The function principle of levelprox

Levelprox sensors generate a high frequency ultrasonic pulse which is coupled to the container wall from the outside using a coupling gel. This pulse propagates within the wall and is multiply reflected. Depending on the duration of the reflection, the sensor is able to distinguish whether gas or liquid interfaces the wall and sets its output accordingly. The sensor adjusts automatically to the mounting conditions at the touch of the button and learns to differentiate between an empty and a filled container.

Levelprox for the food industry

The LP-T50-UP6x3-H1151 was developed to match the specific needs of the food industry. The sensor is mounted with a Tri-clamp connection widely used in this sector. A clamping adapter is either welded or bonded to the container wall. Then the sensor is plugged into the clamping adapter, sealed, and finally fixed in position using a clamping collar. The standard mounting accessories come as a mounting kit. The sonic transducer head is elastically supported by springs to ensure optimum pressure force.

The silicone gel OKS110 is used as a coupling medium. The gel easily attaches to the container wall, retains its elasticity even during high temperatures and is non-toxic.

The advantages of levelprox

Level detection with levelprox sensors is hygienic and works just as well with aggressive liquids as with pressure tanks. Moreover, sensor replacements or re-positioning do not require opening of the container.

Areas of application of levelprox

- Food industry
- Hydraulics
- Machine and system engineering
- Pharmaceutical industry
- Process industry

- Detection of liquids through the wall of a container
- Suited to a variety of container materials, such as metal or glass
- No medium contact, therefore particularly hygienic
- Simple mounting with welding or adhesive Tri-Clamp adapters
- Subsequent sensor mounting or modification of the switch point through adhesive mounting
- Alarm output and indication in the event of errors or insufficient coupling
- Automatic adjustment to ambient conditions
levelprox Non-Invasive Ultrasonic Level Sensor
LP-T50-UP6X3-H1151

Short Description

levelprox sensors detect liquids through the wall of a container. They generate a high frequency ultrasonic pulse whose echo is detected and evaluated by the sensor. The sensor compares the detected echo curve with the curves taught during teach-in, representing a filled and an empty container and sets its output accordingly.

Electric or acoustic noise or a sensor failure are indicated by an LED and an alarm output.

Sensing Conditions

Container
- Min. wall thickness: 1 mm
- Max. wall thickness: 15 mm
- Material: steel, stainless steel, glass

Media
Water, aqueous solutions, oils (e.g. hydraulic oil)

Air bubbles or deposits on the inside of container wall may impair the sensor function, whereas bubbles or solid particles in the medium do not affect the sensor.

Mounting with the Mounting Kit LP-MS-T50-S

For sensor mounting, there is a welding kit available (see accessories). Effective and low-loss coupling of the ultrasound to the container wall is a precondition for error-free sensor function. This can only be ensured, if the coupling point on the container wall is clean. Therefore it is necessary to remove old paint, rust or grease prior from this point prior to mounting the sensor.

1. The clamping adapter must be attached to the container wall at a right angle (welding or adhesive mounting).
2. Push the clamping seal over the clamping adapter.
3. Attach a thin layer of the silicone grease OKS 1110 to the sonic transducer of sensor (see drawing). A package of silicone grease is included in delivery (located under the sensor cover).
4. Plug the sensor into the clamping adapter and seal.
5. Finally assemble the sensor and the clamping adapter using the clamping collar.
If mounted correctly, the sonic transducer is pressed to the mounting surface with a constant force by means of a spring mechanism.

Connection and mounting accessories
- LP-MS-T50-S Identi.-no. 6900253 Welding mounting kit
- U2388-15 RKV4.5T-2 2 meter cordset with stainless steel coupling nut
- A0877 VB2-LP5 teach button device

Sensor Performance in the Event of an Error

If acoustic coupling to the container wall is not sufficient, or electric or acoustic interferences disturb sensor operation, the red LED illuminates constantly and the alarm output switches.

LED Indication
red flashing
TEACH-IN of Liquid Levels

In order to detect filling states reliably, the levelprox sensor must be adjusted to the specific mounting conditions, such as the wall thickness and dimensions. For this, the sensor has to learn to differentiate between two different filling states. The liquid levels must be at least 5 cm below and 3 cm above the sensor centre when presenting the two different conditions.

The sensor automatically carries out the necessary adjustments at the touch of a button. The order in which the different liquid levels are presented is not of importance. If the sensor is removed and re-mounted, repeated teach-in is necessary. This is also recommended when mounting the sensor in the same position. Remote line teach procedure accords to programming via the teach button.

