

Flow Measurement

SITRANS F C

Transmitter SITRANS FCT030

Overview



FCT030 is based on the latest developments within digital signal processing technology – engineered for high measuring performance, fast response to step changes in flow, fast dosing applications, high immunity against process noise, easy to install commission and maintain.

The FCT030 transmitter delivers true multi-parameter measurements i.e. massflow, volumeflow, standard volumeflow, density, temperature and fraction.

The FCT030 IP67 transmitter can be remote connected or compact mounted with all sensors of type FCS300, sizes DN 15 to DN 150, MASS 2100 DI 1.5, DI 3, DI 6, DI 15 and FC300 DN 4.

Fraction

The transmitter FCT030 can be set up at works to measure and report various fraction concentrations of two-part mixtures or solutions. Where a discrete relationship exists between concentration and density at particular temperatures a calculation is performed and the percentage concentration by volume or mass of Part A or Part B (100 % minus Part A) is measured. For solutions and some mixtures the total mass, or dry weight, is also available.

In some industries, a selection of standard density scales has been adopted to represent the density or relative density of the process fluid.

If "Standard fractions" option is chosen at ordering, the following fraction or standard density scales can be selected in the setup menu:

- | | |
|--------------------|--|
| • API number | • %HFCS42 |
| • Balling | • %HFCS55 |
| • °Baumé light | • %HFCS90 |
| • °Baumé heavy | • Ethanol-Water (ABM) ¹⁾
0 % to 20 % |
| • °Brix | • Ethanol-Water (ABM) ¹⁾
15 % to 35 % |
| • °Oeschlé | • Ethanol-Water (ABM) ¹⁾
30 % to 55 % |
| • Plato | • Ethanol-Water (ABM) ¹⁾
50 % to 100 % |
| • Specific Gravity | |
| • Twaddell | |

¹⁾ ABM: Alcohol by Mass.

Application

SITRANS FCT030 transmitters are suitable for applications within the entire process industry where there is a demand for accurate flow measurement. The meter is capable of measuring both liquid and gas flow.

Coriolis flowmeters can be applied in all industries, such as:

- Chemical & Pharma: detergents, bulk chemicals, acids, alkalis, paint mixing systems, solvents and resins, pharmaceuticals, blood products, vaccines, insulin production
- Food & Beverage: dairy products, beer, wine, soft drinks, °Brix/°Plato, fruit juices and pulps, bottling, CO₂ dosing, CIP/SIP-liquids, mixture recipe control
- Automotive: fuel injection nozzle & pump testing, filling of AC units, engine consumption
- Oil & Gas: filling of gas bottles, furnace control, test separators
- Hydrocarbon processing: oil refining, derivatives manufacturing, polymerisation
- Water & Waste Water: dosing of chemicals for water treatment

The multiple outputs and bus communication mean that all of the process information can be read either instantaneously (10 ms update) or periodically as plant operation requires.

Benefits

Flow calculation and measurement

- Dedicated mass flow calculation with DSP technology
- Fast dosing and flow step response with maximum 10 ms response time
- 100 Hz update rate to all outputs
- Maximum data age from pickup to output is 20 ms (two update cycles)
- Independent low flow cut-off settings for mass and volume flowrates
- Automatic zero-point adjustment on command from discrete input or host system
- Empty pipe monitoring

Operation and display

- User-configurable operation display
 - Full graphical display 240 x 160 pixels with up to 6 programmable views
 - Self-explaining alarm handling/log in clear text
 - Help text for all parameters appears automatically in the configuration menu
 - Keypad can be used for controlling dosing as start/stop/hold/reset
- SensorFlash technology stores production specific system documentation and provides removable memory of all flowmeter setups and functions
 - Calibration certificates
 - Pressure and material test certificates (as ordered)
 - Non-volatile memory backup of operational data
 - Transfer of user configuration to other flowmeters
 - Alarm history log
 - Parameter change log
 - Logging of min and max process values
 - Data logging of process values and parameter

