LOF 1.1 and LOF 500 / NB 220
Fibre-optical Overfill Protection System
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I Features

The FAFNIR fibre-optical overfill protection systems are safety devices to prevent the overfilling of storage tanks and process containers. When working with water polluting liquids it is an essential element for protecting the environment.

The overfill protection system consists of a level detector type LOF 1.1… inside the tank and a measuring transducer type LOF 500 … or type NB 220 … with alarm unit and switching output mounted on the tank wall or in a control unit.

There is a system version available for Ex-zone 0 which is composed of the level detector type LOF 1.1… Ex … and the measuring transducer type LOF 500 ….

The alarm unit integrated into the transducer emits visual and in some versions also audible signals, depending on the operation state, e.g. if a certain level is reached.

The level detector can be easily adjusted as required to match the particular size of tank. The entire overfill protection system is maintenance-free.
II Safety instructions

The overfill protection system has been developed, manufactured and tested in accordance with the state of the art and the recognised rules of safety engineering. Nevertheless, it could be hazardous. Therefore, please observe the following safety instructions.

1 Symbols in this operation manual

The safety instructions contained in this manual are highlighted as follows:

⚠️ If you fail to observe these safety instructions, there will be a risk of an accident or the LOF 1.1…, LOF 500 …/NB 220 … overfill protection system may be damaged.

🔗 Useful information to ensure that the overfill protection system operates properly or make your work easier.

2 Correct use

The overfill protection system is used to monitor liquids in storage tanks and process containers. Use the overfill protection system solely for this purpose. FAFNIR accepts no liability for any damage resulting from abnormal use!

3 Basic safety instructions

• Never perform any modifications, attachments or conversions to the system without obtaining prior consent from the manufacturer.

• Installation, operation and maintenance of the overfill protection system may only be performed by skilled, authorised personnel. The overfill protection system may only be installed and serviced by experienced electricians. To maintain the level of expertise it is necessary to partake in regular training courses.

• Operators, setters and maintenance technicians must observe all the relevant safety regulations. This also applies to the local safety and accident prevention regulations which are not listed in this operation manual.

• The transducer must be installed in a closed room or in a housing which conforms to a certain degree of protection depending on the transducer version (see Chap. “Technical data”).

• After completion of installation and when changing the storage liquid an expert from the specialised company or user must conduct a test to ensure that the equipment has been installed correctly and is operating properly.

• Electric circuits for horns and lamps which cannot be wired up as closed circuits must be easy to check to make sure they are in good working order.
• Before putting into operation, all the devices belonging to the overfill protection system must be checked to ensure that they have been connected up correctly and are operating properly. The power supply, including that of downstream equipment, must also be checked.

• If auxiliary power fails (if limits are exceeded) or if there is discontinuity in the cables connecting the various parts of the system, overfill protection systems must report the fault or indicate the maximum tank level.
III Design and operation

The overfill protection system consists of a level detector (1) and a transducer (2) with a binary output (potential-free change-over contact). The switching signal is fed to the annunciator (3a) or the control device (3b) with actuator (3c) direct or via a signal amplifier (4) if necessary. (See Fig. 1)

1 Schematic diagram of the overfill protection system

![Schematic diagram of the overfill protection system](image)

Figure 1: Schematic diagram of the overfill protection system

2 The level detectors LOF 1.1...

This section describes the level detectors' 
- functional principle, and
- design depending on the different detector versions.

2.1 Functional principle

The functional principle of the level detectors is based on the different refraction of light on a prism in a gaseous and in a liquid environment:

The light is transmitted from a transmitter (infrared LED) to the prism via an optical fibre, and from the prism to the receiver (phototransistor) via a second fibre. If the prism is not wet with liquid, the light beam is reflected and transmitted to the receiver. When the prism is submerged in liquid, only a very small amount of light reaches the receiver.

In order to prevent the system from being affected by external light, the level detector transmits pulsed infrared light. The receiver converts the light pulses into electrical pulses, amplifies the pulses, and compares them with the transmitter pulses. Only if both pulses are in phase, a release signal will be transmitted to the transducer. If there is external light, a fibre break or line break, no release signal will be transmitted.
Figure 2: LOF 1.11 F

Figure 3: LOF 1.11 E
Figure 6: LOF ... FP

Figure 7: LOF ... ESP
Figure 8: LOF 1.12 ES/FS/ESP

Figure 9: LOF 1.12 E/F
2.2 General design

The level detectors consist of a probe tube, which reaches into the tank and carries a sensor, protected against mechanical damages, on its bottom end. The corresponding probe length is permanently imprinted at the top end of the probe.

2.2.1 Level detector LOF 1.11 …

This level detector is the LOF standard version and can be used in almost all application areas. The transducer electronics is installed in a stainless steel housing located directly on the probe tube (see Fig. 2 … 4).

The level detector can optionally be equipped with an electric plug-in connection for a comfortable connection to the transducer.

☞ The counter plug that is necessary for installation is not included in the scope of delivery and must be ordered additionally.

2.2.2 Level detector LOF 1.12 …

With this level detector, the transducer electronics are separated from the level detector in a die-cast aluminium housing. The transducer electronics are connected to the opto-electric parts in the coupler housing using a cable (standard length: 1 m) (see Fig. 8 … 9).

In this version the level detector is also suitable for restricted ambient conditions or high ambient temperatures, as the maximum temperature of the transducer electronics may be 70 °C and that of the coupler 120 °C.

2.2.3 Level detector LOF 1.13 …

With this level detector, the coupler with the opto-electric parts and the transducer electronics are separated from the level detector. The connection is provided using a stainless steel tube (standard length: 1 m) with internal optical fibres (see Fig. 10 … 11).

This version is suited for extremely low and high temperatures on the coupler and on the transducer electronics.

2.2.4 Level detector LOF 1.1… Ex …

LOF level detectors with the additional designation “Ex” are approved for Ex-Zone 0, if they are connected to a transducer LOF 500 … (see section 3 "The transducers LOF 500 and NB 220" and Annex)
2.2.5 Level detector LOF 1.1… E with screw-in unit
LOF level detectors with the additional designation "E" are fitted with a screw-in unit, which is used to adjust the probe tube and the response length to a particular height depending on the tank size (see Fig. 3, 5, 7).

2.2.6 Level detector LOF 1.1… F with flange
With LOF level detectors with the additional designation "F" the probe tube is welded to the flange and thus cannot be adjusted in height (see Fig. 2, 4, 6).

2.2.7 Level detector LOF 1.1… S with larger probe tube diameter
The probe tube of LOF level detectors with the additional designation "S" has a diameter of 24 mm (tube wall thickness: 2 mm) instead of the standard values of Ø 10 mm with a tube wall thickness of 1.5 mm (see Fig. 4, 5, 7, 8, 10).

