E-Series®
Ultrasonic Flow Meters

E-Series G2® Ultrasonic Meter

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

Badger Meter

ESM-UM-03099-EN-02 (May 2021)

User Manual

CONTENTS

SCOPE OF THIS MANUAL

This manual contains installation and operation procedures for the Badger Meter® next generation E-Series G2® 5/8 x 3/4 inch Ultrasonic meters. Proper performance and reliability of the product depend upon installation in accordance with these instructions.

ABOUT THE E-SERIES ULTRASONIC METER

The E-Series 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.

Meters 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 that occurs when the flow sensors are not fully submerged.

Operation

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 display total volume and unit of measure, rate of flow, alarm and operating mode, and firmware version. E-Series Ultrasonic meters connected to ORION® endpoints also display temperature data and water pressure data (when equipped with an optional integrated pressure sensor).

Applications

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

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

Construction

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

REQUIREMENTS

IMPORTANT

For proper handling of the higher reading resolution and the extended status indicator capabilities of the E-Series Ultrasonic meter, the following are recommended to support the full capabilities of the meter.

To support *temperature* and *pressure* fields, use the following:

- ORION® Cellular LTE-M or LTE-MS, firmware version 1.2.295 or newer
- ORION Cellular LTE endpoints, firmware version 1.10.1193 or newer
- BEACON® Advanced Metering Analytics (AMA) software suite

To support *maximum flow rate measurement*, use the following:

- ORION® Cellular LTE-M or LTE-MS, firmware version 2.0.445 or newer
- BEACON® Advanced Metering Analytics (AMA) software suite

For assistance, contact Badger Meter Technical Support at 800-616-3837.

BEACON FIRST TIME SETUP

For meters connected to ORION Cellular LTE-M, LTE-MS or LTE endpoints, perform these steps to make sure the E-Series Ultrasonic meter sensor information is accessible in BEACON.

1. In BEACON, select the **Assets** tab. Then select **Utility Settings** from the menu on the left.

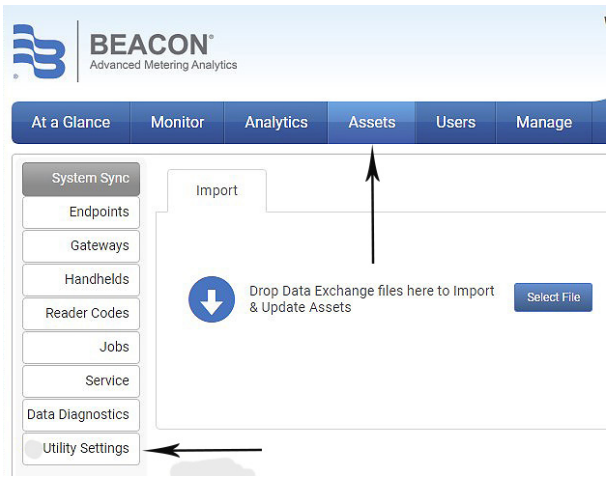


Figure 1: BEACON Assets

2. On the Utility Settings page, scroll down to the *Monitor Page Filters* section and find the *Sensors* section.

Figure 2: Water Pressure and Temperature sensors selection

3. Select the **Water Pressure** and/or **Water Temperature** check boxes to turn on reporting for the temperature and/or pressure meter sensors.
4. Select **Update Utility** at the bottom of the page to save your changes.

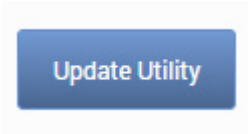


Figure 3: Save changes

5. Select the **At A Glance** tab and click **Add/Remove** on the right side of the page below the main tabs menu.
6. On the window that opens, select **Add** for *Water Pressure Health* and *Water Temperature Health*. Then select **Done**. *Water Pressure Health* and *Water Temperature Health* modules now display on the *At A Glance* page.

   Setup is complete.

SAFETY INFORMATION

The installation of the E-Series Ultrasonic meter must comply with all applicable federal, state and local rules, regulations and codes. Failure to read and follow these instructions can lead to misapplication or misuse of the meter, resulting in personal injury and damage to equipment.

PRODUCT UNPACKING AND INSPECTION

To avoid damage in transit, E-Series Ultrasonic meters are shipped to the customer in special shipping containers. Upon receipt of shipment, be sure to follow these unpacking and inspection procedures:

If damage to a shipping container is evident upon receipt of a meter, request that a representative of the carrier be present when the meter is unpacked.

