FS10i Natural Gas Flow Meter

FCI® FLUID COMPONENTS INTERNATIONAL LLC

In-line pipe tee for 1 " and 2 " diameter pipes *(left)*

1/2 " NPT adjustable compression fitting: 6 ″ [152 mm] or 12 ″ [305 mm] length *(right)*

- **Sub-Metering**
- **Furnace Fuel Lines**
- **Gas-Fired Ovens and Heaters**
- **Gas Engine Fuel Feed**
- **Kilns and Calciners**
- **Boilers**

The FS10i is a compact, economical solution to natural gas flow metering. Utilizing application proven thermal dispersion technology, the FS10i provides a highly accurate and repeatable linearized 4-20 mA output of flow rate. Additionally, for applications benefiting from a high or low flow alarm point, the FS10i includes a user programmable 1A SPDT relay output.

The FS10i flow meter is designed for use in pipe sizes from 1 inch to 20 inches [25 mm to 500 mm]. For line sizes of 1 inch or 2 inch [25 mm or 50 mm] an in-line pipe tee is provided to ensure the instrument's accuracy and repeatability in the installation. The stainless steel pipe tee and female NPT threads allow for easy, secure installation in the pipe run. For line sizes 2 1/2 inch [63,5 mm] or larger, select the insertion-style FS10i. The insertion-style is offered in two probe lengths, either 6 inch or 12 inch inch [152 mm or 305 mm]. These are outfitted with 1/2 inch compression fitting to adjust the actual insertion depth to be compatible with a range of pipe diameters and installation variables to achieve inserting the sensor element to the center-point of the pipe. User set-up, via the PC interface and free FCI software utility program, includes scaling the 4-20 mA output to desired flow range, setting the relay trip point, adding hysteresis or time delay to the relay's action, etc.. For visual indication the FS10i includes a 10-segment LED array that illuminates proportionally to the flow rate as well as will start flashing if an alarm trip occurs. The FS10i is currently the only thermal mass

flow meter with a SIL 2 compliance rating. The FS10i is precision calibrated on FCI's natural gas flow stands which are outfitted with NIST and ISO/IEC 17025 traceable equipment that ensure its accuracy and your confidence in using it.

If your natural gas flow meter selection criteria include low cost, easy installation, and little to no routine maintenance, FCI's FS10i is your solution.

FS10i Features

- **Direct Mass Flow Measurement**
- **Ultra Reliable, No Moving Parts Design**
- **User-Programmable 4-20 mA Output and Relay Trip Point**
- **10 LED Display Array**
- **Easy M12 or Cable Gland Connection to Electronics**
- **SIL 2 Compliance Rating**
- **Optional Div 2 / Zone 2 Approvals**

FS10i Specifications

Instrument

Measuring Principal: Thermal dispersion

Fluid Type: Natural gas

Accuracy: ±1.5 % rdg, ±0.5 % FS

Process Connections
In-line: 1 ″ or 2 ″ pipe tee, FNPT threads
Insertion: 1/2 ″ MNPT compression fitting with either Teflon or metal ferrule

Repeatability: ±0.5 % of reading

Response Time: 4 sec. (1 time constant)

Temperature Coefficient *For temperatures > ±30 °F [± 16 °C]*
Maximum ±0.025 % of reading / °F up to 250 °F [±0,05 % of reading / °C up to 121 °C]

Flow Element

Materials of Construction (Wetted Parts)
In-line: 316 stainless steel pipe tee; 316L stainless steel flow element with Hastelloy C-22 thermowells
Insertion: 316L stainless steel with Hastelloy-C22 thermowells

Operating Temperature
-40 °F to 250 °F [-40 °C to 121 °C]
Teflon ferrule maximum temperature is 200 °F [93 °C]

Operating Pressure

In-line: 225 psi [15,5 bar]
Insertion: 500 psi [34 bar]
Teflon ferrule maximum pressure is 150 psig [10 bar(g)]

Insertion "U" lengths

6″ [152 mm] with variable insertion depth, 1/2″ MNPT compression fitting with Teflon or metal ferrule

12″ [305 mm] with variable insertion depth, 1/2″ MNPT compression fitting with Teflon or metal ferrule

Electronics

Display

10 segment LED array, sequential lighting related to flow rate and flashing when trip point exceeded

Output Signals

Analog: 4-20 mA *
Relay: SPDT, 1A @ 24 Vdc, 120 Vac *(ATEX: DC only)*
Serial: RS232C I/O

* 500 ohm maximum load; user scalable; fault indication per NAMUR NE43 guidelines, user-selectable for high (> 21.0 mA) or low (< 3.6 mA) default

Instrument Set-up

Free FCI set-up and configuration software utility program and 3-wire-to-DB9 RS232 dongle are supplied for interface of the FS10i to user's PC. This interface is required to set the 4-20 mA output for the specific line size, flow range, and engineering units, as well as alarm trip point, hysteresis, and trip time delay.

