

Flow Measurement

SITRANS F US Clamp-on

SITRANS FUG1010 (Gas)

Overview



SITRANS FUG1010 clamp-on non-intrusive ultrasonic flow transmitter is ideal for natural and process gas applications, including checkmetering, allocation, production, storage and gas fired power station applications.

SITRANS FUG1010 is available in single, dual and optional four path configurations, with your choice of IP65 (NEMA 4X) or IP65 (NEMA 7) and IP66 (NEMA 7) explosionproof enclosures.

Benefits

- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external sensors do not require periodic cleaning
- No moving parts to foul or wear as found in turbine and PD meters
- Eliminates the pressure drop or energy loss in orifice metering
- Wide turn-down ratio
- Choice of single, dual or optional four path versions
 - Single path version reduces initial investment
 - Multiple path versions provide higher accuracy, especially with limited straight run and poor flow profile conditions
 - In diametric reflect mode configuration, the meter is less sensitive to crossflow and swirl
- Wide-Beam technology provides improved accuracy over a wide range of flow velocity and operating pressure
- ZeroMatic Path automatically sets zero without stopping flow and reduces zero drift, even at low flow
- Tolerant of most wet gas conditions
- Immune to most pressure reducing valve noise
- Optional rugged stainless steel sensor enclosure permits permanent and direct burial installations
- Easy to use "Si-Ware" diagnostic software

Application

SITRANS FUG1010 is ideal for most natural and process gas industry applications, including:

- Checkmetering
- Allocation
- Flow survey verification
- Lost and unaccounted for (LAUF) gas analysis
- Production
- Storage

Design

FUG1010 is available in three enclosures:

- IP65 (NEMA 4X) enclosure constructed of fiberglass reinforced polyester with stainless steel hardware and polyester keypad
 - Single path
 - Dual path
 - Four path (optional)
- IP65 (NEMA 7) Compact explosionproof enclosure constructed of cast aluminum with glass window, stainless steel hardware
 - Single path
 - Dual path
- IP66 (NEMA 7) Wall mount explosionproof enclosure constructed of cast aluminum stainless steel hardware, with glass window
 - Single path
 - Dual path
 - Four path (optional)

Function

- IP65 (NEMA 4X) and IP66 (NEMA 7) flow display transmitters have integral 33 button keypads and large (128 x 240 pixel) graphic displays visible up to 12 m (40 ft) away
- IP65 (NEMA 7) compact flow transmitter has a 2 x 16 alphanumeric LCD display
- Current, voltage, frequency and RS232 outputs (see specification section for details)
- Analog inputs for pressure and temperature
- ZeroMatic Path automatically compensates for zero flow drift
- Bidirectional flow operation
- 1 Mbyte data logger with both site and data logger storage
- English, spanish, german, italian and french language options
- Internal AGA-8 table for fixed gas composition is available for standard volume computation.
- Complete application and operation diagnostics, to assure calibration and operational integrity
- Upward compatibility and compliance with AGA-10 speed of sound measurement practice

