FS10A Analyzer Flow Switch / Monitor

FLUID COMPONENTS INTERNATIONAL LLC

For Process Analyzers and Sample Handling Systems

SIL 2 Compliance Rating

FS10A Features

- For Gases and Liquids
- Use In Tube Tees or SP76 (NeSSI) Systems
  - Requires Only One SP76 Block
- Superior Low Flow Sensing
- Single Configuration Meets All Flow Ranges, 100:1 Turndown
- Simple Push-Button Field Set-Up
- LED Array Shows Flow Rate and Switch Trip
- Choice of Outputs
  - Relay or Open Collector
  - 4-20 mA Analog Output Option
  - Serial RS232C I/O
- No Moving Parts, Non-Clogging
- No Cavities or Dead-Legs
- Simple, Screw-In Installation
- Lowest Cost Solution for End-Users and System Integrators

The FS10A is a universal flow monitor and switch specifically designed for gas and liquid process analyzer sampling systems. The FS10A is a fast responding, highly repeatable sensor which installs easily into a standard tube tee fitting or new SP76 (NeSSI) modular manifold.

The FS10A utilizes proven thermal-dispersion flow measurement technology with FCI proprietary equal mass sensing to achieve outstanding sensitivity and repeatability. The instrument's wetted parts are superior corrosion-resistant 316L stainless steel with Hastelloy-C sensor tips. An optional all Hastelloy-C sensor element is also available. The sensor element has no moving parts to foul, clog or maintain which ensures continuous reliability and no maintenance costs. There are no cavities, orifices or dead-legs to trap or contaminate samples which preserves sample integrity and faster system sampling times.

FS10A electronics are packaged in a rugged, fully-sealed, aluminum housing which provides exceptional protection and long-life under all process conditions.

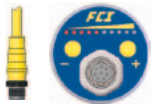
The electronics can be integral mounted with the sensor element resulting in unibody, self-contained unit (FS10A-1, FS10A-2) or the electronics can be separated from the sensor for remote mounting (FS10A-3, FS10A-4). The remote configuration is useful when sensor installation area is subjected to high temperatures, or to mount the front panel and display in a more accessible location.

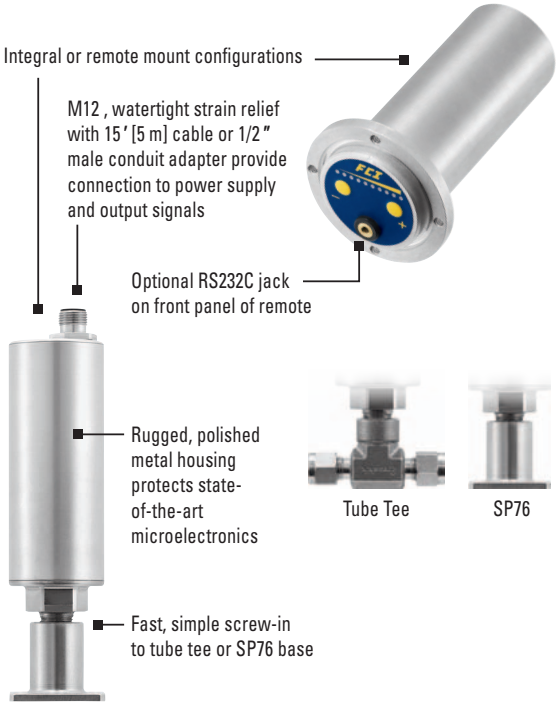
The instrument provides a top-mounted, flow rate monitoring LED array for at-a-glance visual indication of proper flow rate to the analyzer or sampling system, an alarm/trip indication, and as confirmation that the unit is powered and operating. The flow switch's setpoint is conveniently user settable via two push-buttons accessible at the top of the unit, or via its RS232 serial interface.

A choice of electronic outputs is available. The switch output can be either an open collector (n-channel) or a 1A relay settable for NO or NC operation. The switch settings are user programmable for trip control of hysteresis and time delay. Also included standard is a 4-20mA output for flow rate trending or it can be assigned to temperature.

