

Flow Measurement

SITRANS FS (ultrasonic)

Clamp-on ultrasonic flowmeters / SITRANS FST030 transmitter

Overview



FST030 is based on the latest developments within Digital Signal Processing (DSP) technology – engineered for high measuring performance, fast response to step changes in flow, high immunity against process noise, easy to install commission and maintain.

The FST030 transmitter delivers true multi-parameter measurements i.e. volume flow, standard volume flow, density, mass flow, fluid sound velocity and temperature.

The multiple outputs and bus communication mean that all primary process information can be read either instantaneously (10 ms update) or periodically as required by plant operations.

Process values

- Volume flow
- Mass flow
- Flow velocity
- Sound velocity
- Standard volume flow (hydrocarbon variant only)
- Density
- Kinematic viscosity
- Pressure
- Medium temperature
- Specific gravity (hydrocarbon variant only)
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Standard density (hydrocarbon variant only)
- Standard specific gravity (hydrocarbon variant only)
- Standardizing factor (hydrocarbon variant only)
- Liquident (hydrocarbon variant only)
- API gravity (hydrocarbon variant only)
- Standard API gravity (hydrocarbon variant only)
- Standard kinematic viscosity (hydrocarbon variant only)
- Liquid identifier (hydrocarbon variant only)

Benefits

Flow calculation and measurement

- Dedicated volume flow calculation with DSP technology
- 100 Hz update rate for all output on all primary process values
- Maximum data age from sensor to output is 20 ms
- Independent low flow cut-off settings for volume and mass flow, standard volume flow and velocity
- Zero-point adjustment on command from discrete input or host system

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
- SensorFlash technology stores production specific system documentation and provides removable memory of all flowmeter setups and functions
 - Calibration certificates (with ordered calibration)
 - Non-volatile memory backup of operational data
 - Transfer of user configuration to other flowmeters
 - 4 GB SD card for storage and data logging
 - Audit trail of all parameter changes
 - Alarm logging

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

Outputs and control

- Monitoring comprising of 3 individually configurable totalizers
- Multi-parameter outputs, configurable outputs assigned individually to any of the following parameters:
 - Volume flow
 - Standard volume flow
 - Mass flow
 - Flow velocity
 - Sound velocity
 - Density
 - Process viscosity
 - Process pressure
 - Process/medium temperature

Up to six I/O channels are configured as follows.

Benefits (continued)

Channel 1

Channel 1 is 4 to 20 mA analog output with HART 7.5. The current signal can be configured for massflow, volumeflow and includes the availability of active or passive function selected by wiring on the non-Ex terminals. Alternative Modbus RTU RS 485 is available.

Channel 2

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

- Analog current (0/4 to 20 mA)
- Frequency or pulse
- 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 output

Signal output can be user configured to:

- Analog current (0/4 to 20 mA)
- Frequency or pulse
- Redundant frequency or pulse (linked to channel 2)
- Operational and alarm status

Signal input

Signal input can be user-configured for:

- Totalizer reset functions
- Force outputs or freeze process values
- Initiate automatic zero point adjustment

Relay

Relay output(s) can be user configured to:

- Alarm status

4-20 mA signal outputs and inputs are ordered as active or passive for Ex versions, active and passive for non-Ex versions - function selected by wiring on the terminals.

During initial commissioning of the flowmeter, all outputs can be forced to a preset value for simulation, verification or calibration purposes.

Channels 5 and 6 (with internal DSL)

- RTD temperature inputs for 1000, 500 or 100 Ω RTD's - 2, 3 or 4 wire RTD's supported
- Channels 5 and 6 (with external DSL option)
- RTD Temperature inputs or 4-20 ma inputs. Selectable in menu.

Approvals and certificates

The SITRANS FST030 transmitter was designed to comply with or exceed the requirements of international standards and regulations.

Design

The SITRANS FST030 is designed in an IP67/NEMA 4X aluminum enclosure with corrosion resistant coating. It can be wall or pipe mounted and the enclosure can be locked with a padlock or wired with lead security seals. Includes all flow and DSL functions integrated into one unit.

The FST030 is available as standard with one current, HART 7.5 output and can be ordered with additional input/output functions.

The SITRANS FST030 wall mount housing 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 GB micro SD card with the ability to be updated by PC. It is supplied with each transmitter and comes with a complete set of certification documents including report if ordered. Factory conformance certificates are optional at ordering. The Siemens SensorFlash memory unit offers the following features and benefits:

- Copy site setups to SD card for easy transfer to other similar transmitters
- 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 Sensor-Flash (unmounted from the transmitter and inserted into a PC's SD card slot). The firmware is then inserted into the existing flowmeter for system/firmware upgrade.

