



Alloy Valves and Control

BALL VALVES 9500 SERIES

INSTALLATION, OPERATION & MAINTENANCE MANUAL



This manual covers the installation, operation and maintenance of all AVCO standard 9500 series ball valves as described in the current AVCO catalog. Custom made or customer modified versions of the 9500 series may use this manual as a general guide only.

1 General Design

- 1.1 AVCO Ball valves have been designed and engineered to provide long lasting and trouble free service when used in accordance with the instructions and recommendations detailed in this manual.
- 1.2 The valves may be installed for unidirectional flow or vacuum and should only be installed in horizontal pipe runs. Please contact AVCO directly if a 9500 series valve has to be installed in a vertical pipe run. The valves must never be installed with the handle or operator on the underside of the pipe and AVCO advises that, where possible, the valve handle be no more than 45° from top dead center when installed in a horizontal pipe run, particularly when an actuator other than a manual handle is used.

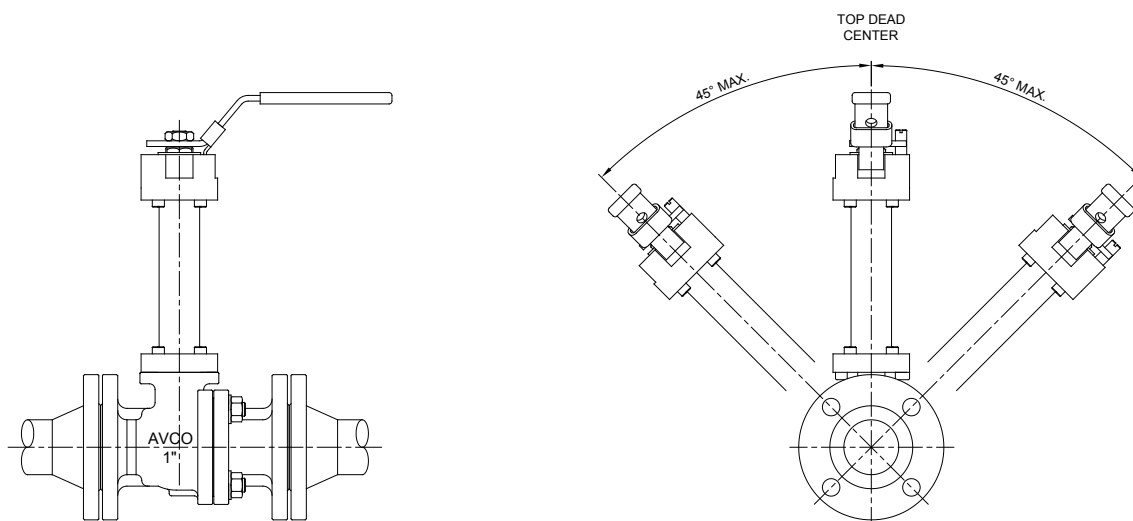


Fig. 1
Typical Valve Installations

2 Installation

- 2.1 Refer to section 9 for instructions as to how to correctly determine whether the vent in the ball should be upstream or downstream and install as appropriate.
- 2.2 Do not dismantle these valves when installing as they should be treated as a unit.
- 2.3 The flanges should be bolted and gasketed in accordance with relevant standards.
- 2.4 The orientation requirements shown in fig. 1 shall be observed.

3 Operation

- 3.1 These valves provide tight shut-off when used under normal operating conditions in accordance with the relevant AVCO pressure/temperature charts.
- 3.2 If these valves are used in a partially open (throttling) condition, the seat life may be reduced as it will be exposed to flowing media in a localized area.
- 3.3 Any media which can solidify, crystallize or polymerize should not be allowed to stand in the ball valve cavities unless regular maintenance is carried out as it could lead to damage of the seats and ball thereby dramatically reducing the life. AVCO offers cavity filled and/or steam jacketed options on this series to minimize maintenance cycles.

4 Manual Operation

- 4.1 All AVCO 9500 series ball valves up to size 2 1/2" are supplied with basic quarter turn lever handles as standard unless otherwise stated. Valve sizes 3" and above are supplied with bare stem set-ups to receive a gear operator or actuator.
- 4.2 For valve sizes 1 1/2" thru 2 1/2" there is a separate lock plate/indicator and valve lock-off is achieved by using a padlock or other suitable locking device. The handle is simply rotated provided no locking device is in place. There are two stop pins per assembly which can be relocated along with the stop plate to give opposite rotation (see fig. 2) and different start positions. Thereby the valve is either clockwise to open and counter-clockwise to close or counter-clockwise to open and clockwise to close.
- 4.3 The handle or lever gives visual indication (see fig. 3) as to whether the valve is in the open or closed position. If the handle/lever is in-line (parallel) with the pipeline, then the valve is open or if the handle/lever is perpendicular to (across) the pipeline, then the valve is closed.

