Underpressure leak detector

VL – H9

Z – 65.22 - 110

Documentation VL-H9

Art. No.: 601 602
Status: 01/2005

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for Documentation of the
Vacuum Leak Detector VL - H9

The following safety instructions must be observed and complied with at all times. They replace or supplement the information provided in the documentation.

These safety instructions are have been made necessary based on the ignition hazard assessment carried out by SGB in accordance with Directive 94/9/EEC.

1. To section 3.3 “Stored Material”

The following has been added:

All vapor-air mixtures, even those which stem from

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

must be able to be classified in gas group II B3 and in temperature code T3/T4.

2. To section 6.2.1 “Installation of the Leak Detector VL-H9/Ex and the Working units VL-H9/A-..-Ex”

Section (1) has been added, sections (3) and (4) have been rewritten and section (5) has been added:

(1) ...
Chose a mounting place, where the ventilation in the housing (by convection) between the flange plate (be distant to the housing) and the vent opening is not being effected.

(3) To avoid excessive heating, the leak detector must not be installed directly next to a heat source.
The ambient temperature must not exceed 40°C; appropriate measures must be taken. (e.g. installation of a roof to protect against sunlight).
If the leak detector VL-H9/Ex is operated with an alarm horn in the explosion area, **the operator must ensure** that a 70% duty cycle is not exceeded, i.e. the acoustic alarm must be switched off within 45 minutes.

(4) If the leak detector is installed in an enclosed space, it must be well ventilated. The operator shall apply EN 60 079-10 as a basis for evaluation.

(5) Neither the leak detector VL-H9/Ex nor the working units may be installed in a protective box. If this should nevertheless be necessary for operational reasons, the protective box must be ventilated in a way that the ventilation as mentioned in sec. (1) is not being effected.

3. To section 6.3 “Installation of the Pneumatic Connecting Lines”

Section (5) has been rewritten, sections (10) and (11) have been deleted and section 6.3.1 “Installation of the Exhaust Line” has been added.

(5) Strong, metallic pipes must be used for the connecting lines (e.g. copper pipes). Plastic pipes with sufficient pressure resistance (over the entire temperature range) may also be used if the interstitial space is zone 1.

6.3.1 Installation of the Exhaust Line

(1) The following lengths may not be exceeded for the exhaust line:
Pipe with 4 mm inside clearance: max. 35 m
Pipe with 6 mm inside clearance: max. 50 m
If these lengths are not sufficient, the manufacturer must be consulted.

(2) The exhaust line is generally routed to the tank vent, in which case an explosion protection device must be installed on the tank vent side.
Exceptions:
Tanks with interior overlay pressure, tanks according to DIN 4119 with double-layered floor, or comparable:

A) The exhaust line can lead outside to a safe area, outside of the explosion area: Provide a condensate trap and liquid stop valve in the exhaust. The area within 1 m diameter of the end of the exhaust is considered as having zone 1 conditions; attach a warning sign if necessary.

B) The exhaust ends in zone 1 (e.g. remote fill chamber or collection space):
An explosion protection device[1] must be provided at the end of the exhaust line. Condensate traps must be provided at low points; a liquid stop valve is not required if the end of the exhaust is in an area which is made liquid-tight according to water protection laws.

(3) Caution: An exhaust line which ends outdoors must not in any circumstances be used to detect leaks (e.g. by “sniffing”). Attach warning signs if necessary.

4. To section 6.5 “Installation of the Electrical Connecting Lines between the working unit and the (Central) Monitoring Device”

6.5.1 “Grounding and Equipotential Bonding” has been added to this section.

(1) The housing of the leak detector must be connected to the equipotential bonding of the overall system by means of the ground stud provided for that purpose.

(2) The fittings in the connecting lines must likewise be integrated into the equipotential bonding, especially when plastic pipes (connecting lines to tanks) have been used.

(3) Before replacing a leak detector (working unit), disconnecting lines or similar work, it must be ensured that the equipotential bonding remains intact (if necessary, pull electrically conducting bridges).

[1] The explosion protection device is not required if the exhaust is routed so that it is frostproof, and it can be guaranteed that the exhaust will not become kinked or clogged.

5. Zu Kap. 6.7 „Montage der elektrischen Verbindungsleitung zwischen Leckagesonde und Meldeeinheit VL-H9/ME-MV-LS“

(1) (1) has been added to:
legal external capacity 640 nF
legal external Inductivity 3 mH

6.7.1 „Installation of the leakage probe“ has been added to this section

(1) These comments, with regard to the risk-analysis are for a leakage probe without coating, type FTL 10 maufactured by Endress und Hauser, and a controlling device Typ FTL 325 N.

(2) In general the leakage probe is installed in the installation kit.

(3) The leakage probe has be installed in accordance to the valid Standards and regulations (e.g. IEC 79-14).

(4) The temperature at the probe (liquid temperature) shall not exceed 85°C.

(5) The ambient temperature of the liquid probe shell not exceed 60°C.

(6) Use a suitable line entrance for connection the probe (see EN 60079 Kap. 10.3)

(7) To observe the system of protection IP 66/67, the cover of the probe’s housing and the line connection has to be installed profesionally. Not used entrances shall be closed with suitable (Ex-d)-approved plug.

6. To section 8.1 “General Notes”

(3) to (5) has been added to this section:

(3) To clean the leak detector VL-H9/Ex or the working unit VL-H9/A-..-Ex, use a moist cloth.

(4) For exchange or repair-work take care that the venting-measures are given (Distance between housing and flange plate >2.5 mm)

(5) Connect only suitable equipment to the 3-way cocks in suction and measuring line (categorie 1 for interstitial spaces of zone 0, categorie 2 for interstitial space of zone 1)

7. To section 8.2 “Maintenance”

(5) to (7) have been added to this section:

(5) The conditions in section 6.5.1 must be observed and complied with at all times.

(6) As part of the annual function test, check the motor of the pump for running noises (damaged bearings).

(7) If the pump has to be changed or when working on the pumps exhaust line a pressure of the suction- and measuring with 10 bar has to carried out for the parts inside the housing.

(8) Additionally for the VL-H9 using a solenoid valve
– If the solenoid valve must be exchanged, take care that the leak detections system is unpressurerized and free of liquid.
– Pull never the solenoid from the body while the voltage is on.

8. Section 8.6.3 “Operation” has been added to the documentation as follows:

After the test work is carried out, ensure again that the 3-way-cocks are in the shown position.

9. Section 9 “Removal” has been added to the documentation as follows:

For removal, the following points must be observed in particular:

- Make sure the unit is free of gas before and during removal (see also section 4 above).
- Seal any openings gas-tight through which the explosion atmosphere can carry over.
- Avoid using spark-producing tools (saws, parting grinders, etc.) for removal whenever possible. If this is unavoidable, be certain to observe EN 1127.
- Avoid the buildup of electrostatic charges (e.g., through friction).
- Properly dispose of contaminated components (possibly through outgassing).

Technical description of the explosion-proof vacuum leak detector VL-H9

Table of contents

1 Object

Leak detector for vacuum systems with an alarm vacuum of > 330 mbar forming part of a leak detector device for double-walled tanks used for the storage of inflammable and non-flammable liquids.

2 Type

Explosion-proof vacuum leak detector type VL-H9.

(For determination of the exact type designation of the leak detector to be used for a specific application, see item 3.5 of the present description)

3 Field of application

3.1 Unpressurised tanks

Double-walled tanks without leak detection liquid in the interstitial space, operated under atmospheric conditions, i.e.:

3.1.1 Double-walled tanks

- to DIN 6608; DIN 6616 shape A, DIN 6618/2, DIN 6619, DIN 6623, DIN 6624 or equivalent design,
- tanks assembled either at the manufacturer's works or on site, with a mark of conformity or general approval issued by the competent building inspection authorities, which confirms that the suitability of the interstitial space for connection of a leak detector VL-H9 has been checked.

3.1.2 Interstitial spaces

- double-walled steel to 3.1.1 or equivalent design,
- double-walled plastic, provided that the suitability for a connection of the leak detector VL-H9 is confirmed in the test certificate,
- suitable and approved lining, the side in contact with the liquid being made of plastic,
- suitable and approved jacketing, the side in contact with the liquid being made of steel or plastic,
- double bottoms of flat-bottom tanks to DIN 4119 or of equivalent design, for which test certificates have been issued by the inspection office responsible for leak detectors, indicating that the interstitial spaces as part of a leak detector device are suitable for the connection of a leak detector VL-H9,
- tanks assembled either at the manufacturer's works or on site to DIN 6625 or of equivalent design, for which test certificates have been issued by the inspection office responsible for leak detectors, indicating that the interstitial spaces as part of a leak detector device are suitable for the connection of a leak detector VL-H9,

- other shapes (e.g. double-walled leakage containments), the suitability of which has been confirmed by the inspection office responsible for leak detectors, indicating that the interstitial spaces as part of a leak detector device are suitable for the connection of a leak detector VL-H9.

3.2 Tanks with excess pressure

Double-walled tanks with interstitial spaces as per 3.1.2 operated at a max. excess pressure of 25 bar, assembled either at the manufacturer's works or on site, for which the suitability of the interstitial space for connection of a leak detector VL-H9 has been confirmed.

3.3 Liquids to be stored

- Inflammable liquids incompatible with water, hazard classes AI, AII, AIII and B, and explosive steam-air mixtures corresponding to gas group IIA or IIB and to temperature code T1 to T3.
- Non-flammable liquids incompatible with water
- Non-flammable liquids incompatible with water that form explosive steam-air mixtures above the liquid level (e.g. by gas evolution).

All of the aforementioned explosive steam-air mixtures must correspond to gas group IIA or IIB and be in temperature code T1 to T3.

Furthermore, it must be determined that the materials MS58 and VA (stainless steel) are resistant to the liquid.

3.4 Utilisation of an acoustic alarm

An acoustic alarm is utilised:

3.4.1 Tanks without a suction line to the tank bottom

Tanks to DIN 6608; DIN 6616 shape A, DIN 6619, DIN 6623; DIN 6624 and DIN 6625, provided that the following parameters are complied with:

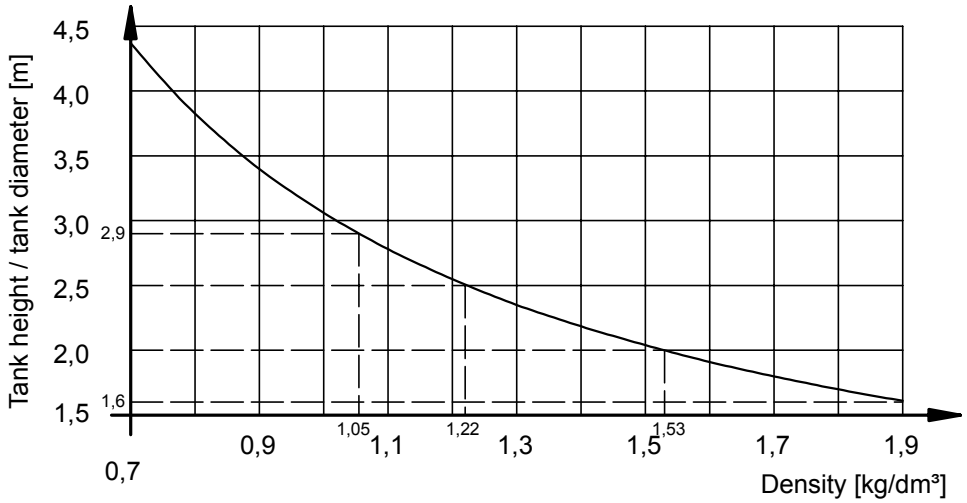


Diagram 1: Tank height / tank diameter as a function of the density

For tanks installed above ground, the actual density may be taken whereas for underground tanks, a min. density p = 1kg/dm³ has generally to be assumed.

3.4.2 Flat-bottom tanks

Tanks to DIN 4119, with a suction line reaching to the deepest point of the interstitial space.