- Carefully open the shipping container, following any instructions that may be marked on the container. Remove all cushioning material surrounding the meter and carefully lift the meter from the container. Keep the container and all packing material for possible use in reshipment or storage.
- Visually inspect the meter and applicable accessory devices for any signs of damage such as scratches, loose or broken parts or other physical 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. Then file a claim with the carrier. A claim for equipment damaged in transit is the responsibility of the customer.

IMPORTANT

Do not lift or move a meter by the electronics, lid or cable(s).

SPECIAL FITTINGS AND ACCESSORIES

To accommodate 5/8…1 inch 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 meter and laying length spacing. Metal setters and meter yokes can provide an electrical continuity to protect meters and consumers from electrical shocks.

REMOVING A METER

⚠ 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.

METER OPERATING MODES

The E-Series Ultrasonic meter automatically moves through storage and transition mode into active mode based on water flow:

- **Storage Mode**

  E-Series Ultrasonic meters are delivered in storage mode so that a meter alarm is not triggered. In storage mode, the meter LCD displays the empty pipe icon ⚠ on the consumption screen, an empty pipe code on the alarm screen (but no alarm code is sent to the endpoint) and **– – – F** (or **– – – C**) on the temperature screen.

- **Transition Mode**

  When the meter senses water in the pipe, it moves into transition mode. In transition mode, the meter displays water consumption and sends a reading to the endpoint, if connected. After sensing a full pipe for 24 hours, the meter transitions to active mode.

  NOTE: If a meter senses an empty pipe in transition mode, the meter goes back into storage mode until water triggers the process to start again.

- **Active Mode**

  Meter is operating normally. If the meter is in active mode and detects an empty pipe, water temperature displays **ErrF** (or **ErrC**).

For more information see *"Temperature Screen*" and "Alarm and Operating Mode Screen" on page 11* .

INSTALLATION

Outdoor Installations

When installed outdoors in a meter box, the E-Series Ultrasonic meter should have a 2…3 inch clearance to avoid damage or strain to the service piping or meter and to accommodate any settling that may occur after installation.

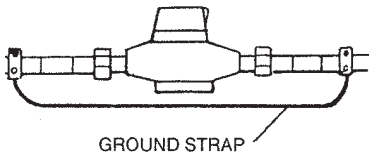
Make sure the service pipe in the meter box is properly bedded so that it is not axially misaligned and that it lays evenly on the bottom of the pipe trench. Place the backfill material covering the pipe appropriately to maintain pipe alignment in the event of eventual ground shifts. This will prevent 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.

Excavate the meter box pit 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 settings for electrical continuity through the service pipe before you remove or service a meter. American Water Works Association (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.

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

⚠CAUTION

- ***DO NOT ATTEMPT TO USE ANY METER AS A LEVER OR CROWBAR TO STRAIGHTEN A MISALIGNED METER POSITION. THIS COULD DAMAGE THE METER.***
- ***TO AVOID POTENTIAL PROBLEMS, CORRECT ANY IRREGULARITIES IN PIPE SPACING AND MISALIGNMENT BEFORE PLACING THE METER INTO ITS POSITION.***

- ***METERS MUST OPERATE IN A COMPLETELY FILLED LINE AT ALL TIMES. THE DOWNSTREAM PIPING MUST ALWAYS BE ARRANGED TO PROVIDE SUFFICIENT BACK PRESSURE TO MAINTAIN A FULL LINE AT THE METER. BY ELIMINATING AIR IN THE LINE, AS WELL AS SUDDEN FLOW SURGES, INACCURATE REGISTRATION AND DAMAGE TO THE METER CAN BE AVOIDED.***

Pre-Installation

Take into account the following considerations before you begin an E-Series Ultrasonic meter installation:

- Inspect the piping around the 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.
- Verify meters are correctly programmed.
- Position the meter so it is accessible for installation, removal and reading.
- 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.
- To avoid cavitation, always install control valves downstream of the meter. Never install the meter on a pump suction side.
- Consider maximum flow rates when sizing and selecting the appropriate meter for the application.
- Pump discharge should never be installed in proximity of the meter.
- Externally weighted check valves and pressure reducing devices should not be located in proximity of the meter.

