

## Flow Measurement

### SITRANS F C

#### Flow sensor SITRANS FCS300

##### Overview



The flow measuring principle is based on the Coriolis Effect. The FCS300 sensor's measuring tubes are energized by an electro-mechanical driver circuit which oscillates them at their resonance frequency.

Two pick-ups are placed symmetrically upstream and downstream of the central driver. When a process fluid passes through the sensor, the Coriolis Effect will act on the vibrating tubes and cause deflection which can be measured as a phase shift between pick-ups 1 and 2. The phase shift is proportional to the mass flow rate.

The amplitude of the driver is automatically regulated to ensure a stable output from both of the pickups.

The temperatures of the sensor tubes are measured with high precision to provide compensation for changes with temperature in the measuring properties.

The sensor signals are analyzed for flow, density and fluid temperature in the sensor front end. The digital signal is controlled to conform to high Safety Integrated Level (SIL) and sent digitally to the transmitter via standard cable. The FCT030 further calculates total mass and volume, fraction, dosing control and many other functions.

The front-end module has a process noise filter, which can be used to improve the meter's performance when installation and application conditions are not ideal. Typical interferences from process conditions such as pump pulsations, mechanical vibrations, oscillating valves can be reduced considerably.

##### Integration

The SITRANS FCS300 Massflow sensor is 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, INMETRO).

The flowmeter is bidirectional and can be installed in any orientation. The sensor is self-draining in many positions, with vertical mounting preferred.

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](http://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.

##### Installation orientation

The optimal installation orientation is vertical with the flow upwards. This ensures that suspended solids or bubbles are completely pushed through the sensor. A drain valve below the sensor will allow the pipe and sensor to drain completely.

##### Supports

In order to support the weight of the flowmeter and to ensure reliable measurements when external effects exist (e.g. plant vibrations), the sensor should be installed in rigidly supported pipelines.

Supports or hangers should be installed symmetrically and stress-free in close proximity to both of the process connections.

##### 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.

##### System design

- The sensor design consists of process connections, inlet and outlet manifolds mounted in a stiff frame and two parallel tubes equally sharing the process medium flow.
- The sensing tubes are curved in the CompactCurve shape which gives high sensitivity and low pressure loss. The CompactCurve shape was selected to ensure that the smallest flows are measured with optimal signal to noise ratio.
- Careful mounting of the pipeline with regard to minimizing vibration at the meter will ensure a secure measurement environment.

##### Installation guidelines

- The mass flowmeter does not require any flow conditioning or straight inlet pipe sections. Care should be exercised however to ensure that any upstream valves, gates, sight glasses etc. do not cavitate and are not set into vibration by the flow.
- It is always preferred to place the flowmeter upstream of any control valve or other pipeline component which may cause flashing, cavitation or vibrations.
- The presence of gas bubbles in the fluid may result in erroneous measurements, particularly in the density measurement. Therefore the flowmeter should not be installed at the lowest pressure point in the liquid piping system or where vapour can collect. Install the meter in pipeline sections with high pressure to maintain system pressure and compress any bubbles.
- Drop lines downstream from the flow sensor should be avoided to prevent the meter tube from draining during flowing conditions. A back-pressure device or orifice is recommended to ensure that flow does not separate within the flow sensor but the metering section remains at positive pressure at all times while there is flow.
- The flowmeter should not come into contact with any other objects. Avoid making attachments to the housing except for the pressure guard components (if required).
- When the connecting pipeline is larger than the sensor size, suitable standard reducers may be installed. A selection of oversize and undersize connections can be ordered - refer to the sizes tables below.

- The flow sensor may be supported at the junction between process connection and the manifold, but should not be used to support adjacent piping. Ensure that the piping is also supported on both sides so that connection stresses are neutral.
- If strong vibrations exist in the pipeline, they should be damped using elastic pipeline elements. The damping devices must be installed outside the supported flowmeter section. Direct connection of flexible elements to the sensor should be avoided.
- Make sure that any dissolved gases, which are present in many liquids, do not outgas. The back pressure at the outlet should be at least 0.2 bar (3 psi) above the vapour pressure of the process fluid.
- Assure that operation below the vapour pressure cannot occur particularly for fluids with low latent heat of vaporisation.
- The sensor should not be installed in the vicinity of strong electromagnetic fields, e.g. near motors, pumps, variable frequency drives, transformers etc.
- When operating meters on a common mounting base the sensors should be mounted and spaced separate from each other to avoid cross-talk and other vibration interferences.
- When operating meters in interconnected pipelines the pipes should be decoupled to prevent cross talk.

### Remote system cabling

The system is designed so that standard instrumentation cable with four cores and overall screen or two screened pairs can be used, or cable sets can be ordered with the flowmeter. The cable can be ordered in various set lengths and terminated in the field.

Be aware of maximum sensor length cable depending on product selection, currently 75 m. Data transmission speed and process variable update rates may be affected by the cable characteristics. For best results, choose a cable with the following electrical characteristics:

Property	Unit	Value
Resistance	[ $\Omega$ /km]	59
Characteristic impedance	[ $\Omega$ ]	100 @ 1 MHz
Insulation resistance	[M $\Omega$ /km]	200
Maximum voltage	[V]	300

The flowmeter system applies maximum 15 V DC in operation and is certified intrinsically safe. The complete system is insulation tested to 1500 V in production.

Cabling solutions which can be ordered with the flowmeter are as follows:

1. High performance plugged cable using M12 connectors into prepared sockets
2. Cable glands for either metric or NPT threaded terminal housings
3. Plain cable in set lengths to be passed through flexible and rigid conduit (not supplied) for metric or NPT threaded terminal housings

Cable for items 1, 2 and 3 are available either gray for standard applications or light blue for Ex applications to identify the circuit as intrinsically safe.

### Insulation and heating

For applications where pipeline insulation is required for personnel protection or process temperature maintenance, the SITRANS FCS300 flow sensor may also be insulated. The form and material of insulation is not prescribed and entirely depends on the practices at the application location or plant.

Insulation must not be crowded around the sensor pedestal but shaped at a 45° cone to allow the pedestal to radiate excess heat and maintain a suitable working temperature within the front-end housing.

### Calibration

To ensure accurate measurement all flowmeters must be initially calibrated. The calibration of each SITRANS FCS300 Coriolis sensor is conducted at an accredited according to ISO/IEC 17025 flow calibration facility. A calibration certificate for every sensor is stored on the SensorFlash SD card. The accreditation body has signed the ILAC MRA agreement (International Laboratory Accreditation Corporation - Mutual Recognition Arrangement). Therefore the accreditation ensures international traceability and recognition of the test results in 39 countries worldwide, including the US (NIST traceability).

