Model 3095FT
Flow Transmitter

MODEL 3095FT FEATURES AND BENEFITS:

• Measurement of differential pressure, static pressure, and process temperature in a single, compact package
• Gage sensor option allows easier field calibration
• Greater billing accuracy through industry-leading ±0.075% differential and absolute pressure measurement accuracy
• Reduced maintenance, easier installation, and lower installed cost due to fewer pipe penetrations
• Reduced calibration with highly stable sensor design
• Greater meter flexibility with 100:1 rangeability
• Low power design that allows remote installation with optional solar power system
INTRODUCTION

Developed in conjunction with the Gas Research Institute, the multi-parameter Model 3095FT is a high-performance extension of the Rosemount® pressure family. Where traditional transmitters measure just one process variable, the Model 3095FT measures three variables simultaneously.

Originally introduced with digital HART protocol communications, the Model 3095FT Flow Transmitter now has two communication options: Model 3095FH with digital HART® communications, and the Model 3095FB with MODBUS® RTU communications.

MODEL 3095FH WITH HART PROTOCOL

The Model 3095FH Flow Transmitter is the world's most compact electronic flow measurement (EFM) device. In one package, this transmitter measures differential pressure, absolute pressure, process temperature, and calculates flow. The three process variables along with the calculated flow are available at all times in response to a single request.

Model 3095FH communications occur on a two-wire system using the digital HART (Highway Addressable Remote Transducer) protocol, which is based on the Bell 202 Frequency Shift Keying (FSK) standard. The Model 3095FH performs flow calculations and relevant data storage in nonvolatile memory per applicable American Gas Association (A.G.A.), American Petroleum Institute (API), and Gas Processors Association (GPA) orifice meter and electronic flow measurement standards.

New Solutions for Gas Flow Measurement

Traditionally, mechanical chart recorders have been installed in low-volume flow metering applications. However, chart recorders do not provide the timeliness or accuracy needed to compete in today's gas industry. The following are some of the problems associated with chart recorders:

• Chart recorders have high maintenance costs, including recommended monthly calibration, replacement pens and charts, and repairs to clocks and bellows.
INTRODUCED IN 1994, THE MODEL 3095FH FLOW TRANSMITTER PROVIDES A FIELD-PROVEN SOLUTION FOR NATURAL GAS FLOW MONITORING AND CUSTODY TRANSFER APPLICATIONS.

- Accurately measures differential pressure, absolute pressure, and process temperature
- Digital HART protocol communications
- Performs flow calculations per American Gas Association (A.G.A.), American Petroleum Institute (API), and Gas Processors Association (GPA) orifice meter and electronic flow measurement standards
- User-configurable data logging that exceeds API MPMS Chapter 21.1 requirements
- Most cost-effective EFM replacement for mechanical chart recorders

NEW IN 1996, THE MODEL 3095FB MULTIVARIABLE™ MODBUS TRANSMITTER IS THE LATEST ADDITION TO THE MODEL 3095F T TRANSMITTER FAMILY.

- Accurately measures differential pressure, absolute (or gage) pressure, and process temperature
- Interfaces directly with RTUs (Remote Terminal Units) or PLCs (Programmable Logic Controllers) using MODBUS RTU protocol communications
- Transmission speed is configurable from 1200 to 9600 baud
- Easily integrates into existing SCADA applications
- Capable of multidropping up to 32 transmitters on the same RS-485 bus

CHARTS MUST BE INTEGRATED TO CALCULATE FLOW VOLUMES.

- Chart recorders are prone to losing data or recording inaccurate data—ink runs dry, painted charts, vibration effects, and errors due to moisture, temperature, drift, and mechanical wear.
- Integration is slow and cumbersome. Billing, accounting, and auditing may take weeks, and inaccurate or late data may result in prohibitive penalties.

With the Model 3095FH, chart recorders can now be replaced with state-of-the-art measurement technology with minimal disruption to your business methods. The Model 3095FH can be installed in many types of flow monitoring and custody transfer applications, ranging from monitoring flow at remote locations, to a comprehensive system that provides on-site flow control and real-time data gathering.

Advantages with the Model 3095FH include superior accuracy, thereby eliminating penalties and reducing unaccounted-for natural gas. The Model 3095FH also has high reliability, low maintenance, and no integration fees, all resulting in lower long-term operating costs.

MODEL 3095FB WITH MODBUS RTU PROTOCOL

Model 3095FB communications occur on a two-wire MODBUS RTU system using an RS-485 bus. The Model 3095FB measures the differential pressure, absolute (or gage) pressure, and process temperature, and communicates this information real-time to a connected Remote Terminal Unit (RTU).

