

**KROHNE**

▶ achieve more

~~70%~~  
~~73%~~  
~~76%~~  
81%



**KROHNE**

▶ achieve more

More efficiency?

Innovative solutions in gas and steam measurement



## Down with costs, up with efficiency

As the leading company in process measurement technology, KROHNE offers an extensive product portfolio worldwide, consisting of analytical, flow, level and temperature measurement techniques suitable for the various applications in all industries. In addition, we have several products that are optimised for gas and steam measurement. KROHNE has developed these four technologies to the optimum. The choice for the most suitable measuring device depends, therefore, not only on the medium to be measured but also on other factors such as pressure, volumetric flow rate, temperature and density. Speak to one of our experts – together we will find the best solution for your application.



### Applications:

- Raw product transport, e. g. natural gas
- Measurement of CNG at petrol stations
- Measurement of steam as energy source
- Measurement of seal gas in turbo compressors
- Measurement of process gas
- Purge gas for cleaning of pipes and measurement systems, e. g. Nitrogen
- Inert gas for controlled atmospheric areas in welding applications
- Burner supply, e. g. controls
- Gas supply for liquids, e. g. Oxygen, Argon or Helium
- CO<sub>2</sub> measurement in the beverage industry
- Dosage and checking of samples for analysers
- Indirect level measurement with air bubbler level measurement method

## Payback through accurate measurement

Gas or steam is used in many process industries and utilities. When experiencing shortages of resources and rising energy prices it is more important to look at cost-effective, optimal usage. This is only possible with more accurate measurement of product volume. Parameters such as temperature and pressure must also be considered as these affect energy efficiency. Only with pressure and temperature compensation can a true measurement be made which will lead to real savings.

Additional parameters such as measurement errors, leakage, pressure loss and maintenance should be taken into consideration to achieve increased efficiency in a plant. This is especially true when incorrect measurement techniques are used which can lead to increased pump loads to achieve the process pressures. Unknown or changing process conditions can cause major measurement errors which can have a devastating effect on costs.

## Clear savings

A flowmeter from KROHNE is an investment in the efficiency of your plant resulting in substantial savings in costs.

### Example in a power station:

A power station (DN 200 diameter) has a gas pipeline with about 680 million cubic meter gas flowing through per year. The gas bill, working on about €0.30/m<sup>3</sup> totals about €204 million. With the installation of an ALTOSONIC V12 that compensates influences like flow profile, contamination and sediment in the medium, the measuring uncertainty was cut by about 50% in comparison to standard ultrasonic meters. The power station can therefore control the measurement more accurately – in some cases the savings can be more than €1 million per year. The purchasing cost of the meter is insignificant compared to this saving!

### Example in a heating application:

Many users assume that pressure and temperature conditions in all processes are always constant. However, fluctuations happen all the time and can cause significant measuring errors. With superheated steam – 190 °C, 5 bar pressure – a pressure increase of just 1 bar will, for example, lead to a measuring deviation of 17.43% due to density change. With a DN 100 pipe size and energy costs of €60 per MWh this means a yearly loss of over €200 000.

The OPTISWIRL 4070 C eliminates most of these errors as the pressure and temperature measurement as well as correction calculations are all integrated within the device. The cost for external pressure and temperature sensors and their installation are thus saved. All measured values are included at the same point in the measurement device, thus it is impossible for separate measurement errors to develop.

## Highlights:

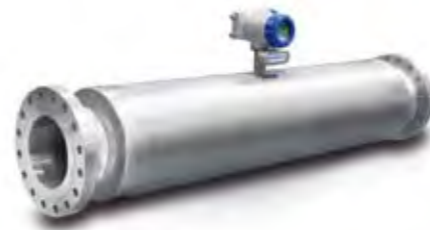
- Highest accuracy and repeatability independent of the medium properties such as viscosity, temperature, density and electrical conductivity
- No moving or intruding parts in the measuring tube
- Low running costs, no wear and tear, maintenance free
- Excellent long-term stability, no recalibration required
- Highly reliable through various redundant measuring chords

## Ultrasonic flowmeters



KROHNE has been the leading specialist for Ultrasonic flowmeters and world leader for in-line measurement devices for more than 25 years. The meters can be used in bi-directional metering with great accuracy and long-term stability. They can also be used in a wide range of pressures and temperatures.