## Flow Measurement

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#### Technical specifications

Flow sensor FCS300		
Parameter	Unit	Value
Process pressure range	[barg (psi)]	The maximum permissible operating pressure is determined by the respective process connection and the temperature of the medium. 316L: 0 ... 100 (0 ... 1450) Nickel-alloy C4 (2.4610) <sup>3)</sup> : 0 ... 100 (0 ... 1450)
Process temperature range	[°C (°F)]	The maximum permissible process temperature is determined by the respective process connection -50 ... +205 (-58 ... +400)
Ambient temperature range	[°C (°F)]	-40 ... +70 (-40 ... +158)
Transport temperature range	[°C (°F)]	-40 ... +70 (-40 ... +158)
Density range	[kg/m <sup>3</sup> (lb/ft <sup>3</sup> )]	1 ... 5000 (0.062 ... 312.2)
Process media	Fluid group Form	1 (suitable for dangerous fluids) Light slurry, liquid and non-condensing gas
No. of process values		
• Primary process values		<ul style="list-style-type: none"> <li>• Mass flow</li> <li>• Density</li> <li>• Process medium temperature</li> </ul>
• Derived process values		<ul style="list-style-type: none"> <li>• Volume flow</li> <li>• Standard volume flow (with reference density)</li> <li>• Fraction A:B</li> <li>• Fraction % A:B</li> </ul>

Performance specifications		Sensor					
Parameter	Unit	DN 15	DN 25	DN 50	DN 80	DN 100	DN 150
Max. zero point error	0.2 % [kg/h (lb/min)]	0.6 (0.0235)	2.16 (0.0792)	7.2 (0.264)	20 (0.735)	41.6 (1.628)	68.8 (2.528)
	0.1 % [kg/h (lb/min)]	0.4 (0.0147) <sup>4)</sup>	1.35 (0.0025) <sup>4)</sup>	4.5 (0.165) <sup>4)</sup>	20 (0.735)	41.6 (1.628)	68.8 (2.528)
Qmin (1 % error)	[kg/h (lb/min)]	70 (2.57)	240 (8.92)	800 (29.4)	2 000 (73.5)	4 000 (146.9)	6 900 (253.5)
Qnom (1 bar pressure)	[kg/h (lb/min)]	4 500 (163.3)	20 500 (753.2)	49 000 (1 800)	122 000 (4 483)	273 000 (10 031)	459 200 (16 873)
Qmax <sup>2)</sup>	[kg/h (lb/min)]	8 000 (293.9.2)	35 000 (1 286)	90 000 (3 307)	250 000 (9 186)	520 000 (19 107)	860 000 (31 600)
Linearity error mass flow							
• for liquids <sup>1)</sup>	[%] standard	± 0.1	± 0.1	± 0.1	± 0.1	± 0.1	± 0.1
	[%] medium	± 0.2	± 0.2	± 0.2	± 0.2	± 0.2	± 0.2
• for gases (additional)	[%]	± 0.40	± 0.40	± 0.40	± 0.40	± 0.40	± 0.40
Repeatability mass flow	[%]	± 0.05	± 0.05	± 0.05	± 0.05	± 0.05	± 0.05
Density accuracy with standard 0.2% calibration	[kg/m <sup>3</sup> (lb/ft <sup>3</sup> )]	± 10 (± 0.62)	± 10 (± 0.62)	± 10 (± 0.62)	± 10 (± 0.62)	± 10 (± 0.62)	± 10 (± 0.62)
Density accuracy with extended 0.1% calibration	[kg/m <sup>3</sup> (lb/ft <sup>3</sup> )]	± 2 (± 0.124) <sup>5)</sup>	± 2 (± 0.124) <sup>5)</sup>	± 2 (± 0.124) <sup>5)</sup>	± 2 (± 0.124) <sup>5)</sup>	± 2 (± 0.124) <sup>5)</sup>	± 2 (± 0.124) <sup>5)</sup>
Temperature error	[°K]	± 0.5	± 0.5	± 0.5	± 0.5	± 0.5	± 0.5

<sup>1)</sup> For reference conditions: ISO 9104 and DIN/EN 29104. Increased error can be expected for gas mass flow measurement (For gas measurement typically + 0.40 % error).

<sup>2)</sup> For gas applications the max. flowrate is calculated at Mach-Number = 0.3.

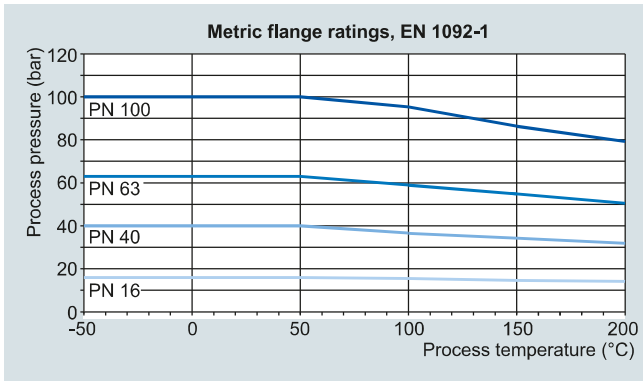
<sup>3)</sup> Hastelloy C is a registered trademark of Haynes International. C4 nickel alloys are equivalent to Hastelloy C4 .

<sup>4)</sup> In preparation: currently as for 0.2 % accuracy class.

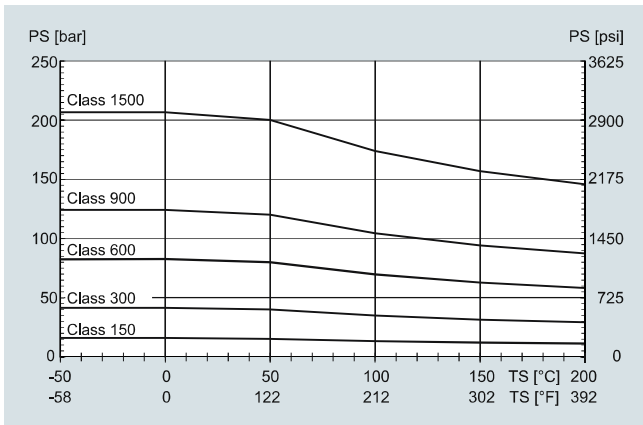
<sup>5)</sup> In preparation: 0.5 kg/m<sup>3</sup>.

