



KROHNE

▶ measure the facts

The path to energy efficiency

Intelligent solutions for energy management

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"Regional Greenhouse Gas Initiative"



China green exchange



EED = Energy Efficiency Directive
 ETS = EU-Emission Trading System
 GHG = Greenhouse Gas
 MID = Measuring Instruments Directive 2014/32/EU
 OIML = International Organization of Legal Metrology
 AGA = American Gas Association

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Reducing energy demand, carbon footprint and production cost in energy intense industries

New regulations and significantly increasing prices for energy and emissions are forcing utilities and energy intense industries to take action in order to stay competitive. Many countries around the world already have energy efficiency regulations and did introduce an emission trading system or have planned so. In Europe these are the EED and the EU-ETS with progressing limitations for the GHG emissions.

All small and medium-sized enterprises have to maintain an energy management system for example according to ISO 50.001 or do regular audits. All power and heat generating plants above 20MW and energy intense industries like the chemical industry, pulp & paper, food & beverage, steel etc. need to make an environmental report with the related GHG emissions for example according to ISO 14.064. To maintain competitiveness the production facilities and the company goals must be harmonized with these new challenges in the best possible way.

Our expertise for your energy management project

KROHNE supports you in the planning and implementation of your energy management. The measurement of the relevant energy flows and GHG-equivalents represent the basis for all further optimizations and measures. As a full scope supplier KROHNE offers a wide range of technologies for the measurement of material bound energy flows like for fuels, hydrogen, biogas, steam, hot water, chilled water, CO₂ and other GHG-equivalents. With our broad measurement portfolio – e.g. six different flow technologies, local experts in calibration law and a huge number of approvals for e.g. international custody transfer standard like MID, OIML, AGA we meet all the requirements to be the perfect partner for your energy management project.



Products, solutions and services from KROHNE – One source portfolio for your energy management

As a flow expert and reliable partner for process instrumentation and automation, KROHNE offers, among other instruments, six different flow technologies under one roof and can thus always offer the best option for the task at hand. From process instruments for the measurement of feedwater, steam or condensate flows to a custody transfer flow metering system for fuel gases according to commonly applied international standards such as MID, OIML, AGA.

Depending on the process and the regulative requirements additional conditions may apply to the instrument such as the Measuring Instruments Directive (MID) or specific calibration requirements.



Complete process instrumentation portfolio

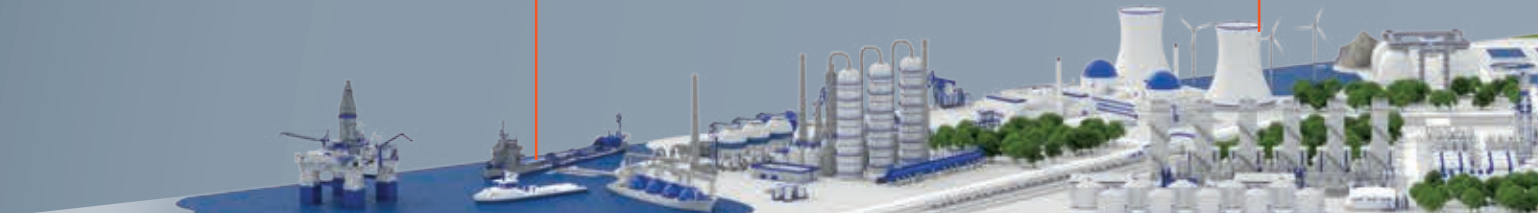
- Complete product portfolio for flow, level, temperature and pressure measurement as well as process analytics
- Large choice of measuring technologies, materials and connections
- High level of expertise in calibration – more than 120 in-house calibration facilities
- Advanced self-diagnostics features to enable process optimisation and use in safety systems

Measurement of typical energy flows and GHG equivalents

Fuel

- Gaseous fuels like natural gas, biogas, hydrogen
- Liquid fuels like biodiesel, heating oil, LFO, HFO
- Solid fuels like biomass, residues, waste, coal

Steam





Engineered and in-house manufactured turnkey solutions for process control and automation

- Metering and monitoring solutions from design concept to on-site commissioning
- Seamless integration of KROHNE and third party instrumentation
- Dedicated KROHNE supervisory and validation software
- In-house engineering, manufacturing, testing, commissioning and field-service

Engineering services in all project phases

- Consultancy & engineering
- Start-up & commissioning
- Calibration & validation
- Operation & maintenance
- Support & training
- Spare parts & repairs
- Local spare parts supply
- Premium options
- Service level agreements



Compressed air

Hot water and condensate

Cold



KROHNE – The long-standing partner of the energy-intensive industries

KROHNE ranks among the world's leading companies involved in the development and production of innovative and reliable process measuring technology for all energy-intensive sectors around the world. We offer our customers products, services and solutions that exceed their expectations in terms of quality, performance, service and design.



Food & Beverage

The food & beverage industry accounts for 30% of the global industrial energy demand. Especially dairies, breweries, bakeries and ready meals preparation utilize energy demanding processes such as evaporation, cooking and baking, sterilization, preserving or cooling. The energy sources are electricity, gas, steam, hot water and cold being used throughout the different processes. Modern energy concepts with combined heat and power plants, usage of waste heat and absorption chillers increase the energy efficiency and reduce operating costs. An energy monitoring system with the associated process instrumentation helps to monitor and optimize the processes.



Chemical

Distillation, rectification, cracking, synthesis and many other processes in the chemical and petrochemical industry require large amounts of energy. Chemical sites usually have their own utilities with closely interlinked energy flows between chemical plant and utilities. By-products, process gases or hydrogen which accrue in the process can be utilized in process heat and power plants. The savings potential can be huge, but requires many single energy flows to be looked at. Steam systems must distribute and handle the expensive energy with care, heat exchangers and condensate traps should work in their efficient range. Waste heat could be recovered by ORC processes or used for other purposes.



Power generation

Power generation

Utilities are often closely interlinked with energy demanding industries. Not only electricity but also steam, heat and cold are supplied to their industrial neighbours. Utilization of combined cycle processes and production of power and heat in cogeneration increases efficiencies above 90%. Depending on the season the utilities company may also receive heat or steam back from the industrial plant and further sub-distribute it to other customers for example households.