2.2.8 Level detector LOF 1.1… P with testing unit
LOF level detectors with the additional designation "P" are equipped with a testing unit, which can be used to test the function of the entire overfill protection system, from the detector tip to the annunciator or control device, without having to dismount the level detector (see Fig. 6, 7).

3 The transducers LOF 500 and NB 220
This section describes the transducers' functional principle, and the design depending on the different transducer versions.

3.1 Functional principle
In the transducer the release signal of the level detector is converted into a binary output signal (relay). The transducer distinguishes two operating states: Normal mode and malfunction. Malfunction means both, the sensor tip is submerged in liquid (alarm) and the level detector is defective, e.g. corrosion, short circuit, line breakage. In any case of a malfunction the relay in the transducer releases. The malfunction is signalled optically and depending on the transducer version also acoustically.
3.2  General design
The transducers LOF 500 … and NB 220 … are equipped with evaluation electronics, that evaluate the signals transmitted by the level detector. A potential-free change-over contact is used to connect the transducer to an annunciator or control device. The operating mode or a malfunction is signalled by means of LEDs:

- The green LED indicates that the transducer is electrically ready to operate.
- The yellow LED
  - is on during normal operation, i.e. if there is no malfunction
  - turns off, if the liquid level has reached or exceeded the maximum permissible height, or if there is an overfill protection system error.

3.2.1  Transducer LOF 500 19" Duo with two transducers
These devices have two transducers set up separately on a European standard size printed circuit board.

3.2.2  Transducer LOF 500 … T with dry running protection
The output relay of these transducers is activated when the sensor tip is submerged in liquid. A relay release occurs when the sensor tip emerges from the liquid, as well as in the case of a short circuit or breakage in the cable between the level detector and the transducer. This is signalled by the extinguishing of the yellow LED.

3.2.3  Transducer LOF 500 … S with additional alarm indicator
These transducers are fitted with an additional alarm relay and a red LED indicating an interruption or short circuit of the signal line between level detector and transducer.

3.2.4  Transducer LOF 500 … Z with two change-over contacts
These transducers provide two potential-free change-over contacts for alarm signalling purposes.
3.2.5 Transducer NB 220 QS

Apart from the green and the yellow LED the NB 220 QS is equipped with a further red lamp, a buzzer, and an acknowledge key for indicating and confirming malfunctions:

- The red alarm lamp
  - is on, if the liquid level has reached or exceeded the maximum permissible height, or if there is an overfill protection system error.
  - turns off, if the cause of the malfunctions has been corrected, i.e. the level detector has re-emerged out of the liquid or the overfill protection system error has been corrected.

- The buzzer
  - sounds, if the liquid level has reached or exceeded the maximum permissible height, or if there is an overfill protection system error.
  - turns off after having pressed the acknowledge key.

- Use the acknowledge key to acknowledge a malfunction. The buzzer’s acoustic signal is switched off.

*: The alarm indicators listed can also be connected externally.
IV Installation

⚠️ When installing the overfill protection system please observe the following safety instructions:

- During all work on the overfill protection system always observe the national safety and accident prevention regulations as well as the generally recognised rules of engineering and all the safety instructions in this manual.
- Wiring may only be carried out when the equipment is disconnected from the power supply.
- The transducer must be installed in closed rooms or in a housing with IP54 protection. The housing protection class for closed rooms differs depending on the transducer version (see Chap. "Technical data").
- Only level detector LOF 1.1… Ex … in combination with transducer LOF 500 … may be operated in potentially explosive atmospheres.

1 Alignment dimensions of the level detector

![Diagram](image.png)

- H Tank height
- S Stub/sleeve height
- A Response level
- Z Probe length
- L Response length
- Y Reference dimension

Figure 12: Alignment dimensions of the level detector
Tank height (H): Height of the tank.
Stub/sleeve height (S): Height of the tank’s stub or sleeve.
Response level (A): Permissible filling level in the tank. Take into account the immersion switch delay time of up to one second (see Chap. “Technical data”).
Probe length (Z): Permanently marked with a punch above the marking groove at the top of the probe. It is the distance between the marking groove and the threshold point of the level detector.
Response length (L): Distance between the hexagonal support of the screw-in unit and the marking groove on the protective sleeve of the sensor at the bottom of the level detector. For the LOF 1.1 E level detectors, the length must be individually adjusted on the level detector according to the tank dimensions (H and S) and the response level (A). For the LOF 1.1 F level detectors, the length cannot be varied and has been individually calculated before ordering. The response length is permanently marked on the flange.
Reference dimension (Y): Reference dimension between the marking groove at the top of the probe tube and the hexagonal support of the screw-in unit to check the correct adjustment of the response length (L), when the level detector is already mounted.

2 Adjusting the response length (LOF 1.1… E …)

(1) Calculate the response length (L) depending on the tank dimensions (H and S) and the response level (A).
L = (H - A) + S

(2) Adjust the calculated response length (L) on the level detector.

3 Installing the level detector in the tank

The potentiometer in the level detector electronics is set by default and is not to be modified by the operator.

The level detector is to be mounted in the tank as perpendicular as possible, so that residual liquid can drip off the sensor easily.
3.1 Mounting level detector LOF 1.1… E
Mount the level detector according to Fig. 12:

1. Tighten up the cap nut of the cutting ring union firmly.
2. Provide the screw-in thread with suitable, resistant sealing material and screw it into the tank sleeve.
3. Check the adjustment of the response length (L) using the reference dimension (Y):
   \[ L = Z - Y \]

3.2 Mounting level detector LOF 1.1… ES
Mount the level detector according to Fig. 12:

1. Tighten up the upper gland screw and the locking screw of the screw-in unit firmly.
2. Provide the screw-in thread with suitable, resistant sealing material and screw it into the tank sleeve.
3. Check the adjustment of the response length (L) using the reference dimension (Y):
   \[ L = Z - Y \]

3.3 Mounting level detector LOF 1.1… F
Flange the level detector to the tank (see. Fig. 12).

4 Electrical connection
For the electrical connection of plug-on detectors, no additional wiring is required. For detectors with long-distance installation, a two-core connecting cable (at least 2 x 1 mm², max. 500 m) must be laid between the level detector and the transducer.

A = anode = green
K = cathode = brown
E = emitter = yellow + screening
C = collector = white
1, 2 = connection to transducer

Figure 13: Connecting the level detector
Figure 14: Connecting level detector LOF … Steck DD 28 plug

Figure 15: Connecting level detector LOF … M12

Connection to transducer:
1 (brown) + 3 (blue)

Figure 16: Cable installation
5 Surge protection

If part of an intrinsically safe circuit is installed in locations requiring EPL ‘Ga’ such that the equipment and the associated equipment are at risk of developing hazardous potential differences within the locations requiring EPL ‘Ga’ or ‘Da’ [zone 0 or zone 20], e.g. through the presence of atmospheric electricity, a surge protection device [BA 350-…] shall be installed between each non-earth bonded core of the cable and the local structure as near as is reasonably practicable, preferably within 1 m, to the entrance to the locations requiring EPL ‘Ga’ or ‘Da’ [zone 0 or zone 20]. Examples of such locations are flammable liquid storage tanks, effluent treatment plants and distillation columns in petrochemical works. A high risk of potential difference is generally associated with a distributed plant [e.g. tank farms] and/or exposed equipment location [e.g. on tall tanks], and the risk is not alleviated simply by using underground cables or tank installation.

