Installation, Operation, and Maintenance Instructions CP Series 5 Cryogenic Valves, Class 150, 1/2" thru 2"

⚠ 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. **Determine what type of media is in the line and wear appropriate protective clothing and equipment. Obtain the 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 3-piece, CP Series 5, Cryogenic ball valves. Please read the instructions carefully and save them for future reference.

2. Installation

The CP Series 5 Cryogenic valves are unidirectional, and therefore, must be installed according to the direction of the flow arrows etched onto sides of the valve body. Valves with buttweld or socket weld ends must be disassembled prior to installation to prevent welding heat from damaging the seats or seals. Otherwise, *extended buttweld ends*, as well as all other end fitting types, do not require disassembly prior to installation. Finally, it is recommended that the valve be in the closed position during installation and initial cool-down.

3. Operation

For manual valves, operation consists of turning handle 90° to either close or open the valve. The valve is in the open position when the handle is parallel with the pipeline. 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.

Locking Handle Device, manual valves only

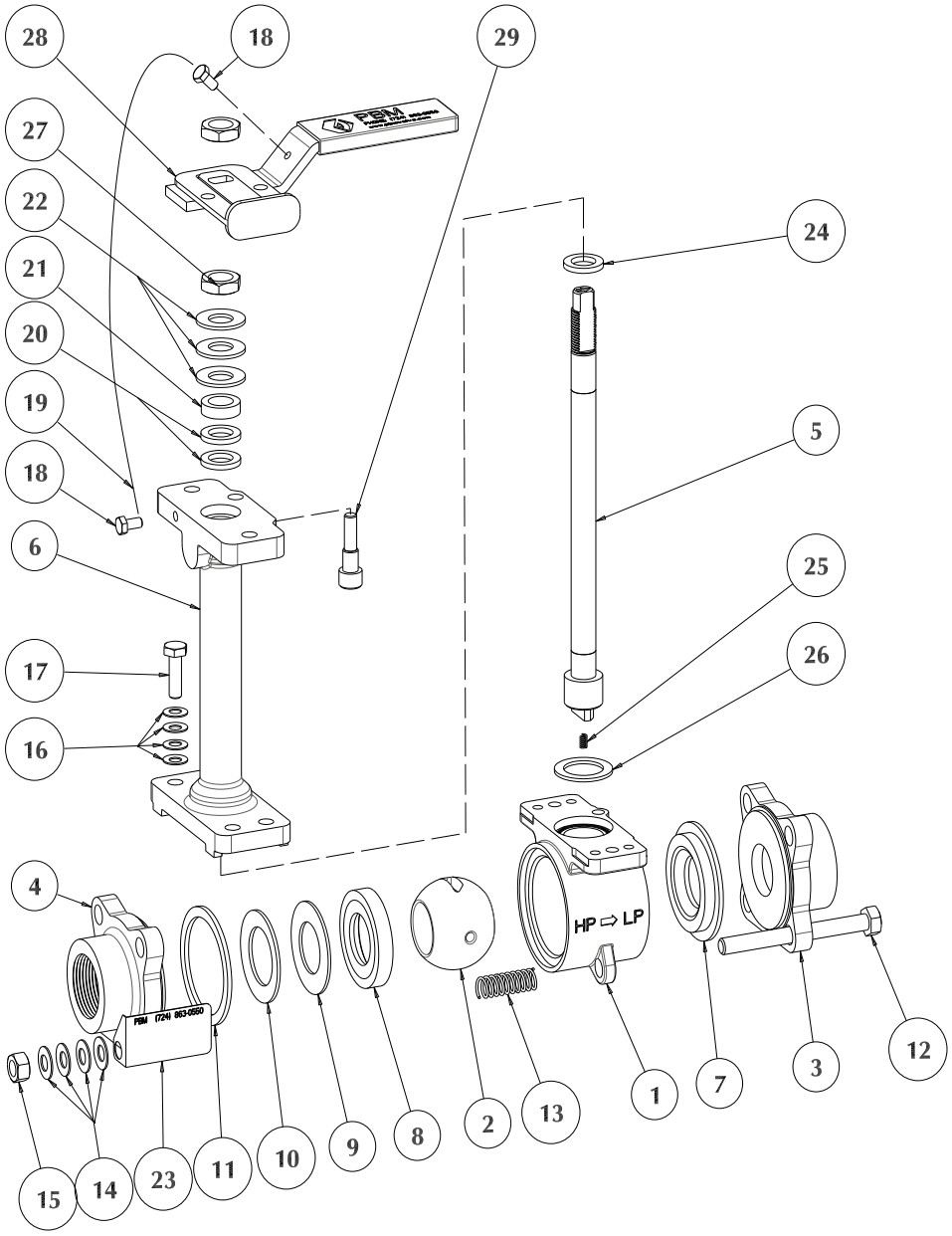
1. Depress handle lock bar inward toward the valve stem until it clears the stop on the valve body.
2. While maintaining the handle lock bar in this position, turn handle to desired position.
3. Release the handle lock bar, ensuring that it returns to the proper position against the handle.

