

# AVCO

*Alloy Valves and Control*

## BALL VALVES HP1100 SERIES

# INSTALLATION, OPERATION & MAINTENANCE MANUAL

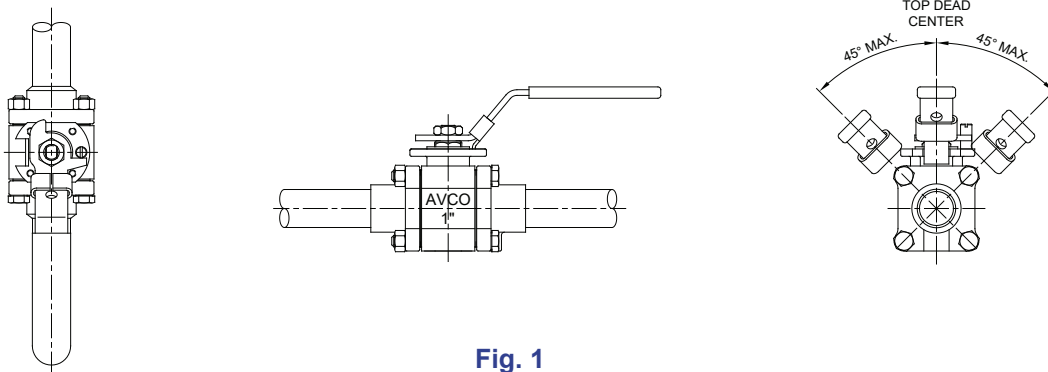


This manual covers the installation, operation and maintenance of all AVCO standard HP1100 series ball valves as described in the current AVCO catalog. Custom made or customer modified versions of the HP1100 series may use this manual as a general guide only.

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#### 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 flow or vacuum in either direction and may be installed in horizontal or vertical applications. Although the valves will operate with the handle or operator on the underside of the pipe it is not recommended 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 of Flanged and Threaded Valves

- 2.1 Do not dismantle these valves when installing as they should be treated as a unit.
- 2.2 For threaded valves be sure not to overtighten the taper threads. When tightening the pipe into the valve do **NOT** use a wrench on the valve body - the end caps have flats for use with a wrench.
- 2.3 Flanged valves should be bolted and gasketed in accordance with relevant standards.
- 2.4 If a threaded valve is 'back welded' after installation it should be treated as a weld end valve and dismantled prior to welding in accordance with section 3.

#### 3 Installation of Weld End Valves

- 3.1 Prepare a clean working area.
- 3.2 With the valve in the open position, remove the body bolts or screws.
- 3.3 Separate the end caps from the body and remove the retainer rings (integral with end cap on sizes up to 1"), body seals (discard body seals) and seats whilst taking care not to damage the plastic parts. The ball can be placed in a part open position to assist removal of the seats.
- 3.4 Whilst supporting the ball to prevent it dropping out and potentially damaging the ball surface, rotate the valve stem to the closed position and remove the ball.
- 3.5 The ball, seats and retainer rings should be placed in a suitably remote clean area to minimize risk of damage whilst welding is being undertaken.

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3.6 Reassemble the end caps onto the body with the appropriate body bolts or screws and position the valve in its relevant location and secure appropriately in readiness for welding.

**NOTE:** AVCO Supplies butt weld end caps in sch 80 & 160 as standard and recommends that the adjoining pipe be the same schedule as that of the end cap to ensure an effective and even weld.

3.7 With the valve in its relevant position TACK WELD with minimum weld sufficient to hold its location unaided.

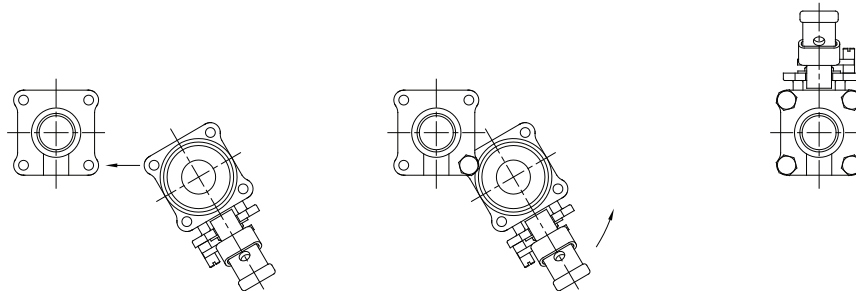
3.8 After the tack weld has suitably cooled, remove the body bolts or screws and ease the body from between the two end caps whilst taking care not to damage the mating surfaces.

