



Process instrumentation and Measurement solutions for the food and beverage industry

Overview

ETA Process Instrumentation

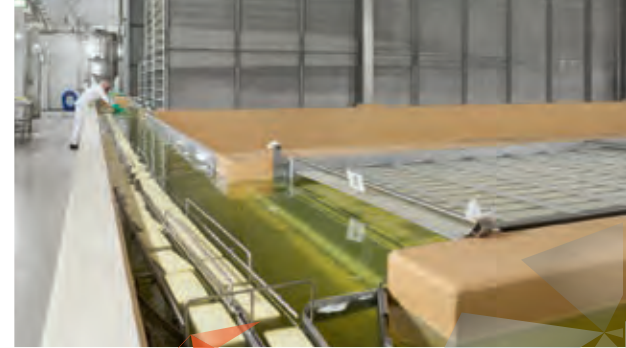
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KROHNE trademarks:

KROHNE
measure the facts
CalSys
CARGOMASTER
EcoMATE
EGM
KROHNE Care
M-PHASE
OPTIBATCH
OPTIBRIDGE
OPTIFLEX
OPTIFLUX
OPTIMASS
OPTISENS
OPTISONIC
OPTISOUND
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VARIVENT®

KROHNE Food & Beverage – Your partner for the right measurement solution

To perform well, you have to be constantly improving. This is particularly true for companies in the food and beverage industry, and for their suppliers. After all, this industry, more than any other, is in a state of constant change and sometimes faces extremely short product life cycles. On top of that, there are strict hygienic and legal regulations that must be adhered to.

KROHNE Food & Beverage is a dedicated expert division that rises to these challenges and offers a whole spectrum of flow, level, temperature and pressure measurement as well as process analysis technology including complete solutions and the pertaining services.

Our extensive range includes measuring devices for storage and interim storage, dosing and mixing, filling and cleaning and utility systems for steam and hot water. We have the right technology for difficult applications such as processing honey and chocolate or measuring the flow of low-conductivity water in mixing stations or hygienic level measurement in product tanks.

KROHNE devices fulfill all international standards. They are 3A and FDA certified, the most important ones are EHEDG registered.

True to the company claim "Measure the facts" the KROHNE Food & Beverage Division supports you to achieve reliable measurement of process variables and clear and precise process diagnostics.

Over 90 years' experience:

1952

The first electromagnetic flowmeter for industrial measurement.

1989

The first FMCW radar level transmitter for process measurement.

1994

The first single straight tube Coriolis mass flowmeter.

1996

Special electromagnetic flowmeter for filling machines.

2003

Hygienic electromagnetic flowmeter with special L-shaped gasket, integrated diagnostic features and conductivity measurement.

2004

World's only EHEDG-certified variable area flowmeter.

2006

The first Vortex flowmeter with integrated gross and net heat management.

2008

Special Coriolis mass flowmeter for filling machines.

2009

Innovative Drop antenna for level measurement in very dusty atmospheres.

2011

Temperature transmitter with insulation resistance monitoring to detect cracks in the thermowell.

2013

Coriolis mass flowmeter without sensitivity for gas entrainment. The first analytical digital sensor portfolio with integrated transmitter technology.

2017

New 24 and 80 GHz radars added to OPTIWAVE series

Product selection list – Flow measurement

This table will help you in selecting the right measurement solution for your application.

| | H250 M40 | OPTIFLUX 6050/6100/6300 | OPTIMASS 1400/6400/7400 | BATCHFLUX 5500 | OPTIBATCH 4011 |
|---|----------------|-----------------------------|-----------------------------|-----------------|----------------|
| | Page 18/46 | Page 19/46 | Page 20-22/47 | Page 18/46 | Page 23/47 |
| Measuring principle | Variable area | Electromagnetic | Coriolis mass | Electromagnetic | Coriolis mass |
| 2-wire | x | - | - | - | - |
| 4-wire | - | x | x | x | x |
| Liquids | | | | | |
| Liquids (e.g. water) | x | x | x | x | x |
| Low flow rates (<2 l/h) | x | x | x | x | x |
| High flow rates (>100000 m ³ /h) | - | x | x | - | - |
| Non-conductive liquids | x | - | x | - | x |
| Viscous media | o | x | x | o | - |
| Accuracy | 1.6% of volume | 0.5%/0.3%/0.2% of volume | 0.15%/0.1%/0.1% of mass | 0.2% of volume | 0.1% of mass |
| Gases | | | | | |
| Industrial gases | x | - | x | - | x |
| Low flow rates (<20 l/min) | x | - | x | - | x |
| High flow rates | o | - | x | - | x |
| Steam | o | - | o | - | x |
| Accuracy | 1.6% of volume | - | 0.5%/0.35%/0.35% of mass | - | 0.35% of mass |
| Special applications | | | | | |
| Hygienic process flowmeter | x | x | x | x | x |
| Slurry, media with pulps, solids | - | x | o | x | - |
| Emulsions (oil/water) | x | o | x | x | o |
| Corrosive CIP liquids (acids, alkalis) | x | x | x | x | x |
| Non Newtonian fluids | - | - | x | - | x |
| Bi-directional measurements | - | x | x | x | x |

x = suitable, o = suitable under certain conditions, - = not suitable

Product selection list – Level measurement

This table will help you in selecting the right measurement solution for your application.

| | OPTISWITCH 6500/6600 | BM 500 | OPTIWAVE 6400/6500 | OPTIWAVE 3500 | OPTIFLEX 2200 | OPTIBAR P 2010 |
|---|-------------------------|-------------------------|-----------------------|-------------------|------------------|-----------------------------|
| | Page 29/48 | Page 29/48 | Page 26/48 | Page 27/48 | Page 28/48 | Page 32/49 |
| Measuring principle | Electromagnetic wave | Potentiometric | FMCW radar 24/80 GHz | FMCW radar 80 GHz | TDR guided radar | Hydrostatic pressure |
| 2-wire | - | - | x | x | x | x |
| 4-wire | x | x | - | - | - | - |
| Liquids and liquid products | | | | | | |
| Storage tanks | x | x | x | x | x | x |
| Process tanks | x | x | - | x | x | x |
| Complex process tanks (e.g. with agitators) | x | - | x | x | - | x |
| Interface measurement | o | - | - | - | x | - |
| Accuracy | - | 0.5% of measuring range | ±2mm; ±0.08" | ±2mm; ±0.08" | ±10mm; ±0.4" | ±0.25% of upper range limit |
| Solids | | | | | | |
| Bulk solids | x | - | x | - | x | x |
| Dusty atmospheres (e.g. flour silos) | x | - | x | - | x | - |
| Low reflecting products | x | - | x | - | - | - |
| Pressure ≤2 barg; ≤29 psig | x | x | x | x | x | x |
| Pressure ≤40 barg; ≤580 psig | x | x | x | x | x | x |
| Process connection temp. ≤+80°C; ≤+176°F | x | x | x | x | x | x |
| Process connection temp. ≤+200°C; ≤+392°F | - | - | x | x | x | - |
| Measuring range ≤30 m; ≤98.4 ft | - | x | x | x | x | x |
| Measuring range ≤80 m; ≤262.4 ft | - | - | x | x | - | x |

x = suitable, o = suitable under certain conditions, - = not suitable

Product selection list – Temperature measurement

This table will help you in selecting the right measurement solution for your application.

| | OPTITEMP TRA-C10 | OPTITEMP TRA-H10/H20 | OPTITEMP TRA-H30 |
|----------------------------------|-----------------------------|-------------------------------|--------------------------------------|
| | Page 37/50 | Page 36/50 | Page 37/51 |
| Design | | | |
| Process connections | Hygienic, clamp | Hygienic, clamp | Hygienic, clamp |
| Standard sensor material | Stainless steel | Stainless steel | Stainless steel |
| Standard housing material | Stainless steel | Aluminium | Stainless steel |
| Measuring range | -50...150°C; -58...302°F | -50...200°C; -58...392°F | -40...150°C; -40...302°F |
| Maximum pressure | 16 bar; 232 psi | 16 bar; 232 psi | 16 bar; 232 psi |
| Temperature sensor | Pt100 class A | Pt100 class A/ replaceable | Pt100 class A in-situ calibration |
| Accuracy | ±0.15% | ±0.15% | ±0.15% |
| 2-wire | x | x | x |
| 4-wire | - | - | - |
| Medium | | | |
| Liquids | x | x | x |
| Solids | x | x | x |
| Gas/steam | x | x | x |

x = suitable, o = suitable under certain conditions, - = not suitable

Product selection list – Pressure measurement

This table will help you in selecting the right measurement solution for your application.

| | OPTIBAR P 2010 | OPTIBAR PC/PM 5060 | OPTIBAR DP 7060 |
|----------------------------------|---------------------------------|--|-------------------------------------|
| | Page 32/49 | Page 32/49 | Page 33/49 |
| Design | | | |
| Process connections | Hygienic | Hygienic | Standard |
| Standard sensor material | Stainless steel | Stainless steel/ ceramic | Stainless steel |
| Standard housing material | Stainless steel | Plastic, aluminium | Plastic, aluminium |
| Measuring range | -1...40 bar; -14.5...218 psi | 25 mbar...100 bar; 0.73...1450.38 psi | 30 mbar...16 bar; 0.73...232 psi |
| Maximum pressure | 40 bar; 580 psi | 100 bar; 1450 psi | 40 bar; 580 psi |
| Temperature sensor | - | - | - |
| Accuracy | ±0.25% of upper range limit | ±0.10% (TD 5:1) | ±0.10% (TD 5:1) |
| 2-wire | x | x | x |
| 4-wire | - | - | - |
| Medium | | | |
| Liquids | x | x | x |
| Solids | x | x | x |
| Gas/steam | - | - | - |

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Product selection list – Process analysis

This table will help you in selecting the right measurement solution for your application.

| | SMARTPAT COND 7200 | SMARTPAT PH 8570 | OPTISYS IND 8100 | OPTISYS TSS x050 |
|----------------------------------|--|----------------------------|--------------------------------|--|
| | Page 40/52 | Page 40/52 | Page 41/52 | Page 41/52 |
| Design | | | | |
| Process connections | Hygienic, clamp | Hygienic, thread | Hygienic, thread with adapters | Hygienic, thread |
| Standard sensor material | Stainless steel | Glass | PEEK | Stainless steel |
| Standard housing material | Stainless steel | Nickel-plated brass | Stainless steel | Stainless steel |
| Measuring range | 0.05...10µS/cm (c=0.01) 1...1000µS/cm (c=0.1) | 0...14 pH | 0...1000 µS/cm | 0...3 AU, 0...6 OD, 0...13000 FAU, 0...13000 FTU, 0...3250 EBC, 0...26.65 mg/l |
| Maximum pressure | 16 bar; 232 psi | 12 bar; 174 psi | 10 bar; 145 psi | 10 bar; 145 psi |
| Temperature range | 0...+135°C; +32...+275°F | 0...+140°C; +32...284°F | -30...+140°C; -22...+284°F | 0...+90°C; +32...+194°F |
| Accuracy | <3% of the measured value | - | 1.0% | <± 5% of the maximum value range |
| Power supply | 15...30 VDC | 15...30 VDC | 15...35 VDC | 18...30 VDC |
| 2-wire | x | x | - | - |
| 4-wire | - | - | x | x |
| Medium | | | | |
| Liquids | x | x | x | x |

x = suitable, o = suitable under certain conditions, - = not suitable

Product selection list – Process analysis

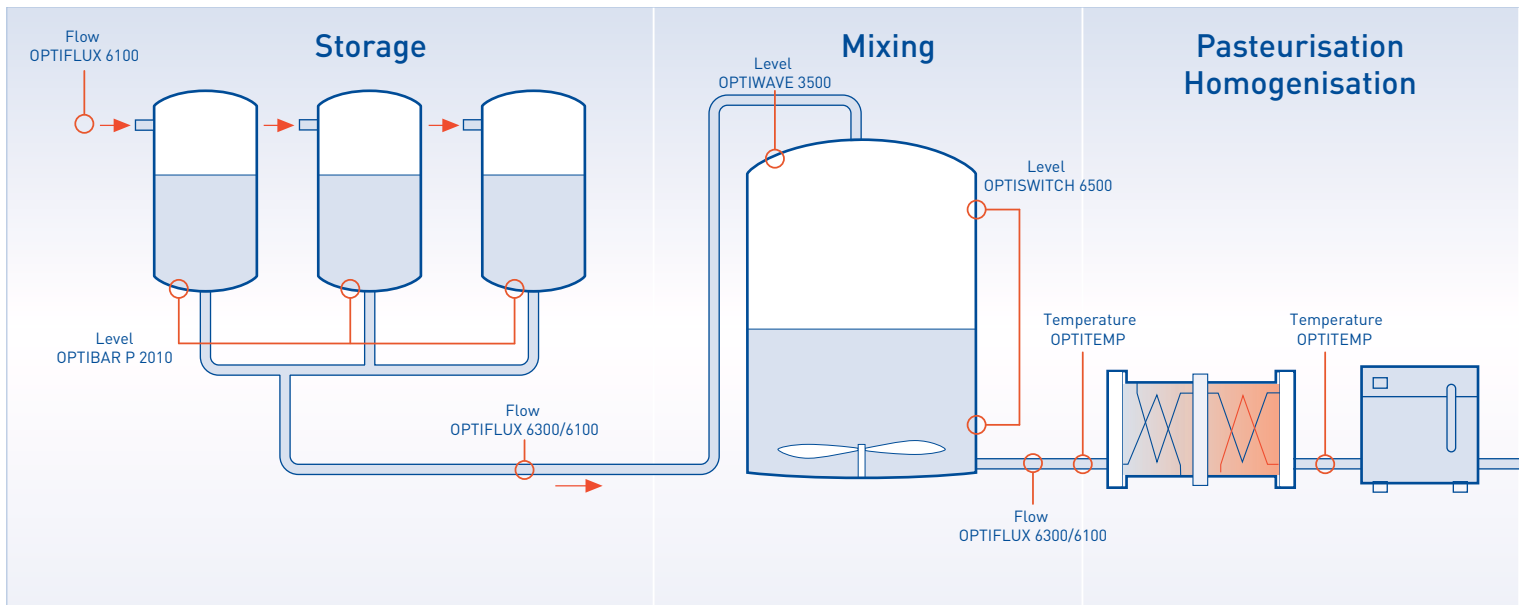
This table will help you in selecting the right measurement solution for your application.

