

Flow Measurement

SITRANS FS (ultrasonic)

Inline ultrasonic flowmeters

SITRANS FUS060 transmitter

Overview



SITRANS FUS060 is a transit time based transmitter designed for ultrasonic flowmetering with dedicated sensors in the FUS inline series up to DN 500. SITRANS FUS060 is engineered for high performance and is suitable for 1- and 2-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 2 paths
- ATEX II 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

Application

The main application for flowmeters with the transmitter SITRANS FUS060 is measurement volume of water and waste water.

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.

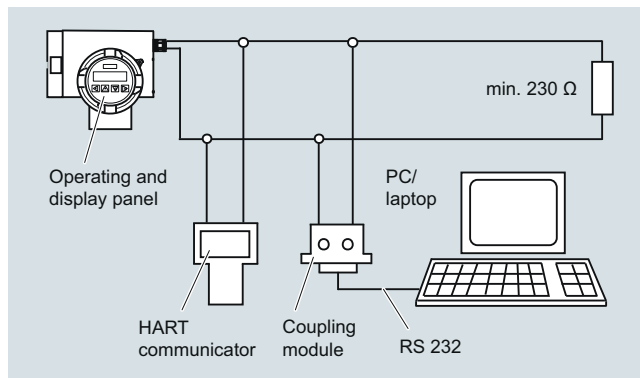
The FUS060 is ordered as part of a complete flowmeter system. It can be ordered separately as spare part and manually programmed with the sensor data.

Function

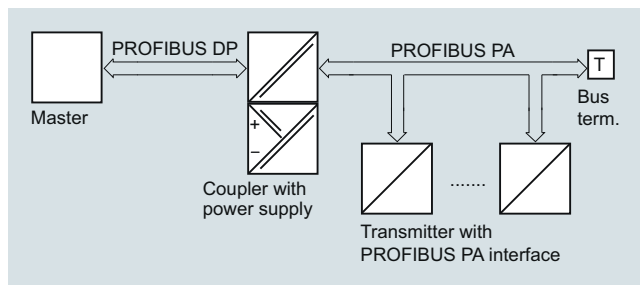
Displays and keypad

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

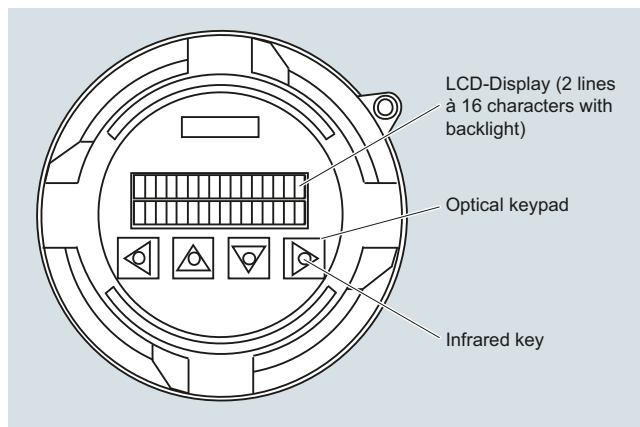


HART communication



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

Function (continued)

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.

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.

