

BUILDING SUSTAINABILITY MANAGEMENT

**Solutions for Building Management
and Optimization**



Badger Meter

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Message from the President

Sustainability has been vital to Badger Meter since our founders invented the frost-proof water meter in 1905. That invention helped people measure their water use, even during the harsh months of winter in Wisconsin. Today, our unique offering of smart metering and flow instrumentation, water quality and toxic gas detection solutions help municipal utilities and building management throughout the world measure virtually anything that moves through a pipe or is in the air we breathe. In the process, we deliver long-term value to our customers, employees and investors by providing solutions that help manage and conserve the world's most precious, natural resources.

As a corporation, Badger Meter pursues continuous improvement initiatives in three major sustainability categories:

- **OUR PRODUCTS** help save water and other natural resources through our highly accurate metering, water quality, analytics and toxic gas detection solutions.
- **OUR OPERATIONS** include socially responsible supply chain practices and responsible use of resources in the management of our facilities.
- **OUR PEOPLE** are a major source of strength and together we strive to cultivate and maintain a healthy, productive and engaged workforce, while contributing to the communities and industries in which we are a part of.

We are proud of our success and the progress we continue to make. Our sustainability team and the company as a whole remain dedicated to helping our customers efficiently use resources, to practice what we preach in our operations and, through our dedicated and engaged workforce, we continue to make our company and the world a more vibrant place.

All the best,

Ken Bockhorst

Chairman, CEO and President - Badger Meter



Actionable Intelligence for Buildings

You and your customers expect peak performance every day, all year-round, and optimizing system performance allows the building to respond to changing occupant and environmental demands and to manage costs. Badger Meter products provide the actionable intelligence for property managers to control, manage and optimize their facilities.

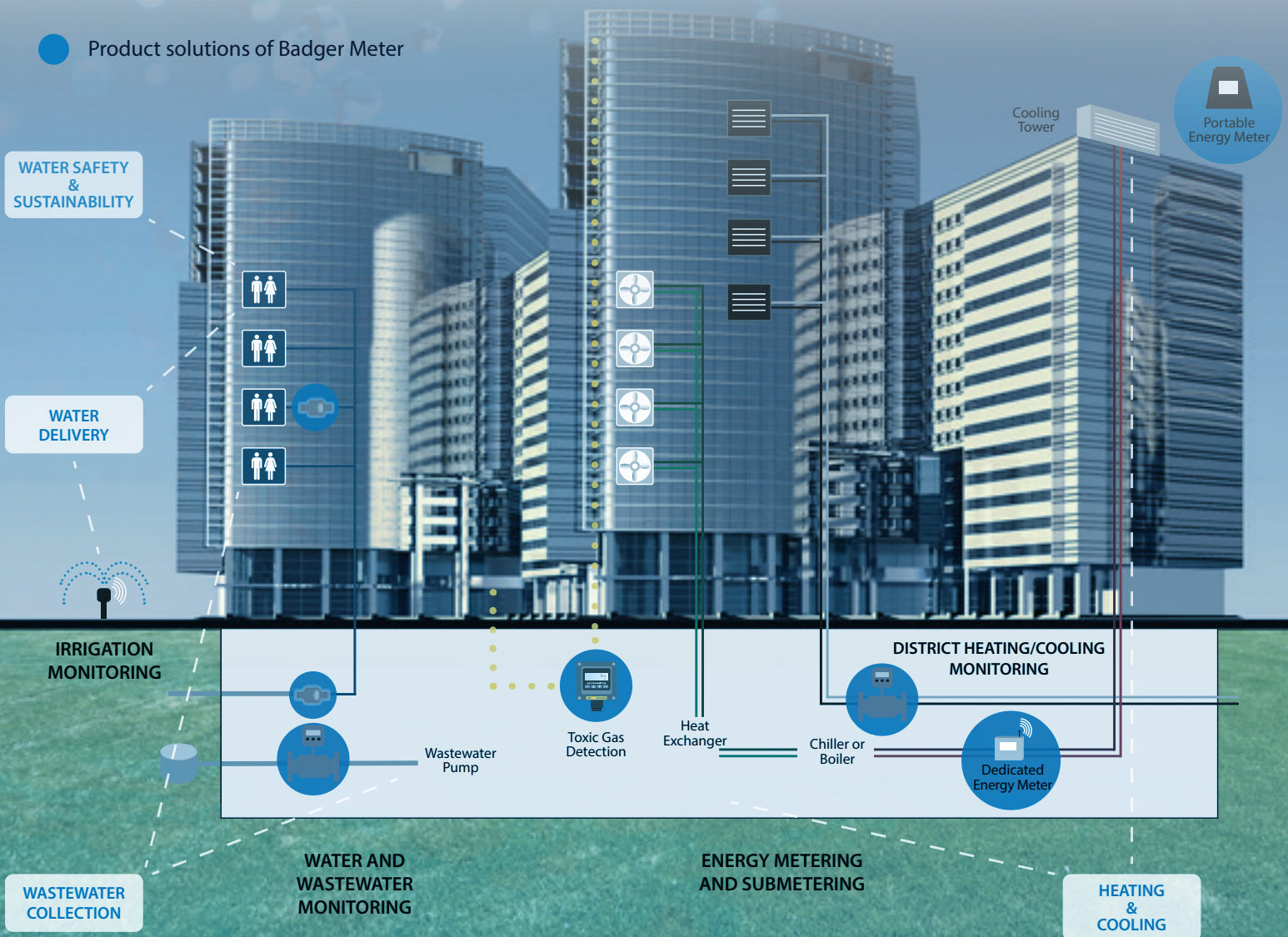
Adjusting building automation and water delivery systems to accommodate changes in usage, occupancy and facility age allows facilities to ensure occupant comfort while balancing costs, quality and extending the useful life of older systems.

With a broad portfolio of technologies, Badger Meter provides solutions for every phase in a building's lifecycle, from new construction to retrofit. A variety of installation styles and options means that Badger Meter delivers solutions specific to your building's needs.

Badger Meter has the measurement solutions you need for:

- Water delivery
- Heating and cooling systems
- Wastewater collection
- Water safety and sustainability
- Toxic gas detection

Product solutions of Badger Meter



Technology that measures your building resources

ModMAG® M2000



Electromagnetic flow meter

Features:

- Dual Hastelloy C electrodes come standard
- Bi-directional flow measurement sensing and totalization
- Digital and analog outputs
- Empty pipe detection
- Cost-effective
- BACnet MS/TP and BACnet IP

ModMAG® M5000



Electromagnetic flow meter

Features:

- Battery-powered meter
- Internal datalogger
- Strong battery life
- Excellent repeatability
- Cost-effective

Dynasonics® TFX-5000



Transit time ultrasonic Clamp-on flow and energy meter

Features:

- Installs without shutting and draining system
- Large, bi-directional flow measuring range
- Data log up to 8 readings
- Water-glycol and energy

Dynasonics® TFX-500w



Transit time ultrasonic Clamp-on water meter

Features:

- Low installation costs
- Non-invasive clamp-on flow meter
- Measures flow rate, total and velocity of water flow
- Set up through keypad interface and SoloCUE® software

