OPTIWAVE X400 Supplementary Instructions

OPTIWAVE 5400 C
OPTIWAVE 6400 C
OPTIWAVE 7400 C

Supplementary Instructions for IECEx applications
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1.1 Scope of the document

These instructions are applicable only to the explosion-protection version of the radar level transmitter. If you do not have these documents, please contact the nearest office or download them from the manufacturer’s internet site.

**INFORMATION!**
The information in these supplementary instructions only contains the data applicable to explosion protection. The technical data for the non-Ex version in the Handbook shall be valid in its current version, provided that it is not rendered invalid or replaced by these supplementary instructions.

**WARNING!**
Installation, commissioning and maintenance may only be carried out by “Personnel trained in explosion protection”.

1.2 Device description

The level transmitter is approved for use in potentially explosive atmospheres when equipped with the appropriate options.

1.3 Standards and approvals

**DANGER!**
In compliance with the IECEx scheme rules, the IECEx version of the device described in these Supplementary Instructions agrees with International Standards IEC 60079-0:2011, IEC 60079-1:2014, IEC 60079-11:2011, IEC 60079-15:2010, IEC 60079-26:2014 and IEC 60079-31:2014. The Ex ia, Ex db ia / Ex ia tb and Ex ic versions are certified for use in hazardous areas by Kiwa ExVision B.V. under certificate of conformity KIWA 17.0012X.

**WARNING!**
Carefully read the IECEx certificate of conformity. Obey the boundary conditions.

The certificate is given on the DVD-ROM supplied with the device. You can also download the certificate from our internet site.
1.4 Equipment protection levels (EPL)

1.4.1 Ex ia-approved devices

The Ex ia-approved device has the markings that follow for Gas Groups:

OPTIWAVE 5400 and OPTIWAVE 6400
PP Drop antenna and PP accessories
• Ex ia IIC T6...T5 Ga/Gb

OPTIWAVE 5400 and OPTIWAVE 6400
All other versions
• Ex ia IIC T6...T4 Ga/Gb

OPTIWAVE 7400
All versions
• Ex ia IIC T6...T3 Ga/Gb

The Ex ia-approved device is suitable for use in potentially explosive atmospheres of all flammable substances in Gas Groups IIA, IIB and IIC. It is certified for applications requiring EPL Ga/Gb or EPL Gb equipment, when fitted with the appropriate options. It agrees with temperature classes T6 thru T1 (Gas Groups) if the temperature limits are obeyed. For more data, refer to Ambient and process connection temperatures on page 17.

EPL Ga/Gb equipment is used in zone 0, but it is installed in the boundary wall between zone 0 and zone 1 (the antenna is in zone 0 and the signal converter is in zone 1). EPL Gb equipment is used in zone 1.

**WARNING!**
Make sure that the installation of the device between zone 0 and zone 1 agrees with IEC 60079-26.
The Ex ia-approved device has the markings that follow for Dust Groups:

**OPTIWave 5400 and OPTIWave 6400**
**PP Drop antenna and PP accessories**
- Ex ia IIIC T85°C...T100°C Da/Db

**OPTIWave 5400 and OPTIWave 6400**
**All other versions**
- Ex ia IIIC T85°C...T130°C Da/Db

**OPTIWave 7400**
**PTFE Drop antenna and Horn / Drop / Hygienic antenna with EPDM gasket**
- Ex ia IIIC T85°C...T150°C Da/Db

**OPTIWave 7400**
**All other versions**
- Ex ia IIIC T85°C...T200°C Da/Db

The Ex ia-approved device is suitable for use in potentially explosive atmospheres of all flammable substances in Dust Groups IIIA, IIIB and IIIC. It is certified for applications requiring EPL Da/Db or EPL Db equipment, when fitted with the appropriate options.

EPL Da/Db equipment is used in zone 20, but it is installed in the boundary wall between zone 20 and zone 21 (the antenna is in zone 20 and the signal converter is in zone 21). EPL Db equipment is used in zone 21.
1.4.2 Ex db ia- and Ex ia tb-approved devices

The Ex db ia-approved device has the markings that follow for Gas Groups:

**OPTIWAVE 5400 and OPTIWAVE 6400**
PP Drop antenna and PP accessories
- Ex db ia IIC T6...T5 Ga/Gb

**OPTIWAVE 5400 and OPTIWAVE 6400**
All other versions
- Ex db ia IIC T6...T4 Ga/Gb

**OPTIWAVE 7400**
All versions
- Ex db ia IIC T6...T3 Ga/Gb

The Ex db ia-approved device is suitable for use in potentially explosive atmospheres of all flammable substances in Gas Groups IIA, IIB and IIC. It is certified for applications requiring EPL Ga/Gb or Gb equipment, when fitted with the appropriate options. It agrees with temperature classes T6 thru T1 (Gas Groups) if the temperature limits are obeyed. For more data, refer to Ambient and process connection temperatures on page 17.

