ST100 Series Features

- Direct Mass Flow Measuring
- Flow Rate, Total Flow, Temperature and Pressure Measurement
- No Moving Parts, Lowest Maintenance
- Line Sizes 1 inch to 100 inches [25 mm to 2450 mm]
- Temperature Service to 850 °F [454 °C]
- Rugged, Industrial Transmitter Enclosure
- Graphic, Multivariable LCD Readout
- Integral and Remote Electronics Versions
- Multi-Gas Calibrations
- New, Patented SpectraCal Gas Calibration
- HART, Foundation Fieldbus, Profibus, Modbus Communications
- Multiple Analog Outputs – 4-20mA, Pulse, Relay
- Exclusive Two-Element Averaging System
- Patented VeriCal® In-Situ Calibration Verification System
- Sensor Configurations to Optimize Application
- Extensive Selection of Process Connections
- Agency Approvals for Hazardous Locations

The ST100 Series Air/Gas Flow Meter Solutions

The ST100 series marries FCI’s 40+ years of flow element innovation and design with an all new, state-of-the-art electronic transmitter and world-class calibration to provide a gas mass flow meter solution for a broad range of industrial process applications. An extensive array of flow elements with attention to detail such as all-welded construction and process connection options ensure compatibility with any process, line size and gas media. The electronics are feature and function rich to provide the process measurements via analog signals or digital bus communications and are packaged in a rugged, robust all-metal transmitter enclosure. FCI’s NIST traceable flow calibration facility puts the final touch matching the ST100 to your process fluid and installation conditions to create a truly precision, long-lasting solution matched to your application.

FCI ST100 series feature thermal-dispersion flow measurement technology that measures mass flow directly and has no moving parts. No added temperature or pressure sensors or their associated process penetration points are needed for mass flow measurement resulting in a significant savings on sensor costs, pipe space and installation labor as well as improved measurement integrity. With no moving parts to foul or clog ST100 delivers a significant improvement in reliability, troubles-free operation and a measurable reduction in maintenance expense.

Models ST100 and STP100 are insertion flow meters for pipe sizes from 2 1/2” to 42” [64 mm to 1066 mm]. Typical calibration range is from 0.75 SFPS to 600 SFPS [0.21 NMPH to 172 NMPH].

Model ST100L is an in-line (spool-piece) flow meter for use in line sizes 1”, 1 1/2”, and 2” [DN25, DN40, and DN50]. Typical calibration range is from 0.0006 SCFM to 1850 SCFM [0,01 NCMH to 3140 NCMH].

Models ST102, ST112, STP102, and STP112 are dual-element averaging insertion flow meters that provide improved accuracy and repeatability in line sizes 12” [305 mm] or larger with irregular or less than fully developed flow profiles.

Models ST110, STP110, ST112, and STP112 are insertion flow meters with the FCI exclusive VeriCal® in-situ calibration verification system.
Two Product Families and Nine Models to Meet Your Applications

The ST100 Series is comprised of two core families—the “ST” and the “STP” with nine total models. The “ST” family are standard mass flow plus temperature measuring instruments. The STP family is an FCI exclusive thermal-dispersion flow meter that includes a third measured parameter of pressure measurement. Within both families are basic single-point models, dual-element averaging systems and models with VeriCal, an FCI patented in-situ calibration verification system.

ST100 Series Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>ST100</th>
<th>ST100L</th>
<th>ST102</th>
<th>ST110</th>
<th>ST112</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Type</td>
<td>Insertion</td>
<td>In-Line</td>
<td>Insertion</td>
<td>Insertion</td>
<td>Insertion</td>
</tr>
<tr>
<td>Flow</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Temperature</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Pressure</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Dual-Element Averaging System</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>VeriCal In-Situ Calibration Verification</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

STP Series Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>STP100</th>
<th>STP102</th>
<th>STP110</th>
<th>STP112</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Type</td>
<td>Insertion</td>
<td>Insertion</td>
<td>Insertion</td>
<td>Insertion</td>
</tr>
<tr>
<td>Flow</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Temperature</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Pressure</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Dual-Element Averaging System</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>VeriCal In-Situ Calibration Verification</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Sensors Optimized to Meet the Application

To match your flow application conditions, the ST100 Series insertion style meters are offered in a choice of two element designs.