3.9 Protect the end cap faces and finish weld the end caps to the pipe.

3.10 When cooled, clean the end cap faces and remove any weld spatter from inside the welded joint.

3.11 Replace the ball into the valve body (whilst in closed position) and carefully rotate to the open position. Replace the seats and retainer rings and insert new body seals (supplied).

3.12 Ease the completed body assembly (as shown below for sizes up to 2" inclusive) between the end caps ensuring that the faces and body seals are not trapped or damaged.



**Fig. 2**  
**Valve Body Installation Procedure**

3.13 Insert the body bolts and tighten to the required torque using the suggested bolt tightening sequence (see the bolting information section).

## 4 Operation

4.1 These valves provide tight shut-off when used under normal operating conditions in accordance with the relevant AVCO pressure/temperature charts.

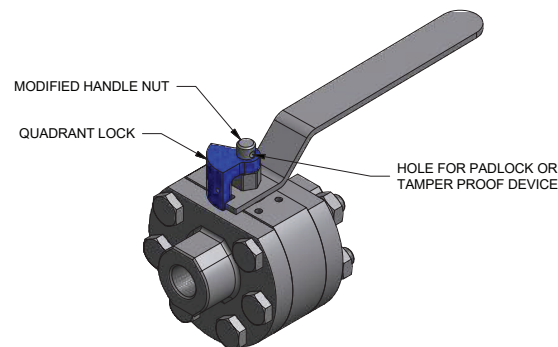
4.2 If these valves are used in a partially open (throttling) condition, the seat life may be reduced as it will be exposed to flowing media in a localized area.

4.3 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 options on this series to minimize maintenance cycles.

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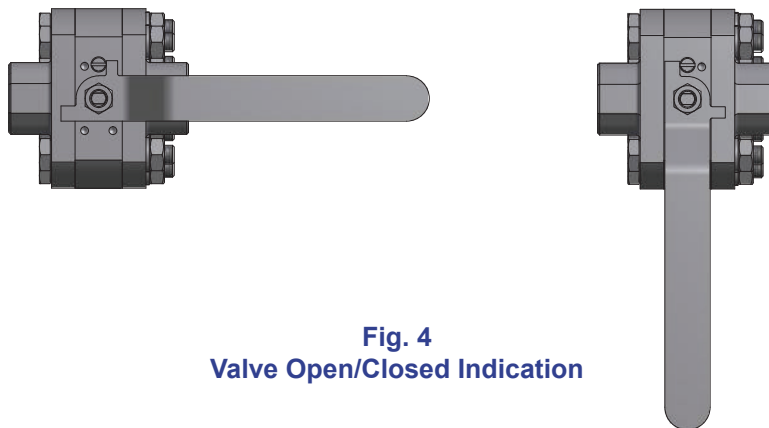
#### 5 Manual Operation

- 5.1 All AVCO HP1100 series ball valves are supplied with basic quarter turn lever handles as standard unless otherwise stated.
- 5.2 The lever has an integral stop for fully open and fully closed positions. The lever can only be correctly installed in one position. Rotating the lever clockwise closes the valve and counter-clockwise opens the valve. A locking mechanism is available as an option for this series.
- 5.3 If the locking handle option is fitted; it comprises of a modified handle nut and a quadrant lock. To open or close the valve, remove any customer attached padlocks or tamper proof devices from the modified handle nut, lift the quadrant lock upwards and off of the stem, allowing desired handle rotation to take place. Simply fit the quadrant lock back on the modified handle nut and secure with a padlock or tamper proof device as necessary.



