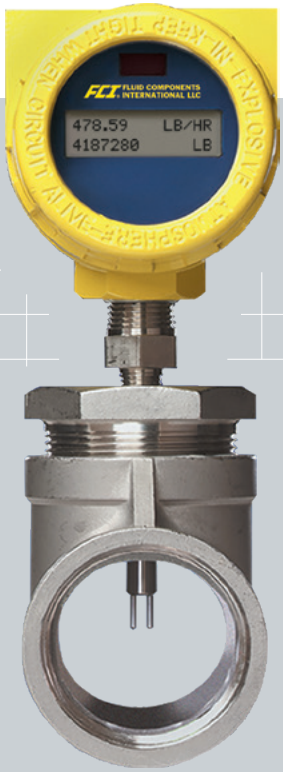
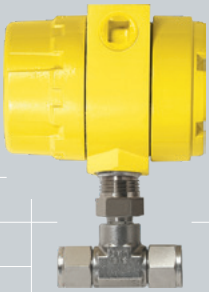
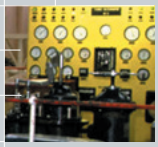
FCI ST75 Series Flow Meters

Small Line, Mass Flow Meters for Industrial and Commercial Process Gases

Low cost, easy installation flow measuring
for 1/4 inch to 2 inch [6 mm to 51 mm] line sizes







FCI ST75 FLOW METER

- Burner/Boiler Fuel and Air Feed Lines
- Industrial Furnaces, Kilns and Oven Fuel/Air Controls
- Natural Gas Sub-Metering
- Heat Treating Gas Controls
- Air Compressor System Control and Point-of-Use Monitoring
- Chiller Air Flow Measurements
- Co-Gen and Turbine Generator Fuel Flow Measurements
- Dosing and Gas Injection Rate Controls

FCI® FLUID COMPONENTS INTERNATIONAL LLC

ST75 Series Features

- **Direct mass, standard volumetric or standard velocity flow measurement**
- **Triple outputs: flow rate, temperature and total flow**
- **HART or Modbus I/O (ST75 A, ST75 AV)**
- **Non-clogging, no moving parts**
- **2 line digital display option**
- **Small, compact design**
- **Easy installation**
- **Built-in Vortab® flow conditioning (ST75V, ST75 AV)**
- **SIL compliant**

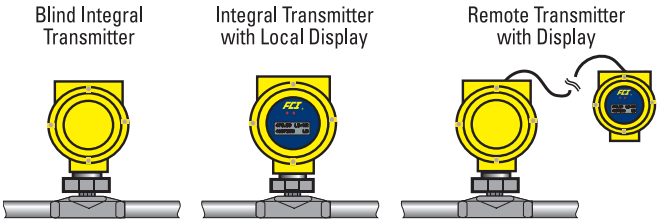


Figure 1: ST75 Series standard configurations

** For pipes larger than 2 inches [51 mm] see FCI insertion style flow meters.*

Superior Air and Gas Flow Measurement

ST75 is an accurate, no moving parts, direct mass flow measurement and monitoring solution for fuel gases, air, compressed air, inert and other gas flows within industrial processes. There are four base models in the series: ST75, ST75A, ST75V, and ST75AV. The "A" suffix models provide enhanced features and HART I/O (see chart below); the "V" suffix models include built-in Vortab flow conditioners. They are available in six different sizes for direct, in-line installation in line sizes from 1/4 inch to 2 inch [6 mm to 51 mm]. *

Model	ST75	ST75 A	ST75 V	ST75 AV
Vortab flow conditioning			■	■
Dual 4-20 mA outputs per NAMUR NE43	■	■	■	■
500 Hz pulse output	■	■	■	■
HART (v7) I/O		■		■
Modbus (485 RTU/ASCII)		■		■
Dual line LCD readout *Optional*	■	■	■	■
Maximum remote distance *Maximum*	50 ' [15 m]	100 ' [30 m]	50 ' [15 m]	100 ' [30 m]
SIL compliance rating		■		■
Ex hazardous location approvals	■	■	■	■
Warranty	1 year	2 years	1 year	2 years

