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:

- **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 a 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!

**Fluid Measurement Concentration Temperature**

- Acetic Acid
  - Concentration 90 - 100 %
  - Temperature 70 °C - 100 °C

- Ethanol
  - Concentration 30 - 100 %
  - Temperature 10 °C - 70 °C

- Hydrofluoric Acid
  - Concentration 40 - 70 %
  - Temperature 10 °C - 70 °C

- Sodium Chloride
  - Concentration 0 - 90 %
  - Temperature 10 °C - 90 °C

- Urea
  - Concentration 0 - 65 %
  - Temperature 10 °C - 70 °C

- Propylene Glycol
  - Concentration 0 - 40 %
  - Temperature 10 °C - 40 °C

- Hydrochloric Acid
  - Concentration, Density & Mass Flow 0 - 15 %
    - Temperature 5 °C - 30 °C
  - Concentration, Density & Mass Flow > 15 %
    - Temperature 30 °C - 100 °C

- Nitric Acid
  - Concentration, Density & Mass Flow 50 - 80 %
    - Temperature 10 °C - 50 °C
  - Concentration, Density & Mass Flow 90 - 100 %
    - Temperature 10 °C - 50 °C

- Oleum
  - Concentration 0 - 30 %
    - Temperature 50 - <100 %
    - Temperature 5 °C - 50 °C

- Phosphoric Acid
  - Concentration 25 - 60 %
    - Temperature 5 °C - 40 °C

- Sulfuric Acid
  - Concentration 80 - 100 %
    - Temperature 10 °C - 220 °C

- Sugar
  - Concentration 0 - 45 %
    - Temperature 10 °C - 70 °C

*Note: Table does not include all fluids in the FLEXIM library. If you do not see your fluid or requirements listed, contact your local FLEXIM representative at www.flexim.com/contact for verification, or email us at info@flexim.com.

---

**FLEXIM**

FLEXIM GmbH
Berlin, Germany
Phone: +49 30 93 66 76 60
info@flexim.de
www.flexim.com

FLEXIM Instruments Benelux B.V.
JX Berkel en Rodenrijs, Netherlands
Phone: +31 10 24 92 333
benelux@flexim.de
www.flexim.nl

FLEXIM Instruments UK Ltd.
Hartford, UK
Phone: +44 1606 781 420
sales@flexim.co.uk
www.flexim.co.uk

FLEXIM Instruments Asia Pte Ltd.
Singapore
Phone: +65 67 94 53 25
salessg@flexim.com
www.flexim.com

FLEXIM Instruments China
Shanghai
Phone: +86 21 64 95 75 20
shanghai@flexim.cn
www.flexim.com

FLEXIM Instruments UK Ltd.
Hartford, UK
Phone: +44 1606 781 420
sales@flexim.co.uk
www.flexim.co.uk

FLEXIM has more than 20 years of experience in clamp-on ultrasonic metering non-intrusive concentration, density and mass flow measurement of aggressive media.
PIOX® S stands its ground where others fail.

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. Its non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.

PIOX® S for reliable concentration and flow measurement

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. Its non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.

PIOX® S for reliable concentration and flow measurement

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. Its non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.

PIOX® S for reliable concentration and flow measurement

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. Its non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.

PIOX® S for reliable concentration and flow measurement

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. Its non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.

PIOX® S for reliable concentration and flow measurement

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. Its non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.

PIOX® S for reliable concentration and flow measurement

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. Its non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.
PIOX® S stands its ground where others fail.

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. Its non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.

PIOX® S for reliable concentration and flow measurement

Enhanced Safety

- Non-intrusive measurement, no need to open the pipe
- Simple maintenance-free solution
- Approved for hazardous area use
- No moving parts, no vibrations, no material fatigue
- No corrosion risk for aggressive media
- No leakage risk
- For harsh industrial environments

Improved Control

- No pressure limit
- 100% pressure-resistant, due to permanent coupling pads
- No leakage risk caused by the mechanical reposition
- 100% media resistant - exotic construction materials are not required
- No corrosion risk from aggressive media
- 100% wear-free - no moving parts, no vibrations, no risk of leakage caused by the mechanical reposition
- No need to open the pipe
- No pressure limit
- 100% pressure-resistant
- 100% leak-proof
- No risk of leaks caused by the mechanical reposition
- No corrosion risk
- 100% plant availability, simple attachment of the clamp-on type to the outside of the pipe during ongoing operation
- 100% media resistant - no contact with flowing media, no need for construction materials

Highly Accurate

- Long-term stability
- No drift
- No frequent recalibration
- Highly sensitive even at low flows
- Temperature compensated sonic velocity of the fluid. Its non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.