The RTU then uses this process variable information to calculate flow, and then communicates the flow information back to the customer host system.

Other applications that can integrate the Model 3095FB include Programmable Logic Controller (PLCs) and Distributed Control Systems (DCS).

Integrating the Model 3095FB into a natural gas measurement solution provides savings for the customer because one device measures three process variables, resulting in reduced maintenance, easier installation, and lower installed cost because of fewer pipe penetrations.

The Model 3095FB can also be used within a plant to measure process flows other than natural gas, such as steam, carbon dioxide, nitrogen, hydrogen, and other fluids.
SYSTEM INTEGRATION

Model 3095FH

The Model 3095FH communicates via the industry standard HART protocol, which uses the Bell 202 Frequency Shift Keying (FSK) technique. Remote communication is accomplished by superimposing a high-frequency signal on top of the fixed output signal. Because all communication uses HART, the Model 3095FH does not provide a 4–20 mA output signal.

With its flexible HART protocol, the Model 3095FH can meet many gas flow measurement needs from a stand-alone instrument to a complex telemetry system. The integration of multi-parameter measurement, advanced flow calculations, and audit trail capabilities into one cost-effective, compact package make the Model 3095FH the ideal choice for orifice plate gas flow measurement installations.

FIGURE 2. Model 3095FH Communication Using a Personal Computer.

FIGURE 3. Model 3095FH Single Site Metering Installation.

KEY FEATURES
- Digital HART protocol
- A.G.A. Flow Calculation
- API Data Logging
- Real Time Clock Battery
Model 3095FB

Figure 5 illustrates integrating the Model 3095FB with an RTU System. Equipment needed for this type of integration includes the Model 3095FB (supplied by Rosemount Inc.), an RTU system with RS-485 physical layer and MODBUS protocol communications capability, and a communications technique allowing the RTU to transmit flow data to the data collection center.

One cost effective communications method is to use land (telephone) lines. However, many flow measurement locations and custody transfer points are in locations that do not have telephone access, so radio, microwave and satellite communications are used as alternatives. Another communications technique that is gaining popularity is integration with cellular phone technology, since cellular access now covers most of the United States.

Although this integration allows retrieval of process variable data at any time, Model 3095FB configuration and calibration tasks would most often be performed by a technician at the gas measurement site using the Model 3095FB User Interface Software.

FIGURE 5. Integrating the Model 3095FB with an RTU System.
MODEL 3095FH
SOFTWARE FUNCTIONALITY

Flow Calculation and Data Logging

The Model 3095FH is preprogrammed with orifice meter flow computation algorithms to meet the requirements of the natural gas industry. The flow calculations are performed according to 1992 A.G.A. Report No. 3/API MPMS Chapter 14.3, with A.G.A. Report No. 8/API MPMS Chapter 14.2 for the compressibility factor.

The Model 3095FH fast update and computation frequencies contribute to its high overall flow accuracy. Sensor updates occur nine times per second and flow calculations update once per second.

Gross versus Detail Characterization

The Model 3095FH calculates the gas compressibility factor using either gross or detail characterization methods. Gross characterization is a simplified method that is acceptable for a narrow range of pressure, temperature, and gas composition. Detail characterization covers all pressure, temperature, and gas composition ranges for which A.G.A. computes compressibility factors. Table 1 identifies the acceptable ranges for both of these characterization methods.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Gross Method</th>
<th>Detail Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>0–1200 psia (1)</td>
<td>0–20,000 psia</td>
</tr>
<tr>
<td>Temperature</td>
<td>32 to 130 °F (1)</td>
<td>–200 to 400 °F</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.554–0.9</td>
<td>0.07–1.52</td>
</tr>
<tr>
<td>Heating Value</td>
<td>477–1200 BTU/SCF</td>
<td>0–1800 BTU/SCF</td>
</tr>
<tr>
<td>Mole % Methane</td>
<td>45.0–100</td>
<td>0–100</td>
</tr>
<tr>
<td>Mole % Nitrogen</td>
<td>0–50.0</td>
<td>0–100</td>
</tr>
<tr>
<td>Mole % CO₂</td>
<td>0–30.0</td>
<td>0–100</td>
</tr>
<tr>
<td>Mole % Ethane</td>
<td>0–10.0</td>
<td>0–100</td>
</tr>
<tr>
<td>Mole % Propane</td>
<td>0–4.0</td>
<td>0–12</td>
</tr>
<tr>
<td>Mole % Butanes</td>
<td>0–1.0</td>
<td>0–6</td>
</tr>
<tr>
<td>Mole % Pentanes</td>
<td>0–0.3</td>
<td>0–4</td>
</tr>
<tr>
<td>Mole % Hexanes Plus</td>
<td>0–0.2</td>
<td>0–Dew Point</td>
</tr>
<tr>
<td>Mole % Helium</td>
<td>0–0.2</td>
<td>0–3.0</td>
</tr>
<tr>
<td>Mole % Hydrogen</td>
<td>0–10.0</td>
<td>0–100</td>
</tr>
<tr>
<td>Mole % CO</td>
<td>0–3.0</td>
<td>0–3.0</td>
</tr>
<tr>
<td>Mole % Argon</td>
<td>0</td>
<td>0–1.0</td>
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<tr>
<td>Mole % Oxygen</td>
<td>0</td>
<td>0–21.0</td>
</tr>
<tr>
<td>Mole % Water</td>
<td>0–0.05</td>
<td>0–Dew Point</td>
</tr>
<tr>
<td>Mole % H₂S</td>
<td>0–0.02</td>
<td>0–100</td>
</tr>
</tbody>
</table>