SITRANS FST030 industrial housing

Separate field enclosure with modular design. The FST030 can be installed direct in the field. The SITRANS FST030 always uses the separate FS DSL for the sensor connection.

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Function

The following functions are available:

- Up to four configurable outputs and 2 RTD input channels selected at ordering
- Outputs can be individually configured for mass flow, volume flow, etc.
- Three built-in totalizers which can count positive, negative or net flows
- Independent low flow cut-offs, adjustable
- Uni/bidirectional flow measurement
- Flow direction adjustable
- Alarm system consisting of alarm-log, alarm pending menu
- Change log, logs all changes made to menu parameters or via communications
- Internal data logger
- Display of operating time with real-time clock
- Flowrate outputs are freely configurable between maximum negative and maximum positive flows according to the sensor capacity
- Limit switches programmable for flow, density and temperature. Limit points can be graded as warning and alarm for values both above and below nominal process conditions
- Zero adjustment menu, with zero point evaluation display
- Full service menu for effective and straight forward application and meter troubleshooting
- Precise temperature measurement ensures optimal accuracy on massflow and density
- Fully compatible with Siemens PDM version 8.2 service pack 1 or higher

Technical specifications

SITRANS FST030	
Process media	<ul style="list-style-type: none"> • Suitable for virtually any sonically conductive fluid, including hazardous liquids • Aggregate state: Light slurry and liquid
Process variables	<ul style="list-style-type: none"> • Volume flow • Mass flow • Flow velocity • Sound velocity • Standard volume flow (hydrocarbon variant only) • Density • Kinematic viscosity • Pressure • Medium temperature • Specific gravity (hydrocarbon variant only) • Totalizer 1 • Totalizer 2 • Totalizer 3 • Standard density (hydrocarbon variant only) • Standard specific gravity (hydrocarbon variant only) • Standardizing factor (hydrocarbon variant only) • Liquident (hydrocarbon variant only) • API gravity (hydrocarbon variant only) • Standard API gravity (hydrocarbon variant only) • Standard kinematic viscosity (hydrocarbon variant only) • Liquid identifier (hydrocarbon variant only)
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 ... 22 V DC, 30 mA, short-circuit-protected
Passive	3 ... 30 V DC, max. 110 mA
Relay	
Type	SPDT dry contact relay
Load	30 V AC/100 mA
Functions	Alarm level, alarm number, limit, flow direction
Digital input	
Voltage	15 ... 30 V DC (2 ... 15 mA)
Current	4 ... 20 mA
Functionality	Reset totalizer 1, 2 and 3, force output, freeze process values, zero point adjustment
Galvanic isolation	All inputs and outputs are galvanically isolated, isolation voltage 500 V
Alarm and warning limit	Available for all process values
Totalizer	Three counters for forward, net and reverse flow
Display	<ul style="list-style-type: none"> • Background illumination with alphanumeric text to indicate flow rate, totalized values, settings and faults • Adjustable damping constant of 0 ... 100 s • Reverse flow indicated by negative sign

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Technical specifications (continued)

SITRANS FST030	
SD card functions	<ul style="list-style-type: none"> • Parameter change log • Configurable data logger • FW update log • Diagnostic log • Error and alarm log • Parameter backup
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 %
Communication	HART 7.5 Modbus RTU RS 485
Enclosure	
Material	Aluminum
Rating	IP66/67, 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
Power supply	
Universal	20 ... 27 V DC 100 ... 240 V AC, 47 ... 63 Hz
Fluctuation	No limit
Power consumption	20 W/22 VA
Minimum pressure for gas	10 bar (145 psi), gas composition and application dependent; plastic pipes support operation at atmospheric pressure. For lower pressure application please contact sales
Environment Environmental conditions according to IEC/EN/UL 61010-1	<ul style="list-style-type: none"> • Altitude up to 2 000 m • Pollution degree 2 • Overvoltage category II
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)
Approvals for FST030 wall mount enclosure	
<u>Canada, USA</u>	Class I, Division 2, Groups A, B, C, D Class II, Division 2, Groups F, G Class III, Division 2 Class I, Zone 2, AEx ia nA [ia Ga] IIC T6...T5 Gc Class I, Zone 2; AEx/Ex ec ia [ia Ga] IIC T6...T5 Gc Class II, Zone 22; AEx/Ex tc [ia Da] IIIC T85°C Dc
• FM17CA0110X • FM17US0219X • CSA 21CA80072942X	
<u>ATEX, UKEx, IECEx</u>	II 3(1) G Ex ec ia [ia Ga] IIC T6...T5 Gc II 3(1) D Ex tc [ia Da] IIIC T85°C Dc
• FM17ATEX0055X • FM21UKEX0059X • IECEx FMG 17.0023X	
<u>Inmetro</u>	Ex ex ia [ia Ga] IIC T6 Gc Ex tc [ia Ga] IIIC T85°C Dc
• BRA 21.GE0013X	
<u>Ambient temperature range</u>	T ₆ for -40 °C ≤ T _a ≤ 45 °C T ₅ for -40 °C ≤ T _a ≤ 60 °C T ₅ 85 °C for -40 °C ≤ T _a ≤ 60 °C

