Vortex flowmeter

Equipment category II 3G, EPL Gc
in protection type non-incendive Ex-nA
1 Safety instructions 3

1.1 General notes ................................................................................................................... 3
1.2 EU conformity ................................................................................................................... 3
1.3 Approval according to the IECEx scheme ........................................................................ 3
1.4 Safety instructions............................................................................................................ 4

2 Device description 5

2.1 Device description ............................................................................................................ 5
2.2 Description code.............................................................................................................. 5
2.3 Marking............................................................................................................................. 6
2.4 Flammable products ........................................................................................................ 7
2.5 Equipment category / EPL.............................................................................................. 7
2.6 Protection types................................................................................................................ 8
2.7 Ambient temperature / temperature classes................................................................. 8
2.8 Electrical data................................................................................................................. 14

3 Installation 16

3.1 Mounting......................................................................................................................... 16

4 Electrical connections 17

4.1 General notes .................................................................................................................. 17
4.2 Power supply .................................................................................................................. 17
4.3 Inputs/Outputs.................................................................................................................. 18
4.4 Grounding and equipotential bonding ......................................................................... 19
4.5 Flow sensor circuits [remote version only] .................................................................... 20

5 Operation 21

5.1 Start-up........................................................................................................................... 21
5.2 Operation ........................................................................................................................ 21
5.3 Electrostatic charge ....................................................................................................... 21

6 Service 22

6.1 Maintenance .................................................................................................................... 22
6.2 Dismantling .................................................................................................................... 22
1.1 General notes

These additional instructions apply to explosion-protected versions of vortex flowmeters in protection type non-sparking "nA", equipment category II 3 G and EPL Gc. They complete the product documentation for the non-explosion protection versions.

The information given in this instruction contains only the data relevant to explosion protection of category 3. The technical details given in the manual for the non-explosion protected versions remain unchanged unless they will be excluded or replaced by this instruction.

1.2 EU conformity

The manufacturer declares with the EU declaration of conformity on his own responsibility conformity with the protection goals of directive 2014/34/EU for use in hazardous areas with gas.

Conformity with harmonised standards was checked by a notified body in accordance with EN 60079-0:2012, EN 60079-11:2012 and EN 60079-15:2010.

The EU declaration of conformity for the equipment category II 3 G is based on the type examination certificate of the KIWA:

KIWA 15 ATEX 0040 X

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

1.3 Approval according to the IECEx scheme

Conformity of the vortex flowmeter for use in hazardous areas with gas was tested in accordance with the IECEx Certification Scheme for Explosive Atmospheres acc. to IEC 60079-0: 2011 cor. 2013, IEC 60079-11: 2011 and IEC 60079-15: 2010. The number of the IEC certificate is:

IECEx KIWA 15.0021 X

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

If these instructions are not followed, there is a risk of explosion.

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

**CAUTION!**
Operating conditions and place of installation may require compliance with additional standards, directives or laws. The responsibility for compliance rests solely with the operator or his agent.
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 remote binary output and a remote current input.

2.2 Description code

The safety description code * consists of the following elements:

### Compact device

<table>
<thead>
<tr>
<th>OPTISWIRL 4200 C .. -Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

- Free - current output 4...20 mA with optional HART® communication or
- FF - Foundation FIELDBUS bus connection or
- PA - PROFIBUS PA bus connection

| 5 | Explosion-protected version |

### Signal converter - remote version

<table>
<thead>
<tr>
<th>VFC 200 F .. 020 -Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

- Free - current output 4...20 mA with optional HART® communication or
- FF - Foundation FIELDBUS bus connection or
- PA - PROFIBUS PA bus connection

| 5 | Sensor electronics VFC 020 |
| 6 | Explosion-protected version |

### Flow sensor - remote version

<table>
<thead>
<tr>
<th>OPTISWIRL 4000 F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

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

The remote version consisting of the flow sensor OPTISWIRL 4000 and the signal converter VFC 200 F 020 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 signal converter housing. On the remote versions there is an additional marking on the flow sensor.