Technical specifications

Input		Accuracy	
Flow range	± 30 m/s (± 100 ft/s), bidirectional	Typical accuracy	1 % ... 2 % of actual volume reading (higher accuracy is pipe condition and flow profile dependent)
Flow sensitivity	0.0003 m/s (0.001 ft/s), flow rate independent	Calibratable Accuracy	± 0.2 ... 0.5 % of flow
Minimum pressure	7 ... 10 bar (100 ... 145 psi), typical (gas composition and application dependent; plastic pipes support operation at atmospheric pressure)	Repeatability	0.05 % ... 0.1 %, of actual volume reading, for 1.5 ... 30 m/s (5 ... 100 ft/s) velocities (pipe condition dependent)
Pipe size	25 mm ... 1.52 m (1" ... 48") (for other sizes, consult factory)	Zero drift	0.0003 m/s (0.001 ft/s), with ZeroMatic Path active
Analog inputs	Current: 4 x 4 ... 20 mA, programmable (IP65 (NEMA 7) enclosure has 2 x 4 ... 20 mA, programmable)	Data refresh rate	5 Hz
Output		Rated operation conditions	
Standard outputs	<ul style="list-style-type: none"> Current: 4 x 4 ... 20 mA, a programmable, standard Additional 2 x optional, except IP65 (NEMA 7) Voltage: 4 x 0 ... 10 V DC, menu programmable (None for IP65 (NEMA 7) enclosure) 4 x Open collector digital pulses (quadrature) (None for IP65 (NEMA 7) enclosure) 2 x 0 ... 5 kHz, TTL pulse square wave + (None for IP65 (NEMA 7) enclosure) 1 x Optically isolated digital pulse & source, IP65 (NEMA 7) enclosure only RS232 Serial Port 	Degree of protection	<ul style="list-style-type: none"> IP65 (NEMA 4X) IP65 (NEMA 7) IP66 (NEMA 7)
Extended outputs	<ul style="list-style-type: none"> MODBUS (RS485/422/232) (not for IP65 (NEMA 7)) 	Gas temperature	-40 ... +60 °C (-40 ... +140 °F) (for higher temperatures consult factory)
Status/Alarm I/O	<ul style="list-style-type: none"> 4 x programmable form C relays (not for IP65 (NEMA 7) enclosure) 4 x programmable N.O. Mer. Wet. Relays optional (not for IP65 (NEMA 7) enclosure) 2 x Optically coupled output logic gates (for IP65 (NEMA 7) enclosure, only) 1 Totalizer clear switch input (not for IP65 (NEMA 7)) 1 Totalizer hold switch input (not for IP65 (NEMA 7) enclosure) 1 x Opto iso. totalizer clear switch input (for IP65 (NEMA 7) enclosure, only) 1 x Opto iso. totalizer hold switch input (for IP 65 (NEMA 7) enclosure, only) 	Ambient temperature	-18 ... +60 °C (0 ... 140 °F)
		Design	
		Dimensions	see SITRANS F US Clamp-on „System info and selection guide“
		Weight	see diagrams
		Power supply	
		<ul style="list-style-type: none"> For IP65 (NEMA 4X) and IP66 (NEMA 7) For IP65 (NEMA 7): 	<ul style="list-style-type: none"> 90 ... 240 V AC, 50 ... 60 Hz (30 VA) or 9 ... 36 V DC (12 W) 90 ... 240 V AC, 50 ... 60 Hz (15 VA) or 9 ... 36 V DC (10 W)
		Indication and operation	
		Data logger memory	1 Mbyte, programmable for 17 data functions
		Display	<ul style="list-style-type: none"> IP65 (NEMA 4X) and IP66 (NEMA 7) enclosures IP65 (NEMA 7) enclosure
		Keypad	<ul style="list-style-type: none"> IP65 (NEMA 4X) and IP66 (NEMA 7) Enclosures IP65 (NEMA 7) Enclosure
		Language options	English, spanish, german, italian, french

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Certificates and approvals

IP65 (NEMA 4X) flow display transmitter ratings

FM and CSA	I.S. Class I, II, Div 1 N-I Class I, Div 2 S Class II, Div 2
CE	EMC Directive 2004/108/EC LVD Directive 2006/95/EG C-TICK
ATEX	<ul style="list-style-type: none"> • Transmitter: Ex II (1) G [Ex ia] IIC Ex II 3 (1) G Ex nC [ia] IIC T5 • Sensors: Ex II 1 G Ex ia IIC T5
INMETRO (Brazil)	<ul style="list-style-type: none"> • Transmitter: [BR-Ex ia] IIC BR-Ex nC [ia] IIC T5 • Sensors: BR-Ex ia IIC T5 IP65

