

Flow Measurement

SITRANS FC (Coriolis)

Sensors and Flowmeter systems / SITRANS FC MASS 2100 and FC300 DN 4

Overview

MASS 2100 DI 1.5 to DI 15 and the FC300 DN4 is suitable for low flow measurement applications of a variety of liquids and gases.

The sensor is designed with a single bended tube in corrosion resistant stainless steel AISI316L or Hastelloy C22 and a solid stainless steel fully welded enclosure to protect the measuring tubes from any harsh environments. For hazardous area applications the MASS 2100 / FC300 DN4 sensor comes in a number of common hazardous area approved variants like ATEX, IECEx, cCSAus, EAC, and NEPSI.

The sensor offers superior performance in terms of flow accuracy, turn-down ratio and density accuracy and delivers true multi-parameter measurements i.e.: mass flow, volume flow, density, temperature and fraction.

With the large variety of process connections and the ability for high pressure solutions up to 1 000 bar, the compact single tube design is especially suitable for high end applications in all industry segments e.g. Automotive, Painting, Chemical, Oil & Gas and F&B. Accurate dosing and mixing down to drops are widely used applications.

The main applications for the MASS 2100 / FC300 DN 4 sensor can be found in:

Chemical industry	Liquid and gas measurement within Miniplant and R&D, dosing of additives and catalysts
Cosmetic industry	Dosing of essence and fragrances
Pharmaceutical industry	High-speed dosing and coating of pills, filling of ampuls/injectors
Food and beverage industry	Dosing of flavourings, colours and additives, density measurement, in-line; Measurement of liquid or gaseous CO2
Automotive industry	Fuel injection nozzle and pump testing, filling of AC units, engine consumption, paint robots, ABS test-beds

Integration

The SITRANS MASS 2100/FC300 DN4 sensor are suitable for both indoor and outdoor installation and meets the requirements of Protection Class IP67/NEMA 4X. Optionally the sensor can be ordered with hazardous certification to Zone 1 (ATEX, IECEx, cCSAus, EAC Ex, NEPSI).

It is important to ensure that the sensor tubes are always completely filled with homogeneous fluid; otherwise measuring errors may occur. Suitable fluids are clean liquids, pastes, light slurries or gases. Condensing vapours, aerated liquids or slush are not recommended.

The materials in contact with the process medium must be evaluated for corrosion and erosion resistances for long sensor life.

The pressure drop through the sensor is a function of the properties of the fluid and the flow rate. A pressure loss and accuracy calculator can be found on the Siemens Internet site www.siemens.com

The preferred flow direction is indicated by an arrow on the sensor. Flow in the direction of the arrow will be measured as positive. The flow direction can be adjusted at the transmitter to compensate for reverse installation.

Shut-off devices

To conduct a system zero adjustment, secure shut-off devices are required in the pipeline.

Where possible, shut-off devices should be installed both upstream and downstream of the flowmeter.

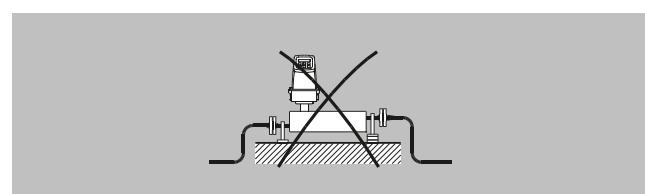
Installation guidelines MASS 2100 DI 3 ... DI 15 (1/8" ... 1/2")

In order to perform according to given specifications for flow and density accuracy, the sensor must be installed using rigid mounting brackets as shown in the installation examples.

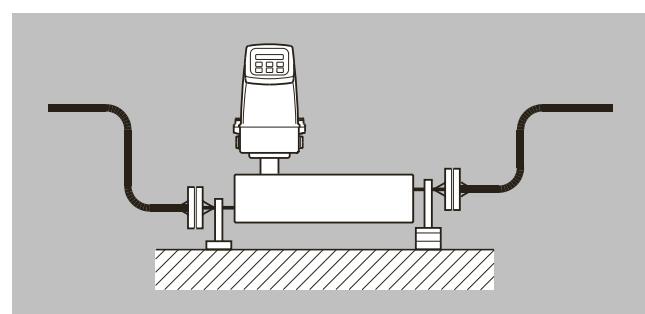
If the liquid is volatile or contains solid particles, vertical mounting is not recommended.

Horizontal:

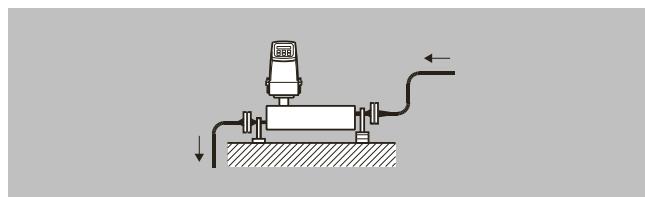
Liquid



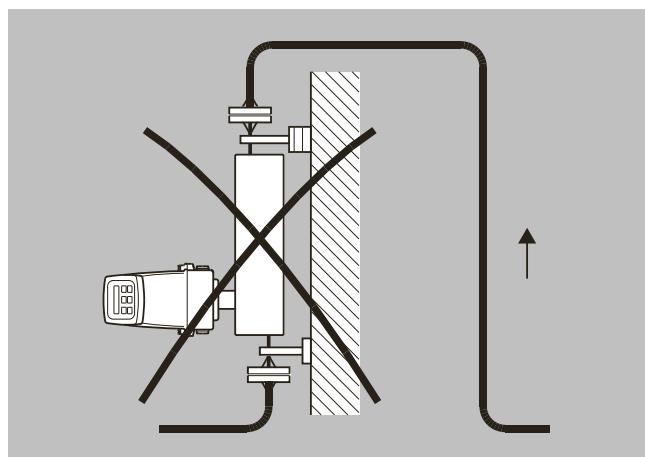
Liquid: example of not recommended horizontal installation



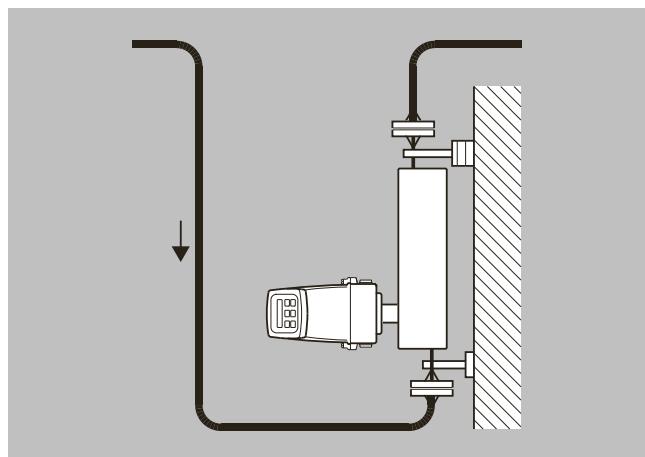
Liquid: example of recommended horizontal installation

Integration (continued)Gas

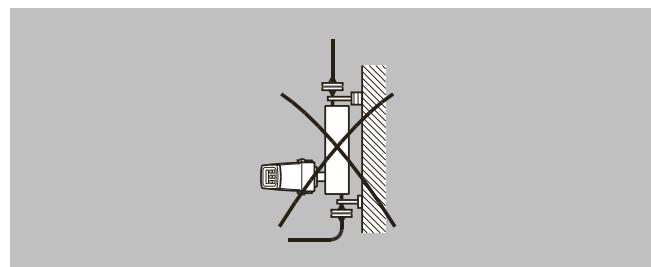
Gas: example of recommended horizontal installation

Vertical:Liquid

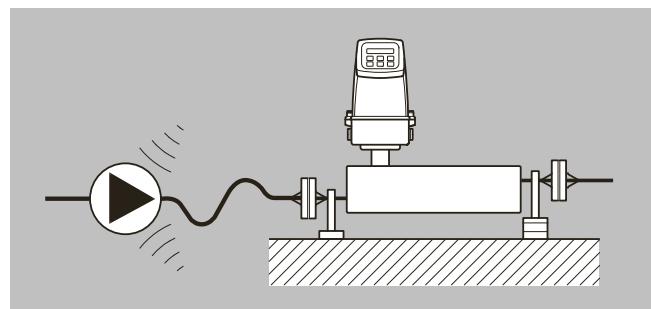
Liquid: example of not recommended vertical installation



Liquid: example of recommended vertical installation

Integration (continued)Gas

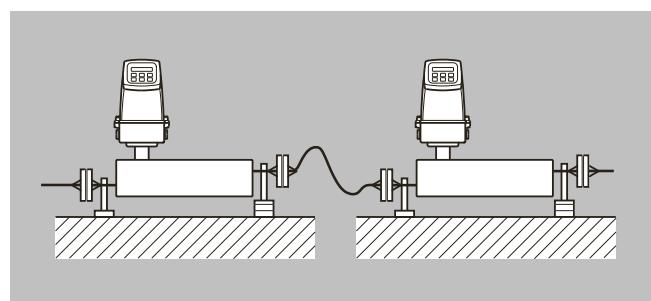
Gas: example of not recommended vertical installation

Vibration

Always locate the flowmeter as far away as possible from components that generate mechanical vibration in the piping. Avoid vibration. If necessary use flexible pipes.

