

Valtek Pressure-balanced Trim

GENERAL INSTRUCTIONS

The following instructions are designed to assist in disassembly, reassembly and troubleshooting of Valtek® control valves equipped with pressure-balanced trim. Product users and maintenance personnel should thoroughly review this bulletin in conjunction with *Mark One and Mark Two Control Valves Installation, Operation, and Maintenance Instructions (IOM 1)*, Valtek Part No. 49011 and the appropriate positioner IOM bulletin.

This publication does not contain information on installing, maintaining, troubleshooting, calibrating, and operating Valtek positioners. Refer to *Mark One and Mark Two Control Valves Installation, Operation, and Maintenance Instructions (IOM 1)*, when this information is required.

To avoid possible injury to personnel or damage to valve parts, WARNING and CAUTION notes must be strictly adhered to. Modifying this product, substituting non-factory or inferior parts, or using maintenance procedures other than outlined could drastically affect performance and be hazardous to personnel and equipment.

For high pressure drops, pressure-balanced trim reduces the trim off-balance area, making oversized actuators unnecessary. Vent holes through the plug balance the pressure on both sides of the plug, minimizing vertical forces. The plug is also constructed with a slight force imbalance which assists the plug in failing open or closed.

An important part of the trim is the sliding plug seal, which determines to a large extent the leakage rate of the valve under shutoff conditions. Four types of plug seals are available: PTFE, metal piston ring, O-ring, and O-ring with PTFE back-up rings (see Figure 1).

Installation

Standard unpacking and installation instructions are outlined in *Mark One and Mark Two Control Valves Installation, Operation, and Maintenance Instructions*

(IOM 1). For fail-open operation, the valve should be installed with the flow direction over the plug. For fail-closed operation, flow direction should be under the plug (see Figure 2).

DISASSEMBLY AND REASSEMBLY

Disassembly of Pressure-balanced Trim

To disassemble Valtek control valves equipped with pressure-balanced trim, refer to Figure 2 and proceed as follows:

WARNING: Depressurize line to atmospheric pressure, drain all process fluids and decontaminate the valve (if caustic or hazardous materials are present). Failure to do so could cause serious injury.

1. Fully retract the plug until the stem clamp indicator points to the open position.
2. Remove the bonnet flange bolting and lift the actuator, bonnet and plug out of the valve body.

WARNING: Danger exists in removing the actuator, bonnet and plug, especially if PTFE plug seals are used. The sleeve may stick to the plug and fall during disassembly, causing possible serious injury and damage to the valve or nearby equipment. If sleeve is observed sticking to the plug, steps 3 - 5 should be consulted.

CAUTION: Lift the actuator, bonnet and plug straight out from the valve body to avoid damage to the plug head, seat ring or plug stem. If the actuator is not provided with a lifting ring, use lifting straps through the yoke legs.

3. If the sleeve is observed sticking to the plug during removal, fully extend the plug by applying air above the piston, allowing the sleeve to remain in the body and the bonnet to raise above the body.
4. In the gap between the top of the sleeve and the bottom of the bonnet, place wooden blocking of equal thickness in at least three places.
5. By applying air below the piston, retract the plug until the plug head is freed from the sleeve.

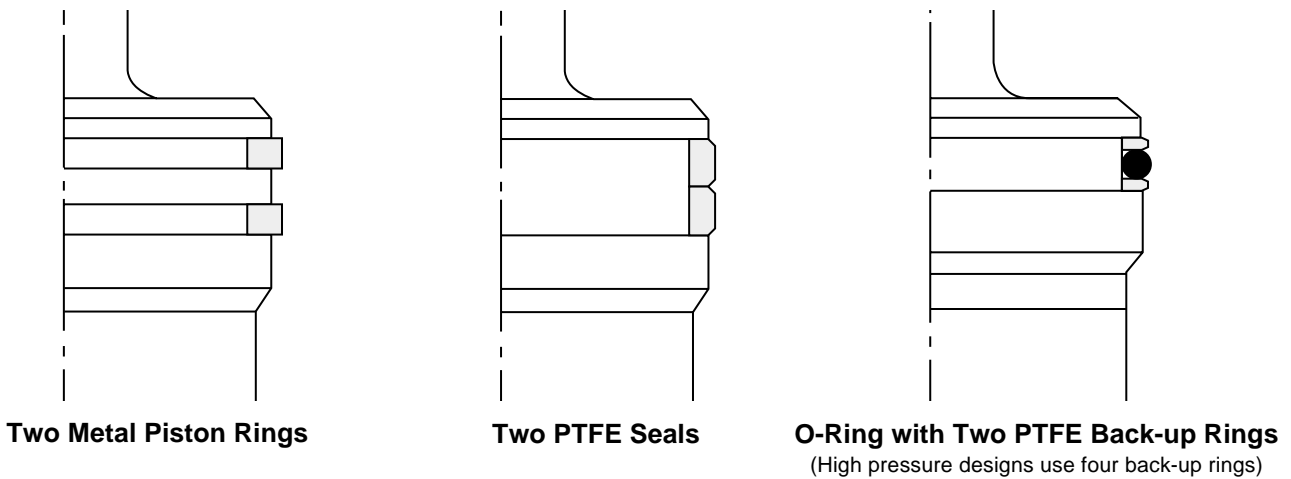


Figure 1: Plug Seal Configurations

6. If the sleeve has not been removed with the plug, lift it out of the valve body.
7. Remove seat ring and gaskets from the valve body.
8. Remove the plug seals from the plug head.
9. The plug may be removed from the actuator and bonnet [See *Mark One and Mark Two Control Valves* Installation, Operation, and Maintenance Instructions (IOM 1)].