Alarms and safety

- Advanced diagnosis and service menu enhances troubleshooting and meter validation
- Configurable upper and lower alarm and warning limits for all process values
- Alarm handling can be selected between Siemens and NAMUR standard configurations
- FCT030 is in preparation to be certified for integrated safety in accordance with IEC 61508 and IEC 61511 as a compact FC330.
 - SIL 2 (single-channel operation) in preparation
 - SIL 3 (dual-channel operation) in preparation

Outputs and control

- Built-in dosing controller with compensation and monitoring comprising 3 built-in totalizers
- Multi-parameter outputs, individually configurable for mass-flow, volumeflow, standard volumeflow, density, temperature or fraction flow such as °Brix or °Plato

Up to four I/O channels are configured as follows:

Channel 1

Channel 1 is 4 to 20 mA analog output with HART 7.5, PROFIBUS PA, PROFIBUS DP and Modbus RS-485 RTU. The current signal can be configured for massflow, volumeflow or density, standard volume flow, medium temperature, Fraction A and B and Fraction A% and B%.

Channel 2

Channel 2 is a signal output which can be freely configured for any process variable.

- Analog current (0/4 to 20 mA)
- 3 stage analog valve dosing control
- Frequency or pulse
- Digital one or two-valve dosing control in combination with channel 3 or 4
- Operational and alarm status

Channels 3 and 4

Channels 3 and 4 can be ordered with signal (freely configured for any process variable) or relay outputs, or signal input.

Signal

Signal output can be user configured to:

- Analog current (0/4 to 20 mA)
- 3 stage analog valve dosing control
- Frequency or pulse
- Redundant frequency or pulse (linked to Channel 2)
- Digital one or two-valve dosing control
- Operational and alarm status

Relay

Relay output(s) can be user configured to:

- Digital one or two-valve dosing control
- Operation status including flow direction
- Alarm status

Signal input

Signal input can be user-configured for

- Dosing control
- Totalizer reset functions
- Force or freeze output(s)
- Initiate automatic zero point adjustment

Signal outputs and inputs for non hazardous areas can be changed for active or passive operations by dip switch.

For hazardous areas Signal outputs and inputs can't be changed by dip switch, and has to be selected individually by ordering.

During service and maintenance all outputs can be forced to a preset value for simulation, verification or calibration purposes.

Approvals and certificates

The FCT030 Coriolis flowmeter program was designed from the ground up to comply with or exceed the requirements of international standards and regulations.

Design

The transmitter SITRANS FCT030 is designed in an IP67/NEMA 4X aluminum enclosure with corrosion resistant coating. It can be remote connected or compact mounted with an sensor

- FCS300 DN 15, DN 25, DN 50, DN 80, DN 100 and DN 150,
- MASS 2100 DI1.5, DI 3, DI 6, DI 15 and
- FC300 DN 4.

FCT030 is available with current output HART 7.5, Modbus RS-485 RTU, PROFIBUS DP or PROFIBUS PA as standard on Channel 1.

The transmitter has a modular design with discrete, replaceable electronic modules and connection boards to maintain separation between functions and facilitate field service. All modules are fully traceable and their provenance is included in the transmitter setup.

SensorFlash

SensorFlash is a standard, 4 GByte micro SD card with the ability to be updated by PC. It is supplied with each sensor with the complete set of certification documents including calibration report. Material, pressure test, factory conformance certificates are optional at ordering.

The Siemens SensorFlash memory unit offers the following features and benefits:

- Automatically program any similar transmitter in seconds to the operation standard
- Transmitter replacement in less than 5 minutes
- True "plug & play" provided by integrated cross-checking data consistency and HW/SW version verification
- Permanent memory of operational and functional information from the moment that the flowmeter is switched on
- New firmware updates can be downloaded from the SIEMENS internet portal for Product Support and placed onto SensorFlash (unmounted from the transmitter and inserted into a PC's SD card slot). The firmware is then inserted into the existing flowmeter and the complete system upgraded.
- Storing of alarm history log
- Storing of parameter change log
- Storing of process peak values log

Datalogging on SensorFlash

The following functions are available:

- Logging of process values
- Logging of parameter settings
- Selectable logging interval

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Function

The following functions are available:

