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SCOPE OF THIS MANUAL

This manual contains installation and operation instructions for the E-Series® Ultrasonic Plus meter. Failure to read and follow these instructions can lead to misapplication or misuse of this product, resulting in personal injury and damage to equipment. Proper performance and reliability of the product depend upon installation in accordance with these instructions.

ABOUT THE E-SERIES ULTRASONIC PLUS METER

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. With an ORION® Cellular endpoint connected to the meter, authorized utility personnel can schedule the integrated valve on the meter to Open, Restricted and Partial restrict via commands sent from BEACON® Software as a Service (SaaS), allowing you to remotely restrict and restore water service in a secure manner.

The E-Series Ultrasonic Plus meter can be installed using horizontal or vertical piping, with water flow in the up direction. The meter will not measure flow when an empty pipe condition is experienced. An empty pipe is defined as a condition when the flow sensors are not fully submerged.

E-Series 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 the American Water Works Association (AWWA) Standard C715.

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

Additional Resources

This related document is available at badgermeter.com

Product Configuration Utility Manual for E-Series Ultrasonic Plus Meter

Safety Information

The installation of the E-Series Ultrasonic Plus meter must comply with all applicable federal, state, and local rules, regulations, and codes.

WARNING

THIS PRODUCT HAS A MAGNETIC FIELD.

Product Unpacking and Inspection

Upon opening the shipping container, visually inspect the product and applicable accessories for any physical damage such as scratches, loose or broken parts, or any other sign of damage that may have occurred during shipment.

NOTE: If damage is found, request an inspection by the carrier's agent within 48 hours of delivery and file a claim with the carrier. A claim for equipment damage in transit is the sole responsibility of the purchaser.

SYSTEM REQUIREMENTS

- BEACON Software as a Service (SaaS) - New users see "[BEACON First Time Setup](#)" on page 8
- ORION® Cellular LTE-M, LTE-MS, C, CS, HLA, HLAS OR HLC endpoint (firmware version 2.0 and higher)

STORAGE MODE

Meter Storage Mode

All E-Series Ultrasonic Plus meters are shipped in Storage mode so that a meter alarm is not triggered. During Storage mode, the empty pipe shows up on the LCD display as an error message, but it will not trigger a meter alarm. After sensing a full pipe for 24 hours, the meter moves from Storage mode to normal operation.

If installed when the meter is still in Storage mode, the meter will function as expected with the addition of also displaying “err” on the flow rate screen. The meter will display consumption and, if connected to an ORION Cellular endpoint, will send a reading to the endpoint.

When the meter is in normal operation, the meter alarm displays immediately upon detecting an empty pipe condition. The alarm clears immediately after the condition is corrected and the pipe is full. BEACON is notified that an empty pipe condition has occurred.

Integrated Valve Storage Mode

When shipped, the integrated valve on the E-Series Ultrasonic Plus meter is also in Storage mode to prevent valve actuation and routine maintenance cycling prior to installation. See [“Valve Routine Maintenance” on page 11](#). When the endpoint is activated after installation, the valve automatically transitions to Active mode.

METER INSTALLATION

The E-Series Ultrasonic Plus meter is permanently sealed to eliminate the intrusion of moisture, dirt, or other contaminants, and is suitable for installation in harsh environments, including meter pits subject to continuous submergence.

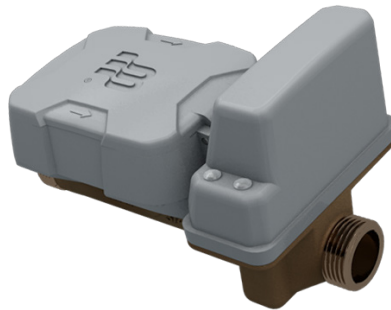


Figure 1: E-Series Ultrasonic Plus with integrated valve

Outdoor Installations

When installed outdoors in a meter box, follow these guidelines:

- The E-Series Ultrasonic Plus meter should have a two- to three-inch clearance to avoid damage or strain to the service piping or meter, and to accommodate any settling that may occur after installation.
- The service pipe in the meter box should be properly bedded to make sure it is not axially misaligned and that it lays evenly on the bottom of the pipe trench. The backfill material covering the pipe should be placed appropriately to maintain pipe alignment in the event of eventual ground shifts. This will prevent damage to the pipe.
- Protect the service lines and the water meter from freezing.
 - ◇ The earth covering the service line must be adequate to prevent frost penetration. Due to the smaller volume of water, service line pipes will freeze sooner than the main distribution line.
 - ◇ The meter box pit should be excavated below the frost line. Even though the meter itself may be positioned above the frost line, the warmer air rising from the earth below the frost line will reduce the possibility of freezing.

Indoor Installations

As a precautionary measure when working with metallic pipes, check indoor locations for electrical continuity through the service pipe before you remove or service a meter.

AWWA policy specifies that service pipes must not be used as an electrical ground. Check your local codes and practices. A permanent ground strap or metal setter must be used if electrical grounding to water services is required in your community.

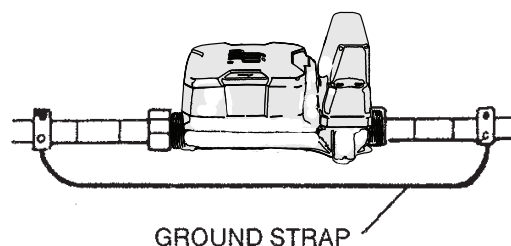


Figure 2: Electrical grounding

IMPORTANT

To prevent floor damage, close the service valve downstream from the meter before installing or removing a meter.

Special Fittings and Accessories

To accommodate meter installations, special fittings and accessories are available. Metal meter setters, re-setters, horns and meter yokes are available for holding the service pipe in proper alignment to the E-Series Ultrasonic Plus meter and lay length spacing. Metal setters and meter yokes can provide electrical continuity to protect meters and consumers from electrical shocks.

Pre-Installation

Before you begin an installation, take these considerations into account:

- Inspect the piping around the E-Series Ultrasonic Plus meter for suitable conditions. The service line, valves, connections and meter must be watertight. Repair the piping system if pipes are corroded or damaged.
- Install the meter in the pipeline in a horizontal or vertical position so that the flow arrow on the meter housing points in the same direction as water flow. Registration should be upright and protected from damage, freezing and tampering.
- Position the meter so it is accessible for installation, removal and reading.
- Verify that a suitable, electrical grounding wire is properly attached to the upstream and downstream pipe connections of the meter. The grounding wire provides an alternative path for any electrical current that may exist across the opening in the line.
- The line opening for the meter should match the lay length of the meter, allowing slight additional space for coupling gaskets. The inlet and outlet sides of the meter should be axially aligned to the pipe.
- The installed meter must not be an obstacle or a hazard to the customer or interfere with public safety.

