

## Flow Measurement

### SITRANS F US Inline

#### Inline ultrasonic flowmeters

##### Overview

Siemens offers two types of ultrasonic flowmeters, inline flowmeters and clamp-on flowmeters. This offers the end user the maximum flexibility to choose the technology that best fits his needs. This chapter shows the inline versions.



SITRANS F US inline ultrasonic flowmeters measure flow of electrically conductive and non-conductive liquids.

##### Benefits

- Greater flexibility:
  - Sensor sizes from DN 50 to DN 3000 mm (2" to 120")
  - Inline retrofit as 1-path and 2-path up to DN 3000 (120")
  - Compact and remote transmitter installation
  - HART and PROFIBUS PA communication
  - Mains or battery powered solutions
  - Dedicated transmitter portfolio for HVAC, power generation, utility and general industry as well as more demanding applications
- Easier service:
  - Comprehensive self-diagnostic for error indication and logging
  - Exchange of the transducers without interrupting operation
  - Battery lifetime of up to 6 years
- Approvals/certificates:
  - Custody transfer approvals within district heating
  - ATEX
  - Standard with calibration certificate

##### Application

Inline ultrasonic flowmeters are suitable for measuring the flow of liquids with good acoustic permeability, independent of conductivity, viscosity, temperature, density and pressure.

- max. 3 % solids
- max. 3 % air and gas
- max. 350 cSt

The main applications can be found in the following sectors:

- Raw water intake for water treatment plants
- Treated waste water
- Power generation and utility
- Oil industry and petrochemical industry
- Irrigation systems
- Cooling water plants within the industry and in power stations
- Plants transporting non-conductive liquids
- Custody transfer - district heating (MID-004)
- Cryogenic fluids
- HART/4 to 20 mA output
- PROFIBUS PA
- ATEX

### System information SITRANS F US Inline ultrasonic flowmeters

Please see **Product selector on the Internet**, since some constraints might be related to some of the features:  
[www.pia-portal.automation.siemens.com](http://www.pia-portal.automation.siemens.com)



SONO 3300/ FUS060	SONO 3100/ FUS060	SONOKIT/ FUS060 FUS080	FUE380	FUS380
7ME3300...	7ME3100...	7ME3210.../ 7ME3220...	7ME3410...	7ME3400...

<b>Industry</b>				
Water, treated waste water	XXX	XX	XXX	XXX
Irrigation	XX	XX	XXX	XXX
Utility, district heating water, cooling	XXX	XX	XXX	XXX
Utility, district heating, CT approvals required			XXX	
Oil	XX	XXX	XX	X
Cryogenic fluids (only on request)		XXX		
Onshore and Offshore applications	XX	XXX	XX	X
Chemical	XXX	XXX	X	
<b>Design</b>				
Compact transmitter mounted on pipe			●	●
Remote transmitter - Sensor up to 100 m	●	●	●	●
Transducers can be replaced under pressure		●	●	
Retrofit on existing steel pipes/non-weldable			●	
<b>Transmitter enclosure</b>				
Polyamid, IP67			●	●
Die-cast aluminum (painted), IP65	●	●	●	
<b>Communication</b>				
HART	●	●	●	
PROFIBUS PA	●	●	●	
<b>Power supply</b>				
3.6 V Battery			●	●
115 ... 230 V AC	●	●	●	●
115 ... 230 V AC and 3.6 V battery backup			●	●
24 V AC/DC	●	●	●	
<b>Accuracy</b>				
0.25 % (with 4-path system on request)		●		
0.50 %	●	●	●	●
<b>Sensor design</b>				
1-path ultrasonic measurement		●	●	
2-path ultrasonic measurement	●	●	●	●
4-path ultrasonic measurement (special request)		● (DN 200 ... 1200)	● (DN 200 ... 1500)	
<b>Dimension</b>				
DN 50	2"	●	U-pipe, on request	Die cast bronze
DN 65	2½"	●	U-pipe, on request	Die cast bronze
DN 80	3"	●	U-pipe, on request	Die cast bronze
DN 100	4"	●	●	1-path only
DN 125	5"	●	●	1-path only
DN 150	6"	●	●	1-path only
DN 200	8"	●	●	●
DN 250	10"	●	●	●
DN 300	12"	●	●	●
DN 350	14"	●	●	●
DN 400	16"	●	●	●
DN 500	20"	●	●	●
DN 600	24"	●	●	●
DN 700	28"		On request	●
DN 800	32"		On request	●
DN 900	36"		On request	●
DN 1000	40"		On request	●
DN 1200	48"		On request	●
DN 1400 ... 2400	54" ... 96"		●	
DN 2500 ... 3000	100" ... 120"		2-path only	
> DN 1200	> 48"		FUS060 only	

X = can be used, XX = often used, XXX = most often used, ● = available

## Flow Measurement

### SITRANS F US InLine

#### System information SITRANS F US InLine ultrasonic flowmeters

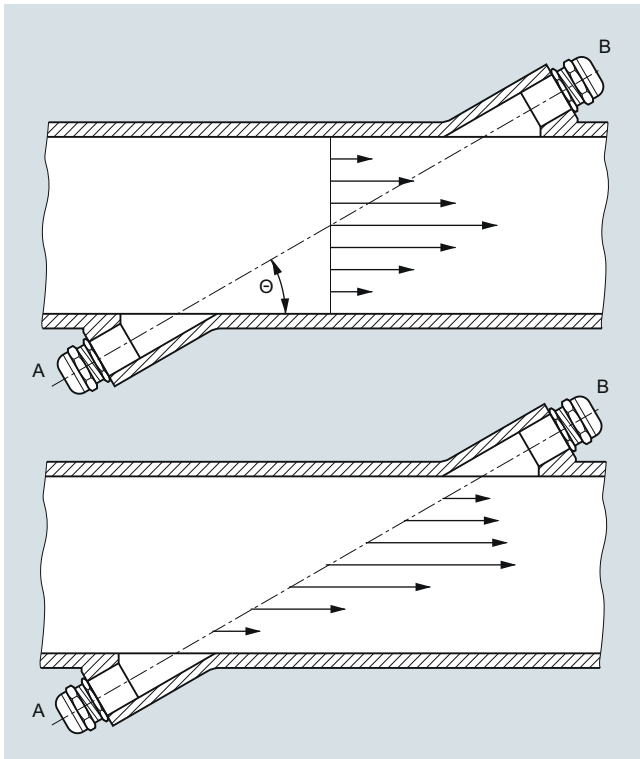
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	SONO 3300/ FUS060	SONO 3100/ FUS060	SONOKIT/ FUS060 FUS080	FUE380	FUS380
	7ME3300...	7ME3100...	7ME3210.../ 7ME3220...	7ME3410...	7ME3400...
<b>Process connection</b>					
Flanges	●	●		●	●
Flangeless (for weld-in)		●			
<b>Flanges Norm</b>					
EN 1092-1	●	●		●	●
EN 1759-1	●	●			
ANSI B16.5		●			
<b>Pressure rating</b>					
PN 6			●		
PN 10	●	●	●		
PN 16	●	●	●	●	●
PN 25		●	●	●	●
PN 40	●	●	●	●	●
Class 150	●	●			
Class 300	●	●			
<b>Pipe, flange</b>					
Carbon steel	●	●	●	●	●
Die cast bronze (DN 50, 65, 80)				●	●
<b>Media temperature</b>					
°C	°F				
-20		-4	●		
-10	●	+14	●		
+2	●	+35.6	●	Min. 5 °C (41 °F)	●
+60	●	+140	●	●	●
+120	●	+248	●	Compact	Compact
+150	●	+302	●	Die cast bronze	Die cast bronze
+160	●	+320	●	●	●
+190		+374	●	●	●
+200		+392	●	●	●
-200 ... +100		-328 ... +212	Cryogenic		
<b>Measuring principle</b>					
Transit time principle	●	●	●	●	●
<b>Approvals</b>					
<u>Custody transfer approval</u>					
MID, MI-004, EN 1434 (European energy meter standard)				●	
Other country-specific type approval available for:					
● Russia	●	●	●	●	●
● China (CPA/CMC)				●	
● Korea KC	●	●	●	●	●
<u>Ex approval</u>					
Ex d ATEX		●	●		
Ex i ATEX	●	●	●		
● = available					

### Function

#### Physical principle (single path)



Velocity distribution along sound path

A sound wave traveling in the same direction as the liquid flow arrives at point B from point A in a shorter time than the sound wave traveling against the direction of flow (from point B to A). The difference in sound transit time indicates the flow velocity in the pipe.

Since delay time is measured at short intervals both in and against flow direction, viscosity and temperature have no influence on measurement accuracy.

#### Measuring principle

In SITRANS F US flowmeters the two ultrasonic transducers are placed at an angle  $\theta$  in relation to the pipe axis. The transducers function as transmitters and receivers of the ultrasonic signals. Measurement is performed by determining the time the ultrasonic signal takes to travel with and against the flow. The principle can be expressed as follows:

$$v = K \cdot (t_{B,A} - t_{A,B}) / (t_{A,B} \cdot t_{B,A}) = K \cdot \Delta t / t^2$$

$v$  = Average flow velocity

$t$  = Transit time

$K$  = Proportional pipe geometry factor

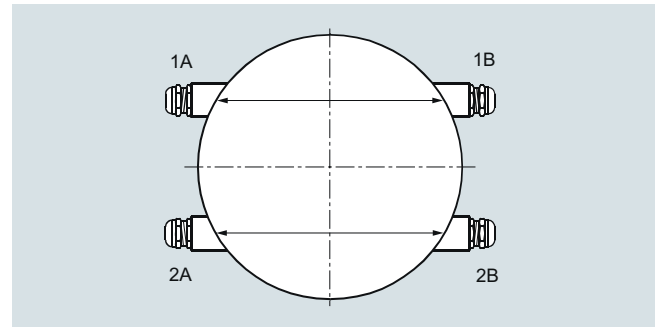
This measuring principle offers the advantage that it is independent of variations in the actual sound velocity of the liquid, i.e. independent of the temperature.

Proportional factor  $K$  is determined by wet calibration.

#### Direct signal processing

The ultrasonic signal is sent directly between the transducers. The advantage gained sending signals from point to point is an extremely good signal strength.

#### 2-path solution



Ultrasonic 2-path flowmeter with 4 transducers. In the upper path transducers 1A / 1B and in the lower path 2A / 2B are displayed.

The accuracy of ultrasonic flowmeters depends on the pipe geometry before and after the flowmeter and the number of ultrasonic measuring paths.

When water flows through a pipe, it has a tendency to swirl and/or flow with different velocities inside the pipe, depending on the pipe design.

A 2-path ultrasonic flowmeter offers:

- less sensitivity to upstream obstruction like bends, pumps or valves.
- high security in the measurements as the meter continues to measure even if, for some reason, one path stops working.

Typical straight inlet requirements are upstream  $10 \times D_i$  ( $D_i$  = diameter of the flowmeter) and downstream  $3 \times D_i$ .

Typical accuracy that can be reached with 2-path ultrasonic flowmetering is  $\pm 0.5\%$  with installations according to above demands.

#### 4-path ultrasonic flowmeters

Some applications require accuracy under extreme short inlet conditions and swirl that cannot be obtained with 2-path solutions.

For these applications we can offer a 4-path solution – customer-specified – according to actual inlet conditions.

Please contact Siemens Flow Instruments for specific applications.

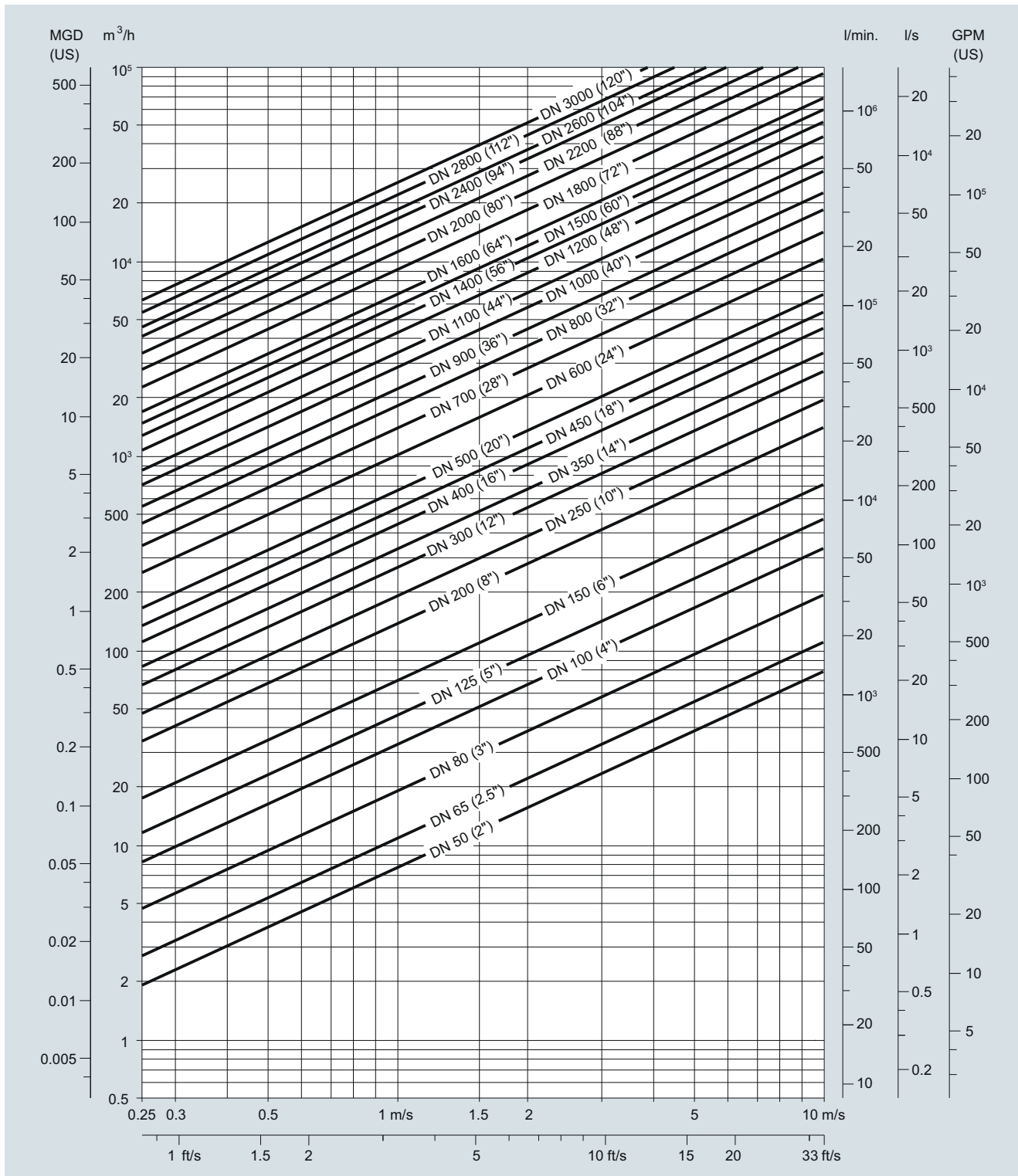
# Flow Measurement

## SITRANS F US Inline

### System information SITRANS F US Inline ultrasonic flowmeters

#### Technical specifications

3



Nominal size and flow

### Guidelines for selection of sensor

- Min. measuring range: 0 ... 1 m/s
- Max. measuring range: 0 ... 10 m/s

Nominal flow velocity:

- Normal: 1 ... 3 m/s
- Minimum: not permanently below 0.5 m/s
- Maximum: up to 8 m/s

Flow velocity calculation formula:

- $v = (4 \times Q_{\max}) / (\pi \times D_i^2 \times 3600)$
- $v$  in m/s,  $Q_{\max}$  in m<sup>3</sup>/h,  $D_i$  in m

Additional to the flow velocity check it is recommended to observe the Reynolds number (Re):

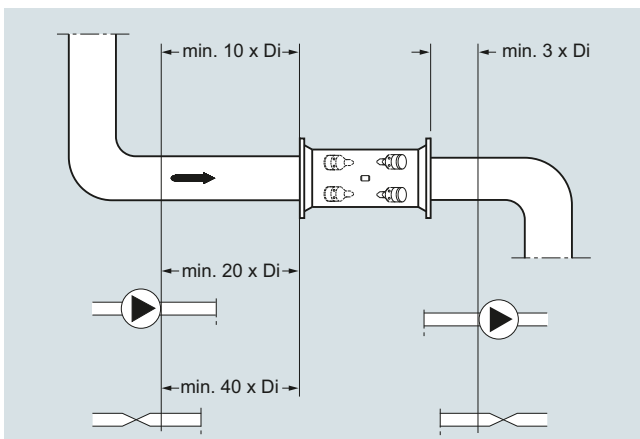
The optimal performance of the flowmeter is with a Re above 10 000, which is typical for flow velocities (water) above 0.5 m/s. Avoid an Re value between 2000 and 5000. In order to observe this and to be above the recommended 0.5 m/s flow velocity limit the sensor size must be reduced.

Re formula:  $Re = V \times D_i / \text{Viscosity}$

$V$  in m/s,  $D_i$  in m, Viscosity in cSt ( $X \times E^{-6} \text{ m}^2/\text{s}$ )

Example: Viscosity for water at 20 °C =  $1 \times E^{-6} \text{ m}^2/\text{s}$

### Inlet and outlet conditions



Recommended inlets and outlets

To maximize performance inlet and outlet must be straight. There must be a certain distance between flowmeter and bends, pumps and valves. It is also important to centre the flowmeter in relation to pipe flanges and gaskets.

Valves must always be installed after the flowmeter. The only exception is installation of the sensor in a vertical pipe. In this case a valve below the sensor is necessary to allow zero point adjustment. It is important to select a valve which does not alter the flow when fully open.

Recommended inlet/outlet	SONOKIT 1-path		
	SONO 3300, SONO 3100, SONOKIT 2-path	FUS380/FUE380 <sup>1)</sup>	SONOKIT 1-path
90° bend	10 x D <sub>i</sub>	10 x D <sub>i</sub>	20 x D <sub>i</sub>
Fully opened valve	10 x D <sub>i</sub>	10 x D <sub>i</sub>	20 x D <sub>i</sub>
Partially opened valve	40 x D <sub>i</sub>	40 x D <sub>i</sub>	40 x D <sub>i</sub>
2 x 90° bends in same plane	15 x D <sub>i</sub>	15 x D <sub>i</sub>	25 x D <sub>i</sub>
2 x 90° bends in two planes	20 x D <sub>i</sub>	20 x D <sub>i</sub>	40 x D <sub>i</sub>
Reductions (Outlet 0 x D <sub>i</sub> )	10 x D <sub>i</sub>	10 x D <sub>i</sub>	20 x D <sub>i</sub>
Pumps	20 x D <sub>i</sub>	20 x D <sub>i</sub>	40 x D <sub>i</sub>
Outlet	3 x D <sub>i</sub>	3 x D <sub>i</sub>	3 x D <sub>i</sub>

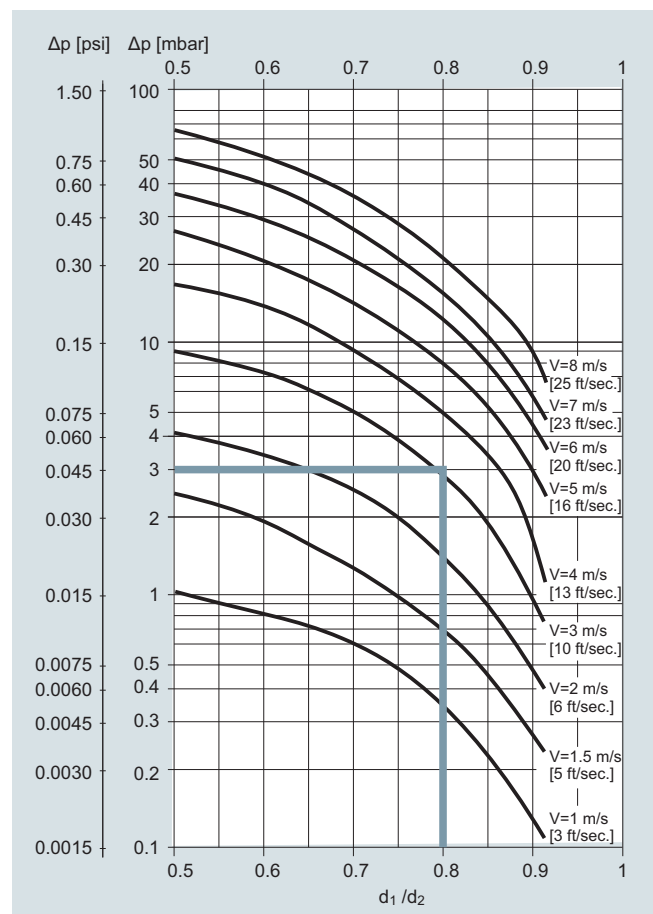
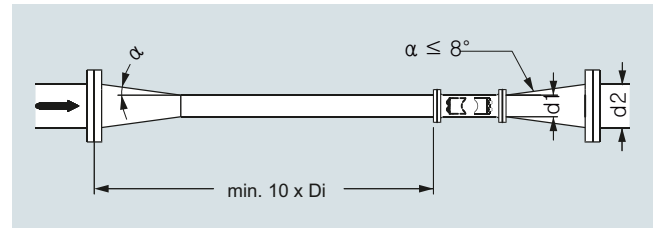
<sup>1)</sup> Inlet for FUE380 approved systems: Minimum straight inlet pipe: 1.5 m, but note further recommendations above.

### Reductions

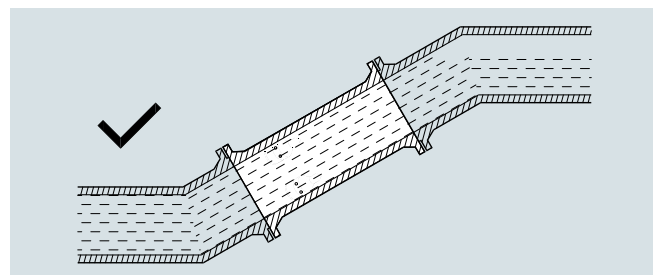
The flowmeter can be installed between two reducers (e.g. DIN 28545). At 8° the pressure drop curve below applies.

### Example:

A flow velocity of 3 m/s ( $V$ ) in a sensor with a diameter reduction from DN 250 to DN 200 ( $d_1/d_2 = 0.8$ ) gives a pressure drop of 3 mbar.



The sensor must always be completely filled with liquid:



The following installations must be avoided:

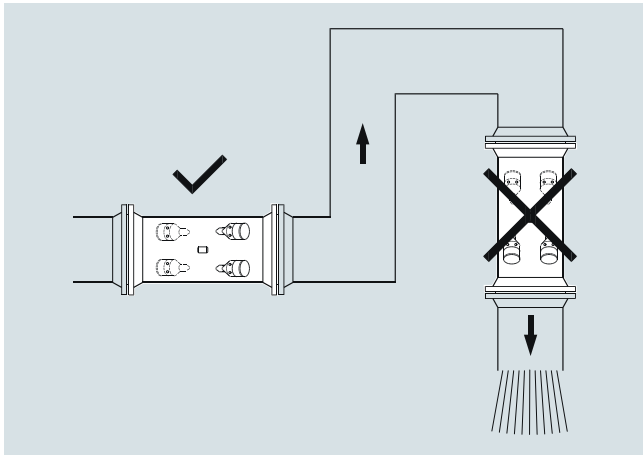
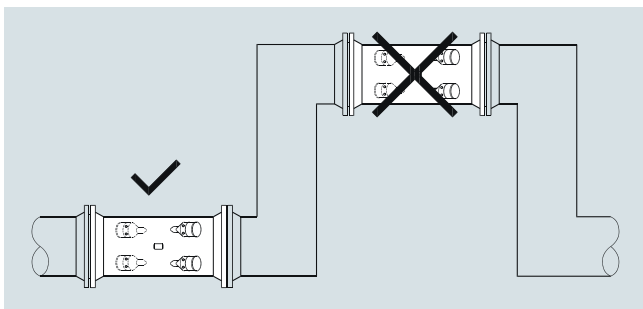
- Installation at the highest point of the pipe system
- Installation in vertical pipes with free outlet

# Flow Measurement

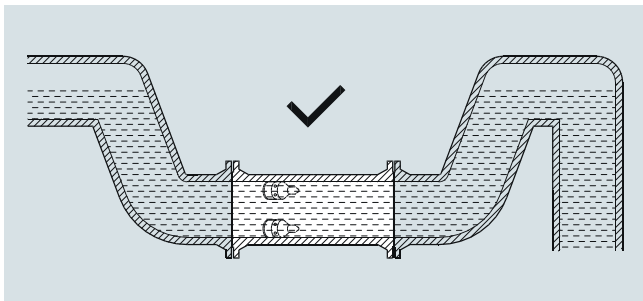
## SITRANS F US Inline

### System information SITRANS F US Inline ultrasonic flowmeters

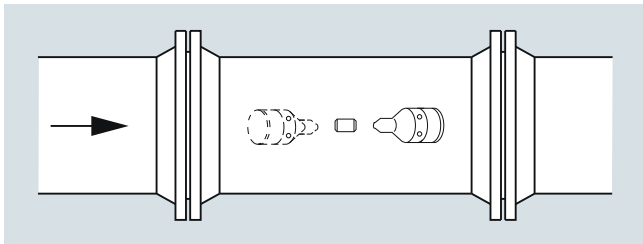
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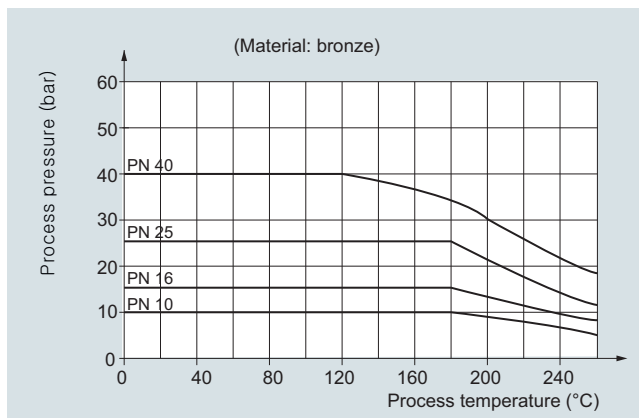
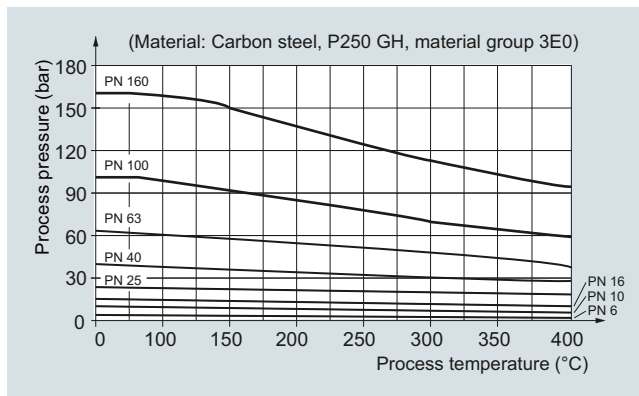
With partially full pipes or pipes with free outlet the flowmeter should be located in a U-shaped tube:



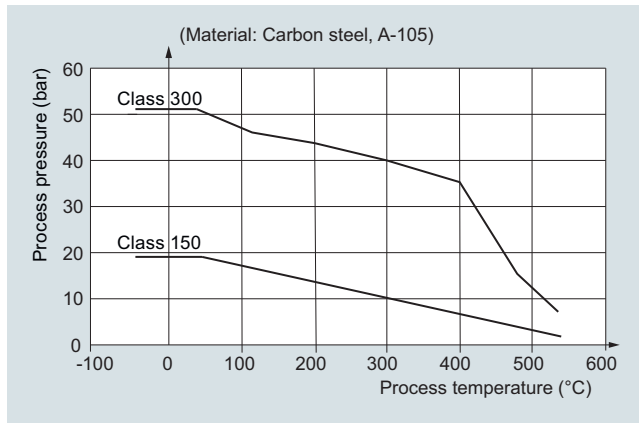
Installing the transducers in horizontal position is recommended:



#### Pressure/temperature curve to EN (DIN) flanges



#### Pressure/temperature curve to ANSI B16.5 flanges



**Note:** The pressure/temperature curves only assist in the selection of a system. No responsibility is taken for the correctness of the information. For further information on the PED standard and requirements, see page 10/15.

### Reference conditions

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).

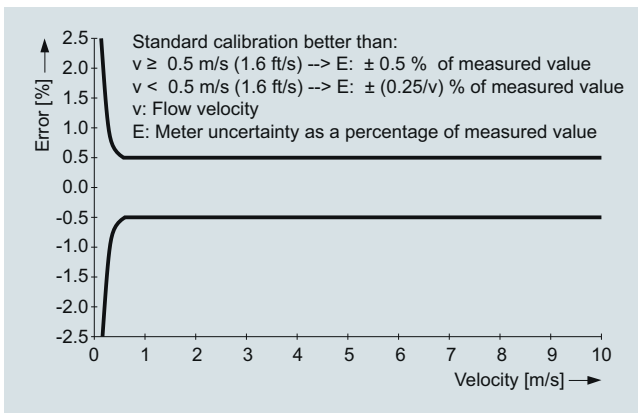
Therefore the calibration certificate ensures recognition of the test results worldwide, including the US (NIST traceability).

Siemens offer accredited calibrations assured to ISO 17025. 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.

Flowmeter calibration data are stored in the internal EEPROM of the transmitters FUS060 or FUS080.

The system accuracy refers to the following systems:

SONO 3300/FUS060, SONO 3100/FUS060<sup>1)</sup> which are typically calibrated on the frequency output.



### Typical calibration reference conditions:

Fluid	Water
Fluid temperature	$22 \pm 5 \text{ }^\circ\text{C}$
Ambient temperature	$22 \pm 5 \text{ }^\circ\text{C}$
Supply voltage	115/230 V AC +10 ... -15 % 24 V DC +25 ... -15 %, 24 V AC $\pm 15 \%$
Straight inlet length	$20 \times D_i$
Outlet	$3 \times D_i$
Rangeability	0 ... 1 m/s to 0 ... 10 m/s
Repeatability	Better than 0.25 % in the range 0.5 ... 10 m/s
Linearity (for water)	
• Reynolds number 1000 < Re < 5000	Better than 1 %
• Reynolds number > 5000	Better than 0.5 %

<sup>1)</sup> Only systems with transmitter FUS060. For systems with transmitter FUS080 see chapter on FUS380 and FUE380.

### Additional effects of deviations from reference conditions

- Current output: As frequency output ( $\pm 0.1 \%$  of actual flow +0.05 % FSO)
- Effect of ambient temperature: Frequency/pulse output: < 0.005 % SPAN/K; Current output: <  $\pm 0.0075 \% \text{ SPAN/K}$
- Effect of supply voltage: 0.005 % of measuring value at 1 % change



## Flow Measurement

### SITRANS F US InLine

#### Transmitter SITRANS FUS060

#### Overview



SITRANS FUS060 is a transit time based transmitter designed for ultrasonic flowmetering with dedicated sensors in the FUS in-line series up to DN 3000. SITRANS FUS060 is engineered for high performance and is suitable for 1-path, 2-path and 4-path flowmeters.

#### Benefits

- Superior signal resolution for optimum turn down ratio
- Simple menu-based local operation with two-line display and four optical input elements, for unlimited use in potentially explosive atmospheres
- Self-monitoring and diagnostic
- Operate up to 4 paths
- ATEX II 2 G Ex dem [ia/ib] IIC T6/T4/T3 Gb
- Remote installation up to 120 m from sensor
- 1 analog output (4 to 20 mA) standard with HART-protocol, 1 digital frequency or pulse output, 1 relay output for limit, alarms, flow direction
- PROFIBUS PA Profile 2, 1 digital frequency or pulse output

#### Design

The transmitter type FUS060 is designed for remote installation in non-hazardous or hazardous areas.

The transmitter is designed for use in a flowmeter system together with sensors type SONOKIT, SONO 3300 and SONO 3100.

The FUS060 is ordered as part of a complete flowmeter system. It can be ordered separately as spare part and manually programmed with the sensor data.

#### Application

The main application for flowmeters with the transmitter SITRANS FUS060 is measurement volume of flow within the general, petrochemical and chemical industries, power engineering and water and waste water, as well as various types of oils and liquid gases.

#### Integration

The transmitter output is often used as input for an automation system or as input for systems of remote reading.

The SITRANS FUS060 transmitter offers current, pulse and relay outputs as standard output functions and supports HART or Profibus PA communication.

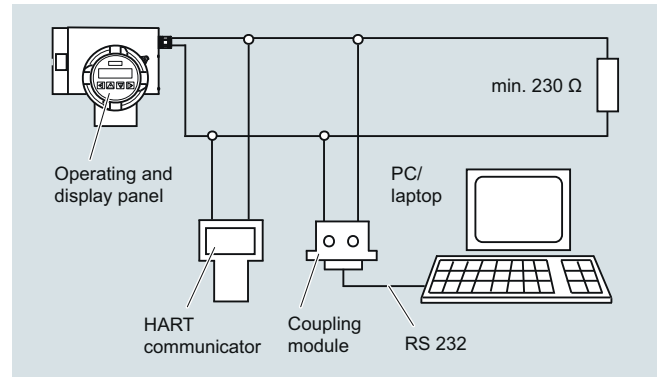
The settings of the transmitter output functions are individually programmed via keypad and display menu.

#### Function

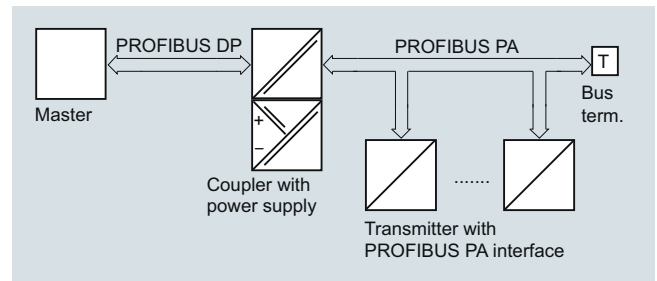
##### Displays and keypad

Operation of the SITRANS FUS060 transmitter can be carried out using:

- Keypad and display unit
- HART communicator
- PC/laptop and SIMATIC PDM software via HART communication
- PC/laptop and SIMATIC PDM software using PROFIBUS PA communication

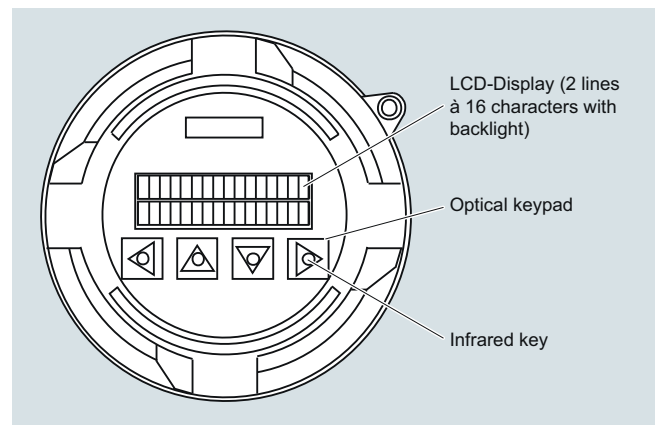


HART communication



PROFIBUS PA communication

The operating and display panel permits simple operation without supplementary equipment. It is not necessary to open the housing. All changes to a setting can therefore also be carried out in the potentially explosive atmosphere.



