Badger Meter

COPY

CITY OF ANN ARBOR

Invitation to Bid
Residential and Special Use Water Meters - 4708
Due: February 8, 2022 at 2 PM CST

Badger Meter

4545 W Brown Deer Road
PO Box 245036
Milwaukee, Wisconsin 53224-9536
414-355-0400 | 800-876-3837
www.badgermeter.com

February 3, 2022

City of Ann Arbor
Procurement Unit,
c/o Customer Services, First Floor
301 East Huron Street
Ann Arbor, MI 48104

RE: Residential and Special Use Water Meters - ITB 4708
Due: *February 8, 2022 at 2 PM CST*

Dear Sir or Madam:

This letter is attached to and becomes part of the above-referenced bid. Payment terms are net 30 days. Prices quoted in this bid, if awarded to Badger Meter, will remain firm for two years with an option to extend for two additional years in one-year increments. The contract period will not exceed four years total with a maximum 3 percent unit price increase per year the contract is extended, if acceptance is made within 120 days.

We provide certification files to help you manage your meter and endpoint inventory along with the corresponding meter accuracy data. The standard method of delivery for this format is via electronic mail. Any deviations from our standard format, or any custom file formats, will be considered on a time and material basis.

A copy of the bid tabulation, for our records, is appreciated. Electronic results can be emailed to bids@badgermeter.com.

In the event you have any questions regarding this correspondence, we can be reached by telephone at 800-876-3837 ext. 16229 or via email at bids@badgermeter.com. Additionally, you may contact your Account Manager, Mark Wright, via phone at 810-223-2170 or via email at mwright@badgermeter.com.

We appreciate the opportunity to support your metering needs.

Sincerely,

BADGER METER, INC.

Jennifer A. Awah-Manga

Jennifer A. Awah-Manga

Assistant Secretary and Proposal Lead

CONFIDENTIALITY STATEMENT

The information contained herein is to be considered confidential and proprietary to the extent allowable by law. © 2022 Badger Meter, Inc. All rights reserved.

Badger Meter

4545 W Brown Deer Road
PO Box 245036
Milwaukee, Wisconsin 53224-9536
414-355-0400 | 800-876-3837
www.badgermeter.com

CERTIFICATION

OF SIGNATURE AUTHORITY

I certify as follows:

By Board Resolution adopted by the Board of Directors of Badger Meter, Inc. and in full force and effect as of this date:

The following *elected executive officers* are, among other things, hereby authorized to execute, amend, and cancel bids and contracts for the sale of products, distributor and representative agreements, bid bonds, surety bonds, contracts, leases and certain other legally binding documents in the ordinary course of business, in the name of Badger Meter, Inc.

Kenneth C. Bockhorst	Chairman, President and Chief Executive Officer
Robert A. Wrocklage	Senior Vice President - CFO
Kimberly K. Stoll	Vice President – Sales and Marketing
William R. A. Bergum	Vice President – General Counsel & Secretary

Pursuant to the Power granted by the Board of Directors, the following *elected non-executive officers* are hereby authorized to execute, amend, and cancel bids, bid-related contracts and documents, requests for proposals and quotes, and all other bid-related documentation in the name of Badger Meter, Inc.

Jennifer Akwi Awah-Manga	Assistant Secretary	Proposal Lead – Bids and Contract Administration
Joanne K. Crumer-Pascale	Assistant Treasurer	Milwaukee Accounting Manager
Wayne Dennis	Assistant Secretary	Senior Director - International Sales & Marketing & Business Development
Charla D. Dury	Assistant Secretary	Proposal Lead – Bids and Contract Administration
Frank J. Fenton	Assistant Secretary	Director – Utility Sales
Charity D. Granberry	Assistant Treasurer	Milwaukee Accounting Manager
David A. Kutil	Assistant Treasurer	Milwaukee Assistant Controller
Benjamin E. Loomis	Assistant Secretary	Milwaukee Credit Manager
David A. Miller	Assistant Secretary	Counsel II
Pamela G. Stokke-Ceci	Assistant Secretary	Assistant General Counsel and Director

BY:

William R. A. Bergum

January 1, 2022

Date

William R. A. Bergum,
Vice President - General Counsel & Secretary
Badger Meter, Inc.

081518

PRICING

BID FORM

VENDOR NAME: Badger Meter, Inc.

BASE BID – Badger E Series Ultrasonic Cold Water Meter, Residential Application, Engineered Polymer					
Item #	Description	Est. Quantity	Unit	Unit Price	Total Price
1	5/8" Water Meter	200	Each	$ 129.24	$ 25,848.00
2	5/8" x 3/4" Water Meter	200	Each	$ 129.24	$ 25,848.00
3	3/4" Water Meter	200	Each	$ 156.60	$ 31,320.00
4	3/4" Short Water Meter	200	Each	$ 145.44	$ 29,088.00
5	1" Water Meter	200	Each	$ 175.68	$ 35,136.00
6	Badger HR-RED High Res. Remote Electronic Display	100	Each	$ 172.26	$ 17,226.00
				TOTAL BASE BID	$ 164,466.00

Alternate BID – Badger E Series Ultrasonic Cold Water Meter, Residential Application, Stainless Steel					
Item #	Description	Est. Quantity	Unit	Unit Price	Total Price
1	5/8" Water Meter	200	Each	$ 167.04	$ 33,408.00
2	5/8" x 3/4" Water Meter	200	Each	$ 167.04	$ 33,408.00
3	3/4" Water Meter	200	Each	$ 201.24	$ 40,248.00
4	3/4" Short Water Meter	200	Each	$ 188.28	$ 37,656.00
5	1" Water Meter	200	Each	$ 221.04	$ 44,208.00
6	1-1/2" Water Meter	200	Each	$ 529.56	$ 105,912.00
7	2" Water Meter	200	Each	$ 711.36	$ 142,272.00
				TOTAL BASE BID	$ 437,112.00

Due to continuous improvements and redesign of Badger Meter products and technology solutions, Badger Meter reserves the right to provide our newest product solutions as an alternative to the proposed products provided they are in conformance with the requirements of the specifications and do not exceed the prices quoted.

BASE BID – Badger E Series Ultrasonic Meter, Fire Service Application					
Item #	Description	Est. Quantity	Unit	Unit Price	Total Price
1	3/4" Water Meter	25	Each	$ 225.00	$ 5,625.00
2	1" Water Meter	25	Each	$ 253.00	$ 6,325.00
				TOTAL BASE BID	$ 11,950.00

BASE BID – Badger M Series, M5000 Electromagnetic Meter, PTFE Liner					
Item #	Description	Est. Quantity	Unit	Unit Price	Total Price
1	1" Water Meter	25	Each	$ 2,705.00	$ 67,625.00
2	1 1/2" Water Meter	25	Each	$ 2,760.00	$ 69,000.00
3	2" Water Meter	25	Each	$ 2,876.00	$ 71,900.00
1	2 1/2" Water Meter	25	Each	$ 2,972.00	$ 74,300.00
4	3" Water Meter	25	Each	$ 3,038.00	$ 75,950.00
5	4" Water Meter	25	Each	$ 3,241.00	$ 81,025.00
				TOTAL BASE BID	$ 439,800.00

REFERENCES: Please list at least three (3) entities for which you have provided similar materials:

	Organization	Address	Contact Person	Telephone
1.	City of Monroe, MI	120 East First Street Monroe, MI 48161	Barry LaRoy City Engineer	734-384-9122
2.	West Bloomfield Township, MI	4550 Walnut Lake Road West Bloomfield, MI 48323	Ed Hapaala Utilities Director	248-451-4785
3.	City of Swartz Creek, MI	8083 Civic Drive Swartz Creek, MI 48473	Robert Bincsik Director of Public & Community Services	810-635-4464

Due to continuous improvements and redesign of Badger Meter products and technology solutions, Badger Meter reserves the right to provide our newest product solutions as an alternative to the proposed products provided they are in conformance with the requirements of the specifications and do not exceed the prices quoted.

FORMS

INVITATION TO BID

City of Ann Arbor
Guy C. Larcom Municipal Building
Ann Arbor, Michigan 48107

Ladies and Gentlemen:

The undersigned, as Bidder, declares that this Bid is made in good faith, without fraud or collusion with any person or persons bidding on the same Contract; that this Bidder has carefully read and examined the bid documents, including City Nondiscrimination requirements, Vendor Conflict of Interest Form, Instructions to Bidders, Bid Forms, Purchase Order Terms and Conditions, General Conditions, Detailed Specifications, and all Addenda, and understands them. The Bidder declares that it conducted a full investigation of the work proposed and is fully informed as to the nature of the work and the conditions relating to the work's performance.

The Bidder acknowledges that it has not received or relied upon any representations or warrants of any nature whatsoever from the City of Ann Arbor, its agents or employees, and that this Bid is based solely upon the Bidder's own independent business judgment.

In accordance with these bid documents, and Addenda numbered 1, *the undersigned, as Bidder, proposes to deliver to the City all product/services herein described for the amounts set forth in the Bid Forms.*

The Bidder declares that it has become fully familiar with the liquidated damage clauses for completion times and for compliance with City Code Chapter 112, understands and agrees that the liquidated damages are for the non-quantifiable aspects of non-compliance and do not cover actual damages that may be shown and agrees that if awarded the Contract, all liquidated damage clauses form part of the Contract.

Bidder further agrees that the cited provisions of Chapter 14 form a part of this Contract.

The Bidder declares that it has become familiar with the City Conflict of Interest Disclosure Form and certifies that the statement contained therein is true and correct.

In submitting this Bid, it is understood that the right is reserved by the City to accept any Bid, to reject any or all Bids, to waive irregularities and/or informalities in any Bid, and to make the award in any manner the City believes to be in its best interest.

SIGNED THIS 3rd DAY OF February, 2022.

Badger Meter, Inc.	
Bidder's Name	Authorized Signature of Bidder
4545 W Brown Deer Road Milwaukee, WI 53223	Jennifer A. Awah-Manga
Official Address	(Print Name of Signer Above)
800-876-3837	bids@badgermeter.com
Telephone Number	Email Address for Award Notice

LEGAL STATUS OF BIDDER

(The Bidder shall fill out the appropriate form and strike out the other three.)

Bidder declares that it is:

* A corporation organized and doing business under the laws of the State of Wisconsin, for whom Jennifer A. Awah- Manga, bearing the office title of Assitant Secretary, whose signature is affixed to this Bid, is authorized to execute contracts.

NOTE: If not incorporated in Michigan, please attach the corporation's Certificate of Authority

• A limited liability company doing business under the laws of the State of _____, whom _____ bearing the title of _____ whose signature is affixed to this proposal, is authorized to execute contract on behalf of the LLC.

* A partnership, organized under the laws of the state of _____ and filed in the county of _____, whose members are (list all members and the street and mailing address of each) (attach separate sheet if necessary):

_____

_____

_____

_____

* An individual, whose signature with address, is affixed to this Bid: _____
(initial here)

Authorized Official

Jennifer A. Awah-Manga **Date** February 3, 2022 **, 201_**

(Print) Name Jenifer A. Awah-Manga Title Assistant Secretary and Proposal Lead

Company: Badger Meter, Inc

Address: 4545 W. Brown Deer Road Milwaukee, WI 53223

Contact Phone (800) 876-3837 Fax (888) 371-5982

Email bids@badgermeter.com

Vendor Conflict of Interest Disclosure Form

All vendors interested in conducting business with the City of Ann Arbor must complete and return the Vendor Conflict of Interest Disclosure Form in order to be eligible to be awarded a contract. Please note that all vendors are subject to comply with the City of Ann Arbor's conflict of interest policies as stated within the certification section below.

If a vendor has a relationship with a City of Ann Arbor official or employee, an immediate family member of a City of Ann Arbor official or employee, the vendor shall disclose the information required below.

1. No City official or employee or City employee's immediate family member has an ownership interest in vendor's company or is deriving personal financial gain from this contract.
2. No retired or separated City official or employee who has been retired or separated from the City for less than one (1) year has an ownership interest in vendor's Company.
3. No City employee is contemporaneously employed or prospectively to be employed with the vendor.
4. Vendor hereby declares it has not and will not provide gifts or hospitality of any dollar value or any other gratuities to any City employee or elected official to obtain or maintain a contract.
5. Please note any exceptions below:

Conflict of Interest Disclosure*	
Name of City of Ann Arbor employees, elected officials or immediate family members with whom there may be a potential conflict of interest.	( ) Relationship to employee ( ) Interest in vendor's company ( ) Other (please describe in box below)
NA	

*Disclosing a potential conflict of interest does not disqualify vendors. In the event vendors do not disclose potential conflicts of interest and they are detected by the City, vendor will be exempt from doing business with the City.

I certify that this Conflict of Interest Disclosure has been examined by me and that its contents are true and correct to my knowledge and belief and I have the authority to so certify on behalf of the Vendor by my signature below:

Badger Meter, Inc.		800-876-3837
Vendor Name		**Vendor Phone Number**
Jennifer A. Awah-Manga	2/3/2022	Jennifer A. Awah-Manga
Signature of Vendor Authorized Representative	**Date**	**Printed Name of Vendor Authorized Representative**

Questions about this form? Contact Procurement Office City of Ann Arbor Phone: 734/794-6500, procurement@a2gov.org

CITY OF ANN ARBOR
DECLARATION OF COMPLIANCE

Non-Discrimination Ordinance

The "non discrimination by city contractors" provision of the City of Ann Arbor Non-Discrimination Ordinance (Ann Arbor City Code Chapter 112, Section 9:158) requires all contractors proposing to do business with the City to treat employees in a manner which provides equal employment opportunity and does not discriminate against any of their employees, any City employee working with them, or any applicant for employment on the basis of actual or perceived age, arrest record, color, disability, educational association, familial status, family responsibilities, gender expression, gender identity, genetic information, height, HIV status, marital status, national origin, political beliefs, race, religion, sex, sexual orientation, source of income, veteran status, victim of domestic violence or stalking, or weight. It also requires that the contractors include a similar provision in all subcontracts that they execute for City work or programs.

In addition the City Non-Discrimination Ordinance requires that all contractors proposing to do business with the City of Ann Arbor must satisfy the contract compliance administrative policy adopted by the City Administrator. A copy of that policy may be obtained from the Purchasing Manager

The Contractor agrees:

(a) To comply with the terms of the City of Ann Arbor's Non-Discrimination Ordinance and contract compliance administrative policy, including but not limited to an acceptable affirmative action program if applicable.

(b) To post the City of Ann Arbor's Non-Discrimination Ordinance Notice in every work place or other location in which employees or other persons are contracted to provide services under a contract with the City.

(c) To provide documentation within the specified time frame in connection with any workforce verification, compliance review or complaint investigation.

(d) To permit access to employees and work sites to City representatives for the purposes of monitoring compliance, or investigating complaints of non-compliance.

The undersigned states that he/she has the requisite authority to act on behalf of his/her employer in these matters and has offered to provide the services in accordance with the terms of the Ann Arbor Non-Discrimination Ordinance. The undersigned certifies that he/she has read and is familiar with the terms of the Non-Discrimination Ordinance, obligates the Contractor to those terms and acknowledges that if his/her employer is found to be in violation of Ordinance it may be subject to civil penalties and termination of the awarded contract.

BadgerMeter, Inc.
Company Name

Jennifer A. Awah-Manga 2/3/2022
Signature of Authorized Representative Date

Jennifer A. Awah-Manga - Assistant Secretary and Proposal Lead
Print Name and Title

4545 W Good Hope Road Milwaukee, WI 53223
Address, City, State, Zip

800-876-3837
Phone/Email Address

Questions about the Notice or the City Administrative Policy, Please contact:
Procurement Office of the City of Ann Arbor
(734) 794-6500

PRODUCT DATA SHEETS

Badger Meter

E-Series® Ultrasonic Meter

Cold Water Engineered Polymer Meter, 5/8, 5/8 x 3/4, 3/4, and 1 inch

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 x 3/4, 3/4, and 1 inch 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 an in-line connector for easy connection and installation to AMR/AMI endpoints. It is also available with a flying lead for field splice connection.

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.

