

Flow Measurement

SITRANS FS (ultrasonic)

Inline ultrasonic flowmeters

SITRANS FUS380 standard flowmeter

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 3/301.

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 FUE080.

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).

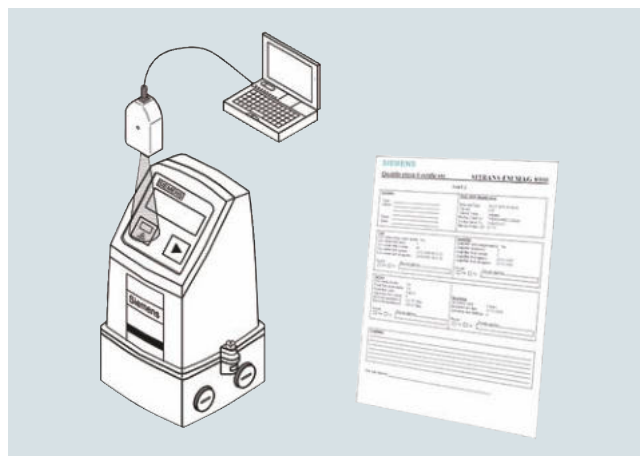
Compact mounting is only possible up to 120 °C (248 °F). The sensor must be isolated to protect transmitter from heat. The transmitter is available in an IP67/NEMA 4X/6 enclosure.

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



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.

Configuration

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) (95 % of Q _i)	Cut-off (% of Q _{max})	Typical pulse value ¹⁾ (l/pulse)
50	15	15.75	15	0.15	0,143	0,90	1
50	45	47.25	15	0.15	0,143	0,30	1
50	45	47.25	30	0.3	0.285	0,60	1
65	25	26.25	25	0.25	0.238	0,90	1
65	72	75.6	25	0.25	0.238	0,31	1
65	72	75.6	50	0.5	0,475	0,63	1
80	40	42	40	0.4	0,380	0,90	2.5
80	120	126	40	0.4	0,380	0,30	2.5
80	120	126	80	0.8	0,760	0,60	2.5
100	60	63	60	0.6	0,570	0,90	2.5
100	180	189	60	0.6	0,570	0,30	2.5
100	240	252	120	1.2	1,140	0,45	2.5
125	100	105	100	1	0,950	0,90	2.5
125	280	294	100	1	0,950	0,32	2.5
125	400	420	200	2	1,900	0,45	2.5
150	150	157.5	150	1.5	1,425	0,90	10
150	420	441	150	1.5	1,425	0,32	10
150	560	588	300	3	2,850	0,48	10
200	250	262.5	250	2.5	2,375	0,90	10
200	700	735	250	2.5	2,375	0,32	10
200	900	945	500	5	4,750	0,50	10
250	400	420	400	4	3,800	0,90	10
250	1120	1176	400	4	3,800	0,32	10
250	1400	1470	800	8	7,600	0,52	10
300	560	588	560	5.6	5,320	0,90	50
300	1560	1638	560	5.6	5,320	0,32	50
300	2100	2205	1120	11.2	10,640	0,48	50
350	750	787.5	750	7.5	7,125	0,90	50
350	2100	2205	750	7.5	7,125	0,32	50
350	2800	2940	1500	15	14,250	0,48	50
400	950	997.5	950	9.5	9,025	0,90	50
400	2660	2793	950	9.5	9,025	0,32	50
400	3600	3780	1900	19	18,050	0,48	50
500	1475	1548.75	1475	14.75	14,013	0,90	100
500	4130	4336.5	1475	14.75	14,013	0,32	100
500	5500	5775	2950	29.5	28,025	0,49	100
600	2150	2257.5	2150	21.5	20,425	0,90	100
600	6020	6321	2150	21.5	20,425	0,32	100
600	8000	8400	4300	43	40,850	0,49	100
700	2900	3045	2900	29	27,550	0,90	100
700	8120	8526	2900	29	27,550	0,32	100
700	10 800	11 340	5800	58	55,100	0,49	100
800	3800	3990	3800	38	36,100	0,90	100
800	10 640	11 172	3800	38	36,100	0,32	100
800	14 200	14 910	7600	76	72,200	0,48	100
900	5000	5250	3800	38	36,100	0,69	100
900	14 000	14 700	5000	50	47,500	0,32	100
900	20 000	21 000	5000	50	47,500	0,23	100
1000	6000	6300	3800	38	36,100	0,57	100
1000	16 800	17 640	6000	60	57,000	0,32	100
1000	24 000	25 200	12 000	120	114,000	0,45	100
1200	9000	9450	3800	38	36,100	0,38	100
1200	25 200	26 460	9000	90	85,500	0,32	100
1200	36 000	37 800	18 000	180	171,000	0,45	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, 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	<ul style="list-style-type: none"> DN 100 ... DN 1200: Carbon Steel EN 1.0345/P235 GH, painted in light-gray. DN 50 ... DN 80: Die-cast bronze G-CuSn10/W2.1050.01 (EN 1982)
Transducer design	<ul style="list-style-type: none"> 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 VdTÜV 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/CISPR-11
• Noise immunity	To EN/IEC 61326-1 (Industry)