3.4.3 Tanks with a suction line to the tank bottom

Tanks to DIN 6618, provided that the following parameters are complied with:

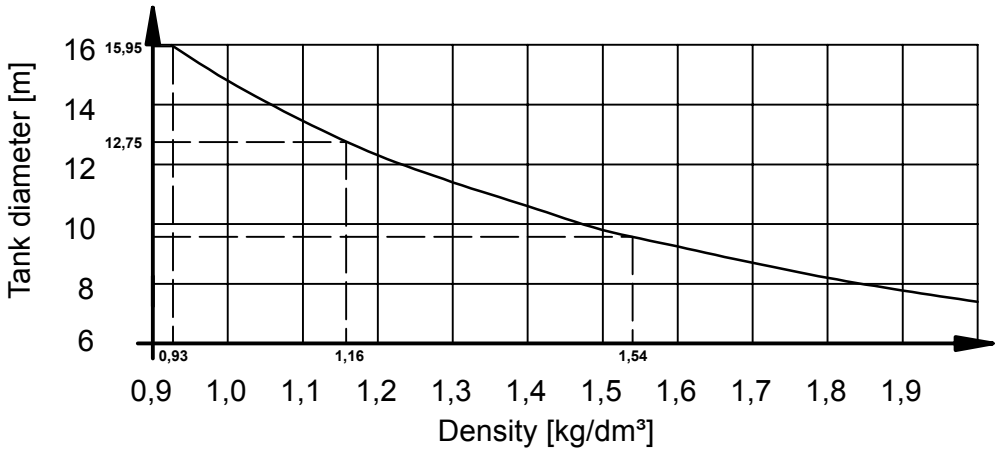


Diagram 2: Tank height (suction line reaching to the tank bottom) as a function of the density

3.4.4 Calculation for utilisation of an acoustic alarm for tanks with a suction line to the bottom

For all other tanks with a suction line to the bottom, the acoustic alarm can be utilised as follows:

The volume of the interstitial space will be reduced as follows by incoming liquid

$$V = \left(1 - \frac{100000 - p_{PA}}{100000 - p_{AE}}\right) \cdot 100\%$$

p_{PA} = Trip pressure Pump Off in Pa
p_{AE} = Trip pressure Alarm On in Pa
V = Percentage of the interstitial space filled in %

Due to the trip pressure P_{AE}, the interstitial space is filled up to height h_1 (in the case of a leakage), starting from the tank bottom.

$$h_1 = \frac{p_{AE}}{g \cdot \rho}$$

h_1 = Filling height of the interstitial space due to trip pres. P_{AE} in m
g = Acceleration due to gravity in m/s²
ρ = Density of the stored liquid in kg/m³

The volume V_1 of the interstitial space at filling height h_1 is determined by calculation (or by measuring the litres), taking account of the tank geometry.

The alarm is ensured, when the following conditions are complied with:

$$V < \frac{V_1}{V_0} \cdot 100\%$$

V1 = Volume of the interstitial space at filling height h1
V0 = Total volume of the interstitial space

3.4.5 Other tanks

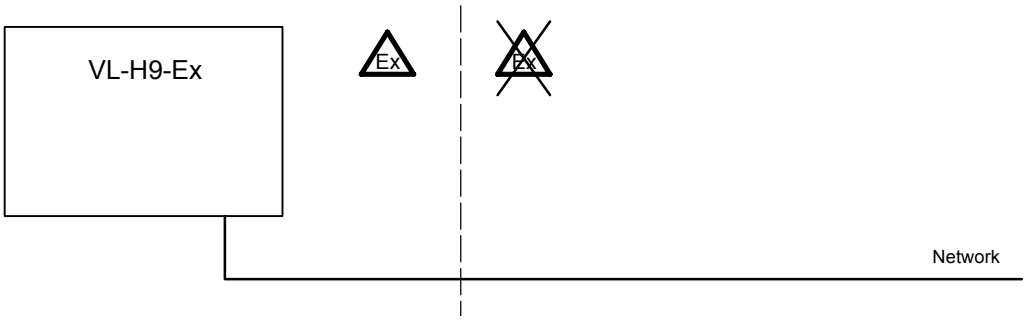
Tanks for which the acoustic alarm in accordance with 3.4.1 through 3.4.4 is not utilised require an additional leak detector which should be at the lowest point of the bottom of the tank.

3.5 Leak detector types

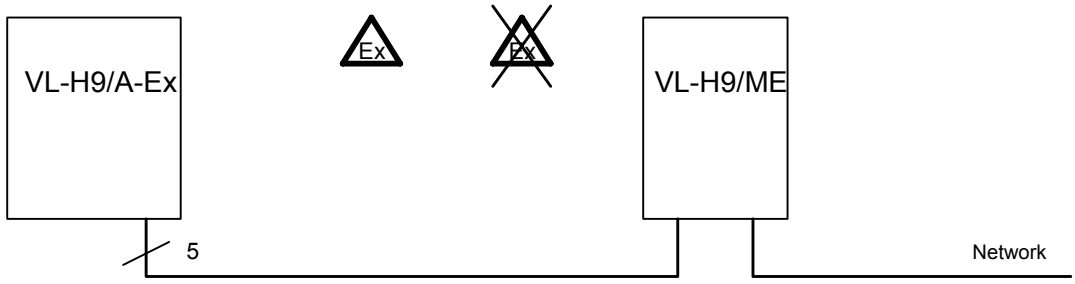
In order to ensure that an appropriate leak detector is used for a specific application, the following rules should be observed:

- In the case of tanks with the surface in contact with the liquid made of steel, the interstitial space is generally considered as zone 1.
- In the case of tanks with the surface in contact with the liquid made of plastic, the interstitial space is generally considered as zone 0.
- Under certain circumstances, the detonation protections on the leak detector side can be omitted (see 6.10 Installation examples).

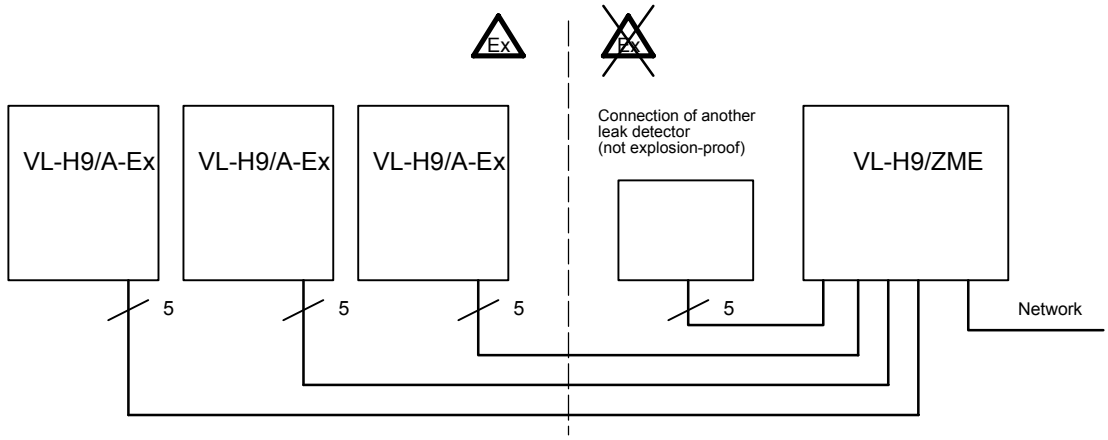
Application	Leak detector type
Leak detector for tanks to 3.1 and 3.4.1 – 3.4.4 completely installed in potentially explosive locations	**VL-H9-Ex**



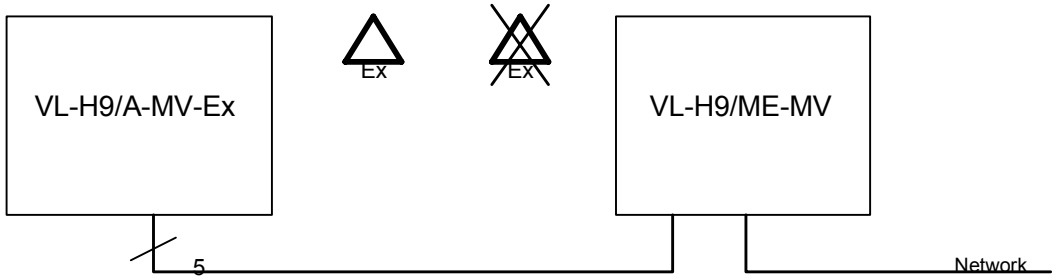
Application	Leak detector type
Leak detector for tanks to 3.1 and 3.4.1 – 3.4.4 consisting of: operation unit installed in potentially explosive locations signalling unit installed outside potentially explosive locations	**VL-H9/A-Ex** with **VL-H9/ME**



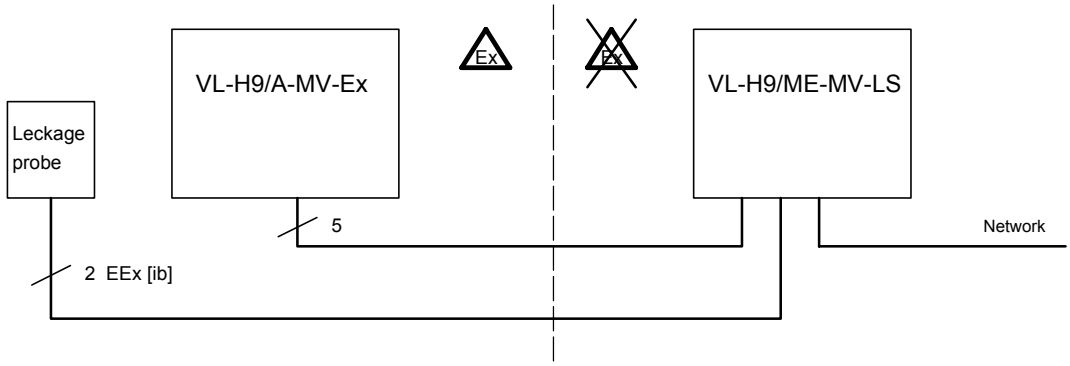
Application	Leak detector type
Leak detector for tanks to 3.1 and 3.4.1 – 3.4.4 consisting of: up to 10 operation units installed in potentially explosive locations central signalling unit installed outside potentially explosive locations	**VL-H9/A-Ex** with **VL-H9/ZME**



Application	Leak detector type
Leak detector for tanks to 3.1 and 3.4.1 – 3.4.4 consisting of: operation unit installed in potentially explosive locations signalling unit installed outside potentially explosive locations	**VL-H9/A-MV-Ex** with **VL-H9/ME-MV**



Application	Leak detector type
Leak detector for tanks to 3.1 and 3.4.1 – 3.4.4 consisting of: operation unit installed in potentially explosive locations signalling unit installed outside potentially explosive locations leakage probe	**VL-H9/A-MV-Ex** with **VL-H9/ME-MV-LS** and **leakage probe FDL30**



4 Functional description

4.1 General

(1) The vacuum leak detector VL-H9 indicates any leakage in the leak detector device by pressure rise (leak detector, connection lines with fittings and interstitial space).

(2) The vacuum pump installed in the leak detector generates a vacuum via the suction line. Such vacuum is controlled via the measuring line by a pressure switch which is also installed in the leak detector.

(3) In general, a slow pressure rise is caused by slight leakage due to the installation. When reaching the trip pressure 'Pump On', the vacuum pump is activated and the interstitial space is evacuated until the trip pressure 'Pump Off' is reached again. In normal operation, the vacuum varies between the two control limits with short running times and longer rest periods for the pump, depending on the pressure tightness of the complete system.

(4) In a case where due to **ingress of air** the pressure in the monitored system rises to the trip value 'Alarm On', an optical and acoustic alarm is activated.

(5) When the pressure drops to the trip value 'Alarm Stop', the alarm is cancelled (e.g. functional check).

(6) If leakage occurs and **liquid** gets into the interstitial space, the pressure will rise and the vacuum pump will be activated by the pressure switch. When the liquid is evacuated and reaches the liquid trap in the suction line, the trap is closed. This prevents the vacuum pump from generating a vacuum in the interstitial space. The pressure in the interstitial space will rise due to the follow-on liquid until the alarm is activated.