NOTE
Reference conditions are 14.73 psia and 60 °F for Gross Method.

(1) The Model 3095FT sensor operating limits may limit the pressure and temperature range.

Data Logging

One significant advantage for the Model 3095FH is its advanced logging capabilities. The Model 3095FH sensor averages flow data continuously, and the averaged data is then logged into the nonvolatile memory as part of the Model 3095FH audit trail. The Model 3095FH creates three types of logs:

- Daily Logs
- Variable Logs
- Event Logs

The daily log maintains at least 50 days of daily logs for user-selected process variables and calculated values. The variable log records the same data as the daily log according to a user-selected time duration (between 1-99 minutes). The event log provides a record of alarms, configuration changes, and significant occurrences that could affect the flow calculation.

Figure 6 illustrates the 19 parameters available for logging by both the daily and variable log. Any or all of the parameters listed may be selected. Figure 7 illustrates an actual variable log configured to log the seven API required variables at 60-minute intervals.

To meet existing billing system requirements, the Model 3095FH can calculate and log static pressure as absolute or gage, based on upstream or downstream tap locations. However, flow is always calculated using the upstream absolute pressure measurement for greatest accuracy.

In total, the Model 3095FH provides the user with a complete audit trail, which exceeds current API MPMS Chapter 21.1 standards for electronic flow measurement systems.
Configuration and Security

The Model 3095FH has extensive configuration capabilities, including gas properties, gas composition, calculation methods, flow parameters, LCD display, and multiple audit trails. Figure 8 illustrates the Model 3095FH flow parameters configuration screen. In addition to these configurable parameters, the transmitter software contains information that is not user changeable: sensor limits, minimum span, fill fluid, materials of construction, module serial number, and transmitter software revision level.

The Model 3095FH system includes two types of transmitter security to prevent unauthorized or accidental changes to the configuration. Mounted on the electronics board is a transmitter security switch, which when enabled, prevents changes to the transmitter configuration.

In addition, the Model 3095FH User Interface Software provides three levels of password security: System Administrator (one password), Maintenance (three passwords), and Operation (six passwords).

USER INTERFACE SOFTWARE PACKAGES

The Model 3095FH User Interface Software is a separate software package that allows easy configuration of the Model 3095FH Flow Transmitter and retrieval of audit trail data. This tool serves as a communications interface to the Model 3095FH.

The Model 3095FB User Interface Software is a separate software package that allows configuration and diagnostics of the Model 3095FB Multivariable MODBUS transmitter.

For best performance of either software package, the following computer hardware and software is recommended:

- DOS-based 386 computer or above
- 4 MB RAM minimum
- Windows 3.1 or higher
- DOS 3.1 or higher
- Mouse or other pointing device
- 2 MB of free hard disk space
**LCD Meter**

The optional Model 3095FH LCD meter (Figure 9) provides local display of process variables, calculated variables, and transmitter diagnostic messages.

During normal operation, the display changes every three seconds to display user-selected parameters. The LCD meter uses two displays to indicate a parameter's value, engineering unit, and parameter name:

- **Parameter Value**: 40.203
- **Engineering Unit**: IN_H2O
- **Parameter Name**: DP

Each display lasts three seconds, with a brief blank display before the LCD meter shows the next parameter. The LCD scrolls through the entire list of selected parameters before repeating the displays.

