

Tilting Disc Check Valve



Operation and Maintenance Manual

Job Name: _____

Contractor: _____

Date: _____

Tilting Disc Check Valve

SAFETY MESSAGES

All safety messages in the instructions are flagged with an exclamation symbol and the word “Warning”. These messages indicate procedures that must be followed exactly to avoid equipment damage, physical injury, or death. Safety labels on the product indicate hazards that can cause equipment damage, physical injury, or death.



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.

PARTS

Order parts from your local Henry Pratt sales representative or directly from Henry Pratt Company. When ordering parts, please include the serial number located on the valve tag.

WARRANTY ISSUE

Seller warrants that, at its option, it will repair, replace, or refund the unit purchase price of any products which are non-conforming due to Seller’s material or workmanship during the warranty period. The warranty period shall be twelve (12) months for parts and eighteen (18) months for all other goods after date of shipment. This shall be Buyer’s sole remedy. In order to maintain this product warranty, Buyer must give written notice to Seller’s Field Service Supervisor prior to any work being performed.

IN CONSIDERATION OF THE FOREGOING, SELLER EXCLUDES ALL OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Seller does not warrant water operated metallic cylinders against damage caused by corrosion, electrolysis or mineral deposits. In no event shall warranty include valve removal or reinstallation.

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Tilting Disc Check Valve

FUNCTIONAL DESCRIPTION

The Pratt Tilting Disc Check valve is designed to open after pump start and allow water to flow through the pipeline or water main with minimal headloss. A top mounted oil dashpot may be included to control the opening and closing of the valve. The valve size, cold working pressure, and sales order number are stamped on the nameplate for reference.

DESCRIPTION OF OPERATION

The Tilted Disc Check Valve consists of two body sections bolted together along a 55 degree diagonal flange. The field replaceable body seat ring is located between these two body halves. The downstream body section contains two pivot pins from which a disc, containing the field replaceable disc seat ring pivots 40 degrees from the closed to the fully open position.

Upon pump start up, the disc will pivot about the disc pins and open relative to the volume of flow through the valve. Full flow through the valve will make the disc open to the point where the disc will make contact with the integral body stops. The partially balanced disc assists in opening the disc and stabilizes the disc in low flow cases where the valve remains partially open.

On pump shutdown, the forward velocity of the water starts to diminish, until the disc is no longer held against the body stops, or in some intermediate position, and the partially balanced disc will move to the closed position. When the forward velocity reaches zero, the disc will have moved to the closed position and the reversal of flow is checked.

APPLICATION PARAMETERS

Due to the unbalanced weight distribution of the disc about the pivot point, this causes the disc to naturally fall into its closed position. This is true for all swinging style check valves. When flow through the valve occurs, the minimal pressure differential will cause the disc to open. However, in some applications there will be conditions that may not be suitable for the swing check valve. These conditions are typically found in applications where a combination of low downstream pipeline pressure, combined with low flow velocities will cause disc flutter to occur. Uncontrolled disc flutter will prematurely wear the valves pivot pins or bushings, if operating conditions do not improve. To eliminate any disc flutter, the addition of an upper dashpot on a tilted disc check valve will eliminate disc flutter and allow the use of this type of check valve where most other checks will prematurely fail. The fringe conditions that require an upper dashpot are when flow velocities fall below 5 feet per second and pressure differential across the disc is 25 psi or less. Also when space constraints do not permit multiple pipe diameters upstream and downstream, as required with other types of swing checks the upper dashpot will eliminate any disc flutter as a result of turbulent flow conditions. See Flow Chart for head loss characteristics and flow velocities.

Tilting Disc Check Valve

VALVE CONSTRUCTION

The Pratt Tilting Disc Check Valve is ruggedly constructed of cast ductile iron. (See the specific submittal drawing for the Materials List submitted for the order).

