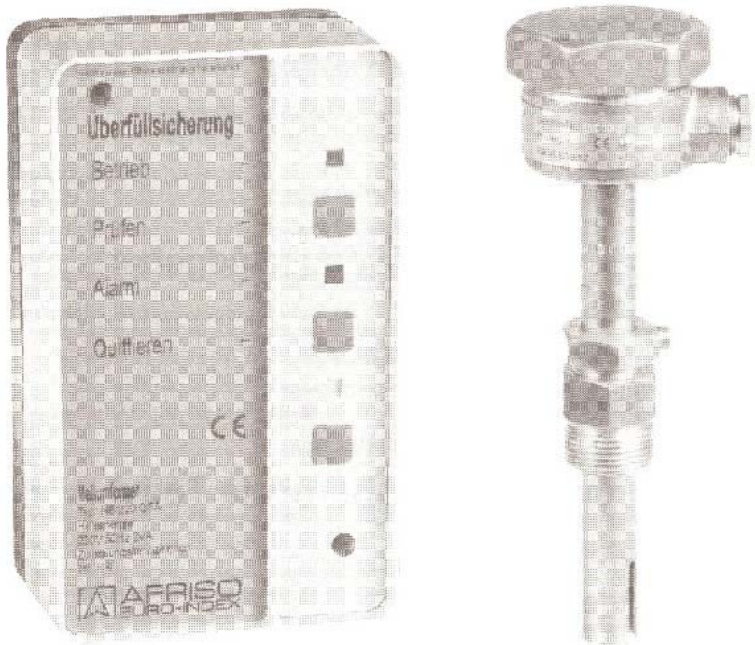
utilizing overfill safety systems



Using overfill safety systems

utilizing overfill safety systems

- The ICPR have decided that tanks can only be filled with substances hazardous to water if they are equipped with **OSS**!

- The technical guidelines are as follows:

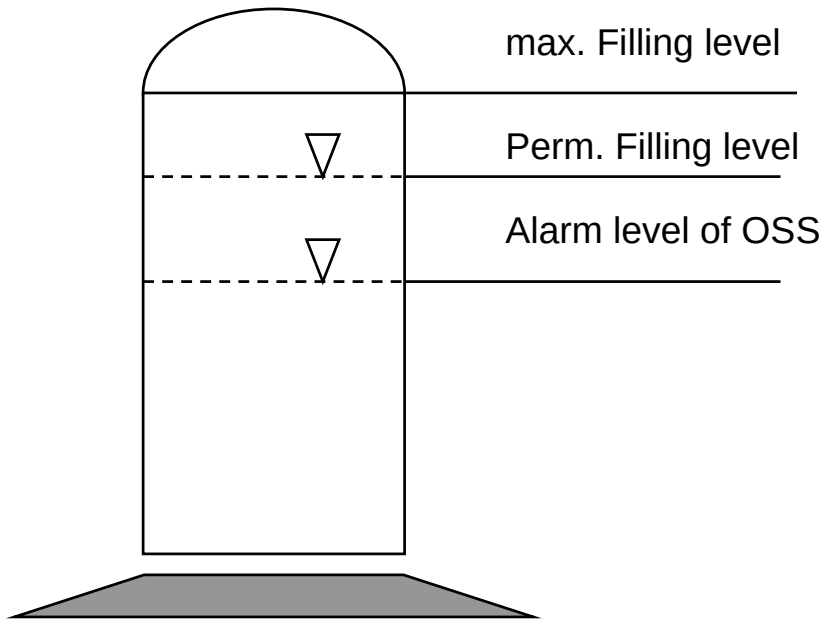
☞ „Before the highest permissible filling level is reached, the overfill safety system must either interrupt the filling operation automatically or trigger off an acoustic alarm. (and as the case may be, it could be a visual alarm.) ! An exception can only be made if other adequate measures are put in place to prevent overfilling !“

☞ The permissible filling level is to be determined and the amount of liquid that will still flow after interrupting the supply should also be taken into account !