Cross talk

Cross talk between sensors mounted close to each other may disturb the measurement. To avoid cross talk never mount more than one meter on each frame and mount flexible hose connections between the sensors as shown.

Zero point adjustment

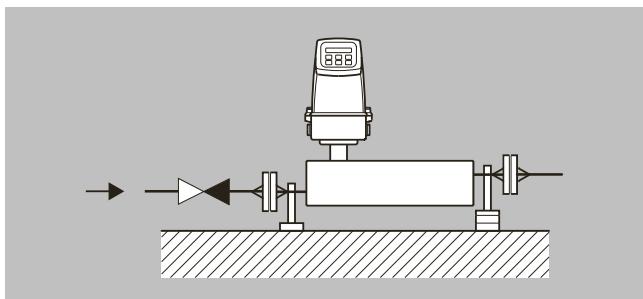
To facilitate zero point adjustment a shut-off valve should always be mounted in connection with the sensor as a proper zero point setting is essential for a good accuracy.

Flow Measurement

SITRANS FC (Coriolis)

Sensors and Flowmeter systems / SITRANS FC MASS 2100 and FC300 DN 4

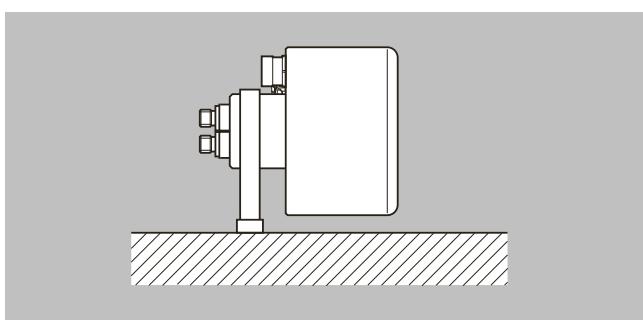
Integration (continued)



Installation guidelines MASS 2100 DI 1.5 (1/16")

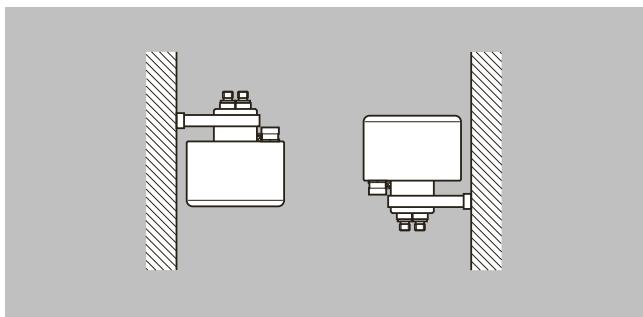
- The optimal installation is horizontal.
- If vertical mounting is necessary, upward flow is recommended to facilitate the removal of air bubbles. To remove the air from the sensor the flow speed in the sensor must be at least 1 m/s.
- If there are solid particles in the liquid, especially in connection with low flow, it is recommended that the sensor be mounted horizontally with inlet flange uppermost so that particles are more easily flushed out. To ensure that the sensor does not become partially empty, there must be sufficient counter-pressure on the unit min. 0.2 bar (2.9 psi).
- Mount the sensor on a vibration-free wall or steel frame.
- Locate the sensor low in the system in order to avoid an under-pressure in the sensor separating air/gas in the liquid.
- Ensure that the sensor is not emptied of liquid (during normal operation) otherwise incorrect measurement will occur.

Horizontal



Liquid and gas application

Vertical



Liquid application (left), gas application (right)

Integration (continued)

Installation guidelines for SITRANS FC300 sensor

Horizontal installation as shown in figure A is recommended with gas or liquid applications.

This installation is also recommended when the flow velocity is low (< 1 m/s) or the liquid contains solid particles or air bubbles.

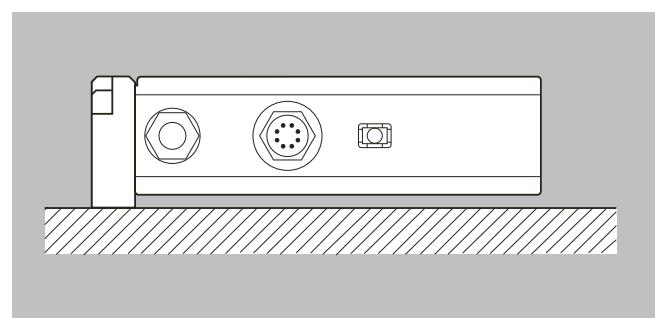
Vertical installation as shown in figure B can be used for liquid or gas applications.

For liquid applications upwards flow is recommended to facilitate the removal of air bubbles and to avoid partly emptying of the sensor.

For gas applications we recommend to place the flow inlet on the sensor high and the outlet low to remove impurities and oil films.

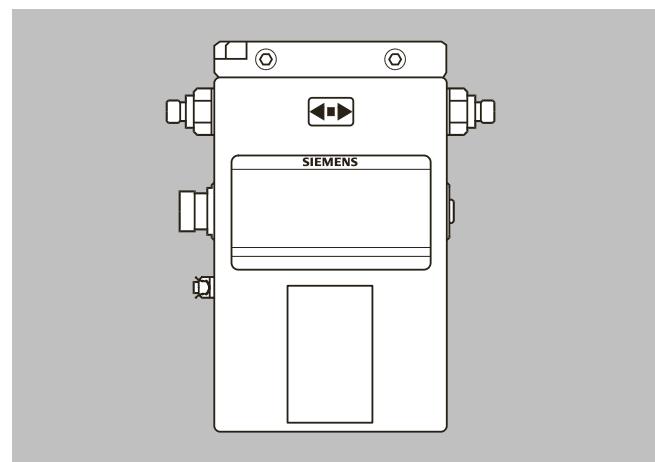
- To ensure that the sensor does not become partly empty, there must be a sufficient counter-pressure on the unit min. 0.2 bar (2.9 psi)
- Mount the sensor on a vibration-free and plane wall or steel frame
- Locate the sensor low in the system in order to avoid under-pressure in the sensor separating air/gas in the liquid
- Ensure that the sensor is not emptied of liquid (during normal operation) otherwise incorrect measurement will occur

Horizontal mounting (recommended)



Liquid or gas (low to high flow)

Vertical mounting



Liquid or gas (medium to high flow)

Technical specifications

Versions dimensions	DI 1.5 (1/16)	DI 3 (1/8)	DI 6 (1/4)	DI 15 (5/8)	FC300 DN 4
Inside pipe diameter [mm (inch)] Sensor consists of one continuous pipe	1.5 (0.06)	3.0 (0.12)	6.0 (0.24)	14.0 (0.55)	SS: 3.5 (0.14) Hast. 3.0 (0.12)
Pipe wall thickness [mm (inch)]	0.25 (0.01)	0.5 (0.02)	1.0 (0.04)	1.0 (0.04)	SS: 0.25 (0.0098) Hast. 0.5 (0.0196)
Mass flow measuring range (liquids) [kg/h (lb/h)]	0 ... 30 (0 ... 66)	0 ... 250 (0 ... 550)	0 ... 1 000 (0 ... 2 200)	0 ... 5 600 (0 ... 12 345)	0 ... 350 (0 ... 772)
Density (for liquids) [g/cm³ (lb/inch³)]	0 ... 2.9 (0 ... 0.10)	0 ... 2.9 (0 ... 0.10)	0 ... 2.9 (0 ... 0.10)	0 ... 2.9 (0 ... 0.10)	0 ... 2.9 (0 ... 0.10)
Fraction e.g. [°Brix]	0 ... 100	0 ... 70 (applicable temperature range: 10 ... 99 °C (50 ... 210.2 °F))	0 ... 70 (applicable temperature range: 10 ... 99 °C (50 ... 210.2 °F))	0 ... 70 (applicable temperature range: 10 ... 99 °C (50 ... 210.2 °F))	0 ... 100
Temperature					
Media temperature	-50 ... +180 °C (-58 ... +356 °F)	-50 ... +180 °C (-58 ... +356 °F)	-50 ... +180 °C (-58 ... +356 °F)	-50 ... +180 °C (-58 ... +356 °F)	-40 ... 115 (40 ... 239) -40 ... 180 (40 ... 356)
Ambient temperature	-20 ... +50 °C (-4 ... +122 °F)	-20 ... +50 °C (-4 ... +122 °F)	-20 ... +50 °C (-4 ... +122 °F)	-20 ... +50 °C (-4 ... +122 °F)	-20 ... +50 °C (-4 ... +122 °F)
Liquid pressure measuring pipe¹⁾					
Stainless steel [bar (psi)]	230 (3 336)	230 (3 336)	265 (3 844)	130 (1 885)	130 (1 885)
Hastelloy C22/2.4602 [bar (psi)]	365 (5 294)	350 (5 076)	410 (5 946)	200 (2 900)	410 (5 945)
Materials					
Measuring pipe, flange and thread connection	Stainless steel AISI 316L/1.4435 Hastelloy C22/2.4602				
Enclosure and enclosure material	IP67 (NEMA 4) and stainless steel AISI 326L/1.4404 The housing is not rated for pressure containment				
Process connections²⁾					
Flange					
• DIN 1092-1, PN 40			DN 10	DN 15	
• ANSI B16.5, Class 150			½"	½"	
• ANSI B16.5, Class 600 (Class 300)			½"	½"	
Dairy (screwed connection, PN 16/25/40) ³⁾					
• DIN 11851			DN 10	DN 15	
• ISO 2853/BS 4825 part 4 (SS3351)			25 mm	25 mm	
Dairy clamp connection (PN 16) ³⁾			25 mm	25 mm	
• ISO 2853/BS 4825 part 3 (SS3016)					
Thread					
• ISO 228/1, PN 100	G ¼" male	G ¼" female	G ¼" male	G ½" male	G ¼" male
• ANSI/ASME B1.20.1, PN 100	¼" NPT male	¼" NPT female	¼" NPT male	½" NPT male	¼" NPT male
Ex-version (sensor)					
• ATEX, IECEx, EAC Ex	Zone 0: Ex ia IIC T3...T6 Ga				
• UL (c-UL-us)	Class I, Div. 1: Grp. A, B, C, D				
• cCSAus	Class 1 Div 1 or Class 1 Zone1				