Follow instructions to ensure optimum performance:

Adjusting for Normal Wear

1. If the valve shows signs of body or bonnet gasket leakage, tighten the end fitting or bonnet fasteners evenly and in a staggered sequence according to the illustration at bottom of Page 4 until the leakage stops. Verify that the valve operates smoothly.
   a. PBM Ball Valves are designed with the Adjust-O-Seal® feature. Initially, there should be a space between end fittings and the body. This space is the key to the Adjust-O-Seal® feature and allows in-line adjustment of the gaskets.
   b. End fitting fasteners should only be tightened as necessary to correct gasket leakage.
2. If the valve shows signs of leakage in stem area due to normal stem packing wear, loosen the upper jam nut on the stem, tighten the lower jam nut to completely compress the spring washers, and then loosen nut 1/4 turn. Tighten the upper jam nut. Leakage should stop, and the valve should continue to operate smoothly.
3. After adjustments have been made to gaskets, or if packing leakage cannot be stopped, a repair kit will be required.

PARTS LIST	
ITEM	**DESCRIPTION**
1	Body
2	Ball
3	Downstream End Fitting
4	Upstream End Fitting
5	Stem
6	Bonnet
7	Downstream Seat
8	Upstream Seat
9	Spring Plate
10	Seat Spring Washer
11	End Fitting Gasket
12	End Fitting Fastener
13	Body Ground Spring
14	Body Spring Washers
15	End Fitting Hex Nut
16	Bonnet Spring Washers
17	Bonnet Fasteners
18	Ground Wire Fastener
19	Ground Wire
20	Upper Stem Packing
21	Follower
22	Stem Spring Washers
23	Nameplate
24	Lower Stem Packing
25	Ball Ground Spring
26	Bonnet Gasket
27	Stem Hex Nut (s)
28	Locking Handle Parts (Manual Only)
29	Stop Pin (Manual Only)



Disassembly of valve:

1. Isolate and depressurize the associated piping system. Cycle the valve to ensure there is no trapped pressure or fluid in the valve cavity. The valve should be left fully open or fully closed. Remove insulation, if any.
2. **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. Retain coupling and mounting bracket.
3. **For Manual Valves Only:** Loosen and remove the upper jam nut from the stem and then remove the handle and lock components.
4. **For valves with mechanical end connections:**
   a. Loosen and remove the end fitting fasteners which connect the valve to the piping. Remove the valve from the piping.
   b. Loosen and remove the hex nuts and spring washers from the body/end fitting fasteners.
   c. Pull the end fittings free from the body.
5. **For valves with welded end connections**, the valve can be disassembled with the body subassembly swung out from the end fittings or it can be disassembled with the body subassembly completely removed from the end fittings.
   a. To swing out the body subassembly from the end fittings:
      i. Open the valve.
      ii. Loosen the hex nuts on all of the end fitting fasteners.