Select the –FP style element for applications in dry, clean air/gases. The –FP design incorporates FCI’s exclusive equal mass sensor in smaller diameter thermo-wells for faster response time and improved repeatability in processes with dynamic temperature swings. The –FP also features a protective shroud.

Select the –S style element when your application involves dirty or erosive fluids, high moisture content gas or a pulsating flow. The –S element features more robust, thicker wall thermo-wells and an un-shrouded equal mass sensor element that provides a noise-filtered response, extended erosion resistance, and easier cleaning. In wet/dirty gas applications such as digester, landfill, biogases, wet compressed air, or with erosive particulates in the gas, the –S sensor element is often the optimal choice.

ST100 Series flow elements feature an all-welded design that ensures maximum strength, durability and leak proofing. Elements are available in 316L stainless steel or, for applications in highly corrosive fluids, Hastelloy-C276 materials of construction.

### ST100 Series Sensors

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Flow Element Material of Construction</th>
<th>All Welded</th>
<th>Temperature Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>To 250 °F [121 °C]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>To 257 °F [125 °C]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>To 350 °F [177 °C]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>To 500 °F [260 °C]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>To 850 °F [454 °C]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ST Series – Insertion</th>
</tr>
</thead>
<tbody>
<tr>
<td>–FP 316L Stainless Steel</td>
</tr>
<tr>
<td>–FP Hastelloy-C276</td>
</tr>
<tr>
<td>–S 316L Stainless Steel</td>
</tr>
<tr>
<td>–S Hastelloy-C276</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STP Series – Insertion</th>
</tr>
</thead>
<tbody>
<tr>
<td>–FP 316L Stainless Steel</td>
</tr>
<tr>
<td>–FP Hastelloy-C276</td>
</tr>
<tr>
<td>–S 316L Stainless Steel</td>
</tr>
<tr>
<td>–S Hastelloy-C276</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ST100L – In-Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>–FP 316L Stainless Steel</td>
</tr>
<tr>
<td>–FP Hastelloy-C276</td>
</tr>
<tr>
<td>–S 316L Stainless Steel</td>
</tr>
<tr>
<td>–S Hastelloy-C276</td>
</tr>
</tbody>
</table>
Extensive Selection of Process Connections

An unmatched selection of process connection choices assures a match to any installation requirements.

**Insertion style meters:** For most applications an adjustable "U" (insertion depth) outfitted with compression fittings is preferred and offers the most installation flexibility. Adjustable elements are available in 6 inch [152 mm], 12 inch [305 mm], 21 inch [533 mm], 36 inch [914 mm], and 60 inch [1524 mm] lengths. Male NPT compression fittings are available in either 3/4 inch or 1 inch, with Teflon or metal ferrules, or with an ANSI or DN flanged tapped and threaded for a 3/4 inch NPT. Fixed length elements made to your specifications with a fixed threaded fitting or an ANSI or DN flange are also available.

For hot tap installations, retractable packing glands, in low (50 psi [3,5 bar]) or medium (500 psi [34 bar]) pressure designs ¹, and packing materials of graphite or Teflon ² are available.

**In-line style meter (Model ST100L):** The spool-piece flow body length is nine times its nominal diameter, and can be fabricated as required with male NPT, female NPT, ANSI flange or DN flange process connections.

¹ High pressure design for applications greater than 500 psi [34 bar] is available; contact FCI with your application needs.

² Teflon packing material may be required for certain process media such as ozone, chlorine or bromine; consult FCI’s AVAL selection program for recommendation.

---

### Insertion-Style Meters Process Connections

<table>
<thead>
<tr>
<th>Variable “U” Length Choices</th>
<th>Compression Fittings</th>
<th>Retractable Packing Glands</th>
<th>Fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1” to 6” (25 mm to 152 mm)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1” to 12” (25 mm to 305 mm)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1” to 21” (25 mm to 533 mm)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1” to 36” (25 mm to 914 mm)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1” to 60” (25 mm to 1524 mm)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Fixed "U" Length:** Specify from 1” to 60” (25 mm to 1524 mm)

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### ST100L In-Line Style Process Connections

<table>
<thead>
<tr>
<th>NPT</th>
<th>NPT</th>
<th>Flanged</th>
<th>Butt Weld</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Female</td>
<td>150 lb, 300 lb; CS, 316L SS or Hastelloy-C276</td>
<td>1” MNPT Flanged 150 lb, 300 lb; CS, 316L SS or Hastelloy-C276</td>
</tr>
<tr>
<td>1” Tubing</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1” Pipe</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1 1/2” Pipe</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2” Pipe</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Inputs, Outputs and Bus Communications for Today and Tomorrow

ST100 Series provides the most extensive array of analog and digital outputs options available. More importantly, the analog and digital bus communications selections are field interchangeable and upgradeable with a plug-in card. Simply, the ST100 Series outputs offering is comprehensive and easily adaptable to any process DCS, PLC or SCADA scheme you will use now or upgrade to in the future.