(7) The factory-set trip values of the pressure switch for operation of the leak detector are given in table 1.

Trip value	Vacuum in mbar	Vacuum in Pa
Alarm „On“	370 +/- 40	37000 +/- 4000
Alarm „Off“	420 +/- 40	42000 +/- 4000
Pumpe „On“	450 +/- 40	45000 +/- 4000
Pumpe “Off“	500 +/- 40	50000 +/- 4000

Table 1: Trip values of the pressure switch [1]

[1] The trip values for ALARM STOP and PUMP ON measured during the functional check may be higher or lower than those indicated, provided that the value measured on site for ALARM STOP is lower than the value for PUMP OFF, and that the value for PUMP ON is higher that the value measured for ALARM ON.

4.2 Functional description of type VL-H9/...-MV-... (design with solenoid valve)

This version of the leak detector VL-H9 is equipped with an additional solenoid valve in the suction line. When an alarm is activated, the solenoid valve is closed, and the pump is switched off. For the purpose of commissioning, the solenoid valve can be opened and the pump switched on by means of a commissioning switch installed in the leak detector.

4.3 Functional description of type VL-H9/...-LS-... (design with leakage probe)

This version of the leak detector VL-H9 is equipped with an additional leakage probe which gives an optical and acoustic signal when a leak is detected.

5 Design of the leak detector

The leak detector VL-H9 is available in various versions (see paragraph 3.5) which are listed as follows:

- VL-H9-Ex Complete device
- VL-H9/A-Ex Operation unit
- VL-H9/ME Signalling unit for one operation unit VL-H9/A-Ex
- VL-H9/ZME Central signalling unit for a maximum of 10 operation units VL-H9/A-Ex
- VL-H9/A-MV-Ex Operation unit with solenoid valve
- VLH9/ME-MV Signalling unit with solenoid valve control for one operation unit VL-H9/A-MV-Ex
- Vl-H9/ME-MV-LS Signalling unit with solenoid valve control for one operation unit VL-H9/A-MV-Ex and the possibility of connecting a leakage probe
- Leakage probe Leakage probe FDL30

For further information, see additional print 'Drawings and technical data' for the vacuum leak detector VL-H9.

This print is available upon request from SGB.

6 Installation instructions

6.1 General instructions

(1) The leak detector device including leak detector VL-H9 shall only be installed by specialists according to § 19 I WHG having submitted proof of their qualifications to TRbF 503 and to TRbF 180/280 no. 1.7.

(2) The relevant VDE regulations must be observed.

(3) The relevant rules for explosion prevention must be observed.

(4) During installation, the relevant rules for the prevention of accidents must be observed.

(5) In the case of tanks with leak protection lining or leak protection jacketing, the manufacturer's installation instructions must be observed.

(6) If pneumatic or electrical connection lines are laid underground in sheath-pipes, the inlet and the outlet of the sheath-pipe must be closed in a gastight manner, in order to prevent explosive vapours from being 'carried over'.

6.2 Place of installation of the leak detector

6.2.1 Installation of the leak detector VL-H9-Ex and of the operation unit VL-H9/A-...-Ex

(1) The leak detector should be installed in the close vicinity of the tank. It can be installed in zone 1, zone 2 or out of potentially explosive locations.

(2) The leak detector VL-H9-Ex can be installed outdoors. In this case, it should be shielded from direct sunlight.

(3) In order to protect the leak detector from excessive heat, it should not be installed near heat sources.

The ambient temperature should not exceed 50°C, since higher temperatures might activate the temperature protection of the operating pump. After cooling down, the pump will automatically restart.

(4) In the case where the leak detector is installed in a closed room, the room must be effectively ventilated.

6.2.2 Installation of the (central) signalling unit VL-H9/ZME, VL-H9/ME-...

(1) The (central) signalling unit <u>must not</u> be installed in potentially explosive locations.

(2) The (central) signalling unit should preferably be installed in closed, dry rooms inaccessible to unauthorised persons. In order to protect the unit from excessive heat, it should not be installed near heat sources.

(3) If the (central) signalling unit is intended for outdoor installation or for installation in humid areas as per VDE specification, it must be provided with a weather-protected box with a clear lid (DIN 40 050 IP 55). In this case, an additional external signal (horn) should be installed at a suitable location. The additional external signal is not required if the alarm signal is transmitted to a control station by using potential free contacts.

6.3 Installation of the pneumatic connection lines

(1) **Attention**: The connection lines and all fittings must have a min. compressive strength of PN10.

(2) Detonation protections are installed directly on the tank connections.

(3) A liquid barrier is installed in the suction line (vertical installation).

(4) Stop valves are installed in the suction and measuring line on the tank side. It must be possible to leave these stop valves in an open position. On the tank connection side, the suction line is provided with a connecting sleeve for pump installation.

(5) The connection lines must be rigid metallic pipes (e.g. copper pipe).

(6) The pipes must have the following dimensions and colour codes:

Suction line:	min. 8 x 1 mm	ends with white colour rings
Measuring line:	min. 8 x 1 mm	ends with red colour rings
Exhaust line:	min. 8 x 1 mm	ends with green colour rings

(7) Connection lines must be installed with a continuous drop of a minimum of 4%. If this is not possible, a compression-proof condensate trap must be provided for at each low point.

(8) In the case of tanks where condensate may be produced (e.g. tanks to DIN 4119), a compression-proof condensate trap with a min. capacity of 0.5 litres must be installed in the suction line upstream of the liquid barrier.

(9) **Attention**: Confusion of tank connections and connection lines may lead to tank destruction.

(10) The exhaust line is connected to the tank ventilation outlet led into the leakage containment (e.g. DIN 4119).

Where neither solution is not possible (e.g. tank with excess pressure, without leakage containment), the exhaust line may end outdoors in a safe place (min. height 1 m, no ignition source within a radius of 1 m). In such a case, an additional liquid barrier in the exhaust line is compulsory.

(11) Attention: Under no circumstances should an exhaust line terminating outdoors be used for detecting a leak (e.g. by sniffing). Warning signs should be used, if this is a possibility.

6.4 Electrical connection

(1) All electrical connections shall be made in a no-voltage condition.

(2) The 230V/50Hz voltage supply shall only be connected:

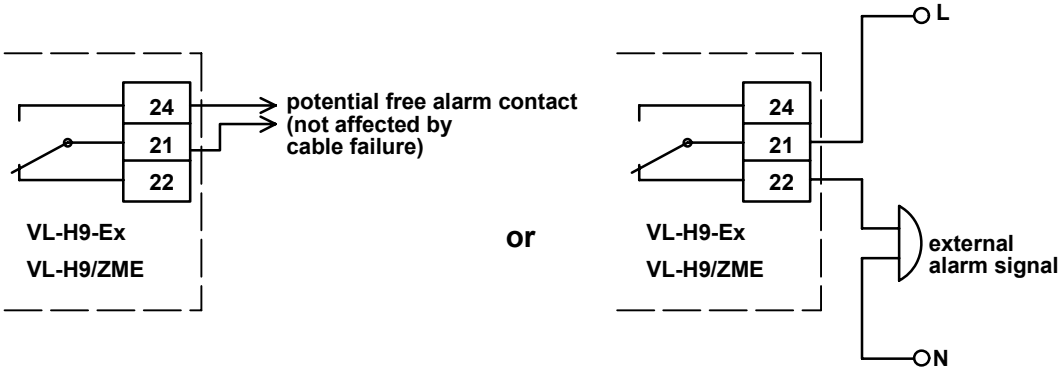
- after all pneumatic connections have been properly made
- after all electrical (connecting) lines have been properly installed
- when all covers of terminal boxes in potentially explosive locations and of the (central) signalling unit are closed (except for VL-H9/A-MV-...)
- when the additional earth required in potentially explosive locations has been installed on the building outside.

(3) The leak detector VL-H9-Ex, the central signalling unit VLH9/ZME and the signalling unit VL-H9/ME-... are designed for an electrical supply of 230V / 50Hz . The connection must be firmly installed. Plug-in or switch-type connections are not permitted. The connection is made as follows:

Mains 230V		
N	L	PE ⏚

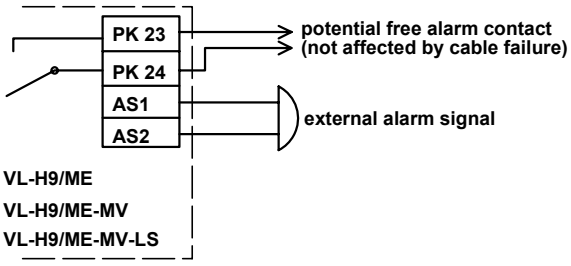
(4) The instructions of the local electric supply company are to be observed.

(5) It is possible either to connect an external alarm signal to the central signalling unit VL-H9/ZME and to the leak detector VL-H9-Ex **or** to transmit the alarm by using potential free contacts.



(6) An additional external signal showing failures can be connected to the terminals AS1 and AS2 of the signalling unit VL-H9ME, VL-H9/ME-MCV or VL-H9/ME-MV-LS.

At the same time, the alarm can be transmitted by using the potential free contacts PK 23 and PK 24.



(7) When using the contacts 21, 22, 23 and 24, the voltage must not exceed 230V / 50Hz / 5A. The terminals AS1 and AS2 are protected by the fine-wire fuse F2 (2.5 A quick-acting).

(8) The vacuum pump is protected by the fine-wire fuse F1 (1A quick-acting or semi time-delay). For replacing the fuses, power to the leak detector must be switched off. The fuses in the leak detector VL-H9-Ex shall only be replaced by the manufacturer.

6.5 Installation of the electrical connection line between operation unit and (central) signalling unit

(1) Requirements of the line:

The line must be of the double insulated type.

Colour of the outer sheath: grey (other colours except blue are possible)

Outer diameter: 6 - 12 mm

No. of wires: 5 (4 + PE) (the wires should be distinguishable, one wire as earth conductor green / yellow)

Cross section: 1 - 1.5 mm²

(2) The connection line between the operation unit and the (central) signalling unit must be firmly installed. Plug-in or switch-type connections are not permitted.

In the operation unit and in the (central) signalling unit, connection is made to the terminals provided for this purpose.

No. in the operating unit	Designation in ME (ZME)	Meaning
1	1 A1	Alarm contact
2	2 A2	Alarm contact
3	3 N	Voltage supply
4	4 L1	Voltage supply
⏚	5 PE	Earth conductor

Table 2: Connection VL-H9/A-Ex

No. in the operating unit	Designation in ME-MV-...	Meaning
1	1 A1	Alarm contact
2	2 N	Voltage supply
3	3 L1	Voltage supply pump
4	4 L2	Voltage supply solenoid v.
⏚	5 PE	Earth conductor

Table 3: Connection VL-H9/A-MV-Ex

(3) **Each channel occupied by an operation unit in the central signalling unit must be activated via the relevant coding bridge.**

In the case where an occupied channel is not activated via the coding bride, the operational lamp does not light up, and no alarm is indicated.

The pump running indication functions independently of the activation.

Coding bridge

(4) If the connection line is laid underground in a sheath-pipe, the inlet and the outlet of the sheath-pipe must be closed in a gastight manner, in order to prevent explosive vapours from being 'carried over'.

6.6 Connection of another SGB leak detector to the central signalling unit

(1) It is possible to connect other leak detectors that are not explosion-proof to the central signalling unit VL-H9/ZME, in order to obtain a central alarm and pump running indication.

(2) Such connection presupposes that the leak detector has a potential free contact that opens in the case of an alarm. The power consumption of the leak detector with connected external signal must not exceed 150 VA.

(3) The leak detector is connected to the central signalling unit only. An additional connection of the leak detector to the network is not necessary since the voltage is supplied via the central signalling unit.[2]

(4) Requirements of the line:

Colour of the outer sheath: grey (other colours except blue are possible)
No. of wires: 5 (4 + PE) (the wires should be distinguishable, one wire as earth conductor green / yellow)
Cross section: 1 - 1.5 mm²

(5) The connection line between the operation unit and the (central) signalling unit must be firmly installed. Plug-in or switch-type connections are not permitted.

