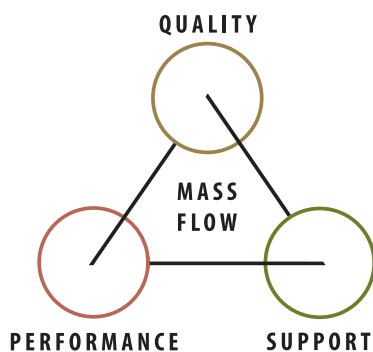




THERMAL MASS FLOW MEASUREMENT FOR GASES



*Make the Wise Choice.
Choose Sage Flow Meters.*



A Commitment to Higher Performance

SAGE METERING is a manufacturer of high performance Thermal Mass Flow Meters which measure the flow rate and consumption of gases for multiple industrial applications. Frequently used for energy management systems to monitor and improve energy efficiency as well as for regulatory compliance in environmental systems including reporting of Greenhouse Gas Emissions.

TYPICAL APPLICATIONS include measurement and sub-metering of natural gas and compressed air for energy utilization and cost accounting within a facility. Measurement of combustion air flow can be used for improving efficiency in boilers and furnaces. Environmental reporting of Greenhouse Gases from combustion sources as well as measurement for carbon credits are frequently encountered.

OTHER KEY environmental applications include flare gas flow measurement in the Oil and Gas Industry where thermal technology offers economic advantages over traditional flow measurement technology. To meet the regulatory requirements of periodic re-calibration or calibration verification, Sage Metering has developed a unique in-situ accuracy verification process to ensure the meter is performing within the original NIST traceable gas calibration while the process remains in operation.

Sage Meters are used for all types of applications:

ENERGY MANAGEMENT

- Natural Gas Measurement
- Compressed Air Flows

ENVIRONMENTAL

- Green House Gas Emissions
- Carbon Credits

PROCESS

- Flare
- Biogas / Landfill Gas
- Combustion Air
- Vent Air

FACILITIES MANAGEMENT

- Natural Gas Sub-metering
- Department Cost Allocation



Experience and Expertise

SAGE METERING, INC. is the fastest growing thermal mass flow meter manufacturer in the industry. Founded in 2002, Sage brings together individuals with many years of combined experience in the design, operation, and application of thermal mass flow meters. This vast knowledge has enabled Sage to identify and improve on the overall design and performance of Thermal Mass Flow instrumentation. Sage's philosophy is inherent throughout its product line and services.

- **Innovative Products**
- **On Time Delivery**
- **Extraordinary Customer Service**
- **Strong Commitment to Quality**
- **Excellent Responsiveness to Customers**

Make the Wise Choice. Choose Sage Flow Meters.

A Pioneer in Technology Development

SAGE METERING has brought to market the first digitally-driven circuit design, eliminating the traditional analog Wheatstone bridge. This feature has provided Sage products with the ability to:

- Eliminate analog drift, improving stability and long term reproducibility
- Show a reproducible zero flow point, permitting simple and reliable calibration verification
- Maintain higher resolution providing greater rangeability
- Digitally-driven temperature sensor eliminates self-heating errors
- Match overheat to application for greater signal resolution
- Remote Style: up to 1000 ft. from probe, and lead-length compensated (junction box has no circuitry – suitable for harsh environments)

IN-SITU CALIBRATION VERIFICATION

- User can easily verify that flow meter remains in calibration with simple field test while process is in operation
- Checks overall instrument performance – both sensor and electronics
- Eliminates the need for periodic factory re-calibration
- Meets regulatory requirements for calibration check

FIRST GRAPHIC DISPLAY IN THERMAL FLOW INDUSTRY

- Provides flow rate, temperature, totalized flow, diagnostics, and signal at a single glance
- High contrast display adjusts to ambient lighting, making it easy to read

IMPROVED TEMPERATURE COMPENSATION

- Ensure accurate flow measurement over wide range of process temperatures

ATTENTION TO ACCURACY

- Calibrations performed on actual gas
- NIST traceable calibration facility provides accuracy flexibility



Flow Control Magazine
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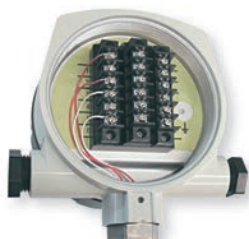


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Sage Prime Thermal Mass Flow Meter (SIP Series)

The Prime is Sage's premier Thermal Mass Flow Meter for all rugged industrial applications. The Prime has been approved for use in hazardous areas by many agencies, plus CE rated for Electromagnetic compatibility. Available in both 24 VDC (12 VDC optional) and 115/230 VAC input power. The 2.5 watts power is the lowest consumption in the industry.