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Technical specifications

Input		Digital output 2	
Measurement	Flow by measuring the transit time difference of ultrasonic signals through ultrasonic transducers in DN 100 ... 500 (4 ... 20") 2-path sensor pipes: 1-path or 2-path	Function	Relay output - programmable for alarm, limit or status indication.
Nominal sizes and number of paths	2-path DN 100 ... 500 (4 ... 20")	Relay, NC or NO contact	Switching capacity max. 5 W Max. 50 V DC, max. 200 mA DC Self-resetting fuse, $R_i = 9 \Omega$
Max. cable length	20 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 explosion protection (ATEX version) - Output function, configurable	Max. 30 V DC, max. 100 mA DC, 50 mA AC (cf. EC-Type Examination certificate) Limit for flow, ultrasonic velocity or ultrasonic amplitude flow direction device status
Analog output		Only PROFIBUS PA version:	Digital output 2 omitted
Function	Current output programmable for flow, sound velocity or amplitude level. Active current output (13.2 V < open loop voltage < 15.8 V)	Communication via analog output 4 ... 20 mA	
- Signal range - Upper limit - Signal on alarm - Load	4 ... 20 mA 20 ... 22.5 mA, adjustable 3.6 mA, 22 mA, or 24 mA Max. 600 Ω ; for non Ex version $\leq 230 \Omega$ for HART communication $\leq 330 \Omega$ for Ex-version	- PC/laptop or HART communicator with SITRANS F flowmeter - Load with connection of coupling module - Load with connection of HART communicator - Cable - Protocol	
Only PROFIBUS PA version:	Analog output omitted, is replaced by digital PROFIBUS PA interface	min. 230 Ω (max. 330 Ω for Ex-version) min. 230 Ω 2-wire shielded ≤ 3 km (≤ 1.86 miles) Multi-core shielded ≤ 1.5 km (≤ 0.93 miles) HART, version 5.1	
Digital output 1		Communication via PROFIBUS PA interface	
Function	Pulse, frequency or status output - programmable for pulses, frequency, alarm, limit or status.	- Power supply - Current consumption from bus	Layers 1 + 2 according to PROFIBUS PA Communication system according to IEC 61158/EN 50170 Separate supply, four-wire device Permissible bus voltage 9 ... 32 V See certificates and approvals 10 mA; ≤ 15 mA in event of error with electronic current limiting
- Active or passive signal, can be configured with positive or negative logic - For explosion protection (ATEX version) and PROFIBUS PA version - Output function, configurable	Active: 24 V DC, ≤ 24 mA, $R_i = 300 \Omega$ Passive: open collector, 30 V DC, ≤ 200 mA Only passive: open collector 30 V DC, ≤ 100 mA Pulse output - Adjustable pulse significance $\leq 5\,000$ pulses/s - Adjustable pulse width ≥ 0.1 ms Frequency response f_{END} selectable up to 10 kHz Limit for flow, totalizers, ultrasonic velocity or ultrasonic amplitude device status, flow direction	Electrical isolation	
		Accuracy	
		Error in measurement (at reference conditions)	
		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
		Analog output 4 ... 20 mA	As pulse output plus ± 0.1 % of measured value, $\pm 20 \mu A$
		Repeatability	$\leq \pm 0.25$ % of measured value at 0.5 ... 10 m/s
		Reference conditions (water)	
		Process temperature in the connected sensor	25 °C $\pm$ 5 °C (77 °F $\pm$ 9 °F)
		Ambient temperature at the transmitter	25 °C $\pm$ 5 °C (77 °F $\pm$ 9 °F)
		Transmitter warming-up time	30 min.

Technical specifications (continued)

Rated operation conditions

Ambient conditions

Ambient temperature

- Operation -20 ... +50 °C (-4 ... +122 °F)
- In potentially explosive atmospheres Observe temperature classes
- Storage -25 ... +80 °C (-13 ... +176 °F)

Enclosure rating

IP65 (NEMA 4)

Electromagnetic compatibility

For use in industrial environments

- Emitted interference To EN 55011 / CISPR-11
- Noise immunity To EN/IEC 61326-1 (Industry)

Medium conditions

The measuring media must be ultrasonic signal compatible. It must be homogeneous and not two-phased to transfer the acoustic ultrasonic signals.

- Process temperature -200 ... +250 °C (-328 ... +482 °F) (not directly influenced by medium temperature)
- Gases/solids Influence accuracy of measurement (approx. max. 3 % gases or solids)

Design

Separate version

Transmitter is connected to the transducers via 3 ... 120 m (9.8 ft ... 395 ft) long specially shielded cables (coaxial cable)

For ATEX versions mounted in the Ex area only with 3 m (9.8 ft) long cables.

Enclosure material

Die-cast aluminium, painted

Wall mounting bracket (standard and special)

Stainless steel (standard: always incl.)

Weight of transmitter

4.4 kg (9.7 lb)

Electrical connection

Cable glands (always incl.)

- Power supply and outputs
 - 2 x M20 (HART)/M25 (PROFIBUS) or
 - 2 x ½"-NPT (HART)
- Transducers/sensor
 - 2/4 x M16 or
 - 2/4 x ½"-NPT

Display and controls

Display

LCD, two lines with 16 characters each

- Multi-display: 2 freely-selectable values are displayed simultaneously in two lines

Flow, volume, mass flow, mass, flow velocity, speed of sound, ultrasonic signal information, current, frequency, alarm information

Operation

4 infrared keys, hierarchical menu shown with codes

Power supply

Supply voltage

- Standard version 120 ... 230 V AC ± 15 % (50/60 Hz) or 19 ... 30 V DC/21 ... 26 V AC
- Ex version 19 ... 30 V DC/21 ... 26 V AC

Power failure

No effect for at least 1 period (> 20 ms)

