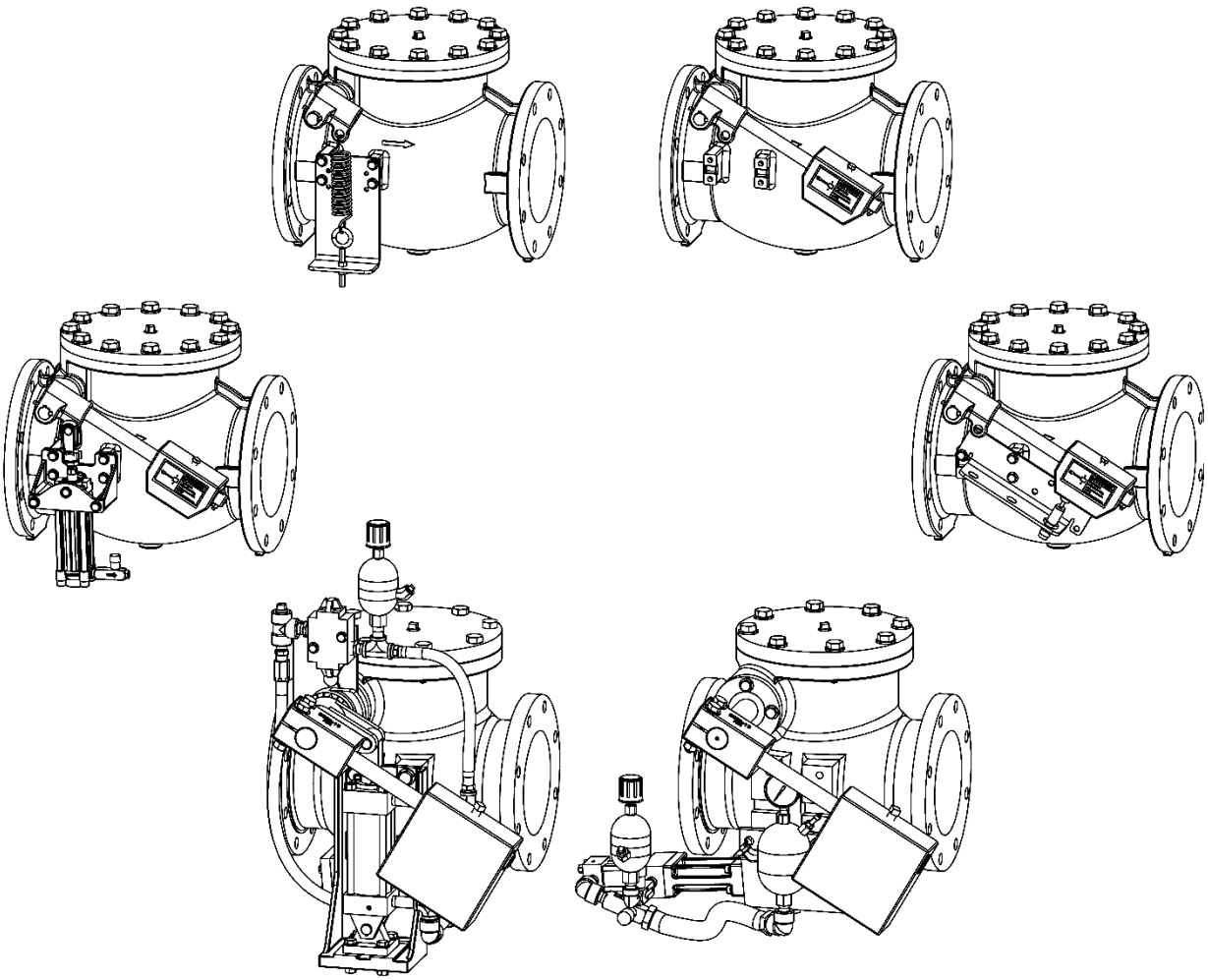
APCO CVS-6000 SWING CHECK VALVES



Instruction **D12059**
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Instructions

These instructions are for use by personnel who are responsible for the installation, operation and maintenance of DeZURIK valves, actuators or accessories.

Safety Messages

All safety messages in the instructions are identified by a general warning sign and the signal word CAUTION, WARNING or DANGER. These messages indicate procedures to avoid injury or death.

Safety label(s) on the product indicate hazards that can cause injury or death. If a safety label becomes difficult to see or read, or if a label has been removed, please contact DeZURIK for replacement label(s).

⚠WARNING

Personnel involved in the installation or maintenance of valves should be constantly alert to potential emission of pipeline material and take appropriate safety precautions. Always wear suitable protection when dealing with hazardous pipeline materials. Handle valves which have been removed from service with suitable protection for any potential pipeline material in the valve.

Inspection

Your DeZURIK product has been packaged to provide protection during shipment; however, items can be damaged in transport. Carefully inspect the unit for damage upon arrival and file a claim with the carrier if damage is apparent.

Parts

Replaceable wear parts are listed on the assembly drawing. These parts can be stocked to minimize downtime. Order parts from your local DeZURIK sales representative or directly from DeZURIK. When ordering parts please provide the following information:

If the valve has a data plate: please include the 7-digit part number with either 4-digit revision number (example: 9999999R000) or 8-digit serial number (example: S1900001) whichever is applicable. The data plate will be attached to the valve assembly. Also, include the part name, the assembly drawing number, the balloon number and the quantity stated on the assembly drawing.

If there isn't any data plate visible on the valve: please include valve model number, part name, and item number from the assembly drawing. You may contact your local DeZURIK Representative to help you identify your valve.

DeZURIK Service

DeZURIK service personnel are available to maintain and repair all DeZURIK products. DeZURIK also offers customized training programs and consultation services. For more information, contact your local DeZURIK sales representative or visit our website at DeZURIK.com.

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Description

A swing check valve consists of a valve body, a cover, and a disc that is connected to a hinge. The disc swings away from the valve seat to allow flow in the forward direction and returns to the valve seat when upstream flow is stopped to prevent backflow.

The flow from the pump opens the disc and raises the counterweight or spring lever arm. When the pump shuts off, the disc closes and is held closed by downstream static pressure. The APCO CVS-6000 valve can be equipped with a Lever & Weight, Lever & Spring, or a Lever & Weight with Air Cushion Cylinder (AC), a Lever & Weight equipped with Oil Cushion (OB), Lever & Weight with Oil Controlled Bottom Mounted Buffer (BMB), or Lever & Weight with Oil Controlled Side Mounted Cylinder (OC).

Handling and Storage

Lifting the valve improperly may damage it. Do not fasten lifting devices to external levers, springs, cylinders, brackets or plumbing. Lift the valve with slings, chains or cables fastened around the valve body or fastened to bolts or rods through bolt holes in the flanges.

If installation will be delayed, refer to **Form 1454 – Recommended Long & Short-Term Storage Procedures**.

Installation

- See figures 2 through 11 for parts identification.
- APCO CVS-6000 Swing Check Valves may be installed in a horizontal or vertical (with flow upwards) orientation. For vertical flow upward, if the CVS-6000 is equipped with a Lever & Weight (LW), the counterweight ARM (B28) should be rotated 90° and the alternate keyway in the Shaft Connector (B19) should be used. See Figure 1.
- For valves with BMB or OC, the Oil Reservoir (B58) and for BMB only, the Hydro-Pneumatic Accumulator (B73) must be mounted vertically regardless of the valve installation position.

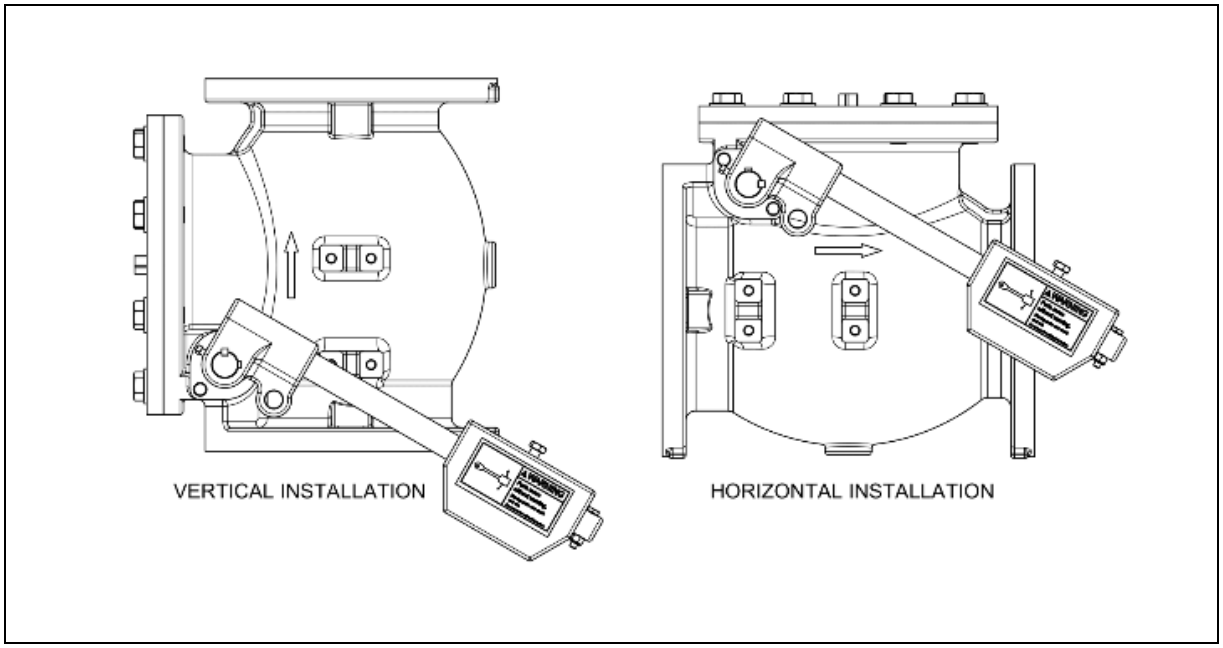

Figure 1: Vertical and Horizontal Installations

- Valves equipped with either the Lever & Weight with Air Cushion Cylinder (AC), Lever & Weight with Oil Cushion (OB), Lever & Weight with Oil Controlled Bottom Mounted Buffer (BMB) or Lever & Weight with Oil Controlled Side Mounted Cylinder (OC) require additional components to mount in the vertical position and need to be ordered that way from the factory.

NOTICE

The recommendation by Manufacturers Standardization Society of the Valve and Fittings Industry (MSS SP- 92) is to install a check valve at a minimum of 10 pipe diameters of straight pipe on the downstream side from tees, fittings, increasers, or pumps and five pipe diameters from elbows to ensure laminar flow with minimum turbulence to minimize premature wear. However, many facilities with smaller footprints have achieved acceptable performance in systems with the check valve installed five pipe diameter lengths of straight pipe from the downstream side of tees, fittings, increasers, or pumps and three pipe diameters lengths from elbows.

- Before installation, remove foreign material such as weld spatter, oil, grease, and dirt from the pipeline.
- Prepare pipe ends and install valves in accordance with the pipe manufacturer's instructions for the joint used.

NOTICE

Do not deflect the pipe-valve joint. Minimize bending stresses in the valve end connection with pipe loading.

- Ensure the valve and pipeline flanges are concentric to ensure proper flange sealing.
- Tighten the flange bolts or studs in a crisscross pattern in a minimum of four stages.

Fusion Bonded Epoxy Coated Valves

NOTICE

Valves with fusion bonded epoxy coated exterior paint require flat washers to be installed under the flange nuts when installing the valve to the pipeline flange to prevent the coating from cracking or chipping.

Maintenance

Disassembly Procedure for the CVS-6000D

See Figures 2 through 8 for part identification.

Note on Orientation:
All directional references (such as “left,” “right,” “front,” and “rear”) are made while facing the inlet flange of the valve unless otherwise specified.

⚠WARNING

These valves may open or close, swinging the counterweight/spring loaded arm without warning due to flow changes from pumps starting and stopping. Servicing or working around these valves while the pipeline is under pressure can cause personal injury or equipment damage.

Workers must be cautious when working around these valves.

Relieve pipeline pressure and lock out the pumps before servicing the valve.

1. Relieve the pressure in the pipeline.
2. If it is necessary to remove the valve from the pipeline, set the valve standing on its inlet/seat side flange so that the disc is in the closed position.
3. Remove closure device:
    a. **Valves equipped with Lever & Weight (LW)** (Figure 3)**:**
        i. Support Lever Assembly (B28), then loosen Screw or Set Screw (B36) and remove Counterweight (B29).
        ii. Loosen Set Screw (B55) and remove Lever Assembly (B28).
    b. **Valves equipped with Lever & Spring (LS)** (Figure 4)**:**
        i. Loosen Nut (B63) to relieve the tension in Spring (B59). Do not remove the nut entirely.
        ii. Remove Spring (B59) from Shaft Connector (B19) and Eye Bolt (B61).
        iii. Remove Lever Arm Bolt / Set Screw (B55) and remove Shaft Connector (B19).
    c. **Valves equipped with Lever & Weight with Air Cushion Cylinder (AC)** (Figure 5)**:**
        i. Support the Lever Assembly (B28).
        ii. Disconnect the pin (B20B) between Lever Assembly (B28) and the Air Cushion Assembly (B20).
        iii. Remove the Cylinder Mount Cover (B52) by first removing the Screws (B21), then uninstall the Cylinder Assembly.
        iv. Remove the Cylinder Mounting Bracket (B24) by first removing Screws (B21).
        v. Remove the Lever & Weight according to step 3a.
    d. **Valves equipped with Lever & Weight with Oil Cushion (OB)** (Figures 6, 7 & 8)**:**
        i. Raise the Counterweight (B29) enough that there is no pressure on the Shock Absorber Assembly (B50) and support the Lever Assembly (B28).
        ii. Remove the Shock Absorber Assembly (B50) by removing the Shock Absorber Jam Nuts (B50B).
        iii. Remove the Oil Cushion Bracket (B51) by removing Screws (B21).
        iv. Remove the Lever & Weight according to step 3a.

