

Leak detector type LAG 2000 A

to indicate leaks on double-walled above-ground and underground tanks



CONTENTS

ABOUT THE MANUAL	2
MODIFICATIONS COMPARED TO PREVIOUS VERSION	2
ABOUT THIS PRODUCT	2
SAFETY ADVICE	3
PRODUCT-RELATED SAFETY ADVICE	3
INTENDED USE	4
USER QUALIFICATION	5
SUITABLE TANKS AND STORAGE MEDIA	6
INAPPROPRIATE USE	6
DESIGN	7
FUNCTION DESCRIPTION	7
PREPARATION FOR ASSEMBLY	8
ASSEMBLY	11
ELECTRIC CONNECTION	18
START-UP	21
FUNCTION CHECK	22
OPERATION	23
ERROR MESSAGE/MEANING	23
TROUBLESHOOTING	24
MAINTENANCE	24
RESTORATION	25
FUNCTION CHECK	25
DISPOSAL	25
TECHNICAL CHANGES	25
TECHNICAL DATA	26
WARRANTY	27
DECLARATION OF PERFORMANCE	27
DECLARATION OF CONFORMITY	27
DECLARATION OF TYPE APPROVAL	27
INSTALLATION CERTIFICATE FROM SPECIALISED COMPANY	28

ABOUT THE MANUAL



- This manual is part of the product.
- This manual must be observed and handed over to the operator to ensure that the component operates as intended and to comply with the warranty terms.
- Keep it in a safe place while you are using the product.
- In addition to this manual, please also observe national regulations, laws and installation guidelines.

MODIFICATIONS COMPARED TO PREVIOUS VERSION

- The general building approval Z-65.24-474 has expired and has been replaced with:
 - CE marking according to the ordinance (EU) no. 305/2011 with declaration of performance according to EN 13160-1:2003 for use in facilities for the storage of fuel oils with a flash point of $>55^{\circ}\text{C}$ for the supply of heating systems in buildings.
 - Certificate of suitability for intended use (ÜHP) according to the federal state building ordinance for use in systems for the storage, filling and handling of water-endangering materials.
- CE Conformity according to ATEX regulation 2014/34/EU with new EC type test certificate numbers.
- Limitations to the selection of the leak detector liquids.

ABOUT THIS PRODUCT

The LAG 2000 A type leak detector is part of a leak detection system in the form of a liquid system for double-walled tanks for the storage, filling and handling of water-endangering liquids. Leaks in the monitoring space of a tank are detected when the level of the leak detector liquid falls. The alarm notification on the indicator is visual and acoustic. The indicator also features a potential-free relay contact.

The LAG 2000 A type leak detector corresponds to the following requirements:

- Class II leak detection system according to EN 13160-1:2003 in connection with EN 13160-3 in the form of a liquid system for tanks on the basis of leak detector liquid.
- Leak detector for apparatus and protection systems for intended use in areas where there is a risk of explosion according to the ATEX directive 2014/34/EU.
- Construction product for stationary systems used in order to store, fill and handle water-endangering substances in accordance with the building code A, part 1 (version 2015/2) no. 15.44: Leak detectors for liquid systems for the storage of water-endangering liquids.
- Construction product and part of systems for the storage, filling and handling of water-endangering materials in Germany according to the sample administrative provision for technical building regulations (MVV TB).

Scope of delivery of the LAG 2000 A:

The scope of delivery of the LAG 2000 A includes the following parts:

- Indicator, assembly and operating manual.
- Leak detector liquid tank (LDL tank) with sensor unit and sensor cable.

SAFETY ADVICE

Your safety and the safety of others are very important to us. We have provided many important safety messages in this assembly and operating manual.

✓ Always read and obey all safety messages.



This is the safety alert symbol.

This symbol alerts you to potential hazards that can kill or hurt you and others. All safety messages will follow the safety alert symbol and either the word "DANGER", "WARNING", or "CAUTION". These words mean:

⚠ DANGER

describes a **personal hazard** with a **high degree of risk**.

→ May result in **death or serious injury**.

⚠ WARNING

describes a **personal hazard** with a **medium degree of risk**.

→ May result in **death or serious injury**.

⚠ CAUTION

describes a **personal hazard** with a **low degree of risk**.

→ May result in **minor or moderate injury**.

NOTICE describes **material damage**.

→ Has an **effect** on ongoing operation.



describes a piece of information

✓ describes a call to action

PRODUCT-RELATED SAFETY ADVICE**⚠ DANGER**

Intended use in potentially explosive areas.

The formation of a hazardous explosive atmosphere cannot be ruled out.

- ✓ Take the required protective measures according to:
GER: Ordinance on Industrial Safety and Health, EC: Directive 1999/92/EC!
- ✓ Assess the likelihood of explosive atmospheres.
- ✓ Assess the presence of sources of ignition.
- ✓ Assess possible impacts of explosions.
- ✓ Divide potentially explosive areas into zones and take measures.



Use in potentially explosive areas is admissible.

- ✓ Installation by a specialised company that specialises in explosion protection (ATEX Directive 1999/92/EC).
- ✓ Installation inside the defined EX protection zone.

**⚠ WARNING**

Escaping, liquid operating media:

- are hazardous for water
- are flammable category 1, 2 or 3 liquids
- can ignite and cause burning
- can cause injury through people falling or slipping
- ✓ Capture operating media during maintenance work.

INTENDED USE

Operating media

- Bioethanol*)
- FAME**)**
- Urea solution
- HVO
- Diesel fuel*)
- Petrol*)
- Marine fuel
- Liquid fertiliser (AHL,ASL,HAS)
- Aviation fuel
- Kerosene**)
- Special petrol
- Water**)**
- Fuel oil**)**
- Bio fuel oil**)**
- Industrial oil
- Vegetable oil**)**



*) are compatible with the following operating media

***) scope of approval: Construction Products Regulation CPR

For operating media without *) and **) as well as others, compatibility with the leak detector liquid is to be proved in coordination with the manufacturer of the leak detector liquid in individual cases.

If the LAG 2000 A is used in combination with other tanks or other substances that are hazardous to water, the relevant statutory and technical requirements must be complied with.



You will find a **list of operating media** with descriptions, the relevant standards and the country in which they are used in the Internet at www.gok-online.de/de/downloads/technische-dokumentation.



Place of operation

CAUTION

- ✓ In the case of systems in connection with areas where there is a risk of explosion, compliance is required with the appropriately valid national regulations and installation regulations!
- ✓ In the case of repair work or changes to explosion-proof apparatus, compliance is required with the national regulations!
- ✓ In the case of repair work and maintenance, **original spare parts** may only be used.



The LAG 2000 A type leak detector is only intended for use areas where there is a risk of explosion (EX protection zones).

Depending on the component, the operation of the LAG 2000 A type leak detector is permitted in:

Component	EX protection zone	Ignition protection type and/or labelling
Indicator ¹⁾	not permitted	⊕ Ex II (1) G [Ex ia] IIC
Leak detector liquid tank ²⁾	1	⊕ Ex II 1 G Ex ia IIC Ga
Sensor unit ³⁾		

²⁾ The indicator is equipped with ⊕ Ex -labelling, but has to be installed outside an EX protection zone!

²⁾ The leak detector liquid tank (LDL tank) is made from conductive plastic. It requires electrical earthing in order to conduct charges away from its surface.

³⁾ In potentially explosive atmospheres, install only the intrinsically safe model of the sensor unit.

Installation location

- operate indoors and outdoors, if protected against the weather (e.g. dome shaft)

NOTICE Malfunctions caused by flooding!

- The LAG 2000 A type leak detector is not designed for installation in areas prone to flooding or risk areas.
- Change the leak detector liquid if required.
- Following flooding, the LAG 2000 A type leak detector must be replaced!