EPL Ga/Gb equipment is used in zone 0, but it is installed in the boundary wall between zone 0 and zone 1 (the antenna is in zone 0 and the signal converter is in zone 1). EPL Gb equipment is used in zone 1.
The Ex ia tb-approved device has the markings that follow for Dust Groups:

**OPTIWAVE 5400 and OPTIWAVE 6400**
- PP Drop antenna and PP accessories
  - Ex ia tb IIIC T85°C...T100°C Da/Db

**OPTIWAVE 5400 and OPTIWAVE 6400**
- All other versions
  - Ex ia tb IIIC T85°C...T130°C Da/Db

**OPTIWAVE 7400**
- PTFE Drop antenna and Horn / Drop / Hygienic antenna with EPDM gasket
  - Ex ia tb IIIC T85°C...T150°C Da/Db

**OPTIWAVE 7400**
- All other versions
  - Ex ia tb IIIC T85°C...T200°C Da/Db

The Ex ia tb-approved device is suitable for use in potentially explosive atmospheres of all flammable substances in Dust Groups IIIA, IIIB and IIIC. It is certified for applications requiring EPL Da/Db or EPL Db equipment, when fitted with the appropriate options.

EPL Da/Db equipment is used in zone 20, but it is installed in the boundary wall between zone 20 and zone 21 (the antenna is in zone 20 and the signal converter is in zone 21). EPL Db equipment is used in zone 21.
1.4.3 Ex ic devices

The Ex ic-approved device has the markings that follow for Gas Groups:

**OPTIWAVE 5400 and OPTIWAVE 6400**
PP Drop antenna and PP accessories
- Ex ic IIC T6...T5 Gc

**OPTIWAVE 5400 and OPTIWAVE 6400**
All other versions
- Ex ic IIC T6...T4 Gc

**OPTIWAVE 7400**
All versions
- Ex ic IIC T6...T3 Gc

The Ex ic-approved device is suitable for use in potentially explosive atmospheres of all flammable substances in Gas Groups IIA, IIB and IIC. It is designed for applications requiring EPL Gc equipment, when fitted with the appropriate options. It agrees with temperature classes T6 thru T1 (Gas Groups) if the temperature limits are obeyed. For more data, refer to *Ambient and process connection temperatures* on page 17.

EPL Gc equipment is used in zone 2.
The Ex ic-approved device has the markings that follow for Dust Groups:

**OPTIWAVE 5400 and OPTIWAVE 6400**
PP Drop antenna and PP accessories
- Ex ic IIC T85°C...T100°C Dc

**OPTIWAVE 5400 and OPTIWAVE 6400**
All other versions
- Ex ia IIIC T85°C...T130°C Dc

**OPTIWAVE 7400**
PTFE Drop antenna and Horn / Drop / Hygienic antenna with EPDM gasket
- Ex ia IIIC T85°C...T150°C Dc

**OPTIWAVE 7400**
All other versions
- Ex ic IIC T85°C...T200°C Dc

The Ex ic-approved device is suitable for use in potentially explosive atmospheres of all flammable substances in Dust Groups IIIA, IIIB and IIIC. It is certified for applications requiring EPL Dc equipment, when fitted with the appropriate options.

EPL Dc equipment is used in zone 22.
1.5 IECEx nameplates

Figure 1-1: Nameplate on the signal converter housing

1. IECEx certification number
2. Types of device protection including approved Gas Groups, temperature classes and equipment protection level
   Types of device protection including approved Dust Groups, maximum surface temperature and equipment protection level
3. Ex ia or Ex ic approvals: Intrinsically-safe circuit data. Refer to 6 for the input voltage range.
   Ex db ia or Ex ia tb approvals: Maximum voltage in accordance with IEC 60079-0. Refer to 6 for the input voltage range.
4. WARNING: Potential electrostatic charging hazard – see instructions
   For more data, refer to Electrostatic discharge on page 13.
5. Cable entry type and size (M20×1.5, ½ NPT)
6. Input voltage range and maximum current (4–20 mA passive – HART)
7. Type code – for more data, refer to “Order code” in the handbook
2.1 Special conditions

This device can be installed on the applicable auxiliary equipment: a bypass chamber, a stilling well or a communicating pipe.

2.2 Precautions

2.2.1 General notes

**WARNING!**

When you install the device, obey the conditions in the IECEx certificate of conformity. These conditions include:
- The special conditions for safe use.

The certificate is given on the DVD-ROM supplied with the device. You can also download the certificate from our internet site.

**DANGER!**

This installation must agree with IEC 60079-14: Explosive atmospheres – Part 14: Electrical installations design, selection and erection.

**DANGER!**

The device contains a PTFE boundary wall (unless the device has a hygienic antenna option) between the process and the signal converter. Do not use the device if the PTFE part is not resistant to corrosion by the tank product.

