ALM SYSTEMS
People. Technology. Sustainability.

Badger Meter Europa

Technology to meet India's water monitoring needs

Automation and Maintenance Management Systems

SMART SOLUTIONS FOR SMART CITY WATER NETWORKS

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Technology Appropriate For India

We, Automation & Maintenance Management Systems (AuM Systems) continuously strive to provide quality instrumentation and automation solutions for the industry. For the same reason, we are in partnership with extremely reliable and excellent quality German manufacturers, of whom Badger is one. We have studied the requirement of India and worked with Badger to work out appropriate solution for our country like measurement of very low flow velocities, thus also enabling leakage monitoring with the meters. Smart domestic water metering that not only provides a robust and reliable form of measurement, but also, ready information for the decision makers on the consumption patterns and thus helping them take informed decisions.

Badger Meter Background With Smart Cities

Badger Meters Europa GmbH, are manufacturers of flow meters, having factories at Nürtinger Str. 76, 72639 Neuffen, Germany. They are serving the industry for the past 10 decades across the globe with their end-to-end solutions for various industries, including water. Badger Meters is now an **Associate Partner of the Smart Cities Council (SCC)**. SSC is a coalition of industry thought leaders, practitioners and innovators dedicated to improving the sustainability, workability and liveability of cities around the world. Partnering with the SCC is a natural connection for Badger Meters, since a smart water network is a key component in the creation of a smart city. Badger Meter has recently ventured into the Indian market and collaborated with AuM Systems to provide solutions for the growing demands in the region.

Badger Meter Background With Smart Cities

1. Bulk Water Metering.

- Very low velocity measurement up to 0.03 m/s.
- Leakage detection in the water networks.
- Improved accuracy of 0.2% achieved with use of high quality electrode material (Hastelloy-C).

2. Domestic Water Metering.

- Smart ultrasonic water meters which last very long due to no wear and tear, as no moving parts involved.
- Long battery life up to 20 years.

Badger Meter Background With Smart Cities

3. Analytics

➢ With Beacon® Advanced Metering Analysis (AMA) cloud-based software suite offers a wide choice of managed, traditional fixed network, mobile, and consumer engagement solutions to meet your meter reading and reporting needs. The BEACON® AMA solution utilizes our proven ORION family of endpoints to capture interval meter reading data through cellular, fixed network, or mobile communication technologies. Integrated EyeOnWater® consumer engagement tools provide utility customers with access to their consumption data, allowing them to view their usage activity and gain a greater understanding and control of the water they consume.

International Smart City Case Studies

i. *Beacon AMA at UC Merced.*

ii. *Beacon AMA at Badger Meter HQ.*

iii. *Beacon AMA and E-series metering at Beauregard Parish, LA.*

iv. *Beacon AMA for Sunnyvale, California.*

Badger Meter

BEACON® Advanced Metering Analytics (AMA) Makes Water Visible at UC Merced

In California, water is precious, competition for water is fierce and conservation is critical. In the midst of the state's worst drought to date, Governor Jerry Brown declared historic statewide mandatory water restrictions calling for a 25 percent reduction in water usage through February 2016.

However, it's not easy to get people to turn off the taps, especially when so many Californians have no idea how much water they are using. According to a March 2014 report by the San Jose Mercury News, 225,000 homes and businesses across the state still are not charged for the water they are using. As the adage goes, "you can't monitor what you don't measure" – and many of those users have no idea how much water they are using because they don't have water meters. These communities, including areas of Bakersfield and Sacramento, use 39 percent more water per capita than the state average. That's 77 more gallons per day per person.

The University of California Merced (UC Merced) is located between these two cities and is in one of the driest climates in California – the Central Valley. Known for being an extremely green campus, staff and students have joined together to dramatically cut water, energy and gas usage per student every year, showing water savings well ahead of goals set by the UC president. As part of its water saving initiatives, UC Merced has relied heavily on BEACON® Advanced Metering Analytics (AMA). "BEACON AMA's automated data collection and online software has significantly reduced the time and resources needed to ensure and document our new compliance standards," said Emron Quarqat, UC Merced's Water Operations Crew Leader. "It has made our team and the campus a lot more aware of our water consumption."

Water conservation competition

What started out as a friendly student competition, focusing on reducing water consumption in the dorms, turned out to be an eye opening experience for the whole campus. In 2010, well before the new compliance standards were set, a group of staff and students developed an energy team to take a look at water conservation. Spearheaded by a student for a class project, a dorm water challenge was set into motion through the help of the energy team. "We knew we needed data and BEACON AMA turned out to be the best solution for providing real-time water consumption data that everyone could see and proactively use," said Quarqat.

BEACON AMA combines cellular endpoints, use of existing cellular networks and an easy-to-use software product to give UC Merced the fast, near real-time data it needed to start conserving.

BEACON AMA offers an interface that is easy to use for the operations crew and the students. By utilizing the BEACON AMA software suite and the EyeOnWater app, the campus can easily access and manage exact, near real-time data. This gives them a troubleshooting tool for any maintenance issues that may arise. Because they have access to accurate data that is collected continuously, it can also easily point to specific occurrences.

In addition to real-time data, the campus operations crew also knew it needed to

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Solution

- **BEACON® Advanced Metering Analytics (AMA)**
- **High Resolution E-Series® Ultrasonic Meters**
- **ModMAG® M-Series® Electromagnetic Flow Meters**
- **Recordall® Disc Series Meters**
- **Recordall Compound Series Meters**

Results

- **Software analytics tools provide campus with an in-depth view of their water usage and conservation efforts**
- **Over one million gallons per year and thousands of dollars saved**
- **Real-time monitoring capabilities**
  - Powerful EyeOnWater app gives end-water customers direct insight into their water usage – making them directly aware of how much water they are using in real-time
- **Proactive analytics tools detect leaks faster**
- **Cost savings generated by more accurate meters and time-saving solutions**
- **Meter reading efficiency**
  - Automated systems enable staff to perform other tasks and reduce expenses

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save time and obtain accurate meter readings. After considering numerous products, the campus selected a variety of Badger Meter flow measurement products. The campus' end-to-end solution includes E-Series® Ultrasonic, ModMAG M-Series® Electromagnetic, Recordall® Disc Series and Recordall Compound Series flow meters – all connected to BEACON AMA via cellular communications.

Since the energy team was formed and with the new compliance measures, UC Merced has tripled the amount of meters on campus. They now monitor all of their reclaimed water, irrigation and wastewater.

Competition pays off

In the first year of the water conservation competition, the campus dorms reduced their water consumption by 14 percent, saving 79,000 gallons of water. They also saved 1.4 million gallons of water from 16 water leaks detected by the near real-time data. Nine dorms and 565 students participated this first year.

The best result is that water conservation continued as a daily habit and the annual competition has grown over the years. In the following years, the campus saw another nine percent reduction, involving over 2,000 students. "The whole campus has their eyes on water conservation and we now know where our water is going," continued Quarqat. "Plus, it's saved us money."

BEACON AMA revealed numerous leaks around campus that the operations crew never knew about, and were easily remedied. For example, a 100 gallon a day leak was responsible for hot water, energy and chemical loss. Stopping the leak saved the university $6,105 annually. In addition, the dorm competition revealed five toilets leaking a total of 150 gallons an hour. The leaks were quickly identified and fixed in seven days, saving the university an estimated one million gallons of water per year and $6,576. Other leaks in cooling towers, boilers and irrigation systems have also been quickly detected and solved using the BEACON AMA system.

"For my crew, the number one concern is keeping an eye on leaks, consumption and the granular measurement data we need to provide to the energy team," said Quarqat. "BEACON AMA and the various meters have made it very easy for us to make smart, quick decisions in which the whole campus benefits."

Conservation trailblazer

Since 2010 UC Merced has been a leader in water and energy conservation. Their efforts have paid off with less consumption, saving university resources that can be applied to other initiatives. UC Merced is leading the charge and setting the example for other universities and colleges in California. Many of these institutions have toured UC Merced, learned about their system and have begun implementation at their own campuses. Meanwhile, staff and students at UC Merced are thinking of new innovative ways to keep improving their campus and the state of California. Up next…making irrigation more efficient!

Making Water Visible®

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BEACON® AMA Implementation at Badger Meter Headquarters – Practicing What You Preach

As an innovator in flow instrumentation and control products, Badger Meter knows the importance of providing valuable and timely measurement data for its customers. Since 1905, it has served water utilities, municipalities, and commercial and industrial customers worldwide.

Understanding the importance and benefits of sustainable operations, Badger Meter uses many of its own metering products in its various locations. BEACON® Advanced Metering Analytics (AMA) created a new opportunity for enhancing operation performance and conservation of resources. As a new product (launched in January 2014), many customers have already seen successes when implementing it throughout a city as part of a utility rollout, and also in specific industries such as hotels and resorts, college campuses and park systems. Badger Meter facility managers also recognized an opportunity to use the analytics platform and communications system to monitor water consumption at the corporate headquarters in Brown Deer, Wis.

Assisting in Sustainability Initiatives

With products that measure virtually anything that moves through a pipe, Badger Meter helps the world manage and conserve its precious natural resources. It also recognizes the importance to practice sustainability through its operations and facility management. By using BEACON AMA at its headquarters, Badger Meter is decreasing its environmental footprint.