**Pressure/temperature curves**

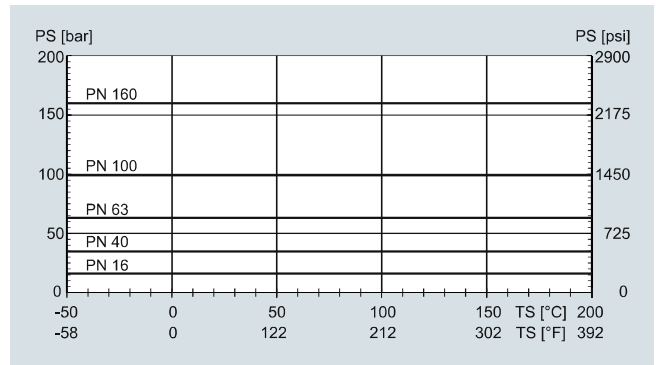
With two major exceptions, the pressure rating of the flow sensors is independent of the process medium temperature. Design rules for flange connections in both the EN1092-1 and ASME B16.5 standards dictate pressure derating with increasing temperature. The charts below show the effect of process medium temperature on the pressure ratings for the flanges within the FCS300 product program.



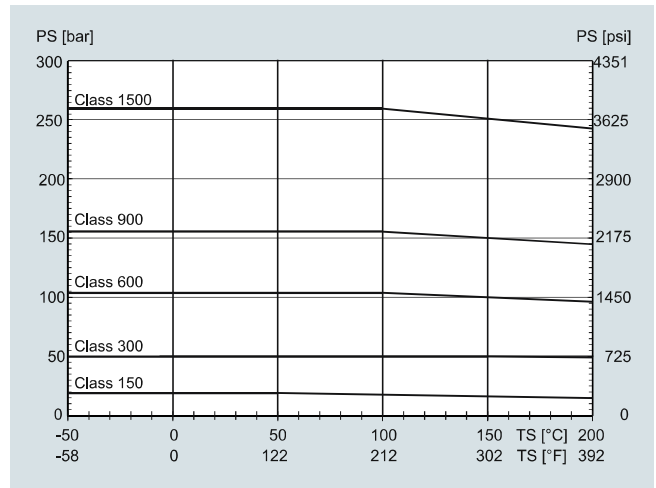
EN1092-1 flanged sensors in AISI 316L



Stainless steel ASME flange 1.4571/1.4404 (AISI 316Ti/316L) up to DN200 (8")



Nickel alloy DIN flange C4 (2.4610) or nickel alloy C22 (2.4602) up to DN200 (8")



Nickel alloy ASME flange C4 (2.4610) or nickel alloy C22 (2.4602) up to DN200 (8")

**Sanitary connection**

Design	Nominal diameter	PS <sub>max</sub>		TS <sub>max</sub>		TS <sub>min</sub>	
		[bar]	[psi]	[°C]	[°F]	[°C]	[°F]
Pipe fitting DIN 11851	DN 15 ... 40 (½ ... 1½")	40	580	140	284	-40	-40
	DN 50 ... 100 (2 ... 4")	25	363	140	284	-40	-40
Pipe fitting SMS 1145	DN 25 ... 80 (1 ... 3")	6	87	140	284	-40	-40
Clamp DIN 32676	DN 15 ... 50 (½ ... 2")	16	232	120	248	-40	-40
	DN 65 ... 100 (2½ ... 4")	10	145	120	248	-40	-40

## Flow Measurement

### SITRANS F C

#### Flow sensor SITRANS FCS300

##### Sensor variants

SITRANS FCS300 sensors are available in a wide range of process connections. The available combinations of type, sensor size and connection size are shown in the tables below.

##### Standard variants

Sensor	Connection	EN 1092-1 B1, PN 16	EN 1092-1 B1, PN 40	EN 1092-1 B2, PN 63	EN 1092-1 B2, PN 100	EN 1092-1 D, PN 40	ANSI B16.5-2009, class 150	ANSI B16.5-2009, class 300	ANSI B16.5-2009, class 600	ANSI B16.5-2009, class 900	ANSI B16.5-2009, class 1500	ISO 228-1 G female pipe thread	ASME B1.20.1 NPT female pipe thread	DIN 11851 hygienic screwed	DIN 32676 (ISO) clamp serie A	SMS 1145 hygienic screwed	JIS B2220:2004/10K	JIS B2220:2004/20K	EN 1092-1 PN 16, NAMUR length	EN 1092-1 PN 40, NAMUR length
<b>Standard: 7ME463.-...</b>																				
DN 15 (½")	DN 10 (¾")		●									●		●	●		●	●		
	DN 15 (½")		●	●	●	●	●	●	●	● <sup>1)</sup>	● <sup>1)</sup>	●	●	●	●		●	●		●
	DN 20 (¾")		●				●							●	●		●	●		
DN 25 (1")	DN 20 (¾")		●				●							●	●		●	●		
	DN 25 (1")		●	●	●	●	●	●	●	● <sup>1)</sup>	● <sup>1)</sup>			●	●	●	●	●		●
	DN 40 (1½")		●	●	●		●	●	●					●	●	●	●	●		
DN 50 (2")	DN 40 (1½")		●	●	●		●	●	●	●	●			●	●	●	●	●		
	DN 50 (2")		●	●	●	●	●	●	●	● <sup>1)</sup>	● <sup>1)</sup>			●	●	●	●	●		●
	DN 65 (2½")		●	●			●	●	●	● <sup>1)</sup>	● <sup>1)</sup>			●	●	●	●	●		
DN 80 (3")	DN 65 (2½")		●	●	●		●	●	●	● <sup>1)</sup>	● <sup>1)</sup>			●	●	●	●	●		
	DN 80 (3")		●	●	●	●	●	●	●	● <sup>1)</sup>	● <sup>1)</sup>			●	●	●	●	●		●
	DN 100 (4")	●	●	●	●		●	●	●	● <sup>1)</sup>	● <sup>1)</sup>			●	●	●	●	●		
DN 100 (4")	DN 80 (3")	●	●	●	●		●	●	●	● <sup>1)</sup>	● <sup>1)</sup>						●	●		
	DN 100 (4")	●	●	●	●		●	●	●	● <sup>1)</sup>	● <sup>1)</sup>						●	●	●	
	DN 150 (6")	●	●	●	●		●	●	●	● <sup>1)</sup>	● <sup>1)</sup>						●	●		●
DN 150 (6")	DN 100 (4")	●	●	●	●		●	●	●	● <sup>1)</sup>	● <sup>1)</sup>						●	●		
	DN 150 (6")	●	●	●	●		●	●	●	● <sup>1)</sup>	● <sup>1)</sup>						●	●	●	
	DN 200 (8")	●	●	●	●		●	●	●	● <sup>1)</sup>	● <sup>1)</sup>						●	●		

<sup>1)</sup> Apply class 600 p and t ratings for class 900 and class 1500 flanges.

