KROHNE

achieve more

Move into the lead

Product overview flow measurement

Contents

Achieve more with KROHNE

KROHNE ranks among the world's leading companies involved in the development and production of innovative and reliable process measuring technology, providing solutions for all sectors around the globe. KROHNE was founded in 1921 in Duisburg, Germany. It has more than 2,500 employees and has a turnover of approximately 306 million euros. The company has 15 production facilities and owns 43 companies and joint ventures. In fact, KROHNE was the second company after VW to have a joint venture in Shanghai. Today, China is one of KROHNE's major markets. With an equity-to-assets ratio of approx. 42 %, the company is largely financially independent.

KROHNE is always a fair and reliable partner to its customers, business partners and employees. We provide our customers with optimal products and solutions which always meet or exceed their expectations in terms of quality, performance capability, service and design. Our customers are registered in diverse branches of industry such as chemicals, petrochemicals, water, wastewater, food, beverages, pharmaceuticals, oil and gas, power plants, pulp and paper etc.

The solution for every application

KROHNE has unique expertise when it comes to flow measurement. And we don't just demonstrate our ability with standard applications but also with applications that are demanding, requiring custom solutions. For us, customer orientation starts as early as research and development. Many of our products which are considered today's industrial standards, were developed in cooperation with our customers. Today, users around the world benefit from KROHNE innovation: Electromagnetic flowmeters with ceramic liners for highly corrosive media in chlorine chemistry. Mass flowmeters with just one straight tube – ideal for highly viscous media and low flow speeds. Ultrasonic flowmeters for custody transfer, working according to the time-of-flight method. Vortex measuring devices with integrated pressure and temperature compensation. And variable area flowmeters: they established KROHNE's business in 1921, today we can't imagine KROHNE without them, if a local display is to ensure the redundancy and the certainty of the system.

Online configurator

For detailed device selection, take advantage of our online platform Configure It. It's quick and easy to find the right product variant for you, to check the availability of the selected product or to request a non-binding quote.
For more information about Configure It go to www.krohne-direct.com

Product selection list

This table will aid you in selecting the right measuring principle for your application.

	Electro-magnetic flowmeters	Variable area flowmeters	Ultrasonic flowmeters	Mass flowmeters	Vortex flowmeters	Flow controllers
	Page 8–17	Page 18–25	Page 26–33	Page 34–41	Page 42–45	Page 46–51
Liquids						
Liquids (e.g. water)	x	x	x	x	x	x
Low flow rates (<2 l/h)	x	x	-	x	-	-
High flow rates (>100,000 m^3/h)	x	-	x	-	-	x
Non-conducting liquids	-	x	x	x	x	o
Viscous liquids	x	o	o	x	o	o
Gases						
Industrial gases	-	x	x	x	x	-
Low flow rates (<20 l/min)	-	x	o	x	-	-
High flow rates	-	o	x	x	x	-
Steam	-	o	x	-	x	-
Special applications						
Slurry, solid-laden media	x	-	-	o	-	-
Emulsions (oil/water)	o	x	o	x	o	o
Corrosive liquids (acids, alkalis)	x	x	x	x	o	o
Corrosive gas flows	-	o	o	o	o	-
Bi-directional measurements	x	-	x	x	-	o
Version						
2-wire	x	x	-	-	x	x
4-wire	x	-	x	x	-	-

x = suitable, o = suitable with conditions, - = not suitable

GDC concept: An electronics concept from which everybody benefits

IFC 300 C for electromagnetic flowmeters
MFC 300 C for mass flowmeters
UFC 300 C for ultrasonic flowmeters

IFC 300 F
MFC 300 F
UFC 300 F

IFC 300 W
MFC 300 W
UFC 300 W

IFC 300 R
MFC 300 R

IFC 100 C

IFC 100 W

User-friendliness is traditionally a top priority at KROHNE: whether during installation, commissioning, operation or communication – high-end technology only makes sense if it is simple and convenient for the customer to access.

That is why at KROHNE, user-friendliness begins with the electronics. Our development and application engineers have worked for years to develop a comprehensive design known as the General Device Concept – GDC for short.

What does it all mean? First of all, it's a modular electronics concept that takes into account all of your requirements in terms of signal inputs and outputs. Secondly, it features a uniform user interface to speed up the commissioning of the devices. Thirdly, it boasts extensive device and process diagnostic functions, which can be exceeded by the Toolbox module. Fourthly, it's easy to integrate fieldbus interfaces such as Profibus and Foundation Fieldbus thanks to the high degree of modularity. And lastly, it's an electronics package that can be used in various housing shapes.

At Interkama 2004, we introduced an amazed field of experts to the IFC 300 electromagnetic converter, an electronics unit which is perfectly suited to all measuring tasks at the highest level of technology. The high-end device even masters the measurement of media with high solid content and flow measurement for rapidly changing media with certainty and ease. All inputs and outputs are electrically isolated from one another. It is not necessary to reparameterize the unit after replacing the converter.

KROHNE launched the little brother of the IFC 300 that is the IFC 100: an all-purpose device which boasts outstanding performance not only when it comes to measuring accuracy and diagnosis but also defines a new benchmark in terms of the price-performance ratio.

In the meantime, the ultrasonic and mass flowmeters also benefit from this GDC concept. And the largely identical electronics package featuring the same operating and connection package means you, the customer, also benefit.

Human Machine Interface (HMI): Simply clever, simply well thought-out

User-friendliness begins with selecting the right display and control elements. But it certainly does not end there.

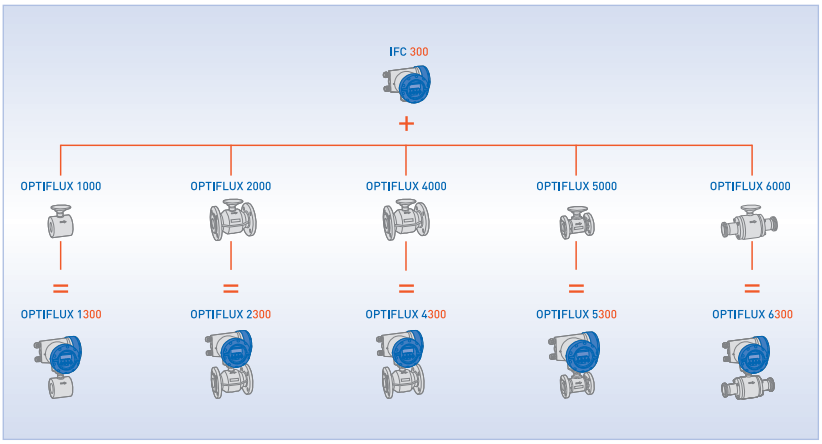
With the market launch of the OPTIFLUX series in 2004, KROHNE has proven in an impressive way how to significantly improve user-friendliness by using pioneering assistance and diagnostics systems.

It all starts with the display: All devices feature a large, high-contrast display which makes it possible to display plain text information as well as graphic information such as the trend development of the flow. Operation is simple and convenient thanks to a user-friendly interface with four optical buttons. Not only does it look good – it's also extremely practical. For example, the glass cover which protects the display from dirt and dust does not have to be removed during parameterization or operation.

Using the quick setup menus, the user can quickly adapt the OPTIFLUX to the application.

The converter can communicate with the user in many languages including German, English, French and Spanish.

Modular product lines: Many combinations for one customised solution



At KROHNE, we believe in the concept of modularity when it comes to offering our customers the measuring solution best suited to their process. Both our IFC and MFC converters can be freely combined with all devices in the OPTIFLUX and OPTIMASS lines. This modularity is also reflected in the names of the devices. For example, the OPTIFLUX 1300 is a combination of the OPTIFLUX 1000 sensor and the IFC 300 converter.

The modular product line

IFC 100 W

IFC 100 C

IFC 300 R

IFC 300 W

IFC 300 F

IFC 300 C

OPTIFLUX 1000
The economic solution with standard functionality

OPTIFLUX 2000
For the water and wastewater industry

WATERFLUX 3000
The first choice for the water and wastewater industries

OPTIFLUX 4000
The standard solution for the process industry

OPTIFLUX 5000 Sandwich
Maximum media resistance, abrasion resistance and accuracy thanks to the high performance ceramic

OPTIFLUX 5000 Flansch
Maximum media resistance, abrasion resistance and accuracy thanks to the high performance ceramic

OPTIFLUX 6000
The device for the food and pharmaceutical industry

The specialists

OPTIFLUX 4040
The 2-wire device that performs
like a 4-wire device

WATERFLUX 3070
The battery powered water meter

TIDALFLUX
For partially filled pipelines

BATCHFLUX 5500
For volumetric filling systems
in the beverage industry

Electromagnetic flowmeters

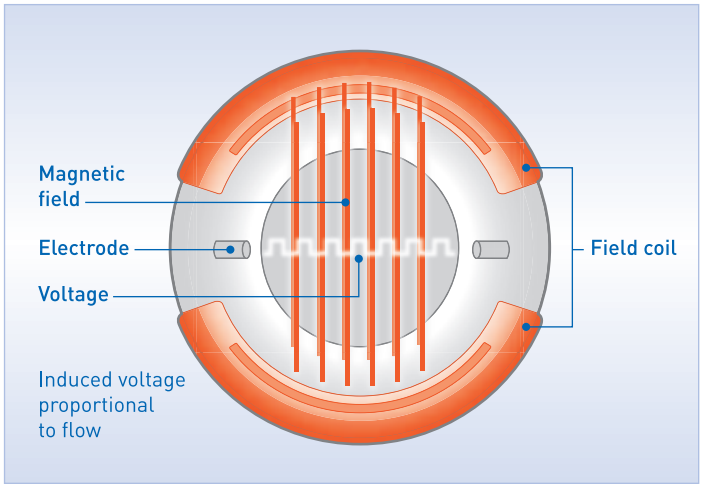
Highlights:

- A converter for all measuring tasks, leading to cost advantages when planning, purchasing, storing and training
- A wide range of converters for every industry
- The unique 3x100%-diagnostics (application and device diagnostic, out-of-spec testing) even exceeds the NAMUR requirements
- Thanks to the new virtual reference, grounding electrodes and expensive grounding rings are no longer necessary
- Reliable measurement, largely independent of the flow profile
- For the lowest conductivities
- Maximum application certainty, even with rapid media changes, pH jumps, high solids content and pulsating flow
- All KROHNE electromagnetic flowmeters are wet-calibrated in a direct comparison of volumes, which is by far the most accurate calibration method
- Abrasion and corrosion-resistant liners, made of high-performance ceramic if necessary
- Free tube cross section (can be cleaned CIP/SIP)
- Maintenance free
- Calibratability approval starting from the standard device
- For nominal sizes DN 2.5 to 3000
- Simple installation and start-up with Quick Start function
- Excellent long-term stability
- Optimum zero-point stability regardless of changes in medium properties
- Minimal or no inlets/outlets

Electromagnetic flowmeters

The measuring principle

As early as 1832, Michael Faraday tried to determine the speed of the current in the Thames by measuring the voltage induced in flowing water by the earth's magnetic field. Electromagnetic flow measurement is based on Faraday's law of induction. According to this law, a specific voltage is induced in a conductor or conductive medium that moves through a magnetic field. This voltage is proportional to the speed of movement of the medium.



On electromagnetic flowmeters, the voltage induced is tapped either by two measuring electrodes in conducting contact with the medium or in a capacitative manner, without contact.

An electronic measuring transducer amplifies the signal and converts it into a standard signal (imposed current) and to a frequency/pulse signal (e.g. one pulse for every cubic meter of measured substance that flows through the measuring tube). The measuring tube is made out of electrically insulated material or lined with insulation on the inside so that the induced voltage is not shorted by the wall of the tube.