USER QUALIFICATION

Installation, start-up, maintenance and restoration of the product may only be commissioned to such companies constituting specialised companies for this work in the meaning of § 62 of the AwSV and additionally have knowledge in the field of fire and explosion control if this work is performed on containers with stored liquids with a flash point $\leq 55^{\circ}\text{C}$. This does not apply if the system is excluded from this obligation to be installed by a specialised company according to national regulations. These will simply be referred to below as "specialised company".

Work on electrical parts may be carried out only by an electrician qualified according to VDE regulations or by an electrician who is qualified according to local regulations.

The specialised company and the operator must observe, comply with and understand all of the following instructions in this assembly and operating manual.

Activity	Qualification
storing, transporting, unpacking, OPERATION	trained personnel
ASSEMBLY, MAINTENANCE, START-UP SHUT-DOWN, REPLACEMENT, RESTART, RESTORATION, DISPOSAL,	qualified personnel, customer service
ELECTRICAL INSTALLATION	qualified electrician
TROUBLESHOOTING	qualified personnel, customer service qualified electrician, trained personnel

MORE INFORMATION

Extract from EN 13160-1

- Triggering of alarm in the case of a leak or malfunction.
- Leak display with optical and acoustic alarm.
- In the case of an interruption of the supply voltage, the leak alarm returns to its intended mode when the voltage is restored.
- Suitable for operation in atmospheric conditions of 0.08MPa (0.8bar) to 0.11MPa (1.1bar).
- Parts which are designed for installation in atmospheres in which there is a risk of explosion are explosion-proof. If there is the possibility of the existence of an explosive atmosphere within the leak detection system and/or its parts, these have to be explosion-proof.
- With the correct ASSEMBLY, the accidental interruption of the supply voltage will be prevented.
- Can be tested for a simulated leak.
- Only interruption leads to an alarm condition.
- Testable indicator with optical and acoustic alarm.
- Can be checked to ensure flawless functioning.
- Only intended for the monitoring of a tank.

Monitoring space

The monitoring space ⑬ for the leak detector must comply with EN 13160-3 and EN 13160-7, and may also consist of basic leak protection lining or leak protection cladding.

The monitoring space must be designed so that the entire volume can be filled with leak detector liquid, and that it is liquid-tight.

SUITABLE TANKS AND STORAGE MEDIA

The LAG 2000 A may be used only in connection with the following tanks:

Table 1:

Tanks	pursuant to standard
above-ground, double-walled tanks	DIN 6616, DIN 6618-3, DIN 6623-2, DIN 6624-2, OENORM C 2115, OENORM C 2116-3, NBN I 03-004, EN 12285-2
underground, double-walled tanks	DIN 6608-2, DIN 6619-2, EN 12285-1
other tanks	in connection with a usability certificate issued by a building inspectorate*
*usability certificate issued by a building inspectorate (e.g. according to VbF, BetrSichV, general building-authority approval, quality assurance RAL-GZ 998 storage tanks) or a conformity certificate as a construction product according to the legal regulations to implement directives from the European Community, which also include building inspectorate and water law requirements and have the CE mark. The certificate must show that the monitoring space is suitable for connecting a leak detector.	
single-wall, unpressurised, above-ground tanks with leak protection lining	The leak protection lining must have a usability certificate issued by a building inspectorate showing that it is suitable for connecting a leak detector for liquid systems.
single-wall, unpressurised, above-ground tanks with leak protection cladding	The leak protection cladding must have a usability certificate issued by a building inspectorate showing that it is suitable for connecting a leak detector for liquid systems.



The restrictions as regards storage media in the construction standards or approvals for tanks must be observed. For example:

DIN 6618-3: Density of the storage medium $\rho_M \leq 1.0\text{kg/l}$;

EN 12285-1 and

EN 12285-2 Type D Class A: Density of the storage medium $\rho_M \leq 1.1\text{kg/l}$

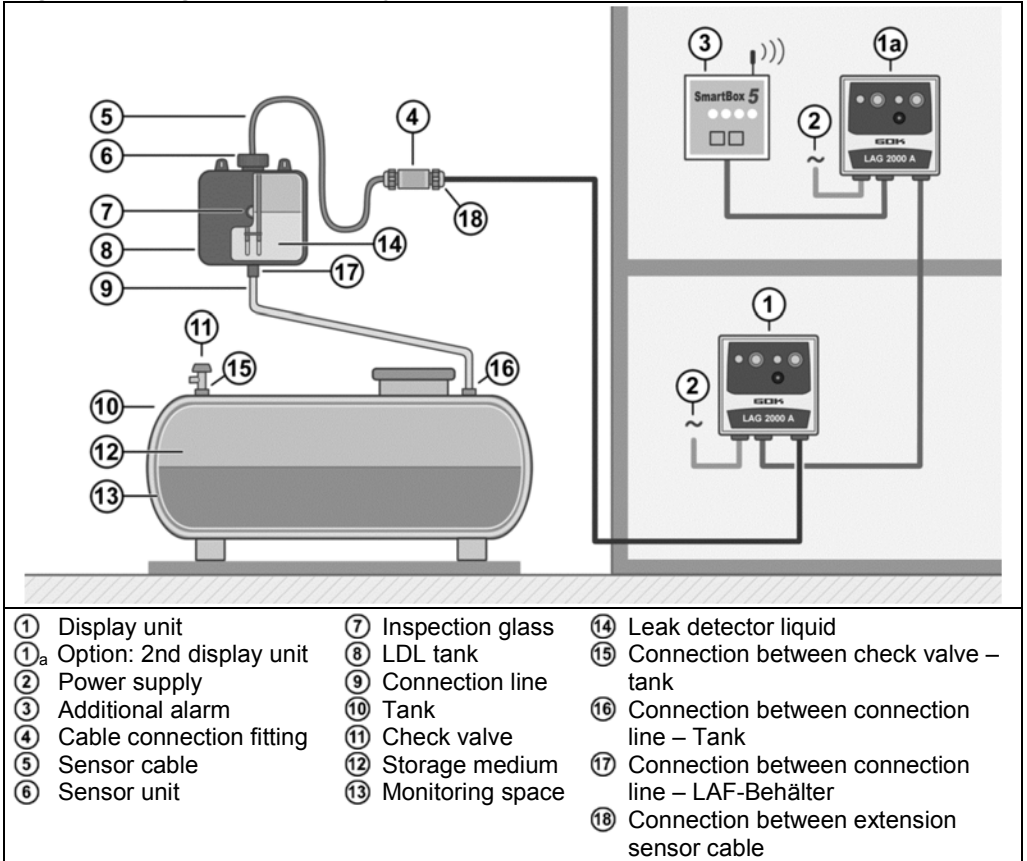
INAPPROPRIATE USE

All uses which exceed the Intended use:

- e.g. operation with different operating media
- changes to the product or parts of the product
- installation in tanks which are not described and/or do not comply with the corresponding legal or technical requirements
- installation in several tanks
- installation in double-walled piping
- installation in pressurised tanks
- failure to comply with the environmental conditions according to the TECHNICAL DATA
- use in areas prone to flooding and risk areas

DESIGN

Figure 1: Design leak detector system



FUNCTION DESCRIPTION

How the LAG 2000 A leak detector system works

The monitoring space (13) of the tanks (10) contains leak detector liquid (14) that is filled up to the inspection glass (7) of the LDL tank (8) (see **Figure 2**). When the tips of the sensor unit (6) are submerged in the leak detector liquid, the electrical circuit between the two electrodes of the sensor unit is closed.

If the tank has a leak, the leak detector liquid flows out. The tips of the sensor unit are no longer submerged, the electric circuit is interrupted and the display unit shows an acoustic and visual alarm.

Type LAG 2000 A with relay output:

The relay for an additional alarm is connected.

