

Overpressure leak detector

DL – 4000

Z – 65.23 - 309

Documentation DL - 4000

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1. Object

Leak detector for double-wall tanks.

2. Type

DL-4000/500 for tanks with a testing pressure of 500 mbar in the interstitial space.

DL-4000/600 for tanks with a testing pressure of 600 mbar in the interstitial space.

3. Field of application

3.1. Tank (observe chapter 3.3)

3.1.1 Monitoring using Type DL-4000/600

- Underground and aboveground double-wall steel or plastic tanks without leak detection fluid in the interstitial space, manufactured in plant or on site, the interstitial space of which is suitable for connection to a DL-4000 according to the specifications in chapter 4.1.
- Underground and aboveground single-wall steel or plastic tanks fitted with pressure-resistant leak-protection lining or leak-protection cladding, the interstitial space of which is suitable for connection to a DL-4000 according to the specifications in chapter 4.1.

3.1.2 Monitoring using Type DL-4000/500

As described in 3.1.1, however only with underground tanks.

3.2. Material to be stored

Liquids hazardous to water

Any vapour-air mixtures produced through

- the stored liquid
- the stored liquid in connection with air / humidity or condensation
- the stored liquid in connection with components (materials) the liquid comes into contact with

have to be able to be classified in explosion group IIA and II B and temperature class T1 to T3.

3.3. Exclusions

The leak detector must not be used if permeation into the interstitial space takes place on account of the material stored and the material composition of the inner tank wall, which can lead to the formation of an explosive atmosphere in the interstitial space during normal operation.

4. Functional description

The overpressure leak detector DL-4000 monitors both walls of a tank for leaks. The monitoring pressure is so high, that leaks below or above the liquid level (stored material and groundwater) are indicated by a fall in pressure.

In order to build up pressure, external air is suctioned in by means of an integrated pump over a drying filter and fed further to the interstitial spaces.

The drying filter dries the external air to a relative humidity of approx. 10%. This drying is necessary to prevent the accumulation of humidity or condensation in the interstitial space. **Used drying filter fillings must be regenerated or replaced.**

4.1. Minimum and maximum pressure values for the tanks

The following pressure values must be kept for the tanks.

Type	Pressure of the material stored on the base of the tank incl. existing overlay pressure if app.	Pressure of the groundwater on the base of the tank	Testing pressure of the interstitial space
DL-4000/500	max. 300 mbar (max. 4.35 psi)	max. 300 mbar (max. 4.35 psi)	min. 500 mbar (min. 7.25 psi)
DL-4000/600	max. 380 mbar (max. 5.51 psi)	max. 380 mbar (max. 5.51 psi)	min. 600 mbar (min. 8.70 psi)

4.2. Switch values of the leak detector

The following pressure values have been pre-set in the factory:

Type	Alarm ON	OFF	Pump ON	OFF	Overpr. safety device OPEN ¹	CL.
DL-4000/500 (psi)	335^{+10}_{-5} mbar ($4.86^{+0.15}_{-0.07}$)	365^{+25}_{-25} mbar ($5.29^{+0.36}_{-0.35}$)	370^{+25}_{-25} mbar ($5.37^{+0.36}_{-0.36}$)	400^{+10}_{-10} mbar ($5.80^{+0.15}_{-0.15}$)	440^{+10}_{-25} mbar ($6.38^{+0.15}_{-0.36}$)	395 mbar (5.73)
DL-4000/600 (psi)	415^{+10}_{-5} mbar ($6.02^{+0.15}_{-0.07}$)	445^{+25}_{-25} mbar ($6.45^{+0.36}_{-0.36}$)	470^{+25}_{-25} mbar ($6.82^{+0.36}_{-0.36}$)	500^{+10}_{-10} mbar ($7.25^{+0.15}_{-0.15}$)	540^{+10}_{-25} mbar ($7.83^{+0.15}_{-0.36}$)	495 mbar (7.18)

4.3. Normal operation

The overpressure leak detector is connected to the interstitial space (s) via the pressure and measuring pipes. The overpressure produced is measured and controlled by a pressure switch.

When the operating pressure has been reached (Pump OFF) the pump is switched off. Due to unavoidable leakages in the leak detector system the pressure slowly falls again. When the switching value "Pump ON" is reached, the pump is switched back on and the operating pressure built up again.

During normal operation the leak detector fluctuates between these two pressure values with short running times and long standstill times depending on the degree of air-tightness and fluctuations in temperature in the complete equipment.

¹ The value given is the reaction pressure, the opening pressure (blow-off pressure; measuring values from chapter 7.4) is up to 30 mbar higher.

4.4. Air or liquid leak

If there is a leak below or above the level of the liquid or the groundwater, air escapes from the interstitial space. The pressure falls until the overpressure pump is switched on to recreate the operating pressure. If the flow volume of the air flowing through the leak is greater than the flow capacity of the pump the pressure in the system will fall and the pump will work permanently.

An enlargement of the leak leads to a further fall in pressure until the alarm pressure has been reached. The optical and acoustic systems are triggered.

4.5. Drying of the air / drying filter

The air pumped into the interstitial space is guided over a drying filter in the suction pipe. The drying filter dries the air to approx. 10% relative humidity to prevent the accumulation of corrosion and condensation² in the interstitial space.

The drying filter has been designed for use for one year providing it is used for the intended purpose and no additional fluctuations in temperature occur.

A used drying filter becomes colourless, having been orange at first. Regenerate or replace used drying material.

4.6. Overpressure valve

The overpressure valve built into the pressure pipe protects the interstitial space from impermissibly high overpressure (test pressure being exceeded).

Impermissibly high overpressure can occur for example through:

- influences of temperature caused by environmental influences
- increases in temperature through hot filling (consult the manufacturer if appropriate)

4.7. Number of tanks connected (ONLY FOR UNDERGROUND TANKS)

The leak detector can be designed for the connection of several tanks due to the number of exits on the distributor below the leak detector. The number of tanks to be connected depends on the max. volume of the interstitial space. 4 m³ must not be exceeded.

5. Assembly instructions

5.1. Basic instructions

(1) Assembly may only be carried out by a qualified company³.

² Accumulation of condensation in the interstitial space can lead to an impermissible increase in pressure in the interstitial space.

- (2) Heed relevant accident prevention regulations.
- (3) Heed explosion protections measures.

5.2. Personal protective equipment

The parts listed here refer exclusively to safety during work on the equipment which could cause an explosion.

If work is being carried out in areas where an explosive atmosphere is very likely, the following pieces of equipment represent the minimum requirement:

- suitable clothing (danger of electro-static charge)
- suitable tools (according to EN 1127)
- a suitable gas warning device which has been calibrated for the steam-air mixture present (work should only be carried out at a concentration 50% under the lowest explosion limit)⁴

5.3. Assembly of the leak detector

- (1) Usually fitted on the wall with dowel plugs and screws.
- (2) In a dry room or in a suitable protective box in the open.
- (3) Assembly in the protective box: additional external signal or alarm forwarding via potential-free contacts to a control room or similar.
- (4) The leak detection unit must **NOT** be assembled in **potentially explosive areas**.
- (5) The distance between the leak detector and the interstitial space must be kept as small as possible.

5.4. Connecting pipes (between leak detector and tank)

- (1) Metal (usually copper) or plastic pipes (hoses), pressure-resistant, weather and waterproof.
- (2) At least 6 mm clearance, at least 1 mm wall thickness for pipes or 2 mm for hoses.
- (3) Not longer than 50 m, if this is not possible then the cross-section of the pipe/hose must be enlarged using appropriate transition pieces.
- (4) Colour marking:

Measuring line:	red
Pressure line:	white (or clear)
- (5) The cross-section of the pipe must remain intact, indentation and bending⁵ are not allowed.
- (6) Plastic pipes/hoses laid underground or above ground outside must be in a protective outer pipe.