(6) The leak detector is connected to the following terminals of the central signalling unit:

[2] In the case where the leak detector has a separate voltage supply, the potential free contact can be led to the ZME. In such case, however, the pump running indicator does not function.

No. in the leak detector	Designation in ZME	Meaning
Potential free contact	1 A1	Alarm contact
Potential free contact	2 A2	Alarm contact
Mains N	3 N	Voltage supply
Mains L	4 L1	Voltage supply
⏚	5 PE	Earth conductor

Table 4: Connection leak detector

(7) Each channel occupied by a leak detector must be activated via the relevant coding bridge in the central signalling unit (compare 6.5 no. (3)).

6.7 Installation of the connection line between leakage probe FDL30 and signalling unit VL-H9/ME-MV-LS

(1) Requirements of the line:

Colour of the outer sheath: blue (intrinsically safe circuit)
No. of wires: 2 (the wires should be distinguishable)
Max. specific resistance: 25 Ω
Cross section: 0.75 - 1.5 mm²

(2) The connection line between the leakage probe and the signalling unit must be firmly installed. Plug-in or switch-type connections are not permitted.

(3) In the signalling unit, connection is made to the blue terminals provided for this purpose.

No. in the leakage probe	Designation in ME	Meaning
1 -	-	intrinsically safe -
2 +	+	intrinsically safe +

Table 5: Connection leakage probe

Where a shielded cable is used, the shield is only connected to the earth terminal in the leakage probe.

(4) If the connection line is laid underground in a sheath-pipe, the inlet and the outlet of the sheath-pipe must be closed in a gastight manner, in order to prevent explosive vapours from being 'carried over'.

6.8 Additional instructions for underground tanks

If a tank is provided with cathodic corrosion protection which requires potential separation, electric isolators must be fitted in the pneumatic lines. These must be provided with overvoltage protection (discharge section), and the isolators must be prevented from accidental bridging.

6.9 Additional instructions for tanks the interstitial space of which is filled with leak detection liquid

(1) Correct functioning of the leak detector device on tanks with interstitial spaces which are filled with leak detection liquid requires an air cushion in the interstitial space at the top of the tank, in order to ensure free passage between filling and testing sockets.

(2) Both filling and testing sockets must be arranged on the tank in such a way as to allow for correct connection of suction and measuring lines.

(3) A vacuum pump (suction flow min. 1.5 m³/h) with intermediate receptacle (e.g. 10 l gas bottle) must be connected to the suction socket on the tank by means of a PVC hose with an internal diameter of 6 mm minimum. By means of the vacuum generated, leak detection liquid is pumped from the interstitial space into the receptacle until no more liquid is drawn up (the column in the PVC hose is interrupted). The passage between suction and measuring socket is now free.

(4) A vacuum gauge must be connected to the measuring socket of the tank, and evacuation at a negative pressure of 600 mbar must be continued until no further leak detection liquid is taken up. The suction must be greater than 600 mbar.

(5) When using leak detector type VL-H9, at least the following quantities of leak detection liquid must be extracted from the interstitial spaces of the tanks:

Tank size [m³]	Liquid qty. to be removed [l]
1 - 5	5.0
7 - 13	10.0
16 - 30	15.0
40 - 60	30.0
80 - 100	35.0

(6) The procedure described in (3) must be repeated several times (if necessary, with interruptions) until the quantities of liquid as listed above are extracted.

(7) After the minimum quantity of leak detection liquid has been extracted, the leak detector may be connected and put into operation without the auxiliary pump (see chapter 7).

6.10 Installation examples

DS = Detonation protection
FS = Liquid stop valve
KG = Condensate trap
AH1= Shut-off cock (lead sealing in the open position is possible)
AH2= Shut-off cock (connecting socket for auxiliary pump)
ML = Measuring line
AL = Exhaust line
SL = Suction line

