SMART Industrial Thermal Gas Mass Flow Meters

Series 620S and 640S
Insertion Meters

Series 780S UHP and 780S
In-Line Meters

SIERRA®
INSTRUMENTS
THE MASS FLOW COMPANY

ISO
REGISTERED
9001:2000

Mass flow rate and totalized flow, as well as other configuration variables, are displayed on the meter's optional 2 x 12 backlit LCD panel. The programmable transmitter is easily configured via an RS-232 serial port and Sierra's Smart Interface PC-based software; or via the display and function switches on the front panel of the device.

Sierra's Smart Thermal Mass Flow Meters offer you a unique feature not available in any other thermal mass flow meter: a means to confirm or "field-validate" that the instrument's primary sensing elements have not drifted or shifted from their original calibration. To fully validate your instrument's performance for ISO 9001-2000 compliance or other quality audits, Sierra's validation routines guide you through a procedure that checks the system electronics, linearization and microprocessor functionality.

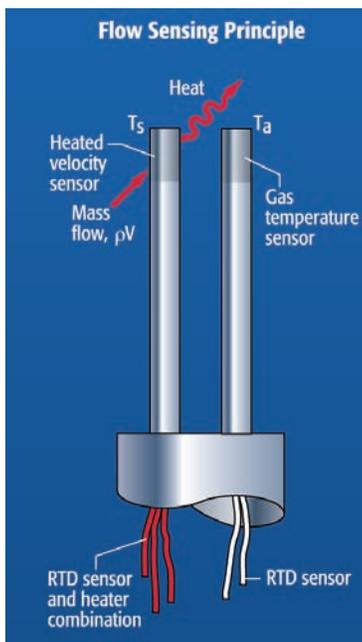### The thermal sensor's principle of operation.

Sierra's immersible thermal sensor consists of two sensing elements–a velocity sensor and a temperature sensor that automatically corrects for changes in gas temperature. The transducer electronics heats the velocity sensor to a constant temperature differential above the gas temperature and measures the cooling effect of the gas flow. The electrical power required to maintain a constant temperature differential is directly proportional to the gas mass flow rate.

Rugged 316 stainless steel construction, low-flow sensitivity, fast response and outstanding rangeability are just a few of the distinguishing features of thermal mass flow meters, and have made them the instrument of choice for many critical gas flow applications. Smart electronics, field-rangeability and validation features add uncommon flexibility, improved reliability and greater operator control capabilities to the thermal gas mass flow meter's benefit package.

Sierra's full line of industrial insertion and in-line thermal mass flow meters are available with Smart Electronics.

Sierra Instruments' Smart Thermal Gas Mass Flow Meters are designed to accommodate the changing measurement requirements and instrument validation demands of industrial gas mass flow monitoring installations. The instrument's smart electronics provide you with a wide range of field-adjustment features, as well as the ability to confirm or "field-validate" your meter's calibration and measurement accuracy.

The microprocessor-based transmitter integrates the functions of flow measurement, flow-range adjustment, meter validation and diagnostics in a compact, NEMA 4X (IP 65) or Hazardous-Area (IP 67) housing.

Flow Sensing Principle

Heat

T_s T_a

Heated velocity sensor

Mass flow, ρV

Gas temperature sensor

RTD sensor and heater combination

RTD sensor

Smart electronics simplify field-adjustments.

Sierra's Smart electronics provide many unique field-adjustment features. You can now make the following password protected adjustments by using the function switches and the instrument display:

Thermal Mass Flow Meters Dramatically Reduce Installation Costs and Total Cost of Ownership

Compare the initial cost and installation cost of a traditional DP flow meter to that of a thermal mass flow meter, which provides mass flow measurement with one device and a single pipe penetration.

DIFFERENTIAL PRESSURE PRODUCING DEVICE

THERMAL MASS FLOW METER
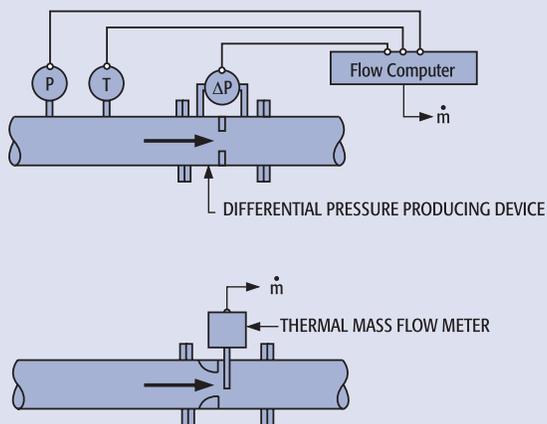
The Model 640S insertion meters are available with a variety of mounting options.