By combining precision lithography structured platinum RTD sensors embedded in FCI's equal mass thermowells with microprocessor electronics and precise actual gas calibration, the ST75 achieves outstanding flow measurement performance. Using FCI's proven thermal dispersion technology, the ST75's direct mass flow measurement eliminates the cost and space of additional sensors required by inferred technologies. With its 100:1 turndown and flow ranges from 0.01 SCFM to 559 SCFM [0,01 NCMH to 950 NCMH], the ST75 measures over a wide flow range, from low to high flow conditions. The ST75 is available in specific calibrations for most gases including natural gas, methane and other hydrocarbon gases, as well as nitrogen, CO_2, argon and all inert gases, compressed air and more.

Easy to Install, Easy to Use

Models ST75 and ST75 A have a standard "T" fitting design that allows for fast, simple in-line installation. Standard NPT line size selections include 1/4 inch, 1/2 inch, 3/4 inch, 1 inch, 1-1/2 inch and 2 inch. For compression fitting tube applications, selections include 1/4 inch, 1/2 inch and 1 inch. For installations with inadequate straight-run or obstructed flows that prevent a fully developed profile for accurate flow measurement with the standard ST75, Models ST75 V and ST75 AV provide the solution. FCI's ST75 V and ST75 AV include all of the features and functionality of the ST75 plus built-in Vortab flow conditioning.

Vortab flow conditioners are the flow conditioning technology proven and recommended by flow measurement experts to eliminate both swirl and velocity profile distortions to ensure accurate flow measurement. Vortab flow conditioners also are the lowest pressure loss solution of all flow conditioning techniques. FCI is the exclusive

provider of Vortab flow conditioners for use with thermal mass flow meters such as the ST75 V and ST75 AV.

To serve a variety of application and installation requirements, the ST75 Series is available in three standard configurations (see Figure 1 on page 2).

To provide convenient and easy access for wire-up and signal isolation, the instrument's enclosure features dual conduit ports in either NPT or M20 threads, as well as removable front and rear covers. ST75 models can be ordered for DC (18 V to 36 V) or AC (85 V to 265 V) power.

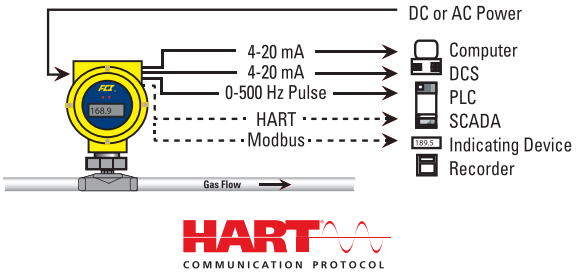
Extensive Outputs Assure Application Compatibility

ST75 provides the most comprehensive selection of outputs in its class. Dual analog outputs, a pulse output and a digital, serial I/O are standard on all models. Models ST75 A and ST75 AV include HART.

Dual 4-20 mA analog outputs are field assignable to flow rate and/or temperature. These outputs are user scalable to the instrument's full calibrated range or any subset. Flow rate is selectable for reading in mass flow or standard volumetric engineering units. A 0-500 Hz pulse output of flow is provided for interface to totalizers

Models ST75A and ST75AV include a selection of either HART or Modbus 1/0. HART is available over output #1, is version 7 compliant and is fully compatible with all versions of HART field communicators and control systems. FCI's HART I/0 and its DD file are certified compliant by FieldComm Group. Modbus is RS485 in accordance with EIA/TIA-485 standard and is RTU and ASCII compatible.

In all models a standard RS232C serial I/O link is provided for instrument configuration, service/troubleshooting data, and measured readings.



