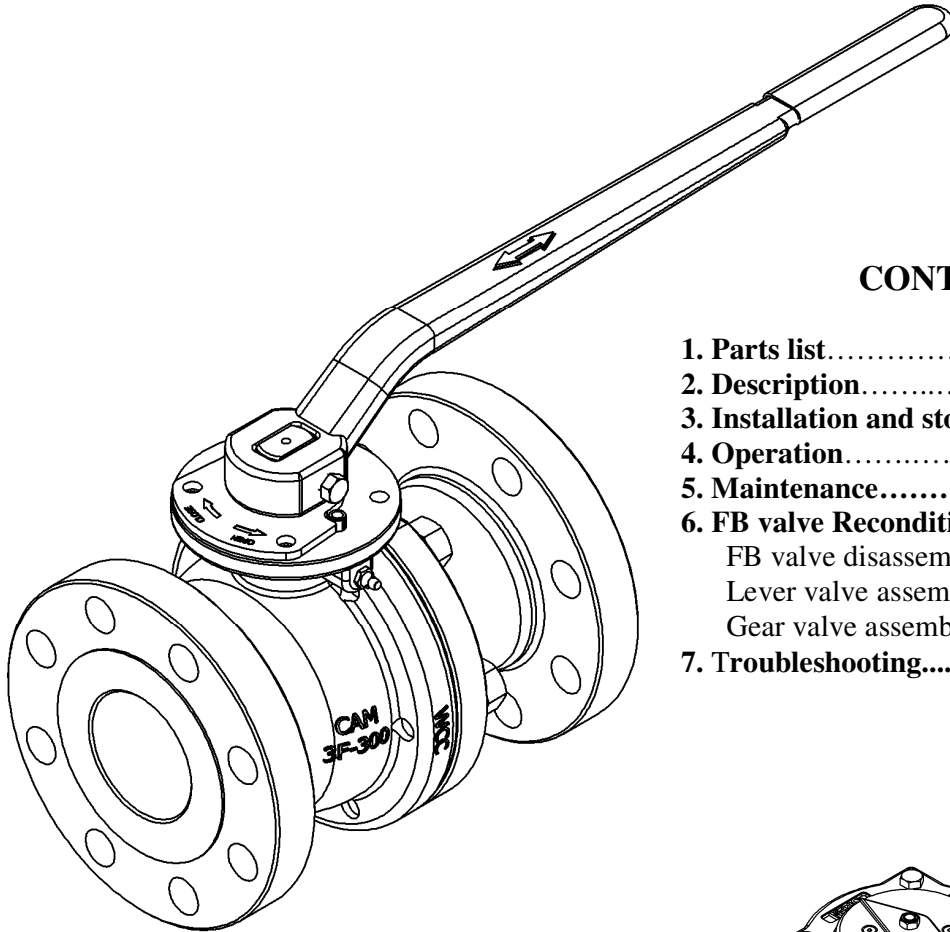


INSTALATION, OPERATION AND MAINTENANCE MANUAL AOP SERIES FB FLOATING BALL VALVE