Operating and display panel

The individual functions and parameters are selected using a hierarchical, multi-language input menu and four infrared keys. The parameters can be specifically selected and modified using codes, e.g.:

- Operating parameters such as measuring range, physical dimensions, device information
- Limits for flow, totalizer, ultrasonic velocity or ultrasonic amplitude
- Noise suppression using damping, error stages and hysteresis
- Display parameters (freely-configurable display)
- Display in volume or mass dimensions
- Density as constant input value for conversion of volume into mass dimensions
- Forward/backward measurement
- Flow direction
- Diagnostics functions and control values
- Functions of the PROFIBUS PA output:
  - flow, net quantity (volume or mass), ultrasonic velocity, ultrasonic amplitude, forward quantity (volume or mass), backward quantity (volume or mass)
- Functions of the analog output:
  - flow, ultrasonic velocity or ultrasonic amplitude
- Functions of digital output 1:
  - pulse output, frequency output, limit, flow direction or device status
- Functions of digital output 2:
  - limit, flow direction or device status
- Simulation of output signal via analog output, digital output 1 and digital output 2

The HART protocol is implemented via the analog output (current output). Using this communication facility, the device can be parameterized with a PC/laptop and SIMATIC PDM software in addition to local operation.

In the version with PROFIBUS PA, the analog output is replaced by the digital PROFIBUS PA output. The device can then be parameterized via PROFIBUS communication and with SIMATIC PDM in addition to local operation.

### Technical specifications

#### Input

Measurement	Flow by measuring the transit time difference of ultrasonic signals through ultrasonic transducers in DN 100 (4") ... 3000 (120") 2-path sensor pipes (depending on selected size, 1-path or 4-path special solutions are possible).
Nominal diameters and number of paths	2-path DN 100 (4") ... DN 3000 (120") (depending on size, optionally also 1-path and 4-path)
Max. cable length	120 m (395 ft) (shielded coaxial cable). For Ex version the transducer cable length is restricted to 3 m (9.84 ft) in order to meet requirements for electrical immunity. For systems with sizes $\geq$ DN 1500 (60") cable length is recommended to be max. 30 m (98.4 ft).

#### Analog output

Function	Current output programmable for flow, sound velocity or amplitude level. Active current output (13.2 V < open loop voltage < 15.8 V) 4 ... 20 mA 20 ... 22.5 mA, adjustable 3.6 mA, 22 mA, or 24 mA Max. 600 $\Omega$ ; for non Ex version $\geq$ 230 $\Omega$ for HART communication $\leq$ 330 $\Omega$ for Ex-version
<ul style="list-style-type: none"> <li>• Signal range</li> <li>• Upper limit</li> <li>• Signal on alarm</li> <li>• Load</li> </ul>	
<ul style="list-style-type: none"> <li>• Only PROFIBUS PA version:</li> </ul>	Analog output omitted, is replaced by digital PROFIBUS PA interface

#### Digital output 1

Function	Pulse, frequency or status output - programmable for pulses, frequency, alarm, limit or status.
<ul style="list-style-type: none"> <li>• Active or passive signal, can be configured with positive or negative logic</li> </ul>	Active: 24 V DC, $\leq$ 24 mA, $R_i = 300 \Omega$ Passive: open collector, 30 V DC, $\leq$ 200 mA
<ul style="list-style-type: none"> <li>• For explosion protection (ATEX version) and PROFIBUS PA version</li> </ul>	Only passive: open collector 30 V DC, $\leq$ 100 mA
<ul style="list-style-type: none"> <li>• Output function, configurable</li> </ul>	Pulse output <ul style="list-style-type: none"> <li>• Adjustable pulse significance <math>\leq</math> 5000 pulses/s</li> <li>• Adjustable pulse width <math>\geq</math> 0.1 ms</li> </ul> Frequency response <ul style="list-style-type: none"> <li>• <math>f_{END}</math> selectable up to 10 kHz</li> </ul> Limit for flow, totalizers, ultrasonic velocity or ultrasonic amplitude device status, flow direction

## Flow Measurement

### SITRANS F US Inline

#### Transmitter SITRANS FUS060

<p><b>Digital output 2</b></p> <p>Function</p> <ul style="list-style-type: none"> <li>Relay, NC or NO contact</li> <li>For explosion protection (ATEX version)</li> <li>Output function, configurable</li> <li>Only PROFIBUS PA version:</li> </ul>	<p>Relay output - programmable for alarm, limit or status indication. Switching capacity max. 5 W Max. 50 V DC, max. 200 mA DC Self-resetting fuse, <math>R_i = 9 \Omega</math></p> <p>Max. 30 V DC, max. 100 mA DC, 50 mA AC (cf. EC-Type Examination certificate)</p> <p>Limit for flow, ultrasonic velocity or ultrasonic amplitude flow direction device status</p> <p>Digital output 2 omitted</p>	<p><b>Rated operation conditions</b></p> <p><u>Ambient conditions</u></p> <p>Ambient temperature</p> <ul style="list-style-type: none"> <li>Operation</li> <li>In potentially explosive atmospheres</li> <li>Storage</li> </ul> <p>Enclosure rating</p> <p>Electromagnetic compatibility</p> <ul style="list-style-type: none"> <li>Emitted interference</li> <li>Noise immunity</li> </ul> <p><u>Medium conditions</u></p> <ul style="list-style-type: none"> <li>Process temperature</li> <li>Gases/solids</li> </ul>	<p>-20 ... +50 °C (-4 ... +122 °F)</p> <p>Observe temperature classes</p> <p>-25 ... +80 °C (-13 ... +176 °F)</p> <p>IP65 (NEMA 4)</p> <p>For use in industrial environments</p> <p>To EN 55011/CISPR-11</p> <p>To EN/IEC 61326-1 (Industry)</p> <p>The measuring media must be ultrasonic signal compatible. It must be homogeneous and not two-phased to transfer the acoustic ultrasonic signals.</p> <p>-200 ... +250 °C (-328 ... +482 °F) (not directly influenced by medium temperature)</p> <p>Influence accuracy of measurement (approx. max. 3 % gases or solids)</p>
<p><b>Communication via analog output 4 ... 20 mA</b></p> <ul style="list-style-type: none"> <li>PC/laptop or HART communicator with SITRANS F flowmeter</li> <li>Load with connection of coupling module</li> <li>Load with connection of HART communicator</li> <li>Cable</li> <li>Protocol</li> </ul>	<p>min. 230 <math>\Omega</math> (max. 330 <math>\Omega</math> for Ex-version)</p> <p>min. 230 <math>\Omega</math></p> <p>2-wire shielded <math>\leq 3</math> km (<math>\leq 1.86</math> miles)</p> <p>Multi-core shielded <math>\leq 1.5</math> km (<math>\leq 0.93</math> miles)</p> <p>HART, version 5.1</p>	<p><b>Design</b></p> <p>Separate version</p> <p>Enclosure material</p> <p>Wall mounting bracket (standard and special)</p> <p>Weight of transmitter</p> <p>Electrical connection</p>	<p>Transmitter is connected to the transducers via 3 ... 120 m (9.8 ... 395 ft) long specially shielded cables (coaxial cable)</p> <p>For ATEX versions mounted in the Ex area only with 3 m (9.8 ft) long cables.</p> <p>Die-cast aluminum, painted</p> <p>Stainless steel (standard: always incl.)</p> <p>4.4 kg (9.7 lb)</p> <p>Cable glands (always incl.)</p> <ul style="list-style-type: none"> <li>Power supply and outputs <ul style="list-style-type: none"> <li>2 x M20 (HART)/M25 (PROFIBUS) or</li> <li>2 x 1/2" NPT (HART)</li> </ul> </li> <li>Transducers/sensor <ul style="list-style-type: none"> <li>2/4 x M16 or</li> <li>2/4 x 1/2" NPT</li> </ul> </li> </ul>
<p><b>Communication via PROFIBUS PA interface</b></p> <ul style="list-style-type: none"> <li>Power supply</li> <li>Current consumption from bus</li> </ul>	<p>Layers 1 + 2 according to PROFIBUS PA Communication system according to IEC 61158/EN 50170</p> <p>Separate supply, four-wire device Permissible bus voltage 9 ... 32 V See certificates and approvals</p> <p>10 mA; <math>\leq 15</math> mA in event of error with electronic current limiting</p>	<p><b>Displays and controls</b></p> <p>Display</p> <ul style="list-style-type: none"> <li>Multi-display: 2 freely-selectable values are displayed simultaneously in two lines</li> </ul> <p>Operation</p>	<p>LCD, two lines with 16 characters each</p> <p>Flow, volume, mass flow, mass, flow velocity, speed of sound, ultrasonic signal information, current, frequency, alarm information</p> <p>4 infrared keys, hierarchical menu shown with codes</p>
<p><b>Electrical isolation</b></p>	<p>Outputs electrically isolated from power supply and from one another</p>	<p><b>Power supply</b></p> <p>Supply voltage</p> <ul style="list-style-type: none"> <li>Standard version</li> <li>Ex version</li> </ul> <p>Power failure</p> <p>Power consumption</p>	<p>120 ... 230 V AC <math>\pm 15</math> % (50/60 Hz) or 19 ... 30 V DC/21 ... 26 V AC</p> <p>19 ... 30 V DC/21 ... 26 V AC</p> <p>No effect for at least 1 period (<math>&gt; 20</math> ms)</p> <p>Approx. 10 VA/10 W</p>
<p><b>Accuracy</b></p> <p>Error in measurement (at reference conditions)</p> <ul style="list-style-type: none"> <li>Pulse output</li> <li>Analog output 4 ... 20 mA</li> <li>Repeatability</li> </ul> <p>Reference conditions (water)</p> <ul style="list-style-type: none"> <li>Process temperature in the connected sensor</li> <li>Ambient temperature at the transmitter</li> <li>Transmitter warming-up time</li> </ul> <p>Installation conditions of connected sensor</p>	<p>Outputs electrically isolated from power supply and from one another</p> <p><math>\leq \pm 0.5</math> % of measured value at 0.5 ... 10 m/s or <math>\leq \pm 0.25\sqrt{V}</math> [m/s] % of measured value at flow <math>&lt; 0.5</math> m/s</p> <p>As pulse output plus <math>\pm 0.1</math> % of measured value, <math>\pm 20 \mu\text{A}</math></p> <p><math>\leq \pm 0.25</math> % of measured value at 0.5 ... 10 m/s</p> <p>25 °C <math>\pm 5</math> °C (77 °F <math>\pm 9</math> °F)</p> <p>25 °C <math>\pm 5</math> °C (77 °F <math>\pm 9</math> °F)</p> <p>30 min.</p> <p>Upstream section <math>&gt; 10 \times</math> DN and downstream section <math>&gt; 5 \times</math> DN</p>	<p><b>Certificates and approvals</b></p> <p>Explosion protection</p>	<p>ATEX II 2 G Ex dem [ia/ib] IIC T6/T4/T3 Gb</p> <p>T6 for media <math>&lt; 85</math> °C (185 °F)</p> <p>T5 for media <math>&lt; 100</math> °C (212 °F)</p> <p>T4 for media <math>&lt; 135</math> °C (275 °F)</p> <p>T3 for media <math>&lt; 200</math> °C (392 °F)</p>

### Coaxial cable

#### Standard Coaxial cable (75 Ω)

Coaxial cable with SMB straight plug on one end for connection to the FUS060

Pre-terminated, can be shortened on sensor side

Outside diameter Ø 5.8 mm

Length 3, 15, 30, 60, 90, 120 m (9.84, 49.21, 98.43, 196.85, 295.28, 393.70 ft) between sensor and transmitter

Material (outside jacket) black PE

Ambient temperature -10 ... +70 °C (14 ... 158 °F)



#### High temperature Coaxial cable (75 Ω)

Coaxial cable with SMB straight plug on one end for the connection to FUS060

Fix terminated, can NOT be shortened

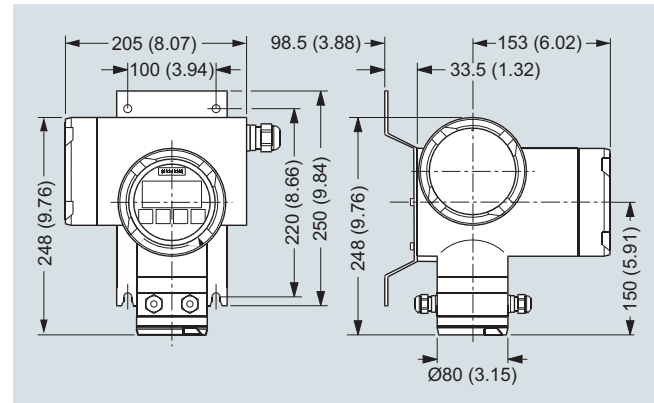
Outside diameter Ø 5.13 mm (first 0.3 m (0.98 ft) part to the transducer), Ø 5.8 mm (for remaining cable to the transmitter - with SMB plug at the end) and between these is a black hot melt junction Ø 16 mm (length 70 mm)

Length 3, 15, 30 m (9.84, 49.21, 98.43 ft) between sensor and transmitter (max 3 m 9.84 ft) transducer cable length for Ex area mounted transmitters)

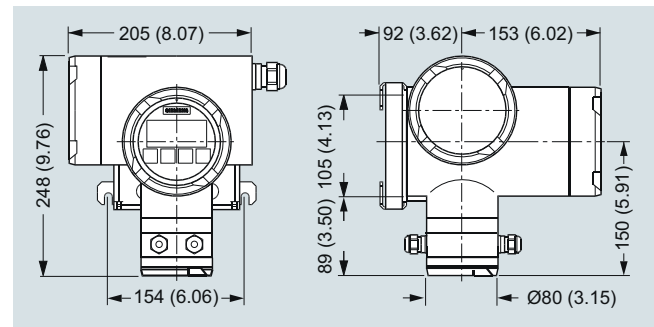
Material (outside jacket) Brown PTFE (0.3 m (0.98 ft) part) and black PE (for remaining cable)

Ambient temperature -200 ... +200 °C (-328 ... +392 °F) (brown PTFE transducer part) and -10 ... +70 °C (14 ... 158 °F) (black PE for remaining transmitter cable part)

### Dimensional drawings

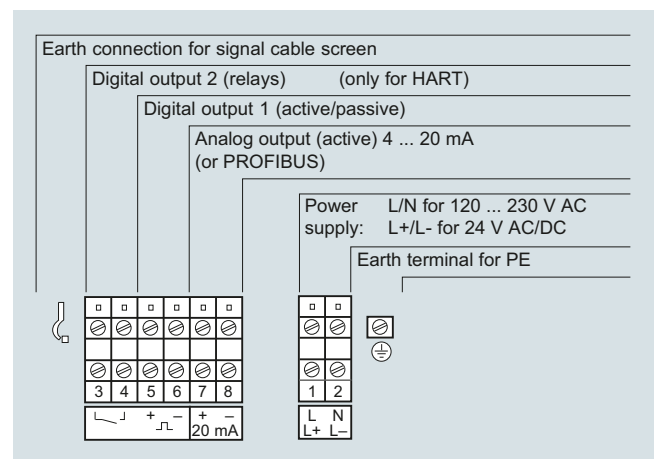


SITRANS FUS060 with standard mounting bracket, dimensions in mm (inch)



SITRANS FUS060 with optional special mounting bracket, dimensions in mm (inch)

### Schematics



Electrical connection SITRANS FUS060

## Flow Measurement

### SITRANS F US Inline

#### Transmitter SITRANS FUS060


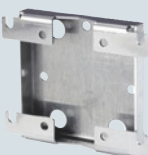

#### Transmitter FUS060 operating instructions, accessories and spare parts

##### Operating instructions

Description	Article No.
• English	<b>A5E01204521</b>
• German	<b>A5E02123845</b>

All literature is available to download for free, in a range of languages, at [www.siemens.com/processinstrumentation/documentation](http://www.siemens.com/processinstrumentation/documentation)

##### Accessories

Description	Article No.	
Standard wall mounting bracket	<b>7ME5933-0AC04</b>	
Special wall-/pipe mounting bracket kit	<b>7ME5933-0AC05</b>	
Safety clamp for electronic cover with glass plate (7ME5933-0AC01)	<b>7ME5933-0AC06</b>	

##### Process Device Manager SIMATIC PDM

**SIMATIC PDM**  
Details about the SIMATIC PDM tool can be found on page 8/5, chapter "Communication and Software"

See page 8/13, chapter "Communication and Software"



##### HART modem for communication with FUS060 HART, PC and SIMATIC PDM


**HART modem**  
With USB connection

**7MF4997-1DB**














##### Spare parts

SITRANS FUS060 transmitter, available standard and Ex versions

**The transmitter configuration is made in the flowmeter Order codes (together with the sensors). The information below is for spare part ordering only and with fixed standardized pre-settings for a DN 2000 2-path system.**

Description	Version	Enclosure	Supply	Article No.	
FUS060, 230 V, HART, Metric cable glands	Transmitter for remote connection	IP65 (NEMA 4)	115 ... 230 V AC 50/60 Hz	<b>7ME3050-2BA10-1BA1</b>	
FUS060, 230 V, HART, Imperial cable glands	Transmitter for remote connection	IP65 (NEMA 4)	115 ... 230 V AC 50/60 Hz	<b>7ME3050-2BA10-1BA2</b>	
FUS060, 230 V, PROFIBUS, Metric cable glands	Transmitter for remote connection	IP65 (NEMA 4)	115 ... 230 V AC 50/60 Hz	<b>7ME3050-2BA10-1DA1</b>	
FUS060, 230 V, PROFIBUS, Imperial cable glands	Transmitter for remote connection	IP65 (NEMA 4)	115 ... 230 V AC 50/60 Hz	<b>7ME3050-2BA10-1DA2</b>	
FUS060, 24 V, HART, Metric cable glands	Transmitter for remote connection	IP65 (NEMA 4)	19 ... 30 V DC/ 21 ... 26 V AC	<b>7ME3050-2BA20-1BA1</b>	
FUS060, 24 V, HART, Imperial cable glands	Transmitter for remote connection	IP65 (NEMA 4)	19 ... 30 V DC/ 21 ... 26 V AC	<b>7ME3050-2BA20-1BA2</b>	
FUS060, 24 V, PROFIBUS, Metric cable glands	Transmitter for remote connection	IP65 (NEMA 4)	19 ... 30 V DC/ 21 ... 26 V AC	<b>7ME3050-2BA20-1DA1</b>	
FUS060, 24 V, PROFIBUS, Imperial cable glands	Transmitter for remote connection	IP65 (NEMA 4)	19 ... 30 V DC/ 21 ... 26 V AC	<b>7ME3050-2BA20-1DA2</b>	
FUS060, ATEX, 24 V, HART, Metric cable glands	Transmitter for remote connection	IP65 (NEMA 4) ATEX approval	19 ... 30 V DC/ 21 ... 26 V AC	<b>7ME3050-2BA21-1CA1</b>	

Ordering of pre-configured FUS060 spare transmitters only via PVR (product variation request - special request)

Description	Article No.		Description	Article No.	
Operating/Display module	<b>7ME5933-0AC00</b>		M20 cable gland set for FUS060 ATEX version power and output connection, PA plastic, 1 x in blue (ATEX Ex i) and 1 x gray (ATEX Ex-e) • cables Ø 5 ... 9 mm (0.20" ... 0.35") • -20 ... +95 °C (-4 ... +203 °F)	<b>A5E02246356</b>	
Electronics cover with glass plate (non Ex) . Die cast aluminum, with corrosion-resistant Basic Polyester powder coating (min. 60 µm)	<b>7ME5933-0AC01</b>		1/2" NPT cable gland set for FUS060 (NPT) power and output connection, gray PA plastic, 2 pcs. • cables Ø 6 ... 12 mm (0.24" ... 0.47") • -40 ... +100 °C (-40 ... +212 °F)	<b>A5E02246396</b>	
Cover for sensor cable and gasket. Die cast aluminum, with corrosion-resistant Basic Polyester powder coating (min. 60 µm)	<b>7ME5933-0AC02</b>		M25 cable gland set for the FUS060 PA (M25) power and output connection, gray PA plastic, 2 pcs. • cables Ø 9 ... 16 mm (0.35" ... 0.63") • -40 ... +100 °C (-40 ... +212 °F)	<b>A5E02246378</b>	
Cover for mains supply/communication. Die cast aluminum, with corrosion-resistant Basic Polyester powder coating (min. 60 µm)	<b>7ME5933-0AC03</b>		M16x1.5 cable gland set for FUS060 (M16) sensor connection, gray PA plastic, 2 pcs. and 2 pcs. blind. • cables Ø 5 ... 9 mm (0.20" ... 0.35") • -40 ... +100 °C (-40 ... +212 °F)	<b>A5E02593526</b>	
FUS060 Sensor connection PCBA, Standard versions only, 1 pc.	<b>A5E02551331</b>		M16 x 1.5 cable gland set for FUS060 (M16) sensor connection, brass chrome, 2 pcs. and 2 pcs. blind • cables Ø 5 ... 9 mm (0.20" ... 0.35") • -20 ... +105°C (-4 ... +221 °F)	<b>A5E02246369</b>	
FUS060 Sensor connection PCBA, ATEX version only, 1 pc.	<b>A5E02551334</b>		1/2" NPT cable gland set for FUS060 (NPT) sensor connection, 4 pcs. M16 bush to 1/2" NPT and 4 pcs. 1/2" NPT gray PA plastic glands • cables Ø 5 ... 9 mm (0.20 ... 0.35") • -20 ... +100 °C (-4 ... +212°F)	<b>A5E02247877</b>	
M20 cable gland set for FUS060 (M20) power and output connection, gray PA plastic, 2 pcs. • cables Ø 6 ... 12 mm (0.24" ... 0.47") • -40 ... +100 °C (-40 ... +212 °F)	<b>A5E02246350</b>				



## Flow Measurement

### SITRANS F US Inline

#### Transmitter SITRANS FUS060

##### Cables for FUS060

Description	Length m (ft)	Article No.
Coaxial cable for FUS060, (75 Ω, max. 70 °C (158 °F), black PVC) (2 pcs.)	3 (9.84)	<b>A5E00875101</b>
	15 (49.21)	<b>A5E00861432</b>
	30 (98.43)	<b>A5E01278662</b>
	60 (196.85)	<b>A5E01278682</b>
	90 (295.28)	<b>A5E01278687</b>
	120 (393.70)	<b>A5E01278698</b>
High temp. coaxial cable for FUS060; with 0.3 m brown PTFE high temp. transducer part, max. 200 °C (392 °F) and black PVC for remaining transmitter part with SMB plug, max. 70 °C (158 °F), impedance 75 Ω (2 pcs.)	3 (9.84)	<b>A5E00875105</b>
	15 (49.21)	<b>A5E00861435</b>
	30 (98.43)	<b>A5E01196952</b>
Special coaxial cable sets for low temperature cryogenic systems; with SMB plug for transmitter SITRANS FUS060, PTFE material, temp. -200 ... +200 °C (-328 ... +392 °F), impedance 75 Ω (2 pcs.)	10 (32.84)	<b>A5E02085593</b>
	15 (49.21)	<b>A5E03262088</b>
	30 (98.43)	<b>A5E02085644</b>
	40 (131.23)	<b>A5E02085649</b>



#### Overview



SITRANS FUS080 is a transit time based transmitter designed for ultrasonic flow metering with any sensor in the FUS inline series SONOKIT, FUS380 and FUE380 up to DN 1200.

The ultrasonic flowmeter transmitter SITRANS FUS080 comes as battery or mains powered version. The SITRANS FUS080 is designed to measure flow water applications.

The SONOKIT retrofit flowmeter series are shown from page 3/277. The standard flowmeter series SITRANS FUS380 is described from page 3/288. The type approved flowmeter series for flow metering in energy meter custody transfer systems are named SITRANS FUE380 - see page 3/294.

#### 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
- IrDA optical interface for local communication
- 2-path measuring principle for optimum accuracy
- Compact or remote mounting
- Measures on all district water qualities and water conductivities
- No pressure drop
- Long-term stability
- 2 galvanic isolated digital outputs for easy connection to a calculator (potential free)
- 1 analog 4 to 20 mA output
- Bidirectional measurement, with 2 totalizers and outputs
- Dynamic range  $Q_i$  (min) :  $Q_s$  (max) up to 1:400
- Compact version with triax cables for highest EMC-protection

#### Application

The main application for flowmeters with the transmitter SITRANS FUS080 is measurement of water flow in district heating plants, local networks, boiler stations, substations, chiller plants, irrigations plants and other general water applications.

#### Design

The transmitter type SITRANS FUS080 is designed with fiber-glass reinforced polyamide enclosure for remote or compact installation in normal areas. The remote versions are available with up to 30 meter distance from flowmeter to transmitter. When ordering as a compact version in the series FUS380 and FUE380 the transducer cables are pre-mounted at the sensor.

The transmitter is available in an IP67/NEMA 4X/6 enclosure and is designed for use in the flowmeters series:

- SONOKIT (1-path or 2-path)
- FUS380 (2-path)
- FUE380 (2-path)

The transmitter FUS080 is always ordered as part of a complete flowmeter system.

It can be manually ordered separately as spare part pre-programmed with the given sensor data.

#### Integration

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

SITRANS FUS380 has two pulse outputs, with functions that can be individually selected.

The settings of the transmitter, eg. flow and pulse output rate, are defined when ordering the complete flowmeter.

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

#### Technical specifications

Input	
Measurement	Flow by measuring the transit time difference of ultrasonic signals through ultrasonic transducers in the sensor pipes. Supporting of 1-path or 2-path sensors in sizes DN 50 ... 1200 measuring on water.
Measuring rate	
• Battery mode	0.5 Hz
• Mains supply	Up to 15 Hz
• Back-up mode	0.5 Hz (at mains supply drop)
Flow rate	0.02 ... 9 m/s (0.065 ... 29.5 ft/s), bidirectional flow metering
Output	
Max. pulse frequency	100 Hz at $Q_s$ ( $Q_{max}$ )
Pulse value and length	Selectable with the ordering of the flowmeter
Output A function	Pulse: forward, reverse, forward net, reverse net (preset: forward)
Output B function	Pulse: forward, reverse, forward net, reverse net (preset: forward) or alarm indication or call-up indication (preset: alarm)
Pulse value A and B	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 <sup>3</sup> /p, 2.5 m <sup>3</sup> /p, 5 m <sup>3</sup> /p, 10 m <sup>3</sup> /p, 25 m <sup>3</sup> /p, 50 m <sup>3</sup> /p, 100 m <sup>3</sup> /p, 250 m <sup>3</sup> /p, 500 m <sup>3</sup> /p, 1 000 m <sup>3</sup> /p
Pulse length (depending on $Q_{max}$ by DN selection)	5, 10, 20, 50, 100, 200, 500 ms (standard 5 ms)
Alarm indication	Path 1 (F1), path 2 (F2) internal, failure (F3, F4), powers supply warning or low battery indication (F5), $Q_{max}$ overflow (F6), pulse overflow (F7, F8), internal data logger warning (F9)
Analog output	Passive current output 4 ... 20 mA Data span pre-selectable depending on pipe size



## Flow Measurement

### SITRANS F US Inline

#### Transmitter SITRANS FUS080/FUE080

##### Rated operation conditions

###### Ambient conditions

###### Ambient temperature

- Operation -10 ... +60 °C (14 ... 140 °F) (MID version: max. +55 °C (131 °F))
- Storage -40 ... +85 °C (-40 ... +185 °F) (battery included)

###### Enclosure rating

IP67/NEMA 4X/6 to EN 60529 and DIN 40050

###### Electromagnetic compatibility

- Emitted interference To EN 55011/CISPR-11
- Immunity To EN/IEC 61326-1 (Industry)
- MID approved (FUE380 series) Environment class E2 and M1

###### Mechanical vibration

2 g, 1 ... 800 Hz sinusoidal in all directions according to IEC 68-2-6

###### Weight of transmitter

Approx. 1.5 kg (3.3 lb)

##### Design

###### Enclosure material

Fibre-glass reinforced polyamide, light gray color

###### Wall mounting kit

IP67/NEMA 4X/6 terminal box for the wall mounting of the transmitter, fiber-glass reinforced polyamide with stainless steel bracket, cable glands entries: 2 x 2 M20 or PG 13.5 for power supply and outputs and 2 x M20 or PG 13.5 for the sensor cables, glands (supply and outputs and double cable entries for sensor cables) are included.

###### Sensor cable

Coaxial cable sets for remote transmitter up to 30 m (98.4 ft) long transducer cable, 75 Ω impedance, cables sets are prepared for the connection to the sensors  
Triax cables for integral version

##### Display and controls

###### Display

LCD, 8 digits, additional 2 digits and symbols for status information

###### Resolution

Totalized information can be displayed with 1, 2 or 3 decimals or automatic adjustment (default)

###### Display setting

Flow unit: Preset: m<sup>3</sup>/h  
Volume unit: Preset: m<sup>3</sup>

###### Push button

One push button for menu selection and display information

###### Communication (IrDA optical eye)

IrDA – optical communication and control interface with Modbus RTU protocol for read or write transmitter settings and data via PC and PDM tool

##### Power supply

###### Battery

D-cell battery pack, 3.6 V LiSOCl (Lithium Thionyl Chloride, 34 Ah), replaceable, life- and working-time up to 6 years

###### Mains

87 ... 265 V AC (50 ... 60 Hz) or 87 ... 265 V AC (50 ... 60 Hz) with D-cell single battery backup, 2.6 V LiSOCl (Lithium Thionyl Chloride, 17 Ah), replaceable, life time up to 8 years

##### Power consumption

###### Mains version

Approx. 2.5 VA

##### SONOKIT, FUS380, FUE380

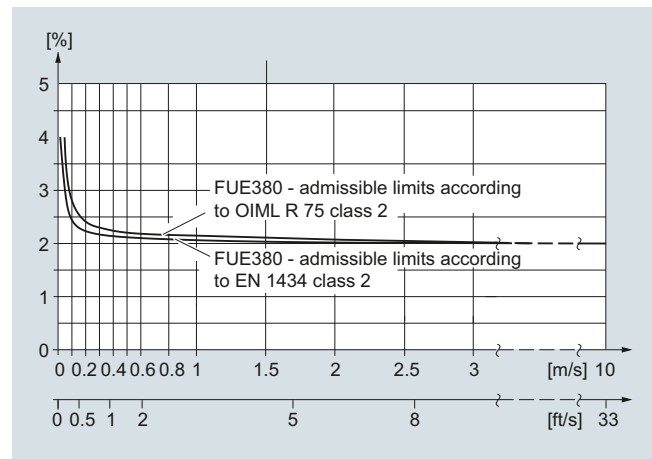
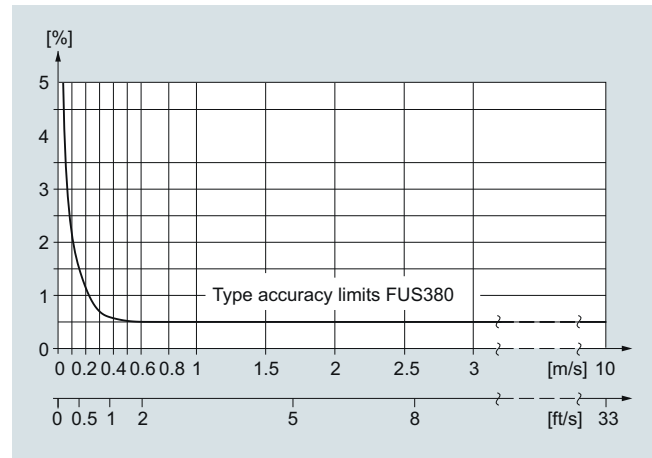
The flow values and settings are predefined according to dimension selection.

The transmitter settings are changeable by using the SW tool PDM (for FUE380 series some of the setting are only readable, restriction of the approval requirements).

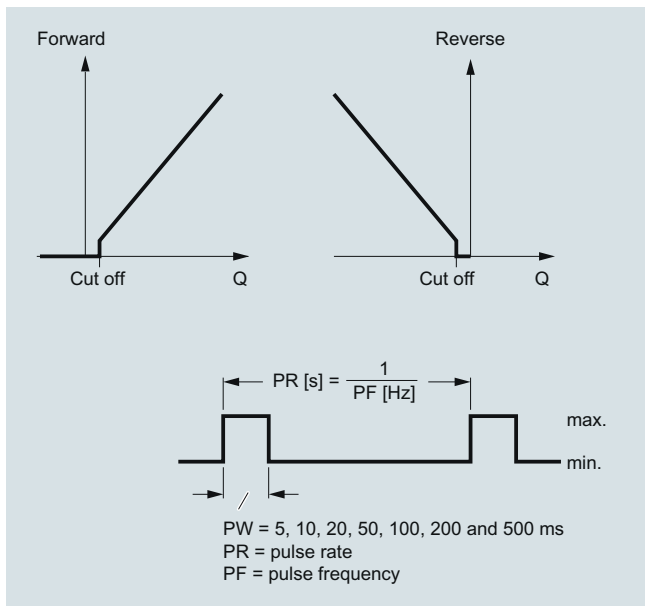
##### Accuracy/Error in measurement:

(at reference conditions for FUS380 and FUE380 series, SONOKIT series will differ in the accuracy)

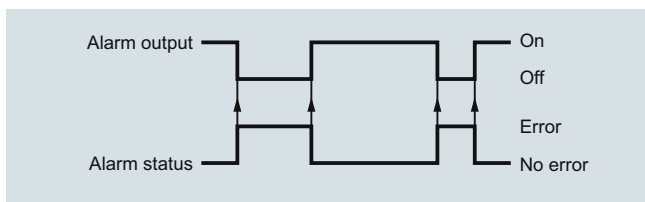
- Pulse output
  - $\leq \pm 0.5$  % of measured value at 0.5 ... 10 m/s or
  - $\leq \pm 0.25/V$  [m/s] % of measured value at flow < 0.5 m/s
- Repeatability  $\leq 0.25$  % of measured value at 0.5 ... 10 m/s
- Reference conditions
  - Process temperature and ambient temperature: 25 °C  $\pm$  5 °C (77 °F  $\pm$  9 °F)
  - Transmitter warming-up time 30 min.
  - Installation conditions of the sensor: Upstream section > 10 x DN and downstream section > 5 DN



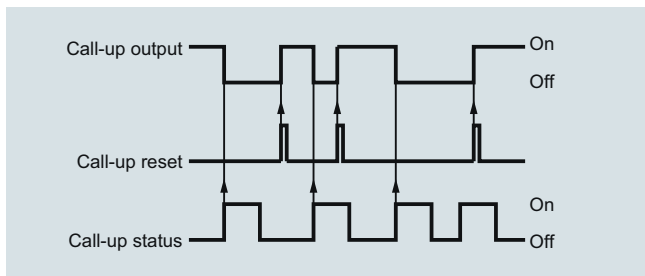
Output configuration



Pulse volume: output A/B configured as volume per pulse, calculated on forward/reverse or net forward/reverse flow. The volume per pulse is free scaleable (via PDM software).