Ultrasonic flowmeters are capable to measure a wide variety of industrial gases and superheated steam independent of temperature, density and pressure influences. When compared to a turbine meter, it has no moving or intruding parts in the measuring tube which can cause a pressure drop and is maintenance free. Due to the smooth pipe section with no obstructions, coating of the measurement tube is minimised, thus reducing operating and maintenance costs. Ultrasonic flowmeters are highly suitable for large flow rates and the accuracy attained is suitable for Custody Transfer applications. With expensive products like natural gas, it pays to install a highly accurate ultrasonic meter such as the ALTOSONIC V12. With the improved accuracy and tangible savings that can be made, the meter will pay for itself in a short period of time.



OPTIMASS 2300

## Mass flowmeters

Coriolis mass flowmeters are able to measure gas and liquids and provide three direct measurement values: mass flow, density and temperature. Values such as volume, mass and volume totals are calculated, e.g. the volume flow is calculated from the mass flow and the density. Similar to variable area meters, mass flowmeters can also measure low flow rates. The meters are also suitable for custody transfer measurements, e.g. loading of tankers or for fuelling vehicles that run on CNG.

For aggressive fluids, a meter with a single Tantalum measuring tube is available which has a high resistance to corrosion. The measurement tubes are also easy to clean with, for example, a 'pig'.

## Highlights:

- Measurement of massflow and temperature; calculation of volumetric flow
- Installation insensitive: Installation is independent of orientation or other outside influences, for example, pipe frequencies
- OPTIMASS is the only single straight-tube mass meter for custody transfer measurement in the highest OIML accuracy class 0.3 for liquids
- Patented adaptive sensor technology (AST) for reliable measurement results
- Minimum pressure loss with straight tube meters

## Vortex flowmeters



OPTISWIRL 4070 C

Vortex flowmeters measure gas and steam independent of pressure and temperature. This applies to wet gases and gas mixtures as well.

The KROHNE OPTISWIRL 4070 C has integrated pressure and temperature compensation. This means that the meter can also accurately measure operating, standard volume and the mass flow under changing process conditions. Vortex flowmeters are good replacements for differential pressure flowmeters whose accuracy and pressure loss is often poor. Vortex flowmeters are suitable for utility metering, for example, in steam or air circuits, a vortex meter is a cost-effective measurement for balancing energy consumption.

## Variable area flowmeters



H250 M40

Where emphasis is on minimum investment and maintenance costs, flow measurement can be achieved with the proven and reliable measurement technology of a variable area flowmeter. Variable flowmeters offer a reliable measurement, good reproducibility and, thanks to a mechanical indicator, can also be used where no power is available.

The meters are equipped with glass or metal cones, depending on the application. The range of applications vary from small flow rates with controllers to process monitoring of flows in pipe sizes to DN 100. Variable area flowmeters are highly suitable for dry gases and steam. The standard meter, H250, from KROHNE is universally installed for gas measurement and thanks to a metal cone it is highly temperature, pressure and corrosion resistant. Variable area flowmeters with a glass cone enables a visual check of the flow rate, e.g. a quick check of a flowing medium where contamination is a danger.







## Highlights:

- Integrated pressure and temperature compensation
- Excellent long-term stability through a robust construction
- Highly accurate
- Maintenance-free sensor
- Robust, fully welded stainless steel construction with excellent corrosion, pressure and temperature resistance
- High application security and stable measurement results through ISP (Intelligent Signal Processing)








## Highlights:

- Reliable measurement of gas and steam, also without a power supply
- Good application reliability even with small flow rates
- Best price-performance ratio
- Minimum pressure loss
- Modular display and converter concept
- Excellent long term stability
- Low maintenance
- Simple installation and commissioning

