Vortex flowmeter

Category II 2G, EPL Gb
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1.1 General notes

These additional instructions apply to explosion-protected versions of vortex flowmeters with protection type intrinsic safety "i", equipment category II 2 G and EPL Gb. They complete the installation and operating instructions for the non-explosion protected versions.

The information given in these instructions contains only the data relevant to explosion protection. The technical details given in the manual for the non-explosion protected versions apply unchanged unless excluded or superseded by these instructions.

1.2 NEPSI conformity

The OPTISWIRL 4200 Vortex Flowmeters series has been approved by NEPSI (National Supervision and Inspection Center for Explosion Protection and Safety of Instrumentation in China) under Certification No.

GYJ16.1096X
GYJ16.1097X
GYJ16.1098X

This certification together with its boundary conditions is required to be observed without fail. The Ex marking is NOT acc. to the ATEX directive 94/9/EC (see also Attachment "Certificate"). Placing the product on the market of the EU for purpose of distribution and/or use in the EU is NOT permitted.
1.3 Security information

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

CAUTION!
The operator respectively his agent is responsible to follow further standards, directives or laws if required due to operating conditions or place of installation. This applies particularly for the use of easy detachable process connections such as SMS or Clamp when measuring flammable mediums.
2.1 Device description

Vortex flowmeters measure and display the flow of flammable and non-flammable gases and liquids. The signal converter includes either a 4...20 mA signal output with optional HART® communication or a bus connection. There are bus connections available according to the FISCO model for connecting to the Foundation Fieldbus or Profibus PA. Signal converters with signal output have a separated binary output and current input.

2.2 Description code

The safety description code * consists of the following elements:

### Compact device

**OPTISWIRL 4200 C .. i-Ex**

1. Product description
2. Type series
3. Compact measuring device
4. Electrical signal output
   - Free - current output 4...20 mA with optional HART® communication or
   - FF - Foundation FIELDBUS bus connection or
   - PA - PROFIBUS PA bus connection
5. Intrinsically safe supply
6. Ex - Explosion-protected version

### Signal converter remote version

**VFC 200 F .. i 020 -Ex**

1. Product description
2. Type series
3. Remote version
4. Electrical signal output
   - Free - current output 4...20 mA with optional HART® communication or
   - FF - Foundation FIELDBUS bus connection or
   - PA - PROFIBUS PA bus connection
5. Intrinsically safe supply
6. VFC020 sensor electronics
7. Ex - Explosion-protected version

### Measuring sensor remote version

**OPTISWIRL 4000 F**

1. Product description
2. Type series sensor
3. Remote version

* positions which are not needed are omitted (no blank positions)

The remote version consisting of the OPTISWIRL 4000 F measuring sensor and the VFC 200 F signal converter is called the OPTISWIRL 4200 F.
2.3 Marking

The marking of the devices in accordance with the description code is shown on the nameplates below. On both the compact devices and the remote versions, the main plate is located on the converter housing. On the remote versions there is an additional marking on the measuring sensor.

Compact devices with two converters for dual measurement (Dual Version) are each marked with a nameplate, which is affixed to each of the converter housings. The details relevant to explosion protection are identical on both nameplates.

![Diagram of nameplates]

1. Device version OPTISWIRL 4200 C or VFC 200 F ... 020 / OPTISWIRL 4000 F
2. Production order number
3. Serial number
4. Year of manufacture
5. Ex data acc. to GY J16.1097X and GYJ.16.1098X
6. Permissible ambient temperature range
7. Maximum values intrinsically safe circuits
8. Observe the safety instructions
9. Internet address of the manufacturer
2.4 Flammable products

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

Operating conditions
Vortex flowmeters operate outside of atmospheric conditions, which means that explosion
protection regardless of the zone assignment – is fundamentally not applicable due to the
lack of key safety data for the interior of the measuring unit.

WARNING!
Operation with flammable products is only permitted as long as no explosive fuel/air mixture
builds up on the inside of the flowmeter under operating conditions. The operator is responsible
for ensuring that the flowmeter is operated safely as regards the temperature and pressure of
the products used.
In case of operation with flammable products the measuring units must be included in the
periodic pressure tests of the system.