The connection between the protection device [BA 350-…] and the local structure shall have a minimum cross-sectional area equivalent to 4 mm² copper.

The use of one or more low voltage surge protection devices [BA 350-…] in an intrinsically safe modifies the way in which that circuit is considered to be earthed. This must be taken into account in the design of the intrinsically safe system.

The cable between the intrinsically safe apparatus in the locations requiring EPL ‘Ga’ or ‘Da’ [zone 0 or zone 20] and the surge protection device [BA 350-…] shall be installed such that it is protected from lightning.
6 Installing the transducer

⚠️ *The transducer may only be set up outside potentially explosive atmospheres. The protection class IP differs depending on the transducer version (see Chap. "Technical data").*

The length of cable from the level detector to the transducer must not be more than:

- 250 m in the case of 0.5 mm²
- 500 m in the case of 1 mm²
- 750 m in the case of 1.5 mm²

⚠️ *For the LOF 1.1… Ex … level detectors, the cable must be labelled intrinsically safe, and if coloured labelling is used, then light-blue.*

(1) Install the transducer according to the wiring diagrams in Fig. 13 … 20.

(2) Before putting the system into operation check all the devices in the overfill protection system to make sure they have been connected up correctly and are operating properly. Also check the power supply, including that to the downstream devices. For this, please observe the appropriate operation manuals for the respective devices.
Figure 17: Connecting the transducer LOF 500

Figure 18: Connecting the transducer LOF 500 19” Duo

Figure 19: Connecting the transducer LOF 500 19”
Figure 20: Connecting the transducer NB 220 H

Figure 21: Connecting the transducer NB 220 QS

Outputs are energised!
External annunciators and control devices must be connected between terminals 4 and 8 to monitor auxiliary power!
V  Maintenance

If the overfill protection system is operated correctly, then the system is basically maintenance-free. However, the performance of the overfill protection system must be tested at regular intervals.

1  Regular testing

⚠️ Check the overfill protection system at regular intervals (at least once a year) to ensure that it is in good working order. It is the user’s responsibility to choose the type of test and the intervals.

Perform the test in such a way that evidence is provided that the overfill protection system operates properly when all its components interact with one another. This interaction takes place when the response level is reached during a filling procedure. If it is not practicable to fill up to response level, the level detector must be made to respond by means of a suitable simulation of the filling level or the physical measuring effect.

🔍 For further information about methods of testing, please refer to VDI/VDE Guideline 2180, Sheet 4.
## VI Troubleshooting

### 1 Fault diagnosis

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<td>green LED is off</td>
<td>power failure</td>
<td>power failure</td>
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| yellow LED is off              | - max. permissible liquid level reached/exceeded  
|                                | - system error (corrosion, short circuit, line breakage, etc.) | - max. permissible liquid level reached/exceeded  
|                                |                                               | - system error (corrosion, short circuit, line breakage, etc.) |
| red LED is on (option)         | system error (interruption/short circuit of signal line between detector and transducer) | - max. permissible liquid level reached/exceeded  
|                                |                                               | - system error (corrosion, short circuit, line breakage, etc.) |
| buzzer sounds (option)         | -                                            | - max. permissible liquid level reached/exceeded  
|                                |                                               | - system error (corrosion, short circuit, line breakage, etc.) |
VII  Technical data

1  Level detectors

Temperature range:  Ambient temperature: -25 °C .. +60 °C
                  Media temperature: -25 °C .. +60 °C
Immersion switch delay:  ≤ 1 second
Temperature/pressure range:  -25 °C to +20 °C, max. 110 bar
                               -25 °C to +120 °C, max. 95 bar
                               -25 °C to +180 °C, max. 80 bar
                               -200 °C to +250 °C, atmospheric pressure cond.
Dimensions, probe tube:  LOF … E/F/FP: Ø 10 x 1.5
                         LOF … ES/FS/ESP: Ø 24 x 2
Materials (medium-contacted parts):  Material no.  Designation
                                    1.4301 to 1.4571 stainless steel (DIN 17 440)
                                    (exception 1.4305)
                                    aluminium oxide 99,9 % industrial sapphire
                                    FFKM perfluoroelastomer
                                    2.4602, 2.4610, 2.4617 stainless steel (DIN 17 744)

☞ Standard materials: 1.4571, FFKM, aluminium oxide 99 %. In case of flange versions, the flanges can also be made of steel with clad sealing surfaces from the materials mentioned above; all medium-contacted, metallic materials can be coated with E-CTFE (Halar).

2  Transducers

Auxiliary power circuit:  LOF 500 …: 24 V, 115 V, 230 V, 50 Hz or 24 V DC
                         NB 220 …: 24 V, 115 V, 230 V, 50 Hz or 24 V DC
Power input:  LOF 500 …: max. 4 VA / 5 W
              LOF 500 19" Duo: max. 8 VA/10 W
              NB 220 …: max. 4 VA / 6 W
Detector signal circuit:  LOF 500 …: U ≤ 15.8 V, I ≤ 26 mA, P ≤ 154 mW
                         NB 220 …: U ≤ 21 V, I ≤ 130 mA, P ≤ 650 mW
Output:
LOF 500/LOF 500 19“:
  1 potential-free change-over contact (level detector)
LOF 500 S/LOF 500 19“ S:
  1 potential-free change-over contact (level detector)
  1 potential-free change-over contact (system)
LOF 500 Z/LOF 500 19“ Z:
  2 potential-free change-over contacts (level detectors)
LOF 500 19“ Duo:
  2 potential-free change-over contacts (level detector)
NB 220 H:
  1 potential-free change-over contact
NB 220 QS:
  2 potential-free change-over contacts
Change-over contact carrying capacity:
AC: \( \leq 250 \text{ V}, \leq 4 \text{ A}, \cos \phi \leq 0.7, 500 \text{ W max.} \)
DC: \( \leq 250 \text{ V}, \leq 0.25 \text{ A}, 50 \text{ W max.} \)
NB 220 QS:
Pump, solenoid valve, etc. (terminal 4, 8):
  230 V, 50 Hz, 50 W max.
External lamp (terminal 5, 8):
  230 V, 50 Hz, 100 W max.
External acknowledge key (terminal 5, 7):
  230 V, 50 Hz
External horn (terminal 9, 8):
  230 V, 50 Hz, 50 W max.
Ambient temperature: 
-25 °C to +50 °C
Protection class IP:
  LOF 500, LS 500 S/Z, NB 220 H/QS/QSF: IP40
  LOF 500 19“ ..: IP00
Dimensions:
LOF 500, LS 500 S, LS 500 Z:  150 x 75 x 110
LOF 500 19“ ..:   160 x 100, 7TE, 3HE,
                  DIN 41612 F,
                  European PCB
NB 220 H:  110 x 51 x 110
NB 220 QS:  150 x 75 x 110
NB 220 QSF:  163 x 97 x  62
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<td>Connecting level detector LOF … M12</td>
<td>17</td>
</tr>
<tr>
<td>16</td>
<td>Cable installation</td>
<td>17</td>
</tr>
<tr>
<td>17</td>
<td>Connecting the transducer LOF 500</td>
<td>20</td>
</tr>
<tr>
<td>18</td>
<td>Connecting the transducer LOF 500 19” Duo</td>
<td>20</td>
</tr>
<tr>
<td>19</td>
<td>Connecting the transducer LOF 500 19”</td>
<td>20</td>
</tr>
<tr>
<td>20</td>
<td>Connecting the transducer NB 220 H</td>
<td>21</td>
</tr>
<tr>
<td>21</td>
<td>Connecting the transducer NB 220 QS</td>
<td>21</td>
</tr>
</tbody>
</table>
EU-Konformitätserklärung
EU Declaration of Conformity
Déclaration UE de Conformité

