

# APCO CVS-6000A (2-14") and CVS-6000 (14-66") Swing Check Valves with Lever & Weight (LW and CLW) and Lever & Spring (LS and CLS)



Instruction **D12009**  
March 2023

## 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](http://DeZURIK.com).

---

## Table of Contents

Description .....	4
Handling and Storage .....	4
Installation .....	5
Fusion Bonded Epoxy Coated Valves.....	5
Maintenance.....	6
Disassembly Procedure .....	6
Assembly Procedure.....	7
Operation .....	8
Start-up Procedure .....	8
Closing Speed Adjustment .....	9
Drawings ( <i>Body Assembly</i> ).....	10
Drawings ( <i>Lever &amp; Spring</i> ).....	12
Drawings ( <i>Lever &amp; Weight</i> ).....	14
Troubleshooting.....	16

## **Description**

A swing check valve consists of a valve body, a bonnet, 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 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 is shut off, the Disc closes and is held closed by downstream static pressure. As the disc is closing, the Counterweight or Spring control the closing speed of the valve and can be adjusted to suit the best performance for the installation

As service requirements change, CVS-6000/6000A -CLW and -CLS Convertible Swing Check Valves can be converted to use any of these closure control devices:

1. CVS-6000/6000A-AC – Air Cushioned Side Mounted.
2. CVS-6000/6000A-BMB – Oil Control Bottom Mounted Buffer.
3. CVS-6000/6000A-OC – Oil Control Side Mounted.

**Note:** Kits for any of the above conversions can be supplied for field installation.

## **Handling and Storage**

Lifting the valve improperly may damage it. Do not fasten lifting devices to attached components or through the seat opening in the body. 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, place valve indoors in secure, weather tight storage. If temporary outside storage is unavoidable, make sure a vermin proof rain cover (water shedding tarp, etc.) is secured around/over the valve to keep off rain and mud. Skid and set the assembly on a flat, solid, and well drained surface for protection from ground moisture, runoff and pooled rain water.

## **Installation**

- See Figures 1-3 for parts identification.
- APCO CVS-6000/6000A Swing Check Valves may be installed in a horizontal or vertical position (with the flow upward). For vertical flow upward, if the CVS-6000/6000A valve has LW or CLW, the Counterweight Arm (B28) should be set 25°-30° below the horizontal line. Unless otherwise specified, all CVS-6000/6000A valves are set up for horizontal installation.

---

### **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 5 pipe diameters from elbows to ensure laminar flow with minimum turbulence to minimize disc movement and premature wear. However, many facilities with smaller footprints have achieved acceptable performance in systems with the check valve installed 5 pipe diameter lengths of straight pipe from the downstream side of tees, fittings, increasers, or pumps and 3 pipe diameters lengths from elbows.

- 
- When installed in the vertical position, the valve shaft must be perpendicular to the incoming horizontal pipe.
  - 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. If excessive seat leakage occurs during start-up, recheck the installation and eliminate any distortion to the valve body.

- 
- Ensure the valve and pipeline flanges are concentric to ensure proper flange sealing and seat leakage control.
  - 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*

See Figures 1 and 2 for part identification.

---

#### **⚠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 lockout the pumps before servicing the valve.**

---

1. Relieve the pressure in the pipeline.
2. If it is necessary to remove valve from pipeline, set valve standing on its inlet flange.
3. **CVS-6000/6000A-LW and -CLW valves only:**
  - a. Support Counterweight Arm (B28), then unscrew Counterweight set screw (B36) and remove Counterweight (B29).
  - b. Disconnect Spring (B59) from Spring Arm (B28).
4. Loosen Lever Arm Nut (B56) holding Counterweight Lever Arm (B19) to Pivot Shaft (A13) and remove Counterweight Lever Arm (B19).
5. Remove Cover (A02) by unscrewing Cover Bolts (A04).
6. Unscrew Disc Arm Set Screws (A14).
7. Remove Pivot Shaft Cover (A15) and Pivot Shaft Seal Retainer (A37) at both ends of the Pivot Shaft (A13).
8. Pull Pivot Shaft (A13) from the right side of the valve (facing inlet).
9. Remove Pivot Shaft Flanged Bushing (A12), Pivot Shaft Key (A33), Pivot Shaft Seal (A17) and Pivot Shaft Cover Seal (A18).
10. Remove Disc Pin Retainer (A41) and pull out Disc Pins (A08).
11. Pull out Disc Arm (A09) and Disc (A10).
12. Remove Disc Seat (A06) and Seat Retaining Ring (A31) by unscrewing all Seat Retaining Screws (A32).
13. Unscrew the Body Seat Retaining Set Screws (A40) located inside the Body Seat Ring (A05).
14. Evenly pry the Body Seat Ring (A05) out of the Body (A01).

