

Badger E-Series

**Cold Water
Ultrasonic Meters**

**Installation and
Operation Manual**



Contents

- About the Badger E-Series Meter 4
- AMR Output..... 4
- E-Series Meter Pre-Installation 4
- Special Fittings and Accessories..... 4
- Outdoor Installations 5
- Indoor Installations 6
- Installing an E-Series Meter in a New Location..... 6
- Replacing an Existing Meter With an E-Series Meter 7
- Special Instructions for Disassembling a Meter 8
- E-Series Meter Operations..... 9
- Meter Display 9
- Unit of Measure 9
- Rate of Flow 9
- Flow Direction..... 9
- Consumption 9
- Indicators and Alarms..... 10
- Activating the Display 11
- Maintenance..... 11

About the Badger E-Series Meter

The Badger® E-Series™ meter is a static meter using ultrasonic technology and solid-state electronics contained in a compact, totally encapsulated, weatherproof and UV-resistant housing for residential and commercial applications. The ultrasonic measurement system has no moving parts, provides long-term accuracy and eliminates measurement errors due to sand, suspended particles, air pockets and pressure fluctuations.

The 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.

AMR Output

An optional output wire (three conductor) that is fully potted and submersible is available for factory connection to the Badger Meter ORION® or GALAXY® remote transmitters. If an AMR transmitter is not ordered with the meter, a four-inch output cable with an in-line connector is included to allow upgrading to AMR. The output from the meter can be specified for factory setting as either a "scaled output" (replica of the Recordall® Transmitter Register [RTR®] output) or "encoder output" (replica of the Absolute Digital Encoder [ADE®] output). The output protocol is indicated on the AMR output wire.

E-Series Meter Pre-Installation

You must take into account the following considerations before installing an E-Series meter.

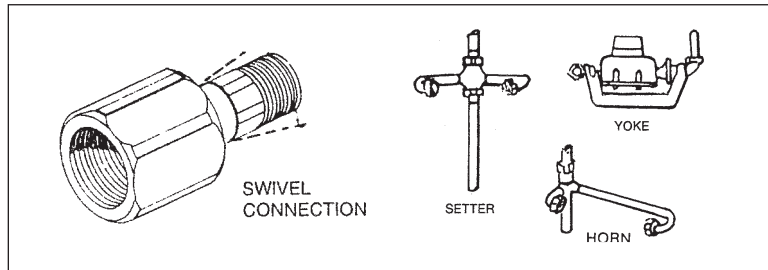
- The service line, valves, connections and meter must be watertight.
- You must provide a high-quality upstream shut-off valve with a low pressure drop.
- For optimum performance, the meter must be installed horizontally in the line with the registration upright.
- Position the meter so that it is accessible for service.
- The meter and service line should be protected against frost, flooding, damage and tampering.
- The installed meter must not be an obstacle or a hazard to the customer or interfere with public safety.

Special Fittings and Accessories

Special fittings and accessories are available to accommodate installations.

Plastic swivel connections for meters are available from Badger Meter to compensate for minor service pipe and setting misalignment for a 5/8-inch, 3/4-inch and 1-inch meter.

Metal meter setters, resetters, horns and meter yokes are available for holding the service pipe in proper alignment to the meter and laying length spacing. The metal setters and meter yokes can provide an electrical continuity to protect meters and consumers from electrical shocks.



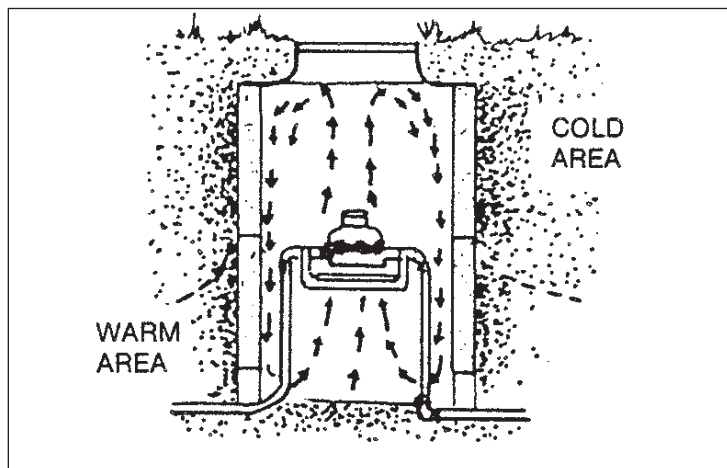
Outdoor Installations

E-Series meters can be installed indoors or outdoors. When installed outdoors in a meter box, the 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 into 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 will prevent damage to the pipe.

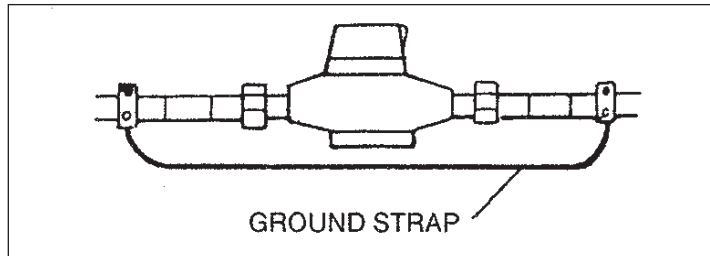
The service lines and the water meter must be protected from freezing. The earth covering the service line must be adequate to prevent frost penetration. Due to the smaller volume of water, service line pipes will freeze sooner than the main distribution line.