PIOX® S Measurement Principle:

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

PIOX® S is 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 spill on or near the case with the Guluck sensors used previously. By simultaneously measuring the media concentration through the sonic velocity and the flow rate by the ultrasonic transit-time principle, PIOX® S can be also used to calculate the mass flow.

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
- High data logging capability
- Simultaneous flow and concentration measurement
- No moving parts, no vibrations
- No risk of contamination caused by process shut-down

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

Two ultrasonic transducers are mounted to the pipe wall, and are alternately sending and receiving ultrasonic signals. Measuring 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.

 PIOX® S Measurement Principle:

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

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

PIOX® S Measurement Principle:

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

POXY® 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. Measuring 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 measured value of the acoustic signal transit-time, the sonic velocity is 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 desired units of measure, such as concentration, density, solid content, just as well as user and industry defined values such as Brix and others. Moreover, by internally combining the values of the volume flow with the measured density of the liquid, the PIOX® S Measurement is able to precisely determine the mass flow rate.
PIOX® S stands its ground where others fail.

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. Its non-intrusive acoustic technology is the method of choice when materials and processes place high demands on safety and reliability.

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

Highly Accurate
- Long-term stability
- No drift
- No frequent recalibrations
- Highly sensitive also at low flows
- Temperature compensated

Enhanced Safety
- Non-intrusive measurement, no need to open the pipe
- Simple maintenance-free solution
- Approved for hazardous area use

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

100% plant availability
Simple attachment of the transducer system to the outside of the pipe during ongoing operation

100% media resistant
No contact with flowing media; media conductivity, materials are not required.

100% leak-proof
No risk of leakage caused by the measuring equipment

100% wear-free
No wear and tear by abrasion media; long life expectancy, maintenance-free due to permanent coupling pads

100% pressure-resistant
No pressure limit

100% plant availability
Simple attachment of the transducer system to the outside of the pipe during ongoing operation

100% media resistant
No contact with flowing media; media conductivity, materials are not required.

100% leak-proof
No risk of leakage caused by the measuring equipment

100% wear-free
No wear and tear by abrasion media; long life expectancy, maintenance-free due to permanent coupling pads

100% pressure-resistant
No pressure limit

PIOX® S Measurement Principle:

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

Two ultrasonic transducers are mounted on the pipe wall, and are alternately sending and receiving ultrasound signals. Measuring 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 measurement of the acoustic 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 velocity and temperature, PIOX® S calculates the desired units of measure, such as concentration, density, solid content, just as well as user and industry defined values such as Brix and others.

Moreover, by internally combining the values of the volume flow with the measured density of the liquid, the PIOX® S Measurement is able to precisely determine the mass flow rate.

 PIOX® S Measurement 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 - 130 °C</td>
</tr>
<tr>
<td>Ethanol</td>
<td>Concentration</td>
<td>30 - 180%</td>
<td>10 °C - 70 °C</td>
</tr>
<tr>
<td>Glycol</td>
<td>Concentration</td>
<td>30 - 85%</td>
<td>0 °C - 80 °C</td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>Concentration, Density &amp; Mass Flow</td>
<td>0 - 15%</td>
<td>5 °C - 30 °C</td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>Concentration, Density &amp; Mass Flow</td>
<td>0 - 15%</td>
<td>30 °C - 100 °C</td>
</tr>
<tr>
<td>Hydrofluoric Acid</td>
<td>Concentration</td>
<td>50 - 80%</td>
<td>5 °C - 70 °C</td>
</tr>
<tr>
<td>Hydrofluoric Acid</td>
<td>Concentration</td>
<td>10 - 130%</td>
<td>5 °C - 70 °C</td>
</tr>
<tr>
<td>Phosphoric Acid</td>
<td>Concentration, Density &amp; Mass Flow</td>
<td>0 - 40%</td>
<td>5 °C - 40 °C</td>
</tr>
<tr>
<td>Propylene Glycol</td>
<td>Concentration</td>
<td>0 - 110%</td>
<td>5 °C - 70 °C</td>
</tr>
<tr>
<td>Sodium Chloride</td>
<td>Concentration, Density &amp; Mass Flow</td>
<td>0 - 30%</td>
<td>5 °C - 70 °C</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>Concentration</td>
<td>0 - 50%</td>
<td>10 °C - 100 °C</td>
</tr>
<tr>
<td>Sugar</td>
<td>Concentration</td>
<td>0 - 10%</td>
<td>10 °C - 90 °C</td>
</tr>
<tr>
<td>Sulfuric Acid</td>
<td>Concentration</td>
<td>60 - 100%</td>
<td>10 °C - 220 °C</td>
</tr>
<tr>
<td>Sugar</td>
<td>Concentration</td>
<td>0 - 45%</td>
<td>10 °C - 70 °C</td>
</tr>
</tbody>
</table>