Easy access to wiring connections



Available with Integral (SIP) or Remote (SRP) electronics (cable lengths to 1000 ft.)



1/4" to 4" flow body with flow conditioner (NPT standard, flange optional)



Easy-to-read graphic display gives flow rate, totalized flow, temperature and diagnostics information

Compact design simplifies installation

Process temperatures to 450° F (232° C) with standard sensor



Insertion Probe (shown with optional mounting hardware SVA05)



Outputs:

- 4–20 mA
- Optional HART™ communication
- Pulse
- Modbus

Hazardous area approvals

In-situ calibration check verifies proper operation of flow meter

Multiple independent calibrations available (field configurable with Addresser software)

For more information on the Sage Prime (above), view the Sage SIP Flyer and Data Sheet by visiting www.sagemetering.com/prime. For more information on the Sage Prism (below), view the Sage SID Flyer and Data Sheet by visiting www.sagemetering.com/prism. Or contact Sage at 866-677-SAGE (7243).

Sage Prism Portable Datalogging Flow Meter (SID Series)

Logs up to 3800 points (flow rate, temperature, time stamps, etc.)

Furnished with carrying case and software

Uploads to Excel format for storage and analysis



Portability with 10 hours of rechargeable battery operation


Calibrated for three different gases or flow ranges

Prism display detail



Sage Rio Thermal Mass Flow Meter (SIX Series)

The Sage Rio Thermal Mass Flow Meter provides the same levels of performance found in the Sage Prime with the added ATEX Flameproof approvals.

ATEX Flameproof approval –
 II 2G Ex d IIB+H2 T6 Gb*

Available with Integral (SIX) electronics.
 Remote style (SRX) optionally available

1/4" to 4" flow body with flow conditioner (NPT standard, flange optional)



Insertion Probe
 (shown with
 optional flange
 mounting)



Rotatable graphic display gives flow rate, totalized flow, temperature and diagnostics information

Outputs:

- 4–20 mA
- Optional HART™ communication
- Pulse
- Modbus

In-situ calibration check verifies proper operation of flow meter

*T6 Rating is suitable for gases with ignition temperature as low as 185°F (85°C)



For more information on the Sage SIX (above), view the Sage SIX Flyer and Data Sheet by visiting www.sagemetering.com/rio. For more information on the Sage Clear (below), view the Sage SIA Flyer and Data Sheet by visiting www.sagemetering.com/clear. Or contact Sage at 866-677-SAGE (7243).

Sage Clear Thermal Mass Flow Meter (SIA Series)

The Sage Clear Thermal Gas Mass Flow Meter provides the user with the high level of performance found in the Sage Prime while offering an economic solution for applications where hazardous area approvals are not required.

High contrast graphic display shows flow rate, temperature, totalized flow and signal value

Compact, powerful electronics in a NEMA 4 enclosure for indoor/outdoor installations

Flow bodies include flow conditioning

In-Line
 Flow Body



4–20 mA signal

Reconfigurable software available

Pulse output

Input power of 24 VDC or 115/230 VAC power

Available with Integral or Remote electronics (cable lengths up to 1000 ft.)

Flow body for 1/4" to 4" pipe or 1/2" insertion probe



Please refer to Application Data Sheet for sizing details and model number on any of the products shown on pages 4 and 5 by visiting www.sagemetering.com/applicationsdata.

Flow Conditioning

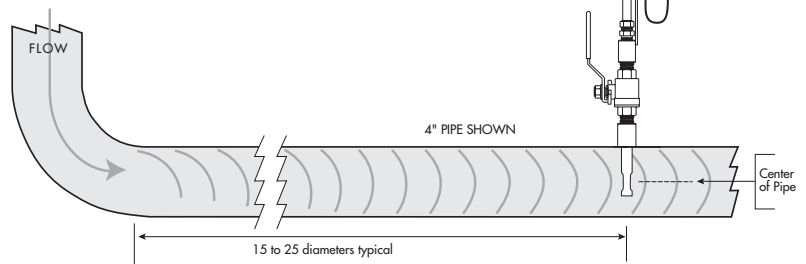
Any insertion flow meter measures the flow at the location of the sensor. Therefore the overall accuracy of the flow measurement is dependent on the flow profile in the pipe.