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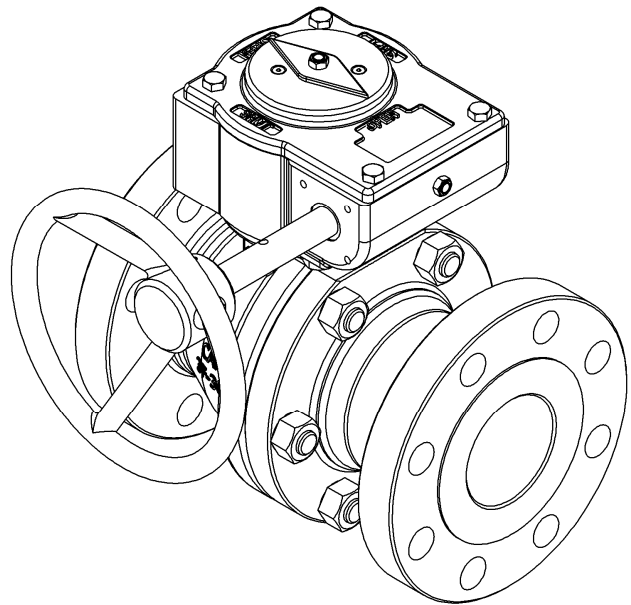
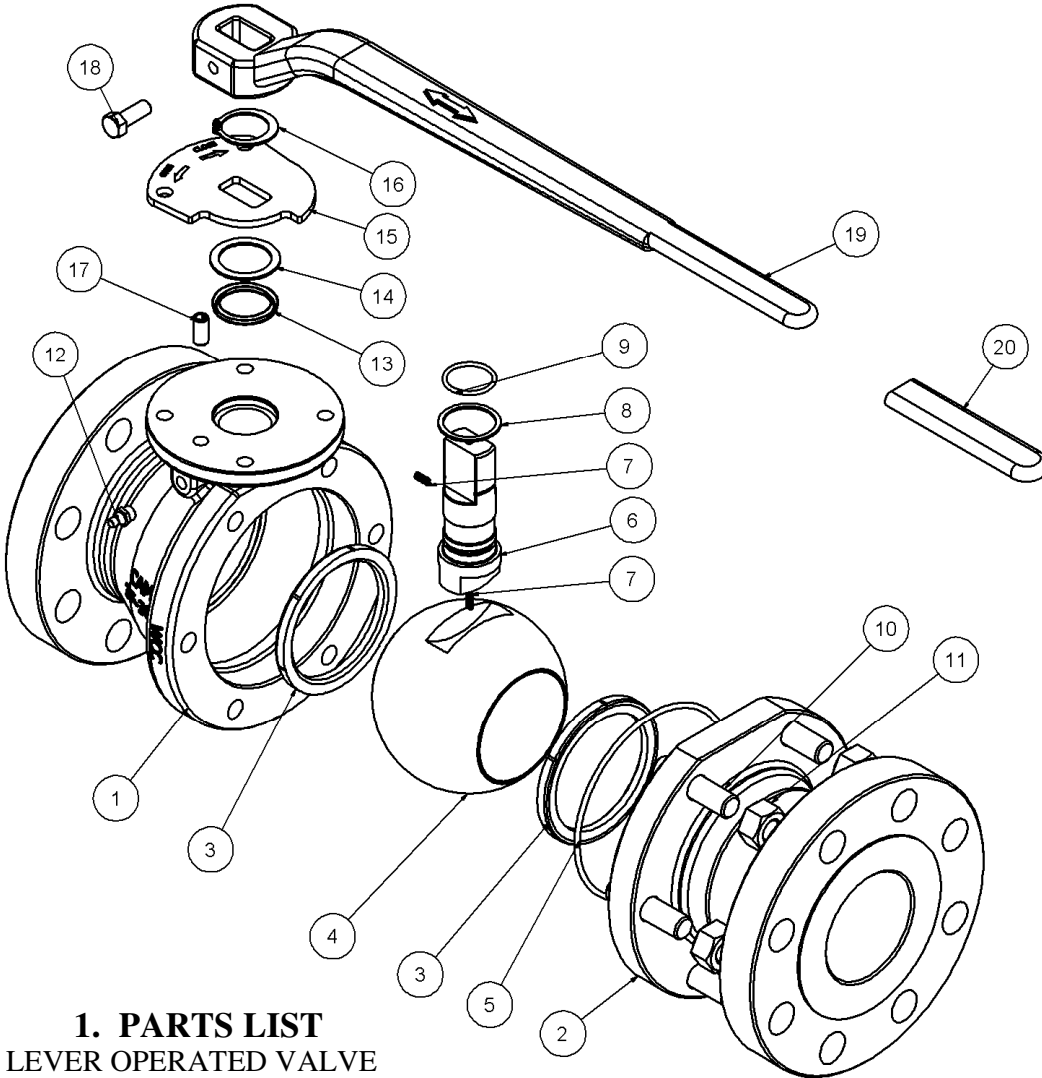