Any of the following variables may be selected for the LCD Display:

- Flow Rate
- Differential Pressure
- Totalized Flow Today
- Totalized Flow Yesterday
- Static Pressure
- Process Temperature
- Energy Flow Rate
- Totalized Energy Today
- Totalized Energy Yesterday
- Heating Value
- Mole Percent CO₂
- Mole Percent N₂
- Orifice Bore at 68 °F
- Date and Time
- Specific Gravity
- Totalized Energy Today

The LCD meter also automatically displays any alarm conditions that might occur during operation.

**PROVEN TECHNOLOGY**

The Model 3095FT benefits from the proven capacitance cell technology featured in our Model 3051C Differential Pressure Transmitter and the patented piezoresistive silicon sensor of the Model 3051C Absolute Pressure Transmitter. The digital technology employed in the Model 3095FT ensures maximum accuracy and rangeability and remote data communications capability.

The extensive use of application-specific integrated circuits (ASICs) and surface-mount electronic technology significantly reduces the size and weight of the transmitter. This flow transmitter actually performs the same measurement and computing functions of other electronic flow measurement devices over 10 times its size and weight.

Figure 10 shows a functional block diagram of the Model 3095FT Flow Transmitter. Its functionality is divided between the sensor module and the electronics module. The sensor module performs all tasks related to measuring and correcting the process variables, while the electronics module performs the flow calculation, data logging, and output functions.

**The Multi-Parameter Sensor Module**

The advanced sensor module of the Model 3095FT measures three process variables simultaneously. The multi-parameter module incorporates a high-accuracy capacitance sensor for differential pressure, a high-accuracy piezoresistive sensor for absolute pressure, and a four-wire RTD input for process temperature measurement. In addition, the sensor electronics convert the process variables directly into digital format for further correction and compensation within the sensor module.

**Differential Pressure**

In the differential pressure sensor, process pressure is transmitted through the isolating diaphragm and fill fluid to the sensing diaphragm in the center of the capacitance cell. Capacitor plates on both sides of the sensing diaphragm detect its position. The differential capacitance between the sensing diaphragm and the capacitor plates is directly proportional to process pressure.
Absolute Pressure

The absolute pressure sensor is fabricated utilizing a processing method called chemical vapor deposition (CVD). This technique, which is superior to other technologies that are vulnerable to drift over time, isolates the sensing element from the silicon substrate to achieve high accuracy and repeatability.

The absolute sensor consists of a Wheatstone bridge circuit made from polysilicon resistors deposited on a silicon substrate. The absolute pressure sensor is hydraulically connected to the high pressure side of the transmitter. Process pressure is transmitted through the fill fluid to the sensing element, creating a very small deflection of the silicon substrate. The resulting strain on the substrate changes the bridge resistance in proportion to the pressure applied.

Gage Pressure (Model 3095FB only)

The gage pressure sensor is fabricated using the same manufacturing techniques and sensor technology as the absolute pressure sensor. However, the reference side of the silicon substrate is vented to atmosphere instead of concealed in the vacuum.

Process Temperature

Process temperature is measured using an input connection on the sensor module for a standard resistance temperature device (RTD). Rosemount Inc. offers a special shielded cable with connector for connecting the RTD input to the Model 3095FT (see ordering information for details).

The Model 3095FT can accept a signal from any 100-ohm platinum RTD that conforms to IEC-751 Class B. The Model 3095FT Flow Transmitter can be supplied with an optional Rosemount Series 68 or 78 RTD temperature sensor. For further information on Rosemount temperature sensors and accessory hardware, contact your Fisher-Rosemount Sales Engineer.

Digital Compensation

The Model 3095FT uses a dedicated microprocessor, located inside the sensor module, to linearize and correct the raw sensor outputs. To ensure premium performance, this sensor microprocessor uses the absolute (or gage) pressure measurement to compensate for zero line pressure effects and an internal temperature measurement to compensate for thermal effects.
FIGURE 11. Exploded View of Model 3095FH.

NOTE
Model 3095FB Multivariable MODBUS Transmitters require a different housing to support a new terminal block and a new electronics board. Model 3095FB Transmitters also do not include a real-time clock battery.
FIGURE 12. Dimensional Drawings of Model 3095FH.

NOTE
Dimensions are in inches (millimeters).

FIGURE 13. Mounting Configurations for Model 3095FH.

NOTE
Dimensions are in inches (millimeters).

NOTE
Dimensions for Model 3095FB Multivariable MODBUS Transmitters are slightly different than illustrated above. Consult factory for details.
MODEL 3095FT SPECIFICATIONS

Model 3095FH Functional Specifications

Service
Natural gas.