Transmitter

The transmitter related to this system is the SITRANS FUS080. Technical specifications to the FUS080 see page 3/259

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 10204-3.1 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 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

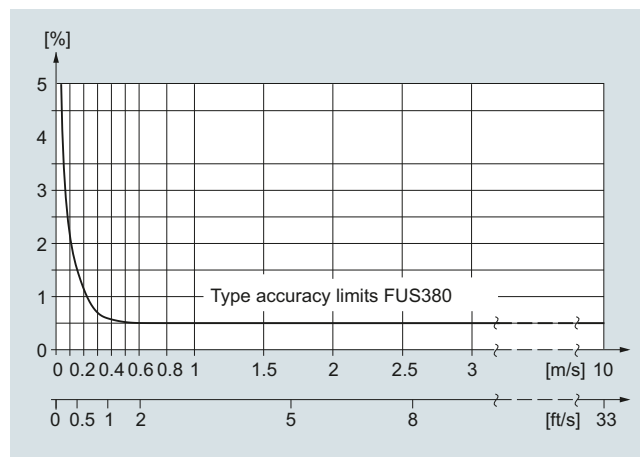
To ensure continuous accurate measurement, flowmeters must be calibrated. The calibration is conducted at Siemens flow facilities with traceable instruments referring directly to the physical unit of measurement according to the International System of Units (SI).

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.

Flowmeter SITRANS FUS380 (standard)



7ME3400-

Ord.
Code

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

Diameter	Approval	Pressure rating	Flow setting [m ³ /h]		Article No.
			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	PN 16, PN 40	60	60	1 N
DN 100 (4")	EN 1434	PN 16, PN 40	60	180	1 Q
DN 100 (4")	OIML R75	PN 16, PN 40	120	240	1 R
DN 125 (5")	EN 1434	PN 16, PN 40	100	100	1 S
DN 125 (5")	EN 1434	PN 16, PN 40	100	280	1 U
DN 125 (5")	OIML R75	PN 16, PN 40	200	400	1 V
DN 150 (6")	EN 1434	PN 16, PN 40	150	150	2 A
DN 150 (6")	EN 1434	PN 16, PN 40	150	420	2 C
DN 150 (6")	OIML R75	PN 16, PN 40	300	560	2 D
DN 200 (8")	EN 1434	PN 16, PN 25, PN 40	250	250	2 E
DN 200 (8")	EN 1434	PN 16, PN 25, PN 40	250	700	2 G
DN 200 (8")	OIML R75	PN 16, PN 25, PN 40	500	900	2 H
DN 250 (10")	EN 1434	PN 16, PN 25, PN 40	400	400	2 J
DN 250 (10")	EN 1434	PN 16, PN 25, PN 40	400	1120	2 L
DN 250 (10")	OIML R75	PN 16, PN 25, PN 40	800	1400	2 M
DN 300 (12")	EN 1434	PN 16, PN 25	560	560	2 N
DN 300 (12")	EN 1434	PN 16, PN 25	560	1560	2 Q
DN 300 (12")	OIML R75	PN 16, PN 25	1120	2100	2 R
DN 350 (14")	EN 1434	PN 16, PN 25	750	750	2 S
DN 350 (14")	EN 1434	PN 16, PN 25	750	2100	2 U
DN 350 (14")	OIML R75	PN 16, PN 25	1500	2800	2 V
DN 400 (16")	EN 1434	PN 16, PN 25	950	950	3 A
DN 400 (16")	EN 1434	PN 16, PN 25	950	2660	3 C
DN 400 (16")	OIML R75	PN 16, PN 25	1900	3600	3 D
DN 500 (20")	EN 1434	PN 16, PN 25	1475	1475	3 J
DN 500 (20")	EN 1434	PN 16, PN 25	1475	4130	3 L
DN 500 (20")	OIML R75	PN 16, PN 25	2950	5500	3 M
DN 600 (24")	EN 1434	PN 16, PN 25	2150	2150	3 S
DN 600 (24")	EN 1434	PN 16, PN 25	2150	6020	3 U
DN 600 (24")	OIML R75	PN 16, PN 25	4300	8000	3 V
DN 700 (28")	EN 1434	PN 16, PN 25	2900	2900	4 E
DN 700 (28")	EN 1434	PN 16, PN 25	2900	8120	4 G
DN 700 (28")	OIML R75	PN 16, PN 25	5800	10800	4 H
DN 800 (32")	EN 1434	PN 16, PN 25	3800	3800	4 N
DN 800 (32")	EN 1434	PN 16, PN 25	3800	10640	4 Q
DN 800 (32")	OIML R75	PN 16, PN 25	7600	14200	4 R

