OPTIWAVE X500 Supplementary Instructions

OPTIWAVE 3500 C
OPTIWAVE 6500 C
OPTIWAVE 7500 C

Supplementary Instructions for NEPSI applications
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1 GENERAL SAFETY INFORMATION

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 Chinese regulations, the NEPSI version of the device described in these Supplementary Instructions agrees with Chinese National Standards GB 3836.1-2010, GB 3836.2-2010, GB 3836.4-2010, GB 3836.20-2010, GB 12476.1-2013, GB 12476.4-2010 and GB 12476.5-2013. The Ex ia-, Ex iaD-, Ex d ia- and Ex iaD tD-approved versions are certified for use in hazardous areas by The National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (NEPSI) under GYJ17.1356X.

**WARNING!**
Carefully read the NEPSI 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) and dust zones

1.4.1 Ex ia-approved devices

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

**OPTIWAVE 3500, OPTIWAVE 6500 and OPTIWAVE 7500**
All versions
- Ex ia IIC T3–T6 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 10.

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 iaD-approved device has the markings that follow for dust zones:

**OPTIWAVE 3500**
All versions
- Ex iaD 20/21 T85–T150

**OPTIWAVE 6500 and OPTIWAVE 7500**
Without distance piece
- Ex iaD 20/21 T85–T150

**OPTIWAVE 6500 and OPTIWAVE 7500**
With distance piece
- Ex iaD 20/21 T85–T200

The Ex iaD-approved device is suitable for use in potentially explosive atmospheres (for all types of dust), when fitted with the appropriate options.

The equipment can be 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). The equipment can also be used in zone 21.
1.4.2 Ex d ia- and Ex iaD tD-approved devices

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

**OPTIWISE 3500, OPTIWISE 6500 and OPTIWISE 7500**
All versions
- Ex d ia IIC T3~T6 Ga/Gb

The Ex d 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 10.

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 iaD tD-approved device has the markings that follow for dust zones:

**OPTIWISE 3500**
All versions
- Ex iaD 20/21 tD A21 IP6X T85°C~T150°C

**OPTIWISE 6500 and OPTIWISE 7500**
Without distance piece
- Ex iaD 20/21 tD A21 IP6X T85°C~T150°C

**OPTIWISE 6500 and OPTIWISE 7500**
With distance piece
- Ex iaD 20/21 tD A21 IP6X T85°C~T200°C

The Ex iaD tD-approved device is suitable for use in potentially explosive atmospheres (for all types of dust), when fitted with the appropriate options.

The equipment can be 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). The equipment can also be used in zone 21.
1.5 NEPSI nameplates

Figure 1-1: Nameplate on the signal converter housing for devices that are not made in China

1. NEPSI certification number
2. Types of device gas protection including approved Gas Groups, temperature classes and equipment protection level
   Types of device dust protection including dust zones and maximum surface temperature
3. Ex ia or Ex iaD approvals: Intrinsically-safe circuit data. Refer to 6 for the input voltage range.
   Ex d ia or Ex iaD tD approvals: Maximum voltage. 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 9.
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
8. Approval logo
2.1 Special conditions

This device can be installed on the applicable auxiliary equipment: a storage tank, tank with agitator etc..

2.2 Precautions

2.2.1 General notes

WARNING!
When you install the device, obey the conditions in the NEPSI 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 Chinese Law and NEPSI regulations. For more data, refer to the related NEPSI explosion protection certificates of conformity and these Chinese National Standards:
- GB 3836.13: Electrical apparatus for explosive gas atmospheres – Part 13: Repair and overhaul for apparatus used in explosive gas atmospheres,
- GB 3836.15: Electrical apparatus for explosive gas atmospheres – Part 15: Electrical installation in hazardous area [other than mines],
- GB 3836.16: Electrical apparatus for explosive gas atmospheres – Part 16: Inspection and maintenance of electrical installation [other than mines],
- GB 50525: Code for construction and acceptance of electric device for explosion atmospheres and fire hazard electrical equipment installation engineering,
- GB 12476.2–2010: Electrical apparatus for use in the presence of combustible dust Part 2: Selection and installation, and
- GB 15577–2007: Safety regulations for dust explosion prevention and protection

DANGER!
The device 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.

