PIOX® S: Concentration and Mass Flow

FLEXIM has a large library of fluids for measuring concentration and mass flow of liquids that continues to grow:

- PIOX® S: Concentration and Mass Flow

More than 20 years of experience in clamp-on ultrasonic metering

PIOX® S: Non-intrusive concentration, density and flow measurement of aggressive media

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Clamp-On and Go Technology

Using non-intrusive transducers, and a strap-on RTD temperature sensor, PIOX® S is truly a clamp-on and go affair. All of the additional costs associated with intrusive technologies are avoided. Furthermore, the hazards associated with intrusive metering technologies are eliminated.

PIOX® S Performance Guarantee

We know our applications well, and coupling this with our large installed base, FLEXIM guarantees that your PIOX® S system measures to your required accuracies or you get your money back.

Ready to Get Started?

Feel free to contact FLEXIM or your local Sales Representative to get started with your PIOX® S measuring system. We look forward to responding to your inquiry!
PIOX® S stands its ground where others fail.

 PIOX® S determines the concentration, density and other parameters via the sonic velocity of the fluid. This non-intrusive acoustic technology is the method of choice when materials and process parameters place high demands on safety and reliability.

Extremely Reliable

Highly Accurate

Improved Control

Enhanced Safety

Advantages:

No risk of corrosion and leaks
Simultaneous measurement of concentration and volume flow or mass flow
Non-intrusive, no need for process shut-down

PIOX® S Measurement Principle:

The measurement method of PIOX® S is based upon the ultrasonic transit-time principle.

Measuring equipment to the outside of the pipe during on-line operation

PIOX® S is capable of accurately calculating the mass flow.

Field proven for the concentration and density measurement of:

Nitric Acid
Sulfuric Acid
Phosphoric Acid
Ammonium Nitrate
Brine
Alcohols, Glycols
Sodium/Potassium Hydroxide
Phosphoric Acid
Sulfuric Acid
Nitric Acid

Concentration Measurement of High Purity Sulfuric Acid

One of the largest chemical companies in the world, residing in Germany, produces, among other chemicals, high purity sulfuric acid. Used as a raw material for many other chemical production processes, continuous concentration measurement during production is crucial to maintain a uniform product quality. A very precise online concentration analyzer in the laboratory is now replaced by the PIOX® S measurement system. Simply clamped onto the pipe, the transducers are immersed into the highly corrosive medium and thus avoid possible contamination of the product stream.

PIOX® S Measurement Principle:

The measurement method of PIOX® S is based upon the ultrasonic transit-time principle.

Two ultrasonic transducers are mounted to the pipe wall, and are alternately sending and receiving ultrasonic signals. The difference in the transit time between the two signals, the flow velocity and the volume flow, based on the pipe’s inner diameter, are accurately calculated.

Based on the mean value of the ultrasonic signal transit-time, the sonic velocity is within the medium is unambiguously determined.

Temperature probe, mounted in clamp-on or inline configuration, transmits the temperature measurement (T).

Real-time concentration analysis
Simultaneous flow measurement
High data logging capability
Accurate and reliable data source

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Advantages:

No risk of corrosion and leaks
Simultaneous measurement of concentration and volume flow or mass flow
Non-intrusive, no need for process shut-down

Advantages:

Highly accurate, even at marginal concentration changes
Ideal solution under high process temperatures (up to 428 °F) and pressures
No possibility of contamination of the medium

By determining the fluid density, PIOX® S is capable of accurately calculating the mass flow.

Whether acids or bases are flowing through pipes - PIOX® S for reliable concentration and flow measurement.

PIOX® S determines the concentration, density and other parameters via the sonic velocity of the fluid. This non-intrusive acoustic technology is the method of choice when materials and process parameters place high demands on safety and reliability.

100% plant availability

No moving parts, no vibrators, no material fatigue

No corrosion risk from aggressive media

No leakage risk

For hazardous area locations

For temperatures up to 750 °F and beyond.

DN6 to DN6000 (0.25” to 230” pipe).

or special alloys including liners or coatings with pipe diameters ranging from

For virtually any pipe size and material

PIOX® S is capable of accurately calculating the mass flow.

