KROHNE

achieve more

Saving your resources

Intelligent solutions for energy measurement

Contents





Saving your resources – Our expertise for energy measurement solutions

Rising raw material and energy prices are forcing companies to care for energy measurement more than ever. On this background, it is increasingly important to look at cost-effective, optimised usage of the existing resources.

This situation calls for a more accurate measurement of the various energy fluids. Parameters such as temperature and pressure must also be considered as they affect energy efficiency. Only with the balancing of true mass flow rates, comparable figures are achieved that will provide effective measures to save steam, oil etc. – and ultimately safe money.

KROHNE devices help to identify potentials for energy efficiency improvement and meet the requirements of energy management systems such as ISO 50001.

As a leading company in the field of process measurement technology, KROHNE offers an extensive product portfolio worldwide, consisting of flow, level, temperature and analytical measurement technologies suitable for diverse applications in all industries.

KROHNE optimised these four technologies to achieve maximum performance. 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.

To make the right choice, it is not sufficient to just have the right technology. It is equally important to have access to experts who are able to recognise the options in each case and implement them purposefully.

Speak to one of our experts – together, we will find the best solution for your application.

Heating/Cooling

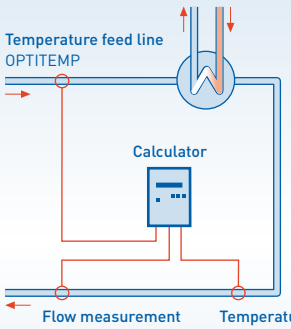
To the perfect degree – Precise thermal energy control

There is an increasing use of applications for the heating and cooling of industrial and office buildings. Buildings consisting of glass and concrete require an evacuation of the thermal energy. In addition, the cooling medium used for a building must be measured. The generation of cooling energy is an increasingly sought-after solution for cooling food, to support industrial processes (like server farms), or simply to provide comfort in a building.

Due to the constantly increasing energy prices and the great efforts made to reduce the emission of CO_2, the requirements to the measurement accuracy of heat and cold meters are continuously increasing, too. Points affecting the correct balancing and measurement include, among others, the installation or design of measuring devices, the choice of pumps and the engineering of the underlying processes.

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.

Heat meter installation



Flow measurement
Inline:
OPTIFLUX 4300
UFM 3030
OPTISWIRL 4070
WATERFLUX 3070
WATERFLUX 3300

Clamp-on:
OPTISONIC 6300
OPTISONIC 6300 P

Temperature return line
OPTITEMP

Measuring the thermal energy of warm and hot water

UFM 3030

- No effect of (magnetite) scaling
- Large dynamic range
- Accurate measurement even at low demand in summer

OPTITEMP temperature sensors

- High measuring accuracy
- Paired design

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.

KROHNE offers the UFM 3030 ultrasonic flowmeter for heating water measurement. For temperature measurement, two highly accurate OPTITEMP temperature sensors are used per installation. They are calibrated and delivered in pairs for minimal deviation. Both temperature signal converters are connected as 2-wire devices directly to the UFM 3030 via analogue inputs and simultaneously supplied. The converter displays the currently consumed quantity of heat as well as the total consumption in kilojoules or kilocalories per unit of time. A separate temperature controller is not required.

Keep things running – With retrofittet measurement equipment

Often, there are situations when processes cannot be interrupted. In this case, clamp-on flowmeters can be used to retrofit heat and cooling measurement.
With its robust industrial construction and regreasing concept, 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 two temperature sensors and a heat quantity calculator, measuring heat or cooling flow volumes becomes possible.

For temporary heat or cooling measurement, the mobile version OPTISONIC 6300 P can be used. Its compact design and ease of installation make the OPTISONIC 6300 P the perfect measuring device for 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 readings are shown on a large colour LCD in a graphical format. The OPTISONIC 6300 P stores the readings in the integrated memory for data logging. Via the included USB stick the logged readings can be transferred to a PC for further analysis or other purposes. The device measures the flow velocity, the current volume flow and a variety of diagnostic values.

OPTISONIC 6300

- Ultrasonic clamp-on flowmeter with separate UFC 300 converter
- Easy installation without interruption of process – no need to open piping
- Universally applicable from DN 15 to DN 4,000

