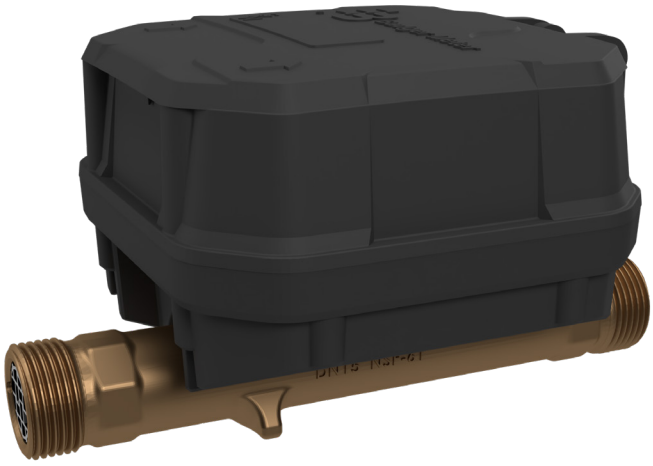
E-Series®
Ultrasonic Flow Meters

E-Series G2® Ultrasonic Meters

Cold Water Lead-Free Meters

DN15, DN20



Badger Meter

ESM-UM-03258-EN-07 (March 2025)

User Manual

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SCOPE OF THIS MANUAL

This manual contains installation, operation and maintenance procedures for the Badger Meter® next generation E-Series G2® DN15 and DN20 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 commercial applications. The ultrasonic measurement system has no moving parts, provides long-term accuracy and minimizes measurement errors due to sand, suspended particles, air pockets and pressure fluctuations.

Meters may come equipped with an integrated 434 or 868 MHz wireless M-Bus radio or a wired M-Bus configurable telegram for fixed network collection systems. They are also available with an encoder output for AMI endpoints and a scaled/unscaled output for SCADA and other external systems.

The registration electronics and battery are encapsulated to withstand harsh environments and protect the electronics in flooded or submerged pit applications.

Meters can be installed using horizontal or vertical piping, with water flow in the up direction. The meter does 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.

Construction

The E-Series Ultrasonic meter features lead-free brass 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 provides long-term accuracy.

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 shows total volume, unit of measure, rate of flow, temperature, alarm and operating mode, firmware version, checksum display, last program date, communication status (integrated radio only) event counter, all segments active, display screen is off.

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.

- ORION Cellular INTL endpoints, firmware version 1.10.1193 or later
- BEACON® AMA software suite

For assistance, please contact Badger Meter Technical Support at 800-616-3837 or the appropriate endpoint provider.



This safety sign signifies that this document must be read prior to starting work or before operating equipment.

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.

⚠ WARNING Indicates a hazardous situation, which, if not avoided, could result in death or serious personal injury.

⚠ CAUTION Indicates a hazardous situation, which, if not avoided, could result in minor or moderate personal injury or damage to property.

Installation Safety

⚠ WARNING

- ***SHUT OFF FLUID SUPPLY AND RELEASE PRESSURE BEFORE SERVICING OR MAKING A PLUMBING CONNECTION.***
- ***IF THE SYSTEM PRESSURE EXCEEDS 16 BAR (232 PSI), A PRESSURE SAFETY VALVE MUST BE INSTALLED.***

⚠ 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.***

Wired M-Bus Safety

⚠ WARNING

- ***SHOCK HAZARD RISK IS HIGHER FOR INSTALLER AT WET LOCATIONS.***
- ***TO REDUCE THE POSSIBILITY OF ELECTRICAL FIRE AND SHOCK HAZARDS, NEVER CONNECT THE CABLE FROM THE MODEM TO ANY ELECTRICAL LINE VOLTAGE. THE WIRED M-BUS MODEM CABLE PROVIDES M-BUS COMMUNICATIONS AND SHOULD ONLY BE CONNECTED TO M-BUS NETWORK EQUIPMENT. THE CABLE DOES NOT HAVE SPECIFIC POLARITY.***
- ***CONNECT ONLY TO AN M-BUS SUPPLY THAT IS KNOWN TO BE DOUBLE INSULATED OR REINFORCED INSULATED FROM THE MAIN POWER SOURCE.***
- ***THE M-BUS SUPPLY SHOULD BE LIMITED BY DESIGN TO 50V, 3A, 150 W MAX.***

PRODUCT UNPACKING AND INSPECTION

To avoid damage in transit, 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.