E-Series Ultrasonic meters meet and exceed ANSI/AWWA C715 standards. The meters comply with the lead-free provisions of the Safe Drinking Water Act, are certified to NSF/ANSI Standards 61 and 372 and carry the NSF-61 mark on the housing.

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…122° F (7…50° 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 in. (15 mm)	5/8 x 3/4 in. (15 mm)	3/4 in. (20 mm)	1 in. (25 mm)
Normal Test Flow Limits	0.1…25 gpm (0.02…5.7 m³/hr)	0.1…25 gpm (0.02…5.7 m³/hr)	0.1…32 gpm (0.02…7.3 m³/hr)	0.4…55 gpm (0.09…12.5 m³/hr)
Minimum Test Flow Limits	0.05 gpm (0.01 m³/hr)	0.05 gpm (0.01 m³/hr)	0.05 gpm (0.01 m³/hr)	0.25 gpm (0.06 m³/hr)
Safe Maximum Operating Condition (SMOC)	25 gpm (5.7 m³/hr)	25 gpm (5.7 m³/hr)	32 gpm (7.3 m³/hr)	55 gpm (12.5 m³/hr)
Typical Pressure Loss	4.3 psi at 15 gpm (0.3 bar @ 3.4 m³/hr)	2.3 psi at 15 gpm (0.16 bar @ 3.4 m³/hr)	2.0 psi at 15 gpm (0.14 bar @ 3.4 m³/hr)	1.8 psi at 25 gpm (0.12 bar @ 5.7 m³/hr)
Reverse Flow - Maximum Rate	4.0 gpm (0.9 m³/hr)	4.0 gpm (0.9 m³/hr)	4.0 gpm (0.9 m³/hr)	9.0 gpm (2.0 m³/hr)
Operating Performance	In the normal temperature range of 45…122° F (7…50° 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 (66° 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 in. (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			

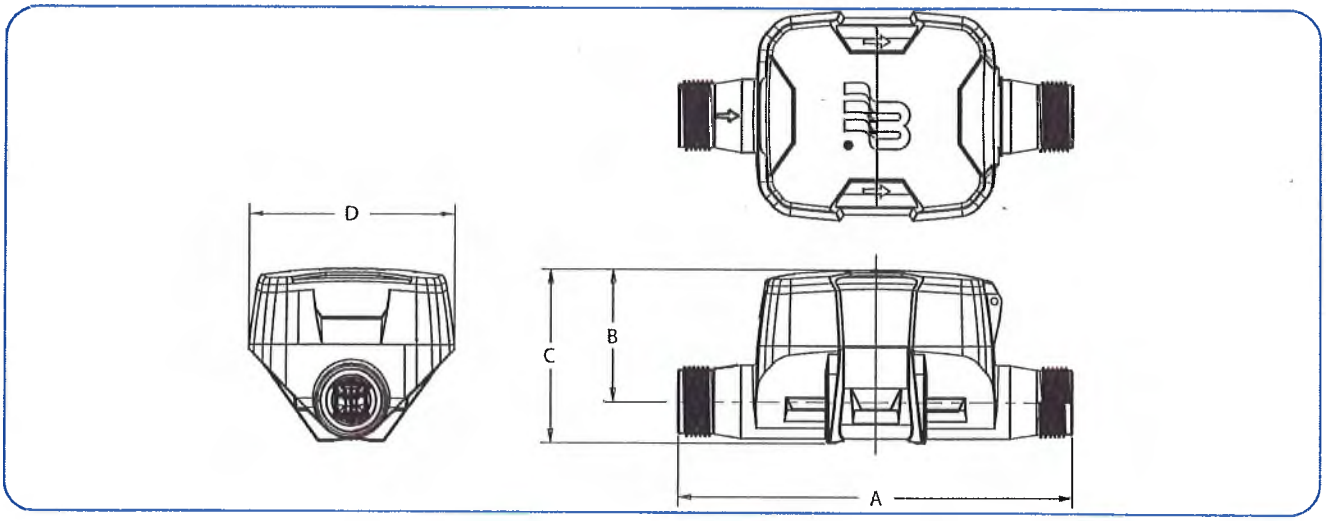
MATERIALS

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

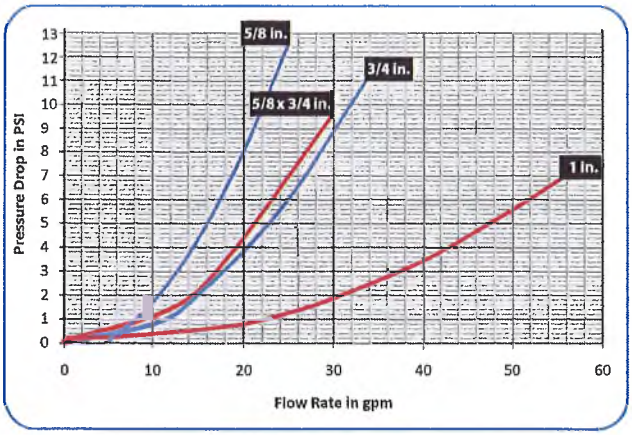
E-Series Ultrasonic Meter Size	5/8 in. (15 mm)	5/8 (15 mm) x 3/4 in. (20 mm)	3/4 in. (20 mm)	1 in. (25 mm)
Size Designation X Lay Length	5/8 × 7-1/2 in. (16 × 191 mm)	5/8 × 3/4 × 7-1/2 in. (16 × 19 × 191 mm)	3/4 × 7-1/2 in. or 3/4 × 9 in. (19 × 191 mm or 19 × 229 mm)	1 × 10-3/4 in. (25 × 273 mm)
Weight (without AMR)	1.60 lb (0.73 kg)	1.58 lb (0.72 kg)	3/4 × 7-1/2 in.: 1.58 lb or 3/4 × 9 in.: 1.64 lb (19 × 191 mm: 0.72 kg or 19 × 229 mm: 0.74 kg)	2.3 lb (1.04 kg)
See illustration below for Measurement Designations.				
Length (A)	7.5 in. (191 mm)	7.5 in. (191 mm)	7.5 in. or 8.85 in. (191 mm or 225 mm)	10.75 in. (273 mm)
Height (B)	2.46 in. (62 mm)	2.46 in. (62 mm)	2.46 in. (62 mm)	2.66 in. (68 mm)
Height (C)	3.27 in. (83 mm)	3.23 in. (82 mm)	3.23 in. (82 mm)	3.62 in. (92 mm)
Width (D)	3.90 in. (99 mm)	3.90 in. (99 mm)	3.90 in. (99 mm)	3.90 in. (99 mm)
Bore Size	5/8 in. (15 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)	1 in. (25 mm)
Coupling Nut & Spud Thread	3/4 in. × 14 NPSM	1 in. × 11-1/2 NPSM	1 in. × 11-1/2 NPSM	1-1/4 in. × 11-1/2 NPSM
Tailpiece Pipe Thread (NPT)	1/2 in.	3/4 in.	3/4 in.	1 in.
Service Pipe Thread (NPT)	1/2 in.	3/4 in.	3/4 in.	1 in.

MEASUREMENT DESIGNATIONS



PRESSURE LOSS CHART

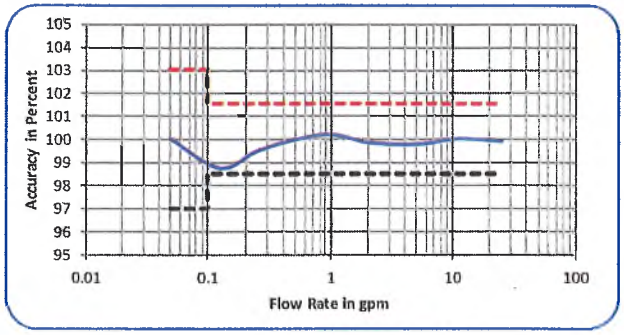
Rate of Flow in gallons per minute (gpm)



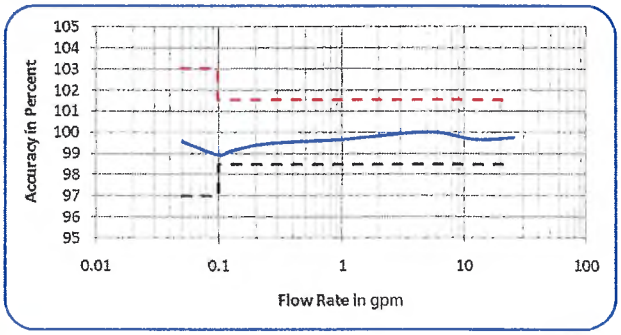
ACCURACY CHARTS

Rate of Flow in gallons per minute (gpm)

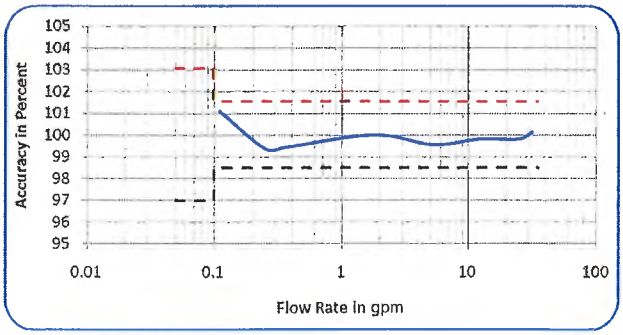
5/8 IN. METER



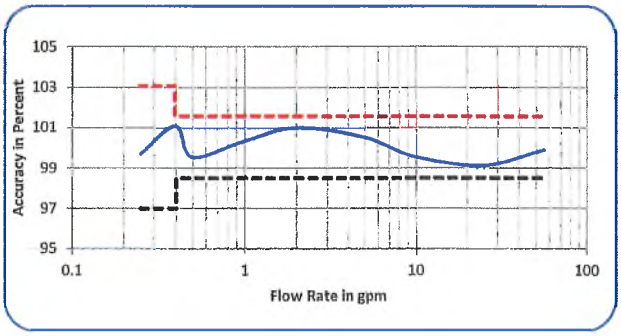
5/8 x 3/4 IN. METER



3/4 IN. METER



1 IN. METER



SMART WATER IS *BADGER METER*

E-Series is a registered trademark of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities.
Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2020 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

Legacy Document Number: ESM-T-12-EN

Badger Meter

E-Series® Ultrasonic Meter

Cold Water Stainless Steel Meter, 5/8, 5/8 x 3/4, 3/4 and 1 inch

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.

Offered in four sizes and lay lengths, the Ultrasonic meter features:

- 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 an in-line connector for easy connection and installation to AMR/AMI endpoints. It is also available with a flying lead for field splice connection.

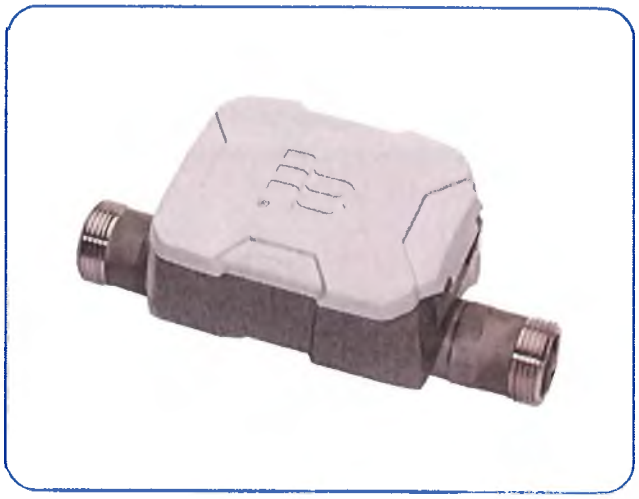
APPLICATIONS

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

E-Series Ultrasonic meters meet and exceed ANSI/AWWA C715 standards. The meters comply with the lead-free provisions of the Safe Drinking Water Act, are certified to NSF/ANSI Standards 61 and 372 and carry the NSF-61 mark on the housing.

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…122° F (7…50° 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 a stainless steel, 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 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.

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 that occurs when the flow sensors are not fully submerged.

SPECIFICATIONS

E-Series Ultrasonic Meter Size	5/8 in. (16 mm)	5/8 x 3/4 in. (16 x 19 mm)	3/4 in. (19 mm)	1 in. (25 mm)
Normal Test Flow Limits	0.1…25 gpm (0.02…5.7 m³/hr)	0.1…25 gpm (0.02…5.7 m³/hr)	0.1…32 gpm (0.02…7.3 m³/hr)	0.4…55 gpm (0.09…12.5 m³/hr)
Minimum Test Flow Limits	0.05 gpm (0.01 m³/hr)	0.05 gpm (0.01 m³/hr)	0.05 gpm (0.01 m³/hr)	0.25 gpm (0.06 m³/hr)
Safe Maximum Operating Condition (SMOC)	25 gpm (5.7 m³/hr)	25 gpm (5.7 m³/hr)	32 gpm (7.3 m³/hr)	55 gpm (12.5 m³/hr)
Typical Pressure Loss	4.3 psi @ 15 gpm (0.3 bar @ 3.4 m³/hr)	2.3 psi @ 15 gpm (0.16 bar @ 3.4 m³/hr)	2.0 psi @ 15 gpm (0.14 bar @ 3.4 m³/hr)	1.8 psi @ 25 gpm (0.12 bar @ 5.7 m³/hr)
Reverse Flow - Maximum Rate	4 gpm (0.9 m³/hr)	4 gpm (0.9 m³/hr)	4 gpm (0.9 m³/hr)	9 gpm (2.0 m³/hr)
Operating Performance	In the normal temperature range of 45…122° F (7…50° 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 (66° 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 in. (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			

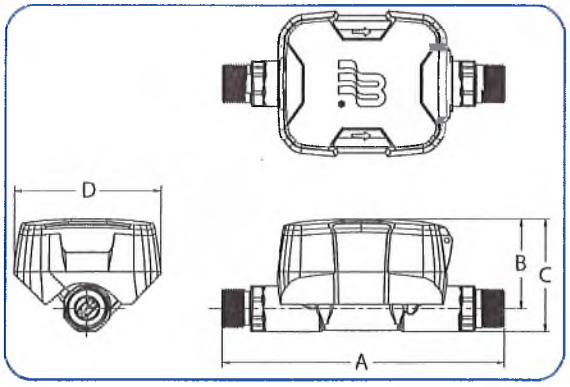
MATERIALS

Meter Housing	316 stainless steel
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

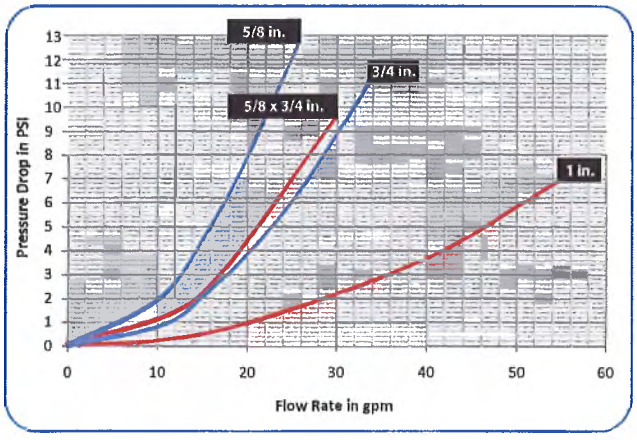
E-Series Ultrasonic Meter Size	5/8 in. (16 mm)	5/8 x 3/4 in. (16 x 19 mm)	3/4 in. (19 mm)	1 in. (25 mm)
Size Designation x Lay Length	5/8 x 7-1/2 in. (16 x 191 mm)	5/8 x 3/4 x 7-1/2 in. (16 x 19 x 191 mm)	3/4 x 7-1/2 in. or 3/4 x 9 in. (19 x 191 mm or 19 x 229 mm)	1 x 10-3/4 in. (25 x 273 mm)
Weight (without AMR)	2.2 lb (1 kg)	2.1 lb (.95 kg)	3/4 x 7-1/2 in.: 2.1 lb or 3/4 x 9 in.: 2.4 lb (20 x 190 mm: 0.95 kg or 20 x 229 mm: 1.08 kg)	3.1 lb (1.4 kg)
See illustration below for Measurement Designations.				
Length (A)	7.5 in. (191 mm)	7.5 in. (191 mm)	7.5 in. or 8.98 in. (191 mm or 228 mm)	10.745 in (273 mm)
Height (B)	2.404 in. (61 mm)	2.404 in. (61 mm)	2.404 in. (61 mm)	2.529 in. (64 mm)
Height (C)	3.014 in. (77 mm)	3.014 in. (77 mm)	3.094 in. (79 mm)	3.359 in. (85 mm)
Width (D)	3.898 in. (99 mm)	3.898 in. (99 mm)	3.898 in. (99 mm)	3.898 in. (99 mm)
Bore Size	5/8 in. (16 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)	1 in. (25 mm)
Coupling Nut & Spud Thread	3/4 in. x 14 NPSM	1 in. x 11-1/2 NPSM	1 in. x 11-1/2 NPSM	1-1/4 in. x 11-1/2 NPSM
Tailpiece Pipe Thread (NPT)	1/2 in.	3/4 in.	3/4 in.	1 in.
Service Pipe Thread (NPT)	1/2 in.	3/4 in.	3/4 in.	1 in.