Differential Sensor

Range
Code 2: 0–2.5 to 0–250 inH\textsubscript{2}O (0–0.62 to 0–62.2 kPa).

Limit
Code 2: –250 to 250 inH\textsubscript{2}O (–62.2 to 62.2 kPa).

Absolute Sensor

Ranges
Code 3: 0–8 to 0–800 psia (0–55.16 to 0–5515.8 kPa).
Code 4: 0–36.26 to 0–3,626 psia (0–250 to 0–25000 kPa).

Limit
Code 3: 0.5 to 800 psia (3.4 to 5515.8 kPa).
Code 4: 0.5 to 3,626 psia (3.4 to 25000 kPa).

Output
Two-wire fixed 8.5 mA with digital HART protocol superimposed on current signal.

Power Supply
External power supply required. Transmitter operates on terminal voltage of 7.5–35 V dc with a constant average operating current of 8.5 mA.

Load Limitations
Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

\[
\text{Loop Resistance} = \frac{\text{Power Supply Voltage}}{0.014}
\]

Communication requires a minimum loop resistance of 250 ohms.

Zero Suppression
Can be set anywhere within the sensor limits as long as the span is greater than or equal to the minimum span, the lower range value does not exceed the lower range limit, and the upper range value does not exceed the upper range limit.

**NOTE**
Flow calculations will cease with negative DP readings.

Failure Mode Alarm
If self-diagnostics detect a gross transmitter failure, the HART output registers an alarm with each message.

Hazardous Locations Certifications

Factory Mutual (FM) Approvals
A Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II, Division 1, Groups E, F, and G. Suitable for Class III, Division 1, indoor and outdoor (NEMA 4X) hazardous locations. Factory Sealed. Provides non-incendive RTD connections for Class I, Division 2, Groups A, B, C, and D. Install per Rosemount drawing 03095-1025.

B Intrinsically Safe for use in Class I, Division 1, Groups A, B, C and D; Class II, Division 1, Groups E, F, G; Non-incendive for Class I, Division 2, Groups A, B, C, and D. Temperature Code T4, NEMA 4X. Factory Sealed. Install per Rosemount drawing 03095-1020.

Canadian Standards Association (CSA) Approvals
C Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition Proof for Class II, Division 1, Groups E, F, and G. Suitable for Class III, Division 1, indoor and outdoor hazardous locations, CSA enclosure Type 4X. Factory Sealed. Provides non-incendive RTD connection for Class I, Division 2, Groups A, B, C, and D. Approved for Class I, Division 2, Groups A, B, C, and D. Install in accordance with Rosemount Drawing 03095-1024.

D Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D when installed in accordance with Rosemount drawing 03095-1021. Temperature Code T3C.

Over Pressure Limit
0 psia to two times the absolute pressure sensor range with a maximum of 3,626 psia.

Static Pressure Limit
Operates within specifications between static line pressures of 0.5 psia and the URL of the absolute pressure sensor.

Temperature Limits
Process:
–40 to 185 °F (–40 to 85 °C).

Ambient:
–40 to 185 °F (–40 to 85 °C).

Storage:
–50 to 212 °F (–46 to 100 °C).

Humidity Limits
0–100% relative humidity.
LCD Meter
Optional dual-row, 11-digit, alphanumeric, scrolling liquid crystal display.

LCD Meter Temperature Limits
- Operating: -13 to 185 °F (-25 to 85 °C).
- Storage: -40 to 185 °F (-40 to 85 °C).

Turn-on Time
Process variables will be within specifications less than 60 seconds after power is applied to transmitter.

Damping
Response to step input change can be user-selectable from 0 to 7 seconds for one time constant. This is in addition to sensor response time of 0.2 seconds.

Real-Time Clock Accuracy
±2 minutes per month at reference conditions.

Model 3095FB MODBUS RTU Functional Specifications

Service
Gas or liquid.

Differential Sensor

Range
- Code 2: 0–2.5 to 0–250 inH₂O (0–0.62 to 0–62.2 kPa).
- Code 3: 0–10 to 0–830 inH₂O (0–2.48 to 0–206 kPa).

Limit
- Code 2: -250 to 250 inH₂O (-62.2 to 62.2 kPa).
- Code 3: -830 to 830 inH₂O (-206 to 206 kPa).

Absolute Sensor

Ranges
- Code 3: 0–8 to 0–800 psia (0–55.16 to 0–5515.8 kPa).
- Code 4: 0–36.26 to 0–3,626 psia (0–250 to 0–25000 kPa).

Limit
- Code 3: 0.5 to 800 psia (3.4 to 5515.8 kPa).
- Code 4: 0.5 to 3,626 psia (3.4 to 25000 kPa).

