

LEAK PREVENTION TECHNOLOGY

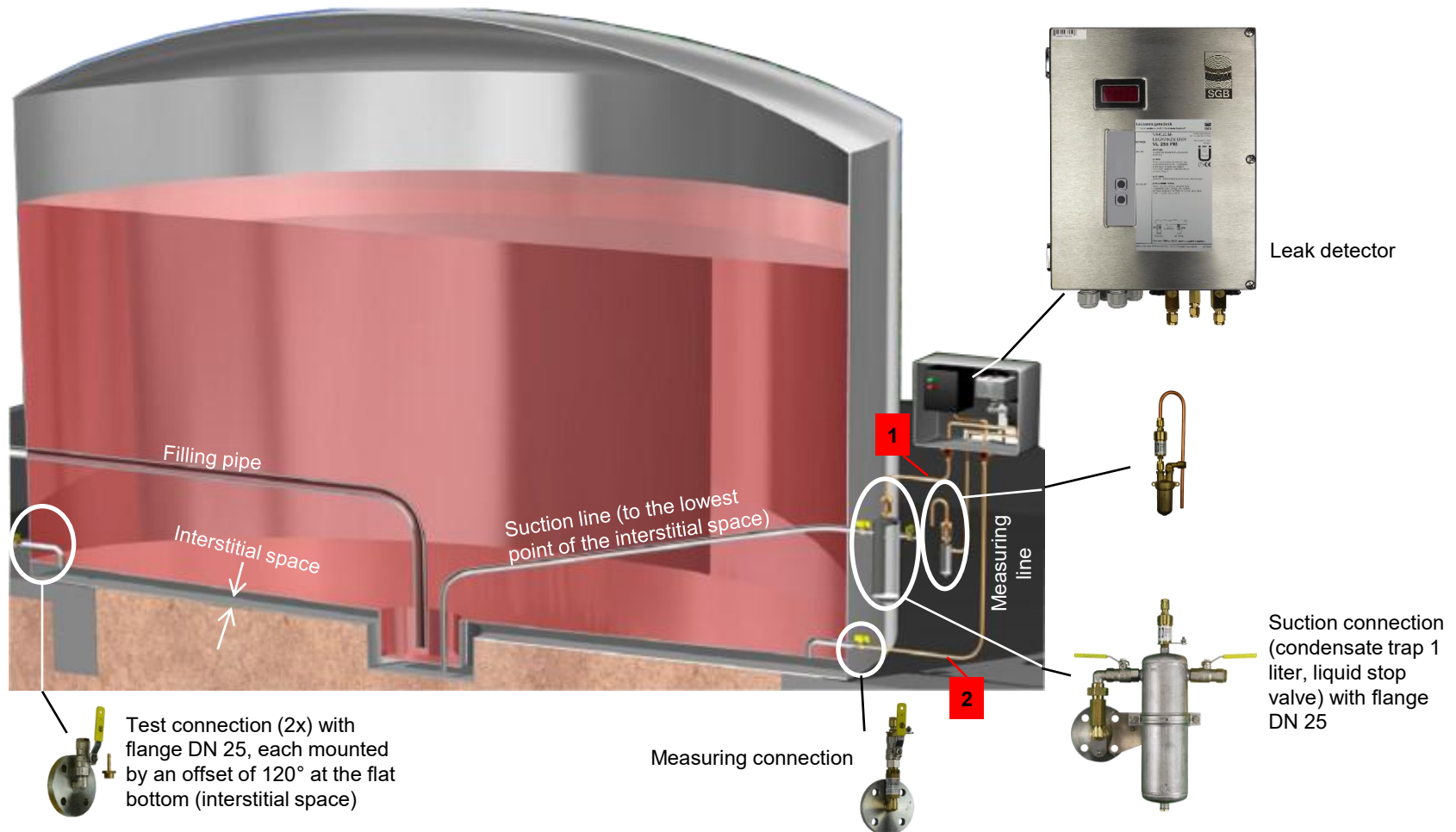
For a clean and protected environment



Leak detection technology for

Double bottoms of flat bottom tanks

Leak detector connection on flat bottom tank with double bottom



Stainless steel tubing with an external diameter of 8 mm and an internal diameter of 6 mm is used for the connecting pipes between the leak detector and the kit / tank connections (1 / 2), as well as for the exhaust kit.

Vacuum monitoring of flat bottom tanks

Alarm- and operating pressure

According to the EN 13160, part 2, the alarm pressure must be at least 255 mbar.

The operating pressure is between 350 and 500 mbar (depending on leak detector).

