Liquid level indicator
BW 25
Liquid level indicator
BW 25
Level measurement of liquids, even at high pressures using the displacement principle

Operating principle
The BW 25 liquid level indicator operates on the displacement principle.

The length of the displacement rod corresponds to the measuring range.

A displacement body suspended on a measuring spring is immersed in the liquid and is subjected to an upthrust based on Archimedes' principle, this being proportional to the mass of the liquid displaced. Every change in the weight of the rod corresponds to a certain change in the length of the spring, and is therefore an indication of the liquid level. Extension of the spring is transmitted by magnetic coupling from the measuring zone to an indicator. This transmission method permits pressure-tight separation of the measuring spring system and the scale.

Scale division showing
- full tank
- level x
- empty tank

Height setting for
- full tank
- level x
- empty tank

$F_B = \text{Buoyancy}$
$F_G = \text{Weight}$

Interface detection possible

Displacement rod available 0.3 – 6 m (1 – 20 ft)

Pressure-tight separation of measuring and display parts

Modular assembly, replacement or retrofit without interruption of the process

Resistant to high pressures $\leq 700$ bar (10000 psig) and high temperature $\leq 400^\circ\text{C} (752^\circ\text{F})$
**Application range**

The limit switch can be used for various materials.

This device is suitable for extreme ambient conditions.

- **Temperatures**: -60 ... +400°C (–76 ... +752°F)
- **Pressure**: Up to 700 bar (10 000 psig)

If the display cannot be installed from above, e.g. there is an agitator in the container, it is possible to install it lateral with the special reference chamber.

In both cases it is important to note that the non-measurable depth is 340 mm because of the spring mounting.

With special versions it is possible to measure the level of the interface between two immiscible liquids of different densities. The displace rod must be covered completely with liquid. The difference in density should be min. 100 g/l.

**Typical products are:**
- Water, aqueous liquids
- Acids/alkalis
- Organic and inorganic solvents

**Typical application in the chemical industry**

**Product** | **Ammonia**
---|---
**Pressure** | 450 bar (6525 psig)
**Temperature** | 70°C (158°F)
**Measuring range** | 1500 mm (4.9 ft)

**Modularity**

The M9 indicator is of modular design.

This offers the following advantages:
- Electrical functions can be retrofitted
- Installation without interrupting the process
- No re-calibration necessary
- Easy and quick to replace through plug-in-technology
## Technical data

### Operating conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>Liquids</td>
</tr>
<tr>
<td>Density</td>
<td>$\geq 0.45 \text{ kg/l}$</td>
</tr>
<tr>
<td>Measuring range</td>
<td>0.3 – 6 m (1 – 20 ft)</td>
</tr>
<tr>
<td>Measuring accuracy</td>
<td>$\pm 1.5 %$ of full scale range</td>
</tr>
<tr>
<td>Temperature</td>
<td>-60 … +400°C (-76 … +752°F)</td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>$\leq 60^\circ \text{C} (\leq 40^\circ \text{F})$</td>
</tr>
<tr>
<td>Operating pressure Standard</td>
<td>40 bar (580 psig)</td>
</tr>
<tr>
<td>Optional</td>
<td>700 bar (10 000 psig)</td>
</tr>
<tr>
<td>Indication</td>
<td>Linear scale markings</td>
</tr>
<tr>
<td></td>
<td>mm, cm, m, inch, ft, %, volume</td>
</tr>
</tbody>
</table>

### Material

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Die-cast aluminium</td>
</tr>
<tr>
<td>Displacement rod Standard</td>
<td>Stainless steel 1.4571 (316 Ti)</td>
</tr>
<tr>
<td>Optional</td>
<td>Titanium</td>
</tr>
<tr>
<td>Spring Standard</td>
<td>Stainless steel 1.4571 (316 Ti)</td>
</tr>
<tr>
<td>Optional (&gt;100°C / 212°F)</td>
<td>ATS 340</td>
</tr>
<tr>
<td>Flange with pressure gland</td>
<td>Stainless steel 1.4571 (316 Ti)</td>
</tr>
</tbody>
</table>

### Connection

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange Standard</td>
<td>DIN 2501 or ANSI 16.5</td>
</tr>
<tr>
<td>Optional</td>
<td>DN 50, PN 40</td>
</tr>
<tr>
<td></td>
<td>DN 40/50/80/100, PN 40; DN 50, PN 64/100</td>
</tr>
<tr>
<td></td>
<td>1½&quot;/ 2&quot;/ 3&quot;/ 4&quot;, 150/300 lb</td>
</tr>
<tr>
<td>Screw</td>
<td>G 1½&quot;</td>
</tr>
<tr>
<td></td>
<td>Others on request</td>
</tr>
</tbody>
</table>

### Protection category (EN 60529 / IEC 529)

| Specification | IP 65 |

### Electromagnetic compatibility (EMC)

| Specification | EN 50081-1, EN 50082-2 |
Limit switches and electrical signal output

One or two limit switches can be built into the indicators.

