

# Installation, Operation, and Maintenance Instructions CN Series 5 Cryogenic Valves, ANSI Class 150 & 300 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 2-piece, CN Series 5, ANSI Cryogenic ball valves. Please read the instructions carefully and save them for future reference.

### 2. Installation

The CN 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. 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

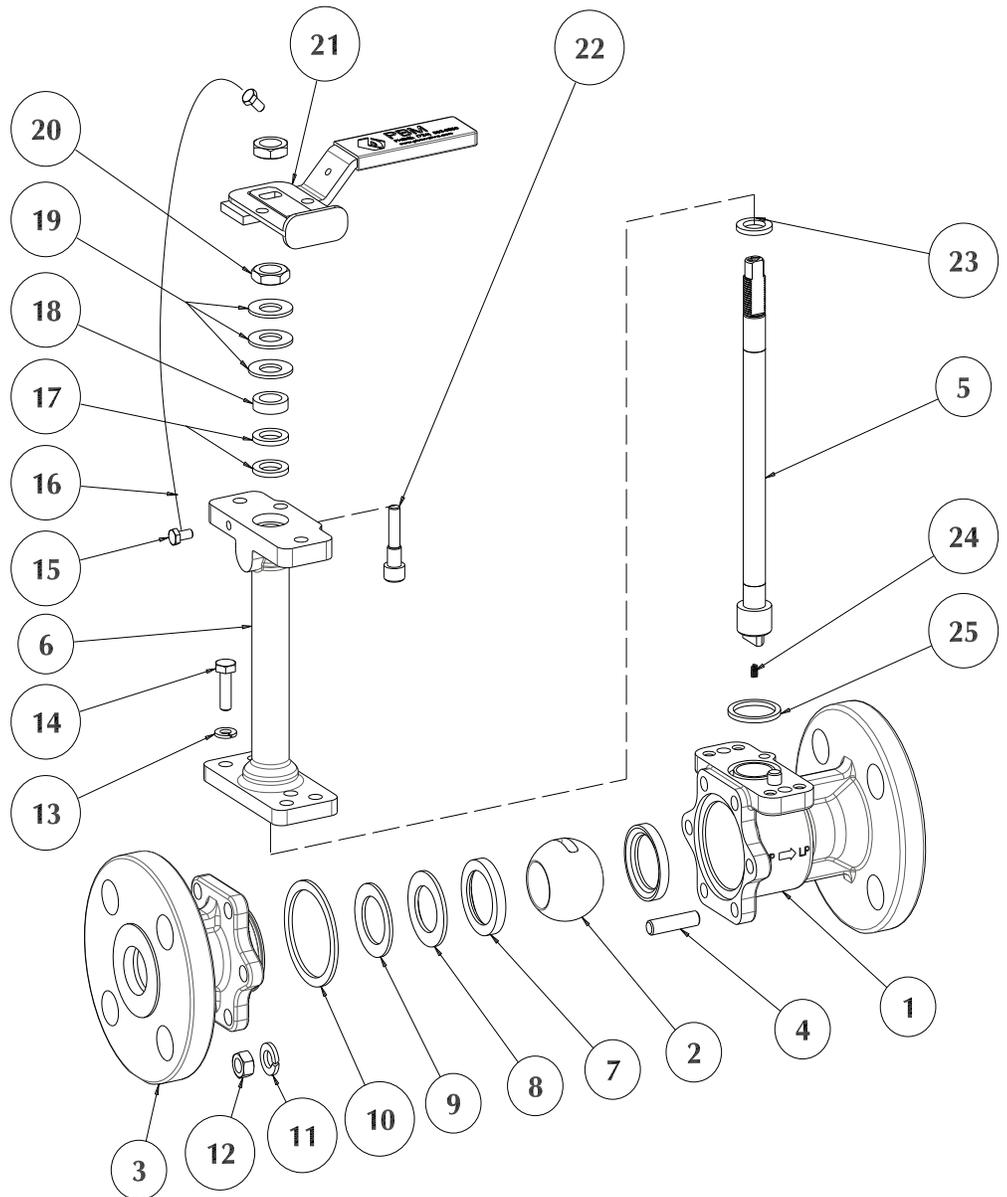
1. Depress handle lock bar inward toward the valve stem until it clears the stop on the valve body.
2. While maintaining the handle lock bar in this position, turn handle to desired position.
3. Release the handle lock bar, ensuring that it returns to the proper position against the handle.

Follow instructions to ensure optimum performance:

### Adjusting for Normal Wear

1. If the valve shows signs of leakage between the body and either the bonnet or end fitting, the gasket(s) require replacement.
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. Re-tighten the upper jam nut. Leakage should stop, and the valve should continue to operate smoothly.
3. If packing leakage cannot be stopped, a repair kit will be required.

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



### 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.
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.
4. Loosen and remove the flange bolting and remove the valve from the piping.
5. Remove the end fitting hex nuts or fasteners, lock washers, and tag, if any.
6. Pull the end fitting free from the body. Remove the spring plate and spring washer from the upstream end fitting.
7. Remove the seat and body gasket. If the valve is equipped with graphite gaskets, carefully remove them from the body with a hook or pick type hand tool. Take care not to scratch or otherwise damage the gasket grooves in the body.
8. Rotate the stem to orient the ball to the closed position. Slide the ball out, taking care not to nick or scratch the ball.
9. Remove the internal ground spring, if any, the hole in the bottom of the stem.
10. Loosen and remove the upper jam nut from the stem. Remove the handle, remaining jam nut, spring washers, follower and ground wire terminal.
11. Loosen and remove the bonnet fasteners and lock washers, then pull the bonnet away from the body.
12. Remove the remaining seat from within the body.
13. Remove the bonnet gasket from the body. If the valve is equipped with graphite gaskets, carefully remove them from the body with a hook or pick type hand tool. Take care not to scratch or otherwise damage the gasket grooves in the body.

