

Installation, Operation, and Maintenance Instructions Multi Port Ball Valves MI & MP Series 4, 1/2" thru 4", 300# Class



WARNING:

For your safety and protection it is important that the following precautions be taken prior to working on the valve.

1. **Depressurize and drain the line.**
2. **Cycle the valve to relieve any pressure trapped in the valve.**
3. **Disconnect any air and electrical connections to the valve assembly.**
4. **Know what the media is in the line and wear appropriate protective clothing and equipment. Obtain appropriate MSDS sheets.**
5. **To ensure safe product selection and operation, it is the responsibility of the process system designer and end user to determine the appropriate compatible materials of construction and adequate product ratings for the process system. Process system designer, installer, and end user are responsible for proper installation, operation, and maintenance.**
6. **When disposing of Teflon parts, do not incinerate or subject to open flames.**

1. General

This Installation, Operation, and Maintenance manual is for the safe use of PBM Adjust-O-Seal[®], MI and MP Series 4 ball valves. Please read the instructions carefully and save them for future reference.

2. Installation

MI and MP Series 4 valves may be installed in any direction as required by the flow pattern. During the installation, the valve should be in either the fully counter-clockwise position or the fully clockwise position. Unless equipped with socket weld end fittings, MI and MP valves need not be disassembled prior to installation.

3. Operation

For manual valves, operation consists of turning the handle either the fully clockwise, fully counter-clockwise, or a 90 degree increment between (as noted by handle location). These valves may also be automated with actuators and other valve automation equipment. Mechanical handle stops must be removed if manual valves are converted to automated valves. For automated valves, operation is controlled by the actuator placed on top of the valve. Valve stops are an integral part of the actuators. Good operating procedure requires periodic inspection of the valves and replacement of parts as required. Always use PBM factory authorized replacement parts.

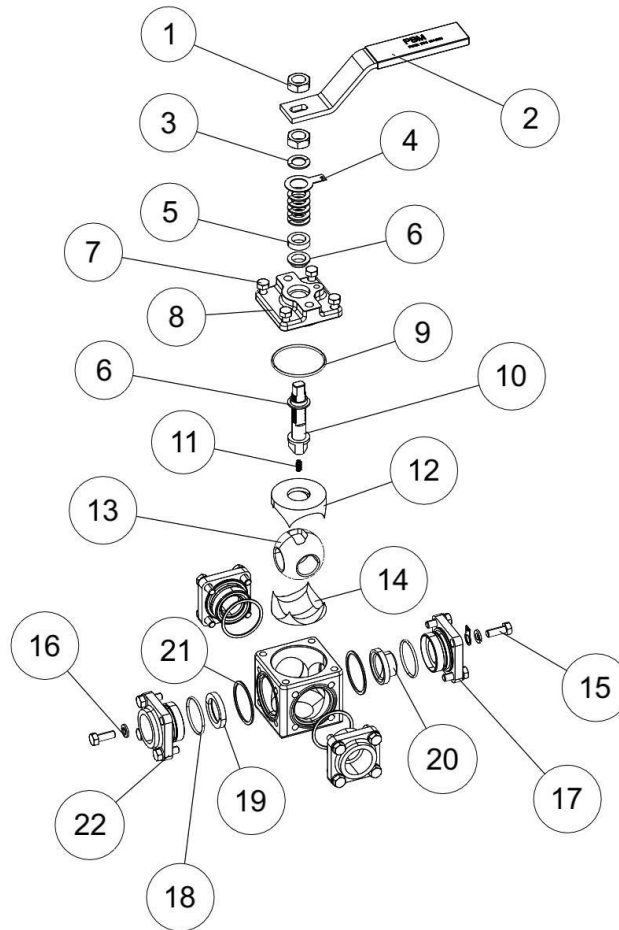
Follow instructions to ensure optimum performance:

Adjusting for Normal Wear

Note: Valve to be fully in one position of flow pattern, prior to adjustments.