Installation Instructions

1. Begin at this step when cutting in for new service. When 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. Provide 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 meter until the 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 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 coupling nuts or flange bolts, and remove the meter and old gaskets.
8. Clean the coupling nuts or flange bolts, removing any pipe dope or dirt.
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.

continued on next page

For 5/8…1 in. Threaded Ends

- Start the coupling nuts at the threaded meter ends. Verify that the nuts are properly aligned to avoid cross-threading or damage to the meter ends.
- An effective method for starting a coupling nut is:
  i. Position the nut squarely against the meter's spud end.
  ii. Turn the nut counterclockwise (in reverse) 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.
  iii. Tighten the nut by hand until it is tight.
  iv. With an open-end wrench, apply a partial turn. Do not over tighten. For plastic swivel connections, a one-quarter turn beyond hand-tight is usually sufficient.

12. After the meter is installed, slowly open the inlet shutoff valve until the meter is full of water and ensure there are no leaks. (The more flow you allow through the meter, appropriate for the meter size, the better.)

    ⚠CAUTION Take caution when opening the inlet valve to avoid damage to the pressure sensor due to extreme water hammer.

13. Slowly open the outlet valve until air is out of the meter and service line.
14. Slowly 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 in the correct direction.
    - The meter is shipped in storage mode so that customers do not experience alarms during shipment or installation. After properly purged of air, and the meter senses a full pipe, it may take up to 30 seconds to begin measurement.
    - The meter itself does not require a quantity of flow to begin measurement. The meter just requires that the pipe is cleared of air and filled with water. If 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 reading for your records.

OPERATIONS

Display

E-Series Ultrasonic meters use a 9-digit Liquid Crystal Display (LCD) that toggles to show consumption, rate of flow, temperature,* pressure,* alarm and operating mode, and firmware version. Indicator and alarm icons appear in the display as symbols that illuminate when the condition is active. See *"Meter Alarms" on page 14* for alarm duration.

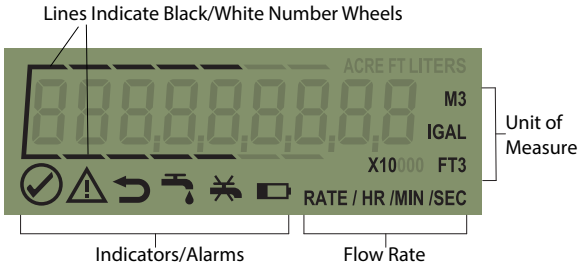


Figure 4: E-Series Ultrasonic Meter LCD

*Pressure monitoring is available when meter is equipped with the optional integrated pressure sensor. Pressure alarms, and temperature and pressure data, are sent as part of the encoder message and surfaced in BEACON AMA when meter is used with ORION Cellular LTE-M, LTE-MS or LTE endpoints.

Activating the Display

The E-Series Ultrasonic meter display illuminates when the register cover is opened. You can change the display screen by touching the optical communication port in the center of the register face or by closing and opening the meter lid. The display reverts to sleep mode after a period of inactivity.

See *"Display Screens" on page 10* for Information about each screen.