☞ The efficiency of the OSS must be guaranteed at all times !

utilizing overfill safety systems

- The permissible filling level of **over- and under-ground diesel tanks,** which are less than 0,8 m beneath the earth surface is for example equal to **95%** and for under-ground tanks which are at least 0,8 m beneath the earth surface **97%** of the whole tank capacity.



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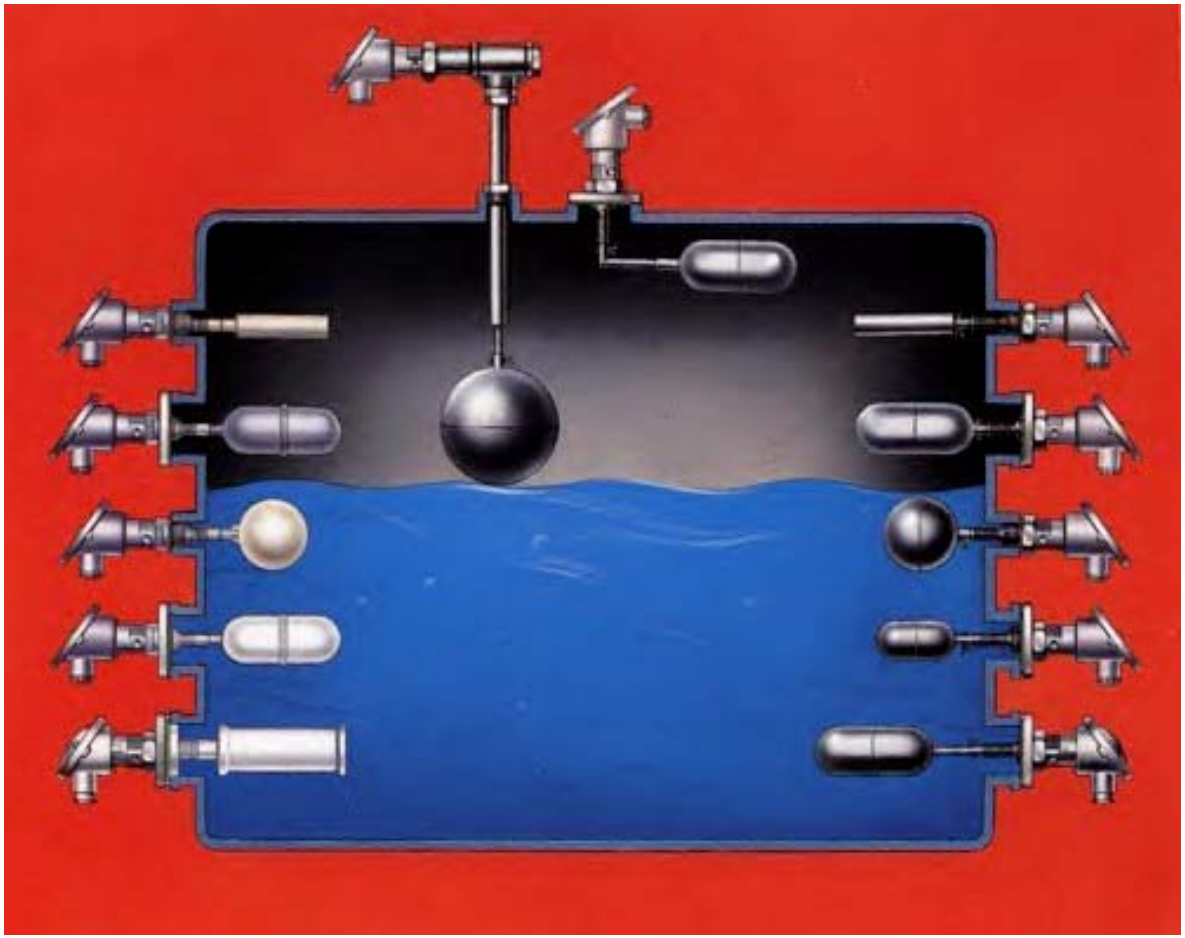
To be able to have a picture of existing possibilities, three technical solutions are presented here:

1. Overfill safety system on the basis of a swimmer,

2. Overfill safety system on the principle of capacitive,

3. Overfill safety system on the basis of a difference in the thermal conductivity of the surrounding medium (Cold conductor).

