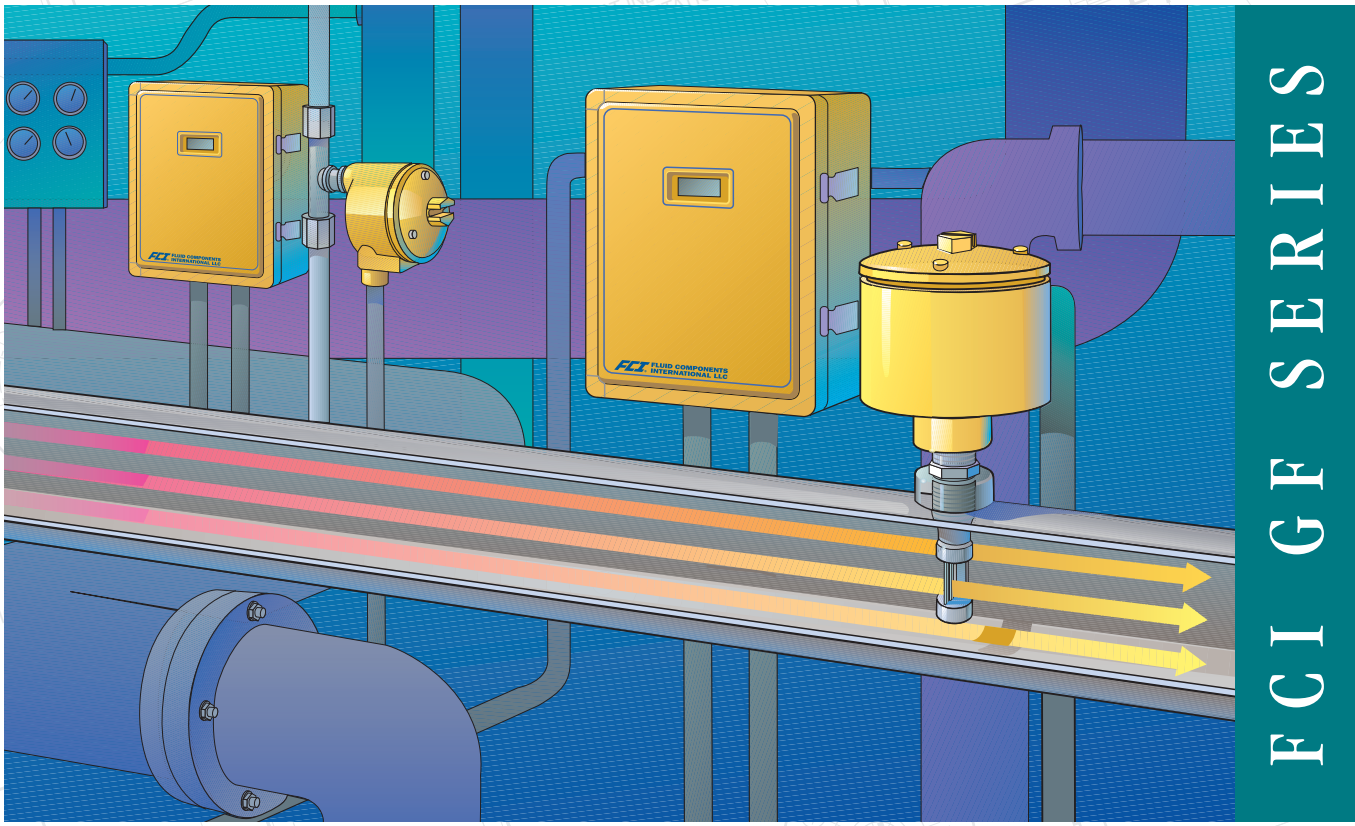
NEW
Now Includes
VeriCal™ In-Situ Calibration
Verification Option
for GF90 & GF03

FCI GF Series:

The Versatile

High Performance



Mass Flowmeter

for Gas Applications.

FCI® FLUID COMPONENTS INTERNATIONAL LLC

The GF Series Gas Mass Flowmeters 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 Flowmeters are available in two models: the GF90 with an insertion flow element and the GF92 with an inline 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 Flowmeters 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.