- *Change the full scale of the instrument. Select from 50% to 100% of the Factory Full-Scale setting. This adjustment can be made for both flow ranges.*

- *Change the alarm settings. High, low or window alarms can be set independently for two flow ranges.*

- *Change the time response. Pick from as low as one second to as high as seven seconds–to smooth the output.*

- *Reset the flow totalizer. The totalizer counts only the selected range. When ranges are switched, the value of the non-selected range is stored in memory.*

- *Change the K factor. Use to compensate for flow profile variations or specific application conditions.*

Optional PC features.

Connecting the meter to a portable PC allows you to make the adjustments described above, and also permits the following operations:

- *Enable and set Zero Flow Cut-Off. This allows you to adjust the low-flow sensitivity, to eliminate false readings caused by leaky valves or convection effects in the pipe.*

- *Adjust alarm hysteresis.*

- *Read and alter the factory calibration. A real-time graphical interface facilitates this procedure.*

- *Read and print out the complete factory configuration. Use for ISO 9000 compliance and other quality audits.*

Insertion meters are ideal for measuring flow in large pipes and ducts.

The Model 640S Insertion Mass Flow Meter is designed for easy insertion into ducts or pipes by means of a flanged stub or compression fitting. Compression fittings and hot-tap mounting facilitate removal of the sensing probe for service and maintenance. Additionally, because the sensor does not significantly block or restrict flow, the permanent pressure loss is negligible. These features reduce total cost-of-ownership over the lifetime of the instrument.

The Model 640S provides an optical/galvanic isolated 4-20 mA output and a 0-5 or 0-10 VDC output, two alarm outputs and one contact input for range or gas selection. The electronics are available in either a NEMA 4X or Hazardous-Area enclosure, with or without display. The enclosure can be mounted directly on the probe or remotely up to 100 feet away.

The Benefits of Thermal Mass Flow Measurement

- Highest accuracy and repeatability for low-pressure gas flow measurement applications
- Outstanding rangeability
- Excellent low-speed sensitivity
- One-second response to changes in flow rate
- Minimal flow blockage and low pressure drop
- No moving parts
- Economical installation and operation
- Low cost-of-ownership over the lifetime of the device

In-line meters with flow conditioning reduce upstream piping requirements.

The Model 780S In-line Mass Flow Meter is the economical solution to problems associated with monitoring flow in installations where long, straight pipe runs are not available. The meter's flow conditioning element effectively eliminates velocity profile distortions, swirl and temperature stratification in the gas stream. The instrument's built-in flow conditioner creates a uniform velocity profile by means of two stainless-steel perforated plates welded into the body between the sensor and the inlet connection.

Required Straight Lengths Relative to Upstream Disturbances		
	Upstream Diameters	
Disturbance	Orifice Plate	Sierra Model 780S
One 90° Elbow	28	1
Two 90° Elbows Same Plane	36	3
Two 90° Elbows Different Planes	62	3
Reducer - 4/1	14	3
Globe Valve - Fully Open	32	2

Built-in flow conditioning creates a uniform velocity profile in constrained applications

The Model 780S flow body reduces upstream piping requirements to less than three diameters after most common flow disturbances. Extensive testing has demonstrated how this device virtually eliminates the effect of piping conditions with fewer upstream diameters than any other flow conditioning technique.

The Model 780S is available with ANSI or DIN flanges, NPT or butt-weld connections. In the 1-inch to 8-inch (DN25 to DN200) versions, the unit's sensor and probe are easily removed from the flow body for service or maintenance.

Ultra-high purity meters are designed for ultra-clean processes.

The Model 780S UHP is designed for gas distribution service in semiconductor fabs, pharmaceutical production and other ultra-clean processes. The instrument's flow body is constructed of 316L electropolished tubing with a 7-10 Ra interior finish. This results in superior corrosion resistance, lower levels of gaseous desorption and an interior surface that is microscopically free of cracks, burrs and other defects that are sites for particle generation and retention.

These meters are available with tri-clamp fittings or are prepared for orbital butt-welding. The 0.25-inch, 0.5-inch and 1-inch models are also available with VCR process connections. Smart transmitter options, enclosures and mounting configurations are the same as for the Model 780S.

A low-cost flow sensor with smart electronics may be all you need for your gas flow measurement application.

Sierra's Model 620S Insertion Mass Flow Meter provides a low-cost alternative for gas flow measurement applications. The meter's ceramic sensor offers long-term stability and 200-millisecond time response, and incorporates the Sierra Smart Electronics. Field-adjustment and Smart Interface terminal emulation capabilities are standard on the device.

The Model 620S provides an optical/galvanic isolated 4-20 mA output and a 0-5 or 0-10 VDC output and two alarm outputs. The meter is available with or without display in a NEMA 4X (IP 65) enclosure.

Sierra's UHP meters are engineered to meet exacting Ultra-High Purity standards.

