Badger Meter

Industrial Turbine Meters

Turbo Meter/Butterfly Valve Assembly



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User Manual

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SCOPE OF THIS MANUAL

This document provides instruction to install a Turbo Meter and Butterfly Valve assembly into a system. Instructions for the connection or operation of specific items (such as the transmitter, solenoid valve, speed control valve, and others) are covered in other documents by Badger Meter or by the manufacturer.

Technical information regarding each component can be found in the Badger Meter® Product Data Sheets or in literature of the component in question. Badger Meter literature can be found on the Badger Meter website at *www.badgermeter.com*. If the component is required and not supplied with the unit, consult the factory.

IMPORTANT

Read this manual carefully before attempting any installation or operation. Keep the manual accessible for future reference.

UNPACKING AND INSPECTION

Upon opening the shipping container, visually inspect the product and applicable accessories for any physical damage such as scratches, loose or broken parts, or any other sign of 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 and file a claim with the carrier. A claim for equipment damage in transit is the sole responsibility of the purchaser.

SAFETY

Terminology and Symbols

⚠DANGER	Indicates a hazardous situation, which, if not avoided, will result in death or serious personal injury.
⚠WARNING	Indicates a hazardous situation, which, if not avoided, could result in death or severe personal injury.
⚠CAUTION	Indicates a hazardous situation, which, if not avoided, could result in minor or moderate personal injury or damage to property.

Considerations

The installation of the Turbo Meter with Butterfly Valve Assembly must comply with all applicable federal, state, and local rules, regulations, and codes.

⚠WARNING

ONLY PERSONNEL WITH APPROPRIATE TRAINING SHOULD OPERATE MACHINERY AND EQUIPMENT. THE PRODUCT MAY BECOME UNSAFE IF HANDLED INCORRECTLY.

⚠WARNING

DO NOT ATTEMPT TO SERVICE THE PRODUCT WHILE IT IS IN USE. MAKE SURE THE UNIT IS COMPLETELY SHUT OFF BEFORE ATTEMPTING ANY SERVICE OR MAINTENANCE.

DESCRIPTION

The Badger Meter Turbo Meter and Butterfly Valve assembly is designed to control and measure the water batching process in concrete batch plants, block plants, pre-stress concrete batch plants or wherever there is a need for water batching. Our reliable Industrial Turbine Meter, with either an unscaled pulse transmitter or an electronic scalable transmitter, combined with a solenoid-controlled air operated butterfly valve creates a water batching system that provides accurate and dependable service in all types of batch plant environments. The batching system can be specified with either a scaled pulse transmitter for use with a batch controller for semi-automatic batching or an electronic scalable transmitter for use in fully automated plants.

The Turbo meter is compact in size and is easy to service without removing the meter from the lines. Available in four line sizes (2 in., 3 in., 4 in. and 6 in.) for up to 2000 gpm (7570 lpm), the system provides a high level of accuracy over a wide flow range with a minimum of pressure loss. Its unique straight-through flow profile and ceramic bearing design optimize performance and accuracy.

The solenoid controlled air operated butterfly valve permits higher flows at lower pressure loss. The valve requires a 70 psi minimum air supply to operate. Included with the valve is a speed control to adjust the closing speed of the valve, which assists in the reduction of water hammer.

THEORY OF OPERATION

The Badger Meter Industrial Turbo Meter is a volumetric liquid flow meter which works on the time-proven principle of a rotor turning at an angular velocity proportional to the fluid velocity through the turbine. The meter has straightening vanes and a nose cone in the inlet side that minimize upstream turbulence and direct the flow to the rotor effectively. The motion of the rotor is relayed to the meter's magneto resistive pulse transmitter or electronically scalable transmitter. The scalable transmitter can then be adjusted to produce the desired pulse rate.

The Turbo Meter and Butterfly Valve Assembly is made up of six main components: The Turbo Meter, Transmitter, Butterfly Valve, Actuator, Solenoid Valve and Air Filter/Regulator. Each part has its own purpose in the batching process. First, the batch controller sends a signal to the Solenoid Valve to open. When it opens, air is filtered through the Air Filter/Regulator and the Solenoid Valve and into the Actuator. This turns the vane of the actuator, which in turn opens the butterfly valve, allowing water to flow through. The Turbo Meter measures the flow, and the Transmitter sends that information to the batch controller via the pulse output. Once the right amount of water has passed through, the batch controller sends another signal to the Solenoid Valve, so it closes, cutting the air supply to the Actuator, which then closes the Butterfly Valve. See *"Dimensions and Parts" on page 9* for locations of parts.

