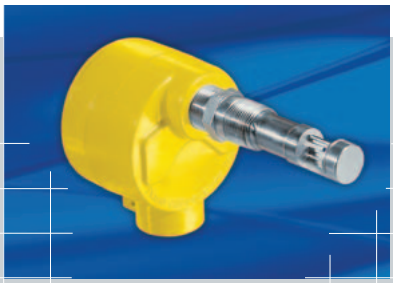
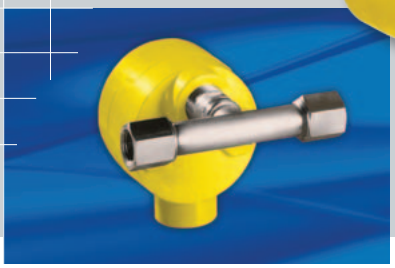
FCI GF Series

Versatile High Performance
Mass Flow Meter for Gas Applications





FCI GF SERIES

- Flare Gas
- Fuel Gas
- Scrubber Balancing
- Landfill Vapor Recovery
- Exhaust Stack
- Hydrogen Make-up Gas
- Natural Gas Pipeline Transmission
- Compressor Fuel
- Combustion Air to Boilers / Furnaces
- Preheater Air to Boilers / Furnaces
- Wastewater Digester Gas / Biogas
- Process Gas
- Heavy Industrial HVAC
- Nitrogen Purge
- Other Gas Applications

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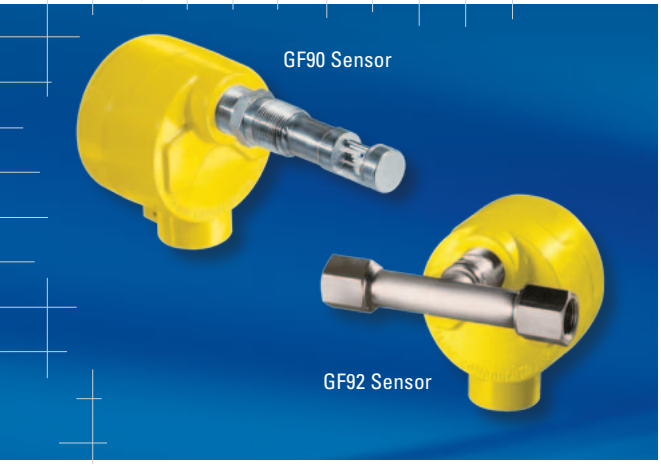
FCI® FLUID COMPONENTS INTERNATIONAL LLC



GF Series Features

- **GF Series gas mass flow meters combine FCI's highly reliable thermal dispersion, no-moving-parts flow element design with an advanced microprocessor-based programmable transmitter. Performance and durability are unmatched in tough industrial applications ranging from exhaust stack gas to digester gas to hydrogen make-up gas flow metering**

Reliability, Flexibility in Industrial Applications

The GF Series mass flow meters are available in two models: the GF90 with an insertion flow element and the GF92 with an in-line flow element. Both models feature standard 316 stainless steel, nickel braze construction. Corrosion- and abrasion-resistant alloys and all-welded construction are available for select service in harsh process environments.

FCI's advanced constant power thermal dispersion technology provides the GF Series mass flow meters with turndowns up to 1000:1, repeatability of ±0.5% reading or better, and flow rate accuracy of ±1% reading plus 0.5% full scale.

Model GF90 Insertion Type

The GF90 is for use in ducts or pipe sizes 2.5 inches [64 mm] and larger nominal inside diameter. The standard flow element has a 1 inch male NPT process connection and an application specific insertion length. Flange connections and field retractable packing gland assemblies are also available.