Gage Sensor

Ranges
- Code C: 0–8 to 0–800 psig (0–55.16 to 0–5515.8 kPa).
- Code D: 0–36.26 to 0–3,626 psig (0–250 to 0–25000 kPa).

Limit
- Code C: 0 to 800 psig (0 to 5515.8 kPa).
- Code D: 0 to 3,626 psig (0 to 25000 kPa).

Power Supply
External power supply required. Transmitter operates on terminal voltage of 7.5–24 V dc.

Power Consumption
Quiescent supply current 10 mA typical.
Transmitting supply current not to exceed 100 mA.

RS-485 Signal Wiring
2-wire half-duplex RS-485 MODBUS.

Bus Terminations
Standard RS-485 bus terminations required per EIA-485.

Zero Suppression
Can be set anywhere within the sensor limits as long as the span is greater than or equal to the minimum span, the lower range value does not exceed the lower range limit, and the upper range value does not exceed the upper range limit.

Failure Mode Alarm
If self-diagnostics detect a gross transmitter failure, non-latched status bits are set in the transmitter alarm registers.

Hazardous Locations Certifications
Worldwide approvals pending.

Over Pressure Limit
0 psia to two times the absolute pressure sensor range with a maximum of 3,626 psia.

Static Pressure Limit
Operates within specifications between static line pressures of 0.5 psia and the URL of the absolute pressure sensor.

Temperature Limits

Process:
- -40 to 400 °F (-40 to 204 °C).

Ambient:
- -40 to 185 °F (-40 to 85 °C).

Storage:
- -50 to 212 °F (-46 to 100 °C).

Humidity Limits
0–100% relative humidity.

LCD Meter
Optional dual-row, 11-digit, alphanumeric, scrolling liquid crystal display.

LCD Meter Temperature Limits
- Operating: -13 to 185 °F (-25 to 85 °C).
- Storage: -40 to 185 °F (-40 to 85 °C).

Turn-on Time
Process variables will be within specifications less than 4 seconds after power is applied to transmitter.

Damping
Response to step input change can be user-selectable from 0.1 to 30 seconds for one time constant. This is in addition to sensor response time of 0.2 seconds.
Performance Specifications (Model 3095FH and Model 3095FB)
(Zero-based spans, reference conditions, silicone oil fill, 316 SST isolating diaphragms, and digital trim values equal to the span end points.)

Differential Pressure
Range 2
0–2.5 to 0–250 inH₂O (0–0.62 to 0–62.2 kPa) (100:1 rangeability is allowed).
Range 3
0–8.3 to 0–830 inH₂O (0–2.48 to 0–206 kPa) (83:1 rangeability is allowed).

Reference Accuracy
(including Linearity, Hysteresis, Repeatability)
±0.075% of span for spans from 1:1 to 10:1 of URL.
For spans less than 10:1 rangedown,
\[
\text{Accuracy} = \left[ 0.025 + 0.005 \left( \frac{\text{URL}}{\text{Span}} \right) \right] \% \text{ of Span}
\]

Ambient Temperature Effect per 50 °F (28 °C)
±(0.025% URL + 0.125% span) spans from 1:1 to 30:1.
±(0.035% URL – 0.175% span) spans from 30:1 to 100:1.

Static Pressure Effects
Zero error = ±0.10% of URL per 1,000 psi (6894 kPa).
Span error = ±0.20% of reading per 1,000 psi (6894 kPa).

Stability
±0.1% of URL for 12 months.

Absolute/Gage Pressure
Range 3 (absolute) C (gage):
0–8 to 0–800 psi (0–55.16 to 0–5515.8 kPa) (100:1 rangeability is allowed).
Range 4 (absolute) /D (gage):
0–36.26 to 0–3,626 psi (0–250 to 0–25000 kPa) (100:1 rangeability is allowed).

Reference Accuracy
(including Linearity, Hysteresis, Repeatability)
±0.075% of span for spans from 1:1 to 6:1 of URL.
For spans less than 6:1 rangedown,
\[
\text{Accuracy} = \left[ 0.03 + 0.0075 \left( \frac{\text{URL}}{\text{Span}} \right) \right] \% \text{ of span}
\]

Ambient Temperature Effect per 50 °F (28 °C)
±(0.05% URL + 0.125% of span) spans from 1:1 to 30:1.
±(0.06% URL – 0.175% of span) spans from 30:1 to 100:1.

Stability
±0.1% of URL for 12 months.