Selection and ordering data

Article No.

Flowmeter SITRANS FUS380 (standard)

7ME3400- Ord.
Code

Flowmeter SITRANS FUS380 (standard)

- Transmitter variant FUS080 power/analog 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.

Pulse width setup

Pulse width

- 5 ms (standard)
- 10 ms
- 20 ms
- 50 ms
- 100 ms
- 200 ms
- 500 ms

Additional information

Please add "-Z" to Article No. and specify Order code(s) and plain text.

Order code

Calibration/certificate FUS380

Production calibration for DN 50 ... 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 m³/h).

Included

Accredited Siemens ISO/IEC 17025 calibration for DN 50 ... 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 m³/h).

D20

Accredited Siemens ISO/IEC 17025 calibration for DN 250 ... 600 with Q_n as selected in diameter. Certificate: 2 x 5 points, 5 %, 10 %, 50 % and 100 % of Q_p (max. 2800 m³/h).

D21

Accredited Siemens ISO/IEC 17025 calibration, DN 500 ... 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 m³/h).

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

Please use online Product selector to get latest updates:

<https://www.pia-portal.automation.siemens.com>

Flowmeter SITRANS FUS380 operating instructions, accessories and spare parts

Operating instructions

Description

Article No.

- English
- German

A5E00730100

A5E00740611

All literature is available to download for free, in a range of languages, at

<http://www.siemens.com/processinstrumentation/documentation>

For accessories and spare parts see the section about FUS080/FUE080.