⚠ CAUTION

- **DO NOT ATTEMPT TO USE ANY METER AS A LEVER OR CROWBAR TO STRAIGHTEN A MISALIGNED METER POSITION. THIS COULD DAMAGE THE METER.**
- **DO NOT ATTEMPT TO INSTALL A METER INTO AN OPENING THAT IS TOO LONG BY FORCING THE PIPING INTO PLACE WITH THE METER COUPLING NUTS. THIS WILL CAUSE SERIOUS DAMAGE TO THE THREADED ENDS OF THE METER AND HOUSING.**
- **TO AVOID POTENTIAL PROBLEMS, CORRECT ANY IRREGULARITIES IN PIPE SPACING AND MISALIGNMENT BEFORE PLACING THE METER INTO ITS POSITION.**

NOTE: 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.

Meter Installation

Follow these steps to install the E-Series Ultrasonic Plus meter:

1. Begin at this step if cutting in for new service. If cutting in is not required, begin at **step 2**.
 - Close the curb (shutoff) valve to relieve water pressure in the line before starting the cutting operation. Be sure to use a high-quality upstream shutoff valve with a low pressure drop.
 - Flush the pipe to clear chips, pipe dope or other plumbing residue.
2. Close the meter inlet-side valve.
3. Open a faucet and wait until water flow stops to depressurize the system. Do not remove the existing meter until the water flow stops.

WARNING

DEPRESSURIZE THE LINE BEFORE STARTING ANY DISASSEMBLY OPERATION. REMOVING A METER THAT IS UNDER LINE PRESSURE CAN RESULT IN COMPONENTS BECOMING PROJECTILES, CAPABLE OF CAUSING PERSONAL INJURY.

4. Check the service valves and make necessary repairs to the curb (shutoff) valve or inlet side valve, if necessary.
5. Before installing or removing a meter, close the outlet-side valve to relieve pressure. Protect the area around the meter against potential spills or leaks that could occur.
6. To replace an existing meter continue with **step 7**. To install a new meter skip to **step 9**.
7. Loosen the meter couplings or flange bolts and remove the existing meter and the old gaskets in the coupling nuts. We recommend replacing the old gaskets with the provided thick rubber gaskets (PN: 34819-038).
8. Clean the coupling nuts or flange bolts, removing any pipe dope, old gasket material, or dirt from the threads or flange bolts.
9. Check the existing position for proper alignment and spacing. Correct any misalignment or spacing issues.
10. Place the connection gaskets inside the connection coupling nuts.
11. Install the meter in the pipeline in a horizontal or vertical position with the **flow arrow on the meter pointing in the direction of flow**. Registration should be upright.

Start the coupling nuts at the threaded meter ends. Verify that the nuts are properly aligned to avoid damage to the meter ends. An effective method for starting a coupling nut is:

- Position the nut squarely against the meter spud end.
 - Turn the nut counterclockwise (left) while holding the nut against the meter spud end. When the first threads on both the nut and the spud end coincide, you will hear a slight click and feel the nut move into the starting position.
 - Turn the nut clockwise (right) until it is hand-tight.
 - With an open-end wrench, apply a partial turn. Do not over tighten.
12. After the meter is installed, slowly open the inlet shutoff valve until the meter is full of water and make sure there are no leaks. (The more flow you allow through the meter, appropriate for the meter size, the better.)
 13. Slowly open the outlet valve until air is out of the meter and service line.
 14. Open a service valve downstream of the meter and verify that no foreign debris in the water obstructs the operation of the system.
 15. Check the read on the meter to make sure it is registering a positive number. If it is not, make sure the meter is installed with the **flow arrow on the meter pointing in the direction of flow**.
 - The meter is shipped in Storage mode so that customers do not experience alarms during shipment or installation. In general, a meter may take up to 2 minutes to begin measurement once the meter senses a full pipe.
 - The meter requires that the pipe is cleared of air and filled with water. If the customer is attempting to purge the meter at low flow rates, it would likely be more difficult and take longer.
 16. When the meter starts recording positive flow, note the meter reading for your records.

ENDPOINT INSTALLATION AND VALVE ACTIVATION

NOTE: ORION Cellular endpoints connected to an E-Series Ultrasonic Plus meter must be firmware version 2.0 or higher.

ORION Cellular endpoints must be installed, activated and provisioned in BEACON for the meter valve to work correctly. Follow endpoint installation and activation directions below. For endpoint provisioning, refer to BEACON Help.

1. Connect the Endpoint

NOTE: This step can be done before or as part of the endpoint installation step.

Connect the ORION Cellular endpoint to the E-Series Ultrasonic Plus meter to complete the assembly.

The meter is available with an inline wired lead connector (Twist Tight® or Nicor®) for easy connection to the endpoint.

2. Install the Endpoint

Choose an appropriate location within the limits of the endpoint/meter connector harness.

- Indoor installation of the endpoint is **recommended**. Mount the endpoint indoors in the floor joist, near an outside wall, and away from large metal objects.
- Outdoor installation of the endpoint is acceptable and may be required where signal strength does not support an indoor installation.
- Pit Installation: Mounting through a non-metal pit lid is **required**.

3. Activate the Endpoint

Activation depends on the endpoint radio mode. Endpoints are shipped with the radio in **Pause** (soft sleep) or **Stop** (hard sleep) mode.

Smart Activation for Endpoints in **Pause** Mode

With Smart Activation, water consumption automatically starts an endpoint in Pause mode. No field programming or special tools are required. After installation, the endpoint radio “wakes up” and begins broadcasting data when the meter encoder detects enough water usage from the register. The amount of consumption required depends on encoder output and meter size. For the E-Series Ultrasonic Plus meter, 0.05 gallons or 0.005 ft³ of water is required. Activation of the endpoint can take up to 15 minutes to complete.