Measurement Designations



PRESSURE LOSS CHART

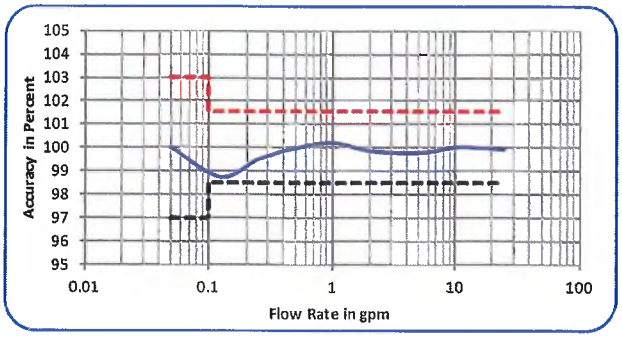
Rate of Flow in gallons per minute (gpm)



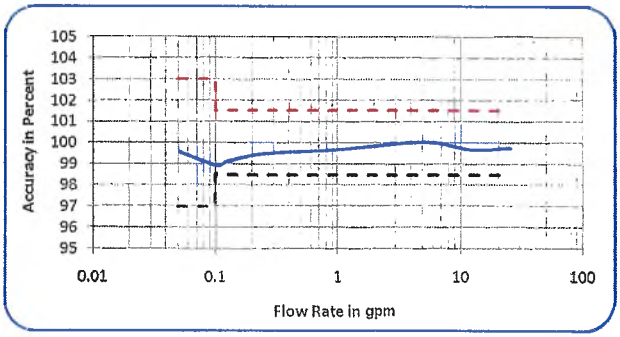
ACCURACY CHARTS

Rate of Flow in gallons per minute (gpm)

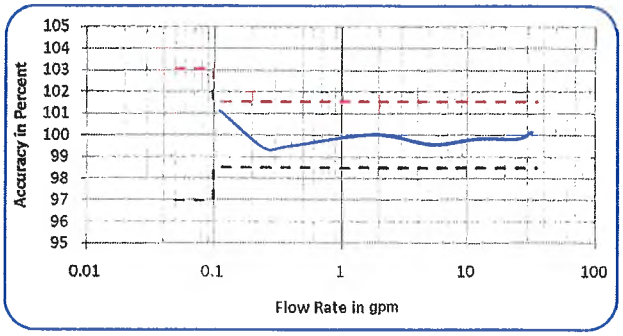
5/8 in. Meter



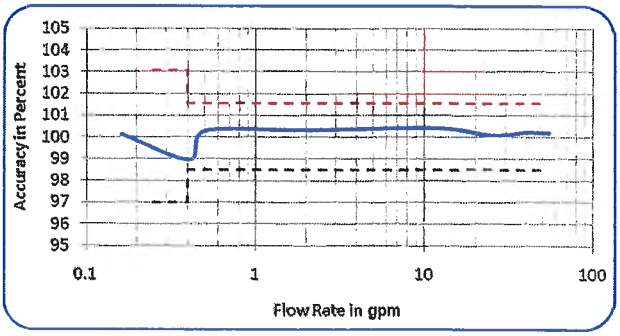
5/8 x 3/4 in. Meter



3/4 in. Meter



1 in. Meter



SMART WATER IS *BADGER METER*

E-Series is a registered trademark of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2020 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

Legacy Document Number: ESM-T-01-EN

E-Series®
Ultrasonic Flow Meters

E-Series G2® Ultrasonic Meters

Lead-Free Bronze Alloy, 5/8 x 3/4 inch

DESCRIPTION

The next generation E-Series G2® Ultrasonic meter uses solid-state technology in a compact, tamper protected, weatherproof and UV-resistant housing, suitable for residential applications. Electronic metering provides information—such as rate of flow and status and alarm indication—and data not typically available through traditional, mechanical meters and registers. Electronic metering minimizes measurement errors due to sand, suspended particles and pressure fluctuations.

Ultrasonic Meter Features

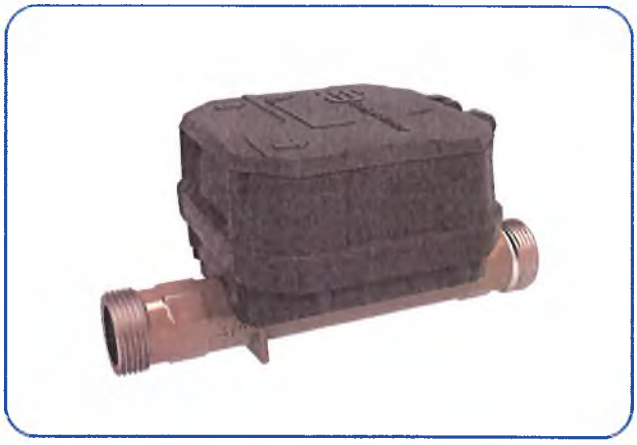
- Open flow tube design prevents obstruction of flow, and provides greater turn-down ratio for extended flow ranges and increased revenue
- No moving parts for increased performance and maximized revenue
- Easy-to-read, 9-digit LCD display for consumption, rate of flow, unit of measure, pressure, temperature, alarm conditions and firmware version
- Meter alarms for better utility visibility and management
- Pressure* and temperature data and alarms reported at meter and through ORION® Cellular LTE-M/LTE endpoints and BEACON® AMA
- Field programmable registration and reporting features
- Designed with replaceable electronics for increased efficiency and savings
- Maximum flow reporting analytics available to improve meter right sizing and monitor irrigation events
- Single and dual outputs include encoder, scaled/unscaled and 4-20 mA

OPERATION AND 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 screen toggles to total volume, unit of measure, rate of flow, pressure*, temperature, firmware and alarm conditions (reverse-flow, no usage, empty pipe, exceeding max flow, suspected leak, pressure*, temperature, end of life and measurement error).

*available with optional integrated pressure sensor



When connected to ORION Cellular LTE-M or LTE endpoints, both the pressure and temperature information are communicated to and presented in BEACON AMA, helping utilities understand and proactively manage their water systems faster and more efficiently.

In the normal temperature range of 45…122° F (7…50° C), the "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

APPLICATIONS

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

E-Series Ultrasonic meters meet and exceed ANSI/AWWA C715 Standards. The lead-free bronze alloy meters comply with the lead-free provisions of the Safe Drinking Water Act and NSF/ANSI Standards 61 and 372.

CONSTRUCTION

The E-Series Ultrasonic meter features lead-free bronze alloy meter housing, ultrasonic transducers, a meter-control circuit board with associated wiring, LCD, and battery. Wetted elements are limited to the pressure vessel and transducers. The electronic components are housed and fully potted within a molded, engineered polymer enclosure, which is attached to the meter housing. The transducers extend through the housing and are sealed by O-rings, enabling turbulence-free water flow through the tube. The open flow tube design prevents obstruction of flow to reduce pressure loss and provide long-term accuracy.

METER INSTALLATION

For long-term performance the meter is weatherproof, UV-resistant, fully submersible and can be installed using horizontal or vertical piping. The registration electronics and battery are encapsulated to withstand harsh environments and protect the electronics in flooded or submerged pit applications. The meter will not measure flow when an "empty pipe" condition is experienced.

NOTE: An empty pipe is defined as a condition that occurs when the flow sensors are not fully submerged.

The meter is available with an in-line connector for easy installation and connection to ORION endpoints. It is also available with a flying lead for field splice connection.

SPECIFICATIONS

E-Series G2 Ultrasonic Meter Size	**5/8 x 3/4 in.**
Normal Test Flow Limits	0.08…30 gpm (0.02…6.8 m^3/hr)
Minimum Test Flow Limits	0.04 gpm (0.01 m^3/hr)
Safe Maximum Operating Condition (SMOC)	30 gpm (6.8 m^3/hr)
Typical Pressure Loss	2.6 psi @ 15 gpm (0.18 bar @ 3.4 m^3/hr)
Operating Performance	In the normal temperature range of 45…122 °F (7…50 °C), new meter consumption measurement is accurate to: • 100% ±1.5% over the normal test flow limits • 100% ±3.0% for the minimum test flow limits
Storage Temperature	–40…140° F (–40…60° C)
Maximum Ambient Storage (Storage for One Hour)	150° F (66° 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 Working Pressure of Meter Housing	175 psi (12 bar)
Maximum Operating Pressure of Pressure Sensor	150 psi (10 bar)
Pressure Sensor Accuracy	±2% of full scale pressure, up to 150 psi (10 bar)
Register Type	Straight reading, permanently sealed electronic LCD; digits are 0.28 in. (7 mm) high
Register Display	• Total consumption (nine digits) • Unit of measure (factory programmed for gallons, cubic feet and cubic meters) • Rate of flow • Pressure *(Optional: for meters ordered with Integrated pressure sensor)* • Temperature • Alarm and operating mode • Firmware version • Alarm indicators
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

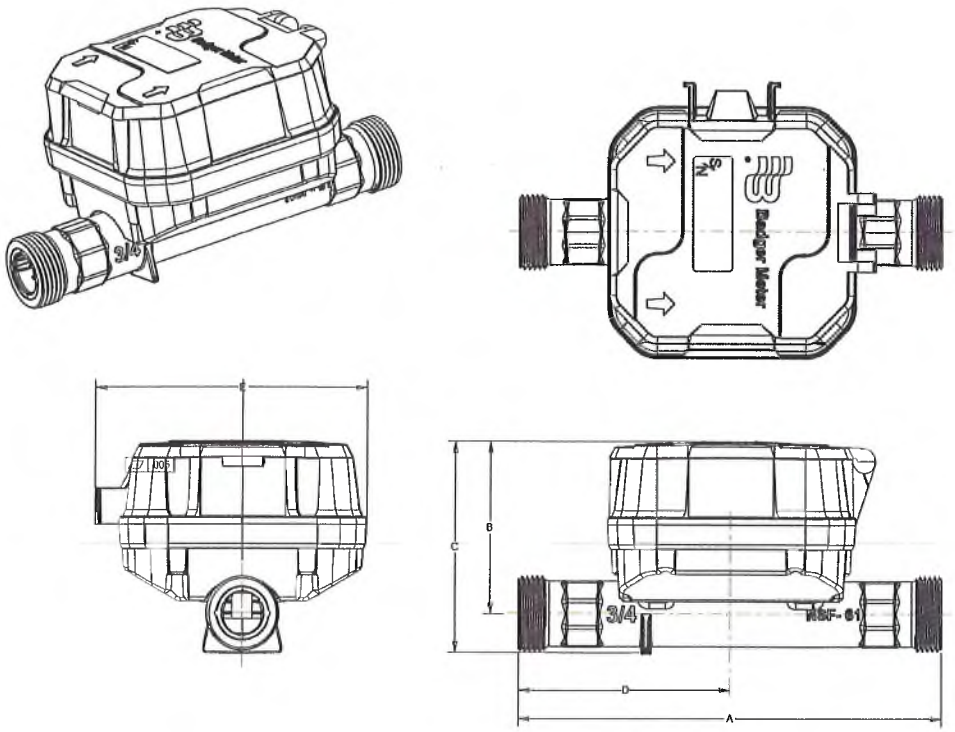
MATERIALS

Meter Housing	Lead-free bronze alloy
Measuring Section	Ultrasonic sensors located in the flow tube
Register Housing and Lid	Engineered polymer

PHYSICAL DIMENSIONS

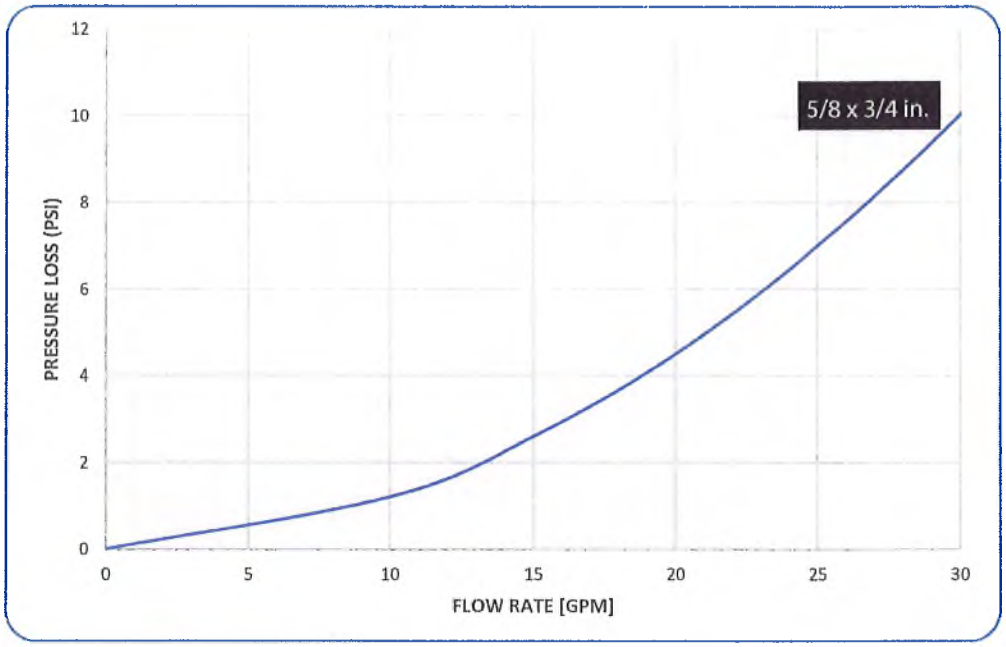
E-Series G2 Ultrasonic Meter Size	**5/8 x 3/4 in.**
Size Designation X Lay Length	5/8 × 3/4 × 7-1/2 in. (16 × 19 × 191 mm)
Bore Size	3/4 in. (19 mm)
Coupling Nut & Spud Thread (NPT)	1 in. (25 mm) × 11-1/2 NPSM
Service Pipe Thread	3/4 in. (19 mm)
Weight (without AMR)	2.7 lb (1.23 kg)
See illustration below for Measurement Designations	
Length (A)	7.49 in. (190 mm)
Height (B)	2.99 in. (76 mm)
Height (C)	3.66 in. (93 mm)
Length (D)	3.74 in. (95 mm)
Width (E)	4.82 in. (122 mm)

Measurement Designations



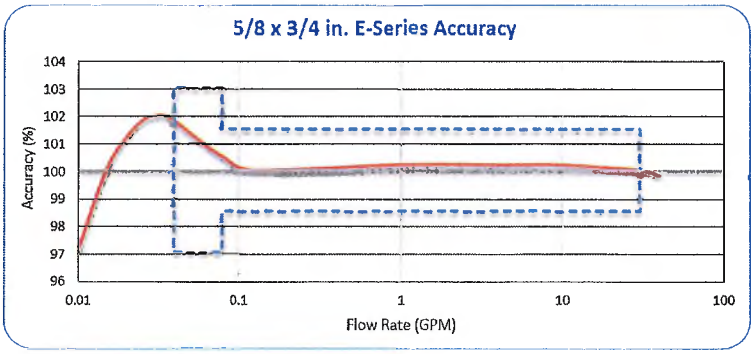
PRESSURE LOSS CHART

Chart represents typical meter performance. Rate of flow in gallons per minute (gpm).