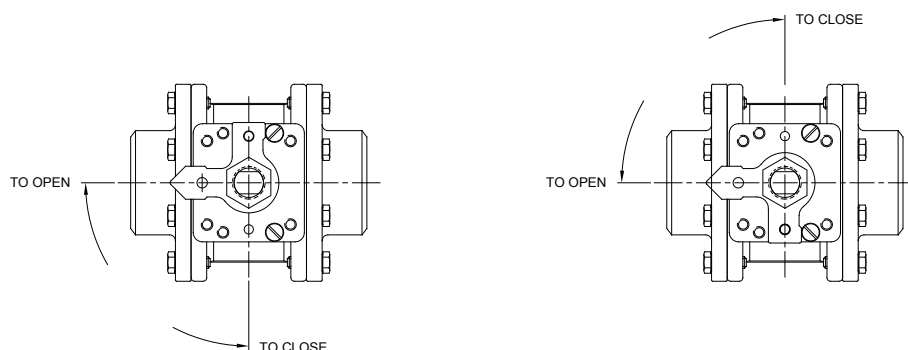


Fig. 2
Valve Handle Rotation Adjustment

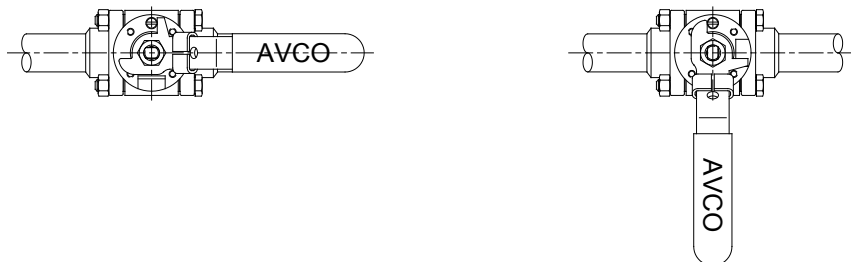


Fig. 3
Valve Open/Closed Indication

5 Automated Operation

- 5.1 These valves can be set up for automated operation as part of a process control system. AVCO supplies a large range of pneumatic and electric actuators with associated controls to accommodate most design conditions.
- 5.2 For sizes 2 1/2" and below the handle/lever, stem nut, stop pin and stop plate should be omitted for automated actuation if not already specified in the purchase order.
- 5.3 The stem has milled flats or a keyway which is machined to exacting tolerances to ensure precise location and operation.
- 5.4 There is no positive stop on the valve for open and closed positions when set up for actuator usage as it is intended that the actuator will control the valve travel.
- 5.5 The mount pad for each valve conforms to ISO 5211 and the stem dimensions are as shown in fig. 4 and table 1 on the following page.
- 5.6 Standard ISO brackets and couplers are available from AVCO to suit a wide range of actuator styles.
- 5.7 AVCO advises, that where an actuator is used, the valve be installed as shown in fig. 1 and as described in paragraph 1.2 for optimal use and life span.
- 5.8 It is imperative that any bracket/coupler combination allows adequate clearance to ensure that the coupler does not exert any compressive force directly on to the stem or stem nut, as this could lead to premature stem leakage and possible damage. When assembled it should be possible for the coupler to freely move up and down by a small amount.