Compact devices with two signal converters for dual measurement (Dual Version) are each marked with a nameplate, which is attached to each of the signal converter housings. The details relevant to explosion protection are identical on both 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. Marking acc. to KIWA 15 ATEX 0040 X or IECEx KIWA 15.0021 X
6. Permissible ambient temperature range
7. Electrical connection data
8. Observe the safety instructions
9. Internet address of the manufacturer
2.4 Flammable products

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

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

**CAUTION!**
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 to ensure that the flowmeter is operated safely in terms of 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 in category II 3 G or EPL Gc according to EN 60079-0 und EN 60079-15 for use in zone 2. The inside of the measuring unit is also approved for zone 2.

Vortex flowmeters are designed according to the “IECEx-Scheme” acc. to “Equipment Protection Level [EPL] Gc”.

**INFORMATION!**
Definition of zone 2 acc. to EN 1127-1, Appendix B:
An area in which an explosive atmosphere as a result of the mixture of flammable substances in the form of gas, steam or mist with air is not expected to occur under normal operation. If, however, such an atmosphere does occur it only lasts for a brief period of time.
2.6 Protection types

The vortex flowmeter is designed in the protection type "non-incendive" in accordance with EN/IEC 60079-15:2010. Explosion protection is ensured in that there are no contacts or hot surfaces with a sparking effect during operation.

The marking for the non-incendive version of compact devices is acc. to
ATEX: II 3 G Ex nA ic IIC T6...T2 Gc
IECEEx: Ex nA ic IIC T6...T2 Gc

The marking for the non-incendive version of remote versions is acc. to
II 3 G Ex ic IIC T6...T2 Gc [flow sensor]
IECEEx: Ex nA [ic] IIC T6 Gc [signal converter]
Ex ic IIC T6...T2 Gc [flow sensor]

The marking contains the following information:

<table>
<thead>
<tr>
<th>II</th>
<th>Explosion protection, group II</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Equipment category 3</td>
</tr>
<tr>
<td>G</td>
<td>Gas explosion protection</td>
</tr>
<tr>
<td>Ex nA</td>
<td>Protection type “non-incendive equipment”</td>
</tr>
<tr>
<td>Ex ic</td>
<td>Protection type “Intrinsic safety”, protection level “ic” [flow sensor circuit, compact device]</td>
</tr>
<tr>
<td>Ex [ic]</td>
<td>Protection type “Intrinsic safety”, protection level “ic” [flow sensor circuit, remote version]</td>
</tr>
<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>Gc</td>
<td>EPL, suitable for zone 2</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_{amb}
- Product temperature T_m
- Nominal size DN
- Heat resistance of the connecting cable
The permitted ambient temperature range is indicated on the nameplate; depending on the device version it is $T_{\text{amb}} = -40...+65^\circ\text{C} / -40...+149^\circ\text{F}$.

The minimum product temperature is $-40^\circ\text{C} / -40^\circ\text{F}$.
Maximum permissible product and ambient temperatures with signal converter or connection box mounted above the flow 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>Nominal size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN15...25</td>
<td>80</td>
<td>65</td>
<td>100</td>
<td>100</td>
<td>135</td>
</tr>
<tr>
<td>DN40...50</td>
<td>80</td>
<td>65</td>
<td>100</td>
<td>100</td>
<td>135</td>
</tr>
<tr>
<td>DN65...100</td>
<td>80</td>
<td>65</td>
<td>100</td>
<td>100</td>
<td>135</td>
</tr>
<tr>
<td>DN150...300</td>
<td>75</td>
<td>65</td>
<td>100</td>
<td>100</td>
<td>135</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>Nominal size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN15...25</td>
<td>176</td>
<td>149</td>
<td>212</td>
<td>212</td>
<td>275</td>
</tr>
<tr>
<td>DN40...50</td>
<td>176</td>
<td>149</td>
<td>212</td>
<td>212</td>
<td>275</td>
</tr>
<tr>
<td>DN65...100</td>
<td>176</td>
<td>149</td>
<td>212</td>
<td>212</td>
<td>275</td>
</tr>
<tr>
<td>DN150...300</td>
<td>167</td>
<td>149</td>
<td>212</td>
<td>212</td>
<td>275</td>
</tr>
</tbody>
</table>