³ For Germany: Qualified company according to § 19I WHG, who has proved its qualification for the assembly of leak detector systems incl. TRbF 180 / 280 no. 1.7.

⁴ Other percentages could be valid depending on country-specific directives.

⁵ If necessary, customary fittings (set bending radii) must be used for the plastic pipes

- (7) Seal the protective pipe gastight.
- (8) Avoid electrostatic charge (e.g. when introducing and pulling through pipes).
- (9) For details about the connection technology refer to worksheet AB-820 500

5.5. Assembly of the drying filter

- (1) As near to the leak detector as possible. If the leak detector is mounted in a protective box, the drying filter can either be mounted in the protective case or outside.
- (2) Horizontal or vertical with suction aperture downwards, using included assembly material.
- (3) Connect the drying filter and the suction fitting of the leak detector using a PVC-hose (or similar).

5.6. Electrical connection

- (1) Voltage supply according to information on type plate
- (2) Firmly laid i.e. no plug or switch connections.
- (3) The regulations of the electric supply company must be heeded⁶.
- (4) Terminal connection: see Technical Data sheet

5.7. Assembly examples

Assembly examples are given in the appendix.

6. Putting into operation / service

- (1) The instructions given in chapter 5 must also be heeded here.
- (2) Should a leak detector be put into operation on a tank which has already been filled, special protective measures must be taken (e.g. check there is no gas in the leak detector and / or interstitial space). Further measures can depend on local conditions and must be evaluated by the operating staff.
- (3) Once the pneumatic connection has been made, make the electrical connection.
- (4) Make sure the "in operation" and "alarm" lamps are lit up and the acoustic alarm is working. Then switch the "acoustic alarm" switch off.
- (5) Connect test cock to the test measuring gauge in position "III".
- (6) The operating pressure shown in the table on page 3 is to be applied to the leak detector system. (Use the assembly pump with a sufficiently large drying filter! or nitrogen pressure store)

⁶ For Germany: also VDE regulations

Build up the pressure using the assembly pump via the pressure line, never via the test cock of the leak detector.

Note: should the pressure not build up with the assembly pump connected, the leak must be located and eliminated (if necessary check the assembly pump for feed capacity or pressure reducer for the correct setting).

- (7) Once the leak detector has reached operating pressure (pump in the leak detector switches off), connect the pressure line again, set test cock to position "I", remove pressure measuring gauge.
- (8) Functional test according to chapter 7.4.

7. Operating instructions

7.1. General instructions

- (1) If the leak detector system is assembled tightly and correctly then it can be assumed that the leak detector is working in the range of control.
- (2) If the pump switches itself on very often or permanently, this is an indication of a leakage which must be eliminated within a reasonable period of time.
- (3) In the case of an alarm there is always either a big leak or a fault. The cause must be established quickly and the problem eliminated.
- (4) The operator must check at regular intervals that the "in operation" lamp is working.
- (5) If the filling in the filter changes colour from orange to colourless it must be replaced or regenerated.
- (6) The leak detector must be disconnected from the mains for any repair work.
- (7) Current interruptions are indicated by the "in operation" lamp going out. The potential-free relay contacts switch.

7.2. Maintenance

- (1) Maintenance work and functional tests may only be carried out by qualified persons ⁷.
- (2) The drying filter must be checked by the owner-operator at regular intervals⁸. If the colour has changed from orange to colourless, the filling in the filter must be replaced or regenerated.
- (3) The leak detector must be checked once every year for functional and operational safety.
- (4) The extent of the annual tests is described in chapter 7.4.
- (5) It must also be ensured that the conditions described in chapter 5 are being observed.

⁷ For Germany: qualified knowledge in the area of assembly and service of leak detection systems or under the responsibility of a qualified person, according to current regulations,

⁸ An interval of at least 2 months is recommended.

7.3. Use for intended purpose

- Underground double-wall tanks, the side of the wall coming into contact with the stored material must be impermeable to substances which could produce potentially explosive vapours.
- Depressurised tank or liquid and overlay pressure must not exceed the max. pressure on the base of the tank
- Tank must be grounded according to valid regulations⁹
- Leak detector system must be airtight according to the table in chapter **Fehler! Verweisquelle konnte nicht gefunden werden.** of this documentation
- Leak detector must be assembled outside the potentially explosive area
- Ducts for the pneumatic hoses must be sealed airtight.
- Leak detector (electric) must not be connected so that it can switch off.

7.4. Functional test

Test of the functional and operating safety must be carried out after

- every start up
- stipulations of chapter 7.2 in the time intervals given there¹⁰
- every case of trouble-shooting

7.4.1 Extent of the test

- (1) If necessary, discuss the tasks to be carried out with the person responsible on-spot.
- (2) Heed the safety instructions regarding contact with the stored goods present.
- (3) Regenerate or replace the filling in the filter.
- (4) Check the through connections in the interstitial space (chapter 7.4.2)
- (5) Test the switching values using the testing device (chapter 7.4.3), alternatively no. (6)
- (6) Test the switching values without using the testing device (chapter 7.4.4), alternatively no. (5)
- (7) Check the overpressure valve using the testing device (chapter 7.4.5), alternatively no. (8)
- (8) Check the overpressure valve without using the testing device (chapter 7.4.6), alternatively no. (7)
- (9) Check air-tightness (chapter 7.4.7)
- (10) Create operating conditions (chapter 7.4.8)
- (11) A qualified person must fill out a test report confirming function and operational safety.

⁹ For Germany: e.g. EN 1127

¹⁰ For Germany: regional-specific legal regulations must also be taken into account (e.g. VAWS)

7.4.2 *Checking the through connections of the interstitial space*

If several interstitial spaces are connected, each individual interstitial space must be checked for through connections:

- (1) If several tanks are connected via a distributor, close all the shut-off cocks on the distributors.
- (2) Connect the measuring gauge to the test cock, set test cock to testing position "III" (see M1-101 400-410)
- (3) Open the Venting device 22.
- (4) Open the shut-off cocks of the first (following) tanks (measuring and pressure line in pairs).
- (5) Determine drop in pressure on the measuring gauge. In case there is no drop in pressure, establish the cause and eliminate it.
- (6) Close the shut-off cocks opened under item (4).
- (7) Repeat items (5) to (7) with each further tank.
- (8) Close the Venting device; test cock in position "I"; remove measuring gauge.
- (9) Open all the shut-off cocks on the distributor which have a tank connected.

7.4.3 *Testing the switching values using the testing device*

- (1) If several tanks are connected via a distributor, close all the shut-off cocks on the distributor.
- (2) Connect the testing device: on the pressure side by screwing the Venting device apart (close pressure line), on the measuring side on the test cock, position "III" (cf. P-115 394)
- (3) Connect the test pressure gauge to the testing device
- (4) Close the needle valve (testing device), the pressure is built up to operating pressure.
- (5) Ventilation via needle valve, establish the switching values "Pump ON" and "Alarm ON" (optical and acoustic alarm) and note the values.
- (6) Close the needle valve and establish the switching values "Alarm OFF" and "Pump OFF". (Sometimes it may be necessary to open the needle valve a little so that a slow increase in pressure takes place.)
- (7) Set test cock to position "I"; connect the pressure line to the leak detector; remove the test pressure gauge.
- (8) Open all the shut-off cocks on the distributor which have a tank connected.

