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INSTALLATION AND OPERATING INSTRUCTIONS



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LEVEL SENSOR

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1. **FUNCTIONAL DESCRIPTION:**

Level sensors (acc. to page 7) are used as measuring sensors for the electrical continuous remote display of levels. The magnetic field, which is in the spherical or cylindrical floats (6), actuates very small reed contacts through the wall of a guide tube (5) and these pick up an uninterrupted measuring-circuit voltage from a resistance chain.

The measuring-circuit voltage is proportional to the liquid level (three-wire potentiometer circuit). The resistance reading can be converted into an analogue signal when used with a measuring transducer.

2. **APPLICATION:**

Level sensors are only used for monitoring the level of liquid media. All materials in contact with the media must have appropriate resistance properties. They may be installed in containers and tanks that comply with the technical requirements, i.e. that are designed for the appropriate operating parameters.

The media to be monitored must be low in solids and should not have a tendency to become resinous or glutinous, or to crystallize.

3. **ASSEMBLY:**

Level sensors are only intended for vertical installation in containers. The maximum deviation from the perpendicular line is $\pm 30^\circ$. The units are preassembled so that on site they only have to be screwed on or flange-mounted. Please pay attention to the sealing surface that they are mechanically perfectly matched.

A suitable seal (4) appropriate to the medium, pressure and temperature must be fitted to seal the unit. The dimension of the seal is dependant on the process connection.

Units, where the diameter of the float is larger than the core diameter of the internal thread or the inside diameter of the connecting flange, are fitted with adjusting rings (7). These adjusting rings are removed together with the float before the unit is installed. The unit is then screwed in or flange mounted and the float and adjusting rings are refitted. Care must be taken to ensure that the float is inserted in the same fitting position and that the adjusting rings are locked in the same position as it was in before dismantling. It must also be ensured that the adjusting ring screw presses slightly into the guide tube material.

During assembly according 3A (Sanitary standard 74-02) you have to attend to the following points:

- If possible the equipment should be welded and the welded seam has to be slured. The surface polish must be less (finer) than 0.4 μm .
- If this is not possible you have to use a 3A compliant seal which you use for the sealing of the connection.

4. **HAZARD NOTICES:**

- It is not allowed to make a temporary installation if components or whole instruments are faulty or wrong, particularly when components are missing.
- Instruments and their accessory parts should not be used to secure lifting gear, to act as foot rests or any other mechanical aids that could damage the installation.
- Where there is a hazard or danger present, warning signs have to be displayed according to the local and national standards. Any isolation device fitted must also comply with these standards.
- The operators have to wear protection clothes according to the local circumstances and regulations. The operators have to be trained and given instructions as well as to be in possession of the technical data.
- The operator is responsible, to ensure that unauthorized persons do not have access to the installations or instruments and these operations.
- If passing the instruments and installations on to a third party, all documentation has to be included indicating the correct mounting procedures, operational details and hazards.

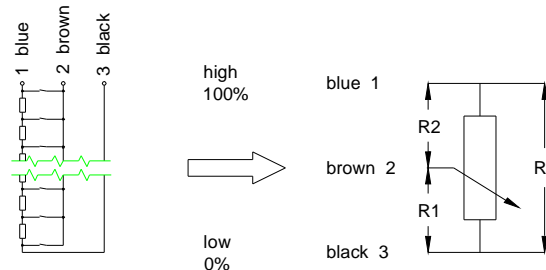
Precautions are necessary for:

- heat radiation from outside on to the instruments.
- heat radiation from the instruments to the surroundings.
- electrical heating systems.
- exposure to medium, gas, mist or steam.

5. ELECTRICAL CONNECTION:

The electrical connection must comply with the safety regulations for installing electrical systems and equipment that apply in the country where the unit is installed and this work may only be undertaken by qualified personnel.

The level sensor is to be connected in the junction box in accordance with the connection plan. The level sensor is to be wired with the electronic transmitter connected in the outgoing circuit.



The cable gland (2) is to be sealed and the lid of the junction box (1) is to be properly sealed.

Control unit:

Level sensors with integral head measuring transducers are to be connected in accordance with the connection plan in the junction box. Information on terminal assignment can be found in the relevant connection plan. The connection data can be found in the appropriate operating instructions.

