Valtek Tiger-Tooth Control Valves

GENERAL INSTRUCTIONS

The following instructions are designed to assist in installing, assembling and troubleshooting Valtek® Tiger-Tooth™ trim. Product users and maintenance personnel should thoroughly review this bulletin in conjunction with Installation, Operation, Maintenance Instructions 1 (Mark One and Two Control Valves) before installing, operating or maintaining the valve.

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

Installation

Standard unpacking and installation instructions are outlined in Installation, Operation, Maintenance Instructions 1. Regardless of the air-action, it is imperative that valves equipped with Tiger-Tooth trim be **installed in the line with the flow direction under plug.**

CAUTION: Improper installation will result in valve failure.

DISASSEMBLY AND REASSEMBLY

Disassembling Unbalanced Tiger-Tooth

Refer to figure 1 and proceed as follows:

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

1. Fully retract plug until the stem clamp is pointing to the open position on the actuator stroke plate.
2. Remove bonnet flange bolting and lift actuator, bonnet and plug assembly out of the valve body. Remove the bonnet gasket.

   CAUTION: A hoist may be necessary for larger actuators (size 50 and larger). Care must be taken to lift the actuator and plug straight out of the valve body. Any scraping of parts while removing the actuator may damage valve parts. When the actuator is not equipped with a lifting ring, do not attach one. Instead, lift the actuator by using lifting straps through the yoke legs.

   WARNING: When lifting by the yoke legs, the center of gravity may be above the lifting point. Therefore, support must be given to prevent the actuator from rotating. Otherwise, serious injury may result.
3. With the actuator, bonnet and plug removed, lift the Tiger-Tooth stack out of the valve body. Most stacks are welded together; however, some are not. If the stack is not welded, lift the individual discs out separately. In larger sizes, the welded stack or crown disc may be too heavy to lift without a hoist. In this case, tapped holes are machined into the top of the crown disc for the installation of lifting rings.

   CAUTION: When removing welded stacks, there is a possibility that the surface welds holding the disks together may fail, allowing individual discs to could come apart and fall. Keep personnel and equipment from under the stack or other trim parts being lifted out of the valve to avoid personal injury or equipment damage.
4. Remove the seat ring and seat ring gasket.
5. The stack may now be cleaned according to established industry methods. If uncertain as to which methods to use with a particular stack and application, contact factory.

   CAUTION: When cleaning welded stacks, do not remove the welds to disassemble the stack. Otherwise, extreme difficulty will arise when aligning and rewelding the stack correctly. If the stack cannot be cleaned without removing the welds, contact factory.