Process Temperature (RTD)
Specification for process temperature is for the transmitter portion only. Sensor errors caused by the RTD are not included. The transmitter is compatible with any PT100 RTD conforming to IEC 751 Class B, which has a nominal resistance of 100 ohms at 0 °C and \( \alpha = 0.00385 \). Examples of compatible RTDs include the Rosemount Series 68 and 78 RTD Temperature Sensors.

Range
Model 3095FH
–40 to 185 °F (–40 to 85 °C).
Model 3095FB
–40 to 400 °F (–40 to 204 °C).

Accuracy
(including Linearity, Hysteresis, Repeatability)
±0.25 °F (0.14 °C) per 50 °F (28 °C).

Stability
±0.5 °F (0.28 °C) for 12 months.

Physical Specifications (Model 3095FH and Model 3095FB)

Electrical Connections
½−14 NPT, CM 20, PG-13.5.

Process Connections
Transmitter: ⅜−18 NPT on 2⅜−8-in. centers.
RTD: RTD dependent (see ordering information).

Process Wetted Parts
Isolating Diaphragms
316L SST or Hastelloy C-276.

Drain/Vent Valves
316 SST or Hastelloy C.

Flanges
Plated carbon steel, 316 SST, or Hastelloy C.

Wetted O-rings
Glass-Filled TFE.

Non-Wetted Parts
Electronics Housing
Low copper aluminum.

Bolts
Plated carbon steel per ASTM A449, Grade 5; or austenitic 316 SST.

Fill Fluid
Silicone oil.

Paint
Polyurethane.

O-rings
Buna-N.

Weight

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight in lb (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 3095FT Transmitter</td>
<td>6.0 (2.7)</td>
</tr>
<tr>
<td>LCD Meter</td>
<td>0.5 (0.2)</td>
</tr>
<tr>
<td>SST Mounting Bracket</td>
<td>1.0 (0.4)</td>
</tr>
<tr>
<td>12 ft (3.66 m) RTD Shielded Cable</td>
<td>0.5 (0.2)</td>
</tr>
<tr>
<td>12 ft (3.66 m) RTD Armored Cable</td>
<td>1.1 (0.5)</td>
</tr>
<tr>
<td>24 ft (7.32 m) RTD Shielded Cable</td>
<td>1.0 (0.4)</td>
</tr>
<tr>
<td>24 ft (7.32 m) RTD Armored Cable</td>
<td>2.2 (1.0)</td>
</tr>
</tbody>
</table>
# ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Model</th>
<th>Product Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3095F</td>
<td>Flow Transmitter</td>
</tr>
</tbody>
</table>

## Code

### Output
- B: RS-485 MODBUS RTU
- H: Digital HART Protocol Signal

### Differential Pressure Range
- 2: 0–2.5 to 0–250 inH₂O (0–6.2 to 0–62.2 kPa)
- 3: 0–10 to 0–830 inH₂O (0–24.8 to 0–206 kPa)

### Absolute/Gage Pressure Ranges
- 3: 0–8 to 0–800 psia (0–55.16 to 0–5515.8 kPa)
- 4: 0–36.26 to 0–3,626 psia (0–250 to 0–25000 kPa)

### Isolator Material
- A: 316L SST Silicone
- B: Hastelloy C-276

### Flange Style, Material
- A: Coplanar, CS
- B: Coplanar, SST
- C: Hastelloy C

### Flange Style, Material
- A: SST
- B: Hastelloy C

### Drain/Vent Material
- 1: Glass-filled TFE

### Flow Dependent Averaging Method
- N: MODBUS RTU Process Variable Measurement (for Model 3095FB only)

### Options
- C1: Custom Configuration
- DF: Flange Adapters — Adapter Type Determined by Selected Flange Material: Plated CS, SST, Hastelloy C

### Typical Model Number

```
{ H 2 3 A B A 1 1 A B 1 1 0 A A }
```
OPTIONS

Standard Configuration
Unless otherwise specified, transmitter is shipped as follows:

Engineering units:
- Differential in \( \text{H}_2\text{O} \) (Range 2)
- Absolute/Gage psi (all ranges)

Output:
- Model 3095FH: Digital HART protocol signal
- Model 3095FB: MODBUS RTU protocol signal

Flange type: Specified model code option
Flange material: Specified model code option
O-ring material: Specified model code option
Drain/vent: Specified model code option

Flow Configuration
- Parameters: Factory default
- Software tag: (Blank)
- Software tag (8 characters maximum) is left blank unless specified.

Custom Configuration (Option Code C1)
If Option Code C1 is ordered, the customer specifies the following information for the Model 3095FT in addition to the standard configuration parameters.