Disassembly Procedure (continued)

4. Remove the Cover (A02) by unscrewing Cover Bolts (A04) (Figure 2).
5. Remove Pivot Shaft Cover Bolts (A16) and remove Pivot Shaft Cover (A15) from both sides of the Pivot Shaft (A13).
    a. Remove Pivot Shaft O-ring (A17) and Pivot Shaft Cover O-ring (A18).
6. Pull Pivot Shaft (A13) from the right side of the valve.
7. Remove Pivot Shaft Bearing Sleeves (A11) and Pivot Shaft Key (A33).
8. Remove Disc (A10).
9. Remove Disc Seat (A06) and Disc Seat Retainer Ring (A31) by removing Disc Seat Retainer Ring Bolts (A32).
10. Remove Body Seat Set Screws (A40) located in the Body Seat Ring (A05).
11. Evenly pry the Body Seat Ring (A05) out of the Body (A01).
12. Remove Body Seat O-ring (A43) from Body Seat Ring (A05).

Disassembly Procedure for the CVS-6000A/6000

See Figures 9 through 11 for part identification.

Note on Orientation:
All directional references (such as “left,” “right,” “front,” and “rear”) are made while facing the inlet flange of the valve unless otherwise specified.

⚠WARNING

These valves may open or close, swinging the counterweight/spring loaded arm without warning due to flow changes from pumps starting and stopping. Servicing or working around these valves while the pipeline is under pressure can cause personal injury or equipment damage.

Workers must be cautious when working around these valves.

Relieve pipeline pressure and lock out the pumps before servicing the valve.

1. Relieve the pressure in the pipeline.
2. If it is necessary to remove the valve from the pipeline, set the valve standing on its inlet/seat side flange so that the disc is in the closed position.
3. Remove closure device:
   a. **Valves equipped with Lever & Weight (LW)** (Figures 10 and 11)**:**
      i. Support Counterweight (B29), then loosen Screw or Set Screw (B36) and remove Counterweight (B29).
      ii. Loosen Lever Arm Bolt / Set Screw (B55) and remove Lever Arm (B19) and Counterweight Arm (B28).
   b. **Valves equipped with Lever & Weight with Oil Controlled Bottom Mounted Buffer (BMB)** (Figure 10)**:**
      i. Remove the Lever & Weight according to step 3a.
      ii. Depressurize the Hydro Pneumatic Accumulator.
      Note: The Oil Reservoir (B58) and Hydro Pneumatic Accumulator (B73) should be kept in the upright position during the entire maintenance process. Alternatively, replace the Air Breather (B14) and Pressure Gauge (B74) with pipe plugs – ensure the accumulator is depressurized prior to removing air breathers or gauges.
      iii. Remove Hydro Pneumatic Accumulator Mtg. Bolts (B72) and secure the Hydro Pneumatic Accumulator (B73) so it stays upright while the rest of the BMB assembly is removed.
      iv. Remove the Pneumatic Cylinder (B20) and Cylinder Spacer (B56) as an assembly by removing Cylinder Spacer Mtg. Bolts (B91). Keep the Oil Reservoir (B58) upright.
      v. Remove replaceable wear parts
         1. For valve sizes smaller than 20”: Remove the Buffer Rod Bushing (B76) then remove the Buffer Rod Scraper (B96), Bushing Seal (B77), Buffer Rod Seal (B71) and Buffer Rod Seal Back-Up (B81).
         2. For valve sizes 20” and larger: Remove Buffer Rod Bushing Ret. Ring (B78) by first removing Retaining Ring Screws (B79). Remove Cylinder Spacer Seal (B89). Remove the Buffer Rod Bushing (B76) then remove the Buffer Rod Scraper (B96), Bushing Seal (B77), Buffer Rod Seal (B71) and Buffer Rod Seal Back-Up (B81).
      vi. Inspect the Buffer Rod (B84) for nicks, scrapes, paint, residue and wear. Replace it if needed.

Disassembly Procedure (continued)

c. Valves equipped with Lever & Weight with Oil Controlled Side Mounted Cylinder (OC) (Figure 11)**:**

i. Remove the Lever & Weight according to step 3a.

ii. Disconnect the pin between Cushion Lever (B27) and Pneumatic Cylinder (B20).

iii. Unscrew Eye Bracket Mounting Bolts (B25) to remove Pneumatic Cylinder (B20).

iv. Loosen Cushion Lever Set Screw (B35) to remove Cushion Lever (B27).

v. Replace the Air Breather (B58) with a Pipe Plug (B44).

vi. If the Oil Reservoir Tank (B40) is connected to valve Cover (A02), remove the Threaded Rod (B59) and the Hex Nuts (B60).

4. Remove the Cover (A02) by unscrewing Cover Bolts (A04) (Figure 9).
5. Unscrew Disc Arm Set screws (A14).
6. Remove Pivot Shaft Cover Bolts (A16) then Pivot Shaft Cover (A15) and Pivot Shaft Seal Retainer (A37) at both ends of the pivot shaft.
7. Pull Pivot Shaft (A13) from the right side of the valve (facing inlet).
8. Remove Pivot Shaft Flanged Bushing (A12), Pivot Shaft Key (A33), Pivot Shaft Seal (A17) and Pivot Shaft Cover Seal (A18).
9. Pull out Disc (A10) and Disc Arm (A09) as an assembly.
10. Remove Disc Pin Retainers (A41) and pull-out Disc Pins (A08) to disconnect Disc (A10) and Disc Arm (A09).
11. Remove Disc Seat (A06) and Seat Retaining Ring (A31) by unscrewing all Seat Retaining Screws (A32).
12. Unscrew the Body Seat Retaining Set Screws (A40) located in the Body Seat Ring (A05).
13. Evenly pry the Body Seat Ring (A05) out of the Body (A01).

Assembly Procedure for 6000D

See Figures 2 through 8 for part identification. Refer to Table 1 for torque specifications.

Note on Orientation:
All directional references (such as “left,” “right,” “front,” and “rear”) are made while facing the inlet flange of the valve unless otherwise specified.

1. If the valve is removed from the pipeline, set Body (A01) standing on its inlet flange.
2. Install Body Seat O-ring (A43) onto Body Seat Ring (A05).
3. Install Body Seat Ring (A05) evenly inside the counterbore of the Body (A01) until it bottoms out.

NOTICE

Use caution when installing the seat into the body. Do not strike, pry, or apply uneven force to the seating surface or the lip of the seat. Mishandling of the seat may result in damage and valve leakage.

4. Install and tighten the Body Seat Set Screws (A40) into the Body Seat Ring (A05).
5. Place the Disc (A10) on a work surface with seat side up, install Disc Seat (A06) and Disc Seat Retainer Ring (A31) and fasten with Disc Seat Retainer Ring Bolts (A32).
6. Set Disc (A10) assembly on top of Body Seat Ring (A05).
7. Install the Pivot Shaft Bearing Sleeve (A11) into the left bore of the Body (A01). For sizes 12" and larger, also install the Spacer (A12).
8. Insert Pivot Shaft Key (A33) in the keyway on Pivot Shaft (A13) and install the Pivot Shaft Bearing Sleeve (A11) onto the right side of Pivot Shaft (A13). For sizes 12" and larger, also install the Spacer (A12).
9. Insert the Pivot Shaft (A13) from the right side of Body (A01) through Disc (A10) until:
    a. For sizes **2-10”** – Both Pivot Shaft Bearing Sleeves (A11) are flush with the outside surface of the Body (A01).
    b. For sizes **12” and larger** – Both Spacers (A12) are flush with the outside surface of the Body (A01).
10. Install Pivot Shaft O-rings (A17) and Pivot Shaft cover O-ring (A18) into both Pivot Shaft Covers (A15).
11. Install both Pivot Shaft Covers (A15) with Pivot Shaft Cover Bolts (A16).
12. Install Cover O-ring (A03) and Cover (A02), then fasten with Cover Bolts (A04).

Bolt Size	*Torque*
1/4”-20	62 in-lbs
5/16”-18	128 in-lbs
3/8”-16	19 ft-lbs
7/16”-14	30 ft-lbs
1/2”-13	46 ft-lbs
9/16”-12	67 ft-lbs
5/8”-11	92 ft-lbs
3/4”-10	113 ft-lbs
7/8”-9	182 ft-lbs
1”-8	273 ft-lbs
1-1/4”-7	545 ft-lbs
1-3/8”-6	715 ft-lbs
1-1/2”-6	949 ft-lbs

Table 1: Torque Specifications

Assembly Procedure (continued)

13. Install closure device:

a. Valves equipped with Lever & Weight (LW) only (Figure 3)**:**

i. Install the Lever Assembly (B28) such that the lever angle is 25-30° below the horizontal axis when valve is closed. Secure with Set Screw (B55).

ii. Install Counterweight (B29) at desired setting and secure with Screw (B36).

b. Valves equipped with Lever & Spring (LS) only (Figure 4)**:**

i. Install the Shaft Connector (B19) on Pivot Shaft (A13) and secure with Set Screw (B55).

ii. Install Spring (B59) between the eyelet on Shaft Connector (B19) and Eye Bolt (B61).

iii. Adjust Nuts (B63) until proper spring tension is achieved.

c. Valves equipped with Lever & Weight with Air Cushion Cylinder (AC) only (Figure 5)**:**

i. Install Lever & Weight according to step 13a.

ii. Install the Cylinder Mounting Bracket (B24) to the valve Body (A01) using Screws (B21).

iii. Install the Air Cylinder with Clevis and Pin (B20) between the Cylinder Mounting Bracket (B24) and the Cylinder Mount Cover (B52) and secure with Screws (B21).

iv. Connect Clevis (B20C) to the shaft connector eyelet part of the Lever Assembly (B28) using Pin (B20B) and rotate the Pin until the clip portion secures to the Clevis (B20C).

d. Valves equipped with Lever & Weight with Oil Cushion (OB) only (Figure 6, 7 & 8)**:**

i. Install Lever & Weight according to step 13a.

ii. Secure Oil Cushion Bracket (B51) to the Body (A01) and secure with Screws (B21).

iii. Install Shock Absorber Assembly (B50) onto Oil Cushion Bracket (B51) and secure with Shock Absorber Jam Nuts (B50B).

iv. Adjust the Shock Absorber (B50A) and the Counterweight (B29) as needed. Verify that the Shock Absorber (B50A) does not prevent the valve from closing fully.

Assembly Procedure for 6000/6000A

See Figures 9 through 11 for part identification. Refer to Table 1 for torque specifications.

1. If valve is removed from pipeline, set body standing on its inlet flange. Install Body Seat Seal (A43) in the groove of Body Seat Ring (A05).

NOTICE

Use caution when installing the seat into the body. Do not strike, pry, or apply uneven force to the seating surface or the lip of the seat. Mishandling of the seat may result in damage and valve leakage.

2. Install Body Seat Ring (A05) evenly inside the counterbore of the Body (A01) until it bottoms out.
3. Screw and tighten the Body Seat Retaining Set Screws (A40) into the Body Seat Ring (A05).
4. Set Disc (A10) with seat side up, install Disc Seat (A06) and Seat Retaining Ring (A31) and fasten with Seat Retaining Screws (A32).
5. Connect Disc Arm (A09) assembly to Disc (A10) by inserting Disc Pins (A08) and secure with Disc Pin Retainers (A41).
6. Set Disc (A10) and Disc Arm (A09) assembly on top of Body Seat Ring(A05).
7. Slip the Pivot Shaft Flanged Bushing (A12) on the Pivot Shaft (A13) with the flanged side against the Pivot Shaft Collar (A60).
8. Insert Pivot Shaft Key (A33) in keyway on Pivot Shaft (A13).
9. Install Pivot Shaft (A13) from right side of Body (A01) through Disc Arm (A09) until Pivot Shaft Collar (A60) is flush with Body (A01).
10. Insert Pivot Shaft Straight Bushing (A11) into the Body (A01) at the other end.
11. Insert Pivot Shaft Seal (A17) and Pivot Shaft Cover Seal (A18) in their respective grooves.
12. Insert Pivot Shaft Seal Retainer (A37) on Pivot Shaft Cover (A15) and install on both ends of Pivot Shaft (A13). Install Pivot Shaft Cover Bolts (A16).
13. Install Cover Seal (A03) and Cover (A02), then fasten with Cover Bolts (A04).
14. Install closure device:
    a. **Valves equipped with Lever & Weight with Oil Controlled Bottom Mounted Buffer (BMB)** (Figure 10)**:**
        i. For valve sizes smaller than 20”: Replace the Buffer Rod Scraper (B96), Bushing Seal (B77), Buffer Rod Seal (B71) and Buffer Rod Seal Back-up (B81). Then install the Buffer Rod Bushing (B76).
        ii. For valve sizes 20” and larger: Replace the Buffer Rod Scraper (B96), Bushing Seal (B77), Buffer Rod Seal (B71) and Buffer Rod Seal Back-Up (B81). Install the Buffer Rod Bushing (B76). Install the Cylinder Spacer Seal (B89) and secure in place with the Buffer Rod Bushing Ret. Ring (B78) and Retaining Ring Screws (B79).
        iii. Install the Pneumatic Cylinder (B20) and Cylinder Spacer (B56) with Cylinder Spacer Mtg. Bolts (B91).
        iv. Install the Hydro Pneumatic Accumulator (B73) using the Hydro Pneumatic Accumulator Mtg. Bolts (B72).

