USM GT400 Ultrasonic Flowmeter
Proven Technology. Superior Performance.
To remain competitive, today’s natural gas industry is under pressure to reduce capital and operating costs, improve uptime and reduce risk. Aging workforce, with nearly half of employees skilled in control and regulatory technologies are expected to retire over the next years. Often, end users must cope with challenges such as high gas pressure or temperature, valve noise, and attenuation of signal due to contamination or the presence of liquids. This requires intelligent solutions to maintain accuracy while transferring gas between the distributor and the recipient.

The USM GT400 ultrasonic flowmeter from Honeywell is the ultimate answer, providing high accuracy, reliability and long-term stability in the most demanding environments.

Honeywell’s ultrasonic meters are designed for use in a wide range of gas custody transfer and secondary metering applications. Featuring advanced technology proven in the field for more than a decade, greater ease of use, and reduced maintenance requirements, they set the standard for precision and reliability.

**Accuracy Ensured**

**Respected Product Lines**
Honeywell is the right partner wherever natural gas needs to be moved, measured or stored. We are focused on the design and manufacture of products for the most demanding gas metering and regulating applications with our respected RMG and Mercury product lines.

**Superior Technology**
Today, intelligent solutions are needed to measure and analyze the quality and volume of natural gas at every stage of its movement, storage and utilization. Gas industry organizations can meet this requirement with Honeywell’s Mercury and RMG product families, which are available individually or as complete systems for gas metering stations.

**Proven Experience**
No other control and instrumentation supplier has more experience in the fast growing natural gas market than Honeywell. From upstream gas production, to transmission, storage and distribution, we understand all facets of the industry.

**Application Know-how**
We partner closely with industrial, commercial and gas distribution customers to provide the right flow measurement solution to optimize operations at gas-fired power plants, gas to liquid (GTL) plants, liquefied natural gas (LNG) storage and export terminals, city gate facilities, petroleum refineries, metals and mineral processing plants, combined heat and power generation facilities, and all sites utilizing natural gas as a feedstock.

**Expert Support**
Our gas industry experts assist with developing standard operating procedures (SOPs) for gas metering station installations, validation routines, calibration procedures, and more. Integrated ultrasonic gas meters with control or SCADA platforms and data collection systems help you interpret meter diagnostics and troubleshoot operating problems.

**Local Service**
You can depend on Honeywell for long-term product reliability and performance, lowest total cost of ownership and installation. Global experience, locally applied.

**Typical applications include:**
- Fiscal metering
- Low-pressure custody/non-custody (atmospheric) transfer
- Allocation metering
- Check metering
- Gas transportation and distribution
- Underground gas storage (bi-directional)
- Gas-fired power plants
- Gas processing plants
- Refining and petrochemicals
- Industrial

Rely on Honeywell
- Over 150 years of combined experience in the natural gas industry
- Global domain expertise with local support
- Broad suite of products, from single instruments to turnkey solutions
- Seamless integration with plant-wide automation and security
- Guaranteed compliance and accuracy in custody transfer

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A Better Solution

For natural gas processes with dry, wet, or corrosive and abrasive gases, or requiring bi-directional measurement with minimal or no pressure drop, ultrasonic devices generally offer better performance, greater reliability, and lower capital and ownership costs than intrusive, mechanical metering technologies.

Traditional flowmeters typically have moving parts and require more frequent repairs and maintenance than new-technology meters. End users may also be forced to utilize costly dual-meter runs to cover the entire range of flow rates and pressure.

Ultrasonic flowmeters, in particular, have disadvantages versus ultrasonic meters in natural gas applications. They incorporate a spinning rotor, which is mounted on ball bearings and spins in proportion to the flow rate. The presence of the rotor in the flow stream creates pressure drop and makes the meter susceptible to impurities like sand in the fluid. In addition, rotors are moving parts, and along with bearings, are subject to continual wear.

Choose the Right Flowmeter

Over the past 20 years, ultrasonic flowmeters have been recognized as the device-of-choice to measure natural gas volume for fiscal accounting. Acceptance by gas pipeline companies has occurred due to the meter’s superior precision, repeatability, capacity and rangeability, as well as its lower maintenance costs.

Ultrasonic flowmeters employ robust transducers generating repeatable pulses (amplitude and frequency). They also include high-speed electronics complete with an accurate clock to detect, resolve and time transmission/reception of sonic pulses with sufficient time domain resolution. The meters’ transducer and electronics configuration permits high pulse transmission rates, and transit time measurement allows rapid integration of fluid flow velocity so accurately measured values can be reported once per second.

The most important development in ultrasonic technology in recent years has been the detection and resolution of sonic pulses with sufficient time domain resolution. The meters’ transducer and electronics configuration permits high pulse transmission rates, and transit time measurement allows rapid integration of fluid flow velocity so accurately measured values can be reported once per second.

The Ultimate Answer

Honeywell’s USM GT400 is an intelligent ultrasonic flowmeter which meets today’s strict requirements for accurate and stable measurements in gas industry operations. This innovative meter improves upon existing ultrasonic designs with a superior multi-path measuring technique, field-proven electronics, sophisticated diagnostics, and user-friendly software to monitor the health of the flow metering system.

