

KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION

Witness: Robert Burton and Justin Sensabaugh

1. Provide a narrative discussion regarding all measures the Company would employ to ensure that cost savings from the use of advanced metering infrastructure (AMI), including but not limited to meter reading and field service expense reductions, would be passed on to ratepayers.
 - a. Explain whether the Company intends to use AFUDC for the proposed project. If not, why not?
 - b. Explain also whether the Company proposes to request regulatory liabilities and/or regulatory assets to capture all such savings and costs associated with the AMI deployment. If so, provide all details including but not limited to the following:
 - i. For any regulatory asset amortization, include the deferred operating expenses, net book value of water meters replaced, and any AFUDC; and
 - ii. For any regulatory liability amortization, include meter reading, field services, ADIT for retired & replaced meters, and any ADIT for AMI placed in service for income tax purposes.
 - c. Please describe any commitments the Company is willing to make regarding the level of expense reductions reflected as rate reductions after the deployment period, for example, through test-year adjustments in the Company's next base rate case used to recover AMI investment costs. If the Company is not willing to make such commitments, please explain why not.

Response:

As Mr. Burton has testified, AMI is the standard that utilities have installed or are moving towards throughout the industry. KAW expects numerous benefits from AMI technology, all of which will also provide benefits to customers. In addition to providing customers with near real time data about their water usage and enhanced customer service, KAW expects to improve safety and operational efficiency by shifting employees from meter reading to higher value work, reducing environmental impact by rolling fewer trucks, increasing billing accuracy, reducing the likelihood of estimated bills, and assistance in addressing unaccounted for water.¹

As Mr. Sensabaugh has testified, AMI will enable strategic and permanent improvements in safety, customer experience, operational efficiencies, and environmental benefits. KAW looks forward to leveraging AMI to empower customers with near real time consumption data to enable smart water use choices, enhancing customer communications regarding customer water consumption patterns and unusually high water use, optimizing KAW's ability to measure and address non-revenue water, and improve water system operations

¹ Burton Direct Testimony, p. 5.

and management. AMI provides a variety of benefits by allowing KAW to collect hourly consumption data from the meter and transmit it to a computer network. This will improve safety, operational efficiency, and customer service. With AMI, it is no longer necessary for employees to walk or drive by meter routes in order to gather consumption data. This will make meter reading more efficient, reduce work site safety hazards associated with meter reading, and reduce our environmental impact by reducing monthly trips to obtain meter readings. Finally, it will allow a shift of employee time spent reading meters to activities related to customer service requests.²

Completing more, higher-value work without adding additional labor resources carries a financial benefit that will be embedded in future revenue requirements, along with all other efficiencies achieved

- a. No. As stated in the Application, Exhibit A to the Application, and in testimony, the requested move to AMI is nothing more than a shift in meter reading technology in the normal course as existing AMR endpoints either come due for scheduled replacement or reach the end of their useful life due to failure. This is not an “Investment Project” that would necessitate AFUDC due to an extended, multi-month period of construction. Rather it is ongoing meter replacement in the normal course of business, and AFUDC is not relevant.
- b. No.
- c. As described in Krista Citron’s testimony, KAW does not intend to reduce staffing levels as a result of near-term AMI deployment. The financial labor benefits the Company anticipates relate to delivering more, higher value work without adding additional resources, and these benefits will be embedded in KAW’s future revenue requirements, as will all other achieved efficiencies.

² Sensabaugh Direct Testimony, pp. 11-12.

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Witness: Krista Citron

2. If the proposed project is approved, explain how many years following full deployment that net benefits will exceed net costs.

Response:

It is important to note that this CPCN is not a single proposed project, but rather a request to change technologies in the normal, scheduled course of periodic meter replacements over approximately the next 10 years.

AMI creates benefits relative to the current state for KAWC operations while AMR / Existing Tech is not anticipated to produce any additional operational or customer service benefits. KAWC also expects our customers to experience significant qualitative benefits not able to be captured in the cost-benefit analysis related to improved customer service, water use management, high bill avoidance, and affordability.

When costs and benefits are netted, average cost AMI becomes the least cost solution after year 15 once AMI deployment has reached saturation and benefits begin in full. This is shown in Figure 21 of Exhibit A. AMI is expected to remain least costly in the years that follow. Refer also to the Citron Direct Testimony at page 10, line 1 through page 12, line 2 for additional discussion on the cost/benefit results. The AMI/AMR costs and benefits by year for a 20-year outlook can also be viewed in the workpapers submitted for KAW_R_AGDR1_NUM008_082925_Attachment A, specifically on the "Comp3-CustDetail" tab.

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Witness: William A. Lewis

3. Provide the number of staff currently assigned to meter reading positions with KAW. If the Commission grants the requested CPCN, explain how many of those personnel will remain in the same capacity.

Response:

KAW currently has 7 employees currently assigned to meter reading positions. As noted in Ms. Citron's testimony pages 6-7, KAW anticipates an overall reduction of meter reading personnel once AMI capable meters are fully deployed throughout the water system. However, these benefits are not expected to be fully recognized until 2036 based on the LOS replacement strategy being proposed. KAW anticipates that with new customer growth and new operational requirements over this time period and yet unknown, the employee resource reduction in the meter reading department will be incorporated into other areas of the operation.

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4. Provide all financial analyses the Company may have conducted regarding cost projections to install and operate its own fixed-network communications network, compared with the cost to install the AMI cellular system such as the one KAW chose. If the Company completed no such analysis, please explain why not.

Response:

KAWC did not analyze a fixed-network system as part of this cost-benefit analysis (CBA). In a previous CBA, a hybrid option of part-cellular and part-fixed-network was included, but was not preferred for several reasons including a poor cost benefit result relative to other options. An AMI cellular system avoids ongoing and increasing costs associated with installing, owning and maintaining the additional infrastructure required to operate an AMI fixed-network system. AMI cellular technology also provides the added benefits of being routinely updated to keep up with the latest technologies, provides greater coverage and security over fixed-network systems. AMI cellular technology protects KAWC from liabilities related to damage to the physical structures caused by storms, security patches vulnerabilities, and/or equipment failures.

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Witness: Krista Citron and Craig Dowell

5. Provide a list and quantification of all capital cost items required to provide AMI functionality, including but not limited to: design, hardware, installation, and testing of the communications network; meters (excluding any remote service switch); meter remote service switches; any other optional meter features and capabilities such as network communications chips); meter testing, handling, and installation; and all meter software applications.

Response:

The cost of the meters and endpoints as outlined in the AMI Plan (Exhibit A to the Application) at page 26 is inclusive of everything needed for the meter and endpoint to function in an AMI environment. The purchase of the endpoint includes access to the vendor's Head End System that stores and transmits interval data to the American Water Meter Data Management System. Cellular AMI eliminates the need for any additional infrastructure needs by utilizing the cellular carrier's existing network.

Costs for the meters, endpoints, lids, and installation labor can also be found at page 26 of the AMI Plan in Figure 17 and described in more detail in the workpapers provided in KAW_R_AGDR1_NUM008_082925_Attachment A.

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Witness: William A. Lewis

6. Does the Company agree that millions of water, gas and electric meters in the U.S. are still read via AMR technology?

Response:

KAW has not counted the number of meters in use in the United States that use AMR technology so KAW cannot answer this question. KAW agrees that AMR technology is still in use in the United States and that KAW currently uses AMR technology. KAW has requested approval to make a simple change from using AMR technology to read meters to using AMI technology. This change would happen in the normal course of meter change outs. KAW has requested this change for the most basic of reasons -- it will drive efficiencies and improvements that will inure to the benefit of customers.

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Witness: William A. Lewis and Justin Sensabaugh

7. Does the Company agree that AMI technology is also subject to the risk of obsolescence? If not, explain fully why not. Describe all measures the Company has taken to address AMI obsolescence risk during the AMI plan development, and identify any such evidence in the materials included in the application for the instant docket.

Response:

All technology, including AMI technology, will eventually become obsolete. The most current generation of iPhones will be obsolete at some point in the future. Technologies change, get improved upon and updated, and get replaced over time. For this case, what is important is that AMR technology has been improved and updated with AMI technology, which is currently the state of the art in reading water meters. What is also important is whether AMI technology will be obsolete before the end of the useful life of the AMI equipment KAW seeks to install. KAW and the water industry have no reason to believe that is the case. KAW has mitigated against AMI obsolescence through the careful process by which it chose the proposed AMI technology. Mr. Sensabaugh describes that process at pages 8-10 of his Direct Testimony. See also the RFI and RFP process described in Exhibit A to the Application. Finally, see p. 23 of that Exhibit and its discussion of the meter selection process which states:

Meter Selection Process

In mid-2024, and continuing through the second quarter of 2025, American Water's Service Company pursued an RFI and an RFP to identify and survey suppliers currently in the market that could meet the meter needs of American Water across its footprint. The goal of the RFI was to identify potential vendors whose products, capabilities, features, capacity, and services would be a good fit for American Water's customers, and the RFP was designed to identify and award business to a strategic partner or partners within the metering domain to provide meters moving forward. In addition, demonstrating diligence, validating vendor capacity, and refreshing pricing, contractual terms and product offerings for both metering and AMI technology (hardware, communication network, software, integration capabilities) were priorities.

American Water began the process with an RFI to validate which vendors could meet American Water's minimum criteria for RFP participation and ensure due diligence was followed. Twelve vendors received the RFI. Three vendors were disqualified due to their non-response to the RFI. Then the RFI results were compared against American Water's minimum established criteria, which were focused on a vendor's ability to meet American Water's purchasing quantities, product needs, provide a current cellular solution, provide a back-up cellular solution, scale across American Water's territory, and respond to the latest integration and security requirements. Two vendors were selected to move forward to the RFP process because they could meet all American Water's minimum requirements, and they were both selected as providers.

American Water proceeded with an RFP with the goals of securing optimum enterprise-wide pricing, delivery and support terms as well as validating technical capabilities that will lead to reduced field visits, improved customer satisfaction and reduced complexity. Following rigorous review, American Water selected both RFP vendors and is currently entering into modernized contracts with both vendors with improved terms and service level agreements.

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Witness: Krista Citron

8. Provide all cost-benefit analyses ("CBAs") and related data the Company conducted not already included in the application.

Response:

Refer to the workpapers in KAW_R_AGDR1_NUM008_0829025_Attachment A. A portion of the attachment is confidential and is being provided pursuant to a petition for confidential protection.

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Witness: Craig Dowell

9. Does KAW believe that AMI benefits will also include: reduced usage on inactive meters, bad-debt write offs, and theft? If not, why not?
- a. Does the Company agree that none of these benefits will result in rate savings for customers until they are both: (i) implemented to their maximum benefit potential; and (ii) included in a rate case test year, test year adjustment, bad debt accrual rate reduction, or sales volume forecast.

Response:

AMI benefits, such as increased interval reads from once per month to 96 readings per day, will allow KAW to identify usage on inactive meters more quickly and with more granular detail as to when the usage occurs, allowing the Company to take action well before the current once-per-month process. The ability to take that action sooner will inure to the benefit of customers as AMI is deployed and KAW agrees it would require a rate case for customers to realize that benefit.

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Witness: William A. Lewis

10. Describe all commitments KAW is willing to make to:

- a. maximize the revenue improvement potential of the AMI meters;
- b. measuring the actual revenue improvements delivered from the AMI meters;
- c. ensure all revenue improvements from AMI meters are represented in the test year, test year adjustments, sales volume forecasts, or bad debt accrual rates of the rate case in which the Company seeks to secure AMI cost recovery.

Response:

- a-c: KAW would not be installing AMI meters to maximize revenue. In fact, KAW is hopeful that AMI meters will enable customers to better monitor their usage and correct hidden leaks before receiving unexpected, high bills.

KAW's purpose in moving toward AMI is to improve customer experience, customer service, billing accuracy, operational efficiency, environmental impacts, and safety.

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Witness: Craig Dowell

11. Explain whether customers would have any capability of accessing their meter's data, and if so, how.

Response:

Customers will have access to the interval consumption data measured by the meter and transmitted by the connected endpoint via the existing Customer Portal (MyWater). Upon completion of the endpoint installation and activation, the endpoint will begin to communicate interval readings (up to 96 per day) to the vendor's Head End System. This interval data will be transmitted to the American Water Meter Data Management System and made available in the Customer Presentment portal empowering the customer with knowledge of how they are consuming water.

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Witness: Justin Sensabaugh

12. What does the company intend to do with data it collects from its customers?

Response:

KAWC intends to help educate customers on their water usage with a vastly enhanced user experience. Please see Exhibit A page numbers 8 and 9. This explains what the customers will see when they log into their MyWater accounts for account information. The customer will see near real time data from the AMI meter, which can read up to 96 times per day versus the once-a-month AMR reads. Figure number 1 in Exhibit A depicts usage graphs in gallons for several different periods of time, to help identify any issues with their water usage.

Also see the response to AG 1-13.

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Witness: William A. Lewis

13. For purposes of these questions and their subparts, the term “customer data” refers to any and all data regarding or pertaining to KAW’s customers, their family members or other persons residing in the same residential household or unit, and includes but is not limited to: (i) customers’ identity; (ii) personal information, including but not limited to street address, e-mail address, telephone number(s), credit history, checking account(s), credit and/or debit card data; and (iii) water consumption, usage, and usage patterns.
- a. For how long will the company retain customer data?
 - b. Does KAW believe that customer data belongs to its customers, or to the company? Explain the reasons for KAW’s beliefs.
 - c. What will the company do with customer data when the retention period which the company selects has expired?
 - d. How will KAW allow its customers to decide whether to allow KAW to sell or otherwise disclose customer data? Will it be via affirmative “opt-in,” or by an affirmative “opt-out” which customers will have to select in order to not allow KAW to disclose their data?
 - (i) provide copies of the “opt-in” or “opt-out” choices regarding the disclosure/sale of customer data which KAW plans to provide to its customers.
 - e. Will the company sell customer data regarding those customers who opt to allow the company to disclose such information to third parties?
 - f. If your response to subpart (e), above is yes:
 - (i) state what protections, if any, the company plans to employ to protect confidentiality of customer data;
 - (ii) state what the company intends to do with the proceeds of the customer information which it sells; and
 - (iii) state whether those customers who opt to allow disclosure of their customer data will receive any monetary benefit, and if so, how much and in what form.
 - g. If KAW does not intend to sell customer data, but will otherwise disclose customer data pertaining to customers who authorize KAW to do so, state what protections, if any, the company plans to employ to protect confidentiality of data that can identify customers, including but not limited to information such as account numbers, credit card numbers, etc.

Response:

Kentucky-American notes that it does not maintain all of the data specified in the question.

- KAWC does **not** collect information about every member of a household or how many people reside in each household.
 - KAWC collects first and last name, physical address, e-mail address, telephone or cellphone number from each account holder.
 - KAWC does **not** collect or use customer credit history information or credit or debit card information. KAWC only collects ACH information to process payments for customers at the customer's request. None of this information nor checking account information is required to maintain a customer account.
 - KAWC collects water consumption and usage from customers in the normal course of business as part of its provision of service to customers.
- a. The Company's Record Retention policy requires that different types of customer data be maintained for different periods based on regulatory requirements. Customer financial account and payment information is destroyed one year after the account closes. Customer billing information is destroyed seven years after the account closes.
- b. KAWC believes that customer data belongs to its customers. KAWC believes that customer data is shared with the Company to facilitate the provision of safe, reliable water and wastewater services and to comply with our regulatory obligations, and the Company is committed to responsible use and protection of that information. American Water's Privacy Policy, applicable to KAWC, is an example of the Company's commitment to transparency with customers. It explains to customers what customer data is collected, how it is used, and how to communicate with the Company if the customer has a question or would like to request a change to their customer information. In addition, American Water has a data privacy program that complies with various state data privacy laws, and a cyber security program that complies with the NIST 2.0 Framework, all of which are applicable to KAWC.
- c. In accordance with the Company's Record Retention policy, customer data is destroyed when it is expired.
- d. KAWC does not sell customer data. KAWC maintains a Payment Assistance Portal so that pledge agencies that assist low-income customers with their utility bill can access their customer account. All KAWC customers are accessible through use of the portal. However, KAWC does not collect or maintain income verification documents. There is neither an opt-out or opt-in option for inclusion in the Payment Assistance Portal.

If KAWC customers have questions or concerns about their customer data, customers may submit a Customer Privacy Request or email the Data Privacy team at American Water by emailing privacy@amwater.com. This information is explained in the Privacy Policy, available at <https://www.amwater.com/corp/resources/PDF/Data-Privacy/American-Water-Privacy-Policy.pdf>

- e. KAWC does not sell customer data.
- f. N/A

- g. KAWC does not collect or maintain credit card numbers. KAWC and American Water protect the confidentiality of customer data through a robust cyber security framework that meets the NIST 2.0 Framework. KAWC and American Water also protect the confidentiality of customer data through contractual obligations, including confidentiality provisions, cyber breach notification requirements, etc.

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Witness: William A. Lewis

14. If the Commission approves the CPCN, explain whether KAW will develop any policies governing the ability of third parties to gain access to the data generated by the AMI meters. If so, provide copies of same.

Response:

American Water maintains a Privacy Policy (applicable to KAWC) to explain to customers what customer data is collected, how it is used, and how to communicate with the Company if the customer has a question or would like to request a change to their customer information. The Privacy Policy is available at <https://www.amwater.com/corp/resources/PDF/Data-Privacy/American-Water-Privacy-Policy.pdf>

Also see the response to AG 1-13.

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Witness: William A. Lewis

15. If the Company will disclose any such data to third parties, explain whether it will commit to protecting customers' privacy, and if so, how.

Response:

The Company is committed to responsible use and protection of customer data. The Company's Privacy Policy is an example of the Company's commitment to transparency with customers. It explains to customers what customer data is collected, how it is used, and how to communicate with the Company if the customer has a question or would like to request a change to their customer information. In addition, American Water has a data privacy program that complies with various state data privacy laws, and a robust cyber security program that complies with the NIST 2.0 Framework, all of which are applicable to KAWC. KAWC and American Water also protect the confidentiality of customer data through contractual obligations, including confidentiality provisions, cyber breach notification requirements, etc.

Also see the response to AG 1-13.

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Witness: Dominic DeGrazia

16. Does the company look upon customer data as a revenue enhancement measure?

Response:

No.

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Witness: Craig Dowell

17. Explain to what extent the proposed AMI meters and infrastructure will be interoperable with KAW's other systems, including but not limited to: IT office systems, metering systems, SCADA, outage management systems, analytic systems, billing systems, and external partners and services. For purposes of this question, the term "interoperable" means the ability of different information technology systems and software applications to communicate, exchange data, and use the information that has been exchanged.

Response:

The data transmitted from the AMI endpoint to the vendor's Head End System will be transferred to the American Water Meter Data Management System. This dataset is made available to our data analytic solution (AWS QuickSight) allowing for the creation of useful analytical dashboards containing data from many other systems such as but not limited to:

- Work & Asset Management
- Billing Systems
- SCADA data
- All other metering systems
- IT Office Systems
- GIS data
- Health & Safety data

American Water continues to survey the industry to learn of innovative ways to use the data obtained via AMI to improve the customer experience and will look to enhance our integrations in the future.

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Witness: Dominic DeGrazia

18. If the Commission approves the CPCN, explain whether KAW will accrue carrying costs, including interest expense, return on equity, depreciation expense during the implementation phase.

Response:

This question seems to indicate a fundamental misunderstanding of KAW's request in this case. KAW has requested approval to make a simple change from using AMR technology to read meters to using AMI technology. This change would happen in the normal course of meter change outs without any accelerated deployment whatsoever. KAW has requested this change for the most basic of reasons -- it will drive efficiencies and improvements that will inure to the benefit of customers. None of the ratemaking items identified in this question would change from this simple move in meter reading technology.

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Witness: Dominic DeGrazia

19. Explain whether KAW is willing to offer an AMI opt-out option. If so, provide all details.

Response:

KAWC is open to an opt-out option and additional charge to cover the cost of an exception-based meter reading. This opt out fee would be proposed in a future KAWC tariff filing as a part of a general rate case or in a separate filing.

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Witness: Dominic DeGrazia

20. Provide KAW's business case for the AMI program.

Response:

Please refer to the Direct Testimony of Robert Burton, the Direct Testimony of Justin Sensabaugh, the Direct testimony of Krista Citron, the Application, and Exhibit A to the Application..

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Witness: Dominic DeGrazia

21. Have any of KAW's affiliated utilities executed a system-wide conversion to AMI meters? If so, state when the conversions occurred, and provide the style of the case and jurisdiction in which any such affiliates obtained approval from their regulatory authorities.

Response:

See response to KAW_R_PSCDR1_NUM001_082925.

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Witness: William A. Lewis

22. Explain whether KAW anticipates any aggregate water savings from the AMI upgrade, and if so, provide estimates.

Response:

The AMI upgrade will provide customers with access to more closely monitor their water usage. Currently, a customer only receives their water usage data via a monthly water bill. While this will continue with the AMI upgrade, customers will also have access to their daily water usage via a customer usage portal during the actual water usage month. As customers acclimate to having more routine access to and knowledge of their water use, KAW anticipates aggregate customer water usage to decrease. Due to variables outside of KAW's control (e.g., how often a customer reviews water usage and whether a customer acts upon the data available to them with the AMI upgrade) it is not possible to provide an accurate estimate of aggregate water savings.

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Witness: Craig Dowell and Justin Sensabaugh

23. Provide the warranty period for: (i) the AMI meters proposes to install; (ii) the battery module that will be attached to the meters; and (iii) communication devices utilized by the AMI meters.

Response:

Meter and Endpoint warranty information can be found in the attachments to this DR:

- KAW_R_AGDR1_NUM023_082925_Attachment 1
- KAW_R_AGDR1_NUM023_082925_Attachment 2



American Water - 2024 RFP Water Meters & Related Services Event #9344 WARRANTY COVERAGE STATEMENTS

- **T-10® Water Meter**
 - 5/8" to 2" Warranty Statements
- **MACH 10® Water Meter**
 - 5/8" to 2" Warranty Statement
 - 3" to 12" Warranty Statement
- **Cellular Endpoint**
 - Warranty Statement
- **Software**
 - Neptune® 360™ Description of Services



A NEPTUNE TECHNOLOGY GROUP WARRANTY STATEMENT

Neptune T-10®, HP Turbine, TRU/FLO® Compound Cold Water Meters

1. TERMS OF LIMITED WARRANTY

With respect to its Neptune T-10®, HP TURBINE, TRU/FLO® Compound Water Meters (collectively the "Water Meters"), Neptune Technology Group Inc. ("Neptune") warrants the following on meters sold on or after 11/1/92:

The Water Meters will be, at the later of (i) the date of original purchase from Neptune or (ii) the date of original shipment from Neptune-authorized distributor of Water Meters (that later date is referred to as "the Date of Shipment") and will remain for a period of eighteen (18) months from the Date of Shipment, or twelve (12) months from date of installation, whichever comes first, free from manufacturing defects in workmanship and material.

- (a) Maincase. The no-lead high copper alloy or Brass maincase of the Water Meters will be at the Date of Shipment free from manufacturing defects in workmanship and material for the life of the Water Meter.
- (b) Frost Protection. All Neptune T-10 Cold Water Meters shipped with a cast-iron bottom cap will, commencing upon the Date of Shipment, be warranted against chamber damage for a period of ten (10) years.
- (c) Registers. Standard, roll sealed registers of the Water Meters will be at the Date of Shipment, and shall remain for the following periods, free from manufacturing defects in workmanship and material for a period of ten (10) years. The ARB®, ProRead™ (ARB VI), E-CODER® (ARB VII), and ProCoder™ system registers are warranted for ten (10) years from Date of Shipment. All ProRead encoder receptacles shipped after January 1, 2001, shall be warranted for five years from the Date of Shipment. All other components and parts are covered under Neptune's standard one-year material and workmanship guarantee.

- (d) Meter Accuracy for Neptune T-10. Neptune T-10 Meters and Neptune T-10 nutating disc chambers in TRU/FLO Compound Water Meters are warranted to meet or exceed, as listed herein, accuracy standards of the AWWA Standard C700-95 for a period of: (i) five (5) years from Date of Shipment for 5/8", 3/4" and 1" meters; (ii) for a period of two (2) years from the Date of Shipment for 1 1/2" and 2" meters; or (iii) the applicable registration shown below, whichever occurs first. Neptune further guarantees that the Neptune T-10 and Neptune T-10 nutating disc chambers in TRU/FLO Compound Water Meters will perform to at least Repaired Meter Accuracy Standards, according to AWWA Manual M-6 Chapter 5 (1999) Table 5.3 for an additional ten (10) years or the registration shown below, whichever occurs first.

SIZE	EXTENDED LOW FLOW ACCURACY	NEW METER ACCURACY	REPAIRED METER ACCURACY
5/8 & 3/4" x 3/4"	1/8 US gpm @ 95% 5 years or 500,000 gallons	500,000 gallons	1,500,000 gallons
3/4"	1/4 US gpm @ 95% 5 years or 750,000 gallons	750,000 gallons	2,250,000 gallons
1"	3/8 US gpm @ 95% 5 years or 1,000,000 gallons	1,000,000 gallons	3,000,000 gallons
1 1/2"	3/4 US gpm @ 95% 2 years or 1,600,000 gallons	1,600,000 gallons	5,000,000 gallons
2"	1 US gpm @ 95% 2 years or 2,700,000 gallons	2,700,000 gallons	8,000,000 gallons

- (e) Meter Accuracy for HP Turbine and TRU/FLO. The HP Turbine and TRU/FLO Compound Cold Water Meters will perform, for a period of one (1) year from the Date of Shipment, to American Water Works Association ("AWWA") accuracy standards for new water meters.



2. WARRANTY RETURN

If a Neptune Water Meter fails an accuracy test during an applicable warranty period, it may be returned to Neptune for repair or replacement at Neptune's option. An accuracy test shall be conducted by the customer according to AWWA standards. Any meter being returned for repair to Neptune under this performance guarantee must be returned with a copy of the customer's test results. If the meter is returned to Neptune without a copy of the test results or if Neptune's factory test shows the meter to meet current AWWA standards, the customer will be charged a nominal testing fee by Neptune in such cases. Neptune will repair or replace the meter at Neptune's option after the meter has been tested by Neptune. Meters repaired or replaced under the performance guarantee will be guaranteed to perform to AWWA repaired meter accuracy standards.

3. WARRANTIES ARE EXCLUSIVE

The warranties set forth in this certificate of warranty are in lieu of any other warranty, guarantee, or representation, whether expressed or implied, including without limitation, the warranty of merchantability and the warranty of fitness for a particular purpose.

4. DAMAGES LIMITED TO COSTS OF REPLACEMENT AND REPAIR

If the Water Meter fails to meet the warranties set forth in Paragraph 1 of this Certificate of Warranty, Neptune, at its option shall, without charge of labor or materials, repair or replace the Water Meter or part thereof, provided that (a) the Water Meter is delivered to a Neptune representative, (b) the Water Meter is accompanied by a Return Material Authorization (RMA), and (c) all costs of delivery to Neptune are assumed by the purchaser of the Water Meter. Neptune's liability is limited to its costs of replacement and repair of the defective water meter. Damages resulting from miscalculation of water usage or lost revenue or profit are not recoverable from Neptune. It is the responsibility of the customer to periodically verify the operation and accuracy of its meters.

5. WARRANTIES ARE INAPPLICABLE UNDER CERTAIN CONDITIONS

The warranties set forth in this Certificate of Warranty do not apply to any Water Meter that has been damaged by, or subjected to, conditions which, in the opinion of Neptune, have affected the Water Meter's ability of performance, including but not limited to: misuse; improper handling, application or installation; excessive operating conditions; foreign materials in the water; aggressive water conditions; tampering or unauthorized repairs or modifications; accidental or intentional damage; acts of God. This Certificate of Warranty shall not apply if product is placed in non-recommended installation, is connected or altered by other than Neptune recommended procedures, is used with other than genuine Neptune meter registers and components, or read by equipment not approved or licensed by Neptune. Neptune makes no claims concerning operability and/or compatibility or third party reading systems. In addition, this Certificate of Warranty shall not apply if third party reading equipment is believed to have caused damage to the meter or register. In order to determine its liability, if any, under this Certificate of Warranty, Neptune shall have the right to inspect any Water Meter or part thereof that is claimed to be defective at Neptune or other location designated by Neptune.

NEPTUNE'S LIABILITY WITH RESPECT TO BREACHES OF THE FOREGOING LIMITED WARRANTY SHALL BE LIMITED AS STATED HEREIN. NEPTUNE'S LIABILITY SHALL IN NO EVENT EXCEED THE PURCHASE PRICE. NEPTUNE SHALL NOT BE SUBJECT TO AND DISCLAIMS THE FOLLOWING: (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 NEPTUNE, OR ANY UNDERTAKINGS, ACT OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL, SPECIAL, MULTIPLE, EXEMPLARY, AND PUNITIVE DAMAGES WHATSOEVER.



A NEPTUNE TECHNOLOGY GROUP WARRANTY STATEMENT

5/8" to 2" MACH 10® Ultrasonic Meter

1. TERMS OF LIMITED WARRANTY

With respect to its Neptune® MACH 10® water meter ("MACH 10"), Neptune Technology Group Inc. ("Neptune") warrants that for meters sold on or after August 1, 2021, for potable water or combined potable water and residential fire service applications, the MACH 10 meter will be warranted to be free from manufacturing defects in workmanship and material as follows:

The MACH 10 will be, at the later of (i) the date of original purchase from Neptune or (ii) the date of original shipment from a Neptune-authorized distributor of water meters (that later date is referred to as "the Date of Shipment"), and will remain for a period of 18 months from the Date of Shipment, or 12 months from date of installation, whichever comes first, free from manufacturing defects in workmanship and material. Neptune makes the following additional warranties with respect to certain MACH 10 components, dependent upon the size of meter:

a) Lead Free Bronze Maincase

i) 5/8" – 1" MACH 10

Neptune warrants that the MACH 10 lead free bronze maincase will be free from manufacturing defects in workmanship and material for twenty (20) years from the Date of Shipment.

ii) 1½" – 2" MACH 10

Neptune warrants that the MACH 10 lead free bronze maincase will be free from manufacturing defects in workmanship and material for ten (10) years from the Date of Shipment.

b) Electronics (Battery, PCB, Transducers, LCD)

i) 5/8" – 1" MACH 10

Neptune warrants that the electronics of the MACH 10 will be free from manufacturing defects in workmanship and material for a period of twenty (20) years from the Date of Shipment. Neptune will repair or replace a non-performing MACH 10 free of charge for the first ten (10) years and at a discount of the then-current list price during the following ten (10) years per the schedule at the right. The MACH 10 warranty does not include the external housing that encapsulates the electronics.

Replacement Price Discount		
Year of Failure	5/8" to 1" MACH 10®	1.5" to 2" MACH 10®
1-10	Full replacement 100%	Full replacement 100%
11	70%	n/a
12	70%	n/a
13	60%	n/a
14	60%	n/a
15	50%	n/a
16	45%	n/a
17	40%	n/a
18	35%	n/a
19	30%	n/a
20	25%	n/a

**Replacement price discount percentages will be applied towards the then-current list price in effect for the year product is accepted by Neptune under warranty conditions. Replacement MACH 10 electronics are warranted for one (1) year after date of shipment or balance of original MACH 10 warranty, whichever is greater.*

ii) 1½" – 2" MACH 10

Neptune warrants the electronics of the MACH 10 will be free from manufacturing defects in workmanship and material for a period of ten (10) years from the Date of Shipment. Neptune will repair or replace a non-performing MACH 10 free of charge during the ten (10) year Warranty Period. The MACH 10 warranty does not include the external housing that encapsulates the electronics.

With respect to Section 1 and subparts a) and b), the period from the Date of Shipment to the expiration of the specified time period is the "Warranty Period" with respect to each specified component. Neptune shall not be responsible for any defects in the MACH 10 or any specified component (whether due to design, materials, manufacture, or otherwise) that manifest themselves after the expiration of the specified Warranty Period.

2. MACH 10 METER ACCURACY

Provided that the MACH 10 meter and the components specified in Section 1 and subparts a) and b) are functioning properly (regardless of whether the MACH 10 meter and specified components are within or outside an applicable Warranty Period), Neptune makes the following warranties with respect to meter accuracy, dependent upon the size of meter:

i) 5/8" – 1" MACH 10

Neptune MACH 10 meters are warranted to meet or exceed meter accuracy of $\pm 1.5\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for twenty (20) years from Date of Shipment. Neptune further warrants the MACH 10 to meet or exceed extended low flow accuracy of $\pm 3\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for twenty (20) years from Date of Shipment.

ii) 1½" – 2" MACH 10

Neptune MACH 10 meters are warranted to meet or exceed meter accuracy of $\pm 1.5\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for ten (10) years from date of shipment. Neptune further warrants the MACH 10 to meet or exceed extended low flow accuracy of $\pm 3\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for ten (10) years from Date of Shipment.

3. WARRANTY RETURNS

If a Neptune MACH 10 meter fails an accuracy test during an applicable Warranty Period, it may be returned to Neptune for evaluation. Any MACH 10 meter proved to the satisfaction of Neptune to have failed the warranties set forth in this Certificate of Warranty will, at the option of Neptune, be repaired or replaced at no cost to the customer. An accuracy test shall be conducted by the customer according to then-current AWWA testing standards. Any meter being returned for repair to Neptune under this performance warranty must be returned with a copy of the customer's test results. If the meter is returned to Neptune without a copy of the test results or if Neptune's factory test shows the meter to meet Neptune's published accuracy specifications, then the customer will be charged a nominal testing fee by Neptune in such cases. If after the meter has been tested by Neptune, Neptune determines that the meter has failed the warranties set forth in this Certificate of Warranty, then Neptune will repair or replace the meter at Neptune's option. Repaired or replacement MACH 10 meters are warranted for one (1) year after Date of Shipment of the repaired or replacement MACH 10 meter or the balance of the original MACH 10 meter warranty, whichever is greater.

4. RESPONSIBILITY LIMITED TO COSTS OF REPLACEMENT AND REPAIR

If the MACH 10 fails to meet the warranties set forth in Sections 1 and 2 of this Certificate of Warranty, then Neptune, at its option shall repair or replace the MACH 10 or part thereof, provided that (a) the MACH 10 is delivered to a Neptune representative, (b) the MACH 10 is accompanied by a Return Material Authorization (RMA), and (c) all costs of delivery to Neptune are assumed by the purchaser of the MACH 10. Neptune's liability is limited to its costs of replacement and repair of the non-performing MACH 10, and without limitation, this warranty does not include field replacement, labor, or materials costs, which are the responsibility of the customer. Damages resulting from miscalculation of water usage or lost revenue or profit are not recoverable from Neptune. It is the responsibility of the customer to periodically verify the operation and accuracy of its meters.

5. WARRANTIES ARE INAPPLICABLE UNDER CERTAIN CONDITIONS

The warranties set forth in this Certificate of Warranty do not apply to any MACH 10 meter that has been damaged by, or subjected to, conditions which, in the opinion of Neptune, have affected the ability of the MACH 10 to perform, including but not limited to: misuse; improper handling, application or installation; excessive operating conditions; foreign materials in the water; aggressive water conditions; tampering or unauthorized repairs or modifications; accidental or intentional damage; or acts of God. This Certificate of Warranty shall not apply if the product is placed in a non-recommended installation, is connected or altered by other than Neptune recommended procedures or is read by equipment not approved or licensed by Neptune. Neptune makes no claims concerning operability and/or compatibility or third-party reading systems. In addition, this Certificate of Warranty shall not apply if third-party reading equipment is believed to have caused damage to the MACH 10. In order to determine its liability, if any, under this Certificate of Warranty, Neptune shall have the right to inspect any MACH 10 meter or part thereof that is claimed to be defective at Neptune or other location designated by Neptune.

THE ABOVE WARRANTY FOR THE MACH 10 WATER METER IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY NEPTUNE WITH RESPECT TO THE MACH 10. **ALL OTHER WARRANTIES, CONDITIONS, TERMS, REPRESENTATIONS, OR OTHER LEGALLY OPERATIVE PROVISIONS CONCERNING THE MACH 10 ARE HEREBY EXPRESSLY EXCLUDED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY, CONDITION, TERM, AND REPRESENTATION OR OTHER LEGALLY OPERATIVE PROVISION AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** THIS PARAGRAPH IS EXPRESSLY INTENDED TO EXCLUDE FROM THIS CONTRACT ALL STATUTORY AND COMMON LAW WARRANTIES TO THE MAXIMUM EXTENT PERMITTED BY LAW. TO AVOID ANY AMBIGUITY OR MISUNDERSTANDING, ALL PROBLEMS ARISING WITH A MACH 10 WATER METER AFTER THIS POINT SHALL BE BUYER'S RESPONSIBILITY. NEPTUNE'S LIABILITY SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE MACH 10 WATER METER. NEPTUNE SHALL NOT BE SUBJECT TO AND DISCLAIMS THE FOLLOWING: (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 NEPTUNE, OR ANY UNDERTAKINGS, ACTS, OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL, SPECIAL, MULTIPLE, EXEMPLARY, AND PUNITIVE DAMAGES WHATSOEVER.



A NEPTUNE TECHNOLOGY GROUP WARRANTY STATEMENT

3" to 12" MACH 10® Ultrasonic Meter

1. TERMS OF LIMITED WARRANTY

With respect to its Commercial and Industrial Neptune® MACH 10® water meter ("MACH 10"), Neptune Technology Group Inc. ("Neptune") warrants that MACH 10 meters sold on or after August 1, 2021, for potable water or combined potable water and fire service applications, will be warranted to be free from manufacturing defects in workmanship and material as follows:

The MACH 10 will be, at the later of (i) the date of original purchase from Neptune or (ii) the date of original shipment from a Neptune-authorized distributor of water meters (that later date is referred to as "the Date of Shipment"), and will remain for a period of 18 months from the Date of Shipment, or 12 months from date of installation, whichever comes first, free from manufacturing defects in workmanship and material. Neptune makes the following additional warranties with respect to certain MACH 10 components.

a) Lead Free Bronze Maincase

Neptune warrants at the Date of Shipment that the lead free, high copper bronze maincase of the MACH 10 will be free from manufacturing defects in workmanship and material for the life of the meter.

b) Electronics (Battery, PCB, Transducers, LCD)

Neptune warrants that the unitized measuring element (UME) and/or electronics of the MACH 10 will be free from manufacturing defects in workmanship and material for a period of ten (10) years from the Date of Shipment. Neptune will repair or replace a non-performing MACH 10 UME free of charge for the first five (5) years and at a discount of the then-current list price, during the following five (5) years per the schedule to the right. The MACH 10 warranty does not include the external housing that encapsulates the electronics.

Year of Failure	MACH 10®
	Replacement Price Discount*
1-5	Full replacement 100%
6	70%
7	60%
8	45%
9	35%
10	25%

** Replacement price discount percentages will be applied towards the then-current list price in effect for the year product is accepted by Neptune under warranty conditions. Replacement MACH 10 electronics are warranted for one (1) year after date of shipment or balance of original MACH 10 warranty, whichever is greater.*

With respect to Section 1 and subparts a) and b), the period from the Date of Shipment to the expiration of the specified time period is the "Warranty Period" with respect to each specified component. Neptune shall not be responsible for any defects in the MACH 10 or any specified component (whether due to design, materials, manufacture, or otherwise) that manifest themselves after the expiration of the specified Warranty Period.