ACCURACY CHART

Charts represent typical meter performance. Rate of flow in gallons per minute (gpm).



SMART WATER IS *BADGER METER*

BEACON, E-Series, E-Series G2 and ORION are registered trademarks of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2021 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

Badger Meter

E-Series® Ultrasonic Meter

Cold Water Stainless Steel Meter, 1-1/2 and 2 inch

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 1-1/2 and 2 inch 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 an in-line connector for easy connection and installation to AMR/AMI endpoints. It is also available with a flying lead for field splice connection.

APPLICATIONS

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

E-Series Ultrasonic meters meet and exceed ANSI/AWWA C715 standards. The meters comply with the lead-free provisions of the Safe Drinking Water Act, are certified to NSF/ANSI Standards 61 and 372 and carry the NSF-61 mark on the housing.

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…122° F (7…50° 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 a stainless steel, 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, the 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 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.

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 that occurs when the flow sensors are not fully submerged.

SPECIFICATIONS

E-Series Ultrasonic Meter Size	1-1/2 in. (40 mm)	2 in. (50 mm)
Normal Test Flow Limits	1.25…100 gpm (0.28…22.7 m³/hr)	1.5…160 gpm (0.34…36.3 m³/hr)
Minimum Test Flow Limits	0.40 gpm (0.09 m³/hr)	0.50 gpm (0.11 m³/hr)
Safe Maximum Operating Condition (SMOC)	100 gpm (22.7 m³/hr)	160 gpm (36.3 m³/hr)
Typical Pressure Loss	3.8 psi (0.26 bar)	5.2 psi (0.36 bar)
Reverse Flow – Maximum Rate	12 gpm (2.73 m³/hr)	18 gpm (4.09 m³/hr)
Operating Performance	In the normal temperature range of 45…122° F (7…50° 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 (66° 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 in. (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	• 100,000,000 gallons • 10,000,000 cubic feet • 1,000,000 cubic meters	
Totalization Display Resolution	• Gallons: 0.X • Cubic feet: 0.XX • Cubic meters: 0.XXX	
Battery	3.6-volt lithium thionyl chloride; battery is fully encapsulated within the register housing and is not replaceable; 20-year battery life	

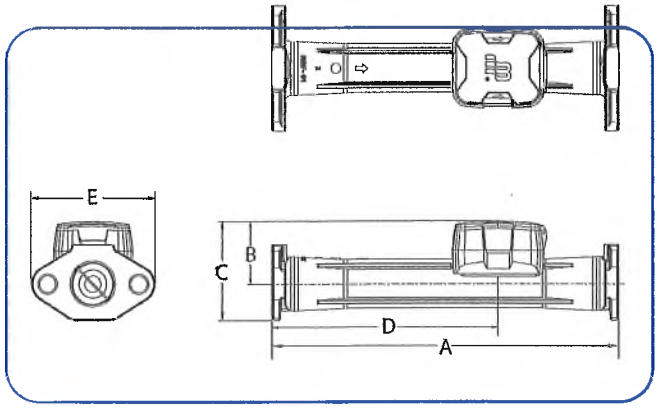
MATERIALS

Meter Housing	316 stainless steel
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

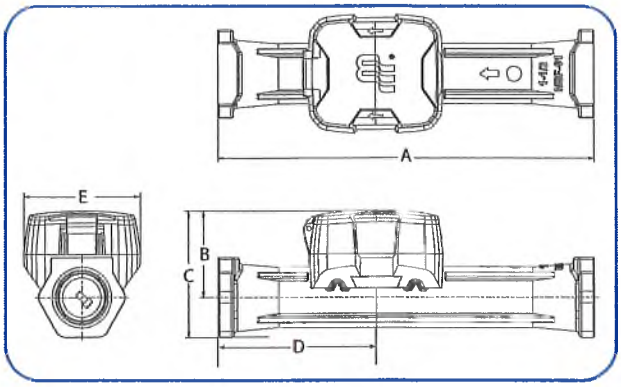
PHYSICAL DIMENSIONS

E-Series Ultrasonic Meter Size	1-1/2 in. (40 mm)	1-1/2 in. (40 mm)	2 in. (50 mm)	2 in. (50 mm)
Housing	Elliptical	HEX	Elliptical	HEX
Size Designation X Lay Length	1-1/2 x 13 in. (38 x 330 mm)	1-1/2 x 12.62 in. (38 x 321 mm)	2 x 17 in. (51 x 432 mm)	2 x 15.25 in. (51 x 387 mm)
Weight (without AMR)	8.2 lb (3.7 kg)	6.5 lb (2.9 kg)	11.9 lb (5.4 kg)	8.9 lb (4.0 kg)
See illustration below for Measurement Designations.				
Length (A)	13 in. (330 mm)	12.62 in. (321 mm)	17 in. (432 mm)	15.25 in. (387 mm)
Height (B)	2.80 in. (71 mm)	2.84 in. (72 mm)	3.01 in. (77 mm)	3.06 in. (78 mm)
Height (C)	4.55 in. (116 mm)	4.15 in. (105 mm)	4.76 in. (121 mm)	4.68 in. (119 mm)
Length (D)	7.10 in. (180 mm)	5.31 in. (135 mm)	11.10 in. (282 mm)	5.05 in. (128 mm)
Width (E)	5.50 in. (140 mm)	3.90 in. (99 mm)	6.08 in. (154 mm)	3.90 in. (99 mm)
Bore Size	1-1/2 in. (40 mm)	1-1/2 in. (40 mm)	2 in. (51 mm)	2 in. (51 mm)
Two-Bolt Elliptical Flange (AWWA)	1-1/2 in. (40 mm)	—	2 in. (51 mm)	—
Bolt Hole Diameter	0.69 in. (17.53 mm)	—	0.81 in. (20.57 mm)	—
Companion Flange	1-1/2 in. (40 mm)	—	2 in. (51 mm)	—
Internal Thread Size	—	1-1/2 in. NPT	—	2 in. NPT

Elliptical Measurement Designations

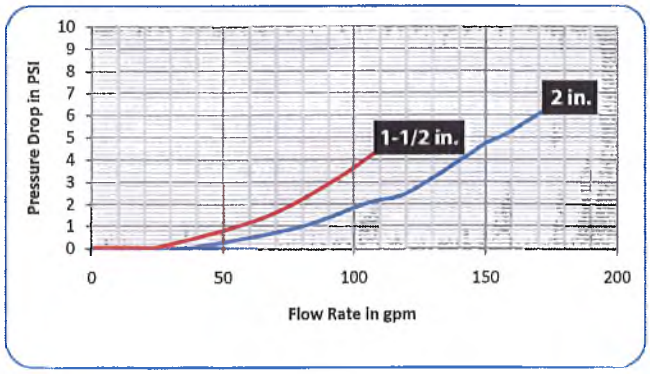


HEX Measurement Designations



PRESSURE LOSS CHART

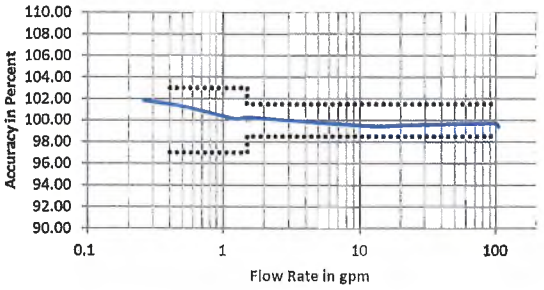
Flow rate in Gallons Per Minute (gpm)



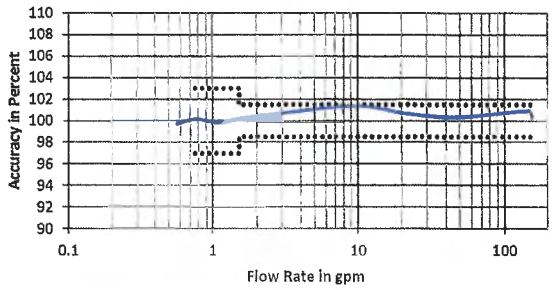
ACCURACY CHARTS

Rate of Flow in gallons per minute (gpm)

1-1/2 in. Meter



2 in. Meter



SMART WATER IS *BADGER METER*

E-Series is a registered trademark of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2020 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

Legacy Document Number: ESM-T-10-EN

ModMAG®

M-Series® | Electromagnetic Flow Meters

Electromagnetic Flow Meters

M5000

DESCRIPTION

Designed, developed and manufactured under strict quality standards, the M5000 electromagnetic flow meter features sophisticated, processor-based signal conversion with accuracies of ± 0.4%. Based on Faraday's Law of Induction, these meters can measure potable water, reclaimed water, ground water and clear, water-based applications that have minimal electrical conductivity.

With no moving parts in the flow stream, there is no pressure loss. Also, accuracy is not affected by temperature, pressure, viscosity or density and there is practically no maintenance required. It is encased in an IP67 housing (optional IP68), which makes it a reliable meter even when submerged.

APPLICATION

The M5000 mag meter is designed for applications without power line access, where flow is continuous, and when indication of rate and totalization are required. The M5000 can accurately measure fluid flow—the fluid is potable or reclaimed water and can contain a moderate amount of solids. The meter is successfully used in water distribution networks and irrigation.

The standard meter is equipped with an internal datalogger or M-Bus interface, or optionally with an externally powered RS485 interface with Modbus®. The collected data can also be retrieved via radio frequency or GSM/GPRS. The data can then be centrally compiled and evaluated. The meter can be checked without process interruption using the Verification Device.

OPERATING PRINCIPLE

The flow meter is a stainless steel tube lined with a non-conductive material. Outside the tube are two DC-powered electromagnetic coils positioned opposite each other. Perpendicular to the coils are two electrodes inserted into the flow tube. The energized coils create a magnetic field across the diameter of the pipe.

As a conductive fluid flows through the magnetic field, a voltage is induced across the electrodes. This voltage is proportional to the average flow velocity of the fluid and is measured by the two electrodes. This induced voltage is then amplified and digitally processed by the converter to produce an accurate analog or digital signal. The signal can then be used to indicate flow rate and totalization, or to communicate to remote sensors and controllers. In addition, the processor controls zero-flow stability, frequency outputs, serial communications, and other parameters.

FEATURES

- Available in sizes 1/2…24 in. (DN 15…600)
- Battery powered, with battery life up to 20 years
- ± 0.4% of measured value ± 2 mm/s accuracy independent of fluid viscosity, density and temperature
- Unaffected by most solids contained in fluids
- LCD Display
- Pulsed DC magnetic field for zero point stability
- No pressure loss for low operational costs
- Corrosion resistant liners for long life
- Calibrated in state-of-the art facilities
- Integral and remote signal converter availability
- Optional grounding rings or grounding electrode
- Measurement largely independent of flow profile
- Low-power digital microcontroller (16 bit)
- Simple programming procedure
- Digital and infrared outputs
- Automatic zero-point stability
- Non-volatile programming
- NSF/ANSI/CAN 61 and 372, OIML and MID certified
- Data logging
- Verification device
- IP67/IP68 protection class
- Modbus RTU (RS232), IRDA, M-Bus, optional Modbus RTU (RS 485)
- BEACON®/AquaCUE® connectivity

Badger Meter

MAG-DS-00175-EN-15 (January 2022)

Product Data Sheet

ELECTRODES

When looking from the end of the meter into the inside bore, the two measuring electrodes are positioned at three o'clock and nine o'clock. M5000 mag meters have an "empty pipe detection" feature. This is accomplished with a third electrode positioned in the meter between twelve o'clock and one o'clock.

If this electrode is not covered by fluid for a minimum five-second duration, the meter will display an "empty pipe detection" condition, send out an error message, if desired, and stop measuring to maintain accuracy. When the electrode again becomes covered with fluid, the error message will disappear and the meter will continue measuring.

The wide selection of liner and electrode materials helps provide maximum compatibility and minimum maintenance over a long operating period. The M5000 amplifier can be integrally mounted to the detector, or if necessary, mounted remotely. The amplifier is housed in a NEMA 4X (IP67) enclosure.

In addition to using grounding rings, a grounding electrode (fourth electrode) can be built into the meter during manufacturing to assure proper grounding. The position of this electrode is at five o'clock

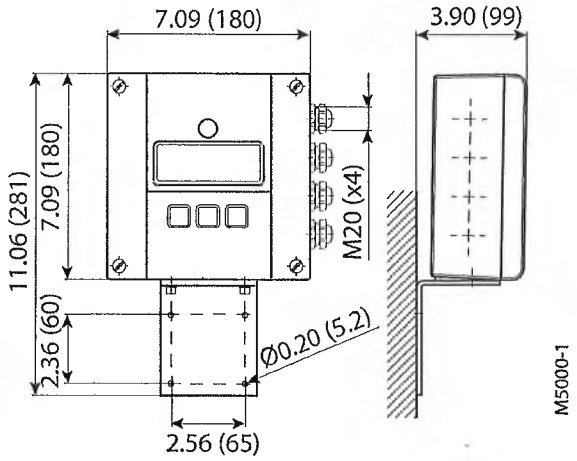
SPECIFICATIONS

NOTE: Measurements in DN are for Nominal Diameter in mm.

M5000 Amplifier

Flow Range	0.1…32.8 ft/s (0.03…10 m/s)	
Accuracy	± 0.4% of measured value ± 2 mm/s OIML/MID: 2…12 in. (DN50…300) with 0d up and 0d downstream ±1% ≥ 1.2 ft/s (0.35 m/s)	
Repeatability	± 0.1%	
Data Logging	About 7,000 records (read out by Modbus or IrDA interface) Logging interval from 1 min to 24 h	
Ambient Temperature	–4…140° F (–20…60° C)	
Flow Direction	Uni-directional or bi-directional. Two separate programmable totalizers for uni-directional measurement.	
Digital Outputs (4)	Galvanically isolated open collector, 30V DC maximum, 20 mA each, maximum output frequency at 100 Hz	
	Absolute Digital Encoded output for connectivity to AquaCUE or BEACON cellular endpoints	
Status Outputs	ADE, High/low flow alarm (0…100% of flow), error alarm, empty pipe alarm, flow direction	
Communication	RS232, Modbus RTU, IrDA, M-Bus, RS 485 (optional), External AMR or GSM/GPRS module (optional)	
Empty Pipe Detection	Separate electrode, field-tunable for optimum performance based on specific application	
Min-Max Flow Alarm	Programmable outputs 0…100% of flow	
Low Flow Cut-Off	Programmable 0…10% of maximum flow	
Galvanic Separation	Functional 500 volts	
Pulse Width	Programmable 5…500 ms	
Coil Power	Pulsed DC	
Sampling Rate	Programmable from 1 to 63 seconds. Standard sampling period is 15 seconds.	
Display	Two lines x 15 characters (7 on top + 8 on bottom), LCD display	
Programming	Three external buttons	
Units of Measure	Gallons, ounces, MGD, liters, cubic meters, cubic feet, imperial gallon, barrel, hectoliter and acre feet	
Battery Life	*Standard*: 10 years with one battery pack; *optional*: up to 20 years with two battery packs for sizes 6 in. (DN 150) or smaller.	
Power Supply	*Standard*: Internal lithium batteries 3.6 volt, optional external battery pack *Optional*: battery back-up model (100…240V AC or 9…36V DC)	
Processing	Low power microcontroller (16 bit)	
Amplifier Housing	NEMA 4X (IP67, optional IP68), cast aluminum, powder-coated paint	
Mounting	Detector-mount or remote wall mount (bracket supplied)	
Meter Enclosure Classification	*Standard*: NEMA 4X (IP67); *Optional*: Submersible NEMA 6P IP68, remote amplifier required	
Junction Box Enclosure Protection	For remote amplifier option:	*Standard*: Powder coated die-cast aluminum, NEMA 4 (IP67) *Optional*: Stainless steel housing 304, Submersible NEMA 6P (IP68)
Approvals	NSF/ANSI/CAN 61 and 372	Models with hard rubber liner 4 in. (DN 100) size and up; PTFE liner, all sizes.
	OIML R49-1	
	MID MI-001	

M5000 Amplifier Dimensions in Inches (Millimeters)



