

Flow Measurement

SITRANS F C

Transmitter 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, corrected volumeflow, density, temperature and fraction.

The FCT030 IP67 transmitter can be remote connected or compact mounted with all sensors of type FCS400, sizes DN 15 to DN 80.

Application

SITRANS FC430 mass flowmeters 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, 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 patented 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
- 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

Alarms and safety

- Advanced diagnosis and service menu enhances troubleshooting and meter validation
- Configurable upper and lower alarms and warning limits for all process values
- Alarm handling can be selected between Siemens and NAMUR standard configurations
- Designed from the ground up and certified to integrated safety levels as:
 - SIL 3 for software
 - SIL 2 for hardware and mechanics
 - SIL 3 for a system with redundant hardware
 Unlike many systems which are certified in practice, the SITRANS FC430 system is certified in design, which is a higher qualification and more robust for secure implementation of safety systems.

Outputs and control

- Built-in dosing controller with compensation and monitoring comprising 3 built-in totalizers
- Multi-parameter outputs, individually configurable for massflow, volumeflow, corrected 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 7.2 which can be validated and setup for safety critical applications (SIL 3). The current signal can be configured for massflow, volumeflow or density.

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
- Discrete 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)
- Discrete one or two-valve dosing control
- Operational and alarm status

Relay

Relay output(s) can be user configured to:

- Discrete 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)

Signal outputs and inputs are individually ordered as active or passive.

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

Approvals and certificates

The FC430 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 FCS400 sensor of size DN 15, DN 25, DN 50 or DN 80.

FCT030 is available as standard with 1 current, HART 7.2 output and can be fitted with add-on modules for additional input/output functions.

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, 1 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 database 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.

Function

The following functions are available:

- Mass flowrate, volume flowrate, density, process temperature, fraction flow
- Up to four output/input channels selected at ordering
- Outputs can be individually configured with mass, volume, density etc.
- 3 built-in totalizers which can count positive, negative or net flows
- 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
- 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. Users can either select from a list of pre-configured fractions such as °Brix or "Ethanol in water", or order a specific fraction calibration to exactly match the process conditions. All fraction calculations fit within 0.1% of the true value.

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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 Corrected 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 output	
Pulse	41.6 μs ... 5 s pulse duration
Frequency	0 ... 10 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	
Type	Change-over voltage-free relay contact
Load	30 V AC/100 mA
Functions	Alarm level, alarm number, limit, flow direction
Digital input	
Voltage	15 ... 30 V DC (2 ... 15 mA)
Functionality	Start/stop/hold/continue dosing, zero point adjust, 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	Two 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	HART 7.2
Enclosure	
Material	Aluminum
Rating	IP67/NEMA 4X to IEC 529 and DIN 40050 (1 mH ₂ O for 30 min.)
Mechanical load	18 ... 1000 Hz random, 3.17 g RMS, in all directions, to IEC 68-2-36
Supply voltage	
Supply	18.5 ... 300 V DC/ 85 ... 260 V AC, 50 ... 60 Hz
Fluctuation	No limit
Power consumption	7.5 W/15 VA
EMC performance	
Emission	EN/IEC 61000-6-4 (Industry)
Immunity	EN/IEC 61000-6-2 (Industry)
NAMUR	Within the value limits according to "General requirements" with error criteria A in accordance with NE 21
Environment	Within the value limits according to "General requirements" with alarm criteria A in accordance with NE 21
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 gland are available in Nylon, Nickel plated brass or stainless steel (316L/W1.4404) in the following dimensions: <ul style="list-style-type: none"> M20 ½" NPT
Cable	Standard industrial signal cable up to 200 m long with 2 x 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.

Approvals	
Hazardous area	<ul style="list-style-type: none"> • ATEX Ex II 2(1) GD Ex d e [ia] ia IIC T6 Gb • FM/CSA Class1 Div. 1 • IEC Ex II 2(1) GD Ex d e [ia] ia IIC T6 Gb
Custody transfer	<ul style="list-style-type: none"> • OIML R 117 type approval to a wide variety of liquids other than water • NTEP (USA) type evaluation program approval to a wide variety of liquids
Pressure equipment	<ul style="list-style-type: none"> • PED • CRN • Unfired pressure vessels (UK)
Hygienic applications	<ul style="list-style-type: none"> • EHEDG for all sensors • 3A for hygienic variant sensors • External cleanability satisfies EHEDG and 3A rules
Certificates	
Safety Integration Level (applies only to compact versions)	<ul style="list-style-type: none"> • SIL 3 for software • SIL 2 for hardware • SIL 3 for redundant hardware systems
CE mark	<ul style="list-style-type: none"> • Pressure equipment • Low voltage directive • WEEE • RoHS
Regional certifications	<ul style="list-style-type: none"> • C-TICK (Australia and New Zealand EMC) • NEPSI (China Ex) • TISS (Japan)

