Overview

SITRANS FUE1010 is a highly accurate clamp-on non-intrusive ultrasonic flowmeter for revenue grade thermal energy sub-metering and energy efficiency distribution monitoring, with a real time coefficient of performance (COP) for HVAC systems.

SITRANS FUE1010 is available in single and dual channel or dual path configurations, with your choice of IP65 (NEMA 4X) dedicated wall mount or IP40 (NEMA 12) portable enclosures.

Benefits

- Measures energy rate and total consumption with highest accuracy available
- Accurately measures at both low flow rates and low differential temperatures
- Easy installation; no need to cut pipe or stop flow
- Minimal maintenance; external transducers do not require periodic cleaning
- No moving parts to foul or wear
- No pressure drop or energy loss
- Wide turn-down ratio
- Choice of single or dual channel / dual path or dual mode operation:
  - Dual channel operation reduces the cost for the system on a per channel measurement basis and permits measuring hot and chilled water lines at the same time
  - Dual path capability insures high flow measurement accuracy on installations with less than desirable piping runs
- Ability to operate in either Wide-Beam Transit-time or reflexor (Doppler) mode for applications with high aeration
- Zeromatic Path automatically sets zero without stopping flow and reduces zero drift, even at low flow

Application

FUE1010 is ideally suited to thermal energy / power industry applications, including:

- Chilled water sub-metering
- Hot water sub-metering
- Condenser water
- Glycol
- Thermal storage
- Lake source cooling

Design

FUE1010 is available in three configurations:

- IP65 (NEMA 4X) Enclosure
  - Single channel
  - Dual channel / dual path
- IP40 (NEMA 12) Portable Enclosure
  - Single channel
- IP40 (NEMA 12) Portable Impact Resistant Enclosure
  - Dual channel / dual path

Function

- Flow display computer has an integral 33 button keypad and large (128 x 240 pixel) graphic display visible up to 12 m (40 ft) away
- 4-wire 1000 Ω platinum RTD's for supply and return temperature measurements are precision matched to within 0.01 °C (0.02 °F)
- Temperature is factory calibrated with built-in field calibrator
- Built-in energy/BTU mode
- Detection of aeration and cavitation caused by worn or damaged impellers, misaligned shafts, etc.
- Reverse flow and empty pipe detection
- Chiller efficiency analysis: accepts an independent analog input representing kW usage for calculation of the following functions which can be selected for data logging or output purposes:
  - Cooling load (kW/ton)
  - Coefficient of performance (COP)
  - Energy efficiency ratio (EER)
- Optional current inputs
- Digital communication options:
  - MODBUS / Metasys N2 (IP65 (NEMA 4X) only)
  - Dial-up modem (IP65 (NEMA 4X) only)
  - RJ45 TCP/IP addressable Ethernet (IP65 (NEMA 4X) only)
  - RS232 Serial digital port (standard)
- Zeromatic Path automatically sets zero
- Bi-directional flow operation
- 1 MByte data logger with both site and data logger storage
- English, Spanish, German, Italian and French language options

SITRANS FUE1010 Energy clamp-on

Technical specifications

SITRANS FUE1010

Input

Flow range	0 … 12 m/s (0 … 40 ft/s), bi-directional
Flow sensitivity	0.0003 m/s (0.001 ft/s)
Pipe size	6.4 mm … 9.14 m (0.25" … 360")
Optional Inputs, single channel	• Current: 2x 4 … 20 m
	• Voltage: 2x 0 … 10 V DC
	• Temperature: 2x 4 wire 1 kΩ RTD
	• Totalizer commands (clear/hold)

Output

Outputs, single channel	• Current: 2x 4 … 20 mA DC (1 kΩ at 30 V DC)
	• Voltage: 2x 0 … 10 V DC (5 kΩ minimum)
	• Status Alarm: 4x SPDT Relays
	• Frequency: 2x 0 … 5000 Hz
	• RS232