¹⁾ Max. at 20 °C (68 °F), DIN 2413, DIN 17457²⁾ Other connections to order, see "Selection and Ordering data"³⁾ Material, AISI 316/1.4401 or corresponding
For accuracy specification see "System information SITRANS FC".

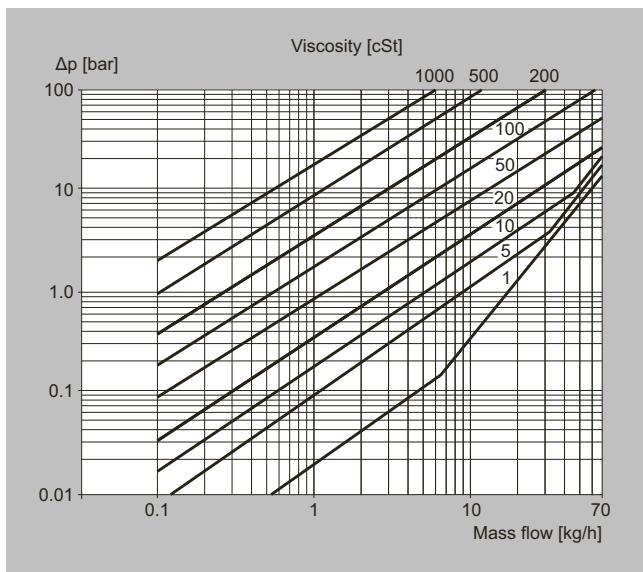
Flow Measurement

SITRANS FC (Coriolis)

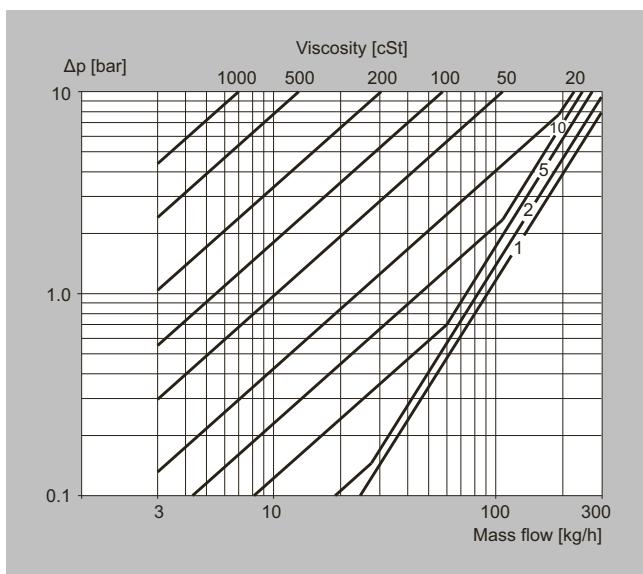
Sensors and Flowmeter systems / SITRANS FC MASS 2100 and FC300 DN 4

Technical specifications (continued)

Pressure drop MASS 2100

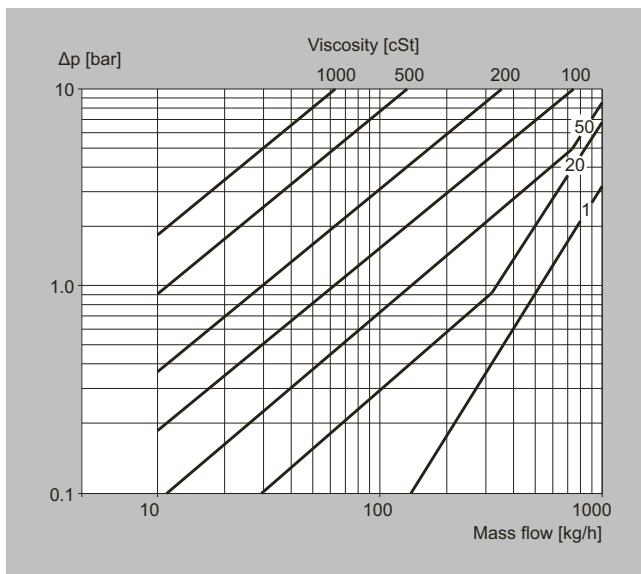


MASS 2100 DI 1.5 (1/16"), pressure drop for density = 1 000 kg/m³

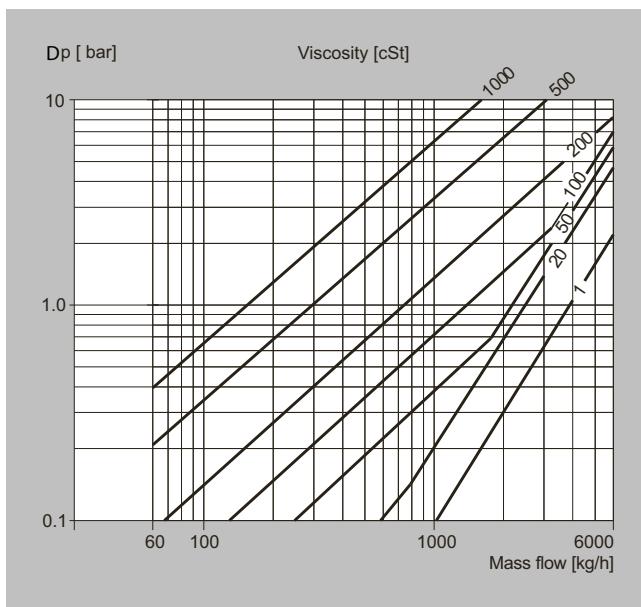


MASS 2100 DI 3 (1/8"), pressure drop for density = 1 000 kg/m³

Technical specifications (continued)



MASS 2100 DI 6 (1/4"), pressure drop for density = 1 000 kg/m³



MASS 2100 DI 15 (1/2"), pressure drop for density = 101 500 kg/m³

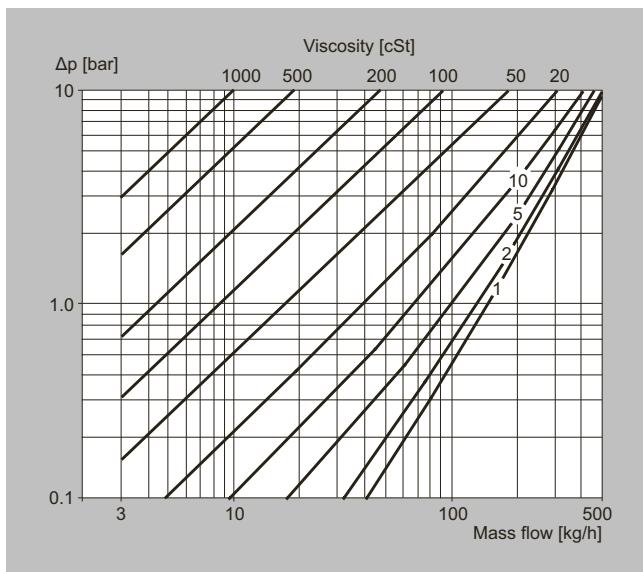
Flow Measurement

SITRANS FC (Coriolis)