---

**Assembly Procedure**

1. If valve is removed from pipeline, set body standing on its inlet flange.
2. Install Body Seat Seal (A43) in the groove of Body Seat Ring (A05).
3. Install Body Seat Ring (A05) evenly inside the counter-bore of the Body (A01) until it bottoms out.
4. Screw and tighten the Body Seat Retaining Set Screws (A40) into the Body Seat Ring (A05).
5. Set Disc (A10) with seat side up, install Disc Seat (A06) and Seat Retaining Ring (A31) and fasten with Seat Retaining Screws (A32).
6. Connect Disc Arm (A09) assembly to Disc (A10) by inserting Disc Pins (A08) and secure with Disc Pin Retainers (A41).
7. Set Disc (A10) and Disc Arm (A09) assembly on top of Body Seat Seal (A43).
8. Slip the Pivot Shaft Flanged Bushing (A12) on the Pivot Shaft (A13) with the flanged side against the Pivot Shaft collar.
9. Insert Pivot Shaft Key (A33) in keyway on Pivot Shaft (A13).
10. Install Pivot Shaft (A13) from right side of Body (A01) through Disc Arm (A09) until Pivot Shaft collar is flush with body.
11. Insert Pivot Shaft Straight Bushing (A11) into the Body (A01) at the other end.
12. Insert Pivot Shaft Seal (A17) and Pivot Shaft Cover Seal (A18) in their respective grooves.
13. Insert Pivot Shaft Seal Retainer (A37) on Pivot Shaft Cover (A15) and install on both ends of Pivot Shaft (A13). Screw on Pivot Shaft Cover Bolts (A16).
14. Install Cover Seal (A03) and Cover (A02), then fasten with Cover Bolts (A04).
15. **CVS-6000/6000A-LW and -CLW valves only:**
  - a. Insert Counterweight arm key (if provided) on Pivot Shaft (A13) and slip Counterweight Arm Assembly in place. Set arm at an angle approximately 25° - 30° below horizontal axis and secure with Lever Arm Bolts (B55) and Lever Arm Bolt Nuts (B56). (See my comments on page 6) Install Counterweight (B29) at desired setting and secure with set screws (B36).
  - b. Insert spring lever arm key (if provided) on Pivot Shaft (A13) and slip Spring Arm (B28) in place. Reconnect Spring (B59) to Spring Arm (B28).

## Operation

The flow from the pump opens the Disc. If the valve is equipped with Lever & Weight, the Counterweight Arm Assembly raises. If the valve is equipped with a Lever & Spring, the spring is extended by the rising Spring Lever Arm.

When the pump is shut off, the decreased flow allows gravity to close the Disc toward the Body Seat Ring. For valves equipped with Lever & Weight, the Counterweight causes the Disc to close faster or slower depending on its position along the Counterweight Arm Assembly. For valves equipped with a Lever & Spring, the stored energy in the extended Spring accelerates disc closure in addition to the weight of the disc.

System static pressure downstream of the check valve keeps the Disc and Disc Seat closed and seated against the Body Seat Ring.

### Closing Hard Versus Slamming:

- Counterweight position or Spring tension control the speed of valve closure. It is ideal to close the valve when or slightly before flow in the pipe reverses.
- If the Counterweight is adjusted too far out on the lever or if the Spring is too tight, the check valve can close hard and cause stress to valve components. *This is not considered slamming.* See “Closing Speed Adjustment”.
- If the Counterweight or Spring is adjusted to its maximum position and the valve still cannot close before the flow reverses, the valve will slam. In that case, Oil Control (CVS-6000-BMB or CVS-6000-OC) will be required.