Figure 1. Lever Operated Valve – exploded view

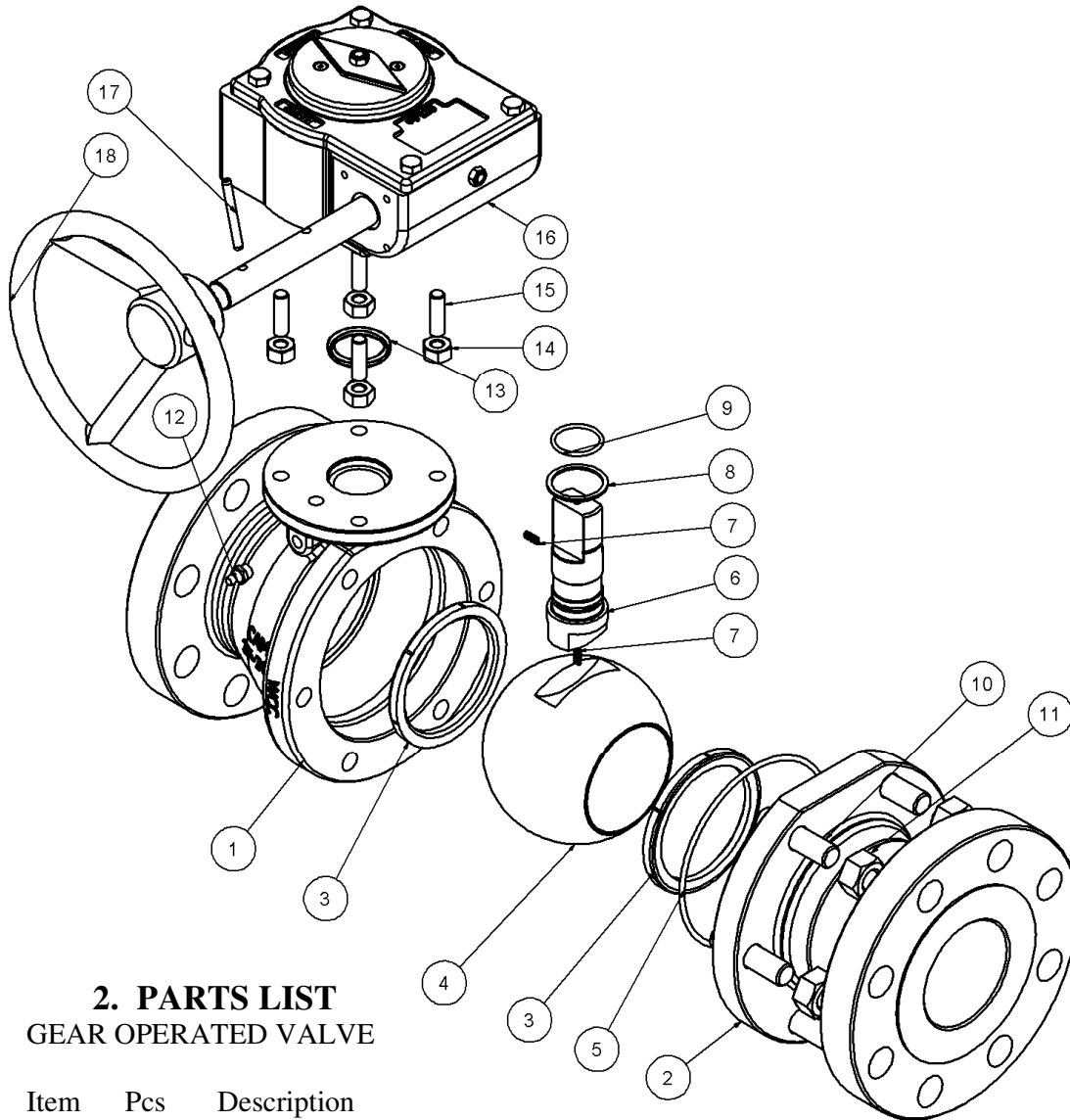


1. PARTS LIST
LEVER OPERATED VALVE

Item	Pcs	Description	Item	Pcs	Description
1	1	Body	12	1	Zerk fitting, stem grease
2	1	Adapter	13	1	Weather seal
3	2	Seat	14	1	Washer
4	1	Ball	15	1	Stop plate
5	1	O-ring, adapter seal	16	1	Snap ring
5a	1	Back-up, adapter (not shown- only for 900/1500 class)	17	1	Stop pin
6	1	Stem	18	1	Lever screw
7	2	Antistatic spring	19	1	Lever
8	1	Stem thrust washer	20	1	Lever Grip
9	1	O-ring, stem seal	21	1	Nameplate (not shown)
9a	1	Back-up, stem seal (not shown- only for 900/1500 class)			
10	x	Adapter studs			
11	x	Adapter nuts			

x- pcs – stud and nut quantity dependent on valve size and class

Figure 2. Gear Operated Valve – exploded view



2. PARTS LIST
GEAR OPERATED VALVE

Item	Pcs	Description
1	1	Body
2	1	Adapter
3	2	Seat
4	1	Ball
5	1	O-ring, adapter seal
5a	1	Back-up, adapter (not shown- only for 900/1500 class)
6	1	Stem (double D style up to 6"RP; key style for 6" FP and up)
7	2	Antistatic spring
8	1	Stem thrust washer
9	1	O-ring, stem seal
9a	1	Back-up, stem seal (not shown- only for 900/1500 class)
10	x	Adapter studs
11	x	Adapter nuts

Item	Pcs	Description
12	1	Zerk fitting, stem grease
13	1	Weather seal
14	4	Gear nut
15	4	Gear stud
16	1	Worm Gear
17	1	Split pin, handwheel pin
18	1	Handwheel
19	1	Stem key (not shown – only for key stem style, 6" FP and up)
21	1	Nameplate (not shown)

x- pcs – stud and nut quantity dependent on valve size and class

2. Description

FB floating ball valves are full bore, through conduit, bi-directional design with blowout proof stem. The FB valves are equipped with standard nylon seats. The floating ball works so that when pressure is applied, the generated force pushes the floating ball, which performs downstream seat sealing.

The lever can be easily removed/ reassembled by means of a hex screw.

The handwheel can be removed from the gear shaft by taking out the split pin.

3. Installation and storing

Valves delivered by AOP

After the valves have been assembled and tested, the valves are drained and painted.

Sealing surfaces of connection flanges are greased and covered by protectors.

All valves are delivered in fully open position.