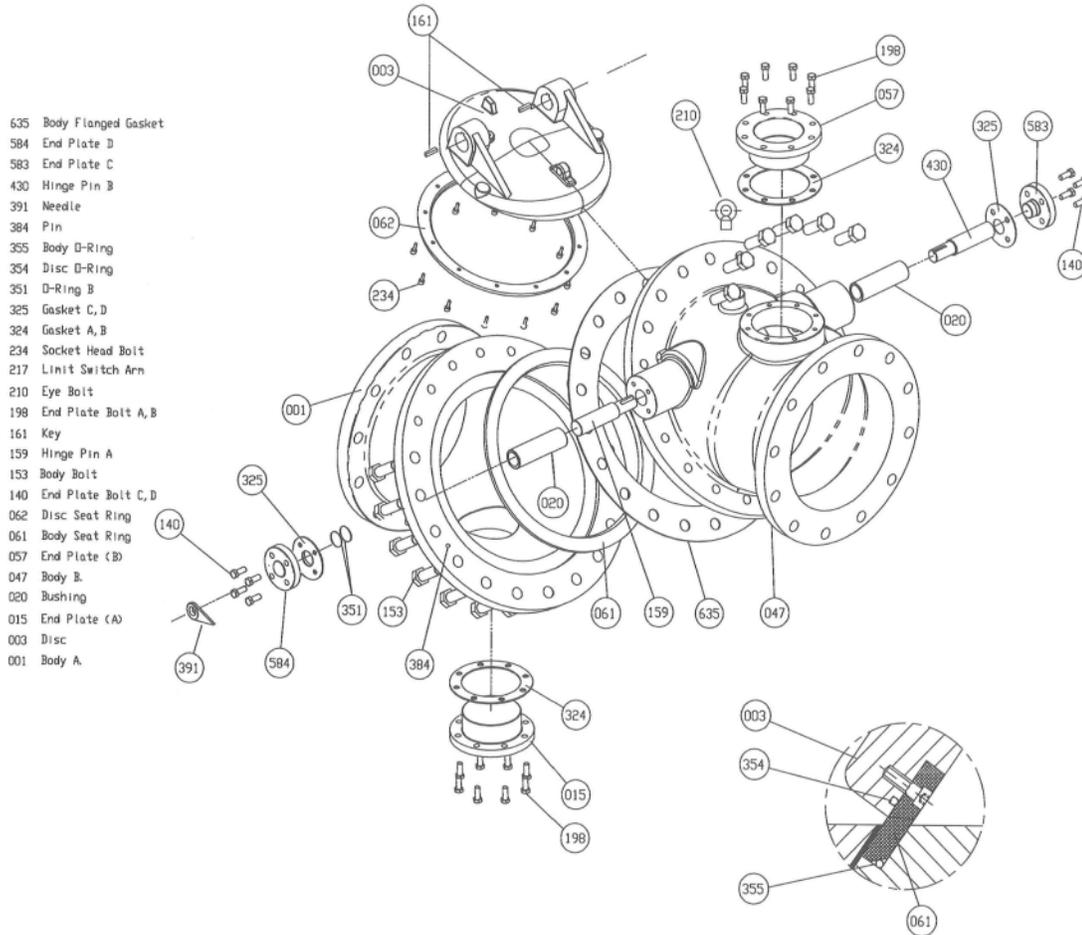


Figure 1 – Exploded View of Tilting Disc Dashpot

The body is flanged to connect to a pipe flange. The body consists of a pivot body half (047) and a seat pivot half (001). The seat (061) is held in place by the two body halves. Top and bottom inspection hole covers (015 and 057) are provided for servicing the valves or to allow installation of an upper dashpot by replacing hole cover 057.

Tilting Disc Check Valve



WARNING

CAUTION: Do not remove the inspection covers while the pipeline is under pressure or the cover may release pressure suddenly.



WARNING

CAUTION: Removal of inspection covers without draining the pipeline and valve may cause serious injury.

