

## Recordall® Combo Meter

Lead-Free Bronze Alloy Size 8 in. (DN200)  
NSF/ANSI Standards 61 and 372 Certified





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## SCOPE OF THE MANUAL

This manual contains information concerning the installation, operation and maintenance of the 8 inch Badger Meter® Recordall® Combo Meter Assembly. To ensure efficient operation of the meters, read and understand the instructions in this manual. Retain the manual in a location where it is readily available.

## PRODUCT INFORMATION

### Product Description

The 8 inch Recordall Combo Meter assembly consists of a stainless steel spool with a bypass port, an 8 inch Recordall Turbo Series Meter with AWWA class II measuring chamber, a Model DCA-01 Detector Check Valve with bypass piping, valves, and an M120 Recordall Disc Meter. The meter assembly measures both low flow domestic use and high volume use through a single water supply line.

#### Turbine Meter

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. Rotor rotation is transmitted to the register gearing through this magnetic coupling.

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 lifecycle cost for meter application. Throughout the normal operating range of the meter, the rotor floats between the thrust bearing system.

The detector check valve is a spring-loaded check valve on the downstream side of the clapper that holds the clapper in a normally closed position. Small water flows bypass the clapper and are registered on the 1-1/2 inch bypass meter. This allows for accurate registration of domestic use, leakage or misuse of water. When a major flow is required, the water pressure overcomes the mechanical advantages of the spring-loaded clapper and pushes it open, permitting full pipe capacity flow. A small amount of water continues to flow through the bypass when the clapper is fully open.

The bypass line consists of piping with a 1-1/2 inch Model 120 Recordall Disc Meter, an isolation valve, and a check valve.

### Related Literature

- The *Recordall Combo Meters Product Data Sheet* contains information on operating principle, meter construction, materials, tolerances and specifications.
- The *Recordall Combo Meters Parts List* contains illustrations of parts, part numbers, and part descriptions.

### Safety Information

The installation of the Recordall Combo 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.

### Unpacking and Inspection

To avoid damage in transit, the Recordall Combo meter assemblies are shipped to the customer in special shipping containers. Upon receipt of shipment, be sure to follow these unpacking and inspection procedures:

**NOTE:** 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 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.

## INSTALLATION

Installation is made similar to placing a length of flanged end pipe in the line. The AWWA Class "D" steel flanged end design permits use in a wide range of applications. The meter must have a full flow of liquid for proper accuracy. It must be installed in horizontal applications only.

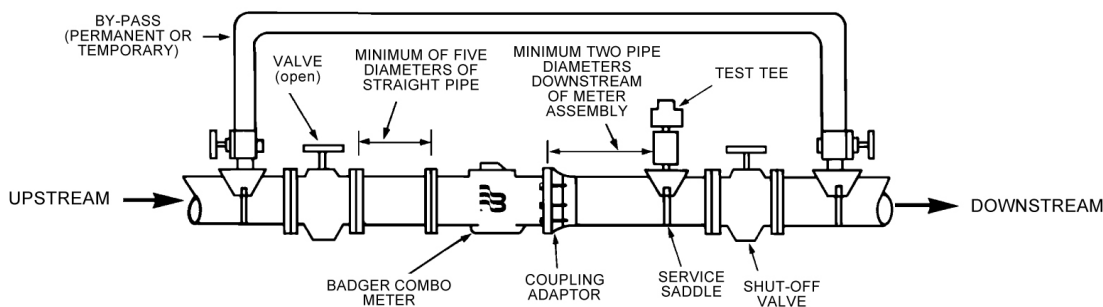


Figure 1: Recommended meter installation

### Preinstallation Considerations

Before proceeding any further with the installation, first read the instructions in the paragraphs immediately following to become familiar with the requirements and procedures involved.

**NOTE:** The Recordall Turbo Series meters are designed for operation in HORIZONTAL piping arrangements.

- Be sure that the meter flow range and size of the meter coincide with the intended service and demand for water.