BEACON AMA is an immediate solution that combines ORION® Cellular endpoints, use of existing cellular networks, and an easy-to-use software product to give Badger Meter employees the fast, near real-time data in order to conserve. This includes monitoring the runoff from a green roof in order to determine its water retention effectiveness at the Brown Deer headquarters. This green roof was designed to reduce storm water run-off. Badger Meter currently uses meters for reporting out to local and state entities. By utilizing the BEACON AMA software suite, the operations group can easily access and manage exact, near real-time data for all 19 meters on the property. This gives them a troubleshooting tool for any maintenance issues that may arise. Because they have access to accurate data that is collected continuously, it can easily point to specific occurrences.

For example, one of the industrial washers used to clean housings for production is heavily used Monday through Friday. Once BEACON AMA was installed, staff quickly realized that this machine had water running through it 24/7 and was wasting

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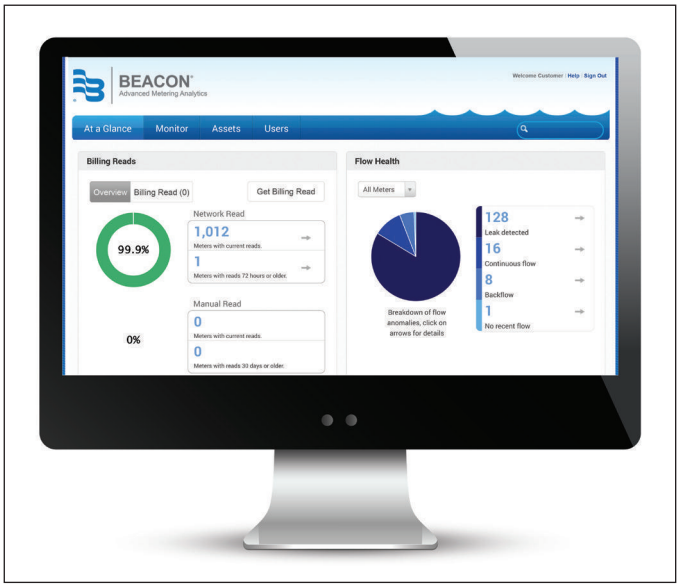
Badger Meter Corporate Headquarters, Milwaukee, WI



BEACON® AMA Utility Dashboard

Recordall® M25 Meter with ORION® Cellular Endpoint

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5,880 gallons per week. Once staff saw this data, they immediately fixed the leak. On average, Badger Meter has saved over $700 per year by fixing this one leak.

"BEACON AMA has made it very easy to get near real time meter readings, keep an eye out for leaks and manage our overall consumption with machines in the plant," said Danielle Slotke, associate engineer.

Reporting Made Easy

The decision to move forward with BEACON AMA was made even easier when considering the various information the company needs to send to local and state entities. The publicly owned water treatment works requires water discharge quantities to determine sewer fee rates. This is important in order to distinguish water from industrial process vs. water from sanitary sewer.

In addition, the Wisconsin Department of Natural Resources requires a permit in order to discharge storm water from the property to surface water that flows into a nearby creek. In order to stay within compliance a monthly report is required. BEACON AMA makes this a simple task.

Although these reports are straightforward, the data collected must be accurate and timely. Given the accuracy of the meters the water was flowing through, the time it takes became more of an issue for these reports. "BEACON's automated data collection and online software has reduced the time it took the Environmental and Safety Manager to collect meter readings every week," continued Slotke. "He can now easily see data in near real time whenever he logs into the BEACON dashboard at his desk."

Future Deployment

Currently there are 19 endpoints installed at the Badger Meter headquarters. Because of the success the Brown Deer facility engineers have had, there are immediate plans to install BEACON AMA in the facility in Racine, Wis.

Badger Meter Solution

- **BEACON® Advanced Metering Analytics (AMA)**
- **ORION® Cellular endpoints**
- **ModMAG® M-Series® Electromagnetic Flow Meters**
- **Recordall® Turbo Series Meters**
- **Recordall Disc Series Meters**
- **High Resolution Encoders**

Results

- **Meter Reading Efficiency**
  - Annual automated system saves over 24 hours of staff time.
- **Software analytics tools provide Badger Meter headquarters with an in-depth view of water usage, conservation efforts, and local/state reporting compliance.**
- **Real-time monitoring capabilities**
  - Powerful EyeOnWater app gives employees direct insight into the property water usage - making them directly aware of water usage
- **Proactive analytics tools detect leaks faster**
  - Annual estimated water savings 306,600 gallons
  - Annual estimated leak savings equals $703

Control. Manage. Optimize.

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BEACON® Advanced Metering Analytics (AMA) and high resolution, E-Series® Ultrasonic meters create a winning combination for Beauregard Parish, LA

When Waterworks District 3 of Beauregard Parish, La., began to research new water meters to replace its aging system, it didn't take long to decide that the BEACON AMA managed solution was the right fit. As the first BEACON AMA starter kit sold by distributor Rural Pipe & Supply, District 3 started its deployment before the four-month trial was over. "As soon as I learned about BEACON AMA, I let District 3 know, and they were on board right from our first conversation," says Todd Stott, sales rep from Rural Pipe & Supply. "Even though they are only partially deployed, they've seen the benefits and have convinced other utilities to sign up for the starter kits as well."

Beauregard Parish, which covers 1,200 square miles, is mainly rural with most of its 7,000 customers spread apart, creating hard-to-reach meters. Although the aging system was working, there were many inefficiencies, including hiring a third party to manually read meters. "We knew immediately that the BEACON AMA software suite, the ORION® Cellular endpoints and the E-Series Ultrasonic meters, would help save time and money," says Jeremy Joffrion, distribution manager for District 3.

Overdue efficiencies

Long driveways, wooded areas, pesky dogs, hidden meters, and often times, multiple meters per property, were all barriers to an easy meter read. On average, it took three people more than 12 days to collect information in the Parish. Realizing that it needed to enter the electronic age, the district knew that the time and money it spent to obtain meter readings could instead be used to increase efficiency. Enter BEACON AMA: an immediate solution that combines cellular endpoints, use of existing cellular networks and an easy-to-use software product to give the utility the fast, near real-time data it needed to start saving time and money. Now, instead of paying for manual meter readings, which averaged $2 per meter, the utility is able to focus on its core competency.

In addition to the time it took to read the meters, the utility also knew it was obtaining readings from aging meters with decreasing accuracy. This was another area desperately needing improvement. After considering various meter products, District 3 selected the high resolution E-Series Ultrasonic engineered polymer meter line for its durability and long-term accuracy.

E-Series Ultrasonic meters use solid-state technology in a compact, totally encapsulated, weatherproof, and UV-resistant housing. Equipped with an easy-to-read, 9-digit LCD display,

District 3 of Beauregard Parish, LA – Front row left to right: Kenny Rogers, Ray Hauser (general manager), Karen Ramsey, Sasha Reeves, Shera Fowler, and Jeremy Joffrion. Second row left to right: Rusty Gross, Michael Guimbellot, Bruce Butts, and Dale Dartez.

Michael Guimbellot, distribution, installs an ORION Cellular endpoint as part of the BEACON AMA managed solution.

the Ultrasonic meter presents consumption, rate of flow, reverse-flow indication, and alarms. With no moving parts, the E-Series meter also improves reliability and has greater extended low flow accuracy compared to other positive displacement meters.

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Accuracy pays

With new, more accurate meters beginning to be installed, District 3 is already capturing more revenue. "The E-Series Ultrasonic meters are catching the lowest flow amounts we've ever been able to record," says Joffrion.

Along with capturing more revenue, District 3 appreciates the ability to gather and analyze more granular measurement data. "It helps me generate better reports," says Joffrion. "The numbers are much more accurate than they have been in the past and will continue to get better as we install more."

With its long term, sustained accuracy, the E-Series meter will also help the District record flows at new meter accuracies throughout the life of the meter. Overall, Joffrion estimates that with the labor efficiencies and added revenue from more accurate metering, the system will pay for itself very quickly.

Improved customer service

BEACON AMA offers an interface that is easy to use for both District 3 and its current customers. By utilizing the BEACON AMA software suite, the utility can easily access and manage exact, near real-time data. This gives the utility a troubleshooting tool for any customer complaints or maintenance issues that may arise. Because the utility has access to accurate data that is collected continuously, it can easily point to specific occurrences on the customer's utility bill to help decipher where and how a discrepancy might have occurred. Customers can then work with the utility to fix any leaks or determine when their water use may have exceeded their expectations.

District 3 has also come to rely on the notes section in the software for each account. After a conversation with a customer, the utility rep will go into the account and record the conversation so he or she knows moving forward what was said, how a problem was addressed and what next steps should be taken to resolve the issue. This has proved to be very helpful, especially with billing discrepancies and when multiple staff are involved.

In addition, the EyeOnWater smartphone/tablet app, included as part of the BEACON AMA software suite, is being downloaded by the district's customers. "This app is growing in popularity because it allows our customers to see the amount of water they are using and when they are using it – especially when they are away from home," says Joffrion.