iii. Remove the nut and spring washers from the fastener which is adjacent to the body “swing-out” ring and nearest the stem. Remove the fastener.
iv. Spring the connecting piping 1/8" (3.2 mm) to remove the compression from the end fittings on the body.
v. Swing the body out from between the end fittings until the body completely clears the end fittings. The body will rotate about the fastener which passes through the “swing-out” ring.
vi. The sprung piping can now be released, if desired.

b. To remove the entire body subassembly from the piping:

i. Open the valve.
ii. Loosen and remove the hex nuts, spring washers, fasteners, and nameplate from the end fittings.
iii. Remove the body ground spring.
iv. Spring the connecting piping 1/8" (3.2 mm) to remove the compression from the end fittings on the body.
v. Slide the body subassembly out from between the end fittings.
vi. The sprung piping can now be released, if desired.

6. Remove the spring plate and spring washer from the upstream end fitting. Remove the seats and gasket from the body.
7. Rotate the stem to orient the ball to the closed position. Slide the ball out, taking care not to nick or scratch the ball. Remove ground spring from the hole in the bottom of the stem.
8. Loosen and remove the upper jam nut from the stem. Remove the handle, remaining jam nut, spring washers, follower and ground wire terminal.
9. Loosen and remove the bonnet fasteners and pull the bonnet away from the body. Remove the bonnet gasket from the body.
10. Push the stem into the bonnet and out the bottom of the bonnet. The bottom packing may come off with the stem. If not, reach into the bonnet counterbore and remove.
11. Remove the top packings from the bonnet.

Reassembly of valve:

1. Before reassembling the valve, examine all parts. Replace any worn or damaged parts. PBM recommends using new seats, seals, and gaskets upon each disassembly and reassembly.

Warning: All valve components must be LOX cleaned and inspected prior to reassembly of the valve in a “clean room” type environment. Failure to do so may create a hazardous operating environment which may result in fire, explosion, and/or bodily harm. Proper LOX cleaning, assembly, installation, and operation are the sole responsibility of the customer or end user.

2. Insert a new packing on the stem such that the packing seats on top of the ledge on the stem. This packing should be white in color.
3. Insert the stem into bottom of the bonnet bore and up through the top of the bonnet.
4. Install the remaining two packings over the stem. Push the packings into the bonnet counterbore. The charcoal gray packing should be the topmost packing.
5. Install the follower over the stem until it rests on the top packing.
6. Install a spring washer onto the stem with the concave side facing upward (away from the bonnet).
7. Install a second spring washer onto the stem with the concave side facing downward.
8. Install the ground wire terminal on the stem.
9. Install the remaining spring washers onto the stem, ensuring that the direction of all spring washers alternate, and that no two adjacent springs are nested or are “parallel”.
10. Lubricate the stem threads with an anti-galling lubricant approved for oxygen service. e.g. Fluorolube.
11. Thread a jam nut onto the stem. Tighten the jam nut to completely compress the spring washers, then back off 1/4 turn.
12. **For Manual Valves Only:** Install the handle and lock components onto the stem such that the right side of the handle will contact the stop pin when the valve is in the open and closed positions. Install and tighten the remaining jam nut to secure the handle to the stem. This step does not apply to valves with gear operators
13. Install the bonnet gasket in the groove on the body, and then install the bonnet on the body. Lubricate bonnet fastener threads with an anti-galling lubricant approved for oxygen service. e.g. Fluorolube.
14. Install two spring washers onto each of the bonnet fasteners with the convex side of both spring washers facing towards the hex head of the screw. Install the remaining two spring washers onto each of the bonnet fasteners with the convex side of both spring washers facing towards the threaded end of the screw.
15. Install each of the fastener and spring washer assemblies into the bonnet and tighten per Table 2 and the illustration on Page 4 of these instructions.
16. Rotate the stem to close the valve. Insert the small ground spring into the hole in the bottom of the stem.
17. Install the ball into the body by orienting the slot in the ball to engage the stem tang, being careful not to nick or scratch the ball. When the valve is in the closed position, the vent hole in the ball should face towards the upstream (high pressure) end of the body.