## Innovative solutions in gas and steam measurement

	Ultrasonic			Mass		
	ALTOSONIC V12	OPTISONIC 7300	OPTISONIC 8300	OPTIMASS 1300	OPTIMASS 2300	OPTIMASS 7300
						
<b>Fluid</b>						
<b>Natural gas</b>	x	x	-	x	x	x
<b>Process gas</b>	-	x	-	x	x	x
<b>Steam</b>	-	x	x	-	-	-
<b>Saturated steam</b>	-	-	-	-	-	-
<b>Process properties</b>						
<b>Process temperature range</b>	-50 °C ... +80 °C	-25 °C ... 180 °C	100 °C ... 540 °C	-45 °C ... +130 °C	-45 °C ... +130 °C	-40 °C ... +150 °C
<b>Maximum pressure</b>	4 ... 150 bar*	150 bar	250 bar	100 bar	150 bar	100 bar
<b>Velocity</b>	≤ 30 m/s	≤ 30 m/s	≤ 60 m/s	to 100 m/s	to 100 m/s	to 150 m/s
<b>Flow rate</b>	20–20600 m³/h	7–30000 m³/h	1–1000 t/h	7–750 m³/h	220–6500 m³/h	0.75–1500 m³/h
<b>Diameters to EN 1092-1</b>	DN 100 ... 600**	DN 50 ... 600**	DN 100 ... 600	DN 15 ... 100	DN 100 ... 300	DN 10 ... 100
<b>Flow meter features</b>						
<b>Inlet and outlet lengths</b>	5D/3D	10D/3D	10D/5D	none	none	none
<b>Bidirectional measurement</b>	x	x	x	x	x	x
<b>Digital communication</b>	MODBUS RS 485	HART, MODBUS	HART, MODBUS	HART, FF, PA, DP, MODBUS	HART, FF, PA, DP, MODBUS	HART, FF, PA, DP, MODBUS
<b>Accuracy for gas and steam measurement***</b>	± 0.5% uncalibrated ± 0.25% calibrated	± 1%	± 1%	± 0.5%	± 0.5%	± 0.5%
<b>Highlights</b>	<ul style="list-style-type: none"> <li>12 measuring paths, 2 of which are used for diagnostic functions</li> <li>For custody transfer applications</li> <li>50% less uncertainty through compensated functions when compared to equivalent solutions</li> <li>Only ultrasonic meter for natural gas measurement in the accuracy class 0.5 according to OIML 137</li> <li>No moving parts, no pressure loss</li> </ul>	<ul style="list-style-type: none"> <li>Universal 2-path ultrasonic flowmeter for process gases</li> <li>Integrated volume-calculation with pressure- and temperature compensation</li> <li>Independent of gas properties</li> <li>No moving parts, no pressure loss</li> </ul>	<ul style="list-style-type: none"> <li>2-path ultrasonic flowmeter for heated steam</li> <li>Integrated massflow-calculation with pressure- and temperature compensation</li> <li>Suitable for temperatures up to 540 °C</li> <li>No moving parts, no pressure loss</li> </ul>	<ul style="list-style-type: none"> <li>Standard meter in the process industry</li> <li>Excellent price-performance ratio</li> <li>Supplied standard with secondary containment housing</li> </ul>	<ul style="list-style-type: none"> <li>Custody transfer applications</li> <li>Twin tube with optimised flow splitter</li> <li>Integrated pressure and temperature compensation</li> <li>Suitable for large pipe sizes and high flow rates</li> </ul>	<ul style="list-style-type: none"> <li>Single straight measuring tube in Tantalum, Titanium, Hastelloy or Stainless steel</li> <li>Sterilizable and cleanable</li> </ul>

\*Higher pressure available on request \*\*Larger diameters available on request \*\*\*Accuracy for liquid measurements may vary

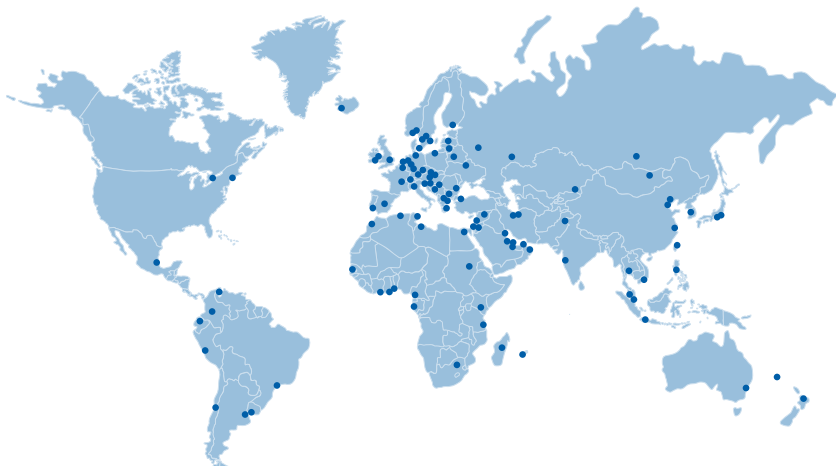
	Mass		Vortex	Variable area			
	OPTIMASS 8300	OPTIGAS 5010	OPTISWIRL 4070 C	H250 M40	DK32, 34, 37	VA40	DK46, 47, 48, 800
							