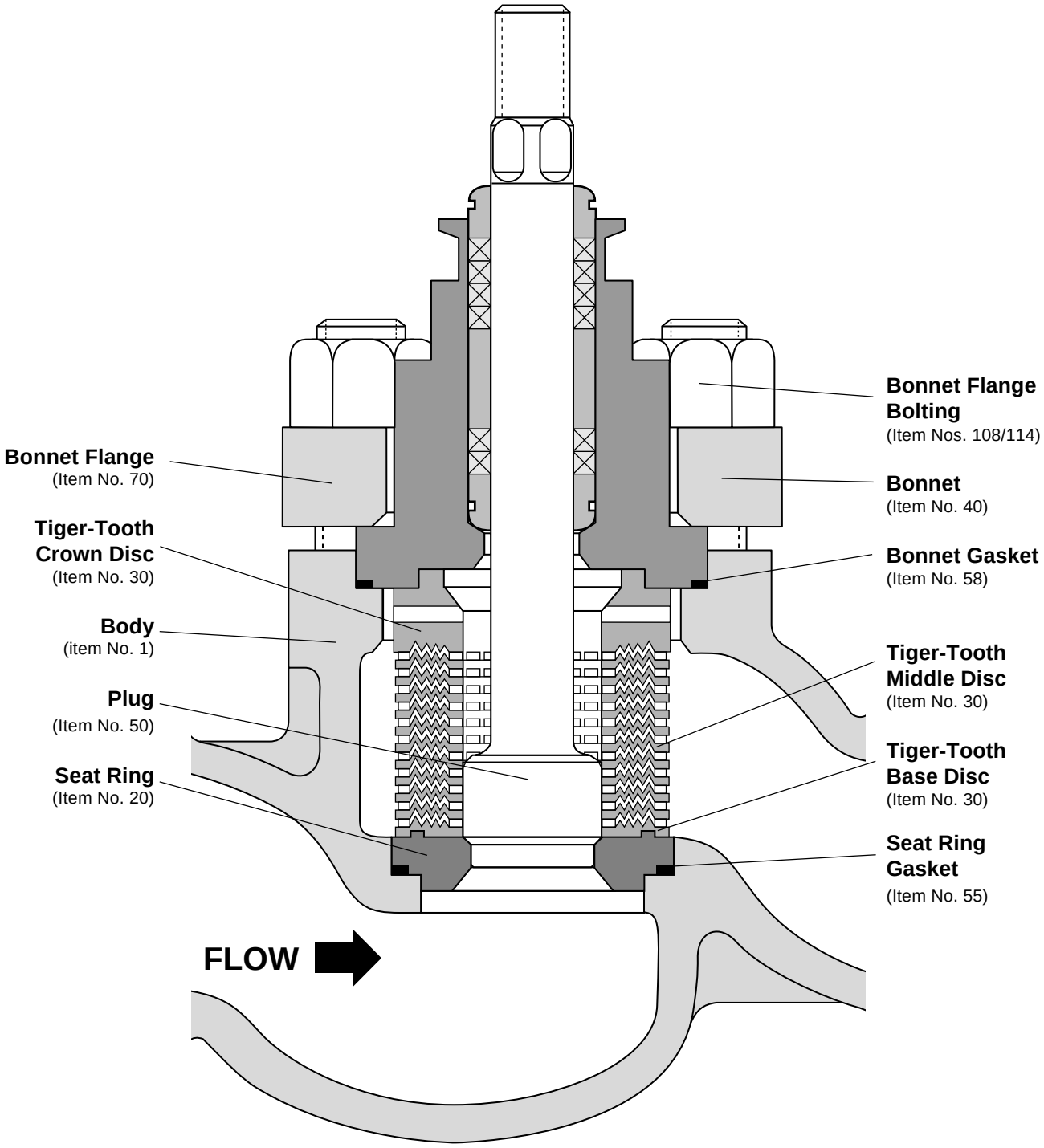

Figure 1: Unbalanced Tiger-Tooth Trim

Note: Item numbers refer to the valve's bill of material. Refer to it for specific part numbers.

Reassembling Unbalanced Tiger-Tooth

Refer to figure 1 and proceed as follows:

1. Clean and inspect gasket surfaces to ensure proper gasket sealing. The bonnet and seat ring gaskets should be replaced each time the valve is disassembled. Install a new seat ring gasket and reinstall seat ring.

   NOTE: *On larger valves, it is advantageous to mount the actuator and bonnet assembly above the body before continuing assembly. Tighten the bolting until the bonnet is fully seated in the body and measure the distance between the bottom of bonnet flange and the top of the body flange (this dimension will be used during tightening of bonnet flange bolting). Remove actuator and body assembly and continue assembly.*

2. Both pinned and welded stacks have an indexing groove machined into the base disc. With welded stacks, install the stack in the valve body being careful to align the indexing groove machined on the bottom of the stack with the raised indexing step located on the top of the seat ring.

   With pinned stack, place the base disc on the seat ring being careful to align the indexing groove machined on the bottom of the stack with the raised indexing step located on the top of the seat ring. Place the next disc (marked number 2) on the base disc (see figure 2) and proceed with succeeding discs until the crown disc is installed. The alignment pin should be installed into the stack after the second disc has been placed. This procedure will help facilitate disc placement

   CAUTION: Make sure the legs are positioned one on top of another in a straight line from the crown to the base. Failure to do so can cause seat gasket or stack failure.

   NOTE: *Small non-welded stacks are constructed with an alignment pin for proper alignment.*

3. Replace the bonnet gasket.

4. Fully retract the plug (stem clamp indicator pointing to the open position) and lower the actuator, bonnet and plug assembly squarely into the body and stack.