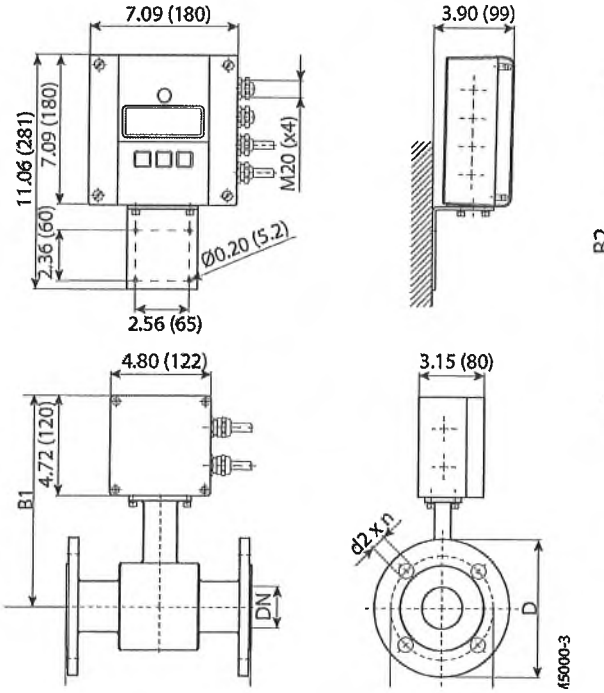
Detector Weight and Flow Range

Size in. (DN)	Est. Weight with Amplifier lb (kg)	Flow Range	
		US	Metric
1/2 (15)	17 (7.7)	0.084…28.0 GPM	0.318…106 l/min
3/4 (20)	17 (7.7)	0.149…49.8 GPM	0.57…188 l/min
1 (25)	18 (8.8)	0.233…78 GPM	0.88…295 l/min
1-1/4 (32)	20.3 (9.2)	0.382…127 GPM	1.45…483 l/min
1-1/2 (40)	22 (10)	0.60…199 GPM	2.26…754 l/min
2 (50)	26 (11.7)	0.93…311 GPM	3.53…1.178 l/min
2-1/2 (65)	35 (15.7)	1.58…526 GPM	0.358…119 m^3/h
3 (80)	38 (17.1)	2.39…797 GPM	0.54…181 m^3/h
4 (100)	49 (22.1)	3.73…1245 GPM	0.85…283 m^3/h
5 (125)	60 (27.1)	5.8…1945 GPM	1.33…442 m^3/h
6 (150)	71 (32.1)	8.4…2801 GPM	1.91…636 m^3/h
8 (200)	96 (43.1)	14.9…4979 GPM	3.39…1131 m^3/h
10 (250)	130 (59.1)	23.3…7780 GPM	5.3…1767 m^3/h
12 (300)	219 (99.3)	33.6…11,204 GPM	7.6…2545 m^3/h
14 (350)	287 (130.2)	45.7…15,249 GPM	10.4…3464 m^3/h
16 (400)	354 (160.9)	60…19,918 GPM	13.6…4524 m^3/h
18 (450)	409 (185.3)	76…25,208 GPM	17.2…5725 m^3/h
20 (500)	502 (228.3)	93…31,121 GPM	21.2…7068 m^3/h
22 (550)	532 (241.3)	113…37,657 GPM	25.7…8553 m^3/h
24 (600)	561 (255.3)	134…44,814 GPM	30.5…10,178 m^3/h

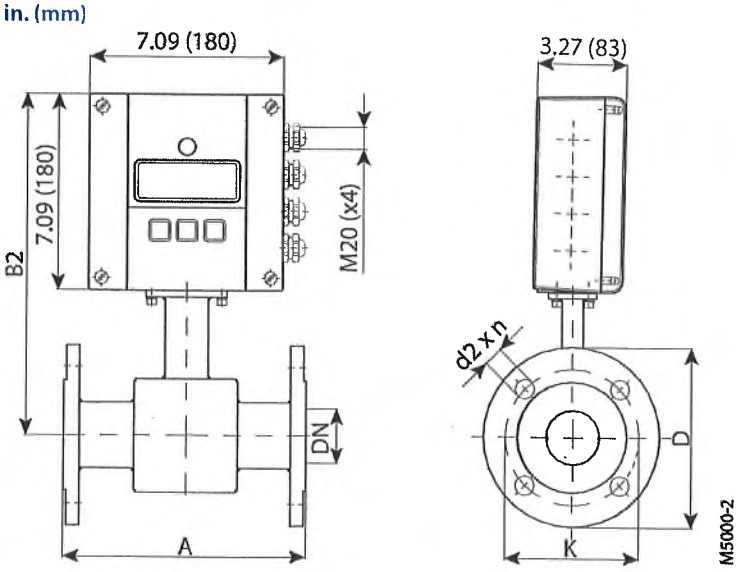
Detector Type VI

Size	1/2…24 in. (DN 15…600)			
Process Connection	**Flange Type**	DIN, ANSI, JIS, AWWA and more		
	Material	*Standard*: carbon steel; *optional*: stainless steel 304/316		
Pressure Limits	Up to 1450 psi (100 bar) PED			
Meter Enclosure Classification	*Standard*: NEMA 4X (IP67); *Optional*: Submersible NEMA 6P IP68, remote amplifier required			
Minimum Conductivity	≥20 µS/cm			
Liners	**Material**	**Available for sizes**	**Fluid Temp for Remote Mount**	**Fluid Temp for Meter Mount**
	PTFE	1/2…24 in. (DN 15…600)	302° F (150° C)	212° F (100° C)
	Hard rubber	1…24 in. (DN 25…600)	178° F (80° C)	178° F (80° C)
Electrode Materials	*Standard*: Hastelloy® C; *optional*: Tantalum, Platinum/Gold plated, Platinum/Rhodium, 316 stainless steel			
Meter Housing Material	*Standard*: Carbon steel painted; *optional*: Stainless steel 304/316 or painted in C5M			
Optional Stainless Steel Grounding Rings	**ANSI Flanges**		**All Other Flanges**	
	Meter Size	Thickness (of 1 ring)	Meter Size	Thickness (of 1 ring)
	Up through 10 in. 12…24 in.	0.135 in. (3.42 mm) 0.187 in. (4.75 mm)	1/2… 24 in.	0.12 in. (3 mm)

Remote Version in. (mm)



Mounted Version in. (mm)



Flange ANSI Class 150 ASME B16.5

Size DN		A Standard		A ISO*		B1		B2		D		K		d2 x n	
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1/2	15	6.7	170	7.9	200	9.4	238	11.7	298	3.5	89	2.4	61	0.6 x 4	16 x 4
3/4	20	6.7	170	7.9	200	9.4	238	11.7	298	3.9	99	2.8	71	0.6 x 4	16 x 4
1	25	8.9	225	7.9	200	9.4	238	11.7	298	4.3	109	3.1	79	0.6 x 4	16 x 4
1-1/4	32	8.9	225	7.9	200	10.0	253	12.3	313	4.6	117	3.5	89	0.6 x 4	16 x 4
1-1/2	40	8.9	225	7.9	200	10.0	253	12.3	313	5.0	127	3.9	99	0.6 x 4	16 x 4
2	50	8.9	225	7.9	200	10.0	253	12.3	313	6.0	152	4.8	122	0.8 x 4	19 x 4
2-1/2	65	11.0	280	7.9	200	10.7	271	13.0	331	7.0	178	5.5	140	0.8 x 4	19 x 4
3	80	11.0	280	7.9	200	10.7	271	13.0	331	7.5	191	6.0	152	0.8 x 4	19 x 4
4	100	11.0	280	9.8	250	10.9	278	13.3	338	9.0	229	7.5	191	0.8 x 8	19 x 8
5	125	15.7	400	9.8	250	11.7	298	14.1	358	10.0	254	8.5	216	0.9 x 8	22 x 8
6	150	15.7	400	11.8	300	12.2	310	14.6	370	11.0	279	9.5	241	0.9 x 8	22 x 8
8	200	15.7	400	13.8	350	13.3	338	15.7	398	13.5	343	11.8	300	0.9 x 8	22 x 8
10	250	19.7	500	17.7	450	14.3	362	16.6	422	16.0	406	14.3	363	1.0 x 12	25 x 12
12	300	19.7	500	19.7	500	16.7	425	19.1	485	19.0	483	17.0	432	1.0 x 12	25 x 12
14	350	19.7	500	21.7	550	17.7	450	20.1	510	21.0	533	18.8	478	1.1 x 12	28 x 12
16	400	23.6	600	23.6	600	18.7	475	21.1	535	23.5	597	21.3	541	1.1 x 16	28 x 16
18	450	23.6	600	25.6	—	19.7	500	22.0	560	25.0	635	22.8	579	1.3 x 16	32 x 16
20	500	23.6	600	25.6	—	20.7	525	23.0	585	27.5	699	25.0	635	1.3 x 20	32 x 20
24	600	23.6	600	30.7	—	23.1	588	25.5	648	32.0	813	29.5	749	1.4 x 20	35 x 20
Other sizes on request															

IMPORTANT: ISO* sensor lay length according to ISO 20456

Flange ANSI Class 300 ASME B16.5

Size DN		A Standard		A ISO*		B1		B2		D		K		d2 x n	
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1/2	15	6.7	170	7.9	200	9.4	238	11.7	298	3.8	95	2.6	67	0.6 x 4	16 x 4
3/4	20	6.7	170	7.9	200	9.4	238	11.7	298	4.6	117	3.3	83	0.8 x 4	19 x 4
1	25	8.9	225	7.9	200	9.4	238	11.7	298	4.9	124	3.5	89	0.8 x 4	19 x 4
1-1/4	32	8.9	225	7.9	200	10.0	253	12.3	313	5.3	133	3.9	99	0.8 x 4	19 x 4
1-1/2	40	8.9	225	7.9	200	10.0	253	12.3	313	6.1	155	4.5	114	0.9 x 4	22 x 4
2	50	8.9	225	7.9	200	10.0	253	12.3	313	6.5	165	5.0	127	0.8 x 8	19 x 8
2-1/2	65	11.0	280	7.9	200	10.7	271	13.0	331	7.5	191	5.9	149	0.9 x 8	22 x 8
3	80	11.0	280	7.9	200	10.7	271	13.0	331	8.3	210	6.6	168	0.9 x 8	22 x 8
4	100	11.0	280	9.8	250	10.9	278	13.3	338	10.0	254	7.9	200	0.9 x 8	22 x 8
5	125	15.7	400	9.8	250	11.7	298	14.1	358	11.0	279	9.3	235	0.9 x 8	22 x 8
6	150	15.7	400	11.8	300	12.2	310	14.6	370	12.5	318	10.6	270	0.9 x 12	22 x 12
8	200	15.7	400	13.8	350	13.3	338	15.7	398	15.0	381	13.0	330	1.0 x 12	25 x 12
10	250	19.7	500	17.7	450	14.3	362	16.6	422	17.5	445	15.3	387	1.1 x 16	28 x 16
12	300	19.7	500	19.7	500	16.7	425	19.1	485	20.5	521	17.8	451	1.3 x 16	32 x 16
14	350	19.7	500	21.7	550	17.7	450	20.1	510	23.0	584	20.3	514	1.3 x 20	32 x 20
16	400	23.6	600	23.6	600	18.7	475	21.1	535	25.5	648	22.5	572	1.4 x 20	35 x 20
18	450	23.6	600	25.6	—	19.7	500	22.0	560	28.0	711	24.8	629	1.4 x 24	35 x 24
20	500	23.6	600	25.6	—	20.7	525	23.0	585	30.5	775	27.0	686	1.4 x 24	35 x 24
24	600	23.6	600	30.7	—	23.1	588	25.5	648	36.0	914	32.0	813	1.6 x 24	41 x 24
Other sizes on request															

IMPORTANT: ISO* sensor lay length according to ISO 20456

Flange EN 1092-1 / PN 10

Size DN		A Standard		A ISO*		B1		B2		D		K		d2 x n	
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
8	200	15.7	400	13.8	350	13.3	338	15.7	398	13.4	340	11.6	295	0.9 x 8	22 x 8
10	250	19.7	500	17.7	450	14.3	362	16.6	422	15.6	395	13.8	350	0.9 x 12	22 x 12
12	300	19.7	500	19.7	500	16.7	425	19.1	485	17.5	445	15.7	400	0.9 x 12	22 x 12
14	350	19.7	500	21.7	550	17.7	450	20.1	510	19.9	505	18.1	460	0.9 x 16	22 x 16
16	400	23.6	600	23.6	600	18.7	475	21.1	535	22.2	565	20.3	515	1.0 x 16	26 x 16
18	450	23.6	600	25.6	—	19.7	500	22.0	560	24.2	615	22.2	565	1.0 x 20	26 x 20
20	500	23.6	600	25.6	—	20.7	525	23.0	585	26.4	670	24.4	620	1.0 x 20	26 x 20
24	600	23.6	600	30.7	—	23.1	588	25.5	648	30.7	780	28.5	725	1.2 x 20	30 x 20
Other sizes on request															

IMPORTANT: ISO* sensor lay length according to ISO 20456

Flange EN 1092-1 / PN 16

Size DN		A Standard		A ISO*		B1		B2		D		K		d2 x n	
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1/2	15	6.7	170	7.9	200	9.4	238	11.7	298	3.7	95	2.6	65	0.6 x 4	14 x 4
3/4	20	6.7	170	7.9	200	9.4	238	11.7	298	4.1	105	3.0	75	0.6 x 4	14 x 4
1	25	8.9	225	7.9	200	9.4	238	11.7	298	4.5	115	3.3	85	0.6 x 4	14 x 4
1-1/4	32	8.9	225	7.9	200	10.0	253	12.3	313	5.5	140	3.9	100	0.7 x 4	18 x 4
1-1/2	40	8.9	225	7.9	200	10.0	253	12.3	313	5.9	150	4.3	110	0.7 x 4	18 x 4
2	50	8.9	225	7.9	200	10.0	253	12.3	313	6.5	165	4.9	125	0.7 x 4	18 x 4
2-1/2	65	11.0	280	7.9	200	10.7	271	13.0	331	7.3	185	5.7	145	0.7 x 4	18 x 4
3	80	11.0	280	7.9	200	10.7	271	13.0	331	7.9	200	6.3	160	0.7 x 8	18 x 8
4	100	11.0	280	9.8	250	10.9	278	13.3	338	8.7	220	7.1	180	0.7 x 8	18 x 8
5	125	15.7	400	9.8	250	11.7	298	14.1	358	9.8	250	8.3	210	0.7 x 8	18 x 8
6	150	15.7	400	11.8	300	12.2	310	14.6	370	11.2	285	9.4	240	0.9 x 8	22 x 8
8	200	15.7	400	13.8	350	13.3	338	15.7	398	13.4	340	11.6	295	0.9 x 8	22 x 12
10	250	19.7	500	17.7	450	14.3	362	16.6	422	15.9	405	14.0	355	1.0 x 12	26 x 12
12	300	19.7	500	19.7	500	16.7	425	19.1	485	18.1	460	16.1	410	1.0 x 12	26 x 12
14	350	19.7	500	21.7	550	17.7	450	20.1	510	20.5	520	18.5	470	1.0 x 16	26 x 16
16	400	23.6	600	23.6	600	18.7	475	21.1	535	22.8	580	20.7	525	1.2 x 16	30 x 16
18	450	23.6	600	25.6	—	19.7	500	22.0	560	25.2	640	23.0	585	1.2 x 20	30 x 20
20	500	23.6	600	25.6	—	20.7	525	23.0	585	28.1	715	25.6	650	1.3 x 20	33 x 20
24	600	23.6	600	30.7	—	23.1	588	25.5	648	33.1	840	30.3	770	1.4 x 20	36 x 20
Other sizes on request															