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 **– – – C** displays 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 **ErrC**.

For more information see *"Alarm & Operating Mode" on page 10* .

INSTALLATION

NOTE: Before proceeding with installation, see *"Installation Safety" on page 4*. If meter is equipped with a wired M-Bus output, see also *"Wired M-Bus Safety" on page 4*.

E-Series Ultrasonic Meters Equipped with Wired M-Bus

Verify power and communications are available from the local M-Bus network. Install wired M-Bus cable to the local wired M-Bus network using connectors and standards meeting local regulations.

- **Primary power**. The primary power for wired M-Bus equipped meters is the continuously powered M-Bus network with a supply of 21…42V DC, 1.3mA.
- **Secondary power.** For wired M-Bus equipped meters, a 3.6-volt lithium thionyl chloride battery provides secondary power intended only for shipping, storage and brief interruptions of the M-Bus power supply.

NOTE: The wired M-Bus meters draw a small amount of power from the M-Bus network to operate efficiently. *If meter is not connected, battery performance is significantly reduced*.

Pre-Installation

Take these factors into account 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.
- 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.
- 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.
- When cutting into a new section of service pipe, flush the pipe to clear chips, pipe dope or other plumbing residue.
- The line opening for the meter should match the laying length of the meter, allowing slight additional space for coupling gaskets. The inlet and outlet sides of the meter setting should be axially aligned the pipe.

Outdoor Installations

When installed outdoors in a meter box, the E-Series Ultrasonic 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.

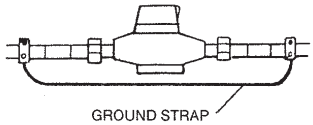
The service pipe in the meter box should be properly bedded to ensure that it is not axially misaligned and that it lays evenly on the bottom of the pipe trench. The backfill material covering the pipe should be placed appropriately to maintain pipe alignment in the event of eventual ground shifts. This prevents damage to the pipe.

The service lines and the water meter must be protected 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 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 reduces the possibility of freezing.

Indoor Installations

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

Installation Instructions

1. Close the meter's inlet-side valve.
2. Open a faucet and wait until water flow stops, to depressurize the system. Do not remove the meter until the flow stops.
3. Check valves and make necessary repairs to the curb (shutoff) valve or inlet side valve if necessary.
4. 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.
5. To replace an existing meter continue with Step 6. To install a new meter skip to Step 8.
6. Loosen the meter couplings or flange bolts and remove the meter and the old gaskets in the coupling nuts. You may choose to replace the old gaskets with the provided 9/64 in. thick rubber gaskets.
7. Clean the coupling nuts or flange bolts, removing any pipe dope or dirt from the threads or flange bolts.
8. Check the existing position for proper alignment and spacing. Correct any misalignment or spacing issues.
9. Place the connection gaskets inside the connection coupling nuts.
10. 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.
11. 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. This is especially important for the engineered polymer meter.

    An effective method for starting a coupling nut is:

    a. Position the nut squarely against the meter's spud end.
    b. 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 hear a slight click and feel the nut move into the starting position.
    c. Tighten the nut by hand until it is “hand-tight.“
    d. 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, open the inlet shutoff valve until the meter is full of water and ensure that there are no leaks. (The more flow you allow through the meter, appropriate for the meter size, the better.)
13. Open the outlet valve until air is out of the meter and service line.
14. Open a valve downstream of the meter and verify that no foreign debris in the water obstructs the operations of the system.
15. Make sure the meter is installed with the *flow arrow on the meter pointing in the direction of flow*. 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 sent 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 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 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 read for your records.

OPERATIONS

Display

E-Series Ultrasonic meters use a 9-digit Liquid Crystal Display (LCD) that toggles to show consumption, unit of measure, alarms, test mode, rate of flow, temperature, alarm & operating mode, firmware version, checksum, last program date, communication status (integrated radio only), all segments ON, and display OFF. Indicator and alarm icons appear in the display as symbols that illuminate when the condition is active. See *"Meter Alarms" on page 13* for alarm duration.

