



Apollo Full Port & Standard Port Three Piece V-Port Ball Valves Installation, Operation, & Maintenance Guide

WARNING: Please read this document in its entirety before installing, operating, or performing maintenance on the valve.

WARNING: Keep all body parts clear of rotating ball to prevent serious injury. This is especially pertinent for valves fitted with actuation.

This manual presents guidelines for the Installation, Operation and Maintenance of manual and automated Apollo 83 & 86 Series Full Port and 84 & 85 Series Standard Port 3-Piece V-Port 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 harm to personnel or damage to property.

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 $>.002"/\text{year}$ ($.05\text{mm}/\text{year}$).
- The possibility of material deterioration in service and need for periodic inspections is the responsibility of the user.
- 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 approved replacement parts.
- V-port valves are intended for throttling applications. Additional isolation valves may be required.
- 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.

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Installation

Proper valve selection is the first step in any successful installation. Refer to Product Data Sheets for application guidance or contact Apollo Industrial Technical Support for additional guidance with control-valve sizing.

Apollo V-Port Ball Valves are available in a variety of sizes and characterizations to provide a selective range of flow characteristics. Accurate system operating characteristics and fluid properties are required to ensure proper selection and performance. Due to the nature of throttling a characterized ball valve, care should be taken to mitigate the risk of cavitation.

WARNING: All installations shall be provided with pressure relief devices in accordance with the requirements of the Pressure Equipment Directive 2014/68/EU. 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.

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 packaging. 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 important to check for valve operation clearances.

V-port valves have a preferred flow direction denoted by an arrow that has been laser-etched on the body. If valve is disassembled, ensure ball is reinstalled in the preferred flow direction. Refer to Reassembly Instructions. Apollo 3-Piece Valves with the V-Port option do not allow center swing-out service. Means for removing the valve shall be made to perform maintenance.

Threaded-End Valve Installation

After removing the valve from its packaging, 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. 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.

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 valve in the fully open position and remove handle, operator or actuator.

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3. Align valve 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.
5. 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.

Operation

Apollo Full Port and Standard Port 3-Piece valves are identified by laser-etching the valve body. Apollo V-Port Ball Valves have a preferred flow direction denoted by a laser-etched arrow on the body.

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.

V-Port ball valves are intended to be used for throttling operating through 90° of stem rotation. Operation is clockwise to close. Users should note that there is a dead-band in the beginning of the flow curve for each valve size. Refer to Product Data Sheets for listed Cv values for each size.

V-Port ball valves may be operated with a hand-lever or fitted with quarter-turn actuators. Valves with actuators shall be checked for acceptable valve stem alignment. Angular or linear misalignment may result in high operational torque and unnecessary wear.

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.
- Inaccurate service conditions used in valve size and profile selection

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

Media that may harden or solidify should not be allowed to remain stagnant in the valve cavity unless regular maintenance is performed.

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.

Apollo 3-Piece V-Port Valves come standard with a "live-loading" stem packing feature and graphite packing. 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.

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Valve Adjustments

WARNING: Never back off the stem packing adjustment screws or nuts when the valve is under pressure.

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 fasteners. 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 fasteners clockwise to the maximum torque shown in Table 1 or 2, as applicable.

Do not over tighten the adjustment fasteners. Over-tightening will result in excessive operating torque and shorten the packing's service life. If stem leakage continues, or operating torque becomes excessive, de-pressurize 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 de-pressurized, 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.

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. To properly order spare parts, you will need the valve model number laser-etched on the valve body.

Disassembly

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.

WARNING: Use caution when servicing valves used to control hazardous media. Wear appropriate protective equipment. Flush and decontaminate valves prior to removal when possible.

- Once the spare parts are on hand, the first step in the valve disassembly is to isolate the valve from line pressure.
- Remove actuation components, if applicable. Using an adjustable wrench, valve handle, 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 fasteners 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 from the piping, take precautions to ensure the safety of personnel. Make sure the valve and piping system are properly stabilized and pressure has been appropriately relieved.
- Remove the valve from piping.
- Set the valve on a suitable clean, solid work surface.

To remove valve seats, body seals, and ball:

- Rotate the stem so the ball is in the closed position.
- Remove body joint fasteners and separate end caps.
- Remove body joint gaskets from the recesses in the ends of the body.
- 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.

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- The ball can now be removed from the body cavity. Maintain internal grounding spring for reassembly.

To remove stem packing:

- Remove components as described in above section.
- Remove the following applicable parts based on valve options purchased: handle and associated hardware, stem packing adjustment nuts or screws, Belleville washers, gland plate and packing gland.
- Press stem with stem bearing down into body and remove.
- Remove the stem packing using care not to scratch or scar the stem packing box.

Inspection

- Thoroughly clean all components in preparation for inspection.
- Inspect the sealing face of end caps 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.
- 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.