E-Series® G2



Ultrasonic water meter

Features:

- No moving parts
- Internal battery
- Reverse flow indication
- Simplified one-piece electronic meter
- Sealed for protection against tampering

Impeller 220 Series



Flow sensor

Features:

- Six-bladed impeller design with a proprietary, non-magnetic sensing mechanism
- Sensor electronics easily removed from tee
- Digital signal easily interfaced with transmitters, monitors or PLCs

Technology that measures your building resources

Impeller SDI



Insertion flow sensor

Features:

- Low installation costs
- Single direction powered insert with raw, scaled pulse and analog output
- Bi-directional powered insert with analog and scaled pulse output
- Battery powered insert with a local and remote display and scaled pulse output

212 Heat Calculator



Compatible with Impeller SDI and ModMAG®

Features:

- 4-20 mA output option
- Communication via M-Bus and Modbus RTU RS485
- Control panel mounted or wall mounted

FC-5000 Btu Monitor



Compatible with Impeller SDI and ModMAG®

Features:

- Scaled pulse output
- Communication via EIA-485 Modbus
- Control panel mounted or wall mounted

About Install Style

Style	Pros +	Cons -
Inline	• The best accuracies and repeatabilities • Wider flow turndown ranges with more low-flow measurement capabilities	• Most labor intensive to install • Requires process shutdown and pipe draining to install (smaller diameter pipes may freeze)
Insertion	• Covers multiple pipe sizes • Less costly to install than an inline meter • Some models can be inserted into an active pipe (e.g. hot tap)	• Lower accuracy than inline • Flow profile dependent
Clamp-on	• Covers multiple pipe sizes • No plumbing skills required • Non-invasive flow meter • Low installation costs	• Lower accuracy than inline

COMPANY

Solutions for Building Management

Turn your Data into Proactive Intelligence

The AquaCUE® Flow Measurement Manager cloud-based software suite offers a wide choice of consumer engagement solutions to meet your meter reading and reporting needs. Increasingly, facility and sustainability managers are looking for ways to understand and monitor their water operations, improve inefficiencies and address equipment problems and wasteful behavior. Sub-metering throughout a facility, property, or campus empowers personnel to make more knowledgeable decisions for more efficient use of valuable, fluid resources.

Benefits

Increased Visibility Through Analytics

- Provides proactive intelligence for optimal water management – faster leak detection, revenue management, water conservation, clarity and easier data collection for compliance reporting.

Enhanced Customer Service

- Advanced user profile and anomaly trending, combined with a cloud-based website and smartphone/tablet apps, allows you to gain a greater understanding of consumption patterns to quickly resolve or prevent related issues.

Focus on Water Management

- Built to minimize your deployment and system maintenance, we provide the hosted software platform, system maintenance and software support.

Future-Proof Technology

- Receive the cloud-based AquaCUE® software suite with regular updates.



AquaCUE®

- Customizable dashboards
- Ability to set unique alert conditions to define and monitor exceptions
- User-friendly website interface enables access to users at all metering locations
- Secure, cloud-based – ISO 27001 certified and SOC 2 examined for security, availability and confidentiality



ORION® cellular endpoint on E-Series® G2

- Utilizes existing cellular infrastructure
- Delivers securely meter data reading to the utility

HEATING AND COOLING SYSTEMS

Heating and cooling systems exist to deliver thermal comfort and acceptable indoor air quality within reasonable installation, operation and maintenance costs. In facilities that contain computer data centers, HVAC systems deliver the cooling required to maintain critical 24-7 operations.

HVAC systems can be designed for individual buildings, or as a larger district network that delivers heating and/or cooling to multiple buildings. District heating and cooling networks provide an economy of scale that is often not as viable for individual buildings.

All heating and cooling systems are comprised of:

- Heat generation or elimination, e.g. a boiler, heat pump or chiller
- Distribution of the heat or chilling via water, steam (heat only), or air
- Consumption of the heating or cooling by a tenant, zone, or department

Measurement of key system parameters is critical to optimize operation and for continuity of service. When buildings convert from constant heating/cooling, to as-needed operation to reduce energy costs and provide a more consistent level of comfort, measurement is an essential part of system feedback loops.

An aerial night view of a city, likely Dubai, showing a river, a bridge, and a tall skyscraper (Burj Khalifa) on the right. The city lights are visible, and the sky is dark.

E

Energy Measurement

W

Water Measurement

S

Steam Measurement

HEATING AND COOLING SYSTEMS

Heating and Cooling

Some water cooled heat pumps and chillers use open loop circuits using evaporative cooling towers that can be prone to mineral build up, therefore it is necessary to add and strategically eliminate water during the system operation. Excessive amounts of added water, known as makeup water, is often indicative of leaks or stuck valves. Monitoring the makeup water flow, can help prevent water damage and water waste.

WITH EVERY ENERGY SYSTEM, WE MEASURE:

1. Energy at each boiler, chiller or cooling tower to determine system efficiency.
2. Energy at each tenant, zone or apartment to determine cost allocation and distribution network load balancing.
3. Makeup water.
4. Wastewater from system blowdown.

Flow and Energy Meter Overview

E W



Dynasonics® TFX-5000



Impeller SDI



ModMAG® M1000



ModMAG® M2000



DXN Portable Ultrasonic Measurement System

Solutions	Line Sizes	Application				Install Style			Communication					Certification				See Page
		Heating	Cooling	Glycol water	Potable water	Inline	Insertion	Clamp-on	BACnet MS/TP	BACnet/IP	Modbus RTU	M-Bus	AquaCUE®	EN1434 Class 2	CE	NSF 61 / 372	US/Canada Safety	
Dynasonics® TFX-5000	1/2"...48" (DN15...DN1200)	✓	✓	✓	✓			✓	✓	✓	✓		✓		✓	NA	✓	24
Impeller SDI + FC5000	1 1/2"...36" (DN40...DN900)	✓	✓	✓	✓		✓		✓		✓	✓			✓			29/33
Impeller SDI + 212	1 1/2"...36" (DN40...DN900)	✓	✓	✓	✓		✓					✓			✓			29/33
ModMAG® M1000 + FC5000	1"...10" (DN25...DN250)		✓	✓	✓	✓			✓		✓	✓	✓		✓	✓	✓	28/29
ModMAG® M1000 + 212	1"...10" (DN25...DN250)		✓	✓	✓	✓						✓	✓		✓	✓		28/29
ModMAG® M2000 + FC5000	1"...10" (DN25...DN250)		✓	✓	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	28/29
ModMAG® M2000 + 212	1"...10" (DN25...DN250)		✓	✓	✓	✓			✓	✓		✓	✓		✓	✓		28/29
DXN Portable Ultrasonic	1/2"...120" (DN12...DN3050)	✓	✓		✓			✓							✓		✓	27