If the OPTIWAVE 7400 has the hygienic antenna option, it contains a PEEK boundary wall between the process and the signal converter. Do not use the device if the PEEK part is not resistant to corrosion by the tank product.

Make sure that:
- you can get access to the device,
- there is sufficient space around the device for inspections,
- you can see the device nameplate, and
- there are no external forces applied on the device.
2.2.2 Electrostatic discharge

**DANGER!**
Risk of electrostatic discharge from painted surfaces, the plastic sun cover, the hygienic antenna, the Drop antenna, the flange plate protection, the extension protection and the slanted flange.

Do not install in a location where the electrostatic charge can increase. For example:

- locations near ventilation systems,
- locations where there is a risk of an increase in electrostatic charge caused by compressed air and dust,
- locations near machines that use friction,
- locations near systems that apply electrons as a spray (e.g. near electrostatic painting systems), and
- locations near other machines and systems that can have large electrostatic charges.

**DANGER!**
Make sure that the device and adjacent objects do not rub together.

Make sure that all personnel and equipment are correctly grounded.

If dirt collects on the device, clean it with a damp cloth.

**ESD warning**

![ESD warning](image)

*Figure 2-1: ESD warning (on the device nameplate)*

① Text: Warning! Potential electrostatic hazard – see instructions
2.2.3 Optional purging system

This option is applicable to:

- gas and dust atmospheres

INFORMATION!

If delivered with the device, the purging connection is plugged with a 1/4 NPTF or 1/8 NPTF screw and engaged on a minimum of 3½ threads.
Connection and operation of the purging connection are the responsibility of the user. The operator is also responsible for selection of a suitable fluid to purge the device.

**Devices installed in a gas atmosphere**
- The purging fluid temperature must be less than the ignition temperature of the gas or vapour atmosphere

**Devices installed in a dust atmosphere**
- **Dust clouds**: The purging fluid temperature must be less than 2/3 of the ignition temperature
- **Dust layers [thickness <5 mm / 0.2”]**: The difference between the purging fluid temperature and the ignition temperature must be more than +75°C / +135°F

**WARNING!**
If the two conditions are applicable, then use the worst condition.
For data about dust layers thicker than 5 mm / 0.2”, refer to regulations given in EN 60079-14: Explosive atmospheres – Part 14: Electrical installations design, selection and erection.

**Devices installed in a gas or dust atmosphere**
- The purging fluid temperature must be between the minimum and maximum limits for the gasket (for more data, refer to the handbook) and the type of antenna (for more data, refer to *Ambient and process connection temperatures on page 17*).
2.2.4 Optional heating/cooling system

This option is applicable to:

- devices that have horn antennas, and
- gas atmospheres

The operating pressure of the heating/cooling system must not be more than 6 barg / 87 psig. The process pressure must not be more than 2 barg / 29 psig.

The heating/cooling fluid temperature must be less than the ignition temperature of the gas or vapour atmosphere.

The heating/cooling fluid temperature must be between the minimum and maximum limits for the gasket (for more data, refer to the handbook) and the type of antenna (for more data, refer to Ambient and process connection temperatures on page 17)
2.3 Operating conditions

The allowable ambient temperature and related process connection temperature range for the device depends on the temperature classes and maximum surface temperature marked on the nameplate.

2.3.1 Ambient and process connection temperatures

**WARNING!**
The gasket temperature must be in the approved limits. For more data, refer to “Pressure and temperature ranges” in the Installation chapter of the handbook. The type of gasket and gasket material must agree with the process.

**WARNING!**
The reference point for the process temperature is the flange facing (flanges), the thread stop (threaded connections) or the facing (hygienic connections) of the device. In the tables that follow, this reference point will be referred to as the “process connection temperature”.

**WARNING!**
An explosive atmosphere is a mixture of air and flammable gases, vapour, mist or dust in atmospheric conditions. If you do not use the device in these conditions ($T_{\text{atm}} = -20...+60^\circ\text{C} / -4...+140^\circ\text{F} \text{ and } p_{\text{atm}} = 0.8...1.1 \text{ barg} / 11.60...15.95 \text{ psig}$), do an analysis of the risk of ignition.

$T_{\text{atm}} = \text{atmospheric temperature and } p_{\text{atm}} = \text{atmospheric pressure}$.

**WARNING!**
Make sure that the maximum process connection temperature and maximum ambient temperature are not more than the values given in the tables.