Activation for Endpoints in **Stop** (or **Pause**) Mode

Endpoints shipped by air are in Stop mode and must be manually activated via infrared (IR) communication. Endpoints in Pause mode can also be manually activated via IR. You can activate the endpoint via IR in two ways:

- Use the Badger Meter **IR Communication Device** (Figure 3) to activate an endpoint in Stop or Pause mode and verify the encoder connection. Instructions are included with the device. For a short video about how to use the device, go to <https://youtu.be/0tWMWeiH3xA>.
- Use the Product Configuration Utility (PCU) software with an ORION handheld device or mobile reading system. The software can also identify the endpoint radio mode (Pause, Stop, Active). For more information, see the *Product Configuration Utility for E-Series Ultrasonic Plus software* user manual at badgermeter.com.



Figure 3: IR Communication Device
(PN: 68891-001)

IMPORTANT

Valve Activation

Once the endpoint is activated, the following process occurs automatically:

1. Endpoint senses and activates the valve on the E-Series Ultrasonic Plus meter. The endpoint then captures the initial meter reading and valve information.
2. Endpoint begins the network registration process. BEACON assigns multiple daily call-in times to the endpoint as part of this process. For weekdays, the endpoint call-in schedule is based on the configurable time slots as defined in BEACON Utility Settings. (See "[BEACON First Time Setup](#)" on page 8 for more information.) The endpoint obtains a current encoder read every 15 minutes.
3. Approximately 10 seconds after activation, the valve LED starts blinking once per minute.
Green = Open. **Red** = Restricted. **Amber** = Partially Restricted.

NOTE: E-Series Ultrasonic Plus meters become accessible on the Monitor page after endpoints are provisioned in BEACON. For complete ORION endpoint installation guidelines and instructions, see the *ORION Water Endpoints Installation Manual*, available in the Resource Library at badgermeter.com.

4. Confirm Installation

Before leaving the installation site, you can confirm endpoint activation with any of these:

1. Check the endpoint activation status with the ORION Endpoint Status tool. See the *ORION Water Endpoints Installation Manual* for more information.
2. Use the Product Configuration Utility (PCU) software to confirm activation via IR. Refer to the *Product Configuration Utility for E-Series Ultrasonic Plus* software user manual for more information.
3. When provisioned, check endpoint signal strength in BEACON. See [Figure 16 on page 13](#).

NOTE: Endpoints automatically transition to the appropriate network.

BEACON FIRST TIME SETUP

Perform these steps to make sure the integrated valve information is accessible in BEACON.

NOTE: Do these steps **one time**, regardless of the number of E-Series Ultrasonic Plus meters you have installed or will install. The Utility Administrator should perform the steps *after* the endpoints are provisioned in BEACON. The Settings can be changed, as necessary.

1. In BEACON, go to **Utility Settings** > **General Settings** ([Figure 4](#)).

Valve Setup

2. Under **General Settings**, perform the following steps for valve setup:
 - a. Scroll down to *Valve Settings* to see the default *Valve Restricted Flow Reasons* ([Figure 5](#)). The reasons will display on the BEACON **Valve Position** window if you schedule a valve position change. See an example at "[Scheduling Valve Position Change](#)" on page 14.

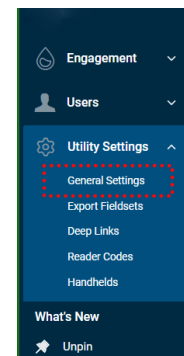


Figure 4: BEACON Utility Settings > General Settings

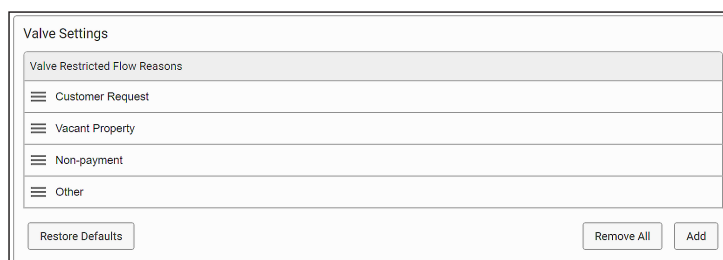


Figure 5: Default valve restricted flow reasons

To add a reason, click the **Add** button. In the blank field that displays, type the reason you want to add, then click **Add** again to confirm.

To remove a reason, select the reason and click the **red X** that appears in the row.

NOTE: If you do not want to use the restricted flow reasons, click **Remove All**. When you remove all, the reasons will not display on the BEACON **Valve Position** window. To return to the original settings/reasons, click **Restore Defaults** (Figure 6) and then click **Yes** when asked to confirm.

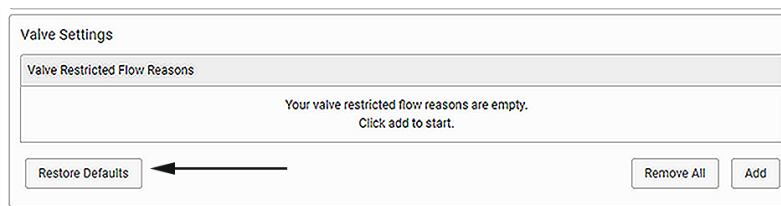
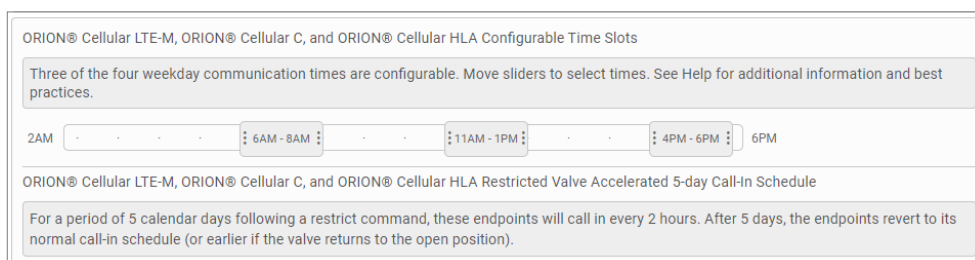


Figure 6: Restore Defaults

- b. Go to *ORION Cellular ... Configurable Time Slots* (Figure 7).



Monitor Page Filters

Meters

☐ Battery Level

☒ Endpoint Firmware Version

☐ Fluid Type

☒ Model

☒ Service Type

☐ Cellular Technology

☒ Endpoint Status

☒ Has Endpoint

☐ Pit Type

☒ Signal Strength

☒ Compound

☒ Endpoint Type

☒ Has Valve

☒ Read Method

☒ Size

☒ Endpoint Connector

☒ Exceptions

☐ Manufacturer

☒ Resolution

Valves

☒ Current Position

☒ Restricted Flow Reason

☒ Exceptions

☒ Pending Movement

☒ Recent Movement

Figure 9: Valve filters

3. Click **Update Utility** at the bottom of the page to save all your changes. Make sure you receive the **Success** message.