Technical specifications (continued)

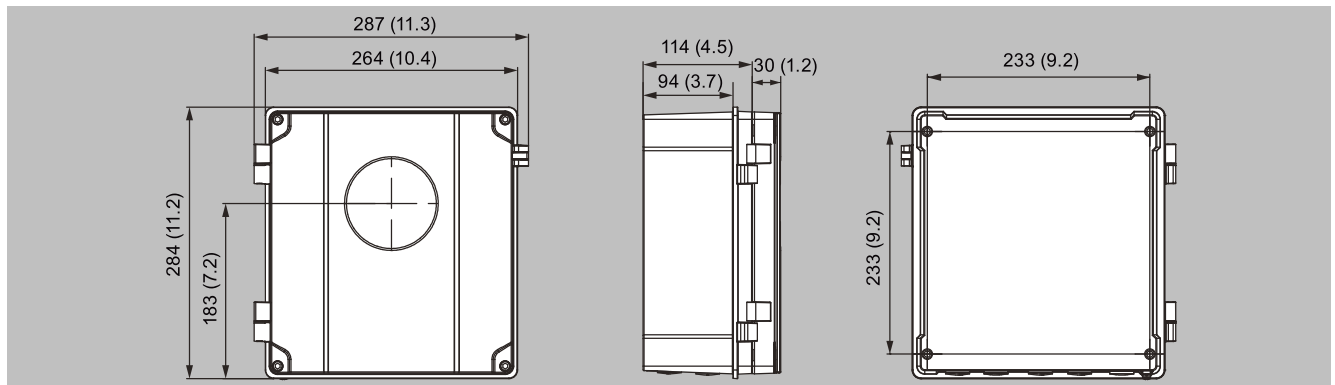
SITRANS FST030	
Approvals for FST030 industrial enclosure	
<u>Canada, USA</u>	Canada: Ex db eb ia [ia Ga] IIC T6 Gb Ex tb [ia Da] IIIC T85°C USA: Class I, Division 1, Groups A, B, C, D Class II, Division 1, Groups E, F, G Class III, Division 1 Class I, Zone 1: AEx db eb ia [ia Ga] IIC T6 Gb Class II, Zone 21: AEx tb [ia Da] IIIC T85°C II 2(1) G Ex db eb ia [ia Ga] IIC T6 Gb II 2(1) D Ex tb [ia Da] IIIC T85°C Db
• CSA 2508628 • FM18US0063X • FM21CA0019X	
<u>ATEX, UKEx, IECEx</u>	
• Sira 11ATEX1342X • CSAE 21UKEX1109X • IECEx SIR 11.0150X	
<u>Inmetro</u>	Ex db eb ia [ia Ga] IIC T6 Gb Ex tb [ia Da] IIIC T85°C Db
• BRA 21.GE0013X	
<u>Ambient temperature range</u>	T _a = -40 ... 60 °C
Approvals for FS230 external DSL	
<u>Canada, USA</u>	IS Class I, Division 1, Groups A, B, C, D IS Class II, Division 1, Groups E, F, G IS Class III, Division 1 Class I, Zone 0; AEx/Ex ia IIC T6...T5 Ga Class II, Zone 21; AEx/Ex ib IIIC T64°C...T74°C Db
• FM16CA0157X • FM16US0318X • CSA 21CA8007621X	
<u>ATEX, UKEx, IECEx</u>	II 1 G Ex ia IIC T6...T5 Ga II 2 D Ex ib IIIC T5 64°C...T5 74°C Db
• FM16ATEX0094X • FM21UKEX0058X • IECEx FMG 16.0037X	
<u>Inmetro</u>	Ex ia IIC T6...T5 Ga Ex ib IIIC T5 64°C Db
• BRA 21.GE001	
<u>EAC Ex</u>	Ex ia IIC T6...T5 Ga Ex ib IIIC T64°C...T5 74 °C Db
<u>Ambient temperature range</u>	T ₆ : -40 °C ≤ T _a ≤ 50 °C T ₅ : -40 °C ≤ T _a ≤ 60 °C T ₅ 64 °C: -40 °C ≤ T _a ≤ 50 °C T ₅ 74 °C: -40 °C ≤ T _a ≤ 60 °C
Certificates	
CE conformity marking	<ul style="list-style-type: none"> • Low voltage directive • WEEE • RoHS
EMC performance	
Emission	CISPR 11:2009/A1:2010 and EN 55011:2009/A1:2010
Immunity	IEC/EN 61326-1:2013