DANGER!
Only the manufacturer can repair the device and replace components. If the device does not operate correctly, speak or write to the manufacturer.
2.2.2 Electrostatic discharge

**DANGER!**
Risk of electrostatic discharge from painted surfaces, the plastic sun cover, the Lens antenna, the flange plate 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
2.3 Operating conditions

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 ($T_{atm} = -20...+60^\circ C / -4...+140^\circ F$ and $p_{atm} = 0.8...1.1$ barg / 11.60...15.95 psig), do an analysis of the risk of ignition.

$T_{atm}$ = atmospheric temperature and $p_{atm}$ = 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.

### OPTIWAVER 3500

<table>
<thead>
<tr>
<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for Zones 20/21, Zone 21 or Zone 22</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>
<td></td>
<td>+48</td>
<td>+118</td>
</tr>
<tr>
<td>T5</td>
<td>T100°C</td>
<td>+75</td>
<td>+167</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+63</td>
<td>+145</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>+64</td>
<td>+147</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+55</td>
<td>+131</td>
</tr>
<tr>
<td>T3</td>
<td>T150°C</td>
<td>+49</td>
<td>+120</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimum ambient temperature</th>
<th>Minimum process connection temperature (min. process temperature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[°C]</td>
<td>[°F]</td>
</tr>
<tr>
<td>-40</td>
<td>-40</td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for Zones 20/21, Zone 21 or Zone 22</th>
<th>Minimum ambient temperature</th>
<th>Minimum process connection temperature (min. process temperature)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All classes</td>
<td>All surface temperatures</td>
<td>-40</td>
<td>-40</td>
</tr>
</tbody>
</table>
OPTIWARD 6500 and 7500
Without distance piece

<table>
<thead>
<tr>
<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for Zones 20/21, Zone 21 or Zone 22</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>
<td></td>
<td>+48</td>
<td>+118</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+60</td>
<td>+140</td>
</tr>
<tr>
<td>T5</td>
<td>T100°C</td>
<td>+75</td>
<td>+167</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+63</td>
<td>+145</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+100</td>
<td>+212</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>+64</td>
<td>+147</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+55</td>
<td>+131</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+135</td>
<td>+275</td>
</tr>
<tr>
<td>T3</td>
<td>T150°C</td>
<td>+49</td>
<td>+120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+150</td>
<td>+302</td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for Zones 20/21, Zone 21 or Zone 22</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>-35</td>
<td>-31</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.
### OPTIWISE 6500 and 7500

**With distance piece**

<table>
<thead>
<tr>
<th>Temperature class for EPL Ga/Gb, EPL Gb or EPL Gc</th>
<th>Maximum surface temperature for Zones 20/21, Zone 21 or Zone 22</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</td>
<td>+60 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+53 °C</td>
<td>+50 °C</td>
</tr>
<tr>
<td>T5</td>
<td>T100°C</td>
<td>+75 °C</td>
<td>+75 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+68 °C</td>
<td>+65 °C</td>
</tr>
<tr>
<td>T4</td>
<td>T135°C</td>
<td>+70 °C</td>
<td>+70 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+65 °C</td>
<td>+65 °C</td>
</tr>
<tr>
<td>T3</td>
<td>T200°C</td>
<td>+61 °C</td>
<td>+61 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+53 °C</td>
<td>+53 °C</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 Zones 20/21, Zone 21 or Zone 22</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</td>
<td>-40 °C</td>
</tr>
</tbody>
</table>

(1) Min. process connection temperature is -20°C / -4°F, if a Kalrez®6375 gasket is used.
3.1 General notes

**WARNING!**
- De-energize the circuit.
- Do not wire the device in a potentially explosive atmosphere.
- Use the applicable cable glands for the cable entry openings in the housing [M20×1.5 or \( \frac{1}{2} \) 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!**
- Do not blow dust with compressed air if it collects on the housing. Clean the device with a damp cloth before you remove the terminal compartment cover.
- Make sure that no dust goes into the electrical compartment after you open the cover.

