OPTISWIRL 5080 Technical Datasheet

Vortex flowmeter for high temperature applications

- Universal device for measurement of conductive and non-conductive liquids, gases and steam with temperatures up to +430°C / +806°F
- Large measuring ranges with unexcelled low-flow performance
- High immunity to pipe vibrations

1.1 The solution for high temperature applications

As part of the KROHNE family of vortex flowmeters the **OPTISWIRL 5080** turns out to be a universal device for the measurement of all kinds of media, whether these are conductive or non-conductive liquids, gases or steam. Its rugged design makes it ideal for flow measurement in high temperature applications.

Real-time, dynamic frequency filters focus on the vortex shedding frequency.
This results in a large measuring range with unexcelled low-flow performance on the one hand, and a high vibration immunity on the other.

Highlights

- Flange or sandwich designs available: DN15...300 / 3/4...12" (flange) & DN15...200 / 3/4...8" (sandwich)
- Accuracy of ±0.5% of reading in liquids and ±1.0% of reading in gas and steam
- For medium temperatures of up to +430°C / +806°F
- Large measuring ranges with unexcelled low-flow performance
- High vibration immunity
- Pulse output configurable for raw frequency, scaled frequency or totalising pulse
- Remote version with field housing converter with cable length up to 15.2 m / 50 ft
- Intrinsically safe version or explosionproof electronics housing available
- Measurement of conductive and non-conductive liquids, gases and steam

Industries

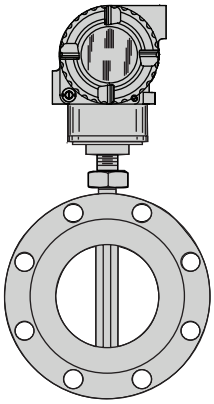
- Chemicals
- Oil & Gas
- Food & Beverage
- Pharmaceuticals
- Iron, Steel and Metals
- Pulp & Paper
- Water

Applications

- Measurement of saturated steam and superheated steam
- Steam boiler monitoring
- Measurement of consumption of industrial gases
- Measurement of thermo oils

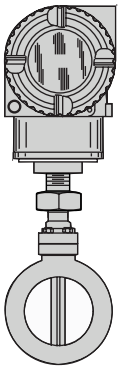
1.2 Options and variants

1. OPTISWIRL 5080 C: The universal device for liquids, gases and steam as flange version



The OPTISWIRL 5080 C as compact flowmeter in a flange version is suitable for universal use in measuring liquids, gases and vapours.

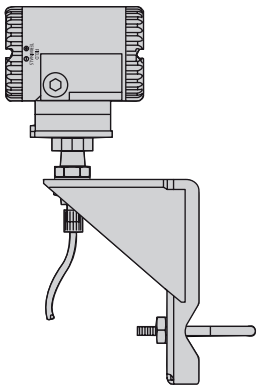
2. The compact OPTISWIRL 5080 as easy-to-install sandwich version



The OPTISWIRL 5080 C as a compact flowmeter in a sandwich version mounts between ANSI or EN 1092-1 raised face flanges.

Each sandwich device is provided with hex-nut spacers to allow centrical alignment in the pipeline.

3. OPTISWIRL 5080 F: Version with remote mounted electronics

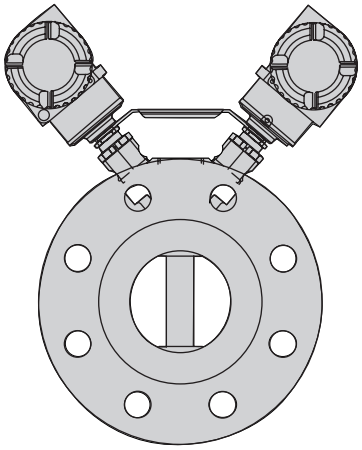


Both the flange version and the sandwich version of the OPTISWIRL 5080 are available as remote version with field mounting converter.

This feature allows separating the signal converter from the flow sensor up to a distance of 15 m / 50 ft.
So easy operation and reading of values at eye level is possible even when the flow sensor is installed in inaccessible areas.

A U-bolt for mounting to DN50 or 2" pipes is provided with each remote device.
Alternatively the support bracket can be mounted to a wall.

4. Dual measurement flowmeter version for twofold reliability



The OPTISWIRL 5080 is optionally available as a dual version.

This is a genuine redundant system with two independent flow sensors and two signal converters.
This set-up provides twofold reliability and availability of the measurement.

1.3 Functional principle

Vortex flowmeters are used to measure the flow of gases, vapours and liquids at completely filled pipes.

The measuring principle is based on the Karman vortex street. The measuring tube contains a bluff body at which vortex shedding occurs and which is detected by a sensor unit located behind. The frequency **f** of the vortex shedding is proportional to the flow velocity **v**. The non-dimensional Stouhal number **S** describes the relationship between vortex frequency **f**, width **b** of the bluff body and the average flow velocity **v**:

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

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

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 (Downloadcenter).*

Measuring system

Application range	Flow measurement of conductive and non-conductive liquids, gases and steam
Function / Measuring principle	Karman vortex street

Measurement

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

Signal converter

Versions	Compact version (the signal converter is mounted directly on the flow sensor)
	Remote version (electrical connection to the flow sensor via signal cable) Cable length: ≤ 15 m / 50 ft

Flow sensor

Standard	Flange version
	Sandwich version
Option	Dual measuring device in flange version (redundant measurement)

Display and user interface

Local display	16-character digital indicator and configurator
	Indication: Flow rate, totaliser value or alternating between both
Interface and display languages	English
Communication format	Digital communications is provided in both the analogue (4...20 mA) and digital modes based upon the FSK (Frequency Shift Keying) technique.
Diagnostics	**Online diagnostics:** Flowmeter uses internal diagnostic functions including hardware checks and internal code and database validation. Error checking and diagnostic codes are also embedded in the communications protocol. These diagnostics are performed at start-up and as continuous background checks.
	Offline diagnostics (self test): The configurators allow self-tests to be initiated to validate the signal converter electronics. This test uses an internally generated frequency signal.
Security	**Write protect jumper:** A write protect jumper provides additional security by allowing the user to prevent the local indicator (configurator) and remote configurator from writing to the electronics. This write protection capability meets the security requirements of ISA-584.01-1986.
	Password protection: This is provided in the local display/configurator mode to assure operating security. A second level of protection is provided for configuration security.

Measuring accuracy

Reference conditions

Factory calibration conditions	Medium: Clear water
	Process & ambient temperature: +20...+30°C / +68...+86°F
	Relative humidity: 50...90%
	Supply voltage at mA output: 24 ± 0.5 VDC

Accuracy

Liquids	±0.5% of measured value (Re ≥ 30000)
	±1.0% of measured value (20000 < Re < 30000)
	±2.0% of measured value (10000 < Re < 20000)
Gases and steam	±1.0% of measured value (Re ≥ 20000)
	±2.0% of measured value (10000 < Re < 20000)
Process temperature effect on K-factor	There is an effect on the reference K-factor due to a diameter change of the flow tube bore with temperature. The effect is -0.3% of flow rate per +55°C / +100°F increase in temperature. The flowmeter will automatically recompute a flowing K-factor when process temperature is entered in the database fluid definition.

Operating conditions

Temperature

Process temperature	+150…+430°C / +302…+806°F
Ambient temperature	**Non-Ex:** -20…+80°C / -4…+176°F
	Ex: depending on type of protection and temperature class ATEX intrinsically safe: T_a = -40...+80°C ATEX flameproof: T_a = -20...+80°C FM intrinsically safe: T_a = 80°C FM explosion-proof: T_a = -40...+85°C IECEx intrinsically safe: T_a = -40...+80°C IECEx flameproof: T_a = -20...+80°C
	Note: When operating at ambient temperatures below -29°C / -20°F, it is important to maintain a minimum loop voltage of 15.75 VDC to maintain remote configurator communications capability.

Pressure

Medium pressure	Designed to withstand pressure within ANSI/ASME B16.5 Class 150, 300, 600, 900 or 1500 flange ratings and metric EN 1092-1, PN16, PN40, PN63, PN100 or PN160 flange ratings.
Maximum static pressure	103.4 barg / 1500 psig / 10340 kPa or that imposed by flange rating.

Media properties

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

Nominal flow velocity limits

Lower range limit	6.0/ $\sqrt{\rho_f}$ m/s or 5.0/ $\sqrt{\rho_f}$ ft/s
Upper range limit	300/ $\sqrt{\rho_f}$ m/s or 250/ $\sqrt{\rho_f}$ ft/s
ρ_f is the fluid density at flowing conditions	

Environmental protection

Ingress protection	Electronics housing: IP66 / NEMA4X

Installation conditions

Inlet section	≥ 15 x DN without disturbing flow; ≥ 20 x DN 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 a flow straightener; ≥ 8 DN after a flow straightener
Outlet section	≥ 5 x DN

Materials

Flowmeter body & shedding bar	**OPTISWIRL 5080 flange version:** DN15...DN100: body and flanges in 316 stainless steel DN150...DN200: body in 316 stainless steel; flanges in 304 stainless steel DN250...DN300: body and flanges in 304 stainless steel
	OPTISWIRL 5080 sandwich version: 316 stainless steel for all sizes or CX2MW Nickel Alloy (equivalent to Hastelloy® C) up to DN100
Electronics housing & housing covers	Low copper, die-cast aluminum alloy with epoxy finish
Seals	Flow sensor seals for high temperature sensor: 316 stainless steel gasket; 316 SS/grafoil flow dam
	Seal of housing covers, housing neck and terminal block: Buna-N O-ring seals
Dual measurement manifold	CF8M stainless steel

Process connections

DIN EN 1092-1	DN15...300
ASME B16.5	3/4...12"
For detailed information on combination flange/pressure rating, refer to section "Dimensions and weights".	