OPTISONIC 6300 P

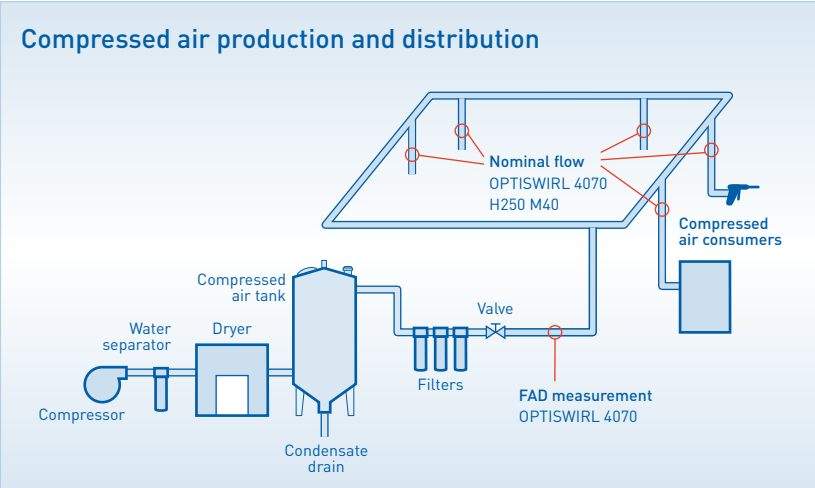
- Portable ultrasonic clamp-on flowmeter
- User-friendly operation through full colour graphic display and full keypad
- Quick and easy transfer of logged data to your PC through USB interface

Compressed air

Performance under pressure – Compressed air production and distribution

Virtually every production operation has a compressed air network – but only in rare cases, these networks are monitored and adapted to reflect actual consumption rates. Costs can easily be reduced if the compressors used to provide the compressed air can be controlled against actual consumption. Even with energy prices under 10 cents per kilowatt hour, it is worth monitoring the compressed air system with measurement equipment as costs created by leaks or untapped output can easily run up into the five figure range over the course of a year. Only when consumption rates have been measured, the processes can be controlled and optimised.

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



Measuring the flow rates in the compressed air network

The objective of measuring compressed air can be to determine consumption profiles and peak consumption to improve compressor monitoring. The measuring devices also detect leaks: if, for example, flow is being measured on a day off, this is a clear indication of a leak. For this purpose, the compressed air network is equipped with measuring devices in various points.

Much thought has been put into which measuring method would be suited best to compressed air measurement in terms of the price-performance ratio. Test measurements were conducted. Thermal mass measuring devices, vortex flowmeters without pressure compensation and the OPTISWIRL 4070 with integrated pressure compensation were tested.

The test clearly revealed that even relatively small pressure fluctuations in a compressed air network have serious consequences in terms of accuracy and that pressure compensation is necessary. As the KROHNE device features this function and no additional components such as a pressure transmitter or evaluation unit are needed, the OPTISWIRL 4070 came out on top with the least deviation compared to the reference device.

For precise measurements at any time, any changes in pressure or temperature that occur in the network must be accounted for or compensated for during measurement as they may cause such parameters as the density of the medium to change. That is why the OPTISWIRL 4070 features integrated pressure and temperature measurement as well as a computer that directly puts out the corrected volume flow.

Effective pressure (at least)	4 bar; 50 psi	8 bar; 116 psi
Temperature	+20 °C; +68 °F	+20 °C; +68 °F
Measuring error at pressure deviation ±1 bar; ±14.5 psi	20 %	11 %
Measuring error at temperature deviation ±10 °C; ±50 °F	4 %	4 %
Energy costs* not measured at pressure deviation ±1 bar; ±14.5 psi (€) p.a.	€164,250	€122,859
Energy costs* not measured at temperature deviation ±10 °C; ±50 °F (€) p.a.	€32,850	€44,676

*Nominal pipe size DN 100, 50 % capacity, energy costs 75 €/1,000 Nm^3

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 +20 °C/+15 °C; +68 °F/+59 °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 4070. 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 4070 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 FAD meters generate savings of up to 8–10 % through monitoring FAD and compressor health.

OPTISWIRL 4070 C

- 2-wire vortex flowmeter with integrated pressure and temperature compensation
- Suitable for liquids, gases, steam and saturated steam
- Available up to DN 300