Tilting Disc Check Valve

INSTALLATION

RECEIVING AND STORAGE

Uncrate and inspect valves upon receipt for damage during shipment. Do not drop valve when unloading from carrier or installing into pipeline. When lifting, the valve should be lifted with straps or bolts in the flange holes or at the lifting eye. The valve should never be lifted by any part of the dashpot assembly.

The valves should remain crated, clean and dry until installed to prevent weather related damage. For long-term storage greater than six months, the valves should be stored indoors or the ends of the valve should be sealed with plastic wrap to prevent debris from accumulating inside the valve body.

INSTALLING THE VALVE

The installation of the valve is important for its proper operation. The Tilted Disc Check Valve can only be used for horizontal flow or vertical flow up applications.



WARNING

CAUTION: For horizontal flow applications, the valve must be installed with the pivot pins located above the horizontal centerline of the valve and must be level to the horizontal plane of the valve.

Each valve is provided with a flow arrow integrally cast on the valve body. This flow arrow must point in the direction the water will flow. Pratt Tilting Disc Check Valves use ANSI B16.1, Class 125 and Class 250 flanges for cast iron valves. These flanges are flat faced and should be mated with flat faced companion flanges. The valve and adjacent piping must be supported and aligned to prevent cantilevered stress being transferred to the valve's flanges when installing the flange bolts or studs.



WARNING

CAUTION: The valve must be mated with flat faced flanges or damage may result. The use of excessive bolt torque can damage the valve.

When mating the check valve with butterfly isolation valves, the clearance between the butterfly disc and the fully open check valve stem must be checked. A spacer pipe is sometimes needed. See the valve arrangement drawing for disc clearance dimensions.

WHEN INSTALLING: Lower the valve into the pipeline using slings or chains around the valve body. Eye bolts or bars can also be used in the bolt holes. Lubricate the flange bolts and insert them around the flange. Lightly turn bolts until gaps are eliminated. The tightening of the bolts should then be done in graduated steps using the cross over tightening method.

Tilting Disc Check Valve

MAINTENANCE

The operation of the valve can be seen by observing the movement of the indicator pointer on the side of the valve (4" and larger sizes). The valve should move about 40 degrees from the closed to the fully open position. It is normal for the valve to not fully open in cases where the fluid velocity is less than 8 ft/sec or a top mounted oil dashpot is installed.

Dashpot assemblies require periodic maintenance. See the dashpot section in this manual for maintenance procedures.

LUBRICATION

The Pratt Tilted Disc Check Valve contains disc pin bearing sleeves which are water lubricated, thus requiring no external lubrication. There are no grease fittings on the Pratt Tilting Disc Check Valve.

INSPECTION

Periodic inspection for leakage can be performed by placing a listening device (or an ear) on the valve while it is closed and the line is under pressure. If leakage is heard, close the isolation valve, drain the valve connection, and inspect the seating surfaces for wear or mineral deposits. Clean or repair trim as needed.



WARNING

CAUTION: Removal of inspection covers without draining the pipeline and valve may cause serious injury.

The inspection hole covers can be removed from the valve to facilitate internal inspection of the valve. A hoist or jacking mechanism should be used to lift the disc to inspect the seating surfaces. If replacement of the disc, pivot pin bushings, disc ring, or seat ring is required, the valve must first be removed from the line.

Tilting Disc Check Valve

TROUBLESHOOTING

Several problems and solutions are presented below to assist you in troubleshooting the valve assembly in an efficient manner.

TROUBLESHOOTING BASIC VALVE

The valve opens automatically without the need of a power source to allow forward flow. The valve may not open to the full open position depending on fluid velocity but it will always open far enough to pass the flow with a minimal headloss. The valve will automatically close to prevent reverse flow through the pump. The valve has metal seats and a moderate bang heard during disc closing is normal when an upper dashpot is not installed (refer to Figure 1).

