+ Gas Meter Solutions

Turbines, cones, orifice fittings, and ultrasonic flowmeters



Gas flow can be measured with several different devices, each with different primary measurement principles, applicable ranges, and costs. Selecting the proper meter for a given application requires an assessment of flow rates, required accuracy, and cost-to-benefit expectations.

To satisfy this broad range of needs, the Sensia portfolio of gas measurement technologies includes turbine meters, ultrasonic meters, and differential pressure devices such as orifice meters and cone meters.

When selecting your next flowmeter,

- + consider the accuracy and repeatability required for the application
- + carefully estimate the required flow capacity; consider both anticipated low- and high-flow conditions to better evaluate the level of rangeability (turndown) required.
- do not assume that cost is the most important factor; durability, power, and communication requirements and maintenance may be equally important
- + consider the installation requirements and location; some meters are designed to perform reliably with shorter upstream and downstream piping requirements
- + consider how fluid composition affects your choice of materials of construction, management of solids or liquids, and computational requirements.
- + consider operational costs associated with pressure loss, user intervention, and maintenance





NUFLO turbine meter technology



NUFLO high-pressure turbine meter technology

TURBINE METER TECHNOLOGY

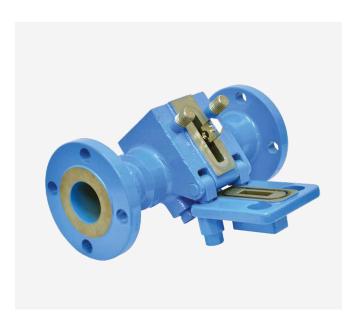
NUFLO 2-in twin-bladed turbine meter technologies infer gas volume by determining the speed of the gas moving through the meter. They are specially suited for low-pressure gas measurement in 2-in lines but can accommodate pressures up to 2,220-psi gauge pressure.

- + Unique cartridge design enables removal of all internal parts as one assembly (three cartridge ranges cover the gas flow rates typically found in 1- to 3-in flowline applications)
- + Often used for measuring the supply of fuel gas to line heaters or small compressors
- + Between-flange design simplifies installation and makes the meter easy to remove from the line for maintenance
- + Negligible pressure drop
- + Measurement largely unaffected by gas density

Sensia also offers a high-pressure turbine meter for flowing pressures between 3,500 and 15,000 psi [24 and 103 MPa]. This meter can measure flow rates as low as one tenth its capacity, and with four sizes available between 1 and 3 in, a diverse range of flows can be metered. These rugged meters are frequently used to measure flows associated with well stimulation.



BARTON gas turbine meter technology



NUFLO technology orifice fitting

TURBINE METERS

BARTON gas turbine meter technologies provide custodytransfer-quality measurement.

- + 3/4- to 12-in line sizes with threaded end connections and flanged connections up to ANSI 2500
- + Turndown greater than 10:1 for a wide range of flow rates
- + Permanently lubricated ball bearings for a quick response to changes in flow rate and a long lifetime
- + No power requirement for operation; operational with other Sensia self-powered products for a complete solution
- + Measurement largely unaffected by gas density

ORIFICE FITTINGS

For economical performance under varying operating conditions and ease of service, the orifice meter is historically the preferred choice for many industrial and oilfield measurements. NUFLO technology orifice fittings infer the rate of gas flow by measuring the pressure difference across an orifice plate.

Operators can adapt to flow rate increases or decreases and minimize the effects of wear simply by changing an inexpensive orifice plate. The use of a fitting makes plate changing a single-person task, eliminating the need to unbolt flanges to access a plate. A self-centering receptacle in each fitting helps ensure proper alignment of the plate for accurate measurement.

- + Fittings supplied and entire meter runs manufactured to customer's specification
- + Simple trusted measurement
- + No moving parts and no power required
- + Measurement of a variety of mixtures from the well with accuracy to meet API allocation measurement standards
- + Custody transfer accuracy when installed per AGA-3 or ISO-5167 standards
- + Multiple fitting types are available
- + Single chamber fitting—for lines that can be depressurized to change or inspect the orifice plate
- + Dual-chamber fitting—for enabling the plate to be changed without depressurizing the flowline or interrupting the flow
- + Available for 2- to 6-in line sizes for standard, sour, and lowtemperature applications with pressure ratings up to ANSI 1500
- + Orifice plates available in line sizes up to 36 in and in a variety of materials



NUFLO Cone DP flowmeter

CAIDON CA

CALDON LEFM flowmeter

CONE METERS

The NUFLO cone meter is a differential-based device that is well suited for gas production and similar measurement applications where space is limited.