Pulp & Paper

The paper making process would not be possible without the use of water and steam. The latter is the typical energy carrier in the paper industry and in some of the processes it still cannot be replaced. Bleaching, deinking, boiling and drying are some of these processes. The sites are usually operating their own utilities which can also use the residues from production as fuel. Excess process heat from integrated pulp and paper sites can be used in the production, in non-integrated sites for electricity generation.



Heating/Cooling

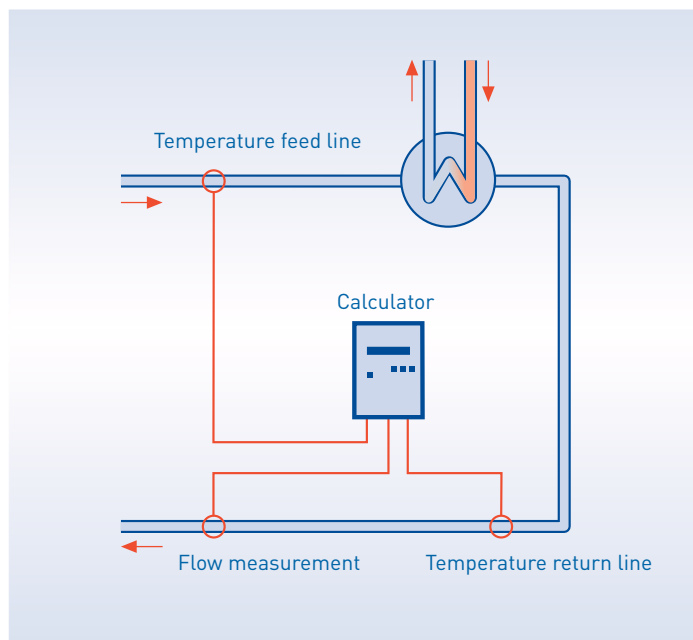


Measurement of heat and cold

The more intensive use of waste heat from industrial processes entails further integration of energy systems with the transport of heat and cold. This energy is used for either space heating/cooling of residential buildings, large private and municipal complexes as well as for industrial processes.

The flow of heat and cold must be measured for process control and accounting purposes. Usually, water or demi water is used for the heat or cold transport. Additives for inhibition of scaling and corrosion of the systems are often applied. In minor cases water-glycol mixtures are being used.

Depending on the local situation and the nature of the project, different rules may apply. For example, for the accounting of energy flows of in form of hot water MI-004 as an annex of the MID applies in Europe.



KROHNE products for heating/cooling

OPTISONIC 3400 ultrasonic flowmeter and the WATERFLUX and OPTIFLUX electromagnetic flowmeters certified according to MI-004 and other standards.

The measuring point consists of the flowmeter, a pair of matched temperature sensors and an energy calculator. All components as part of a system must be certified.

If no local rules apply also other flow technologies like **ultrasonic clamp-on – OPTISONC 6300 – or vortex – OPTISWIRL Series** – can be applied. Both meter types are available with integrated energy calculator.



Measuring the thermal energy of heat and cold



OPTISONIC 3400

- Accurate 3-path meter:
large dynamic range, maintenance-free,
no pressure loss
- Cryogenic (-200°C/-328°F) and HT
(+250°C/+482°F) versions; viscosities
up to over 1000 cSt
- Flange: DN25...3000 / 1...120", max.
PN200 / ASME Cl 1500; also weld-ends
- 3 x 4...20 mA, HART®, Modbus, FF,
PROFIBUS-PA/DP



[krohne.link/
optisonic-3400-en](https://www.krohne.com/link/optisonic-3400-en)

When measuring the quantity of heat consumed in individual production areas (such as steam generators, CIP systems, heating circuit production or ventilation systems) both the flow rate of the heating water as well as the difference in temperature before and after each consumer must be precisely measured. The objective is to determine both the individual and total demand for heating water, which can then be assigned to individual consumers as costs for heat balancing.

OPTISONIC 3400 – Class 1 certified ultrasonic flowmeter for heat and cold

Its unique design utilizing three direct ultrasonic signal paths makes it the most accurate meter for heat and cold measurement on the market. It is based on the OPTISONIC process flowmeter and measures reliably and accurately in all diameters and process conditions. So it can cope with demi water or be applied in systems with the risk of magnetite formation. KROHNE offers the complete solution consisting of flowmeter, temperature sensors and heat calculator. As a certified manufacturer according to module D we can supply fiscally calibrated heat meters and offer recalibration services once this is required.

Clamp-On flow measurement for fast results

OPTISONIC 6300 – Measurement without process interruption

Often, processes cannot be interrupted. In this case, the OPTISONIC 6300 clamp-on flowmeters is the perfect device for heat and cold measurement. With its robust industrial construction, regreasing concept and permanent coupling pads, the OPTISONIC 6300 clamp-on flowmeter for liquids provides a revolutionary easy-to-handle solution. It can be fitted on the outside of pipes to measure the flow rate of liquids. Flow measurement can be performed anywhere and started immediately. In combination with a pair of temperature sensors, measurement of heat or cold flows becomes possible. The OPTISONIC 6300 and the OPTISONIC 6300 F are designed for permanent installation.

OPTISONIC 6300 P – Portable version for temporary energy measurement

Its compact design and ease of installation is optimized for the temporary flow monitoring in numerous applications. Thanks to its mobility, the device is equally suited to comparative measurements on stationary measuring equipment or for use as a short-term replacement for defective devices. All it takes are a few simple steps and just a few minutes to complete installation. It is powered by an integrated battery (14 hours operating time) or via the mains adapter supplied. The setup can quickly be done via the mobile app. Measurements can be stored in the built-in 16 GB data logger.



