

# Flow Measurement

## SITRANS F C

### Flow sensor SITRANS FC300

#### Overview



SITRANS FC300 is a compact Coriolis mass sensor suitable for flow measurement of a variety of liquids and gases.

The sensor offers superior performance in terms of flow accuracy, turn-down ratio and density accuracy. The ease of installation through a „plug & play“ interface ensures optimum performance and operation.

A new designed encapsulation in stainless steel with a surprisingly low weight of only 3.5 kg (7.7 lb), ensures a rigid and robust sensor performance for a wide range of applications.

#### Benefits

- High accuracy better than 0.1% of mass flow rate
- Large dynamic turn-down ratio better than 500:1
- Densitometer performance available through a density accuracy better than 0.001 g/cm<sup>3</sup> (0.000036 lb/inch<sup>3</sup>) with a repeatability better than 0.0002 g/cm<sup>3</sup> (0.000072 lb/inch<sup>3</sup>)
- One tube without internal welds, reductions or flow splitters offers optimal hygiene, safety and CIP cleanability for food and beverage and pharmaceutical applications
- Larger wall thickness, ensures optimal life-time and corrosion resistance and high-pressure durability
- Balanced pipe design with little mechanical energy loss, ensures optimal performance and stability under non-ideal and unstable process conditions (pressure, temperature, density-changes etc.).
- 4-wire Pt1000 temperature measurement ensures optimum accuracy on mass flow, density and fraction flow
- Multi-plug electrical connector and SENSORPROM enable true „plug & play“. Installation and commissioning in less than 10 minutes.
- Intrinsically safe Ex design ia IIC as standard
- Sensor pipe available in high-quality AISI 316L stainless steel mat. no. 1.4435 or Hastelloy C22 mat. no. 2.4602 offering optimum corrosion resistance.
- Rugged and space-saving sensor design in stainless steel matching all applications.
- High-pressure program as standard
- The sensor calibration factor is also valid for gas measurement.

#### Application

The industry today has an increasing demand for mass flowmeters with a reduced physical size without loss of performance. The meters must be suitable for installation in traditional process industry environment as well as OEM equipment for instance within automotive or appliance industry. Independent of industry application the meter must deliver accurate and reliable measurements. The new and versatile design of the FC300 offers this flexibility.

#### The main applications for the SITRANS FC300 DN 4 can be found in:

<b>Chemical industry</b>	Liquid and gas measurement in normal as well as corrosive environments
<b>Cosmetic industry</b>	Dosing of essence and fragrances
<b>Pharmaceutical industry</b>	High-speed dosing and coating of pills, filling of ampuls/injectors
<b>Food and beverage industry</b>	Filling, dosing of flavorings, colors and additives, inline density measurement Measurement and dosing of liquid or gaseous CO <sub>2</sub>
<b>Automotive industry</b>	Fuel injection nozzle and pump testing, filling of AC units, engine consumption, paint robots, ABS test-beds

#### Design

The FC300 sensor consists of a single tube bent in double omega pipe geometry, welded directly to the process connectors at each end. The sensor is available in 2 material configurations, AISI 316L or Hastelloy C22 with 1/4"-NPT or G1/4"-ISO process connections.

The enclosure is made of stainless steel AISI 316L mat. no. 1.4409 with a grade of encapsulation of IP66/NEMA4. The enclosure has a very robust design and with an overall size of 130 x 200 x 60 mm (5.12" x 7.87" x 2.36") the sensor is very compact and requires only little installation space.

The sensor can be delivered in a standard version with a maximum liquid temperature of 115 °C (239 °F) or a high-temperature version, with raised electrical connector for 180 °C (356 °F).

The sensor can be installed in horizontal or vertical position. The sensor can be mounted directly on any given plane surface or if desired with the enclosed quick release clamp fitting which, along with its compact design and multi-plug electrical connector, will keep installation costs and time to a minimum.

#### Function

The measuring principle is based on the Coriolis effect. See "System information SITRANS F C Coriolis mass flowmeters".

#### Integration

The sensor can be connected to all MASS 6000 transmitters for remote installation only.

