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Operating Instructions

FS10 / FS11

Magnetic Float Level Switches

FS10 / FS11 -
MAGNETIC FLOAT SWITCH

1. FUNCTIONAL DESCRIPTION:

The magnetic float switch (acc. to page 7) operates according to the float principle. One or several floats (6) with a magnetic system incorporated are positioned on a non-magnetic guide tube (5).
When a specified level is reached, the magnetic field produced by the magnet in the float actuates a reed switch (sealed contact) inside the guide tube. This closes or breaks the electric circuit, depending on the function of the switch.
The device has one or several floats, depending on the number of switches used, the distance between these switches and their function.

2. AREA OF APPLICATION:

Magnetic float switches are used as level monitors and to control liquid media. 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 liquids must be free of solids or low in solids and must not have a tendency to become resinous or glutinous, or to crystallize. It is not acceptable for any solid particles present to be magnetizable or, if they are magnetizable, they must not come into the immediate vicinity of the magnets.

3. ASSEMBLY:

Magnetic float switches are only intended for vertical installation in containers and tanks. The maximum deviation from the perpendicular line is ± 30°. 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.

4. HAZARD NOTICES:

- It is not allowed to make a temporary installation, if components or whole instruments are faulty or wrong, resp. 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.

<u>Precautions are necessary for:</u>

- heat radiation from outsite 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:

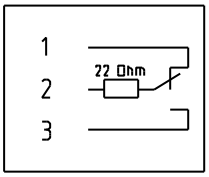
The electrical connection must comply with the safety regulations for installing electrical systems and equipment that apply in the country where the unit is installed and this work may only be undertaken by qualified personnel.
The magnetic float switch is to be connected in the junction box (1) or to the connecting cable, as indicated on the connection plan. For units with the junction box, the cable is passed through the cable gland (2) and sealed. Ensure the lid of the junction box is properly sealed.

6. OPTIONS:

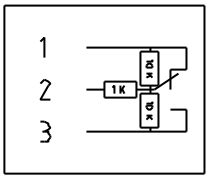
Additional to the reed switches, temperature sensing contacts can be fitted within the guide tube (5) with either normally open or normally closed contacts. Furthermore it is possible to install a temperature sensor with or without control unit. The control unit converts the sensor resistance into an 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.

Additionally the magnetic switches can be provided with the following configurations:

Circuit for the operation
on SPS with 22Ω resistance



Namur circuit acc. to EN 60947



When using additional control instruments , it is important that the appropriate installation and maintenance manual accompanies the unit.

7. CAUTION:

The user has to ensure, that instruments, which have an earthing connection, are properly earthed. Instruments with connecting cable are not earthed and in case of malfunction they can become live. Those instrument must 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 srew outside the terminal box, with which can be hold a earthing connection to the plant.

If the switch is connected to an inductive load, it may be damaged beyond repair. A protective circuit with an RC element or a freewheeling diode should be provided. If the switch is connected to a capacitive load, a protective resistor is to be connected in series to limit the peak current.

Electrical overloading may result in the switch being damaged beyond repair. This will cause the magnetic float switch and the control connected in the out-going circuit to malfunction, which may result in damage to property and injury to persons. Maximum electrical switching capacities must be complied with.

The power supply should be adequate and correct for the application.

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 provided that the magnetic float switch is designed for the ambient conditions such as the temperature, protection rating and medium.

9. FUNCTIONAL TEST:

The user is responsible for periodically carrying out a functional test or a visual check. The function of the contacts can be tested with the unit in situ or removed, by moving the float manually or by filling

the container. Care must be taken to ensure that the functional test does not trigger any process operations.
A visual check is made of components in the unit that are exposed to the liquid stored in the tank, its vapors or condensate to ascertain whether any signs of corrosion exist. This inspection can only be carried out from inside the storage tank or after the unit has been removed.