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 flow sensor

<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>Tamb in °C</td>
<td>60</td>
<td>65</td>
<td>60</td>
<td>65</td>
<td>40</td>
</tr>
<tr>
<td>Nominal size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN15...25</td>
<td>85</td>
<td>65</td>
<td>100</td>
<td>100</td>
<td>135</td>
</tr>
<tr>
<td>DN40...50</td>
<td>80</td>
<td>65</td>
<td>100</td>
<td>100</td>
<td>135</td>
</tr>
<tr>
<td>DN65...100</td>
<td>85</td>
<td>65</td>
<td>100</td>
<td>100</td>
<td>135</td>
</tr>
<tr>
<td>DN150...300</td>
<td>80</td>
<td>65</td>
<td>100</td>
<td>100</td>
<td>135</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>Tamb in °F</td>
<td>140</td>
<td>149</td>
<td>140</td>
<td>149</td>
<td>104</td>
</tr>
<tr>
<td>Nominal size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN15...25</td>
<td>185</td>
<td>149</td>
<td>212</td>
<td>212</td>
<td>275</td>
</tr>
<tr>
<td>DN40...50</td>
<td>176</td>
<td>149</td>
<td>212</td>
<td>212</td>
<td>275</td>
</tr>
<tr>
<td>DN65...100</td>
<td>185</td>
<td>149</td>
<td>212</td>
<td>212</td>
<td>275</td>
</tr>
<tr>
<td>DN150...300</td>
<td>176</td>
<td>149</td>
<td>212</td>
<td>212</td>
<td>275</td>
</tr>
</tbody>
</table>

1 Permanent service temperature of connecting cable and cable entry min. 176°F
## Max. permissible product and ambient temperatures for devices with painted flow sensors / signal converters or connection box mounted above the flow 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>Nominal size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DN15…25</td>
<td>70</td>
<td>65</td>
<td>100</td>
<td>95</td>
<td>120</td>
</tr>
<tr>
<td>DN40…50</td>
<td>70</td>
<td>65</td>
<td>100</td>
<td>95</td>
<td>115</td>
</tr>
<tr>
<td>DN65…100</td>
<td>70</td>
<td>65</td>
<td>100</td>
<td>90</td>
<td>105</td>
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<tr>
<td>DN150…300</td>
<td>65</td>
<td>65</td>
<td>95</td>
<td>90</td>
<td>120</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>Nominal size</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>DN15…25</td>
<td>159</td>
<td>149</td>
<td>212</td>
<td>203</td>
<td>248</td>
</tr>
<tr>
<td>DN40…50</td>
<td>159</td>
<td>149</td>
<td>212</td>
<td>203</td>
<td>239</td>
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<tr>
<td>DN65…100</td>
<td>158</td>
<td>149</td>
<td>212</td>
<td>194</td>
<td>221</td>
</tr>
<tr>
<td>DN150…300</td>
<td>149</td>
<td>149</td>
<td>203</td>
<td>194</td>
<td>248</td>
</tr>
</tbody>
</table>

1  Permanent service temperature of connecting cable and cable entry min. 176°F
Max. permissible product and ambient temperatures for devices with painted flow sensors / signal converters or connection box mounted at side or underneath the flow 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>
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</thead>
<tbody>
<tr>
<td>Tamb in °C</td>
<td>60</td>
<td>65</td>
<td>60</td>
<td>65</td>
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</tr>
</tbody>
</table>