---

### **NOTICE**

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

---

## Start-up Procedure

### CVS-6000/6000A-LW and -CLW valves:

1. Position Counterweight(s) (B29) midway on the Counterweight Arm (B28).
2. Set lever arm 25°-30° below horizontal
3. 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.
4. Start and stop pump and observe rate of closing.
5. Adjust Counterweight(s) (B29). See “Closing Speed Adjustment”.
6. During this sequence of pump start and stops, gradually open the downstream isolation valve until it is full open.
7. Repeat steps 4 through 6 as necessary until satisfactory performance is achieved.
8. If satisfactory performance cannot be achieved after making these adjustments, contact the DeZURIK Representative or Field Service for assistance.



**CVS-6000/6000A-LS and -CLS valves:**

1. Adjust Spring by turning Nut (B63)
2. Set Counterweight Arm (B28) 25°-30° below horizontal
3. 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.
4. Start and stop pump and observe rate of closing.
5. Adjust Spring (B59). See "Closing Speed Adjustment".
6. During this sequence of pump start and stops, gradually open the downstream isolation valve until it is full open.
7. Repeat steps 4 through 6 as necessary until satisfactory performance is achieved.
8. If satisfactory performance cannot be achieved after making these adjustments, contact the DeZURIK Representative or Field Service for assistance.

## **Closing Speed Adjustment**

It is ideal to close the valve when or slightly before flow in the pipe reverses. Testing must be conducted carefully and adjustments made in small increments

