ADVANCED INSIGHT FOR CUSTODY TRANSFER MEASUREMENT

Daniel Dual-Configuration 3410 Series
Gas Ultrasonic Flow Meters
Delivering decades of application expertise to you

Daniel Flow Products

With a legacy that spans eight decades, Emerson’s field-proven Daniel flow measurement solutions combined with our deep application expertise have enabled oil and gas companies worldwide to heighten the accuracy, efficiency and reliability of fiscal measurement operations. We understand that even a small change in measurement accuracy can have a major impact on profitability.
Meeting Gas Measurement Challenges Head-On

Having an eye into your process is more critical than ever before. Less sophisticated instruments are unable to rapidly detect contaminants or liquids in wet, rich and/or dirty gas, resulting in escalating LAUF product that can quickly amount to a significant loss in revenues. Daniel Dual-Configuration 3410 Series Gas Ultrasonic Flow Meters are engineered to help mitigate these losses by offering unique path layouts that deliver advanced process insight and greater measurement reliability. A patented, synchronized transducer firing technique further enhances meter performance by ensuring lightning fast sampling for real-time detection of flow disturbances.

Gain Greater Insight Into Your Process

Verify, Detect and Validate in Real Time

Dual-configuration meter designs enable operators to:

- Achieve cost-effective, integrated check metering with the Model 3415 meter that combines a 4-path chordal design with a single reflective path
- Detect minute traces of liquid or other contamination along the bottom of the pipe with the Model 3416 meter that features the same integrated check meter as the Model 3415 plus an additional diagnostic path
- Experience the ultimate in reliability with the Model 3417 meter that offers two completely independent 4-path meters in one body for total measurement redundancy

Value Beyond Compare

Each dual-configuration 3410 Series meter features:

- A patented transducer synchronization method that eliminates measurement interference and noise due to rapid firing and sampling of two meters running simultaneously, resulting in more stable ultrasonic signals
- Daniel British Gas-design that provides an unparalleled 3D view of the flow profile with the ability to measure all four primary flow disturbances: swirl, crossflow, asymmetry and turbulence
- Process alerts that help identify buildup, liquids, blockage and deviating gas quality to minimize measurement uncertainty
New Challenges, New Solutions

With today’s pipelines more likely to be carrying dirty gas, significant measurement errors are becoming increasingly common because the cause of the error is imperceptible by many technologies. If not detected quickly, even a minute amount of liquid or other contamination in the bottom of a pipe can significantly increase LAUF product. Daniel Dual-Configuration 3410 Series Gas Ultrasonic Meters enable operators to maximize uptime and increase throughput by detecting process upsets and flow disturbances faster than ever before.

Implement the Right Technology

• Reduce capital costs, streamline installation and simplify maintenance with dual-configuration meters that offer verification and redundancy
• Ensure greater availability and reliability of gas measurement systems that are designed for increasingly complex custody transfer measurement applications

Boost Productivity and Profits

• Advanced built-in diagnostics alert operators immediately of changes in gas quality, process conditions and flow integrity to allow corrective action before measurement is affected
• Automatic calculations of AGA 8 Compressibility and AGA 10 Speed of Sound as well as corrected volume rates, mass rates and energy rates reduce manual recalculations
• Ethernet connectivity expedites data transfers
• Easily track meter performance to baseline to help streamline maintenance and extend calibration cycles for significant cost reduction

Minimize Operational Challenges

• 3410 Series meter compatibility simplifies management of spare parts and upgrades
• New shrouds protect transducers and cabling to reduce maintenance
• High quality, forged bodies reduce lead times

Simplify Installation and Start-Up

• The minimum upstream piping recommendation for all Daniel 3410 Series gas ultrasonic meters has been shortened based on new perturbation testing conducted with a third party witness (testing results available upon request)

Minimize LAUF product by uncovering hidden dangers. Dirt buildup on pipeline walls, richer hydrocarbons and higher liquid content – even in trace amounts – can negatively impact measurement accuracy for months if undetected.

OIML R137 1&2 Accuracy Class 0.5 received for all Daniel Dual-Configuration 3410 Series Gas Ultrasonic Meters

Piping Recommendation for Daniel 3410 Series Gas Ultrasonic Meter with a Flow Conditioner (compact installation rated for OIML Accuracy Class 1.0)
(Note: 10D upstream can increase baseline diagnostic stability and is rated for OIML Accuracy Class 0.5)
**Powerful Two-in-One Meter Designs**

Daniel Dual-Configuration 3410 Series Gas Ultrasonic Flow Meters deliver greater process insight by combining the power of two meters in a single body. The advanced models build upon the signature Daniel four-path chordal, British Gas design, offering either chordal and reflective designs in the same body or a fully-redundant chordal design in a mirrored configuration.