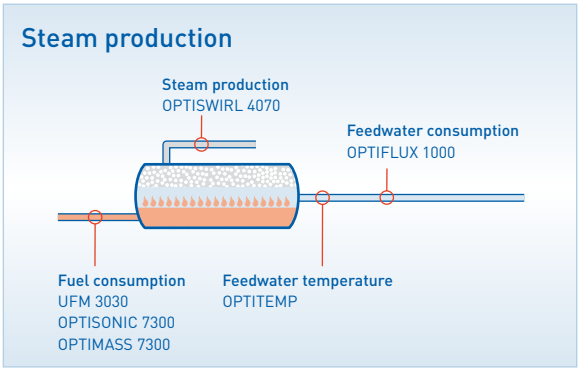
Steam

A hot topic – Steam production and distribution

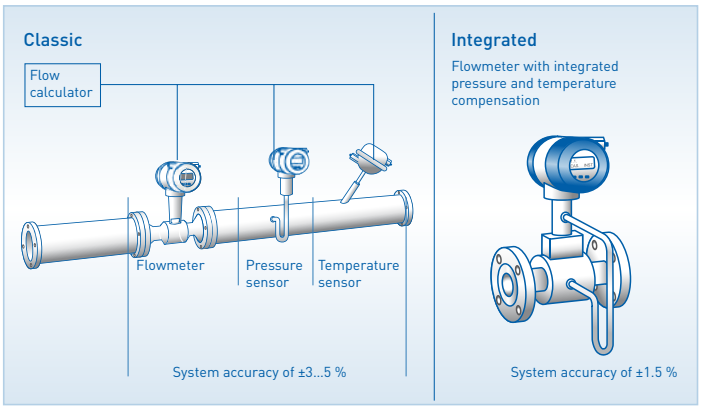
Every major production process, including pasteurisation, brewing, sterilisation, washing and cleaning requires steam or heating water. However, the supply of steam is extremely energy-consuming as the boiler is usually fired using liquid fossil fuels or natural gas. Accordingly, it is essential to have accurate measurements of the quantity produced in order to optimise burner control and, ultimately, operate the plant in an efficient and environmentally-friendly way.

Boilers typically have an efficiency of 90 % to 92 %. However, looking at the entire efficiency of the steam system, the efficiency is much lower. This is because of uninsulated steam pipelines, leakages, deposits at the condensate traps or sometimes the condensate traps are completely out of order. Precise steam measurements can help to identify power losses and increase the performance of the steam system. Only if you know your actual consumption, you can take measures to reduce it.

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.



Measuring the flow rate of steam



OPTISWIRL 4070 F

- Remote version with field housing converter with connecting cable up to 15 m; 49 ft

Many users assume that pressure and temperature conditions in all processes are always constant. However, fluctuations happen all the time and can cause significant measuring errors. With superheated steam – +190 °C; +374 °F/5 bar; 72.5 psi pressure – a pressure increase of just 1 bar; 14.5 psi will, for example, lead to a measuring deviation of 17.43 % due to density change. With a pipe size of DN 100 and energy costs of €60 per MWh, this means a yearly loss of over €200,000.

The OPTISWIRL 4070 eliminates most of these errors. Vortex flowmeters primarily measure the volume flow rate and require a specified density in order to display the mass flow of a product. The KROHNE device can display the desired parameter directly without the need for an external computing unit. The pressure and temperature measurement as well as correction calculations are all integrated into the OPTISWIRL 4070. The cost for external pressure and temperature sensors and their installation is thus saved. All measured values are included in the same point within the measuring device, so it is impossible for separate measurement errors to occur. Furthermore, not only the mass flow even the gross heat energy can be displayed and measured as well. Also available as remote version allowing for a use in locations which are difficult to access.

Energy costs when measuring saturated steam and superheated steam

	Saturated steam		Superheated steam		
Effective pressure (at least)	5 bar; 72.5 psi	17 bar; 246.6 psi	1.7 bar; 24.7 psi	2.8 bar; 40.6 psi	4.4 bar; 63.8 psi
Temperature	+158.9 °C; +318 °F	+207 °C; 404.6 °F	+180 °C; 356 °F	+170 °C; +338 °F	+180 °C; +356 °F
Measuring error at pressure deviation ±1 bar; ±14.5 psi	16 %	5 %	37 %	27 %	19 %
Measuring error at temperature deviation ±10 °C; ±50 °F	22 %	4 %	2 %	3 %	3 %
Non-calculated energy costs* at pressure deviation ±1 bar; ±14.5 psi (€) p.a.	€216,000	€168,000	€215,000	€218,000	€222,000
Non-calculated energy costs* at temperature deviation ±10 °C; ±50 °F (€) p.a.	€299,000	€568,000	€14,100	€21,400	€31,200

*Nominal pipe size DN 100, 50 % capacity, energy costs 60 €/MWh

Measuring heavy fuel oil consumption

Oil is one of the fossil fuels that are often used for producing energy or heat in various industries. Food processes, for example, need a lot of heat and steam for various processes such as pasteurization, drying, deep frying and cleaning along entire production process.

To fire the required boilers, combined burners for coal and oil can be used. In order to start the combustion process and/or support the coal fire, oil is used for the booster and supporting burner. To get an ideal fuel ratio between oil and air, a precise mass measurement in the oil line is needed. As heavy oil is used for this application, the circulation line is heated to reduce the viscosity of the liquid. To get the correct consumption value, also the return lines to the oil tank have to be monitored.

For measuring the consumption of heavy fuel oil (HFO) on each boiler, the OPTIMASS 7300 Coriolis mass flowmeter can be installed in pairs on each boiler, one measuring the flow to the boiler and the other measuring the return flow of unused oil.

The accurate measurement allows the operators to monitor the usage of HFO closely and precisely and to evaluate the efficiency of the plant. If the HFO is not being burned, it is continuously recirculated. Being installed in pairs, the meters can be used as a cross-check to each other and also to check for leaks in the system.