The standard for the competition: Electromagnetic flowmeters from KROHNE

Industries:

- Water and wastewater
- Chemical
- Food and beverage
- Pharmaceutical
- Power plants
- Pulp and paper
- Mines and mining

As founder and world market leader in electromagnetic flowmeter technology, we have been impressing our customers with innovation for more than 45 years, innovations that continue to set the standard for the competition. Our OPTIFLUX product line is an excellent example of this: a converter for all applications. A one-of-a-kind diagnostics package that can even look into the process. An intuitive operating concept featuring a quick start function for simple start-up.

Thanks to this unique combination of high-end technology and maximum user-friendliness, you will benefit in a wide range of industries: in the food and beverage industry, where fruit juices, milk and liquid hops must be mixed, dosed and filled under hygienic conditions. In the chemicals industry and in the pulp and paper industry, where our devices deal with acids, alkalis, pastes, sludges and other caustic media, or in the metal and mining industry where media with a high solid content are encountered on a daily basis (ore or excavator mud).

As world market leader, we produce electromagnetic flowmeters in our plants in the Netherlands, Brazil, India and China. It is no wonder that the Physikalisch-Technische Bundesanstalt (PTB) in Braunschweig, Germany, relies on electromagnetic flowmeters from KROHNE in their calibration systems.

OPTIFLUX 4300 in the filtration system in the Haltern waterworks

Production process of high-performance ceramics

Electromagnetic flow measurement: Increased safety through the use of high-performance ceramics in flange design

The converter is not the only deciding factor in the reproducibility of the measured value during electromagnetic flow measurement. The form stability of the measuring tube under temperature and pressure stresses also plays an important role. To obtain a reliable measurement even with critical media, the measuring tube material, the electrode construction and the process connection must all be taken into account.

The challenge: The new measuring tube material should be highly resistant to caustic, corrosive and abrasive media and show off its superiority to conventional liners made of plastic such as PFA.

KROHNE accepted this challenge and, in close cooperation with FRIATEC AG from Mannheim, Germany, developed a high-performance ceramic for industrial use which can even withstand rapid temperature changes and high mechanical stresses.

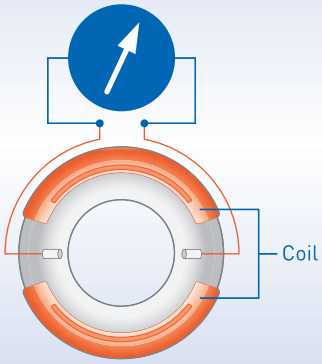
When it comes to measuring critical media such as those used in chlorine chemistry, it was also necessary to optimize the electrode construction. The result of these efforts? Using the so-called Cermet electrode has made it possible to develop a 100 % gap-free design. In doing so, the metal of the electrode combines with the material of the ceramic to form an insoluble compound when exposed to high temperatures.

In addition to the sandwiched version, our engineers also developed a flanged version. This version not only guarantees easy installation but also minimizes the risk of leakage in case of a fire.

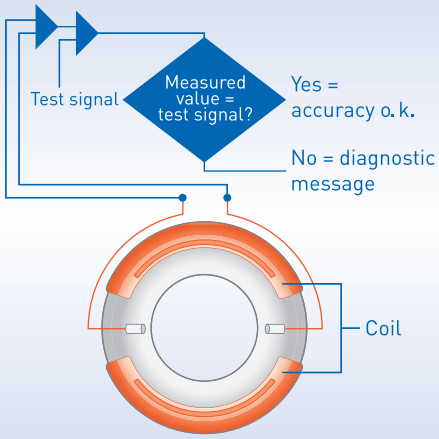
It is no wonder that the fields of application of the ceramic electromagnetic flowmeter are so numerous today. They range from measuring acids and alkalis in chemistry to usage in chlorine chemistry, to the volumetric filling of liquids in the beverage, pharmaceutical and cosmetics industries.

Electromagnetic flowmeters: 3x100%-diagnostics for maximum certainty

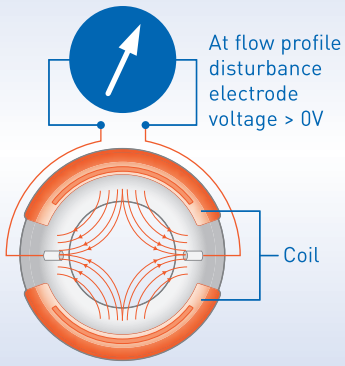
Resistance measurement
for detecting electrode covering, electrode short-circuit, excessively low conductivity and for measuring the conductivity and the coil temperature (media temperature)



Accuracy test
by means of a cyclically fed test signal



Magnetic field polarity reversal
for checking the flow profile and for detecting a partially filled measuring tube



KROHNE is the first and to date only manufacturer to offer its customers complete application and process diagnostics as well as an accuracy and linearity test (out-of-spec diagnostics) in addition to the usual device diagnostics for the OPTIFLUX line.

In a working committee led by NAMUR, representatives of manufacturers and users met to define which application problems (e.g. gas bubbles) should ideally be detected by the measuring devices for each measuring process.

With the indicators supplied by OPTIFLUX and knowledge of the process, the user can detect the following application problems with a high degree of certainty:

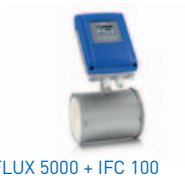
- Gas bubbles
- Electrode corrosion, deposits on electrodes
- Short-circuit
- Low conductivity
- Partial filling of measuring tube
- Liner damage
- External magnetic fields
- Disrupted flow profile

During the out-of-spec test, a determination is made, both online and cyclically, as to whether the device is still within its specifications. In particular, the accuracy is tested by feeding a test signal. The linearity of the device and the accuracy of the field current with which the magnetic field is generated are also checked.

Thanks to the 3x100%-diagnostics, the OPTIFLUX is much more than a simple flowmeter: it examines the process and provides the user with valuable information. In this respect, the OPTIFLUX even exceeds the requirements of VDI/VDE/NAMUR 2650.

The modular product line

	The economic solution with standard functionality for simple applications	For the water and wastewater industry	The first choice for the water and wastewater industries
	OPTIFLUX 1100	**OPTIFLUX 2100**	**WATERFLUX 3100**
	 OPTIFLUX 1000 + IFC 100	 OPTIFLUX 2000 + IFC 100	 WATERFLUX 3000 + IFC 100
Measuring accuracy	±0.3 % of measured value	±0.3 % of measured value	±0.3 % of measured value
Electrical conductivity	≥5 µS/cm (water ≥20 µS/cm)	≥5 µS/cm (water ≥20 µS/cm)	≥5 µS/cm (water ≥20 µS/cm)
Process conditions	Solid content max. 3 %	Solid content max. 3 %	Solid content max. 3 %
Outputs	Current, Pulse, Status	Current, Pulse, Status	Current, Pulse, Status
Power supply	100 ... 230 VAC, 12 ... 24 VDC, 24 VAC/DC	100 ... 230 VAC, 12 ... 24 VDC, 24 VAC/DC	100 ... 230 VAC, 12 ... 24 VDC, 24 VAC/DC
Protection category: Compact (C) Wall (W)	IP66, 67; NEMA4X, 6	IP66, 67; NEMA4X, 6	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6
	OPTIFLUX 1300	**OPTIFLUX 2300**	**WATERFLUX 3300**
	 OPTIFLUX 1000 + IFC 300	 OPTIFLUX 2000 + IFC 300	 WATERFLUX 3000 + IFC 300
Measuring accuracy	±0.3 % of measured value	±0.2 % of measured value	±0.2 % of measured value
Electrical conductivity	≥1 µS/cm (water ≥20 µS/cm)	≥1 µS/cm (water ≥20 µS/cm)	≥1 µS/cm (water ≥20 µS/cm)
Process conditions	Solid content max. 30 %	Solid content max. 30 %	Solid content max. 30 %
Outputs	Current, Pulse, Status	Current, Pulse, Status	Current, Pulse, Status
Inputs	Binary	Binary	Binary
Communication	HART, FF, PA, DP, Modbus	HART, FF, PA, DP, Modbus	HART, FF, PA, DP, Modbus
Power supply	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC	100 ... 230 VAC, 12 ... 24 VDC, 24 VAC/DC
Protection category: Compact (C) Field (F) Wall (W) 19" Rack (R)	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1
Sensor	**OPTIFLUX 1000**	**OPTIFLUX 2000**	**WATERFLUX 3000**
	 OPTIFLUX 1000	 OPTIFLUX 2000	 WATERFLUX 3000
Process connection EN 1092-1	DN 10 ... 150; PN 16, 40	DN 25 ... 3,000; PN 2.5 ... 40	DN 25 ... 600; PN 16
Process connection ASME B 16.5	3/8 ... 6"; CL 150, 300	1 ... 120"; CL 150, 300	1 ... 24"; CL 150
Process temperature	-25 ... 120 °C; -13 ... 248 °F	-5 ... 90 °C; 23 ... 194 °F	-5 ... +70 °C; 23 ... 158 °F
Ambient temperature	-25 ... 65 °C; -13 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F
Materials liner	PFA	Polypropylen, hard rubber	Rilsan®
Materials electrodes	Hastelloy C4	Hastelloy C4, Titanium, stainless steel	Stainless steel 1.4301; AISI 304
Sensor	IP66, 67, 68; NEMA4, 4X, 6, 6P	IP66, 67, 68; NEMA4, 4X, 6, 6P	IP66, 67, 68; NEMA4, 4X, 6, 6P
Ex-Approvals	-	EEx, FM, CSA	-
Other approvals	FDA, MI-005	KTW, WRc, KIWA, ACS, OIML R49, MI-005, MI-001	ACS, DVGW, KTW, NSF, WRc