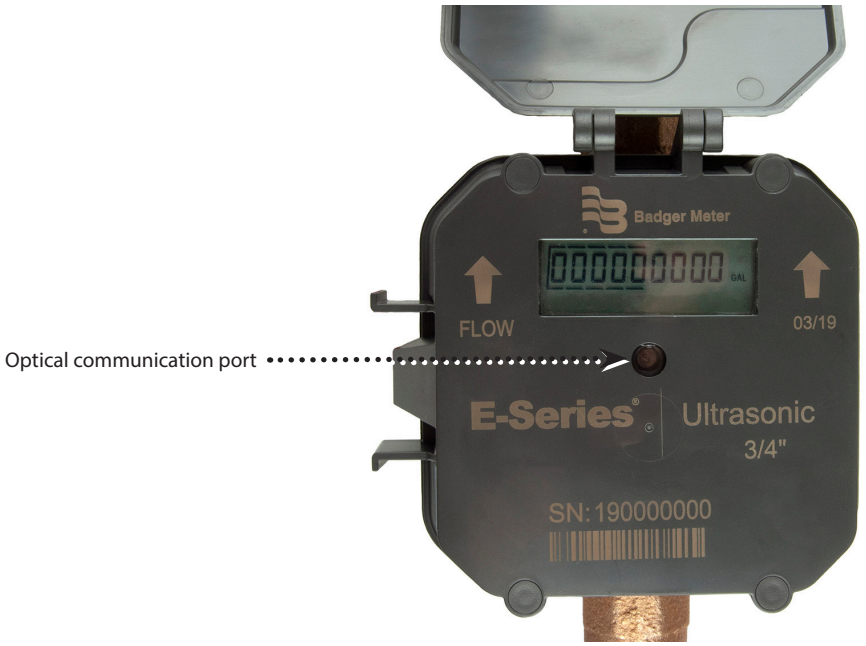


Figure 5: Meter, lid open, showing optical communication port

Flow Direction

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

Display Screens

Total Consumption Screen

The total consumption screen shows all nine digits, including leading zeroes and a decimal point.

The displayed value is the sum of the forward flow minus the reverse flow. The display also includes indicator lines above and below the digits to represent the typical utility meter reading (electronic equivalent of white and black number wheels on mechanical registers).

Totalized flow displays up to 10 million gallons with a resolution of 0.01 gallons, 1 million cubic feet with a resolution of 0.001 cubic feet, or one thousand cubic meters with a resolution of 0.0001 cubic meters.

Unit of measure and resolution are factory programmed for the meter. Options are gallons, cubic feet and cubic meters.

The examples show typical displays for the three different units of measure.

Gallons

Meter reading to the nearest?

	100th gallon =	1234567.89
	10th gallon =	1234567.8
	1 gallons =	1234567
	10 gallons =	123456
	100 gallons =	12345
Typical Billing Units →	1000 gallons =	1234

Cubic Feet

Meter reading to the nearest?

	1000th ft³ =	123456.789
	100th ft³ =	123456.78
	10 ft³ =	123456.7
	1 ft³ =	123456
	10 ft³ =	12345
Typical Billing Units →	100 ft³	1234

Cubic Meters

Meter reading to the nearest?

	10000th m³ =	12345.6789
	1000th m³ =	12345.678
	100th m³ =	12345.67
	10th m³ =	12345.6
Typical Billing Units →	1 m³ =	12345
	10 m³	1234

Rate of Flow Screen

Rate of flow is factory programmed in gallons per minute. The LCD shows both the unit of measure and rate of flow. The rate of flow screen also serves as the flow indicator. The rate of flow display is shown without leading zeros. When the rate of flow screen is displayed, it is updated every two seconds.

Figure 6: Rate of flow screen

Pressure Screen*

Displays current water pressure. The pressure sensor is rated to a maximum psi of 150. If the maximum operating pressure is exceeded, **P 999 PSI** (or **P 99.9 bAr**) displays until pressure is back within the specified range. If the pressure sensor is damaged, **P Err PSI** (or **P Err bAr**) will display.

NOTE: Meters operating above 175 psi are operating outside approved specifications.

Figure 7: Pressure screen

*When meter is equipped with optional integrated pressure sensor and used in conjunction with ORION Cellular LTE-M, LTE-MS or LTE endpoints, pressure data and alarms are sent as part of the encoder message and surfaced in BEACON AMA.

Temperature Screen*

Displays current water and ambient temperature. If the meter is in active mode and detects an empty pipe, water temperature displays **ErrF** (or **ErrC**). If the meter is in storage mode and detects an empty pipe, water temperature displays **– – – F** (or **– – – C**). Ambient temperature is displayed in all modes. Water temperature is not reported in storage mode. Temperature data begins reporting in transition mode when there is a full pipe.

*When used in conjunction with ORION Cellular LTE-M, LTE-MS or LTE endpoints, temperature data is sent as part of the encoder message and surfaced in BEACON AMA.

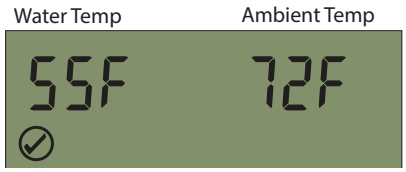


Figure 8: Temperature screen

Alarm and Operating Mode Screen

Displays alarm condition and meter operating mode. This screen is only visible in active mode if an alarm is detected. Screen is always visible in storage and transition mode.

Display format: **ErXXX.YYY.Z**

XXX **Position 1** First set of 3 characters displays an alarm code that has occurred. See duration of each individual alarm in alarms chart on *page 13*.

