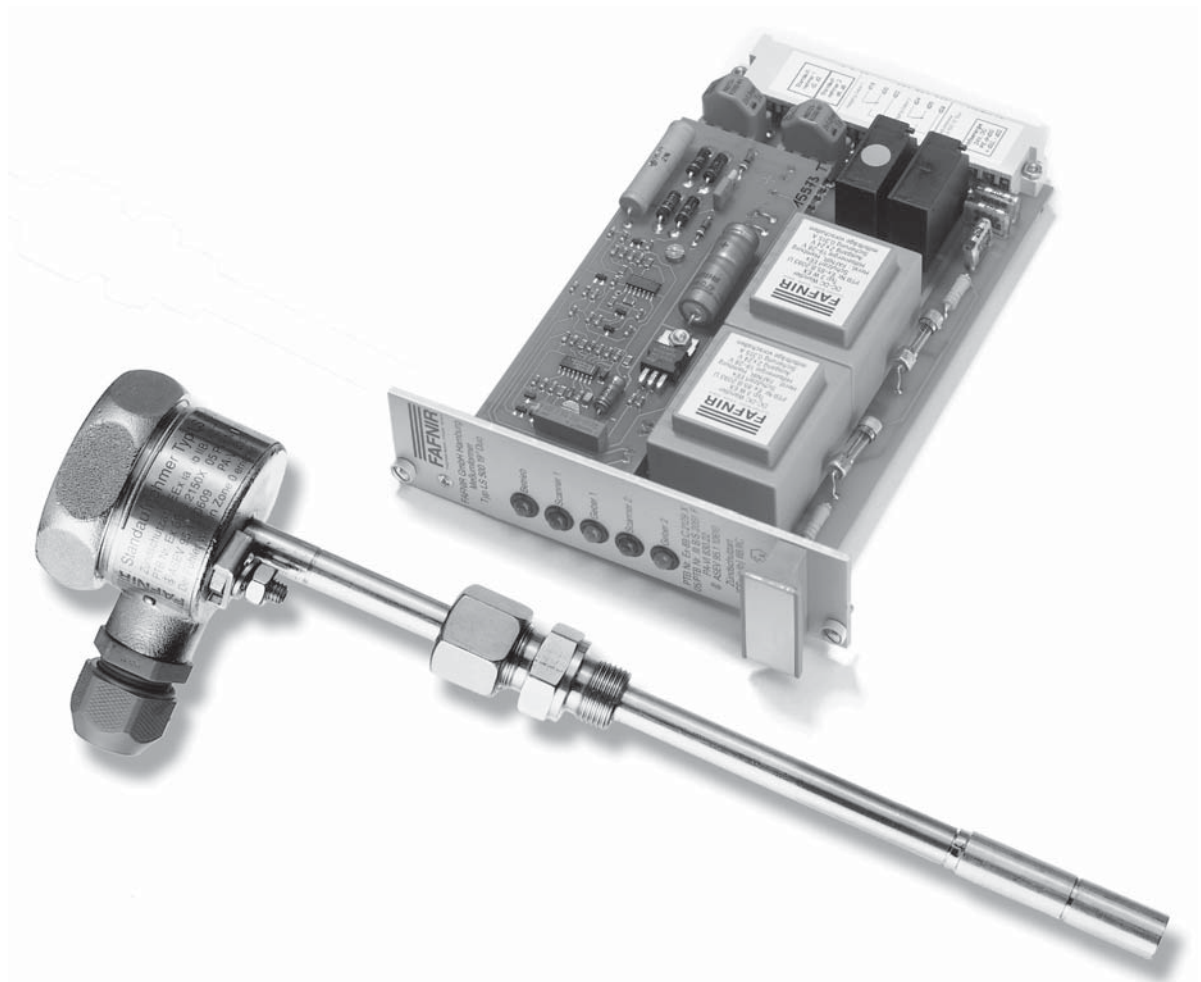


LS 300

Level Detector

LS 500

Measuring Transducer



07/2005
Issue: 2

Table of contents

| | |
|---|----|
| Features of level detector type LS 300 . with measuring transducer LS 500 ... | 4 |
| Safety instructions | 5 |
| Structure and function | 7 |
| 1 Level detector type LS 300 | 7 |
| 2 Measuring transducer type LS 500 | 14 |
| Installation | 17 |
| Periodic testing | 21 |
| 1 Level detector without test connection | 21 |
| 2 Level detector with test connection | 22 |
| Level detector with measuring transducer LS 500 19" AK5 | 23 |
| Fault diagnosis | 24 |
| 1 Level detector LS 300 | 24 |
| 2 Measuring transducers LS 500/Z, LS 500 19"/Z and LS 500 19" Duo | 24 |
| 3 Measuring transducers LS 500 S, LS 500 19" S | 24 |
| 4 Measuring transducer LS 500 19" AK5 | 24 |
| Technical data | 25 |
| 1 Level detector type LS 300 | 25 |
| 2 Measuring transducer LS 500 | 26 |

| | |
|---|-----------|
| Annex | 27 |
| Setting instructions | 27 |
| 1 General | 27 |
| 2 Determination of after-flow quantity after response from the safety system . | 27 |
| 3 Establishing the threshold height for the system | 27 |
| EC type test certificate for level detector type LS 300 | 29 |
| EC type test certificate for measuring transducer type LS 500 | 31 |

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Features of level detector type LS 300 . with measuring transducer LS 500 .

Level detector type LS 300 with measuring transducer LS 500 constitutes a safety system which is designed to prevent the overfilling of tanks and process vessels by subjecting them to constant monitoring.

The safety system can be used in all storage tanks containing liquids. It consists of a level detector in the tank and a measuring transducer with output terminal for wall installation or for fitting in the 19" system.

The level detector can easily be customised to suit the respective size of tank. The safety system is maintenance-free.

Safety instructions

Level detector type LS 300 . with measuring transducer LS 500 . is used for monitoring liquids in tanks and process vessels. Use the devices for this purpose only. The manufacturer shall not be liable for any form of damage resulting from improper use!