The tables that follow are applicable in these conditions:

- Device installation must agree with the instructions given in the handbook.
- Make sure that the device temperature does not increase because of other heat sources (sunlight, adjacent system components etc.). The device must not be operated above the maximum permitted ambient temperature.
- Do not put insulation around the signal converter. Make sure that the airflow around the signal converter is sufficient. It is permitted to have insulation on the pipe or stilling well and the process connection.
### OPTIWAVE 5400 and OPTIWAVE 6400

<table>
<thead>
<tr>
<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for EPL Da/Db, EPL Db or EPL Dc</th>
<th>Maximum ambient temperature</th>
<th>Maximum process connection temperature (max. process temperature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>T85°C</td>
<td>+60</td>
<td>+140</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+44</td>
<td>+111</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+85</td>
<td>+185</td>
</tr>
<tr>
<td>T5</td>
<td>T100°C</td>
<td>+75</td>
<td>+167</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+59</td>
<td>+138</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+100</td>
<td>+212</td>
</tr>
<tr>
<td>T4 ①</td>
<td>T130°C ①</td>
<td>+57</td>
<td>+135</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+48</td>
<td>+118</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+115</td>
<td>+239</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+130</td>
<td>+266</td>
</tr>
</tbody>
</table>

① Max. process connection temperature is +100°C / +212°F, if the PP Drop antenna and PP accessories are used.

<table>
<thead>
<tr>
<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for EPL Da/Db, EPL Db or EPL Dc</th>
<th>Minimum ambient temperature</th>
<th>Minimum process connection temperature (min. process temperature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All classes ①</td>
<td>All surface temperatures ①</td>
<td>-40</td>
<td>-40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-33</td>
<td>-27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-50</td>
<td>-58</td>
</tr>
</tbody>
</table>

① Min. process connection temperature is -20°C / -4°F, if a Kalrez® 6375 gasket is used. Min. process connection temperature is -40°C / -40°F, if an FKM/FPM gasket is used. Min. process connection temperature is -40°C / -40°F, if the PP Drop antenna and PP accessories are used.
## OPTIWAVE X400

### OPTIWAVE 7400

<table>
<thead>
<tr>
<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for EPL Da/Db, EPL Db or EPL Dc</th>
<th>Maximum ambient temperature</th>
<th>Maximum process connection temperature (max. process temperature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T6</td>
<td>T85°C</td>
<td>+60 [°C] +140 [°F]</td>
<td>+60 [°C] +140 [°F]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+54 [°C] +129 [°F]</td>
<td>+85 [°C] +185 [°F]</td>
</tr>
<tr>
<td>T5</td>
<td>T100°C</td>
<td>+75 [°C] +167 [°F]</td>
<td>+75 [°C] +167 [°F]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+69 [°C] +156 [°F]</td>
<td>+100 [°C] +212 [°F]</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>+72 [°C] +162 [°F]</td>
<td>+115 [°C] +239 [°F]</td>
</tr>
<tr>
<td>T3 ①</td>
<td>T200°C (①)</td>
<td>+64 [°C] +147 [°F]</td>
<td>+150 [°C] +302 [°F]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+54 [°C] +129 [°F]</td>
<td>+200 [°C] +392 [°F]</td>
</tr>
</tbody>
</table>

① Max. process connection temperature is +150°C / +302°F, if the device has a Metallic Horn, Drop or hygienic antenna with an EPDM gasket or a PTFE Drop antenna

### Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc

<table>
<thead>
<tr>
<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for EPL Da/Db, EPL Db or EPL Dc</th>
<th>Minimum ambient temperature</th>
<th>Minimum process connection temperature (min. process temperature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All classes ①</td>
<td>All surface temperatures ①</td>
<td>-40 [°C] -40 [°F]</td>
<td>-40 [°C] -40 [°F]</td>
</tr>
</tbody>
</table>

① Min. process connection temperature is -15°C / +5°F, if the device has a hygienic antenna with an FKM/FPM gasket. Min. process connection temperature is -20°C / -4°F, if a Kalrez® 6375 gasket is used. Min. process connection temperature is -30°C / -22°F, if a Metaglas® feedthrough is used. Min. process connection temperature is -30°C / -22°F, if the device has a hygienic antenna with an EPDM gasket. Min. process connection temperature is -40°C / -40°F, if the device has a Horn or Drop antenna with an FKM/FPM gasket.
INFORMATION!
These tables are applicable if the process connection has a distance piece and you replace an OPTIWAVE 7300 signal converter with the OPTIWAVE 7400 signal converter. For more data about the replacement of the signal converter, refer to OPTIWAVE 7300: Replacement of the signal converter on page 32.

These tables are also applicable if the process connection has a distance piece and you replace an OPTIWAVE 6300 signal converter with the OPTIWAVE 6400 signal converter. For more data about the replacement of the signal converter, refer to OPTIWAVE 6300: Replacement of the signal converter on page 31.

Refer to the tables that follow if:

- you replace an OPTIWAVE 7300 signal converter with the OPTIWAVE 7400 signal converter without a distance piece, or
- you replace an OPTIWAVE 6300 signal converter with the OPTIWAVE 6400 signal converter without a distance piece.