- Mass flowrate, volume flowrate, density, process temperature, frame temperature, fraction flow
- Up to four output/input channels selected at ordering
- Outputs can be individually configured with mass, volume, density etc.
- Three built-in totalizers which can count forward, backward or forward and backward
- Low flow cut-off, adjustable
- Density cut-off or empty pipe cut-off, adjustable
- Flow direction adjustable
- Alarm system consisting of alarm-log, alarm pending menu
- Internal data logger is updated each 10 minutes with operational data such as system health, totalizer values, all configurations and data needed for custody transfer requirements to OIML R 117 and NTEP
- Display of operating time with real-time clock. Daylight saving time is not implemented
- Uni/bidirectional flow measurement
- Flowrate outputs are freely configurable between maximum negative and maximum positive flows according to the sensor capacity
- Limit switches programmable for flow, density, temperature or fraction process values. Limit points can be graded as warning and alarm for values both above and below nominal process conditions
- Process noise filter for optimization of measurement performance under non-ideal application conditions. 5-stage pumping filter compensates for flow fluctuations caused by e.g. single acting piston pumps
- Full dosing controller with 5 user-configurable recipes
- Automatic zero adjustment menu, with zero point evaluation display
- Full service menu for effective and straight forward application and meter troubleshooting
- Precise temperature measurement ensures optimum accuracy on massflow, density and fraction flow.
- Fraction flow computation is based on a 5th-order algorithm matching known applications.
- Audit trail information, stores parameters changes with time stamp information
- Simulation of process values, status information and alarms
- Aerated flow filtering system, for advanced filtering of fluids with gas or air bubbles
- Datalogging of process values and parameter changes on SensorFlash

Technical specifications

Process media	<ul style="list-style-type: none"> Fluid Group 1 (suitable for dangerous fluids) Aggregate state: Paste/light slurry, liquid and gas
Number of process variables	7
Measurement of	<ul style="list-style-type: none"> Mass flow Volume flow Density Process media temperature Standard volume flow Reference density Fraction A flow Fraction B flow Fraction A % Fraction B %
Current output	
Current	0 ... 20 mA or 4 ... 20 mA (Channel 1 only 4 ... 20 mA)
Load	< 500 Ω per channel
Time constant	0 ... 100 s adjustable
Digital output¹⁾	
Pulse	41.6 μs ... 5 s pulse duration
Frequency	0 ... 12.5 kHz, 50 % duty cycle, 120 % overscale provision
Time constant	0 ... 100 s adjustable
Active	0 ... 24 V DC, 110 mA, short-circuit-protected
Passive	3 ... 30 V DC, max. 110 mA
Relay	only for channel 3 and 4
Type	Change-over voltage-free relay contact
Load	30 V AC/100 mA
Functions	Alarm level, alarm number, limit, flow direction
Digital input¹⁾	only for channel 3 and 4
Voltage	15 ... 30 V DC (2 ... 15 mA)
Functionality	Start/stop/hold/continue dosing, reset totalizer 1 and 2, force output, freeze output
Galvanic isolation	All inputs and outputs are galvanically isolated, isolation voltage 500 V.
Cut-off	
Low-flow	0 ... 9.9 % of maximum flow
Limit function	Mass flow, volume flow, fraction, density, sensor temperature
Totalizer	Three eight-digit counters for forward, net or reverse flow
Display	<ul style="list-style-type: none"> Background illumination with alphanumeric text, 3 × 20 characters to indicate flow rate, totalized values, settings and faults. Time constant as current output 1 Reverse flow indicated by negative sign
Zero point adjustment	Via keypad or remote via digital input