PREPARATION FOR ASSEMBLY

Before starting the installation process, observe the following in addition to the INFORMATION ON SAFETY AND USE:

Leak detector liquid

Generally, leak detector liquids are ethylene or propylene glycol-based liquids. They are mixed with water in a specified ratio. The mixture must be adjusted so that it cannot freeze. Leak detector liquids may not enter into a dangerous chemical reaction with the materials that they come into contact with and are therefore especially conditioned for their intended use.



In Germany, only approved leak detector liquids may be used, see QR-Code.

Some tanks may be filled with leak detector liquids in the factory (notice on type label).



In Germany, leak detector liquids may be replaced or mixed only if this is permitted according to an expert assessment. Observe the instructions provided by the manufacturer of the leak detector liquid.

Permitted leak detector liquids

In the area of application of the ordinance (EU) no. 305/2011:

- in systems for the transport/the distribution/storage of fuel oil for the supply of heating/cooling systems in buildings, as well as in facilities for the transport, the distribution and the storage of water which is not intended for human consumption:
 - **Antifrogen[®] N** from the company CLARIANT with file number BAM 6.1/15163.

In the area of application:

- the sample administrative provision for technical building regulations (MVV TB) as a construction product and part of systems for the storage, filling and handling of water-endangering materials in Germany
- the replacement of leak detectors in Germany
- leak detection systems in EU member states (possibly with national certificate of suitability for intended use)



In EU member states, leak detector liquids may only be used which satisfy the provisions of the respective national laws and regulations.

Figure 2: Leak detector liquid tank – LDL tank ⑧ with sensor unit ⑥

The monitoring space contains ⑬ a specified volume of leak detector liquid ⑭ (see type label on the tank ⑩!). The larger this volume is, the larger the overall usable volume of all LDL tanks ⑧ of the leak detector system must be. The usable volume V_a is 50% of the volume between the level of the liquid directly before an alarm is triggered and the top of the LDL tank. The usable volume is $V_a = 4.5\text{l}$. An inspection glass ⑦ is used to check the level of the liquid.

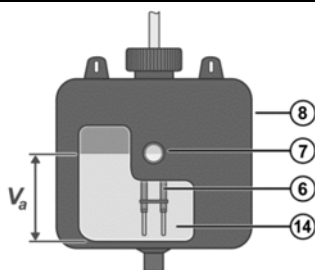
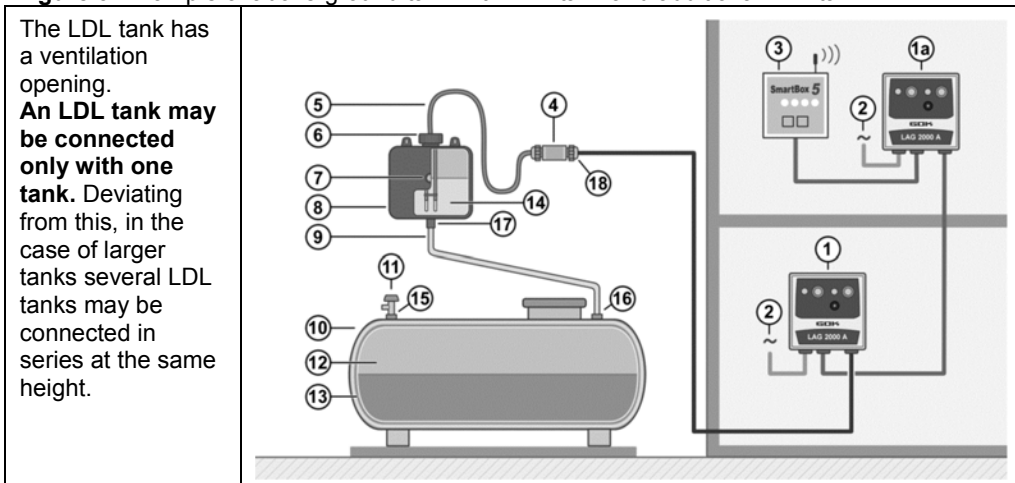


Figure 3: Example of above-ground tank with LDL tank and additional LDL tank



Replacing leak detectors on systems that were installed before 31 December 2002:

- If more than 1 tank is monitored with one/several LDL tanks or one display unit, no upgrade is required.
- Several tanks may be monitored with several LDL tanks connected in series at the same height and with just one display unit if this conforms with the approval requirements.

A distinction is made between the following 2 tank storage scenarios to determine the number of LDL tanks required:

Scenario 1: Above-ground tank and underground tank with earth coverage < 30cm⁴⁾

The usable volume of an LDL tank must be at least 1L per 35L leak detector liquid in the monitoring space.

One LDL tank is sufficient for 157.5L monitoring volume. That corresponds to tanks with a storage volume of up to 20,000L.

The number of additional LDL tanks can be determined from the volume of the leak detector liquid in the monitoring space shown in **Table 2**.

Table 2:

Volume of leak detector liquid according to type label on the tank	Number of required LDL tanks <u>with</u> sensor unit	Number of required additional LDL tanks <u>litres</u> sensor unit
0 to 157.5 Litres	1	0
158 to 315 Litres		1
316 to 472.5 Litres		2
473 to 630 Litres		3
631 to 787.5 Litres		4

⁴⁾ In Germany, underground tanks only within the scope of replacing leak detectors.

Scenario 2: Underground tanks with at least 30cm earth coverage ⁴⁾

The usable volume of an LDL tank must be at least 1L per 100L leak detector liquid in the monitoring space.

One LDL tank is sufficient for 450L monitoring volume. That corresponds to tanks with a storage volume of up to 60,000L.

The number of additional LDL tanks can be determined from the volume of the leak detector liquid in the monitoring space shown in **Table 3**.

Table 3:

Volume of leak detector liquid according to type label on the tank	Number of required LDL tanks with sensor unit	Number of required additional LDL tanks without sensor unit
0 to 450 Litres	1	0
451 to 900 Litres		1
901 to 1350 Litres		2
1351 to 1800 Litres		3
1801 to 2250 Litres		4

Connection line ⑨ LDL tank ⑧ – monitoring space ⑬ of the fuel tank ⑩

- The connection line is the inlet of the leak detector system.
- If possible, the inlet and outlet must be attached to the end points of the leak detector system to ensure an adequate flow of leak detector liquid.
- Do not use any pipes or fittings that are zinc-plated on the inside, as zinc reacts with the leak detector liquid.
- Pipes and fittings must be protected against corrosion on the outside.
- The inside diameter of the connection line must be $\geq 13\text{mm}$.
- Do not install any constrictions or shut-off fittings in the connection line. Constrictions are possible at the connections.
- With copper pipes, an isolation part must be installed to prevent contact corrosion.
- Hoses may only be used where LDL tanks are installed on the domes of underground tanks, or as a short visual section in the connection line.
- The connection line must not be the sole support for the LDL tank.
- The connection line must rise continuously from the fuel tank to the LDL tank.






For connection lines in potentially explosive atmospheres, according to EN 131260-3, electrical surface resistance must be $< 1 \times 10^9 \Omega$.

This requirement does not apply to the LAG 2000 A if the outer diameter of the connection line is $\leq 20\text{mm}$.

Check valve of the monitoring space

- The check valve is the outlet of the leak detector system.
- To check the function of the leak detector, the leak detector liquid is drained via a check valve.
- The check valve must be dimensioned for a flow of $> 0.5\text{L/min}$. leak detector liquid, e.g. 1/2" ball valve.

