



OPTISWIRL 4200

Supplementary Instructions

Vortex flowmeter

Equipment protection level Gb / Db

in type of protection Flameproof enclosures Ex d and

in type of protection Equipment dust-ignition protection through enclosure Ex t



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1.1 General notes

These additional instructions apply to explosion protected versions of vortex flowmeters in protection type Flameproof enclosure "d", Increased safety "e" and Equipment dust-ignition protection through enclosure "t", equipment category II 2 G and II 2 D, EPL Gb and EPL Db. They complete the standard manual for the non-explosion protected versions.

The information given in this instruction contains only the data relevant to explosion protection of category 2. The technical details given in the standard manual for the non-explosion protected versions remain unchanged unless they will be excluded or replaced by this instruction.

1.2 NEPSI conformity

The flowmeters series has been approved by NEPSI (National Supervision and Inspection Center for Explosion Protection and Safety of Instrumentation in China). This product is in accordance with the following standards:

- GB 3836.1-2010 Explosive atmospheres - Part 1: Equipment - General requirements
- GB 3836.2-2010 Explosive atmospheres - Part 2: Equipment protection by flameproof enclosures "d"
- GB 3836.3-2010 Explosive atmospheres - Part 3: Equipment protection by increased safety "e"
- GB 3836.4-2010 Explosive atmospheres - Part 4: Equipment protection by intrinsic safety "i"
- GB 12476.1-2013 Electrical apparatus for use in the presence of combustible dust - Part 1: Equipment - General requirements
- GB 12476.4-2010 Electrical apparatus for use in the presence of combustible dust - Part 4: Protection by intrinsic safety "iD"
- GB 12476.5-2013 Electrical apparatus for use in the presence of combustible dust - Part 5: Protection by enclosures "tD"

The certificate number is:

GYJ17.1343X

This certification together with its boundary conditions is required to be observed without fail.



INFORMATION!

The Ex marking is NOT according to the ATEX directive. Placing the product on the market of the EU for purpose of distribution and/or use in the EU is NOT permitted.

1.3 Approval according to the IECEx scheme

Conformity of the vortex flowmeter for use in hazardous areas with gas and dust was tested in accordance with the "IECEx Certification Scheme for Explosive Atmospheres" according to IEC 60079-0:2011, IEC 60079-1:2014, IEC 60079-7:2015, IEC 60079-11:2011 and IEC 60079-31:2013. The number of the IEC certificate is:

IECEx KIWA 15.0021X

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

OPTISWIRL 4200 C .. -Ex					
①	②	③	④	⑤	

- ① Product designation
- 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 Explosion-protected version

Signal converter - remote version

VFC 200 F .. 020 -Ex					
①	②	③	④	⑤	⑥

- ① Product designation
- 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 Sensor electronics VFC 020
- ⑥ Explosion-protected version

Flow sensor - remote version

OPTISWIRL 4000 F		
①	②	③

- ① Product designation
- ② Type series of flow sensor
- ③ Remote version

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

The remote version consisting of the flow sensor OPTISWIRL 4000 F 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.

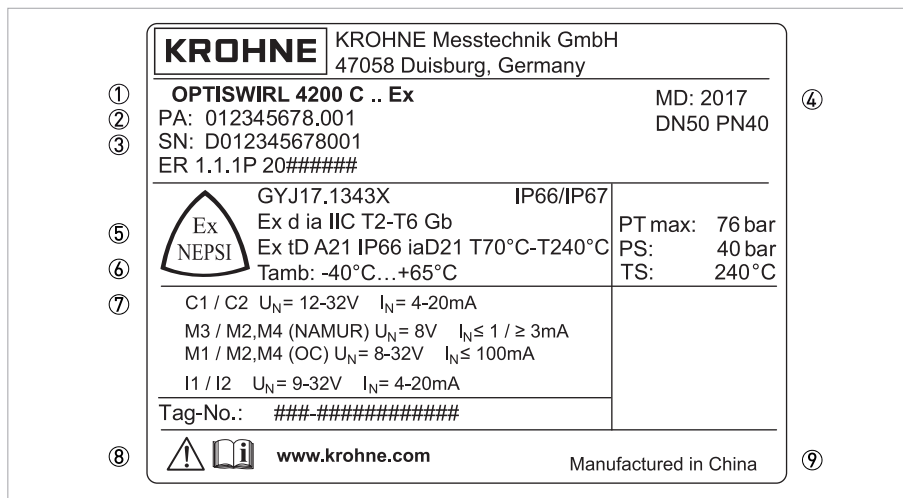


Figure 2-1: Example of nameplate for compact version

- ① Device version OPTISWIRL 4200 C
- ② Production order number
- ③ Serial number
- ④ Year of manufacture
- ⑤ Marking according to NEPSI GYJ17.1343X
- ⑥ Permissible ambient temperature range
- ⑦ Electrical connection data
- ⑧ Information to observe the safety instructions
- ⑨ Country of manufacture