6. OPTIONS:

Additional to the reed switches, temperature sensing contacts can be fitted within the guide tube (5) with either normally open or normally closed contacts. Furthermore it is possible to install a temperature sensor with or without control unit. The control unit converts the sensor resistance into an analogue signal of 4-20 mA. A combination of reed switch with temperature contacts and temperature sensor is possible. The temperature sensor is normally a PT100, alternatively other values can be used (for example a PT1000). The temperature contact will be chosen according to the information given by the customer and can be put in with or without hysteresis. When using additional control instruments of the KSR range, it is important that the appropriate installation and maintenance manual accompany the unit.

7. CAUTION:

- The operator has to guarantee that instruments that have an earth, will be earthed.
- Instruments with a connection cable are not earthed and can be alive in case of error.
- These instruments are only allowed to be operated with extra-low voltage.
- Instruments which are used in plants and have an inside coating, have to be provided with a earthing bracket or a screw outside the terminal box, be provided with an earthing bracket or screw through which an earthing connection must be made to the plant.
- Instrument cables must not be run in trunking or close proximity with power lines that have heavy switching functions. Such power cables may cause switch damage from high-voltage spikes. Shielded connecting lines have to be used. These lines have to be earthed one-side.
- It is important that an adequate and correct power supply is used

8. MAINTENANCE:

The units must be installed and commissioned in accordance with the generally accepted rules of engineering practice. When in service, the units do not require any maintenance providing that parameters such as the type of medium, density, temperature and pressure are complied with.

9. FUNCTIONAL TEST:

The user is responsible for periodically carrying out a functional test or, at the very least, a visual check.

A functional test can be performed on the measuring chain with the sensor either removed or in situ. If the units are in situ, it must be possible to fill the system.

1. Remove connecting cable.
2. Connect ohmmeter to two wires.
3. Move float manually or by filling the system from the min. to max. points.
4. The resistance reading displayed changes continuously as a function of the wire colours connected.

BLACK-BROWN (R1)	BLUE-BROWN (R2)	BLACK-BLUE (Ri)
Resistance increases in proportion to the height of the float	Resistance falls from the value of the overall resistance in inverse proportion to the height of the float	Display of overall resistance (Ri)

10. NOTES:

- Do not operate level sensors in close proximity to powerful electromagnetic fields. (Minimum clearance: 1 m.)
- Only use in conjunction with a suitable measuring transducer.
- When used on safety barriers, the overall resistance of the reed measuring chain (Ri) must be between 1 k to 100 k Ohms.
- The level sensor must not be subjected to any mechanical loads, vibrations or shocks. If these loads are existing, support or protecting elements have to be used.
- Mechanical shocks transmitted through the medium on to the instrument is not allowed.
- For flammable or explosive mediums, instruments with 94/9/EG ATEX approvals have to be used.
- The conditions of the environment have to be optimised so that all indicating instruments on-site can be read correctly and be positioned within a normal field of view.
- Disposal of the instruments must be in accordance with the regional and national directions and guidelines. By disposal it is possible that residues of the medium remain within the instrument.



TRANSPORTATION SPECIFICATIONS:

These instruments should be packed with respect to the delicate nature of some of the parts. Outer packing, such as wooden cases should be marked with fragile or similar signs to help protect the instruments.

11. NOMINAL DATA FOR EX-INSTRUMENT:

VERSIONS WITH «INTRINSIC SAFETY» PROTECTION RATING

Supply circuit as a passive n-terminal circuit:

- For protection rating EEx ia IIC
- only for connection to a certified intrinsically safe circuit
- Maximum values:
 $U_i \leq 30 \text{ V}$
 $I_i \leq 150 \text{ mA}$
- The effective self inductance and capacitance are negligible.

Supply circuit with separately certified integral measuring transducer:

- For intrinsically safe protection rating EEx ia IIC / EEx ib IIC
- only for connection to a certified intrinsically safe circuit.
- Maximum current:
In accordance with the nominal data of the separately certified measuring transducer.

Supply circuit temperature switches:

- For protection rating EEx ia IIC
- only for connection to a certified intrinsically safe circuit.
- Maximum current each electric circuit: $I_i \leq 100 \text{ mA}$
- The effective self inductance and capacitance are negligible.

