

# Pressure-balanced Trim 11

*Used in Globe Valves*

## 1.1 - GENERAL INFORMATION

The following instructions were designed to help you to disassemble, reassemble and to troubleshoot globe valves supplied with pressure-balanced trim. Before the installation, operation or any maintenance, users and maintenance personnel must read this bulletin carefully, as well as the maintenance bulletin of the valve where the pressure-balanced trim is installed: GLS valves (IOM 01), GLH valves (IOM 03) or GLB valves (IOM 06).

In applications involving high differential pressures, using a pressure-balanced plug reduces the unbalanced areas of the trim, making the use of oversized actuators unnecessary. Pressure communication holes equalize the fluid pressure on both sides of the plug head, minimizing the vertical forces. The plug is also manufactured with a small imbalance that helps it to open or close in case of failure.

An important aspect of the pressure-balanced trim is the sliding sealing of the plug, with determines to a large extent the leakage rate when the valve is closed. There are four types of plug sealing: O-ring; O-ring with PTFE back-up rings; PTFE and; metal piston rings (see Figure 1).



## 1.2 - SAFETY WARNINGS

To avoid potential injury and/or damage to the valve parts, **WARNING** and **CAUTION** notes must be strictly observed. Changing this product characteristics, using non-original spare parts or using maintenance procedures different from those presented herein may affect the performance of the valve, be hazardous to personnel and equipment and may void the manufacturer warranty.



## WARNING

**Standard industry safety practices must be applied when using this equipment. Industrial safety standards for personal protection and for equipment handling must also be observed.**

## INSTALLATION

Instructions for the removal of the packaging and for installation of the valves are presented in maintenance manuals No. 01, 03 and 06 (respectively for GLS, GLH and GLB valves).

Valves that open in case of failure of air supply must be installed with the flow over the plug. On valves that close in case of failure, the flow direction must be from underneath the plug (see Figure 2).

## DISASSEMBLY AND REASSEMBLY

### 1.3 - DISASSEMBLING THE PRESSURE-BALANCED PLUG

To disassemble a valve equipped with pressure-balanced trim, refer to Figure 2 and proceed as indicated below:



## CAUTION

**Removing the valve for maintenance: piping must be depressurized and process fluid drained. In case of toxic, caustic or hazardous fluid services, the valve must be decontaminated to avoid accidents.**



## CAUTION

**When operating the valve, keep your hands, hair, clothes, etc. away from moving parts. Failure to follow this warning**

**may result in serious injury.**

- Retract the plug all the way, until the stem clamp points to the open position.
- Remove the bonnet flange nuts and, then, lift the actuator, bonnet and plug assembly, removing it from the valve.



## CAUTION

**During the removal of the assembly comprised by the actuator, bonnet and plug, there is the risk of the seat retainer getting stuck in the plug sealing and falling off during the disassembly (specially if PTFE plug seals are used), causing severe injuries, as well as damages to the valve and to the equipment nearby. If the seat retainer is stuck in the plug, follow the steps indicated below.**



## CAUTION

**Heavy actuators may require using of a hoist for their removal. In case the actuator has one lifting ring, use it to lift the actuator, otherwise, use a hook or pass lifting straps through the yoke legs to raise the assembly. During the disassembly, the actuator must be maintained in the upright position to prevent damages to the plug and to the seat.**

- If the seat retainer gets stuck in the plug during the disassembly, apply air in the upper chamber of the actuator and advance the piston completely, enabling the seat retainer to remain in the body and the bonnet to be lifted over above this component.
- In the gap between the upper portion of the seat retainer and the lower portion of the bonnet, place wood blocks with same thickness in at least three places.
- Apply air underneath the piston and retract the actuator stem until the plug head is free from the seat retainer.

- Remove the seat retainer, the seat ring and the gaskets.
- Remove the plug seals installed in the plug head.
- If necessary, the plug may be dismantled apart from the bonnet and the actuator according to the instructions contained in the maintenance bulletins No. 01, 03 or 06.

## 1.4 - REASSEMBLING THE PRESSURE-BALANCED PLUG

To reassemble a Valtek valve equipped with a pressure-balanced plug, refer to the Figure 2 and proceed as indicated below:

- Inspect carefully the plug head and the inner surface of the seat retainer checking it for scratches or roughness. Surface scratches can be removed using a fine emery cloth. If there are deeper scratches, contact your Valtek Sulamericana representative. Check also if the seating surfaces, either of the plug or the seat ring, are in good conditions and may ensure a good sealing.
- If the plug has been detached from the bonnet and the actuator, reinstall it according to the instructions presented in the maintenance bulletins No. 01, 03 or 06.
- For replacing the plug seals, refer to the Figure 1 and proceed as follows:

### O-Ring with Back-up Rings

Both the O-ring and the back-up rings can be stretched and slid over the plug head until they are positioned in the slot.