Overfill safety systems using a swimmer principle



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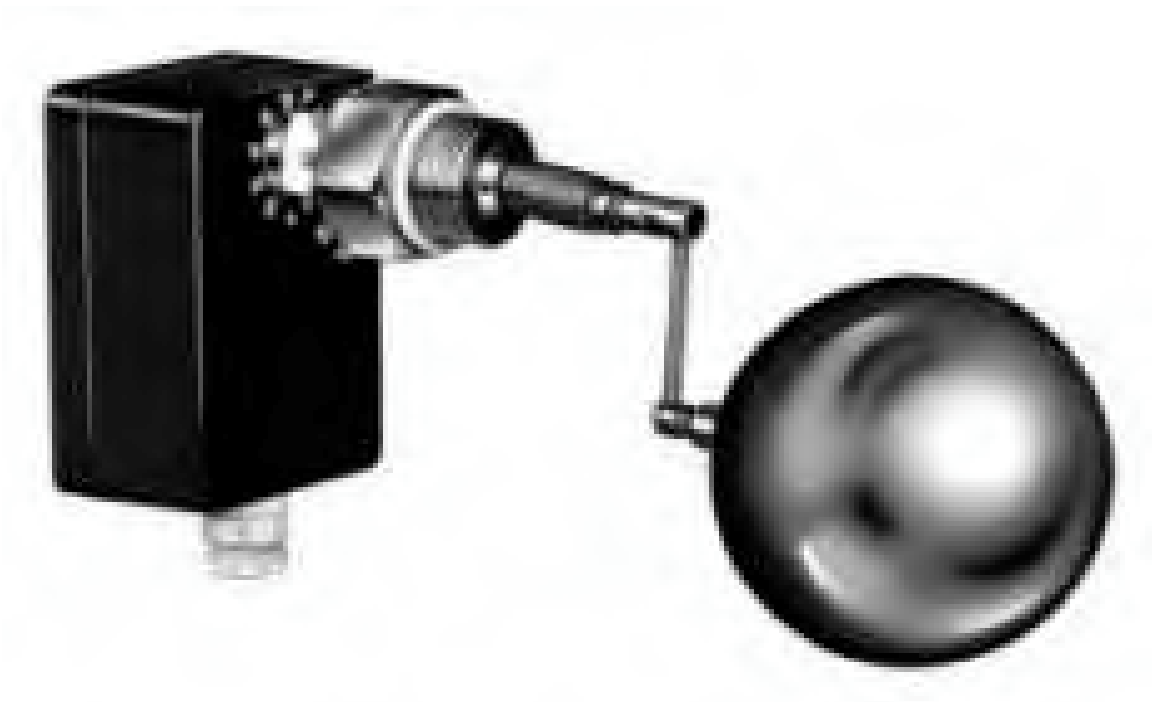
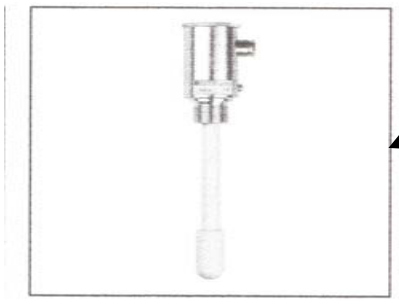
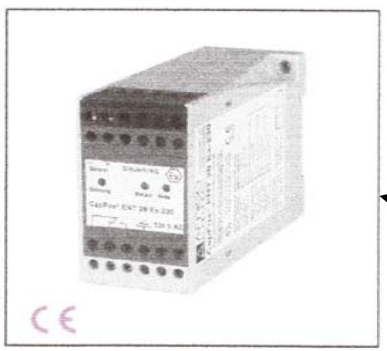
- The OSS functions according to the buoyancy principle of a floater, which must be connected to a corresponding remote display and equipped accordingly (when the highest permissible level is reached ➔ interruption of the filling process or triggering off of an acoustic alarm)