Ambient temperature	
Operation	
• Transmitter	-40 ... +60 °C (-40 ... +140 °F), (humidity max. 95 %)
• Display	-20 ... +60 °C (-4 ... +140 °F)
Storage	
• Transmitter	-40 ... +70 °C (-40 ... +158 °F) (Humidity max. 95 %)
• Display	-20 ... +70 °C (-4 ... +158 °F)
Communication Ch1	HART 7.5 PROFIBUS PA PROFIBUS DP Modbus RS-485 RTU
Enclosure	
Material	Aluminum
Rating	IP67/NEMA 4X to IEC 529 and DIN 40050 (1 mH ₂ O for 30 min.)
Mechanical load	18 ... 400 Hz random, 3.17 g RMS, in all directions
Supply voltage	
Supply	20 ... 27 V DC ± 10%; 100 ... 240 V AC ± 10 %, 47 ... 63 Hz
Fluctuation	No limit
Power consumption	7.5 W/15 VA
EMC performance	
Emission	EN 55011/CISPR-11 (Class A)
Immunity	EN/IEC 61236-1 (Industry)
NAMUR	Within the value limits according to "General requirements" with error criteria A in accordance with NE 21
Environment	
Environmental conditions acc. to IEC/EN/UL 61010-1	<ul style="list-style-type: none"> Altitude up to 2000 m Pollution degree 2
Maintenance	The flowmeter has a built-in error log/pending menu which should be inspected on a regular basis.
Cable glands	Cable glands are available in Nylon, Nickel plated brass or stainless steel (316L/W1.4404) in the following dimensions: <ul style="list-style-type: none"> 1 × M25, 2 × M20 3 × ½" NPT
Digital cable connection	Standard industrial signal cable up to 75 m long with 2 × screened pairs or 4-wire overall screen can be laid between the sensor and transmitter. Siemens offers cables in a selection of pre-cut lengths and prepared for either gland or plug connection.
Analog cable connection (MASS 2100/FC300)	Standard industrial cable up to 15 m distance between sensor and transmitter. PVC insulated 5 × 2 × Ø 0.34 mm, twisted and screened in pairs, temperature range -20 ... +105 °C Siemens offers cables in a selection of pre-cut lengths and with two M20 connectors mounted.

¹⁾ With 300 Ω internal impedance. For coil switching use the passive output option.

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Approvals

Hazardous area

- ATEX, IECEx, cCSAus (Class 1 Div 1), EAC Ex, cCSAus Zone 1, NEPSI, INMETRO (depending on version and configuration)
 - Zone 1:
Ex db eb ia [ia Ga] IIC T6 Gb
 - Zone 21:
Ex tb [ia Da] IIIC T85°C Db

Custody transfer (in preparation)

- OIML R 117 type approval to a wide variety of liquids other than water (in preparation)

Pressure equipment

- NTEP for US and Canada (in preparation)
- PED
- CRN (in preparation)

Hygienic applications (in preparation)

- EHEDG (in preparation) for hygienic variant sensors (DN 25 ... DN 80)
- External cleanability satisfies EHEDG

Certificates

Safety Integration Level (in preparation)

- SIL 3 for software (in preparation)
- SIL 2 for hardware (in preparation)
- SIL 3 for redundant hardware systems (in preparation)

