

Flow Measurement

SITRANS F US Inline

Flowmeter SITRANS FUS380 standard

Overview



The 2-path flowmeter SITRANS FUS380 comes as battery or mains-powered and is designed to measure water flow in district heating plants local networks, boiler stations, substations, chiller plants (including glycol mixes), and other general water applications.

The type-approved flowmeter version is named SITRANS FUE380 - see page 3/294.

Technically, the meter types SITRANS FUS380 and SITRANS FUE380 are completely identical, only difference is the calibration limit and the type approval for custody transfer.

Benefits

- Battery-powered up to 6 years
- 115/230 V mains-powered with back-up battery option in case of mains power failure
- Fast measuring frequency 15 Hz/0.5 Hz (230 V AC/Battery)
- Easy one-button straight forward display
- 2-path measuring principle for optimum accuracy
- Compact or remote mounting
- Measures on most district water qualities and water conductivities
- No pressure drop
- Long-term stability
- 2 galvanically isolated digital outputs for easy connection to a calculator (potential-free)
- Analog output 4 to 20 mA
- Bidirectional measurement, with 2 totalizers and outputs
- Dynamic range Q_i (min) : Q_s (max) up to 1:400

Application

The main application for SITRANS FUS380 is measurement of water flow or water flow in energy meter systems in district heating networks or chilled water (including glycol mixes).

Design

The 2-path design of SITRANS FUS380 ensures maximum accuracy under short inlet conditions. The flowmeter consists of a flow sensor pipe, 4 transducers/transducer cables and a transmitter SITRANS FUS080.

The unit is available in a compact or a remote version. Both versions are pre-mounted with short coax-cables. Remote transmitter up to a distance of 30 m by one Sensor link cable (SSL).

Compact mounting is only possible up to 120 °C (248 °F). The sensor must be isolated to protect transmitter from heat. The transmitter is available in an IP67/NEMA 4X/6 enclosure.

Integration

The flowmeter digital output is often used as input for an energy meter or as input for digital systems for remote reading.

SITRANS FUS380 has two digital output functions that can be individually selected.

Pulse output rate is defined when ordering. To get optimal benefit the pulse value must be selected as low as possible.

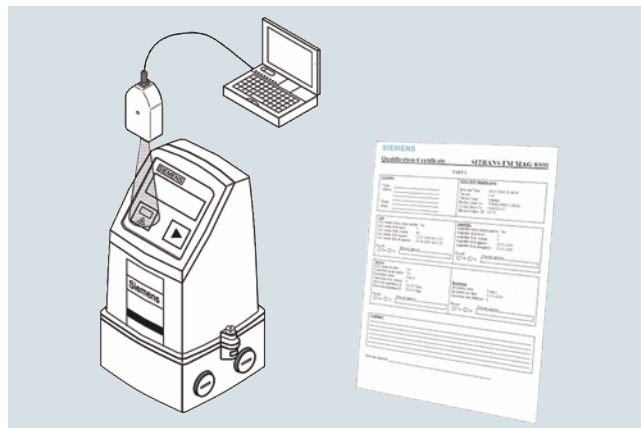
If the flowmeter forms part of an energy meter system for custody transfer, no further approvals are needed, except possible local approvals on the flowmeter.

Function

Together with the SIMATIC PDM tool the FUS380 offers the possibility of testing and verifying the flowmeter on site and creating a printed "Qualification Certificate" with specific data that defines the quality status of the measurement.

The Qualification Certificate shows information about the actual status of the flowmeter:

- General settings, flowmeter and battery information, totalizer values, and pulse output settings
- Detailed information about the transmitter and the sensor functionality, and a main parameter list for evaluating the functionality of the flowmeter