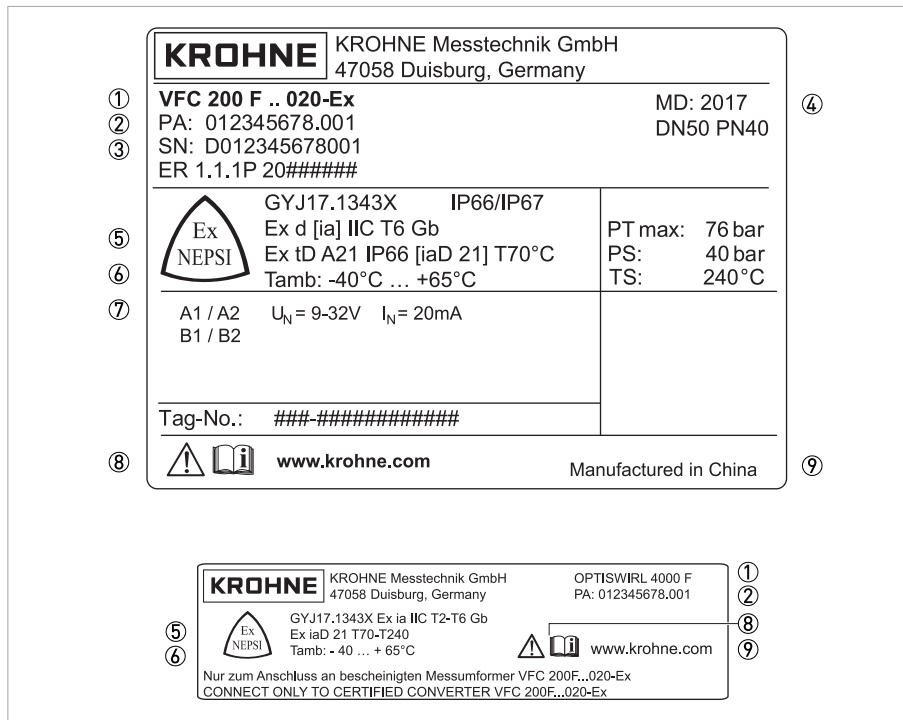


Figure 2-2: Example of nameplates for remote version

- ① Device version VFC 200 F .. 020 / OPTISWIRL 4000 F
- ② Production order number
- ③ Serial number
- ④ Year of manufacture
- ⑤ Marking according to NEPSI GYJ17.1343X
- ⑥ Permissible ambient temperature range
- ⑦ Electrical connection data
- ⑧ Information to observe the safety instructions
- ⑨ Country of manufacture

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 $P_{\text{atm}} = 0.8...1.1 \text{ bar} / 11.6...15.9 \text{ psi}$.

Outside of this range, for most mixtures no key figures are available for the ignition behaviour.

Operating conditions

Vortex flowmeters operate outside of atmospheric conditions, which means that explosion protection according to the applied standards, 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 Protection Level (EPL)

The Vortex flowmeters are designed in EPL Gb and Db in accordance with GB 3836.1-2010, GB 3836.2-2010, GB 3836.3-2010, GB 3836.4-2010, GB 12476.1-2013, GB 12476.4-2010 and GB 12476.5-2013 for use in zone 1 or zone 21.

The inside of the measuring unit is also approved for zone 1.



INFORMATION!

Definition of zone 1 according to IEC 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, under normal operation may occasionally occur.

Definition of zone 21 according to IEC 1127-1, Appendix B:

An area in which an explosive atmosphere may occasionally occur in the form of a cloud of flammable dust in the air under normal operation.

2.6 Protection types

The lowmeter is designed using equipment protection by flameproof enclosures and equipment dust ignition protection by enclosure.

The following types of protection are used:

Electronics compartment	Ex d and Ex tD
Connection compartment	either Ex d or Ex e and Ex tD
Flow sensor	Ex ia and Ex iaD

The marking for the flameproof version of compact devices is as follows

Ex d ia IIC T2-T6 Gb
or
Ex d e ia IIC T2-T6 Gb

The marking for the flameproof version of remote versions is as follows

Ex d [ia] IIC T6 Gb (signal converter)
or
Ex d e [ia] IIC T6 Gb (signal converter)
Ex ia IIC T2-T6 Gb (flow sensor)