Accuracy

Accuracy	± 0.5% ... 1.0% of flow, for velocities greater than 0.3 m/s (1 ft/s)
	± 0.0015 ... 0.003 m/s (± 0.005 ... 0.01 ft/s), for velocities less than 0.3 m/s (1 ft/s)
Batch repeatability	± 0.15% of flow, for velocities greater than 0.3 m/s (1 ft/s)
	± 0.0005 m/s (± 0.0015 ft/s), for velocities less than 0.3 m/s (1 ft/s)

Rated operation conditions

Degree of protection	Dedicated wall mount enclosure: IP65 (NEMA 4X) Portable enclosures: IP40 (NEMA 12)
Liquid Temperature	
• Standard	-40 … +120 °C (-40 … +250 °F)
• Optional	-40 … +230 °C (-40 … +450 °F)
Transducer temperature	
• Standard	-40 … +120 °C (-40 … +250 °F)
• Optional	-62 … +232 °C (-80 … +450 °F)
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

	90 … 240 V AC, 50-60 Hz, 30 VA or 9 … 36 V DC, 12 W

Indication and operation

Data logger memory	1 Mbyte of storage
Display	128 x 240 pixel LCD with backlight
Keypad	33 keypad buttons with tactile feedback
Language options	English, Spanish, German, Italian, French

Certificates and approvals

Safety ratings

• Dedicated wall mount enclosure	FM FMc CE • LVD IEC 61010-1 • EMC EN61000-6-2, -4
• Portable enclosures	UL ULc CE • LVD IEC 61010-1 • EMC EN61000-6-2, -4

4

Left column

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUE1010 Energy clamp-on		
• Dedicated IP65 (NEMA 4X)	7ME3500-	
• Portables IP40 (NEMA 12) battery powered	7ME3502-	
	▪▪▪▪▪ - 0 ▪▪▪ ▪▪▪	

Number of channels/ultrasonic beams Dedicated meter

Dedicated meter

Single channel	1
Dual channel / Dual beam	2

Portables

Single channel	3
Dual channel / Dual beam	4

Flowmeter functions and I/O configurations

• Portable Type 1 Standard - Reflexor capability - Graphic display - 2x 0 ... 10 V - 2x 4 ... 20 mA - 2x pulse output - 4x status logic	A	
• Portable Type 3 option adder - Energy efficiency COP/EER output - 2x 4 ... 20 mA analog input	C	
• Dedicated Type 1 Standard - Reflexor capability - Graphic display - 2x 0 ... 10 V - 2x 4 ... 20 mA - 2x pulse output - 4x relay C type	D	
• Dedicated Type 3 option adder - Reflexor capability - Energy efficiency COP/EER output - 2x 4 ... 20 mA analog input	F	
• Specials (Expanded I/O and or Mercury wetted relays for dedicated only) Add Order code and plain text.	Z	J1Y

Meter power options

90 ... 230 V AC (Dedicated only)	A	
9 ... 36 V DC (Dedicated only)	B	
Charger Type A for Europe (CEE7/7)	C	
Charger Type C for Australia (AS3112)	D	
Charger Type D for U.K. (BS1363)	E	
Charger Type J for Japan (JIS8303)	F	
Charger Type K for U.S. (NEMA 5-15P)	G	
Charger Type L for Switzerland (SEV1011)	H	
No Charger	J	
Other versions (External battery for extended service with portable meter) Add Order code and plain text.	Z	K1Y

Communication options

RS232 (standard)	0	
MODBUS (dedicated only)	1	
Ethernet (dedicated only)	2	
Other versions (Dial up Modem (dedicated only)) Add Order code and plain text.	9	L1Y

Right column

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUE1010 Energy clamp-on		
• Dedicated IP65 (NEMA 4X)	7ME3500-	
• Portables IP40 (NEMA 12) battery powered	7ME3502-	
	▪▪▪▪▪ - 0 ▪▪▪ ▪▪▪	