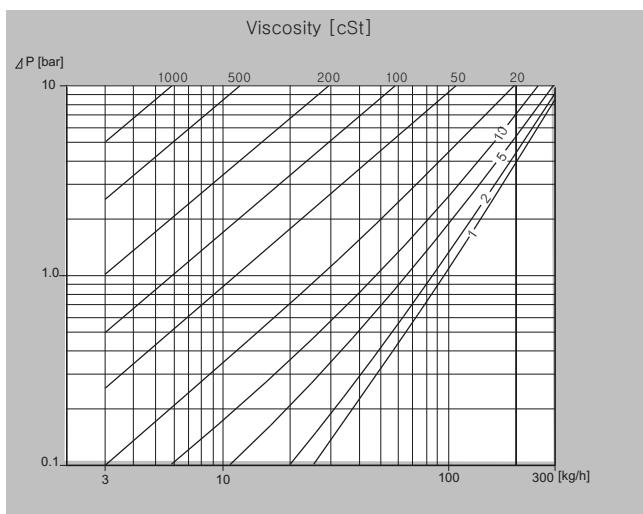
Sensors and Flowmeter systems / SITRANS FC MASS 2100 and FC300 DN 4

Technical specifications (continued)

Pressure drop FC300 DN4



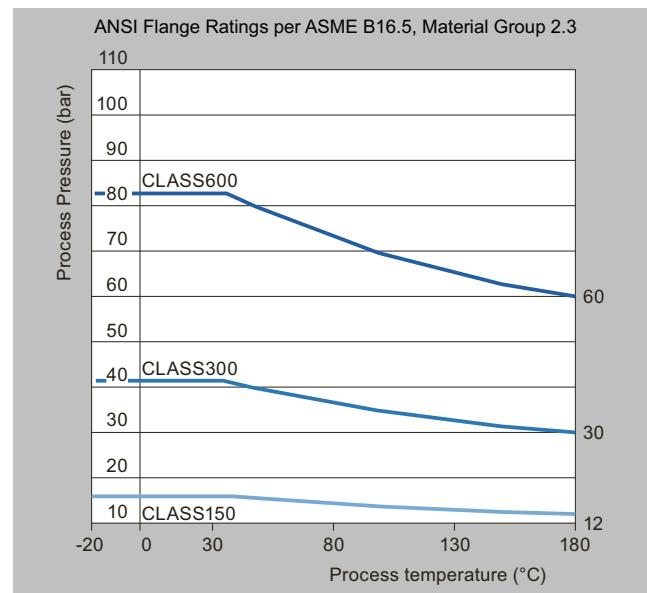
Stainless steel 316L/1.4404



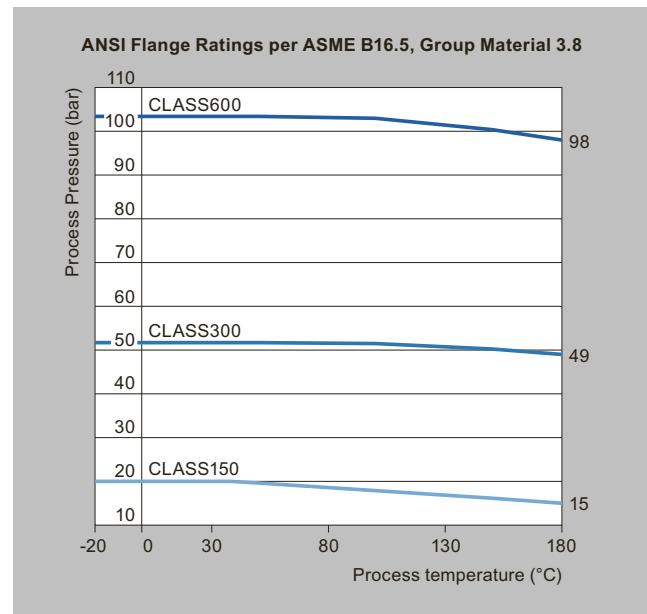
SITRANS FC300 DN 4, pressure loss, viscosity and flow rate for Hastelloy C22 / 2.4602

Technical specifications (continued)

Pressure/temperature curves MASS 2100 DI 3 ... 15



ASME flanges B16.5 stainless steel



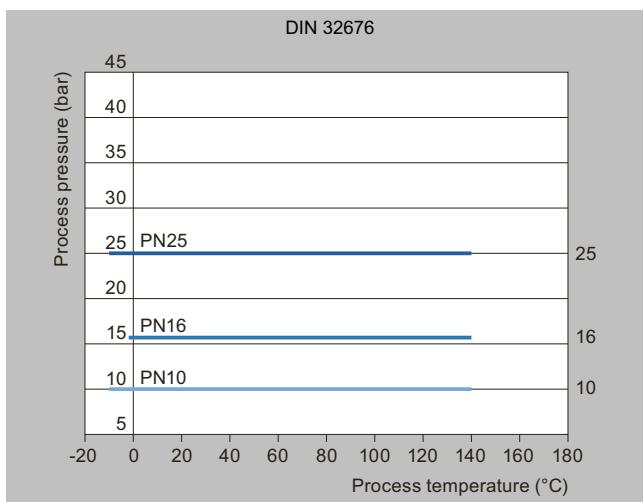
ASME flanges B16.5 Hastelloy C22/2.4602

Flow Measurement

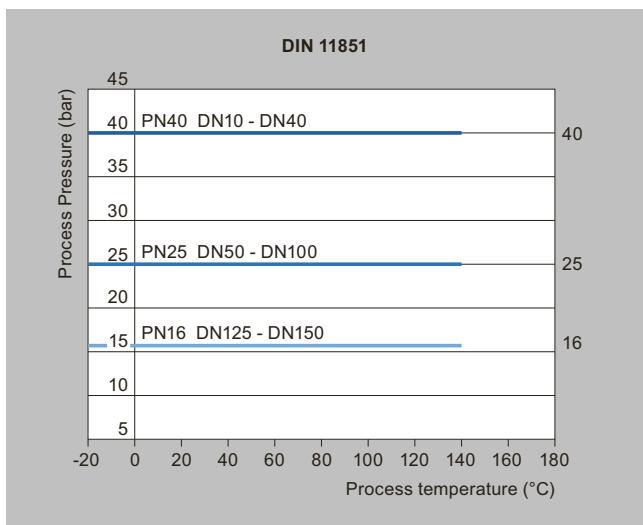
SITRANS FC (Coriolis)

Sensors and Flowmeter systems / SITRANS FC MASS 2100 and FC300 DN 4

Technical specifications (continued)

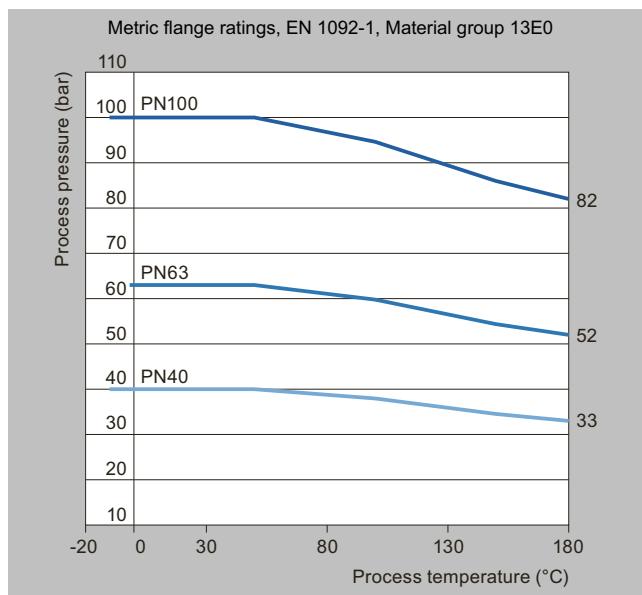


DIN 32676 flanges stainless steel (PN 10 ... PN 25)

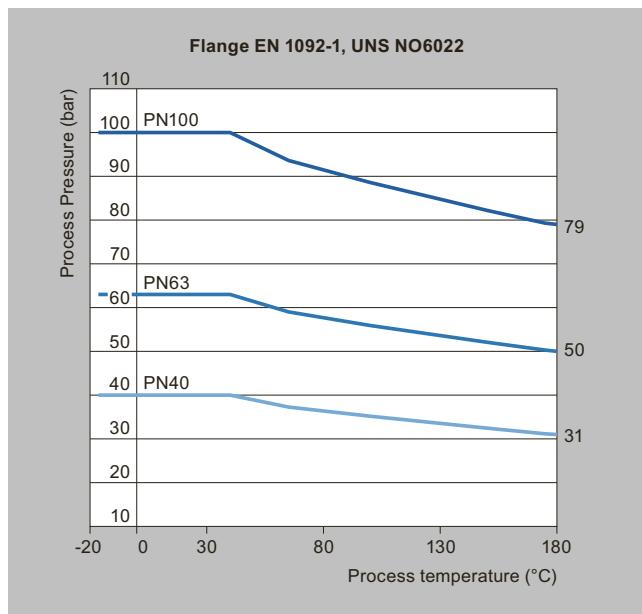


DIN 11851 flanges stainless steel (PN 25 ... PN 40)