If the valve is lever operated, the lever may be separately packaged for easier handling and transportation.

If the valve has a gear operator, the gear is installed on the valve and factory adjusted for open and closed position. The gear handwheel may be separately packaged for easier handling and transportation.

All FB valves should be stored in full open position, with the flange seal surfaces and the bore greased, and the protectors installed on the flanges.

Before installation

Ensure that, during transportation and before installation, grease fittings and sealing surfaces of connection flanges are not damaged.

Remove the connection flange protectors and ensure that no foreign materials are inside the valve bore. If pressure tests are conducted before installation, drain the valve to remove testing water.

Installation

AOP FB valves may be installed in any position with flow from either direction.

When handling or installing a valve keep the valve in full open position to prevent foreign objects from damaging the ball.

Use studs, nuts and raised face gaskets or ring joints, as per size and class conforming to ASME B16.5. Tighten the studs alternately, cross pattern method, several times, using the torques recommended by ANSI or gasket manufacturer specification.

Field testing: when field testing is required the following procedures are recommended:

- Ensure that the test fluids are compatible with the valve seat and seal material
- Flush the system to remove foreign material that may be in the line as a result from installation procedures, to avoid damages to the ball and seats
- If performing line shell testing, the valve shall be in half open position. The maximum line pressure can be 1-1/2 times the valve maximum cold working pressure.
- If performing seat testing, make sure the valve is fully closed. The maximum pressure for seat testing is the maximum cold working pressure.

- After completion of testing, purge all test fluids from the valve.

CAUTION: if the seats are tested to a higher pressure than maximum cold working pressure, the seats can be permanently damaged. If a higher test pressure is desired contact AOP representative for details.