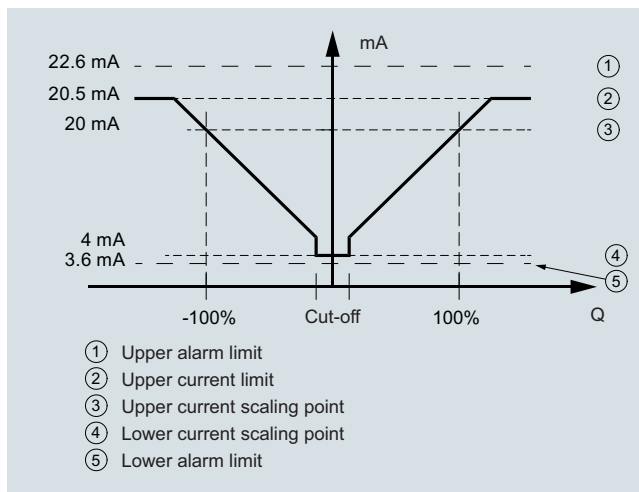


Pulse output B can be used as stated above or as alarm or call-up function.

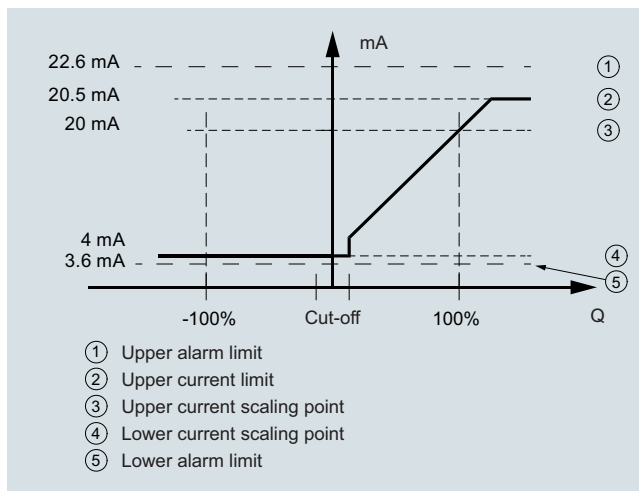


Call-up: the call-up output is active until manually reset by use of PDM tool. The call-up function is activated when an alarm is activated.

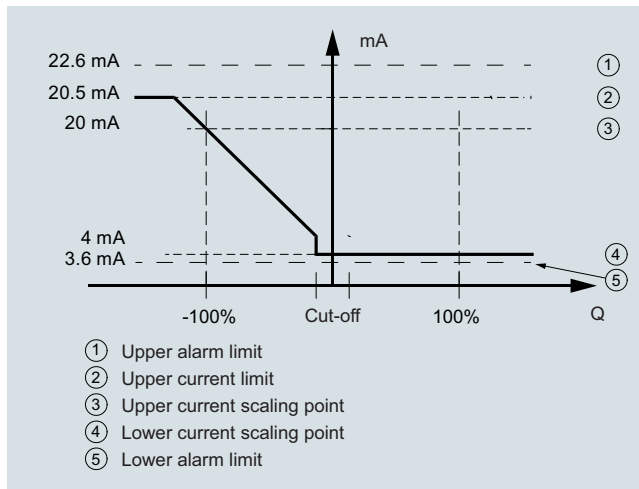
**Current output**



Bidirectional flow



Positive flow




Negative flow

## Flow Measurement


### SITRANS F US Inline

#### Transmitter SITRANS FUS080/FUE080

##### Sensor coaxial cable for SONOKIT series with FUS080

Coaxial cable		
<b>Standard coaxial cable (75 Ω)</b>		
Outside diameter	Ø 5.8 mm	
Length	15, 30 m (49.2, 98.4 ft) between sensor and transmitter	
Material (outside jacket)	Black PE	
Ambient temperature	-10 ... +70 °C (14 ... 158 °F)	

##### Sensor coaxial cable for FUS380/FUE380 series

Coaxial cable		
<b>High temperature coaxial cable (75 Ω)</b>		
	With special designed glands for connection in the sensor/transducer	
Outside diameter	Ø 5.13 mm (first 0.3 m (0.98 ft) part to the transducer), Ø 5.8 mm (for remaining cable to the transmitter – black holt melt junction part between (Ø 16 mm, length 70 mm)	
Length	Up to 30 m (98.4 ft) between sensor and transmitter	
Material (outside jacket)	Brown PTFE (0.3 m (9.84 ft) part) and black PE (for remaining cable)	
Ambient temperature	-200 ... +200 °C (-328 ... +392 °F) (brown PTFE transducer part) and -10 ... +70 °C (14 ... 158 °F) (black PE for remaining transmitter cable part)	

### Transmitter FUS080 operating instructions, accessories and spare parts

#### Operating instructions


Description	Article No.
for use with SONOKIT • English	<b>A5E03059912</b>
integrated in FUS/FUE380 • English • German	<b>A5E00730100</b> <b>A5E00740611</b>

All literature is available to download for free, in a range of languages, at [www.siemens.com/processinstrumentation/documentation](http://www.siemens.com/processinstrumentation/documentation)

#### Accessories

Description	Article No.
Sun lid for FUS080 transmitter (frame and lid)	<b>A5E02328485</b>
Brace (holder) for optical IrDA eye	<b>A5E00695277</b>
IrDA infrared interface adapter with USB for data acquisition with 1.2 m (3.9 ft) cable	<b>FDK:087L4163</b>

#### Process Device Manager SIMATIC PDM

SIMATIC PDM	See page 8/13, chapter "Communication and Software"
Details about the SIMATIC PDM tool can be found on page 8/5, chapter "Communication and Software"	

#### Spare parts

A spare part transmitter can be ordered for a specific system. In the description of the following spare part transmitters the related transmitter Article No. found on the device silver front label is noted.

#### Spare part transmitter for FUS380 systems (7ME3400)

Description	Article No.
FUS080 transmitter 3.6 V battery (no battery included, to be ordered separate) as spare part transmitter for FUS380 flowmeter series. Transmitter Article No. 7ME3450-0AA10-2AA0	<b>A5E02729700</b>
FUS080 transmitter 3.6 V battery (battery included) as spare part transmitter for FUS380 flowmeter series <sup>1)</sup> . Transmitter Article No. 7ME3450-0AA20-2AA0	<b>A5E02729035</b>
FUS080 transmitter 230 V mains as spare part transmitter for FUS380 flowmeter series. Transmitter Article No. 7ME3450-0AA30-2AA0	<b>A5E02699309</b>
FUS080 transmitter 230 V mains with backup-battery as spare part transmitter for FUS380 flowmeter series. Transmitter Article No. 7ME3450-0AA40-2AA0	<b>A5E02729610</b>

When ordering: Inform on flowmeter Article No. and flowmeter serial no. (e.g. 7ME3400-xxxx-xxxx-Z, XX.... and xxxxxxHxxx)

#### Spare part transmitter for FUE380 approved systems (7ME3410)

(only with MID approval marks, no MID verification – only a complete flowmeter can be MID-verified, i.e. sensor together with the transmitter)

Description	Article No.
FUE080 transmitter 3.6 V battery (no battery included, to be ordered separate) as spare part transmitter for FUE380 flowmeter series. Transmitter Article No. 7ME3450-0AA10-2AB0	<b>A5E02734600</b>
FUE080 transmitter 3.6 V battery (battery included) as spare part transmitter for FUE380 flowmeter series <sup>1)</sup> . Transmitter Article No. 7ME3450-0AA20-2AB0	<b>A5E02734568</b>
FUE080 transmitter 230 V mains as spare part transmitter for FUE380 flowmeter series. Transmitter Article No. 7ME3450-0AA30-2AB0	<b>A5E02734539</b>
FUE080 transmitter 230 V mains with backup-battery as spare part transmitter for FUE380 flowmeter series. Transmitter Article No. 7ME3450-0AA40-2AB0	<b>A5E02734585</b>

When ordering: Inform on flowmeter Article No. and flowmeter serial no. (e.g. 7ME3410-xxxx-xxxx-Z, XX.... and xxxxxxHxxx)

#### Spare part transmitter for SONOKIT systems (7ME3210/7ME3220)

Description	Article No.
FUS080 transmitter 3.6V battery (no battery included, to be ordered separate) as spare part transmitter for SONOKIT flowmeters. Transmitter Article No. 7ME3450-0AA10-2AA0	<b>A5E03048726</b>
FUS080 transmitter 3.6V battery (battery included) as spare part transmitter for SONOKIT flowmeters <sup>1)</sup> . Transmitter Article No. 7ME3450-0AA20-2AA0	<b>A5E03048714</b>
FUS080 transmitter 230V mains as spare part transmitter for SONOKIT flowmeters. Transmitter Article No. 7ME3450-0AA30-2AA0	<b>A5E03048701</b>
FUS080 transmitter 230V mains with backup-battery as spare part transmitter for SONOKIT flowmeters. Transmitter Article No. 7ME3450-0AA40-2AA0	<b>A5E03048719</b>

When ordering: Inform on flowmeter Article No. and flowmeter serial no. (e.g. 7ME3220-xxxx-xxxx-Z, XX.... and xxxxxxHxxx)











<sup>1)</sup> 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.

## Flow Measurement

### SITRANS F US Inline


#### Transmitter SITRANS FUS080/FUE080

Spare part transmitter for FUS880 retrofitting systems (7ME3440)


Description	Article No.		Description	Article No.	
<p><b>Sparepart FUS080 transmitter 3.6 V, incl. 3.6V dual batterie pack, USA version</b></p> <p>Transmitter Article No.: 7ME3450-0AA20-1CA0; Label, 0: Siemens FUS080 transmitter; Version, 0: Without connection box; Enclosure, A: IP67/NEMA 4X/6; Code A: Standard; Supply Voltage, 2: 3.6V DC battery; Ex. Approval, 0: no Ex approval; Display, 1: With display and unit label; Region version, C: USA: AcFt,CFS; Application, A: Standard FUS080 (for SITRANS Retrofit - 7ME344); Code, 0: Standard</p>	<b>A5E03412669</b>		<p>Internal battery pack, one set of 2 D-cell (3.6 V 34 Ah)<sup>1)</sup></p> <ul style="list-style-type: none"> <li>1 pc. pack</li> <li>24 pcs. pack</li> </ul>	<b>A5E02679676</b> <b>A5E02896941</b>	
			<p>Single battery back-up to main supply (17 Ah)<sup>1)</sup></p>	<b>A5E02679923</b>	
			<p>Battery cover for transmitter FUS080</p>	<b>A5E00694468</b>	
			<p>PG 13.5 cable gland set for FUS080 power and output connection, black PA plastic, 2 pcs.</p> <ul style="list-style-type: none"> <li>cables Ø 6 ... 12 mm (0.24" ... 0.47")</li> <li>-40 ... +100 °C (-40 ... +212 °F)</li> </ul>	<b>FDK:083G0228</b>	
<p><b>FUS080 transmitter for FUS880 retrofit systems, USA version,</b></p> <p>incl. wall-mounting kit, 2 transducers and 2 pcs. 60 ft (20 m) of cables.</p> <p>Label, 0: Siemens FUS080 transmitter; Diameter, 0A: None; Wall Thickness, A: None; Pipe Material, 0: No Pipe; Track configuration, 1: 1-Track; Region version, 2: USA: AcFt,CFS; Transmitter, D: FUS080,IP67, Battery, Remote, unit label; Template, A: None; Transducer coax cable, 4: 20 m with gland</p>	<b>7ME3440-0AA01-2DA4</b>		<p>PG 13.5 cable gland set (two cable entries) for FUS080 sensor connection, black PA plastic, 2 pcs.</p> <ul style="list-style-type: none"> <li>cables Ø 6 ... 12 mm (0.24" ... 0.47")</li> <li>-40 ... +100 °C (-40 ... +212 °F)</li> </ul>	<b>A5E00694500</b>	
			<p>SITRANS FUS/FUE380 wall mounting kit for remote transmitter mounting, including connection plate (DN 50 ... DN 1200/2" ... 48")</p>	<b>A5E00694509</b>	
<p><b>FUS080 transmitter for FUS880 retrofit systems, USA version,</b></p> <p>incl. wall-mounting kit, 4 transducers and 4 pcs. 60 ft (20 m) of cables:</p> <p>Label, 0: Siemens FUS080 transmitter; Diameter, 0A: None; Wall Thickness, A: None; Pipe Material, 0: No Pipe; Track configuration, 3: 2-Track (X-Configuration); Region version, 2: USA: AcFt,CFS; Transmitter, D: FUS080 ,IP67, Battery, Remote,unit label; Template, A: None; Transducer coax cable, 4: 20 m with gland</p>	<b>7ME3440-0AA03-2DA4</b>		<p>SITRANS FUS/FUE380 terminal box for compact transmitter mounting, including connection plate, (bronze sensors only, DN 50 ... DN 80/2" ... 3")</p>	<b>A5E01208138</b>	
			<p>SITRANS FUS/FUE380 terminal box for compact transmitter mounting, including connection plate, (steel sensors only, DN 100 ... DN 1200/4" ... 48")</p>	<b>A5E00694660</b>	
			<p>FUS080 display and keypad with Siemens logo</p>	<b>A5E00873496</b>	
			<p>FUS080 display and keypad neutral (without logo)</p>	<b>A5E33147123</b>	

<sup>1)</sup> 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.


## Sensor cables for FUS380/FUE380 flowmeters

Description	Article No.	
<b>DN 50 to 80 flowmeters</b>		
Coaxial cable for FUS080; with 0.3 m brown PTFE high temp. transducer part, max. 200 °C (392 °F) and black PVC for remaining transmitter part, max. 70 °C (158 °F); impedance 75 Ω		
5 m (16.4 ft) cable set (4 pcs.) for DN 50 ... DN 80 (2" ... 3") remote mounting	<b>A5E01208092</b>	
10 m (32.8 ft) cable set (4 pcs.) for DN 50 ... DN 80 (2" ... 3") remote mounting	<b>A5E01208114</b>	
20 m (65.6 ft) cable set (4 pcs.) for DN 50 ... DN 80 (2" ... 3") remote mounting	<b>A5E01208117</b>	
30 m (98.4 ft) cable set (4 pcs.) for DN 50 ... DN 80 (2" ... 3") remote mounting	<b>A5E01208121</b>	
0.5 m (1.64 ft) cable set (4 pcs.) for DN 50 ... DN 80 (2" ... 3") for compact version of FUS380/FUE380	<b>A5E01208126</b>	
<b>DN 100 to 1200 flowmeters</b>		
Coaxial cable for FUS080; with 0.3 m brown PTFE high temp. transducer part, max. 200 °C (392 °F) and black PVC for remaining transmitter part, max. 70 °C (158 °F); impedance 75 Ω		
5 m (16.4 ft) cable set (4 pcs.) for DN 100 ... DN 1200 (4" ... 48") remote mounting	<b>A5E00695476</b>	
10 m (32.8 ft) cable set (4 pcs.) for DN 100 ... DN 1200 (4" ... 48") remote mounting	<b>A5E00695479</b>	
20 m (65.6 ft) cable set (4 pcs.) for DN 100 ... DN 1200 (4" ... 48") remote mounting	<b>A5E00695480</b>	
30 m (98.4 ft) cable set (4 pcs.) for DN 100 ... DN 1200 (4" ... 48") remote mounting	<b>A5E00695483</b>	
1 m (3.28 ft) cable set (4 pcs.) for DN 100 ... DN 1200 (4" ... 48") for compact version of FUS380/FUE380	<b>A5E00695486</b>	

## Sensor cables for SONOKIT flowmeter with FUS080

Description	Article No.	
15 m (49.2 ft) cable set (2 pcs.) remote mounting with SONOKIT flowmeters	<b>A5E02478541</b>	
30 m (98.4 ft) cable set (2 pcs.) remote mounting with SONOKIT flowmeters	<b>A5E02478751</b>	

## Sensor cables for FUS880 retrofitting systems (7ME3440)

Description	Article No.	
<b>Coaxial cable with transducer connection</b>		
for use in FUS880 and SONO 3300 sensors; with 0.3 m brown PTFE high temperature transducer part, max. 200 °C (392 °F) and black PVC for the remaining transmitter part, max. 70 °C (158 °F); cable impedance 75 Ω		
• 1 x 10 m (32.8 ft)	<b>FDK:085L2400</b>	
• 1 x 20 m (65.6 ft)	<b>FDK:085L2401</b>	
• 1 x 30 m (98.4 ft)	<b>FDK:085L2402</b>	
<b>Transducer spare part set of two transducers with gaskets for STRANS FUS880 retrofitting systems</b>	<b>FDK:087H3007</b>	

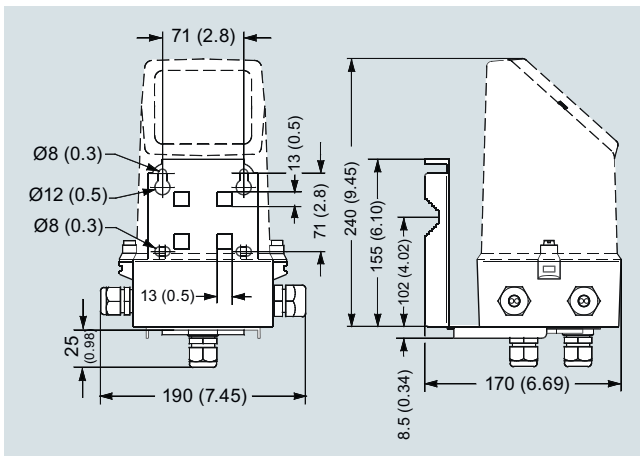
## Flow Measurement

### SITRANS F US InLine

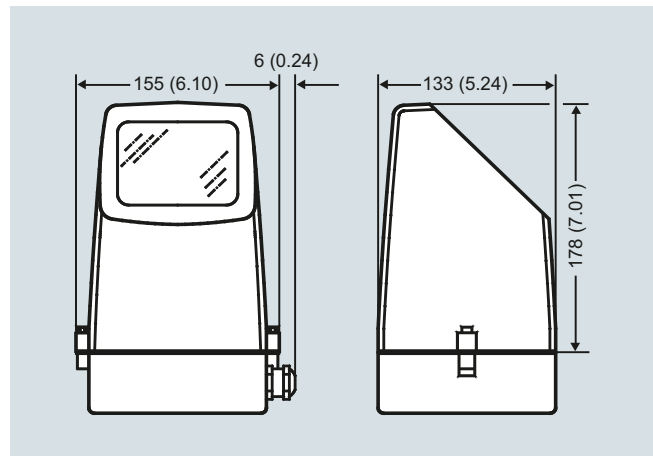
#### Transmitter SITRANS FUS080/FUE080

#### Dimensional drawings

#### *FUS080 transmitter IP67/NEMA 4X/6, wall mounting and compact mounting*

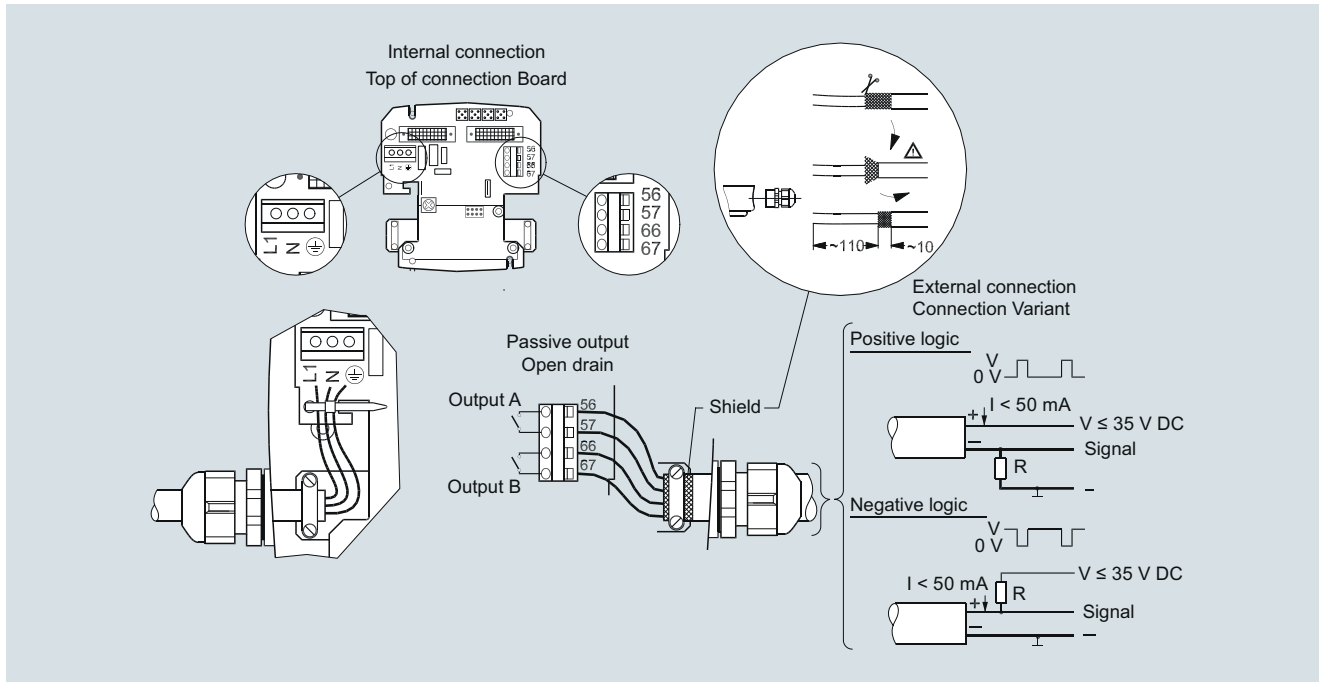


Transmitter wall mounted, dimensions in mm (inch)

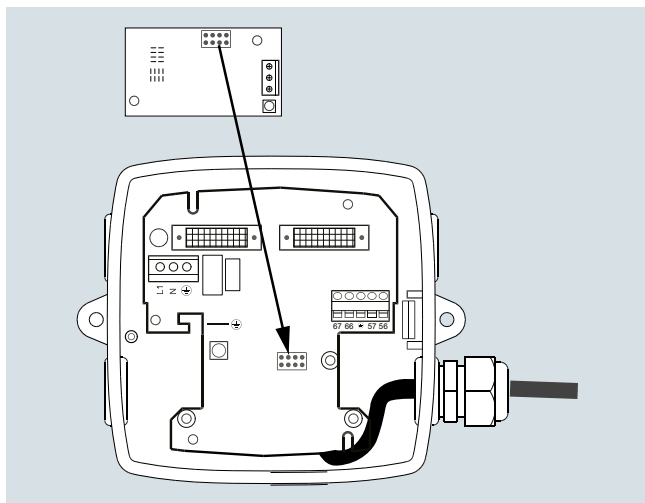


Transmitter compact mounted, dimensions in mm (inch)

**Schematics**



Electrical connection of SITRANS FUS080



Analog module SITRANS FUS080



## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SONO 3300/FUS060

#### Overview



The combination of SONO 3300 sensor and FUS060 transmitter is ideal for applications within the general industry. Measurements are independent of liquid temperature, density, pressure and conductivity. Transducers cannot be replaced.

#### Benefits

- Robust remote transmitter FUS060
- Robust design for industrial applications
- Measures all liquids less than 350 cSt, conductive or non-conductive
- No pressure drop
- Reliable and accurate flow measurements
- Long-time stability
- ATEX approval

#### Application

The main application for SONO 3300/FUS060 ultrasonic flowmeter is measurement of volume.

SONO 3300/FUS060 can be used for water and treated waste water, oil, hot water/cooling systems.

#### Design

The SONO 3300/FUS060 consists of a casted sensor (DN 50 to 80 (2" to 3")), welded pipes (DN 100 to 300 (4" to 12")) and a transmitter FUS060.

The transmitter can only be mounted separately.

The internal signal cables from transducers to sensor connection box are protected from an aggressive environment by stainless steel pipes.

#### Sensor installation

See system information.

#### Technical specifications

The transmitter related to this system is the SITRANS FUS060.  
 Technical specifications to the FUS060 see page 3/247.

#### 2-path sensor with flanges and inline transducers

<b>Error in measurement</b>	
Error in measurement at reference conditions	$v > 0.5 \dots 10 \text{ m/s}$ , $< \pm 0.5 \%$ of rate ( $v = \text{flow speed}$ )
Max. flow velocity	10 m/s (32 ft/s)
<b>Nominal size</b>	
	DN 50, DN 65, DN 80, DN 100, DN 125, DN 150, DN 200, DN 250, DN 300 (2" ... 12")
Media temperature	Separate version: $-10 \dots +160 \text{ }^\circ\text{C}$ (14 ... 320 $^\circ\text{F}$ )
Ambient temperature (sensor)	Separate version: $-20 \dots +60 \text{ }^\circ\text{C}$ (-4 ... +140 $^\circ\text{F}$ ) Storage: $-40 \dots +85 \text{ }^\circ\text{C}$ (-40 ... +185 $^\circ\text{F}$ )
Enclosure	Standard version: IP67 (NEMA 4X/NEMA 6) ATEX version: As standard, but with ATEX approval (see below)
<b>Process connections</b>	
PN designated EN 1092-1, type 11 (B)	<ul style="list-style-type: none"> <li>• DN 50 ... 300 (2" ... 12"), PN 40</li> <li>• DN 100 ... 300 (4" ... 12"), PN 16</li> <li>• DN 200 ... 300 (8" ... 12"), PN 10</li> </ul>
Class designated EN 1759-1	<ul style="list-style-type: none"> <li>• DN 50 ... 300 (2" ... 12"), class 150</li> <li>• DN 50 ... 300 (2" ... 12"), class 300</li> </ul>
Transducer	Inline version welded into pipe
<b>Materials</b>	
Pipe	<ul style="list-style-type: none"> <li>• DN 50 ... 80 (2" ... 3"): Cast steel EN 1.1131-GS-15Mn5</li> <li>• DN 100 ... 300 (4" ... 12"): Carbon steel EN 1.0345-P235GH</li> </ul>
Flange	<ul style="list-style-type: none"> <li>• DN 50 ... 300 (2" ... 12"): EN 1.0025-S235JRG2</li> </ul>
Class	ASTM A105
Transducer	Stainless steel AISI 316 or similar

### Certificates and approvals

Conformity certificate	The devices are supplied as standard with a Siemens Certificate of Conformity on DVD
Material certificate	Material certificate according to EN 10204-3.1 is optionally available
NDT examination report	Extended material certificate is available on special request (PVR)
Calibration report	A standard calibration report is shipped with each flowmeter.
Extended accredited ISO/IEC 17025 calibration certificates	Optionally available
Approvals	No custody transfer approvals
Ex approval	System ATEX approval for SONO 3300 with remote transmitter FUS060-Ex (ATEX II 2 G Ex dem [ia/ib] IIC T6/T4/T3 Gb) For Ex version the transducer cable length is restricted to 3 m (9.84 ft), in order to meet requirements.

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).

### Coaxial cable between sensor SONO 3300 and transmitter FUS060

<b>Standard Coaxial cable (75 Ω)</b>	Coaxial cable with SMB straight plug on one end for the FUS060 connector
Outside diameter	Ø 5.8 mm
Length	3, 15, 30, 60, 90, 120 m (9.84, 49.21, 98.43, 196.85, 295.28, 393.70 ft) between sensor and transmitter
Material (outside jacket)	black PE
Ambient temperature	-10 ... +70 °C (14 ... 158 °F)
<b>High temperature Coaxial cable (75 Ω)</b>	Coaxial cable with SMB straight plug on one end for the FUS060 connector
Outside diameter	Ø 5.13 mm (first 0.3 m (0.98 ft) part to the transducer), Ø 5.8 mm (for remaining cable to the transmitter - with SMB plug at the end) and between these is a black hot melt junction Ø 16 mm (length 70 mm)
Length	3, 15, 30, 60, 90, 120 m (9.84, 49.21, 98.43, 196.85, 295.28, 393.70 ft) between sensor and transmitter (max. 3 m (9.84 ft)) transducer cable length for Ex area mounted transmitters)
Material (outside jacket)	Brown PTFE (0.3 m (0.98 ft) part) and black PE (for remaining cable)
Ambient temperature	-200 ... +200 °C (-328 ... +392 °F) (brown PTFE transducer part) and -10 ... +70 °C (14 ... 158 °F) (black PE for remaining transmitter cable part)



# Flow Measurement

## SITRANS F US Inline

### Flowmeter SONO 3300/FUS060

#### Selection and Ordering data

Sensor SONO 3300 with transmitter FUS060 Article No. Order code  
**7ME3300-**

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

Diameter	Qn setting [m <sup>3</sup> /h]	
DN 50 (2")	10	1 A
DN 50 (2")	26	1 B
DN 50 (2")	60	1 D
DN 65 (2½")	15	1 E
DN 65 (2½")	42	1 F
DN 65 (2½")	100	1 H
DN 80 (3")	20	1 J
DN 80 (3")	60	1 K
DN 80 (3")	150	1 M
DN 100 (4")	36	1 N
DN 100 (4")	100	1 P
DN 100 (4")	230	1 R
DN 125 (5")	50	1 S
DN 125 (5")	150	1 T
DN 125 (5")	360	1 V
DN 150 (6")	80	2 A
DN 150 (6")	220	2 B
DN 150 (6")	500	2 D
DN 200 (8")	120	2 E
DN 200 (8")	380	2 F
DN 200 (8")	900	2 H
DN 250 (10")	200	2 J
DN 250 (10")	600	2 K
DN 250 (10")	1400	2 M
DN 300 (12")	300	2 N
DN 300 (12")	850	2 P
DN 300 (12")	2200	2 R

#### Flange norm and pressure rating

(All sizes are not available in all pressure ratings)

##### EN 1092-1

PN 10 (DN 200 ... 300 (8" ... 12"))  
 PN 16 (DN 80 ... 300 (3" ... 12"))  
 PN 40 (DN 50 ... 300 (2" ... 12"))

##### ANSI B16.5

class 150 (DN 50 ... 300 (2" ... 12"))  
 class 300 (DN 50 ... 300 (2" ... 12"))

#### Sensor type (approval) and transmitter mounting

IP67 standard, remote transmitter  
 IP67 Ex-version (ATEX), remote transmitter (Ex-version)

#### Cable gland entries in FUS060 and SONO 3300

Cable glands M20 in sensor and in transmitter M25/20/16 x 1.5

#### Transmitter version of SITRANS FUS060

IP65 (NEMA 4), 120/230 V AC  
 IP65 (NEMA 4), 24 V AC/DC  
 IP65 (NEMA 4), 24 V AC/DC, Ex-version (ATEX)

#### Selection and Ordering data

Sensor SONO 3300 with transmitter FUS060 Article No. Order code  
**7ME3300-**

#### FUS060 output module

HART, 4 ... 20 mA, 1 pulse output, 1 relay  
 HART, Ex version, 4 ... 20 mA, 1 pulse output, 1 relay  
 PROFIBUS PA, 1 pulse/frequency

#### Transducer coaxial cable

4 x 3 m, max. 70 °C (158 °F), the only option for Ex i  
 4 x 15 m, max. 70 °C (158 °F)  
 4 x 30 m, high temp. max.200 °C (392 °F)  
 4 x 30 m, max. 70 °C (158 °F)  
 4 x 60 m, max. 70 °C (158 °F)  
 4 x 90 m, max. 70 °C (158 °F)  
 4 x 120 m, max. 70 °C (158 °F)  
 4 x 3 m, high temp. max. 200 °C (392 °F), the only option for Ex i  
 4 x 15 m, high temp. max. 200 °C (392 °F)

#### Selection and Ordering data

Order code

#### Additional information

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

##### Calibration

Production calibration DN 50 ... DN 300 (with certificate, 2 x 3 points in 10 %, 25 % and 100 % Qn)

Included

Accredited Siemens ISO/IEC 17025 calibration for DN 50 to DN 200 with Qn as selected in Diameter. Calibration certificate: 2 x 5 points in 5 %, 10 %, 25 %, 50% and 100 % Qn (max. flow 630 m<sup>3</sup>/h).

D20

Accredited Siemens ISO/IEC 17025 calibration for DN 200 to DN 300 with Qn as selected in Diameter. Calibration certificate: 2 x 5 points in 5 %, 10 %, 25 %, 50 % and 100 % Qn (max. flow 2000 m<sup>3</sup>/h).