Features and Functions

Proven Multi-path Technology

Honeywell’s innovative multi-path technology outperforms competitive ultrasonic meters in precision gas flow measurement. It has been proven in demanding applications across the industry for more than a decade.

The GT400 is designed with high stability against turbulence thanks to its direct path technology with six measuring paths on three levels. The paths are arranged in an “X” pattern in horizontal planes: a central plane, and two geometrically similar planes. This orientation permits measurement of swirl, cross-flow and asymmetry, as well as transparent path velocity weighting per the Gauss-Chebyshev profile model for compressible fluids. It is particularly beneficial in city gate applications, where limited space for piping and installation can affect meter operation.

Field-proven Electronics

The GT400 incorporates electronics that have improved metering system uptime in installations worldwide. The electronics are used to optimize the meter’s internal diagnostics; speed of sound (SoS) and flow velocity calculations; signal processing; data storage; interface to flow computers, gas chromatographs and SCADA systems; and field service diagnostics tools.

Plug & Play Transducer Design

At the heart of the GT400 are its transducers, which transmit and receive sound waves or acoustic pulses. The transit time difference between pairs of transducers is the most significant aspect of meter operation. With the GT400, all path-specific measurements are handled internally by the electronics.

Honeywell’s Exd transducer consists of piezoelectric crystals fully encapsulated in Titanium housing for resistance to contamination. This unique design is plug & play and field-replaceable under pressure. The transducer operates at standard frequencies of 120 or 200 Hz for use in most gas metering applications; alternate frequency designs are available for use in noisy environments. Temperature range is -40°-176° F (-40°- 80° C) and pressure range is 0-4351 psig (0-300 barg). Wide measuring ranges (120:1 and above) with correspondingly high flow velocities of more than 131 ft/s (40 m/s) are also possible.

Proprietary Detection Algorithm

The GT400 utilizes numerous criteria to validate pulses without compromising high firing rates (pulses per second). One of the criteria common to many instrumentation suppliers, including Honeywell, is peak identification and quantization of position and amplitude in the pulse envelope. However, most companies avoid the use of comparative analysis of pulses, or “stacking,” since it is a burden on signal processing in noisy and turbulent environments—resulting in either data refresh rates exceeding one second, or a reduction of evaluated samples falling below statistical acceptability.

To improve its signal process capabilities, Honeywell implemented additional qualitative analysis to evaluate the pulse envelope and identify ultrasonic pulses, while still maintaining high firing rates. Our proprietary, MID-approved detection algorithm is key to insensitive to regulator noise in many installations.

Advanced Noise Immunity

In a gas pipeline system, noise generated by piping configurations, valves, pressure regulators and nozzle jetting can impede the performance of some ultrasonic flowmeters. Honeywell addressed this problem with its proprietary MID-approved signal processing algorithm and unique Exd-rated transducer design, which work together to extend signal amplitude for a high signal-to-noise ratio (SNR) in comparison to traditional intrinsically safe transducers. Noise created at ultrasonic frequencies has marginal impact on the USM’s measurements.

The GT400 provides improved overall performance thanks to:

- Rugged, non-intrusive design
- Bi-directional measurement
- Real-time system monitoring
- Detect path design
- Six cross acoustic paths
- Designed “cross flow” measurement
- Dynamic 3-D flow profile modeling
- Extended diagnostic functions
- Precise flow profile identification
- Enhanced swirl and asymmetry measurement
- Best-in-class Exd transducer
- Superior noise suppression
- No moving parts or pressure drop
- Wide turndown ratio (120:1)
- Low-to-high pressure operation (0-4351 psig, 0-300 barg)
- Extended flow range 0.5-131 ft/s, 0.15-40 m/s
- Excellent repeatability and measurement certainty

(continued on next page)
Precision Delay Time Adjustment

For users of ultrasonic flowmeters, the test for system delay time and adjustment described in AGA 9 (6.9) is a critical requirement. Besides the time-of-flight of the ultrasonic pulse, delay times caused by signal-processing electronics, properties of the transducers and calculation algorithms can occur within the system. These delay times must be determined by laborsious measurement techniques at the factory, since they cannot be identified directly.

Honeywell’s patented “live” Precision Adjustment/Echo Measurement capability enables the most precise adjustment of delay time and avoids the disadvantages of related testing procedures. It also preserves delay time and avoids the disadvantages of measurement uncertainty resulting from related testing procedures. It also preserves delay time and avoids the disadvantages of measurement uncertainty resulting from related testing procedures.

This application is easy to use and all data is displayed systematically in clearly arranged tables. It is also possible to combine selected measured values and parameters in user-defined tables.

First, RMGViewUSM monitors the health of the GT400 and warns if there are any pending problems (e.g. transducer failure). Secondly, it monitors the gas process and alerts when there are any upset conditions (e.g. pipeline contamination, blockages or liquids in the gas stream). Thirdly, the software monitors calculated metering uncertainties and provides alarm notification.