<table>
<thead>
<tr>
<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for EPL Da/Db, EPL Db or EPL Dc</th>
<th>Maximum ambient temperature</th>
<th>Maximum process connection temperature (max. process temperature)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>°C</td>
<td>°F</td>
</tr>
<tr>
<td>T6</td>
<td>T85°C</td>
<td>+60</td>
<td>+140</td>
</tr>
<tr>
<td></td>
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<td>+50</td>
<td>+122</td>
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<tr>
<td>T5</td>
<td>T100°C</td>
<td>+75</td>
<td>+167</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+65</td>
<td>+149</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>+67</td>
<td>+153</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+59</td>
<td>+138</td>
</tr>
<tr>
<td>T3</td>
<td>T150°C</td>
<td>+54</td>
<td>+129</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for EPL Da/Db, EPL Db or EPL Dc</th>
<th>Minimum ambient temperature</th>
<th>Minimum process connection temperature (min. process temperature)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>°C</td>
<td>°F</td>
</tr>
<tr>
<td>All classes (1)</td>
<td>All surface temperatures (1)</td>
<td>-40</td>
<td>-40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-37</td>
<td>-35</td>
</tr>
</tbody>
</table>

1 Min. process connection temperature is -20°C / -4°F, if a Kalrez® 6375 gasket is used. Min. process connection temperature is -30°C / -22°F, if a Metaglas® feedthrough is used. Min. process connection temperature is -40°C / -40°F, if the device has a Horn or Drop antenna with an FKM/FPM gasket.
3.1 General notes

**WARNING!**
- De-energize the circuit.
- Use the applicable cable glands for the cable entry openings in the housing (M20×1.5 or ½ NPT). For the cable entry size, refer to the device nameplate.
- *Ex d-approved devices*: Use heat-resistant cables and cable glands certified for continuous operation above +90°C / +194°F.
3.2 Terminal compartment

3.2.1 How to open the terminal compartment

**WARNING!**

- If dirt collects on the housing, clean the device with a damp cloth before you remove the terminal compartment cover.
- Do not remove the terminal compartment cover while the electrical power is connected.
- Make sure that there is no dust on the threads and the O-ring for the electrical compartment cover.

**Equipment needed**

- Wrench (supplied)
- 3 mm Allen wrench (not supplied)

- De-energize the circuit.
- Use the 3 mm Allen wrench to remove the cover stop.
- Use the wrench to remove the cover.

For more data about the procedure, refer to the handbook.
3.2.2 How to close the terminal compartment

**WARNING!**
*If dirt collects on the terminal compartment gasket, clean it before you attach the terminal compartment cover.*

**DANGER!**
*Ex d applications*
*Make sure that the terminal compartment is sealed and its cover is fully engaged. An explosion can cause death or injury to personnel and/or damage to equipment. Obey the instructions that follow:*

- Attach the cover. Make sure that a slot on the top of the cover is correctly aligned with the hole for the cover stop.
- Attach the cover stop (make sure that there is also a spring washer and a socket head screw). Tighten the screw with a 3 mm Allen wrench.

3.3 Terminal tightening capacity

The terminal tightening capacity for current output terminals is:

<table>
<thead>
<tr>
<th>Type of wire</th>
<th>Terminal tightening capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[mm²]</td>
</tr>
<tr>
<td>Flexible</td>
<td>3.3</td>
</tr>
</tbody>
</table>

3.4 Equipotential bonding system

Connect the device to the equipotential bonding system for the hazardous location.

**You can use 2 terminals to connect the device to the equipotential bonding system:**
- a ground connection in the terminal compartment and
- an external ground terminal adjacent to the cable entries

Makes sure that the electrical connections agree with the applicable regulations (IEC 60079-14). Use the ground terminal in the terminal compartment to connect all electrical cable shields to ground.

Ground all remaining electrical wires in the hazardous location or make sure that they have good insulation. Refer also to the sections that follow in this chapter.

**Ex ia- and Ex ic-approved devices**
The device electronics are isolated with a rating of 500 V\textsubscript{RMS}.

**Ex db ia- or Ex ia tb-approved devices**
The device does not agree with the 500 V\textsubscript{RMS} dielectric strength requirement. Obey all the instructions given in the "Electrical connections" chapter.
3.5 Ex ia and Ex ic equipment

3.5.1 How to connect the electrical cables

Refer to the handbook for data about the device terminals.

Cable glands are supplied on customer demand. If you supply the cable glands, this part must have a degree of ingress protection IP≥6X (IEC 60529). We recommend that you use a part that has a degree of ingress protection IP≥68. Make sure that the cable gland is sealed.