FS10A has a common 1/4 inch NPT (male) connection for threading into standard tube tee fittings or FCI's SP76 base. Electrical and electronic connections at the FS10A are via a standard M12 connector or a fixed cable gland with tinned and marked wire leads for user's connections.

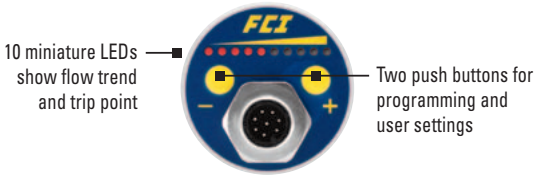
Integral Configuration

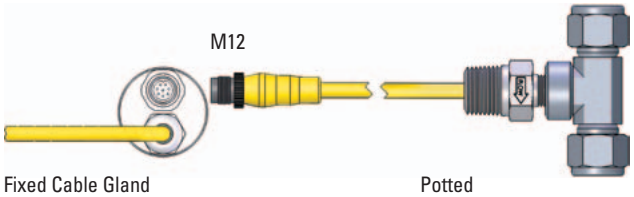
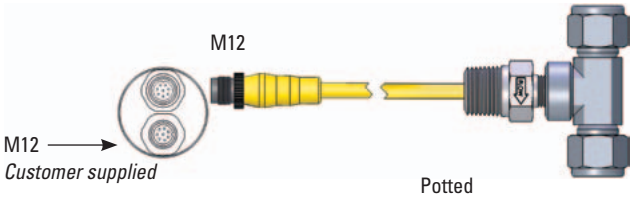
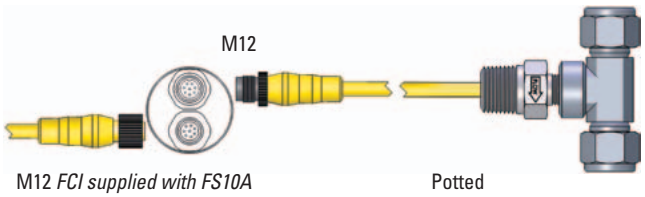
Front Panel / Top	Selections	Block 5 Order Code (FS10A OIS)
	With watertight cable gland to cable pigtail; 15′ [5 m]	Block 5, Code 1
	With M12 (male) connector *For user supplied M12 cable*	Block 5, Code 2
	M12, supplied with mating cable M12 to cable pigtail	■ 6′ [2 m]: (Block 5, Code 3) ■ 15′ [5 m]: (Block 5, Code 4) ■ 30′ [10 m]: (Block 5, Code 5)
	1/2″ NPT (male) conduit adapter with watertight cable gland to cable pigtail; 15′ [5 m]	Block 5, Code 6



Remote Configuration

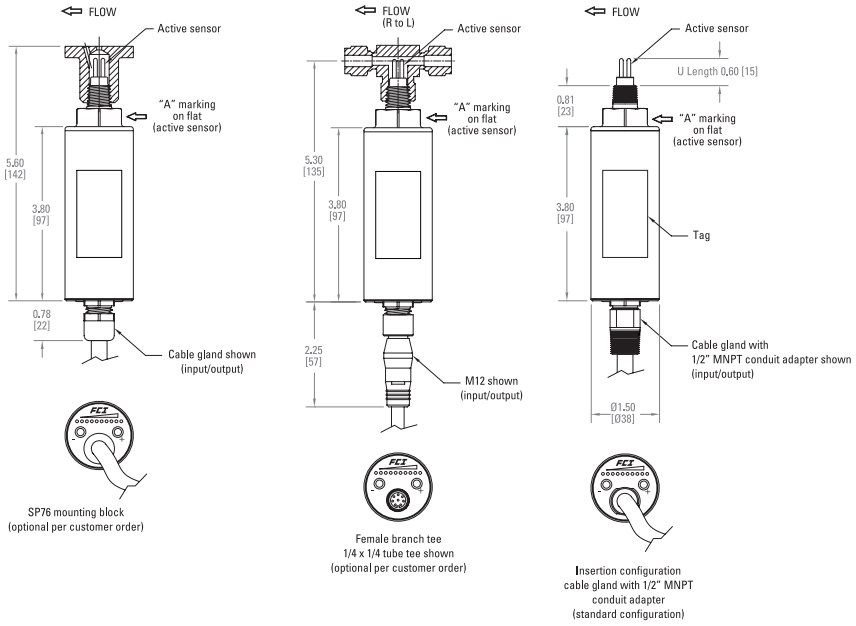
Front Panel / Top	Selections	Block 1 Order Code (FS10A OIS)
	Standard	Block 1, Code 3
	With RS232C connector jack on front panel; sealed with threaded cap and "O" ring when not in use	Block 1, Code 4