The marking for the dustproof version of compact devices is as follows

Ex tD A21 IP66 iaD 21 T70°C-T240°C

The marking for the dustproof version of remote versions is as follows

Ex tD A21 IP66 [iaD 21] T70°C (signal converter)
Ex iaD 21 T70-T240 (flow sensor)

The marking contains the following information:	
G	Gas explosion protection
D	Dust ignition protection
d	Protection type "Flameproof enclosure"
e	Protection type "Increased safety"
tD	Protection type "Equipment - dust ignition protection by enclosure"
ia	Protection type "Intrinsic safety", level of protection "ia"
IIC	Gas group, suitable for gas groups IIC, IIB and IIA
A21 or iaD 21	Rating for dust, suitable for zone 21
T6 or T2-T6	Temperature class range, suitable for temperature class T1...T6
T70°C	Maximum surface temperature of the signal converter housing without dust coating at ambient temperature 65°C / 149°F and product temperature 65°C / 149°F
T70-240 or T70°C-T240°C	Maximum surface temperature range of the flow sensor housing without dust coating at ambient temperature 65°C / 149°F (is determined by the product temperature)
Gb	EPL, suitable for zone 1
IP66	Rated ingress protection (IP code)

**INFORMATION!**

Considering the given temperature limits operation is possible in all ranges of the temperature classes T1 to 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.

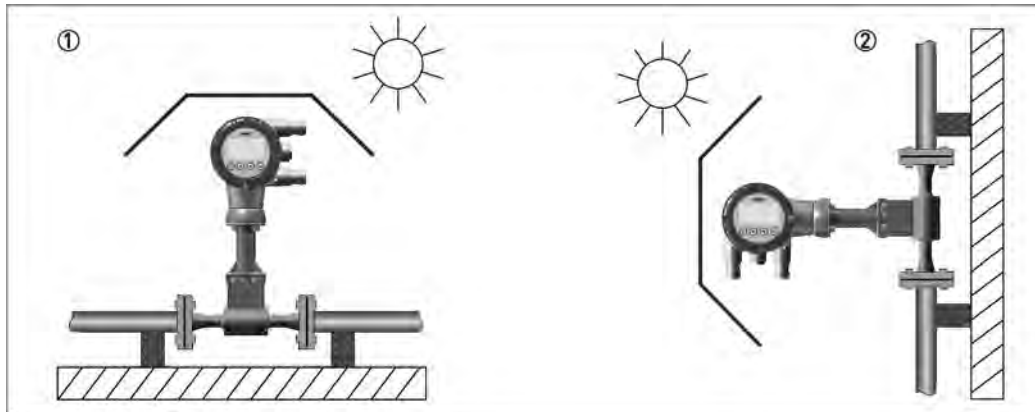
The tables take into account the following parameters:

- Ambient temperature T_{amb}
- Product temperature T_m
- Nominal size DN
- Heat resistance of the connecting cable

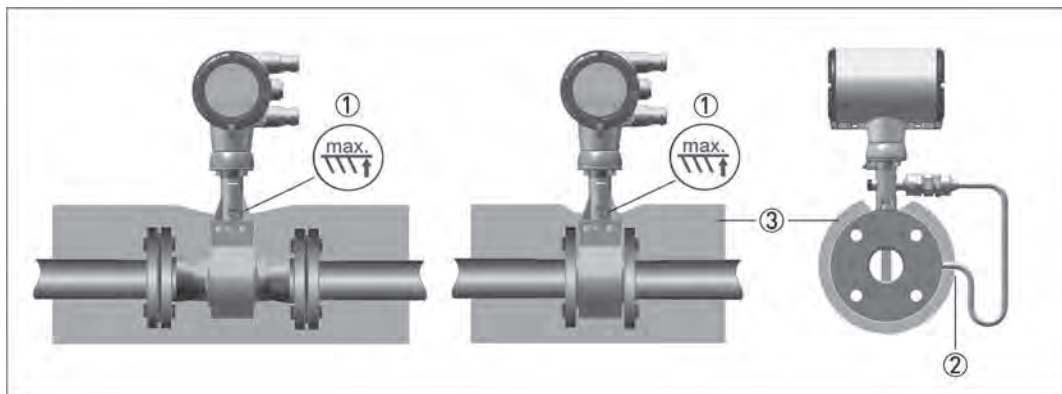
**INFORMATION!**

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 $T_{amb} = -40...+65^{\circ}\text{C} / -40...+149^{\circ}\text{F}$.

The minimum product temperature is $-40^{\circ}\text{C} / -40^{\circ}\text{F}$.

When using in zone 21, observe the maximum permissible product and ambient temperatures for temperature class 2 and the information for use of a heat-resistant connecting cable and cable entry.