The GF Insertion Model The GF90 is available for use in ducts or pipe sizes with a suggested minimum 2 inch [50 mm] 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 to 1600 SFPS [0.08 to 488 NMPS] at a standard temperature of 70° F and pressure of 14.7 psia [21.1° C and pressure of 1.013 bar(a)].

The GF92 Inline Model The GF92 is used for gas mass flow metering in pipe lines or tubing sizes from 0.125 to 3 inches [3.2 to 76 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 to 3 inch pipe sizes. Custom lengths are also available.

Flow sensitivity ranges from 0.006 to 2000 SCFM [0.01 to 3398 NCMH] at a standard temperature of 70° F and pressure of 14.7 psia [21.1° C and pressure of 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 reconfiguration to the instrument's performance parameters (i.e., the changing of relay set points, output zeros and spans, 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 friendly 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 English 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.

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.

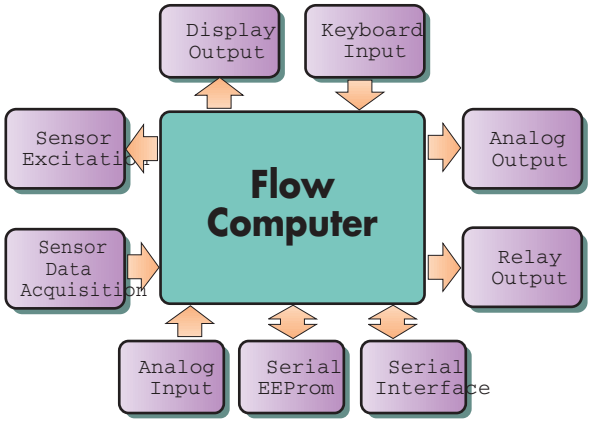
Multiple Calibration Groups. Up to three calibration groups can be stored in a single GF Series transmitter. Each group can be independently configured for a specific calibration range, media, switch point settings, etc. For example, a hydrogen line that requires periodic purging with nitrogen gas can be measured with a single GF Series Mass Flowmeter. 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.

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.

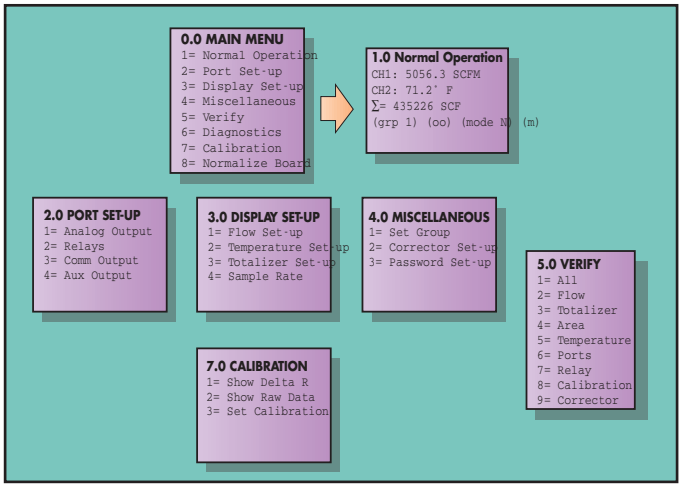
Auxiliary Input Terminal. An auxiliary input terminal is available for connection to an external signal source. This terminal provides a method for remotely switching between calibration groups.

System Approvals. Local flow element and remote transmitter enclosures that meet hazardous location explosion-proof protection are available. Agency system approvals for FCI's GF Series Mass Flowmeters include Factory Mutual Research (FM), ATEX and CE Mark. Other agency approvals are available for special applications. A fiberglass NEMA/CSA Type enclosure is standard. All aluminum and stainless steel enclosures are rated for hazardous location use.

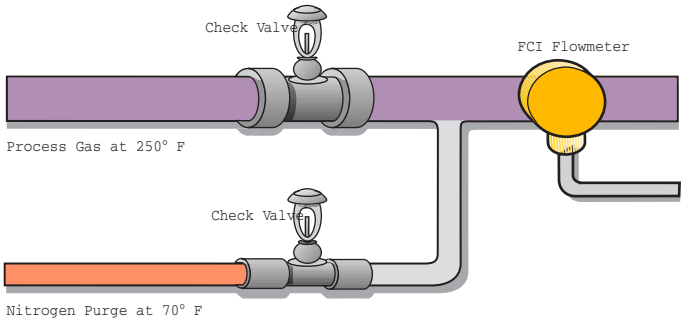
GF Series Top Level Block Diagram



GF Series User-Friendly Menu Structure -- First Level



Typical Multi-Calibration Group Application



FCI's Instrument User's Protection Plan

Guaranteed Performance. FCI guarantees the performance of its entire product line -- including mass flowmeters, flow switch/monitors and liquid level/interface controllers -- in accepted applications or your money back.