All sensors are delivered with a SENSORPROM containing all information about calibration data, identity and factory pre-programming of transmitter settings

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#### 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.

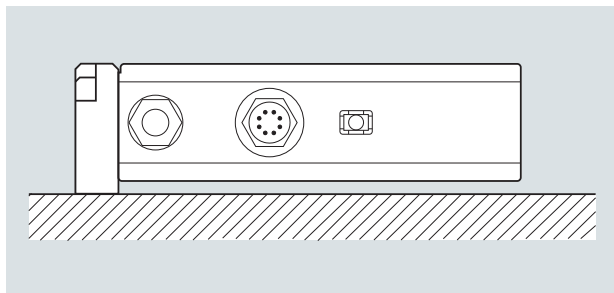
Vertical installation as shown in figure B can be used for liquid or gas applications.

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.

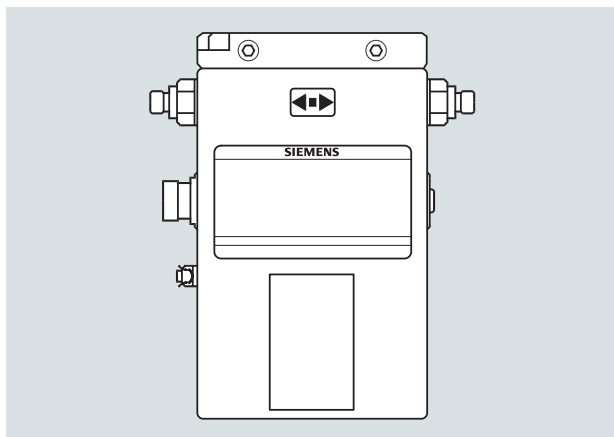
- To ensure that the sensor does not become partly empty, there must be a sufficient counter-pressure on the unit min. 0.1 to 0.2 bar.
- Mount the sensor on a vibration-free and plane wall or steel frame.
- Locate the sensor low in the system in order to avoid under-pressure in the sensor separating 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) (fig. A)



Liquid or gas (low to high flow)

Vertical mounting (fig. B)



Liquid or gas (medium to high flow)

#### Technical specifications

Sensor size	DN 4 (1/6")
<b>Mass flow</b>	
Measuring range	0 ... 350 kg/h (0 ... 772 lb/h)
Accuracy, mass flow	0.1% of rate
Repeatability	0.05 of rate
Max. zero point error	0.010 kg/h (0.022 lb/h)
<b>Density</b>	
Density range	0 ... 2.9 g/cm <sup>3</sup> (0 ... 0.105 lb/inch <sup>3</sup> )
Density error	0.0015 g/cm <sup>3</sup> (0.000036 lb/inch <sup>3</sup> )
Repeatability error	0.0002 g/cm <sup>3</sup> (0.0000072 lb/inch <sup>3</sup> )
<b>Temperature</b>	
Standard	-40 ... +115 °C (-40 ... +239 °F)
High-temperature version	-40 ... +180 °C (-40 ... +356 °F)
Temperature error	0.5 °C (0.9 °F)
<b>BRIX</b>	
Measuring range	0 ... 100 BRIX
Brix error	0.3 BRIX
<b>Inside pipe diameter</b>	
Stainless steel version	3.5 mm (0.14")
Hastelloy version	3.0 mm (0.12")
<b>Pipe wall thickness</b>	
Stainless steel version	0.25 mm (0.0098")
Hastelloy version	0.5 mm (0.0196")
<b>Liquid pressure measuring pipe<sup>1)</sup></b>	
Stainless steel	130 bar (1885 psi) at 20 °C (68 °F)
Hastelloy C22	410 bar (5945 psi) at 20 °C (68 °F)
<b>Materials</b>	Mat. no. 1.4435 (AISI 316L) Stainless steel
Measuring pipe and connection	Mat. no. 2.4602 (Hastelloy C22)
<b>Enclosure<sup>2)</sup></b>	
Material	Mat. no. 1.4404 (AISI 316L) Stainless steel
Enclosure grade	IP67/NEMA4
<b>Connection thread</b>	
ISO 228/1	G1/4" male
ANSI/ASME B1.20.1	1/4" NPT male
<b>Ex approval</b>	EEx ia IIC T3-T6 05ATEX138072X UL/CSA
<b>Weight</b>	3.5 kg (7.7 lb)
<b>Dimensions</b>	135 x 205 x 58 mm (5.31" x 8.07" x 2.28")

<sup>1)</sup> According to DIN 2413, DIN 17457

<sup>2)</sup> Housing is not rated for pressure containment.