Flow sensitivity ranges from 0.25 SFPS [0.08 NMPS] to 1000 SFPS [305 NMPS] at a standard temperature of 70 °F [21.1 °C] and pressure of 14.7 psia [1.013 bar (a)]. *Higher flow ranges may be possible depending on application specifics; contact FCI.*

Model GF92 In-Line Type

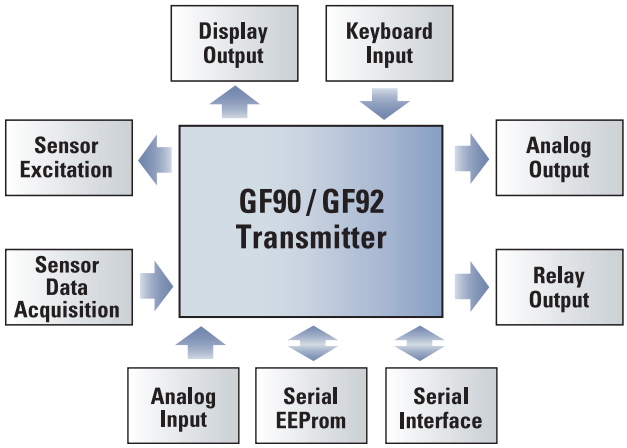
The GF92 is used for gas mass flow metering in pipe or tubing sizes from 0.125 inches [3.2 mm] to 2 inches [51 mm]. It has a standard body length of 7.25 inches [184 mm] for installation in 1 inch [25 mm] flow tubes and 12 inches [305 mm] length for 1.5 inch [38 mm] to 2 inch [51 mm] pipe sizes. Custom lengths are also available.

Flow sensitivity ranges from 0.006 SCFM [0.01 NCMH] to 2000 SCFM [3398 NCMH] at a standard temperature of 70° F [21.1°C] and pressure of 14.7 psia [1.013 bar (a)]. Contact FCI or an FCI representative for the specific flow range sensitivity for your application.

Smart Electronics

The GF Series' microprocessor-based electronics are easily addressable via a built-in keypad or through the serial ports and allow complete in-field configuration of the instrument's parameters (e.g., the setting of relay set points, analog output's zero and span, display units, and installation and operation parameters within the calibrated instrument range). RS-232C serial port provides the ability to interface with a computer or any ASCII-oriented terminal.

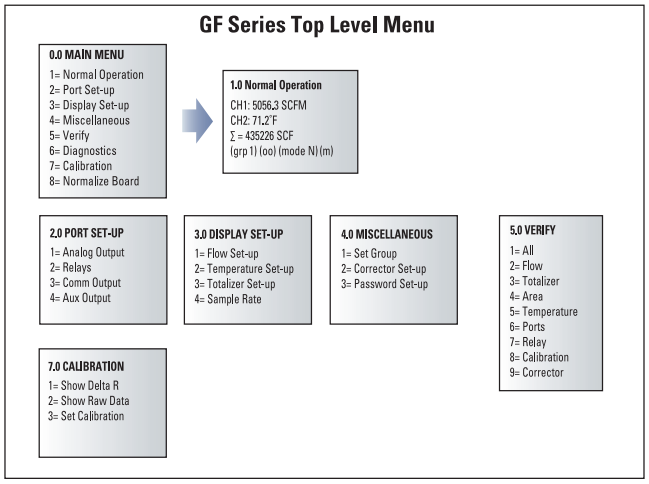
Two independent analog outputs can be set in the field. Modes include: 4-20 mA, 0-10 Vdc, 0-5 Vdc, or 1-5 Vdc. Process flow rate, temperature and all GF Series functions are simultaneously available through the RS-232C serial ports.



Smart Features

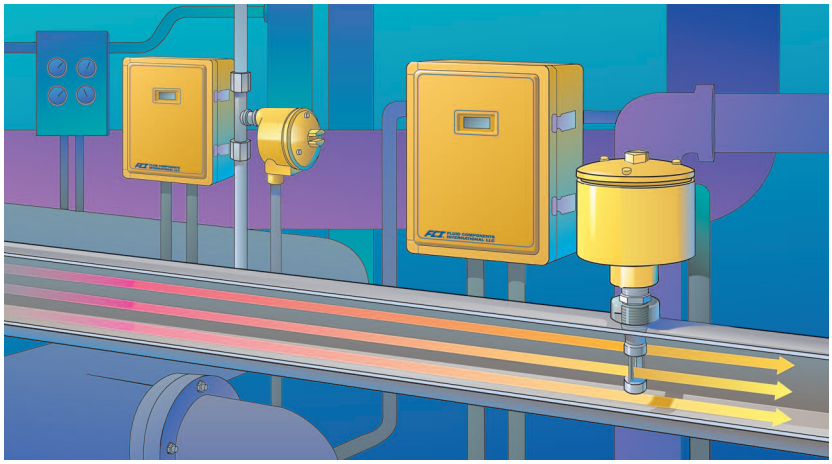
Outstanding features of FCI's GF Series microprocessor-based electronics include:

User-Friendly Operation and Maintenance – Start-up, verification and operation are easily performed through the keyboard and menu-driven display.



Indicator Display – Four lines by twenty character liquid crystal display indicates flow rate, total flow, temperature, relay status, current calibration mode and sample rate. Flow rate, total flow and temperature can be independently set to Imperial or Metric (SI) units.

In-Field Programming – The built-in keypad permits easy touch, in-field programming to change zero, span, switch points, units of measurement, two totalizer modes, instrument verification, trouble shooting and other critical instrument functions. Built-in testing and diagnostics. Built-in testing and diagnostic capabilities ensure accurate and reliable performance. Diagnostics include out of range detection and forced relay status.



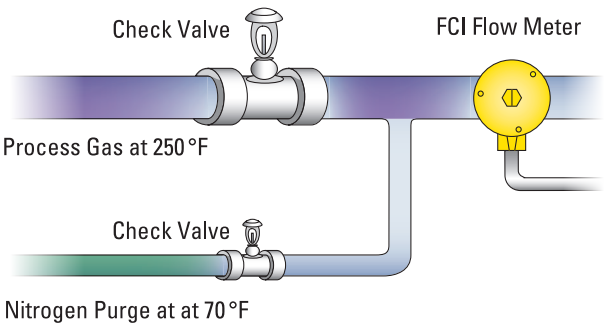
Built-In Testing and Diagnostics – Built-in testing and diagnostic capabilities ensure accurate and reliable performance. Diagnostics include out of range detection and forced relay status.

Non-Volatile Memory – Non-volatile memory prevents the loss of valuable application data and totalized flow due to loss of power.

Security – Pass-code protection offers security against both unauthorized access and equipment tampering.

Multiple Calibration Groups – Up to three calibration groups can be stored in a single GF Series transmitter. Each group can be independently configured for a specific calibration range, media, switch point settings, etc. For example, a hydrogen line that requires periodic purging with nitrogen gas can be measured with a single GF Series mass flow meter. The complete calibration data for each gas can be stored in one of three available groups. Each calibration group can be manually or automatically selected to provide an accurate indication of a specific process gas.

Example of Multi-Calibation Group Application



The three calibration groups can also be utilized to enhance or preserve accuracy over wide flow turndowns. Accurate flows with turndown ratios of 1000:1 are possible through group linkage. In addition, automatic switching between groups can also be controlled by process temperature variations.

Auxiliary Input Terminal – An auxiliary input terminal is available for connection to an external signal source. This terminal provides a method for remotely switching between calibration groups.

Enclosures – The local flow element enclosures are NEMA 4X and Ex-rated available in either aluminum or 316L stainless steel. Optionally, the sensor element can be supplied with no enclosure, with only wire or cable pigtail termination. The standard transmitter/electronics enclosures are rugged, NEMA 4X/IP66 rated fiberglass type available with either two (2) 1 inch NPT(F) conduit ports or three (3) 21 mm openings for user installation of M20 or M25 conduit connections or cable glands. An aluminum NEMA 4X and Ex-rated enclosure with three (3) 1 inch NPT(F) conduit ports is optionally available.

Agency Approvals – System agency approvals for hazardous installations include FM, CSA, ATEX, IECEx and GOST/RTN. Additional approvals and certifications include CPA, Canadian CRN and PED, and CE mark.

Options

VeriCal™ – An in-situ calibration verification system for insertion style Model GF90 flow meter. A specially configured flow element assembly and extra bench mark calibration in the GF90 combined with a portable flow control kit. Provides "wet" field verification of calibration without removing flow meter from the pipe. Contact FCI for details or consult FCI's ST100 Series flow meter brochure.