FAFNIR GmbH
Bahnenfelder Straße 19
22765 Hamburg / Germany

erklärt als Hersteller in alleiniger Verantwortung, dass das Produkt
declares as manufacturer under sole responsibility that the product
déclare sous sa seule responsabilité en qualité de fabricant que le produit

Standaufnehmer
Level Detector
DéTECTeur de niveau

LOF 1.1...

den Vorschriften der europäischen Richtlinien
complies with the regulations of the European directives
est conforme aux réglementations des directives européennes suivantes

durch die Anwendung folgender harmonisierter Normen entspricht
by applying the harmonised standards
par l'application des normes

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

EN 50581:2012
EN 61326-1:2013
EN 50014:1997
EN 50020:1994
EN 50284:1999

Das Produkt ist festgelegt als Elektro- und Elektronikgerät der RoHS-
The product is determined as electrical and electronic equipment of RoHS
Le produit est déterminé comme des équipements électriques et électroniques de RoHS

Kategorie / Category / Catégorie

Überwachungs- und Kontrollinstrumenten in der Industrie /
Industrial Monitoring and Control Instruments /
Instruments de contrôle et de surveillance industriels

Das Produkt entspricht den EMV-Anforderungen
The product complies with the EMC requirements
Le produit est conforme aux exigences CEM

Störaussendung / Emission / Émission
Störfestigkeit / Immunity / D’immunité

Klasse B / Class B / Classe B
Grundlegende elektromagnetische Umgebung /
Basic electromagnetic environment /
Environnement électromagnétique ordinaire

Die notizierte Stelle TÜV NORD CERT GmbH, 0044 hat eine EG-Baumusterprüfung durchgeführt und folgende Bescheinigung ausgestellt
The notified body TÜV NORD CERT GmbH, 0044 performed an EC-type examination and issued the certificate
L'organisme notifié TÜV NORD CERT GmbH, 0044 a effectué examen CE de type et a établi l'attestation

LOF 1.1... Ex ...

TÜV 03 ATEX 2171

Ort, Datum / Place, Date / Lieu, Date

Geschäftsführer / Managing Director / Gérant: René Albrecht

Seite / Page / Page 1/1
EU-Konformitätserklärung
EU Declaration of Conformity
Déclaration UE de Conformité

FAFNIR GmbH
Bahnenfelder Straße 19
22765 Hamburg / Germany

erklärt als Hersteller in alleiniger Verantwortung, dass das Produkt
declares as manufacturer under sole responsibility that the product
déclare sous sa seule responsabilité en qualité de fabricant que le produit
Messumformer
Measuring Transducer
Transducteur de mesure

LOF 500 ...

den Vorschriften der europäischen Richtlinien
complies with the regulations of the European directives
est conforme aux réglementations des directives européennes suivantes

| 2011/65/EU | Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten | RoHS |
| 2011/65/EU | Restriction of the use of certain hazardous substances in electrical and electronic equipment | RoHS |
| 2011/65/UE | Limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques | RoHS |
| 2014/30/EU | Elektromagnetische Verträglichkeit | EMV |
| 2014/30/EU | Electromagnetic compatibility | EMC |
| 2014/30/UE | Compatibilité électromagnétique | CEM |
| 2014/34/EU | Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen | ATEX |
| 2014/34/EU | Equipment and protective systems intended for use in potentially explosive atmospheres | ATEX |
| 2014/34/UE | Appareils et systèmes de protection destinés à être utilisés en atmosphères explosibles | ATEX |

Durch die Anwendung folgender harmonisierter Normen entspricht
by applying the harmonised standards
par l'application des normes

RoHS / RoHS / RoHS
EMV / EMC / CEM
ATEX / ATEX / ATEX
EN 50581:2012
EN 61326-1:2013
EN 60079-0:2009
EN 60079-11:2012
EN 60079-26:2007

Das Produkt ist bestimmt als Elektro- und Elektronikgerät der RoHS-
The product is determined as electrical and electronic equipment of RoHS
Le produit est déterminé comme des équipements électriques et électroniques de RoHS

Kategorie / Category / Catégorie

Überwachungs- und Kontrollinstrumenten in der Industrie / Industrial Monitoring and Control Instruments /
Instruments de contrôle et de surveillance industriels

Das Produkt entspricht den EMV-Anforderungen
The product complies with the EMC requirements
Le produit est conforme aux exigences CEM

Störaussendung / Emission / Émission
Störfestigkeit / Immunity / D’immunité

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

Die notizierte Stelle TÜV NORD CERT GmbH, 0044 hat eine EG-Baumusterprüfung durchgeführt und folgende Bescheinigung ausgestellt
The notified body TÜV NORD CERT GmbH, 0044 performed a EC-type examination and issued the certificate
L'organisme notifié TÜV NORD CERT GmbH, 0044 a effectué examen CE de type et a établi l'attestation

LOF 500 ...