7.4.4 *Testing the switching values without a testing device*

- (1) If several tanks are connected via a distributor, close all the shut-off cocks on the distributor except the cocks on the tank with the smallest volume.
- (2) Connect test pressure gauge to the test cock, position "III".
- (3) Ventilate using Venting device, establish the switching values "Pump ON" and "Alarm ON" (with optical and acoustic alarm), note the values.

- (4) Close the Venting device and establish the switching values "Alarm OFF" and "Pump OFF", note the values.
- (5) Test cock in position "I", remove the test pressure gauge.
- (6) Open all the test cocks on the distributor which have a tank connected.

7.4.5 Checking the overpressure valve using the testing device

- (1) If several tanks are connected via a distributor, close all the shut-off cocks on the distributor.
- (2) Connect the test pressure gauge: on the pressure side by screwing the Venting device apart (close pressure line to the tank), on the measuring side on the test cock, position "II".
- (3) Open the needle valve until the pump starts to run.
- (4) Set test cock to position "IV"
- (5) Close the needle valve and establish the opening pressure¹¹ of the overpressure valve, note the value.
- (6) Set test cock to position "III" (pump switches off).
- (7) Establish the closing pressure of the overpressure valve (no further drop in pressure), note the value.
- (8) Set test cock to position "I"; screw the Venting device together below the leak detector; remove the test pressure gauge.
- (9) Open all the test cocks on the distributor which have a tank connected.

7.4.6 Checking the overpressure device without testing device

- (1) If several tanks are connected via a distributor, close all the shut-off cocks on the distributor except the cocks on the tank with the smallest volume.
- (2) Set test cock to position "II", (pressure switch is ventilated). pump switches on and the alarm is triggered.
- (3) Connect the test pressure gauge to the test cock, then turn the test cock clockwise through 90° into the testing position "IV" (pressure switch is "blinded", i.e. pump is not switched off).
- (4) Wait for the opening pressure¹¹ of the overpressure valve (note the value), **should the test pressure of the interstitial space reach 500 mbar (DL-4000/500) or 600 mbar (DL-4000/600) during this process, the test must be aborted immediately, the pressure reduced and the overpressure valve replaced.**
- (5) After the opening pressure has been reached (no further increase in pressure), set the test cock to position "III".
- (6) The pump switches off, establish closing pressure of the overpressure valve¹², note the value.

¹¹ In the switching values table the reaction pressure of the overpressure valve is given, the (measured) opening pressure can be up to 30 mbar higher

- (7) Set the test cock to position "I", remove the test pressure gauge.
- (8) Open all the test cocks on the distributor which have a tank connected.

7.4.7 Testing the air-tightness

- (1) Check that all the shut-off cocks with tanks connected are open.
- (2) Connect the test pressure gauge to the test cock, position "III".
- (3) Once the pressure has been equalised, the air-tightness test can begin. It is to be evaluated as positive if the values remain within those given in the following table.

Volume of interstitial space in litres	Max. 1 mbar (0.015 psi) fall in pressure in
250	15 minutes
500	30 minutes
1000	1.0 hour
1500	1.5 hours
2000	2.0 hours
2500	2.5 hours
3000	3.0 hours
3500	3.5 hours
4000	4.0 hours

- (4) To determine any leaks in the tanks or in the connecting lines it is recommended to subject each separate interstitial space to a test for air-tightness. To do this, simply open only the shut-off cocks of the tank concerned, closing all the others.
- (5) Set test cock to position "I", remove the test pressure gauge.

7.4.8 Establishing the operating condition

- (1) Seal the housing and the "acoustic alarm" switch.
- (2) Shut-off cocks for every connected tank must be in the "open" position.

7.5. Alarm

- (1) In case of alarm the red signal lamp 1 lights up red and the acoustic signal 69 sounds.

¹² If the pump should switch on before the closing pressure is reached the cause must be determined and eliminated.

- (2) Remove the lead on the "acoustic alarm" switch, turn off the acoustic alarm and inform a qualified company immediately.
- (3) The expert from the qualified company or the operator must establish why the alarm was triggered, eliminate the problem and then check that the leak detection system is functioning correctly as described in section 7.4.

8. Dismantling

Special attention must be paid to the following points when dismantling equipment which could be potentially explosive:

- Check there is no gas around before and during work.
- Close openings through which an explosive atmosphere can escape absolutely gastight.
- Do not carry out dismantling work with tools which cause sparks (saw, parting-off grinder...). If it should be unavoidable, pay particular attention to EN 1127.
- Avoid electro-static charge (e.g. caused by rubbing plastic components or wearing unsuitable working clothes).
- Dispose of contaminated components (possible gas evolution) properly.