Purge Assembly – Flow element/probe with integral plumbing and fixture for purging.

GF Series Mass Flow Meter Specifications

Application

- **Gas Mass Flow Measurement**
  GF90: In ducts or pipes sizes with a minimum 2.5" [64 mm] nominal inside diameter
  GF92: In pipe lines or tubing sizes from 0.125" to 2" [3.2 mm to 51 mm]

Flow Element

- **Process Connection**
  GF90: 1" Male NPT
  ANSI or DIN flanged
  Retractable packing gland with 1.25" NPT(M), ANSI or DIN flange
  GF92: NPT (M), NPT (F), flanged, butt weld preparation
- **Insertion Length (GF90)**
  Variable length; specify insertion "U" length to extend the tip of the flow element 1" [25 mm] past the centerline of the process pipe
- **Body Length (GF92)**
  7.25" [184 mm] for 1" flow tubes; 12" [305 mm] for 1.5" to 3" pipe spool pieces; variable "A" lengths available
- **Material of Construction**
  GF90/GF92: 316L stainless steel (brazed) or Hastelloy C-276 (brazed)
  GF90 with optional Verical Assembly: 316L stainless steel, all-welded
- **Flow Range**
  GF90: 0.25 SFPS to 1000 SFPS [0.08 NMPS to 305 NMPS for most gases at a standard temperature of 70 °F [21.1 °C] and pressure of 14.7 psia [1.013 bar(a)]
  GF92: 0.006 SCFM to 1330 SCFM [0.01 NCMH to 3140 NCMH] for most gases at a standard temperature of 70 °F [21.1 °C] and pressure of 14.7 psia [1.013 bar(a)]
  Actual velocity for both the GF90 and GF92 must be limited to a maximum of 200 FPS [61 MPS]
- **Operating Temperature**
  GF90/GF92: 40 °F to 100 °F [4 °C to 38 °C]
  GF90/GF92: -50 °F to 200 °F [-45 °C to 93 °C]
  GF90/GF92: -50 °F to 350 °F [-45 °C to 177 °C]
  GF90 only: -100 °F to 850 °F [-73 °C to 454 °C]
- **Operating Pressure**
  To 1000 psig [70 bar(g)]

Transmitter

- **Signal Output**
  Analog: Two independent signal outputs, isolated or non-isolated; field selectable as:
  4-20 mA, 600 ohms maximum load
  0-10 Vdc, 5000 ohms minimum load
  0-5 Vdc, 2500 ohms minimum load
  1-5 Vdc, 2500 ohms minimum load
  Digital: RS-232C serial port
  Optional: HART output
- **Switch Points (Dual Alarms)**
  The switch points may be field set by programming the GF90 or GF92 to alarm at high, low or windowed flow or at high, low or windowed process temperature
- **Relays**
  Two independently adjustable 2 amp at 115/230 Vac or 24 Vdc
  Slave Relay Energization Terminals: Customer provided relay may be energized at programmable values connecting to points on the output terminal strip
  +External Relay: 20 Vdc, sourcing up to 100 mA total both relay outputs
  -External Relay: Open/ground (switching)
- **Power Input**
  AC: 115 Vac, ±15 Vac; 16 watts maximum
  AC: 230 Vac, ±30 Vac; 16 watts maximum
  DC: 24 Vdc (22 Vdc to 30 Vdc]; 16 watts maximum
  All field selectable via power input switch and wire-up terminals
- **Indicator Display and Built-In Keypad**
  4 lines by 20 character liquid crystal display that may be programmed to indicate flow rate, total flow, temperature, and switch point status in customer determined English or Metric (SI) values; keypad permits easy touch programming to change zero, span, switch points, and units of measurement and for instrument verification, trouble shooting and other critical instrument functions
- **Enclosures**
  Standard
  Fiberglass; NEMA 4X, two (2) 1" NPT(F) conduit ports
  Fiberglass; NEMA 4X/IP66, three (3) 21 mm conduit/cable gland ports
  Optional
  Aluminum; NEMA 4/4X with window for external viewing of digital display; three (3) 1" NPT(F) conduit ports; hazardous location rated Groups B, C, D, E, F, G and EEx d IIC
- **Electrical Connection:** 1" NPT(F)
- **Temperature Range:** 0 °F to 150 °F [-18 °C to 66 °C]