Nominal size

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>DN15...25</th>
<th>DN40...50</th>
<th>DN65...100</th>
<th>DN150...300</th>
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</thead>
<tbody>
<tr>
<td>Tamb in °C</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>65</td>
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<tr>
<td>1</td>
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<td>120</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>Tamb in °F</td>
<td>140</td>
<td>149</td>
<td>140</td>
<td>149</td>
<td>104</td>
</tr>
</tbody>
</table>

Nominal size

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>DN15...25</th>
<th>DN40...50</th>
<th>DN65...100</th>
<th>DN150...300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamb in °F</td>
<td>149</td>
<td>149</td>
<td>149</td>
<td>149</td>
</tr>
<tr>
<td>1</td>
<td>203</td>
<td>194</td>
<td>248</td>
<td>248</td>
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<td>176</td>
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<tr>
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</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 circuits with the following maximum values. A $U_m$ of 253 V is required for the power supply units.

<table>
<thead>
<tr>
<th>Device version</th>
<th>Circuit Terminals</th>
<th>Nominal voltage</th>
<th>Nominal current</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPTISWIRL 4200 C Ex VFC 200 F 020 Ex</td>
<td>Current output 4...20 mA C1, C2</td>
<td>12...32 VDC</td>
<td>4...20 mA</td>
</tr>
<tr>
<td></td>
<td>Binary output M1, M2, M3, M4</td>
<td>8...32 VDC</td>
<td>≤100 mA</td>
</tr>
<tr>
<td></td>
<td>Current input I1, I2</td>
<td>9...32 VDC</td>
<td>0...20 mA</td>
</tr>
<tr>
<td>OPTISWIRL 4200 C FF Ex VFC 200 F FF 020 Ex</td>
<td>Bus connection D, D-</td>
<td>9...32 VDC</td>
<td>20 mA</td>
</tr>
<tr>
<td>OPTISWIRL 4200 C PA Ex VFC 200 F PA 020 Ex</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Further information for operation of the FF transmitter are provided in separate supplementary instructions.
2. Further information for operation of the PA transmitter are provided in separate supplementary instructions.

Flow sensor circuits

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

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

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

- $U_o = 6.65$ V
- $I_o = 35$ mA
- $P_o = 58$ mW
- $C_o = 2.5$ μF
- $L_o = 0.5$ mH

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

- $U_o = 6.65$ V
- $I_o = 21$ mA
- $P_o = 35$ mW
- $C_o = 2.6$ μF
- $L_o = 0.5$ mH
Remote circuit (connector X5501)

- $U_o = 6.65 \text{ V}$
- $I_o = 1107 \text{ mA}$
- $P_o = 650 \text{ mW}$
- $C_o = 2.5 \mu\text{F}$
- $L_o = 73 \mu\text{H}$
3.1 Mounting

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

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 signal converter.
- Loosen the hexagon socket screw ①.
- Turn the signal converter or connection box.
- Screw signal converter or connection box back to the base again.

![Diagram of signal converter and connection box with Allen screws M4 on connection housing](image)

① Allen screws M4 on connection housing
4.1 General notes

Rated values for insulation

- The insulation of the vortex flowmeter OPTISWIRL 4200 ... - Ex is rated in compliance with IEC 60 664-1. The following rating parameters are taken into account:
  - Overvoltage category for signal and instrument loops: II
  - Pollution degree of the insulation: 2

Terminal compartment

The signal circuit is electrically connected in the terminal compartment of the signal converter. The protection type of the terminal compartment is “nA”. Unused entries shall be closed in compliance with EN 60079-15.

Connecting cables

The connecting cables should be selected according to the applicable installation standards (e.g. EN 60079-14 / VDE 0165) 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.
- Lay cables so as to ensure that there is sufficient distance between surfaces of the measuring unit and the connecting cable.
- Supplied blind plugs / cable entries guarantee protection against foreign objects and water (protection category) IP66 / 67 according to EN 60529.
- 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 in accordance with EN 60079-15 (>IP66 / 67).
- Before connecting or loosening the equipotential bonding cable, ensure there are no differences in potential.

Ensure that the gaskets and incised gasket ring are tight.

