



Apollo Full Port Three Piece, Enclosed Fastener Ball Valves Installation, Operation, & Maintenance Guide

Introduction

This manual presents guidelines for the Installation, Operation and Maintenance of manual and automated Apollo full port 3-Piece, enclosed fastener ball valves.

Storage & Protection

Valves should be stored in original shipping containers until installation with protective means in place to prevent any damaging effects from the environment or other potentially damaging influences. Valves should be properly supported and secured before moving to prevent possible damage to property or harm to personnel.

Limitations

- Conditions supporting no greater than European Pressure Equipment Directive (PED) Category III valves. Valves are not to be used in safety functions such as safety loops or separating incompatible fluids.
- For gases and liquids in European Pressure Equipment Directive (PED) Groups 1 & 2.
- Service to be compatible with the materials of construction. Prior to selection it is the user's responsibility to determine that the valve is appropriate for the intended application. Applications should not allow corrosion > .002"/year (.05mm/year).
- The possibility of material deterioration in service and need for periodic inspections is the responsibility of the user.
- For carbon steel valves, complete valve replacement will be necessary after 10 years of continuous service above 800°F (426°C).
- Mechanical supports are not to be welded directly to the valve; however, they may be fitted to the associated piping.

- It is the piping system designer's responsibility to implement appropriate protection measures to minimize reaction forces and moments which result from supports, attachments, piping, etc.
- Laws of the state must be observed as they apply.
- In-service inspections may be required by national authorities of the country where the valve is installed.
- Some national or local authorities may require periodic hydrostatic testing.
- Only use Conbraco replacement parts.
- Valves are intended for on-off service only and should not to be used for throttling applications.
- Valves are primarily intended for industrial use.
- Level of training, experience or ability of users should be at least that of trained and skilled maintenance personnel or technicians.

Installation

Proper valve selection is the first step in any successful installation. Refer to an "Apollo Top Entry Ball Valve" catalog for application guidance or contact your distributor or the factory for more detailed assistance. **WARNING: All installations shall be provided with pressure relief devices in accordance with the requirements of the Pressure Equipment Directive 97/23/EC. Proper installation prior to initial operation is the user's responsibility.**

Furthermore, where an additional hazard can occur due to valve exposure to fire or other unexpected external heat source, a supplemental pressure relief device shall be installed to protect against excessive pressure. This device shall prevent the pressure from rising more than 21% above the maximum allowable working pressure. Means must also be provided to monitor valve filling to prevent over pressurization and instability.

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Pre-Installation Inspection

Inspect the piping system prior to valve installation whenever possible, to ensure that it has been properly flushed and cleared of construction and fabrication debris. The seating surfaces in soft seated valves are particularly susceptible to weld slag and sand blasting grit. Pipe scale, metal chips and other foreign materials should be removed.

Just prior to installation, remove each valve from its packing and remove any end covers. Examine the flow bore for debris. All Apollo ball valves are shipped in the open position to prevent damage to the ball surface. Any grit or foreign matter must be removed. Scratched or dented balls must be replaced. Do not install a damaged valve.

It is also important to check for valve operation clearances. With the exception of special directional valves, installation is acceptable in any position using standard pipe fitting practices.

Weld-End Valve Installation

Installation welding shall be done in accordance with the applicable Code or regulation covering the system into which the valve is installed. Both butt-weld and socket-weld valves require special consideration for installation. In addition to the general cautions already discussed, the heat of welding may damage seats and seals. A warning label is included with all weld end valves.

1. Only personnel qualified per ASME BPVC Section IX should weld pressure-containing components. Only qualified weld procedures should be employed.
2. Place the valves in fully open position and remove handles, operator or actuators.
3. Align in the piping system. For socket-weld valves, slip into the piping system retracting the pipe approximately 1/16" (1.5mm) from the bottom of socket weld connections.
4. Wrap the center section of valve with wet rags to minimize heat transfer to the seats and seals. Do not allow the valve center section temperature to exceed 400°F (204°C) as monitored by either a Tempil® Stick or other suitable method. Use multiple passes with a bead size of 1/8" (3mm) or less. Stop after each pass and allow the valve to cool so as not to

exceed the body temperature limit noted above. Maintain wet rags.