Future deployment for more customers

Moving forward into a wider implementation, the utility will deploy 100 Badger Meter ORION Cellular endpoints per month, with a goal of 1,000 in 2015 and every year after. It will also continue to replace aging meters with E-Series Ultrasonic meters.

Beauregard Parish Solution

- **BEACON® Advanced Metering Analytics (AMA)**
- **100 ORION® Cellular endpoints initially installed, ordering 100 per month with a total goal of 1,000 per year**
- **High Resolution E-Series® Ultrasonic Meters**

Results

- **Meter reading efficiency**
  - Automated systems enable staff to perform other tasks and reduce third-party expenses
- **Added revenue generated by more accurate meters and time-saving solutions**
- **Improved customer service**
  - Faster leak detection
  - More detailed usage information reduces billing disputes
  - EyeOnWater smartphone/tablet app

Making Water Visible®

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Badger Meter

BEACON Advanced Metering Analytics (AMA) managed solution increases efficiency, minimizes infrastructure, improves customer service, and strengthens conservation efforts for Sunnyvale, California

The need for increased efficiency and real-time data, without increasing infrastructure, leads to a move towards a new AMA solution

The city of Sunnyvale, California had been looking at improving efficiency from its current AMR and manual read systems for over ten years. When the city also started receiving requests from commercial utility clients for real-time water use data for conservation efforts, utility managers knew they needed a solution that could automate their data collection and provide information at a granular level, without having to build and/or manage more infrastructure. After considering many options, Sunnyvale made the decision to move to a new fixed network AMI system and selected the Badger Meter BEACON Advanced Metering Analytics solution for its ability to meet all of its needs.

The city immediately started using 75+ Badger Meter cellular endpoints and the BEACON AMA software suite to streamline efficiency and gain better access to useable, instantaneous data for some of its commercial customers. Because of the ability of BEACON AMA to be up and running quickly, without the city having to install infrastructure or manage technology, Sunnyvale was able to provide a cost effective and useful service to its commercial customers.

Increased efficiency, reduced infrastructure and a managed solution

One of the main barriers for the city when deciding on an AMI system was that most solutions required additional infrastructure in order to get to the next level of information the city needed. The city also knew it did not have the in-house technical expertise to work with a complicated system. BEACON AMA offered an immediate solution that combined cellular infrastructure and an easy to use software product to give the utility the fast, real-time data its customers were demanding.

"Utilities are always looking for savings and efficiencies in all aspects of their business," says Tim Kirby, Assistant Director of Finance for Sunnyvale. "Managed solutions such as this help by providing the technology and infrastructure that municipalities and utilities usually would have been forced to deal with themselves. By having a managed solution, it puts the burden on the vendor and not with the utility, so we don't have to worry about it. We don't have to maintain anything outside our area of expertise."

As Kirby also noted, "Cellular is going to be one of the first things to be recovered in a disaster. So, here in California where we have earthquakes, one of the first things that will come back online will be the cellular infrastructure. That will ensure the utility remains financially sound by getting us up and running again and our revenue coming in more quickly than if we had to try and bring back our own infrastructure."

Reduced customer complaints, enhanced customer service

BEACON AMA offers an interface that is easy to use for both the utility and its customers. By utilizing the BEACON AMA software suite, the city can easily access and manage exact, real-time data. This gives the city a troubleshooting tool for any customer complaints or maintenance issues that may arise. Because the city has access to accurate data that is collected continuously, it can easily point to specific occurrences on the customer's utility bill to help decipher where and how a discrepancy might have occurred. Customers can

(continued)

Solution

- **BEACON Advanced Metering Analytics (AMA)**
  - 75+ cellular endpoints initially plus 500 more to follow
  - Managed solution including BEACON software suite and cellular endpoints

Results

- **No infrastructure or technology to maintain**
  - Keeps the city technologically current
  - The utility can concentrate on its core competency - water management
- **Improved customer service**
  - Highly accurate and real time data helps the utility avoid usage disputes and leads to faster leak detection
- **Long term conservation goals can easily be met**

BEA-CS-00647-EN-01 (January 2014)

Case Study

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then work with the utility to fix any leaks or determine when their water use may have exceeded their expectations. Through the use of a future smart phone app, customers will also have the ability to see the amount of water they are using and when they are using it.

"All customers are being driven to mobile applications – water utilities should be no different. Customers do not want to be tied to their desktop computer," says Kirby.

Better, continuous information leads to long term conservation goals being met

For Sunnyvale, conservation is a critical issue. The city realized it will face long-term water supply issues as the cost of water continues to increase. The city knew it needed a solution that could communicate to customers how much water they were using and when they had leaks. When end water customers have instantaneous information and know how much water they use, they can make behavioral changes to help control long term water costs and conserve resources. BEACON AMA gives those customers the ability to manage their use themselves – reactively. It also enables the city to reach out to its end water customers during times of drought and meet its overall conservation goals.

Future deployment for more customers

Moving forward into a wider implementation, the city will deploy 500 more Badger Meter cellular endpoints over the next two years and would like to expand BEACON AMA city-wide within the next five to ten years.

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Product Catalogues

ModMAG®

M-Series® | B-MAG Electromagnetic Flow Meters

Badger Meter Europa

Electromagnetic flow meters

The company

About us

Badger Meter Europa GmbH is a wholly owned subsidiary of Badger Meter, Inc., USA, based in Milwaukee, Wisconsin. With sales of more than 350 million Euro and the dedication of more than 1450 employees all around the world, Badger Meter is a leading marketer and manufacturer of flow measurement and control devices since 1905. Badger Meter was a pioneer in flow measurement and can look back today at many patents in that field.

Badger Meter Europa GmbH is responsible for the international operations worldwide, except for the United States, Mexico, Canada and Latin America which are operated from Badger Meter, Inc., USA. Highly qualified people as well as state-of-the-art production and test facilities ensure the best sales support and service for our customers.

Customer proximity & competence

We can help you in a timely manner to solve your measurement problems, advising you to assist in optimizing your measurement solution, technology and site location before you make a decision.
An extensive distributor and service network ensures the best service worldwide. Local representatives are a big advantage for our customers. The short distance and local language support provide efficient service. Our distributors are trained on Badger Meter products at their own facilities or in our training center.
Our name assures you that our products have been manufactured with the best care and in conformity with all DIN ISO 9001:2008 directives.

Quality is our tradition

A company which has successfully been providing the industry with flow meters for more than 110 years is always aware of the importance of quality in its products. However, quality is an on-going process which we, as a company, embrace every day. At Badger Meter Europa GmbH, we consider quality in all aspects of our operation. It is the quality of our work, which you, as a customer, are entitled to expect from us. Quality begins with the individual, our employees, and requires a company philosophy which fits accordingly. Our quality should accompany you throughout the process: from inquiry, through order to product and service.
No compromise in terms of quality.

Service

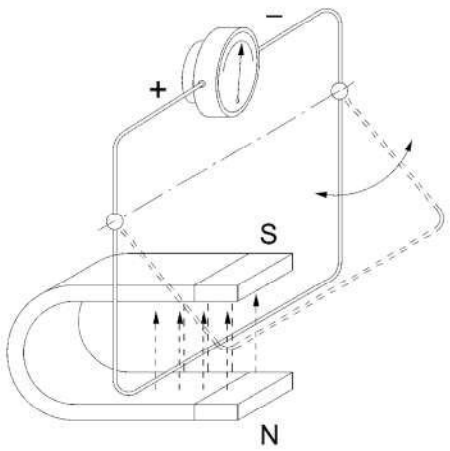
Urgent orders may be delivered overnight with our „Hot-Shot" service.

Electromagnetic flow meters

Electromagnetic flow meters are ideally suited for flow measurement of all liquids with a minimum conductivity of 5 μS/cm (20 μS/cm for demineralized water).
These meters are very accurate and the flow measurement is independent of density, temperature and pressure of the medium.

Measuring principle

The operating principle of the electromagnetic flow meter is based on Faraday's law of magnetic induction: The voltage induced across any conductor, as it moves at right angles through a magnetic field, is proportional to the velocity of that conductor. The voltage induced within the fluid is measured by two diametrically opposed internally mounted electrodes.
The induced signal voltage is proportional to the product of the magnetic flux density, the distance between the electrodes and the average flow velocity of the fluid.



Meters for conductive fluids – Detectors

- Flange process connection
- Size DN 6 – 2000
- Nominal pressure up to PN 100

Detector type II for a great variety of applications

The electromagnetic detector type II is not only available in a number of different flange process connections (DIN, ANSI, JIS, AWWA, etc.) but also in a number of liners like hard rubber, soft rubber, PTFE, PFA or Halar.
The detector can be configured with up to four electrodes for measuring, empty pipe and grounding electrodes.

Available in sizes from DN 6 to DN 2000 and nominal pressures up to PN 100, the detector type II is best suited for a variety of applications in industry and water/ waste water industry.
Lined measuring pipes with materials that are approved for drinking water: KTW/DVGW,
NSF-61, WRAS, ACS.

