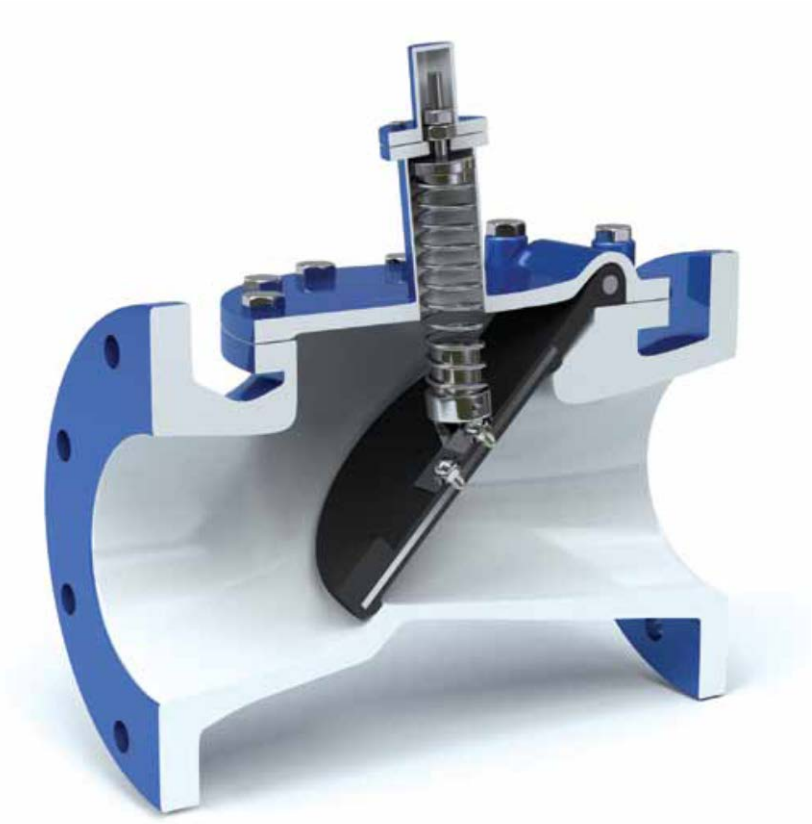
APCO CRF-100, 100SA, 100SR
RUBBER FLAPPER SWING CHECK VALVES



Instruction D12007
May 2017

DeZURIK | APCO | HILTON | WILLAMETTE

Instructions

These instructions provide installation, operation and maintenance information for APCO CRF Rubber Flapper Swing Check Valves. They are for use by personnel who are responsible for installation, operation and maintenance of APCO CRF Rubber Flapper Swing Check Valves.

Safety Messages

All safety messages in the instructions are flagged with an exclamation symbol and the word Caution, Warning or Danger. These messages indicate procedures that must be followed exactly to avoid equipment damage, personal injury or death. Safety label(s) on the product indicate hazards that can cause equipment damage, personal injury or death.

Safety label(s) on the product indicate hazards that can cause equipment damage, personal 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 APCO CRF Rubber Flapper Swing Check Valve has been packaged to provide protection during shipment; however, it 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

Recommended spare parts are listed on the assembly drawing. These parts should be stocked to minimize downtime. Order parts from your local DeZURIK sales representative, or directly from DeZURIK. When ordering parts please choose from the following:

If the valve has a DeZURIK APCO nameplate please include the 7-digit part number and 4-digit revision number (example: 9999999R000) located on the data plate 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 nameplate visible on the valve, please include Valve Model number, the part name, and item number from the assembly drawing. You may contact your local DeZURIK APCO 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.

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Description

A rubber flapper swing check valve consists of a valve body, a cover, and a flapper that is connected to the body and cover. The flapper 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. They can be equipped with optional adjustable spring assist, spring return or bottom mounted buffer attachments.

Handling and Storage

Lifting the valve improperly may damage it. Do not fasten lifting devices to the actuator 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 equipment 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

The APCO CRF Rubber Flapper Swing Check Valve may be installed in either horizontal or vertical position (with the flow upward). The embossed flow arrow on the valve body must be pointing in the direction of flow. Valves with Bottom Mounted Buffer, the oil tanks **(27)** and **(32)** of **Figure 2** must always be in upright position. Unless otherwise specified, the valves are shipped for horizontal installation.

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

CAUTION!

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 and minimum of four stages.