Analog Outputs, HART and Modbus Packaging

Comprehensive, scalable and flexible describe the ST100 series’ standard bundle of analog outputs. All ST models feature dual 4-20 mA outputs that are fully assignable to flow rate and/or temperature and all STP models add a third 4-20 mA output for pressure measurement. All 4-20 mA outputs are user scalable to represent the full range or any sub-set and are fully assignable to any of the measured variables. All models also include a user selectable 0-1kHz or 0-10kHz frequency or pulse output of of flow. The frequency output is proportional to flow rate while the pulse output can be used for external flow totalizers.

Also available as an option in the analog output/HART bundle are dual 2A, SPDT relays which can be used to trigger alarms or other external actions.

Digital Bus Communications Options

The ST100 Series also features the most comprehensive selection of optional digital bus communications available in a thermal-dispersion flow meter. All bus communications provide actual measurements, including flow rate, total flow, temperature (and, with STP models, pressure), diagnostics and instrument service information. All ST100 Series user set-up and configuration parameters can be performed over the bus.

Provided with the standard analog output bundle is full two-way HART bus available over the #1 4-20 mA signal. The HART bus is fully compatible with all versions of HART field communicators and HART control systems.

Optionally available are Foundation Fieldbus H1, Profibus-PA and Modbus-485. These bus options are full two-way I/O These bus communication options are mutually exclusive with the analog outputs.

All bus communications have been submitted for testing and certifications by their respective organizations. Contact FCI, or visit the organization’s or FCI’s web site for current status of certification. Device description and device adaptation software tools (EDDL file, DTM software) are available from FCI and/or downloadable from the associated fieldbus organizations’ web sites.

Digital I/O Ports

All ST100 Series models include a USB port for connection to a laptop or other computer for all user set-up programming, field enactable device changes and servicing diagnostics. Also provided standard is an Ethernet 10/100 network port. Currently the Ethernet port is designed to facilitate remote access by FCI service personnel to perform service and diagnostics, and for customers to conveniently upload software enhancements. Full network addressability for user continuous interrogation over a the a direct Internet or LAN connection is in design. Contact FCI for availability. Temporary connection to both USB and Ethernet connections can be made by removing the rear cover of the instrument enclosure or can be permanently attached through the conduit ports.
Digital Display / Readout

The ST100 Series’ optional digital readout provides a best-in-class information suite, backlit LCD and four-button keypad. The display backlight has a unique proximity detector that illuminates when a person approaches, or can be set to always on. The display and button functions can be rotated electronically in 90° increments to optimize display viewing and button activations.

The display buttons provide convenient, ready access to all instrument setup and programming, as well as diagnostics and troubleshooting. (In the blind unit, these functions must be performed through the serial I/O or bus communications ports.) Because buttons are activated through the front panel glass, there is never a need to open the enclosure, which also ensures that button functions are protected against accidental or unwanted activation.

The LCD display provides readouts of the process variables and service diagnostics and troubleshooting. The normal process measuring mode screen is the most comprehensive of any thermal dispersion flow meter on the market.

Full Instrument Agency Approvals

ST100 Series meters are agency approved for hazardous environment installations. Unlike other suppliers, FCI products have undergone agency testing and obtained approvals on the entire instrument, not just the enclosure. This highest level of agency certification is your evidence of FCI’s integrity to ensure every FCI instrument meets the intended safety requirements of your installation. Current ST100 agency approvals include:

FM, FMc (Canadian): Class I, Division 1, Hazardous Locations;
Groups B,C,D,E,F,G
ATEX and IECEx: Zone 1, II 2 GD Ex d IIC T4

FCI continually obtains additional agency approvals; contact FCI for availability of other agency approvals.
Up to Five Unique Calibrations

While single calibration is sufficient for many operations, the ST100 Series can provide up to five (5) unique calibration groups. Depending on your application need, this feature can provide significant cost and time savings. Some examples include:

- **Broaden Measuring Range** – Extend the turndown ratio up to 2000:1; saves on the cost of using multiple flow meters.
- **Different Mixtures of Same Gases** – Embed calibrations to optimize flow measurement accuracy in dynamic or seasonally affected processes (e.g. Digester Gas Group 1 is 65% CH₄, 35% CO₂; Group 2 is 62% CH₄, 38% CO₂.)
- **Different Gases** – Portable or temporary installations that may serve multiple applications, or to reduce spares inventory in plants with multiple installations and applications.