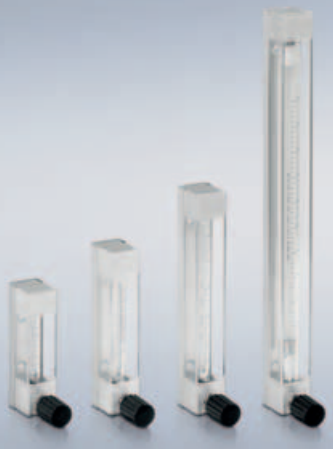
The standard solution for the process industry	Maximum media resistance, abrasion resistance and accuracy thanks to the high performance ceramic	Maximum media resistance, abrasion resistance and accuracy thanks to the high performance ceramic	The device for the food and pharmaceutical industry
OPTIFLUX 4100	**OPTIFLUX 5100 sandwich**	**OPTIFLUX 5100 flange**	**OPTIFLUX 6100**
 OPTIFLUX 4000 + IFC 100	 OPTIFLUX 5000 + IFC 100	 OPTIFLUX 5000 + IFC 100	 OPTIFLUX 6000 + IFC 100
±0.3 % of measured value	±0.3 % of measured value	±0.3 % of measured value	±0.3 % of measured value
≥5 µS/cm (water ≥20 µS/cm)	≥5 µS/cm (water ≥20 µS/cm)	≥5 µS/cm (water ≥20 µS/cm)	≥5 µS/cm (water ≥20 µS/cm)
Solid content max. 3 %	Solid content max. 3 %	Solid content max. 3 %	Solid content max. 3 %
Current, Pulse, Status	Current, Pulse, Status	Current, Pulse, Status	Current, Pulse, Status
100 ... 230 VAC, 12 ... 24 VDC, 24 VAC/DC	100 ... 230 VAC, 12 ... 24 VDC, 24 VAC/DC	100 ... 230 VAC, 12 ... 24 VDC, 24 VAC/DC	100 ... 230 VAC, 12 ... 24 VDC, 24 VAC/DC
IP66, 67; NEMA4X, 6	IP66, 67; NEMA4X, 6	IP66, 67; NEMA4X, 6	IP66, 67; NEMA4X, 6
OPTIFLUX 4300	**OPTIFLUX 5300 sandwich**	**OPTIFLUX 5300 flange**	**OPTIFLUX 6300**
 OPTIFLUX 4000 + IFC 300	 OPTIFLUX 5000 + IFC 300	 OPTIFLUX 5000 + IFC 300	 OPTIFLUX 6000 + IFC 300
±0.2 % of measured value	±0.15 % of measured value	±0.15 % of measured value	±0.2 % of measured value
≥1 µS/cm (water ≥20 µS/cm)	≥1 µS/cm (water ≥20 µS/cm)	≥1 µS/cm (water ≥20 µS/cm)	≥1 µS/cm (water ≥20 µS/cm)
Solid content max. 30 %	Solid content max. 30 %	Solid content max. 30 %	Solid content max. 30 %
Current, Pulse, Status	Current, Pulse, Status	Current, Pulse, Status	Current, Pulse, Status
Binary	Binary	Binary	Binary
HART, FF, PA, DP, Modbus	HART, FF, PA, DP, Modbus	HART, FF, PA, DP, Modbus	HART, FF, PA, DP, Modbus
85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC
IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1
OPTIFLUX 4000	**OPTIFLUX 5000 sandwich**	**OPTIFLUX 5000 flange**	**OPTIFLUX 6000**
 OPTIFLUX 4000	 OPTIFLUX 5000	 OPTIFLUX 5000	 OPTIFLUX 6000
DN 2.5 ... 2,000; PN 6 ... 40	DN 2.5 ... 100; PN 16, 40	DN 15 ... 250; PN 10, 16, 40	DN 2.5 ... 150; hygienic connections
1/10 ... 80"; CL 150, 300, 600, 900, 1500	3/8 ... 4"; CL 150, 300	1/2 ... 10"; CL 150, 300	1/10 ... 6"; hygienic connections
-40 ... 180 °C; -40 ... 356 °F	-60 ... 180 °C; -76 ... 356 °F	-60 ... 180 °C; -76 ... 356 °F	-40 ... 180 °C; -40 ... 356 °F
-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F
PFA, PTFE, ETFE and Hard rubber, PU	Aluminium oxide, Zirconium oxide	Aluminium oxide, Zirconium oxide	PFA
Hastelloy C4, Titanium, Tantalum, stainless steel, Platinum, low noise	Cermet	Cermet ≤DN 150/6", stainless steel, HC4, Titanium, Tantalum, Platinum ≥DN 150/6"	Hastelloy C4, stainless steel, Titanium, Tantalum, Platinum
IP66, 67, 68; NEMA4, 4X, 6, 6P	IP66, 67, 68; NEMA4, 4X, 6, 6P	IP66, 67, 68; NEMA4, 4X, 6, 6P	IP66, 67, 68; NEMA4, 4X, 6, 6P
EEx, FM, CSA	EEx, FM, CSA	EEx, FM, CSA	EEx, FM, CSA
FDA, OIML R49, R117, KIWA, MI-001, MI-005	FDA, MI-005	FDA, MI-005	FDA, 3A, EHEDG, MI-005

The specialists

	For partially filled pipelines	The battery powered water meter
	TIDALFLUX 4110 PF	**WATERFLUX 3070**
		
Signal converter	**IFC 110**	**IFC 070**
Measuring accuracy	±1 % of measured value	≤0.2 % of measured value
Electrical conductivity	≥50 µS/cm (water ≥50 µS/cm)	>20 µS/cm
Process conditions	Solid content max. 10 %	-
Outputs	Current	Puls, Status
Inputs	Binary	-
Communication	HART	Datalogger/GSM (option)
Power supply	24, 115/120, 230/240 VAC	Battery, 1 or 2 batteries, 15 year battery lifetime
Protection category	IP65; NEMA4, 4X	IP66, 67; NEMA4, 4X, 6
Sensor	**TIDALFLUX 4000**	**WATERFLUX 3000**
Process connection		
EN 1092-1	DN 200 ... 1,800; PN 6, 10	DN 25 ... 600; PN 16
ASME B 16.5	8 ... 72"; CL 150, 300	1 ... 24"; CL 150
Temperature range		
Process	-5 ... 60 °C; 23 ... 140 °F	-5 ... +70 °C; 23 ... 158 °F
Ambient	-25 ... 60 °C; -13 ... 140 °F	-40 ... +65 °C; -40 ... 149 °F
Materials		
Liner	Polyurethane	Rilsan®
Electrodes	Hastelloy C4, stainless steel	Stainless steel 1.4301; AISI 304
Protection category		
Sensor	IP66, 67, 68; NEMA4, 4X, 6, 6P	IP66/67/68; NEMA4/4X/6/6P
Approvals		
Ex (with converter)	EEx zone 2	-
Other approvals	-	ACS, DVGW, KTW, NSF, WRc

	The 2-wire device that performs like a 4-wire device	For volumetric filling systems in the beverage industry
	OPTIFLUX 4040 C	BATCHFLUX 5500
		
Signal converter	**IFC 040**	**IFC 500**
Measuring accuracy	±0.5 % of measured value	±0.2 % of measured value
Electrical conductivity	≥5 µS/cm (water ≥20 µS/cm)	≥5 µS/cm (water ≥20 µS/cm)
Process conditions	Solid content max. 3 %	Water ... milk
Outputs	Current	Frequency
Inputs	-	-
Communication	HART	-
Power supply	14 ... 36 VDC	24 VDC
Protection category	IP66, 67; NEMA4, 4X, 6	DN 2.5, 4, 6, 25, 40: IP66, 67; NEMA4, 4X, 6 DN 10, 15: IP69K; NEMA6P
Sensor	**OPTIFLUX 4000**	**BATCHFLUX 5000**
Process connection		
EN 1092-1	DN 10 ... 150; PN 16, 25, 40	DN 2.5 ... 40
ASME B 16.5	3/8 ... 6"; CL 150, 300	1/10 ... 1 1/2"
Temperature range		
Process	-25 ... 140 °C; -13 ... 284 °F	-20 ... +140 °C; -4 ... +284 °F
Ambient	-25 ... 60 °C; -13 ... 140 °F	+0 ... 60 °C; +32 ... 140 °F
Materials		
Liner	PTFE, PFA	Zirconium dioxide
Electrodes	Hastelloy, Platinum, stainless steel, Tantalum, Titanium	Cermet
Protection category		
Sensor	IP66, 67; NEMA4, 4X, 6	DN 2.5, 4, 6, 25, 40: IP66, 67; NEMA4, 4X, 6; DN 10, 15: IP69K; NEMA6P
Approvals		
Ex (with converter)	EEx, FM	-
Other approvals	FDA	3A, FDA

Glass devices



DK46, 47, 48, 800
Small and compact
dosing meters

VA40
The sturdy device with
low pressure loss

GA24
For maximum safety
requirements

DK700
The cost-effective
version for the
analytical field

VA45
For measuring gases with
low operating pressures

K20
The cost-effective
plastic alternative

Metal devices

H250 M40
The new
standard device,
explosion proof and
intrinsically safe

H250 M9
The popular
classic

H250 M8M
With space-saving
display

H250 M8E
With illuminated
display and
mA output

DK34
For vertical flows

DK37 M8M
Dosing meter
with large display

DK37 M8E
Dosing meter
with electronic signal output

DK32, 34
Dosing meter for high
pressures and rough
ambient conditions

Variable area flowmeters

Highlights:

- Reliable liquid and gas flow measurement, even without auxiliary energy
- High degree of application certainty, even with extremely small flow volumes
- Best price-to-performance ratio
- Minimal pressure losses
- Modular display and measuring transducer concept
- Excellent long-term stability
- Low maintenance
- Simple installation and start-up
- Approval in accordance with KTA 1401, RCC-E, RCC-M and NPT stamp

Variable area flowmeters

The measuring principle

Flowmeters based on the float principle generally consist of a vertical, conical measuring tube made out of glass, metal or plastic. Inside the tube there is a float whose shape depends on the application and which moves up and down freely. In most flowmeters, the medium to be measured flows from the bottom to the top and lifts the float in the process. At constant flow rates, the float position stabilizes where the lifting force acting on the float (A), the float form drag (W) and the float weight (G) are balanced.

With glass cones, the flow value can be read directly from a scale at the level of the float reading line. When it comes to metal cones, the height of the float is measured and displayed via a magnetic coupling system.

Diagram of VA40

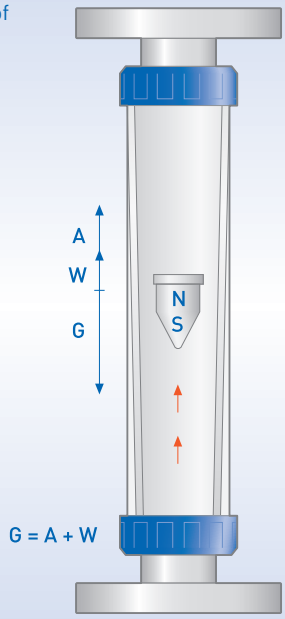
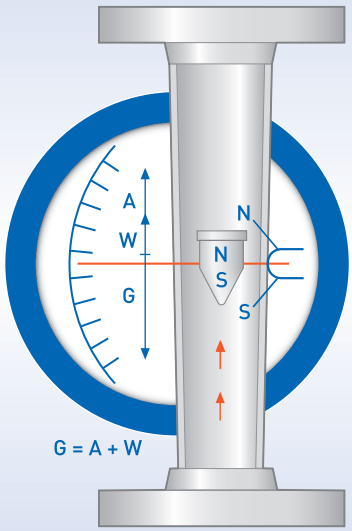


Diagram of H250 M40



Maximum reliability when measuring liquids and gases – Since 1921

Since 1921, the name KROHNE has not only stood for innovative and reliable process measuring technology solutions, but also for exact, reliable and long-lasting variable area measuring technology.

Today, as the world's market leader, we cover a variety of applications with our comprehensive product portfolio of metal, glass and plastic cones.

The range of applications spans from hygienic and aseptic applications for the food industry, the pharmaceutical industry and medical technology, for which the world's only all-metal variable area flowmeter with EHEDG certification is used, right down to usage in the chemical and water industry or industrial forges and furnaces.

We can offer our customers particular expertise in safety-critical areas such as power plants. In such cases, our devices are put to the test in comprehensive test programs.

For over 30 years, KROHNE has been a reliable partner for nuclear power plant operators and system builders. In this field, KROHNE meets the requirements of KTA 1401, RCC-E, RCC-M and ASME Section III. This authorizes us to mark products with the N stamp and NPT stamp.