Detector type III with short lay length

Thanks to its very short lay length, the detector type III is often the right alternative for many applications. Delivered with a PTFE liner, the detector type III has a standard nominal pressure of PN 40.

- Wafer connection
- Size DN 25 – 100
- Nominal pressure PN 40

Sanitary detector for liquid food flow measurement

The sanitary detector was developed for the flow measurement of liquid food. This model is available with Tri-Clamp® BS 4825/ISO 2852, DIN 11851 process connections and also with any special connections (customer specifications). The sanitary detector is delivered in a stainless steel housing and with PTFE lining.

- Process connections Tri-Clamp® BS 4825/ ISO 2852, DIN 11851
- Size DN 10 – 100
- Nominal pressure PN 10/16

Technical data: Detectors

Type	Type II	Type III	Type Food
Size	DN 6 – 2000 (1/4"...80")	DN 25 – 100 (1"...4")	DN 10 – 100 (3/8"...4")
Process connections	Flange: DIN, ANSI, JIS, AWWA u.a.	Wafer connection, (in-between flange mounting)	Tri-Clamp® BS 4825/ISO 2852, DIN 11851 among others
Nominal pressure	Up to PN 100	PN 40	PN 10/16
Protection class	IP 67, optional IP 68	IP 65, optional IP 68	IP 65, optional IP 68
Min. conductivity	5 μS/cm (min. 20 μS/cm for demineralized water)	5 μS/cm (min. 20 μS/cm for demineralized water)	5 μS/cm (min. 20 μS/cm for demineralized water)
Liner materials	Hard / soft rubber | from DN 25 | 0 up to +80 °C PTFE | DN 6 – 600 | -40 up to +150 °C Halar (ECTFE) | from DN 300 | -40 up to +150 °C	PTFE | -40 up to +150 °C	PTFE | -40 up to +150 °C
Electrodes materials	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium	Hastelloy C (standard) Tantal Platinum / Gold plated Platinum / Rhodium
Housing	Carbon steel / optional stainless steel	Carbon steel / optional stainless steel	Stainless steel
Lay length	DN 6 – 20 | 170 mm DN 25 – 50 | 225 mm DN 65 – 100 | 280 mm DN 125 – 200 | 400 mm DN 250 – 350 | 500 mm DN 400 – 700 | 600 mm DN 750 – 1000 | 800 mm DN 1200 – 1400 | 1000 mm DN 1600 | 1600 mm DN 1800 | 1800 mm DN 2000 | 2000 mm or according to ISO 13359	DN 25 – 50 | 100 mm DN 65 – 100 | 150 mm	Tri-Clamp® connection: DN 10 – 50 | 145 mm DN 65 – 100 | 200 mm DIN 11851 connection: DN 10 – 20 | 170 mm DN 25 – 50 | 225 mm DN 65 – 100 | 280 mm

Amplifiers

Amplifier for a great variety of applications – ModMAG® M2000

- For all detectors
- Accuracy ±0,2 % of actual flow
- Flow range 0,03 – 12 m/s
- Size DN 6 – DN 2000
- Protection class IP 67
- Interfaces ModBus®, HART®, M-Bus, Profibus DP

The amplifier type ModMAG® M2000 is best suited for bidirectional flow measurement of fluids with a conductivity > 5 µS/cm (> 20 µS/cm for demineralized water). ModMAG® M2000 shows a high accuracy, is easy to use and can be chosen for a large and flexible applications spectrum.
The backlight, four-line display shows all actual flow measuring data, daily and complete information, including alarm messages.
The standard amplifier has 4 programmable digital outputs, one digital input, analog output and different interfaces.
Integrated system self check-up makes putting into operation and servicing easier.

The back-up function enables retrieval of parameters while servicing the meter, without the need for reprogramming the device or transferring to another device.

Verification Device

The verification device enables the ModMAG® electromagnetic flow meters M2000 and B-MAG | M5000 to be checked on site in regular time intervals at a low cost and without interruption of the process. All important parameters of the flow meter are measured, recorded and evaluated.

ModMAG®

Battery-powered amplifier for water supply – B-MAG | M5000

The B-MAG | 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.

- For flanged process connections
- Accuracy better than ±0,4 % of actual flow
- Flow range 0,03 to 10 m/s
- Size DN 15 – DN 600
- Protection class IP 67 / IP 68
- Interfaces IrDA, ModBus® RTU, M-Bus
- Up to 20 years battery life span

The meter is best suited for applications without a power supply where exact consumption or flow rates are required. The B-MAG | M5000 can also be used with an available power supply. The meter can be powered with mains voltage and in case of a mains failure, it is powered by an internal battery. Important data is therefore saved.

The B-MAG | M5000 has been designed for very harsh environmental measurement conditions. The meter has no moving parts and can be used to measure water containing particles like sand or gravel. The B-MAG | M5000 is encased in an IP 67 housing (optional IP 68), which makes it a reliable meter even when submerged.

The standard meter is equipped with an internal datalogger which can be read via an IrDA or M-Bus with ModBus® RTU protocol.
The collected data can also be retrieved via radio frequency or GSM/GPRS. The data can thus be centrally compiled and evaluated.

BATTERY OPERATED

Low-cost amplifier for a great variety of applications – ModMAG® M1000

- For all detectors
- Accuracy ±0,3 % of actual flow
- Flow range 0,03 – 12 m/s
- Size DN 6 – DN 200

The ModMAG® M1000 amplifier is suited for bidirectional flow measurement of liquids > 5 µS/cm (> 20 µS/cm for demineralized water).
It combines all the opportunities of price with high level performance. Information such as flow rate, total flow rates, daily flow rate or even an alert can easily be read from the LCD display.

Various inputs, outputs and interfaces allow a wide range of different applications with the ModMAG® M1000. Thanks to the IP 67 aluminium housing the ModMAG® M1000 is ideal for outdoor applications in rugged environmental conditions.

Amplifier for hazardous areas – ModMAG® M3000/M4000

The amplifier with modular design allows flow measurements in ex-zones 1 and 2, in either the mounted or remote version. The amplifier housing, made of powder-coated aluminium, is available in protection class IP 67 and with a separate connection space.

Programming can be done either with closed housing thanks to a magnetic pen or with open housing via three buttons. The four-line display shows all necessary data like actual flow, totalizer and status messages.

The programmable excitation frequency even enables the amplifier to be adjusted for difficult metering applications. The newly developed process for amplifier compensation enables a high accuracy, especially in the lower flow range.

The ModMAG® M3000/M4000 is especially suited for flow measurements in chemical and pharmaceutical industries, as well as water and waste water plants with explosion-proof zones.

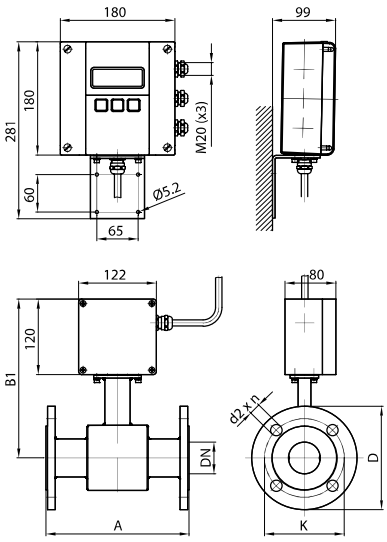
- For all detectors
- Accuracy ±0,2 % of actual flow
- Flow range 0,03 – 12 m/s
- Protection class IP 67
- Ex-proof