D21

##### Material certificate

EN 10204-3.1

F10

##### 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. Product selector link:

[www.pia-portal.automation.siemens.com](http://www.pia-portal.automation.siemens.com)

### Flowmeter SONO 3300 with FUS060 operating instructions, accessories and spare parts

#### Operating instructions


Description	Article No.
SITRANS FUS060	
• English	<b>A5E01204521</b>
• German	<b>A5E02123845</b>
SITRANS F US SONO 3300	
• English	<b>A5E01365400</b>
• German	<b>A5E02690975</b>

All literature is available to download for free, in a range of languages, at [www.siemens.com/processinstrumentation/documentation](http://www.siemens.com/processinstrumentation/documentation)

#### Accessories

##### Potting kit


Description	Article No.
Potting kit for terminal box of SONO 3200 transducers for IP68/NEMA 6P (not for Ex sensors)	<b>FDK:085L2403</b>



##### Cable connection boxes

(Optional for the connection of individually transducer cables with the FUS060 transducer cables)


Description	Article No.
Junction box for coaxial cable	
• IP65 metal box for 4 coaxial cables (2 pair)	<b>FDK:085B1361</b>



#### Spare parts


##### Cables for SONO 3300 with FUS060 (only as spare parts)

Description	Length m (ft)	Article No.
Coaxial cable for FUS060, (75 Ω, max. 70 °C (158 °F), black PVC) (2 pcs.)	3 (9.84)	<b>A5E00875101</b>
	15 (49.21)	<b>A5E00861432</b>
	30 (98.43)	<b>A5E01278662</b>
	60 (196.85)	<b>A5E01278682</b>
	90 (295.28)	<b>A5E01278687</b>
	120 (393.70)	<b>A5E01278698</b>
High temp. coaxial cable for FUS060; with 0.3 m brown PTFE high temp. transducer part (max. 200 °C (392 °F)) and black PVC transmitter part with SMB plug (max. 70 °C (158 °F)); impedance 75 Ω (2 pcs.)	3 (9.84)	<b>A5E00875105</b>
	15 (49.21)	<b>A5E00861435</b>
	30 (98.43)	<b>A5E01196952</b>



##### Cable glands (for the SONO 3300 terminal box) (only as spare parts)

Type	Material	Temperature range [°C (°F)]	Article No.
M20	Nickel-plated brass, 2x cables Ø 5 ... 6 mm (2 pcs.)	-25 ... +200 (-13 ... +392)	<b>A5E02246329</b>



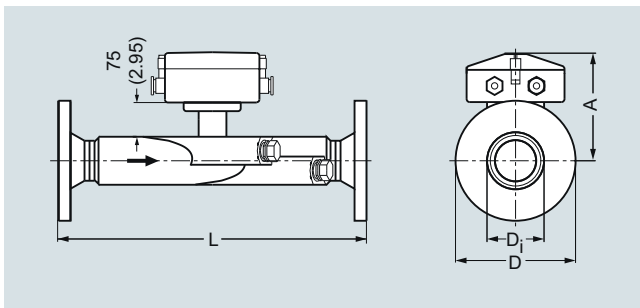
## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SONO 3300/FUS060

Description	Article No.	Description	Article No.
SONO 3300 terminal box lid, in stainless steel painted black (1 pc.)	<b>FDK:085U1505</b>	SONO 3300 stainless steel terminal box (1 pc.), M20 cable gland version, incl. lid in stainless steel (painted black) and gasket in EPDM	<b>A5E00836867</b>
Gasket for SONO 3300 terminal lid in EPDM (1 pc.)	<b>FDK-085U1820</b>	Coax cable connecting plate (1 pc.) for SONO 3300 terminal box and use with transmitter type FUS060	<b>A5E02593568</b>

#### Dimensional drawings



Sensor SONO 3300, dimensions in mm (inch)

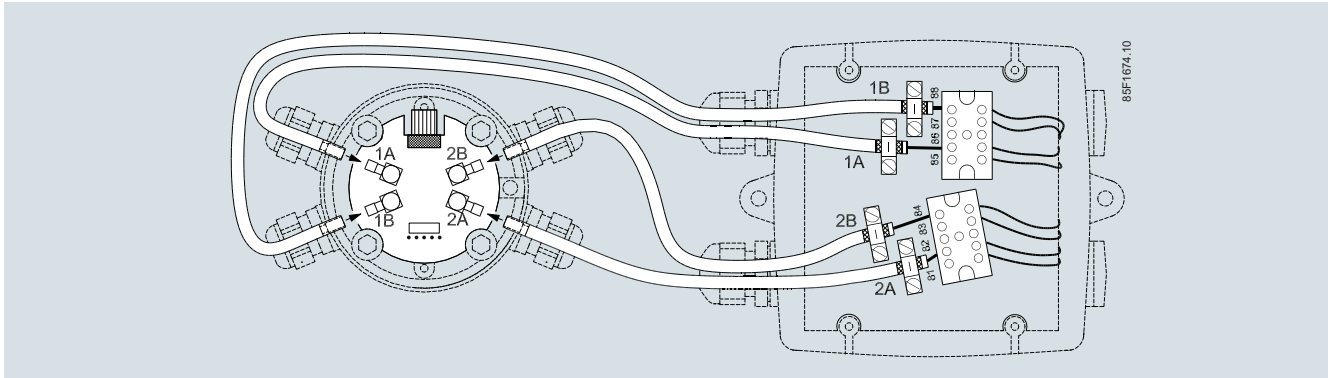
DN	EN 1092-1																	
	PN 10						PN 16						PN 40					
	L <sup>1)</sup>		D		D <sub>i</sub>		L <sup>1)</sup>		D		D <sub>i</sub>		L <sup>1)</sup>		D		D <sub>i</sub>	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
50													475	18.70	165	6.50	52.60	2.07
65													475	18.70	185	7.28	62.70	2.47
80							380	14.96	200	7.87	78.00	3.07	400	15.75	200	7.87	78.00	3.07
100							375	14.76	220	8.66	102.40	4.00	400	15.75	235	9.25	102.40	4.00
125							375	14.76	250	9.84	128.30	5.05	400	15.75	270	10.63	128.30	5.05
150							360	14.17	285	11.22	154.20	6.07	400	15.75	300	11.81	154.20	6.07
200	400	15.75	340	13.39	207.30	8.16	400	15.75	340	13.39	207.30	8.16	450	17.72	375	14.76	206.50	8.13
250	400	15.75	395	15.55	260.40	10.25	400	15.75	405	15.94	260.40	10.25	500	19.69	450	17.72	258.80	10.19
300	400	15.75	445	17.52	309.70	12.19	420	16.54	460	18.11	309.70	12.19	500	19.69	515	20.28	307.90	12.12

DN	ANSI												Weight <sup>2)</sup>					
	150 lb						300 lb						EN and ANSI		EN		ANSI	
	L <sup>1)</sup>		D		D <sub>i</sub>		L <sup>1)</sup>		D		D <sub>i</sub>		A					
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	kg	lb	kg	lb
50 mm/2"	510	20.08	152	5.98	52.6	2.07	520	20.47	165	6.50	52.6	2.07	180	7.09	14	30.9	17	37.5
65 mm/2½"	510	20.08	178	7.01	62.7	2.47	520	20.47	190	7.48	62.7	2.47	186	7.32	16	35.3	20	44
80 mm/3"	420	16.54	191	7.52	78.0	3.07	440	17.32	210	8.27	78.0	3.07	193	7.60	19	42	23	51
100 mm/4"	420	16.54	229	9.01	102.4	4.03	440	17.32	254	10	102.4	4.03	205	8.07	25	55	35	78
125 mm/5"	440	17.32	254	10.00	128.3	5.05	460	18.11	279	10.98	128.3	5.05	218	8.58	29	64	40	89
150 mm/6"	430	16.93	279	10.98	154.2	6.07	450	17.71	318	12.52	154.2	6.07	232	9.13	35	78	50	111
200 mm/8"	480	18.90	343	13.50	202.7	7.98	500	19.69	381	15	202.7	7.98	256	10.08	54	119	72	160
250 mm/10"	490	19.29	406	15.98	254.5	10.02	520	20.47	444	17.48	254.5	10.03	283	11.14	85	189	98	217
300 mm/12"	550	21.65	483	19.02	306.3	12.06	580	22.83	521	20.51	306.3	12.06	309	12.17	115	256	142	322

<sup>1)</sup> Length tolerance (mm): DN 50 ... 100 +2/-3, DN 125 ... 200 +3/-4, DN 250 ... 300 +4/-5

<sup>2)</sup> Approximate weights without transmitter FUS060 - weight of FUS060 is 4.4 kg (9.7 lb)

**Schematics**



Electrical connection of SITRANS FUS060 and SONO 3300

## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SONO 3100/FUS060

#### Overview



The combination of the SONO 3100 sensor and the FUS060 transmitter is ideal for applications where process shut-down is impossible during service and where there is a need for extreme high/low temperatures and pressures.

Transducers can be changed without interrupting operation. SONO 3100 can optionally be delivered as a 4-path solution for absolute best performance and accuracy.

#### Benefits

- Transducers can be replaced under pressure
- Measurement of all liquids less than 350 Cst, conductive or non-conductive
- No pressure drop
- Reliable and accurate flow measurements
- Long-time stability
- On request as special versions:
  - Special sensor material, e.g. Duplex, stainless steel
  - High/low temperature sensor version: +250 °C (+482 °F)/ -200 °C (-328 °F) sensors
  - Pressure rating 430 bar (6235 psi)
  - Special sensor sizes down to DN 25
  - 1-path or 2-path sensor technology

#### Application

The main application for SONO 3100 in combination with transmitter type FUS060 is to measure volume flow within:

- Petrochemical industry
- Power engineering
- Water and waste water
- Oil and liquefied gases

SITRANS FUS060 holds ATEX for hazardous areas, HART and PROFIBUS PA. SONO 3100 holds ATEX Ex approval.

#### Design

The SONO 3100 in combination with FUS060 consists of a SONO 3100 sensor, SONO 3200 transducers with O-rings or flanges depending on selection - and a FUS060 transmitter.

SONO 3100 is basically supplied in a 2-path solution with flanges in sizes from DN 100 to DN 600 and without flanges in sizes from DN 100 to DN 300.

2 path standard, 1-path or 4-path special versions are available on request, depending on size (DN 25 to DN 1200).

SONO 3100 is as standard available in carbon steel from DN 100 to DN 600.

FUS060 is designed for remote wall mounting only.

#### Technical specifications

**The transmitter related to this system is the SITRANS FUS060. Technical specifications to the FUS060 see page 3/247.**

#### 2-path sensor fitted with four SONO 3200 transducers

##### Error in measurement

Error in measurement at reference conditions  $v > 0.5 \dots 10 \text{ m/s}$ ,  $\pm 0.5 \%$  of rate ( $v$ =flow velocity)

Max flow velocity 10 m/s (32 ft/s)

Nominal size DN 100 ... 600 (4" ... 24")

Media temperature

- Standard -10 ... +200 °C (14 ... 392 °F)

- ATEX Ex d version -20 ... +180 °C (-4 ... +356 °F)

- ATEX Ex i version -10 ... +190 °C (14 ... 374 °F)

- Specials -200 °C (-328 °F) or up to 250 °C (482 °F)

Ambient temperature

- Standard and Ex-i version -20 ... +60 °C (-4 ... +140 °F)

- Ex d version -20 ... +180 °C (-4 ... +356 °F)

Enclosure

IP67 (NEMA 4X/6)/IP68 (NEMA 6P) and ATEX (see below)

##### Process connections

PN designated, EN 1092-1, type 11 (B)

Pipe material carbon steel

- DN 200 ... 600 (8" ... 24"), PN 10
- DN 100 ... 600 (4" ... 24"), PN 16
- DN 200 ... 600 (8" ... 24"), PN 25
- DN 100 ... 500 (4" ... 20"), PN 40

Class designated, EN 1759-1

Pipe material carbon steel

- DN 100 ... 600 (4" ... 24") Class 150
- DN 100 ... 300 (4" ... 12") Class 300

Without flanges (EN 10217), (weld-in version)

only in carbon steel

- DN 350 ... 600 (14" ... 24"), PN 10
- DN 100 ... 600 (4" ... 24"), PN 16
- DN 200 ... 600 (8" ... 24"), PN 25
- DN 100 ... 500 (4" ... 20"), PN 40

Transducer SONO 3200

O-ring or flange versions

##### Materials

Pipe

Steel EN 1.0345-P235GH

Flange

PN

EN 10025-S235JRG2, 1E1

Class

ASTM A105, 1,1

Transducer body

Stainless steel AISI 316 or similar

Transducer terminal house

Stainless steel AISI 316 or plastic PA 6.6



**Certificates and approvals**

System ATEX approval for SONO 3100 together with transmitter FUS060-Ex

ATEX II 2G Ex dem [ia/ib] IIC T6/T4/T3 Gb or  
ATEX II 2G Ex d IIC T3-T6 Gb with SONO 3200 Exd transducers (for standard FUS060 transmitter, installed outside of Ex zone)

For FUS060 Ex version the transducer cable length is restricted to 3 m (9.84 ft), in order to meet requirements for electrical immunity.

Conformity certificate CE

The devices are supplied as standard with a Siemens Certificate of Conformity on DVD

Material certificate

Material certificate according to EN 10204-3.1 is optionally available

NDT examination report

Extended material certificate is optionally available

Pressure certificate

Pressure test according to EN 10204-2.3 optionally available

Calibration report

A standard calibration report is shipped with each flowmeter.

Optionally available:

Extended accredited ISO/IEC 17025 calibration certificates

Approvals

No custody transfer approvals

The sensor SONO 3100 with transmitter FUS060 conforms to Product Family Standard EN 61326/A3 appendix A (Title: Electrical Equipment for Measurement control and laboratory use – EMC requirements).

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).

The SONO 3100 as weld-in version does not include the flanges. Thus, it can neither be tested nor approved according to PED. After the installation, all installation-related activities (welding, pressure test etc.) are the responsibility of the customer.

**Selection and Ordering data**

Article No. Order code

**SITRANS F US SONO 3100 sensor 2-path**

7ME3100-

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

**Diameter Qn setting [m<sup>3</sup>/h]**

DN 100 (4")	28	1 N
DN 100 (4")	100	1 P
DN 100 (4")	220	1 R
DN 125 (5")	44	1 S
DN 125 (5")	150	1 T
DN 125 (5")	350	1 V
DN 150 (6")	64	2 A
DN 150 (6")	220	2 B
DN 150 (6")	500	2 D
DN 200 (8")	110	2 E
DN 200 (8")	380	2 F
DN 200 (8")	900	2 H
DN 250 (10")	180	2 J
DN 250 (10")	600	2 K
DN 250 (10")	1300	2 M
DN 300 (12")	250	2 N
DN 300 (12")	850	2 P
DN 300 (12")	2000	2 R
DN 350 (14")	350	2 S
DN 350 (14")	1000	2 T
DN 350 (14")	2800 <sup>1)</sup>	2 V
DN 400 (16")	450	3 A
DN 400 (16")	1300	3 B
DN 400 (16")	3600	3 D
DN 500 (20")	1300	3 J
DN 500 (20")	2200	3 K
DN 500 (20")	4200 <sup>1)</sup>	3 M
DN 600 (24")	1300	3 S
DN 600 (24")	3200	3 T
DN 600 (24")	4200 <sup>1)</sup>	3 V

**Flange norm and pressure rating**

(All sizes are not available in all pressure ratings)

EN 1092-1

PN 10 (DN 200 ... DN 600)

PN 16 (DN 100 ... DN 600)

PN 25 (DN 200 ... DN 600)

PN 40 (DN 100 ... DN 500)

ANSI B16.5

class 150 (DN 100 ... DN 600)

class 300 (DN 100 ... DN 300)

Pipe without flanges (EN 10217) (weld-in version)<sup>2)</sup>

PN 10 (DN 200 ... DN 600)

PN 16 (DN 100 ... DN 600)

PN 25 (DN 200 ... DN 600)

PN 40 (DN 100 ... DN 500)

B

C

D

E

H

J

P

Q

R

S



# Flow Measurement

## SITRANS F US Inline

### Flowmeter SONO 3100/FUS060

#### Selection and Ordering data

**SITRANS F US SONO 3100 sensor 2-path** Article No. Order code  
7ME3100-

#### Pipe and flange material

Carbon steel (DN 100 ... 1200) 1

#### Transducer type and approval

IP67 (NEMA 4X/6) PA housing, PN 40, O-ring, 50 mm, 100 °C (212 °F) (DN 100 ... 600) 1  
 IP68 SS housing, PN 40, O-ring, 50 mm, 200 °C (392 °F) (DN 100 ... 600) 2  
 IP68 SS housing, PN 40, O-ring, 50 mm, 180 °C (356 °F), Ex d ATEX approval (only with standard FUS060) (DN 100 ... 600) 3  
 IP67 (NEMA 4X/6) PA housing, PN 40, flange, 88 mm, 100 °C (212 °F) (DN 100 ... 300) 4  
 IP68 SS housing, PN 40, flange, 88 mm, 200 °C (392 °F) (DN 100 ... 300) 5  
 IP68 SS housing, PN 40, flange, 88 mm, 180 °C (356 °F), Ex d ATEX approval (only with standard FUS060) (DN 100 ... 300) 6  
 IP67 SS housing, PN 40, O-ring, 50 mm, 190 °C (374 °F), Ex i ATEX approval (only with FUS060 Ex-version) (DN 100 ... 600) 7  
 IP67 SS housing, PN 40, flange, 88 mm, 190 °C (374 °F), Ex i ATEX approval (only with FUS060 Ex-version) (DN 100 ... 300) 8

#### Cable gland entries

Cable glands M20 in transducers and in transmitter M25/20/16 x 1.5 1  
 Cable glands ½" NPT in transducers and in transmitter 2

#### Transmitter version of SITRANS FUS060

IP65 (NEMA 4), 120/230 V AC N  
 IP65 (NEMA 4), 24 V AC/DC P  
 IP65 (NEMA 4), 24 V AC/DC ATEX Ex version Q

#### FUS060 output module

HART, 1 pulse output, 1 relay B  
 HART Ex, 1 pulse output, 1 relay C  
 PROFIBUS PA, 1 pulse/frequency D

#### Transducer coaxial cable

4 x 3 m, max. 70 °C (158 °F), the only option for Ex i 0  
 4 x 15 m, max. 70 °C (158 °F) 1  
 4 x 30 m, high temp. max. 200 °C (392 °F) 2  
 4 x 30 m, max. 70 °C (158 °F) 3  
 4 x 60 m, max. 70 °C (158 °F) 4  
 4 x 90 m, max. 70 °C (158 °F) 5  
 4 x 120 m, max. 70 °C (158 °F) 6  
 4 x 3 m, high temp. max. 200 °C (392 °F), the only option for Ex i 7  
 4 x 15 m, high temp. max. 200 °C (392 °F) 8

- 1) Reduced Q value during calibration (Qn setting unchanged).  
 2) For weld-in sensor versions according to EN 10217 (flangeless sensors 7ME3100-xxYxx-xxxx, Y = P, Q, R, S) the tube roundness shall be agreed via the PVR process (only if the factor of Du / Wxx > 100).

#### Selection and Ordering data

Order code

#### Additional information

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

#### Calibration

Production calibration DN 100 ... DN 600 (with certificate)

Included

Accredited Siemens ISO/IEC 17025 calibration for DN 100 to DN 200 with Qn as selected in diameter. Calibration certificate: 2 x 5 points in 5 %, 10 %, 25 %, 50 % and 100 % Qn (max. flow 630 m<sup>3</sup>/h).

D20

Accredited Siemens ISO/IEC 17025 calibration for DN 200 to DN 600 with Qn as selected in diameter. Calibration certificate: 2 x 5 points in 5 %, 10 %, 25 %, 50 % and 100 % Qn (max. flow 2800 m<sup>3</sup>/h).

D21

Accredited Siemens ISO/IEC 17025 calibration for DN 400 to DN 600 with Qn as selected in diameter. Calibration certificate: 2 x 5 points in 5 %, 10 %, 25 %, 50 % and 100 % Qn (max. flow 8000 m<sup>3</sup>/h).

D22

#### Material certificate

EN 10204-3.1 F10  
 EN 10204-3.1 and 100 % NDT on weldings, DN 100 ... DN 400 F11  
 EN 10204-3.1 and 100 % NDT on weldings, DN 500 ... DN 600 F12

#### Pressure certificate

EN 10204-2.3 F21

#### 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. Product selector link:

[www.pia-portal.automation.siemens.com](http://www.pia-portal.automation.siemens.com)

## Flowmeter SONO 3100 with FUS060 operating instructions, accessories and spare parts

## Operating instructions

Description	Article No.
SITRANS FUS060	
• English	<b>A5E01204521</b>
• German	<b>A5E02123845</b>
SITRANS F US SONO 3100	
• English	<b>A5E00814513</b>

All literature is available to download for free, in a range of languages, at [www.siemens.com/processinstrumentation/documentation](http://www.siemens.com/processinstrumentation/documentation)

## Accessories

Description	Article No.
Potting kit for terminal box of SONO 3200 transducer for IP68/NEMA 6P (not for Ex sensors)	<b>FDK:085L2403</b>



Description	Transducer length	Article No.
Extraction tool for replacement of SONO 3200 O-ring transducers under pressure and for hot-tapping (working conditions: typically water, max. 40 bar and max. 60 °C (max. 580 psi and max. 140 °F))	50 mm (1.97") transducers	<b>FDK:085B5331</b>



Cable connection boxes  
(For the connection of individually transducer cables with the FUS060 transducer cables)

Description	Article No.
Junction box for coaxial cable	
• IP65 metal box for 4 coaxial cables (2 pair)	<b>FDK:085B1361</b>
• IP65 EEx e plastic box for 4 coaxial cables (2 pair), no ATEX approval	<b>FDK:085B1363</b>



## Spare parts

Transducer SONO 3200 spare parts, complete units

Type	Material	Gasket	Press. rating	Terminal housing	Approv.	Temp. range [°C (°F)]	Length mm (inch)	Article No.
O-ring	316 SS	O-ring	PN 40	Plastic, PA 6.6 M20		-20 ... +100 (-4 ... +212)	50 (1.97)	<b>FDK:085B5453</b>
O-ring	316 SS	O-ring	PN 40	316 SS M20		-20 ... +200 (-4 ... +392)	50 (1.97)	<b>FDK:085B5450</b>
O-ring	316 SS	O-ring	PN 40	316 SS M20	Ex d <sup>1)</sup>	-20 ... +180 (-4 ... +356)	50 (1.97)	<b>FDK:085B5451</b>
O-ring	316 SS	O-ring	PN 40	316 SS M20	Ex i <sup>2)</sup>	-10 ... +190 (14 ... 374)	50 (1.97)	<b>A5E00836448</b>
O-ring	316 SS	O-ring	PN 40	Plastic, PA 6.6 ½" NPT		-20 ... +100 (-4 ... +212)	50 (1.97)	<b>A5E00839472</b>
O-ring	316 SS	O-ring	PN 40	316 SS ½" NPT		-20 ... +200 (-4 ... +392)	50 (1.97)	<b>A5E00839431</b>
Flange	316 SS	Graphite	PN 40	Plastic, PA 6.6 M20		-20 ... +100 (-4 ... +212)	88 (3.47)	<b>FDK:085B5461</b>
Flange	316 SS	Graphite	PN 40	316 SS M20		-20 ... +200 (-4 ... +392)	88 (3.47)	<b>FDK:085B5462</b>
Flange	316 SS	Graphite	PN 40	316 SS M20	Ex d <sup>1)</sup>	-20 ... +180 (-4 ... +356)	88 (3.47)	<b>FDK:085B5463</b>
Flange	316 SS	Graphite	PN 40	316 SS M20	Ex i <sup>2)</sup>	-10 ... +190 (14 ... 374)	88 (3.47)	<b>A5E00836465</b>
Flange	316 SS	Graphite	PN 40	Plastic, PA 6.6 ½" NPT		-20 ... +100 (-4 ... +212)	88 (3.47)	<b>A5E00839479</b>
Flange	316 SS	Graphite	PN 40	316 SS ½" NPT		-20 ... +200 (-4 ... +392)	88 (3.47)	<b>A5E00839440</b>
Flange	316 SS	Copper ring	PN 40	316 SS PG13.5 (cryogenic version)		-200 ... +100 (-328 ... +212)	88 (3.47)	<b>FDK:085B5416</b>
Flat flange	316 SS	Flat gasket	PN 40	316 SS M20 (cryogenic version)		-200 ... +100 (-328 ... +212)	88 (3.47)	<b>A5E02593524</b>

<sup>1)</sup> ATEX (Ex) IIC 2G Ex d IIC T3-T6 Gb


<sup>2)</sup> For systems with FUS060 ATEX IIC 2G Ex dem [ia/ib] T6/T4/T3

## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SONO 3100/FUS060


##### Terminal housing for SONO 3200 sensor

Type	Pressure rating	Material	Temp. range [°C (°F)]	Article No.	
Terminal housing (M20 cable gland)	N/A	PA 6.6	-20 ... +100 (-4 ... +212)	<b>FDK:085B5501</b>	
Terminal housing (M20 cable gland)	N/A	ASTM 316	-20 ... +200 (-4 ... +392)	<b>FDK:085B5504</b>	
Terminal housing (1/2" NPT cable gland)	N/A	PA 6.6	-20 ... +100 (-4 ... +212)	<b>A5E00839460</b>	
Terminal housing (1/2" NPT cable gland)	N/A	ASTM 316	-20 ... +200 (-4 ... +392)	<b>A5E00839427</b>	
Ex d <sup>1)</sup> terminal housing (M20 cable gland)	N/A	ASTM 316	-20 ... +180 (-4 ... +356)	<b>FDK:085B5505</b>	
Ex i <sup>2)</sup> terminal housing (M20 cable gland)	N/A	ASTM 316	-10 ... +190 (14 ... 374)	<b>A5E00835255</b>	

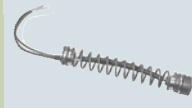
1) ATEX (Ex) IIC 2G EEx d IIC T3 ... T6

2) For systems with FUS060 ATEX IIC 2G Ex dem [ia/ib] T6/T4/T3






##### SONO 3200 spare parts, transducer body without terminal housing, including insert

Type	Material	Gasket	Pressure rating	Temp. range [°C (°F)]	Length mm (inch)	Article No.	
O-ring	316 SS	O-ring	PN 40	-20 ... +200 (-4 ... +392)	50 (1.97)	<b>FDK:085B1405</b>	
Flange	316 SS	Graphite	PN 40	-20 ... +200 (-4 ... +392)	88 (3.47)	<b>FDK:085B1464</b>	

##### SONO 3200 spare parts, transducer insert

Type	Temp. range [°C (°F)]	Length mm (inch)	Article No.	
Insert	-20 ... +200 (-4 ... +392)	50 (1.97)	<b>FDK:085B1411</b>	
Insert	-20 ... +200 (-4 ... +392)	88 (3.47)	<b>FDK:085B1459</b>	


##### Transducer SONO 3200 gaskets

Type	Pressure rating	Material	Temperature range [°C (°F)]	Article No.	
Gasket O-ring (3 pcs. for o-ring transducers)	PN 40	FKM	-20 ... +200 (-4 ... +392)	<b>FDK:085B1089</b>	
Gasket flange	PN 40/160	Graphite	-20 ... +200 (-4 ... +392)	<b>FDK:085B1080</b>	
Gasket and 12 mm (0.47") bolts and nuts for flange transducers (4 pcs.)	PN 40	AISI 316 or equal	-20 ... +200 (-4 ... +392)	<b>FDK:085B1083</b>	
Gasket and 16 mm (0.63") bolts and nuts for flange transducers (4 pcs.)	PN 160	Graphite, 316 SS	-20 ... +200 (-4 ... +392)	<b>FDK:085B1084</b>	
Gasket for cryogenics transducer with flat flange (2 pcs.)	PN 40	Graphite/metal composite	-200 ... +100 (-328 ... +212)	<b>A5E02593522</b>	

SONO 3200 cable glands

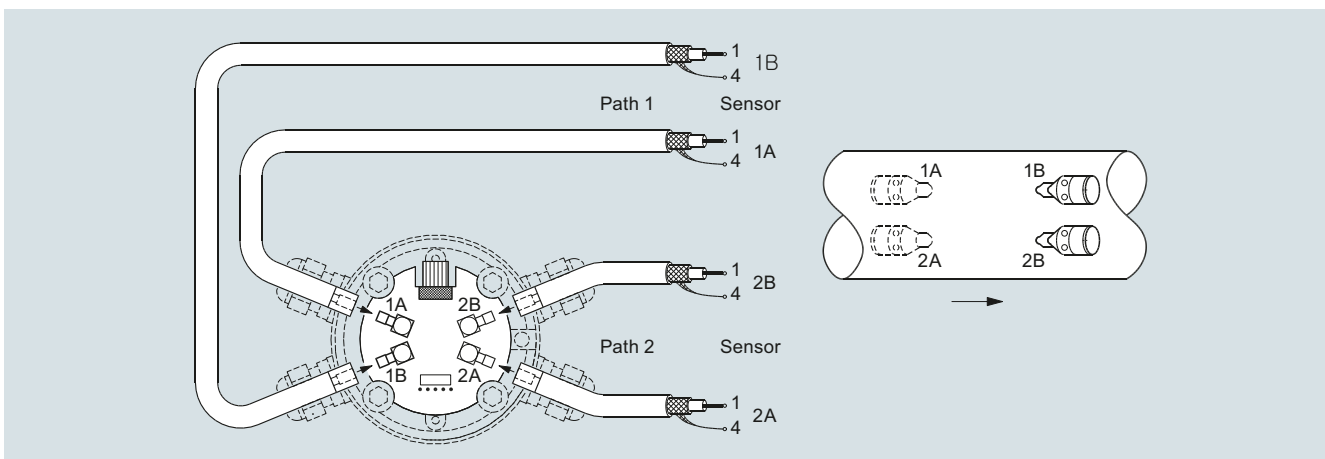
Type/description	Temperature range [°C (°F)]	Appr.	Article No.	
black PA plastic, cable Ø 5 ... 13 mm (1 pc.)	-20 ... 100 (-4 ... +212)		<b>A5E02246304</b>	
½" NPT gray PA plastic, cable Ø 5 ... 9 mm (1 pc.)	-20 ... 100 (-4 ... +212)		<b>A5E02246309</b>	
½" NPT chrome-plated brass, cable Ø 5 ... 9 mm (1 pc.)	-40 ... 100 (-40 ... +212)		<b>A5E02246258</b>	
M20 stainless steel, cable Ø 4 ... 6 mm (1 pc.)	-25 ... 200 (-13 ... +392)	Ex i	<b>A5E02246194</b>	
M20 Stainless steel, cable Ø 5 ... 8 mm (1 pc.)	-60 ... 180 (-76 ... +356)	Ex d	<b>A5E02246311</b>	

Cables for SONO 3100 with FUS060

Description	Length m (ft)	Article No.	
Coaxial cable for FUS060, (75 Ω, max. 70 °C (158 °F), black PVC) (2 pcs.)	3 (9.84)	<b>A5E00875101</b>	
	15 (49.21)	<b>A5E00861432</b>	
	30 (98.43)	<b>A5E01278662</b>	
	60 (196.85)	<b>A5E01278682</b>	
	90 (295.28)	<b>A5E01278687</b>	
High temp. coaxial cable for FUS060; with 0.3 m brown PTFE high temp. transducer part, max. 200 °C (392 °F) and black PVC for remaining transmitter part with SMB plug, max. 70 °C (158 °F); (impedance 75 Ω) (2 pcs.)	3 (9.84)	<b>A5E00875105</b>	
	15 (49.21)	<b>A5E00861435</b>	
	30 (98.43)	<b>A5E01196952</b>	
SITRANS F US special coaxial cable sets for low temperature cryogenic systems, with SMB-plug for transmitter SITRANS FUS060, PTFE material, temp. -200 ... +200 °C (-328 ... +392 °F), impedance 75 Ω (2 pcs.)	10 (32.84)	<b>A5E02085593</b>	
	15 (49.21)	<b>A5E03262088</b>	
	30 (98.43)	<b>A5E02085644</b>	
	40 (131.23)	<b>A5E02085649</b>	



**Schematics**



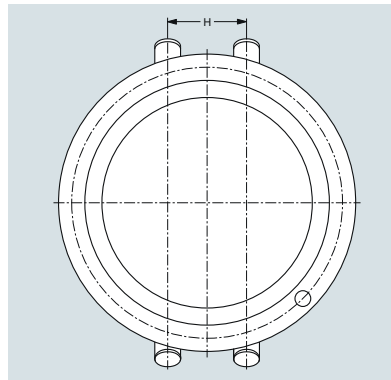
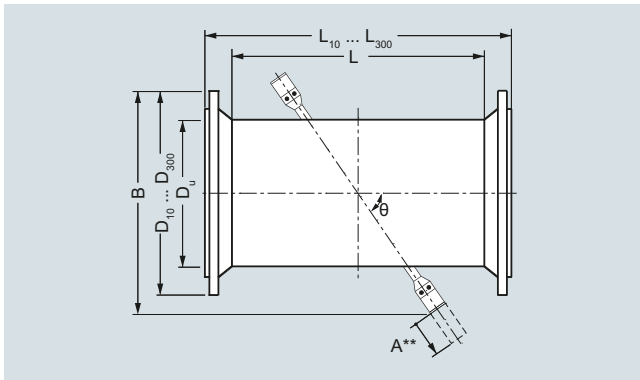
Electrical connection of SITRANS FUS060 and SONO 3100

## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SONO 3100/FUS060

#### Dimensional drawings of sensor SONO 3100



#### Sensor SONO 3100 with EN norm

DN	DU [mm]	L <sup>1) 4)</sup> [mm]	B <sup>5)</sup> [mm]	θ [°]	H [mm]	PN 10			PN 16			PN 25			PN 40		
						W <sub>min</sub> <sup>2)</sup> [mm]	D <sub>10</sub> [mm]	L <sub>10</sub> <sup>1)</sup> [mm]	W <sub>min</sub> <sup>2)</sup> [mm]	D <sub>16</sub> [mm]	L <sub>16</sub> <sup>1)</sup> [mm]	W <sub>min</sub> <sup>2)</sup> [mm]	D <sub>25</sub> [mm]	L <sub>25</sub> <sup>1)</sup> [mm]	W <sub>min</sub> <sup>2)</sup> [mm]	D <sub>40</sub> [mm]	L <sub>40</sub> <sup>1)</sup> [mm]
100	114.3	860	305	45 <sup>3)</sup>	42.8	-	-	-	3.6	220	960	-	-	-	3.6	235	990
125	139.7	862	325	45 <sup>3)</sup>	64.5	-	-	-	4.0	250	970	-	-	-	4.0	270	990
150	168.3	862	350	45 <sup>3)</sup>	78.1	-	-	-	4.5	285	970	-	-	-	4.5	300	1010
200	219.1	668	430	45 <sup>3)</sup>	102.1	6.3	340	790	6.3	340	790	6.3	360	820	6.3	375	840
250	273.0	714	480	45 <sup>3)</sup>	127.6	6.3	395	850	6.3	405	850	7.1	425	890	7.1	450	920
300	323.9	607	525	45 <sup>3)</sup>	151.8	7.1	445	740	7.1	460	760	8.0	485	790	8.0	515	830
350	355.6	639	550	45 <sup>3)</sup>	166.4	8.0	505	770	8.0	520	800	8.0	555	840	8.8	580	880
400	406.4	703	600	45 <sup>3)</sup>	191.3	8.0	565	850	8.0	580	875	8.8	620	925	11.1	660	975
500	508.0	797	690	45 <sup>3)</sup>	241.1	7.1	670	950	8.0	715	980	10.0	730	1050	14.2	755	1080
600	610.0	912	830	60	294.8	7.1	780	1075	8.8	840	1105	11.0	845	1165	-	-	-

<sup>1)</sup> Length tolerance (mm): DN 100 +2/-3, DN 125 ... 200 +3/-4, DN 250 ... 400 +4/-5, DN 500 ... 600 +5/-6

<sup>2)</sup> Wall thickness for pressure rates PN 6 ... 40. For weld-in sensor versions according EN10217 (flangeless sensors 7ME3100-xxYxx-xxxx, Y=P, Q, R, S) the tube roundness shall be agreed via the PVR process (only if the factor of Du/Wxx > 100).

W<sub>min</sub> wall thickness are min. values. The delivered sensor can have larger wall thicknesses to meet the selected pressure rate. Any specific required wall thickness must be ordered as PVR.

<sup>3)</sup> For all sensors with flange transducers path angle are 60°

<sup>4)</sup> L is the length of sensor versions without flanges (weld-in version). For weld-in sensor versions according to EN 10217 (flangeless sensors 7ME3100-xxYxx-xxxx, Y = P, Q, R, S) the tube roundness shall be agreed via the PVR process (only if the factor of Du/Wxx > 100).

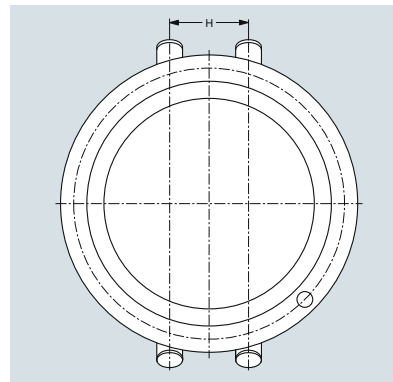
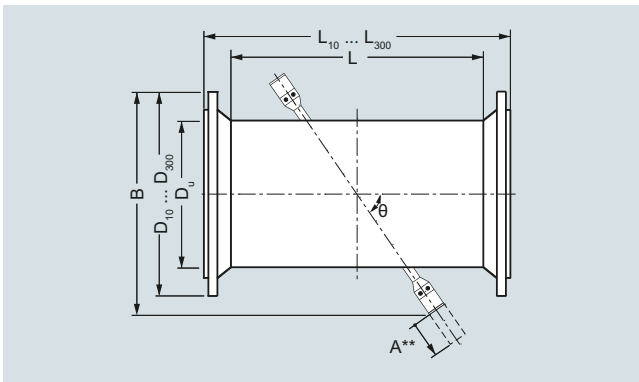
<sup>5)</sup> B dimension value is an approximate information and may differ a little by flange pressure rate.