Assembly Procedure for 6000/6000A (Continued)

v. Reinstall the Air Breather (B14) or Pressure Gauge (B74) if they were replaced with pipe plugs during the disassembly process.

b. Valves equipped with Lever & Weight with Oil Controlled Side Mounted Cylinder (OC) (Figure 11)**:**

i. If the Oil Reservoir Tank (B40) is connected to the valve Cover (A02), install using the Threaded Rod (B59) and Hex Nuts (B60).

ii. Remove Pipe Plug (B44) and install Air Breather (B58).

iii. Install Cushion Lever (B27) and secure with Cushion Lever Set Screw (B35).

iv. Install Pneumatic Cylinder (B20) using Eye Bracket Mounting Bolts (B25). Connect the pin between Cushion Lever (B27) and Pneumatic Cylinder (B20).

15. Insert Lever Arm Key (B49) on Pivot Shaft (A13) if provided and slip Counterweight Arm assembly (B19 and B28) in place. If no key/keyway is present, set arm at an angle approximately 25º - 30º below horizontal axis. Secure with Lever Arm Bolts or Set Screw (B55) and Lever Arm Nuts (B56).
16. Install Counterweight (B29) at desired setting and secure with Counterweight Set Screws (B36).

Drawings

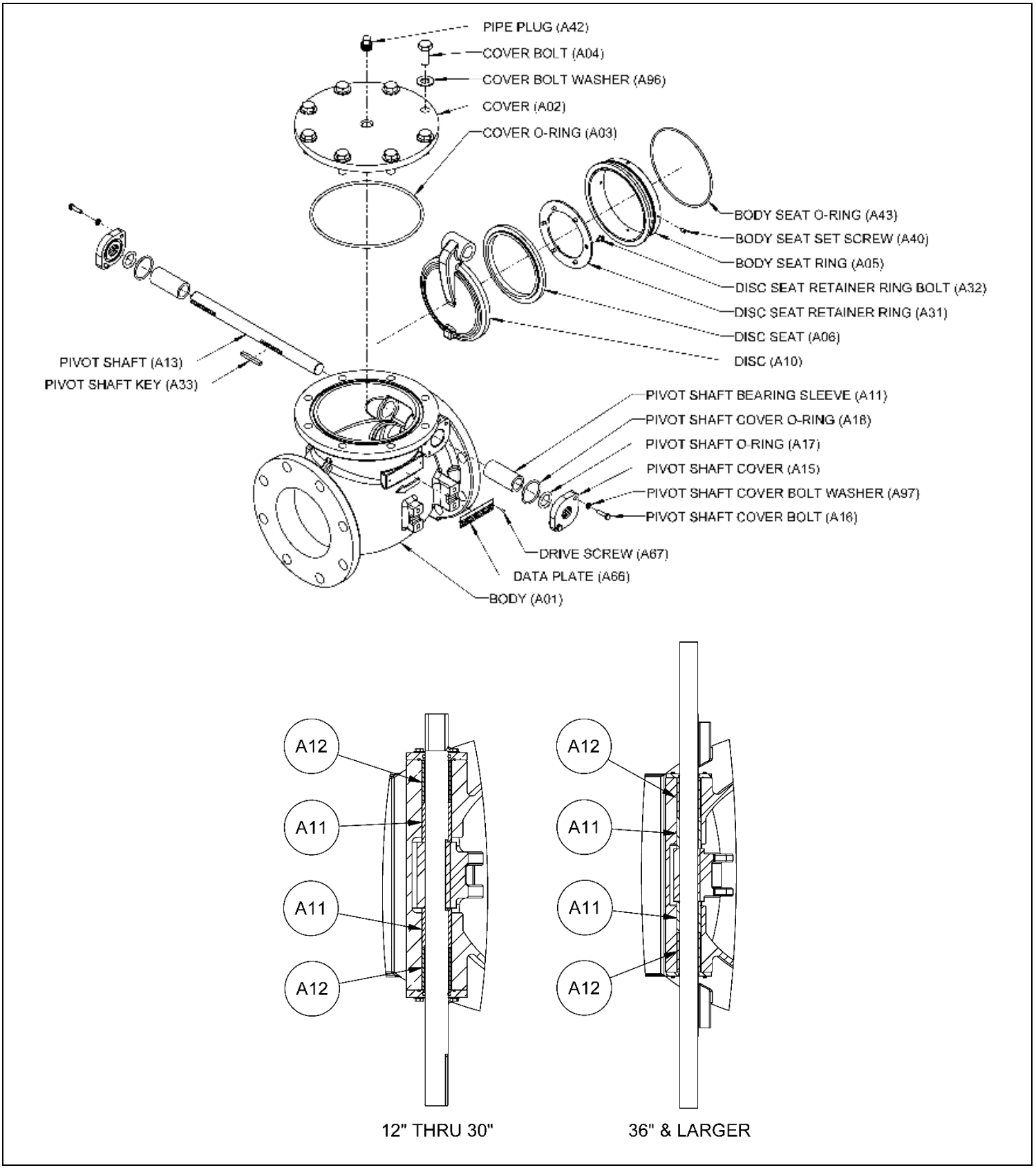

Figure 2: CVS-6000D Basic Valve Assembly

Table 2: Basic Valve Assembly – Parts Identification

Item No.	*Description*	*Size*
A01	BODY	-
A02	COVER	-
A03	COVER O-RING	-
A04	COVER BOLT	-
A05	BODY SEAT RING	-
A06	DISC SEAT	-
A10	DISC	-
A11	PIVOT SHAFT BEARING SLEEVE	-
A12	SPACER	12” & LARGER
A13	PIVOT SHAFT	-
A15	PIVOT SHAFT COVER	-
A16	PIVOT SHAFT COVER BOLT	-
A17	PIVOT SHAFT O-RING	-
A18	PIVOT SHAFT COVER O-RING	-
A31	DISC SEAT RETAINER RING	-
A32	DISC SEAT RETAINER RING BOLT	-
A33	PIVOT SHAFT KEY	-
A40	BODY SEAT SET SCREW	-
A42	PIPE PLUG	-
A43	BODY SEAT O-RING	-
A66	DATA PLATE	-
A67	DRIVE SCREW	-
A96	COVER BOLT WASHER	-
A97	PIVOT SHAFT COVER BOLT WASHER	-

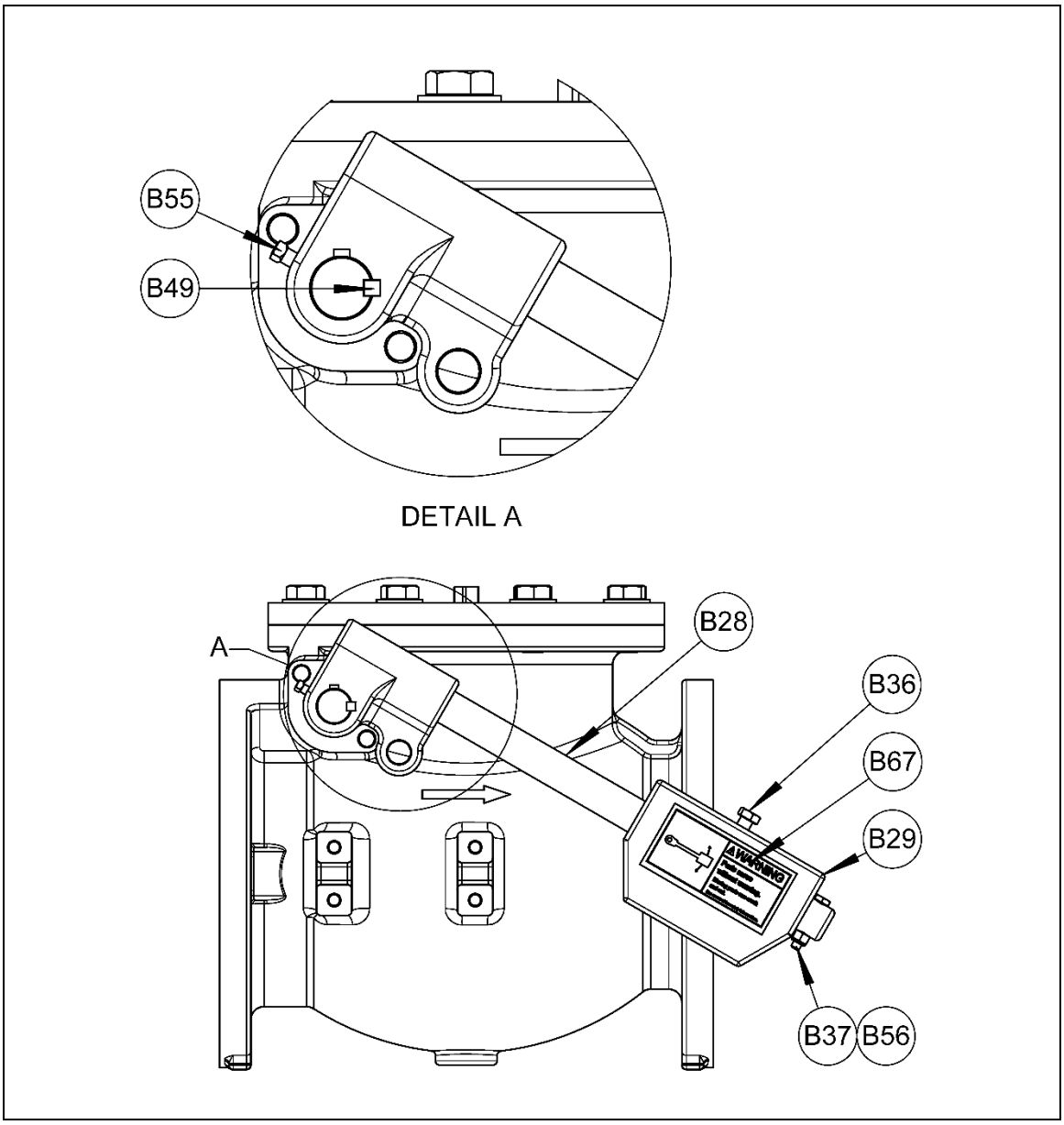

Figure 3: Lever & Weight (LW) Assembly

Table 3: Lever & Weight (LW) Assembly – Parts Identification

Item No.	*Description*
B28	LEVER ASSEMBLY
B29	COUNTERWEIGHT
B36	SCREW
B37	SCREW
B49	KEY
B55	SET SCREW
B56	NUT
B67	CVS WARNING LABEL

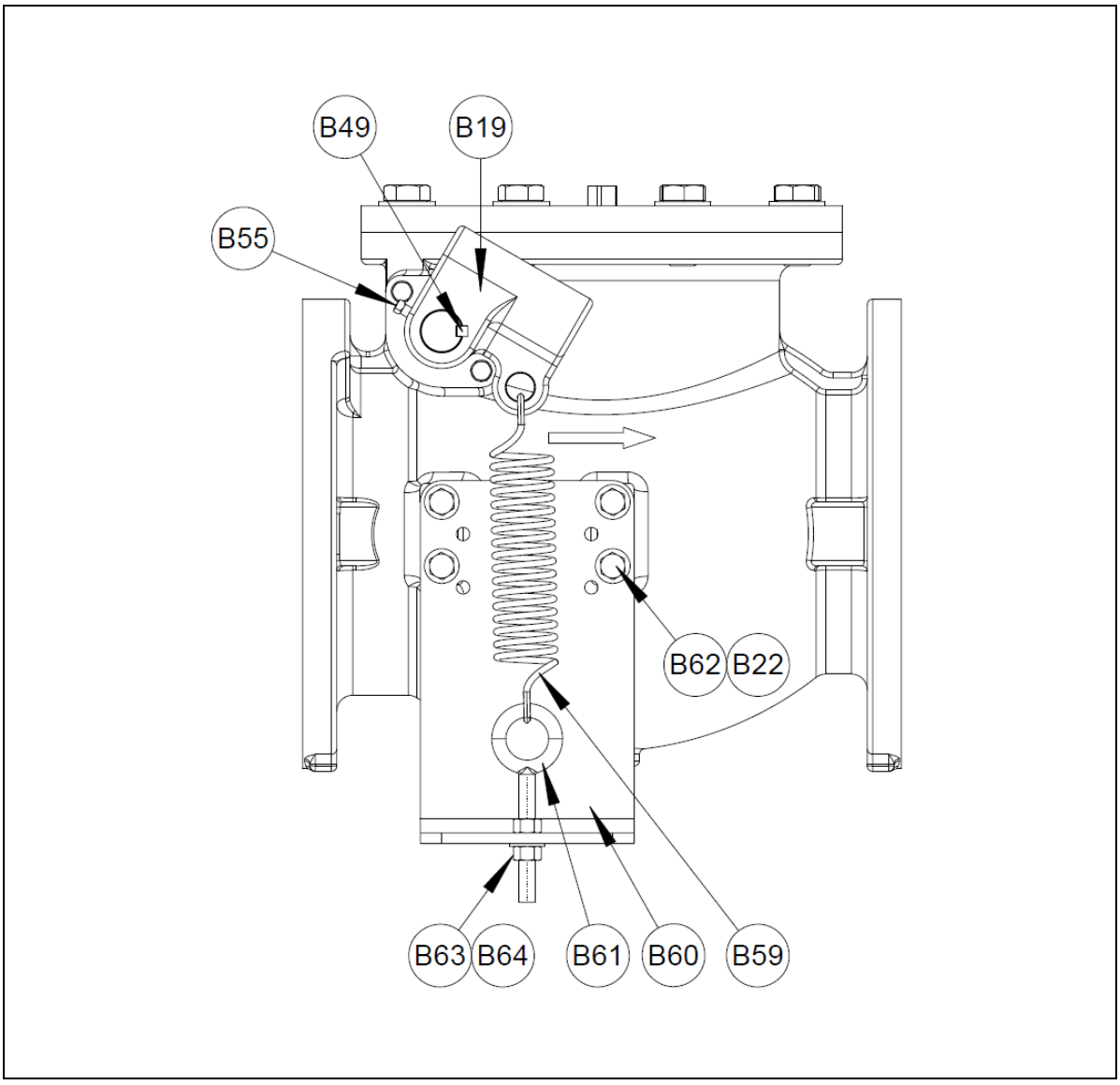

Figure 4: Lever & Spring (LS) Assembly

Table 4: Lever & Spring (LS) – Parts Identification

Item No.	*Description*
B19	SHAFT CONNECTOR
B22	WASHER
B49	KEY
B55	SET SCREW
B59	SPRING
B60	SPRING BRACKET
B61	EYE BOLT
B62	SCREW
B63	NUT
B64	WASHER