Field proven for the concentration and density measurement of:

Nitric Acid
Sulfuric Acid
Phosphoric Acid
Ammonium Nitrate
Brine
Alcohols, Glycols
Copolymer

Concentration Measurement of High Purity Sulfuric Acid

One of the largest chemical companies in the world, residing in Germany, produces, among other chemicals, high purity sulfuric acid. Used as a raw material for many other chemical production processes, continuous concentration measurement during production is crucial to maintain a uniform product quality. A very precise online concentration analyzer in the laboratory is now replaced by the PIOX® S measurement system. Simply clamped onto the pipe, the transducers are immersed into the highly corrosive medium and thus avoid possible contamination of the product stream.

PIOX® S Measurement Principle:

The measurement method of PIOX® S is based upon the ultrasonic transit-time principle.

Two ultrasonic transducers are mounted to the pipe wall, and are alternately sending and receiving ultrasonic signals. The difference in the transit time between the two signals, the flow velocity and the volume flow, based on the pipe’s inner diameter, are accurately calculated.

Based on the mean value of the ultrasonic signal transit-time, the sonic velocity is within the medium is unambiguously determined.

Temperature probe, mounted in clamp-on or inline configuration, transmits the temperature measurement (T).

Real-time concentration analysis
Simultaneous flow measurement
High data logging capability
Accurate and reliable data source

Advantages:

No risk of corrosion and leaks
Simultaneous measurement of concentration and volume flow or mass flow
Non-intrusive, no need for process shut-down
PIOX® S stands its ground where others fail.

**Where acids or bases are flowing through pipes**

PIOX® S for reliable concentration and flow measurement

- PIOX® S determines the concentration, density and other parameters via the sonic velocity of the fluid. The non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.

**Advantages:**

- No moving parts, no vibrations
- Non-intrusive measurement, no contact with flowing media
- No moving parts, no vibrations
- Simultaneous flow measurement
- Universal applicability, compatible with almost all media

**PIOX® S Measurement Principle:**

The measurement method of PIOX® S is based upon the ultrasonic transit-time principle.

Two ultrasonic transducers are mounted to the pipe wall, and are alternately sending and receiving ultrasonic signals. The difference in the transit time between the two signals, the flow velocity and the volume flow, based on the pipe inner diameter, are accurately calculated.

Based on the mean value of the ultrasonic signal transit-time, the sonic velocity in the medium is unambiguously determined.

A temperature probe, mounted in clamp-on or inline configuration, transmits the temperature measurement (T).

Based on the measured sonic velocity and temperature, PIOX®S calculates the density of the medium, which is necessary for the accurate determination of the mass flow rate.
PIOX® S stands its ground where others fail.

**Compact and reliable flow measurement**

PIOX® S determines the concentration, density and other parameters via the sonic velocity of the fluid. The non-intrusive acoustic technology is the method of choice where materials and process lines pose demands on safety and reliability.

**Extremely Reliable**

- No moving parts, no vibrations, no materials fatigue
- No corrosion risk from aggressive media
- No leakage risk
- For harsh industrial environments

**Highly Accurate**

- Non-intrusive measurement, no need to open the pipe
- Simple maintenance-free solutions
- Approved for hazardous area use
- Real-time concentration analysis
- Simultaneous flow measurement
- High data logging capability
- Accurate and reliable data source

**Advanced Safety**

- Real-time concentration analysis
- Simultaneous flow measurement
- High data logging capability
- Accurate and reliable data source

- By determining the fluid density, PIOX® S is capable of accurately calculating the mass flow.
- For virtually any pipe size and material, whether it is steel, plastic, glass or composite tubes including pipes or couplings with pipe diameters ranging from 0.25” to 230” pipe diameters.
- For temperatures up to 750°F and beyond.
- For hazardous area locations - transducers and transmitters are available in ATEX certified versions.