2.5 Equipment category / EPL

Vortex flowmeters are designed according to the GB 3836.1-2010 and GB 3836.4-2010.

INFORMATION!
Definition of zone 1 acc. to EN 1127-1, Appendix B: An area in which an explosive atmosphere
may occasionally occur as a result of the mixture of flammable substances in the form of gas,
steam or mist with air under normal operation.
2.6 Protection types

The marking acc. to NEPSI:

Vortex Flowmeter: Ex ia IIC T2...T6 Gb
Vortex Flow Sensor: Ex ia IIC T2...T6 Gb
Vortex Flow Signal Converter: Ex ia IIC T4...T6 Gb

The marking contains the following information:

<table>
<thead>
<tr>
<th>Ex ia</th>
<th>Intrinsically safe, level of protection “ia”</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIC</td>
<td>Gas group, suitable for gas groups IIC, IIB and IIA</td>
</tr>
<tr>
<td>T6...T2</td>
<td>Temperature class range</td>
</tr>
<tr>
<td>Gb</td>
<td>EPL, suitable for zone 1</td>
</tr>
</tbody>
</table>

**INFORMATION!**

In principle, operation is possible in all ranges of the temperature classes T1...T6.

2.7 Ambient temperature / temperature classes

Because of the influence of the temperature of the product, no fixed temperature class is assigned to vortex flowmeters. The temperature class of these devices is rather a function of the product temperature and ambient temperature that is present and the specific device version. The classification is outlined in the following tables.

The tables take into account the following parameters:

- Ambient temperature $T_{\text{amb}}$
- Product temperature $T_m$
- Nominal size DN
- Heat resistance of the connecting cable
INFORMATION!
The maximum permissible product temperatures listed in the tables are valid under the following conditions:

- The measuring device is installed and operated in accordance with the manufacturer’s installation instructions.
- It must be ensured that the flowmeter is not heated by the effects of additional heat radiation (sunshine, neighbouring system components) and thus operated above the permissible ambient temperature range.

- Insulation must be limited to the piping. Unobstructed ventilation of the signal converter must be ensured.

The permitted ambient temperature range is indicated on the nameplate; depending on the device version it is \( T_{\text{amb}} = -40 \ldots +65^\circ C / -40 \ldots +149^\circ F \).

The minimum product temperature is \(-40^\circ C / -40^\circ F\).
Maximum permissible product and ambient temperatures with signal converter or connection box mounted above the measuring sensor

Maximum permissible product and ambient temperatures per temperature class in °C

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>T6</th>
<th>T5</th>
<th>T4</th>
<th>T3</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt; in °C</td>
<td>40</td>
<td>60</td>
<td>60</td>
<td>65</td>
<td>40</td>
</tr>
</tbody>
</table>

Nominal size

| DN15 ... 25 | 85 | 65 | 135 | 135 | 200 | 200 | 185 | 185 | 240 | 210 | 185 |
| DN40 ... 50 | 75 | 65 | 135 | 135 | 200 | 195 | 165 | 165 | 240 | 195 | 165 |
| DN65 ... 100 | 70 | 65 | 135 | 135 | 200 | 165 | 145 | 145 | 240 | 165 | 145 |
| DN150 ... 300 | 80 | 65 | 135 | 135 | 200 | 200 | 170 | 170 | 240 | 200 | 170 |

1) Permanent service temperature of connecting cable and cable entry min. 80°C

Maximum permissible product and ambient temperatures per temperature class in °F

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>T6</th>
<th>T5</th>
<th>T4</th>
<th>T3</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt; in °F</td>
<td>104</td>
<td>140</td>
<td>140</td>
<td>149</td>
<td>104</td>
</tr>
</tbody>
</table>

Nominal size

| DN15 ... 25 | 185 | 149 | 275 | 275 | 392 | 392 | 365 | 365 | 464 | 410 | 365 |
| DN40 ... 50 | 167 | 149 | 275 | 275 | 392 | 383 | 329 | 329 | 464 | 383 | 329 |
| DN65 ... 100 | 158 | 149 | 275 | 275 | 392 | 329 | 293 | 293 | 464 | 329 | 293 |
| DN150 ... 300 | 176 | 149 | 275 | 275 | 392 | 392 | 338 | 338 | 464 | 392 | 338 |

1) Permanent service temperature of connecting cable and cable entry min. 176°F
Maximum permissible product and ambient temperatures with signal converter or connection box mounted at side or underneath the measuring sensor.