Fusion/Powder Coated Valves

CAUTION!

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

Maintenance

The CRF Rubber Flapper Swing Check Valve does not require routine maintenance, but should be included as part of the normal facility equipment inspections for any malfunction while under normal usage conditions. An inspection can be quickly performed as follows:

WARNING!

Servicing the valve while the pipeline is under pressure can cause personal injury or equipment damage. Relieve pipeline pressure before servicing the valve.

1. Relieve the pressure in the pipeline.
2. Isolate the Rubber Flapper Check Valve from system **before loosening** the Cover Bolts (4) to remove the Cover (2).
3. Loosen each cover bolt only three full turns, then tap the side of the cover with a mallet to separate only the valve cover from the Cover Gasket (3), this will relieve any pressure in the valve.
4. Continue loosening to remove all cover bolts and lift off the cover. After removing the cover, the Flapper (10) will be fully exposed and freely removed. At this point, the flapper and body surfaces should be examined for wear.

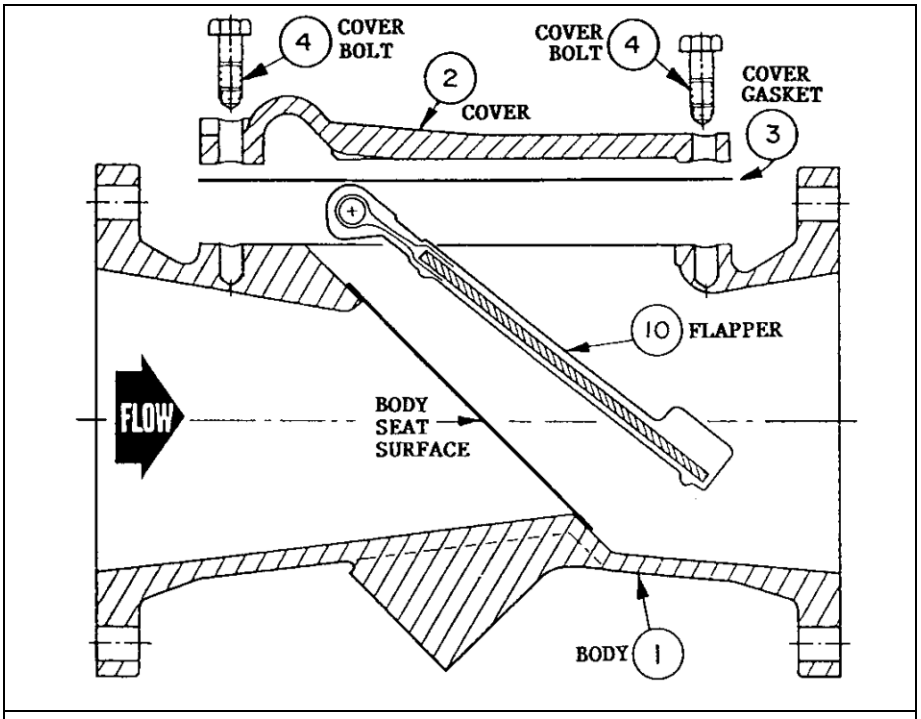


Figure 1- Flapper Swing Check Valve Disassembly

5. To reassemble, replace Cover Gasket (3), often the same cover gasket can be reused several times.
6. Replace flapper and be sure it rests flat and centered against the body seat surfaces.

Maintenance *(Continued)*

7. Carefully replace cover over the flapper so as not to move the flapper from its seating position, then replace cover bolts and tighten lightly while alternating the tightening of each cover bolt 180° apart to prevent tilting the cover.
8. Slowly open discharge isolation valve to pressurize rubber flapper check valve and observe the cover gasket (3) joint is not leaking.

   Note: Cover Gasket is not used on rubber lined valves.

Operation

The flow from the pump opens the flapper. When the pump is shut off, backflow pressure (and Spring Assist or Spring Return if equipped) pushes the flapper to close against the body seat surface. If the valve is equipped with a Bottom Mounted Buffer, as the disc is closing, the flapper closes freely for the majority of its travel from full open to close. When the flapper is about 90% closed, it comes in contact with the Buffer Rod (33) which controls the speed of closing for the last 10% of flapper travel. See Figure 2. This type of control provides for proper adjustment to suit the best performance for the installation, and can minimize pipeline surge and water hammer.