Flow Measurement

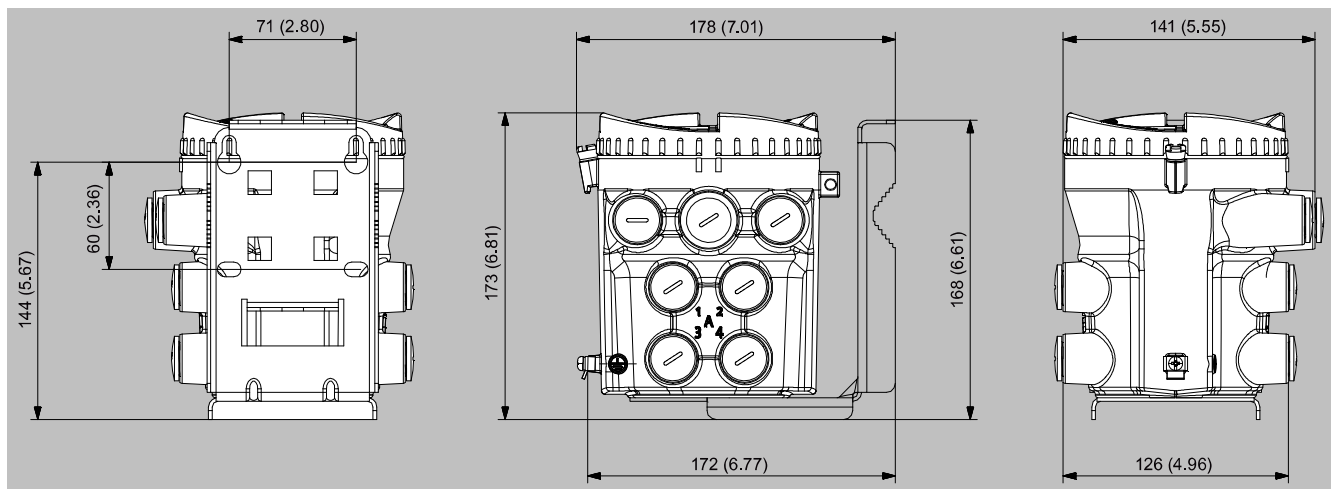
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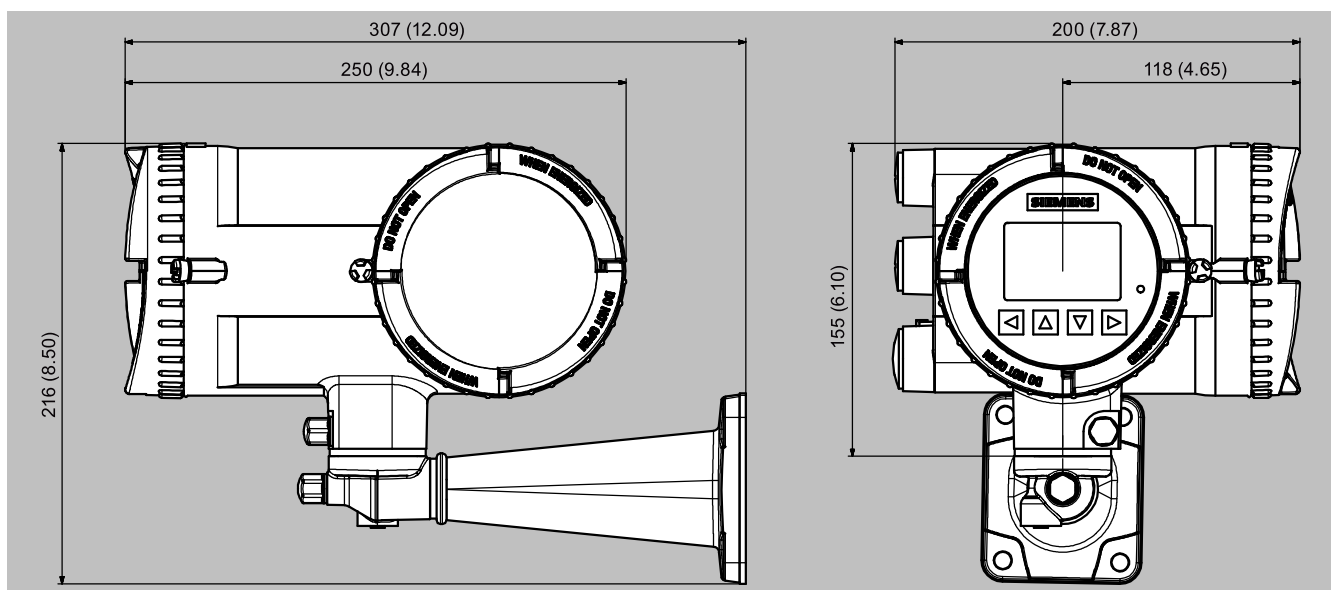
Dimensional drawings