IP65 (NEMA 7) compact explosion-proof enclosure ratings

FM and CSA	XP Class I, Div 1 D-I Class II, Div 1 I.S. Class I, Div 1 N-I Class I, Div 2 S Class II, Div 2
CE	EMC Directive 2004/108/EC LVD Directive 2006/95/EG C-TICK
ATEX	<ul style="list-style-type: none"> • Transmitter: Ex II 2 (1) G Ex d [ia] IIB + H2 T5 • Sensors: Ex II 1 G Ex ia IIC T5
INMETRO (Brazil)	<ul style="list-style-type: none"> • Transmitter: BR-Ex d [ia] IIB + H2 T5 • Sensors: BR-Ex ia IIC T5

IP66 (NEMA 7) wall mount explosionproof enclosure ratings

FM and CSA	XP Class I, Div 1 D-I Class II, Div 1 I.S. Class I, Div 1 N-I Class I, Div 2 S Class II, Div 2
CE	EMC Directive 2004/108/EC LVD Directive 2006/95/EG C-TICK
ATEX	<ul style="list-style-type: none"> • Transmitter: Ex II (1) G [Ex ia] IIC Ex II 3 (1) G Ex nC [ia] IIC T5 Ex II 2 (1) G Ex d [ia IIC] IIB+H2 T5 • Sensors: Ex II 1 G Ex ia IIC T5
INMETRO (Brazil)	<ul style="list-style-type: none"> • Transmitter: [BR-Ex ia] IIC BR-Ex d [ia IIC] IIB T5 • Sensors: BR-Ex ia IIC T5

Flow Measurement SITRANS F US Clamp-on

SITRANS FUG1010 (Gas)

Standard MLFB for quick delivery on SITRANS FUG1010 (Gas meter)

Selection and Ordering data	Order No.	Order code
SITRANS FUG1010 Gas Meter Clamp-on	L) 7 ME 3 6 1 - - - - 0 - - - -	K 1 2 + K 1 2 + R 1 2
Design	0	
IP65 (NEMA 4X)		
Number of ultrasonic paths	2	
Dual path		
Flowmeter functions and I/O configurations	B	
includes graphic or digital display		
<ul style="list-style-type: none"> Extended I/O option <ul style="list-style-type: none"> additional 2 x 4 ... 20 mA Mercury wetted relays 4 x digital pulse outputs (2 x open collector and 2 x 0 ... 5 V TTL) 		
Meter power options	B	
9 ... 36 V, DC (except compact NEMA 7)		
Communication options	0	
RS 232 (standard)	1	
MODBUS (dedicated only, excludes NEMA 7 compact)		
RTD temperature sensor		0
(includes mounting hardware for pipes above 1.5" / 38 mm OD)		1
No RTDs		2
1 x standard clamp-on RTD		3
2 x standard clamp-on RTD		4
1 x submersible clamp-on RTD		
2 x submersible clamp-on RTD		
Notes:		
1. Temperature input is required for FUH systems		
2. Only the Interface detector set up as a dual channel can use 2 RTD's		
Sensor for channel 1		A
(includes pipe mounting kit and spacer bar for indicated max. OD listed)		N
See „Sensor selection charts“ for specifications.		P
no sensor		Q
C2H (high precision) Mounting frame and straps provided up to 1200 mm (48")		
D1H (high precision) Mounting frame and straps provided up to 1200 mm (48")		
D2H (high precision) Mounting frame and straps provided up to 1200 mm (48")		
Sensor for channel 2		A
(includes pipe mounting kit and spacer bar for indicated max. OD listed)		N
See „Sensor selection charts“ for specifications.		P
no sensor		Q
C2H (high precision) Mounting frame and straps provided up to 1200 mm (48")		
D1H (high precision) Mounting frame and straps provided up to 1200 mm (48")		
D2H (high precision) Mounting frame and straps provided up to 1200 mm (48")		
Approvals		1
FM/CSA/CE/C-TICK (default)		2
ATEX, CE, C-TICK		
Standard MLFB product offering represents 4 to 6 weeks delivery time		
For sensor and RTD cables for quick delivery see tables at end of section.		
L) Subject to export regulations AL: N, ECCN: 3A991X.		

