System information SITRANS F C Coriolis mass flowmeters

Overview

SITRANS F C Coriolis mass flowmeters are designed for measurement of a variety of liquids and gases. The meter offers accurate measurement of mass flow, volume flow, density, temperature and fraction.

Compatibility between transmitters and sensors

Transmitter	Page	Compact	Remote	Ex-Approval	Sensor	Page
FCT030	3/146	Yes	Yes	Yes	FCS300 Standard, DN 15 ... DN 150	3/157
		No	Yes	Yes	MASS 2100, DI 1.5	3/177
		Yes	Yes	Yes	MASS 2100, DI 3, DI 6, DI 15	3/184
		No	Yes	Yes	FC300, DN 4	3/180
FCT010	3/171	Yes	No	Yes	FCS300 Standard, DN 15 ... DN 150	3/157
		No	Yes	Yes	MASS 2100, DI 1.5	3/177
		Yes	Yes	Yes	MASS 2100, DI 3, DI 6, DI 15	3/184
		No	Yes	Yes	FC300, DN 4	3/180
MASS 6000 IP67 Polyamide enclosure	3/202	No	Yes	No	FCS200, DN 10 ... DN 25	3/225
		No	Yes	No	FC300, DN 4	3/180
		No	Yes	No	MASS 2100, DI 1.5	3/177
		Yes	Yes	No	MASS 2100, DI 3 ... DI 15	3/184
MASS 6000 19"	3/207	No	Yes	No	FCS200, DN 10 ... DN 25	3/225
		No	Yes	No	FC300, DN 4	3/180
		No	Yes	No	MASS 2100, DI 1.5	3/177
		No	Yes	No	MASS 2100, DI 3 ... DI 15	3/184
MASS 6000 Ex 19"	3/207	No	Yes	Yes	FCS200, DN 10 ... DN 25	3/225
		No	Yes	Yes	FC300, DN 4	3/180
		No	Yes	Yes	MASS 2100 Ex, DI 1.5	3/177
		No	Yes	Yes	MASS 2100 Ex, DI 3 ... DI 15	3/184
MASS 6000 Ex d Stainless steel enclosure	3/216	No	Yes	Yes	FCS200, DN 10 ... DN 25	3/225
		No	Yes	Yes	FC300, DN 4	3/180
		No	Yes	Yes	MASS 2100 Ex, DI 1.5	3/177
		Yes	Yes	Yes	MASS 2100 Ex, DI 3 ... DI 15	3/184
SIFLOW FC070 Standard	3/221	No	Yes	No	FCS200, DN 10 ... DN 25 FC300, DN 4 MASS 2100, DI 1.5 MASS 2100, DI 3 ... DI 15	3/225 3/180 3/177 3/184
SIFLOW FC070 Ex CT	3/221	No	Yes	Yes	FCS200, DN 10 ... DN 25 FC300, DN 4 MASS 2100, DI 1.5 MASS 2100, DI 3 ... DI 15	3/225 3/180 3/177 3/184

Benefits

Greater flexibility

- Wide product program
- High performance and top-end flowmeters
- Compact or remote installation using the same transmitters and sensors within their flowmeter series

Easier commissioning

All SITRANS F C Coriolis flowmeters feature a sensor related memory unit SENSORPROM or SensorFlash which stores calibration data and transmitter settings for the lifetime of the product.

At commissioning the flowmeter commences measurement without any initial programming.

Easier service

- Comprehensive self-diagnosis and service menu enhances troubleshooting and meter verification.
- Transmitter replacement requires no programming. SENSORPROM automatically updates all settings after initialization.

Room for growth

- FC330/FC310:
  Digital platform allows for any sensor in the range to be matched in compact or remote.
- MASS 2100/FC300 sensors with FCT digital platform allows all sensors from DI1,5 to DI 15 to be matched with the FCT010 and FCT030 transmitters.
  Both analog and digital connections are available.
- MASS 6000:
  Available for MASS 2100, FC200 and FC300. USM II the Universal Signal Module with "plug & play" simplicity makes it easy to access and integrate the flowmeter with almost any system and bus-protocol and it ensures the flowmeter will be easy to upgrade to future communication/bus platforms.
- SIFLOW:
  Available for MASS 2100, FC200 and FC300.
  Direct integration into SIMATIC S7-300 systems or as standalone transmitter as a flowmeter specific I/O module ensures fast and smooth startup, seamless integration, fast operation.