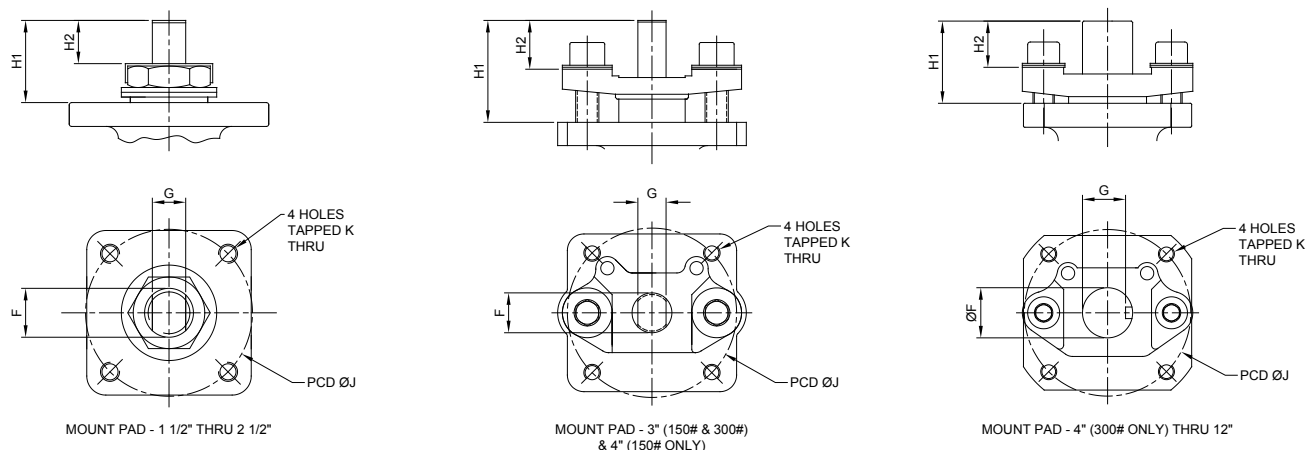


Fig. 4 - Valve Stem & Mount Pad Set-Up

SIZE	ANS Class	F (in.)	G	H1 (in.)	H2 (in.)	J (in.)	K (in.)	ISO 5211	Weight (lbs)	TORQUE (in-lbs)	CV
1 1/2"	150#	M20	0.551	1.673	0.713	2.756	M8	F07	15.0	216	213
	300#	M20	0.551	1.673	0.713	2.756	M8	F07	15.9	216	213
2"	150#	M20	0.551	1.673	0.713	2.756	M8	F07	19.8	300	378
	300#	M20	0.551	1.673	0.713	2.756	M8	F07	27.6	300	378
2 1/2"	150#	M20	0.551	1.673	0.713	2.756	M8	F07	32.0	531	660
	300#	M20	0.551	1.673	0.713	2.756	M8	F07	40.4	531	660
3"	150#	0.984	0.669	2.417	1.142	4.016	M10	F10	43.0	781	951
	300#	0.984	0.669	2.417	1.142	4.016	M10	F10	70.6	781	951
4"	150#	0.984	0.669	2.417	1.142	4.016	M10	F10	72.8	1444	1691
	300#	0.984	0.827	2.610	1.335	4.016	M10	F10	101	1444	1691
6"	150#	1.417	1.220	2.992	1.902	4.921	M12	F12	137	3356	3806
	300#	1.417	1.220	2.992	1.902	4.921	M12	F12	194	3356	3806
8"	150#	1.417	1.220	2.992	1.902	4.921	M12	F12	243	12744	7812
	300#	1.417	1.220	2.992	1.902	4.921	M12	F12	359	12744	7812
10"	150#	1.890	1.673	3.370	1.830	5.512	M16	F14	366	15930	13371
	300#	1.890	1.673	3.370	1.830	5.512	M16	F14	525	15930	13371
12"	150#	2.362	2.087	4.980	2.660	6.496	M20	F16	523	21240	19255
	300#	2.362	2.087	4.980	2.660	6.496	M20	F16	783	21240	19255

Table 1 - Valve Stem & Mount Pad Dimensions in Inches

6 Maintenance

6.1 AVCO valves will give a long and trouble free life provided they are operated within the specified design parameters, but occasionally maintenance is required and should be addressed as set out below:

6.2 Stem Leakage - 1 1/2" thru 2 1/2"

- 6.2.1 Remove the handle/lever retaining nut or screw, handle/lever, travel stop and lock washer.
- 6.2.2 Examine the Belleville washers and check the outer edges are touching and concentric. If all appears to be OK, continue to 6.2.4.
- 6.2.3 Remove stem nut, replace Belleville washers (if necessary) and ensure that the outside edges are touching concentrically. Replace the stem nut.
- 6.2.4 Tighten the stem nut until the required torque is achieved (see table 2) or until the Belleville washers are flattened and then back off by the minimum amount required until the lock washer can be located onto the stem nut.
- 6.2.5 Replace the handle/lever and handle/lever nut or screw.
- 6.2.6 If stem leakage still occurs the valve will require refurbishment, full instructions are listed in section 7.

6.3 Stem Leakage - 3" thru 12"

- 6.3.1 If possible place valve in open position or if not remove the handle/lever retaining screw and handle/lever if fitted..
- 6.3.2 Examine the packing flange Belleville washers and check the outer edges are touching and concentric. If all appears to be OK, continue to 6.3.4.
- 6.3.3 Remove/loosen the packing gland screws, replace Belleville washers (if necessary) and ensure that the outside edges are touching concentrically. Replace the packing gland screws and hand tighten.
- 6.3.4 Tighten the packing gland screws until the required torque is achieved (see table 2) or until the Belleville washers are flattened.
- 6.3.5 Replace the handle/lever and handle/lever nut or screw if it was removed in 6.3.1.
- 6.3.6 If stem leakage still occurs the valve will require refurbishment, full instructions are listed in section 7.

6.4 Leakage at Body Joint

- 6.4.1 Check the body bolt torque settings and tighten to the required torque (see table 2) using the suggested bolt tightening sequence (see the bolting information section 8).
- 6.4.2 If leakage is still encountered the body seals will require replacement or the mating faces may be damaged and should be inspected as detailed in section 7.

6.5 In-Line Leakage

- 6.5.1 Check that the valve is fully closing and that there are no restrictions preventing the full rotation to the closed position.
- 6.5.2 If the full travel is being achieved then it is likely that the valve seats or ball is damaged or worn or the ball is incorrectly fitted (see section 9) and may require replacement or correction. See section 7 for details on how to carry out a complete refurbishment.

6.6 Leakage at Pipeline Joint

- 6.6.1 Ensure that mating faces and gasket are not damaged and verify that all bolts have been tightened to the relevant torque giving adequate gasket compression. Gasket compression and bolting torque for flanged joints should be specified by the gasket supplier.

6.7 Leakage at Bonnet Joint

- 6.7.1 A seal is present at the joint between the main body and cryogenic bonnet.
- 6.7.2 If leakage occurs the bonnet screws should be checked and tightened to the required torque as shown in table 2.
- 6.7.3 If leakage still occurs it will be necessary to replace the bonnet seal as described below:

NOTE: Leakage at the bonnet seal is also an indication that the secondary stem seal (sizes 1 1/2" thru 2 1/2" only) is leaking, however the valve will still operate normally as the secondary stem seal is not critical and does not need correcting unless bad mechanical wear is present, thereby necessitating a full refurbishment. If the bonnet is removed, then the stem seal can be tightened as described in para 6.2.

WARNING: Ball valves are designed as pressure containing equipment and as such a risk assessment should be carried out to ensure that no pressurized fluid or gas is contained in the ball cavity and relevant procedures followed for the handling of hazardous materials before any work commences.