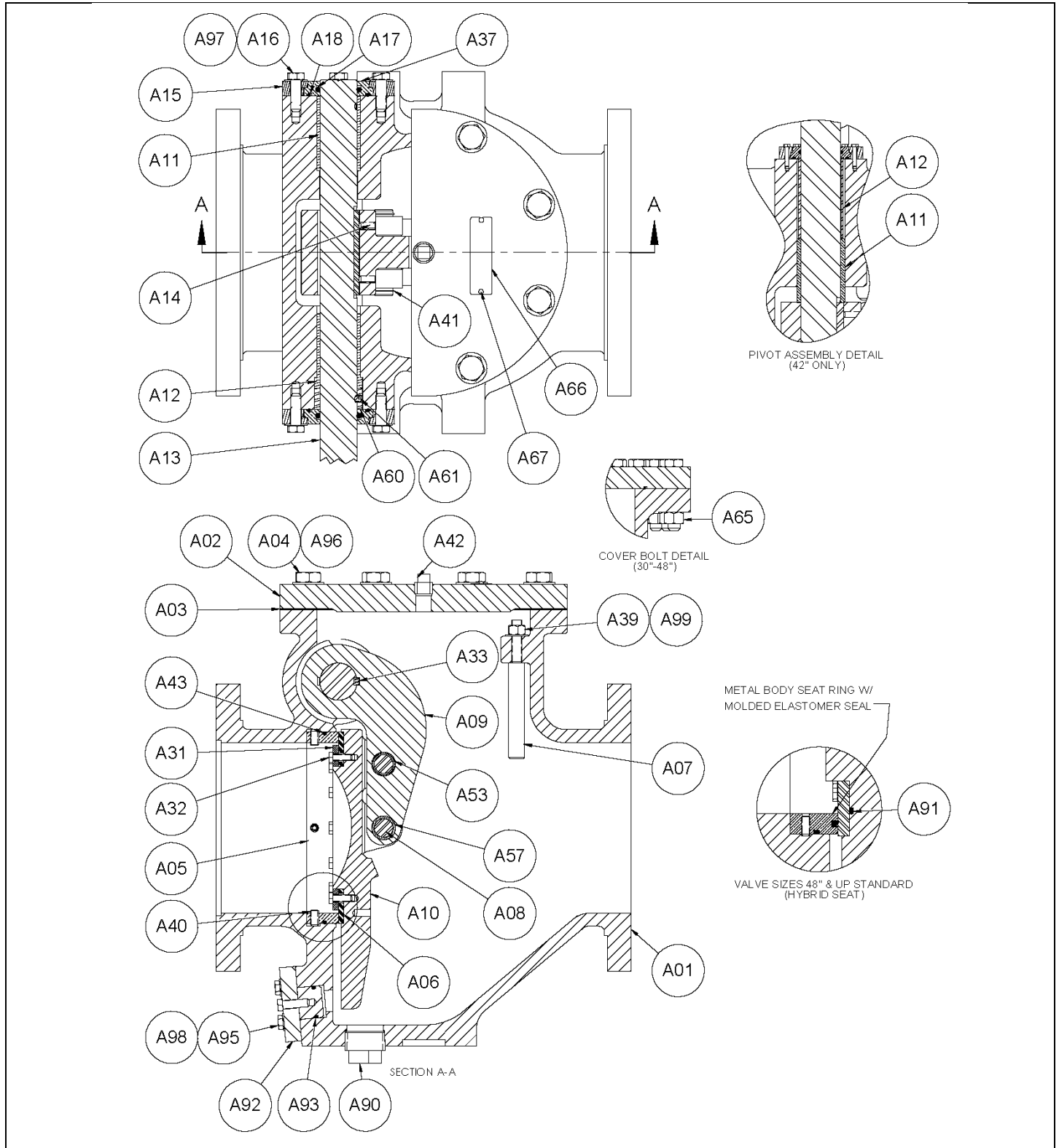
**CVS-6000/6000A-LW and -CLW**

- Faster Disc closing - Move Counterweight(s) (B29) away from the Pivot Shaft (A13).
- Slower Disc closing – Move Counterweight(s) (B29) toward Pivot Shaft (A13).