Technical specifications (continued)



EN 1092 flanges stainless steel (PN 40 ... PN 100)



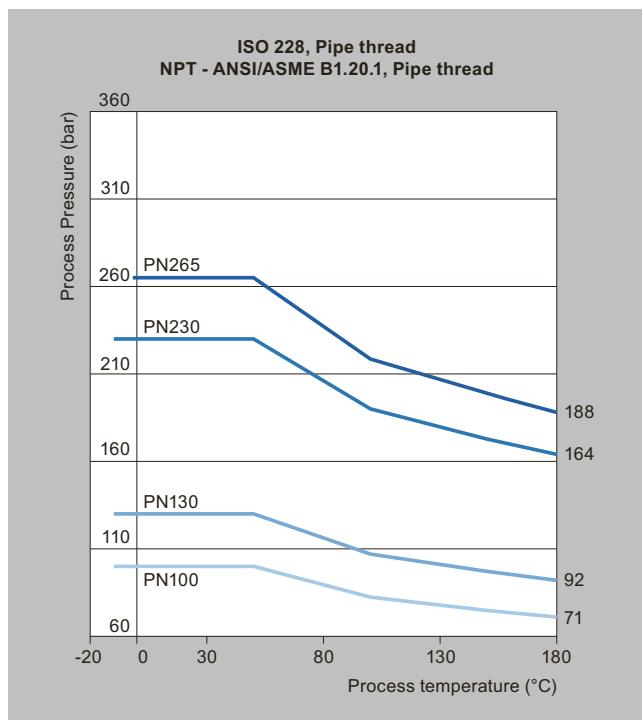
EN 1092 flanges Hastelloy C22/2.4602 (PN 40 ... PN 100)

Flow Measurement

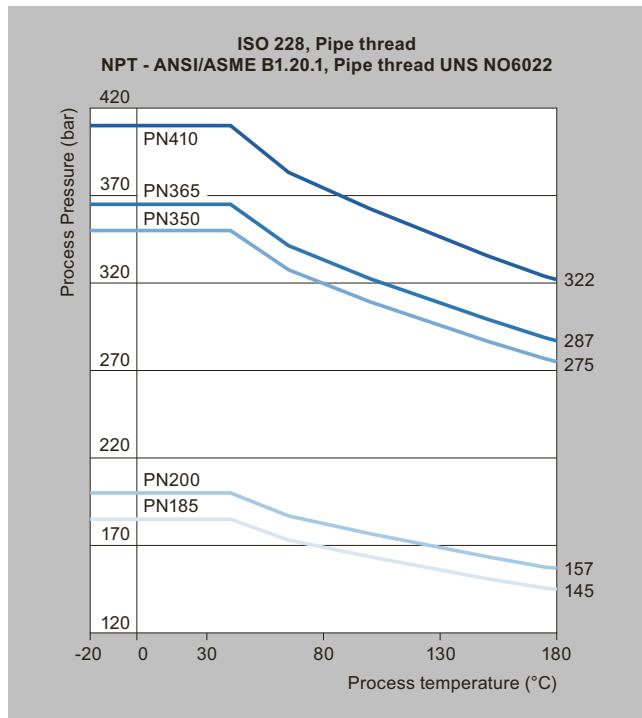
SITRANS FC (Coriolis)

Sensors and Flowmeter systems / SITRANS FC MASS 2100 and FC300 DN 4

Technical specifications (continued)



ISO 228 and NPT pipe thread stainless steel (PN 100 ... PN 265)

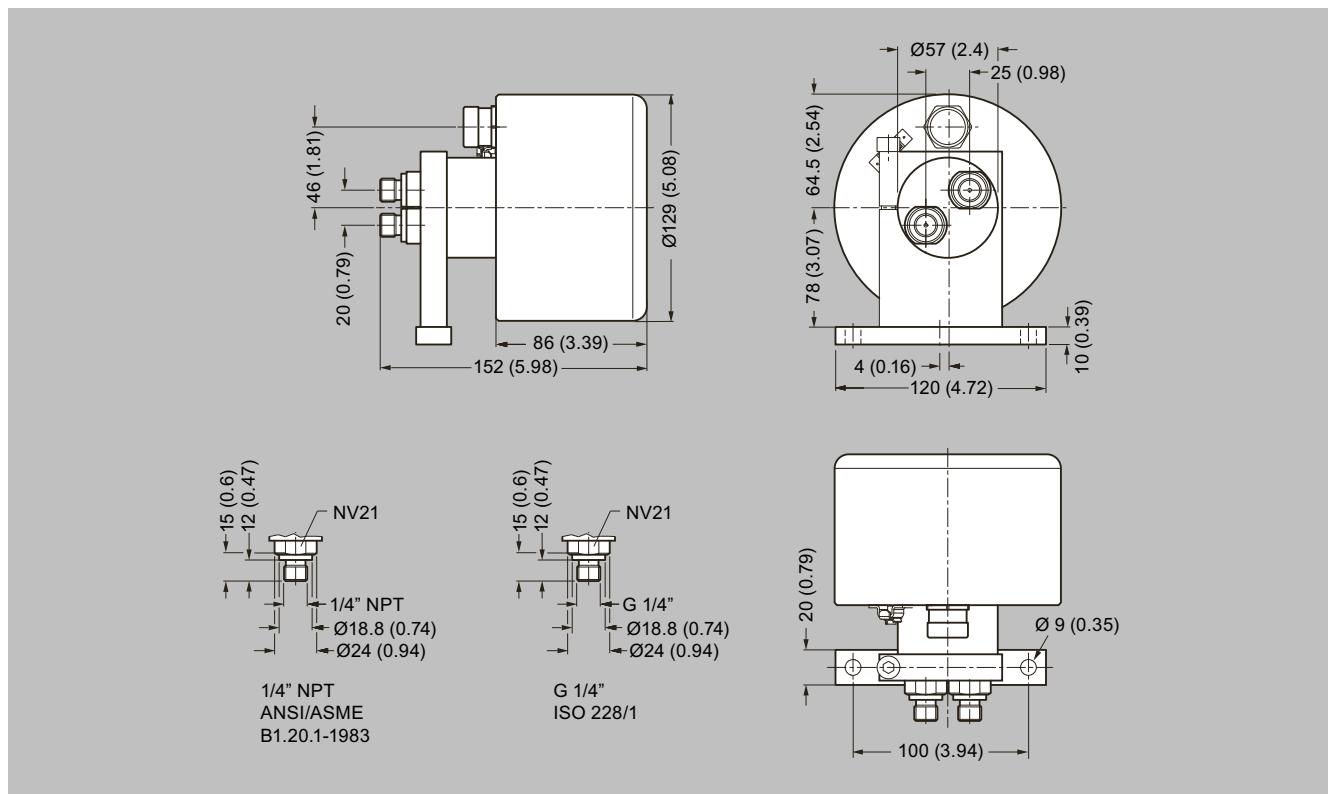


ISO 218 and NPT pipe thread stainless steel (PN 185 ... PN 410)

For further information on the PED standard and requirements, see the pressure equipment directives 2014/68/EU.

Dimensional drawings

MASS 2100 DI 1.5 (1/16")



Dimensions in mm (inch)