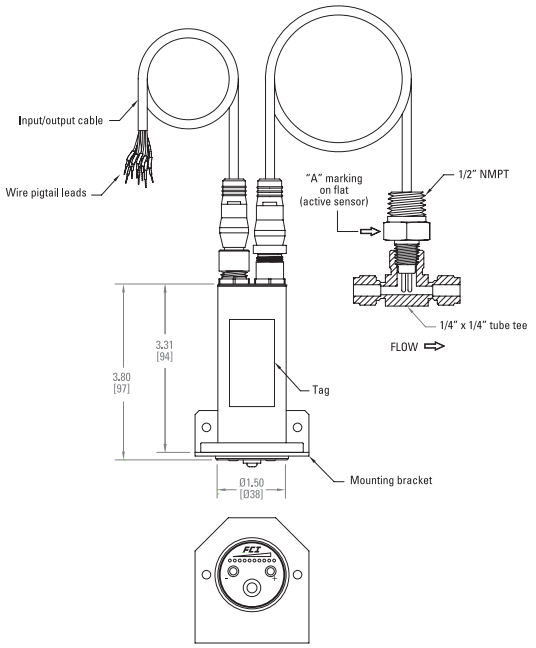
Block 5 Order Code (FS10A OIS)		**Block 4 Order Code** (FS10A OIS)
Code 1 15′ [5 m]	Power Input / Outputs — Block 5 / From Flow Element to Electronics — Block 4  M12 Fixed Cable Gland — Potted	**B** 6′ [2 m]; polyurethane jacketed **C** 15′ [5 m]; polyurethane jacketed **D** 30′ [10 m]; polyurethane jacketed **E** 6′ [2 m]; PTFE **F** 15′ [5 m]; PTFE **G** 30′ [10 m]; PTFE
Code 2	 M12 M12 → *Customer supplied* Potted	
Code 3 6′ [2 m] **Code 4** 15′ [5 m] **Code 5** 30′ [10 m]	 M12 M12 *FCI supplied with FS10A* Potted	