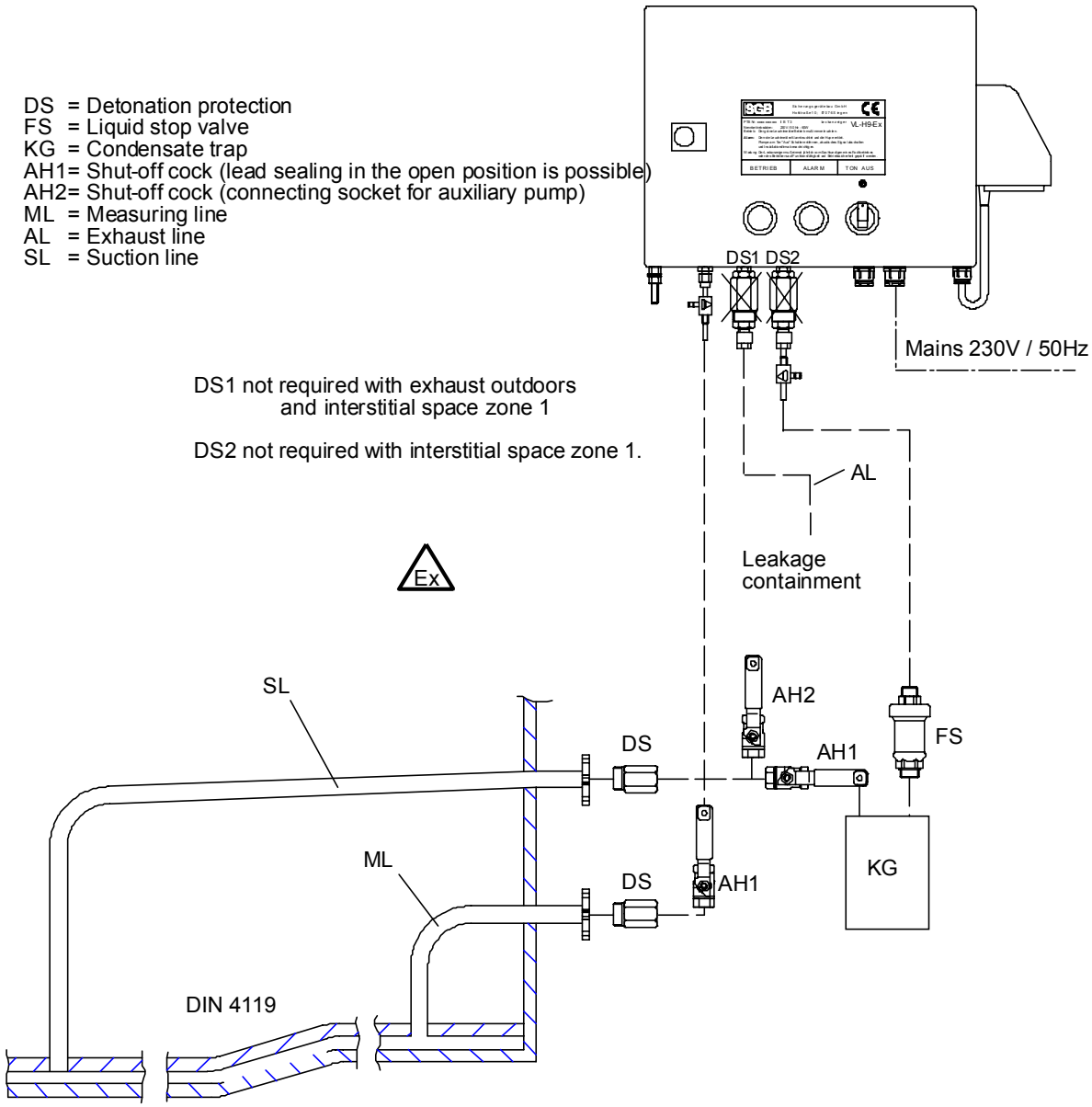


Fig. 1 : Tank with VL-H9-Ex

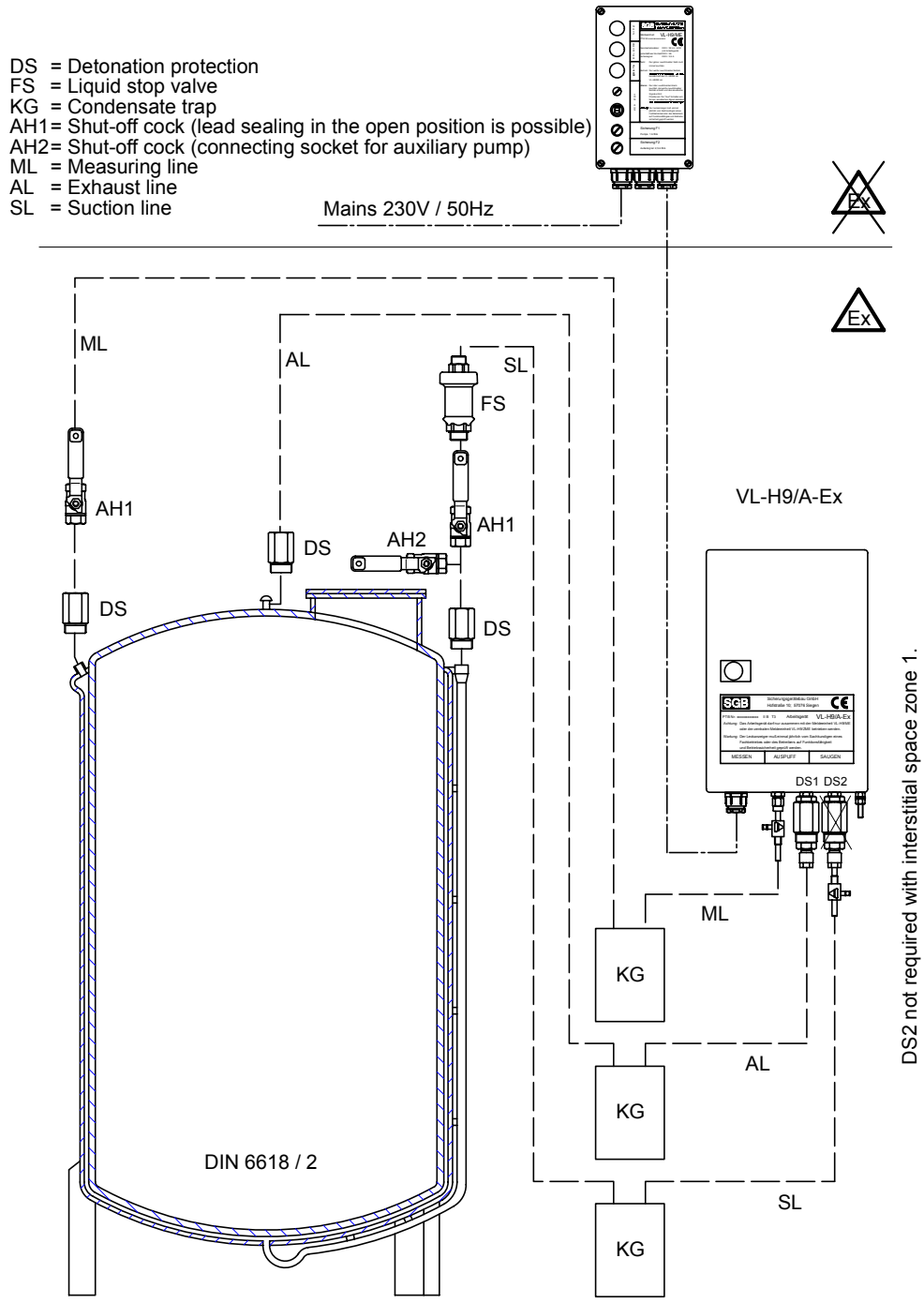


Fig. 2 : Tank with VL-H9/A-Ex and VL-H9/ME

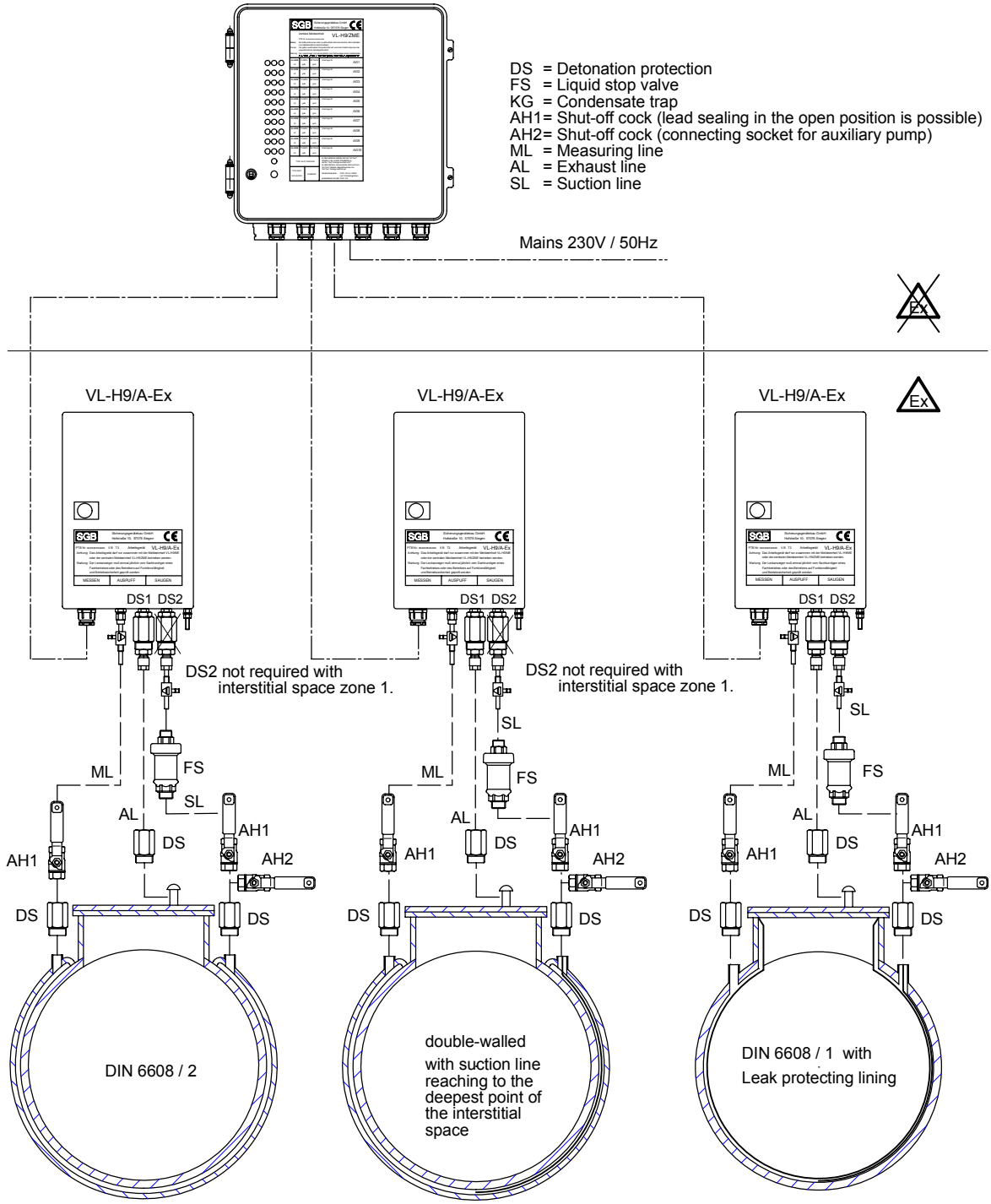


Fig. 3 : Several tanks with VL-H9/A-Ex and VL-H9/ZME

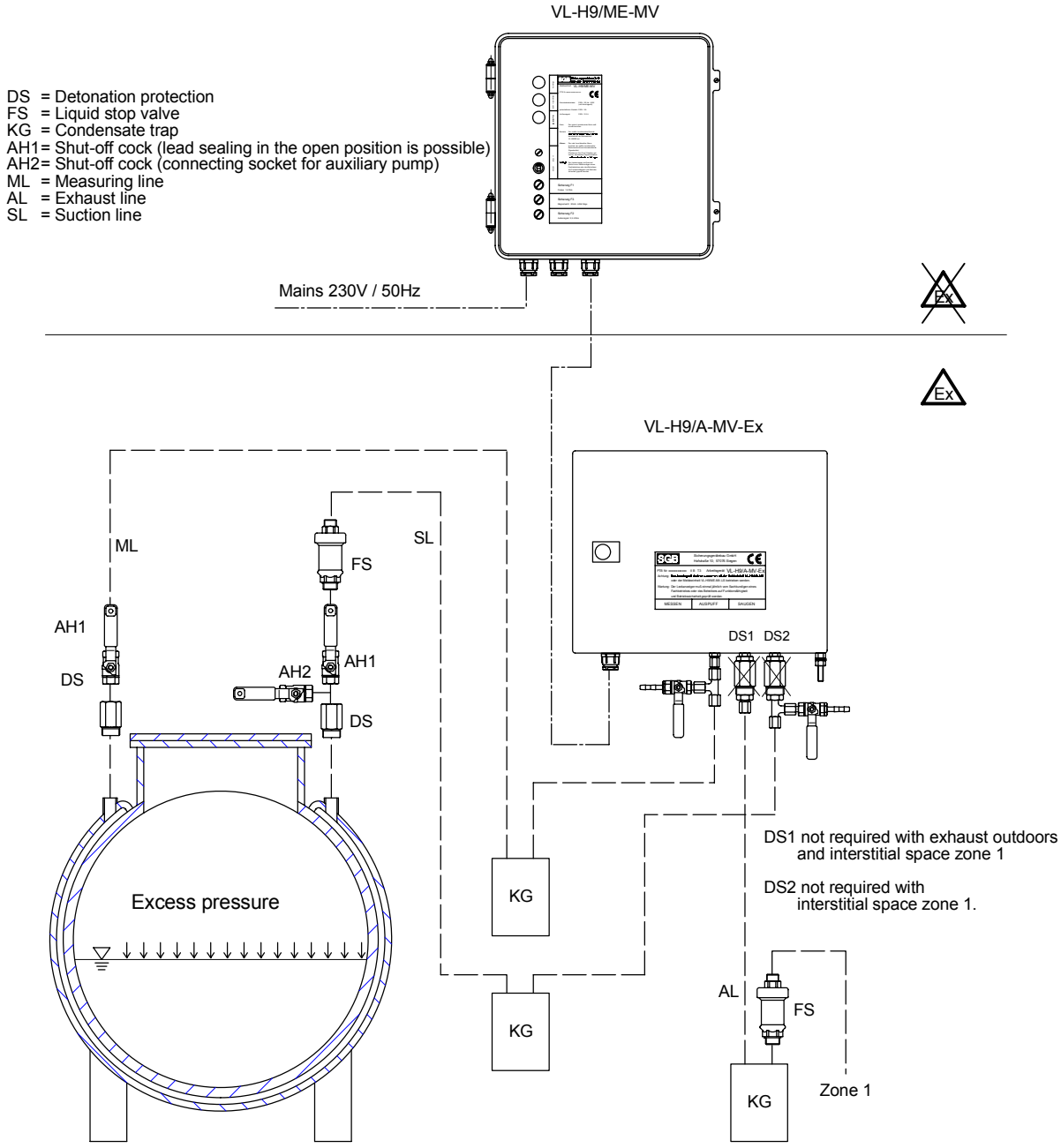


Fig. 4 : Tank with VL-H9/A-MV-Ex and VL-H9/ME-MV

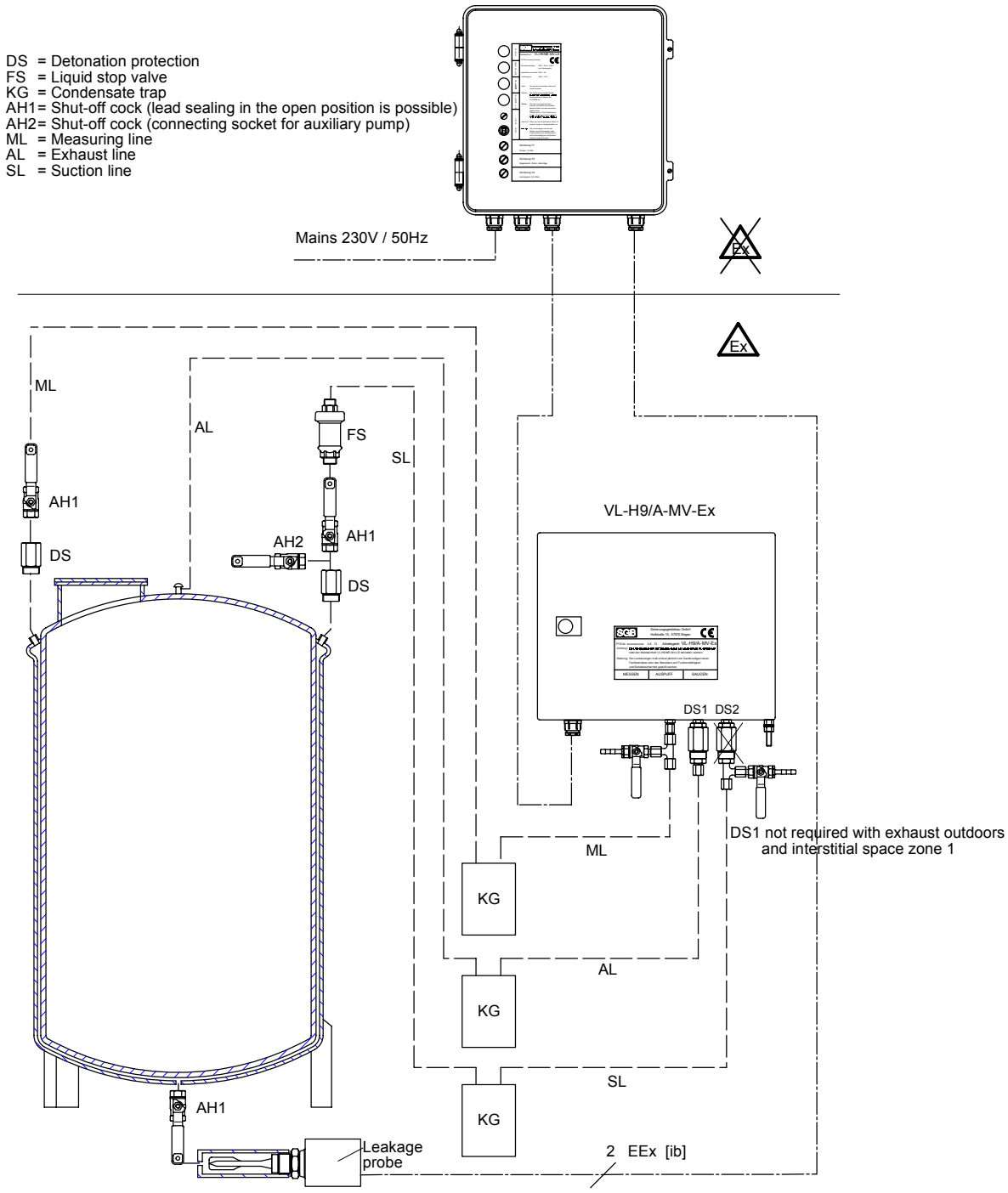
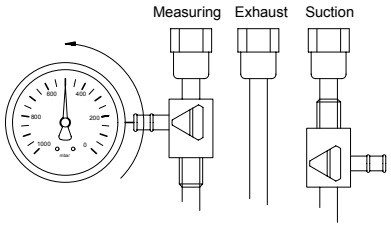


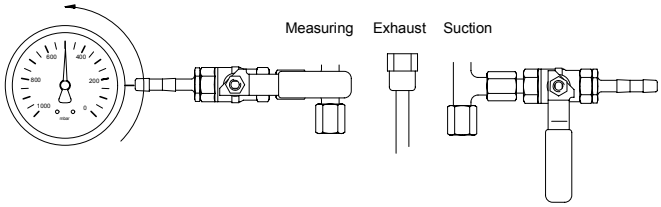
Fig. 5 : Tank with VL-H9/A-MV-Ex , VL-H9/ME-MV-LS and leakage probe FDL30

7 Commissioning of the leak detector device

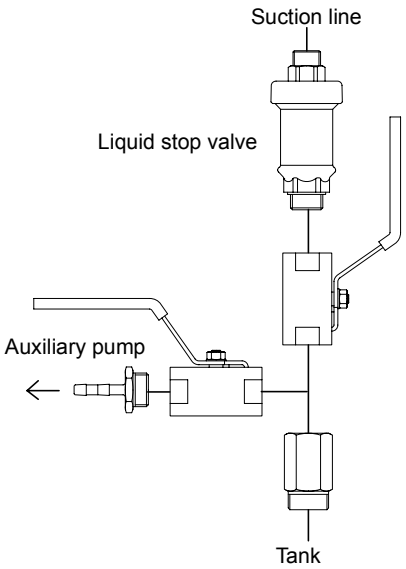
(1) The interstitial space must be prepared in accordance with the manufacturer's instructions, and the leak detector must be installed in compliance with section 6. The voltage supply is not connected.