### Maximum permissible product and ambient temperatures per temperature class in °C

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>T6</th>
<th>T5</th>
<th>T4</th>
<th>T3</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt; in °C</td>
<td>40</td>
<td>60</td>
<td>60</td>
<td>65</td>
<td>40</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal size</th>
<th>DN15 ... 25</th>
<th>85</th>
<th>65</th>
<th>135</th>
<th>135</th>
<th>200</th>
<th>200</th>
<th>200</th>
<th>240</th>
<th>240</th>
<th>240</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DN40 ... 50</td>
<td>75</td>
<td>65</td>
<td>135</td>
<td>135</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>240</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>DN65 ... 100</td>
<td>70</td>
<td>65</td>
<td>135</td>
<td>135</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>240</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>DN150 ... 300</td>
<td>80</td>
<td>65</td>
<td>135</td>
<td>135</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>240</td>
<td>240</td>
<td>240</td>
</tr>
</tbody>
</table>

① Permanent service temperature of connecting cable and cable entry min. 80°C

### Maximum permissible product and ambient temperatures per temperature class in °F

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>T6</th>
<th>T5</th>
<th>T4</th>
<th>T3</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt; in °F</td>
<td>104</td>
<td>140</td>
<td>140</td>
<td>149</td>
<td>104</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Nominal size</th>
<th>DN15 ... 25</th>
<th>185</th>
<th>149</th>
<th>275</th>
<th>275</th>
<th>392</th>
<th>392</th>
<th>392</th>
<th>464</th>
<th>464</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>DN40 ... 50</td>
<td>167</td>
<td>149</td>
<td>275</td>
<td>275</td>
<td>392</td>
<td>392</td>
<td>392</td>
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<td>464</td>
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<tr>
<td></td>
<td>DN65 ... 100</td>
<td>158</td>
<td>149</td>
<td>275</td>
<td>275</td>
<td>392</td>
<td>392</td>
<td>392</td>
<td>464</td>
<td>464</td>
<td>464</td>
</tr>
<tr>
<td></td>
<td>DN150 ... 300</td>
<td>176</td>
<td>149</td>
<td>275</td>
<td>275</td>
<td>392</td>
<td>392</td>
<td>392</td>
<td>464</td>
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<td>464</td>
</tr>
</tbody>
</table>

① Permanent service temperature of connecting cable and cable entry min. 176°F
Maximum permissible product and ambient temperatures for devices with painted measuring sensors / signal converters or connection box mounted above the measuring sensor.

Maximum permissible product and ambient temperatures per temperature class in °C

<table>
<thead>
<tr>
<th>Temperature class</th>
<th>T6</th>
<th>T5</th>
<th>T4</th>
<th>T3</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt; in °C</td>
<td>40</td>
<td>60</td>
<td>65</td>
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<td>65</td>
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Nominal size

<table>
<thead>
<tr>
<th>DN15 ... 25</th>
<th>60</th>
<th>120</th>
<th>120</th>
<th>120</th>
<th>120</th>
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</thead>
<tbody>
<tr>
<td>DN40 ... 50</td>
<td>55</td>
<td>120</td>
<td>115</td>
<td>120</td>
<td>115</td>
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<tr>
<td>DN65 ... 100</td>
<td>55</td>
<td>110</td>
<td>105</td>
<td>120</td>
<td>110</td>
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<tr>
<td>DN150 ... 300</td>
<td>60</td>
<td>120</td>
<td>115</td>
<td>120</td>
<td>115</td>
</tr>
</tbody>
</table>