Power consumption

Approx. 10 VA/10 W

Certificates and approvals

Explosion protection

ATEX II 2
G Ex dem [ia/ib] IIC T6/T4/T3 Gb
T6 for media < 85 °C (185 °F)
T5 for media < 100 °C (212 °F)
T4 for media < 135 °C (275 °F)
T3 for media < 200 °C (392 °F)

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 connection to the FUS060

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)

Fix terminated, can NOT be shortened

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)



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Selection and ordering data

Transmitter FUS060 operating instructions, accessories and spare parts

Operating instructions

Description	Article No.
• English	A5E01204521
• German	A5E02123845

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

Accessories

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

Process Device Manager SIMATIC PDM

SIMATIC PDM For more details about SIMATIC PDF please go to chapter 8 "Digitalization and Communication".	See the Selection and Ordering data on chapter 8 "Digitalization and Communication"	
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HART modem for communication with FUS060 HART, PC and SIMATIC PDM

HART modem With USB connection	7MF4997-1DB	
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Spare parts

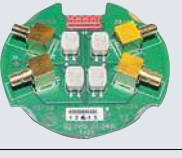
SITRANS FUS060 transmitter, available standard and Ex versions

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	7ME3050-2BA10-1BA1	
FUS060, 230 V, HART, Imperial cable glands	Transmitter for remote connection	IP65 (NEMA 4)	115 ... 230 V AC 50/60 Hz	7ME3050-2BA10-1BA2	
FUS060, 230 V, PROFIBUS, Metric cable glands	Transmitter for remote connection	IP65 (NEMA 4)	115 ... 230 V AC 50/60 Hz	7ME3050-2BA10-1DA1	
FUS060, 230 V, PROFIBUS, Imperial cable glands	Transmitter for remote connection	IP65 (NEMA 4)	115 ... 230 V AC 50/60 Hz	7ME3050-2BA10-1DA2	
FUS060, 24 V, HART, Metric cable glands	Transmitter for remote connection	IP65 (NEMA 4)	19 ... 30 V DC/ 21 ... 26 V AC	7ME3050-2BA20-1BA1	
FUS060, 24 V, HART, Imperial cable glands	Transmitter for remote connection	IP65 (NEMA 4)	19 ... 30 V DC/ 21 ... 26 V AC	7ME3050-2BA20-1BA2	
FUS060, 24 V, PROFIBUS, Metric cable glands	Transmitter for remote connection	IP65 (NEMA 4)	19 ... 30 V DC/ 21 ... 26 V AC	7ME3050-2BA20-1DA1	
FUS060, 24 V, PROFIBUS, Imperial cable glands	Transmitter for remote connection	IP65 (NEMA 4)	19 ... 30 V DC/ 21 ... 26 V AC	7ME3050-2BA20-1DA2	
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	7ME3050-2BA21-1CA1	

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

Selection and ordering data (continued)

Description	Article No.	
Operating/Display module	7ME5933-0AC00	
Electronics cover with glass plate (non Ex). Die cast aluminum, with corrosion-resistant Basic Polyester powder coating (min. 60 µm)	7ME5933-0AC01	
Cover for sensor cable and gasket. Die cast aluminum, with corrosion-resistant Basic Polyester powder coating (min. 60 µm)	7ME5933-0AC02	
Cover for mains supply/communication. Die cast aluminum, with corrosion-resistant Basic Polyester powder coating (min. 60 µm)	7ME5933-0AC03	
FUS060 Sensor connection PCB, Standard versions only, 1 pc.	A5E02551331	
FUS060 Sensor connection PCB, ATEX version only, 1 pc.	A5E02551334	
M20 cable gland set for FUS060 (M20) power and output connection, grey PA plastic, 2 pcs. • cables Ø 6 ... 12 mm (0.24" ... 0.47") • -40 ... +100 °C (-40 ... +212 °F)	A5E02246350	
M20 cable gland set for FUS060 ATEX version power and output connection, PA plastic, 1x in blue (ATEX Ex i) and 1x grey (ATEX Ex-e) • cables Ø 5 ... 9 mm (0.20" ... 0.35") • -20 ... +95 °C (-4 ... +203 °F)	A5E02246356	
1/2" NPT cable gland set for FUS060 (NPT) power and output connection, grey PA plastic, 2 pcs. • cables Ø 6 ... 12 mm (0.24" ... 0.47") • -40 ... +100 °C (-40 ... +212 °F)	A5E02246396	