OPTISONIC 6300

- Stationary ultrasonic clamp-on flowmeter, for installation at any location without process interruption or need to cut pipes
- Up to +200°C / +392°F
- Robust stainless steel sensor rail for pipes DN15...4000 / 1/2...160"
- 4...20 mA, HART®7, Modbus, FF, PROFIBUS-PA/DP



[krohne.link/
optisonic-6300-en](https://krohne.link/optisonic-6300-en)



OPTISONIC 6300 P

- Portable, battery-powered ultrasonic flowmeter used to collect additional flow data or for cost-effective on-site verification of inline flowmeters
- For pipes DN15...4000 / 1/2...160"; up to +120°C / +248°F
- Portable signal converter with integrated data logger



[krohne.link/
clamp-on-6300-p](https://krohne.link/clamp-on-6300-p)



OPTIFLUX 4300

- High accuracy ($\pm 0.2\%$), certified for custody transfer
- For low conductivity media ($> 1 \mu\text{S}/\text{cm}$) and high solid contents ($\leq 70\%$)
- Flange: DN2.5...3000 / 1/10...120", max. PN40 / ASME Cl 300
- 3 x 4...20 mA, HART®, Modbus, FF, PROFIBUS-PA/DP, PROFINET



[krohne.link/
optiflux-4300-en](https://krohne.link/optiflux-4300-en)

From process measurement until MID-certified applications

The WATERFLUX 3070, WATERFLUX 3300 and the OPTIFLUX 4300 are MID certified electromagnetic flowmeters for heat and cold. The WATERFLUX with its unique patented design can be installed in tubes without additional inlet and outlet runs. The OPTIFLUX is the flowmeter where a full bore is required. KROHNE offers the complete solution consisting of flowmeter, temperature sensors and heat calculator.



WATERFLUX 3070 / 3300

- Integrated temperature and pressure measurement for leak monitoring
- CT: MI-001, OIML R49 up to DN600 / 24", no inlet/outlet runs needed
- Burial installation possible (IP68)



krohne.link/emf-en





All-in-one flowmeter for the monitoring of steam and condensate based energy flows

Based on the Vortex principle the OPTISWIRL 4200 is able to measure heat flows at elevated temperatures and pressures. The converter includes a heat calculator which together with the integrated pressure and temperature sensor and a connected second temperature sensor calculates the heat flow. This integration significantly reduces installation cost and offers a great option for heat flow measurement for process control and monitoring purposes.

OPTISWIRL 4200 / 5080

- For liquids, (wet) gases, saturated and superheated steam (+240°C / +464°F) / OPTISWIRL 5080 up to +427°C / +800°F
- Integrated pressure and temperature measurement: direct output of mass, nominal flow, energy, gross/net heat
- Flange: DN15...300 / 1/2...12"; wafer version: max. DN100 / 4", 2-wire, 4...20 mA, HART®, FF, PROFIBUS-PA



[krohne.link/
vortex-en](https://krohne.link/vortex-en)

Case study Ultrasonic flow measurement in a district heating network

- Integration of a biomass CHP plant into a sustainable heating network
- Hot water flow measurement for heat supply in accordance with Power and Heat Act
- For invoicing purposes, the flowmeters were required to comply with the Measuring Instruments Directive (MID) MI-004 in order to meet the requirements of the local Verification Act



krohne.link/app-dist-heat-en



Compressed air



Performance under pressure – Compressed air production and distribution

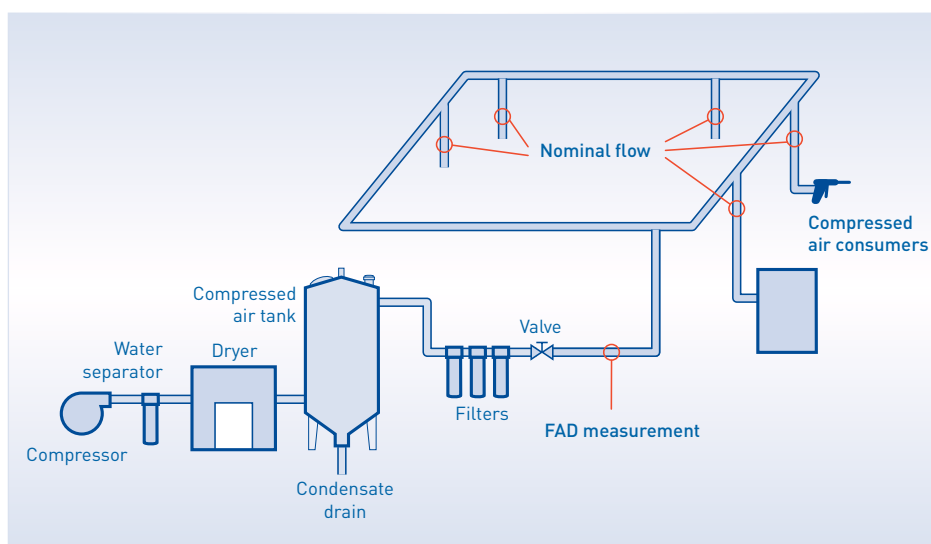
Compressed air has many advantages, but inefficient production, an inefficiently operated system, leaks or uncontrolled consumption can create big losses. With the rising electricity prices compressed air will get more costly than ever. A compressed air network offers a big savings potential by the optimization of the production, distribution and consumption. For this sufficient controls are necessary.

KROHNE offers different flow technologies for the measurement of compressed air. From the measurement and calculation of the free air delivery (FAD) to the distribution of the compressed air to single consumers.

KROHNE products for compressed air

Variable area flowmeters for low flows and **OPTISWIRL Series of vortex flowmeters** for larger consumers.

Both technologies are drift free and the entire flowmeter with its flow tube are factory calibrated.





For simple and cost-effective flow measurement of gases or liquids without auxiliary power

KROHNE offers different variable area flowmeters with an electronic indicator. They are robust, have a local indicator which works without power supply and are available for different mounting orientations even for downward flow. Also, small flow control assemblies for the distribution of air flows with pressure regulator and flow control valve can be supplied.



Variable area flowmeters

- Glass and metal tube purge meters for low-flow applications <math><DN15 / 1/2''</math> and process meters up to $DN150 / 6''$
- Optional switches, 4...20mA, HART®, FOUNDATION™ Fieldbus, PROFIBUS-PA
- Globally approved for use in hazardous areas and suited for safety related SIL 2 applications



krohne.link/va-en

Measuring of FAD (free air delivery) of a compressor

A Bureau of Energy Efficiency survey says that a flawless compressor with maximum efficiency can achieve 85 % of its rated efficiency. There are various factors affecting the efficiency such as oil filters, air filters, motor speed, and humidity at the inlet of the compressor and inlet filters. The reduction in efficiency due to the deterioration of the above parameters is 8–10 % (approx.). Hence it becomes extremely important to measure the FAD (free air delivery) of a compressor. It is defined as the amount of atmospheric air (free air) that can be sucked in by the compressor at the inlet condition (suction side) under

- Atmospheric pressure of 1 atmosphere
- Atmospheric temperature of +15°C/+59°F; +20°C/+68°F
- Relative humidity of 0 % (100 % dry air),
- Motor speed (rpm) of 100 % of its rated speed

There are various techniques to perform FAD measurement, but they are time-consuming, expensive and require considerable efforts. KROHNE measures FAD online using the OPTISWIRL 4200. With the special software features built into the device, we can offer a single instrument for FAD metering with online pressure and temperature compensation and calculations based on RPM and humidity.