Supply circuit temperature sensors:

- For protection rating EEx ia IIC
- only for connection to a certified intrinsically safe circuit.
- Maximum current each electric circuit:
 $U_i \leq 28 \text{ V}$
 $I_i \leq 100 \text{ mA}$
- Maximum current, entire electric circuit:
 $P_i \leq 700 \text{ mW}$
- The effective self inductance and capacitance are negligible.
- By installation of one or more control units please note as well the parameters of the accessory certification.

Supply circuit pressure transmitters:

- For protection rating EEx ia IIC.
- only for connection to a certified intrinsically safe circuit.
- Please consider the electrical parameters of the accessory separate certification.

VERSION WITH "EXPLOSION PROOF" PROTECTION RATING

Supply circuit as a passive n-terminal circuit:

- Only for connection to a circuit with safe limitation of the electrical parameters to the following values:
Rated voltage $U_N = 30 \text{ VDC/AC}$
Rated current $I_N = 150 \text{ mA}$

Supply circuit temperature sensors and temperature switches:

- Only for connection to a circuit with safe limitation of the electrical parameters to the following values:
Rated voltage: $U_N = 100 \text{ VDC/AC}$
Rated current: $I_N = 300 \text{ mA}$
Switching capacity: $P_{SN} = 1 \text{ W}$
Entire capacity: $P_{FN} = 700 \text{ mW}$

If the instrument is delivered without the cable gland, it is only allowed to mount a cable gland in accordance to the norm EN 50018 (pressure-proof encapsulation EExd).

12. NOTICES FOR EX-INSTRUMENT:

- The level sensor is according to RL 94/9/EG (ATEX 95) annex I an instrument of the instrument group II category 1G resp. 2G, which can be used acc. to RL 99/92/EG (ATEX 137) in the zones 1 and 2 as well as the gas groups IIA, IIB and IIC, which are explosion endangered by flammable substances in the area of the temperature classes T1 to T6 resp. the listed values of the notices.
The requests acc. to EN 60079-14 have to be observed by the application.
- In the case of the version with the EEx ia IIC, EEx d ia IIC, and EEx d ib IIC rating for hazardous locations, only the guide tube and float for the level sensor of the type in accordance with the type code may be used in Zone 0. These components are to be included in the routine pressure inspections of the equipment.
- The parts of the composition in the material of the components of the category 1G may not exceed the following values:
< 10% for: Aluminium + Magnesium + Titanium + Zirconium, or
< 7.5% for: Magnesium + Titanium + Zirconium.
- The allowed length of the guide tube is defined by suitable material matchings in terms of float: The max.length is 4m if both parts are made of stainless steel. A conductive plastic coated float can be used in all area acc. to the type key.
- The level sensor is acc. to RL 94/9/EG (ATEX 95) annex I an instrument of the instrument group II category 2D, which can be used acc. to RL 99/92/EG (ATEX 137) in the zones 21 and 22 of flammable dusts.
The requests acc. to EN 50281-1-2 have to be observed by the application.
The level sensor resp. the components have to comply with the protection rating IP6*.

Amendments, completions as well as repair works at the measuring system (e.g. change of a control unit, terminal box) may be done only by briefed qualified persons (acc. to ATEX 137). The operator is responsible, that the measuring system correspond to the original design. The type label may not be changed.

- The assignment between the temperature classes resp. the surface temperature and the maximum ambient temperature has to be taken from the following table, incl. installation of temperature switches.

Temperature classes / surface temperature		Ambient temperature	
		EEx ia/ib IIC	EEx d (ia/ib) IIC
T6	80°C	80°C	80°C
T5	95°C	95°C	95°C
T4	130°C	130°C	120°C
T3	180°C	180°C	

Separate certified control units, when installed, also have operational ambient temperature limits that have to be observed.