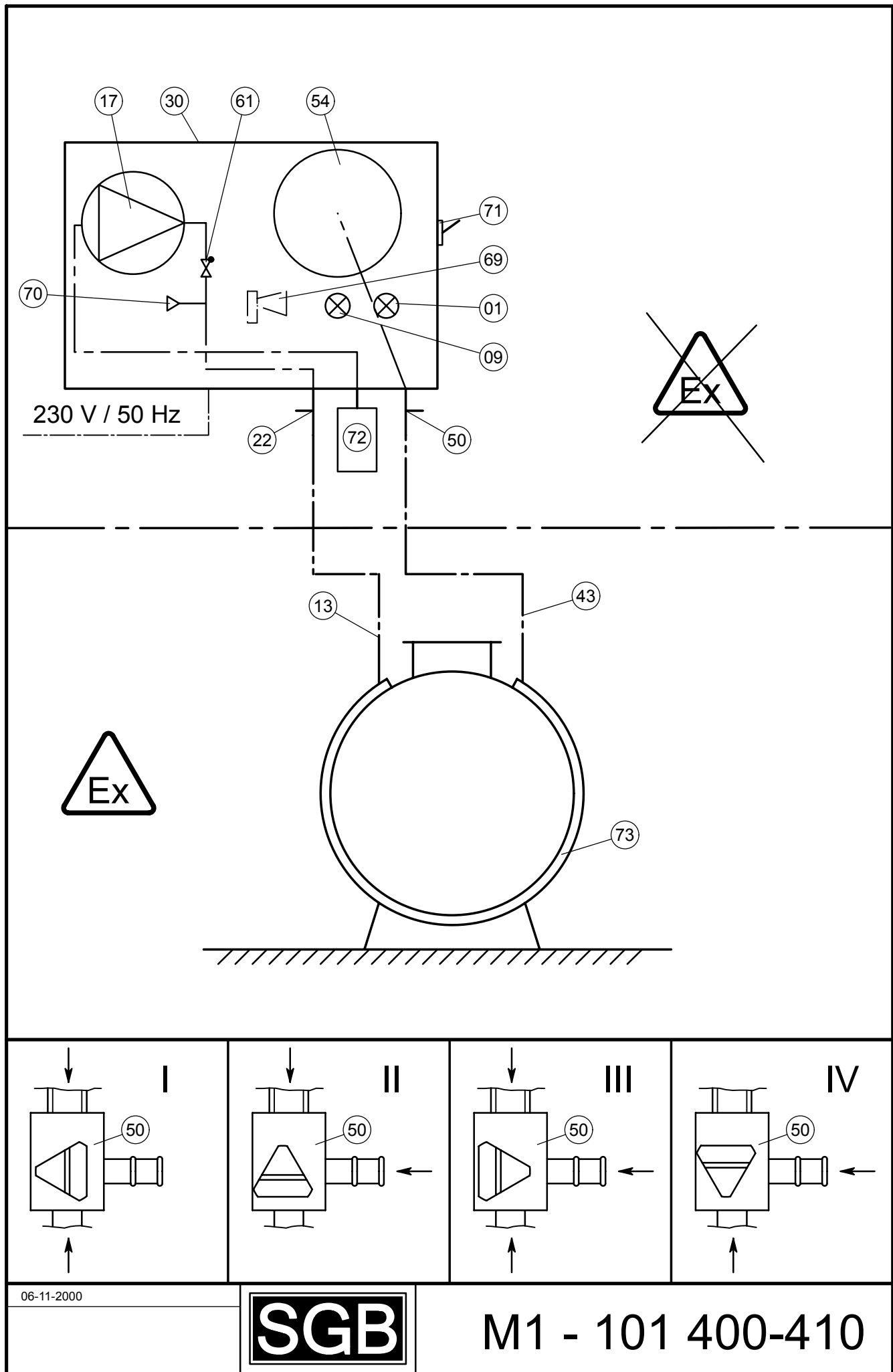
9. Marking

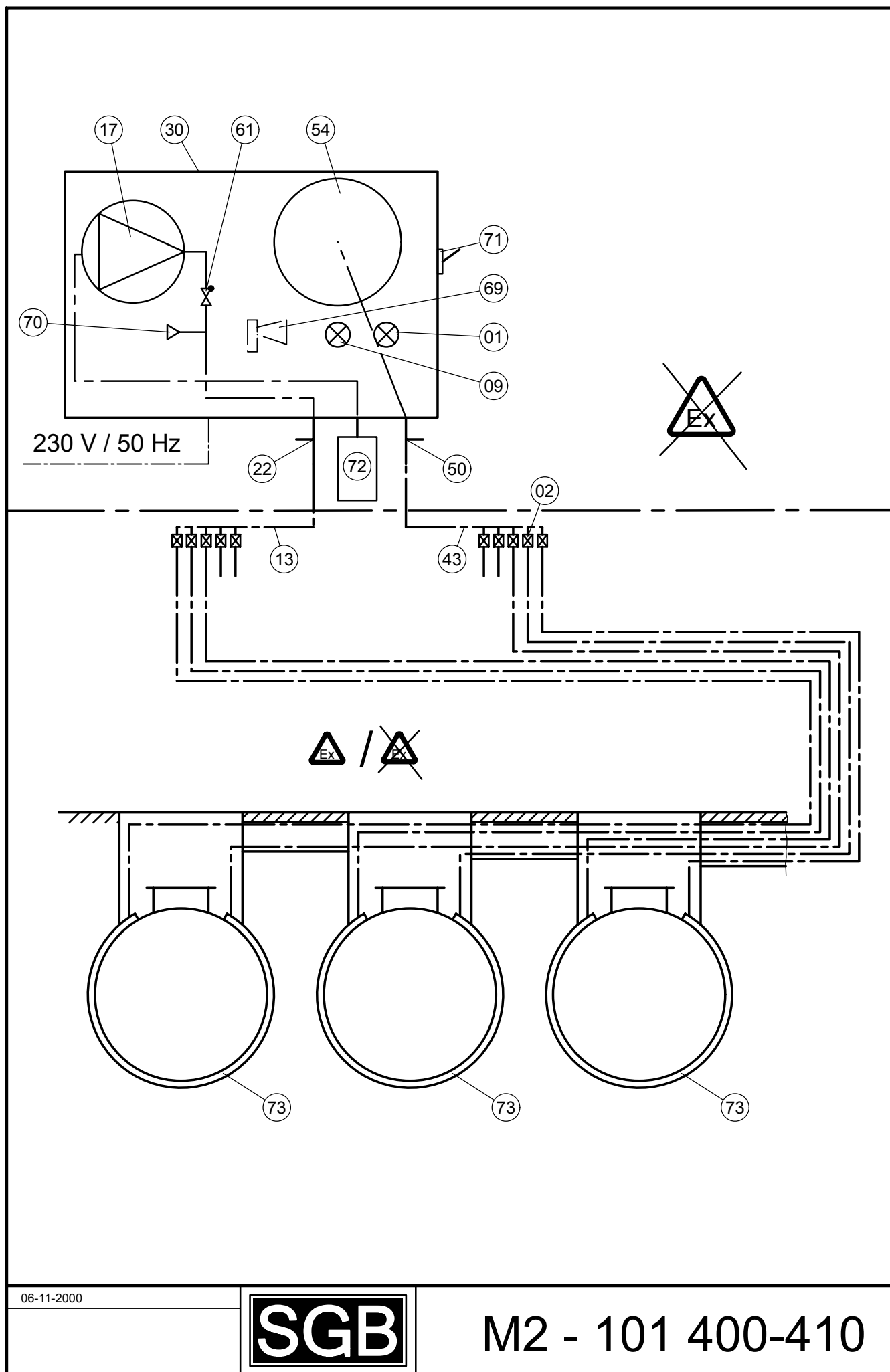
- Electrical data
- Serial number
- Type description
- Date of manufacture (month / year)
- Manufacturer's mark
- Statutory marks
- Pressure and measuring lines can be connected to areas requiring category 3 (Group II (G)) devices.