HART COMMUNICATION PROTOCOL

Designed and Built to Last

ST75 will significantly reduce maintenance costs and time. ST75 is a no moving parts design that virtually eliminates the wear out, clogging and excessive pressure drop associated with other flow metering techniques. The sensor element is all-welded stainless steel with Hastelloy-C tips that provide extra protection against invasive conditions within the pipe. The instrument's electronics are housed in an all-metal, aluminum, or stainless steel NEMA 4X (IP66, IP67) rated enclosure to provide the ruggedness and dust/weather proof protection needed to ensure long-life in industrial and commercial installations.

Find your gas here?

FCI has provided thermal mass flow meter solutions for all of these and more…

Acetaldehyde
Acetic Acid
Acetone
Acetonitrile
Acetyl Chloride
Air
Allyl Chloride
Ammonia
Aniline
Argon
Benzene
Bio-Gas
Boron Trifluoride
Bromine
Bromobenzene
Butadiene
Butene
Butylene Oxide
Butyne
Carbon Dioxide
Carbon Disulfide
Carbon Monoxide
Carbon Tetrachloride
Carbonyl Sulfide
Chlorine
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
Chloroprene
Cis-2-Butene
Cis-2-Hexene
Compressed Air
Cumene
Cyanogen
Cyclobutane
Cyclohexane
Cyclooctane
Cyclopentane
Cyclopropane
Decene
Deuterium
Deuterium Oxide
Diethyl Amine
Diethyl Ether
Diethyl Ketone
Digester Gas
Dimethyl Ether
Dimethyl Propane
Dimethyl Sulfide
Ethane
Ethanol
Ethyl Acetate
Ethyl Acrylate
Ethyl Alcohol
Ethyl Amine
Ethyl Benzene
Ethyl Bromide
Ethyl Chloride
Ethyl Fluoride
Ethyl Mercaptan
Ethylene
Ethylene Dichloride
Ethylene Oxide
Flare Gas
Fluorine
Fluorobenzene
Fluoroform
Freon-11
Freon-12
Freon-13
Freon-14
Freon-21
Freon-22
Freon-23
Furan
Halon
Helium
Heptene
Hexanol
Hexene
Hydrazine
Hydrogen
Hydrogen Bromide
Hydrogen Chloride
Hydrogen Cyanide
Hydrogen Deuteride
Hydrogen Fluoride
Hydrogen Iodide
Hydrogen Peroxide
Hydrogen Sulfide
Iodine
Isobutane
Isobutene
Isobutyl Alcohol
Isoheptane
Isohexane
Isooctane
Isopentane
Isoprene
Isopropyl Alcohol
Isopropyl Amine
Ketene
Krypton
Landfill Gas
M-Cresol
Mercury
Methane
Methanol
Methyl Acetate
Methyl Alcohol
Methyl Amine
Methyl Butane
Methyl Fluoride
Methyl Formate
Methyl Hexane
Methyl Hydrazine
Methyl Mercaptan
Methyl Octane
Methyl Pentane
Methylal
Methylene Chloride
Morpholine
M-Xylene
Naphthalene
Natural Gas
N-Butane
N-Butane
N-Butanol
N-Butyl Alcohol
N-Decane
N-Dodecane
Neon
Neopentane
N-Heptane
N-Hexane
Nitric Oxide
Nitrogen
Nitrogen Dioxide
Nitromethane
Nitrous Oxide
N-Nonane
N-Octane
Nonene
N-Pentane
N-Propanol
N-Propyl Alcohol
N-Propyl Amine
N-Undecane
Octene
Oxygen
O-Xylene
Ozone
Pentanol
Pentene
Phenol
Phosgene
Propadiene
Propane
Propanol
Propyl Chloride
Propylene
Propylene Oxide
Propyne
P-Xylene
R-11
R-12
R-13
R-13B1
R-14
R-21
R-22
R-23
R-112
R-113
R-114
R-114B2
R-115
R-116
R-134A
R-142B
R-152A
R-216
R-500
R-502
R-503
R-504
R-C318
Radon
Silane
Silicon Tetrachloride
Styrene
Sulfur Dioxide
Sulfur Hexafluoride
Sulfur Trioxide
Superheated Thiophene
Titanium Tetrachloride
Toluene
Trans-2-Butene
Trimethyl Amine
Triptane
Uranium Hexafluoride
Vinyl Acetate
Vinyl Chloride
Vinyl Fluoride
Vinyl Formate