Maximum permissible product and ambient temperatures with signal converter or connection box mounted above the flow sensor



Max. permissible product and ambient temperatures per temperature class in °C

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °C	60	65	60	65	60	65	40	60	65	40	60	65
Nominal size												
DN15...25	80	65	100	100	135	135 ①	200	200 ①	165 ①	240	200 ①	165 ①
DN40...50	80	65	100	100	135	135 ①	200	175 ①	150 ①	240	175 ①	150 ①
DN65...100	80	65	100	100 ①	135 ①	130 ①	200	150 ①	130 ①	235 ①	150 ①	130 ①
DN150...300	75	65	100	100	135	135 ①	200	185 ①	155 ①	240	185 ①	155 ①

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

Max. permissible product and ambient temperatures per temperature class in °F

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °F	140	149	140	149	140	149	104	140	149	104	140	149
Nominal size												
DN15...25	176	149	212	212	275	275 ①	392	392 ①	329 ①	464	392 ①	329 ①
DN40...50	176	149	212	212	275	275 ①	392	347 ①	302 ①	464	347 ①	302 ①
DN65...100	176	149	212	212 ①	275 ①	266 ①	392	302 ①	266 ①	455 ①	302 ①	266 ①
DN150...300	167	149	212	212	275	275 ①	392	365 ①	311 ①	464	365 ①	311 ①

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



Max. permissible product and ambient temperatures per temperature class in °C

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °C	60	65	60	65	60	65	40	60	65	40	60	65
Nominal size												
DN15...25	85	65	100	100	135	135	200	200	200 ①	240	240	240 ①
DN40...50	80	65	100	100	135	135	200	200	200 ①	240	240	240 ①
DN65...100	85	65	100	100	135	135 ①	200	200 ①	200 ①	240	240 ①	240 ①
DN150...300	80	65	100	100	135	135	200	200	200 ①	240	240	240 ①

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

Max. permissible product and ambient temperatures per temperature class in °F

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °F	140	149	140	149	140	149	104	140	149	104	140	149
Nominal size												
DN15...25	185	149	212	212	275	275	392	392	392 ①	464	464	464 ①
DN40...50	176	149	212	212	275	275	392	392	392 ①	464	464	464 ①
DN65...100	185	149	212	212	275	275 ①	392	392 ①	392 ①	464	464 ①	464 ①
DN150...300	176	149	212	212	275	275	392	392	392 ①	464	464	464 ①

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

Max. permissible product and ambient temperatures per temperature class in °C

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °C	60	65	60	65	60	65	40	60	65	40	60	65
Nominal size												
DN15...25	70	65	100	95 ①	120 ①	115 ①	120	120 ①	115 ①	120	120 ①	115 ①
DN40...50	70	65	100	95 ①	115 ①	105 ①	120	115 ①	105 ①	120	115 ①	105 ①
DN65...100	70	65	100 ①	90 ①	105 ①	95 ①	120	105 ①	95 ①	120	105 ①	95 ①
DN150...300	65	65	95	90 ①	120 ①	110 ①	120	120 ①	110 ①	120	120 ①	110 ①

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

Max. permissible product and ambient temperatures per temperature class in °F

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °F	140	149	140	149	140	149	104	140	149	104	140	149
Nominal size												
DN15...25	159	149	212	203 ①	248 ①	239 ①	248	248 ①	239 ①	248	248 ①	239 ①
DN40...50	159	149	212	203 ①	239 ①	221 ①	248	239 ①	221 ①	248	239 ①	221 ①
DN65...100	158	149	212 ①	194 ①	221 ①	203 ①	248	221 ①	203 ①	248	221 ①	203 ①
DN150...300	149	149	203	194 ①	248 ①	230 ①	248	248 ①	230 ①	248	248 ①	230 ①

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

Max. permissible product and ambient temperatures per temperature class in °C

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °C	60	65	60	65	60	65	40	60	65	40	60	65
Nominal size												
DN15...25	65	65	95	90	120	120 ①	120	120	120 ①	120	120	120 ①
DN40...50	65	65	85	80	120 ①	120 ①	120	120 ①	120 ①	120	120 ①	120 ①
DN65...100	65	65	95	90 ①	120 ①	120 ①	120	120 ①	120 ①	120	120 ①	120 ①
DN150...300	65	65	85	85	120	120 ①	120	120	120 ①	120	120	120 ①

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

Max. permissible product and ambient temperatures per temperature class in °F

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °F	140	149	140	149	140	149	104	140	149	104	140	149
Nominal size												
DN15...25	149	149	203	194	248	248 ①	248	248	248 ①	248	248	248 ①
DN40...50	149	149	185	176	248 ①	248 ①	248	248 ①	248 ①	248	248 ①	248 ①
DN65...100	149	149	203	248 ①	248 ①	248 ①	248	248 ①	248 ①	248	248 ①	248 ①
DN150...300	149	149	185	248	248	248 ①	248	248	248 ①	248	248	248 ①

