OPTISWIRL 4200 Technical Datasheet

Vortex flowmeter

- Integrated pressure and temperature compensation
- Development acc. to IEC 61508 edition 2, for SIL2
- Gross and net heat measurement for hot water and steam
- Comprehensive communication options
- Remote version with field housing converter with connection cable up to 50 m / 164 ft

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1.1 The all-in-one solution

Vortex flowmeters are suitable for a wide range of media. This is particularly true of the **OPTISWIRL 4200**. Its capability to master even fluctuating pressures and temperatures turns it into an ideal all-rounder for the measurement of energy carriers in auxiliary and supply processes.

Already the basic version of the **OPTISWIRL 4200** is equipped with a temperature compensation for saturated steam applications. With the optional pressure sensor the **OPTISWIRL 4200** has an integrated density compensation available, which even allows an exact measurement of gases and superheated steam with varying process conditions. The additional integrated gross and net heat measurement makes the **OPTISWIRL 4200** to be a reliable partner for advanced energy management systems.

With the novel AVFD (Advanced Vortex Frequency Detection) the **OPTISWIRL 4200** is fitted with an up-to-date signal filter. It analyses the measured signal and eliminates interferences and perturbations. Thereby, stable measurements can even be realised under demanding process conditions.

The **OPTISWIRL 4200** was designed for the safety-related applications from the very beginning. It was developed according to the standard IEC 61508 edition 2. The certification is effected within the scope of a Full Assessment by TÜV Süd. Thereby the **OPTISWIRL 4200** can be used for continuous volume flow measurement in safety-related applications with classification SIL2.

Highlights

- Development acc. to IEC 61508 edition 2
- Advanced technology for signal filtering - AVFD (Advanced Vortex Frequency Detection)
- Integrated pressure and temperature compensation
- Temperature compensation for saturated steam included as standard
- Integrated gross and net heat calculation for steam and hot water
- Comprehensive communication options
- Field mounted version with cable length up to 50 m / 164 ft
- Integrated reduction of nominal size
- Measurement of conductive and non-conductive liquids, gases and steam

Industries

- Chemicals
- Oil & Gas
- Power plants
- Food & Beverage
- Pharmaceuticals
- Iron, Steel and Metals
- Paper & Pulp
- Water
- Automobile industry

Applications

- Measurement of saturated steam and superheated steam
- Steam boiler monitoring
- Heat metering of steam and hot water
- Measurement of consumption of industrial gases
- Measurement of consumption in compressed air systems
- Monitoring of compressor output
- Evaluation of Free Air Delivery (FAD)
- SIP- and CIP-processes in the food, beverage and pharmaceutical industries
- Safety-related measurement in SIL applications (SIL2)

1.2 Options and variants

1. The universal device with temperature compensation for saturated steam integrated as standard

The **OPTISWIRL 4200 C** as compact flowmeter in a flange version is suitable for universal use in measuring liquids, gases and vapours.

The temperature compensation for saturated steam is integrated as standard, thus enabling direct compensation of the density; the mass and energy can also be measured.

The advanced signal filter technology AVFD (Advanced Vortex Frequency Detection) complements the high accurate measurement.

2. The easy to install sandwich version with optimised centering rings

The **OPTISWIRL 4200 C** as a compact flowmeter in a sandwich version is suitable for universal use in the measurement of liquids, gases and vapours. The temperature compensation for saturated steam is integrated as standard.

The flowmeter is provided with additional optimised centering rings. The **OPTISWIRL** can be aligned centrically by turning the centering rings, eliminating any offset between the **OPTISWIRL** and the pipeline.

3. The one-of-a-kind 2-wire device with integrated pressure and temperature compensation

DThe OPTISWIRL 4200 as a flange or sandwich flowmeter is optinally available with integrated pressure and temperature compensation for gases, wet gases, gas mixtures or vapours. The advantage of this unique design couldn't be clearer:

- No additional cost-intensive installation of pressure and temperature sensors
- No additional cabling work
- No faulty measurement results, because pressure, temperature and volume flow can be read at a single point
- Direct measurement of mass and/or energy

4. OPTISWIRL 4200 with shut-off valve for the pressure measurement

As an option, the **OPTISWIRL 4200** can be supplied with a shut-off valve to allow the pressure sensor to be exchanged without interrupting the process.
What is more, the pressure sensor can be shut off for the purpose of pressure or leak testing of the pipeline. Using the built-in two-way valve, the pressure sensor can also be calibrated and tested at a later time.

5. Dual measurement for twofold reliability

The **OPTISWIRL 4200** is optionally available as a dual version.
This is a genuine redundant system with two independent measuring sensors and two signal converters. This provides twofold functional reliability and availability of the measurement.
This variant is ideally suited for measurements in multi-product pipelines. In such pipelines, two different products are moved through one after the other. One signal converter can be programmed for one product, and the other signal converter for the other product.

6. The OPTISWIRL 4200 F as remote version

The **OPTISWIRL 4200** is also available as a remote version with field housing converter.
This feature allows separating the signal converter from the measuring sensor up to a distance of 50 m / 164 ft, in case the measuring sensor is mounted in inaccessible areas. The remote mounted signal converter allows easy operation and reading of values at eye level.
Additionally to the flow rates, measurements of the integrated pressure and temperature sensors can be displayed.

7. OPTISWIRL 4200 1R/2R with integrated nominal diameter reduction

The **OPTISWIRL 4200** with integrated nominal diameter reduction up to two nominal diameter sizes assures best results in accuracy and optimal measuring ranges even in pipelines with large diameters, which have been designed for a low pressure loss.

By forgoing complex pipeline reduction installations, space and cost saving installations can be realized. At the same time the number of potential leakages is reduced to a minimum.

1.3 Functional principle

Vortex flowmeters are used to measure the flow of gases, vapours and liquids in completely filled pipes. The measuring principle is based on the principle of the Karman vortex street. The measuring tube contains a bluff body, behind which vortex shedding occurs and is detected by a sensor unit located behind. The frequency **f** of the vortex shedding is proportional to the flow velocity **v**.
The nondimensional Stouhal number **S** describes the relationship between vortex frequency **f**, width **b** of the bluff body and the mean flow velocity **v**:

$$f = \frac{S \cdot v}{b}$$

The vortex frequency is recorded at the sensor and evaluated at the converter.

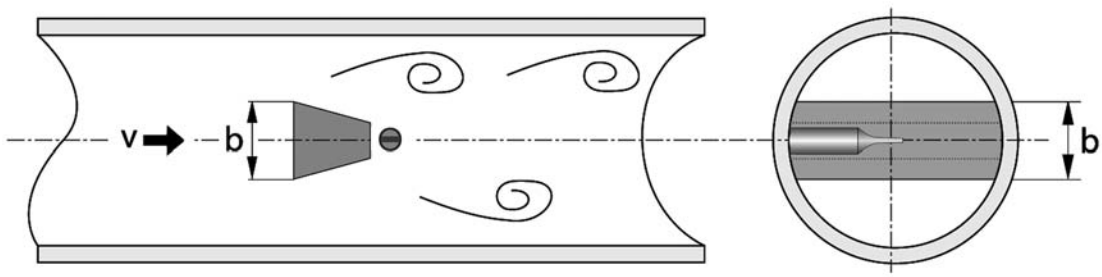


Figure 1-1: Functional principle

2.1 Technical data

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Download Center).*

Measuring system

Application range	Flow measurement of liquids, gases and vapours
Function / Measuring principle	Karman vortex street

Measured value

Primary measured value	Number of separated vortices
Secondary measured value	Operating and standard volume flow, mass flow

Signal converter

Versions	Compact
	Remote version - cable length ≤ 50m (164 ft)

Measuring sensor

Standard	Flange version (with integrated temperature measurement), Measuring sensor: VFM 4000 F
	Sandwich version (with integrated temperature measurement), Measuring sensor: VFM 4000 W
Option	Basic device with additional pressure measurement
	Basic device with additional pressure measurement and shut-off valve for pressure sensor
	Dual measuring device in both flange and sandwich version (redundant measurement)
	Dual measuring device in flange version with additional pressure measurement
	Flange version with single reduction, measuring sensor: F1R
	Flange version with double reduction, measuring sensor: F2R

Display and user interface

Local display	Graphic display
Interface and display languages	German, English, French, further 22 languages in preparation

Measurement accuracy

Reference condition	Water at 20ºC
	Air at 20°C and 1.013 bar abs.

Maximum measuring error

Volume flow (Liquids)	±0.75% of measured value (Re ≥ 20000)
	±2.0% of measured value (10000 < Re < 20000)
Volume flow (Gases and vapours)	±1.0% of measured value (Re ≥ 20000)
	±2.0% of measured value (10000 < Re < 20000)
Mass flow / Nominal volume flow (Gases and vapours)	±1.5% of measured value (Re ≥ 20000)
	±2.5% of measured value (10000 < Re < 20000)
Mass flow (Liquids / water)	±1.5% of measured value (Re ≥ 20000)
	±2.5% of measured value (10000 < Re < 20000)
Temperature	+/- 1 °C
pressure	±0.75% of full scale
Repeatability (Volume flow)	±0.1% of measured value

Operating conditions

Temperature

Product	-40…+240°C / -40…+465°F
Ambient	Non-Ex: -40…+85°C / -40…+185°F
	Ex: -40...+60°C / -40...+140°F
Storage	-50…+85°C / -58…+185°F

Pressure

Product	Max. 100 bar / 1450 psi (higher pressures on request)
Ambient	Atmosphere

Media properties

Density	Taken into consideration when sizing.
Viscosity	< 10 cP
Reynold's number	10000...2300000

Recommended flow velocities

Liquids	0.25…7 m/s / 0.82…23 ft/s (optional up to 10 m/s / 32.8 ft/s taking cavitation into account)
Gases and steams	2.0…80 m/s / 6.6…262.5 ft/s
	DN15: 3.0…45 m/s / 9.8…148 ft/s; DN25: 2.0…70 m/s / 6.6…230 ft/s
For precise information see section 1.2 Intended Use.	