In vacuum leak detection systems, in the event of a leak, the stored goods and their vapours enter the monitoring chamber, the connecting pipes or even the leak detector.

Therefore:

All used components must be chemically sufficiently resistant to the stored material and its vapours.

and

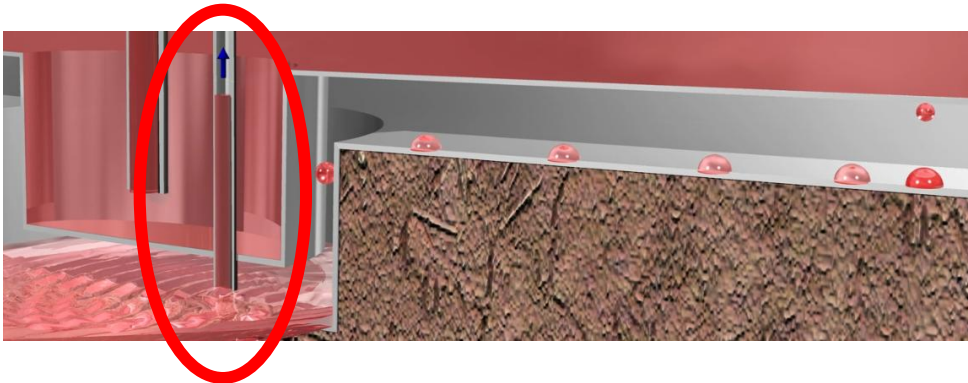
In the event of potentially explosive atmospheres, the leak detection system must be designed to be explosion-proof!

Principle of vacuum monitoring at flat bottom tanks

In case of a liquid leak, the liquid enters the interstitial space and collects at the low point of the interstitial space.

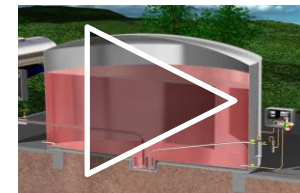


The incoming liquid decreases the vacuum, which causes the pump to turn on and evacuate the interstitial space until the operating vacuum is reached.



After some time, the liquid is sucked into the suction line.

Video animation
Monitoring a flat
bottom tank:



Principle of vacuum monitoring at flat bottom tanks



The liquid enters the condensate trap, ...

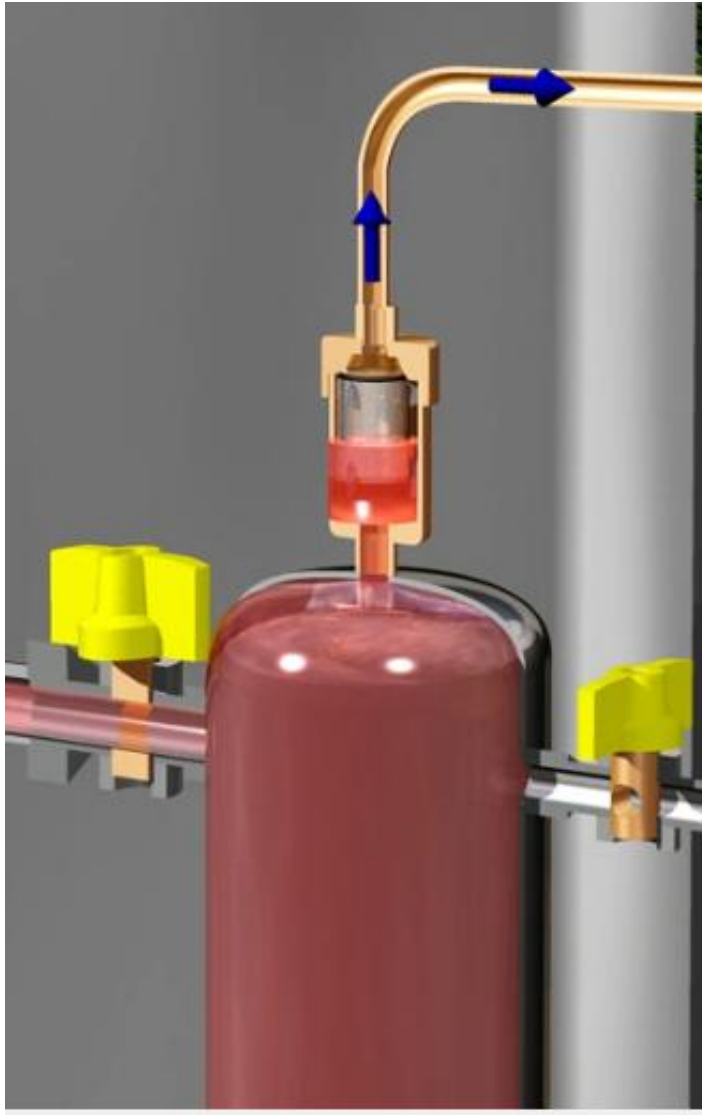


... which will be filled more and more.