ST75 Series Flow Meter Specifications

Instrument

- **Media:** Air, compressed air, nitrogen, oxygen, argon, CO_2, ozone, other inert gases, natural gas, other hydrocarbon gases, and hydrogen
- **Pipe/Line Size Compatability:** 1/4″ to 2″ [6 mm to 51 mm][1]
- **Range**[2]

NPT Line Size	Minimum SCFM	Minimum [NCMH]	Maximum SCFM	Maximum [NCMH]
1/4″	0.04	[0,07]	17.34	[29,47]
1/2″	0.13	[0,22]	50.64	[86,04]
3/4″	0.22	[0,38]	88.88	[151,00]
1″	0.35	[0,59]	139.95	[237,78]
1-1/2″	0.85	[1,44]	339.31	[576,48]
2″	1.40	[2,38]	559.27	[950,20]

Tubing Line Size	Minimum SCFM	Minimum [NCMH]	Maximum SCFM	Maximum [NCMH]
1/4″	0.01	[0,01]	3.02	[5,14]
1/2″	0.05	[0,09]	21.15	[35,94]
1″	0.25	[0,42]	99.08	[168,33]

- **Accuracy**
  Model ST75, ST75 A
  Standard: ±2% reading, ±0.5% full scale
  Optional: ±1% reading, ±0.5% full scale
  Model ST75V, ST75 AV
  Standard: ±1% reading, ±0.5% full scale
- **Repeatability:** ±0.5% reading
- **Turndown Ratio:** 3:1 to 100:1
- **Temperature Compensation**
  Standard: 40 °F to 100 °F [4 °C to 38 °C]
  Optional: 0 °F to 250 °F [-18 °C to 121 °C]
- **Agency Approvals**

FM, FMc:	Class I, Division 1, Groups B, C, D; T4 Ta= +60°C; Type 4X, IP66 Class II/III, Division 1, Groups E, F, G; T4 Ta= +60°C; Type 4X, IP66 *Model ST75 and ST75V also include:* Nonincendive for Class I, Division 2, Groups A, B, C and D; T4 Ta=+60°C; Type 4X, IP66
ATEX:	Zone 1, Zone 21 II 2 G Ex db IIC T6...T1 Gb II 2 D Ex tb IIIC T85°C...T300°C Db; IP66/IP67 Ta= -40°C to +65°C
IECEx:	Ex db IIC T6...T1 Gb; Ex tb IIIC T85°C...T300°C Db; IP66/IP67 Ta=-40°C to +65°C
Other:	EAC (TRCU) Russia, NEPSI, CE Marking, CPA, PED, CRN
SIL (ST75 A, ST75 AV):	SIL 1 compliant, safe failure fraction (SFF) 78.5% to 81.1%

- **Warranty**
  ST75, ST75 V: One year
  ST75 A, ST75 AV: Two years

Flow Element

- **Installation:** In-line "T," NPT or tube
- **Type:** Thermal dispersion
- **Material of Construction**
  All-welded 316 stainless steel probe element with Hastelloy-C22 thermowells; 316 stainless steel NPT and tube fittings; ST75 V and ST75 AV flow body is schedule 40 stainless steel
- **Maximum Operating Pressure**
  T-fitting [NPT female]: 240 psi [16.5 barg]
  Tube: 600 psi [41 barg]
- **Operating Temperature (Process)**
  0 °F to 250 °F [-18 °C to 121 °C]
- **Process Connection**
  Model ST75, ST75 A
  T-fitting [NPT female]: 1/4″, 1/2″, 3/4″, 1″, 1 1/2″ or 2″
  Tubing: 1/4″, 1/2″ or 1″
  Model ST75 V, ST75 AV
  Female NPT, Male NPT, ANSI flanges, DIN flanges