The OPTISWIRL 4200 tells you exactly when your compressor needs attention and when you should leave it alone. If the FAD reading remains constant and at an acceptable level, there's no need to worry. But if you notice the FAD progressively slipping, then you can prepare to switch over to a back-up compressor and carry out the required maintenance with no wasted efforts and no costly surprise due to shut-downs.



Energy savings pay back calculation

A medium size process plant operates with a 3,220 Nm³/h / 2,000 SCFM compressor

+ A typical 3,220 Nm³/h / 2,000 SCFM compressor

+ Considering around 8,000 hrs of operation per year

+ Average electricity cost for industrial use = 9 cent/kWh

+ Then the electricity consumed by the compressor will be =
250 x 8,000 x 0.09 = 180,000 €/year

KROHNE Vortex flowmeters generate savings of up to 8–10 % through monitoring FAD and compressor health.



krohne.link/vortex-en

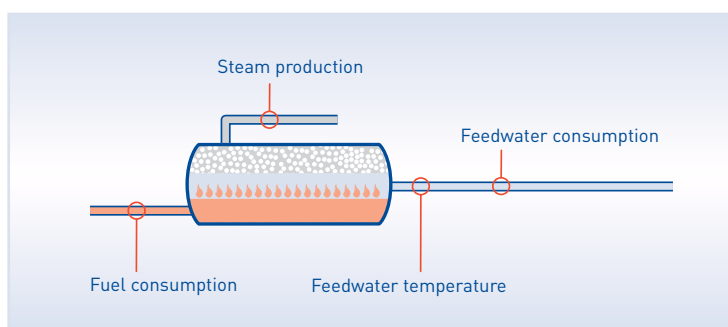
Steam



A hot topic – Steam production and distribution

Steam is a quite common heat carrier in the industry. It can be found in power generation, for heating purposes and in many production processes in the food, chemical, petrochemical, pulp and paper and other industries. Steam has a high energy content, provides an excellent heat transfer and can be directly injected into many products being heated.

Steam is produced in external combined heat and power plants, or industrial steam plants being fired with natural gas, biomass or residues from the production. Today often backpressure turbines are utilized in the plants for electricity production. The steam leaving the turbine can further be used for plant purposes.



KROHNE products for steam

KROHNE offers three flow technologies for the measurement of steam flows: **DP-flow with different primary flow element types, vortex and ultrasonic flowmeters.**

Each technology has its specific characteristics, advantages and limitations. As a flow specialist we can always offer the best suitable technology for the particular application.

Steam has a high energy content and is costly in production. The main losses in the steam systems typically occur in condensate traps, inefficient heat exchangers, valve leaks and the uncontrolled use of steam.

The measurement of the steam flows and the monitoring of its quality is pivotal for the efficient steam distribution and reveals optimization potential.

Product selection list: steam applications

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

Application / Product	OPTIBAR DP Orifice Plate	OPTIBAR DP Flow nozzle	OPTIBAR DP Venturi Tube	OPTIBAR DP Cone Meter	OPTIBAR PT2000	OPTISWIRL 4200 / 5080	OPTISONIC 8300
Saturated steam	+	++	++	++	++	++	-
Superheated steam	++	++	++	++	++	++	++
Maximum temperature	+720°C/ +1328°F	+720°C/ +1328°F	+720°C/ +1328°F	+720°C/ +1328°F	+590°C/ +1094°F	+430°C/ +806°F	+620°C/ +1148°F
Maximum pressure	400 barg/ 5802 psig	400 barg/ 5802 psig	400 barg/ 5802 psig	400 barg/ 5802 psig	180 barg/ 2611 psig	103 barg/ 1494 psig	400 barg/ 5802 psig
Maximum diameter	1.200 mm	1.200 mm	1.200 mm	1.200 mm	1.500 mm	300 mm	600 (1.000) mm
Suitable for short available straight pipe length	+/-	+	+	++	+	+/-	+
Bi-directional flow	+	-	+	-	+	-	+
Quick retrospective installation	-	-	-	-	+	-	-
ISO 5167 compliant	+	+	+	+	-	-	-
Calibration in pipe section	+	+	+	+	-	-	-
Low pressure drop	-	+/-	+	-	+	+	+
Turndown ratio	-	+/-	+	+/-	-	+	++
Integrated flow computer	-	-	-	-	-	+	-

++ = recommended, + = suitable, o = suitable under certain conditions, - = not suitable



Measuring the flow rate of steam

Flow nozzle meter

- Based on ISA 1932, long radius or Venturi nozzle (acc. to ISO 5167-3 or ASME MFC-3M)
- Accurate flow measurement at high flow velocities (e.g. feed water, steam, condensate, hydrocarbons, refined products, CO₂, LH₂)
- Manufacturing capability up to 48"; inhouse calibration also for applications with high Reynolds numbers
- Complete scope of supply from one source, incl. engineering, documentation, testing, calibration, valves, flow nozzle, process instrumentation, etc.



krohne.link/dpflow-en

DP-Flow is the oldest and most universal flow technology. Due to the high temperature and pressure coverage the majority of flowmeters in the water-steam cycle of a power plant are DP-flowmeters. Its characteristics are determined by the primary flow element type and can range from simple averaging pitot tubes for retrospective installation in existing steam systems until redundant and calibrated metering sections with long radius nozzle for the performance testing of a power plant.

Orifice plates, flow nozzles and Venturi tubes are standardized according to ISO 5167. OPTIBAR DP flow are complete flowmeter assemblies with primary element, condensate pots, process valves, manifold, transmitters, flow computer and other accessories ready for installation.