The liquid reaches the liquid stop valve.

Principle of vacuum monitoring at flat bottom tanks



The float switch of the liquid stop valve is pushed upwards, the vacuum pump sucks against the closed liquid stop valve

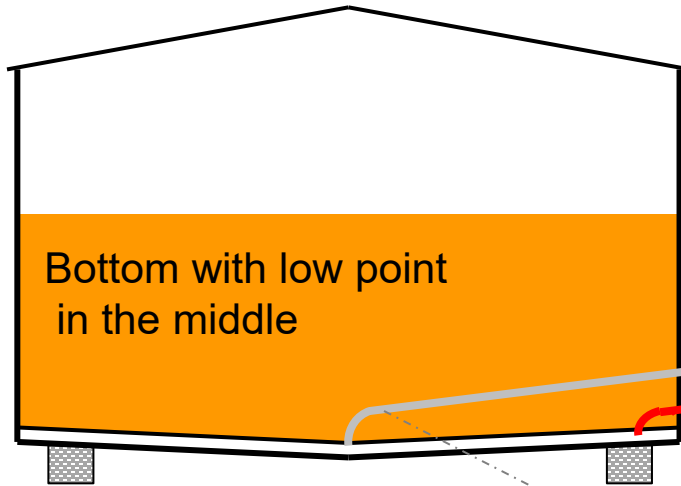
Because of the vacuum that still exists on the measuring line side, additional stored material or water is sucked into the interstitial space and the measuring line.

This causes the vacuum to drop until the “Alarm ON” pressure is reached. This triggers the visual and audible alarms.

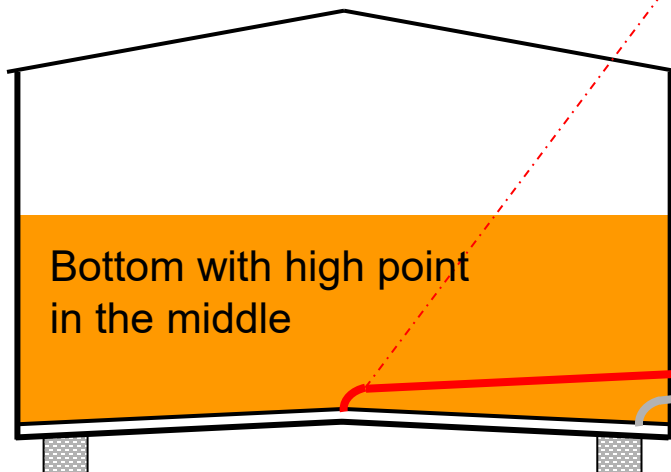


It is also an option to use a liquid sensor in conjunction with solenoid valves instead of the liquid stop valve. The liquid alarm is then triggered when the sensor comes into contact with liquid.