Dimensional Drawings

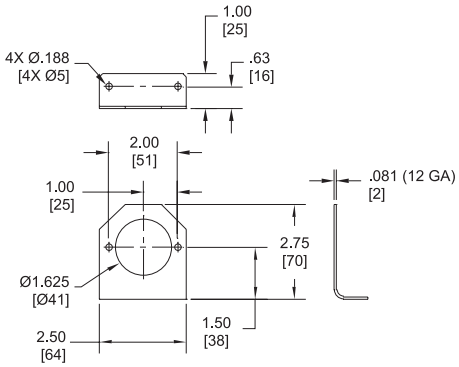
Integral Mount



Remote Mount

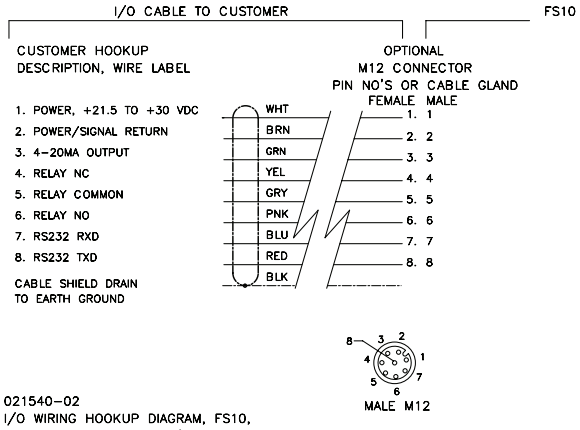


Mounting Bracket *Included with remote configuration*



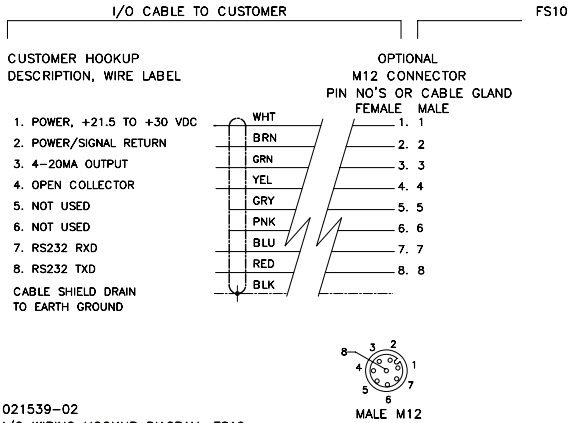
Input/Output Wiring Diagrams

FS10A OIS:
Block 6, Code E



021540-02
I/O WIRING HOOKUP DIAGRAM, FS10,
INTEGRAL AND REMOTE W/ JACK,
8 WIRE CABLE GLAND OR M12,
OUTPUTS: RELAY, 4-20MA, RS232

FS10A OIS:
Block 6, Code D



021539-02
I/O WIRING HOOKUP DIAGRAM, FS10,
INTEGRAL AND REMOTE W/O JACK,
8 WIRE CABLE GLAND OR M12,
OUTPUTS: OPEN COLLECTOR, 4-20MA, RS232

FS10A Specifications

Instrument

Media Compatibility: All gases and liquids compatible with 316L stainless steel and Hastelloy C22

Process Connection: 1/4″ NPT; compatible with 1/4″, 3/8″ and 1/2″ tube tee, 1/4″ tube tee with 1/8″ injection tube adapters and SP76 adapter (FCI part number 019897-01)

Flow Sensitivity / Range

	Air / Gas				Liquids			
	CC / Min		SCFH		CC / Min		GPH	
	Min	Max	Min	Max	Min	Max	Min	Max
1/8″ tube adapter with 0.0625″ ID injection tube	10	2,000	0.02	5	0.70	18.00	0.01	0.30
1/8″ tube adapter with 0.0940″ ID injection tube	25	5,000	0.05	10	1.50	40.00	0.03	0.60
1/4″ tube tee	50	20,000	0.10	40	4.00	100.00	0.07	1.70
SP76 adapter	50	20,000	0.10	40	4.00	100.00	0.07	1.70
3/8″ tube tee	180	50,000	0.40	100	14.00	350.00	0.20	5.50
1/2″ tube tee	375	100,000	0.80	200	30.00	750.00	0.50	12.00

Repeatability: ±0.5% of reading

Temperature Coefficient *For temperatures > ±30 °F [± 16 °C]*

Gas: Maximum ±0.025% of reading/°F up to 500 °F [±0.05% of reading/°C up to 260 °C]

Liquid: Maximum ±0.2% of reading/°F up to 250 °F [±0.367% of reading/°C up to 121 °C]

Turndown Ratio: 5:1 to 100:1

Agency Approvals

SIL: SIL 2 Compliant; Safe Failure Fraction (SFF) 90%

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, IEC: Nonincendive for gas and dust, Zone 2
II 3 G Ex nA IIC T4 Gc
II 3 D Ex tc IIIC T81 °C Dc
IP64

Remote Flow Element

FM, FMc: Class I, Division 1, Groups A, B, C, D; T2...T6
Ta = -40°C TO +65°C (electronics)
Class II/III, Division 1 Groups E, F, G; T2...T6
Ta = -40°C to +65°C (electronics); Type 4X, IP67
Tp = -40°C to +260°C (T1...T6); includes Zone 1/Division 1 ambient temperature zone for a remote mounted flow element

ATEX: II 2 G Ex d IIC Gb T2...T6; Ta = 40°C TO +65°C
II 2 D Ex tb IIIC Db T300°C...T85°C; IP67

IEC: Ex d IIC Gb T2...T6; Ta = 40°C TO +65°C
Ex tb IIIC Db T300°C...T85°C; IP67

Refer to *Probe Installation Operation Manual* (06EN003428) for Zone 1/Division 1 installation