Trip Point Hysteresis Control: 0-100% of span

Trip Point Time Delay: User settable for 0-65,000 seconds

Input Power: 24 Vdc (21.5 Vdc to 30 Vdc); 2.5 watts maximum

Operating Temperature: -40 °F to 160 °F [-40 °C to 71 °C]

Enclosure / Housing

Material: Stainless steel body; aluminum end-cap/top with polyester overlay and clear, silicone sheath impact guard

Protection Ratings

Non-Ex installations: IP65, IP66, IP67
FM, FMc approved: NEMA 4X
ATEX, IECEx approved: IP64

Agency Approvals

FM , FMc	Nonincendive, Class I Division 2 Groups A, B, C, D; Class II, Division 2 Groups E, F, G; Class III, T4@Ta=71°C, Type 4X
ATEX , IECEx	Nonincendive for gas and dust, Zone 2/Zone 22 II 3 G Ex nA IIC T4 Gc, -40°C ≤ Ta ≤ +71°C II 3 D Ex tc IIIC T81 °C Dc, -40°C ≤ Ta ≤ +71°C IP64
Other:	EAC/TR CU

Ingress Protection   IP65, IP66, IP67 in non-hazardous locations

CE Marking, CRN, complies with Canadian Electrical code requirements of ANSI / ISA 12.27.01-2011 as a single seal device

IEC 61508 (SIL)   SIL 2 Compliant with Hardware Fault Tolerance (HFT) of 0; Safe Failure Fraction (SFF) 90%
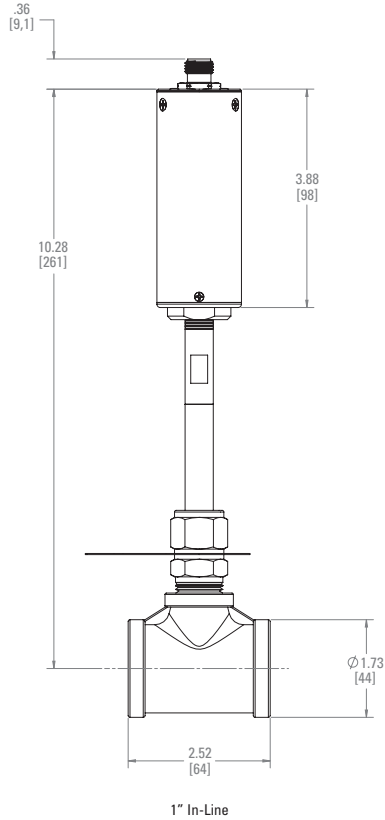
Warranty: 1 Year

Flow Range / Pressure Service / Temperature Compensation

In-line Type

Block 1 Code	Block 3 Code	Description	Flow Range	Pressure Service	Temperature Compensation
L	1	1 inch, in-line, natural gas	1 SCFM to 50 SCFM [1,6 NCMH to 80 NCMH]	10 psi(a) to 50 psi(a) [0,7 bar(a) to 3,5 bar(a)]	Extended, 30 °F to 180 °F [-1 °C to 82 °C]
M	2	2 inch, in-line, natural gas	2 SCFM to 200 SCFM [3,2 NCMH to 320 NCMH]	10 psi(a) to 50 psi(a) [0,7 bar(a) to 3,5 bar(a)]	Extended, 30 °F to 180 °F [-1 °C to 82 °C]

Insertion Type

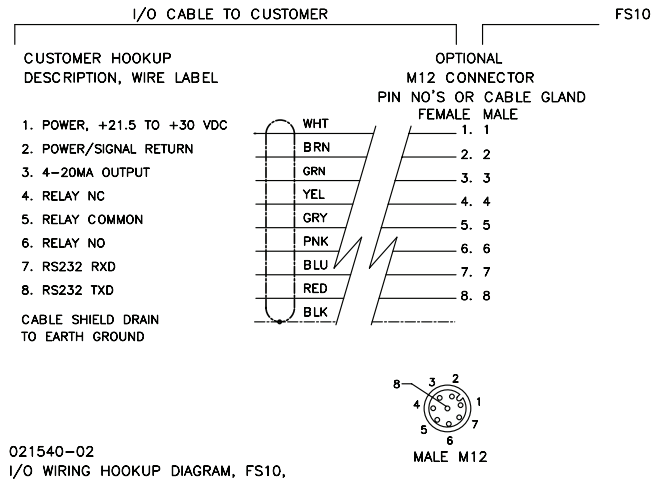| Block 1 Code	Block 3 Code	Description	Flow Range	Pressure Service	Temperature Compensation
E, F, J, or K	3	Insertion, natural gas	1.25 SFPS to 125 SFPS [0,4 NMPS to 38 NMPS]	10 psi(a) to 50 psi(a) [0,7 bar(a) to 3,5 bar(a)]	Extended, 30 °F to 180 °F [-1 °C to 82 °C]
	4	Insertion, natural gas	4 SFPS to 400 SFPS [1,2 NMPS to 122 NMPS]	50 psi(a) to 165 psi(a) [3,5 bar(a) to 11,4 bar(a)]	Extended, 30 °F to 180 °F [-1 °C to 82 °C]