Flow

- **Accuracy:** ±1% reading, +0.5 full scale
- **Repeatability:** ±0.5% reading or better
- **Turndown Ratio**
  Field set to within specified flow range from 2:1 to 100:1; turndown ratios up to 1000:1 are possible in some applications; signal output may be field set to be zero or non-zero based; up to three independent calibrations may be stored in the GF Series transmitter and selected via the built-in keypad, RS-232C serial port or auxiliary input terminal (4-20 mA)
- **Calibration Adjustment**
  Up to three (3) independent calibration groups available; each group is precisely calibrated at the factory in accordance with the submitted Application Data Sheet to turndown ratios as high as 1000:1; most calibrations are performed in the actual process fluid and process conditions described by the customer's specification; adjustment to zero and span are made easily in the field by using the keypad to input revised flow or temperature range information

Temperature

- **Accuracy**
  ±2 °F [±1 °C]; valid only above minimum flowing conditions of 5 SFPS [1.5 NMPS]
- **Repeatability**
  ±1 °F [±0.55 °C]

Agency Approvals

- FM/CSA Class I, Div 2, Groups A, B, C, D
  Class II, Div 1 and 2, Groups E, F, G
  ATEX EEx d IIC, II 2 G/D, T4
  IECEx Ex d IIC T2 or T4
  Tamb (Housing) = -40C to +60C
  Tamb (Sensing Element) = -40C to +177C
  Canadian CRN, CPA, GOST/RTN
  CE, PED

Warranty

- 3 years

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

FCI's World Class Calibration Ensures Installed Accuracy

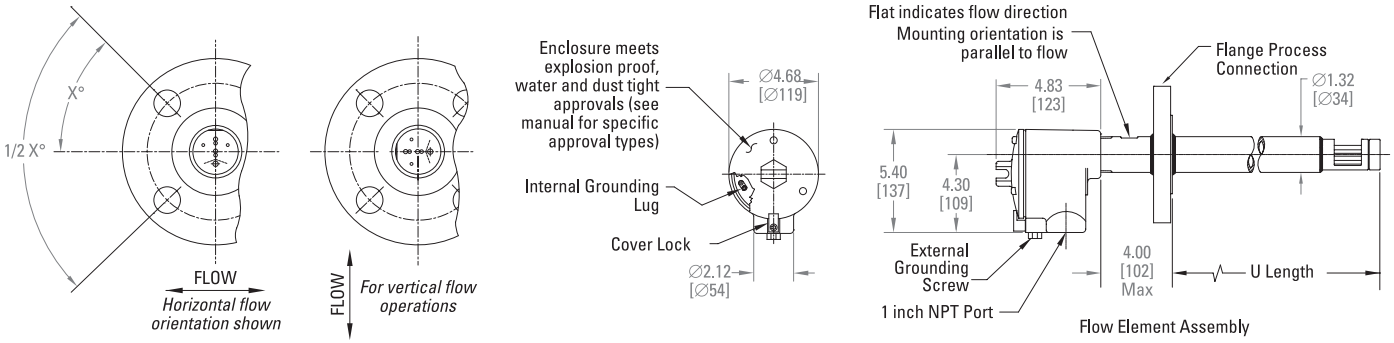
GF Series models are tested and calibrated to rigorous standards so that you get the instrument that does the job specified. To design and produce the highest quality flow instrumentation, FCI operates a world-class NIST traceable flow calibration laboratory with more than 18 flow stands certified to meet such stringent standards as MIL-STD 45662A and ANSI/NCSL Z-540.