1. Leakage at Valve Inspection Covers (15): Re tighten bolts evenly or replace non asbestos sheet gasket.
2. Leakage at Mating Flanges: Re tighten bolts using the cross over method or replace mating flange gasket. Check alignment of mating pipe.
3. Valve Leaks when Closed: Flush debris from seat by cycling valve. Verify that valve is subject to a minimum differential pressure of at least 10 psi when closed and any isolation valves are open. If leakage persists, inspect interior of valve. Clean seating surfaces.
4. Valve Fails to Open: Check pressure differential across disc; upstream pressure must be greater than downstream pressure. Verify that any suction or discharge isolation valves are open and there is no line blockage. Drain pipe on both sides of the valve, remove inspection cover (015), and inspect disc ring (062) and seat ring (061) for damage or wedged debris.
5. Noisy Operation: Flow noise is normal. Loud flow noise similar to hammering may be cavitation from dropping high pressures across valve; review flow velocity through valve and pump application.

Tilting Disc Check Valve

OPTIONAL TOP DASHPOT

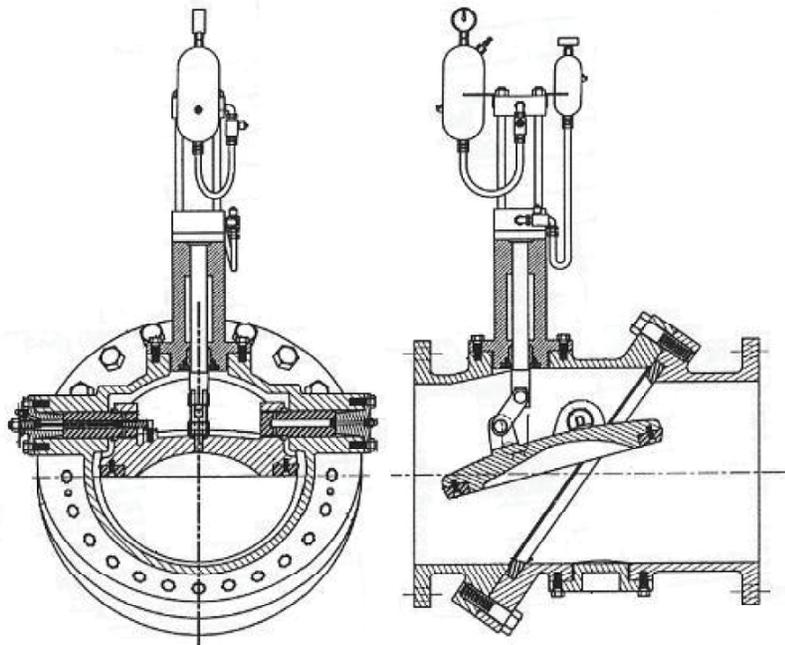
FUNCTIONAL DESCRIPTION

The Top Mounted Dashpot, herein referred to as the Upper Dashpot, when required, is installed through the top inspection port of the Pratt check valve and is connected to the top side of the valve disc. This unit provides independently adjustable speed control of valve opening and valve closing to reduce pressure surges on pump start-up and water hammer upon pump shut down. The upper dashpot consists of a heavy duty NFPA interchangeable high pressure oil hydraulic cylinder with internal hydraulic cushion, two adjustable flow control valves, a pressurized oil reservoir, a non pressurized oil reservoir, and piping. The dashpot bracket, which provides an air gap between cylinder and check valve, prevents pressurized hydraulic fluid from entering the valve housing and contaminating the water system. The dashpot bracket also contains the connecting rod bushing, O-ring retainer plate and screws, O ring seals, and the connecting rod, which is connected to the piston rod of the hydraulic cylinder with an adjustable coupling assembly. The connecting rod is attached to the check valve disc via links and threaded pins.



WARNING

CAUTION: For valves with Top Mounted Dashpots, DO NOT paint exposed surfaces of the connecting rod or the cylinder piston rod or damage will result to the hydraulic seals.