- 6.7.4 Operate the valve to either fully open or fully closed position.
- 6.7.5 Slowly loosen and remove the four bonnet bolts.
- 6.7.6 Carefully remove the bonnet assembly upwards whilst maintaining the fully open or closed position.
- 6.7.7 The valve stem (sizes 1 1/2" thru 2 1/2" only) will now be exposed and can be tightened/inspected as per para 6.2.
- 6.7.8 Discard the bonnet seal and inspect the mating surfaces for any imperfections. Thoroughly clean both surfaces with a suitable cleaning fluid. If there is any build-up of solids, use a blunt tool (preferably not metal) and ensure the mating surfaces are not scratched. If any mating surface shows signs of eroded or corroded leak paths or damage to machined areas, it should be replaced.
- 6.7.9 Fit a new bonnet seal and carefully lower the bonnet back onto the valve body whilst taking care that the valve stem or ball (depending upon actual design based upon size) and bonnet stem locate correctly. Stem/ball engagement should go together easily - do not force it as complications may occur.
- 6.7.10 Insert the bonnet bolts and tighten to the required torque using the suggested bolt tightening sequence (see the bolting information section).
- 6.7.11 Operate the valve several times, re-check the bonnet bolt torques and tighten if required. The upper stem packing may also need adjustment as it may have been disturbed.

7 Refurbishing

- 7.1 AVCO Valves can be refurbished if the need arises and complete maintenance kits are available or individual components purchased as required. A maintenance kit consists of thrust washer, packing washers, disc spring washers, seats and body seals in quantities relevant to the specific valve size.

NOTE: If any of the seal, seat or washer materials differ to that of the originally supplied specification, then the nameplate must be revised or the valve tagged to indicate the change as the temperature and pressure range could be affected.

WARNING: Ball valves are designed as pressure containing equipment and as such a risk assessment should be carried out to ensure that no pressurized fluid or gas is contained in the ball cavity and relevant procedures followed for the handling of hazardous materials before any work commences.

NOTE: The following instructions assume that all relevant safety checks have been carried out, the valve has been removed from the pipeline and are purely aimed at valve refurbishment.

- 7.2 Prepare a clean working area.
- 7.3 If fitted, remove any actuators and associated brackets per manufacturers' instructions.
- 7.4 With the valve in the open position, remove the body bolt nuts.
- 7.5 Separate the end cap from the main body whilst taking care not to damage the mating faces.
- 7.6 Remove the seat from the end cap.
- 7.7 Carefully rotate the ball in the main body of the valve to the closed position, remove the ball, second seat and body seal.
- 7.8 Whilst supporting the ball to prevent it dropping out and potentially damaging the ball surface, rotate the valve to the closed position and remove the ball.
- 7.9 Inspect the bonnet assembly and if it is considered to be in good condition skip to paragraph 7.13.

NOTE: Paragraphs 7.10 & 7.11 are relevant to the bonnet stem and paragraphs 7.12 is relevant to the body stem (sizes 1 1/2" thru 2 1/2" only). Either of these sections can be skipped if the stem assemblies are determined to be in good condition.

7.10 Dismantling & reassembling bonnet stem assembly - 1 1/2" thru 2 1/2"

- 7.10.1 Unscrew the bonnet bolts and carefully lift the bonnet assembly off the main body.
- 7.10.2 Inspect the exposed valve stem for signs of leakage or damage and repair as described in paragraph 7.12.
- 7.10.3 If fitted, unscrew the handle retaining nut/screw and remove the handle/lever. The stop pin can also be removed. Please note that these items are not installed if the valve has been set up for powered actuation.
- 7.10.4 Remove the stem nut lock washer.
- 7.10.5 Use a wrench on the stem flats to prevent the stem from turning, unscrew the stem nut and remove. The Belleville washers, gland ring, travel stop (if fitted) and packing can now be removed. The stem, thrust seal and thrust ring can be withdrawn via the bottom of the bonnet.
- 7.10.6 Thoroughly clean all components with a suitable cleaning fluid. If there is any build-up of solids, use a blunt tool (preferably not metal) and ensure machined surfaces are not scratched. If any component shows signs of eroded or corroded leak paths or damage to machined areas, it should be replaced.
- 7.10.7 Fit a new thrust ring onto the stem followed by a new thrust seal (if fitted). Ensure the correct order is observed.

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- 7.10.8 Insert the stem complete with thrust seal and thrust ring up into the bonnet body.
- 7.10.9 Ease the new packing onto the stem whilst taking care not to damage it, followed by the gland ring and travel stop (if fitted).
- 7.10.10 Place the Belleville washers onto the stem whilst ensuring that the outside edges are touching concentrically.
- 7.10.11 Replace the stem nut and Tighten the stem nut until the required torque is achieved (see table 2) or until the Belleville washers are flattened and then back off by the minimum amount required until the lock washer can be located onto the stem nut.
- 7.10.12 Operate the stem several times and re-tighten if required.
- 7.10.13 Screw in the stop pin(s), replace the handle/lever and handle/lever nut or screw. Please note that these items are not fitted for powered actuation.
- 7.10.14 Fit a new bonnet seal and carefully lower the bonnet back onto the valve body whilst taking care that the valve stem and bonnet stem locate correctly.
- 7.10.15 Insert the bonnet bolts and tighten to the required torque using the suggested bolt tightening sequence (see the bolting information section).
- 7.10.16 Operate the valve several times, re-check the bonnet bolt torques and tighten if required.