Electrical connections

Supply voltage	15.5...42 VDC; depending on electrical safety approvals and certifications
	Intrinsically safe: max. 30 VDC With intrinsically safe certifications with a 24 VDC supply, an active barrier is required.
Cable entries	1/2 NPT or M20

Outputs

Output damping	Damping smooths the flow rate output and optimises the flowmeter's response time to the control system. Damping is an exponential filter with a selectable time constant; it can be set between 0 and 32 seconds. An eight second damping factor will pass 64% of the step change in this time period. Damping applies to all outputs except the raw pulse output where no damping is applied to the direct vortex shedding frequency.

Analogue output

General	Flow rate available as a 4...20 mA signal with the 20 mA value being set by the configured full range flow rate.
Type	4...20 mA HART®
Supply current	22 mA DC maximum
Supply voltage effect	Less than 0.005% per Volt
Ambient temperature effect (amplifier only)	For +28°C / +50°F change in ambient temperature within operative limits. Zero (4 mA): ±0.02% of span maximum Span (16 mA): ±0.1% of span maximum
Response time (without damping)	0.5 seconds or the vortex shedding period for frequencies less than 2 Hz.

HART®

	HART analogue or digital multidrop mode
Remote configurator / Communicator	HART communicator or PC-Based configurator
Communication rate	1200 baud
Communication distance (rated)	1800 m / 6000 ft
Flow/Total measurement update	5 times/s
Raw pulse measurement update	Vortex shedding frequency

Digital output

General	Digital information is superimposed on a 4...20 mA signal at 1200 baud
Supply current	10 mA DC maximum
Supply voltage effect	No effect on accuracy
Ambient temperature effect (amplifier only)	±0.01% of reading from -40...+80°C / -40...+176°F
Response time (without damping)	0.5 seconds or the vortex shedding period for frequencies less than 2 Hz.

Pulse output

General	The pulse output is an externally powered 2-wire transistor switch type output. This output can be configured using any applicable configuration device to select any one of three types of pulse outputs: raw pulse, rate pulse and total pulse.
	Raw pulse: This is the vortex shedding frequency directly passed through providing an instantaneous, non dampened frequency output
	Rate pulse: The frequency of this output is a 50% duty cycle pulse output with a frequency range of 0...10, 0...100 or 0...1000 Hz, proportional to zero flow to the full range flow rate/upper range value (URV).
	Total pulse: The frequency of this output is also a 50% duty cycle pulse output that is configured to provide a pulse when a determined volumetric/totalized unit has flowed through the meter.
Specifications	Isolated 2-wire transistor switch
	Applied voltage: 5...30 VDC
	Maximum "ON" state voltage drop: 1.0 VDC
	Maximum "ON" state current: 20 mA
	Reverse polarity protected
	Short circuit protected
	Connectable to pull up or pull down counters
Supply current	20 mA DC maximum
Supply voltage effect	No effect on accuracy
Ambient temperature effect (amplifier only)	±0.01% of reading from -40...+80°C / -40...+176°F
Response time (without damping)	Raw pulse: Vortex shedding frequency
	Rate or total pulse: 0.25 seconds or the vortex shedding period for frequencies less than 2 Hz.

Approvals and certificates

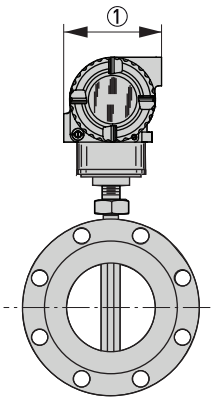
CE	This device fulfils the statutory requirements of the relevant EU directives. The manufacturer certifies successful testing of the product by applying the CE mark.
	For full information of the EU directives & standards and the approved certifications, please refer to the CE declaration or the manufacturer website.
Non-Ex	Standard
Hazardous areas	
ATEX	**Intrinsically safe:** II 1G II 2D Ex ia IIC T4 Ga Ex tb IIIC T103°C Db Compact and remote versions (electronics and junction box)
	Flameproof: II 2/1 (1) G II 2D Ex db [ia Ga] ia IIC T4 Gb Ex tb IIIC T85°C Db Compact versions (electronics) and remote versions (electronics housing)
IECEx	**Intrinsically safe:** Ex ia IIC T4 Ga Ex tb IIIC T103°C Db
	Flameproof: Ex d [ia Ga] ia IIC T4 Gb Ex tb IIIC T85°C Db Compact versions (electronics) and remote versions (electronics housing)
FM (in preparation)	**Intrinsically safe** for Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G; Also Zone approved AEx ia IIC
	Explosionproof with IS sensor connection for Class I, Div. 1, Groups B, C, and D; **Dust-ignitionproof** for Class II, Div. 1, Groups E, F, and G; Class III, Div. 1
Other standards and approvals	
Vibration resistance	Flowmeter was tested with up to 3g of acceleration with no physical damage, no shift in calibration after the test and no loss of communications throughout the test.
EMI and RFI	Flowmeters meet the requirements of EN 61326-1.

2.2 Dimensions and weights

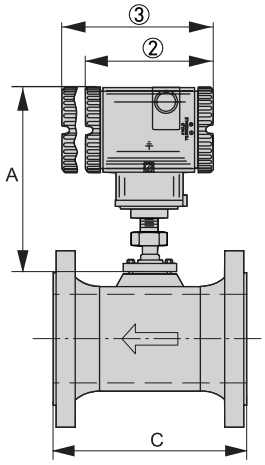
2.2.1 Dimensions for flange versions

Compact versions - single measurement

Standard version (front and side view)



① = 96 mm / 3.77"



A = 297 mm / 11.7"

② = 124 mm / 4.9"
③ = 154 mm / 6.1"
Extended cover this side when digital display available

Nominal size	Flange rating	O.D. (outer Ø)	I.D. (inner Ø)	C
		[mm]		
DN15	PN40 ①	95	18.8	138
	PN100	105	18.8	152
DN25	PN40 ①	115	24.3	142
	PN100	140	24.3	178
	PN160	140	24.3	178
DN40	PN40 ①	150	38.1	152
	PN100	170	38.1	186
	PN160	170	38.1	190
DN50	PN40 ①	165	49.2	166
	PN63	180	49.2	194
	PN100	195	49.2	206
	PN160	195	49.2	220
DN80	PN40 ①	200	72.9	202
	PN63	215	72.9	230
	PN100	230	72.9	242
	PN160	230	72.9	258

Nominal size	Flange rating	O.D. (outer Ø)	I.D. (inner Ø)	C
		[mm]		
DN100	PN40 ①	235	97.2	222
	PN63	250	97.2	248
	PN100	265	97.2	272
	PN160	265	97.2	292
DN150	PN16	285	146.3	237
	PN40 ①	300	146.3	277
	PN63	345	146.3	317
	PN100	355	146.3	357
	PN160	355	146.3	383
DN200	PN16	340	193.7	302
	PN25	360	193.7	338
	PN40	375	193.7	354
	PN63	415	193.7	398
	PN100	430	193.7	438
	PN160	430	193.7	458
DN250	PN16	405	242.9	318
	PN25	425	242.9	354
	PN40	450	242.9	388
	PN63	470	242.9	428
	PN100	505	242.9	492
DN300	PN16	460	288.9	359
	PN25	485	288.9	387
	PN40	515	288.9	433
	PN63	530	288.9	483
	PN100	585	288.9	543

Table 2-1: Dimensions for DIN flanges

① May be used with PN25 mating flange.

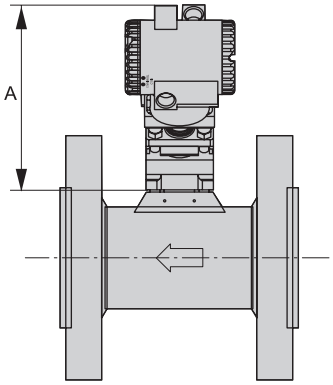
Nominal size	Flange rating	O.D. (outer Ø)	I.D. (inner Ø)	C (RF)	C (RTJ)
		[inch]			
3/4"	Class 150	3.88	0.74	6.56	-
	Class 300	4.62	0.74	6.94	7.32
	Class 600	4.62	0.74	7.44	7.44
	Class 900	5.12	0.74	8.44	8.44
	Class 1500	5.12	0.74	8.44	8.44
1"	Class 150	4.25	0.96	6.80	7.18
	Class 300	4.88	0.96	7.32	7.70
	Class 600	4.88	0.96	7.82	7.82
	Class 900	5.88	0.96	8.70	8.70
	Class 1500	5.88	0.96	8.70	8.70

Nominal size	Flange rating	O.D. (outer Ø)	I.D. (inner Ø)	C (RF)	C (RTJ)
		[inch]			
1 1/2"	Class 150	4.62	1.50	7.32	7.70
	Class 300	6.12	1.50	7.82	8.20
	Class 600	6.12	1.50	8.44	8.44
	Class 900	7.00	1.50	9.44	9.44
	Class 1500	7.00	1.50	9.44	9.44
2"	Class 150	6.00	1.94	7.75	8.13
	Class 300	6.50	1.94	8.25	8.75
	Class 600	6.50	1.94	9.01	9.13
	Class 900	8.50	1.94	11.25	11.37
	Class 1500	8.50	1.69	11.25	11.37
3"	Class 150	7.50	2.87	8.88	9.26
	Class 300	8.25	2.87	9.62	10.12
	Class 600	8.25	2.87	10.38	10.50
	Class 900	9.50	2.87	11.88	12.00
	Class 1500	10.50	2.63	13.12	13.25
4"	Class 150	9.00	3.83	9.62	10.00
	Class 300	10.00	3.83	10.38	10.88
	Class 600	10.75	3.83	12.12	12.24
	Class 900	11.50	3.83	13.12	13.24
	Class 1500	12.25	3.44	13.88	14.00
6"	Class 150	11.00	5.76	12.00	12.38
	Class 300	12.50	5.76	12.76	13.26
	Class 600	14.00	5.76	14.74	14.86
	Class 900	15.00	5.19	16.50	16.62
	Class 1500	15.50	5.19	19.00	19.25
8"	Class 150	13.50	7.63	15.00	15.38
	Class 300	15.00	7.63	15.75	16.26
	Class 600	16.50	7.63	18.00	18.12
	Class 900	18.50	6.81	20.26	20.38
	Class 1500	19.00	6.81	24.26	24.64
10"	Class 150	16.00	9.56	15.00	15.38
	Class 300	17.50	9.56	16.24	16.74
	Class 600	20.00	9.56	19.50	19.62
12"	Class 150	19.00	11.37	17.00	17.38
	Class 300	20.50	11.37	18.24	18.74
	Class 600	22.00	11.37	20.74	20.76