Other conditions

Ingress protection	Compact version and remote version: IP 66/67
	Optional remote version: IP66/68

Installation conditions

Inlet section	≥ 15 x DN (without disturbing flow, after pipe narrowing, after a single 90° bend)
	≥ 30 x DN (after a double bend 2x90°)
	≥ 40 x DN (after a double three-dimensional bend 2x90°)
	≥ 50 x DN (after control valves)
	≥ 2 DN before flow straightener; ≥ 8 DN after flow straightener
Outlet section	≥ 5 x DN

Materials

Measuring sensor and process connections	Standard: 1.4404/316L
	Option: Hastelloy® C-22 on request
Electronics housing	Die-cast aluminium
Pressure sensor gasket	Standard: FPM
	Option: FFKM
Measuring tube gasket	Standard: 1.4435/316L
	Option: Hastelloy® C-276
	Selection depends on measuring sensor material/medium.

Process connections flange version

DIN EN 1092-1	DN15...300 - PN16...100 (higher pressures on request)
ASME B16.5	½...12" - 150...600 lb (higher pressures on request)
JIS B 2220	DN15...300 - JIS 10...20 K (higher pressures on request)
For detailed information on combination flange/pressure rating, refer to section "Dimensions and weights".	

Process connections sandwich version

DIN	DN15...100 - PN100 (higher pressures on request)
ASME	½...4" - 600 lb (higher pressures on request)
JIS	DN15...100 - 10...20 K (higher pressures on request)

Electrical connections

Power supply	Non-Ex: 12...36 VDC
	Ex: 12...30 VDC

Inputs and outputs

General	All inputs and outputs are electrically isolated from one another.
Time constant	The time constant corresponds to 63% of the elapsed time of a processor procedure. 0...100s (rounded up to 0.1s)

Current output

Type	4...20 mA HART® (passive)
Output data	Volume flow, mass flow, standard volume flow, Gross/Net power, FAD, density, temperature (internal sensor), pressure, vortex frequency, flow velocity
Resolution	5 µA
Linearity / accuracy	0.1% (from read value)
Temperature coefficient	50 ppm/K (typically), 100 ppm/K (max.)
Error signal	Acc. to NE 43
Description of abbreviations	U_{ext} = external voltage; R_L = load + resistance
Load	Minimum 0 Ω; maximum R_L = ((U_{ext} - 12 VDC) / 22 mA)

HART®

	HART® protocol via passive current output
HART® revision	7 Burst mode
Manufacturer ID	69 (0x45)
Device type code	205 (0xCD)
System requirements	Load min. 250 Ω
Multidrop operation	4 mA

Binary output

Function	Pulse, frequency, status, limit value
Type	passive Proximity sensor in accordance with DIN EN 60947-5-6 (Namur sensor) or pulse output signal according to VDI/VDE 2188 (category 2)
Temperature coefficient	50 ppm/K
Residual current	< 0.2 mA @ 32V (Ri = 180 kOhm)
Pulse width	0.5...2000 ms

Pulse output

Output data	Volume, mass, standard volume, gross/net heat energie
Pulse rate	Max. 500 pulses/s
Power supply	Non-Ex: 24 VDC as NAMUR or open < 1 mA, maximum 36 V, closed 120 mA, U < 2 V
	Ex: 24 VDC as NAMUR or open < 1 mA, maximum 30 V, closed 120 mA, U < 2 V

Frequency output

Output data	Volume flow, mass flow, standard volume flow, volume, mass, standard volume, Gross/Net power, Gross/Net energie, FAD, density, temperature (internal sensor or external input), pressure, vortex frequency, flow velocity, sec enthalpie, Reynolds number
Max. frequency	1000 Hz

Status output

Output data	Totalizer in accordance with NE 107 (F, S, C), overflow of flow totalizer, overflow of power totalizer, state of medium

Threshold

Output data	Volume flow, mass flow, standard volume flow, volume, mass, standard volume, Gross/Net power, Gross/Net energie, FAD, density, temperature (internal sensor or external input), pressure, vortex frequency, flow velocity, sec enthalpie, Reynolds number

Current input

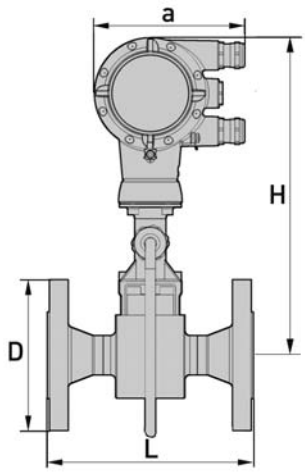
Type	4...20 mA (passive)
Resolution	6 µA
Linearity / accuracy	0.1% (of read value)
Temperature coefficient	100 ppm/K (typically), 200 ppm/K (max)
Voltage drop	10 V

Approvals and certificates

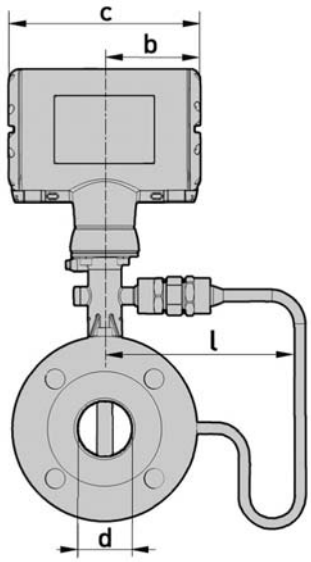
ATEX	ATEX II2 G - Ex ia IIC T6...T2 Gb (in preparation) ATEX II2 G - Ex d ia IIC T6...T2 Gb (in preparation) ATEX II3 G - Ex nA IIC T6...T2 Gc (in preparation) ATEX II2 D - Ex tb IIIC T70°C Db (in preparation)
IECEx	IECEx - Ex ia IIC T6...T2 Gb (in preparation) IECEx - Ex d ia IIC T6...T2 Gb (in preparation) IECEx - Ex nA IIC T6...T2 Gc (in preparation) IECEx - Ex tb IIIC T70°C Db (in preparation)
FM	FM IS Class I DiV 1 (in preparation) FM XP Class I Div 1 (in preparation) FM NI Class I Div 2 (in preparation) FM DIP Class II, III Div 1 (in preparation)

2.2 Dimensions and weights

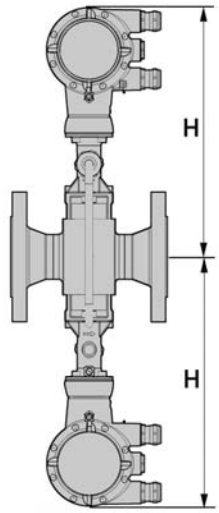
2.2.1 Flange versions



a = 148.5 mm / 5.85"



b = 85.8 mm / 3.38"
c = 171.5 mm / 6.76"



Option: version with 2 transmitters

Dimensions Flange version EN 1092-1 [mm]

Size : DN	Press. rating PN	d	d F1R ①	d F2R ②	D	L	H	H F1R ①	H F2R ②	l	l F1R ①	l F2R ②
15	40	17.3	-	-	95	200	308.8	-	-	169.3	-	-
15	100	17.3	-	-	105	200	308.8	-	-	169.3	-	-
25	40	28.5	17.3	-	115	200	308.4	358.8	-	169.3	169.3	-
25	100	28.5	17.3	-	140	200	308.4	358.8	-	169.3	169.3	-
40	40	43.1	28.5	17.3	150	200	312.3	358.4	358.8	169.5	169.3	169.3
40	100	42.5	28.5	17.3	170	200	312.3	358.4	358.8	169.5	169.3	169.3
50	16	54.5	42.5	28.5	165	200	318.3	362.3	358.4	169.3	169.5	169.5
50	40	54.5	42.5	28.5	165	200	318.3	362.3	358.4	169.3	169.5	169.5
50	63	54.5	42.5	28.5	180	200	318.3	362.3	358.4	169.3	169.5	169.5
50	100	53.9	42.5	28.5	195	200	318.3	362.3	358.4	169.3	169.5	169.5
80	16	82.5	54.5	42.5	200	200	330.3	368.3	362.2	169.3	169.5	169.5
80	40	82.5	54.5	42.5	200	200	330.3	368.3	362.2	169.3	169.5	169.5
80	63	81.7	54.5	42.5	215	200	330.3	368.3	362.2	169.3	169.5	169.5
80	100	80.9	54.5	42.5	230	200	330.3	368.3	362.2	169.3	169.5	169.5
100	16	107	80.9	54.5	220	250	346.8	380.3	368.3	171.5	169.3	169.5
100	40	107	80.9	54.5	235	250	346.8	380.3	368.3	171.5	169.3	169.5
100	63	106	80.9	54.5	250	250	346.8	380.3	368.3	171.5	169.3	169.5
100	100	104	80.9	54.5	265	250	346.8	380.3	368.3	171.5	169.3	169.5

Size : DN	Press. rating PN	d	d F1R ①	d F2R ②	D	L	H	H F1R ①	H F2R ②	l	l F1R ①	l F2R ②
150	16	159	107	80.9	285	300	366.3	396.8	368.3	191.5	171.5	169.3
150	40	159	107	80.9	300	300	366.3	396.8	368.3	191.5	171.5	169.3
150	63	157	107	80.9	345	300	366.3	396.8	368.3	191.5	171.5	169.3
150	100	154	107	80.9	355	300	366.3	396.8	368.3	191.5	171.5	169.3
200	10	207	159	107	340	300	392.1	416.3	396.8	202.8	191.5	171.5
200	16	207	159	107	340	300	392.1	416.3	396.8	202.8	191.5	171.5
200	25	207	159	107	360	300	392.1	416.3	396.8	202.8	191.5	171.5
200	40	207	159	107	375	300	392.1	416.3	396.8	202.8	191.5	171.5
250	10	260	207	159	395	380	418.8	442.1	416.3	229.5	202.8	191.5
250	16	260	207	159	405	380	418.8	442.1	416.3	229.5	202.8	191.5
250	25	259	207	159	425	380	418.8	442.1	416.3	229.5	202.8	191.5
250	40	259	207	159	450	380	418.8	442.1	416.3	229.5	202.8	191.5
300	10	310	260	207	445	450	442.8	468.8	442.1	255	229.5	202.8
300	16	310	260	207	460	450	442.8	468.8	442.1	255	229.5	202.8
300	25	308	260	207	485	450	442.8	468.8	442.1	255	229.5	202.8
300	40	308	260	207	515	450	442.8	468.8	442.1	255	229.5	202.8