Flow Measurement

SITRANS F US Clamp-on

SITRANS FUG1010 (Gas)

Selection and Ordering data

Order No. Ord. code

SITRANS FUG1010 Gas meter clamp-on

- IP65 (NEMA 4X) L) **7ME3610-**
- IP65 (NEMA 7) compact L) **7ME3611-**
- IP66 (NEMA 7) wall mounted L) **7ME3613-**

0 -

Number of channels/ultrasonic paths

- Single path 1
- Dual path 2
- Special: Four path (NEMA 4X and NEMA 7 wall mount only) 9 **H 1 A**

Flowmeter functions and I/O configurations (includes graphic or digital display)

IP65 (NEMA 4X) and IP66 (NEMA 7 wall mounted) units

- Standard (all but Compact NEMA 7) **A**
 - Graphic display
 - 4 x 4 ... 20 mA analog input
 - 2 x 0 ... 10 V
 - 2 x 4 ... 20 mA analog output
 - 2 x pulse output
 - 4 x relay C type
 - 2 x RTD input

- Extended I/O option **B**
 - additional 2 x 4 ... 20 mA
 - Mercury wetted relays
 - 4 x digital pulse outputs (2 x open collector and 2 x 0 ... 5 V TTL)

IP65 (NEMA 7) compact units

- Standard **D**
 - Digital display
 - 2 x 4 ... 20 mA (loop)
 - 2 x 4 ... 20 mA analog input
 - 2 x status (open collector)
 - 1 x RTD input
- Digital pulse option **E**
 - 1 x digital pulse open collector output
- Mercury wetted relays for standard meter **Z** **J 1 A**
- Dry contact form C relays for extended I/O meter **Z** **J 1 D**

Meter power options

- 90 ... 240 V AC **A**
- 9 ... 36 V DC (except compact NEMA 7) **B**
- 9 ... 36 V DC negative GND (Compact only) **J**
- 9 ... 36 V DC positive GND (Compact only) **K**

Communication options

- RS232 (standard) 0
- MODBUS (excludes NEMA 7 Compact) 1

RTD temperature sensor

(includes mounting hardware for pipes above 1.5" outer diameter)

- No RTDs 0
- 1 x standard clamp-on RTD 1
- 2 x standard clamp-on RTD 2
- 1 x submersible clamp-on RTD 3
- 2 x submersible clamp-on RTD 4

Selection and Ordering data

Order No. Ord. code

SITRANS FUG1010 Gas meter clamp-on

- IP65 (NEMA 4X) L) **7ME3610-**
- IP65 (NEMA 7) compact L) **7ME3611-**
- IP66 (NEMA 7) wall mounted L) **7ME3613-**

0 -

Sensor for channel 1

(includes pipe mounting kit and spacer bar for indicated max. outer diameter listed)
See „Sensor selection chart“ for specifications.

no sensor **A**

For the following A1H to D4H sensors, temperature range is -40 °C to 65 °C (-41 °F to 150 °F), nominal 21 °C (70 °F):

B1H (high precision) Trackmount and straps provided up to 125 mm (5") **K**

B2H (high precision) Trackmount and straps provided up to 125 mm (5") **L**

B3H (high precision) Trackmount and straps provided up to 125 mm (5") **T**

C1H (high precision) Mounting frame and straps provided up to 1200 mm (48")¹⁾ **M**

C2H (high precision) Mounting frame and straps provided up to 1200 mm (48")¹⁾ **N**

D1H (high precision) Mounting frame and straps provided up to 1200 mm (48")¹⁾ **P**

D2H (high precision) Mounting frame and straps provided up to 1200 mm (48")¹⁾ **Q**