The bottom mounted buffer assembly (figure 2) utilizes two air over oil tanks, an accumulator (32) and an oil reservoir (27). The accumulator is pressurized to allow the buffer to fully extend by counteracting the pressure in the pipeline. The oil reservoir is vented to atmosphere and its main function is to lubricate the piston and the cylinder.

Start-up Procedure (Bottom Mounted Buffer)

1. Remove the pipe plug from the top of the oil reservoir and replace it with the air breather cap that is supplied with the valve (it is normally taped to the tank or oil piping).
2. Check for proper oil levels. Make sure both oil tanks are in vertical position.
   a. **Hydro-pneumatic Tank Accumulator (32)** - 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 (27)** - The oil 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.”
3. Make initial adjustments to the following speed controls:
   - Flow Control Valve **(41)** = 3 turns open. See “Adjustment of Flow Control Valve”
   - Internal Cushion Needle Valve = 1-1/2 turns open. See “Operation of Internal Cushion.”
   - Fully open Flow Control Valve (41A) that is connected to the oil reservoir.
4. Pressurize Hydro-pneumatic tank to a pressure according to the formula:

$$\text{Tank pressure} = \frac{\text{Line pressure}}{4} + 5 \text{ psi}$$

Operation *(Continued)*

5. Start pump. While valve is opening, visually ascertain that buffer rod fully extends into the valve body. If not, pressurize hydro-pneumatic tank until it does. The chart below shows the maximum stroke length of the buffer rod for the following sizes:

Valve size	4”	6”	8”	10”	12”	14”	16”	18”	20”	24”	30”	36”	42”	48”
Buffer Rod Stroke	1-1/2			1-5/8		1-3/4					Contact DeZURIK			

6. Shut-off pump and observe rate of closing. Based on this initial run, make necessary adjustments to the flow control valve and/or the internal cushion needle valve until satisfactory closing is achieved.

A split collar is mounted on the buffer rod to lock it in place when it is necessary to disconnect the cylinder for repairs while the pump is running. In very rare cases however, it can be used to shorten the buffer rod stroke when the system demands higher percentage of free fall closing of the flapper.

The Rubber Flapper Check Valve with bottom mounted buffer has two controlling stages in the closing cycle. The flow control valve controls the first stage of flapper closure and the secondary control is the internal cushion needle valve which controls the remaining 20% of the buffer stroke.