Level detector type LS 300 . with measuring transducer LS 500 . was developed, manufactured and inspected in accordance with state-of-the-art technology and recognised technical safety rules and regulations. Nevertheless, hazards may arise from the use of it. Therefore, please observe the following safety instructions:

- Do not change or modify the system or add any equipment without the prior consent of the manufacturer.
- The installation, operation and maintenance of the system may only be carried out by expert, authorised personnel. Only experienced electricians are allowed to install and service the system. Specialized knowledge must be obtained by undergoing regular training.
- Operators, installers and service personnel must observe all applicable safety regulations. This also applies to the local safety regulations and accident prevention regulations not mentioned in these operating instructions.
- During installation of the level detector the sensor may only be in an intensive vapour flow if it is provided with a protective sleeve to prevent excessive vapour movement.
- The measuring transducer may not be operated in potentially explosive atmospheres and must be installed in enclosed rooms or in a housing conforming to protection class IP 54.
- The plug-in printed circuit board version of measuring transducer type LS 500 . 19" must be installed in a housing with protection of at least IP 20.
- Following the installation work and when changing the storage liquid, an inspection with respect to determining proper installation and perfect operation must be carried out by an expert of the specialised company or the operator.
- Electric circuits for horns and lamps that cannot be switched according to the quiescent current principle must be easy to check with respect to their operability.
- Prior to putting into service, all the devices of the overflow prevention must be checked with respect to correct connection and proper operation. The electrical power supply, including the supply of the downstream devices, must be checked.

- The specialised company or operator of the system may only use such system parts without inspection symbols that comply with the national regulations.
- In case of failure of the auxiliary power supply (exceeding or dropping below the limit values) or in case of interruption of the connecting lines between the system parts, level detector type LS 300 . with measuring transducer LS 500 . must report this fault or indicate the maximum filling level.

The safety instructions in this manual are labelled as follows:



If you fail to observe these safety instructions, there is a risk of an accident or the level detector type LS 300 . or measuring transducer LS 500 . may be damaged.



Useful information that will guarantee proper functioning of the devices or facilitate your work.

Structure and function

1 Level detector type LS 300 .

The level detector consists of a sensor (encapsulated PTC resistor) and a probe tube which can be adjusted in height with a clampable screw-in unit is permanently mounted using a flange (see figs. 2a–d and chap. "Installation").

The encapsulated PTC resistor serves for detecting the liquid level. Detecting the liquid level is the purpose of the encapsulated PTC resistor in the form of a varying resistance at the threshold point of the level detector, the resistance value of which increases with rising temperature (see figs. 2a–2d).

Since liquids possess better heat conductivity values than gases, the PTC resistor heats up in air or gas spaces. In case of submergence of the PTC resistor in liquid, e.g. upon reaching the liquid level, the PTC-resistor cools off and the resistance value drops. The signal current is limited in such a way that a re-heating of the PTC resistor in its submerged state is not possible. In a gaseous environment, the heating-up time of the PTC resistor ranges from 15 seconds (at +60 °C ambient temperature) to two minutes (at -20 °C ambient temperature).

1.1 Level detector type LS 300 . SP ..

This type of level detector is fitted with a pneumatic testing unit and a test connection on the probe tube (see figs. 2b–d). This testing unit is connected to an external pressure supply for performing the function test (e.g. the portable tester type FS 82 T).



The tester type FS 82 T is available from the FAFNIR company as an optional extra.

The gas required for the function test (e.g. nitrogen) is fed directly by the testing unit to the PTC resistor sensor. During the diffusion process the PTC resistor is cooled by the gas flow to the value that is equivalent to immersion in a liquid. The signal display installed is activated and operability of the overflow prevention is indicated.

1.2 Type code

There are various versions of level detector type LS 300 . available (see figs. 2a–2d): As an optional feature the sensor tip can be supplied in tantalum and parts coming into contact with the product can be made of the materials listed in the section "Materials" or they can be coated additionally with E-CTFE (Halar) (B). All level detectors can also be supplied for -25 °C to +80 °C liquid temperature (H). A non-return valve (R) is compulsory if the pneumatic test pipe is laid permanently.



When being used in a potentially explosive atmosphere the special conditions in the EC type test certificate must be observed.

| Type designation | Figure | Probe tube [mm] | Min. connection dimensions |
|----------------------|---------|-----------------|----------------------------|
| LS 300 E | Fig. 2a | Ø 10 x 1,5 | G 3/8 |
| LS 300 ES | Fig. 2a | Ø 24 x 2 | G 1 |
| LS 300 F | Fig. 2a | Ø 10 x 1,5 | DN 15 |
| LS 300 FS | Fig. 2b | Ø 24 x 2* | DN 25 |
| LS 300 F Duo | Fig. 2b | Ø 10 x 1,5 | DN 25 |
| LS 300 E SP | Fig. 2b | Ø 24 x 2 | G 1 |
| LS 300 F SP | Fig. 2c | Ø 24 x 2* | DN 25 |
| LS 300 F SP Plug-in | Fig. 2c | Ø 24 x 2* | DN 25 |
| LS 300 E SP Plug-in | Fig. 2c | Ø 24 x 2 | G 1 |
| LS 300 F Duo Plug-in | Fig. 2d | Ø 10 x 1,5 | DN 25 |

* E-CTFE (Halar) coated

Explanation of type codes

| | | |
|---------|---|--|
| E | = | screw-in unit |
| F | = | flange |
| Duo | = | 2 level detectors in one flange |
| S | = | Probe tube Ø 24 x 2 |
| P | = | Pneumatic test connection (function test) |
| Plug-in | = | Pluggable electrical connection (counter plug S-28 is not included in the scope of delivery) |
| R | = | Non-return valve |
| U | = | Overvoltage protection integrated |
| H | = | Special temperature range -25 to +80 °C |

In the case of the level detectors provided with a clampable screw-in unit (G 1 or G 3/8) the individual threshold length for the respective tank can be adjusted by moving the probe tube in the screw-in unit (see figs. 2a–d and chap. "Installation").

In the case of the level detectors provided with a flange the probe tube is permanently installed and its height is not adjustable.