6. After the valve has fully cooled, reinstall the handle, operator or actuator.
7. Alternatively: The valve may be partially disassembled for welding.
8. Place the valve in the open position.
9. Tack-weld the valve in place in the piping.
10. Remove all four body bolts and slide the center section subassembly out of line. Protect the seats from damage.
11. Complete the weld using qualified personnel and weld procedures.
12. Replace the body seals. **DO NOT RE-USE.**
13. Reinstall the body sub-assembly. Reinstall the body bolting in accordance with the torque instructions located in the "Re-assembly" section of this manual.
14. Cycle the valve to ensure smooth operation.

Threaded-End Valve Installation

After removing the valve from its packing, inspect the NPT threads for damage. Occasionally threads may require chasing prior to installation to remove burrs or other minor imperfections.

Apply pipe sealant compound or PTFE tape to the male pipeline threads only. Do not use sealant on the female threads because excess compound may be forced into the valve body. This could cause sticking of the ball or encourage the accumulation of dirt and debris that could prevent positive valve shutoff.

Operation

Apollo full port 3-piece, enclosed fastener ball valves are identified by laser etching the valve body and an attached warning tag. Most Apollo ball valves are non-directional. However, valves may be ordered with the vented ball option which safe guards against excessive pressure build-up in the body cavity. This option renders the valves directional. Valves with this feature are identified by a special tag permanently affixed to the valve body with the word "Flow" 2

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and an arrow showing the required orientation of the valve shown in red.

Although each valve is thoroughly tested and inspected before it leaves the factory, nameplates and/or warning tags could be lost or destroyed during shipment or while in storage. If either is missing or not legible, contact your distributor or the factory for assistance before placing the valve in service.

Ball valves are intended to be on-off devices operating through 90° of stem rotation. Operation is clockwise to close.

The most common service failures not related to the installation and start-up processes are:

- Exceeding the operating temperature or pressure limits of the valve due to a process upset condition.
- A chemical attack on valve components due to either misapplication or changes in the service.

Violating temperature and pressure limits can result in immediate valve failure where chemical attack or corrosion generally occurs gradually.

Maintenance

Preventive Maintenance Schedule

A regularly scheduled and documented preventive maintenance program needs to be established to achieve maximum useful valve life at the lowest cost. Initially, it is recommended that valves be inspected monthly for smooth operation and leak free performance.

For manual valves, after an initial break-in period of approximately 500 cycles, stem packings may require adjustment. In most applications, inspection and or adjustments twice a year will be sufficient to assure reasonable valve life.

For automated valves, after an initial break-in period of approximately 5,000 cycles, stem packings may require adjustment. Monthly adjustments (approximately 20,000 cycles) should be sufficient thereafter. Valves may be ordered with a “live-loading” feature. The “live loading” feature has design allowances for compaction and wear of the stem packing. It also makes allowance for thermal expansion and contraction as the valve goes through temperature cycles.

Valve Adjustments

At some point in the service life of the valve, leakage may occur. This should be noted in the maintenance history log of the valve. The stem packing was adjusted at the factory to provide a leak tight seal when the valve was new, but compaction can occur within these seals that may make re-adjustment necessary. Stem packing leakage should be stopped as soon as it is detected. On actuated valves, most mounting hardware allows access to the packing adjustment screws. If this is not the case, it may be necessary to remove the actuator to gain adequate access to make the packing adjustment. Packing adjustment can be accomplished by turning the stem packing adjustment screws clockwise to the maximum torque shown in Table 1. **Caution: Never back off the stem packing adjustment screws when the valve is under pressure.**

Table 1: Stem Packing Adjustment Torque

Nominal Valve Size (mm)	(in)	Torque ⁽¹⁾	
		(N-m)	(in-lbs)
10	1/4 & 3/8	2.26	20
15	1/2	2.26	20
20	3/4	5.42	48
25	1	5.42	48
32	1-1/4	10.84	96
40	1-1/2	10.84	96
50	2	16.26	144

⁽¹⁾ Increase adjustment screw torque's by 25% for valves with graphoil packing (-24 option)

Do not over tighten the adjustment screws. Over-tightening will result in excessive operating torque and shorten the packing's service life. If 3

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stem leakage continues, or operating torque becomes excessive, depressurize the valve and replace the stem seals.