SpectraCal® Gas Equivalency Calibration

SpectraCal is a FCI proprietary and patent protected gas equivalency algorithm routine that provides a lower cost alternative and greater field flexibility over actual gas calibrations. SpectraCal allows user selection from twenty different gases and the ability to customize any mixture of these gases. While for most applications and for the best possible accuracy is obtained when FCI’s standard gas calibration is performed, SpectraCal is an excellent alternative in applications that may change over time, are less understood or are variable or dynamic. Because all ST100 series instruments have multiple calibration capability, it is possible to specify both an actual gas calibration and SpectraCal in the same instrument.

When SpectraCal is specified, FCI performs a precision gas calibration using pure nitrogen that is stored in the ST100’s on-board memory. Then, as any of the other twenty gases are selected they automatically adjusted and corrected by FCI’s custom gas equivalency algorithm against this nitrogen data. During instrument set-up, any of the twenty gases or user defined gas mixes are user assigned to any of the available calibration groups. For example, in the field the user can select propane and assign it to Group #1, butane and assign it to Group #2 and Ethane and assign it to Group #3. Another example is digester gas, where a 65% Methane + 35% CO₂ can be set-up and assigned to Group #1, a 63% Methane + 37% CO₂ can be set-up and assigned to Group #2, and a 60% Methane + 40% CO₂ can be set-up and assigned to Group #1.

For SpectraCal, order option “Z” in the ST100 series’ calibration section.
VeriCal™ In-Situ Calibration Verification

Models ST110, ST112, STP110 and STP112

- Validate Calibration in Minutes
- Save Costs, No Need to Remove Flow Meter From Process
- Comply with ISO and Local Regulations for In-Situ Calibration
- Provides Flow Element Cleaning

In addition to all of the other ST100 Series features and functions, Models ST110, ST112, STP110 and STP112 include FCI’s exclusive and patented VeriCal system. VeriCal provides the capability to perform 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 verification, an FCI flow meter outfitted with VeriCal also provides the most convenient and lowest cost solution. Performing a verification with VeriCal also provides a secondary benefit of cleaning the flow element which helps ensure performance and reduce the need for routine maintenance.

The VeriCal option is comprised of three components:

- A specially modified and fitted flow element. This special flow element includes a welded and sealed inlet valve, sonic nozzle, internal tubing, and an exit port near the flow sensors, plus additional calibration steps and documentation. After the flow meter 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 are compared. With each ST110, ST112, STP110 or STP112, 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 ST flow element. The VeriCal kit provides a specially designed 100 psig [6.9 bar (g)] pressure regulator, pressure gauge packaged in a NEMA 4 (IP66) rated enclosure and a 25 foot [7.6 m] air hose with quick disconnect fittings to connect the kit to the ST flow element. The kit is fully portable or can be permanently mounted. The VeriCal kit, part number 020849-03, is ordered separately as a second line item. A single VeriCal kit can be used with and support any number of VeriCal flow elements.

- A user-supplied nitrogen source with a hose, regulated 125 psig to 150 psig [8.6 bar (g) to 10.3 bar (g)], either from an installed plant line or a portable supply tank. Typical test requires approximately 40 ft³ [1.1 m³] of nitrogen. Consult your local FCI representative about available refillable nitrogen supply options.

How It Works

With the VeriCal kit attached to the ST flow meter and the nitrogen source, a positive pressure nitrogen injection is introduced. With the ST flow element fully retracted from the actual flow stream and the ST set in the VeriCal Calibration group mode, the user adjusts the pressure at the VeriCal kit to inject small, controlled doses of nitrogen at specific pressures (prescribed on the FCI VeriCal calibration document). At each pressure point, measured flow readings are taken from the ST flow meter and compared to the respective baseline readings in the documentation provided by FCI. The procedure can be performed as often as desired.

