Submersible level probe with ceramic measuring cell

Equipment category
ATEX II 1G Ex ia IIB T4 Ga
ATEX II 1D Ex ia IIIC T135°C Da
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1.1 General notes

This additional Ex instruction applies to explosion-protected versions of the submersible hydrostatic level probe OPTIBAR LC 1010 with the marking II 1 G or II 1 D. It completes the standard documentation for non-explosion protected versions.

The information given in this instruction contains only the data relevant to explosion protection of category 1. The technical details given in the manual for the non explosion-protected versions remain unchanged unless excluded or superseded by this document.

1.2 EU conformity

The manufacturer declares with the EU declaration of conformity on his own responsibility conformity with the protection goals of directive 2014/34/EU acc. to EN 60079-0+A11 for use in hazardous areas with gas.

The EU type test certificate of the Institut für Sicherheitstechnik GmbH forms the basis of the EU declaration of conformity:

IBExU 18 ATEX 1143 X

The "X" after the certificate number refers to special conditions for safe use of the device, which have been listed in these instructions. If needed the EU type examination certificate can be downloaded from the manufacturer’s website.

1.3 Safety instructions

Assembly, installation, start-up and maintenance may only be performed by personnel trained in explosion protection!

CAUTION!

The operator or his agent is responsible for observing any additional standards, directives or laws if required due to operating conditions or place of installation. This applies in particular to the use of easily detachable process connections when measuring flammable media.
2.1 Device description

The OPTIBAR LC 1010 submersible hydrostatic level probe is designed to measure the absolute pressure and gauge pressure in flammable and non-flammable gases and liquids.

2.2 Marking

The marking of the entire device is on the housing, where the following identification plate can be found.

![Identification Plate](image)

**Figure 2-1: Example of an identification plate**

1. Device Type
2. Manufacturer
3. Note to observe the documentation
4. ID number for the CE marking
5. Permitted maximum electrical values for supply circuit (output A or output H)
6. Permitted maximum electrical values for optional PT100 circuit (output B or output K)
7. Information relevant for Ex approval
8. Connecting cable assignment
9. Nominal measuring range, electrical characteristics output A or H [supply circuit]
2.3 Flammable products

**Atmospheric conditions:**
An explosive atmosphere is a mixture of air and flammable gases, vapours, mists or dusts under atmospheric conditions. It is defined by the following values
\[ T_{\text{atm}} = -20...+60^\circ \text{C} / -4...+140^\circ \text{F} \text{ and } P_{\text{atm}} = 0.8...1.1 \text{ bar} / 11.6...15.9 \text{ psi.} \]
Outside of this range, for most mixtures no key figures are available for the ignition behaviour.

**Operating conditions:**
Outside of atmospheric conditions, the explosion protection according to directive 2014/34/EC (ATEX) – regardless of the zone assignment – is not applicable due to the lack of key safety data.

2.4 Equipment category

**Category 1G equipment (EPL-Ga equipment)**
The device is installed in hazardous areas requiring equipment of category 1G.

2.5 Types of protection

The pressure transmitter is designed with protection type intrinsic safety, protection level "ia" according to EN 60079-11.

The marking is:
acc. to ATEX:
II 1G Ex ia IIB T4 Ga bzw. II 1D Ex ia IIIC T135°C Da

<table>
<thead>
<tr>
<th>The marking contains the following information:</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>G</td>
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<td>D</td>
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<tr>
<td>Ex ia</td>
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<td>IIB</td>
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<td>IIIC</td>
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<tr>
<td>T4</td>
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<tr>
<td>T135°C</td>
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<tr>
<td>Ga</td>
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<td>Da</td>
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</tbody>
</table>
2.6 Ambient temperature / temperature classes

OPTIBAR LC 1010 VGKL with housing S (stainless steel), T (titanium) and output A (4...20 mA), B (4...20 mA 3-wire Pt100), H (4...20 mA HART®) and K (4...20 mA HART® 3-wire Pt100).

The maximum permissible ambient temperatures depending on the temperature classes are specified in the following tables.

