

Inline ultrasound flow measurement system for process gases

The Prosonic Flow G 300/500 is highly precise, robust and maintenance-free. Together with advanced gas analysis, it can analyze the content of gas mixtures.

The Prosonic Flow G 300/500 ultrasound flowmeter with integrated pressure and temperature sensors meets all of the requirements of advanced process measurement technology in terms of gas volumes or analysis of the content. Because it was developed for demanding process conditions, the Prosonic Flow G 300/500 is suitable for applications in the oil & gas and chemical industries.

Author: Daniel Winter, Product Manager Flow Measurement Technology, Endress+Hauser Messtechnik GmbH+Co. KG

Gas is becoming increasingly important in all industries, both as a source of energy and for process optimization. The new Prosonic Flow G from Endress+Hauser is the ideal flowmeter for demanding applications, whether it involves natural gas, process gas, pure gas or gas mixture applications, in offshore and onshore environments.

The application spectrum is diverse: gas burner consumption, exhaust gas and flue gas measurements, supply of technical gases or fresh air, control measurements for custody transfer measurement points or simply as a replacement for high-maintenance mechanical meters used in combustion gas measurement applications. Thanks to the optional integrated pressure and temperature measurement, as well as the existing gas analysis package, the Prosonic Flow G 300/500 offers a compact instrument for highly precise flow measurements, plus other information related to the characteristics of the gas.

New sensor design extends fields of application

Modern industrial systems are facing increasingly greater challenges in the area of process control technology. Superior precision and reliability, high process temperatures and pressures, a high degree of long-term stability, simple installation and commissioning, and seamless system integration are just a few of the required characteristics. The new Prosonic Flow G fulfills all of these demands with ease.

Compared to other gas measurement systems, the Prosonic Flow G 300/500 can measure pipes with nominal sizes between DN25 and DN300, without a loss of pressure and under all application conditions while delivering highly precise and reproducible measurement values. This instrument can easily handle wet gases, low process pressure, small flow velocities and rapidly changing process conditions. Because it serves as a complete measurement point, external pressure and temperature

instrumentation and the installation of a flow calculator are not required. This minimizes the installation effort.

The Prosonic Flow G 300/500 is extremely robust. It features a stainless steel measuring tube (1.4404 (316, 316L)) and an ultrasound transmitter made from Grade 2 titanium, a combination that meets NACE MR0175/MR0103 requirements. The measurement system is thus highly resistant to corrosion, making it ideal for applications in the oil & gas or chemical industries.

The Prosonic Flow G can operate at a process pressure of up to 100 bar and a process temperature of up to 150°C. Additional safety is provided through a built-in rupture disc that prevents gas from penetrating the sensor housing in case of leakage, thus providing controlled releasing of overpressure. Since the surface of the measurement sensor housing is also made from corrosion-resistant stainless steel, the Prosonic Flow G is also suitable for harsh conditions in offshore and onshore environments.

The Prosonic Flow G also offers a high degree of precision when measuring moist or wet gases. The innovative sensor design features a special drainage system that immediately dissipates condensation that collects on the surface of the transmitter. That means condensation does not affect the strength of the ultrasound signal, thus making sure that the measurement is not influenced and that the measurement values remain highly precise even when wet gases are involved.

For technical reasons, until now ultrasound technology has rarely been used for measuring “unclean” gas mixtures. The Proline Prosonic Flow G 300/500 is intended to change that. A typical example is the measurement of natural gas in upstream areas. Raw natural gas usually has a high liquid content, not to mention that pressure and temperature can fluctuate significantly. Similar challenges occur with other Proline Prosonic Flow G 300/500 applications, such as measuring the outlets of underground gas storage facilities or LNG regasification systems, as well as chemical and petrochemical processes. It’s exactly this spectrum of applications that Endress+Hauser is focused on. “This new instrument is helping us get our foot in the door of the oil & gas industry,” says Dr Michal Bezděk, project development manager for the instrument at Endress+Hauser Flow, Reinach.