| | OPISENS TSS 7000 | OPTISENS COND 7200 | OPTISENS IND 7000 | VISCOLINE |
|----------------------------------|------------------------------------|--|--|-------------------------------|
| | Page 42/53 | Page 43/53 | Page 43/53 | Page 42/53 |
| Design | | | | |
| Process connections | Hygienic, clamp | Hygienic, clamp | Hygienic, thread, VARIVENT®, Milk cone | Hygienic |
| Standard sensor material | Stainless steel | Stainless Steel | PEEK | Stainless steel |
| Standard housing material | Stainless steel | Stainless steel | Stainless steel | Stainless steel |
| Measuring range | E.g. 0...3% milk fat or 0...25 g/l | 0.05...10 µS/cm (c=0.01) 1...1000 µS/cm (c=0.1) | 0.5...2000 mS/cm | -10...+250°C; +14...+482°F |
| Maximum pressure | 10 bar; 145 psi | 16 bar; 232 psi | 12 bar; 174 psi | 40 bar; 580 psi |
| Temperature range | 0...85°C; +32...185°F | 0...+135°C / +32...+275°F | -10°C...+125°C / +14°F...+257°F | - |
| Accuracy | ±2% | - | ≤1% | 0.2% repeatability |
| Power supply | 24 VDC, 230 VAC (with MAC 300) | 24 VDC, 230 VAC (with MAC 100) | 24 VDC, 230 VAC (with MAC 100) | 24 VDC/ 230 VAC |
| 2-wire | - | - | - | - |
| 4-wire | x | x | x | x |
| Medium | | | | |
| Liquids | x | x | x | x |

x = suitable, o = suitable under certain conditions, - = not suitable



Improved measurements throughout the complete process



Innovative measurement solutions for a cost-effective ice cream industry

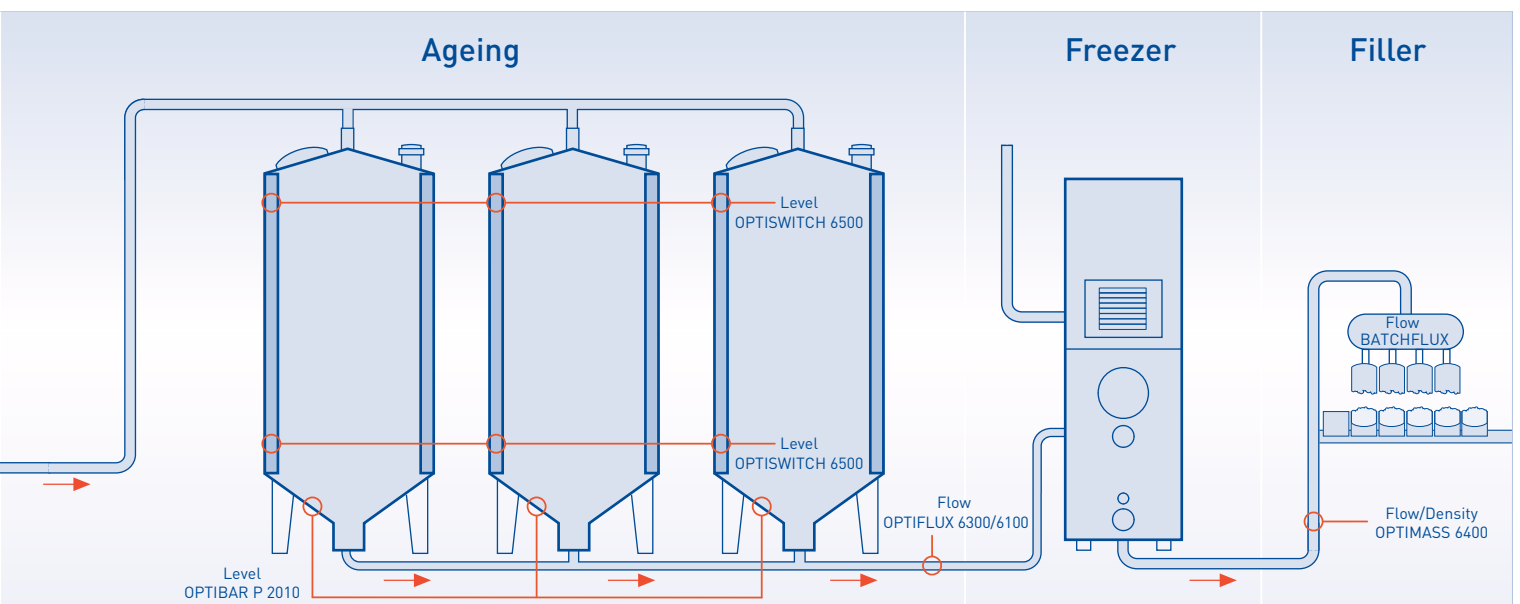
The first mentioning of ice cream dates back to 1265. Since then, process automation and measures have advanced, but just recently KROHNE unlocked the next stage of savings in ice cream processing.

The EGM™ (Entrained Gas Management) functionality with OPTIMASS Coriolis mass and density meters overcomes all difficulties with aerated products. Where previously an automation of the density measurement of frozen, aerated ice cream has not been available, you can now exploit this advantage for your production.

You can also significantly reduce waste time during start-up and ramp-down of your process. As EGM™ stands for any composition of air and product between 0 and 100 %, the density of ice cream can be determined inline and in real time for an overrun between 0 and 160.

Value-added applications:

- Measure mass or volume in the aerated and frozen part of ice cream
- Batching aerated sauces and gravy into main ice cream lines (e.g. 400 ms shots)
- Dosing of (inert) gasses or air
- Intake of dairy products (milk concentrate) in empty-full-empty with EGM™
- Storage of milk powder
- Viscosity control of coatings (chocolate)



Precise measurement solutions for an economical juice industry

The current worldwide market volume for orange juice is more than \$2.3 billion the biggest regional markets being the United States followed by Canada, Western Europe, and Japan.

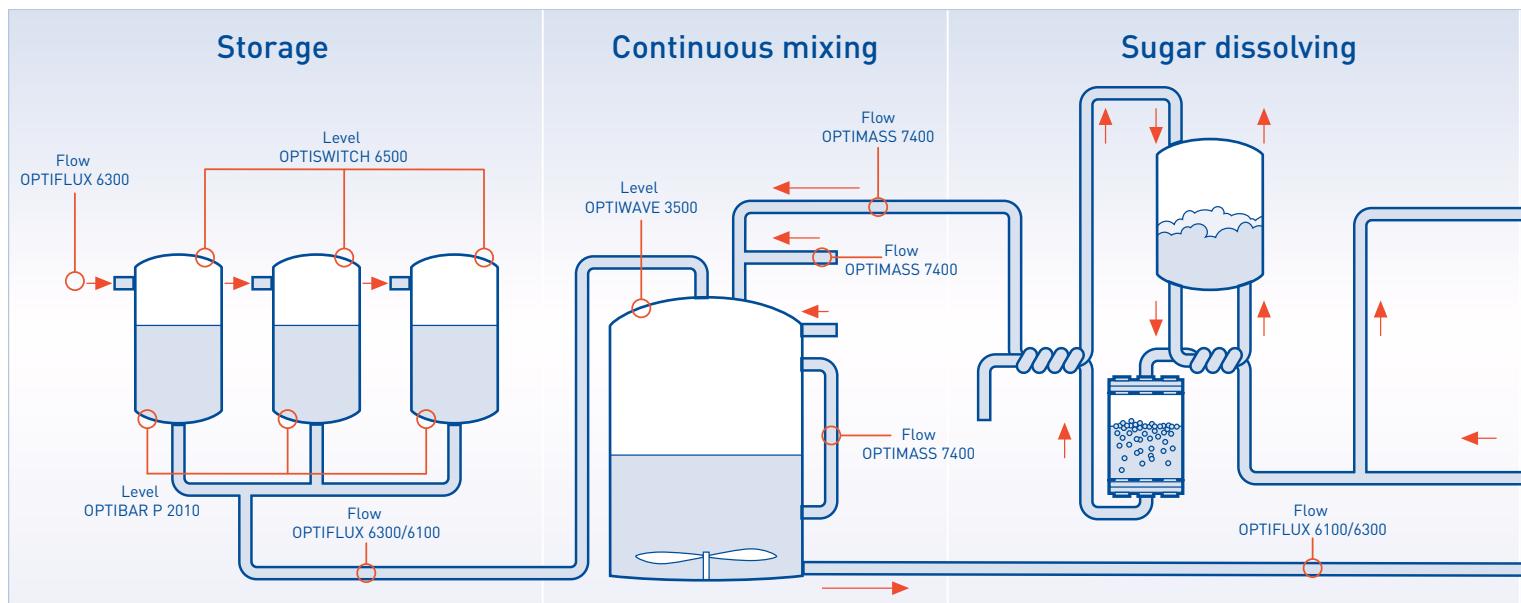
In addition to a full range of measuring solutions, KROHNE specifically provides extremely precise control options needed in the beverage industry – including the mass flow of juice concentrate, tank levels in sugar silos, as well as the °Brix concentration and the ratio of juice and pulp during the filling process.

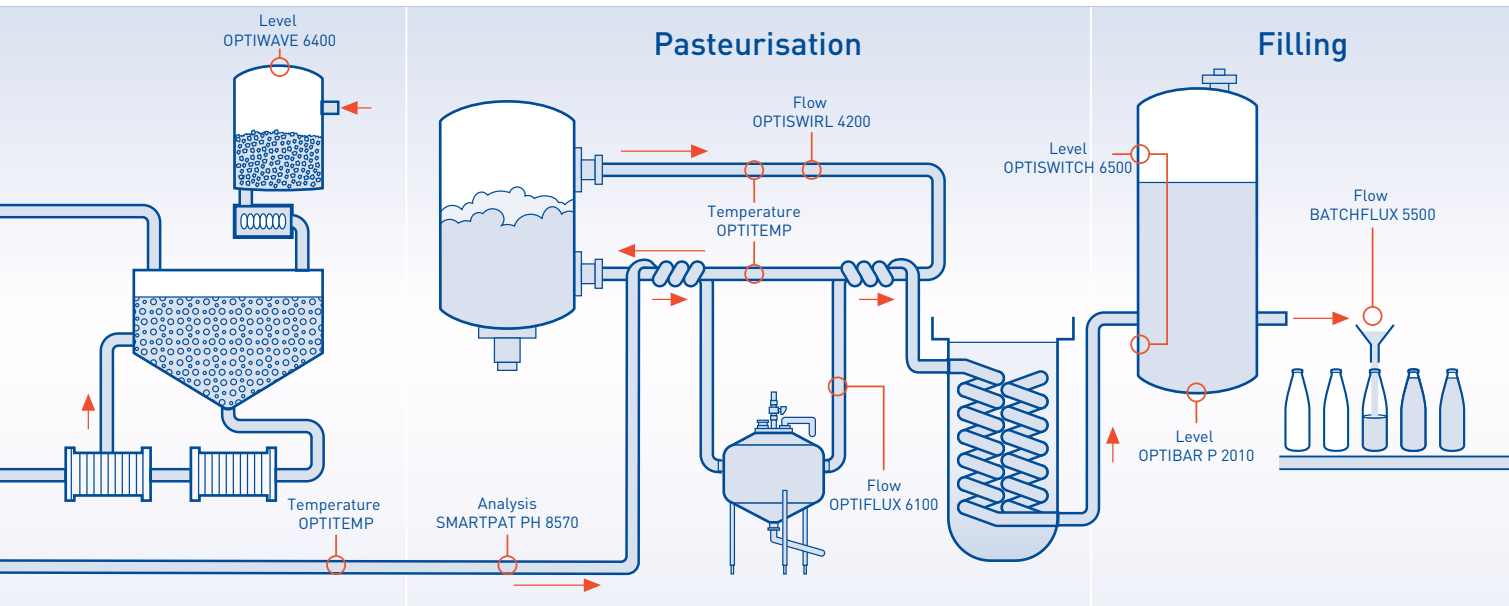
Value-added applications:

- Measure pulp and liquid with EGM™
- Accurate concentration measurement
- Volumetric or mass based filling
- Compact net energy measurement

Due to the low temperatures, the juice produces a high pressure drop where a straight tube mass flowmeter is the only choice. KROHNE has the perfect solution – OPTIMASS 7400. The single straight tube device has a low pressure drop while maintaining a high accuracy in mass flow, density and juice concentration measurement.

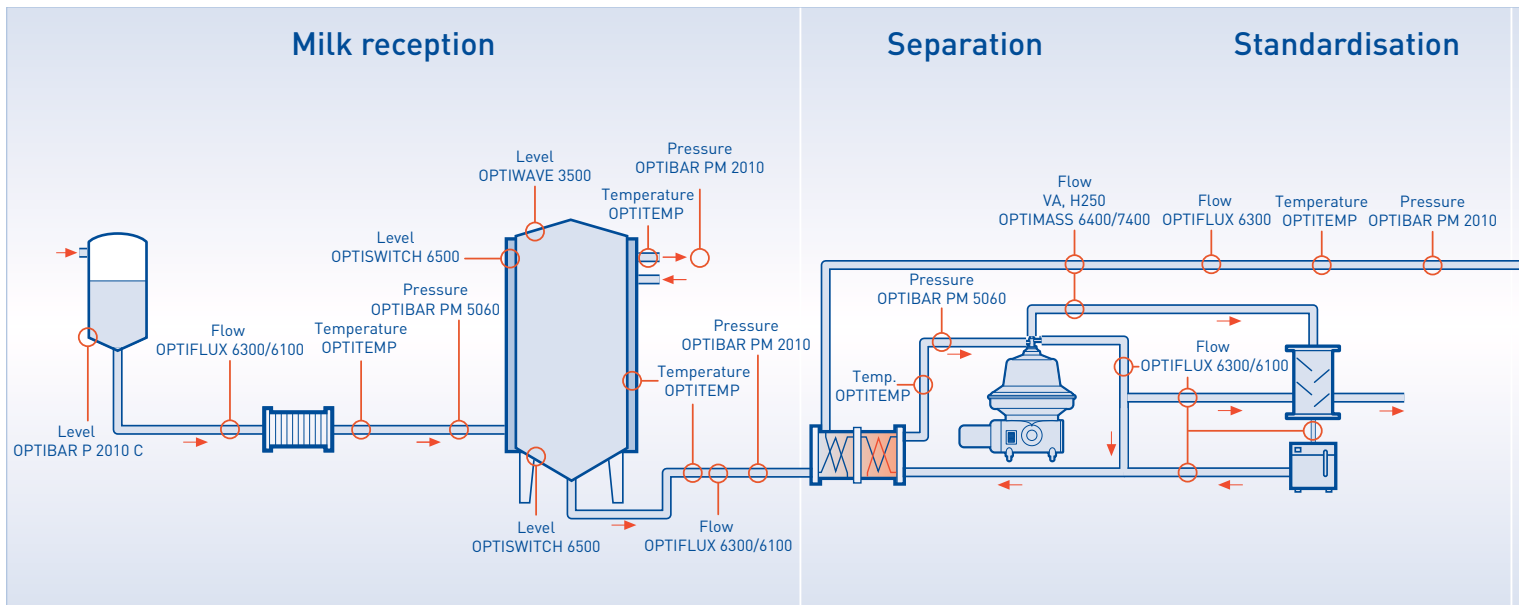
Improved measurements throughout the complete process







Improved measurements throughout the complete process



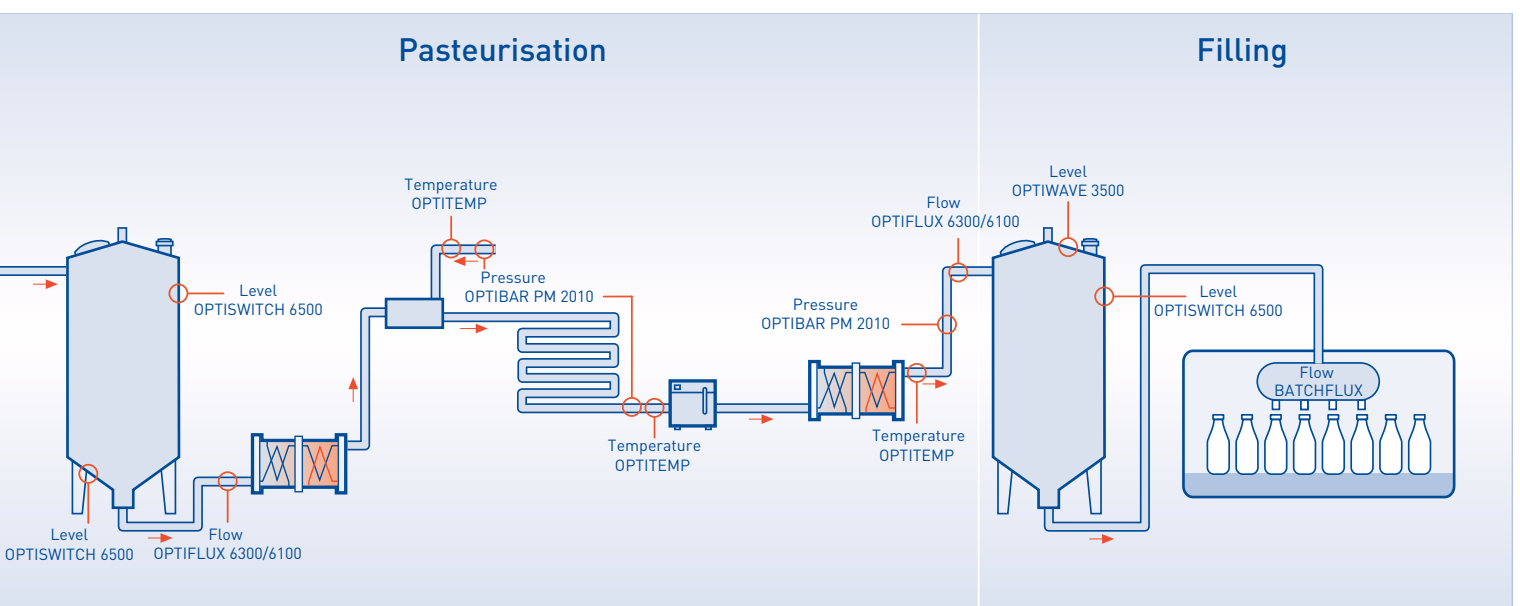
Advanced measurement solutions for the trendy dairy industry

In 2012, the world's annual production of milk was 620 million tonnes, with the largest producers being the United States with 90 million tonnes followed by India and China. About 37 % of this was consumed as liquid milk and cream, about 32 % was converted into various cheeses, about 17 % was made into butter, and about 8 % was used to make ice cream and other frozen desserts.