7.11 Dismantling & reassembling bonnet stem assembly - 3" thru 12"

- 7.11.1 Unscrew the packing gland screws and remove the Belleville washers. The packing gland flange, gland ring (3" thru 4"), bushing (6" thru 12") and packing can now be removed.
- 7.11.2 Unscrew the bonnet bolts and carefully lift the bonnet assembly off the main body. Take care not to damage the stem packing area as the bonnet is raised. The stem should ideally stay located in the valve body.
- 7.11.3 Remove the bonnet gasket.
- 7.11.4 Remove the thrust ring and thrust seal (if fitted) from the stem.
- 7.11.5 Remove the stem from the valve body.
- 7.11.6 Remove the lower bushing from the top of valve body.
- 7.11.7 Thoroughly clean all components with a suitable cleaning fluid. If there is any build-up of solids, use a blunt tool (preferably not metal) and ensure machined surfaces are not scratched. If any component shows signs of eroded or corroded leak paths or damage to machined areas, it should be replaced.
- 7.11.8 Insert the lower bushing into the valve body.
- 7.11.9 Fit a new thrust ring onto the stem followed by a new thrust seal (if fitted). Ensure the correct order is observed.
- 7.11.10 Insert the stem complete with thrust seal and ring into the lower bushing in the valve body. The stem may require minimal supporting until the bonnet is placed in position.
- 7.11.11 Place a new bonnet gasket on top of the valve mating face, ensuring it is concentric with the lower bushing.
- 7.11.12 Carefully lower the bonnet over the stem until it locates with the lower bushing.

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- 7.11.13 Ease the new packing onto the stem and into the bonnet cavity, followed by the gland ring.
- 7.11.14 Insert the bonnet bolts and tighten to the required torque using the suggested bolt tightening sequence (see the bolting information section).
- 7.11.15 Insert the bushing (6" thru 12") into the gland flange and locate the gland flange onto the stem. Place Belleville washers onto the gland screws and tighten to the required torque (see table 2) or until the Belleville washers are flattened. The Belleville washers should have their outside edges touching concentrically.
- 7.11.16 Operate the stem several times and re-tighten the gland screws if required.
- 7.11.17 Check the bonnet bolt torques and tighten if required.
- 7.12 Dismantling & reassembling valve body stem assembly - 1 1/2" thru 2 1/2 only"**
 - 7.12.1 Unscrew the bonnet bolts and carefully lift the bonnet assembly off the main body if not already removed.
 - 7.12.2 Remove the stem nut lock washer.
 - 7.12.3 Use a wrench on the stem flats to prevent the stem from turning, unscrew the stem nut and remove. The Belleville washers, gland ring and packing can now be removed. The stem, thrust seal and thrust ring can be withdrawn via the body cavity.
 - 7.12.4 Thoroughly clean all components with a suitable cleaning fluid. If there is any build-up of solids, use a blunt tool (preferably not metal) and ensure machined surfaces are not scratched. If any component shows signs of eroded or corroded leak paths or damage to machined areas, it should be replaced.
 - 7.12.5 Fit a new thrust ring onto the stem followed by a new thrust seal. Ensure the correct order is observed.
 - 7.12.6 Insert the stem complete with thrust seal and thrust ring up into the valve body.
 - 7.12.7 Ease the new packing onto the stem whilst taking care not to damage it, followed by the gland ring.
 - 7.12.8 Place the Belleville washers onto the stem whilst ensuring that the outside edges are touching concentrically.
 - 7.12.9 Replace the stem nut and Tighten the stem nut until the required torque is achieved (see table 2) or until the Belleville washers are flattened and then back off by the minimum amount required until the lock washer can be located onto the stem nut.
 - 7.12.10 Operate the stem several times and re-tighten if required.
 - 7.12.11 Fit a new bonnet seal and carefully lower the bonnet back onto the valve body whilst taking care that the valve stem and bonnet stem locate correctly.
 - 7.12.12 Insert the bonnet bolts and tighten to the required torque using the suggested bolt tightening sequence (see the bolting information section).
 - 7.12.13 Operate the valve several times, re-check the bonnet bolt torques and tighten if required.
- 7.13 The ball must have no scratches or scoring, other than minor signs of rubbing, around its seating periphery (fig. 5). If the ball does not pass inspection it should be replaced.

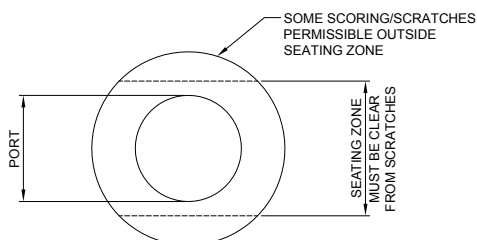


Fig. 5
Ball Inspection

- 7.14 Place a new seat in the body cavity and another in the end cap. Ensure the seats are the right way round - angled seating face should be visible.
- 7.15 Replace the ball into the valve body (whilst in closed position and considering section 9 for vent hole location) and carefully rotate to the open position.

NOTE: A trace of silicon based lubricant or clean grease (i.e. Petroleum jelly), if compatible with pipeline media, will assist with rebuilding by holding the seats and body seals in place. **DO NOT** use grease with abrasive additives.

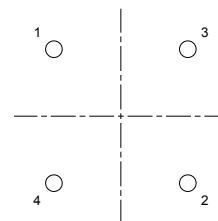
- 7.16 Place the body seal onto the end cap and ease the completed end cap into the main body.
- 7.17 Replace the body nuts onto the body studs and tighten to the required torque using the suggested bolt tightening sequence (see the bolting information section). It is suggested that periodic opening and closing be performed during the tightening sequence to help with concentricity, as it is possible for the ball to be trapped between the seats, especially in horizontal applications.
- 7.18 If possible the valve should be tested at design pressure for any leakage and relevant corrective action taken as necessary.