HEATING AND COOLING SYSTEMS

Heating and Cooling

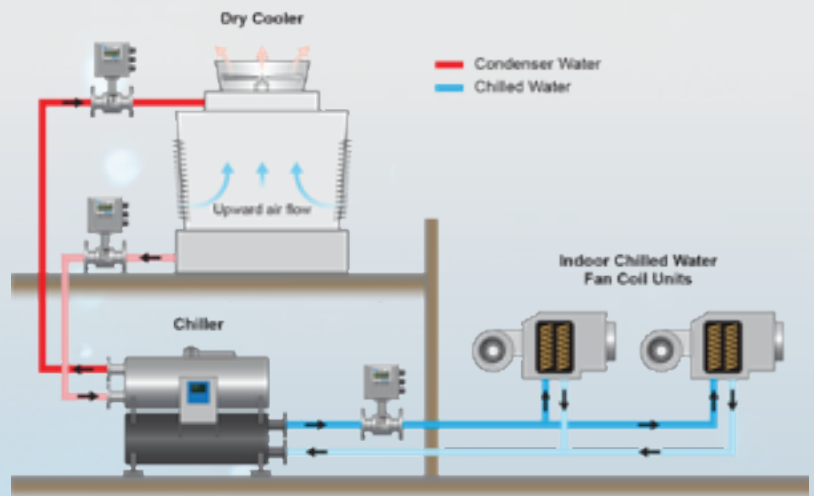
Measurement Location

E W

Water based Heating & Cooling Systems

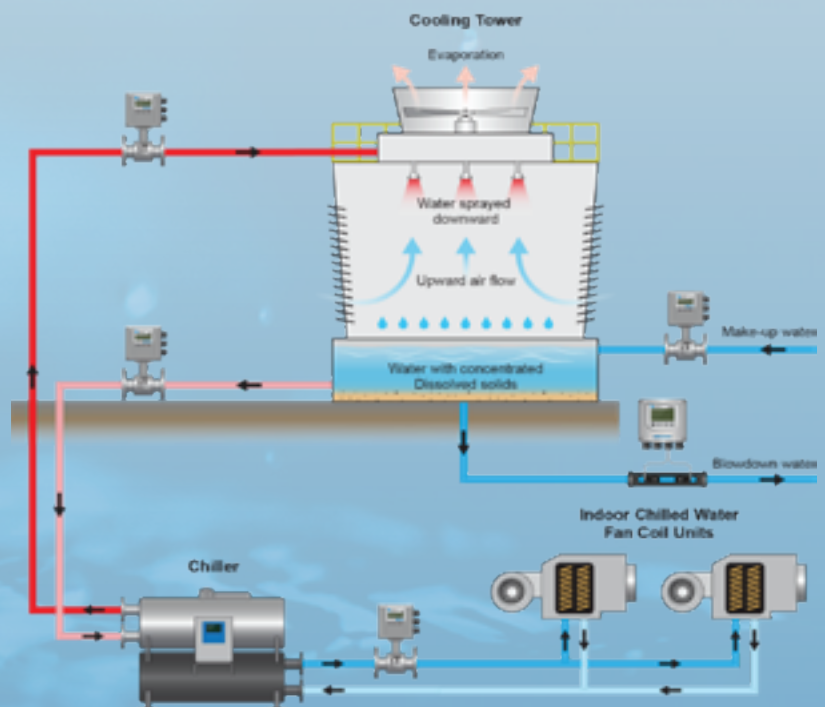
Heating and cooling systems can comprise of either air source or water source heat pumps and chillers, along with gas or biomass fuelled boilers, to accordingly increase or decrease the temperature of the water within pressurized heating and cooling circuits.

During operation, the primary loop circulation pumps that feed water through the heat pump, chiller or boiler heat exchangers, along with the secondary loop circulation pumps feeding water through the building's fan coil units or radiators, require accurate water flow monitoring. This is to ensure the systems are operating at the correct design flow rates, which is imperative to ensure designed system energy efficiencies are achieved and maintained. Flow instrumentation is also required if the heat pump or chiller rejects and/or absorbs energy via a closed loop water source.



Cooling Towers

Ideally, the amount of makeup water added to a cooling tower loop should equal the amount of water lost through evaporation and blowdown water. The amount of water lost through evaporation will vary based on the type and efficiency of the cooling tower and the amount of cooling. Using too much makeup water often signals a system leak or stuck valve.



HEATING AND COOLING SYSTEMS

Steam Heating

Steam-based systems are used to efficiently and cost-effectively heat facilities in cooler climates. Steam-based systems, similar to their hydronic counterparts, are used in both district heating networks and within individual systems.

IN STEAM HEAT SYSTEMS, WE MEASURE:

- 1. Energy at each boiler or chiller to determine system efficiency.
- 2. Energy at each tenant, zone or apartment to determine cost allocation and distribution network load balancing.
- 3. Makeup water.
- 4. Wastewater from system blowdown.
- 5. Water condensate return. Condensate is a byproduct of steam as it cools and offsets makeup water.

Flow Meter Overview

S



Vortex VN2000 - Insertion



Vortex VN2000 - Hot Tap

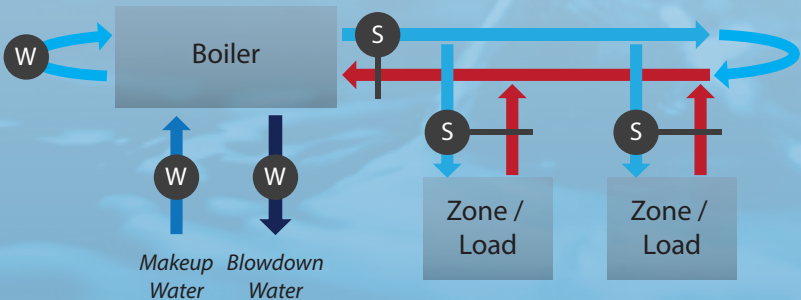
Product	Line Sizes	Install Style			Communication					Certification		
		Inline	Insertion	Clamp-on	BACnet MS/TP	BACnet/IP	Modbus RTU	Mbus	AquaCUE®	CE	US/Canada Safety	See Page
Vortex VN2000	2"...36" (DN50...DN900)		✓		✓		✓					34

Measurement Location

S W

Steam Load Management

Measures energy efficiency by measuring steam delivery through a pipe to a heating zone. Low flow capability is important to understand system operation across all settings of heat generation.



WATER MEASUREMENT AND OPTIMIZATION

As water scarcity increases globally, regional governments respond by establishing water usage restrictions, or mandating water use reductions. The first step in managing or reducing water usage is to understand your water usage baseline. You cannot manage what you do not measure. Badger Meter provides a complete portfolio of solutions for measuring water usage from small to large pipes, with solutions for common applications including:

- Potable water
- Reclaimed water
- Landscape / irrigation water
- Wastewater

To understand water consumption within a facility that consumes water in multiple locations, Badger Meter recommends adding flow meters at key locations to provide zone-specific water usage reductions. Common areas that measure water within a facility includes:

- Residents or tenants
- Food services
- Landscape / irrigation
- Pool / spa
- Cooling towers
- Departments, such as in manufacturing or medical facilities
- Other facility zones

**E****Energy Measurement****W****Water Measurement****S****Steam Measurement**

WATER MEASUREMENT AND OPTIMIZATION

Effective Water Measurement for Smarter Buildings

Due to water scarcity, everyone is exploring and implementing methods to reduce total water consumption and waste. While builders designed and oversized the plumbing in older buildings to accommodate future occupancy, even new buildings with more optimized plumbing are finding that bathrooms, appliances, and people are continuing to reduce water usage on an ongoing basis.