### ⚠ CAUTION

**THE LIFE OF THE TURBO METER WILL BE CURTAILED IF OPERATED AT FLOW RATES HIGHER THAN SPECIFIED.**

- The meters are designed for use in cold water service (up to 120° F or 49° C) within the applicable flow requirements for turbo meters. For use with water at higher temperatures, consult your Badger Meter representative or nearest Badger Meter regional sales office.
- Avoid locating the meter in close quarters. Allow sufficient space to permit access for meter reading, testing, and maintenance.
- Because of the need to test large meters periodically to verify their performance, it is recommended that a bypass system be incorporated into the piping arrangement. This will also provide a means of performing periodic cleanout and routine maintenance without interrupting service to the customer. A test tee can be installed downstream of the meter for field accuracy testing. The side port on the check valve can also be used for accuracy testing.
- The Turbo Series meters are tested for accuracy and pressure prior to shipment, so no field adjustments are required. To optimize turbine performance, consider the following factors when installing the Combo meter assembly.
  - ◇ Do not install check valves or pressure-reducing devices upstream of the meter.
  - ◇ Valves immediately upstream of the meter should only be fully-open gate valves. Butterfly valves are acceptable if they are 5 pipe diameters or more upstream from the meter. Downstream, fully open gate or butterfly valves can be used.
  - ◇ If a service saddle or reducing tee is used for field accuracy testing, it should be at least 2 pipe diameters downstream of the meter's outlet flange.

## Installing the 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.**

Overall dimensions and laying lengths of each meter size are listed in the *Recordall Combo Meter Product Data Sheet*. Review the dimensional requirements, choose an installation point in the piping, and proceed as follows:

1. Measure precisely the overall length of the Combo Meter Assembly with gaskets attached to the inlet and outlet flange connections.
2. Provide proper gap length in service piping.
3. Install meter in the pipeline so that the flow arrow on the meter housing points in the same direction as water flow.
4. With the assembly and gaskets in place, tighten flange connection bolts. A cross star torque pattern is recommended.
5. To relieve possible strain on the piping, position a meter support under the meter housing where appropriate.

### ⚠ CAUTION

**TURBINE 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 TURBINE MECHANISM CAN BE AVOIDED.**

## Performance Checks and System Startup

Any valves or devices controlling the flow of water through a Combo Meter Assembly must always be opened and closed *slowly* to prevent shock loads that may damage the meter's rotor assembly.

Complete the following checks to ensure that a meter assembly is properly installed and operational:

1. After opening the vent screw 3 turns on the strainer and check valve (if applicable), slowly open the upstream valve to apply water pressure to the meter and check to see if there are any leaks. Continue venting until a steady water stream is visible. Tighten the vent screw. Tighten the flange bolts as required.
2. Perform a functional test of the meter. Slowly open the valve on the downstream (consumer) side of the meter to evacuate any air that may still be trapped in the service line. When air has been eliminated, increase the demand flow rate by further opening the downstream valve or valves. Observe the register for correct direction of the flow. The large test pointer will now move in the proper direction. Now open all applicable service valves. Finally, close the bypass valves completely.
3. Check the flow rate to verify the flow does not exceed the maximum continuous duty specification, as defined in ["SPECIFICATIONS" on page 13](#). The rate of flow can be quickly checked by timing the quantity registered through the meter in one minute.

## Shutdown Instructions

If the Combo Meter Assembly is to be shut down for an extended period of time or if it is being removed from service, Badger Meter recommends that all components be thoroughly flushed to prevent the settling out of undissolved solids or the accumulation of corrosive deposits. The strainer should be flushed at this time.