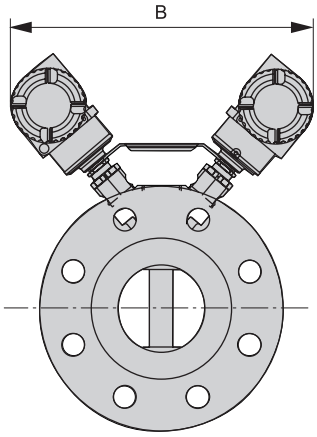
Table 2-2: Dimensions for ANSI flanges

Compact versions - dual measurement

Side view



Front view

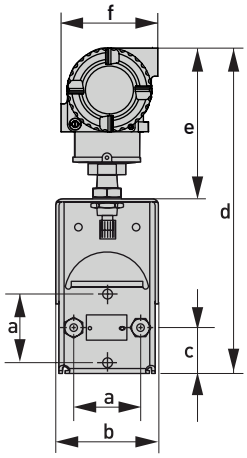


Dimension	[mm / inch]
A	305 / 12.0
B	508 / 20.0

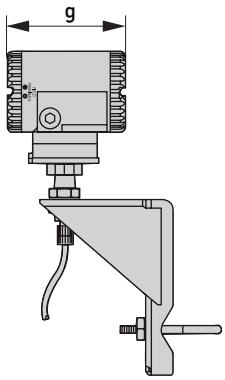
Table 2-3: Dimensions in mm and inch

Remote versions - signal converter and mounting bracket

Front view



Side view

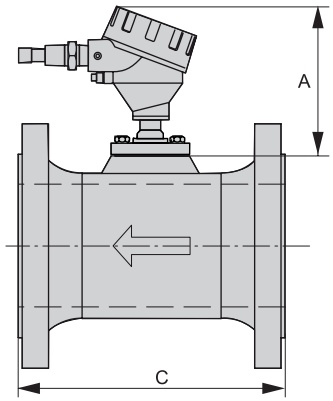


	a	b	c	d	e	f	g
mm	69.9	99	46	318	140	96	154
inch	2.75	3.9	1.8	12.5	5.5	3.8	6.1

Table 2-4: Dimensions in mm and inch

Remote versions - flow sensor

Standard version



A = 297 mm / 11.7"

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	PN160	140	24.3	178
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	PN160	170	38.1	190
DN50	PN40 ①	165	49.2	166
	PN63	180	49.2	194
	PN100	195	49.2	206
	PN160	195	49.2	220
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		[inch]			
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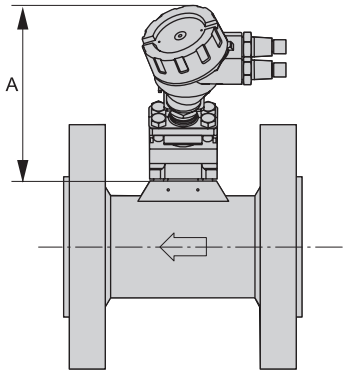
	Class 600	4.62	0.74	7.44	7.44
	Class 900	5.12	0.74	8.44	8.44
	Class 1500	5.12	0.74	8.44	8.44
1"	Class 150	4.25	0.96	6.80	7.18
	Class 300	4.88	0.96	7.32	7.70
	Class 600	4.88	0.96	7.82	7.82
	Class 900	5.88	0.96	8.70	8.70
	Class 1500	5.88	0.96	8.70	8.70

Nominal size	Flange rating	O.D. (outer Ø)	I.D. (inner Ø)	C (RF)	C (RTJ)
		[inch]			
1 1/2"	Class 150	4.62	1.50	7.32	7.70
	Class 300	6.12	1.50	7.82	8.20
	Class 600	6.12	1.50	8.44	8.44
	Class 900	7.00	1.50	9.44	9.44
	Class 1500	7.00	1.50	9.44	9.44
2"	Class 150	6.00	1.94	7.75	8.13
	Class 300	6.50	1.94	8.25	8.75
	Class 600	6.50	1.94	9.01	9.13
	Class 900	8.50	1.94	11.25	11.37
	Class 1500	8.50	1.69	11.25	11.37
3"	Class 150	7.50	2.87	8.88	9.26
	Class 300	8.25	2.87	9.62	10.12
	Class 600	8.25	2.87	10.38	10.50
	Class 900	9.50	2.87	11.88	12.00
	Class 1500	10.50	2.63	13.12	13.25
4"	Class 150	9.00	3.83	9.62	10.00
	Class 300	10.00	3.83	10.38	10.88
	Class 600	10.75	3.83	12.12	12.24
	Class 900	11.50	3.83	13.12	13.24
	Class 1500	12.25	3.44	13.88	14.00
6"	Class 150	11.00	5.76	12.00	12.38
	Class 300	12.50	5.76	12.76	13.26
	Class 600	14.00	5.76	14.74	14.86
	Class 900	15.00	5.19	16.50	16.62
	Class 1500	15.50	5.19	19.00	19.25
8"	Class 150	13.50	7.63	15.00	15.38
	Class 300	15.00	7.63	15.75	16.26
	Class 600	16.50	7.63	18.00	18.12
	Class 900	18.50	6.81	20.26	20.38
	Class 1500	19.00	6.81	24.26	24.64
10"	Class 150	16.00	9.56	15.00	15.38
	Class 300	17.50	9.56	16.24	16.74
	Class 600	20.00	9.56	19.50	19.62
12"	Class 150	19.00	11.37	17.00	17.38
	Class 300	20.50	11.37	18.24	18.74
	Class 600	22.00	11.37	20.74	20.76

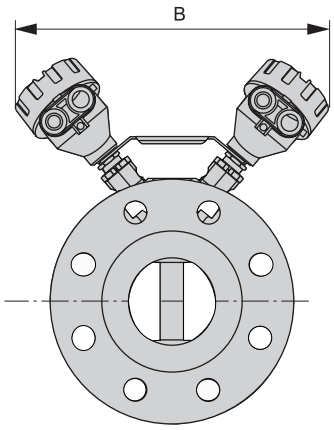
Table 2-6: Dimensions for ANSI flanges

Remote versions - dual measurement

Side view



Front view



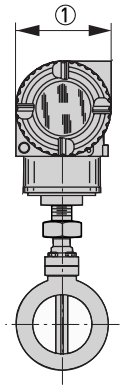
Dimension	[mm / inch]
A	290 / 11.4
B	508 / 20.0

Table 2-7: Dimensions in mm and inch

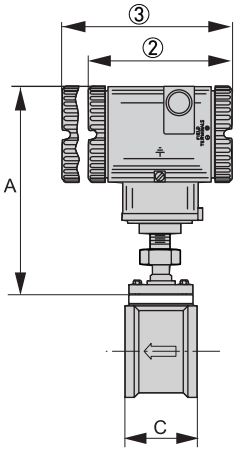
2.2.2 Dimensions for sandwich versions

Compact versions

Standard version (front and side view)



① = 96 mm / 3.8"



② = 124 mm / 4.9"
③ = 154 mm / 6.1"

Extended cover this side when digital display available

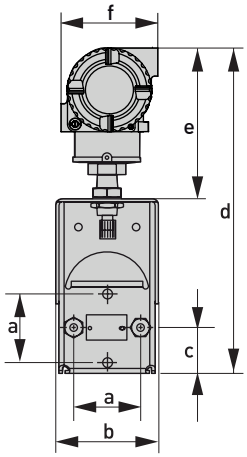
Nominal size	O.D. (outer Ø)	I.D. (inner Ø)	C
[mm / inch]			
15 / 3/4	57.2 / 2.25	18.8 / 0.74	79.5 / 3.13
25 / 1	66.8 / 2.63	24.3 / 0.96	79.5 / 3.13
40 / 1 1/2	85.9 / 3.38	38.1 / 1.50	79.5 / 3.13
50 / 2	104.6 / 4.12	49.2 / 1.94	79.5 / 3.13
80 / 3	136.7 / 5.38	72.9 / 2.87	95.3 / 3.75
100 / 4	174.5 / 6.87	96.7 / 3.81	120.7 / 4.75
150 / 6	222.3 / 8.75	147.3 / 5.80	177.8 / 7.00
200 / 8	279.4 / 11.00	193.0 / 7.60	228.6 / 9.00

Table 2-8: Dimensions in mm and inch

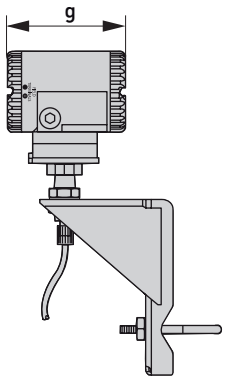
Flowmeter body fits between ANSI Class 150, 300, or 600 raised face flanges and PN16, 40, 63, and 100 flanges.