Reassembly for Valves with Graphite Packing

***NOTE: For Chlorine, Oxygen and similar services, assemble without lubricants.**

- Begin the reassembly process by cleaning each of the component parts with a clean lint-free 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.
- Lubricate the stem packing adjustment studs or screws.
- Install the stem packing, packing gland, gland plate, Belleville spring washers (refer to Figure 1 for arrangement), and stem packing adjustment nuts or screws in the order given.
- Tighten the fasteners evenly to the torque in Table 1 or Table 2, as applicable, ensuring the gland plate remains parallel to the valve body. Do not overtighten, as this will result in excessive operating torque and shortened packing life.
- Place the internal grounding spring on the stem and carefully insert the ball into the body. Using the stem, rotate the ball to the open position. Verify the characterized profile will be facing the upstream end cap by noting the flow direction arrow etched on the body. Refer to Figure 2.
- *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. This acts to hold the gasket in place for the assembly process, but is not required.
- Lubricate and install the body bolts finger tight at this time.
- Cycle the valve open and closed several times to ensure 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 3 or Table 4, as applicable. Cycle the valve open and closed between each step to ensure continued smooth operation.

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- Complete the fastener torquing sequence with one final check going around the bolt pattern clockwise at the specified torque level.
- Complete the reassembly by installing the handle, lock plate and stops, or the actuation components as applicable.

Reassembly for Valves with -EF Packing

***NOTE: For Chlorine, Oxygen and similar services, assemble without lubricants.**

- Begin the reassembly process by cleaning each of the component parts with a clean lint-free 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.
- *Lightly lubricate the stem with MorOil FLO 1150 or approved equivalent unless valve service requires dry assembly. Packing shall be pre-compressed two rings at a time. For packing sets that have an odd number of packing rings, the final packing pre-compression will be compressing a single ring.
- Install two rings of the -EF option packing. Offset packing rings such that each consecutive ring has 180° of separation between the skive cuts in the packing rings. Use the appropriate compression tool listed in Table 5 (except as noted), and the valve's packing retention system (gland, gland plate, and stem packing adjustment fasteners) as the means for packing pre-compression. Carefully insert the appropriate compression tool into the stuffing box; avoid scratching the stuffing box or compressing the packing by hand.
- Lubricate the stem packing adjustment fasteners. Install the packing gland, gland plate, and stem packing adjustment fasteners in the order given. Ensure the gland and gland plate remain parallel to the valve body and centered about the valve stem. Torque the stem packing adjustment fasteners to the applicable value specified in Table 1 or Table 2, as applicable. Ensure that the gland plate does not make contact with the valve's mounting pad or anything that could prevent desired compression of the stem packing. Remove the packing retention system and compression tool. Repeat the packing installation and packing pre-compression process as listed above until the entire packing set has been pre-compressed. If the final pre-compression does not require a compression tool, then the packing retention system does not have to be removed after the final pre-compression has been performed.
- Place the internal grounding spring on the stem and carefully insert the ball into the body. Using the stem, rotate the ball to the open position. Verify the characterized profile will be facing the upstream end cap by noting the flow direction arrow etched on the body. Refer to Figure 2.
- *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. This acts to hold the gasket in place for the assembly process, but is not required.
- Lubricate and install the body bolts finger tight at this time.
- Cycle the valve open and closed several times to ensure 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 3 or Table 4, as applicable. Cycle the valve open and closed between each step to ensure continued smooth operation.
- Complete the fastener torquing sequence with one final check going around the bolt pattern clockwise at the specified torque level.
- Complete the reassembly by installing the handle, lock plate and stops, or the actuation components as applicable.

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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”.

Name Plate Information

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. Example for illustrative purposes only, is shown in Figure 2.

ASME QUALIFIED VALVES:

APOLLO	MADE IN USA	↓
Model	Valve Size (in)	
Design Standards		
Ball & Stem	Assembly Date	
Seat & Packing Material		
Press Rating (PSIG)	Temp Range (F) @ Max Press (PSI)	
Pressure (PSIG) @ Max Seat Temp (F)		

CE QUALIFIED VALVES:

APOLLO	MADE IN USA	↓
Model	Valve Size (DN)	
Design Standards		
Ball & Stem	Assembly Date	
Seat & Packing Material		
Press Rating (BAR)	Temp Range (C) @ Max Press (BAR)	CE _{US}
Pressure (BAR) @ Max Seat Temp (C)		

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Table 1
Stem Packing Adjustment Torque - 83/86 Series Full Port

83/86 Series Full Port Valve Size (in)	Graphite Packing Torque (in-lbs)	-EF Packing Torque (in-lbs)
1/2	25	25
3/4	60	32
1	60	32
1-1/2	120	74
2	180	150

Table 2
Stem Packing Adjustment Torque - 84/85 Series Standard Port

84/85 Series Std Port Valve Size (in)	Graphite Packing Torque (in-lbs)	-EF Packing Torque (in-lbs)
3/4	25	25
1	60	32
1-1/2	120	74
2	120	74
2-1/2	180	150

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Table 3
Body Bolting Torque – 83/86 Series Full Port

83/86 Series Full Port Valve Size (in)	Body Bolt Torque (ft-lbs)
1/2	6-8
3/4	12-16
1	18-24
1-1/2	68-90
2	150-200