1. PBM Ball Valves are designed with the Adjust-O-Seal[®] feature. If the valve shows signs of leakage due to normal seat wear, tighten the side and end fitting fasteners evenly, in the staggered sequence as shown at bottom of Page 3, until the leakage stops and the valve operates smoothly:
 - a) Initially, there should be a space between end or side fittings and the body. This space is the key to the Adjust-O-Seal[®] feature and allows in-line adjustment of the seats and gasket.
 - b) End and side fitting fasteners should be tightened only until valve stem breakaway torque is reached (see Torque Table - Page 4).
2. If valve shows signs of leakage in stem area due to normal stem packing wear, loosen the upper jam nut on the stem, then tighten the lower jam nut as follows:
 - a) For valves 2" and smaller, tighten nut to completely compress spring washers, then loosen nut 1/2 turn.
 - b) For 3" valves, tighten nut until a gap of about 0.05" (1.3 mm) exists between the adjacent spring washers.
 - c) For 4" valves, tighten the nut until a gap of about 0.10" (2.5 mm) exists between the adjacent spring washers. Leakage should stop, and the valve should continue to operate smoothly.
3. After adjustments have been made to seats, or if packing leakage cannot be stopped, a repair kit will be required

PARTS LIST	
ITEM	DESCRIPTION
1	Stem Nut
2	Handle (Manual Only)
3	Spring Washer
4	Grounding (If Any)
5	Follower
6	Stem Packing
7	Bonnet Bolt(s)
8	Bonnet
9	Bonnet O-ring
10	Stem
11	Grounding Spring (If Any)
12	Upper Cavity Filler (If Any)
13	Ball
14	Lower Cavity Filler (If Any)
15	Body Bolt(s)
16	Body Lock-Washer(s)
17	Blank Side Fitting
18	Side Fitting O-ring
19	Side Fitting Seat(s)
20	Blank Seat
21	Body Gasket(s)
22	Side Fitting(s)



Disassembly of valve:

- The orientation of the stem and handle, if equipped, with respect to the body, must be noted prior to disassembly to ensure that upon subsequent reassembly, the valve will function as intended.
- Isolate and depressurize the associated piping system. Cycle the valve to ensure there is no trapped pressure or fluid in the valve cavity.
- For Automated Valves Only:** Remove all air and electrical power from the actuator, solenoid valve, and switchbox, if any. Then remove the automation assembly from the valve. Remove the mounting bracket and coupling.
- For Manual Valves Only:** Loosen and remove the upper jam nut from the stem and then remove the handle.
- For valves with welded end connections, the valve can be disassembled with the body subassembly removed from the end fittings, or it can be disassembled with the body subassembly completely removed from the end fittings.
 - In order to remove the body subassembly from the end fittings, valve should be in one of the open positions. First loosen all the end and side fitting fasteners, then remove the fasteners and lock washers.
 - Remove the body from the end fittings until the body completely clears all the end fittings. The piping can now be returned to its original position, if desired.
- If the entire valve is to be removed from the piping, disconnect the end connections from the piping and remove the valve from the piping.
- Loosen and remove the blank, end, and side fitting fasteners and lock washers. Remove the blank, end, and side fittings.
- Remove the seats, gaskets, and O-rings.
- Loosen and remove the bonnet fasteners and lock washers. Pull the bonnet and stem upwards and out of the valve body, taking care not to scratch or nick the ball. Remove the O-ring from the bonnet.
- Loosen and remove the jam nut from the stem. Remove the spring washers, stop disc (if applicable), and follower.
- Remove the internal ground spring, if any, from under stem.
- Remove the jam or lock nut, spring washers, and follower from the stem.
- Push the stem down and out of the bonnet and remove the packing from the bonnet. The bottom packing may come off with the stem. If not, reach into the bonnet counterbore and remove.
- Remove the top cavity filler, if applicable.
- Pull the ball up through the top of the valve and out of the body, taking care not to nick or scratch the ball.
- Remove the bottom cavity filler, if applicable.
- For 3" and 4" side entry valves without cavity fillers, remove the Teflon ball holder.