2. MACH 10 METER ACCURACY WARRANTY

Provided that the MACH 10 meter and the components specified in Section 1 and subparts a) and b) are functioning properly (regardless of whether the MACH 10 meter and specified components are within or outside an applicable Warranty Period detailed above), Neptune makes the following warranties with respect to meter accuracy:

Neptune MACH 10 meters are warranted to meet or exceed new meter accuracy per AWWA specifications of $\pm 1.5\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for ten (10) years from Date of Shipment. Neptune further warrants the MACH 10 to meet or exceed extended low flow accuracy of $\pm 3\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for ten (10) years from Date of Shipment (that period being the "Accuracy Warranty Period").

3. WARRANTY RETURNS

If a Neptune MACH 10 meter fails an accuracy test during the Accuracy Warranty Period, the meter or UME may be returned to Neptune for evaluation. An accuracy test shall be conducted by the customer according to then-current AWWA testing standards. Any meter being returned for repair to Neptune under the accuracy warranty must be returned with a copy of the customer's test results. If the meter is returned to Neptune without a copy of the test results or if Neptune's factory test shows the meter to meet Neptune's published accuracy specifications, then the customer will be charged a nominal testing fee by Neptune in such cases. If after the meter has been tested by Neptune, Neptune determines that the meter has failed the accuracy warranty set forth in this Certificate of Warranty, then Neptune will repair or replace the meter at Neptune's option. Repaired MACH 10 meters are warranted for one (1) year after Date of Shipment of the repaired MACH 10 meter or the balance of the applicable original MACH 10 meter warranty (maincase, UME/electronics, or accuracy), whichever is greater.

If a replacement UME is deemed necessary, the new UME will include a new original warranty as specified in Sections 1 and 2 of this Certificate of Warranty.

4. RESPONSIBILITY LIMITED TO COSTS OF REPLACEMENT AND REPAIR

If the MACH 10 fails to meet the warranties set forth in Sections 1 and 2 of this Certificate of Warranty, then Neptune, at its option shall repair or replace the MACH 10 or part thereof, provided that (a) the MACH 10 is delivered to a Neptune representative, (b) the MACH 10 is accompanied by a Return Material Authorization (RMA), and (c) all costs of delivery to Neptune are assumed by the purchaser of the MACH 10. Neptune's liability is limited to its costs of replacement and repair of the non-performing MACH 10, and without limitation, this warranty does not include field replacement, labor, or materials costs, which are the responsibility of the customer. Damages resulting from miscalculation of water usage or lost revenue or profit are not recoverable from Neptune. It is the responsibility of the customer to periodically verify the operation and accuracy of its meters.

5. WARRANTIES ARE INAPPLICABLE UNDER CERTAIN CONDITIONS

The warranties set forth in this Certificate of Warranty do not apply to any MACH 10 meter that has been damaged by, or subjected to, conditions which, in the opinion of Neptune, have affected the ability of the MACH 10 to perform, including but not limited to: misuse; improper handling, application or installation; excessive operating conditions; foreign materials in the water; aggressive water conditions; tampering or unauthorized repairs or modifications; accidental or intentional damage; or acts of God. This Certificate of Warranty shall not apply if the product is placed in a non-recommended installation, is connected or altered by other than Neptune recommended procedures or is read by equipment not approved or licensed by Neptune. Neptune makes no claims concerning operability and/or compatibility or third-party reading systems. In addition, this Certificate of Warranty shall not apply if third-party reading equipment is believed to have caused damage to the MACH 10. In order to determine its liability, if any, under this Certificate of Warranty, Neptune shall have the right to inspect any MACH 10 meter or part thereof that is claimed to be defective at Neptune or other location designated by Neptune.

THE ABOVE WARRANTY FOR THE MACH 10 WATER METER IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY NEPTUNE WITH RESPECT TO THE MACH 10. **ALL OTHER WARRANTIES, CONDITIONS, TERMS, REPRESENTATIONS, OR OTHER LEGALLY OPERATIVE PROVISIONS CONCERNING THE MACH 10 ARE HEREBY EXPRESSLY EXCLUDED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY, CONDITION, TERM, AND REPRESENTATION OR OTHER LEGALLY OPERATIVE PROVISION AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** THIS PARAGRAPH IS EXPRESSLY INTENDED TO EXCLUDE FROM THIS CONTRACT ALL STATUTORY AND COMMON LAW WARRANTIES TO THE MAXIMUM EXTENT PERMITTED BY LAW. TO AVOID ANY AMBIGUITY OR MISUNDERSTANDING, ALL PROBLEMS ARISING WITH A MACH 10 WATER METER AFTER THIS POINT SHALL BE BUYER'S RESPONSIBILITY. NEPTUNE'S LIABILITY SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE MACH 10 WATER METER. NEPTUNE SHALL NOT BE SUBJECT TO AND DISCLAIMS THE FOLLOWING: (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 NEPTUNE, OR ANY UNDERTAKINGS, ACTS, OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL, SPECIAL, MULTIPLE, EXEMPLARY, AND PUNITIVE DAMAGES WHATSOEVER.



A NEPTUNE TECHNOLOGY GROUP WARRANTY STATEMENT

Cellular Endpoint

1. WARRANTY EFFECTIVE DATE

This warranty will be effective for any cellular endpoint that is shipped on or after June 1, 2021. Each warranty referenced in this statement begins at the later of (i) the date of original purchase from Neptune or (ii) the date of original shipment from a Neptune-authorized distributor of water meters (that later date is referred to as "the Date of Shipment").

2. CELLULAR ENDPOINT

Neptune Technology Group Inc. warrants that the cellular endpoint (which includes a Neptune-supplied battery that is not intended to be removable or replaceable) shall be free from defects in manufacture and design for a period of twenty (20) years from the "Date of Shipment" (such period being the "Warranty Period"). Neptune shall not be responsible for any defects in the cellular endpoint (whether due to design, materials, manufacture, or otherwise) which manifest themselves after the expiration of the Warranty Period. Neptune will repair or replace a non-performing cellular endpoint free of charge for the first ten (10) years, and at the then-current list price during the remaining ten (10) years according to the discount schedule at the right. Replacement cellular endpoints are warranted for the balance of the original applicable cellular endpoint warranty.

3. WARRANTIES ARE INAPPLICABLE UNDER CERTAIN CONDITIONS

This warranty does not include field replacement labor or materials costs, which are the responsibility of the utility. This warranty does not apply if product is placed in non-recommended installations; may have been repaired with parts not recommended by Neptune; converted, altered, or connected by other than Neptune recommended procedures; is used with other than genuine Neptune meter registers and components or read by equipment not approved or licensed by Neptune; or damaged due to improper care or maintenance, or improper periodic testing (please refer to the Cellular Endpoint Installation and Maintenance Guide). This warranty does not apply to any cellular endpoint that has been damaged by, or subjected to, conditions which, in the opinion of Neptune, have affected the cellular endpoint's ability of performance, including but not limited to: misuse; improper handling; application or installation; excessive operating conditions; tampering or unauthorized repairs and modifications; accidental or intentional damage; or acts of God. In no event shall Neptune be liable for special, incidental, indirect, or consequential damages, including, without limitation, lost revenue. Neptune contracts with third parties to provide cellular data service, as available, to and for the cellular endpoint.

Year of Failure	Cellular Endpoint
	Replacement Price Discount*
1-10	Full replacement: 100%
11	70%
12	70%
13	60%
14	60%
15	50%
16	45%
17	40%
18	35%
19	30%
20	25%

** Replacement price discount percentages will be applied towards the then-current list price in effect for the year product is accepted by Neptune under warranty conditions. Replacement endpoints are warranted for one (1) year after date of shipment or balance of original endpoint warranty, whichever is greater.*

CUSTOMER ACKNOWLEDGES THAT CELLULAR DATA SERVICE IS MADE AVAILABLE ONLY WITHIN THE OPERATING RANGE OF THE NETWORKS. SERVICE MAY BE TEMPORARILY REFUSED, INTERRUPTED, OR LIMITED BECAUSE OF: (A) FACILITIES LIMITATIONS; (B) TRANSMISSION LIMITATIONS CAUSED BY ATMOSPHERIC, TERRAIN, OTHER NATURAL OR ARTIFICIAL CONDITIONS ADVERSELY AFFECTING TRANSMISSION, WEAK BATTERIES, SYSTEM OVERCAPACITY, MOVEMENT OUTSIDE A SERVICE AREA OR GAPS IN COVERAGE IN A SERVICE AREA AND OTHER CAUSES REASONABLY OUTSIDE OF A CELLULAR DATA PROVIDER'S CONTROL SUCH AS, BUT NOT LIMITED TO, INTENTIONAL OR NEGLIGENT ACTS OF THIRD PARTIES THAT DAMAGE OR IMPAIR THE NETWORK OR DISRUPT SERVICE; OR (C) EQUIPMENT MODIFICATIONS, UPGRADES, RELOCATIONS, REPAIRS, AND OTHER SIMILAR ACTIVITIES NECESSARY FOR THE PROPER OR IMPROVED OPERATION OF SERVICE.



CUSTOMER ACKNOWLEDGES THAT CELLULAR DATA SERVICE MAY BE PROVIDED FROM A PROVIDER'S CARRIER PARTNER(S). CARRIER PARTNER NETWORKS ARE MADE AVAILABLE AS-IS AND THE CELLULAR DATA SERVICE PROVIDER MAKES NO WARRANTIES OR REPRESENTATIONS AS TO THE AVAILABILITY OR QUALITY OF ROAMING SERVICE PROVIDED BY CARRIER PARTNERS, AND THE CELLULAR DATA SERVICE PROVIDER WILL NOT BE LIABLE IN ANY CAPACITY FOR ANY ERRORS, OUTAGES, OR FAILURES OF CARRIER PARTNER NETWORKS.

CUSTOMER UNDERSTANDS AND AGREES THAT IT: (1) HAS NO CONTRACTUAL RELATIONSHIP WITH THE UNDERLYING CELLULAR DATA PROVIDER; (2) IS NOT A THIRD-PARTY BENEFICIARY OF ANY AGREEMENT BETWEEN NEPTUNE AND THE UNDERLYING CELLULAR DATA PROVIDER; (3) THAT THE UNDERLYING CELLULAR DATA PROVIDER HAS NO LIABILITY OF ANY KIND TO CUSTOMER, WHETHER FOR BREACH OF CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE; AND (4) THAT DATA TRANSMISSIONS AND MESSAGES MAY BE DELAYED, DELETED OR NOT DELIVERED, AND NO EMERGENCY CALL CAPABILITY EXISTS.

THE ABOVE WARRANTY FOR THE CELLULAR ENDPOINT IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY NEPTUNE WITH RESPECT TO THE CELLULAR ENDPOINT. ALL OTHER WARRANTIES, CONDITIONS, TERMS, REPRESENTATIONS, OR OTHER LEGALLY OPERATIVE PROVISIONS CONCERNING THE CELLULAR ENDPOINT ARE HEREBY EXPRESSLY EXCLUDED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY, CONDITION, TERM, AND REPRESENTATION OR OTHER LEGALLY OPERATIVE PROVISION AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THIS PARAGRAPH IS EXPRESSLY INTENDED TO EXCLUDE FROM THIS CONTRACT ALL STATUTORY AND COMMON LAW WARRANTIES TO THE MAXIMUM EXTENT PERMITTED BY LAW. TO AVOID ANY AMBIGUITY OR MISUNDERSTANDING, ALL PROBLEMS ARISING WITH A CELLULAR ENDPOINT AFTER THIS POINT ARE BUYER'S RESPONSIBILITY. NEPTUNE'S LIABILITY SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE CELLULAR ENDPOINT. NEPTUNE SHALL NOT BE SUBJECT TO AND DISCLAIMS THE FOLLOWING: (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 NEPTUNE, OR ANY UNDERTAKINGS, ACTS, OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL, SPECIAL, MULTIPLE, EXEMPLARY, AND PUNITIVE DAMAGES WHATSOEVER.



Neptune® 360™

The Neptune® 360™ cloud platform delivers an intuitive, user-friendly design, making AMR and AMI meter reading data clear and easy to interpret. System-wide Key Performance Indicators and geographical views assist with identifying areas of concern and ways to maximize operational efficiency and improve overall customer service and quality of service.

Description of Services

The Neptune 360 subscription provides the customer with a non-transferable license to access the Neptune 360 application for all internal personnel. The Customer shall not permit the use of the Service by any unauthorized third parties, unless mutually agreed in writing. The subscription includes the following services:

- Secure access to the Neptune 360 platform, which includes:
 - Neptune 360 Web App
 - Neptune 360 Mobile App
 - Neptune 360 Field Manager App
 - Application Programming Interfaces (if applicable)
- 24x7 application and security monitoring
- Database preventive maintenance and scalability monitoring
- Software upgrades and updates, with prior notice via email
- Providing all server operating system and hardware updates
- Data back-up and replication
- Data Security and Business Continuity Plan (BCP) processes
- Telephone support at 1-800-647-4832 Monday-Friday from 7:00am-5:00pm Central time, excluding corporate holidays, and email support at support@neptunetg.com

Service Level Objectives

- **Availability.** Neptune will use commercially reasonable efforts to provide at least 99% uptime of Neptune 360, excluding communicated maintenance windows.
- **Ticket Issuance.** Neptune will open a trouble ticket upon the earlier to occur of: (i) when Neptune first observes an issue; or (ii) when Customer first reports the issue. If an issue relates to Customer's system and Neptune becomes aware of the issue, Neptune will promptly report this information to Customer. Technical support hours are Monday-Friday from 7am-5pm Central Time. Neptune's commitment is to open a ticket and respond to said ticket within 24 hours of issue identification.
- **Response Time.** The urgency and time to correct will be dependent upon the issue itself and its impact to the Customer to perform billing functions (a "Billing Impediment"). Neptune shall prioritize the correction of any Billing Impediment and shall endeavor to correct such problems within 72 hours after issue identification. Other issues are considered a bug and fixes will be implemented upon an assigned software major or minor release schedule.

Data Ownership

All data that is received from the Neptune 360 platform is captured, processed, stored, and accessed within the country in which the utility customer resides. Any data and information provided to Neptune by Customer or its Consumers ("Customer Data") remains the property of Customer. Customer grants to Neptune the right and license to host,



access, store, and use the Customer Data for the purposes of providing and maintaining the Service. Upon expiration or failure to renew the subscription, Neptune will no longer provide the Service and Customer may no longer use the platform. Within 30 days of the expiration effective date, the Customer may provide a written request for any Customer Data. Neptune will use commercially reasonable efforts to provide Customer Data in a mutually agreed upon format for export or download so long as Customer is current in all payments to Neptune. Neptune has no obligation to maintain or provide the Customer Data, unless otherwise required to do so by law.

Application Programming Interfaces

- **License.** For the sole purpose of creating an interface between Neptune 360 and applications licensed by Customer from third parties, the subscription includes a non-exclusive, non-transferable license to use APIs as well as related documentation required for their implementation.
- **Limitations on Rights of Use.** Customer shall not use the API for any other purpose except as expressly authorized in writing. Customer has no rights to the object code or source code of the API. Customer may not disassemble, decompile, reverse translate or apply any other procedure to a non- source code delivered API. Any rights in API(s) and the Documentation not expressly granted to Customer in writing shall remain with Neptune.
- **Upgrades.** Neptune may make changes to the APIs from time to time. Neptune will make commercially reasonable efforts to maintain backward compatibility of the APIs but makes no guarantees and assumes no obligation to ensure backward compatibility. APIs may not remain compatible with third-party software or programs after changes to the APIs, changes to third-party software or programs, or changes to the Neptune 360 platform.
- **Third-Party Use.** Customer acknowledges and agrees that the license shall not extend to any third-party of Customer and if Customer desires to engage third parties to utilize Neptune's APIs for development or any other purposes, Neptune's prior written consent must be obtained. Upon receiving consent, the third-party must enter into a separate agreement with Neptune prior to using the APIs.

Disclaimer of Warranties

OTHER THAN THE SERVICE LEVELS LISTED ABOVE, NEPTUNE DOES NOT MAKE ANY WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO THE SERVICES RENDERED HEREUNDER, AND HEREBY EXPRESSLY DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, WITH RESPECT TO SUCH SERVICES, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND NEPTUNE EXPRESSLY DISCLAIMS SUCH WARRANTIES AND CONDITIONS.



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Badger Meter

Lead-Free Bronze Disc Meters

PRODUCTS COVERED

This warranty shall apply to all Recordall® Lead-Free Bronze Disc Meters, models 25 through 170, when used to measure potable water, including the registers used with these meters (collectively "Product") sold on or after January 25, 2019. 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 Product to be free from defects in materials and workmanship appearing within the following time frames and those listed in the table below:

Housings

Twenty-five (25) years and six (6) months after shipment from Badger Meter.

Local Registers Supplied with the Meters Listed Herein

Twenty-five (25) years and six (6) months after shipment from Badger Meter.

	AWWA New Meter Accuracy	AWWA Repaired Meter Accuracy (AWWA M6 Manual)	Badger Meter Extended Low Flow Meter Accuracy
Recordall Meter Model, Size	<i>The meter product will meet or exceed new meter accuracy standards set forth in AWWA Standard C700 for the following periods:</i>	<i>The meter product will meet or exceed repaired meter accuracy standards set forth in AWWA Manual M-6, Chapter 5, Table 5.3 for the following periods:</i>	<i>Badger Meter further warrants the meter product to meet or exceed the following extended low flow accuracies in excess of AWWA standard:</i>
Model 25, 5/8 in. and 5/8 x 3/4 in.	Five (5) years from date of shipment or registration of 750,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 2,500,000 gallons, whichever occurs first, with a 25 gpm safe maximum operating capacity and a 15 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 98.5% at a rate of 1/4 gpm and low flow accuracy of 95.0% at a rate of 1/8 gpm for five (5) years from date of shipment or registration of 675,000 gallons, whichever occurs first.
Model 35, 3/4 in.	Five (5) years from date of shipment or registration of 750,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 2,500,000 gallons, whichever occurs first, with a 35 gpm safe maximum operating capacity and a 25 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 97% at a rate of 3/8 gpm for five (5) years from date of shipment or registration of 675,000 gallons, whichever occurs first.
Model 55, 1 in.	Five (5) years from date of shipment or registration of 1,000,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 3,000,000 gallons, whichever occurs first, with a 55 gpm safe maximum operating capacity and a 40 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 95% at a rate of 1/2 gpm for three (3) years from date of shipment or registration of 575,000 gallons, whichever occurs first.
Model 70, 1 in.	Five (5) years from date of shipment or registration of 1,100,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 3,250,000 gallons, whichever occurs first, with a 70 gpm safe maximum operating capacity and a 50 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 95% at a rate of 3/4 gpm for three (3) years from date of shipment or registration of 1,100,000 gallons, whichever occurs first.
Model 120, 1-1/2 in.	Two (2) years from date of shipment or registration of 1,600,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 5,600,000 gallons, whichever occurs first, with a 120 gpm safe maximum operating capacity and a 80 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 95% at a rate of 1-1/4 gpm for two (2) years from date of shipment or registration of 1,440,000 gallons, whichever occurs first.
Model 170, 2 in.	Two (2) years from date of shipment or registration of 2,100,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 10,400,000 gallons, whichever occurs first, with a 170 gpm safe maximum operating capacity and a 100 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 95% at a rate of 1-1/2 gpm for two (2) years from date of shipment or registration of 1,890,000 gallons, whichever occurs first.

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. The foregoing warranty applies only to the extent that the Product is installed, serviced and operated strictly in accordance with AWWA Standard C700 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 have been exposed to adverse installation conditions, damaged by any water conditions and/or water quality, including but not limited to foreign matter in the water such as dirt, sand, minerals, debris, deposits, biofilms, extreme corrosivity, or other impurities, or which have been subject to passage of high-speed air slugs, vandalism, negligence, accident, acts of God, alteration, improper installation, operation or repair, or other circumstances which are beyond the reasonable control of Badger Meter. 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.

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.

Making Water Visible®

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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 x 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 $\pm 1.5\%$ 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 $\pm 3\%$ 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 DISCLAIM: (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.

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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 $\pm 1.5\%$ 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 $\pm 3\%$ 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).

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.

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Badger Meter

E-Series G2® Ultrasonic Meter

Lead-Free Bronze Alloy Meters, 3, 4, 6, 8 inch

PRODUCTS

This warranty shall apply to all Badger Meter E-Series G2® Ultrasonic lead-free meters, sizes 3 inch, 4 inch, 6 inch and 8 inch, when used to measure potable cold water, and the internal encoder and battery used with these meters (collectively "Product"), sold on or after December 15, 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 following time frames.

Housing

Ten (10) years and six (6) months after shipment from Badger Meter.

Electronics (Battery, Registration, Transducer)

Ten (10) years and six (6) months after shipment from Badger Meter.

Pressure Sensor

Five (5) 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 $\pm 1.5\%$ 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 $\pm 3\%$ for the published ranges set forth in Badger Meter's current published data sheet for ten (10) years from 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.

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Badger Meter

E-Series® Ultrasonic Plus Meter

with Integrated Valve
5/8 x 3/4 inch, 3/4 inch

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 August 21, 2024. 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 (prorated)
Transducers ¹	20 years and 6 months after shipment (prorated)
Encoder Register ¹	20 years and 6 months after shipment (prorated)
Valve and Valve Power Module ¹	20 years and 6 months after shipment (prorated) or a maximum of 240 valve actuation cycles,* whichever comes first

*A cycle is defined as the valve going from the unactuated state to the actuated state and returning to the unactuated state.

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.

METER ACCURACY

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](#)) for twenty (20) years after shipment from Badger Meter.

EXTENDED LOW-FLOW METER ACCURACY

Badger Meter further warrants the Product will meet extended minimum test flow accuracy of $\pm 3\%$ for the published ranges set forth in the Badger Meter current published product data sheet for twenty (20) years 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. 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

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Badger Meter
HR-E®
High Resolution Encoder

PRODUCTS COVERED

This Badger Meter warranty shall apply to the High Resolution Encoder (HR-E®) ("Product"), sold on or after June 18, 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 warrants the Product to be free from defects in materials and workmanship appearing within twenty (20) years and six (6) months 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.

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 Product repaired or altered by parties 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 Product exposed to conditions other than those detailed in the Badger Meter Product technical literature or which have been subject to vandalism, negligence, accident, acts of God, alteration, improper installation, operation or repair, or other circumstances which are beyond the reasonable control of Badger Meter. 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.

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

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Badger Meter
HR-E® LCD
High Resolution LCD Encoder

PRODUCTS COVERED

This Badger Meter warranty shall apply to the High Resolution LCD encoder (HR-E LCD) ("Product"), sold on or after June 23, 2021. The warranty is extended only to utilities, municipalities, or other commercial users, and authorized Badger Meter, Inc. (Badger Meter®) distributors, hereinafter 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 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.

PRODUCT RETURNS

Product failures must be proven and verified to the satisfaction of Badger Meter. 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 asserted defect within 10 (ten) days after its discovery. If the defect arises and a valid claim is received within the Warranty Period, at its option, Badger Meter will either (1) exchange the Product with a new, used or refurbished Product that is at least functionally equivalent to the original Product, or (2) refund the purchase price of the Product.

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. A replacement Product assumes the remaining warranty of the original Product, or ninety (90) days from the date of replacement, whichever provides longer coverage.

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 a Product exposed to conditions other than those detailed in applicable 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 a 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

Badger Meter liability with respect to breaches of the foregoing warranty shall be limited as stated herein. 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

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Legacy document number: LCD-W-01


Badger Meter

ORION® Cellular Water Endpoints

Network as a Service (NaaS)

PRODUCTS

This warranty shall apply to Badger Meter ORION® Cellular water endpoints, including the ORION Cellular C, HLD, LTE-M and HLA water endpoints sold on or after September 27, 2024.

This warranty is not transferable and is extended only to utilities, municipalities and authorized distributors selling to utilities and municipalities within the United States or Canada, 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.

MATERIAL AND WORKMANSHIP

Badger Meter warrants all ORION Cellular water endpoints, including battery (configured to the standard mode of operation set by the factory at time of shipment), hereafter referred to as "Product(s)" as listed below, to be free from defects in material and workmanship for the time period stated. Badger Meter reserves the right to adjust the daily schedule and cadence of Product communications as appropriate based on factors that may negatively impact the Product as installed, including, but not limited to, cellular coverage, RF interference, or signal obstruction.

ORION Water Endpoints	20 years and 6 months after shipment
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Products are warranted to be free from defects in material and workmanship for twenty (20) years and six (6) months after shipment from Badger Meter. 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:

Year	Discount %	Year	Discount %
11	70	16	45
12	65	17	40
13	60	18	35
14	55	19	30
15	50	20	25
		>20	0

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

GUARANTEE OF NETWORK PERFORMANCE

If the communication network that supports any ORION Cellular water endpoint in the Customer's meter service area ("Network") explicitly and publicly discontinues operation during the Product warranty time period stated herein, thereby rendering any endpoint unable to successfully transmit meter reading data ("Shut Down"), then for each Shut Down endpoint, as confirmed in writing by the Network operator and verified in writing by Badger Meter, Badger Meter will provide the following guarantee in exchange for applicable fees and minimum purchase commitments as described in the most current BEACON® Software as a Service (SaaS) with ORION NaaS Pricing Terms and Conditions document from Badger Meter.

Badger Meter will supply a replacement endpoint that is supported by the most current technology readily available for full-scale use in the Customer's meter service area affected by Shut Downs ("Replacement

endpoints") at no charge to the Customer for such Replacement endpoints during the first ten (10) years of the Product warranty time period, and according to the prorated price discount schedule stated herein, during the last ten (10) years of the Product warranty time period. Replacement endpoints are warranted for and under the balance of the original applicable endpoint warranty.

The Customer shall be responsible for all other direct and indirect costs associated with the Replacement endpoints, including but not limited to costs associated with installation and maintenance. If the Customer agrees to pay for shipping and the most current Badger Meter published disposal fee per Replacement endpoint, Badger Meter will properly dispose of returned Shut Down endpoints.

PRODUCT RETURNS

Product failures must be proven and verified to the satisfaction of Badger Meter. 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 asserted defect within 10 (ten) 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 the defective Product for the Customer within a reasonable time, after receipt of proof 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 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. Badger Meter liability shall in no event exceed the contract price. BADGER METER SHALL NOT BE SUBJECT TO AND DISCLAIM: (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.


Badger Meter

ORION® Water Products

with BEACON® Software as a Service (SaaS)

PRODUCTS

This warranty shall apply to Badger Meter ORION® series AMR/AMI Water Endpoints, reading hardware and software for a BEACON® system, sold on or after April 11, 2024.

ORION series AMR/AMI Water Endpoints include Fixed Network (SE), ME and Mobile M endpoints.

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.

MATERIAL AND WORKMANSHIP

Badger Meter warrants all ORION series AMR/AMI Water Endpoints including battery, reading hardware and software, hereafter referred to as “Product(s)” as listed below, to be free from defects in material and workmanship for the time period stated.

ORION SE, ORION ME ³ and ORION Mobile M Water Endpoints ¹	20 years and 6 months after shipment
ORION Cellular LTE-MP Endpoints	10 years and 6 months after shipment
Trimble® T10 Tablet ²	3 years after shipment
Dell® Latitude 5430 Laptop ² and Latitude 7230 Tablet ²	3 years after shipment
Panasonic Toughbook® Laptop for BEACON Mobile Solution ²	3 years after shipment
Trimble® Ranger 7 Handheld ²	3 years after shipment
Trimble Yuma 7 Tablet ²	3 years after shipment
ORION ME Modules ² for Trimble Yuma 7 Tablet and Trimble Ranger 7 Handheld	3 years after shipment
Microsoft® Surface Go 3 Tablet ²	1 year after shipment
ORION Mobile (ME) Transceiver ²	3 years after shipment
ORION Mobile Integrated Receiver ²	1 year after shipment
ORION Fixed Network (SE) Gateway Transceiver	1 year after shipment

¹ Water Endpoints and Endpoint batteries—collectively ORION Water Endpoint Products—are warranted to be free from defects in material and workmanship for twenty (20) years and six (6) months after shipment from Badger Meter. Badger Meter will repair or replace, at its discretion, a non-performing ORION Water Endpoint 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 ORION Water Endpoint Product list prices at the time of ORION Water Endpoint 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.

² Batteries, antennas, cables and accessories warranty is limited to 12 months from the date of shipment.

³ Mobile solutions deployed prior to February 1, 2023 include ORION ME endpoints that are migratable to fixed network. BEACON SaaS mobile solutions deployed on or after February 1, 2023 include ORION ME endpoints that operate in mobile mode only.

PRODUCT RETURNS

Product failures must be proven and verified to the satisfaction of Badger Meter. 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 asserted defect within 10 (ten) 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 the defective Product for the Customer within a reasonable time, after receipt of proof 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 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. Badger Meter's 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.

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Badger Meter

Badger Meter Utility Parts Warranty

WARRANTY COVERAGE

Badger Meter warranty obligations are limited to the terms set forth below.

PRODUCTS COVERED

This Badger Meter warranty shall apply to parts purchased from Badger Meter for approved use in or with Utility products sold by Badger Meter ("Parts") against defects in materials and workmanship under normal use for a period of ninety (90) days from the date of purchase by the original end-user purchaser ("Warranty Period").

PRODUCT RETURNS

Part failures must be proven and verified to the satisfaction of Badger Meter. 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 asserted defect within 10 (ten) days after its discovery. If the defect arises and a valid claim is received within the Warranty Period, at its option, Badger Meter will either (1) exchange the part with a new, used or refurbished part that is at least functionally equivalent to the original part, or (2) refund the purchase price of the part.

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. A replacement Part assumes the remaining warranty of the original Part, or ninety (90) days from the date of replacement, whichever provides longer coverage.

LIMITS OF LIABILITY

This warranty shall not apply to any Part repaired or altered by any party other than Badger Meter. The foregoing warranty applies only to the extent that the Part is installed, serviced and operated strictly in accordance with Badger Meter instructions. The warranty shall not apply and shall be void with respect to a Part exposed to conditions other than those detailed in applicable 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.

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 a Part, 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 part and shall not be construed as an express warranty. Any suggestions by Badger Meter or its agents regarding use, application or suitability of the Part 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. Badger Meter's 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.

Making Water Visible®

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**KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION**

Witness: Justin Sensabaugh

24. Provide the expected lifespan of: (i) the AMI meters KAW proposes to install; and (ii) the battery module that will be attached to the meters.

Response:

Please refer back to the response to AG 1-23.

KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION

Witness: Justin Sensabaugh

25. Does KAW agree that the more frequently an AMI meter is “pinged” (i.e., accessed by the utility for data communication), the more the battery’s lifespan will be diminished. If KAW does not agree, provide a complete answer regarding why not.

Response:

No, KAW does not agree. KAW relies on the information provided in the warranty for the AMI meters that is referenced in KAW’s response to AG 1-23.

KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION

Witness: Krista Citron

26. Reference the Advanced Meter Infrastructure Plan (“AMI Plan”)¹ at 3. Assuming that the meters’ expected lifespan is not 20 years, explain why the benefit period does not match the meters’ expected lifespan.

Response:

A ten-year useful life for the meters (2-inch and smaller, the majority of KAWC’s residential metering infrastructure) is already reflected in the cost benefit analysis. A twenty-year net-present value (NPV) was used for three reasons:

1. Lids: The lids that must be purchased during the first replacement cycle are not planned for routine replacement within the measured period, meaning that they are expected to produce benefits throughout the 20-year period.
2. Meters replaced in years 2-10: Meters replaced each year create benefits for ten years, and it will take KAWC ten years to replace all meters. Therefore, meters replaced in years 9 and 10 would still be creating benefits in years 19-20. Likewise, meters replaced in years 5 and 6, for example, would still be creating benefits in years 15-16.
3. Meter reading: Meter reading benefits will begin after full deployment, around year 11, and are enabled by the meters installed in years 2-10. Ignoring these benefits would substantially understate the benefits associated with the costs incurred.

Due to these three factors, twenty years was the minimum amount of time that seemed reasonable for the cost benefit analysis and associated NPVs in order to create a reasonable match between costs and benefits.

¹ See Exhibit A of the Application Filed in this proceeding.

KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION

Witness: William A. Lewis

27. Provide all reasons why KAW chose not to pursue replacement of all meters at one time, rather than replacing the meters in their existing scheduled replacement plan.

Response:

In KAW's last rate case (Case No. 2023-00191), KAW requested approval to move to AMI technology. That AMI proposal, like the proposal in this case, was to replace meter technology in the normal course and on the existing schedule without any acceleration. But because the first two years following that proposal would have resulted in a high percentage of change outs, the OAG opposed that request and incorrectly alleged that it was an "accelerated pace."¹ It was not "accelerated" at all. At the time, more than 74,000 of the company's 142,000 meters had aged ten years or more, and this caused the need for a significant quantity of scheduled replacement work. In that case, the OAG questioned what it perceived to be an accelerated pace. Now, in this question, the OAG asks why KAW has not chosen an accelerated pace. KAW made this choice for the exact same reason in made the same choice in its proposal in Case No. 2023-00191 – to maximize the economic value of its assets for customers.

¹ OAG January 5, 2024 Post-Hearing Brief, p. 27.

KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION

Witness: Krista Citron

28. Reference the AMI Plan at 21. Confirm that performing meter replacements in a given geographical area would present cost savings as opposed to performing them on based on length of service.

Response:

No, geography will not impact many of the AMI benefits outlined throughout the AMI Plan. Because KAWC intends to transition meter technologies as part of their normal, scheduled, periodic meter replacement program, there will not be a bulk geographic meter change-out. However, there are still some efficiencies to be achieved by grouping LOS replacements geographically. It is likely that most meters in a given residential area will be approximately the same age, and therefore eligible for replacement around the same timeframe. This will allow KAWC's installation contractor(s) to work more effectively.

**KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION**

Witness: Justin Sensabaugh

29. Reference the AMI Plan at 22. Confirm that KAW has identified at least two vendors who still manufacture the AMR components necessary to replace the existing AMR components.

Response:

Confirmed.

KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION

Witness: Justin Sensabaugh

30. Explain whether the proposed AMI meters will allow for remote disconnects and re-connects.

Response:

The proposed solution currently does not have the capability to completely shut off water service from a remote location. The capability to completely shut off water service is being evaluated by the manufacturer; however, there is no public timeline for this capability.

KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION

Witness: Craig Dowell

31. The AMI Plan states in paragraph 4, page 3, of the Executive Summary that “American Water Works Service Company, Inc. (“Service Company”) completed both a metering request for information (“RFI”) and a request for proposals (“RFP”) process to evaluate metering options enterprise-wide, including for the benefit of KAW and its customers.” Please provide the following:
- a. All communications and agreements between KAW and the Service Company regarding the RFI, including the actual RFI and all related reports, responses, studies, presentations, and work product associated with the RFI.
 - b. All communications and agreements between KAW and the Service Company regarding the RFP, including: (i) the actual RFP and all related reports, responses, studies, presentations, and work product associated with the RFP; and (ii) all electronic spreadsheets, etc., with formulas intact.
 - c. Documentation, including all workpapers, reports, summaries, comparisons, spreadsheets (in electronic form with formulas intact), and presentations of all alternatives and options evaluated in both the RFI and RFP, including vendor pricing and information.
 - d. All Service Company costs passed to KAW regarding these two activities.

Response:

- a. – b. The Service Company designed, conducted, and finalized the RFI/RFP process based on its increased purchasing power that KAW could not leverage standing alone. KAW benefits from the size and breadth of American Water, its increased purchasing power, and its access to discounts on equipment and supplies needed for utility operations, including, for example, meters.
- a. – c. See generally response to Staff DR 1-19.
- a. Some responsive documents are confidential and some are not. See KAW_R_AGDR1_NUM31_082925-Attachment _1 without a confidential designation for non-confidential documents. See KAW_R_AGDR1_NUM31_082925-Attachment_1_CONFIDENTIAL for confidential documents being provided pursuant to a petition for confidential treatment.
- b. Some responsive documents are confidential and some are not. See KAW_R_AGDR1_NUM31_082925-Attachment _2 without a confidential designation for non-confidential documents. See

KAW_R_AGDR1_NUM31_082925-Attachment_2_CONFIDENTIAL for confidential documents being provided pursuant to a petition for confidential treatment.

- c. See the responses to a and b above.
- d. The Service Company did not track the costs of the RFI / RFP process independently. As with other Service Company costs, the costs of the RFI / RFP will be allocated in accordance with the terms of the Cost Allocation Manual.


Badger Meter

Lead-Free Bronze Disc Meters

PRODUCTS COVERED

This warranty shall apply to all Recordall® Lead-Free Bronze Disc Meters, models 25 through 170, when used to measure potable water, including the registers used with these meters (collectively "Product") sold on or after January 25, 2019. 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 Product to be free from defects in materials and workmanship appearing within the following time frames and those listed in the table below:

Housings

Twenty-five (25) years and six (6) months after shipment from Badger Meter.

Local Registers Supplied with the Meters Listed Herein

Twenty-five (25) years and six (6) months after shipment from Badger Meter.

	AWWA New Meter Accuracy	AWWA Repaired Meter Accuracy (AWWA M6 Manual)	Badger Meter Extended Low Flow Meter Accuracy
Recordall Meter Model, Size	<i>The meter product will meet or exceed new meter accuracy standards set forth in AWWA Standard C700 for the following periods:</i>	<i>The meter product will meet or exceed repaired meter accuracy standards set forth in AWWA Manual M-6, Chapter 5, Table 5.3 for the following periods:</i>	<i>Badger Meter further warrants the meter product to meet or exceed the following extended low flow accuracies in excess of AWWA standard:</i>
Model 25, 5/8 in. and 5/8 x 3/4 in.	Five (5) years from date of shipment or registration of 750,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 2,500,000 gallons, whichever occurs first, with a 25 gpm safe maximum operating capacity and a 15 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 98.5% at a rate of 1/4 gpm and low flow accuracy of 95.0% at a rate of 1/8 gpm for five (5) years from date of shipment or registration of 675,000 gallons, whichever occurs first.
Model 35, 3/4 in.	Five (5) years from date of shipment or registration of 750,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 2,500,000 gallons, whichever occurs first, with a 35 gpm safe maximum operating capacity and a 25 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 97% at a rate of 3/8 gpm for five (5) years from date of shipment or registration of 675,000 gallons, whichever occurs first.
Model 55, 1 in.	Five (5) years from date of shipment or registration of 1,000,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 3,000,000 gallons, whichever occurs first, with a 55 gpm safe maximum operating capacity and a 40 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 95% at a rate of 1/2 gpm for three (3) years from date of shipment or registration of 575,000 gallons, whichever occurs first.
Model 70, 1 in.	Five (5) years from date of shipment or registration of 1,100,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 3,250,000 gallons, whichever occurs first, with a 70 gpm safe maximum operating capacity and a 50 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 95% at a rate of 3/4 gpm for three (3) years from date of shipment or registration of 1,100,000 gallons, whichever occurs first.
Model 120, 1-1/2 in.	Two (2) years from date of shipment or registration of 1,600,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 5,600,000 gallons, whichever occurs first, with a 120 gpm safe maximum operating capacity and a 80 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 95% at a rate of 1-1/4 gpm for two (2) years from date of shipment or registration of 1,440,000 gallons, whichever occurs first.
Model 170, 2 in.	Two (2) years from date of shipment or registration of 2,100,000 gallons, whichever occurs first.	Fifteen (15) years from date of shipment or registration of 10,400,000 gallons, whichever occurs first, with a 170 gpm safe maximum operating capacity and a 100 gpm maximum rate for continuous operation.	Badger Meter warrants Product low flow accuracy of 95% at a rate of 1-1/2 gpm for two (2) years from date of shipment or registration of 1,890,000 gallons, whichever occurs first.