A\*\*) Space required for replacement of transducer min. 230 mm (9.1 inch). For replacement with special tool (extraction tool) see more information on page 3/271.

#### SONO 3100, 2-path

Nominal diam. DN	Flange type - Weight [kg (lb)]			
	PN 10	PN 16	PN 25	PN 40
100 (4")	-	32 (70.5)	-	35 (77.2)
125 (5")	-	38 (83.8)	-	44 (97.0)
150 (6")	-	45 (99.2)	-	52 (114.6)
200 (8")	59 (130.0)	58 (127.9)	70 (154.3)	79 (174.2)
250 (10")	73 (161.0)	75 (163.3)	96 (211.6)	117 (257.9)
300 (12")	83 (183.0)	92 (202.8)	114 (251.3)	151 (332.9)
350 (14")	98 (216.0)	113 (249.1)	145 (322.9)	191 (421.1)
400 (16")	119 (262.4)	141 (310.9)	191 (421.1)	275 (606.3)
500 (20")	153 (337.3)	207 (456.4)	284 (626.0)	379 (836.0)
600 (24")	193 (425.5)	276 (608.5)	363 (800.3)	-

Weight of system incl. process flanges and standard O-ring transducers. For sensors with flange transducer please add approx. 10 kg (22.05 lb). For SS terminal housings instead of the standard PA housing add approx. 5 kg (11.03 lb).



## Sensor SONO 3100 with ANSI norm

Size (DN)	D <sub>U</sub>	L <sup>1) 4)</sup>	B <sup>5)</sup>	θ	H	Class 150			Class 300		
						W <sub>min</sub> <sup>2)</sup>	D <sub>150</sub>	L <sub>150</sub> <sup>1)</sup>	W <sub>min</sub> <sup>2)</sup>	D <sub>300</sub>	L <sub>300</sub> <sup>1)</sup>
inch (mm)	[inch]	[inch]	[inch]	[°]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]	[inch]
4 (100)	4.50	33.86	12.01	45 <sup>3)</sup>	1.69	0.14	9.00	39.86	0.25	10.00	40.62
5 (125)	5.50	33.94	12.80	45 <sup>3)</sup>	2.54	0.15	10.00	40.94	0.27	11.00	41.70
6 (150)	6.63	33.94	13.78	45 <sup>3)</sup>	3.07	0.16	11.00	40.94	0.30	12.50	41.70
8 (200)	8.63	26.30	16.93	45 <sup>3)</sup>	4.02	0.16	13.50	34.30	0.29	15.00	35.06
10 (250)	10.75	28.11	18.90	45 <sup>3)</sup>	5.02	0.18	16.00	36.11	0.34	17.50	37.35
12 (300)	12.75	23.90	20.67	45 <sup>3)</sup>	5.98	0.20	19.00	32.90	0.39	20.50	34.14
14 (350)	14.00	25.16	21.65	45 <sup>3)</sup>	6.55	0.21	21.00	35.16	-	-	-
16 (400)	16.00	27.68	23.62	45 <sup>3)</sup>	7.53	0.22	23.50	33.74	-	-	-
20 (500)	20.00	31.38	27.17	45 <sup>3)</sup>	9.49	0.26	27.50	42.76	-	-	-
24 (600)	24.00	35.91	32.68	60	11.61	0.30	32.00	47.91	-	-	-

<sup>1)</sup> Length tolerance (mm): 4" +0.08"/-0.12" (+2/-3mm), 5" ... 8" +0.12"/-0.16" (+3/-4mm), 10" to 16" +0.16"/-0.20" (+4/-5mm), 20" ... 24" +0.20"/-0.24" (+5/-6mm)

<sup>2)</sup> Minimum wall thickness for pressure rates Class 150 or Class 300. For weld-in sensor versions according to EN 10217 (flangeless sensors 7ME3100-xxYxx-xxxx, Y = P, Q, R, S) the tube roundness shall be agreed via the PVR process (only if the factor of D<sub>u</sub>/W<sub>xx</sub> > 100). W<sub>min</sub> wall thickness are min. values. The delivered sensor can have larger wall thicknesses to meet the selected pressure rate. Any specific required wall thickness must be ordered as PVR.

<sup>3)</sup> For all sensors with flange transducers path angle are 60°

<sup>4)</sup> L is the length of sensor versions without flanges (weld-in version)

For weld-in sensor versions according to EN 10217 (flangeless sensors 7ME3100-xxYxx-xxxx, Y = P, Q, R, S) the tube roundness shall be agreed via the PVR process (only if the factor of D<sub>u</sub>/W<sub>xx</sub> > 100).

<sup>5)</sup> B dimension value is an approximate information and may differ a little by flange pressure rate.

A\*\*) Space required for replacement of transducer min. 230 mm (9.1 inch). For replacement with special tool (extraction tool) see more information in „Sensor SONO 3100 accessories and spare parts“ on page 3/271.

## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SONO 3100/FUS060

Approximate weights for SONO 3100 sensor with ANSI B16.5 flanges

Nominal diameter		Weight [kg (lb)] <sup>1)</sup>			
DN	DN	CL150		CL300	
[inch]	[mm]	[kg]	[lb]	[kg]	[lb]
4	100	32	70.5	35	77.2
5	125	38	83.8	44	97.0
6	150	45	99.2	52	114.6
8	200	58	127.9	79	174.2
10	250	75	165.3	117	257.9
12	300	92	202.8	151	332.9
14	350	113	249.1	-	-
16	400	141	310.9	-	-
20	500	207	456.4	-	-
24	600	276	608.5	-	-

<sup>1)</sup> Weight of system incl. process flanges and standard O-ring transducers. For sensors with flange transducer please add approx. 10 kg (22.05 lb). For SS terminal housings instead of the standard PA housing add approx. 5 kg (11.03 lb).



#### Overview



SONOKIT is a transit time based ultrasonic flowmeter for retrofitting on existing pipelines.

The kit offers all necessary parts and special tools to make the installation as 1-path or 2-path flowmeter.

The set is made for installation on empty pipes or pipes under pressure without process shut-down (hot-tap).

Please contact Siemens for further information on hot-tap tools and instructions.

SONOKIT has inline transducers (in contact with media) which assure superior accuracy and performance.

#### Benefits

- Cost-effective solution – contains all the necessary components for retrofitting
- SONOKIT is easy to install in pipeline sizes DN 200 to DN 3000 (8" to 120") 1-path DN 100 to DN 2400 (4" to 96").
- No bypass installation necessary – withstands pressures up to 40 bar (580 psi) and media temperatures between -20 °C and +200 °C (-4 °F and +392 °F)
- High accuracy – the bigger the pipe, the more accurate the result
- Solid construction and no moving parts for a 100 % maintenance and obstruction-free flowmeter
- The SONOKIT comes with transducers in IP68 enclosure
- Available in a robust version that can be buried and withstands constant flooding
- Inline transducers assure superior accuracy and performance
- Automatic calculation of the calibration factor when pipe geometry data are entered in the transmitter
- FUS060 transmitter versions with HART or PROFIBUS PA
- FUS080 transmitter, battery or mains-powered

#### Application

- Raw water intake for water treatment plants
- Water distribution systems
- Irrigation systems
- Power generation (energy and water)
- District heating plants
- Cooling water plants within the industry and in power stations
- Systems within the oil and refinery business
- Sewage treatment plants
- Plants transporting non-conductive liquids

#### Design

The SONOKIT package box contains all necessary parts to build an ultrasonic flowmeter on existing pipes depending on choices at ordering:

- Papers to wrap around pipes for alignment of sensors
- Transducer alignment tools
- Mounting plates, transducer holders and SONO 3200 transducers
- Transducer cables
- SITRANS FUS060 or FUS080 transmitter for wall mounting
- 4-path version (up to DN 1500 (60")) is available on special request (PVR)

#### Technical specifications

**The transmitter related to this system is the SITRANS FUS080 or FUS060.**

**Technical specifications to the FUS060 see page 3/247 and to FUS080 see page 3/253.**

#### Accuracy

Typical, depending on accuracy of measurements of installation

- 2-path:  $\leq \pm (0.5 \dots 1.5 \%)$
- 1-path:  $\leq \pm (1 \dots 3 \%)$

#### Note:

Accuracy depends on the accuracy of the measurements taken at location. This means that inaccurate measurements of angles, distance between transducers, wall thickness and pipe diameter have a direct effect on the accuracy. Values measured are entered into the memory of the FUS060 or FUS080 transmitter.

#### Requirements for pipes

<b>Size</b>	FUS060: DN 100 ... DN 3000 (4" ... 120") FUS080: DN 100 ... DN 1200 (4" ... 48")
Line pressure	max. 40 bar (580 psi)
Media temperature	
• Standard	-10 ... +200 °C (14 ... 392 °F)
• ATEX Ex d version	-20 ... +180 °C (-4 ... +356 °F)
• ATEX Ex i version	-10 ... +190 °C (14 ... 374 °F)
Ambient temperature (sensor)	
• Standard and Ex-i version	-20 ... +60 °C (-4 ... +140 °F)
• Ex d version	-20 ... +180 °C (-4 ... +356 °F)
<b>Transducer enclosure/ approvals/certificates</b>	
Standard version	IP67 (NEMA 6)/IP68 (NEMA 6P)
Ex approval	System ATEX approval for SONO 3200 Ex i transducers together with transmitter FUS060-Ex: ATEX II 2 G Ex dem [ia/ib] IIC T6/T4/T3 Gb or ATEX II 2G Ex d IIC T3-T6 Gb with SONO 3200 Ex d transducers (for standard FUS060 transmitter, installed outside of Ex zone)
Material certificates	EN 10204-3.1 material certificate on transducer mounting parts
<b>Transducer materials</b>	
Terminal housing	Standard version: PA 6.6, 100 °C (212 °F) or stainless steel AISI 316, 200 °C (392 °F)
Transducer body	Standard version: Stainless steel AISI 316, 200 °C (392 °F)



## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SONOKIT (with FUS060 or FUS080)

##### Materials of existing pipeline

Steel	Transducer holder: EN 10273 or EN 10216 (P235GH) Mounting plates <sup>1)</sup> : EN 10273 or EN 10216 (P235GH)
Concrete	Transducer holder: Stainless steel AISI 316 or similar Mounting plates <sup>1)</sup> : (not included)
Stainless steel	Transducer holder: Stainless steel AISI 316 or similar Mounting plates <sup>1)</sup> : Stainless steel AISI 316 or similar

##### Pipe wall thickness

Steel pipe (AISI 316 and St. 37.2 or corresponding material)	Transducer and holder available in length $L = 160$ , allowing a pipe wall thickness up to 20 mm (0.79")
Concrete pipe	Transducer and holder available in length $L = 230$ , allowing a pipe wall thickness up to 200 mm (7.9") and pipe sizes $\geq$ DN 600

##### Dimension of the package box (L x W x H, approx.)

856 x 390 x 344 mm  
(33.7" x 15.4" x 13.5")

##### Weight example of a package (standard 2-path with FUS060)

approx. 53 kg (116.8 lb)

##### Certificates and approvals

###### Conformity certificate

The devices are supplied as standard with a Siemens Certificate of Conformity on a DVD

###### Material certificate

Material certificate for the transducer parts according to EN 10204-3.1 is optionally available

###### Approvals

No custody transfer approvals

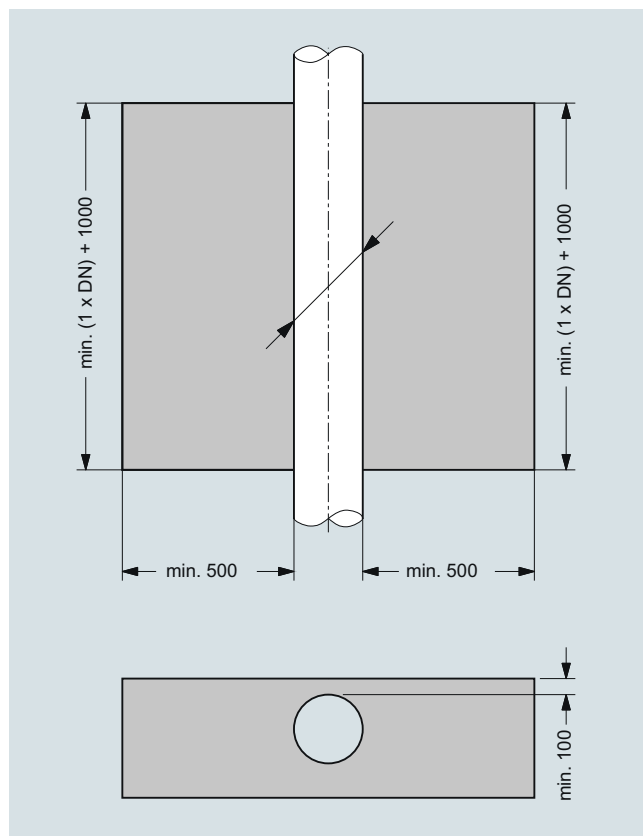
###### Information on PED approval:

The SONOKIT includes the pipe mounting parts only and therefore it cannot be PED-approved. After the installation, all installation-related activities (welding, pressure test etc.) are the responsibility of the customer.

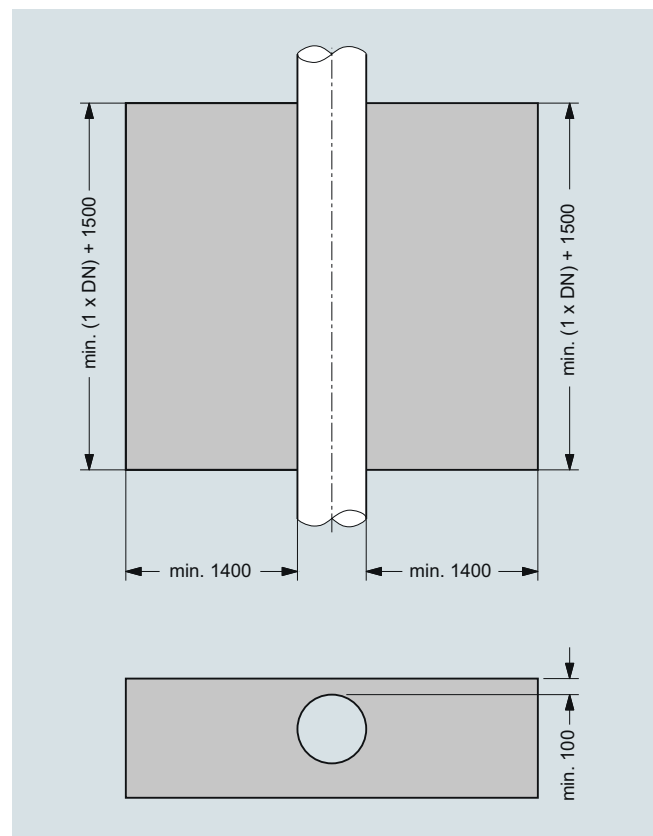
<sup>1)</sup> Mounting plates are only included for empty pipe installation types (refer to selection "A"). For hot tap mounting the mounting plates are not included (refer to selection "B").

#### Installation requirements

The space requirements (in mm) around the pipe for retrofitting a SITRANS F US ultrasonic flowmeter type SONOKIT are given below in mm:



Empty pipe installation



Hot-tap installation

Selection and Ordering data		Article No.	Ord. code	Selection and Ordering data		Article No.	Ord. code
<b>SITRANS F US SONOKIT</b>		7ME3210-		<b>SITRANS F US SONOKIT</b>		7ME3210-	
<b>1-path sensor</b>				<b>1-path sensor</b>			
<p>Click on the Article No. for the online configuration in the PIA Life Cycle Portal.</p>				<p>IP68 SS housing, Sylgard potting kit, PN 40, O-ring, 200 °C (392 °F), no approval</p>		4	
<b>Diameter</b>	<b>Qn setting [m<sup>3</sup>/h]</b>			<p>IP67 SS housing, PN 40, O-ring, 190 °C (374 °F), Ex i type, ATEX approval (only with FUS060 Ex)</p>		5	
DN 100 (4")	100	1 P		<b>Cable gland entries</b>			
DN 125 (5")	150	1 T		Cable glands M20 in transducers and in transmitter M25/20/16 x 1.5 (FUS080 only M20)		1	
DN 150 (6")	220	2 B		Cable glands ½" NPT in transducers and in transmitter (only with FUS060)		2	
DN 200 (8")	380	2 F		<b>Transmitter version of SITRANS FUS060</b>			
DN 250 (10")	600	2 K		(only DN 100 ... 2400 (4" ... 96"))			
DN 300 (12")	850	2 P		IP65 (NEMA 4), 120/230 V AC		N	
DN 350 (14")	1000	2 T		IP65 (NEMA 4), 24 V AC/DC		P	
DN 400 (16")	1300	3 B		IP65 (NEMA 4), 24 V AC/DC Ex version		Q	
DN 450 (18")	1700	3 F		<b>Transmitter version of SITRANS FUS080</b>			
DN 500 (20")	2200	3 K		(only DN 100 ... 1200 (4" ... 48"))			
DN 550 (22")	2600	3 P		PDM software tool and IrDA-adaptor, which are needed for settings update, to be ordered separately, see FUS080 accessories			
DN 600 (24")	3200	3 T		IP67/NEMA 4X/6 115 ... 230 V AC		U	
DN 650 (26")	3600	4 B		IP67/NEMA 4X/6 3.6 V battery version, incl. dual battery pack		V	
DN 700 (28")	4200	4 F		IP67/NEMA 4X/6 115 ... 230 V AC, incl. 3.6 V single battery backup		W	
DN 750 (30")	4800	4 K		IP67/NEMA 4X/6 3.6 V battery version (no battery pack included) <sup>2)</sup>		X	
DN 800 (32")	5500	4 P		<b>Transmitter output module</b>			
DN 900 (36")	7500	5 B		Transmitter SITRANS FUS080:			
DN 1000 (40")	9000	5 K		Pulse and/or alarm output (standard for FUS080).		A	
DN 1100 (44")	10000	5 P		Transmitter SITRANS FUS060:			
DN 1200 (48")	13200	5 T		HART, 1 pulse output, 1 relay		B	
Only for FUS060				HART Ex version, 1 pulse output, 1 relay		C	
DN 1300 (52")	14000	6 A		PROFIBUS PA, 1 pulse/frequency		D	
DN 1400 (56")	16800	6 C		<b>Transducer coaxial cables</b>			
DN 1500 (60")	19000	6 E		(with FUS080 only, 15 and 30 m, 70°C (158 °F) cable types)			
DN 1600 (64")	22800	6 G		2 x 3 m, max. 70 °C (158 °F), the only option for Ex i		0	
DN 1700 (68")	25000	6 J		2 x 15 m, max. 70 °C (158 °F)		1	
DN 1800 (72")	27600	6 L		2 x 30 m, high temp. max. 200 °C (392 °F)		2	
DN 1900 (76")	31000	6 N		2 x 30 m, max. 70 °C (158 °F)		3	
DN 2000 (80")	36000	6 Q		2 x 60 m, max. 70 °C (158 °F)		4	
DN 2100 (84")	37000	6 S		2 x 90 m, max. 70 °C (158 °F)		5	
DN 2200 (88")	42000	6 U		2 x 120 m, max. 70 °C (158 °F)		6	
DN 2300 (92")	45000	6 W		2 x 3 m, high temp. max. 200 °C (392 °F), the only option for Ex i		7	
DN 2400 (96")	51000	7 A		2 x 15 m, high temp. max. 200 °C (392 °F)		8	
<b>Installation method<sup>1)</sup></b>				Special version (add Order code):			
Empty pipe (incl. transducer holder and mounting plates). Alignment rods and tools must be ordered as accessories.		A		No transducer cable, cable length 2 x 3 m, the only option for Ex i		9	R O A
Hot tap, mounting under pressure (mounting plates <b>not</b> incl.). Special mounting tools to be ordered separately.		B		No transducer cable, cable length 2 x 15 m		9	R O B
<b>Transducer holder</b>				No transducer cable, cable length 2 x 30 m		9	R O C
Carbon steel, length = 160 mm, mounting plates in carbon steel		1		No transducer cable, cable length 2 x 60 m		9	R O D
Stainless steel, length = 160 mm, mounting plates in stainless steel		2		No transducer cable, cable length 2 x 90 m		9	R O E
Stainless steel, length = 230 mm, for concrete pipe (DN 600 ... DN 2400)		3		No transducer cable, cable length 2 x 120 m		9	R O F
<b>Transducer type and approval</b>							
IP67 (NEMA 4X/6) PA housing, PN 40, O-ring, 100 °C (212 °F), no approval		1					
IP68 SS housing, PN 40, O-ring, 180 °C (356 °F), Ex d, ATEX approval (only with standard FUS060)		2					
IP68 PA housing, Sylgard potting kit, PN 40, O-ring, 100 °C (212 °F), no approval		3					

<sup>1)</sup> Mounting tools must be ordered separately as "-Z"-options.

<sup>2)</sup> 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.\*

## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SONOKIT (with FUS060 or FUS080)

#### Selection and Ordering data

##### Additional information

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

##### Material certificate

EN 10204-3.1, transducer body material  
EN 10204-3.1, transducer holder material  
EN 10204-3.1, mounting plate material

##### Regional specific approval

KCC marking for Korea

##### 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).

##### Accessories

Alignment rods-set for DN 100 ... 650 (4" ... 26")  
Ø = 25 mm, L = 500 mm, 3 pcs.

Alignment rods-set for DN 700 ... 1900 (28" ... 76")  
Ø = 25 mm, L = 500 mm, 6 pcs.

Alignment rods-set for DN 2000 ... 2400 (80" ... 96")  
Ø = 25 mm, L = 500 mm, 8 pcs.

Spanner key for transducer mounting type SONO 3200  
O-ring type

Tool set with various mounting/spare parts for SONOKIT installation

#### Order code

**F30**

**F31**

**F32**

**W28**

**Y17**

**S10**

**S11**

**S12**

**T11**

**T12**

#### Operating instructions

Description	Article No.
SITRANS FUS060	
• English	<b>A5E01204521</b>
• German	<b>A5E02123845</b>
SITRANS FUS080	
• English	<b>A5E03059912</b>
• German	<b>A5E31628428</b>
SITRANS F US SONOKIT 1-path	
• English	<b>A5E00814557</b>
• German	<b>A5E02610428</b>

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## Flowmeter SONOKIT (with FUS060 or FUS080)

Selection and Ordering data		Article No.	Ord. code	Selection and Ordering data		Article No.	Ord. code
<b>SITRANS F US SONOKIT 2-path sensor</b>		7	ME 3 2 2 0 -	<b>SITRANS F US SONOKIT 2-path sensor</b>		7	ME 3 2 2 0 -
<a href="#">Click on the Article No. for the online configuration in the PIA Life Cycle Portal.</a>							
<b>Diameter</b>	<b>Qn setting [m<sup>3</sup>/h]</b>			<b>Transducer holder</b>			
DN 200 (8")	380	2 F		Carbon steel, length = 160 mm, mounting plates in carbon steel	1		
DN 250 (10")	600	2 K		Stainless steel, length = 160 mm, mounting plates in stainless steel	2		
DN 300 (12")	850	2 P		Stainless steel, length = 230 mm, for concrete pipe (DN 600 ... DN 3000)	3		
DN 350 (14")	1000	2 T		<b>Transducer type and approval</b>			
DN 400 (16")	1300	3 B		IP67 (NEMA 4X/6) PA housing, PN 40, O-ring, 100 °C (212 °F), no approval	1		
DN 450 (18")	1700	3 F		IP68 SS housing, PN 40, O-ring, 180 °C (356 °F), EEx d, ATEX approval (only with standard FUS060)	2		
DN 500 (20")	2200	3 K		IP68 PA housing, Sylgard potting kit, PN 40, SS, O-ring, 100 °C (212 °F), no approval	3		
DN 550 (22")	2600	3 P		IP68 SS housing, Sylgard potting kit, PN 40, SS, O-ring, 200 °C (392 °F), no approval	4		
DN 600 (24")	3200	3 T		IP67 SS housing, PN 40, O-ring, 190 °C (374 °F), Ex i, ATEX approval (only with FUS060 Ex)	5		
DN 650 (26")	3600	4 B		<b>Cable gland entires</b>			
DN 700 (28")	4200	4 F		Cable glands M20 in transducers and in transmitter M25/20/16 x 1.5 (FUS080 only M20)	1		
DN 750 (30")	4800	4 K		Cable glands ½" NPT in transducers and in transmitter (only with FUS060)	2		
DN 800 (32")	5500	4 P		<b>Transmitter version of SITRANS FUS060</b> (only DN 200 ... 4000 (8" ... 160"))			
DN 900 (36")	7500	5 B		IP65 (NEMA 4), 120/230 V AC			N
DN 1000 (40")	9000	5 K		IP65 (NEMA 4), 24 V AC/DC			P
DN 1100 (44")	10 000	5 P		IP65 (NEMA 4), 24 V AC/DC Ex version			Q
DN 1200 (48")	13 200	5 T		<b>Transmitter version of SITRANS FUS080</b> (only DN 200 ... 1200 (8" ... 48"))			
Only for FUS060				PDM software tool and IrDA-adaptor, which are needed for settings update, to be ordered separately, see FUS080 accessories			
DN 1300 (52")	14 000	6 A		IP67/NEMA 4X/6 115 ... 230 V AC			U
DN 1400 (56")	16 800	6 C		IP67/NEMA 4X/6 3.6 V battery version, incl. dual battery pack			V
DN 1500 (60")	19 000	6 E		IP67/NEMA 4X/6 115 ... 230 V AC, incl. 3.6 V single battery backup			W
DN 1600 (64")	22 800	6 G		IP67/NEMA 4X/6 3.6 V battery version (no battery pack included) <sup>4)</sup>			X
DN 1700 (68")	25 000	6 J		<b>Transmitter output module</b>			
DN 1800 (72")	27 600	6 L		Transmitter SITRANS FUS080:			
DN 1900 (76")	31 000	6 N		Pulse and/or alarm output (standard for FUS080).			A
DN 2000 (80")	36 000	6 Q		Transmitter SITRANS FUS060:			
DN 2100 (84")	37 000	6 S		HART, 1 pulse output, 1 relay			B
DN 2200 (88")	42 000	6 U		HART Ex version, 1 pulse output, 1 relay			C
DN 2300 (92")	45 000	6 W		PROFIBUS PA, 1 pulse/frequency			D
DN 2400 (96")	51 000	7 A					
DN 2500 (100")	53 000	7 C					
DN 2600 (104")	60 000	7 E					
DN 2700 (108")	62 000	7 G					
DN 2800 (112")	72 000	7 J					
DN 2900 (116")	71 000	7 L					
DN 3000 (120")	78 000	7 N					
<b>Installation method<sup>1)</sup></b>							
Empty pipe (incl. transducer holder and mounting plates). Alignment rods and tools must be ordered as accessories.		A					
Hot tap, mounting under pressure (mounting plates <b>not</b> incl.). Special mounting tools to be ordered separately.		B					

1) Mounting tools must be orderd separately as "-Z" options

## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SONOKIT (with FUS060 or FUS080)

Selection and Ordering data	Article No.	Ord. code
<b>SITRANS F US SONOKIT 2-path sensor</b>	<b>7ME3220-</b>	
<b>Transducer coaxial cables (with FUS080 only, 15 and 30 m, 70°C (158 °F) cable types)</b>		
4 x 3 m, max. 70 °C (158 °F), the only option for Ex i		0
4 x 15 m, max. 70 °C (158 °F)		1
4 x 30 m, high temp. max. 200 °C (392 °F)		2
4 x 30 m, max. 70 °C (158 °F)		3
4 x 60 m, max. 70 °C (158 °F) (up to DN 3000)		4
4 x 90 m, max. 70 °C (158 °F) (up to DN 3000)		5
4 x 120 m, max. 70 °C (158 °F) (up to DN 3000)		6
4 x 3 m, high temp. max. 200 °C (392 °F), the only option for Ex i		7
4 x 15 m, high temp. max. 200 °C (392 °F)		8
Special version (add Order code):		
No transducer cable, cable length 4 x 3 m, the only option for Ex i		9 R 0 A
No transducer cable, cable length 4 x 15 m		9 R 0 B
No transducer cable, cable length 4 x 30 m		9 R 0 C
No transducer cable, cable length 4 x 60 m (up to DN 3000)		9 R 0 D
No transducer cable, cable length 4 x 90 m (up to DN 3000)		9 R 0 E
No transducer cable, cable length 4 x 120 m (up to DN 3000)		9 R 0 F

Selection and Ordering data	Order code
<b>Additional information</b>	
Please add „-Z“ to Article No. and specify Order code(s) and plain text.	
<b>Material certificate</b>	
EN 10204-3.1, transducer body material	<b>F30</b>
EN 10204-3.1, transducer holder material	<b>F31</b>
EN 10204-3.1, mounting plate material	<b>F32</b>
<b>Tag name plate</b>	
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).	<b>Y17</b>
<b>Regional specific approval</b>	
KCC marking for Korea	<b>W28</b>
<b>Accessories</b>	
Alignment rods-set for DN 100 ... 750 (4" ... 30") Ø = 25 mm, L = 500 mm, 3 pcs.	<b>S10</b>
Alignment rods-set for DN 800 ... 2100 (32" ... 84") Ø = 25 mm, L = 500 mm, 6 pcs.	<b>S11</b>
Alignment rods-set for DN 2200 ... 3000 (88" ... 120") Ø = 25 mm, L = 500 mm, 8 or 10 pcs.	<b>S12</b>
Spanner key for transducer mounting type SONO 3200 O-ring type	<b>T11</b>
Tool set with various mounting/spare parts for SONOKIT installation	<b>T12</b>

#### Operating instructions

Description	Article No.
SITRANS FUS060	
• English	<b>A5E01204521</b>
• German	<b>A5E02123845</b>
SITRANS FUS080	
• English	<b>A5E03059912</b>
• German	<b>A5E31628428</b>
SITRANS F US SONOKIT 2-path	
• English	<b>A5E02445496</b>
• German	<b>A5E02554972</b>

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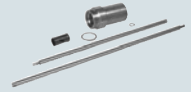

## Flowmeter SONOKIT accessories and spare parts



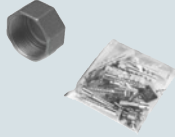
## Accessories

## Potting kit for SONO 3200 terminal housing

Description	Article No.	
Potting kit for terminal box of SONO 3200 transducers for IP68/NEMA 6P (not for Ex sensors)	<b>FDK:085L2403</b>	

## Tools for SONO 3200 transducers and SONOKIT

Description	Article No.	
Extraction tool for replacement of SONO 3200 O-ring transducers under pressure and for hot-tapping (working conditions: typically water, max. 40 bar and max. 60 °C (max. 580 psi and max. 140 °F)) For transducer length:		
• Up to 160 mm (6.3")	<b>FDK:085B5333</b>	
• Up to 230 mm (9.1")	<b>FDK:085B5335</b>	
Angle measurement tool for SONOKIT	<b>FDK:085B5330</b>	
Hot-tap drilling tool for SONOKIT, the extraction tool is required, max. pressure 40 bar (580 psi)	<b>FDK:085B5392</b>	
Alignment tool for SONOKIT (typically for hot-tapping) For use on pipe sizes in the range DN 300 to DN 1200.	<b>FDK:085B5393</b>	

Description	Article No.	
Alignment rods-set for DN 100 ... 650 (4" ... 26"), Ø = 25 mm, L = 500 mm, 3 pcs.	<b>A5E02609214</b>	
Alignment rods-set for DN 700 ... 1900 (28" ... 76"), Ø = 25 mm, L = 500 mm, 6 pcs.	<b>A5E02609215</b>	
Alignment rods-set for DN 2000 ... 3000 (80" ... 120"), Ø = 25 mm, L = 500 mm, 10 pcs.	<b>A5E02609216</b>	
Spanner key for transducer mounting type SONO 3200 O-ring type	<b>A5E02609218</b>	
Tool set with various mounting/spare parts for SONOKIT installation	<b>A5E02609219</b>	

## Flow Measurement


### SITRANS F US InLine

#### Flowmeter SONOKIT (with FUS060 or FUS080)

##### Cable connection boxes

(For the connection of individual transducer cables with the FUS060 transducer cables)


Description	Article No.
Junction box for coaxial cable	
• IP65 metal box for 2 coaxial cables	<b>FDK:085B1360</b>
• IP65 metal box for 4 coaxial cables	<b>FDK:085B1361</b>
• IP65 EEx e plastic box for 2 coaxial cables, no ATEX approval	<b>FDK:085B1362</b>
• IP65 EEx e plastic box for 4 coaxial cables, no ATEX approval	<b>FDK:085B1363</b>



##### Spare parts

Transducer SONO 3200 spare parts, complete transducer with ½"-NPT cable glands


Transducer type	Material	Gasket	Pressure rating	Terminal housing	Approval	Temperature range [°C (°F)]	Length [mm (inch)]	Article No.
O-ring	316 SS	O-ring	PN 40	Plastic PA 6.6		-20 ... +100 (-4 ... +212)	160 (6.3)	<b>A5E00839476</b>
O-ring	316 SS	O-ring	PN 40	316 SS		-20 ... +200 <sup>1)</sup> (-4 ... +392)	160 (6.3)	<b>A5E00839435</b>
O-ring	316 SS	O-ring	PN 40	Plastic PA 6.6		-20 ... +100 (-4 ... +212)	230 (9.41)	<b>A5E00839477</b>
O-ring	316 SS	O-ring	PN 40	316 SS		-20 ... +200 <sup>1)</sup> (-4 ... +392)	230 (9.41)	<b>A5E00839437</b>



<sup>1)</sup> 316 SS housing for -20 ... +200 °C (-4 ... +392 °F) media temp. but cable glands only for -20 ... +100 °C (-4 ... +212 °F) ambient temp.

Transducer SONO 3200 spare parts, complete transducer with M20 cable glands

Transducer type	Material	Gasket	Pressure rating	Terminal housing	Approval	Temperature range [°C (°F)]	Length [mm (inch)]	Article No.
O-ring	316 SS	O-ring	PN 40	Plastic PA 6.6		-20 ... +100 (-4 ... +212)	160 (6.3)	<b>FDK:085B5454</b>
O-ring	316 SS	O-ring	PN 40	316 SS		-20 ... +200 <sup>1)</sup> (-4 ... +392)	160 (6.3)	<b>FDK:085B5455</b>
O-ring	316 SS	O-ring	PN 40	Plastic PA 6.6		-20 ... +100 (-4 ... +212)	230 (9.41)	<b>FDK:085B5458</b>
O-ring	316 SS	O-ring	PN 40	316 SS	Ex d <sup>2)</sup>	-20 ... +180 (-4 ... +356)	160 (6.3)	<b>FDK:085B5452</b>
O-ring	316 SS	O-ring	PN 40	316 SS	Ex i <sup>3)</sup>	-10 ... +190 (14 ... 374)	160 (6.3)	<b>A5E00836462</b>
O-ring	316 SS	O-ring	PN 40	316 SS		-20 ... +200 <sup>2)</sup> (-4 ... +392)	230 (9.41)	<b>FDK:085B5459</b>




<sup>1)</sup> 316 SS housing for -20 ... +200 °C (-4 ... +392 °F) media temp. but cable glands only for -20 ... +100 °C (-4 ... +212 °F) ambient temp.