4. Operation

FB ball valves only work in the fully closed or fully open position; these valves work for on/off service only.

WARNING: These valves shall never be operated partially open or partially closed. Throttling (partial opening) or “pinching” flow may cause non-uniform wear on seats and ball over the sealing surfaces where it is exposed to the flow line, preventing tight shut-off.

To close the valve, turn the lever or gear handwheel clockwise; to open the valve turn the lever or gear handwheel counter-clockwise.

All lever operated valves should have the lever in line with valve through bore when open and perpendicular (90 degrees) with the through bore when close.

All gear operated valves have the gear indicator along with valve through bore when open and perpendicular with the through bore when closed. The gear has also “OPEN” and “SHUT” markings. While opening or closing the ball must reseat, this reseating torque is higher than the run torque. If lever operated turn the lever until the stop plate stops on the pin. If gear operated turn the handwheel until the gear has a positive stop.

CAUTION: If the valve is not correctly resealed at the end of opening or closing the ball and the seats can quickly be damaged when exposed to flow pressure, preventing tight shut-off.

NOTE: All valves 6” full port and larger size come with gear operator only; these sizes are not available with lever operated option.

These valves can be operated by one person. It is recommended that no extensions be used for operating the valve.

5. Maintenance - recommendations

The FB floating ball valves have a tight seat to ball seal insuring leak-free performance for a long period of time.

However all valves have an external stem lube fitting, which is installed on the body stem neck, for periodic lubrication of the stem journal, if desired.

Also the gears are factory lubricated for long operation (on gear operated valves). If desired the gear can be lubricated using the lube fitting located on the side of the gear operator.

6. FB valve Reconditioning

The FB valves can be rebuilt if it is necessary.

CAUTION: Prior to disassembly, the valve must first be isolated from system pressure and flow. Operate the valve at least two times to make sure there is no pressure trapped into the body.

After observing the above precautions, remove the valve from the pipe line system. Set the valve in a clean place free of dust and/or metallic chips.

6.1. Disassemble the FB valve

1. Operate the valve to the closed position.
2. Remove the lever, snap ring, stop plate and washer.
3. If the valve is gear operated, loosen the gear nuts, at the same time lift the gear until it comes off of the stem. Remove stem key- on 6" FP and larger valve only.
4. Stand the valve on the body end flange. Care should be taken to avoid damage of the sealing surface of the raised portion or ring groove (as applicable).
5. Using a proper wrench loosen the adapter nuts and carefully lift the adapter from the body. Stand the adapter on the flange end; make sure to avoid scarring the sealing surfaces.
6. Carefully remove the ball from the body, make sure not to lose the antistatic spring between the ball and the stem.
7. Remove the seats from the body and adapter. Make sure not to damage the body and adapter seat pockets during this operation.
8. Remove the stem from the body. It may be necessary to push it past the weather seal.
9. Remove the O-rings from the stem and adapter (and the back-up for 900/1500 class valves). Also remove the weather seal from the body.

Clean and inspect all the parts for damage, wear or corrosion. Observe all sealing surfaces. If it's necessary use fine emery cloth for removal of deposits on the machined surfaces. Scratches or cuts on the ball and seats sealing surfaces are cause for replacement. It is recommended to use new O-ring seals when reassembling. Flush lube and sealant while the valve is disassembled.

6.2. Assemble the FB valve

6.2.a. Assembling a Lever Operated Valve

After inspecting the parts and getting the new replacement parts as required, follow the next steps:

1. Install the stop pin into the body (if it has been removed)
2. Grease the seats pockets and install the seats into the body and adapter seat pocket
3. Install the weather seal into the body
4. Install the thrust washer onto the stem and the o-ring on the stem groove. (If it is a 900/1500 class valve install the back-up ring on the side of the O-ring toward handle end connection. Make sure the back-up doesn't come out of the groove). Grease the stem and stem seal well.
5. Install one antistatic spring on the stem side hole. While keeping the spring in place with a screw driver, drive the stem into the body stem hole until completely engages and the stem stops on the thrust washer. Rotate the stem with the flats connecting the ball to be parallel with the body flow bore
6. Install the second antistatic spring into the stem end hole and grease it. Take the ball, align the flats with the stem flats and lower into the body while rotating to engage the stem. The ball sits on the body seat in the closed position.
NOTE: If a gear operated valve, measure the ball and using a marker, mark a line on the center of the ball. Measure from both sides of the ball to make sure the line is in the center of the ball-see 6.2.b.
7. Install the o-ring on the adapter groove. (If it is a 900/1500 class valve install the back-up ring on the side of the O-ring toward adapter flange face. Make sure the back-up doesn't come out from the groove). Grease the adapter seal.

8. Lift the adapter, turn over and rotate to align the body ANSI flange holes with the adapter ANSI flange holes. If the adapter body connection flange has one or more flat sides ensure the adapter flat side matches with the body flat side.
9. Lower the adapter over the body studs and install the nuts. It is not acceptable to use grease on the nuts. If desired anti-seize grease can be used on the stud thread only.
Tighten the nuts in a cross pattern to recommended torque- see table below.

Stud size	Threads per in	Nut HEX. size	TORQUE FOR B7; B7M; L7; L7M; 660; STUDS & SCREWS			
			Ft-lbs		N-m	
			min	max	min	max
3/8	16	11/16	22	26	29	34
1/2	13	7/8	45	52	61	71
5/8	11	1-1/16	88	101	118	136
3/4	10	1-1/4	153	176	206	237
7/8	9	1-7/16	243	267	328	360
1	8	1-5/8	361	397	488	537
1-1/8	8	1-13/16	523	575	706	776
1-1/4	8	2	726	798	981	1080
1-3/8	8	2-3/16	976	1073	1320	1450
1-1/2	8	2-3/8	1278	1400	1727	1890

10. Install the washer and stop plate over the stem. Make sure the stop plate markings are facing up. Install the snap ring on the stem groove.
11. Install the lever. Operate the valve and check for proper opening and closing.

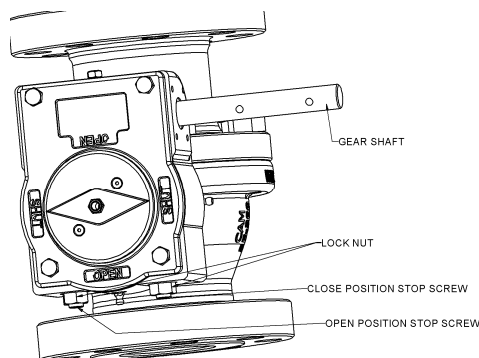
6.2.b. Assembling a Gear Operated Valve

After inspecting the parts and getting the new replacement parts as required, follow next steps:

1. Take out the stop pin from the body (if has not been removed)
2. Follow assembling procedure 6.2.a; steps 2 up to 9. Note the marking on the ball that has to be done at pct 6.
3. Install the studs on the gear. Check the gear to ensure is in the closed position (the indicator shall be parallel with the gear shaft), turn the gear with the shaft on the right side (the gear shaft shall be perpendicular on the valve flow bore toward the adapter) and slide over the stem. (On 6" and larger valves install the key on the stem prior to sliding the gearbox onto the valve stem) Thread the gear nuts on the gear studs while lowering the gear. The gear studs should be as indicated in the table below:

Valve size	Valve class	Gear stud size
1"FP	150-1500	1/4"-20UNC
1-1/2"FP and 2"RP	150-1500	5/16"-18UNC
2"FP and 3"RP	150-600	5/16"-18UNC
2"FP and 3"RP	900-1500	3/8"-16UNC
3"FP and 4"RP	150-600	3/8"-16UNC
4"FP and 6"RP	150-600	3/8"-16UNC
6"FP and 8"RP	150-300	5/8"-11UNC
8"FP and 10"RP	150-300	3/4"-10UNC