Remote versions - signal converter and mounting bracket

Front view



Side view

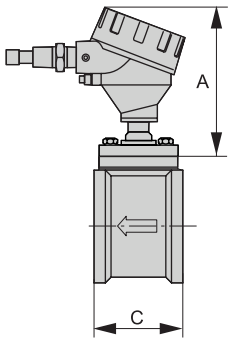


	a	b	c	d	e	f	g
mm	69.9	99	46	318	140	96	154
inch	2.75	3.9	1.8	12.5	5.5	3.8	6.1

Table 2-9: Dimensions in mm and inch

Remote versions - flow sensor

Standard version



Nominal size	O.D. (outer Ø)	I.D. (inner Ø)	C
[mm / inch]			
15 / 3/4	57.2 / 2.25	18.8 / 0.74	79.5 / 3.13
25 / 1	66.8 / 2.63	24.3 / 0.96	79.5 / 3.13
40 / 1 1/2	85.9 / 3.38	38.1 / 1.50	79.5 / 3.13
50 / 2	104.6 / 4.12	49.2 / 1.94	79.5 / 3.13
80 / 3	136.7 / 5.38	72.9 / 2.87	95.3 / 3.75
100 / 4	174.5 / 6.87	96.7 / 3.81	120.7 / 4.75
150 / 6	222.3 / 8.75	147.3 / 5.80	177.8 / 7.00
200 / 8	279.4 / 11.00	193.0 / 7.60	228.6 / 9.00

Table 2-10: Dimensions in mm and inch

2.2.3 Weight

Nominal size		Approx. weights	
[mm]	[inch]	[kg]	[lb]
DN15	3/4	2.8	6
DN25	1	3.2	7
DN40	1 1/2	3.7	8
DN50	2	5.0	11
DN80	3	8.5	19
DN100	4	12.0	26
DN150	6	16.5	36
DN200	8	27.5	61

Table 2-11: Weight for sandwich versions in kg and lb

The electronics housing itself weighs about 2 kg / 4 lbs and varies slightly depending on whether indicator/configurator, and/or extended housing covers are used.

DIN flanges				ANSI flanges			
Nominal size	Flange rating	Weight [kg]	Weight [lb]	Nominal size	Flange rating	Weight [kg]	Weight [lb]
DN15	PN40	6.08	13.3	3/4"	Class 150	5.21	11.4
DN15	PN100	7.85	17.2	3/4"	Class 1500	9.25	20.3
DN25	PN40	6.58	14.4	1"	Class 150	6.03	13.2
DN25	PN160	9.26	20.1	1"	Class 1500	11.52	25.3
DN40	PN40	8.62	18.9	1 1/2"	Class 150	8.07	17.7
DN40	PN160	13.29	29.2	1 1/2"	Class 1500	16.15	35.5
DN50	PN40	10.34	22.7	2"	Class 150	9.98	21.9
DN50	PN160	17.92	39.4	2"	Class 1500	25.08	55.2
DN80	PN40	15.60	34.3	3"	Class 150	20.00	44.0
DN80	PN160	27.08	59.6	3"	Class 1500	50.26	110.7
DN100	PN40	20.64	45.4	4"	Class 150	21.55	47.4
DN100	PN160	37.33	82.2	4"	Class 1500	71.22	156.9
DN150	PN16	28.39	62.5	6"	Class 150	35.7	78.6
DN150	PN160	89.32	196.8	6"	Class 1500	162.43	358.0
DN200	PN16	43.5	95.8	8"	Class 150	58.24	128.3
DN200	PN160	162.29	357.7	8"	Class 600	131.76	290.4
DN250	PN16	65.63	144.6	8"	Class 1500	298.6	658.3
DN250	PN100	191.73	422.6	10"	Class 150	73.07	161.0
DN300	PN16	93.21	205.4	10"	Class 600	216.5	477.2
DN300	PN100	280.82	619.0	12"	Class 150	114.98	253.4
				12"	Class 600	245.62	241.4