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. The foregoing warranty applies only to the extent that the Product is installed, serviced and operated strictly in accordance with AWWA Standard C700 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 have been exposed to adverse installation conditions, damaged by any water conditions and/or water quality, including but not limited to foreign matter in the water such as dirt, sand, minerals, debris, deposits, biofilms, extreme corrosivity, or other impurities, or which have been subject to passage of high-speed air slugs, vandalism, negligence, accident, acts of God, alteration, improper installation, operation or repair, or other circumstances which are beyond the reasonable control of Badger Meter. 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.

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.

Making Water Visible®

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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 x 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 $\pm 1.5\%$ 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 $\pm 3\%$ 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 DISCLAIM: (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

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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 $\pm 1.5\%$ 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 $\pm 3\%$ 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).

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

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E-Series G2® Ultrasonic Meter

Lead-Free Bronze Alloy Meters, 3, 4, 6, 8 inch

PRODUCTS

This warranty shall apply to all Badger Meter E-Series G2® Ultrasonic lead-free meters, sizes 3 inch, 4 inch, 6 inch and 8 inch, when used to measure potable cold water, and the internal encoder and battery used with these meters (collectively "Product"), sold on or after December 15, 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 following time frames.

Housing

Ten (10) years and six (6) months after shipment from Badger Meter.

Electronics (Battery, Registration, Transducer)

Ten (10) years and six (6) months after shipment from Badger Meter.

Pressure Sensor

Five (5) 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 $\pm 1.5\%$ 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 $\pm 3\%$ for the published ranges set forth in Badger Meter's current published data sheet for ten (10) years from 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.

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Badger Meter

E-Series® Ultrasonic Plus Meter

with Integrated Valve
5/8 x 3/4 inch, 3/4 inch

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 August 21, 2024. 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 (prorated)
Transducers ¹	20 years and 6 months after shipment (prorated)
Encoder Register ¹	20 years and 6 months after shipment (prorated)
Valve and Valve Power Module ¹	20 years and 6 months after shipment (prorated) or a maximum of 240 valve actuation cycles,* whichever comes first

*A cycle is defined as the valve going from the unactuated state to the actuated state and returning to the unactuated state.

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.

METER ACCURACY

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](#)) for twenty (20) years after shipment from Badger Meter.

EXTENDED LOW-FLOW METER ACCURACY

Badger Meter further warrants the Product will meet extended minimum test flow accuracy of $\pm 3\%$ for the published ranges set forth in the Badger Meter current published product data sheet for twenty (20) years 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. 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. © 2024 Badger Meter, Inc. All rights reserved.

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Badger Meter
HR-E®
High Resolution Encoder

PRODUCTS COVERED

This Badger Meter warranty shall apply to the High Resolution Encoder (HR-E®) ("Product"), sold on or after June 18, 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 warrants the Product to be free from defects in materials and workmanship appearing within twenty (20) years and six (6) months 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.

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 Product repaired or altered by parties 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 Product exposed to conditions other than those detailed in the Badger Meter Product technical literature or which have been subject to vandalism, negligence, accident, acts of God, alteration, improper installation, operation or repair, or other circumstances which are beyond the reasonable control of Badger Meter. 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.

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

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Badger Meter
HR-E® LCD
High Resolution LCD Encoder

PRODUCTS COVERED

This Badger Meter warranty shall apply to the High Resolution LCD encoder (HR-E LCD) ("Product"), sold on or after June 23, 2021. The warranty is extended only to utilities, municipalities, or other commercial users, and authorized Badger Meter, Inc. (Badger Meter®) distributors, hereinafter 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 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.

PRODUCT RETURNS

Product failures must be proven and verified to the satisfaction of Badger Meter. 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 asserted defect within 10 (ten) days after its discovery. If the defect arises and a valid claim is received within the Warranty Period, at its option, Badger Meter will either (1) exchange the Product with a new, used or refurbished Product that is at least functionally equivalent to the original Product, or (2) refund the purchase price of the Product.

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. A replacement Product assumes the remaining warranty of the original Product, or ninety (90) days from the date of replacement, whichever provides longer coverage.

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 a Product exposed to conditions other than those detailed in applicable 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 a 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

Badger Meter liability with respect to breaches of the foregoing warranty shall be limited as stated herein. 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

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Legacy document number: LCD-W-01


Badger Meter

ORION® Cellular Water Endpoints

Network as a Service (NaaS)

PRODUCTS

This warranty shall apply to Badger Meter ORION® Cellular water endpoints, including the ORION Cellular C, HLD, LTE-M and HLA water endpoints sold on or after September 27, 2024.

This warranty is not transferable and is extended only to utilities, municipalities and authorized distributors selling to utilities and municipalities within the United States or Canada, 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.

MATERIAL AND WORKMANSHIP

Badger Meter warrants all ORION Cellular water endpoints, including battery (configured to the standard mode of operation set by the factory at time of shipment), hereafter referred to as "Product(s)" as listed below, to be free from defects in material and workmanship for the time period stated. Badger Meter reserves the right to adjust the daily schedule and cadence of Product communications as appropriate based on factors that may negatively impact the Product as installed, including, but not limited to, cellular coverage, RF interference, or signal obstruction.

ORION Water Endpoints	20 years and 6 months after shipment
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Products are warranted to be free from defects in material and workmanship for twenty (20) years and six (6) months after shipment from Badger Meter. 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:

Year	Discount %	Year	Discount %
11	70	16	45
12	65	17	40
13	60	18	35
14	55	19	30
15	50	20	25
		>20	0

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

GUARANTEE OF NETWORK PERFORMANCE

If the communication network that supports any ORION Cellular water endpoint in the Customer's meter service area ("Network") explicitly and publicly discontinues operation during the Product warranty time period stated herein, thereby rendering any endpoint unable to successfully transmit meter reading data ("Shut Down"), then for each Shut Down endpoint, as confirmed in writing by the Network operator and verified in writing by Badger Meter, Badger Meter will provide the following guarantee in exchange for applicable fees and minimum purchase commitments as described in the most current BEACON® Software as a Service (SaaS) with ORION NaaS Pricing Terms and Conditions document from Badger Meter.

Badger Meter will supply a replacement endpoint that is supported by the most current technology readily available for full-scale use in the Customer's meter service area affected by Shut Downs ("Replacement

endpoints") at no charge to the Customer for such Replacement endpoints during the first ten (10) years of the Product warranty time period, and according to the prorated price discount schedule stated herein, during the last ten (10) years of the Product warranty time period. Replacement endpoints are warranted for and under the balance of the original applicable endpoint warranty.

The Customer shall be responsible for all other direct and indirect costs associated with the Replacement endpoints, including but not limited to costs associated with installation and maintenance. If the Customer agrees to pay for shipping and the most current Badger Meter published disposal fee per Replacement endpoint, Badger Meter will properly dispose of returned Shut Down endpoints.

PRODUCT RETURNS

Product failures must be proven and verified to the satisfaction of Badger Meter. 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 asserted defect within 10 (ten) 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 the defective Product for the Customer within a reasonable time, after receipt of proof 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 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. 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.



ORION® Water Products

with BEACON® Software as a Service (SaaS)

PRODUCTS

This warranty shall apply to Badger Meter ORION® series AMR/AMI Water Endpoints, reading hardware and software for a BEACON® system, sold on or after April 11, 2024.

ORION series AMR/AMI Water Endpoints include Fixed Network (SE), ME and Mobile M endpoints.

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.

MATERIAL AND WORKMANSHIP

Badger Meter warrants all ORION series AMR/AMI Water Endpoints including battery, reading hardware and software, hereafter referred to as "Product(s)" as listed below, to be free from defects in material and workmanship for the time period stated.

ORION SE, ORION ME ³ and ORION Mobile M Water Endpoints ¹	20 years and 6 months after shipment
ORION Cellular LTE-MP Endpoints	10 years and 6 months after shipment
Trimble® T10 Tablet ²	3 years after shipment
Dell® Latitude 5430 Laptop ² and Latitude 7230 Tablet ²	3 years after shipment
Panasonic Toughbook® Laptop for BEACON Mobile Solution ²	3 years after shipment
Trimble® Ranger 7 Handheld ²	3 years after shipment
Trimble Yuma 7 Tablet ²	3 years after shipment
ORION ME Modules ² for Trimble Yuma 7 Tablet and Trimble Ranger 7 Handheld	3 years after shipment
Microsoft® Surface Go 3 Tablet ²	1 year after shipment
ORION Mobile (ME) Transceiver ²	3 years after shipment
ORION Mobile Integrated Receiver ²	1 year after shipment
ORION Fixed Network (SE) Gateway Transceiver	1 year after shipment

¹ Water Endpoints and Endpoint batteries—collectively ORION Water Endpoint Products—are warranted to be free from defects in material and workmanship for twenty (20) years and six (6) months after shipment from Badger Meter. Badger Meter will repair or replace, at its discretion, a non-performing ORION Water Endpoint 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 ORION Water Endpoint Product list prices at the time of ORION Water Endpoint 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.

² Batteries, antennas, cables and accessories warranty is limited to 12 months from the date of shipment.

³ Mobile solutions deployed prior to February 1, 2023 include ORION ME endpoints that are migratable to fixed network. BEACON SaaS mobile solutions deployed on or after February 1, 2023 include ORION ME endpoints that operate in mobile mode only.

PRODUCT RETURNS

Product failures must be proven and verified to the satisfaction of Badger Meter. 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 asserted defect within 10 (ten) 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 the defective Product for the Customer within a reasonable time, after receipt of proof 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 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. Badger Meter's 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.

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Badger Meter

Badger Meter Utility Parts Warranty

WARRANTY COVERAGE

Badger Meter warranty obligations are limited to the terms set forth below.

PRODUCTS COVERED

This Badger Meter warranty shall apply to parts purchased from Badger Meter for approved use in or with Utility products sold by Badger Meter ("Parts") against defects in materials and workmanship under normal use for a period of ninety (90) days from the date of purchase by the original end-user purchaser ("Warranty Period").

PRODUCT RETURNS

Part failures must be proven and verified to the satisfaction of Badger Meter. 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 asserted defect within 10 (ten) days after its discovery. If the defect arises and a valid claim is received within the Warranty Period, at its option, Badger Meter will either (1) exchange the part with a new, used or refurbished part that is at least functionally equivalent to the original part, or (2) refund the purchase price of the part.

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. A replacement Part assumes the remaining warranty of the original Part, or ninety (90) days from the date of replacement, whichever provides longer coverage.

LIMITS OF LIABILITY

This warranty shall not apply to any Part repaired or altered by any party other than Badger Meter. The foregoing warranty applies only to the extent that the Part is installed, serviced and operated strictly in accordance with Badger Meter instructions. The warranty shall not apply and shall be void with respect to a Part exposed to conditions other than those detailed in applicable 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.

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 a Part, 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 part and shall not be construed as an express warranty. Any suggestions by Badger Meter or its agents regarding use, application or suitability of the Part 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. Badger Meter's 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.

Making Water Visible®

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American Water - 2024 RFP Water Meters & Related Services Event #9344 WARRANTY COVERAGE STATEMENTS

- **T-10® Water Meter**
 - 5/8" to 2" Warranty Statements
- **MACH 10® Water Meter**
 - 5/8" to 2" Warranty Statement
 - 3" to 12" Warranty Statement
- **Cellular Endpoint**
 - Warranty Statement
- **Software**
 - Neptune® 360™ Description of Services



A NEPTUNE TECHNOLOGY GROUP WARRANTY STATEMENT

Neptune T-10®, HP Turbine, TRU/FLO® Compound Cold Water Meters

1. TERMS OF LIMITED WARRANTY

With respect to its Neptune T-10®, HP TURBINE, TRU/FLO® Compound Water Meters (collectively the "Water Meters"), Neptune Technology Group Inc. ("Neptune") warrants the following on meters sold on or after 11/1/92:

The Water Meters will be, at the later of (i) the date of original purchase from Neptune or (ii) the date of original shipment from Neptune-authorized distributor of Water Meters (that later date is referred to as "the Date of Shipment") and will remain for a period of eighteen (18) months from the Date of Shipment, or twelve (12) months from date of installation, whichever comes first, free from manufacturing defects in workmanship and material.

- (a) Maincase. The no-lead high copper alloy or Brass maincase of the Water Meters will be at the Date of Shipment free from manufacturing defects in workmanship and material for the life of the Water Meter.
- (b) Frost Protection. All Neptune T-10 Cold Water Meters shipped with a cast-iron bottom cap will, commencing upon the Date of Shipment, be warranted against chamber damage for a period of ten (10) years.
- (c) Registers. Standard, roll sealed registers of the Water Meters will be at the Date of Shipment, and shall remain for the following periods, free from manufacturing defects in workmanship and material for a period of ten (10) years. The ARB®, ProRead™ (ARB VI), E-CODER® (ARB VII), and ProCoder™ system registers are warranted for ten (10) years from Date of Shipment. All ProRead encoder receptacles shipped after January 1, 2001, shall be warranted for five years from the Date of Shipment. All other components and parts are covered under Neptune's standard one-year material and workmanship guarantee.

- (d) Meter Accuracy for Neptune T-10. Neptune T-10 Meters and Neptune T-10 nutating disc chambers in TRU/FLO Compound Water Meters are warranted to meet or exceed, as listed herein, accuracy standards of the AWWA Standard C700-95 for a period of: (i) five (5) years from Date of Shipment for 5/8", 3/4" and 1" meters; (ii) for a period of two (2) years from the Date of Shipment for 1 1/2" and 2" meters; or (iii) the applicable registration shown below, whichever occurs first. Neptune further guarantees that the Neptune T-10 and Neptune T-10 nutating disc chambers in TRU/FLO Compound Water Meters will perform to at least Repaired Meter Accuracy Standards, according to AWWA Manual M-6 Chapter 5 (1999) Table 5.3 for an additional ten (10) years or the registration shown below, whichever occurs first.

SIZE	EXTENDED LOW FLOW ACCURACY	NEW METER ACCURACY	REPAIRED METER ACCURACY
5/8 & 3/4" x 3/4"	1/8 US gpm @ 95% 5 years or 500,000 gallons	500,000 gallons	1,500,000 gallons
3/4"	1/4 US gpm @ 95% 5 years or 750,000 gallons	750,000 gallons	2,250,000 gallons
1"	3/8 US gpm @ 95% 5 years or 1,000,000 gallons	1,000,000 gallons	3,000,000 gallons
1 1/2"	3/4 US gpm @ 95% 2 years or 1,600,000 gallons	1,600,000 gallons	5,000,000 gallons
2"	1 US gpm @ 95% 2 years or 2,700,000 gallons	2,700,000 gallons	8,000,000 gallons

- (e) Meter Accuracy for HP Turbine and TRU/FLO. The HP Turbine and TRU/FLO Compound Cold Water Meters will perform, for a period of one (1) year from the Date of Shipment, to American Water Works Association ("AWWA") accuracy standards for new water meters.



2. WARRANTY RETURN

If a Neptune Water Meter fails an accuracy test during an applicable warranty period, it may be returned to Neptune for repair or replacement at Neptune's option. An accuracy test shall be conducted by the customer according to AWWA standards. Any meter being returned for repair to Neptune under this performance guarantee must be returned with a copy of the customer's test results. If the meter is returned to Neptune without a copy of the test results or if Neptune's factory test shows the meter to meet current AWWA standards, the customer will be charged a nominal testing fee by Neptune in such cases. Neptune will repair or replace the meter at Neptune's option after the meter has been tested by Neptune. Meters repaired or replaced under the performance guarantee will be guaranteed to perform to AWWA repaired meter accuracy standards.

3. WARRANTIES ARE EXCLUSIVE

The warranties set forth in this certificate of warranty are in lieu of any other warranty, guarantee, or representation, whether expressed or implied, including without limitation, the warranty of merchantability and the warranty of fitness for a particular purpose.

4. DAMAGES LIMITED TO COSTS OF REPLACEMENT AND REPAIR

If the Water Meter fails to meet the warranties set forth in Paragraph 1 of this Certificate of Warranty, Neptune, at its option shall, without charge of labor or materials, repair or replace the Water Meter or part thereof, provided that (a) the Water Meter is delivered to a Neptune representative, (b) the Water Meter is accompanied by a Return Material Authorization (RMA), and (c) all costs of delivery to Neptune are assumed by the purchaser of the Water Meter. Neptune's liability is limited to its costs of replacement and repair of the defective water meter. Damages resulting from miscalculation of water usage or lost revenue or profit are not recoverable from Neptune. It is the responsibility of the customer to periodically verify the operation and accuracy of its meters.

5. WARRANTIES ARE INAPPLICABLE UNDER CERTAIN CONDITIONS

The warranties set forth in this Certificate of Warranty do not apply to any Water Meter that has been damaged by, or subjected to, conditions which, in the opinion of Neptune, have affected the Water Meter's ability of performance, including but not limited to: misuse; improper handling, application or installation; excessive operating conditions; foreign materials in the water; aggressive water conditions; tampering or unauthorized repairs or modifications; accidental or intentional damage; acts of God. This Certificate of Warranty shall not apply if product is placed in non-recommended installation, is connected or altered by other than Neptune recommended procedures, is used with other than genuine Neptune meter registers and components, or read by equipment not approved or licensed by Neptune. Neptune makes no claims concerning operability and/or compatibility or third party reading systems. In addition, this Certificate of Warranty shall not apply if third party reading equipment is believed to have caused damage to the meter or register. In order to determine its liability, if any, under this Certificate of Warranty, Neptune shall have the right to inspect any Water Meter or part thereof that is claimed to be defective at Neptune or other location designated by Neptune.

NEPTUNE'S LIABILITY WITH RESPECT TO BREACHES OF THE FOREGOING LIMITED WARRANTY SHALL BE LIMITED AS STATED HEREIN. NEPTUNE'S LIABILITY SHALL IN NO EVENT EXCEED THE PURCHASE PRICE. NEPTUNE SHALL NOT BE SUBJECT TO AND DISCLAIMS THE FOLLOWING: (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 NEPTUNE, OR ANY UNDERTAKINGS, ACT OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL, SPECIAL, MULTIPLE, EXEMPLARY, AND PUNITIVE DAMAGES WHATSOEVER.



A NEPTUNE TECHNOLOGY GROUP WARRANTY STATEMENT

5/8" to 2" MACH 10® Ultrasonic Meter

1. TERMS OF LIMITED WARRANTY

With respect to its Neptune® MACH 10® water meter ("MACH 10"), Neptune Technology Group Inc. ("Neptune") warrants that for meters sold on or after August 1, 2021, for potable water or combined potable water and residential fire service applications, the MACH 10 meter will be warranted to be free from manufacturing defects in workmanship and material as follows:

The MACH 10 will be, at the later of (i) the date of original purchase from Neptune or (ii) the date of original shipment from a Neptune-authorized distributor of water meters (that later date is referred to as "the Date of Shipment"), and will remain for a period of 18 months from the Date of Shipment, or 12 months from date of installation, whichever comes first, free from manufacturing defects in workmanship and material. Neptune makes the following additional warranties with respect to certain MACH 10 components, dependent upon the size of meter:

a) Lead Free Bronze Maincase

i) 5/8" – 1" MACH 10

Neptune warrants that the MACH 10 lead free bronze maincase will be free from manufacturing defects in workmanship and material for twenty (20) years from the Date of Shipment.

ii) 1½" – 2" MACH 10

Neptune warrants that the MACH 10 lead free bronze maincase will be free from manufacturing defects in workmanship and material for ten (10) years from the Date of Shipment.

b) Electronics (Battery, PCB, Transducers, LCD)

i) 5/8" – 1" MACH 10

Neptune warrants that the electronics of the MACH 10 will be free from manufacturing defects in workmanship and material for a period of twenty (20) years from the Date of Shipment. Neptune will repair or replace a non-performing MACH 10 free of charge for the first ten (10) years and at a discount of the then-current list price during the following ten (10) years per the schedule at the right. The MACH 10 warranty does not include the external housing that encapsulates the electronics.

Replacement Price Discount		
Year of Failure	5/8" to 1" MACH 10®	1.5" to 2" MACH 10®
1-10	Full replacement 100%	Full replacement 100%
11	70%	n/a
12	70%	n/a
13	60%	n/a
14	60%	n/a
15	50%	n/a
16	45%	n/a
17	40%	n/a
18	35%	n/a
19	30%	n/a
20	25%	n/a

**Replacement price discount percentages will be applied towards the then-current list price in effect for the year product is accepted by Neptune under warranty conditions. Replacement MACH 10 electronics are warranted for one (1) year after date of shipment or balance of original MACH 10 warranty, whichever is greater.*

ii) 1½" – 2" MACH 10

Neptune warrants the electronics of the MACH 10 will be free from manufacturing defects in workmanship and material for a period of ten (10) years from the Date of Shipment. Neptune will repair or replace a non-performing MACH 10 free of charge during the ten (10) year Warranty Period. The MACH 10 warranty does not include the external housing that encapsulates the electronics.

With respect to Section 1 and subparts a) and b), the period from the Date of Shipment to the expiration of the specified time period is the "Warranty Period" with respect to each specified component. Neptune shall not be responsible for any defects in the MACH 10 or any specified component (whether due to design, materials, manufacture, or otherwise) that manifest themselves after the expiration of the specified Warranty Period.

2. MACH 10 METER ACCURACY

Provided that the MACH 10 meter and the components specified in Section 1 and subparts a) and b) are functioning properly (regardless of whether the MACH 10 meter and specified components are within or outside an applicable Warranty Period), Neptune makes the following warranties with respect to meter accuracy, dependent upon the size of meter:

i) 5/8" – 1" MACH 10

Neptune MACH 10 meters are warranted to meet or exceed meter accuracy of $\pm 1.5\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for twenty (20) years from Date of Shipment. Neptune further warrants the MACH 10 to meet or exceed extended low flow accuracy of $\pm 3\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for twenty (20) years from Date of Shipment.

ii) 1½" – 2" MACH 10

Neptune MACH 10 meters are warranted to meet or exceed meter accuracy of $\pm 1.5\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for ten (10) years from date of shipment. Neptune further warrants the MACH 10 to meet or exceed extended low flow accuracy of $\pm 3\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for ten (10) years from Date of Shipment.

3. WARRANTY RETURNS

If a Neptune MACH 10 meter fails an accuracy test during an applicable Warranty Period, it may be returned to Neptune for evaluation. Any MACH 10 meter proved to the satisfaction of Neptune to have failed the warranties set forth in this Certificate of Warranty will, at the option of Neptune, be repaired or replaced at no cost to the customer. An accuracy test shall be conducted by the customer according to then-current AWWA testing standards. Any meter being returned for repair to Neptune under this performance warranty must be returned with a copy of the customer's test results. If the meter is returned to Neptune without a copy of the test results or if Neptune's factory test shows the meter to meet Neptune's published accuracy specifications, then the customer will be charged a nominal testing fee by Neptune in such cases. If after the meter has been tested by Neptune, Neptune determines that the meter has failed the warranties set forth in this Certificate of Warranty, then Neptune will repair or replace the meter at Neptune's option. Repaired or replacement MACH 10 meters are warranted for one (1) year after Date of Shipment of the repaired or replacement MACH 10 meter or the balance of the original MACH 10 meter warranty, whichever is greater.

4. RESPONSIBILITY LIMITED TO COSTS OF REPLACEMENT AND REPAIR

If the MACH 10 fails to meet the warranties set forth in Sections 1 and 2 of this Certificate of Warranty, then Neptune, at its option shall repair or replace the MACH 10 or part thereof, provided that (a) the MACH 10 is delivered to a Neptune representative, (b) the MACH 10 is accompanied by a Return Material Authorization (RMA), and (c) all costs of delivery to Neptune are assumed by the purchaser of the MACH 10. Neptune's liability is limited to its costs of replacement and repair of the non-performing MACH 10, and without limitation, this warranty does not include field replacement, labor, or materials costs, which are the responsibility of the customer. Damages resulting from miscalculation of water usage or lost revenue or profit are not recoverable from Neptune. It is the responsibility of the customer to periodically verify the operation and accuracy of its meters.

5. WARRANTIES ARE INAPPLICABLE UNDER CERTAIN CONDITIONS

The warranties set forth in this Certificate of Warranty do not apply to any MACH 10 meter that has been damaged by, or subjected to, conditions which, in the opinion of Neptune, have affected the ability of the MACH 10 to perform, including but not limited to: misuse; improper handling, application or installation; excessive operating conditions; foreign materials in the water; aggressive water conditions; tampering or unauthorized repairs or modifications; accidental or intentional damage; or acts of God. This Certificate of Warranty shall not apply if the product is placed in a non-recommended installation, is connected or altered by other than Neptune recommended procedures or is read by equipment not approved or licensed by Neptune. Neptune makes no claims concerning operability and/or compatibility or third-party reading systems. In addition, this Certificate of Warranty shall not apply if third-party reading equipment is believed to have caused damage to the MACH 10. In order to determine its liability, if any, under this Certificate of Warranty, Neptune shall have the right to inspect any MACH 10 meter or part thereof that is claimed to be defective at Neptune or other location designated by Neptune.

THE ABOVE WARRANTY FOR THE MACH 10 WATER METER IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY NEPTUNE WITH RESPECT TO THE MACH 10. **ALL OTHER WARRANTIES, CONDITIONS, TERMS, REPRESENTATIONS, OR OTHER LEGALLY OPERATIVE PROVISIONS CONCERNING THE MACH 10 ARE HEREBY EXPRESSLY EXCLUDED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY, CONDITION, TERM, AND REPRESENTATION OR OTHER LEGALLY OPERATIVE PROVISION AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** THIS PARAGRAPH IS EXPRESSLY INTENDED TO EXCLUDE FROM THIS CONTRACT ALL STATUTORY AND COMMON LAW WARRANTIES TO THE MAXIMUM EXTENT PERMITTED BY LAW. TO AVOID ANY AMBIGUITY OR MISUNDERSTANDING, ALL PROBLEMS ARISING WITH A MACH 10 WATER METER AFTER THIS POINT SHALL BE BUYER'S RESPONSIBILITY. NEPTUNE'S LIABILITY SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE MACH 10 WATER METER. NEPTUNE SHALL NOT BE SUBJECT TO AND DISCLAIMS THE FOLLOWING: (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 NEPTUNE, OR ANY UNDERTAKINGS, ACTS, OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL, SPECIAL, MULTIPLE, EXEMPLARY, AND PUNITIVE DAMAGES WHATSOEVER.



A NEPTUNE TECHNOLOGY GROUP WARRANTY STATEMENT

3" to 12" MACH 10® Ultrasonic Meter

1. TERMS OF LIMITED WARRANTY

With respect to its Commercial and Industrial Neptune® MACH 10® water meter ("MACH 10"), Neptune Technology Group Inc. ("Neptune") warrants that MACH 10 meters sold on or after August 1, 2021, for potable water or combined potable water and fire service applications, will be warranted to be free from manufacturing defects in workmanship and material as follows:

The MACH 10 will be, at the later of (i) the date of original purchase from Neptune or (ii) the date of original shipment from a Neptune-authorized distributor of water meters (that later date is referred to as "the Date of Shipment"), and will remain for a period of 18 months from the Date of Shipment, or 12 months from date of installation, whichever comes first, free from manufacturing defects in workmanship and material. Neptune makes the following additional warranties with respect to certain MACH 10 components.

a) Lead Free Bronze Maincase

Neptune warrants at the Date of Shipment that the lead free, high copper bronze maincase of the MACH 10 will be free from manufacturing defects in workmanship and material for the life of the meter.

b) Electronics (Battery, PCB, Transducers, LCD)

Neptune warrants that the unitized measuring element (UME) and/or electronics of the MACH 10 will be free from manufacturing defects in workmanship and material for a period of ten (10) years from the Date of Shipment. Neptune will repair or replace a non-performing MACH 10 UME free of charge for the first five (5) years and at a discount of the then-current list price, during the following five (5) years per the schedule to the right. The MACH 10 warranty does not include the external housing that encapsulates the electronics.

Year of Failure	MACH 10®
	Replacement Price Discount*
1-5	Full replacement 100%
6	70%
7	60%
8	45%
9	35%
10	25%

** Replacement price discount percentages will be applied towards the then-current list price in effect for the year product is accepted by Neptune under warranty conditions. Replacement MACH 10 electronics are warranted for one (1) year after date of shipment or balance of original MACH 10 warranty, whichever is greater.*

With respect to Section 1 and subparts a) and b), the period from the Date of Shipment to the expiration of the specified time period is the "Warranty Period" with respect to each specified component. Neptune shall not be responsible for any defects in the MACH 10 or any specified component (whether due to design, materials, manufacture, or otherwise) that manifest themselves after the expiration of the specified Warranty Period.

2. MACH 10 METER ACCURACY WARRANTY

Provided that the MACH 10 meter and the components specified in Section 1 and subparts a) and b) are functioning properly (regardless of whether the MACH 10 meter and specified components are within or outside an applicable Warranty Period detailed above), Neptune makes the following warranties with respect to meter accuracy:

Neptune MACH 10 meters are warranted to meet or exceed new meter accuracy per AWWA specifications of $\pm 1.5\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for ten (10) years from Date of Shipment. Neptune further warrants the MACH 10 to meet or exceed extended low flow accuracy of $\pm 3\%$ for the published ranges set forth in Neptune's current product sheet in existence at the time of the Date of Shipment of the MACH 10 meter for ten (10) years from Date of Shipment (that period being the "Accuracy Warranty Period").

3. WARRANTY RETURNS

If a Neptune MACH 10 meter fails an accuracy test during the Accuracy Warranty Period, the meter or UME may be returned to Neptune for evaluation. An accuracy test shall be conducted by the customer according to then-current AWWA testing standards. Any meter being returned for repair to Neptune under the accuracy warranty must be returned with a copy of the customer's test results. If the meter is returned to Neptune without a copy of the test results or if Neptune's factory test shows the meter to meet Neptune's published accuracy specifications, then the customer will be charged a nominal testing fee by Neptune in such cases. If after the meter has been tested by Neptune, Neptune determines that the meter has failed the accuracy warranty set forth in this Certificate of Warranty, then Neptune will repair or replace the meter at Neptune's option. Repaired MACH 10 meters are warranted for one (1) year after Date of Shipment of the repaired MACH 10 meter or the balance of the applicable original MACH 10 meter warranty (maincase, UME/electronics, or accuracy), whichever is greater.

If a replacement UME is deemed necessary, the new UME will include a new original warranty as specified in Sections 1 and 2 of this Certificate of Warranty.

4. RESPONSIBILITY LIMITED TO COSTS OF REPLACEMENT AND REPAIR

If the MACH 10 fails to meet the warranties set forth in Sections 1 and 2 of this Certificate of Warranty, then Neptune, at its option shall repair or replace the MACH 10 or part thereof, provided that (a) the MACH 10 is delivered to a Neptune representative, (b) the MACH 10 is accompanied by a Return Material Authorization (RMA), and (c) all costs of delivery to Neptune are assumed by the purchaser of the MACH 10. Neptune's liability is limited to its costs of replacement and repair of the non-performing MACH 10, and without limitation, this warranty does not include field replacement, labor, or materials costs, which are the responsibility of the customer. Damages resulting from miscalculation of water usage or lost revenue or profit are not recoverable from Neptune. It is the responsibility of the customer to periodically verify the operation and accuracy of its meters.

5. WARRANTIES ARE INAPPLICABLE UNDER CERTAIN CONDITIONS

The warranties set forth in this Certificate of Warranty do not apply to any MACH 10 meter that has been damaged by, or subjected to, conditions which, in the opinion of Neptune, have affected the ability of the MACH 10 to perform, including but not limited to: misuse; improper handling, application or installation; excessive operating conditions; foreign materials in the water; aggressive water conditions; tampering or unauthorized repairs or modifications; accidental or intentional damage; or acts of God. This Certificate of Warranty shall not apply if the product is placed in a non-recommended installation, is connected or altered by other than Neptune recommended procedures or is read by equipment not approved or licensed by Neptune. Neptune makes no claims concerning operability and/or compatibility or third-party reading systems. In addition, this Certificate of Warranty shall not apply if third-party reading equipment is believed to have caused damage to the MACH 10. In order to determine its liability, if any, under this Certificate of Warranty, Neptune shall have the right to inspect any MACH 10 meter or part thereof that is claimed to be defective at Neptune or other location designated by Neptune.

THE ABOVE WARRANTY FOR THE MACH 10 WATER METER IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY NEPTUNE WITH RESPECT TO THE MACH 10. **ALL OTHER WARRANTIES, CONDITIONS, TERMS, REPRESENTATIONS, OR OTHER LEGALLY OPERATIVE PROVISIONS CONCERNING THE MACH 10 ARE HEREBY EXPRESSLY EXCLUDED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY, CONDITION, TERM, AND REPRESENTATION OR OTHER LEGALLY OPERATIVE PROVISION AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** THIS PARAGRAPH IS EXPRESSLY INTENDED TO EXCLUDE FROM THIS CONTRACT ALL STATUTORY AND COMMON LAW WARRANTIES TO THE MAXIMUM EXTENT PERMITTED BY LAW. TO AVOID ANY AMBIGUITY OR MISUNDERSTANDING, ALL PROBLEMS ARISING WITH A MACH 10 WATER METER AFTER THIS POINT SHALL BE BUYER'S RESPONSIBILITY. NEPTUNE'S LIABILITY SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE MACH 10 WATER METER. NEPTUNE SHALL NOT BE SUBJECT TO AND DISCLAIMS THE FOLLOWING: (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 NEPTUNE, OR ANY UNDERTAKINGS, ACTS, OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL, SPECIAL, MULTIPLE, EXEMPLARY, AND PUNITIVE DAMAGES WHATSOEVER.



A NEPTUNE TECHNOLOGY GROUP WARRANTY STATEMENT

Cellular Endpoint

1. WARRANTY EFFECTIVE DATE

This warranty will be effective for any cellular endpoint that is shipped on or after June 1, 2021. Each warranty referenced in this statement begins at the later of (i) the date of original purchase from Neptune or (ii) the date of original shipment from a Neptune-authorized distributor of water meters (that later date is referred to as "the Date of Shipment").

2. CELLULAR ENDPOINT

Neptune Technology Group Inc. warrants that the cellular endpoint (which includes a Neptune-supplied battery that is not intended to be removable or replaceable) shall be free from defects in manufacture and design for a period of twenty (20) years from the "Date of Shipment" (such period being the "Warranty Period"). Neptune shall not be responsible for any defects in the cellular endpoint (whether due to design, materials, manufacture, or otherwise) which manifest themselves after the expiration of the Warranty Period. Neptune will repair or replace a non-performing cellular endpoint free of charge for the first ten (10) years, and at the then-current list price during the remaining ten (10) years according to the discount schedule at the right. Replacement cellular endpoints are warranted for the balance of the original applicable cellular endpoint warranty.

3. WARRANTIES ARE INAPPLICABLE UNDER CERTAIN CONDITIONS

This warranty does not include field replacement labor or materials costs, which are the responsibility of the utility. This warranty does not apply if product is placed in non-recommended installations; may have been repaired with parts not recommended by Neptune; converted, altered, or connected by other than Neptune recommended procedures; is used with other than genuine Neptune meter registers and components or read by equipment not approved or licensed by Neptune; or damaged due to improper care or maintenance, or improper periodic testing (please refer to the Cellular Endpoint Installation and Maintenance Guide). This warranty does not apply to any cellular endpoint that has been damaged by, or subjected to, conditions which, in the opinion of Neptune, have affected the cellular endpoint's ability of performance, including but not limited to: misuse; improper handling; application or installation; excessive operating conditions; tampering or unauthorized repairs and modifications; accidental or intentional damage; or acts of God. In no event shall Neptune be liable for special, incidental, indirect, or consequential damages, including, without limitation, lost revenue. Neptune contracts with third parties to provide cellular data service, as available, to and for the cellular endpoint.

Year of Failure	Cellular Endpoint
	Replacement Price Discount*
1-10	Full replacement: 100%
11	70%
12	70%
13	60%
14	60%
15	50%
16	45%
17	40%
18	35%
19	30%
20	25%

** Replacement price discount percentages will be applied towards the then-current list price in effect for the year product is accepted by Neptune under warranty conditions. Replacement endpoints are warranted for one (1) year after date of shipment or balance of original endpoint warranty, whichever is greater.*

CUSTOMER ACKNOWLEDGES THAT CELLULAR DATA SERVICE IS MADE AVAILABLE ONLY WITHIN THE OPERATING RANGE OF THE NETWORKS. SERVICE MAY BE TEMPORARILY REFUSED, INTERRUPTED, OR LIMITED BECAUSE OF: (A) FACILITIES LIMITATIONS; (B) TRANSMISSION LIMITATIONS CAUSED BY ATMOSPHERIC, TERRAIN, OTHER NATURAL OR ARTIFICIAL CONDITIONS ADVERSELY AFFECTING TRANSMISSION, WEAK BATTERIES, SYSTEM OVERCAPACITY, MOVEMENT OUTSIDE A SERVICE AREA OR GAPS IN COVERAGE IN A SERVICE AREA AND OTHER CAUSES REASONABLY OUTSIDE OF A CELLULAR DATA PROVIDER'S CONTROL SUCH AS, BUT NOT LIMITED TO, INTENTIONAL OR NEGLIGENT ACTS OF THIRD PARTIES THAT DAMAGE OR IMPAIR THE NETWORK OR DISRUPT SERVICE; OR (C) EQUIPMENT MODIFICATIONS, UPGRADES, RELOCATIONS, REPAIRS, AND OTHER SIMILAR ACTIVITIES NECESSARY FOR THE PROPER OR IMPROVED OPERATION OF SERVICE.



CUSTOMER ACKNOWLEDGES THAT CELLULAR DATA SERVICE MAY BE PROVIDED FROM A PROVIDER'S CARRIER PARTNER(S). CARRIER PARTNER NETWORKS ARE MADE AVAILABLE AS-IS AND THE CELLULAR DATA SERVICE PROVIDER MAKES NO WARRANTIES OR REPRESENTATIONS AS TO THE AVAILABILITY OR QUALITY OF ROAMING SERVICE PROVIDED BY CARRIER PARTNERS, AND THE CELLULAR DATA SERVICE PROVIDER WILL NOT BE LIABLE IN ANY CAPACITY FOR ANY ERRORS, OUTAGES, OR FAILURES OF CARRIER PARTNER NETWORKS.

CUSTOMER UNDERSTANDS AND AGREES THAT IT: (1) HAS NO CONTRACTUAL RELATIONSHIP WITH THE UNDERLYING CELLULAR DATA PROVIDER; (2) IS NOT A THIRD-PARTY BENEFICIARY OF ANY AGREEMENT BETWEEN NEPTUNE AND THE UNDERLYING CELLULAR DATA PROVIDER; (3) THAT THE UNDERLYING CELLULAR DATA PROVIDER HAS NO LIABILITY OF ANY KIND TO CUSTOMER, WHETHER FOR BREACH OF CONTRACT, WARRANTY, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHERWISE; AND (4) THAT DATA TRANSMISSIONS AND MESSAGES MAY BE DELAYED, DELETED OR NOT DELIVERED, AND NO EMERGENCY CALL CAPABILITY EXISTS.