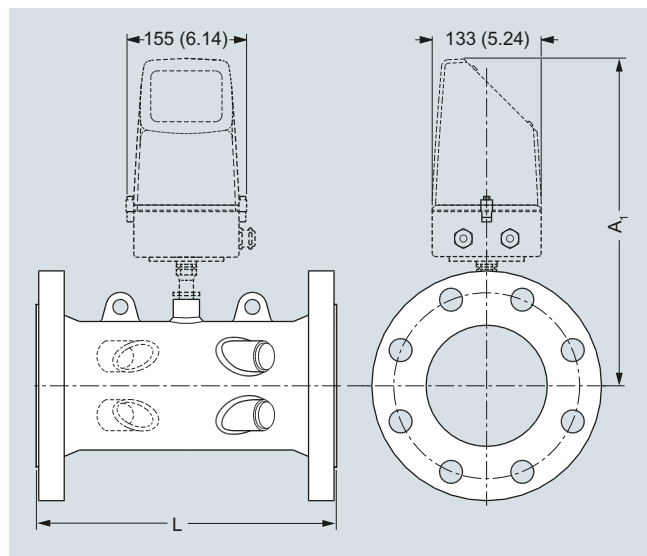
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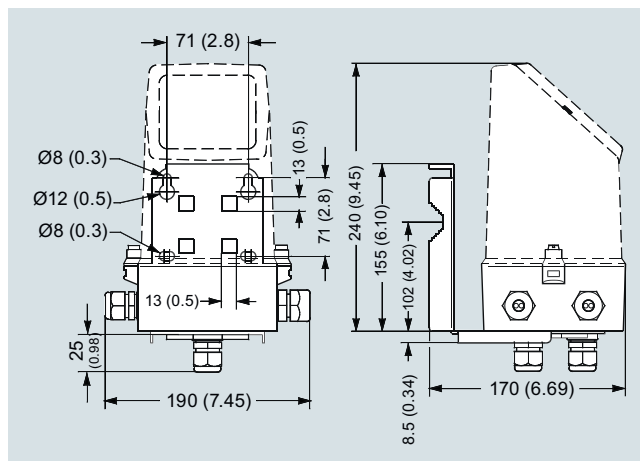
Inline ultrasonic flowmeters

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Dimensional drawings



Transmitter IP67/NEMA 4X/6, wall mounting



Dimensions in mm (inch)

Sensor dimensions for FUS380 and FUE380

Size	PN 16		PN 25		PN 40		A ₁	Lift hug
	L	Weight	L	Weight	L	Weight		
DN	mm	kg	mm	kg	mm	kg	mm	
50	-	-	-	-	300 +0/-2	10	350	No
65	-	-	-	-	300 +0/-2	15	363	No
80	-	-	-	-	350 +0/-2	18	370	No
100	350 +0/-2	15	-	-	350 +0/-2	18	372	No
125	350 +0/-2	18	-	-	350 +0/-2	24	385	No
150	500 +0/-3	28	-	-	500 +0/-3	34	399	No
200	500 +0/-3	38	500 +0/-3	47	500 +0/-3	55	425	Yes
250	600 +0/-3	60	600 +0/-3	76	600 +0/-3	91	452	Yes
300	500 +0/-3	66	500 +0/-3	81	-	-	478	Yes
350	550 +0/-3	94	550 +0/-3	121	-	-	495	Yes
400	600 +0/-3	124	600 +0/-3	153	-	-	520	Yes
500	625 +0/-3	194	625 +0/-3	231	-	-	570	Yes
600	750 +0/-3	303	750 +0/-3	365	-	-	622	Yes
700	875 +0/-3	361	875 +0/-3	565	-	-	673	Yes
800	1000 +0/-3	494	1000 +0/-3	770	-	-	724	Yes
900	1230 +6/-6	535	1300 +6/-6	835	-	-	775	Yes
1000	1300 +6/-6	594	1370 +6/-6	1000	-	-	826	Yes
1200	1360 +6/-6	732	-	-	-	-	928	Yes

Notes:

- Weight for transmitter/electronics 1.5 kg (compact version) or approximately 5 kg (remote version including 10 m cable set)
- - Means not available
- All weights are **approximate**
- For flange values - see norm EN 1092-1

Dimensional drawings (continued)