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, indoor settings must be checked 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 servicing or removing a meter.

Installing an E-Series Meter in a New Location

When cutting into a new section of service pipe, flush the pipe to clear chips, pipe dope or any other plumbing residue.

Before cutting the existing service line, attach a suitable electrical grounding line that spans the section of pipe being removed. The grounding wire provides an alternate path for any electrical current that may exist across the opening in the line.

Note: You must close the curb (shut-off) valve to relieve water pressure in the line before you start the cutting operation.

Install properly sized inlet and outlet meter valves, meter couplings and meter setters in conformance with local plumbing codes and recommended practices.

The meter must be set in a horizontal or vertical position, protected from freezing, damage and tampering.

Note: Make sure the line opening in which the meter is to be set matches the laying length of the meter, allowing slight additional space for coupling gaskets. Make sure that the inlet and outlet sides of the meter setting are axially aligned to the pipe.



CAUTION: Do not attempt to use any meter as a lever or crowbar to straighten a misaligned meter setting. This could damage the meter.

DO NOT attempt to set a meter into an opening that is too long by forcing the piping into place with the meter's 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 setting.

Note: Pipe dope or sealants are not required.

To install the E-Series meter, follow these steps:

1. Place the connection gaskets inside the connection coupling nuts.
2. Set the meter between the coupling nuts properly positioned for flow direction.
3. Start the coupling nuts at the threaded meter ends. Verify that the nuts are properly aligned to avoid cross threading damage (stripping) to the meter ends.

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 will 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 overtighten. For plastic swivel connections, a one-quarter turn beyond hand tight is usually sufficient.

Before turning on the service water, use care to protect against potential leakage.

1. Shut off the valves on both the inlet and outlet sides of the meter.
2. Open the curb (shut-off) valve slowly to pressurize the service line to the meter.
3. Slowly open the meter's inlet-side valve to fill the meter.
4. Check for leaks around the meter and its connections.
5. Slowly open the meter's outlet-side valve to pressurize the consumer side of the system.
6. Open a faucet to allow entrapped air to escape.
7. Once water is flowing normally, turn off the faucet.

Replacing an Existing Meter With an E-Series Meter

Before you begin the replacement procedure, inspect the piping around the meter setting for suitable conditions. Repair the piping system if pipes are corroded or damaged.

Verify that a suitable, electrical grounding wire is properly attached to the upstream and downstream pipe connections of the meter. Do not remove the meter without an alternate ground path permanently in place.

To prepare for the replacement installation, follow these steps:

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 (shut-off) valve or inlet side valve if necessary.
4. Close the meter's outlet-side valve.

Protect the floor below the meter against potential spills or leaks that could occur. Protect the coupling area from debris, so that the new meter will not be damaged or contaminated.

To replace an existing meter, follow these steps:

1. Loosen meter couplings and remove the meter and the old gaskets in the coupling nuts.
2. Clean the coupling nuts, removing any pipe dope or dirt from the threads.

3. Check the existing setting for proper alignment and spacing. Correct any misalignment and spacing in the setting.
4. Place new connection gaskets inside the coupling nuts.
5. Set the meter between the coupling nuts. Position it properly for the flow direction.
6. Start the coupling nuts at the threaded meter ends. Verify that the nuts are properly aligned to avoid cross-threading damage (stripping) to the meter ends.

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 the coupling nut and the meter spud end coincide, you will hear a slight click and feel the nut move into the starting position.
- c. Turn the nut by hand until it is "hand tight."
- d. With an open-end wrench, apply a partial turn. Do not overtighten. For plastic swivel connections, a one-quarter turn beyond hand tight is usually sufficient.

Before turning on the service water, use care to protect against potential leakage.

1. Shut off the valves on both the inlet and outlet sides of the meter.
2. Slowly open the curb (shut-off) valve to pressurize the service line to the meter.
3. Slowly open the meter's inlet-side valve to fill the meter.
4. Check for leaks around the meter and its connections.
5. Slowly open the meter's outlet-side valve to pressurize the consumer side of the system.
6. Open a faucet to allow entrapped air to escape.
7. Once water is flowing normally, turn off the faucet.