① Permanent service temperature of connecting cable and cable entry min. 176°F

Maximum permissible product and ambient temperatures with signal converter stainless steel (metallic bright) or connection box stainless steel (metallic bright) mounted above the flow sensor

Max. permissible product and ambient temperatures per temperature class in °C

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °C	60	65	60	65	60	65	40	60	65	40	60	65
Nominal size												
DN15...25	75	65	100	100	135	135 ①	200	170 ①	145 ①	225	170 ①	145 ①
DN40...50	75	65	100	100 ①	135 ①	130 ①	200	150 ①	130 ①	235	150 ①	130 ①
DN65...100	75	65	100	100 ①	135 ①	115 ①	195 ①	135 ①	115 ①	195 ①	135 ①	115 ①
DN150...300	75	65	100	100 ①	135 ①	135 ①	200	155 ①	135 ①	230	155 ①	135 ①

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

Max. permissible product and ambient temperatures per temperature class in °F

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °F	140	149	140	149	140	149	104	140	149	104	140	149
Nominal size												
DN15...25	167	149	212	212	275	275 ①	392	338 ①	293 ①	437	338 ①	293 ①
DN40...50	167	149	212	212 ①	275 ①	266 ①	392	302 ①	266 ①	455	302 ①	266 ①
DN65...100	167	149	212	212 ①	274 ①	239 ①	383 ①	274 ①	239 ①	383 ①	274 ①	239 ①
DN150...300	167	149	212	212 ①	275 ①	275 ①	392	311 ①	275 ①	446	311 ①	275 ①

① Permanent service temperature of connecting cable and cable entry min. 176°F

Maximum permissible product and ambient temperatures with signal converter stainless steel (metallic bright) or connection box stainless steel (metallic bright) mounted at side or underneath the flow sensor

Max. permissible product and ambient temperatures per temperature class in °C

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °C	60	65	60	65	60	65	40	60	65	40	60	65
Nominal size												
DN15...25	85	65	100	100	135	135	200	200	200 ①	240	240	240 ①
DN40...50	75	65	100	100	135	135 ①	200	200	200 ①	240	235 ①	225 ①
DN65...100	85	65	100	100	135	135 ①	200	200 ①	200 ①	240	240 ①	225 ①
DN150...300	75	65	100	100	135	135	200	200	200 ①	240	240	235 ①

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

Max. permissible product and ambient temperatures per temperature class in °F

Temperature class	T6		T5		T4		T3			T2		
T _{amb} in °F	140	149	140	149	140	149	104	140	149	104	140	149
Nominal size												
DN15...25	185	149	212	212	275	275	392	392	392 ①	464	464	464 ①
DN40...50	167	149	212	212	275	275 ①	392	392	392 ①	464	455 ①	437 ①
DN65...100	185	149	212	212	275	275 ①	392	392 ①	392 ①	464	464 ①	437 ①
DN150...300	167	149	212	212	275	275	392	392	392 ①	464	464	455 ①

① Permanent service temperature of connecting cable and cable entry min. 176°F

2.8 Surface temperature for equipment category II 2 D

For use in areas with flammable dust it should be noted that the indicated maximum surface temperature of T70°C at an ambient temperature of 65°C / 149°F and a product temperature of 65°C / 149°F is valid without a dust coating. For higher product temperatures the maximum surface temperature is defined by the product.

2.9 Electrical data

Signal circuits

The vortex flowmeter signal circuits may only be connected to circuits with the following maximum values. A safety value of $U_m = 253 \text{ V}$ is considered for the power supply units.

Device version	Circuit Terminals	Nominal voltage	Nominal current
OPTISWIRL 4200 C Ex VFC 200 F 020 Ex	Current output 4...20 mA C1, C2	12...32 VDC	4...20 mA
	Binary output M1, M2, M3, M4	8...32 VDC	$\leq 100 \text{ mA}$
	Current input I1, I2	9...32 VDC	4...20 mA
OPTISWIRL 4200 C FF Ex VFC 200 F FF 020 Ex ①	Bus connection A1, A2 B1, B2	9...32 VDC	20 mA
OPTISWIRL 4200 C PA Ex VFC 200 F PA 020 Ex ②			

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 safety values of the flow sensor circuits are listed below:

Remote signal converter, sensor circuit (terminal 1 to 7, color coded)

$U_o = 6.65 \text{ V}$; $I_o = 1107 \text{ mA}$; $P_o = 650 \text{ mW}$; $C_o = 1.5 \mu\text{F}$; $L_o = 73 \mu\text{H}$

Remote flow sensor (terminal 1 to 7, color coded)

$U_i = 7 \text{ V}$; $I_i = 1107 \text{ mA}$; $P_i = 650 \text{ mW}$; $C_i = 0$; $L_i = 0$



INFORMATION!