### Category 1G equipment

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Ambient temperature range at the electronics and media temperature range at the sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4, T3, T2, T1</td>
<td>-25...+65°C / -13...+149°F</td>
</tr>
</tbody>
</table>

### Category 1D equipment

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>Ambient temperature range at the electronics and media temperature range at the sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4, T3, T2, T1</td>
<td>-25...+65°C / -13...+149°F</td>
</tr>
</tbody>
</table>

2.7 Electrical data

2.7.1 Output A and output B

OPTIBAR LC 1010 VGKL with housing S (stainless steel), T (titanium) and output A (4...20 mA), output B (4...20 mA 3-wire Pt100).

Supply and signal circuit: terminal 1[+], 2[-] In protection type intrinsic safety Ex ia IIB or IIIC

**Maximun values**

- $U_i [V] = 28$ V
- $I_i [mA]: 93$ mA
- $P_i [mW]: 660$ mW
- $C_i [nF]: \approx 49.2$ nF

The effective inner inductance $L_i$ is negligibly.

All electrical connection values plus circuit inductivities 1 µH/m and circuit capacities 160 pF/m for factory supplied cable. The supply connections have a maximum internal capacity of 100 nF to the housing.
### 2.7.2 Output H and output K

<table>
<thead>
<tr>
<th>OPTIBAR LC 1010 VGKL with housing S (stainless steel), T (titanium), and output H (4...20 mA HART®), output K (4...20 mA HART® 3-wire Pt100).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply and signal circuit: terminal</strong> 1[+], 2[-]</td>
</tr>
<tr>
<td><strong>Maximum values</strong></td>
</tr>
<tr>
<td>• $U_i$ [V]: 28 V</td>
</tr>
<tr>
<td>• $I_i$ [mA]: 93 mA</td>
</tr>
<tr>
<td>• $P_i$ [mW]: 660 mW</td>
</tr>
<tr>
<td>• $C_i$ [nF]: ~ 14 nF</td>
</tr>
<tr>
<td>The effective inner inductance $L_i$ is negligibly.</td>
</tr>
<tr>
<td><strong>All electrical connection values plus circuit inductivities</strong> 1 $\mu$H/m and circuit capacities 160 pF/m for factory supplied cable.</td>
</tr>
<tr>
<td>The supply connections have a maximum internal capacity of 27 nF to the housing.</td>
</tr>
</tbody>
</table>

### 2.7.3 Optional 3-wire Pt100 for output B and output K

<table>
<thead>
<tr>
<th>OPTIBAR LC 1010 VGKL with housing S (stainless steel), T (titanium) and output B (4...20 mA 3-wire Pt100), output K (4...20 mA HART® 3-wire Pt100).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pt100 circuit (3-wire)</strong></td>
</tr>
<tr>
<td><strong>Maximum values</strong></td>
</tr>
<tr>
<td>• $U_i$ [V]: 30 V</td>
</tr>
<tr>
<td>• $I_i$ [mA]: 54 mA</td>
</tr>
<tr>
<td>• $P_i$ [mW]: 405 mW</td>
</tr>
<tr>
<td>The effective internal capacitance $C_i$ is negligibly.</td>
</tr>
<tr>
<td>The effective inner inductance $L_i$ is negligibly.</td>
</tr>
<tr>
<td><strong>All electrical connection values plus circuit inductivities</strong> 1 $\mu$H/m and circuit capacities 160 pF/m for factory supplied cable.</td>
</tr>
<tr>
<td>The supply connections have a maximum internal capacity to the housing of 100 nF for output B and 27 nF for output K.</td>
</tr>
</tbody>
</table>
3.1 Installation

Installation and setup must be carried out according to the applicable installation standards (e.g. EN 60079-14) by qualified personnel trained in explosion protection. The information given in the manuals and the supplementary instructions must be observed at all times.

Install pressure transmitters so that

- there is sufficient overvoltage protection in the event of lightning or overvoltage.
- they are not in a pneumatic flow.
- excessive dust deposits (over 5 mm) and complete dust coverage are prevented.
- there is no danger from mechanical impact effects.
- the device is accessible for any necessary visual inspections and can be viewed from all sides.
- the nameplate is clearly visible.
- it can be operated from a location with secure footing.