Case study

Equipping a biomass plant with process instrumentation for billing steam quantities

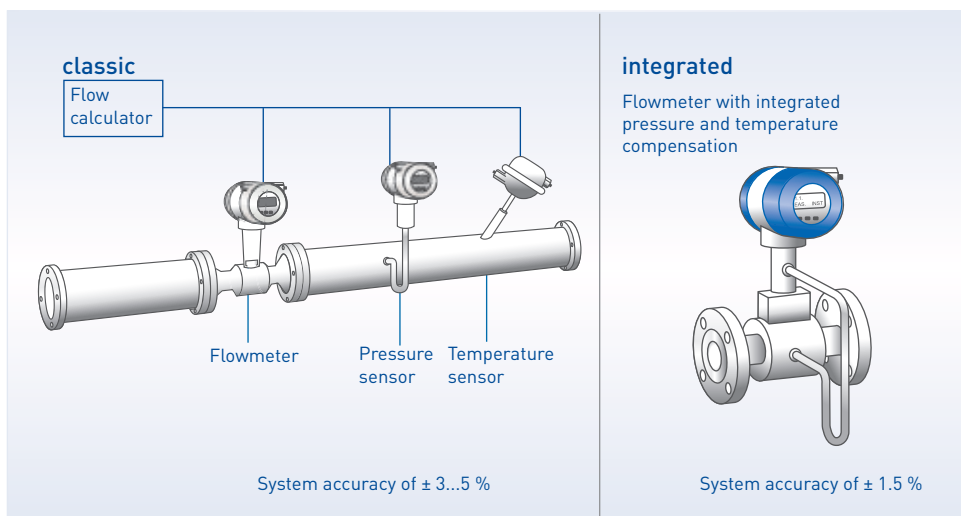
- Compliance with all metrological requirements for subsidies and feed-in tariffs in accordance with the Combined Heat and Power Act
- Traceably calibrated meter runs for precise calculation of thermal energy
- Full scope of delivery from one source – from instrumentation to documentation to calibration and commissioning



krohne.link/app-biomass-plant-en



The OPTISWIRL Vortex flowmeters can often be found in industrial steam systems. OPTISWIRL can indicate if the steam is wet, saturated or superheated as an important diagnosis value. The multivariable OPTISWIRL 4200 with integrated temperature and pressure sensor measures the steam density and massflow in one device. When connecting an external RTD for the condensate return the OPTISWIRL measures the energy flow as an economic all-in-one solution.



The OPTISONIC 8300 is an ultrasonic steam flowmeter covering temperatures of up to $+620^{\circ}\text{C}$ / $+1148^{\circ}\text{F}$. It can measure the flow bi-directionally, has an unparalleled flow turndown and does not create any pressure loss. OPTISONIC 8300 can equally be found in power plants and in steam supply lines to industrial customers where flow rates can significantly change seasonally or flow directions can reverse. The ultrasonic flowmeter has an integrated flow computer for pressure and temperature compensation.

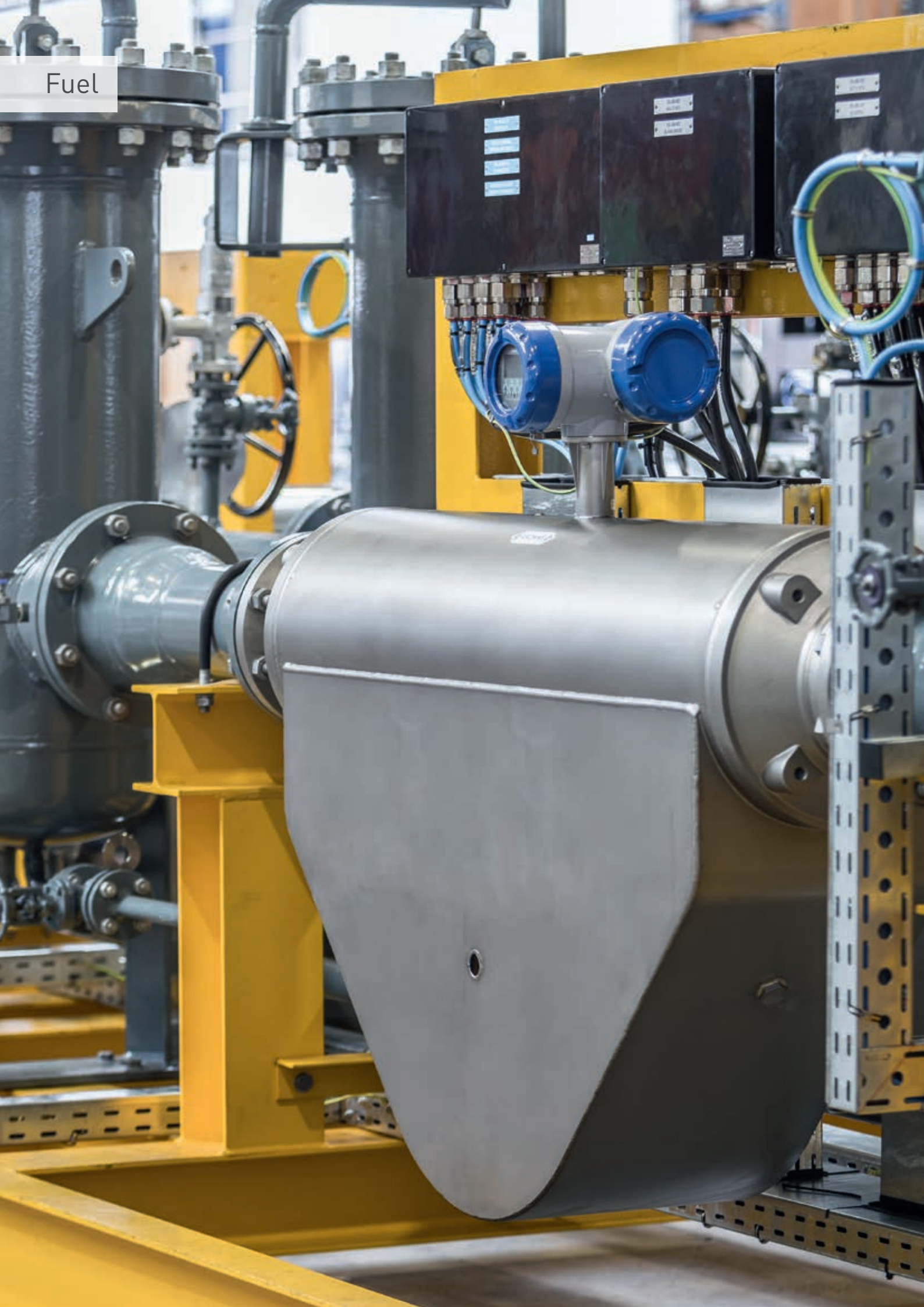
OPTISONIC 8300

- 2-path meter with optional mass flow and enthalpy calculation
- For steam billing, boiler or power plant monitoring (up to $+620^{\circ}\text{C}$ / $+1148^{\circ}\text{F}$)
- DN100...1000 / 4...40"; max. PN250 / ASME Cl 2500
- Large turndown ratio (60:1)