Application

Coriolis flowmeters are generally suitable for measuring liquids and gases. The flow measurement is independent of changes in process conditions/parameters such as temperature, density, pressure, viscosity, conductivity and flow profile.

Due to this versatility the meter is easy to install and use. The Coriolis flowmeter is recognized for its high accuracy over a wide turn-down ratio.

The main applications of the Coriolis flowmeter can be found in all industries, such as:	
Chemical and pharma	Detergents, bulk chemicals, pharmaceuticals, acids, alkalis, filling and dosing
Food and beverage	Dairy products, beer, wine, soft-drinks, °Plato/°Brix, fruit juices and pulps, bottling, CO_2 dosing, CIP-liquids
Automotive	Fuel injection nozzle and pump testing, filling of AC units, engine consumption measurement, paint robots
Oil and gas	Filling of gas bottles, furnace control, CNG-dispensers, test separators, LPG, well-head water-cut monitoring
Water and waste water	Dosing of chemicals for water treatment

System information SITRANS F C Coriolis mass flowmeters

Please see Product selector www.pia-selector.automation.siemens.com **on the Internet, since some constrains might be related to some of the features**

	FC330	FC310	MASS 2100 DI 1.5	MASS 2100 DI 3 to DI 15	FC300 DN 4	FCS200 DN 10 to DN 25	MASS 6000 IP67	MASS 6000 19"	MASS 6000 Ex d	SIFLOW FC070 Std/Ex CT	MASS 2100/FC300 with FCT010	MASS 2100/FC300 with FCT030
	7ME4633	7ME4631	7ME4100	7ME4100	7ME4400	7ME4500	7ME4110	7ME4110	7ME4110	7ME4120	7ME4811	7ME4813
Design												
Compact	●	●		●			●		●		●[3]	●[3]
Remote	●		●	●	●	●	●	●	●	●	●	●
Transmitter enclosure												
Polyamide, IP67/NEMA 6							●					
Noryl (SIMATIC S7-300), IP20/NEMA 2										●		
Stainless steel IP67/NEMA 6									●			
19" rack IP20/NEMA 2 aluminum								●				
Back of panel IP20 aluminum								●				
Wall mounting IP65 ABS plastic								●				
Front of panel IP65 ABS plastic								●				
Aluminum IP67 Field mounting enclosure	●	●									●	●
Aluminum IP67 Wall mounting enclosure	●											●
Communication												
HART	●						●	●	●			●
PROFIBUS PA	●						●	●	●			●
PROFIBUS DP	●						●	●				●
Modbus RTU/RS 485	●	●					●	●		●	●	●
Modbus RTU/RS 232										●		
FOUNDATION Fieldbus H1							●	●	●			
DeviceNet							●	●				
Supply voltage												
24 V DC	●	●								●	●	●
24 V AC/DC							●	●	●			
115/230 V AC	●						●	●				●
Pipe size												
DI 1.5 (1/16")			●								●	●
DI 3 (1/8")				●							●	●
DN 4 (1/6")					●						●	●
DI 6 (¼")				●							●	●
DN 10 (3/8")						●						
DI 15 (½")				●							●	●
DN 15 (½")	●	●				●						
DN 25 (1")	●	●										
DN 50 (2")	●	●										
DN 80 (3")	●	●										
DN 100 (4")	●	●										
DN 150 (6")	●	●										
Process connection norms and pressure												
Pipe thread												
NPT ANSI/ASME B.20.1; PN 100	●	●	●	●	●						●	●
NPT ANSI/ASME B.20.1; PN 350						●						
VCO						●						
ISO 228/1; PN 100	●	●	●	●	●						●	●

● = available

Please see Product selector www.pia-selector.automation.siemens.com **on the Internet, since some constrains might be related to some of the features**