TÜV 03 ATEX 2172

Ort, Datum / Place, Date / Lieu, Date

Geschäftsführer / Managing Director / Gérant: René Albrecht

Seite / Page / Page 1/1

FAFNIR GmbH • Bahnenfelder Str. 19 • 22765 Hamburg • Telefon: +49 / (0) 40 / 39 82 07-0 • Telefax: +49 / (0) 40 / 390 63 39
EU-Konformitätserklärung
EU Declaration of Conformity
Déclaration UE de Conformité

FAFNIR GmbH
Bahnenfelder Straße 19
22765 Hamburg / Germany

erklärt als Hersteller in alleiniger Verantwortung, dass das Produkt
declares as manufacturer under sole responsibility that the product
déclare sous sa seule responsabilité en qualité de fabricant que le produit

Messumformer
Measuring Transducer
Transducteur de mesure

NB 220 ...

den Vorschriften der europäischen Richtlinien
complies with the regulations of the European directives
est conforme aux réglementations des directives européennes suivantes

durch die Anwendung folgender harmonisierter Normen entspricht
by applying the harmonised standards
par l'application des normes

| 2011/65/EU | Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten | RoHS
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| 2011/65/UE | Limitation de l'utilisation de certaines substances dangereuses dans les équipements électriques et électroniques | RoHS
| 2014/30/EU | Elektromagnetische Verträglichkeit | EMV
| 2014/30/EU | Electromagnetic compatibility | EMC
| 2014/30/UE | Compatibilité électromagnétique | CEM
| 2014/35/EU | Bereitstellung elektrischer Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen auf dem Markt | NSRL
| 2014/35/EU | Making available on the market of electrical equipment designed for use within certain voltage limits | LVD
| 2014/35/UE | Mise à disposition sur le marché du matériel électrique destiné à être employé dans certaines limites de tension | DBT

Das Produkt ist bestimmt als Elektro- und Elektronikgerät der RoHS-
The product is determined as electrical and electronic equipment of RoHS
Le produit est déterminé comme des équipements électriques et électroniques de RoHS

Kategorie / Category / Catégorie

Überwachungs- und Kontrollinstrumenten in der Industrie /
Industrial Monitoring and Control Instruments /
Instruments de contrôle et de surveillance industriels

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

Das Produkt entspricht den EMV-Anforderungen
The product complies with the EMC requirements
Le produit est conforme aux exigences CEM


Ort, Datum / Place, Date / Lieu, Date

Geschäftsführer / Managing Director / Gérant: René Albrecht
Translation

(1) EC-Type Examination Certificate

(2) Equipment and protective systems intended for use in potentially explosive atmospheres
   - Directive 94/9/EC

(3) EC-Type Examination Certificate Number
   TÜV 03 ATEX 2171

(4) Equipment: Level detector type LOF 1.1...EX
(5) Manufacturer: FAFNIR GmbH
(6) Address: Bahrenfelder Strasse 19
            D-22765 Hamburg

(7) This equipment or protective system and any acceptable variation thereto are specified in the
    schedule to this certificate and the documents therein referred to.

(8) The TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Certification Body, notified body number
    (94/9/EC), certifies that this equipment or protective system has been found to comply with the
    Essential Health and Safety Requirements relating to the design and construction of equipment
    and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential report N° 03YEX550487-2.

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

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment or
     protective system is subject to special conditions for safe use specified in the schedule to this
     certificate.

(11) This EC-type examination certificate relates only to the design, examination and tests of the
     specified equipment in accordance to the Directive 94/9/EC. 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 equipment or protective system must include the following:

   Ex II 1/2 G EEx ia IIC T6 bzw. II 2 G EEx ia IIC T6

TÜV NORD CERT GmbH & Co. KG
Am TÜV 1
30519 Hannover
Tel.: +49 (0) 511 865-1455
Fax: +49 (0) 511 865-1590

Hanover, 2005-07-07

Head of the Certification Body

This certificate may only be reproduced without any change, schedule included. Excerpts or changes shall be allowed by the TÜV NORD CERT GmbH & Co. KG
EC-Type Examination Certificate No. TÜV 03 ATEX 2171

Description of equipment
The level detector type LOF 1.1... Ex – consisting of the sensor, the probe tube, the screw-in unit or flange and the connection socket – is connected to the measuring transducer LOF 500...

This level detector is installed on tanks and pipes. A short circuit or breakage of the connecting cable between the level detector and the measuring transducer is indicated.

Use as category 1/2 operating equipment
These level detectors are installed in areas subject to explosion hazards that require category 1/2 operating equipment.

The permissible ambient temperature range, depending on the temperature class, is shown in the following table:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Ambient temperature range</th>
<th>Medium temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3</td>
<td>+180 °C</td>
<td>-20 °C to +60 °C</td>
</tr>
<tr>
<td>T4</td>
<td>+110 °C</td>
<td>-20 °C to +60 °C</td>
</tr>
<tr>
<td>T6</td>
<td>+60 °C</td>
<td>-20 °C to +60 °C</td>
</tr>
</tbody>
</table>

In the presence of explosive mixtures of vapour and air, the process pressure of the media must be between 0.8 bar and 1.1 bar. If explosive mixtures are not present, the devices may also be operated beyond this range in compliance with their manufacturer's specifications.

Use as category 2 operating equipment
These level detectors are installed in areas subject to explosion hazards for category 2 operating equipment.

The permissible ambient temperature range, depending on the temperature class, is shown in the following table:

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Ambient temperature range</th>
<th>Medium temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3</td>
<td>-25 °C to 180 °C</td>
<td>+180 °C</td>
</tr>
<tr>
<td>T4</td>
<td>-25 °C to 110 °C</td>
<td>+130 °C</td>
</tr>
<tr>
<td>T6</td>
<td>-25 °C to 60 °C</td>
<td>+80 °C</td>
</tr>
</tbody>
</table>

Electrical data

Type LOF 1.1... Ex
Signal generator circuit(s) in the type of protection intrinsic safety EEx ia IIB/IIC only for connection to the respective measuring transducer of the type LOF 500...

in accordance with EC prototype test certificate no. TÜV 03 ATEX 2172

The signal generator circuits are DC-isolated from one another and from the earth connection.
(16) The test documents are listed in the test report no. 03YEX550487-2.

(17) Special conditions for safe use

none

(18) Essential Health and Safety Requirements

no additional ones
Instruction manual - level detector type LOF 1.1... Ex ...

As of: 02.2003

1 Application
When used in connection with a measuring transducer of the series LOF 500 ..., the level detector detects liquid levels.
The prism and the probe tube can be set up in Zone 0.

2 Function
The functional principle of the level detector is based on the different refraction of light in a prism located in a gaseous or liquid environment.
The light is transmitted from a transmitter (infrared LED) via an optical waveguide (OWG) to the prism, and from there via a second OWG to the receiver (phototransistor). If the prism is not wetted with liquid, the light beam is reflected and transmitted to the receiver. When the prism is submerged in water, only a very small amount of light reaches the receiver.