**CVS-6000/6000A-LS and -CLS**

- Faster Disc Closing – Turn Nut (B63) clockwise
- Slower Disc Closing – Turn Nut (B63) counterclockwise

**Drawings** (Body Assembly)



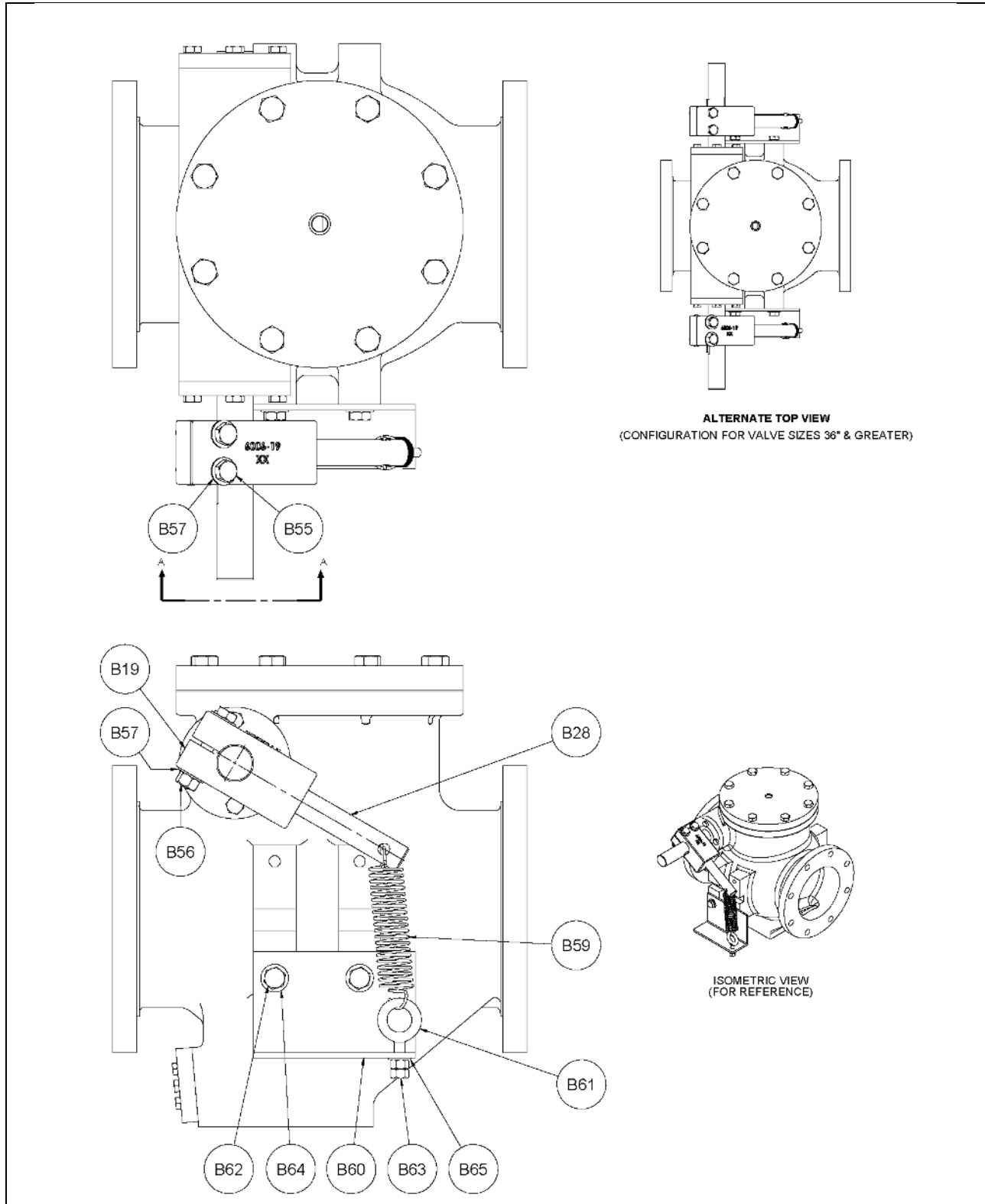
**Table 1-1** (Figure 1 Parts Identification)