1.3 Examples of configurations

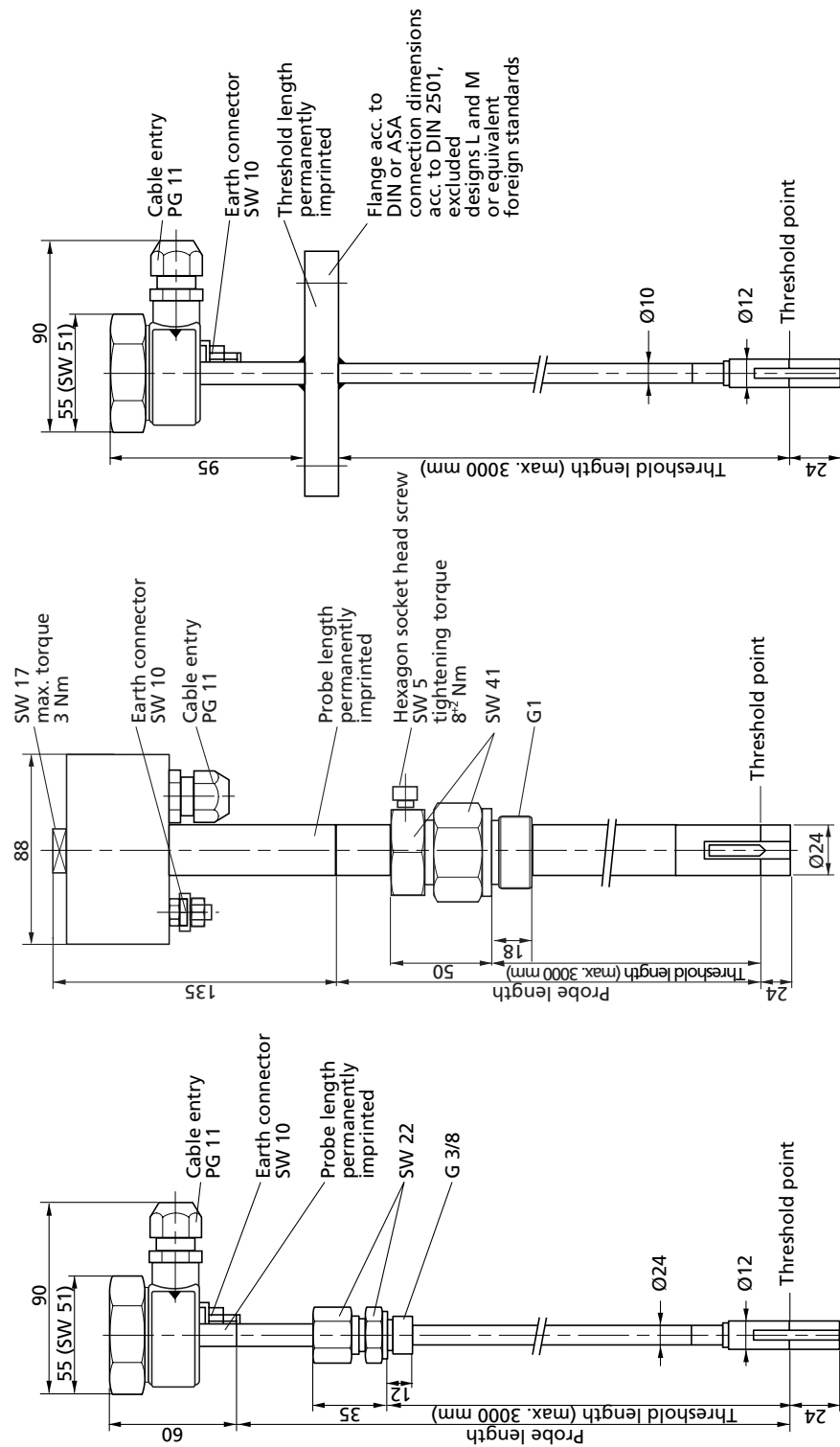


Fig. 2a: Level detectors type LS 300 E, type LS 300 E S and type LS 300 F

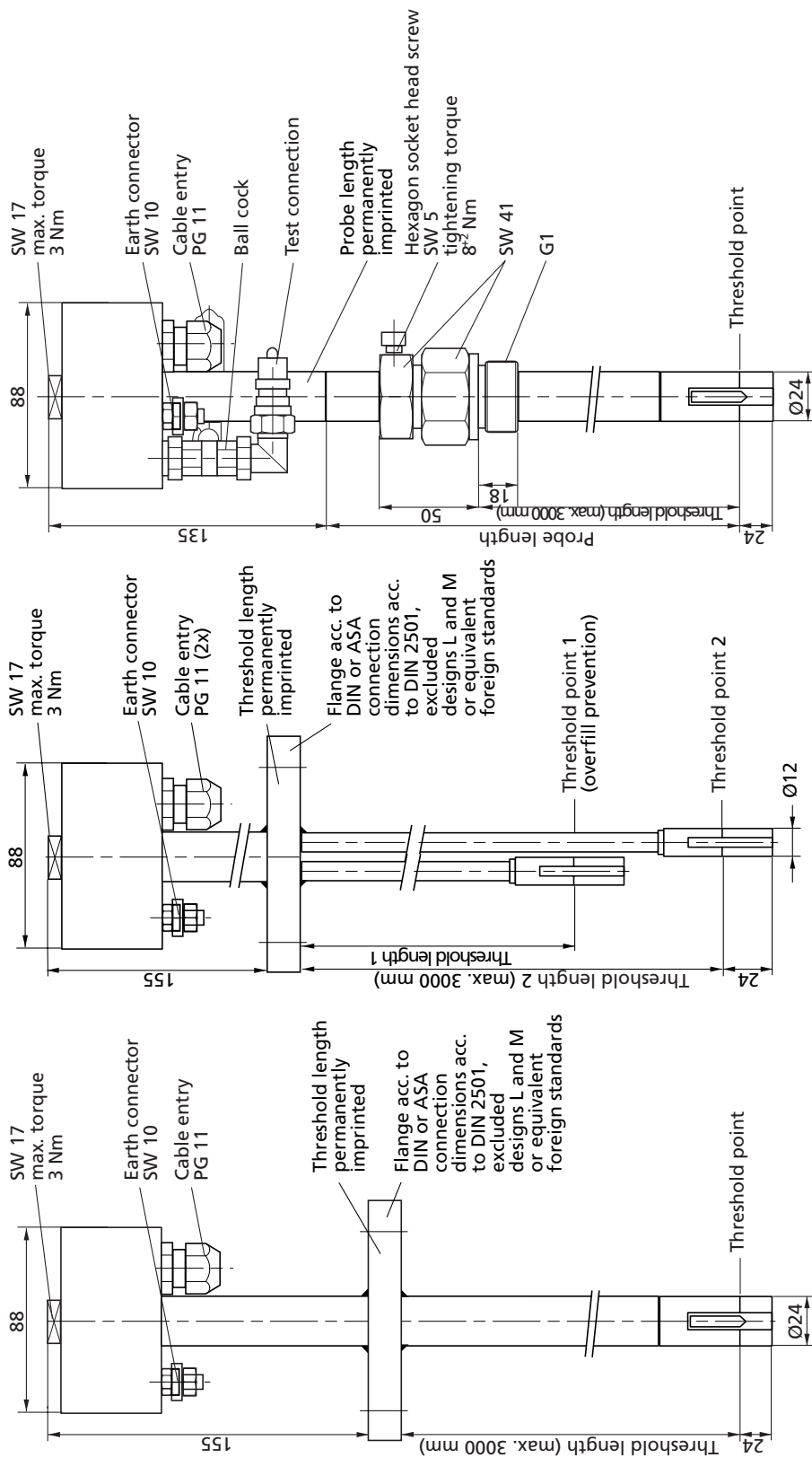


Fig. 2b: Level detectors type LS 300 F S, type LS 300 F Duo and type LS 300 E SP

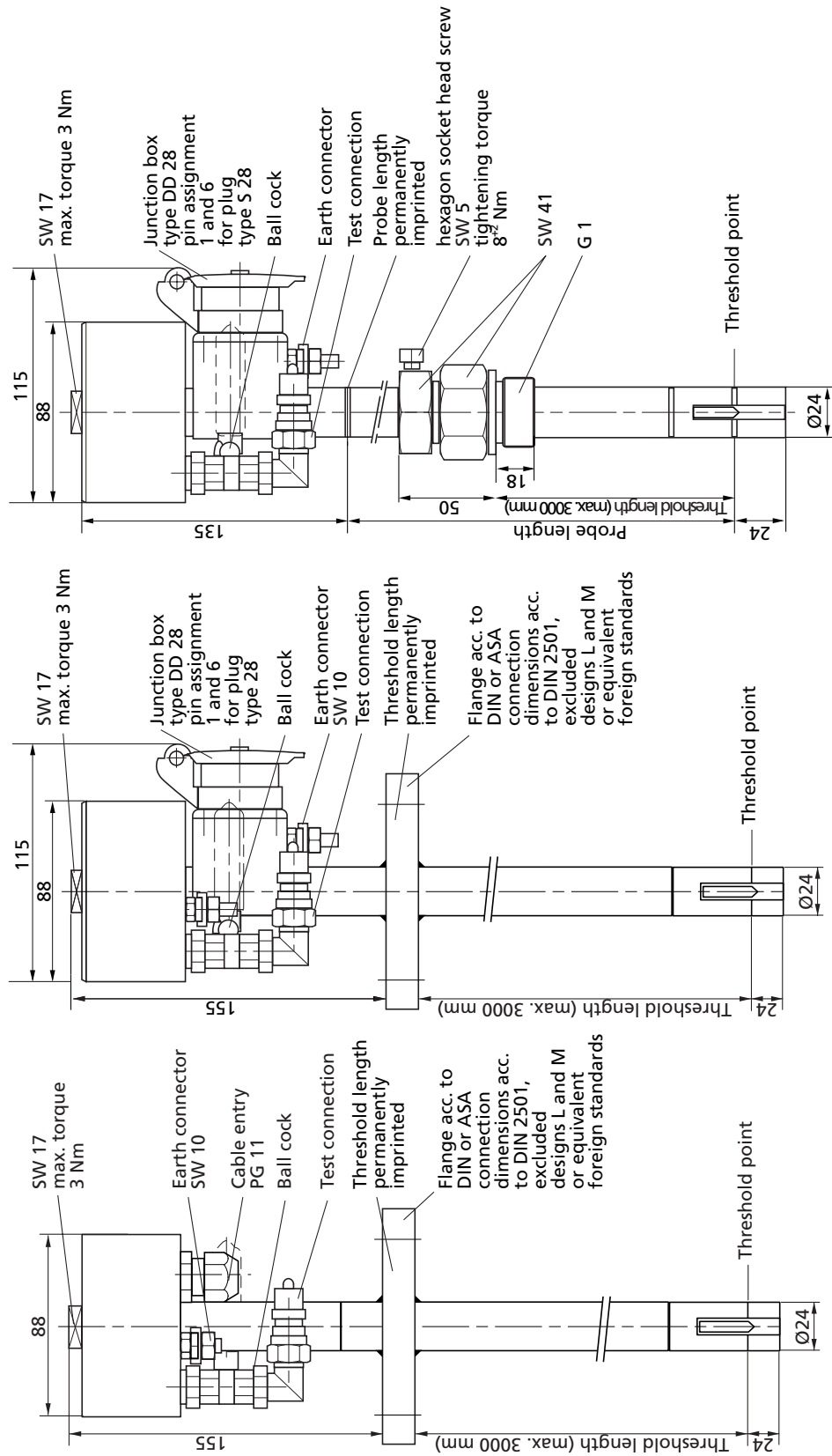


Fig. 2c: Level detectors type LS 300 F SP, LS 300 F SP plug-in and type LS 300 E SP plug-in

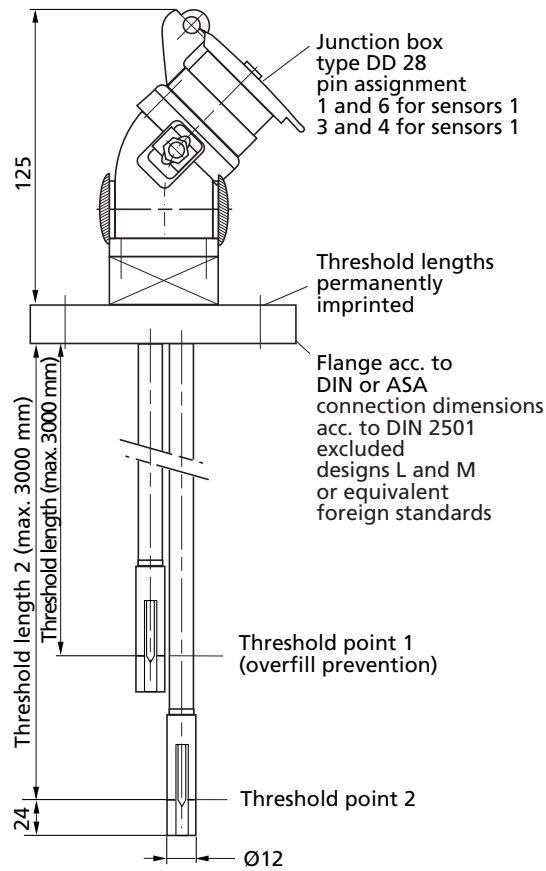


Fig. 2d: Level detector LS 300 F Duo Plug-in

1.4 All parts coming into contact with media are made of material 316 Ti, Hastelloy C or B. Flanges are also available made of steel with clad sealing surfaces made of material 316 Ti, Hastelloy C or B.

| | Parts coming into contact with media are made of |
|---|--|
| Material e.g. 316 Ti | Stainless steel |
| Material Hastelloy B or C | Stainless steel |
| Tantalum (sensor tip) and stainless steel with E-CTFE coating | Tantalum and Halar |
| Tantalum (sensor tip) and stainless steel | Tantalum and stainless steel |
| Tantalum | Tantalum |

1.5 Application

Level detector type LS 300 . is operated under the below mentioned conditions in tanks for the storage of combustible and non-combustible, water-endangering liquids from which no permanent deposits are to be expected.