##### Hygienic sensor variants

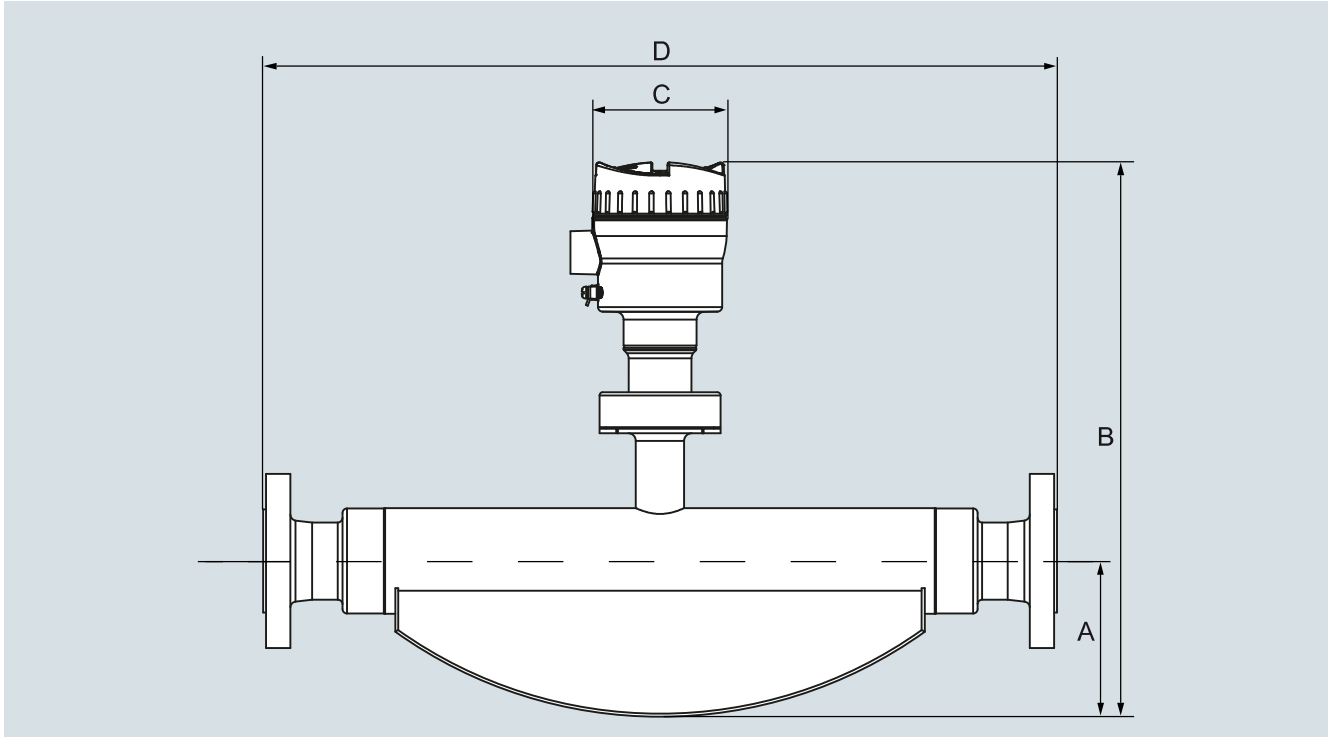
The hygienic sensors will have to be ordered with stainless steel tubes 316L/1.4435/1.4404 (polished). Hygienic sensors are offered with process connection conforming to various international quick-connect clamps or threaded connectors. Pressure ratings are according to the relevant standard and the sensor size.

##### NAMUR sensor variants

The NAMUR variants have built-in lengths according to NAMUR recommendation NE 132. The recommendations of NE 132 are stated for sensors with flanges the same size as the sensor nominal size, and for flanges to EN1092-1 PN 40 with B1 flange facing. For DN 100 and DN 150 flanges to PN 16.

## Dimensional drawings

## Sensor dimensions



Sensor [DN]	[inch]	A		B		C		Weight	
		[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[kg]	[lb]
15	½	80	3.15	358	14.09	90	3.54	4.6	10.1
25	1	103	4.06	398	15.67	90	3.54	7.9	17.4
50	2	126	4.96	435	17.13	90	3.54	25.7	56.7
80	3	181	7.13	525	20.67	90	3.54	66.5	147
100	4	262	10.31	622	24.49	90	3.54	128	282
150	6	317	12.48	714	28.11	90	3.54	207	456

SITRANS FCS300, dimensions in mm (inch), weights in kg (lb), for a EN 1092 PN 40 flanged version.

The built-in length D depends on the flange.

## Flow Measurement

### SITRANS F C

#### Flow sensor SITRANS FCS300

##### Overall length

The overall length (built-in length (D)) of each sensor depends on the connection standard and the pressure rating. The tables below summarize the dimensions available at the time of publishing. Please contact Siemens for further information about our desired process connection specification.

Sensor in AISI 316L: 7ME463.-...

Sensor AISI 316L Connection	DN 15 (½")			DN 25 (1")			DN 50 (2")		
	DN 10 (3/8")	DN 15 (½")	DN 20 (¾")	DN 20 (¾")	DN 25 (1")	DN 40 (1½")	DN 40 (1½")	DN 50 (2")	DN 65 (2½")
EN 1092-1 B1, PN 16									
EN 1092-1 B1, PN 40	385	385	421	576	525	576	763	715	763
EN 1092-1 B2, PN 63		403			564	572	745	745	
EN 1092-1 B2, PN 100		403			564	576	745	745	
EN 1092-1 D, PN 40		385			525			715	
ASME B16.5, class 150		435	421	575	575	576	763	715	756
ASME B16.5, class 300		421			576	576	756	763	
ASME B16.5, class 600		421			576		756	773	
ASME B16.5, class 900		421			576		780	790	800
ASME B16.5, class 1500		421					780	790	800
ISO 228-1 G female pipe thread		450							
ASME B1.20.1 NPT female pipe thread		450							
DIN 11851 Hygienic screwed	413	413	413	590	590	590	763	740	740
DIN 32676 (ISO) Hygienic clamp	413	413	413	590	590	590	763	740	740
SMS 1145 Hygienic screwed					590	590	763	740	740
JIS B2220/10K	385	385	421	576	525	576	763	715	763
JIS B2220/20K	385	385	421	576	525	576	763	715	763
EN 1092-1 PN 16, NAMUR length									
EN 1092-1 PN 40, NAMUR length		510			600			715	