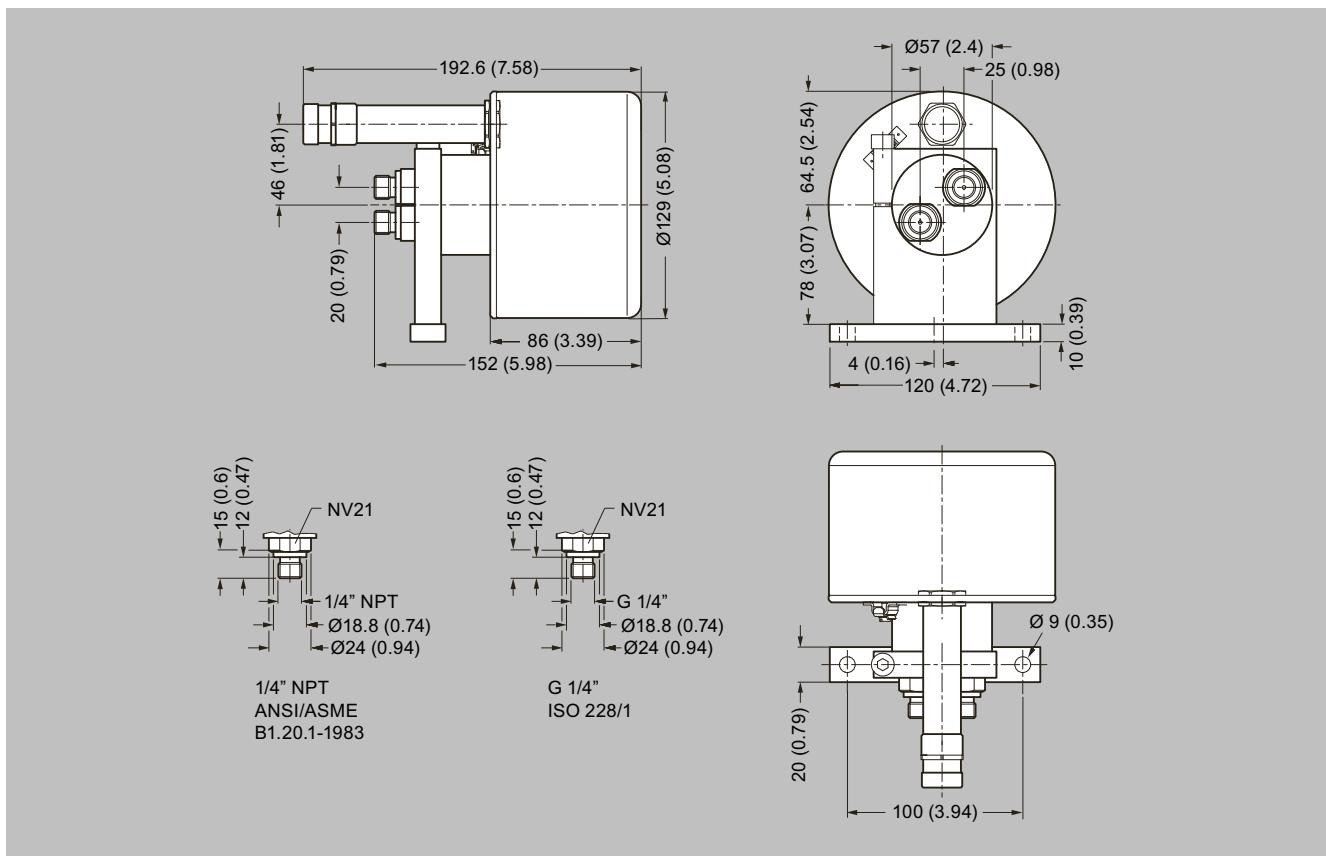
Flow Measurement

SITRANS FC (Coriolis)

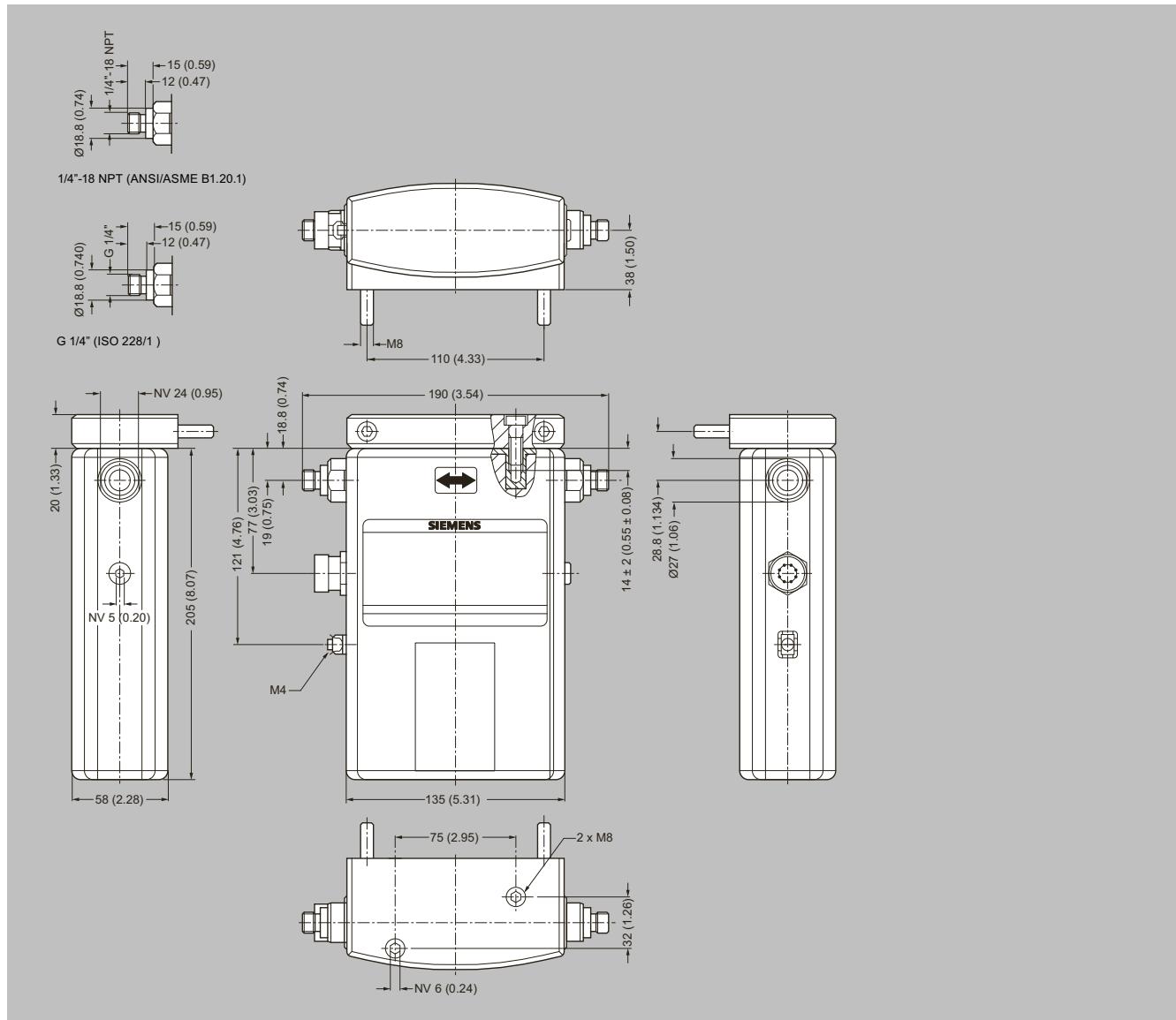
Sensors and Flowmeter systems / SITRANS FC MASS 2100 and FC300 DN 4

Dimensional drawings (continued)

MASS 2100 DI 1.5 High-temperature version to 180 °C (356 °F)



Dimensions in mm (inch)

Dimensional drawings (continued)**SITRANS FC300 DN 4**

SITRANS FC300, weight 3.5 kg (7.7 lb), dimensions in mm (inch)

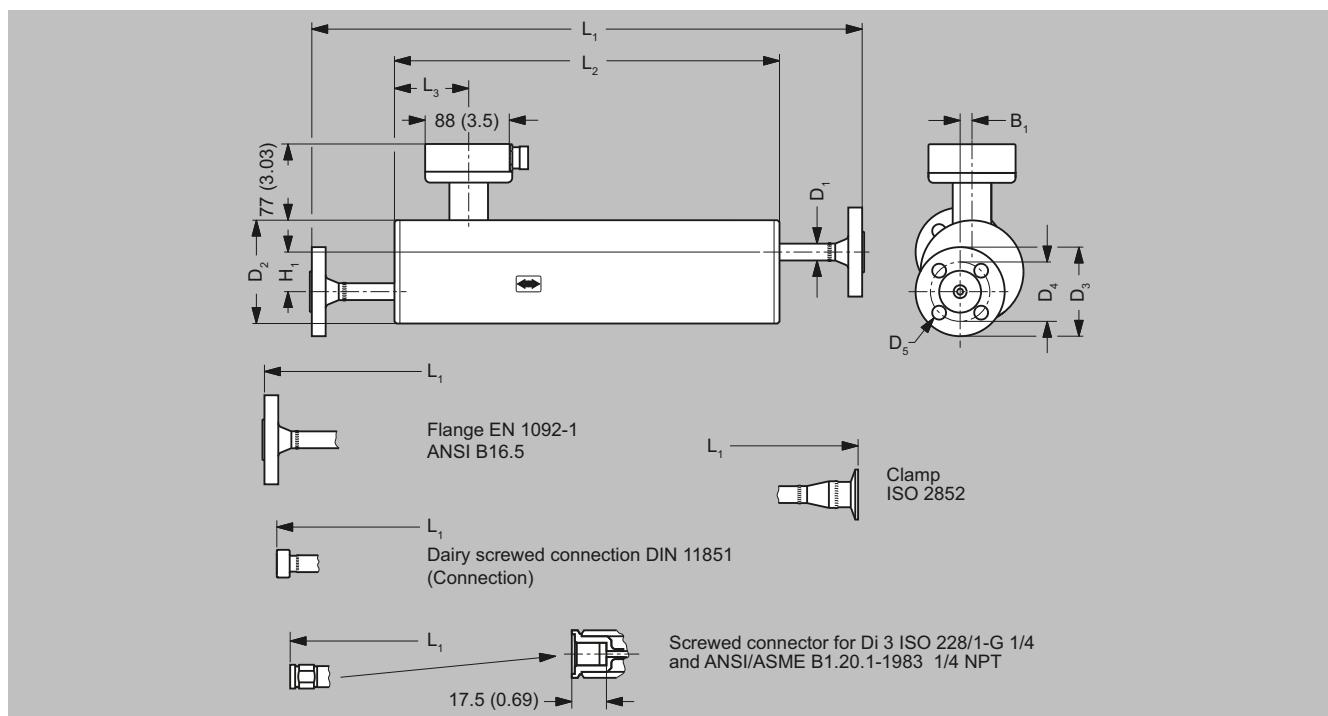
Flow Measurement

SITRANS FC (Coriolis)