Flow Measurement

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Selection and Ordering data	Order No.
SITRANS FCT030 Transmitter for replacement or installation extension for SITRANS FC430 Digital coriolis flowmeter	7 ME 4 6 0 3 -
Transmitter with HART, I/O and LUI, for compact or remote mounting, weatherproof and flameproof (where specified). Order the sensor separately.	0
Material and mounting style	
Compact, IP67, aluminum	◆ 2
Remote, IP67, aluminum, M12	◆ 5
Remote, IP67, aluminum, T/Box	◆ 8
Ex approvals	
Non-Ex	◆ A
ATEX II 2GD	◆ C
IECEX GDb	◆ F
FM/CSA/UL Class 1, Div 1	◆ H
Cable glands	
Metric, no glands	◆ A
Metric, plastic	◆ B
Metric, brass/Ni plated	◆ E
Metric, stainless steel	◆ F
NPT, no glands	◆ G
NPT, plastic	◆ H
NPT, brass/Ni plated	◆ L
NPT, stainless steel	◆ M
Power supply	
18 ... 300 V DC; 18 ... 85, 185 ... 250 V AC, 50/60 Hz	◆ 0
Enclosure protection rating	
IP67/NEMA 4X	◆ 4
Local User Interface	
Blind	◆ 1
Graphical, 240x160 pxl	◆ 3
Software functions	
Standard	◆ A
I/O configuration Ch1	
Ca 4 ... 20 mA HART active SIL certified	◆ E
Cp 4 ... 20 mA HART passive SIL certified	◆ F

◆ Short lead time (details in PMD)

Selection and Ordering data

Selection and Ordering data	Order code
Further designs	
Please add "-Z" to Order No. and specify Order code(s).	
I/O configuration Ch2, Ch3 and Ch4	
None	◆ F00
aSignal, None, None	◆ F40
aSignal, aSignal, None	◆ F41
aSignal, aSignal, aSignal	◆ F42
aSignal, aSignal, Ia	◆ F43
aSignal, aSignal, R	◆ F44
aSignal, Ia, None	◆ F45
aSignal, Ia, Ia	◆ F46
aSignal, Ia, R	◆ F47
aSignal, R, None	◆ F50
aSignal, R, R	◆ F51
pSignal, None, None	◆ F60
pSignal, pSignal, None	◆ F61
pSignal, pSignal, pSignal	◆ F62
pSignal, pSignal, Ip	◆ F63
pSignal, pSignal, R	◆ F64
pSignal, Ip, None	◆ F65
pSignal, Ip, Ip	◆ F66
pSignal, Ip, R	◆ F67
pSignal, R, None	◆ F70
pSignal, R, R	◆ F71
aSignal, aSignal, pSignal	F80
aSignal, aSignal, Ip	F81
aSignal, pSignal, None	F82
aSignal, pSignal, pSignal	F83
aSignal, pSignal, Ia	F84
aSignal, pSignal, Ip	F85
aSignal, pSignal, R	F86
aSignal, Ia, Ip	F87
aSignal, Ip, None	F90
aSignal, Ip, Ip	F91
aSignal, Ip, R	F92
pSignal, pSignal, Ia	F93
pSignal, Ia, None	F94
pSignal, Ia, Ia	F95
pSignal, Ia, Ip	F96
pSignal, Ia, R	F97

Notes on I/O configurations:

a or p suffix: The I/O module is selected at ordering with either active or passive function.

Signal: The output can be selected for Current (0 or 4 to 20 mA), frequency or pulse function in the menu.

I: Discrete status input to the flowmeter. Functions are selected in the menu including 'Freeze output', 'Reset totalizer'.

R: 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 **this level**, including "-Z" options A..., B..., E... and F...

Selection and Ordering data	Order code
Add-on options and accessories	
Please add "-Z" to Order No. and specify Order code(s).	
Certificates	
Factory certificate to EN 10204 2.1	◆ C10
Factory certificate to EN 10204 2.2	◆ C11
Cable	
None	◆ L50
5 m (16.4 ft), standard with M12 plugs fitted	◆ L51
5 m (16.4 ft), standard	◆ L52
10 m (32.8 ft) standard with M12 plugs fitted	◆ L55
10 m (32.8 ft), standard	◆ L56
25 m (82 ft), standard with M12 plugs fitted	◆ L59
25 m (82 ft), standard	◆ L60
50 m (164 ft), standard with M12 plugs fitted	◆ L63
50 m (164 ft), standard	◆ L64
75 m (246 ft), standard with M12 plugs fitted	◆ L67
75 m (246 ft), standard	◆ L68
150 m (492 ft), standard with M12 plugs fitted	◆ L71
150 m (492 ft), standard	◆ L72
Additional data	
Please add "-Z" to Order No. and specify Order code(s) and plain text.	
Tag name	
Tag name plate, stainless steel	Y17
Transmitter setup	
Custom transmitter setup	Y20

◆ Short lead time (details in PMD)

Operating instructions for SITRANS FC430

Description	Order No.
• English	A5E03361511
• German	A5E03651143
• Spanish	A5E03651152
• French	A5E03651188
• Italian	A5E03651190
• Chinese	A5E03922773

This device is shipped with a Quick Start guide and a CD containing further SITRANS F C literature.

All literature is also available for free at:
<http://www.siemens.com/flowdocumentation>