Location of suction- and measuring line



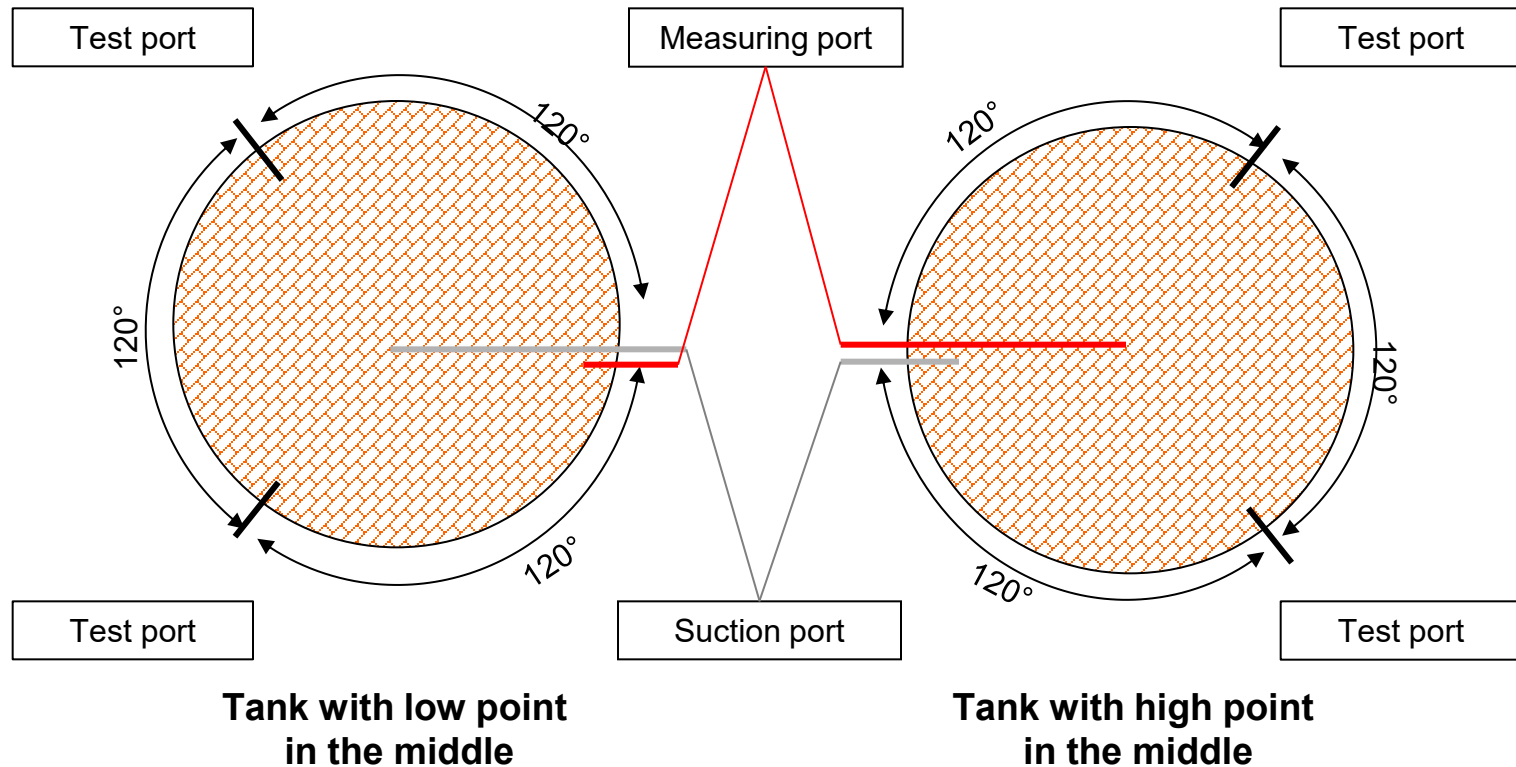
Measuring line:
Connected to a **high point**
in the interstitial space



Suction line:
Connected to the **lowest point** of the interstitial space

Location of the test ports

Test connections are installed in angles of 120° degree to the suction/measuring connection

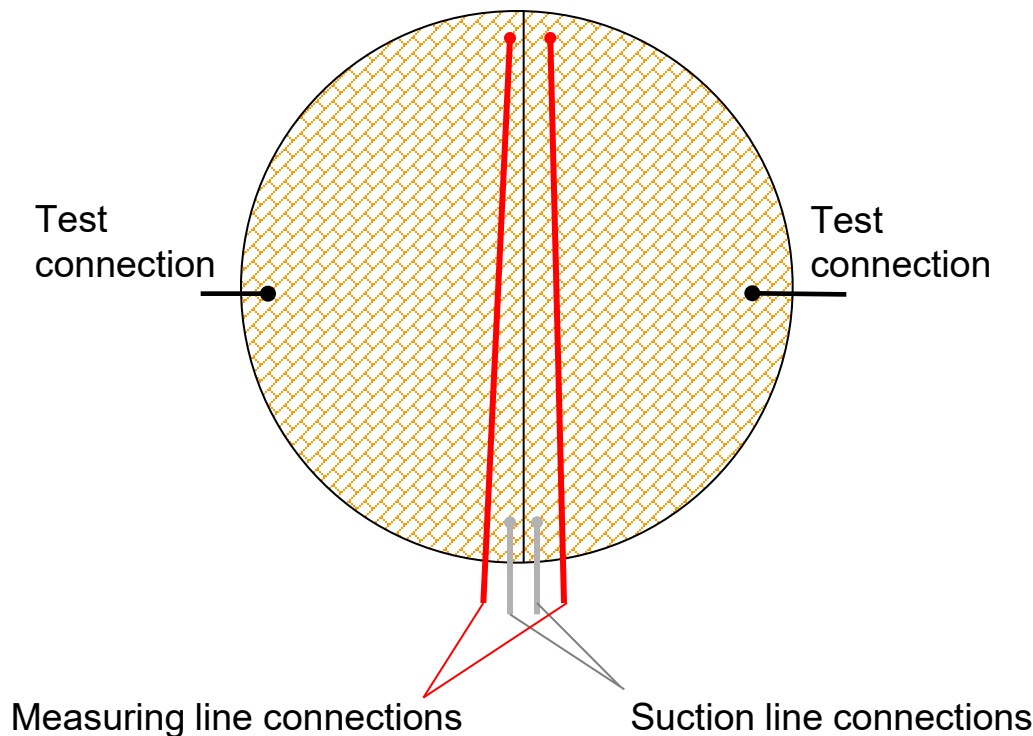


On tanks with small diameters test connections may not be necessary.
Consider requirements of the approval for the double bottom!