Table 4
Body Bolting Torque – 84/85 Series Standard Port

84/85 Series Std Port Valve Size (in)	Body Bolt Torque (ft-lbs)
3/4	6-8
1	12-16
1-1/2	45-60
2	90-120
2-1/2	150-200

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Table 5
-EF Packing Compression Tool

Stem Diameter (in)	Compression Tool Part #	Inside Diameter	Outside Diameter (in)	Height (in)	Used on	Packing Number
0.375	*USE GLAND	-	-	-	1/2" FP, 3/4" SP	D581700
0.500	78271401	0.510 ± 0.003	0.745 ± 0.003	0.185 ± 0.003	3/4" FP, 1" SP, 1" FP	D557000
0.625	78271601	0.635 ± 0.003	0.995 ± 0.003	0.416 ± 0.003	1.5" SP 1.5" FP, 2" SP	D567000
0.750	78271801	0.760 ± 0.003	1.245 ± 0.003	0.543 ± 0.003	2" FP, 2.5" SP	D560200

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Figure 1
Belleville Washer Arrangement

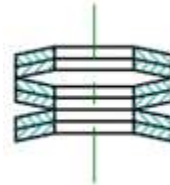
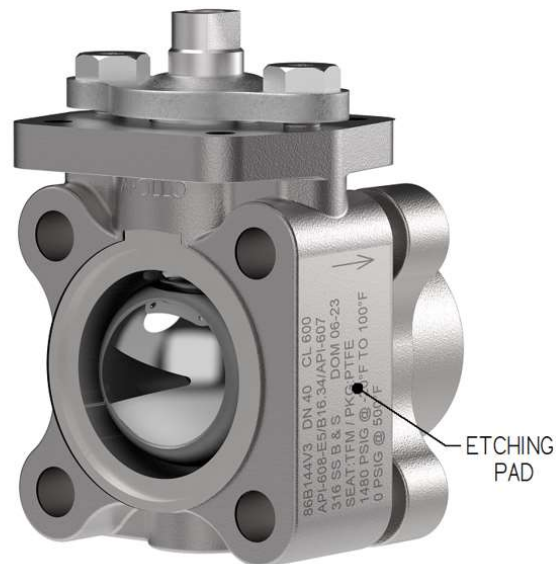


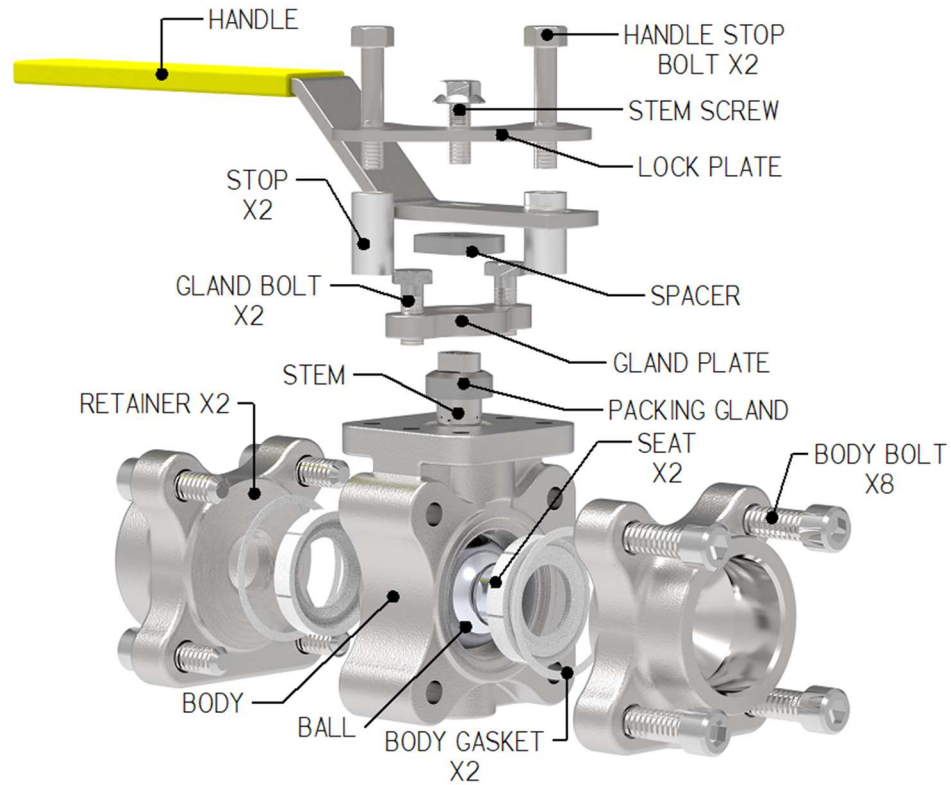
Figure 2
Laser-etched Nameplate and Flow Direction Arrow
*Characterized profile preferred to face upstream, as shown



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Figure 3
Exploded Assembly

*Stem bearing, stem packing, and grounding springs not shown.
*Handle extends as shown with the etching pad on the right side in open position.



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Figure 4
View of Live-Loaded Stem Packing