Valves with high operating torque not resulting from stem seal over-tightening or valves, which have leakage by the seats, may have damaged seats or ball surfaces. These valves should be depressurized, disassembled, and inspected for damage.

Valve Overhaul

As part of planned maintenance or as a result of a problem that cannot be adjusted away, a valve may require a complete overhaul. Due to the uncomplicated design of the Apollo flanged ball valves, this can easily be accomplished.

The first step is to contact your distributor to acquire an appropriate rebuild kit. These kits typically contain a complete set of seats, seals, and gaskets. If seat or ball damage is suspected, it is wise to order a new ball when the seal kit is purchased. To properly order spare parts, you will need the valve model number laser etched on the valve body. A list of recommended spare parts to hold as maintenance items are shown in Appendix "A". This list is generic, as the severity of the service and availability of some exotic alloys can also affect recommended spare parts stocking levels.

Disassembly

- Once the spare parts are on hand, the first step in the valve disassembly is to isolate the valve from line pressure.
WARNING: Do not attempt to work on any valve under pressure. Depending on the service, valve surface temperature may be hot. Use proper protective gear to protect against burns and any possible uncontrolled release of fluid.
- Using an adjustable wrench, valve lever, or properly sized open end wrench, rotate the stem until the valve is in the one half open, one half closed position. Be careful not to damage the stem. This will allow any cavity pressure to be released into the pipeline. Place the valve in the open position after this is done.

- Loosen each of the body joint nuts approximately one turn only initially. This will allow a second chance for any cavity pressure stored within the valve to be released. Leakage may occur outside of the pipeline.
- Before removing the valve body bolting, take precautions to assure the safety of maintenance personnel. Make sure the valve and piping system are properly stabilized.
- Carefully remove the valve body bolting. Verify the valve is in the open position. Remove the valve body center section from the piping system. It may be necessary to spread the endcaps slightly to overcome compressive loads imparted by the piping system.
- If only seat or ball damage is suspected, one body fastener may be left loosely assembled between the endcaps and body and the valve "swung out of line" for service. In this case, proceed to step 9.
- Set the body center section on a suitable clean solid work surface.
- Remove the lockplate, lever, external grounding spring, stem packing adjustment screws and the packing gland. Do not attempt to remove the stem packing at this time.
- The gaskets can now be removed from the recesses in the ends of the body.
- Using the stem, rotate the ball to the closed position. Pressing either by hand or with a non-marring soft face tool on the spherical surface of the ball, remove one seat.
- Press in the opposite direction to remove the other seat.
- The ball can now be easily removed from the body cavity.
- Once the ball is removed, the stem can be pressed down into the body and removed.
- Finally, remove the stem packing using care not to scratch or scar the stem packing box.

Inspection

- Thoroughly clean all the components in preparation for inspection.
- Inspect the sealing face of endcaps left on the piping system for scratches and pits. If either of these is apparent and can be removed with #120 or finer grit emery cloth, replacement will not be necessary. If replacement of the endcaps becomes necessary, then replacement of the entire valve is recommended.

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- Inspect stem packing contact surfaces for scratches and pits. If either of these is apparent and can be removed with #120 or finer grit emery cloth, body replacement will not be necessary. Deep scratches running down the side of the stuffing box or excessive pitting will necessitate the replacement of the valve body.
- Inspect the ball in the same manner. Replace the ball if necessary.
- Inspect remainder of body interior for pitting or corrosion and replace either if excessive.
- Inspect all parts for wear due to erosion or abrasion and replace if excessive.

Note: Carbon steel component parts are zinc phosphate treated and oil dipped to improve fatigue properties and increase wear and corrosion resistance.

Re-assembly

- Begin the re-assembly process by cleaning each of the component parts with a clean towel or cloth.
- Place the stem bearing on the stem, and insert the stem into the valve body stem bore. Place the flats on top of the stem perpendicular to the centerline of the body.
- Install the stem packing, packing gland, gland plate, and stem packing adjustment screws in the order given. Install the screws finger tight at this time.
- Place the internal grounding spring on the stem and carefully insert the ball into the body. Using the stem rotate it to the open position.
- Apply a small amount of service compatible lubricant to the new seats and install them in the valve body. Seats may be installed dry however some assembly lubricant is desirable and acts to hold the seats in place during the assembly process.
- Apply a small amount of compatible grease to the body side of the gasket. Again this acts to hold the gasket in place for the assemble process but is optional.