Obey the instructions that follow:

- Electrical wires must agree with applicable standards (e.g. IEC 60079-14).
- Use the electrical connection procedure in the Handbook.
- Put the electrical wires in position and safely attach them to prevent damage. The electrical wires must also be a sufficient distance from hot surfaces.
- Make sure that unused electrical wires are safely connected to the ground potential of the hazardous area. If this is not possible, make sure that each of the unused electrical wires are safely isolated (other electrical wires, ground etc.) and rated for a test voltage ≥500 V<sub>RMS</sub>.
- If it is necessary, make sure the electrical wire insulation gives good protection from corrosion.
- Connect only to separate certified, intrinsically-safe circuits. Make sure that the electrical circuit characteristics are not more than the values that follow.

3.5.2 Maximum intrinsically-safe values for the electrical circuit

<table>
<thead>
<tr>
<th>Output</th>
<th>Intrinsically-safe values for the electrical circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U&lt;sub&gt;i&lt;/sub&gt; I&lt;sub&gt;i&lt;/sub&gt; P&lt;sub&gt;i&lt;/sub&gt; C&lt;sub&gt;i&lt;/sub&gt; L&lt;sub&gt;i&lt;/sub&gt;</td>
</tr>
<tr>
<td>[V] [mA] [mW] [nF] [µH]</td>
<td></td>
</tr>
</tbody>
</table>
| 4...20 mA passive – HART   | ≤30 ≤130 ≤1000 =10 ~0

3.5.3 Supply voltage

<table>
<thead>
<tr>
<th>Current output terminals</th>
<th>Minimum voltage at output terminals [VDC]</th>
<th>Maximum voltage at output terminals [VDC]</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Input)</td>
<td>12 ①</td>
<td>30 ①</td>
</tr>
</tbody>
</table>

① Minimum voltage at output terminals for a current output of 21.5 mA
3.5.4 Electrical schematic

Figure 3-2: Electrical schematic for Ex i-approved equipment

1. Intrinsically-safe power supply
2. Non-Ex zone
3. Ex zone
4. Resistor for HART® communication
5. Grounding wire – if the electrical wire is shielded (braided wire etc.)

**INFORMATION!**

For applications where EPL Gb is necessary, you must connect the device to an intrinsically-safe circuit with protection concept “ib”. If the device is connected to an intrinsically-safe circuit with protection concept “ia”, the device operates with a higher level of safety.
3.6 Ex db ia / Ex ia tb equipment

3.6.1 General notes

Ex db ia- and Ex ia tb-approved equipment have two separate compartments. The electronics in the electronics block compartment are Ex ia-approved and the terminal compartment is Ex db / Ex tb-approved.

![Figure 3-3: Compartments in Ex db ia- and Ex ia tb-approved equipment](image)

- Electronics block (Ex ia) compartment
- Terminal (Ex db / Ex tb) compartment

**DANGER!**

*If you must open the electronics block compartment to remove the electronics blocks for servicing, de-energize the device. It is not necessary to disconnect the wires from the Ex db / Ex tb terminals.*

*If you must open the terminal compartment to remove the terminal block for servicing, de-energize the device first.*

3.6.2 How to connect the electrical cables

Cable glands are supplied on customer demand. If you supply the cable glands, this part must have a degree of ingress protection IP≥6X (IEC 60529). We recommend that you use a part that has a degree of ingress protection IP≥68. Make sure that the cable gland is sealed.

**WARNING!**

*Use only Ex d-approved cable glands and adaptors for Ex d applications. Use only Ex t-approved cable glands and adaptors for Ex t applications.*

**Terminal compartment**

- If you connect electrical wires to the terminals in the flameproof terminal compartment, use approved flameproof cable glands (M20×1.5 or ½ NPT). The cable glands must have a test certificate that agrees with IEC 60079-1. Obey the instructions given on the test certificates. Make sure that the tightening capacity of the cable gland is applicable to the diameter of the electrical wire.

- If you use conduits to connect electrical wires to the terminals in the flameproof terminal compartment, obey the instructions that follow. Make sure that the conduits are correctly attached and the flameproof compartment is sealed. The flameproof joint must have a minimum thread length of 8 mm / 0.32”. The conduits must have a test certificate that agrees with IEC 60079-1. Use conduit stopping boxes that agree with precautions given in the test certificate and data in standards related to the installation of the conduit.
• If you connect electrical wires to the terminals in the dustproof terminal compartment, use approved flameproof cable glands (M20×1.5 or ½ NPT). The cable glands must have a test certificate that agrees with IEC 60079-31. Obey the instructions given on the test certificates. Make sure that the tightening capacity of the cable gland is applicable to diameter of the electrical wire.

