



Measurement Products

Flow measurement solutions
Trusted application expertise for
enhanced performance, operational
and financial benefits

Power and productivity
for a better world™



Expertise in technology

More than a century of experience

To operate any process efficiently, it is essential to measure, actuate, record and control. With ABB's measurement products and solutions, you receive the best technology combined with the most reliable products available on the market.

ABB offers a broad range of life cycle services for optimum product performance. A global network of measurement product specialists delivers local service and support.

Research and development is a vital source of ABB's technology leadership. It builds on the foundation of existing technologies for new applications, and continues to develop the breakthrough technologies needed to meet future challenges.

ABB and its heritage companies have been leaders in innovation and technology for more than 100 years.

Aztec

Bailey

BOMEM

Bush Beach Engineering
— Limited —

FISCHER
& PORTER **F**

Hartmann & Braun

K-TEK

Kent

Pressductor®

SENSYCON

Schoppe & Faeser

Taylor

TBI-Bailey

TORBAR
FLOWMETERS LTD

TOTALFLOW
MEASUREMENT & CONTROL SYSTEMS

Comprehensive measurement solutions

Serving any industry

World-class measurement solutions

ABB measurement products provide world-class measurement solutions for any industry, utility or municipality. Latest innovations deliver technological solutions to make it easier for you to run your plant. ABB's measurement products are based on common technology, providing a common look and feel and method of operation. This results in products that are easy to configure, easy to integrate, and easy to maintain.

For more information please visit:
www.abb.com/measurement

ABB's measurement products portfolio:

- Analytical measurement
- Flow measurement
- Natural gas measurement
- Valve automation
- Pressure measurement
- Temperature measurement
- Recorders and controllers
- Level measurement
- Device management
- Force measurement
- Service

1 Water and waste water | 2 Power and industrial steam | 3 Chemical and petrochemical | 4 Oil and gas | 5 Pulp and paper | 6 Minerals | 7 Metals | 8 Food and beverage | 9 Pharmaceuticals



Expertise in flow measurement

Millions and millions of flowmeters installed

ABB offers one of the world's largest, most innovative ranges of flow measurement solutions. Unrivalled in its breadth and scope, ABB flowmeters provide high-quality measurement for almost any application and industry.

A common HMI platform enables you to easily configure, integrate and maintain ABB flow measurement products. Other innovations deliver higher accuracy, easier maintenance and maximum reliability. No wonder there are millions of ABB flowmeters installed around the world today.

For more than a hundred years, ABB solutions have delivered reliable and accurate results in countless flow measurement applications.

For more information please visit www.abb.com/flow

Some of ABB's innovations in flow measurement

- 1914 First venturi tube for gas
- 1930 First mass-produced variable area flowmeter
- 1962 First wedge type flow meter for slurry service
- 1970s First swirl-type flowmeter
- 1974 First magmeter with capacitive signal pick up
- 1980s First battery powered full-bore magmeter
- 2002 First subsea flowmeter
- 2011 First renewable powered flowmeter utilizing wind and solar power

ABB's flow portfolio includes:

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- Natural gas and liquid measurement page 24
- Vortex and swirl flow measurement page 28
- Thermal mass flow measurement page 30
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- Energy metering page 33
- Service page 35



Flowmeters for liquids, gases and steam

A comprehensive portfolio

Application, product features	Electro-magnetic	Vortex/Swirl	Thermal mass	Coriolis mass	Variable area	Differential pressure	Flow computers
Liquids							
Conductive	X	X		X	X	X	
Non-conductive		X		X	X	X	
Solids content	X	X		X	X	X	
Pulsating	X	X			X		
Viscosity > 10 cSt	X	X		X		X	
Liquid calculations							X
Custody liquid measurement	X						X
Gas/oil well optimization							X
Gases							
Dry/clean		X	X	X	X	X	
Moist		X		X	X	X	
Corrosive				X		X	
Contaminated		X	X	X	X	X	
Gas calculations							X
Custody gas measurement				X			X
Steam*		X		X	X	X	
Fluid temperature	-40...180 °C -40...356 °F	-55...400 °C -67...752 °F	-25...300 °C -13...572 °F	-50...200 °C -58...392 °F	-20...400 °C -4...752 °F	-50...500 °C -58...932 °F	
Ambient temperature	-25...60 °C -13...140 °F	-55...70 °C -67...158 °F	-25...70 °C -13...158 °F	-40...60 °C -40...140 °F	-25...60 °C -13...140 °F	-40...85 °C -40...185 °F	-40...60 °C -40...140 °F
Accuracy	0.2% of rate	0.5% of rate	1% of rate	0.1% of rate 1 g/l	1.6 per VDI/VDE 3513	0.7% of max.	0.075% of DP/SP span
Partially filled pipelines	X						
Size range	DN 1...2400 [1/25...96"]	DN 15...400 [1/2...16"]	DN 25...3000 [1...120"]	DN 1.5...150 [1/16...6"]	DN 15...100 [1/2...4"]	DN 15...8000 [1/2...320"]	
Typical up-/ downstream sections	3D/2D	15D/5D 3D/2D	15D/5D	0D/0D	0D/0D	10D/4D	
Standard pressure ratings	PN 10...40 CL 150 CL 300 JIS K10	PN 10...64 CL 150 CL 300	PN 40 CL 150 CL 300	PN 16...100 CL 150...600	PN 16...100 CL 150...600	PN 10...400 CL 150...2500	
Hygienic/sterile certifications	EHEDG 3A, FDA		CIP/SIP	EHEDG FDA			
Certified calibrations	X	X	X	X	X	X	
Ex-approvals	ATEX, FM CSA	ATEX, FM CSA	ATEX, FM CSA GOST	IEC, ATEX FM, CSA NEPSI	ATEX, FM CSA	ATEX, FM CSA	ATEX CSA
Communication	FF, HART PA, DP	FF, HART, PA	HART, DPV1	HART, PA FF	HART	FF, HART PA	Totalflow MODBUS

* e.g. saturated steam, superheated steam

Global availability

A partner to rely on, wherever you are



Calibration facilities for fluids with (5-350) m³/h



Calibration facilities for gases with (1-8.800) kg/h

ABB has six flowmeter calibration laboratories located in Australia, China, Germany, India, the UK and the USA. The calibration rigs are built in accordance with ISO standards and certified to meet key international standards bodies, such as SIMT, UKAS, NIST, DAkkS, NVLAP and NATA. The ABB flow calibration certification laboratories are recognized by the International Laboratory Accreditation Cooperation (ILAC), enabling customers to use calibrated flowmeters globally. The flow rigs are some of the largest in the world based on their constant flow capability.