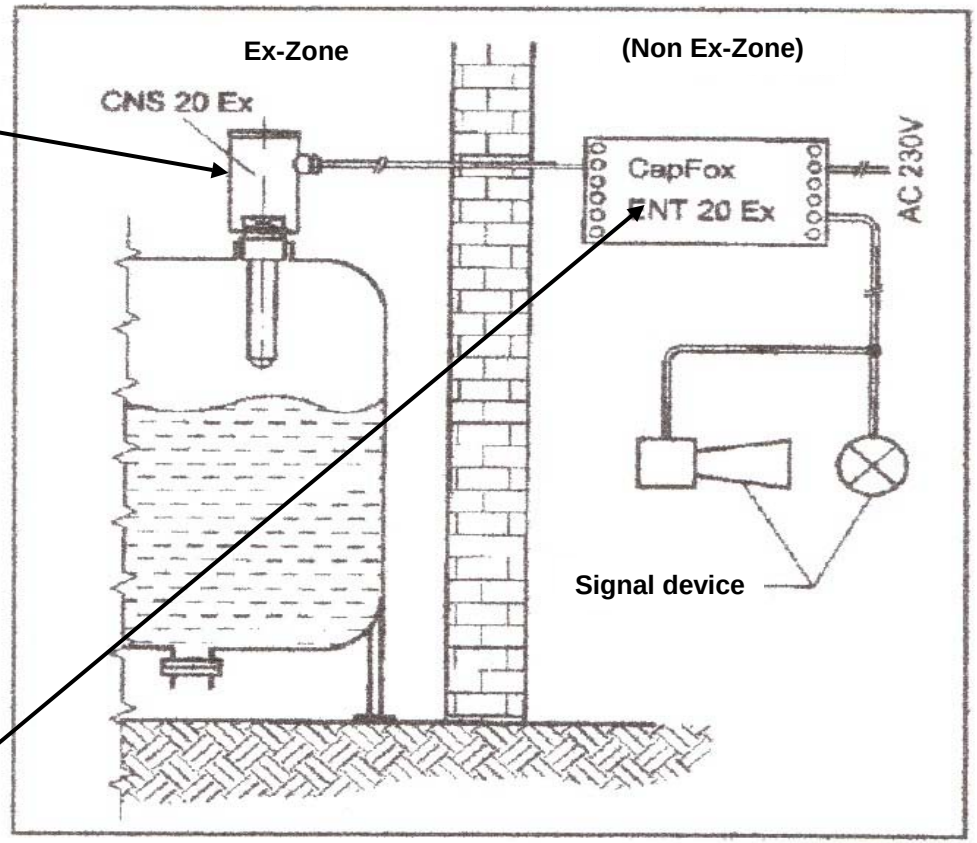


Overfill safety systems using the capacitive principle

This OSS consist of measuring device (1) and the probe (2)