Sensor Connection	DN 80 (3")			DN 100 (4")			DN 150 (6")		
	DN 65 (2½")	DN 80 (3")	DN 100 (4")	DN 80 (3")	DN 100 (4")	DN 150 (6")	DN 100 (4")	DN 150 (6")	DN 200 (8")
EN 1092-1 B1, PN 16		870	875	1222	1122	1260	1569	1421	
EN 1092-1 B1, PN 40	910	870	875	1222	1144	1260	1599	1461	1650
EN 1092-1 B2, PN 63	910	910	1060	1234	1304				
EN 1092-1 B2, PN 100	910	910	1080	1234	1334				
EN 1092-1 D, PN 40		870							
ASME B16.5, class 150		880	880	1244	1144	1330	1630	1485	1650
ASME B16.5, class 300	920	895	1075		1324			1505	1670
ASME B16.5, class 600	920	920	1100	1244	1354		1675	1555	
ASME B16.5, class 900	965	1100	1130	1470	1380		1705	1605	
ASME B16.5, class 1500	965	1300	1150	1500	1400		1725	1665	
ISO 228-1 G female pipe thread									
ASME B1.20.1 NPT female pipe thread									
DIN 11851 Hygienic screwed	990	940	940						
DIN 32676 (ISO) Hygienic clamp	950	910	910						
SMS 1145 Hygienic screwed	990	940							
JIS B2220/10K	910	870		1275	1150	1300			
JIS B2220/20K	910	870		1275	1150	1300			
EN 1092-1 PN 16, NAMUR length					1400			1700	
EN 1092-1 PN 40, NAMUR length		915							

SITRANS FCS300, overall length (D), dimensions in mm

Sensor Connection	DN 15 (½")			DN 25 (1")			DN 50 (2")		
	DN 10 (¾")	DN 15 (½")	DN 20 (¾")	DN 20 (¾")	DN 25 (1")	DN 40 (1½")	DN 40 (1½")	DN 50 (2")	DN 65 (2½")
EN 1092-1 B1, PN 16									
EN 1092-1 B1, PN 40	15,16	15,16	16,57	22,68	20,67	22,68	30,04	28,15	30,04
EN 1092-1 B2, PN 63		15,87			22,20	22,52	29,33	29,33	
EN 1092-1 B2, PN 100		15,87			22,20	22,68	29,33	29,33	
EN1092-1 D, PN 40		15,16			20,67			28,15	
ASME B16.5, class 150		17,13	16,57	22,64	22,64	22,68	30,04	28,15	29,76
ASME B16.5, class 300		16,57			22,68	22,68	29,76	30,04	
ASME B16.5, class 600		16,57			22,68	22,68	29,76	30,43	
ASME B16.5, class 900		16,57			22,68		30,71	31,10	31,50
ASME B16.5, class 1500		16,57			22,68		30,71	31,10	31,50
ISO 228-1 G female pipe thread		17,72							
ASME B1.20.1 NPT female pipe thread		17,72							
DIN 11851 Hygienic screwed	16,26	16,26	16,26	23,23	23,23	23,23	30,04	29,13	29,13
DIN 32676 (ISO) Hygienic clamp	16,26	16,26	16,26	23,23	23,23	23,23	30,04	29,13	29,13
SMS 1145 Hygienic screwed					23,23	23,23	30,04	29,13	29,13
JIS B2220/10K	15,16	15,16	16,57	22,68	20,67	22,68	30,04	28,15	30,04
JIS B2220/20K	15,16	15,16	16,57	22,68	20,67	22,68	30,04	28,15	30,04
EN 1092-1 PN 16, NAMUR length									
EN 1092-1 PN 40, NAMUR length		20,08			23,62			28,15	

Sensor Connection	DN 80 (3")			DN 100 (4")			DN 150 (6")		
	DN 65 (2½")	DN 80 (3")	DN 100 (4")	DN 80 (3")	DN 100 (4")	DN 150 (6")	DN 100 (4")	DN 150 (6")	DN 200 (8")
EN 1092-1 B1, PN 16		34,25	34,45	48,11	44,17	49,61	61,77	55,94	
EN 1092-1 B1, PN 40	35,83	34,25	34,45	48,11	45,04	49,61	62,95	57,52	64,96
EN 1092-1 B2, PN 63	35,83	35,83	41,73	48,58	51,34				
EN 1092-1 B2, PN 100	35,83	35,83	42,52	48,58	52,52				
EN1092-1 D, PN 40		34,25							
ASME B16.5, class 150		34,65	34,65	48,98	45,04	52,36	64,17	58,46	64,96
ASME B16.5, class 300	36,22	35,24	42,32		52,13			59,25	65,75
ASME B16.5, class 600	36,22	36,22	43,31	48,98	53,31		65,94	61,22	
ASME B16.5, class 900	37,99	43,31	44,49	57,87	54,33		67,13	63,19	
ASME B16.5, class 1500	37,99	51,18	45,28	59,06	55,12		67,91	65,55	
ISO 228-1 G female pipe thread									
ASME B1.20.1 NPT female pipe thread									
DIN 11851 Hygienic screwed	38,98	37,01	37,01						
DIN 32676 (ISO) Hygienic clamp	37,40	35,83	35,83						
SMS 1145 Hygienic screwed	38,98	37,01							
JIS B2220/10K	35,83	34,25		50,20	45,28	50,20			
JIS B2220/20K	35,83	34,25		50,20	45,28	50,20			
EN 1092-1 PN 16, NAMUR length					55,12			66,93	
EN 1092-1 PN 40, NAMUR length		36,02							

SITRANS FCS300, overall length (D), dimensions in inch



## Flow Measurement

### SITRANS F C

#### Flow sensor SITRANS FCS300

Sensor in Nickel-Alloy C4: 7ME463.-...