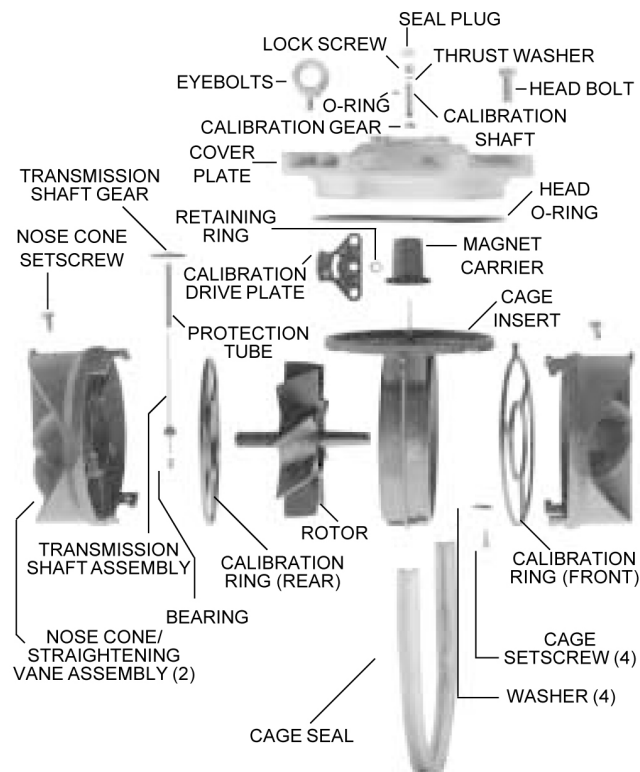


Figure 2: Measuring element assembly, 8 inch

## SERVICING PARTS AND ASSEMBLIES

This section contains information about general maintenance and servicing. Instructions for disassembling the Recordall Turbo Series mainline meter for servicing can be found in the *Recordall Turbo Series Meter User Manual*. Also see the *Recordall Combo Meter Parts List* for part numbers of replaceable components and correct ordering information. If satisfactory repair cannot be made, contact Badger Meter.

Instructions for servicing the Disc Series bypass meter can be found in the *Recordall Disc Series Meter User Manual*. Component detail can be found in the *Recordall Disc Series Meter Parts List*.

When the performance of the Combo Meter indicates a need for servicing of the Recordall Turbo Series meter, refer to the following instructions pertaining to removal, inspection and installation of service parts and assemblies. With the Recordall Turbo Series unitized construction, service is simplified with a reduction in required product maintenance training. Also see the *Recordall Turbo Series Meter Parts List* for part numbers of replaceable components for ordering information. If satisfactory repair cannot be made, contact Badger Meter.

### Maintenance

Badger Meter products have been carefully designed to be as maintenance-free as possible. However, depending upon installation location and condition of water being metered, maintenance may occasionally be required. The maintenance and inspection procedure can also be used as a guide to locating a problem in the unit that may be the cause of abnormal meter operation.

Meters can be serviced without removing them from the line. A typical installation would be equipped with drain and piping valves. To inspect or replace components of the head assembly for the turbo or the chamber assembly in the disc meter, close the upstream and downstream valves. However, if the installation does not have a drain valve, proceed as follows to relieve pressure:



**⚠ WARNING**

**UPSTREAM AND DOWNSTREAM VALVES MUST BE CLOSED BEFORE ATTEMPTING TO REMOVE METER HEAD OR COVER FROM HOUSING OR PERFORMING ANY SERVICE/MAINTENANCE REQUIRING DISASSEMBLY. FAILURE TO DO SO CAN LEAD TO HEAD OR COVER BEING "EJECTED" FROM HOUSING, CAUSING PERSONAL INJURY AND/OR PROPERTY DAMAGE!**

1. Loosen each of the head or cover bolts about one and one-half turns. Do not completely remove the bolts.
2. If the O-ring between the meter head/cover and the housing is secure and not leaking, pry the measuring element assembly loose by inserting a screwdriver blade where the head and housing join together.

**⚠ CAUTION**

**BE SURE THAT ANY WATER COMING OUT OF THE METER HEAD DOES NOT SPRAY ONTO ELECTRICAL EQUIPMENT TO CREATE A SHOCK HAZARD.**

3. Allow the meter to drain and relieve internal pressure.
4. When pressure is relieved, remove the head bolts. Lift the measuring element assembly from the housing.

For specific maintenance of the Turbo Head, see the *Recordall Turbo Series Meter User Manual*.

5. When service is complete, start up the system as noted in ["Performance Checks and System Startup"](#) on page 7.

**Check Valve**

Periodic preventive check valve maintenance is highly recommended and should be practiced according to schedule to assure continuous accuracy and trouble-free performance of your check valve. The valve is water lubricated and should be regularly inspected for corrosion, obstructions in the waterways and for freedom of movement for all working parts. The frequency of the inspections is dependent upon the quality of the water supply and authority having jurisdiction. Make sure all equipment is adequately protected to prevent freezing and physical damage. Repair all leaks.

To remove or replace the knuckle joint assembly, follow these steps:

1. Shut down the water system and lock it out, if possible.
2. Loosen the vent screw in the lid *slowly* to relieve system pressure.
3. Loosen and remove all inspection port bolts and remove the lid and gasket from valve.
4. Install proper size clapper check removal tool (see diagram 1 in [Figure 3](#) and Item 10 in [Figure 5](#)). Be sure tool is pushed to within 1/2 inch of linkage.