8 Bolting Information

- 8.1 The stem nut should be tightened finger tight and then torqued per table 2 or tightened with a wrench until the disc spring washers are fully flat. Once the required tightening has been achieved, the nut should be backed off no more than 1/8 turn until the lock pad can be assembled onto the stem.
- 8.2 Packing gland screws should be tightened finger tight and then torqued per table 2 or tightened with a wrench until the Belleville washers are fully flat.
- 8.3 Body stud nuts should be tightened until finger tight and then gradually fully tightened per the bolting sequence shown in paragraphs 8.4 through 8.8 to the torque shown in table 2. It is important that tightening be done gradually so as not to trap or pinch any part of the seats or seals and to maintain concentricity.

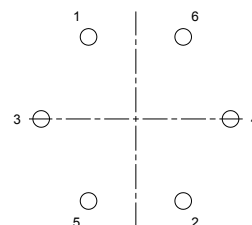
8.4 Four bolt sequence.

- 8.4.1 First round to 30% torque - 1-2, 3-4
- 8.4.2 Second round to 60% torque - 1-2, 3-4
- 8.4.3 Third round to 100% torque - 1-2, 3-4
- 8.4.4 Final checking round - 1,3,2,4



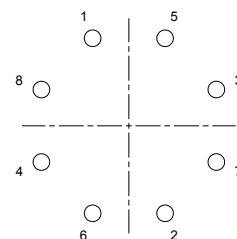
8.5 Six bolt sequence

- 8.5.1 First round to 30% torque - 1-2, 3-4, 5-6
- 8.5.2 Second round to 60% torque - 1-2, 3-4, 5-6
- 8.5.3 Third round to 100% torque - 1-2, 3-4, 5-6
- 8.5.4 Final checking round - 1,6,4,2,5,3



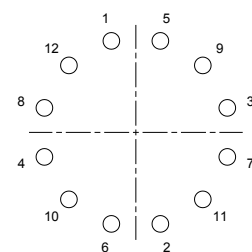
8.6 Eight bolt sequence

- 8.6.1 First round to 30% torque - 1-2, 3-4, 5-6, 7-8
- 8.6.2 Second round to 60% torque - 1-2, 3-4, 5-6, 7-8
- 8.6.3 Third round to 100% torque - 1-2, 3-4, 5-6, 7-8
- 8.6.4 Final checking round - 1,5,3,7,2,6,4,8



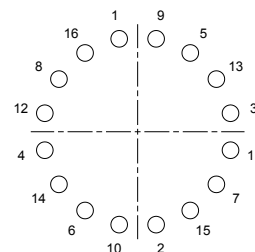
8.7 Twelve bolt sequence

- 8.7.1 First round to 20% torque - 1-2, 3-4, 5-6, 7-8, 9-10, 11-12
- 8.7.2 Second round to 40% torque - 1-2, 3-4, 5-6, 7-8, 9-10, 11-12
- 8.7.3 Third round to 80% torque - 1-2, 3-4, 5-6, 7-8, 9-10, 11-12
- 8.7.4 Fourth round to 100% torque - 1-2, 3-4, 5-6, 7-8, 9-10, 11-12
- 8.7.5 Final checking round - 1,5,9,3,7,11,2,6,10,4,8,12



8.8 Sixteen bolt sequence

- 8.8.1 1st round to 20% torque - 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16
- 8.8.2 2nd round to 40% torque - 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16
- 8.8.3 3rd round to 80% torque - 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16
- 8.8.4 4th round to 100% torque - 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-14, 15-16
- 8.8.5 Final checking round - 1,9,5,13,3,11,7,15,2,10,6,14,4,12,8,16



Valve Size	ANSI Class	Body Studs		Packing Gland Screws		Stem Nuts		Bonnet Bolts	
		Size	Torque (ft.lbs)	Size	Torque (ft.lbs)	Size	Torque (ft.lbs)	Size	Torque (ft.lbs)
1 1/2"	150	M12	50	-	-	M20	18	M8	26
	300	M16	100	-	-	M20	18	M8	26
2"	150	M12	50	-	-	M20	18	M8	26
	300	M12	50	-	-	M20	18	M8	26
2 1/2"	150	M12	50	-	-	M20	18	M8	26
	300	M12	50	-	-	M20	18	M8	26
3"	150	M12	50	M14	22	-	-	M10	38
	300	M14	75	M14	33	-	-	M10	38
4"	150	M12	50	M14	22	-	-	M10	38
	300	M16	100	M14	33	-	-	M10	38
6"	150	M16	100	M16	33	-	-	M12	50
	300	M20	170	M16	40	-	-	M12	50
8"	150	M20	170	M16	33	-	-	M12	50
	300	M24	385	M16	40	-	-	M12	50
10"	150	M20	170	M20	48	-	-	M16	100
	300	M24	385	M20	57	-	-	M16	100
12"	150	M20	170	M20	48	-	-	M20	170
	300	M24	385	M20	57	-	-	M20	170

