

Core Products for Efficient Measurement in Plant Utilities






Contents



Steam	3
Steam systems offer numerous options for saving, re-using and reclaiming energy. There are opportunities for energy optimization throughout the steam system process. Check out the product list on page 3 to learn more about best technologies to improve your steam systems.	
Compressed Air	5
Compressed air systems offer numerous areas of potential energy savings. With the correct instrumentation, you can reliably identify weaknesses and savings potential in your compressed air systems. Check out the product list on page 5 to learn more about best technologies to improve your compressed air systems.	
Heating	6
It is common to find a multitude of industry-specific heating processes and technologies in today's market. That's why the implementation of accurate technologies are needed to assess their performance and improve their output. Check out the product list on page 6 to learn more about best technologies for your heating systems.	
Cooling	8
In many industries, the production of cooling energy accounts for roughly 10% of electricity consumption. Even minor energy reductions can mean significant cost savings. Check out the product list on page 8 to learn more about best technologies to improve your cooling systems.	
Industrial Gases	10
Utilities in the process industry use large amounts of industrial gases and to ensure that these gases are monitored efficiently, the proper measurement of flow is key within the distribution lines. Check out the product list on page 10 to learn more about best technologies for your industrial gas systems.	

Measuring Instruments for Steam





Steam generation and distribution

	<p>Flow measurement (steam quantity and quality) Prowirl F 200 (vortex)</p> <ul style="list-style-type: none">▪ Multivariable vortex meter (incl. flow computer) for direct mass and volume measurement of saturated or superheated steam with best-in-class accuracy▪ Optionally available with integrated pressure and temperature measurement for the calculation of delta heat and energy flow▪ Maximum accuracy thanks to “PremiumCal” calibration <p>Unique worldwide: steam quality measurement (dryness fraction)</p>
	<p>Flow measurement (steam quantity) Deltabar PMD75 (differential pressure transmitter)</p> <ul style="list-style-type: none">▪ For mass and volume measurement of saturated or superheated steam▪ Nominal diameters: DN 10 to 1000 (3/8 to 40")▪ Recognized and standardized technology since 1929 (ISO 5167)▪ External pressure and temperature compensation required
	<p>Pressure measurement Cerabar PMP51B (pressure transmitter)</p> <ul style="list-style-type: none">▪ Pressure measuring range: up to 400 bar (6000 psi)▪ Process temperatures up to 400°C (752°F) with diaphragm seal▪ Wireless control of the device in the process area with the SmartBlue App without process interruption▪ Reduce systematic failures — error-free SIL commissioning and proof testing▪ High accuracy (up to +/- 0.055%)

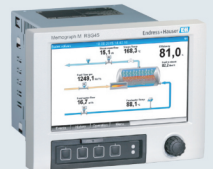
Fuel consumption measurement

	<p>Flow measurement (natural gas) t-mass F/I 300/500 (thermal mass)</p> <ul style="list-style-type: none">▪ Patented fully metallic, drift-free sensor provides reliable measurement over prolonged periods of time and even after repeated exposure to temperature cycling▪ Optional bidirectional measurement and reverse flow detection — a first for thermal mass flowmeters!▪ Heartbeat Verification allows for onboard, traceable verification without process interruption — third-party attested
	<p>Flow measurement (fuel oil) Promass E 200 (Coriolis)</p> <ul style="list-style-type: none">▪ For mass and volume measurement of liquid fuels▪ With highly accurate, direct density measurement▪ High measuring accuracy (±0.25%) and turndown (over 1000:1) <p>i Promass I 300 enables permanent in-line viscosity measurement to control the optimum combustion of fuels.</p>

Measurement of condensate, fresh water and feed water

	<p>Flow measurement (feed water) Prowirl F 200 (vortex)</p> <ul style="list-style-type: none">For volume, energy and mass measurement of feed waterOptionally available with integrated temperature measurement for the calculation of delta heat and energy flowRobust design: over 400,000 installations worldwide
	<p>Flow measurement Proline Promag W 10 (electromagnetic)</p> <ul style="list-style-type: none">For cost-effective volume measurement of make-up water with sufficient conductivity (>50 µS/cm)No pressure lossHigh measuring accuracy (±0.5%)Very high turndown (1000:1)
	<p>Flow measurement (condensate) Prosonic Flow 92F (ultrasonic)</p> <ul style="list-style-type: none">For volume measurement of hot condensate – independent of electrical conductivity and low flow rateSuitable for use up to 200°C (392°F)Immune to magnetite depositsNo pressure loss – low risk of flashingAlso available as clamp-on version for measurement from outside without opening the pipe
	<p>Temperature measurement TR13 / TR15 (RTD, butt-weld version)</p> <ul style="list-style-type: none">For temperature differential measurementTapered shank design allows for fast response timesHigh flexibility due to modular assembly with standard terminal heads and customized immersion length