Transmitter

- **Enclosure**
  Rating: NEMA 4X, IP66, IP67
  Material
  Standard: Aluminum, polyester powder coated
  Optional: 316 stainless steel
  Conduit/Cable Port: Dual, 1/2" NPT or M20x1.5
- **Operating Temperature**
  0 °F to 140 °F [-18 °C to 60 °C]
- **Input Power**
  DC: 18 Vdc to 36 Vdc (6 watt maximum)
  AC: 85 Vac to 265 Vac (12 watt maximum)
  (CE Marking approval from 100 Vac to 240 Vac)
- **Output Signal**
  Standard
  (2) 4-20 mA, user assignable to flow rate and/or temperature
  (1) 0-500 Hz pulse for total flow
  Output #1 have fault indication per NAMUR NE43 guidelines; user selectable for high (>21.0 mA) or low (<3.6 mA)
- **Bus Communications (ST75A/ST75AV)** HART or Modbus
  HART: Version 7; FieldComm Group certifed; available over output #1; DD file included
  Modbus: RS485 (in accordance with EIA/TIA-485 standard)
  - Modbus device type: Slave
  - Address range: 0-255
  - Supported function codes: 03,04
  - Supported baud rate: 9600,19200
  - Transmission mode: RTU and ASCII; standard MS (16 bit), standard LS (16 bit), Daniel extensions (32 bit)
  - Response time (delay between polls): 50 ms or greater
  - Functions
    - Readings: Flow rate, temperature, totalized flow (single precision), flow engineering units, temperature engineering units
    - Other: Enable (activate) totalizer, reset totalizer, change K factor
- **Communication Port:** RS232C standard
- **Digital Display (optional):** 2-line x 16 characters LCD. Displays measured value and engineering units. Top line assigned to flow rate. Second line is user assignable to temperature reading, as flow totalizer or alternating. Display can be rotated in 90° increments for optimum viewing orientation.

Specifications at reference operating conditions of 70 °F, 14.7 psia [21.1 °C, 1.013 bar(a)] and for Models ST75, ST75 A straight pipe run 20d upstream, 10d downstream.

FCI is a continuous improvement company. Specifications subject to change without notice.

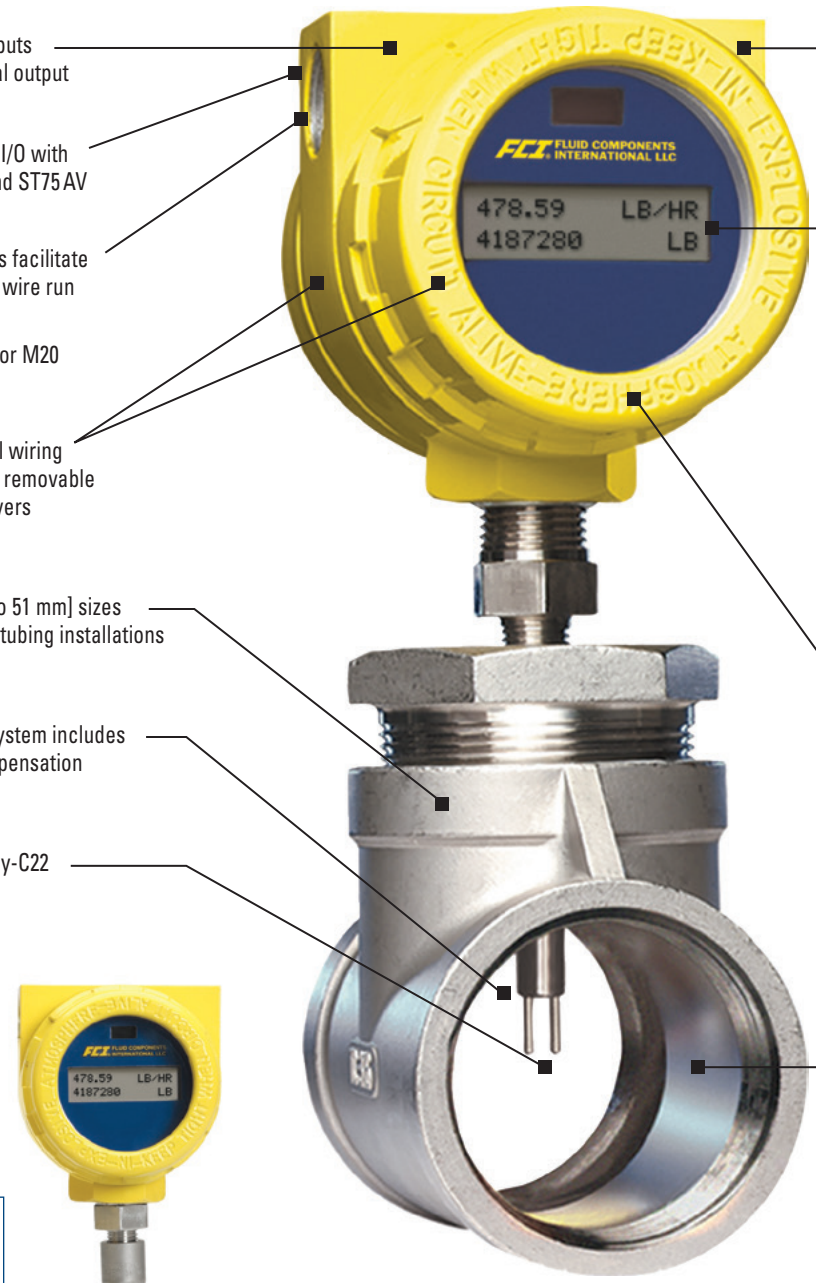
[1] For line sizes > 2 inches [> 51 mm] see FCI insrtion-style flow meters

