

**SIL 2  
Compliance Rating**



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 [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:**  $\pm 1.5\%$  rdg,  $\pm 0.5\%$  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:**  $\pm 0.5\%$  of reading

**Response Time:** 4 sec. (1 time constant)

**Temperature Coefficient** For temperatures  $> \pm 30^\circ\text{F}$  [ $\pm 16^\circ\text{C}$ ]

Maximum  $\pm 0.025\%$  of reading /  $^\circ\text{F}$  up to  $250^\circ\text{F}$  [ $\pm 0.05\%$  of reading /  $^\circ\text{C}$  up to  $121^\circ\text{C}$ ]

### 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

$-40^\circ\text{F}$  to  $250^\circ\text{F}$  [ $-40^\circ\text{C}$  to  $121^\circ\text{C}$ ]

Teflon ferrule maximum temperature is  $200^\circ\text{F}$  [ $93^\circ\text{C}$ ]

*FS10i specifications continued on next page*

**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 (>21.0mA) or low (<3.6mA) 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 4-20mA 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

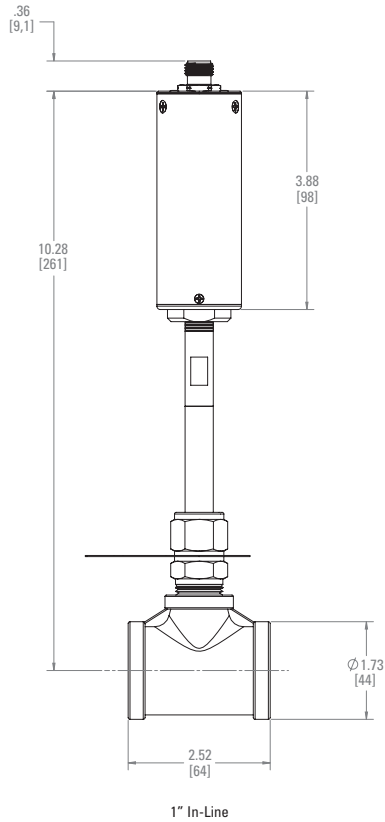
**Flow Range/Pressure Service/Temperature Compensation**

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]

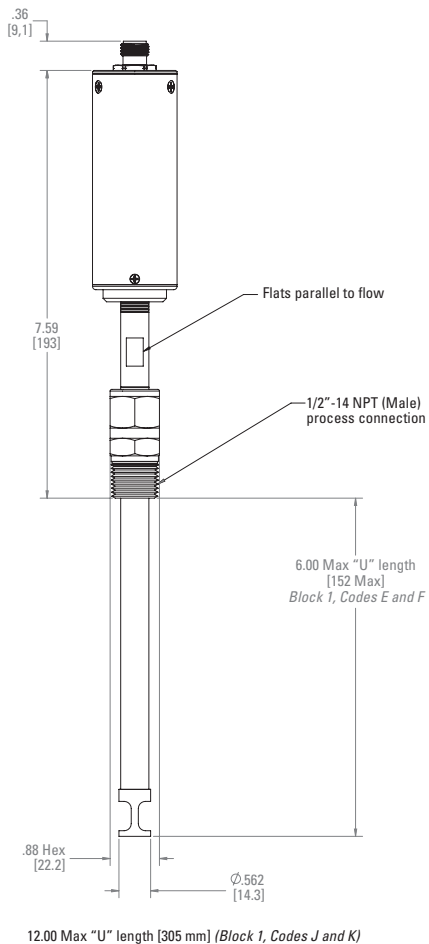
Insertion Type					
Block 1 Code	Block 3 Code	Description	Flow Range	Pressure Service	Temperature Compensation
E, F, J, or K	3	Insertion, natural gas	1.25 SFPS to 125 SFPS [0,4 NMPS to 38 NMPS]	10 psi(a) to 50 psi(a) [0,7 bar(a) to 3,5 bar(a)]	Extended, 30 °F to 180 °F [-1 °C to 82 °C]
	4	Insertion,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