OPTIMASS 7300

- Single straight tube meter with low pressure drop
- High safety with standard pressure rating 100 bar; 1,450 psi and PED-approved secondary containment
- No installation restrictions, straight upstream and downstream sections are not required
- All common approvals available
- Remote electronics suitable for installation up to 300 m; 984.3 ft from the sensor

Energy monitoring

On-screen control –
Monitoring your total energy data

To provide a comprehensive solution for energy management KROHNE and Schneider Electric collaborate in the field of energy monitoring. Monitoring of the measured energy values (water, compressed air, gas, electricity, steam, etc.) allows for an easy identification of efficiency improvement potentials.

The EGX300 is a first step into energy monitoring, without the need of software to be installed via the existing Ethernet; data is available over a web browser.

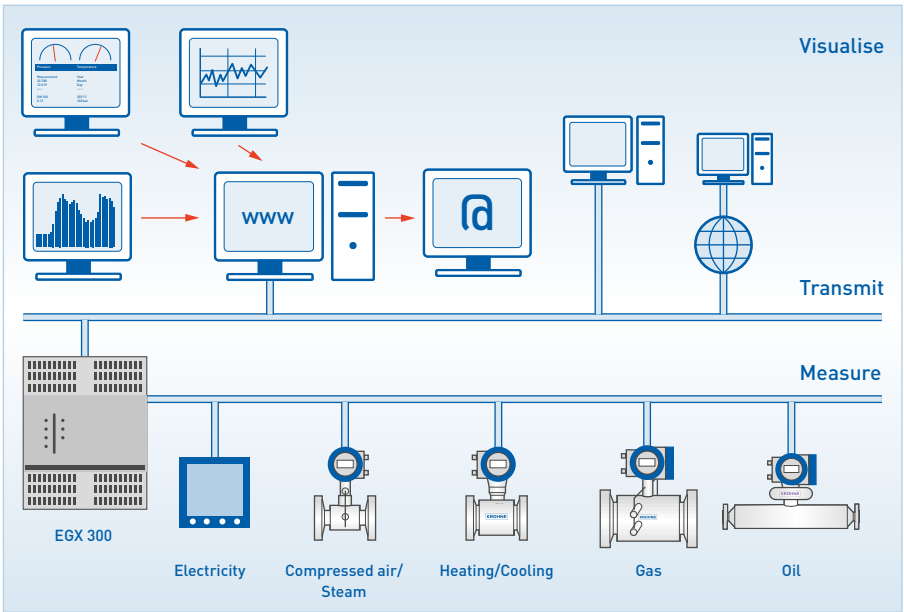
SPM7 (StruxureWare Power Monitoring 7.0) is a complete solution to monitor energy data and reduce energy-related costs, and provides web-based access, trends and reports.

EGX300 – First step into energy monitoring

The EGX300 offers the easy start for the introduction of an energy management system such as the ISO 50001 for the measuring and monitoring of energy supply, load curve analysis for potential evaluation and documentation of savings. The PowerLogic EGX300 marks the start of an energy management system over the existing Ethernet of a facility incl. the monitoring of energy needs and load curve analyses. Without any software installation, the monitoring is always and everywhere available through web browser. For further analysis and processing in reports, all weekly or monthly data recorded are also made available via e-mail. The access to all measurement data is open and transparent, even for comprehensive long-time analyses. It is an energy monitoring solution, which grows step by step with the extension of the EnMS.

Features:

- Flexible set-up through combination of EGX300 with EGX100-interface
- Up to 32 devices local
- Up to 64 devices through 16 EGX100
- Measurement and monitoring of real-time data of different measuring points through standard web browser
- Real-time trends for detailed analysis
- Automatic identification of devices
- Easy configuration through websites
- Free choice of log-in-intervals and data
- Automatic delivery of the data through e-mail/FTP
- Analysis and reports through Microsoft Excel®
- Data and system security through 5 user groups and 13 users with individuals write and read permissions
- Individual language selection (de, en, fr, es, it) for each user



EGX300

SPM7 – Complete solution to reduce energy related costs

The software SPM7 is a comprehensive energy management solution for industrial plants and buildings. It delivers the information needed to reduce energy-related costs, to avoid standstill and optimise the use of operational equipment. It establishes an intelligent, energy-specific platform for the whole company and ensures a uniform recording of media such as water, compressed air, gas and steam. The web-based access allows every user an individual and timely observation of the relevant information.

By analysing historical trends, energy optimizations or unused capacities are shown in detail. The evidence for efficiency improvements and the balancing of costs to buildings, departments and processes is taken over by the software. Tailor-made information is made available in the easiest way to all interest groups, business areas and automation systems.