**Daniel Model 3415 4+1 Gas Ultrasonic Meter**

Achieve measurement verification with this cost-effective, integrated check meter that features a single reflective path at a 30° angle

Typical Application Sites
- Transmission pipelines
- Industrial interconnects

**Daniel Model 3416 4+2 Gas Ultrasonic Meter**

Detect even trace amounts of liquid along the bottom of the pipe with the addition of a second reflective path, positioned vertically, in this advanced integrated check meter

Typical Application Sites
- Production and gathering
- Transmission pipelines
- Gas plant inlets/outlets
- Underground storage

**Daniel Model 3417 4+4 Gas Ultrasonic Meter**

Validate measurement with two independent, four-path meters in one body for ultimate reliability

Typical Application Sites
- Pipeline interconnects
- Pipelines (no bypass)
- Industry/city gates
- Border stations
- LNG regasification terminals
- Offshore production

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**Advanced Process Insight**

Improve Measurement Confidence with Unparalleled Intelligence

- Border stations
- LNG regasification terminals
- Offshore production
- Power Plants
- Market Center/Hubs and Pipeline Interconnects
- Gas Plant Inlets/Outlets
- Transmission Pipelines
- Underground Storage
- Above Ground Storage
- Industry/City Gates
- Production Sites
- Under Ground Storage
- Transmission Pipelines
- LNG

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**Model 3415 (4+1)**
**Model 3416 (4+2)**
**Model 3417 (4+4)**
**Integrated Check Metering**

Detect a bias or even a trace amount of liquid or debris in real time with these advanced, integrated check meters that feature reflective path technology.

**Chordal and Reflective Design Highlights**

- Superior combination of a chordal path, custody meter and a reflective path, check meter in one body for performance verification and enhanced detection of buildup and liquids
- Chordal and reflective paths react differently to process changes, preventing common mode error and increasing process insight to mitigate LAUF product
- Synchronized firing of transducers prevents interference from the check meter

**Advantages of Reflective Technology**

- Improved sensitivity to pipe wall changes enabling advanced warning of adverse flow conditions, process upsets and/or meter deviations
- Real-time detection of trace amounts of contamination or liquid volume fractions (LVF) of as little as 0.1% inside the pipe mitigates measurement errors to minimize LAUF
- Simple, direct verification of custody measurement with ability to have an alarm at 1.0% deviation (or user defined limit) within flow computer or SCADA system

**Bottom Line Improvements**

- Prevent fiscal losses and damage to equipment
- Simplify maintenance and prevent unnecessary trips to the field
- Achieve continuous backup measurement
- Reduce capital costs and streamline installation by eliminating a separate check meter

**Predictive Diagnostics**

Daniel MeterLink Software is the gateway to a wealth of diagnostic data generated by the ultrasonic meter’s firmware. MeterLink’s intuitive user interface enables operators to quickly troubleshoot and determine the root cause of flow disturbances to maximize uptime and minimize measurement uncertainty.
A Smart Investment

• Continuous measurement alleviates unplanned downtime and ensures complete backup for meters located remotely
• Independent measurements allow the meter to be shared in a pay-check configuration between two contracting parties
• Increased flexibility of meter station design with valves, intermediate piping and even entire meter runs eliminated
• Trending data from two independent transmitters can help extend calibration cycles

Dual 4-Path, Chordal Design Highlights

• Redundant Daniel British Gas-design custody meter ensures premium measurement accuracy and maximum uptime
• Secondary four-path meter offers a mirror image of the primary four-path meter for measurement validation
• Synchronized firing of transducers, with each meter firing 500 times per second, ensures fastest sampling rates for immediate detection of flow disturbances

3D View of Flow Profile

All Daniel four-path gas ultrasonic flow meters are based on the field-proven British Gas design that measures and compensates for crossflow and calculates values for four primary disturbances:

• Swirl
• Crossflow
• Asymmetry
• Turbulence.

If there is no compensation for crossflow, the meter’s health diagnostics may not reveal flow disturbances that can result in a significant error. Advanced Daniel dual-configuration meters are engineered to detect and communicate even minor flow disturbances in real time, enabling operators to take action before measurement is adversely affected.
Daniel Dual-Configuration 3410 Series Gas Ultrasonic Meter Specifications

<table>
<thead>
<tr>
<th>Performance</th>
<th>Models 3415 &amp; 3416</th>
<th>Model 3417</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>±0.1%, OIML Accuracy Class 0.5 (4-path meter); ±0.2% (1-path/2-path meter)</td>
<td>±0.1%, OIML Accuracy Class 0.5</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>-50°C to +100°C (-58°F to +212°F)</td>
<td></td>
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<tr>
<td>Pressure Range</td>
<td>689 to 25,759 kPa (50 to 4,000 PSIG)</td>
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</tbody>
</table>

**Mechanical and Material**

<table>
<thead>
<tr>
<th>Line Sizes</th>
<th>DN200 to DN600 (8-in to 24-in)</th>
<th>DN200 to DN1050 (8-in to 42-in)</th>
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</thead>
<tbody>
<tr>
<td>Pressure Ratings</td>
<td>PN50 to PN200 / ANSI 300 to ANSI 1500</td>
<td></td>
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<tr>
<td>Forging Materials</td>
<td>Carbon Steel, Stainless Steel (optional), Duplex (optional)</td>
<td></td>
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</tbody>
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**Availability**

| Lead Times (carbon steel) | DN200 to DN400 (8-in to 16-in, ANSI 600): 8 weeks / Additional Sizes: 10 to 12 weeks |

**Daniel 3415/3416/3417**  
Dual-Configuration Gas Ultrasonic Meters

**Daniel 3414**  
Four-Path Gas Ultrasonic Meter

**Daniel 3411/3412**  
One- and Two-Path Gas Ultrasonic Meters

For more information, please visit: [www.Emerson.com/Daniel](http://www.Emerson.com/Daniel)