18. Rotate the stem until the ball is in the open position. Install the seats and end fitting gasket into the body. It should be noted that there is a visible difference between the upstream (high pressure) and downstream (low pressure) seats. The downstream seat has an integral gasket on its outer diameter, while the upstream seat requires a separate end fitting gasket. These seats must be installed with respect to the "HP" and "LP" markings on the side of the body.
19. Install the spring washer into the counterbore of the upstream end fitting. The spring washer should be installed with the concave side facing the end fitting, and the OD of the spring washer should be in contact with the base of the counterbore.
20. Install the spring plate directly over the spring washer in the end fitting counterbore.
21. For valves with mechanically connected end fittings, install end fittings against body. Be certain that the end fitting with spring washer is located on the high pressure (HP) end of the body.
22. For valves with end fittings welded into the piping, with the valve open, spring the end fittings outward and slide the body between them. Release spring force from end fittings to allow end fittings to enter body. Be certain that the end fitting with spring washer is located on the high pressure (HP) end of the body.
23. Lubricate external threads of body bolting with anti-galling lubricant approved for oxygen service. e.g. Fluorolube.
24. Install fasteners, nameplate, ground spring, and spring washers into the end fittings and body.
25. Install two spring washers onto each of the body fasteners with the convex side of both spring washers facing towards the body. Install the remaining two spring washers onto each of the body fasteners with the convex side of both spring washers facing towards the threaded end of the screw.
26. Install and hand-tighten the hex nuts, and then close the valve.
27. Tighten the body fasteners as per Table 2 and the illustration below. Cycle the valve to verify freedom of operation.
28. If the valve has mechanically connected end fittings, reinstall the valve into the piping.
29. If practical, check the valve seats and seals for leaks.
30. Insulate the valve, if applicable.
31. For valves with gear operators, reinstall the bracket, coupling, and gear operator.
32. **For Automated Valves Only:** Reinstall the automation assembly with the bracket and coupling. Then reconnect air and electrical power.
33. Insulate the valve, if applicable.

Table 1 - Replacement Kits and Parts

Valve Size	Repair Kit (V-TEF™)	Ball (316L S/S)	Stem (316L S/S)	Stem Spring Washers	Follower
1/2″	CPTFC5 - - G - - 1	CPHLC502	CPHLD505	SPK-E110	SPK-D506
3/4″	CPTFD5 - - G - - 1	CPHLD502	CPHLD505	SPK-E110	SPK-D506
1"	CPTFE5 - - G - - 1	CPHLE502	CPHLE505	SPK-E510	SPK-E506
1-1/2"	CPTFG5 - - G - - 1	CPHLG502	CPHLH505	SPK-H510	SPK-H506
2"	CPTFH5 - - G - - 1	CPHLH502	CPHLH505	SPK-H510	SPK-H506

Notes for Table above:

1. Standard repair kits include V-TEF™ seats, stem packings, and body gasket.
2. Replacement parts are one each per part number.

Tightening Procedure for Bonnet and End Fittings:

1. Hand-tighten fasteners.
2. Wrench-tighten each fastener in the sequence illustrated at right until the spring washers begin to compress.
3. Continue tightening fasteners 1/4 turn in sequence until the recommended torque value in Table 2 is achieved.

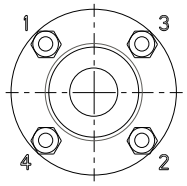


Table 2 - Fastener Torque

Valve Size	Fastener Torque Body / Bonnet	
	in - lbs	N - m
1/2″	36 / 36	4.0 / 4.0
3/4″	36 / 36	4.0 / 4.0
1″	72 / 36	8.1 / 4.0
1-1/2″	180 / 72	20 / 8.1
2″	240 / 72	27 / 8.1

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