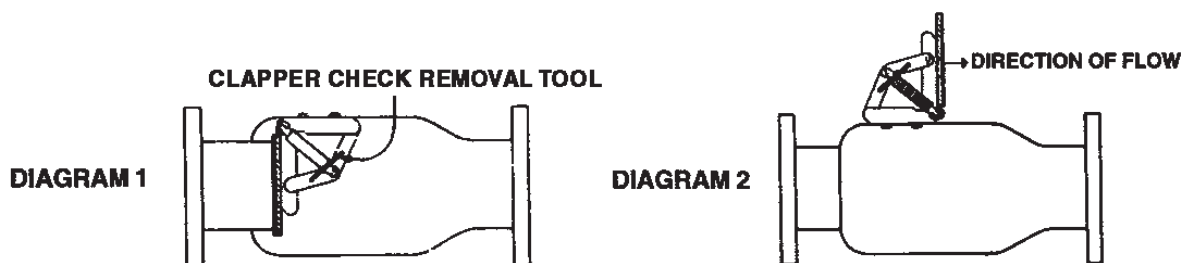


Figure 3: Clapper check removal tool

5. Loosen equally the two knuckle joint mounting bolts until assembly is free. As bolts are loosened, the linkage will release slightly and lock the clapper retainer tool in place.
6. Remove the knuckle joint from the body assuring the clapper retainer tool is not disturbed, as the preloaded knuckle joint springs have considerable tension in this position.
7. Bolt the knuckle joint to the outside of the body using the new 3/8 inch bolts supplied with the new knuckle joint (see Diagram 2).

8. Push on the clapper plate to release the clapper retainer clip, remove and slowly release tension on the clapper. Unbolt the knuckle joint assembly from outside the body.
9. Bolt the replacement knuckle joint assembly to the body as in step 7.
10. Push on the clapper plate to extend the springs and install the clapper retainer tool, making sure the springs are seated on the pins. Unbolt the knuckle joint assembly from the bolt hole.
11. Insert the two new 3/8 inch mounting bolts and washers through the mounting holes in the body. Position the knuckle joint in place inside the body and finger-tighten both bolts.
12. Torque the knuckle joint mounting bolts to 60 inch-pounds. Remove the clapper retainer tool.
13. Replace the lid and the new gasket.
14. Start system as described in [“Performance Checks and System Startup” on page 7](#).

Yearly inspection is advised for meters installed in water with high levels of debris or contaminants. The measuring chamber should be cleaned and inspected.

### **Calibration Check and Adjustment**

For calibration check and adjustment of the Turbo Series meters, see the *Recordall Turbo Series User Manual*.