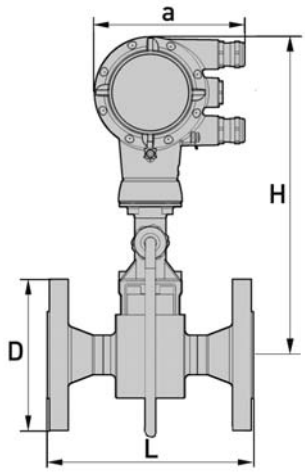
① F1R - single reduction
② F2R - double reduction

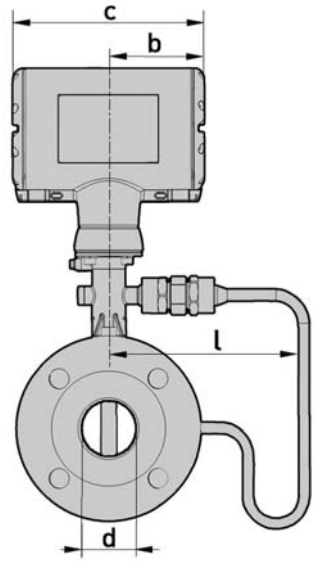
Weight Flange version EN 1092-1 [kg]

Size : DN	Press. rating PN	with	without	F1R ① without	F1R ① with	F2R ② with	F2R ② without
		Pressure sensor		Pressure sensor		Pressure sensor	
15	40	6.1	5.5	-	-	-	-
15	100	7.1	6.5	-	-	-	-
25	40	7.9	7.3	7.2	6.6	-	-
25	100	9.9	9.3	9.7	9.1	-	-
40	40	10.8	10.2	9.7	9.1	9.9	8.3
40	100	14.8	14.2	13.3	12.7	12.5	11.9
50	16	12.7	12.1	11.4	10.8	10.6	10.0
50	40	12.9	12.3	11.9	11.3	11.2	10.6
50	63	16.9	16.3	15.0	14.4	14.3	13.7
50	100	18.4	17.8	17.2	16.6	16.6	16.0
80	16	17.4	16.8	15.6	15.0	14.2	13.6
80	40	19.4	18.8	17.1	16.5	15.8	15.2
80	63	23.4	22.8	20.3	19.7	19.0	18.4
80	100	27.4	26.8	24.0	23.4	22.8	22.2
100	16	22.0	21.4	21.5	20.9	18.7	18.1
100	40	25.0	24.4	24.9	24.3	22.1	21.5
100	63	30.0	29.4	30.1	29.5	27.4	26.8
100	100	36.0	35.4	36.7	36.1	34.0	33.4
150	16	35.8	35.2	33.9	33.3	32.3	31.7
150	40	41.8	41.2	41.4	40.8	40.2	39.6
150	63	59.8	59.2	58.3	57.7	59.0	58.4
150	100	67.8	67.2	69.2	68.6	70.8	70.2
200	10	38.4	37.8	40.7	40.1	43.1	42.5
200	16	38.4	37.8	40.3	39.7	44.3	43.7
200	25	47.4	46.8	49.5	48.9	50.8	50.2
200	40	55.4	54.8	58.0	57.4	58.5	57.9
250	10	58.0	57.4	63.1	62.5	59.8	59.2
250	16	59.0	58.4	64.7	64.1	61.5	60.9
250	25	75.0	74.4	78.5	77.9	76.8	76.2
250	40	93.0	92.4	96.3	95.7	96.1	95.5
300	10	76.3	75.7	81.1	80.5	85.8	85.2
300	16	82.8	82.2	87.6	87.0	92.9	92.3
300	25	99.3	98.7	105.1	104.5	113.0	112.4
300	40	128.1	127.5	132.0	131.4	143.2	142.6
Weight specifications for version with two signal converters + 3.20 kg							

① F1R - single reduction
② F2R - double reduction

Dimensions Flange version ASME B16.5





a = 148.5 mm / 5.85"

b = 85.8 mm / 3.38"
c = 171.5 mm / 6.76"

Dimensions Flange version ASME B16.5 [mm]

Size : NPS	Press. rating Class	d	d F1R ①	d F2R ②	D	L	H	H F1R ①	H F2R ②	l	l F1R ①	l F2R ②
½	150	16	-	-	90	200	308.8	-	-	169.3	-	-
½	300	16	-	-	95	200	308.8	-	-	169.3	-	-
½	600	14	-	-	95	200	308.8	-	-	169.3	-	-
1	150	27	15.8	-	110	200	308.4	358.8	-	169.3	169.3	-
1	300	27	15.8	-	125	200	308.4	358.8	-	169.3	169.3	-
1	600	24	15.8	-	125	200	308.4	358.8	-	169.3	169.3	-
1½	150	41	26.6	15.8	125	200	312.3	358.4	358.8	169.5	169.3	169.3
1½	300	41	26.6	15.8	155	200	312.3	358.4	358.8	169.5	169.3	169.3
1½	600	38	26.6	15.8	155	200	312.3	358.4	358.8	169.5	169.3	169.3
2	150	53	40.9	26.6	150	200	318.3	362.3	358.4	169.5	169.5	169.3
2	300	53	40.9	26.6	165	200	318.3	362.3	358.4	169.5	169.5	169.3
2	600	49	40.9	26.6	165	200	318.3	362.3	358.4	169.5	169.5	169.3
3	150	78	52.6	40.9	190	200	330.3	368.3	362.3	169.3	169.5	169.5
3	300	78	52.6	40.9	210	200	330.3	368.3	362.3	169.3	169.5	169.5
3	600	74	52.6	40.9	210	200	330.3	368.3	362.3	169.3	169.5	169.5
4	150	102	78.0	52.6	230	250	346.8	380.3	368.3	171.5	169.3	169.5
4	300	102	78.0	52.6	255	250	346.8	380.3	368.3	171.5	169.3	169.5
4	600	97	78.0	52.6	275	250	346.8	380.3	368.3	171.5	169.3	169.5
6	150	154	102	78.0	280	300	366.3	396.8	380.3	191.5	171.1	169.3
6	300	154	102	78.0	320	300	366.3	396.8	380.3	191.5	171.1	169.3
6	600	146	102	78.0	355	300	366.3	396.8	380.3	191.5	171.1	169.3

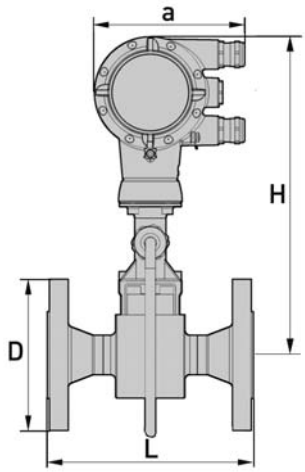
Size : NPS	Press. rating Class	d	d F1R ①	d F2R ②	D	L	H	H F1R ①	H F2R ②	l	l F1R ①	l F2R ②
8	150	203	154	102	345	300	392.1	416.3	396.8	202.8	191.5	171.5
8	300	203	154	102	380	300	392.1	416.3	396.8	202.8	191.5	171.5
10	150	255	203	154	405	380	418.8	442.1	416.3	229.5	202.8	191.5
10	300	255	203	154	455	380	418.8	442.1	416.3	229.5	202.8	191.5
12	150	305	255	203	485	450	442.8	468.8	442.1	255.0	229.5	202.8
12	300	305	255	203	520	450	442.8	468.8	442.1	255.0	229.5	202.8

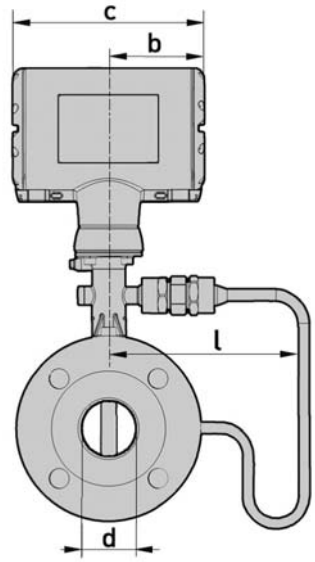
① F1R - single reduction
② F2R - double reduction

Weight Flange version ASME B16.5 [kg]

Size : NPS	Pressure rating Class	with	without	F1R without	F1R with	F2R with	F2R without
		Pressure sensor		Pressure sensor		Pressure sensor	
½	150	5.1	4.5	-	-	-	-
½	300	5.5	4.9	-	-	-	-
½	600	5.7	5.1	-	-	-	-
1	150	6.8	6.2	6.6	6.0	-	-
1	300	7.8	7.2	7.6	7.0	-	-
1	600	8.1	7.5	7.9	7.3	-	-
1½	150	8.9	8.3	8.6	8.0	7.7	7.1
1½	300	11.0	10.4	10.9	10.3	10.0	9.4
1½	600	12.0	11.4	11.8	11.2	11.0	10.4
2	150	11.6	11.0	11.0	10.4	10.3	9.7
2	300	13.0	12.4	12.6	12.0	11.9	11.3
2	600	14.5	13.9	14.0	13.4	13.4	12.8
3	150	20.4	19.8	16.9	16.3	15.6	15.0
3	300	23.4	22.8	20.4	19.8	19.2	18.6
3	600	24.4	23.8	22.9	22.3	21.8	21.2
4	150	24.0	23.4	25.3	24.7	22.7	22.1
4	300	32.0	31.4	33.9	33.3	31.2	30.6
4	600	41.0	40.4	44.1	43.5	41.2	40.6
6	150	36.8	36.2	37.8	37.2	36.9	36.3
6	300	51.8	51.2	56.1	55.5	55.8	55.2
6	600	76.8	76.2	79.8	79.2	82.6	82.0
8	150	50.6	50.0	48.8	48.2	52.5	51.9
8	300	75.4	74.8	72.2	71.6	78.1	77.5
10	150	75.0	74.4	75.2	74.6	73.9	73.3
10	300	107.0	106.4	112.4	111.8	113.5	112.9
12	150	107.0	106.4	109.8	109.2	120.4	119.8
12	300	152.0	151.4	165.4	155.8	171.7	171.1