With sufficient amount of straight pipe run, the desired flow profile naturally occurs. Sage recommends straight run distances which are dependent upon upstream and downstream pipe configuration. These recommended distances provide the expected flow profile at the sensor.

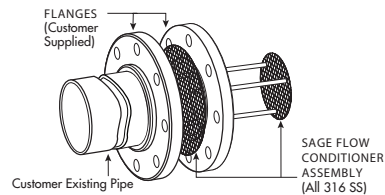
Often the desired amount of straight run is not available. In these situations, Sage Metering offers flow conditioning assemblies. They are easily installed between two flanges as shown to the right. When using a flow conditioning assembly, the recommended straight run is greatly reduced. The use of a flow conditioner is a very simple method for obtaining the best possible overall accuracy.

The same installation guidelines should be followed when using a Sage in-line flow body. Flow bodies, however, incorporate a built-in flow conditioning assembly, therefore reducing the straight run requirements.

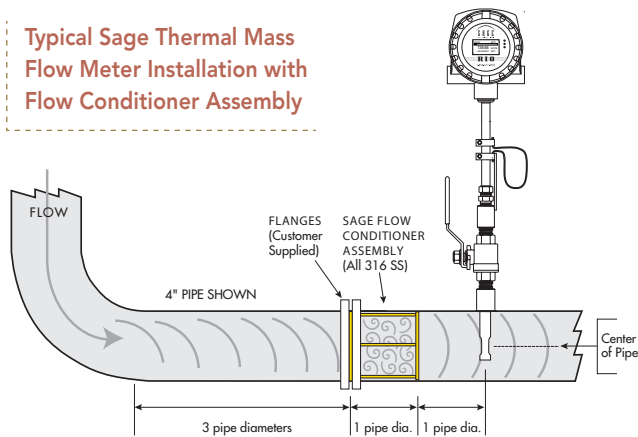
Typical Sage Flow Meter Installation Following a Single 90° Elbow without Sage Flow Conditioning



Installed Sage Flow Conditioner Assembly



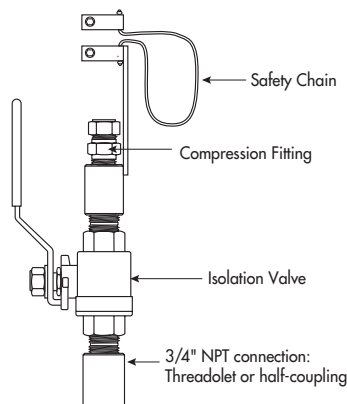
Typical Sage Thermal Mass Flow Meter Installation with Flow Conditioner Assembly



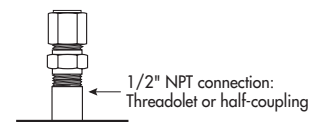
Installation Hardware

The Sage Flow Meter with insertion probe can easily be installed into a pipe or duct by using a 1/2" or 3/4" NPT connection. The two most common methods of installation are the 3/4" isolation valve with a compression fitting or the simple 1/2" compression fitting. The compression fittings have Teflon ferrules which provide ease in installation and positioning the sensor. The use of the isolation valve permits the probe to be removed while the process is in operation. Flange connections can also be provided to meet user's piping requirements.

Isolation Valve and Fitting Model Number SVA05



Compression Fitting Model Number STCF05



Principle of Operation

Sage Thermal Mass Flow Meters measure heat transfer as the gas flows past a heated surface. The two RTD sensors are constructed from reference grade platinum windings. The RTDs are clad in a protective 316SS sheath and driven by a proprietary sensor drive circuit. The flow sensor is self-heated; the second (temperature) sensor measures the gas temperature. As gas