<sup>2)</sup> ATEX (Ex) IIC 2G Ex d IIC T3-T6 Gb

<sup>3)</sup> For systems with FUS060 ATEX IIC 2G Ex dem [ia/ib] T6/T4/T3

Transducer SONO 3200 spare parts, transducer terminal housing with M20 cable glands

Type	Article No.
Material: PA 6.6, Temperature range: -20 ... +100 °C (-4 ... +212 °F)	<b>FDK:085B5501</b>
Material: AISI 316, Temperature range: -20 ... +200 °C (-4 ... +392 °F)	<b>FDK:085B5504</b>
Material: AISI 316, Ex d <sup>1)</sup> , Temperature range: -20 ... +180 °C (-4 ... +356 °F)	<b>FDK:085B5505</b>
Material: AISI 316, Ex i <sup>2)</sup> , Temperature range: -10 ... +190 °C (14 ... 374 °F)	<b>A5E00835255</b>




<sup>1)</sup> ATEX (Ex) IIC 2G Ex d IIC T3-T6 Gb

<sup>2)</sup> For systems with FUS060 ATEX IIC 2G Ex dem [ia/ib] T6/T4/T3




### Flowmeter SONOKIT (with FUS060 or FUS080)

#### Transducer SONO 3200 spare parts, transducer terminal housing with 1/2"-NPT cable glands

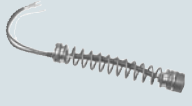
Type	Article No.	
Material: PA 6.6, Temperature range: -20 ... +100 °C (-4 ... +212 °F)	<b>A5E00839460</b>	
Material: AISI 316, Temperature range: -20 ... +200 °C (-4 ... +392 °F)	<b>A5E00839427</b>	

#### Transducer SONO 3200 spare parts transducer body with insert as well as insert only


Temperature range [°C (°F)]	Gasket	Length [mm (inch)]	Article No.	
-20 ... +200 (-4 ... +392)	O-ring (FFKM O-ring material) <sup>1)</sup>	160 (6.3)	<b>FDK:085B1406</b>	
-20 ... +200 (-4 ... +392)	O-ring (FKM 602 O-ring material) <sup>2)</sup>	160 (6.3)	<b>FDK:085B5510</b>	
-20 ... +200 (-4 ... +392)	O-ring	230 (9.41)	<b>FDK:085B5511</b>	

<sup>1)</sup> Chemical resistant O-ring material. Body specially for Ex-approved transducers.


<sup>2)</sup> Body specially for standard transducers.

Temperature range [°C (°F)]	Length [mm (inch)]	Article No.	
-20 ... +200 (-4 ... +392)	160 (6.3)	<b>FDK:085B1419</b>	
-20 ... +200 (-4 ... +392)	230 (9.41)	<b>FDK:085B1420</b>	


#### Transducer SONO 3200 gasket

Type	Pressure rating	Material	Temperature range [°C (°F)]	Article No.	
Gasket O-ring (3 pcs. for O-ring transducers)	PN 40	FKM	-20 ... +200 (-4 ... +392)	<b>FDK:085B1089</b>	

#### Cables for SONOKIT SONO 3200 transducers with FUS060

Description	Length [m (ft)]	Article No.	
Coaxial cable for FUS060, (75 Ω, max. 70 °C (158 °F), black PVC) (2 pcs.)	3 (9.84)	<b>A5E00875101</b>	
	15 (49.21)	<b>A5E00861432</b>	
	30 (98.43)	<b>A5E01278662</b>	
	60 (196.85)	<b>A5E01278682</b>	
	90 (295.28)	<b>A5E01278687</b>	
	120 (393.70)	<b>A5E01278698</b>	
High temp. coaxial cable for FUS060; with 0.3 m brown PTFE high temp. transducer part, max. 200 °C (392 °F) and black PVC transmitter part with SMB plug, max. 70 °C (158 °F); (impedance 75 Ω) (2 pcs.)	3 (9.84)	<b>A5E00875105</b>	
	15 (49.21)	<b>A5E00861435</b>	
	30 (98.43)	<b>A5E01196952</b>	

#### Cables for SONOKIT SONO 3200 transducers with FUS080

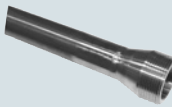
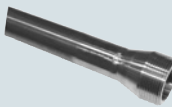
Description	Length [m (ft)]	Article No.	
Coaxial cable for FUS080, (75 Ω, max. 70 °C (158 °F), black PVC) (2 pcs.)	15 (49.21)	<b>A5E02478541</b>	
	30 (98.43)	<b>A5E02478751</b>	

## Flow Measurement

### SITRANS F US Inline

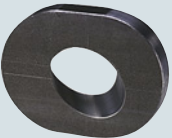
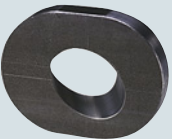
#### Flowmeter SONOKIT (with FUS060 or FUS080)

##### Transducer holder for SONOKIT SONO 3200 transducers

Description	Article No.	
1-path (each incl. 1 pc.)		
• 160 mm (6.3") stainless steel 45°, DN 100 ... DN 150 (4" ... 6")	<b>FDK:085L1103</b>	
• 160 mm (6.3") carbon steel 45°, DN 100 ... DN 150 (4" ... 6")	<b>FDK:085L1102</b>	
• 230 mm (9.1") for concrete pipe 60°, DN 600 ... DN 2400 (24" ... 96")	<b>FDK:085L1107</b>	
• 160 mm (6.3") stainless steel 60°, DN 200 ... DN 2400 (8" ... 96")	<b>FDK:085L1105</b>	
• 160 mm (6.3") carbon steel 60°, DN 200 ... DN 2400 (8" ... 96")	<b>FDK:085L1104</b>	
2-path (each incl. 1 pc.)		
• 230 mm (9.1") for concrete pipe 60°, DN 600 ... DN 3000 (24" ... 120")	<b>FDK:085L1111</b>	
• 160 mm (6.3") stainless steel 60°, DN 200 ... DN 3000 (8" ... 120")	<b>FDK:085L1109</b>	
• 160 mm (6.3") carbon steel 60°, DN 200 ... DN 3000 (8" ... 120")	<b>FDK:085L1108</b>	

The other transducer holder parts are either completely in stainless steel for the concrete and stainless steel pipes (AISI 316L/1.4404 or similar). For carbon pipes the part welded onto the pipe is in carbon steel (St.37 or similar). Thread part is stainless steel (AISI 316L/1.4404 or similar).

##### Mounting plate for SONOKIT SONO 3200 transducers

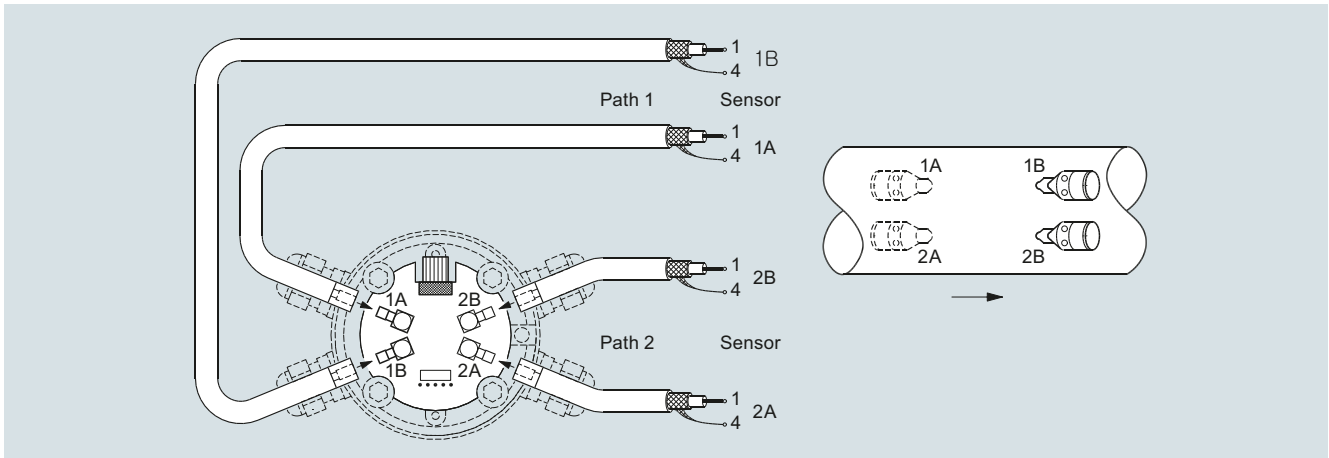
Description	Article No.	
1-path (each incl. 1 pc.)		
• Stainless steel plate, 45°, DN 100 ... DN 150 (4" ... 6")	<b>FDK:085L1113</b>	
• Carbon steel plate, 45°, DN 100 ... DN 150 (4" ... 6")	<b>FDK:085L1112</b>	
• Stainless steel plate, 60°, DN 200 ... DN 2400 (8" ... 96")	<b>FDK:085L1115</b>	
• Carbon steel plate, 60°, DN 200 ... DN 2400 (8" ... 96")	<b>FDK:085L1114</b>	
2-path (each incl. 1 pc.)		
• Stainless steel plate, 60°, DN 200 ... DN 3000 (8" ... 120")	<b>FDK:085L1119</b>	
• Carbon steel plate, 60°, DN 200 ... DN 3000 (8" ... 120")	<b>FDK:085L1118</b>	

The mounting plates are either in stainless steel (AISI 316L/1.4404 or similar) or carbon steel (St.37 or similar).

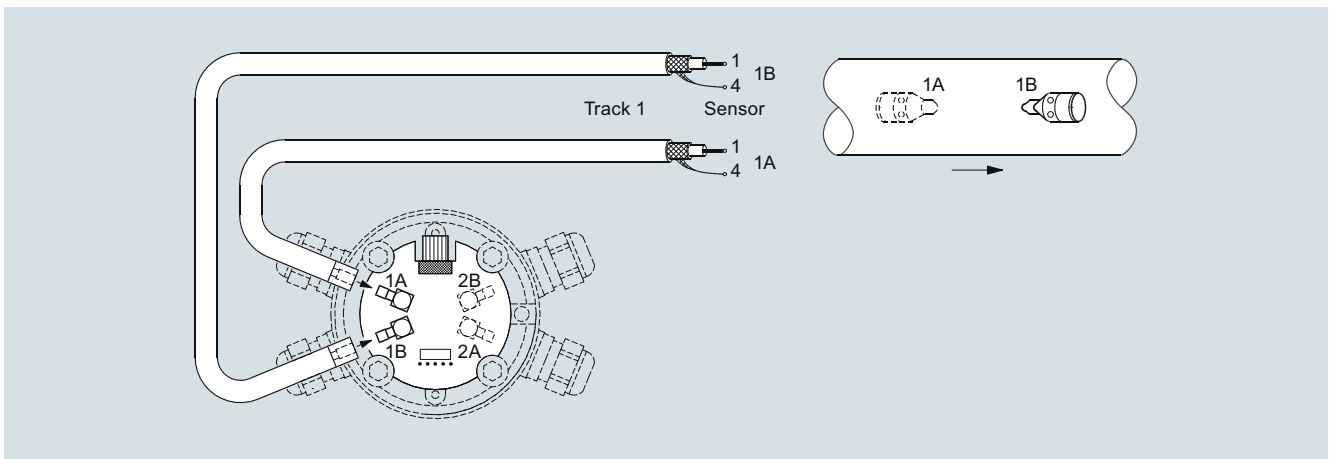
##### SONO 3200 cable glands

Type/ description	Tempera- ture range [°C (°F)]	Appr	Article No.	
black PA plastic, cable Ø 5 ... 13 mm (1 pc.)	-20 ... 100 (-4 ... +212)		<b>A5E02246304</b>	
½" NPT gray PA plastic, cable Ø 5 ... 9 mm (1 pc.)	-20 ... 100 (-4 ... +212)		<b>A5E02246309</b>	
½" NPT chrome-plated brass, cable Ø 5 ... 9 mm (1 pc.)	-40 ... 100 (-40 ... +212)		<b>A5E02246258</b>	
M20 stainless steel, cable Ø 4 ... 6 mm (1 pc.)	-25 ... 200 (-13 ... +392)	Ex i	<b>A5E02246194</b>	
M20 stainless steel, cable Ø 5 ... 8 mm (1 pc.)	-60 ... 180 (-76 ... +356)	Ex d	<b>A5E02246311</b>	

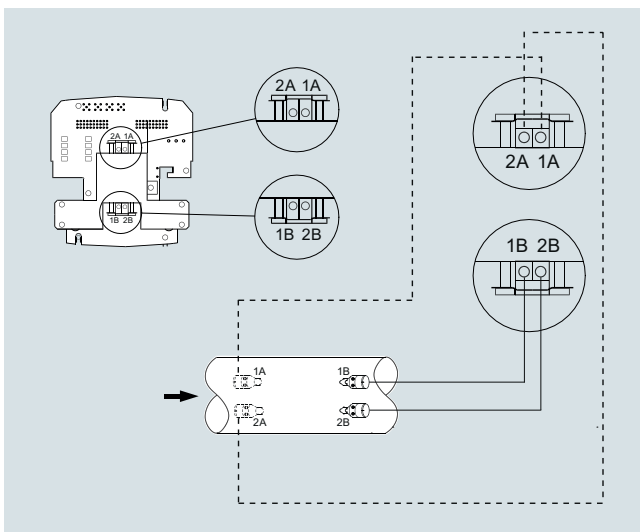
**Schematics**



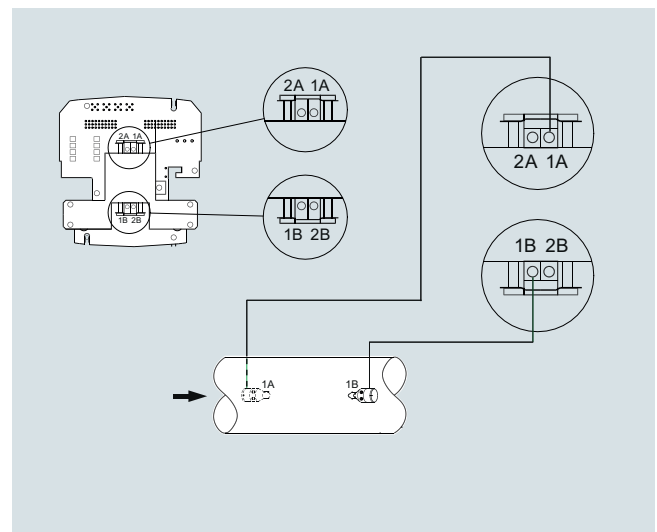
Electrical connection of SITRANS FUS060 and SONOKIT 2-path. Max. 30 m transducer cable length for sizes  $\geq$  DN 3000.



Electrical connection of SITRANS FUS060 and SONOKIT 1-path



Electrical connection of SITRANS FUS080 and SONOKIT 2-path



Electrical connection of SITRANS FUS080 and SONOKIT 1-path

## 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.

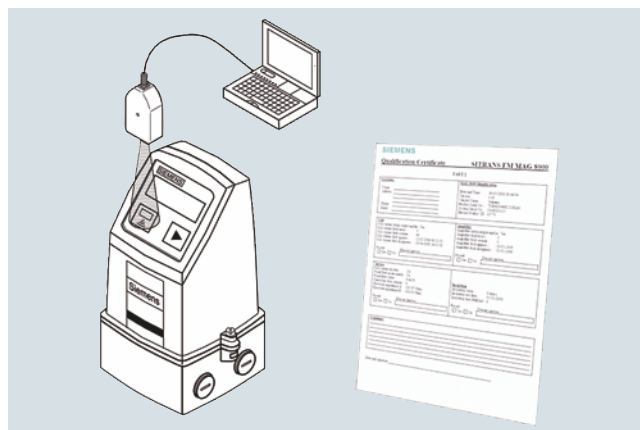
If the flowmeter forms part of an energy meter system for custody transfer, no further approvals are needed, except possible local approvals on the flowmeter.

#### 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 <sub>s</sub> (m <sup>3</sup> /h)	Q <sub>max</sub> (m <sup>3</sup> /h) (105 % of Q <sub>s</sub> )	Q <sub>p</sub> (m <sup>3</sup> /h)	Q <sub>i</sub> (m <sup>3</sup> /h) (1:100 of Q <sub>p</sub> )	Cut-off (m <sup>3</sup> /h)	Cut-off (% of Q <sub>max</sub> )	Typical pulse value <sup>1)</sup> (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<sub>i</sub>, Q<sub>p</sub> and Q<sub>s</sub> are shown on the system label of the FUS380. Q<sub>i</sub> (Q<sub>min</sub>) means the minimal and Q<sub>p</sub> (Q<sub>nom</sub>) the nominal flow rate. Q<sub>s</sub> is the highest operatable flow rate. The maximum flow rate (Q<sub>max</sub>) is 105 % of Q<sub>s</sub>. The low flow cut-off is 50 % of Q<sub>i</sub>.

In order to obtain best pulse output resolution in the range Q<sub>min</sub> to Q<sub>s</sub> of approx. 100 Hz at Q<sub>s</sub>, two or three flow values for every dimension can be selected at ordering. Therefore the ordering data table also shows Q<sub>p</sub> (Q<sub>n</sub>). This flow rate is between Q<sub>i</sub> (Q<sub>min</sub>) and Q<sub>s</sub> 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<sub>s</sub> (m<sup>3</sup>/h) /360.

For example Q<sub>s</sub> = 300 m<sup>3</sup>/h; L/pulse > 300/360; L/pulse > 0.83; therefore the pulse value must be 1 l/pulse

<sup>1)</sup> 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

### SITRANS F US Inline

#### Flowmeter SITRANS FUS380 standard

#### 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 <sub>36</sub> Pb <sub>2</sub> 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 <sup>3</sup> /p, 2.5 m <sup>3</sup> /p, 5 m <sup>3</sup> /p, 10 m <sup>3</sup> /p, 25 m <sup>3</sup> /p, 50 m <sup>3</sup> /p, 100 m <sup>3</sup> /p, 250 m <sup>3</sup> /p, 500 m <sup>3</sup> /p, 1000 m <sup>3</sup> /p
Pulse width	5/10/20/50/100/200/500 ms
Flow unit setup	Preset: m <sup>3</sup> /h
Volume unit setup	Preset: m <sup>3</sup>

#### Flowmeter Calibration and traceability

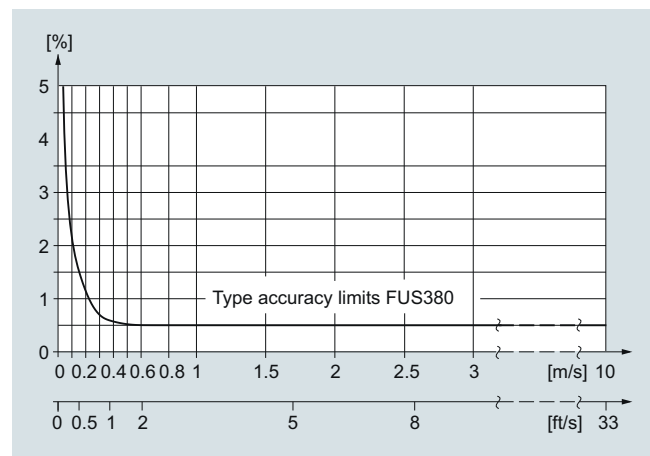
To ensure continuous accurate measurement, flowmeters must be calibrated. The calibration is conducted at Siemens flow facilities with traceable instruments referring directly to the physical unit of measurement according to the International System of Units (SI).

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 m<sup>3</sup>/h to 10 000 m<sup>3</sup>/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 m<sup>3</sup>/h).

#### Accuracy SITRANS FUS380:

± 0.5 % for 0.5 m/s < v < 10 m/s and ± 0.25/V<sub>act</sub> [%] below 0.5 m/s



Selection and Ordering data					Article-No.	Order code
<b>Flowmeter SITRANS FUS380 (standard)</b>					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 <sup>3</sup> /h]			
			Q <sub>p</sub> (Q <sub>n</sub> ) is the normal flow according to the approval requirements. Q <sub>p</sub> and Q <sub>s</sub> is shown on the system label.			
			Q <sub>p</sub> (Q <sub>n</sub> )	Q <sub>s</sub>		
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

## SITRANS F US Inline

### Flowmeter SITRANS FUS380 standard

Selection and Ordering data					Article-No.	Order code	
<b>Flowmeter SITRANS FUS380 (standard)</b>					7ME3400 -	0 - A	
Diameter	Approval	Pressure rating	Flow setting [m <sup>3</sup> /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	
<b>Flange norm and pressure rating</b>							
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
<b>Compact/remote connection</b>							
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>							
<u>Sensor link cable (SSL)</u>							
• 5 m (16.4 ft)							2
• 10 m (32.8 ft)							3
• 20 m (65.6 ft)							4
• 30 m (98.4 ft)							5
<b>Pulse output value setup</b>							
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: $L/\text{pulse} > Q_s \text{ (m}^3/\text{h)} / 360$ . For example $Q_s = 300 \text{ m}^3/\text{h}$ ; $L/\text{pulse} > 300/360$ ; $L/\text{pulse} > 0.83$ ; therefore the pulse value must be 1 l/pulse							
<u>Pulse value</u>							
• 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 <sup>3</sup> /pulse							8
• 0.25 l/pulse							9
• 0.5 l/pulse							9
• 5 l/pulse							9
• 25 l/pulse							9
• 50 l/pulse							9
• 2.5 m <sup>3</sup> /pulse							9
• 5 m <sup>3</sup> /pulse							9
• 10 m <sup>3</sup> /pulse							9
• 25 m <sup>3</sup> /pulse							9
• 50 m <sup>3</sup> /pulse							9
• 100 m <sup>3</sup> /pulse							9
• 250 m <sup>3</sup> /pulse							9
• 500 m <sup>3</sup> /pulse							9
• 1000 m <sup>3</sup> /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



## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SITRANS FUE380 with CT approval

#### Overview



The 2-path flowmeter SITRANS FUE380 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 without type approval) and other general water applications.

The flowmeter FUE380 is approved according to energy meter standards EN 1434 class 2, OIML R 75 class 2 and MID class 2. Metrological parameters are protected against manipulation. The type-approved flowmeter version is named SITRANS FUE380. For a standard flowmeter type FUS380 without a type approval, see separate FUS380 chapter.

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  $Q_i:Q_p$  up to 1:50/100 or max. range  $Q_i:Q_s$  up to 1:400

#### Application

The main application for SITRANS FUE380 is measurement of water flow or water flow in energy meter systems for custody transfer in district heating networks or chilled water (including glycol mixes without type approval).

Combined with an energy calculator and a pair of temperature sensors, SITRANS FUE380 can be used as part of an energy meter system. For this purpose Siemens offers energy calculator SITRANS FUE950.

#### Design

The 2-path design of SITRANS FUE380 ensures maximum accuracy under short inlet conditions. The approved 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.

#### FUE380 MI-004 approval

The SITRANS FUE380 program is type-approved according to international energy meter standard EN 1434. On 1 November 2006 the MI-004 energy meter directive became effective providing that all energy meters with a MI-004 verification label can be sold across the EU borders.

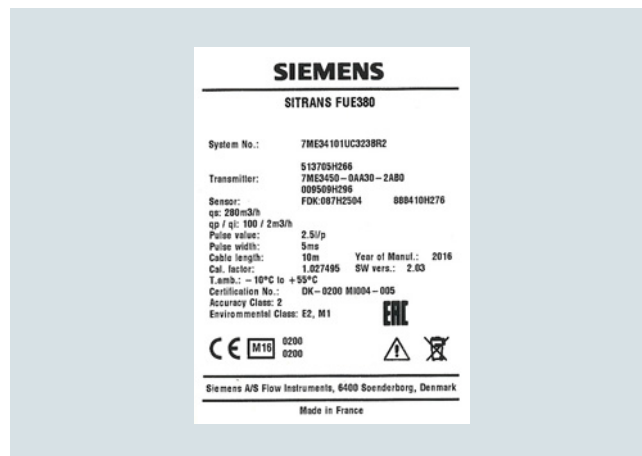
The FUE380 are MI-004 verified and labeled products according to Directive 2014/32/EU of the European Parliament and Council of 26 February, 2014 on measuring instruments, Annex VI Thermal Energy Meters (MI-004), in sizes from DN 50 to DN 1200.

The MID certification is obtained as module B + module D approvals according to the above-mentioned directive.

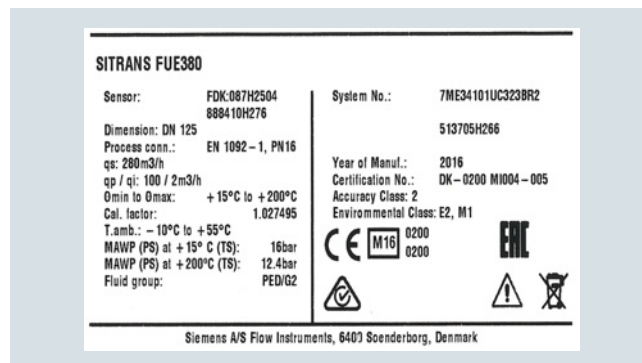
Module B: MI-004 Type MID approval according to EN 1434: 2007 (approved for media water)

Module D: Quality insurance MID approval of production

The MID system label with the approval information is placed on the side of the transmitter and on the sensor. An example of the product label is shown below:



FUE380 transmitter label (with MID first verification)



FUE380 sensor label (with MID first verification)

### Integration

The flowmeter digital output is often used as input for an energy meter or as input for digital systems for remote reading. SITRANS FUE380 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.

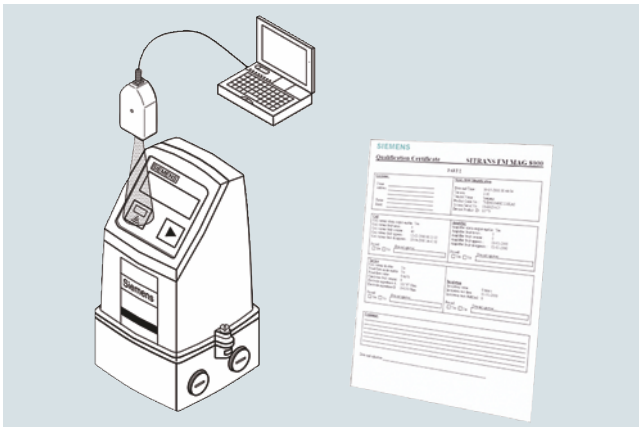
If the flowmeter forms part of an energy meter system for custody transfer, no further approvals are needed, except possible local approvals on the flowmeter.

### Function

Together with the SIMATIC PDM tool the FUE380 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



## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SITRANS FUE380 with CT approval

#### Configuration SITRANS FUE380 type-approved

##### Selection guide SITRANS FUE380, type-approved flowmeter

DN	Q <sub>s</sub> (m <sup>3</sup> /h)	Q <sub>max</sub> (m <sup>3</sup> /h) (105 % of Q <sub>s</sub> )	Q <sub>p</sub> (m <sup>3</sup> /h)	Q <sub>i</sub> (m <sup>3</sup> /h)	Q <sub>i</sub> (m <sup>3</sup> /h)	Cut-off (m <sup>3</sup> /h)	Cut-off (% of Q <sub>max</sub> )	Typical pulse value (l/pulse)
				(1:50 of Q <sub>p</sub> ) EN 1434/MID	(1:100 of Q <sub>p</sub> ) OIML R 75/MID			
50	30	31.5	15	0.3	-	0.075	0.24	1
50	45	47.25	15	0.3	-	0.075	0.16	1
50	45	47.25	30	-	0.30	0.150	0.32	1
65	50	52.5	25	0.5	-	0.125	0.24	1
65	72	75.6	25	0.5	-	0.125	0.17	1
65	72	75.6	50	-	0.50	0.250	0.33	1
80	80	84	40	0.8	-	0.200	0.24	2.5
80	120	126	40	0.8	-	0.200	0.16	2.5
80	120	126	80	-	0.80	0.400	0.32	2.5
100	120	126	60	1.2	-	0.300	0.24	2.5
100	180	189	60	1.2	-	0.300	0.16	2.5
100	180	189	120	-	1.20	0.600	0.32	2.5
125	200	210	100	2.0	-	0.500	0.24	2.5
125	280	294	100	2.0	-	0.500	0.17	2.5
125	280	294	200	-	2.00	1.000	0.34	2.5
150	300	315	150	3.0	-	0.750	0.24	10
150	420	441	150	3.0	-	0.750	0.17	10
150	420	441	300	-	3.00	1.500	0.34	10
200	500	525	250	5.0	-	1.250	0.24	10
200	700	735	250	5.0	-	1.250	0.17	10
200	700	735	500	-	5.00	2.500	0.34	10
250	800	840	400	8.0	-	2.000	0.24	10
250	1 120	1 176	400	8.0	-	2.000	0.17	10
250	1 120	1 176	800	-	8.00	4.000	0.34	10
300	1 120	1 176	560	11.2	-	2.800	0.24	50
300	1 560	1 638	560	11.2	-	2.800	0.17	50
300	1 560	1 638	1120	-	11.20	5.600	0.34	50
350	1 500	1 575	750	15.0	-	3.750	0.24	50
350	2 100	2 205	750	15.0	-	3.750	0.17	50
350	2 100	2 205	1 500	-	15.00	7.500	0.34	50
400	1 900	1 995	950	19.0	-	4.750	0.24	50
400	2 660	2 793	950	19.0	-	4.750	0.17	50
400	2 660	2 793	1 900	-	19.00	9.500	0.34	50
500	2 950	3 097.5	1 475	29.5	-	7.375	0.24	100
500	4 130	4 336.5	1 475	29.5	-	7.375	0.17	100
500	4 130	4 336.5	2 950	-	29.50	14.75	0.34	100
600	4 300	4 515	2 150	43.0	-	10.75	0.24	100
600	6 020	6 321	2 150	43.0	-	10.75	0.17	100
600	6 020	6 321	4 300	-	43.00	21.50	0.34	100
700	5 800	6 090	2 900	58.0	-	14.50	0.24	100
700	8 120	8 526	2 900	58.0	-	14.50	0.17	100
700	8 120	8 526	5 800	-	58.00	29.00	0.34	100
800	7 600	7 980	3 800	76.0	-	19.00	0.24	100
800	10 640	11 172	3 800	76.0	-	19.00	0.17	100
800	10 640	11 172	7 600	-	76.00	38.00	0.34	100
900	10 000	10 500	5 000	100.0	-	25.00	0.24	100
900	14 000	14 700	5 000	100.0	-	25.00	0.17	100
900	14 000	14 700	10 000	-	100.00	50.00	0.34	100

### Flowmeter SITRANS FUE380 with CT approval

DN	$Q_s$ (m <sup>3</sup> /h)	$Q_{max}$ (m <sup>3</sup> /h) (105 % of $Q_s$ )	$Q_p$ (m <sup>3</sup> /h)	$Q_i$ (m <sup>3</sup> /h)	$Q_i$ (m <sup>3</sup> /h)	Cut-off (m <sup>3</sup> /h)	Cut-off (% of $Q_{max}$ )	Typical pulse value (l/pulse)
				(1:50 of $Q_p$ ) EN 1434/MID	(1:100 of $Q_p$ ) OIML R 75/MID			
1 000	12 000	12 600	6 000	120.0	-	30.00	0.24	100
1 000	16 800	17 640	6 000	120.0	-	30.00	0.17	100
1 000	16 800	17 640	12 000	-	120.00	60.00	0.34	100
1 200	18 000	18 900	9 000	180.0	-	45.00	0.24	100
1 200	25 200	26 460	9 000	180.0	-	45.00	0.17	100
1 200	25 200	26 460	18 000	-	180.00	90.00	0.34	100

Dynamic range  $Q_i:Q_p$ : better than 1:100 or 1:50 according to OIML R 75 class 2 and MID EN 1434 class 2.

$Q_i$  ( $Q_{min}$ ) means the minimal and  $Q_p$  ( $Q_{nom}$ ) the nominal flow rate according to the approval requirements.

$Q_s$  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  $Q_i$ .

$Q_i$ ,  $Q_p$  and  $Q_s$  are shown on the system nameplate of the FUE380.

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

#### Note:

The minimum flow ( $Q_i$ ) should be checked in the PIA-portal or product master data base (PMD)

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<sup>3</sup>/h) /360.

For example  $Q_s = 300$  m<sup>3</sup>/h;  $L/pulse > 300/360$ ;  $L/pulse > 0.83$ ; therefore the pulse value must be 1 l/pulse

## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SITRANS FUE380 with CT approval

#### Technical specifications

<b>Pipe design</b>	2-path sensor with flanges and inline transducers wet-calibrated from factory
Nominal size welded version (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 ... DN 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 <sub>36</sub> Pb <sub>2</sub> 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) MID: min. +15 °C/+59 °F
• DN 50 ... DN 80	Remote: 2 ... 150 °C (35.6 ... 302 °F) MID: min. +15 °C/+59 °F
• DN 50 ... DN 1200	Compact: 2 ... 120 °C (35.6 ... 248 °F) MID: min. +15 °C/+59 °F
Degree of protection	Sensor connection IP67/NEMA 4X/6
Electromagnetic compatibility	
• Emitted interference	To EN 55011/CISPR-11
• Noise immunity	To EN/IEC 61326-1 (Industry)
• MID	Environment class E2 and M1
Max. flow velocity at Q <sub>s</sub>	DN 50 ... DN 1200: 9 m/s (29.5 ft/s)

#### Transmitter

The transmitter related to this system is the SITRANS FUE080. Technical specifications to the FUE080 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 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	<ul style="list-style-type: none"> <li>Approval standards: EN 1434 and OIML R 75 Class 2</li> <li>Type approval: MID, MI-004, class 2 approval and certification (according to EN 1434)</li> <li>CPA/CMC (China)</li> </ul>

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).

#### Type-dependent settings

Flow value	Predefined according to EN 1434/OIML R 75/MID
Approval	Country specific
Flow rate v <sub>f</sub>	0.02 ... 9 m/s (0.065 ... 29.5 ft/s)
Output A	Preset: Forward pulses
Output B	Preset: Alarm
Pulse value A & B (depending on DN value)	Preset: See scheme - previous page Preset for SITRANS FUE950 or free selectable depending on flow rate (Q <sub>s</sub> )
Pulse width	Preset: 5 ms
Flow unit setup	Preset: m <sup>3</sup> /h
Volume unit setup	Preset: m <sup>3</sup>

#### 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 m<sup>3</sup>/h to 10 000 m<sup>3</sup>/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<sub>n</sub> as selected flow is shipped with each SITRANS FUE380. This production calibration protocol consists of 2 x 3 points at Q<sub>i</sub>, 10 % Q<sub>p</sub> and Q<sub>p</sub> (max. 4 200 m<sup>3</sup>/h).