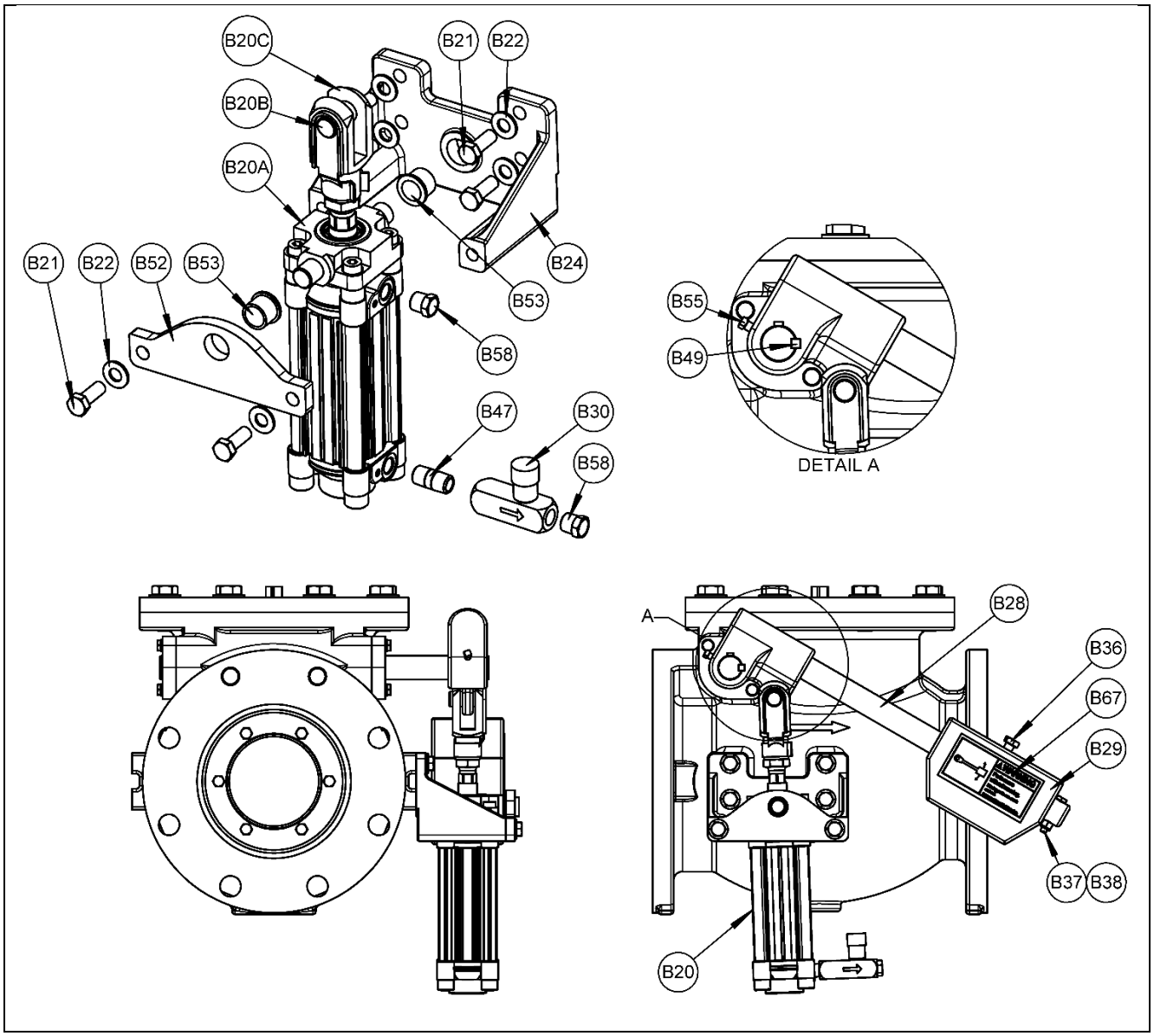

Figure 5: Lever & Weight with Air Cushion Cylinder (AC) Assembly

Table 5: Lever & Weight with Air Cushion Cylinder (AC) Assembly – Parts Identification

Item No.	***Description***
B20	AIR CYLINDER WITH CLEVIS AND PIN
B20A	AIR CYLINDER
B20B	PIN
B20C	CLEVIS
B21	SCREW
B22	WASHER
B24	CYLINDER MOUNTING BRACKET
B30	FLOW CONTROL
B47	PIPE NIPPLE
B52	CYLINDER MOUNT COVER
B53	FLANGED BEARING
B58	BREATHER

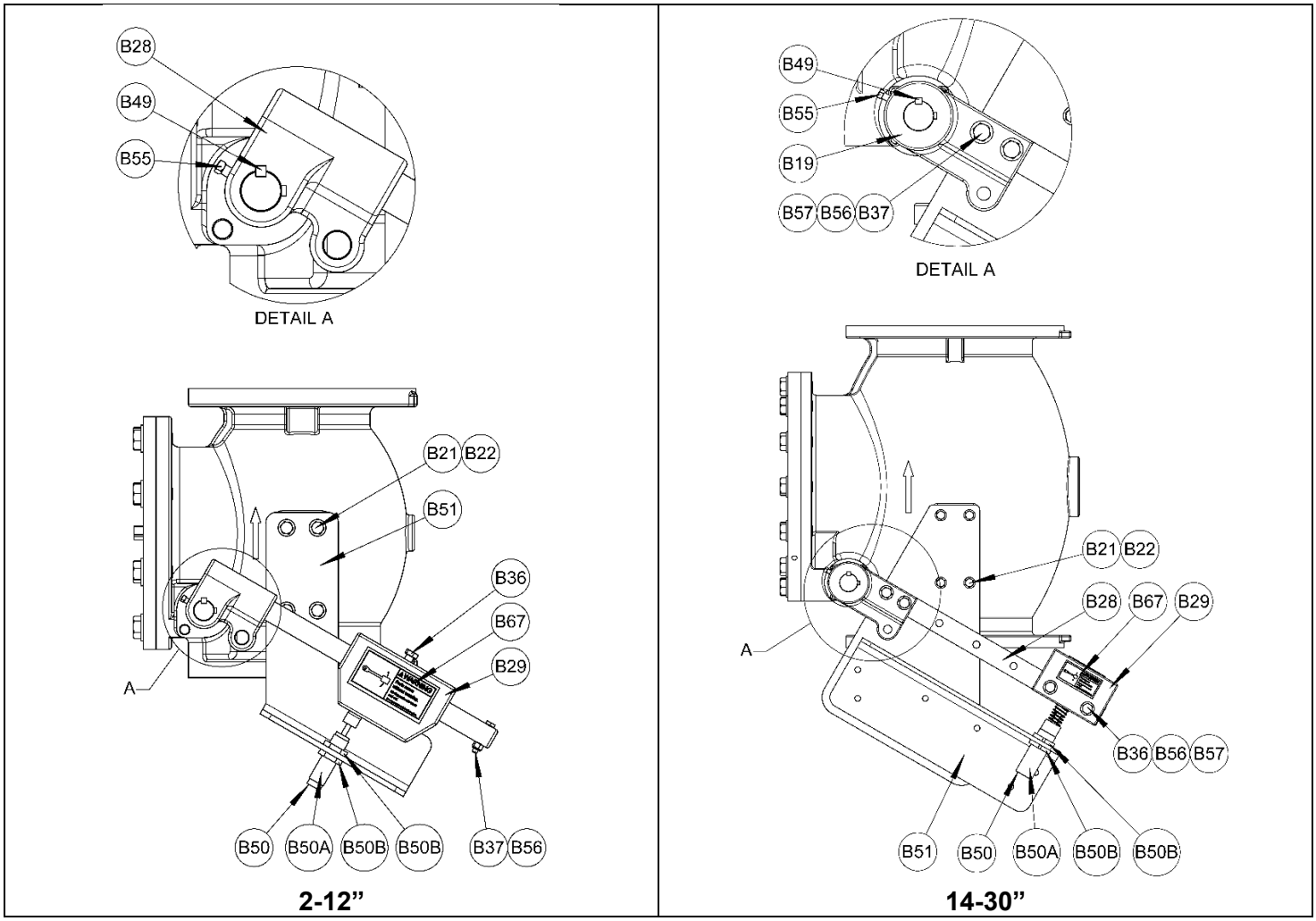

Figure 6: Lever & Weight with Oil Cushion (OB) Assembly 2-30"– Vertical Installation

Table 6: Lever & Weight with Oil Cushion (OB) Assembly 2-30" – Parts Identification

2-12"	
Item No.	***Description***
B21	SCREW
B22	WASHER
B28	LEVER ASSEMBLY
B29	COUNTERWEIGHT
B36	SET SCREW
B37	SCREW
B49	KEY
B50	SHOCK ABSORBER ASSEMBLY
B50A	SHOCK ABSORBER
B50B	SHOCK ABSORBER JAM NUT
B51	OIL CUSHION BRACKET
B55	SCREW
B56	NUT
B67	CVS WARNING LABEL

14-30"	
Item No.	***Description***
B19	SHAFT CONNECTOR
B21	SCREW
B22	WASHER
B28	LEVER
B29	COUNTERWEIGHT
B36	SCREW
B37	SCREW
B49	KEY
B50	SHOCK ABSORBER ASSEMBLY
B50A	SHOCK ABSORBER
B50B	SHOCK ABSORBER JAM NUT
B51	OIL CUSHION BRACKET
B55	SCREW
B56	NUT
B57	WASHER
B67	CVS WARNING LABEL

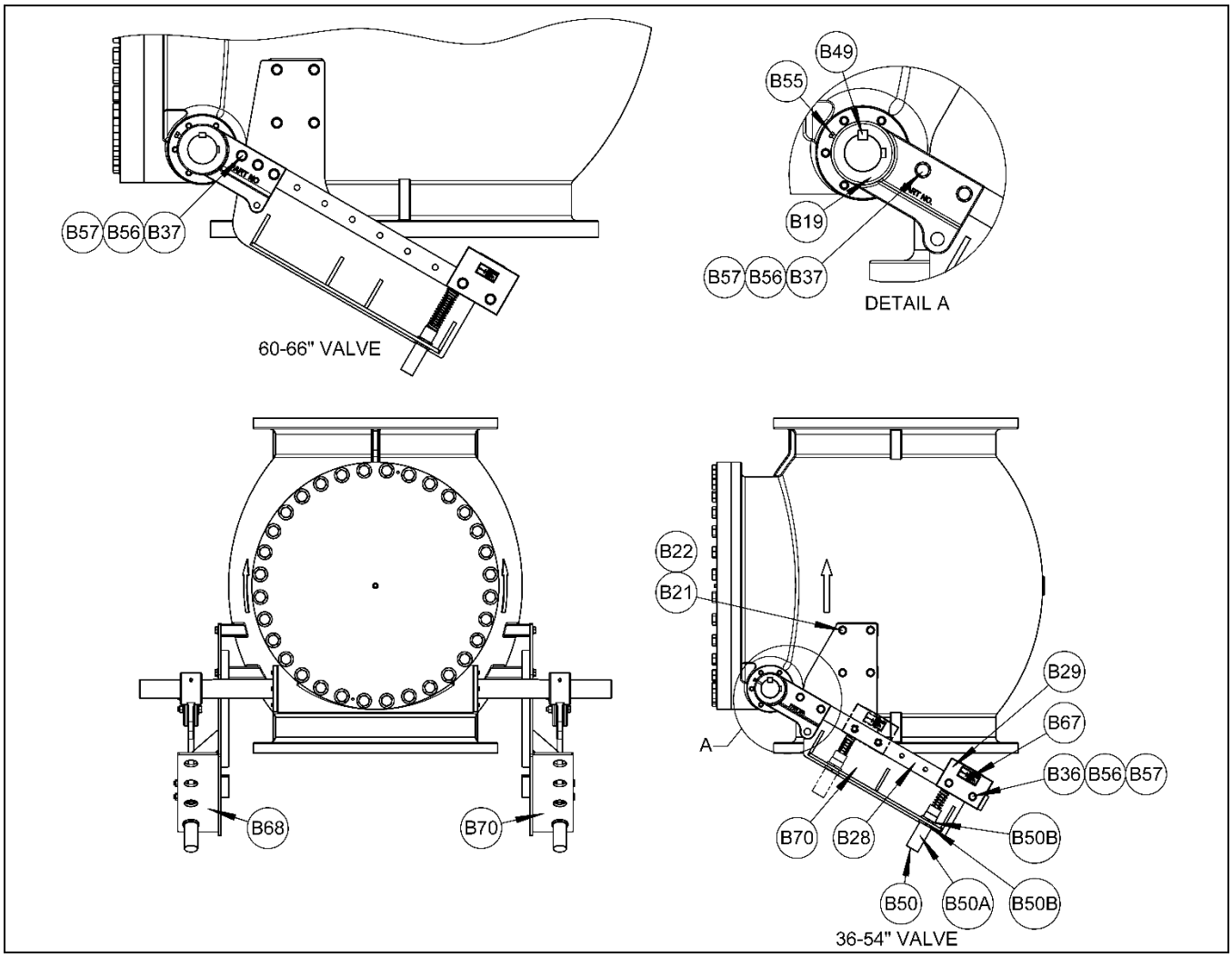

Figure 7: Lever & Weight with Oil Cushion (OB) Assembly 36-66" – Vertical Installation