Configuration SITRANS FUS380

Selection guide SITRANS FUS380, standard version

DN	Q _s (m ³ /h)	Q _{max} (m ³ /h) (105 % of Q _s)	Q _p (m ³ /h)	Q _i (m ³ /h) (1:100 of Q _p)	Cut-off (m ³ /h)	Cut-off (% of Q _{max})	Typical pulse value ¹⁾ (l/pulse)
50	15	15.75	15	0.15	0.075	0.48	1
50	45	47.25	15	0.15	0.075	0.16	1
50	45	47.25	30	0.3	0.150	0.32	1
65	25	26.25	25	0.25	0.125	0.48	1
65	72	75.6	25	0.25	0.125	0.17	1
65	72	75.6	50	0.5	0.250	0.33	1
80	40	42	40	0.4	0.200	0.48	2.5
80	120	126	40	0.4	0.200	0.16	2.5
80	120	126	80	0.8	0.400	0.32	2.5
100	60	63	60	0.6	0.300	0.48	2.5
100	180	189	60	0.6	0.300	0.16	2.5
100	240	252	120	1.2	0.600	0.24	2.5
125	10	10.5	100	1	0.500	4.76	2.5
125	280	294	100	1	0.500	0.17	2.5
125	400	420	200	2	1.000	0.24	2.5
150	150	157.5	150	1.5	0.750	0.48	10
150	420	441	150	1.5	0.750	0.17	10
150	560	588	300	3	1.500	0.26	10
200	250	262.5	250	2.5	1.250	0.48	10
200	700	735	250	2.5	1.250	0.17	10
200	900	945	500	5	2.500	0.26	10
250	400	420	400	4	2.000	0.48	10
250	1 120	1 176	400	4	2.000	0.17	10
250	1 400	1 470	800	8	4.000	0.27	10
300	560	588	560	5.6	2.800	0.48	50
300	1 560	1 638	560	5.6	2.800	0.17	50
300	2 100	2 205	1 120	11.2	5.600	0.25	50
350	750	787.5	750	7.5	3.750	0.48	50
350	2 100	2 205	750	7.5	3.750	0.17	50
350	2 800	2 940	1 500	15	7.500	0.26	50
400	950	9 97.5	950	9.5	4.750	0.48	50
400	2 660	2 793	950	9.5	4.750	0.17	50
400	3 600	3 780	1 900	19	9.500	0.25	50
500	1 475	1 548.75	1 475	14.75	7.375	0.48	100
500	4 130	4 336.5	1 475	14.75	7.375	0.17	100
500	5 500	5 775	2 950	29.5	14.750	0.26	100
600	2 150	2 257.5	2 150	21.5	10.750	0.48	100
600	6 020	6 321	2 150	21.5	10.750	0.17	100
600	8 000	8 400	4 300	43	21.500	0.26	100
700	2 900	3 045	2 900	29	14.500	0.48	100
700	8 120	8 526	2 900	29	14.500	0.17	100
700	10 800	11 340	5 800	58	29.000	0.26	100
800	3 800	3 990	3 800	38	19.000	0.48	100
800	10 640	11 172	3 800	38	19.000	0.17	100
800	14 200	14 910	7 600	76	38.000	0.25	100
900	5 000	5 250	3 800	38	19.000	0.36	100
900	14 000	14 700	5 000	50	25.000	0.17	100
900	20 000	21 000	5 000	50	25.000	0.12	100
1 000	6 000	6 300	3 800	38	19.000	0.30	100
1 000	16 800	17 640	6 000	60	30.000	0.17	100
1 000	24 000	25 200	12 000	120	60.000	0.24	100
1 200	9 000	9 450	3 800	38	19.000	0.20	100
1 200	25 200	26 460	9 000	90	45.000	0.17	100
1 200	36 000	37 800	18 000	180	90.000	0.24	100

The values Q_i, Q_p and Q_s are shown on the system label of the FUS380. Q_i (Q_{min}) means the minimal and Q_p (Q_{nom}) the nominal flow rate. Q_s is the highest operatable flow rate. The maximum flow rate (Q_{max}) is 105 % of Q_s. The low flow cut-off is 50 % of Q_i.

In order to obtain best pulse output resolution in the range Q_{min} to Q_s of approx. 100 Hz at Q_s, two or three flow values for every dimension can be selected at ordering. Therefore the ordering data table also shows Q_p (Q_n). This flow rate is between Q_i (Q_{min}) and Q_s and indicates the normal or typical flow.

To get optimal benefit of the pulses the pulse value and pulse length shall be selected as low as possible. The following calculation formula can be used for determining the shortest pulse value at a pulse length of 5 ms: L/pulse > Q_s (m³/h) /360.