In-line Type

.36
[9,1]

3.88
[98]

10.28
[261]

∅ 1.73
[44]

2.52
[64]

1" In-Line

Insertion Type

.36
[9,1]

7.59
[193]

Flats parallel to flow

1/2"-14 NPT (Male)
process connection

6.00 Max "U" length
[152 Max]
Block 1, Codes E and F

.88 Hex
[22.2]

∅.562
[14.3]

12.00 Max "U" length [305 mm] *(Block 1, Codes J and K)*

I/O Cable Wiring

I/O CABLE TO CUSTOMER   FS10

CUSTOMER HOOKUP   OPTIONAL
DESCRIPTION, WIRE LABEL   M12 CONNECTOR
                                 PIN NO'S OR CABLE GLAND
                                 FEMALE   MALE

1. POWER, +21.5 TO +30 VDC   WHT   1. 1
2. POWER/SIGNAL RETURN   BRN   2. 2
3. 4-20MA OUTPUT   GRN   3. 3
4. RELAY NC   YEL   4. 4
5. RELAY COMMON   GRY   5. 5
6. RELAY NO   PNK   6. 6
7. RS232 RXD   BLU   7. 7
8. RS232 TXD   RED   8. 8
                              BLK

CABLE SHIELD DRAIN
TO EARTH GROUND

MALE M12

021540-02
I/O WIRING HOOKUP DIAGRAM, FS10,
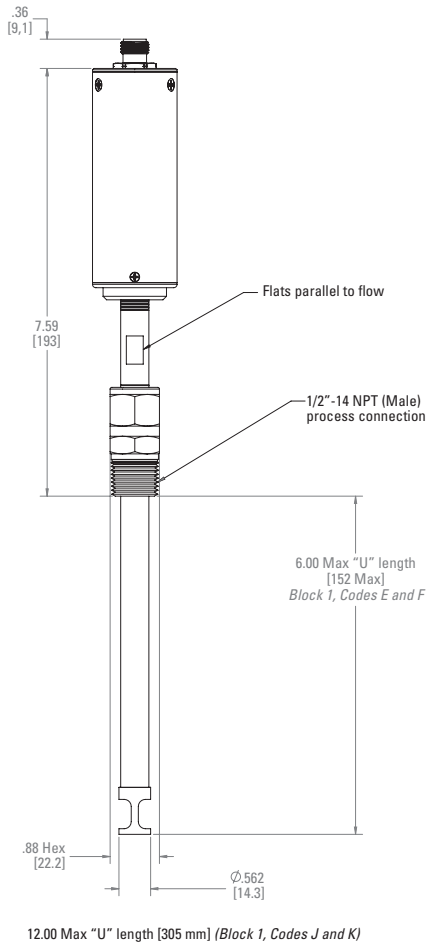
Front Panel / Top	Selections	Block 2 Order Code (FS10i OIS)
	With watertight cable gland to cable pigtail; 15' [5 m] *Not available with ATEX approval*	Block 2, Code 1
	With M12 (male) connector *For user supplied M12 cable*	Block 2, Code 2

FS10i-to-PC Interface

Using FS10 Series
PC interface*
– Set-up
– K-Factors
– Diagnostics

PC

USB

RS232 connection dongle
P/N 027592-XX

In from
FS10i cable

PWR RTN

RxD

TxD

DB9-D.P

To PC
DB9 (Male)