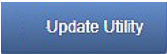


Figure 10: Update Utility to save changes

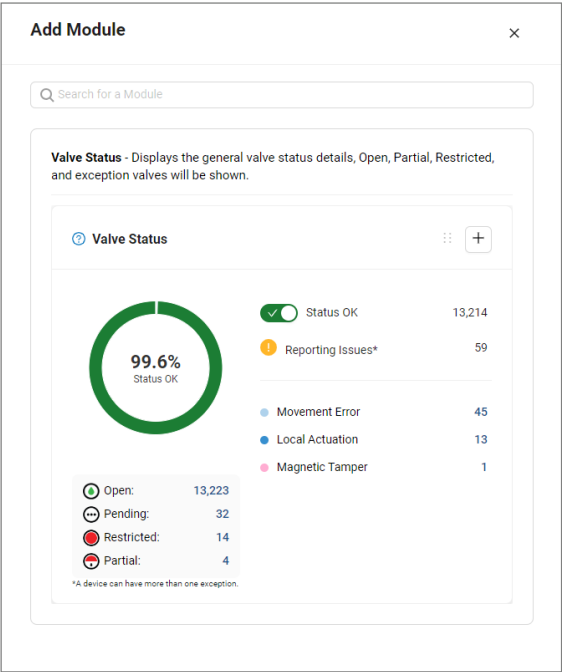
IMPORTANT

Click **Update Utility** to save any change you make under **General Settings**.

4. Go to the **At A Glance** tab and select **+Add Module** on the top right side of the screen.
5. In the window that opens, click the plus sign **+** to add **Valve Status to the At A Glance page**. Then click the **X** to close the **Add Module** window.

The *Valve Status* module is now displayed on the *At A Glance* page.

First time setup is complete.



INTEGRATED VALVE

The valve position LED (Figure 12) provides visual cues as green, red and amber lights to indicate valve position and status.

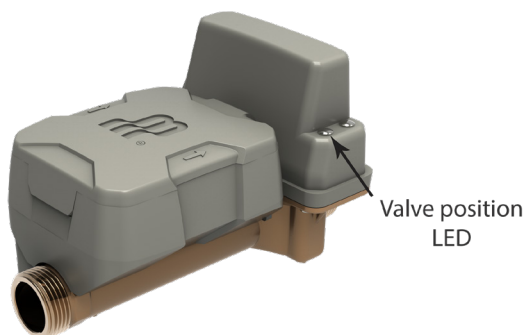


Figure 12: Valve position LED

Valve Positions

Status	Valve Position	LED Color	LED Indicator
Active	Open	Green	Blinks once per minute
Active	Partial	Amber	Blinks once per minute
Active	Restricted	Red	Blinks once per minute
Valve opening	Moving	Green	Blinks continuously until the valve movement stops
Valve closing	Moving	Red	Blinks continuously until the valve movement stops
Obstacle/Error on Restriction	Restricting	Amber	Steady (up to a minute), then blinks once per minute
Storage	Open	--	Valve does not operate in Storage mode

The valve is OPEN and in Storage mode when the meter is shipped from the factory. It automatically transitions to Active status when the endpoint is activated. Active valves can be moved into three different positions:

- OPEN Normal water flow
- PARTIAL Reduced water flow (1.0 gpm \pm 0.5 gpm*)
- RESTRICTED Restricted water flow (0.125 gpm or less* for humanitarian, life-sustaining measures)

*Typical flow based on 60 psi at the meter

Valve Routine Maintenance

To make sure it is working properly, the valve cycles once every 30 days, automatically, at about 2 a.m. local time. One cycle is two consecutive actuations, from—and back to—the valve starting position.

Example: Open (starting position) > Restricted > Open.

In BEACON, the maintenance cycle date/time is displayed as *Last Maintenance Cycle* on the expanded meter card, under the **Valve** tab (Figure 13).

NOTE: The valve will not actuate if it detects any flow. It will make three more attempts (2:15, 2:30, 2:45 a.m.) and if there is still flow, the valve will re-attempt the following day at the same time.

IMPORTANT

The valve uses a lithium battery that supports a minimum of 480 actuations or 240 cycles (on average, one cycle per month for 20 years). Each valve actuation affects battery life, therefore routine maintenance is not performed during any month the valve is actuated by the utility.

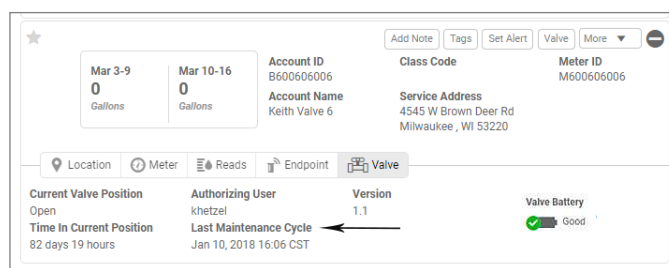


Figure 13: Last Maintenance Cycle date

BEACON Monitor Page

BEACON monitors, updates and displays information about each E-Series Ultrasonic Plus meter. Each card on the **Monitor** page in BEACON corresponds to a meter in the Utility portfolio. The card is a resource for meter account information, including meter ID, account ID, name and address.

Click the plus sign (+) in the upper right corner to expand the card. Expanding the card reveals tabs with additional account information: **Location**, **Meter**, **Reads**, **Endpoint** and **Valve**. Select a tab to see information specific to the tab label. In [Figure 14*](#), the **Endpoint** tab is selected.

*The endpoint must be active and provisioned in BEACON and the Utility Settings must be configured. Complete information is available in [BEACON Help](#).

Star icon

Mar 3-9 0 Gallons

Mar 10-16 0 Gallons

Account ID: B300303003

Account Name: Brian SQA

Service Address: 4545 W Brown Deer Rd, Milwaukee, WI 53220

Class Code

Meter ID: M300303003

Buttons: Add Note, Tags, Set Alert, Valve, More

Click to collapse or expand the card

Location | Meter | Reads | **Endpoint** | Valve

Previous Comm: Mar 15, 2018 10:45 CDT

Next Comm: May 8, 2018 10:45 CDT

Register Interface Encoder

Endpoint S/N: 113030303

Endpoint Install Date: Mar 15, 2018 23:59 CDT

Status: Active

Signal Strength: (()) Good

Firmware Version: 1.5.555

Battery: Good

Figure 14: Sample expanded meter card on BEACON Monitor page

Next Endpoint Communication

With the **Endpoint** tab selected, you can see endpoint status information.