VL-H9-Ex and VL-H9/A-Ex



VL-H9/A-MV-Ex



Connection of the auxiliary pump

The auxiliary pump is connected to the suction line socket on the tank.(Never connect it to the testing socket of the leak detector). A pressure gauge is connected to the measuring line of the testing socket. The interstitial space is evacuated until a negative pressure of 500mbar is achieved. Then the connecting socket is closed, and the auxiliary pump is removed.

	Measuring line	Suction line
Shut-off cock on the tank	open	open

Position of the stop valves on the tank during commissioning

(3) Before carrying out the functional check (paragraph 8.3), the mains supply to the leak detector must be switched on.

8 Operating instructions

8.1 General instructions

(1) When the leak detector device has been installed in an appropriate and pressure tight manner (interstitial space, connecting lines, leak detector), the leak detector will work within the control range. In case of a fall in pressure due to unavoidable slight leakage, the leak detector will build up pressure again until the rated value is reached.

Frequent backfeed or even continuous running of the pump indicates leakage that should be rectified without delay.

If an alarm is triggered, an important leakage or a defect is indicated. The cause has to be established, and remedial action taken as quickly as possible.

(2) Note: In case of single-walled tanks fitted with a flexible leakage protection lining, the interstitial space should never be depressurised (this will lead to collapse of the leakage protection lining).

8.2 Maintenance

(1) **Once a year**, the leak detector VL-H9 should be checked for functional safety by an expert from a specialist company or by the tank user's expert.

(2) The extent of the annual check is described in paragraph 8.3

(3) It should be ascertained whether the provisions of paragraph 7 are still complied with.

(4) Before opening the case lid of the central signalling unit, the voltage supply must be disconnected from the unit.

8.3 Functional testing of the leak detector device

The functional safety and the reliability of the leak detector should be checked

- after each commissioning
- at intervals as specified in paragraph 8.2 and
- after each trouble shooting.

When carrying out the functional check, make sure that the explosion protection measures are complied with.

A functional check must comprise the following steps:

(1) Determination of the extent of work to be carried out in agreement with the person responsible in the tank user's company.

(2) Procuring information on the stored liquid and on its handling.

(3) Checking of the condensate traps for liquid (8.3.1)

(4) Continuity check in the interstitial space (8.3.2)

(5) Checking of the trip values: with interstitial space (8.3.3.1)
without interstitial space (8.3.3.2)

(6) Checking of the max. pump suction head (8.3.4)

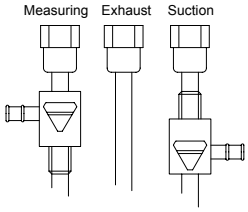
(7) Leak test (8.3.5)

(8) Preparation of the device for the operation (8.3.6)

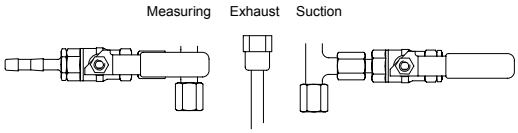
The equipment listed hereafter is recommended for the functional check:

- vacuum gauge with a class-dependent measuring accuracy of at least 1.6, with an end scale value up to 1,000 mbar and a nominal size of at least NG100
- testing receptacle with a capacity of 1 l
- needle valve
- flexible hoses for connecting the test equipment

8.3.1 Emptying of the condensate traps



VL-H9-Ex und VL-H9/A-Ex



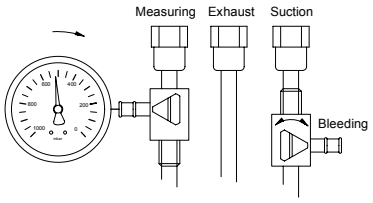
VL-H9/A-MV-Ex

If the pneumatic connecting lines are equipped with condensate traps, these boxes must be emptied. Proceed as follows: close the stop valves on the tank and bleed the suction and measuring lines on the leak detector. Now the connecting lines are at atmospheric pressure, and the condensate traps can be emptied.

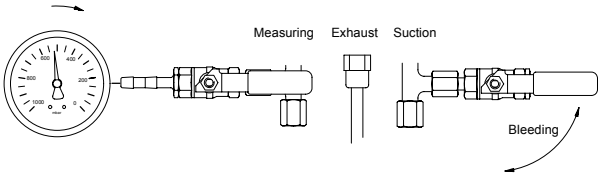
	Measuring line	Suction line
Shut-off cock on the tank	closed	closed

Position of the stop valves on the tank when emptying the condensate traps

8.3.2 Continuity check of the interstitial space



VL-H9-Ex und VL-H9/A-Ex



VL-H9/A-MV-Ex

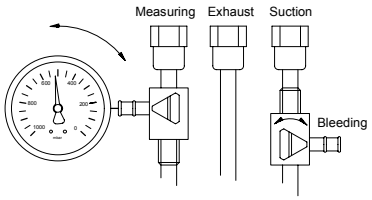
For the continuity check, the pressure gauge is connected to the testing socket of the measuring line, and the stop valves on the tank are opened. The suction line is bled through the three-way valve until the pressure gauge indicates a pressure drop. If further testing sockets are installed on the interstitial space (e.g. DIN 4119), these sockets must also be bled until the pressure drops.

	Measuring line	Suction line
Shut-off cock on the tank	open	open

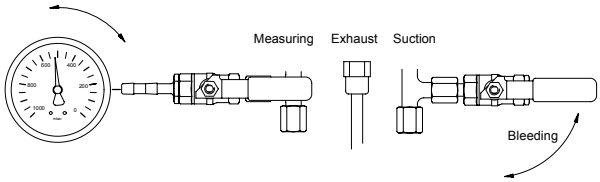
Position of the stop valves on the tank during the continuity check

8.3.3 Checking of the trip values of the pressure switch

8.3.3.1 Checking with interstitial space



VL-H9-Ex und VL-H9/A-Ex



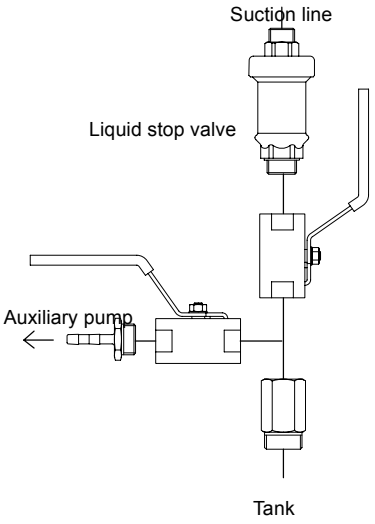
VL-H9/A-MV-Ex

The pressure gauge is connected to the three-way valve of the measuring line. The interstitial space can be bled through the three-way valve of the suction line and the pressure increases. By means of the vacuum pump of the leak detector or by using an auxiliary pump, the pressure falls as a result of the suction of the pump. In this way, the trip values of the pressure switch as per table 1 can be checked.

In the case of the operation unit VL-H9/A-MV-Ex, the pump must switch off when the alarm point is reached. In order to continue the test, the starting switch inside the signalling unit must be put into the starting position. [3]

	Measuring line	Suction line
Shut-off cock on the tank	closed	closed

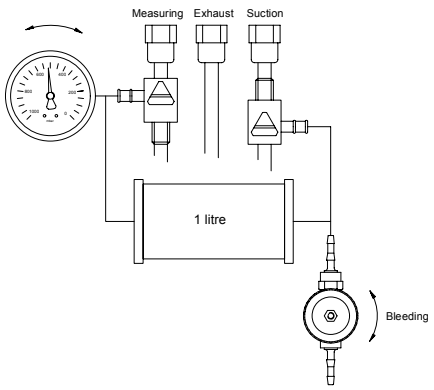
Position of the stop valves on the tank when checking the trip values



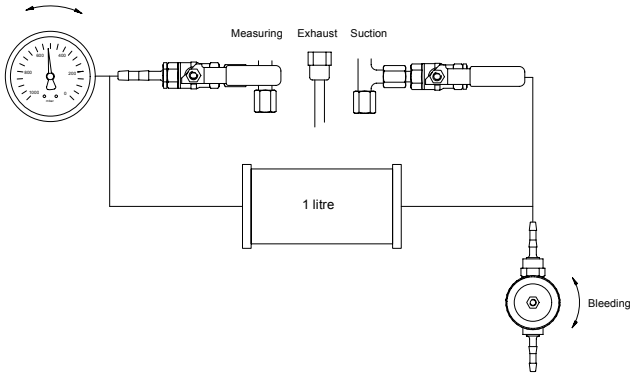
Do not connect the auxiliary pump to the three-way valve of the leak detector but to the connecting socket on the tank.

[3] When the starting switch is in the **starting** position (left-side), the **status indication lamp** goes out. Only when there is no alarm **and** when the starting switch is in the operating position (right-side), will it light up again.

8.3.3.2 Short-duration test with intermediate receptacle



VL-H9-Ex and VL-H9/A-Ex



VL-H9/A-MV-Ex

Short-circuit the leak detector via the testing equipment (receptacle + needle valve + lines + measuring instrument). Adjust the two three-way valves in such a way that the interstitial space is isolated from the leak detector. Now the leak detector can be bled via the needle valve, the pressure increases. When the needle valve is closed, the pressure drops again by means of the vacuum pump of the leak detector. In this way, the trip values of the pressure switch as per table 1 can be checked.

Make sure that the pressure changes slowly in order to allow for an exact reading of the trip values.

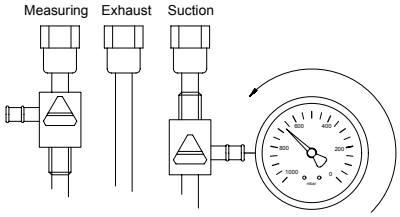
In the case of the operation unit VL-H9/A-MV-Ex, the pump must switch off when the alarm point is reached. In order to continue the test, the starting switch inside the signalling unit must be put into the starting position.[4]

	Measuring line	Suction line
Shut-off cock on the tank	closed	closed

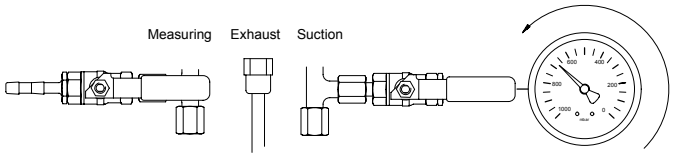
Position of the stop valves on the tank when checking the trip values

[4] When the starting switch is in the **starting** position (left-side), the **status indication lamp** goes out. Only when there is no alarm **and** when the starting switch is in the operating position (right-side), will it light up again.