Dimensions Flange version ASME B16.5 [zoll]





a = 135 mm / 5.32"

b = 108 mm / 4.26"
c = 184 mm / 7.25"

Dimensions Flange version ASME B16.5 [zoll]

Size : NPS	Press. rating Class	d	d F1R ①	d F2R ②	D	L	H	H F1R ①	H F2R ②	l	l F1R ①	l F2R ②
½	150	0.63	-	-	3.5	7.9	12.2	-	-	6.67	-	-
½	300	0.63	-	-	3.7	7.9	12.2	-	-	6.67	-	-
½	600	0.40	-	-	3.7	7.9	12.2	-	-	6.67	-	-
1	150	1.1	0.62	-	4.3	7.9	12.1	14.1	-	6.67	6.67	-
1	300	1.1	0.62	-	4.9	7.9	12.1	14.1	-	6.67	6.67	-
1	600	1.0	0.62	-	4.9	7.9	12.1	14.1	-	6.67	6.67	-
1½	150	1.6	1.1	0.6	4.9	7.9	12.3	14.1	14.1	6.67	6.67	6.67
1½	300	1.6	1.1	0.6	6.1	7.9	12.3	14.1	14.1	6.67	6.67	6.67
1½	600	1.5	1.1	0.6	6.1	7.9	12.3	14.1	14.1	6.67	6.67	6.67
2	150	2.1	1.6	1.1	5.9	7.9	12.5	14.3	14.1	6.67	6.67	6.67
2	300	2.1	1.6	1.1	6.5	7.9	12.5	14.3	14.1	6.67	6.67	6.67
2	600	1.9	1.6	1.1	6.5	7.9	12.5	14.3	14.1	6.67	6.67	6.67
3	150	3.1	2.1	1.6	7.5	7.9	13.0	14.5	14.3	6.67	6.67	6.67
3	300	3.1	2.1	1.6	8.3	7.9	13.0	14.5	14.3	6.67	6.67	6.67
3	600	2.9	2.1	1.6	8.3	7.9	13.0	14.5	14.3	6.67	6.67	6.67
4	150	4.0	3.1	2.1	9.1	9.8	13.7	15.0	14.5	6.76	6.67	6.67
4	300	4.0	3.1	2.1	10	9.8	13.7	15.0	14.5	6.76	6.67	6.67
4	600	3.8	3.1	2.1	11	9.8	13.7	15.0	14.5	6.76	6.67	6.67
6	150	6.1	4.0	3.1	11	12	14.4	15.6	15.0	7.54	6.76	6.67
6	300	6.1	4.0	3.1	13	12	14.4	15.6	15.0	7.54	6.76	6.67
6	600	5.8	4.0	3.1	14	12	14.4	15.6	15.0	7.54	6.76	6.67

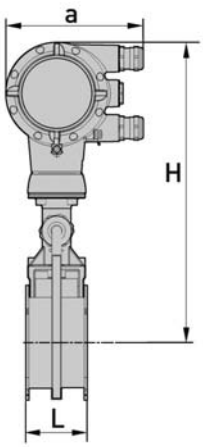
Size : NPS	Press. rating Class	d	d F1R ①	d F2R ②	D	L	H	H F1R ①	H F2R ②	l	l F1R ①	l F2R ②
8	150	8.0	6.1	4.0	14	12	15.4	16.4	15.6	8.0	7.54	6.76
8	300	8.0	6.1	4.0	15	12	15.4	16.4	15.6	8.0	7.54	6.76
10	150	10	8.0	6.1	16	15	16.5	17.4	16.4	9.04	8.0	7.54
10	300	10	8.0	6.1	18	15	16.5	17.4	16.4	9.04	8.0	7.54
12	150	12	10	8.0	19	18	17.4	18.5	17.4	10.0	9.04	8.0
12	300	12	10	8.0	21	18	17.4	18.5	17.4	10.0	9.04	8.0

① F1R - single reduction
② F2R - double reduction

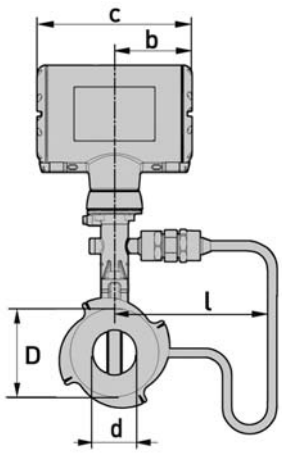
Weight Flange version ASME B16.5 [lb]

Size : NPS	Press. rating Class	with	without	F1R without	F1R with	F2R with	F2R without
		Pressure sensor		Pressure sensor		Pressure sensor	
½	150	11	9.9	-	-	-	-
½	300	12	11	-	-	-	-
½	600	13	11	-	-	-	-
1	150	15	14	14.6	13.2	-	-
1	300	17	16	16.8	15.4	-	-
1	600	18	17	17.4	16.1	-	-
1½	150	20	18	19.0	17.6	17.0	15.7
1½	300	24.3	22.9	24.0	22.7	22.1	20.7
1½	600	26.5	25.1	26.0	24.7	24.1	22.9
2	150	25.6	24.3	24.3	22.9	22.7	21.4
2	300	28.7	27.3	27.8	26.5	26.2	24.9
2	600	32.0	30.7	30.9	29.6	29.6	28.2
3	150	45.0	43.7	37.3	36.0	34.4	33.1
3	300	51.6	50.3	45.0	43.7	42.3	41.0
3	600	53.8	52.5	50.5	49.2	48.1	46.8
4	150	52.9	51.6	55.8	54.5	50.1	48.7
4	300	70.6	69.3	74.8	73.4	68.8	67.5
4	600	90.4	89.1	97.3	95.9	91.0	89.5
6	150	81.2	79.8	83.4	82.0	81.4	80.0
6	300	114.2	112.9	123.7	122.4	123.1	121.7
6	600	169.4	168.1	176	174.7	182.2	181.0
8	150	111.6	110.3	107.6	106.3	115.8	114.5
8	300	166.3	165.0	159.2	157.9	172.2	171.0
10	150	165.4	164.1	165.9	164.5	163.0	161.7
10	300	236.0	234.7	247.9	246.6	250.3	249.0
12	150	236.0	234.7	242.2	240.8	265.5	264.2
12	300	335.2	333.9	364.8	343.6	378.7	377.4

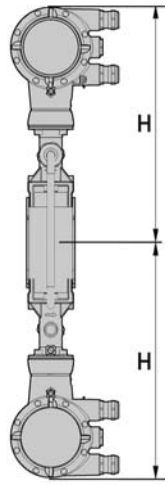
2.2.2 Sandwich version



a = 133 mm / 5.24"



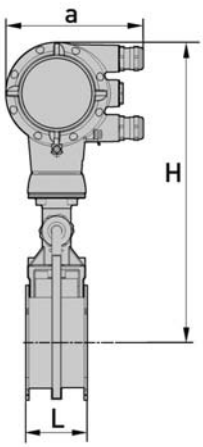
b = 105 mm / 4.13"
c = 179 mm / 7.05"



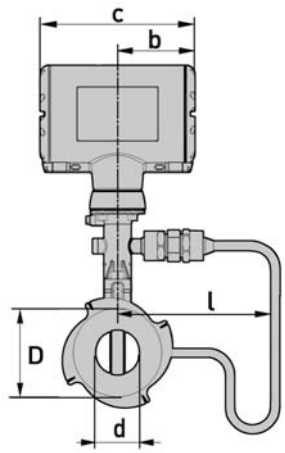
Dimension H x 2
Specified weight + 2.80 kg

Sandwich version EN

Size	Pressure rating	Dimensions [mm]					Weight [kg]	
DN	PN	d	D	L	H	l	With pressure sensor	Without pressure sensor
15	100	16	45	65	265	174.25	4.1	3.5
25	100	24	65	65	265	174.25	4.9	4.3
40	100	38	82	65	270	174.5	5.5	4.9
50	100	50	102	65	275	174.5	6.6	6
80	100	74	135	65	290	174.25	8.8	8.2
100	100	97	158	65	310	176.5	10.1	9.5



a = 135 mm / 5.32"

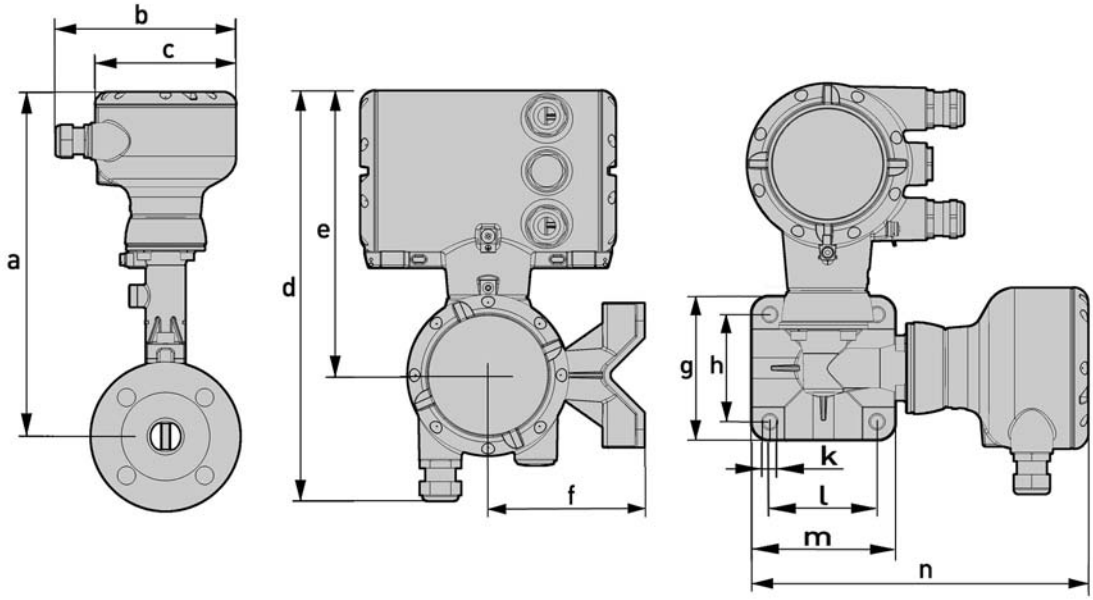


b = 108 mm / 4.26"
c = 184 mm / 7.25"