utilizing overfill safety systems

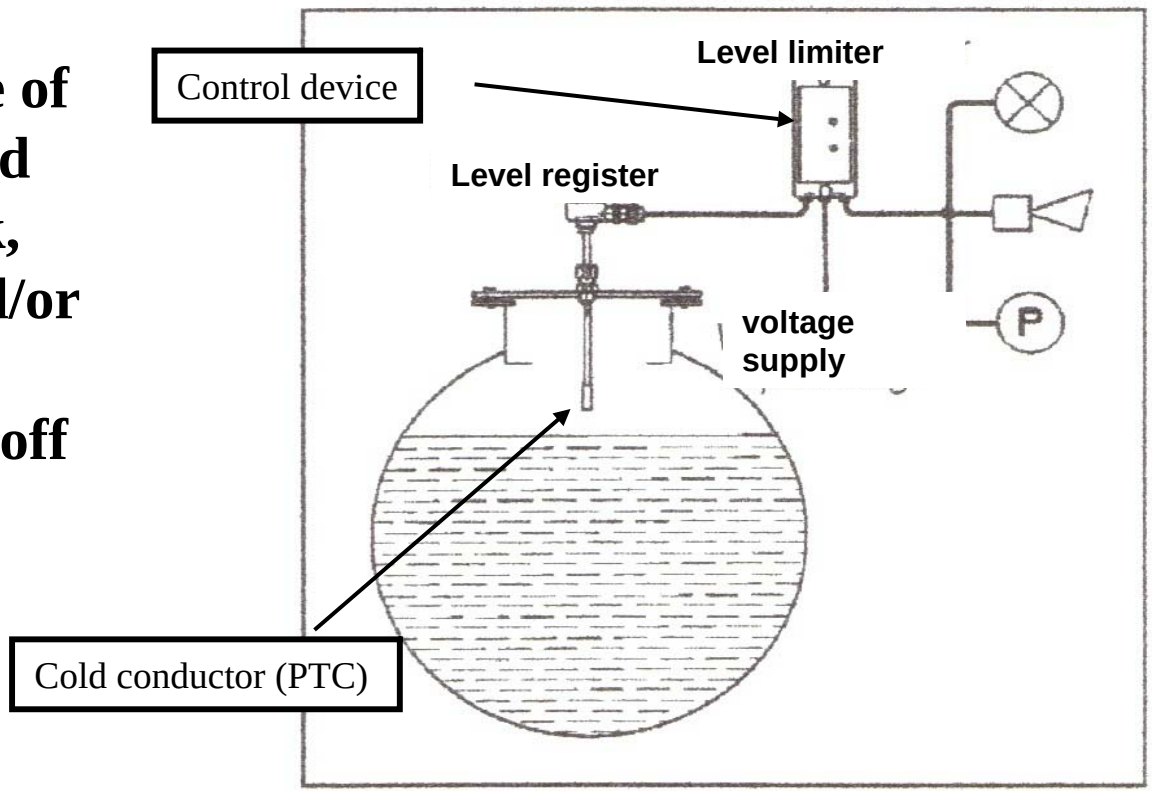
- This method uses the probe electrode (2) as an electric condenser. The capacity of the condenser is dependent among other things on the medium surrounding it. This capacity is low in the air, while it rises when the probe electrode is being introduced into the liquid. The value of the probe's capacity depends among other things mainly on the level of liquid in the tank.

- The probe‘s electronics determines the capacity of the probe and sends a signal to the level gauge (1) for evaluation.

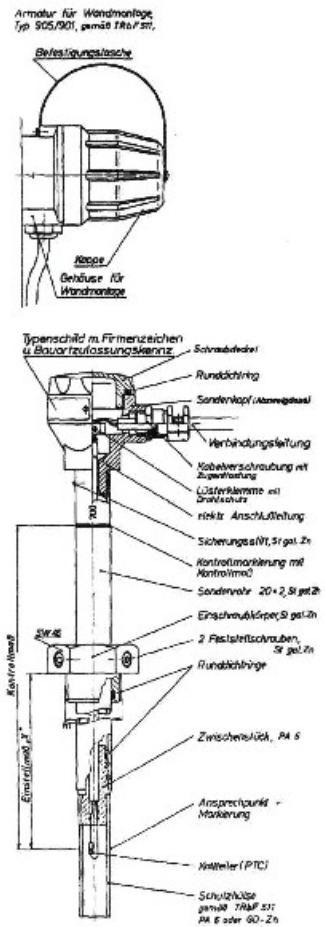
- When the set limiting level (highest permissible) is reached, the filling process will either be interrupted or an appropriate signal is given !

Overfill safety system on the basis of a difference in the thermal conductivity of the surrounding medium (cold conductor)

Schematic structure of a PTC-OSS mounted on a stationary tank, either for visual and/or acoustic signal or suitable for putting off the filling pump.