Location of the test ports

Devided bottoms

A division of the double bottom is made, when the volume of the interstitial space exceeds specified limits or when the segmentation can help to facilitate a leak detection.



The double bottom is divided in two parts. The test connections should be arranged in distances as big as possible, to the measuring connection.

The double bottom has a fall to the lower edge of the picture. Each suction connection is directed to the low point.

Consider requirements of the approval for the double bottom!

Creation of the interstitial space (double bottom)

Basic requirements

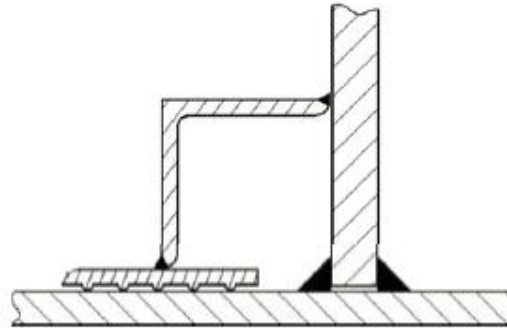
- Free passage for air, water and stored product
(Viscosity $< 5000 \text{ mm}^2/\text{s}$, increase gap width with viscous products)
- Sufficiently resistant to water and stored product
(Inappropriate combinations of materials and stored product can lead to chemical reactions with the release of hydrogen)
- Tightness requirement: $0,1 \text{ mbar} \cdot \text{l/s}$
(Leak rate $\triangleq 0,1 \text{ ml/s}$)
- Volume of interstitial space not larger than 10 000 litre (EN 13160)
(Better smaller, as easier to test for leaks. 4000 litres can be tested in 7 hours.)

Creation of the interstitial space (double bottom)

VdTÜV Information Sheet 963 on Fuel Storage Systems, Part 1: Installation of new double floors or retrofitting of existing ones

4.1.2

Leak-proof lining using
perforated sheet metal
(Type A)

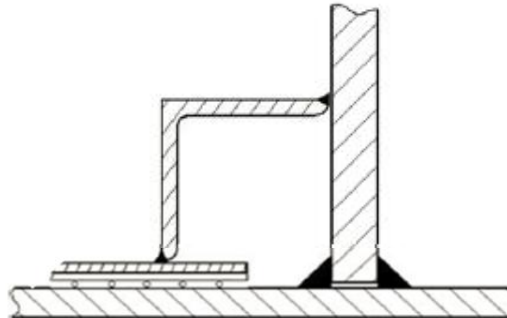


Advantage:

- Small interstitial space crack, therefore large areas with small volume possible
- Partition of interstitial space only from a diameter of 60 m

4.1.3

Leak-proof lining using
smooth metal sheets
and wire mesh as
spacers (Type B)



Creation of the double bottom

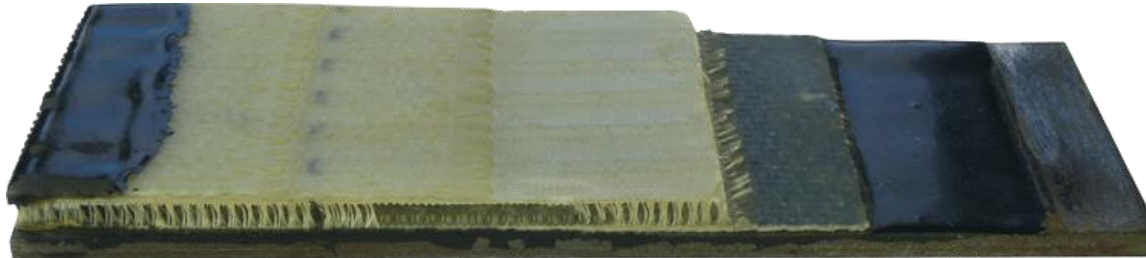
4.2.1

Leak protection lining, glass fibre reinforced synthetic resin laminate (design type C)