[2] Actual range subject to gas type and specific conditions

ST75 Series Features

In-line, Mass Flow Measurement

With premium components and attention to detail, FCI's ST75 series provides long-lasting flow meter quality and value. Its features and functions ensure application compatibility, maximum installation convenience, superior industrial durability and lowest maintenance.



Three analog outputs and RS232C digital output

HART or Modbus I/O with Models ST75A and ST75AV

Dual conduit ports facilitate power and signal wire run isolation

Selection of NPT or M20 threads

Easy access to all wiring terminations with removable front and rear covers

1/4″ to 2″ [6 mm to 51 mm] sizes for both pipe and tubing installations

Fully calibrated system includes temperature compensation

Premium Hastelloy-C22 sensor tips

DC or AC powered

2-line x 16 characters LCD

- Displays measured value and engineering units
- Top line assigned to flow rate
- Second line is user assignable to temperature reading, as flow totalizer or alternating
- Display can be rotated in 90° increments for optimum viewing orientation

Compact, rugged NEMA 4X/IP66, IP67, all metal enclosure and agency approvals for Div. 1, Zone 1 hazardous location installations

- Optional stainless steel enclosure

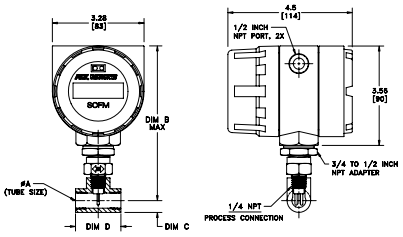
No moving parts technology is

- Non-clogging
- Maintenance free
- Minimal pressure drop

ST75V
ST75AV

Built-in Vortab® flow conditioner in Models ST75V, ST75AV

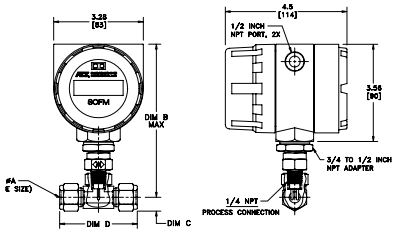
Models ST75 / ST75 A Pipe (NPT) Tee Configuration



1. DIMENSIONS IN INCHES, BRACKETS [ ] ARE IN mm.
2. REDUCERS USED ON LARGER PIPE TEES (NOT SHOWN) ALLOW FOR MAX B DIMENSION.
3. PIPE TEES ARE 150 # CLASS.

