

**Cold Water
Recordall®
Turbo 160 Meter**

Size 1 1/2" (DN 40 mm)

**Technical
Brief**

DESCRIPTION

Badger Meter offers the 1-1/2" Turbo Series meter in Cast Bronze and a Low Lead Alloy. The Low Lead Alloy (Trade Designation: Turbo Series LL-NS) version complies with NSF/ANSI Standard 61 and carries the NSF-61 Mark on the product.

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

OPERATION: Water flows into the meter's measuring element contacting the multi-vaned rotor. Flow readings are obtained by rotor revolutions transmitted by magnetic drive coupling through the meter's cover plate to the sealed register. Magnetic drive is achieved by a right angle worm drive, coupling the rotor to a vertical transmission spindle, driving a gear set rotating the magnet carrier. A ceramic magnet in a carrier rotates around a vertical axis. Through the magnetic coupling, rotor rotation is transmitted to a follower magnet which transmits rotation to the register gearing.

The turbo measuring element is designed to greatly reduce wear by reducing friction potential between the moving parts of the rotor and bearing system. Less wear, in this critical area of the design, provides the utility manager with a lower life cycle cost for meter application. Throughout the normal operating range of the meter, the rotor floats between the thrust bearing system.

OPERATING PERFORMANCE: The Badger® Recordall Turbo 160 is designed to provide excellent registration accuracy for the low flow rate, normal operating flow rate, and maximum continuous operation flow.

CONSTRUCTION: The Badger Recordall Turbo 160 meter construction which complies with ANSI and AWWA C701 standards, consists of three basic components: meter housing, interchangeable measuring element and permanently sealed register. The housing is bronze, with elliptical flanges. The measuring element consists of the transmission coupling, measuring element insert, rotor, inlet and outlet straightening vanes with nose cones, and calibration ring assembly. The unique inlet and outlet straightening vanes minimize swirl from piping arrangements upstream as well as downstream.

To simplify maintenance, the register and measuring element can be removed without removing the meter housing from the installation. No change gears are required for accuracy calibration. Interchangeability of certain parts between 1 1/2" - 4" like-sized meters also minimizes spare parts inventory investment.

MAGNETIC DRIVE: Direct magnetic drive, through the use of high-strength magnets, provides positive, reliable and dependable register coupling for straight-reading, remote or automatic meter reading options.

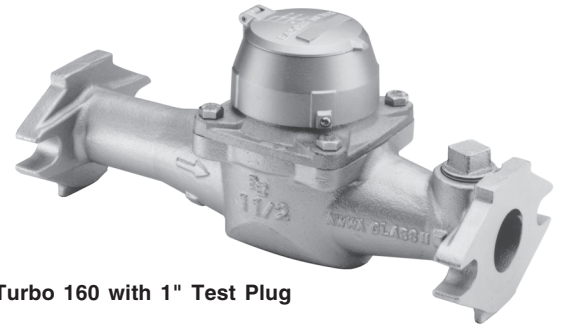
SEALED REGISTER: The standard register consists of a straight-reading odometer-type totalization display, 360° test circle with center sweep hand and flow finder to detect leaks. Register gearing consists of self-lubricating thermoplastic gears to minimize friction and provide long life. Permanently sealed; dirt, moisture, tampering and lens fogging problems are eliminated. Multi-position register simplifies meter installation and reading. Automatic meter reading and close proximity systems are available for all Recordall Turbo meters. (See back of sheet for additional information.) All reading options are removable from the meter without disrupting water service.

TAMPER-RESISTANT FEATURES: Customer removal of the register to obtain free water can be prevented if the tamper detection seal wire screw or TORX® tamper resistant seal screw is added to the meter. Either can be installed at the meter site or at the factory. A tamper resistant calibration plug seal provides protection from unauthorized personnel.

MAINTENANCE: Badger Recordall Turbo meters are designed and manufactured to provide long-term service with minimal maintenance. When maintenance is required, it can be performed easily either at the meter installation or at any other convenient location. As an alternative to repair by the utility, Badger offers various maintenance and meter component exchange programs to fit the needs of the utility.

CONNECTIONS: Companion flanges for installation of meters on various pipe types and sizes are available in cast iron or bronze as an option.

TEST PLUG: An optional 1" NPT test plug puts an end to removing and reinstalling meters during field accuracy and pressure testing.



Turbo 160 with 1" Test Plug

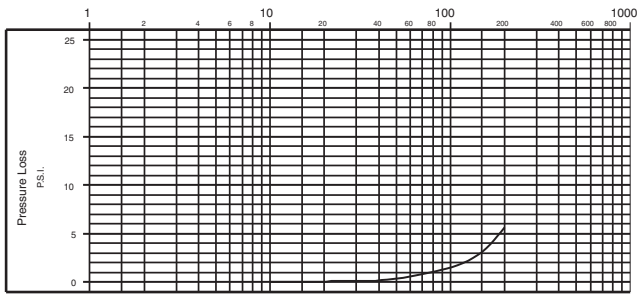
SPECIFICATIONS

Typical Operating Range (100% ± 1.5%)	4 - 200 GPM (0.9 to 45.4 m³/h)
Maximum Continuous Operation	160 GPM (36 m³/h)
Maximum Intermittent Flow	200 GPM (45.4m³/h)
Typical Low Flow (Min. 95%)	2.5 GPM (0.6 m³/h)
Pressure Loss at Maximum Continuous Operation	3.8 PSI (.26 bar at 36 m³/h)
Maximum Operating Temperature	120°F (49°C)
Maximum Operating Pressure	150 PSI (10 bar)
Meter Flanges	1 1/2" Elliptical AWWA 125 pound class
Register	Straight reading, permanently sealed magnetic drive standard. Automatic Meter Reading and Close Proximity units optional.
Registration	100,000,000 Gallons 100 gallons/sweep hand revolution. 10,000,000 Cubic Feet 10 cubic ft./sweep hand revolution. 1,000,000 m³ 1 m³/sweep hand revolution. 100,000,000 Imperial Gallons 100 Imperial Gallons/sweep hand revolution.