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

Flow Element

Materials of Construction: (Wetted parts) 316L stainless steel with Hastelloy C-22 thermowells; optional, all Hastelloy-C22 probe assembly

Operating Temperature

Standard: -40 °F to 250 °F [-40 °C to 121 °C]

Optional: -40 °F to 500 °F [-40 °C to 260 °C]; remote configuration only

Operating Pressure

Tube tee fitting: 500 psig [34 bar (g)]

SP76 adapter: Per SP76 manifold specifications up to 500 psig [34 bar (g)] maximum

Transmitter / Electronics

Enclosure: NEMA 4X [IP64], anodized aluminum

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

Output Signals

	Block 6, Order Code D	Block 6, Order Code E
Open Collector N-Channel (100 mA)	■	
Relay, SPDT; 1A @ 24 Vdc; 120 Vac *(ATEX: DC only)*		■
4-20 mA Trending Output *	■	■
RS232C Serial I/O	■	■

* 500 max. load; user scalable, general purpose, uncalibrated output proportional to flow rate for trend monitoring or assignable to temperature; fault indication per NAMUR NE43 guidelines, user-selectable for high (>21.0 mA) or low (<3.6 mA) *default*

For linearized and calibrated analog outputs, see FCI's line of thermal mass flow meter products

Display: 10 LED array, red; sequential lighting proportional to flow trend and flashes at setpoint

User Interface: Two top-mounted push buttons to program switch/trip point, zero and span setting, relay hysteresis and time delay; button operation may be user disabled to prevent unwanted changes; all set-up functions also programmable via RS232C port

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

Remote Configuration: Transmitter/electronics are separated from the flow element and interconnected with a cable; flow element has potted cable terminating in an M12 for direct plug-in connection with the electronics; cable lengths available in 6′, 15′ and 30′ [2 m, 5 m or 10 m] lengths; optional extended temperature service to 500 °F [260 °C] requires selection of the interconnecting cable with PTFE jacketing

FLUID COMPONENTS INTERNATIONAL LLC

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Order Information Sheet (OIS)

FS10A Series

Flow Switch / Flow Monitor

– Integral Configuration

FS10A - | | | | 0 | | | 0 | | |

Block No.	1	2	3	4	5	6	7	8	9

INSTRUCTIONS: To order an **FS10A** in an integral configuration, please fill in each numbered block above by selecting required codes from the corresponding categories below. Use of any "W" or "*" codes requires prior approval from FCI. For special data, documentation, test reports or required quality reports, refer to FCI's Engineering and Quality Assurance Order Information Sheets (OIS).