To support the variety of the dairy industry with constantly changing products geared to specific target groups, KROHNE has the right solutions for flow, level, temperature and pressure measurement as well as process analysis.

Value-added applications:

- Real-time qualification of milk intake
- Mass and density measurement with EGM™ with immunity to air slugs in line (empty-full-empty)
- Temperature point verification inline
- Product consistency for e.g. mozzarella through inline real-time viscosity measurement to predict offline viscosity
- Cheese milk standardisation – milk concentrate from various sources blended to specification



Flow measurement

Variable area flowmeters · Electromagnetic flowmeters · Coriolis mass flowmeters



Move into the lead – Flow measurement for the food and beverage industry

KROHNE has unique expertise when it comes to flow measurement. We hold over 1,000 patents relating to flow products and not only demonstrate our ability with standard applications, but also with applications that are demanding and require 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 close cooperation with our customers.

We have developed solutions for the most difficult flow applications, e.g. for viscous, dense liquids or liquids that have to be measured with entrained gas. Another example is the filling machines market segment where we developed dedicated electromagnetic and Coriolis mass flowmeters.

Typical applications include:

- Mixing, dosing and filling of drinks under hygienic conditions
- Inerting of tanks or containers
- Measurement and dosing of additives
- Filling systems applications
- Measurement of hot steam, also for CIP and SIP processes
- Measurement of degrees Brix, flow, density, specific gravity

Highlights:

OPTIFLUX – series of electromagnetic flowmeters

- All KROHNE EMF are wet-calibrated with a direct comparison of volumes
- Electric conductivity of the medium can be used for detection of product change
- For high bubble content, high solids content and pulsating flow
- 3x100% diagnostics (application and device diagnostic, out-of-spec test)

OPTIMASS – series of Coriolis mass flowmeters

- Single straight tube design eliminates effects of high viscous liquids or pastes on measurement
- Not susceptible to installation effects
- Minimal pressure loss with straight tube measuring devices: up to two sizes smaller than competitor devices if compared by pressure drop
- EGM™ enables measurements of highly viscous mediums, inhomogeneous mixtures, media with solid content or gas inclusions
- OPTIMASS 7000 suitable for highly shear sensitive mediums as well as media requiring low flow velocity
- OPTICHECK – inline verification of meter accuracy

Variable area flowmeters

- Local indication without the need for auxiliary power
- World's only all-metal variable area flowmeter with EHEDG certification

OPTICHECK

- On-site verification tool for electromagnetic, vortex and mass flowmeter

H250 M40 – Reliable and cost-effective variable area flowmeter for liquids and gases



The H250 M40 is the only all-metal variable area flowmeter certified by the EHEDG. It can be used for hygienic process applications, e.g. the measurement of cream or milk. It is also installed in utility systems for measuring carbon dioxide or nitrogen/air consumption.

Furthermore, it does not need a minimum conductivity. And through its modular system, it can be upgraded on site from a simple gauge to a true process meter.



- Pipe size: DN15 to DN100
- Temperature range: 0...+200 °C / +32...+392 °F
- Accuracy: 1.6 %
- Process connections: DIN 11851, 11864-2, SMS, Tri Clamp, APV Flange
- Protection class: IP66/68, IP69K
- Optional stainless steel converter housing
- Contact, current and pulse outputs, PROFIBUS®, FOUNDATION™ fieldbus



BATCHFLUX 5500 – Electromagnetic flowmeter for volumetric filling systems

- Pipe size: DN2.5 to DN40
- For very short filling cycles <500 ms
- Temperature range: 0...+150 °C / +32...+302 °F
- Vacuum-proof ceramic tube
- Process connections: hygienic adapters
- Protection class: IP66/69K
- CIP/SIP cleanable
- Pulse and status outputs
- Low power consumption of 3 W
- Standard deviation <0.08 %



The light weight compact device was specifically developed for the precise cold and hot dosing of any drink, even with fibre content. Due to its high measuring accuracy and long-term stability, the BATCHFLUX has already proven its effectiveness in many rotary fillers for filling thin-walled PET bottles of various sizes. The extremely high reproducibility is largely because of the ceramic tube that retains its shape and is vacuum-proof at temperatures of over +130 °C / +266 °F despite frequent hot cleaning cycles.

Best practice

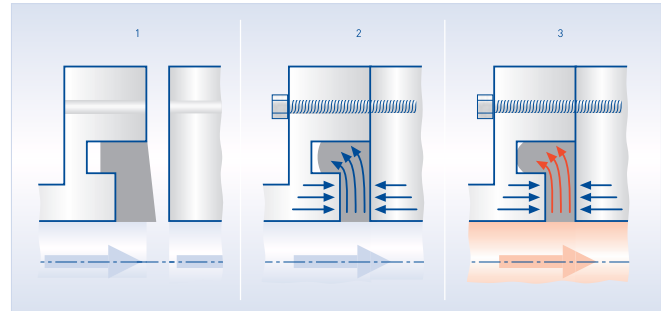
When cold filling following pasteurisation with KHS-ACF-(Aseptic-Cold-Filling) technology, KHS AG – one of the leading international suppliers of filling and packaging systems – uses electromagnetic flowmeters by KROHNE.



OPTIFLUX 6050/6100/6300 – Electromagnetic flowmeters for basic hygienic applications

OPTIFLUX 6X00 electromagnetic flowmeters are the standard hygienic meters for conductive liquids. Their sensor features an outstanding sealing concept. The L shaped gasket has the largest sealing force at the end towards the process pipe. This reduces the danger of the seal being pushed out of place during the cleaning process, it only extends backwards into the expansion chamber. This guarantees a hygienic seal and also increases its lifetime.

For basic hygienic applications such as in CIP stations, the OPTIFLUX 6050 version is the first choice. The regular process meter is the OPTIFLUX 6100 offering the required accuracy and the required communications like PROFIBUS® and FOUNDATION™ fieldbus. The OPTIFLUX 6300 is used when it comes to difficult applications or custody transfer approval is required. The IFC 100 and IFC 300 offer conductivity measurement for identifying product changes. All three instruments, as any electromagnetic, mass or vortex flowmeter from KROHNE, can be validated on site by using our special OPTICHECK tool.



Best practice

KHS AG in its latest generation of blending systems specifically introduced KROHNE to achieve shorter product changeover times, e.g. performed volume flow measurement of the mixed product with OPTIFLUX 6300 as this device does not allow deposits to build up on the sealing ring.



- Pipe size: DN2.5 to DN150
- Temperature range:
0... +140 °C / +32...+284 °F
- Vacuum-proof liner, stabilised by stainless steel mesh
- Accuracy: OPTIFLUX 6300: 0.2 %, 6100: 0.3 %, 6050: 0.5 %
- Process connections: DIN 11850, ISO 2037, 11851, 11864-2, SMS, Tri Clamp, welded ends
- CIP/SIP cleanable
- Optional stainless steel converter housing
- Contact, current and pulse outputs, PROFIBUS®, FOUNDATION™ fieldbus, PROFINET





OPTIMASS 6400 – Bent tubes Coriolis mass flowmeter with highest precision available for aerated products

- Entrained Gas Management EGM™
- Pipe sizes: DN8 to DN100
- One device for mass flow, volume, density, temperature and concentration
- Two-phase flow signal
- Temperature range: -70...+230 °C / -94...+446 °F
- Accuracy: 0.10 % for liquids (0.05 % optional), 0.35 % for gases
- Process connections: DIN 11851, 11864-2, 32676, SMS, Tri Clamp and others
- Optional stainless steel converter housing
- Contact, current and pulse outputs, PROFIBUS®, FOUNDATION™ fieldbus, Modbus, EtherNet/IP, PROFINET

A high level of performance, in combination with a wide operating temperature range up to +230 °C / +446 °F, makes the OPTIMASS 6400 the ideal choice for mass flow measurement in a wide variety of applications.

Due to the synthesised drive control, OPTIMASS 6400 overcomes any difficulty with air entrainment in the product, whether it is homogeneously distributed or in slugs. KROHNE unlocks potentials in measuring shake type milk mix drinks, aerated yogurts, cream, dough or margarine.



OPTIMASS 1400 – Two straight tubes Coriolis mass flowmeter with an excellent efficiency ratio

The OPTIMASS 1400 is the general purpose meter for liquids and gases. Compared to other Coriolis meters, it also features a very small footprint. The flow splitter is optimised to create a minimum pressure loss.

Best practice

TOPOCHICO Soft Drinks of Mexico with its high-quality mixing plants for domestic and export products relies on KROHNE for the exact measurement of level, temperature, pressure and flow.

For example during product changeover, dilute syrup phases can be completely recovered with the self-draining OPTIMASS 1400 used for syrup concentrate measurement.



- Entrained Gas Management EGM™
- Pipe size: DN15 to DN50
- One device for mass flow, volume, density, temperature and concentration
- Two-phase flow signal
- Temperature range: -40...+130 °C / -40...+266 °F
- Accuracy: 0.15 % for liquids, 0.35 % for gases
- Process connections: DIN 11851, 11864-2, SMS, Tri Clamp and others
- Optional stainless steel converter housing
- Contact, current and pulse outputs, PROFIBUS®, FOUNDATION™ fieldbus, Modbus, EtherNet/IP, PROFINET



OPTIMASS 7400 – Single straight tube Coriolis mass flowmeter for dense, viscous and shear sensitive liquids



- Entrained Gas Management EGM™
- Pipe size: DN8 to DN80
- One device for mass flow, volume, density, temperature and concentration
- Two-phase flow signal
- Temperature range: -40...+150 °C / -40...+302 °F (titanium)
- Accuracy: 0.10 % for liquids, 0.35 % for gases
- Measuring tubes in titanium, stainless steel, Hastelloy®, tantalum
- Process connections: DIN 11851, 11864-2, 32676, SMS, Tri Clamp and others
- Optional stainless steel converter housing
- Contact, current and pulse outputs, PROFIBUS®, FOUNDATION™ fieldbus, Modbus, EtherNet/IP, PROFINET
- Custody transfer according to MID or OIML



The single straight tube technology of the OPTIMASS 7400 keeps the pressure loss to a bare minimum. The meter precisely measures the mass flow as well as density – independently from viscosity changes.

Best practice

EDELWEISS, one of the most renowned cheese makers in Germany, ensures a consistent quality of its end products. To ensure reproducibility, the maintenance-free OPTIMASS 7300 is used in the production line. It also allows for the processing of different media in succession.



OPTIBATCH 4011 – Coriolis batch meter for linear and rotating filling machines

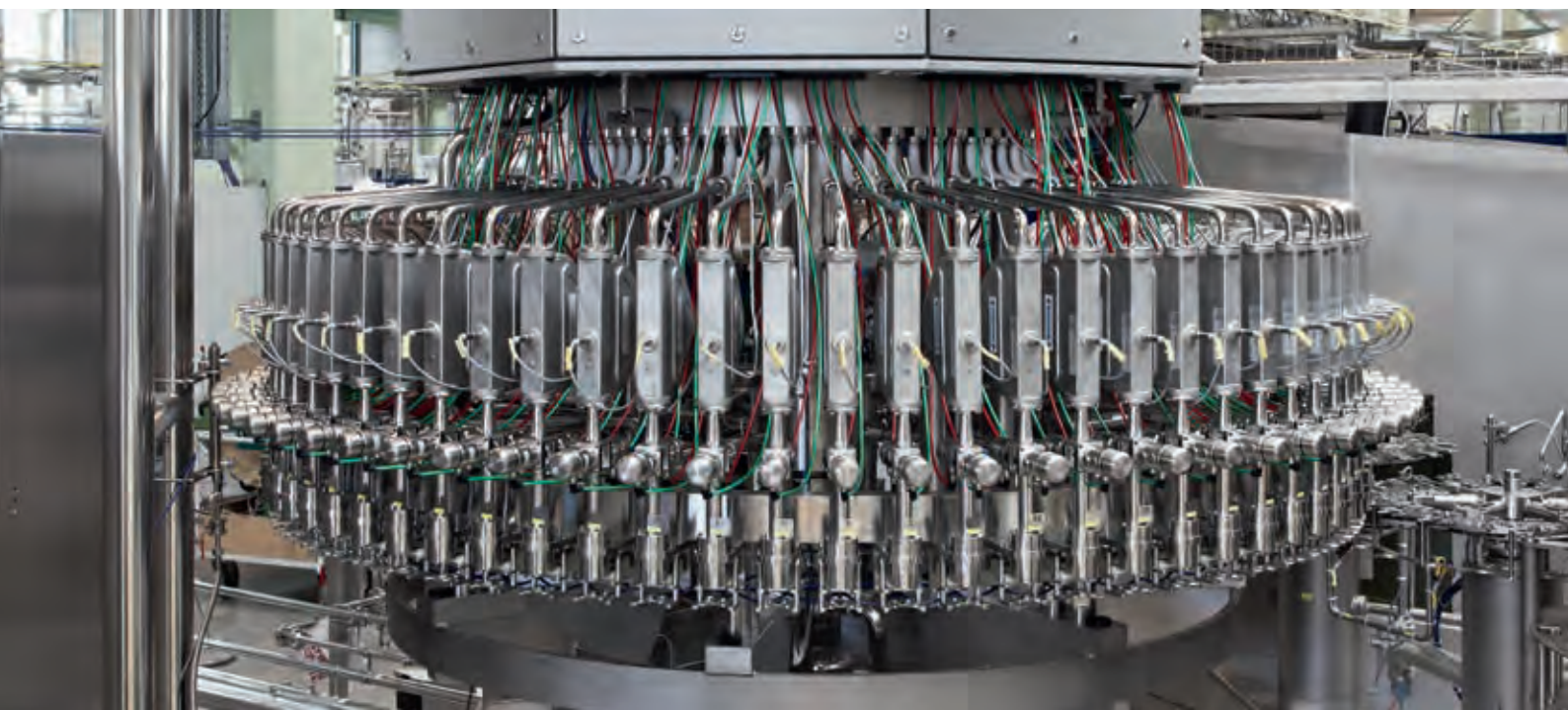
OPTIBATCH 4011 measures regardless of viscosity, conductivity or inlet runs and determines volume or mass flow in extremely short filling cycles. Using Coriolis batch meter allows exact measuring while filling products. OPTIBATCH 4011 was specifically developed for use with filling machines and features superior accuracy through direct measurement. The filling processes can take place both with and without pressure. Depending on requirements, both carbonated and non-carbonated products can be measured using the meters. A separate evaluation unit is not required; the entire electronics of the measuring device is integrated into a fully welded stainless steel housing.