THE ABOVE WARRANTY FOR THE CELLULAR ENDPOINT IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY NEPTUNE WITH RESPECT TO THE CELLULAR ENDPOINT. ALL OTHER WARRANTIES, CONDITIONS, TERMS, REPRESENTATIONS, OR OTHER LEGALLY OPERATIVE PROVISIONS CONCERNING THE CELLULAR ENDPOINT ARE HEREBY EXPRESSLY EXCLUDED, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY, CONDITION, TERM, AND REPRESENTATION OR OTHER LEGALLY OPERATIVE PROVISION AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THIS PARAGRAPH IS EXPRESSLY INTENDED TO EXCLUDE FROM THIS CONTRACT ALL STATUTORY AND COMMON LAW WARRANTIES TO THE MAXIMUM EXTENT PERMITTED BY LAW. TO AVOID ANY AMBIGUITY OR MISUNDERSTANDING, ALL PROBLEMS ARISING WITH A CELLULAR ENDPOINT AFTER THIS POINT ARE BUYER'S RESPONSIBILITY. NEPTUNE'S LIABILITY SHALL IN NO EVENT EXCEED THE PURCHASE PRICE OF THE CELLULAR ENDPOINT. NEPTUNE SHALL NOT BE SUBJECT TO AND DISCLAIMS THE FOLLOWING: (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 NEPTUNE, OR ANY UNDERTAKINGS, ACTS, OR OMISSIONS RELATING THERETO, AND (3) ALL CONSEQUENTIAL, INCIDENTAL, SPECIAL, MULTIPLE, EXEMPLARY, AND PUNITIVE DAMAGES WHATSOEVER.



Neptune® 360™

The Neptune® 360™ cloud platform delivers an intuitive, user-friendly design, making AMR and AMI meter reading data clear and easy to interpret. System-wide Key Performance Indicators and geographical views assist with identifying areas of concern and ways to maximize operational efficiency and improve overall customer service and quality of service.

Description of Services

The Neptune 360 subscription provides the customer with a non-transferable license to access the Neptune 360 application for all internal personnel. The Customer shall not permit the use of the Service by any unauthorized third parties, unless mutually agreed in writing. The subscription includes the following services:

- Secure access to the Neptune 360 platform, which includes:
 - Neptune 360 Web App
 - Neptune 360 Mobile App
 - Neptune 360 Field Manager App
 - Application Programming Interfaces (if applicable)
- 24x7 application and security monitoring
- Database preventive maintenance and scalability monitoring
- Software upgrades and updates, with prior notice via email
- Providing all server operating system and hardware updates
- Data back-up and replication
- Data Security and Business Continuity Plan (BCP) processes
- Telephone support at 1-800-647-4832 Monday-Friday from 7:00am-5:00pm Central time, excluding corporate holidays, and email support at support@neptunetg.com

Service Level Objectives

- **Availability.** Neptune will use commercially reasonable efforts to provide at least 99% uptime of Neptune 360, excluding communicated maintenance windows.
- **Ticket Issuance.** Neptune will open a trouble ticket upon the earlier to occur of: (i) when Neptune first observes an issue; or (ii) when Customer first reports the issue. If an issue relates to Customer's system and Neptune becomes aware of the issue, Neptune will promptly report this information to Customer. Technical support hours are Monday-Friday from 7am-5pm Central Time. Neptune's commitment is to open a ticket and respond to said ticket within 24 hours of issue identification.
- **Response Time.** The urgency and time to correct will be dependent upon the issue itself and its impact to the Customer to perform billing functions (a "Billing Impediment"). Neptune shall prioritize the correction of any Billing Impediment and shall endeavor to correct such problems within 72 hours after issue identification. Other issues are considered a bug and fixes will be implemented upon an assigned software major or minor release schedule.

Data Ownership

All data that is received from the Neptune 360 platform is captured, processed, stored, and accessed within the country in which the utility customer resides. Any data and information provided to Neptune by Customer or its Consumers ("Customer Data") remains the property of Customer. Customer grants to Neptune the right and license to host,



access, store, and use the Customer Data for the purposes of providing and maintaining the Service. Upon expiration or failure to renew the subscription, Neptune will no longer provide the Service and Customer may no longer use the platform. Within 30 days of the expiration effective date, the Customer may provide a written request for any Customer Data. Neptune will use commercially reasonable efforts to provide Customer Data in a mutually agreed upon format for export or download so long as Customer is current in all payments to Neptune. Neptune has no obligation to maintain or provide the Customer Data, unless otherwise required to do so by law.

Application Programming Interfaces

- **License.** For the sole purpose of creating an interface between Neptune 360 and applications licensed by Customer from third parties, the subscription includes a non-exclusive, non-transferable license to use APIs as well as related documentation required for their implementation.
- **Limitations on Rights of Use.** Customer shall not use the API for any other purpose except as expressly authorized in writing. Customer has no rights to the object code or source code of the API. Customer may not disassemble, decompile, reverse translate or apply any other procedure to a non- source code delivered API. Any rights in API(s) and the Documentation not expressly granted to Customer in writing shall remain with Neptune.
- **Upgrades.** Neptune may make changes to the APIs from time to time. Neptune will make commercially reasonable efforts to maintain backward compatibility of the APIs but makes no guarantees and assumes no obligation to ensure backward compatibility. APIs may not remain compatible with third-party software or programs after changes to the APIs, changes to third-party software or programs, or changes to the Neptune 360 platform.
- **Third-Party Use.** Customer acknowledges and agrees that the license shall not extend to any third-party of Customer and if Customer desires to engage third parties to utilize Neptune's APIs for development or any other purposes, Neptune's prior written consent must be obtained. Upon receiving consent, the third-party must enter into a separate agreement with Neptune prior to using the APIs.

Disclaimer of Warranties

OTHER THAN THE SERVICE LEVELS LISTED ABOVE, NEPTUNE DOES NOT MAKE ANY WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO THE SERVICES RENDERED HEREUNDER, AND HEREBY EXPRESSLY DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, WITH RESPECT TO SUCH SERVICES, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND NEPTUNE EXPRESSLY DISCLAIMS SUCH WARRANTIES AND CONDITIONS.



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#winyourday
neptunetg.com

Neptune Technology Group
1600 Alabama Highway 229
Tallahassee, AL 36078
800-633-8754 f 334-283-7293



Recordall® Disc Meters

Lead-Free Bronze Alloy, Sizes 5/8, 5/8 x 3/4, 3/4 & 1 inch
NSF/ANSI/CAN Standards 61 and 372 Certified



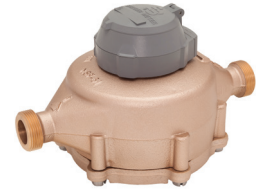
Model 25—5/8 in., 5/8 x 3/4 in.



Model 35—3/4 in.



Model 55—1 in.



Model 70—1 in.

DESCRIPTION

The Recordall Disc Series meters meet or exceed the most recent revision of AWWA Standard C700 and are available in a lead-free bronze alloy. The meters comply with the lead-free provisions of the Safe Drinking Water Act, are certified to NSF/ANSI/CAN Standards 61 and 372 (Trade Designations: M25-LL, M35-LL, M55-LL, M70-LL) and carry the NSF-61 mark on the housing. All components of the lead-free bronze alloy meter (housing, measuring element, seals, and so on) comprise the certified system.

Applications: For use in measurement of potable cold water in residential, commercial and industrial services where flow is in one direction only.

Operation: Water flows through the meter's strainer and into the measuring chamber where it causes the disc to nutate. The disc, which moves freely, nutates on its own ball, guided by a thrust roller. A drive magnet transmits the motion of the disc to a follower magnet located within the permanently sealed register. The follower magnet is connected to the register gear train. The gear train reduces the disc nutations into volume totalization units displayed on the register or encoder face.

Operating Performance: The Recordall Disc Series meters meet or exceed registration accuracy for the low flow rates (95%), normal operating flow rates ($100 \pm 1.5\%$), and maximum continuous operation flow rates as specifically stated in AWWA Standard C700.

Construction: Recordall Disc meter construction, which complies with ANSI/AWWA standard C700, consists of three basic components: meter housing, measuring chamber and permanently sealed register or encoder. The meter is available in a lead-free bronze alloy with externally threaded spuds. A corrosion-resistant engineered polymer material is used for the measuring chamber.

Magnetic Drive: Direct magnetic drive, through the use of high-strength magnets, provides positive, reliable and dependable register coupling for straight-reading or AMR/AMI meter reading options.

Tamper-Proof Features: Unauthorized removal of the register or encoder is inhibited by the option of a tamper detection seal wire screw, TORX® tamper-resistant seal screw or the proprietary tamper-resistant keyed seal screw. Each can be installed at the meter site or at the factory.

Maintenance: Badger Meter Recordall Disc Series meters are designed and manufactured to provide long-term service with minimal maintenance. When maintenance is required, it can be performed easily either at the meter installation or at any other convenient location.

To simplify maintenance, the register, measuring chamber, and strainer can be replaced without removing the meter housing from the installation. No change gears are required for accuracy calibration. Interchangeability of parts among like-sized meters and meter models also minimizes spare parts inventory investment. The built-in strainer has an effective straining area of twice the inlet size.

Connections: Tailpieces/Unions for installations of meters on various pipe types and sizes, including misaligned pipes, are available as an option.

Meter Spud and Connection Sizes

Model	Size Designation (in.)	×	"L" Laying Length (in.)	"B" Bore Dia. (in.)	Coupling Nut and Spud Thread (in.)	Tailpiece Pipe Thread (NPT) (in.)
25	5/8	×	7-1/2	5/8	3/4 (5/8)	1/2
	5/8 x 3/4	×	7-1/2	5/8, 3/4	1 (3/4)	3/4
35	3/4	×	7-1/2	3/4	1 (3/4)	3/4
	3/4	×	9	3/4	1 (3/4)	3/4
	3/4 x 1	×	9	3/4	1-1/4 (1)	1
55	1	×	10-3/4	1	1-1/4 (1)	1
70	1	×	10-3/4	1	1-1/4 (1)	1



Badger Meter

RDM-DS-00467-EN-07 (September 2024)

Product Data Sheet

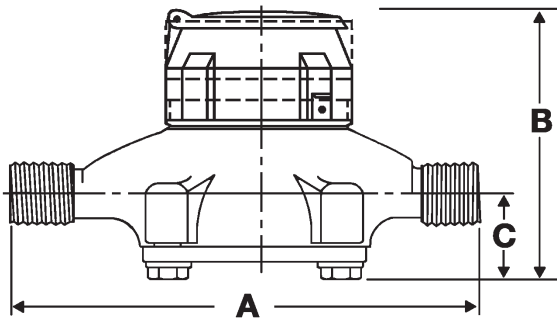
SPECIFICATIONS

	Model 25 (5/8 in. & 5/8 x 3/4 in.)	Model 35 (3/4 in.)	Model 55 (1 in.)	Model 70 (1 in.)
Typical Operating Range (100% ±1.5%)	0.5...25 gpm (0.11...5.7 m³/hr)	0.75...35 gpm (0.17...7.9 m³/hr)	1...55 gpm (0.23...12.5 m³/hr)	1.25...70 gpm (0.28...16 m³/hr)
Low Flow	0.25 gpm (0.057 m³/hr) Min. 98.5%	0.375 gpm (0.085 m³/hr) Min. 97%	0.5 gpm (0.11 m³/hr) Min. 95%	0.75 gpm (0.17 m³/hr) Min. 95%
Maximum Continuous Operation	15 gpm (3.4 m³/hr)	25 gpm (5.7 m³/hr)	40 gpm (9.1 m³/hr)	50 gpm (11.3 m³/hr)
Pressure Loss at Maximum Continuous Operation	5/8 in. size: 3.5 psi @ 15 gpm (0.24 bar @ 3.4 m³/hr) 5/8 x 3/4 in. size: 2.8 psi @ 15 gpm (0.19 bar @ 3.4 m³/hr)	5 psi @ 25 gpm (0.37 bar @ 5.7 m³/hr)	3.4 psi @ 40 gpm (0.23 bar @ 9.1 m³/hr)	6.5 psi @ 50 gpm (0.45 bar @ 11.3 m³/hr)
Maximum Operating Temperature	80° F (26° C)			
Maximum Operating Pressure	150 psi (10 bar)			
Measuring Element	Nutating disc, positive displacement			
Meter Connections	<i>Available in NL bronze and engineered polymer to fit spud thread bore diameter sizes:</i>			
	5/8 in. size: 5/8 in. (DN 15 mm) 5/8 x 3/4 in. size: 3/4 in. (DN 15 mm)	3/4 in. (DN 20 mm)	1 in. (DN 25 mm)	1 in. (DN 25 mm)

MATERIALS

	Model 25 (5/8 in. & 5/8 × 3/4 in.)	Model 35 (3/4 in.)	Model 55 (1 in.)	Model 70 (1 in.)
Meter Housing	Lead-free bronze alloy			
Housing Bottom Plates	Cast iron, lead-free bronze alloy, engineered polymer	Cast iron, lead-free bronze alloy		
Measuring Chamber	Engineered polymer			
Disc	Engineered polymer			
Trim	Stainless steel			
Strainer	Engineered polymer			
Disc Spindle	Stainless steel	Stainless steel	Engineered polymer	Stainless steel
Magnet	Ceramic	Ceramic	Ceramic	Ceramic
Magnet Spindle	Engineered polymer	Engineered polymer	Engineered polymer	Stainless steel
Register Lid and Shroud	Engineered polymer, bronze			

DIMENSIONS



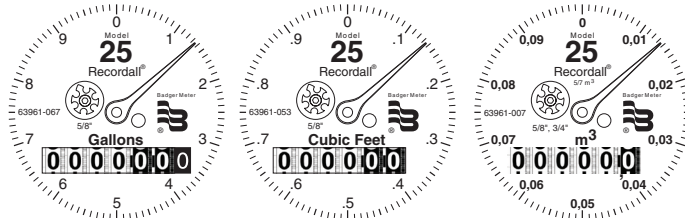
Meter Size	Model	A Laying Length	B Height Reg.	C Centerline Base	Width	Approx. Shipping Weight
5/8 in. (15 mm)	25	7-1/2 in. (190 mm)	4-15/16 in. (125 mm)	1-11/16 in. (42 mm)	4-1/4 in. (108 mm)	4-1/2 lb (2 kg)
5/8 in. x 3/4 in. (15 mm)		7-1/2 in. (190 mm)	4-15/16 in. (125 mm)	1-11/16 in. (42 mm)	4-1/4 in. (108 mm)	4-1/2 lb (2 kg)
3/4 in. (20 mm)	35	7-1/2 in. (190 mm)	5-1/4 in. (133 mm)	1-5/8 in. (41 mm)	5 in. (127 mm)	5-1/2 lb (2.5 kg)
3/4 in. (20 mm)		9 in. (229 mm)	5-1/4 in. (133 mm)	1-5/8 in. (41 mm)	5 in. (127 mm)	5-3/4 lb (2.6 kg)
3/4 in. x 1 in. (20 mm)		9 in. (229 mm)	5-1/4 in. (133 mm)	1-5/8 in. (41 mm)	5 in. (127 mm)	6 lb (2.7 kg)
1 in. (25 mm)	55	10-3/4 in. (273 mm)	6 in. (152 mm)	2-1/32 in. (52 mm)	6-1/4 in. (159 mm)	8-3/4 lb (3.9 kg)
1 in. (25 mm)	70	10-3/4 in. (273 mm)	6-1/2 in. (165 mm)	2-5/16 in. (59 mm)	7-3/4 in. (197 mm)	11-1/2 lb (5.2 kg)

REGISTERS / ENCODERS

Standard—Sweep-Hand Registration

The standard register is a straight-reading, permanently sealed magnetic drive register. Dirt, moisture, tampering and lens fogging problems are eliminated. The register has a six-odometer wheel totalization display, 360° test circle with center sweep hand, and flow finder to detect leaks. Register gearing is made of self-lubricating engineered polymer, which minimizes friction and provides long life. The multi-position register simplifies meter installation and reading. The register capacity is 10,000,000 gallons (1,000,000 ft³, 100,000 m³).

A Model 25 register is used in the following example:



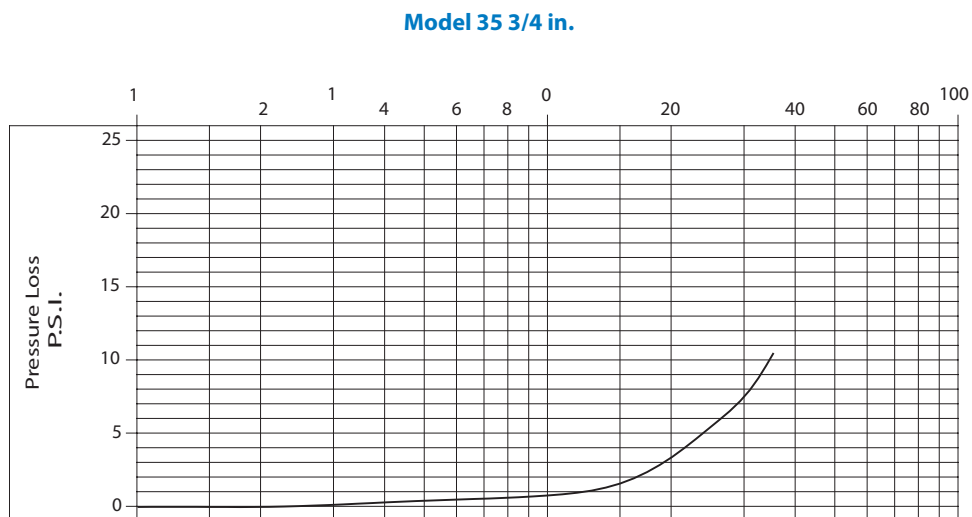
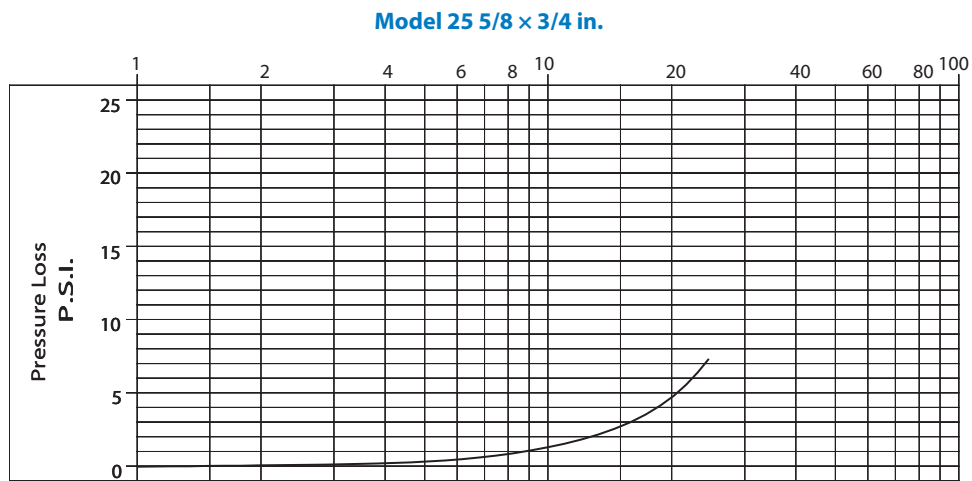
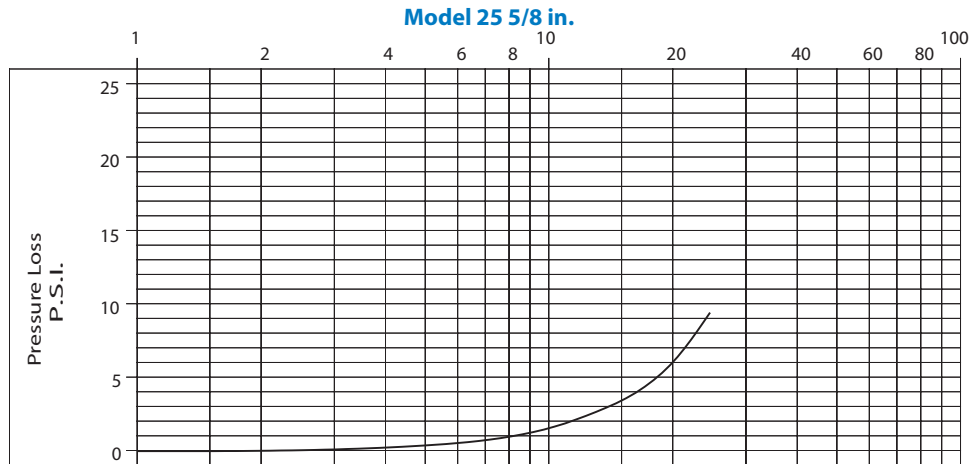
Model	Gallon	Cubic Feet	Cubic Meter
25 (5/8 in.)	10	1	0.1/0.01
25 (5/8 x 3/4 in.)	10	1	0.1/0.01
35	10	1	0.1
55	10	1	0.1
70	10	1	0.1

Optional—Encoders for AMR/AMI Reading Solutions

AMR/AMI solutions are available for all Recordall Disc Series meters. All reading options can be removed from the meter without disrupting water service. Badger Meter encoders provide years of reliable, accurate readings for a variety of applications. See details at www.badgermeter.com.

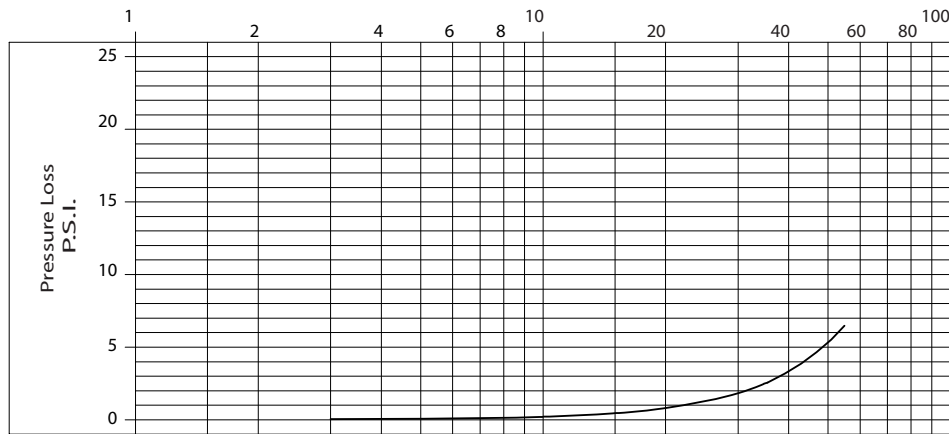
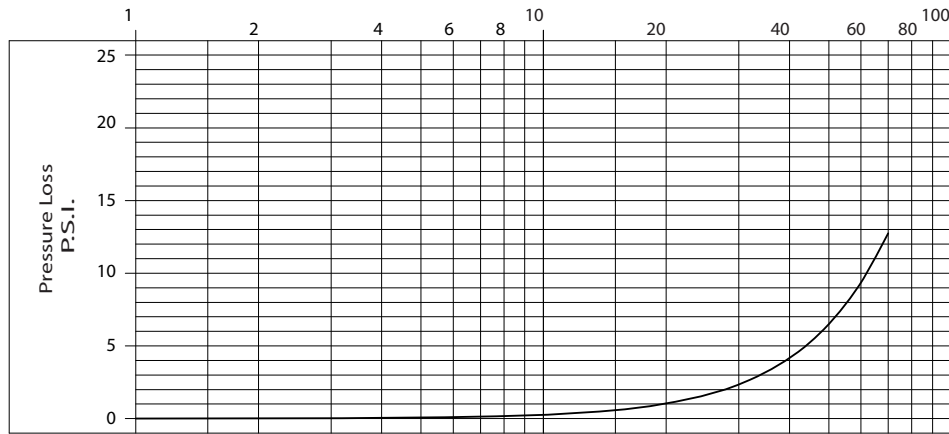
PRESSURE LOSS CHARTS

Rate of Flow in Gallons per Minute



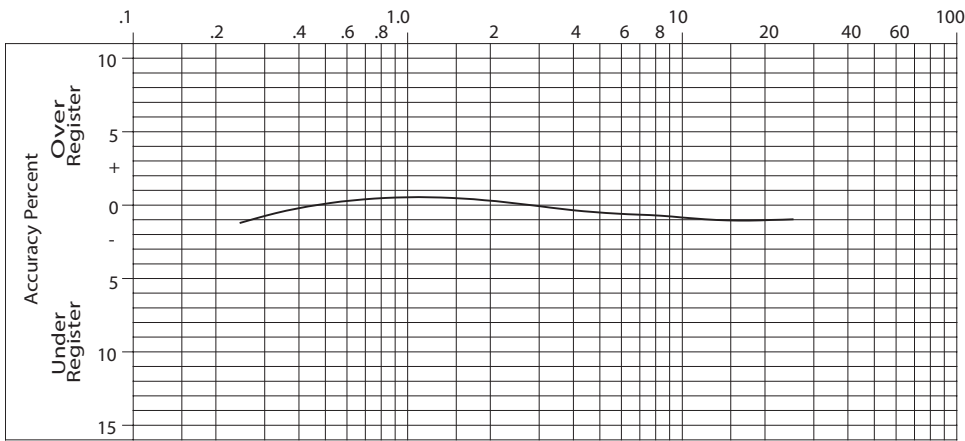
PRESSURE LOSS CHARTS (CONTINUED)

Rate of Flow in Gallons per Minute

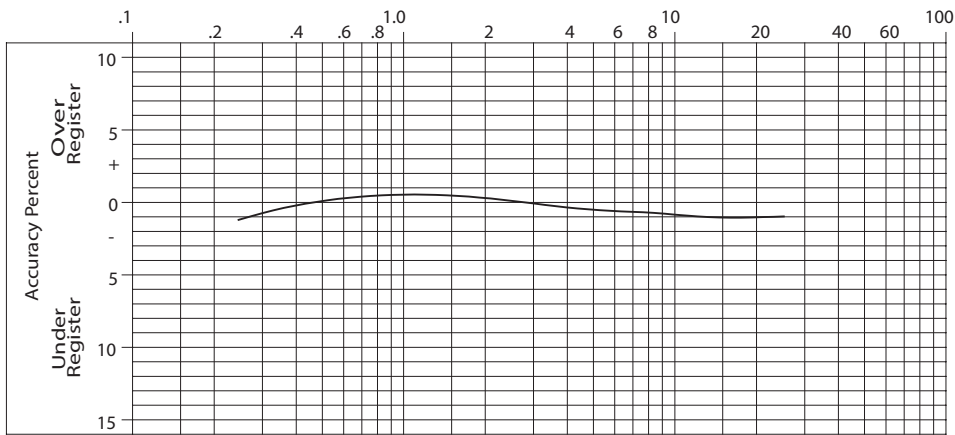
Model 55 1 in.**Model 70 1 in.**

ACCURACY CHARTS

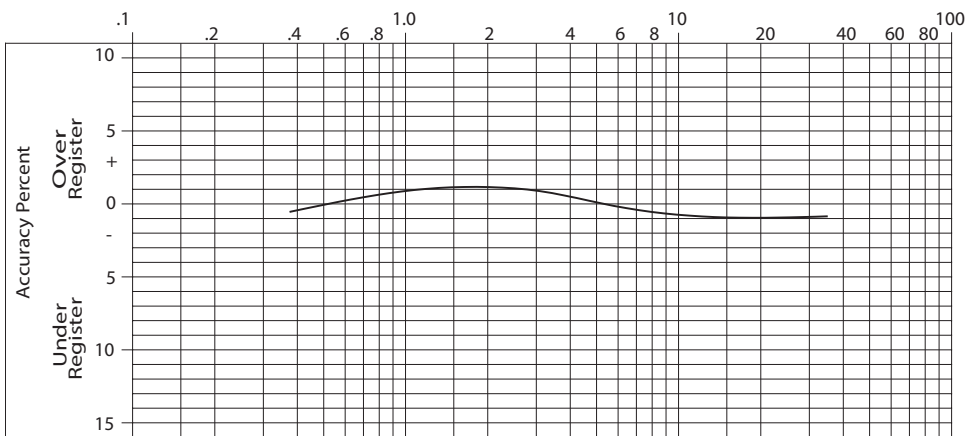
Model 25 5/8 in.



Model 25 5/8 x 3/4 in.

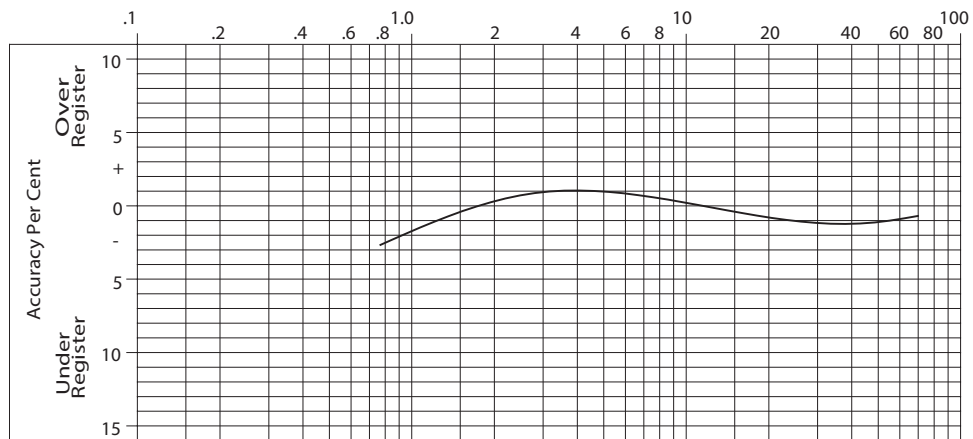


Model 35 3/4 in.

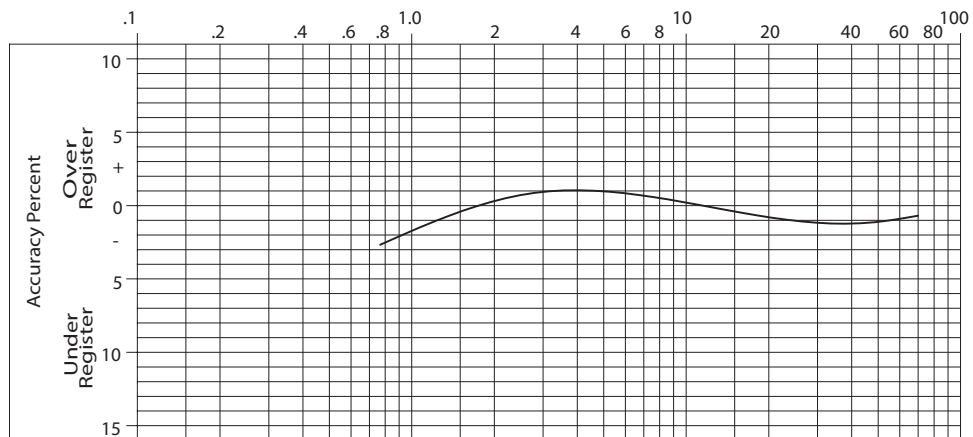


ACCURACY CHARTS (CONTINUED)

Model 55 1 in.



Model 70 1 in.





Recordall® Disc Meters

Lead-Free Bronze Alloy 120 & 170, Sizes 1-1/2 in. (40 mm) & 2 in. (50 mm), NSF/ANSI/CAN Standards 61 and 372 Certified

DESCRIPTION

Recordall Models 120 and 170 Disc Series meters meet or exceed the most recent revision of AWWA Standard C700 and are available in a lead-free bronze alloy. Both meters comply with the lead-free provisions of the Safe Drinking Water Act, are certified to NSF/ANSI/CAN Standards 61 and 372 (Trade Designations: M120-LL and M170LL) and carry the NSF-61 mark on the housing. All components of the lead-free bronze alloy meter (housing, measuring element, seals, and so on) comprise the certified system.

Applications: For use in measurement of potable cold water in residential, commercial and industrial services where flow is in one direction only.

Operation: Water flows through the meter's strainer and into the measuring chamber where it causes the disc to nutate. The disc, which moves freely, nutates on its own ball, guided by a thrust roller. A drive magnet transmits the motion of the disc to a follower magnet located within the permanently sealed register. The follower magnet is connected to the register gear train. The gear train reduces the disc nutations into volume totalization units displayed on the register or encoder face.

Operating Performance: The Recordall Disc Series meters meet or exceed registration accuracy for the low flow rates (95%), normal operating flow rates ($100 \pm 1.5\%$), and maximum continuous operation flow rates as specifically stated in AWWA Standard C700.

Construction: Recordall Disc meter construction, which complies with ANSI/AWWA standard C700, consists of three basic components: meter housing, measuring chamber, and permanently sealed register or encoder. The water meter is available in a lead-free bronze alloy. A corrosion-resistant engineered polymer material is used for the measuring chamber.

Magnetic Drive: Direct magnetic drive, through the use of high-strength magnets, provides positive, reliable and dependable register coupling for straight-reading or AMR/AMI meter reading options.

Tamper-Proof Features: Unauthorized removal of the register or encoder is inhibited by the option of a tamper detection seal wire screw, TORX® tamper-resistant seal screw or the proprietary tamper-resistant keyed seal screw. Each can be installed at the meter site or at the factory.

Maintenance: Badger Meter Recordall Disc Series meters are designed and manufactured to provide long-term service with minimal maintenance. When maintenance is required, it can be performed easily either at the meter installation or at any other convenient location.

To simplify maintenance, the register, measuring chamber, and strainer can be replaced without removing the meter housing from the installation. No change gears are required for accuracy calibration. Interchangeability of parts among like-sized meters minimizes spare parts inventory investment. The built-in strainer has an effective straining area of twice the inlet size.

Connections: Companion flanges in cast iron or NL bronze are available as options. Straight connection sets are available in NL bronze.



SPECIFICATIONS

Meter Model	M120	M170
Typical Operating Range (100% \pm 1.5%)	2.5...120 gpm (0.57...27 m ³ /hr)	2.5...170 gpm (0.57...39 m ³ /hr)
Low Flow (Min. 95%)	1.25 gpm (0.28 m ³ /hr)	1.5 gpm (0.34 m ³ /hr)
Maximum Continuous Operation	80 gpm (18 m ³ /hr)	100 gpm (23 m ³ /hr)
Pressure Loss at Maximum Continuous Operation	4.8 psi at 80 gpm (0.33 bar at 18 m ³ /hr)	3.3 psi at 100 gpm (0.23 bar at 23 m ³ /hr)
Maximum Operating Temperature	80° F (26° C)	80° F (26° C)
Maximum Operating Pressure	150 psi (10 bar)	150 psi (10 bar)
Measuring Element	Nutating disc, positive displacement	Nutating disc, positive displacement
Meter Connections	1-1/2 in. AWWA two-bolt elliptical flange, drilled or 1-1/2...11-1/2 NPT internal pipe threads	2 in. AWWA two-bolt elliptical flange, drilled or 2...11-1/2 NPT internal pipe threads
Test Plugs	Optional 1 in. NPT test plug (TP)	Optional 1 in. NPT test plug (TP)

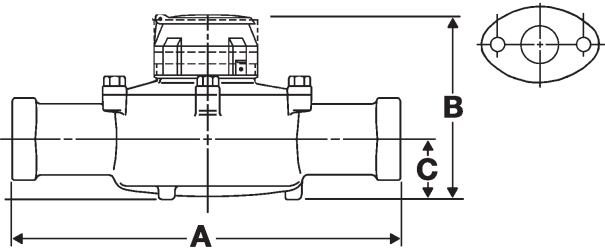
Materials

Meter Housing	Lead-free bronze alloy
Housing Top Plates	Lead-free bronze alloy
Measuring Chamber	Engineered polymer
Disc	Engineered polymer
Trim	Stainless steel
Strainer	Engineered polymer
Disc Spindle	Stainless steel
Magnet	Ceramic
Magnet Spindle	Stainless steel
Register Lid and Shroud	Engineered polymer, bronze



RDM-DS-00465-EN-10 (April 2024)

DIMENSIONS



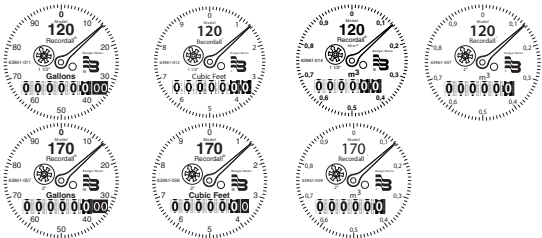
Meter Size	Meter Model	A Laying Length	B Height Reg./RTR	C Centerline Base	Width	Approx. Shipping Weight
1-1/2 in. (40 mm)	120 EL, Hex	12-5/8 in. (321 mm)	7 in. (178 mm)	2-3/8 in. (60 mm)	8-3/4 in. (222 mm)	19 lb (8.6 kg)
1-1/2 in. (40 mm)	120 EL, TP					
1-1/2 in. (40 mm)	120 ELL	13 in. (330 mm)	7 in. (178 mm)	2-3/8 in. (60 mm)	8-3/4 in. (222 mm)	19 lb (8.6 kg)
1-1/2 in. (40 mm)	120 ELL, TP					
2 in. (50 mm)	170 EL, Hex	15-1/4 in. (387 mm)	8 in. (203 mm)	2-7/8 in. (73 mm)	9-1/2 in. (241 mm)	30 lb (13.6 kg)
2 in. (50 mm)	170 EL, TP					
2 in. (50 mm)	170 ELL	17 in. (432 mm)	8 in. (203 mm)	2-7/8 in. (73 mm)	9-1/2 in. (241 mm)	30 lb (13.6 kg)
2 in. (50 mm)	170 ELL, TP					

EL = Elliptical ELL = Elliptical Long Hex = Hexagon, 1-1/2...11-1/2 in. NPT TP=Test Plug 1 in.

REGISTERS / ENCODERS

Standard—Sweep-Hand Registration

The standard register is a straight-reading, permanently sealed magnetic drive register. Dirt, moisture, tampering and lens fogging problems are eliminated. The register has a six-odometer wheel totalization display, 360° test circle with center sweep hand, and flow finder to detect leaks. Register gearing is made of self-lubricating engineered polymer, which minimizes friction and provides long life. The multi-position register simplifies meter installation and reading. The register capacity is 100,000,000 gallons (10,000,000 ft³, 1,000,000 m³).



Meter Model	Gallon	Cubic Feet	Cubic Meter
120	100	10	1/0.1
170	100	10	1

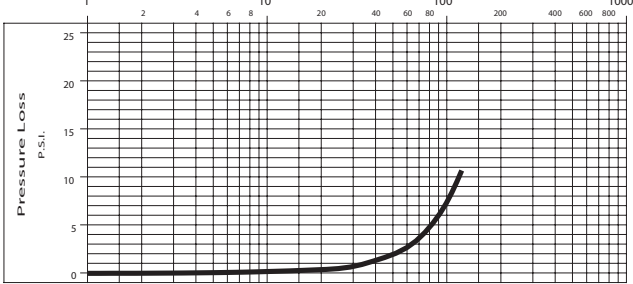
Optional—Encoders for AMR/AMI Reading Solutions

AMR/AMI solutions are available for all Recordall Disc Series meters. All reading options can be removed from the meter without disrupting water service. Badger Meter encoders provide years of reliable, accurate readings for a variety of applications and are also available pre-wired to Badger Meter approved AMR/AMI solutions. See details at badgermeter.com.

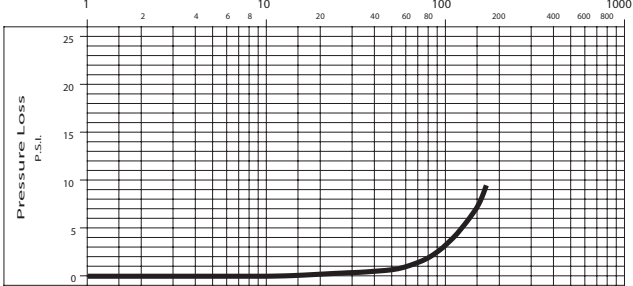
PRESSURE LOSS CHARTS

1-1/2 in. Meter

Rate of Flow in Gallons per Minute



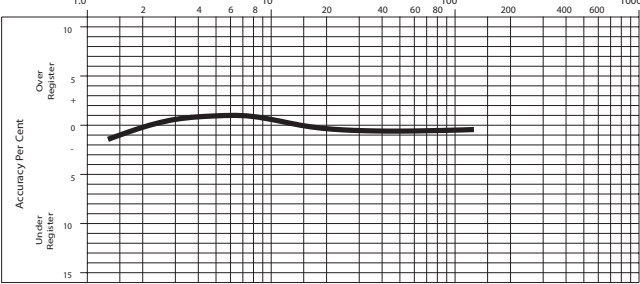
2 in. Meter



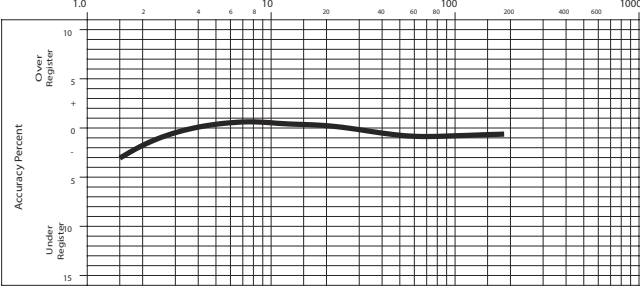
ACCURACY CHARTS

1-1/2 in. Meter

Rate of Flow in Gallons per Minute



2 in. Meter



SMART WATER IS BADGER METER

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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 (empty pipe, temperature, exceeding max flow, sensor error, reverse flow, suspected leak, 30 day no usage, end of life).
- High resolution industry standard ASCII encoder protocol sends alarms and data to ORION® Cellular endpoints and BEACON® SaaS* suite to establish a smart water solution.