Code	[BLOCK 1] Base Unit Type and Flow Orientation
1	Integral configuration with flow direction in tube tee = horizontal right-to-left or vertical up; in SP76 adapter, flow side-to-center port
2	Integral configuration with flow direction in tube tee = horizontal left-to-right or vertical down; in SP76 adapter, flow center-to-side port
Code	**[BLOCK 2] Flow Element Material and Temperature Service**
A	316L stainless steel probe with Hastelloy-C22 thermowells; -40 °F to 250 °F [-40 °C to 121 °C]; integral [10]
E	All Hastelloy-C22 probe and thermowells; -40 °F to 250 °F [-40 °C to 121 °C]; integral [10]
W	Other, agency approved, customer specified
Code	**[BLOCK 3] Process Connection / Adapter**
0	None, not required [1]
1	1/4 ″ tube tee; 316L stainless steel
2	3/8 ″ tube tee; 316L stainless steel
3	1/2 ″ tube tee; 316L stainless steel
4	SP76 adapter base plate; 316L stainless steel
5	1/8 ″ tube adapter in 1/4 ″ tube tee with 0.0940 ″ ID injection tube *Increases low flow rate sensitivity to 25 cc/min (gas)*; 316 stainless steel
6	1/8 ″ tube adapter in 1/4 ″ tube tee with 0.0625 ″ ID injection tube *Increases low flow rate sensitivity to 10 cc/min (gas)*; 316 stainless steel
W	Other, agency approved, customer specified
Code	**[BLOCK 4]**
0	*Block 4 Code is always "0" with FS10A integral version*
Code	**[BLOCK 5] Power and Signal Output Connection Type**
1	Fixed, watertight cable gland to wire pigtail; 15 ′ [5 m] [13]
2	M12 connector only *No cable supplied; connecting cable supplied by customer*
3	M12 at FS10A and supplied with mating M12 to cable pigtail; 6 ′ [2 m]
4	M12 at FS10A and supplied with mating M12 to cable pigtail; 15 ′ [5 m]
5	M12 at FS10A and supplied with mating M12 to cable pigtail; 30 ′ [10 m]
6	1/2 ″ (male) conduit adapter with fixed, watertight cable gland to wire pigtail; 15 ′ [5 m] [13]
W	Agency approved, customer specified
Code	**[BLOCK 6] Outputs** *All models include RS232C Serial I/O*
D	Open collector [11] + 4-20 mA trending output flow monitor [6]
E	Relay output + 4-20 mA trending output flow monitor [6]
W	Agency approved, customer specified
Code	**[BLOCK 7] Media Service**
0	*Block 7 Code always "0"*
Code	**[BLOCK 8] Factory Set-Up and Calibration**
0	Not required *User field set*
A	Switch configuration and set-up for air or water [3]
B	Switch configuration and set-up for air or water + factory pre-setting of trip point (on air or water) [3]
Code	**[BLOCK 9] Agency Approvals** *CE marking always included*
0	Not required
1	FM, FMc (CSA)
2	ATEX, IECEx [13]
5	EAC / TR CU
*****	Other *Contact FCI for other approvals and conditions of use*

Notes

1. Code 0 in Block 3 is not recommended when factory pre set-up is specified (Block 8, Code B). Best accuracy is obtained when calibrated together with factory supplied adapter (Block 3, Codes 1-7 or W)
3. When Code A or B is specified in Block 8, a completed FCI Application Data Sheet (ADS) must be submitted with order
6. 4-20 mA output may be assigned to temperature. Contact FCI for information on how to order and specify
10. Enclosure/electronics maximum temperature is 160 °F [71 °C]
11. N-channel, MOSFET
13. Cable gland not available with ATEX/IEC approval

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Order Information Sheet (OIS)

FS10A Series

Flow Switch / Flow Monitor

– Remote Configuration

FS10A - [ ][ ][ ][ ][ ][ ][0][ ][ ]

Block No.	1	2	3	4	5	6	7	8	9

INSTRUCTIONS: To order an **FS10A** in a remote configuration, please fill in each numbered block above by selecting required codes from the corresponding categories below. Use of any "W" or "*" codes requires prior approval from FCI. For special data, documentation, test reports or required quality reports, refer to FCI's Engineering and Quality Assurance Order Information Sheets (OIS).

Code	[BLOCK 1] Base Unit Type
A	Remote configuration with panel mount adaptor *P/N 025719-01*
B	Remote configuration with surface mount adaptor *P/N 025442-01*
	With FCI supplied Ex d cable gland and adapter installed on remote flow element; Requires selection of Code H, J, K, E, F, G or W in Block 4
C	Remote configuration with panel mount adaptor *P/N 025719-01* and nickel plated brass cable gland + adapter
D	Remote configuration with surface mount adaptor *P/N 025442-01* and nickel plated brass cable gland + adapter
E	Remote configuration with panel mount adaptor *P/N 025719-01* and 316L stainless steel cable gland + adapter
F	Remote configuration with surface mount adaptor *P/N 025442-01* and 316L stainless steel cable gland + adapter

Code	[BLOCK 2] Flow Element Material and Temperature Service
B	316L stainless steel probe with Hastelloy-C22 thermowells; -40 °F to 250 °F [-40 °C to 121 °C]; remote
C	316L stainless steel probe with Hastelloy-C22 thermowells; extended temperature -40 °F to 500 °F [-40 °C to 260 °C]; remote [2]
F	All Hastelloy-C22 probe and thermowells; -40 °F to 250 °F [-40 °C to 121 °C]; remote
G	All Hastelloy-C22 probe and thermowells; extended temperature -40 °F to 500 °F [-40 °C to 260 °C]; remote [2]
W	Other, agency approved, customer specified