Industries:

- Mechanical and plant engineering
- Water and wastewater
- Food and beverage
- Chemical
- Pharmaceutical
- Power plants
- Offshore plants
- Petrochemical

Measuring the flow of CO_2 in the inlet lines of the storage tanks at Eckes-Granini

Metal devices

	With space-saving display	With illuminated display and mA output	The popular classic	The new standard device, explosion proof and intrinsically safe
	H250 M8M	H250 M8E	H250 M9	H250 M40
				
Measuring accuracy (VDI/VDE 3513-2)	1.6 %	1.6 %	1.6 %	1.6 %
Outputs	-	4-20mA	4-20mA	4-20mA
Limit switches	2	via HART	2	2
Totalizer	-	via HART	6 digit	8 digit, pulse output
Communication	-	HART	HART, PA	HART, FF, PA
Power supply	-	14.8 ... 30 VDC	12 ... 30 VDC	14 ... 30 VDC, 2-wire operation
Protection category	IP65	IP65	IP65, 67; NEMA4, 4X, 6	IP66, 67; NEMA4, 4X, 6
Process connections				
EN 1092-1	DN 15...150	DN 15...150	DN 15...150	DN 15...150
ASME B16.5	1/2 ... 6"	1/2 ... 6"	1/2 ... 6"	1/2 ... 6"
Threaded	1/2 ... 2" NPT, G 1/2 ... G2	1/2 ... 2" NPT, G 1/2 ... G2	1/2 ... 2" NPT, G 1/2 ... G2	1/2 ... 2" NPT, G 1/2 ... G2
Special	Clamp, aseptic	Clamp, aseptic	Clamp, aseptic	Clamp, aseptic
Pressure ratings				
EN 1092-1	PN 16, 40, 63, 100, 160, 250*	PN 16, 40, 63, 100, 160, 250*	PN 16, 40, 63, 100, 160, 250*	PN 16, 40, 63, 100, 160, 250*
ASME B16.5	CL 150, 300, 600, 900, 1,500*	CL 150, 300, 600, 900, 1,500*	CL 150, 300, 600, 900, 1,500*	CL 150, 300, 600, 900, 1,500*
Process pressure	0 ... 400 bar, optional to 3,000 bar	0 ... 400 bar, optional to 3,000 bar	0 ... 400 bar, optional to 3,000 bar	0 ... 400 bar, optional to 3,000 bar
Measuring ranges				
Water	10 ... 120,000 l/h	10 ... 120,000 l/h	10 ... 120,000 l/h	10 ... 120,000 l/h
Air	0.7 ... 2,800 m^3/h	0.7 ... 2,800 m^3/h	0.7 ... 2,800 m^3/h	0.7 ... 2,800 m^3/h
Temperature ranges				
Process	-80 ... 200 °C; -112 ... 362 °F	-25 ... 200 °C; -13 ... 362 °F	-200 ... 300 °C; -328 ... 572 °F	-200 ... 300 °C; -328 ... 572 °F
Ambient non-Ex	-40 ... 70 °C; -40 ... 128 °F	-20 ... 70 °C; -4 ... 128 °F	-40 ... 120 °C; -40 ... 248 °F	-40 ... 120 °C; -40 ... 248 °F
Ambient Ex	-40 ... 60 °C; -40 ... 140 °F	-20 ... 60 °C; -4 ... 140 °F	-40 ... 60 °C; -40 ... 140 °F	-40 ... 60 °C; -40 ... 140 °F
Materials				
Wetted parts	Stainless steel, Hastelloy C4, Titanium, Monel, ceramic, PTFE	Stainless steel, Hastelloy C4, Titanium, Monel, ceramic, PTFE	Stainless steel, Hastelloy C4, Titanium, Monel, ceramic, PTFE	Stainless steel, Hastelloy C4, Titanium, Monel, ceramic, PTFE
Display	PPS	PPS	Die cast aluminium, polyurethane coating or stainless steel	Die cast aluminium, polyurethane coating or stainless steel
Approvals				
Ex	ATEX, NEPSI	ATEX, NEPSI	ATEX, NEPSI, FM	ATEX, IEC-EX, FM, FM-C, NEPSI
Hygiene	EHEDG	EHEDG	EHEDG	EHEDG

	Dosing meter for high pressures and rough ambient conditions	Dosing meter with large display	Dosing meter with electronic signal output
	DK32, 34	DK37 M8M	DK37 M8E
			
Measuring accuracy (VDI/VDE 3513)	4.0 %	2.5 %	2.5 %
Outputs	-	-	4-20mA
Limit switches	2	2	via HART
Totalizer	-	-	via HART
Communication	-	-	HART
Power supply	-	-	14.8 ... 30 VDC
Protection category	IP65	IP65	IP65
Process connections			
Connections	1/4" NPT, 1/2" NPT, G 1/4, cutting clamp, clamping ring, hose connections*	1/4" NPT, 1/2" NPT, G 1/4, cutting clamp, clamping ring, hose connections*	1/4" NPT, 1/2" NPT, G 1/4, cutting clamp, clamping ring, hose connections*
Flange adapter	DN 15, 25, 1/2-1"	DN 15, 25, 1/2-1"	DN 15, 25, 1/2-1"
Pressure ratings			
EN 1092-1	PN 40*	PN 40*	PN 40*
ASME B16.5	CL 150, 300*	CL 150, 300*	CL 150, 300*
Process pressure	130 bar, optional to 500 bar	130 bar, optional to 500 bar	130 bar, optional to 500 bar
Measuring ranges			
Water	3 ... 150 l/h	3 ... 150 l/h	3 ... 150 l/h
Air	16 ... 4,800 l/h	16 ... 4,800 l/h	16 ... 4,800 l/h
Temperature ranges			
Process	-80 ... 150 °C; -112 ... 302 °F	-40 ... 150 °C; -40 ... 302 °F	-25 ... 135 °C; -13 ... 275 °F
Ambient non-Ex	-20 ... 70 °C; -4 ... 128 °F	-40 ... 70 °C; -40 ... 128 °F	-20 ... 70 °C; -4 ... 128 °F
Ambient Ex	-20 ... 60 °C; -4 ... 140 °F	-40 ... 60 °C; -40 ... 140 °F	-20 ... 60 °C; -4 ... 140 °F
Materials			
Wetted parts	Stainless steel, Titanium, Monel, Hastelloy	Stainless steel, Titanium, Monel, Hastelloy	Stainless steel, Titanium, Monel, Hastelloy
Display	Die cast aluminium, polyurethane coating	PPS	PPS
Approvals			
Ex	ATEX, NEPSI	ATEX, NEPSI	ATEX, NEPSI
Hygiene	-	-	-

*others on request

Glass devices

	Small and compact design	The cost-effective version for the analytical field	The rugged device with low pressure loss
	DK46, 47, 48, 800	DK700	VA40
			
Measuring accuracy (VDI/VDE 3513)	1.0; 2.5; 4.0 %	4.0; 6.0 %	1.0 %
Outputs	-	-	-
Limit switches	2	-	2
Totalizer	-	-	-
Communication	-	-	-
Power supply	-	-	-
Protection category	-	-	-
Process connection			
Connections	1/4" NPT, G 1/4", cutting clamp, clamping ring, hose connections*	G 1/8", hose connections	Threaded, flange, hose connectoions, hygienic design
Pressure ratings			
EN 1092-1	-	-	PN 40
ASME B16.5	-	-	CL 150
Process pressure	4 ... 10 bar	1 ... 4 bar	7 ... 10 bar
Measuring ranges			
Water	0.4 ... 160 l/h	0.25 ... 40 l/h	0.4 ... 10,000 l/h
Air	0.5 ... 5,000 l/h	0.5 ... 1,000 l/h	0.007 ... 310 m^3/h
Temperature ranges			
Process	-5 ... 100 °C; -23 ... 212 °F	-5 ... 100 °C; -23 ... 212 °F	-20 ... 100 °C; -4 ... 212 °F
Ambient non-Ex	-20 ... 100 °C; -4 ... 212 °F	-20 ... 100 °C; -4 ... 212 °F	-20 ... 100 °C; -4 ... 212 °F
Ambient Ex	-20 ... 70 °C; -4 ... 128 °F		-20 ... 85 °C; -4 ... 185 °F
Materials			
Measuring cone	Borosilicate glass	Borosilicate glass	Borosilicate glass
Process connection	Stainless steel, brass, PVDF	PVDF	Stainless steel, PVDF
Approvals			
Ex	ATEX	-	ATEX
Hygiene	-	-	-

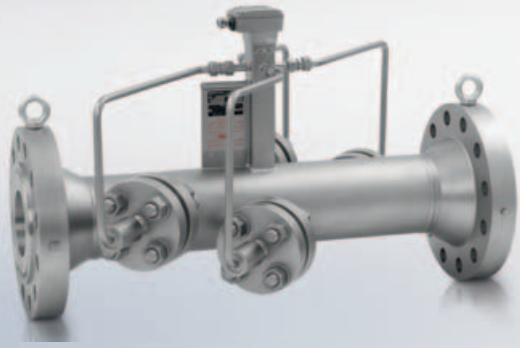
*others on request

	For measuring gases with low operating pressures	For maximum safety require-ments	The cost-effective plastic alternative
	VA45	GA24	K20
			
Measuring accuracy (VDI/VDE 3513)	2.5 %	1.0 %	+/- 2.5 % full scale
Outputs	-	-	-
Limit switches	-	2	-
Totalizer	-	-	-
Communication	-	-	-
Power supply	-	-	-
Protection category	-	-	-
Process connection			
Connections	Threaded, flange, hose connections	Flange DN 15 ... 50 1/2 ... 2" ASME	Threaded G 1/2 ... 2"
Pressure ratings			
EN 1092-1	-	PN 40	-
ASME B16.5	-	CL 150	-
Process pressure	1 bar	7 ... 10 bar	2 ... 12 bar
Measuring ranges			
Water	-	0.4 ... 10,000 l/h	0.65 ... 25,000 l/h
Air	150 ... 60,000 l/h	0.007 ... 310 m^3/h	-
Temperature ranges			
Process	-20 ... 100 °C; -4 ... 212 °F	-40 ... 120 °C; -40 ... 248 °F	-20 ... 100 °C; -4 ... 212 °F
Ambient non-Ex	-20 ... 100 °C; -4 ... 212 °F	-20 ... 100 °C; -4 ... 212 °F	-20 ... 100 °C; -4 ... 212 °F
Ambient Ex	-	-	-
Materials			
Measuring cone	Borosilicate glass	Borosilicate glass	Polysulphone
Process connection	Stainless steel	Steel plate galvanized and coated	Polysulphone
Approvals			
Ex	-	ATEX	-
Hygiene	-	-	-

Process measuring technology

OPTISONIC 7300
Universal 2-beam device for inline measurement of process gases

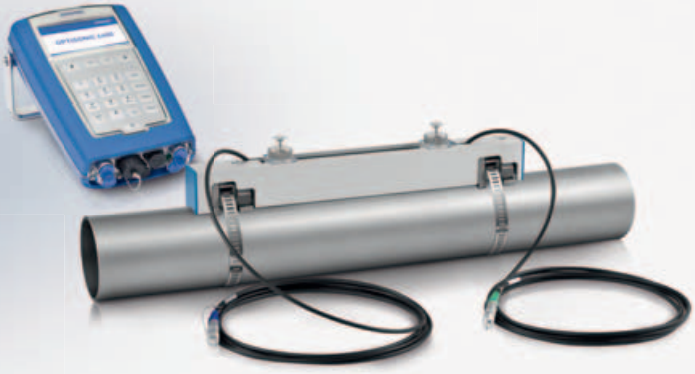
UFM 3030
Universal 3-beam device for inline measurement of liquids



UFM 530 HT
Rugged 2-beam high-temperature device for extreme process conditions

OPTISONIC 8300
Universal 1 or 2-beam device for inline measurement of overheated steam