Size inch	PN 16		PN 25		PN 40		A ₁ inch	Lift hug
	L inch	Weight lb	L inch	Weight lb	L inch	Weight lb		
2	-	-	-	-	11.81 +0/-0.08	22	13.78	No
2½	-	-	-	-	11.81 +0/-0.08	33	14.30	No
3	-	-	-	-	13.78 +0/-0.08	40	14.57	No
4	13.78 +0/-0.08	33	-	-	13.78 +0/-0.08	40	14.65	No
5	13.78 +0/-0.08	40	-	-	13.78 +0/-0.08	53	15.16	No
6	19.68 +0/-0.12	62	-	-	19.68 +0/-0.12	75	15.71	No
8	19.68 +0/-0.12	84	19.68 +0/-0.12	104	19.68 +0/-0.12	121	16.74	Yes
10	23.62 +0/-0.12	132	23.62 +0/-0.12	168	23.62 +0/-0.12	201	17.80	Yes
12	19.68 +0/-0.12	146	19.68 +0/-0.12	179	-	-	18.82	Yes
14	21.65 +0/-0.12	207	21.65 +0/-0.12	267	-	-	19.49	Yes
16	23.62 +0/-0.12	273	23.62 +0/-0.12	337	-	-	20.48	Yes
20	24.61 +0/-0.12	428	24.61 +0/-0.12	509	-	-	22.45	Yes
24	29.53 +0/-0.12	668	29.53 +0/-0.12	805	-	-	24.49	Yes
28	34.45 +0/-0.12	796	34.45 +0/-0.12	1246	-	-	26.50	Yes
32	39.37 +0/-0.12	1089	39.37 +0/-0.12	1698	-	-	28.51	Yes
36	48.43 +0/-0.24	1179	51.18 +0/-0.24	1841	-	-	30.52	Yes
40	51.18 +0/-0.24	1310	53.94 +0/-0.24	2205	-	-	32.52	Yes
48	53.34 +0/-0.24	1614	-	-	-	-	36.54	Yes

Notes:

- Weight for transmitter/electronics 3.3 lb (compact version) or approximately 11 lb (remote version including 32.8 ft cable set)
- - Means not available
- All weights are **approximate**
- For flange values - see norm EN 1092-1