Model ST110: Single element flow meter outfitted with VeriCal
Model ST112: Dual element averaging flow meter, both elements outfitted with VeriCal
Model STP110: Single element flow meter with pressure measurement outfitted with VeriCal
Model STP112: Dual element flow meter with pressure measurement, both elements outfitted with VeriCal

P/N 020849-03: VeriCal Kit

Other gases may be used; contact FCI for specific information.
ST100 Series Features

AC or DC power supply

Global agency approvals of entire instrument for hazardous location installations: FM, FMc, ATEX, IEC

Multiple calibrations
- Up to five independent, separate calibrations
- Multiple gases or mixed gas compositions
- Same gas, different flow range to optimize accuracy and extend turndown

Precision calibration and calibration choices
- Specific gas and application matched calibration in FCI NIST traceable facility
- Exclusive patented SpectraCal® gas equivalency calibration

Extensive selection of process connections
- Simple, adjustable installation with threaded NPT connector
- Teflon or metal ferrule seals
- Fixed connections
- ANSI or DN flanges
- Retractable assemblies

Four conduit ports provide greatest signal integrity and separation for power input, analog output lines, digital I/O relays and/or auxiliary input signals; choice of NPT and M20 threads

Weather-proof, ruggedized, enclosures
- Choices for local or remote mounting
- NEMA 4X, IP67

Comprehensive informational display and externally-activated keypad
- Digital readout of all measured parameters; flow rate, total flow, temperature and pressure with engineering units
- Analog flow rate bar graph
- Alarm relay status indication
- Instrument fault indication
- User programmable 20 character field (example: display gas type, tag number or application/location)
- Display orientation rotates in 90° increments electronically
- Backlighted: auto-on activation via proximity sensor or set for always on
- Four button electronic keypad: proximity activation, no need to open enclosure; full instrument programmability through keypad; protected against unwanted activation

Extensive analog and digital communications outputs
- 4-20 mA with HART (dual or triple)
- Serial Ethernet USB
- Foundation Fieldbus H1
- Profinet PA
- Modbus 485
- 0-1 kHz or 0-10 kHz frequency or pulse
- Dual relays

Multi-function: measures mass flow rate and temperature; STP Series adds pressure measurement

Stainless steel or Hastelloy-C276 wetted parts

All welded sensor elements for maximum service life and leak-proofing

Precision, wide-ranging platinum RTD sensors

Exclusive equal mass elements provide optimum performance in processes with wide temperature swings
ST100 Series Mass Flow Meter General Specifications

**Instrument**
- **Measuring Capability**
  - ST1XX Models: Flow rate, total flow and temperature
  - STP1XX Models: Flow rate, total flow, temperature and pressure

- **Basic Style**
  - ST100: Insertion, single element
  - ST100L: In-line (spool piece), single element
  - ST102: Insertion, two element averaging system
  - ST110: Insertion, single element with VeriCal™ capability
  - ST112: Insertion, two element averaging system with VeriCal™ capability
  - STP100: Insertion, single element with pressure measurement
  - STP102: Insertion, two element averaging system with pressure measurement
  - STP110: Insertion, single element with pressure measurement and VeriCal™ capability
  - STP112: Insertion, two element averaging system with pressure measurement and VeriCal™ capability

- **Flow Measurement Range**
  - Insertion Style: 0.25 SPS to 600 SPS [0.07 NMPS to 172 NMPS]
  - ST100L In-line: 0.0062 SCFM to 1850 SCFM [0.01 Nm3/h to 3,140 Nm3/h]
  - Temperature: –40 °F to 250 °F [-40 °C to 121 °C]

- **Temperature Measurement Range**
  - Up to 850 °F [454 °C] commensurate with element
  - See Operating Temperature in Flow Element specification

- **Pressure Measurement Range (STP Models)**
  - Available Ranges:
    - 0 psig to 50 psig [0 bar (g)]
    - 0 psig to 100 psig [0 bar (g)]
    - 0 psig to 500 psig [0 bar (g)]
    - 0 psig to 1000 psig [0 bar (g)]
  - Media: All gases that are compatible with the flow element material

- **Accuracy**
  - Flow: ±1% reading, 0.5% full scale standard accuracy
  - Temperature: ±2 °F ±2 °C (display only, flow rate must be greater than 5 AFPS [1.5 m/sec])
  - Pressure (STP Models): ±0.25% full scale pressure range