Display unit


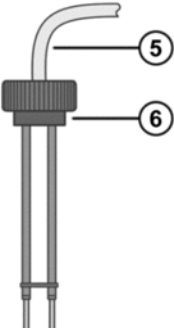
	<p>The display unit has an -sign but must be installed outside the ex protection zone.</p> <ul style="list-style-type: none"> • Installation in a dry room that is easily accessible and entered often. • Installation at eye height on a smooth, vertical wall. • Must not be reached by water or spray water.
	<p>If it is installed outdoors, the display unit must be installed in a protective housing with protection type IP 65 and an external alarm (e.g. „SmartBox® 5“, GOK-Art. No. 28 500 00, rotating light, siren, etc.) must be connected via the relay output as an additional alarm.</p>

Refer to the TECHNICAL DATA, ambient temp. T_{amb}

Relay output for additional alarm "B":

- For the values of the potential free relay contact, refer to the TECHNICAL DATA.
- Terminal for additional "alarm": In alarm status terminals 2 and 3 are open and terminals 1 and 3 closed.
- See **Figure 5** for a view and the terminal assignment of the display unit.

Sensor unit with sensor cable

	<p>In potentially explosive atmospheres, install only the intrinsically safe model of the sensor unit. The lid of the sensor unit may be cleaned only when there is no potentially explosive atmosphere.</p> <ul style="list-style-type: none"> • In a fixed installation the sensor cable must be configured as an intrinsically safe circuit separated from other electric circuits. • Do not place the sensor cable parallel to high voltage cables, as there is a risk of extraneous radiation. • Protect the sensor cable against damage, installation inside a metal tube is recommended. • Do not shorten the sensor cable. • Install the sensor cable so that the sensor unit can be dismantled easily after it has been installed. 	
--	--	---

ASSEMBLY

Before assembly, check that the product is complete and has not suffered any damage during transport.

ASSEMBLY must be carried out by a specialised company.

See USER QUALIFICATION!

The specialised company and the operator must observe, comply with and understand all of the following instructions in this assembly and operating manual. For the system to function as intended, it must be installed professionally in compliance with the technical rules applicable to the planning, construction and operation of the entire system.

Installing the LDL tank



The hazardous features of the storage medium according to the German Ordinance on Hazardous Materials (GefStoffV) are decisive for where the LDL tank is installed. In the case of flammable, highly flammable and extremely flammable storage media, according to BetrSichV, observe **Table 4**.

Table 4

Storage medium	Installing the LDF tank in	Requirement
flammable highly flammable extremely flammable flashpoint $\leq 55^{\circ}\text{C}$	potentially explosive atmosphere zone 1	conductive connection line ⁵⁾
flammable category 3 non-flammable (flashpoint $> 55^{\circ}\text{C}$ bis 100°C)	potentially explosive atmosphere zone 2	Seal masonry opening gastight ⁶⁾
storing flammable, highly flammable or extremely flammable substances together with non-flammable substances	non-hazardous areas	
substances hazardous to water	If non-flammable liquids are stored in divided storage tanks together with flammable, highly flammable or extremely flammable liquids, the requirements for storing flammable, highly flammable and extremely flammable liquids apply. If other substances hazardous to water are stored, the relevant statutory and technical requirements must be observed.	

⁵⁾ See installation instructions for the connection line between the LDL tank and the monitoring space of the fuel tank

⁶⁾ Channels from connection lines that come out of the dome must be protected against the infiltration

Installation location for the LDL tank

According to EN 13160-3, the LDL tank must be positioned so that:

- the hydrostatic pressure of the leak detector liquid at the lowest point of the tank is at least 30mbar (= 3kPa) higher than the maximum pressure of the storage medium at the lowest point of the tank (including working pressures) and also the maximum pressure of the groundwater at the lowest point of the tank and

- the pressure in the monitoring space does not exceed the nominal pressure of the monitoring space

Remark 1: Here, the nominal pressure P_N corresponds to the maximum permissible pressure p_s .

Remark 2: The construction standards for tanks contain only information about the test pressure of the monitoring space $p_{t,2}$ but none about the maximum permissible pressure in the monitoring space $p_{s,2}$.

- the LDL tank must be positioned as follows
- no surface or rainwater, dirt or windborne sand may get into the LDL tank, the sensor unit or the cable connection fitting (accessory)
- it must be protected against UV radiation

Tabelle 5: Double-walled tanks and information about working and test pressures

Tank acc. to construction standard	Tank		Monitoring space	
	Working pressure $p_{o,1}$	Test pressure $p_{t,2}$	Maximum permissible pressure $p_{s,2}$	
DIN 6608-2	500mbar	600mbar	To year of manufacture 1975: 500mbar ⁸⁾ To year of manufacture 1976: 550mbar ⁸⁾	
DIN 6616				
DIN 6618-3				
DIN 6619-2				
DIN 6623-2				
DIN 6624-2				
EN 12285-1			Class A	400mbar
EN 12285-2	Class B, C	600mbar	550mbar ⁹⁾	
Tank type D				
none		$\geq 600\text{mbar}^{10)}$	$p_{s,2} = p_{t,2} / 1,1^{8)}$	

⁸⁾ According to VdTÜV fact sheet 904, issue 03.01, because DIN standards make no reference to $p_{s,2}$

⁹⁾ Assumed as $p_{s,2} = p_{t,2} / 1.1$, because EN standards make no reference to $p_{s,2}$
Annotation: All pressures are excess pressures

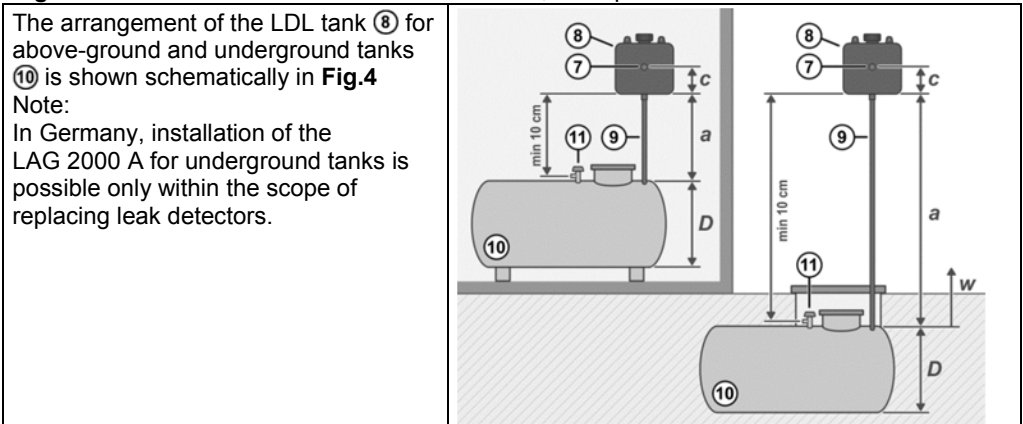
¹⁰⁾ Minimum test pressure acc. EN 13160-7

Installation dimension a for the LDL tank in the scope covered by EN 13160-3



- The installation dimension a is the distance between the top of the fuel tank and the bottom of the LDL tank. The minimum installation dimension a_{min} is to be determined according to calculation equations [2] and [3] and must be complied with. The installation dimension a_{max} may not be exceeded and must be determined according to calculation equation [4] and be complied with.
- The following applies: $a_{min} \leq a \leq a_{max}$ [1].
- Distance between the check valve (11) and the bottom of the LDL tank: ≥ 10 cm.