Best practice

KRONES AG of Bavaria develops, manufactures and installs complete systems for process, filling and packaging technology. For a rotary filling machine with over 100 filling points for different carbonated products in a bottling line, measuring devices with high accuracy and long-term stability are required. The use of OPTIBATCH 4011 during filling operation meets the high demands of KRONES' customers – even for non-conducting and fatty liquids.



- Pipe size: DN8 to DN15
- One device for mass and volume flow
- Temperature range: 0...+100 °C / +32...+212 °F (+120 °C / +248 °F 1h for cleaning)
- Standard deviation $\leq 0.04\%$
- Measuring tubes in stainless steel
- Process connections: DIN 11864-2, 32676, SMS, Tri Clamp
- Complete housing in stainless steel
- Pulse output



Level measurement

FMCW radar level transmitters · TDR guided radar level transmitters ·
Potentiometric level transmitters · Electromagnetic level switches



For the highest level of quality – Level measurement for the food and beverage industry

KROHNE has always been a pioneer in the development of level measurement technology that meets the industry's growing demands for efficiency. The food and beverage industry is subject to constant change with sometimes extremely short product life cycles that must be aligned to new trends again and again. We help our customers to stay on top of these developments.

Some examples:

KROHNE was one of the first manufacturers to develop level measuring equipment for industrial use. Among them the world's first process radar device; the first TDR (Time Domain Reflectometry) level transmitter suitable for the measurement of the distance, level, volume and mass of liquids and solids; the first non-contact FMCW (Frequency Modulated Continuous Wave) measurement in 2-wire design. To complement our innovative technology, our OPTIFLEX and OPTIWAVE product lines feature a sophisticated and modular housing concept with bayonet locking system for maximum flexibility.

Current applications include, for example:

- Inventory management for malt or grain silos
- Monitoring of the tank level in sugar silos
- Blending control for mixing tanks
- Storage of milk powder

Highlights:

FMCW radar / TDR guided radar level transmitters

- Distance, level, volume, mass and/or interface measurement
- Not affected by process conditions: dust, foam, vapour, agitated or boiling surfaces, changes in pressure, temperature and density
- Flat PEEK antenna for liquids
- Drop antenna for solids: its ellipsoidal shape and non-adhesive surface avoid product deposits in dusty or humid atmosphere
- Measuring distances up to 100 m/328 ft

Potentiometric level transmitters

- Measurement independent of media properties
- Not sensitive to adhesives and foam
- For small tanks
- Quick response time



OPTIWAVE 6400/6500 – FMCW radar level transmitter for solid applications



- 2-wire FMCW radar
- Insensitive to build-up or dust due to PP Drop antenna
- Empty tank detection
- Tank heights: up to 100 m / 328 ft
- Accuracy: ± 2 mm / 0.08"
- Configurable measuring range
- Precise level measurement for non-flat surfaces



The 24 GHz OPTIWAVE 6400 is equipped with the proven Drop antenna. Insensitive to product build-up, it is designed for granulates and rocks in silos or bulk storage.

The 80 GHz OPTIWAVE 6500 has a flush Lens antenna: its narrow radar beam is best suited for powders and dusty atmospheres.

Best practice

Built in the 14th century, Brittany's last remaining water-powered mill MOULIN DE CHARBONNIÈRE today sets itself high standards for a modern and efficient management when it comes to storage and production costs and opted for KROHNE for the accurate measurement of the silo levels. With its Drop antenna, the OPTIWAVE 6400 allows measurements in the flour dust atmosphere of the silos, it is durable, maintenance-free and also has a data logger for monitoring.



OPTIWAVE 3500 – FMCW radar level transmitter for liquid applications



The 80 GHz OPTIWAVE 3500 offers a signal for tank level or indicating the total volume of liquid in the tank. Its specially designed flat encapsulated PEEK antenna is easy to clean and is not affected by density changes due to product variation or temperature.

Best practice

A mustard producer was looking for a suitable solution for his warehouse in France. The task was to implement the continuous and non-contact measurement of the level of different varieties of mustard in the silos. Maintenance-free OPTIWAVE 3500 radar level transmitters were installed with Drop antennas for each tank. Besides the optimisation of the stock management, the non-contact technology also allows the measurement during the filling process.



- 2-wire FMCW radar level transmitter with encapsulated PEEK antenna for liquids
- Insensitive to cleaning in place
- Not affected by adhesive media
- Empty tank detection
- Accuracy: ± 2 mm / 0.08"
- Process connection: DIN 11851, SMS, Tri Clamp, VARIVENT®
- Configurable measuring range
- Process conditions up to $+150$ °C / $+302$ °F, 25 barg / 362.6 psig



OPTIFLEX 2200 – TDR guided radar level transmitter for solid and liquid application

Some level applications require insertion type instruments, due to the fact that the liquid comes along with a layer of foam on top. But even these devices often do not provide correct values. OPTIFLEX 2200 features DPR (Dynamic Parasite Rejection) software for the elimination of the false reflections caused by environmental disturbances and product build-up. Dust, foam, vapour, agitated surfaces, temperature and density do not affect device performance.

Another advantage is the modularity of the OPTIFLEX 2200: Thanks to the innovative housing design, you can specify the way the display is fixed to the device. This makes it accessible, regardless of whether it is installed on a tank, in a recess or in buildings with low roofs. The remote version – OPTIFLEX 2200 F – features a separate signal converter with display. It allows installation and operation up to 100 m / 328 ft away from the probe, e.g. at the tank bottom or in a control room. Today, KROHNE is the only manufacturer to offer this possibility over such a distance.

- Quick coupling system permits removal of the converter under process conditions and 360° rotation for better readability of the display screen
- Remote converter: up to 100 m / 328 ft distance to the probe
- Measuring range: up to 40 m / 131 ft
- Process connection: Tri Clamp, DIN 11851



OPTISWITCH 6500/6600 – Hygienic level switches



Electromagnetic wave level switches for level detection and dry-run protection for liquids and solids. Through their small and optimised sensor shape, the devices are easy to clean and the risk of clogging of sticky products is minimised. The measurement is precise and not affected by the mounting position. Coating of the sensor or condensate are not detected. Easier to clean than a vibrating fork switch.

- One switch type for all media/functions
- High or low level alarm for liquids and solids (E_r -value >1.5)
- Detects foam and interface
- Identifies a liquid and its changed characteristics e.g. degree of water contamination
- Available with stainless steel housing or with minimised electronics in sensor
- Minimum insertion length as small as 12 mm / 0.47"
- External LED alarm indicator



Best practice

For their excellent beers, the world renowned brewery ST-FEULLIEN of Belgium prefers – besides other devices provided by KROHNE – the OPTISWITCH 6500 for the filtering of malt and mash during the brewing process. During measuring, alternating media are accurately identified and excellent product quality is always guaranteed.



BM 500 – Potentiometric level transmitter for liquids

Level transmitter dedicated for small metal tanks for conductive liquids. Based on the potentiometric measuring principle, the BM 500 does not have a dead zone or blocking distance. Transmitter performance is also not affected by coatings on the sensor rod. Device can be installed from top or from bottom of the tank.

- Insensitive to foam, sticky or splashing liquids
- Continuous level measurement in small tanks >50 mm / 2" (no dead zone)
- Accuracy: $\pm 0.5\%$ of full measuring range
- Not affected by adhesive media
- LED level monitoring
- Empty tank detection
- Configurable measuring range



Pressure measurement

Process pressure transmitters · Differential pressure transmitters



| Tank Data Sheet | | |
|--------------------------------|------|-----------|
| General Information | | |
| Designation: 11. 2017. 10. 10. | | |
| Material: | 316L | Material: |
| Capacity: | 1000 | Material: |
| Height: | 1000 | Material: |
| Weight: | 1000 | Material: |
| Manufacturer: | 1000 | Material: |
| Installation: | 1000 | Material: |
| Notes: | 1000 | Material: |

E05.26.04.27.160LIS1162
+K / 6 B0

21%

Impressive control – Pressure measurement for the food and beverage industry

Pressure transmitters are used for many different tasks in food business. Many of them are used as hydrostatic pressure devices for level monitoring of open or pressurised tanks.

Other pressure devices control the process pressure in the pipelines. A lot of important process steps like homogenisation or evaporation are controlled by pressure.

Delta p transmitters are used for filter or leakage control on filter systems in breweries or dairies, or as level measurement of pressurised tanks with young beer.

These manifold applications need individual solutions, which is why KROHNE offers a wide range of pressure devices.

Typical applications include:

- Level control in process and storage tanks
- Wort cooler pressure management
- Carbon dioxide head pressure measurement
- Pressure control at pasteuriser
- Pressure control at heat exchanger

Highlights:

OPTIBAR – series of process / differential pressure transmitters

- Measuring differential pressure up to +150 °C / +302 °F without diaphragm seal
- Flush and recessed metal (PM) and ceramic (PC) diaphragms
- Absolute, gauge differential pressure measurement
- Low measuring ranges dp cell with high static pressure
- Various housing materials available
- Very good repeatability and long-term stability
- Turndown ratio up to 100:1

OPTIBAR PC 5060/PM 5060 – Process pressure transmitters with ceramic or stainless steel diaphragm



The pressure transmitters are universal measuring devices for gases, vapours and liquids. The measuring cells can be built into the process flush and the radially recessed position of the gasket provides additional protection in abrasive media.

The OPTIBAR PC 5060 features a ceramic capacitive measuring cell that demonstrates its robustness and longevity in many applications. As a special advantage, the pressure transmitters offer process temperatures up to +150 °C / +302 °F and complete resistance against sudden temperature shocks. The OPTIBAR PM 5060 offers proven performance up to +105 °C / +221 °F.

- Flush and recessed ceramic diaphragm
- Accuracy: 0.05...0.2 % of upper range value
- Process connections: DIN 11851, VARIVENT®, SMS, DRD, Tri Clamp, Neumo BioConnect
- Protection class: IP66, 67, optional IP69K
- Current output, PROFIBUS®, FOUNDATION™ fieldbus



OPTIBAR P 2010 – Ultra compact pressure transmitter with stainless steel diaphragm



Compact transmitter in stainless steel with fully-welded flush diaphragm. Exceptional linearity, low temperature effects and high overpressure capability. Food-grade oil filling for all hygienic process connections.

- Fully-welded flush-mount stainless steel diaphragm
- Accuracy: 0.25 % of upper range limit
- Temperature range: -10...+125 °C / +14...+257 °F
- Process connections: DIN 11851, VARIVENT®, SMS, Tri Clamp
- Protection class: IP67



OPTIBAR DP 7060 – Differential pressure transmitter for flow, level and differential pressure

Newly developed measuring cell with a centred overload protection diaphragm, which limits the maximum applied pressure to the differential pressure sensor. A permanent memory stores various events for analysis.

- Piezoresistive differential pressure cell
- Accuracy: <math><0.065\%</math> of upper range value
- Measuring range: from 10 mbar to 16 bar / 0.15 to 232 psi
- Temperature range: $-40\dots+85\text{ }^{\circ}\text{C}$ / $-40\dots+185\text{ }^{\circ}\text{F}$
- Integrated line pressure measurement
- Insensitive against static pressure effects
- Protection class: IP66, 67, optional IP69K
- Current output, PROFIBUS®, FOUNDATION™ fieldbus
- Hygienic process connection with diaphragm seals (3A)



Temperature measurement

Temperature assemblies



The highest degree of precision – Temperature measurement for the food and beverage industry

Temperature assemblies are the devices, which are required most in the food process. Many processes as, e.g., pasteurization or the mashing process are temperature controlled. But also where the media for heating or cooling buildings are being monitored for energy consumption, precise temperature elements are required.

All hygienic temperature assemblies feature a robust design, meticulous workmanship and dimensional accuracy. Certified materials, testing throughout the production process and consistent final inspections guarantee the consistently high quality of our products.

Please note our in-situ verifiable temperature device that allows for the element to stay in place during periodical verifications. This drastically reduces the cost of ownership per measurement point.

Typical applications include:

- Temperature measurement in the mash tun
- Temperature control in the sugar dissolving tank
- Temperature before separator
- Pasteurisation control
- Control after the heat exchanger
- CIP temperature control

Highlights:

OPTITEMP – series of temperature assemblies

- Very good repeatability and long-term stability
- Standardised and customer-specific temperature assemblies
- Compact, fast and precise measurement
- Fabricated in hygienic design
- Pt100 class A acc. to IEC 60751
- In-situ verification

OPTITEMP TRA-H10 – Standard temperature assembly for the food market



The OPTITEMP TRA-H10 consists of a 6 or 10 mm / 0.24 or 0.39" stainless steel sensor and an aluminium connection head. Various immersion lengths and a stainless steel connection heads are available.

- Construction with no dead space
- Surface roughness of 0.8 µm, optional 0.5 µm
- Standard connection heads or stainless steel versions
- Single or double Pt100 sensor
- Standard and customised insertion lengths



OPTITEMP TRA-H20 – Hygienic temperature assembly with replaceable insert



The OPTITEMP TRA-H20 has the same features as the OPTITEMP TRA-H10 plus the possibility to replace the measuring insert. The insert for a 6 mm / 0.24" thermowell is 3 mm / 0.12"; for 10 mm / 0.39" – 6 mm / 0.24".

- Construction with no dead space
- Surface roughness of 0.8 µm, optional 0.5 µm
- Standard connection heads or stainless steel versions
- Transmitter mounted in head or in field housing
- Single or double Pt100 sensor
- Standard and customised insertion lengths
- Replaceable insert





OPTITEMP TRA-C10 – Compact temperature sensor with a very small footprint

The small form factor and robust design make the OPTITEMP TRA-C10 suitable for any application where space is a challenge. With the integrated transmitter preconfigured to a fixed temperature range, the sensor is simple to order, easy to install and maintain.

OPTITEMP TRA-C10 is a highly accurate sensor featuring great reliability over the long term and excellent measuring stability.



- Pt100 or 4...20 mA output
- Process connection: DIN, ISO or 1" Tri Clamp



OPTITEMP TRA-H30 – Hygienic temperature assembly for on-site calibration

The OPTITEMP TRA-H30 is the high-end device for critical applications. Periodical verification of your temperature points can be done during operation. Apart from your savings from not having to dismount the elements the shut-down for maintenance can be avoided. The on-site calibration takes place under actual process conditions.