**Fig. 3**  
**Locking Handle Option**

- 5.4 The handle or lever on all valve sizes gives visual indication 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.



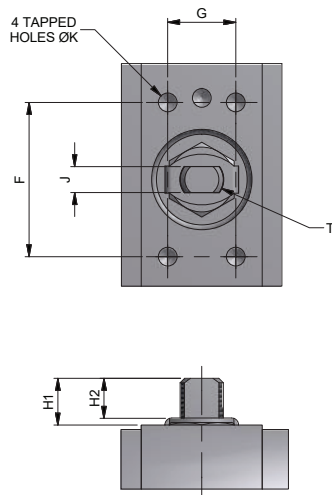
**Fig. 4**  
**Valve Open/Closed Indication**

## 6 Automated Operation

- 6.1 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.
- 6.2 The handle/lever, stem nut & stop pin should be removed for automated actuation if not already specified in the purchase order.

**WARNING: If the valve is being prepared for actuated use, it is imperative that the lock tab is still fitted to the stem nut. Failure to do so will result in stem leakage.**

- 6.3 The stem has milled flats which are machined to exacting tolerances to ensure positive location. The flats also indicate valve ball position. When the flats are parallel to the pipeline, the valve is open and when the flats are perpendicular to the pipeline, the valve is closed.
- 6.4 There is no positive stop on the valve for open and closed positions when set up for actuated use as it is intended that the actuator will control the valve travel.
- 6.5 The mount pad and stem dimensions for each valve are as shown in fig. 5 and table 1 below.



SIZE	F (mm)	G (mm)	H1 (mm)	H2 (mm)	J (mm)	K	T (mm)
1/4" (DN 8)	1.339 (34)	0.591 (15)	0.406 (10.3)	0.344 (8.7)	0.224 (5.7)	M5	3/8-24 UNF
3/8" (DN 10)	1.339 (34)	0.591 (15)	0.406 (10.3)	0.344 (8.7)	0.224 (5.7)	M5	3/8-24 UNF
1/2" (DN 15)	1.339 (34)	0.591 (15)	0.406 (10.3)	0.344 (8.7)	0.224 (5.7)	M5	3/8-24 UNF
3/4" (DN 20)	1.339 (34)	0.591 (15)	0.406 (10.3)	0.344 (8.7)	0.224 (5.7)	M5	3/8-24 UNF
1" (DN 25)	1.339 (34)	0.591 (15)	0.406 (10.3)	0.344 (8.7)	0.224 (5.7)	M5	3/8-24 UNF
1 1/2" (DN 40)	1.969 (50)	1.181 (30)	0.579 (14.7)	0.490 (12.5)	0.295 (7.5)	M6	7/16-20 UNF
2" (DN 50)	2.756 (70)	1.417 (36)	0.752 (19.1)	0.671 (17.1)	0.339 (8.6)	M8	9/16-18 UNF

**Fig. 5**  
**Valve Stem & Mount Pad Set-Up**

**Table 1**  
**Valve Stem & Mount Pad Dimensions in Inches**

- 6.6 Standard brackets and couplers are available from AVCO to suit a wide range of actuator styles.
- 6.7 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.
- 6.8 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.

## **7 Maintenance**

7.1 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:

### **7.2 Stem Leakage**

7.2.1 Remove the handle/lever retaining nut or screw, handle/lever and lock tab.

7.2.2 Examine the disc spring washers and check they are back to back with the outer OD edges touching and concentric. If all appears to be OK, continue to 7.2.4.

7.2.3 Remove the stem nut, recenter the disc spring washers while ensuring they are back to back with the outer OD edges touching concentrically. Replace the stem nut.

7.2.4 Tighten the stem nut until the required torque is achieved (see table 2) or until the disc springs are flattened and then further tighten by the minimum amount required until the lock tab can be located onto the stem nut.

7.2.5 Replace the handle/lever and handle/lever nut or screw.

7.2.6 If stem leakage still occurs the valve will require refurbishment, full instructions are listed in section 8.

### **7.3 Leakage at Body Joint**

7.3.1 Check the body bolt torque settings and tighten to the required torque using the suggested bolt tightening sequence (see the bolting information section).