PRE-INSTALLATION CONSIDERATIONS

The unit is supplied with the valve mounted to the meter using an NPT companion flange. Flange gaskets are provided for both sides of the butterfly valve body. The installer needs to provide the upstream meter flange gasket.

Make sure the upstream piping is free of debris, and that the mating pipeline flange is of the same rating (size/class) as the flange on the meter.

⚠CAUTION

MAKE SURE THAT THE INSTALLATION AREA IS NOT TOO HOT OR HUMID. HIGH HUMIDITY OR TEMPERATURE CAN DAMAGE THE COMPONENTS.

Disc/Pipe Clearance

Make sure that there is enough clearance for the valve to open and close without scraping the disc edge on the pipe ID.

Valve Size (in.)	**2**	**3**	**4**
Disc Swing Size (in.)	1.467	2.743	3.601
Opens into	Standard, Sch 40 and Sch 80 pipes		

⚠CAUTION

FAILURE TO CHECK CLEARANCE MAY RESULT IN DAMAGE TO THE VALVE.

INSTALLATION

Upstream Piping

1. Using an appropriate flange gasket, attach the inlet flange of the valve to the upstream pipeline flange.
2. For low pressure applications (typically 50–60 psig or less), a properly threaded length of pipe (an NPT fitting or NPT coupling) can be threaded directly into the companion flange without disassembling the unit. Make sure to use a suitable pipe thread sealant.

NOTE: The externally threaded NPT connection must be of proper thread length. Threads that are too long can interfere with the operation of the butterfly valve disk.

Flanged Downstream Piping

If the downstream piping is already fitted with a flange, the NPT companion flange needs to be removed to make room for the pipeline flange. This can be done with the meter flanged to the upstream piping, or on a work bench.

1. Remove the 4 (or 8) flange bolts connecting the butterfly valve to the meter.
2. Inspect the gaskets for damage. If not damaged, the gaskets can be re-used.
3. Lay the companion flange aside.
4. Keeping the valve in the upright orientation, install the valve between the downstream pipeline flange and the meter's outlet flange. Tighten all nuts/capscrews in a crossover or star pattern for even sealing. Make sure there is metal-to-metal contact between the flange face and the valve body.

NOTE: If the supplied gaskets are not used, be sure to use gaskets that do not protrude into the flowstream, as this can restrict flow.

NOTE: Be sure the valve is in the "closed" position, to prevent damage to the disk while inserting the valve between the meter and flange.

Other Connections

- Connect the batch controller to the Transmitter and the Solenoid Valve according to instructions in documentation for those products.
- Connect supply air to the filter regulator (min. 70 psig). The fitting provided is a push-in type fitting for rigid poly piping (3/8 in. OD). Simply push the tubing into the fitting until it stops.

⚠WARNING

USE CLEAN AIR FOR THE AIR FILTER REGULATOR. COMPRESSED AIR CONTAINING CHEMICALS, ORGANIC SOLVENT, SYNTHETIC OIL OR CORROSIVE GAS MAY CAUSE BREAKAGE OF PARTS OR MALFUNCTION.

⚠WARNING

AIR CONTAINING TOO MUCH MOISTURE MAY CAUSE MALFUNCTION. INSTALL AN AIR DRIER OR AN AFTERCOOLER BEFORE THE FILTER REGULATOR.

OPERATION

The batch controller operates the Turbo Meter and Butterfly Valve assembly. Any batching controls will go through the batch controller. There are some ways to adjust the operation of the assembly, which are described below.

Adjustment

Adjusting the Actuator Speed

The speed which the actuator opens and closes the valve can be adjusted by turning the knob on the side of the speed control valve (see item 7 in *"Dimensions and Parts" on page 9*). Turning the knob clockwise closes the valve, slowing the actuator speed. The actuator should close the valve slower than 6–8 seconds to avoid water hammer.

Adjusting the Air Pressure

Check the air pressure regularly to make sure it is at the correct setting. If the air pressure has changed, adjust the air pressure to the correct level. The air pressure to the actuator can be raised or lowered as required using the pressure adjustment handle on top of the air filter regulator (see item 9 in *"Dimensions and Parts" on page 9*).