IMPORTANT: ISO* sensor lay length according to ISO 20456

Flange EN 1092-1 / PN 25

Size DN		A Standard		A ISO*		B1		B2		D		K		d2 x n	
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1/2	15	6.7	170	7.9	200	9.4	238	11.7	298	3.7	95	2.6	65	0.6 x 4	14 x 4
3/4	20	6.7	170	7.9	200	9.4	238	11.7	298	4.1	105	3.0	75	0.6 x 4	14 x 4
1	25	8.9	225	7.9	200	9.4	238	11.7	298	4.5	115	3.3	85	0.6 x 4	14 x 4
1-1/4	32	8.9	225	7.9	200	10.0	253	12.3	313	5.5	140	3.9	100	0.7 x 4	18 x 4
1-1/2	40	8.9	225	7.9	200	10.0	253	12.3	313	5.9	150	4.3	110	0.7 x 4	18 x 4
2	50	8.9	225	7.9	200	10.0	253	12.3	313	6.5	165	4.9	125	0.7 x 4	18 x 4
2-1/2	65	11.0	280	7.9	200	10.7	271	13.0	331	7.3	185	5.7	145	0.7 x 4	18 x 8
3	80	11.0	280	7.9	200	10.7	271	13.0	331	7.9	200	6.3	160	0.7 x 8	18 x 8
4	100	11.0	280	9.8	250	10.9	278	13.3	338	9.3	235	7.5	190	0.9 x 8	22 x 8
5	125	15.7	400	9.8	250	11.7	298	14.1	358	10.6	270	8.7	220	1.0 x 8	26 x 8
6	150	15.7	400	11.8	300	12.2	310	14.6	370	11.8	300	9.8	250	1.0 x 8	26 x 8
8	200	15.7	400	13.8	350	13.3	338	15.7	398	14.2	360	12.2	310	1.0 x 8	26 x 12
10	250	19.7	500	17.7	450	14.3	362	16.6	422	16.7	425	14.6	370	1.2 x 12	30 x 12
12	300	19.7	500	19.7	500	16.7	425	19.1	485	19.1	485	16.9	430	1.2 x 12	30 x 16
14	350	19.7	500	21.7	550	17.7	450	20.1	510	21.9	555	19.3	490	1.3 x 16	33 x 16
16	400	23.6	600	23.6	600	18.7	475	21.1	535	24.4	620	21.7	550	1.4 x 16	36 x 16
18	450	23.6	600	25.6	—	19.7	500	22.0	560	26.4	670	23.6	600	1.4 x 20	36 x 20
20	500	23.6	600	25.6	—	20.7	525	23.0	585	28.7	730	26.0	660	1.4 x 20	36 x 20
24	600	23.6	600	30.7	—	23.1	588	25.5	648	33.3	845	30.3	770	1.5 x 20	39 x 20
Other sizes on request															

IMPORTANT: ISO* sensor lay length according to ISO 20456

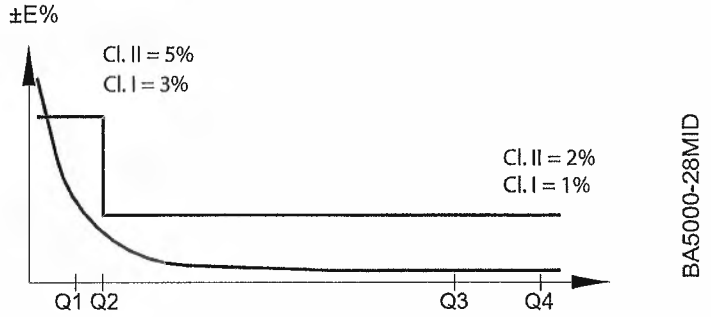
Flange EN 1092-1 / PN 40

Size DN		A Standard		A ISO*		B1		B2		D		K		d2 x n	
inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
1/2	15	6.7	170	7.9	200	9.4	238	11.7	298	3.7	95	2.6	65	0.6 x 4	14 x 4
3/4	20	6.7	170	7.9	200	9.4	238	11.7	298	4.1	105	3.0	75	0.6 x 4	14 x 4
1	25	8.9	225	7.9	200	9.4	238	11.7	298	4.5	115	3.3	85	0.6 x 4	14 x 4
1-1/4	32	8.9	225	7.9	200	10.0	253	12.3	313	5.5	140	3.9	100	0.7 x 4	18 x 4
1-1/2	40	8.9	225	7.9	200	10.0	253	12.3	313	5.9	150	4.3	110	0.7 x 4	18 x 4
2	50	8.9	225	7.9	200	10.0	253	12.3	313	6.5	165	4.9	125	0.7 x 4	18 x 4
2-1/2	65	11.0	280	7.9	200	10.7	271	13.0	331	7.3	185	5.7	145	0.7 x 4	18 x 8
3	80	11.0	280	7.9	200	10.7	271	13.0	331	7.9	200	6.3	160	0.7 x 8	18 x 8
4	100	11.0	280	9.8	250	10.9	278	13.3	338	9.3	235	7.5	190	0.9 x 8	22 x 8
5	125	15.7	400	9.8	250	11.7	298	14.1	358	10.6	270	8.7	220	1.0 x 8	26 x 8
6	150	15.7	400	11.8	300	12.2	310	14.6	370	11.8	300	9.8	250	1.0 x 8	26 x 8
8	200	15.7	400	13.8	350	13.3	338	15.7	398	14.8	375	12.6	320	1.2 x 8	30 x 12
10	250	19.7	500	17.7	450	14.3	362	16.6	422	17.7	450	15.2	385	1.3 x 12	33 x 12
12	300	19.7	500	19.7	500	16.7	425	19.1	485	20.3	515	17.7	450	1.3 x 12	33 x 16
14	350	19.7	500	21.7	550	17.7	450	20.1	510	22.8	580	20.1	510	1.4 x 16	36 x 16
16	400	23.6	600	23.6	600	18.7	475	21.1	535	26.0	660	23.0	585	1.5 x 16	39 x 16
18	450	23.6	600	25.6	—	19.7	500	22.0	560	27.0	685	24.0	610	1.5 x 20	39 x 20
20	500	23.6	600	25.6	—	20.7	525	23.0	585	29.7	755	26.4	670	1.7 x 20	42 x 20
24	600	23.6	600	30.7	—	23.1	588	25.5	648	35.0	890	31.3	795	1.9 x 20	48 x 20
Other sizes on request															

IMPORTANT: ISO* sensor lay length according to ISO 20456

OIML APPROVED METER

The M5000 is type approved according to the international water meter standards OIML R49. The meter is approved as Class I and Class II for the detector sizes 2...12 inches (DN 50...300).



Q2/Q1 = 1.6 and Q4/Q3 = 1.25

OIML R 49 specification for Class I

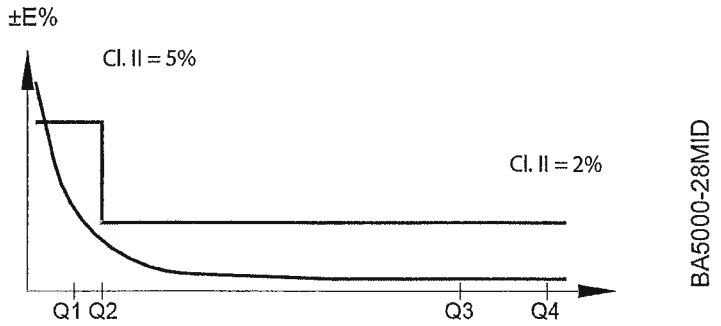
Size in. (DN)	**2 (50)**	**2 1/2 (65)**	**3 (80)**	**4 (100)**	**5 (125)**	**6 (150)**	**8 (200)**	**10 (250)**	**12 (300)**
R (Q3/Q1)	200	200	200	250	250	160	160	160	100
Q1 [m^3/h)	0.315	0.5	0.8	1	1.6	3.94	6.25	10	15.63
Q2 [m^3/h)	0.504	0.8	1.28	1.6	2.56	6,3	10	16	25
Q3 [m^3/h)	**63**	**100**	**160**	**250**	**400**	**630**	**1000**	**1600**	**1600**
Q4 [m^3/h)	78.75	125	200	312.5	500	787.5	1250	2000	2000
OIML R49 Class	1								

OIML R 49 specification for Class II

Size in. (DN)	**6 (150)**	**8 (200)**
R (Q3/Q1)	250	250
Q1 [m^3/h)	2.52	4
Q2 [m^3/h)	4.03	6.4
Q3 [m^3/h)	**630**	**1000**
Q4 [m^3/h)	787.5	1250
OIML R49 Class	2	

MID Approved Meter (MI-001)

The M5000 is type approved according to Directive 2004/22/EC of the European Parliament and Council of March 31, 2004 Measuring Instruments (MID) Annex MI-001. The meter is approved for the detector sizes 2...12 inches (DN 50...300).



Q2/Q1 = 1.6 and Q4/Q3 = 1.25

Size in. (DN)	2 (50)	2-1/2 (65)	3 (80)	4 (100)	5 (125)	6 (150)	8 (200)	10 (250)	12 (300)
R (Q3/Q1)	200	200	200	250	250	250	250	160	100
Q1 [m^3/h]	0.315	0.5	0.8	1	1.6	2.52	4	10	15.63
Q2 [m^3/h]	0.504	0.8	1,28	1.6	2.56	4.03	6.4	16	25
Q3 [m^3/h]	**63**	**100**	**160**	**250**	**400**	**630**	**1000**	**1600**	**1600**
Q4 [m^3/h]	78.75	125	200	312.5	500	787.5	1250	2000	2000

The conformity declaration of above certificate is according to module B (type approval) and D (quality insurance of production).

PART NUMBER CONSTRUCTION

If you are interested in a product configuration that is not designated for your region, please contact Badger Meter.

Detector and Amplifier Ordering Information for North America

Hard Rubber Liner

M5 -[ ][ ][ ][

Detector and Amplifier Ordering Information for North America

PTFE Liner

M5 | | | | | | | | | | | | |

M5000	Meter Type	Detector: PTFE C-Steel 150# flanges P1	Detector: PTFE C-Steel 300# flanges P2	Detector: PTFE Stainless Steel 150# flanges P4	Electrodes & Grounding	Amplifier	Remote cable	Communications/ Outputs	Wiring Method	Unit of Measure Totalizer/Flow Rate	Testing & Tagging
Meter Type- Standard LL											
1/2 in.	005	—	—	—							
3/4 in.	007	—	—	—							
1 in.	010	—	—	—							
1-1/4 in.	012	—	—	—							
1-1/2 in.	015	—	—	—							
2 in.	020	—	—	—							
2-1/2 in.	025	—	—	—							
3 in.	030	—	—	—							
4 in.	040	—	—	—							
5 in.	050	—	—	—							
6 in.	060	—	—	—							
8 in.	080	—	—	—							
10 in.	100	—	—	—							
12 in.	120	—	—	—							
14 in.	140	—	—	—							
16 in.	160	—	—	—							
18 in.	180	—	—	—							
20 in.	200	—	—	—							
22 in.	220	—	—	—							
24 in.	240	—	—	—							

Electrodes & Grounding	
Alloy C with 316 Stainless Steel Grounding Rings	A
Stainless Steel with 316 Stainless Steel Grounding Rings	S
Alloy C Electrode and Grounding Electrode	C
Stainless Steel Electrode and Grounding Electrode	D

Amplifier Type	
Battery Powered; Meter Mounted	H
Battery Powered; Remote Mounted	J
Battery Powered; Remote Mounted; Submersible	K
Battery Powered; Remote Mounted; Submersible (IP68) with remote cable 15 ft and longer	L

Remote Cable Length	
None	WW
5 ft. Standard Cable	AA
10 ft. Standard Cable	AB
15 ft. Standard Cable	AC
30 ft. Standard Cable	AF
50 ft. Standard Cable	AK
75 ft. Standard Cable	AR
100 ft. Standard Cable	BW

Communications/Outputs	
Standard Output	S
Standard Output with MODBUS 485 RTU	M

Wiring Method	
None	XX
Twist Tight - 5 ft. (MTR, ASSY)	TF
Twist Tight - 10 ft. (MTR, ASSY)	TH
Twist Tight - 25 ft. (MTR, ASSY)	TJ
Twist Tight - 75 ft. (MTR, ASSY)	TK
Nicor - 6 ft. (MTR, ASSY)	NG
Nicor - 25 ft. (MTR, ASSY)	NJ
Itron - 5 ft. (MTR, ASSY)	CF
Itron - 25 ft. (MTR, ASSY)	CJ

Unit of Measure Totalizer/ Flow Rate	
Gallons/gallons per minute	G
Gallons/cubic feet per minute	B
Gallons/cubic meters per second	D
Cubic Meters/gallons per minute	C
Cubic Meters/cubic meters per second	E
Cubic Meters/cubic meters per minute	T
Cubic Meters/cubic meters per hour	H
Cubic Feet/gallons per minute	F
Cubic Feet/cubic feet per minute	J
Cubic Feet/cubic meters per hour	K
Liters/gallons per minute	L
Liters/liters per second	N
Liters/liters per minute	P
Liters/liters per hour	Q
Million Gallons/gallons per minute	M
Gallons/millions gallons per day	R
Acre Feet/gallons per minute	A
Second-Foot Day/cubic feet per second	S
Custom Units	Z

Testing & Tagging	
Factory Calibrated	F
3rd Party Calibrated	3
Factory Calibrated/Stainless Steel Tag	S
3rd Party Calibrated w/ Stainless Steel Tag	T
State of Kansas Certified	K

Detector Ordering Information International

MID ☐-☐/☐-☐/☐-☐-☐/☐-☐

Model	
MID electromagnetic flow meter	MID
Type	
Type 6	6
Size	
DN 15 to 600	
Pressure rate	
Process connection	
DIN flanges	F
ANSI flanges	A
Process Connection Material	
C-steel	ST
SST 1.4301 (ANSI 304)	V2
SST 1.4404 (ANSI 316)	V4
Liner	
PTFE	PT
Hard rubber	HG
Softrubber	WG
Halar	HA
Electrodes	
Measure + empty pipe electrode	ML
Measure + grounding + empty pipe electrode	MEL
Electrode material	
Hastelloy C	HC
Tantalum	TA
Platinum/gold plated	PG
Platinum/Rhodium	PR
Housing	
C-steel	St
SST 1.4301 (ANSI 304)	V2
SST 1.4404 (ANSI 306)	V4

Amplifier Ordering Information International

☐ ☐ ☐ m

Amplifier	
M5000 (battery-operated/no battery pack)	M50B0
M5000 (battery-operated/1 battery pack)	M50B1
M5000 (battery-operated/2 battery packs)	M50B2
Line powered (battery back-up/100…240V AC)	M50AB
Line Powered (battery back-up/9…36V DC)	M50DB
Mounted/remote/cable length	
Amplifier detector mounted	M
Remote version cable length	R
Remote amplifier with cable length	
Remote amplifier with 10 m cable length	10
Remote amplifier with 15 m cable length	15
Remote amplifier with 20 m cable length	20
Remote amplifier with 25 m cable length	25
Remote amplifier with 30 m cable length	30

Control. Manage. Optimize.

ModMAG is a registered trademark of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2022 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

Translated Document Numbers: MAG-DS-02302-ES-010, MAG-DS-03223-FR-07

Badger Meter

HR-RED

High Resolution Remote Electronic Display

APPLICATION

The High Resolution Remote Electronic Display (HR-RED) is designed to provide remote visual readings when connected directly to Badger Meter high resolution products: HR-E®, HR-E LCD, HR-E LCD 4-20 encoders, or E-Series® Ultrasonic meters. The HR-RED is used to read compatible encoder products that are not easily accessible or are in difficult to read locations. Installations such as those inside houses or buildings, meter vaults, or dangerous industrial locations are ideal for the HR-RED.

OPERATION

The HR-RED is a battery operated device. When attached to Badger Meter high resolution encoders or high resolution E-Series Ultrasonic meters, the unit is designed to provide the same output resolution as the encoder, up to 9 digits for Badger Meter products. It also displays the encoder serial number. To conserve battery life the HR-RED is awakened only when the internal acoustic switch is activated. This is easily accomplished by tapping the target circle on the register display.

How the meter reading displays depends on the output resolution. The letters "RD" display to the left of the digits. Decimal points do not display.

6 digit output or less: "RD" and all digits appear at the same time, right-justified, and display for 10 seconds.

EXAMPLE of 6 digit meter reading

<displays for 10 sec>	**RD 123456**

7 or 8 digit output: "RD" appears by itself for 2 seconds. Then the complete meter reading (up to 8 digits) displays for 10 seconds.