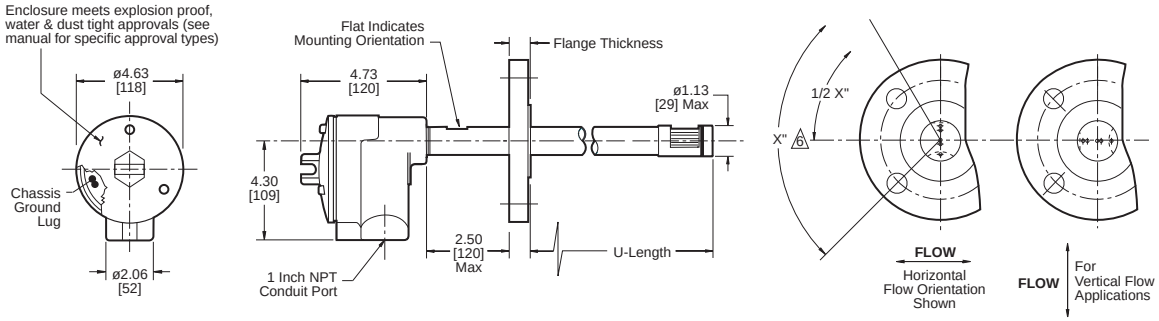
3-Year Warranty. All FCI products are warranted against faulty materials or workmanship for three full years from the date of delivery to the buyer. (Ask for a copy of our complete warranty.)

Customer Service. FCI provides prompt 24 hour customer service including expedited field service, start-up assistance and commissioning, repair support, and toll-free factory service.

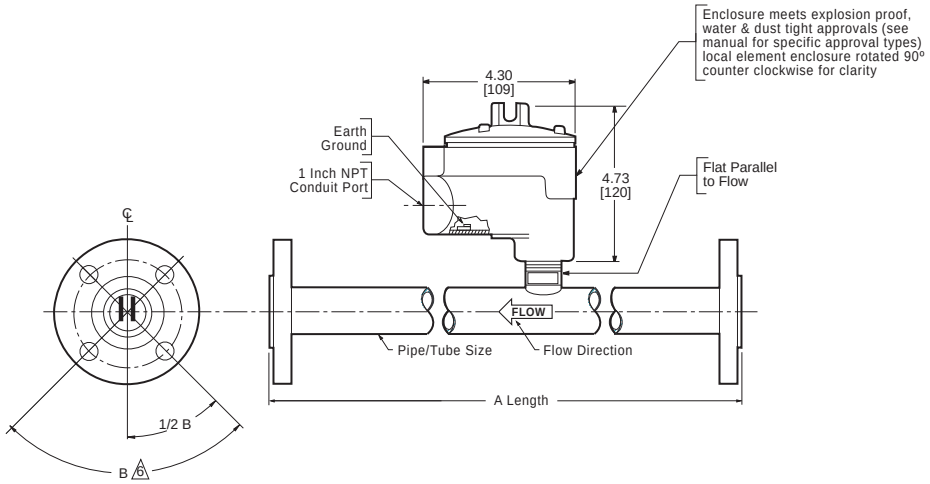
Typical GF90/GF92 Mass Flow Metering Applications

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

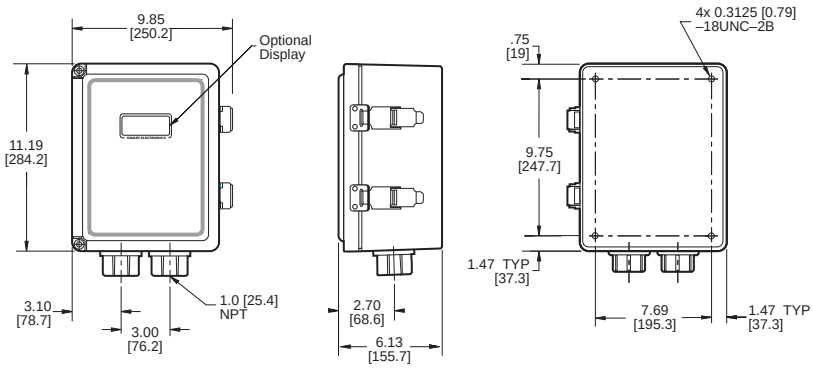
GF90 Flow Element



GF92 Flow Element



GF Remote Transmitter Enclosure



GF Series Mass Flowmeter Specifications

Application

Gas Mass Flow Measurement:

GF90: In ducts or pipes sizes with a minimum 2 inch [51 mm] nominal inside diameter.

GF92: In pipe lines or tubing sizes from 0.125 to 3 inches [3.2 to 76 mm].

Flow Elements

Process Connection:

GF90: 1 inch male NPT standard. Flange connections and field retractable packing gland assemblies available.

GF92: 3/4 inch female NPT standard. 1, 1.5, 2 and 3 inch male or female NPT, flange connections available.

Insertion Length -- GF90: Variable length. Specify insertion "U" length (dimension from the process connection to the tip of the flow element) to extend the tip of the flow element 1 inch [25 mm] past the centerline of the process pipe.

Body Length -- GF92: 7.25 inches [184 mm] for 1 inch flow tubes; 12 inches [305 mm] for 1.5 to 3 inch pipe spool pieces. Variable A-lengths available.

Material of Construction: All wetted surfaces are 316 stainless steel with nickel braze. Corrosion-resistant alloys are available with factory specified all welded construction or compatible brazes.

Flow Range:

GF90: 0.25 to 1600 SFPS [0.08 to 488 NMPS] for most gases at a standard temperature of 70° F and pressure of 14.7 psia [21.1°C and pressure of 1.013 bar(a)].

GF92: 0.006 to 2000 SCFM [0.01 to 3398 NCMH] for most gases at a standard temperature of 70°F and pressure of 14.7 psia [21.1°C and pressure of 1.013 bar(a)].

Actual velocity for both the GF90 and GF92 must be limited to a maximum of 200 feet per second [61 meters per second].

Operating Temperature: –50° to +350°F [–45° to +177°C] with the standard temperature flow element. The GF90 is available in a High Temperature Flow Element configuration for service in process temperatures from –100° to +850° F [–73° to +454°C].

Operating Pressure: To 1000 psig [69 bar(g)].

Transmitter

Signal Output:

Analog: Two independent signal outputs available that may be field set from the following listed selection:

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.

HART or Profibus Communications: Optional

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 10 amp at 115 Vac and 24 Vdc or 2 amp at 230 Vac.

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: 115 Vac, ±15 Vac, 16 watts maximum or 230 Vac, ±30 Vac, 16 watts maximum, or 24 Vdc, –2 and +6 Vdc, 16 watts maximum as selected by the power input switch and terminal selection.

Indicator Display & 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.

Electrical Enclosures

Fiberglass NEMA/CSA Type 4X is standard. All aluminum and stainless steel enclosures are rated for hazardous location use (Class I and II, Division 1 and 2, Groups B, C, D, E, F and G; and EEx d IIC) and resists the effect of weather and corrosion (NEMA/CSA Type 4X and equivalent to IP66).

Electrical Connection: 1 inch female NPT.

Temperature Range: 0° to 150° F [–18° 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 independent calibration groups are 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.