Tilting Disc Check Valve with Upper Dashpot

Tilting Disc Check Valve

INSTALLATION

Follow the installation instructions for the basic valve for installation of the valve in the line. Use the following steps to start up the upper dashpot.

1. The upper, or opening external flow control valve, should be set in the full open position (counterclockwise). The lower, or closing external flow control valve, should be initially set at 50% open.
2. The cylinder's internal cushion adjustment screw in the face of the head is factory set at 4 turns from being bottomed out.
3. The dashpot has been filled with oil in the factory and no additional fluid is required unless external leakage is observed. (See maintenance section on how to check fluid level.)
4. Using a compressed air source, charge the pressurized reservoir until the air pressure equals about 20% of the water pressure on the discharge or downstream side of the check valve.
5. Start the pump and observe the action of the valve through the opening cycle and allow the water system pressure to stabilize.
6. Shut down the pump and observe by sound and by observing the indicator the closing action of the valve. Depending on application, this pressure in the pressurized reservoir may need to be increased to satisfy correct operation.
7. If pressure surging is observed on the valve opening or if water hammer noises exist on valve closure, the appropriate external flow control valve can be gradually turned to a smaller number setting until optimum valve operation is achieved. See Figure 3. The unit is designed to control the operating time between 5 and 30 seconds.



WARNING

CAUTION: Flow control valves should not be used at settings below the blue band (second from the bottom). Lower settings will allow small particles of silt present in the hydraulic fluid to clog the valve and cause the upper dashpot to bind and result in damage to the valve or dashpot.

It is recommended that the person making adjustments to the flow control valve be familiar with the sounds created by water hammer and valve slam and not confuse them with the metallic sounds created by the valve upon metal seat closure. An over control situation should be avoided so that cavitation (loud rumbling) does not occur. After setting the flow control valve, tighten the locknut or set screw on the valve. Record the flow control valve setting and air pressure for future reference.

Tilting Disc Check Valve

OPERATION:

Upon start up, the forward flow of the water will open the check valve. The hydraulic fluid within the top portion of the dashpot cylinder is slowly bled through the top external flow control valve until the valve travels to the full open position.

