-relevant adjustments are required for operation of the sensors.

III.e ... putting into service

Before putting into service, all devices must be checked of right installation and connection. The electrical supply, as well of connected devices, must be checked.

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

Generally, the level sensor is maintenance-free. In the event of a defect, it must be sent back to the manufacturer or one of its representations.

If an error occurs, e.g. no float on the probe tube, the corresponding diagnostic error is issued. If the error is corrected during active operation, the sensor leaves the error mode.

Level sensors with 4 ... 20 mA interface

In the event of a fault, the residual current flows (3.6 mA or 21.5 mA, whichever is set). If the fault current of 21.5 mA can not flow, e.g. if there is a low supply, the fault current of 3.6 mA is automatically set.

Level sensors with HART protocol

The second data byte of the level sensor response contains the device status. The flag "Device malfunction" (0x80, bit 7) signals a device error. If the "More Status Available" flag (0x10, bit 4) is also set, then device-specific status bits (byte 0) can be queried:

| Bit | Fault | Description |
|-----|-------------------|---|
| 0 | HART parameters | HART parameters have been changed illegally |
| 1 | Sensor parameters | Sensor parameters have been changed illegally |
| 2 | Measurement | No measurement possible |
| 3 | Error counter | Too many errors during the measurement |
| 4 | Undervoltage | Supply voltage is too low |

Table III.f1: Device-specific status bits in the HART protocol

Level sensors with DDA protocol:

In the event of an error, the error code "E102" is output in the fill level data field.

Level sensors with H, Modbus, UC and UDP protocol:

In the event of an error, the status code 1 is output.

Level sensors with LC protocol:

In the event of an error, the status bit (bit 7) in the status byte is set to 1.

Level sensors with TAG protocol

In the event of an error, the status bit (bit 23) is set to 1 and the fill level indicates the cause of the error:

| Fill level (only bits 22 ... 0) | Status information |
|---------------------------------|---|
| 0x000000 | General problem with the sensor |
| 0x000001 | RAM error |
| 0x000002 | Parameter error |
| 0x000003 | The float is too close to the end |
| 0x000005 | The float is upside down |
| 0x000007 | Switched ON (power up) or reset (Reset) |
| 0x7FFFFFFF | Level overflow |

Table III.f2: Device-specific status bits in the TAG protocol

Level sensors with TLS interface:

For each measurement, the probes are switched on for approximately 500 ms. If the probe is unable to perform regular measurements, the measurement is marked as invalid by falsification of the parity bit.

IV Safety related codes

| Parameter | Value | | | |
|--|---------------------------------|----------------|----------------|----------------|
| Safety Integrity Level | SIL 2 | | | |
| Hardware fault tolerance | HFT = 0 | | | |
| Security related subsystem | Type B | | | |
| Failure rate [h ⁻¹] | λ_{SD} | λ_{SU} | λ_{DD} | λ_{DU} |
| TORRIX ... | 8.53E-09 | 3.46E-07 | 8.34E-07 | 1.38E-07 |
| TORRIX ... C... / TORRIX ... TAG... | 4.11E-08 | 3.13E-07 | 8.13E-07 | 1.20E-07 |
| TORRIX ... HART C... | 3.95E-08 | 3.59E-07 | 8.10E-07 | 1.16E-07 |
| VISY-Stick ... RS485 / TORRIX ... RS485... | 3.95E-08 | 2.65E-07 | 7.73E-07 | 1.10E-07 |
| VISY-Stick ... / TORRIX ... SC... | 3.95E-08 | 1.87E-07 | 7.25E-07 | 9.82E-08 |
| VISY-Stick ... TLS | 3.95E-08 | 2.33E-07 | 8.19E-07 | 1.15E-07 |
| Mean frequency of dangerous failure per hour, PFH [h ⁻¹] | See failure rate λ_{DU} | | | |
| Mean Time to Recovery | MTTR = 8 h | | | |
| Interval of the retest | $T_1 = 1$ year | | | |
| Architecture | 1001 | | | |

Table IV: Safety related codes

V Additional requirements for software elements

There are no requirements for software elements.