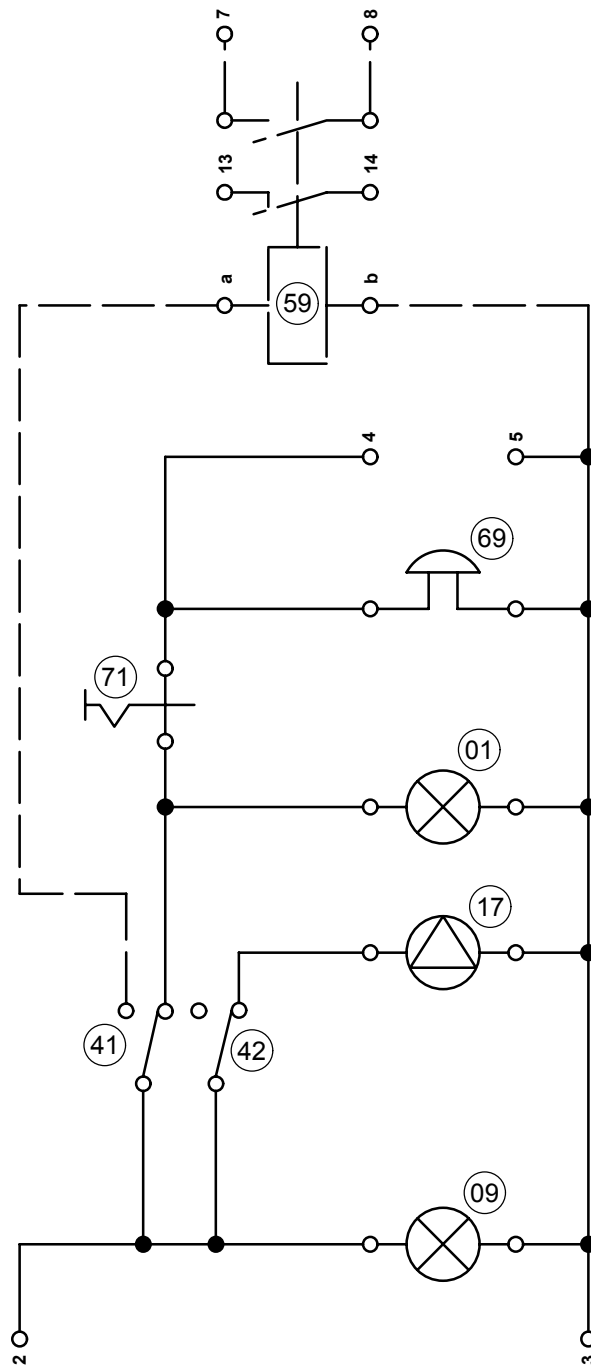
10. Abbreviations

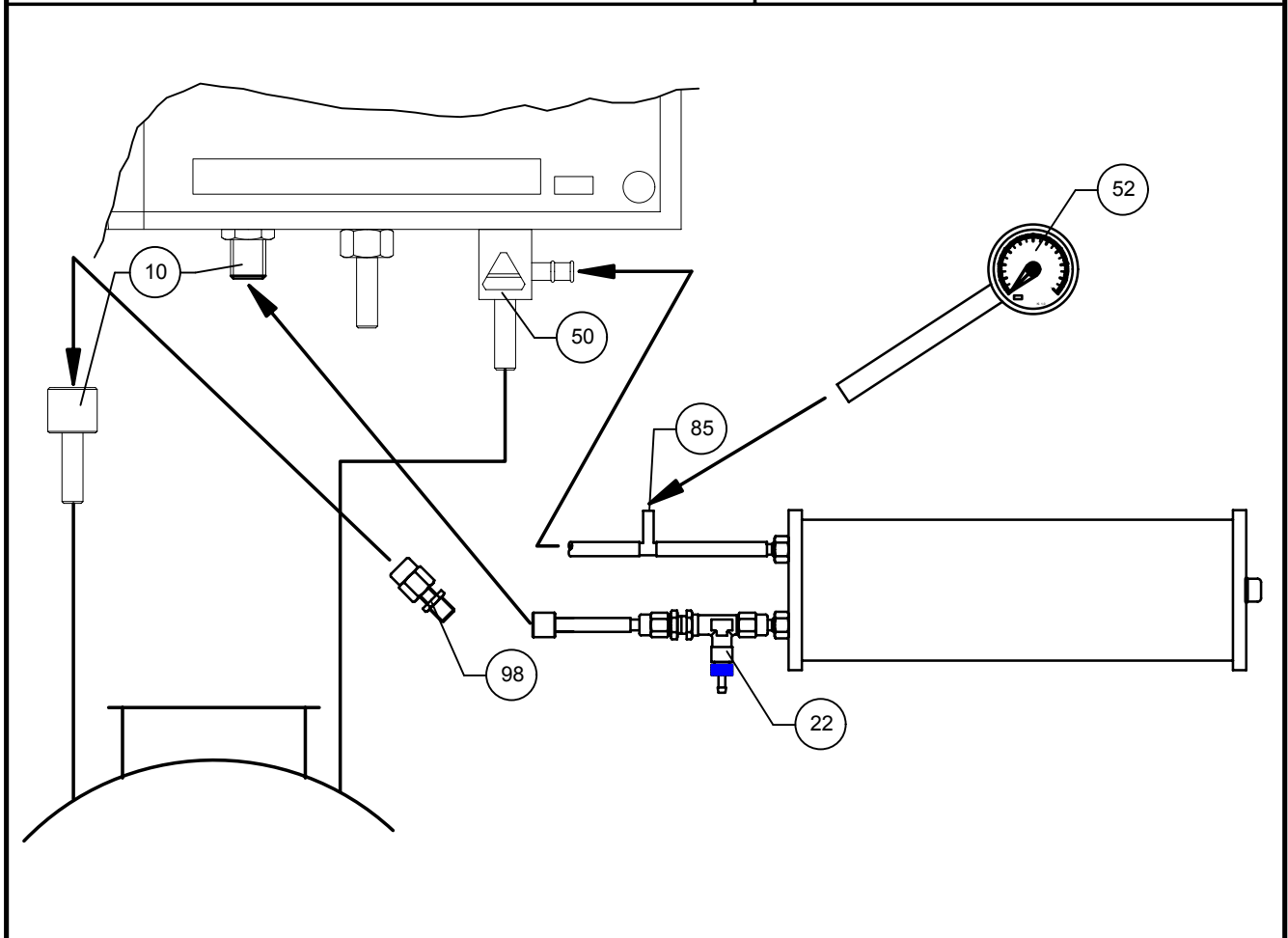
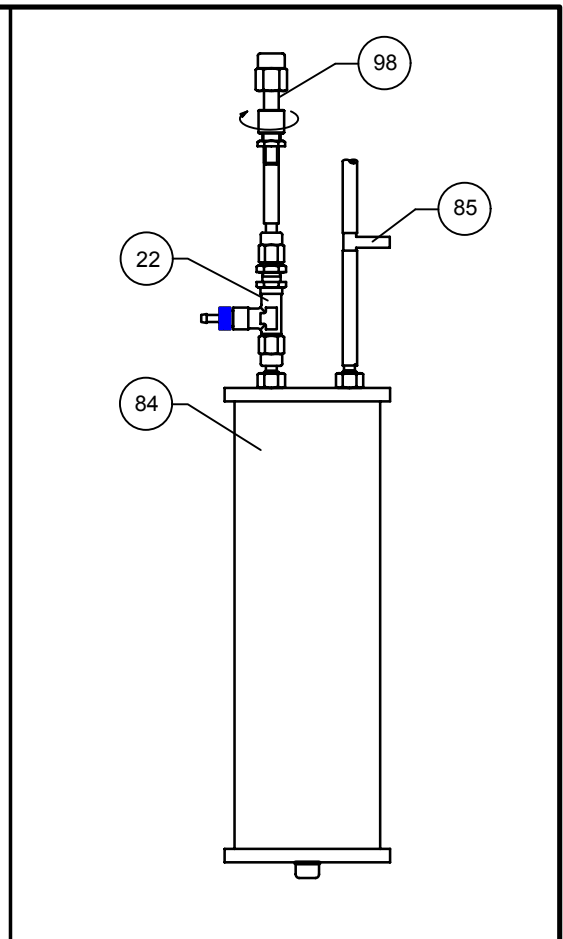
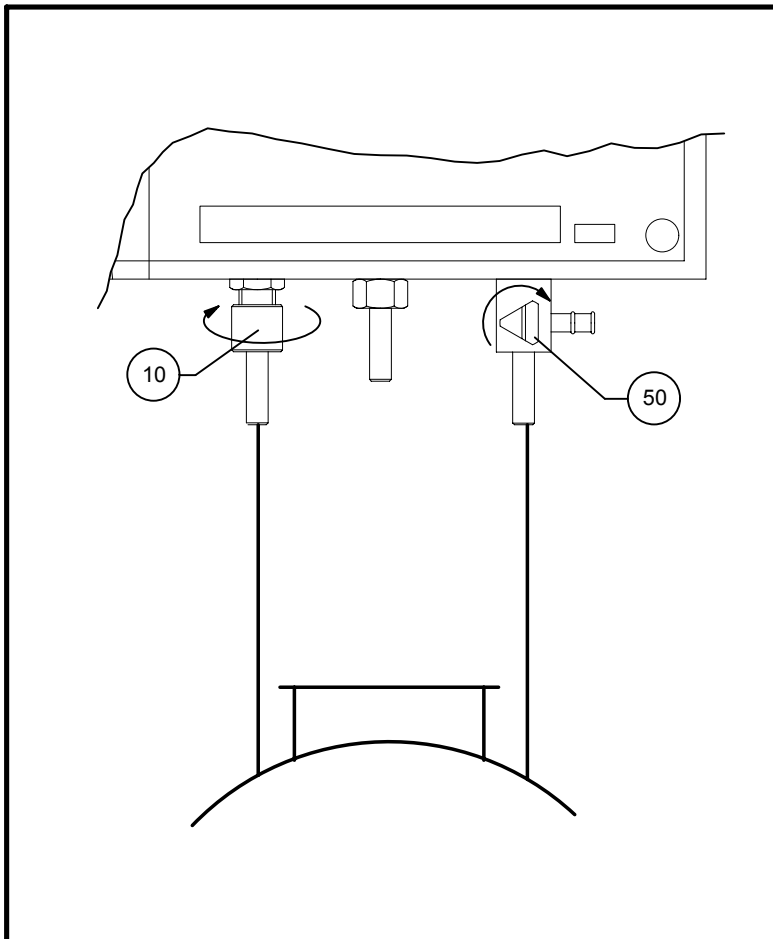
01	Signal lamp "alarm", red
02	Shut-off cock
09	Signal lamp "in operation", green
13	Pressure line
17	Overpressure pump
22	Venting device
30	Housing
41	Alarm switch in 54
42	Pump switch in 54
43	Measuring line
50	Test cock
54	Overpressure switch