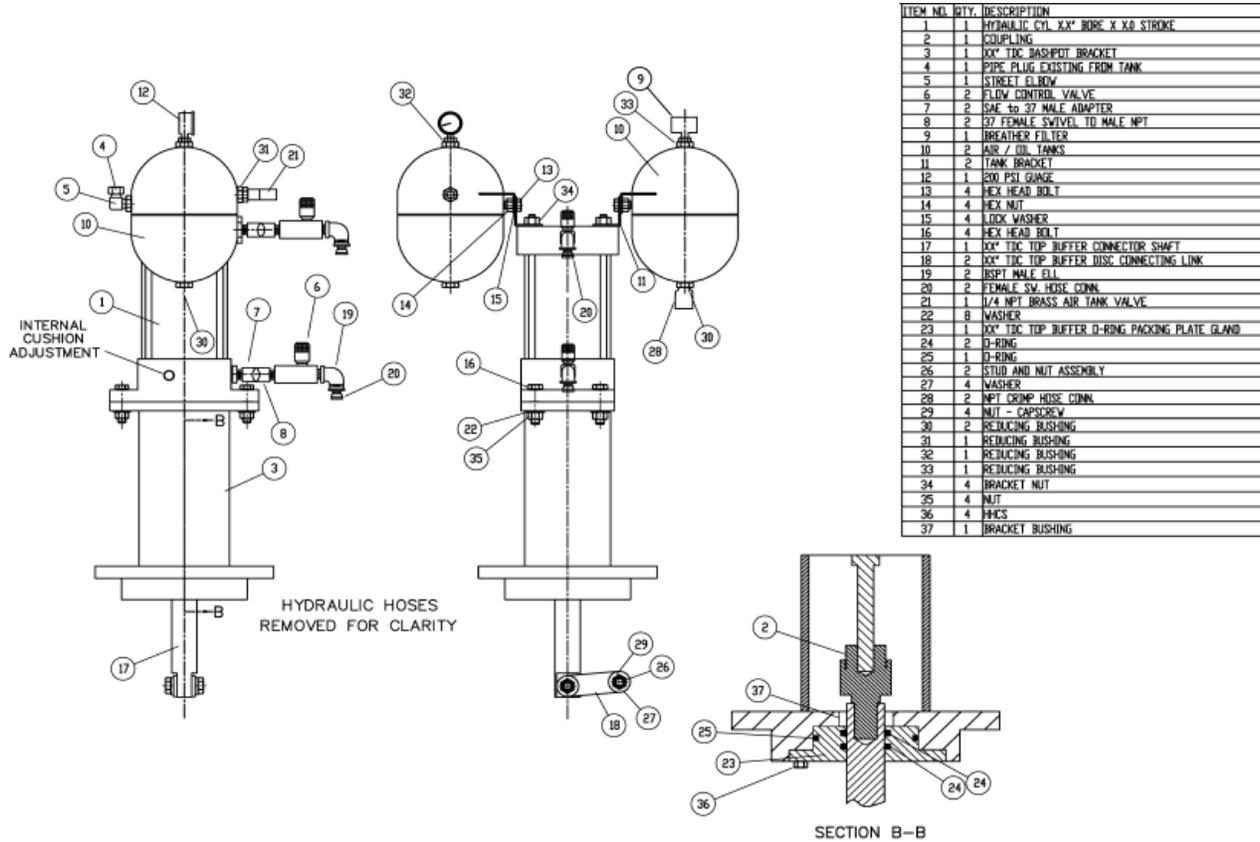


Figure 2 - Upper Dashpot

On pump shutdown, the reversal of flow will start to drive the disc to the closed position. In the first stage of the two stage shutdown process, the first 90% of the disc travel will be controlled through the bottom flow control valve. The cylinder's internal cushion then enters the cushion cavity, located in the rod end cap of the hydraulic cylinder, and provides a finer speed control, (second stage) over the final 10% of disc travel, to the closed position.

Tilting Disc Check Valve

MAINTENANCE

The upper dashpot should be checked occasionally for the proper air pressure within the pressurized oil reservoir while the check valve is in the fully closed position. The air pressure should be maintained at a pressure equal to about 20% of the water system pressure on the discharge or downstream side of the valve. If the air pressure cannot be maintained, the leak within the dashpot unit must be found and corrected. The hydraulic fluid level within the pressurized oil reservoir and non pressurized reservoir does not have to be checked unless external leakage is observed. The source of leakage must first be repaired and then the fluid level checked. A small amount of pipe thread sealant such as Loctite PST should be used on clean threads to ensure a tight joint. Allow approximately a one hour period for the sealant to set before pressurizing the unit.

CHECKING OIL AND GREASE LEVELS:

1. The check valve should be closed. The pump should be locked out to prevent start up.
2. The air in the pressurized oil reservoir must be bled from the reservoir, using the air valve mounted on the reservoir.
3. Remove the pipe plugs from both reservoir fill ports.
4. Slowly add hydraulic fluid equal to Mobil #DTE24 until fluid is up to the halfway point of the reservoirs. Replace pipe plug with thread sealant Loctite PST.
5. Using the air connection, recharge the pressurized oil reservoir to about 20% of the water pressure on the downstream side of the check valve. This pressure may need to be increased to provide a satisfactory closure.
6. Restore power to the pump.

GREASE: The upper dashpot is provided with an oil reservoir at the bottom of the dashpot bracket. Add just enough oil into the reservoir to allow the connecting rod and connecting rod bushing to be lubricated. Grease can also be brushed onto the connecting rod in lieu of adding oil to the reservoir. This oil will not enter the flow stream and is prevented from doing so through the use of dual O-ring seals in the dashpot O-ring retainer.