For example Q_s = 300 m³/h; L/pulse > 300/360; L/pulse > 0.83; therefore the pulse value must be 1 l/pulse

¹⁾ Typical pulse values for SITRANS FUS380 with pulse length 5 ms. Other values are possible - please see the selections at the 7ME340 Order codes.

Flow Measurement

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Technical specifications

Sensor design	2-path sensor with flanges and inline transducers wet-calibrated from factory
Nominal size (DN 50 ... DN 80 in bronze)	DN 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, 500, 600, 700, 800, 900, 1000, 1200
Pressure rate	PN 16, PN 25, PN 40 EN 1092-1 flanges: • type 01 (B): DN 100 to DN 125 • type 11 (B): DN 150 to DN 1200 • type 11 (B) 'design': DN 50 to DN 80
Pipe material	• DN 100 ... DN 1200: Carbon Steel EN 1.0345/P235 GH, painted in light-gray. • DN 50 ... 80: Die-cast bronze G-CuSn10/W2.1050.01 (EN 1982)
Transducer design	• DN 100 ... DN 1200: Inline version and welded onto the pipe • DN 50 ... DN 80: Screwed into the pipe
Transducer material	Stainless steel (AISI 316/1.4404)/brass (CuZn ₃₆ Pb ₂ As)

Sensor operating conditions

Ambient temperature	
• Operation	-10 ... +60 °C (14 ... 140 °F) (MID version: -10 ... +55 °C (14 ... 131 °F))
• Storage	-40 ... +85 °C (-40 ... +185 °F)
Measured media	Heating water, according to VDI-2035 (pH 8.2 - 10.5), industrial VdTUV information sheet 1466 and AGFW information sheet FW 510.
Media/surface temperature	
• DN 100 ... DN 1200	Remote: 2 ... 200 °C (35.6 ... 392 °F)
• DN 50 ... DN 80	Remote: 2 ... 150 °C (35.6 ... 302 °F)
• DN 50 ... DN 1200	Compact: 2 ... 120 °C (35.6 ... 248 °F)
Degree of protection	Sensor connection IP67/NEMA 4X/6
Max. flow velocity	DN 50 ... DN 1200: 9 m/s (29.5 ft/s)
Electromagnetic compatibility	
• Emitted interference	To EN 55011/CSPRI-11
• Noise immunity	To EN/IEC 61236-1 (Industry)

Transmitter

The transmitter related to this system is the SITRANS FUS080. Technical specifications to the FUS080 see page 3/253 ff.

Sensor cable

Transducer cable length	Pre-mounted with short coax-cables
Sensor link cable length (SSL)	5, 10, 20, 30 m (16.4, 32.8, 65.6, 98.4 ft)

Certificates and approvals

Conformity certificate (CE)	The devices are supplied as standard with a Siemens Certificate of Conformity on DVD
Material certificate	Material certificate according EN 3.1 is optionally available
Calibration report	A standard calibration report is shipped with every flowmeter. Extended accredited ISO/IEC 17025 calibration certificates optionally available
Approvals	No custody transfer approvals

The sensors are approved according to EU directive 2014/68/EU dated 27 June 2014 regarding fluid group 1, classified in category III. Design according to EN 13480 (PED Directive).

SITRANS FUS380 uncertainty

	FUS380
Flow value setting	Predefined settings according to dimension
Approval	No approval
Flow rate v_f	0.02 ... 9 m/s (0.065 ... 29.5 ft/s)
Output A	Pulse: forward, reverse, forward net, reverse net (Preset: forward)
Output B	Pulse (forward, reverse, forward net, reverse net, alarm, call-up (Preset: alarm))
Pulse value A & B (depending on DN value)	0.1 l/p, 0.25 l/p, 0.5 l/p, 1 l/p, 2.5 l/p, 10 l/p, 25 l/p, 50 l/p, 100 l/p, 250 l/p, 500 l/p, 1 m ³ /p, 2.5 m ³ /p, 5 m ³ /p, 10 m ³ /p, 25 m ³ /p, 50 m ³ /p, 100 m ³ /p, 250 m ³ /p, 500 m ³ /p, 1000 m ³ /p
Pulse width	5/10/20/50/100/200/500 ms
Flow unit setup	Preset: m ³ /h
Volume unit setup	Preset: m ³