Advanced transmitter electronics complement the concept

Prosonic Flow G can be combined with two different transmitters: as a compact version (Proline 300) or as a remote version (Proline 500) with up to four interfaces for input and output of the measurement values. And in terms of measurement performance and accuracy of up to +/- 0.5%, the Proline measurement transmitters make no compromises.

Digital signal processing, which already begins in the intelligent sensor, lays the foundation for a real multivariable measurement. That means the Prosonic Flow G can monitor multiple important process control parameters simultaneously, such as flow velocity, ultrasound speed, pressure or temperature, and forward the values to a process control system. Thanks to the digital transmission via HART, Modbus RS485, WiFi or via the freely configurable input and output ports, users enjoy complete, 24/7 access to all of the measurement data, including the diagnostic data acquired through Heartbeat technology.

Comprehensive process and quality monitoring thanks to integrated gas analysis

The Prosonic Flow G 300/500 can also be ordered with the “advanced gas analysis” option. When combined with the optional integrated pressure and temperature measurement functionality, this package enables the simple calculation of parameters in mass or norm volume. Additional process parameters that characterize the currently measured gas mixture are calculated as well. “This versatility is unique on the market,” emphasizes Michal Bezděk.

As well as volume flow, corrected volume flow, mass flow and energy flow, the Prosonic Flow G determines the calorific value, Wobbe index, molar mass, methane content and density or viscosity of the gas mixture. To define a known gas mixture, the option exists to combine up to 20 different components, thus permitting the precise composition of mixed gases. The calculations for natural gas applications are based on international standards such as AGA NX-19, AGA-8, AGA-5 or SGERG-88. In addition, users have a unique range of operating modes to choose from that make it possible to identify the characteristics of diverse natural gases and biogases based on the measured ultrasound velocity without knowledge of the composition of the gas. The integrated gas analysis thus ensures optimal process quality and safety.

Process safety, around-the-clock

Since the Prosonic Flow G was developed under stringent quality requirements in accordance with IEC 61508 (SIL), it can also be employed in safety-critical SIL applications, a unique feature for inline ultrasound gas meters. Device or process errors that occur are clearly categorized and displayed in accordance with NAMUR NE107. This enables the fast and targeted implementation of countermeasures.

Heartbeat technology for reliable measurements and superior operational safety

An additional highlight of the Prosonic Flow G 300/500 is Heartbeat technology. This testing function is integrated into all Proline measurement instruments and enables permanent self-diagnostics with the highest diagnostic coverage (>95%), as well as a TÜV-certified, metrologically traceable device verification without process interruption. All of this reduces the complexity and hazards within a plant, which in turns increases reliability and availability.

Web server – direct access to field data

The Proline 300/500 measurement transmitter comes with a web server as standard. Users have direct access to all diagnostic, configuration and instrument data via a standard Ethernet cable and laptop or WiFi, all without additional software or hardware. This enables simple and intuitive commissioning, as well as time-saving maintenance and service activities.

HistoROM – simply unforgettable

The data storage concept (HistoROM) ensures maximum data security – before, during and after service. All calibration data and device parameters, which are stored securely in the HistoROM data storage module, are automatically reloaded after maintenance work. This concept guarantees safe and rapid maintenance. The days when errors stemming from incompatible drivers or firmware in replacement parts led to delays in restarting devices are a thing of the past.



Prosonic Flow G 300/500, which can measure nominal diameters from DN 25 to DN300, fulfills all of the requirements of advanced inline ultrasound gas measurements with ease, regardless of process conditions.



The integrated drainage system dissipates condensation that collects on the ultrasound transmitter and ensures maintenance-free, highly precise flow measurements even with wet gases.



The integrated advanced gas analysis package enables insights into the measured gas for optimal quality monitoring and for guaranteed high process stability.