Data logging and evaluation

	<p>Data logging/evaluation Memograph M RSG45 (advanced data manager)</p> <ul style="list-style-type: none">For the visualization and recording of performance data and consumption dataFor calculating the thermal energy content and aggregate energy flows from the measured values for flow, temperature and/or pressureCalculation standard according to IAPWS-IF97/ASME
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i Fuel consumption is measured to determine the boiler efficiency and the (carbon dioxide) emissions produced. To calculate the efficiency of a boiler, the thermal energy content of the feed water must be taken into account by measuring the temperature and flow. Furthermore, the thermal energy content of the condensate return lines and the added water is needed to calculate the total efficiency of the boiler system.

Measuring Instruments for Compressed Air


Flow measurement (dry or humid air)

	<p>Flow measurement (dry air) t-mass F/I 300/500 (thermal mass)</p> <ul style="list-style-type: none">Patented fully metallic, drift-free sensor provides reliable measurement over prolonged periods of time and even after repeated exposure to temperature cyclingOptional bidirectional measurement and reverse flow detection – a first for thermal mass flowmeters!Heartbeat Verification allows for onboard, traceable verification without process interruption – third-party attested
	<p>Flow measurement (non-dry/non-filtered air) Prowirl F 200 (vortex)</p> <ul style="list-style-type: none">Direct measurement in standardized mass flow or corrected volume flow (Nm³/h or SCFM)High long-term stability: no zero point drift, “lifetime” calibration factorNegligible pressure lossWith integrated pressure and temperature measurement (optional) for the calculation of mass flow/volume flowImproved accuracy thanks to “PremiumCal”

Pressure measurement (plant pressure, filter monitoring)

	<p>Pressure measurement Cerabar PMP51B (pressure transmitter)</p> <ul style="list-style-type: none">Pressure measuring range: up to 400 bar (6000 psi)Process temperatures up to 400°C (752 °F) with diaphragm sealWireless control of the device in the process area with the SmartBlue App without process interruptionReduce systematic failures- error free SIL commissioning and Proof testingHigh accuracy (up to +/- 0.055%)
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Data logging and evaluation

	<p>Data logging/evaluation Memograph M RSG45 (advanced data manager)</p> <ul style="list-style-type: none">For precise monitoring of plants and distribution networksCustomized overview of the installationVisualization and logging of performance data (e.g. specific energy consumption)Alarm managementCommunication gateway
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i In large-scale installations, by measuring the flow of air at the system outlet, it is possible to monitor the total production as well as the consumption of each individual station. The quality of the air will determine whether a thermal flowmeter or a vortex meter should be used. The most important parameters for monitoring compressors are the specific energy consumption (kWh/Nm³), the monitoring of free air delivery (FAD), and leak monitoring in compressed air systems.

Measuring Instruments for Heating

Fuel consumption measurement



- Flow measurement**
t-mass F/I 300/500 (thermal mass)
- Patented fully metallic, drift-free sensor provides reliable measurement over prolonged periods of time and even after repeated exposure to temperature cycling
 - Optional bidirectional measurement and reverse flow detection – a first for thermal mass flowmeters!
 - Heartbeat Verification allows for onboard, traceable verification without process interruption – third-party attested



- Flow measurement (fuel oil)**
Promass E 200 (Coriolis)
- For measuring the consumption (mass flow/volume flow) of liquid fuels
 - Direct density measurement
 - No straight inlet runs required
 - High measuring accuracy ($\pm 0.25\%$) and turndown (over 1000:1)
 - Measurement is independent of viscosity
- i** Promass I 300 enables permanent in-line viscosity measurement to control the optimum combustion of fuels.

Energy flow measurement (feed/return line)



- Flow measurement**
Prosonic Flow 91W / E 100 (ultrasonic)
- For volume measurement of hot water – independent of conductivity
 - Measurement immune to magnetite deposits
 - Clamp-on sensor (91W):
 - Non-intrusive measuring technology
 - For temporary measurement without opening the pipe
 - No pressure loss
 - In-line sensor (E 100):
 - High accuracy ($\pm 0.07\%$ o.f.s. to 0.5% o.r.) thanks to traceable factory calibration
 - Integrated temperature measurement
 - Short inlet runs
- Temperature measurement**
TH13 (modular RTD)
- For reliable temperature monitoring (e.g. if liquefied gas from the vaporizer enters the main pipeline)
 - Tapered shank design allows for fast response times
 - High flexibility due to modular assembly with standard terminal heads and customized immersion length

Data logging and evaluation



- Data logging/evaluation**
Memograph M RSG45 (advanced data manager)
- Flexible, high-performance system for the visualization, storage, organization and analysis of process values (e.g. boiler efficiency)
 - System-compatible: supports common fieldbus systems like Modbus, Profibus DP, PROFINET or EtherNet/IP
 - Integrated web server: remote access to device operation and visualization for lower maintenance costs
 - Stainless steel front with touch control