<b>Fluid</b>							
<b>Natural gas</b>	x	x	x	o	o	o	o
<b>Process gas</b>	x	-	x	x	x	x	x
<b>Steam</b>	-	-	x	x	x	-	-
<b>Saturated steam</b>	-	-	x	-	-	-	-
<b>Process properties</b>							
<b>Process temperature range</b>	-220 °C ... +230 °C	-40 ... 93 °C	-40 °C ... +240 °C	-200 °C ... +300 °C higher temperature on request	-80 °C ... +150 °C higher temperature on request	-5 °C ... +100 °C	-5 °C ... +100 °C
<b>Maximum pressure</b>	100 bar	350 bar	PN 100*	400 bar*	150 bar*	10 bar	10 bar
<b>Velocity</b>	to 100 m/s	to 100 m/s	2–80 m/s	3 cm/s ... 3 m/s	< 3 cm/s	3 cm/s ... 2 m/s	< 3 cm/s
<b>Flow rate</b>	4–1680 m³/h	1–120 kg/min	6.79–21028 m³/h	0.7 ... 600 m³/h	16 ... 4800 l/h	0.07 ... 310 m³/h	5 ... 5000 l/h
<b>Diameters to EN 1092-1</b>	DN 15 ... 150	DN 15, 25	DN 15 ... 300	DN 15 ... 150	1/4" NPT	DN 15 ... 50	1/4" NPT
<b>Flow meter features</b>							
<b>Inlet and outlet lengths</b>	none	none	20D/5D	5D/3D	none	5D/3D	none
<b>Bidirectional measurement</b>	x	-	-	-	-	-	-
<b>Digital communication</b>	HART, FF, PA, DP, MODBUS	HART, Modbus	4–20 mA, HART	4–20 mA, HART, Fieldbus Foundation, Profibus PA	4–20 mA, HART	-	-
<b>Accuracy for gas and steam measurement***</b>	± 0.5%	± 0.5%	± 1%	1.6% of measurement value from 50% to VDI/VDE 3513-2	2.5–4% of measurement value from 50% to VDI/VDE 3513-2	1.0% of measurement value from 50% to VDI/VDE 3513-2	1.0–4.0% of measurement value from 50% to VDI/VDE 3513-2
<b>Highlights</b>	<ul style="list-style-type: none"> <li>Wetted surfaces in stainless steel</li> <li>Optional heating and cooling</li> </ul>	<ul style="list-style-type: none"> <li>Signal converter (transmitter) or MODBUS Direct Data Communication (DDC) outputs</li> <li>High accuracy and wide measuring range</li> <li>Compact and low cost</li> <li>Easy to install and commission</li> <li>Developed in conjunction with dispenser manufacturers</li> </ul>	<ul style="list-style-type: none"> <li>First 2-wire meter with integrated pressure and temperature compensation</li> <li>Fully welded SS construction</li> <li>Temperature, pressure and corrosion resistant</li> <li>Ready to use, plug and play</li> </ul>	<ul style="list-style-type: none"> <li>Completely modular meter</li> <li>Individually configured for almost every application</li> <li>Cost effective and reliable standard solution</li> <li>Available for horizontal or vertical applications</li> </ul>	<ul style="list-style-type: none"> <li>For use with gas analysers to SIL 2</li> <li>Robust all-metal construction ensures resistance to pressure, temperature and corrosion</li> <li>No power supply needed</li> </ul>	<ul style="list-style-type: none"> <li>Glass tubes enable visual indications</li> <li>Special versions for the food and pharmaceutical industries</li> <li>No power supply needed</li> </ul>	<ul style="list-style-type: none"> <li>Small flow rate meters with visual indication</li> <li>Fine adjustable valve for flow rate</li> <li>No power supply needed</li> </ul>

x = suitable o = partly suitable - = not suitable

## KROHNE

### Product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers



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