Technical data: Amplifiers

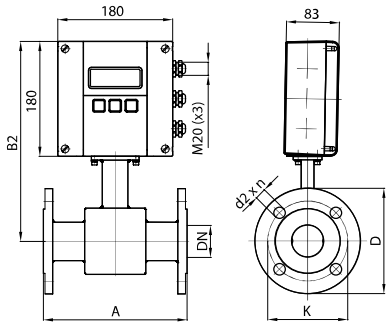



Type	ModMAG® M1000	ModMAG® M2000	ModMAG® M3000/M4000	B-MAG I M5000
Size	DN 6 – DN 200	DN 6 – DN 2000	DN 6 – DN 600 (M3000) DN 6 – DN 300 (M4000)	DN 15 – DN 600
Accuracy	±0,3 % of actual flow, ±2 mm/s of actual flow	±0,2 % of actual flow, ±1 mm/s of actual flow	±0,2 % of actual flow, ±1 mm/s of actual flow	±0,4 % of actual flow, ±2 mm/s of actual flow
Repeatability	0,1 %	0,1 %	0,1 %	0,1 %
Flow range	0,03 – 12 m/s	0,03 – 12 m/s	0,03 – 12 m/s	0,03 – 10 m/s
Conductivity	Min. 5 µS/cm (min. 20 µS/cm for demineralized water)	Min. 5 µS/cm (min. 20 µS/cm for demineralized water)	Min. 5 µS/cm (min. 20 µS/cm for demineralized water)	Min. 20 µS/cm
Power supply	92 – 275 VAC (50/60 Hz) < 14 VA, optional 9 – 36 VDC, 4 W	85 – 265 VAC (50/60 Hz) < 20 VA, optional 9 – 36 VDC	85 – 265 VAC (50/60 Hz) < 20 VA, optional 24 VDC	Internal Lithium batteries 3,6 V Optional battery back-up model (100 – 240 VAC or 9 – 36 VDC)
Display	LCD graphic display	LCD 4 lines / 20 characters	LCD 4 lines / 16 characters	LCD, 2 lines
Digital outputs	2 x open collector 1 x relay	4 x open collector 2 x relays	2 x open collector 2 x relays (M3000)	4 x open collector
Digital inputs	Yes	Yes	Yes	Yes
Analog output	0/4 – 20 mA, 0 – 10 mA	0/4 – 20 mA, 0/2 – 10 mA	0/4 – 20 mA, 0 – 10 mA	–
Interface	ModBus® RTU RS232/RS485 ModBus® TCP/IP M-Bus, HART®	ModBus® RTU RS232/RS485 Profibus DP, M-Bus, HART®	–	ModBus® RTU RS232 (optional RS485), M-Bus, IrDA
Empty pipe detection	Separate electrode	Separate electrode	Separate electrode	Separate electrode
Datalogger	30.000 measuring values	10.000 measuring values (optional)	–	7.224 measuring values
Housing	Aluminium, IP 67	Aluminium, IP 67	Aluminium, IP 67 (NEMA 4x)	Aluminium, IP 67 (optional IP 68)
Remote version	Max. 50 m	Max. 100 m	Max. 30 m	Max. 30 m
Ambient temperature	-20 °C up to +60 °C	-20 °C up to +60 °C	-20 °C up to +50 °C	-20 °C up to +60 °C
Approvals	–	OIML R49-1, MID MI-001 in process	M3000 ATEX Zone 2, FM/CSA Class I, Div. 2 M4000 ATEX Zone 1, FM/CSA Class I, Div. 1	OIML R49-1, MID MI-001

Flange process connection
Wall mounted



Flange process connection
Meter mounted



Dimensions (mm)

DN (mm)	Size (inches)	A Std*	A ISO**	B 1	B 2	with ANSI-flanges Ø D	Ø K	Ø d2 x n	with DIN flanges Ø D	Ø K	Ø d2 x n
6	1/4"	170	–	228	305	88,9	60,3	15,9 x 4	90	60	14 x 4
8	3/10"	170	–	228	305	88,9	60,3	15,9 x 4	90	60	14 x 4
10	3/8"	170	–	228	305	88,9	60,3	15,9 x 4	90	60	14 x 4
15	1/2"	170	200	238	315	88,9	60,3	15,9 x 4	95	65	14 x 4
20	3/4"	170	200	238	315	98,4	69,8	15,9 x 4	105	75	14 x 4
25	1"	225	200	238	315	107,9	79,4	15,9 x 4	115	85	14 x 4
32	1 1/4"	225	200	253	330	117,5	88,9	15,9 x 4	140	100	18 x 4
40	1 1/2"	225	200	253	330	127	98,4	15,9 x 4	150	110	18 x 4
50	2"	225	200	253	330	152,4	120,6	19 x 4	165	125	18 x 4
65	2 1/2"	280	200	271	348	177,8	139,7	19 x 4	185	145	18 x 4
80	3"	280	200	271	348	190,5	152,4	19 x 4	200	160	18 x 8
100	4"	280	250	278	355	228,6	190,5	19 x 8	220	180	18 x 8
125	5"	400	250	298	375	254	215,9	22,2 x 8	250	210	18 x 8
150	6"	400	300	310	387	279,4	241,3	22,2 x 8	285	240	22 x 8
200	8"	400	350	338	415	342,9	298,4	22,2 x 8	340	295	22 x 12
250	10"	500	450	362	439	406,4	361,9	25,4 x 12	395	350	22 x 12
300	12"	500	500	425	502	482,6	431,8	25,4 x 12	445	400	22 x 12
350	14"	500	550	450	527	533,4	476,2	28,6 x 12	505	460	22 x 16
400	16"	600	600	475	552	596,9	539,7	28,6 x 16	565	515	26 x 16
450	18"	600	–	500	577	635,0	577,8	31,7 x 16	615	565	26 x 20
500	20"	600	–	525	602	698,5	635,0	31,7 x 20	670	620	26 x 20
550	22"	600	–	550	627	749,3	692,1	34,9 x 20	–	–	–
600	24"	600	–	588	665	812,8	749,3	34,9 x 20	780	725	30 x 20
650	26"	600	–	613	690	869,9	806,4	34,9 x 24	–	–	–
700	28"	600	–	625	702	927,1	863,6	35,1 x 28	895	840	30 x 24
750	30"	800	–	650	727	984,2	914,4	34,9 x 28	–	–	–
800	32"	800	–	683	760	1060,5	977,9	41,3 x 28	1015	950	33 x 24
850	34"	800	–	708	785	1111,2	1028,7	41,3 x 32	–	–	–
900	36"	800	–	725	802	1168,4	1085,8	41,3 x 32	1115	1050	33 x 28
950	38"	800	–	750	827	1238,3	1149,4	41,3 x 32	–	–	–
1000	40"	800	–	790	867	1346,2	1257,3	41,3 x 36	1230	1160	36 x 28
1200	48"	1000	–	900	977	1511,5	1422,4	41,3 x 44	1455	1380	39 x 32
1350	54"	1000	–	975	1052	1682,8	1593,9	47,8 x 44	–	–	–
1400	56"	1000	–	1000	1077	–	–	–	1675	1590	42 x 36

Standard

with ANSI flanges	from DN 6 to 1400	Lbs 150
with DIN flanges	from DN 6 to 200	PN 16
	from DN 250 to 1400	PN 10

*Standard **ISO 13359
Sizes DN 1600 – 2000 upon request.

Flow range

DN (mm)	Size (inches)	0,03 m/s	2,5 m/s	10 m/s	12 m/s
6	1/4"	0,05 l/min	4,2 l/min	17 l/min	20 l/min
8	3/10"	0,09 l/min	7,5 l/min	30,2 l/min	36 l/min
10	3/8"	0,14 l/min	12 l/min	47,1 l/min	57 l/min
15	1/2"	0,32 l/min	27 l/min	106 l/min	127 l/min
20	3/4"	0,57 l/min	47 l/min	188,5 l/min	226 l/min
25	1"	0,88 l/min	74 l/min	294,5 l/min	353 l/min
32	1 1/4"	1,45 l/min	121 l/min	483 l/min	579 l/min
40	1 1/2"	2,3 l/min	188 l/min	754 l/min	905 l/min
50	2"	3,5 l/min	295 l/min	1178 l/min	1414 l/min
65	2 1/2"	6,0 l/min	498 l/min	1991 l/min	2389 l/min
80	3"	9,0 l/min	754 l/min	3016 l/min	3619 l/min
100	4"	14 l/min	1178 l/min	4712 l/min	5655 l/min
125	5"	1,33 m³/h	110 m³/h	442 m³/h	530 m³/h
150	6"	1,9 m³/h	159 m³/h	636 m³/h	763 m³/h
200	8"	3,4 m³/h	283 m³/h	1131 m³/h	1357 m³/h

Flow range

DN (mm)	Size (inches)	0,03 m/s	2,5 m/s	10 m/s	12 m/s
250	10"	5,3 m³/h	442 m³/h	1767 m³/h	2121 m³/h
300	12"	7,6 m³/h	636 m³/h	2545 m³/h	3054 m³/h
350	14"	10,4 m³/h	866 m³/h	3464 m³/h	4156 m³/h
400	16"	14 m³/h	1131 m³/h	4524 m³/h	5429 m³/h
450	18"	17 m³/h	1431 m³/h	5725 m³/h	6870 m³/h
500	20"	21 m³/h	1767 m³/h	7068 m³/h	8482 m³/h
550	22"	26 m³/h	2138 m³/h	8553 m³/h	10263 m³/h
600	24"	31 m³/h	2545 m³/h	10178 m³/h	12214 m³/h
700	28"	42 m³/h	3464 m³/h	13854 m³/h	16625 m³/h
750	30"	48 m³/h	3976 m³/h	15904 m³/h	19085 m³/h
800	32"	54 m³/h	4523 m³/h	18096 m³/h	21714 m³/h
900	36"	69 m³/h	5725 m³/h	22902 m³/h	27482 m³/h
1000	40"	85 m³/h	7068 m³/h	28274 m³/h	33929 m³/h
1200	48"	122 m³/h	10178 m³/h	40714 m³/h	48857 m³/h
1400	55"	166 m³/h	13854 m³/h	55416 m³/h	66499 m³/h

Larger diameters upon request

Product line overview

Electromagnetic flow meters
Ultrasonic flow meters
Weirs and flumes
Turbine meters
Oscillating piston meters
Nutating disc meters
Impeller meters
Vortex meters
Variable area flow meters
Differential pressure flow meters
Venturi tubes
Mass meters
Heat meters
Hydraulic testers
Flow calibrators
Lubrication meters
Oil management systems
Control valves
Concrete finishing products

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Badger Meter

E-Series® Ultrasonic Meter

Cold Water Engineered Polymer Meter, 5/8", 5/8" x 3/4", 3/4", & 1" NSF/ANSI Standard 61 Certified, Annex G

DESCRIPTION

The E-Series® Ultrasonic meter uses solid-state technology in a compact, totally encapsulated, weatherproof, and UV-resistant housing, suitable for residential and commercial applications. Electronic metering provides information—such as rate of flow and reverse flow indication—and data not typically available through traditional, mechanical meters and registers. Electronic metering eliminates measurement errors due to sand, suspended particles and pressure fluctuations.