7.3.2 If leakage is still encountered the body seals will require replacement and/or the mating faces may be damaged and should be inspected as detailed in section 8.

### **7.4 In-Line Leakage**

7.4.1 Check that the valve is fully closing and that there are no restrictions preventing the full rotation to the closed position.

7.4.2 If the full travel is being achieved then it is likely that the valve seats and/or ball is damaged or worn and may require replacement. See section 8 for details on how to carry out a complete refurbishment.

### **7.5 Leakage at Pipeline Joint**

7.5.1 For threaded end valves ensure that the joint has been correctly tightened and adequate jointing material used.

7.5.2 For flanged valves 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.

7.5.3 For weld end valves ensure that the weld has no leak points or 'burn through' and repair as required using the instructions detailed in section 3 as appropriate.

## 8 Refurbishing

8.1 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, seats and body seals in quantities relevant to the specified 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 and are purely aimed at valve refurbishment.

8.2 Prepare a clean working area.

8.3 If fitted, remove any actuators and associated brackets per manufacturers' instructions.

8.4 With the valve in the open position, remove the body bolts or screws.

8.5 Gently slide the center body section from between the end caps whilst prizing the end caps apart to clear the location ring. Take care not to damage the mating faces. The seat retainers may come loose and should be restrained to prevent them from falling and becoming damaged.

8.6 Remove the body seals and seat retainers complete with seats.

**NOTE:** The seat retainers are integral to the end cap for valve sizes 1" and below.

8.7 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.

8.8 Inspect the stem assembly and if it is considered to be in good condition skip to paragraph 8.18.

8.9 If fitted, unscrew the handle retaining nut/screw and remove the handle/lever. The stop pins can also be removed if desired.

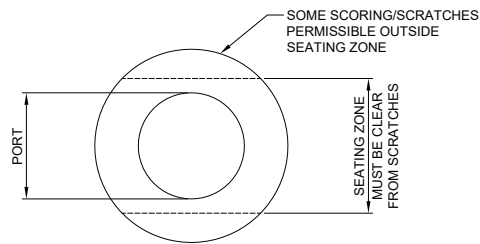
8.10 Remove the stem nut lock tab.

8.11 Use a wrench on the stem flats to prevent the stem from turning, unscrew the stem nut and remove. The disc spring washers, gland ring and packing can now be removed. The stem and thrust washer can be withdrawn via the body cavity.

8.12 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. The ball must have no scratches or scoring, other than minor signs of rubbing, around its seating periphery (fig. 6). Any components that do not pass inspection should be replaced.

8.13 Fit the thrust washer onto the stem.

8.14 Insert the stem with thrust washer up into the valve body.

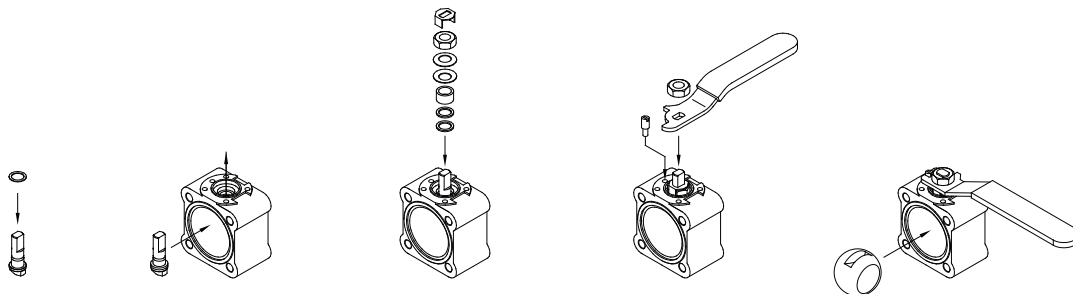


**Fig. 6**  
**Ball Inspection**

- 8.15 Ease the packing washers onto the stem whilst taking care not to damage them, followed by the metal gland ring. Place the disc spring washers onto the stem whilst ensuring they are back to back with the outer OD edges touching concentrically. Replace the stem nut and Tighten the stem nut until the required torque is achieved (see table 2) or until the disc springs are flattened and then further tighten by the minimum amount required until the lock tab can be located onto the stem nut.
- 8.16 Operate the stem several times and re-tighten if required.
- 8.17 Screw in the stop pin(s), replace the handle/lever and handle/lever nut or screw.
- 8.18 Replace the ball into the valve body (whilst in closed position) and carefully rotate the stem to the open position. Insert the seats, retainer rings and body seals.