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.

* Software as a Service

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/CAN 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.



Badger Meter

ESM-DS-00675-EN-12 (December 2023)



In the normal temperature range of 45...122° F (7...50° C), the Ultrasonic “new meter” consumption measurement is accurate to:

- $\pm 1.5\%$ over the normal flow range
- $\pm 3.0\%$ 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 m ³ /hr)	0.1...25 gpm (0.02...5.7 m ³ /hr)	0.1...32 gpm (0.02...7.3 m ³ /hr)	0.4...55 gpm (0.09...12.5 m ³ /hr)
Minimum Test Flow Limits	0.05 gpm (0.01 m ³ /hr)	0.05 gpm (0.01 m ³ /hr)	0.05 gpm (0.01 m ³ /hr)	0.25 gpm (0.06 m ³ /hr)
Safe Maximum Operating Condition (SMOC)	25 gpm (5.7 m ³ /hr)	25 gpm (5.7 m ³ /hr)	32 gpm (7.3 m ³ /hr)	55 gpm (12.5 m ³ /hr)
Typical Pressure Loss	4.3 psi @ 15 gpm (0.3 bar @ 3.4 m ³ /hr)	2.3 psi @ 15 gpm (0.16 bar @ 3.4 m ³ /hr)	2.0 psi @ 15 gpm (0.14 bar @ 3.4 m ³ /hr)	1.8 psi @ 25 gpm (0.12 bar @ 5.7 m ³ /hr)
Reverse Flow - Maximum Rate	4 gpm (0.9 m ³ /hr)	4 gpm (0.9 m ³ /hr)	4 gpm (0.9 m ³ /hr)	7.5 gpm (1.7 m ³ /hr)
Operating Performance	In the normal temperature range of 45...122° F (7...50° C), new meter consumption measurement is accurate to: <ul style="list-style-type: none"> • ±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	<ul style="list-style-type: none"> • Consumption (up to nine digits) • Rate of flow • Alarms (empty pipe, temperature, exceeding max flow, sensor error, reverse flow, suspected leak, 30 day no usage, end of life) • Unit of measure factory programmed for gallons, cubic feet and cubic meters 			
Register Capacity	<ul style="list-style-type: none"> • 10,000,000 gallons • 1,000,000 cubic feet • 100,000 cubic meters 			
Totalization Display Resolution	<ul style="list-style-type: none"> • 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			

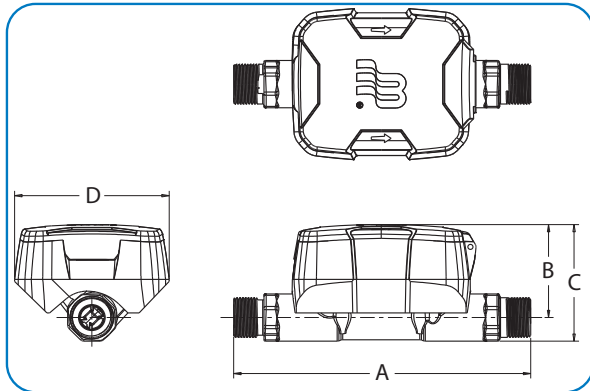
MATERIALS

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

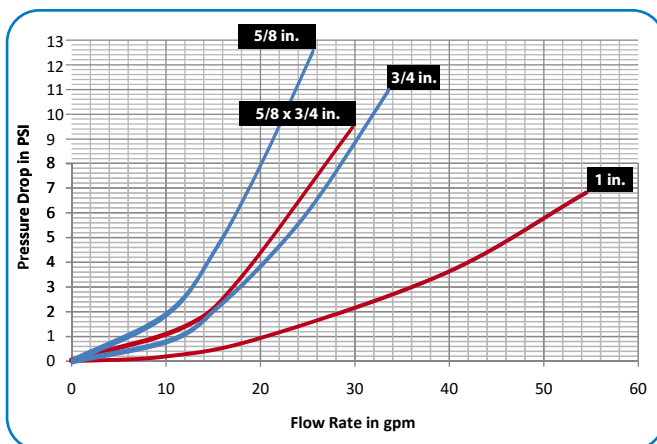
E-Series Ultrasonic Meter Size	5/8 in. (16 mm)	5/8 × 3/4 in. (16 × 19 mm)	3/4 in. (19 mm)	1 in. (25 mm)
Size Designation × Lay Length	5/8 × 7-1/2 in. (16 × 191 mm)	5/8 × 3/4 × 7-1/2 in. (16 × 19 × 191 mm)	3/4 × 7-1/2 in. or 3/4 × 9 in. (19 × 191 mm or 19 × 229 mm)	1 × 10-3/4 in. (25 × 273 mm)
Weight (without AMR)	2.2 lb (1 kg)	2.1 lb (.95 kg)	3/4 × 7-1/2 in.: 2.1 lb or 3/4 × 9 in.: 2.4 lb (20 × 190 mm: 0.95 kg or 20 × 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. × 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

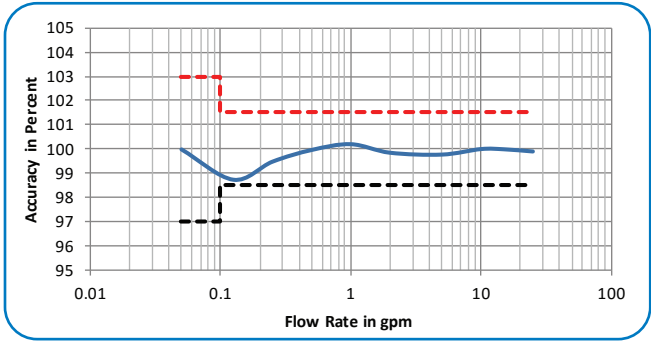
Rate of Flow in gallons per minute (gpm)



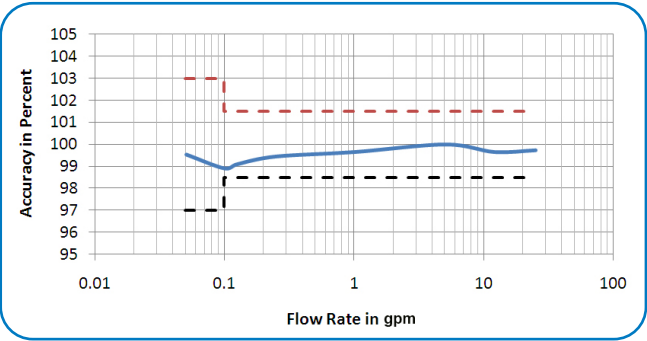
ACCURACY CHARTS

Rate of Flow in gallons per minute (gpm)

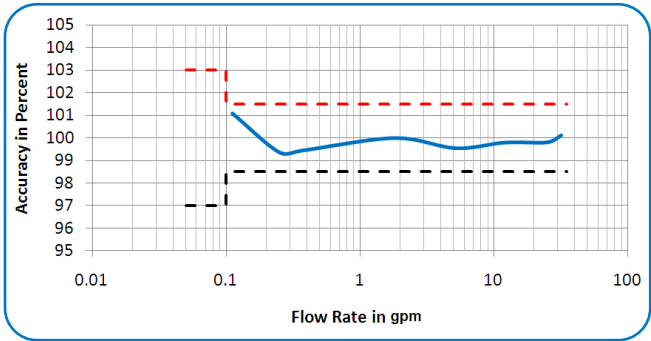
5/8 in. Meter



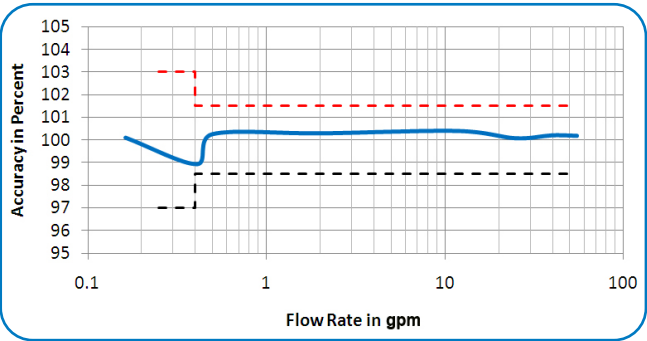
5/8 × 3/4 in. Meter



3/4 in. Meter



1 in. Meter



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E-Series® Ultrasonic Meter

Cold Water Stainless Steel Meter, 3/4 and 1 inch UL Certified for Fire Service Applications

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 two sizes, the Ultrasonic meter features:

- UL Listing under UL Subject 327B for residential fire service applications.
- 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 (empty pipe, temperature, exceeding max flow, sensor error, reverse flow, suspected leak, 30 day no usage, end of life).
- High resolution industry standard ASCII encoder protocol sends alarms and data to ORION® Cellular endpoints and BEACON® SaaS* suite to establish a smart water solution.

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.

* Software as a Service

APPLICATIONS

This Ultrasonic meter is UL Listed under UL Subject 327B, inferential type water meters used in residential fire service applications. These applications are regulated by local codes and requirements established by the Authority Having Jurisdiction (AHJ). Additional application information is provided in NFPA 13D, one- and two-family residences.

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/CAN Standards 61 and 372 and carry the NSF-61 mark on the housing.

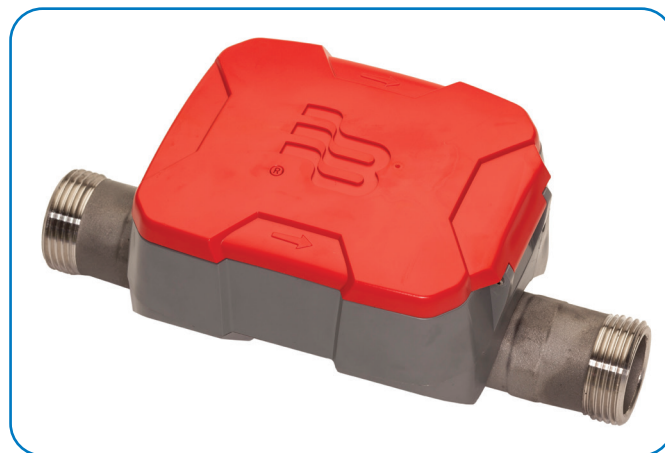
OPERATION & PERFORMANCE

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.



Badger Meter

ESM-DS-00674-EN-08 (November 2022)



In the normal temperature range of 45...122° F (7...50° C), the Ultrasonic “new meter” consumption measurement is accurate to:

- $\pm 1.5\%$ over the normal flow range
- $\pm 3.0\%$ 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 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.



Product Data Sheet

SPECIFICATIONS

E-Series Ultrasonic Residential Fire Service Certified under UL 327B Residential Fire Service Meters - File No. 15653, Control No. 4DP3	3/4 in. (20 mm)	1 in. (25 mm)
Normal Test Flow Limits (per UL Listing, at $\pm 1.5\%$ accuracy)	2...30 gpm (0.5...6.8 m ³ /hr)	2...50 gpm (0.5...11.4 m ³ /hr)
Normal Test Flow Limits	0.1...32 gpm (0.02...7.3 m ³ /hr)	0.4...55 gpm (0.09...12.5 m ³ /hr)
Minimum Test Flow Limits	0.05 gpm (0.01 m ³ /hr)	0.25 gpm (0.01 m ³ /hr)
Safe Maximum Operating Condition (SMOC)	32 gpm (7.3 m ³ /hr)	55 gpm (12.5 m ³ /hr)
Typical Pressure Loss	2.0 psi @ 15 gpm (0.14 bar @ 3.4 m ³ /hr)	1.8 psi @ 25 gpm (0.12 bar @ 5.7 m ³ /hr)
Reverse Flow - Maximum Rate	4.0 gpm (0.91 m ³ /hr)	9.0 gpm (2.04 m ³ /hr)
Operating Performance	In the normal temperature range of 45...122° F (7...50° C), new meter consumption measurement is accurate to: <ul style="list-style-type: none"> • $\pm 1.5\%$ over the normal flow range • $\pm 3.0\%$ 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	
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	<ul style="list-style-type: none"> • Consumption (up to nine digits) • Rate of flow • Alarms (empty pipe, temperature, exceeding max flow, sensor error, reverse flow, suspected leak, 30 day no usage, end of life) • Unit of measure factory programmed for gallons, cubic feet and cubic meters 	
Register Capacity	<ul style="list-style-type: none"> • 10,000,000 gallons • 1,000,000 cubic feet • 100,000 cubic meters 	
Totalization Display Resolution	<ul style="list-style-type: none"> • 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	

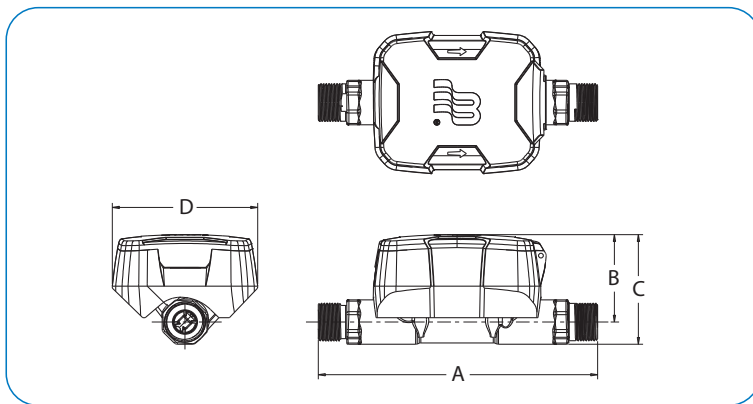
MATERIALS

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

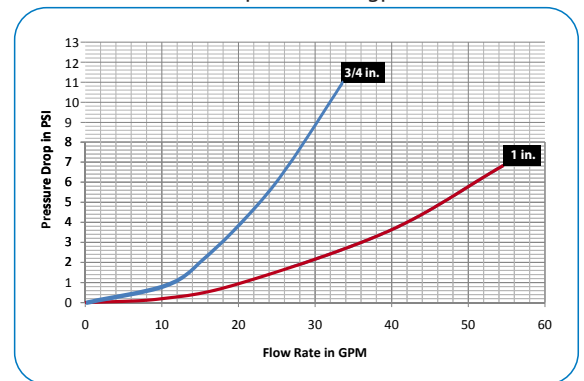
E-Series Ultrasonic Residential Fire Service Certified under UL 327B Residential Fire Service Meters - File No. 15653, Control No. 4DP3	3/4 in. (20 mm)	1 in. (25 mm)
Size Designation × Lay Length	3/4 × 7-1/2 in. or 3/4 × 9 in. (19 × 191 mm or 19 × 229 mm)	1 × 10-3/4 in. (25 × 273 mm)
Weight (without AMR)	3/4 × 7-1/2 in.: 2.1 lb or 3/4 × 9 in.: 2.4 lb (19 × 191 mm: 0.95 kg or 19 × 229 mm: 1.08 kg)	3.1 lb (1.4 kg)
See illustration below for Measurement Designations.		
Length (A)	7.5 in. or 8.98 in. (191 mm or 228 mm)	10.745 in. (273 mm)
Height (B)	2.404 in. (61 mm)	2.529 in. (64 mm)
Height (C)	3.094 in. (79 mm)	3.359 in. (85 mm)
Width (D)	3.898 in. (99 mm)	3.898 in. (99 mm)
Bore Size	3/4 in. (19 mm)	1 in. (25 mm)
Coupling Nut & Spud Thread	1 in. × 11-1/2 NPSM	1-1/4 in. × 11-1/2 NPSM
Tailpiece Pipe Thread (NPT)	3/4 in.	1 in.
Service Pipe Thread (NPT)	3/4 in.	1 in.

Measurement Designations



PRESSURE LOSS CHART

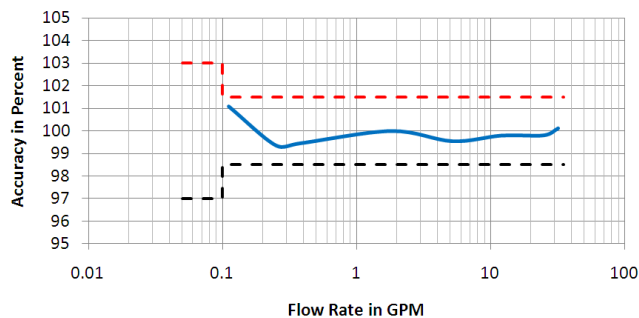
Rate of Flow in Gallons per Minute (gpm)



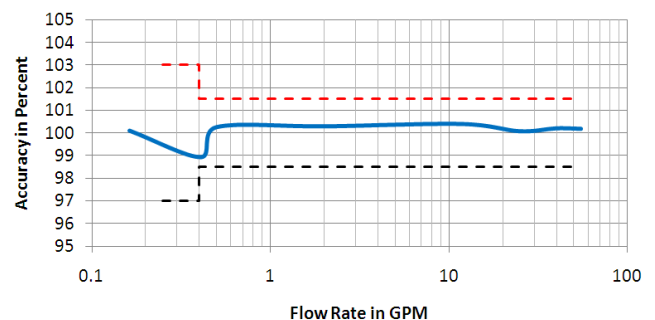
ACCURACY CHARTS

Rate of Flow in Gallons per Minute (gpm)

3/4 in. Meter



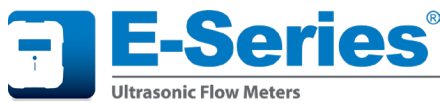
1 in. Meter



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www.badgermeter.com



E-Series® Ultrasonic Meter

**Cold Water Stainless Steel Meter, 1-1/2 and 2 inch
UL Certified for Fire Service Applications**

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:

- UL Listing under UL Subject 327B for residential fire service applications.
- 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 (empty pipe, temperature, exceeding max flow, sensor error, reverse flow, suspected leak, 30 day no usage, end of life).
- High resolution industry standard ASCII encoder protocol sends alarms and data to ORION® Cellular endpoints and BEACON® SaaS* suite to establish a smart water solution.

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.

* Software as a Service

APPLICATIONS

This Ultrasonic meter is UL Listed under UL Subject 327B, inferential type water meters used in residential fire service applications. These applications are regulated by local codes and requirements established by the Authority Having Jurisdiction (AHJ). Additional application information is provided in NFPA 13D, one- and two-family residences.

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/CAN Standards 61 and 372 and carry the NSF-61 mark on the housing.

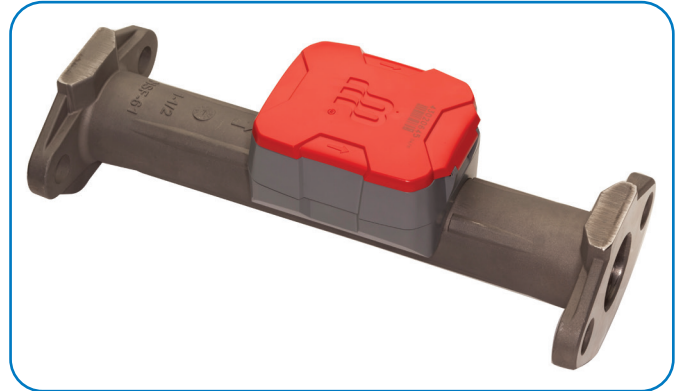
OPERATION & PERFORMANCE

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.



Badger Meter

ESM-DS-00673-EN-11 (November 2022)



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 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.



Product Data Sheet

SPECIFICATIONS

E-Series Ultrasonic Residential Fire Service Certified under UL 327B Residential Fire Service Meters - File No. 15653, Control No. 4DP3	1-1/2 in. (40 mm)	2 in. (50 mm)
Normal Test Flow Limits	1.5...100 gpm (0.34...22.7 m ³ /hr)	2...160 gpm (0.45...36.3 m ³ /hr)
Minimum Test Flow Limits	0.40 gpm (0.09 m ³ /hr)	0.50 gpm (0.11 m ³ /hr)
Safe Maximum Operating Condition (SMOC)	100 gpm (22.7 m ³ /hr)	160 gpm (36.3 m ³ /hr)
Typical Pressure Loss	3.8 psi (0.26 bar)	5.2 psi (0.36 bar)
Reverse Flow, Maximum Rate	12 gpm (2.73 m ³ /hr)	18 gpm (4.09 m ³ /hr)
Operating Performance	In the normal temperature range of 45...122° F (7...50° C), new meter consumption measurement is accurate to: <ul style="list-style-type: none"> • ±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	
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	<ul style="list-style-type: none"> • Consumption (up to nine digits) • Rate of flow • Alarms (empty pipe, temperature, exceeding max flow, sensor error, reverse flow, suspected leak, 30 day no usage, end of life) • Unit of measure factory programmed for gallons, cubic feet and cubic meters 	
Register Capacity	<ul style="list-style-type: none"> • 100,000,000 gallons • 10,000,000 cubic feet • 1,000,000 cubic meters 	
Totalization Display Resolution	<ul style="list-style-type: none"> • 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	

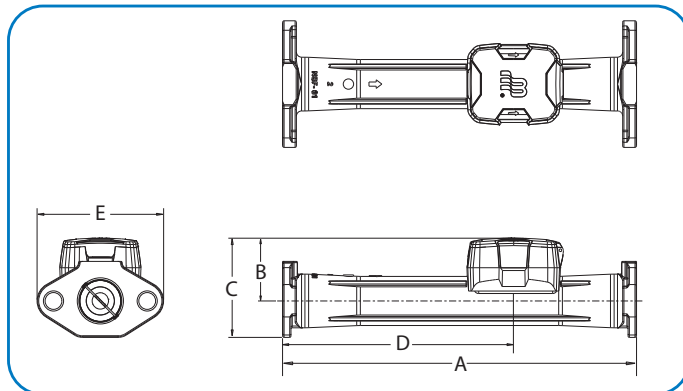
MATERIALS

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

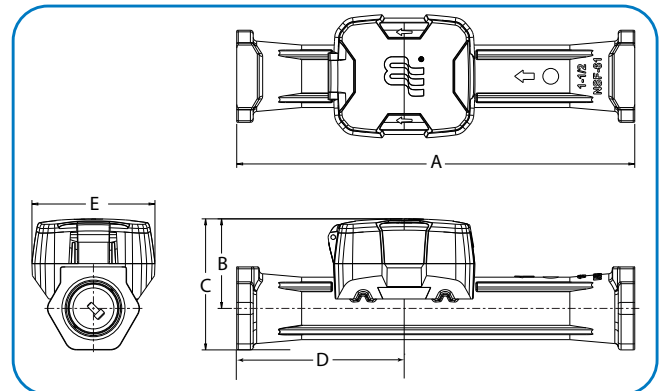
PHYSICAL DIMENSIONS

E-Series Ultrasonic Residential Fire Service Certified under UL 327B Residential Fire Service Meters - File No. 15653, Control No. 4DP3	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)	—
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

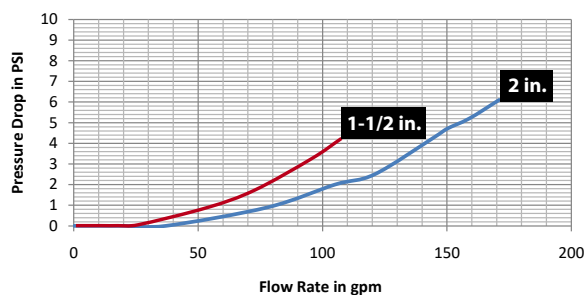


HEX Measurement Designations



PRESSURE LOSS CHART

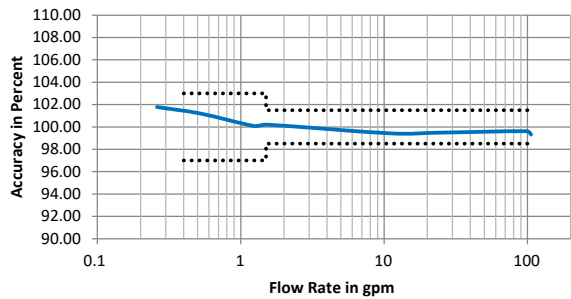
Flow rate in gallons per minute (gpm)



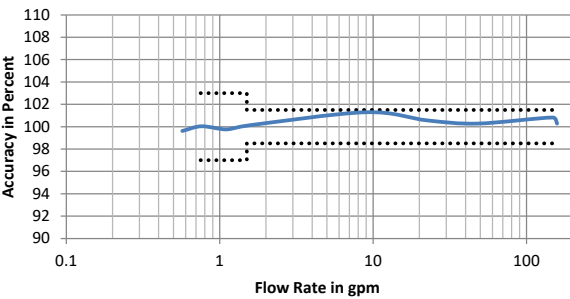
ACCURACY CHARTS

Rate of Flow in gallons per minute (gpm)

1-1/2 in. Meter

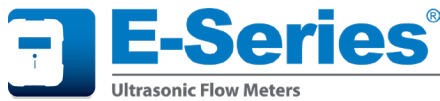


2 in. Meter



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E-Series G2® Ultrasonic Meters

Lead-Free Bronze Alloy, 5/8, 5/8 x 3/4, 3/4, 1 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

- 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 (reverse-flow, no usage, empty pipe, exceeding max flow, suspected leak, pressure*, temperature, end of life and measurement error) and firmware version
- High resolution industry standard ASCII encoder protocol sends alarms and data to ORION® endpoints and BEACON® Software as a Service (SaaS) suite to establish a smart water solution for better visibility and management
- Pressure* and temperature data and alarms reported at meter and through ORION endpoints and BEACON SaaS
- Field programmable registration and maintains an hourly internal logging capacity of 160 days of data
- 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

**available with optional integrated pressure sensor*

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.

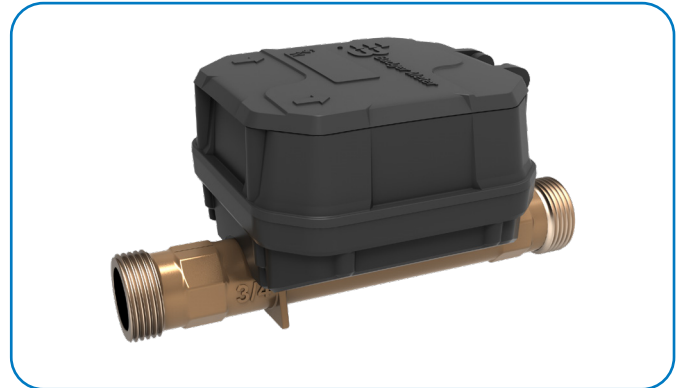
The LCD screen toggles to total volume, unit of measure, rate of flow, pressure*, temperature, firmware and alarm conditions (reverse-flow, no usage, empty pipe, exceeding max flow, suspected leak, pressure*, temperature, end of life and measurement error).

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



Badger Meter

ESM-DS-03096-EN-10 (May 2024)



In the normal temperature range of 45...122° F (7...50° C), the “new meter” consumption measurement is accurate to:

- $\pm 1.5\%$ over the normal flow range
- $\pm 3.0\%$ from the extended low flow range to the minimum flow value

**available with optional integrated pressure sensor*

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/CAN Standards 61 and 372.

The 3/4 and 1 inch Ultrasonic meters are UL Listed under UL Subject 327B, inferential type water meters used in residential fire service applications. These applications are regulated by local codes and requirements established by the Authority Having Jurisdiction (AHJ). Additional application information is provided in NFPA 13D, one- and two-family residences.

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 flow tube is designed to reduce pressure loss and provide long-term accuracy.



Product Data Sheet

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 inline 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 in.	5/8 x 3/4 in.	3/4 in. (7-1/2 in.)	3/4 in. (9 in.)	1 in.
Normal Test Flow Limits	0.08...30 gpm (0.02...6.81 m³/hr)	0.08...30 gpm (0.02...6.81 m³/hr)	0.1...35 gpm (0.02...7.95 m³/hr)	0.1...35 gpm (0.02...7.95 m³/hr)	0.16...62 gpm (0.04...14.08 m³/hr)
Minimum Test Flow Limits	0.04 gpm (0.009 m³/hr)	0.04 gpm (0.009 m³/hr)	0.04 gpm (0.009 m³/hr)	0.04 gpm (0.009 m³/hr)	0.075 gpm (0.017 m³/hr)
Safe Maximum Operating Condition (SMOC)	30 gpm (6.81 m³/hr)	30 gpm (6.81 m³/hr)	35 gpm (7.95 m³/hr)	35 gpm (7.95 m³/hr)	62 gpm (14.08 m³/hr)
Typical Pressure Loss	TBD	2.6 psi @ 15 gpm (0.18 bar @ 3.4 m³/hr)	4.2 psi @ 25 gpm (0.29 bar @ 5.7 m³/hr)	4.2 psi @ 25 gpm (0.29 bar @ 5.7 m³/hr)	4.1 psi @ 40 gpm (0.28 bar @ 9.1 m³/hr)
UL Approval for Residential Fire Service Meters - File No. EX15653	NA	NA	UL 327B	UL 327B	UL 327B
UL Test Flow Limits (at ±1.5% accuracy)	NA	NA	2...30 gpm (0.45...6.81 m³/hr)	2...30 gpm (0.45...6.81 m³/hr)	2...50 gpm (0.45...11.36 m³/hr)
Typical UL Pressure Loss	NA	NA	4.2 psi @ 25 gpm (0.29 bar @ 5.7 m³/hr)	4.2 psi @ 25 gpm (0.29 bar @ 5.7 m³/hr)	4.1 psi @ 40 gpm (0.28 bar @ 9.1 m³/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	175 psi (12 bar)				
Pressure Sensor Accuracy	±2% of full scale pressure, up to 175 psi (12 bar)				
Register Type	Straight reading, permanently sealed electronic LCD; digits are 0.28 in. (7 mm) high				
Register Display	<ul style="list-style-type: none"> Total consumption (nine digits) Rate of flow Temperature Pressure (Optional: for meters ordered with integrated pressure sensor) Alarm and operating mode Firmware version Alarm indicators Unit of measure (factory programmed for gallons, cubic feet and cubic meters) 				
Totalization Display Resolution	<ul style="list-style-type: none"> Gallons: 0.01 Cubic feet: 0.001 Cubic meters: 0.0001 				
Scaled/Unscaled Output*	Solid-state relay and Open Collector				
Max. Voltage	30V DC				
Current	10 mA				
Pulse Width	50 ms (programmable 25...100 ms)				
Analog 4-20 mA Output*	Two-wire/passive flow rate measurement				
Input Voltage Range	9...50V DC supply				
Current	4...20 mA				
Max. Load Resistance (Ohms)	(50 Ohms + 50 Ohms) × (Supply Voltage - 9V)				
Battery	3.6-volt lithium thionyl chloride; battery is fully encapsulated within the register housing and is not replaceable; 20-year battery life				

*Applicable to meters with dual output options

MATERIALS

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

* Fire Service meters do not have a Strainer

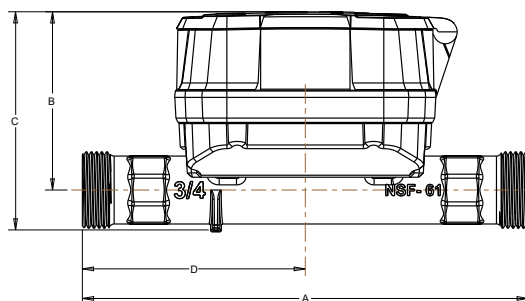
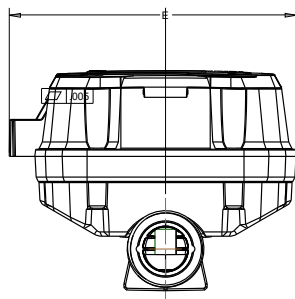
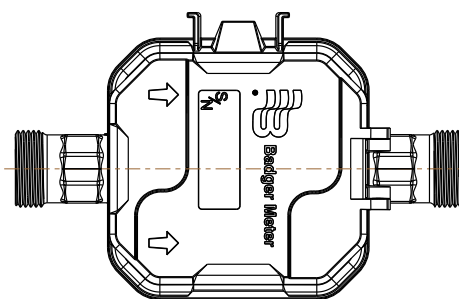
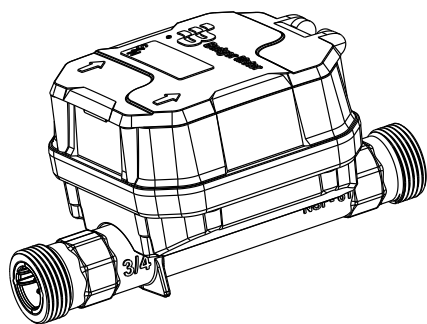
PHYSICAL DIMENSIONS

E-Series G2 Ultrasonic Meter Size	5/8 in.	5/8 x 3/4 in.	3/4 in. (7-1/2 in.)	3/4 in. (9 in.)	1 in.
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. (19 x 191 mm)	3/4 x 9 in. (19 x 229 mm)	1 x 10-3/4 in. (25 x 273 mm)
Bore Size	5/8 in. (16 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)	1 in. (25 mm)
Coupling Nut & Spud Thread (NPSM)	3/4 in. (19 mm) x 14 NPSM	1 in. (25 mm) x 11-1/2 NPSM	1 in. (25 mm) x 11-1/2 NPSM	1 in. (25 mm) x 11-1/2 NPSM	1-1/4 in. (32 mm) x 11-1/2 NPSM
Service Pipe Thread (NPSM)	1/2 in. (13 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)	1 in. (25 mm)
Tailpiece Pipe Thread (NPSM)	1/2 in. (13 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)	1 in. (25 mm)
Weight (without AMR)	TBD	2.7 lb (1.23 kg)	2.62 lb (1.19 kg)	2.86 lb (1.30 kg)	4.02 lb (1.82 kg)

See illustration below for Measurement Designations

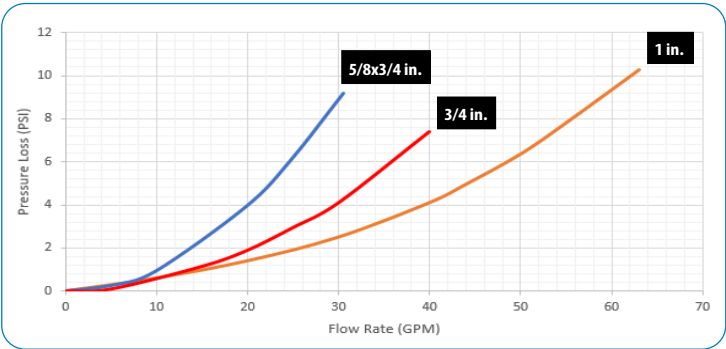
Length (A)	7.49 in. (190 mm)	7.46 in. (189 mm)	7.46 in. (189 mm)	8.93 in. (227 mm)	10.75 in. (273 mm)
Height (B)	2.95 in. (75 mm)	2.99 in. (76 mm)	2.99 in. (76 mm)	2.99 in. (76 mm)	3.19 in. (81 mm)
Height (C)	3.55 in. (90 mm)	3.66 in. (93 mm)	3.66 in. (93 mm)	3.69 in. (94 mm)	4.06 (103 mm)
Length (D)	3.74 in. (95 mm)	3.74 in. (95 mm)	3.74 in. (95 mm)	3.77 in. (96 mm)	3.94 (100 mm)
Width (E)	4.82 in. (122 mm)				

Measurement Designations



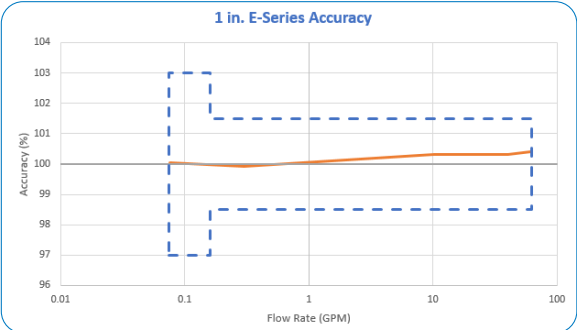
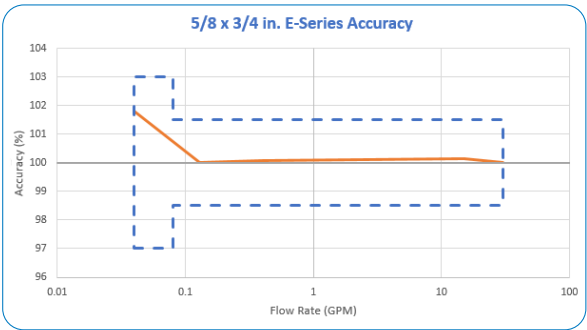
PRESSURE LOSS CHART

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



ACCURACY CHARTS

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



SMART WATER IS BADGER METER

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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 (empty pipe, temperature, exceeding max flow, sensor error, reverse flow, suspected leak, 30 day no usage, end of life).
- High resolution industry standard ASCII encoder protocol sends alarms and data to ORION® Cellular endpoints and BEACON® SaaS* suite to establish a smart water solution.

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.