3 Device versions
Level detector type LOF 1.1. Ex .SP
The level detector with the additional designation “P” is equipped with a testing unit that enables a true inspection of the functional efficiency of the total overfill prevention system, from the sensor tip to the signalling and controlling unit, without having to remove the level detector first.
Level detector type LOF 1.11 Ex .
The level detector type LOF 1.11 Ex . is the standard device and covers virtually all application cases. The probe electronics are installed in a stainless steel housing located directly on the probe tube.
Level detector type LOF 1.12 Ex .
With this level detector, the probe electronics are separated from the level detector in a die-cast aluminium housing. The connection is provided using a standard 1-metre-long cable.
This version is selected whenever confined space conditions exist or the probe electronics could become too hot (max. temperature of the probe electronics = 60 °C).
Level detector type LOF 1.13 Ex .
With this level detector, the coupler and the probe electronics are separated from the level detector. The connection is provided using a standard 1 m long stainless steel tube with internal glass fibres.
This version is selected whenever very low or very high temperatures could occur at the coupler or at the probe electronics (max. temperature of the coupler electronics = 120 °C).
3.1 Type code

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Probe tube</th>
<th>Type designation</th>
<th>Probe tube</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOF 1.11 Ex E</td>
<td>ø 10 x 2</td>
<td>LOF 1.12 Ex FS</td>
<td>ø 24 x 2</td>
</tr>
<tr>
<td>LOF 1.11 Ex ESP</td>
<td>ø 24 x 2</td>
<td>LOF 1.12 Ex ESP</td>
<td>ø 10 x 1.5</td>
</tr>
<tr>
<td>LOF 1.11 Ex FP</td>
<td>ø 10 x 1.5</td>
<td>LOF 1.12 Ex FP</td>
<td>ø 10 x 1.5</td>
</tr>
<tr>
<td>LOF 1.11 Ex F</td>
<td>* ø 10 x 1.5</td>
<td>LOF 1.13 Ex E</td>
<td>ø 10 x 1.5</td>
</tr>
<tr>
<td>LOF 1.11 Ex ES</td>
<td>ø 24 x 2</td>
<td>LOF 1.13 Ex F</td>
<td>* ø 10 x 1.5</td>
</tr>
<tr>
<td>LOF 1.11 Ex FS</td>
<td>* ø 24 x 1.5</td>
<td>LOF 1.13 Ex ES</td>
<td>ø 24 x 2</td>
</tr>
<tr>
<td>LOF 1.12 Ex E</td>
<td>ø 10 x 1.5</td>
<td>LOF 1.13 Ex FS</td>
<td>* ø 24 x 2</td>
</tr>
<tr>
<td>LOF 1.12 Ex F</td>
<td>* ø 10 x 1.5</td>
<td>LOF 1.13 Ex ESP</td>
<td>ø 24 x 2</td>
</tr>
<tr>
<td>LOF 1.12 Ex ES</td>
<td>ø 24 x 2</td>
<td>LOF 1.13 Ex FP</td>
<td>ø 10 x 1.5</td>
</tr>
</tbody>
</table>

* E-CTFE (Halar) coating possible

All level detectors type LOF 1.11 Ex . can also be manufactured with an electric plug-in connection; the type designation is then supplemented by the additional term "Plug-in", e.g. LOF 1.11 E Ex . Plug-in.

Type code explanation:
- E = screw-in unit
- F = flange
- S = probe tube ø 24 x 2
- P = test connection

Plug-in = pluggable electric connection, the necessary counter plug type S-28 is not included in the scope of delivery.

4 Application

The level detectors may, under the following conditions, be part of the equipment included in tanks used for the storage of flammable liquids of the hazard class AI, All and B and of the temperature class T1 to T6.

The probe tube and the prism can be set up in Zone 0. The connection and the electronics are located in Zone 1.

Use in case of non-atmospheric conditions

II 1/2 G EEx

<table>
<thead>
<tr>
<th>$T_A$</th>
<th>$T_{Medium}$</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>+60 °C</td>
<td>+60 °C</td>
<td>T6</td>
</tr>
<tr>
<td>+110 °C</td>
<td>+60 °C</td>
<td>T4</td>
</tr>
<tr>
<td>+180 °C</td>
<td>+60 °C</td>
<td>T3</td>
</tr>
</tbody>
</table>

II 2 G EEx

<table>
<thead>
<tr>
<th>$T_A$</th>
<th>$T_{Medium}$</th>
<th>Temperature class</th>
</tr>
</thead>
<tbody>
<tr>
<td>+60 °C</td>
<td>+80 °C</td>
<td>T6</td>
</tr>
<tr>
<td>+110 °C</td>
<td>+130 °C</td>
<td>T4</td>
</tr>
<tr>
<td>+180 °C</td>
<td>+180 °C</td>
<td>T3</td>
</tr>
</tbody>
</table>

Pressure

Standard pressure range: 0 to 4 bar
Special version: 0 to 400 bar
5 **Materials**

Materials of the level detectors (medium-contacted parts)

<table>
<thead>
<tr>
<th>Material no.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4301 to 1.4571</td>
<td>stainless steel in accordance with DIN 17 440</td>
</tr>
<tr>
<td>FFKM</td>
<td>perfluoroelastomer (Kalrez)</td>
</tr>
<tr>
<td>2.4602, 2.4610, 2.4617</td>
<td>stainless steel in accordance with DIN 17 744</td>
</tr>
</tbody>
</table>

Flanges can also be made of steel with clad sealing surfaces from the materials mentioned above.

Standard materials of the medium-contacted parts

Material no. 1.4571, FFKM and aluminium oxide 99 %

In the case of level detectors in the flange version, all medium-contacted, metallic materials can be coated with E-CTFE (Halar).

6 **Installation regulations**

During any work carried out on the level detectors, the relevant technical safety regulations, in particular the BetrSichV (German plant safety directive) regulations, and the VDE (German association of electricians) regulations for electrical connection work must be observed.

6.1 **Electrical connection**

For overfill prevention sensors with plug-on sensors, no additional wiring is required. For overfill prevention sensors with long-distance installation, a two-core connecting cable (at least 2 x 1 mm², max. 500 m) must be laid between the overfill protection sensor and the fittings.

6.2 **Technical data**

<table>
<thead>
<tr>
<th>Temperature range:</th>
<th>Ambient temperature</th>
<th>-25 ... +60 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media temperature</td>
<td>-25 ... +60 °C</td>
<td></td>
</tr>
</tbody>
</table>

Inductance (outward acting): negligibly small

Capacitance (outward acting): negligibly small

Connection data: The level detector may only be connected to certified circuits and to the following “Ex”-related maximum values.

\[ U_0: \quad 24 \text{ V} \]
\[ I_0: \quad 150 \text{ mA} \]
\[ P_0: \quad 600 \text{ mW} \]

7 **Labelling**

EC prototype certificate no. TÜV 03 ATEX 2171

In compliance with EC Guideline 94/9: [CE 0032][Ex] II 1/2 G EEx ia IIB/IIC T6

II 2 G EEx ia IIB/IIC T6

For level detector with E-CTFE (Halar) coating.

In compliance with EC Guideline 94/9: [CE 0032][Ex] II 1/2 G EEx ib IIB T6
Translation

(1) **EC-Type Examination Certificate**

(2) Equipment and protective systems intended for use in potentially explosive atmospheres - **Directive 94/9/EC**

(3) EC-Type Examination Certificate Number

**TÜV 03 ATEX 2172**

(4) Equipment: Transductor type LOF 500 …

(5) Manufacturer: FAFNIR GmbH

(6) Address: Bahrenfelder Strasse 19
D-22765 Hamburg

(7) This equipment or protective system and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Certification Body, notified body number N° 0032 in accordance with Article 9 of the Council Directive of the EC of March 23, 1994 (94/9/EC), certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential report N° 03YEX550487-1.