IMPORTANT POTABLE WATER FLOW METER SECTION TIPS:

1. Always select a flow meter size designed to measure the anticipated flow rates based on expected water usage.
2. Strategically position flow meters in all key locations, such as by bathrooms and kitchens, to quickly pinpoint abnormal water usage patterns that could indicate a possible leak.
3. Always be mindful of site installation constraints when selecting a meter, because while all meters should be plumbed to operate under full pipe conditions, some meters require straight runs of pipe before and after the meter.

Share the data where needed

Not all currently deployed building management systems provide data views that allow an entire organization to view and manage water usage, however Badger Meter flow meters offer multiple output options to enable sharing of water measurement data.

1. Outputs for AquaCUE® and other water consumption dashboards
2. Modbus and BACnet connections for Building Energy Management Systems (BEMS)
3. Pulse and analog outputs
4. AquaCUE® provides an additional REST API interface for sharing water consumption data



WATER MEASUREMENT AND OPTIMIZATION

Effective Water Measurement for Smarter Buildings

Flow Meter Overview

W



Dynasonics®
TFX-5000



ModMAG® M5000



ModMAG® M2000



ModMAG® M1000



Impeller SDI



E-Series® G2

Product	Line Sizes	Application			Install Style			Communication					Certification			See Page
		Makeup Water	Blowdown Water	Condensate Return	Inline	Insertion	Clamp-on	BACnet MS/TP	BACnet/IP	Modbus RTU	M-Bus	AquaCUE®	CE	NSF 61 / 372	US/Canada Safety	
Dynasonics® TFX-5000	1/2"...48" (DN15...DN1000)	✓	✓	✓			✓	✓	✓	✓		✓	✓	NA	✓	24
ModMAG® M5000	1/2"...24" (DN15...DN600)	✓	✓	✓	✓					✓	✓	✓	✓	✓		30
ModMAG® M2000	1/4"...54" (DN6...DN1350)	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	28
ModMAG® M1000	1/4"...20" (DN6...DN500)	✓	✓	✓	✓					✓	✓	✓	✓	✓		28
Impeller SDI	1 1/2"...36" (DN40...DN900)	✓	✓	✓	✓	✓										33
E-Series® G2	1/2"...3/4" (DN15...DN20)	✓			✓						✓	✓	✓			26

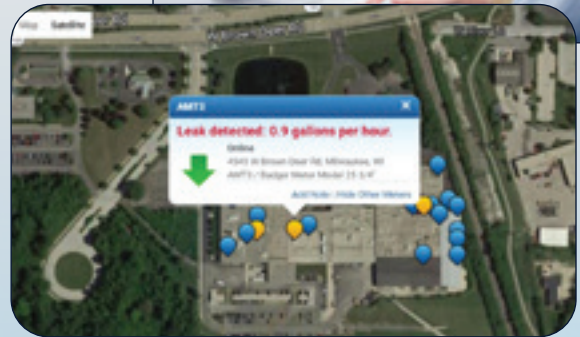
WATER MEASUREMENT AND OPTIMIZATION

Optimization

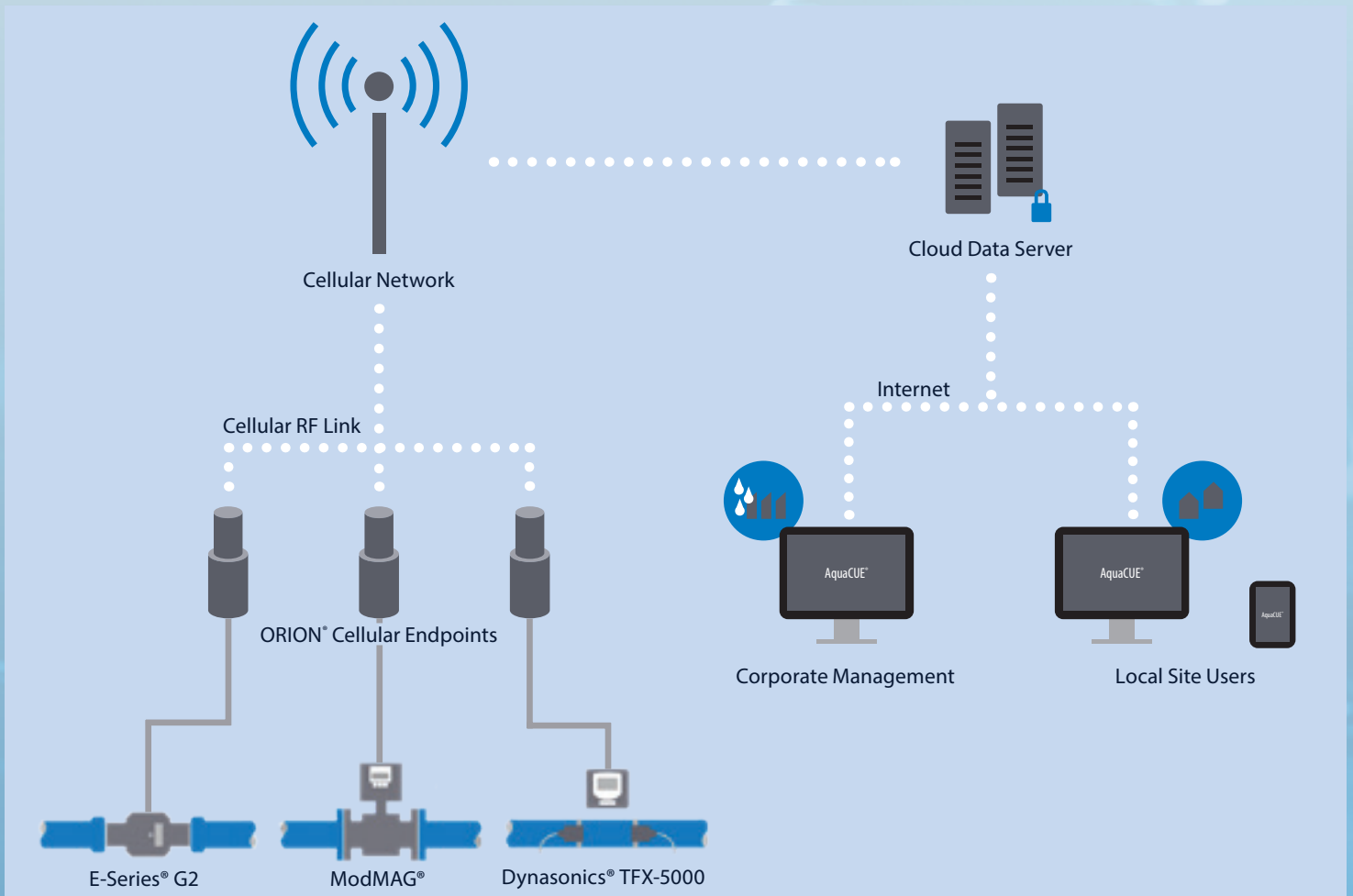
AquaCUE® turns your data into proactive intelligence

The AquaCUE® Flow Measurement Manager brings a new level of optimizing information to light. Its intuitive software suite with targeted advanced metering analytics, combined with proven cellular communication technologies, enables greater visibility and control over water resources. The system puts interval meter data to work to address demands for actionable intelligence and improved operations.