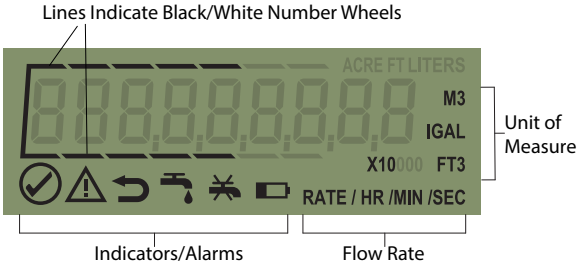


Figure 1: E-Series Ultrasonic Meter LCD

Activating the Display

The display illuminates when the register cover is opened. You can alternate the display among the different screens by touching the optical communication port in the center of the register face (*Figure 2*) or by closing and opening the meter lid. The display reverts to sleep mode after a period of inactivity.

See *"Display Screens" on page 9* for Information about each screen.

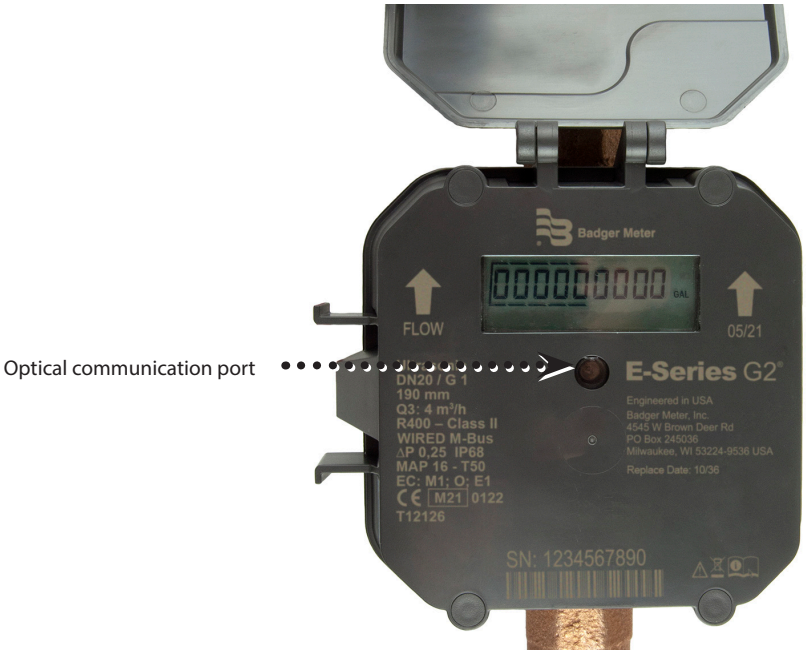


Figure 2: Meter, lid open, showing optical communication port

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

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 100 thousand cubic meters with a resolution of 0.0001 cubic meters, or one million cubic feet with a resolution of 0.001 cubic feet, or 10 million gallons with a resolution of 0.01 gallons.

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

Cubic Meters



Meter reading to the nearest?

	10000th m^3 =	12345.6789
	1000th m^3 =	12345.678
	100th m^3 =	12345.67
	10th m^3 =	12345.6
Typical Billing Units →	1 m^3 =	12345
	10 m^3 =	1234

Test Mode

In test mode, the screen display is *100 X* the resolution of the standard total consumption screen, to prevent truncation and reduce uncertainty with low-flow test measurements.



Figure 3: Test mode screen

Rate of Flow

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 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 4: Rate of flow screen

Temperature*

Displays current water and ambient temperature. If the meter detects an empty pipe, water temperature displays **– – – 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 INTL endpoints, temperature data is sent as part of the encoder message and surfaced in BEACON AMA.



Figure 5: Temperature screen

Alarm & Operating Mode

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 12*.

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 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 6*), transition (*Figure 7*) and active mode (*Figure 8*).

5 Storage r Transition A Active

Also see *"Meter Operating Modes" on page 5*.



Figure 6: Alarm and operating mode screen in storage mode



Figure 7: Alarm and operating mode screen in transition mode



Figure 8: Alarm and operating mode screen in active mode

Firmware Version

Displays current meter firmware version.



Figure 9: Firmware version screen

Checksum

Displays string of characters used to identify an ARM application file.