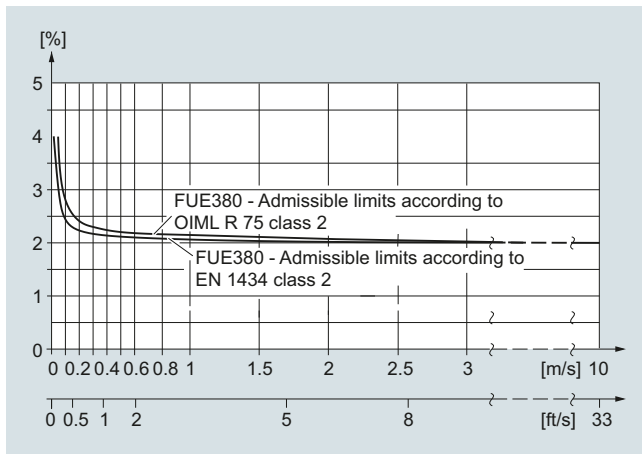
**Typical accuracy SITRANS FUE380:**

$$\pm(0.5 + 0.02 Q_p/Q) [\%]$$

$Q_p$  according to EN 1434/OIML requirements.

Example: DN 100,  $Q_p = 60 \text{ m}^3/\text{h}$  at  $Q = 1.2 \text{ m}^3/\text{h}$ :

Accuracy at  $1.2 \text{ m}^3/\text{h} = \text{typical } 1.5 \%$



SITRANS FUE380 fulfils the requirements

$E_f = \pm(2 + 0.02 Q_p/Q_i)$  max.  $\pm 5 \%$ , according to EN 1434 and OIML R 75, class 2 or MID class 2 requirements.

## Flow Measurement


### SITRANS F US Inline

#### Flowmeter SITRANS FUE380 with CT approval

##### Selection and Ordering data

Article No. Order code

##### Flowmeter SITRANS FUE380 (type-approved)

 7ME3410 - 
 Click on the Article No. for the online configuration in the PIA Life Cycle Portal.

Diameter	Approval	Pressure rating	Flow setting [m <sup>3</sup> /h]		
			Q <sub>p</sub> [m <sup>3</sup> /h]	Q <sub>s</sub> [m <sup>3</sup> /h]	
Pipe material: Die-cast bronze					
DN 50 (2")	EN 1434	PN 40	15	30	1 B
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	50	1 F
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	80	1 K
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	120	1 P
DN 100 (4")	EN 1434	PN16, PN 40	60	180	1 Q
DN 100 (4")	OIML R75	PN16, PN 40	120	180	1 R
DN 125 (5")	EN 1434	PN16, PN 40	100	200	1 T
DN 125 (5")	EN 1434	PN16, PN 40	100	280	1 U
DN 125 (5")	OIML R75	PN16, PN 40	200	280	1 V
DN 150 (6")	EN 1434	PN16, PN 40	150	300	2 B
DN 150 (6")	EN 1434	PN16, PN 40	150	420	2 C
DN 150 (6")	OIML R75	PN16, PN 40	300	420	2 D
DN 200 (8")	EN 1434	PN16, PN 25, PN 40	250	500	2 F
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	700	2 H
DN 250 (10")	EN 1434	PN16, PN 25, PN 40	400	800	2 K
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	1 120	2 M
DN 300 (12")	EN 1434	PN16, PN 25	560	1 120	2 P
DN 300 (12")	EN 1434	PN16, PN 25	560	1 560	2 Q
DN 300 (12")	OIML R75	PN16, PN 25	1 120	1 560	2 R
DN 350 (14")	EN 1434	PN16, PN 25	750	1 500	2 T
DN 350 (14")	EN 1434	PN16, PN 25	750	2 100	2 U
DN 350 (14")	OIML R75	PN16, PN 25	1 500	2 100	2 V
DN 400 (16")	EN 1434	PN16, PN 25	950	1 900	3 B
DN 400 (16")	EN 1434	PN16, PN 25	950	2 660	3 C
DN 400 (16")	OIML R75	PN16, PN 25	1 900	2 660	3 D
DN 500 (20")	EN 1434	PN16, PN 25	1 475	2 950	3 K
DN 500 (20")	EN 1434	PN16, PN 25	1 475	4 130	3 L
DN 500 (20")	OIML R75	PN16, PN 25	2 950	4 130	3 M
DN 600 (24")	EN 1434	PN16, PN 25	2 150	4 300	3 T
DN 600 (24")	EN 1434	PN16, PN 25	2 150	6 020	3 U
DN 600 (24")	OIML R75	PN16, PN 25	4 300	6 020	3 V
DN 700 (28")	EN 1434	PN16, PN 25	2 900	5 800	4 F
DN 700 (28")	EN 1434	PN16, PN 25	2 900	8 120	4 G
DN 700 (28")	OIML R75	PN16, PN 25	5 800	8 120	4 H
DN 800 (32")	EN 1434	PN16, PN 25	3 800	7 600	4 P
DN 800 (32")	EN 1434	PN16, PN 25	3 800	10 640	4 Q
DN 800 (32")	OIML R75	PN16, PN 25	7 600	10 640	4 R



## Flow Measurement

### SITRANS F US Inline

#### Flowmeter SITRANS FUE380 with CT approval

Selection and Ordering data	Article No.	Order code
<b>Flowmeter SITRANS FUE380 (type-approved)</b>	7ME3410 -	
<b>Transmitter variant FUE080 power/analog output</b>		
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 <ul style="list-style-type: none"> <li>115 ... 230 V AC</li> <li>115 ... 230 V AC, backup 3.6 V DC, Lithium battery, single pack is included</li> </ul> <p>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.</p>		B D E G  R U
<b>Country specific design</b>		
Neutral, no approval mark China, PA 2008-T222 Russia, EN 1434/OIML R75 MID-Approval (MI004), Language on name plate English  MID-Approval (MI004), Language on name plate German MID-Approval (MI004), Language on name plate Polish MID-Approval (MI004), Language on name plate French		A C M R S T U
<b>Pulse width setup</b>		
Pulse width <ul style="list-style-type: none"> <li>5 ms (standard)</li> <li>10 ms</li> <li>20 ms</li> <li>50 ms</li> <li>100 ms</li> <li>200 ms</li> <li>500 ms</li> </ul>		2 2 3 4 5 6 7 8

Selection and Ordering data	Order code
<b>Additional information</b> Please add „-Z“ to Article No. and following add-on code(s) with plain text.	
<b>Calibration/certificate FUE380</b>	
Approval, verification and approval sealing as defined with the article number. See Order code.	
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 <sup>3</sup> /h).	<b>Included</b>
3.1 Inspection certificate (EN 10204-3.1) - pipe material	<b>C12</b>
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 <sup>3</sup> /h).	<b>D20</b>
Accredited Siemens ISO/IEC 17025 calibration for DN 250 ... DN 600 with $Q_n$ as selected in diameter. Certificate: 2 x 5 points, $Q_i$ , 5 %, 10 %, 50 % and 100 % of $Q_p$ (max. 2800 m <sup>3</sup> /h).	<b>D21</b>
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 <sup>3</sup> /h).	<b>D22</b>
Output B as reverse flow pulses. No calibration/verification of this function.	<b>E21</b>
<b>Tag name plate</b>	
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).	<b>Y17</b>

#### Flowmeter SITRANS FUE380 operating instructions, accessories and spare parts

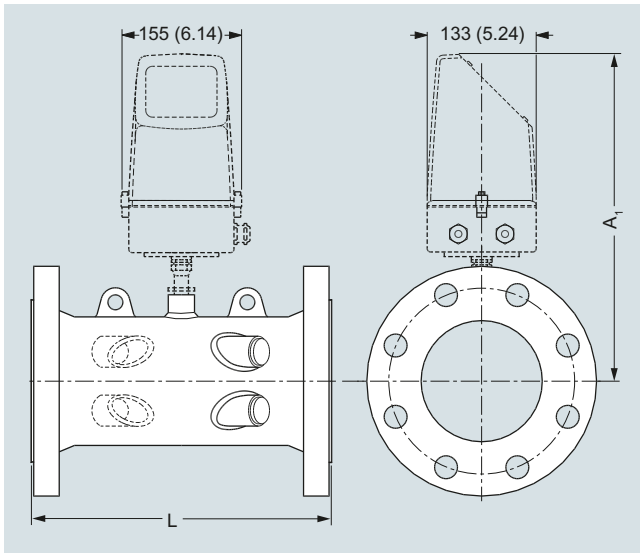
##### Operating instructions

Description	Article No.
• English	<b>A5E00730100</b>
• German	<b>A5E00740611</b>

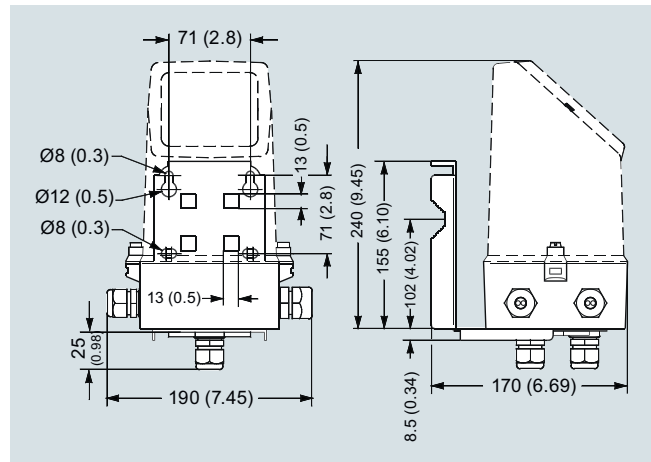
All literature is available to download for free, in a range of languages, at [www.siemens.com/processinstrumentation/documentation](http://www.siemens.com/processinstrumentation/documentation)

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

### Dimensional drawings



### Transmitter IP67/NEMA 4X/6, wall mounting



Dimensions in mm (inch)

### Sensor dimensions for FUS380 and FUE380

Size DN	PN 16		PN 25		PN 40		A <sub>1</sub> mm	Lift hug
	L mm	Weight kg	L mm	Weight kg	L mm	Weight kg		
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	553	-	-	673	Yes
800	1000 +0/-3	494	1000 +0/-3	770	-	-	724	Yes
900	1230 +0/-6	535	1300 +0/-6	835	-	-	775	Yes
1000	1300 +0/-6	594	1370 +0/-6	1000	-	-	826	Yes
1200	1360 +0/-6	732	-	-	-	-	928	Yes

#### Notes:

- Weight for transmitter/electronics 1.5 kg (compact version) or approximately 3 kg (remote version including 10 m cable set)
- - Means not available
- All weights are **approximate**
- For flange values - see norm EN 1092-1

## Flow Measurement

### SITRANS F US Inline

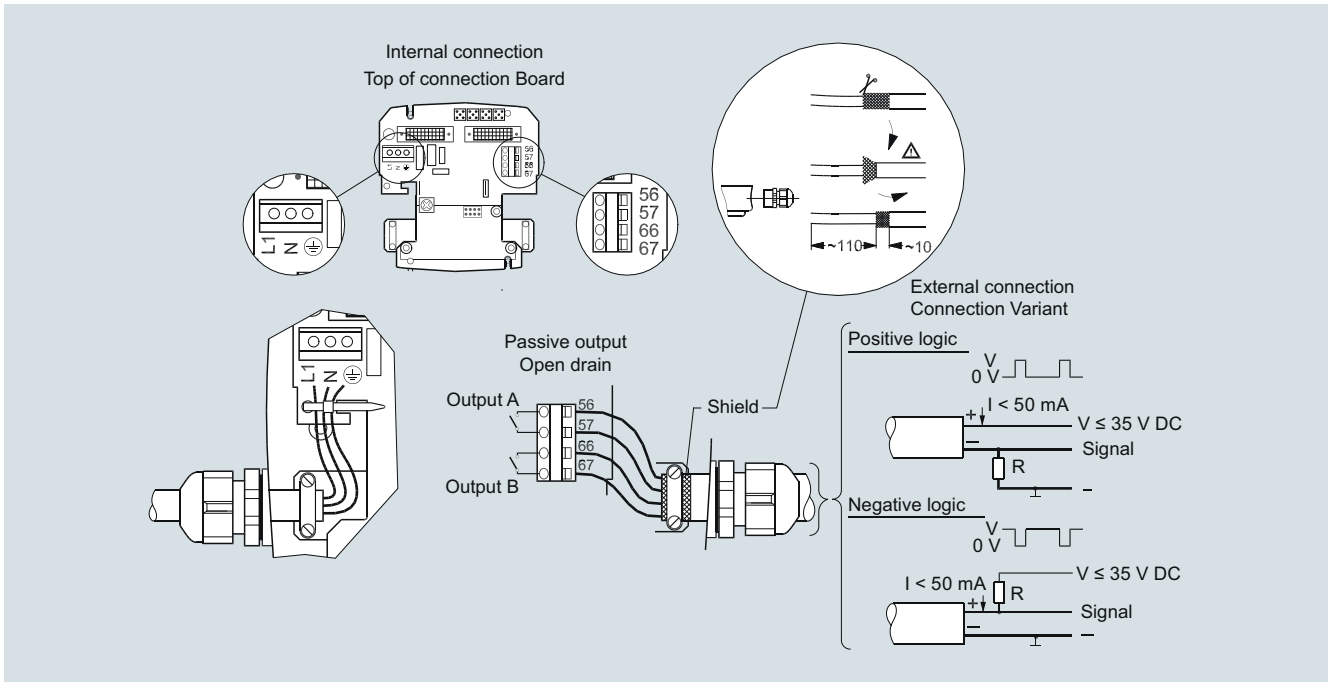
#### Flowmeter SITRANS FUS380 and FUE380

Size	PN 16		PN 25		PN 40		A <sub>1</sub>	Lift hug
	L	Weight	L	Weight	L	Weight		
inch	inch	lb	inch	lb	inch	lb	inch	
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	53.54 +0/-0.24	1614	-	-	-	-	36.54	Yes

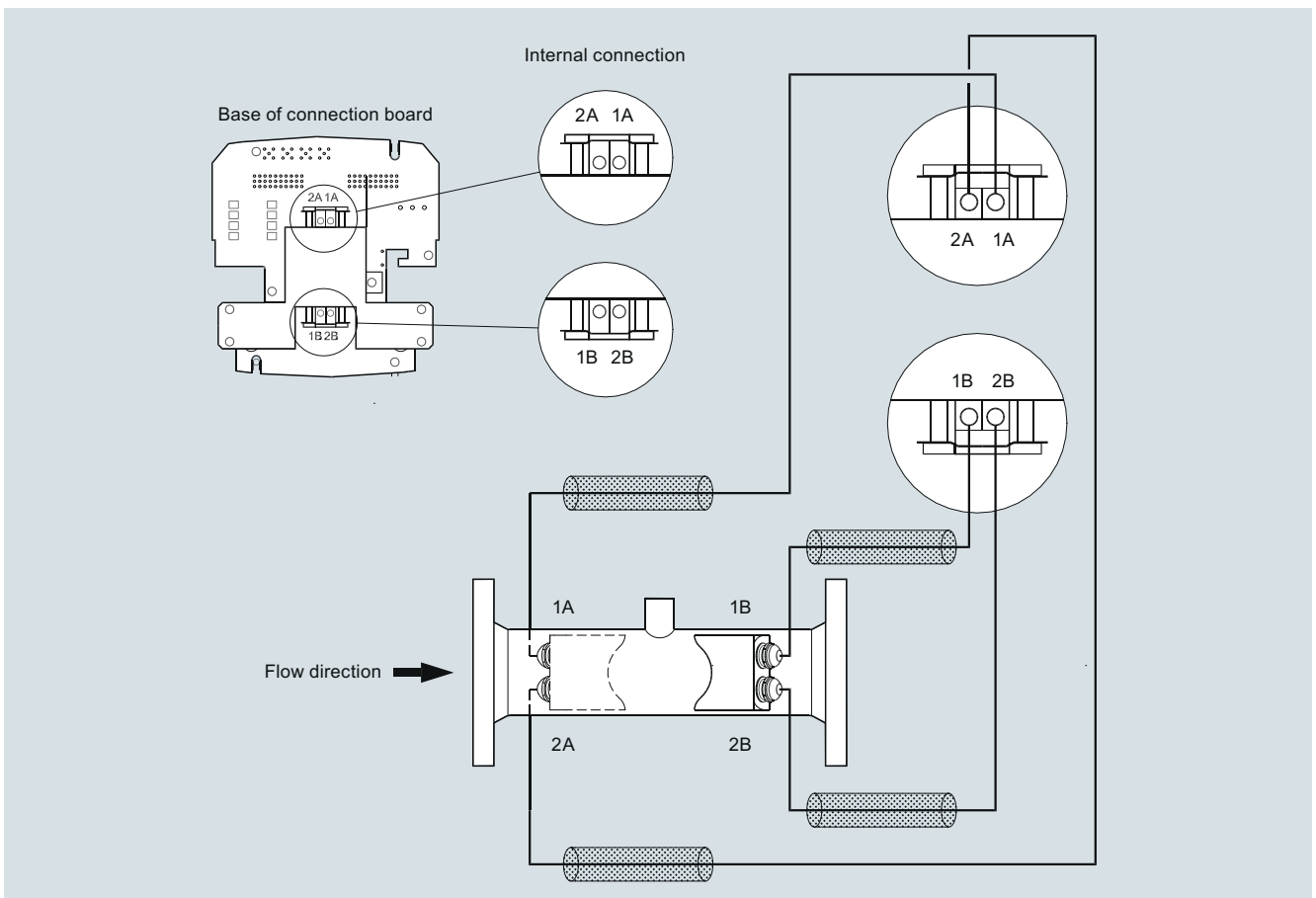
#### Notes:

- Weight for transmitter/electronics 3.3 lb (compact version) or approximately 6.6 lb (remote version including 32.8 ft cable set)
- - Means not available
- All weights are **approximate**
- For flange values - see norm EN 1092-1

**Schematics**



Electrical connection of transmitter SITRANS FUS/FUE380



Electrical connection of sensor SITRANS FUS/FUE380



## Flow Measurement

### SITRANS F US Inline

#### SITRANS FUE950 energy calculator

##### Overview



SITRANS FUE950 is a universal thermal energy calculator, which meets the requirements EN 1434 and has the MID and PTB K7.2 approval for energy metering with the media water.

SITRANS FUE950 has been developed for the SITRANS FUS380/ FUE380 and alternatively MAG 5000/6000 or FST020. SITRANS FUE950 is modular in construction and can by order be fitted with optional modules depending on the application. The FUE950 supports none of the SITRANS FX, FC products and only some of the FUS clamp-on products.

##### Benefits

###### Basic functions

- Prepared for heating, cooling measurement
- Approval for MID for heat metering and PTB K7.2 for cooling
- High-accuracy thermal energy metering, meets EN1434 requirements
- Measured temperature range  $-20 \dots +190 \text{ }^{\circ}\text{C}$  ( $-4 \dots +374 \text{ }^{\circ}\text{F}$ )
- Instantaneous values for energy/volume flow
- Battery or mains powered
- Battery version with battery lifetime of typically up to 10 years
- Optical data interface
- Real date and time
- Auto-detection of 2-wire or 4-wire temperature sensors

###### Additional functions

- Individual tariff functions
- Advanced functions for cooling/heating applications or the combination
- Memory for 24 periods (months, weeks, days)
- Data logger function
- Expandable functionality with 2 optional plug and play add-on modules
- Communication over M-Bus, RS 485 or RS 232

###### Add-on modules

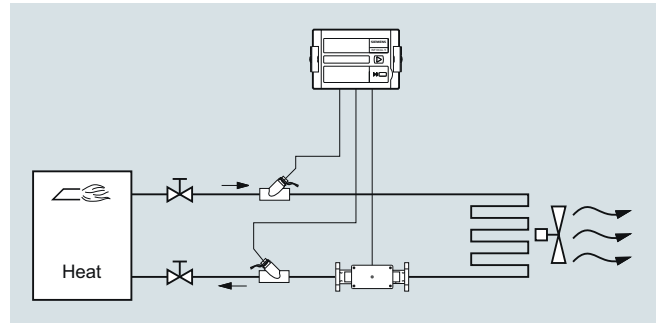
- Plug-in module with 2 extra pulse inputs
- Plug-in module with 2 pulse outputs
- Plug-in module with combination of input and output pulses
- Plug-in module for M-Bus communication
- Plug-in module for RS 232 or RS 485 communication
- Plug-in module with 2 passive current outputs ( $4 \dots 20 \text{ mA}$ )

##### Application

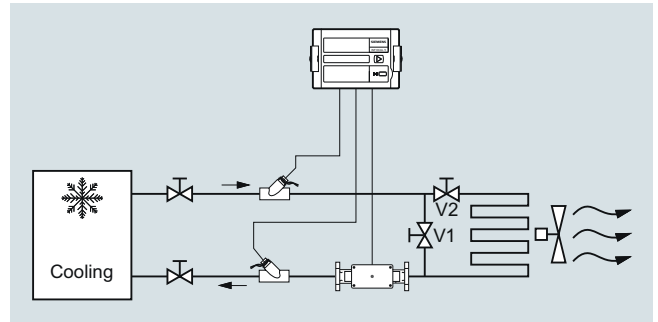
The SITRANS FUE950 is able to handle 3 kinds of applications, means energy calculation in:

- District heating applications
- Chilled water applications
- Combined cooling/heating applications

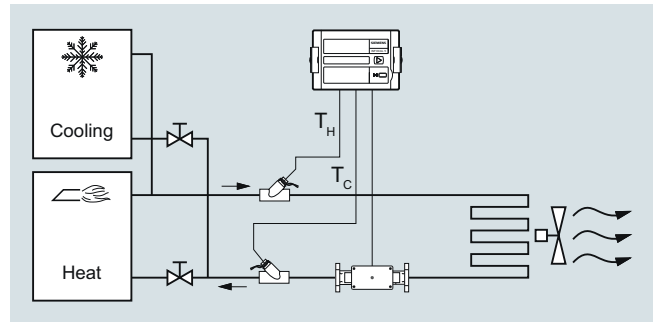
###### Energy metering in heating, hot water applications (code "A" and "B")



###### Energy metering in cooling, chilled water applications (code "C" and "D")



###### Energy metering in combined cooling/heating applications (code "E" and "F")



## Design

SITRANS FUE950 has an easy-read 8-digit LCD display with associated pictograms for the various functions. As the display has been made for several applications, some figures/symbols not used for normal district heating applications will be shown.

SITRANS FUE950 has a push button for simple operation and provides user-friendly control via the various display menu loops. The display will always be configured for the application chosen, and for the selected display settings.

The integrator has an IP54 plastic housing and is designed for wall or panel mounting. The housing comes with prepared rubber gaskets cable entries for fast and easy installation.

### Operation menu loop structure

The FUE950 display has six menu loops and the menus are numbered in the display from 1 to 6. Some display menus consist of two values (to maximum seven) that are shown alternately at 4-second intervals.

The main menu loop no. 1 with the current data, e.g. for energy, volume, flow rate and temperature, is preprogrammed as default setting.

In the combined heating/cooling configuration the menu loop no. 5 (tariff menu loop) will be activated additionally.

### Display and output pulses

Units: MWh, GJ, Gcal, MBtu, m<sup>3</sup>, gal, m<sup>3</sup>/h, GPM, °C, °F and kW; all decimal points are statically (the unit "gal" is shown with factor x 100).

The display unit and the last fractional digit are typical used for the pulse outputs.

## Function

### Technical principle

Calculation of energy is based on the following formula:

$$\text{Energy} = \text{Volume} \times (T_{\text{Hot}} - T_{\text{Cold}}) \times K_{\text{factor}} (T_i)$$

Volume: Volume [m<sup>3</sup>] of a given amount of volume pulses

T<sub>Hot</sub>: Measured temperature in the hot line

T<sub>Cold</sub>: Measured temperature in the cold line

K<sub>factor</sub> (T<sub>i</sub>): Thermal coefficient of media enthalpy and heat content

The energy calculation is made by a counter and depends on temperature difference, pulse input frequency and legal requirements.

The calculator always carries out at least one energy calculation every 2 seconds. If the connected flowmeter has not sent enough pulses the energy calculation and flow indication is also based on the 8 seconds value.

### Data memory

The FUE950 has a history memory of 24 periods (months, weeks, days). The following values are stored monthly, weekly or daily in the EEPROM on the programmed day of 1...31 (via software tool).

• Date/Time	• Volume
• Energy	• Error day counter
• Tariff energy 1	• Maximum monthly flow rate
• Tariff energy 2	• Maximum monthly power
• Tariff definition 1	• Date of maximum monthly flow rate
• Tariff definition 2	• Date of maximum monthly power
• Pulse counter input 1	• Pulse counter input 2
• Operation hours	

### Data logger memory (LOG)

The LOG of the calculator is stored every 24 hours with all cumulative values in the EEPROM. The storage frequency can be selected from various storage intervals (5, 6, 10, 12, 15, 20, 30, 60 minutes or the default setting of 24 hours). The data which are stored in the LOG could be read out using a software tool and can be used for evaluations.

### Extract of possible LOG settings

Storage interval	Values	Number of data records	Recording period
5 minutes	• Error status	440	36.6 hours
15 minutes	• Overload time temperature	440	110 hours
1 hour	• Overload time flow rate	440	18.3 days
24 hours (default setting)	• Forward temperature • Return temperature • Date and time • Energy • Tariff energy 1 • Tariff energy 2 • Tariff definition 1 • Tariff definition 2 • Volume • Error day counter	440	440 days

### Maximal Values

The integrator creates max. values for power and flow rate based on consumption time, which are stored in the EEPROM. The integration intervals are adjustable to 6, 15, 30 or 60 minutes and 24h. Default setting is 60 minutes.

### Tariff/Accounting date function

The calculator includes two independent memories in which the accumulated energy at two programmable tariff dates are stored.

- Last accounting date
- Last but one accounting date

### Values stored

- Energy
- Volume
- Tariff counter 1
- Tariff counter 2
- Pulse counter 1
- Pulse counter 2
- Date

The integrator offers two optional tariff memories for monitoring plant load states. Here it concerns threshold value tariffs. Extensive tariff conditions make it possible to adapt the calculator individually to the required customer-specific applications.

Both tariffs are separately configurable and independent from each other. Energy or time can be measured alternatively per tariff register dependent on the tariff mode adjusted in each case.

With the "time triggered tariff function" the switch-on time and the switch-off time are adjustable independent from each other for each day of the week in steps of 15 minutes.

## Flow Measurement

### SITRANS F US Inline

#### SITRANS FUE950 energy calculator

The following tariff limit types of the tariff function are possible: (This example applies to the display at 1 fractional digits after comma)

Type	Description	Limit	Limit resolution
dT	Temperature difference	1 ... 190 °C	1 °C
-dT	Negative temperature difference	1 ... 190 °C	1 °C
TR	Return temperature (low)	1 ... 190 °C	1 °C
TV	Forward temperature (high)	1 ... 190 °C	1 °C
P	Power	10 ... 2 500 kW	10 kW
Q	Flow	1 ... 255 m <sup>3</sup> /h	1 m <sup>3</sup> /h
FE	"Theoretically forward energy" with return temperature of 0 °C		
Z	"Time triggered" counting energy		
E	"External" counting energy		

#### Error handling and memory

Events such as changes and faults are stored in a non-volatile memory with a capacity of up to 127 entries. The following events are recorded:

- Checksum error
- Temperature measurement error
- Error hours
- Start and end of test mode

If SITRANS FUE950 records an error, this will be automatically indicated by a "alarm symbol" on the display.

To protect the reading data, all the relevant data are saved in a non-volatile memory (EEPROM). This memory saves the measured values, device parameters and types of error at regular intervals.

The following events are recorded:

- Temperature sensor error
- Swapped hot and cold temperature sensors
- Battery low warning
- Power supply failure
- Optical communication warning
- RAM checksum error

#### Outputs/Inputs/Communication

##### Communication interfaces:

SITRANS FUE950 is fitted with an optical infra-red send/receive port in accordance with EN1434/IEC 61107, protocol standard, EN 1434/EN 60870-3 (M-Bus protocol).

A specific optical head with a permanent magnet (IrDA-adapter) in accordance with EN 1434 can be used for readout data or communication with the parameterization software.

##### 2 ports for optionally plug-in modules

The calculator features 2 ports for the plug-in modules.

One slot is for the function modules and the other for the communication modules.

#### Communication modules

The following communication modules are available as options: RS 232 module, RS 485 module and M-Bus module. The RS 232 and RS 485 communication modules are serial interfaces and permit data exchange with the calculator. For this purpose a special data cable is necessary.

The M-Bus module is a serial interface for communication with external devices (M-Bus Master/Centre). According to the M-Bus structure a number of calculators can be connected to a control centre.

#### Pulse input module

Two pulse inputs are available. The pulse value and the unit is configurable for energy, water, gas or electrical meter by parameterization software. Data are separate cumulated in different registers and are also stored on the two accounting day's (Tariff registers).

#### Combined Pulse Input/Output module

Two pulse inputs combined with one pulse output are available on one module. The pulse inputs are configurable with value and the unit by parameterization software.

The pulse output is also programmable using the parameterization software.

#### Pulse output

The calculator provides levels for two optional external pulse outputs, which can be freely programmed using the parameterization software tool.

Default setting is one pulse which occurs per change in the least significant digit in the display with the unit and resolution selected by the device ordering.

Possible pulse output values

- Energy (default setting)
- Volume (default setting)
- Tariff energy 1
- Tariff energy 2
- Tariff condition 1, limit switch
- Tariff condition 2, limit switch
- Energy error
- Volume error
- Volume with specific resolution (0.1, 1.0, 10 or 100)
- Energy with specific resolution (0.1, 1.0, 10 or 100)

#### Combined current output module

Optional module with 2 passive 4 ... 20 mA outputs.

Possible output values:

- Power (default setting for output #1)
- Flow (default setting for output #2)
- Hot, cold or difference temperature

The settings can be configured by parameterization software. The current output module occupies both ports, means no other plug-in module will possible to plug in.

#### Module combinations

The calculator has a group of extension modules for communication and another group of extension modules for additional functionality. These modules are available first selected within the calculator, or for retrofitting in the field.

One single function module as well as one single communication module out of following modules is selectable.

Function modules:

- Pulse input module, 2 inputs
- Pulse output module, 2 outputs
- Combined pulse module 2 inputs, 1 output
- Combined current output module, 2 x passive 4 ... 20 mA (occupies both ports)

Communication modules:

- M-Bus (M-Bus protocol according EN 1434-3)
- RS 232 (M-Bus protocol according EN 1434-3)
- RS 485 (M-Bus protocol according EN 1434-3)

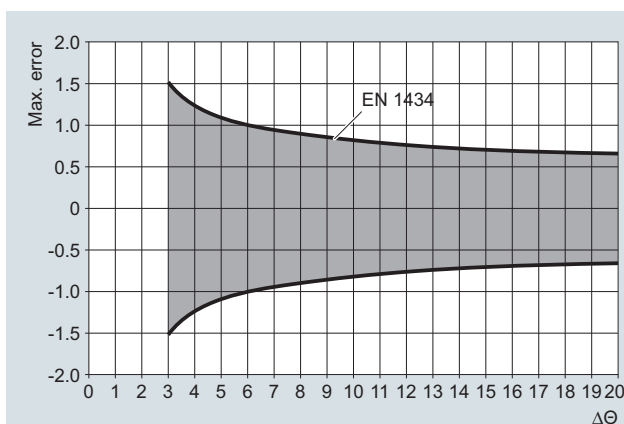
### Integration

SITRANS FUE950 is a multi-purpose energy calculator for media water which meets the requirements of EN 1434. Further, the energy calculator has been specially developed to process volume pulses from SITRANS FUS380/FUE380 or alternatively MAG 5000/6000 or FST020 transmitter.