[krohne.link/
optisonic-8300-en](https://krohne.link/optisonic-8300-en)

Fuel



Measurement of gaseous and liquid fuels

Gaseous fuel flow to a burner or gas turbine is typically handled by a fuel gas system. The fuel gas system conditions the gas flow, measures its quantity and quality and reports the quantities to the gas supplier. Further functions such as redundancy or safety functions can be implemented.

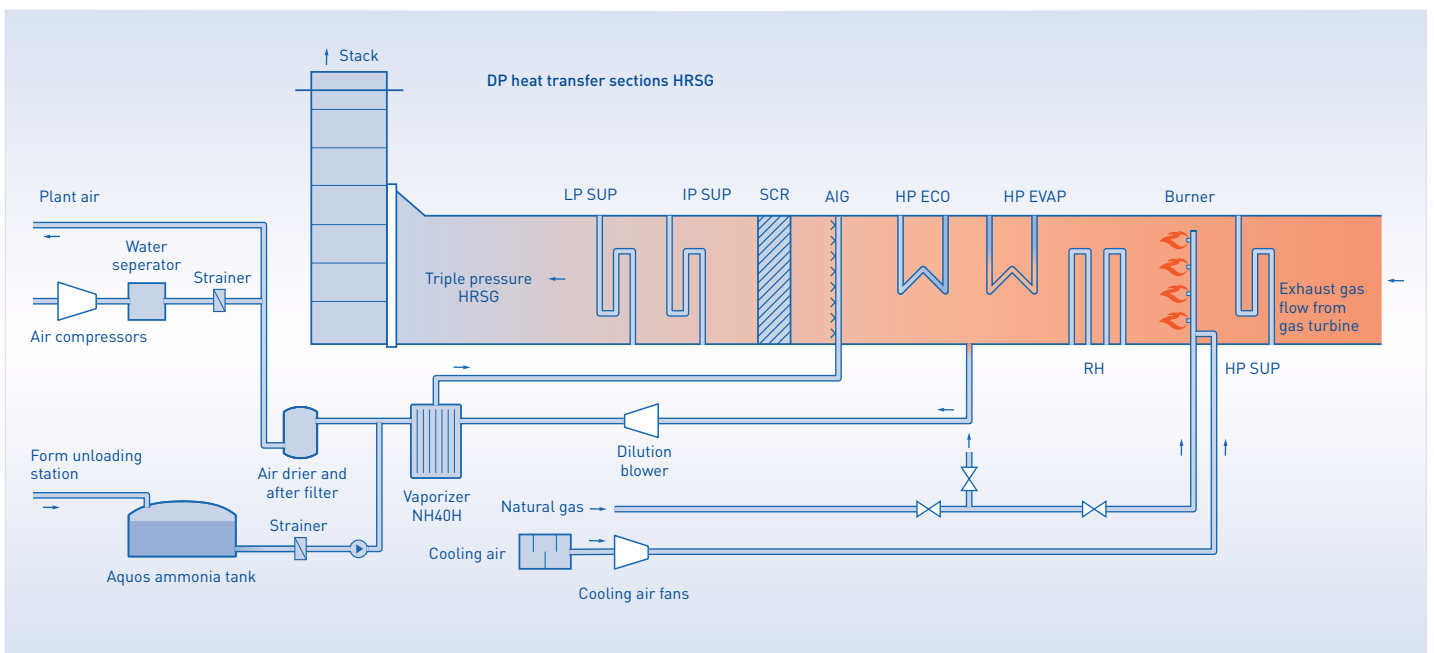
Liquid fuels like biodiesel, LFO, HFO and others are used as main fuel or supplemental fuel for biomass firing and for other solid fuels. The total liquid fuel flow to the unit must in the most cases be measured according to the relevant custody transfer standard such as MID or OIML. For process control of single burners or burner rows, the oil flow must be measured reliably for efficient process control and safety in accordance with low emissions.

KROHNE products for fuels

Coriolis mass flowmeters for mass flow and density measurement of burner fuel oil, gaseous and liquid ammonia, lime slurries and other applications.

ALTOSONIC V12 Ultrasonic flowmeter for custody transfer (CT) measurement of gases has been designed to offer the best possible measurement accuracy, not only during calibration under ideal conditions but also during less ideal conditions in the field.

KROHNE offers tested **turnkey solutions** for all kind of applications – worldwide. From pure CT-flow measurement until multitrain gas pressure-regulator stations.





OPTIMASS Series

- Mass, volume flow and temperature measurement of liquids and gases, density and concentration measurement of liquids
- CT approvals for liquids: OIML R117, MI-005 etc.
- CT approvals for gases: OIML R137, MI-002, AGA9 etc.
- Secure wireless access via Bluetooth®, even in safety-related applications



krohne.link/coriolis-en

Fuel flow measurement with enhanced process information

KROHNE's OPTIMASS series Coriolis mass-flowmeters work without rotating parts. Even fuels which might contain impurities cannot block the flowmeter like it might happen with mechanical meters. Beside the mass flow the OPTIMASS measures the products density and thus gives an important process information about the current fuel being fired.

In case of an MI-002 requirement KROHNE with its experts in calibration law can arrange the required system approval.



ALTOSONIC V12

- 12-chord meter, for high accuracy flow metering of natural gas
- CT: OIML R137 (class 0.5), MI-002, AGA9 etc.
- Many variants, extensive CBM diagnostics free of charge
- Flange: DN100...1600 / 4...64"; max. PN450 / ASME CL 2500



krohne.link/altosonic-v12-en

The ALTOSONIC V12 is a 12-chord ultrasonic custody transfer (CT) flowmeter for fuel gases including hydrogen. It has been designed to offer the best possible measurement accuracy, not only during calibration under ideal conditions but also during less ideal conditions in the field. As a result, ALTOSONIC V12 is the first ultrasonic flowmeter that was certified to OIML R137 class 0.5 by NMI.