Government of India
Ministry of Commerce & Industry
Petroleum & Explosives Safety Organisation (PESO)
5th Floor, A-Block, CGO Complex, Seminary Hills,
Nagpur - 440006

E-mail : explosives@explosives.gov.in
 Phone/Fax No : 0712 -2510248, Fax-2510577

Approval No : A/P/HQ/MH/104/6555 (P479308)

Dated : 22/09/2020

To,

M/s. FAFNIR GmbH,
Scnackenburgallee 149 c,Hamburg
22525
GERMANY

Sub : Approval of Filling Level Sensors. under Petroleum Rules 2002- Regarding.

Sir(s),

Please refer to your letter No. **OIN576302** dated **11/09/2020** on the subject.

The following Ex electrical equipment(s) manufactured by you according to **EN 60079-11 : 2012, EN 60079-26 : 2015, EN/IEC 60079-0: 2018,** standards and covered under **TUV NORD CERT GmbH** Test reports mentioned below is/are approved for use in **Zone 0** of Gas **IIB/IIC** hazardous areas coming under the the Petroleum Rules, 2002 administered by this Organization.

| Sr. No | Description | Safety Protection | Equipment reference Number | Test Agency | | | Drawing no |
|--------|--|--|----------------------------|--------------------|-----------------------------|------------------|----------------------------------|
| | | | | Name | Certificate No. | Certificate Date | |
| 1 | Filling Level Sensor type VISY-Stick.. and type TORRIX Ex... | Ex ia IIC T6..T4 Ga or Ex ia IIB T6..T4 Ga or Ex ia IIC T6..T5 Ga or Ex ia IIB T6..T5 Ga or Ex ia IIC T4 Ga or Ex ia IIB T4 Ga | P479308/1 | TUV NORD CERT GmbH | TUV 99 ATEX 1496 X Issue 02 | 19/02/2020 | PF025B031 Rev B, PF025B059 Rev C |

This Approval is granted subject to observance of the following conditions:-

- 1)The design and construction of the equipment shall be strictly in accordance with description, condition and drawings as mentioned in the TUV NORD CERT GmbH Test Reports referred to above.
- 2)The equipment shall be used only with approved type of accessories and associated apparatus.
- 3)Each equipment shall be marked either by raised lettering cast integrally or by plate attached permanently to the main structure to indicate conspicuously:-
 - (a) Name of the manufacturer
 - (b) Name and number by which the equipment is identified.
 - (c) Number & date of the test report of the TUV NORD CERT GmbH applicable to the equipment.
 - (d) Equipment reference number of this letter by which use of apparatus is approved.

(e) Protection level.

4) A certificate to the effect that the equipment has been manufactured strictly in accordance with the drawing referred to in the TUV NORD CERT GmbH Test report and is identical with the one tested and certified at TUV NORD CERT GmbH shall be furnished with each equipment.

5) The customer shall be supplied with a copy of this letter, an extract of the conditions and maintenance schedule, if any, recommended by TUV NORD CERT GmbH in their test reports and copy of instructions booklet detailing operation & maintenance of the equipment so as to maintain its Flame Proof characteristics.

6) The After sales service and maintenance of subject equipment shall be looked after by your representative Gilbarco Veeder Root India Pvt Ltd, B-Wing First Floor Art Guild House, Phoenix Market City, Kurla (West), Mumbai 400 070

This approval also covers the permissible variations as approved under the TUV NORD CERT GmbH test reports referred above. This approval is liable to be cancelled if any of the conditions of the approval is violated or not complied with . The approval may also be amended or withdrawn at any time, if considered necessary in the interest of safety.

The field performance report from actual users/your customers of the subject equipment may please be collected and furnished to this office for verification and record on annual basis.

The Approval is Valid upto **31/12/2024**

Yours faithfully,

(Ninad Dattaram Gawade)
Dy. Controller of Explosives
For Chief Controller of Explosives
Nagpur

Copy to :

1. Jt. Chief Controller of Explosives, West Circle, MUMBAI
2. Gilbarco Veeder Root India Pvt Ltd, B-Wing First Floor Art Guild House, Phoenix Market City, Kurla (West), Mumbai 400 070

for Chief Controller of Explosives
Nagpur

(For more information regarding status, fees and other details please visit our website <http://peso.gov.in>)

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