Sensor Nickel-Alloy C4	DN 15 (½")			DN 25 (1")			DN 50 (2")		
	DN 10 (3/8")	DN 15 (½")	DN 20 (¾")	DN 20 (¾")	DN 25 (1")	DN 40 (1½")	DN 40 (1½")	DN 50 (2")	DN 65 (2½")
EN 1092-1 B1, PN 40	449	442	428	646	614	576	814	764	819
EN 1092-1 B2, PN 63	449	442	428	646	614	576	814	764	819
EN 1092-1 B2, PN 100	449	442	428	646	614	576	814	764	819
ANSI B16.5, class 150		442	428	646	614	576	814	764	819
ANSI B16.5, class 300		442	428	646	614	576	814	764	819
ANSI B16.5, class 600		442	428	646	614	576	814	764	819
JIS B2220/10K		442	428	646	614	576	814	764	819

Sensor	DN 80 (3")			DN 100 (4")			DN 150 (6")		
	DN 65 (2½")	DN 80 (3")	DN 100 (4")	DN 80 (3")	DN 100 (4")	DN 150 (6")	DN 100 (4")	DN 150 (6")	DN 200 (8")
EN 1092-1 B1, PN 16			971	1357	1280	1261	1592	1502	
EN 1092-1 B1, PN 40	1021	971	971	1357	1280	1261	1592	1502	
EN 1092-1 B2, PN 63	1021		971	1357	1280	1261	1632	1542	
EN 1092-1 B2, PN 100	1021	971	971	1357	1280	1261	1632	1542	
ANSI B16.5, class 150	1021	971	971	1357	1280	1261	1592	1502	
ANSI B16.5, class 300	1021	971	971	1357	1280	1261	1632	1542	
ANSI B16.5, class 600	1021	971	971	1357	1280	1261	1632	1542	
JIS B2220/10K	1021	971	971	1357	1280	1261	1592	1502	

SITRANS FCS300, overall length (D), dimensions in mm

Sensor	DN 15 (½")			DN 25 (1")			DN 50 (2")		
	DN 10 (3/8")	DN 15 (½")	DN 20 (¾")	DN 20 (¾")	DN 25 (1")	DN 40 (1½")	DN 40 (1½")	DN 50 (2")	DN 65 (2½")
EN 1092-1 B1, PN 40	17.7	17.4	16.9	25.4	24.2	22.7	32.0	30.1	32.2
EN 1092-1 B2, PN 63	17.7	17.4	16.9	25.4	24.2	22.7	32.0	30.1	32.2
EN 1092-1 B2, PN 100	17.7	17.4	16.9	25.4	24.2	22.7	32.0	30.1	32.2
ANSI B16.5, class 150		17.4	16.9	22.6	22.6	22.7	32.0	30.1	31.2
ANSI B16.5, class 300		17.4	16.9	25.4	24.2	22.7	32.0	30.1	31.2
ANSI B16.5, class 600		17.4	16.9	25.4	24.2	22.7	32.0	30.1	31.2
JIS B2220/10K		17.4	16.9	25.4	24.2	22.7	32.0	30.1	32.2

Sensor	DN 80 (3")			DN 100 (4")			DN 150 (6")		
	DN 65 (2½")	DN 80 (3")	DN 100 (4")	DN 80 (3")	DN 100 (4")	DN 150 (6")	DN 100 (4")	DN 150 (6")	DN 200 (8")
EN 1092-1 B1, PN 16			38.2	53.4	50.4	49.6	62.7	59.1	
EN 1092-1 B1, PN 40	40.2	38.2	38.2	53.4	50.4	49.6	62.7	59.1	
EN 1092-1 B2, PN 63	40.2		38.2	53.4	50.4	49.6	64.3	59.1	
EN 1092-1 B2, PN 100	40.2	38.2	38.2	53.4	50.4	49.6	64.3	59.1	
ANSI B16.5, class 150	40.2	38.2	38.2	53.4	50.4	49.6	62.7	59.1	
ANSI B16.5, class 300	40.2	38.2	38.2	53.4	50.4	49.6	64.3	59.1	
ANSI B16.5, class 600	40.2	38.2	38.2	53.4	50.4	49.6	64.3	59.1	
JIS B2220/10K	35.83	34.25	41.73	53.4	50.4	49.6	62.7	59.1	

SITRANS FCS300, overall length (D), dimensions in inch

#### Overview



The complete flowmeter system SITRANS FC330 can be ordered for standard, hygienic or NAMUR service.

The flowmeter is based on the latest developments within digital signal processing technology – engineered for high measuring performance:

- Fast response to rapid changes in flow
- Fast dosing applications
- High immunity against process noise
- High turndown ratio of flowrates
- Suitable for liquid and gas service
- Easy to install, commission and maintain

FC330 is available with current output HART 7.5, Modbus RS485 RTU, PROFIBUS DP or PROFIBUS PA as standard on Channel 1. Additional functions can be freely configured for analog, pulse, frequency, relay or status output or binary input.

The transmitter comes with a user-configurable graphical display and SensorFlash, a micro SD card for configuration backup, firmware update and data storage.

The SITRANS FC330 flowmeter system consists of a SITRANS FCS300 sensor and a SITRANS FCT030 transmitter.

#### Benefits

- It is compact and light, fitting neatly into dense piping arrangements
- Easy maintenance because modules can be exchanged rapidly
- Effective separation of measurement from plant vibration
- Highly secure operation in safety critical applications
- Non-volatile memory of all setup and operation data
- Reliable measurements due to high signal to noise ratio
- Secure, digital transfer of measurement data from the sensor
- Short overall length; easy drop-in replacement into most existing installations