SITRANS FST030, wall mount version, dimensions in mm (inch)

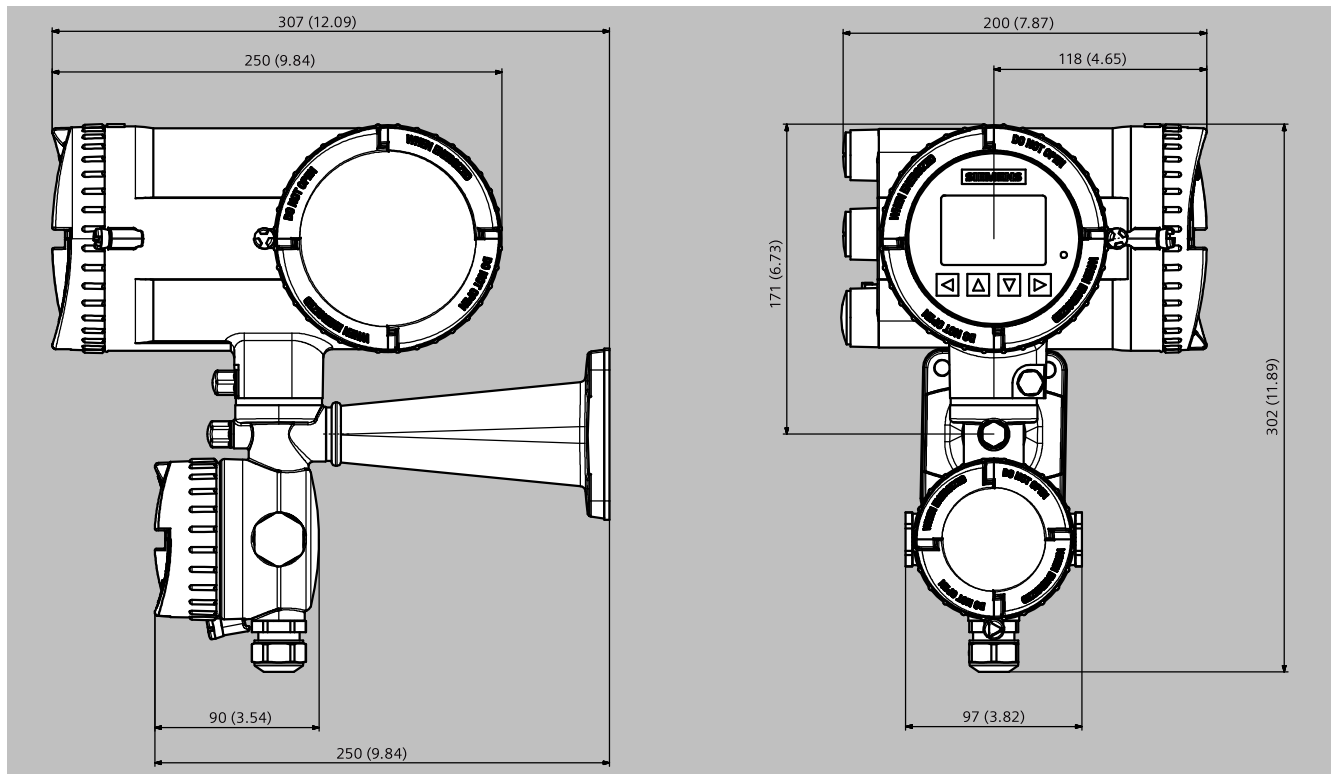


External DSL, dimensions in mm (inch)



SITRANS FST030 industrial transmitter with M12 connection, dimensions in mm (inch)

Dimensional drawings (continued)



SITRANS FST030 with terminal house, dimensions in mm (inch)