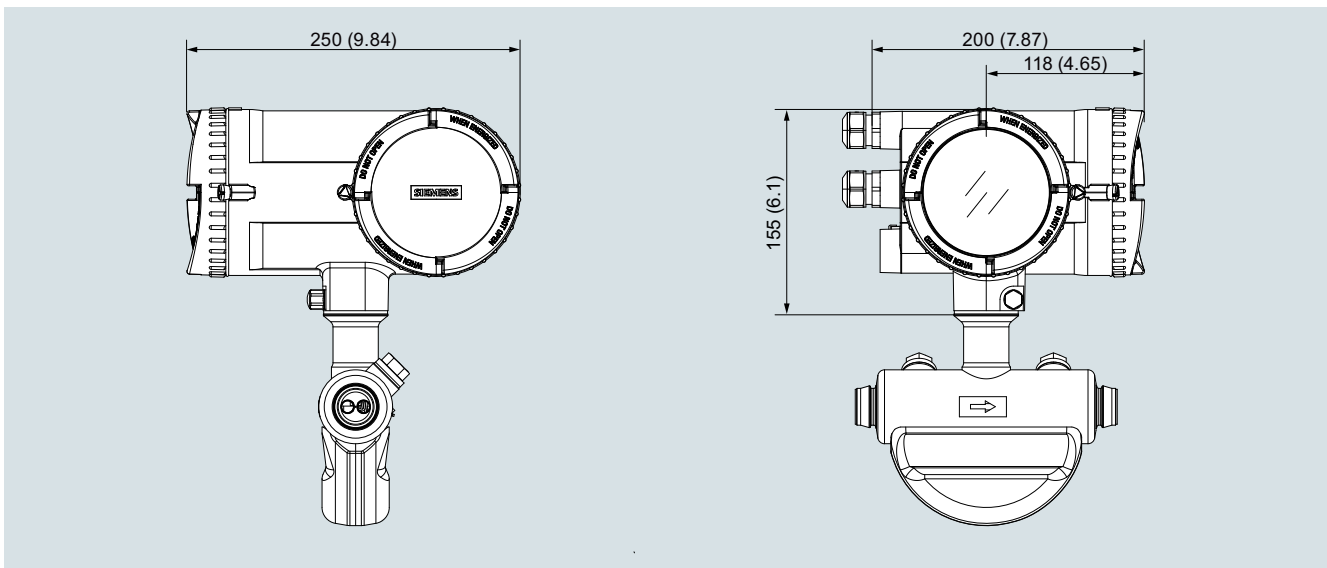
CE mark

- Pressure equipment
- Low voltage directive
- WEEE
- RoHS

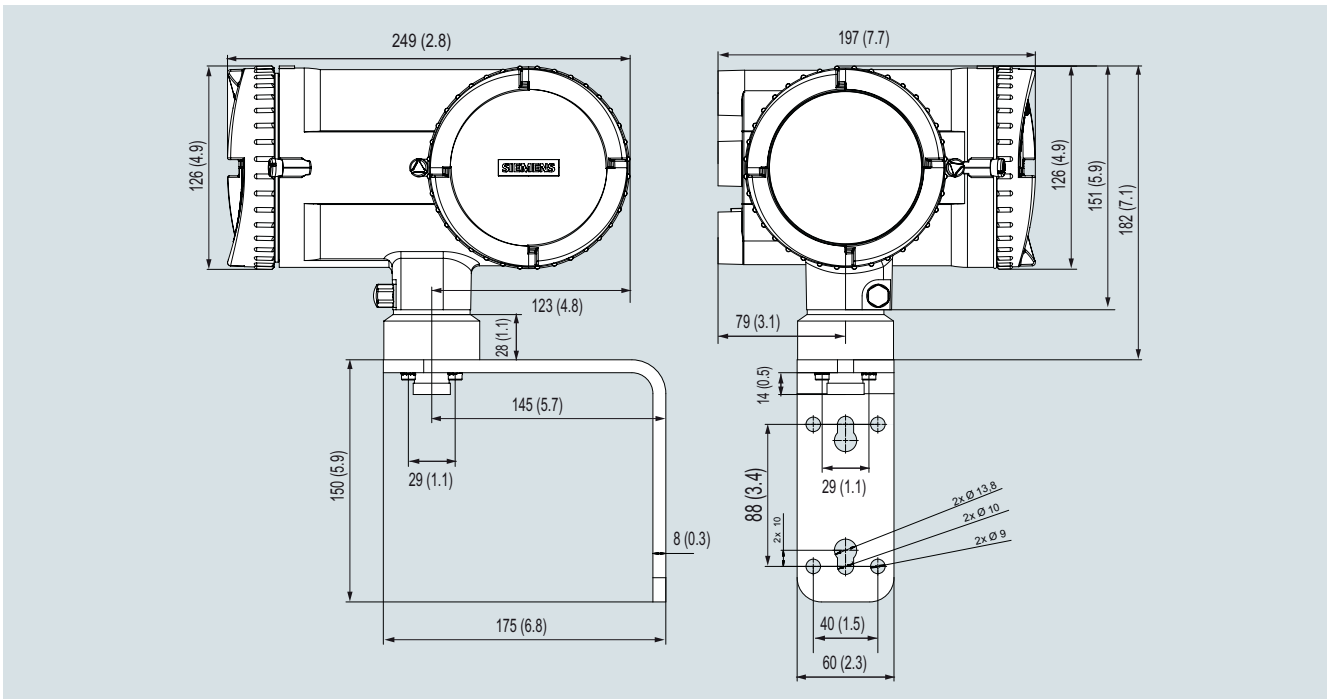
Regional certifications

- C-TICK (Australia and New Zealand EMC)
- EAC (Belarus, Armenia, Kazakhstan, Russia)
- KCC (South Korea) (in preparation)