- **Repeatability**
  - Flow: ±0.5% reading
  - Temperature: ±1 °F ±1 °C (flow rate must be greater than 5 AFPS)

- **Temperature Coefficient**
  - With optional temperature compensation. Valid from 10% to 100% of full scale calibration.
  - Flow: Maximum ±0.015% of reading / °F up to 850 °F
  - ±0.03% of reading / °C up to 454 °C

- **Turndown Ratio**
  - Standard: Factory set and field adjustable from 10:1 to 100:1 within calibrated flow range

- **Temperature Compensation**
  - Standard: ±30 °F ±16 °C
  - Optional: ±100 °F ±55 °C

- **Agency Approvals**
  - FM, FMc (Canadian): Class I, Division 1, Hazardous Locations;
    - Groups B,C,D,E,F,G
  - ATEX and IECEx: Zone 1, II 2 GD Ex d IIC T4

- **Calibration**: Performed on NIST traceable equipment

**Flow Element**
- **Material of Construction**
  - All-welded 316L stainless steel; Hastelloy-C optional

- **Operating Pressure**
  - Metal ferrule: 1000 psig [69 bar (g)]
  - Teflon ferrule: 150 psig [10 bar (g)] (200 °F [93 °C] maximum)

- **Operating Temperature (Process)**
  - ST100, ST102 Insertion Style:
    - FP type element: -40 °F to 350 °F [-40 °C to 177 °C]
    - S type element: -40 °F to 500 °F [-40 °C to 260 °C]
    - FP type element: -40 °F to 850 °F [-40 °C to 454 °C]†
  - ST110, ST112 Insertion Style:
    - FP type element: -40 °F to 250 °F [-40 °C to 121 °C]
    - S type element: -40 °F to 250 °F [-40 °C to 121 °C]
    - FP type element: -40 °F to 350 °F [-40 °C to 177 °C]

- **STP Series Insertion Style (all models):**
  - FP type element: -40 °F to 250 °F [-40 °C to 125 °C]
  - S type element: -40 °F to 250 °F [-40 °C to 125 °C]

- **ST100, ST102 Insertion Flow Elements**
  - Process Connection:
    - 3/4" or 1" male NPT, stainless steel with adjustable Teflon ferrule or metal ferrule; or flanged tapped and threaded for 3/4" fitting, ANSI or DIN flanges
    - Compression fittings not available with ultra high temperature (850 °F [454 °C]) versions of ST100

- **Retractable Packing Glands**
  - Low pressure: 950 psig [34 bar (g)] or medium pressure: 500 psig [34 bar (g)] with graphite or Teflon packing material; 1 1/4" male NPT or ANSI or DIN flange *
  - Teflon packing required when process media is ozone, chlorine or bromine

- **Fixed Fittings**
  - 1" male NPT or ANSI or DIN flange

- **Insertion Length**
  - Field adjustable lengths:
    - 1" to 6" [25 mm to 152 mm]
    - 1" to 12" [25 mm to 305 mm]
    - 1" to 21" [25 mm to 533 mm]
    - 1" to 60" [25 mm to 1524 mm]
  - Fixed lengths from 2.6" to 60" [66 mm to 1524 mm]

ST100 Specifications Cont’d

- **ST100L In-line Flow Tube**
  Flow element is threaded and keyed in an in-line flow tube, calibrated and supplied as a spool-piece; options include low flow injection tubes and built-in Vortab flow conditioners for optimum low flow rangeability and performance
  
  **Size:** 1” diameter tubing; 1”, 1 1/2” or 2” schedule 40 pipe
  **Length:** 9 nominal diameters
  **Process Connection:** Female NPT, male NPT, ANSI or DN Flanges
  **Option:** Flanges sized for flow tube

- **Remote Transmitter Configurations:** Transmitter may be mounted remotely from flow element using interconnecting cable (up to 1000’ [350 m])

- **STP Models: Additional Specifications on Pressure Sensor**
  Calibrated at nominal 70 °F [21 °C]
  **Zero/Span Shift:** 0.83% full scale/100 °F [1.5% full scale/100 °C]
  **Zero Tolerance:** ±0.5% of span
  **Span Tolerance:** ±0.5% of span
  **Long Term Stability:** ±0.2% full scale per year