Information whenever you need it – Device management, fieldbus and wireless

ABB's instrumentation devices feature the latest in onboard diagnostics and intelligence to help you run your business more effectively. Just as important, ABB gives you the choice to decide which communication protocols you want to use to access this information. You can choose from a family of tools and from different ways to manage the lifecycle of the devices in order to get the most out of your investment.

ABB's device management product range includes

- Fieldbus and wireless solutions
- Mobility handhelds
- Asset vision software
- Scalable service management

Electromagnetic flow measurement

The best solution for conductive fluids

From water and wastewater to chemical, pharmaceutical, paper and many applications in the food and beverage industry, whenever the flowrate of conductive liquids, slurries or sludges is to be measured, electromagnetic flowmeters from ABB are in their element. They have been recognized for many decades as being among the most successful in the market place – a comprehensive range of product lines and models that meets practically all needs, covering just about every application.

ABB's modular range of electromagnetic flowmeters enables you to achieve the best levels of efficiency and performance from your production process. With the most complete range of electromagnetic flowmeters, ABB delivers the power to solve everything from the simplest to the most demanding process applications, enabling previously unattainable operational and financial benefits. Proven to be tough, as well as reliable and incredibly easy to work with, these innovative flowmeters save you time and money at every stage in the life cycle.

Whatever and whenever the application, ABB's intelligent design, state-of-the-art technology and advanced features work harder and smarter to make your operations more cost effective.

Benefits of using ABB's electromagnetic flowmeters

- ABB's ProcessMaster improves your process control by as much as 60% using innovative signal processing and enhanced noise filtering technology
- Best in class high solids content flow measurement performance from the proven FSM4000 flowmeter
- Increase your revenues through highly stable, accurate measurements from ABB's world leading WaterMaster
- AquaMaster is one of the market's most innovative products with amazing low-flow performance and ground-breaking power options



Electromagnetic flow measurement

High accuracy for the process industry



ProcessMaster for demanding process industry applications



Hot fluid measurement with ProcessMaster in a chemical plant

The first choice for demanding process industry applications, ProcessMaster electromagnetic flowmeter is tough, reliable, incredibly easy to work with and helps save resources at every stage of the lifecycle.

The challenge – maintain high accuracy and eliminate the impact of gas bubbles and electrode deposits on process and flow results

In many process driven industries such as chemical, power, water and wastewater, oil and gas and pulp and paper, potential disturbances to electromagnetic flow measurement can be disruptive and expensive. Gas bubbles in the flow medium, deposits on electrodes and grounding problems all affect measurement accuracy and increase the probability of process downtime associated with poor process and flow data.

The solution – precise, reliable measurement for efficient plant operation and constant product quality

Modular in design, ProcessMaster makes diagnostics easy. Developed for tough process conditions, its advanced diagnostic functions enable transparency of the device and process status. The electromagnetic flowmeter detects even the smallest amounts of gas bubbles in the fluid, as well as deposits on electrodes. This allows you to react to critical events at a very early stage, increasing productivity and minimizing downtime. ProcessMaster is remarkable for its free pipe cross-section, high measurement accuracy, robustness and long-term stability.

Your benefits

- Intuitive operation
- Extended diagnostic functionality
- Advanced signal processing with long-term stability
- State-of-the-art sensor memory technology



Electromagnetic flow measurement

The trusted flowmeter of choice



Metering pulp in a paper mill



Metering reject in a paper mill

FSM4000 masters your critical applications and conserves valuable resources with highly accurate measurement of process parameters in a wide range of industries.

The challenge – coping with abrasive slurries when measurements involve solid-loaded liquids, low conductivity fluids, pulsating flows or other inhomogeneous materials

To achieve efficient processes and make the most of high production capacity, all fluids must be measured precisely to evaluate the deteriorating quality and high levels of impurities in pulps, mixtures and slurries.

The solution – critical measurement of conductive fluids in demanding processes

Increasing efficiency begins with highly accurate measurement. The FSM4000 creates the ideal conditions for acquiring accurate raw materials data due to its volume flow measurement facility. In an industry like pulp and paper, the FSM4000 is ideal for basic and highly demanding applications alike, measuring not only pulp stock concentrations of up to 15%, but also high levels of impurities, such as shards of glass and plastic particles, found when measuring reject materials and in closed water cycles. The flowmeter has vacuum-proof linings, resistant to temperatures up to 180 °C (356 °F), and self-cleaning electrodes for alkaline applications in pulp processes. The FSM4000 provides an undamped, noise-free output signal at the head box so that basis weight control systems keep on running no matter what the process conditions.



Your benefits

- Longer life compared to standard lining flowmeters
- Reduced maintenance for lower cost of ownership
- High measurement quality through constant results
- Standard installation lengths/inside diameter with no constriction

Electromagnetic flow measurement

The clean choice for hygienic applications



Metering soft drinks



Metering milk in the dairy industry

HygienicMaster provides the perfect balance of performance, flexibility and control to deliver clear business and performance benefits that maintain the integrity of your process.

The challenge – getting the best levels of efficiency and performance in the most demanding hygienic applications

Your production process requires reliable, accurate instrumentation. In hygienic processes such as obtaining standard, repeatable dairy products with constant fat content, it is often impossible to achieve the right balance of operational and financial benefit without sacrificing performance and control.

The solution – unsurpassed electromagnetic flow measurement with highest accuracy and advanced signal processing for the lowest cost of ownership

HygienicMaster is the best hygienic flow metering solution available. Designed specifically for the food & beverage, pharmaceutical and biotechnology industries, it is manufactured from FDA approved materials and certified in accordance with EHEDG and 3A. HygienicMaster is packed with advanced features and functionality to enable you to operate more efficiently, make rapid decisions, reduce costs, and increase profitably. It uses advanced filtering technology to improve accuracy by separating the signal from the noise, resulting in better product quality and highest reliability.