The Ultrasonic 5/8", 5/8" × 3/4", 3/4", and 1" meters feature:

- Minimum extended low-flow rate lower than typical positive displacement meters.
- Simplified one-piece electronic meter and register that are integral to the meter body and virtually maintenance free.
- Sealed, non-removable, tamper-protected meter and register.
- Easy-to-read, 9-digit LCD display presents consumption, rate of flow, reverse-flow indication, and alarms.
- High resolution industry standard ASCII encoder protocol.

The Ultrasonic meter is available with a wired lead, in-line connector or fully prewired to AMR/AMI devices.

APPLICATIONS

Use the Ultrasonic meter for measuring potable cold water in residential, commercial and industrial services. The meter is also ideal for non-potable, irrigation water applications or less than optimum water conditions where small particles exist.

The Ultrasonic meter complies with applicable portions of ANSI/AWWA Standard C700 and NSF/ANSI Standard 61, Annex G. There is currently no AWWA standard that specifically addresses ultrasonic meters for residential applications.

OPERATION & PERFORMANCE

As water flows into the measuring tube, ultrasonic signals are sent consecutively in forward and reverse directions of flow. Velocity is then determined by measuring the time difference between the measurement in the forward and reverse directions. Total volume is calculated from the measured flow velocity using water temperature and pipe diameter. The LCD display shows total volume and alarm conditions and can toggle to display rate of flow.

In the normal temperature range of 45…85° F (7…29° C), the Ultrasonic "new meter" consumption measurement is accurate to:

- ±1.5% over the normal flow range
- ±3.0% from the extended low flow range to the minimum flow value

CONSTRUCTION

E-Series Ultrasonic meters feature an engineered polymer, lead-free meter housing, an engineered polymer and stainless steel metering insert, a meter-control circuit board with associated wiring, LCD, and battery. Wetted elements are limited to the pressure vessel, polymer/stainless steel metering insert and the transducers. The electronic components are housed and fully potted within a molded, engineered polymer enclosure, which is permanently attached to the meter housing. The transducers extend through the polymer housing and are sealed by O-rings.

The metering insert holds the stainless steel ultrasonic reflectors in the center of the flow area, enabling turbulence-free water flow through the tube and around the ultrasonic signal reflectors. The metering insert's patented design virtually eliminates chemical buildup on the reflectors, ensuring long-term metering accuracy.

METER INSTALLATION

The meter is completely submersible and can be installed using horizontal or vertical piping, with flow in the up direction. The meter will not measure flow when an "empty pipe" condition is experienced. An empty pipe is defined as a condition when the flow sensors are not fully submerged.

SPECIFICATIONS

E-Series Ultrasonic Meter Size	5/8" (15 mm)	5/8" x 3/4" (15 mm)	3/4" (20 mm)	1" (25 mm)
Operating Range	0.1…25 gpm	0.1…25 gpm	0.1…32 gpm	0.4…55 gpm
Extended Low-Flow Rate	0.05 gpm	0.05 gpm	0.05 gpm	0.25 gpm
Maximum Continuous Operation	25 gpm	25 gpm	32 gpm	55 gpm
Pressure Loss	4.3 psi at 15 gpm	2.3 psi at 15 gpm	2.0 psi at 15 gpm	1.8 psi at 25 gpm
Reverse Flow - Maximum Rate	4.0 gpm	4.0 gpm	4.0 gpm	9.0 gpm
Operating Performance	In the normal temperature range of 45…85° F (7…29° C), new meter consumption measurement is accurate to: • ± 1.5% over the normal flow range • ± 3.0% from the extended low flow range to the minimum flow value			
Storage Temperature	– 40…140° F (– 40…60° C)			
Maximum Ambient Storage (Storage for One Hour)	150° F (72° C)			
Measured-Fluid Temperature Range	34…140° F (1°…60° C)			
Humidity	0…100% condensing; meter is capable of operating in fully submerged environments			
Maximum Operating Pressure of Meter Housing	175 psi (12 bar)			
Register Type	Straight reading, permanently sealed electronic LCD; digits are 0.28" (7 mm) high			
Register Display	• Consumption (up to nine digits) • Rate of flow • Alarms • Unit of measure factory programmed for gallons, cubic feet and cubic meters			
Register Capacity	• 10,000,000 gallons • 1,000,000 cubic feet • 100,000 cubic meters			
Totalization Display Resolution	• Gallons: 0.XX • Cubic feet: 0.XXX • Cubic meters: 0.XXXX			
Battery	3.6-volt lithium thionyl chloride; battery is fully encapsulated within the register housing and is not replaceable; 20-year battery life			

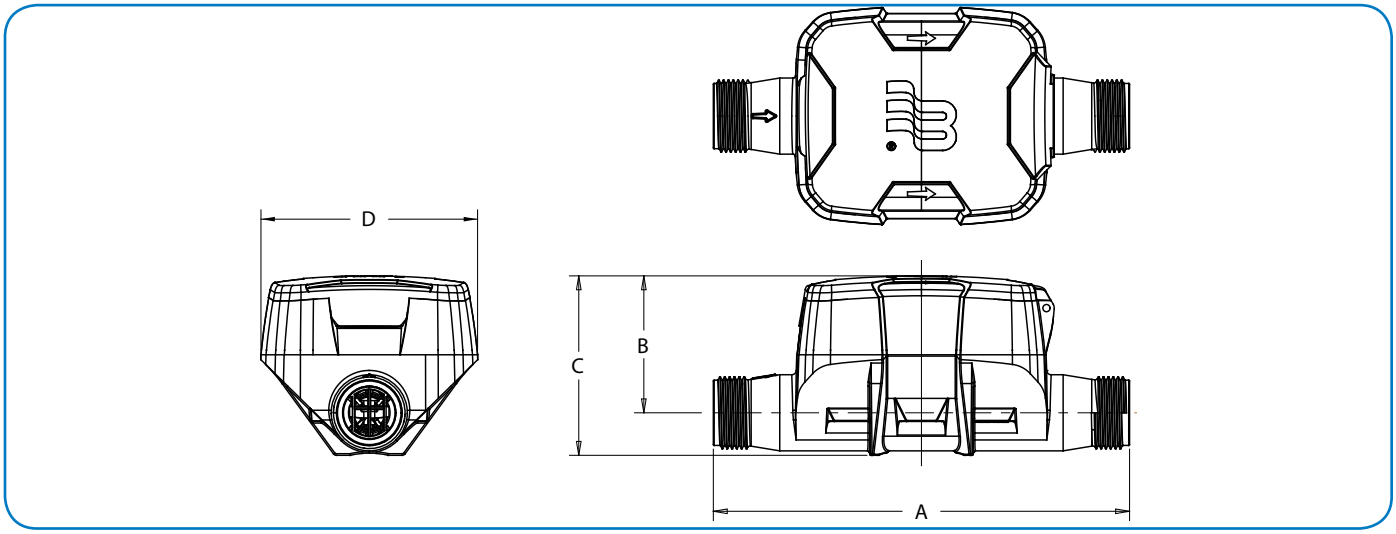
MATERIALS

Meter Housing	Engineered polymer
Measuring Element	Pair of ultrasonic sensors located in the flow tube
Register Housing & Lid	Engineered polymer
Metering Insert	Engineered polymer & stainless steel
Transducers	Piezo-ceramic device with wetted surface of stainless CrNiMo

PHYSICAL DIMENSIONS

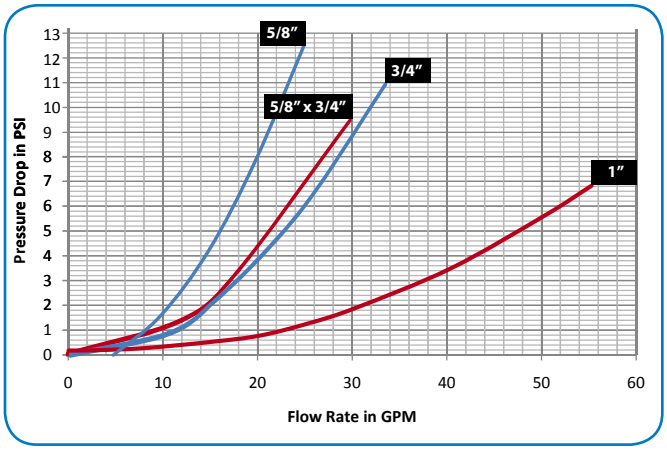
E-Series Ultrasonic Meter Size	5/8" (15 mm)	5/8" x 3/4" (15 mm)	3/4" (20 mm)	1" (25 mm)
Size Designation X Lay Length	5/8" × 7-1/2"	5/8" × 3/4" × 7-1/2"	3/4" × 7-1/2" or 3/4" × 9"	1" × 10-3/4"
Weight (without AMR)	1.60 lb	1.58 lb	3/4 " × 7-1/2" : 1.58 lb 3/4" × 9" : 1.64 lb	2.3 lb
See illustration below for Measurement Designations.				
Length (A)	7.5"	7.5"	7.5" or 8.85"	10.75"
Height (B)	2.46"	2.46"	2.46"	2.66"
Height (C)	3.27"	3.23"	3.23"	3.62"
Width (D)	3.90"	3.90"	3.90"	3.90"
Bore Size	5/8"	3/4"	3/4"	1"
Coupling Nut & Spud Thread	3/4" × 14 NPSM	1" × 11-1/2 NPSM	1" × 11-1/2 NPSM	1-1/4" × 11-1/2 NPSM
Tailpiece Pipe Thread (NPT)	1/2"	3/4"	3/4"	1"
Service Pipe Thread (NPT)	1/2"	3/4"	3/4"	1"