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

- **EN 50 014:1997**
- **EN 50 020:1994**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type examination certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. 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 equipment or protective system must include the following:

![Ex II (1) G [EEx ia] IIC](Ex II (1) G [EEx ia] IIC)

TÜV NORD CERT GmbH & Co. KG
Am TÜV 1
30519 Hannover
Tel.: +49 (0) 511 886-1455
Fax: +49 (0) 511 886-1590

Head of the Certification Body

Hanover, 2005-07-07

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

EC-Type Examination Certificate N° TÜV 03 ATEX 2172

Description of equipment

In connection with the respective level detector type LOF 1.1… Ex, the measuring transducer type LOF 500 … transmits signals from gas and liquid tanks.

The measuring transducer type LOF 500 … is installed in a housing; the type LOF 500 19" … is designed as a plug-in printed circuit board.

Electrical data

Supply circuit (connections d30 and d32, or d32 and z32, or terminals 14 and 15)

U = 24/110/230 V AC, ± 15 %, 40…60 Hz, approx. 4 or 8 VA

or

U = 24 V DC, ± 20 %, approx. 5 or 10 W

Signal generator circuit (connections d2 and d4, or d2 and z2, or d8 and z8, or terminals 1 and 2)

in the type of protection intrinsic safety EEx ia IIC

Maximum values:

U₀ = 15.8 V
I₀ = 26 mA
R = 980 Ω
P₀ = 147 mW

Characteristic: trapezoidal

C₀ = 1.2 nF
L₁ negligibly small

The maximum permissible value pairs for the outer inductances (L₀) and capacitances (C₀) are shown in the following table:

<table>
<thead>
<tr>
<th>L₀</th>
<th>1 mH</th>
<th>5 mH</th>
<th>10 mH</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₀</td>
<td>200 nF</td>
<td>150 nF</td>
<td>110 nF</td>
</tr>
</tbody>
</table>

Output circuits (connections d18, d20 and d22, or d24, d26 and d28, or d16, d18, d20, d22, d24 and d26, or terminals 6 to 11)

Alternating voltage

≤ 250 V
≤ 4 A
≤ 500 VA

Direct voltage

≤ 250 V
≤ 0.25 A
≤ 50 W

cos φ ≥ 0.7

The signal generator circuits are safely DC-isolated from the supply and output circuits up to a peak voltage value of 375 V.
(16) The test documents are listed in the test report no. 03YEX550487-1.

(17) Special conditions for safe use

   none

(18) Essential Health and Safety Requirements

   no additional ones
Translation

1. SUPPLEMENT

to Certificate No.

TÜV 03 ATEX 2172

Equipment: Transducer type LOF 500 ...

Manufacturer: FAFNIR GmbH

Address: Bahrenfelder Straße 19
22765 Hamburg
Germany

Order number: 8000411136

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Amendments:

In the future, the transducer type LOF 500 ... may also be manufactured according to the test
documents listed in the test report.
The permissible ambient temperature range will be -25 °C to +50 °C. Furthermore the “Electrical data”
were changed.

Electrical Data

Supply circuit
(Terminals 14 (L,+), 15 (N, -) and
12/13 (PE) resp.
connections d30 (L, +), d32 (N, -) and
dz14/dz28 (PE) resp. d32 (L, +),
z32 (N, -) and dz16/dz30 (PE))

U = 24 V d.c. ± 20 %, about 5 resp. 10 W
U = 24 V a.c. ± 10 %, 50...60 Hz, about 4 resp. 8 VA, resp.
U = 115 V a.c. ± 10 %, 50...60 Hz, about 4 resp. 8 VA, resp.
U = 230 V a.c. ± 10 %, 50...60 Hz, about 4 resp. 8 VA
U_m = 100 V at d.c. supply
U_m = 253 V at a.c. supply

Signal transmitter circuits
(Terminals 1 and 2 resp.
connections d2 and d4 resp.
d2, z2, d8 and z8)
in type of protection intrinsic safety Ex ia IIC resp. Ex ia IIB

Maximum values: U_o = 15.8 V
I_o = 26 mA
P_o = 154 mW
R_i = 950 Ω
C_i = 1.2 nF
L_i negligibly small

Characteristic line: trapezoidal

The maximum permissible value pairs of the external
inductances (L_o) and capacitances (C_o) have to be taken
from the following table:

<table>
<thead>
<tr>
<th>L_o (mH)</th>
<th>C_o (nF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>230</td>
</tr>
<tr>
<td>2</td>
<td>290</td>
</tr>
<tr>
<td>1</td>
<td>340</td>
</tr>
</tbody>
</table>

Ex ia IIC: 20 mH 10 mH 5 mH
Ex ia IIB: 1.2 µF 1.5 µF 1.7 µF

Aforementioned maximum values are valid at coincidental
appearance of concentrated capacitance and inductance.
## 1. Supplement to Certificate No. TÜV 03 ATEX 2172

<table>
<thead>
<tr>
<th>Output circuits (Terminals 6 to 11 resp.)</th>
<th>Alternating voltage</th>
<th>Direct voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connections</td>
<td>≤ 250 V</td>
<td>≤ 250 V</td>
</tr>
<tr>
<td>d16, d18, d20, d22, d24 and d26 resp.</td>
<td>≤ 4 A</td>
<td>≤ 250 mA</td>
</tr>
<tr>
<td>d18, d20, d22, d24, d26 and d28)</td>
<td>≤ 100 VA</td>
<td>≤ 50 W</td>
</tr>
<tr>
<td></td>
<td>cos φ ≥ 0,7</td>
<td></td>
</tr>
</tbody>
</table>

The intrinsic safety circuits are safely galvanically separated from the supply circuits up to a peak value of the nominal voltage of 190 V (d.c. supply) resp. 375 V (a.c. supply) and from the output circuits up to a peak value of the nominal voltage of 375 V.

Furthermore the equipment was evaluated according to the latest standards.

The device will then be labeled as follows:

Ex II (1) G [Ex ia Ga] IIC

All other data apply unchanged for this supplement.

The equipment incl. of this supplement meets the requirements of these standards:


(16) Test documents are listed in the test report No. 12 203 106393.

(17) Special conditions for safe use

none

(18) Essential Health and Safety Requirements

no additional ones

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

[Signature]

Schwedt

Hanover office, Am TÜV 1, 30519 Hannover, Fon +49 (0)511 986 1455, Fax +49 (0)511 986 1590
Instructions

Measuring Transducer type LOF 500...

I  Range of application

The measuring transducer is used in conjunction with a sensor for detecting a liquid level.