## BYPASS COMPONENTS HEAD ASSEMBLIES

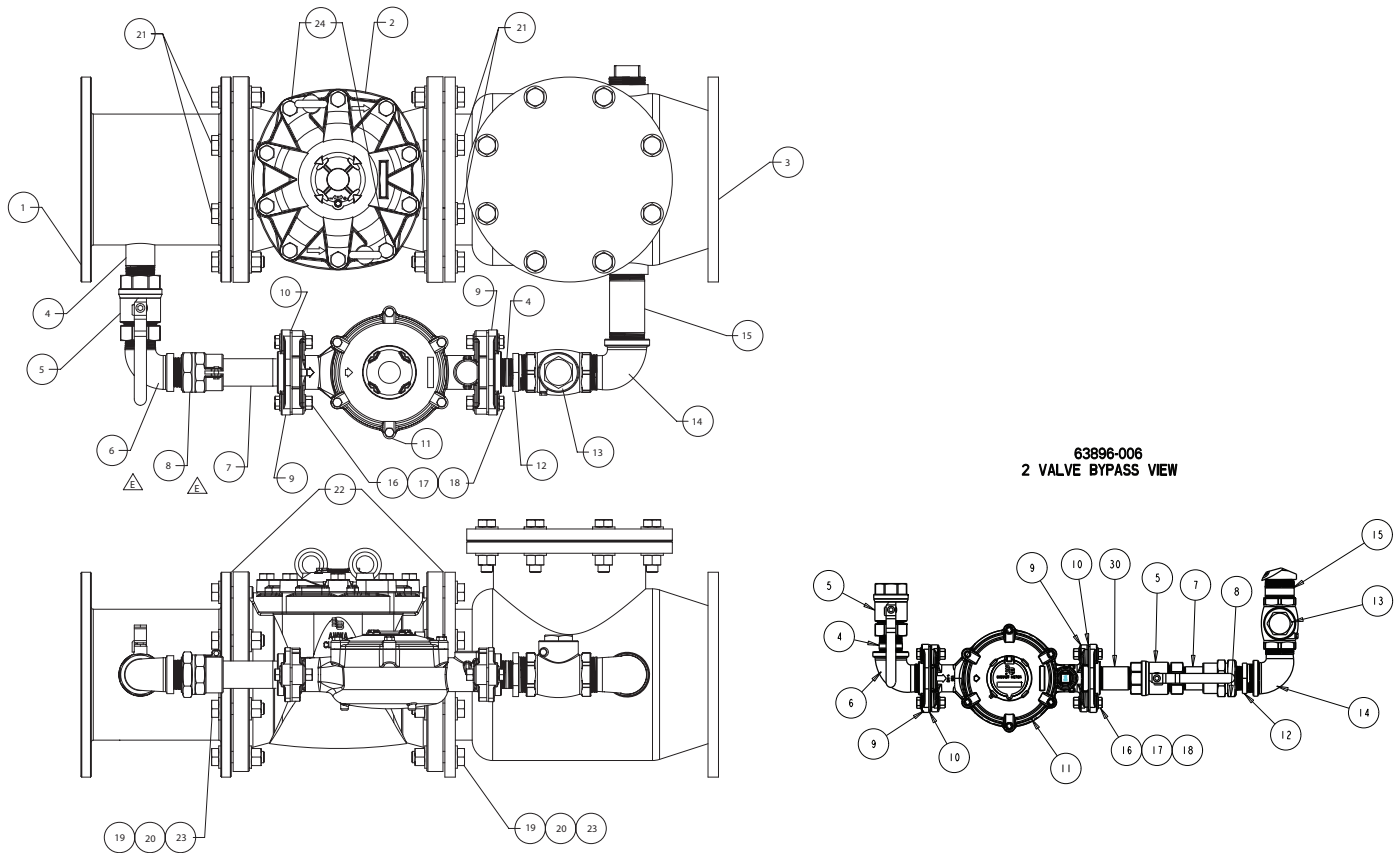


Figure 4: Meter assembly and part identification

Item	Part	Item	Part
1	Spool piece (lay length 11-7/8 in.)	13	2 in. Swing check valve
2	8 in. CI Turbo series, combo	14	Street elbow 2 in.
3	8 in. Check valve	15	2 × 4-1/2 in. Nipple
4	Close nipple 1.5 in. (2 required)	16	Bolt, 5/8-11 × 2-1/4 in.
5	Ball valve, locking	17	Nut, 5/8-11
6	Street elbow 1.5 in.	18	Washer, 5/8 in.
7	Nipple 1.5 × 6 in., 1 Thd	19	Bolt, 3/4-10 × 3
8	Repair coupling, 1.5 in. long	20	Nut, 3/4-10
9	Flange, threaded, 1.5 in. (2 required)	21	Hex head bolt 3/4-10 × 2-1/4 in.
10	Gasket, elliptical 1.5 in. (2 required)	22	Gasket, circular, 8 in.
11	M120 Disc series elliptical long, bypass meter	23	Washer, 3/4 in.
12	Bushing, 2 in. × 1.5 in.		