The *Next Comm* field displays the next endpoint call-in time, which includes configured time slots, accelerated endpoint call-in times when the valve is restricted, and “off-peak” and weekend endpoint call-in times that are scheduled in BEACON. See [“BEACON First Time Setup” on page 8](#) for more information.

The **Endpoint** tab also displays the endpoint *Signal Strength*, which is important for actuating the valve.

Actuation History

With the **Valve** tab selected, you can see information specific to the valve, including the actuation history. On the expanded meter card, click the **Valve** tab, then click **Actuation History** to expand the view and see actuation dates, times and positions ([Figure 15](#)).

Location | Meter | Reads | Endpoint | **Valve** | Sensors

Current Valve Position: Open

Valve S/N: 50007703

Current Install Date: Jan 5, 2023 9:38 CST

Authorizing User

Last Maintenance Cycle: Mar 15, 2024 21:00 CDT

Version: 4.2.240

Valve Battery: Good

Actuation History

Date Actuated	Authorizing User	Status	Position
Mar 15, 2024 21:00 CDT	Maintenance Cycle	Successful	Open
Feb 13, 2024 20:00 CST	Maintenance Cycle	Successful	Open
Jan 13, 2024 20:00 CST	Maintenance Cycle	Successful	Open
Dec 13, 2023 20:00 CST	Maintenance Cycle	Successful	Open
Nov 12, 2023 20:00 CST	Maintenance Cycle	Successful	Open

Showing 1 to 5 of 15 entries

Previous 1 2 3 Next

Figure 15: Actuation History

ACTUATING INTEGRATED VALVE IN BEACON

Best Practice
Actuate the valve using BEACON. Make sure the endpoint is connected to the meter and activated.

IMPORTANT
Make sure to complete valve setup in BEACON Utility Settings. See "BEACON First Time Setup" on page 8 for details.

NOTE: To schedule multiple valves for actuation, see "Batch Actuation" on page 16.

Scheduling Actuation

In BEACON, you can schedule valve actuation for

- the next endpoint communication time, or
- a specific date

IMPORTANT
Before scheduling valve actuation, with the **Endpoint** tab selected, check the signal strength of the endpoint connected to the meter. You should have good signal strength to actuate the valve (Figure 16).

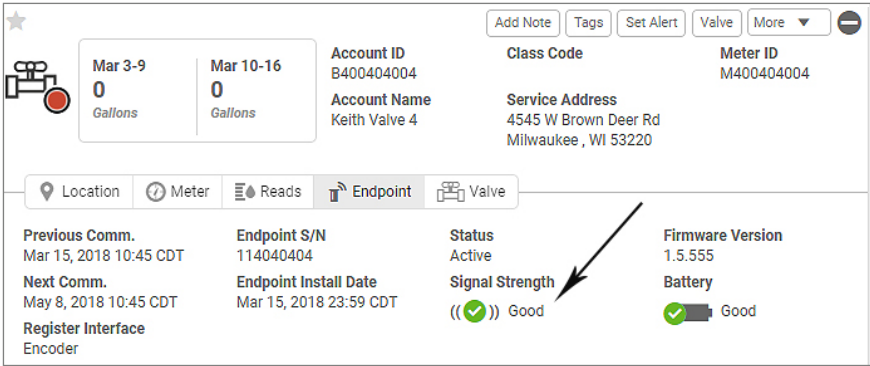


Figure 16: Endpoint signal strength - Endpoint tab on expanded meter card

Scheduling Valve Position Change

NOTE: Scheduling a valve to **Open** can only be set for the next communication.

1. On the BEACON Monitor page, locate the desired account. You can use the filters on the left side of the screen, enter the Account ID, Name, or Meter ID into the Search field, or scroll to find the desired account meter card.
2. On the account meter card, click the **Valve** button (Figure 17) to open the *Schedule Valve Actuation* popup window (Figure 18).
3. Schedule valve position change.

To schedule actuation for the next communication:

- a. Click to select the desired new valve position.
- b. Select a Restricted Flow Reason* if you are restricting flow.
- c. Click **On Next Communication**. Then click **Next**.
- d. On the confirmation window that opens, click **Confirm**. The valve will move at the next communication date/time shown at the bottom of the popup window.

To schedule actuation for a specific date:

NOTE: This option only applies to restricting a valve.

- a. Click to select the desired new valve position.
- b. Select Restricted Flow Reason*.
- c. Click **Specific Date** and click the date field. Choose the desired weekday using the calendar that displays. Then click **Next**.
- d. On the confirmation window that opens, click **Confirm**.

The valve will move on the selected date shown at the bottom of the window, during the first configurable time slot as defined in BEACON Utility Settings. The alert bar on the meter card (Figure 19) shows the scheduled valve actuation message.

*Restricted Flow Reasons display as configured in Utility Settings. See "BEACON First Time Setup" on page 8 for details.

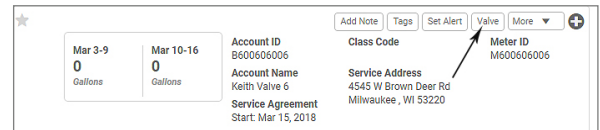


Figure 17: Valve button on meter card

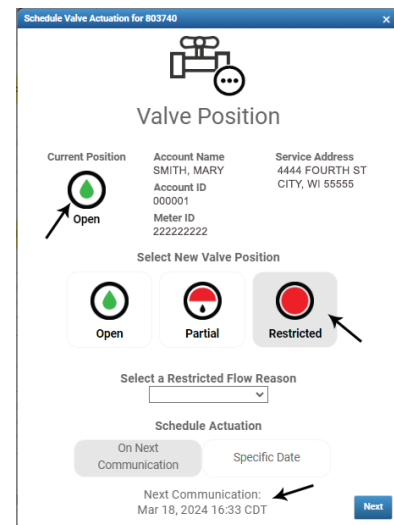


Figure 18: Schedule Valve Actuation popup

Canceling Scheduled Valve Position Change

1. On the Monitor page in BEACON, click **View Details** in the meter card alert bar for the valve that is scheduled to change (Figure 19).



Figure 19: Meter card alert bar

2. In the popup window (Figure 20) click **Cancel Position Change**.

The valve position change is canceled and the message is removed from the alert bar on the meter card.