## Flow Measurement

### SITRANS F C

#### Flowmeter SITRANS FC330

#### Technical specifications

<b>Sizes</b>	DN 15 (1/2") DN 25 (1") DN 50 (2") DN 80 (3") DN 100 (4") DN 150 (6")	<b>Process connections</b>	<ul style="list-style-type: none"> <li>• Flanges EN 1092-1 B1, EN 1092-1 B2, EN 1092-1 D, ANSI/ASME B16.5, JIS B 2220</li> <li>• Pipe threads ASME B1.20 (NPT) female pipe thread, ISO228-1 G female pipe thread (BSPP)</li> <li>• Hygienic threads DIN 11851, SMS 1145</li> <li>• Hygienic clamps DIN 32676 serie A</li> </ul>
<b>Accuracy</b>	± 0,10 % or 0,20 % for liquids additional ±0,40 for gases	<b>Approvals</b>	<ul style="list-style-type: none"> <li>• Hazardous area (zone 1) ATEX, IECEx, EAC Ex, CSA, cCSAus (NEPSI, INMETRO, EAC (in preparation))</li> <li>• Pressure equipment PED, CRN (in preparation)</li> <li>• Hygienic EHEDG (DN 25 ... DN 80) (in preparation)</li> <li>• Custody transfer OIML R 117, NTEP (in preparation)</li> <li>• Operational safety (compact system only NAMUR 7ME471) SIL 2 Single (in preparation) SIL 3 Redundant system (in preparation)</li> </ul>
<b>Repeatability</b>	± 0.05 %	<b>NAMUR</b>	NAMUR-compliant (e.g. NE 21, NE 41, NE 107 and NE 132)
<b>Flow range (liquids)</b> (water @ 1 bar pressure loss) ( $Q_{nom}$ )		<b>I/O</b>	Up to 4 channels combining analog, relay or digital outputs and binary input
<ul style="list-style-type: none"> <li>• DN 15 4 500 kg/h (163.3 lb/min)</li> <li>• DN 25 20 500 kg/h (753.2 lb/min)</li> <li>• DN 50 49 000 kg/h (1 800 lb/min)</li> <li>• DN 80 122 000 kg/h (4 483 lb/min)</li> <li>• DN 100 273 000 kg (10 031 lb/min)</li> <li>• DN 150 459 200 kg/h (16 873 lb/min)</li> </ul>		<b>Communication</b>	HART PROFIBUS PA PROFIBUS DP Modbus RTU (RS 485)
<b>Architecture</b>	Compact or remote configuration	<b>EMC performance</b>	Emission EN 55011/CISPR-11 (Class A) Immunity EN/IEC 61326-1 (Industry)
<b>Display</b>	Full graphical display, 240 x 160 pixels with selection of 6 languages	<b>Mechanical load</b>	18 to 400 Hz random The flow meter will mechanically tolerate 3.17 g RMS in all directions. Flow accuracy cannot be guaranteed under all conditions.
<b>Power supply</b>	20 ... 27 V DC ± 10%; 100 ... 240 V AC ± 10 %, 47 ... 63 Hz ± 10%		
<b>Weight</b>	4.6 ... 212 kg		
<b>Material</b>			
<ul style="list-style-type: none"> <li>• Sensor - Wetted parts - Enclosure</li> <li>• Transmitter</li> </ul>	316L stainless steel or Nickel Alloy C4 304 stainless steel Aluminum with corrosion-resistant coating		
<b>Enclosure rating</b>	IP67		
<b>Pressure ratings</b>			
<ul style="list-style-type: none"> <li>• Measuring tubes - 316L - Nickel Alloy C4 (DN 15 ... 50)</li> <li>• Sensor enclosure</li> </ul>	100 bar (1450 psi) 100 bar (1450 psi) No pressure containment		
<b>Temperature ratings</b>			
<ul style="list-style-type: none"> <li>• Process medium</li> <li>• Ambient</li> <li>• Display</li> </ul>	-50 ... +205 °C (-58 ... +400 °F) -40 ... +60 °C (-40 ... +140 °F) <sup>1)</sup> -20 ... +60 °C (-4 ... +140 °F)		

<sup>1)</sup> If operating outdoors, avoid direct sunlight, particularly in warm climatic regions.

Selection and Ordering data	Article No.	Order code
<b>SITRANS FC330 Digital Coriolis flowmeter with SITRANS FCS300 standard flow sensor compact or remote mounting with FCT030 transmitter</b>	<a href="#">↗</a> 7 ME 4 6 3 3 -	- - - - -
<a href="#">↗</a> Click on the Article No. for the online configuration in the PIA Life Cycle Portal.		
<b>Sensor size, connector size</b>		
DN 15, DN 10 (½", 3/8")		3 F
DN 15, DN 15 (½", ½")		3 G
DN 15, DN 20 (½", ¾")		3 H
DN 25, DN 20 (1", ¾")		3 K
DN 25, DN 25 (1", 1")		3 L
DN 25, DN 40 (1", 1½")		3 N
DN 50, DN 40 (2", 1½")		4 B
DN 50, DN 50 (2", 2")		4 C
DN 50, DN 65 (2", 2½")		4 D
DN 80, DN 65 (3", 2½")		4 J
DN 80, DN 80 (3", 3")		4 K
DN 80, DN 100 (3", 4")		4 L
DN 100, DN 80 (4", 3")		5 M
DN 100, DN 100 (4", 4")		5 N
DN 100, DN 150 (4", 6")		5 Q
DN 150, DN 100 (6", 4")		6 D
DN 150, DN 150 (6", 6")		6 F
DN 150, DN 200 (6", 8")		6 H
<b>Process connection</b>		
EN 1092-1 B1, PN 16		A 0
EN 1092-1 B1, PN 40		A 1
EN 1092-1 B2, PN 63		A 2
EN 1092-1 B2, PN 100		A 3
EN 1092-1 D, PN 40		A 5
ASME B16.5 RF, class 150		D 1
ASME B16.5 RF, class 300		D 2
ASME B16.5 RF, class 600		D 3
ASME B16.5 RF, class 900 (p- and t-rating as class 600)		D 4
ASME B16.5 RF, class 1500 (p- and t-rating as class 600)		D 5
ISO 228-1G female pipe thread		E 1
ASME B1.20.1 NPT female pipe thread		E 3
DIN 11851 hygienic screwed		F 1
DIN 32676 (ISO) clamp serie A		G 2
SMS 1145 hygienic screwed		K 1
JIS B2220/10K		L 2
JIS B2220/20K		L 4
EN 1092-1, PN 16, NAMUR length		N 1
EN 1092-1, PN 40, NAMUR length		N 2
<b>Wetted parts material</b>		
AISI 316L/1.4435/1.4404		1
AISI 316L/1.4435/1.4404 (polished)		2
Nickel-alloy C4		3
<b>Calibration/Accuracy class</b>		
0.2 % flow, 10 kg/m <sup>3</sup> density		0
0.1 % flow, 2 kg/m <sup>3</sup> density		1
Standard fraction (with density 2 kg/m <sup>3</sup> )		8
Customer selected fraction		9
		N O Y

## Flow Measurement

### SITRANS F C

#### Flowmeter SITRANS FC330

Selection and Ordering data	Article No.	Order code
<b>SITRANS FC330 Digital Coriolis flowmeter with SITRANS FCS300 standard flow sensor compact or remote mounting with FCT030 transmitter</b>	7 ME 4 6 3 3 -	
<b>Mounting style, transmitter housing and material</b> None (replacement sensor)  Compact, IP67 fieldmount, aluminum Remote, IP67 fieldmount, aluminum, M12 Remote, IP67 fieldmount, aluminum, T/Box Remote, IP67, wall mount, aluminium		A D G K U
<b>Ex approval (depending on variant)</b> Non-Ex ATEX (zone 1) IECEX (zone 1)  US (cCSAus), Div 1 Canada (cCSAus), zone 1 NEPSI (in preparation)  INMETRO (in preparation) KCs (in preparation) EAC (in preparation)		A C F L M N P Q U
<b>Local User Interface</b> None (replacement sensor, DSL only) Blind Graphical, 240 x 160 pxl		0 1 3