Features:

- Data acquisition: Company-wide acquisition of data for all energy media (water, compressed air, gas, electricity, steam, etc.)
- Scaleable, flexible architecture: Potential to expand the system to hundreds of measuring points; distributed server and client computers; set-up of complex data processing and control functions
- Web portal: Multi-user access to customer-specific system diagrams, real-time data and historical data, status displays and alarms
- Reporting: Preconfigured and individual reports; support of Microsoft Excel® and other reporting tools; time-controlled forwarding through e-mail or Internet
- Trending: Graphical views of any measurement data combination; checks of consistency and plausibility of consumption data

SPM7: Tailor-made energy management solution

Trend analysis

- Creation of one or several trend overlays for easy visual analysis of data.
- Trends for all parameters (water, compressed air, gas, electricity, steam, etc.) and predicted needs.
- Graphical compilation of profiles from several measuring points or comparison of related parameters from the whole company.
- Identification of energy-related costs of all areas, feeders, processes and tools in the whole system.

Power trend

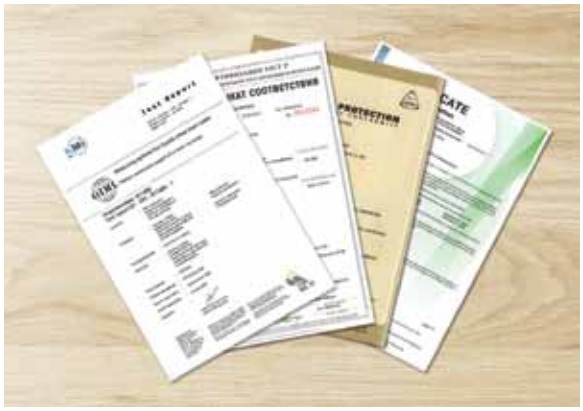
Reporting

- Reports are created manually, time-controlled or event based. Automatic forwarding through e-mail or in HTML format.
- Standard reporting:
  - Easy and quick creation of reports in Microsoft Excel® with an efficient reporting assistant.
  - Compilation of energy and consumption reports.
  - Compilation of consumer profile reports – system-wide consumption patterns over a specified period including peak consumption.
- Individual reporting:
  - Creation of individual reports and performance of other analyses with Visual Basic or any other SQL Server Reporting Tool, e.g. Crystal Reports.
  - Demonstration of authentic operation conditions through combination of data from SPM7 and other databases.

Energy usage summary

Performance monitoring and accuracy: KROHNE leading features

When liquids or gases are transferred from one party to another, the parties have to agree on the quantity and quality of the product. This puts special requirements on the measuring devices relying on worldwide accepted standards. In this context, custody transfer means an assurance for both parties. Which is where KROHNE comes in. Performance monitoring and accuracy are leading features in our custody transfer meters. KROHNE also supports complete liquid and gas metering systems from planning until comissioning on site.



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-training to ensure quality and continuity.