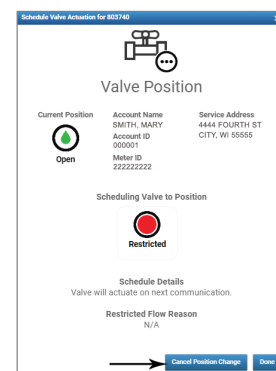


Figure 20: Cancel scheduled change

After Actuation

- For five (5) calendar days after the valve completes a *Restricted* command, the endpoint communication accelerates to once every 2 hours. See "[Accelerated Endpoint Call-In](#)" below. When the valve is opened, the call-in schedule reverts back to normal.
- The daily endpoint check-in time changes after a scheduled valve actuation. Select the **Endpoint** tab on the expanded meter card to see the *Next Comm* (next endpoint communication) time.

The screenshot shows a web interface for a meter card. At the top, there are two date ranges: 'Mar 3-9' and 'Mar 10-16', both showing '0 Gallons'. To the right, account details include 'Account ID: B300303003', 'Account Name: Brian SQA', 'Class Code', 'Service Address: 4545 W Brown Deer Rd, Milwaukee, WI 53220', and 'Meter ID: M300303003'. Below this is a navigation bar with tabs: 'Location', 'Meter', 'Reads', 'Endpoint' (selected), and 'Valve'. The 'Endpoint' tab displays several fields: 'Previous Comm.' (May 8, 2020 10:45 CDT), 'Next Comm.' (May 9, 2020 12:00 CDT), 'Endpoint S/N' (113030303), 'Endpoint Install Date' (Mar 15, 2020 23:59 CDT), 'Status' (Active), 'Signal Strength' (((✓)) Good), 'Firmware Version' (1.5.555), and 'Battery' (Good). A red arrow points to the 'Next Comm.' field.

Figure 21: Sample expanded meter card - Next Comm

IMPORTANT

For newly opened valves, check the alert bar on the meter card for any Post Open Flow Action alerts that might indicate an unexpected flow condition.

Accelerated Endpoint Call-In

After a *Restricted* command, the endpoint communication changes temporarily.

Restricted Valves

After restriction, the endpoint will call in **every 2 hours for five (5) calendar days**. The accelerated call-in schedule will occur on even hours regardless of when the valve was restricted. The call-in will occur within 1...5 minutes of the top of the hour.

Example of accelerated endpoint call-in times after valve restriction:

	Endpoint Call-in Times												
Day 1	Valve RESTRICTED at 8 am					10 am	12 pm	2 pm	4 pm	6 pm	8 pm	10 pm	
Day 2...5	12 am	2 am	4 am	6 am	8 am	10 am	12 pm	2 pm	4 pm	6 pm	8 pm	10 pm	
Day 6	Endpoint resumes the normal call-in schedule (4x each weekday, 1x each weekend day) on Day 6 (or earlier if valve is opened)												

During the first five days, this accelerated call-in schedule provides multiple opportunities each day to open the valve quickly, if needed. After five days, the endpoint reverts to the normal call-in schedule.

Opened Valves

After a scheduled valve opening, the endpoint reverts to the configurable time slots that were selected as the normal call-in schedule (see "[BEACON First Time Setup](#)" on page 8).

Batch Actuation

To schedule multiple valves to actuate, you can perform a batch actuation. On the BEACON Monitor page, you can search for specific valves and create a filter to schedule batch position changes. You can also cancel scheduled actuations for multiple valves. See instructions below.

When scheduling batch actuation, remember the following criteria:

- All the selected valves must move to the same position.
- If you schedule valves to *Restricted*, the reason for restriction applies to *all* valves in the batch.
- If you schedule actuation for a specific date, the actuation date applies to *all* valves in the batch. Each valve in the batch will actuate during the first configurable time slot (as defined in BEACON Utility Settings).
- If you schedule actuation for the NEXT COMMUNICATION, each valve in the batch will actuate at its own unique endpoint call-in time.
- Check the meter card alert bar to see any pending valve actuations.

Scheduling Batch Actuation

1. On the Monitor page, create a Filter to select multiple valves for batch actuation.
2. Select **Actuate Valves** from the **Actions** drop-down menu on the top right of the Monitor page ([Figure 22](#)).

The *Schedule Batch Valve Actuation* window opens for the meters in you selected ([Figure 23](#)).

3. In the *Schedule Batch Valve Actuation* window,
 - a. confirm the number of valves selected (bottom left of the window)
 - b. select the symbol for the new valve position.
 - c. choose "On Next Communication" or pick a "Specific Date."
 - d. select a Restricted Flow Reason*, if applicable.

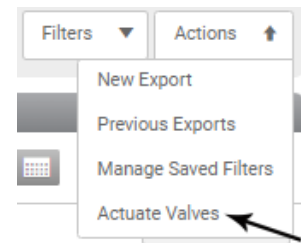


Figure 22: Actions drop-down menu

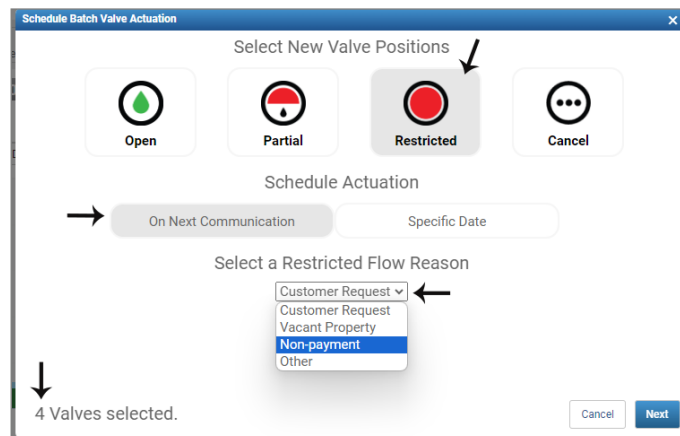


Figure 23: Schedule Batch Valve Actuation screen

*Restricted Flow Reasons will display if configured in Utility Settings. See ["BEACON First Time Setup"](#) on [page 8](#) for details.

- Click **Next**.

The confirmation window displays the valve actuation details you selected ([Figure 24](#)).