Cellular endpoints minimize the need for complicated infrastructure and are pre-programmed to automatically broadcast hourly meter reading and event data to the system software. This information helps identify potential leaks and other anomalies in water use. The customizable dashboard delivers information set per individual requirements.



Data transfer and data collection



WATER MEASUREMENT AND OPTIMIZATION

Optimization

Define and design

- Sub-metering improves water-use visibility. Identify, define and install flow meters anywhere water flows through a pipe. Set parameters and design the optimal flow management system to meet your water efficiency goals.

Monitor and learn

- The intuitive AquaCUE® dashboard features in-depth analytics and graphs that incorporate historical data, such as temperature and rainfall overlays, to provide an easy to understand picture of how water is currently being used throughout your facilities.

Take action and make a difference

- With smart flow measurement comes smart flow management. AquaCUE® empowers users at all levels of an organization to identify and quickly address flow inefficiencies, equipment problems or wasteful behaviors. Smarter water consumption helps conserve water and save money.

FEATURES YOU NEED

- Customize dashboards to deliver information in a format matched to your response
- Ability to set unique alert conditions to define and monitor exceptions
- User friendly website interface enables access to users at all metering locations
- Secure, cloud-based - ISO 27001 certified and SOC 2 examined for security, availability and confidentiality
- Automatic software updates
- Integration with your operations and process systems via API

Water Measurement

W

Product	Line Sizes	Application			Install Style			Communication						Water Safety	See Page
		Water	Wastewater	Landscape irrigation	Inline	Insertion	Clamp-on	BA Cnet MS/TP	BA Cnet/IP	Modbus RTU	M-Bus	AquaCUE®	Pulse and/or Analog	NSF 61 / 372	
Dynasonics® TFX-500w	1/2"...10" (DN65...DN250)	✓		✓			✓	✓		✓		✓	✓	NA	25
Dynasonics® TFX-5000	1/2"...48" (DN15...DN1000)	✓	✓				✓	✓	✓	✓		✓	✓	NA	24
ModMAG® M5000	1/2"...24" (DN15...DN600)	✓	✓		✓					✓	✓	✓	✓	✓	30
ModMAG® M2000	1/4"...54" (DN6...DN1350)	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓	28
E-Series® G2	1/2"...3/4" (DN15...DN20)	✓			✓						✓	✓	✓		26

WATER MEASUREMENT AND OPTIMIZATION

Irrigation

Flow Meter Overview



RS-900w



Impeller SDI



Impeller 220 Series

		Application		Install Style			Communication						Water Safety	
Product	Line Sizes	Water	Landscape irrigation	Inline	Insertion	Clamp-on	BACnet MS/TP	BACnet/IP	Modbus RTU	M-Bus	AquaCUE®	Pulse and/or Analog	NSF 61 / 372	See Page
Impeller SDI	1 1/2"...36" (DN40...DN900)	✓			✓							✓		33
Impeller 220 Series	3"...40" (DN80...DN1000)	✓	✓	✓	✓							✓		32
RS-900w	1"...2" (DN25...DN50)	✓	✓	✓								✓	✓	31

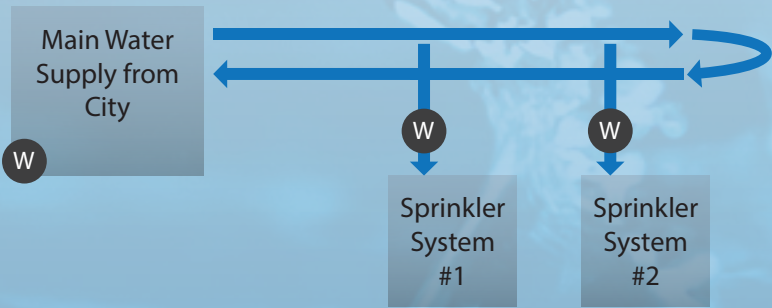
Measurement Location



Irrigation Water Management

A dedicated irrigation meter exclusively meters water used for outdoor watering and irrigation. A separate irrigation meter provides accurate measurement of outdoor water use and better ability to manage peak demands driven by irrigation demands.

Some water utilities and municipalities allow customers to deduct irrigation water usage from their wastewater billing. Irrigation systems are a common source of many leaks, the water lines are susceptible to freezing in some climates and raised sprinkler heads can be damaged during lawn mowing.



WATER MEASUREMENT AND OPTIMIZATION

Wastewater

Flow Meter Overview

W



Dynasonics® TFX-5000



ModMAG® M1000



ModMAG® M2000



DXN Portable Ultrasonic Measurement System

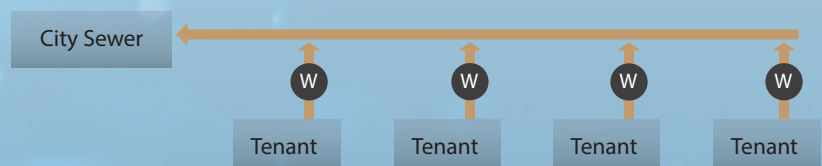
		Application			Install Style			Communication						Water Safety	
Product	Line Sizes	Water	Wastewater	Landscape irrigation	Inline	Insertion	Clamp-on	BACnet MS/TP	BACnet/IP	Modbus RTU	M-Bus	AquaCUE®	Pulse and/or Analog	NSF 61 / 372	See Page
Dynasonics® TFX-5000	1/2" ... 48" (DN15 ... DN1200)	✓	✓				✓	✓	✓	✓		✓	✓	NA	24
ModMAG® M1000	1/4" ... 8" (DN6 ... DN200)	✓	✓		✓					✓	✓	✓	✓	✓	28
ModMAG® M2000	1/4" ... 54" (DN6 ... DN1350)	✓	✓		✓			✓	✓	✓	✓	✓	✓	✓	28
DXN Portable Ultrasonic	1/2" ... 120" (DN12 ... DN3050)	✓	✓				✓								27

Measurement Location

W

Wastewater Management

Humans consume vast quantities of water and create an increasing amount of wastewater. We help customers measure their water usage. Measurements help customers determine where they can reduce costs, identify losses and comply with water use restrictions.



WATER QUALITY MONITORING

Badger Meter is an added-value solutions partner that strives to help our customers and channel partners control, manage and optimize water resources, from when it enters the building, to when it leaves. As global leaders in smart water quality monitoring, disinfection control and digital management tools, Badger Meter delivers pioneering, innovative, smart sensor technology that measures water quality and reduces the risks of corrosion, leaks, bursts and repairs within water systems.



WATER QUALITY MONITORING

nano::station

The modular nano::station combines leading water quality instruments into a versatile system for real-time water quality monitoring. Integrating the i::scan multi-parameter spectrophotometer probe, this solution helps facilities managers to create conditions that prevent the growth of waterborne bacteria. By monitoring water quality online, favorable conditions for Legionella growth can be detected in real-time, allowing for immediate action to be taken to prevent harmful effects.