### PTFE Plug Seals

Heat one plug seal up to 300°F (150°C) and slide it up to the slot in the plug head. The high temperature will expand the ring, making it easy to slide it up to the slot. Special care must be taken to prevent the ring from rolling instead of sliding over the plug head.

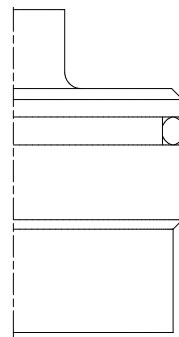


## CAUTION

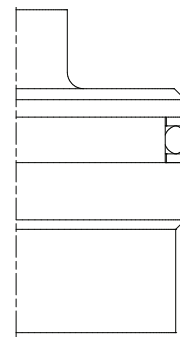
**Use gloves during this procedure to avoid burning your hands.**

The second plug seal can be installed in the same

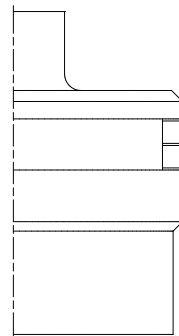
## Installation, Operation and Maintenance Instructions



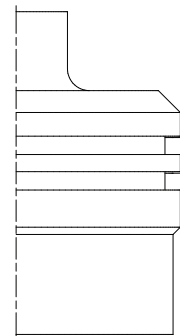
O-Ring Seal



O-Ring with two PTFE Back-up Rings  
(High pressure designs use four back-up rings)



Two PTFE Seals



Two Metal Piston Rings

**Figure 1 – Configurations of Plug Seals**

way as the first one. If, for any reason the second plug seal cannot slide over the plug, cut the seal at approximately 30° and fit it in the housing slot. Make sure that the seal with 30° cut is mounted on the lower pressure side.

### Metal Piston Rings

#### a) NiResist Plug Seals

When NiResist-type metal piston rings are compressed, larger and smaller gaps are created on each side of the ring, where the ends meet. The side with the marking “T” or “Top”, or the side that presents the largest gap (in case the ring has no marking), must be installed in the plug facing the stem side on flow-under applications, or facing towards the plug contour on flow-over applications.

#### b) VMG-type (Multiseal) Rings

If using VMG-type metal seals, the spring that presses the ring against the seat retainer must be assembled inside the ring.

For minimizing leakage and, irrespective of the type of metal piston ring used, install the rings with the openings 180° apart when using two rings or 120° apart when using three rings.



### WARNING

**If NiResist rings are used, care must be taken to prevent the excessive expansion of the rings during the assembly. Failure to observe this warning may result in broken rings.**

- Install a new seat gasket and place the seat ring in its place.

**Note:** All gaskets must be replaced whenever the valve is disassembled.

- Install the seat retainer (with the thinner end of the

## Installation, Operation and Maintenance Instructions

cathedral window downward), the bonnet gasket and the seat retainer gasket.

- Lower the assembly comprised by the actuator, bonnet and plug perpendicularly over the seat retainer bore. If PTFE plug seals or O-ring are used, the plug may remain retracted when it is inserted into the seat retainer. Special care must be taken with sealing surfaces (inner surface of P/B seat retainer and plug seals) to prevent risks or scratches on these components as the plug start to slide through the bore of the seat retainer.

If the sealing of the plug is carried out with metal piston rings, the plug must be extended a few inches to allow the use of a ring compressor on the metal rings. A suitable sized screw-type hose clamp may also be used to compress the rings during reassembly.

- Once the bonnet is resting squarely in the valve body, tighten the bonnet flange nuts with your fingers.
- Using the actuator, move the valve plug, seating it in the seat ring two or three times to ensure proper alignment of the plug with the seat.
- In case of valves equipped with pneumatic actuators, let the plug seated on the seat ring and start tightening the bonnet flange nuts, keeping the flange parallel to the body. Tighten the first nut 1/6 of turn, then tighten the directly opposite nut 1/6 of turn and so on, successively. Tighten completely all nuts to assure the proper compression of the gaskets. The bonnet must remain completely seated in

the valve body, metal to metal, which can be easily felt through the wrench used to tighten the nuts.