	FC330	FC310	MASS 2100 DI 1.5	MASS 2100 DI 3 to DI 15	FC300 DN 4	FCS200 DN 10 to DN 25	MASS 6000 IP67	MASS 6000 19"	MASS 6000 Ex d	SIFLOW FC070 Std/Ex CT	MASS 2100/FC300 with FCT010	MASS 2100/FC300 with FCT030
	7ME4633	7ME4631	7ME4100	7ME4100	7ME4400	7ME4500	7ME4110	7ME4110	7ME4110	7ME4120	7ME4811	7ME4813
Flange												
EN 1092-1 PN 16	●	●										
EN 1092-1 PN 40	●	●		●							●	●
EN 1092-1 PN 63	●	●										
EN 1092-1 PN 100	●	●		●							●	●
ANSI B16.5 Class 150	●	●		●							●	●
ANSI B16.5 Class 300	●	●										
ANSI B16.5 Class 600	●	●		●							●	●
ANSI B16.5 Class 900[5]	●	●										
ANSI B16.5 Class 1500[5]	●	●										
JIS B2220 10K	●	●										
JIS B2220 20K	●	●										
Dairy												
DIN 11851	●	●		●							●	●
DIN 11851 PN 40				●							●	●
Clamp ISO 2852 PN 16				●							●	●
ISO 2853 PN 16				●							●	●
DIN 32676 (ISO) clamp serie A	●	●										
SMS 1145	●	●										
Others on request	●	●	●	●	●						●	●
Pipe material												
Stainless steel AISI 316L/ 1.4435/1.4404	●	●	●	●	●						●	●
Nickel-Alloy C4	●	●										
Hastelloy C22/2.4602			●	●	●	●[4]					●	●
With heating jacket												
Internal U-tube											●	●
Pressure rating												
PN 16	●	●										
PN 40	●	●		●							●	●
PN 63	●	●										
PN 100	●	●	●	●	●						●	●
PN 160											●	●
PN 214						●					●	●
PN 350						●					●	●
High-pressure version[1]			●	●	●						●	●
Accuracy												
Flow error ≤ 0.1 % of rate[6]	●	●	●	●	●						●	●
Flow error ≤ 0.2 % of rate[6]	●	●										
Flow error ≤ 0.5 % of rate[6]						●						
Density error ≤ 0.0005 g/cm³				●							●	●
Density error ≤ 0.001 g/cm³			●								●	●
Density error ≤ 0.002 g/cm³	●	●										
Density error ≤ 0.010 g/cm³	●	●										
Density error ≤ 0.0015 g/cm³				●[2]	●							
Cable glands												
PG 13.5								●[3]				
½" NPT	●	●					●				●	●
M20	●	●					●		●		●	●

● = available

1) See technical specifications.
2) DI 3, DI 6 and DI 15
3) Only when mounted in enclosure.
4) Process connectors in AISI 316Ti/1.4571
5) Sensor pressure and temperature limited to ANSI class 600 rating
6) For reference conditions: ISO 9104 and DIN/EN 29104. Increased error can be expected for gas mass flow measurement.

System information SITRANS F C Coriolis mass flowmeters

Please see Product selector www.pia-selector.automation.siemens.com **on the Internet, since some constrains might be related to some of the features**