* Software as a Service

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/CAN 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:

- $\pm 1.5\%$ over the normal flow range
- $\pm 3.0\%$ 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 m ³ /hr)	1.5...160 gpm (0.34...36.3 m ³ /hr)
Minimum Test Flow Limits	0.40 gpm (0.09 m ³ /hr)	0.50 gpm (0.11 m ³ /hr)
Safe Maximum Operating Condition (SMOC)	100 gpm (22.7 m ³ /hr)	160 gpm (36.3 m ³ /hr)
Typical Pressure Loss	3.8 psi (0.26 bar)	5.2 psi (0.36 bar)
Reverse Flow – Maximum Rate	12 gpm (2.73 m ³ /hr)	18 gpm (4.09 m ³ /hr)
Operating Performance	In the normal temperature range of 45...122° F (7...50° C), new meter consumption measurement is accurate to: <ul style="list-style-type: none"> • ±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	<ul style="list-style-type: none"> • Consumption (up to nine digits) • Rate of flow • Alarms (empty pipe, temperature, exceeding max flow, sensor error, reverse flow, suspected leak, 30 day no usage, end of life) • Unit of measure factory programmed for gallons, cubic feet and cubic meters 	
Register Capacity	<ul style="list-style-type: none"> • 100,000,000 gallons • 10,000,000 cubic feet • 1,000,000 cubic meters 	
Totalization Display Resolution	<ul style="list-style-type: none"> • 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	

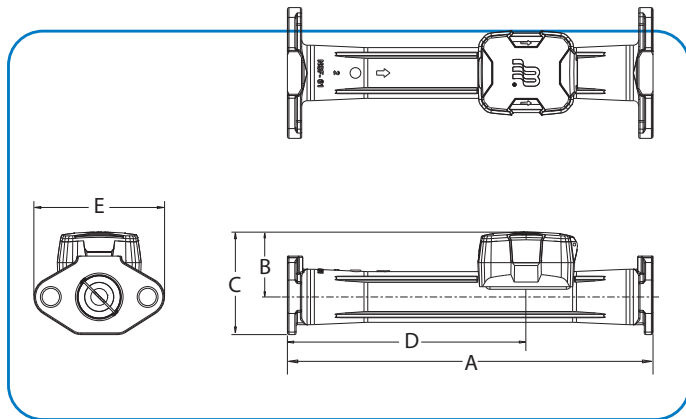
MATERIALS

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

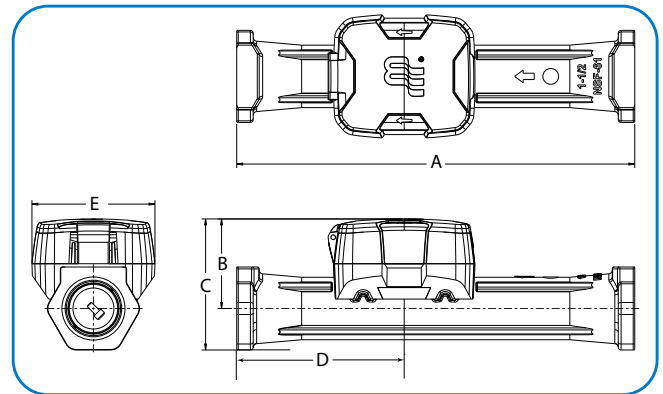
PHYSICAL DIMENSIONS

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

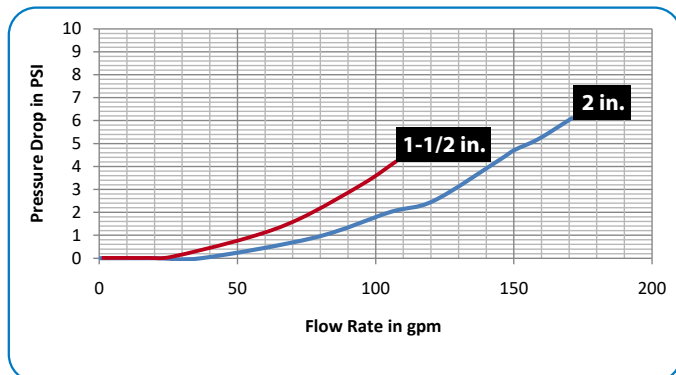


HEX Measurement Designations



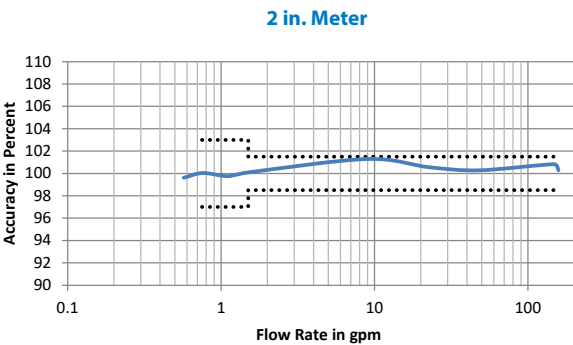
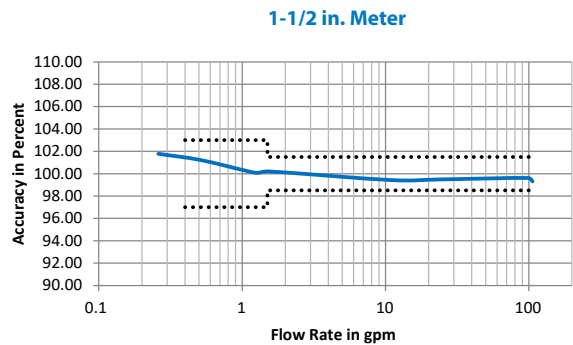
PRESSURE LOSS CHART

Flow rate in Gallons Per Minute (gpm)



ACCURACY CHARTS

Rate of Flow in gallons per minute (gpm)



SMART WATER IS BADGER METER

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E-Series G2® Ultrasonic Meter

Lead-Free Bronze Alloy, 3, 4, 6 and 8 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 commercial 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 3, 4, 6 and 8 inch Meter Features

- Open flow tube design prevents flow obstruction to reduce pressure loss
- Greater turn-down ratio for extended flow ranges and increased revenue
- Easy-to-read, 9-digit LCD display, which presents consumption, rate of flow, unit of measure, pressure, temperature, alarm conditions and firmware version
- Pressure alarm and pressure and temperature data reported through ORION Cellular endpoints and BEACON®
- Field programmable registration and maintains an hourly internal logging capacity of 160 days of data
- Single and dual outputs include high resolution industry standard ASCII encoder protocol, scaled/unscaled and 4-20 mA

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

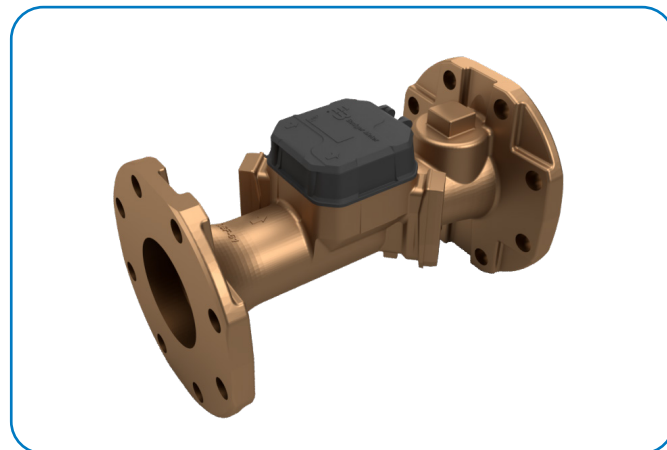
APPLICATIONS

Use the E-Series Ultrasonic meter for measuring potable cold water in 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 the most recent version of AWWA C715 Standards. The lead-free bronze alloy meters comply with the lead-free provisions of the Safe Drinking Water Act and NSF/ANSI/CAN Standards 61 and 372. E-Series Ultrasonic meters also conform to UL 327B and FM 1044 for fire service applications.

OPERATION & PERFORMANCE

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

In normal temperature range of 45...122° F (7...50° C), the Ultrasonic “new meter” consumption measurement is accurate to:

- $\pm 1.5\%$ over the normal flow range
- $\pm 3.0\%$ from the extended low flow range to the minimum flow value

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



Badger Meter

ESM-DS-02781-EN-20 (May 2024)

Product Data Sheet

SPECIFICATIONS

E-Series G2 Ultrasonic Meter Size	3 in.		4 in.		6 in.		8 in.
	3 × 12 in. (76 × 305 mm)	3 × 17 in. (76 × 432 mm)	4 × 14 in. (102 × 356 mm)	4 × 20 in. (102 × 508 mm)	6 × 18 in. (152 × 457 mm)	6 × 24 in. (152 × 610 mm)	8 × 20 in. (203 × 508 mm)
Normal Test Flow Limits	0.75...560 gpm		1.5...1100 gpm		2.2...2000 gpm		4...3500 gpm
Minimum Test Flow Limits	0.37 gpm		0.75 gpm		1.1 gpm		2.0 gpm
Safe Maximum Operating Condition (SMOC)	560 gpm		1100 gpm		2000 gpm		3500 gpm
Typical Pressure Loss	2.6 psi @ 350 gpm		2.1 psi @ 630 gpm		1.5 psi @ 1400 gpm	1.8 psi @ 1400 gpm	2.4 psi @ 2800 gpm
Totalization Display Resolution	3 inch and 4 inch meters <ul style="list-style-type: none">Gallons: 0.1Cubic feet: 0.01Cubic meters: 0.001				6 inch and 8 inch meters <ul style="list-style-type: none">Gallons: 1.0Cubic feet: 0.1Cubic meters: 0.01		
Operating Performance	In normal temperature range of 45...122° F (7...50° C), new meter consumption measurement is accurate to: <ul style="list-style-type: none">100% ±1.5% over the normal test flow limits100% ±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	175 psi (12 bar)						
Pressure Sensor Accuracy	±2% of full scale pressure, up to 175 psi (12 bar)						
Register Type	Straight reading, permanently sealed electronic LCD; digits are 0.28 in. (7 mm) high						
Register Display	<ul style="list-style-type: none">Consumption (up to nine digits)Rate of flowAlarmsPressure				<ul style="list-style-type: none">TemperatureFirmware versionUnit of measure factory programmed for gallons, cubic feet and cubic meters		
Scaled/Unscaled Output*	Solid-state relay with 4-20mA output; open drain MOSFET with encoder output						
Max. Voltage	30V DC						
Current	100 mA						
Pulse Width	50 ms (programmable 25...100 ms)						
Analog 4-20 mA Output*	Two-wire/passive						
Input Voltage Range	9...50V DC supply						
Current	4...20 mA						
Max. Load Resistance (Ohms)	50 Ohms + 50 Ohms (supply voltage - 9V)						
Battery	3.6-volt lithium thionyl chloride battery is fully encapsulated within the register housing and is not replaceable. 20-year battery life; 15-year battery life for dual output meters						

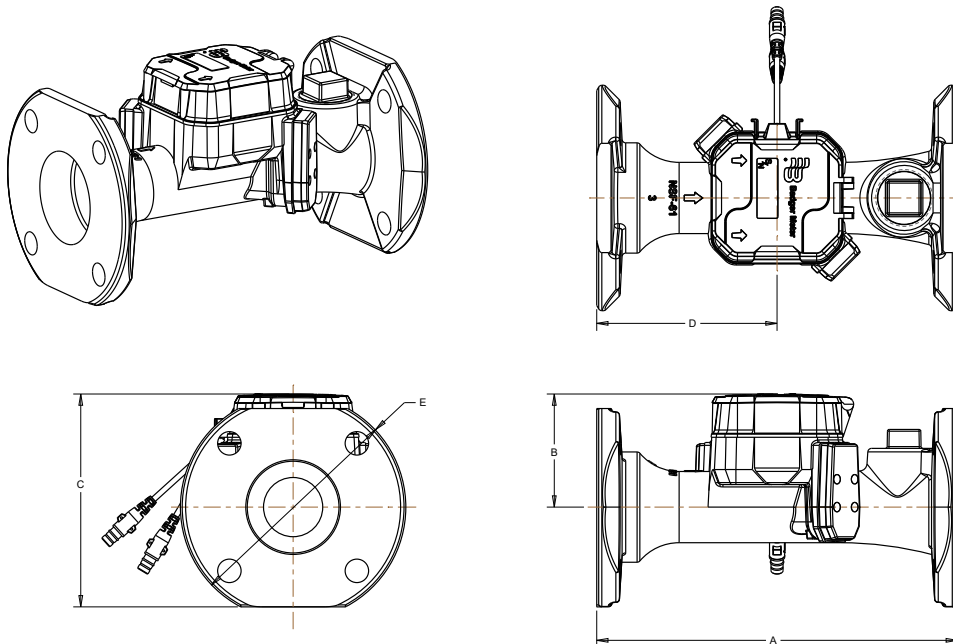
NOTE: See Pressure Loss Chart on [page 4](#) for typical pressure loss over complete UL 327B flow range.

* Applicable to meters with dual output options

PHYSICAL DIMENSIONS

E-Series G2 Ultrasonic Meter Size	3 in.		4 in.		6 in.		8 in.
Housing	Round	Round	Round	Round	Round	Round	Round
Size Designation X Lay Length	3 × 12 in. (76 × 305 mm)	3 × 17 in. (76 × 432 mm)	4 × 14 in. (102 × 356 mm)	4 × 20 in. (102 × 508 mm)	6 × 18 in. (152 × 457 mm)	6 × 24 in. (152 × 610 mm)	8 × 20 in. (203 × 508 mm)
Weight (without AMR)	26 lb (11.8 kg)	28.5 lb (12.9 kg)	38 lb (17.2 kg)	42 lb (19.1 kg)	59 lb (26.8 kg)	66 lb (29.9 kg)	96 lb (43.5 kg)
See illustration below for Measurement Designations							
Length (A)	12 in. (305 mm)	17 in. (432 mm)	14 in. (356 mm)	20 in. (508 mm)	18 in. (457 mm)	24 in. (610 mm)	20 in. (508 mm)
Height (B)	3.76 in. (95 mm)	3.76 in. (95 mm)	3.99 in. (101 mm)	3.99 in. (101 mm)	5.15 in. (131 mm)	5.15 in. (131 mm)	6.49 in. (165 mm)
Height (C)	7.08 in. (180 mm)	7.08 in. (180 mm)	8.5 in. (216 mm)	8.5 in. (216 mm)	10.36 in. (263 mm)	10.36 in. (263 mm)	13.05 in. (331 mm)
Height with Lifting Ring	NA	NA	NA	NA	12.96 in. (329 mm)	12.96 in. (329 mm)	15.65 in. (398 mm)
Length (D)	6 in. (152 mm)	8.5 in. (216 mm)	7 in. (178 mm)	10 in. (254 mm)	8 in. (203 mm)	8 in. (203 mm)	9 in. (229 mm)
Width (E)	7.5 in. (191 mm)	7.5 in. (191 mm)	9 in. (229 mm)	9 in. (229 mm)	11 in. (279 mm)	11 in. (279 mm)	13.50 in. (343 mm)
Number of Bolts	4	4	8	8	8	8	8
Bolt Hole Diameter	0.781 in. (19.84 mm)						
Companion Flange	3 in. (76 mm)	3 in. (76 mm)	4 in. (102 mm)	4 in. (102 mm)	6 in. (152 mm)	6 in. (152 mm)	8 in. (203 mm)
NPT Test Port	1.5 in. (38 mm)	1.5 in. (38 mm)	2 in. (51 mm)	2 in. (51 mm)	2 in. (51 mm)	2 in. (51 mm)	2 in. (51 mm)

Measurement Designations



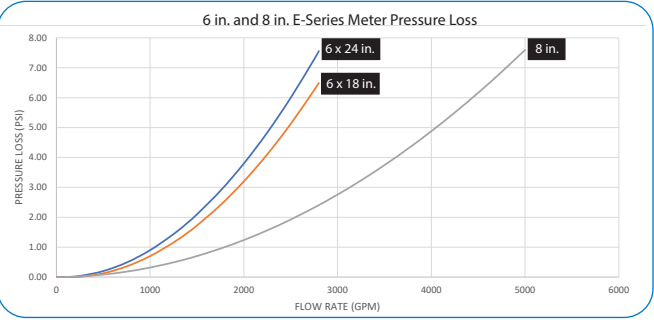
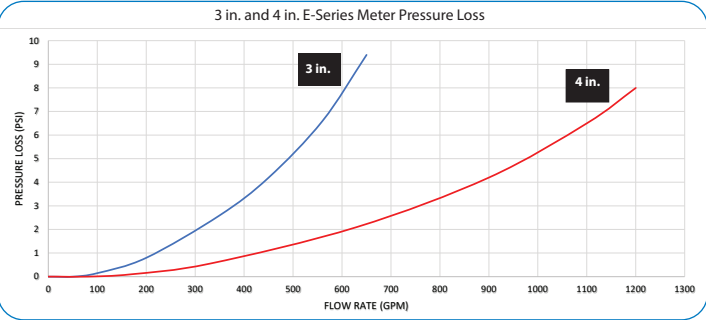
Drawings illustrate the 3 inch meter

MATERIALS

Meter Housing	Lead-free bronze alloy
Measuring Section	Ultrasonic sensors located in the flow tube
Register Housing & Lid	Engineered polymer
Transducer Port Covers 3 in., 4 in.	Lead-free bronze alloy
Transducer Port Covers 6 in., 8 in.	Engineered polymer

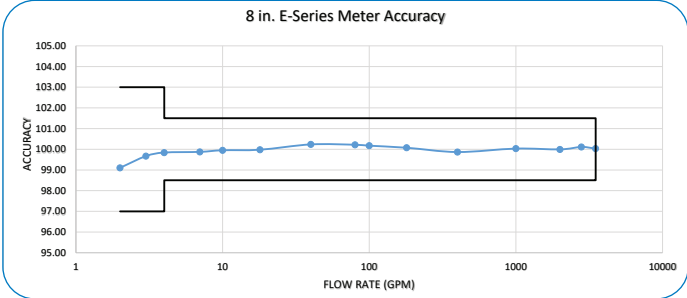
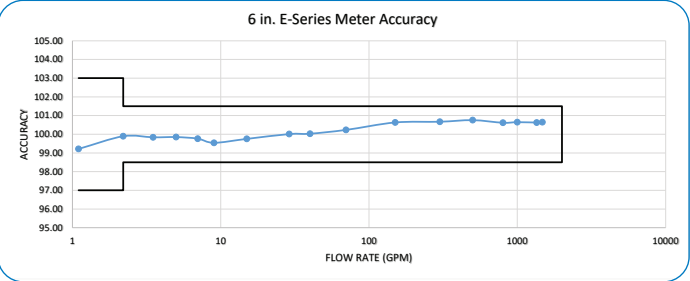
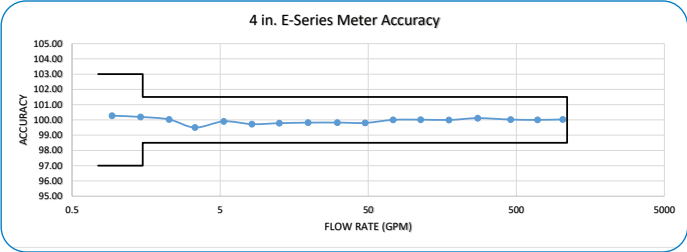
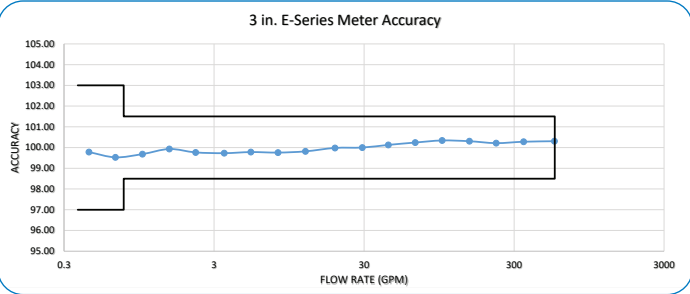
PRESSURE LOSS CHARTS

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



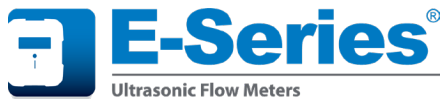
ACCURACY CHARTS

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



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E-Series® Ultrasonic Plus Meter with Integrated Valve

5/8 × 3/4 in., 3/4 × 7-1/2 in., 3/4 × 9 in.

DESCRIPTION

The E-Series® Ultrasonic Plus meter uses solid-state ultrasonic transit time technology to measure cold potable water and incorporates an integrated valve into the lay length of the meter. The integrated valve allows remote flow restriction of water service in residential utility applications.

Authorized utility personnel can actuate the valve via a command sent from BEACON® SaaS (Software as a Service) to an ORION® Cellular endpoint connected to the meter.

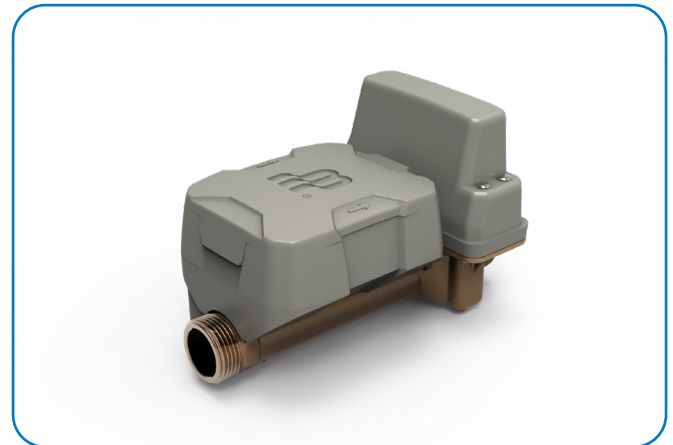
BEACON displays the status of the valve (open, partial or restricted) and upon a command to transition the valve, confirms the success of that actuation. Status of the valve is also indicated on the physical meter via a position-indicating LED.

E-Series Ultrasonic Plus meters comply with the lead-free provisions of the Safe Drinking Water Act, are certified to NSF/ANSI/CAN Standards 61 and 372, and carry the NSF 61 marking. All components of the meter comprise the certified system. E-Series Ultrasonic Plus meters comply with the applicable portions of the most recent revision of AWWA Standard C715.

All electronic components utilized in the meter and RF Transceiver design comply with applicable FCC Part 15 standards and AWWA C707 for encoded remote reading systems.

Features

- Delivers precision accuracies with extended flow ranges
- Gate valve integrated into standard lay length of meter—no cut-ins required
- Patented magnetically coupled valve to extend field life (US Patent No. 10,161,777.B2)
- Patented flow restriction valve technology supports open, restricted and partially restricted options (US Patent No. 8,539,827)
- Does not require infrastructure
- Valve position-indicating LED
- Fully submersible—electronics completely encapsulated to withstand harsh, flooded pit environments
- Low pressure loss
- Easy-to-read, 9-digit display presents consumption, rate of flow, reverse flow indication and alarms
- High resolution industry standard ASCII encoder protocol



APPLICATIONS

The E-Series Ultrasonic Plus meter provides a cost-effective, non-confrontational, safe method for water utilities to temporarily restrict an end consumer's water service. The most common application is for authorized utility personnel to inhibit water service of repeat delinquent accounts to encourage prompt payment from the property owner. Other applications may include actuating the valve as tenants change, or accommodating end-customer requests for temporary water restriction.

CONSTRUCTION

The E-Series Ultrasonic Plus meter features lead-free bronze alloy meter housing, ultrasonic transducers, a meter-control circuit board with associated wiring, LCD, and battery. 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.

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 shows total volume, rate of flow and alarm conditions.



Badger Meter

ESM-DS-02022-EN-07 (May 2023)

Product Data Sheet

A battery-powered DC motor module drives the dry-side magnetic coupling that is completely separated from the pressure vessel. The dry-side magnet couples to a mating wet-side magnetic assembly consisting of a magnetic disc, power screw and gate. The combined dry-side and wet-side magnetic coupling transfers torque from the motor to turn the power screw inside the pressure vessel, which ultimately drives the gate into the open, restricted* or partially restricted positions based on a command prompted by the connected ORION Cellular endpoint via BEACON. If necessary, actuation of the valve can be also be performed at the meter site.

System screens within BEACON indicate the position of the valve and record the date and time for all valve actuations. In addition, the position of the valve can also be determined by physical inspection of the meter via the valve position LED.

* When the valve is in restricted position, typical water flow is restricted to 0.125 gpm (0.03 m³/hr) or less for humanitarian, life-sustaining measures.

INSTALLATION

The E-Series Ultrasonic Plus 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 (flow sensors are not fully submerged) condition is experienced.

SPECIFICATIONS

E-Series Ultrasonic Plus Meter Size	5/8 in. x 3/4 in. (15 mm)	3/4 in. (20 mm)
Normal Test Flow Limits	0.1...25 gpm (0.023... 5.68 m ³ /h)	0.1...32 gpm (0.023... 7.27 m ³ /h)
Minimum Test Flow Limits	0.05 gpm (0.014 m ³ /h)	0.05 gpm (0.014 m ³ /h)
Safe Maximum Operating Condition (SMOC)	25 gpm (5.68 m ³ /hr)	32 gpm (7.27 m ³ /hr)
Typical Pressure Loss	4.0 psi at 15 gpm (0.28 bar at 3.41 m ³ /h)	2.8 psi at 15 gpm (0.19 bar at 3.41 m ³ /hr)
Reverse Flow - Maximum Rate	4.0 gpm (0.91 m ³ /hr)	4.0 gpm (0.91 m ³ /hr)
Operating Performance	In the normal temperature range of 45...122° F (7...50° C), new meter consumption measurement is accurate to: <ul style="list-style-type: none"> • ±1.5% over the normal flow range • ±3.0% from the extended low flow range to the minimum flow value 	
Typical Flow Rate in Restricted Position*	0.125 gpm (0.03 m ³ /hr) or less for humanitarian, life-sustaining measures	
Typical Flow Rate in Partially Restricted Position*	1.0 gpm ± 0.5 gpm (0.227 m ³ /hr ± 0.114 m ³ /hr)	
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	<ul style="list-style-type: none"> • Consumption (up to nine digits) • Rate of flow • Alarms • Unit of measure factory programmed for gallons, cubic feet and cubic meters 	
Register Capacity	<ul style="list-style-type: none"> • 10,000,000 gallons • 1,000,000 cubic feet • 100,000 cubic meters 	
Totalization Display Resolution	<ul style="list-style-type: none"> • Gallons: 0.XX • Cubic feet: 0.XXX • Cubic meters: 0.XXXX 	
Meter Battery	3.6-volt lithium thionyl chloride battery is fully encapsulated within the register housing and is not replaceable; 20-year battery life	
Valve Battery	3.6-volt lithium thionyl chloride battery within the power module; 20-year battery life, based upon 480 actuations	

* "Typical Flow Rate" based on 60 psi (4 bar) at the meter

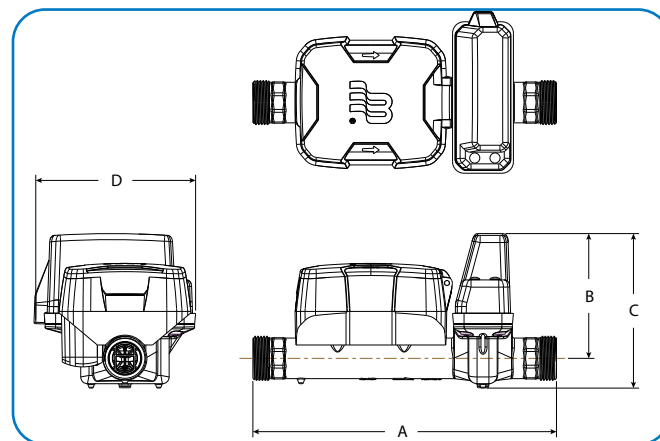
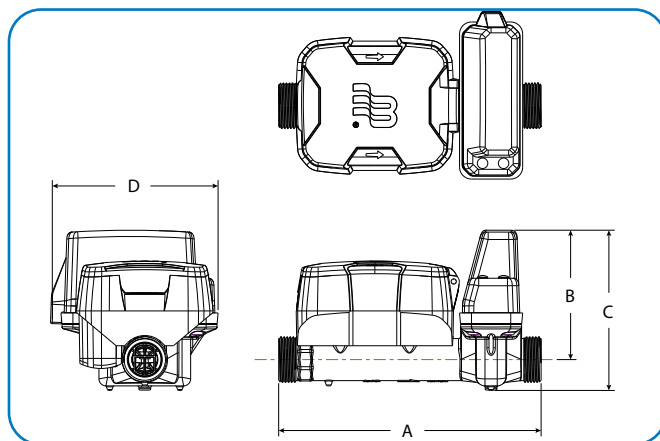
MATERIALS

Meter Housing	Lead-free bronze alloy
Valve Bonnet	Lead-free bronze alloy
Bonnet Seal	EPDM O-ring
Register Housing	Engineered polymer
Power Control Module Housing	Engineered polymer
Gate	PTFE
Power Screw	316 stainless steel

PHYSICAL DIMENSIONS

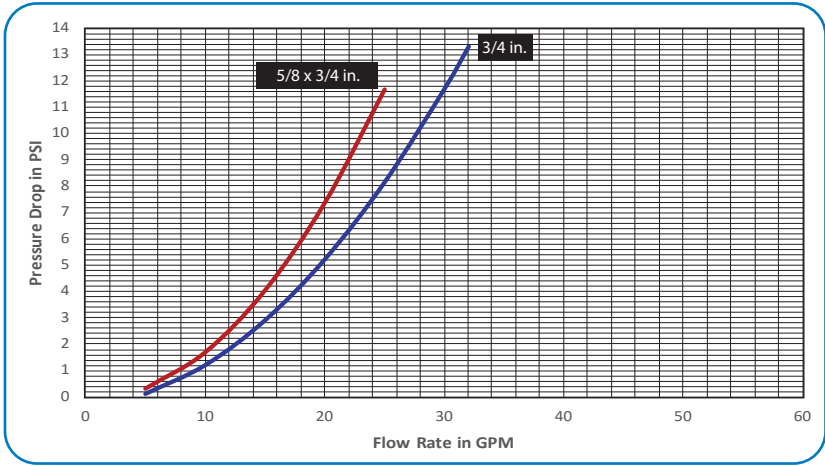
E-Series Ultrasonic Plus Meter Size	5/8 in. × 3/4 in. (15 mm)	3/4 in. (20 mm)	
Size Designation X Lay Length	5/8 in. × 3/4 in. × 7-1/2 in. (15.9 mm × 19 mm × 190.5 mm)	3/4 in. × 7-1/2 in. (19 mm × 190.5 mm)	3/4 in. × 9 in. (19 mm × 228.6 mm)
Weight (without endpoint)	4.2 lb (1.91 kg)	4.2 lb (1.91 kg)	4.4 lb (1.99 kg)
See illustration below for Measurement Designations			
Length (A)	7.5 in. (190.5 mm)	7.5 in. (190.5 mm)	9.0 in. (228.6 mm)
Height (B)	3.69 in. (93.73 mm)	3.69 in. (93.73 mm)	3.69 in. (93.73 mm)
Height (C)	4.57 in. (116.08 mm)	4.57 in. (116.08 mm)	4.57 in. (116.08 mm)
Width (D)	4.728 in. (120.09 mm)	4.728 in. (120.09 mm)	4.728 in. (120.09 mm)
Bore Size	3/4 in. (19 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)
Coupling Nut & Spud Thread	1 in. × 11-1/2 NPSM	1 in. × 11-1/2 NPSM	1 in. × 11-1/2 NPSM
Tailpiece Pipe Thread (NPT)	3/4 in. (19 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)
Service Pipe Thread (NPT)	3/4 in. (19 mm)	3/4 in. (19 mm)	3/4 in. (19 mm)

Measurement Designations



PRESSURE LOSS CHART

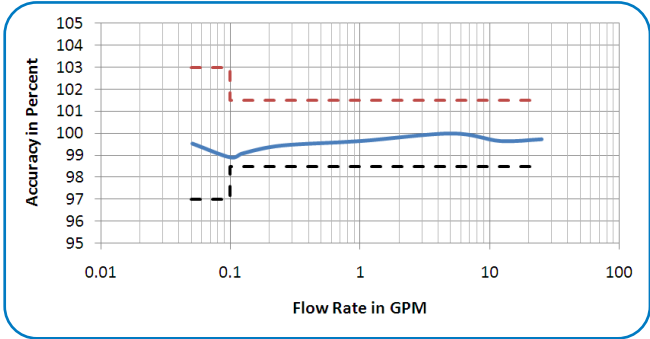
Typical Rate of Flow in Gallons per Minute (gpm)



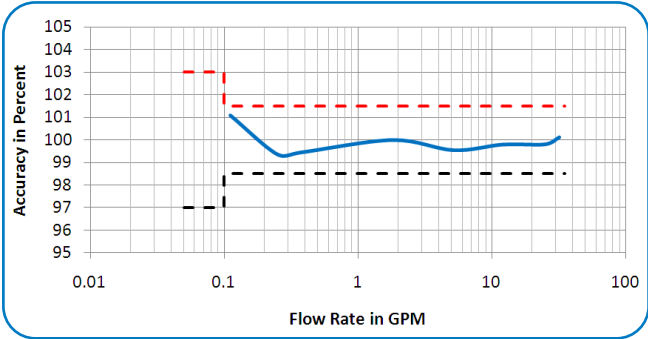
ACCURACY CHARTS

Typical Curve—Rate of Flow in Gallons per Minute (gpm)

5/8 x 3/4 in. Meter



3/4 in. Meter



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HR-E® LCD Encoder

DESCRIPTION

Applications: The High Resolution encoder (HR-E LCD) is a fully electronic, solid-state encoder with no moving parts. It is designed for use with all current Badger Meter Recordall® Disc, Turbo Series, Compound Series, Combo Series and Fire Service meters and assemblies. The HR-E LCD provides connectivity with Badger Meter ORION® and GALAXY® AMR/AMI endpoints and other AMR/AMI technology solutions approved by Badger Meter.

NOTE: For more detailed information, refer to the document *HR-E LCD Encoder User Manual*, available at www.badgermeter.com.

Field Programmable: The HR-E LCD encoder comes standard as factory programmed to customer specifications, with the option for field programming the unit of measure, meter type, meter model, digit resolution from the encoder, billing units, and rate-of-flow time and units. Programming is performed through the IR port via a computer.

Electronic Resolution: Standard encoded output from the HR-E LCD is nine digits.

Status Indicators: Status indicators are sent as part of the encoder extended message to AMR/AMI systems such as ORION Cellular, Fixed Network and Migratable endpoints that are capable of receiving an extended message. The details can also be read through an IR interface.

Mounting: Icons on the HR-E LCD encoder face indicate encoder status and alarm conditions. The fully potted encoder assembly has a bayonet mount compatible with all Recordall Disc, Turbo Series, Compound Series, Combo Series and Fire Series meters and assemblies. The bayonet mount positions the encoder in any of four orientations for visual reading convenience. The HR-E LCD encoder can be removed from the meter without disrupting water service.

Magnetic Drive Communication: The HR-E LCD encoder detects movement of the wet side meter magnet with magnetic sensors to provide reliable and dependable encoded communication.

Tamper-resistant Features:

Unauthorized removal of the HR-E LCD encoder is inhibited by a tamper-resistant Torx® seal screw. Torx seal screws are provided as standard accessories. Optional proprietary tamper-proof screws are also available.

Magnetic sensors detect and report an attempted encoder removal. In addition, the HR-E LCD encoder is resistant to magnetic tampering. The encoder detects an attempted tamper—as well as encoder removal—and sends a tamper alarm in either situation. Approved endpoints capable of receiving the alarms, such as ORION Cellular, Fixed Network and Migratable endpoints, can then report the tamper condition to the meter reading software.



SPECIFICATIONS

Encoder type	Straight reading, permanently sealed, electronic LCD absolute encoder with field-programmable option
Encoder display	Status indicators, unit of measure, billing units, automatic toggle between 9-digit and 6-digit consumption (segmented leak detector in this mode), rate of flow, meter model
Unit of measure	U.S. gallons, Imperial gallons, cubic feet, cubic meters, and liters clearly identified on register face
Flow rate	Seconds, minutes, and hours
Numerals	7 mm (0.28 in.) high
Weight	11 ounces
Humidity	0...100% condensing
Temperature	Storage: – 40...60° C (– 40...140° F) Max. ambient for 1 hr: 70° C (158° F) Electronics & Display: – 10...60° C (14...140° F)
Status indicators	Electronic and visual icons for: meter functioning correctly, meter alarm (indicates temperature limits exceeded, magnetic tamper or encoder removal), reverse flow, suspected leak, 30-day no usage, end of battery life
Signal output	Industry standard ASCII format
Signal type	Three-wire synchronous for AMR/AMI solutions Red = clock/power; Black = ground; Green = data
Battery	Lithium thionyl chloride AA cell, fully encapsulated within encoder housing
Battery Life	20 years (calculated)



Badger Meter

ENC-DS-01763-EN-06 (January 2021)

Product Data Sheet

Construction: The housing of the HR-E LCD encoder is constructed of an engineered polymer enclosure and a polycarbonate lens. For long-term performance, the enclosure is fully encapsulated, weatherproof, and UV-resistant to withstand harsh environments and to protect the electronics in flooded or submerged pit applications. An epoxy potting (patented design - 8,482,908) comprises the encoder bottom. Due to this unique sealing, the HR-E LCD exceeds all applicable requirements of AWWA Standard C706 and C707.

Wire Connections: The HR-E LCD encoder 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 a field splice connection, or fully prewired to an AMR/AMI endpoint.

Operating Characteristics: The HR-E LCD encoder is shipped in storage mode so a meter status alarm is not triggered. In storage mode, the meter model screen is displayed. Upon sensing two revolutions of the meter magnet, the encoder goes into normal operation mode. The display then automatically toggles between these four modes:

- 9-digit consumption displays for 45 seconds.
- 6-digit consumption (segmented leak detector in this mode) displays for 5 seconds.
- Rate of flow displays for 5 seconds.
- Meter model displays for 5 seconds.

DIMENSIONAL DRAWINGS

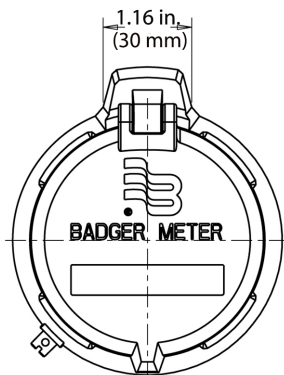


Figure 1: Top view

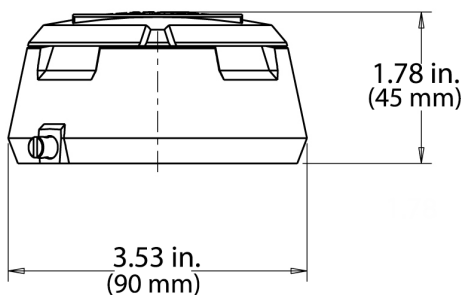


Figure 2: Front view

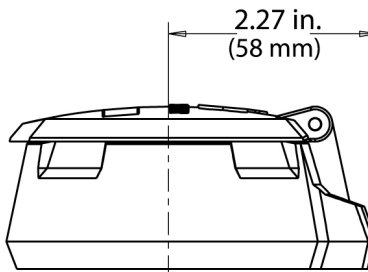


Figure 3: Left side view

MEASUREMENT RESOLUTION

The electronic encoder output resolution of the HR-E LCD is as noted below.

Recordall Disc Series	Size (in.)	9-dial encoder output (gal)	9-dial encoder output (ft³)	9-dial encoder output (m³)
LP	5/8, 5/8 x 3/4	0.01	0.001	0.0001
M25	5/8, 5/8 x 3/4	0.01	0.001	0.0001
M35	3/4	0.01	0.001	0.0001
M40	1	0.01	0.001	0.0001
M55	1	0.01	0.001	0.0001
M70	1	0.01	0.001	0.0001
M120	1-1/2	0.1	0.01	0.001
M170	2	0.1	0.01	0.001

Recordall Turbo Series	Size (in.)	9-dial encoder output (gal)	9-dial encoder output (ft³)	9-dial encoder output (m³)
T160	1-1/2	0.1	0.01	0.001
T200	2	0.1	0.01	0.001
T450	3	0.1	0.01	0.001
T1000	4	0.1	0.01	0.001
T2000	6	1	0.1	0.01
T3500	8	1	0.1	0.01
T5500	10	1	0.1	0.01
T6200	12	10	1	0.01
T6600	16	10	1	0.01
T10000	20	10	1	0.01

Recordall Compound Series	Size (in.)	9-dial encoder output (gal)	9-dial encoder output (ft³)	9-dial encoder output (m³)
High Side T200	2	0.1	0.01	0.001
Low Side M25	2	0.01	0.001	0.0001
High Side T450	3	0.1	0.01	0.001
Low Side M25	3	0.01	0.001	0.0001
High Side T1000	4	0.1	0.01	0.001
Low side M35	4	0.01	0.001	0.0001
High Side T2000	6	1	0.1	0.01
Low Side M35	6	0.01	0.001	0.0001
High Side T3500	8	1	0.1	0.01
Low side M120	8	0.1	0.01	0.001

NOTE: For Fire Service Meters and Assemblies, please refer to appropriate Disc and TSM information provided above.

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Badger Meter

HR-E High Resolution Encoder

DESCRIPTION

Applications: The High Resolution Encoder (HR-E) is designed for use with all current Recordall® Disc, Turbo, Compound, Combo and Fire Series meters and assemblies. The HR-E provides connectivity with Badger Meter ORION® and GALAXY® AMR/AMI endpoints, BadgerTouch® modules and other AMR/AMI technology solutions approved by Badger Meter.