- The classification between the temperature classes resp. the surface temperature and the maximum ambient temperatures for the area of the connection head as well as the maximum temperature of medium of temperature sensors are to be taken from the table below:

Sensing element data - guide tube d = 8 mm

Power of all electric circuit sensors: $P_i \leq 700$ mW			
Temperature classes / surface temp.		ambient temperature	Temperature of medium
T6	80°C	$\leq 75^\circ\text{C}$	$< 10^\circ\text{C}$
T5	95°C	$\leq 95^\circ\text{C}$	$< 20^\circ\text{C}$
T4	130°C	$\leq 100^\circ\text{C}$	$< 45^\circ\text{C}$
T3	195°C	$\leq 100^\circ\text{C}$	$< 95^\circ\text{C}$

Power of all electric circuit sensors $P_i \leq 270$ mW			
Temperature classes / surface temp.		ambient temperature	Temperature of medium
T6	80°C	$\leq 75^\circ\text{C}$	$< 40^\circ\text{C}$
T5	95°C	$\leq 95^\circ\text{C}$	$< 55^\circ\text{C}$
T4	130°C	$\leq 100^\circ\text{C}$	$< 85^\circ\text{C}$
T3	195°C	$\leq 100^\circ\text{C}$	$< 140^\circ\text{C}$

Sensing element data - guide tube d = 21.3 mm

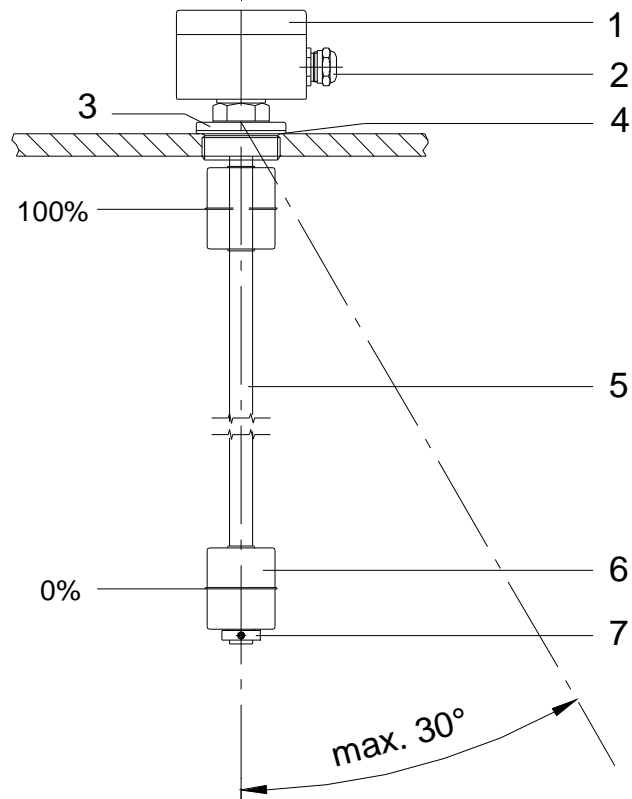
Power of all electric circuit sensors: $P_i \leq 700$ mW			
Temperature classes / surface temp.		ambient temperature	Temperature of medium
T6	80°C	$\leq 75^\circ\text{C}$	$< 70^\circ\text{C}$
T5	95°C	$\leq 95^\circ\text{C}$	$< 85^\circ\text{C}$
T4	130°C	$\leq 100^\circ\text{C}$	$< 120^\circ\text{C}$
T3	195°C	$\leq 100^\circ\text{C}$	$< 180^\circ\text{C}$

Power of all electric circuit sensors $P_i \leq 270$ mW			
Temperature classes / surface temp.		ambient temperature	Temperature of medium
T6	80°C	$\leq 75^\circ\text{C}$	$< 75^\circ\text{C}$
T5	95°C	$\leq 95^\circ\text{C}$	$< 90^\circ\text{C}$
T4	130°C	$\leq 100^\circ\text{C}$	$< 125^\circ\text{C}$
T3	195°C	$\leq 100^\circ\text{C}$	$< 185^\circ\text{C}$

For intermediate sizes of guide tube diameter, values can be calculated by interpolation of the figures in the tables based on guide tube surface area.

- Control units, when installed, also have operational ambient temperature limits that have to be observed.
- Please consider by installation of a pressure transmitter the thermic parameters of the accessory separate certification: Temperature classe T4 by $T_{\text{amb}} -40^\circ\text{C}$ to $+80^\circ\text{C}$
- If temperatures in excess of 70°C occur at the cable gland or above 80°C at the wire terminations, only a verified heat-resistant cable for the relevant temperature may be used. The cable gland must be suitable for this temperature.

- Metallic or electrically conductive housings on level sensor must be earthed to the main equipment.
- Equipment for use in hazardous locations is identified with a special rating plate containing all data relevant to explosion protection.



