

## Installation, Operation, Maintenance Instructions

# Three-way Control Valves

### GENERAL INFORMATION

The following instructions are designed to assist in unpacking, disassembling, reassembling and troubleshooting Valtek three-way valves. Product users and maintenance personnel should thoroughly review this bulletin in conjunction with Maintenance Instructions 1 (Mark One and Two Control Valves) prior to installing, operating or performing any maintenance on the valve.

This publication does not contain information on Valtek positioners. Refer to the appropriate Maintenance Instructions for installing, maintaining, troubleshooting, calibrating, and operating Valtek positioners.

**To avoid possible injury to personnel or damage to valve parts, WARNING and CAUTION notes must be strictly adhered to. Modifying this product, substituting nonfactory parts, or using maintenance procedures other than outlined could drastically affect performance and be hazardous to personnel and equipment, and may void existing warranties.**

Three-way valves are used for either converging or diverging service. For interchangeability, a standard globe valve converts to a three-way valve with the addition of a three-way adaptor, upper seat ring, two upper seat gaskets, and a three-way plug. Its operation is similar to a standard Mark One globe valve.

### Unpacking

1. While unpacking the valve, check packing list against the materials received. Lists describing the valve and accessories are included in each shipping container.
2. When lifting the valve from the shipping container, position the lifting straps to avoid damage to the tubing and mounted accessories. Valves provided with a lifting ring (up to 6-inch) may be lifted by the actuator lifting ring. On larger valves, lift the valve using straps through the yoke legs or if provided, lifting brackets bolted to bonnet stud.
3. In the event of shipping damage, contact your shipper immediately.
4. If any problems arise, call your Valtek representative.

### Troubleshooting

If difficulty is suspected with the control valve, check the following:

1. Make sure the valve has a sufficient air supply.
2. Check for air leaks in the air supply, instrument signal system, and positioner.
3. Make sure the packing isn't too tight by loosening the gland flange nuts and retightening to just over finger-tight.

**CAUTION: Do not overtighten the packing. This can cause excessive packing wear and high stem friction which may impede plug movement.**

4. Check for proper, full-stroke operation as indicated in the “Quick-check” section of Maintenance Instructions 1.
5. If the valve does not function properly, check the bonnet flange and three-way adapter for squareness to the body. Gaps between the bonnet flange and three-way adapter must be uniform for proper operation. If the assembly is out of alignment, loosen the body bolting and tighten according to steps 16-18 in the “Reassembly” section.
6. If problems still exist, disassemble the valve according to the “Disassembly” section.

## Disassembling Three-way Valves

To disassemble three-way valves, refer to Figure 1 and proceed as follows:

**WARNING: Depressurize line to atmospheric pressure and drain all fluids before working on valve. Failure to do so can cause serious injury.**

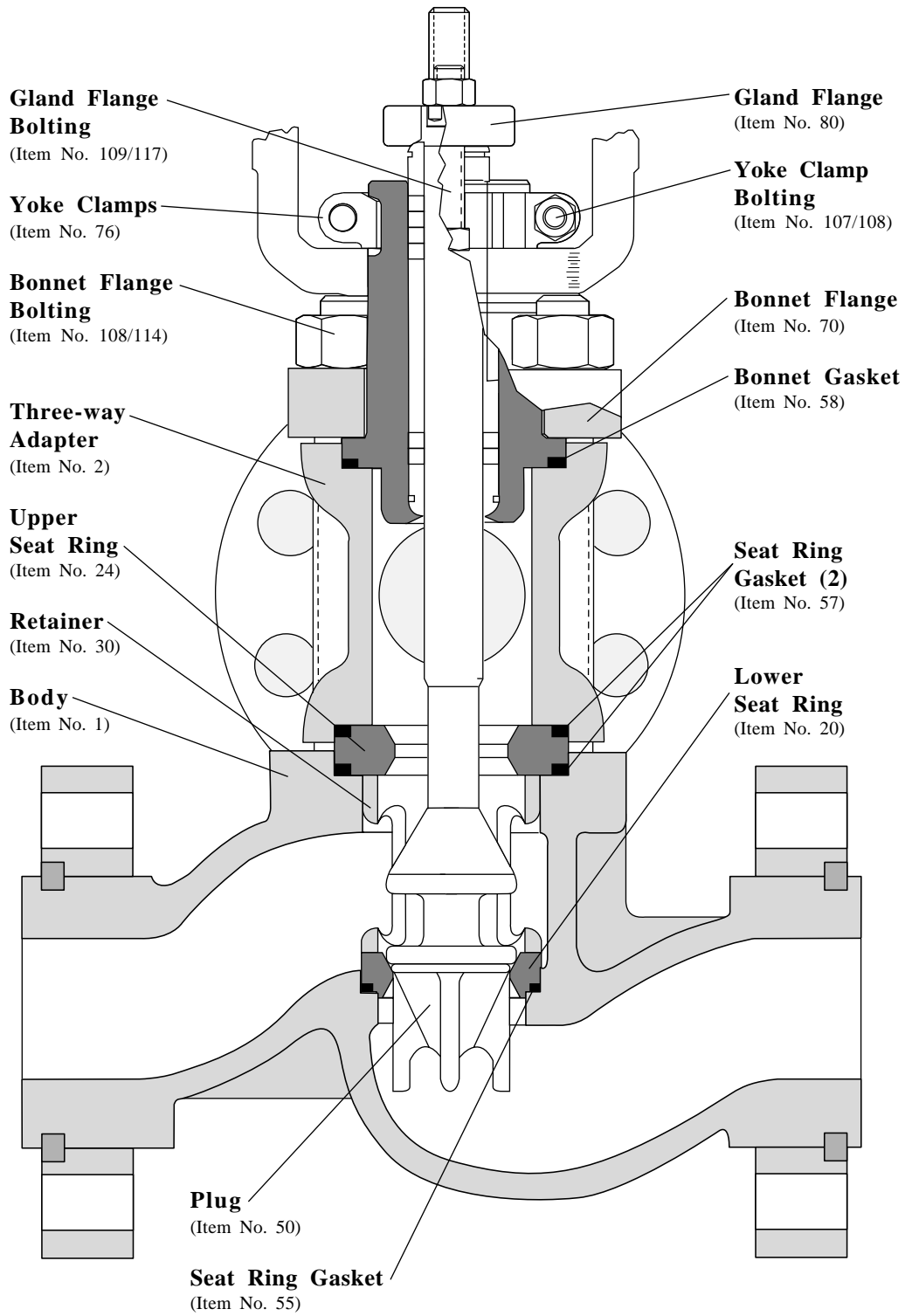
1. Apply air to the cylinder so that the plug is at mid-stroke.
2. Loosen the stem clamp and gland flange. Remove yoke clamps (or yoke bolts, if used). Disengage the plug stem from the actuator stem by rotating the actuator in a counterclockwise direction.  
**CAUTION: Do not allow the plug to rotate. Flats are provided on the plug stem so it can be held with a wrench. Prevent the plug from dropping into the seat ring when the actuator is removed. Heavy actuators may require a hoist. If a lifting ring is not provided, use lifting straps around the yoke legs. Be aware that the center of gravity may be above the lifting straps.**
3. Remove the bonnet flange nuts and bonnet flange. Carefully slide the bonnet up off the plug stem to avoid galling.
4. Remove the three-way adapter by lifting it over the plug stem.  
**CAUTION: Large adapters may require a hoist. Lift the three-way adapter straight away from the body to prevent damaging the plug stem.**
5. Remove the upper seat ring and gaskets.
6. Remove the plug. Check the guiding and seating surfaces for galling and scoring.
7. Remove the retainer, lower seat ring and seat gasket. Check both seat rings for galling and scoring.