Strategically placed nano::stations measure water quality at crucial points by monitoring biocides, organics and parameters at the inlet point. Combined with the con::cube event detection and control terminal, this helps to detect unusual events that affect water quality. The nano::station also takes into consideration flow-dependent biocide injections at the inlet and critical points, utilizing one main control terminal with multiple measuring points.



Water quality monitoring and optimization in water systems

- Online, real-time monitoring and event detection
- Measures NTU, TOC, DOC, Conductivity, pH, Free Chlorine
- Multiple measuring points, one control terminal with advanced alarm algorithms

MetriNet

MetriNet water quality monitoring solution provides class-leading, smart sensor technology for the continuous policing of water systems, providing 24/7 data to demonstrate validity and system efficacy.

This bespoke, low-powered system for closed & open loop applications can be configured to suit individual building requirements, enabling key parameters to be measured at any location to safeguard water and reduce the risk of corrosion within pipes. By installing MetriNet smart sensors at water supply pinch-points, including HVAC systems, toilets, showers and cooling towers, early warnings alert to any changes in Dissolved Oxygen, pH, Conductivity and Pressure conditions, allowing for timely action. With a small footprint for easy installation anywhere within a building, biocidal sensors can also be added to reduce the risk of Legionella.



Water quality management in HVAC systems

- Continuous measurement, alarming & sensing for hot & cold water systems
- Dissolved Oxygen, pH, Conductivity, Turbidity, Pressure & Temperature
- Flexibility in data backhaul via BMS or Cellular to AquaCUE®
- Low-powered smart sensor technology

GAS DETECTION SOLUTIONS

Badger Meter offers class-leading toxic and hazardous gas detection instrumentation for over 60 gases and vapors, providing the latest smart, digital technology for fixed, portable and bespoke solutions. Our expertise in sensor design and manufacture allows us to deliver the highest level of protection for people and processes, helping facilities managers to ensure a safe, healthy environment. Our gas detectors, featuring the exclusive AutoTest verification system, automatically test themselves daily with self-generated gas to safeguard system integrity and the quality of the environment in which we live and work.

F12

F12 Toxic Gas Detectors employ smart sensors & feature the exclusive AutoTest verification system. Automatically testing itself daily with self-generated gas, the F12 safeguards the quality of the environment in which we live and work & provides system integrity

Features

- Test & calibration history stored in sensor memory
- LCD graphic display
- Internal data logger stores gas values at user-defined intervals from 1 to 60 minutes
- CE & RoHS Compliant



- Measures over 60 different gases & vapors
- AutoTest sensor verification
- Available as an intrinsically safe 2-wire transmitter or an AC/DC powered unit with multiple alarms
- Interchangeable, pre-calibrated smart sensors
- Internal data logger

H10

The interchangeable H10 smart gas sensors utilize advanced smart sensor technology, capable of measuring over 60 different gases and vapors. This allows facilities managers to measure anything from ozone to chlorine gas in less than one minute, simply by plugging the sensor directly into any of our smart detectors for immediate use.

When installed in our gas detectors, calibration data is loaded into the microprocessor so that no adjustments are needed.



- Advanced smart sensor technology
- Measures over 60 different gases & vapors
- Sensor, amplifier & memory module in one compact package
- Interchangeable & pre-calibrated

FLOW METERING SOLUTIONS

Ultrasonic flow meters, electromagnetic flow meters, impeller meters and vortex meters - all of these products provide both HVAC and water solutions.

E Energy Measurement

W Water Measurement

S Steam Measurement

FLOW METERING SOLUTIONS

Dynasonics® TFX-5000

Transit Time Ultrasonic Clamp-on Flow and Energy Meter

E W

The TFX-5000 transit time ultrasonic flow meter measures volumetric flow and heating/cooling energy rates in clean liquids, as well as those with small amounts of suspended solids or aeration, such as surface water or raw sewage.

By clamping on to the pipe, the meter installs without having to shut down the system or drain the pipes and are never in contact with the internal liquid.

Features

- Large, bi-directional flow measuring range
- Data log up to 8 records
- Non-invasive clamp-on
- Large, easy-to-read graphical display
- Rugged, aluminum enclosure for a long service life in harsh environments



- High flow ranges
- Large pipe sizes
- Cost-effective
- Horizontal/vertical installation

Technical data

Types	Flow meter Heating & cooling energy flow meter	
Sizes	1/2"...48" (DN15...DN1200)	
Flow rate	0.7...33000 gpm (0.19...7500 m³/h)	
Accuracy	Medium pipes	± 0.5% ± 0.0025 ft/s (0.008 m/s)
	Small pipes	1" (25 mm) and larger = ±1% ± 0.03 ft/s (0.009 m/s) 3/4" (20 mm) and smaller = ±1% of full scale
Display (flow rate/total)	8-digit	
Installation position	All installation positions (vertical, horizontal)	
Medium temperature measurement range	-40...350 °F (-40...176 °C)	
Power supply	• External 24 VAC / 9 - 28 VDC • Mains supply 85 - 264 VAC	
Connectivity	BACnet MS/TP, BACnet/IP, Modbus RTU, Modbus TCP, EtherNet/IP and AquaCUE® connectivity, pulse/analog	

FLOW METERING SOLUTIONS

Dynasonics® TFX-500w

Ultrasonic Clamp-on Flow Meter

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The TFX-500w ultrasonic clamp-on flow meter is quickly and easily installed without cutting or tapping the pipe. Ultrasonic waves transmit upstream and downstream through the pipe wall and water flowing in the pipes. By measuring the difference in the travel time and knowing the pipe size, the meter determines the velocity and flow rate. TFX-500w flow meters are a cost effective meter for measuring water flow in a variety of applications.

Features

- Low installation costs
- Non-invasive clamp-on flow meter
- Bidirectional, full pipe flow measurement
- Measures flow rate, total and velocity of water flow.
- Large easy to read display
- Set up through keypad interface and SoloCUE® software



- Low flow ranges
- Small pipe sizes
- Cost-effective
- Horizontal/vertical installation

Technical data

Sizes	1/2"...10" (DN65...DN250)
Flow rate	0.1...9800 gpm (0.02...2673 m³/h)
Accuracy	±1 %
Display (Flow rate/total)	8-digit
Installation position	All installation positions (vertical, horizontal)
Power supply	9...28V DC@5 W maximum
Temperature measurement range	-40...250 °F (-40...121 °C)
Connectivity	BACnet MS/TP, Modbus RTU and AquaCUE® connectivity, pulse/analog

FLOW METERING SOLUTIONS

E-Series® G2

Ultrasonic water meter

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The E-Series® G2 water meter features ultrasonic technology and electronic static metering construction. With no moving parts, the E-Series® water meter improves reliability by virtually eliminating the mechanical wear that can shorten lifetime and produce erroneous results long term. Electronic metering eliminates measurement errors due to sand, suspended particles and pressure fluctuations. An integrated temperature compensation improves the accuracy over varying conditions.

The meter is contained in a compact, totally encapsulated, weatherproof and UV-resistant housing. An internal battery powers the meter to provide dependable service in building and property management applications.