**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, retainers and body seals in place. **DO NOT** use grease with abrasive additives.

- 8.19 Ease the completed body assembly (as shown in fig. 2 for sizes up to 2" inclusive) between the end caps ensuring that the faces and body seals are not trapped or damaged.
- 8.20 Insert body bolts or screws 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.



**Fig. 7**  
**Valve Re-Assembly Procedure**

- 8.21 All of the above procedures can be carried out without the need to disturb flanged or threaded end cap connections to the pipeline, as the center section is designed to be removed alone to cater for welded connections. It is at the owner/operators discretion as to whether these connections be renewed.



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#### 9 Bolting Information

- 9.1 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 further tightened no more than 1/4 turn until the lock tab can be assembled onto the stem.
- 9.2 The body bolts should be tightened until finger tight and then gradually fully tightened in a star pattern per the bolting sequence shown in figs. 8 & 9 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.

#### 9.3 Six bolt sequence.

- 9.3.1 First round to 30% torque - 1-2, 3-4, 5-6
- 9.3.2 Second round to 60% torque - 1-2, 3-4, 5-6
- 9.3.3 Third round to 100% torque - 1-2, 3-4, 5-6
- 9.3.4 Final checking round - 1, 3, 5, 2, 6, 4

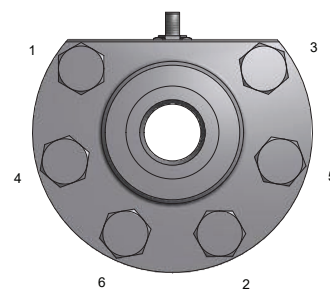


Fig. 8

#### 9.4 Eight bolt sequence

- 9.4.1 First round to 30% torque - 1-2, 3-4, 5-6, 7-8
- 9.4.2 Second round to 60% torque - 1-2, 3-4, 5-6, 7-8
- 9.4.3 Third round to 100% torque - 1-2, 3-4, 5-6, 7-8
- 9.4.4 Final checking round - 1, 5, 3, 7, 2, 6, 4, 8

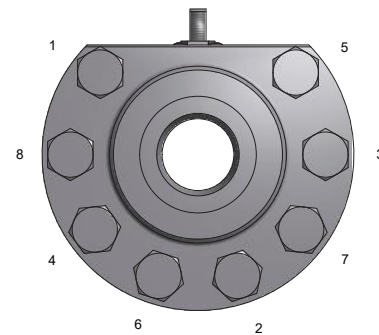


Fig. 9

Valve Size	Body Bolts		Stem Nuts	
	Size	Torque (in.lbs)	Size	Torque (in.lbs)
1/4"	M10	340	3/8-24 UNF	29
3/8"	M10	340	3/8-24 UNF	29
1/2"	M10	340	3/8-24 UNF	29
3/4"	M10	340	3/8-24 UNF	29
1"	M12	590	3/8-24 UNF	29
1 1/2"	M16	1470	7/16-20 UNF	29
2"	M16	1470	9/16-18 UNF	63

Table 2  
Valve Torque Settings

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- 9.5 If a bolt, screw 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.

**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 Inc.).

**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 The following figure shows the typical exploded view for all valve sizes, but please consider that the end caps (item 2) may differ to those actually shown in these figures.