Pipe (NPT) Tee Configuration			
DIM A Pipe Size	**DIM B** Top to Flow CL	**DIM C** Flow CL to Bottom	**DIM D** Tee Length
1/4″	6.0 [152,4] Max.	0.38 [9,65]	1.54 [39,12]
1/2″	6.5 [165,1] Max.	0.56 [14,22]	2.28 [57,91]
3/4″	7.0 [177,8] Max.	0.68 [17,27]	2.56 [65,02]
1″	7.3 [185,4] Max.	0.86 [21,84]	2.92 [74,17]
1 1/2″	7.8 [198,1] Max.	1.17 [29,72]	3.82 [97,03]
2″	8.0 [203,2] Max.	1.42 [36,07]	4.66 [118,40]

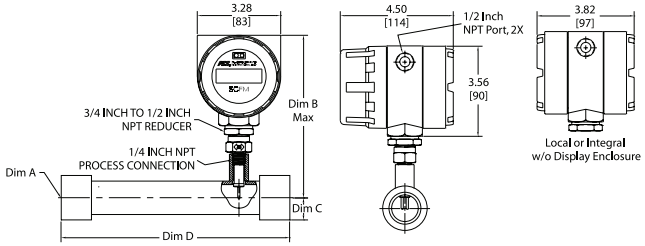
Models ST75 / ST75 A Tube Tee Configuration



1. DIMENSIONS IN INCHES, BRACKETS [ ] ARE IN mm.
2. COMPRESSION FITTING FERRULES 316 SST.

Tube Tee Configuration			
DIM A Pipe Size	**DIM B** Top to Flow CL	**DIM C** Flow CL to Bottom	**DIM D** Tee Length
1/4″	5.7 [144,8] Max.	0.33 [8,39]	2.34 [59,44]
1/2″	5.9 [149,9] Max.	0.53 [13,46]	2.84 [72,14]
1″	7.8 [198,1] Max.	0.87 [22,10]	3.86 [98,04]

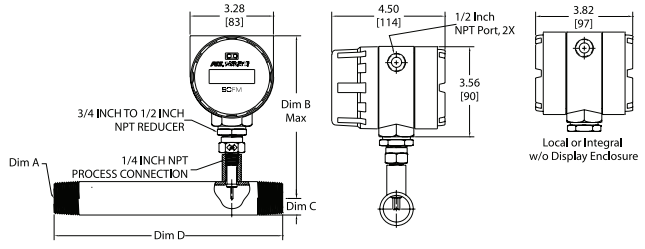
Models ST75 V / ST75 AV Female NPT



1. Dimensions are in INCHES; brackets [ ] are in MILLIMETERS.

Female NPT Configuration			
DIM A Pipe Size	**DIM B** Top to Flow CL	**DIM C** Flow CL to Bottom	**DIM D** VMR Length
1/4″	5.50 [140]	0.38 [9,5]	5.00 [127]
1/2″	5.69 [144,5]	0.57 [14]	7.50 [190,5]
3/4″	6.45 [164]	0.69 [17,5]	9.00 [229]
1″	6.44 [163,5]	0.88 [22]	9.00 [229]
1 1/2″	6.42 [163]	1.25 [32]	13.50 [343]
2″	6.43 [163]	1.50 [38]	18.00 [457]