- Ambient conditions
 - Temperature: -20 °C to +60 °C
 - Pressure: 0.8 bar to 1.1 bar
- Deviating conditions
 - Liquid temperature
 - Normal temperature: -25 °C to +50 °C
 - Special temperature: -25 °C to +80 °C
 - Pressure
 - Standard pressure range: 0 to 4 bar
 - Special version: 0 to 26 bar

Deviations, e.g. 0 °C to +80 °C, stated on the rating plate.



If the sensor tip cools down on account of substantial liquid spraying or vapour movement, the level detector will switch off prematurely. This can be avoided by fitting a protective sensor sleeve against excessive vapour movement.

2 Measuring transducer type LS 500 .

The measuring transducer consists of evaluation electronics for the PTC resistor of the level detector, potential-free changeover contacts for connecting to a control system or a power factor as well as signal lamps inside the housing.

The evaluation electronic converts the resistance changes at the PTC resistor to relay operations with a binary signal output. Operation of the PTC resistor is constantly monitored by the scanner integrated into the measuring transducer. The properties of the PTC resistor, e.g. heating up and cooling down behaviour, are checked several times a second without affecting the running measuring process. The test function ensures that the PTC resistors which are no longer operationally reliable on account of external influences (corroded sensor sleeve) are detected immediately and reported owing to a response from the alarm system of the overfill prevention. Since the power fed to the PTC resistor via the scanner is regulated accurately, maximum operational reliability and service life are guaranteed.

The state of electrical readiness for operation of the measuring transducer is indicated by the green pilot lamp on the front of the device. The blue (red) signal lamp flashes if the PTC resistor is in the heated state (scanner function).

2.1 Measuring transducer type LS 500 .

A relay release occurs if the tip of the level detector cools down and in the event of a fault (detection by the scanner), power failure, short circuit and cable breakage in the connection between the level detector and the measuring transducer. This is indicated by the yellow LED going out (see fig. 3b).



With the exception of type LS 500 Duo, there is an alarm relay with an LED available as an option. If there is an interruption or a short circuit in the signal line between the level detector and the measuring transducer, the relay attracts and the "Fault" LED lights up.

2.2 Measuring transducer type LS 500 19" AK5

A flashing blue LED on the device indicates that the PTC resistor is heated up (scanner function). In this state the relay contact for controllers and indicators is closed. When the level detector tip has cooled down and in the event of malfunctions (detection by the scanner), short circuit or cable breakage in the connection between the level detector and the measuring transducer and in the event of an interruption in auxiliary power this relay contact is open. If a fault is detected by the monitoring electronics, this relay contact is also open and a relay contact (fault) is closed in addition.

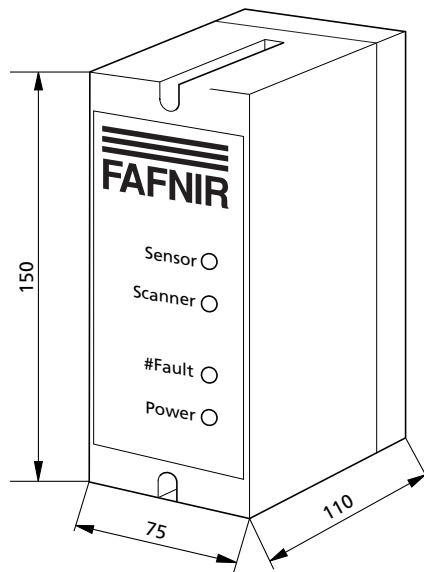


Fig. 3a: Measuring transducer type LS 500

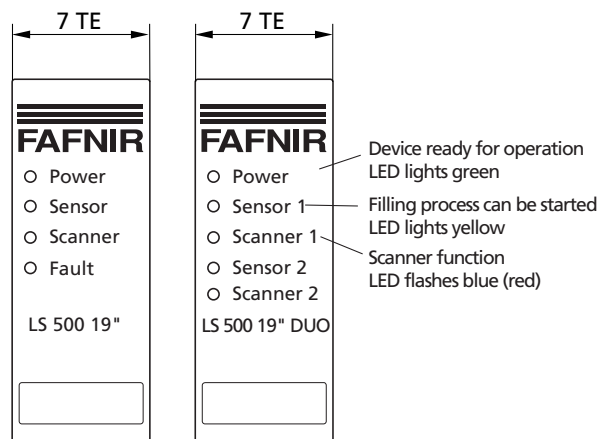


Fig. 3b: Measuring transducer type LS 500 19", type LS 500 19" Duo and LS 500 AK5

2.3 Type code

There are three basic versions of measuring transducers available (type LS 500 / LS 500 19" / LS 500 19" Duo) (see figs. 3a and 3b). Types LS 500 and LS 500 19" are also available with additional alarm (S). An alarm is no longer possible if two potential-free change-over contacts are available for alarm signalling (Z). Type LS 500 19" AK5 can only be supplied in 24 V (AC/DC) whereas all the other types can be supplied with 24 V, 110 V, 230 V, 40...60 Hz and 24 V:

| Type designation | Figures |
|---|---------|
| LS 500 LS 500 S LS 500 Z | Fig. 3a |
| LS 500 19" LS 500 19" S LS 500 19" Z LS 500 19" AK 5 | Fig. 3b |
| LS 500 19" Duo | Fig. 3b |

Explanation of type codes

S = Additional alarm

Z = 2 potential-free change-over contacts for alarm signalling

Duo = Evaluation of two level detectors

Installation



For all work performed on the level detector type LS 300 . and measuring transducer LS 500 ., observe the national safety and accident prevention regulations as well as all the safety instructions in this manual of operating instructions.



To set up and operate the system, the generally recognised rules of engineering and these operating instructions are applicable.



During installation of the level detector the sensor may only be in an intensive vapour flow if it is provided with a protective sleeve against excessive vapour movement.



The measuring transducer may not be operated in potentially explosive atmospheres and must be installed in enclosed rooms or in a housing conforming to protection class IP 54.

The installation position of the level detector in the tank must be selected so that neither splashes of liquid nor excessive vapour flow can result in premature response of the system or faults. The level detector should be installed as vertically as possible so that any residual liquid can drop down from the sensor.



Measuring transducer type LS 500 . must be protected against splashes of water and be installed in accordance with IP 40 housing protection.



The plug-in printed circuit board version of measuring transducer type LS 500 19" must be installed in a housing with protection of at least IP 20.

The level detector consists of a probe tube adjustable in height which projects into the storage tank and possesses a sensor at the bottom end protected against physical damage. Each probe length (Z) is permanently imprinted at the top end of the probe, above the marking groove. The probe length is provided as a distance dimension between this marking groove and the threshold point of the level detector.