WARNING

CAUTION: For valves with Top Mounted Dashpots, DO NOT paint exposed surfaces of the connecting rod or the cylinder piston rod or damage will result to the hydraulic seals.

Tilting Disc Check Valve

TROUBLESHOOTING VALVE WITH UPPER DASHPOT

The top mounted oil dashpot is linked directly to the disc. (See illustration below) Flow control valves (6) control the opening and closing speeds. The last 10% of closure is also controlled by the cylinder cushion control (refer to figure #2).

1. Valve Does Not Close Fully: Check air pressure in reservoir; should be at least 20% of the water system pressure on the downstream side of the valve or 10 psig minimum. The pressure can be increased until the valve closes but the opening stroke may be reduced. Open lower flow control valve (6) further to allow greater oil flow. If valve slam occurs readjust flow control valve (close) until slam is diminished. A differential pressure across the disc of at least 50 psig is typical for dashpot valves. If the pressure is lower, the dashpot may not be needed and may hinder valve efficiency.
2. Valve Slams Closed: Dashpot should prevent slamming by controlling the valve closure. Throttle down the bottom flow control valve (6) to slow down valve closure. If problem persists, check oil level in unit.
3. Valve Does Not Open: Open top flow control valve (6) fully counterclockwise. Check pressure differential across disc; upstream pressure must be greater than downstream pressure. Verify that downstream shutoff valve is open and there is no line blockage. Lower pressure on air tank (pressure should be 20% of water system pressure). Pressure can be temporarily reduced to 0 psig to assist in valve opening. Drain the pipe on both sides of the valve, remove inspection cover (015), and inspect both disc and body seat rings (062 and 061) for damage or wedged debris. If debris is wedged in the valve, it may be necessary to jack open the disc with a hydraulic jack. Use a floor jack and a 2x4 to push the disc, from the lower inspection port, up and out of the body seat. Inspect the seats for damage and repair if required.
4. Noisy Operation or Vibration: Flow noise is normal. Loud flow noise similar to hammering may be cavitation from dropping high pressures across valve during opening and closing. Open flow control valves (6) to provide shorter open and close operating times.
5. Pump Backspins: Valve is closing too slowly. Open bottom flow control valve (6) further. If surges in the pipeline result, surge relief devices on the pipeline probably need attention.
6. Pressure Surges: Throttle down bottom flow control valve (6) further to increase closing time.
7. Leakage of Oil: Wipe down controls and identify location of leak. Tighten fittings where needed. Check that cylinder rod is clean with no paint or buildup. Cylinder seal kits can be used if cylinder leakage occurs. An air tank pressure of at least 10 psi is needed to energize the rod seals.
8. Leakage of Water through Dashpot: Replace seals (24) and (25) in bushing assembly.

FLOW CONTROL VALVE ADJUSTMENT

Flow control valves are specialized needle valves that allow free flow in one direction and controlled flow in the other direction. They are used to control the flow out of hydraulic cylinders. Hence, the "Controlled Flow" arrow marked on the valve must point away from the cylinder.

Tilting Disc Check Valve

The flow control valve has color coded bands and a numbered dial that allows the operator to make fine adjustments to the valve operating speed. Turning the numbered dial clockwise will close the flow control valve. The exposed color bands just below the bottom of the dial indicate the flow control position. All of the bands exposed represent the valve's full open position. The flow control valve can be adjusted in increments of 1/10 of a turn by aligning the numbers (0 through 9) on the dial with the scribed line on the flow control valve body. One full revolution of the knob will expose or remove a color band. Do not use at settings below the second to the bottom band or clogging may occur. After all adjustments are made, the set screw located in the knurled knob should be locked into place to prevent accidental changes in the flow control valve setting.