## Dimensional Drawings

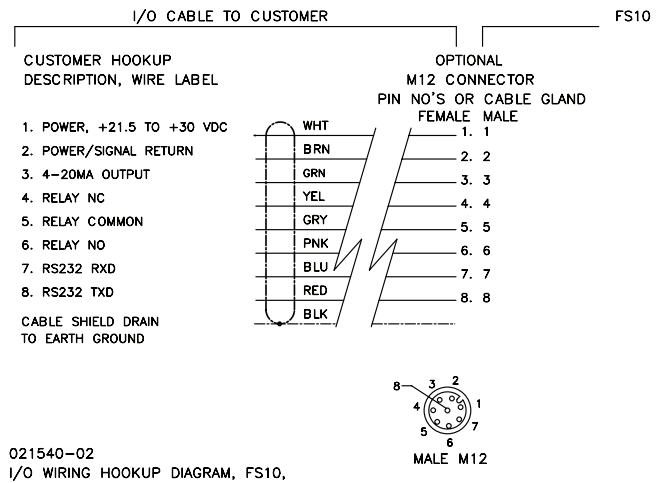
### In-line Type



### Insertion Type

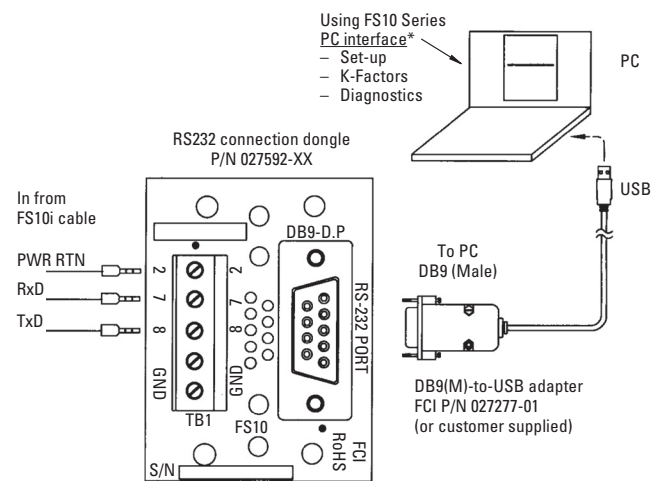


## Input/Output Wiring Diagram



Front Panel / Top	Selections	Block 2 Order Code (FS10i OIS)
	With watertight cable gland to cable pigtail; 15' [5 m] <i>Not available with ATEX approval</i>	Block 2, Code 1
	With M12 (male) connector <i>For user supplied M12 cable</i>	Block 2, Code 2

## FS10i-to-PC Interface



\* 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 -

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Block No.

1 2 3 4

Code	[BLOCK 1] Process Connection and "U" Length
<b>In-Line</b>	
<b>L</b>	1" FNPT, 150 lb pipe tee <sup>5</sup>
<b>M</b>	2" FNPT, 150 lb pipe tee <sup>5</sup>
<b>Insertion, "U" Length</b>	
<b>E</b>	1/2" NPT compression fitting with Teflon ferrule; 6" [152 mm] length
<b>F</b>	1/2" NPT compression fitting with metal ferrule; 6" [152 mm] length
<b>J</b>	1/2" NPT compression fitting with Teflon ferrule; 12" [305 mm] length
<b>K</b>	1/2" NPT compression fitting with metal ferrule; 12" [305 mm] length
Code	[BLOCK 2] Power and Signal Output Connection Type
<b>2</b>	M12 connector only <i>No cable supplied</i> <sup>1</sup>
<b>1</b>	Fixed, watertight cable gland to wire pigtail; 15' [5 m] <sup>4</sup>
Code	[BLOCK 3] Gas Medium and Calibration
<b>In-Line</b> <sup>5</sup>	
<b>1</b>	Natural gas <sup>5</sup> <i>Use if Block 1 Code is L</i>
<b>2</b>	Natural gas <sup>5</sup> <i>Use if Block 1 Code is M</i>
<b>Insertion</b> <sup>6</sup>	
<b>3</b>	Natural gas; 1.25 SFPS to 125 SFPS [0,4 NMPS to 38 NMPS] <sup>6</sup>
<b>4</b>	Natural gas; 4 SFPS to 400 SFPS [1,2 NMPS to 122 NMPS] <sup>6</sup>
Code	[BLOCK 4] Agency Approvals <i>CE Marking always included</i>
<b>0</b>	None; CE Marking only
<b>1</b>	FM, FMc <sup>2</sup>
<b>3</b>	ATEX, IECEx <sup>2</sup>
<b>5</b>	EAC/TR CU <sup>2</sup>
<b>*</b>	Other <i>Contact FCI for other approvals and conditions of use</i>

## Accessories

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

## Notes

- Connecting cable to be customer supplied, or select from Accessories list and order as separate item.
- Approvals for hazardous area are Division 2/Zone 2 + Zone 22; see specifications for details.
- 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.

In-line Type					
Block 1 Code	Block 3 Code	Description	Flow Range	Pressure Service	Temperature Compensation
<b>L</b>	<b>1</b>	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]
<b>M</b>	<b>2</b>	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]

6.

Insertion Type					
Block 1 Code	Block 3 Code	Description	Flow Range	Pressure Service	Temperature Compensation
<b>E, F, J, or K</b>	<b>3</b>	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]
	<b>4</b>	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]



Visit FCI online at [www.FluidComponents.com](http://www.FluidComponents.com) | FCI is ISO 9001 and AS9100 Certified

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