14. 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.
15. 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 seat into the body recess with the seating side facing the valve centerline.
3. Insert a new packing on the stem such that the packing seats on top of the ledge on the stem.
4. Insert the stem into bottom of the bonnet bore and up through the top of the bonnet.
5. Install the remaining two packings over the stem. Push the packings into the bonnet counterbore. The charcoal gray packing should be the topmost packing.
6. Install the follower over the stem until it rests on the top packing.
7. Install a spring washer onto the stem with the concave side facing upward (away from the bonnet).
8. Install a second spring washer onto the stem with the concave side facing downward.
9. Install the ground wire terminal on the stem.
10. 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”.
11. Lubricate the stem threads with an anti-galling lubricant approved for oxygen service. e.g. Fluorolube.
12. Thread a jam nut onto the stem. Tighten the jam nut to completely compress the spring washers, then back off 1/4 turn.
13. **For Manual Valves Only:** Install the handle on the stem such that stop pin will contact the right side of the handle when the valve is open and closed. Install and tighten the remaining hex nut to secure the handle to the stem. This step does not apply to valves with gear operators.
14. Install the bonnet gasket in the groove on the body, and then install the bonnet on the body.
15. Lubricate bonnet fastener threads with an anti-galling lubricant approved for oxygen service. e.g. Fluorolube.
16. Install a lock washer onto each of the bonnet fasteners and then install each of the fastener and lock washer assemblies into the bonnet. Tighten the bonnet fasteners as per Table 2 and the illustration on Page 4 of these instructions.
17. Rotate the stem to close the valve. Insert the small ground spring into the hole in the bottom of the stem.
18. 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.
19. Rotate the stem until the ball is in the open position. Install the end fitting gasket and remaining seat into the body.
20. 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.
21. Install the spring plate directly over the spring washer in the end fitting counterbore.
22. With the valve closed, install end fitting against body.
23. Lubricate external threads of body fasteners with an anti-galling lubricant approved for oxygen service. e.g. Fluorolube.
24. Install lock washers and end fitting hex nuts onto the body fasteners. Hand-tighten the hex nuts.
25. Torque the body fasteners in a staggered and incremental sequence as per Table 2 of these instructions. Cycle the valve to verify freedom of operation.
26. If the valve has mechanically connected end fittings, reinstall the valve into the piping.
27. If practical, check the valve seats and seals for leaks.
28. Insulate the valve, if applicable.
29. For valves with gear operators, reinstall the bracket, coupling, and gear operator.
30. **For Automated Valves Only:** Reinstall the automation assembly with the bracket and coupling. Then reconnect air and electrical power.
31. Insulate the valve, if applicable.

Table 1 - Replacement Kits and Parts						
Valve Size	Repair Kit (TFM™)	Repair Kit (Graphite)	Ball (316L S/S)	Stem (316L S/S)	Stem Spring Washers	Follower
1/2"	CNTFC5 -- G -- 1	CNTFC5 -- Z -- 1	CPHLC502	CPHLD705	SPK-E110	SPK-D506
3/4"	CNTFD5 -- G -- 1	CNTFD5 -- Z -- 1	CPHLD502	CPHLD705	SPK-E110	SPK-D506
1"	CNTFE5 -- G -- 1	CNTFE5 -- Z -- 1	CPHLE502	CPHLE705	SPK-E510	SPK-E506
1-1/2"	CNTFG5 -- G -- 1	CNTFG5 -- Z -- 1	CPHLG502	CPHLH705	SPK-H510	SPK-H506
2"	CNTFH5 -- G -- 1	CNTFH5 -- Z -- 1	CPHLH502	CPHLH705	SPK-H510	SPK-H506

**Notes for Table above:**

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

**Tightening Procedure for Bonnet and End Fittings:**

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

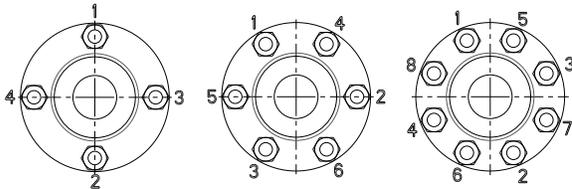


Table 2 - Class 150 Fastener Torque		
Valve Size	Fastener Torque Body / Bonnet	
	in - lbs	N - m
1/2"	50 / 50	5.6 / 5.6
3/4"	50 / 50	5.6 / 5.6
1"	50 / 75	5.6 / 8.5
1-1/2"	75 / 75	8.5 / 8.5
2"	175 / 75	19.8 / 8.5

Table 2 - Class 300 Fastener Torque		
Valve Size	Fastener Torque Body / Bonnet	
	in - lbs	N - m
1/2"	50 / 50	5.6 / 5.6
3/4"	50 / 50	5.6 / 5.6
1"	75 / 75	8.5 / 8.5
1-1/2"	125 / 75	14.1 / 8.5
2"	175 / 75	19.8 / 8.5