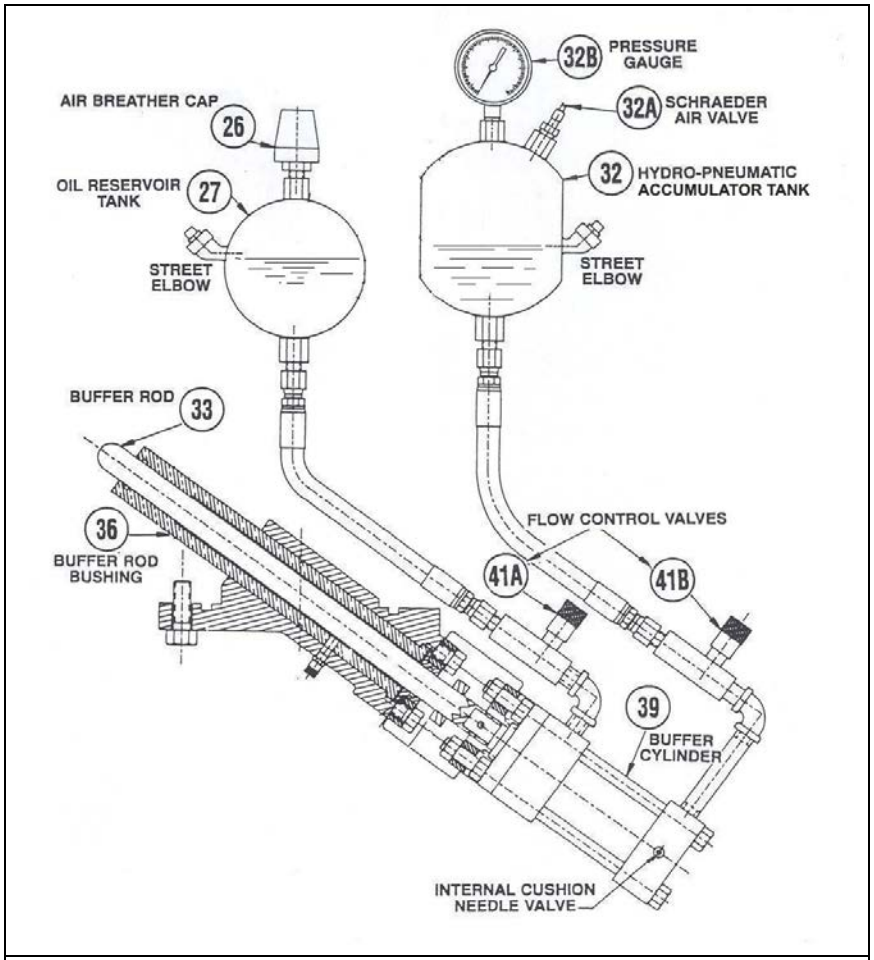


Figure 2 – Bottom Mounted Buffer Assembly

Oil Filling Procedure

Recommended Oils: Motor oil SAE 20, Mobil DTE 24, Castrol Hyspin AW 32.

Step 1: Hydro-pneumatic accumulator tank **(32)**

1. Shut down pump.
2. Release pressure of hydro-pneumatic tank and remove pipe plug located on the side of the tank and also either the Pressure Gauge **(32B)** or Air Valve **(32A)**.
3. Fully open Flow Control Valve **(41B)** and slowly fill cylinder with oil until it spills out of the side port. This is the oil fill level.
4. Replace both fittings and pressurize tank according to the formula;

$$\text{Tank pressure} = \frac{\text{Line pressure}}{4} + 5 \text{ psi}$$

5. Set flow control valve three turns counterclockwise from fully closed position.
6. Start pump and observe if buffer rod extends. If not, while valve is still open add more pressure in increments of 5 psi until rod fully extends.

Step 2: Oil Reservoir **(27)**

1. Start pump.
2. Remove side plug and Breather Cap **(26)** and slowly fill with oil until it spills out of the side port. This is the oil fill level.
3. Replace both fittings.
4. Shut down pump.

Maintenance (Bottom Mounted Buffer)

The Rubber Flapper Check Valve is shipped from the factory fully lubricated and oil tanks filled with oil to their proper levels ready for installation. It requires a very minimal amount of preventive maintenance.

Special care should be taken to the exposed area of the buffer rod when painting the valve. It should be fully masked to prevent even a small amount of paint to from getting on the buffer rod which could damage the cylinder rod seal and cause the cylinder to leak.

A periodic (approximately 6 months) lubrication of the exposed area of the buffer rod is required to keep the Rubber Flapper Check Valve in good operating condition. Recommended Grease: White water proof, FDA approved LUBRIPLATE or equal.

Adjustment of Flow Control Valve

The Flow Control Valve has a micrometer type adjustment, which incorporates a color coded reference scale to simplify setting, resetting and adjusting.

A lock nut is provided for locking the valve setting. Turning the knob clockwise closes the valve and turning counterclockwise opens the valve and increases rate of closure of the Rubber Flapper Check Valve. See Figure 3.

Adjustment of Flow Control Valve *(Continued)*

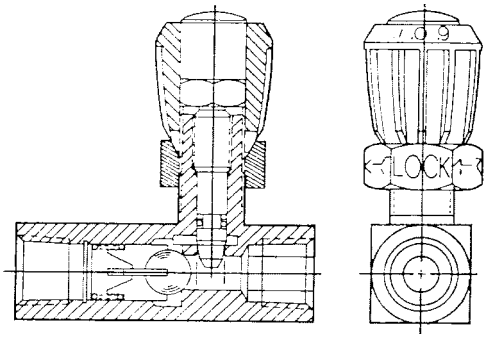


Figure 3 - Flow Control Valve

Operation of Internal Cushion

As illustrated below, the cushioning of a hydraulic cylinder stroke is obtained by trapping the exhaust fluid as the piston assembly nears the end of its stroke. In Figure 4, as the Cushion Plunger (1) enters Cushion Cavity (2), the exhaust fluid is almost completely trapped by the Ball Check (3) and Adjusting Screw (4) creating a back pressure against piston assembly. The back pressure cushions and slows the final part of the piston stroke thus, reducing the high impact hammering of the Piston Assembly against the Cylinder Cap.

Turning the Adjusting Screw to allow more or less fluid to escape regulates the degree of cushioning as desired.