Obey instructions that follow:
• Use the electrical connection procedure in the Handbook.
• The electrical wiring must agree with the applicable standards (e.g. IEC 60079-14).
• Do not remove more than 6 mm / 0.2” of insulation from the electrical wire.
• Put the electrical wires in position and safely attach them to prevent damage. The electrical wires must also be a sufficient distance from hot surfaces.
• If it is necessary, make sure that the electrical wire insulation gives good protection from corrosion.
• Make sure that the device is connected to a PELV (protective extra-low voltage) circuit.
• Make sure that electrical wires for the converter are isolated from the ground of the hazardous area. This data is also applicable to the equipotential bonding conductors (PE).
• Make sure that unused electrical wires and shields are safely connected to the ground potential of the hazardous area. If this is not possible, make sure that each of the unused electrical wires are safely isolated (other electrical wires, ground etc.) and rated for a test voltage ≥1500 VRMS.

Load resistor
• Connect the load resistor to the positive terminal of the power supply.
• Ground the negative connection.
• If the load resistor has to be connected to the negative terminal, the loop resistance must not be more than 250 ohms.

CAUTION!
Do not ground the positive connection.

3.6.3 Supply voltage

<table>
<thead>
<tr>
<th>Current output terminals</th>
<th>Minimum voltage at output terminals [VDC]</th>
<th>Maximum voltage at output terminals [VDC]</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Input)</td>
<td>15 (1)</td>
<td>36 (1)</td>
</tr>
</tbody>
</table>

(1) Minimum voltage at output terminals for a current output of 21.5 mA
3.6.4 Electrical schematic

**DANGER!**
Keep the grounding wire a minimum distance of 2 mm / 0.83" away from the output terminals.

**CAUTION!**
Make sure that you connect the load resistor to the positive side.

---

**Figure 3-4: Electrical schematic for Ex db ia- and Ex ia tb-approved equipment (with galvanic isolation)**

| ① Galvanically-isolated power supply |
| ② Resistor for HART® communication |
| ③ Non-Ex zone                        |
| ④ Ex zone                           |
| ⑤ Grounding wire – if the electrical wire is shielded (braided wire etc.) |
| ⑥ Power supply                      |
| ⑦ |U| < 13 V                             |

---

**Figure 3-5: Electrical schematic for Ex db ia- and Ex ia tb-approved equipment (without galvanic isolation)**
WARNING!
Make sure that it is safe to supply electrical power. Do a start-up check:

- Are the wetted components (gasket, flange and antenna) resistant to corrosion by the tank product?
- Does the information given on the nameplate agree with the application?
- Did you connect the equipotential bonding system correctly?
- **Ex d applications:** If you supplied the cable glands and adaptors, are these parts Ex d-approved?
- **Ex t applications:** If you supplied the cable glands and adaptors, are these parts Ex t-approved?
- **Ex i applications:** Are you using an intrinsically-safe barrier within the correct parameters? For more data, refer to *Ex ia and Ex ic equipment* on page 24. The electrical circuit characteristics must not be more than the maximum intrinsically-safe values.
- Did you install the correct cable glands? Is the terminal compartment correctly sealed?
- Does the optional purging system agree with Ex requirements?
5.1 Periodic maintenance

**CAUTION!**
Do not try to repair flameproof joints. If it is necessary to repair a flameproof joint, speak or write to your supplier.

Do not replace an Ex ia electronic block with a different block that is from a device which does not have an intrinsically-safe barrier.

Do not use connectors in the signal converter housing or open the cover to change the device configuration when there is an explosive atmosphere. Maintenance can only be carried out by “Personnel trained in explosion protection”.

**INFORMATION!**
For more data about regular inspections and maintenance procedures for devices with Ex and other approvals, refer to the related supplementary instructions.

5.2 Keep the device clean

Obey these instructions:

- Keep the thread of the terminal compartment cover clean.
- If dirt collects on the device, clean it with a damp cloth.

**WARNING!**
The device contains a PTFE boundary wall (unless the device has a hygienic antenna option) between the process and the signal converter. If the PTFE part is not resistant to corrosion by your cleaning agents, do not clean the device with them.

If the device has the hygienic antenna option, it contains a PEEK boundary wall between the process and the signal converter. If the PEEK part is not resistant to corrosion by your cleaning agents, do not clean the device with them.

If you use the incorrect cleaning agent (i.e. the device is not resistant to corrosion by your cleaning agent), do not use the device in a hazardous location. If aid is necessary, speak or write to the supplier.
5.3 How to remove the device

The installation and removal of the device or the signal converter is a task for approved personnel (operator, fitter, electrician etc.). If you must change the signal converter or all of the device, refer to the procedures in the handbook.

If you must do work in a hazardous location:
- Before you open the flameproof or dustproof terminal compartment, de-energize the device. For more data, refer to How to open the terminal compartment on page 22.
- Before you remove the device from the process connection, make sure that the tank is not pressurized. A pressurized tank can cause injury to persons when they do work on it.
- Make sure that all electrical wires are isolated from the ground. This is also applicable to Protective Earth (PE), Functional Earth (FE) and equipotential bonding conductors.
- Apply grease to dry housing cover seals after you open the terminal compartment. Use a multi-purpose grease (e.g. UNIMOLY® C 220).
- Close the housing cover immediately after maintenance. Make sure that the housing is sealed.