Special Instructions for Disassembling a Meter

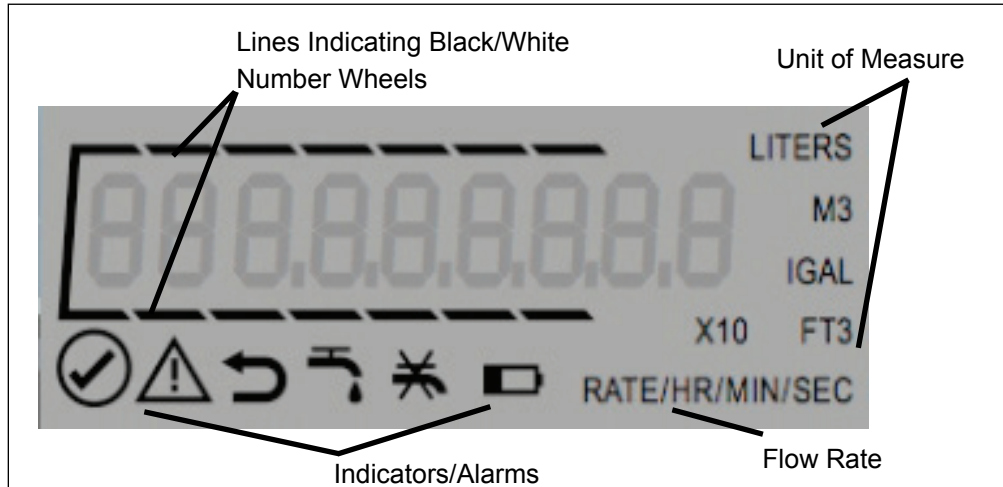


WARNING: Removing the test plug or disassembling a meter that is under line pressure can result in personal injury. The line must be depressurized before starting any disassembly operation. Failure to depressurize the line could result in components becoming projectiles capable of causing injury to maintenance personnel or bystanders.

E-Series Meter Operations

Meter Display

Badger E-Series meters use a Liquid Crystal Display (LCD) to show consumption, flow and alarm information. The LCD has a nine-digit display. The specific unit of measure and resolution are factory programmed. Totalized flow displays up to 10 million gallons, with a resolution of 0.01 gallon, or one million cubic feet with a resolution of 0.001 cubic foot.



Unit of Measure

The unit of measure is factory programmed. Options include gallons, cubic feet, cubic meters, imperial gallons and liters.

Rate of Flow

The rate of flow is factory programmed for gallons per minute. 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. A reverse flow rate is indicated by a minus sign before the flow rate.

Flow Direction

The direction of water flow is noted on the LCD and is molded into the electronics housing and on the metal casting.

Consumption

The consumption display includes all nine digits, including 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 white and black number wheels on mechanical registers.

The following examples show typical displays for three different units of measure:

Gallons

1	2	3	4	5	6	7.	8	9
---	---	---	---	---	---	----	---	---

Visual reading for typical consumption/billing purposes: 1,234 thousands of gallons.

Detailed meter reading with full display resolution: 1,234,567.89 gallons.

Cubic Feet

1	2	3	4	5	6.	7	8	9
---	---	---	---	---	----	---	---	---

Visual reading for typical consumption/billing purposes: 1234 hundreds of cubic feet.
 Detailed meter reading with full display resolution: 123,456.789 cubic feet.

Cubic Meters

1	2	3	4	5.	6	7	8	9
---	---	---	---	----	---	---	---	---







Visual reading for typical consumption/billing purposes: 12345 cubic meters.
 Detailed meter reading with full display resolution: 12,345.6789 cubic meters

Indicators and Alarms

Indicators and alarms appear in the display as symbols that illuminate when the condition is active. Indicators and alarms include:

- Meter functioning correctly indicator
- Reverse flow alarm
- Suspected leak alarm
- 30-day no usage alarm
- Battery end of life indicator
- Other alarm conditions (empty pipe, poor quality sensor measurement and low temperature)

The LCD indicators illuminate to indicate a specific condition exists and dim when the alarm condition is eliminated.

Indicator/Alarm	LCD	Condition indicated
Meter Functioning Correctly		There are no alarms.
Alarm Condition		The meter cannot record successful measurements. Possible conditions: there's an empty or partially-filled pipe or the water temperature is below three degrees C.
Reverse Flow Alarm		Net reverse flow is greater than the programmed value. The default value is 100 times the display resolution. This alarm remains active for 35 days. The alarm automatically clears after 35 days if the reverse flow condition has not reoccurred.
Potential Leak Alarm		Twenty-four hours pass without one 15-minute interval of no flow. The alarm clears automatically when a 15-minute no-flow interval occurs.
30-Day No Usage Alarm		No measured flow in the past 30 days. The alarm is automatically cleared once flow occurs.
End of Battery Life Indicator		Indicates battery life based on pre-calculated consumption. The battery is calculated to last 20 years.

Activating the Display

The E-Series meter's display illuminates when the register cover is opened. After a period of time, the display will revert to sleep mode. You can alternate the display between total flow mode and rate of flow mode. You can switch between the displays by touching the optical display switch or by closing and opening the meter's lid. The optical switch is located just below the LCD on the left side of the register's face.



Maintenance

Badger E-Series meters are designed and manufactured to provide long-term service with no maintenance. The enclosure, which includes the electronics, ultrasonic sensors, battery and display, is completely potted and therefore permanently sealed and not serviceable.

ADE, Badger, GALAXY, ORION, Recordall, and RTR are registered trademarks, and E-Series is a trademark of Badger Meter, Inc.



Please see our Web site at
www.badgermeter.com
for specific contacts.



BadgerMeter, Inc.

P.O. Box 245036
Milwaukee, WI 53224-9536
800-876-3837

infocentral@badgermeter.com • www.badgermeter.com