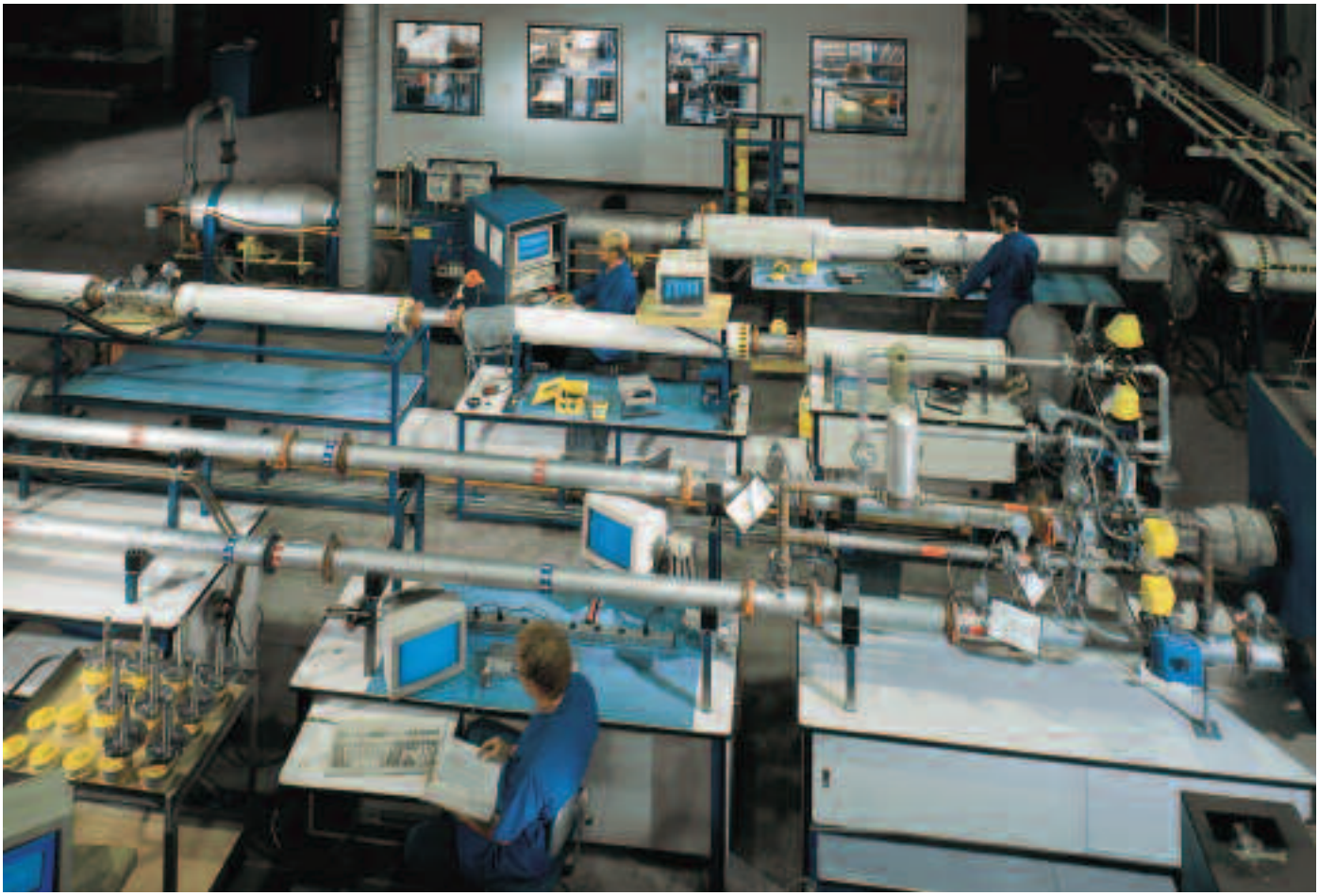
Temperature

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

Factory Mutual Research(FM), CSA (Class I, Division 2, Groups A, B, C, D; Class II, Division 1 and 2, Groups E, F, G.), ATEX (EExd IIc T4); CE Marked.



Test and Calibration Laboratory | Fluid Components International maintains an extensive, instrument test and calibration laboratory at its headquarters in San Marcos, California. Utilizing the latest in advanced, computerized data acquisition systems and calibration test equipment, this facility permits comprehensive product development, testing, and calibration. Any FCI product can be calibrated in accordance with customer specifications. Laboratory standards are maintained with NIST (National Institute of Standards and Technology) traceable Cavitating Venturis (CVs) and precisely calibrated, pressure and temperature corrected turbine flowmeters.

Combustible and non-combustible gas calibration flow stands allow for the calibration of FCI products in a wide range of gases and gas mixtures in flow stand line sizes as small as 1/8 inch to 30 inches [3 to 760 mm] in diameter. A variety of flow profiles from laminar to turbulent conditions are generated to duplicate actual field conditions. Flow rates from 0 to 20,000+ SCFM [0 to 34,000 NCMH], velocities from 0 to 800 SFPS [0 to 240 NMPS], pressures from vacuum to 3000 psig [200 bar(g)], and temperatures from -100º to +900ºF [-70º to +480ºC] are available.