The verification of intrinsic safety is not necessary for the interconnection of vortex flow sensor connected to the signal converter, if the cable length doesn't exceed 50 m / 164 ft using the supplied cable.

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 $\pm 180^\circ$. 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.

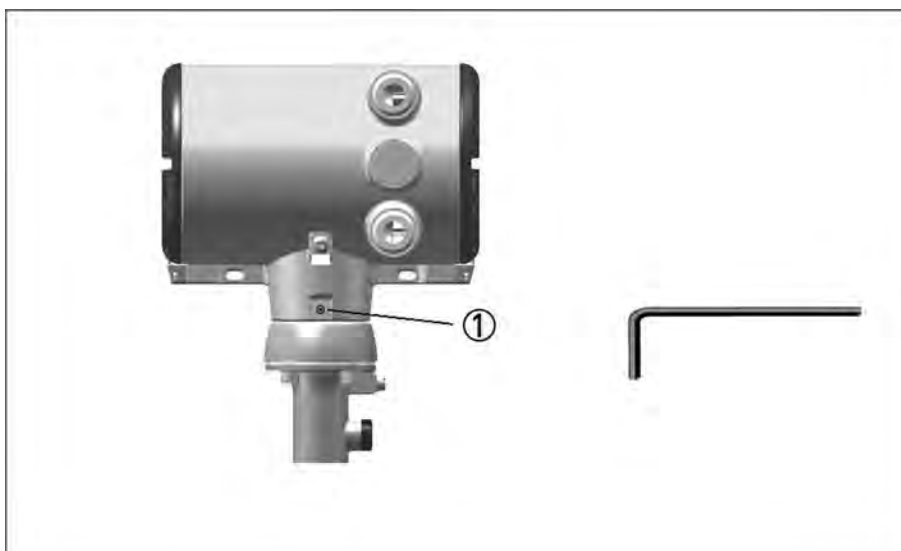


Figure 3-1: Aligning the signal converter

① Allen screws M4 on connection housing

3.2 Special conditions and requirements

Flameproof joints

The housing must be replaced if there is any damage of the flameproof joint. For the details on the dimensions of the flameproof joints, the manufacturer shall be contacted.



WARNING!

Machining of flameproof joints is not allowed.

Equipotential bonding

The earthing terminal shall be connected reliably to be included in the equipotential bonding system.

Electrostatic charge

When the enclosure is with the paint layer, friction should be avoided in case there will cause the ignition by electrostatic accumulation.

Special requirements

- Do not open the cover when the signal converter is located in explosive atmospheres.
- The enclosure shall be kept from the dust, but the dust shall not be blown by compressed air.
- Users are forbidden to change the configuration to ensure the explosion-protection performance of the equipment. Any faults shall be settled with experts from the manufacturer.
- During installation, operation and maintenance, users shall comply with the relevant requirements of the product instruction manual,
GB3836.13-2013 "Explosive atmospheres - Part 13: Equipment repair, overhaul and reclamation",
GB3836.15-2000 "Electrical apparatus for explosive gas atmospheres - Part 15: Electrical installations in hazardous areas (other than mines)",
GB3836.16- 2006 "Electrical apparatus for explosive gas atmospheres - Part 16: Inspection and maintenance of electrical installation (other than mines)",
GB15577- 2007 "Safety regulations for dust explosion prevention and protection",
GB12476.2-2010 "Electrical apparatus for use in the presence of combustible dust - Part 2: Selection and installation" and
GB50257-2014 "Code for construction and acceptance of electric device for explosive atmospheres and fire hazard electrical equipment installation engineering".

Lock on electronics and terminal compartment

The electronics and terminal compartment of the vortex flowmeter must be locked during operation. The covers for the electronics and terminal compartment are secured by a special fastener. When closing the flameproof compartment, first manually tighten the covers until the stop. Then loosen the covers ($\leq 90^\circ$) so that the lock (special fastener) can be secured in the next possible position in the cover. Use a WS3 Allen key to turn the screw of the special fastener. No waiting period is necessary prior to opening the housing.

4.1 General notes

Rated values for insulation

- The insulation of the vortex flowmeter OPTISWIRL 4200 ... - Ex is rated in compliance with IEC 60664-1. 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 terminal compartment is designed in type of protection "d" and optional in type of protection "e" and in type of protection "tD".

Connecting cables

The connecting cables should be selected according to the installation standards and the maximum operating temperature.