   CAUTION: The bonnet aligns closely to the body and the plug fits inside the stack; therefore, extreme caution should be taken in the above step to ensure the bonnet and plug are installed squarely. Failure to do so can result in damage to valve parts.

   WARNING: Keep hands, hair, clothing, etc. away from all moving parts while operating the actuator. Failure to do so can result in serious injury.

5. Once the actuator is resting on the body, tighten the bonnet flange bolting finger-tight.

6. With a caliper, measure the distance from the bottom of the bonnet flange to the top of the body flange at four bolt locations which are equally spaced around the bonnet flange. The total variation in distance should not exceed $\pm$.010 inch. Tighten or loosen the bonnet flange bolting until this tolerance is achieved.

   CAUTION: This tolerance must be maintained or the plug will gall in the stack during step 7. Also, do not tighten the bolting more than $^1/_6$ turn past finger-tight.

7. Using the actuator, slowly seat the plug two or three times to center the seat ring and to align the stack.

   NOTE: *Step 8 applies only to valves with pneumatic actuators. If an hydraulic or mechanical actuator is used, leave the plug in the mid-stroke position and proceed to next step.*

   WARNING: Failure to return the plug to a mid-stroke position will cause damage to the actuator and the valve during the bonnet tightening sequence. This is due to the inability of most mechanical/hydraulic actuators to accommodate the $^1/_{16}$ inch back driving during the tightening sequence.

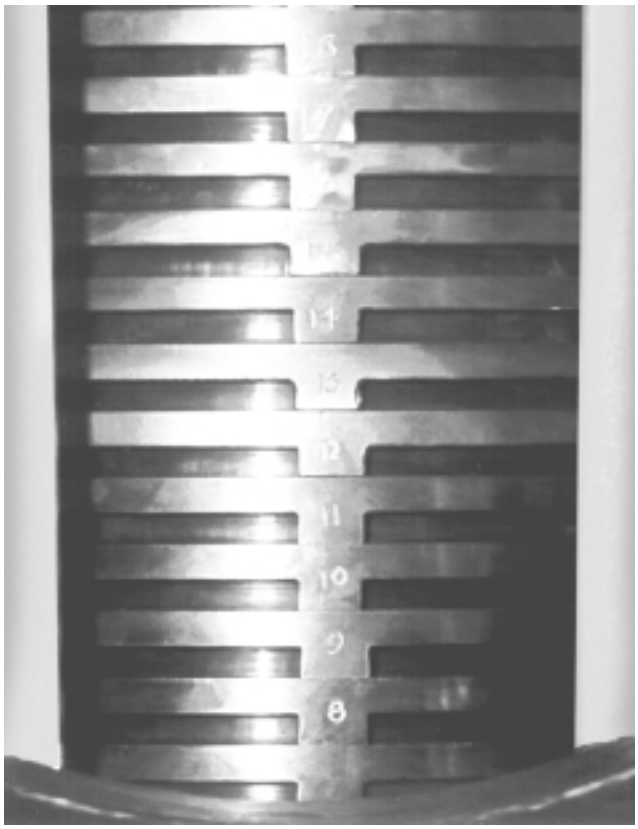

Figure 2: Numbered Discs Showing Correct Leg Alignment

8. Leaving the plug in the extended (or closed) position, begin tightening the bonnet flange bolting in a crisscross pattern that will keep the bonnet flange square (within ±.010 inch) with the body. Tighten the first bolt 1/6, then tighten the bolt directly opposite 1/6 turn.
9. Continue tightening bolting until the bonnet is firmly seated, metal-to-metal, in the body. On 4-inch and smaller valves, this can be easily felt through the wrench. On larger valves or when a torque wrench is required, tighten the bolting until the dimension from step 1 (the measured distance between the bottom of the bonnet flange and the top of the body flange) is achieved.
10. Using the actuator, slowly retract the plug to check the alignment of the stack. Watch the actuator stem clamp indicator for any signs of irregular stem motion, which may indicate galling or sticking of the plug in the stack. If sticking does occur, extend the plug, disassemble the valve, and realign the stack (be sure to change the gaskets when reassembling).