Table 7: Lever & Weight with Oil Cushion (OB) 36-66" – Parts Identification – Vertical Installation

Item No.	*Description*
B19	SHAFT CONNECTOR
B21	SCREW
B22	WASHER
B28	LEVER
B29	COUNTERWEIGHT
B36	SCREW
B37	SCREW
B49	KEY
B50	SHOCK ABSORBER ASSEMBLY
B50A	SHOCK ABSORBER
B50B	SHOCK ABSORBER JAM NUT
B55	SCREW
B56	NUT
B57	WASHER
B67	CVS WARNING LABEL
B68	OIL CUSHION BRACKET LH
B70	OIL CUSHION BRACKET RH

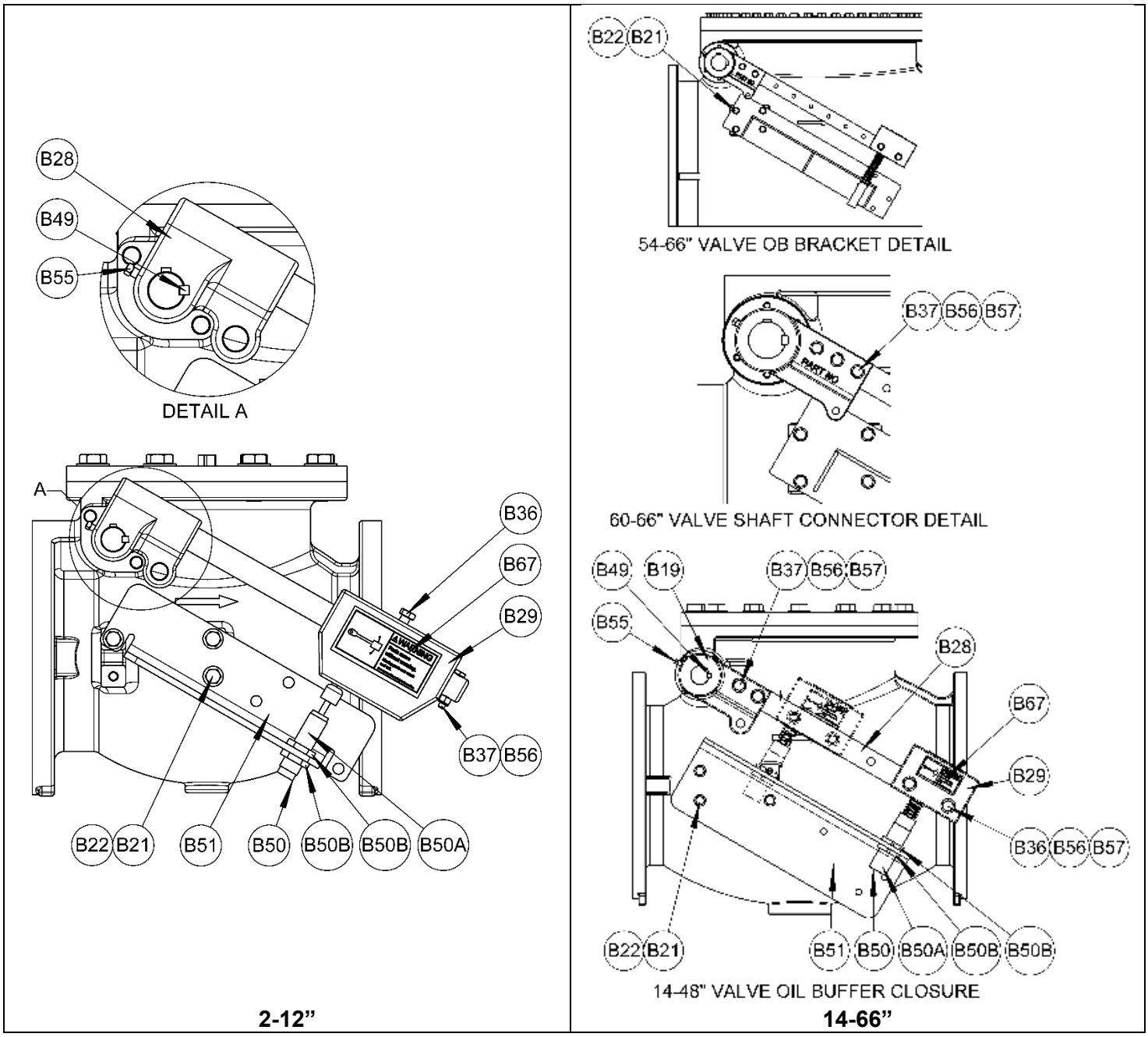

Figure 8: Lever & Weight with Oil Cushion (OB) Assembly 2-66”– Horizontal Installation

Table 8: Lever & Weight with Oil Cushion (OB) Assembly 2-66" – Parts Identification – Horizontal Installation

2-12"	
Item No.	***Description***
B21	SCREW
B22	WASHER
B28	LEVER ASSEMBLY
B29	COUNTERWEIGHT
B36	SET SCREW
B37	SCREW
B49	KEY
B50	SHOCK ABSORBER ASSEMBLY
B50A	SHOCK ABSORBER
B50B	SHOCK ABSORBER JAM NUT
B51	OIL CUSHION BRACKET
B55	SCREW
B56	NUT
B67	CVS WARNING LABEL

14-66"	
Item No.	***Description***
B19	SHAFT CONNECTOR
B21	SCREW
B22	WASHER
B28	LEVER
B29	COUNTERWEIGHT
B36	SCREW
B37	SCREW
B49	KEY
B50	SHOCK ABSORBER ASSEMBLY
B50A	SHOCK ABSORBER
B50B	SHOCK ABSORBER JAM NUT
B51	OIL CUSHION BRACKET
B55	SET SCREW
B56	NUT
B57	WASHER
B67	CVS WARNING LABEL

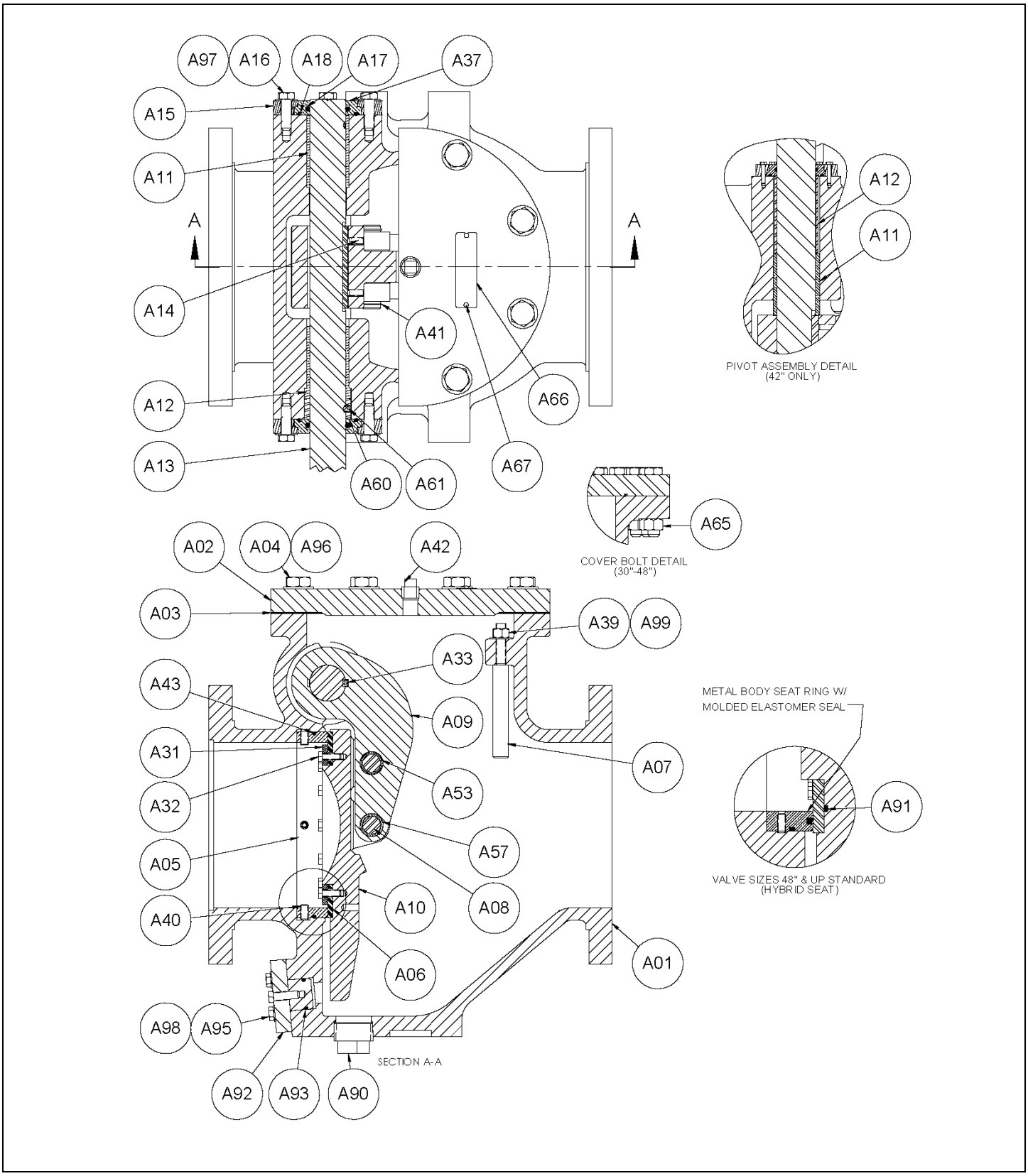

Figure 9: CVS-6000/6000A Basic Valve Assembly

Table 9: CVS-6000/6000A Valve Assembly Parts Identification

A01	BODY
A02	COVER
A03	COVER SEAL
A04	COVER BOLTS
A05	BODY SEAT RING
A06	DISC SEAT
A07	DISC STOP
A08	DISC PIN
A09	DISC ARM
A10	DISC
A11	PIVOT SHAFT STRAIGHT BUSHING
A12	PIVOT SHAFT FLANGED BUSHING (ALL EXCEPT 42”)
A12	SPACER (42” ONLY)
A13	PIVOT SHAFT
A14	DISC ARM SET SCREW
A15	PIVOT SHAFT COVER
A16	PIVOT SHAFT COVER BOLT
A17	PIVOT SHAFT SEAL
A18	PIVOT SHAFT COVER SEAL
A31	SEAT RETAINING RING
A32	SEAT RETAINING SCREW
A33	PIVOT SHAFT KEY
A37	PIVOT SHAFT SEAL RETAINER
A39	DISC STOP LOCKNUT
A40	BODY SEAT RETAINING SET SCREW
A41	DISC PIN RETAINER
A42	COVER PIPE PLUG
A43	BODY SEAT SEAL
A53	PIVOT SLEEVE BEARING
A57	DISC ARM SLEEVE
A60	PIVOT SHAFT COLLAR (NOTE 2)
A61	PIVOT SHAFT SET SCREW (NOTE 2)
A65	COVER NUT
A66	DATA PLATE
A67	DRIVE SCREW
A90	BODY PIPE PLUG
A91	DISC RING SEAL
A92	BMB PLUG (NOTE 1)
A93	BMB PLUG SEAL (NOTE 1)
A95	BMB PLUG RETAINING SCREW (NOTE 1)
A96	COVER BOLT WASHER
A97	PIVOT SHAFT COVER WASHER
A98	BMB COVER WASHER (NOTE 1)
A99	DISC STOP WASHER

NOTES:
1. BMB PLUG NOT INCLUDED FOR VALVES WITH BMB CLOSURE CONTROL
2. VALVE SIZES 2-3”, 16-54” & 66” HAVE A SINGLE PIECE, WELDED PIVOT SHAFT

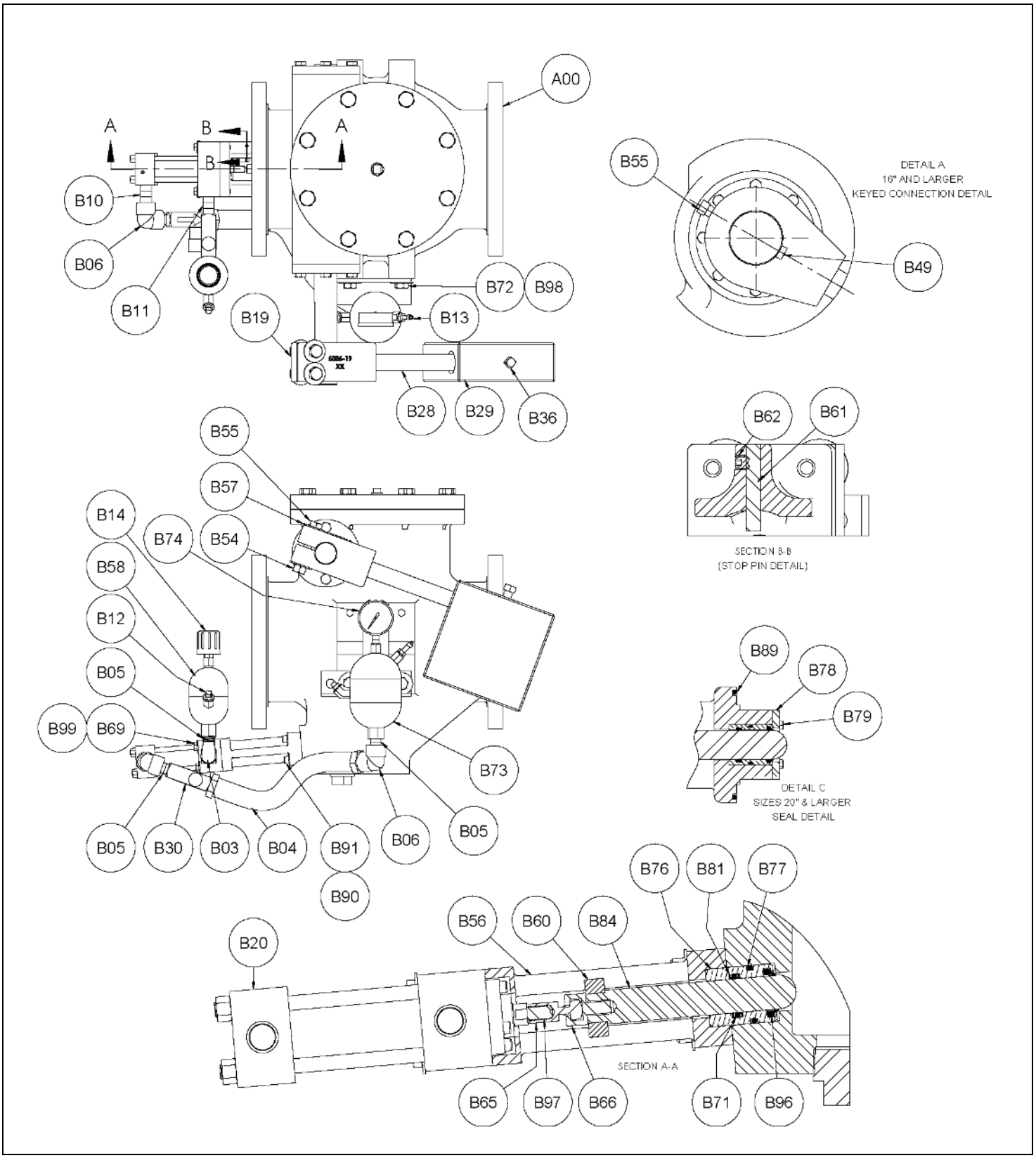

Figure 10: Lever & Weight with Oil Controlled Bottom Mounted Buffer (BMB)