(1) Permanent service temperature of connecting cable and cable entry min. 80°C

Maximum permissible product and ambient temperatures per temperature class in °F

<table>
<thead>
<tr>
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<th>T6</th>
<th>T5</th>
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<th>T3</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt; in °F</td>
<td>104</td>
<td>140</td>
<td>140</td>
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Nominal size

<table>
<thead>
<tr>
<th>DN15 ... 25</th>
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<th>248</th>
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<tr>
<td>DN40 ... 50</td>
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<td>248</td>
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<td>131</td>
<td>230</td>
<td>221</td>
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<td>221</td>
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<td>DN150 ... 300</td>
<td>140</td>
<td>248</td>
<td>239</td>
<td>248</td>
<td>239</td>
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</tbody>
</table>

(1) Permanent service temperature of connecting cable and cable entry min. 176°F
Maximum permissible product and ambient temperatures for devices with painted measuring sensors / signal converters or connection box mounted at side or underneath the measuring sensor

Maximum permissible product and ambient temperatures per temperature class in °C

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<th>T2</th>
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<tbody>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt; in °C</td>
<td>40</td>
<td>60</td>
<td>60</td>
<td>65</td>
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<td>Nominal size</td>
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<td></td>
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<tr>
<td>DN15 ... 25</td>
<td>85</td>
<td>65</td>
<td>120</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>DN40 ... 50</td>
<td>70</td>
<td>65</td>
<td>120</td>
<td>120</td>
<td>120</td>
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<td>DN65 ... 100</td>
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<tr>
<td>DN150 ... 300</td>
<td>75</td>
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<td>120</td>
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</tr>
</tbody>
</table>

(1) Permanent service temperature of connecting cable and cable entry min. 80°C

Maximum permissible product and ambient temperatures per temperature class in °F

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<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt; in °F</td>
<td>104</td>
<td>140</td>
<td>140</td>
<td>149</td>
<td>104</td>
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<td>Nominal size</td>
<td></td>
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<tr>
<td>DN15 ... 25</td>
<td>185</td>
<td>149</td>
<td>248</td>
<td>248</td>
<td>248</td>
</tr>
<tr>
<td>DN40 ... 50</td>
<td>158</td>
<td>149</td>
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<tr>
<td>DN65 ... 100</td>
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<tr>
<td>DN150 ... 300</td>
<td>167</td>
<td>149</td>
<td>248</td>
<td>248</td>
<td>248</td>
</tr>
</tbody>
</table>

(1) Permanent service temperature of connecting cable and cable entry min. 176°F
2.8 Electrical data

Signal circuits

The vortex flowmeter signal circuits may only be connected to separate, certified, intrinsically safe isolating amplifiers or zener barriers connected to separate, intrinsically safe circuits with the following maximum values per circuit:

<table>
<thead>
<tr>
<th>Device version</th>
<th>Maximum values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Circuit Terminals</td>
</tr>
<tr>
<td>OPTISWIRL 4200 C i Ex</td>
<td>Current output 4-20 mA</td>
</tr>
<tr>
<td>VFC 200 F i Ex</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Binary output</td>
</tr>
<tr>
<td></td>
<td>M1, M2, M3, M4</td>
</tr>
<tr>
<td></td>
<td>Current input</td>
</tr>
<tr>
<td></td>
<td>I1, I2</td>
</tr>
<tr>
<td>OPTISWIRL 4200 C FF i Ex</td>
<td>Bus terminal</td>
</tr>
<tr>
<td>VFC 200 F FF i Ex</td>
<td>D, D-</td>
</tr>
<tr>
<td>OPTISWIRL 4200 C PA i Ex</td>
<td>Bus terminal</td>
</tr>
<tr>
<td>VFC 200 F PA i Ex</td>
<td>D, D-</td>
</tr>
</tbody>
</table>

Measuring sensor circuits

With the compact device, the intrinsically safe measuring sensor circuits are designed as internal circuits.