To achieve the highest possible accuracy in GF Series, FCI utilizes these precision flow stands to flow actual gases and reference fluids matched to the temperature and process conditions of your application. Further utilizing the extensive flow laboratory capabilities, FCI has developed an all new, patent pending and scientifically engineered SpectraCal gas equivalency algorithm as an economical alternative to actual gas calibration.

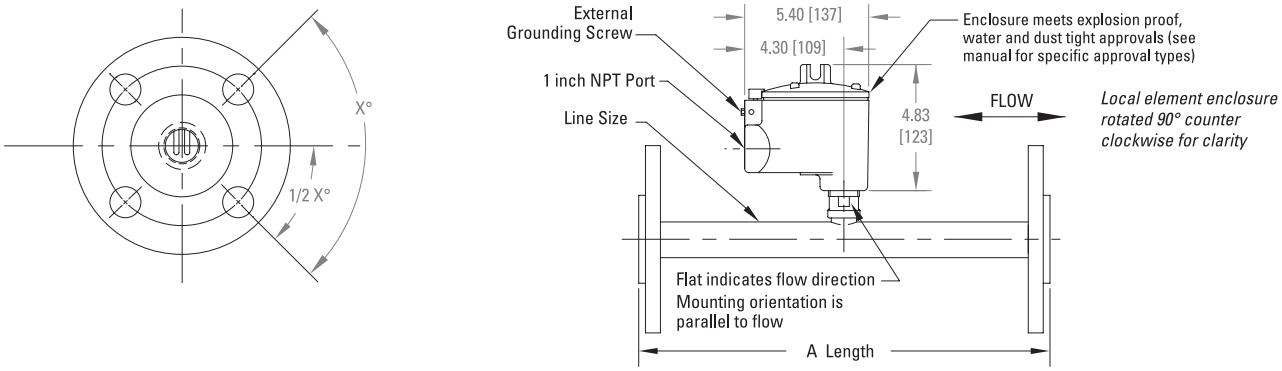
Other suppliers are often limited only to air calibrations and rely on non-field tested or un-validated theoretical equivalencies for other gases and gas mixtures. This procedure can be inadequate and create measurement and output errors well outside published specifications. FCI calibration capabilities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

More than 18 precision flow stands to match NIST traceable fluids, process conditions, flow rates and line sizes specified in your application.

GF90 Flow Element

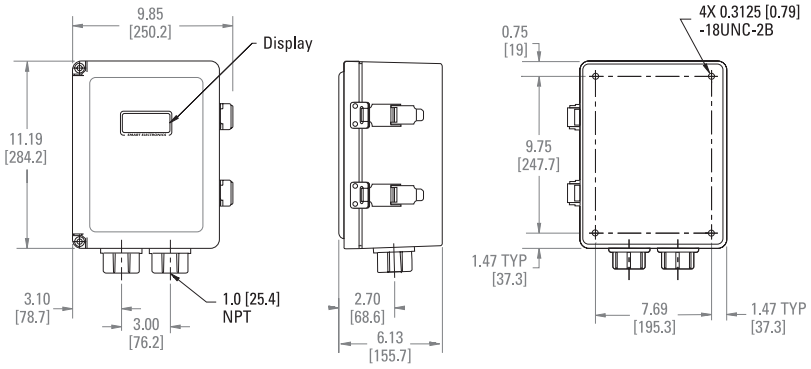


GF92 Flow Element

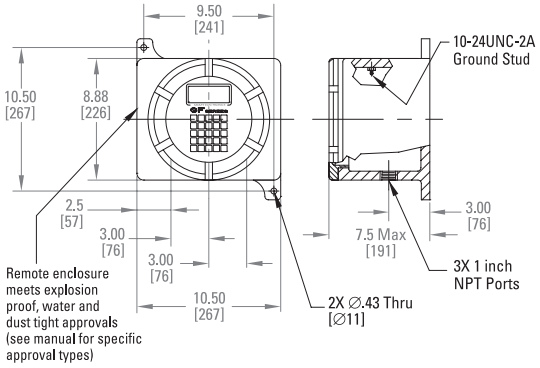


GF Series Remote Transmitter Enclosures

Fiberglass Type



Aluminum Type



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