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

- 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 hot surfaces of the measuring unit and the connecting cable.
- Supplied blind plugs / cable entries guarantee an ingress protection code IP66/67 according to IEC 60529.
- The outer diameter of the connecting cable must be within the sealing range of the cable entry (7...12 mm / 0.28...0.47").
- Unused cable entries shall be closed considering the type of protection.
- Before connecting or loosening the equipotential bonding connection, ensure there is no difference in potential.

Ensure that the gaskets and incised gasket ring are tight.



CAUTION!

The IP protection code 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).

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 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 $1500 V_{\text{eff}}$ 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 according to EN 60079-14! They are connected to the PA terminals.

In the case of compact flowmeters and measuring units with flange connections, the flow sensor is conductively connected to the pipeline. For compact flowmeters 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.

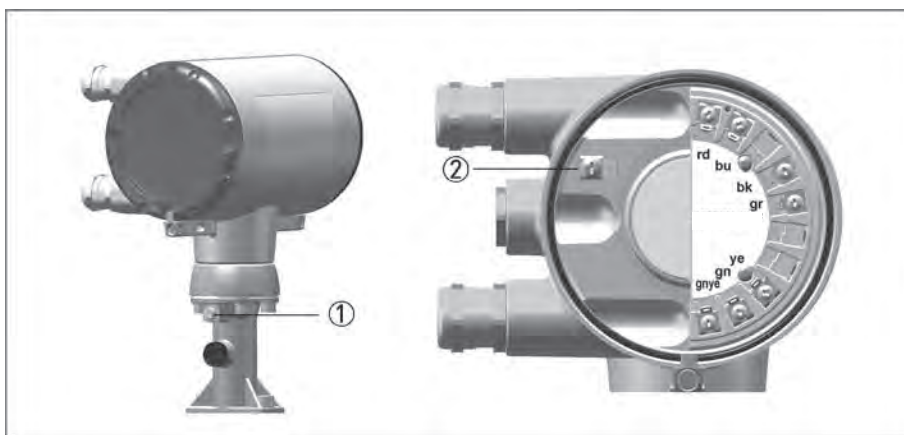


Figure 4-1: Ground connection of compact version

- ① Electrical grounding connection on connection piece between flow 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.

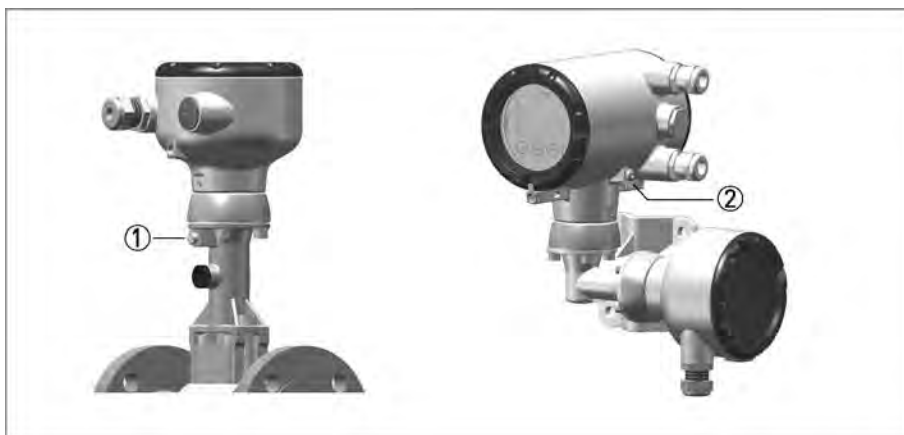


Figure 4-2: Ground connection of remote version

- ① Electrical grounding connection on flow 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_{eff}) 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.