	FC330	FC310	MASS 2100 DI 1.5	MASS 2100 DI 3 to DI 15	FC300 DN 4	FCS200 DN 10 to DN 25	MASS 6000 IP67	MASS 6000 19"	MASS 6000 Ex d	SIFLOW FC070 Std/Ex CT	MASS 2100/FC300 with FCT010	MASS 2100/FC300 with FCT030
	7ME4633	7ME4631	7ME4100	7ME4100	7ME4400	7ME4500	7ME4110	7ME4110	7ME4110	7ME4120	7ME4811	7ME4813
Approvals												
Custody transfer												
NTEP	●[9]					●						
Other media than water pattern approval - OIML R 117 (DN 25 to DN 150)	●[9]											
Harzardous locations												
ATEX zone 1	●	●	●	●	●	●	●	●	●	●[3][4]	●	●
IECEx zone 1	●	●				●				●[4]	●	●
EAC Ex zone 1	●	●	●	●	●	●		●	●	●[3][4]		
US /CSA) Div 1	●	●									●	●
Canada (CSA) zone 1	●	●									●	●
FM						●				●		
UL			●[1]	●[1]	●						●	●
CSA										●[4]		
NEPSI	●	●				●						
INMETRO	●[9]	●[9]										
Ordinary locations												
UL listed (us, ca) Flowmeter c-UL-us							●[2]	●[7]				
UL recognized (us, ca) Flowmeter c-UL-us							●[2][5]	●[5][6]				
PED												
Fluid group 1 Category III, gas PED Directive 2014/68/EU	●	●										
CRN												
Category F OF10769.5C CRN	●[9]	●[9]	●	●[8]	●						●[8]	●[8]
F&B/Pharma												
EHEDG	●[9][10]	●[9][10]										
Marine												
SITRANS FC310: Germanischer Lloyd/ det Norske Veritas, Bureau Veritas, Lloyds of London, American Bureau of Shipping, Rina, CCS	●[9]	●[9]										

Note: Special conditions for safe use might be specified in certificates or operating instructions.

● = available

1) Sensor pressure max. 100 bar (1450 psi)
2) Only remote version
3) Can be placed in zone 2 if mounted in minimum IP54 cabinet
4) Only Ex version
5) 24 V; IP20
6) 115 ... 230 V; IP20
7) 115 ... 230 V; IP65
8) Only DI 6 is CRN
9) In preparation
10) DN 25 to DN 80

Function

The flow measuring principle is based on the Coriolis effect. The flowmeter consists of a system FC310 or FC330 or a combination of a sensor type MASS 2100/FC300/FCS200 and a transmitter type MASS 6000/SIFLOW FC070/FCT010 and FCT030.

The SITRANS F C sensors are energized by an electro-mechanical driver circuit which oscillates the pipe at its resonant frequency.

Two pick-ups, 1 and 2 are placed symmetrically on both sides of the driver. When liquid or gas flows through the sensor, Coriolis force will act on the measuring pipe and cause a pipe deflection which can be measured as a phase shift on pick-up 1 and 2. The phase shift is proportional to the mass flow rate.

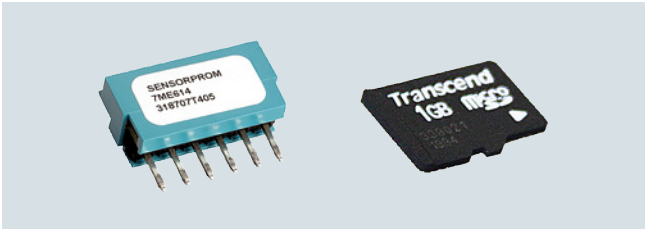
The amplitude of the driver is automatically regulated to ensure a stable output from the 2 pick-ups.

The temperature of the sensor is measured by a Pt1000.

The flow-proportional signal from the 2 pick-ups, the temperature measurement and the driver frequency are fed into the SITRANS F C transmitter for calculations of mass, volume, fraction, temperature and density.

The signal transfer function is based on a DFT technology (Discrete Fourier Transformation).

The transmitter has a built-in noise filter, which can be used to improve the meter's performance if the installation and application conditions are not ideal. Typically influence from process noise such as pump pulsations, mechanical vibrations, oscillating valves can be reduced considerably.



SENSORPROM and SensorFlash flow memory units

FC310 flow transmitters communicate via Modbus RTU and FC330 via HART/Modbus/PROFIBUS DP/ PROFIBUS PA.

Integration

Installation requirements/System design information

The SITRANS F C mass flowmeter is suitable for in- and outdoor installations. The standard instrument meets the requirements of Protection Class IP67/NEMA 4x or IP65. The flowmeter is bidirectional and can be installed in any orientation, however, the sensor is not self-emptying in all positions.
It is important to ensure that the meter tubes are always completely filled with homogeneous fluid. Otherwise measuring errors may occur.
The corrosion resistance of the fluid-wetted materials must be evaluated.
The pressure drop through the sensor is a function of the properties of the fluid and the flow rate. The **Sizing Program** (download from www.siemens.com) can be used to calculate the pressure drop.