When it comes to the remote versions, the intrinsically safe measuring sensor circuits are led through. The maximum permissible values of the measuring sensor circuits considered safe are listed below:

Pressure sensor circuit (connector X2.1 .. X2.5)

- \( U_o = 6.65 \, \text{V} \)
- \( I_o = 35 \, \text{mA} \)
- \( P_o = 58 \, \text{mW} \)
- \( C_o = 2.5 \, \text{μF} \)
- \( L_o = 0.5 \, \text{mH} \)

Piezo / Temperature sensor circuit (connector X2.7 .. X2.12)

- \( U_o = 6.65 \, \text{V} \)
- \( I_o = 21 \, \text{mA} \)
- \( P_o = 35 \, \text{mW} \)
- \( C_o = 2.6 \, \text{μF} \)
- \( L_o = 0.5 \, \text{mH} \)
3.1 Installation

Installation and setup must be carried out according to the applicable installation standards (e.g. GB 3836.15) by qualified personnel trained in explosion protection. The information given in the manuals and the supplementary instructions must be observed at all times.

**Vortex flowmeters must be installed in such a way that**

- no external forces are affecting the indication unit.
- 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.

**Aligning the signal converter**
The signal converter and the connection box of remote systems may be aligned on the base up to a maximum of ± 180°. For this reason, the M4 hexagon socket screw connecting the base, the converter and connection box must be loosened. Once the signal converter and the connection box has been turned, it must be screwed back on to the base again (tightening torque 2 Nm).

- De-energise the converter.
- Loosen the 1 hexagon socket screw.
- Turn the signal converter and connection box.
- Screw base to signal converter and the connection box once again.

![Diagram showing Allen screws M4 on connection housing](image-url)

1. Allen screws M4 on connection housing
3.2 Special conditions

Equipotential bonding
Vortex flowmeter converters and measuring sensors with optional pressure sensor [remote system only] must be included in the equipotential bonding of the hazardous area.

INFORMATION!

Lock on electronics and terminal compartment
The electronics and terminal compartment may be opened in hazardous areas when measuring and carrying out adjustments.
4.1 General notes

The separate intrinsically safe signal circuits are electrically connected in the terminal compartment of the signal converter. The circuits are designed in protection type “intrinsically safe” and galvanically isolated from ground (test voltage ≥ 500 V<sub>eff</sub>). The intrinsically safe measuring sensor circuits are connected in the connection boxes on the wall bracket and measuring sensor.

The connecting cables must be selected according to prevailing installation standards (e.g. GB 3836.15) and the maximum operating temperature.

The connecting cable between the measuring sensor and wall bracket with remote systems is part of the supply.

- The connecting cables must be fixed and laid so they are sufficiently protected against damage.
- All cores that are not used must be securely connected to the ground potential of the hazardous area or carefully insulated against each other and against ground (test voltage ≥ 500 V<sub>eff</sub>)
- Lay cables so as to ensure that there is sufficient distance between surfaces of the measuring sensor and the connecting cable.
- Supplied blind plugs / cable entries guarantee protection against foreign objects and water (protection category) IP66 / 67.
- Before connecting or loosening the equipotential bonding cable, ensure there are no differences in potential.
- Any existing cable shields should be connected to ground according to applicable installation regulations (GB3836.15). A terminal in the terminal compartment permits a short way grounding of the cable shields.
- The outer diameter of the connecting cable must be within the sealing range of the cable entry (6...12 mm / 0.24...0.47”).
- Unused cable entries are to be closed.

Ensure that the seals and cut seals are tight.

4.2 Power supply

Vortex flowmeters do not require a separate power supply. The required supply for the built-in electronics is provided via the 4...20mA current output or the bus connection.

4.3 Inputs / Outputs

The terminal assignment is described in the standard documentation. The signal circuits of the vortex flowmeters may only be connected to certified intrinsically safe slave units or circuits. For more information refer to chapter "Electrical data".

The current output, the current input and the binary output are designed for connection to a certified, intrinsically safe circuit, protection type: intrinsic safety Ex ia IIC or Ex ib IIC.

The bus connections are designed for connection to a certified, intrinsically safe circuit, protection type: intrinsic safety Ex ia IIC or Ex ib IIC according to the FISCO model.
The current output, the current input and the binary output are reliably separated up to a peak voltage of 60 V. All signal circuits are electrically isolated from the earth.