Figure 4: Installation dimensions for the LDL tank, for explanations see **Table 6**




Calculation equations for installation dimension a according to EN 13160-3

	$a_{min} =$	$D \times (\rho - 1) + p_{o,1} + 16.8$	[2]
		Calculation equation [2] applies only with [3]	
		$a \geq w + 16.8$	[3]
	$a_{max} =$	$p_{s,2} - D - c$	[4]

Table 6:

Key for **Figure 4** and for the calculation equations according to DIN EN 13160-3:

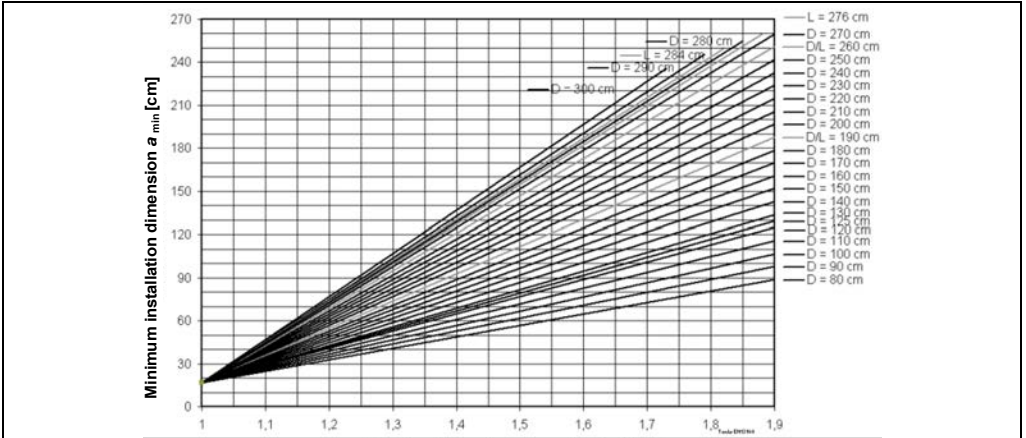
Symbol	Unit	Explanation	Comment
a	[cm]	Installation dimension	Distance
a_{min}	[cm]	Minimum installation dimension	Must not be less than this.
a_{max}	[cm]	Maximum permissible installation dimension	Must not be exceeded.
D	[cm]	Diameter for cylindrical tanks or tank installation height for vertical tanks	
ρ	[kg/l]	Density of the liquid storage medium	$1\text{kg/l} \leq \rho \leq 1.9\text{kg/l}$
$p_{o,1}$	[mbar]	Working pressure inside the tank above the liquid storage medium	Excess pressure, see Table 5 Note: Where the pressure is purely hydrostatic $p_{o,1} = 0$
16,8	[cm]	Safety allowance	According to EN 13160-3. Figure 5: $30.5\text{cm} - c = 16.8\text{cm}$
w	[cm]	Possible groundwater or backwater allowance above top of tank	 Consider flooding!
c	[cm]	Distance between the bottom of the tank and the level of the liquid in the usable volume V_a of the LDL tank	Series LAG 2000 A: $c = 13.7\text{cm}$
$p_{s,2}$	[mbar]	Maximum permissible pressure in the monitoring space	Excess pressure, see Table 5

- **Diagram 1** can be used to determine the minimum installation dimension a_{min} in relation to the density of the storage medium with the parameter tank diameter D or tank height L . All above-ground and underground tanks according to DIN 6616, DIN 6618-3, DIN 6623-2, DIN 6624-2, DIN 6608-2, DIN 6619-2 and according to EN 12285-1 and EN 12285-2 Typ D only for Classes B and C. Assumed as: $p_{s,2} = 550\text{mbar}$, $w = 0$, $p_{o,1} = 0$.
- **Diagram 2** applies only for above-ground and underground tanks according to EN 12285-1 and EN 12285-2 Type D in Class A. Assumed as: $p_{s,2} = 360\text{mbar}$, $w = 0$, $p_{o,1} = 0$.

Minimum installation dimension a_{min} according to EN 13160-3

For tanks DIN 6616, DIN 6618-3, DIN 6623-2, DIN 6624-2, DIN 6608-2, DIN 6619-2 and according to EN 12285-1 and EN 12285-2 type D only Class B und C

Diagram 1:

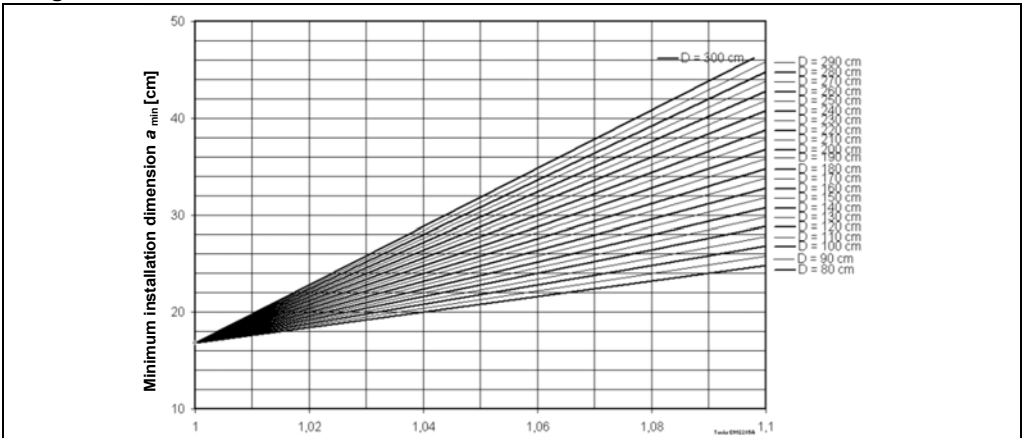


Density of the storage medium in [kg/l]

Minimum installation dimension a_{min} nach EN 13160-3

for tanks according to EN 12285-1 and EN 12285-2 type D Class A

Diagram 2:



Density of the storage medium in [kg/l]

Installation dimension a for the LDL tank within the scope of replacing leak detectors

- The minimum installation dimension a_{min} for replacing leak detectors within the scope of TRbF 501 is to be determined according to calculation equations [5] and [6] and be complied with. The installation dimension a_{max} may not be exceeded and must be determined according to calculation equation [4].
 - The following applies: $a_{min} \leq a \leq a_{max}$ [1]
 - Distance between the check valve (11) and the bottom of the LDL tank: $\geq 10\text{cm}$
- The arrangement of the LDL tank for above-ground and underground tanks is shown schematically in **Figure 4**.

Calculation equations for installation dimension a (scope a TRbF)

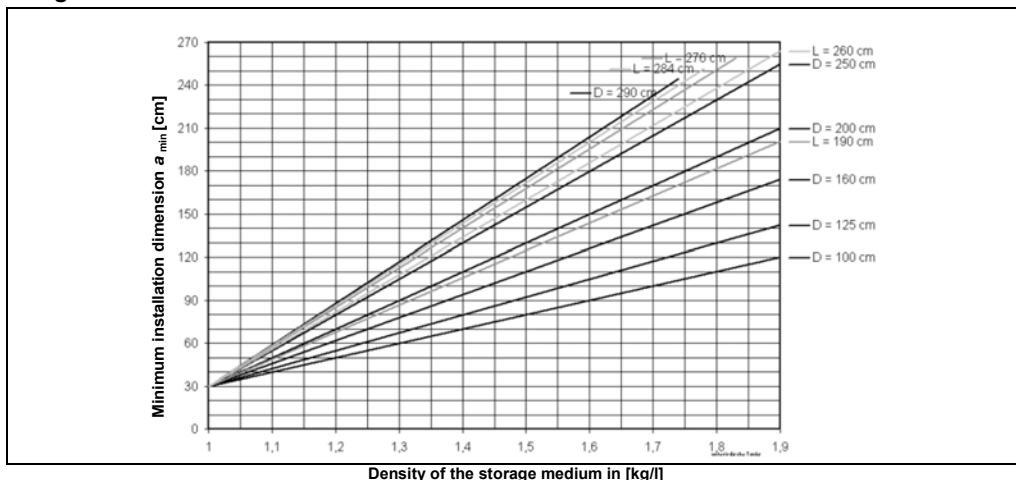
	$a_{min} =$	$D \times (\rho - 1) + p_{o,1} + 30$	[5]
		Calculation equation [5] applies only with [6]	
		$a \geq w + 30$	[6]

Table 7: The following changes compared to Table 6 (scope TRbF):

Symbol	Unit	Explanation	Comment
30	cm	Safety allowance <u>only for underground tanks</u>	According to VdTÜV fact sheet 904

- For underground tanks **diagram 3** can be used to determine the minimum installation dimension a_{min} in relation to the density of the storage medium with the parameter tank diameter D or tank height L.
- Assumed as: $p_{s,2} = 550\text{mbar}$, $w = 0$, $p_{o,1} = 0$
- As opposed to calculating the installation dimension a according to EN 13160-3, when the installation dimension a is calculated according to TRbF 501 and VdTÜV fact sheet 904, the bottom of the LDL tank is used as the reference line.