- 59 Relay (optionally available)
- 61 Reflux barrier with filter
- 69 Buzzer
- 70 Overpressure valve
- 71 "Acoustic alarm" switch
- 72 Drying filter
- 73 Interstitial space
- 84 Test tank 1 litre
- 85 Test muff for pressure gauge









Technical data**1. Electrical data (voltage version: see type plate!)**

Electrical supply (without external signal)	230 V – 50 Hz – 60 W 115 V – 60 Hz – 60 W 24 V (=) - 25 W 12 V (=) - 25 W
Switch contact load, terminal strips AS	max. 50 VA
Switch contact load, potential-free contacts	max.: 230 V – 50 Hz – 8 A min.: 5 V – 5 mA
External fuse of the leak detector	max. 10 A
Overvoltage category	2

1.1. Terminal assignment ~

- 2 Phase
- 3 Neutral
- 4 & 5 External signal (voltage in case of alarm)
- 7 & 8 Potential-free contacts, contact open in case of alarm (and power failure)

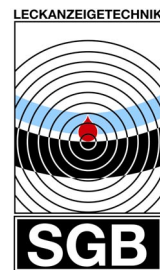
1.2. Terminal assignment =

- 2 Plus +
- 3 Minus -
- 4 & 5 External signal (voltage in case of alarm)
- 7 & 8 Potential-free contacts, contact open in case of alarm (and power failure)

2. Pneumatic data (requirements concerning the test measuring gauge)

Nominal size	mind. 100
Accuracy class	mind. 1.6
Scale end value	600 mbar

Drying filter for DL-4000

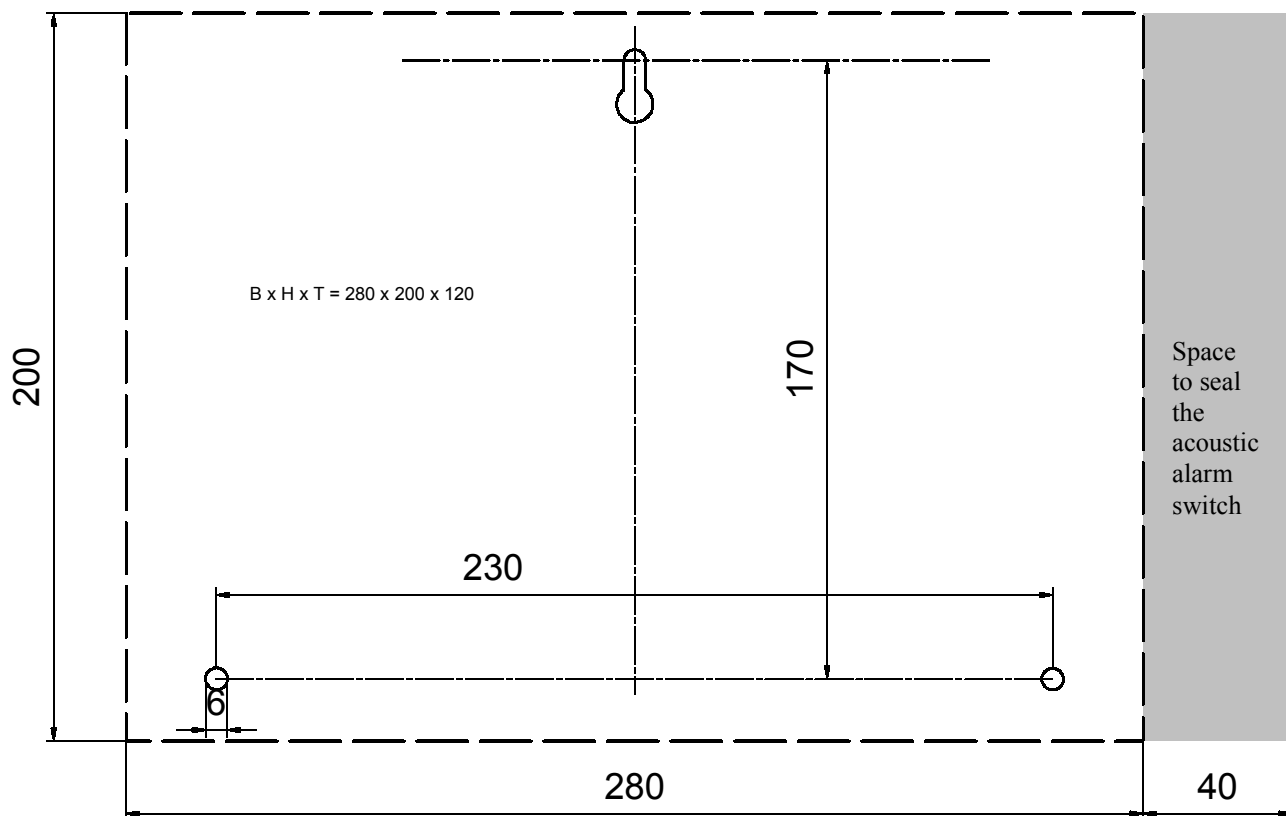


Size of drying filter for underground tanks:

TF 180

Size of drying filter for aboveground tanks:

TF-Type:	TF 180	TF 1	TF 2	TF 6
Volume of interstitial space:	$\leq 200 \text{ l}$	$\leq 500 \text{ l}$	$\leq 1500 \text{ l}$	$\leq 3500 \text{ l}$



Work Sheet: AB-820 500

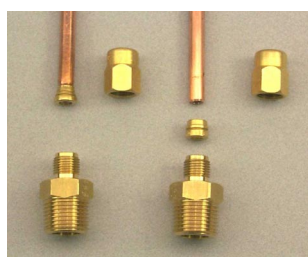
Pneumatic connections

1 Flare type fitting for flare type pipes

1. Lubricate the O-rings
2. Place the intermediate ring loosely in the threaded connection piece
3. Push the union nut and the thrust collar over the pipe
4. Tighten the union nut manually
5. Tighten the union nut until clearly increased force is needed
6. Finished assembly: turn by a further $\frac{1}{4}$ of a revolution



2 Clamping ring threaded fitting for plastic and metal pipes



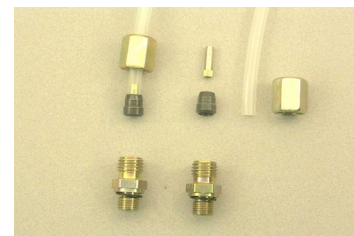
1. Insert the support sleeve into the end of the pipe
2. Insert the pipe with support sleeve as far as it will go
3. Tighten the thread until strong resistance can be clearly felt
4. Lightly loosen the nut
5. Tighten the nut until resistance can be felt (nut must exactly match the thread of the basic body)