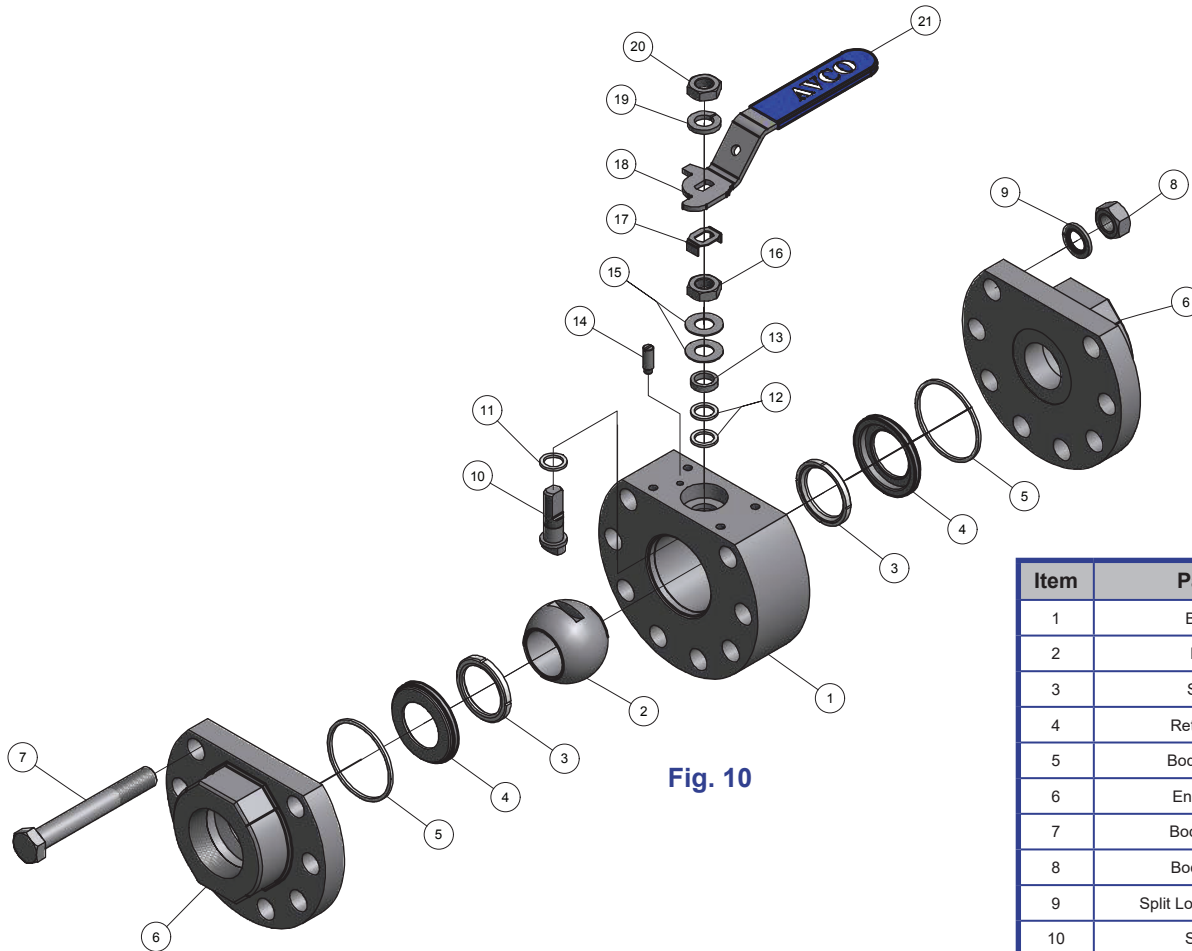


Fig. 10

**Note**

\* The retainer (item 4) is integral with the End Cap (item 6) for valve sizes 1/2" thru 1"

Item	Parts
1	Body
2	Ball
3	Seat
4	Retainer*
5	Body Seal
6	End Cap
7	Body Bolt
8	Body Nut
9	Split Lock Washer
10	Stem
11	Thrust Washer
12	Packing
13	Gland Ring
14	Stop Pin
15	Belleville Washer
16	Stem Nut
17	Lock Tab
18	Handle
19	Handle Washer
20	Handle Nut
21	Handle Sleeve