D3H (high precision) Mounting frame and straps provided up to 1200 mm (48")¹⁾ **U**

D4H (high precision) Mounting frame and straps provided up to 1200 mm (48")¹⁾ **R**

For the following B1H to D4H sensors, temperature range is -1 °C up to 104 °C (30 °F up to 220 °F), nominal 65 °C (150 °F):

B1H (high temperature range HP) **Z** **P 1 K**

B2H (high temperature range HP) **Z** **P 1 L**

B3H (high temperature range HP) **Z** **P 1 T**

C1H (high temperature range HP) **Z** **P 1 M**

C2H (high temperature range HP) **Z** **P 1 N**

D1H (high temperature range HP)¹⁾ **Z** **P 1 P**

D2H (high temperature range HP)¹⁾ **Z** **P 1 Q**

D3H (high temperature range HP)¹⁾ **Z** **P 1 U**

D4H (high temperature range HP)¹⁾ **Z** **P 1 R**

¹⁾ Supplied spacer bar supports pipes up to 750 mm (30 inches). For pipes larger than 750 mm (30 inches) purchase also, spare part 7ME3960-0MS40 (1012BN-4).

L) Subject to export regulations AL: N, ECCN: 3A991X.

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Selection and Ordering data	Order No.	Ord. code
SITRANS FUG1010 Gas meter clamp-on		
• IP65 (NEMA 4X)	L) 7ME3610-	
• IP65 (NEMA 7) compact	L) 7ME3611-	
• IP66 (NEMA 7) wall mounted	L) 7ME3613-	
	0 -	
Sensor for channel 2 (includes pipe mounting kit and spacer bar for indicated max. outer diameter listed) See „Sensor selection chart“ for specifications.		
no sensor		A
For the following A1H to D4H sensors, temperature range is -40 °C to 65 °C (-41 °F to 150 °F), nominal 21 °C (70 °F):		
B1H (high precision) Trackmount and straps provided up to 125 mm (5")		K
B2H (high precision) Trackmount and straps provided up to 125 mm (5")		L
B3H (high precision) Trackmount and straps provided up to 125 mm (5")		T
C1H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾		M
C2H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾		N
D1H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾		P
D2H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾		Q
D3H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾		U
D4H (high precision) Mounting frame and straps provided up to 1200 mm (48") ¹⁾		R
Other versions (different size, mount, type or pipe larger than DN 1200 (48") or corrosion resistant), add Order code and plain text.	Z	Q 1 Y
For the following B1H to D4H sensors, temperature range is -1 °C up to 104 °C (30 °F up to 220 °F), nominal 65 °C (150 °F):		
B1H (high temperature range HP)	Z	Q 1 K
B2H (high temperature range HP)	Z	Q 1 L
B3H (high temperature range HP)	Z	Q 1 T
C1H (high temperature range HP)	Z	Q 1 M
C2H (high temperature range HP)	Z	Q 1 N
D1H (high temperature range HP)	Z	Q 1 P
D2H (high temperature range HP)	Z	Q 1 Q
D3H (high temperature range HP)	Z	Q 1 U
D4H (high temperature range HP)	Z	Q 1 R
Approvals		
FM/CSA/CE/C-TICK (default)	1	
ATEX, CE, C-TICK	2	
INMETRO (Brazil)	3	

L) Subject to export regulations AL: N, ECCN: 3A991X.