### Technical specifications

Approval	MID approved in accordance with energy meter EN 1434 and PTB K7.2 (German national cooling approval)	
Approved temperature range		
• Heating	0 ... 180 °C (32 ... 356 °F)	
• Cooling	0 ... 105 °C (32 ... 221 °F)	
Absolute temperature range	-20 ... +190 °C (-4 ... -374 °F)	
Differential temperature		
• Heating	3 ... 177 K (starting at 0.1 K)	
• Cooling	3 ... 102 K	
Measuring accuracy	Meets requirements of EN 1434 Typically max. $\pm (0.5 + 3K/\Delta\Theta)$ [%] of measured value	
Measuring rates		
• Battery type D-cell	Volume: 1 s, temperature: 4 s	
• Mains versions	Volume: 1/8 s, temperature: 2 s	
Flow range	Depends on pulse input value (IN0), see "Selection and Ordering data".	
Power range value	Depends on pulse input value as follows:	
	Pulse input value (I/P or gal/P)	Max power [kW]
	1	15 000
	2.5	15 000
	5	15 000
	10	150 000
	25	150 000
	50	150 000
	100	1 500 000
	250 *)	1 500 000
	500 *)	1 500 000
	1 000 *)	15 000 000
	*) not available for gal/pulse	

### Typical accuracy of FUE950



### User interface (always included)

Display	8-digit LCD display with associated pictograms/symbols
Units	MWh, GJ, Gcal, MBtu, m <sup>3</sup> , m <sup>3</sup> /h, GPM, gal, °C, °F, kW, MBtu/h (gal is shown with factor x 100)
Totalizer value range	99 999 999 or 9 999 999.9 (0 and 1 digit after comma). Display digits: Flow in 6 digits; Volume, power and energy in 8 digits
Values	Power, energy, volume, flow rate, temperatures
Push button	Single push button for the menu controlling
Optical interface IrDA interface	ZVEI optical interface with M-Bus protocol as per EN 1434, connection via separate IrDA-adaptor baud rate: 300 or 2400

### Rated operation conditions

Enclosure	IP54 in accordance with IEC 529
Material	
• Housing	C Lexan 141R (or similar); colors: light gray (top part) and black (bottom part)
• Pipe/wall fitting	PA 6.6 GF25 (or similar)
• Other plastic parts	ABS Cicolac GPM500 (or similar)
• Gaskets	Neoprene and rubber cable bushings: EPDM 50
• Rubber cable bushings	EPDM 50
Temperature	
• Ambient	5 ... 55 °C (41 ... 131 °F)
• Storage	-25 ... +70 °C (-13 ... +158 °F) Relative ambient humidity < 93 %
Environment class	
• Mechanic class	M1/M2
• Electromagnetic class	E1/E2 (MID) or C (DIN EN 1434)

### Temperature input (always included)

Function	The temperature sensors must be connected to terminals 1-5 and 6-2 (TH) and 3-7 and 8-4 (TC) depending on cable type (2-wire or 4-wire).
Temperature range Absolute measuring range	-20 ... 190 °C (-4 ... 374 °F) for T <sub>H</sub> and T <sub>C</sub>
Temperature difference	Start 0.1 K, min. 3 K, max. 177 K
Measurement cut-off	0.125 K 16-bit digital resolution AD converter
Display resolution	T <sub>H</sub> and T <sub>C</sub> : 0.1 K, $\Delta T$ : 0.1 K
Sensor types	Pt100 or Pt500 as 2-wire or 4-wire; Standard is Pt500. Sensor cable length: up to 10 m (according EN 1434 and MID-type approval).
Sensor connection	4-wire or 2-wire; auto detection of connection version

### Flow input (IN0) (always included)

Function	Used as standard for flow input of the external flowmeter. The input is marked as 10 (+ Flow Pulse), 11 (- Gnd) on the terminal strip. Note: The pulse input value selection must be the same as the pulse output setting of the flowmeter.
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## Flow Measurement

### SITRANS F US Inline

#### SITRANS FUE950 energy calculator

Pulse value	1 ... 1 000 l/pulse or 1 ... 100 gal/pulse, selection by corresponding Order code. Will be shown at the device label	Possible pulse output selection	<ul style="list-style-type: none"> <li>• Energy (default setting for 'Out1')</li> <li>• Volume (default setting for 'Out2')</li> <li>• Tariff energy 1</li> <li>• Tariff energy 2</li> <li>• Tariff condition 1 (limit switch)</li> <li>• Tariff condition 2 (limit switch)</li> <li>• Energy error</li> <li>• Volume error</li> <li>• Volume with specific display resolution (or with factor 0, 1, 10 or 100 thereof)</li> <li>• Energy with specific display resolution (or factor 0.1 thereof)</li> </ul>
Pulse frequency	≤ 100 Hz (200 Hz)		
Pulse ON-time	≥ 3 ms		
Pulse OFF-time	≥ 2 ms		
Type	Active pulse input		
Terminal voltage	3.6 V DC (supplied internally by FUE950)		
Flowmeter installation place	The flowmeter installation place can be in the hot line or cold line ("forward or return pipe") selected by corresponding Order code. The "installation place" will be shown at the device display and nameplate		
Connected cable	Max. 10 m (shielded cables are highly recommended)		
<b>Ports for option modules</b>			
Type	The calculator features 2 ports for optional plug-in modules.		
Function modules (Port 1 or 2)	<ul style="list-style-type: none"> <li>• Pulse input module, 2 inputs (In1, In2)</li> <li>• Pulse output module, 2 outputs (Out1, Out2)</li> <li>• Combination module of 2 inputs (In1, In2) and 1 output (Out1)</li> </ul>		
Current output module (Port 1)	2 passive 4 ... 20 mA (#1, #2) (occupies both port 1 and 2)		
Communication modules (Port 1 or 2)	M-Bus, RS 232 or RS 485 (M-Bus protocol, according EN 1434-3)		
<b>Pulse output</b>			
Function	The module contains connections for 2 pulse outputs, which can be programmed as desired using a software tool. The pulse outputs are marked as standard as O1, 'gnd' and O2, 'gnd' on the terminal strip and Out1 respectively Out2 in the display.		
Type	Passive "open collector" pulse output, outputs potential isolated to each other		
Pulse value	Last significant digits of the display (unit/pulse), selection by corresponding Order code and setting can be read via display menu, settings changeable via software tool		
Pulse output 1			
• Pulse frequency	≤ 4 Hz		
• Pulse width	125 ms ± 10 %		
• Pulse duration	125 ms ± 10 %		
• Pulse break	≥125 ms -10 %		
Pulse output 2			
• Pulse frequency	≤ 100 Hz, depending on the selected pulse length		
• Ratio	Pulse duration/pulse break ~1:1		
Pulse length	5, 10, 50, 100 ms (default: 5 ms)		
External voltage supply	3 ... 30 V DC		
Current	≤ 20 mA with a residual voltage of ≤ 0.5 V		
		<b>Pulse input</b>	
		Function	Add-on module for two additional counters. The pulse input 1 is marked as I1, 'gnd' and the input 2 as I2, 'gnd' on the terminal strip and indicated in the display as separate registers IN1 and IN2 and can also be transferred via the communication modules.
		Type	Passive "open collector" pulse inputs, outputs not potential isolated to each other, data are separate cumulated in different registers and are also stored on the two accounting day's.
		Pulse value	Pulse value and the unit are configurable for energy, water, gas or electrical meter by a software tool Default: Pulse input 0.1 m <sup>3</sup> or 1 gal (if unit 'gal' is ordered with the Z-option "L05")
		Pulse frequency	≤ 8 Hz
		Pulse length	≥ 10 ms
		External voltage supply	3 V DC (supplied internally by FUE950)
		Current	based on R <sub>i</sub> = 2.2 MΩ
		Cable length	< 10 m connection limit
		<b>Current output module</b>	
		Function	The module contains connections for 2 passive current outputs, which can be programmed individually using the software tool. The outputs are marked „#1" and „#2" with corresponding polarity „+" and „-" on the terminal strip. The module will be connected on port 1 only, but both ports are occupied by the module.
		Terminal voltage	External supply: 10 ... 30 V DC (passive output)
		Signal range	4 ... 20 mA; 4 mA = 0 value and 20 mA = default maximum values (for #1: Power in kW and for #2: Flow with the max. values and selected unit). Defaults: For power it is the max. selectable value x 100 000 the last digit of display (e. g. 20 mA = 10 000 kW (1 digit res.) or 100 000 kW (0 digit res.). For flow it is the max. selectable value x 10 000 the last digit of display (e. g. 20 mA = 1 000.0 m <sup>3</sup> /h (1 digit res.) or 10 000 m <sup>3</sup> /h (0 digit res.).



**SITRANS FUE950 energy calculator**

Load	Max. 800 Ω
Upper limit	Up to 20.5 mA (exceed causes the error current value)
Signal on alarm	Errors are indicated with 3.5 mA or 22.6 mA (programmable, default: 3.5 mA)
Output values	Power, flow, temperature (configuring via software tool; default: for #1: Power and for #2: Flow)

<b>M-Bus output</b>	
Type	The optional M-Bus plug-in module is a serial interface for communication with external devices (M-Bus Repeater)
Protocol	M-Bus according EN 1434-3
Connection	The connection is not polarity-conscious and is electrically isolated, connection of 2 x max. 2.5 mm <sup>2</sup> wires, 300 or 2400 baud (auto baud detection), current drawn: one M-Bus load.  M-Bus address: Each port has its own primary M-Bus address (Prim1 = the last two digits of the serial number; Prim2 = 0). The secondary address is unique for each calculator and is factory-set to equal the serial number.

<b>RS 232 output</b>	
Type	The optional module RS 232 is a serial interface for data transmission with external devices, e.g. PC; baud rate: 300 or 2400. The module contains a 3-pole terminal strip with terminals marked 62 (TX), 63 (RX) and 64 (GND). For this purpose a special data cable is necessary.
Protocol	M-Bus according EN 1434-3
Connection	The module contains a 3-pole terminal strip with terminals marked 62, 63, 64 (max. 2.5 mm <sup>2</sup> ); Connected cable length: max 10 m; For communication with a PC a special adapter cable is required (Article No. A5E02611774).

<b>RS 485 output</b>	
Function	The optional RS 485 module is a serial interface for data transmission with external devices, e.g. PC; baud rate: 2400. The module contains a 4-pole terminal strip with terminals marked D+, D-, Vcc and GND.
Protocol	M-Bus protocol according EN 1434-3
Connection	Terminals D+ and D-; electrically isolated; 2400 baud only.  An external supply of 12 V DC ± 5 V (<5 W) is needed for the module (terminals Vcc and GND). The module terminals are max. for 2.5 mm <sup>2</sup> wires. Connected cable length: max. 10 m

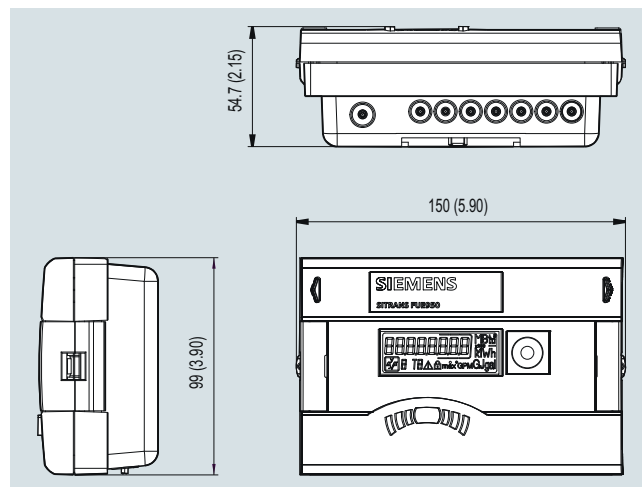
<b>Power consumption</b>	
230 V and 24 V versions	Typical current appr. 0.15 VA
3.6 V D-cell battery	Typical battery lifetime 10 years under normal conditions (no add-on modules, max. 40 °C ambient temperature)
<b>Supply data</b>	
Battery, 3.6 V type (option)	3.6 V lithium D-cell, battery lifetime typically 16 years with independently powered flowmeter
230 V AC module (option)	Plug-in module for 230 V AC (195 ... 253 V AC), 50/60 Hz (incl. battery backup)
24 V AC module (option)	Plug-in module for 24 V AC (12 ... 30 V AC) (incl. battery backup)
Battery backup (option)	Only with mains supply modules by internal 3.0 V lithium battery (type CR 2032) Displayed values, date and time are still updated, but the measuring functions have stopped, including the flow rate measurement. Communication via optional modules M-Bus, RS 485, RS 232 or optical interface is maintained, affecting the backup battery lifetime.

**Accessories/Software**

The parameterization software based on the M-Bus is a convenient tool for handling the calculator. It runs on Windows and is used for configuration of the calculator functionality, reading out different memories, printing out calculator logs. For further details please contact your local Siemens representative.

A specific optical head with a permanent magnet in (IrDA adapter with bluetooth) accordance with EN 1434 can be used for programming/altering programming of readout data, configuration data, etc. The reader head can also be used to change measuring data.

**Dimensional drawings**



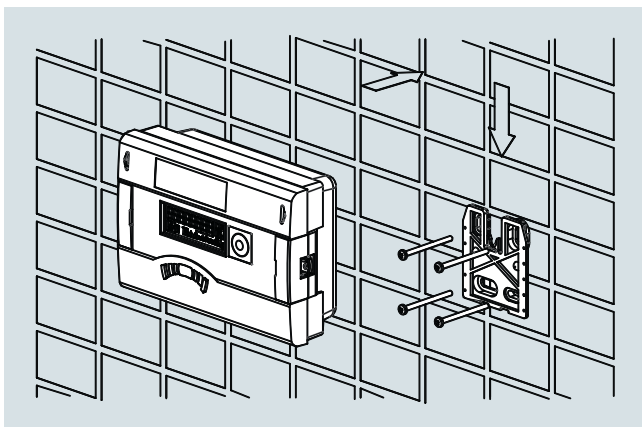
SITRANS FUE950, dimensions in mm (inch)

## Flow Measurement

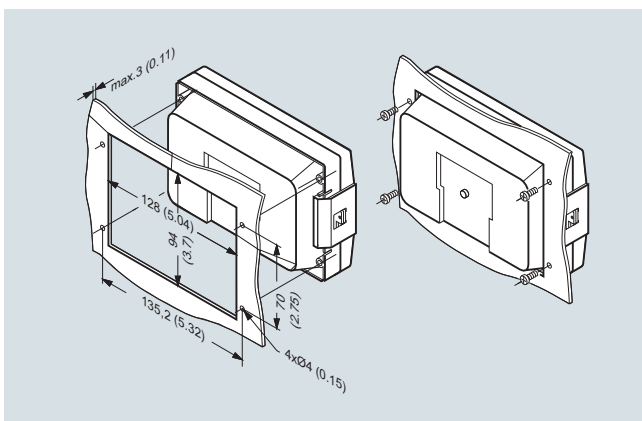
### SITRANS F US Inline

#### SITRANS FUE950 energy calculator

3



Wall mounting



Panel mounting, dimensions in mm (inch)

#### Pt500 temperature sensor pairs

##### Application

The temperature sensor set is designed for use with the Siemens energy calculator type SITRANS FUE950 for measurement of the energy consumption in a district heating or cooling net.

Temperature sensors are one of the integral components of every thermal energy meter in heating or cooling applications. They are used for determining temperature changes in fluids due to energy taken from or supplied to the loop. The temperature is thus measured by mounting temperature sensors upstream and downstream from the point where the exchange in the thermal energy of the system is.

To ensure an accurate measurement of the temperature difference according to MID (EN 1434) or PTB K7.2 the sensors are delivered as matched pairs.

By selection with the corresponding Order code the Pt500 sensor pair sets can be delivered with heating approval or with approvals for combined heating/cooling applications.

#### Technical specifications

##### Temperature sensor pairs:

##### 2-wire Pt500

Pt500 2-wire temperature sensor pair (EN 1434)	
Measuring insert	Pt500 temperature sensor, EN 60751, tolerance class B, 2-wire
Pairing	Paired to EN 1434 (10 ... 130 °C/14 ... 266 °F)
Media temperature	0...150 °C (32 ... 302 °F)
Response time $T_{0,5}$	See sensor pocket specifications
Medium	Typically heating water
Pressure rating	See sensor pocket specifications
Protection	IP65
Pipe material	AISI 304Ti/1.4303
Dimension	Ø 6 mm
Sensor tube length	50 mm
Cable length	Up to 10 m (32.8 ft), fixed connected silicon cable, 2 connection wire terminals, terminal sleeves to DIN 46228

##### 4-wire Pt500

Pt500 4-wire temperature sensor pair (with MID and PTB K7.2 approval)	
Measuring insert	Pt500 temperature sensor, EN 60751, tolerance class to ISO 751 Class B; 4-wire
Pairing	Matched paired according to EN 1434 at 10, 75 and 140 °C (50, 167 and 284 °F)
Type approval	MID (DE-06-MI004-PTB011) and PTB K7.2 (PTB 22.77/09.01). Only to be mounted with related sensor pockets according to the type approvals.
Media temperature	0...150 °C (32 ... 302 °F)
Permissible temp. pair range for ΔT	<ul style="list-style-type: none"> <li>• Heating 3 ... 150 K</li> <li>• Cooling 3 ... 85 K</li> </ul>
Medium	Approved for heating/cooling water
Protection	IP65
Environment	<ul style="list-style-type: none"> <li>• Mechanic class M3</li> <li>• Electromagnetic class E1 (MID)</li> </ul>
Pressure rating	See sensor pocket specifications
Material	<ul style="list-style-type: none"> <li>• Protective tube Stainless steel AISI 304Ti/1.4571 (or similar), diameter of protective tube: 6 mm</li> <li>• Connector cable Silicon cable, 4 connection wire terminals, terminal sleeves to DIN 46228</li> </ul>
Sensor tube length	140 or 230 mm (5.51 or 9.06 inch)
Cable length	5 m (16.4 ft), fixed connected



### Sensor pockets

#### Stainless steel sensor pocket (for 4-wire Pt500 types only - standard)

Media temperature	0 ... 150 °C (32 ... 302 °F)
Approval	Approved only together with 4-wire sensors
Medium	Approved for heating/cooling water; up to max. 5 m/s flow velocity
Pressure rating	PN 40
Length	Face-to-face length 120/135 and 210/225 mm (4.72"/5.23" and 8.27"/8.86")
External diameter	Protective tube 8/11 mm (0.32"/0.43")
Internal diameter	Protective tube 6 mm (0.24")
Pipe connection	Thread G 1/2" (with sealing screw for sensor)
Material	Protective tube AISI 316Ti/1.4571 (or similar)
Use	<ul style="list-style-type: none"> <li>Use with related 4-wire Pt500 sensors only (according type approval)</li> <li>For flow velocities up to 5 m/s</li> <li>Recommended to install with welded sleeve (according to EU standard)</li> </ul>

#### Stainless steel sensor pocket (for 2-wire Pt500 types only - some only available as spare part)

Media temperature	0 ... 180 °C (32 ... 356 °F)				
Medium	Approved for heating water				
Response time $T_{0.5}$	Typically 13 s at 0.4 m/s without pasta Typically 5 s at 0.4 m/s with pasta				
Pressure rating	PN 25				
Length	L1 (mm)	92	127	168	223
	L (mm)	82	117	155	210
Material	Stainless steel: AISI 316Ti/1.4571				
Use	For 2-wire Pt500 types only				

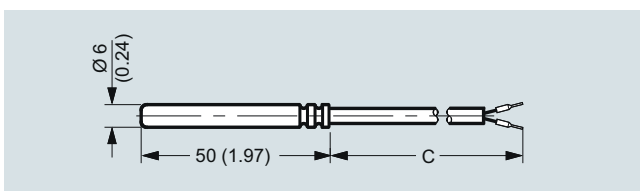
#### Brass sensor pocket (for 2-wire Pt500 types only - some only available as spare part)

Media temperature	0 ... 150 °C (32 ... 302 °F)			
Medium	Approved for heating water			
Response time $T_{0.5}$	Typically 9 s at 0.4 m/s without pasta Typically 5 s at 0.4 m/s with pasta			
Pressure rating	PN 16			
Length	L1 (mm)	47	92	127
	L (mm)	40	82	117
Material	Brass: CuZn <sub>40</sub> Pb <sub>2</sub> (Ms58)			
Use	For 2-wire Pt500 types only			

### Dimensional drawings

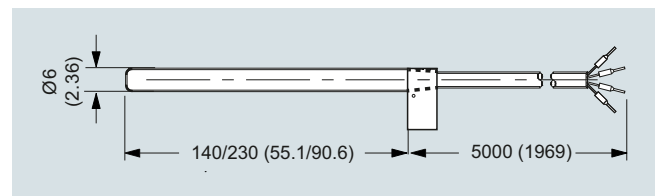
#### Pt500 2-wire temperature sensor pair (EN 1434)

Cable length 2, 3, 5 or 10 m ('C' at the dimensional drawing)



Pt500 2-wire temperature sensor, dimensions in mm (inch)

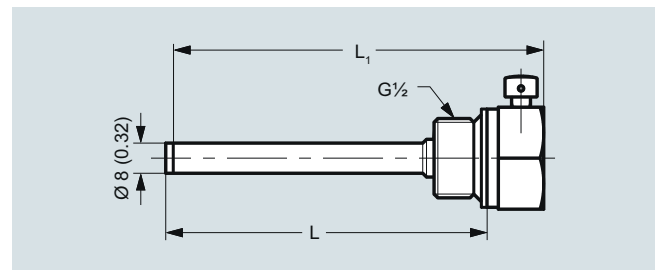
#### Pt500 4-wire temperature sensor pair (with MID and PTB K7.2 approval)



Pt500 4-wire temperature sensor, dimensions in mm (inch)

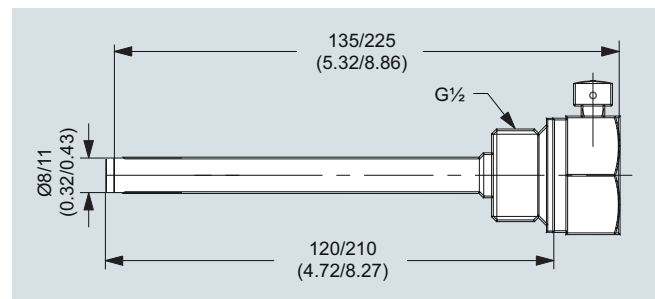
#### Stainless steel sensor pocket (for 2-wire Pt500 types only)

Length	L1 (mm)	92	127	168	223
	L (mm)	82	117	155	210



Sensor pocket (for 2-wire Pt500 types only), stainless steel, dimensions in mm (inch)

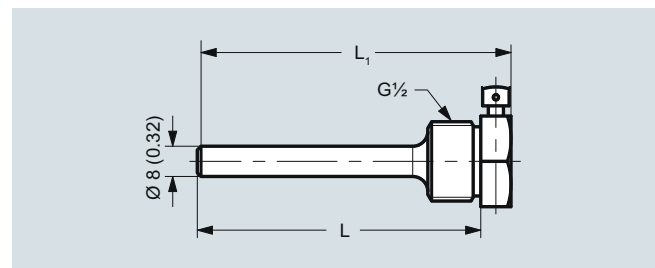
#### Stainless steel sensor pocket (for 4-wire Pt500 types only)



Stainless steel sensor pocket, dimensions in mm (inch)

#### Brass sensor pocket (for 2-wire Pt500 types only)

Length	L1 (mm)	47	92	127
	L (mm)	40	82	117



Sensor pocket, brass (for 2-wire Pt500 types only), dimensions in mm (inch)

## Flow Measurement

### SITRANS F US Inline

#### SITRANS FUE950 energy calculator

##### Selection and Ordering data

Article No.

Order code

##### Energy calculator SITRANS FUE950, MID or PTB K7.2 custody transfer approved

7ME3480 - - - - -

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

##### Flow input setting (IN0)

The pulse input value selection must be the same as the pulse output setting of the selected flowmeter. To get optimal function and performance the pulse value must be selected as low as possible according to the maximum flow rate.

The following calculation formula can be used for determining the lowest pulse value at a pulse length of 5 ms:  $L/\text{pulse} > Q_{\max} (\text{m}^3/\text{h})/360$ .

For example  $Q_{\max} = 300 \text{ m}^3/\text{h}$ ;  $L/\text{pulse} > 300/360$ ;  $L/\text{pulse} > 0.83$ ; therefore the pulse value must be 1 l/pulse.

Pulse input in l/pulse or in gal/pulse (with option L05)	Flow limit $Q_{\max}$ in $\text{m}^3/\text{h}$	Flow limit $Q_{\max}$ in GPM *) (with option L05)
1	360	6 000
2.5	900	15 000
5	1 800	30 000
10	3 600	60 000
25	9 000	150 000
50	18 000	300 000
100	36 000	600 000
250	90 000	-
500	180 000	-
1 000	360 000	-

\*) GPM = Gallons per minute

2 A  
2 B  
2 C  
3 A  
3 B  
3 C  
4 A  
4 B  
4 C  
5 A

##### Calculator application/Flowmeter installation place

For heating, flowmeter in return pipe (cold pipe), typical standard

For heating, flowmeter in forward pipe (hot pipe)

For cooling, media water, flowmeter in forward pipe (cold pipe)

For cooling, media water, flowmeter in return pipe (hot pipe)

For combined cooling/heating, flowmeter in forward pipe (hot pipe as heating) (MID conformity declaration for heating)

For combined cooling/heating, flowmeter in return pipe (cold pipe as heating) (MID conformity declaration for heating)

A  
B  
C  
D  
E  
F

##### Temperature sensor type

Pt500 setup, no sensor pair included (standard)

Pt500 setup and Pt500 sensor pair (6/140 mm), 4-wire with 5 m connection cable, 6 mm sensor diameter and 140 mm sensor length. MID approved DE-06-MI004-PTB011, PTB approved 22.77/09.01, incl. factory test report (mentioned approvals are only valid if temp. sensors are used with the applicable temperature sensor pockets).

Pt500 setup and Pt500 sensor pair (6/230 mm), 4-wire with 5 m connection cable, 6 mm sensor diameter and 230 mm sensor length. MID approved DE-06-MI004-PTB011, PTB approved 22.77/09.01, incl. factory test report (mentioned approvals are only valid if temp. sensors are used with the applicable temperature sensor pockets).

Pt100 setup, no sensor pair included

Pt 500 setup and PT500 sensor pair (6/50 mm), 2-wire type incl. 5 m cable, 6 mm sensor diameter and 50 mm length, with MID approval (only for use with the applicable temperature sensor pockets)

Pt 500 setup and PT500 sensor pair (6/50 mm), 2-wire type incl. 10 m cable, 6 mm sensor diameter and 50 mm length, with MID approval (only for use with the applicable temperature sensor pockets)

0  
3  
4  
5  
6  
7

##### Temperature sensor pocket sets: (for 6 mm sensor diameter)

No pockets (standard)

Brass pockets for 6 mm 2-wire sensors, length 82/92 mm, G½ inch, max. PN 16 (2 pcs.)

Stainless steel pocket, 120/135 mm length for 6 mm sensor diameter, max. PN 40 and max. 5 m/s (2 pcs. for 140 mm 4-wire sensors above)

Stainless steel pockets for 6 mm 2-wire sensors, length 117/127 mm, G½ inch, max. PN 25 (2 pcs.)

Stainless steel pocket, 210/225 mm length for 6 mm sensor diameter, max. PN 40 and max 5 m/s (2 pcs. for 230 mm 4-wire sensors above)

Stainless steel pockets for 6 mm 2-wire sensors, length 155/168 mm, G½ inch, max. PN 25 (2 pcs.)

0  
2  
5  
6  
7  
8

##### Voltage supply

Battery 3.6 V DC (Lithium D-cell type) (standard)

Mains power module for 230 V AC supply (incl. back-up battery)

Mains power module for 24 V AC supply (incl. back-up battery)

No power supply module (power supply ordering separate)

1  
2  
3  
4

3

Selection and Ordering data	Article No.	Order code
<b>Energy calculator SITRANS FUE950, MID or PTB K7.2 custody transfer approved</b>	7ME3480 - - - - -	
<b>Option modules</b>		
No module (standard)		A
<u>1 module (communication module)</u>		
M-Bus module		B
RS 232 module (M-Bus protocol)		C
RS 485 module (M-Bus protocol)		D
<u>1 module (function module)</u>		
Pulse output, 2x output (Out1 "Energy" and Out2 "Volume")		E
Pulse input, 2x input (In1 and In2)		F
Pulse out-/input combination, 2x input and 1x output		G
<u>Combination of 2 modules (communication and function module)</u>		
M-Bus module and Pulse output, 2x output (Out1 "Energy" and Out2 "Volume")		H
M-Bus module and Pulse input, 2x input (In1 and In2)		J
M-Bus module and Pulse out-/input combination, 2x input and 1x output		K
RS 232 module (M-Bus) and Pulse output, 2x output (Out1 "Energy" and Out2 "Volume")		L
RS 232 module (M-Bus) and Pulse input, 2x input (In1 and In2)		M
RS 232 module (M-Bus) and Pulse out-/input combination, 2x input and 1x output		N
RS 485 module (M-Bus) and Pulse output, 2x output (Out1 "Energy" and Out2 "Volume")		P
RS 485 module (M-Bus) and Pulse input, 2x input (In1 and In2)		Q
RS 485 module (M-Bus) and Pulse out-/input combination, 2x input and 1x output		R
Combination current output module, 2x passive 4 ... 20 mA (Out 1 "Power", Out 2 "Flow") (occupies both module Ports 1 and 2)		S
<b>Display units and resolutions</b>		
MWh & kW, m <sup>3</sup> , m <sup>3</sup> /h in 2 digit resolution; Temperature: no decimal figures		C
MWh & kW, m <sup>3</sup> , m <sup>3</sup> /h in 1 digit resolution; Temperature: no decimal figures		D
MWh & kW, m <sup>3</sup> , m <sup>3</sup> /h in 0 digit resolution; Temperature: no decimal figures		E
GJ & kW, m <sup>3</sup> , m <sup>3</sup> /h in 2digit resolution; Temperature: no decimal figures		H
GJ & kW, m <sup>3</sup> , m <sup>3</sup> /h in 1 digit resolution; Temperature: no decimal figures		J
GJ & kW, m <sup>3</sup> , m <sup>3</sup> /h in 0 digit resolution; Temperature: no decimal figures		K
Gcal & kW, m <sup>3</sup> , m <sup>3</sup> /h in 2 digit resolution; Temperature: no decimal figures		M
Gcal & kW, m <sup>3</sup> , m <sup>3</sup> /h in 1 digit resolution; Temperature: no decimal figures		N
Gcal & kW, m <sup>3</sup> , m <sup>3</sup> /h - in 0 digit resolution; Temperature: no decimal figures		P
MBTU & MBTU/h, m <sup>3</sup> , m <sup>3</sup> /h in 2 digit resolution; Temperature: no decimal figures		Q
MBTU & MBTU/h, m <sup>3</sup> , m <sup>3</sup> /h in 1 digit resolution; Temperature: no decimal figures		R
MBTU & MBTU/h, m <sup>3</sup> , m <sup>3</sup> /h - in 0 digit resolution; Temperature: no decimal figures		S
<b>Verification/Approval</b>		
Without type approval mark, neutral label (standard))		0
With MID type approval mark (only for heating combinations, selection "A, B, E and F")		1
With MID approval mark and first MID verification (only for heating, selection A, B, E and F")		2
Cooling approval mark, German national cooling approval according PTB-TR-K7.2 (only for cooling and media water, selection "C and D")		7
Cooling approval mark, German national cooling approval according PTB-TR-K7.2 and first verification (only for cooling and media water, selection "C and D")		8
<b>Further designs</b>		
Please add "-Z" to Article No. and specify Order code		
<b>Certificate</b>		
Including factory test report (certificate) of FUE950	ALWAYS INCLUDED	
<b>Cooling, setup for non water</b>		
Water/glycol setting for media type "Tyfocor LS (R)" (only with neutral label, no verification and approval)		C 0 2
<b>Optional settings/programming</b>		
Tariff function settings (specify in clear text, up to max. 20 characters)		D 0 2
Pulse output setting of option module (specify in clear text, up to max. 20 characters)		D 0 6
Pulse input setting of option module (specify in clear text, up to max. 20 characters)		D 0 8
Pulse input setting of 4 ... 20 mA option module (please specify 20 mA related type and value in clear text, up to max. 20 characters)		D 1 0
<b>Special display units</b>		
Flow in 'GPM' and Volume in 'gal' (x100) (digits/resolution as selected above, only with 0 digit resolution)		L 0 5
Temperature in deg. F (digit resolution as selected above)		L 3 1

## Flow Measurement

### SITRANS F US Inline

#### SITRANS FUE950 energy calculator

#### Flowmeter SITRANS FUE950 operating instructions, accessories and spare parts

##### Operating instructions

Description	Article No.
• English	<b>A5E03424739</b>

All literature is available to download for free, in a range of languages, at [www.siemens.com/processinstrumentation/documentation](http://www.siemens.com/processinstrumentation/documentation)

##### Accessories

Description	Article No.
Infrared optical head (Bluetooth type) for data acquisition & programming of FUE950	<b>A5E02611768</b>
Bracket for SITRANS FUE950 wall mounting (20 pcs.)	<b>A5E02611769</b>
Cable for data acquisition via RS 232 PC/D-sub 9F/3 wire	<b>A5E02611774</b>

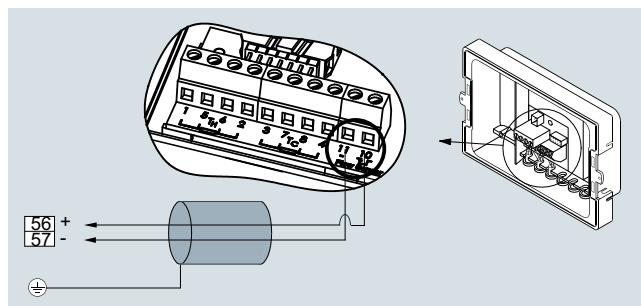
##### Spare parts

Description	Article No.
<b>Add-on modules for FUE950 (only for 7ME348 versions)</b>	
Pulse input module (2 inputs)	<b>A5E03461432</b>
Pulse output module (2 outputs)	<b>A5E03461436</b>
Combined pulse in-/output module (2 inputs and 1 output)	<b>A5E03461437</b>
RS 232 module (M-Bus protocol)	<b>A5E03461459</b>
RS 485 module (M-Bus protocol)	<b>A5E03461512</b>
M-Bus module	<b>A5E03461516</b>
Combined current output module, 2 x passive 4 ... 20 mA	<b>A5E03461583</b>
Connection cable for option modules (types: Pulse, RS 232/RS 485, M-Bus, mA) (special connection cable with 2 plugs)	<b>A5E03461585</b>
<b>Power supply for FUE950 (only for 7ME348 versions)</b>	
3.6 V D-cell battery for SITRANS FUE950	<b>A5E03461708</b>
230 V AC supply module (incl. internal fuse T50 mA L 250 V and back-up battery) for SITRANS FUE950	<b>A5E03461717</b>
24 V AC supply module for SITRANS FUE950, incl. back-up battery	<b>A5E03461719</b>
<b>Pocket for temperature sensors Pt500 (for related 4-wire Pt500 type only, 1 pc.)</b>	
Stainless steel pocket (1 pc.), 135 mm length for 6 mm sensor diameter, max. PN 40 and max. 5 m/s (recommended for 140 mm sensor length).	<b>A5E03462868</b>
Stainless steel pocket (1 pc.), 225 mm length for 6 mm sensor diameter, max. PN 40 and max. 5 m/s (recommended for 230 mm sensor length).	<b>A5E03462870</b>

Description	Article No.
<b>Pt500 4-wire temperature sensor pair, with MID MI004 and PTB K7.2 approvals and verification (for related 4-wire sensor pocket types only)</b>	
Pt500 sensor pair (6/140 mm), 4-wire with 5 m connection cable, 6 mm sensor diameter and 140 mm sensor length. MID approved DE-06-MI004-PTB011, PTB approved 22.77/09.01 (mentioned approvals are only valid if temp. sensors are used with the applicable temperature sensor pockets).	<b>A5E03462872</b>
PT500 sensor pair (6/230 mm), 4-wire with 5 m connection cable, 6 mm sensor diameter and 230 mm sensor length. MID approved DE-06-MI004-PTB011, PTB approved 22.77/09.01 (mentioned approvals are only valid if temp. sensors are used with the applicable temperature sensor pockets).	<b>A5E03462878</b>
<b>FUE950 enclosure (only for 7ME348 versions)</b>	
Bottom part of FUE950 enclosure (1 pc.)	<b>A5E03461508</b>
Snap fit for FUE950 enclosure (1 pc.)	<b>A5E30461731</b>
<b>Pocket for Pt500 temperature sensors (for corresponding 2-wire Pt500 types only, 1pc.)</b>	
Brass pocket 6 mm, G½B x 40 mm (PN 16), 1 pc.	<b>A5E02611778</b>
Brass pocket 6 mm, G½B x 85 mm (PN 16), 1 pc.	<b>A5E02611779</b>
Brass pocket 6 mm, G½B x 120 mm (PN 16), 1 pc.	<b>A5E02611780</b>
Stainless steel 6 mm, G½B x 85 mm (PN 25), 1 pc.	<b>A5E02611781</b>
Stainless steel 6 mm, G½B x 120 mm (PN 25), 1 pc.	<b>A5E02611783</b>
Stainless steel 6 mm, G½B x 155 mm (PN 25), 1 pc.	<b>A5E02611792</b>
Stainless steel 6 mm, G½B x 210 mm (PN 25), 1 pc.	<b>A5E02611793</b>
<b>Pt500 temperature sensor pair, 2-wire cable, 6 mm sensor diameter, with MID/EN-approval (for corresponding 2-wire sensor pocket types only)</b>	
Cable length:	
2 m	<b>A5E02611794</b>
3 m	<b>A5E02611795</b>
5 m	<b>A5E02611796</b>
10 m	<b>A5E02611798</b>

##### Schematics

#### Electrical connection for SITRANS FUS380/FUE380/FUE950 and MAG 5000/6000/FUE950



The diagram shows the connection between SITRANS FUE950 (terminals 10 and 11) and FUS380/FUE380 and MAG 5000/6000 (terminals 56 and 57). Temperature sensors must be connected to terminals 5 (1) and 6 (2) (T<sub>H</sub>) and 7 (3) and 8 (4) (T<sub>C</sub>).

##### Note:

The right flowmeter pulse output value must be equal to the FUE950 pulse input value and must be checked via the user menu of the transmitter MAG 5000/6000 or nameplate of FUE380 or FUS380.