- No moving parts
- Reverse flow indication
- Simplified one-piece electronic meter
- Sealed for protection against tampering

Features

- OIML MID R49, Module B and D for cold potable water
- Minimum extended low-flow rate lower than typical mechanical meters
- Sealed IP68, non-removable, tamper-protected meter
- Measures flow rate and total consumption
- Internal data logging and extraction of meter readings and alarms
- Drinking Water approvals for NSF, WRAS, KTW, CE UK, Belgaqua, Hygiene (Pseudomonas)
- AquaCUE® connectivity

Technical data

Sizes	1/2"...3/4" (DN15...DN20)
Flow rate	0.06...97 gpm (0.014...22 m³/h)
Accuracy	+/- 2% from Q2 to Q4 +/- 5% from Q1 to Q2
Display (Flow rate/total)	9-digit
Installation position	All installation positions (vertical, horizontal)
Power supply	15 year battery life
Temperature measurement range	-34...140 °F (1...60 °C)
Connectivity	M-Bus, AquaCUE® and pulse

FLOW METERING SOLUTIONS

DXN Portable Ultrasonic Measurement System

Portable Hybrid Ultrasonic Flow Meter

E W

The DXN Portable Ultrasonic Flow and Energy Meter is a true hybrid instrument, capable of measuring liquid flow with multiple technologies, including: Doppler, transit time and liquid thermal (heat energy) flow. Easy to install by clamping onto the outside of the pipe, the DXN measures flow using non-invasive ultrasonic sensors. Compatible with a pipe wall thickness gauge, inside pipe diameter can be verified to ensure accurate ultrasonic measurements when piping details are unknown or unavailable.

The DXN captures and displays multiple user-defined and application parameters at once and can record the data with an easy-to-use data logging function.

Features

- Application Flexibility. Equipped to read Doppler, transit time and liquid thermal (heat energy) flow and will automatically choose the type of flow measurement based on the signal quality during operation.
- Streamlined Installation. Can be installed and set up by a single individual by clamping the meter onto the pipe - does not require operations to be drained or shut down.
- Advanced Features. Equipped with a touchscreen interface, full-color graphing, wizard-based start-up configuration, USB connectivity and Modbus TCP/IP connectivity.



- Automatic Transit Time and Doppler switching
- Built-in Wall Thickness Gauge
- Energy Measurement
- Battery-powered

Technical data

Types	Portable Flow meter Portable Heating & cooling energy Flow Meter	
Sizes	1/2"...120" (DN15...DN3050)	
Flow rate	Transit time	Medium and large pipes : Bi-directional up to 40 ft/s (12 m/s), depending on pipe and fluid Small pipes (DTTSU) : Bi-directional up to 20 ft/s (6 m/s), depending on pipe and fluid
	Doppler	Uni-directional to 40 ft/s (12 m/s)
Accuracy	Transit time	3/4" (20 mm) and smaller : $\pm 1\%$ of full scale 1" (25 mm) and larger : $\pm 1\% \pm 0.03$ ft/s (0.009 m/s)
	Doppler	$\pm 2\%$ of full scale
Display (Flow rate/total)	800 × 480 WVGA color outdoor readable display; Gloved-operation resistive touch screen 6 in. × 3.6 in. (152.4 mm × 41.44 mm)	
Installation position	All installation positions (vertical, horizontal)	
Medium temperature measurement range	-40...350 °F (-40...176 °C)	
Power supply	External Powered (100...240V AC 50/60 Hz 50 W 10...18 V) Battery (6 – 9 hours of continuous operation)	
Connectivity	Modbus TCP, pulse/analog	

FLOW METERING SOLUTIONS

ModMAG® M1000 & M2000

Electromagnetic Flow Meter



Combining a general-purpose detector with an amplifier, the ModMAG® M1000 and M2000 electromagnetic flow meters feature an advanced, user-friendly design for field verification testing, with the use of a simple, handheld device. The meters are manufactured under strict quality standards and employ sophisticated, microprocessor-based signal conversion with accuracies up to 0.3 percent of reading for ModMAG® M1000 and 0.2 percent of reading for ModMAG® M2000. The wide selection of liner and electrode materials helps ensure maximum compatibility and minimum maintenance over a long operating period.

Features

- Dual Hastelloy C electrodes come standard
- LCD display
- Verification device
- Bi-directional flow measurement sensing and totalization
- Digital and analog outputs
- Store and restore parameters
- AquaCUE® connectivity
- BACnet MS/TP and BACnet IP



- High flow ranges
- Large pipe sizes
- Cost-effective
- Horizontal/vertical installation

Technical data

Types	M1000	M2000
Sizes	1/4"...20" (DN6...DN500)	1/4"...78" (DN6...DN2000)
Flow velocity	0.10...39.37 ft/s (0.03...12 m/s)	0.10...39.37 ft/s (0.03...12 m/s)
Accuracy	± 0.3 %	± 0.2 %
Display	LCD display	LCD display
Installation position	All installation positions (vertical, horizontal)	All installation positions (vertical, horizontal)
Temperature measurement range	Up to 302 °F (150 °C)	Up to 302 °F (150 °C)
Power supply	9...36 VDC, 92...275 VAC	10...36 VDC, 85...265 VAC

FLOW METERING SOLUTIONS

ModMAG® M1000 & M2000

Impeller SDI and ModMAG® are compatible with 212 Heat Calculator

The 212 heat calculator has been designed to measure the energy consumed in hot water heating systems and chilled water cooling systems.

The 212 is supplied with temperature probes and easily interfaces with our impeller meters, electromagnetic flow meters and non-invasive ultrasonic flow meters.



- 4-20 mA output option
- Communication via M-Bus and Modbus RTU RS485
- Control panel mounted or wall mounted

Impeller SDI and ModMAG® are compatible with FC-5000 BTU Monitor

The FC-5000 product lines are microprocessor-driven devices designed for flow monitoring, while the BTU Monitor expands device capabilities by integrating inputs for fluid temperature data. Instantaneous rate and total energy consumption is achieved simultaneously.

Features

- BTU calculator
- Large, easy-to-read display
- Intuitive navigation and programming
- Fully programmable inputs and outputs



- Scaled pulse output
- Communication via EIA-485 Modbus and USB
- Control panel mounted or wall mounted

FLOW METERING SOLUTIONS

ModMAG® M5000

Battery-powered Electromagnetic Water Meter

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The ModMAG® M5000 is a battery-powered electromagnetic flow meter, with a very high accuracy even at very low flows. The excellent repeatability, as well as the above-average battery life, makes this innovative water meter indispensable for the water market. Typical applications are leak detection in water networks, water consumption measurements and irrigation plants.

The meter is best suited for applications without a power supply, where exact consumption or flow rates are required. Of course, the ModMAG® M5000 can also be used with an available power supply. The meter can be powered with main voltage and in case of a main failure, it is powered by an internal battery. Important data is consequently saved.