RS-232 PORT

TB1   FS10

GND   GND

FCI
RoHS

S/N

DB9(M)-to-USB adapter
FCI P/N 027277-01
(or customer supplied)
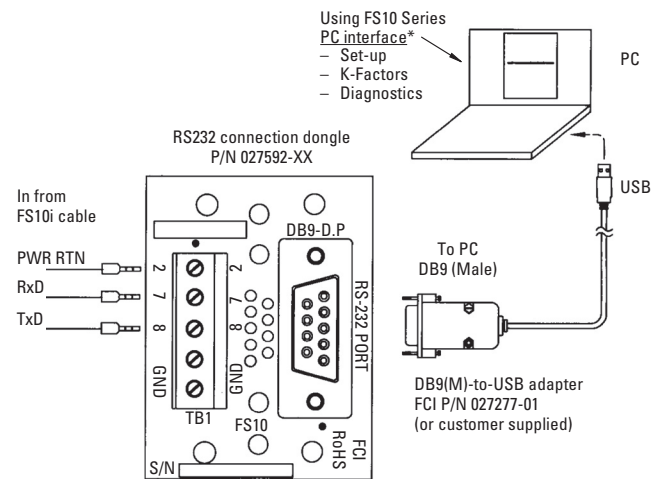
* FS10 Series PC interface included with product and downloadable from FCI's website:
https://www.fluidcomponents.com/support/downloads-updates
PC software allows set-up and configuration of an FS10 Series through the PC's RS232C or USB port.

Ordering Information FS10i – ☐ ☐ ☐ ☐

Block No.   1   2   3   4

Code	[BLOCK 1] Process Connection and "U" Length
In-Line	
L	1" FNPT, 150 lb pipe tee [5]
M	2" FNPT, 150 lb pipe tee [5]
Insertion, "U" Length	
E	1/2" NPT compression fitting with Teflon ferrule; 6" [152 mm] length
F	1/2" NPT compression fitting with metal ferrule; 6" [152 mm] length
J	1/2" NPT compression fitting with Teflon ferrule; 12" [305 mm] length
K	1/2" NPT compression fitting with metal ferrule; 12" [305 mm] length

Code	[BLOCK 2] Power and Signal Output Connection Type
2	M12 connector only *No cable supplied* [1]
1	Fixed, watertight cable gland to wire pigtail; 15' [5 m] [4]

Code	[BLOCK 3] Gas Medium and Calibration
In-Line [5]	
1	Natural gas [5] *Use if Block 1 Code is L*
2	Natural gas [5] *Use if Block 1 Code is M*
Insertion [6]	
3	Natural gas; 1.25 SFPS to 125 SFPS [0,4 NMPS to 38 NMPS] [6]
4	Natural gas; 4 SFPS to 400 SFPS [1,2 NMPS to 122 NMPS] [6]

Code	[BLOCK 4] Agency Approvals *CE Marking always included*
0	None; CE Marking only
1	FM, FMc [2]
3	ATEX, IECEx [2]
5	EAC / TR CU [2]
*	Other *Contact FCI for other approvals and conditions of use*

Accessories

Part Number	Description
M12 Connecting Cables [1] M12(f)-to-pigtails with wire markers. 8-wire with shield. Polyurethane jacket. (For use with order Block 2 = Code 2.)	
022474-A02	2 m [6'] length
022474-A05	5 m [15'] length
022474-A10	10 m [30'] length
RS-232 Connection Dongles* (3-wire termination. DB9(f) breakout.) Includes GND points for power supply and mA output (except M12 field tap).	
* A dongle kit including both DIN rail and panel mounting items is supplied with every FS10i flow meter	
Replacement Dongles	
027592-01	DIN rail mounting*
027592-02	Panel mounting; adhesive-backed standoffs*
Optional Dongles	
027592-03	Wall plate mounting (fits 1 gang USA wall box)
027604-01	M12 field tap (for temporary use only. Requires the M12 connection on the FS10i, order Block 2, Code = 2)
Premium Connection Interface Modules – Full 8-wire termination and DB9(f) breakout	
027596-01	DIN rail mounting, non-isolated mA output
027596-02	DIN rail mounting, with isolated mA output
027596-03	Panel mounting, with non-isolated mA output
027596-04	Panel mounting, with isolated mA output
RS-232-to-USB (Type A) Adapter (includes driver software)	
027277-01	DB9 (m) with thumb-screws (for use with FS10i flow meter. Works with all dongles and connection interface modules.

Notes

1. Connecting cable to be customer supplied, or select from Accessories list and order as separate item.
2. Approvals for hazardous area are Division 2 / Zone 2 + Zone 22; see specifications for details.
4. Cannot be selected with ATEX, IECEx, or EAC/TR CU approval *(i.e. if Block 2 is Code 1, then Block 4 cannot be Code 3 or 5).*

5.

Block 1 Code	Block 3 Code	Description	Flow Range	Pressure Service	Temperature Compensation
In-line Type					
L	1	1 inch, in-line, natural gas	1 SCFM to 50 SCFM [1,6 NCMH to 80 NCMH]	10 psi(a) to 50 psi(a) [0,7 bar(a) to 3,5 bar(a)]	Extended, 30 °F to 180 °F [-1 °C to 82 °C]
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6.

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