Measurement Designations



PRESSURE LOSS CHART

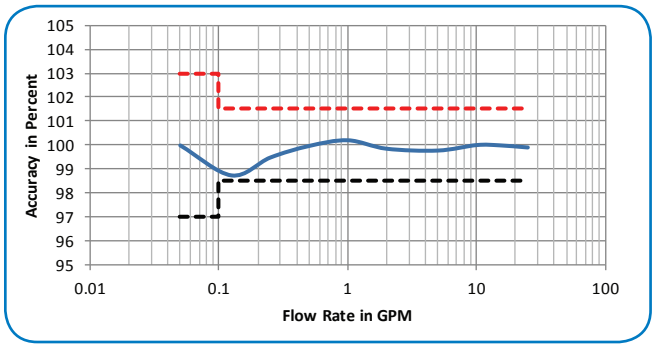
Rate of Flow in Gallons per Minute (gpm)



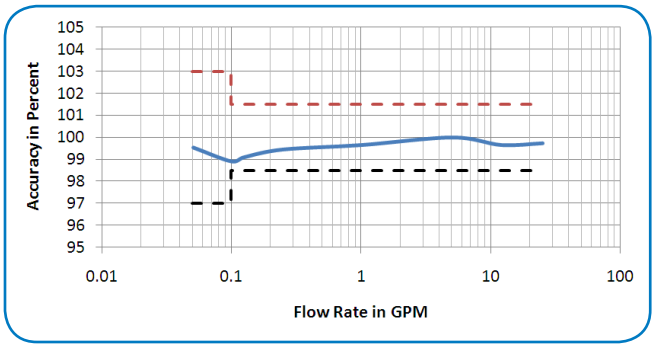
ACCURACY CHARTS

Rate of Flow in Gallons per Minute (gpm)

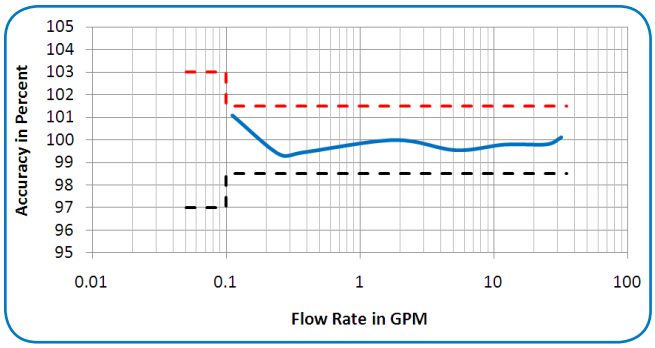
5/8" Meter



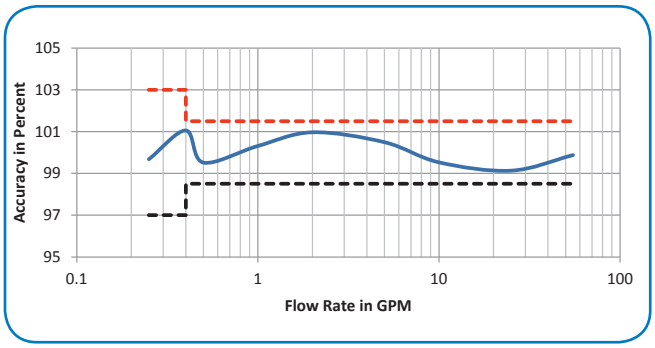
5/8" × 3/4" Meter



3/4" Meter



1" Meter



Making Water Visible®

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Legacy Document Number: ESM-T-12-EN

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E-Series®

Submersible cold water stainless steel ultrasonic meter

Features

- Four sizes and lay lengthes
- Completely submersible IP68
- Minimum extended low-flow rate lower than typical positive displacement meters.
- Simplified one-piece electronic meter and register that are integral to the meter body and virtually maintenance free.
- Sealed, non-removable, tamper-protected meter and register.
- Easy-to-read 9-digit LCD display – presents consumption, rate of flow, reverse-flow indication, and alarms.
- Digital or industry standard encoder protocol.
- ANSI/NSF standard 61 certified, Annex G
- ANSI/AWWA standard C700
- Lead-free

Description

The electronic Badger Meter E-Series® meter utilizes ultrasonic and solid-state technology in a compact, totally encapsulated, weatherproof, and UV-resistant housing for residential and commercial applications. Electronic metering provides information and data not typically available through traditional, mechanical meters and registers, such as rate of flow and reverse flow indication, and eliminates measurement errors due to sand, suspended particles and pressure fluctuations.

The E-Series® Meter is available with a wired lead, 308 in-line connector or fully prewired to ORION® and GALAXY® AMR/AMI endpoints. It is also offered with the Itron® in-line connector, in-line connector with pit endpoint, or prewired to an Itron remote endpoint.

The E-Series® meter complies with applicable portions of ANSI/AWWA standard C700 and NSF/ANSI standard 61, annex G. There is currently no AWWA standard that specifically addresses ultrasonic meters for residential applications.

Applications

The E-Series® meter can be used for measuring potable, cold water in residential, commercial and industrial services. It is ideal for non-potable, reclaimed, irrigation water applications or less than optimum water conditions where small particles exist.

Measuring principle

As water flows into the measuring tube, ultrasonic signals are sent consecutively in forward and reverse directions of flow. Velocity is then determined by measuring the time difference between the measurement in the forward and reverse directions. Total volume is calculated from the measured flow velocity using water temperature and pipe diameter. The LCD display shows total volume and alarm conditions and can toggle to display rate of flow.

Construction

E-Series® meters feature a stainless steel, lead-free meter housing, an engineered plastic and stainless steel metering insert, a meter-control circuit board with associated wiring, LCD and battery. Wetted elements are limited to the pressure vessel, plastic/stainless steel metering insert and the transducers. The electronic components are housed and fully potted within a molded, engineered plastic enclosure, which is permanently attached to the meter housing. The transducers extend through the stainless steel housing and are sealed by O-rings. The metering insert holds the stainless steel ultrasonic reflectors in the center of the flow area, enabling turbulence-free water flow through the tube and around the ultrasonic signal reflectors. The metering insert's patented design virtually eliminates chemical buildup on the reflectors, ensuring long-term metering accuracy.

Technical data

	DN15 (5/8“) Model E-25	DN15 (5/8“ x 3/4“) Model E-25	DN20 (3/4“) Model E-35	DN25 (1“) Model E-55
Operating range	0,4 – 95 l/min (0.1 - 25 GPM)	0,4 – 95 l/min (0.1 - 25 GPM)	0,4 – 121 l/min (0,1 – 32 GPM)	1,5 – 208 l/min (0.40 – 55 GPM)
Extended low flow rate	0,2 l/min (0.05 GPM)	0,2 l/min (0.05 GPM)	0,2 l/min (0.05 GPM)	1 l/min (0.25 GPM)
Maximum continuous operation	95 l/min (25 GPM)	95 l/min (25 GPM)	121 l/min (32 GPM)	208 l/min (55 GPM)
Pressure loss	0,3 bar (4.3 PSI) at 57 l/min (15 GPM)	0,2 bar (3.0 PSI) at 57 l/min (15 GPM)	0,1 bar (1.8 PSI) at 57 l/min (15 GPM)	0,1 bar (1.8 PSI) at 95 l/min (25 GPM)
Reverse flow - maximum rate	15 l/min (4.0 GPM)	15 l/min (4.0 GPM)	15 l/min (4.0 GPM)	34 l/min (9.0 GPM)
Accuracy at normal temperature range	±1.5% over the normal flow range +3.0% from the extended low-flow range to the minimum flow value			
Storage temperature	-40°C to +60°C (-40°F to 140° F)			
Maximum ambient storage (storage for one hour)	72°C (150° F)			
Measured fluid temperature range	1°C to 60°C (34°F to 140°F)			
Humidity	0-100% condensing; meter is capable of operating in fully submerged environments			
Maximum operating pressure of meter housing	12 bar (175 PSI)			
Register type	Straight reading, permanently sealed electronic LCD; digits are 7 mm (0.28“) high			
Register display	• Consumption (up to nine digits) • Rate of flow • Alarms • Unit of measure factory programmed for gallons, cubic feet and cubic meters			
Register capacity	40,000,000 l/min 1,000,000 cubic feet 100,000 cubic meters			
Totalization display resolution	Gallons: 0.01 Cubic feet: 0.001 Cubic meters: 0.0001			
Battery	3.6-volt lithium thionyl chloride; battery is fully encapsulated within the register housing and is not replaceable; 20 year battery life			
Meter weight (without AMR)	1 kg (2.2 lbs)	1 kg (2.2 lbs)	1 kg (2.2 lbs)	1,3 kg (3.1 lbs)