Your benefits

- Highest measurement accuracy
- Modern diagnostics to keep the process up and running
- Backwards compatible to old field sensors
- Intuitive navigation and configuration

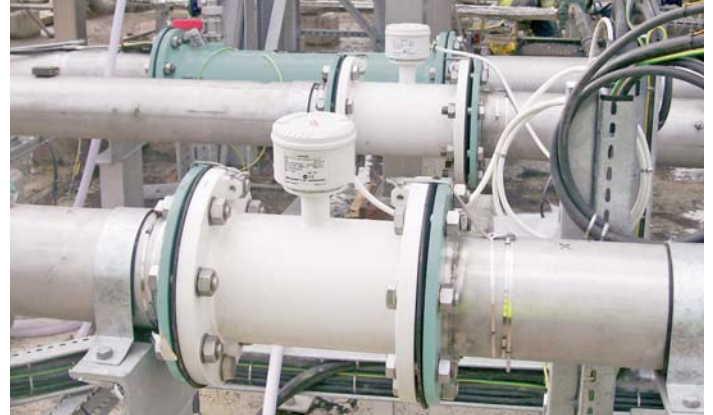


Electromagnetic flow measurement

The perfect fit for all water applications



Remote flow control with WaterMaster



WaterMaster provides the flexibility to solve demanding water applications

WaterMaster is the ultimate solution for flow measurement and management in sectors as diverse as water, wastewater, sewage and effluent.

The challenge – the increasing demand to reduce leakage and meet tight environmental regulatory standards through modernization

Water and wastewater companies are under pressure to reduce leakage in water distribution networks. As energy costs increase, so does the cost of providing water services. It is critical for utilities to get the best levels of efficiency and performance from production processes that require reliable, accurate measurement products.

The solution – efficiently manage precious water resources by accurately measuring water volumes consumed from production processes

ABB's WaterMaster flowmeters set the standard for water, wastewater, sewage and effluent flow measurement and management. Reliable and accurate, the products and associated software tools deliver speed, simplicity and ease of use at every stage of the process lifecycle. WaterMaster provides the flexibility to solve demanding water application challenges and deliver previously unattainable operational and financial benefits. Proven in the toughest applications, the rugged, robust and buriable sensors eliminate the need for expensive meter chambers.

Your benefits

- VeriMaster in-situ verification capabilities
- Improved performance with digital signal processing (DSP)
- Advanced self-calibration and diagnostic capability
- Accuracy, simplicity and ease of use



Electromagnetic flow measurement

Saving energy and cost naturally



AquaMaster reduced bore flow sensor installed in potable water network



AquaMaster for accurate water network reporting

AquaMaster 3 comes with power supply options, including 5-year battery power and environmentally friendly wind and solar power.

The challenge – effective flow metering for billing, survey and leak detection in remotely located water distribution and irrigation networks

Achieving the highest measurement accuracy, especially in remote locations where mains power is unavailable, is a critical requirement in water distribution networks and irrigation schemes. For operators, obtaining data from geographically remote installations is an expensive and time-consuming requirement.

The solution – using a truly flexible flowmeter combining power management, measurement accuracy, data storage and communications

ABB's AquaMaster range is the industry benchmark. It conforms to international standards for accurate flow metering and its wide measuring capability enables accurate recording and data storage of daily flows. AquaMaster patented sensors give class-leading low flow performance to aid network leak detection. All data is stored in the sensor to reduce on-site setup. The on-board data logger records for several months. In low flow periods, when leakage flow is more distinguishable, the flow sensor's patented reduced bore rubber lining technology provides accelerated flow velocity proving high accuracy at extremely low flowrates, often at night.

Your benefits

- Best in class leakage detection
- Renewable (Solar/Wind) energy option
- Quad band GSM/SMS messaging
- Optional full bore irrigation application flow sensor



Electromagnetic flow measurement

The next level in flowmeter versatility



AquaProbe is ideal for flow survey applications



AquaProbe is easy to install and to use

Well-established and widely used in clean water flow installations worldwide, AquaProbe insertion meters set the industry standard for probe-based in-situ measurement.

The challenge – perform temporary flow surveys or minimally disruptive flowmetering in a water distribution network

Clean and potable water distribution applications often require economical, non-disruptive installation of a flowmeter to the water supply. Applications are often remote with potentially no mains power available and, as a consequence, data may need to be recorded locally and accessed remotely via wireless communication.

The solution – a flexible, reliable, high accuracy single insertion meter for both temporary and permanent installations

AquaProbe insertion meters need little introduction to anyone connected with clean water flow measurement. Easy to install via its “hot tap” feature, AquaProbe’s ‘fit and flow’ design avoids the expense and inconvenience of taking the network off-line, as with traditional in-line flowmeters. AquaProbe is compatible with both AquaMaster 3 and WaterMaster transmitters and several power supply options are available, including 5-year battery power and environmentally friendly wind and solar power. AquaMaster 3’s on-board data logger records high accuracy data for several months and can be accessed via GSM networks.

Your benefits

- AC, DC battery or solar/wind compatible power supply
- Bi-directional flow capability over a wide flow range
- Multi-speed, multi-channel, dual variable datalogger
- Unrivalled return on investment



Coriolis mass flow measurement

Simple and precise flow measurement



ABB's CoriolisMaster series provides a wide range of Coriolis flowmeters for various applications, from dosing single drops with highest accuracy to filling ocean-going tankers. Choose one of the most compact meters on the market to cover even your toughest applications with solids or gas inclusions.

CoriolisMaster offers a wide meter size range providing precise measurement of mass flow, volume flow, density, temperature and concentration. CoriolisMaster saves investment costs covering all these measurements in one meter. It is simple to install and commission.

CoriolisMaster has a history of success in a variety of industries and applications with the broadest measuring ranges – from measuring upstream hydrocarbon fluids to dosing chocolate or calculating the concentration of chemical liquids.

ABB's innovative sensor memory concept maximizes meter uptime.