The preferred flow direction is indicated by the arrow on the flowmeter. Flow in this direction will be indicated as positive.

Installation orientation

- FCS300 – sensors
  The optimal installation orientation is vertical with flow upwards (liquids) and up to 10° off vertical for self-draining.
- MASS 2100/FC300 – sensors
  The optimal installation orientation is horizontal.

Supports

- In order to support the weight of the flowmeter and to ensure reliable measurements when external effects exist (e.g. vibrations), the sensor should be installed in well-supported pipelines. Supports or hangers should be installed symmetrically and stress-free in close proximity to the process connections.

Shut-off devices

- To conduct a system zero adjustment, shut-off devices are required in the pipeline:
  - In horizontal installations at the outlet for FC300 and the inlet for MASS 2100.
  - In vertical installations at the inlet.
- When possible, shut-off devices should be installed both up- and downstream of the flowmeter. A bypass valve is recommended where regular zero adjustment is planned to avoid disruption of the flowing system.

Installation: straight run requirements

- The mass flowmeter does not require any flow condition or straight inlet sections. Care should be exercised to ensure that any valves, gates, sight glasses etc. do not cavitate and are not set into vibration by the flowmeter.

System design information

- 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 highest point in the system where bubbles are possibly largest.
- Long drop lines downstream from the flowmeter should be avoided to prevent the meter tube from draining during operation.
- The flowmeter should not come into contact with any other objects. Avoid attachments to the housing.
- When the cross-section of the connecting pipeline is larger than the sensor size, suitable standard reducers may be installed.
- 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 and outside the section between the shut-off devices.
- 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).
- Assure that operation below the vapor pressure cannot occur when a vacuum exists in the meter tube or for fluids which boil readily.
- The sensor should not be installed in the vicinity of strong electromagnetic fields, e.g. near motors, pumps, transformers etc.
- When operating more than one meter in one or multiple interconnected pipelines, the sensors should be spaced distant from each other or the pipelines should be decoupled to prevent cross talk.

Zero adjustment

- In order to adjust the zero under operating conditions it must be possible to reduce the flow rate to „ZERO“ while the meter tube is completely filled. It is important for accurate measurements that during the zero adjustment there are no gas bubbles in the flowmeter. It is also important that the pressure and temperature in the meter tube be the same as that which exists during operation.

3

Technical specifications

Flowmeter uncertainty/specifications

To ensure continuous accurate measurement, flowmeters must be calibrated. The Siemens flowmeter calibration process is ISO9001-certified, ensuring the entire calibration procedure is controlled to the highest quality standards.

All primary measuring instrumentation used by the Flow Laboratory during the performance of its calibrations, has been calibrated with international standards traceability referring directly to the physical unit of measurement according to the International System of Units (SI). Therefore the calibration certificate ensures recognition of the test results worldwide, including the US (NIST traceability).

A calibration certificate is shipped with every sensor and calibration data are stored in the SENSORPROM memory unit. FC310 and FC330 meters have the calibration data written to the front end section. A backup of all calibrations and PDF copies of all certificates are stored in the SensorFlash.

FCS300 sensors: for liquids

	Q_{min} at 1% accuracy water		Q_{nom} [1]		100 % (Q_{max}) [2]	
	kg/h	(lb/min)	kg/h	(lb/min)	kg/h	(lb/min)
DN 15 (½")	70	(2.57)	4 500	(165.3)	8 000	(293.9)
DN 25 (1")	240	(8.92)	20 500	(753.2)	35 000	(1 286)
DN 50 (2")	800	(29.4)	49 000	(1 800)	90 000	(3 307)
DN 80 (3")	2 000	(73.5)	122 000	(4 483)	250 000	(9 186)
DN 100 (4")	4 000	(147)	273 000	(10 031)	520 000	(19 108)
DN 150 (6")	6 900	(253)	459 200	(16 873)	860 000	(31 600)