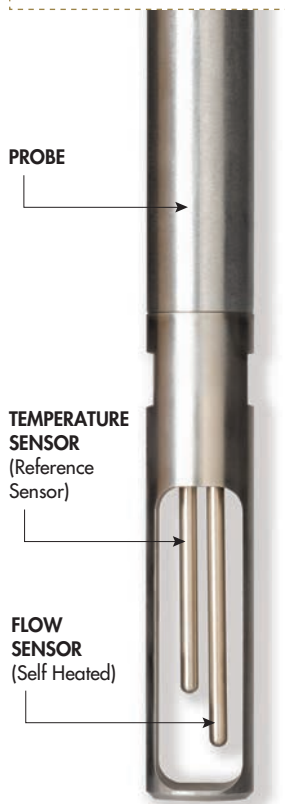
Sage Thermal Mass Flow Technology Uses Dual Temperature Sensors to Measure Flow Rate

flows by the flow sensor the gas molecules carry heat away from the surface of the heated sensor. The sensor drive circuit replenishes the lost energy by heating the flow sensor until it reaches the desired temperature difference above the reference sensor.

The electrical power required to maintain a constant temperature differential is proportional to the mass flow rate.

Sage's proprietary

sensor drive circuit maintains the constant temperature difference over the entire operating temperature range of the instrument. The circuit responds quickly to changes in process flow rate or gas temperature. The inherently non-linear signal provides excellent low flow sensitivity and high turndown capabilities. The signal is linearized to provide the output signal from the flow meter.



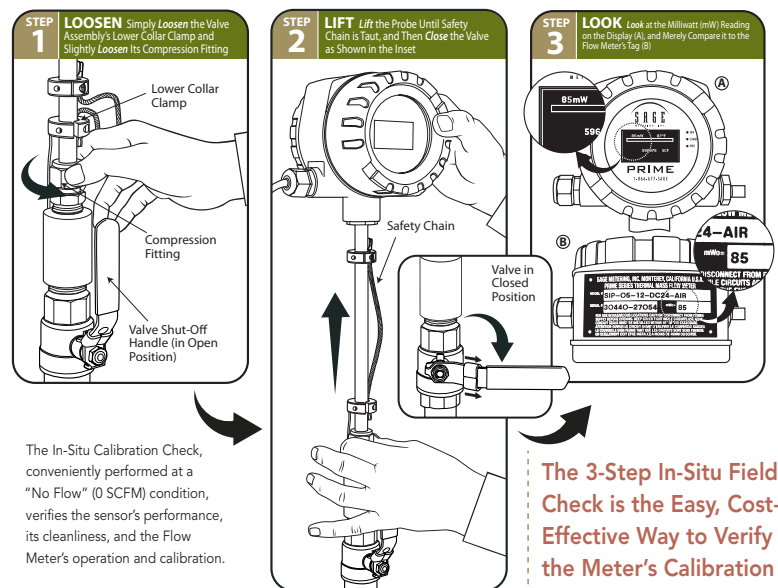
Calibration

Calibration is an essential portion of any thermal mass flow meter.

The calibration establishes the relationship between mass flow and the power required to maintain the specified temperature difference. For best accuracy, calibrations are performed on the actual gas in Sage's NIST traceable calibration facility. Calibrations are performed to match customer's exact application requirements rather than using standard calibration ranges provided by other manufacturers.

In-Situ Calibration Verification

One of the challenges with any thermal mass flow meter is to check the instrument's calibration. Verification is possible if just one of the calibration data points can be checked during normal operation. Sage has developed a unique method which permits the user to verify calibration of the flow meter without having to shut down or remove the sensor from the process. This "in-situ" process is accomplished in three easy steps – **Loosen, Lift, and Look** (see below). This permits the user to



The In-Situ Calibration Check, conveniently performed at a "No Flow" (0 SCFM) condition, verifies the sensor's performance, its cleanliness, and the Flow Meter's operation and calibration.

The 3-Step In-Situ Field Check is the Easy, Cost-Effective Way to Verify the Meter's Calibration

obtain a "no flow" data point which can be compared against the original factory calibration listed on the name plate and on the calibration certificate.

This is all possible due to the digitally driven bridge circuit which provides excellent reproducibility and virtual elimination of electronic drift which occurs in typical analog driven designs.

When the measured signal matches the original NIST traceable calibration data the accuracy of the meter is verified and also confirms that the sensors are clean. This simple test provides a tremendous benefit to the user eliminating the cost and inconvenience of periodic factory calibration of the flow meter.



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