Using the Easy Set-up technology and sensor memory systems saves precious maintenance and commissioning time.

Benefits of using ABB's Coriolis flowmeters

- Reduce flowmeter maintenance by up to 90%
- Coriolis meters are free of mechanical wear and minimize any installation issues
- Save up to 25% pump power – by using the CoriolisMaster double tube design with lowest pressure drop
- Save critical installation space – the CoriolisMaster saves you more than 40% in length and meter volume

Coriolis mass flow measurement

The proven solution for all applications

Proven in many thousands of installations, the CoriolisMaster meter provides reliable measurement in the field. Insensitive to solid inclusions and withstanding a high degree of gas inclusions this meter has a history of success in all industries.

The challenge – to provide highly efficient flow measurement with greater flexibility

When measuring flow, density, temperature and even concentration of liquids, most users look for a single solution – an accurate, low maintenance and universally usable flowmeter with long term stability. It must be capable of measuring all fluids and fluid characteristics such as aggregate state, conductivity and density.

The solution – best in class mass flow measurement for all your high performance measurement requirements

The modular CoriolisMaster design meets all high performance measurement requirements while encompassing the most advanced flow measuring principles. It offers unrivalled accuracy to 0.1% in direct mass flow measurement, and is easy to install in any orientation. It withstands vibrations or gas inclusions to a high degree and works where many others fail. A range of flexible connection sizes means the instrument adapts to all your measurement processes. Much more than a pure flowmeter, the CoriolisMaster delivers powerful mass flow analysis alongside world-class meter diagnostics.

Your benefits

- Self draining in vertical or horizontal installations
- All major worldwide approvals available
- Wide choice of line sizes: 1 mm (1/16")-150 mm (6")
- Provides different materials and withstands high pressures
- Hygienic version EHEDG approved



The CoriolisMaster sensor in a custody transfer truck filling application



CoriolisMaster in a process industry application



Coriolis mass flow measurement

The better alternative

CoriolisMaster meters have it all: highest measuring accuracy, easy installation and handling, compact and space-saving design and one of the lowest pressure losses in the industry for double tube designs.

The challenge – achieve precise measurement over a very wide flow range with just one meter size

In a highly complex plant with very limited installation space, the flow rates can vary by a factor of 100 due to different plant loads. At present, meters operate with high pressure drop and high maintenance costs. Plant managers need a simpler solution that saves maintenance cost and time, space and pump power.

The solution – using CoriolisMaster, the better alternative

The CoriolisMaster series is one of the most compact meter designs and one of the lowest pressure drops of any double tube design. Its excellent measurement performance works across a wide flow range and its low pressure can save pump power of up to 50%. As no in- and outlet sections are required, the compact meter design saves precious installation space. CoriolisMaster provides solutions not only for liquid flow measurements but also for gas flow measurements, density, temperature and concentration. The proven transmitter concept provides a well-known operability, sensor memory concept and Easy Set-up.

Your benefits

- Offers liquid and gas measurement
- One of the lowest pressure drops in the industry
- Excellent performance guarantees a very wide flow range per meter size
- Hygienic meter versions available



CoriolisMaster features a compact and space-saving design



CoriolisMaster measuring oil-water-gas mixtures



Coriolis mass flow measurement

Measuring very low flow

For very low flow rates, the Coriolis MS2 sensor provides precision even for smallest amounts of liquids. The single tube design offers unrivaled measurement performance in a compact design. Meter sizes down to 1.5 mm (1/16") are available.

The challenge – dosing of single drops of chemicals or biocides

Whether it's chemical dosing to an oil well, a paper machine, dosing of flavor in food or chemical dosing in waste water, all face the same challenge: measure flow when most measuring principles fail due to low flow rates.

The solution – one of the smallest and most compact meters available: the MS2 meter

Utilizing a bent single tube design, the MS2 meter senses the smallest flow rates with high precision. The sturdy design enables the meter to measure even under tough conditions with a wide flow range. The meter comes with ABB's renowned transmitter concept enabling simplicity of usage, sensor memory concept and in-the-field diagnostics, verification, recalibration and optimization.

Your benefits

- Withstands high pressures of up to 400 bar (5800 psi)
- Measures 600 g/h or lower
- Various wetted materials available



Measuring flow even at very low flow rates



CoriolisMaster mass flowmeters are ideal for liquid mass flow applications



Differential pressure flow measurement

Simplifying complex measurements

ABB has proven experience and capability in the design, engineering, manufacture and application of the most comprehensive range of differential producing flow elements, including some of the most complex differential pressure (DP) solutions.

ABB's DP flow measurement portfolio includes innovative in-line and insertion DP flowmeters that are fully configured, leak-tested and ready to install, saving you time and money while reducing critical skill set requirements. ABB's DP flowmeters reduce the cost of ownership in a number of ways. They reduce purchasing, installation and maintenance costs and minimize pressure losses in the system. Whether your application involves high or low pressures, aggressive fluids, erosive slurries, viscous liquids or extreme temperatures, ABB has a DP flow solution to meet your needs.

Benefits of using ABB's differential pressure flowmeters

- Save time and reduce installed cost up to 30%
- Lower boiler, compression and pumping costs by utilizing flowmeters that reduce pressure loss by 90%
- Enhance environmental compliance by reducing potential leak points up to 50% with installation ready solutions



Differential pressure flow measurement

Meeting your process conditions



Wedge flowmeter in wellhead natural gas application



Wedge meters are well suited to fluids used in the oil and gas industry

ABB's Wedge flowmeter is robust, reliable and versatile. It has no critical dimensions to wear and is compatible with not only multivariable transmitters but also with a variety of remote seal DP transmitters. So whether the measured process is dirty, viscous, hot, clean, abrasive or tends to foul, ABB Wedge flowmeters offer accurate measurement.

The challenge – eliminate plant down time whilst maintaining meter performance in high temperature and high pressure processes

Delayed coking is a thermal cracking process used in petroleum refineries to take advantage of residuals and vacuum distillates after crude oil has been cracked into consumer products. Furnaces, transfer lines and coking drums must operate continuously to meet production demands, with minimal down time as a prerequisite. As fluids pass through the process, the life of the flow meter is further tested as the process stages become even more demanding.