MASS 2100 and FC300 sensors: for liquids

	Q_{min} at 1% accuracy water		Q_{nom} [1]		100 % (Q_{max}) [2]	
	kg/h	(lb/h)	kg/h	(lb/h)	kg/h	(lb/h)
DI 1.5 (1/16")	0.1	(0.22)	15	(33)	30	(66)
DI 3 (1/8")	1.0	(2.2)	125	(275)	250	(550)
DN 4 (1/6")	1	(2.2)	175	(386)	350	(770)
DI 6 (¼")	0	(11)	500	(1 102)	1 000	(2 200)
DI 15 (½")	5	(44)	2 800	(6 173)	5 600	(12 345)

[1] Q_{nom} = Δ 1 barg @ water 20 °C.

[2] Q_{max} = 10 m/sec @ water 20 °C at inlet (up to 30 m/s in the flowtubes).

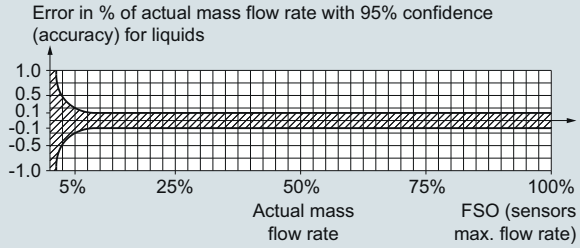
For gas applications the massflow rate is depending on the gas type. The max. flowrate is calculated with the Mach-Number to be Ma = 0.3.

- For flow > 5 % of the sensors max. flow rate, the error can be read directly from the curve below.
- For flow < 5 % of the sensors max. flow rate, use the formula to calculate the error.
- The error curve is plotted from the formula:

$$E = \pm\sqrt{(Cal.)^2 + \left(\frac{z \times 100}{qm}\right)^2}$$

E = Error [%]
Z = Zero point error [kg/h] [1]
qm = Mass flow [kg/h]
Cal. = Calibrated flow accuracy: 0.10, 0.15 or 0.20

[1] Zero point error for each sensor is shown in the tables below.



For gas applications: typical additional 0.4 % + zero point

Reference conditions for flow calibrations (ISO 9104 and DIN/EN 29104)	
Flow conditions	Fully developed flow profile
Temperature, medium	25 °C (77 °F) ± 5 K
Temperature, ambient	25 °C (77 °F) +10/-5 K
Liquid pressure	2 ± 1 bar
Density	0.997 g/cm^3
Brix	40 °Brix
Supply voltage	U_n ±1 %
Warming-up time	30 min.
Cable length	5 m between transmitter and sensor

Additions in the event of deviations from reference conditions	
Current output	As pulse output ± (0.1% of actual flow +0.05 % FSO)
Effect of ambient temperature	• Display/frequency/pulse output: < ± 0.003%/K act. • Current output: < ± 0.005 %/K act.
Effect of supply voltage	< 0.005 % of measuring value on 1 % alteration

Sensor type		**FC300**	**MASS 2100**			
Sensor size		DN 4 (1/6")	DI 1.5 (1/16")	DI 3 (1/8")	DI 6 (¼")	DI 15 (½")
Number of measuring pipes		1	1	1	1	1
Mass flow						
Linearity error[1)]	% of rate	0.10	0.10	0.10	0.10	0.10
Repeatability error	% of rate	0.05	0.05	0.05	0.05	0.05
Max. zero point error	[kg/h]	0.010	0.001	0.010	0.050	0.200
Density						
Density error[2)]	[g/cm^3]	0.0025[3)]	0.001	0.0015	0.0015	0.0005
Repeatability error	[g/cm^3]	0.0002	0.0002	0.0002	0.0002	0.0001
Range	[g/cm^3]	0 ... 2.9	0 ... 2.9	0 ... 2.9	0 ... 2.9	0 ... 2.9
Temperature						
Error	[°C (°F)]	0.5 (0.9)	0.5 (0.9)	0.5 (0.9)	0.5 (0.9)	0.5 (0.9)
Brix						
Error	[°Brix]	0.3	0.2	0.3	0.3	0.1

1) For reference conditions: ISO 9104 and DIN/EN 29104. Increased error can be expected for gas mass flow measurement (For gas measurement typically additional +0.40 % error).
2) Accuracy is only valid when sensor is density-calibrated.
3) Hastelloy C22 version.

