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 IEC standards

IEC 60079-0:2017-12, Ed. 7.0	Equipment – General requirements
IEC 60079-1:2014-06, Ed. 7.0	Equipment protection by flameproof enclosures "d"
IEC 60079-11:2011-06, Ed. 6.0	Equipment protection by intrinsic safety "i"
IEC 60079-26:2021-02, Ed. 4.0	Equipment with Equipment Protection Level (EPL) Ga
IEC 60079-31:2022-01, Ed. 3.0	Equipment dust ignition protection by enclosure “t”

III Instructions for safety

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 resp. with protection by enclosure (TORRIX Exd ...) there is the possibility to use a heater for the indication 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.

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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.

The TORRIX Ex... with connection terminals is designed to be opened. Further dismantling would possibly damage the level sensor and invalidate the approval.

With the TORRIX Exd ... a certified cable gland must be mounted in the flameproof enclosure according to the manufacturer's instructions. The covers of the connection compartment and of the display can be opened after de-energizing both circuits (sensor and heater) with a four-minute delay, whereby the M4 hexagon socket locking screw must first be loosened (screw into the enclosure). To close the lids, screw them back on completely and then secure them with the M4 screw (screw out of the enclosure against the lid).

III.c Installation

All wiring operations must solely be carried out with the power disconnected. Special rules and regulations, including IEC 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 IEC 60079-26, clause 6):

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 the event of hazards due to swinging 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 intrinsic 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.

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

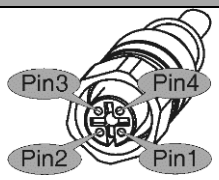
Pin	TORRIX Ex SC... VISY-Stick ...	TORRIX Ex C... TORRIX Ex TAG... VISY-Stick ... TLS	TORRIX Ex RS485... VISY-Stick ... RS485	M12 cable (female)
1	+	+	+	
2	A		A (+)	
3	-	-	-	
4	B		B (-)	

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 IEC 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, overhaul and repair

In general, the devices are maintenance-free. In case of a defect it must be send back to FAFNIR or one of his representations.

For devices that are completely intrinsically safe, there is compliance with the dielectric strength test between the intrinsically safe circuit and the chassis of the device with a voltage of 500 V_{AC} according to IEC 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.

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IV Equipment marking

1 Manufacturer: FAFNIR GmbH, 22525 Hamburg

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

3 Certificate number: IECEx TUN 05.0004X

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

Ex ia IIC T6…T1 Ga
Ex ia IIC T6…T1 Ga/Gb
Ex ia IIC T6…T1 Gb
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

Ex ia IIB T6…T1 Ga
Ex ia IIB T6…T1 Ga/Gb
Ex ia IIB T6…T1 Gb
Ex ia IIIC TX °C Db

TORRIX Exd …

Ex ia/db IIC T6…T1 Ga/Gb
Ex db ia IIC T6…T1 Gb
Ex ia tb IIIC TX °C Db

TORRIX Exd …-A / TORRIX Exd … Flex / TORRIX Exd … PL

Ex ia/db IIB T6…T1 Ga/Gb
Ex db ia IIB T6…T1 Gb
Ex ia tb IIIC TX °C Db

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

Ex ia IIC T4…T1 Ga
Ex ia IIC T4…T1 Ga/Gb
Ex ia IIC T4…T1 Gb
Ex ia IIIC TX °C Db

VISY-Stick Advanced … TLS / VISY-Stick … Flex … TLS

Ex ia IIB T4…T1 Ga
Ex ia IIB T4…T1 Ga/Gb
Ex ia IIB T4…T1 Gb
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 Ex d thread: **Cable entry, e. g. M20 × 1.5

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7 Technical data: See instructions for technical data

* Marking is only valid for sensors type VISY-Stick Sump …

** Marking is only valid for sensors types 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	≤	15 V	30 V	13 V
I_i	≤	60 mA	100 mA / 200 mA[1]	200 mA
P_i	≤	100 mW	1 W	625 mW
C_i	<	10 nF	10 nF	20 nF
L_i	<	100 µH	20 µH	410 µH

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 V ± 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).

[1] The permissible input current I_i depends on the ambient temperature T_a

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For use in EPL Ga, EPL Ga/Gb and EPL Gb		
Temperature class	**T_a**	**T_F**
T6	$I_i \leq 100$ mA: -40 °C ... +40 °C $I_i \leq 200$ mA: -40 °C ... +25 °C	-40 °C ... +75 °C
T5	$I_i \leq 100$ mA: -40 °C ... +55 °C $I_i \leq 200$ mA: -40 °C ... +40 °C	-40 °C ... +90 °C
T4	$I_i \leq 100$ mA: -40 °C ... +85 °C $I_i \leq 200$ 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**	
$I_i \leq 100$ mA: X°C = T_a + 40 °C	Consider IEC 60079-14	-40 °C ... +85 °C
$I_i \leq 200$ 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 IEC 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).

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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 IEC 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 Specific 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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