The solution – robust flowmeters with no moving parts and minimum maintenance requirements

ABB's wedge flowmeters have no moving parts or critical surfaces, so maintenance is virtually eliminated and performance is never affected by worn or damaged surfaces. Compatible with remote differential pressure seals, aggressive fluids and solids are retained and managed within the process. The wedge design is flexible enough to cover a range of coker application requirements for wetted materials and pressure or temperature limits. A number of coating options further extend erosion and corrosion resistance. Instead of multiple complete flow meters, a single wedge primary with multiple pressure taps manages measurement redundancy.

Your benefits

- Reduce installation costs by 50% compared to traditional DP systems
- High resistance to corrosion and erosion
- Minimal maintenance requirements
- Requires minimal straight pipe lengths



Differential pressure flow measurement

Orifice metering for all applications



OriMaster M installed in a lagged steam pipeline



OriMaster simplifies installation and commissioning

OriMaster, the one-piece, advanced design, orifice-based flow meter that greatly simplifies installation and commissioning and reduces the possibility of leakage between the orifice and transmitter.

The challenge – achieve reliable, accurate orifice installations and best performance with reduced overall costs

Best practice guides focus on the importance of orifice centralization. Impulse lines must be short and routed identically and correctly, depending on the fluid phase and transmitter location. Impulse lines often leak from the many joints involved and routing can determine the presence of condensation or gas bubbles with the resultant effect on response times and accuracy.

The solution – savings in procurement, engineering, installation and maintenance

ABB's OriMaster is a compact, complete, pre-assembled flowmeter combining orifice, instrument manifold, impulse lines and differential pressure or multivariable transmitter in one pressure-tested assembly. Total cost savings are achieved through reduced engineering time, a simplified procurement process and significantly less labor time and installation cost. Once installed, the savings continue through higher reliability and reduced maintenance costs, with significantly fewer potential leak points. Should process conditions change. The orifice plate can be replaced economically and on-site with minimum downtime.

Your benefits

- One-piece flowmeter with integral transmitter, manifold and RTD
- Wide application pipe size range
- Removable orifice plates when flow conditions change or for maintenance
- Fully pressure tested to eliminate leaks



Differential pressure flow measurement

Economical flow metering solutions for gases, liquids and steam



Torbars find application in solar heating schemes



Torbar measuring steam in a refinery

Torbar is a multiport self-averaging flow meter with a design based on the classical Pitot tube concept of fluid and bulk gas flow measurement.

The challenge – meter demineralized water underground on solar fields or ‘islands’ with minimal pressure loss and non-intrusive installation

Flow measurement of water in solar field systems is a unique application with specific challenges like installation restrictions and the need to minimize energy input when pumping the water. In many cases only a small footprint, easy-to-install flowmeter that handles non-conductive liquids will meet the challenge. Ideally the flowmeter should be easy to remove for inspection and maintenance without disrupting the flow and should create only minimal pressure losses.

The solution – low-loss insertion metering, removable under pressure

ABB Torbar units provide economical measurement, particularly in medium or large pipe sizes. Simple to install via a small threaded tapping or flanged branch, even if the pipework is below ground, Torbars fit onto existing pipework without the need to remove pipe sections or fit process flanges. Retractable versions can be removed and re-inserted without disturbing the process. With only a small cross-section disrupting the flow stream, they create minimal pressure losses and can be used in challenging installations, which often only have much shorter straight pipe lengths available.

Your benefits

- Economical to purchase and install
- Incurs minimal pressure losses
- Can be installed in the pipe via single threaded or flanged tapping
- Retractable versions can be installed and removed without shutting down the process



Differential pressure flow measurement

All the documentation, testing and certification that your industry needs



Venturi flow tubes are used in many industries



Venturi flow tubes on the seabed feed oil to FPSOs

For over 100 years Venturi flow tubes have been the solution of choice wherever low pressure loss, high accuracy, short straight piping or high-solids fluids are encountered.

The challenge – metering a variety of liquids and gases, with low energy losses

To minimize on-site energy usage and CO₂ 'footprint', gases and liquids have to be metered with low-pressure losses by using flowmeters robust enough to withstand extremes of pressure and temperature. They must be available in a variety of wetted materials to resist attack from corrosive process fluids.

The solution – a robust device designed for use where the specific requirement is low pressure-loss

ABB Venturi flow tubes are engineered and manufactured to exacting and very specific application requirements. The Venturi tube comes with the documentation, testing and certification you need, with materials fully traceable and certified, using coded welders and supplied with full data dossiers. Materials and processes are controlled to ABB's own internal manufacturing levels and 'wet' flow calibration can be arranged. The classical Venturi tube is a robust, low pressure-loss device, available for line sizes 25 to 1200 mm (1 to 48 in.) as standard, with larger sizes available.

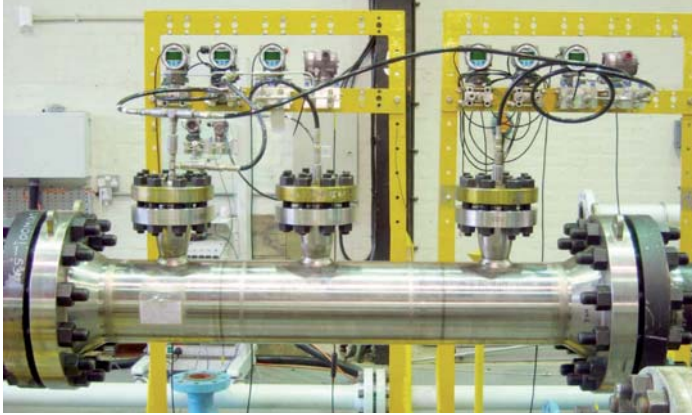
Your benefits

- Reduce energy costs by typically 20 to 25%
- Reduce greenhouse gas emissions
- Can be designed for elevated pressures and/or temperatures
- Full data dossiers covering manufacture, materials and testing
- Flow calibration available for enhanced performance



Differential pressure flow measurement

Trusted measurement solutions for offshore oil and gas operations



Wet gas meters are calibrated on gas-liquid mixtures before despatch



The output from many of today's gas fields contains a liquid phase

ABB's world leading expertise in engineering and welding in exotic materials, combined with comprehensive material traceability, certification and documentation results in the most reliable solution for wet gas metering.