CAUTION!
The manufacturer is not liable for any damage resulting from improper use or use other than the intended purpose. This applies in particular to hazards due to insufficient corrosion resistance and suitability of the materials in contact with product.
4.1 General notes

Circuits
The circuits are designed in protection type “intrinsically safe”.

The connecting cables should be selected according to the applicable installation standards (e.g. EN 60079-14) and the maximum operating temperature. Ensure that no residual current can form between separate intrinsically safe signal circuits.

- The connecting cables must be fixed and laid so they are sufficiently protected against damage.
- Devices with plugs are to be mounted in that way that ingress protection IP20 is maintained.
- Lay cables so as to ensure that there is sufficient distance between surfaces of the measuring unit and the connecting cable.
- Unused cable entries are to be closed (>IP66 / 67).

Ensure that all seals are tight.

4.2 Power supply

The pressure transmitter does not require a separate power supply. The required supply for the built-in electronics is provided via the 4...20 mA current output.

Overvoltage protection
If the level probe is being used as category 1 G equipment, a suitable overvoltage protection device must be installed upstream (see Industrial Safety Regulations [BetrSichV] and EN 60079-14).

4.3 Inputs/outputs

The terminal assignment of the built-in electrical equipment is described in the standard documentation. The pressure transmitter signal circuits may only be connected to certified intrinsically safe slave units or circuits. For more information refer to chapter “Electrical data”.

4.4 Grounding and equipotential bonding

If the device is not sufficiently electrostatically grounded via the process cables, an additional ground connection must be established using the ground terminal.

Any existing cable shields should be connected to ground according to applicable installation regulations (EN 60079-14). A terminal connection in the terminal compartment permits a short way grounding of the cable shields.

4.5 Impact and friction sparks

When used as category 1G equipment, the OPTIBAR LC 1010 in titanium versions must be mounted in such a way that sparks from impact and friction between titanium and steel (except stainless steel, if the presence of rust particles can be excluded) cannot occur.
5.1 Start-up

Start-up is only permitted when the pressure transmitter:

- is correctly installed in the system and connected.
- has been checked for the proper state with regard to its installation and connection requirements.

The user of the system must have it checked before start-up in compliance with the national regulations for checks before startup.

5.2 Operation

Pressure transmitter must be operated in such a way that they remain within the maximum and minimum permissible temperatures and pressures and the electrical limit values.

Pressure transmitter may only be operated if the equipment parts necessary for safety are effective in the long run, and are not rendered inoperable during operation.

For more information refer to chapter “Dismantling”.

5.3 Electrostatic charge

A caution label points out the safety measures that must be taken with regard to electrostatic charges during operation.

Attention!
Plastic parts
There is a danger of electrostatic charge!

In order to avoid ignition hazards due to electrostatic charge, the pressure transmitter may not be used in areas with:

- processes that generate strong charges,
- mechanical friction and cutting processes,
- spraying of electrons (e.g. in the vicinity of electrostatic painting systems).

In order to avoid ignition hazards due to electrostatic charge, the connecting cables must be permanently laid and the pressure transmitter may not be dry cleaned.
6.1 Maintenance

Maintenance work of a safety-relevant nature within the meaning of explosion protection may only be carried out by the manufacturer, his authorised representative or under the supervision of authorised inspectors.

To maintain proper condition, regular inspections are required for systems in hazardous areas.

The following checks are recommended:

• Checking the housing, the cable entries and the feed lines for corrosion and/or damage.
• Checking the measuring unit and the piping connections for leakage.
• Checking the measuring unit and the indicator for dust deposits.
• Including the pressure transmitters in the regular pressure test of the process line.

6.2 Dismantling

Removal and installation are the responsibility of the operator.

Before disconnecting the electric connecting cable of the device, make sure that all cables leading to the indication unit are isolated from the ground of the hazardous area. This also applies to functional earthing conductors [FE] and equipotential bonding conductors [PA].

**WARNING!**

• Pressurised pipes have to be depressurised before removing the measuring unit.
• In the case of environmentally critical or hazardous products, appropriate safety precautions must be taken with regard to residual liquids in the measuring unit.
• New gaskets have to be used when re-installing the device in the piping.
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