Reassembly of valve:

1. Before reassembling the valve, examine the parts and repair or replace damaged or worn parts. Clean metal parts, as necessary, using a solvent compatible with the process fluid and a non-abrasive cloth. PBM recommends using new seats, body gaskets, and seals at each assembly.
2. Insert the bottom cavity filler, if applicable, concave facing upward, in the bottom of the valve body.
3. For 3" and 4" side entry valves with cavity fillers, insert the Teflon ball holder, concave side facing upward, in the bottom of the valve body.
4. Insert the ball into the valve through the bore in the top of the body. Insert the top cavity filler, if applicable, concave side facing downward.
5. Install a new packing, with flange surface seated onto flange of the stem, onto the threaded end of the stem and slide it down until it contacts the shoulder.
6. Insert the stem into bonnet bore and through the stem bore of the bonnet. Install a new top packing over the stem with the flanged surface facing upward. Push the packing into the bonnet.
7. Lubricate the bonnet O-ring and 1/4" of the top body bore with lubricant compatible to process fluid. Place the O-ring in the bonnet groove.
8. Insert the stem tang into the ball slot, taking care not to scratch or nick the ball, and insert the bonnet into the body, taking care not to cut the O-ring. The stem tang and ball will fit on only one orientation. The port identification markings on the top surface of the stem should match the port orientation of the ball.
9. Lubricate the threads of the bonnet fasteners with anti-galling lubricant. Install the bonnet fasteners and lock washers and tighten in a staggered sequence.
10. Install the follower over the stem until it seats on the packing. Lubricate the stem threads with anti-galling lubricant.
11. Install a spring washer onto the stem with the concave side facing upward.
12. **For Manual Valves:** Install the stop disc. Ensure correct flow pattern is obtained.
13. Install a second spring washer onto the stem with the concave side facing downward. Install the remaining spring washers onto the stem in an alternating or *series* arrangement. No two adjacent spring washers should be facing the same direction or in a *parallel* arrangement.
14. Thread a stem hex nut onto the stem. For valves 2" and smaller, tighten the nut to completely compress the spring washers, then back off 1/2 turn. For 3" valves, tighten the nut until a gap of about 0.05" (1.3 mm) exists between the adjacent spring washers. For 4" valves, tighten the nut until a gap of about 0.10" (2.5 mm) exists between the adjacent spring washers.
15. **For Manual Valves Only:** Install the handle on the stem such that the handle and stem, with respect to the body, reflects the orientation as noted prior to disassembly. Install and tighten the remaining hex nut to secure the handle to the stem.
16. Rotate the stem such that the flats on the top of the stem are parallel to the axis of the side fittings. Insert the internal ground spring, if any, into the hole at the bottom of the stem.
17. While carefully orienting the ball such that its slot will properly engage the stem tang, insert the ball into the body. Be careful not to nick or scratch the ball. Rotate the stem 90° to retain the ball within the body.
18. Install the seats, gaskets, and O-rings into the blank, end, and side fittings.
19. For valves with end fittings welded into the piping, spread the end fittings outward and slide the body between them. Release the force from the end fittings to allow end fittings to enter the body.
20. For valves that were completely removed, install the seats and gaskets into the blank, end, and side fittings. Insert the blank, end, and side fittings into the body.
21. Lubricate the threads of the blank, end and side fitting fasteners with an anti-galling lubricant. Install a lock washer onto each of the fasteners, and install the fasteners into the blank / end / side fittings and body. The external ground wire, if equipped, should be installed on one of the end / side fitting fasteners nearest its attachment point on the stem.
22. Hand-tighten the end fitting fasteners, and then hand-tighten the blank and side fitting fasteners.
23. Wrench-tighten the fasteners according to the procedure shown below, while maintaining an even gap between the body and end / side fittings, and until the stem torque, as shown in the torque table on Page 4 is reached. Cycle the valve to verify freedom of operation and torque. If practical, check the valve seats and seals for leaks.
24. **For Automated Valves Only:** Reinstall the automation assembly with the bracket and coupling. Then reconnect air and electrical power.
25. Insulate the valve, if applicable.

Tightening Procedure for End Fittings:

1. Hand-tighten the fasteners on one end, side, or blank fitting.
2. Hand-tighten the fasteners on each of the remaining end, side, or blank fittings per the staggered sequence illustrated in Figure "A" below.
3. Wrench-tighten each fastener in increments per the staggered sequence illustrated in Figure "B" below until the lock washers begin to compress.
4. Wrench-tighten the fasteners on each of the remaining end, side, or blank fittings per the staggered sequence illustrated in Figure "A" below.
5. Continue tightening bolts or hex nuts 1/8 turn until the recommended stem torque value is achieved.