The challenge – meter wet gas with a single-phase differential pressure flow meter, without the use of separators

In offshore installations, differential pressure flowmeters on wet gas face significant problems. Liquid presence will cause the meter to over-read the gas flow and 'hold-up' behind the DP restriction, causing additional metering errors. Without a multiphase meter, the phases of the fluid must be physically separated using heavy and expensive equipment, in locations where space and weight are at a premium.

The solution – economical flow metering without separation

Separation of the process phases for well testing is often either not possible or not economic. During the liquid phase, ABB's wet gas meter corrects for errors without the need for test separators. Reliable and robust, the meter combines the beneficial characteristics of a Venturi tube with ABB's proven correction algorithm and the latest PLC and transmitter technology. The Venturi tube enables up to 50% less pressure loss, and prevents blockage or damage caused by the liquid phase. For marginally viable gas fields, ABB's wet gas meter is the cost-effective solution.

Your benefits

- One-supplier solution
- Application tailored
- Full data dossiers covering manufacture, materials and testing
- Flow calibrated on wet gas for assured performance



Natural gas and liquid measurement

Absolute accuracy, efficiency, safety and productivity



For any oil and gas operation the need to increase accuracy, efficiency, safety and productivity is an ever-present challenge. Totalflow remote measurement and automation systems from ABB take you way beyond mere process integration with software and hardware systems that are absolutely compatible with your business and each other. Totalflow products deliver the most accurate information in the most efficient manner. If more than standard is needed, ABB offers you the right solution tailored specifically to your needs.

Representing a convergence of state-of-the-art technologies, ABB Totalflow products are scalable across all segments of oil and gas automation and measurement applications – up to and including custody gas and liquid measurement, gas well optimization and production enhancement.

Greater functionality and flexibility seamlessly co-exists with business efficiency and operational value to enable you to implement unique, custom applications without the need for complex, engineered solutions.

Benefits of using ABB's Totalflow flowmeters

- Monitor, measure and control your facilities anywhere, anytime
- Measure and monitor gas and liquid flow in compliance with AGA and API standards
- Reliable measurement, automation, monitoring, control and alarming applications for remote oil and gas systems
- Easy-to-use software systems for real-time measurement and control right from the office

Natural gas and liquid measurement

Reliable oil and gas measurement and monitoring technology

Easy installation, minimal calibration and accurate custody-transfer are just some of the benefits of ABB's Totalflow G4 flow computers. Years of experience with real-world applications mean greater efficiency, exceptional productivity and long-term profitability for you.

The challenge – today's natural gas market requires high measurement accuracy and real-time gas/liquid custody-transfer and flow information either from local or remote installations

Rising prices for oil and gas have made it more important to have accurate and reliable measurements of flow. Custody transfer is one of the most important applications where the ownership of a fluid or gas is transferred from one person or company to another. In this transfer phase, it is critical that both parties agree on the type of flowmeter and on the conditions of use.

The solution – products and systems in support of accurate, reliable and auditable oil and gas measurement

The Totalflow G4 flow computers target the oil and gas industry's custody-transfer and measurement needs. These low-power, high-reliability, microprocessor-based units meet a wide range of measurement, monitoring and alarm applications for remote gas or oil systems. The μ FLO^{G4} is packaged in a lightweight aluminum enclosure that incorporates the electronics boards, integrated multivariable transducer, remote communications options and batteries. All G4 flow computers fully comply with API and AGA standards for custody-transfer electronic measurement devices and for flow rate, volume and energy calculations. In addition, all calculations are performed once per second and historical flow volumes and data logs can be stored for more than 40 days.

Your benefits

- XSeries G4 (extendable) technology
- Integrated, object-oriented, real-time software system
- Dynamic, rugged, low-power electronics
- I/O points, communications channels, protocols and software grow with your needs



Accurate custody-transfer with Totalflow G4 flow computers



High measurement accuracy and real-time gas flow information



Natural gas and liquid measurement

Improving oil and gas production

Scalability across the field asset's lifecycle. Remote measurement and automation requires devices that withstand oppressive heat, driving rain, freezing temperatures, and the challenges and risks that happen throughout the life cycle of your operations. ABB's rugged XSeries (XFC^{G4} and XRC^{G4}) systems will respond in the reliable way they were engineered.

The challenge – as production falls, natural gas wells require the removal of liquids as part of the production process

To address the problem of liquid build up and the resulting bottom hole back pressure, a plunger will be inserted into a well as a mechanical seal between the gas and the liquid. While the well is shut-in, bottom hole pressure increases, and becomes the driving force to move the plunger and the liquid to the surface. It is important to measure the produced liquid, the natural gas and the holding tank levels and also to control the gas sales valve or execute pressure override control.

The solution – to optimize a well's production, the well must be closed just long enough to build the required pressure to move the liquid in the tubing to the surface

Once gas flow is stabilized, the automatic controller releases the plunger and it drops back to bottom, whereupon the cycle repeats. Totalflow XFCs and XRC's support an extensive set of plunger control options that are all designed to remove liquid from the well and increase production. Set up can be accomplished locally with a laptop computer using Totalflow PCCU software or remotely with Totalflow WinCCU software, SCADAverage or 3rd party SCADA system. Initialization requirements are menu-selectable and an easy-to-use graphical user interface is available.

Your benefits

- Spacious cable routing, large enclosures and powerful battery
- Several charging options available
- Seamless and simple upgrades
- Ready for quick installation
- Explosion-proof, cast aluminum models available



Real time automation of chemical injection



Totalflow XSeries RTU in a natural gas multi-well PAD application



Natural gas and liquid measurement

Controlling chemical injection

Chemical injection lowers the critical velocity needed to lift fluids to the surface. Totalflow XSeries devices (XFC^{G4} and XRC^{G4}) cover all phases of enhanced production and offer solutions that scale from individual wells to large pads with up to 20 wells.

The challenge – chemical injection is a key element in the efficient and improved operation of a production well

Exact amounts of chemical, often measured in minimum amounts per day, are required to correctly treat a well. Better control of the chemical injection pump will create significant chemical cost savings each year as well as maintaining high production efficiency and increased revenues.