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Selection and Ordering data	Order No.	Order code
<b>SITRANS F C Flow sensors</b>		
<b>SITRANS FC300 DN 4 (1/6") sensor, without heating jacket<sup>1)</sup></b>	<b>7ME4400-</b>	
<b>Pipe material and temperature</b>		
Stainless steel mat. no. 1.4435/316L	<b>1 G</b>	
115 °C (239 °F)	<b>1 H</b>	
180 °C (356 °F)		
Mat. no. 2.4602/Hastelloy C22	<b>2 G</b>	
115 °C (239 °F)	<b>2 H</b>	
180 °C (356 °F)		
<b>Pressure</b>		
PN 100	<b>D</b>	
PN 130 (316L)	<b>G</b>	
PN 410 (C22)	<b>Q</b>	
<b>Process connection</b>		
Pipe thread		
G 1/4" male	<b>1 0</b>	
1/4" NPT male	<b>1 1</b>	
<b>Configuration</b>		
Standard		<b>1</b>
Density		<b>2</b>
BRIX/PLATO		<b>3</b>
Fraction (specification required)		<b>9</b>
<b>Transmitter compact mounted on sensor</b>		<b>N 0 Y</b>
No transmitter, sensor and adapter only		<b>A</b>
MASS 6000, Ex d, stainless steel enclosure, 1 current, 1 freq./pulse and 1 relay output, 24 V AC/DC with EEx de [ia/ib] T3 -T6 Ex-approval		<b>B</b>
MASS 6000, IP67, Polyamide enclosure, cable glands M20, 1 current, 1 freq./pulse and 1 relay output, 24 V AC/DC		<b>C</b>
MASS 6000, IP67, Polyamide enclosure, cable glands M20, 1 current, 1 freq./pulse and 1 relay output, 115/230 V AC 50/60 Hz		<b>D</b>
MASS 6000, IP67, Polyamide enclosure, cable glands 1/2" NPT, 1 current, 1 freq./pulse and 1 relay output, 24 V AC/DC		<b>E</b>
MASS 6000, IP67, Polyamide enclosure, cable glands 1/2" NPT, 1 current, 1 freq./pulse and 1 relay output, 115/230 V AC 50/60 Hz, 1/2" NPT		<b>F</b>
<b>Cable</b>		
No cable		<b>A</b>
5 m (16.4 ft) cable		<b>B</b>
10 m (32.8 ft) cable		<b>C</b>
25 m (82 ft) cable		<b>D</b>
50 m (164 ft) cable		<b>E</b>
75 m (246 ft) cable		<b>F</b>
150 m (492 ft) cable		<b>G</b>
<b>Calibration</b>		
Standard calibration 3 flow x 2 points		<b>1</b>
Standard calibration matched pair 3 flow x 2 points		<b>2</b>
Accredited calibration matched pair 5 flow x 2 points (DANAK)		<b>3</b>
Extended calibration customer-specified select Y60, Y61, Y62 or Y63 (see additional information)		<b>8</b>

<sup>1)</sup> Not possible to order DN 4 sensor with heating jacket

### Operating instructions for SITRANS F C FC300

Description	Order No.
Operating instructions for SITRANS F C FC300	
• English	<b>A5E00698213</b>
• German	<b>A5E00728101</b>
• Spanish	<b>A5E00746629</b>
• French	<b>A5E00746625</b>
This device is shipped with a Quick Start guide and a CD containing further SITRANS F literature.	
All literature is also available for free at: <a href="http://www.siemens.com/flowdocumentation">http://www.siemens.com/flowdocumentation</a>	