Sensor type		**FCS300**					
Sensor size		DN 15 (½")	DN 25 (1")	DN 50 (2")	DN 80 (3")	DN 100 (4")	DN 150 (6")
Number of measuring pipes		2	2	2	2	2	2
Mass flow:							
Linearity error[1)]	% of rate Standard	0.1	0.1	0.1	0.1	0.1	0.1
	% of rate Medium	0.2	0.2	0.2	0.2	0.2	0.2
Repeatability of flowrate at rates > 5 % of Q_{max}	% of rate	0.05	0.05	0.05	0.05	0.1	0.1
Max. zero point error		0.6 (0.0235)	2.16 (0.0792)	7.2 (0.264)	20.0 (0.735)	41.6 (1.628)	68.8 (2.528)
Density							
Density error	(Standard) [g/cm^3]	0.010	0.010	0.010	0.010	0.010	0.010
	(Extended) [g/cm^3]	0.002	0.002	0.002	0.002	0.002	0.002
Range	[kg/dm^3]	0.001 ... 5.0	0.001 ... 5.0	0.001 ... 5.0	0.001 ... 5.0	0.001 ... 5.0	0.001 ... 5.0
Repeatability error	[kg/m^3]	± 0.25	± 0.25	± 0.25	± 0.25	± 0.25	± 0.25
Temperature							
Error	[°K]	0.5	0.5	0.5	0.5	0.5	0.5

1) For reference conditions: ISO 9104 and DIN/EN 29104. Increased error can be expected for gas mass flow measurement (For gas measurement typically additional +0.4 % error).

Technical specifications PROFIBUS PA/DP for FCT030

General specifications	
PROFIBUS device profile	Profile V 4.0 and compatible to V 3.x

Electrical specification DP

Physical layer specifications	
Applicable standard	IEC 61158/EN 50170
Physical Layer (Transmission technology)	RS 485
Transmission speed	≤ 12 Mbit/s
Number of stations	Up to 32 per line segment (maximum total of 126)
Cable specification (Type A)	
Cable design	Two wire twisted pair
Shielding	CU shielding braid or shielding braid and shielding foil
Impedance	35 up to 165 Ω at frequencies from 3 ... 20 MHz
Cable capacity	< 30 pF per meter
Core diameter	> 0.34 mm², corresponds to AWG 22
Resistance	< 110 Ω per km
Signal attenuation	Max. 9 dB over total length of line section
Max. bus length	100 m at 12 Mbit/s, up to 1.2 km at 93.75 kbit/s. Extendable by repeaters

Electrical specification PA

Physical layer specifications	
Applicable standard	IEC 61158/EN 50170
Physical Layer (Transmission technology)	IEC-61158-2
Transmission speed	31.25 kbit/s
Number of stations	Up to 32 per line segment (maximum total of 126)
Max. basic current [I_B]	14 mA
Fault current [I_{FDE}]	0 mA
Bus voltage	9 ... 32 V (non Ex)
Preferred cable specification (Type A)	
Cable design	Two wire twisted pair
Conductor area (nominal)	0.8 mm² (AWG 18)
Loop resistance	44 Ω/km
Impedance	100 Ω ± 20 %
Wave attenuation at 39 kHz	3 dB/km
Capacitive asymmetry	2 nF/km
Bus termination	Passive line terminated at both ends
Max. bus length	Up to 1.9 km. Extendable by repeaters

IS (Intrinsic Safety) data	
Required sensor electronics	Compact mounted SITRANS FCT030
FISCO	Yes
Max. U_I	17.5 V
Max. I_I	380 mA
Max. P_I	5.32 V
Max. L_I	10 µH
Max. C_I	5 nF
Max. U_o	1.3 V
Max. I_o	50 µA
FISCO cable requirements	
Loop resistance R_C	15 ... 150 Ω/km
Loop inductance L_C	0.4 ... 1 mH/km
Capacitance C_C	80 ... 200 nF/km
Max. Spur length in IIC and IIB	30 m
Max. Trunk length in IIC	1 km
Max. Trunk length in IIB	5 km

PROFIBUS parameter support

The following parameters are accessible using a Class 1 Master.