Table 2-12: Weight for flange versions in kg and lb

2.3 Pressure & temperature ratings for flanges

ANSI flange rating acc. to ASME B16.5 for group 2.2 materials

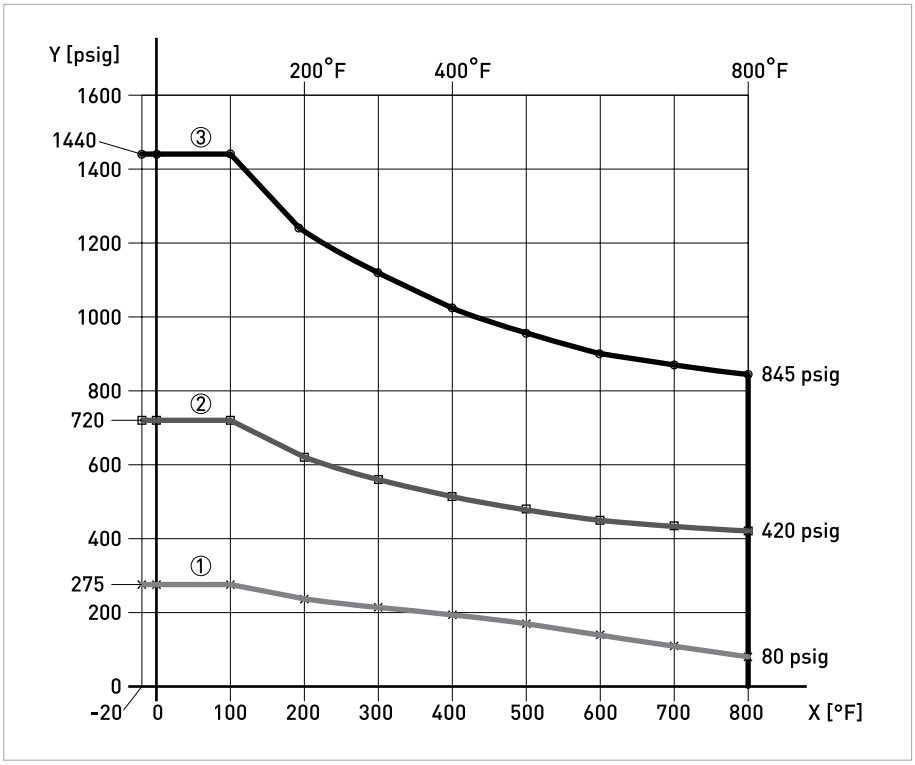


Figure 2-1: ANSI flange rating acc. to ASME B16.5 for group 2.2 materials

X: Process temperature in °F
Y: Process pressure in psig

① Class 150
② Class 300
③ Class 600

ANSI flange rating acc. to ASME B16.5 for group 2.1 materials

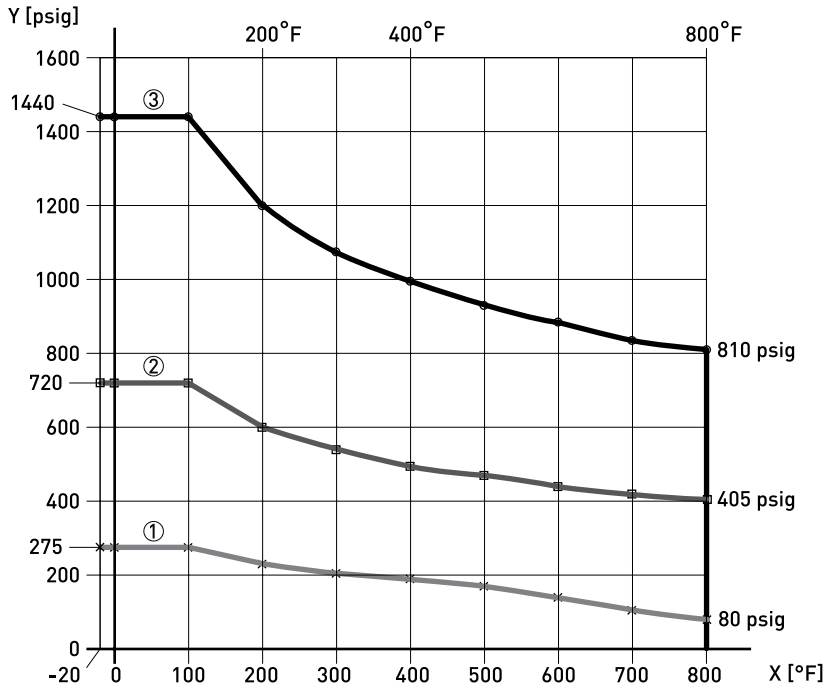


Figure 2-2: ANSI flange rating acc. to ASME B16.5 for group 2.1 materials

X: Process temperature in °F
Y: Process pressure in psig

① Class 150
② Class 300
③ Class 600

DIN flange rating acc. to EN 1092-1 for material group 14E0

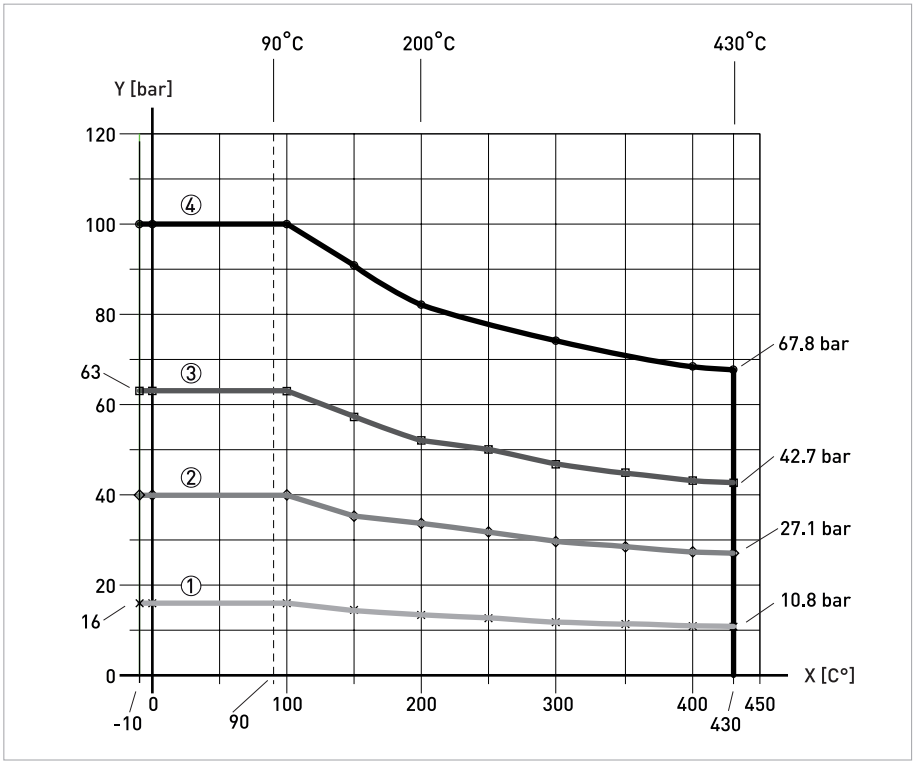


Figure 2-3: DIN flange rating acc. to EN 1092-1 for material group 14E0

X: Process temperature in °C
Y: Process pressure in bar

① PN16
② PN40
③ PN63
④ PN100

DIN flange rating acc. to EN 1092-1 for material group 10E0

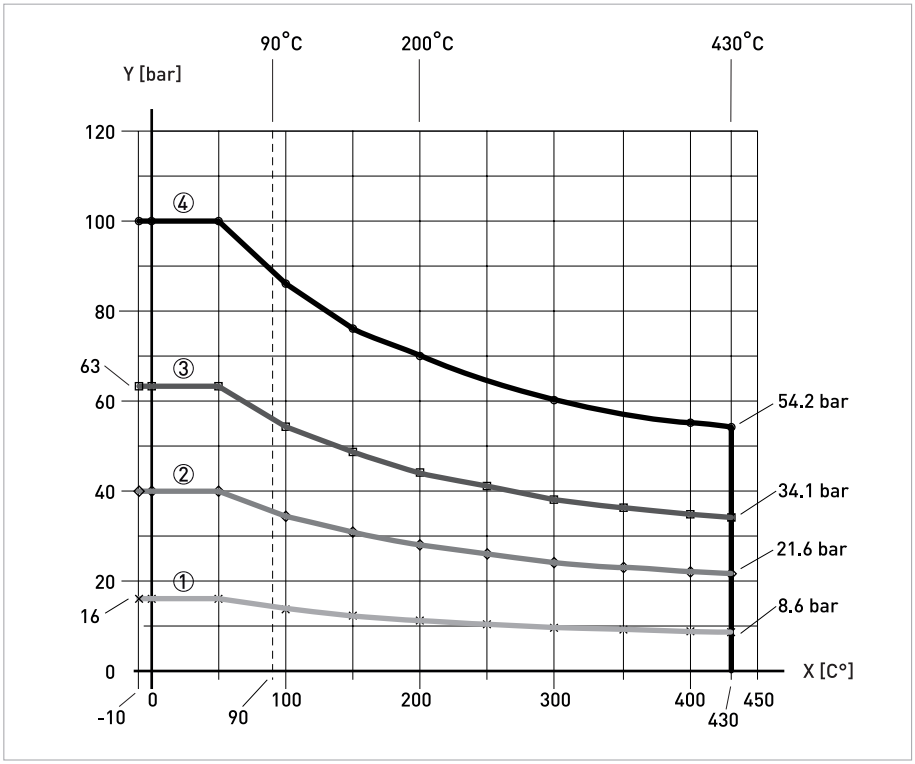


Figure 2-4: DIN flange rating acc. to EN 1092-1 for material group 10E0

X: Process temperature in °C
Y: Process pressure in bar

① PN16
② PN40
③ PN63
④ PN100

3.1 Intended use

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

This device is a Group 1, Class A device as specified within CISPR11:2009. It is intended for use in industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The vortex flowmeters are used for flow measurement of gases, vapours and liquids.

- The flow sensors are made from stainless steel 316 or 304 or CX2MW Nickel Alloy (equivalent to Hastelloy® C).
- 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 maximum process data indicated on the nameplate.
- External forces and moments, caused e.g. by pipe stresses, have not been taken into account.

3.2 Installation conditions

For accurate volumetric flow measurement the measuring device needs a completely filled pipe and a fully developed flow profile.

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 flange diameter of pipe!*
- *Use flanges with smooth holes, e.g. welding neck flanges.*
- *Align carefully the holes of the connecting flange and the flowmeter flange.*
- *Check the compatibility of the gasket material with the process product.*
- *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 run.*
- *Never install the device directly behind piston compressors or rotary piston meters.*
- *The device must not be heated by radiated heat (e.g. exposure to the sun) to a electronics housing surface temperature above the maximum permissible ambient temperature. If it is necessary to prevent damage from heat sources, a heat protection (e.g. sun shade) has to be installed.*
- *Do not lay signal cables directly next to cables for the power supply.*
- *At product temperatures or ambient temperatures >+65° C / +149° F, a connection cable and cable glands with a minimum service temperature of +80° C / +176° F must be used.*

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

3.2.1 Installation when measuring liquids

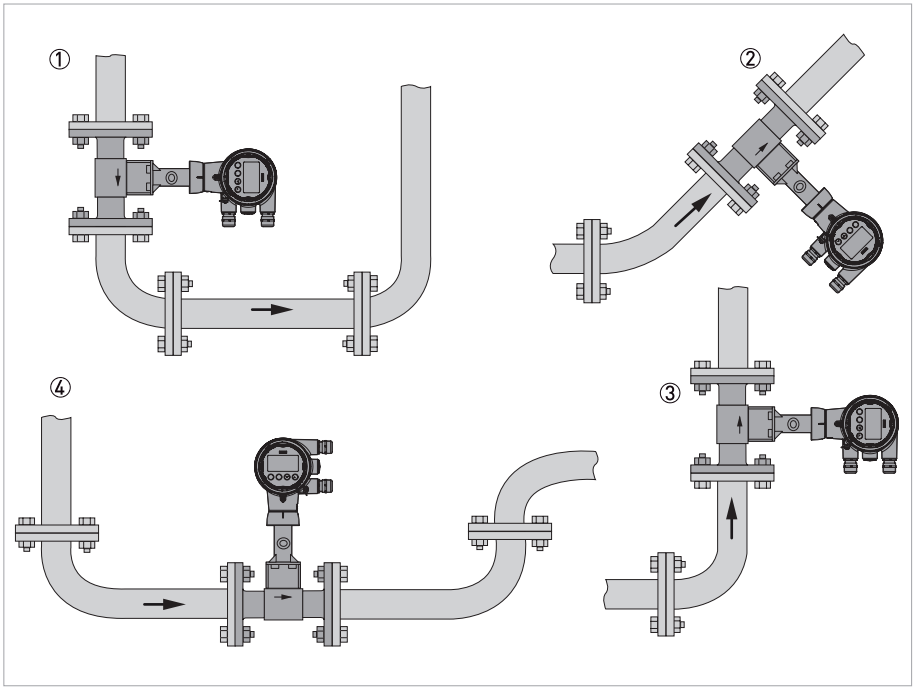


Figure 3-1: Recommended installation

① If the device is installed in a downpipe, a standpipe must be installed immediately after it
② Installing the device in an inclined standpipe
③ Installing the device in a vertical standpipe
④ Installing the device in the lower pipe bend

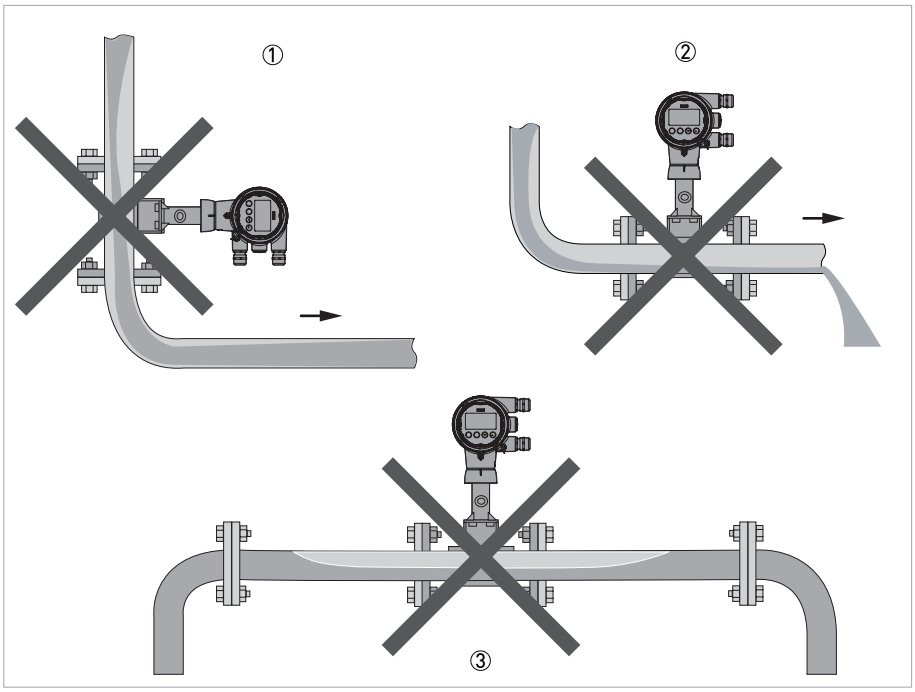


Figure 3-2: Not recommended installation

① Installing the device in a downstream pipe
② Installing the device in front of an outlet
③ Installing the device in an upper pipe bend due to risk of gas bubbles forming

- *Installing the device in a downstream pipe ① or upstream pipe of an outlet ②, there is a risk of partially filled pipes leading to inaccurate measurements.*
- *Installing the device in an upper pipe bend ③, there is a risk of gas bubbles forming. Gas bubbles can lead to pressure surges and inaccurate measurement.*