Disassembling Pressure-balanced Tiger-Tooth

Refer to figure 3 and proceed as follows:

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

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

   CAUTION: A hoist may be necessary for larger actuators (size 50 and larger). Care must be taken to lift the actuator and plug straight out of the valve body. Any scraping of parts while removing the actuator may damage valve parts. When the actuator is not equipped with a lifting ring, do not attach one. Instead, lift the actuator by using lifting straps through the yoke legs.

   WARNING: When lifting by the yoke legs, the center of gravity may be above the lifting point. Therefore, support must be given to prevent the actuator from rotating. Otherwise, serious injury may result.

   WARNING: Danger exists in removing the actuator, bonnet and plug — especially if PTFE plug seals are used. The Tiger-Tooth sleeve may stick to the plug and fall during disassembly, causing possible serious injury and/or damage to the valve or nearby equipment. Steps 3 - 6 must be read and understood before attempting to remove the plug from the sleeve.
3. If the sleeve is observed sticking to the plug during removal, do not attempt to lift the plug and sleeve out of the body.
4. Fully extend the plug, leaving the sleeve in the body and creating a space between the bottom of the bonnet and the top of the sleeve.
5. Place wooden blocking of equal thickness in at least three places between the sleeve and the bonnet. Retract the plug until it is freed from the sleeve. Remove the sleeve gasket.

   NOTE: *On long stroke valves, it may be necessary to repeat this step several times with different lengths of wood to remove the sleeve.*
6. Lift the actuator, bonnet and plug assembly from the body, taking care not to damage the sleeve bore or plug head. Remove the plug seals from the plug head.
7. Lift the Tiger-Tooth sleeve and stack out of the valve body. Most stacks are welded together; however, some are not. If the stack is not welded, lift the individual disks out separately. In larger sizes, the sleeve, welded stack or crown disk may be too heavy to lift without a hoist; in this case, tapped holes are machined into the top of the part for the installation of lifting rings.

   CAUTION: When removing welded stacks, there is a possibility the welds holding the discs together may fail, allowing individual disks to come apart and fall. Keep personnel and equipment from under the stack or other trim parts being lifted out of the valve to avoid personal injury or equipment damage.
8. Check the inside bore of the sleeve for scoring or galling. Superficial damage may be removed with a light application of emery cloth. If more serious damage exists, contact 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 functioning of the valve.
9. Remove the seat ring, seat ring gasket and bonnet gasket.
10. The stack may now be cleaned according to established industry methods. If uncertain as to which methods to use with a particular stack and application, contact factory.

    CAUTION: When cleaning welded stacks, do not remove welds to disassemble the stack; otherwise extreme difficulty will arise in aligning and rewelding the stack correctly. If the stack cannot be cleaned without removing the welds, contact factory.