Selection and Ordering data	Order code
Further designs	
Please add „-Z“ to Order No. and specify Order code(s).	
Cable assembly for sensors (add for # of paths) See „Sensor cable selection chart“	K..
Cable assembly for RTDs (add for # of RTDs) See „RTD cable selection chart“	R..
Cable termination kit (for one cable pair)	
• Termination for standard, plenum and armored sensor cable	T01
• Termination for submersible sensor cable	T11
• RTD cable termination kit for standard RTD	T21
• RTD cable termination kit for submersible RTD	T31
• Insert RTD cable termination kit	T41
Languages (Meter and Documentation)	
• German	B10
• French	B12
• Spanish	B13
• Italian	B14
Tag name plate	
• Stainless steel tags with 3.2 mm (0.13 inch) characters (68 characters max.)	Y19

MLFB example

Application example

A clamp-on meter is required for a 300 mm (12") carbon steel gas line with a wall thickness of 12.7 mm (0.5"). Meter electronics are to be located in a Class I Div 2 area only 18 m (60 ft) from the pipeline. 12 V DC power is available at the site.

Dual path operation is desired for improved accuracy and redundant measurement. Pulse output will be primary flow data source.

MLFB Order No.: **7ME3610-2BB00-0QQ1-Z
K03 + K03**

Selection and Ordering data	Order No.	Ord. code
FUG1010 meter family	7 ME 3 6 1 -	
IP65 (NEMA 4X) enclosure	0	
Dual path	2	
Custody Transfer option with digital pulse	B	
9 ... 36 V DC power option	B	
RS232 Standard	0	
No RTD required	0	
Sensor code for path 1	Q	
Sensor code for path 2	Q	
FM approval required	1	
30 m (100 ft) sensor cab. for path 1		K 0 3
30 m (100 ft) sensor cab. for path 2		K 0 3

Selection and Ordering data	Order No.
Operating Instructions for FUG1010	
English NEMA 4x & NEMA 7 Wall Mount	A5E02951519A
German NEMA 4x & NEMA 7 Wall Mount	A5E02951531A
English NEMA 7 Compact	CQO:1010GCXFM-3

This device is shipped with a Quick Start Guide and a CD containing further SITRANS F literature.

All literature is also available for free at:
<http://www.siemens.com/flowdocumentation>

Flow Measurement

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Sensor Selection Chart

High precision sensors for steel pipe with outer diameter/wall thickness ratio >10

Sensor Size code	Order Code	Pipe wall (mm)		Pipe wall (inches)	
		min.	max.	min.	max.
B1H	K	2.0	3.0	0.08	0.12
B2H	L	3.0	4.1	0.12	0.16
B3H	T	2.7	3.3	0.106	0.128
C1H	M	4.1	5.8	0.16	0.23
C2H	N	5.8	8.1	0.23	0.32
D1H	P	8.1	11.2	0.32	0.44
D2H	Q	11.2	15.7	0.44	0.62
D3H	U	7.4	9.0	0.293	0.354
D4H	R	15.7	31.8	0.62	1.25

Sensor Cable Selection Chart

Sensor cable codes for length and type options

Cable length m (ft)	Standard (PVC jacket)	Submersible (polyethylene jacket)	Plenum Rated (teflon jacket)	Armored
	-40...+80 °C (-40...+176 °F)	-40...+80 °C (-40...+176 °F)	-40...+200 °C (-40...+392 °F)	-40...+80 °C (-40...+176 °F)
Order code				
6 (20)	K01¹⁾	K11	K21	K31
15 (50)	K02	K12¹⁾	K22	K32¹⁾
30 (100)	K03¹⁾	K13¹⁾	K23	K33
46 (150)	K04¹⁾	K14	K24	K34
61 (200)	K05	K15	K25	K35
91 (300)	K06¹⁾	K16	K26	K36

RTD Cable Selection Chart

RTD cable codes for length and type

Cable length m (ft)	Standard (teflon wrapped)	Submersible (extruded jacket)
	-40 ... +200 °C (-40 ... +392 °F)	-40 ... +200 °C (-40 ... +392 °F)
Order code		
6 (20)	R01¹⁾	R11
15 (50)	R02¹⁾	R12
30 (100)	R03¹⁾	R13
46 (150)	R04	R14
61 (200)	R05	R15
91 (300)	R06	R16

¹⁾ Standard MLFB for quick deliver