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 ASSEMBLY NOT INCLUDED FOR VALVES WITH BMB CLOSURE CONTROL
2. VALVE SIZES 2-3", 16-54" & 66" HAVE A SINGLE PIECE, WELDED PIVOT SHAFT ASSEMBLY
3. CPC SMARTCHECK VALVE IS ONLY AVAILABLE IN SIZES 4-20"

**Drawings** (Lever & Spring)

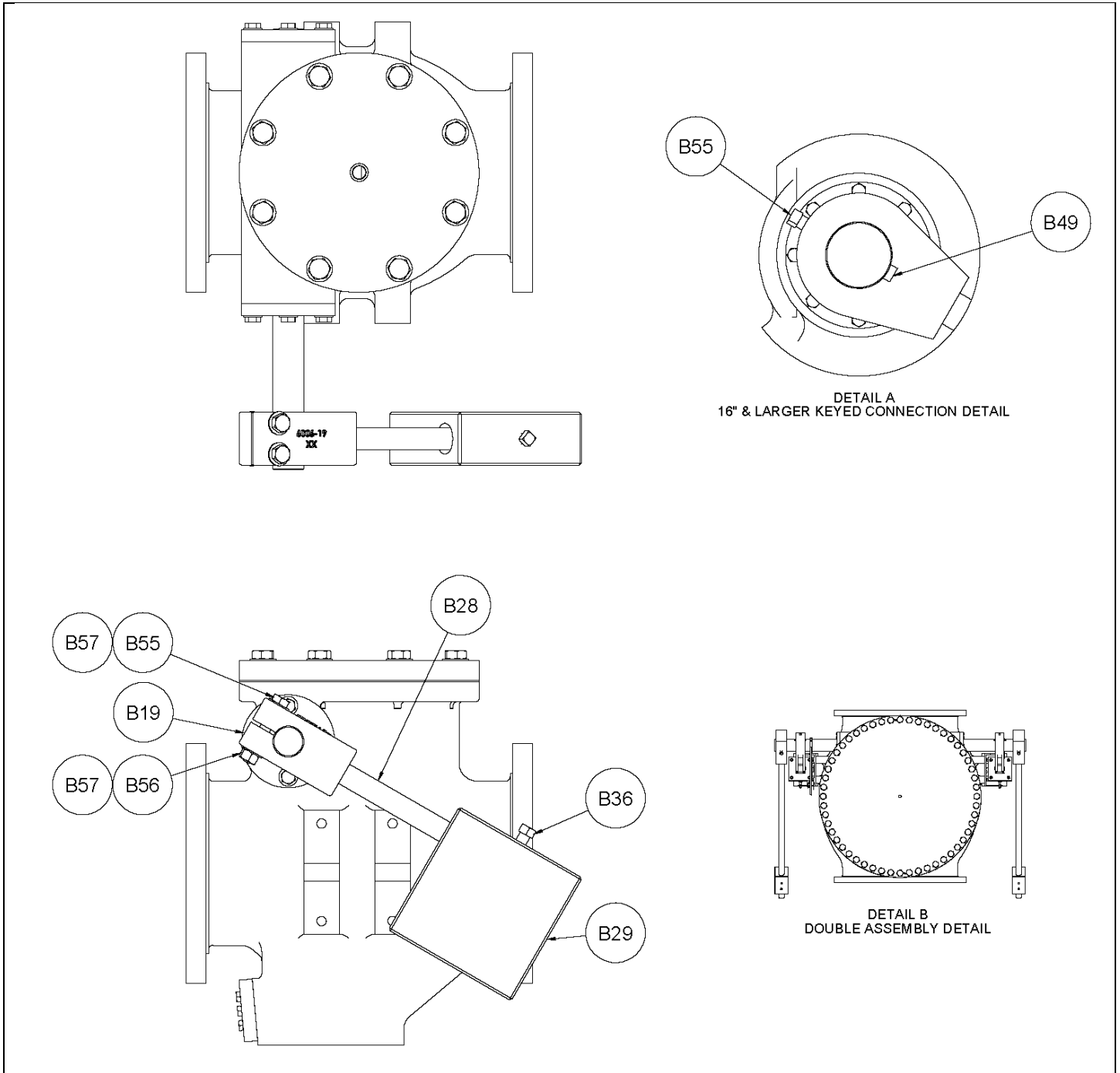


**Figure 2 – CVS-6000/6000A-LS and -CLS Swing Check Valve with Lever and Spring**

**Table 2-1** *(Figure 2 Parts Identification)*

B19	LEVER ARM
B28	SPRING ARM
B49	SPRING LEVER ARM KEY
B55	SPRING LEVER ARM BOLT (2.5-14") / SET SCREW (16-66")
B56	SPRING LEVER ARM NUT
B57	WASHER
B59	SPRING
B60	SPRING BRACKET
B61	EYE BOLT
B62	SPRING BRACKET BOLT
B63	EYE BOLT RETAINING NUT
B64	WASHER
B65	WASHER

**Drawings** (Lever & Weight)



**Figure 3 - CVS-6000/6000A-LW and -CLW Swing Check Valve with Lever and Weight**

**Table 3-1** *(Figure 3 Parts Identification)*

B19	COUNTERWEIGHT LEVER ARM
B28	COUNTERWEIGHT ARM
B29	COUNTERWEIGHT
B36	COUNTERWEIGHT SET SCREW
B49	LEVER ARM KEY
B55	LEVER ARM BOLT (2-14") / SET SCREW (16"-66")
B56	LEVER ARM NUT
B57	COUNTERWEIGHT LEVER ARM WASHER

## 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.
	Miss-alignment or damage to field piping and supports.	Adjust miss-alignment 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.



## Limited Warranty

DeZURIK, Inc. ("Seller") manufactured products, auxiliaries and parts thereof that we manufacture for a period of twenty-four (24) months from date of shipment from Seller's factory, are warranted to the original purchaser only against defective workmanship and material, but only if properly stored, installed, operated, and serviced in accordance with Seller's recommendations and instructions.

For items proven to be defective within the warranty period, your exclusive remedy under this limited warranty is repair or replacement of the defective item, at Seller's option, FCA Incoterms 2020 Seller's facility with removal, transportation, and installation at your cost.

Products or parts manufactured by others but furnished by Seller are not covered by this limited warranty. Seller may provide repair or replacement for other's products or parts only to the extent provided in and honored by the original manufacturer's warranty to Seller, in each case subject to the limitations contained in the original manufacturer's warranty.

No claim for transportation, labor, or special or consequential damages or any other loss, cost or damage is being provided in this limited warranty. You shall be solely responsible for determining suitability for use and in no event shall Seller be liable in this respect.

This limited warranty does not warrant that any Seller product or part is resistant to corrosion, erosion, abrasion or other sources of failure, nor does Seller warrant a minimum length of service.

Your failure to give written notice to us of any alleged defect under this warranty within twenty (20) days of its discovery, or attempts by someone other than Seller or its authorized representatives to remedy the alleged defects therein, or failure to return product or parts for repair or replacement as herein provided, or failure to store, install, or operate said products and parts according to the recommendations and instructions furnished by Seller shall be a waiver by you of all rights under this limited warranty.