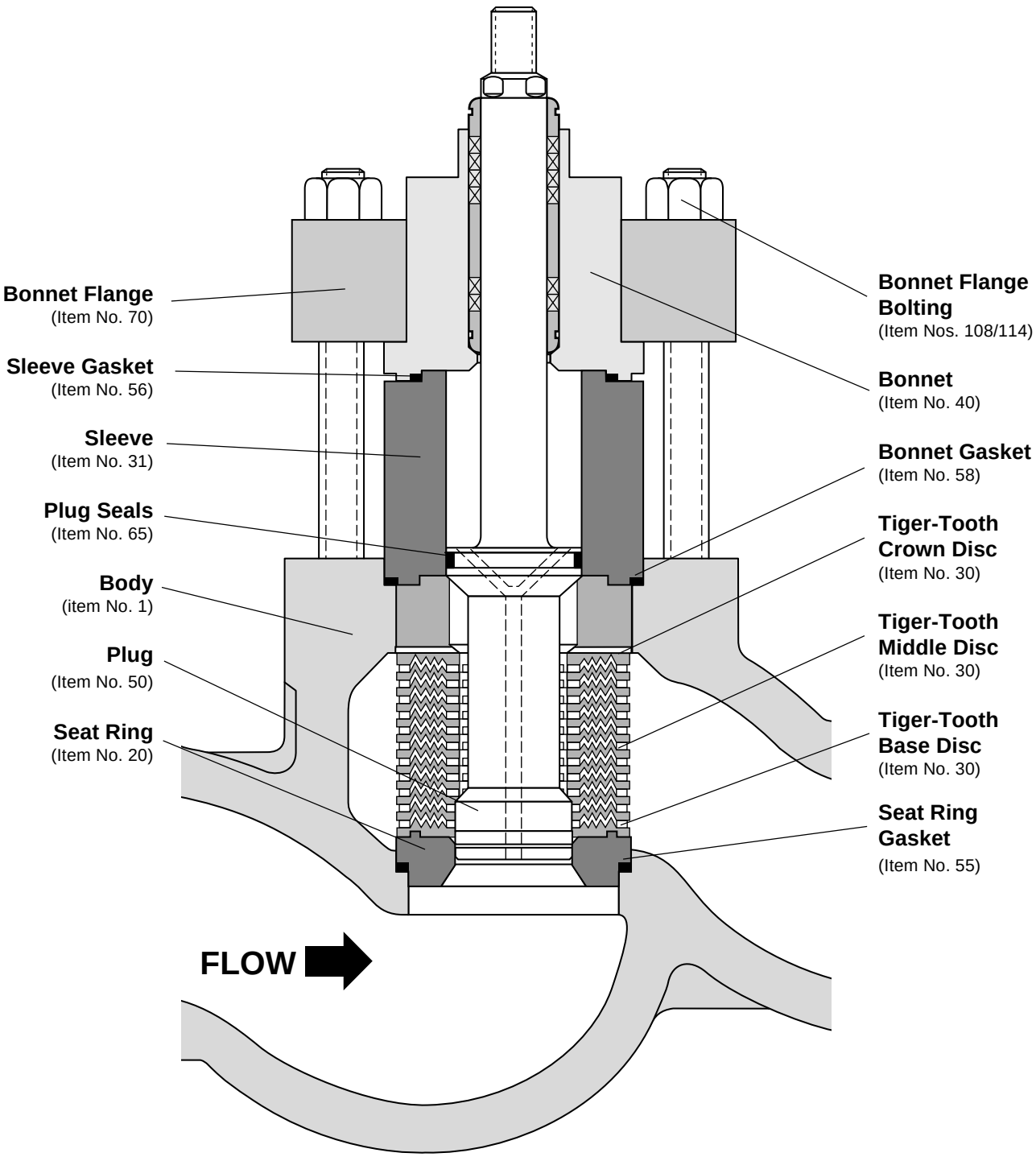

Figure 3: Pressure-balanced Tiger-Tooth Trim

Note: Item numbers refer to the valve's bill of material. Refer to it for specific part numbers.

Reassembling Pressure-balanced Tiger-Tooth

Refer to figure 3 and proceed as follows:

1. Clean and inspect gasket surfaces to ensure proper gasket sealing. All gaskets should be replaced whenever the valve is disassembled. Install new seat gasket and reinstall seat ring.

   NOTE: *On larger valves, it is advantageous to mount the actuator and bonnet assembly above the body before continuing assembly. Tighten the bolting until the bonnet is fully seated in the body and measure the distance between the bottom of the bonnet flange and the top of the body flange (this dimension will be used during tightening the bonnet flange bolting). Remove actuator and body assembly and continue assembly.*

2. Both pinned and welded stacks have an indexing groove machined into the base disc. With welded stacks, install the stack in the valve body being careful to align the indexing groove machined on the bottom of the stack with the raised indexing step located on the top of the seat ring.

   With pinned stack, place the base disc on the seat ring being careful to align the indexing groove machined on the bottom of the stack with the raised indexing step located on the top of the seat ring. Place the next disc (marked number 2) on the base disc (see figure 2) and proceed with succeeding discs until the crown disc is installed. The alignment pin should be installed into the stack after the second disc has been placed. This procedure will help facilitate disc placement

   CAUTION: Make sure the legs are positioned one on top of another in a straight line from the crown to the base. Failure to do so can cause seat gasket or stack failure.

   NOTE: *Small non-welded stacks are constructed with an alignment pin to assist alignment.*

3. Replace the bonnet and sleeve gaskets and plug seals.

4. Reinstall the sleeve above the stack.

5. When using PTFE seals, fully retract the plug (stem clamp travel indicator pointing to the open position) and lower the actuator, bonnet and plug squarely into the sleeve bore. With metal piston ring plug seals, the plug must be extended a few inches to allow the use of a ring compressor on the rings (a suitably sized screw-type hose clamp will also serve to compress the rings for reassembly). Care should be taken to avoid damaging the sealing surfaces while fitting the plug into the sleeve bore.