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

No RTDs (Note: temperature input is required for energy system)	0	
1x pair standard clamp-on RTD (NEMA 4X only)	1	
2x pair standard clamp-on RTD (for dual channel NEMA 4X only)	2	
1x pair standard clamp-on RTD (NEMA 12 portable)	3	
2x pair standard clamp-on RTD (for dual channel NEMA 12 portable)	4	
1x pair submersible clamp-on RTD (NEMA 4X only)	5	
2x pair submersible clamp-on RTD (for dual channel NEMA 4X only)	6	
Special (for insert style RTDs)	9	M1Y

Transducer for channel 1
(includes pipe mounting kit and spacer bar for indicated max. outer diameter listed)
See „Transducer selection charts" for specifications.

no transducer			A
A2 universal	to 3"/track mount		B
B3 universal	to 5"/track mount		C
C3 universal	to 13"/mounting frame		D
D3 universal	to 24"/mounting frame		E
E2 universal	to 48"/mounting frame		F
A1H (high precision)	to 3"/track mount		G
A2H (high precision)	to 3"/track mount		H
A3H (high precision)	to 3"/track mount		J
B1H (high precision)	to 5"/track mount		K
B2H (high precision)	to 5"/track mount		L
C1H (high precision)	to 24"/mounting frame		M
C2H (high precision)	to 24"/mounting frame		N
D1H (high precision)	to 48"/mounting frame		P
D2H (high precision)	to 48"/mounting frame		Q
D4H (high precision)	to 48"/mounting frame		R
Doppler	to 12" with chain or strap kit		S
Other versions (different size, type, mount, temperature range, or corrosion resistant), add Order code and plain text.			Z P1Y

4

SITRANS FUE1010 Energy clamp-on

Selection and Ordering data	Order-No.	Ord. code
SITRANS FUE1010 Energy clamp-on		
• Dedicated IP65 (NEMA 4X)	**7ME3500 -**	
• Portables IP40 (NEMA 12) battery powered	**7ME3502 -**	
	■■■■ - 0■■■ ■ ■■■	

Transducer for channel 2
(includes pipe mounting kit for indicated max. outer diameter listed)
See „Transducer selection charts" for specifications.

no transducer		**A**
A2 universal	to 3"/track mount	**B**
B3 universal	to 5"/track mount	**C**
C3 universal	to 13"/mounting frame	**D**
D3 universal	to 24"/mounting frame	**E**
E2 universal	to 48"/mounting frame	**F**
A1H (high precision)	to 3"/track mount	**G**
A2H (high precision)	to 3"/track mount	**H**
A3H (high precision)	to 3"/track mount	**J**
B1H (high precision)	to 5"/track mount	**K**
B2H (high precision)	to 5"/track mount	**L**
C1H (high precision)	to 24"/mounting frame	**M**
C2H (high precision)	to 24"/mounting frame	**N**
D1H (high precision)	to 48"/mounting frame	**P**
D2H (high precision)	to 48"/mounting frame	**Q**
D4H (high precision)	to 48"/mounting frame	**R**
Doppler	to 12" with chain or strap kit	**S**
Other versions (different size, type, mount, temperature range, or corrosion resistant), add Order code and plain text.		**Z** **Q1Y**

Approvals

no approval	**0**
FM / Dedicated	**1**
UL / Portable	**2**

Selection and Ordering data	Order code
Further designs	
Please add „-Z" to Order No. and specify Order code(s).	
Cable assembly for transducers (add for # of channels) See „Transducer 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 transducer cable	**T01**
• Termination for submersible transducer cable	**T11**
• RTD cable termination kit for standard RTD	**T21**
• RTD cable termination kit for submersible RTD	**T31**
Languages (Meter, Labels and Documentation)	
• German	**B10**
• French	**B12**
• Spanish	**B13**
• Italian	**B14**
Wet flow transfer calibration	
• Standard In-house 6 point calibration (up to 6" or DN 150)	**D10**
Tag name plate	
• Stainless steel with 12 mm characters (max 15 char.)	**Y17**
• Stainless steel with 8 mm characters (max 15 char.)	**Y18**

MLFB example

Application example

A dedicated clamp-on energy meter is required for two separate returns lines. Both will use clamp-on RTDs for the supply and return lines. AC power is available and data access will be via MODBUS communication.