Intelligent Diagnostic Technique

One of the key advantages of ultrasonic flowmeters over all other flow measurement technologies is the availability of diagnostic information beyond just delivering pulses or signals proportional to the gas volume. Honeywell offers the Windows™-based RMGViewUSM parameterization and diagnostics software as an interface to robust condition monitoring capabilities.

This application is easy to use and all data is displayed systematically in clearly arranged tables. It is also possible to combine selected measured values and parameters in user-defined tables. The software facilitates real-time performance monitoring of the gas chromatograph. This approach enables end users to increase the measurement certainty of the UGM facility station, reduce the need for monthly site visits to verify the accuracy of process transmitters, and quickly identify problems with the calibration of the gas chromatograph.

Intuitive User Interface

Supplied with the GT400, RMGViewUSM parameterization and diagnostics software as an interface to Honeywell’s patented “live” Precision Delay Time Adjustment enables the most precise adjustment of delay time and avoids the disadvantages of related testing procedures. It also preserves delay time and avoids the disadvantages of measurement uncertainty resulting from related testing procedures.

Lower CAPEX

With the GT400, users can reduce the cost of implementing an advanced gas metering system. This is due, in part, to the ability to employ smaller size meters with higher flow velocity, greater rangeability and extended turndown. The USM’s crossed path arrangement also enables high-accuracy measurement without the need for long inlet piping. A single ultrasonic meter can often replace dual turbine meter runs in low- and high-flow applications. In addition, the USM’s improved signal conditioning capabilities help do away with expensive noise reduction infrastructure.

Reduced OPEX

The GT400 is the ultimate answer to driving down maintenance and repair costs at gas metering sites. It is a non-mechanical device with no moving parts. The meter’s operation is not directly impacted by contamination on the pipe wall, and the inclusion of High-reliability transducers—proven in service since 1999—minimize the need to send technicians to the field.
### Technical Specifications

#### Measuring Range

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#### Meter Dimensions

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#### Technical Data

**Gases**
- Pipeline Quality Natural Gas, Air

**Measurements**
- Volume Flow, Totalized Volume, Velocity of Gas, Speed of Sound, Swirl

**Path Configuration**
- 6 Direct Cross (X) Paths; 3 Planes

**Measurement uncertainty from Gh to Qmax**
- +/0.5%

**HP-flow calibration. Full measuring range (Gh to Qmax)**
- +/-0.1%

**Repeatability**
- 14.5 psi (1 bar), up to ANSI 600; Consult Honeywell for higher design pressure

**Ranges**
- up to ANSI 600; Consult Honeywell for higher design pressure

**Ambient Temperature**
- -40°F (-40°C) to 131°F (+55°C)

**Gas Temperature Range**
- -40°F (-40°C) to 176°F (+80°C)

**Operating Relative Humidity**
- up to 95% non-condensing

**Measuring Interval**
- Typically 5 Hz measurements/second

**Power supply**
- 24 VDC +/- 10%

**Power requirement**
- Typically 7 W

**Hazardous Area Approvals**
- CSA, FM: Class I, Div 1, Groups B, C, D T6; ATEX: Ex II 2G Ex de IIB + H2 T6; IECEx: Ex de IIB + H2 T6 Gb

**Metrology Approvals**
- Measurement Canada, MID, PTB

**Conformities**
- AGA9

**Electrical Safety**
- EMV, Environmental

**Analogue output**
- 0/4-20 mA (galvanically isolated, programmable, load resistor: max. 400 Ohm, Umax = 16 V)

**Frequency outputs**
- 2 HF-outputs with fmax = 5 kHz, Namur or Open Collector

**Digital I/O**
- 2 X, Programmable

**Analog input for P&T**
- galvanically isolated two-wire 4-20 mA p-transmitter or a 4-wire PT100

**Interfaces**
- RS 485-0: Service port with MODBUS-Protocol; RMGViewUSM (max. cable length: 1640 ft); Ethernet via external module
- RS 485-1: Customizable for special interfacing requirements
- RS 485-2: MODBUS-protocol for interfacing with Flow Computers, SCADA, Ethernet via external module

**Transducer Frequency**
- 120 HZ/200 HZ for Sizes <= 8" (DN 200)
- 200 HZ for Sizes > 8" (DN 150)

**RMGViewUSM**
- Diagnostics Software
  - Visualization, flow data, diagnostics, configuration, parameter changes, export/import of parameters and data

**Protection**
- IP66

**Meter Body Material**
- Casted Steel: GS ASME A352 (or LCC)

**Material Electronics Housing**
- Aluminum cast

**Color/Finish**
- Metallic Silver (RAL 9006, 5-9% gloss) and blue (RAL Design 260 40 40, 5-9% gloss)

**Installation outside**
- With weather protection cover and sun roof

**Remarks**
- Consult Honeywell for special requirements

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For More Information
To learn more about Honeywell's USM GT400, contact your Honeywell Process Solutions representative, or visit www.honeywellprocess.com.

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## Automation and Control Solutions

Honeywell Process Solutions

1250 West Sam Houston Parkway South
Houston, TX 77042

1280 Kemper Meadow Drive
Cincinnati, OH 45240

www.honeywellprocess.com