Code	[BLOCK 3] Process Connection / Adapter
0	None, not required [1]
1	1/4" tube tee; 316L stainless steel
2	3/8" tube tee; 316L stainless steel
3	1/2" tube tee; 316L stainless steel
4	SP76 adapter base plate; 316L stainless steel
5	1/8" tube adapter in 1/4" tube tee with 0.0940" ID injection tube *Increases low flow rate sensitivity to 25 cc/min (gas)*; 316 stainless steel
6	1/8" tube adapter in 1/4" tube tee with 0.0625" ID injection tube *Increases low flow rate sensitivity to 10 cc/min (gas)*; 316 stainless steel
W	Other, agency approved, customer specified

Code	[BLOCK 4] Flow Element to Electronics Cable and Connections				
	Length	Connection at Flow Element	Connection at Electronics	Temp Service	Jacket Type
B	6' [2 m]	Potted	Molded M12	176 °F [80 °C]	Polyurethane
C	15' [5 m]	Potted	Molded M12	176 °F [80 °C]	Polyurethane
D	30' [10 m]	Potted	Molded M12	176 °F [80 °C]	Polyurethane
H	6' [2 m]	Potted	Removable [12] M12	176 °F [80 °C]	Polyurethane
J	15' [5 m]	Potted	Removable [12] M12	176 °F [80 °C]	Polyurethane
K	30' [10 m]	Potted	Removable [12] M12	176 °F [80 °C]	Polyurethane
E	6' [2 m]	Potted	Removable [12] M12	500 °F [260 °C]	PTFE [2]
F	15' [5 m]	Potted	Removable [12] M12	500 °F [260 °C]	PTFE [2]
G	30' [10 m]	Potted	Removable [12] M12	500 °F [260 °C]	PTFE [2]
W	Agency approved, customer specified				

Code	[BLOCK 5] Power and Signal Output Connection Type
1	Fixed, watertight cable gland to wire pigtail; 15' [5 m] [13]
2	M12 connector only *No cable supplied; connecting cable supplied by customer*
3	M12 at FS10A and supplied with mating M12 to cable pigtail; 6' [2 m]
4	M12 at FS10A and supplied with mating M12 to cable pigtail; 15' [5 m]
5	M12 at FS10A and supplied with mating M12 to cable pigtail; 30' [10 m]
W	Agency approved, customer specified

Code	[BLOCK 6] Outputs *All models include RS232C Serial I/O*
D	Open collector [11] + 4-20 mA trending output flow monitor [6]
E	Relay output + 4-20 mA trending output flow monitor [6]
W	Agency approved, customer specified

Code	[BLOCK 7] Media Service
0	*Block 7 Code always "0"*

Code	[BLOCK 8] Factory Setup
0	Not required *User field set*
A	Switch configuration and set-up for air or water [3]
B	Same as Code A above + factory pre-setting of trip point (on air or water) [3]

Code	[BLOCK 9] Agency Approvals *CE marking always included*
0	Not required
1	FM, FMc (CSA)
2	ATEX, IECEx [13]
5	EAC / TR CU
*****	Other *Contact FCI for other approvals and conditions of use*

Notes

1. Code 0 in Block 3 is not recommended when factory pre set-up is specified (Block 8, Code B). Best accuracy is obtained when calibrated together with factory supplied adapter (Block 3, Codes 1-7 or W)
2. Extended temperature unit (Block 2, Code C or G) requires selection of PTFE jacketed, potted cable at flow element (Block 4, Code E, F, G)
3. When Code A or B is specified in Block 8, a completed FCI Application Data Sheet (ADS) must be submitted with order
6. 4-20 mA output may be assigned to temperature. Contact FCI for information on how to order and specify
10. Enclosure/electronics maximum temperature is 160 °F [71 °C]
11. N-channel, MOSFET
12. Removable M12 connector is required to facilitate use of Ex d cable gland or small diameter conduit in Ex D Zone 1/Div 1 installations
13. Cable gland not available with ATEX/IEC approval