Reassembly of Pressure-balanced Trim

To reassemble Valtek control valves equipped with pressure-balanced trim, refer to Figure 2 and proceed as follows:

1. Carefully inspect the plug head and sleeve bore for signs of galling and scoring. Superficial scoring can be removed with a light application of emery cloth. If more serious scoring exists, contact the local Valtek control valve representative. Also, check to see if the seating surfaces on both the seat ring and plug are free of damage.
2. If the plug has been removed from the bonnet and actuator, reinstall it according to the instructions outlined in *Mark One and Mark Two Control Valves* Installation, Operation, and Maintenance Instructions (IOM 1).
3. To replace the plug seals on the plug, refer to Figure 1 and observe the following directions:

PTFE Seals—Heat one seal to 300° F (150° C) and slip it over the plug into the seal groove. Thermal expansion causes the ring to stretch, thereby making it relatively easy to slide over the plug head.

WARNING: Gloves should be worn to help prevent the hands from being burned.

Care must be taken to prevent the seal from rolling, rather than sliding over the plug. The second seal

can be installed following the same procedures as the first. If for any reason the second seal cannot be slipped onto the plug, cut the seal at approximately a 30° angle and place over the plug. Make certain the cut seal is on the low pressure side.

Metal Piston Rings – When metal piston rings are compressed, open and closed gaps are created on either side where the ends meet. The open gap side, and side normally marked ‘T’ or ‘Top,’ must be installed on the piston toward the plug stem on flow-under applications, or towards the plug contour on flow-over applications. When two rings are used, rotate the gaps 180° apart to minimize leakage. When three rings are used, rotate gaps 120° apart.

CAUTION: Because of the high ductility of NiResist metal piston rings, care must be taken to prevent expanding of the ring during assembly.

O-ring with Back-up Rings – Both the O-ring and back-up rings can stretch over plug and into place.

4. Install a new seat gasket and relocate the seat ring.
5. Install the sleeve, bonnet gasket and sleeve gasket.

NOTE: All gaskets should be replaced whenever the valve is disassembled.

6. Lower the actuator, bonnet and plug assembly squarely into the sleeve bore. If PTFE or O-ring seals are used, the plug may remain retracted while entering the sleeve. Care should be taken with these seals to avoid scoring or galling the sealing surface while fitting them into the sleeve bore. With metal piston ring seals, the plug must be extended a few inches to allow the use of a ring compressor on the metal rings. A suitably sized screw-type hose clamp will also serve to compress the rings for reassembly.