3 Olive threaded fitting for plastic and metal pipes

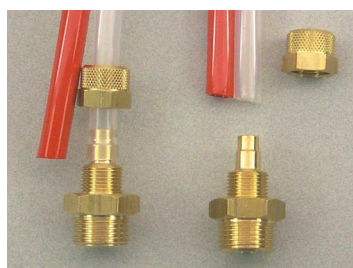


1. Insert the reinforcing sleeve into the end of the pipe
2. Knock in the reinforcing sleeve
3. Push the union nut and the olive over the end of the pipe
4. Screw the union nut by hand until you feel a stop
5. Press the pipe against the stop in the inner cone
6. Tighten the union nut by approx. 1.5 revolutions (pipe must not turn)
7. Loosen the union nut: check whether the pipe visibly projects from under the cutting ring (it doesn't matter if the clamping ring can be turned)



8. Retighten the union nut using normal force

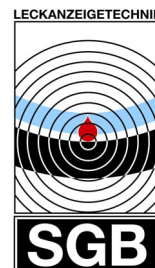
4 Quick-action fitting for PA- and PUR-tubes



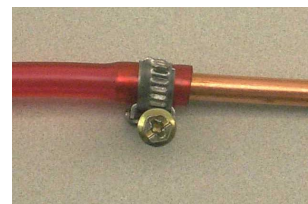
1. Make a right-angled cut in the PA pipe
2. Loosen the union nut and push it over the end of the pipe
3. Push the pipe onto the nipple up to where the thread begins
4. Tighten the union nut by hand
5. Further tighten the union nut using a wrench until clearly increased force is needed (approx. 1 to 2 revolutions)

NOT suitable for PE-pipes

Pneumatic connections



5 Tube connections (socket 4 and 6 mm for EXCESS PRESSURE)



1. Push wire or screw clip over the tube
2. Push the tube onto the Cu pipe or the tube socket (if necessary heat or dampen PVC tube), tube must fit tightly all the way round
3. Wire clip: clamp tightly using pliers and push onto the joint
Screw clip: push the clip over the joint and tighten it using a screwdriver, care must be taken that the clip is a smooth tight fit.

6 Tube connections (socket 4 and 6 mm for VACUUM)

For vacuum applications where there is no excess pressure on the connection lines even in the case of a leakage proceed as in item 5, but without clips.

For vacuum applications where excess pressure could arise in the case of a leakage, proceed as in Item 5.

DEUTSCHES INSTITUT FÜR BAUTECHNIK

Anstalt des öffentlichen Rechts

(German Institute for Constructional Engineering)

10829 Berlin, June 02, 1999
Kolonnenstraße 30 L
Telephone: (030) 78730-315
Telefax: (030) 78730-320
Ref.: V 16-1.65.23-32/99

General Approval of the Building Inspection Authorities

Approval no.: Z-65.23-309

Applicant: Sicherungsgerätebau GmbH
Hofstr. 10
D-57076 Siegen

Subject of approval: Leak detector type "DL-4000/." forming part of a leak detector device for double-wall tanks made from steel or plastic used for the storage of liquids hazardous to water, functioning according to the overpressure system

Validity: July 31, 2006

The Building Inspection Authorities herewith issue general approval for the a/m device. The present approval comprises five pages and two appendices.

I. SPECIAL PROVISIONS

1 Subject of approval and field of application

- 1.1 The subject of this general approval is an overpressure leak detector of the type designation "DL-4000/.", which comprises a pressure absorber, a pressure-controlled pump and an overpressure valve as well as a leak signalling unit issuing optical and acoustic alarms. Leaks in the walls of the interstitial space are registered by means of falls in pressure and then indicated optically and acoustically (for the design of the leak display units see Appendix 1).
- 1.2 Depending on the individual version, the leak detector may be connected to interstitial spaces of underground and aboveground double-wall tanks made of steel or plastic as well as underground and aboveground single-wall tanks made of steel or plastic fitted with pressure-resistant leak protection lining or leak-protection cladding suitable for storing liquids which are hazardous to water. These are mainly interstitial spaces of tanks according to DIN 6608-2¹, DIN 6616², 6619-2³ or DIN 6623-2⁴ with a proof of application approved by the Building Inspection Authorities according to the serial numbers 15.2, 15.3, 15.8 and 15.10 of the Building Regulations List A Part 1 without leak detector liquid or those with a general approval from the Building Inspection Authorities. The interstitial space must be suitable for the connection of this leak detector. The pressure of the stored material on the base of the tank including any overlay pressure must not exceed 300 mbar for the overpressure leak detector type "DL-4000/500" and 380 mbar for the type "DL-4000/600". The overpressure leak detector has an alarm overpressure limit of at least 330 mbar for type "DL-4000/500" and at least 410 mbar for the type "DL-4000/600". If the leak detector is connected to double-wall tanks with general approval from the Building Inspection Authorities, the pressures laid down in the approval must be observed.
- 1.3 This present general approval only serves to prove the functional safety of the subject of approval in the sense of paragraph 1.1.
- 1.4 The present general approval is granted regardless of testing or approval reservations of other legal areas (e.g. 1st Directive to the device safety law - low-voltage guideline -, Law governing electromagnetic compatibility of devices - EMVG guideline, 11th Directive to the device safety law - explosion protection directive -).
- 1.5 This general approval of the building authorities means that the determination of suitability and type approval of the subject of approval in terms of water regulations according to § 19 of the Water Resources Law is not applicable.

¹ DIN 6608-2: Liegende Behälter (Tanks) aus Stahl, doppelwandig, für die unterirdische Lagerung wassergefährdender, brennbarer und nichtbrennbarer Flüssigkeiten - Ausgabe September 1989
(*Horizontal tanks made of steel, double-wall, for underground storage of liquids hazardous to water, flammable and inflammable - Issue September 1989*)

² DIN 6616: Liegende Behälter (Tanks) aus Stahl, doppelwandig, für die oberirdische Lagerung wassergefährdender, brennbarer und nichtbrennbarer Flüssigkeiten - Ausgabe September 1989 - Form A
(*Horizontal tanks made of steel, double-wall, for aboveground storage of liquids hazardous to water, flammable and inflammable - Issue September 1989 - form A*)

³ DIN 6619-2: Stehende Behälter (Tanks) aus Stahl, doppelwandig, für die unterirdische Lagerung wassergefährdender, brennbarer und nichtbrennbarer Flüssigkeiten - Ausgabe September 1989
(*Vertical tanks made of steel, double-wall, for underground storage of liquids hazardous to water, flammable and inflammable - Issue September 1989*)

⁴ DIN 6623-2: Stehende Behälter (Tanks) aus Stahl, doppelwandig, mit weniger als 1000 Liter Volumen, für die oberirdische Lagerung wassergefährdender, brennbarer und nichtbrennbarer Flüssigkeiten - Ausgabe September 1989
(*Vertical tanks made of steel, double-wall, with a volume of less than 1000 litres for aboveground storage of liquids hazardous to water, flammable and inflammable - Issue September 1989*)

2 Regulations applicable to the subject of approval

2.1 Composition

- 2.1.1 The overpressure leak detector of the type "DL-4000/." comprises a pressure absorber, a pressure-controlled pump and an overpressure valve as well as a leak signalling unit issuing optical and acoustic alarms
- 2.1.2 The proof of functional safety of the subject of approval is assured by the "Zulassungsgrundsätzen für Leckanzeigergeräte für Behälter (ZG-LAGB)" (*"Principles for Approval for Leak Detection Devices for Tanks"*) issued by the German Institute for Constructional Engineering in August 1994.

2.2 Manufacture and marking

2.2.1 Manufacture

The leak detector shall be manufactured only in the applicant's manufacturing shops. Its design, dimensions and materials shall be in accordance with the specifications described in appendix 2 of the present general approval.

2.2.2 Marking

The manufacturer shall place the conformity mark on the leak detector, on the packing of the leak detector or on the delivery note. The conformity mark shall be in accordance with the relevant codes of the different states. Such marking is only valid if the conditions as per paragraph 2.3 have been complied with. In addition, the leak detector shall be marked with the following data:

Type designation
Approval number.