Selection and Ordering data	Order code
<b>Additional information</b>	
Please add "-Z" to Order No. and specify Order code(s) and plain text.	
Pressure testing certificate PED: 97/23/EC	<b>C11</b>
Material certificate EN 10204-3.1	<b>C12</b>
Welding certificate NDT-Penetrant: ISO 3452	<b>C13</b>
Factory certificate according to EN 10204 2.2	<b>C14</b>
Factory certificate according to EN 10204 2.1	<b>C15</b>
Tag name plate, stainless steel	<b>Y17</b>
Tag name plate, plastic	<b>Y18</b>
Customer-specific transmitter setup	<b>Y20</b>
Customer-specified, matched pair (5 x 2)	<b>Y60</b>
Customer-specified calibration (5 x 2)	<b>Y61</b>
Customer-specified, matched pair (10 x 1)	<b>Y62</b>
Customer-specified calibration (10 x 1)	<b>Y63</b>
Cleaned for oil and grease	<b>Y80</b>
Special version	<b>Y99</b>

### Spare parts

Description	Order No.
<b>Multiple plug for cable mounting</b>	<b>FDK-083H5056</b>
<b>Cable with multiple plug</b>	
Standard blue cable between MASS 6000 and MASS 2100,	5 m (16.4 ft) <b>FDK-083H3015</b>
5 x 2 x 0.34 mm <sup>2</sup> twisted and screened in pairs.	10 m (32.8 ft) <b>FDK-083H3016</b>
Temperature range -20 °C ... +110 °C (-4 °F ... +230 °F)	25 m (82 ft) <b>FDK-083H3017</b>
	50 m (164 ft) <b>FDK-083H3018</b>
	75 m (246 ft) <b>FDK-083H3054</b>
	150 m (492 ft) <b>FDK-083H3055</b>
<b>2 kB SENSORPROM unit</b> (Sensor Serial No. and Order No. must be specified by ordering)	<b>FDK-083H4410</b>
<b>Bracket</b>	<b>A5E02590427</b>
<b>Demo suitcase</b> including MASS 6000 and HART module	<b>A5E00789737</b>

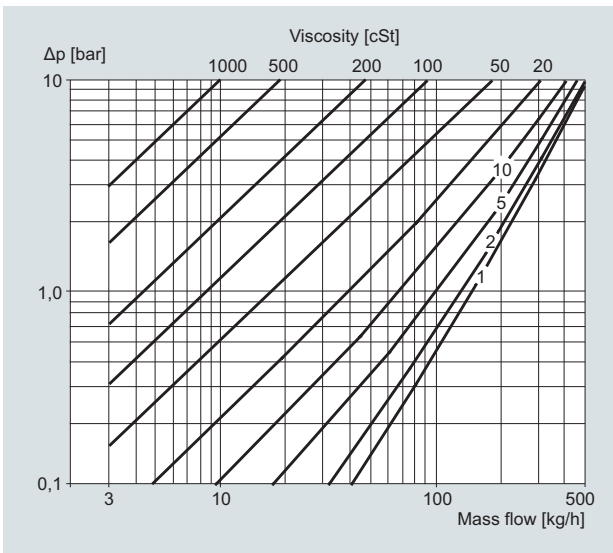
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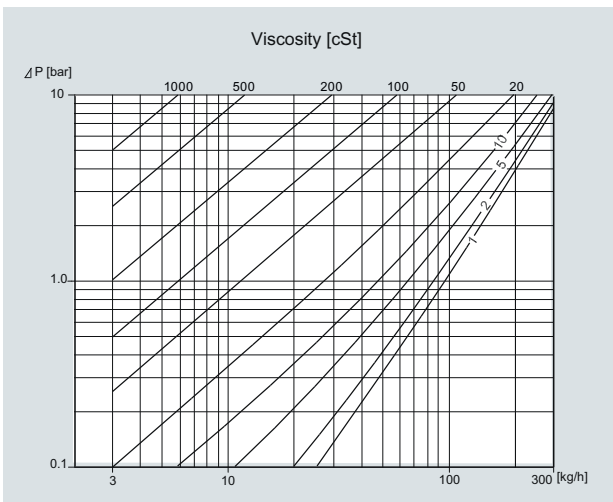
### Characteristic curves