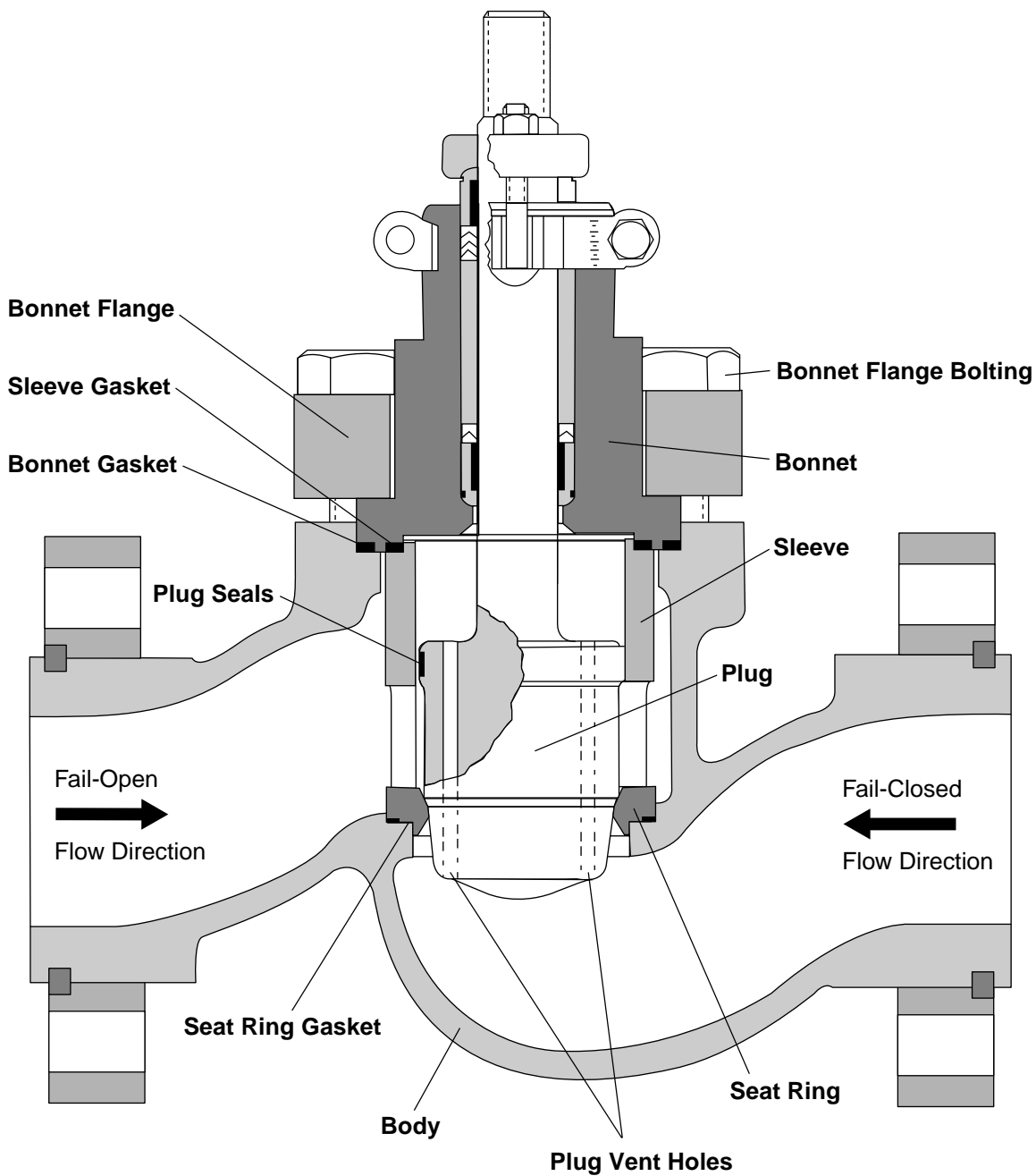


Figure 2: Pressure-balanced Trim

7. Once the bonnet is resting squarely in the valve body, tighten the bonnet flange bolting to finger-tightness.
 8. Using the actuator, seat the plug two or three times to center the seat ring.
 9. Leaving the plug in seated position, begin tightening the bonnet flange bolting so as to keep the bonnet square with valve body. Tighten a bolt $\frac{1}{6}$ turn (one flat), then tighten the bolt directly opposite $\frac{1}{6}$ turn. Continue tightening all bolts in this manner until the bonnet is firmly seated, metal to metal, in the body. This can be easily felt through the wrench.
 10. Slowly stroke the plug up and down to check the alignment of the plug with the sleeve.
- CAUTION: If binding or sticking is observed, discontinue stroking the valve and reassemble using the above steps. Failure to do so could cause serious valve damage.**

Troubleshooting Chart

Failure	Probable Cause	Corrective Action
Jerky stem travel	<ol style="list-style-type: none"> 1. Overtightened graphite packing 2. Galling or scoring between the plug and the sleeve 3. Overtightened packing 4. Service temperature exceeds operating parameter of trim design 5. Inadequate air supply 6. Malfunctioning positioner 	<ol style="list-style-type: none"> 1. Graphite packing is often associated with jerky stem movement; therefore, only tighten the packing box enough to prevent leakage. 2. Superficial scoring or galling may be removed with a light application of emery cloth; if more serious damage exists, contact the factory. CAUTION: Trim parts are machined to close tolerances which are essential for correct functioning of the valve. Attempting to remove deep scratches could result in high leakage rates or improper valve functioning. 3. Adjust the packing box nuts to slightly over finger-tight (over-tightening will also cause excessive packing wear and high stem friction). 4. Reconfirm service conditions and contact factory 5. Check for leaks in the air supply of instrument signal system; tighten any loose connections and replace any leaky lines 6. Refer to positioner maintenance instructions
Excessive leakage	<ol style="list-style-type: none"> 1. Insufficiently tightened bonnet flange bolting 2. Worn or damaged seat ring 3. Worn or damaged plug seals 4. Worn or damaged gaskets 5. Inadequate actuator thrust 6. Incorrectly adjusted plug 	<ol style="list-style-type: none"> 1. Refer to step 9 of the <i>Reassembly</i> section for correct tightening procedure. 2. Disassemble and replace or repair seat ring; for correct procedure on remachining the seat ring see <i>Mark One and Mark Two Control Valves (IOM 1)</i> 3. Disassemble and replace plug seals 4. Disassemble and replace gaskets 5. Check for adequate air supply to the actuator; if supply is correct, reconfirm service conditions and contact factory 6. Refer to <i>Mark One and Mark Two Control Valves (IOM 1)</i> and correct plug adjustment
Valve does not fail in correct direction	<ol style="list-style-type: none"> 1. Incorrect flow direction 2. Galling or scoring between plug and sleeve 	<ol style="list-style-type: none"> 1. Reconfirm flow direction and, if necessary, correct flow direction through valve. 2. See No. 2, 'Jerky stem travel' (above)

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