Flowmeter Calibration and traceability

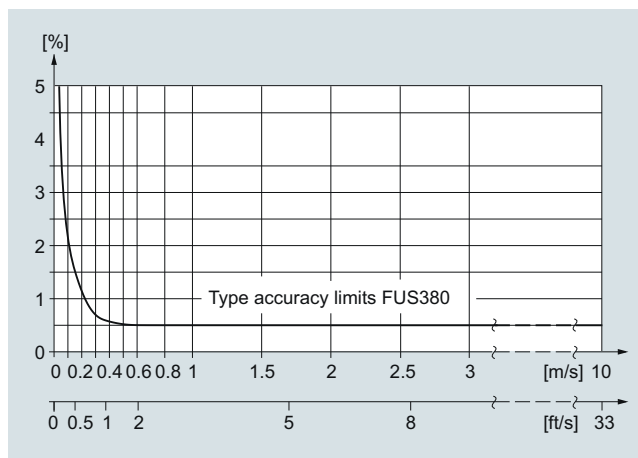
To ensure continuous accurate measurement, flowmeters must be calibrated. The calibration is conducted at Siemens flow facilities with traceable instruments referring directly to the physical unit of measurement according to the International System of Units (SI).

Therefore, the calibration certificate ensures recognition of the test results worldwide, including the US (NIST traceability). Siemens offers accredited calibrations assured to ISO 17025 in the flow range from 0.0001 m³/h to 10 000 m³/h. Siemens Flow Instruments accredited laboratories are recognized by ILAC MRA (International Laboratory Accreditation Corporation - Mutual Recognition Arrangement) ensuring international traceability and recognition of the test results worldwide.

A standard calibration certificate with Q_n as selected flow is shipped with each SITRANS FUS380. This production calibration protocol consists of 2 x 3 points at Q_i , 10 % Q_p and Q_p (max. 4 200 m³/h).

Accuracy SITRANS FUS380:

± 0.5 % for 0.5 m/s < v < 10 m/s and ± 0.25/V_{act} [%] below 0.5 m/s



Selection and Ordering data	Article-No.	Order code
Flowmeter SITRANS FUS380 (standard)	7ME3400 - 0 - A	

Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Diameter	Approval	Pressure rating	Flow setting [m ³ /h]		
			Q _p (Q _n)	Q _s	
Pipe material: Die-cast bronze					
DN 50 (2")	EN 1434	PN 40	15	15	1 A
DN 50 (2")	EN 1434	PN 40	15	45	1 C
DN 50 (2")	OIML R75	PN 40	30	45	1 D
DN 65 (2½")	EN 1434	PN 40	25	25	1 E
DN 65 (2½")	EN 1434	PN 40	25	72	1 G
DN 65 (2½")	OIML R75	PN 40	50	72	1 H
DN 80 (3")	EN 1434	PN 40	40	40	1 J
DN 80 (3")	EN 1434	PN 40	40	120	1 L
DN 80 (3")	OIML R75	PN 40	80	120	1 M
Pipe material: Carbon steel					
DN 100 (4")	EN 1434	PN16, PN 40	60	60	1 N
DN 100 (4")	EN 1434	PN16, PN 40	60	180	1 Q
DN 100 (4")	OIML R75	PN16, PN 40	120	240	1 R
DN 125 (5")	EN 1434	PN16, PN 40	100	100	1 S
DN 125 (5")	EN 1434	PN16, PN 40	100	280	1 U
DN 125 (5")	OIML R75	PN16, PN 40	200	400	1 V
DN 150 (6")	EN 1434	PN16, PN 40	150	150	2 A
DN 150 (6")	EN 1434	PN16, PN 40	150	420	2 C
DN 150 (6")	OIML R75	PN16, PN 40	300	560	2 D
DN 200 (8")	EN 1434	PN16, PN 25, PN 40	250	250	2 E
DN 200 (8")	EN 1434	PN16, PN 25, PN 40	250	700	2 G
DN 200 (8")	OIML R75	PN16, PN 25, PN 40	500	900	2 H
DN 250 (10")	EN 1434	PN16, PN 25, PN 40	400	400	2 J
DN 250 (10")	EN 1434	PN16, PN 25, PN 40	400	1 120	2 L
DN 250 (10")	OIML R75	PN16, PN 25, PN 40	800	1 400	2 M
DN 300 (12")	EN 1434	PN16, PN 25	560	560	2 N
DN 300 (12")	EN 1434	PN16, PN 25	560	1 560	2 Q
DN 300 (12")	OIML R75	PN16, PN 25	1 120	2 100	2 R
DN 350 (14")	EN 1434	PN16, PN 25	750	750	2 S
DN 350 (14")	EN 1434	PN16, PN 25	750	2 100	2 U
DN 350 (14")	OIML R75	PN16, PN 25	1 500	2 800	2 V
DN 400 (16")	EN 1434	PN16, PN 25	950	950	3 A
DN 400 (16")	EN 1434	PN16, PN 25	950	2 660	3 C
DN 400 (16")	OIML R75	PN16, PN 25	1 900	3 600	3 D
DN 500 (20")	EN 1434	PN16, PN 25	1 475	1 475	3 J
DN 500 (20")	EN 1434	PN16, PN 25	1 475	4 130	3 L
DN 500 (20")	OIML R75	PN16, PN 25	2 950	5 500	3 M
DN 600 (24")	EN 1434	PN16, PN 25	2 150	2 150	3 S
DN 600 (24")	EN 1434	PN16, PN 25	2 150	6 020	3 U
DN 600 (24")	OIML R75	PN16, PN 25	4 300	8 000	3 V
DN 700 (28")	EN 1434	PN16, PN 25	2 900	2 900	4 E
DN 700 (28")	EN 1434	PN16, PN 25	2 900	8 120	4 G
DN 700 (28")	OIML R75	PN16, PN 25	5 800	10 800	4 H
DN 800 (32")	EN 1434	PN16, PN 25	3 800	3 800	4 N
DN 800 (32")	EN 1434	PN16, PN 25	3 800	10 640	4 Q
DN 800 (32")	OIML R75	PN16, PN 25	7 600	14 200	4 R

Flow Measurement

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Flowmeter SITRANS FUS380 standard

Selection and Ordering data					Article-No.	Order code
Flowmeter SITRANS FUS380 (standard)					7ME3400 -	0 - A
Diameter	Approval	Pressure rating	Flow setting [m ³ /h] Qp (Qn)	Qs		
<u>Remote only</u>						
DN 900 (36")	EN 1434	PN16, PN 25	5 000	5 000	5 A	
DN 900 (36")	EN 1434	PN16, PN 25	5 000	14 000	5 C	
DN 900 (36")	OIML R75	PN16, PN 25	10 000	20 000	5 D	
DN 1 000 (40")	EN 1434	PN16, PN 25	6 000	6 000	5 J	
DN 1 000 (40")	EN 1434	PN16, PN 25	6 000	16 800	5 L	
DN 1 000 (40")	OIML R75	PN16, PN 25	12 000	24 000	5 M	
DN 1 200 (48")	EN 1434	PN16	9 000	9 000	5 S	
DN 1 200 (48")	EN 1434	PN16	9 000	25 200	5 U	
DN 1 200 (48")	OIML R75	PN16	18 000	36 000	5 V	
Flange norm and pressure rating						
System without sensor - only a transmitter FUS080 as spare part - settings as defined with this Article No.						A
<u>EN 1092-1 Flanges</u>						
PN 16 (DN 100 ... DN 1 200)						C
PN 25 (DN 200 ... DN 1 000)						D
PN 40 (DN 50 ... DN 250)						E
Compact/remote connection						
Note: Sensor cable always firmly connected to connection box.						
Compact version, Liquid max. 120 °C (248 °F)						0
<u>Remote version, Liquid max. 150/200 °C (302/392 °F)</u>						
Sensor link cable (SSL)						
• 5 m (16.4 ft)						2
• 10 m (32.8 ft)						3
• 20 m (65.6 ft)						4
• 30 m (98.4 ft)						5
Pulse output value setup						
To get optimal benefit of the pulses the pulse value and pulse length shall be selected as low as possible. The following calculation formula can be used for determining the shortest pulse value at a pulse length of 5 ms: $L/pulse > Q_s (m^3/h) / 360$. For example $Q_s = 300 m^3/h$; $L/pulse > 300/360$; $L/pulse > 0.83$; therefore the pulse value must be 1 l/pulse						
Pulse value						
• 0.1 l/pulse						1
• 1 l/pulse						2
• 2.5 l/pulse						3
• 10 l/pulse						4
• 50 l/pulse						5
• 100 l/pulse						6
• 250 l/pulse						7
• 1 m ³ /pulse						8
• 0.25 l/pulse						9
• 0.5 l/pulse						9
• 5 l/pulse						9
• 25 l/pulse						9
• 500 l/pulse						9
• 2.5 m ³ /pulse						9
• 5 m ³ /pulse						9
• 10 m ³ /pulse						9
• 25 m ³ /pulse						9
• 50 m ³ /pulse						9
• 100 m ³ /pulse						9
• 250 m ³ /pulse						9
• 500 m ³ /pulse						9
• 1000 m ³ /pulse						9
						N 0 A
						N 0 B
						N 0 C
						N 0 D
						N 0 E
						N 0 F
						N 0 G
						N 0 H
						N 0 J
						N 0 K
						N 0 L
						N 0 M
						N 0 N
						N 0 P