The solution – Totalflow XSeries devices have an optional chemical injection pump control application

The application allows the pumper to enter the amount of chemical required per day and the injection rate for each pump stroke. The chemical tank reservoir level can be monitored and level alarm and shutdown set points are field adjustable. A pulse from the chemical flowmeter can be accepted as an input. Trending of the chemical injected and the XSeriesG4 measured gas production can also be used as a tool to determine optimum chemical volume amount. Better chemical control will enable improved well performance and increased production while the review of chemical trends and gas production trends enhances production field management. The XSeries will also provide alarming, data logging, level measurement, remote communications, plunger optimization, nomination control, and gas flow measurement.

Your benefits

- Precise injection of chemical
- Cost savings and increased revenues
- Easy installation and simple start-up
- Low power electronics



Totalflow XSeries cover all phases of enhanced production



A high IO count Totalflow XSeries powered by solar charged batteries



Vortex and swirl flow measurement

Precise cost-effective measurement

Achieving best-in-class flow measurement with the shortest upstream and downstream piping requirements is a challenge. With their innovative and robust design, ABB vortex and swirl flowmeters deliver high precision performance and process reliability in flow rate and volume measurement of liquids, gases and steam.

When a flowing fluid meets an obstruction, pressure variations are created in the fluid, causing eddies to shed at the obstruction. ABB make the most of this phenomenon in their vortex and swirl flowmeters. Equipped with digital signal processing (DSP), 2-wire technology and advanced filtering techniques, these class-leading instruments allow improved flow signal detection and provide measurement immunity from the effects of hydraulic noise and pipeline vibration. ABB is the only manufacturer offering high-performance swirl flowmeters to its customers around the world.

Benefits of using ABB's vortex and swirl flowmeters

- Save 75% straight pipe run by employing swirl meter instead of traditional vortex meters, turbines or orifice plates
- Reduce your measurement uncertainty by 50% or more by using swirl meters in gas and steam applications
- Internal temperature compensation saves investment and installation effort

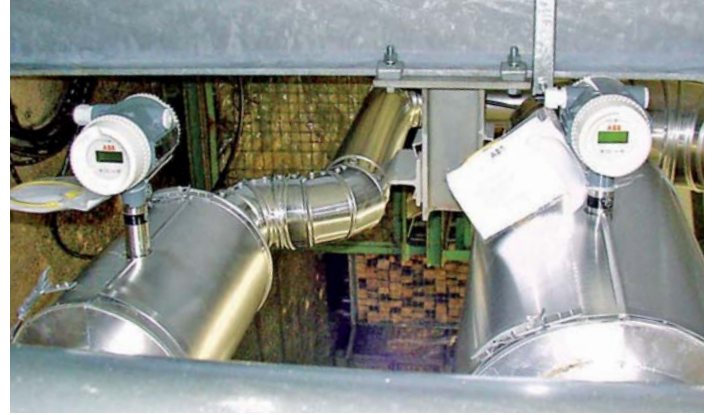


Vortex and swirl flow measurement

Cost-effective measurement of non-conductive fluids



Space saving swirl meters in steam application



Swirl flowmeters in steam lines with split range for high and low consumption

ABB's unique swirl flowmeters present an economical solution for measuring low viscous liquids, gas and steam in volume and mass units employing integrated temperature measurement.



The challenge – improve flow signal detection in dynamic liquid, gas and steam applications

Scarcity of fossil fuels and greenhouse programs continuously drive up energy costs, with billing gaining more importance. The impact of high energy costs combined with large quantities of energy usage means that even small measurement variations create huge monetary differences. The situation is further complicated by fluctuations in consumption rates often requiring high measuring range dynamics of 1:25 or greater.

The solution – extremely dynamic flow measurement with high accuracy

ABB uses robust design techniques for its unique swirl flowmeters FS4000 to provide high performance and reliable measurement of liquid, gas and steam. The swirl flowmeters use a specific frequency measurement principle which provides high accuracy of 0.5% and low flow measurement capability. Additionally, ABB's swirl flowmeters help you save up to 80% installation space, because only shortest upstream and downstream sections are required. By offering large measuring spans, even small flow amounts during low consumption periods can be measured, that other measurement solutions would not have captured. Both high accuracy and low flow measurement capability help you save energy and drive your processes to higher efficiency levels.

Your benefits

- Save 80% installation space
- Simple, compact in-line installation
- Direct steam mass flow with integrated temperature compensation
- Increased plant availability, no moving parts, no wear, no maintenance

Thermal mass flow measurement

Consistent mass measurement of gases



ABB's Sensyflow series of thermal mass flowmeters is the best choice for industrial and test rig applications, where the combination of direct mass flow measurement with high accuracy, short response times, reliability and easy installation is an everyday requirement. Direct gas mass flowmetering solutions succeed in a variety of environments and are essential at key stages across the wastewater process and in the increasingly common measurement of biogas and activation air.

ABB's Sensyflow direct gas mass flowmeters use dynamic direct measurement methods independent of density, temperature, viscosity, pressure and conductivity. Sensyflow provides a mass flow and totalized output and utilizes the hot film anemometer measuring principle for all technical gases and gas mixtures, including biogas and compressed air.

Operating within the widest flow range with little loss of accuracy, even at low flow rates, Sensyflow improves process quality and provides best-in-class installation, commissioning, maintenance costs and response times.

Benefits of using ABB's thermal mass flowmeters

- Sensyflow will save you in excess of 30% set up time and 10% in gas consumption
- Up to four characteristic gas flow curves from one single meter
- Special units for boiler control, biogas measurements, compressed air accounting, pharmaceuticals, pneumatics and food and beverage applications
- High-performance units for combustion engines, automobiles and paint robots

Thermal mass flow measurement

Direct measurement of gas mass flow

Sensyflow thermal mass flowmeters intelligently indicate the mass flow or normalized volume flow as the measuring signal without any additional pressure and temperature compensation, providing valuable measurement advantages.