Structure of a cold conductor PTC-OSS



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- This overfill safety systems is based on the principle of the PTC-resistance (Positive Temperature - Coefficient) made of semiconductor material, the so called „cold conductor“. The afore-mentioned coefficient is a measure of the proportional change in the resistance when the temperature changes by 1 K.

- One characteristic of the cold conductor is the fact that the value of the resistance increases with increase in temperature. With a change in the heat transportation due to changes in the medium (Air-stored liquid) surrounding the cold conductor, the electric current flowing through the semiconductor also changes. The changes in electric current can be used for switching a device if is high enough.

utilizing overfill safety systems

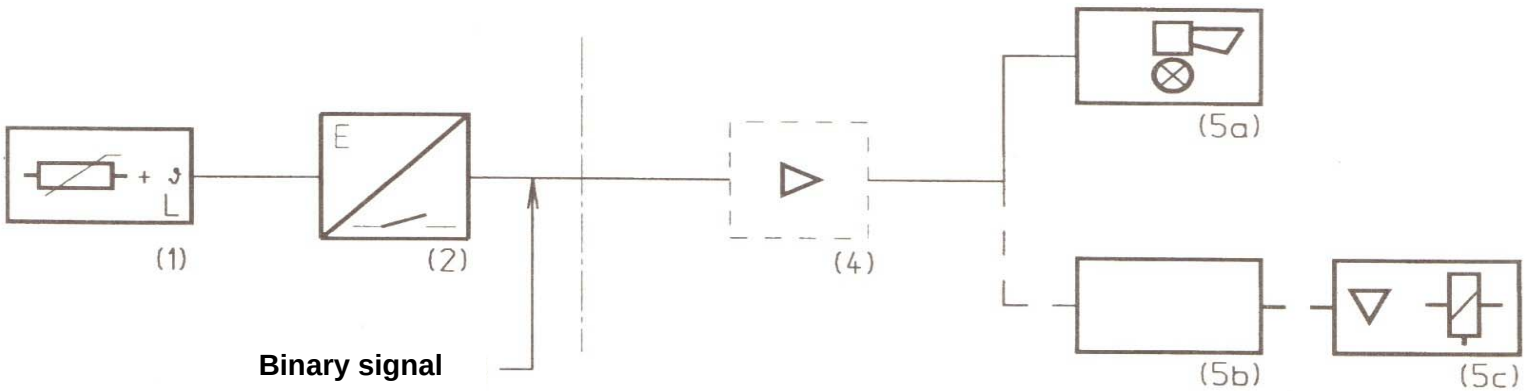
Technical design:

- The OSS consists of a level register (2) and converter (1) with binary signal output and visual/acoustic alarm. The signal for switching will be transmitted directly through a controller or as the case may be through a signal booster to the alarm or control device.

- See the schematic structure in the following diagram:

utilizing overfill safety systems

2.1 Diagram of an overfill safety device



1 **Level register (Type 76)**
2 **Converter (Type NB 220 QSA)**
4 **Signal booster**
5a **Alarm device**
5b **Control device**
5c **Controller**