This limited warranty is voided by any misuse, modification, abuse or alteration of Seller's product or part, accident, fire, flood or other Act of God, or your failure to pay entire contract price when due.

The foregoing limited warranty shall be null and void if, after shipment from our factory, the item is modified in any way or a component of another manufacturer, such as but not limited to; an actuator is attached to the item by anyone other than a Seller factory authorized service personnel.

All orders accepted shall be deemed accepted subject to this limited warranty, which shall be exclusive of any other or previous warranty, and this shall be the only effective guarantee or warranty binding on Seller, despite anything to the contrary contained in the purchase order or represented by any agent or employee of Seller in writing or otherwise, notwithstanding, including but not limited to implied warranties.

THE FOREGOING REPAIR AND REPLACEMENT LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, OBLIGATIONS AND LIABILITIES, INCLUDING, BUT NOT LIMITED TO, ALL WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR OF MERCHANTABILITY OR OTHERWISE, EXPRESSED OR IMPLIED IN FACT OR BY LAW, AND STATE SELLER'S ENTIRE AND EXCLUSIVE LIABILITY AND YOUR EXCLUSIVE REMEDY FOR ANY CLAIM IN CONNECTION WITH THE SALE AND FURNISHING OF SERVICES, GOODS OR PARTS, THEIR DESIGN, SUITABILITY FOR USE, INSTALLATION OR OPERATIONS. NEITHER ANY PERFORMANCE OR OTHER CONDUCT, NOR ANY ORAL OR WRITTEN INFORMATION, STATEMENT, OR ADVICE PREPARED BY SELLER OR ANY OF OUR EMPLOYEES OR AGENTS WILL CREATE A WARRANTY, OR IN ANY WAY INCREASE THE SCOPE OR DURATION OF THE LIMITED WARRANTY.

## Disclaimer

Metric fasteners should not be used with ASME Class 150/300 bolt holes and flange bolt patterns. If you use metric fasteners with ASME Class 150/300 bolt holes and flange bolt patterns, it may lead to product failure, injury, and loss of life. DeZURIK Inc. disclaims all liability associated with the use of metric fasteners with ASME Class 150/300 bolt holes and flange patterns, including but not limited to personal injury, loss of life, loss of product, production time, equipment, property damage, lost profits, consequential damages of any kind and environment damage and/or cleanup. Use of metric fasteners with ASME Class 150/300 bolt holes and flange bolt patterns is a misuse that voids all warranties and contractual assurances. If you use metric fasteners with ASME Class 150/300 bolt holes and flange bolt patterns, you do so at your sole risk and any liability associated with such use shall not be the responsibility of DeZURIK, Inc. In addition to the foregoing, DeZURIK's Manufacturer's Conditions apply.

## Limitation of Liability

IN NO EVENT SHALL SELLER BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, PUNITIVE, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO; DAMAGE TO OR LOSS OF OTHER PROPERTY OR EQUIPMENT, BUSINESS INTERRUPTION, COST OF SUBSTITUTE PRODUCTS, LOSS OF TIME, LOSS OF PROFITS OR REVENUE, COST OF CAPITAL, LOSS OF USE, OR DIMINUTION IN VALUE) WHATSOEVER, AND SELLER'S LIABILITY, UNDER NO CIRCUMSTANCES, WILL EXCEED THE CONTRACT PRICE FOR THE GOODS AND/OR SERVICES FOR WHICH LIABILITY IS CLAIMED. ANY ACTION FOR BREACH OF CONTRACT BY YOU, OTHER THAN RIGHTS RESPECTING OUR LIMITED WARRANTY DESCRIBED ABOVE, MUST BE COMMENCED WITHIN 12 MONTHS AFTER THE DATE OF SALE.

## Sales and Service

For information about our worldwide locations, approvals, certifications and local representative:

Web site: [www.dezurik.com](http://www.dezurik.com) E-Mail: [info@dezurik.com](mailto:info@dezurik.com)



250 Riverside Ave. N., Sartell, MN 56377 • Phone: 320-259-2000 • Fax: 320-259-2227

*DeZURIK, Inc. reserves the right to incorporate our latest design and material changes without notice or obligation.*

*Design features, materials of construction and dimensional data, as described in this manual, are provided for your information only and should not be relied upon unless confirmed in writing by DeZURIK, Inc. Certified drawings are available upon request.*