In order to adjust the threshold length (L) as a distance between the hexagon support of the screw-in unit and the marking groove on the protective sleeve of the sensor at the bottom end of the level detector, proceed as follows:

- Calculate the threshold length (L) depending on the tank dimensions and the threshold height (A). $L = (H - A) + S$
- Adjust the calculated threshold length (L) on the level detector.



When the level detector has been installed, the correct adjustment of the threshold length (L) can be checked, without removing the sensor, by means of the reference dimension (Y) (= distance between the marking groove at the top end of the probe tube and the hexagon support of the screw-in unit) and the imprinted probe length (Z).
 $L = Z - Y$

In order to lock the probe tube in place, proceed as follows:

- Tighten the upper gland screw and the locking screw of the screw-in unit firmly.
- Provide the screw-in thread with suitable, resistant sealing material and screw it into the tank muff provided for it.



Since the threshold length (L) of level detector type LS 300 F.. is not variable (probe tube welded into the flange), this dimension must be calculated and specified before order placement using the tank dimensions and the accurately determined threshold length (A). The threshold length is permanently imprinted in the flange of the level detector.



Wiring work may only be carried out when the equipment is disconnected from the mains.

The wiring between the level detector and the measuring transducer must be carried out using a blue cable or a cable marked blue. The cable length must not exceed 250 m for a cross-section of 0.5 mm², 500 m for 1 mm² and 750 for 1.5 mm². In the event of different cross-sections the maximum length of cable will also be different.

The measuring transducer is suitable for wall mounting, control cabinet installation and fitting in 19" systems.

For the connections required for installation of the relevant measuring transducer please refer to the wiring diagrams in fig. 4.



If the measuring transducer is set up in the field, the housing protection type must be at least IP 54. For use of the level detector within potentially explosive atmospheres in tanks outside buildings, overvoltage protection must be provided in the signal sensor line. Only if the signal sensor line is laid in a metal tube or metal cable conduit (the pipe or conduit must be connected to tank potential or be integrated into the equipotential bonding system) is it possible to dispense with overvoltage protection. Level detector types LS 300...U are provided with integrated voltage protection.



If there is no overvoltage protection, the overvoltage protection type BA 350 must be fitted close to the level detector (approx. 50 cm). An external earthing terminal is provided for the electrical connection (4 mm² cable) between the housing and the tank.



Prior to putting into service, all the devices in the system must be checked with respect to correct connection and proper operation. In addition, the electrical power supply, including that of the downstream devices, must also be checked. For this purpose observe the relevant operating instructions for the devices being used.

Periodic testing



The performance of the level detector/measuring transformer must be tested at reasonable intervals, but at least once a year. It is the operator's responsibility to select the method of testing and the intervals within the specified period.

Testing must be performed in such a way that it verifies correct performance when all the components in the system interact with one another.

This interaction takes place when approaching the threshold height during filling. If filling up to the threshold height is not practicable, the level detector must be made to respond by suitable simulation of the level of liquid or of the physical measuring effect.

If the performance of the level detector/measuring transducer can be established in another way (exclusion of function-retarding faults), the test can also be performed by simulating the relevant output signal.

1 Level detector without test connection

If the level detector does not have a test connection (see type code in chap. "Structure and mode of operation") with a measuring transformer you can conduct the function test as follows:

- Remove the level detector and immerse it in the storage liquid; approx. two seconds after immersion of the level detector the relay in the measuring transducer should release and thus activate the signalling unit.
- Fill tank up to the threshold height (see chap. "Installation"); the system should respond and activate the signalling unit.

1.1 Take the quiescent current principle of the signalling unit

In order to check whether the signalling unit is operating according to the quiescent current principle, either

- interrupt the auxiliary power supply to the measuring transducer (the green LED on the device must no longer be lit) or
- interrupt or short-circuit the signal line between the level detector and the measuring transducer.

In both cases the signalling unit should respond.

2 Level detector with test connection

If the level detector has a test connection (see type code in chap. "Structure and mode of operation") with a measuring transformer the function test must first of all be prepared. Then an external pressurised gas unit must be connected to the test connection integrated into the level detector (e.g. the type FS 82 T portable tester optionally available from the FAFNIR company):

- Connect the pressurised gas unit to the pneumatic test connection using a push-fit coupling or threaded connection (with non-return valve) (see fig. 5).
- For the purpose of additional protection from the tank open the ball cock located behind the push-fit coupling or the non-return valve (see Fig. 5). Now the gas can be fed to the PTC resistor via the test connection. The PTC resistor thus cools down to the value equivalent to immersion of the PTC resistor in liquid.

In order to verify performance the signalling unit must respond.

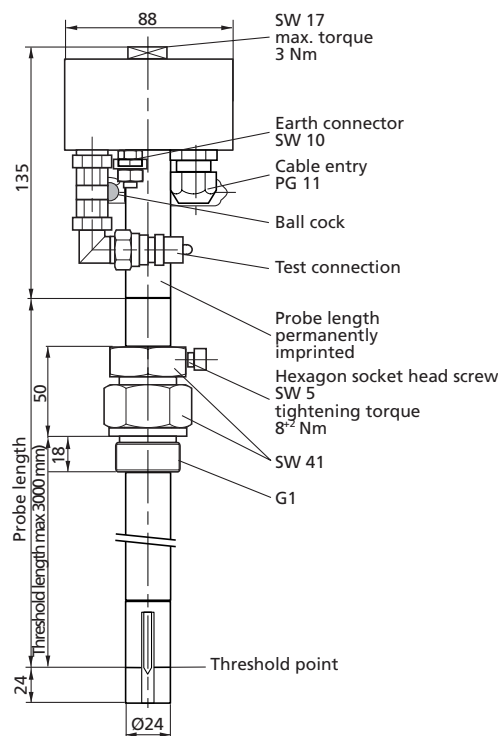


Fig. 5: Level detector type LS 300 E SP

3 Level detector with measuring transducer LS 500 19" AK5

Level detectors with measuring transducer LS 500 19" AK5 are subject to constant self-monitoring. Owing to failsafe operation it is possible to dispense with the periodic performance test on the overfill prevention.

Downstream parts of equipment such as alarm and fault indicating units are checked by pressing buttons on the measuring transducer:

- Check downstream alarm systems by pressing the test button "Test indicators" on the measuring transducer for 2 seconds
- Check downstream fault indicating systems by pressing the test button "Test fault" on the measuring transducer for 2 seconds

Fault diagnosis

1 Level detector LS 300 ...

Corrosion monitoring is not required because the level detector is continuously tested and monitored by the measuring transducer. On the measuring transducer this procedure is indicated by the flashing blue LED "Scanner". If a fault occurs such as a short circuit or cable breakage due to corrosion, an alarm signal is given.