- Construction with no dead space
- Surface roughness of 0.8 μm , optional 0.5 μm
- Standard connection heads or stainless steel versions
- Transmitter mounted in head
- Single or double Pt100 sensor
- Standard and customised insertion lengths
- Can be calibrated on site under process conditions



Process analysis

Analytical sensors with integrated transmitter · Inline process rheometers ·
Conductivity measuring systems



From analysis to the solution – Process analysis products for the food and beverage industry

KROHNE is your partner for all aspects of analytical instrumentation. From pH measurement to the determination of the inline viscosity; KROHNE supplements the measurement of almost all parameters.

Our main goals are attaining sturdiness, reliability and quality in the various application areas.

Typical applications include:

- Process control in water treatment
- Filter monitoring
- Backflushing control ion exchanger
- Protection of reverse osmosis (RO) membranes
- Process control in the production of cheese, milk, beer, fruit juices, yogurt, etc.
- Pure water and ultrapure water monitoring
- Separation processes (milk/water)
- Distillation
- CIP/SIP processes
- Standardise fat content in drinking milk production

Highlights:

SMARTPAT – series of analytical sensors

- No external transmitter needed
- Configuration and easy offline calibration via PACTware™ with dedicated DTMs
- Easy installation and retrofitting on site: sensors fit in 98 % of all existing mounting assemblies
- Very cost-effective for new installations

OPTISYS – conductivity measuring system

- Fast temperature compensation
- Configuration via touch display

SMARTPAT COND 7200 – Hygienic conductivity sensor with integrated transmitter



The SMARTPAT COND 7200 conductive measurement principle is characterised by high sensitivity, especially at low conductivity values. For this reason, the product is perfect for quality control in water conditioning and preparation in the food and beverage industry.

SMARTPAT COND 7200 is available with various hygienic process connection like VARIVENT® and Tri Clamp.

- Measuring range from 0.05 $\mu\text{S}/\text{cm}$ up to 1000 $\mu\text{S}/\text{cm}$
- Loop powered 2 wire sensor with integrated transmitter
- Equipped with integrated temperature sensor
- Available with different low cells constants



SMARTPAT PH 8570 – Hygienic pH sensor with integrated transmitter



The SMARTPAT PH 8570 is the dedicated sensor for the food and beverage industry. The robust design withstands the typically cleaning with caustic soda solutions at +90 °C / +194 °F and has therefore a much longer lifetime than any pH-ISFET sensor element. The maximum temperature is +140 °C / +284 °F.

- Long-term stability with pressurised RheoLid electrolyte filled reference electrode
- Fast and stable adjustment behaviour of the membrane glass type S
- Suitable for CIP and SIP
- Low maintenance – high potential of cost savings with offline calibration under controlled conditions
- With integrated Pt1000 and standard VP 2 connector



OPTISYS IND 8100 – Hygienic conductivity measuring system

OPTISYS IND 8100 is used to analyse and differentiate liquid media. It provides either the direct measured conductivity or the calculated concentration value. Additionally, the measured temperature is also available as an output.

- Measuring range: from 500 $\mu\text{S}/\text{cm}$ to 1 S/cm
- Compact hygienic design ($\leq\text{DN}40$)
- Very fast temperature compensation
- Touch display
- Compact and remote
- Separate output for conductivity and temperature



OPTISYS TSS x050 – Hygienic absorption measurement system



The OPTISYS TSS x050 series are 180° absorption measuring systems for fluids and operate in the near infrared range (880 nm wavelength). The systems are installed in and/or on tanks or pipelines. The optical part of the systems are submerged in the process medium in order to measure the physical medium properties of absorbing irradiated light.

The OPTISYS TSS 1050 and TSS 2050 are simple designed, low cost sensors with an absorption scale between 0 to 100%. There are 3 OPLs (Optical Path Length) available.

The OPTISYS TSS 3050 and TSS 4050 are used for monitoring the optical absorption of fluids in order to watch the process results continuously or to securely indicate changes. The OPTISYS TSS 4050 additionally is used in manual or automatic quick-change fittings of the SENSOFIT family.

- Suitable for CIP/SIP and includes installation version for retractable assemblies
- Accurate NIR absorption measurement regardless of the colour
- Compact system with integrated electronics



OPTISENS TSS 7000 – Hygienic suspended solid sensor



The OPTISENS TSS 7000 is an NIR sensor with a 4 beam technology. It features 2 NIR LEDs (880 nm) light sources and 2 detectors. With this technology it compensates for most errors due to dirt, aging of the detectors or even light source variations directly at the sensor itself.

The sensor features a glassfree design by measuring directly through the PP or PVDF material layer. This means no problems due to glass as window material and its different characteristics or resistance. With its 2" and 3" Tri Clamp or VARIVENT® N connection it is easy adaptable to pipes for inline installation.

- Maximum product safety thanks to glass-free design, no optical window
- Durable LED
- Self-compensating four beam technology reduces drift caused by soiling or ageing
- Multiple path length for various concentration ranges



OPTISENS COND 7200 – Hygienic conductivity sensor

The conductive conductivity sensor OPTISENS COND 7200 have a standardised robust design and a long lifespan. In combination with a MAC 100 signal converter, it is possible to create an extremely reliable low-cost measurement system, which is suitable for a wide range of water analysis measurement tasks.

- Measuring range from 0.05 $\mu\text{S}/\text{cm}$ up to 1000 $\mu\text{S}/\text{cm}$
- Sterilisable sensor design for hygienic requirements
- Small cell constants for pure water applications
- Integrated temperature sensor



OPTISENS IND 7000 – Hygienic conductivity sensor



The inductive conductivity sensor OPTISENS IND 7000 features a compact and hygienic design as well as a wide measuring range. The sensor is manufactured using hygienic PEEK material. The measuring cell with two inner, ring-shaped measuring coils is completely sealed and is therefore not in contact with the media.

- Sterilisable sensor design
- FDA/food-use approved PEEK material
- Integrated temperature sensor for automatic temperature compensation



VISCOLINE – Rheometer for continuous inline measurement of process viscosity

VISCOLINE is ideal for use wherever viscosity measurement is required for process or quality control.

This innovative rheometer is extremely adaptable and can be used for a variety of non-Newtonian applications including ketchup, mayonnaise, yogurt, sauces, cheese, emulsions and many, many more. The measurement of viscosity under process conditions makes it possible to predict offline viscosity at atmosphere or point of final filling.

- No moving parts – no recalibration
- Analog outputs or digital communications
- Immune to sudden changes in process viscosity
- Re-homogenised flow by mixer
- Digital communication protocol
- 0.2 % repeatability, 0.1 cp resolution



Energy measurement



Saving your resources – Energy measurement for the food and beverage industry

Highlights:

OPTISWIRL 4200 – Vortex flowmeter

- Integrated temperature and pressure compensation
- Gross and net heat measurement
- Integrated nominal diameter reduction
- Development according to IEC 61508

OPTISONIC 3400 – ultrasonic flowmeter

- Thermal energy measurement
- No effect of magnetite scaling

OPTISONIC 6300 – Clamp-on flowmeter

- Installation without interruption of the process
- From DN15 to DN400

WATERFLUX – water meter

- Installation without inlet/outlet straight run

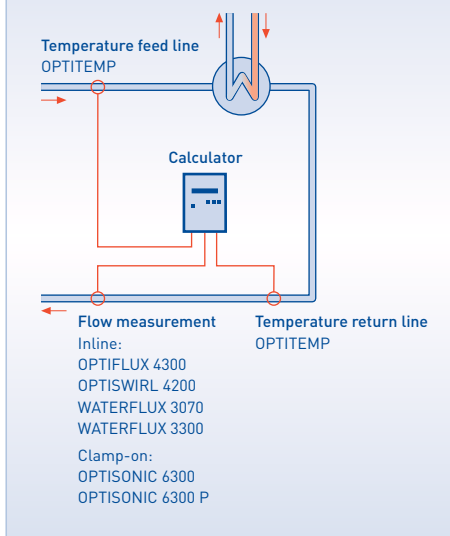
Many organisations measure utilities precisely to report the reduction of their carbon footprint periodically. Besides that fact, an increase of efficiency can be unlocked with specialised instruments by KROHNE.

They help to identify potentials for energy efficiency improvement and meet the requirements of energy management systems such as ISO 50001. The choice of the most suitable measuring device depends not only on the medium to be measured, but also on other factors such as pressure, volumetric flow rate, temperature and density.

Typical applications include:

- Measurement of the thermal energy of warm and hot water
- Measurement of the flow rates in compressed air networks
- Measurement of free air delivery (FAD)
- Measurement of the flow rate of steam
- Measurement of heavy fuel oil consumption

Heat meter installation

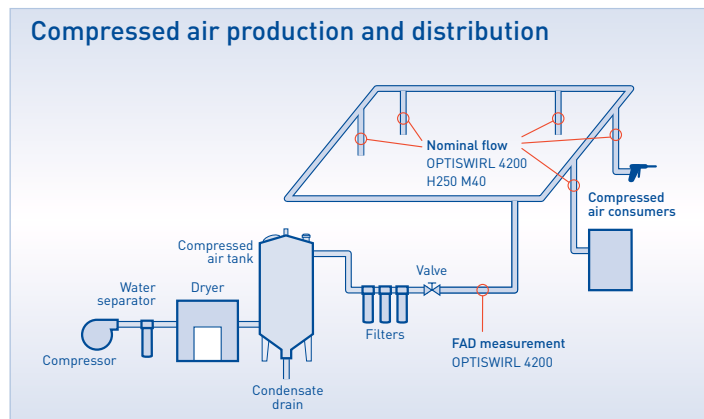


Thermal energy control

KROHNE is committed to improving the efficiency and accuracy of measuring thermal energy. Whether it comes to developing new projects or retrofitting existing facilities, we offer a variety of measurement solutions for different ranges of pressure, temperature and flow with numerous national and international approvals.

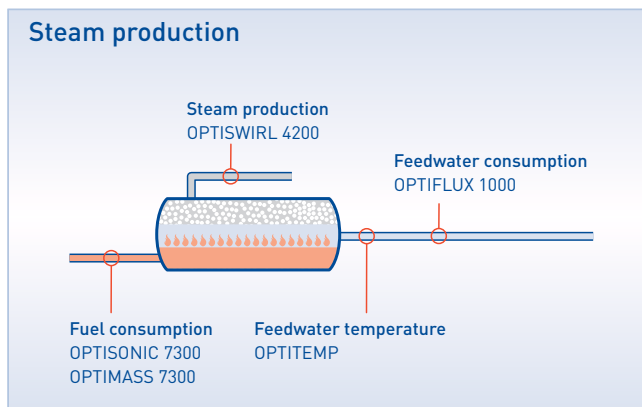
Management of compressed air production and distribution

KROHNE devices help to identify potential solutions to improve the efficiency of the compressed air network. For example by identifying leaks, monitoring the compressor's efficiency, monitoring consumption profiles and peak consumption.








Management of steam production and distribution

Steam production








KROHNE offers solutions to measure the fuel consumption, steam production and distribution as well as the consumption of the boiler feedwater to fully analyse the efficiency of the steam system.

Flow measurement





| | Reliable and cost-effective variable area flowmeter for liquids and gases | Electromagnetic flowmeter for volumetric filling systems | Electromagnetic flowmeter for basic hygienic applications | Electromagnetic flowmeter for general hygienic applications | Electromagnetic flowmeter for difficult hygienic applications |
|---|---|---|--|---|---|
| | H250 M40 | BATCHFLUX 5500 | OPTIFLUX 6050 | OPTIFLUX 6100 | OPTIFLUX 6300 |
| |  |  |  |  |  |
| Measuring accuracy | 1.6% | ±0.2% of measured value | ±0.5% of measured value above 0.5 m/s; depending on measuring sensor ±2.5 mm/s below 0.5 m/s | ±0.3% of measured value | ±0.2% of measured value |
| Measuring range | Water: 10...120000 l/h Air: 0.7...2800 m³/h | 4...4500 l/h | 4...760000 l/h | 4...760000 l/h | 4...760000 l/h |
| Electrical conductivity | - | ≥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) |
| Outputs | Current, pulse, status | Pulse, status | Current, pulse, status | Current, pulse, status | Current, pulse, status |
| Inputs | - | - | - | Binary | Binary |
| Communication | HART®, FF, PA | - | HART®, Modbus | HART®, FF, PA, DP, Modbus | HART®, FF, PA, DP, Modbus |
| Power supply | 14...30 VDC (2 wire) | 24 VDC | 100...230 VAC, 24 VDC | 100...230 VAC, 12...24 VDC, 24 VAC/DC | 100...230 VAC, 12...24 VDC, 24 VAC/DC |
| Protection category: Compact (C) Field (F) Wall (W) | IP66, 68; NEMA4, 4X, 6 | DN2.5, 4, 6, 25, 40: IP66, 67; NEMA4, 4X, 6 DN10, 15: IP69K | IP66/67; NEMA4, 4X | IP66/67; NEMA4, 4X | IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6P |
| Process connections | | | | | |
| Nominal sizes | DN15...100; 1/2"...4" | DN2.5, 4, 6, 10, 15, 25, 40 | DN2.5...150 | DN2.5...150 | DN2.5...150 |
| Flanges | EN 1092 or ASME | - | - | - | - |
| Hygienic connections | DIN 11851, 11864-2; SMS; DIN Clamp, Tri Clamp, APV | Sandwich, hygienic adapters | DIN 11850, 11851, 11864-2; SMS; ISO 2037, DIN Clamp, Tri Clamp, others on request | DIN 11850, 11851, 11864-2; SMS; ISO 2037, DIN Clamp, Tri Clamp, others on request | DIN 11850, 11851, 11864-2; SMS; ISO 2037, DIN Clamp, Tri Clamp, others on request |
| Threaded | G1/2...2; 1/2...2" NPT | - | - | - | - |
| Pressure rating | Depending on process connection | Depending on process connection | Depending on process connection | Depending on process connection | Depending on process connection |
| Process temperature | -200...+300°C; -328...+572°F | -20...+140°C; -4...+284°F | -40...+120°C; -40...+248°F | -40...+140°C; -40...+284°F | -40...+140°C; -40...+284°F |
| Ambient temperature | Non-Ex: -40...+120°C; -40...248°F | 0...+60°C; +32...+140°F | -40...+65°C; -40...+149°F | -40...+65°C; -40...+149°F | -40...+65°C; -40...+149°F |
| Materials | | | | | |
| Wetted parts | Stainless steel, Hastelloy®, titanium, Monel®, ceramic, PTFE | Liner: Zirconium dioxide Electrodes: Cermet | PFA, stainless steel, Hastelloy® | PFA, stainless steel, Hastelloy® | PFA, stainless steel, Hastelloy® |
| Approvals | | | | | |
| Hygienic approvals, conformity | EC 1935/2004, FDA, EHEDG | EC 1935/2004, FDA, 3A | EC 1935/2004, FDA, 3A, EHEDG | EC 1935/2004, FDA, 3A, EHEDG | EC 1935/2004, FDA, 3A, EHEDG |
| Ex approvals | ATEX, IEC-EX, cFMus, NEPSI, CCOE/PESO, KGS, EAC/GOST, INMETRO | - | Ex, FM, CSA | Ex, FM, CSA | Ex, FM, CSA |
| Other approvals | - | - | - | - | MI-005 |