Table 2
Valve Torque Settings

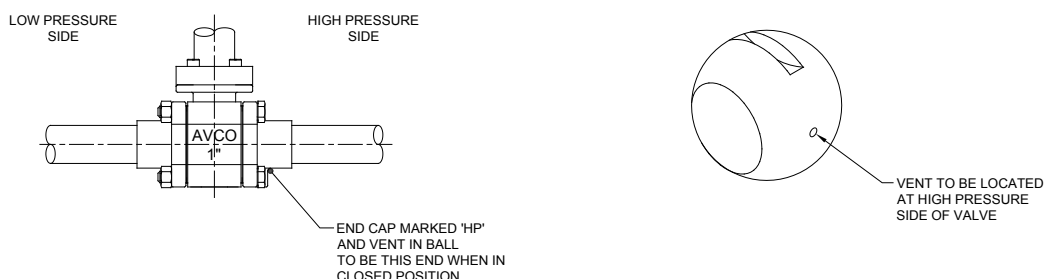


Fig. 6
Vented Ball Installation

- 8.9 If a bolt, screw, stud or nut is damaged or lost, it should be replaced with one of exactly the same specification as that originally supplied. AVCO holds spares in stock.

9 Determining Correct Installation of Vented Ball

- 9.1 The 9500 series ball valve has a vented ball to prevent pressure build-up in the ball cavity and as such it is important the ball be correctly installed.
- 9.2 Each valve supplied will have one end cap marked 'HP' for high pressure end.
- 9.3 The user shall determine which end of the valve will be the higher pressure when the valve is in the 'closed' position. This may or may not coincide with the flow direction and is specific to the type of system.
- 9.4 The end cap marked 'HP' must be installed at the high pressure side as determined in paragraph 9.3.
- 9.5 The vent in the ball must always be at the same end as the end cap marked 'HP' for correct operation. Failure to do so will result in operational leakage.

10 Valve Conformance

- 10.1 The valve shall be deemed to conform with its originally supplied specifications provided that:
- 10.1.1 The maintenance kit material is identical to that of the originally specified valve or the name-plate be revised to show the new conditions.
- 10.1.2 Any component that is replaced during maintenance or repair is an AVCO authorized spare part and is specific to the originally specified valve. Any component of the valve can be replaced, but AVCO recommends that if the body becomes damaged then the complete valve be replaced.
- 10.1.3 Parts from different AVCO valve series should not be inter-changed unless authorized by AVCO.
- 10.1.4 Parts from other valve manufacturers must not be used.
- 10.1.5 If the valve is altered in any way from that of the original specification or without consent from AVCO, then no liability can be accepted by AVCO (Alloy Valves & Control).

11 Safety Precautions

- 11.1 Ascertain what media the pipeline carries before removing or working on any fitted valve. The media can be corrosive, toxic, flammable or a contaminant. Where there is evidence of harmful or hazardous media ever flowing through the valve, then utmost care must be taken. As a minimum AVCO suggests the following precautions be taken, but it is the responsibility of the owner/operator to ensure that a risk assessment is carried out and relevant safety procedures followed thereof.
- 11.2 Wear eye protectors.
- 11.3 Wear protective overalls and gloves.
- 11.4 Wear protective headgear.
- 11.5 Wear protective footwear.
- 11.6 Ensure running water is easily accessible.
- 11.7 Have a suitable fire extinguisher nearby.
- 11.8 Check Upstream and downstream pressure gauges to ensure the pipeline contains no pressure.
- 11.9 Ensure any pressurized media in the ball or cavity is released by opening the valve half open.
- 11.10 Ideally the valve should be flushed or decontaminated with the valve in the half open position to clear ball and body cavity.

12 Exploded Views

- 12.1 Figures 7 & 8 and table 3 on the following pages show the typical exploded views and part descriptions for all valve sizes.

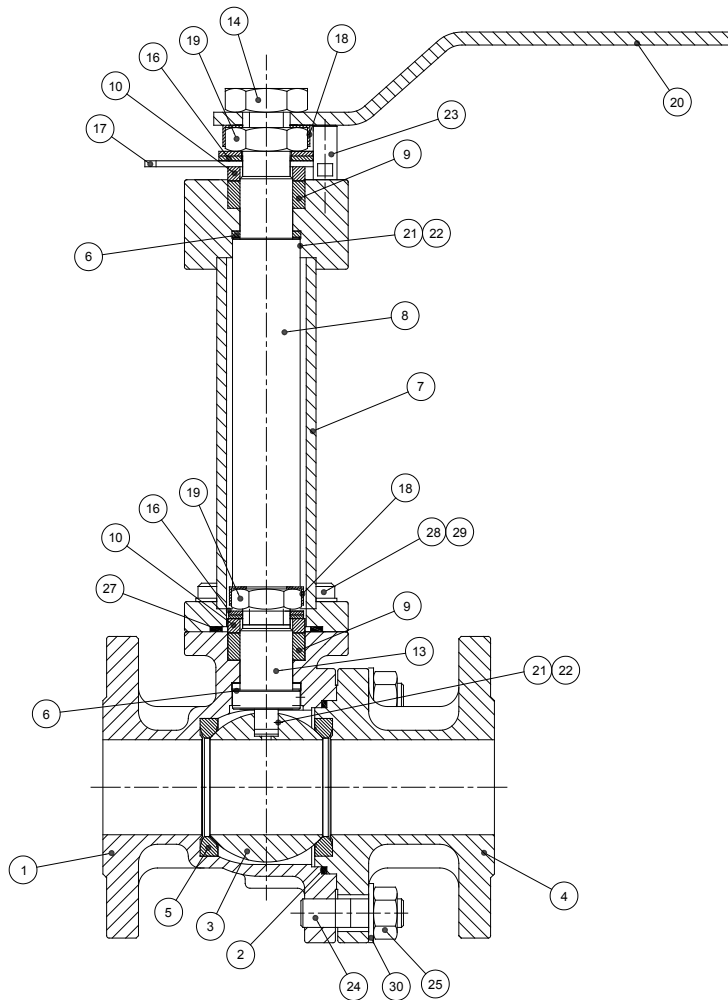


Fig. 7
1 1/2" thru 2 1/2"