Table 10: Lever & Weight with Oil Controlled Bottom Mounted Buffer (BMB) Parts Identification

A00	VALVE ASSEMBLY
B03	STREET ELBOW
B04	HOSE
B05	CLOSE NIPPLE
B06	ELBOW – 3000 PSI
B08	REDUCER (TO CYLINDER PORTS, NOT SHOWN)
B10	NIPPLE
B11	NIPPLE
B12	PIPE PLUG
B13	TANK VALVE
B14	AIR BREATHER (NOTE 1)
B19	LEVER ARM
B20	PNEUMATIC CYLINDER
B28	COUNTERWEIGHT ARM
B29	COUNTERWEIGHT
B30	FLOW CONTROL VALVE (NOTE 2)
B36	SET SCREW
B49	LEVER ARM KEY
B54	NUT
B55	LEVER ARM BOLT/SET SCREW
B56	CYLINDER SPACER
B57	WASHER
B58	OIL RESERVOIR
B60	SPLIT SHAFT COLLAR
B61	BUFFER ROD STOP
B62	BUFFER ROD STOP SET SCREW
B65	CYLINDER ROD COUPLER
B66	CYLINDER ROD ADAPTOR
B69	CYLINDER MTG. BOLT
B71	BUFFER ROD SEAL
B72	HYDRO PNEUMATIC ACCUMULATOR MTG. BOLT
B73	HYDRO PNEUMATIC ACCUMULATOR
B74	PRESSURE GAUGE
B76	BUFFER ROD BUSHING
B77	BUSHING SEAL
B78	BUFFER ROD BUSHING RET. RING
B79	RETAINING RING SCREW
B81	BUFFER ROD SEAL BACK-UP
B84	BUFFER ROD
B89	CYLINDER SPACER SEAL
B90	WASHER
B91	CYLINDER SPACER MTG. BOLT
B96	BUFFER ROD SCRAPER
B97	SET SCREW
B98	WASHER
B99	WASHER

NOTES
1. DO NOT SHIP WITH AIR BREATHER (B14) INSTALLED. INSTALL PIPE PLUG (B12) INSTEAD
2. FLOW CONTROL VALVE (B30) IS TO BE INSTALLED SO THAT FLOW IS CONTROLLED FLOWING OUT OF THE CYLINDER AND FREE FLOW TOWARDS THE CYLINDER.
3. VALVE SIZES 14” & LARGER HAVE TWO COUNTERWEIGHT ASSEMBLIES (B19, B28 and B29), ONE ON EITHER SIDE OF THE VALVE.

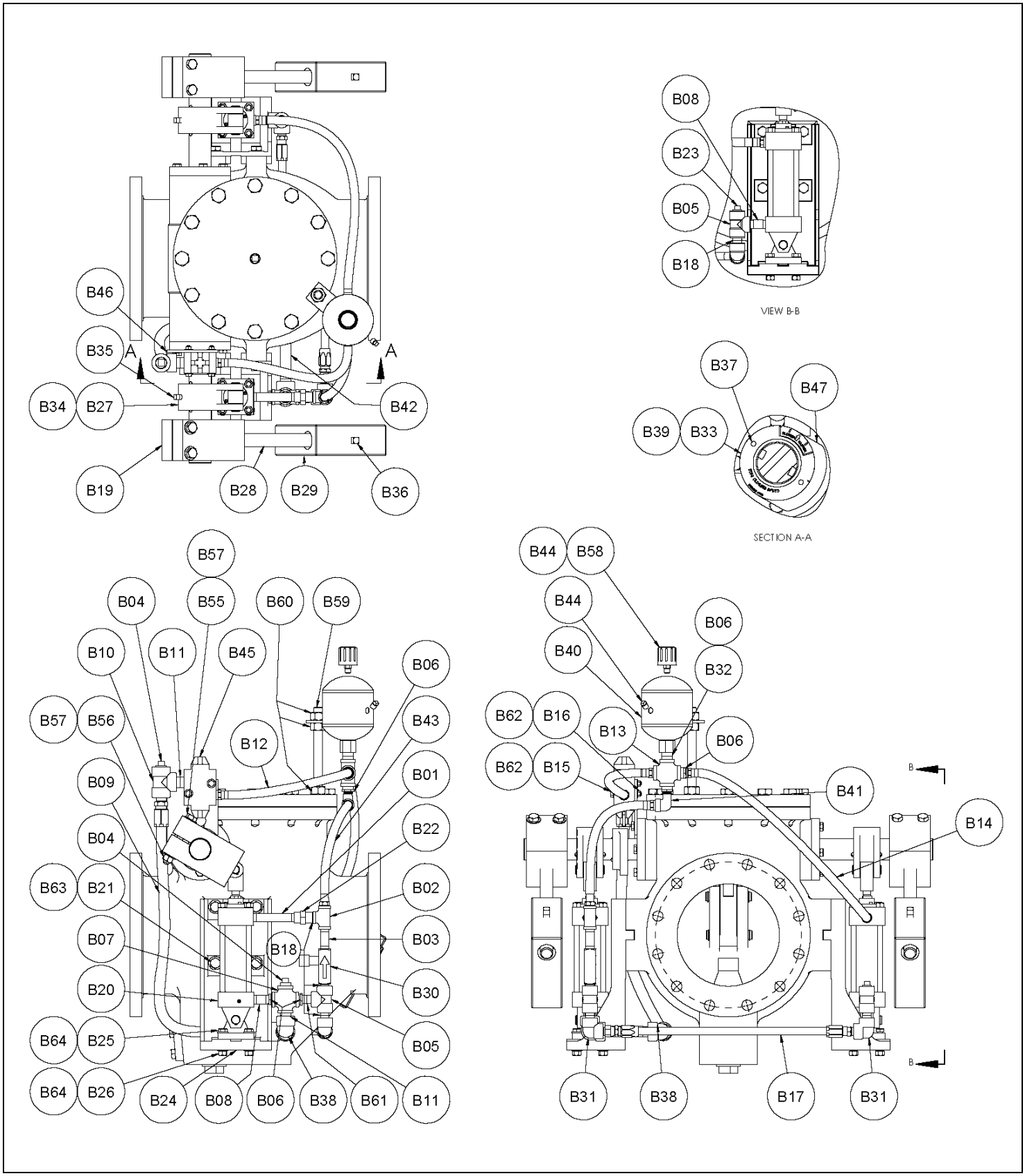

Figure 11: Lever & Weight with Oil Controlled Side Mounted Cylinder (OC)

Table 11: Lever & Weight with Oil Controlled Side Mounted Cylinder (OC) Parts Identification

B01	NIPPLE
B02	TEE
B03	NIPPLE
B04	PIPE PLUE
B05	TEE
B06	REDUCING BUSHING (SEE NOTE 3)
B07	CROSS
B08	NIPPLE
B09	HOSE
B10	TEE
B11	NIPPLE
B12	HOSE
B13	CROSS
B14	HOSE
B15	TIMING VALVE SCREW
B16	TIMING VALVE NUT
B17	HOSE
B18	NIPPLE
B19	COUNTERWEIGHT LEVER ARM
B20	PNEUMATIC CYLINDER
B21	CYLINDER BRACKET MOUNTING BOLT
B22	UNION
B23	PIPE PLUG
B24	CYLINDER BRACKET
B25	CYLINDER BRACKET MOUNTING BOLT
B26	CYLINDER BRACKET MOUNTING NUT
B27	CYLINDER LEVER
B28	COUNTERWEIGHT ARM
B29	COUNTERWEIGHT
B30	FLOW CONTROL VALVE
B31	ELBOW
B32	NIPPLE
B33	TIMING VALVE CAM DIAL
B34	CUSHION LEVER KEY
B35	CUSHION LEVER SET SCREW
B36	COUNTERWEIGHT SET SCREW
B37	DRIVE SCREW
B38	ELBOW
B39	CAM SET SCREW
B40	OIL RESERVOIR TANK
B41	ELBOW
B42	NIPPLE
B43	HOSE
B44	PIPE PLUG (SEE NOTE 2)
B45	TIMING VALVE
B46	TIMING VALVE MOUNTING BRACKET
B47	CAM
B49	LEVER ARM KEY (NOT SHOWN)
B55	LEVER ARM BOLT/SET SCREW
B56	LEVER ARM NUT
B57	WASHER
B58	AIR BREATHER
B59	THREADED ROD (SEE NOTE 1)
B60	HEX NUT (SEE NOTE 1)
B61	NIPPLE
B62	WASHER
B63	WASHER
B64	WASHER

NOTES

1. B59 & B60 ARE REPLACED WITH A SINGLE BRACKET (NOT SHOWN) WHEN VALVE IS USED IN VERTICAL ORIENTATION
2. VALVE IS SHIPPED WITH PIPE PLUG IN PLACE OF BREATHER ON RESERVOIR, BREATHER SHIPPED LOOSE
3. ADDITIONAL REDUCER ON 14-20” IS USED TO CONNECT OIL RESERVOIR TO 1” NPT CROSS

Proximity Switch (SEL30)

APCO CVS-6000D Swing Check Valves can be equipped with an optional Proximity Switch (SEL30). The switch senses the position of a bracket that is attached to the Pivot Shaft (A13) and relays whether the valve is fully closed or not.

Installation (SEL30)

Refer to Figure 13 for component identification.

⚠WARNING

Removal of the Cover Bolts (A04) during proximity switch installation may compromise the seal between the valve cover and body. To prevent unintended release of process media or pressure, it is imperative that the valve be fully **isolated and depressurized** before loosening or removing any Cover Bolts (A04).

1. Install Bracket (L2) using Cover Bolts (A04).
2. With the valve in the closed position, install Actuator Lever Assembly (L3) with the SEL30 Switch (L1) centered on the indicator arm of the Actuator Lever Assembly (L3).
3. Install SEL30 Switch (L1) into Bracket (L2).
4. Using a feeler gauge, adjust the SEL Switch (L1) and/or the Actuator Lever Assembly (L3) to achieve a 0.100” spacing between the sensor and the lever assembly. See Figure 12.
5. Test the system to ensure valve position is properly relayed.