Materials

Meter housing	316 stainless steel
Measuring element	Pair of ultrasonic sensors located in the flow tube
Register housing and lid	Engineered thermoplastic
Metering insert	Engineered thermoplastic and stainless steel
Transducers	Piezo-ceramic device with wetted surface of stainless CrNiMo

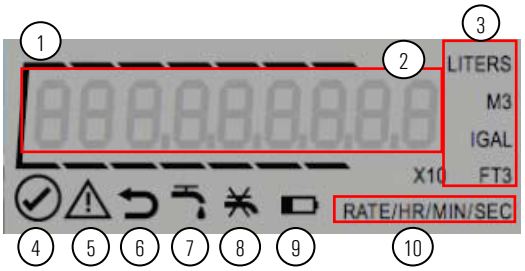
Dimensions

Model	E-25	E-25	E-35	E-55
Size designation x ley length	5/8" x 7 1/2"	5/8"x 3/4“ x 7 1/2"	3/4" x 7 1/2" or 3/4“ x 9”	1" x 10 3/4"
Bore size	5/8"	3/4"	3/4"	1"
Coupling nut & spud thread	¾" x 14 NPSM	1" x 11 1/2 NPSM	1" x 11 1/2 NPSM	1 1/4“ x 11 1/2 NPSM
Tailpiece pipe thread (NPT)	½"	3/4"	3/4"	1"
Service pipe thread (NPT)	¾"	3/4"	3/4"	1"

Meter installation

The meter is comptetely submersible and can be installed using horizontal or vertical piping, with water flow in the up direction. The meter will not measure flow when an “empty pipe” condition is experienced. An empty pipe is defined as a condition when the flow sensors are not fully submerged.

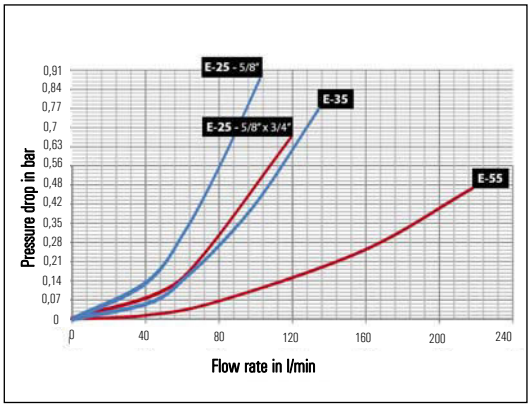
E-series display



1. Billing units indicator
2. Nine-digit display with decimal
3. Consumption units of measure
4. Meter operating normally
5. Meter alarm or error
6. Reverse flow
7. Suspected leak
8. No flow over 30 days
9. Low-battery alert
10. Rate of flow units of measure

Pressure loss chart

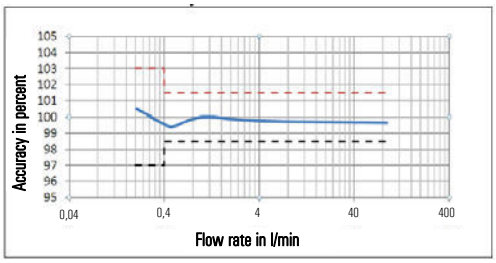
Rate of flow in liters per minute



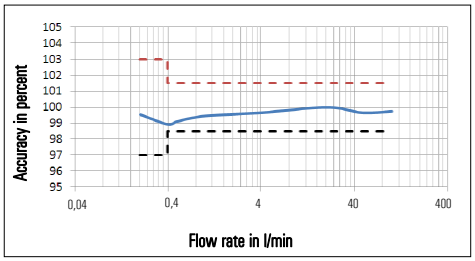
Accuracy charts

Rate of flow in liters per minute

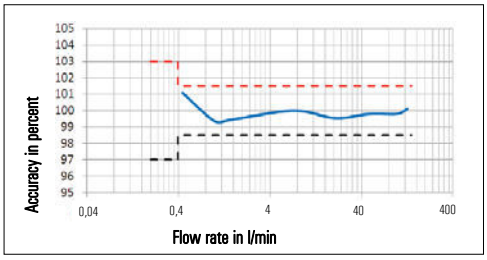
Model E-25, $^{5}/_{8}$" (DN15)



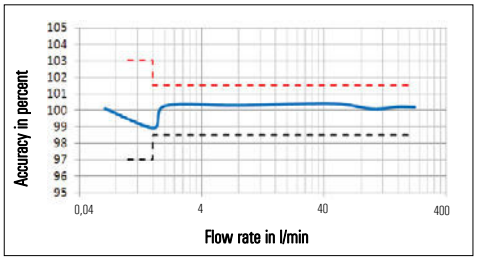
Model E-25, $^{3}/_{4}$" (DN20)



Model E-35, 1" (DN20)



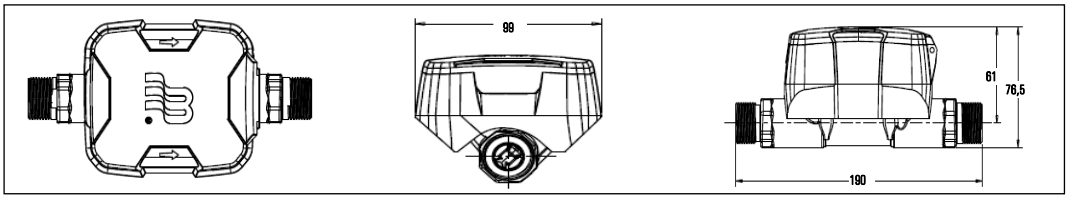
Model E-55, 1" (DN25)



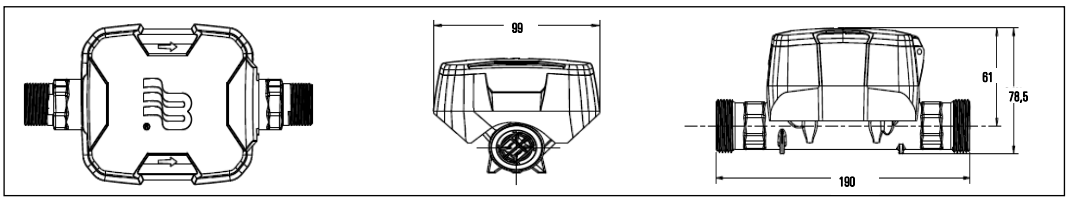
Meter spud and connection sizes

Model	E-25	E-25	E-35	E-55
Size designation x ley length	5/8" x 7 1/2"	5/8"x 3/4" x 7 1/2"	3/4" x 7 1/2" or 3/4" x 9"	1" x 10 3/4"
Length (A)	190 mm (7.5")	190 mm (7.5")	190 mm (7.5") or 228 mm (8.98")	273 mm (10.745")
Height (B)	61 mm (2.404")	61 mm (2.404")	61 mm (2.404")	64.2 mm (2.529")
Height (C)	76.5 mm (3.014")	78.5 mm (3.014")	78 mm (3.094")	85.3 mm (3.359")
Width (D)	99 mm (3.898")	99 mm (3.898")	99 mm (3.898")	99 mm (3.898")

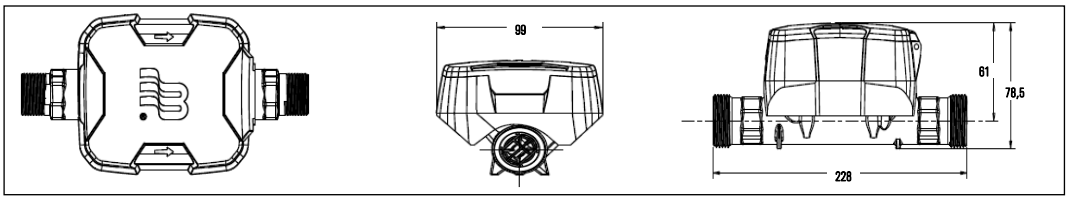
Dimensions (in mm)



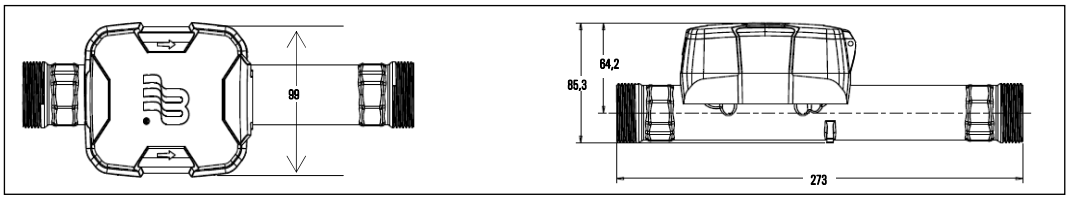
Model E-25



Model E-35



Model E-35



Model E-55