4.4 Grounding and equipotential bonding

**CAUTION! Equipotential bonding**

Vortex signal converters and measuring sensors in the remote version with pressure sensor must be included in on-site equipotential bonding system acc. to GB3836.15! They are connected to the PA terminals.

In the case of compact meters and measuring units with flange connections, the sensor is conductively connected to the pipeline. For compact measuring devices and "sandwich" type measuring units, a separate conductor connected either to the internal or external PA terminal must be provided to connect to the equipotential bonding.

**Ground connection compact version**

1. Electrical grounding connection on connection piece between measuring sensor and signal converter.
2. Electrical grounding terminal in the housing

For remote systems with pressure sensor, the connection of the measuring sensor can either be made via the PA connection in the converter’s terminal compartment or via the external PA connection.

**Ground connection remote version**

1. Electrical grounding connection on measuring sensor
2. Electrical grounding connection on signal converter housing
4.5 Measuring sensor circuits (remote version only)

Observe the following points when connecting the measuring sensor to the signal converter:

- Use only the supplied connecting cable (max. length 50 m / 164 ft).
- Before connecting or loosening the equipotential bonding cable, ensure there are no differences in potential.
- Connect the connecting cable shield to the equipotential bonding of the hazardous area in the wall bracket. Sensor-side, the shield must be carefully isolated from the earth (test voltage $500 \text{ V}_{\text{eff}}$) and connected via the cable shoe to the corresponding connector on the terminal block.
- The terminal compartments of the measuring sensor circuits are supplied with a bridge between the internal PA connection and the terminal with the designation "gnye". This connection must not be separated.
The measuring sensor circuit is designed in protection type intrinsically safe Ex ia II C.
5.1 Start-up

Start-up may only commence when the vortex flowmeter:

• 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

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

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

When it comes to flammable products, the measuring sections must be included in the periodic pressure tests of the system.

Operating the converter insert during operation is permitted. To do so, remove the housing cover. Close the housing cover immediately after adjustment of the converter insert.

Terminal compartments (protection type intrinsic safety) may be opened even in an energised state in hazardous area. Work on electrical connections (e.g. configuration via the HART® interface) is also permitted in an energised state. Terminal compartments must be closed immediately upon completion of the work.

5.3 Electrostatic charge

In order to avoid ignition hazards due to electrostatic charge, vortex flowmeters 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).
• pneumatically conveyed dust is exposed.

CAUTION!
Electrostatic charging of the housing surface by friction must be avoided. The devices must 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:

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

6.2 Dismantling

Exchanging the built-in equipment

Due to the modular design of the vortex flowmeters, from a safety perspective, the electrical equipment built into the indicator can be replaced with identical spare parts. To do so, remove the housing cover. Close the housing cover immediately after the spare parts are exchanged. Ensure that the cover seal is tight.

General notes

Exchanging and dismantling should take place in a de-energised state, if at all possible. If that is not possible, the basic conditions for intrinsic safety [e.g. no grounding or connection of different intrinsically safe circuits to one another] must be observed during dismantling.

Display screen

The display can be rotated in 90° increments. It is connected to the connector pictured on the next page.

Exchanging the converter insert

It is permitted to replace the entire VFC 200 converter insert with a version identical in construction.
Take special note of the following figure and:

- ensure that the construction is the same by checking the nameplates.
- the connecting cable of the sensor circuits is to be laid in the cutout provided between the converter insert and housing. Avoid damage such as that caused by crushing.
- proper connection of the measuring sensor 4 and the display connector 1
- tighten the mounting screws M4 6 evenly

![Diagram of transmitter module](image)

Figure 6-1: Connect transmitter module

1. Connector for LC display
2. Service connector
3. SIL jumper
4. Connection to measuring sensor
5. Nameplate of converter insert
6. Fixing screw

**Exchanging the entire device**

The dismantling and installation is within 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).

**CAUTION!**

- 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.
KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature assemblies
- Pressure transmitters
- Analysis products
- Products and systems for the oil & gas industry
- Measuring systems for the marine industry

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