| | Two straight tubes Coriolis mass flowmeter with an excellent efficiency ratio | Bent tubes Coriolis mass flowmeter with highest precision available for aerated products | Single straight tube Coriolis mass flowmeter for dense, viscous and shear sensitive liquids | Coriolis batch meter for linear and rotating filling machines |
|--|---|--|---|---|
| | OPTIMASS 1400 | OPTIMASS 6400 | OPTIMASS 7400 | OPTIBATCH 4011 |
| |  |  |  |  |
| Measuring accuracy | Liquid: ±0.15% Gas: 0.35% Density: ±2 kg/m ³ | Liquid: ±0.1%, ±0.05% optional Gas: 0.35% Density: ±1 kg/m ³ | Liquid: ±0.1% Gas: 0.35% Density: ±2 kg/m ³ | Liquid: Mass: ±0.15% Volume: ±0.2% |
| Measuring range | 48...170000 kg/h | 5...1500000 kg/h | 9.5...560000 kg/h | 6...4320 kg/h |
| Electrical conductivity | - | - | - | - |
| Outputs | Current, pulse/frequency, status | Current, pulse/frequency, status | Current, pulse/frequency, status | Pulse/frequency |
| Inputs | Binary | Binary | Binary | - |
| Communication | HART®, FF, PA, DP, Modbus, EtherNet/IP | HART®, FF, PA, DP, Modbus, EtherNet/IP | HART®, FF, PA, DP, Modbus, EtherNet/IP | Modbus |
| Power supply | 85...250 VAC, 11...31 VDC, 20.5...36 VAC/DC | 85...250 VAC, 11...31 VDC, 20.5...36 VAC/DC | 85...250 VAC; 11...31 VDC, 20.5...36 VAC/DC | 24 VDC |
| Protection category: Compact (C) Field (F) Wall (W) | IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X | IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X | IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X, 6 IP66, 67; NEMA4, 4X | IP67; NEMA 4X - - |
| Process connection | | | | |
| Nominal sizes | DN15...50 | DN8...100 | DN6...80 | DN8...15 |
| Flanges | EN 1092 or ASME | EN 1092 or ASME | EN 1092 or ASME | - |
| Hygienic connections | DIN 11851, 11864-2; SMS; DIN Clamp, Tri Clamp, others on request | DIN 11851, 11864-2; SMS; DIN Clamp, Tri Clamp, others on request | DIN 11851, 11864-2; SMS; DIN Clamp, Tri Clamp, others on request | DIN 11864-2; DIN Clamp, Tri Clamp |
| Threaded | - | - | - | - |
| Pressure rating | Depending on process connection | Depending on process connection | Depending on process connection | Depending on process connection |
| Process temperature | -40...+130°C; -40...+266°F | 200...+400°C; -328...+752°F | -40...+150°C; -40...+302°F | 0...+100°C; +32...+212°F |
| Ambient temperature | -40...+65°C; -40...+149°F | -40...+65°C; -40...+149°F | -40...+65°C; -40...+149°F | -40...+55°C; -40...+131°F |
| Materials | | | | |
| Wetted parts | Duplex stainless steel | Stainless steel, Hastelloy® C22, duplex steel | Stainless steel, Hastelloy® C22, titanium, tantalum | Stainless steel |
| Approvals | | | | |
| Hygienic approvals, conformity | EC 1935/2004, FDA, 3A, EHEDG | EC 1935/2004, FDA, 3A, EHEDG | EC 1935/2004, FDA, 3A, EHEDG | EC 1935/2004, FDA, 3A, EHEDG |
| Ex approvals | ATEX, FM, CSA, NEPSI, IECEx | ATEX, cFMus, IECEx, NEPSI | ATEX, FM, CSA, NEPSI, IECEx | - |
| Other approvals | - | MID 2004/22/EC, OIML | Inmetro, NTEP, MID 2004/22/EC, OIML | - |



Level measurement



| | 2-wire FMCW radar level transmitter for solid applications | 2-wire FMCW radar level transmitter for liquid applications | 2-wire TDR guided radar level transmitter for solid /liquid applications | 4-wire potentiometric level transmitter for hygienic applications | Microwave level switches for hygienic applications |
|---|--|---|---|---|---|
| | OPTIWAVE 6400/6500 | OPTIWAVE 3500 | OPTIFLEX 2200 | BM 500 | OPTISWITCH 6500/6600 |
| |  |  |  |  |  |
| Measuring accuracy | ±2 mm; ±0.08" | ±2 mm; ±0.08" | ±3 mm; ±0.12" | ±0.5% from probe length | - |
| Measuring range | 0...100 m; 0...328 ft | 0...50 m; 0...164 ft | 0.6...40 m; 2...131 ft | 0.2...3 m; 0.7...10 ft | - |
| Measurable products | Powders, granulates, bulk solids | Liquids, pastes, slurries | Liquids and solids | Liquids and pastes | Liquids and solids |
| Dielectric constant | ≥1.4 | ≥1.4 | ≥1.4 (1.1) | - | > 1.5 |
| Outputs | Current, optional: 2nd current | Current, optional: 2nd current | Current, optional: 2nd current | Current | Status |
| Inputs | - | - | - | - | - |
| Communication | HART® | HART® | HART®, FF, PA | - | - |
| Power supply | 12...30 VDC (non-Ex and Ex i) | 12...30 VDC (non-Ex and Ex i) | 14...30 VDC (non-Ex and Ex i) | 18...36 VDC (non Ex) | 18...36 VDC (non Ex) |
| Protection category Compact (C) Field (F) | IP66, 68; NEMA4X, 6P | IP66, 68; NEMA4X, 6P | IP66, 67; NEMA4X, 6P IP66, 67; NEMA4X, 6P | IP66, 67; NEMA4X, 6P IP66, 67; NEMA4X, 6P | IP66, 67; NEMA4X, 6P |
| Process connection | | | | | |
| Nominal sizes | OPTIWAVE 6400: DN80...200 OPTIWAVE 6500: DN40...70 | DN25...40 | DN25...150 | DN50 | DN25 |
| Flanges | EN 1092 or ASME | EN 1092 or ASME | EN 1092 or ASME | - | - |
| Hygienic connections | - | VARIVENT® DN50, DIN 11851 DN50, SMS 51, Neumo Biocontrol | DIN 11851, Tri Clamp | Weld in adapter, 11851, SMS; VARIVENT®, DIN Clamp, Tri Clamp, others on request | Weld in adapter, 11851, SMS; VARIVENT®, DIN Clamp, Tri Clamp, others on request |
| Threaded | G1 1/2; 1 1/2" NPT | G1 1/2; 1 1/2" NPT | G1 1/2...1 1/2; 1/2...1 1/2" NPT | G1 h | G1/2 h |
| Pressure rating | Depending on process connection | Depending on process connection | Depending on process connection | Depending on process connection | Depending on process connection |
| Process temperature | OPTIWAVE 6400: -50...+130°C; -58...+266°F OPTIWAVE 6500: -50...+150°C; -58...+302°F | -50...+150°C; -58...+302°F | -50...+150°C; -58...+302°F, | -20...+140°C; -4...+284°F | -20...+85°C; -4...+185°F |
| Ambient temperature | -40...+80°C; -40...+176°F | -40...+80°C; -40...+176°F | -40...+80°C; -40...+176°F | -20...+60°C; -4...+140°F (compact) -20...+100°C; -4...+212°F (remote) | -40...+85°C; -40...+185°F |
| Materials | | | | | |
| Wetted parts | PTFE, PP or stainless steel | PEEK | Stainless steel, Hastelloy® | Stainless steel | PEEK, stainless steel |
| Approvals | | | | | |
| Hygienic approvals, conformity | EC 1935/2004, FDA | EC 1935/2004, FDA, EHEDG | EC 1935/2004, FDA | EC 1935/2004, FDA, 3A | EC 1935/2004, FDA, 3A, EHEDG |
| Ex approvals | ATEX, IECEx, cQPSus | ATEX, IECEx, cQPSus | ATEX, IECEx, cFMus, NEPSI, INMETRO | - | ATEX |
| Other approvals | - | - | SIL2, CRN, WHG, EAC | EAC | EAC |

Pressure measurement





| | Ultra-compact pressure transmitter with flush metallic diaphragm also for hygienic applications | Process pressure transmitter with metallic measuring cell for pressure and level measurement | Process pressure transmitter with ceramic measuring cell for pressure and level measurement | Differential pressure transmitter for hydrostatic level measurement with integrated absolute pressure measurement |
|---------------------------------|---|--|---|---|
| | OPTIBAR P 2010 | OPTIBAR PM 5060 | OPTIBAR PC 5060 | OPTIBAR DP 7060 |
| |  |  |  |  |
| Measuring accuracy | <± 0.25% FSO | <± 0.075% of upper range value <± 0.10% of upper range value <± 0.20% of upper range value | <± 0.05% of upper range value <± 0.10% of upper range value <± 0.20% of upper range value | <± 0.065% of upper range value |
| Measuring range | 0.1...40 bar; 1...580 psig | 0.025...100 bar; 0.4...1450 psig | 0.025...100 bar; 0.4...1450 psig | 10, 30, 100, 500 mbar; 3, 16 bar; 0.15, 0.4, 1.4, 7.2, 43.5, 232 psi |
| Outputs | 4...20 mA, 0...10 V | 4...20 mA | 4...20 mA | 4...20 mA |
| Inputs | - | - | - | - |
| Communication | - | HART®, FF, PA | HART®, FF, PA | HART®, FF, PA |
| Power supply | 24 VDC | 9.5...35 VDC | 9.5...35 VDC | 9.5...35 VDC |
| Protection category Compact (C) | IP66, 67; NEMA4X, 6P | IP66, 68, optional IP69K | IP66, 68, optional IP69K | IP66, 68, optional IP69K |
| Process connection | | | | |
| Nominal sizes | From DN25; 1/2" | From G1/2; 1/2" NPT frontflush | From G1/2; 1/2" NPT frontflush | 1/4" NPT, 1/2" NPT |
| Flanges | - | From DN25, 1" ASME | From DN25, 1" ASME | With OPTIBAR diaphragm seal |
| Hygienic connections | VARIVENT®, SMS, DIN 11851, DIN Clamp and Tri Clamp | DIN 11851, 11864-1, SMS, VARIVENT®, DRD, PMC | DIN 11851, 11864-1, SMS, VARIVENT®, DRD, PMC | - |
| Threaded | From G1/2 front flush | From G1/2; 1/2" NPT frontflush | From G1/2; 1/2" NPT frontflush | 1/4" NPT, 1/2" NPT |
| Pressure rating | Depending on process connection | Depending on process connection | Depending on process connection | Depending on process connection |
| Process temperature | -40...+125°C; -40...+257°F | -40...+105°C; -40...+221°F | -40...+150°C; -40...+302°F | -40...+85°C; -40...+185°F |
| Ambient temperature | -40...+85°C; -40...+185°F | -40...+80°C; -40...+176°F | -40...+80°C; -40...+176°F | -40...+80°C; -40...+176°F |
| Materials | | | | |
| Wetted parts | Stainless steel, Hastelloy® C-276 | Stainless steel, Hastelloy® C-276 | Stainless steel, 99.996% ceramic or stainless steel only | Stainless steel, Hastelloy® C-276, Monel®, tantalum |
| Approvals | | | | |
| Hygienic approvals, conformity | EC 1935/2004, FDA, 3A | EC 1935/2004, FDA, 3A | EC 1935/2004, FDA, 3A | EC 1935/2004, FDA, 3A |
| Ex approvals | ATEX / IECEx Ex ia 1G / 1D | ATEX / IECEx Ex ia, Ex d, Ex d ia | ATEX / IECEx Ex ia, Ex d, Ex d ia | ATEX / IECEx Ex ia, Ex d, Ex d ia |
| Other approvals | - | - | SIL 2 | - |





Temperature measurement

| | Compact temperature sensor with a very small footprint | Standard temperature assembly for the food market |
|------------------------------------|---|---|
| | OPTITEMP TRA-C10 | OPTITEMP TRA-H10 |
| |  |  |
| Measuring accuracy | PTD: class A acc. EN 60751 Thermocouple: class acc. to DIN EN 60584 | PTD: class A acc. EN 60751 Thermocouple: class acc. to DIN EN 60584 |
| Measuring range | -50...+200°C; -58...+392°F | -50...+200°C; -58...+392°F |
| Measurable products | Liquids, gases or solids | Liquids, gases or solids |
| Outputs | Resistance or current output | Resistance or current output |
| Communication | - | HART®, PA |
| Power supply | 24 VDC | 24 VDC |
| Protection category Compact (C) | Depending on connection head: IP54, 65, 67 or 68 | Depending on connection head: IP54, 65, 67 or 68 |
| Process connection | | |
| Number of sensors | 1 | 1 or 2 |
| Diameter | Ø6 mm; 0.24" | Ø6, 10 mm; 0.24, 0.39" |
| Standard length | 50, 100 mm; 2, 4" (other on request) | 50, 100 mm; 2, 4" (other on request) |
| Hygienic connections | DIN, ISO or Tri Clamp | DIN, ISO or Tri Clamp |
| Threaded | G1/2 | - |
| Pressure rating | Depending on process connection | Depending on process connection |
| Process temperature | See measuring range | See measuring range |
| Ambient temperature | -40...+70°C; -40...+158°F | -40...+70°C; -40...+158°F |
| Materials | | |
| Wetted parts | Stainless steel | Stainless steel |
| Approvals | | |
| Hygienic approvals, conformity | EC 1935/2004, FDA | EC 1935/2004, FDA |
| Other approvals | - | SIL 2 |


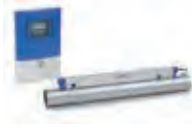



| | Hygienic temperature assembly with replaceable insert | Hygienic temperature assembly for on-site calibration |
|--|---|---|
| | OPTITEMP TRA-H20 | OPTITEMP TRA-H30 |
| |  |  |
| Measuring accuracy | PTD: class A acc. EN 60751 Thermocouple: class acc. to DIN EN 60584 | PTD: class A acc. EN 60751 Thermocouple: class acc. to DIN EN 60584 |
| Measuring range | -50...+200°C; -58...+392°F | -50...+200°C; -58...+392°F |
| Measurable products | Liquids, gases or solids | Liquids, gases or solids |
| Outputs | Resistance or current output | Resistance or current output |
| Communication | HART®, PA | HART®, PA |
| Power supply | 24 VDC | 24 VDC |
| Protection category Compact (C) | Depending on connection head: IP54, 65, 67 or 68 | Depending on connection head: IP54, 65, 67 or 68 |
| Process connection | | |
| Number of sensors | 1 or 2 | 1 |
| Diameter | Ø6, 10 mm; 0.24, 0.39" | Ø6, 10 mm; 0.24, 0.39" |
| Standard length | 50, 100 mm; 2, 4" (other on request) | 50, 100, 150, 200 mm; 2, 4, 6, 8" (other on request) |
| Hygienic connections | DIN, ISO or Tri Clamp | DIN, ISO or Tri Clamp |
| Threaded | - | - |
| Pressure rating | Depending on process connection | Depending on process connection |
| Process temperature | See measuring range | See measuring range |
| Ambient temperature | -40...+70°C; -40...+158°F | -40...+70°C; -40...+158°F |
| Materials | | |
| Wetted parts | Stainless steel | Stainless steel |
| Approvals | | |
| Hygienic approvals, conformity | EC 1935/2004, FDA | EC 1935/2004, FDA |
| Other approvals | SIL 2 | - |