⚠WARNING

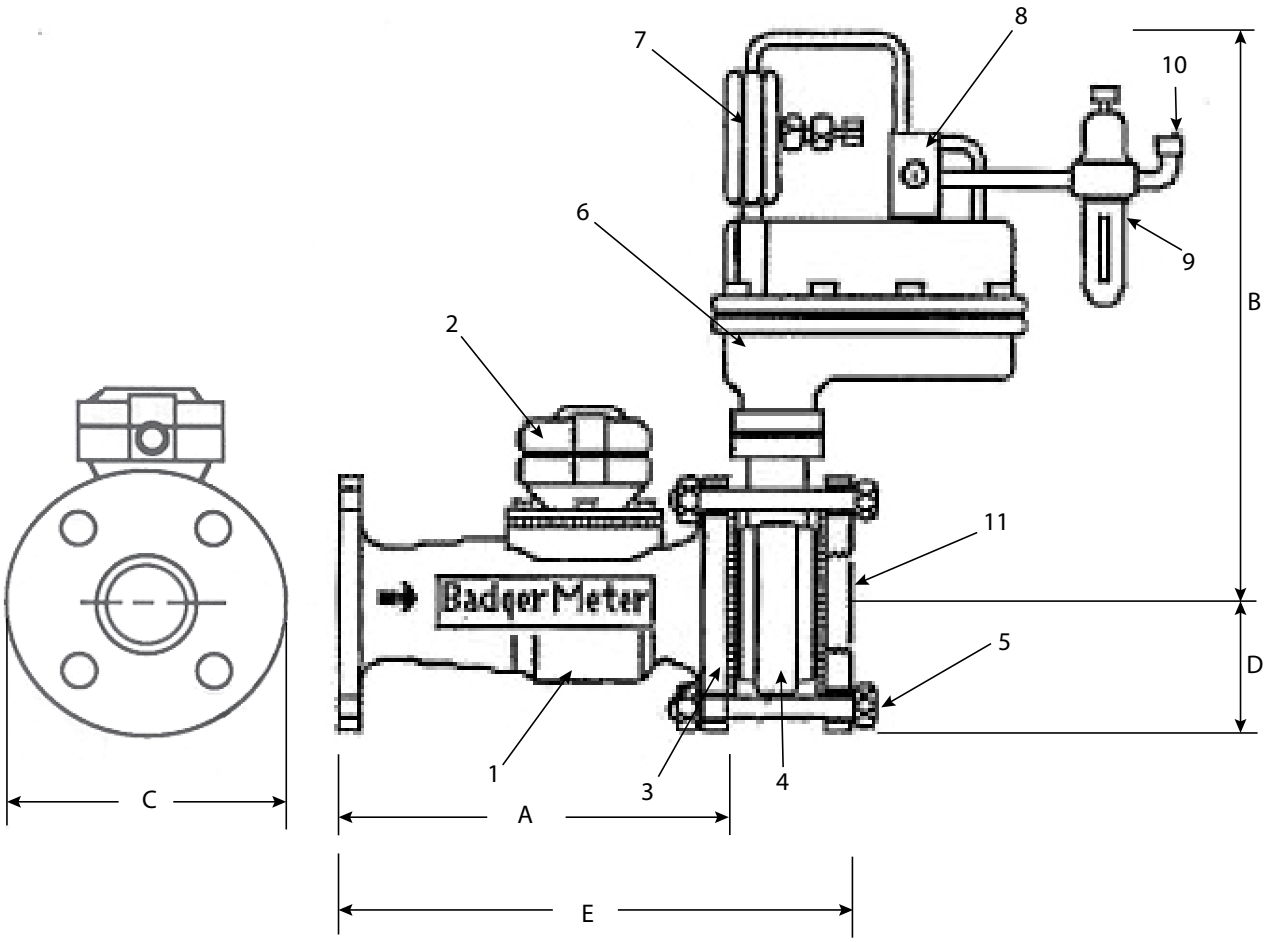
ADJUST THE HANDLE BY HAND. TOOLS MAY BREAK IT.

⚠WARNING

MAKE SURE TO UNLOCK THE HANDLE BEFORE ADJUSTING THE PRESSURE AND LOCK IT AFTER SETTING THE PRESSURE. FAILURE TO FOLLOW THIS PROCEDURE CAN DAMAGE THE HANDLE AND THE OUTLET PRESSURE MAY FLUCTUATE.

1. Pull the pressure regulator handle to unlock it. An orange mark appears in the gap to show it is unlocked.
2. Turn the handle by hand to set the air pressure. Turn clockwise to raise the pressure, or counterclockwise to lower the pressure. Adjust the pressure incrementally.
3. When finished adjusting, push the pressure regulator handle back down to lock it. The orange mark will disappear to show it is locked.