- Slip the body subassembly into the endcaps in the pipeline. Lubricate and install the body bolts and nuts finger tight at this time.
- Cycle the valve open and closed several times to assure all components are properly aligned.
- Using a criss-cross pattern, in three approximately equal steps, torque the body bolts to the value given in Table 2. Cycle the valve open and closed between each step to assure continued smooth operation.
- Complete the fastener torquing sequence with one final check going around the bolt pattern clockwise at the specified torque level.
- Tighten the stem packing adjustment screws to the values shown in Table 1 under the Maintenance Section. Do not over-tighten the stem packing adjustment screws.
- Complete the re-assembly by installing the lever, lock plate and stops or actuator as applicable.

Warning: For Chlorine, Oxygen and other like services, assemble without lubricants.

Table 2: Body Bolting Torque

Valve Size		Torque ($\pm 10\%$)	
(mm)	(in)	(N-m)	(ft-lbs)
10	1/4 & 3/8	8.1-10.8	6-8
15	1/2	8.1-10.8	6-8
20	3/4	16.2-21.6	12-16
25	1	24.4-32.5	18-24
32	1-1/4	61.0-81.0	45-60
40	1-1/2	92.1-122.0	68-90
50	2	203.271.2	150-200

Final Adjustments

Occasionally after testing or initial start-up, a minor stem packing leak may occur. Adjust the stem packing as appropriate and as described in the section entitled "Valve Adjustments".

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Name Plate/Hand Tag Information

One of three possible identification methods may appear on the valve. Non-ASME/ANSI valve feature a yellow mylar hang tag secured about the valve stem. ASME/ANSI qualified valves feature a laser etching on the side of the body. On qualified designs, 1-1/4" and larger, the CE logo will be displayed.

ASME/ANSI NAMEPLATE
MODEL
MANUFACTURING DATE
DESIGN CODE
BALL/STEM
SEAT/PACKING
DN – SIZE
PS – MAXIMUM ALLOWABLE PRESSURE @ 38°C
CWP @ 100°F
CONBRACO IND., INC. Made In U.S.A.

CE NAMEPLATE
CE MARK
NOBO NO.
MODEL
MANUFACTURING DATE
DESIGN CODE
BALL/STEM
SEAT/PACKING
DN – SIZE
PS – MAXIMUM ALLOWABLE PRESSURE @ 38°C
CWP @ 100°F
CONBRACO IND., INC. Made In U.S.A.

WARNING TAG

Carefully read the applicable Installation, Operation, & Maintenance Manual in its entirety before removing valve from shipping container. To obtain manual, download from <http://www.conbraco.com/iom>.
DO NOT REMOVE TAG.

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Appendix A

Recommended Spare Parts for Initial Start-Up and 1 Year of Service

Item	Number of Valves to be Supported				
	1 to 10	11 to 25	26 to 50	51 to 100	101 Plus
Seal Kits*	1	2	4	8	10
Stem	0	1	2	4	5
Ball	0	1	2	4	5
Spare Valve(s)**	0	0	1	2	3

Recommended Spare Parts for 2 Years of Service

Item	Number of Valves to be Supported				
	1 to 10	11 to 25	26 to 50	51 to 100	101 Plus
Seal Kits*	2	4	8	16	20
Stem	1	2	4	8	10
Ball	1	2	4	8	10
Spare Valve(s)**	0	1	2	3	4

Recommended Spare Parts for 3 Years of Service

Item	Number of Valves to be Supported				
	1 to 10	11 to 25	26 to 50	51 to 100	101 Plus
Seal Kits*	3	6	12	24	30
Stem	1	3	6	12	15
Ball	1	3	6	12	15
Spare Valve(s)**	1	2	3	4	5

*Seal kits consist of stem packing set, bonnet gasket and seats

**Recommended if order quantities do not already include spare valves