OPTISONIC 6300
Flexible clamp-on device with industrial clamp-on mechanism



OPTISONIC 6400
Portable clamp-on device

Custody transfer

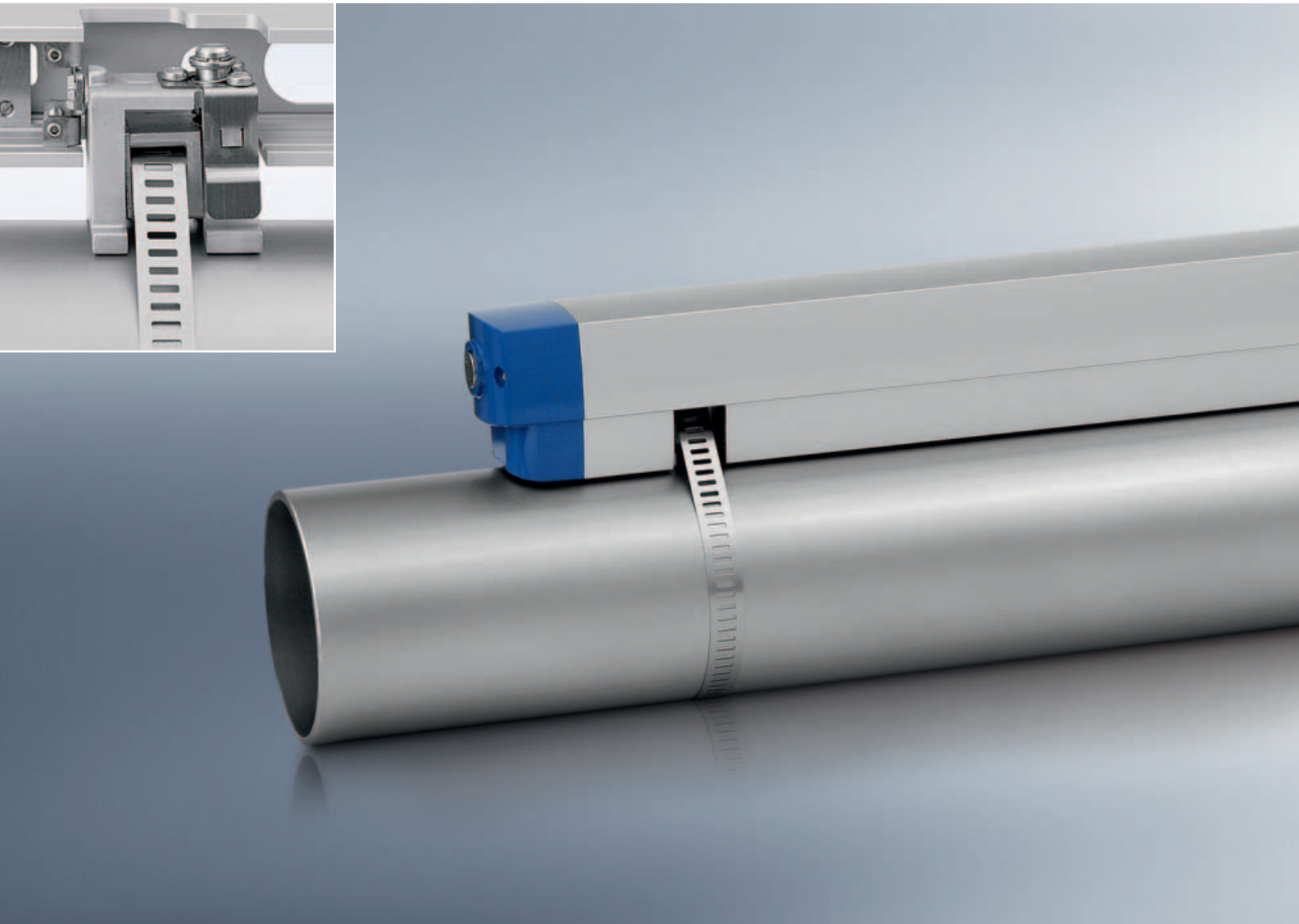
ALTOSONIC III
Cost-effective 3-beam device to measure light products for custody transfer

ALTOSONIC V12
12-beam device for measuring gas for custody transfer

ALTOSONIC V
5-beam device for measuring crude oil and crude oil products for custody transfer

Ultrasonic flowmeters

UFC 300 W



User-friendliness redefined

Ultrasonic clamp-on flowmeters: no training, no special tools, no open issues

Whether it's installation, commissioning, calibration or maintenance, KROHNE is the first manufacturer of ultrasonic clamp-on flowmeters to comprehensively deal with and redefine the topic of user-friendliness.

For the OPTISONIC 6300 ultrasonic flowmeter, for example, it takes just 15 minutes from installation to complete commissioning of the device.

This is due not only to the simple installation using patented clamping devices requiring no special tools but also to the signal measuring transducers pre-installed on the rail at the factory.

And commissioning the OPTISONIC 6300 is as simple as it is safe. After being switched on for the first time, the electronic unit carries out an automatic self test. The preset parameters cover 90 % of all applications.

An intelligent installation assistant now guides the user step by step through the program – and simultaneously provides support during optimization of the flow measurement.

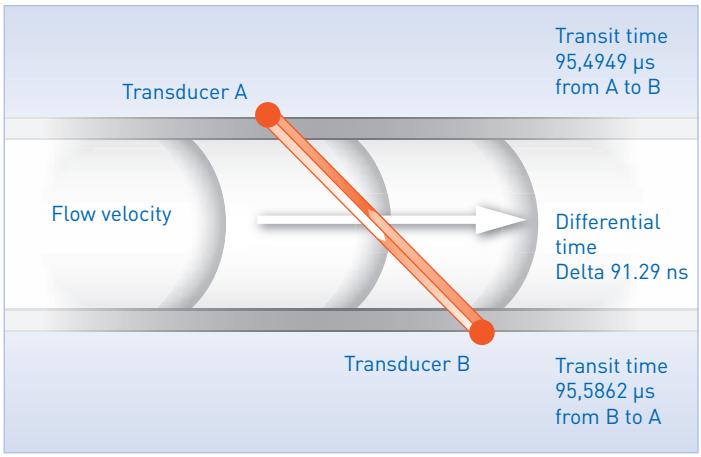
Ultrasonic flowmeters

Highlights:

- Maximum accuracy and reproducibility regardless of media properties such as viscosity, temperature, density and electrical conductivity
- No moving parts or components that protrude into the measuring tube
- Low operating costs due to non-wearing parts and maintenance-free status
- Excellent long-term stability, no recalibration
- High degree of reliability thanks to several redundant measuring paths

The measuring principle

KROHNE ultrasonic flowmeters are based on the time-of–flight method. This method consists of two diagonally opposed ultrasonic sensors which function alternately as transmitters and receivers. The sound signal alternately emitted from both is at once accelerated by the flow and slowed down against the flow. The difference in the time the signal requires to travel the measured sections is directly proportional to the mean flow rate from which the volumetric flow can then be calculated. Through the use of several ultrasonic paths, flow profile aberrations can be compensated.



Crude oil measurements with the UFM 3030 for the PCK

Standard in the process industry: Benchmark for custody transfer

Whether liquid or gaseous, aggressive or corrosive: KROHNE ultrasonic flowmeters measure a wide range of media.

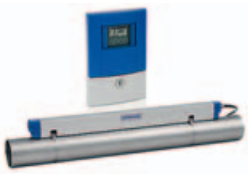
In 1997, KROHNE introduced the ALTOSONIC V, the first high precision, calibratable ultrasonic flowmeter for the petroleum industry. The ALTOSONIC V's five measuring paths can perform extremely precise and reproducible measurements regardless of the viscosity of the medium – a real quantum leap.

As the world's leader in the field of ultrasonic inline flowmeters, our devices are at home in a wide range of industries. Whether it's measuring cooling water and demineralized water in power plants, controlling dosing and mixing processes in the chemical industry or measuring liquid hydrocarbons in the oil and gas industry, you can put your absolute trust in KROHNE ultrasonic flowmeters in any situation.

Industries:

- Oil and gas
- Petrochemical
- Chemical
- Cold and hot water
- Heating, Ventilation & Air Conditioning (HVAC)
- Power plants
- Semi-conductors

Process measuring technology

	Flexible clamp-on device with clamping mechanism suitable for industry	Portable clamp-on device	Universal 3-beam device for inline measurement of liquids	Rugged 2-beam high-temperature device for extreme process conditions
	OPTISONIC 6300	OPTISONIC 6400	UFM 3030	UFM 530 HT
				
Signal converter	UFC 300	UFC 400	UFC 030	UFC 030
Measuring accuracy	±1.0 % of measured value	±1.0 % of measured value	±0.5 % of measured value	±1.0 % of measured value
Process conditions	Liquids with max. 5 % solid content and max. 2 % gas content	Liquids with max. 5 % solid content and max. 2 % gas content	Liquids with max. 5 % solid content and max. 2 % gas content	Liquids with max. 5 % solid content and max. 1 % gas content
Outputs	Current, Pulse, Status	Current, Pulse, Status	Current, Pulse, Status	Current, Pulse, Status
Inputs	Binary	2x0(4)-20 mA	Binary, mA (temp., pressure)	Binary, mA (temp., pressure)
Communication	HART	USB slave, HART	HART, Profibus PA	HART, Profibus PA
Power supply	85 ... 250 VAC; 20.5 ... 26 VAC/DC	Battery power	100 ... 240 VAC; 24 VAC/DC	100 ... 240 VAC; 24 VAC/DC
Protection category: Compact (C) Field (F) Wall (W)	- IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X	- IP65 -	IP67; NEMA6 IP65; NEMA4, 4X -	- IP65, NEMA4, 4X -
Sensor	OPTISONIC 6000	OPTISONIC 6000	UFS 3000	UFS 500 HT
Process connection				
EN 1092-1	DN 15 ... 4,000	DN 15 ... 4,000	DN 25 ... 3,000; PN 10 ... 100	DN 25 ... 80; 100 ... 150; 200 ... 300; PN 10, 16, 40
ASME B 16.5	1/2 ... 160"	1/2 ... 160"	1 ... 120"; CL 150 ... 1,500	1 ... 12"; CL 150
Temperature range				
Process	-40 ... 120 °C; -40 ... 248 °F	-40 ... 120 °C; -40 ... 248 °F	-25 ... 220 °C; -13 ... 428 °F	-25 ... 500 °C; -274 ... 932 °F
Ambient (incl. converter)	-40 ... 60 °C; -40 ... 140 °F	-20 ... 55 °C; -4 ... 131 °F	-40 ... 65 °C; -13 ... 149 °F	-40 ... 65 °C; -13 ... 149 °F
Materials				
Measuring tube, flange	Sensor in aluminium, stainless steel	Sensor in aluminum	Steel, stainless steel, HC4, Duplex	Stainless steel, steel, Duplex, Inconel
Protection category				
Sensor	IP67; NEMA6	IP67; NEMA6	IP65, 67, 68; NEMA4, 4X, 6, 6P	IP65; NEMA4, 4X
Approvals				
Ex	ATEX, FM, CSA, NEPSI	-	ATEX, FM, CSA, NEPSI	ATEX, FM, CSA
Custody transfer	-	-	EN 1434, MI-004	-

Custody transfer

Universal 2-beam device for inline measurement of process gases	Universal 1 or 2-beam device for inline measurement of over-heated steam	12-beam device for measurement of gases for custody transfer	Cost-effective 3-beam device to measure light products for custody transfer	5-beam device for measurement of petro-leum and petroleum products for custody transfer
OPTISONIC 7300	**OPTISONIC 8300**	**ALTOSONIC V12**	**ALTOSONIC III**	**ALTOSONIC V**
				