Electronic Resolution: Encoder output from the HR-E includes eight-dial resolution to AMR/AMI endpoints and the option of four, five, six, seven or eight-dial resolution for touch applications. Refer to tables on the next page for details.

Mounting: The HR-E in its shroud assembly uses a bayonet mount compatible with all Recordall Disc, Turbo, Compound and Fire Series meters and assemblies. The bayonet mount allows positioning of the register in any of four orientations for visual reading convenience. The HR-E can be removed from the meter without disrupting water service.

Magnetic Drive: A direct-drive, high-strength magnetic coupling, through the meter body to the wetted magnet, provides reliable and dependable register coupling.

Local Indication: The HR-E face features an eight-dial mechanical odometer wheel stack and a flow finder with a calibrated test circle.

Tamper-Resistant Features: Unauthorized removal of the HR-E is inhibited by the option of a tamper detection seal wire screw, tamper-resistant TORX® seal screw, or the proprietary tamper-resistant keyed seal screw. Each can be installed at the meter site or at the factory.

Construction: The housing of the HR-E is constructed of a strengthened glass lens top and a corrosion-resistant metal bottom. Internal construction materials are thermoplastic for long life and high reliability. The encoder gearing is self-lubricating thermoplastic to minimize friction and provide long, reliable life. The shroud assembly is thermoplastic.

Temperature: The operating range of the HR-E is $-40\ldots140^{\circ}\text{F}$ ($-40\ldots60^{\circ}\text{C}$). The water meter should not be subjected to temperatures below freezing.

Sealing: The HR-E encoder is permanently sealed to eliminate the intrusion of moisture, dirt or other contaminants. The HR-E achieves true water resistance due to the unique adhesive technology used to seal the glass dome to the corrosion-resistant metal bottom. Due to this sealing process, the HR-E exceeds all applicable requirements of AWWA Standard C707. With leak rates less than 10-6 cc/sec, as tested by a helium mass spectrometer, the HR-E is suitable for installation in all environments, including meter pits subject to continuous submergence.

Electrical: The electronic circuitry is designed to provide immunity to electrical surges and transients per IEC1000-4-2, IEC1000-4-4. Operation of the HR-E is dependent on the wire length limitations of connected AMR/AMI equipment.



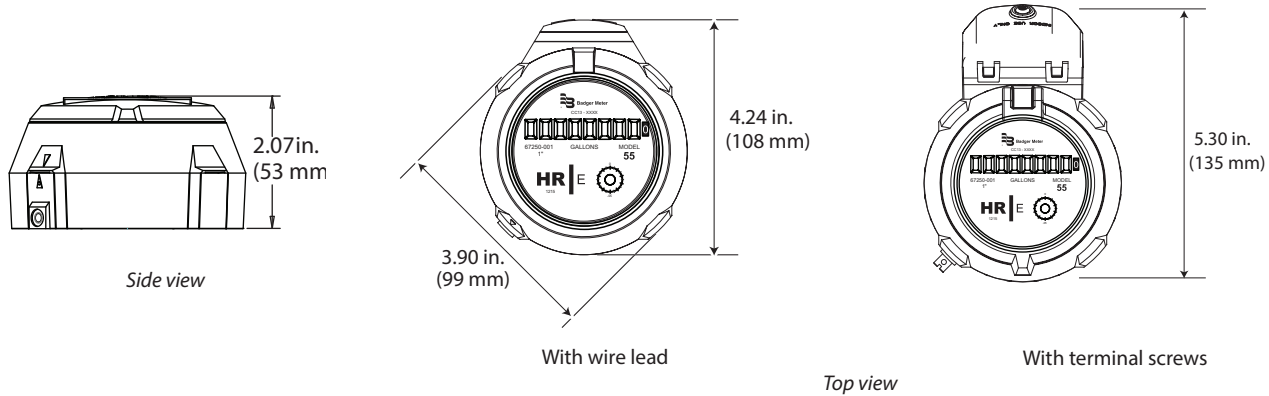
SPECIFICATIONS

Encoder Type	Straight reading, permanently sealed, magnetic drive
Unit of Measure	U.S. Gallons, Cubic Feet, Cubic Meters, clearly identified on encoder face
Number Wheels	Eight with 5/32 inch high numerals
Test Circle	360° circle with ten major increments, ten divisions each
Weight	10 ounces
Humidity	0...100% condensing when equipped with potted lead wire, 0...95% non-condensing with screw-terminal wire connections
Temperature	$-40\ldots140^{\circ}\text{F}$ ($-40\ldots60^{\circ}\text{C}$)
Signal Output	Industry Standard ASCII Format
Visual Resolution	1/100th of Test Circle
Electronic Resolution	8-dial resolution for AMR/AMI; 4, 5, 6, 7 or 8-dial resolution for BadgerTouch
Signal Type	3-wire synchronous for AMR/AMI solutions (red=clock/power, black=ground, green=data) 2-wire asynchronous for Touch solutions
Power Source	External

Operating Characteristics: The reading obtained by an AMR/AMI device is sensed directly from the position of the encoder's odometer using internal LED light paths to determine the exact position of each number wheel. This technology eliminates electromechanical contacts that could wear out, and provides greater long-term performance.

Wire Connections: The HR-E 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 a field splice connection or fully prewired to an AMR/AMI endpoint. A terminal screw version of the HR-E is also available. This version features a tamper-resistant cap over the three-wire terminals. The HR-E with terminal screws is designed for indoor installations in protected environments such as residential basements.

DIMENSIONAL DRAWINGS



MEASUREMENT RESOLUTION

The minimum electronic resolution of the HR-E is as noted below (8-Dial Reading). To verify the correct resolution for your application, contact Badger Meter Customer Service.

Recordall Disc Series	Size (in.)	8-Dial Resolution (gal)	8-Dial Resolution (ft³)	8-Dial Resolution (m³)
M25/MLP	5/8	0.1	0.01	0.001
M25/MLP	3/4	0.1	0.01	0.001
M35	3/4	0.1	0.01	0.001
M40	1	0.1	0.01	0.001
M55	1	0.1	0.01	0.001
M70	1	0.1	0.01	0.001
M120	1-1/2	1	0.1	0.01
M170	2	1	0.1	0.01

Fire Service Series	8-Dial Resolution (gal)	8-Dial Resolution (ft³)	8-Dial Resolution (m³)
3 in.	1	0.1	0.01
4 in.	1	0.1	0.01
6 in.	10	1	0.1
8 in.	10	1	0.1
10 in.	10	1	0.1

Recordall Turbo Series	Size (in.)	8-Dial Resolution (gal)	8-Dial Resolution (ft³)	8-Dial Resolution (m³)
T160	1-1/2	1	0.1	0.01
T200	2	1	0.1	0.01
T450	3	1	0.1	0.01
T1000	4	1	0.1	0.01
T2000	6	10	1	0.1
T3500	8	10	1	0.1
T5500	10	10	1	0.1
T6200	12	100	10	0.1
T6600	16	100	10	1
T10000	20	100	100	1

Recordall Compound Series	Size (in.)	8-Dial Resolution (gal)	8-Dial Resolution (ft³)	8-Dial Resolution (m³)
High Side T200	2	1	0.1	0.01
Low Side M25	2	0.1	0.01	0.001
High Side T450	3	1	0.1	0.01
Low Side M25	3	0.1	0.01	0.001
High Side T1000	4	1	0.1	0.01
Low Side M35	4	0.1	0.01	0.001
High Side T2000	6	10	1	0.1
Low Side M35	6	0.1	0.01	0.001

Resolution stated as individual high and low readings.

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ORION® Cellular Water Endpoints

DESCRIPTION

ORION® Cellular water endpoints are innovative, two-way endpoints for smart water applications. The endpoints utilize existing IoT (Internet of Things) cellular infrastructure to efficiently and securely deliver meter reading data to the utility in a Network as a Service (NaaS) approach. Leveraging existing cellular infrastructure, the NaaS solution offers all the performance benefits of AMI, while eliminating network-related maintenance and technology concerns and enhancing deployment flexibility.

Cellular endpoints are members of the time-tested ORION family of products from Badger Meter, designed for maximum flexibility. Since 2002, the ORION product family has provided comprehensive Advanced Metering Analytics (AMA) for interval meter reading and data capture using both one-way and two-way communications.

FUNCTIONALITY

Operation: ORION Cellular water endpoints communicate with the encoder and capture 15-minute interval read data and meter status information. The endpoints then automatically broadcast the information, including endpoint status information, via the cellular network to BEACON® Software as a Service (SaaS). ORION NaaS is powered by the proven ORION system for interval data capture and two-way communication. The solution employs cellular endpoints which, as they leverage the public cellular network and require no proprietary gateways to operate, dramatically reduce infrastructure requirements compared to a traditional fixed network. This speeds installations and simplifies expansion as a system evolves.

The endpoints are designed to call in four times each workday and feature a configurable schedule that enables utility customers to select call-in times that best support their processes.

Activation: ORION Cellular water endpoints are shipped in an inactive, non-transmitting state. The Badger Meter IR Communication Device can be used to activate the endpoints and verify the encoder connection. Successful endpoint function can be confirmed through a web app demonstrating that communication has been verified to both the encoder and the network.

Alternatively, the endpoints offer a Smart Activation feature. After installation, the endpoints begin broadcasting data when the encoder senses the first usage of water. No field programming or special tools are required.

Broadcast Mode: ORION Cellular water endpoints broadcast fixed network reading data through the secure cellular network within the service area.

Specific configurations also transmit a radio frequency (RF) message to facilitate troubleshooting in the field. See ["Configurations" on page 2](#).

Data Storage: The endpoints store 42 days of 15-minute data.



ORION Cellular C endpoint (pictured)

Output Message: ORION Cellular water endpoints broadcast a unique serial number, meter reading data, and applicable status indicators. As an advanced data security measure, each message is securely transported to BEACON SaaS only via private network and never over the public internet.

APPLICATION

Configurations: ORION Cellular water endpoints are multi-purpose endpoints that can be deployed in indoor, outdoor and pit (non-metal pit lid) applications. The electronics and battery assembly are fully encapsulated in epoxy for environmental integrity. The endpoint is available with a connector assembly for ease of installation.

Meter Compatibility: When attached to a Badger Meter High Resolution Encoder, the ORION Cellular water endpoint is compatible with all current Badger Meter Recordall® Disc, Turbo Series, Compound Series, Combo Series and Fire Service meters and assemblies, and with E-Series G2® Ultrasonic, E-Series® Ultrasonic, E-Series® Ultrasonic Plus, and ModMAG® electromagnetic flow meters.

Encoder Compatibility: The ORION Cellular water endpoint is suitable for use with a Badger Meter High Resolution Encoder as well as the following Badger Meter approved three-wire encoder registers that have a manufacture date within 10 years of the current date as long as the encoder has three wires connected to it and is programmed into the three-wire output mode for AMR/AMI: Honeywell® (Elster/ABB) ScanCoder, evoQ4 meter with Sensus® protocol module; Master Meter® Octave® Ultrasonic meter encoder output; Metron-Farnier Hawkeye; Mueller Systems 420 Solid State Register (SSR) LCD; Neptune® ProRead, E-Coder®, ARB-V®, and ProCoder; and Sensus iPerl®.



SPECIFICATIONS

Dimensions	5.125 in. (130 mm) (H)
	1.75 in. (44 mm) Diameter at top
	2.625 in. (W) x 2.875 in. (D) at base (67 mm (W) x 73 mm (D) at base)
Broadcast Network	LTE-M cellular network (primary communication technology)
	NB-IoT (secondary communication technology for certain variants)
RF Message for Troubleshooting	Where available (see table below) frequency is FCC-regulated 902...928 MHz frequency hopping modulation
Operating Temperature Range	
	<ul style="list-style-type: none"> Storage, Meter Reading and RF Message (for troubleshooting) –40...60° C (–40...140° F) Cellular Communications –20...60° C (–4...140° F)
Humidity	0%...100% condensing
Battery	One (1) lithium thionyl chloride D cell (nonreplaceable)

Construction: All ORION Cellular water endpoints are housed in an engineered polymer enclosure with an ORION RF board, battery and antenna. For long-term performance, the enclosure is fully potted to withstand harsh environments and to protect the electronics in flooded or submerged pit applications.

Wire Connections: ORION Cellular water endpoints are available with inline connectors (Twist Tight® or Nicor®) for easy installation and connection to compatible encoders/meters. The endpoints are also available with flying leads for field splice connections. Other wire connection configurations may be available upon request.

FEATURES

Smart City Ready	Future-proof technology
Communication Type	Two-way
Application Type	Control/Monitor
Endpoint Communication	Configurable call-in schedule, up to four times each workday
Reading Interval Type	15-minute
Encoder Compatibility	Absolute
Fixed Network Reading	✓
Cut-Wire Indication	✓
Encoder Error	✓
Low Battery Indication	✓
Remote Clock Synchronization	✓
Firmware Upgrades	✓

CONFIGURATIONS

Endpoint	Notes
ORION Cellular C	Includes RF and IR messages for troubleshooting
ORION Cellular HLD	Includes RF and IR messages for troubleshooting
ORION Cellular LTE-M	Includes RF and IR messages for troubleshooting

NOTE: For the ORION Cellular LTE-MP endpoint, see the *ORION Cellular LTE-MP Endpoint product data sheet*, available at www.badgermeter.com.

License Requirements: ORION Cellular water endpoints comply with Part 15, Part 22, Part 24, and Part 27 of the FCC Rules. No license is required by the utility to operate an ORION meter reading system. This device complies with Industry Canada license-exempt RSS standard(s).

Transportation: **WARNING:** The operation of transmitters and receivers on airlines is strictly prohibited by the Federal Aviation Administration. As such, the shipping of radios and endpoints via air is prohibited. Please follow all Badger Meter return and/or shipping procedures to prevent exposure to liability.

Warning: To reduce the possibility of electrical fire and shock hazards, never connect the cable from the endpoint to any electrical supply source. The endpoint cable provides SELV low voltage limited energy power to the load and should only be connected to passive elements of a water meter register.

Caution: Endpoint batteries are *not* replaceable. Users should make no attempt to replace the batteries. Changes or modifications to the equipment that are not expressly approved by Badger Meter could void the user's authority to operate the equipment.

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ORION® Water Endpoints

ME Endpoint

DESCRIPTION

The ORION® ME endpoint is a two-way water endpoint for mobile applications.

In addition to providing the current and snapped daily reading, the endpoint two-way functionality allows users to capture data profile information wirelessly, without having to directly access the endpoint, during the normal reading process.

The ORION ME endpoint is a member of the time-tested ORION family of products from Badger Meter, designed for maximum flexibility. Since 2002, the ORION product family has been providing comprehensive advanced metering analytics (AMA) for interval meter reading and data capture using both one-way and two-way communications.

FUNCTIONALITY

Operation: The endpoint continuously monitors the encoder circuit. At predetermined intervals, the endpoint broadcasts the totaled reading value along with other meter data to the mobile collection devices.

Activation: The endpoints offer a Smart Activation feature. All ORION endpoints are shipped in an inactive, non-transmitting state. After the endpoint is installed, it begins broadcasting data when the encoder senses the first usage of water. No field programming or tools are required to activate the endpoint.

Broadcast Mode: Once activated, the endpoints begin transmitting in mobile priority mode. After installation, using the endpoint two-way communication, an endpoint transmits its meter data every six seconds.

Data Profiling: The endpoints store up to 90 days of hourly historical interval meter data within nonvolatile memory.

Output Message: The endpoint broadcasts its unique serial number, current meter reading, daily snapped meter reading and applicable status indicators for mobile reading collection.



APPLICATION

Configurations: Available in integral, remote or endpoint-only configurations, the endpoint can be deployed in indoor, outdoor and pit applications. The endpoint electronics and battery assembly are fully encapsulated in epoxy for environmental integrity.

Meter Compatibility: When attached to a Badger Meter encoder, the endpoint is compatible with all current Badger Meter Recordall® Disc, Turbo Series, Compound Series, Combo Series and Fire Service meters and assemblies, and with E-Series® Ultrasonic and ModMag® Electromagnetic flow meters.

Encoder Compatibility: The endpoint is suitable for use with all Badger Meter encoders as well as the following Badger Meter approved three-wire encoder registers that have a manufacture date of 2000 or newer, are programmed into the AMR/AMI three-wire output mode and have three-wires connected: Elster C700 Digital, InVISION and ScanCoder® encoders and evoQ4 meter (encoder output); Hersey® Translator; Master Meter® Octave® Ultrasonic meter encoder output; Metron-Farnier Hawkeye; Mueller Systems 420 Solid State Register (SSR) LCD; Neptune® ProRead, E-Coder® and ARB-V®; and Sensus® Electronic Register encoder (ECR) and ICE.



SPECIFICATIONS

Dimensions	5.125 in. (H); 1.75 in. (W) at top; 2.125 in. (W) at bottom
Broadcast Frequency MHz Band	FCC regulated 902...928 MHz frequency hopping modulation
Operating Temperature Range	-40...60° C (-40...140° F) based on storage and meter reading.
Storage and Meter Reading	RF output may be reduced by extremely low temperatures. The water meter should not be subjected to temperatures below freezing.
Humidity	0...100% condensing
Battery	One (1) lithium thionyl chloride C cell (nonreplaceable)
Battery Life	20 years (calculated)

Construction: All ORION ME endpoints are housed in an engineered polymer enclosure with an ORION RF board, battery and antenna. To assure long-term performance, the enclosure is fully potted to withstand harsh environments and to protect the electronics in flooded or submerged pit applications.

Wire Connections: ORION ME endpoints are available with in-line connectors (Twist Tight or Nicor®) for easy installation and connection to compatible encoders/meters. The endpoints are also available with flying leads for field splice connections. Other wire connection configurations may be available upon request.

Range: Transmission reception depends on a number of factors: topographical features, a building's construction materials and obstacles such as buildings, trees, vegetation and fences. Temporary conditions, such as a vehicle parked near the endpoint or heavy rain or snow, could also affect reception. These factors need to be considered when installing and communicating with the endpoint using a handheld or mobile reading system. For a more in-depth discussion, see the white paper, *Understanding RF Propagation of AMR/AMI Systems*, available at www.badgermeter.com.

FEATURES

Communication Type	Two-Way
Application Type	Control/Monitor
Reading Interval Type	Midnight/Now
Encoder Compatibility	Absolute/Incremental
Mobile Reading	✓
Premise Leak Detection	✓
Cut-Wire Indication	✓
Reverse Flow Indication (Absolute Encoder)	✓
No Usage Indication	✓
Encoder Error (Absolute Encoder)	✓
Low Battery Indication	✓
Remote Programming	✓
Remote Clock Synchronization	✓
Firmware Upgrades	✓

License Requirements: ORION ME endpoints comply with Part 15 of the FCC Rules. No license is required by the utility to operate an ORION meter reading system.

Transportation: The Federal Aviation Administration prohibits operating transmitters and receivers on all commercial aircraft. The ORION endpoint is considered an operating transmitter and cannot be shipped by air.

Caution: Changes or modifications to the equipment that are not expressly approved by Badger Meter could void the user's authority to operate the equipment.

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ORION® ME Mobile Transceiver USB-Powered

DESCRIPTION

The ORION® USB-powered ME mobile transceiver is a portable transceiver designed for use with the BEACON® Software as a Service (SaaS) and the ORION ORS Mobile Reading System. When connected, the ORION mobile transceiver optimizes performance and can read ORION ME endpoints.

The ORION mobile transceiver is packaged in a rugged, weather-resistant aluminum enclosure and features a plug-and-play design that can be easily maintained and operated.

A full speed USB 2.0 device, the ORION mobile transceiver performs a series of diagnostic checks when powered and turned on, and communicates via the light emitting diode (LED) at the top of the device.

LED STATUS INDICATORS

Steady red	Transceiver power on.
Flashing green	Transceiver is working properly and capturing the ORION message.
No LED light	Transceiver is not receiving power. Check the power supply and cable connections. Contact Technical Support if unable to restore transceiver power.

POWER

USB-powered devices are powered with 5V provided by the USB port.



SUPPORT PARTS

The [ORION USB-Powered ME Mobile Transceiver Parts List](#) can be found on the Badger Meter website, badgermeter.com.

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Trimble Yuma 7

TABLET COMPUTER

EVERYTHING YOU HAVE EVER NEEDED IN A RUGGED TABLET

The Trimble® Yuma® 7 tablet is a 7-inch, fully-rugged field tablet for professional organizations that know they can't afford to take shortcuts. Bringing together the scalable flexibility of the Trimble EMPOWER Platform, a bold 7-inch tablet form-factor, and the industry-leading Windows® 10 Pro OS, the Yuma 7 delivers a perfect combination of strength, smarts, and flexibility, making it perfectly suited to large scale field data capture in nearly any industry and application.

Customization comes standard

Introducing the Trimble EMPOWER Platform: a modular expansion system that gives you the power to customize your mobile computing solution to your workflow, and the confidence of knowing that your investment is scalable for future needs.

With Trimble EMPOWER-enabled modules, you can add specialist features such as high-accuracy GNSS, or RFID Asset tracking to your devices, or bring your own solution to life through the EMPOWER platform developer program. The developer program is accessible to both hardware and software developers, empowering anyone to create solutions that transform the way the world works.

Built to handle the big jobs

At 7 inches, the Yuma 7's high-resolution Gorilla Glass display provides the perfect combination of size and robustness to survive the rigors of real-world use. The Yuma 7 delivers powerful and dependable system capabilities, including 4G mobile data connectivity, wireless communications and broad peripheral support, all aimed at getting more work done faster, and in more places than ever before. Yuma 7 is completely rugged, MIL STD-810G and IP68 tested, and purpose built to perform in almost any environment, hot or cold, wet or dry.

Windows 10 Professional means business

The Yuma 7 is powered by Windows 10 Pro, the industry leading professional operating system for businesses. Using Windows 10 Pro you can move seamlessly from field to office by running both field applications and office applications on a single device. With the enterprise-grade security capabilities built right into Windows 10 Pro, the Yuma 7 can be integrated seamlessly with your IT infrastructure, no matter how large (or small) your organization is.

Maintenance and service plans that you can depend upon

Investing in equipment that is destined for years of outdoor operation demands quality that you can trust, comprehensive technical support when it is needed, and professional service and maintenance coverage should something go wrong. Trimble stands by the quality of our products with a full 2-year factory warranty with options to extend that coverage up to a total of five years. Trimble also provides access to professionally trained service technicians and comprehensive technical support, anywhere in the world.

Key Features

- ▶ **Trimble EMPOWER Platform:** Delivering a flexible, versatile, field solution that is scalable for future needs.
- ▶ **High definition 7-inch sunlight readable touchscreen:** The perfect display for big jobs.
- ▶ **4G LTE mobile data, 802.11 a/b/g/n and Bluetooth 4:** Reliable high-speed wireless connectivity on the go, when and where you need it.
- ▶ **Windows 10 Pro:** Compatibility with existing workflows and infrastructure, and enterprise level security functionality that you can trust.
- ▶ **Trust Trimble:** Professional maintenance and service plans that you can depend upon



Yuma 7 TABLET COMPUTER

PLATFORM

- CPU: Intel Pentium N4200
- Graphics: Intel® HD Graphics 505

OS & SOFTWARE

- Operating System: Microsoft Windows 10 Professional
- Pre-loaded software package includes: Trimble® EMPOWER™ Hub, Trimble GNSS Status, Universal Windows Platform Apps

MEMORY/STORAGE

- 8 GB RAM
- 128 GB SSD (EMMC)
- Storage expansion: via microSD card slot (SDXC up to 256 GB)
- SanDisk® or Kingston® recommended

DISPLAY & TOUCH PANEL

- Display: LED backlit, Gorilla® Glass
- 10 point capacitive multi-touch with rain mode
- Size: 7 inches (16:10 aspect ratio)
- Resolution: 1280 x 800 pixels
- Brightness: Daylight Readable, 800 cd/m²

CAMERAS

- Rear: 8 MP AF with LED Flash
- Front: 2 MP

WIRELESS

- 802.11 a/b/g/ac/n (2.4 GHz/5 GHz ISM radio band)
- Bluetooth 4.2 (including BTLE) wireless technology

MOBILE DATA 3G, 4G/LTE (OPTIONAL)

- Americas/EMEA region
 - WWAN Module: Sierra Wireless EM7455
 - 3G - HSPA+, UMTS Bands: B1, B2, B3, B4, B5, B8
 - 4G - LTE Bands: B1, B2, B3, B4, B5, B7, B12, B13, B20, B25, B26, B29, B30, B41
- APAC region
 - WWAN Module: Sierra Wireless EM7430
 - 3G - HSPA+, UMTS Bands: B1, B5, B6, B8, B9, B19
 - 3G - TD-SCDMA Band B39
 - 4G - LTE: Bands: B1, B3, B5, B7, B8, B18, B19, B21, B28, B38, B39, B40, B41
- SIM Type: micro

GNSS

- Chipset: Ublox NEO-M8T
- Horizontal accuracy²: 2-4 m (RMS)
- Constellations: L1 GPS, GLONASS, BeiDou, SBAS
- Supports raw-data output (post-processing) and RTCM 2.3

SOUND

- Integrated Speaker & Microphone

SENSORS

- 3-axis accelerometer
- Magnetic sensor
- Gyroscope
- Ambient light sensor

I/O

- Keypad:
 - User programmable, 4-way Directional pad, with non-programmable Enter key.
 - 4x user programmable function keys.
 - Windows Home key.
 - Power
 - Volume +/- keys
- External GNSS antenna jack - MMCX connector
- Replaceable I/O Boot
 - DC power input (19 V)
 - 2x USB 3.0 host (type A)
 - 3.5 mm Audio/headset jack

BATTERY AND POWER¹

- Dual, Li-Ion hot-swappable battery packs. Field replaceable.
- Capacity: 7.2 V, 3150 mAh, 22.9 Wh nominal (each battery)
- Charging time: Full-charge 3.5 hours, 2 hours to 80 % capacity
- LED Battery charge level indication built into each battery
- Battery Life: Typically 7 hours. (depending on display setting, connectivity, data processing etc)

TRIMBLE EMPOWER PLATFORM READY

- Trimble EMPOWER module slots: 2
- Compatible with "Trimble EMPOWER Enabled" modules

ENVIRONMENTAL SPECIFICATIONS

IEC ratings:

- Water/Dust ingress: IP65 and IP68. (IEC 60529)

MIL-STD-810G test ratings

- Operating temperature: -20 °C to +60 °C (-4 °F to +140 °F)
- Storage temperature: -40 °C to +70 °C (-22 °F to +158 °F)
- Free drop: 1.2 m on concrete (Method 516.5 Procedure IV)
- Heavy vibration (Method 514.5 Procedure I Category 24)
- Humidity: 95% RH Non-condensing (MIL-STD-810G Method 507.6, Procedure II)
- High altitude operation: 30,000 ft (MIL-STD-810G Method 500.5)
- High altitude transport: 40,000 ft (MIL-STD-810G Method 500.5)
- Solar exposure (MIL-STD-810G, Method 505.5, Procedure II)

PHYSICAL DIMENSIONS

- Size (L x W x H): 165 mm x 245 mm x 50 mm (6.5" x 9.65" x 2")
- Weight: 1.2 kg (2.6 lbs) with batteries

COMPLIANCE

- FCC part 15 (Class B device), CE Mark, RoHS.

IN THE BOX

- Trimble Yuma 7 tablet computer with Windows 10 Pro
- One Battery pair
- AC Power adapter/charger
- Stylus and tether
- Screen Protector
- Accessory screwdriver
- Documentation

OPTIONAL ACCESSORIES

- Battery Charger
- Shoulder Sling
- External GNSS Antenna
- Tempered Glass Screen Protector
- USB desktop hub
- Survey Pole Bracket
- Vehicle Hard Mount Bracket
- Fabric Carry Pouch
- DC Vehicle Charger for 12 V/24 V systems. (9 Vdc-32 Vdc)
- USB to RS232 adaptor

DEVELOPER RESOURCES

EMPOWER Platform Developer Program: Including access to generic Windows 10 SDK assets and resources, a hardware MDK for customized EMPOWER Module developers and specific SDKs for software developers seeking to create custom apps leveraging Trimble EMPOWER Modules. For more information go to:

<https://empower.trimble.com/developer/>

1. Battery operating and recharge times will vary based on a wide range of operating conditions and user preferences, such as screen brightness, battery conditioning, temperature, operating system settings, data connectivity and software applications.
2. GNSS accuracy may be affected by environmental conditions including multipath, obstructions, satellite geometry and atmospheric conditions. Specified accuracy assumes open-sky conditions, horizontal antenna mounting, and SBAS corrections are used. Ionospheric conditions, multipath signals or obstruction of the sky by buildings or heavy tree canopy may degrade accuracy.

TRIMBLE INC
P.O. Box 947
Corvallis, OR 97339
USA
541-750-9200 Phone
empower.trimble.com

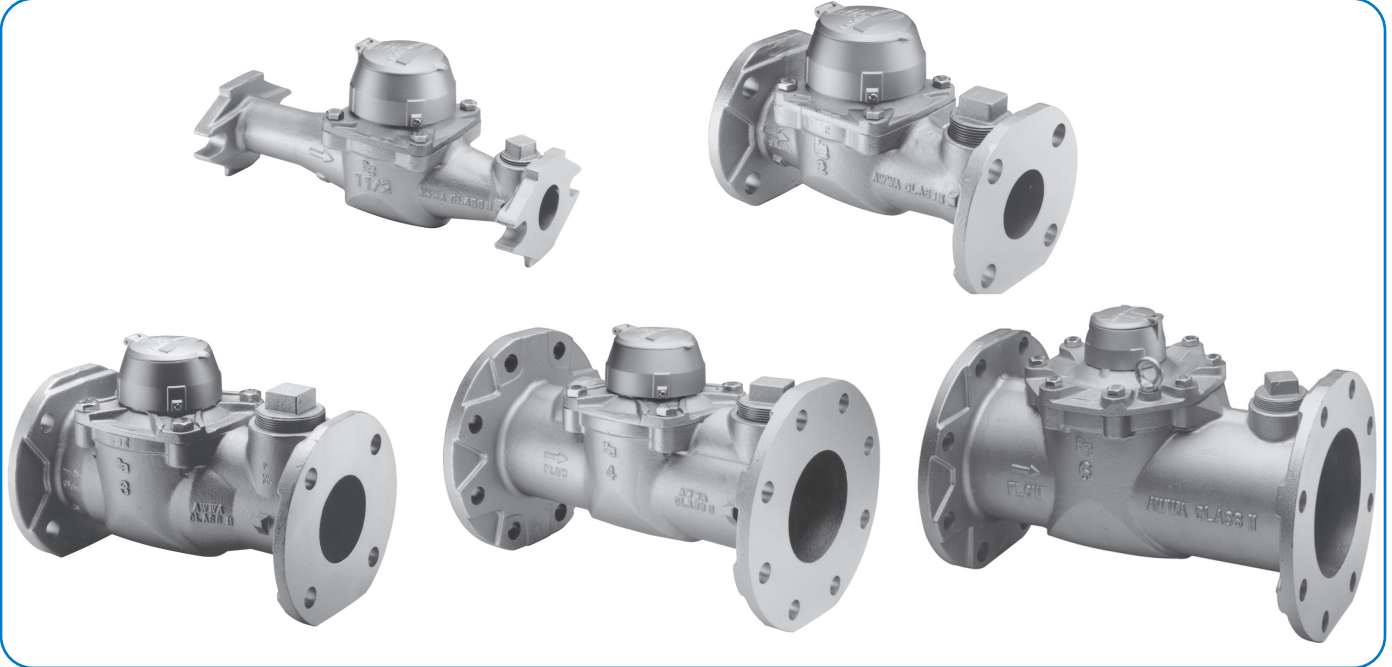
Contact your local Trimble Authorized Distribution Partner for more information



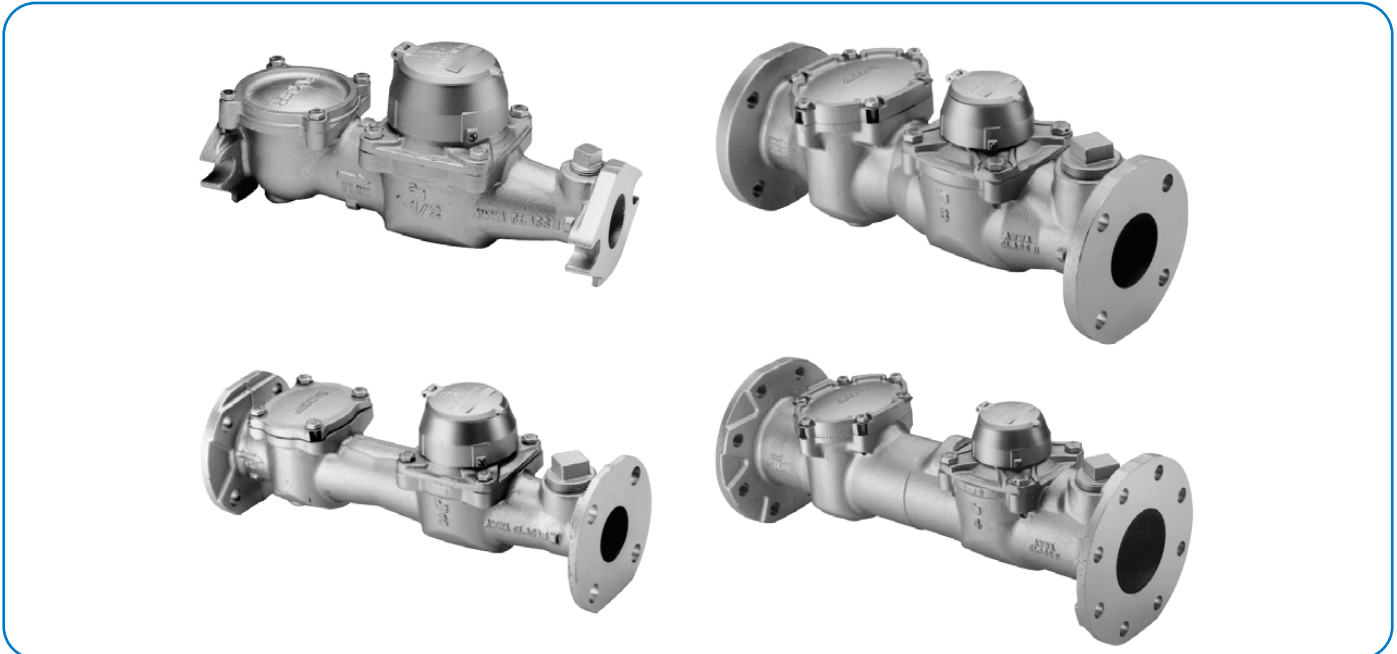
Recordall® Turbo Series Meters

Models 160 (1-1/2 in.), 200 (2 in.), 450 (3 in.), 1000 (4 in.),
2000 (6 in.), 3500 (8 in.), 5500 (10 in.), 6200 (12 in.)

Models without Integral Strainers, Sizes 1-1/2...12 in.



Models with Integral Strainers, Sizes 1-1/2...4 in.

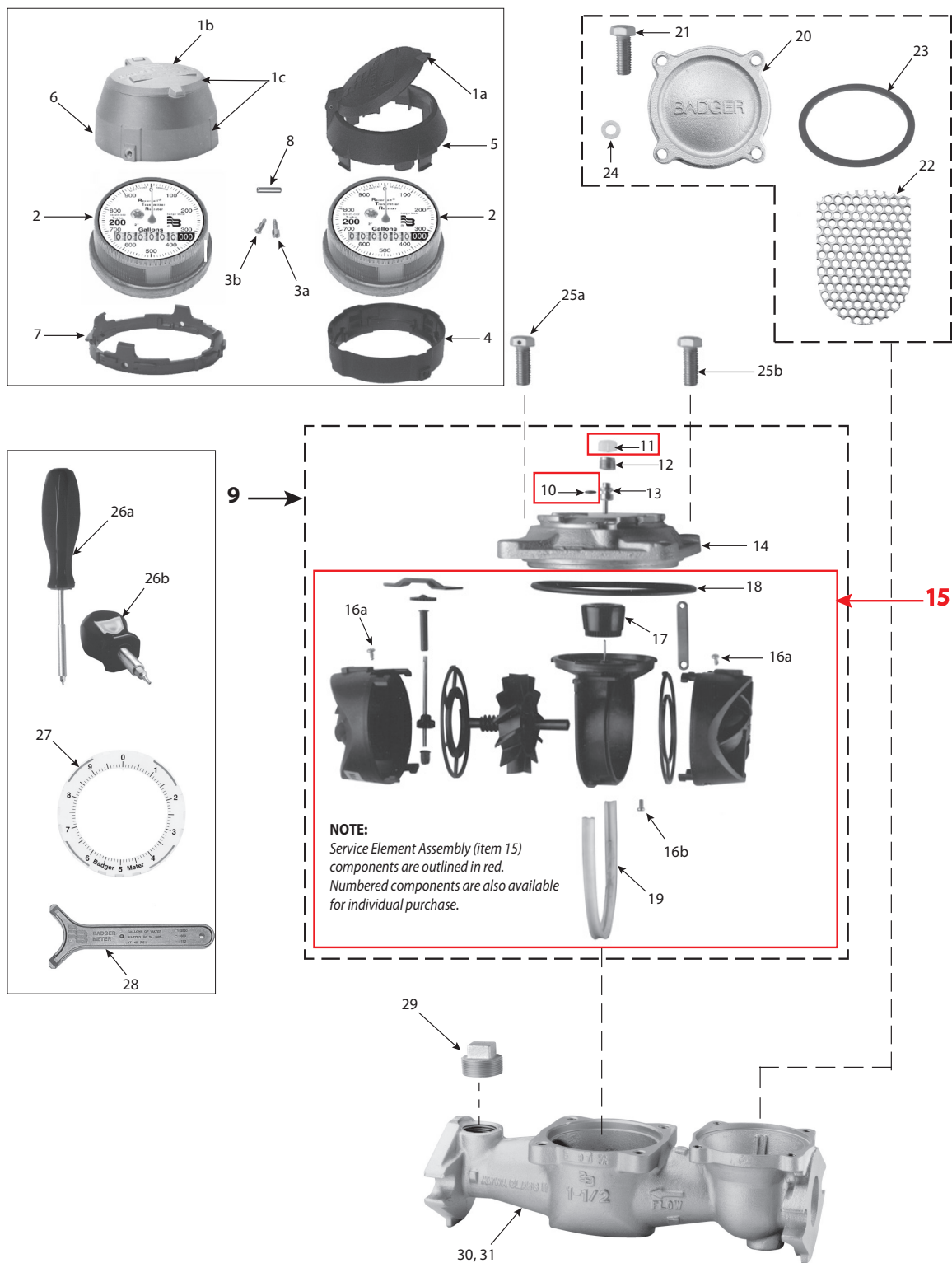


Badger Meter

RTS-PS-00024-EN-09 (February 2022)

Parts List

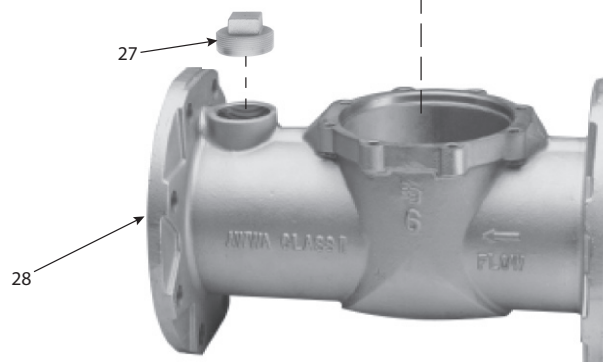
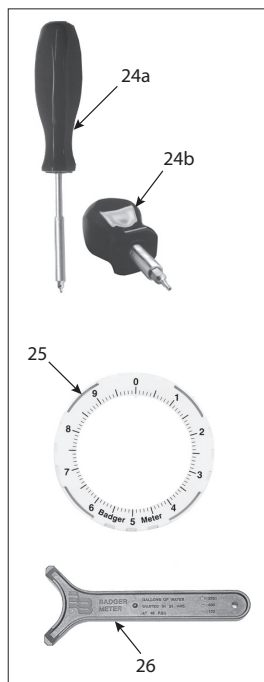
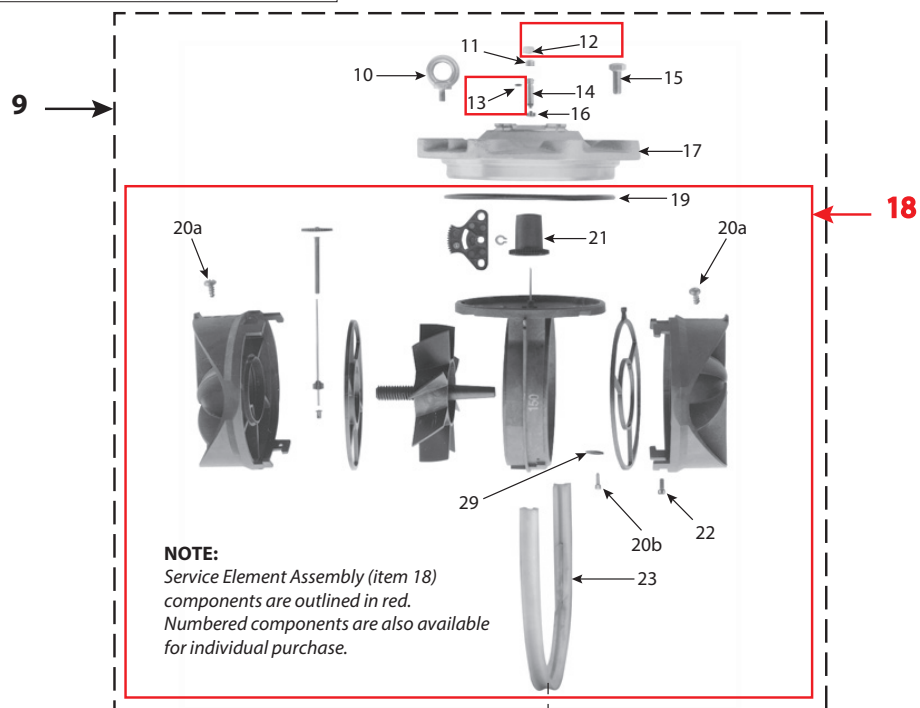
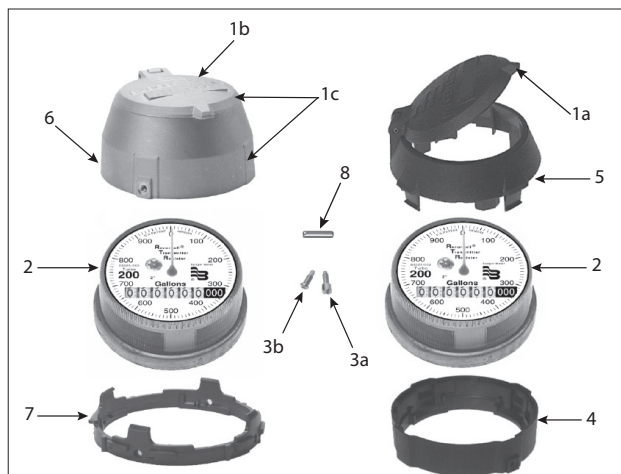
Sizes 1-1/2 in., 2 in., 3 in. and 4 in.