Min. installation dimension a_{min} for underground tanks acc. to DIN 6608-2, DIN 6619-2 Diagram 3:



Attaching the LDL tank

	<ul style="list-style-type: none"> ✓ Check for completeness and damage. ✓ Define the installation location. ✓ To be attached to a nearby wall, to an intended fittings cabinet, or to the dome with a tripod made from flat or angled iron. ✓ Define the installation height for attaching = installation dimension a + 287.5mm. ✓ Mark the attachment holes horizontally.
--	--

<p>15 072 99</p>	<ul style="list-style-type: none"> ✓ Drill the holes for anchors and insert anchors, e.g. S10 x 50 anchors. ✓ Attach the LDL tank with 2 screws, e.g. hexagonal wood screws 8 x 40 steel, zinc-plated according to DIN 571. ✓ The screws and anchors are included in the GOK assembly set for the leak detector, Art. No. 15 072 99.
------------------	---

Installation of the connection line between LDL tank and monitoring space of the tank

For installation, it is recommended that you use the GOK assembly set for the leak detector, Art. No. 15 072 99.

Connections:

- LDL tank: Male thread G 3/4 according to EN ISO 228-1 and double sleeve G 3/4 (included with delivery).
- Tank: Generally, a sleeve with a female thread G 1 EN ISO 228.

The following options are available for the connection line:

- Threaded tube according to EN 10255 (DIN 2440), not zinc-plated inside, outside with surface protection, e.g. dimension R 3/4.
- Copper tube according to EN 1057 or EN 13349 with plastic sheath and isolation part, recommended in dimension 15 x 1mm.
- Install the isolation part directly on to the tank connection.
- LDL tank installed in the dome: EPDM hose 14 x 3.

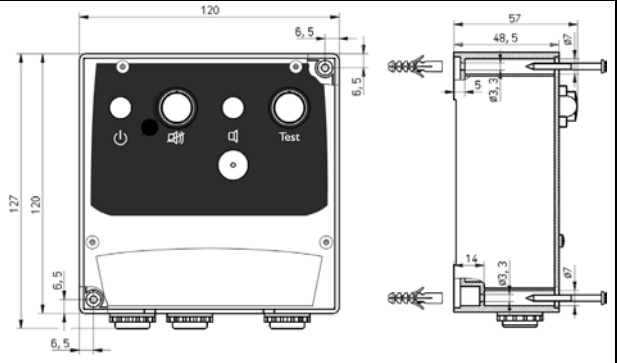
Installing the check valve

Tank connection: Generally, a sleeve with female thread G 1 according to EN ISO 228:

- ✓ The check valve (11) must be positioned so that a collection vessel placed below it.
- ✓ Install the check valve on the second support of the monitoring space (13).
- ✓ Distance between outlet of check valve and LDL tank: $\geq 10\text{cm}$.
- ✓ The check valve is included in the GOK assembly set for the leak detector, Art. No. 15 072 99.

Mounting the display unit

- ✓ Remove the display unit from the packaging.
- ✓ Check for completeness, damage and labelling.
- ✓ Unscrew 4 screws on the front of the display unit.
- ✓ Remove the front of the display unit.
- ✓ Drill 2 mounting holes \varnothing 5mm.
- ✓ Mount the display unit with the 2 enclosed S5 anchors and wood screws 3 x 35 DIN 96.



ELECTRIC CONNECTION



⚠ DANGER Danger to life due to electric shock!

Electric shock from touching live parts.

- ✓ Before opening the housing, ensure that the equipment is free of all voltage.
- ✓ **Only place under tension after ending all work.**

NOTICE

The housing of the display unit is suitable for wall mounting and is connected to the 230V mains supply. Under normal circumstances, the display unit must be operated with the housing cover closed. It is installed and started up by a qualified technician while the unit is open.

Safety precautions for electrical components

⚠ CAUTION

The functions and operating safety of the device are guaranteed only under the climatic conditions that are specified in TECHNICAL DATA. If the device is transported from a cold to a warm environment, condensation may cause the device to malfunction or may even destroy the device. Because of this, you must ensure that the device has acclimatised to the ambient temperature before using it.

⚠ CAUTION

If you have any doubts that the device can be operated safely, do not operate it. Your safety may be adversely affected by the device, if for example:

- it is obviously damaged
- it no longer works as specified
- it has been stored in unsuitable conditions for some time
- ✓ If in doubt, send the device to the manufacturer for repair or maintenance.

Figure 5: Electrical power connection of the display unit

	A1	Light "Operation"
	A2	Button "Alarm sound"
	A3	Light "Alarm"
	A4	Alarm buzzer
	A5	Button Test
	A6	Nipple for cable lead-through
	A	Terminal for "power supply"
	B	Terminal for additional "alarm"
	C	Terminal for sensor cable

	<p>⚠ DANGER</p> <p>⚡ Electrical potential! Electric shock risk.</p> <ul style="list-style-type: none"> ✓ Switch off the power supply and make sure that it cannot be switched on again inadvertently. ✓ Via terminal "Power" „A“. ✓ AC voltage 230V / 50Hz ② ✓ Use only a fixed connection, not a plug or switch. ✓ Insert the cable through the nipple. ✓ Connect the cable according to the terminal block designation.
--	---

Connect the sensor unit

Connect – direct	Connect – indirect
<p>Fig. 6: display unit can be connected directly</p> <p>If the display unit ① and the LDL tank ⑧ are installed beside each other, the sensor cable ⑤ can be connected directly with the display unit</p>	<p>Fig. 7: display unit can be connected in directly</p> <p>If the display unit ① and the LDL tank ⑧ are in different rooms or more than 0,4 m apart, the sensor cable ⑤ must be extended.</p>

Connect – direct Fig. 6

- ✓ Connect the sensor cable, see **Figure 6**: Terminal "C"
- ✓ Insert sensor cable through nipple "A6" on the display unit ①
- ✓ Attach the sensor cable to 4 and 5 according to the terminal block designation.
- ✓ The polarity is unimportant.
- ✓ If no additional alarm is to be connected to the relay output, screw the front on again with 4 screws..

Connect – indirect Fig.7

- To extend the cable, use a connection box or a GOK cable connection fitting ④ (accessory GOK Art. No. 15 379 00). The cable connection fitting is also included in the GOK assembly set for the leak detector, GOK Art. No. 15 072 99.
- Use to extend cables with a blue outer sheath or marked with a blue flag for intrinsically safe circuits.
- ✓ Install the cable connection fitting IP 54 ④ at the top beside the LDL tank
- ✓ Connect the sensor cable ⑤ to the cable connection fitting ④
- ✓ Connect the extension sensor cable to the cable connection fitting ④
- ✓ Fix the extension sensor cable to the wall
- ✓ See **Figure 6** to connect the extension sensor cable: Terminal „C“
- ✓ Insert the extension sensor cable through nipple „A6“ on the display unit
- ✓ Attach the extension sensor cable to 4 and 5 according to the terminal block designation.
- ✓ The polarity is unimportant.
- ✓ If no additional alarm is to be connected to the relay output, replace the front with 4 screws.