**Note:** If the valve is equipped with an electric or hydraulic actuator, retract the plug to the half-stroke position and continue to tighten the nuts of the bonnet flange.



### WARNING

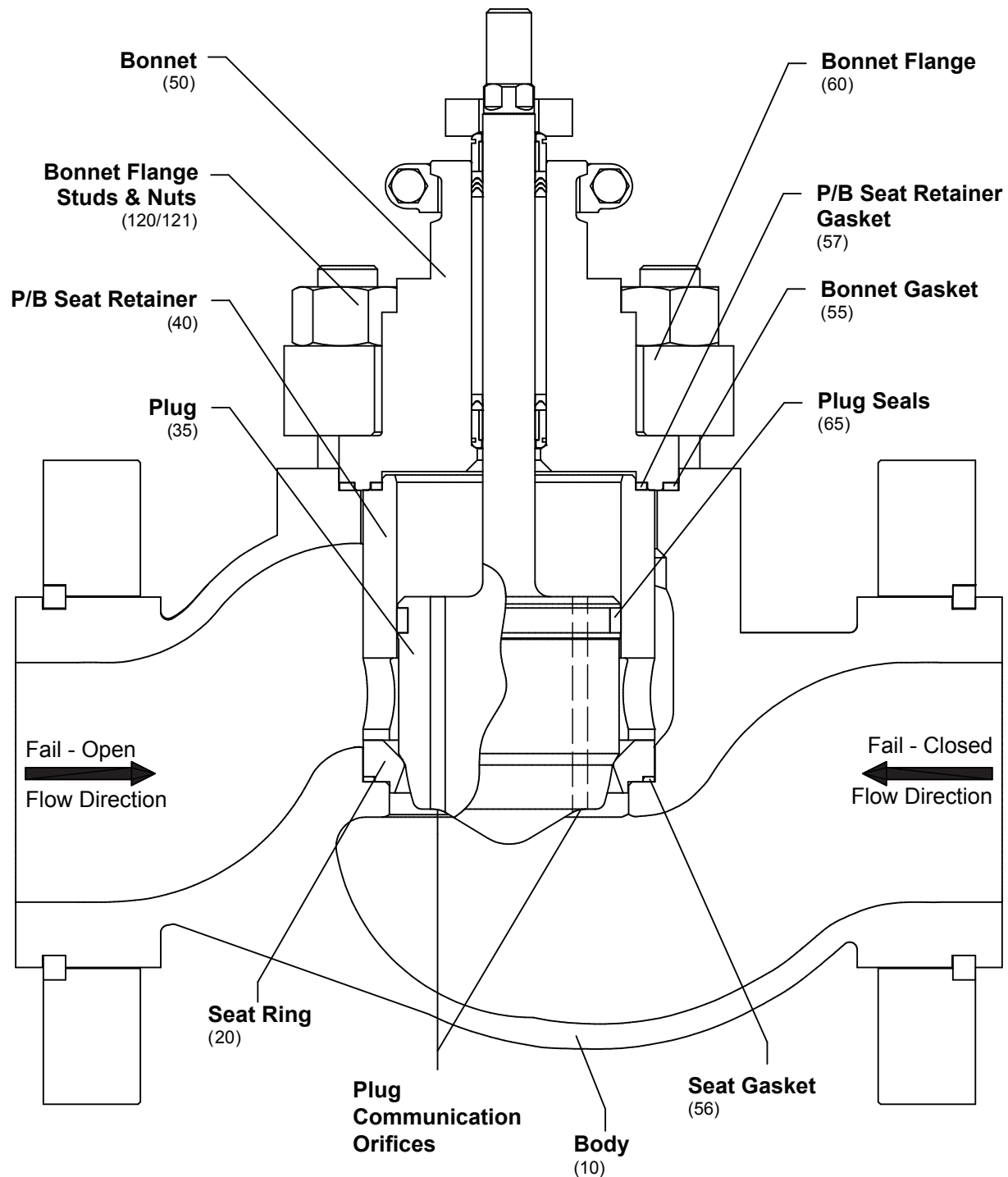
**Failure to return the plug to the half-stroke position (for valves equipped with electric or hydraulic actuators) will cause damages to the actuator and/or to the valve during the bonnet tightening sequence. This is caused because the majority of electric and hydraulic actuators is unable to retract 1/8 in. (3.2 mm) during the tightening sequence of the bonnet flange.**

- Move the plug slowly upwards and downwards to check the proper alignment of the plug with the bore of the seat retainer.