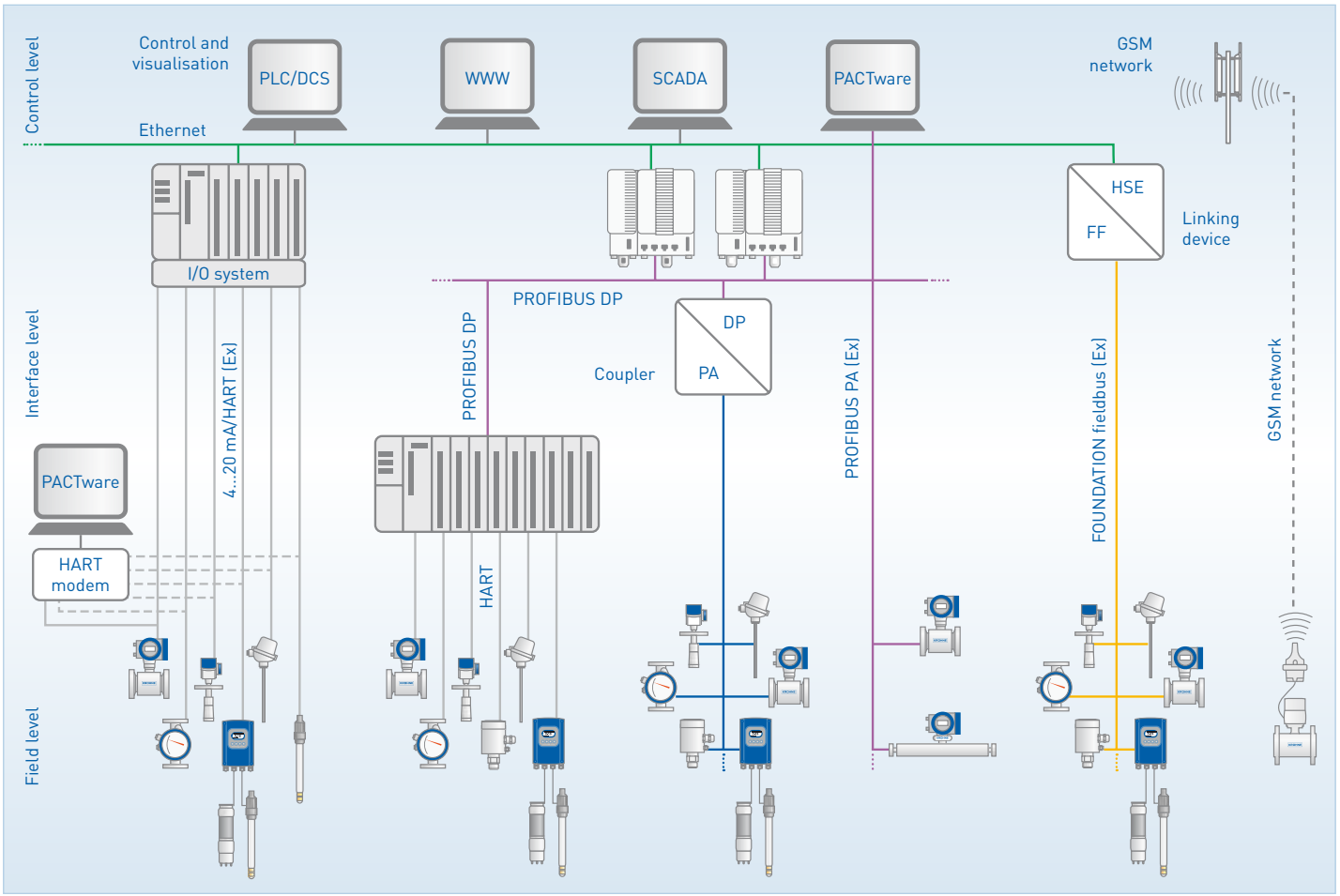
Flowmeters for custody transfer

Oil measurement				
Approvals	OIML R117-1, API, European Measuring Instruments Directive (MID) MI-005, GOST			
Products	Mass		Ultrasonic	
	OPTIMASS 2300	OPTIMASS 7300	ALTOSONIC III	ALTOSONIC V
				

Gas measurement	
Approvals	OIML R137 part 1 and 2, European Measuring Instruments Directive (MID) MI-002
Products	Ultrasonic
	ALTOSONIC V12
	

Water measurement					
Approvals	OIML R49, European Measuring Instruments Directive (MID) MI-001				
Products	Electromagnetic				
	OPTIFLUX 1300	OPTIFLUX 2300	OPTIFLUX 5300	OPTIFLUX 6300	WATERFLUX 3070
					

Further custody transfer measurement incl. heating, cooling, steam				
Approvals	European Measuring Instruments Directive (MID) MI-004			
Products	Ultrasonic	Electromagnetic		
	UFM 3030	OPTIFLUX 4300	WATERFLUX 3070	WATERFLUX 3300
				



Communication at KROHNE: 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. They meet 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 have made DTMs available for our field devices with HART®, PROFIBUS® or FOUNDATION™ fieldbus interfaces. For remote monitoring of applications such as water metering, KROHNE has developed a GSM-based solution for online data transmission and logging. So you will always have the information you need conveniently close to hand.

PACTware™ and all KROHNE DTMs are available free of charge and fully functional without a license. They are included on a CD with each delivery of the device and are available in the KROHNE download centre.

Calibration at 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.

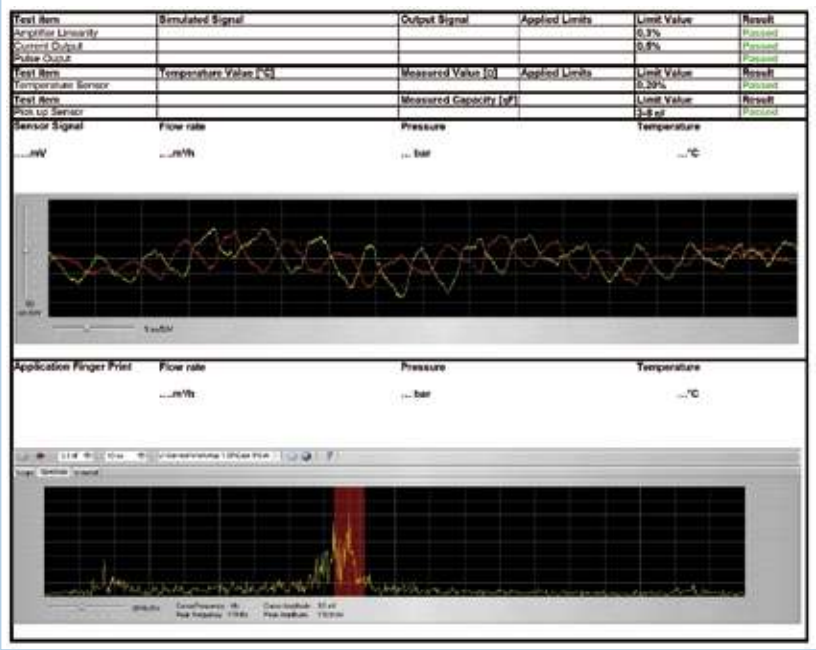
To achieve this, we operate more than 120 calibration facilities for volume flow, mass flow, level, temperature and pressure to (wet-)calibrate any device we manufacture. For example, every flowmeter is by default wet-calibrated using water or air before leaving our facilities.