Limit switches SC 3.5 N0
2-wire limit switches are connected in conformity with DIN 19234 (NAMUR). For operation, an isolation switching amplifier is required.

Technical data SC 3.5-N0
- Connection: 2-wire
- Voltage: 8 V DC
- Ambient temperature: -25 ... +100°C (-13 ... +212°F)
- Self-inductance (L_i): 150 µH
- Self-capacitance (C_i): 100 nF
- Electromagnetic compatibility (EMC): EN 50081-2, EN 50082-2
- Spark protection: EEx ia IIC T6, EEx ib IIC T6

Technical Data Auto cut-off
- No-load voltage U_i: 16 V
- Short-circuit current I_i: 52 mA
- Output P_i: 169 mW

Connection diagram
SC 3.5-N0
K1 = 1 Limit switch
K2 = 2 Limit switches

Electrical signal output ESK II

The ESK II can be installed in the indicators as an option. Given an intrinsically safe feed unit, the transmitter may also be used in hazardous areas.

Technical data
- Electrical connection: 2-wire
- Power supply: 12.7 – 30 V DC
- Current output: 4 – 20 mA
- Power influence: < 0.1%
- Load resistance dependence: < 0.1%
- Temperature drift: ≤ 5 µA/ K
- Load impedance (U-12 V)/20 mA, max. 800 Ω
- Ambient temperature: -25 ... +85°C
- Effective inner self-inductance: negligible
- Effective inner self-capacitance: ≤ 20 nF
- Protection category: to EN 60529/IEC 529 IP 20
- Spark protection: EEx ia IIC T6
- Approval: PTB No. Ex-94.C.2067

Only for connection to intrinsically safe circuits with the following peak values:
- No-load voltage U_i: 30 V
- Short-circuit current I_i: 100 mA
- Output P_i: 1 W

Connection diagram
ESK II-4-wire configuration, 4 – 20 mA

Limit switches SB 3.5-E2-Y
This 3-wire limit switch has a 10 – 30 V DC connection. The switching point is visible on the scale.

3-wire limit switches (with integrated preamplifier) can be connected directly to a PLC.

Technical data SB 3.5-E2-Y
- Electrical connection: 3-wire
- Voltage: 10 – 30 V DC
- No-load power consumption: ≥ 15 mA
- Continuous current: 100 mA
- Ambient temperature: -25 ... +70°C (-13 ... +158°F)
- Protection category: to EN 60529/IEC 529 IP 67
- Electromagnetic compatibility (EMC): EN 50081-2, EN 50082-2
- Protection category: to EN 60529/IEC 529 IP 67
- Electromagnetic compatibility (EMC): EN 50081-2, EN 50082-2
- Display: LED
**Reference vessel**

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection</strong></td>
<td>DIN 2501 or ANSI B 16.5</td>
</tr>
<tr>
<td><strong>Flanges</strong></td>
<td>DN 25/50, PN 40</td>
</tr>
<tr>
<td><strong>Drain</strong></td>
<td>3/8&quot;</td>
</tr>
<tr>
<td><strong>Other connections</strong></td>
<td>on request</td>
</tr>
</tbody>
</table>

**Dimensions in mm (inches)**

- **Dimension C** = length of displacer rod (measuring range)

- **Dimensions in mm (inches)**

- **Flange version**
  - Flange version
  - Screw version

- **Special flange PN 40 (300 lb/RF)**
  - Flange version
  - Screw version
**Approvals**

<table>
<thead>
<tr>
<th>Application</th>
<th>Instrument version</th>
<th>Certification mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>With explosion protection: In stationary storage tanks for flammable liquids of dangerous materials classes AI, AII and B, excl. carbon disulphide (CS₂), in Zone 0.</td>
<td>BW 25 /... /... /... /... /... /... /... /... / Z0</td>
<td>PTB No. III B/S 1970</td>
</tr>
</tbody>
</table>

*Note:* Certified devices are not standard versions! Deviations in design and technical data are possible!

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**Type code**

**Instrument**

- **BW 25** Liquid level indicator

<table>
<thead>
<tr>
<th>Material (flange)</th>
<th>Measuring section</th>
<th>Top-mounted indicator</th>
<th>Built-in equipment</th>
<th>Safety function</th>
</tr>
</thead>
<tbody>
<tr>
<td>R Stainless steel 1.4571</td>
<td>N No reference vessel</td>
<td>M 9 Indicator M 9</td>
<td>KI.. Limit switch SC 3.5-N0 with 1–2 contacts</td>
<td>Ex Explosion-protected electrical equipment</td>
</tr>
<tr>
<td>B Reference vessel</td>
<td></td>
<td></td>
<td>KD.. Limit switch SB 3.5-E2-Y with 1–2 contacts</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ESK Electrical signal output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ESK/K.. Electrical signal output and 1–2 limit switches</td>
<td></td>
</tr>
</tbody>
</table>

**Application**

- N Non-Ex
- Z0 Flammable liquids of dangerous materials classes AI, AII and B

**Options**

- TS Liquid/liquid interface detection