Sandwichausführung ASME

Baugröße	Druckstufe	Abmessungen [Zoll]					Gewicht [lb]	
NPS	Class	d	D	L	H	l	Mit	Ohne
							Drucksensor	
½	150	0,63	1,77	2,56	10,43	6,82	9,04	7,72
½	300	0,63	1,77	2,56	10,43	6,82	9,04	7,72
½	600	0,55	1,77	2,56	10,43	6,82	9,04	7,72
1	150	0,94	2,56	2,56	10,43	6,82	10,8	9,48
1	300	0,94	2,56	2,56	10,43	6,82	10,8	9,48
1	600	0,94	2,56	2,56	10,43	6,82	10,8	9,48
1½	150	1,5	3,23	2,56	10,63	6,87	12,13	10,8
1½	300	1,5	3,23	2,56	10,63	6,87	12,13	10,8
1½	600	1,5	3,23	2,56	10,63	6,87	12,13	10,8
2	150	1,97	4,02	2,56	10,83	6,87	14,55	13,23
2	300	1,97	4,02	2,56	10,83	6,87	14,55	13,23
2	600	1,97	4,02	2,56	10,83	6,87	14,55	13,23
3	150	2,91	5,31	2,56	11,42	6,82	19,4	18,08
3	300	2,91	5,31	2,56	11,42	6,82	19,4	18,08
3	600	2,91	5,31	2,56	11,42	6,82	19,4	18,08
4	150	3,82	6,22	2,56	12,21	6,95	22,27	20,94
4	300	3,82	6,22	2,56	12,21	6,95	22,27	20,94
4	600	3,82	6,22	2,56	12,21	6,95	22,27	20,94

2.2.3 Remote version



Dimension **a**

	Flange & Sandwich version						Flange version			
DN ▸	15	25	40	50	80	100	150	200	250	300
NPS ▸	½	1	1½	2	3	4	6	8	10	12
[mm] ▸	265.7	265.2	269.2	275.2	287.2	303.7	323.2	348.9	375.7	399.7
["] ▸	10.5	10.4	10.6	10.8	11.3	12.0	12.7	13.7	14.8	15.7

Dimension **a** F1/2R

	Flange version									
DN ▸	15	25	40	50	80	100	150	200	250	300
NPS ▸	½	1	1½	2	3	4	6	8	10	12
F1R ① [mm] ▸	-	315.7	315.2	319.2	325.2	337.2	353.7	373.2	398.9	425.7
F1R ① ["] ▸	-	12.4	12.4	12.6	12.8	13.3	13.9	14.7	15.7	16.8
F2R ② [mm] ▸	-	-	315.7	315.2	319.2	325.2	337.2	353.7	373.2	398.9
F2R ② ["] ▸	-	-	12.4	12.4	12.6	12.8	13.3	13.9	14.7	15.7

① F1R - single reduction - ② F2R - double reduction

Dimensions **b...n**

	b	c	d	e	f	g	h	j	k	l	m	n
[mm]	139	108	276	191	105	97	72	108	9	72	97	226
["]	5.46	4.25	10.9	7.53	4.14	3.82	2.84	4.25	0.35	2.84	3.82	8.90

2.3 Flow tables

Measuring ranges

Size		Q_{min}	Q_{max}	Q_{min}	Q_{max}
DN - EN 1092-1	NPS - ASME B16.5	[m^3/h]		[gph]	

Water

15	½	0.45	5.0	119	1321
25	1	0.81	11.40	214	3012
40	1½	2.04	28.57	539	7547
50	2	3.53	49.47	933	13069
80	3	7.74	108.37	2045	28629
100	4	13.30	186.21	3514	49192
150	6	30.13	421.86	7960	111445
200	8	52.66	792.42	13911	209335
250	10	90.5	1266.8	23908	334653
300	12	113.4	1839.8	29960	486024
		Values based on water at 20°C / 68°F			

Air

15	½	6.79	32.56	1794	8602
25	1	10.20	114.0	2695	30116
40	1½	25.35	326.63	6697	86287
50	2	43.89	565.49	11595	149388
80	3	96.14	1238.60	25398	327207
100	4	165.19	2128.27	43639	562236
150	6	374.23	4821.57	98862	1273738
200	8	702.95	9056.8	185700	2392553
250	10	1123.7	14478	29685	3824683
300	12	1632.1	21028	431155	55550104
		Values based on air at 20°C / 68°F and 1.013 bar abs / 14.891 psig			

Measuring range saturated steam: 1...7 bar

Gauge pressure [bar]		1		3.5		5.2		7	
Density [kg/m³]		1.13498		2.4258		3.27653		4.16732	
Temperature [°C]		120.6		148.2		160.4		170.6	
Flow rate		min	max	min	max	min	max	min	max
DN EN 1092-1	NPS ASME B16.5	[kg/h]		[kg/h]		[kg/h]		[kg/h]	
15	½	5.87	36.97	7.68	79.0	8.93	106.68	10.06	135.69
25	1	11.82	129.39	17.28	276.40	20.09	373.53	22.66	474.82
40	1½	29.64	370.71	43.33	792.33	50.63	1070.2	56.8	1361.2
50	2	51.31	641.82	75.02	1371.8	87.19	1852.8	98.33	2356.6
80	3	112.41	1405.8	164.33	3004.7	191	4058.4	215.39	5161.8
100	4	193.14	2415.5	282.36	5162.7	328.16	6973.3	370.09	8869.2
150	6	437.56	5472.4	639.69	11696	743.45	15798	838.44	20093
200	8	821.91	10279	1201.6	21970	1396.5	29675	1574.9	37743
250	10	1313.9	16433	1920.9	35122	2232.5	47439	2517.7	60337
300	12	1908.3	23866	2789.8	51010	3242.4	68899	3656.6	87630

Measuring range saturated steam: 10.5...20 bar

Gauge pressure [bar]		10.5		14		17.5		20	
Density [kg/m³]		5.88803		7.60297		9.31702		10.5442	
Temperature [°C]		186.2		198.5		208.5		215	
Flow rate		min	max	min	max	min	max	min	max
DN EN 1092-1	NPS ASME B16.5	[kg/h]		[kg/h]		[kg/h]		[kg/h]	[kg/h]
15	½	12.78	191.71	16.51	247.55	20.23	303.36	22.89	343.32
25	1	26.93	670.88	30.6	857.88	33.87	955.48	36.04	1201.41
40	1½	67.51	1878.2	76.72	2150.7	84.93	2395.3	90.35	2557.7
50	2	116.89	3251.7	132.82	3723.4	147.03	4147	156.42	4428.1
80	3	256.03	7122.4	290.93	8155.8	322.06	9083.7	342.62	9699.3
100	4	439.91	12238	499.9	14013	553.38	15608	588.69	16666
150	6	996.62	27725	1132.5	31747	1253.7	35359	1333.7	37756
200	8	1872.1	52079	2127.3	59634	2354.9	66419	2505.2	70921
250	10	2992.7	83254	3400.71	95333	3764.6	106180	4004.9	113380
300	12	4346.5	120920	4939.1	138460	5467.5	154210	5816.5	164660

Measuring range saturated steam: 15...100 psig

Gauge pressure [psig]		15		50		75		100	
Density [lb/ft³]		0.0719		0.1497		0.2036		0.2569	
Temperature [°F]		249.98		297.86		320.36		338.184	
Flow rate		min	max	min	max	min	max	min	max
DN EN 1092-1	NPS ASME B16.5	[lb/h]		[lb/h]		[lb/h]		[lb/h]	[lb/h]
15	½	12.9	82.70	16.83	1720.12	19.62	234.0	22.04	295.23
25	1	26.25	289.40	37.86	602.09	44.15	818.63	49.59	1032.76
40	1½	65.81	829.61	94.92	1726	110.68	2346.7	124.32	2960.5
50	2	113.94	1436.3	164.34	2988	191.63	4062.9	215.23	5125.6
80	3	249.57	3146.1	360	6545.3	419.74	8899.4	471.45	11227
100	4	428.81	5405.7	618.51	11246	721.21	15291	810.06	19291
150	6	971.47	12246	1401.2	25478	1633.9	34642	1835.2	43703
200	8	1824.8	23004	2632.1	47859	3069.1	65072	3447.2	82092
250	10	2917.2	36774	4207.7	76508	4906.4	104030	5510.8	131230
300	12	4236.8	53410	6111.1	111120	7125.8	151080	8003.6	190600

Measuring range saturated steam: 150...300 psig

Gauge pressure [psig]		150		200		250		300	
Density [lb/ft³]		0.3627		0.4681		0.5735		0.6792	
Temperature [°F]		366.08		388.04		406.22		422.06	
Flow rate		min	max	min	max	min	max	min	max
DN EN 1092-1	NPS ASME B16.5	[lb/h]		[lb/h]		[lb/h]		[lb/h]	[lb/h]
15	½	27.79	416.68	35.86	573.83	43.94	659.14	52.04	780.29
25	1	58.93	1459.16	66.94	1875.90	74.1	2089.00	80.63	2284.90
40	1½	147.72	4107.2	167.83	4702.8	185.76	5237	202.15	5728
50	2	255.75	7111.9	290.56	8141.9	321.6	9066.8	350	9917
80	3	560.19	15578	636.44	17834	704.43	19860	766.6	21722
100	4	962.54	26766	1093.5	30643	1210.4	34124	1317.2	37324
150	6	2180.6	60639	2477.4	69421	2742.1	77307	2984	84556
200	8	4096.1	113900	4653.6	130400	5150.7	145210	5605.2	158830
250	10	6548.1	182090	7439.3	208460	8234.1	232140	8960.6	253910
300	12	9510.2	264460	10805	302760	11959	337150	13014	368770

3.1 Intended use

The vortex flowmeters are made to measure the flow of gases, vapours and liquids.