We can also provide customer-specific calibration tasks such as multi-point calibration, very different parameters such as temperature, viscosity, pressure etc., use the actual medium or similar, build or emulate customer-specific flow geometries or use piping provided by the customer.

For calibration, we only use direct comparisons 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 to10 times better than that of the meter under test.

Validation of flowmeters

We offer in-process validation services for flowmeters. For our OPTISWIRL 4070 measuring device, the accuracy and linearity, current output, pulse output, sensor signal and the integrated temperature sensor are checked among other parameters. This guarantees the long-lasting performance of your meters without process interruption.



Validation certificate

Beyond the highest requirements: KROHNE services

For us, service starts at our first contact with you and lasts as long as the life of our systems installed at your plant.

Quality and reliability are key to maintaining the highest service standards. All KROHNE feeder factories are ISO 9001 certified. In fact, long before ISO 9000 existed, KROHNE was manufacturing to the highest industrial standards. Now certification exists in every factory to demonstrate that we not only fulfil ISO requirements but have passed the ISO certification procedure every three years since the standard was introduced.

But it's not simply a one-way process. We actively encourage companies like yours to participate in our research and development. Many of our products that are today considered the pinnacle of excellence were developed in cooperation with our customers.

Engineering services through all project stages

- Project management
- Control and asset management systems in project concept phase
- Basic engineering based on the specification required by the user
- Detail engineering phase
- Commissioning services
- On-site start-up and commissioning
- Product training (on-site)
- Calibration services

Please check www.krohne.com for your local service contact.

Proven quality

Before shipping, every meter is thoroughly inspected. This rigorous programme of specific measurements, tests and factory inspections is called KROHNE proved.

So, if you install and operate any KROHNE product by following our operating instructions correctly, problems shouldn't occur. If they do, we will provide you with all the technical support and service you need.

Choose from maintenance and service contracts tailored to suit all business sizes and needs:

- Spare parts and consumables
- Field service and on-site repair
- Returns
- Workshop repair
- Helpdesk

KROHNE Academy and KROHNE Academy online

The KROHNE Academy is a series of seminars organised in collaboration with leading automation companies aimed at plant engineers, operators and contractors across the process industries. It brings industry experts together to provide an insight into the various technologies, industrial standards and procedures that plant operators can find themselves faced with.

Taking place in various countries, KROHNE Academy seminars address key operating issues, from plant safety to ways of increasing plant efficiency and controlling costs, and show possible solutions. They also provide an ideal opportunity for you to speak to the experts and benefit from their vast application knowledge.

Learn more about KROHNE Academy at
www.krohne.com

KROHNE Academy online is a free eLearning platform that contains audio enhanced, interactive Web Based Trainings. As with its on-site seminars, the online KROHNE academy learning material is vendor agnostic and not specific to individual products and/or industries. The main focus of each course relates to a measurement technology such as Variable Area, Vortex, Ultrasonic or Mass flow or to a more general topic such as the basics of gas measurement or pipeline leak detection.

Register now for free and start your training at
http://academy-online.krohne.com

Additional online services:

(Find them at **www.krohne.com**)

- **Configure It**
  Configure It is a highly advanced online configuration tool for standard devices offering free 2D/3D CAD data of KROHNE flow devices for planning engineers. It enables you to configure any KROHNE product to handle your application in a few simple steps.

- **KROVASYS 4**
  Selection and calculation tool for variable area flowmeters.

- **Planning tool for water & wastewater industry**
  The planning tool for wastewater treatment plants as well as water and wastewater applications for generating tender documents covering flow, level, analysis, pressure and temperature.

- **PiCK**
  Get any information related to your KROHNE product from our dedicated online resource PiCK. Just enter your serial number, and key material like manuals, Quick Starts and calibration documents is at your fingertips.