5.4 OPTIWAVE 6300: Replacement of the signal converter

You can replace the signal converter of an OPTIWAVE 6300 level transmitter that has an Ex approval that agrees with certificate of conformity IECEx KEM 06.0025X. But do the checks that follow:

DANGER!

Devices with Ex i approvals: Make sure that you use an intrinsically-safe barrier and electrical wires with the correct parameters. This data is given on the device nameplate of the new converter. Make sure that the signal converter was not installed in Zone 0 or Zone 20.

- If your device was made after June 2009, you can replace the signal converter with an OPTIWAVE 6400 signal converter.
- If your device was made before June 2009, you must attach an adaptor when you replace the signal converter with an OPTIWAVE 6400 signal converter. Use the spare parts list in the OPTIWAVE 6400 handbook to order the adaptor with the new signal converter.

If you replace the signal converter, the data (temperature, voltage etc.) given in these supplementary instructions agrees with the new device configuration.
5.5 OPTIWAVE 7300: Replacement of the signal converter

You can replace the signal converter of an OPTIWAVE 7300 level transmitter that has an Ex approval that agrees with certificate of conformity IECEx KEM 06.0025X. But do the checks that follow:

**DANGER!**

**OPTIWAVE 7300 with a hygienic antenna option:** You cannot replace the signal converter with an OPTIWAVE 7400 signal converter.

**DANGER!**

**Devices with Ex i approvals:** Make sure that you use an intrinsically-safe barrier and electrical wires with the correct parameters. This data is given on the device nameplate of the new converter. Make sure that the signal converter was not installed in Zone 0 or Zone 20.

- If your device was made after June 2009, you can replace the signal converter with an OPTIWAVE 7400 signal converter.
- If your device was made before June 2009, you must attach an adaptor when you replace the signal converter with an OPTIWAVE 7400 signal converter. Use the spare parts list in the OPTIWAVE 7400 handbook to order the adaptor with the new signal converter.

If you replace the signal converter, the data [temperature, voltage etc.] given in these supplementary instructions agrees with the new device configuration.

5.6 Manufacturer

If the serial number on the device nameplate starts with the letter "F", this device is made by:

KROHNE S.A.S.
2 Allée des Ors – B.P. 98
26103 Romans-sur-Isère CEDEX
France

If the serial number on the device nameplate starts with the letter "S", this device is made by:

KROHNE Measurement Technology (Shanghai) Co., Ltd.
Minshen Road 555 Songjiang Industrial Zone
Shanghai 201612
China

If you need to return your device for inspection or repair, make sure that you send it to the correct manufacturer and obey the instructions that follow.
5.7 Returning the device to the manufacturer

5.7.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.

**WARNING!**

*Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:*

- Due to statutory regulations on environmental protection and safeguarding the health and safety of the personnel, the manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.
- This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.

**WARNING!**

*If the device has been operated with toxic, caustic, radioactive, flammable or water-endangering products, you are kindly requested:*

- to check and ensure, if necessary by rinsing or neutralising, that all cavities are free from such dangerous substances,
- to enclose a certificate with the device confirming that it is safe to handle and stating the product used.
5.7.2 Form (for copying) to accompany a returned device

**CAUTION!**
To avoid any risk for our service personnel, this form has to be accessible from outside of the packaging with the returned device.

<table>
<thead>
<tr>
<th>Company:</th>
<th>Address:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department:</td>
<td>Name:</td>
</tr>
<tr>
<td>Tel. no.:</td>
<td>Fax no. and/or Email address:</td>
</tr>
<tr>
<td>Manufacturer’s order no. or serial no.:</td>
<td></td>
</tr>
</tbody>
</table>

The device has been operated with the following medium:

<table>
<thead>
<tr>
<th>This medium is:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>radioactive</td>
<td></td>
</tr>
<tr>
<td>water-hazardous</td>
<td></td>
</tr>
<tr>
<td>toxic</td>
<td></td>
</tr>
<tr>
<td>caustic</td>
<td></td>
</tr>
<tr>
<td>flammable</td>
<td></td>
</tr>
</tbody>
</table>

We checked that all cavities in the device are free from such substances.

We have flushed out and neutralized all cavities in the device.

We hereby confirm that there is no risk to persons or the environment through any residual media contained in the device when it is returned.

<table>
<thead>
<tr>
<th>Date:</th>
<th>Signature:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stamp:</td>
<td></td>
</tr>
</tbody>
</table>
KROHNE – Process instrumentation and measurement solutions

- Flow
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Head Office KROHNE Messtechnik GmbH
Ludwig-Krohne-Str. 5
47058 Duisburg (Germany)
Tel.: +49 203 301 0
Fax: +49 203 301 10389
info@krohne.com

The current list of all KROHNE contacts and addresses can be found at:
www.krohne.com