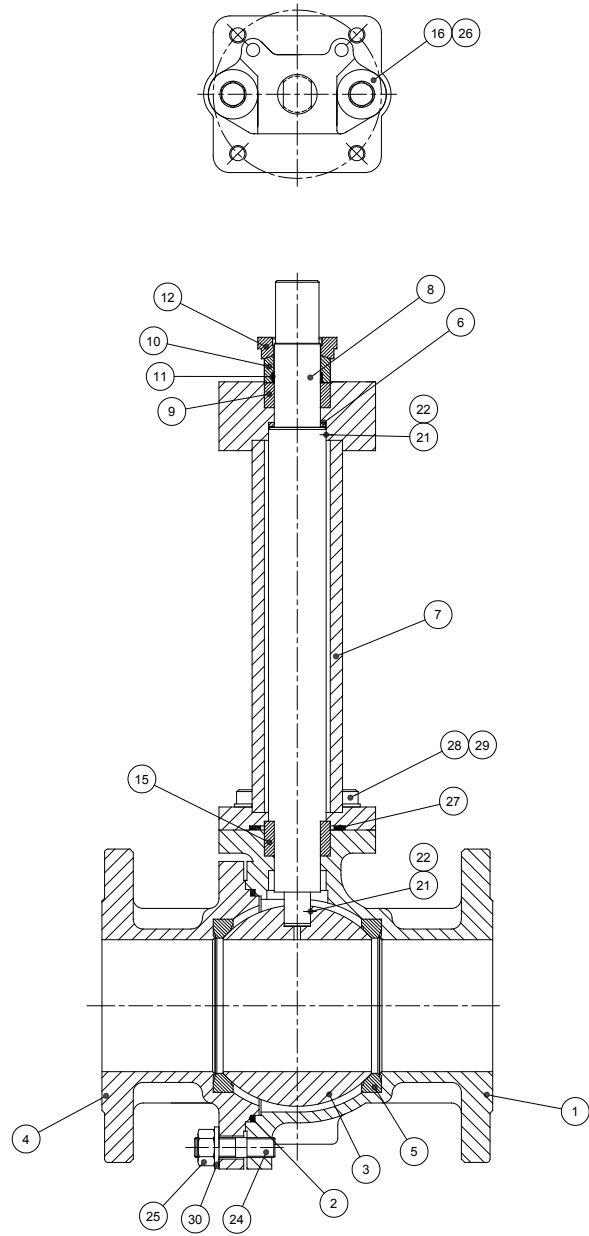


Fig. 8
3" thru 12"

Item	Description	Valve Size			Material
		1 1/2" thru 2 1/2"	3" thru 4"	6" thru 12"	
1	Body	Yes	Yes	Yes	A351-CF8M
2	Body Seal	Yes	Yes	Yes	SS 316/Graphite
3	Ball	Yes	Yes	Yes	A351-CF8M
4	End Cap	Yes	Yes	Yes	A351-CF8M
5	Seat	Yes	Yes	Yes	CTFE
6	Thrust Ring	Yes	Yes	Yes	TFM 4215
7	Cryogenic Bonnet	Yes	Yes	Yes	A276-316
8	Cryogenic Stem	Yes	Yes	Yes	A276-316
9	Packing	Yes	Yes	Yes	Grafoil
10	Gland Ring	Yes	Yes	No	A276-316
11	Upper Bushing	No	No	Yes	PTFE
12	Packing Gland	No	Yes	Yes	A351-CF8M
13	Lower Stem	Yes	No	No	A276-316
14	Handle Nut	Yes	No	No	A194-8
15	Lower Bushing	No	Yes	Yes	CTFE
16	Belleville Washer	Yes	Yes	Yes	A276-301
17	Travel Stop	Yes	No	No	Stainless Steel
18	Lock Washer	Yes	No	No	Stainless Steel
19	Stem Nut	Yes	No	No	A276-304
20	Handle	Yes	No	No	Steel
21	Anti-Static Ball	Yes	Yes	Yes	A276-316
22	Spring	Yes	Yes	Yes	A276-316
23	Stop Pin	Yes	No	No	Stainless Steel
24	Body Stud	Yes	Yes	Yes	A193-B8
25	Body Nut	Yes	Yes	Yes	A194-8
26	Packing Gland Screw	No	Yes	Yes	A193-B8
27	Gasket	Yes	Yes	Yes	SS 316/Graphite
28	Bonnet Bolt	Yes	Yes	Yes	A193-B8
29	Bonnet Bolt Washer	Yes	Yes	Yes	Stainless Steel
30	Body Bolt Washer	Yes	Yes	Yes	Stainless Steel

Table 3 - Parts and Materials List