The devices are particularly suitable for the measurement of:

- Clean liquids with low viscosity (< 10 cP)
- Hydrocarbons with low viscosity (< 10 cP)
- Water
- Chemicals with low corrosiveness
- Saturated steam
- Superheated steam, including CIP and SIP applications in the food industry

DN15C and DN25C have a robust sensor (pick up) for rough measurement conditions, e.g. high flow velocities.

Responsibility for the use of the measurement devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

- The sensors are made from stainless steel 316 L (1.4404) or Hastelloy® C22.
- In your project planning, please observe the data given in the corrosion tables.
- The pressure-bearing parts have been designed and rated for stationary operation taking into account the maximum pressure and temperature.
- Observe the data indicated on the nameplate for PS, TS and PT (PED 97/23/EC).
- External forces and moments, caused e.g. by pipe stresses, have not been taken into account.

Primarily, volumetric flow and temperature are measured, with pressure measurement as an option. From these parameters the measuring device calculates the mass flow or standard volumetric flow using pre-programmed density data and then exports the measured values via various communication interfaces.

The devices are rated for the following flow velocities:

Liquids: DN15...DN300		V_{min}: 0,25 m/s	0,8 ft/s	$V_{min}\,[m/s] = 0{,}5 \times \sqrt{\frac{998}{\rho}} \quad \rho\left[\frac{kg}{m^3}\right]$	①
		V_{max}: 10m/s	32 ft/s	$V_{max}\,[m/s] = 7 \times \left(\frac{998}{\rho}\right)^{0,47} \quad \rho\left[\frac{kg}{m^3}\right]$	②
Gases and steams:	DN15	V_{min}: 3 m/s	10 ft/s	$V_{min}\,[m/s] = 6 \times \sqrt{\frac{1{,}204}{\rho}} \quad \rho\left[\frac{kg}{m^3}\right]$	①
		V_{max}: 45 m/s	147 ft/s	$V_{max}\,[m/s] = 7 \times \left(\frac{998}{\rho}\right)^{0,47} \quad \rho\left[\frac{kg}{m^3}\right]$	②
	DN15C	V_{min}: 3 m/s	10 ft/s;	$V_{min}\,[m/s] = 12 \times \sqrt{\frac{1{,}204}{\rho}} \quad \rho\left[\frac{kg}{m^3}\right]$	①
		V_{max}: 55 m/s	180 ft/s;	$V_{max}\,[m/s] = 7 \times \left(\frac{998}{\rho}\right)^{0,47} \quad \rho\left[\frac{kg}{m^3}\right]$	②
	DN25	V_{min}: 2 m/s	6,6 ft/s	$V_{min}\,[m/s] = 6 \times \sqrt{\frac{1{,}204}{\rho}} \quad \rho\left[\frac{kg}{m^3}\right]$	①
		V_{max}: 70 m/s	229 ft/s	$V_{max}\,[m/s] = 7 \times \left(\frac{998}{\rho}\right)^{0,47} \quad \rho\left[\frac{kg}{m^3}\right]$	②
	DN25C	V_{min}: 2 m/s	6,6 ft/s	$V_{min}\,[m/s] = 12 \times \sqrt{\frac{1{,}204}{\rho}} \quad \rho\left[\frac{kg}{m^3}\right]$	①
		V_{max}: 80 m/s	262 ft/s	$V_{max}\,[m/s] = 7 \times \left(\frac{998}{\rho}\right)^{0,47} \quad \rho\left[\frac{kg}{m^3}\right]$	②
	DN40... DN300	V_{min}: 2 m/s	6,6 ft/s	$V_{min}\,[m/s] = 6 \times \sqrt{\frac{1{,}204}{\rho}} \quad \rho\left[\frac{kg}{m^3}\right]$	①
		V_{max}: 80 m/s	262 ft/s	$V_{max}\,[m/s] = 7 \times \left(\frac{998}{\rho}\right)^{0,47} \quad \rho\left[\frac{kg}{m^3}\right]$	②

① Use the larger value, according to the amount.
② Use the smaller value, according to the amount.

3.2 Installation conditions

For accurate volumetric flow measurement the measuring device needs a completely filled pipe and a fully developed flow profile.
Please observe the instructions regarding inlet and outlet sections as well as the installation position.

Any vibration will distort the measuring result. That is why any vibrations in the pipeline must be prevented through suitable measures.

Procedures to carry out before installing the device:

- *Nominal diameter of connection pipe flange = nominal diameter of device!*
- *Use flanges with smooth holes, e.g. weld neck flanges.*
- *Align carefully the holes of the connecting flange and the device flange.*
- *Check the compatibility of the gasket material with the process medium.*
- *Make sure that the gaskets are arranged concentrically. The flange gaskets must not project into the pipe cross-section.*
- *The flanges have to be concentric.*
- *There must not be any pipe bends, valves, flaps or other internals in the immediate inlet section.*
- *Devices in sandwich version may only be installed using centering rings.*
- *Never install the device directly behind piston compressors or rotary piston meters.*
- *Do not lay signal cables directly next to cables for the power supply.*

If there is a risk of waterhammers in steam networks, appropriate condensate separators must be installed.
Suitable measures must be taken to avoid water cavitation if it is a possible risk.

Sunshades

The meter MUST be protected from strong sunlight.

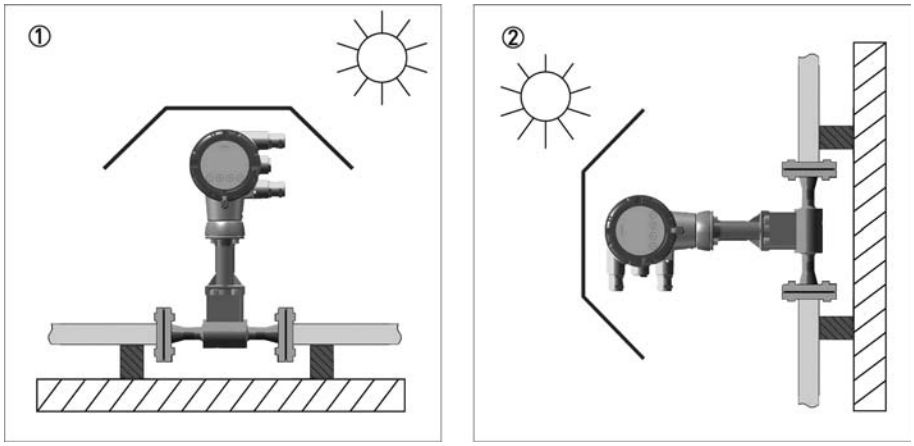


Figure 3-1: Sunshades

① Horizontal mounting
② Vertical mounting

A sunshade is available from the manufacturer as an option.

3.2.1 Prohibited installation when measuring liquids

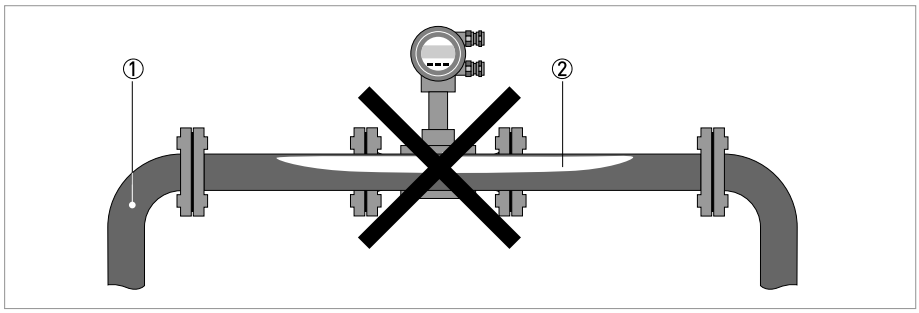


Figure 3-2: Upper pipe bend

Prohibited: Installing the device in an upper pipe bend ①, because there is a risk of gas bubbles ② forming. Gas bubbles can lead to pressure surges and inaccurate measurement.

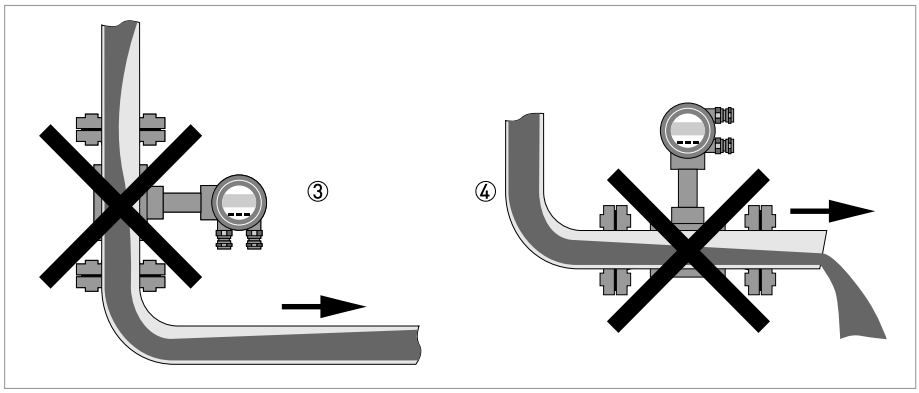
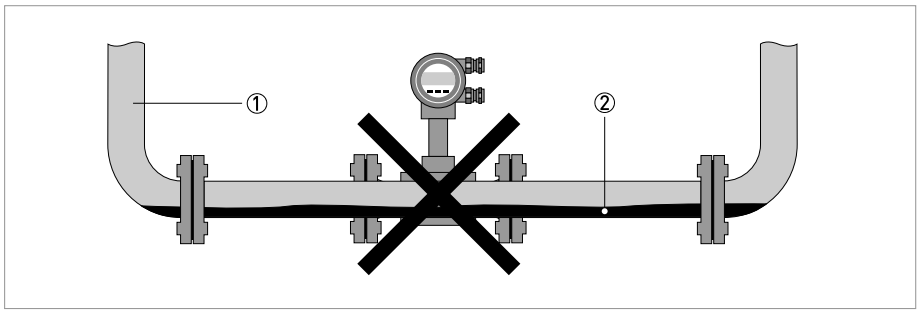


Figure 3-3: Downpipe and outlet

Installing the device in a downstream pipe ③ or upstream pipe of an outlet ④. There is the risk of partially filled pipes leading to faulty measurements.