## Reassembling Three-way Valves

To reassemble three-way valves, refer to Figure 1 and proceed as follows:

1. Clean all gasket surfaces.  
**NOTE: Use new gaskets whenever the valve is disassembled.**

2. Install new seat ring gasket, lower seat ring and retainer.
3. Insert the plug into the body.  
**CAUTION: Most three-way seat rings are non-directional; however, on soft seat and special seat rings make sure the proper seating surface is facing the plug.**
4. Install the upper seat ring and new gaskets.
5. Lower the three-way adapter over the plug stem into the body. Make sure the three-way adapter is aligned with the correct flow direction.
6. Replace the bonnet gasket.
7. Slide the bonnet over the plug stem, making sure not to gall the plug stem.  
**CAUTION: Adapters above two inches have different gasket recess depths, and must be installed with the correct bonnet gasket recess in contact with the correct bonnet gasket recess. Measure the depth of the upper gasket recess in the body. The bonnet gasket recess in the adapter is the same depth.**
8. Lower the bonnet flange over the plug stem onto the bonnet.
9. Insert guides and packing into the bonnet, following the procedure outlined in Maintenance Instructions 1.
10. Hand tighten the bonnet flange bolting.
11. Apply air to the cylinder so the actuator stem is at mid-stroke.
12. Lower the actuator and gland flange into place. Screw the plug stem into the actuator stem by rotating the actuator in a clockwise direction.
13. Tighten the stem clamp.
14. Replace the yoke clamps.
15. Tighten the gland flange nuts slightly more than finger tight.  
**CAUTION: Do not over tighten packing. This can cause excessive packing wear and high stem friction.**
16. Stroke plug two or three times to center seat rings.
17. Seat the plug in the lower seat ring with air pressure in the actuator. Tighten two opposing body bolting nuts  $\frac{1}{6}$ -turn. In this manner, tighten remaining bolting  $\frac{1}{6}$ -turn.
18. Continue to alternately seat the plug in the lower and upper seat rings and to tighten the bolting  $\frac{1}{6}$ -turn. Firmly tighten all bolting evenly and completely, using full wrench force to compress the gaskets and to seat the assembly metal-to-metal. Proper tightness requires considerable force. However, the bottoming of the parts metal-to-metal can be easily felt through the wrench.
19. When reinstalling the valve in the line, make sure the flow is in the proper direction.



**Figure 1:**  
**Mark One Three-way Valve Body Subassembly**

**NOTE:** Item numbers correspond directly to the valve's bill of material. Refer to the bill of material for specific part numbers.

Valtek is dedicated to providing accurate, detailed and current maintenance instructions to the users of its products. If incorrect, unclear, or incomplete material is discovered, please contact Valtek Corporate Communication, Box 2200, Springville, Utah 84663-0903; Phone 801-489-8611; Telex 388-458; Fax 801-489-3719.

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