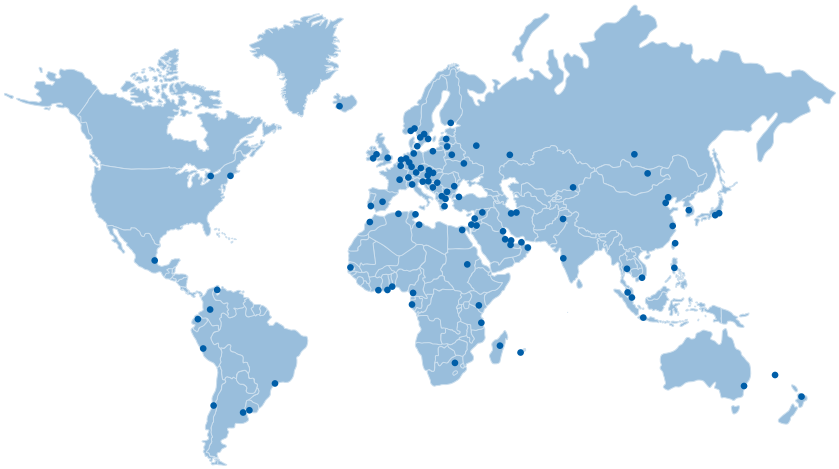
Flowmeters for energy measurement

	Vortex	Ultrasonic				Variable area
	OPTISWIRL 4070	UFM 3030	OPTISONIC 6300	OPTISONIC 6300 P	OPTISONIC 7300	H250 M40
						
Recommended energy measurements						
Heating	x	x	x	x	–	–
Cooling	x	x	x	x	–	–
Compressed air	x	–	–	–	x	x
Steam	x	–	–	–	–	–
Gas	x	–	–	–	x	x
Oil	–	x	–	–	–	–
Process conditions						
Temperature range	–40...+240°C; –40...+464°F	–25...220°C; –13...+428°F	–40...+200°C; –40...+392°F	–40...+200°C; –40...+392°F	–40...+180°C; –40...+356°F	–200...+300°C; –328...+572°F
Maximum pressure	PN100; CL 600	PN100; CL 1500	–	–	PN40; CL 900	PN250; CL 1500 (others on request)
Measuring range	Liquids: +0.3...+7 m/s –0.98...+23 ft/s Gases and steams: +2.0...+80 m/s –6.6...+262.5 ft/s	0...+20 m/s 0...+66 ft/s	+0.5...+20 m/s	+0.5...+20 m/s	–30...+30 m/s –98.4...+90.4 ft/s	Water: 10...120,000 l/h Air: 0.7...2800 m^3/h
Diameter to EN 1092-1	DN15...300	DN25...2000	DN15...4000	DN15...4000	DN50...600	DN15...100
Flowmeter features						
Inlet and outlet section	20DN/5DN	10DN/5DN	10DN/5DN	10DN/5DN	10DN/3DN	5DN/3DN
Digital communication	HART®	HART®	HART®	USB slave	HART®, Modbus, Profibus®, FF	HART®, FF, PA
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	±0.5%	±1%	±1%	Air calibration (atmospheric): 2...3": ±1.5%; 4...24": ±1%	1.6%
Highlights	• First 2-wire meter with integrated pressure and temperature compensation • Fully welded stainless steel construction • Temperature, pressure and corrosion resistant • Ready to use, plug & play	• Independent of conductivity, viscosity, temperature, density and pressure • No moving or intruding parts, therefore no pressure loss or wear • Minimal operational and maintenance costs	• 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	• 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	• 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	• Reliable low-flow measurement of compressed air and gas • Mechanical gas flow indication without the need of auxiliary power • Optional electronic modules for upgrade of alarm switches, analogue output, totaliser or communication interfaces • Cost-effective measurement solution

Electromagnetic			Mass		
OPTIFLUX 4300	**WATERFLUX 3070**	**WATERFLUX 3300**	**OPTIMASS 1300**	**OPTIMASS 6400**	**OPTIMASS 7300**
					
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"	DN08...100; 1/2...12"	DN06...100; 1/2...4"
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	HART®, FF, PA, DP, Modbus	HART®, FF, PA, DP, Modbus
±0.2%	±0.2%	±0.2%	Liquid: ±0.15% Gas: 0.35% Density: ±2 kg/m³	Liquid: ±0.1% Gas: 0.35% Density: ±1 kg/m³ (±0.2 kg/m³)	Liquid: ±0.1 % Gas: 0.35% Density: ±2 kg/m³ (±0.5 kg/m³)
• Standard device in the process industry • More than 300,000 units deployed • Chemically resistant to alkaline solutions and acids	• 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	• Easy installation without straight inlet or outlet sections • For installation in small spaces • Wide range of approvals for potable water	• Standard meter in the process industry • Excellent price-performance ratio • Supplied standard with secondary containment housing	• The high performance meter for the process industrie • Cryogenic, high-temperature and high-pressure options • Supreme liquid and gas performance with CT approval	• Single straight measuring tube in titanium, HASTELLOY® or stainless steel • Sterilisable and cleanable

KROHNE
product overview

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



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