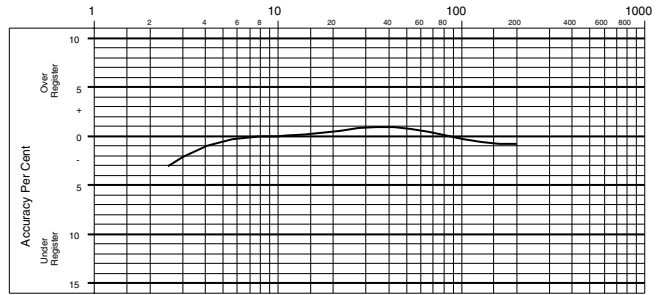
MATERIALS

Housing	Cast Bronze (B81), Low Lead Alloy
Turbo Head	Cast Bronze (B81), Low Lead Alloy
Nose Cone and Straightening Vanes	Thermoplastic
Rotor	Thermoplastic
Rotor Radial Bearings	Lubricated Thermoplastic
Rotor Thrust Bearings	Sapphire Jewels
Rotor Bearing Pivots	Passivated 316 Stainless Steel
Calibration Mechanism	Stainless Steel and Thermoplastic
Magnet	Ceramic
Register Lid and Shroud	Thermoplastic, Bronze
Trim	Stainless Steel

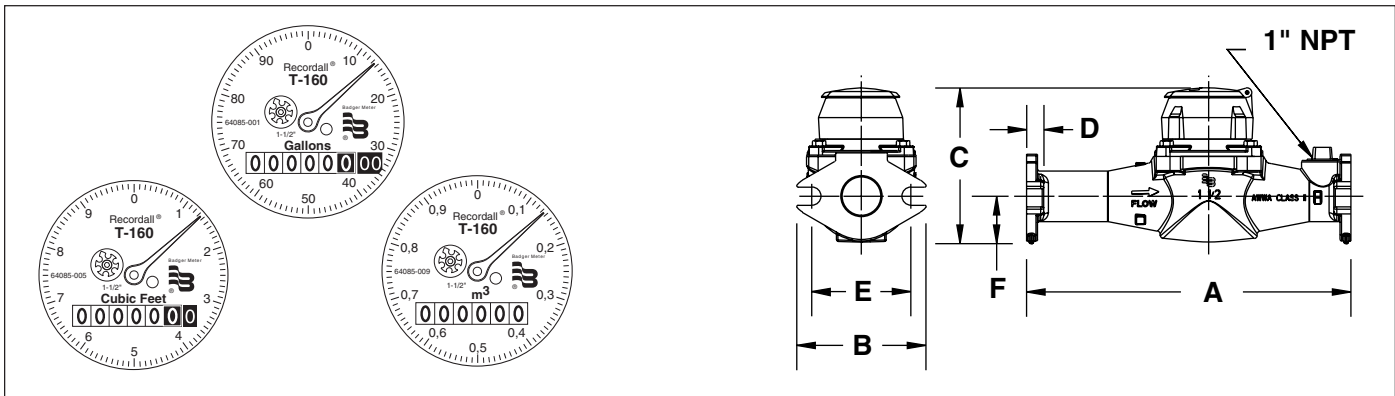
PRESSURE LOSS CHART
Rate of Flow, in Gallons per Minute



ACCURACY CHART
Rate of Flow, in Gallons per Minute



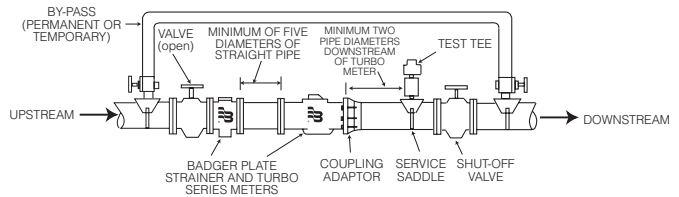
Meter & Pipe Size	DIMENSIONS								
	Length A	Width B	Height C	Flange D	Bolt Circle E	Centerline F	No. Bolts	Net Weight	Shipping Weight
1 1/2" EL (DN 40)	13" (330mm)	5 7/32" (133mm)	6 9/32" (159mm)	51/64" (20mm)	4" (102mm)	1 27/32" (47mm)	2	14.3 lb. (6.5 kg)	16.8 lb (7.6 kg)



PROPER INSTALLATION: The following installation guidelines will insure optimum field performance and reliability when installing a Badger Turbo meter.

1. A strainer is recommended to insure optimum flow conditioning and protection for the turbo meter measuring element.
2. When using a strainer, five (5) diameters of straight pipe separating the strainer upstream of the meter is recommended.
3. ONLY full-open gate valves should be used immediately upstream of the meter. Butterfly valves MUST be five (5) pipe diameters or more upstream of the meter. Full-open gate or butterfly valves can be used downstream.
4. DO NOT install pressure reducing devices or check valves upstream of the meter.

5. Unweighted check valves MUST be located at least three (3) pipe diameters downstream of the meter.
6. Pressure reducing devices and externally weighted check valves MUST be located at least five (5) pipe diameters downstream of the meter.



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BadgerMeter, Inc.

P.O. Box 245036, Milwaukee, WI 53224-9536
(800) 876-3837 / Fax: (888) 371-5982

www.badgermeter.com