**Field proven for the concentration and density measurement of:**

- Nitric Acid
- Sulfuric Acid
- Phosphoric Acid
- Ammonium Nitrate
- Brine
- Alcohols, Glycols
- Brine
- Sodium/Potassium Hydroxide
- Phosphoric Acid
- Sulfuric Acid
- Nitric Acid

**Mass Flow Measurement of Nitric Acid**

As a Dutch plant in a Norwegian fertilizer manufacturer, trucks are loaded with nitric acid. Over a period of 12 years, the PIOX® S measurement stabilizes in two different concentrations - 68% and 60%. The reason for this was a dilution effect by adding water. To ensure the accuracy of this process, a reliable concentration measurement was required. This is one of the reasons why PIOX® S was the ideal solution for this task. As the ultrasonic transducers are simply clamped on the outside of the pipe, without contacting the media. There is no risk of corrosion or acid spills as was the case with the Coriolis meters used previously. By simultaneously measuring the media concentration through the sonic velocity, and supervising the media density through the transit-time principle, PIOX® S can be also used to calculate the mass flow.

**Concentration Measurement of High Purity Sulfuric Acid**

One of the largest chemical companies in the world, residing in the Netherlands, makes high purity sulfuric acid. The PIOX® S can be also used to calculate the mass flow.

**PIOX® S Measurement Principle:**

The measurement method of PIOX® S is based upon the ultrasonic transit-time principle.

Based on the measured sonic signal transit-time, the sonic velocity $c$ within the medium is unambiguously determined.

A temperature probe, mounted in clamp-on or inline configuration, transmits the temperature measurement $T$. Based on the measured sonic signal transit-time, the sonic velocity $c$ within the medium is unambiguously determined.

Two ultrasonic transducers are mounted to the pipe wall, and emit alternatingly sending and receiving ultrasonic signals. The difference is the transit time between the two signals, the flow velocity $v$ and the volume flow, based on the pipes inner diameter, are accurately calculated.

The measurement method of PIOX® S is based upon the ultrasonic transit-time principle.
PIOX® S: Concentration and Mass Flow

FLEXIM has a large library of fluids for measuring concentration and mass flow of liquids that continues to grow*:

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Measurement</th>
<th>Concentration</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caprolactam</td>
<td>Concentration</td>
<td>90 - 100 %</td>
<td>70 °C (158 °F) - 130 °C (266 °F)</td>
</tr>
<tr>
<td></td>
<td>Concentration, Density &amp; Mass Flow</td>
<td>70 °C (158 °F) - 130 °C (266 °F)</td>
<td></td>
</tr>
<tr>
<td>Ethanol</td>
<td>Concentration</td>
<td>30 - 100 %</td>
<td>10 °C (50 °F) - 70 °C (158 °F)</td>
</tr>
<tr>
<td></td>
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<td>10 °C (50 °F) - 70 °C (158 °F)</td>
<td></td>
</tr>
<tr>
<td>Ethylene Glycol</td>
<td>Concentration</td>
<td>20 - 55 %</td>
<td>0 °C (32 °F) - 30 °C (86 °F)</td>
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<td></td>
<td>Density &amp; Mass Flow</td>
<td>30 °C (86 °F) - 100 °C (212 °F)</td>
<td></td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>Concentration</td>
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<td></td>
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<tr>
<td>Hydrofluoric Acid</td>
<td>Concentration</td>
<td>40 - 70 %</td>
<td>10 °C (50 °F) - 70 °C (158 °F)</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>Concentration</td>
<td>20 - 40 %</td>
<td>10 °C (50 °F) - 70 °C (158 °F)</td>
</tr>
<tr>
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<td>10 °C (50 °F) - 70 °C (158 °F)</td>
<td></td>
</tr>
<tr>
<td>Nitric Acid</td>
<td>Concentration</td>
<td>0 - 5 %</td>
<td>10 °C (50 °F) - 50 °C (122 °F)</td>
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</tr>
<tr>
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<tr>
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<td>0 - 30 %</td>
<td>50 - &lt;100 %</td>
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<td>Concentration</td>
<td>0 - 50 %</td>
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<tr>
<td>Sugar</td>
<td>Concentration</td>
<td>0 - 90 %</td>
<td>10 °C (50 °F) - 90 °C (194 °F)</td>
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<td>Concentration</td>
<td>80 - 100 %</td>
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<tr>
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<td>0 - 65 %</td>
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FLEXIM AMERICAS Corporation
Headquarter
250-V Executive Drive
Edgewood, NY 11717
Phone: (631) 492-2000
FLEXIM has offices located throughout North America. Please have a look for your local representative at: www.flexim.com or call us at: 1-888-852-PIPE

**FLEXIM**

when measuring matters

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**No more corrosion and mechanical failures**

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