- Based on the same measurement principles as the orifice meter but requires significantly less straight pipe upstream and downstream, saving valuable space and weight in cramped conditions.
- + Available in sizes from ½ to 48 in with threaded end connections or flanged connections up to ANSI 2500-
- + Available in special materials
- + No moving parts and low cost of ownership
- + Well suited for unprocessed and processed gas
- + Circumferential flow passage prevents liquid buildup and is ideal for wet gas
- + Custody-transfer quality through calibrating the entire meter run at a qualified calibration facility

ORIFICE FITTINGS

The CALDON LEFM ultrasonic flowmeter measures the rate of gas flow by measuring the speed at which sound travels within the pipe. It is specifically designed for measurement of natural gas where accuracy and reliability are critical.

Innovative features such as sensor isolation from the process fluid and the use of a proprietary corrosion-resistant coating on internals enable safer and effective use of the meter in a variety of applications—even those prone to erosion, chemical attack, or sudden pressure or temperature changes.

- + Custody transfer measurement with no pressure drop
- + Available in line sizes of 6 in and larger
- + No need for flow conditioning or long, straight runs upstream, enabling a smaller footprint and low installation cost
- + No moving parts and no intrusions into the pipeline, enabling pigging for cleaning or inspection
- + No need to shut down flow and depressurize the pipeline for
- + transducer replacement
- + Low operating costs due to the lack of a pressure drop and reduced pumping horsepower requirements
- + Local and remote diagnostic capabilities that signal the onset of measurement deviation
- + Savings in installation, maintenance, and operating costs
- + Measurement largely unaffected by gas density

Meter Sizing Made Easy



Graphical view of selected meter's performance

Even when flow conditions are well defined, choosing the meter that will deliver the best performance in a specific application can be difficult. Sensia's sizing programs take the guesswork out of the process by automating the meter selection based on user-specified meter design and flow parameters.

Sensia's differential pressure cone meter sizing program recommends the optimal cone meter size, beta ratio, and full-scale differential pressure to suit a required flow rate for a specified gas.

The program provides a similar service for selection of NUFLO technology, BARTON technology, and CALDON technology. This program not only recommends a meter type and size but also provides a graphical display of the meter's performance envelope so that users can easily detect the boundaries of the meter's range. Users can override the automated meter selection to see the effect on performance.

Both programs are free, easy to use, and readily available for download from the Sensia website.

Gas Sampling Solution



CLIF MOCK technology

The Sensia portfolio of CLIF MOCK* measurement technology includes a sampler controller that is specially designed to sample gas streams in proportion to time or volume. As the solenoid supplies air pressure to the pump, the pump collects product samples from the pipeline and deposits them into a receiver, which can be transported for offsite analysis. The pump can collect a sample size of 0.05 to 1.00 cm³ every 5 seconds.

The system can be direct mounted to a sample probe in a pipeline or remote mounted. It is CSA certified as intrinsically safe.

Sample count, flow total, flow rate, and performance indicators are displayed on a readout and transmitted via serial communications.

Sensia offers the sampler controller as a stand-alone instrument and as the cornerstone of a complete sampling system, custom designed to meet a individual applications.

Meters and More

Sensia has the products and the expertise to satisfy all of your flow measurement needs.

Choosing a gas meter is just the first step in creating a total gas measurement solution. The measurement of gas is based on standard volumes, mass, or energy amounts, which requires the calculation of several flow parameters that a gas meter alone cannot provide. At a minimum, these parameters are derived from fluid composition and pressure and temperature measurements. These parameters can be computed instantaneously by a flow computer or separately using measurements made by a recorder.

Sensia offers a variety of electronic products to simplify this process and provide the accuracy required for a wide variety of applications.

The BARTON gas chart recorder technology displays and records the measured differential pressure, static pressure, and temperature.

Scanner* flow computers measure, display, record, and compute flow using nearly any type of flow sensor in the industry. They may be self-contained and have onboard power as well as pressure and temperature sensors, or they may be connected to peripheral devices such as radio communications systems, gas chromatographs, and external power.

Where pressure and temperature is relatively constant, Sensia turbine totalizers, differential pressure indicators, and transmitters can sense, communicate, and record flow.

PACKAGED SOLUTIONS

Sensia's expertise goes beyond the design and manufacture of measurement devices to include the design and assembly of complete measurement systems and subsystems. Our custom measurement skids can include all of measurement and automation and the networking of multiple measurement locations with software.

Sensia also packages essential measurement components together to create bolt-in subsystems. These ready-to-install systems typically include a turbine meter, straight-run piping, pressure sensor, temperature sensor, and a flow computer preprogrammed with site-specific and user-specified parameters.

- 1. BARTON Model 202 chart recorder
- 2. Scanner 2000 flow computer and NUFLO cone meter technology
- 3. NUFLO MC-III flow totalizer and BARTON 7400 technology
- 4. FUJI® transmitter and NUFLO single-chamber orifice fitting technology
- 5. NUFLO MC-II* flow totalizer and NUFLO 2-in turbine meter technology
 6. Preassembled explosion-proof Scanner 2000 flow computer bolt-in system



Fabricated gas measurement skid