GFC 300	**GFC 300**	**GFC V12**	**UFC III**	**UFC-V / UFP-V**
Air calibration (atmospheric): 2 ... 2.5": ±2 %; 3 ... 24": ±1 %	High pressure calibration with natural gas: 4": ±1.5 %; 6 ... 24": ±1.0 %	±0.2 % of measured value, ±0.1 % following linea-rization through flow computer	±0.20 % of measured value, turndown ratio 1:20	±0.15 % of measured value, turndown ratio 1:10; ±0.20 % of measured value, turndown ratio 1:50
Process gases	Overheated steam	Natural gas	Single-phase hydrocar-bons	Multi-phase hydrocarbons, viscosity 0.1 ... 400 cSt higher values on request
Current, Pulse, Status	Current, Pulse, Status	4 x digital		4 x digital, 1 x analogue
2 x 4-20 mA, active	2 x 4-20 mA, active	-	-	6 x digital, 16 x analogue
HART, Modbus (Profibus, FF pending)	HART, Modbus (Profibus, FF pending)	Modbus 2 x RS 485	-	Modbus RS 422/485
85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC	24 VDC	100 ... 240 VAC; 24 VAC/DC	100 ... 240 VAC; 24 VAC/DC
IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X	- IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X	IP66 - -	IP67; NEMA6 - -	IP65, 67; NEMA4, 6 - -
OPTISONIC 7000	**OPTISONIC 8000**	**ALTOSONIC V12**	**ALTOSONIC III**	**ALTOSONIC V**
DN 50 ... 600; PN 10, 16, 40	-	-	-	-
2 ... 24"; CL 150 ... 900	4 ... 24"; CL 150 ... 600	4 ... 64"; Cl 150 ... 2,500"	2 ... 40"; CL 150 ... 1,500"	4 ... 40"; CL 150 ... 1,500"
-40 ... 180 °C; -40 ... 356 °F	100 ... 540 °C; 212 ... 1,004 °F	-50 ... 80 °C; -58 ... 175 °F	-200 ... 250 °C; -328 ... 428 °F	-200 ... 250 °C; -328 ... 428 °F
-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 150 °F	-40 ... 70 °C; -13 ... 149 °F	-55...60 °C; -67...140 °F
Steel, stainless steel, Hastelloy C, Duplex	Steel, stainless steel, Hastelloy C, Duplex	LT carbon steel, stainless steel + Duplex optional	Stainless steel	Steel, stainless steel, Hastelloy C4, Duplex
IP67; NEMA6	IP67; NEMA6	IP66	IP67; NEMA6	IP65, 67; NEMA4, 6
ATEX; pending: FM, CSA, NEPSI	-	ATEX, FM, CSA, IECEx	ATEX, FM, CSA, IECEx	ATEX, FM, CSA, IECEx
-	-	OIML R137, MID, AGA 9, ISO 17089	MID 005, 2004/22/EC, OIML R-117-1 class 0.3, Gosstandard	OIML R-117

The modular product line

MFC 300 R

MFC 300 W

MFC 300 F

MFC 300 C

OPTIMASS 1000
The standard device with an
excellent price-performance-ratio

OPTIMASS 3000
Suitable for
extremely low flow rates

OPTIMASS 2000
The first choice for bulk flows
for custody transfer

OPTIMASS 7000
The high-end solution featuring
a straight measuring tube

OPTIMASS 8000
For process temperatures
from -220 ... 230 °C

The specialists

OPTIGAS 5010
Specially designed for CNG and
LPG in dispensing systems

OPTIBATCH 4011
Specially designed for linear
and rotating filling machines

Mass flowmeters

Mass flowmeters: The cost-effective solution for high-end technology

When it comes to Coriolis mass flowmeters, excellent measuring technology should not be a question of budget. That's why our engineers have developed a cost-effective device, the OPTIMASS 1300, with a whole series of features normally reserved for high-tech devices.

The experience gained from the OPTIMASS 7000 series was naturally included in development. Which means that there are no longer any special installation regulations for the OPTIMASS 1300. Another highlight is definitely the diagnostics platform, which is unique in this class of device. It not only monitors the device itself but also the process and the process environment.

Within the system, the diagnostics software monitors such things as the process temperature and a series of auxiliary values such as the driver unit power, in order to ultimately come to a conclusion as to the status of the respective medium. The OPTIMASS can even generate warning messages when a certain proportion of gas bubbles or solids is exceeded, providing valuable information about the process itself

What about data security? It's twice as secure. Device parameters and calibration data are stored once in the sensor electronics and once in the converter. That means that in the event of a failure, the electronics can simply be replaced without any loss of data.


MFC 300
+ 1.308
KROHNE

Highlights:

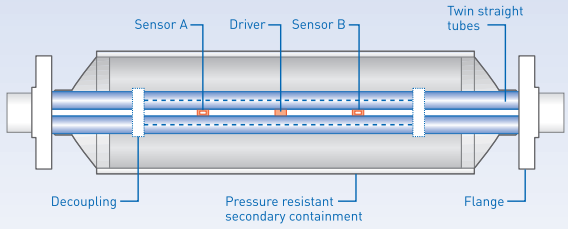
- Measurement of mass flow, density and temperature as well as calculation of volume flow and mass or volume concentration with a single device
- Complete line of measurement devices for a variety of applications
- Not susceptible to effects of installation: Can be installed regardless of type of installation and external influences such as tube vibrations
- OPTIMASS is the only straight tube measuring device for use when custody transfer is required in the highest OIML accuracy class of 0.3
- Electronics for all sensors, the modular design guarantees quick and easy replacement of electronics and/or sensors
- Reliable measurement even for problematic applications such as highly viscous media, inhomogeneous mixtures, media with solid content or gas inclusions
- From 0.00015 to 2,300 t/h flow
- Up to a process temperature of 230 °C
- Pressure-resistant jacket up to 100 bar
- Easily drained and easy to clean
- Patented Adaptive Sensor Technology (AST) for maximum reliability in measuring results
- Minimal pressure loss with straight tube measuring devices = low power consumption
- OPTIMASS 7000 for highly sensitive media as well as media with low flow speed
- Rapid signal processing even with media and temperature changes and sudden changes in density
- Superior density accuracy, even during rapid changes in temperature; excellent zero-point stability
- OPTIMASS 2000 with integrated pressure compensation for measuring bulk flow rates
- OPTIBATCH – ideal for linear and rotating filling machines

Mass flowmeters

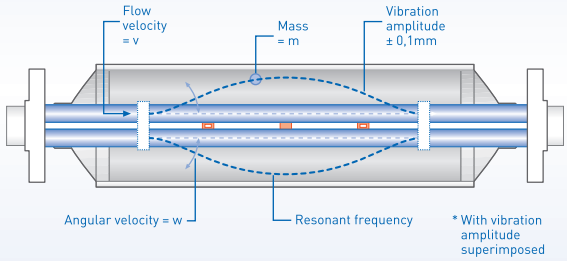
The measuring principle

The function of mass flowmeters is based on the Coriolis principle. The mass flow rate of liquids and gases can be calculated from the deformation of the measuring tube caused by the flow. The media density can also be derived from the resonance frequency of the vibrating tube. Two sensor coils are used to calculate the Coriolis effect. If there is no flow, both sensors record the same sinusoidal signal. Once a flow begins, the Coriolis force acts on the flowing mass particles of the medium and causes the measuring tube to deform, resulting in a phase shift between the sensor signals. The sensors measure the phase shift of the sinusoidal vibrations. This phase shift is directly proportional to the mass flow.

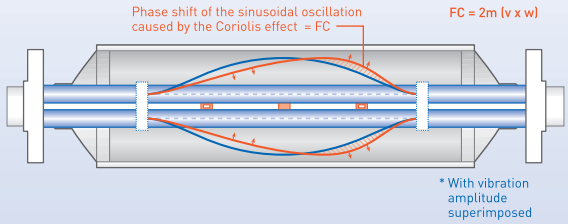
Diagram of OPTIMASS 1000



Sympathetic vibration without flow*



Phase shift with flow*



Superior accuracy – Even with quick temperature and media changes

Just how accurate and reliable a mass flowmeter actually is becomes obvious when constant parameters such as medium, temperature or density undergo sudden changes. The OPTIMASS series from KROHNE sets standards in this regard as well:

With the new, sensor-oriented preprocessing electronics package, used for all OPTIMASS sensors, analogue signal processing takes place directly at the sensor, which means faster and more accurate signal analysis – and therefore excellent measuring performance. The result is that the electronic system is extremely insensitive to disturbances, even with very high flow rates, changes in medium and temperature or jumps in density and follows the flow quickly and accurately.

The storing of all device parameters and calibration data is doubly secure. It is stored once in the sensor electronics itself and once in the converter. That means there is no need to reparameterize following a change of measuring transducer or sensor.

Industries:

- Chemical
- Pharmaceutical
- Food
- Oil and gas
- Petrochemical
- Pulp and paper
- Mining and minerals
- Power plants
- Water and wastewater

OPTIMASS in the dosing process at Jass

The modular product line

	The standard device with an excellent price-to-performance-ratio	The first class solution for bulk measurement	Suitable for extremely low flow rates
	OPTIMASS 1010	**OPTIMASS 2000**	**OPTIMASS 3010**
Measuring accuracy	Liquid: ±0.15 %; Gas: ±0.5 %; Density: ±2 kg/m³	Liquid: ±0.1 %; Gas: ±0.5 %; Density: ±2 kg/m³ (±0.5 kg/m³)	Liquid: ±0.1 %; Gas: ±0.5 %; Density: ±2 kg/m³
Communication	Modbus	Modbus	Modbus
Power supply	12 VDC	12 VDC	12 VDC
Protection category	IP67; NEMA4X	IP67; NEMA4X	IP67; NEMA4X
	OPTIMASS 1300	**OPTIMASS 2300**	**OPTIMASS 3300**
	 OPTIMASS 1000 + MFC 300	 OPTIMASS 2000 + MFC 300	 OPTIMASS 3000 + MFC 300
Measuring accuracy	Liquid: ±0.15 %; Gas: ±0.5 %; Density: ±2 kg/m³	Liquid: ±0.1 %; Gas: ±0.5 %; Density: ±2 kg/m³ (±0.5 kg/m³)	Liquid: ±0.1 %; Gas: ±0.5 %; Density: ±2 kg/m³
Outputs	Current, Pulse, Status	Current, Pulse, Status	Current, Pulse, Status
Inputs	Binary	Binary	Binary
Communication	HART, FF, PA, DP, Modbus	HART, FF, PA, DP, Modbus	HART, FF, PA, DP, Modbus
Power supply	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC
Protection category: Compact (C) Field, separate (F) Wall (W) Rack (R)	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1
Sensor	**OPTIMASS 1000**	**OPTIMASS 2000**	**OPTIMASS 3000**
	 OPTIMASS 1000	 OPTIMASS 2000	 OPTIMASS 3000
Nominal sizes			
Device, EN 1092-1	DN 15 ... 50	DN 100 ... 250	DN 1 ... 4
Connection EN 1092-1	DN 15 ... 100	DN 100 ... 300	DN 15
Device, ASME B16.5	1/2 ... 2"	4 ... 10"	1/25 ... 4/25"
Connection ASME B16.5	1/2 ... 4"	4 ... 12"	1/2"
Screw-on connector NPT	-	-	1/4"
Pressure rating EN 1092-1	PN 40, 63, 100	PN 40, 63, 100, 160	PN 40, 63
Pressure rating ASME B16.5	CL 150, 300, 600	CL 150, 300, 600, 900, 1.500	CL 150, 300, 600
Secondary pressure containment	100 bar	40 bar (burst prev >100 bar)	30 bar
Process temperature	-40 ... 130 °C; -40 ... 266 °F	-40 ... 130 °C; -49 ... 266 °F	-40 ... 150 °C; -40 ... 300 °F
Ambient temperature	-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F
Sensor materials	Stainless steel	Stainless steel	Stainless steel, Hastelloy C 22
Protection category sensor	IP67; NEMA4X	IP67; NEMA4X	IP67; NEMA4X
Ex-Approvals	ATEX, FM, CSA, NEPSI	ATEX, FM, CSA, NEPSI	ATEX, FM, CSA, NEPSI
Hygiene	3A, ASME Bioprocessing	3A, ASME Bioprocessing	-
Custody transfer	-	PTB, NMI, NTEP,MID 2004/22/EC	-
Medium			
Water	x	x	x
Other liquids	x	x	x
Slurries	x	x	-
Gases	x	x	x