  **Maximum Over Pressure:**
  - 50 psi, 100 psi [4 bar, 7 bar] versions: 3.0 x rated rate range
  - 500 psi, 1000 psi [35 bar, 70 bar] versions: 2.0 x rated rate range

  **Minimum Burst Pressure (all):**
  - 50 psi, 100 psi [4 bar, 7 bar] versions: 40 x rated rate range
  - 500 psi, 1000 psi [35 bar, 70 bar] versions: 20 x rated rate range

  **Wetted Materials:**
  - 17-4 PH stainless steel diaphragm (not recommended for hydrogen service; contact FCI for Model STP for use in hydrogen)
  - 304 stainless steel fittings

- **Flow Transmitter/Electronics**
  - **Operating Temperature:** 0 °F to 140 °F [-18 ° to 60 °C]
  - **Input Power**
    - **AC:** 85 Vac to 265 Vac; ____ Watts maximum, ____ mA maximum
    - **DC:** 24 Vdc ± 20%; ____ Watts maximum, ____ mA maximum

  - **Outputs**
    - **Analog:**
      - ST1XX Models: Standard: Two (2) 4-20 mA, 0-1kHz, or 0-10 kHz pulse/frequency
      - Optional: Two (2) 2A SPDT relays
      - STP1XX Models: Standard: Three 4-20 mA, 0-1kHz, or 0-10 kHz pulse/frequency
      - Optional: Two (2) 2A SPDT relays

    - 4-20 mA outputs are user assignable to flow rate, temperature and/or if so equipped, pressure; outputs are user programmable to full flow range or subsets of full flow range; pulse/frequency output is user selectable as pulse for external counter/flow totalizer, or as 0-1 kHz or 0-10 kHz frequency representing flow rate

  - **Digital:**
    - **Standard**
      - HART, USB, Ethernet
    - **Optional**
      - Foundation Fieldbus H1, Proibus PA, Modbus 485

- **Auxiliary Inputs**
  Two 4-20 mA input channels. Used for FCI administered special configurations to allow ST100 series to accept outputs from external devices such as gas analyzers, gas composition or pressure sensors.

- **Enclosure**
  NEMA 4X, IP67; aluminum; 4 conduit ports with either 1/2” NPT or M20x1.5 entries; epoxy coated; stainless steel enclosure pending

- **Readout/Display and On-board Keypad (optional):**
  - Large 2” x 2”, pixel LCD; digital + bar graph and engineering units
  - Digital displays of flow rate, total flow, temperature and pressure (with STP models); user selectable for engineering units
  - Analog bar graph of flow rate
  - Relay/alarm status indication
  - User-programmable 20 alphanumeric character field associated with each calibration group
  - Set-up & Service mode displays text and service codes
  - Backlighted – backlight activated by close (?!) proximity motion detection, or user may set for always on
  - Four (4) button keypad for user programming of instrument set-up and service interrogation
  - Keypad activation through front window – no need to open enclosure to access or activate buttons
  - Display is electronically rotatable in 90° increments to optimize viewing angle
  - User selectable languages: English, German, Spanish, French or Chinese; metric or imperial engineering units

  **Note:** If readout/display not ordered, all user set-up and service interrogation must be done via computer link to bus comm and/or USB port.

- **Other Options**
  - **Vortab Flow Conditioners**
    - Model ST100L (in-line) provided and system calibrated with Vortab flow conditioners
  - **Ball Valves**
  - **Element Coatings and Materials**
    - For service in highly corrosive gases or with erosive particulates, FCI can provide special coatings and wetted materials to protect the element and provide longer service life. Examples include Kynar, Tantalum, and chromium carbide.

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Model ST100, ST102 Insertion Flow Meter

Integral Configuration and Remote Transmitter

Remote Configuration: Local Enclosure and Flow Element
Model ST100L In-Line Flow Meter

Dimensional Drawing: Integral Configuration and Remote Transmitter

Remote Configuration: Local Enclosure and Flow Element
Model STP100, STP102 Insertion Flow Meter

Integral Configuration and Remote Transmitter

Remote Configuration: Local Enclosure and Flow Element
Model ST110, ST112, STP110, STP112 Flow Meter

Dimensional Drawing: Integral Configuration and Remote Transmitter

Remote Configuration: Local Enclosure and Flow Element
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