YYY **Position 2** Second set of 3 characters displays an alarm code that is currently active. The alarm is stored in this position until reported to the endpoint.

- Up to 15 min with ORION Cellular
- Up to 1 hr with ORION SE/ME
- Up to 35 days if not connected to an ORION endpoint

Alarm code reappears if condition is still present or reoccurs and resends message to endpoint.

Z **Position 3** The character in the last position is the code for the meter operating mode. The meter has three operating modes: storage (*Figure 9*), transition (*Figure 10*) and active mode (*Figure 11*).

5 Storage r Transition A Active

Also see *"Meter Operating Modes" on page 6*.

Figure 9: Alarm and operating mode screen in storage mode

Figure 10: Alarm and operating mode screen in transition mode

Figure 11: Alarm and operating mode screen in active mode

Firmware Version Screen

Displays current meter firmware version.

Figure 12: Firmware version screen

4-20 mA Set Point Screen

Displays for meters with 4-20 mA output. The default display value is equal to the safe maximum operating condition flow rate which is dependent on the size of the meter.

Figure 13: Analog output screen

Scaled Pulse Set Point Screen

Displays for meters with scaled pulse output. The display resolution presents the pulse weight for a given unit of measure. See the default pulse weight chart for each unit of measure in *Figure 15*.

The unscaled pulse output does not have a dedicated display screen. Default values are shown in the chart in *Figure 15*.

Figure 14: Scaled pulse screen

Meter Size	Pulse Weight					
	Scaled (units/pulse)			Unscaled (units/pulse)		
	gal	ft3	m3	gal	ft3	m3
5/8 x 3/4 in.	1	0.1	0.01	0.02	0.002	0.00005

Figure 15: Default pulse weights

Meter Size	Measurement Resolution						
	Scaled (pulse/unit)			Unscaled (pulse/unit)			Analog Output
	gal	ft3	m3	gal	ft3	m3	20 mA Set point (gpm)
5/8 x 3/4 in.	1	10	100	50	500	20,000	30

OUTPUTS

Encoder Output

Programmed to the industry standard ASCII encoder protocol, E-Series Ultrasonic meters have the ability to transmit meter status indicators to ORION Cellular, Fixed Network (SE) and Migratable (ME) endpoints as part of the extended encoder/meter reading message. The details can also be read through an IR interface.

Endpoint Reading Resolution

The standard electronic encoder output resolution of the E-Series Ultrasonic meter is 9 digits. Though the meter output is 9-digit resolution, the reading resolution sent to the reading software is dependent on the endpoint that the meter is connected to. Readings reported from the endpoints are the left-most significant digits of the encoder reading.

Endpoint Technology	Reading Resolution Reported to Reading Software
ORION Cellular	9-digit reading, plus the extended message capability
ORION Migratable (ME)/Fixed Network (SE)	8-digit reading, plus the extended message capability
ORION Classic (CE)	7-digit reading
GALAXY	6-digit reading

Wire Connections

The E-Series Ultrasonic meter is available with a connector for easy connection and installation to AMR/AMI endpoints. It is also available with a flying lead for field splice connection. The in-line connector is recommended for pit applications.

Dual Output

The E-Series Ultrasonic meter is also available with dual outputs. The following dual output options are available:

- Encoder and encoder
- Encoder and scaled/unscaled
- Encoder and 4-20 mA
- Scaled/unscaled and 4-20 mA

Scaled Output

- Scaled output is a switch closure output defined as: **red** wire = positive, **black** wire = negative.
- Scaled output from the register has a default resolution 1/10th of the register test circle (resolution may vary in some cases).
- The nominal pulse output width is programmable from 30…100 msec.
- This pulse output is compatible with most totalizers and batch controllers.

Unscaled Output

- Unscaled output is a switch closure output defined as: **green** wire = positive, **black** wire = negative
- This pulse output is compatible with most totalizers and batch controllers.

Analog Output

- The flow rate measurement is converted to a standard 4-20 mA control signal.
- This signal is proportional to the flow of fluid passing through the flow meter.
- The 4-20 mA output is isolated when paired with scaled/unscaled output.
- Power for the device can be obtained from a 9…50V DC control loop.