- with aluminium-waterproof foil



- with 3-D-fibre glass cloth



4.2.2

Flexible plastic foil as leak protection lining (design type D)

4.2.3

Inflexible plastic sheet as leak protection lining (design type E)

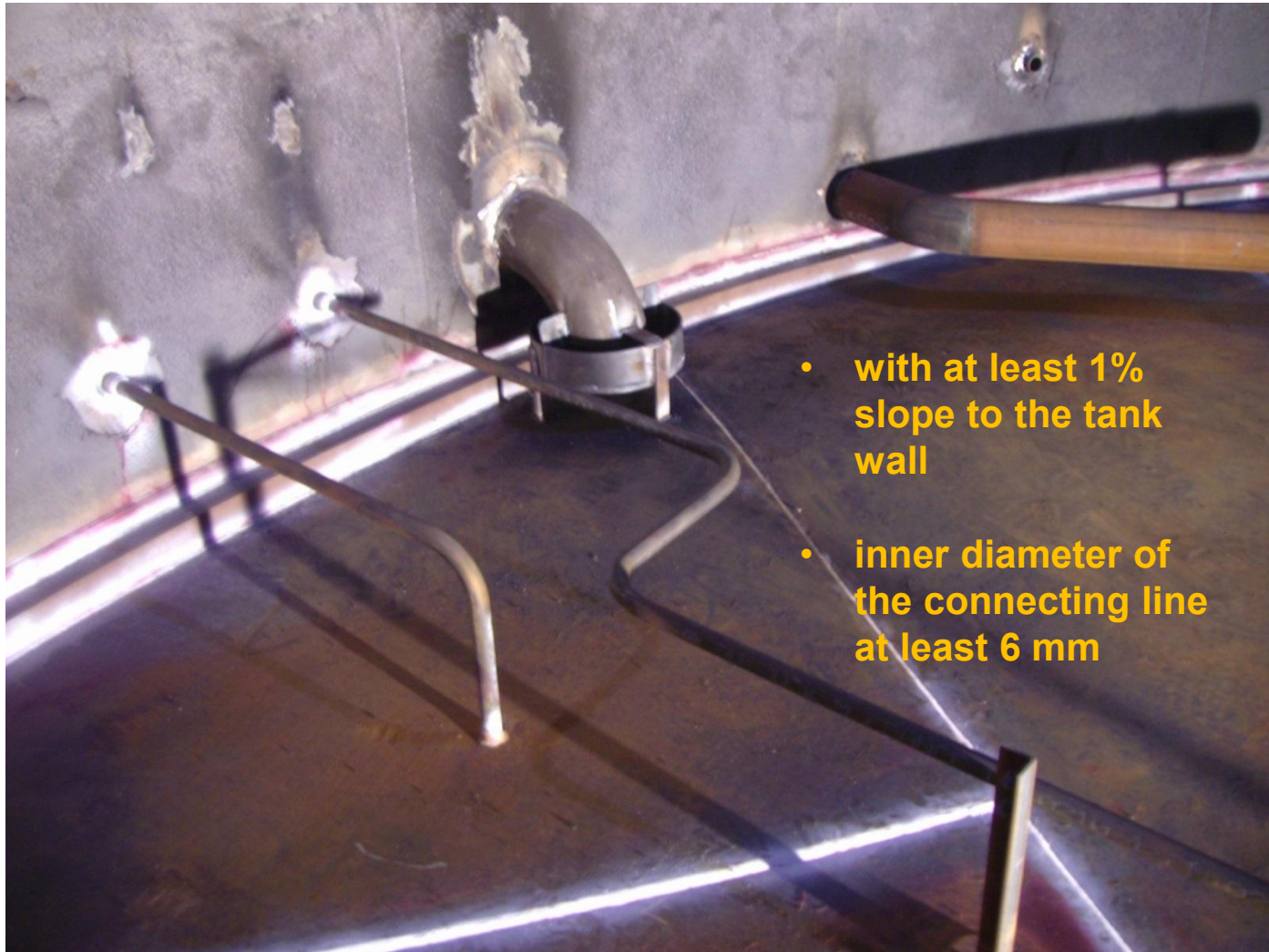
Installation of suction- and measuring-line in an on tank

Leading the pipeline through tank pit



Installation of suction and measuring line in and on tank

Suction and measuring line at inner tank



- with at least 1% slope to the tank wall
- inner diameter of the connecting line at least 6 mm