Selection and Ordering data	Article-No.	Order code
Flowmeter SITRANS FUS380 (standard)	7ME3400 - 0 - A	
Transmitter variant FUS080 power/anaaloo output 115 ... 230 V AC 3.6 V Lithium battery, dual pack is included 115 ... 230 V AC, backup 3.6 V DC Lithium battery, single pack is included 3.6 V battery version (no battery pack included) Option with 4 ... 20 mA analog output module • 115 ... 230 V AC • 115 ... 230 V AC, backup 3.6 V DC, Lithium battery, single pack is included Note: Lithium batteries are subject to special transportation regulations according to United Nations "Regulation of Dangerous Goods, UN 3090 and UN 3091". Special transport documentation is required to observe these regulations. This may influence both transport time and costs.		B D E G R U
Pulse width setup Pulse width • 5 ms (standard) • 10 ms • 20 ms • 50 ms • 100 ms • 200 ms • 500 ms		2 3 4 5 6 7 8

Selection and Ordering data	Order code
Additional information Please add „-Z“ to Article No. and following add-on code(s) with plain text.	
Calibration/certificate FUS380 Production calibration for DN 50 ... DN 1200 with Q _n as selected in diameter. Incl. Calibration protocol: 2 x 3 points, Q _i , 10 % Q _p and Q _p (max. 8000 m ³ /h). Accredited Siemens ISO/IEC 17025 calibration for DN 50 ... DN 200 with Q _n as selected in diameter. Certificate: 2 x 5 points, Q _i 5 %, 10 %, 50 % and 100 % of Q _p (max. 630 m ³ /h). Accredited Siemens ISO/IEC 17025 calibration for DN 250 ... DN 600 with Q _n as selected in diameter. Certificate: 2 x 5 points, 5 %, 10 %, 50 % and 100 % of Q _p (max. 2800 m ³ /h). Accredited Siemens ISO/IEC 17025 calibration, DN 500 ... DN 1200 with Q _n as selected in diameter. Certificate: 2 x 5 points, Q _i 5 %, 10 %, 50 % and 100 % of Q _p (max. 8000 m ³ /h).	Included D20 D21 D22
Output B as reverse flow pulses. No calibration/verification of this function.	E21
Material certificate EN 10204-3.1 (pipe material)	C12
Regional specific approval KCC marking for Korea	W28
Tag name plate Stainless steel TAG plate (1 x 24 x 80 mm), wire fixed. Font size depends on text length: 8 mm for 1 ... 10 characters, 4 mm for 11 ... 20 characters (specify in plain text).	Y17

Flowmeter SITRANS FUS380 operating instructions, accessories and spare parts**Operating instructions**

Description	Article No.
• English	A5E00730100
• German	A5E00740611

All literature is available to download for free, in a range of languages, at www.siemens.com/processinstrumentation/documentation

For accessories and spare parts see chapter of transmitter SITRANS FUS080/FUE080 on page 3/257.



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www.pia-portal.automation.siemens.com