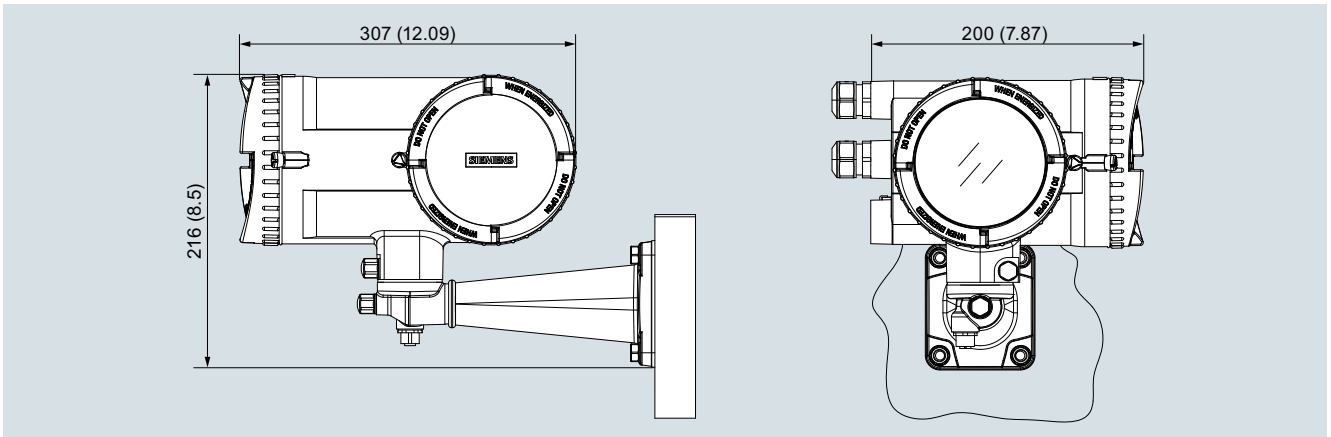
Dimensional drawings



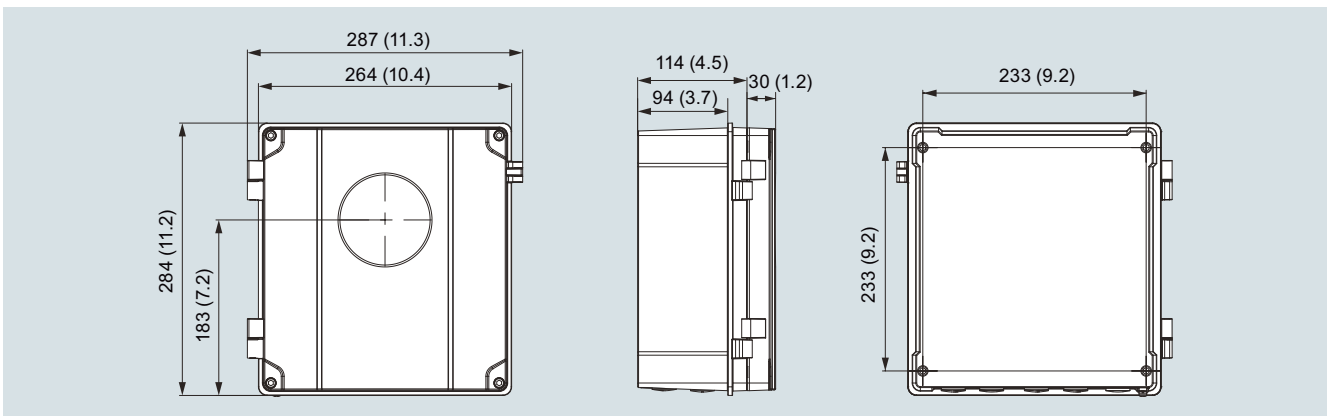
SITRANS FCT030, compact version, dimensions in mm (inch)



SITRANS FCT030, field mount version for low flow MASS2100/FC300 sensors with analog cable and M20 plug connection, dimensions in mm (inch)



SITRANS FCT030, field mount version for sensors with digital cable and M12 plug connection, dimensions in mm (inch)



SITRANS FCT030, wall mount version, dimensions in mm (inch)