3.2.2 Prohibited installation when measuring vapours and gases



① Lower pipe bends
② Condensate

Prohibited: Installing the device in a lower pipe bend ①, because there is a risk of condensate forming ②.
Condensate can lead to cavitation and inaccurate measurement. Under certain circumstances the device can be destroyed and the measured product can leak.

3.2.3 Heat insulation

The area above the converter support must not be heat-insulated.
The heat insulation ③ may only extend to the maximum height ① shown below.

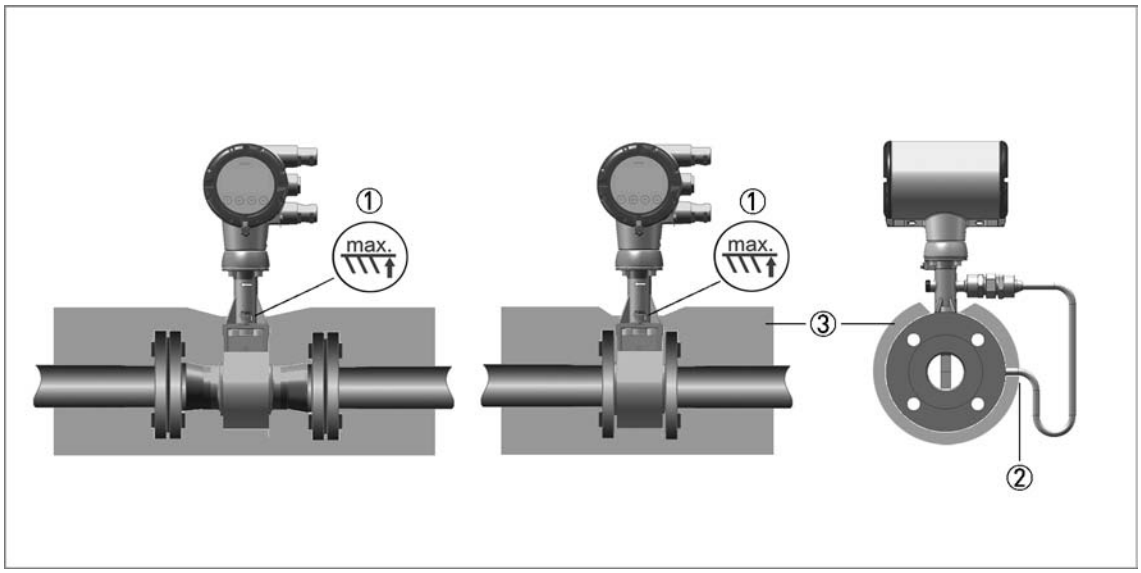


Figure 3-4: Installation heat insulation

① Max. height of the insulation up to the marking on the neck of the measuring sensor
② Max. thickness of the insulation up to the bend of the pressure pipe
③ Insulation

The heat insulation ③ may only extend as far as the bend of the pressure sensing line ②.

3.3 Inlet and outlet sections

3.3.1 Minimum inlet sections

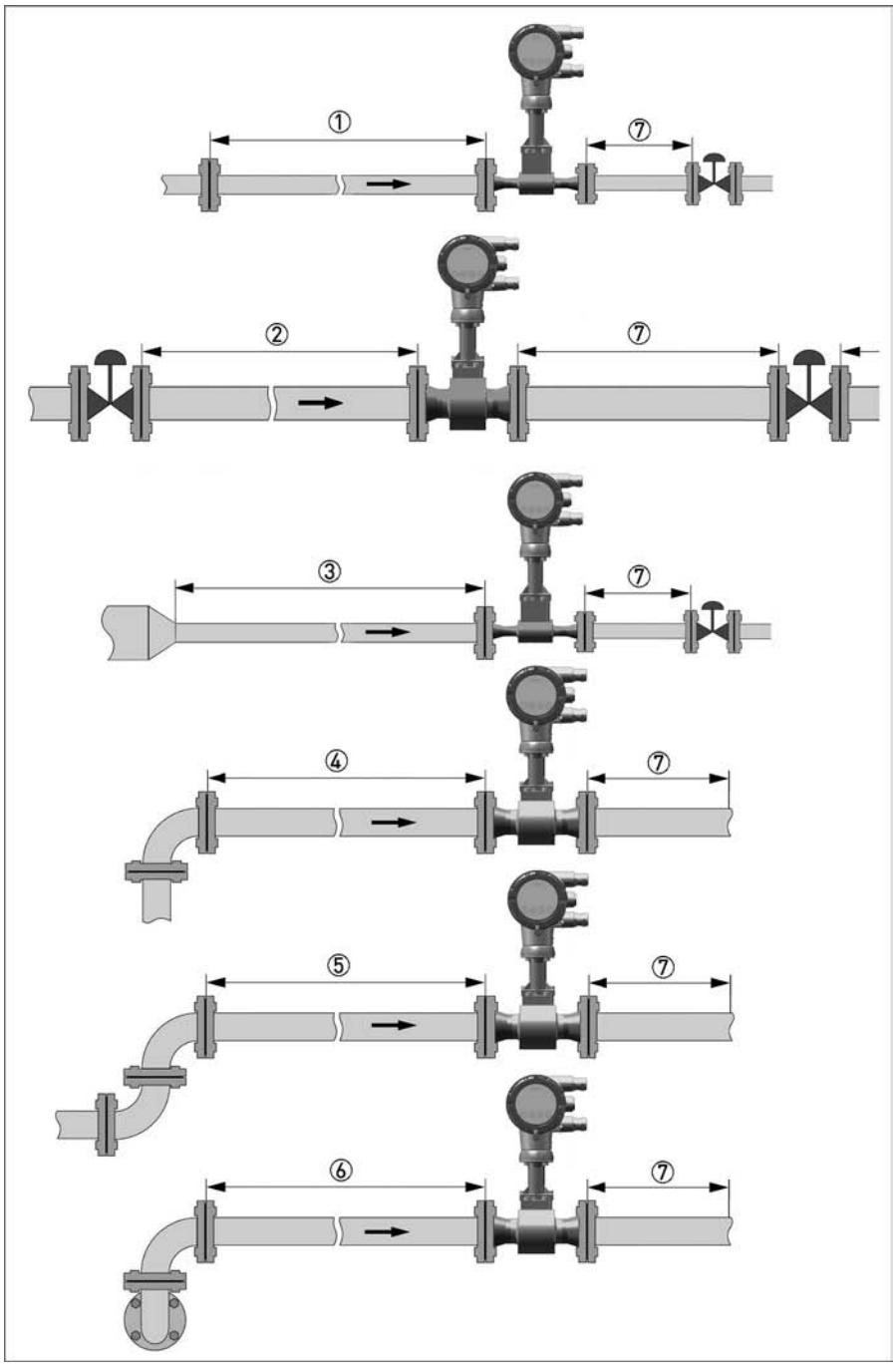


Figure 3-5: Inlet sections

① General inlet section without disturbing flow ≥ 15 DN
② Behind a control valve ≥ 50 DN
③ After a pipe diameter reduction ≥ 15 DN
④ After a single bend 90° ≥ 20 DN
⑤ After a double bend 2x90° ≥ 20 DN
⑥ After a double three-dimensional bend 2x90° ≥ 40 DN
⑦ Outlet section: >5 DN

3.3.2 Minimum outlet sections

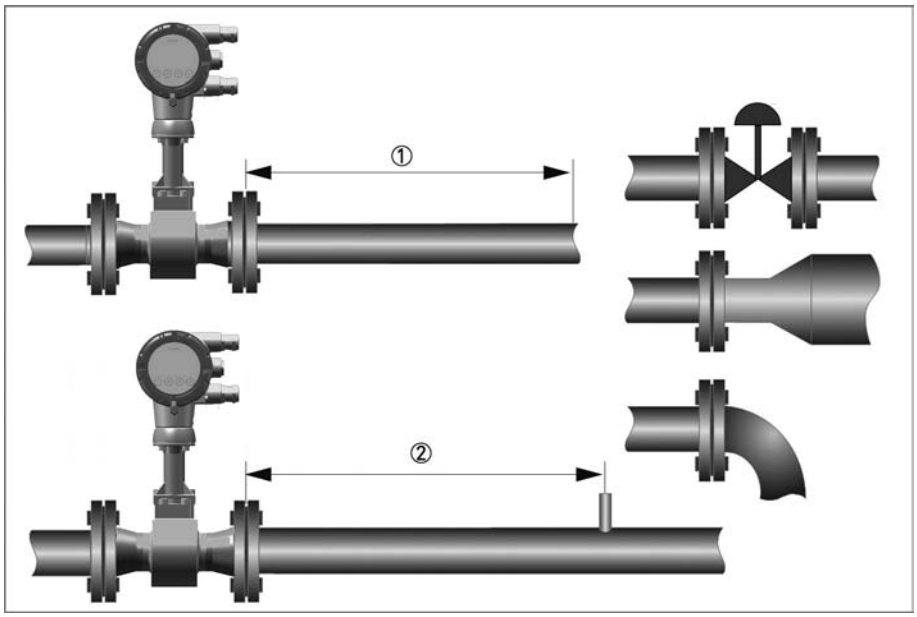


Figure 3-6: Minimum outlet sections

① Upstream of pipe expanders, pipe bends, control valves, etc. ≥ 5 DN
② Upstream of measuring points ≥ 5 DN

The interior of the pipe at the metering points must be free of burrs and other flow impediments. The measuring device has an internal temperature sensor. The distance from external temperature measuring points must be ≥ 5 DN. Use measuring sensors that are as short as possible to avoid disturbances of the flow profile.

3.3.3 Flow straightener

If, due to the type of installation, the required inlet sections are not available, the manufacturer recommends using flow straighteners. Flow straighteners are installed between two flanges upstream of the device and shorten the required inlet section.