Figure 10: Checksum screen

Last Program Date

Displays the date the meter was last programmed.
Example: 'PYYYY.MM.DD



Figure 11: Last program date screen

Communication Status

Displays status of the communication interface for meters with integrated radios only.

For wired M-Bus, the screen displays "bUS oFF," "bUS on" or "bUS bAd."

For wireless M-Bus, the screen displays "rAdIo oFF" or "rAdIo on."



Figure 12: Communication status wired screen



Figure 13: Communication status wireless screen

Event Counter

Counts the number of times a meter is unlocked.



Figure 14: Event counter

All Segments ON

Displays all segments on the LCD.



Figure 15: All segments ON screen

Display Screen OFF

A blank screen displays. No LCD segments are illuminated.



Figure 16: Display screen OFF

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 endpoints as part of the extended encoder/meter reading message. The details can also be read through an IR interface. The standard electronic encoder output resolution of the meter is 9 digits.

Wired M-Bus

E-Series Ultrasonic meters may come equipped with an integrated wired M-Bus, 2400 baud (adjustable to 300 baud) configurable telegram.

For E-Series Ultrasonic meters equipped with wired M-Bus, install wired M-Bus cable to the local wired M-Bus network using connectors and standards meeting local regulations. Verify power and communications are available from the local M-Bus network.

NOTE: See*"Wired M-Bus Safety" on page 4.*

Wireless M-Bus

E-Series Ultrasonic meters may come equipped with an integrated 434 or 868 MHz wireless M-Bus, OMS compliant, configurable telegram radio.

Wire Connections

The meter is available with an in-line connector for easy connection and installation to AMI endpoints. The in-line connector is recommended for pit applications.

The meter is also available with a flying lead for field splice connection and for the wired M-Bus integrated radio option. W

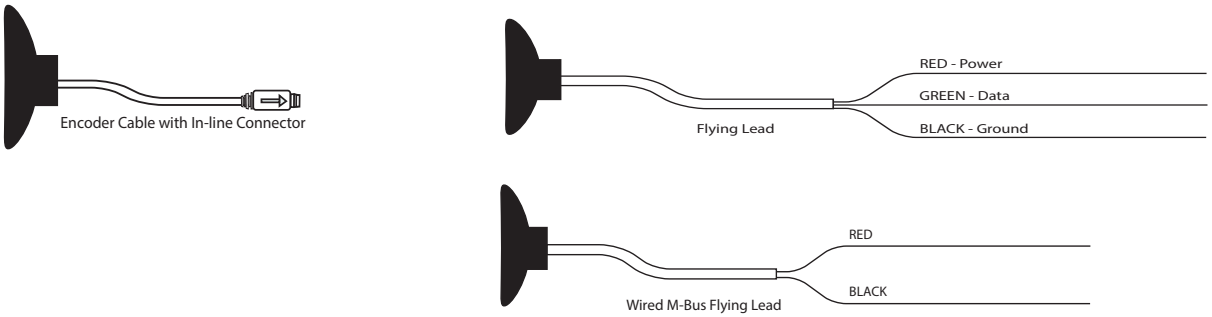


Figure 17: Wiring options

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 & Operating Mode" on page 10* and *"Alarm Codes" on page 14*.

Alarms are sent as part of the encoder message to AMR/AMI systems that are capable of receiving an extended message.

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	E-Series Ultrasonic with ORION Cellular
Normal Meter Operation		Meter operating correctly	n/a	n/a
Temperature		Temperature outside limits: above 60° C or below 1° C. Meter continues to operate but is outside specified accuracy range.	Alarm clears after 35 days unless condition continues	Meter sends consumption and alarm to the endpoint once per occurrence
Empty Pipe		Empty or partially filled pipe. Last known good read is displayed.	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 0.004 m^3 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 14 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.

Alarm Codes

Alarm codes are shown on the alarm and operating mode screen. See *"Alarm & Operating Mode" on page 10*. Contact Badger Meter Technical Support for any codes not listed here.