6. Once the bonnet is resting on the sleeve, reinstall and tighten the bonnet flange bolting finger-tight.

7. With a caliper, measure the distance from the bottom of the bonnet flange to the top of the body flange at four bolt locations which are equally spaced around the bonnet flange. The total variation in distance should not exceed $\pm$.010 inch. Tighten or loosen the bonnet flange bolting until this tolerance is achieved.

   CAUTION: The above tolerance must be maintained or the plug will gall in the stack during step 8. Also, do not tighten the bolting more than $^1/_6$ turn past finger-tight.

8. Using the actuator, slowly seat the plug two or three times to center the seat ring and align the stack.

9. Leaving the plug in the extended (or closed) position, begin tightening the bonnet flange bolting in a crisscross pattern that will keep the bonnet flange square (within $\pm$.010 inch) with the body. Tighten the first bolt $^1/_6$ turn, then tighten the bolt directly opposite $^1/_6$ turn.

10. Continue tightening bolting until the bonnet is firmly seated, metal-to-metal, in the body. On 4 inch and smaller valves, this can be easily felt through the wrench. On larger valves or when a torque wrench is required, tighten the bolting until the dimension from step 1 (the measured distance between the bottom of the bonnet flange and the top of the body flange) is achieved.

11. Using the actuator, slowly extend the plug to check the alignment of the stack. Watch the stem clamp travel indicator for any signs of irregular stem motion, which may indicate galling or sticking of the plug in the stack or sleeve. If sticking does occur, extend the plug, disassemble the valve and realign the stack. Check for any possible damage to the stack, sleeve or plug (be sure to replace the gaskets when reassembling).

Troubleshooting

Problem	Probable Cause	Corrective Action
Jerky stem travel	1. Overtightened packing	1. Adjust the packing box bolts to slightly over finger-tight (over-tightening will cause excessive packing wear and high stem friction)
	2. Inadequate air supply	2. Check for leaks in air supply or instrument signal system; tighten any loose connections and replace any leaky lines
	3. Service temperature exceeds operating parameter of trim design	3. Reconfirm service conditions and contact factory
	4. Malfunctioning positioner	4. Refer to positioner maintenance bulletin
	5. Galling and scoring between plug and plug	5. Superficial damage may be removed with a light application of emery cloth; if more serious damage exists, contact factory; do not attempt to remove deep scratches or high leakage rates will occur
	6. Worn or damaged seat ring	6. Disassemble and replace (or repair) seat ring (for correct procedure on remachining the seat ring, see Maintenance Instructions 1)
Excessive leakage	1. Insufficiently tightened bonnet flange bolting	1. Refer to “Reassembly” section for correct tightening procedure
	2. Inadequate actuator thrust	2. Check for adequate air supply to the actuator; if supply is okay, reconfirm service conditions and contact factory
	3. Incorrectly adjusted plug	3. Refer to Maintenance Bulletin 1 for correct plug adjustment
	4. Worn or damaged plug seals	4. Disassemble and replace plug seals
	5. Worn or damaged gaskets	5. Disassemble and replace gaskets
	6. Worn or damaged seat ring	6. Disassemble and replace or repair seat ring (for correct procedure on remachining the seat ring, see Maintenance Instructions 1)
Restricted flow	1. Incorrectly adjusted limit stop or handwheel	1. Check stroke limiting device and correct, if necessary
	2. Dirty stack	2. Disassemble and clean stack, using established cleaning methods
Excessive noise	1. Improper flow direction	1. Check installation for flow direction under the seat; reinstall, if necessary
	2. Loose parts	2. Check all external bolts nuts for tightness; if noise is internal, disassemble and check for damaged parts or missing seat gasket
	3. Jerky or improper stem travel	3. See corrective action stem travel under “Jerky stem travel”
	4. Excessive pressure drop	4. Check design service conditions and contact factory
	5. Throttling too close to seat	5. Recommended minimum throttling should be 5 percent or more open

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