Features

- LCD display
- Battery-powered
- Internal datalogger
- Strong battery life
- Excellent repeatability
- AquaCUE® connectivity



- High flow ranges
- Large pipe sizes
- Cost-effective
- Horizontal/vertical installation

Technical data

Sizes	1/2"...24" (DN15...DN600)
Flow rate	0.08...44816 gpm (0.018...10178 m³/h)
Accuracy	± 0.4 %
Display	LCD display
Installation position	All installation positions (vertical, horizontal)
Temperature measurement range	Up to 302 °F (150 °C)
Power supply	Battery-powered

FLOW METERING SOLUTIONS

Dynasonics® RS-900w

Ultrasonic Flow Sensor

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By combining ultrasonic technology in a robust, cost-effective design, the Dynasonics® RS-900w ultrasonic flow meter acts as an accurate, long-lasting static solution that is suitable for mixed-zone irrigation applications. The RS-900w meter measures the flow of water used in irrigation systems with full pipes, which makes it ideal for commercial turf irrigation, golf course irrigation and irrigation pump stations.

As a flow meter, the RS-900w meter is ideal for users requiring a high level of accuracy and cost efficiency. It is encased in a robust housing and has no moving parts, reducing maintenance to a minimum. Thanks to its singlepiece threaded body, the RS-900w meter is quickly and easily installed. It is compatible with irrigation controllers and no straight run distances are required during the installation, making it a perfect fit for the accurate flow measurement of irrigation applications.



- Measure a wide flow range accurately and cost effectively
- Easy to install single-piece threaded body
- No moving parts
- No straight-run requirements

Features

- Three sizes with NPT or BSP tapered threads
- Submersible IP 68 with fully potted electronics
- No moving parts to wear
- Same two-wire power/pulse output as impeller flow sensors
- Forward and reverse flow flashing LED indicators

Technical data

Sizes	1"...2" (DN25...DN50)
Flow rate	0.25...200 gpm (0.059...45.4 m³/h)
Accuracy	± 2 %
Installation position	All installation positions (vertical, horizontal)
Nominal pressure	Up to 200 psi (13.8 bar)
Connectivity	Pulse up to 200 Hz

FLOW METERING SOLUTIONS

Impeller 220 Series

Flow Sensor

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220 Series sensors are specifically designed for installation in underground vaults that might be subjected to flooding.

As the liquid flow turns the impeller, a low impedance 8V DC square wave signal is transmitted with a frequency proportional to the flow rate. This signal can travel up to 2000 feet (610 m) between the sensor and the display unit without the need for amplification.

Features

- Six-bladed impeller design with a proprietary, non-magnetic sensing mechanism
- Sensor electronics easily removed from tee
- Two-wire sensor - power and signal transmit on a single pair of wires up to the distance of 2000 feet (610 m)
- Flow indicators are configured with two 48 inch (DN1200) single conductor leads
- Digital signal easily interfaced with transmitters, monitors or PLCs



- Low flow ranges
- Small pipe sizes
- Cost-effective
- Horizontal/vertical installation

Technical data

Sizes	1/2"...4" (DN15...DN100)
Flow rate	0.3...30 ft/sec (0.9...9.14 m/sec)
Accuracy	± 1 %
Installation position	All installation positions (vertical, horizontal)
Nominal pressure	Up to 400 psi (27 bar)
Temperature measurement range	Up to 221 °F (105 °C)

FLOW METERING SOLUTIONS

Impeller SDI

Insertion Flow Sensor

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The SDI series flow sensor offers unparalleled performance for liquid flow measurement in closed pipe systems, in an easy-to-install economical package. Impeller sensors offer a quick response to changes in flow rate and are well suited to flow control and batch type applications, in addition to flow monitoring. The new four-bladed impeller design is rugged, non-fouling and does not require custom calibration. The battery-powered versions are a complete flow measuring system, providing a programmable display of rate, total or both powered by a “C” sized lithium battery.

Features

- Low installation costs
- Single direction powered insert with raw, scaled pulse and analog output
- Bi-directional powered insert with analog and scaled pulse output
- Battery powered insert with a local and remote display and scaled pulse output

Technical data

Sizes	1-1/2"…36" (DN40…DN900)
Accuracy	±1%
Installation position	Horizontal installation
Nominal pressure	Up to 1000 psi (68 bar)
Power supply	• Battery powered • 8-35 VDC • 12-30 VAC



- High flow ranges
- Large pipe sizes
- Cost-effective
- Horizontal installation

FLOW METERING SOLUTIONS

Vortex VN2000

Vortex Meters

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VN2000 Hot tap Insertion Flow Meter

The VN2000 Hot Tap Insertion Vortex Flow Meter measures the volumetric or mass flow rate of steam, gases or liquids over a large flow range. The meter is a heavy-duty design engineered to stand up to the most abusive environments inside and outside the pipe. A removable insertion/extraction tool aids in installation or removal in high pressure applications.

VN2000 Compact Insertion Flow Meter

The VN2000 Compact Insertion Vortex Flow Meter measures the volumetric or mass flow rate of steam, gases or liquids over a large flow range. The meter is a heavy-duty design engineered to stand up to the most abusive environments inside and outside the pipe. The meter includes a mounting assembly to simplify the installation and ensure proper installation depth and orientation for a specified pipe size. Additionally, the probe length is sized to match the pipe size to minimize the meter length.



- High flow ranges
- Large pipe sizes
- Cost-effective
- Horizontal installation

Technical data

Types	VN2000 Hot tap Insertion Flow Meter	VN2000 Compact Insertion Flow Meter
Sizes	2"...36" (DN50...DN900)	2"...24" (DN50...DN600)
Flow rate	Steam: 26...2282271 kg/m ³ Gas/air: 0.5...187593 kg/m ³	Steam: 26...981449 kg/m ³ Gas/air: 0.5...80671 kg/m ³ Liquids: 52...142280 kg/m ³
Accuracy	± 1 %	± 1 %
Display	Rotatable display: Flow rate - 6 digits	Rotatable display: Flow rate - 6 digits
Installation position	Horizontal installation	Horizontal installation
Nominal pressure	Up to 1000 psi (68 bar)	Up to 1000 psi (68 bar)
Temperature measurement range	-250...400 °F (-120 °C...204 °C)	-250...400 °F (-120 °C...204 °C)
Power supply	14...36 VDC, (loop-powered with 4...20 mA) option, 28 VDC max	14...36 VDC, (loop-powered with 4...20 mA) option, 28 VDC max

DELIVERING SMART WATER SOLUTIONS

Smart Network Overview

Smart Network

With current and future communication and software technologies, we are creating robust digital solutions to help users turn data into actionable insights that drive better results, changing the way our customers collect, communicate, store and leverage data.



Building Sustainability Management

Solutions for Building Management and Optimization

For the Americas
Badger Meter, Inc.
P.O. Box 245036
Milwaukee, WI 53224-9536
USA
Tel.: +1-414-355-0400
infocentral@badgermeter.com
www.badgermeter.com

For international operations
Badger Meter Europa GmbH
Nürtinger Str. 76
72639 Neuffen
Germany
Tel.: +49-70 25-92 08-0
badger@badgermeter.com
www.badgermeter.com

For APAC
Badger Meter Europa GmbH
Singapore Branch
28 Ayer Rajah Crescent #08-06
Singapore 139959, Singapore
Tel.: +65 63 46 48 36
CBoey@badgermeter.com
www.badgermeter.com



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