2 Measuring transducers LS 500/Z, LS 500 19"/Z and LS 500 19" Duo

In the event of a power failure, failure of device fuses, inoperable sensor element or a short circuit in the signal line between the level detector and the measuring transducer the relay in the measuring transducer releases and operates the sequence control circuit.

3 Measuring transducers LS 500 S, LS 500 19" S

In the event of an interruption or short circuit in the signal line between the level detector and the measuring transducer an alarm relay attracts and the red LED "Fault" lights up. If there is a short circuit in the signal line, the blue LED "Scanner" also lights up.

4 Measuring transducer LS 500 19" AK5

In the event of a power failure, failure of device fuses, an inoperable sensor element or a short circuit in the signal line between the level detector and the measuring transducer the relay contact (controllers and indicators) is open and it operates the sequence control circuit. If a fault is detected by the monitoring electronics, this relay contact is also open and a relay contact (Fault) is closed in addition.



If measuring transducer LS 500 19" AK5 is used, there is no need to perform the periodic test.

Technical data

1 Level detector type LS 300

| | |
|------------------------------|--|
| Temperature range: | Media -25 °C to +50 °C -40 °C to +80 °C special temperature |
| Pressure range: | 0 to 25 bar |
| Media compatibility: | Materials of parts in contact with media: stainless steel: 316 Ti (flange) Hastelloy C or B (screw-in unit, probe tube, test nozzle, sensor) Tantalum (sensor) E-CTFE (Halar) |
| Submergence switching delay: | < 2 seconds |
| Heating-up/release time | |
| Ambient temp.: | at -20 °C < 2 min, at +60 °C < 15 sec |
| Housing protection type: | IP 67 |

2 Measuring transducer LS 500

Auxiliary power:

LS 500 24 V, 110 V, 230 V, 40...60 Hz or
24 V DC

LS 500 19" AK5 24 V, 40...60 Hz or 24 V DC

Power input:

LS 500 max. 4 VA or 5 W

LS 500 19" Duo max. 8 VA or 10 W

LS 500 19" AK5 max. 6 VA or 7 W

Ambient temperature: -25 °C to +50 °C

Housing protection type: Must be set up with at least IP 20

Outputs:

LS 500/500 19" 1 potential-free change-over contact
(level detector)
Alternating voltage:
 $\leq 250 \text{ V}; \leq 4 \text{ A}, \cos \varphi \geq 0.7$; max. 500 VA
Direct voltage:
 $\leq 250 \text{ V}; \leq 0.25 \text{ A}$; max. 50 W

LS 500 S/500 19" S 1 potential-free change-over contact
(level detector)
1 potential-free change-over contact (Fault)
Alternating voltage: See above
Direct voltage: See above

LS 500 Z/500 19" Z 2 potential-free change-over contacts
(1 level detector)
Alternating voltage: See above
Direct voltage: See above

LS 500 19" Duo 2 potential-free change-over contacts
(2 level detector)
Alternating voltage: See above
Direct voltage: See above

LS 500 19" AK5 1 potential-free NOC (level detector)
1 potential-free NOC (Fault)
Alternating voltage:
 $\leq 60 \text{ V}; \leq 4 \text{ A}, \cos \varphi \geq 0.7$; max. 500 VA
Direct voltage:
 $\leq 60 \text{ V}; \leq 0.25 \text{ A}$; max. 50 W

Inputs: Level detector input: two-core,
independent of polarity, max. cable length 750 m
for 1.5 mm²

Annex

Setting instructions

1 General

To be able to adjust the system correctly the following requirements must be met:

- Knowledge of the filling height which is equivalent to the permissible degree of filling (the permissible degree of filling can be calculated in accordance with the German instruction TRbF 280 No. 2.2, see 3.1),
- Knowledge of the filling height change which is equivalent to the after-flow quantity to be expected

2 Determination of after-flow quantity after response from the safety system

2.1 Maximum volumetric flow of the feed pump

Max volumetric flow can be determined either by measurement (transferring a defined quantity of liquid by pumping) or it can be read off the pump characteristic. In the case of tanks conforming to DIN 4119 the permissible volumetric flow is stated on the tank plate.

2.2 Closing delay times

- (1) In as much as the threshold times, switching times and running times of the various system parts are not known from the relevant data sheets they must be measured.
- (2) If valves have to be operated manually in order to interrupt the filling process, the time between the response of the safety system and the interruption of the filling process must be estimated according to local conditions.

2.3 After-flow quantity

Addition of the closing delay times results in total closing delay time. Multiplication of the total closing delay time by the volumetric flow determined in accordance with 2.1 and addition of the capacity of the pipes which may also have to be emptied after the response of the overflow prevention results in the after-flow quantity.

3 Establishing the threshold height for the system

The after-flow quantity determined in accordance with no. 2 is subtracted from the volume of liquid which is equivalent to the permissible degree of filling. From the difference the threshold height is determined by referring to the measuring table. If there is no measuring table available and if the threshold height cannot be determined by calculation, it must be determined by gauging the capacity of the tank by litres.

3.1 Calculation of response height for safety system to prevent the overfilling of tanks

Operating site: Tank no.: Cubic capacity: [m³]

Overfill prevention system: Manufacturer / type: FAFNIR

Inspection symbol / approval symbol:

1 Max. volumetric flow [Q_{max}]: [m³/h]

2 Close delay times

2.1 Level detector acc. measurement / data sheet: [s]

2.2 Switch / relay / etc.: [s]

2.3 Feed pump, run-out time: [s]

2.4 Shutoff valve

- mechanical, manually operated

Alarm time / to start of closing: [s]

Closing time: [s]

- electrically, pneumatically or hydraulically operated

Closing time: [s]

Total closing delay time [t_{tot}]: [s]

3 After-flow quantity [V_{tot}]

3.1 After-flow quantity from total closing delay time:

$$V_1 = Q_{\max} \times \frac{t_{\text{tot}}}{3.600} \dots\dots\dots [m^3]$$

3.2 After-flow quantity from pipes:

$$V_2 = \quad \times d^2 \times L \dots\dots\dots [m^3]$$

$$V_{\text{tot}} = V_1 + V_2 \dots\dots\dots [m^3]$$

4 Threshold height

4.1 Quantity at permissible degree of filling: [m³]

4.2 After-flow quantity: [m³]

Quantity at threshold height

(= difference from 4.1 and 4.2): [m³]

4.3 The following threshold height results from the difference:

Sounding height: [mm]

or air sounding height: [mm]

or the contents indicator reading: [mm or m³]

EC type test certificate for level detector type LS 300 ...