- Energy computer**
EngyCal RH33 (BTU meter)
- Certified BTU meter suitable for custody transfer measurement
 - Wide range of calculation functions: e.g. power, volume, density, enthalpy, enthalpy differential, mass, temperature differential, energy, deficits or total amounts
 - For maximum accuracy when processing the values measured with the TR10 temperature sensor (Callendar-Van-Dusen coefficient)

Measuring Instruments for Cooling

Flow measurement (refrigerants and coolants)



- Flow measurement (refrigerants)**
Proline Prosonic Flow W/I 400 (ultrasonic)
- Repeatable measuring accuracy even when installed close (2xDN) to elbows, expansions/reductions, and other obstructions
 - Simple retrofitting of existing measuring points with almost no limitations
 - Heartbeat Verification allows for onboard, traceable verification without process interruption – third-party attested



- Flow measurement (refrigerants)**
Proline Prosonic Flow P 500 (ultrasonic)
- Can be installed close to elbows, expansions or constrictions in the pipe and still maintain the same measurement accuracy
 - Mounted without process interruption or opening the pipe
 - Remote version with up to 3 I/Os



- Flow measurement (refrigerants)**
Prowirl F 200 (vortex)
- For volume measurement of liquids and gases
 - Guaranteed long-term stability: no zero point drift, “lifetime” calibration factor
 - Negligible pressure loss
 - Very robust: not affected by pressure shock and vibration
 - Install upside-down to utilize the optional wet steam detection/measurement application package



- Flow measurement (coolants)**
Proline Promag W 10 (electromagnetic)
- Volume and conductivity measurement of water and wastewater
 - Can be ordered with grounding-free measurement and unrestricted mounting “0 x DN full bore”
 - Optionally with NEMA 6P/IP68 submergence rating



- Flow measurement (coolants)**
Prosonic Flow E 100/E Heat (ultrasonic)
- For volume measurement of cold water
 - High turndown over 200:1
 - High measuring accuracy (±0.07% o.f.s. to ±0.5% o.r.)
 - “E Heat” sensor suitable for custody transfer

Pressure and temperature measurement



- Pressure measurement**
Cerabar PMP51B (pressure transmitter)
- Pressure measuring range: up to 400 bar (6,000 psi)
 - Process temperatures up to 400 °C (752 °F) with diaphragm seal
 - Wireless control of the device in the process area with the SmartBlue App without process interruption
 - Reduce systematic failures-error free SIL commissioning and Proof testing
 - High accuracy (up to +/- 0.055%)



- Temperature measurement**
TH13 (modular RTD)
- For temperature differential measurement (feed/return line)
 - Tapered shank design allows for fast response times
 - High flexibility due to modular assembly with standard terminal heads and customized immersion length

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i For cooling systems with direct cooling (NH₃, CO₂, etc.), pressure, temperature, electrical power and flow must be measured to calculate the cooling capacity or the energy efficiency ratio (ERR) of an installation. The same applies for other performance indicators such as the coefficient of performance (COP) of heat pumps, machines, installations and specific energy consumption.

Measuring Instruments for Industrial Gases

Flow measurement of industrial gases



- Flow measurement (cryogenic fluids)**
Promass F 500 (Coriolis)
- For highly accurate measurement of mass flow, density and volume flow of cryogenic liquefied gases such as nitrogen (N₂), argon (Ar) or liquefied natural gas
 - Applicable down to -196°C (-321°F)
 - No straight inlet runs required
 - Suitable for custody transfer



- Flow measurement**
t-mass F/I 300/500 (thermal mass)
- Patented fully metallic, drift-free sensor provides reliable measurement over prolonged periods of time and even after repeated exposure to temperature cycling
 - Optional bidirectional measurement and reverse flow detection – a first for thermal mass flowmeters!
 - Heartbeat Verification allows for onboard, traceable verification without process interruption – third-party attested



- Flow measurement (dry gases in distribution pipelines)**
t-mass A 150/B 150 (thermal mass)
- For direct mass/corrected volume measurement of industrial gases without pressure or temperature compensation
 - Negligible pressure loss compared with mechanical flowmeters
 - High turndown (up to 100:1), ideal for identifying leaks
 - No moving parts
 - Low-cost insertion version (t-mass B 150) or in-line version (t-mass A 150)



- Flow measurement (wet gases)**
Prowirl F 200 (vortex)
- With integrated (optional) pressure and temperature measurement for the direct measurement and calculation of mass flow and corrected volume flow (Nm³/h or SCFM)
 - High long-term stability: no zero point drift, “lifetime” calibration factor
 - Negligible pressure loss

Pressure and temperature measurement



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