Model 3095FH (see 00806-0100-4015)
- Gas composition parameters, contract hour, log parameters, LCD display parameters, meter run configuration parameters, low flow cut-off, passwords, static pressure tap location, static pressure measurement, damping, descriptor, message, and upper and lower trim points for each process variable.

Model 3095FB (see 00806-0100-4738)
- Message, descriptor, slave address, baud rate, upper and lower trim points for each process variable, damping for each process variable, units for each process variable, upper and lower operation limits.

Tagging
Three customer tagging options are available:

1. Standard SST tag is wired to the transmitter. Tag character height is 0.125 in. (3.18 mm), 85 characters maximum.
2. Tag may be permanently stamped on transmitter nameplate upon request, 65 characters maximum.
3. Tag may be stored in transmitter memory. Software tag (8 characters maximum) is left blank unless specified.

ACCESSORIES

Model 3095FH User Interface Software Packages
The User Interface software package is available with or without the HART modem and connecting cables. All configurations are packaged separately.


Part No. 03095-5110-0003: Windows User Interface Software–Site License.

Part No. 03095-5105-0001: HART Modem and Cables.

Model 3095FB User Interface Software Packages
The User Interface software package is available with or without the converter and connecting cables. All configurations are packaged separately.


Part No. 03095-5125-0003: Windows User Interface Software–Site License.

Part No. 03095-5106-0001: Converter and Cables.

Optional Three-valve Manifolds
(Packaged Separately)


Part No. 01151-0150-0002: 3-Valve Manifold, 316 SST (Anderson, Greenwood & Co., M4AV1S).

Remote Power Supply Packages
The Remote Power Supply package (Part No. 03095-5000-1010) provides a continuous power source for one Model 3095FH in locations where power is not available.

The Backup Power Supply package (Part No. 03095-5000-2000) provides a continuous power source for one Model 3095FH in locations where the dc power supply may not be reliable due to power line outages. Both configurations are packaged separately.


The Model 3095FH logged data can be imported into Flow-Cal™, an editing and graphing software package developed by Coastal Flow Measurement Inc. for the natural gas industry. For further information concerning this software package, contact Coastal Flow.
REMOTE POWER SUPPLY ASSEMBLY
(Included with Rosemount Part No. 03095-5000-1010 and 03095-5000-2000)

To allow use in remote installations, the Model 3095FH can be supplied with an optional solar power system. This option provides sufficient power to operate one transmitter in various weather conditions while remaining as compact and cost effective as possible. Other commercially available power systems may be used if they meet the power requirements of the Model 3095FH.

General Specifications
Enclosure
Fiberglass reinforced polyester, NEMA 3R rating.

Enclosure Dimensions
11.5 3 8.8 3 5.4 in. (292 3 224 3 137 mm).

Enclosure Electrical Openings
Output (to transmitter) 
½-14 NPT conduit hub.

Supply (from solar panel or power source) 
⅛-inch compression fitting.

Computer Hookup
BNC Connector. Protected by waterproof BNC cap and chain.

Enclosure Security
⅝-in. inside diameter stainless steel latch suitable for padlock.

Performance
Power Output
9.5 mA average.
11.35 V minimum (no load).

Operating Temperature
–40 to 140 °F (–40 to 60 °C).

Charging Temperature
–4 to 140 °F (–20 to 60 °C).

Longest No Power Operating Duration
Fully charged battery with no solar input will power transmitter for a minimum of:
35 days at 60 °F (15.6 °C).
24 days at –4 °F (–20 °C).

Minimum Equivalent Sun Hours/Day
2.5.

Enclosure Weight with Battery
20 lb (9.0 kg).

Consult the factory for remote power supply information for Model 3095FB Multivariable MODBUS Transmitters.


Solar Panel Specifications
Type
2 Watt, photovoltaic.

Dimensions
13.75 3 6.75 3 0.50 in. (35 3 173 3 1 mm).

Weight
1.3 lb (0.6 kg).

Battery Specifications
Type
12 Volt, 12 amp-hour, maintenance-free sealed lead acid.

Terminals
⅛-in quick disconnect tabs.

Dimensions
5.95 3 3.86 3 3.84 in. (151 3 98 3 96 mm).

Weight
8.82 lb (4.0 kg).

Expected Service Life
Three years from installation date.

Battery Backup Specifications
(Appplies to Rosemount Part No. 03095-5000-2000)

User-Supplied Power Supply
15–40 V dc, 500 mA minimum.

NOTE
Battery Backup units are supplied with two ⅛-14 NPT conduit hubs.