Installation of suction and measuring line in and on tank

Measuring line to tank centre



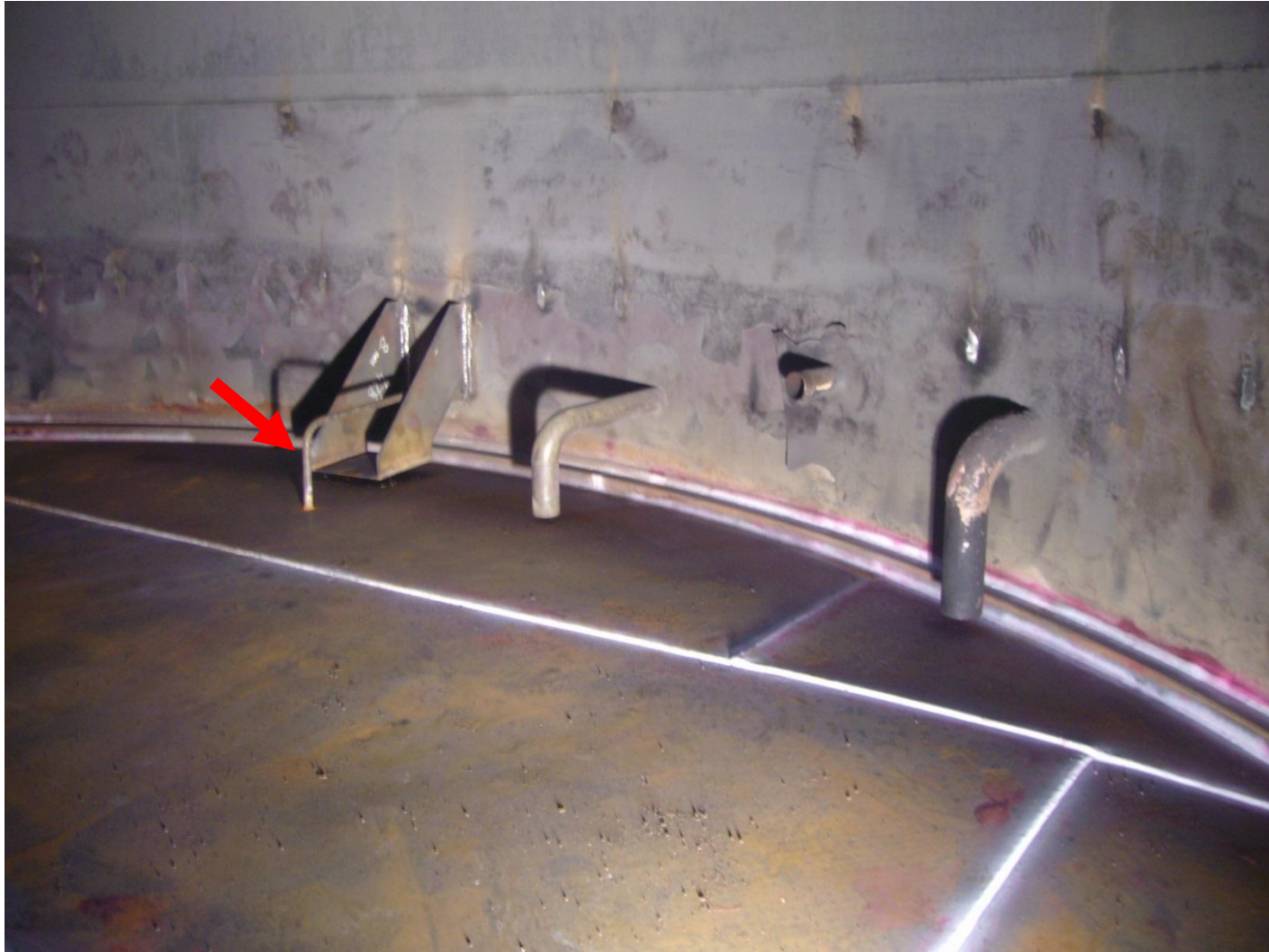
Measuring line connection at ground



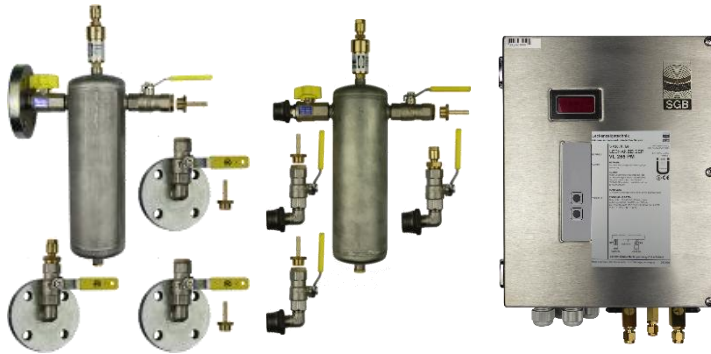
The connection of the measuring line must always be at least 100 mm higher in level than the connection point of the suction line. Otherwise, provide a measuring chamber with a diameter of at least 100 mm and a height necessary to reach the required level difference.