Wiring Connections

Encoder and Encoder

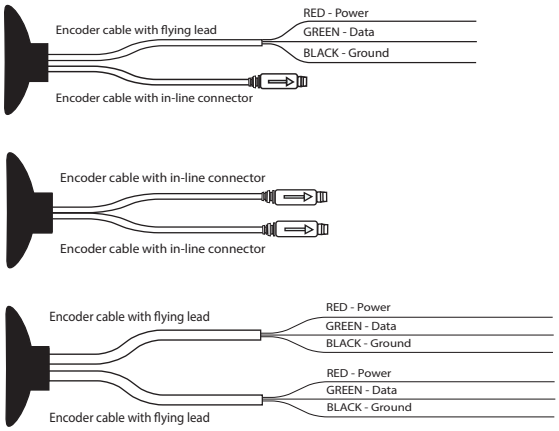


Figure 16: Encoder and encoder wiring options

Encoder and Scaled Unscaled

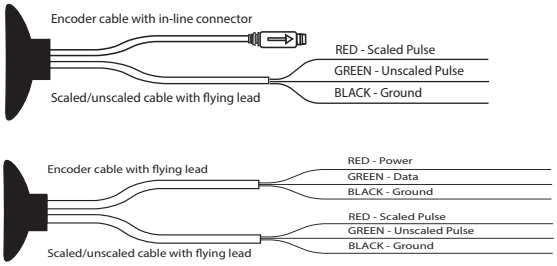


Figure 17: Encoder and scaled/unscaled output wiring options

Encoder and 4-20

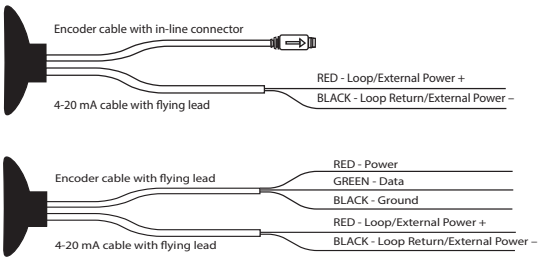


Figure 18: Encoder and 4-20 mA wiring options

Scaled/Unscaled and 4-20 mA

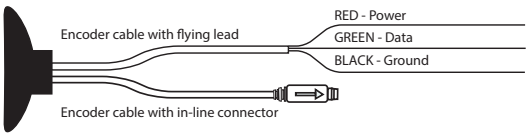


Figure 19: Scaled/unscaled and 4-20 mA wiring option

METER ALARMS

E-Series Ultrasonic meter alarms appear on the display as icons that illuminate when the condition occurs. Alarms are displayed for the number of days listed in the table below. Alarms also appear as 3-character codes on the alarm and operating mode screen. See *"Alarm and Operating Mode Screen" on page 11* and *"Alarm Codes" on page 15*.

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

NOTE: Meters are delivered in storage mode so that an alarm is not triggered. In storage mode, the meter LCD displays an empty pipe icon, but no error code is sent to the endpoint. For alarms reported within BEACON, refer to BEACON Help at *beaconama.net*.

Alarms	Icon	Alarm Description	Number of Days Icon Displays	High Resolution with ORION Cellular, Fixed Network (SE) or Migratable (ME)
Normal Meter Operation		Meter operating correctly	n/a	n/a
Temperature		Temperature outside limits: above 140° F or below 34° F. Meter continues to operate but is outside specified range.	Alarm clears after 35 days unless condition continues	Meter sends consumption and alarm to the endpoint once per occurrence
Pressure*		Pressure sensor is damaged, or pressure is outside specified threshold limits: above 130 psi or below 20 psi. If maximum operating pressure is exceeded, **P 999 PSI** (or **P 99.9 bAr**) displays until pressure is back within the specified range. If the pressure sensor is damaged, **P Err PSI** (or **P Err bAr**) will display.	Alarm clears after 35 days unless condition continues	
Empty Pipe		Empty or partially filled pipe. Last known good read is displayed. If the meter is active and detects an empty pipe, water temperature displays **ErrF** (or **ErrC**). If meter is in storage mode and detects an empty pipe, water temperature displays **– – – F** (or **– – – C**).	Alarm clears when pipe is filled	
Measurement Error		Interference of ultrasonic signal. Meter is not measuring properly. Meter continues to operate unless sensors are damaged.	Alarm clears after 35 days unless condition continues	
Exceeding Max Flow		Maximum flow rate exceeded. No consumption is accumulated until flow is back within specified range.	Alarm clears after 35 days unless condition continues	Meter sends consumption and alarm to the endpoint once per occurrence
Reverse Flow		Meter detects one (1) gal of reverse water flow, triggers the reverse flow alarm icon on the display and sends alarm message to the endpoint.	Alarm clears after 35 days unless condition continues	Meter detects reverse flow and sends alarm to the endpoint once per occurrence
No Usage		Flow rate less than the low flow operating rate for 30 days.	Alarm clears automatically once flow occurs	Meter detects no usage and sends alarm to the endpoint once per occurrence
Suspected Leak		Flow rate more than the low flow operating rate for 24 hours.	Alarm clears automatically when flow rate drops below low flow operating rate	Meter detects suspected leak and sends alarm to the endpoint once per occurrence
End of Life		Battery nearing end of life.	Alarm is activated after 19 years and does not clear	Meter sends alarm message to the endpoint once per occurrence
Program Alert	n/a	Meter has been programmed in last 35 days.	n/a	Meter sends alarm message to the endpoint once per occurrence.