Description	Article No.	
M25 cable gland set for the FUS060 PA (M25) power and output connection, grey PA plastic, 2 pcs. • cables Ø 9 ... 16 mm (0.35" ... 0.63") • -40 ... +100 °C (-40 ... +212 °F)	A5E02246378	
M16x1.5 cable gland set for FUS060 (M16) sensor connection, grey PA plastic, 2 pcs. and 2 pcs. blind. • cables Ø 5 ... 9 mm (0.20" ... 0.35") • -40 ... +100 °C (-40 ... +212 °F)	A5E02593526	
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)	A5E02246369	
½" NPT cable gland set for FUS060 (NPT) sensor connection, 4 pcs. M16 bush to ½" NPT and 4 pcs. ½" NPT grey PA plastic glands • cables Ø 5 ... 9 mm (0.20" ... 0.35") • -20 ... +100 °C (-4 ... +212 °F)	A5E02247877	

Cables for FUS060

Description	Article No.	
Coaxial cable for FUS060, (75 Ω, max. 70 °C (158 °F), black PVC), (2 pcs.) • 3 m (9.84 ft) • 15 m (49.21 ft) • 30 m (98.43 ft) • 60 m (196.85 ft) • 90 m (295.28 ft) • 120 m (393.70 ft)	A5E00875101 A5E00861432 A5E01278662 A5E01278682 A5E01278687 A5E01278698	
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 m (9.84 ft) • 15 m (49.21 ft) • 30 m (98.43 ft)	A5E00875105 A5E00861435 A5E01196952	
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 m (32.84 ft) • 15 m (49.21 ft) • 30 m (98.43 ft) • 40 m (131.23 ft)	A5E02085593 A5E03262088 A5E02085644 A5E02085649	

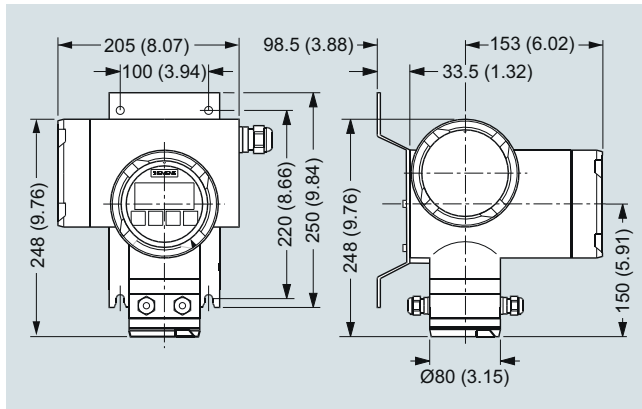
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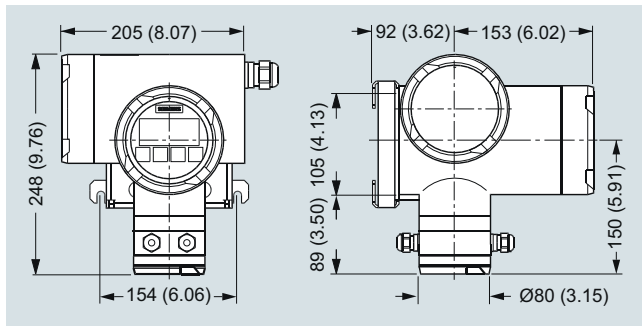
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Dimensional drawings

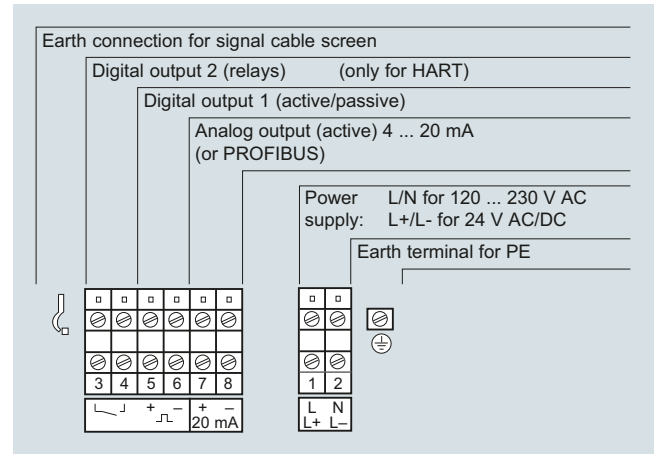


SITRANS FUS060 with standard mounting bracket, dimensions in mm (inch)



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

Circuit diagrams



Electrical connection SITRANS FUS060