8.3.4 Checking of the pump suction head



VL-H9-Ex and VL-H9/A-Ex



VL-H9/A-MV-Ex

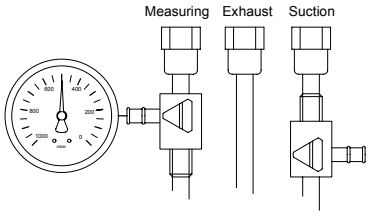
The pressure switch is bled via the three-way valve (with the pump running), and the pressure gauge is connected to the suction line. The interstitial space remains separated. Now, the maximum pump suction head can be checked. It must be > 580 mbar.

In the case of the operation unit VL-H9/ME-MV-..., the starting switch must be in the starting position.

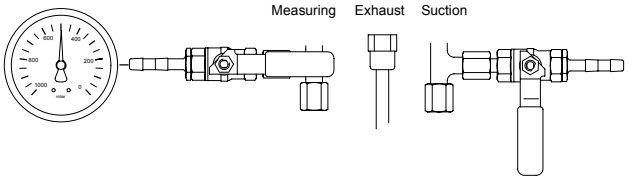
	Measuring line	Suction line
Shut-off cock on the tank	closed	closed

Position of the stop valves on the tank when checking the pump head

8.3.5 Leak test



VL-H9-Ex and VL-H9/A-Ex



VL-H9/A-MV-Ex

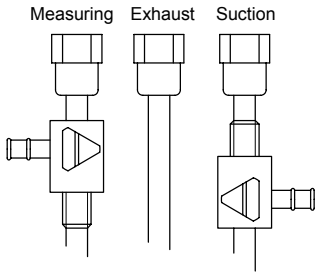
For carrying out the leak test, the pressure gauge is connected to the testing socket of the measuring line. If the vacuum pump is running, wait until it switches off.[5] During 20 minutes, the pressure should not significantly increase. Any leakage detected must be rectified, and the test must be repeated.

	Measuring line	Suction line
Shut-off cock on the tank	open	open

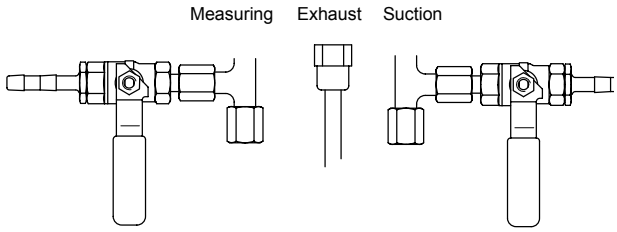
Position of the stop valves on the tank during the leak test.

[5] If the pump is continuously running, the leakage must be rectified.

8.3.6 Operation



VL-H9-Ex und VL-H9/A-Ex



VL-H9/A-MV-Ex

After completion of the functional check, the three-way valves must be restored to the operating position. The measuring and suction lines are connected to the interstitial space, the connections for testing purposes are closed. The stop valves in the measuring line and in the suction line must be lead sealed in the open position.

In the signalling unit VL-H9/ME-MV-..., the starting switch must be reset into the operating position, the status indication lamps for operation and mains must be on. The 'Alarm stop' switch must be lead sealed and the indication lamp 'Alarm Stop' must be off.

The covers of operation units VL-H9/A-Ex, VL-H9/A-MV-Ex and the leak detector VL-H9-Ex are lead sealed.

	Measuring line	Suction line
Shut-off cock on the tank	open, sealed	open, sealed

Position of the stop valves on the tank during operation.

The specialist must record the test results in a test report.

8.4 Occurrence of alarm signal

(1) In case of an alarm, the red signal lamp 'Alarm' lights up, and the acoustic signal sounds. The white signal lamp 'Operation' on the signalling unit VL-H9/ME-... goes out.

(2) Remove the lead seal on the switch 'Alarm Stop', stop the acoustic alarm and immediately contact a specialist company.

(3) Close stop valves in the tank measuring and suction line.

(4) The specialist must establish the cause of the alarm, take remedial action, restart leak detector no. 7 and carry out a functional check. It is important that the connection lines are suitable for excess pressure (e.g. tanks to DIN 4119 or tanks with excess pressure) .

(5) In the case where the alarm is attributed to a defect in the leak detector (e.g. mechanical damage, failure of a component ....), the manufacturer of the leak detector must carry out a repair or a check.

Appendix Technical data

A1 Electrical data

Connected wattage leak detector VL-H9-Ex	230~ V – 50 Hz – 70 W
Connected wattage signalling unit with operation unit	230~ V – 50 Hz – 60 W
Connected wattage central signalling unit with 10 operation units	230~ V – 50 Hz – 600 W
Contact load, potential free contact (terminals 21, 22, 23 and 24)	230~ V – 50 Hz – max.5 A
Max. load external signal (terminals AS)	230~ V – 50 Hz – 150 W
Pump fuse F1	1 A (quick-acting or semi time-delay)
External signal fuse F2	2.5 A (max. 3 A)
External signal fuse F2 (ONLY VL-H9/Ex)	0,125 A (quick-acting)
Solenoid valve fuse F3	0.1 A (semi time-delay)
External fusing of the leak detector	max. 10 A
Overvoltage category	II

A2 Ex data

Gas group	II B3
Temperature code	T3/T4
Compressive strength pressure switch	25 bar
Compressive strength closed solenoid valve	25 bar
Water hammer resistance test valve and pump	10 bar

A3 Audible alarm

Buzzer signalling unit VLH9/ME-...	70 dB(A) within a radius of 1m
Buzzer central signalling units VL-H9/ZME	85 dB(A) within a radius of 1m
Signal horn leak detector VL-H9-Ex	95 dB(A) within a radius of 1m

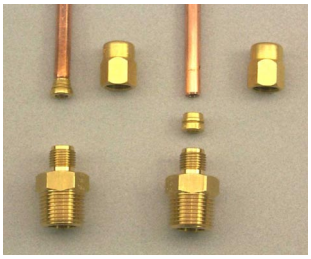
Work Sheet: AB-820 500

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 ¼ of a revolution

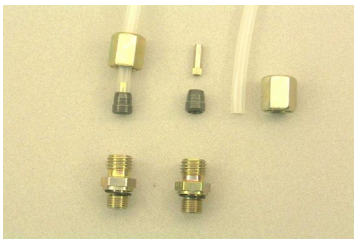
2 Clamping ring threaded fitting for plastic and metal pipes



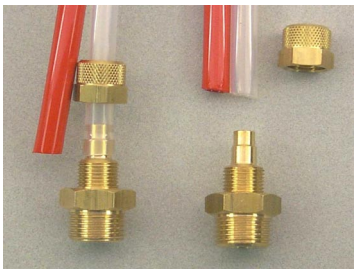
1. Insert the support sleeve into the end of the pipe
2. Insert the pipe with support sleeve as far as it will go
3. Tighten the thread until strong resistance can be clearly felt
4. Lightly loosen the nut
5. Tighten the nut until resistance can be felt (nut must exactly match the thread of the basic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



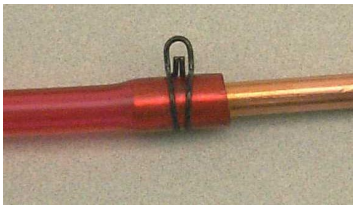
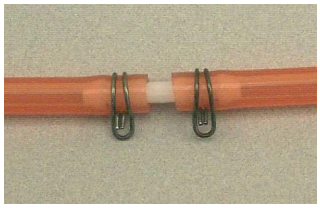
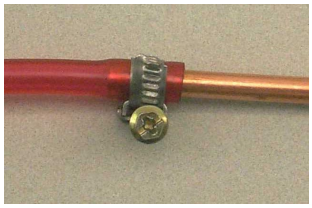
4 Quick-action fitting for PA- and PUR-tubes



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

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, April 26, 2002
Kolonnenstraße 30 L
Telephone: (030) 78730-364
Telefax: (030) 78730-320
Ref.: V 14-1.65.22-23/02

Notice
about
the modification and extension of the period of validity
of the General Approval of the Building Inspection Authorities dated April 17, 1997

Approval no.:	Z-65.22-110
Applicant:	Sicherungsgerätebau GmbH Hofstr. 10 D-57076 Siegen
Subject of approval:	Leak detector forming part of a leak detector system for double-wall tanks used for the storage of liquids hazardous to water, functioning according to the underpressure system
Period of validity until:	April 30, 2007

This notice extends the period of validity of the General Approval of the Building Inspection Authorities No. Z-65.23-111 dated April 15, 1997. This notice comprises three pages. It is only valid in connection with the above-mentioned general approval of the building inspection authorities and may only be used together with this.

Re. II. SPECIAL PROVISIONS

Sections 1 and 3.2 of the Special Provisions of the general approval of the building inspection authorities have been modified as follows:

1 Subject of approval and field of application

(1) The subject of this general approval is an underpressure leak detector of the type designation VL-H9 with a pressure-switch controlled evacuating pump for an alarm pressure of ≥ 330 mbar. The leak detectors may be connected to double-wall tanks according to section (2). 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).

(2) The area of application is restricted to double-wall steel containers according to DIN 6608-2, DIN 6616 Form A, DIN 6618-2, DIN 6619-2, DIN 6623-2, DIN 6624-2 and DIN 4119 for the storage of liquids hazardous to water when they are operated under atmospheric temperatures. The underpressure leak detectors can also be used for containers with general approval by the building inspection authorities if the suitability of the interstitial space has been designated for the connection of a leak detector for underpressure systems. They are also suitable for single-wall DIN containers or single-wall containers with general approval by the building inspection authorities which are operated with a leak protection lining with a general approval by the building inspection authorities.

(3) The present General Approval only serves to prove the functional safety of the subject of approval in the sense of section (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 -).

(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 h of the Water Resources Law is not applicable.

3.2 For flat bottom tanks according to DIN 4119[1] a general approval of the building inspection authorities for steel leak protection linings must be provided to prove that the interstitial space of the double-wall tank bottom in the on-site version is suitable for use as part of a leak detection system in connection with the underpressure leak detector.

By order

Strasdas

Official seal

Deutsches Institut für Bautechnik

German Institute for Constructional Engineering

[1] DIN 4119-1: Above-ground, cylindrical flat bottom tanks made of metallic materials: Basic principles, versions, tests - Issue June 1979

I. SPECIAL PROVISIONS

1 Subject of approval and field of application

1.1 The present general approval applies to vacuum leak detectors type VL-H9 with pressure-controlled evacuation pump for an alarm vacuum pressure of ≥ 330 mbar. The leak detectors are suitable for an installation on double-walled tanks as specified in paragraph 3.1. Leaks in the walls of the interstitial space are detected by pressure increase and indicated by an acoustic signal (for design of the leak detector devices, see appendix 1).

1.2 The application is limited to double-walled steel tanks to DIN 6608-2, DIN 6616 shape A, DIN 6618-2, DIN 6619-2, DIN 6623-2, DIN 6624-2 and DIN 4119 used for the storage of liquids incompatible with water at ambient temperatures. The vacuum leak detectors may also be used for tanks subject to a general approval issued by the Building Inspection Authorities, provided that the space to be monitored is suitable for the installation of such vacuum leak detectors. They are also suitable for single-walled tanks to DIN or single-walled tanks subject to a general approval of the building inspection authorities, provided that these tanks are equipped with a suitable, approved lining.

1.3 This general approval confirms the functional safety of the subject of approval in the sense of paragraph 1.1. It does not signify that the components meet the requirements of the '11th code of the legal provisions for the safety of devices' (code on the suitability of devices and protective systems for potentially explosive locations – code on protection against explosion – 11th GSGV)' of December 1996 (Official Bulletin I, p. 1914).

2 Regulations applicable to the subject of approval

2.1 Composition

2.1.1 The subject of approval consists of various versions of the vacuum leak detector type VL-H9 comprising at least the following components: indicator and control elements, vacuum pump, pressure switch and electrical and/or electronic components for output signal processing:

Type VL-H9 Ex	(Zone 1 and 2; direct power supply 230V)
Type VL-H9/A-Ex	(Signalling unit VL-H9/ME outside of potentially explosive locations or central signalling unit type VL-H9/ZME)
Type VL-H9/A-MV-Ex	(Separated from the signalling unit VL-H9/ME-MV in the potentially explosive location)
Type VL-H9/ME-MV-LS	(Signalling unit with solenoid valve control and leakage probe type FDL 30 of the manufacturer Endress + Hauser GmbH + Co.)