Process analysis

| | Hygienic conductivity sensor | Hygienic pH sensor | Hygienic conductivity measuring system | Hygienic absorption measurement system |
|-----------------------------------|---|---|--|---|
| | SMARTPAT COND 7200 | SMARTPAT PH 8570 | OPTISYS IND 8100 | OPTISYS TSS x050 |
| |  |  |  |  |
| Parameter | Conductive conductivity | pH | Inductive conductivity | Suspended solid / turbidity |
| Measuring accuracy | ±3% | – | 1.00% | <±5% |
| Measuring range | 0.05...10 µS/cm (c=0.01) 1...1000 µS/cm (c=0.1) | 0...14 pH | 500 µS/cm...1 S/cm | 0...100%, 0...3 AU, 0...6 OD, 0...13000 FAU, 0...13000 FTU, 0...3250 EBC, 0...26.65 mg/l |
| Process conditions | Liquids | Liquids | Liquids | Liquids |
| Temperature sensor | Pt1000 | P1000 | Pt1000 | – |
| Outputs | 1 x 4...20 mA (passive) | 1 x 4...20 mA (passive) | 2 x 4...20 mA (passive) 2 relays | 1 x 4...20 mA (passive) |
| Inputs | – | – | 2 inputs for changing measuring ranges | – |
| Communication | HART® 7 | HART® 7 | – | – |
| Power supply | 15...30 VDC (loop powered) | 15...30 VDC (loop powered) | 15...35 VDC | 18...30 VDC |
| Protection category | IP68 | IP68 | IP67, 69K | IP69K |
| Process connection | | | | |
| Diameter range | – | – | – | – |
| Process connection | VARIVENT® N Tri Clamp DN25/32/40, DN50 | PG13.5 | G1 hygienic, multiple adapters | G 1/2 , PG13.5 |
| Temperature/pressure range | | | | |
| Pressure range | Max. 16 bar; 232 psig | Max. 12 bar; 174 psi | Max. 10 bar; 145 psi | Max. 10 bar; 145 psig |
| Process temperature | 0...+135°C; +32...+275°F | 0...+140°C; +32...285°F | -30...+140°C; -22...176°F | 0...+90°C; +32...+194°F |
| Ambient temperature | -10...+85°C; +14...+185°F | -10...+85°C; +14...+185°F | -40...85°C; -40...185°F | – |
| Materials | | | | |
| Sensor material | Stainless steel, PEEK, Viton, FKM | Glass, ceramic, Rheolid gel | PEEK | Stainless steel, Sapphire glass |
| Approvals | | | | |
| Approvals | – | IECEX, ATEX, NEPSI, FM (zone 0) | – | – |
| Certificates | FDA | FDA | EC 1935/2004, FDA, EHEDG, 3A | EC 1935/2004, FDA |

| | Hygienic suspended solid sensor | Hygienic conductivity sensor | Hygienic conductivity sensor | Rheometer for continuous inline measurement of process viscosity |
|-----------------------------------|---|---|--|---|
| | OPTISENS TSS 7000 | OPTISENS COND 7200 | OPTISENS IND 7000 | VISCOLINE |
| |  |  |  |  |
| Parameter | Suspended solid | Conductive conductivity | Inductive conductivity | Dynamic viscosity |
| Measuring accuracy | ±2% | – | ≤1% | 0.2% repeatability |
| Measuring range | E.g. 0...3% milk fat or 0...25 g/l | 0.05...10 µS/cm (c=0.01) 1...1000 µS/cm (c=0.1) | 0.5...2000 mS/cm | 50...200.000 cP |
| Process conditions | Liquids | Liquids | Liquids | Liquids |
| Temperature sensor | – | Pt100 | Pt1000 | – |
| Outputs | 4...20 mA, relays (with MAC 300) | 4...20 mA, relays (with MAC 100) | 4...20 mA, relays (with MAC 100) | 4...20 mA, EtherNet IP |
| Inputs | – | – | – | – |
| Communication | Modbus (with MAC 300) | – | – | Ethernet, Profinet |
| Power supply | 230 VAC (with MAC 300) | 24 VDC, 230 VAC (with MAC 100) | 24 VDC, 230 VAC (with MAC 100) | 24 VDC, 230 VAC |
| Protection category | IP68 | IP65,67 | IP68 | IP67; NEMA4 |
| Process connection | | | | |
| Diameter range | – | – | – | DN25...100; 1...4" |
| Process connection | Tri Clamp 2" or 3" VARIVENT® N | Tri Clamp DN 25/40 | VARIVENT® N, Milk cone DN50, 65, G1 1/2, G2 | Customer specific, Tri Clamp or others |
| Temperature/pressure range | | | | |
| Pressure range | Max. 10 bar; 145 psig | Max.16 bar; 232 psi | Max.12 bar; 174 psi | Max. 40 bar; 580 psi |
| Process temperature | 0...+85°C; +32...+185°F | 0...+135°C ; +32...+275°F | -10°C...+125°C; +14°F...+257°F | -20...+40°C; -4...+285°F |
| Ambient temperature | 0...+50°C; +32...+122°F | – | – | – |
| Materials | | | | |
| Sensor material | PP or PVDF | Stainless steel | PEEK | Stainless steel |
| Approvals | | | | |
| Approvals | – | – | – | EC, UL, CSA |
| Certificates | EC 1935/2004, FDA | FDA | FDA | EC 1935/2004, FDA |

Energy measurement

| | Vortex | Ultrasonic | | | |
|--|--|--|--|--|---|
| | OPTISWIRL 4200 | OPTISONIC 6300 | OPTISONIC 6300 P | OPTISONIC 3400 | OPTISONIC 7300 |
| |  |  |  |  |  |
| Recommended energy measurements | | | | | |
| Heating | x | x | x | – | – |
| Cooling | x | x | x | – | – |
| Compressed air | x | – | – | x | x |
| Steam | x | – | – | – | – |
| Gas | x | – | – | x | x |
| Oil | – | – | – | – | – |
| Process conditions | | | | | |
| Temperature range | –40...+240°C; –40...+464°F | –40...+200°C; –40...+392°F | –40...+200°C; –40...+392°F | –200...+250°C; –328...+482°F | –40...+180°C; –40...+356°F |
| Maximum pressure | PN100; CL 600 | – | – | PN100; CL 1500 | PN40; CL 900 |
| Measuring range | Liquids: 0.25...7 m/s; 0.8...23 ft/s; optional up to 10 m/s; 32.8 ft/s Gases and steam: 2...80 m/s; 6.6...262.5 ft/s (depends on density) | +0.5...+20 m/s; +1.6...+66 ft/s | +0.5...+20 m/s; +1.6...+66 ft/s | +0.3...+20 m/s; +0.98...+65 ft/s | –30...+30 m/s; –98.4...+90.4 ft/s |
| Diameter to EN 1092-1 | DN15...100 | DN15...4000 | DN15...4000 | DN25...3000 | DN50...600 |
| Flowmeter features | | | | | |
| Inlet and outlet section | 15DN/7DN | 10DN/5DN | 10DN/5DN | 5DN/3DN | 10DN/3DN |
| Digital communication | HART®, PA, FF | HART® | USB slave | HART®, Modbus, FF | HART®, Modbus, FF |
| Measuring accuracy | Re > 20,000 ±0.75% for liquids Re > 20,000 ±1% for gases and steam 10,000 < Re < 20,000 ±2% for liquids, gases and steam | ±1% | ±1% | Volume flow: DN100; 4": < ± 1.5% of measured value, DN150...600; 6...24": < ± 1% of measured value | Air calibration (atmospheric): 2...3": ±1.5%; 4...24": ±1% |
| Highlights | <ul style="list-style-type: none"> • Integrated temperature and pressure compensation • Gross and net heat measurement • With integrated nominal diameter reduction • Development according to IEC 61508 | <ul style="list-style-type: none"> • Ultrasonic clamp-on flowmeter with separate UFC 300 converter • Easy installation without process interruption – no need to open piping • Universally applicable from DN15 to DN4000 | <ul style="list-style-type: none"> • Portable ultrasonic clamp-on flowmeter • User friendly operation through full-colour graphic display and full keypad • Quick and easy transfer of logged data to your PC through USB interface | <ul style="list-style-type: none"> • Thermal energy measurement • No effect of magnetite scaling | <ul style="list-style-type: none"> • Universal 2-path ultrasonic flowmeter for process gases • Integrated volume calculation with pressure and temperature compensation • Independent of gas properties • No moving parts, no pressure loss |

| Electromagnetic | | | Mass | | |
|---|--|--|---|--|--|
| OPTIFLUX 4300 | WATERFLUX 3070 | WATERFLUX 3300 | OPTIMASS 1400 | OPTIMASS 6400 | OPTIMASS 7400 |
|  |  |  |  |  |  |
| x | x | x | x | x | x |
| x | x | x | x | x | x |
| - | - | - | x | x | x |
| - | - | - | - | - | - |
| - | - | - | x | x | x |
| - | - | - | x | x | x |
| -40...+180°C; -40...+356°F | -5...70°C; +23...+158°F | -5...+70°C; +23...+158°F | -40...+130°C; -40...+266°F | -200...+400°C; -328...+752°F | -40...+150°C; -40...+302°F |
| PN40; CL 1500 | PN16; CL 150 | PN16; CL 150 | PN100; CL 600 | PN160; CL 1500 | PN100; CL 600 |
| -12...+12 m/s; -40...+40 ft/s | -12...+12 m/s; -40...+40 ft/s | -12...+12 m/s; -40...+40 ft/s | 48...170,000 kg/h | 5...1,500,000 kg/h | 9.5...560,000 kg/h |
| DN2.5...2000; 1/10...80" | DN25...600; 1...24" | DN25...600; 1...24" | DN15...50; 1/2...4" | DN8...100; 1/2...4" | DN6...80; 1/4...3" |
| 5DN/2DN | none | none | none | none | none |
| HART®, FF, PA, DP, Modbus | Datalogger/GSM (optional) | HART®, FF, PA, DP, Modbus | HART®, FF, PA, DP, Modbus, EtherNet IP | HART®, FF, PA, DP, Modbus, EtherNet IP | HART®, FF, PA, DP, Modbus, EtherNet IP |
| ±0.2% | ±0.2% | ±0.2% | Liquid: ±0.15% Gas: 0.35% Density: ±2 kg/m ³ | Liquid: ±0.1%, ±0.05% optional Gas: 0.35% Density: ±1 kg/m ³ (±0.2 kg/m ³) | Liquid: ±0.1% Gas: 0.35% Density: ±2 kg/m ³ (±0.5 kg/m ³) |
| <ul style="list-style-type: none"> Standard device in the process industry More than 300,000 units deployed Chemically resistant to alkaline solutions and acids | <ul style="list-style-type: none"> Battery-driven with very low power consumption for remote locations Easy installation without straight inlet or outlet sections IP68 rated signal converter for submersion in flooded chambers | <ul style="list-style-type: none"> Easy installation without straight inlet or outlet sections For installation in small spaces Wide range of approvals for potable water | <ul style="list-style-type: none"> Standard meter in the process industry Excellent price-performance ratio Supplied standard with secondary containment housing | <ul style="list-style-type: none"> The high-performance meter for the process industrie Cryogenic, high-temperature and high-pressure options Supreme liquid and gas performance with CT approval | <ul style="list-style-type: none"> Single straight measuring tube in titanium, HASTELLO® or stainless steel Sterilisable and cleanable |

Services

Project services · Online tools · Maintenance services · Metrological services · Seminars · In-situ verification · Calibration

Beyond the highest requirements

From engineering and planning to commissioning, training and documentation: our services cover all project stages, and can be offered for all enterprise sizes:

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- Engineering
- Commissioning
- On-site start-up
- Product training (on-site)
- Calibration, (in-situ) verification and documentation
- Maintenance services
- Seminars and trainings on various topics

Please see right page for more details on selected services.



Commissioning of flowmeters

Online tools:



PiCK

Enter the serial number and get device specific documents, e.g. manuals, handbooks, calibration certificates, etc.:
pick.krohnegroup.com

Configure It

Configure It

Configure flow and level and temperature devices and get free 2D/3D CAD data:
www.krohne-direct.com

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Metrological accreditation of custody transfer applications

We offer special services for metrological accreditation of measuring and loading systems for liquids and gases, according to local fiscal regulations:

- Project management from planning to commissioning, training and documentation
- For mobile and stationary measuring systems

Seminars: KROHNE Academy & KROHNE Academy online

KROHNE Academy is a series of seminars in collaboration with leading automation companies. Taking place in various countries, it addresses key operating issues, from plant safety to ways of increasing efficiency and controlling costs, and shows possible solutions. Should your interest be more towards working "hands-on" with our devices, then our service academy is what you are looking for. Learn more about KROHNE Academy at www.krohne.com

KROHNE Academy online is an online eLearning platform, focusing on industrial process instrumentation. It comprises electronic learning content with full audio, explaining measuring technology without relation to specific manufacturers. Register now for free and start your training at academy-online.krohne.com



Large team of field service engineers and technicians



MID MI-005 tanker filling system for liquefied gas



Functional safety seminar at KROHNE headquarters, Duisburg, Germany

In-situ verification

OPTICHECK is the essential tool to assure that your process measuring devices are performing according to specification. When connected to an installed meter (in-situ), it gathers data to ensure that the meter is performing within 1 % of the factory calibration.

- Printed individual verification certificate
- Preventive maintenance and service features
- Storage of verification data
- Download factory calibration settings from KROHNE manufacturing database



Calibration from KROHNE: Certainty you can count on

Calibration is one of KROHNE's core areas of expertise. If you buy a KROHNE product, you will get a measuring device that performs most accurate with low uncertainty under real process conditions.