Table 8: Technical data for sensor cable ⑤

Sensor cable of the sensor unit	
Voltage of sensor unit	max. 25V - AC
Permissible extension sensor cable	Wet room – NYM Soil - NYM or similar
Maximum length of extension sensor cable	maximum 100m – with cross section 1.5mm ²

Connection relay output for additional alarm

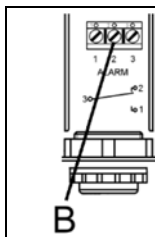


⚠ DANGER

Electrical potential!

Electric shock risk.

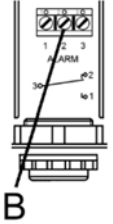
- ✓ Switch off the power supply and make sure that it cannot be switched on again inadvertently.



See **Figure 8** to connect the cable of the external alarm: Terminal **B** Alarm:

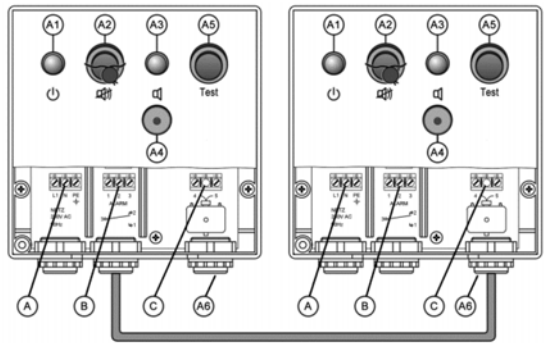
- ✓ Insert the cable through the nipple on the display unit.
- ✓ Connect the cable from the external alarm to 1, 2 or 3 according to the terminal block designation.
- ✓ Attach the front with 4 screws.

Connection relay output for additional alarm – 2nd Display unit as external alarm



B

- Another display unit ①a can be connected to terminal **B Alarm** of display unit ① as an external alarm for remote signal transmission.
- Another external alarm can be connected to the display device ①a.
- ✓ Mounting and electrical connection of the display unit ①a as described above for display unit, not attach the front.



display unit ① display unit ①a

Connect the 2nd display unit ①a:

- ✓ See **Figure 8** to connect the cable of the display unit ① : Terminal "C"
- ✓ Insert sensor cable through nipple "A6" on the display unit ①a.
- ✓ Attach the cable to 4 and 5 according to the terminal block designation.
- ✓ The polarity is unimportant.
- ✓ If no other additional alarm is to be connected to the relay output, replace the front with 4 screws.
- ✓ Fix the cable to the wall.

START-UP

Check that the following connections are correct according to ASSEMBLY:

- tank ⑩ – LDL tank ⑧
- tank ⑩ – check valve ⑪
- sensor unit ⑥ – display unit ①
- AC power supply ② – display unit ①
- external alarm ③ – display unit ①

Safety information on leak detector liquid



✓ Before filling with leak detector liquid, read the safety data sheet (SDS) under all circumstances.



✓ When filling with leak detector liquid, wear safety goggles and gloves under all circumstances.



✓ If skin or clothing should make contact with the leak detector liquid or a mixture of the leak detector liquid and water, wash with soap and water without undue delay.

✓ If leak detector liquid should get into the eyes, rinse the eyes with lots of clean water immediately. Consult a doctor as quickly as possible.

✓ If the leak detector liquid is accidentally swallowed, DO NOT induce vomiting. Consult a doctor as quickly as possible.

✓ Clear up spilt leak detector liquid and/or mixtures consisting of leak detector liquid and water as follows: Absorb with a suitable product, and dispose of through a waste disposal company, stating the components.



Please read this operating manual and the safety data sheet for the leak detector liquid before you use it for filling purposes!

Filling the leak detector liquid

1. Determine the volume of the monitoring space for the required volume of leak detector liquid ⑭ – see type label on the tank ⑩.
2. Place a collection vessel below the check valve ⑪.
3. Open the check valve ⑪.
4. Remove the sensor unit ⑥ from the LDL tank ⑧.
5. Add leak detector liquid until ⑭ einfüllen it flows from the check valve ⑪.
6. Vent the air in the system, if necessary, replenish the leak detector liquid ⑭.
7. Close the check valve ⑪.
8. Fill leak detector liquid ⑭ to the middle of the inspection glass ⑦ of the LDL tank.
9. Check the connection between the fuel tank – LDL tank, include. connections, for leaks.
10. Install the sensor unit ⑥.
11. Attach a permanent label indicating the leak detector liquid that is used to the LDL tank as well as an accompanying safety data sheet (SDS), making sure that it is clearly visible.

Starting up the display unit

The display unit starts operating as soon as the connections have been installed properly according to "Installing the display unit".

FUNCTION CHECK

Function check of the indicator with the initial start-up

	<ul style="list-style-type: none"> • Green light A1 is lit → OK. • Press Test A5 and set to "ON": → Red light A3 is lit and the alarm buzzer A4 is triggered → OK. • Press Test A5 again and set to "OFF": • → Red light A3 goes out and the alarm buzzer A4 is switched off → OK.
	<ul style="list-style-type: none"> • Place a collection vessel below the check valve ⑪. • Open the check valve ⑪ • → Red light A3 is lit and the alarm buzzer A4 is triggered → OK. • Close the check valve ⑪. • Remove the sensor unit ⑥ from the LDL tank ⑧. • Fill leak detector liquid middle of the inspection glass ⑦ of the LDL tank ⑧. • Replace the sensor unit ⑥ in the LDL tank ⑧: → Red light A3 goes out and the alarm buzzer A4 is switched of → OK.

Function test of the 2nd display unit as an external alarm ①a

	<p>The alarm message is displayed on both display units simultaneously. The following function test has no influence on the display unit ①:</p> <ul style="list-style-type: none"> • Green light A1 is lit → OK. • Press Test A5 and set to "ON": → Red light A3 is lit and the alarm buzzer A4 is triggered → OK. • Press Test A5 again and set to "OFF": → Red light A3 goes out and the alarm buzzer A4 is switched off → OK.
--	--

OPERATION

When the device is in a proper condition as intended, operation is limited to the following regular monitoring of the display unit:

	<ul style="list-style-type: none"> • Green light A1 lit? → OK. • Red light A3 not lit? → OK. • Alarm buzzer A4 not triggered? → OK. • External alarm (option) not in operation → OK.
--	--

ERROR MESSAGE/MEANING

Display light A3 with triggering of alarm buzzer on the display unit ① and optionally on the display unit ①a

If the display light A3 lights and the alarm buzzer A4 sounds, there is a leak.

- ✓ Replenish leak detector liquid ⑭ to the middle of the inspection glass ⑦ of the LDL tank ⑧.