MONTAGEANLEITUNG FÜR FLEXIBLE MESSWERTGEBER

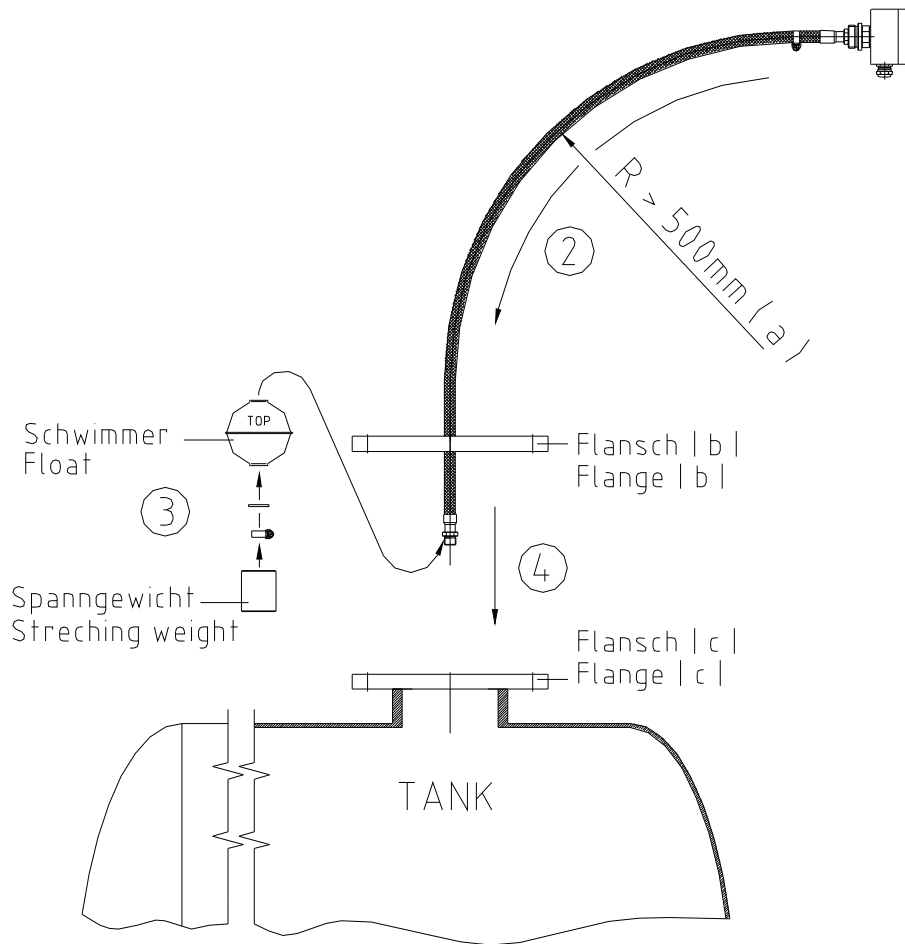
Biegeradius des Messwertgebers von min. 500mm muss eingehalten werden | a |.

1. Spanggewicht und Schwimmer entfernen
2. Messwertgeber durch den Flansch | b | führen
3. Schwimmer | TOP OBEN | und Spanggewicht montieren und in die Tanköffnung einführen bis zum Flansch | b |.
4. Flansch | b | auf Gegenflansch | c | legen und Messwertgeber bis zum Stopfen einführen und verschrauben ! Achtung Knickgefahr beachten !

INSTALLATION INSTRUCTIONS FOR FLEXIBLE LEVEL SENSORS

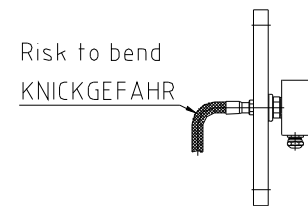
The bending radius from level sensor must be min. 500mm | a | !

1. Remove stretching weight and float
2. Insert level sensor trough the flange | b |.
3. Install float | top oben | and stretching weight and insert them in the tank until the flange | b |.
4. Place flange | b | on counter flange | c | and insert level sensor till the thread and screw on. Pay attention to risk of bend !



GERÄT WIRD MIT HOLZ GELIEFERT !
Instrument will delivered with wood !

WRONG !
FALSCH !



WRONG !
FALSCH !