In Figure 5, when pressurized fluid enters the Cylinder Cap End to strike the Piston Assembly in the opposite direction, the pressure fluid moves the Ball Check (3) off its seat, opening the passage for more fluid to act against the Piston, thus speeding its start-up movement as the Cushion Plunger (1) is immediately forced out of its cavity (2).

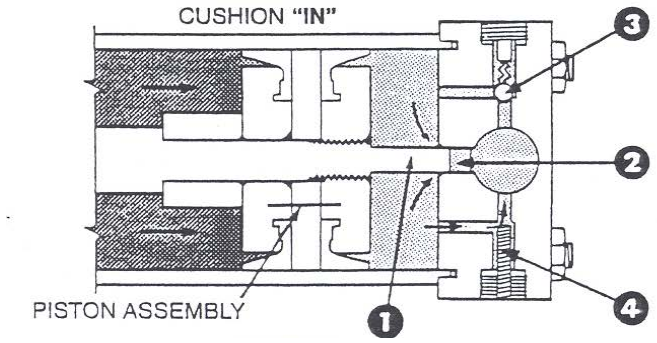


Figure 4 - Cushion "IN" Stroke

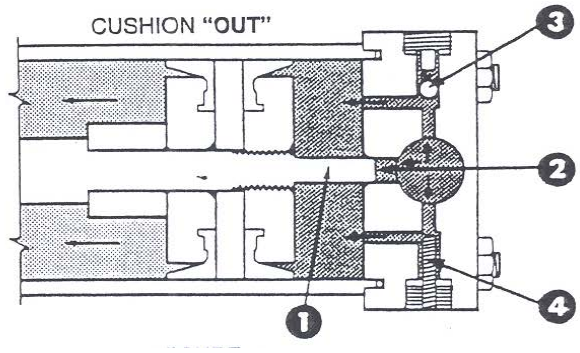


Figure 5 - Cushion "OUT" Stroke

Spring Return Attachment Option

The Series 100SR is designed to minimize or eliminate slam in high head applications where rapid flow reversal causes standard swing check valves to slam. This valve has a 35° disc stroke as compared to conventional style swing check valves, which typically have between 80° to 90° disc travel. Adding a spring return feature causes the disc to speed up or accelerate valve closure. Having the valve closed before reverse flow occurs can in many instances drastically reduce or even eliminate valve slam.

Note: Pump does not require shutdown or to be depressurized to make spring adjustments.

Adjustment of Closing Speed (to minimize slam)

To Increase Closing Speed:

Remove Spring Cover (54), See Figure 6.

1. Loosen Adjusting Screw Lock Nut (58), and then turn Spring Adjusting Screw (57) clockwise. This will increase the compressive load on the spring (63), as well as apply more pressure on the flapper to cause it to close faster and reduce slam.
2. Lock the Adjusting Screw with the Lock Nut when desired setting has been reached.

To Decrease Closing Speed: (Minimize head loss and increase flow rate)

1. Remove Spring Cover (54), see figure 6.
2. Loosen Adjusting Screw Lock Nut (58), and then turn Spring Adjusting Screw (57) counterclockwise. This will decrease the pressure of the flapper-hence, minimize head loss and increase flow rate.
3. Lock the Adjusting Screw with the Lock Nut when desired setting has been reached.

Maintenance (Spring Return)

There are very few moving parts in this valve – a spring adjusting mechanism where all components are made of stainless steel, and a rubber flapper. This valve requires virtually little or no maintenance.

For periodic inspection of the rubber flapper and the body seat surface, the following procedures may be taken: Refer to Figure 6 for details and parts.

WARNING!

Servicing the valve while the pipeline is under pressure can cause personal injury or equipment damage. Relieve pipeline pressure before servicing the valve.

1. Relieve the pressure in the pipeline.
2. Isolate the Rubber Flapper Check Valve from system **before loosening** the Cover Bolts (4) to remove the Cover (2).
3. Loosen each cover bolt only three full turns, then tap the side of the cover with a mallet to separate only the valve cover from the Cover Gasket (3), this will relieve any pressure in the valve.
4. Continue loosening to remove all cover bolts and lift off the cover. After removing the cover, the Flapper (10) will be fully exposed and freely removed. At this point, the flapper and body surfaces should be examined for wear.