EXAMPLE of 8 digit meter reading

<displays for 2 sec>	**RD**
<displays for 10 sec>	**12345678**

9 digit output: "RD" appears, followed by the first of the 9 digits, and displays for 5 seconds. Then the remaining 8 digits display for 10 seconds.

EXAMPLE of 9 digit meter reading

<displays for 5 sec>	**RD 1**
<displays for 10 sec>	**23456789**

After the meter reading displays, the serial number of the encoder or meter displays. Then the HR-RED returns to sleep mode.

Tap Target Circle to Activate

TAMPER-PROOF FEATURES

The HR-RED is supplied with an anti-tamper indicator. Any time the connection is interrupted, a visual alarm appears on the display.

There is no maintenance since the electronics and battery are fully encapsulated in the housing and not accessible. The unit is also supplied with a tamper resistant Torx® seal screw to prevent access to the unit.

FEATURES

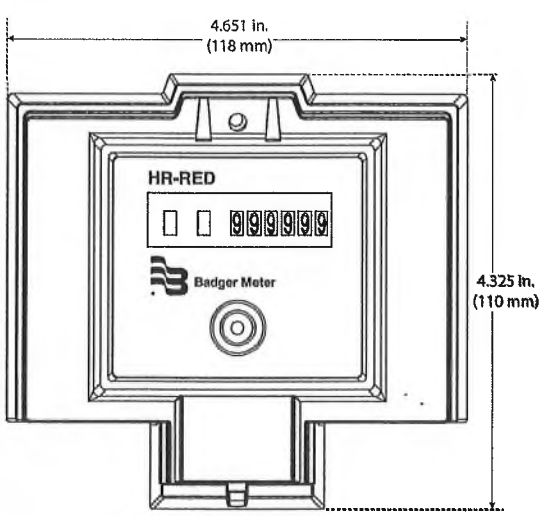
- Environmentally sealed
- Tamper indicators
- Designed for use with any Badger Meter high resolution encoder or E-Series Ultrasonic meter
- Torx seal screw security
- Acoustic "TAP" switch for viewing
- 10 year calculated battery life

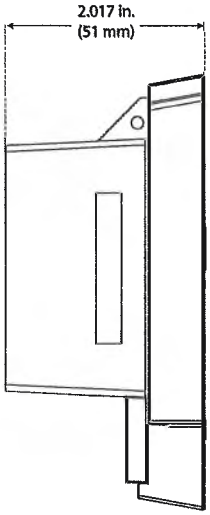
Product Data Sheet

SPECIFICATIONS

Operating Temperature	–4…140° F (–20…60° C)
Encoder Compatibility	HR-E, HR-E LCD, HR-E LCD 4-20, E-Series Ultrasonic meter
Dimensions	L 4.651 in. (118 mm) x H 4.325 in. (110 mm) x W 2.017 in. (51 mm)
Weight	9 oz (255 g)
Display	LCD, 8 characters, 0.25 inches high
Battery Life	10 years, 3.6V lithium battery
Construction	High impact thermoplastic, weather and UV resistant

DIMENSIONS





NOTE: Refer to the *HR-RED Installation Data Sheet* available in the Resource Library at *www.badgermeter.com* for installation instructions.

Making Water Visible®

HR-E and Making Water Visible are registered trademarks of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2017 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

The Americas | Badger Meter | 4545 West Brown Deer Rd | PO Box 245036 | **Milwaukee, WI 53224-9536** | 800-876-3837 | 414-355-0400
México | Badger Meter de las Americas, S.A. de C.V. | Pedro Luis Ogazón N°32 | Esq. Angelina N°24 | Colonia Guadalupe Inn | CP 01050 | México, DF | México | +52-55-5662-0882
Europe, Eastern Europe Branch Office (for Poland, Latvia, Lithuania, Estonia, Ukraine, Belarus) | Badger Meter Europe | ul. Korfantego 6 | 44-193 Knurów | Poland | +48-32-236-8787
Europe, Middle East and Africa | Badger Meter Europa GmbH | Nurtinger Str 76 | 72639 Neuffen | Germany | +49-7025-9208-0
Europe, Middle East Branch Office | Badger Meter Europe | PO Box 341442 | Dubai Silicon Oasis, Head Quarter Building, Wing C, Office #C209 | Dubai / UAE | +971-4-371 2503
Slovakia | Badger Meter Slovakia s.r.o. | Racianska 109/B | 831 02 Bratislava, Slovakia | +421-2-44 63 83 01
Asia Pacific | Badger Meter | 80 Marine Parade Rd | 21-06 Parkway Parade | Singapore 449269 | +65-63464836
China | Badger Meter | 7-1202 | 99 Hangzhong Road | Minhang District | Shanghai | China 201101 | +86-21-5763 5412
Switzerland | Badger Meter Swiss AG | Mittelholzerstrasse 8 | 3006 Bern | Switzerland | +41-31-932 01 11

WARRANTIES

Badger Meter

E-Series® Ultrasonic Meter

Cold Water Lead-Free Meters
5/8, 5/8 x 3/4, 3/4, 1 inch

PRODUCTS

This warranty shall apply to all Badger Meter E-Series® Ultrasonic lead-free meters (stainless steel, bronze alloy or engineered polymer), sizes 5/8 inch, 5/8 × 3/4 inch, 3/4 inch, and 1 inch, when used to measure potable water and the internal register/encoder and battery used with these meters (collectively "Product"), sold on or after June 28, 2021. This warranty is not transferable and is extended only to utilities, municipalities, other commercial users and authorized distributors, hereafter referred to as "Customer" and does NOT apply to consumers or any person or entity who is not an original customer of Badger Meter or its authorized distributors.

MATERIALS AND WORKMANSHIP

Badger Meter, Inc. ("Badger Meter") warrants Product to be free from defects in materials and workmanship appearing within the earlier of the following time frames.

Lead-Free Housings

Twenty (20) years and six (6) months after shipment from Badger Meter.

Electronics, Battery, Transducers, and Register/Encoder Supplied with the Meters Listed Herein

Twenty (20) years and six (6) months, prorated, after shipment from Badger Meter.

This warranty is prorated as follows: For the first ten (10) years of the warranty the Product is replaced at no charge, and the warranty is prorated at price discounts during the last ten (10) years of the warranty.

Specifically, Badger Meter will repair or replace, at its discretion, a non-performing Product at no cost during the first ten (10) years of the warranty and at prorated price discounts during the last ten (10) years of the warranty. Badger Meter will apply these prorated price discounts to the Product list prices in effect at the time of Product return and according to the following prorated price discount schedule:

- Years 11 through 12—75% discount
- Years 13 through 15—50% discount
- Year 16—40% discount
- Year 17—30% discount
- Year 18—20% discount
- Years 19 through 20—10% discount

Replacement Products are warranted for and under the balance of the original applicable Product warranty.

Pressure Sensor

Five (5) years and six (6) months after shipment from Badger Meter.

This warranty is only applicable for the bronze E-Series G2® Ultrasonic meter with the optional pressure sensor installed.

METER ACCURACY

The Product will meet or exceed all applicable specifications outlined in AWWA Standard C715 in addition to meeting meter accuracy of ±1.5% for the published ranges set forth in Badger Meter's current published product data sheet for twenty (20) years from the date of shipment from Badger Meter.

EXTENDED LOW-FLOW METER ACCURACY

Badger Meter further warrants the Product will meet extended minimum test flow accuracy of ±3% for the published ranges set forth in Badger Meter's current published product data sheet for twenty (20) years from the date of shipment from Badger Meter.

PRODUCT RETURNS

Any Product proved to the satisfaction of Badger Meter to have failed the foregoing warranties will, at the option of Badger Meter, be repaired or replaced without charge to the Customer. Any eligible Product repaired or replaced by Badger Meter will retain the original Product's warranty based on the original Product purchase date, at Badger Meter's sole discretion. The Badger Meter obligation hereunder shall be limited to such repair and replacement and shall be conditioned upon Badger Meter receiving written notice of any alleged defect within ten (10) days after its discovery. This exclusive remedy shall not be deemed to have failed its essential purpose so long as Badger Meter is willing and able to replace defective products or issue a credit to purchaser within a reasonable time of proof to Badger Meter that a defect is involved. Product returns must be shipped by the Customer prepaid F.O.B. to the nearest Badger Meter factory or distribution center. The Customer shall be responsible for all direct and indirect costs associated with removing the original Product and reinstalling the repaired or replacement Product.

LIMITS OF LIABILITY

This warranty shall not apply to Product repaired or altered by parties other than Badger Meter, or read by equipment not explicitly approved or licensed by Badger Meter. The foregoing warranty applies only to the extent that the Product is installed, serviced and operated strictly in accordance with AWWA Standard C715 and AWWA M6 Manual, as applicable. The warranty shall not apply and shall be void with respect to Product exposed to conditions other than those detailed in the Badger Meter Product

technical and/or operational literature, or which, as determined at Badger Meter's sole discretion, have affected the ability of the Product to perform, including, but not limited to: exposure to adverse installation conditions; misuse; vandalism; negligence; accident; acts of God; alteration; improper installation, operation or repair; damage from passage of high-speed air slugs; damage by water quality conditions, including but not limited to: aggressive water, foreign matter, biofilms, or extreme corrosivity; damage caused by actions not in accordance with the intended use; or other circumstances which are beyond the reasonable control of Badger Meter, as determined at Badger Meter's sole discretion. With respect to product not manufactured by Badger Meter, the warranty obligations of Badger Meter shall in all respects conform and be limited to the warranty extended to Badger Meter by the supplier of product.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (except warranties of Title).

Any description of Product, whether in writing or made orally by Badger Meter or its agents, specifications, samples, models, bulletins, drawings, diagrams, engineering sheets, or similar materials used in connection with any Customer's order are for the sole purpose of identifying Product and shall not be construed as an express warranty. Any suggestions by Badger Meter or its agents regarding use, application or suitability of Product shall not be construed as an express warranty unless confirmed to be such in writing by Badger Meter.

Exclusion of Consequential Damages and Disclaimer of Other Liability

Badger Meter liability with respect to breaches of the foregoing warranty shall be limited as stated therein. Badger Meter liability shall in no event exceed the contract price. BADGER METER SHALL NOT BE SUBJECT TO AND DISCLAIMS: (1) ANY OTHER OBLIGATIONS OR LIABILITIES ARISING OUT OF BREACH OF CONTRACT OR OF WARRANTY (2) ANY OBLIGATIONS WHATSOEVER ARISING FROM TORT CLAIMS (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR ARISING UNDER OTHER THEORIES OF LAW WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY BADGER METER, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL AND CONTINGENT DAMAGES WHATSOEVER.

SMART WATER IS *BADGER METER*

E-Series and E-Series G2 are registered trademarks of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2021 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

Badger Meter

E-Series® Ultrasonic Meter

Cold Water Stainless Steel Lead-Free Meters, 1-1/2, 2 in.

PRODUCTS

This warranty shall apply to all Badger Meter E-Series® Ultrasonic lead-free meters, sizes 1-1/2 in. and 2 in., when used to measure potable water and the internal register/encoder and battery used with these meters (collectively "Product"), sold on or after June 3, 2020. This warranty is not transferable and is extended only to utilities, municipalities, other commercial users and authorized distributors, hereafter referred to as "Customer" and does NOT apply to consumers or any person or entity who is not an original customer of Badger Meter or its authorized distributors.

MATERIALS AND WORKMANSHIP

Badger Meter, Inc. ("Badger Meter") warrants Product to be free from defects in materials and workmanship appearing within the following time frames.

Lead-Free Housings
Ten (10) years and six (6) months after shipment from Badger Meter.

Electronics, Battery, Transducers, and Register/Encoder Supplied with the Meters Listed Herein
Ten (10) years and six (6) months after shipment from Badger Meter.

METER ACCURACY

The Product will meet or exceed all applicable specifications outlined in AWWA Standard C715 in addition to meeting meter accuracy of ±1.5% for the published ranges set forth in Badger Meter's current published product data sheet for ten (10) years from the date of shipment from Badger Meter.

EXTENDED LOW-FLOW METER ACCURACY

Badger Meter further warrants the Product will meet extended minimum test flow accuracy of ±3% for the published ranges set forth in Badger Meter's current published product data sheet for ten (10) years from the date of shipment from Badger Meter.

PRODUCT RETURNS

Any Product proved to the satisfaction of Badger Meter to have failed the foregoing warranties will, at the option of Badger Meter, be repaired or replaced without charge to the Customer. Any eligible Product repaired or replaced by Badger Meter will retain the original Product's warranty based on the original Product purchase date, at Badger Meter's sole discretion. The Badger Meter obligation hereunder shall be limited to such repair and replacement and shall be conditioned upon Badger Meter receiving written notice of any alleged defect within ten (10) days after its discovery. This exclusive remedy shall not be deemed to have failed its essential purpose so long as Badger Meter is willing and able to replace defective products or issue a credit to purchaser within a reasonable time of proof to Badger Meter that a defect is involved. Product returns must be shipped by the Customer prepaid F.O.B. to the nearest Badger Meter factory or distribution center. The Customer shall be responsible for all direct and indirect costs associated with removing the original Product and reinstalling the repaired or replacement Product.

LIMITS OF LIABILITY

This warranty shall not apply to Product repaired or altered by parties other than Badger Meter, or read by equipment not explicitly approved or licensed by Badger Meter. The foregoing warranty applies only to the extent that the Product is installed, serviced and operated strictly in accordance with AWWA Standard C715 and AWWA M6 Manual, as applicable. The warranty shall not apply and shall be void with respect to Product exposed to conditions other than those detailed in the Badger Meter Product technical and/or operational literature, or which, as determined at Badger Meter's sole discretion, have affected the ability of the Product to perform, including, but not limited to: exposure to adverse installation conditions; misuse; vandalism; negligence; accident; acts of God; alteration; improper installation, operation or repair; damage from passage of high-speed air slugs; damage by water quality conditions, including but not limited to: aggressive water, foreign matter, biofilms, or extreme corrosivity; damage caused by actions not in accordance with the intended use; or other circumstances which are beyond the reasonable control of Badger Meter, as determined at Badger Meter's sole discretion. With respect to product not manufactured by Badger Meter, the warranty obligations of Badger Meter shall in all respects conform and be limited to the warranty extended to Badger Meter by the supplier of product.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (except warranties of Title).

Badger Meter Warranty

Any description of Product, whether in writing or made orally by Badger Meter or its agents, specifications, samples, models, bulletins, drawings, diagrams, engineering sheets, or similar materials used in connection with any Customer's order are for the sole purpose of identifying Product and shall not be construed as an express warranty. Any suggestions by Badger Meter or its agents regarding use, application or suitability of Product shall not be construed as an express warranty unless confirmed to be such in writing by Badger Meter.

Exclusion of Consequential Damages and Disclaimer of Other Liability

Badger Meter liability with respect to breaches of the foregoing warranty shall be limited as stated therein. Badger Meter liability shall in no event exceed the contract price. BADGER METER SHALL NOT BE SUBJECT TO AND DISCLAIMS: (1) ANY OTHER OBLIGATIONS OR LIABILITIES ARISING OUT OF BREACH OF CONTRACT OR OF WARRANTY (2) ANY OBLIGATIONS WHATSOEVER ARISING FROM TORT CLAIMS (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR ARISING UNDER OTHER THEORIES OF LAW WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY BADGER METER, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL AND CONTINGENT DAMAGES WHATSOEVER.

SMART WATER IS *BADGER METER*

E-Series is a registered trademark of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities.
Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2020 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

Legacy Document Number: ESM-W-03

Badger Meter

E-Series® Ultrasonic Plus Meter

with Integrated Valve

5/8 x 3/4 in., 3/4 in.

PRODUCTS

This warranty shall apply to all Badger Meter E-Series® Ultrasonic Plus lead-free meters with integrated valve, sizes 5/8 x 3/4 inch and 3/4 inch, when used to measure potable water, and the internal register/encoder and battery used with these meters (collectively "Product"), sold on or after April 1, 2021. This warranty is not transferable and is extended only to utilities, municipalities, other commercial users and authorized distributors, hereafter referred to as "Customer," and does NOT apply to consumers or any person or entity who is not an original customer of Badger Meter or its authorized distributors.