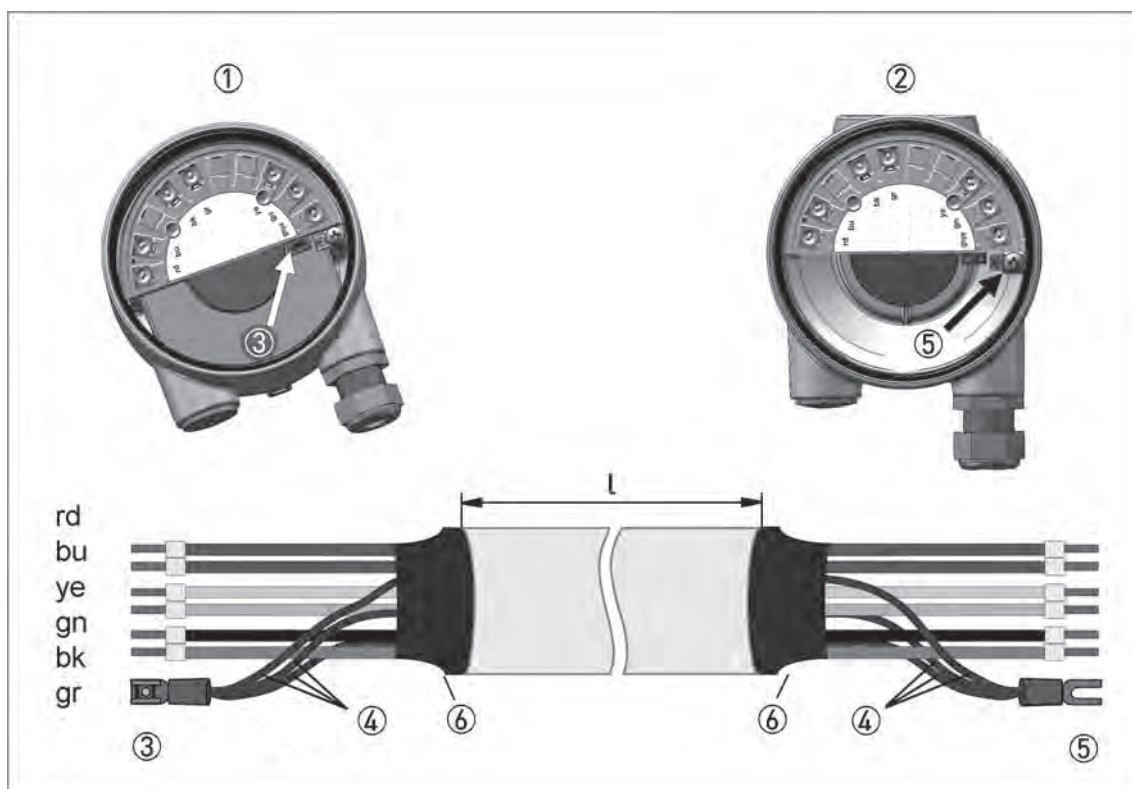


Figure 4-3: Connection of remote version

- ① Terminal connection of flow sensor
- ② Terminal connection of signal converter
- ③ Terminal end pair shielding of flow sensor
- ④ Filler wire pair shielding (protected with heat shrink tubing)
- ⑤ Fork clamp pair shielding on signal converter side
- ⑥ Heat shrink tubing

The flow sensor circuit is designed in protection type intrinsically safe Ex ia II C.

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.

Opening the signal converter (protection type flameproof enclosure or dustproof housing or terminal compartment in increased safety) in hazardous areas is only permitted in a de-energised state.

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.

If it is absolutely necessary to open the flameproof enclosure or the dustproof electronics compartment in the presence of a potentially explosive atmosphere, the device must be de-energised.

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 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 flow sensor ⑤ and the display connector ①.
- tighten the mounting screws M4 ⑦ evenly.

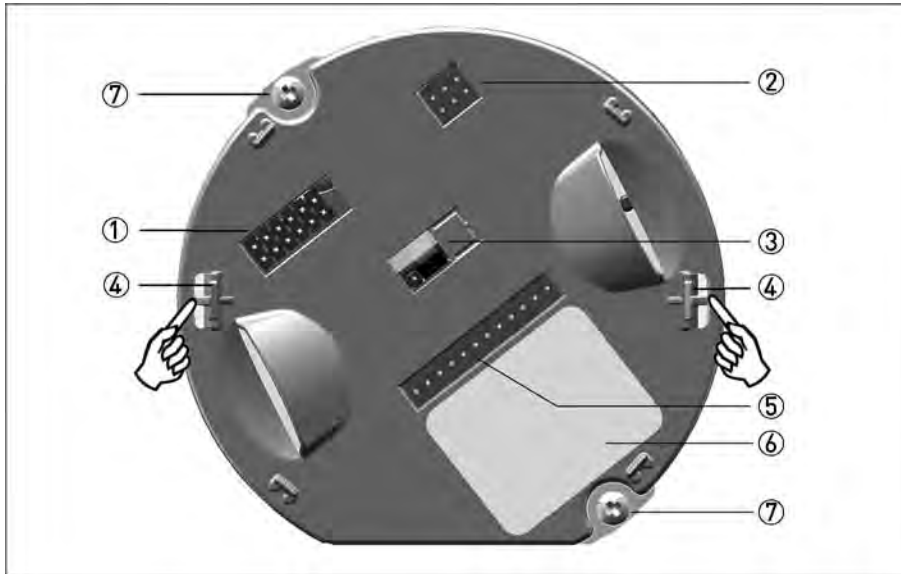


Figure 6-1: Connection of signal converter module

- 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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