*Pressure alarms are available with meters equipped with the optional integrated pressure sensor, and connected to ORION Cellular LTE-M, LTE-MS or LTE endpoints.

Alarm Codes

Alarm codes are shown on the alarm and operating mode screen. See *"Alarm and Operating Mode Screen" on page 11*.

NOTE: For alarms reported within BEACON, refer to BEACON Help at *beaconama.net*.

001	Empty pipe	**010**	Reverse flow	**083**	Empty pipe, Temperature, Measurement error
002	Temperature	**011**	Empty pipe, Reverse flow	**089**	Empty pipe, No usage, Measurement error
003	Empty pipe, Temperature	**012**	Temperature, Reverse flow	**0C0**	Program alert, Measurement error
004	End of life	**013**	Empty pipe, Temperature, Reverse flow	**100**	Pressure
008	No usage	**018**	No usage, Reverse flow	**101**	Empty pipe, Pressure
009	Empty pipe, No usage	**020**	Suspected leak	**140**	Program alert, Pressure
00A	Temperature, No usage	**040**	Program alert	**150**	Reverse flow, Program alert, Pressure
00B	Empty pipe, Temperature, No usage	**080**	Measurement error	**200**	Exceeding max flow
00C	End of life, No usage	**081**	Empty pipe, Measurement error	**202**	Temperature, Exceeding max flow
00D	Empty pipe, End of life, No usage	**082**	Temperature, Measurement error	**204**	End of life, Exceeding max flow
				300	Pressure, Exceeding max flow

SPECIFICATIONS

E-Series G2 Ultrasonic Meter Size	5/8 x 3/4 in.
Normal Test Flow Limits	0.08…30 gpm (0.02…6.8 m^3/hr)
Minimum Test Flow Limits	0.04 gpm (0.01 m^3/hr)
Safe Maximum Operating Condition (SMOC)	30 gpm (6.8 m^3/hr)
Typical Pressure Loss	2.6 psi @ 15 gpm (0.18 bar @ 3.4 m^3/hr)
Operating Performance	In the normal temperature range of 45…122 °F (7…50 °C), new meter consumption measurement is accurate to: • 100% ±1.5% over the normal test flow limits • 100% ±3.0% for the minimum test flow limits
Storage Temperature	– 40…140° F (– 40…60° C)
Maximum Ambient Storage (Storage for One Hour)	150° F (66° C)
Measured Fluid Temperature Range	34…140° F (1…60° C)
Humidity	0…100% condensing; meter is capable of operating in fully submerged environments
Maximum Working Pressure of Meter Housing	175 psi (12 bar)
Maximum Operating Pressure of Pressure Sensor	150 psi (10 bar)
Pressure Sensor Accuracy	±2% of full scale pressure, up to 150 psi (10 bar)
Register Type	Straight reading, permanently sealed electronic LCD; digits are 0.28 in. (7 mm) high
Register Display	• Total consumption (nine digits) • Unit of measure (factory programmed for gallons, cubic feet and cubic meters) • Rate of flow • Pressure *(Optional: for meters ordered with integrated pressure sensor)* • Temperature • Alarm and operating mode • Firmware version • Alarm indicators
Totalization Display Resolution	• Gallons: 0.01 • Cubic feet: 0.001 • Cubic meters: 0.0001
Battery	3.6-volt lithium thionyl chloride; battery is fully encapsulated within the register housing and is not replaceable; 20-year battery life

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