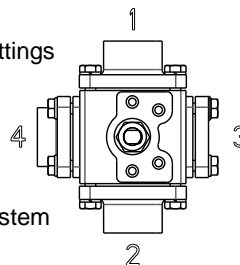


Figure "A"

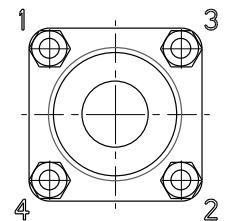


Figure "B"

Replacement Kits and Parts							
Valve Size	MP Repair Kit (V-TEF™)	MI Repair Kit (V-TEF™)	Cavity Filler Kit (VTFE)	MP, MI Tee Port Ball (316L S/S)	MP, MI Angle Port Ball (316L S/S)	MP, MI LL Port Ball (316L S/S)	MP Stem (316L S/S)
1/2"	MPTFC4- -G- -1	MITFC4- -G- -1	MPTFC4- -J- -3	MPHLC402T MIHLC402T	MPHLC402A MIHLC402A	MPHLC102D MPHLC102D	MPHLC405
3/4"	MPTFD4- -G- -1	MITFD4- -G- -1	MPTFD4- -J- -3	MPHLD102T MPHLC102T	MPHLD102A MPHLC102A	MPHLD102D MPHLC102D	MPHLC405
1"	MPTFE4- -G- -1	MITFE4- -G- -1	MPTFE4- -J- -3	MPHLE102T MIHLE402T	MPHLE102A MIHLE402A	MPHLE102D MPHLE102D	MPHLE405
1-1/2"	MPTFG4- -G- -1	MITFG4- -G- -1	MPTFG4- -J- -3	MPHLG102T MIHLG402T	MPHLG102A MIHLG402A	MPHLG102D MIHLG102D	MPHLG405
2"	MPTFH4- -G- -1	MITFH4- -G- -1	MPTFH4- -J- -3	MPHLH102T MIHLH402T	MPHLH102A MIHLH402A	MPHLH102D MPHLH102D	MPHLG405
3"	MPTFK4- -G- -1	MITFK4- -G- -1	MPTFK4- -J- -3	MPHLK402T MIHLK402T	MPHLK402A MIHLK402A	MPHLK402D MIHLK402D	MPHLK405
4"	MPTFL4- -G- -1	MITFL4- -G- -1	MPTFL4- -J- -3	MPHLL402T MIHLL402T	MPHLL402A MIHLL402A	MPHLL402D MIHLL402D	MPHLL405

Notes for Table above:

- For repair kits above, insert flow pattern of valve between G - - 1, example: MPTFC4 - - G371 / MITFC4 - - G371.
- Standard repair kits include 4 each V-TEF™ seats and gaskets, 2 V-TEF™ stem packings, 1 S-TEF® (gray) stem packing, 4 end fitting o-rings, and 1 bonnet o-ring. Cavity filler kits include 2 VTFE fillers.
- Standard repair kits and replacement parts are V-TEF™.
- Replacement parts are one each per part number.
- For materials other than V-TEF™, substitute the correct material ID and code.
- For valves with grounding, add "G" to the end of the stem part number.

Material Definitions:

TF	V-TEF™	Chemically modified polytetrafluoroethylene
VT	VTFE	Virgin Polytetrafluoroethylene
HT	S-TEF®	Stainless steel reinforced polytetrafluoroethylene
PK	PEEK™	Polyetheretherketone
UT	UHMWPE	Ultra High Molecular Weight Polyethylene
KY	KYNAR	Polyvinylidene Fluoride

Notes for Table at right:

- Stem torques are shown in nominal values and represent ideal conditions. (100 psig / 6.9 bar or less, ambient temperature, with fluid free of suspended solids and comparable in viscosity to water).
- For UHMWPE seats, multiply by 1.25. For S-TEF® or Kynar seats, multiply by 1.56. Consult factory for PEEK seat torques.
- Torque values measured at the stem, NOT at the fasteners.

Valve Size	Size Code	Valve Stem Nominal Breakaway Torque – V-TEF™ Seats	
		in - lbs	N-m
1/2"	C5	67	7.6
3/4"	D5	80	9.0
1"	E5	154	17.4
1-1/2"	G5	313	35.4
2"	H5	491	55.5
3"	K5	840	94.9
4"	L5	1539	173.9



1070 Sandy Hill Road, Irwin, PA. 15642

Phone: (724) 863-0550 or (800) 967-4PBM Fax: (724) 864-9255
 E-mail: info.pbmvalve@imi-critical.com Web: www.pbmvalve.com
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