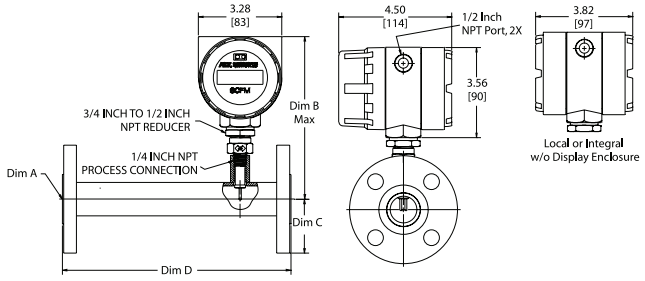
Models ST75 V / ST75 AV Male NPT



1. Dimensions are in INCHES; brackets [ ] are in MILLIMETERS.

Male NPT Configuration			
DIM A Pipe Size	**DIM B** Top to Flow CL	**DIM C** Flow CL to Bottom	**DIM D** Tee Length
1/4″	5.50 [140]	0.38 [9,5]	5.00 [127]
1/2″	5.69 [144,5]	0.42 [10,6]	7.50 [190,5]
3/4″	6.45 [164]	0.51 [13]	9.00 [229]
1″	6.44 [163,5]	0.65 [16,5]	9.00 [229]
1 1/2″	6.42 [163]	.95 [24]	13.50 [343]
2″	6.43 [163]	1.19 [30]	18.00 [457]

Models ST75 V / ST75 AV Flanged



1. Dimensions are in INCHES; brackets [ ] are in MILLIMETERS.
2. Flanges are 150# Class.

Flanged Configuration			
DIM A Pipe Size	**DIM B** Top to Flow CL	**DIM C** Flow CL to Bottom	**DIM D** Tee Length
1/4"	n/a	n/a	n/a
1/2"	5.69 [144,5]	1.75 [45]	7.50 [190,5]
3/4"	6.45 [164]	1.94 [49]	9.00 [229]
1"	6.44 [163,5]	2.12 [54]	9.00 [229]
1 1/2"	6.42 [163]	2.50 [64]	13.50 [343]
2"	6.43 [163]	3.00 [76]	18.00 [457]

More Air / Gas Mass Flow Meter Solutions

In addition to the ST75 Series, FCI manufactures a broad line of thermal dispersion flow meter products for industrial and plant applications. From general-purpose air flow measurement to special-function, mixed gas flare flows; from small line sizes to the largest stacks and ducts, FCI has the selection to best solve your applications and ensure optimum solutions. Contact your local FCI representative or visit **www.FluidComponents.com** for detailed product information and specifications on these products.

- **ST50 Series** models are compact and economical, yet full featured air and gas meters designed for air, compressed air, nitrogen (ST50) and biogas, digester gas, natural gas (ST51, ST51 A) applications.

- **ST80 Series** for all gases, combines high-performance, extensive installation options and an array of output choices to meet the needs of the most demanding industrial applications.

- **ST100 Series** is industry's most advanced gas flow meters. All gases, flow, temperature and pressure, multiple outputs, bus communications, graphical display, multiple calibrations, VeriCal, on-board data logger, and more.

- **MT Series** "multi-point" flow measuring systems can be configured with two (2) to eight (8) flow sensing elements to optimize measurements within the largest of pipe and duct sizes.

FCI's World Class Calibration Ensures Installed Accuracy

ST75 Series models are tested and calibrated to rigorous standards so that you get the instrument that does the job specified. To design and produce the highest quality flow instrumentation, FCI operates a world-class flow calibration laboratory with calibrations performed on more than 19 different flow stands, using equipment traceable to NIST (US National Institute of Standards and Technology), and ISO/IEC 17025 (International Standards for test lab quality systems).

To achieve the highest possible accuracy in ST75 Series, FCI utilizes these precision flow stands to flow actual gases and reference fluids matched to the temperature and process conditions of your application.

Other suppliers are often limited only to air calibrations and rely on non-field tested or un-validated theoretical equivalencies for other gases and gas mixtures. This procedure can be inadequate and create measurement and output errors well outside published specifications. FCI calibration capabilities are un-matched in the industry, providing you with total confidence that your installation meets its published specifications and your application needs.

More than 19 precision flow stands to match NIST traceable fluids, process conditions, flow rates and line sizes specified in your application.

Discuss your flow measurement application

ASK AN FCI EXPERT

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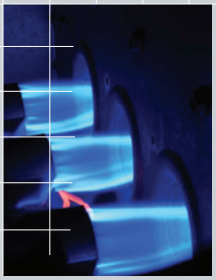

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