WARNING

CAUTION: Flow control valves should not be used at settings below the band that is second from the bottom. Lower settings will trap small particles of silt in the hydraulic fluid and clog the valve.

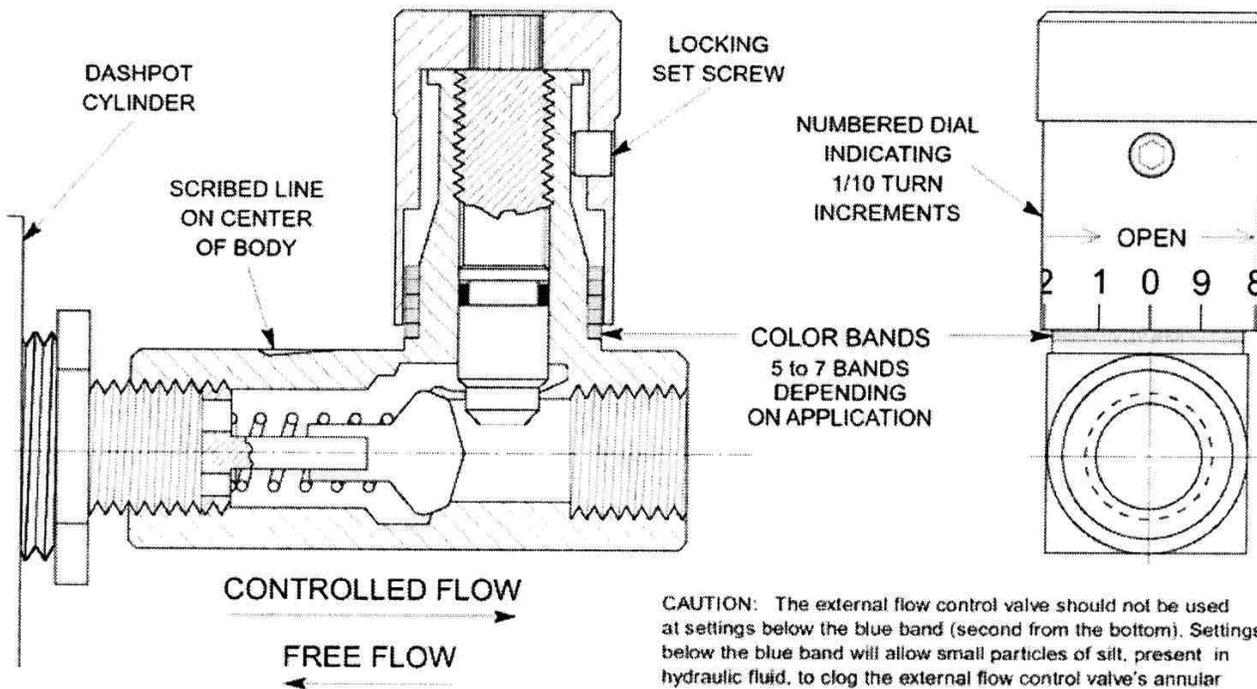


Figure 3 - Flow Control Valve



Tilting Disc Check Valve

HOW TO CONTACT PRATT

HOW TO ORDER PARTS:

To order parts, contact our Parts Department:

Write: - Henry Pratt Company
401 South Highland Avenue
Aurora, IL 60506-5563

Attn: Parts Manager

Call - (630) 844-4000

Fax - (630) 844-4191

Please include valve serial number and description of part requested.

HOW TO OBTAIN SERVICE:

To obtain further information or secure field service, contact our Field Service Department:

Write: - Henry Pratt Company
401 South Highland Avenue
Aurora, IL 60506-5563

Attn: Field Service Manager

Call - (630) 844-4163

Fax - (630) 844-4160

Please include the following with your inquiry for service:

Henry Pratt Order Number:

Henry Pratt Item Number:

Valve Serial Number:

Type of Service Requested