Check Valve

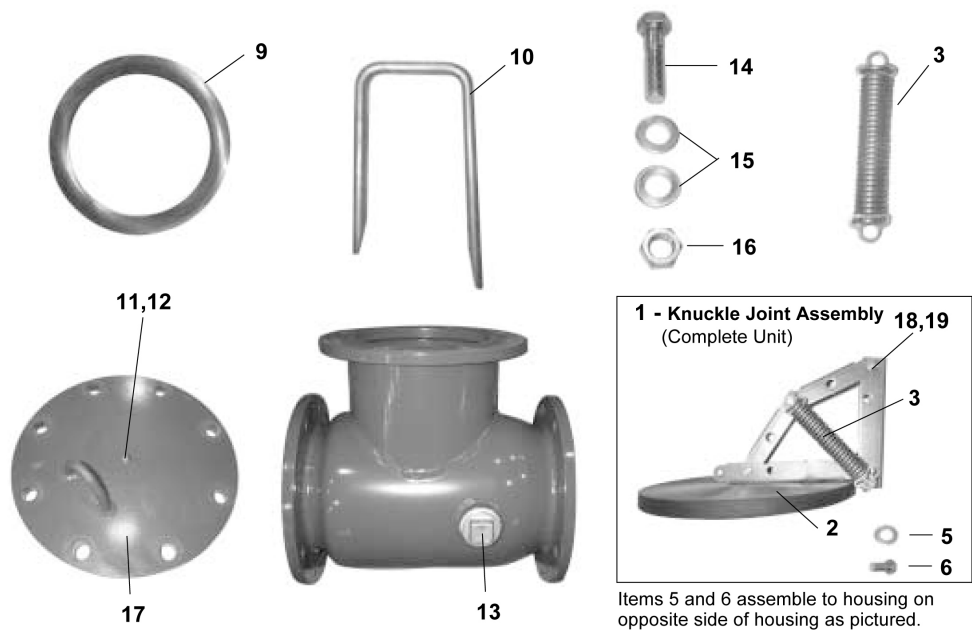


Figure 5: Check valve

Item	Part	Item	Part
1	Knuckle Joint Assembly - (Complete Unit)	11	Vent Screw
2	Clapper Plate with attached Link	12	Nylon Washer
3	Spring - 4 in., 6 in. (2 required), 8 in., 10 in. (3 required)	13	Drain Plug
5	Neoprene Washer (2 required)	14	Bolt
6	3/8 in. Stainless Steel Bolt (2 required)	15	Washer
7	Bronze Seat (replaceable in line) (not pictured)	16	Nut
8	Seat O-ring (not pictured)	17	Cover
9	Gasket	18	Clapper Retainer Clip (Wire Style)
10	Check Removal Tool	19	Clapper Retainer Clip (E-Ring)

## SPECIFICATIONS

Combo Meter Model	8 in. Model (200 mm)
Meter Flange, AWWA Class D (C-207)	8 in. (200 mm)
Typical Operating Range (100% $\pm$ 1.5%)	2.5...4500 gpm (0.56...1022 m <sup>3</sup> /h)
Low Flow Registration (95% minimum)	1.25 gpm (0.28 m <sup>3</sup> /h)
Maximum Continuous Flow	3500 gpm (795 m <sup>3</sup> /h)
Pressure Loss at Maximum Continuous Flow	6.3 psi at 3500 gpm (0.43 bar at 795 m <sup>3</sup> /h)
Pressure Loss at Crossover	2 psi (0.138 bar)
Minimum Crossover Accuracy	90%
Maximum Operating Pressure	150 psi (10 bar)
Maximum Operating Temperature	105° F (40° C)
Check Valve	Conforms to UL 312 and FM 1045
Bypass Line	Specify right-facing (standard, as shown) or left-facing assembly

## Materials

Meter Housing	Fusion-bonded epoxy coated ductile cast iron
Bypass Meter Housing	Lead-free bronze alloy
Bypass Measuring Chamber	Injection-molded thermoplastic
Bypass	Brass piping conforming to AWWA C800, NSF 61 & 372 compliant
Spool Body	Stainless steel, with stainless steel bypass port. Standard steel flange connections with zinc chromate plating.
Nose Cone & Straightening Vanes	Thermoplastic
Rotor	Thermoplastic
Rotor Radial Bearings	Lubricated thermoplastic
Rotor Thrust Bearing	Sapphire jewels
Rotor Bearing Pivots	Passivated 316 stainless steel
Calibration Mechanism	Stainless steel & thermoplastic
Magnet	Ceramic
Clapper Assembly (clapper, spring, hinge & pins)	Stainless steel
Clapper Seal	Elastomeric, EPDM
Valve Seat	Stainless steel
Valve Body & Cover Plate	Fusion-bonded epoxy coated steel
Valve Cover Plate Gasket	Elastomeric sheet
Register Housing & Cover	Thermoplastic or bronze
Trim	Zinc-plated stainless steel or (optional) all stainless steel.

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