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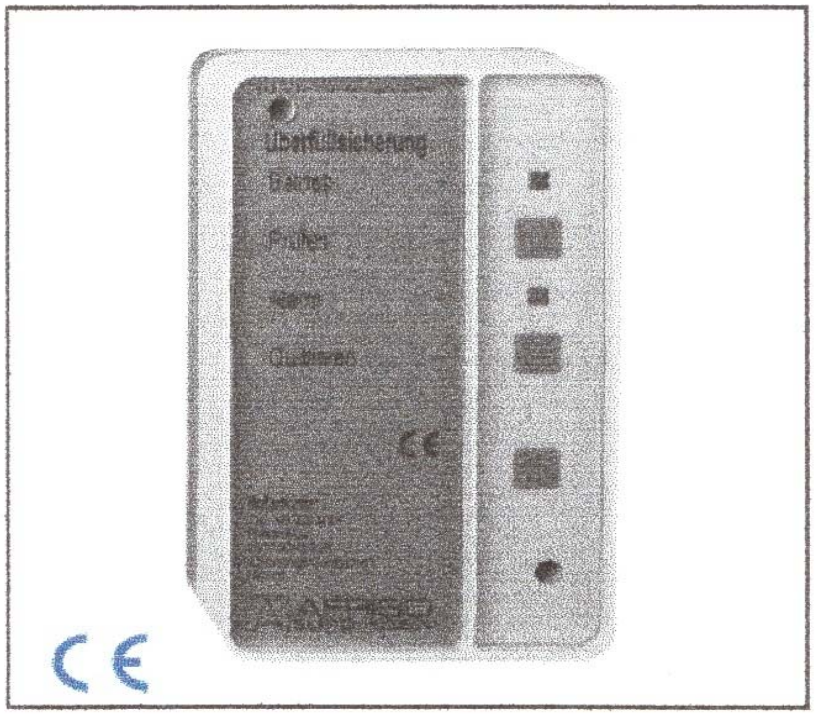
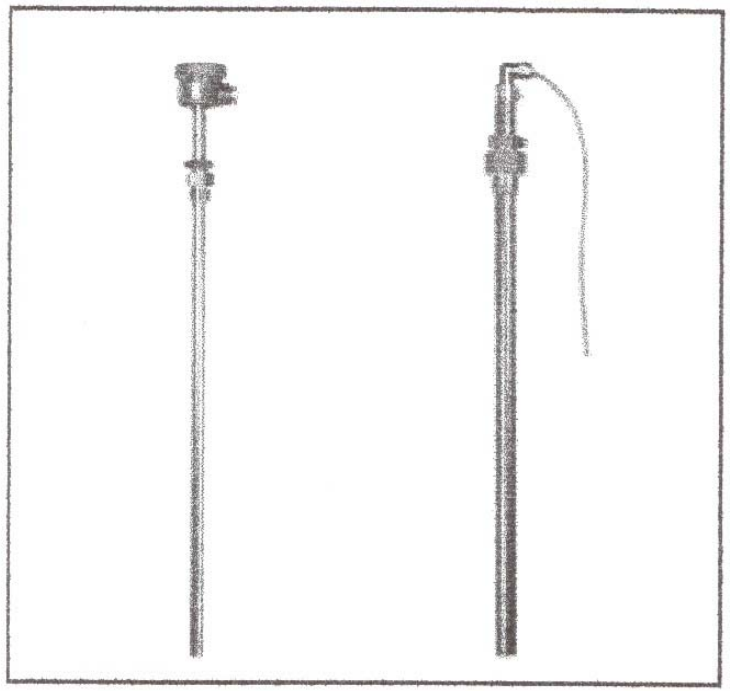


Level limiter (1) in a case mounted on the wall with the level transmitter (2) (correspond also with the designation converter and level register)



Level register Type 76 A in combination With level limiter NB 220 H, NB 220 QS And NB 220 QSA approved as component Of overfill safety device

Operating temperature: - 25°C to + 50 °C

utilizing overfill safety systems

■ Operating and maintenance and/or checking of OSS !

- ☛ The effectiveness of the OSS should be checked regularly.
- ☛ This should be done practically by simulating the filling level.
- ☛ When errors, irregularities etc. are detected, appropriate repair measures should be initiated !

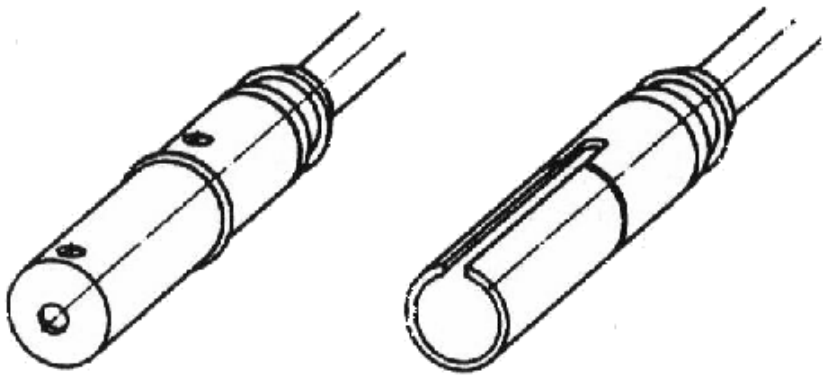
☞ **General operating instructions should always be observed and adhere to !**