3.2.2 Installation when measuring steam and gases

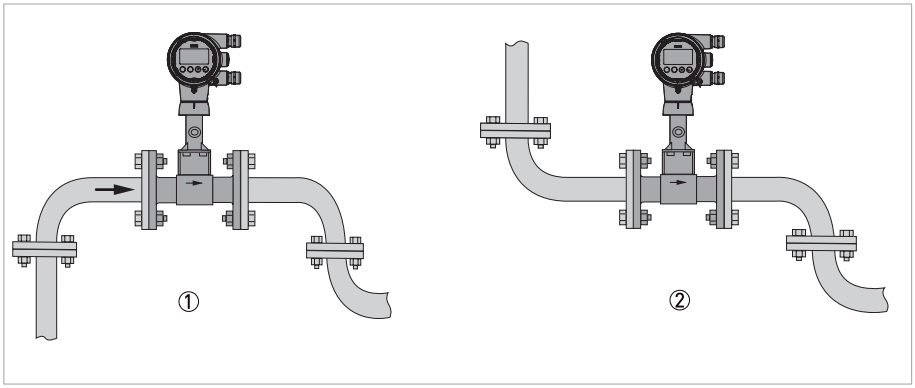


Figure 3-3: Recommended installation

① Installing the device in an upper pipe bend
② If the device is installed in a downpipe, a downpipe must be installed immediately after it

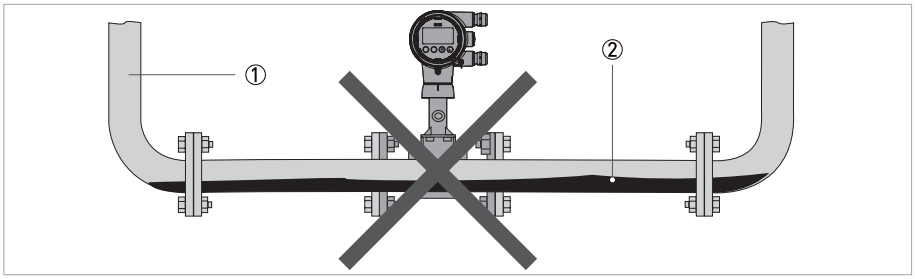


Figure 3-4: Not recommended installation

① Lower pipe bends
② Condensate

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

3.2.3 Mounting arrangements versus medium

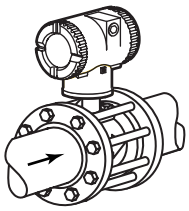
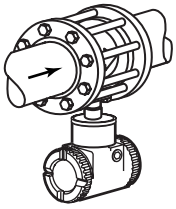
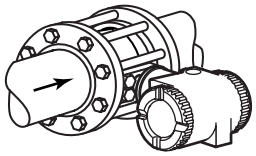
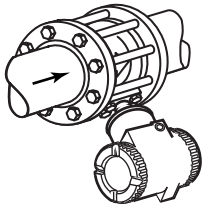
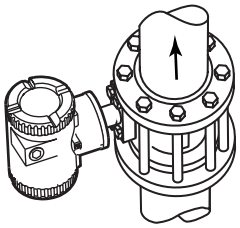
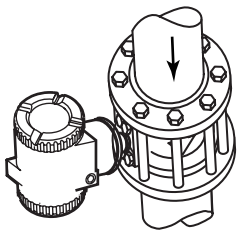
Flowmeter orientation		Liquid	Gas	Saturated steam	Superheated steam
	Housing above and Isolation valve is not used	Yes ①	Yes	No	Yes ②
	Housing above and isolation valve is used	No ⑤	Yes	No	Yes ②
	Housing below pipe	Yes ③, ④, ⑥	Yes ④	Yes	Yes ②
	Housing to side of pipe	Yes	Yes	No	Yes ②
	Housing to side and below pipe	Yes ⑥	Yes	No	Yes ②
	Vertical pipe, flow upward	Yes	Yes	No	Yes ②
	Vertical pipe, flow downward	Yes ⑦	Yes	No	Yes ②

Table 3-1: Mounting arrangements versus medium

① Possibility of temporary startup error due to trapped air.
② Requires adequate insulation.
③ Best choice when errors due to startup can not be tolerated.
④ Recommended only for clean fluids.
⑤ Not recommended for liquids with isolation valve.
⑥ Preferred for liquids with isolation valve.
⑦ Not preferred; must maintain full pipe with no voids in fluid.

3.2.4 Pipelines with control valve

To ensure smooth and correct measurement, the manufacturer recommends not installing the measuring device downstream from a control valve. This would run the risk of vortex formation, which would distort the measuring result.

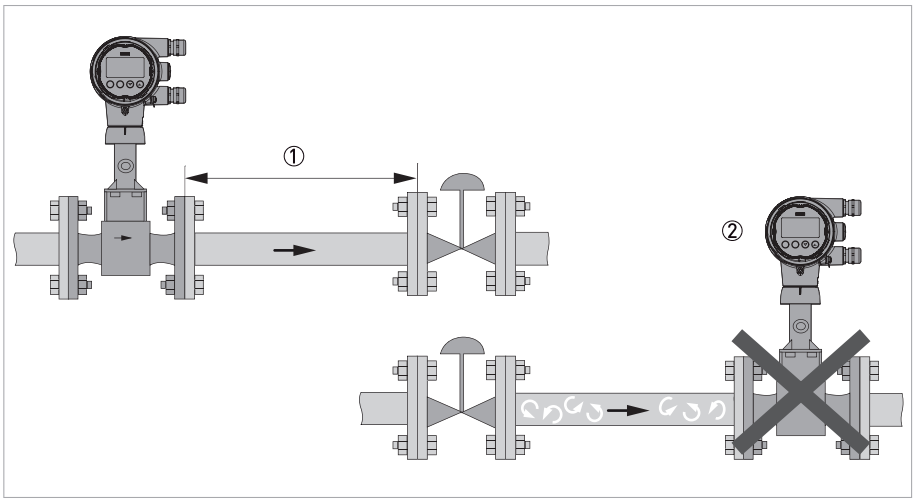


Figure 3-5: Pipelines with control valve

① Recommended: installing the device before the control valve at a distance of ≥ 5 DN
② Not recommended: installing the device directly downstream of control valves, due to vortex formation

3.3 Minimum inlet sections

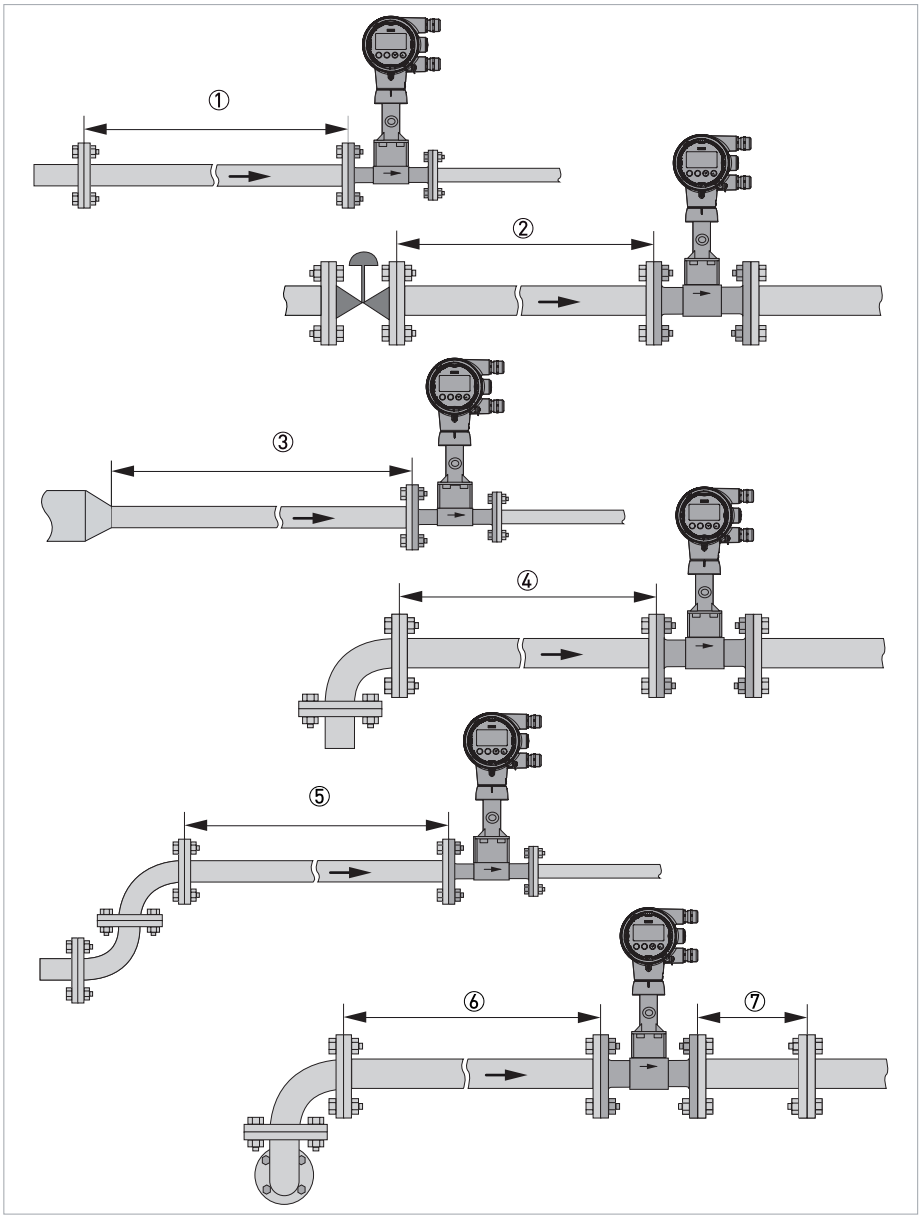


Figure 3-6: Minimum inlet sections

① General inlet section without disturbing flow ≥ 15 DN
② After a control valve ≥ 50 DN
③ After a pipe diameter reduction ≥ 20 DN
④ After a single bend 90° ≥ 20 DN
⑤ After a double bend 2x90° ≥ 30 DN
⑥ After a double three-dimensional bend 2x90° ≥ 40 DN
⑦ Outlet section > 5 DN