Installation of suction and measuring line in and on tank

Test connection



Leak detectors for flat bottom tanks



VL 255 PM

Operating vacuum: Not more than -380 mbar

Functionality of the interstitial space given for -650 mbar

Stored goods: **Water-polluting liquids with a flash point > 55/60°C**, and others, if sufficient resistance of leak detector against stored liquid is given

Types: Brass/stainless steel

VL 255 PMMV

with liquid sensor (up to 100/150°C)

Operating vacuum: Not more than -380 mbar

Functionality of the interstitial space given for -650 mbar

Stored goods: **Water-polluting liquids with a flash point > 55/60°C**, highly aggressive stored products such as acids and lyes

Types: Stainless steel

Also usable for heated flat bottom tanks.



Leak detectors for flat bottom tanks

VL 330 A-Ex with LAE

Operating vacuum: Not more than -540 mbar
Functionality of the interstitial space given for -750 mbar

Stored goods: Water-polluting liquids with a flash point $> 55/60^{\circ}\text{C}$ and $\leq 55/60^{\circ}\text{C}$, whose (possible) explosive steam-air mixtures can be classified in gas groups IIA to IIB3 as well as in temperature codes T1 to T3 (T4)

Types: Brass/stainless steel



VLX 330 A-Ex HK with LAE HK

Operating vacuum: not more than -540 mbar
Functionality of the interstitial space given for -700 mbar

Stored goods: Water-polluting liquids with a flash point $> 55/60^{\circ}\text{C}$ and $\leq 55/60^{\circ}\text{C}$, whose (possible) explosive steam-air mixtures can be classified in gas groups IIA to IIB and H_2 as well as in temperature codes T1 to T4.

Types: Brass/stainless steel



Leak detectors for flat bottom tanks

VLXE 330 A-Ex with LAE 330 PM

Operating vacuum: Not more than -450 mbar
Functionality of the interstitial space given for -700 mbar

Stored goods: Water-polluting liquids with a flash point $> 55/60^{\circ}\text{C}$ and $\leq 55/60^{\circ}\text{C}$, whose (possible) explosive steam-air mixtures can be classified in gas groups IIA to IIB and H_2 as well as in temperature codes T1 to T4

Types: Brass/stainless steel



VLXE 330 Ex M/VLXE 330 Ex MMV

Operating vacuum: not more than -450 mbar
Functionality of the interstitial space given for -700 mbar

Stored goods: Water-polluting liquids with a flash point $> 55/60^{\circ}\text{C}$ and $\leq 55/60^{\circ}\text{C}$, whose (possible) explosive steam-air mixtures can be classified in gas groups IIA to IIB (IIB + H_2) as well as in temperature codes T1 to T4

Types: Stainless steel



Leak detectors for flat bottom tanks

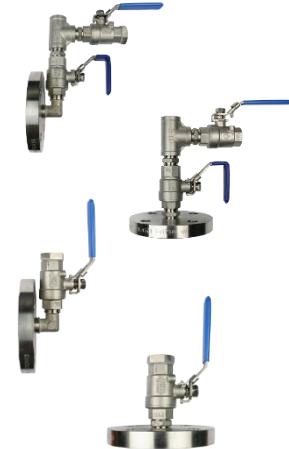
VLX 350 SA-Ex

Static system without integrated vacuum pump

Operating vacuum: -350 up to -700 mbar

Stored goods: Water-polluting liquids with a flash point $> 55/60^{\circ}\text{C}$ **and** $\leq 55/60^{\circ}\text{C}$, whose (possible) **explosive steam-air mixtures can be classified in gas groups II A, II B or II C as well as in temperature codes T1 to T6.**

Type: Stainless steel



The background of the slide is a collage of six photographs showing various industrial gas equipment. Top left: A white gas meter and control unit mounted on a large white storage tank. Top middle: A green gas pipeline running horizontally across a grey industrial wall. Top right: A grey gas control unit mounted on a wall with a black gas detector on top. Bottom left: A grey gas control unit mounted on a wall with a gas detector and piping. Bottom middle: A close-up of a gas valve and piping on a tank. Bottom right: A gas control unit and piping on a wall next to a large industrial pipe.

**If you have any questions,
please do not hesitate to
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