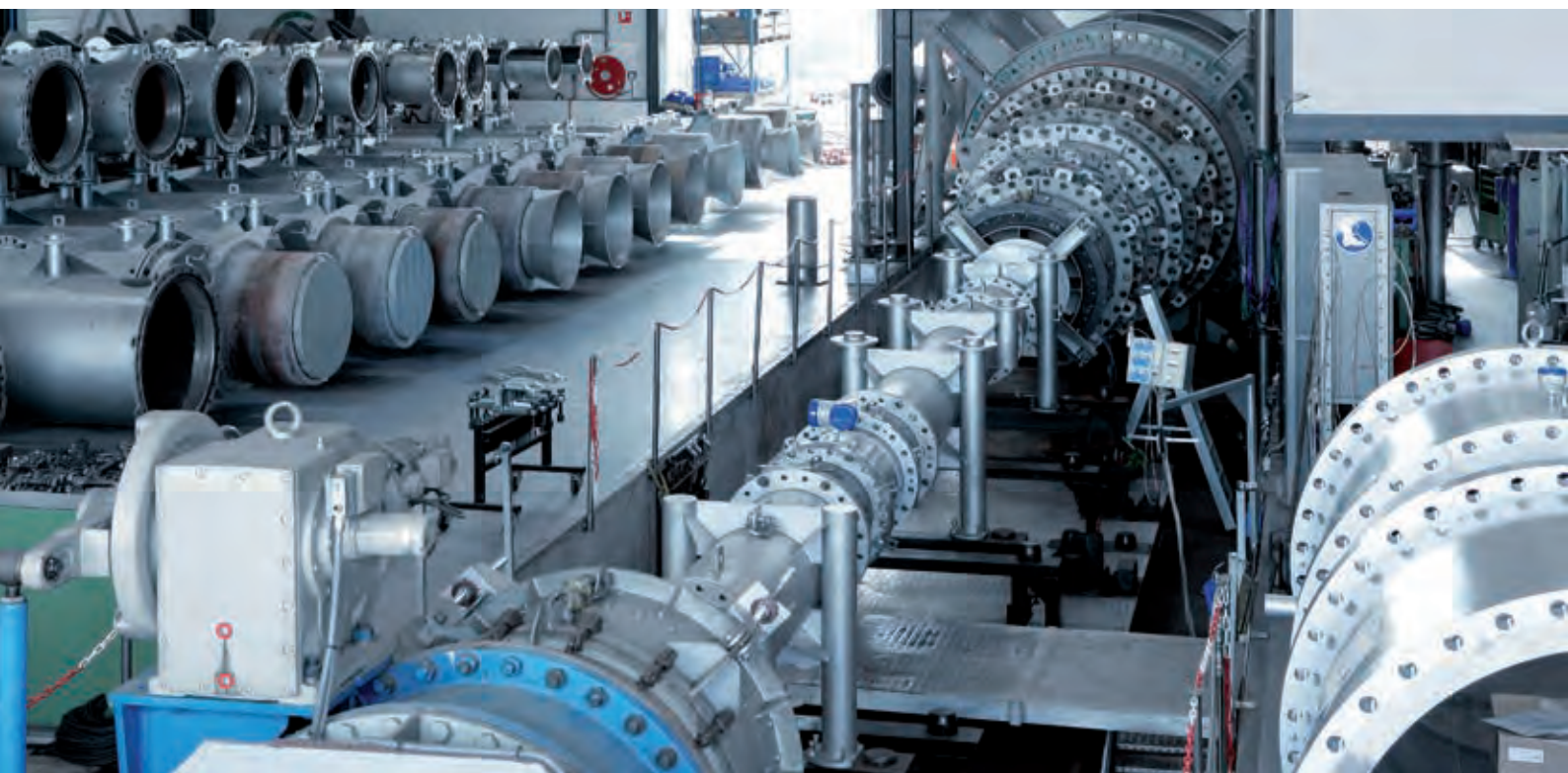
To achieve this, we operate more than 140 calibration facilities for volume flow, mass flow, level, temperature, density and pressure to (wet-)calibrate any device we manufacture. For example, every flowmeter is wet-calibrated using water or air as standard before leaving our facilities.

We can also provide customer specific calibration such as:

- Carry out multipoint calibrations
- Vary different parameters such as temperatures, viscosities, pressures etc.
- Use the actual medium or similar
- Build or emulate customer-specific flow geometries
- Use piping provided by the customer

For calibration we only use direct comparison of measurands (e.g. we calibrate our Coriolis mass flowmeters with a gravimetric weighing system). Our calibration rigs are the most accurate used in measuring device production worldwide: the accuracy of the reference is usually 5 to 10 times better than that of the meter under test.

The world's most precise volumetric calibration rig for flowmeters up to DN 3000/120"





Stretch for calibration of FMCW level transmitters

Volumetric piston prover

This goes for small as well as for very large sizes: KROHNE operates the world's most precise volumetric calibration rig for flowmeters up to DN 3000/120" with a certified accuracy of 0.013 %. The reference vessel is a 44 m/144 ft high tank containing almost ½ million litres/132,000 gal (US) of water which allows for a maximum flow rate of 30,000 m³/h/7,925,000 gal (US)/h.

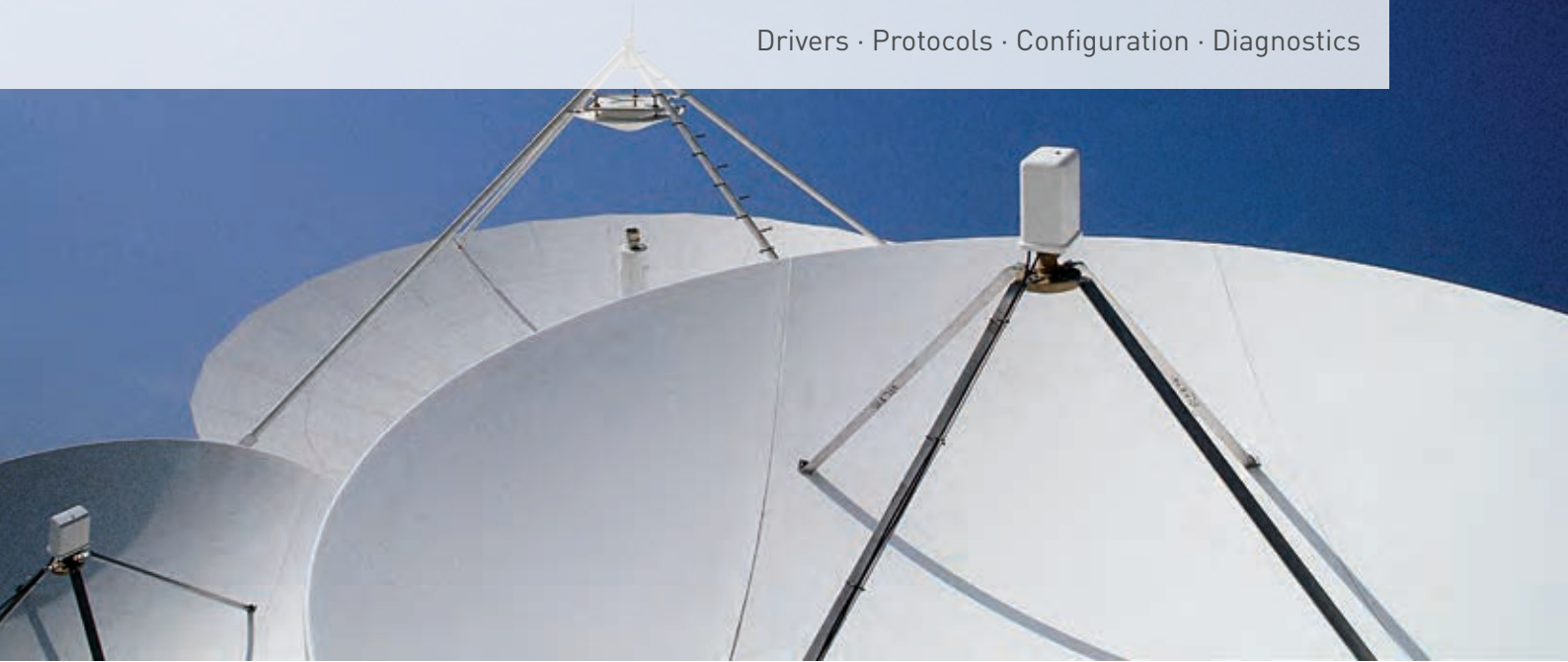
Certified technology for fiscal & custody transfer applications

Our meters can be calibrated and certified according to various standards such as OIML, API, Measuring Instruments Directive (MI-001, 002, 004, 005), GOST, etc. The standards we use for calibration are ISO/IEC 17025 accredited and traceable to international or national standards. Regular inspections by national metrology institutes, round robin tests and alignments with national and international metrological standards according to ISO 9000 and EN 45000 guarantee the quality and comparability of our calibration rigs. Staff performing the calibrations are trained and given regular re-trainings to ensure quality and continuity.



Communication technology

Drivers · Protocols · Configuration · Diagnostics



Open for the future

KROHNE is committed to making communication convenient. Which is why our field devices communicate reliably with controllers, control systems and PCs, and can also be used for a variety of control and regulating tasks.

Protocols and interfaces

We support proven and established protocols as well as new ones for certain industries, e.g. EtherNet/IP™ for the food and beverage industries, or PROFINET® for the water and wastewater sector.

Device integration

KROHNE meets all of the prerequisites for integration into modern plant asset management systems, based on integration technologies such as DD/EDD and FDT/DTM.

We are a longstanding member of PACTware™ and the FDT Group®. Since 2003, we provide DTMs and EDDs for our field devices with HART®, PROFIBUS® or FOUNDATION™ fieldbus interfaces.



Configuration and diagnostics via DTMs



Easy navigation, device status available anytime



Simple parameterisation supported by graphic elements

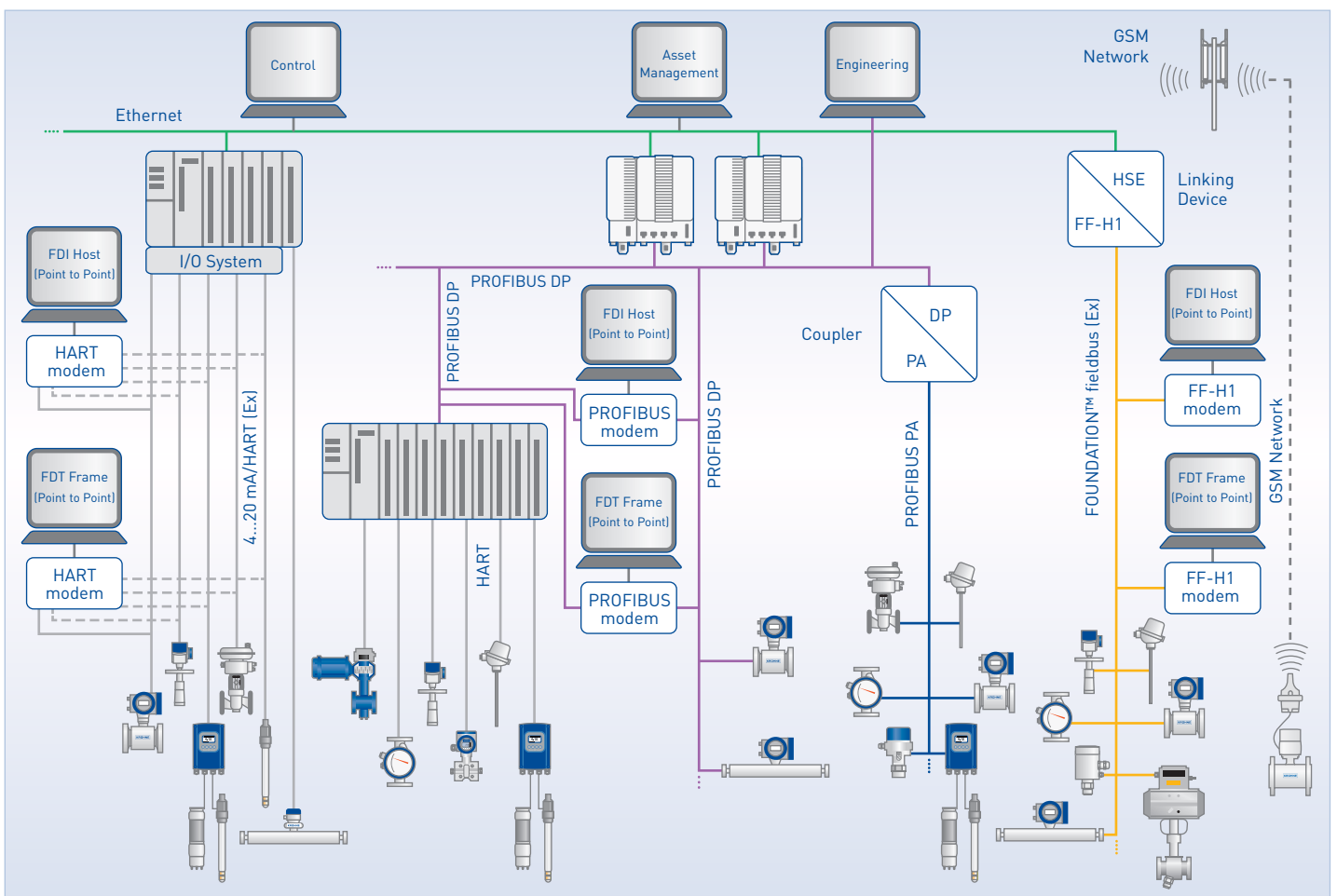


Detailed diagnostics overview with recommendations to resolve actual events



Advanced monitoring functions with optional recording of events

Fast and convenient access to process and device data from any level



Technology icons

To deliver reliable values even under difficult conditions, KROHNE products and solutions use a number of high-end technologies.

These are highlighted by the technology icons, each representing a unique and characteristic feature that also generates additional benefit for users:



Ceramic durability

By implementing oxide ceramic sensors into OPTIFLUX and BATCHFLUX electromagnetic flowmeters as well as ceramic diaphragms into OPTIBAR pressure devices, KROHNE is using a superior material that is permanently resistant to corrosive and abrasive media and also immune to temperature shocks.



EGM™ Entrained Gas Management

EGM™ was developed for the OPTIMASS Coriolis mass flowmeters to overcome problems caused by air or gas entrainments in a liquid. Powerful control algorithms maintain measurement, even during a complete transition from a pure liquid phase to a gas phase and back. Mass flow and density measurements remain stable and continuous, which has been demonstrated in batch / loading / empty-full-empty applications.



Total 3D linearisation

For a robust and accurate differential pressure measurement, even under changing process conditions, each OPTIBAR DP 7060 differential pressure transmitter is linearised in 3 dimensions during calibration: differential pressure, ambient temperature and static pressure are taken into account in combination. Since the full specified operating range is covered, an outmost stable and accurate measurement under all process conditions is guaranteed.



SmartSense insulation monitoring

Temperature assemblies with Pt100 or thermocouple sensors can produce erroneous measurements due to humidity in the measuring insert, e.g. caused by wear, corrosion or cracks. OPTITEMP temperature transmitters with SmartSense monitor the temperature sensor and warn for isolation errors.

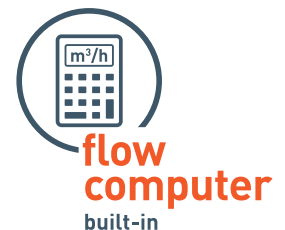
Transmitter built-in

The SMARTPAT series of analysis sensors significantly eases the handling of analytical sensors: formerly an external device, the transmitter has now been miniaturised and built into the sensor head, enabling direct 4...20 mA/HART® 7 communication. This reduces the costs of ownership, eases installation and maintenance, and allows for usage in Ex applications (zone 0).



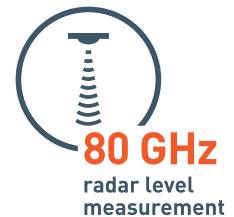
Flow computer built-in

Many KROHNE flowmeters have a built-in flow computer that compensates for the effects of pressure and temperature on the flow measurement or to convert to standard volume. The OPTISONIC 7300/8300 have analogue input for P & T sensors, the OPTISWIRL 4200 has both integrated. This saves both cost and installation efforts for an external flow computer.



80 GHz radar level measurement

The 80 GHz technology used in the OPTIWAVE series is the most recent and versatile radar technology for level measurement of liquids and solids. Over an identical distance, it presents a highly focused beam with a smaller diameter compared to lower frequency radars, ideal for dusty atmospheres or low reflective media. The small dead zone and narrow beam angle allow for use in both small and tall vessels.



Multiphase measurement

Multiphase measurement allows for the simultaneous measurement of flow rates of oil, water and gas in multiphase mixtures, without the need of separation. This saves time, costs, space and installation efforts compared to conventional test separators. Our magnetic resonance based multiphase flowmeter M-PHASE 5000 offers a full bore, non-radioactive solution for measuring multiphase flow.



E-RTTM pipeline leak detection

E-RTTM is a leading mathematical model for continuous internal monitoring of pipelines. Integrated in our PipePatrol system, it compares measurement data from the actual pipeline with those of a simulated "virtual pipeline" in real time. If the model detects a discrepancy, a leak signature analysis using leak pattern recognition determines whether it is a leak or safe, with outstanding accuracy.



KROHNE – Process instrumentation
and Measurement solutions

- Flow
- Level
- Temperature
- Pressure
- Process analysis
- Services

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