Due to its design with 12 acoustic chords a flow conditioner is no longer required; standards such as AGA9, ISO 17089 and MID are met with just 5D straight inlet piping.

For European installations the ALTOSONIC V12 is available in a twin-version, allowing unlimited re-verification intervals under the measuring instruments directive.

Tailor-made skid solutions with maximum availability

Fuel gas systems ensure the gas condition and often incorporate the flow measurement along with the measurement of gas quality and other parameters like the heating value. A variety of different engineered systems are applied depending on the site, the grid pressure, the gas quality, redundancy and other requirements.

KROHNE supplies engineered skid-built solutions that can beside, the pure fiscal flow measurement contain: Pressure regulators, safety valves, filters, condensate removal, pre-heating or other functions.



Fuel gas skid

- Different skid solutions from pure CT-flow measurement until multi train gas pressure-regulator stations
- Engineered turn-key solutions according to the individual requirements
- Compliance with international and local standards e.g. OIML R137, AGA9, MI-002
- From initial design phase up to on-site commissioning and training

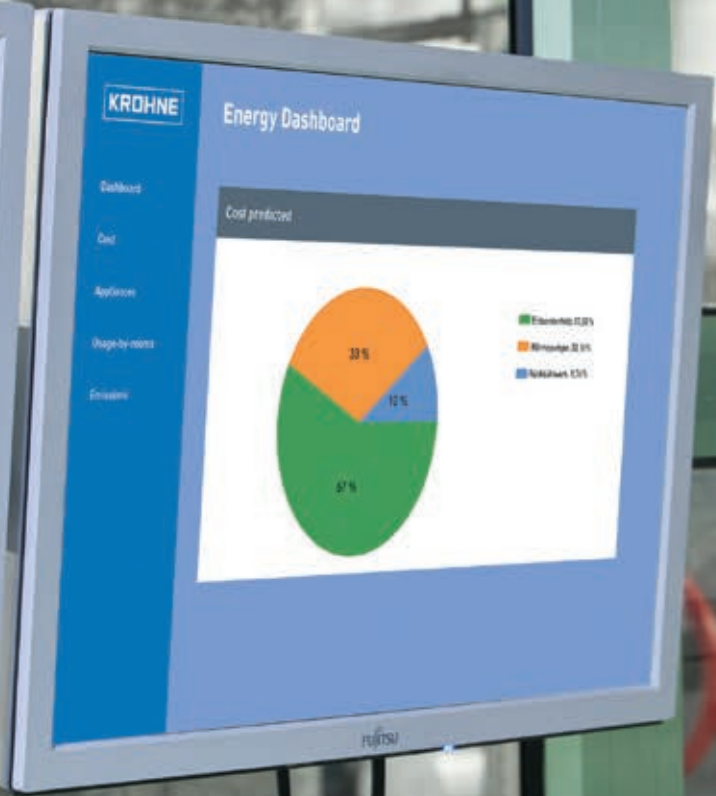


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Burner Management System

Energy monitoring



On-screen control – Monitoring your total energy data

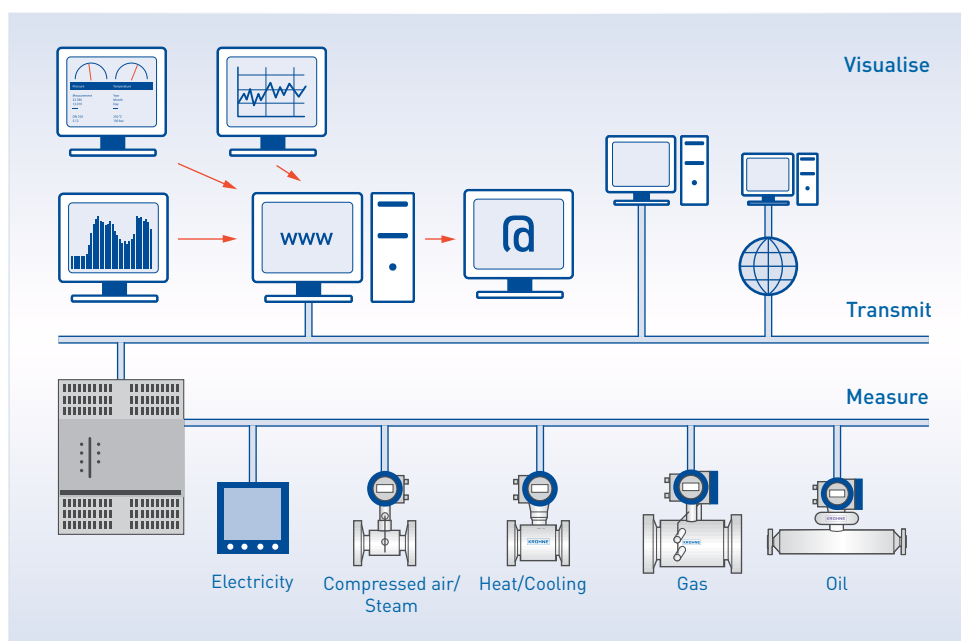
With the energy transition and successive regulations and systems like the EED (energy efficiency directive) and the different emission trading systems and greenhouse gas initiatives the monitoring of energy flows is getting more and more important. Also monitoring of other KPI's (Key performance indicators) for the plant efficiency and of GHG equivalents is included in many energy and environmental management systems such as ISO 50.001, ISO 14.064 and others.

Monitoring systems capture the measurement data for a certain time e.g. for at least two years, indicate normal and abnormal operation values and offer a good and complete picture about the plant status.

Systems can be hooked up on existing automation and data acquisition infrastructure or be realized as a system independently of the existing process control. Data can be stored on local servers or in a cloud. Together with the sensors KROHNE offers complete solutions including the monitoring system compliant with the local requirements.