3.4 Minimum outlet sections

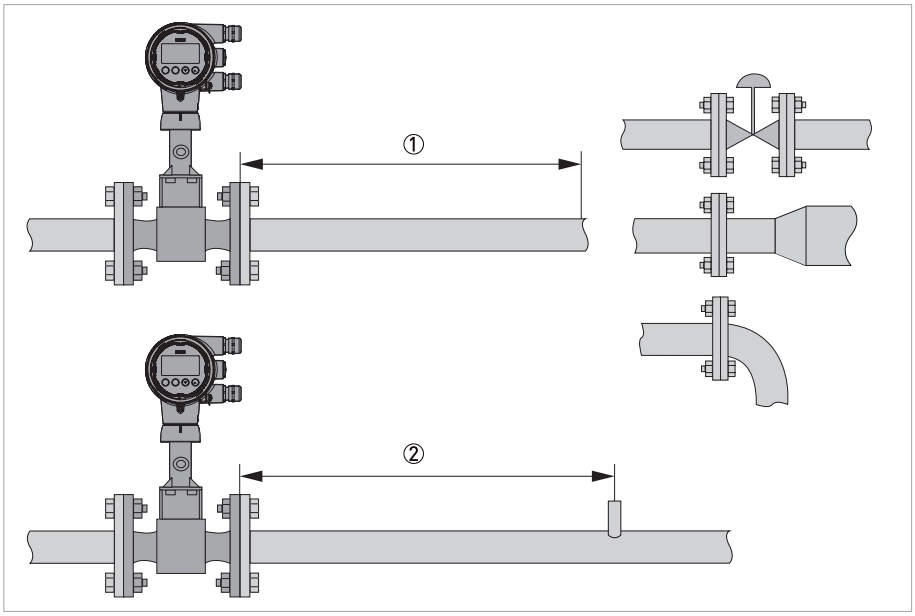


Figure 3-7: Minimum outlet sections

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 flow sensors that are as short as possible to avoid disturbances of the flow profile.

3.5 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.

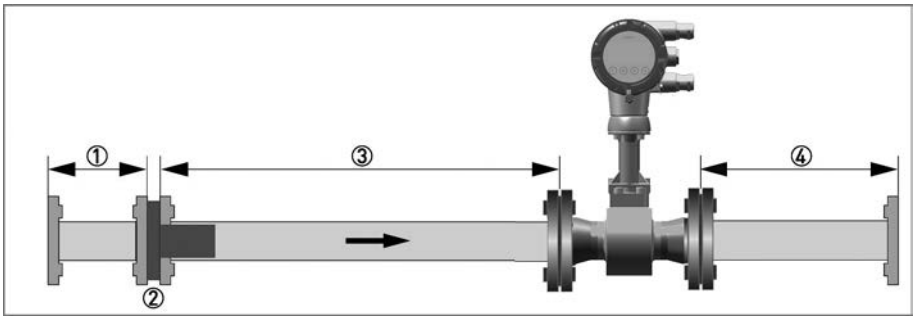


Figure 3-8: Flow straightener

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

3.6 Heat insulation

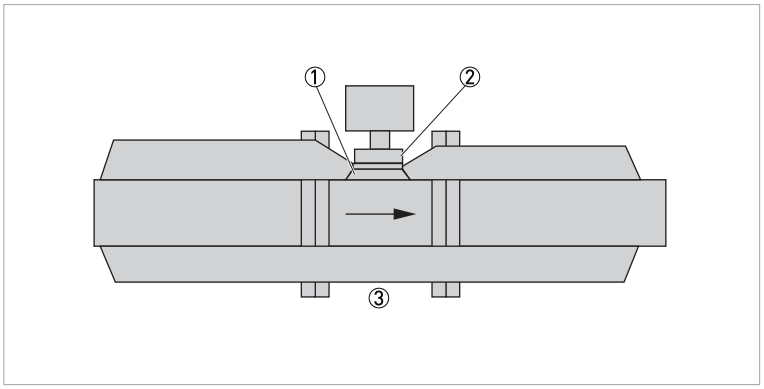


Figure 3-9: Installation heat insulation

① Bonnet pad
② Bonnet
③ Insulation

- *For applications with medium temperatures above +160° C / +320° F an insulation of the pipeline in accordance to our insulation guideline is suggested.*
- *No insulation is allowed beyond the bonnet pad.*
- *Avoid higher electronic temperatures than +80° C / +176° F.*
- *The area above the signal converter support must not be heat-insulated.*

Sun cover

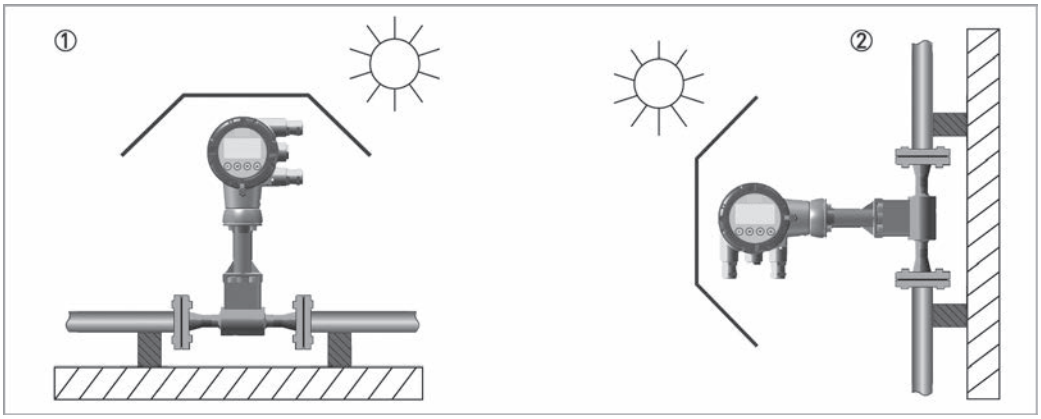


Figure 3-10: Installation recommendations

① Horizontal mounting
② Vertical mounting

The flowmeter **MUST** be protected from strong sunlight.

4.1 Electrical installation of compact mounted electronics

The signal converter housing must be grounded to insure proper operation and peak performance.

A flowmeter with a compact mounted electronics requires only power and output signal wiring.

4.2 Electrical installation of remote mounted electronics

The signal converter housing must be grounded to insure proper operation and peak performance.

To use the flowmeter as shipped with the cable attached at both ends, mount the electronics housing and flowmeter body within the limits of the cable length.

If the cable must be disconnected (run the cable through conduit or for some other reason), you must disconnect the cable at the flowmeter (junction box) end. You cannot disconnect the cable at the electronics housing end because it has been epoxied into the metal connector.
It is labelled "Factory Sealed / Electronics End / Do Not Remove."

4.2.1 Identification on field terminals

Field wires enter through 1/2 NPT or M20 conduit threaded entrances on either side of the electronics housing. Wires terminate under screw terminals and washers on terminal block (refer to next figure) in the field terminal compartment.

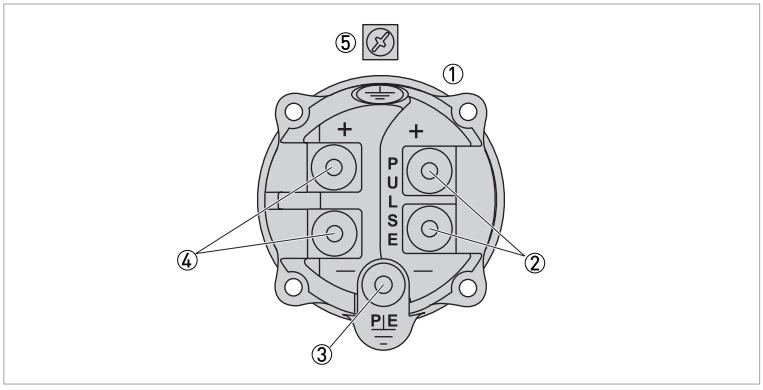


Figure 4-1: Identification on field terminals

① Terminal block (located in field terminal side of housing)
② Pulse output terminals
③ Physical earth (ground)
④ (+) and (-) power terminals
⑤ Earth (ground) screw located external to terminal block

Plug unused entrance to ensure moisture and RFI/EMI protection.

4.3 Wiring of the flowmeter

4.3.1 Wiring the flowmeter to a control loop

When wiring a flowmeter with 4...20 mA output signal, the supply voltage and loop load must be within specified limits. The supply output load versus voltage relationship is shown in the next figure.

Any combination of supply voltage and loop load resistance in the shaded area can be used. To determine the loop load resistance (flowmeter output load), add the series resistance of each component in the loop, excluding the flowmeter. The power supply must be capable of supplying 22 mA of loop current.