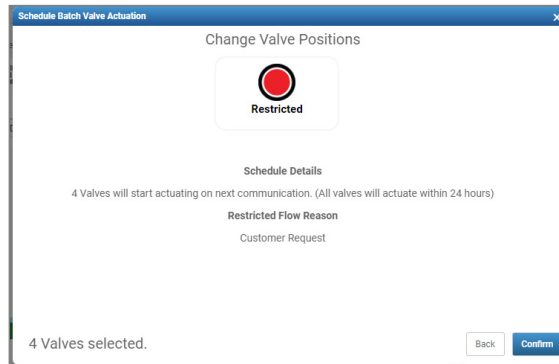


Figure 24: Valve actuation confirmation screen

- Click **Confirm**. The window closes.

On the Monitor page, the valve actuation message displays in the alert bar for the valves scheduled to change ([Figure 25](#)).

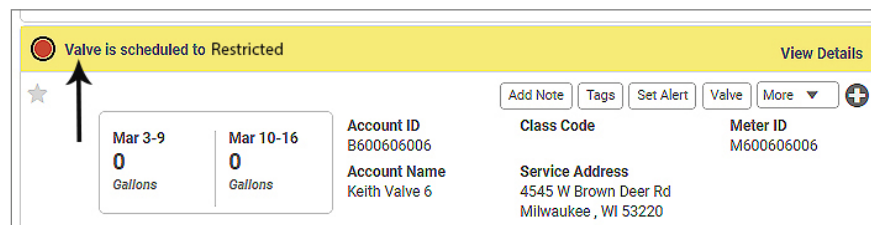


Figure 25: Valve scheduled to Restricted


NOTE: To cancel the valve actuation, see ["Canceling Batch Actuation" on page 18](#).

Batch Actuation: Partial to Restricted Position

For batch actuation, you cannot change the valve position directly from Partial to Restricted, or Restricted to Partial. You must first change the valve position to **Open** in order to move the valve out of Partial position or into Partial position.

Canceling Batch Actuation

To cancel a scheduled batch actuation before the scheduled date, follow these steps.

1. On the Monitor page, select the meters you scheduled for batch actuation.
2. Select **Actuate Valves** from the **Actions** drop-down menu on the top right of the BEACON Monitor page (Figure 26) to open the *Schedule Batch Valve Actuation* window.
3. At the top of the window, click  to cancel the pending batch actuation (Figure 27). Then click **Next**.

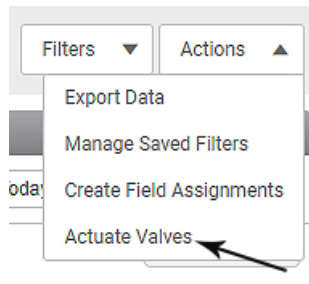


Figure 26: Actuate valves

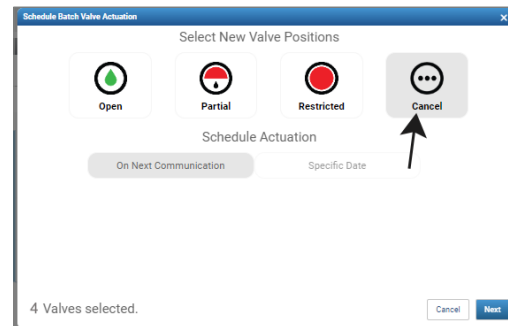


Figure 27: Select Cancel

4. The confirmation window opens as shown in Figure 28. Click **Confirm**.

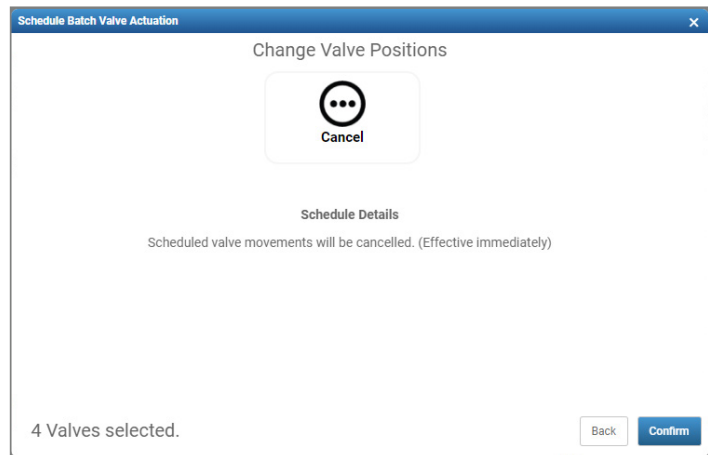


Figure 28: Confirm cancellation

Actuation is canceled immediately and the message is removed from the alert bar on the meter card(s).

VALVE CONDITIONS

The following chart describes the possible conditions specific to the integrated valve that may be triggered. Exceptions are communicated to BEACON when connected to an ORION Cellular endpoint.

Integrated Valve Exceptions	Description
Command Failed	Endpoint sends message saying it cannot complete command. Valve may have reached the desired position, but settings did not update.
Local Actuation	Valve actuation takes place at the meter site via IR at the valve or endpoint IR port.
Low Battery	Valve battery life is low. Approximately 1 year of battery life remains.
Movement Delay	Scheduled valve movement is delayed. Occurs when excessive flow through the meter delays the scheduled valve change time. Exception clears automatically when scheduled valve change occurs.
Magnetic Tamper	Valve detects a strong magnetic field. Could cause malfunction by disrupting the positional sensing feature. Requires attention at meter site to move/remove the magnet.
Movement Error	Valve did not successfully reach desired position. May require attention at meter site.
Replace Meter	Battery life, based on calculated valve usage, is nearing end of life. Approximately 6 months (or less) of battery life remains. The valve remains in its current position if the battery reaches end of life.
Valve Tamper	Valve disconnected from the endpoint. Requires attention at meter site to resolve.

NOTE: Additional information about the integrated valve is available online in [BEACON Help](#).

METER OPERATIONS

Display

E-Series Ultrasonic Plus meters use a nine-digit Liquid Crystal Display (LCD) to show consumption, flow rate and alarm information.

Status Indicators

Indicators and alarms illuminate when the condition is active, and dim when the condition is eliminated.