MATERIALS AND WORKMANSHIP

Badger Meter, Inc. ("Badger Meter") warrants Product to be free from defects in materials and workmanship for the time period stated.

Lead-Free Housing	20 years and 6 months after shipment
Battery[1]	20 years and 6 months after shipment
Transducers[1]	20 years and 6 months after shipment
Encoder Register[1]	20 years and 6 months after shipment
Meter Accuracy[1,2]	20 years and 6 months after shipment
Valve and Valve Power **Module**	5 years and 6 months after shipment or a maximum of 240 valve open and restrict actuation cycles

[1] Badger Meter will repair or replace, at its discretion, a non-performing Product at no cost during the first ten (10) years, and at a prorated price during the last ten (10) years of the warranty. Badger Meter will apply these prorated price discounts to the Product list prices at the time of Product return and according to the following prorated price discount schedule: Years 11 through 12 - 75% discount; Years 13 through 15 - 50% discount; Year 16 - 40% discount; Year 17 - 30% discount; Year 18 - 20% discount; and Years 19 through 20 - 10% discount. Replacement Products are warranted for and under the balance of the original applicable Product warranty.

[2] The Product will meet or exceed all applicable specifications outlined in AWWA Standard C715 in addition to meeting the meter accuracy as set forth in the Operating Performance Specifications of the Badger Meter current published product data sheet (*ESM-DS-02022-EN*).

PRODUCT RETURNS

Any Product proved to the satisfaction of Badger Meter to have failed the foregoing warranties will, at the option of Badger Meter, be repaired or replaced without charge to the Customer. Any eligible Product repaired or replaced by Badger Meter will retain the original Product's warranty based on the original Product purchase date, at Badger Meter's sole discretion. The Badger Meter obligation hereunder shall be limited to such repair and replacement and shall be conditioned upon Badger Meter receiving written notice of any alleged defect within ten (10) days after its discovery. This exclusive remedy shall not be deemed to have failed its essential purpose so long as Badger Meter is willing and able to replace defective products or issue a credit to purchaser within a reasonable time of proof to Badger Meter that a defect is involved. Product returns must be shipped by the Customer prepaid F.O.B. to the nearest Badger Meter factory or distribution center. The Customer shall be responsible for all direct and indirect costs associated with removing the original Product and reinstalling the repaired or replacement Product.

LIMITS OF LIABILITY

This warranty shall not apply to Product repaired or altered by parties other than Badger Meter, or read by equipment not explicitly approved or licensed by Badger Meter. The foregoing warranty applies only to the extent that the Product is installed, serviced and operated strictly in accordance with AWWA Standard C715 and AWWA M6 Manual, as applicable. The warranty shall not apply and shall be void with respect to Product exposed to conditions other than those detailed in the Badger Meter Product technical and/or operational literature, or which, as determined at Badger Meter's sole discretion, have affected the ability of the Product to perform, including, but not limited to: exposure to adverse installation conditions; misuse; vandalism; negligence; accident; acts of God; alteration; improper installation, operation or repair; damage from passage of high-speed air slugs; damage by water quality conditions, including but not limited to: aggressive water, foreign matter, biofilms, or extreme corrosivity; damage caused by actions not in accordance with the intended use; or other circumstances which are beyond the reasonable control of Badger Meter, as determined at Badger Meter's sole discretion. With respect to product not manufactured by Badger Meter, the warranty obligations of Badger Meter shall in all respects conform and be limited to the warranty extended to Badger Meter by the supplier of product.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (except warranties of Title).

Any description of Product, whether in writing or made orally by Badger Meter or its agents, specifications, samples, models, bulletins, drawings, diagrams, engineering sheets, or similar materials used in connection with any Customer's order are for the sole purpose of identifying Product and shall not be construed as an express warranty. Any suggestions by Badger Meter or its agents regarding use, application or suitability of Product shall not be construed as an express warranty unless confirmed to be such in writing by Badger Meter.

Exclusion of Consequential Damages and Disclaimer of Other Liability

Badger Meter liability with respect to breaches of the foregoing warranty shall be limited as stated therein. Badger Meter liability shall in no event exceed the contract price. BADGER METER SHALL NOT BE SUBJECT TO AND DISCLAIMS: (1) ANY OTHER OBLIGATIONS OR LIABILITIES ARISING OUT OF BREACH OF CONTRACT OR OF WARRANTY (2) ANY OBLIGATIONS WHATSOEVER ARISING FROM TORT CLAIMS (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR ARISING UNDER OTHER THEORIES OF LAW WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY BADGER METER, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL AND CONTINGENT DAMAGES WHATSOEVER.

SMART WATER IS *BADGER METER*

E-Series is a registered trademark of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2021 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

Badger Meter

Two-Year Flow Instrumentation Product Warranty

PRODUCTS

This warranty shall apply to Badger Meter Equipment and Parts hereafter referred to as "Product(s)", as identified on page 2 of this document, sold on or after July 1, 2019. This warranty is not transferable and is extended only to utilities, municipalities, other commercial users and authorized distributors, hereafter referred to as "Customer" and does NOT apply to consumers or any person or entity who is not an original customer of Badger Meter or its authorized distributors.

MATERIALS AND WORKMANSHIP

Badger Meter warrants Product to be free from defects in materials and workmanship appearing within the earlier of either: two (2) years after installation; or two (2) years and six (6) months after shipment from Badger Meter.

PRODUCT RETURNS

Product failures must be proven and verified to the satisfaction of Badger Meter. The obligation of Badger Meter hereunder shall be limited to such repair and replacement and shall be conditioned upon Badger Meter receiving written notice of any alleged defect within ten (10) days after its discovery. This exclusive remedy shall not be deemed to have failed its essential purpose so long as Badger Meter is willing and able to replace defective Product to Customer within a reasonable time after receipt of proof that a defect is involved. Product returns must be shipped by the Customer prepaid CPT to the nearest Badger Meter factory or distribution center. The Customer shall be responsible for all direct and indirect costs associated with removing original Product and reinstalling the repaired or replacement Product.

LIMITS OF LIABILITY

This warranty shall not apply to any Product repaired or altered by any Party other than Badger Meter. The foregoing warranty applies only to the extent that the Product is installed, serviced and operated strictly in accordance with instructions from Badger Meter. The warranty shall not apply and shall be void with respect to Product exposed to conditions other than those detailed in Product technical literature, or which have been subject to vandalism, negligence, accident, acts of God, improper installation, operation or repair, alteration, or other circumstances which are beyond the reasonable control of Badger Meter. With respect to equipment and parts not manufactured by Badger Meter, the warranty obligations of Badger Meter shall in all respects conform and be limited to the warranty extended to Badger Meter by the supplier.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE (except warranties of title).

Any description of the Product, whether in writing or made orally by Badger Meter or agents of Badger Meter, specifications, samples, models, bulletins, drawings, diagrams, engineering sheets or similar materials used in connection with any order from the Customer are for the sole purpose of identifying the Product and shall not be construed as an express warranty. Any suggestions by Badger Meter or agents of Badger Meter regarding use, application or suitability of the Product shall not be construed as an express warranty unless confirmed to be such in writing by Badger Meter.

Exclusion of Consequential Damages and Disclaimer of Other Liability

The liability of Badger Meter with respect to breaches of the foregoing warranty shall be limited as stated herein. The liability of Badger Meter shall in no event exceed the contract price. BADGER METER SHALL NOT BE SUBJECT TO AND DISCLAIMS: (1) ANY OTHER OBLIGATIONS OR LIABILITIES ARISING OUT OF BREACH OF CONTRACT OR OF WARRANTY, (2) ANY OBLIGATIONS WHATSOEVER ARISING FROM TORT CLAIMS (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR ARISING UNDER OTHER THEORIES OF LAW WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY BADGER METER, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL AND CONTINGENT DAMAGES WHATSOEVER.

PRODUCTS GOVERNED BY THIS TWO-YEAR WARRANTY POLICY
ModMAG® M-Series® Mag Meters
Dynasonics® TFX-500w and TFX-5000 Ultrasonic Clamp-On Meters

Control. Manage. Optimize.

Dynasonics, ModMAG and M-Series are registered trademarks of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2019 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

The Americas | Badger Meter | 4545 West Brown Deer Rd | PO Box 245036 | Milwaukee, WI 53224-9536 | 800-876-3837 | 414-355-0400
México | Badger Meter de las Americas, S.A. de C.V. | Pedro Luis Ogazón N°32 | Esq. Angelina N°24 | Colonia Guadalupe Inn | CP 01050 | México, DF | México | +52-55-5662-0882
Europe, Eastern Europe Branch Office (for Poland, Latvia, Lithuania, Estonia, Ukraine, Belarus) | Badger Meter Europe | ul. Korfantego 6 | 44-193 Knurów | Poland | +48-32-236-8787
Europe, Middle East and Africa | Badger Meter Europa GmbH | Nurtinger Str 76 | 72639 Neuffen | Germany | +49-7025-9208-0
Europe, Middle East Branch Office | Badger Meter Europe | PO Box 341442 | Dubai Silicon Oasis, Head Quarter Building, Wing C, Office #C209 | Dubai / UAE | +971-4-371 2503
Slovakia | Badger Meter Slovakia s.r.o. | Raclanska 109/B | 831 02 Bratislava, Slovakia | +421-2-44 63 83 01
Asia Pacific | Badger Meter | 80 Marine Parade Rd | 19-07 Parkway Parade | Singapore 449269 | +65-63464836
Switzerland | Badger Meter Swiss AG | Mittelholzerstrasse 8 | 3006 Bern | Switzerland | +41-31-932 01 11

Badger Meter

Model RED Remote Electronic Display

PRODUCTS COVERED

This warranty shall apply to the Model RED Remote Electronic Display ("Product"), sold on or after September 11, 2017. This warranty is extended only to utilities, municipalities, other commercial users and authorized Badger Meter, Inc. distributors, hereafter referred to as "Customer," and does NOT apply to consumers, or any person or entity who is not an original Customer of Badger Meter or its authorized distributors.

MATERIALS AND WORKMANSHIP

Badger Meter warrants the Product to be free from defects in materials and workmanship appearing within the earlier of either: One (1) year after installation; or one (1) year and six (6) months after shipment from Badger Meter.

PRODUCT RETURNS

Any Product proved to the satisfaction of Badger Meter to have failed the foregoing warranties will, at the option of Badger Meter, be repaired or replaced without charge to the Customer. The Badger Meter obligation hereunder shall be limited to such repair and replacement and shall be conditioned upon Badger Meter receiving written notice of any alleged defect within ten (10) days after its discovery. This exclusive remedy shall not be deemed to have failed its essential purpose so long as Badger Meter is willing and able to replace defective products, or issue a credit to purchaser within a reasonable time of proof to Badger Meter that a defect is involved. Product returns must be shipped by the Customer prepaid F.O.B. to the nearest Badger Meter factory or distribution center. The Customer shall be responsible for all direct and indirect costs associated with removing the original product and reinstalling the repaired or replacement Product.

LIMITS OF LIABILITY

This warranty shall not apply to any Product repaired or altered by any party other than Badger Meter. The foregoing warranty applies only to the extent that the Product is installed, serviced and operated strictly in accordance with Badger Meter instructions. The warranty shall not apply and shall be void with respect to Products exposed to conditions other than those detailed in Product technical literature, or which have been subject to vandalism, negligence, accident, acts of God, improper installation, operation or repair, alteration, or other circumstances which are beyond the reasonable control of Badger Meter. With respect to products not manufactured by Badger Meter, the warranty obligations of Badger Meter shall in all respects conform and be limited to the warranty extended to Badger Meter by the supplier.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (except warranties of title).

Any description of the Product, whether in writing or made orally by Badger Meter or its agents, specifications, samples, models, bulletins, drawings, diagrams, engineering sheets or similar materials used in connection with any Customer's order are for the sole purpose of identifying the Product and shall not be construed as an express warranty. Any suggestions by Badger Meter or its agents regarding use, application, or suitability of the Product shall not be construed as an express warranty unless confirmed to be such in writing by Badger Meter.

Exclusion of Consequential Damages and Disclaimer of Other Liability

The liability of Badger Meter with respect to breaches of the foregoing warranty shall be limited as stated herein. The liability of Badger Meter shall in no event exceed the contract price. BADGER METER SHALL NOT BE SUBJECT TO AND DISCLAIMS: (1) ANY OTHER OBLIGATIONS OR LIABILITIES ARISING OUT OF BREACH OF CONTRACT OR OF WARRANTY, (2) ANY OBLIGATIONS WHATSOEVER ARISING FROM TORT CLAIMS (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR ARISING UNDER OTHER THEORIES OF LAW WITH RESPECT TO PRODUCTS SOLD OR SERVICES RENDERED BY BADGER METER, OR ANY UNDERTAKINGS, ACTS OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL, AND CONTINGENT DAMAGES WHATSOEVER.

Making Water Visible®

Making Water Visible is a registered trademark of Badger Meter, Inc. Other trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists. © 2017 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

The Americas | Badger Meter | 4545 West Brown Deer Rd | PO Box 245036 | Milwaukee, WI 53224-9536 | 800-876-3837 | 414-355-0400
México | Badger Meter de las Americas, S.A. de C.V. | Pedro Luis Ogazón N°32 | Esq. Angelina N°24 | Colonia Guadalupe Inn | CP 01050 | México, DF | México | +52-55-5662-0882
Europe, Eastern Europe Branch Office (for Poland, Latvia, Lithuania, Estonia, Ukraine, Belarus) | Badger Meter Europe | ul. Korfantego 6 | 44-193 Knurów | Poland | +48-32-236-8787
Europe, Middle East and Africa | Badger Meter Europa GmbH | Nurtinger Str 76 | 72639 Neuffen | Germany | +49-7025-9208-0
Europe, Middle East Branch Office | Badger Meter Europe | PO Box 341442 | Dubai Silicon Oasis, Head Quarter Building, Wing C, Office #C209 | Dubai / UAE | +971-4-371 2503
Slovakia | Badger Meter Slovakia s.r.o. | Racianska 109/B | 831 02 Bratislava, Slovakia | +421-2-44 63 83 01
Asia Pacific | Badger Meter | 80 Marine Parade Rd | 21-06 Parkway Parade | Singapore 449269 | +65-63464836
China | Badger Meter | 7-1202 | 99 Hangzhong Road | Minhang District | Shanghai | China 201101 | +86-21-5763 5412
Switzerland | Badger Meter Swiss AG | Mittelholzerstrasse 8 | 3006 Bern | Switzerland | +41-31-932 01 11

Legacy Document Number: RED-W-1

SMART WATER IS BADGER METER

Trademarks appearing in this document are the property of their respective entities. Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists
© 2022 Badger Meter, Inc. All rights reserved.

www.badgermeter.com

The Americas | Badger Meter | 4545 West Brown Deer Rd | PO Box 245036 | Milwaukee, WI 53224-9536 | 800-876-3837 | 414-355-0400
México | Badger Meter de las Americas, S.A de C.V. | Pedro Luis Ogazón N°32 | Esq. Angelina N°24 | Colonia Guadalupe Inn | CP 01050 | México, DF | México | +52-55-5662-0882
Europe, Eastern Europe Branch Office (for Poland, Latvia, Lithuania, Estonia, Ukraine, Belarus) | Badger Meter Europe | ul. Korfantego 6 | 44-193 Knurów | Poland | +48-32-236-8787
Europe, Middle East and Africa | Badger Meter Europa GmbH | Nurtinger Str 76 | 72639 Neuffen | Germany | +49-7025-9208-0
Europe, Middle East Branch Office | Badger Meter Europe | PO Box 341442 | Dubai Silicon Oasis, Head Quarter Building, Wing C, Office #C209 | Dubai / UAE | +971-4-371 2503
Slovakia | Badger Meter Slovakia s r.o. | Racianska 109/B | 831 02 Bratislava, Slovakia | +421-2-44 63 83 01
Asia Pacific | Badger Meter | 80 Marine Parade Rd | 19-07 Parkway Parade | Singapore 449269 | +65-63464836
Switzerland | Badger Meter Swiss AG | Mittelholzerstrasse 8 | 3006 Bern | Switzerland | +41-31-932 01 11