Selection and Ordering data	Order code	Selection and Ordering data	Order code
<b>Further designs</b> Please add <b>"-Z"</b> to Article No. and specify Order code(s).		<b>I/O configuration Ch2, Ch3 and Ch4</b> None	<b>F00</b>
<b>Cable glands</b> None (replacement sensor)	<b>A00</b>	Non Ex: Sig O, None, None	<b>F01</b>
Metric, no glands	<b>A01</b>	Non Ex: Sig O, Sig I/O, None	<b>F02</b>
Metric, Nylon, limited to -20 °C/-4 °F	<b>A02</b>	Non Ex: Sig O, Sig I/O, Sig I/O	<b>F03</b>
Metric, brass/Ni plated	<b>A05</b>	Non Ex: Sig O, Sig I/O, R	<b>F04</b>
Metric, stainless steel	<b>A06</b>	Non Ex: Sig O, R, R	<b>F05</b>
NPT, no glands	<b>A11</b>	Non Ex: Sig O, R, None	<b>F06</b>
NPT, Nylon, limited to -20 °C/-4 °F	<b>A12</b>	Ex: pSig O, None, None	<b>F11</b>
NPT, brass/Ni plated	<b>A15</b>	Ex: pSig O, pSig I/O, None	<b>F12</b>
NPT, stainless steel	<b>A16</b>	Ex: pSig O, pSig I/O, pSig I/O	<b>F13</b>
Metric thread with M12 socket fitted	<b>A20</b>	Ex: pSig O, pSig I/O, R	<b>F14</b>
<b>Software functions and CT approvals</b> None (replacement sensor)	<b>B10</b>	Ex: pSig O, R, R	<b>F15</b>
Standard	<b>B11</b>	Ex: pSig O, R, None	<b>F16</b>
CT OIML R 117 (in preparation)	<b>B31</b>	Ex: aSig O, None, None	<b>F21</b>
CT NTEP (in preparation)	<b>B52</b>	Ex: aSig O, aSig I/O, None	<b>F22</b>
<b>I/O configuration Ch1</b> No output channel	<b>E00</b>	Ex: aSig O, aSig I/O, aSig I/O	<b>F23</b>
4 ... 20 mA HART Active/Passive (non-Ex)	<b>E02</b>	Ex: aSig O, aSig I/O, R	<b>F24</b>
Ca 4 ... 20 mA HART active (Ex)	<b>E06</b>	Ex: aSig O, R, R	<b>F25</b>
Ca 4 ... 20 mA HART passive (Ex)	<b>E07</b>	Ex: aSig O, R, None	<b>F26</b>
PROFIBUS PA	<b>E10</b>		
PROFIBUS DP (non-Ex)	<b>E11</b>		
Modbus RTU RS 485	<b>E14</b>		
		<b>Notes on I/O configurations:</b> <b>a or p suffix:</b> The I/O module is selected at ordering with either active or passive function. <b>Signal:</b> The output can be selected for Current (0 or 4 to 20 mA), frequency or pulse function in the menu. <b>I:</b> Discrete status input to the flowmeter. Functions are selected in the menu including 'Freeze output', 'Reset totalizer' (only CH3&4). <b>R:</b> Relay output for discrete status reporting. Function is selected in the menu, including 'Error', 'High flow warning'. The MLFB structure for FC430 systems must be filled to <b>this level</b> , including <b>"-Z"</b> options A., B., E., and F.	

Selection and Ordering data	Order code
<b>Add-on options and accessories</b>	
Please add "-Z" to Article No. and specify Order code(s).	
<b>Certificates</b>	
Factory certificate to EN 10204 -2.2	<b>C01</b>
Material certificate EN 10204-3.1 with inspection	<b>C02</b>
Material certificate EN 10204-3.2 with inspection	<b>C03</b>
NACE MR0175/EN 10204-3.1	<b>C04</b>
Declaration of conformity certificate EN 10204-2.1	<b>C05</b>
Inspection certificate EN 10204-3.1 incl. dimension and function test	<b>C06</b>
Inspection certificate EN 10204-3.1 with PMI	<b>C07</b>
Pressure test acc. AD2000	<b>C08</b>
Test package (Pressure, NDT, WPS, WPQS)	<b>C09</b>
Inspection certificate to EN 10204 3.1/NDE-weld	<b>C10</b>
Certificate of accuracy acc. EN 10204 2.1	<b>C11</b>
Inspection certificate to EN 10204 3.1 with PMI (including heat analysis)	<b>C12</b>
<b>Customer selected calibration</b>	
DN 15 ... 50: Multi-point (5 flows x 1 pass)	<b>D60</b>
DN 15 ... 50: Multi-point (10 flows x 1 pass)	<b>D61</b>
DN 80: Multi-point (5 flows x 1 pass)	<b>D62</b>
DN 80: Multi-point (10 flows x 1 pass)	<b>D63</b>
DN 100: Multi-point (5 flows x 1 pass)	<b>D64</b>
DN 100: Multi-point (10 flows x 1 pass)	<b>D65</b>
DN 150: Multi-point (5 flows x 1 pass)	<b>D66</b>
DN 150: Multi-point (8 flows x 1 pass)	<b>D67</b>
<b>Cable</b>	
None	<b>L50</b>
5 m (16.4 ft), standard with M12 connectors fitted	<b>L51</b>
5 m (16.4 ft), standard	<b>L52</b>
10 m (32.8 ft) standard with M12 connectors fitted	<b>L55</b>
10 m (32.8 ft), standard, without plugs	<b>L56</b>
25 m (82 ft), standard with M12 connectors fitted	<b>L59</b>
25 m (82 ft), standard, without plugs	<b>L60</b>
50 m (164 ft), standard with M12 connectors fitted	<b>L63</b>
50 m (164 ft), standard, without plugs	<b>L64</b>
75 m (246 ft), standard with M12 connectors fitted	<b>L67</b>
75 m (246 ft), standard, without plugs	<b>L68</b>
<b>Sensor options</b>	
FCS300 Marine approval (in preparation)	<b>S22</b>
<b>SD-Card accessibility via USB</b> (not allowed in USA by Patent)	
Mass storage enabled	<b>S30</b>
<b>Region-specific approvals and certificates</b>	
South Korea (KCC) (in preparation)	<b>W28</b>
<b>Additional data</b>	
Please add "-Z" to Article No. and specify Order code(s) and plain text.	
<b>Tag name</b>	
Tag name plate, stainless steel	<b>Y17</b>

**Operating instructions for SITRANS FC330**

Description	Article No.
English	<b>A5E44030648</b>
• for firmware V 4.0 and onwards	
German	<b>TBD</b>
• for firmware V 4.0 and onwards	

All literature is available to download for free, in a range of languages, at [www.siemens.com/processinstrumentation/documentation](http://www.siemens.com/processinstrumentation/documentation)