2.1.2 The functional safety of the subject of approval in the sense of paragraph 1.1 has proved to be in accordance with the 'principles of approval for leak detector devices for tanks' (ZG-LAGB) of August 1994, issued by the German Institute for Constructional Engineering.

2.2 Manufacture and marking

2.2.1 Manufacture

The leak detectors shall be manufactured only in the applicant's manufacturing shops. The leakage probes shall be manufactured only in manufacturing plants that are qualified to provide them with the certificate of conformity, in accordance with the relevant codes of the different states. Design, dimensions and materials of leak detectors and leakage probes 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 packaging 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 carry out in-house inspection and testing. In the course of such in-house inspection and testing, every leak detector or its components must be checked. By means of such individual checks, the manufacturer 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
- 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 retested.

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 of leak detectors

3.1 For tanks to DIN 6608-2[1], DIN 6616 shape A[2], DIN 6618-2[3], DIN 6619-2[4], DIN 6623-2[5] and DIN 6624-2[6], liquids should have the following maximum densities:

DIN 6608-2[1], DIN 6616 shape A[2] and DIN 6624-2[6]:

Tank diameter 2.90 m	≤ 1.05 kg/dm³
Tank diameter 2.50 m	≤ 1.22 kg/dm³
Tank diameter 2.00 m	≤ 1.53 kg/dm³
Tank diameter 1.60 m	≤ 1.90 kg/dm³

DIN 6618-2[3]

Tank height 15.950 m	≤ 0.93 kg/dm³
Tank height 12.750 m	≤ 1.16 kg/dm³
Tank height 9.585 m	≤ 1.54 kg/dm³
Tank height ≤ 7.40 m	≤ 1.90 kg/dm³

DIN 6619-2[4]

Tank height 2.84 m	≤ 1.07 kg/dm³
Tank height 2.76 m	≤ 1.10 kg/dm³
Tank height 2.60 m	≤ 1.17 kg/dm³
Tank height ≤ 1.90 m	≤ 1.61 kg/dm³

DIN 6623-2[5]

Tank height 1.20 m	≤ 1.90 kg/dm³

3.2 In case of tanks to DIN 4119-1[7], a test certificate issued by the testing division for leak detectors of the TUEV Nord *(Technical Control Board North)* must provide proof that the interstitial space of the double-walled tank bottom manufactured at site in combination with the vacuum leak detector is suitable as part of a leak detector device.

3.3 The liquids to be stored should not have a tendency to thickening or to precipitation of solids.

3.4 When selecting a leak detector device, it is important to ensure that the leak detector and the interstitial spaces have adequate resistance to the liquids to be stored. Liquids indicated in the positive list (table 2) of DIN 6601[8] as being compatible with the materials, as well as other liquids which can be compared to the aforementioned liquids as concerns their corrosion behaviour, do not imply a special proof of resistance.

1) DIN 6608-2: Horizontal steel tanks, double-walled, for underground storage of inflammable and non-flammable liquids incompatible with water - Issue August 1989 -
2) DIN 6616: Horizontal steel tanks, double-walled, for above ground storage of inflammable and non-flammable liquids incompatible with water - Issue September 1989 - shape A
3) DIN 6618-2: Vertical steel tanks, double-walled, for above ground storage of inflammable and non-flammable liquids incompatible with water - Issue September 1989 -
4) DIN 6619-2: Vertical steel tanks, double-walled, for underground storage of inflammable and non-flammable liquids incompatible with water - Issue September 1989 -
5) DIN 6623-2: Vertical steel tanks, double-walled, with a capacity of less than 1000 l, for above ground storage of inflammable and non-flammable liquids incompatible with water - Issue September 1989 -
6) DIN 6624-2 Horizontal steel tanks, double-walled, with a capacity between 1000 and 5000 l, for above ground storage of inflammable and non-flammable liquids incompatible with water - Issue September 1989 -
7) DIN 4119-1 Cylindrical flat-bottom tanks above ground, made of metallic materials; principles, design, testing - Issue June 1979 -
8) DIN 6601 Resistance of the materials used for steel tanks against liquids (positive list of liquids) - Issue October 1991 –

4. Conditions relating to the construction of leak detectors

4.1 Leak detectors should be installed by the manufacturer or by companies specialised as per § 19 l of the Water Resources Law, in accordance with paragraph 6 of the technical specification[9] and commissioned in accordance with paragraph 7 of the technical specification[9]. Installation, maintenance, repair and cleaning of the leak detectors shall only be carried out by companies specialised as per § 19 l of the Water Resources Law, unless such work is exempted from these rules, or the manufacturer has this work carried out by his own experts.

When connecting the leak detector VL-H9/ME-MV LS to a tank with internal operating pressure, the leak detector including its connecting line to the interstitial space shall be subject to a leak test in which 1.1 times the max. permissible tank operating pressure is applied. The solenoid valve must be closed during the test. The leakage probe of the leak detector unit shall be installed in the lowest position of the interstitial space. Please note that a minimum liquid depth of 25 mm is required for the probe to detect the liquid.

4.3 The leak detector housing should not be exposed to radiating heat with a temperature of more than +50°C. When stored liquids have a temperature of more than +40°C, the exhausted air must be cooled down in cooling runs of at least 1.50 m length, between the interstitial space and the leak detector.

5. Provisions concerning use, maintenance and regular checks

Leak detector devices with leakage probes must be operated and maintained in accordance with paragraph 8 of the technical specification[9].The technical specification[7] is part of the manufacturer's supply.

By order

Dr. Ing. Kanning

Official seal

German Institute for
Constructional Engineering

[9] The manufacturer's technical specification of January 30, 1997 for the leak detector type VL-H9 was verified by the technical control board TUEV Nord e.V.

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(1) # EC-TYPE-EXAMINATION CERTIFICATE

(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-type-examination Certificate Number:

PTB 04 ATEX 2112 X

(4) Equipment: Low-pressure leakage indicator, type VLX... or VL-H9...

(5) Manufacturer: Sicherungsgerätebau GmbH

(6) Address: Hofstraße 10, 57076 Siegen, Germany

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

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 04-24280 .

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

EN 50014:1997 + A1 + A2 **EN 50018:2000** **EN 50019:2000**

EN 50028:1987 **EN 50284:1999**

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

(11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

II 1/2 G EEx m e d IIB T4 *

with flame arrester: II G IIB3

Zertifizierungsstelle Explosionsschutz
By order:

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Braunschweig, December 13, 2004

* By SGB limited to T3

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • D-38116 Braunschweig

(13) # SCHEDULE

(14) ## EC-TYPE-EXAMINATION CERTIFICATE PTB 04 ATEX 2112 X

(15) Description of equipment

The low-pressure leakage indicator, type VLX... or VL-H9... is used for the leakage monitoring of containers (tanks) and pipings for the storage and conveyance of flammable liquids which are hazardous to water and which may form gas/vapour/air-mixtures assigned to explosion group IIB3 and temperature class T4 and for which category-1 equipment is required according to equipment group II.

The low-pressure leakage indicator consists of a mounting enclosure into which the following components are installed: A pump and a solenoid of type of protection Encapsulation "m", a housing with two pressure-operated switches of type of protection Flameproof Enclosure "d" and a terminal box of type of protection Increased Safety "e". The pump, the solenoid and the housing for the pressure-operated switches are interconnected with the control room by means of pipings.

Electrical equipment separately certified for category 2, is separated from areas requiring category-1 equipment by means of flame arresters which are approved for explosion group IIB3 according to EN 12874:2001.

Due to its venting measures, the mounting enclosure is suitable for the installation of further equipment which is separately certified for category 2.

Electrical data

Mains supply	230 V, 50 W, 50/60 Hz
Pump	230 V, 28 W, 50/60 Hz
Pressure-operated switch	230 V, 1 A, cos(phi) $\geq$ 0.9
Solenoid	230 V, 8.5 W, 50/60 Hz

(16) Test report PTB Ex 04-24280

(17) Special conditions for safe use

1. The low-pressure leakage indicator, type VLX... or VL-H9... is suitable for the installation in hazardous areas where category-2 equipment is required according to the fixings of equipment group II.

2. The suction and pressure pipes of the diaphragm pump shall be connected to the tank and/or to the tank venting elements by means of suitable flame arresters such as deflagration protection and/or detonation guards.
3. When the gas pipes are applied with test taps, it shall be guaranteed that these are mounted into the gas pipes and shut off, both, with a minimum degree of protection of IP67. Otherwise the test taps shall be secured with flame arresters.
4. Only equipment, which is explosion protected as category-1 equipment according to the fixings of equipment group II, may be connected to the test taps.
5. The low-pressure leakage indicator, type VLX... or VL-H9... shall be installed outdoor or in suitably vented rooms as such, that sufficient venting of the mounting enclosure is guarateed by convection through the breathers.
6. The low-pressure leakage indicator shall be included in the local equipotential bonding system.
7. The low-pressure leakage indicator shall be subject to a recurrent leak test.
8. The low-pressure leakage indicator has been evaluated exclusively concerning its zone-separation. Further requirements to e.g. pipings, tank facilities, function of the leakage indicator, etc. shall be considered separately.

(18) Essential health and safety requirements

met by compliance with the standars mentioned above

Zertifizierungsstelle Explosionsschutz
By order:

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Braunschweig, December 13, 2004

CONFORMITY DECLARATION

This declaration applies to the

VACUUM LEAK DETECTORS ***VL – H9/Ex and VL – H9/A-..-Ex***
(as a component by the means of the EU directive 94/9EEC)

made by Sicherungsgerätebau GmbH
Hofstraße 10
D- 57076 Siegen

With this declaration, SGB verifies that the above mentioned leak detector complies with the protection requirements specified in the EU directive 89/336/EEC for the adjustment of statutory regulations of the member states for electromagnetic compatibility or the German law for electromagnetic compatibility (EMVG) from November 9, 1992 (§ 4 section 1).

This declaration applies to items that are produced according to the documentation (technical description, and drawing(s)), that are part of this declaration.

The following regulations were applied to evaluate the product regarding electromagnetic compatibility.

- EN 50 081-1 generic specification, malfunction message
- EN 55 082-1 generic specification, malfunction resistance

With this declaration, SGB certifies that the above mentioned leak detector corresponds with protection requirements specified in the EU directive 73/23/EEC for the adjustment of the statutory regulations of the member states regarding electrical equipment for use within certain voltage limits or in the 1st regulation of the Equipment Safety Act (Gerätesicherheitsgesetz) from June 11, 1979.

This declaration applies to items that are produced according to the documentation (technical description, and drawing(s)), that are part of this declaration.

The following regulations were applied to evaluate the product regarding its 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 certifies that the above mentioned leak detector corresponds with protection requirements specified in the EU directive 94/9/EEC for the adjustment of the statutory regulations of the member states for devices and protection systems for intended use in explosive areas or in the 2nd regulation of the Equipment Safety Act (Gerätesicherheitsgesetz) from December 12, 1996.

The pneumatic components of the leak detector may be connected to interstitial spaces of tanks and pipes that require category 2 devices, and under special conditions also category 1.
This declaration applies to devices that are produced according to internal QM documents in accordance with the documentation (technical description with drawings), that are part of this declaration.

The product has been evaluated. The following documents have also been applied:

- EU type-examination certificates for the components used (see parts list)
- Ignition hazard assessment report according to EN 13463-1 section 5.2.8:2001

Additional hazards do not follow from the ingnition hazard assessment / risk analysis (...X certificates have been taken into account).

- EN 60 079-10
- EN 1127-1:1997
- EN 50 284: 1999
- EN 13160-1:2003
- PTB 04 ATEX 2112 X

Siegen, January 3, 2004

Martin Hücking
Development, Explosion Officer

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
☎ +49 / 271 / 48964 - 0
Fax: +49 / 271 / 48964 - 6