On-Site Calibration and Training | In-situ calibration is available from FCI's Field Service engineers where precise test and calibration is accomplished in actual media conditions.

FCI's Training Department can provide on-site or at the factory Product Knowledge Workshops for our customers. The workshops cover installation, setup, and troubleshooting skills, and include hands-on exercises using real products, under actual operating conditions.

24 Hour Customer Service Access Available

FCI FLUID COMPONENTS INTERNATIONAL LLC

NIST Net

Web: www.fluidcomponents.com
1755 La Costa Meadows Drive, San Marcos, California 92078 USA | **Phone:** 760-744-6950 | **Toll free:** 800-854-1993 | **Fax:** 760-736-6250
European Office: Persephonestraat 3-01 5047 TT Tilburg, The Netherlands | **Phone:** 31-13-5159989 | **Fax:** 31-13-5799036

ISO 9001:2000 and AS9100 certified

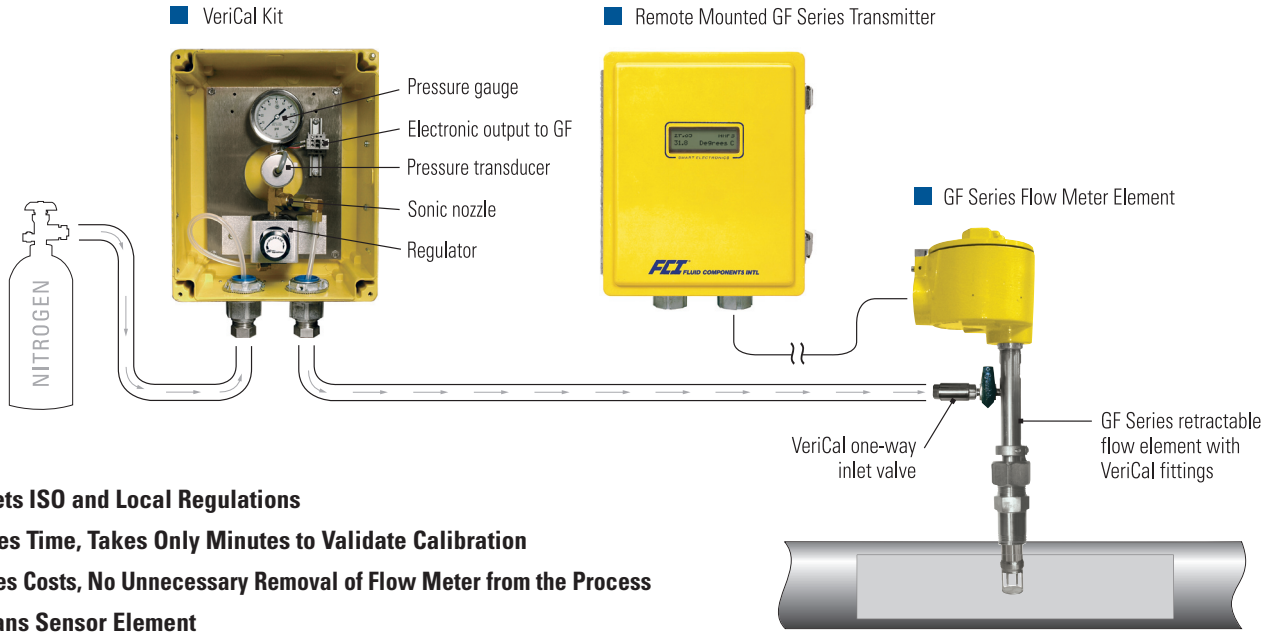
©Copyright 2006 by Fluid Components International LLC. All rights reserved. Subject to change without notice.
Manufactured in accordance with one or more of the following U.S. patents: 5,111,692 and 4,994,780.
0606-5K

Doc. No. 02MK011290H

VeriCal™

FLUID COMPONENTS INTERNATIONAL LLC
1755 La Costa Meadows Drive
San Marcos, California 92078 USA
760-744-6950* / 800-854-1993 Fax: 760-736-6250
Please note: new area code for FCI "442" effective January 1, 2009
www.fluidcomponents.com