Sensors and Flowmeter systems / SITRANS FC MASS 2100 and FC300 DN 4

Dimensional drawings (continued)

MASS 2100 sensor for analog cable connection



Dimensions in mm (inch)

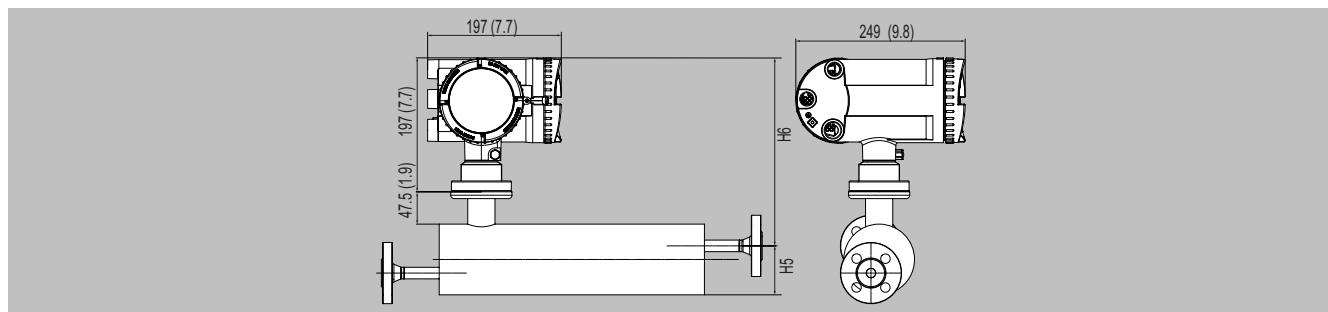
Sensor size	Connections	Type	Pres- sure rat- ing	Size	L1	L2	L3	H1	B1	D1	D2
					mm (inch)						
DN 3 (1/8")	Pipe thread ISO 228/1 - G 1/4 (female)	PN 100	1/4"	470 (18.50)	280 (11.02)	75.5 (2.97)	60 (2.36)	0	21.3 (0.84)	104 (4.09)	
		PN 230	1/4"	470 (18.50)	280 (11.02)	75.5 (2.97)	60 (2.36)	0	21.3 (0.84)	104 (4.09)	
		PN 350	1/4"	470 (18.50)	280 (11.02)	75.5 (2.97)	60 (2.36)	0	21.3 (0.84)	104 (4.09)	
	Pipe thread ANSI/ASME B 1.20.1 - 1/4" NPT (female)	PN 100	1/4"	470 (18.50)	280 (11.02)	75.5 (2.97)	60 (2.36)	0	21.3 (0.84)	104 (4.09)	
		PN 230	1/4"	470 (18.50)	280 (11.02)	75.5 (2.97)	60 (2.36)	0	21.3 (0.84)	104 (4.09)	
		PN 350	1/4"	470 (18.50)	280 (11.02)	75.5 (2.97)	60 (2.36)	0	21.3 (0.84)	104 (4.09)	
DN 6 (1/4")	Pipe thread ISO 228/1 - G 1/4 (male)	PN 100	1/4"	564 (22.20)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
		PN 265	1/4"	564 (22.20)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
		PN 410	1/4"	564 (22.20)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
	Pipe thread ANSI/ASME B 1.20.1 - 1/4" NPT (male)	PN 100	1/4"	564 (22.20)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
		PN 265	1/4"	564 (22.20)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
		PN 410	1/4"	564 (22.20)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
	Flange EN 1092-1	PN 40	DN 10	562 (22.13)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
			DN 15	640 (25.20)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
		PN 100	DN 10	582 (22.91)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
	Flange ANSI B16.5		DN 15	653 (25.71)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
		Class 150	1/2"	627 (24.69)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
			3/4"	672 (26.46)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
	Screwed connection DIN 11851	Class 600	1/2"	610 (24.02)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
			3/4"	695 (27.36)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
		PN 40	DN 10	534 (21.02)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
	Clamp ISO 2852		DN 15	574 (22.60)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
		PN 16	25 mm	572 (22.52)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
	Hygienic screwed ISO 2853		DN 25	575 (22.64)	390 (15.35)	62 (2.44)	40 (1.57)	12 (0.47)	17 (0.67)	104 (4.09)	
DN 15 (1/2")	Pipe thread ISO 228/1 – G 1/2 (male)	PN 100	1/2"	618 (24.33)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
		PN 130	1/2"	618 (24.33)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
		PN 200	1/2"	618 (24.33)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	

Dimensional drawings (continued)

Sensor size	Connections	Type	Pres- sure rat- ing	Size	L1 mm (inch)	L2	L3	H1	B1	D1	D2
DN 15 (1/2")	Pipe thread ANSI/ASME B 1.20.1 - 1/2" NPT (male)	PN 100	1/2"	618 (24.33)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
		PN 130	1/2"	618 (24.33)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
		PN 200	1/2"	618 (24.33)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
	Flange EN 1092-1	PN 40	DN 15	622 (24.49)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
			DN 25	724 (28.50)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
		PN 100	DN 15	635 (25.00)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
	Flange ANSI B16.5		DN 25	760 (29.92)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
		Class 150	1/2"	641 (25.24)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
			3/4"	719 (25.24)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
	Screwed connection DIN 11851	Class 600	1/2"	661 (26.02)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
			3/8"	742 (29.21)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
	Clamp ISO 2852	PN 40	DN 15	588 (23.15)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
			DN 25	674 (26.54)	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	
	Hygienic screwed ISO 2853	PN 16	DN 25	626 (24.65) ¹⁾	444 (17.48)	75 (2.97)	44 (1.73)	20 (0.79)	21.3 (0.84)	129 (5.08)	

¹⁾ For Hastelloy L1 is 628 mm (24.72 inch)

Compact with FCT030



Dimensions in mm (inch)

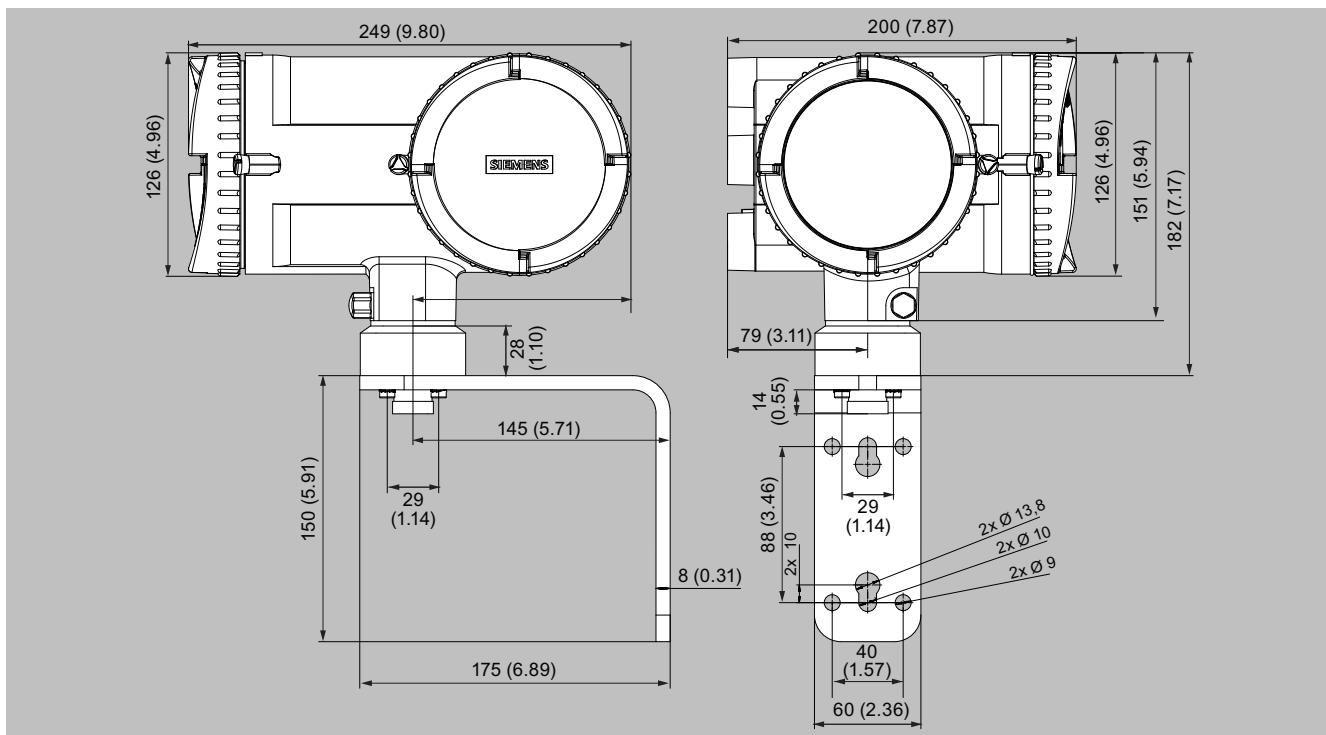
Flow Measurement

SITRANS FC (Coriolis)