Flow Measurement

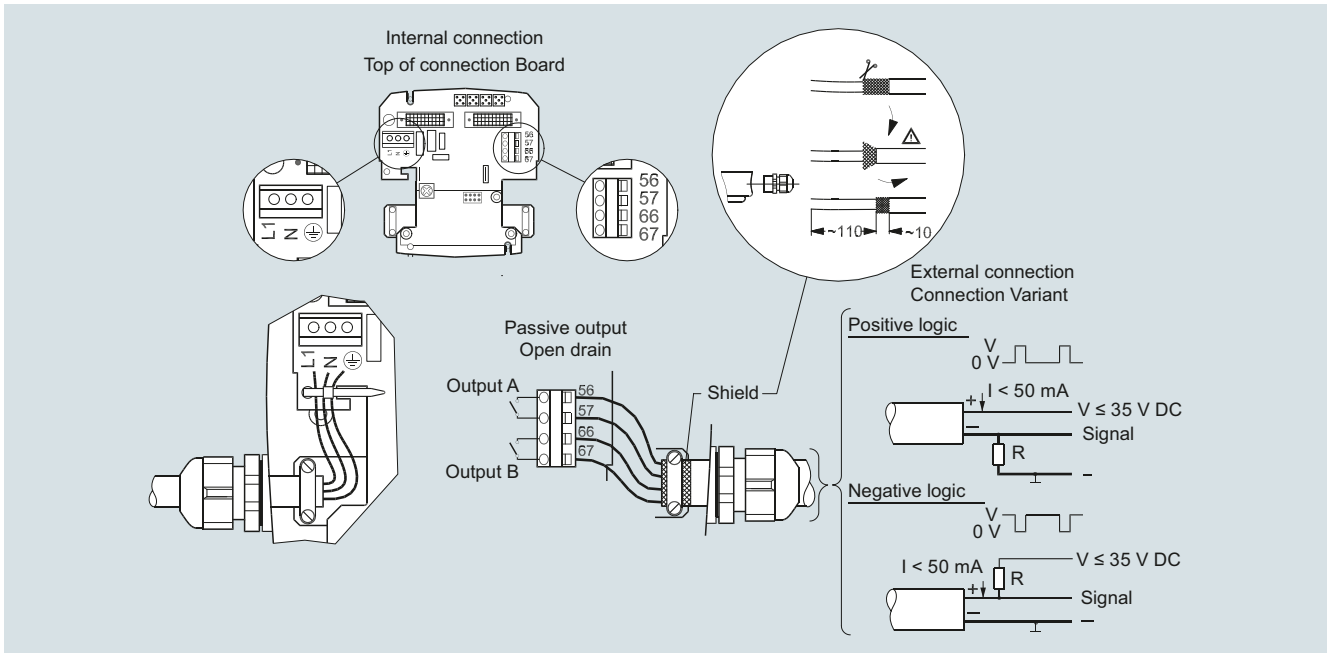
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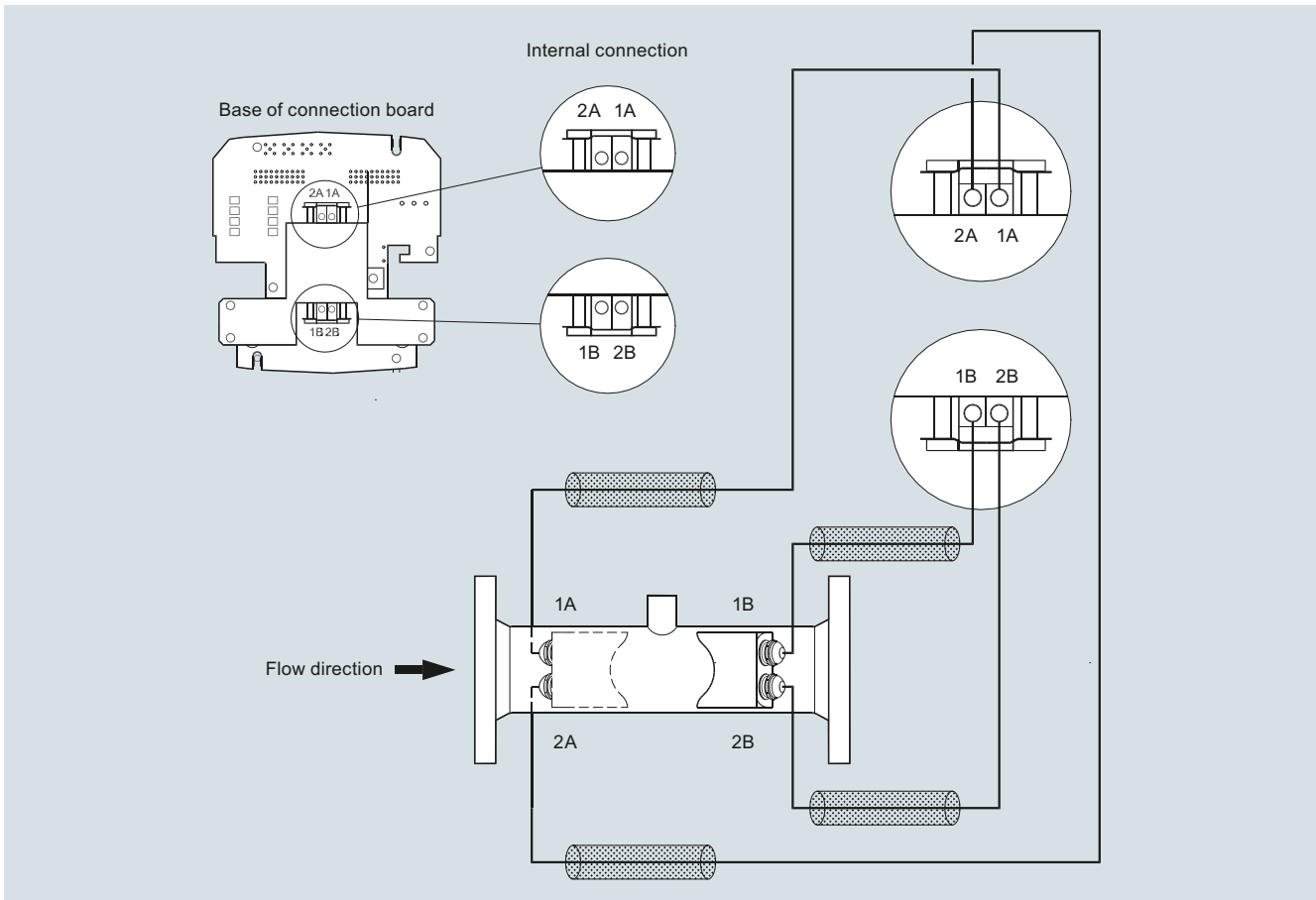
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Circuit diagrams

3



Electrical connection of transmitter SITRANS FUS/FUE380



Electrical connection of sensor SITRANS FUS/FUE380