In-Situ Calibration Verification Option for Model GF90 and GF03 Gas Flow Meters



- **Meets ISO and Local Regulations**
- **Saves Time, Takes Only Minutes to Validate Calibration**
- **Saves Costs, No Unnecessary Removal of Flow Meter from the Process**
- **Cleans Sensor Element**

Validate Flow Meter Performance In The Installation

FCI's GF90 and GF03 gas flow meter models can be optionally provided with a unique and FCI-patented* in-situ calibration verification system. The VeriCal option provides periodic field validation and verification of the flow meter's measuring performance and calibration, all without extracting the flow meter from the pipe or process. In gas flow processes with procedures or regulations requiring periodic calibration verifications, the GF90 or GF03, outfitted with the VeriCal option, provide the most convenient and lowest cost solution.

A secondary benefit of the VeriCal system is that sensor elements are cleaned by the nitrogen gas, which helps ensure performance and reduce routine maintenance.

The VeriCal option is comprised of three components:

- A specially modified and fitted GF flow element. This special flow element includes a welded and sealed inlet valve, internal tubing, and an exit port near the flow sensors, plus additional calibration steps and documentation. After the GF90 or GF03 system has been precision calibrated in FCI's NIST traceable flow laboratory, the lab also flows nitrogen to obtain five (5) base line measurement points across the flow range to which all field checks using the VeriCal system can be compared. With each VeriCal outfitted GF90 or GF03 element, FCI provides a printed document showing the five base line flow readings for use by your field technicians.
- A VeriCal kit with fixtures and fittings to meter and control a precise flow of nitrogen** across the GF flow element. The VeriCal kit provides a specially designed 100 psig [6.9 bar (g)] pressure regulator, a high accuracy pressure transducer with a 4-20mA output, a sonic nozzle, and pressure gauge packaged in a NEMA 4 (IP66) rated enclosure. The kit is fully portable, or can be permanently mounted. The VeriCal kit also includes a 25 foot [7,6 m] air hose with quick disconnect fittings to connect the kit to the GF flow element, and a 25 foot [7,6 m] 2-conductor cable to connect the kit's electronic output to the GF transmitter's auxiliary input terminals *(order part number 020849-01).* In applications where an electronic output to the GF's transmitter is not desired or cannot be implemented, and less accuracy is acceptable, a VeriCal kit without the pressure transducer and output cable is available† *(order part number 020849-02).*
- A user-supplied nitrogen source with a hose, regulated 125 to 150 psig [8,6 to 10,3 bar(g)], either from an installed plant line or a portable supply tank. Typical test requires approximately 40 ft^3 [1,1 m^3] of nitrogen. *Consult your local FCI representative about available refillable nitrogen supply options.*

How It Works

With the VeriCal kit attached to the GF90/GF03 flow meter and to the nitrogen** source, a positive pressure nitrogen injection is introduced. The GF90/GF03 digital display provides a precise readout of the pressure from the pressure transducer's output†, the flow rate, and temperature. With the GF90/GF03 flow element fully retracted from the actual flow stream, and the GF operating in the VeriCal mode, the user adjusts the pressure to inject small controlled doses of nitrogen at a specified pressure. The nitrogen flow passes directly by the GF90/GF03 flow element at highly repeatable rates and the measured flow readings on the GF90/GF03 display are compared to the base line readings in the document provided by FCI. This procedure can be performed as often as desired.

* *VeriCal is manufactured in accordance with U.S. Patent Number 7,201,033B2*

** *Other gases may be used; Contact FCI for specification information*

† *In VeriCal kit without the pressure transducer, no digital readout of pressure is displayed, and the user adjusts pressure based on the analog dial of the gauge in the kit.*

VeriCal Specifications

Pressure Range: 0 to 100 psig [0 to 6.9 bar (g)]

Process Temperature Range: Procedure is conducted at ambient temperature.

Agency Approvals: FM, CSA, ATEX pending for VeriCal system. Contact FCI for availability.

GF Flow Element:

Material of Construction: 316L Stainless steel
Process Connection: Retractable packing gland
Process Temperature: 350°F [177°C] maximum

©2007 Fluid Components International LLC. All rights reserved. FCI is a registered trademark of Fluid Components International LLC. Information subject to change without notice.

0708 5K **Doc No. 02MK011530B**