10. NOTICES:

- Do not operate magnetic float switches in close proximity to powerful electromagnetic fields. Minimum clearance: 1 m.
- The magnetic float switch must not be subjected to any mechanical loads, vibrations or shock influences. If these loads are existing, supporting or protecting elements have to be used.
- Mechanical shocks transmitted through the medium to the instrument is not allowed.
- The switching points of the magnetic float switch cannot be adjusted.
- For flammable or explosive mediums, instruments with 94/9/EG ATEX approvals have to be used.
- Disposal of instruments should be according to regional and national directions and guidelines. By disposal it is possible that residues of the medium remain within the instrument.
- The conditions of the environment have to be optimised so that all indicating instruments on site can be read correctly and positioned so that they may be seen in a normal field of view.

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 instrument.

11. NOMINAL DATA FOR EX-INSTRUMENTS:

VERSION WITH "INTRINSIC SAFETY" PROTECTION RATING

Supply circuit switches and temperature switches:

- For protection rating EEx ia IIC
- only for connection to a certified intrinsically safe circuit.
- Maximum current: $I_i \leq 100$ 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:
  $U_i \leq 28$ V
  $I_i \leq 100$ mA
- Maximum current, entire electric circuit:
  $P_i \leq 700$ 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 OPTION /N (NAMUR CIRCUIT) WITH "INTRINSIC SECURITY" PROTECTION RATING

Supply circuit:

- For protection rating EEx ia IIC.
- only for connection to a certified intrinsically safe circuit.
- Maximum current:
  $U_i \leq 15$ V
  $I_i \leq 60$mA
- The effective self inductance and capacitance are negligible.

VERSION WITH "EXPLOSION PROOF" PROTECTION RATING

Supply circuit:

- Only for connection to a circuit with safe limitation of the electrical parameters to the following values:
  Rated voltage: U_N = 250 VDC/AC

Switching capacity: P_{SN} = 50W/VA
Entire capacity: P_{FN} = 700 mW

VERSION WITH OPTION /N (NAMUR CIRCUIT) WITH "FLAMEPROOF ENCLOSURE" PROTECTION RATING

Supply circuit:

- Only for connection to a circuit with safe limitation of the electrical parameters to the following values:
  Rated voltage: U_N = 15 VDC
  Switching capacity: I_N = 60 mA

VERSION WITH OPTION /R (PROTECTIVE RESISTOR) WITH "FLAMEPROOF ENCLOSURE" PROTECTION RATING

Supply circuit:

- Only for connection to a circuit with safe limitation of the electrical parameters to the following values:
  Rated voltage: U_N = 250 VDC/AC
  Switching capacity: I_N = 100 mA

If the instrument will be supplied without cable gland, it is only allowed to mount a cable gland which is according to norm EN 50018 (pressure die-cast EExd).

12. NOTICES FOR EX-INSTRUMENTS:

- Magnetic float switches may be used in accordance with 94/9/EG ATEX approvals in Zones 1 and 2 and in gas groups IIA, IIB and IIC, which are subject to explosion hazards as a result of combustible substances in the range of temperature classes T1 to T6 respectively the listed values in the below mentioned table.

- In the case of the version with "intrinsic safety" protection rating, only the guide tube and float for the magnetic float switch 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 assignment between the temperature classes and the maximum ambient temperature has to be taken from the following table, incl. installation of temperature switches.

Temperature Class	Ambient temperature			
	EEx ia IIC		EEx d IIC	
	Basis	Opt. /N	Basis	Opt. /N / R
T6	80°C	75°C	80°C	75°C
T5	95°C	90°C	95°C	90°C
T4	130°C	125°C	120°C	115°C
T3	180°C	175°C		

- The classification between the temperature classes 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: Pi ≤ 700 mW		
Temperature class	ambient temperature	Temperature of medium
T6	≤ 75°C	< 10°C
T5	≤ 95°C	< 20°C
T4	≤ 100°C	< 45°C
T3	≤ 100°C	< 95°C
T2	≤ 100°C	< 175°C
T1	≤ 100°C	< 305°C