Sensors and Flowmeter systems / SITRANS FC MASS 2100 and FC300 DN 4

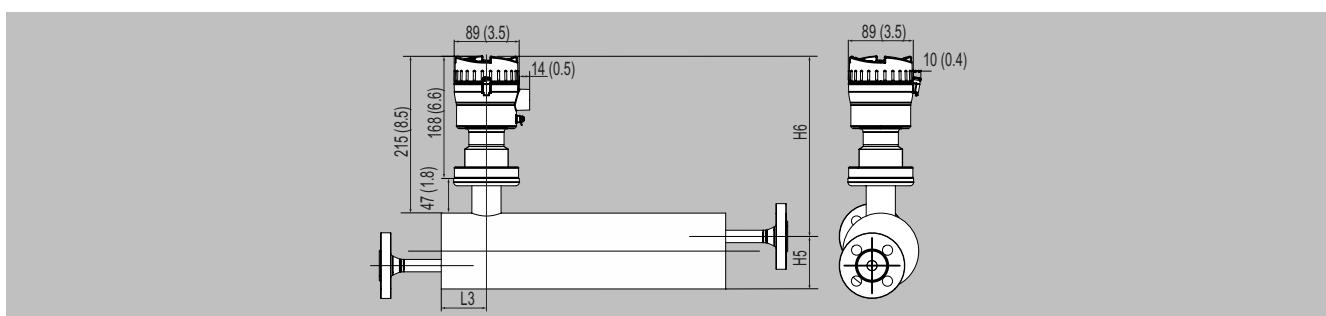
Dimensional drawings (continued)

Transmitter FCT030 remote field mount for M20 analog cable connection



Dimensions in mm (inch)

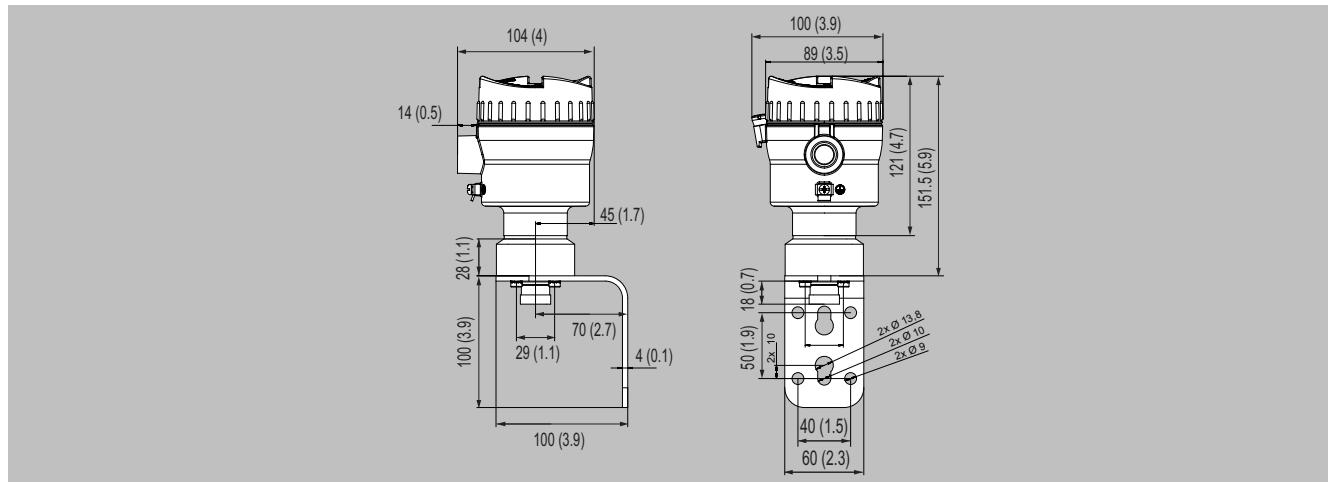
Compact with FCT010



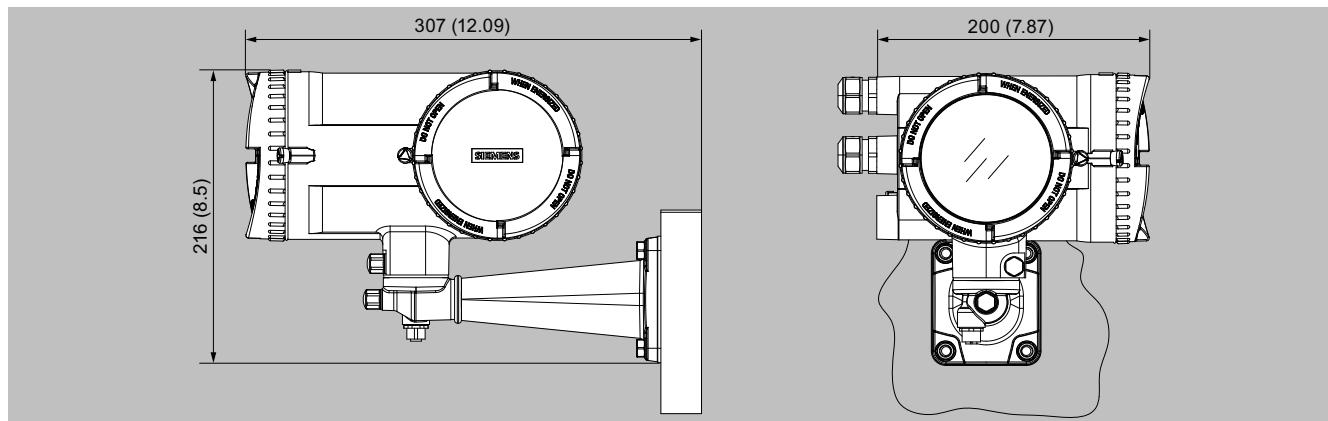
Dimensions in mm (inch)

MASS 2100 with FCT010 transmitter compact

Sensor size	L3 mm (inch)	H5	H6	H5 + H6
DN 3 (1/8")	75.5 (2.97)	82 (3.23)	237 (9.33)	319 (12.56)
DN 6 (1/4")	62 (2.44)	72 (2.83)	247 (9.72)	319 (12.56)
DN 15 (1/2")	75 (2.97)	86.5 (3.41)	257 (10.11)	343.5 (13.52)

Dimensional drawings (continued)**Dimensions for the FCT010 remote mounted (for analog cable connections for MASS 2100 / FC300 DN4)**

Dimensions in mm (inch)

Transmitter FCT030 remote field mount for M12 digital cable connection

Dimensions in mm (inch)

MASS 2100 sensor with "heating jacket"

Sensor size	Connections heated			L5 mm (inch)	H3	B2	D6	D7	D8
	Type	Pressure rating	Size						
DN 3 (1/8")	EN 1092-1	PN 40	DN 15	234 (9.21)	122 (4.8)	22 (0.87)	95 (3.74)	65 (2.56)	14 (0.55)
	ANSI B16.5	Class 150	1/2"	234 (9.21)	131.6 (5.18)	22 (0.87)	88.9 (3.5)	60.5 (2.38)	15.7 (0.62)
DN 6 (1/4")	EN 1092-1	PN 40	DN 15	234 (9.21)	112 (4.41)	22.7 (0.89)	95 (3.74)	65 (2.56)	65 (2.56)
	ANSI B16.5	Class 150	1/2"	234 (9.21)	121.6 (4.79)	22.7 (0.89)	88.9 (3.5)	60.5 (2.38)	60.5 (2.38)
DN 15 (1/2")	EN 1092-1	PN 40	DN 15	234 (9.21)	126.5 (4.98)	31.5 (1.24)	95 (3.74)	65 (2.56)	65 (2.56)
	ANSI B16.5	Class 150	1/2"	234 (9.21)	136.1 (5.36)	31.5 (1.24)	88.9 (3.5)	60.5 (2.38)	60.5 (2.38)