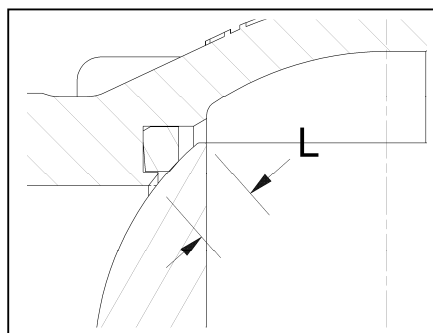
- To set the closed stop turn the hand wheel until the marking on the ball (created at pct 6.2.a 6) is centered with the adapter flow bore. Check with a scissor type tool for the ball marking to be on center. Loosen the jam nut on the stop farthest from the hand wheel shaft. Then turn the stop bolt clockwise until it stops. Retighten the jam nut. It may be necessary to turn the stop screw counter clockwise in order to get additional travel and move the operator further closed. **The hand wheel should always be turned in the closed direction to set the closed stop, so that all slack will be taken out of the gearing. This ensures a more accurate stop setting.**



After setting the closed stop a quick check should be made to ensure that it has been correctly set. This is accomplished by turning the hand wheel shaft several turns towards the open position, and then returning it until the closed stop is contacted. Check with a scissor type spring calipers tool for the ball marking to be on center, make sure the ball did not close differently when operated.

If the marking on the ball is missing, a second way to check the correct closed position is to mark the ball – after fully closing the gear- with a circle tangent to the adapter flow bore (or body flow bore) in a plane 90 degree with the stem axis. Half way open the ball and measure the minimum distance from the ball corner (ball flow bore to sphere corner) to the marking; the distance shall be as L dimension from below table.

Valve size	Valve class	Dimension L (inches)
1"FP	150-1500	0.25"
1-1/2"FP and 2"RP	150-1500	0.29"
2"FP and 3"RP	150-1500	0.36"
3"FP and 4"RP	150-600	0.54"
4"FP and 6"RP	150-600	0.51"
6"FP and 8"RP	150-300	0.91"
8"FP and 10"RP	150-300	0.99"



- To set the open stop turn the gear shaft counter clockwise, moving the valve to the open position. Look into the bore of the valve, and continue opening until the flow bore of the ball is in alignment with the flow bore of the body and adapter. There should not be more than 1/16" of the ball radius exposed into the flow bore once the final setting has been made. Once the alignment is accomplished loosen the jam nut on the open stop bolt, and turn the stop bolt clockwise until it stops. Retighten the jam nut. It may be necessary to turn the stop screw counter clockwise in order to get additional travel and move the operator further open, in order to align the ball flow bore with the flow bore of the seat holder. **The hand wheel should always be turned in the open direction to set the open stop, so that all slack will be taken out of the gearing. This ensures a more accurate stop setting.**

After setting the open stop a quick check should be made to ensure that it has been set correctly. This is accomplished by turning the hand wheel shaft several turns towards closed then returning it until it hits the open stop.

6. Install the handwheel and secure with the handwheel split pin.

7. TROUBLESHOOTING

Malfunction	Probable cause	Repair
Will not open or close	Iced up due restricted flow or low temperature	Grease body and bearing
	Pressure locked. (condition in which the body pressure exceeds the line pressure)	Replace valve temperature or pressurize line to rated working pressure to reduce pressure differential sufficient to operate the valve
Hard to operate	Accumulation or solidification of material in the body	Flush valve to get the material out of body
	Swelling seats	Install correct trim*
	Corrosion between stem and valve body	Grease the stem. If still won't operate disassemble the valve and replace damaged parts.
	Operator not installed properly	Check operator
Leak pass the seat	Foreign material between seat and ball	Operate several times to wipe clean
	Worn or damaged seats and or ball	Disassemble the valve and replace worn parts
	Operator stops not properly set	Adjust stops to proper setting
Leak around stem	Worn or damaged stem O-ring seal	Disassemble the valve and replace Stem O-ring
Leak between body and adapter	Worn or damaged stem O-ring seal	Disassemble the valve and replace Adapter O-ring
	Adapter studs and nuts not tightened properly	Tighten nuts to specified torque

*Contact AOP representative for proper trim selection for the required application