#### Pressure drop

4



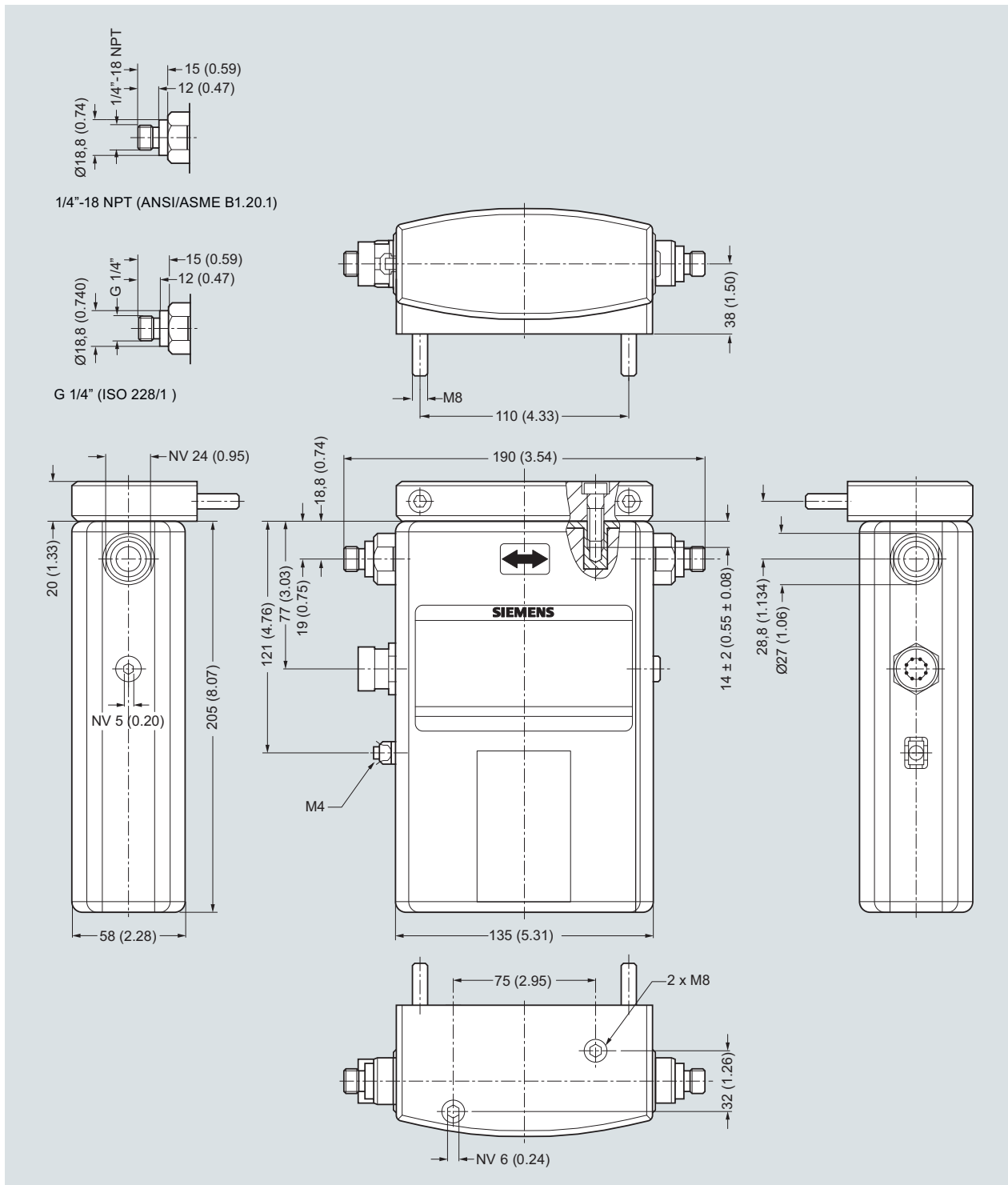
Stainless steel 316L



Hastelloy C22

### Dimensional drawings

#### SITRANS FC300 DN 4



SITRANS FC300, dimensions in mm (inch)