DIMENSIONS AND PARTS



	2 in.	3 in.	4 in.
A	10.00 in. (254 mm)	12.00 in. (305 mm)	14.00 in. (356 mm)
B	13.67 in. (347 mm)	13.67 in. (347 mm)	15.34 in. (390 mm)
C	6.00 in. (152 mm)	7.50 in. (191 mm)	9.00 in. (229 mm)
D	2.75 in. (70 mm)	3.50 in. (89 mm)	4.25 in. (108 mm)
E	12.75 in. (324 mm)	15.00 in. (381 mm)	17.12 in. (435 mm)
Est. Wt.	50–55 lb (22–25 kg)	65–75 lb (29–34 kg)	70–80 lb (31–37 kg)

Number	Item Name	Pcs
1	Turbo meter body	1
2	Transmitter head assembly	1
3	Flange gasket (Garlock®)	2
4	Valve body	1
5	Flange bolts/nuts	4 or 8
6	Valve Actuator	1
7	Actuator speed control valve (pre-adjusted)	1
8	Electric diverting valve	1
9	Air filter/regulator (pre-adjusted for 40–50 psig)	1
10	Supply air connection	1
11	Outlet connection (NPT-Standard)	1

MATERIALS

Other materials are available upon request.

Component	Part	Material
Meter	Housing Material	Cast Iron
	O-Ring and Tetraseal	Buna N
	Rotor and Nose Cone	Ryton
	Bearings	Ceramic
	Straightening Vanes	316 Stainless Steel
	Head Gasket	Buna N
Valve	Body	Ductile Iron
	Disc	Nickel Plated
	Stem (upper and lower)	410 Stainless Steel
	Seat and O-Ring	EPDM
Actuator	Housing	Die cast aluminum
	Coating (External)	Alkyd enamel
	Vane O-ring	Buna-N (Durometer 50)
	Shaft O-rings (2)	Buna-N (Durometer 70)
	Vane	Die Cast Aluminum
	Shaft	Carbon Steel
	Bushings (2)	660 Phosphor Bronze
	Lubricant*	Dubois MPG-2 Petroleum based grease
	Housing Sealer	RTV silicone rubber
Air Filter/Regulator	Bowl	Polycarbonate
	Bowl Guard	Steel plate

*Grease does not contain silicone when using Buna-N or Viton seals. EPDM seals use silicone based grease.

SPECIFICATIONS

System

System Size	2 in.	3 in.	4 in.
Accuracy ±0.5% @ indicated Flow Range	20–160 gpm (76–606 lpm)	60–350 gpm (227–1325 lpm)	100–1000 gpm (378–3785 lpm)
Accuracy ±1.5% @ indicated Flow Range	8–200 (30–757 lpm)	10–450 gpm (38–1703 lpm)	25–1250 gpm (95–4732 lpm)
Repeatability*	0.25%		
Temperature Range	32 to 200 °F (0 to 93 °C)		
Minimum Operating Pressure	7 psi (0.5 bar)		
Maximum Operating Pressure	125 psi (8.6 bar)		

* Reading over full range tested with potable water at 60° F (16° C).
Flange Face Configurations: (ANSI Standards)
Flat Faced Flanges: 125 lb (57 kg) Cast Iron

Solenoid

Voltage	115V AC/60 Hz (Other voltages available upon request)
Power Consumption	0.29 Amp Inrush 0.18 Amp Holding
Actuator Displacement	41 cu in./190° stroke
Operating Pressure	60–120 psi (4–8 bar)

Meter

Meter Size	2 in.	3 in.	4 in.	6 in.
Accuracy	± 1.5%			
Repeatability*	± 0.25%			
Temperature Range**	32 to 250 °F (0 to 121 °C)			
Flow Range	8–160 gpm (30–606 lpm)	10–350 gpm (38–1325 lpm)	25–1000 gpm (95–3785 lpm)	40–2000 gpm (151–7570 lpm)
Minimum Operating Pressure	7 psi (0.5 bar)			
Maximum Operating Pressure	125 psi (8.6 bar)			

* Reading over full range tested with potable water at 60° F (16° C).
** Temperature rating is for meters with PFT 3-E transmitters. Other ratings are available.

Actuator

Pressure	40–120 psig
Ambient Temperature	0 to 225 °F (–17 to 107 °C)
Operating Media	Air or non-corrosive gas
Air Consumption (Cubic in. per 90°)	41.0

Air Filter/Regulator

Proof Pressure	217.56 psi (1.5 MPa)
Max. Operating Pressure	145.04 psi (1.0 MPa)
Set Pressure Range	7.25–123.28 psi (0.05–0.85 MPa)
Filtration	5 µm
Drain Capacity	0.49 $in.^3$ (8 cm^3)
Construction	Relieving type
Mass	0.44 lb (0.20 kg)

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