2.3 Certificate of conformity

2.3.1 General

Conformity of the leak detector with the provisions of the present general approval must be confirmed by the manufacturer's certificate of conformity, issued on the basis of in-house inspection and testing and an initial testing of the leak detector by an authorised technical control board.

2.3.2 In-house inspection and testing

The manufacturer shall implement and carry out in-house inspection and testing.

In the course of such in-house inspection and testing, every leak detector or its components shall be checked. Such individual checks shall ensure that materials, dimensions, tolerances and design correspond to the approved sample, and that the leak detector is reliable.

The results of in-house inspection and testing shall be recorded and evaluated. The records should contain the following details as a minimum:

- designation of the leak detector
- type of in-house inspection and testing
- date of manufacture, inspection and testing of the leak detector
- results of inspection and testing
- signature of the person responsible for in-house inspection and testing.

The records shall be kept on file for at least 5 years. Upon request, they shall be presented to the German Institute for Constructional Engineering and the Building Inspection Authorities.

In the event of inadequate test results, the manufacturer shall immediately take appropriate remedial action. Leak detectors that do not meet the requirements shall be separated so as to avoid confusion with satisfactory units. After repair (if possible and necessary from a technical point of view), the leak detector shall be re-tested.

2.3.3 Initial testing of the leak detector by an authorised technical control board.

Initial testing shall comprise the functional checks as defined in the approval principles for leak detectors on tanks. If the general approval of the Building Inspection Authorities includes checking of samples from current production, initial testing as described herein is not necessary.

3 Conditions relating to the design

- 3.1 A leak detector with the type designation "DL-4000/." may be used for tanks according to section 3.1 of the Technical Description⁵ with general approval by the building authorities.
- 3.2 When selecting the leak detection devices care must be taken that the leak detector and the interstitial spaces of the double-wall tanks made of steel or plastic as well as the single-wall tanks made of steel or plastic with pressure-resistant leak protection lining or leak-protection cladding are sufficiently resistant to the liquids to be stored.

4. Conditions relating to the construction of leak detectors

- 4.1 (1) Leak detectors should be installed in accordance with paragraph 6 of the technical specification¹ and commissioned in accordance with paragraph 6 of this technical specification. Installation, maintenance, repair and cleaning of the leak detectors shall only be carried out by specialist companies as per § 19 I of the Water Resources Law.
(2) Carrying out of installation, maintenance, repair and cleaning work by specialist companies is not required if such work is exempted from these rules, or if such work is carried out by in-house experts.
- 4.2 The possible groundwater and catchment water level must not be more than 3.00 m in the case of "DL-4000/500" or 3.80 m in the case of type "DL-4000/600" above the base of the tank.
- 4.3 The interstitial space must not contain any leak detection fluid. The leak detector may be used with tanks suitable for storing liquids hazardous to water whose flash point is < 5 °C, but must not be set up and operated in potentially explosive areas.
- 4.4 The leak detector must not be used if permeation into the interstitial space takes place on account of the material stored and the material composition of the inner tank wall, which can lead to the formation of an explosive atmosphere in the interstitial space during normal operation.
- 4.5 The leak detector type DL-4000/500 is only suitable for underground tanks. Several underground tanks can be connected together by means of a distributor; the interstitial space must not exceed a maximum volume of 4 m³, however.
- 4.6 The leak detector must be installed in a dry room or in the open in a suitable protective box. If it is not operated in a dry room, it has to be arranged in a switch box or switch cupboard which complies at least with protection type IP 54. The protective box must be installed in such a way that the leak detector cannot cool down to below -5°C or be fitted with a thermostat-controlled heating device.

⁵ The technical description "Leak Detector DL-4000" of the applicant dated 15th May 2001 approved by TÜV Nord e.V.

5. Provisions concerning use, maintenance and regular checks

The leak detector must be operated and maintained according to paragraph 7 of the technical specification¹. The technical specification⁶ should be part of the manufacturer's supply.

By order

Strasdas

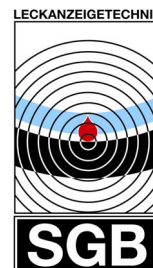
Official seal

Deutsches Institut für
Bautechnik

*German Institute for
Constructional Engineering*

⁶ Technical specification "European Leak Control ELC" of the applicant issued on March 23, 1999, tested by the TÜV Nord e.V.

DECLARATION OF CONFORMITY



This declaration applies for

PRESSURE LEAK DETECTORS DL-4000, DL-5, ELC

from the Company **Sicherungsgerätebau GmbH**
Hofstraße 10
D- 57076 Siegen

With this declaration, SGB confirms that the leak detector specified above fulfills the protection requirements established in EC Guideline 89/336/EEC for alignment of the legal regulations of the member states regarding electromagnetic compatibility and in the German law on electromagnetic compatibility (EMC) dated 9 November 1992 (§ 4 Para. 1).

This declaration applies for appliances produced according to the documentation (technical description, drawing(s) – which are constituents of this declaration.

The following declarations were used for evaluation of the products in terms of its electromagnetic compatibility:

- EN 55 014-1:1998+A1:1999
- EN 55 014-2: 1998, Cat. I
- EN 61 000-3-3: 1995
- EN 61 000-3-2: 1997
+ A1:1998 + A2:1998

With this declaration, SGB confirms that the leak detector specified above fulfills the protection requirements established in EC Guideline 73/23/EEC for alignment of the legal regulations of the member states regarding electrical operating equipment for use within certain voltage limits and defined in the 1st Code on the Equipment Protection Law dated 11 June 1979.

The following declarations were used for evaluation of the products in terms of use within certain voltage limits:

- EN 60 335-1:1988
- EN 61 010-1:1993 (IEC 1010-1:1990 + A1:1992, modified)

With this declaration, SGB confirms that the leak detector specified above fulfills the protection requirements established in EC Guideline 94/9 EEC for alignment of the legal regulations of the member states for equipment and protective systems for intended use in explosion hazard areas or in the 2nd Code on the Equipment Protection Law dated 12 December 1996.

The leak detector may be connected with its pneumatic components to monitoring chambers of tanks requiring equipment regarding category 3.

This declaration applies for appliances produced according to the documentation in accordance with internal QM documentation (technical description with drawings) – which are constituents of this declaration.

Evaluation of the product was accomplished. The following documents were used for this purpose:

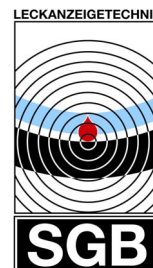
- EN 1127-1:1997
- EN 13463-1:2001
- EN 13160-1:2003

The ignition hazard analysis / risk evaluation indicated no further hazards.

Siegen, 4 July 2003

Martin Hücking, Development, Explosion-protection representative

Warranty



Dear customer,

You have purchased a high-quality leak detector from our company.

All of our leak detectors undergo a 100% quality control examination.

The type plate with the serial number is only affixed after all test criteria have been complied with.

The **warranty period** for our leak detectors is **24 months**, beginning on the date of installation on site.

The maximum warranty period is 27 months from our date of sale.

Our warranty will be effective only if the customer submits to us the functional report or test report on initial putting into service, prepared by a recognised company specialised in water and water protection systems, including the serial number of the leak detector.

Our warranty shall not apply in the event of faulty or improper installation or improper operation, or if modifications or repairs are carried out without the manufacturer's consent.

In case of malfunction, please contact your local specialist company:



Stamp of the specialist company

Yours sincerely



Sicherungsgerätebau GmbH
Hofstraße 10 - D - 57076 Siegen

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