II  Standards

The equipment is designed in accordance with the following European standards:

- EN 60079-0:2009  Equipment - General requirements
- EN 60079-11:2012  Equipment protection by intrinsic safety "i"
- EN 60079-26:2007  Equipment with equipment protection level (EPL) Ga

III  Instructions for safe...

III.a  ... use

The device serves as associated equipment and is not approved for use in potentially explosive areas. The intrinsically safe sensor circuit can be conducted to Ex Zone 0 and is suitable for all gas groups (IIA, IIB and IIC). The measuring transducer LOF 500 19” Duo has two galvanically isolated intrinsically safe sensor circuits.

The approval applies to the equipment types LOF 500...

III.b  ... assembly or disassembly

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

For the top-hat rail or wall mounting, the housing upper part must be removed from the lower part. For this, loosen the two screws from the housing upper part and pull apart both parts.

After installation, put back the upper housing part onto the lower part and tighten it by using the two housing screws.
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.

The LOF 500 ... measuring transducer is suitable for top hat rail and wall mounting. The equipment type LOF 500 19" ... is designed as a plug-in card and provided for establishing in a 19-inch casing. The measuring transducer must be installed outside potentially explosive atmospheres/areas.

The LOF 500 19" ... must be installed with a minimum casing protection class of IP20. The LOF 500 ... measuring transducer is built in a casing with protection class IP40. If the measuring transducer is mounted outdoors, the casing protection class must be at least IP54.

When wiring the evaluation unit to the sensor (preferably blue coloured cable), the inductance and capacitance approved in section V must not be exceeded. The terminal assignment is:

<table>
<thead>
<tr>
<th>Power supply</th>
<th>LOF 500 ...</th>
<th>LOF 500 19&quot; ...</th>
<th>LOF 500 19&quot; Duo</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (+)</td>
<td>14</td>
<td>d30</td>
<td>d32</td>
</tr>
<tr>
<td>N (-)</td>
<td>15</td>
<td>d32</td>
<td>z32</td>
</tr>
<tr>
<td>PE</td>
<td>12, 13</td>
<td>d14, d28, z14, z28</td>
<td>d16, d30, z16, z30</td>
</tr>
<tr>
<td><strong>Output circuit (potential-free relay contact)</strong></td>
<td>order of relay contacts: Changer, Normal Close, Normal Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Sensor</td>
<td>8, 6, 7</td>
<td>d16, d18, d20</td>
<td>d18, d20, d22</td>
</tr>
<tr>
<td>&quot;S&quot; or &quot;Z&quot; (optional)*</td>
<td>11, 9, 10</td>
<td>d22, d24, d26</td>
<td></td>
</tr>
<tr>
<td>2nd Sensor</td>
<td></td>
<td>d24, d26, d28</td>
<td></td>
</tr>
<tr>
<td><strong>Sensor circuit</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Sensor</td>
<td>1, 2</td>
<td>d2, d4</td>
<td>d2, z2</td>
</tr>
<tr>
<td>2nd Sensor</td>
<td></td>
<td></td>
<td>d8, z8</td>
</tr>
</tbody>
</table>

*Option: S = Error relay; Z = Second relay.

III.d ... calibration

To operate the device security settings are not necessary.

III.e ... commissioning

Before commissioning, all equipment must be checked to ensure it is properly connected and installed. The power supply, as well of connected equipment, must be checked.

III.f ... maintenance, overhaul and repair

Generally the device is maintenance-free. In case of a defect it must be send back to FAFNIR or one of his representations.
IV  Equipment marking
1 Manufacturer: FAFNIR GmbH, Hamburg
2 Type designation: LOF 500 …
3 Serial number: Ser. N°: …
4 Certificate Number: TÜV 03 ATEX 2172
5 Ex-marking: II (1) G [Ex ia Ga] IIC
6 CE-marking: 0044
7 Technical data:
   \[ T_a = \text{\degree}C \leq +50 \degree C \]
   \[ U_o \leq 15.8 \text{ V} \]
   \[ I_o \leq 26 \text{ mA} \]
   \[ P_o \leq 154 \text{ mW} \]
   \[ C_i \leq 1.2 \text{ nF} \]

See instruction manual for permissible outer inductance and capacitance

V  Technical data
The power supply for the measuring transducer, depending on model:
\[
\begin{align*}
U &= 24 \text{ V d.c. \pm 20 \%}, \quad \text{\~5 W (or \~10 W for the LOF 500 19" Duo), or} \\
U &= 24 \text{ V a.c. \pm 10 \%}, \quad 50 \text{ Hz to } 60 \text{ Hz, } \text{\~4 VA (or \~8 VA for the LOF 500 19" Duo), or} \\
U &= 115 \text{ V a.c. \pm 10 \%}, \quad 50 \text{ Hz to } 60 \text{ Hz, } \text{\~4 VA (or \~8 VA for the LOF 500 19" Duo), or} \\
U &= 230 \text{ V a.c. \pm 10 \%}, \quad 50 \text{ Hz to } 60 \text{ Hz, } \text{\~4 VA (or \~8 VA for the LOF 500 19" Duo).}
\end{align*}
\]
The safe maximum voltage is
\[
U_m = 100 \text{ V at d.c. supply} \\
U_m = 253 \text{ V at a.c. supply}
\]
The electric circuit of the sensor is designed with "Intrinsic safety" [ia] ignition protection class with a trap ezoidal output characteristic. The output values are:

\[
\begin{align*}
\text{Output voltage} & \quad U_o \leq 15.8 \text{ V} \\
\text{Output current} & \quad I_o \leq 26 \text{ mA} \\
\text{Output power} & \quad P_o \leq 154 \text{ mW} \\
\text{Internal resistance} & \quad R_i \leq 950 \Omega \\
\text{Internal capacitance} & \quad C_i \leq 1.2 \text{ nF} \\
\text{Internal inductance} & \quad L_i \quad \text{negligibly small}
\end{align*}
\]

The maximum values of the parameter pairings may simultaneously be used as concentrated capacitances and concentrated inductances.

As outputs a maximum of two relays are available with potential-free relay contacts. The terminal values are:

\[
\begin{align*}
\text{a.c. voltage} & \quad U \leq 250 \text{ V; } I \leq 4 \text{ A; } P \leq 100 \text{ VA; } \cos \varphi \geq 0.7 \\
\text{d.c. voltage} & \quad U \leq 250 \text{ V; } I \leq 250 \text{ mA; } P \leq 50 \text{ W}
\end{align*}
\]
The intrinsically safe sensor circuit of the measuring transducer is galvanically isolated from the power supply safely up to a peak value of 190 V d.c. supply and 375 V a.c. supply. It is galvanically isolated safely up to a peak value of 375 V of the output circuits.
The sensor can be used in the following ambient temperature range:
\[ T_a = -25 \degree C \ldots +50 \degree C \]

VI  Specific conditions
None.
Internally left blank