Item	Description	Part Numbers for Sizes 1-1/2 in., 2 in., 3 in. and 4 in.			
		1-1/2 in.	2 in.	3 in.	4 in.
1a	Register flat lid (plastic) medium gray	62278-003	62278-003	62278-003	62278-003
1b	Register flat lid (bronze)	62353-001	62353-001	62353-001	62353-001
1c	Register flat lid and shroud (bronze)	62616-001	62616-001	62616-001	62616-001
2	Register, 100 gallon T. C.	64085-001	64085-002	64085-003	64085-004
	Register, 100 gallon T. C. (Reclaimed)	64085-031	64085-032	64085-033	64085-034
	Register, 10 cubic ft T.C.	64085-005	64085-006	64085-007	64085-008
	Register, 10 cubic ft T.C. (Reclaimed)	64085-035	64085-036	64085-037	64085-038
	Register, 1 cubic meter T. C.	64085-009	64085-010	64085-011	64085-012
	Register, 1000 gallon T.C.	—	—	—	—
	Register, 100 cubic ft T.C.	—	—	—	—
3a	Register, 10 cubic meter T.C.	—	—	—	—
	Tamper-resistant screw, standard (for local register, ADE®, RTR®)	62335-001	62335-001	62335-001	62335-001
3b	Tamper-resistant screw, standard (for HR-E® LCD encoder, not shown)	62624-001	62624-001	62624-001	62624-001
	Tamper-resistant TORX® seal screw (for local register, ADE, RTR)	62516-001	62516-001	62516-001	62516-001
3c	Tamper-resistant TORX seal screw (for HR-E LCD encoder, not shown)	62516-002	62516-002	62516-002	62516-002
	Tamper-resistant keyed seal screw, standard (for local register, ADE, RTR)	66925-001	66925-001	66925-001	66925-001
	Tamper-resistant keyed seal screw, short (for HR-E LCD encoder, not shown)	66925-003	66925-003	66925-003	66925-003
4	Plastic shroud (bottom half) medium gray	62279-009	62279-009	62279-009	62279-009
5	Plastic shroud (top half) medium gray	62280-004	62280-004	62280-004	62280-004
6	Bronze shroud (for flat lid)	62442-001	62442-001	62442-001	62442-001
7	Plastic insert for flat lid bronze shroud	62455-001	62455-001	62455-001	62455-001
8	Flat lid hinge pin	59568-003	59568-003	59568-003	59568-003
9	Head assembly (LL), complete*	63010-024	63010-025	63010-026	63010-027
	Head assembly (LL), complete (for models with integral strainer)*	63010-025	63010-025	63010-026	63010-027
10	O-Ring, calibration shaft	62754-001	62754-001	62754-001	62754-001
11	Seal plug, calibration shaft	62793-001	62793-001	62793-001	62793-001
12	Lock screw, calibration shaft	68291-001	68291-001	68291-001	68291-001
13	Calibration shaft	68288-001	68288-001	68288-001	68288-001
14	Cover plate (LL)	66131-002	66131-002	66132-002	66132-002
15	Service element assembly	62755-038	62755-042	62755-039	62755-043
	Service element assembly (for models with integral strainer)	62755-042	62755-042	62755-039	62755-043
16a	Cage / nose cone setscrews (2 required)	62976-007	62976-007	62976-007	62976-007
16b	Cage setscrew (1 required)	62976-005	62976-005	62976-005	62976-005
17	Magnet carrier with top ball	62976-018	62976-018	62976-019	62976-019
18	O-Ring, head	62754-002	62754-002	62754-003	62754-003
19	Cage seal	62924-001	62924-001	62924-002	62924-002
20	Strainer cover (LL) (for models with integral strainer)	62635-005	63233-003	63281-003	63281-003
21	Cover Bolt (for models with integral strainer)	55031-033	55031-060	55031-062	55031-062
22	Screen (for models with integral strainer)	63115-001	63277-001	63283-001	63285-001
23	Gasket (for models with integral strainer)	11071-033	22650-050	22650-051	22650-051
24	Washer for strainer cover (for models with integral strainer)	—	55262-015	55262-015	55262-015
25a	Head bolt, w/seal hole (1 required)	25421-043	25421-043	25421-034	25421-034
25b	Head bolt, w/o seal hole (3 required)	55031-060	55031-060	55031-116	55031-116
26a	TORX seal screw driver and bit (long)	62658-003	62658-003	62658-003	62658-003
26b	TORX seal screw driver and bit (stubby)	62658-001	62658-001	62658-001	62658-001
27	Register test ring	62446-001	62446-001	62446-001	62446-001
28	Plastic shroud disassembly tool	62346-001	62346-001	62346-001	62346-001
29	Test plug (LL)	33879-016	33879-014	33879-012	33879-012
30	Housing, round flange (LL), w/o test plug	—	62748-007	62764-006	62765-006
	Housing, round flange (LL), w/ test plug	—	62748-006	62764-007	62765-005
	Housing, round flange (LL), w/ test plug (for models with integral strainer)	—	63220-003	63127-005	63128-007
31	Housing, elliptical flange (LL) w/o test plug	62747-006	62749-006	—	—
	Housing, elliptical flange (LL) w/ test plug	62747-005	62749-005	—	—
	Housing, elliptical flange (LL) w/ test plug (for models with integral strainer)	63125-005	63126-005	—	—
—	TORX seal screw driver bit (not shown)	62657-001	62657-001	62657-001	62657-001
—	Driver bit, keyed seal screw (not shown)	66925-002	66925-002	66925-002	66925-002
—	Bit driver, stubby, without bit (not shown)	62658-005	62658-005	62658-005	62658-005
—	Bit driver, standard, without bit (not shown)	62658-006	62658-006	62658-006	62658-006

*Part numbers listed for reference only. *Head assembly complete* must be ordered as a configured item. Please contact your Customer Service Representative for availability.

Sizes 6 in., 8 in., 10 in. and 12 in.



Item	Description	Part Numbers Part Numbers for Sizes 6 in., 8 in., 10 in. and 12 in.			
		6 in.	8 in.	10 in.	12 in.
1a	Register flat lid (plastic) medium gray	62278-003	62278-003	62278-003	62278-003
1b	Register flat lid (bronze)	62353-001	62353-001	62353-001	62353-001
1c	Register flat lid and shroud (bronze)	62616-001	62616-001	62616-001	62616-001
2	Register, 10,000 gallon T. C.	—	—	—	64085-043
	Register, 10,000 gallon T. C. (reclaimed)	—	—	—	64085-047
	Register, 1000 cubic ft T.C.	—	—	—	64085-044
	Register, 1000 cubic ft T.C. (reclaimed)	—	—	—	64085-048
	Register, 1 cubic meter T. C.	—	—	—	—
	Register, 1000 gallon T.C.	64085-017	64085-018	64085-019	—
	Register, 1000 gallon T.C. (reclaimed)	64085-039	64085-041	64085-049	—
	Register, 100 cubic ft T.C.	64085-020	64085-021	64085-022	—
	Register, 100 cubic ft T.C. (reclaimed)	64085-040	64085-042	64085-050	—
3a	Register, 10 cubic meter T.C.	64085-023	64085-024	64085-025	64085-045
	Tamper-resistant screw, standard (for local register, ADE, RTR)	62335-001	62335-001	62335-001	62335-001
3b	Tamper-resistant screw, standard (for HR-E LCD encoder, not shown)	62624-001	62624-001	62624-001	62624-001
	Tamper-resistant TORX seal screw (for local register, ADE, RTR)	62516-001	62516-001	62516-001	62516-001
3c	Tamper-resistant TORX seal screw (for HR-E LCD encoder, not shown)	62516-002	62516-002	62516-002	62516-002
	Tamper-resistant keyed seal screw, standard (for local register, ADE, RTR)	66925-001	66925-001	66925-001	66925-001
4	Tamper-resistant keyed seal screw, short (for HR-E LCD encoder, not shown)	66925-003	66925-003	66925-003	66925-003
	Plastic shroud (bottom half) medium gray	62279-009	62279-009	62279-009	62279-009
5	Plastic shroud (top half) medium gray	62280-004	62280-004	62280-004	62280-004
6	Bronze shroud (for flat lid)	62442-001	62442-001	62442-001	62442-001
7	Plastic insert for flat lid bronze shroud	62455-001	62455-001	62455-001	62455-001
8	Flat lid hinge pin	59568-003	59568-003	59568-003	59568-003
9	Head assembly (LL), complete*	63010-028	63010-029	63010-030	63010-048
10	Eyebolts	59215-039	59215-067	59215-067	59215-067
11	Lock screw, calibration shaft	68291-001	68291-001	68291-001	68291-001
12	Seal plug, calibration shaft	62793-001	62793-001	62793-001	62793-001
13	O-Ring, calibration shaft	62754-001	62754-001	62754-001	62754-001
14	Calibration shaft	68289-001	68290-001	68290-001	68290-001
15	Head bolt, w/seal hole (6 in., 1 required; 8...12 in., 2 required)	25421-044	58088-004	58088-004	58088-004
	Head bolt, w/o seal hole (6 in., 7 required; 8...12 in., 8 required)	55031-117	55031-172	55031-172	55031-172
16	Calibration gear	62976-031	62976-031	62976-031	62976-031
17	Cover plate (LL)	66133-002	66134-002	66134-002	66134-002
18	Service Element Assembly	62755-040	62755-041	62755-044	62755-044
19	O-Ring, head	62754-004	62754-005	62754-005	62754-005
20a	Cage / nose cone setscrews (2 required)	62976-050	62976-050	62976-050	62976-050
20b	Cage setscrew (4 required)	63177-011	62976-044	62976-044	62976-044
21	Magnet carrier (with top ball)	63177-015	62976-047	62976-047	62976-047
22	Screw	—	62976-007	62976-007	62976-007
23	Cage seal	62924-003	62924-004	—	—
24a	TORX seal screw driver and bit (long)	62658-003	62658-003	62658-003	62658-003
24b	TORX seal screw driver and bit (stubby)	62658-001	62658-001	62658-001	62658-001
25	Register test ring	62446-001	62446-001	62446-001	62446-001
26	Plastic shroud disassembly tool	62346-001	62346-001	62346-001	62346-001
27	Test plug (LL)	33879-012	33879-012	—	—
28	Housing, round flange (LL) w/o test plug	62837-006	—	63355-003	—
	Housing, round flange (LL) w/ test plug	62837-005	63304-004	—	—
	Housing, round flange (Cast Iron) w/o test plug	—	—	—	67101-017
29	Washer (4 required)	63177-012	62976-049	62976-049	62976-049
—	TORX seal screw driver bit (not shown)	62657-001	62657-001	62657-001	62657-001
—	Driver bit, keyed seal screw (not shown)	66925-002	66925-002	66925-002	66925-002
—	Bit driver, stubby, without bit (not shown)	62658-005	62658-005	62658-005	62658-005
—	Bit driver, standard, without bit (not shown)	62658-006	62658-006	62658-006	62658-006

*Part numbers listed for reference only. *Head assembly complete* must be ordered as a configured item. Please contact your Customer Service Representative for availability.

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www.badgermeter.com

KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION

Witness: Krista Citron

32. The AMI Plan, paragraph 5, page 3, of the Executive Summary discusses the CBA completed to evaluate the AMI proposal. Please provide the following:
- a. All workpapers and documentation used to develop the CBA, including vendor pricing, basis of material, installation, maintenance, and operations costs, equipment vendor information and communications, and internal communications and electronic data and documentation including spreadsheets, etc., with all formulas intact.

Response:

Refer to the vendor information in Appendix A of the AMI Plan, the workpapers in KAW_R_AGDR1_NUM008_0829025_Attachment A, and the responses to AGDR1_NUM031, NUM034, NUM035, and NUM047.

KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION

Witness: Craig Dowell

33. The AMI Plan overview, page 5, discusses AMI meters. Please provide the following:
- a. Regarding the actual measurement technology, how do AMI meters differ from AMR meters?
 - b. Do AMR meters provide indication of backflow, tampering and no flow when read? Please elaborate.
 - c. If AMR meters do not provide indication of backflow and the metering device is the same, please discuss in detail how AMI meters provide this indication.
 - d. Other than the meter register is there a difference between the actual water flow measurement between AMI and AMR meters?
 - e. What is the difference in meter registers between AMI and AMR meters?
 - f. How do meter registers translate to meter data that is electronically read by AMI and AMR meters?
 - g. Is meter data available on the meter register even if data transmitters or transmission fails for AMI and AMR meters?

Response:

- A. Meters do not have distinction between AMR nor AMI. The meter is designed to measure the flow of water. The endpoint makes the determination whether the meter data will be transmitted to the Head End System via AMR or AMI.
- B. Meters are not classified as AMR nor AMI. Meters have different features and functionality, but this is not determined by AMR/AMI. Please reference Appendix B of the AMI Plan for details on features and functionality of the meters.
- C. If a meter does not have the ability to recognize reverse flow, the Head End System could determine the reverse flow based on the interval read data.
- D. No, meters are not classified as AMR nor AMI.
- E. No difference, as meters are not classified as AMR or AMI.
- F. Registers use a standard protocol to communicate read and alerts/alarm data to endpoint.
- G. Endpoints store meter read data in case a device is unable to transmit to the Head End System.

KENTUCKY-AMERICAN WATER COMPANY
CASE NO. 2025-00240
ATTORNEY GENERAL'S FIRST REQUEST FOR INFORMATION

Witness: Craig Dowell

34. The AMI Plan overview, page 5, discusses Endpoints (or Communication Modules). Please provide the following:
- a. Why would an endpoint be specific to marketing literature?
 - b. Explain in detail how communication to the meter would affect the meter register or the meter itself.
 - c. Will the deployed meters have any ability to regulate or stop the flow of water upon request?
 - d. Vendor information for all endpoint technology selected if deployment of AMI is approved.
 - e. Does the endpoint provide alarms for high flows or backflow independent of scheduled or requested data transmission?

Response:

- A. There are multiple acceptable terms in the industry for endpoints. This statement explains that depending on the marketing material the author may choose to use any of the acceptable terms.
- B. Inbound communication is from the Head End System to the Endpoint and is typically executed to perform an On-Demand Read or to initiate a Firmware Update. The frequency of inbound requests can affect the battery of the endpoint. The 2-way communication refers to the endpoint not the meter.
- C. The approved vendors have a meter that contains integrated remote flow control valve. However, this would be determined by KAW if/when to deploy this type of meter.
- D. Product Sheets for both approved vendor endpoints are attached:
 - KAW_R_AGDR1_NUM034_082925_Attachment1
 - KAW_R_AGDR1_NUM034_082925_Attachment2
 - KAW_R_AGDR1_NUM034_082925_Attachment3
 - KAW_R_AGDR1_NUM034_082925_Attachment4
- E. No, endpoints are configured to communicate with Head End System the interval data and any alerts/alarms are stored and transmitted during the scheduled communication times.



ORION® Cellular Water Endpoints

DESCRIPTION

ORION® Cellular water endpoints are innovative, two-way endpoints for smart water applications. The endpoints utilize existing IoT (Internet of Things) cellular infrastructure to efficiently and securely deliver meter reading data to the utility in a Network as a Service (NaaS) approach. Leveraging existing cellular infrastructure, the NaaS solution offers all the performance benefits of AMI, while eliminating network-related maintenance and technology concerns and enhancing deployment flexibility.

Cellular endpoints are members of the time-tested ORION family of products from Badger Meter, designed for maximum flexibility. Since 2002, the ORION product family has provided comprehensive Advanced Metering Analytics (AMA) for interval meter reading and data capture using both one-way and two-way communications.

FUNCTIONALITY

Operation: ORION Cellular water endpoints communicate with the encoder and capture 15-minute interval read data and meter status information. The endpoints then automatically broadcast the information, including endpoint status information, via the cellular network to BEACON® Software as a Service (SaaS). ORION NaaS is powered by the proven ORION system for interval data capture and two-way communication. The solution employs cellular endpoints which, as they leverage the public cellular network and require no proprietary gateways to operate, dramatically reduce infrastructure requirements compared to a traditional fixed network. This speeds installations and simplifies expansion as a system evolves.

The endpoints are designed to call in four times each workday and feature a configurable schedule that enables utility customers to select call-in times that best support their processes.

Activation: ORION Cellular water endpoints are shipped in an inactive, non-transmitting state. The Badger Meter IR Communication Device can be used to activate the endpoints and verify the encoder connection. Successful endpoint function can be confirmed through a web app demonstrating that communication has been verified to both the encoder and the network.

Alternatively, the endpoints offer a Smart Activation feature. After installation, the endpoints begin broadcasting data when the encoder senses the first usage of water. No field programming or special tools are required.

Broadcast Mode: ORION Cellular water endpoints broadcast fixed network reading data through the secure cellular network within the service area.

Specific configurations also transmit a radio frequency (RF) message to facilitate troubleshooting in the field. See ["Configurations" on page 2](#).

Data Storage: The endpoints store 42 days of 15-minute data.



ORION Cellular HLD endpoint (pictured)

Output Message: ORION Cellular water endpoints broadcast a unique serial number, meter reading data, and applicable status indicators. As an advanced data security measure, each message is securely transported to BEACON SaaS only via private network and never over the public internet.

APPLICATION

Configurations: ORION Cellular water endpoints are multi-purpose endpoints that can be deployed in indoor, outdoor and pit (non-metal pit lid) applications. The electronics and battery assembly are fully encapsulated in epoxy for environmental integrity. The endpoint is available with a connector assembly for ease of installation.

Meter Compatibility: When attached to a Badger Meter High Resolution Encoder, the ORION Cellular water endpoint is compatible with all current Badger Meter Recordall® Disc, Turbo Series, Compound Series, Combo Series and Fire Service meters and assemblies, and with E-Series G2® Ultrasonic, E-Series® Ultrasonic, E-Series® Ultrasonic Plus, and ModMAG® electromagnetic flow meters.

Encoder Compatibility: The ORION Cellular water endpoint is suitable for use with a Badger Meter High Resolution Encoder as well as the following Badger Meter approved three-wire encoder registers that have a manufacture date within 10 years of the current date as long as the encoder has three wires connected to it and is programmed into the three-wire output mode for AMR/AMI: Honeywell® (Elster/ABB) ScanCoder, evoQ4 meter with Sensus® protocol module; Master Meter® Octave® Ultrasonic meter encoder output; Metron-Farnier Hawkeye; Mueller Systems 420 Solid State Register (SSR) LCD; Neptune® ProRead, E-Coder®, ARB-V®, and ProCoder; and Sensus iPerl®.



SPECIFICATIONS

Dimensions	5.125 in. (130 mm) (H)
	1.75 in. (44 mm) Diameter at top
	2.625 in. (W) x 2.875 in. (D) at base (67 mm (W) x 73 mm (D) at base)
Broadcast Network	LTE-M cellular network (primary communication technology)
	NB-IoT (secondary communication technology for certain variants)
RF Message for Troubleshooting	Where available (see table below) frequency is FCC-regulated 902...928 MHz frequency hopping modulation
Operating Temperature Range	
	• Storage, Meter Reading and RF Message (for troubleshooting) –40...60° C (–40...140° F)
	• Cellular Communications –20...60° C (–4...140° F)
Humidity	0%...100% condensing
Battery	One (1) lithium thionyl chloride D cell (nonreplaceable)

Construction: All ORION Cellular water endpoints are housed in an engineered polymer enclosure with an ORION RF board, battery and antenna. For long-term performance, the enclosure is fully potted to withstand harsh environments and to protect the electronics in flooded or submerged pit applications.

Wire Connections: ORION Cellular water endpoints are available with inline connectors (Twist Tight® or Nicor®) for easy installation and connection to compatible encoders/meters. The endpoints are also available with flying leads for field splice connections. Other wire connection configurations may be available upon request.

FEATURES

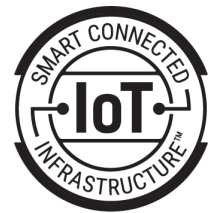
Smart City Ready	Future-proof technology
Communication Type	Two-way
Application Type	Control/Monitor
Endpoint Communication	Configurable call-in schedule, up to four times each workday
Reading Interval Type	15-minute
Encoder Compatibility	Absolute
Fixed Network Reading	✓
Cut-Wire Indication	✓
Encoder Error	✓
Low Battery Indication	✓
Remote Clock Synchronization	✓
Firmware Upgrades	✓

CONFIGURATIONS

Endpoint	Notes
ORION Cellular C	Includes RF and IR messages for troubleshooting
ORION Cellular HLD	Includes RF and IR messages for troubleshooting
ORION Cellular LTE-M	Includes RF and IR messages for troubleshooting

NOTE: For the ORION Cellular LTE-MP endpoint, see the *ORION Cellular LTE-MP Endpoint product data sheet*, available at www.badgermeter.com.

ORION® Cellular endpoints are IoT Network Certified for Smart Connected Infrastructure™ by CTIA, an association representing the U.S. wireless communications industry and companies throughout the mobile ecosystem. The certification signifies that the endpoints meet global 4G and 5G, 3GPP, NIST, and CTIA certification standards for cybersecurity and network performance, and are suitable to support critical infrastructure operations.



License Requirements:	ORION Cellular water endpoints comply with Part 15, Part 22, Part 24, and Part 27 of the FCC Rules. No license is required by the utility to operate an ORION meter reading system. This device complies with Industry Canada license-exempt RSS standard(s). The device shall be used in such a manner that the potential for human contact in normal operation is minimized. This equipment complies with RSS-102 radiation exposure limits. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body. This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.
Transportation:	WARNING: The operation of transmitters and receivers on airlines is strictly prohibited by the Federal Aviation Administration. As such, the shipping of radios and endpoints via air is prohibited. Please follow all Badger Meter return and/or shipping procedures to prevent exposure to liability.
Warning:	To reduce the possibility of electrical fire and shock hazards, never connect the cable from the endpoint to any electrical supply source. The endpoint cable provides SELV low voltage limited energy power to the load and should only be connected to passive elements of a water meter register.
Caution:	Endpoint batteries are <i>not</i> replaceable. Users should make no attempt to replace the batteries. Changes or modifications to the equipment that are not expressly approved by Badger Meter could void the user's authority to operate the equipment.

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ORION® Water Endpoints

ME Endpoint

DESCRIPTION

The ORION® ME endpoint is a two-way water endpoint for mobile applications.

In addition to providing the current and snapped daily reading, the endpoint two-way functionality allows users to capture data profile information wirelessly, without having to directly access the endpoint, during the normal reading process.

The ORION ME endpoint is a member of the time-tested ORION family of products from Badger Meter, designed for maximum flexibility. Since 2002, the ORION product family has been providing comprehensive advanced metering analytics (AMA) for interval meter reading and data capture using both one-way and two-way communications.

FUNCTIONALITY

Operation: The endpoint continuously monitors the encoder circuit. At predetermined intervals, the endpoint broadcasts the totaled reading value along with other meter data to the mobile collection devices.

Activation: The endpoints offer a Smart Activation feature. All ORION endpoints are shipped in an inactive, non-transmitting state. After the endpoint is installed, it begins broadcasting data when the encoder senses the first usage of water. No field programming or tools are required to activate the endpoint.

Broadcast Mode: Once activated, the endpoints begin transmitting in mobile priority mode. After installation, using the endpoint two-way communication, an endpoint transmits its meter data every six seconds.

Data Profiling: The endpoints store up to 90 days of hourly historical interval meter data within nonvolatile memory.

Output Message: The endpoint broadcasts its unique serial number, current meter reading, daily snapped meter reading and applicable status indicators for mobile reading collection.



APPLICATION

Configurations: Available in integral, remote or endpoint-only configurations, the endpoint can be deployed in indoor, outdoor and pit applications. The endpoint electronics and battery assembly are fully encapsulated in epoxy for environmental integrity.

Meter Compatibility: When attached to a Badger Meter encoder, the endpoint is compatible with all current Badger Meter Recordall® Disc, Turbo Series, Compound Series, Combo Series and Fire Service meters and assemblies, and with E-Series® Ultrasonic and ModMag® Electromagnetic flow meters.

Encoder Compatibility: The endpoint is suitable for use with all Badger Meter encoders as well as the following Badger Meter approved three-wire encoder registers that have a manufacture date of 2000 or newer, are programmed into the AMR/AMI three-wire output mode and have three-wires connected: Elster C700 Digital, InVISION and ScanCoder® encoders and evoQ4 meter (encoder output); Hersey® Translator; Master Meter® Octave® Ultrasonic meter encoder output; Metron-Farnier Hawkeye; Mueller Systems 420 Solid State Register (SSR) LCD; Neptune® ProRead, E-Coder® and ARB-V®; and Sensus® Electronic Register encoder (ECR) and ICE.



SPECIFICATIONS

Dimensions	5.125 in. (H); 1.75 in. (W) at top; 2.125 in. (W) at bottom
Broadcast Frequency MHz Band	FCC regulated 902...928 MHz frequency hopping modulation
Operating Temperature Range	-40...60° C (-40...140° F) based on storage and meter reading. RF output may be reduced by extremely low temperatures. The water meter should not be subjected to temperatures below freezing.
Storage and Meter Reading	
Humidity	0...100% condensing
Battery	One (1) lithium thionyl chloride C cell (nonreplaceable)
Battery Life	20 years (calculated)

Construction: All ORION ME endpoints are housed in an engineered polymer enclosure with an ORION RF board, battery and antenna. To assure long-term performance, the enclosure is fully potted to withstand harsh environments and to protect the electronics in flooded or submerged pit applications.

Wire Connections: ORION ME endpoints are available with in-line connectors (Twist Tight or Nicor®) for easy installation and connection to compatible encoders/meters. The endpoints are also available with flying leads for field splice connections. Other wire connection configurations may be available upon request.

Range: Transmission reception depends on a number of factors: topographical features, a building's construction materials and obstacles such as buildings, trees, vegetation and fences. Temporary conditions, such as a vehicle parked near the endpoint or heavy rain or snow, could also affect reception. These factors need to be considered when installing and communicating with the endpoint using a handheld or mobile reading system. For a more in-depth discussion, see the white paper, *Understanding RF Propagation of AMR/AMI Systems*, available at www.badgermeter.com.

FEATURES

Communication Type	Two-Way
Application Type	Control/Monitor
Reading Interval Type	Midnight/Now
Encoder Compatibility	Absolute/Incremental
Mobile Reading	✓
Premise Leak Detection	✓
Cut-Wire Indication	✓
Reverse Flow Indication (Absolute Encoder)	✓
No Usage Indication	✓
Encoder Error (Absolute Encoder)	✓
Low Battery Indication	✓
Remote Programming	✓
Remote Clock Synchronization	✓
Firmware Upgrades	✓

License Requirements: ORION ME endpoints comply with Part 15 of the FCC Rules. No license is required by the utility to operate an ORION meter reading system.

Transportation: The Federal Aviation Administration prohibits operating transmitters and receivers on all commercial aircraft. The ORION endpoint is considered an operating transmitter and cannot be shipped by air.

Caution: Changes or modifications to the equipment that are not expressly approved by Badger Meter could void the user's authority to operate the equipment.

SMART WATER IS BADGER METER

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www.badgermeter.com

AMI Your Way

Neptune® R900® System: Cellular Endpoint



Neptune's cellular endpoint allows you to progress at your own pace to AMI when integrated into your Neptune® R900® System. Neptune's cellular endpoint provides all of the benefits of an advanced meter reading solution without the operational burden of network infrastructure while allowing you to protect existing asset investments. An easily deployable AMI solution, the cellular endpoint allows you to start collecting actionable meter data immediately. Powered by nationwide cellular network carriers, you are assured a reliable, highly secure, and easy-to-deploy cellular AMI data solution for both current and future needs.

- No AMI fixed network infrastructure installation, maintenance, operations, or upgrade costs for the life of the deployment.
- Seamlessly integrates with existing R900 technology for a flexible AMI solution.
- Access all of your meter data from anywhere at any time with Neptune® 360™.
- Improve operations and customer service with real-time, high-resolution AMI data and advanced analytics.
- Automatically recover from network outages with 96 days of stored data.
- Two-way solution using nationwide cellular carriers.
- LTE-M cellular technology helps ensure robust coverage.
- Network resources available to support network connectivity during disaster recovery.

Specifications

Environmental Conditions

- Operating temperature:
-22°F to +149°F (-30°C to +65°C)
- Storage temperature:
-40°F to +158°F (-40°C to +70°C)
- Operating humidity: 100%
condensing

Antennas

- Wall: standard internal antenna
- Pit: internal or external antenna

Encoded Register Compatibility

- Neptune® MACH 10®, ARB® V,
ProRead™, E-CODER®,
and ProCoder™
- Sensus ECR II, ICE, iPerl,
Electronic Register and OMNI
- Hersey/Mueller Translator
- Badger ADE, HR E|LCD, E-Series
- Elster/AMCO InVision (Sensus
protocol version)

Operation

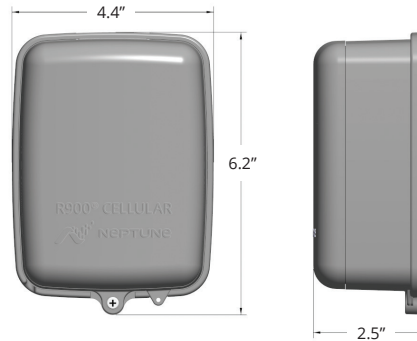
- Regular cellular LTE-M
transmissions with configurable
transmission windows
- Mobile 900 MHz backup
transmissions
- Verify installation via the cellular
endpoint manager tool
- 15-minute interval data with
automatic back-fill
- Priority alerts

Warranty

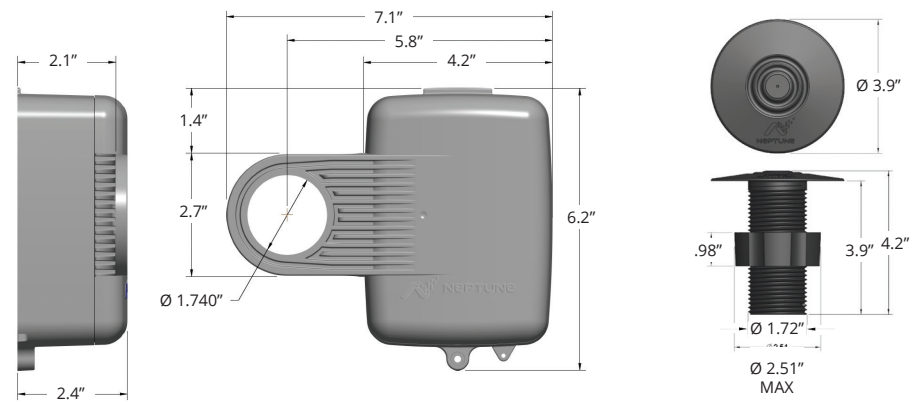
- Neptune provides a limited
warranty for performance,
materials, and workmanship.
See warranty statement for details.

Dimensions

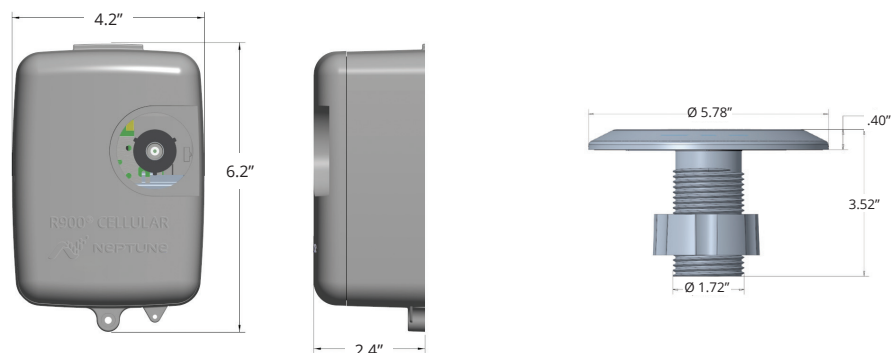
Wall Endpoint



Pit Endpoint (Internal Antenna)



Pit Endpoint with External Through-the-Lid Antenna



Neptune Technology Group
1600 Alabama Highway 229
Tallahassee, AL 36078
800-633-8754 f 334-283-7293

Critical Communication and Easy Migration

Neptune® R900® System Endpoints



Neptune's R900® System endpoints greatly improve access to meter readings while delivering accurate, detailed, and timely consumption information to proactively identify and resolve high bill complaints, reduce delinquent payments, and eliminate write-offs to maximize revenue. The user-friendly, intuitive endpoint design simplifies the installation process and increases operational efficiency.

Neptune R900 wall and pit endpoints provide continuous transmission of meter data and the flexibility of mobile or fixed network reading methods. Migrate easily to AMI when you're ready without separate reading systems, site visits, or endpoint reconfiguration.

- Improve meter reading efficiency with robust walk-by, mobile, and fixed network connectivity
- Build on to existing technology investments with forward and backward compatible endpoints
- Improve quality of service and billing accuracy with detailed consumption data
- Fast installation and no programming required
- Works seamlessly with existing assets and future enhancements
- Pinpoint trouble areas quickly with flags that identify leaks, reverse flow, and tampering
- Peace of mind with access to 96 days of stored history



NEPTUNE
TECHNOLOGY GROUP

#winyourday

Technical Specifications

Electrical Specifications

- Endpoint power: Lithium battery with capacitor

Transmitter Specifications

- Two-way endpoint
- Transmit period (interleaved mobile and fixed network messages):
 - Standard mobile message every 14 seconds at 100 mW
 - Standard fixed network message every 7½ minutes at 1 Watt
- FCC verification: Part 15.247
 - Transmitter channels: 50; frequency-hopping, spread-spectrum
 - Frequency range: 910 to 920 MHz
- Encoder register reading interval:
 - Every 15 minutes
- Data logging interval:
 - 96 days of hourly data

Environmental Conditions

- Operating temperature: -22°F to +149°F (-30°C to +65°C)
- Storage temperature: -40°F to +158°F (-40°C to +70°C)
- Operating humidity: 100% condensing

Antennas

- Wall endpoint: standard internal antenna
- Pit endpoint: standard through-the-lid antenna
 - 18" Coax
 - 6' Coax
 - 20' Coax

Encoded Register Compatibility

- Neptune ARB® V, ProRead™, ProCoder™, and E-CODER®
- Sensus ECR II, ICE, iPerl, Electronic Register and OMNI
- Hersey/Mueller Translator
- Badger ADE and HR E|LCD
- Elster/AMCO InVision (Sensus protocol version)

Options

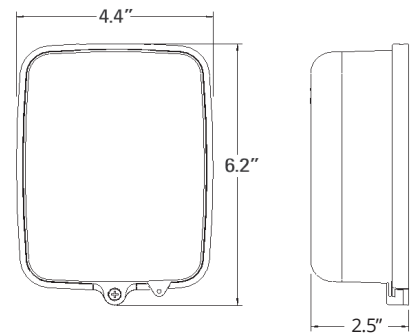
System Compatibility

- Handhelds with R900® belt clip transceiver - mobile RF
- R900 mobile data collector - mobile RF
- R900 gateways - fixed network RF

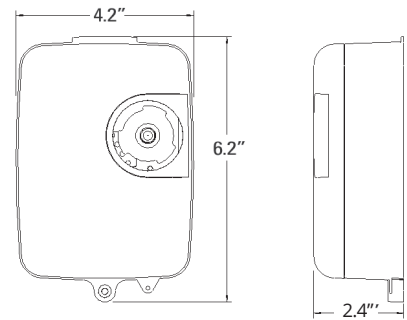
Warranty

- Neptune provides a limited warranty for performance, materials, and workmanship. See warranty statement for details.

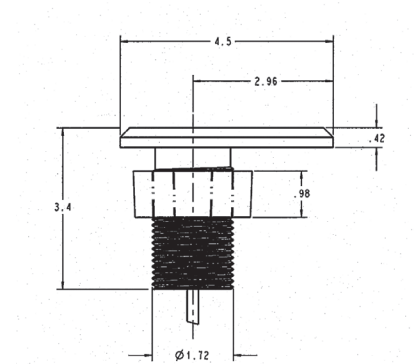
Dimensions



R900 Wall Endpoint



R900 Pit Endpoint



R900 Pit Antenna