![Figure 3-1: How to open the terminal compartment cover](image)
Equipment needed
• Wrench (supplied)
• 3 mm Allen wrench [not supplied]

- 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. Lubricate the gasket with a mutli-purpose grease [e.g. UNIMOLY® C 220].*

**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

Make sure that the electrical connections agree with the applicable regulations (for more data, refer to *General notes* on page 8). 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 iaD-approved devices**
The device electronics are isolated with a rating of 500 $V_{RMS}$.

**Ex d ia- or Ex iaD tD-approved devices**
The device does not agree with the 500 $V_{RMS}$ dielectric strength requirement. Obey all the instructions given in the “Electrical connections” chapter.

3.5 Ex ia and Ex iaD 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 $IP \geq 6X$ (IEC 60529). We recommend that you use a part that has a degree of ingress protection $IP \geq 68$. Make sure that the cable gland is sealed.

**Obey the instructions that follow:**
- Electrical wires must agree with applicable standards (for more data, refer to *General notes* on page 8).
- 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 $\geq 500 \, V_{RMS}$.
- 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>$U_i$</td>
<td>$I_i$</td>
</tr>
<tr>
<td>[V]</td>
<td>[mA]</td>
</tr>
<tr>
<td>4...20 mA passive – HART</td>
<td>$\leq$30</td>
</tr>
</tbody>
</table>

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.

For applications in zone 21, 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 d ia / Ex iaD tD equipment

3.6.1 General notes

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

Figure 3-3: Compartments in Ex d ia- and Ex iaD tD-approved equipment
① Electronics block (Ex ia) compartment
② Terminal (Ex d / Ex tD) 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 d / Ex tD terminals.

If you must remove the terminal block for servicing, do not open the terminal compartment in a potentially explosive atmosphere.

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 GB 3836.1 and GB 3836.2. 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 and a minimum of 5 threads are engaged in the cable entry.
- 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 GB 3836.1 and GB 3836.2. 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 GB 12476.1 and GB 12476.2 with an IP6X degree of protection. 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 (for more data, refer to General notes on page 8).
- 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 V_{RMS}.

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>16 (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.

![Electrical schematic for Ex d ia- and Ex iaD tD-approved equipment (with galvanic isolation)](image1)

![Electrical schematic for Ex d ia- and Ex iaD tD-approved equipment (without galvanic isolation)](image2)

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. \(|U| < 13 \text{ V}\)
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 iaD equipment* on page 16. 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?
5.1 Periodic maintenance

In normal operational conditions, no maintenance is necessary. Only the manufacturer can repair the device and replace components. If it is necessary, maintenance must be done by approved personnel (the manufacturer or personnel approved by the manufacturer).

**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.
- Do not blow dust with compressed air if it collects on the device. Clean the device with a damp cloth.

**WARNING!**
The device 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:

- **Ex ia-approved devices**: Before you open the terminal compartment, de-energize the device. For more data, refer to *How to open the terminal compartment* on page 14.
- **Devices with other Ex protection concepts**: Do not open the terminal compartment in a potentially explosive atmosphere.
- 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 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.
5.5 Returning the device to the manufacturer

5.5.1 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.
### 5.5.2 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>radioactive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>water-hazardous</td>
</tr>
<tr>
<td></td>
<td>toxic</td>
</tr>
<tr>
<td></td>
<td>caustic</td>
</tr>
<tr>
<td></td>
<td>flammable</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
- Level
- Temperature
- Pressure
- Process Analysis
- Services