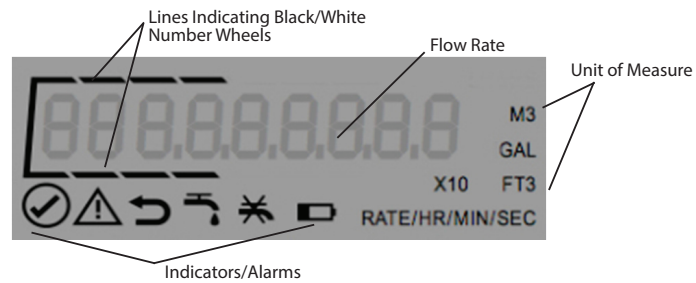


Figure 29: E-Series Ultrasonic Plus Meter LCD

All E-Series Ultrasonic Plus meters are delivered in Storage mode so that a meter alarm is not triggered. During Storage mode, the empty pipe shows on the LCD as an error message, but it will not trigger a meter alarm. The meter needs to sense a full pipe for 24 hours for the meter to go from Storage mode to normal operation. If installed when the meter is still in Storage mode, the meter will function as expected with the addition of also displaying “err” on the flow rate screen. The meter displays consumption and, if connected to an ORION Cellular endpoint, sends a reading to the endpoint. When the meter is in normal operation, the meter alarm displays immediately upon detecting the empty pipe condition. The alarm clears immediately after the condition is corrected and the pipe is full. Systems that support the additional alarm conditions will be notified that an empty pipe condition has occurred.

The chart below describes meter conditions that may be triggered and communicated when connected to an ORION Cellular endpoint.

Meter Status Indicator	Symbol	Description
Meter functioning correctly	✓	Meter operating correctly.
Meter alarm	⚠	<p>Meter alarm and consumption data are sent to the endpoint. Several potential conditions may exist, including:</p> <ul style="list-style-type: none"> Empty pipe: “err” displays on LCD. Last known good read is displayed. Alarm clears when pipe is filled. Temperature limits exceeded: meter continues to operate but outside specified range. Alarm clears after 60 days unless alarm condition continues. Maximum flow rate is exceeded. No consumption is displayed until back within specified flow range. Both the meter functioning correctly and the meter alarm are active. Alarms clear after 60 days unless alarm condition continues. Other meter or sensor issue: interference of ultrasonic signal. Meter continues to operate unless sensors are damaged. Alarm clears after 60 days unless alarm condition continues.
Reverse flow	↩	The meter detects reverse flow, triggers the reverse flow alarm symbol on the E-Series display and sends alarm message to the endpoint. The alarm remains active for 60 days. The alarm automatically clears after 60 days if the condition has not recurred.
Suspected leak	🚰	Meter detects 24 hours without one 15-minute interval of no flow and sends alarm message to the endpoint. The alarm clears automatically when a 15-minute no-flow interval occurs.
30 day no usage	🚰	No measured flow in past 30 days. Meter detects 30 day no usage and sends alarm to the endpoint. The alarm automatically clears once flow occurs.
End of life battery indicator	🔋	Indicated battery life based on pre-calculated consumption. Alarm is activated after 19 years and does not clear. Meter sends alarm message to the endpoint.

Activating the Display

The display illuminates when the register lid is opened. After a period of time, the display will revert to sleep mode. You can alternate the display between total flow and rate of flow mode by touching the optical display switch or by closing and opening the meter lid. The optical switch is located just below the LCD on the left side of the register face ([Figure 30](#)).

Unit of Measure

The unit of measure and resolution are factory programmed. Options include gallons, cubic feet and cubic meters.

Totalized flow displays up to 10 million gallons with a resolution of 0.01 gallons, one million cubic feet with a resolution of 0.001 cubic feet, or 100 thousand cubic meters with a resolution of 0.0001 cubic meters.

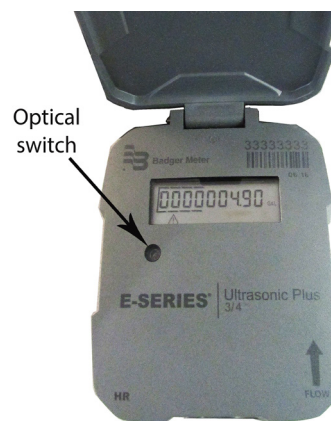


Figure 30: Lid open showing optical display switch

Rate of Flow

The rate of flow is factory programmed for either gallons per minute or meters cubed per hour, depending on the unit of measure selected. The LCD displays both the unit of measure and rate of flow. The rate of flow display also serves as the flow finder indicator. The rate of flow display is shown without leading zeros. When rate of flow is displayed it is updated every two seconds.

Flow Direction

The direction of water flow is noted on the face of the electronics housing and cast into the meter housing.

Consumption

Consumption is displayed with all nine digits, leading zeroes and a decimal point. The displayed value is the sum of the forward flow minus the reverse flow. This display also includes indicator lines above and below the digits to provide the electronic equivalent of the white and black number wheels on mechanical registers. The following examples show typical displays for three different units of measure:

Gallons		Cubic Feet		Cubic Meters	
Meter reading to the nearest?	100th gallon	Meter reading to the nearest?	1000th ft³	Meter reading to the nearest?	10000th m³
	10th gallon		100th ft³		1000th m³
	1 gallon		10th ft³		100th m³
	10 gallons		1 ft³		10th m³
	100 gallons		10 ft³		1 m³
Typical billing units	→ 1000 gallons	Typical billing units	→ 100 ft³	Typical billing units	→ 1 m³

SPECIFICATIONS

E-Series Ultrasonic Plus Meter	5/8 in. x 3/4 in. (15 mm)	3/4 in. (20 mm)
Normal Test Flow Limits	0.1...25 gpm (0.02...5.68 m ³ /hr)	0.1...32 gpm (0.02...7.27 m ³ /hr)
Minimum Test Flow Limits	0.05 gpm (0.014 m ³ /hr)	0.05 gpm (0.014 m ³ /hr)
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 @ 3.41 m ³ /hr)	2.8 psi at 15 gpm (0.19 bar @ 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: ±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	Consumption (up to nine digits) Rate of flow Alarms Unit of measure factory programmed for gallons, cubic feet and cubic meters	
Register Capacity	10,000,000 gallons 1,000,000 cubic feet 100,000 cubic meters	
Totalization Display Resolution	Gallons: 0.XX Cubic feet: 0.XXX Cubic meters: 0.XXXX	
Meter Battery	3.6-volt lithium thionyl chloride battery is fully encapsulated within the register housing and is not replaceable; 20-year battery life	
Integrated 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

MAINTENANCE

Badger Meter E-Series Ultrasonic Plus meters are designed and manufactured to provide long-term service with no maintenance. The enclosure, which includes the electronic meter ultrasonic sensors, battery and display, is completely potted, permanently sealed, and non-removable.

TROUBLESHOOTING

Technical Support

Contact Technical Support, 800-616-3837, if additional assistance is required.

SMART WATER IS BADGER METER

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