KROHNE product for energy and GHG-monitoring

- **Different Energy and GHG-Monitoring systems** as local solution or cloud based system
- Measurement, normalization, control and evaluation of media and resources independent of its signal output
- No interference with existing control systems
- Compliant with current regulations





KROHNE Service – By your side, every step of the way

KROHNE Service

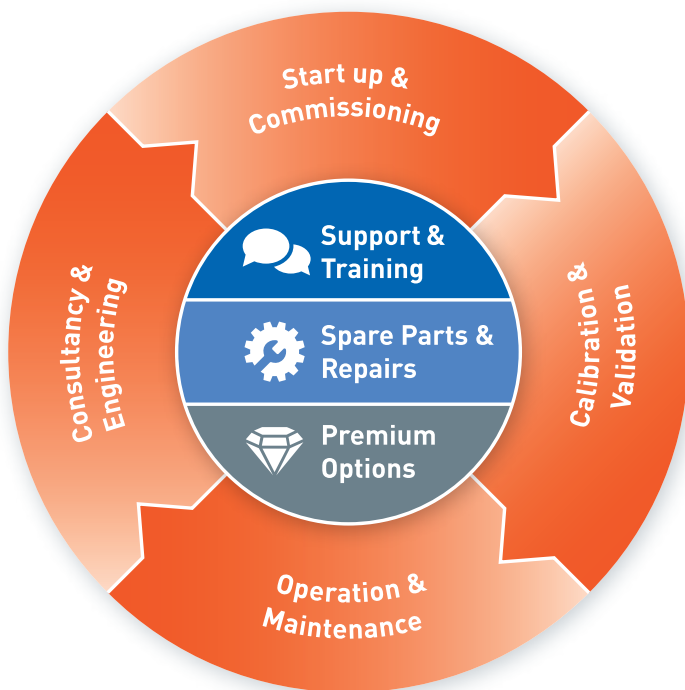
Service has been always a fundamental part of the KROHNE business and its relation with its customers. Over many years, KROHNE has developed strong service capabilities to provide excellent support throughout the entire project lifecycle.

In close cooperation with our customers, we developed a sophisticated service portfolio ensuring optimal efficiency from first planning to operation and maintenance.

Certified KROHNE owned companies as well as selected partners are organised in regional service hubs to provide our customers excellent local technical support in more than 100 countries around the world.



krohne.com/en/services



- **Core services**
 - **Consultancy & engineering**
Pre-sales support starting at the planning phase and engineering through to final quotations and technical details
 - **Start-up & commissioning**
Assistance and commissioning, FAT / SAT support, plant / site audits and remote start-up support
 - **Calibration & validation**
Periodic inspection, validation, recalibration, including environmental and metrological certification
 - **Operation & maintenance**
Scheduled maintenance and field services, on-site assistance and troubleshooting
- **Support & training**
Maximise uptime and process efficiency with different service helpdesk options and trainings, starting from online courses through to tailor-made in-house workshops
- **Spare parts & repairs**
Local spare parts supply & management and various repair for replacement options to solve any issues as they appear
- **Premium options**
Customised services for specific customer needs including express services, exclusive support options & trainings, expert audits and priority treatment

PICK Product Information Center

The PRODUCT INFORMATION CENTER supplies device-specific documents on the basis of the serial number.

The following document types are available:

- Manuals
- Handbooks
- Quickstart manuals
- Supplementary manuals
- Calibration certificates
- Factory settings as .bin file
- Parameter datasheets
- Type plates



pick.krohne.com



Product selection list

Liquid and gaseous fuels measurement

This table will help you in selecting the right instrument for your application

Application / Product	OPTISONIC 3400	OPTISONIC 7300	ALTOSONIC 5	ALTOSONIC V12	OPTIMASS 2400	OPTIMASS 6400	OPTIMASS 7400	OPTIBAR DP-Flow
ISO 5167/ ASME MFC- 3M flow element	-	-	-	-	-	-	-	+
Maximum diameter	1.000 mm	1.000 mm	600 mm	1.600 mm	400 mm	300 mm	100 mm	1.200mm
Process temperature range	-200...+250°C/ -328...+482°F	-40...+180°C/ -40...+356°F	-200...+250°C/ -328...+482°F	-40...+175°C/ -40...+347°F	-45...+130°C/ -49...+266°F	-200...+400°C/ -328...+752°F	-40...+150°C/ -40...+302°F	-253...+720°C/ -423...+1328°F
Suitable for short available straight pipe length	+	+/-	+	+	++	++	++	+
Bi-directional flow	+	+	+	+	+	+	+	+
Gases	-	+	-	+	+	+	+	+
MID-MI-002 certification	-	-	-	+	+	+	-	-
OIML R137 certified	-	-	-	+	-	+	-	-
AGA 9 certified	-	-	-	+	+	+	-	-
Liquids	+	-	+	-	+	+	+	+
Non- conductive Liquids	+	-	+	-	+	+	+	+
Liquid/ Cryogenic gases	+	-	+	-	-	+	-	+
MID-MI-005 certified system component	-	-	-	-	+	+	+	-
OIML R117 certified	-	-	+	-	+	+	+	-

Product selection list

Heat and Cold in form of water / condensate

This table will help you in selecting the right instrument for your application

Application / Product	OPTISONIC 3400 DH	OPTIFLUX 4300	WATERFLUX 3300/ 3070	OPTIBAR PT2000	OPTISWIRL 4200
Hot water	++	+	+/-	++	++
Condensate/ demi-water	++	-	-	++	++
Cooling/ cold water	++	++	++	+	+
Suitability for magnetite formation	+	-	-	+/-	+/-
MID-MI-004 certification	+	+	+	-	-
Maximum process temperature	+250°C/ +482°F	+180°C/ +356°F	+50°C/ +122°F	+300°C/ +572°F	+240°C/ +464°F
MID-certified temperature	+180°C/ +356°F	+180°C/ +356°F	+50°C/ +122°F	NA	NA
Maximum process pressure	40 barg/ 580 psig	40 barg/ 580 psig	16 barg/ 232 psig	320 barg/ 4641 psig	100 barg/ 1450 psig
Maximum diameter	3.000 mm	3.000 mm	1.200 mm	300 mm	1.500 mm
MID-certified diameter	1.000 mm	1.000 mm	1.000 mm	NA	NA
Certification for cold measurement EN1434	+	-	+	-	-
Suitable for short available straight pipe length	+	+	++	+	+
Bi-directional flow	+	+	+	+	-
Quick retrospective installation	-	-	-	+	-
Turndown ratio	++	++	++	+/-	+
Integrated flow computer	-	-	-	-	+

++ = recommended, + = suitable, o = suitable under certain conditions, - = not suitable