***Frequent sources of error when using OSS*:**

- Limiting value was set wrongly, the highest permissible filling level is exceeded.
- The OSS is mounted at the wrong place e.g. tank systems installed in row, dead corners in rectangular tanks caused by braces on top of the tank, in gauging pipe without holes.
- Pollution of the probes cause by deposits, dirt etc..
- Mistaking the tank fittings (assigning of the OSS- plug to the inlet fitting is not clear enough or there was no clear labelling).
- Technical defects of the OSS e.g. ageing, a crack in the glass or cold conductor, leakage of the case enclosing the cold conductor.
- Incorrect operation of the OSS by the tank car driver.

utilizing overfill safety systems

Practical example: Older OSS with a protective shell not having a longitudinal slit and an opening at the bottom but only some round holes. The round holes can be blocked and this can lead to oil no being transported to the PTC and therefore hinder its function.



Old design **New design**

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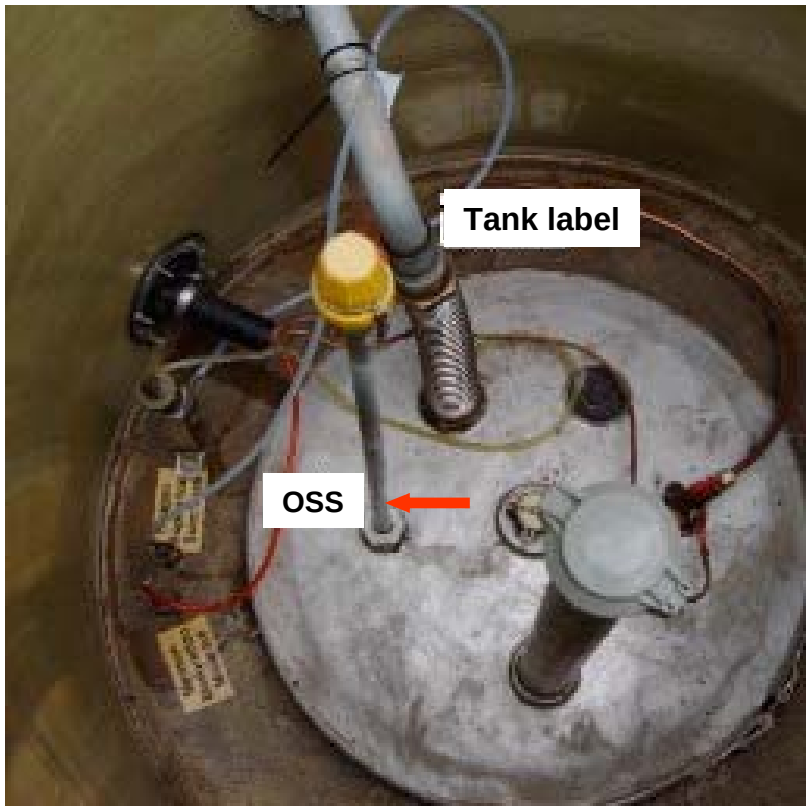
Practical example:



Example of mounting of a PTC-OSS,

Under-ground tank

Visual OSS on a tank for storing chemicals

Conclusion:

Overfilling of tanks and containers are often the cause of accidents resulting in the pollution of the environment or rivers and seas.

These can be prevented as much as possible by using **suitable and efficient** overfill safety systems. It is important to **chose the suitable OSS applicable for the respective case so that an efficient system of checking, maintenance and repair** can be put in place.