Pipe 1 is a DN150 (6") schedule 40 carbon steel line
Pipe 2 is a DN 300 (12") ductile iron line

MLFB Order No.: **7ME3500-2DA10-2NE0-Z**
K03 + K05 + R03 + R05 + R02 + R03

Selection and Ordering data	Order-No.	Ord. code
FUE1010 meter family	**7ME350■ - ■■■0 -**	**■■■ ■**
IP65 (NEMA 4X) enclosure	**0**	
Dual channel	**2**	
Dedicated Type 1 I/O option	**D**	
90 ... 230 V AC power option	**A**	
MODBUS option	**1**	
2 pairs of clamp-on RTDs	**2**	
Transducer code for 6" pipe	**N**	
Transducer code for 12" pipe	**E**	
No approval required	**0**	
30 m (100 ft) transducer cable for channel 1		**K03**
61 m (200 ft) transducer cable for channel 1		**K05**
30 m (100 ft) cable for RTD 1		**R03**
61 m (200 ft) cable for RTD 2		**R05**
15 m (50 ft) cable for RTD 3		**R02**
30 m (100 ft) cable for RTD 4		**R03**

4

Transducer selection charts

Universal transducers for any pipe material

Trans-ducer	Order code	Outer diameter range (mm)		Outer diameter range (inches)	
Size code		min	max	min	max
A2	**B**	12.7	50.8	0.5	2
B3	**C**	19	127	0.75	5
C3	**D**	51	305	2	12
D3	**E**	203	610	8	24
E2	**F**	254	6096	10	240

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

Trans-ducer	Order Code	Pipe wall (mm)		Pipe wall (inches)	
Size code		min	max	min	max
A1H	**G**	0.635	1.016	0.025	0.04
A2H	**H**	1.016	1.524	0.04	0.06
A3H	**J**	1.524	2.032	0.06	0.08
B1H	**K**	2.032	3.048	0.08	0.12
B2H	**L**	3.048	4.064	0.12	0.16
C1H	**M**	4.064	5.842	0.16	0.23
C2H	**N**	5.842	8.128	0.23	0.32
D1H	**P**	8.128	11.176	0.32	0.44
D2H	**Q**	11.176	15.748	0.44	0.62
D4H	**R**	15.748	31.75	0.62	1.25

Transducer cable selection chart

Transducer cable codes for length and type options

Cable length m (ft)	Standard (PVC jacket) -40…+80 °C (-40…+176 °F)	Submersible[1] (polyethylene jacket) -40…+80 °C (-40…+176 °F)	Plenum Rated (teflon jacket) -40…+200 °C (-40…+392 °F)	Armored[1] -40…+80 °C (-40…+176 °F)
	Order code			
6 (20)	**K01**	**K11**	**K21**	**K31**
15 (50)	**K02**	**K12**	**K22**	**K32**
30 (100)	**K03**	**K13**	**K23**	**K33**
46 (150)	**K04**	**K14**	**K24**	**K34**
61 (200)	**K05**	**K15**	**K25**	**K35**
91 (300)	**K06**	**K16**	**K26**	**K36**

[1] Submersible and armored transducer cable is not available for portable versions.

RTD cable selection chart

RTD cable codes for length and type

Cable length m (ft)	Standard (teflon wrapped) -40 … +200 °C (-40 … +392 °F)	Submersible[1] (extruded jacket) -40 … +200 °C (-40 … +392 °F)
	Order code	
6 (20)	**R01**	**R11**
15 (50)	**R02**	**R12**
30 (100)	**R03**	**R13**
46 (150)	**R04**	**R14**
61 (200)	**R05**	**R15**
91 (300)	**R06**	**R16**

[1] Submersible RTD cable is not available for portable versions.