The challenge – to meet the demands of industrial and test-rig applications where quick, precise gas measurement is process critical

Sensitive gas measurements are required at key stages across the wastewater process. In addition, measurement of biogas and activation air is becoming increasingly more common, but difficult to achieve in low flow and low pressure applications. A further challenge is that many customers prefer their measurement display in mass units.



Sensyflow FMT400-VTS for precise burner control



The solution – measure mass flow directly even in harsh environmental conditions

ABB's Sensyflow flowmeters directly indicate the mass flow or normalized volume flow of gases without any additional pressure or temperature compensation. The flowmeters are highly accurate with short response times and a wide flow range with little or no loss of accuracy, even at the lowest flow rates. Thermal mass flow meters provide a mass flow output without pressure or temperature compensation and use the hot film anemometer measuring principle – capable of measuring all technical gases and gas mixtures directly, including biogas and compressed air. Sensyflow flowmeters meet the increasing demands to save energy, optimize biological processes, control biochemical reactions and comply with local security and safety requirements.

Your benefits

- Highly dynamic, accurate and reliable
- Easy and economical installation
- No moving parts, no obstructions
- Manufacturer calibrated

Sensyflow FMT500-IG at a water treatment plant



Variable area flow measurement

Low cost measurement for gases, liquids and steam

Variable area flowmeters are the low cost solution for almost all applications involving the measurement of industrial process liquids, gases or steam.

ABB's variable area flowmeters are reliable and cost effective and meet most application requirements by featuring a wide range of design varieties, measuring tubes and float types. Proven in many customer applications, they offer a high reproducibility and, because no external power supply is needed, are also trusted as mechanical back-up meters.

Benefits of using ABB's variable area flowmeters

- Measuring and dosing liquids and gases
- Fluid temperature up to 400 °C (536 °F)
- Pressure up to 400 bar (2500 lbs)
- ATEX, IECEx, FM and CSA approvals



VA Master in high pressure methanol injection application



The challenge – finding a cost-effective but reliable measurement solution

From the smallest flow ranges in laboratory analysis to high flow rates in industrial processing, advanced measuring instruments transmit measured values and diagnostic data to control rooms or process control systems. Nevertheless, in order to quickly and reliably determine the flow status directly in the field, sometimes an easy-to-install and highly-robust local flow indicator is needed.

The solution – a wide range of variable area flowmeters that require no special installation conditions

Variable area flowmeters provide a cost effective solution for measuring moderate to very low flow rates. ABB's portfolio includes metal, glass and purge flowmeters suitable for nearly any application and installation requirement. The variable area flowmeters can be used as pure indicators without the need for power supply. Optionally, they can transmit process information via contact output or current 4/20 mA to a process control system. ABB's VA meters feature high reproducibility as standard, supporting you in process monitoring and enabling system integrity.

Your benefits

- No need for upstream/downstream sections
- Dosing and measuring from a single device with integral mount needle valves
- Visual control of the media

VA Master FAM540 and FAM3200 in gas mixing armature



Energy metering

Calculates and logs steam usage for billing and accounting

With SensyCal FCU, ABB combines state-of-the-art communication methods with many years of expertise in the field of calibrated measurement for accounting purposes.

The challenge – establish a multifunctional, precise and compact measuring point for a range of process signal processing applications

When you need to determine the thermal output of boiler systems and branch lines by calculating mass flow and thermal balance, using the available transmissions from all the installed meters on site, or simply for fiscal metering purposes, you require a flow computer with advanced performance, greater power, flexibility and control.

The solution – keep your steam under control with a universal measurement computer designed for industrial process signal monitoring and logging

SensyCal FCU400-S calculates and logs the mass flow and heat energy for steam and saturated steam applications to allow for billing and accounting. The flow and condensate temperature can be measured enabling accounting of open systems. In addition, density and enthalpy can be calculated using internationally approved steam tables.

Your benefits

- Process variables in line with international steam tables
- Flexible communication capabilities
- Integrated data logger function and key date recording
- Simple transmission of measured variables to control systems



Custody transfer in district heating station



Precise energy metering for steam distribution



Control systems

Scalable systems for the entire enterprise

A reliable, cost effective and easy to use process automation system is perhaps the single most important success factor for a manufacturing enterprise.

ABB delivers the right level of control and safety solutions for all kinds of process and power automation needs with the best lifecycle support to protect client investment and maximize the return on asset investments already made.

Our offering consists of

- System 800xA – the automation flagship for control and monitoring, instrumentation, electrical integration, safety and maintenance for process industries
- Freelance – the easy-to-use distributed control system for process applications
- Compact 800 – process control components for stand alone automation solutions
- Safety Systems – complete TÜV certified safety system that complies with IEC 61508 and IEC 61511 standards

These automation solutions are available all over the world via ABB's offices and selected authorized value providers.

As the world's largest supplier of process control systems, ABB's automation systems give you the best platform to optimize your plant and safely operate your industrial processes.

ABB's automation solutions integrate the intelligence embedded in today's field devices into the control system, thus making it available for plant and business processes. The result streamlines work to achieve lower deployment costs, better process and product quality, and improved availability. These industrial automation solutions provide you with the technology needed to achieve a sustainable competitive advantage in today's challenging business environment. They lay the foundations for continuous improvement in life cycle and operations, providing a new dimension in information flow and resulting in time savings, better engineering and a real increase in productivity.



Services for flow measurement products

Performance optimization solutions



Dedicated to optimizing your plant productivity and performance, ABB's services enable improved utilization and performance of your automation equipment, processes, and personnel. ABB provides support from the planning phase right through to commissioning and servicing.

ABB's service specialists are strategically located to support all products and systems globally. ABB's broad scope of services lays the foundation for end-to-end support for your enterprise.

ABB's performance optimization services:

- Consulting
- Installation and commissioning
- Maintenance and field services
- Asset management systems
- Fieldbus and wireless solutions
- Project execution
- Migration and upgrades
- Repairs and calibration
- Spare parts and consumables
- Support, remote service, and training
- Maintenance support agreements
- In the field meter verification
- Meter recalibration

ABB service – value added services for bottom-line results.

Contact us

To find your local ABB contact visit:

www.abb.com/contacts

For more product information visit:

www.abb.com/flow

Note:

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