<table>
<thead>
<tr>
<th>Push button (under the screw cover) or TEACH line</th>
<th>LED-indication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> Press and hold button for 2 s (connect teach line to &quot;+”).</td>
<td>green short OFF, then ON</td>
</tr>
<tr>
<td></td>
<td>yellow ON</td>
</tr>
<tr>
<td></td>
<td>red OFF</td>
</tr>
<tr>
<td><strong>Step 2</strong> After 2 s the green LED starts flashing (teach mode) and the sensor is waiting for the first filling state. On releasing the button, the first filling state is taught (disconnect teach line from '+').</td>
<td>green flashing</td>
</tr>
<tr>
<td></td>
<td>yellow flashes mutually</td>
</tr>
<tr>
<td></td>
<td>red OFF</td>
</tr>
<tr>
<td><strong>Step 3</strong> The sensor is waiting for the second filling state.</td>
<td>green flashing</td>
</tr>
<tr>
<td></td>
<td>yellow flashes alternately</td>
</tr>
<tr>
<td></td>
<td>red OFF</td>
</tr>
<tr>
<td><strong>Step 4</strong> On pressing and releasing the button (connect and disconnect teach line to and from &quot;+&quot;), the second filling state is taught. After successful teach-in, the sensor returns to its RUN mode and the values just taught are stored.</td>
<td>green ON</td>
</tr>
<tr>
<td></td>
<td>yellow ON or OFF</td>
</tr>
<tr>
<td></td>
<td>red OFF</td>
</tr>
</tbody>
</table>

Unsuccessful teach procedure

If the sensor is not capable of adjusting to the second filling level, the red LED illuminates and the sensor returns to step 3. The teach mode is cancelled by pressing the button for more than 5 s (connect teach line to "+"). If the teach procedure fails, the values taught will not be saved. In addition to the illuminated red LED, the alarm output switches if the attempt to teach fails.

DIP Switch Configuration

<table>
<thead>
<tr>
<th>DIP switch</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OFF 1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N.C. 2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N.O. 2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>button disabled</td>
<td>time functions 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>button enabled</td>
<td>(see table below)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time delay [sec.]</th>
<th>DIP switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>OFF OFF OFF</td>
</tr>
<tr>
<td>1</td>
<td>OFF OFF ON</td>
</tr>
<tr>
<td>2</td>
<td>OFF ON OFF</td>
</tr>
<tr>
<td>3</td>
<td>OFF ON ON</td>
</tr>
<tr>
<td>4</td>
<td>ON OFF OFF</td>
</tr>
<tr>
<td>5</td>
<td>ON ON ON</td>
</tr>
<tr>
<td>7</td>
<td>ON ON OFF</td>
</tr>
<tr>
<td>10</td>
<td>ON ON ON</td>
</tr>
</tbody>
</table>

1) Factory setting
2) If the “normally open” switch position is selected, the switching output will switch when there is liquid on the other side of the container wall.
   If the “normally closed” switch position is selected, the switching output will switch when there is no liquid on the other side of the container wall.
3) In order to avoid disturbances due to turbulent liquid levels, the levelprox features an adjustable switch-on and switch-off delay. Timing functions are adjusted via DIP switches 3…5.
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- Simple mounting with Tri-Clamp welding or adhesive adapters
- Alarm output and alarm indication in the event of interferences or insufficient coupling
- Automatic adjustment to the ambient conditions via push button or teach line

Wiring diagram

Principle of operation
Non-invasive ultrasonic level sensors detect liquids through the wall of a metal container. They generate a high-frequency ultrasonic pulse whose echo is detected and evaluated by the sensor. The sensor compares the detected echo curve with the curves taught during teach-in, representing a filled and an empty container. Electric or acoustic noise or a sensor failure are indicated by an LED and an alarm output.
## levelprox - Non-Invasive Ultrasonic Level Sensor
### LP-T50-UP6X3-H1151

### Supply voltage indication
- green LED

### Switching status indication
- yellow LED

### Alarm indication
- red LED

### Adjustment to ambient conditions
- via push button or teach line

### Error performance
- **Unsuccessful teach procedure**
  - red LED and alarm output on
- **Acoustic/electric interference**
  - or insufficient coupling
  - red LED flashing, alarm output on

### Mounting accessories
- **Silicone grease IKS 1110**
  - included in delivery (non-toxic)
- **LP-MS-T50-S**
  - welding mounting kit

### Connector
- U2388-15
- RKV4.5T-2
- 2 meter cordset with stainless steel coupling nut
- A0877
- VB2-LP5
- teach button device