Power of all electric circuit sensors: Pi ≤ 270 mW		
Temperature class	ambient temperature	Temperature of medium
T6	≤ 75°C	< 40°C
T5	≤ 95°C	< 55°C
T4	≤ 100°C	< 85°C
T3	≤ 100°C	< 140°C
T2	≤ 100°C	< 225°C
T1	≤ 100°C	< 360°C

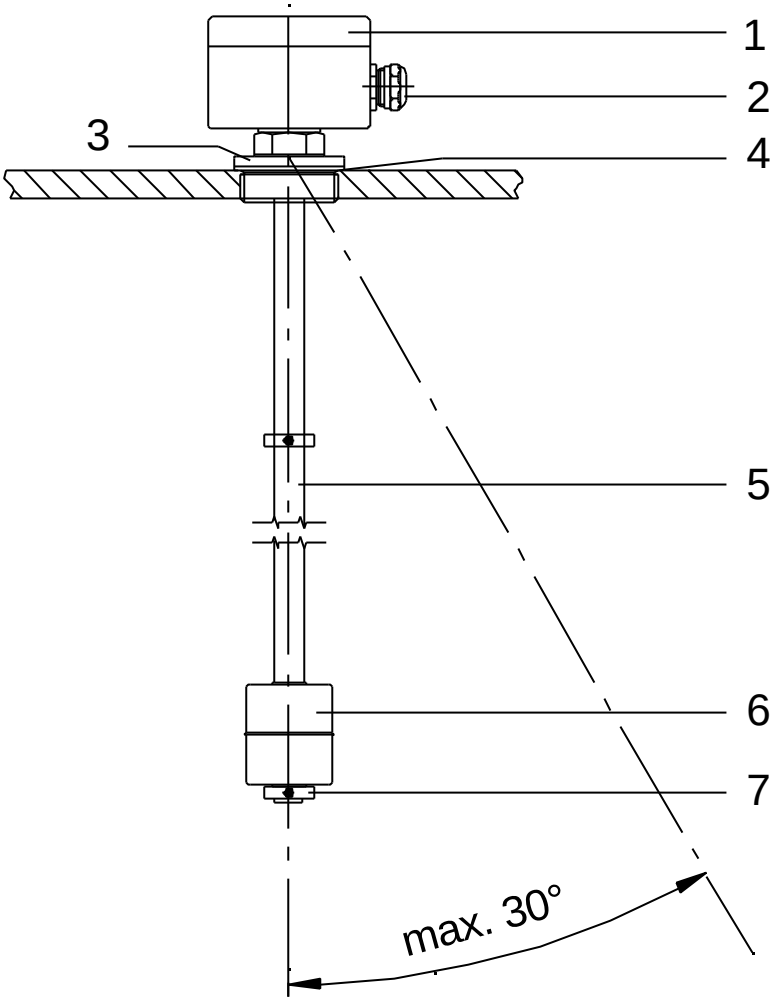
Sensing element data - guide tube d = 21.3 mm

Power of all electric circuit sensors: Pi ≤ 700 mW		
Temperature class	ambient temperature	Temperature of medium
T6	≤ 75°C	< 70°C
T5	≤ 95°C	< 85°C
T4	≤ 100°C	< 120°C
T3	≤ 100°C	< 180°C
T2	≤ 100°C	< 270°C
T1	≤ 100°C	< 420°C

Power of all electric circuit sensors: Pi ≤ 200 mW		
Temperature class	ambient temperature	Temperature of medium
T6	≤ 75°C	< 75°C
T5	≤ 95°C	< 90°C
T4	≤ 100°C	< 125°C
T3	≤ 100°C	< 185°C
T2	≤ 100°C	< 280°C
T1	≤ 100°C	< 430°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_{amb} –40°C to +80°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 magnetic switches 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.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max. 30°