Maintenance-Spring Return *(Continued)*

Disassembly Procedure:

1. Isolate the Rubber Flapper Valve from the system, and then relieve pressure on the discharge side of the valve by loosening the cover bolts (4) and (5) approximately three full turns.
2. Completely unscrew all cover bolts and lift off Cover (2) including the spring mechanism assembly. This will disconnect the Spring (63) from the Lower Spring Guide (51).
3. Remove Rubber Flapper (10) and check for cracks and tears and inspect body seat surface for wear.

Assembly Procedure:

1. Replace Cover Gasket (3) if necessary.
2. Replace Rubber Flapper (10) and make certain it rests flat and centered against the body seat surfaces.
3. Install Spring (63) over Lower Spring Guide (51).
4. Carefully replace Cover (2) over Flapper (10) making sure not to move Flapper from its seating position.
5. Replace cover bolts (4) and (5) and tighten alternately opposite each other in rotation.

Drawings

NO	DESCRIPTION
1	Body
2	Cover
3	Gasket (except Series 100R Valves)
4	Cover Bolt
5	Cover Bolt
10	Rubber Flapper
10A	Flapper Plug Screw
10C	Plug Screw Nut
51	Lower Spring Guide
53	Upper Spring Guide
54	Spring Cover
55	Pivot
56	Spring Bracket
57	Spring Adjusting Screw
58	Adjusting Screw Lock Nut
59	Thread Seal Washer
61	Adjusting Screw Bushing
63	Spring
64	Pin Retainer

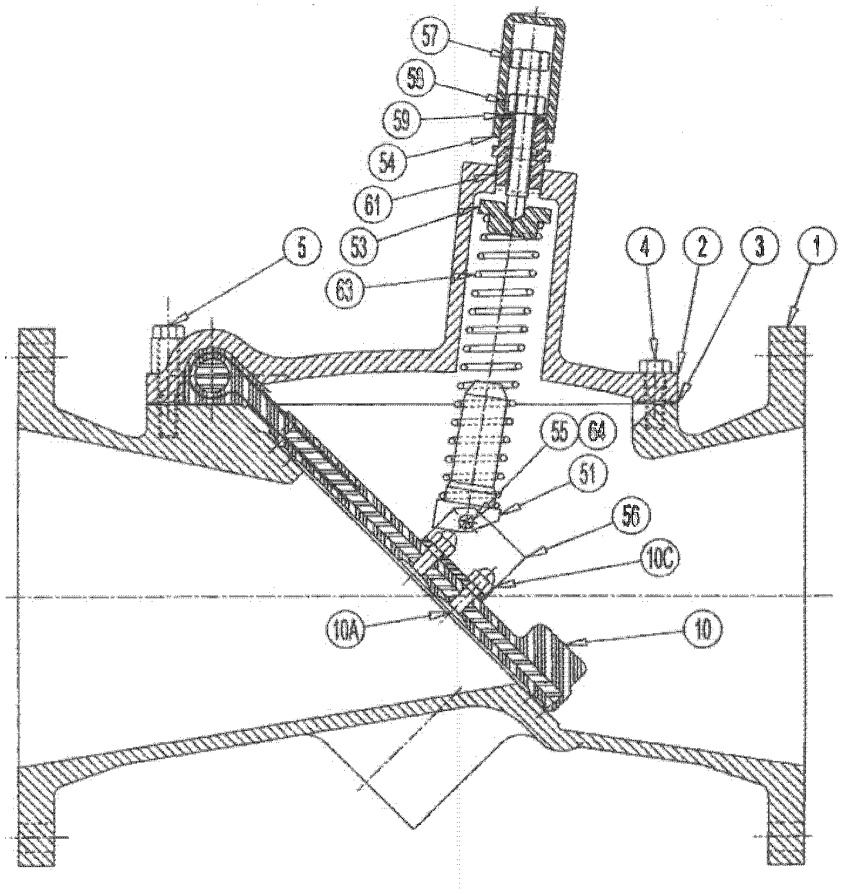


Figure 6 – Spring Return Attachment

Troubleshooting

Condition	Possible Cause	Corrective Action
Cover leaks.	Cover gasket is damaged.	Replace cover gasket.
Valve leaks excessively from one side of the flapper to the other.	Foreign matter caught between flapper and seat.	Fully open valve to remove object.
	Flapper is worn or damaged.	Replace flapper.
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.

Guarantee

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

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