The specialists

The high-end solution featuring a straight measuring tube	For process temperatures from -220 ... 230 °C
OPTIMASS 7010	**OPTIMASS 8010**
Liquid: ±0.1 %; Gas: ±0.5 %; Density: ±2 kg/m³ (±0.5 kg/m³)	Liquid: ±0.1 %; Gas: ±0.5 %; Density: ±2 kg/m³ (±0.5 kg/m³)
Modbus	Modbus
12 VDC	12 VDC
IP67; NEMA4X	IP67; NEMA4X
OPTIMASS 7300	**OPTIMASS 8300**
 OPTIMASS 7000 + MFC 300	 OPTIMASS 8000 + MFC 300
Liquid: ±0.1 %; Gas: ±0.5 %; Density: ±2 kg/m³ (±0.5 kg/m³)	Liquid: ±0.1 %; Gas: ±0.5 %; Density: ±2 kg/m³ (±0.5 kg/m³)
Current, Pulse, Status	Current, Pulse, Status
Binary	Binary
HART, FF, PA, DP, Modbus	HART, FF, PA, DP, Modbus
85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC
IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1	IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP65; NEMA4, 4X IP20; NEMA1
OPTIMASS 7000	**OPTIMASS 8000**
 OPTIMASS 7000	 OPTIMASS 8000
DN 6 ... 80	DN 15 ... 100
DN 10 ... 100	DN 15 ... 150
1/4 ... 3"	1/2 ... 4"
1/2 ... 4"	1/2 ... 6"
-	-
PN 40, 63, 100	PN 40, 63, 100
CL 150, 300, 600	CL 150, 300, 600, 900, 1.500
100 bar	-
-40 ... 150 °C; -40 ... 302 °F	-220 ... 230 °C; -364 ... 440 °F
-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F
Stainless steel, Hastelloy C22, Titanium, Tantalum	Stainless steel
IP67; NEMA4X	IP67; NEMA4X
ATEX, FM, CSA, NEPSI	ATEX, FM, CSA
EHEDG, 3A, ASME Bioprocessing	-
PTB, NMI, NTEP, MID 2004/22/EC	-
x	x
x	x
x	x
x	x

Specially designed for linear and rotating filling machines	Specially designed for CNG and LPG in dispensing systems
OPTIBATCH 4011	**OPTIGAS 5010**
Liquid: Mass: ±0.15 % Volume: ±0.2 %	Liquid: ±0.5 % per batch; Gas: ±0.5 % per batch
Modbus (configuration)	Modbus
24 VDC	12 VDC
IP67; NEMA6	IP67; NEMA4X
OPTIBATCH 4011	**OPTIGAS 5050 / 5051**
	
Liquid: Mass: ±0.15 % Volume: ±0.2 %	Liquid: ±0.5 % per batch; Gas: ±0.5 % per batch
Pulse	Current, Pulse, Status
-	Binary
Modbus (configuration)	HART, PA, Modbus
24 VDC	85 ... 250 VAC; 11 ... 31 VDC; 20.5 ... 26 VAC/DC
IP67; NEMA6	IP67; NEMA4X IP67; NEMA4X - -
OPTIBATCH 4000	**OPTIGAS 5000**
DN 10 ... 15	DN 15, 25
-	-
-	1/2", 1"
-	-
-	3/4", 1"
Process pressure: 10 bar	Process pressure: 350 bar static, 300 bar cyclical
-	-
0 ... 100 °C; 32 ... 212 °F	-40 ... 93 °C; -40 ... 200 °F
-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F
Stainless steel	Stainless steel
IP67; NEMA4X	IP67; NEMA4X
-	ATEX, FM, CSA, NEPSI
3A, ASME Bioprocessing, EHEDG	-
-	PTB, NTEP
x	-
x	x (LPG)
-	-
-	x

OPTISWIRL 4070 C Flange
The universal device with
standard integrated temperature
compenstion for saturated steam

OPTISWIRL 4070 C Sandwich
The first vortex flowmeter
with integrated pressure and
temperature compensation

Vortex flowmeters

Highlights:

- Integrated pressure and temperature compensation
- Temperature compensation for saturated steam is a standard feature
- All devices feature 2-wire technology
- Excellent long-term stability thanks to sturdy construction
- High measuring accuracy
- Maintenance-free sensor
- Non-wearing, fully-welded stainless steel construction with high resistance to corrosion, pressure and temperature
- Intelligent Signal Processing (ISP) ensures maximum measurement reliability and stability
- Instantly ready for operation (plug & play)

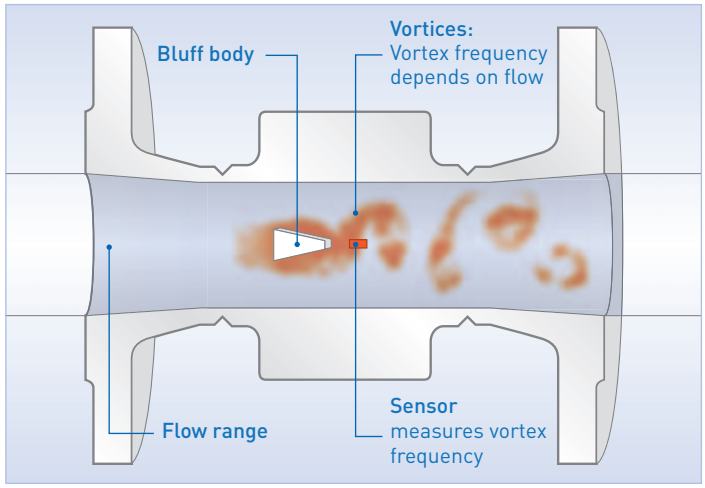
Industries:

- Chemical
- Metal
- Power plants
- Oil and gas
- Petrochemical
- Pulp and paper
- Food and beverage
- Water and wastewater

Vortex flowmeters

The measuring principle

The function of vortex flowmeters is based on the principle of the Karman vortex street. Opposing vortices form behind an object in a stream. The measuring tube contains a bluff body, behind which vortex shedding occurs. The frequency of the vortex shedding is proportional to the flow rate. The shedded vortices are picked up and counted as pressure surges by a piezo crystal in the sensor.



Allrounder with integrated pressure and temperature compensation

Vortex flowmeters are suitable for a wide range of media. This is particularly true of the KROHNE OPTISWIRL: It measures both conducting and non-conducting liquids as well as all industrial gases. It also measures saturated steam and superheated steam, compressed air and nitrogen, liquefied gas and flue gas, demineralized water and boiler feed water, solvents and heat transfer oil.

The OPTISWIRL 4070 even masters fluctuating pressures and temperatures thanks to integrated pressure and temperature compensation.

And to ensure a high degree of certainty and measuring stability in all these applications, each vortex flowmeter is equipped at the factory with a technology exclusively available at KROHNE: Intelligent Signal Processing – or ISP for short – eliminates external interference, thus guaranteeing a safe and exact analysis.

	The universal device with standard integrated temperature compensation for saturated steam	The first vortex flowmeter with integrated pressure and temperature compensation
	OPTISWIRL 4070 C flange	OPTISWIRL 4070 C sandwich
		
Signal converter	VFC 070 C	VFC 070 C
Measuring accuracy	Re > 20000 ±0.75 % for liquids; Re > 20000 ±1 % for gases and steam; 10000 < Re < 20000 ±2 % for liquids, gases and steam	Re > 20000 ±0.75 % for liquids; Re > 20000 ±1 % for gases and steam; 10000 < Re < 20000 ±2 % for liquids, gases and steam
Repeatability	±0.1 %	±0.1 %
Product temperature	-40 ... 240 °C; -40 ... 464 °F	-40 ... 240 °C; -40 ... 464 °F
Outputs	mA, Puls	mA, Puls
Communication	HART	HART
Power supply (Non Ex)	14 ... 30 VDC	14 ... 30 VDC
Power supply (Ex)	14 ... 36 VDC	14 ... 36 VDC
Protection category	IP66, 67	IP66, 67
Sensor	OPTISWIRL 4000 flange	OPTISWIRL 4000 sandwich
Process connection		
EN 1092-1	DN 15 ... 300; PN 16, 25, 40, 63, 100	DN 15 ... 100; PN 16, 25, 40, 63, 100
ASME B 16.5	1/2 ... 12"; CL 150, 300, 600	1/2 ... 4"; CL 150, 300, 600
Temperature range		
Process	-40 ... 240 °C; -40 ... 464 °F	-40 ... 240 °C; -40 ... 464 °F
Ambient (Non Ex)	-40 ... 85 °C; -40 ... 185 °F	-40 ... 85 °C; -40 ... 185 °F
Ambient (Ex)	-40 ... 65 °C; -40 ... 149 °F	-40 ... 65 °C; -40 ... 149 °F
Materials		
Sensor	1.4404/316L, Hastelloy C22	1.4404/316L, Hastelloy C22
Electronics housing	Aluminum	Aluminum
Sensor seal	1.4435/316L, Hastelloy C276	1.4435/316L, Hastelloy C276
Protection category		
Sensor	IP66, 67	IP66, 67
Approvals		
Ex	ATEX II 2G EEx d ia [ia] IIC T6	ATEX II 2G EEx d ia [ia] IIC T6

Measuring principle: Deflector plate

DW 181
With screw-in thread

DW 182
With flanged connection, DN 15 ... 65

DW 183
With flanged connection, DN 65 ... 200

DW 184
Immersion version, A 250

Measuring principle: Electromagnetic

DWM 1000
Monitoring unit with binary output

DWM 2000
Flowmeter with
4 ... 20 mA output

Flow controllers

Highlights DWM 1000–2000:

- Measurement and monitoring of electrically conductive liquids, pastes and suspensions
- Process temperature: -25 °C ... 150 °C
- Operating pressure: 25 bar
- Sturdy construction
- No moving parts, maintenance-free
- Parts in contact with media made of stainless steel and ceramic
- Electronic unit can be replaced while under operating conditions
- For pipelines ≥DN 25/(1")

Electromagnetic switches and flowmeters

The measuring principle

As early as 1832, Faraday tried to determine the speed of the current in the Thames by measuring the voltage induced in flowing water by the earth's magnetic field. Electromagnetic flow measurement is based on Faraday's Law of induction. According to this law, a specific voltage is induced in a conductor or conductive medium that moves through a magnetic field. This voltage is proportional to the speed of movement of the medium.

On electromagnetic flowmeters, the induced voltage is tapped via two measuring electrodes in conducting contact with the medium.

An electronic converter converts the signal into a proportional output signal.

Sturdy and maintenance-free: Flow switch DWM 1000 and flowmeter DWM 2000

Industries:

- Water and wastewater
- Food and beverage
- Chemical
- Pharmaceutical
- Process industry
- Pulp and paper
- Mines and mining
- Steel

As the inventor and founder of the industrially used electromagnetic flow technology, we have been impressing our customers with exemplary innovation for over 45 years.

With the DWM 1000/2000 flow controllers, KROHNE offers its customers two sturdy units.

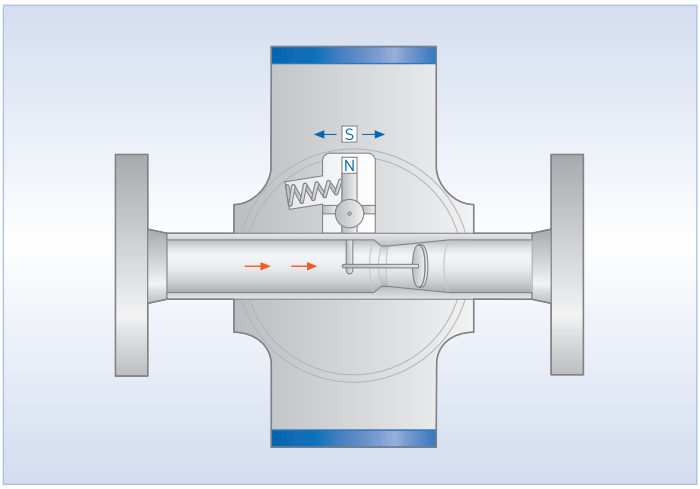
Depending on the design, the flow speed is monitored (DWM 1000) or measured and output via a 4-20 mA (DWM 2000).