**CAUTION!**
The IP protection category of the signal converter housing is largely determined by the cable gland used and the installation.

Connection terminals

The capacity of the connection terminals is 0.5 mm² to 2.5 mm².

The torque of the connection terminals is 0.6 Nm.

4.2 Power supply

The vortex flowmeter does not require a separate power supply. The required supply for the built-in electronics is provided via the 4...20 mA current output or the bus connection.
4.3 Inputs/Outputs

The terminal assignment of the built-in electrical equipment is described in the standard documentation. The signal circuits of the vortex flowmeter may only be connected to downstream devices or circuits that satisfy the requirements of protective extra-low voltage (PELV).

Only circuits that are suitable for operation in zone 2 hazardous areas may be connected. Outside of the vortex flowmeter, measures must be taken for the circuits to prevent the rated voltage from being exceeded by more than 40% due to temporary faults.

Connecting power supply and I/O functions

- Before connecting or disconnecting the electrical connection cables of the device, make sure that all cables leading to the signal converter are isolated from the ground of the hazardous area. This also applies to protective earth (PE) and equipotential bonding conductors (PA).
- All connecting cable conductors and shields that are not securely connected to the equipotential grounding system of the hazardous area shall be carefully isolated from each other and from ground (test voltage 1500 V<sub>eff</sub> for non-intrinsically safe cables).
4.4 Grounding and equipotential bonding

**CAUTION!**

**Equipotential bonding**

Vortex signal converters and flow sensors must be included in on-site equipotential bonding acc. to EN 60079-14! They are connected to the PA terminals.

In the case of compact devices and measuring units with flange connections, the connection may be made via a conducting connection of the flow sensor 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 the connection of the flow sensor can either be made via the PA connection in the signal converter 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 Flow sensor circuits (remote version only)

Observe the following points when connecting the flow 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. On the flow sensor side, the shield must be carefully isolated from the earth [test voltage 500 V<sub>eff</sub>] and connected via the terminal end to the corresponding connector on the terminal block.
- The terminal compartments of the flow 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 flow sensor circuit is designed in protection type intrinsically safe Ex ic IIC.
5.1 Start-up

Start-up may only initiate 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.
- has been correctly locked to the electronics and terminal compartment.

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

If the device needs to be configured due to the existence of an explosive atmosphere, this can be done using the supplied bar magnets. There is no need to open the housing as it can be done through the glass window of the electronics compartment or digitally via the signal output [HART® interface].

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.

In case of operation with flammable products the measuring units must be included in the periodic pressure tests of the system.

During operation it is only permitted to open the indicator if no explosive atmosphere is present.

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) or
- 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.

Treat cover threads as necessary with the lubricating paint UNIMOLY C220®.

For systems in hazardous areas, regular checks are required in order to maintain the proper condition.

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
The dismantling and installation is within the responsibility of the operator.

Due to the modular design of the vortex flowmeters, from a safety perspective, the electrical equipment built into the signal converter 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
Only identical displays or components from the manufacturer may be used.

The device must be de-energised, if it is absolutely necessary to open the housing in the presence of a potentially explosive atmosphere.

Before connecting or disconnecting the electrical connection cables of the device, make sure that all cables leading to the signal converter are isolated from the ground of the hazardous area. This also applies to protective earth (PE) or functional earth (FE) and equipotential bonding conductors (PA).

Display
The display can be rotated in 90° increments. It is connected to the connector as shown in the following figure.

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 flow 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 connector for the flow sensor and for the display.
- tighten the mounting screws M4 evenly.

![Connection of signal converter module](image)

**Figure 6-1: Connection of signal converter module**

1. Connector for LC display
2. Service connector
3. SIL jumper
4. Display clamps
5. Connection to the flow sensor
6. Nameplate of converter insert
7. 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).

Observe the information above. Also, ensure that all process connections and the pipeline are depressurised and free of product. Where environmentally critical products are concerned, carefully decontaminate the wetted parts of the flange system after dismantling.

**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.
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