Cyclic services:		
Input (Master view)	**Parameter**	**FCT030**
	Mass flow	✓
	Volume flow	✓
	Media temperature	✓
	Frame temperature	✓
	Standard volume flow	✓
	Density	✓
	Fraction A[1)]	✓
	Fraction B[1)]	✓
	Pct Fraction A[1)]	✓
	Pct Fraction B[1)]	✓
	Totalizer 1	✓
	Totalizer 2	✓
	Totalizer 3	✓
	Digital dosing control	✓
	Analog dosing control	✓
	Dosing status	✓
Output (Master view)	Control totalizer 1+2+3	✓
	Control commands as Zero point adjustment	✓

[1)] Requires a flowmeter ordered with fraction option.

Technical specifications PROFIBUS PA/DP for MASS 6000

General specifications	
PROFIBUS device profile	3.00 class B
Certified	Yes, according to Profile for process control devices V3.00.
MS0 connections	1
MS1 connections	1
MS2 connections	2

Electrical specification DP

Physical layer specifications	
Applicable standard	IEC 61158/EN 50170
Physical Layer (Transmission technology)	RS 485
Transmission speed	≤ 1.5 Mbit/s
Number of stations	Up to 32 per line segment (maximum total of 126)
Cable specification (Type A)	
Cable design	Two wire twisted pair
Shielding	CU shielding braid or shielding braid and shielding foil
Impedance	35 up to 165 Ω at frequencies from 3 ... 20 MHz
Cable capacity	< 30 pF per meter
Core diameter	> 0.34 mm², corresponds to AWG 22
Resistance	< 110 Ω per km
Signal attenuation	Max. 9 dB over total length of line section
Max. bus length	200 m at 1500 kbit/s, up to 1.2 km at 93.75 kbit/s. Extendable by repeaters

Electrical specification PA

Physical layer specifications	
Applicable standard	IEC 61158/EN 50170
Physical Layer (Transmission technology)	IEC-61158-2
Transmission speed	31.25 kbit/s
Number of stations	Up to 32 per line segment (maximum total of 126)
Max. basic current [I_B]	14 mA
Fault current [I_{FDE}]	0 mA
Bus voltage	9 ... 32 V (non Ex)
Preferred cable specification (Type A)	
Cable design	Two wire twisted pair
Conductor area (nominal)	0.8 mm² (AWG 18)
Loop resistance	44 Ω/km
Impedance	100 Ω ± 20 %
Wave attenuation at 39 kHz	3 dB/km
Capacitive asymmetry	2 nF/km
Bus termination	Passive line terminated at both ends
Max. bus length	Up to 1.9 km. Extendable by repeaters

PROFIBUS parameter support

The following parameters are accessible using a MS0 relationship from a Class 1 Master.
MS0 specifies cyclic Data Exchange between a Master and a Slave.

Cyclic services:		
Input (Master view)	**Parameter**	**MASS 6000**
	Mass flow	✓
	Volume flow	✓
	Temperature	✓
	Density	✓
	Fraction A[1)]	✓
	Fraction B[1)]	✓
	Pct Fraction A[1)]	✓
	Totalizer 1	✓
	Totalizer 2[2)]	✓
	Batch progress[2)]	✓
	Batch setpoint	✓
	Batch compensation	✓
	Batch status (running ...)	✓
Output (Master view)	Set Totalizer 1+2	✓
	Set Mode Totalizer 1+2	✓
	Batch control (start, stop ...)	✓
	Batch setpoint	✓
	Batch compensation	✓

[1)] Requires a SENSORPROM containing valid fraction data.

[2)] Value returned is dependent on the BATCH function.
When ON, Batch progress is returned.
When OFF, TOTALIZER 2 is returned.