Translation

(1) **EC TYPE-EXAMINATION CERTIFICATE**

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



(3) EC-Type Examination Certificate Number

TÜV 00 ATEX 1656 X

(4) Equipment: Tank level gauge type LS 300...

(5) Manufacturer: FAFNIR GmbH

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

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

(8) The TÜV Hannover/Sachsen-Anhalt e.V., 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° 01YEX133817.

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

EN 50 014: 1997

EN 50 020: 1994

EN 50 284:1999

(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 and construction of the specified equipment or protective system according to Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and placing on the market of this equipment or protective system.


(12) The marking of the equipment or protective system must include the following:



II 1 G EEx ia IIC T4 resp.

II 1/2 G EEx ia IIC T4

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover


Head of the
Certification Body

Hanover, 2001-03-20

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page 1/2



(13)

SCHEDULE

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 00 ATEX 1656 X**

(15) Description of equipment

The tank level gauge type LS 300... consisting of the sensor with integrated PTC resistor, the tube, the screw-in body resp. flange and the junction box is intended for the connection to the measuring transmitter type LS 500... The gauge will be erected at tanks whereby the sensor will be placed in zone 0.

A short circuit or open circuit between the level detector and the transducer will be signaled.

When using the associated over voltage protection the marking is:

II 1/2 G EEx ia IIC T4

Electrical Data

Type LS 300...

Signal transmitter circuit(s)

in type of protection „Intrinsic Safety“ EEx ia IIB/IIC
only for the connection to associated measuring transmitter of the type LS 500, LS 500 19", LS 500 19" Duo or LS 500 19" AK5 according to EC-type Examination Certificate No. TÜV 00 ATEX 1641

Type LS 300 FS... Tantal

Signal transmitter circuit(s)

in type of protection „Intrinsic Safety“ EEx ia IIB
only for the connection to associated measuring transmitter of the type LS 500, LS 500 19", LS 500 19" Duo or LS 500 19" AK5 according to EC-type Examination Certificate No. TÜV 00 ATEX 1641

The signal transmitter circuits are galvanically separated against each other and against earth.

(16) Test documents are listed in the test report No.: 01 YEX 133817.

(17) Special conditions for safe use

1. The tank level gauges of the stated types have be connected to signal transmitter circuits of the measuring transmitter type LS 500... only.

2. When using the associated over voltage protection equipontial bonding is required.

(18) Essential Health and Safety Requirements

no additional ones

EC type test certificate for measuring transducer type LS 500 ...



Translation

(1) **EC TYPE-EXAMINATION CERTIFICATE**

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



(3) EC-Type Examination Certificate Number

TÜV 00 ATEX 1641

(4) Equipment: Measuring transmitter type LS 500...

(5) Manufacturer: FAFNIR GmbH

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

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

(8) The TÜV Hannover/Sachsen-Anhalt e.V., 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° 01YEX133809.

(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 and construction of the specified equipment or protective system according to Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and placing on the market of this equipment or protective system.

(12) The marking of the equipment or protective system must include the following:

 II (1) G [EEx ia] IIC

TÜV Hannover/Sachsen-Anhalt e.V.
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover

Hanover, 2001-03-20


Head of the
Certification Body



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page 1/3



(13)

SCHEDULE

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 00 ATEX 1641**

(15) Description of equipment

The measuring transmitter in combination with the associated level gauge type LS 500... is intended for the transmission of signals out of tanks filled with gaseous medias resp. fluids.

Electrical data

Type LS 500, type LS 500 19", type LS 500 19" Duo

| | |
|--|---|
| Supply circuit | U = 24/110/230 V a.c., ± 15 %, 40...60 Hz, about 4 VA |
| (connections d30 and d32, resp. d32 and z32 | resp. 8 VA |
| resp. terminals 14 and 15) | resp. |
| | U = 24 V d.c., ± 20 %, about 5 resp. 10 W |

Type LS 500 19" AK5

| | |
|-----------------------------|---------------------------------------|
| Supply circuit | U = 24 V a.c., 40...60 Hz, about 4 VA |
| (connections dz30 and dz32) | resp. |
| | U = 24 V d.c., about 7 W |

Type LS 500, type LS 500 19", type LS 500 19" Duo, type LS 500 19" AK5

| | | |
|-----------------------------|--|------------|
| Signal transmitter circuits | in type of protection „Intrinsic Safety“ | EEx ia IIC |
| (connections d2 and d4 | resp. | EEx ia IIB |
| resp. d2 and z2 | | |
| resp. d8 and z8 | | |
| resp. dz2 and dz4 | | |
| resp. terminals 1 and 2) | | |

Maximum values: $U_o = 15,8 \text{ V}$
 $I_o = 154 \text{ mA}$
 $R = 157 \text{ } \Omega$
 $P_o = 600 \text{ mW}$

Characteristic line: trapezoidal

$C_i = 1,2 \text{ nF}$
 L_i negligibly small

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

| | EEx ia IIC | | EEx ia IIB | |
|-------|------------|--------|------------|--------|
| L_o | 0,65 mH | 1 mH | 1,5 mH | 4 mH |
| C_o | 200 nF | 150 nF | 900 nF | 630 nF |



Schedule EC-type Examination Certificate N° TÜV 00 ATEX 1641

Typ LS 500, type LS 500 19", type LS 500 19" Duo

| | | |
|---|--|---|
| Output circuits (connections d18, d20 and d22 resp. d24, d26 and d28 resp. d16, d18, d20, d22, d24 and d26 resp. terminals 6 bis 11) | Alternating voltage ≤ 250 V ≤ 4 A ≤ 500 VA cos φ ≥ 0,7 | Direct voltage ≤ 250 V ≤ 0,25 A ≤ 50 W |
|---|--|---|

Type LS 500 19" AK5

| | | |
|--|---|--|
| Output circuit (connections dz12 and dz14 resp. dz20 and dz22) | Alternating voltage ≤ 60 V ≤ 4 A ≤ 500 VA cos φ ≥ 0,7 | Direct voltage ≤ 60 V ≤ 0,25 A ≤ 50 W |
|--|---|--|

The signal transmitter circuits of type LS 500, type LS 500 19" and type LS 500 19" Duo are safely galvanically separated from the supply and output circuits up to a peak value of the nominal voltage of 375 V.

The signal transmitter circuit of type LS 500 19" AK5 are safely galvanically separated from the supply circuit up to a peak value of the nominal voltage of 30 V. The output circuits are safely galvanically separated from all other circuits up to a peak value of the nominal voltage of 60 V.

(16) Test documents are listed in the test report No.: 01 YEX 133809.

(17) Special conditions for safe use

none

(18) Essential Health and Safety Requirements

no additional ones