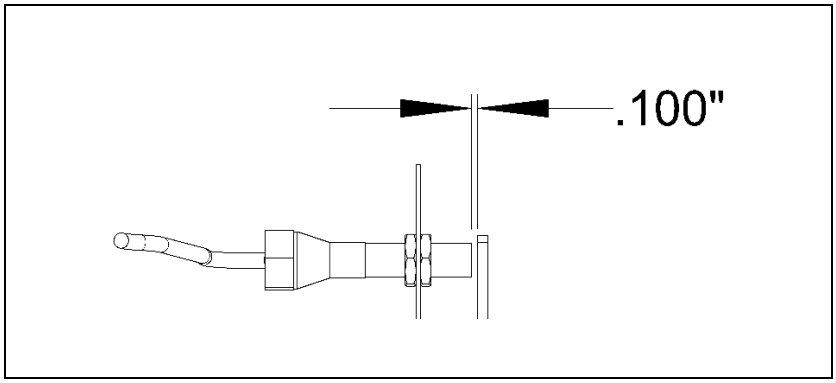

Figure 12: Proximity Switch (SEL30) Installation Spacing

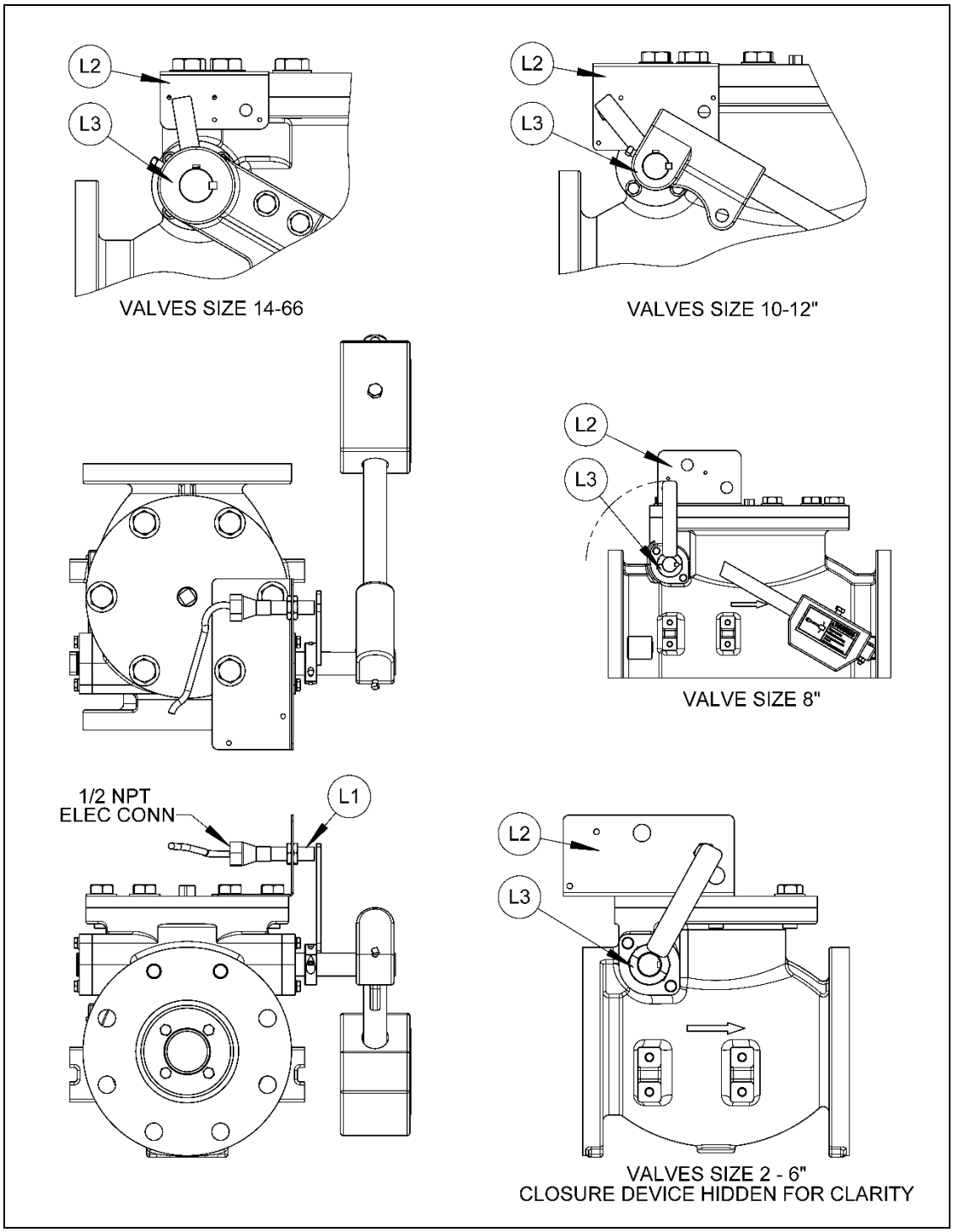

Figure 13: Proximity Switch (SEL30)

Table 12: Proximity Switch Parts Identification

Item No.	*Description*
L1	SEL30 SWITCH
L2	BRACKET, ACCESSORY SWITCH
L3	ACTUATOR LEVER ASSY

Limit Switch (SEL22)

CVS-6000D Swing Check Valves can be equipped with an optional Limit Switch (SEL22). The switch is mechanically triggered by an indicating arm that is attached to the Pivot Arm (A13) and relays whether the valve is fully closed or not.

Installation (SEL22)

Refer to Figure 14 for component identification.

⚠WARNING

Removal of the Cover Bolts (A04) during limit switch installation may compromise the seal between the valve cover and body. To prevent unintended release of process media or pressure, it is imperative that the valve be fully **isolated and depressurized** before loosening or removing any Cover Bolts (A04).

1. Install Bracket (L2) using Cover Bolts (A04).
2. Install SEL22 Switch (L1) onto Bracket (L2) using Screws (L4), Washers (L6) and Hex Nuts (L5).
3. With the valve in the closed position, install Actuator Lever Assembly (L3) such that the Switch (L1) is triggered.
4. Test the system to ensure valve position is properly relayed.

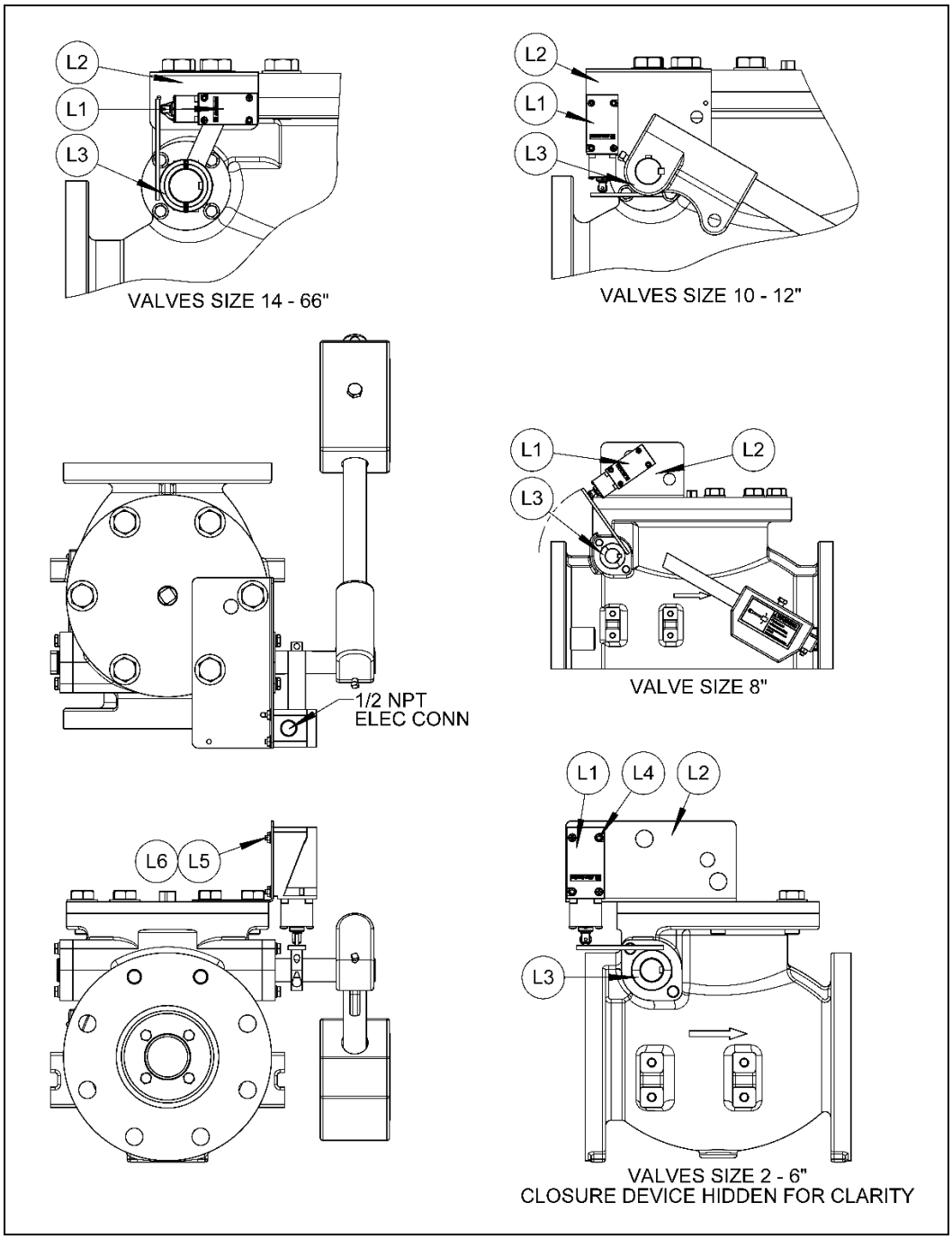

Figure 14: Limit Switch (SEL22)

Table 13: Limit Switch Parts Identification

Item No.	*Description*
L1	SEL22 SWITCH
L2	BRACKET, ACCESSORY SWITCH
L3	ACTUATOR LEVER ASSY
L4	SCREW
L5	HEX NUT
L6	WASHER

Operation

When the pump starts, flow opens the Disc (A10) and either lifts the Counterweight (B29) or extends the Spring (B59). When the pump stops, reduced flow allows gravity and the Counterweight or Spring to begin closing the Disc toward the Body Seat Ring (A05). The Counterweight or Spring is set so that closure occurs just before flow reversal, preventing reverse flow from forcing the Disc shut.

Once closed, system static pressure (downstream of the valve) keeps the Disc (A10) and Disc Seat (A06) firmly against the Body Seat Ring (A05).

If equipped with an Air Cushion Cylinder (AC), as the Disc (A10) opens, the Air Cushion Cylinder Assembly (Figure 6) piston is pulled upward, drawing air freely into the Air Cylinder (B20A) through the Flow Control (B30). As the Disc (A10) closes, the Air Cylinder (B20A) piston is pushed downward and the compressed air escapes through the Flow Control (B30) on the bottom of the Air Cylinder (B20A). Closure can be dampened by the Air Cylinder (B20A). The exhausting air can be adjusted with the Flow Control (B30) to suit the best performance for the installation.

If equipped with a Lever & Weight with Oil Cushion (OB), the Counterweight (B29) contacts the Shock Absorber (B50A) and dampens the final stage of disc closure.

Closing Hard Versus Slamming:

- **Closing Hard** – The Disc contacts the Body Seat Ring with force before flow reversal, often due to excessive counterweight leverage or high spring tension. While it can cause stress on components, this is not considered slamming. Cushioning devices can minimize this impact.
- **Slamming** – Occurs when the valve closes after flow reversal. Reverse flow grabs the Disc and forces it shut violently.

NOTICE

Surges can be generated during pump starts and stops. Make sure pump station safety devices are operational and that the time between each pump start and stop is sufficient for system pressures to return to steady state condition.

Startup Procedure APCO CVS-6000D

1. Adjust closure devices to neutral settings.
    - **Lever & Weight (LW):** Position the Counterweight (B29) midway on the lever arm. Set the lever arm 25°-30° below horizontal.
    - **Lever & Spring (LS):** Adjust the Spring (B59) to the most relaxed setting by moving the Nuts (B63) to approximately ¼" from the threaded end of the Eye Bolt (B61).
    - **Lever & Weight with Air Cushion Cylinder (AC):** Starting from the fully closed position, rotate the adjustment knob on the Flow Control (B30) two full turns counterclockwise.
    - **Lever & Weight with Oil Cushion (OB):** When adjusting the position of the Counterweight (B29), make sure the Counterweight (B59) still contacts the Shock Absorber (B50A). If necessary, reposition the Shock Absorber (B50A) into the correct hole in the Oil Cushion Bracket (B51).
2. Throttle the isolation valve on the discharge side of the Swing Check Valve to approximately 1/3 open to prevent full column reversal and slamming when the pump stops.
3. Start and stop pump and observe rate of closing.
4. Adjust Counterweight(s) (B29) or Spring(s) (B59) to set closing speed.
   Note: If the valve is closing hard, closure devices should be adjusted slower. If the valve is slamming due to flow reversal, closure devices should be adjusted faster. See ***Closing Hard Versus Slamming*** in Operation section.
    - All valves with counterweights:
        i. For faster disc closure – move Counterweight(s) (B29) away from the Pivot Shaft (A13).
        ii. For slower disc closure – move Counterweight(s) (B29) toward the Pivot Shaft (A13).
    - Valves with lever & spring
        i. For faster disc closure – adjust Nuts (B63) toward the eye in Eye Bolt (B61).
        ii. For slower disc closure – adjust Nuts (B63) away from the eye in Eye Bolt (B61).
    - CVS-6000D-AC
        i. If cushioning is required, turn the adjusting screw of Flow Control (B30) one-half (½) turn clockwise – do not fully close the Flow Control (B30).
5. During this sequence of pump start and stops, gradually open the downstream isolation valve until it is full open.
6. Repeat steps 3 through 5 as necessary until satisfactory performance is achieved.
7. If satisfactory performance cannot be achieved after making these adjustments, contact the DeZURIK Representative or Field Service for assistance.

Startup Procedure APCO CVS-6000/6000A with BMB

The Oil Controlled Bottom Mounted Buffer allows check valves to open freely and provide control of the disc movement while closing. This allows the valve disc to close freely for 90% of its stroke. The disc then meets the Buffer Rod, which controls the speed of closing over the last 10% of disc travel.

The Oil Controlled Bottom Mounted Buffer has two controlling stages during the last 10% of closing. The Flow Control Valve provides primary control. Secondary control over the last 5% of disc closure is provided by the Internal Cushion.

The Cylinder (B20) incorporates the use of a Hydro Pneumatic Accumulator (B73), a device that activates and pushes the Buffer Rod (B84) into the valve body. The Cylinder is self-contained and uses oil as a controlling media, creating a completely closed system.