The only prerequisite is that the electrical conductivity of the medium be at least 20 µS/cm. DWM 1000 and DWM 2000 switch and flowmeters are ideal for use with largely homogenous liquids, pastes and sludges – even with solid content.

Flow controllers

The measuring principle

With the flow controllers DW 181–184, the fluid flows against a springmounted baffle. The position of the baffle changes with increasing flow. A built-in magnet transmits the position to the display and also activates the limit switch.



Always the right choice: Flow controllers DW 181, 182, 183, and 184

With the flow controllers DW 181, 182, 183 and 184, KROHNE offers the ideal flow control solution for virtually any process connection.

Each device is equipped with a limit switch (dry reed contact) and it is possible to install another switch at any time. For greater switching energies of up to 1200 VA, an additional amplifying relay can be installed.

Maximum freedom, even when it comes to the right display: For the DW 181 to 184 versions, there are two different choices available with the G and A displays.

The G display enables visual monitoring of the flow via a 10-point scale. The switching point can be changed at any point along the way. The A display allows a more accurate reading of the flow value (e.g. in l/h or in m^3/h) via a scale. With this display, the switching points can be set even when there is no flow.

Industries:

- Power plants
- Steel
- Mining
- Petrochemical
- Oil and gas
- Chemical
- Food and beverage
- Water and wastewater

Highlights DW 181–DW 184:

- One or two electric limit switches
- For horizontal or vertical pipelines (DW 181–183)
- Mounting type for horizontal pipelines (DW 184)
- Depending on design, available with screw-type, flange or mounting flange connectors
- Two different flow displays (G and A) to choose from (DW 181–183)
- High-temperature design up to max. 300 °C
- Ex- version (EEx d)
- Tropical version with Amphenol sockets and a double coating of epoxy on device
- Local indication without power supply, can be used as variable area flowmeter

Flow controllers and flowmeters

	Flow controllers based on baffle measuring principle	Flow controller based on electromagnetic measuring principle
	DW 181–184	DWM 1000
		
Measuring accuracy	±15 % of switching point	When v >1 m/s or 3.3 ft/s: accuracy ±5 % of switching point; when v >1 m/s or 3.3 ft/s: accuracy ±1 % of switching point
Repeatability	±3 % of switching point	±1 % of switching point
Limit switches	1 or 2 binary outputs 1 or 2 relay outputs	1 binary output
Output	-	-
Communication	-	-
Power supply	Switching voltage AC: 24, 48, 110, 240 VAC Switching voltage DC: 24, 48, 110 VDC	48 ... 250 VAC 48 ... 250 VDC Relay voltage: 48, 110, 230 VAC; 48, 110 VDC
Protection category	Standard: IP55 High temperature: IP44 EEx d: IP65	IP66, 68; NEMA4, 4X, 6P
Nominal size		
Pipe diameter	≥DN 15 (1/2")	≥DN 25 (1")
Connection	G/ NPT 3/4 ... 2" DN 15 ... 200 1/2 ... 8"	- Std fitting G1A; screw-on welding socket (Ø 39 mm/1.25") - Long sensor (option) G1"1/2; NPT 1"1/2; screw-on welding socket (Ø 60 mm / 2.4") - spool piece (option) DN 25 ... 50 (1 ... 2"); DN 32 (1"1/4) on request - FT Tuchenhagen (option) VARIVENT® Connection
Pressure ratings		
Max. operating pressure	100 bar (1450 psig); more on request	25 bar (360 psig)
Process conditions		
Medium	Homogeneous, clean liquids	Conductive liquids, pastes, slurries ≥20 mS/cm
Viscosity standard	≤30 mPas; 0.02 lb/fts	-
Viscosity special version	≤250 mPas; 0.16 lb/fts	-
Measuring range	0.2 ... 4 m/s; 0.66 ... 13.12 ft/s	0.1 ... 9.9 m/s; 0.3 ... 32.5 ft/s
Temperature ranges		
Process	-40 ... 150 °C; -40 ... 300 °F -25 ... 300 °C; -15 ... 570 °F (high temperature)	-25 ... 150 °C; -13 ... 300 °F -25 ... 60 °C; -13 ... 140 °F (IP68)
Ambient	-40 ... 80 °C; -40 ... 175 °F -25 ... 60 °C; -13 ... 140 °F (high temperature)	-25 ... 60 °C; -13 ... 140 °F
Materials		
Measuring tube	Bronze, stainless steel, steel	Stainless steel, Zirconium
Measuring system	Stainless steel	Electrode: Platinum
Approvals		
Ex	EEx ia, EEx d	-

	Flowmeter based on electromagnetic measuring principle
	DWM 2000
	
Measuring accuracy	when v >1 m/s or 3.3 ft/s: accuracy ±5 % of switching point when v >1 m/s or 3.3 ft/s: accuracy ±1 % of switching point
Repeatability	±1% of measured value
Limit switches	-
Output	4-20 mA, 3-wire
Communication	RS 232
Power supply	12, 24 VDC, 50 mA
Protection category	IP66, 68; NEMA4, 4X, 6P
Nominal size	
Pipe diameter	≥DN 25 (1")
Connection	- Std fitting G1A; screw-on welding socket (Ø 39 mm/1.25") - Long sensor (option) G1"1/2; NPT 1"1/2; screw-on welding socket (Ø 60 mm / 2.4") - spool piece (option) DN 25 ... 50 (1 ... 2"); DN 32 (1"1/4) on request - FT Tuchenhagen (option) VARIVENT® Connection
Pressure ratings	
Max. operating pressure	25 bar (360 psig)
Process conditions	
Medium	Conductive liquids, pastes, slurries ≥20 mS/cm
Viscosity standard	-
Viscosity special version	-
Measuring range	1 ... 8 m/s; 3.3 ... 26.2 ft/s
Temperature ranges	
Process	-25 ... 150 °C; -13 ... 300 °F -25 ... 60 °C; -13 ... 140 °F (IP68)
Ambient	-25 ... 60 °C; -13 ... 140 °F
Materials	
Measuring tube	Stainless steel, Zirconium
Measuring system	Electrode: Platinum
Approvals	
Ex	-

Open for the future

Communication at KROHNE: Open for the future

Industrial automation in the process industry has been undergoing rapid change for the past twenty years. This has also affected industrial measurement technology. Where it was once centralized and largely self-contained structures that dominated, today the pace is set by intelligent, decentralized architectures.

Thus, system concepts in which the products of a variety of manufacturers work harmoniously together are becoming a reality via open, standard interfaces such as HART, PROFIBUS and FOUNDATION FIELDBUS.

KROHNE has been actively following this development for years. Whether we are talking about flow measurement, level measurement, temperature measurement or analytical measuring technology, KROHNE field devices are open for the future. They communicate reliably with controllers, control systems and PCs and can also be used for a variety of control and regulating tasks.

PACTware and all KROHNE DTMs are available free of charge and fully functional without a license. They come with the devices on a CD and can also be downloaded from the KROHNE download center.

Integration is a top priority at KROHNE

But KROHNE field devices are capable of much more. They meet all of the prerequisites for integration into plant asset management systems. And they allow the supplying of serious integration technologies such as DD/EDD and FDT/DTM.

What's so special about FDT/DTM? For the first time, open, bus-independent integration of field technology into the plant asset management system is possible – this is without a doubt a milestone for industrial communication and KROHNE, a longstanding member of PACTware and the FDT group, has played and continues to play a signifi cant role. So it is no wonder hat, we have made DTMs available for our field units with HART and/or PROFIBUS interfaces since the beginning of 2003.

Configure It:
The online platform for everyone

For as long as KROHNE has been in business, our engineers and application technicians have been working hard on the development and testing of groundbreaking technologies.

The result: innovations that greatly exceed statutory requirements. Innovations that give the market a decisive push forwards.

With the Configure It online platform, our customers can tap into these innovations even more easily, faster and more conveniently – 7 days a week, 365 days a year, 24 hours a day.

Maximum functionality and ease of use

Configure It combines maximum functionality with extraordinary ease of use. This is made possible by the intuitive user interface and the very clear structure of navigation within the program.

The result? With Configure It you can configure in just a few steps exactly the product that is optimally suited for your application. Try it for yourself!

By the way: Not only can you order most of our products via Configure It, you can also obtain replacement parts and complete systems.

For more information about Configure It, go to **www.krohne-direct.com**

Calibration from KROHNE: Certainty you can count on

The true quality of a flowmeter becomes apparent when conditions are less than favourable: e.g. extreme fluctuating pressures, vacuum surges, measuring inhomogeneous media or media with a high proportion of solids.

That is why we at KROHNE do everything, starting with the calibration, to ensure that our flowmeters perform impressively, with the highest degree of accuracy, reliability and reproducibility, even under such conditions.

That is why every KROHNE flowmeter is wet-calibrated in a direct comparison of volumes, which is by far the most accurate calibration method. And: calibration is performed using the world's most accurate calibration equipment.

It is no wonder that the accuracy of the KROHNE calibration stations is generally 5 times better than that of the flowmeters to be tested. For our customers, this not only means a maximum degree of certainty, but also guarantees the accuracy information of all flowmeters under reference conditions.

Yet another advantage for our customers: KROHNE calibration stations are certified and regularly inspected to guarantee a constant high level of measurement accuracy.

KROHNE proved:
Expect more – achieve more

Every one of our flowmeters is given a thorough inspection before leaving one of our factories in Germany, Great Britain, the Netherlands, France, Brazil, China, India or Russia.

We call these specific measurements, tests and factory inspections "KROHNE proved". They go well beyond any legal requirements, thus guaranteeing our customers not only compliance with specified technical data but also the precise and reliable use of our devices under extremely difficult conditions.

For example, every electronic component undergoes a whole series of comprehensive temperature change tests.

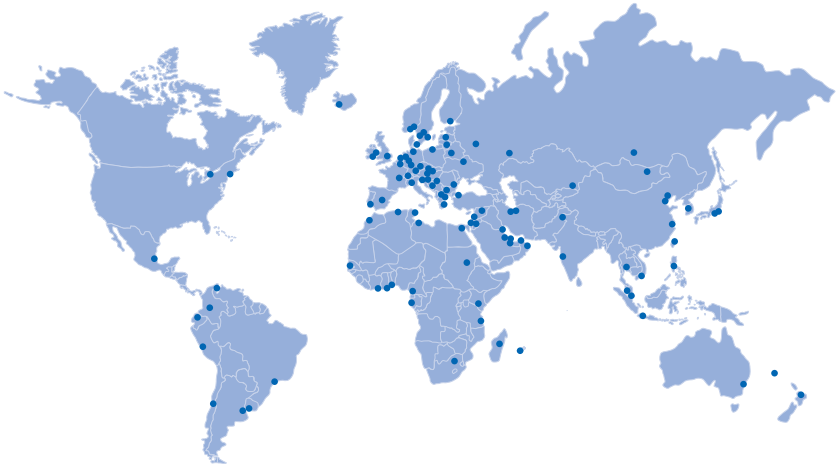
During these tests the components are exposed to cyclical temperature changes of between –20 °C and +60 °C. Breakdowns in the field are thus kept to a minimum.

And we will not budge on these strict tests. After all, we want to be sure that we have a clear picture of the quality and performance capability of the products we offer our customers.

This is the basic principle by which you can measure any device leaving our factory, now and in the future.

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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