### WARNING

**If mechanical jamming or sticking is observed, stop moving the valve, disassemble the valve and reassemble according to the steps above. Failure to do this may cause severe damages to the valve.**



**Figure 2 – Pressure-balanced Trim**

<sup>(1)</sup> Item numbers above correspond directly to the valve's bill of material.

## Installation, Operation and Maintenance Instructions

### 1.5 - TROUBLESHOOTING OF VALVES EQUIPPED WITH PRESSURE-BALANCED TRIM

Problem	Probable Cause	Corrective Action
Excessive leakage	<ul style="list-style-type: none"> <li>• Insufficient tightness on the bonnet flange nuts</li> <li>• Worn or damaged seat ring</li> <li>• Worn or damaged plug seals</li> <li>• Worn or damaged seat gasket</li> <li>• Insufficient actuator thrust</li> <li>• Improper plug adjustment</li> </ul>	<ul style="list-style-type: none"> <li>• See steps on “Reassembling the Pressure-balanced Plug” section for tightening procedures</li> <li>• Disassemble valve and change or repair seat ring</li> <li>• Disassemble valve and replace plug seals</li> <li>• Disassemble the valve and replace the gaskets</li> <li>• Verify air supply pressure to actuator; if pressure is adequate, double check service conditions and contact manufacturer</li> <li>• Use the correct procedure for adjusting the plug, indicated in the GL<math>\bar{S}</math>, GL<math>\bar{A}</math> and GL<math>\bar{B}</math> valves maintenance bulletins</li> </ul>
Valve does not fail in correct position	<ul style="list-style-type: none"> <li>• Incorrect flow direction</li> <li>• Scratches or markings on surfaces between the plug and the seat retainer bore</li> <li>• Incorrect assembly of the actuator</li> <li>• Insufficient actuator thrust</li> </ul>	<ul style="list-style-type: none"> <li>• Correct flow direction</li> <li>• Surface scratches can be removed using fine emery cloth with soft application. If there are any damage more severe, contact factory. <b>WARNING: components comprising valve trim are machined with precise tolerances, which are essential for the proper operation of the valve. Attempting to remove deeper scratches may result in larger leakage rates or in improper operation of the valve</b></li> <li>• Change failsafe position of the actuator spring; see the correct procedure to revert the mounting position in the “Reversing the Air Action” in the GL<math>\bar{S}</math>, GL<math>\bar{A}</math> and GL<math>\bar{B}</math> valves maintenance bulletins</li> <li>• Recheck service conditions and contact the manufacturer</li> </ul>
Jerky stem motion	<ul style="list-style-type: none"> <li>• Overtightened graphite packing</li> <li>• Scratches or markings on surfaces between the plug and the seat retainer bore</li> <li>• Overtightened packing</li> <li>• Service temperature is above the operating limits of trim design</li> <li>• Insufficient air supply</li> <li>• Malfunctioning positioner</li> </ul>	<ul style="list-style-type: none"> <li>• Graphite packing is usually associated to the stem jerky movement. Therefore, tighten the packing nuts only as enough to prevent leakage</li> <li>• Use the same procedure above (when the valve does not fail in correct position)</li> <li>• Adjust the packing nuts with a torque slightly over finger-tight (excessive tightening may cause premature wear of the packing, and will also increase the friction with the valve stem)</li> <li>• Reconfirm service conditions and contact the manufacturer</li> <li>• Check for leaks in air supply or instrument signal system; tighten loose fittings and replace the leaking ferrules</li> <li>• See positioner IOM</li> </ul>



Although Valtek Sulamericana provides precise and detailed installation, operation and maintenance instructions, in accordance with their design reviews, the customer/user shall be responsible for the information provided to generate product specifications, shall understand precisely the operation and maintenance instructions provided with the products and shall provide training for their employees and contracted personnel regarding the safe use of Valtek Sulamericana products, in accordance with the specific applications they were designed for. The information herein shall not be considered as a certificate for assurance of satisfactory results. Valtek Sulamericana products are continuously improved and upgraded and the specification, dimensions and information contained herein are subject to change without notice. For further information or to confirm these presented here, consult Valtek Sulamericana at Rua Goiás, 345, Diadema, São Paulo, Brasil, CEP 09941-690, Phone: 55-11 4072-8600, Fax: 55-11 4075-2477.

## Quality Management System



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