Validate...don't calibrate!

Only Sierra's S-Series Meters let you validate your instrument's performance for ISO 9000 or other quality audits

Sierra's Smart Mass Flow Meters provide you with a totally new and unique benefit: the ability to field-validate instrument performance and measurement accuracy. Each meter's unique electronic and sensor characteristics, or "signature," are stored in memory; allowing you to verify the stability of the primary element–the flow sensor–as well as the signal processing circuitry.

In the factory...

Sierra ensures starting-point accuracy by calibrating each thermal mass flow meter with a NIST-traceable mass flow standard. Then, all instrument information and calibration data is stored in the microprocessor.

In the field...

In the field, validating the stability of the meter's sensing elements is as simple as measuring their resistance and comparing the output to the sensors' "signature-data" stored in memory. Simulating a sensor output and comparing the output to the NIST-traceable calibration data validates system electronics

and microprocessor programming. A zero and span check verifies output circuits to fully validate instrument performance. Validation can be accomplished manually with a digital voltmeter and an ohmmeter, using the display and membrane switches found on the instrument panel. However, the transmitter's ability to interface with a computer offers you the greatest flexibility and control.

With a portable PC...

The Sierra Smart Interface software is an easy-to-use, menu-driven program for validating, troubleshooting and re-configuring the meter. In this mode, the meter is connected to a PC with the furnished cable. The Smart Interface software provides an indication of current settings in the main menu, and makes all programmable functions available in a pull-down menu. The Function Selector allows you to choose a procedure and then guides you through all validation procedures. This method can be used in the field or in the instrument shop, eliminating the need to return a flow meter to the factory for testing or instrument re-ranging. The Smart Interface software also provides a means for you to download and print detailed instrument information.

NIST-traceable calibration ensures accurate starting-point accuracy.

Sierra Instruments thoroughly tests and calibrates every flow meter at customer-specified conditions. A calibration certificate, traceable to National Standards, is provided with each instrument.

Sierra's Smart Industrial Mass Flow Meters are FM, CSA and ATEX approved for operation in hazardous areas and all are CE-approved. Inline bodies are PED approved.

Technical support ensures your satisfaction.

Sierra's experienced Application Engineers are trained to answer questions regarding equipment capabilities, utility and application. Technical support is available by phone or on location—for installation, trouble-shooting or service. And for customer convenience, trained industrial representative firms throughout the world offer Sierra products.

Please write, call, fax or e-mail us today, for information on the world's most reliable, flexible and accurate thermal gas mass flow meters.

Model 620S

- Insertion probe lengths from 3.7 to 24-inch
- Input Power: 10-30 VDC
- Output Signal: Optical/galvanic isolated 4-20 mA, 0-5 or 0-10 VDC, Pulse
- Probe Mounted or Remote Mounted Electronics
- NEMA 4X Electronics Enclosure
- Available with or without display

Model 640S

- Insertion probe lengths from 6 to 36-inch
- Input Power: 10-30 VDC or 100-240 VAC
- Output Signal: Optical/galvanic isolated 4-20 mA, 0-5 or 0-10 VDC, Pulse
- Probe Mounted or Remote Mounted Electronics
- NEMA 4X or Hazardous-Area Electronics Enclosure
- Available with or without display
- Mounting options: ANSI 1-inch 150 lb flange or 3/4-inch tube compression fitting with 1-inch male NPT
- Hot-tap mounting system
- Optional communications protocols: MODBUS, Foundation Fieldbus, Profibus PA

Model 780S UHP

- Flow body sizes from 1 to 8-inch 7-10 Ra
- Input Power: 10-30 VDC or 100-240 VAC
- Output Signal: Optical/galvanic isolated 4-20 mA, 0-5 or 0-10 VDC, Pulse
- Probe Mounted or Remote Mounted Electronics
- NEMA 4X or Hazardous-Area Electronics Enclosure
- Available with or without display
- Mounting options: Butt weld prep on all flow bodies; VCR on 1-inch bodies; Tri-clamp on 1 to 4-inch bodies
- Cleaned and packaged to Class 100 standards
- Optional communications protocols: MODBUS, Foundation Fieldbus, Profibus PA

Model 780S

- Flow body sizes from 1/4 to 8-inch 316L stainless steel or carbon steel (some sizes)
- Input Power: 10-30 VDC or 100-240 VAC
- Output Signal: Optical/galvanic isolated 4-20 mA, 0-5 or 0-10 VDC, Pulse
- Probe Mounted or Remote Mounted Electronics
- NEMA 4X or Hazardous-Area Electronics Enclosure
- Available with or without display
- Mounting options: ANSI flange, DIN flange or NPT connection
- Optional communications protocols: MODBUS, Foundation Fieldbus, Profibus PA

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