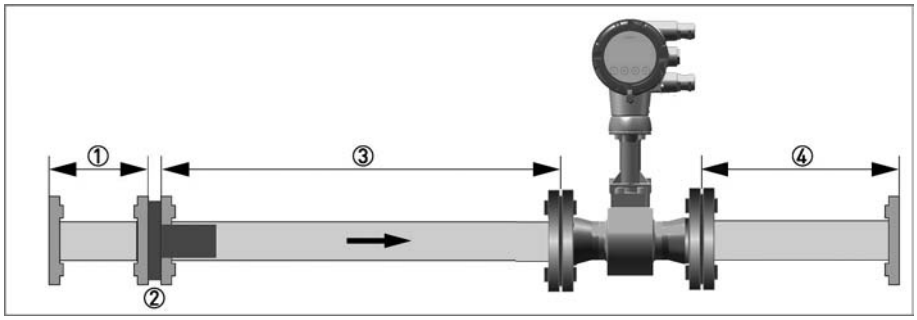


Figure 3-7: Flow straightener

① Straight inlet section upstream of straightener ≥ 2 DN
② Flow straightener
③ Straight pipe run between flow straightener and device ≥ 8 DN
④ Minimum straight outlet section ≥ 5 DN

4.1 Connecting the signal converter

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

When using the binary output M1...M4 as pulse output and frequencies above 100 Hz, shielded cables are to be used in order to reduce effects from electrical interferences(EMC).

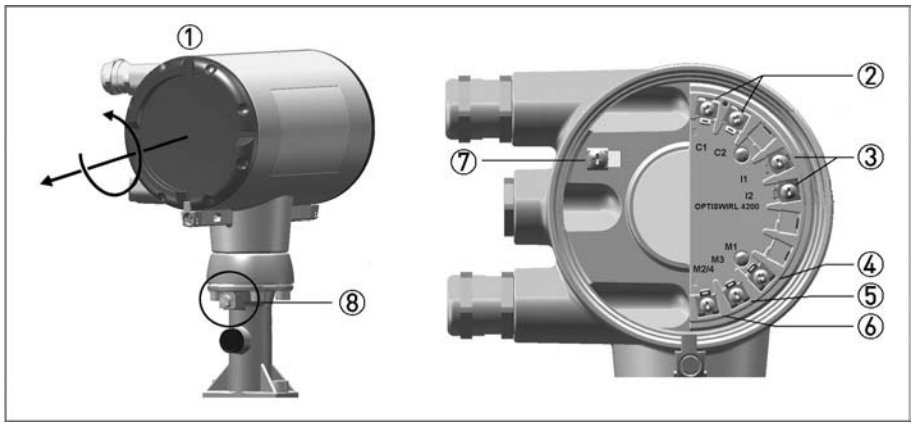


Figure 4-1: Connecting the signal converter

① Housing cover of the electrical terminal compartment
② Signal converter supply and 4...20mA Loop, terminal C1 + terminal C2 -
③ Current input 4...20mA, terminal I1 +, terminal I2 - (external transmitter, optional)
④ Terminal M1 binary or pulse output + (Hi current)
⑤ Terminal M3 binary or pulse output + (NAMUR)
⑥ Terminal M2/4 binary or pulse output, common minus connection
⑦ PE terminal in housing
⑧ PE terminal on connection piece between measuring sensor and signal converter.

Both grounding terminals ⑦ and ⑧ are equally effective from a technical point of view.

Steps for connecting the signal converter:

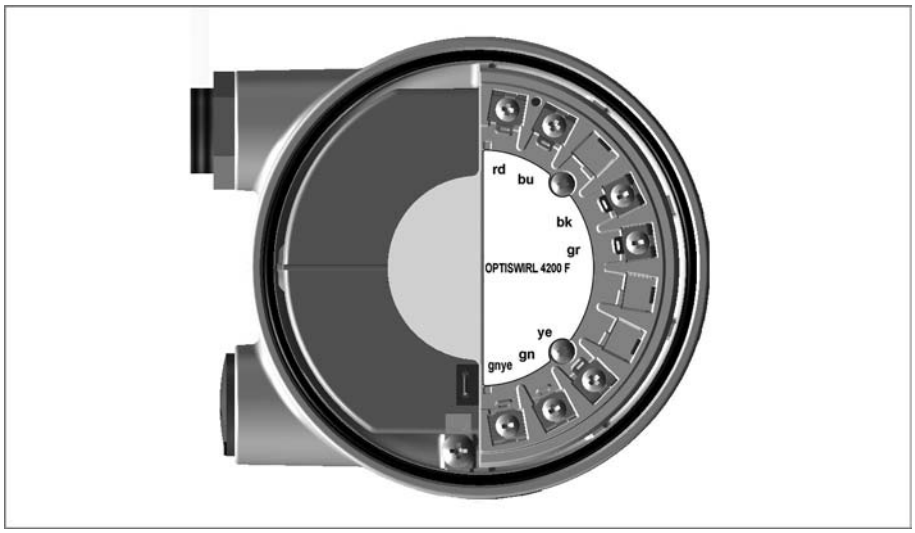
- Unscrew the housing cover ① of the electrical terminal compartment.
- Thread the connection cable through the leadthrough in the housing.
- Connect the cable according to the terminal diagrams below.
- Connect the grounding to the terminal ⑦. Alternatively use the PE terminal ⑧ on the connection piece between the measuring sensor and the signal converter.
- Tighten the cable glands.
- Turn the housing cover and gasket back onto the housing and tighten it by hand.

Ensure that the housing gasket is properly fitted, clean and undamaged.

4.2 Electrical connections

The signal converter is a 2-wire device with 4...20mA as output signal for the flow. All other inputs and outputs are passive and always require an additional power supply.

4.3 Connection of remote version



The connections in the sensor and wall mount bracket connection boxes are identical in construction.

Connection cable strand colour

Terminals	Strand colour
rd	red
bu	blue
bk	black
gr	grey
ye	yellow
gn	green
gnye	Shielding

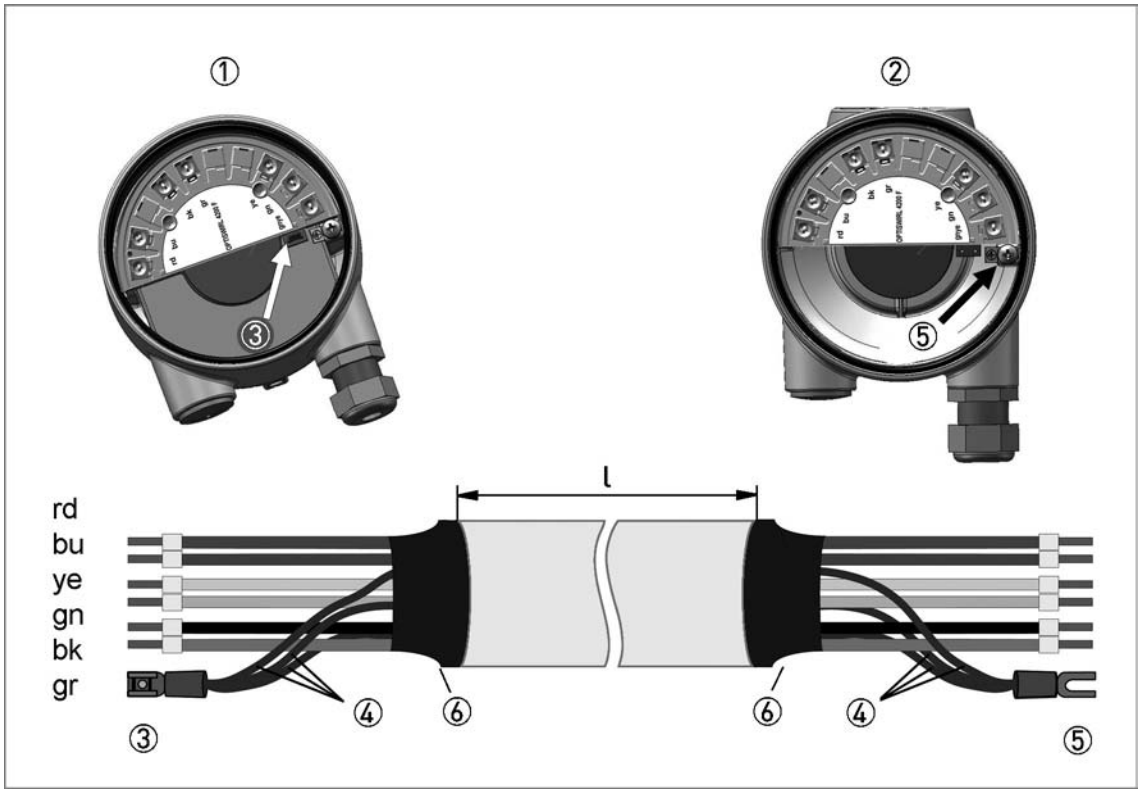


Figure 4-2: Connection of remote version

① Terminal connection measuring sensor
② Terminal connection signal converter
③ Terminal end pair shielding measuring sensor
④ Filler wire pair shielding
⑤ Fork clamp pair shielding signal converter side
⑥ Heat shrink tubing

The maximum cable length is l = 50 m.

Please provide us with the missing information so that we can be of help to you as quickly as possible.

Then please fax this page to the appropriate sales associate. We will then contact you as soon as possible.

Device data

Nominal connection size:			
Pressure rating:			
Raised face:			
Material of pipeline:			
Connection type:	☐ Flange	☐ Sandwich	
Design:	☐ Compact	☐ Remote 5 m cable length	☐ Remote 50 m cable length
Display:	☐ With	☐ Without	
Approval:	☐ No Ex	☐ ATEX II2 G -Ex ia IIC T6 ☐ ATEX II2 G -Ex d ia IIC T6 ☐ ATEX II3 G - Ex nA IIC T6 ☐ ATEX II2 D - Ex tb IIIC T70°C Db	☐ FM Class I,II,III US/C ☐ FM XP US/C ☐ FM DIP US/C ☐ FM NI US/C
		☐ IECEx - Ex ia IIC T6 ☐ IECEx - Ex d ia IIC T6 ☐ IECEx - Ex nA IIC T6 ☐ IECEx - Ex tb IIIC T70°C Db	

Rating data

Product:	
Operating pressure:	
Rated pressure:	
Operating temperature:	
Rated temperature:	
Operating density:	
Viscosity:	
Measuring range:	
Comments:	

Contact data

Company:	
Contact person:	
Telephone number:	
Fax number:	
E-mail:	