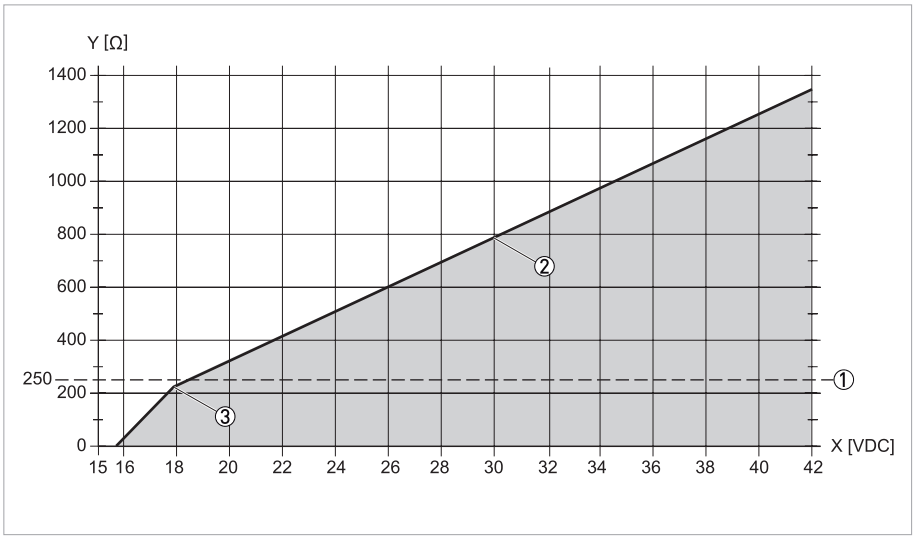


Figure 4-2: Relationship of output load versus supply voltage

X [VDC]: Supply voltage
Y [Ω]: Output load

① Minimum load with configurator or communicator
② 30 V maximum for intrinsically safe units
③ 227.5 Ω at 17.7 V

The flowmeter function with an output load less than 250 Ω provided that a PC-based configurator or HART communicator is not connected to it.
Connecting a PC-based configurator or HART communicator while operating below a 250 Ω load may cause output disturbance and/or communication problems.

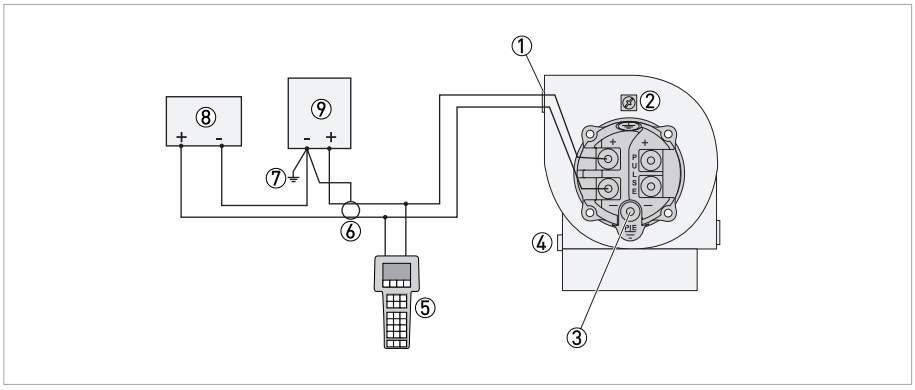


Figure 4-3: Wiring a flowmeter with a 4...20 mA output

① 1/2 NPT or M20 conduit connection (2 places)
② Internal ground terminal
③ Physical earth ground (required for explosionproof applications)
④ External ground terminal
⑤ HART communicator or PC-based configurator
⑥ Shielded wire (optional)
⑦ Ground (optional)
⑧ Receiver
⑨ Power supply

4.3.2 Wiring a flowmeter with a pulse output

Two separate loops are required when using the pulse output on a flowmeter with the 4...20 mA or digital signal. Each loop requires its own power supply. The following drawings show the connections with a transistor switch (sinking) counter input with receiver supplied power; with a transistor switch (sinking) counter input and external power supply and pull-up resistor; and with a transistor switch (sourcing) counter input and external power supply and pull-up resistor.

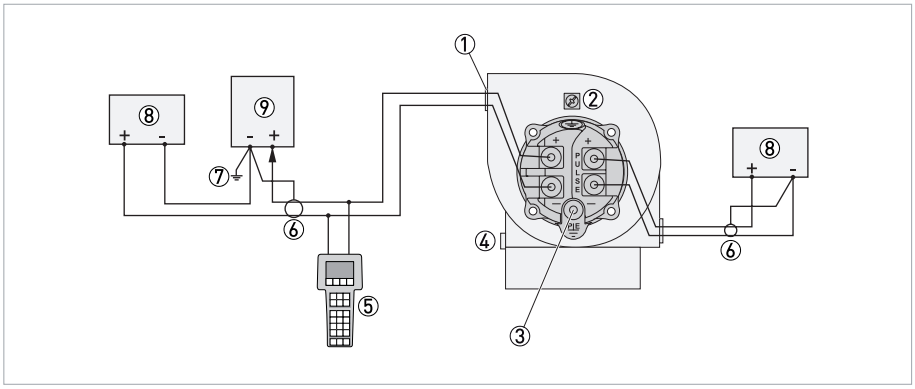


Figure 4-4: Wiring a flowmeter with a pulse output transistor switch (sinking) counter input with receiver supplied power

① 1/2 NPT or M20 conduit connection (2 places)
② Internal ground terminal (connect a ground wire in accordance with local practice)
③ PE ground (required for explosion-proof applications)
④ External ground terminal
⑤ HART Communicator or PC-based configurator (at least 250 Ω total resistance between configurator and power supply
⑥ Optional shielded wire (if used, terminate the shield at the negative terminal of the power supply)
⑦ Optional ground (grounding the loop at the negative terminal of the power supply is recommended but not required)
⑧ Receiver
⑨ Power supply

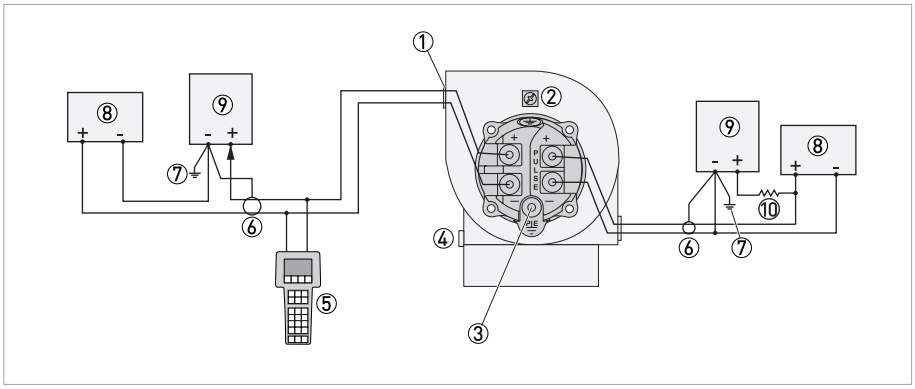


Figure 4-5: Wiring a flowmeter with a pulse output transistor switch (sinking) counter input with external power supply and pull-up resistor

① 1/2 NPT or M20 conduit connection (2 places)
② Internal ground terminal (connect a ground wire in accordance with local practice)
③ PE ground (required for explosion-proof applications)
④ External ground terminal
⑤ HART Communicator or PC-based configurator (at least 250 Ω total resistance between configurator and power supply
⑥ Optional shielded wire (if used, terminate the shield at the negative terminal of the power supply)
⑦ Optional ground (grounding the loop at the negative terminal of the power supply is recommended but not required)
⑧ Receiver
⑨ Power supply
①⓪ Load resistor (max. pulse output current is 20 mA; load resistor must be sized accordingly)

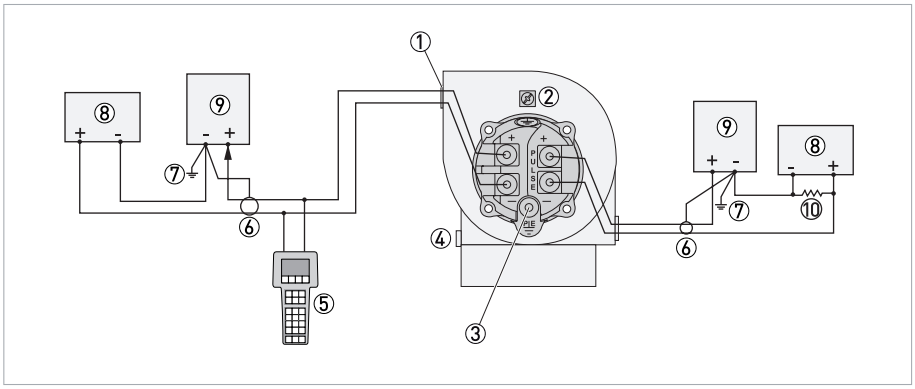


Figure 4-6: Wiring a flowmeter with a pulse output transistor switch (sinking) counter input with external power supply and pull-up resistor

① 1/2 NPT or M20 conduit connection (2 places)
② Internal ground terminal (connect a ground wire in accordance with local practice)
③ PE ground (required for explosion-proof applications)
④ External ground terminal
⑤ HART Communicator or PC-based configurator (at least 250 Ω total resistance between configurator and power supply
⑥ Optional shielded wire (if used, terminate the shield at the negative terminal of the power supply)
⑦ Optional ground (grounding the loop at the negative terminal of the power supply is recommended but not required)
⑧ Receiver
⑨ Power supply
①⓪ Load resistor (max. pulse output current is 20 mA; load resistor must be sized accordingly)

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Then please send 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	
Display:	_ With		
Approval:	_ Non-Ex	ATEX	
		_ Intrinsically safe: II 1G II 2D Ex ia IIC T4 Ga Ex tb IIIC T103°C Db	**_ Flameproof:** II 2/1 (1) G II 2D Ex db [ia Ga] ia IIC T4 Gb Ex tb IIIC T85°C Db
		IECEx	
		_ Intrinsically safe: Ex ia IIC T4 Ga Ex tb IIIC T103°C Db	**_ Flameproof:** Ex d [ia Ga] ia IIC T4 Gb Ex tb IIIC T85°C Db
		FM	
		_ Intrinsically safe for Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G Also Zone approved AEx ia IIC	**_ Explosionproof** with IS sensor connection for Class I, Div. 1, Groups B, C, and D; **_ Dust-ignitionproof** for Class II, Div. 1, Groups E, F, and G; Class III, Div. 1

Rating data

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

Contact data

Company:	
Contact person:	
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