Start-up Procedure

1. Position Counterweight (B29) midway on the Counterweight Arm (B28).
2. Set outside lever arm 25°-30° below horizontal (not to interfere with cylinder).
3. Open Flow Control Valve (B30) three complete turns counterclockwise from the fully closed position. See “Adjustment of Flow Control Valve”.
4. Fully open Flow Control Valve connected to Oil Reservoir (B58)
5. Throttle the isolation valve on the discharge side of the Swing Check Valve to approximately 1/3 open to prevent full column reversal and slamming when the pump stops.
6. Remove pipe plug on top of Oil Reservoir (B58) and install the Air Breather (B14), which is shipped with the valve.
7. Check for proper oil levels. Make sure oil tanks are in vertical position.
    a. Hydro Pneumatic Accumulator (B73): Release air pressure and remove pipe plug on the side of the tank. Oil should be visible in the elbow, which is the oil fill level. Add if necessary. (See "Oil Filling Procedure").
    b. Oil Reservoir (B58): The oil level should be checked when the valve is open. Oil should be visible in the elbow, which is the oil fill level. Add if necessary. See “Oil Filling Procedure". Pressurize Hydro Pneumatic Accumulator (B73) according to this formula:
8. Tank pressure = (Line pressure ÷ 4) + 5 psi
9. This is the pressure necessary to extend the buffer rod into the valve body
10. Start pump. While valve is opening, visually verify that Buffer Rod (B84) fully extends into the valve body. If not, pressure the Hydro Pneumatic Accumulator (B73) until it does. Table 14 shows the maximum stroke length of the Buffer Rod (B84).

Valve Size	6”	8”	10”	12”	14”	16”	18”	20”	24”	30”	36”	42”	48”	54"	66”
Stroke, (inches)	1½	1½	2	2	3	4	5	6	4	5	6	7	6	9	11

Table 14: Maximum Stroke Length of Buffer Rod

11. Shut off the pump and observe rate of closing.
12. Adjust Counterweight to set closing speed until the disc contacts the buffer rod.

Startup Procedure APCO CVS-6000/6000A with BMB (Continued)

13. Adjust Counterweight(s) (B29) or Spring(s) (B59) to set closing speed.
    Note: If the valve is closing hard, closure devices should be adjusted slower. If the valve is slamming due to flow reversal, closure devices should be adjusted faster. See ***Closing Hard Versus Slamming*** in Operation section.
    a. All valves with counterweights:
        i. For faster disc closure – move Counterweight(s) (B29) away from the Pivot Shaft (A13).
        ii. For slower disc closure – move Counterweight(s) (B29) toward the Pivot Shaft (A13).
14. Adjust Flow Control Valve to set the closing speed of the Cylinder (for the last 10% of travel). Turning the knob clockwise closes the valve and turning counterclockwise opens the valve and increases rate of closure of the Check Valve.
15. During this sequence of pump start and stops, gradually open the downstream isolation valve until it is fully open.
16. Repeat steps 10 through 15 as necessary until satisfactory performance is achieved.
17. When shut-down sequence is established, lock the Flow Control Valve knob.
18. If satisfactory performance cannot be achieved after making these adjustments, contact your local DeZURIK Representative or DeZURIK Field Service for assistance.

Startup Procedure APCO CVS-6000/6000A with OC

Valves equipped with Oil Control Side Mounted (OC) have Two Stage (2-4”) or Three Stage (6-20”) adjustable control. The Timing Valve (6-20” only) allows unrestricted Primary Control until a preset travel distance is achieved. Secondary control is provided by the Flow Control Valve. The third control is the Internal Cushion located in the cylinder head and provides additional control over the last 10% of disc travel. The hydraulic cylinder is self-contained and uses oil as a controlling media, creating a completely closed system.

Start-up Procedure

1. Position Counterweight (B29) midway on the Counterweight Arm (B28).
2. Set outside lever arm 25°-30° below horizontal (not to interfere with cylinder).
3. Size 6”-20” only: Set Cam (B47) on the Timing Valve (B45) so that arrow on cam is pointing to the center line of the roller on the Timing Valve while the disc is in closed position. See “Timing Valve Adjustment”.
4. Throttle the isolation valve on the discharge side of the Swing Check Valve to approximately 1/3 open to prevent full column reversal and slamming when the pump stops.
5. Remove Pipe Plug (B44) on top of Oil Reservoir Tank (B40) and install the Air Breather (B58), which is shipped with the valve.
6. Check for proper oil levels. Make sure Oil Reservoir Tank is in vertical position. The oil level should be checked when the valve is closed. Oil should be visible in the elbow, which is the oil fill level. Add if necessary. See “Oil Filling Procedure".
7. Start and stop pump and observe rate of closing.
8. Adjust Counterweights to set Primary Stage closing speed.
   Note: If the valve is closing hard, closure devices should be adjusted slower. If the valve is slamming due to flow reversal, closure devices should be adjusted faster. See ***Closing Hard Versus Slamming*** section in Operation.
   a. All valves with counterweights:
      i. For faster disc closure – move Counterweight(s) (B29) away from the Pivot Shaft (A13).
      ii. For slower disc closure – move Counterweight(s) (B29) toward the Pivot Shaft (A13).
9. Adjust Timing Valve (6-20” only) to set the disc position when the Second Stage control should activate. See “Timing Valve Adjustment”.
10. Adjust Flow Control Valve (B30) to set the Second Stage closing speed. Turning the knob clockwise closes the valve and turning counterclockwise opens the valve and increases rate of closure of the Check Valve. During this sequence of pump start and stops, gradually open the downstream isolation valve until it is fully open.
11. Repeat steps 7 through 10 as necessary until satisfactory performance is achieved.
12. When shut-down sequence is established, lock the Flow Control Valve knob and tighten Timing Valve set screws to prevent tampering of settings.
13. If satisfactory performance cannot be achieved after making these adjustments, contact your local DeZURIK Representative or DeZURIK Field Service for assistance.

Timing Valve Adjustment (CVS-6000-OC Valves)

The Timing Valve (B45) automatically starts the second stage of closure control. When the Cam (B47) is depressed, the Disc (A10) can travel toward closed freely. Oil flows directly from the Cylinder (B20) to the Oil Reservoir Tank (B40), bypassing the Flow Control Valve (B30). The unrestricted flow of oil allows rapid disc travel toward closed. When the Cam is released, Disc speed of travel is controlled by the adjustable Flow Control Valve. The travel distance before the second stage of closure control begins is set by adjusting the Cam.

- Turning the Cam **counter-clockwise** will **increase** the Disc travel distance before the Roller releases the Cam, permitting the Disc to close at a fast rate for **longer** travel distance.
- Turning the Cam **clockwise** will **decrease** the Disc travel distance before the Roller releases the Cam, permitting the Disc to close at a fast rate for **shorter** travel distance.
- If the Cam is adjusted so the Cam and Roller do not make contact at all, the second stage Flow Control Valve will control the Disc movement from full open to 90% closed. At 90% closed, the third stage of control (internal to the cylinder head) starts.

Figure 15 shows position of the Cam in relation to Cam Follower with check valve in closed position. The cam is connected to the valve Pivot Shaft and rotates in the same direction as the disc travels. In this example, the Cam is set to allow the disc to rapidly close from full open to 50% open before second stage closure control begins.

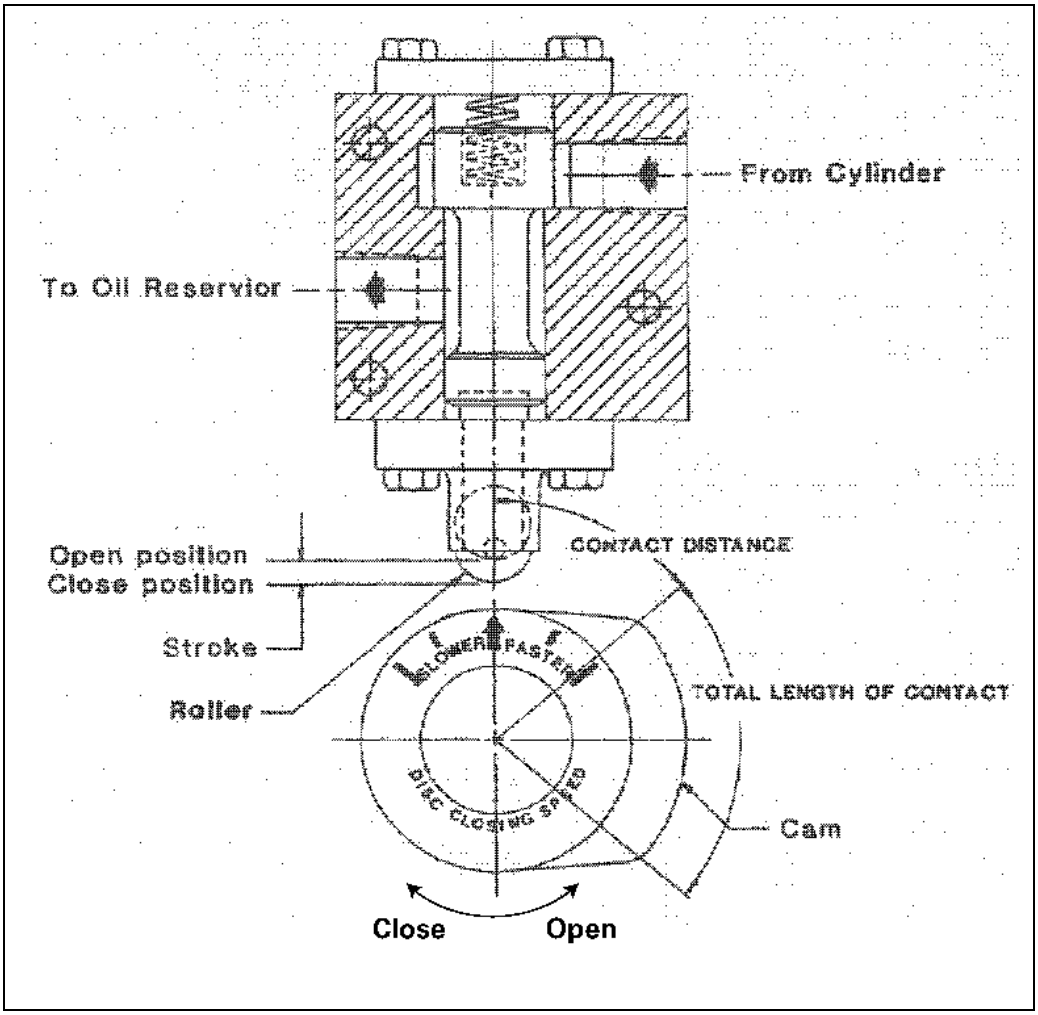

Figure 15: Timing Valve for CVS-6000-OC

Oil Filling Procedure

See Figures 10 & 11 for part identification. Recommended Oils: Motor oil SAE 20, Mobil DTE 24, Castrol Hyspin AW 32.

CVS-6000-BMB Valves

Step 1: Hydro Pneumatic Accumulator (B73)

1. Shut down pump.
2. Release pressure of Hydro Pneumatic Tank and remove pipe plug located on the side of the tank and either the Pressure Gauge (B74) or Air Valve.
3. Fully open Flow Control Valve (B30). (Make note of setting before turning knob.)
4. Slowly fill cylinder with oil until it spills out of the side port. This is the oil fill level.
5. Replace both fittings and pressurize tank according to this formula:
6. Tank pressure = (Line pressure/4) + 5 psi
7. Start pump and observe if Buffer Rod (B84) extends. If not, while valve is still open add more pressure until it does.
8. Reset Flow Control Valve (B30) to original setting noted in step 3.

Step 2: Oil Reservoir (B58)

1. Start pump.
2. Fully open Flow Control Valve (B30). (Make note of setting before turning knob.)
3. Remove side Pipe Plug (B12) and Air Breather (B14) and slowly fill with oil until it spills out of the side port.
4. Replace both fittings.
5. Shut down pump.
6. Reset Flow Control Valve (B30) to original setting noted in step 2.
7. NOTE: The Oil Reservoir should always be in atmospheric condition.

CVS-6000-OC Valves

1. Fully close swing check valve.
2. Fully open Flow Control Valve (B30). (Make note of setting before turning knob.)
3. Manually lift roller of Timing Valve (B45) and hold in that position until step 5.
4. Remove pipe plug in street elbow located on side of Oil Reservoir (B58) and slowly fill with oil until oil level is visible in street elbow, then replace pipe plug.
5. Manually open and close swing check valve by lifting Counterweight Arm (B28) at least three times to force out any entrapped air in the cylinder(s).
6. Remove pipe plug in street elbow located on side of Oil Reservoir Tank (B40) and check oil level. Refill if necessary and repeat step 5 until proper oil level is maintained when the swing check valve is fully closed.
7. Check system for any entrapped air by manually opening the swing check valve by lifting Counterweight Arm (B28), then closing the Flow Control Valve (B30) while still on the open position. The Disc (A10) should remain in the open position, otherwise, repeat steps 2 through 7.
8. Reset Flow Control Valve (B30) to original setting noted in Step 2.

Troubleshooting

Condition	Possible Cause	Corrective Action
Shaft seal leaks.	Seal is worn.	Replace seal.
Valve leaks excessively from one side of the disc to the other.	Foreign matter caught between disc and seat.	Fully open valve to remove object.
	Disc seat is worn or damaged.	Replace disc seat.
Valve leaks at flange joint.	Loose flange bolting.	Tighten flange bolting.
	Blown flange gasket.	Replace flange gasket.
	Misalignment or damage to field piping and supports.	Adjust misalignment or repair piping or supports.
	Damaged flange face/s or improper flange connections.	Repair flange, replace valve body or adjust flange connections.
Valve does not fully close.	Object is wedged between seat and disc.	Fully open valve to remove object.
The proximity switch isn't working properly and doesn't respond when the valve moves.	The Actuator Lever Assembly (L3) isn't installed properly to signal the valve is in the closed position.	Adjust the Actuator Lever Assembly (L3) to align with the proximity switch in the valve closed position.
	The proximity switch is too far or too close to the indicator.	Adjust the proximity switch to the appropriate installation distance.
	The proximity switch is faulty or damaged.	Replace the proximity switch.
The limit switch isn't working properly and doesn't respond when the valve moves.	The Actuator Lever Assembly (L3) isn't installed properly to signal the valve is in the closed position.	Adjust the Actuator Lever Assembly (L3) so it is activating the mechanical switch when the valve is closed.
	The limit switch is faulty or damaged.	Replace the limit switch.

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