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	**101**	Empty pipe
008	No usage	**018**	No usage, Reverse flow	**140**	Program alert
009	Empty pipe, No usage	**020**	Suspected leak	**150**	Reverse flow, Program alert
00A	Temperature, No usage	**040**	Program alert	**200**	Exceeding max flow
00B	Empty pipe, Temperature, No usage	**080**	Measurement error	**202**	Temperature, Exceeding max flow
00C	End of life, No usage	**081**	Empty pipe, Measurement error	**204**	End of life, Exceeding max flow
00D	Empty pipe, End of life, No usage	**082**	Temperature, Measurement error	**300**	Exceeding max flow

SPECIFICATIONS

E-Series G2 Ultrasonic Meter	*DN15*			*DN20*		
Length	110, 165 mm			190 mm		
R Value	250	400	800	250	400	800
Nominal Flow Rate Q3 m^3/hr (gpm)	2.5 (11.007)	2.5 (11.007)	2.5 (11.007)	4 (17.612)	4 (17.612)	4 (17.612)
Overload Flow Rate Q4 m^3/hr (gpm)	3.125 (13.759)	3.125 (13.759)	3.125 (13.759)	5 (22.014)	5 (22.014)	5 (22.014)
Transitional Flow Rate Q2 l/h (gpm)	16 (0.070)	10 (0.044)	5 (0.022)	25.6 (0.113)	16 (0.070)	8 (0.035)
Minimum Flow Rate Q1 l/h (gpm)	10 (0.044)	6.25 (0.028)	3.125 (0.014)	16 (0.070)	10 (0.044)	5 (0.022)
Pressure Loss at Q3 bar (psi)	0.25 (3.626)	0.25 (3.626)	0.25 (3.626)	0.25 (3.626)	0.25 (3.626)	0.25 (3.626)
Reverse Flow Maximum Rate m^3/hr (gpm)	3.125 (13.759)	3.125 (13.759)	3.125 (13.759)	5 (22.014)	5 (22.014)	5 (22.014)
Starting Flow Rate l/h (gpm)	5 (0.022)	3.125 (0.014)	1.5625 (0.007)	8 (0.035)	5 (0.022)	2.5 (0.011)

Operating Temperature	In the normal temperature range of 7…50° C (45…122° F), new meter consumption measurement is accurate to: • ± 2% from Q2 to Q4 • ± 5% from Q1 to Q2		
Storage Temperature	– 40…70° C (– 40…158° F)		
Measured-Fluid Temperature Range	1…60° C (34…140° F)		
Humidity	0…100% condensing; meter is capable of operating in fully submerged environments; IP68 rating (1 m for 7 days)		
Maximum Admissible Pressure (MAP)	16 bar (232 psi)		
Register Type	Straight reading, permanently sealed electronic LCD; digits are 7 mm (0.28 in.) high		
Register Display	• Consumption (up to nine digits) • Unit of measure • Alarms • Test mode • Rate of flow	• Temperature • Alarm & operating mode • Firmware version • Checksum • Last program date	• Communication status (integrated radio only) • Event counter • All segments ON • Display screen OFF
OMS Parameters	• Actuality duration • Volume, Key date • Date, Key date • Remaining battery • Date & current time	• Reverse volume • Flow rate • Water temperature • Ownership number • Operating hours	• Error hours • Overload date/time • Overload hours • Ambient temperature • Meter status
Meter Status and Alarms	• Empty pipe • Temperature out of range • End of life	• No consumption • Reverse flow • Leak	• Measurement error • Communication error • Exceeding maximum flow
Register Capacity	100,000 cubic meters		
Totalization Display Resolution	Cubic meters: 0.XXXX		
Internal Data Logging Extraction	160 days of hourly data for encoder output. 320 days of hourly data for integrated radio variants. Data includes meter reading, serial number, alarms and status indicators, and temperature information.		
Wired M-Bus Supply Voltage	Primary power, 21…42V DC, 1.3 mA. Secondary 3.6-volt lithium thionyl chloride battery for shipping, storage and brief interruptions to the M-Bus power supply. Also see*"Wired M-Bus Safety" on page 4*.		
Battery	Primary power for stand-alone meters and wireless M-Bus, 3.6-volt lithium thionyl chloride battery. Battery is fully encapsulated within the register housing and is not replaceable; 15-year battery life.		
Approvals	Conforms to IEC 61010-1 safety requirements over the normal operating temperature range, an altitude of <2000 m (6560 ft) and a pollution degree of 3.		

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