*Note: Table does not include all fluids in the FLEXIM library. If you do not see your fluid or requirements listed, contact your local FLEXIM representative at www.flexim.com/contact for verification, or email us at info@flexim.com.

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

Clamp-On and Go Technology
Using non-intrusive transducers, and a strap-on RTD temperature sensor, PIOX® S is a 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 a 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: 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 Range</th>
<th>Temperature Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caprolactam</td>
<td>Concentration</td>
<td>90 - 100%</td>
<td>70 °C - 130 °C</td>
</tr>
<tr>
<td>Ethanol</td>
<td>Concentration</td>
<td>30 - 70%</td>
<td>10 °C - 70 °C</td>
</tr>
<tr>
<td>Ethylene Glycol</td>
<td>Concentration</td>
<td>0 - 15%</td>
<td>0 °C - 85 °C</td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>Concentration, Density &amp; Mass Flow</td>
<td>0 - 15%</td>
<td>30 °C - 100 °C</td>
</tr>
<tr>
<td>Hydrochloric Acid</td>
<td>Concentration</td>
<td>0 - 15%</td>
<td>30 °C - 100 °C</td>
</tr>
<tr>
<td>Hydrofluoric Acid</td>
<td>Concentration</td>
<td>50 - 70%</td>
<td>10 °C - 50 °C</td>
</tr>
<tr>
<td>Nitric Acid</td>
<td>Concentration, Density &amp; Mass Flow</td>
<td>0 - 50%</td>
<td>10 °C - 50 °C</td>
</tr>
<tr>
<td>Oleum</td>
<td>Concentration, Density &amp; Mass Flow</td>
<td>0 - 100%</td>
<td>5 °C - 50 °C</td>
</tr>
<tr>
<td>Phosphoric Acid</td>
<td>Concentration, Density &amp; Mass Flow</td>
<td>0 - 50%</td>
<td>5 °C - 50 °C</td>
</tr>
<tr>
<td>Propylene Glycol</td>
<td>Concentration</td>
<td>0 - 40%</td>
<td>0 °C - 40 °C</td>
</tr>
<tr>
<td>Sodium Chloride</td>
<td>Concentration, Density &amp; Mass Flow</td>
<td>0 - 30%</td>
<td>10 °C - 70 °C</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>Concentration</td>
<td>0 - 50%</td>
<td>10 °C - 100 °C</td>
</tr>
<tr>
<td>Sugar</td>
<td>Concentration</td>
<td>0 - 10%</td>
<td>10 °C - 100 °C</td>
</tr>
<tr>
<td>Sulphuric Acid</td>
<td>Concentration</td>
<td>0 - 80%</td>
<td>10 °C - 200 °C</td>
</tr>
<tr>
<td>Urea</td>
<td>Concentration</td>
<td>0 - 40%</td>
<td>10 °C - 70 °C</td>
</tr>
</tbody>
</table>

*Note: Table does not include all fluids in the FLEXIM library. If you do not see your fluid or requirements listed, contact your local FLEXIM representative at www.flexim.com/contact for verification, or email us at info@flexim.com.

FLEXIM

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

Clamp-On and Do Technology
Using non-intrusive transducers, and a strap-on RTD temperature sensor, PIOX® S is a plug-in ultrasonic probe. 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 a 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!