	<ul style="list-style-type: none"> • Remove the seal on the button A2, press A2 and set to "OFF": → Alarm buzzer A4 and external alarm are switched off. → Red light A3 does not go out. → There is a leak. <p>The system is <u>no</u> longer operating as intended.</p> <ul style="list-style-type: none"> ✓ Contact a specialised company to check the leak detector and/or repair the leak and start the system again.
--	--

When the leak has been repaired and the system restarted

	<ul style="list-style-type: none"> • The red light A3 on the display unit and, if connected, on the 2nd display unit goes out again. • Press A2 and set to "ON". • Replace the seal on A2: <ul style="list-style-type: none"> → Green light A1 is lit again. → The display unit and, if connected, the 2nd display unit again operates as intended in the tank system.
--	--

TROUBLESHOOTING

Fault cause	Action
Green light A1 is not lit	<ul style="list-style-type: none"> ✓ Check the power connection. ✓ If the fault cannot be found through the activities described in CARE AND MAINTENANCE, replace the leak detector with a new one. ✓ Do not repair the display unit yourself, send it to the manufacturer.
„Red light A3 is lit and the alarm buzzer A4 is triggered without leak on sensor unit / sensor cable	<ul style="list-style-type: none"> ✓ Check the sensor cable for breaks. ✓ If the fault cannot be found through the activities described in CARE AND MAINTENANCE, replace the sensor unit with a new one. ✓ Do not repair the sensor unit yourself, send it to the manufacturer.
No leak detector liquid flows from the check valve	<ul style="list-style-type: none"> ✓ Dismantle the connection line between the monitoring space and the LDL tank and check for contamination. ✓ Dismantle the check valve and check for contamination. ✓ If necessary, clean the monitoring space . ✓ Add new leak detector liquid.
Contaminated leak detector liquid	<ul style="list-style-type: none"> ✓ Replace the leak detector liquid, making sure that it is an approved liquid and that it is mixed with water in the correct ratio. ✓ Before filling with leak detector liquid, read the safety data sheet (SDS) under all circumstances. ✓ Comply with all safety information, as described under "Filling the leak detector liquid"!

MAINTENANCE

The functions and operating safety of the LAG 2000 A must be checked at least once per year or after maintenance or repair by a specialised company (see SAFETY INFORMATION) or by the operator's qualified personnel.



RESTORATION

If the actions described in TROUBLESHOOTING do not lead to a proper restart and if there is no dimensioning problem, the product must be sent to the manufacturer to be checked. Our warranty does not apply in cases of unauthorised interference.

See also: Quality and inspection requirements for tank protection RAL-RG 977, Series 100 Facilities for flammable liquids hazardous to water, GP 131 "Installation, maintenance, repair of leak detection systems on facilities for flammable and non-flammable liquids" from the German Association For Quality Control And Tank Protection, Gütegemeinschaft Tankschutz. If the leak detector is not in a suitable condition, it should be repaired by a specialised company.

FUNCTION CHECK

Function check following repair work and in the scope of the annual maintenance

- Inspection of the indicator and/or optionally of the 2nd indicator and inspection of the sensor unit:
 - ✓ Also refer to "Function check of the indicator with the initial start-up".
 - Check the LDL tank and the leak detector liquid:
 - ✓ Place a collection vessel below the check valve.
 - ✓ Open the check valve.
 - ✓ Leak detector liquid flows out at a rate of min. 0.5 L/min.
 - ✓ Line is not blocked.
 - Red light  **A3** is lit and the alarm buzzer **A4** is triggered.
 - External alarm and/or 2nd display unit is triggered.
 - ✓ Close the check valve.
 - ✓ Check the captured leak detector liquid visually for contamination:
 - Leak detector liquid not contaminated → **OK**.
 - ✓ Remove the sensor unit from the LDL tank.
 - ✓ Fill leak detector liquid to the middle of the inspection glass of the LDL tank.
 - ✓ Replace the sensor unit in the LDL tank:
 - Red light  **A3** goes out and the alarm buzzer **A4** is switched off. → **OK**.
 - LDL tank and leak detector liquid → **OK**.

DISPOSAL



To protect the environment, our products may not be disposed of along with household waste.



The product must be disposed of via a local collection station or a recycling station.
D WEEE Register No.: DE 78472800.

TECHNICAL CHANGES

All the information contained in this assembly and operating manual is the result of product testing and corresponds to the level of knowledge at the time of testing and the relevant legislation and standards at the time of issue. We reserve the right to make technical changes without prior notice. Errors and omissions excepted. All figures are for illustration purposes only and may differ from actual designs.

TECHNICAL DATA

Display unit and/or 2nd display unit

supply voltage 	230V AC 50 - 60Hz ± 10% to 15%		
relay output 1 potential-free relay contact	max. switched voltage 250V AC (50 - 60)Hz	max. switched current 1.0A	max. switched power 100VA
safe electric circuit	$U_o = 19.6V$ $I_o = 7.62mA$ $P_o = 37.3mW$		
ambient pressure p_{amb} abs.	0.08MPa (0.8bar) to 0.11MPa (1.1bar)		
sound level alarm sound	min. 70dB(A)		
ambient temp. T_{amb}	-5°C to +50°C		
protection type	IP20 acc. EN 60529		
power consumption P	max. 3.6W		
dimensions	120 x 120 x 50mm		
housing material	PS		
marking ignition protection type	 II (1) G [Ex ia] IIC		
EU-declaration of type approval	EPS 16 ATEX 1 171		
electrical device acc. EN 60335-1	<ul style="list-style-type: none"> • over-voltage category III • contamination degree 2 • protection class type I 		

Technical data for LDL tank and sensor unit

material	PE electrostatically conductive
marking ignition protection type	Ex II 1 G Ex ia IIC Ga
EU-declaration of type approval	EPS 16 ATEX 1 172 U
safe electric circuit	$U_i = 25V$ $I_i = 40mA$ $P_i = 270mW$
nominal volume V_N	10.4L
usable Volume V_a	4.5L
connection Connection line	male thread G 3/4 A
with double sleeve	both sides female thread G 3/4
installation direction	vertical
length of sensor cable	0.5m
permissible ambient temperature T_{amb}	-20°C to +60°C
permissible temp. of operating medium T_{liq}	-20°C to +60°C

WARRANTY

We guarantee that the product will function as intended and will not leak during the legally specified period. The scope of our warranty is based on Section 8 of our terms and conditions of delivery and payment.

**DECLARATION OF PERFORMANCE**

You will find the manufacturer's **declaration of performance** for this product on the website: http://www.gok-online.de/en/certificate/declaration_of_performance.php


**DECLARATION OF CONFORMITY**

You will find the manufacturer's **declaration of conformity** for this product on the website: http://www.gok-online.de/en/certificate/declaration_of_conformity.php

**DECLARATION OF TYPE APPROVAL**

You will find the manufacturer's **declaration of type approval** for this product on the website: http://www.gok-online.de/en/certificate/declaration_of_type_approval.php



INSTALLATION CERTIFICATE FROM SPECIALISED COMPANY	
	To be kept by system operator. Important for any warranty claims.
I hereby confirm that the following safety device(s) was/were installed correctly:	Leak detectorTyp LAG 2000 A Leak detector for systems containing acc. to EN 13160-1/EN 13160-3 (TRbF 501)
We hereby certify that the LAG 2000 A leak detector was installed in accordance with the applicable assembly and operating manual. After it was installed and before start-up, the device was subjected to a function test. On start-up the leak detector functioned properly and as intended. The operator was informed about the operation, maintenance and repair of the LAG 2000 A in accordance with the assembly and operating manual.	
Specialised company is ▶	<input type="checkbox"/> Specialised company according to water law <input type="checkbox"/> (Electrical installations-) company
Device no. LAG 2000 A ▶	
Year of manufacture, LAG 2000 A ▶	
External alarm ▶	
Tank manufacturer ▶	
Year of manufacture/Factory no. of the tank ▶	
Tank storage	<input type="checkbox"/> above ground Norm: _____ <input type="checkbox"/> underground _____
Storage volume ▶	_____ litres
Volume of the monitoring space ▶	_____ litres
Storage operating medium ▶	
Leak detector liquid ▶	
Number of leak detector liquid tanks ▶	_____ units
<input type="checkbox"/> The leak detector was installed as a replacement on an existing underground tank within the scope of TRbF 501. Type (old) _____ Device no. (old) _____	
Address of operator <div style="border: 1px solid gray; height: 150px; width: 100%; background-color: #f0f0f0;"></div>	Address of specialised company <div style="border: 1px solid gray; height: 150px; width: 100%; background-color: #f0f0f0;"></div>
Place, date	Specialised company (stamp, signature)