

Serie 2003/2013

Three-way Control Valve, mixing/diverting

Service

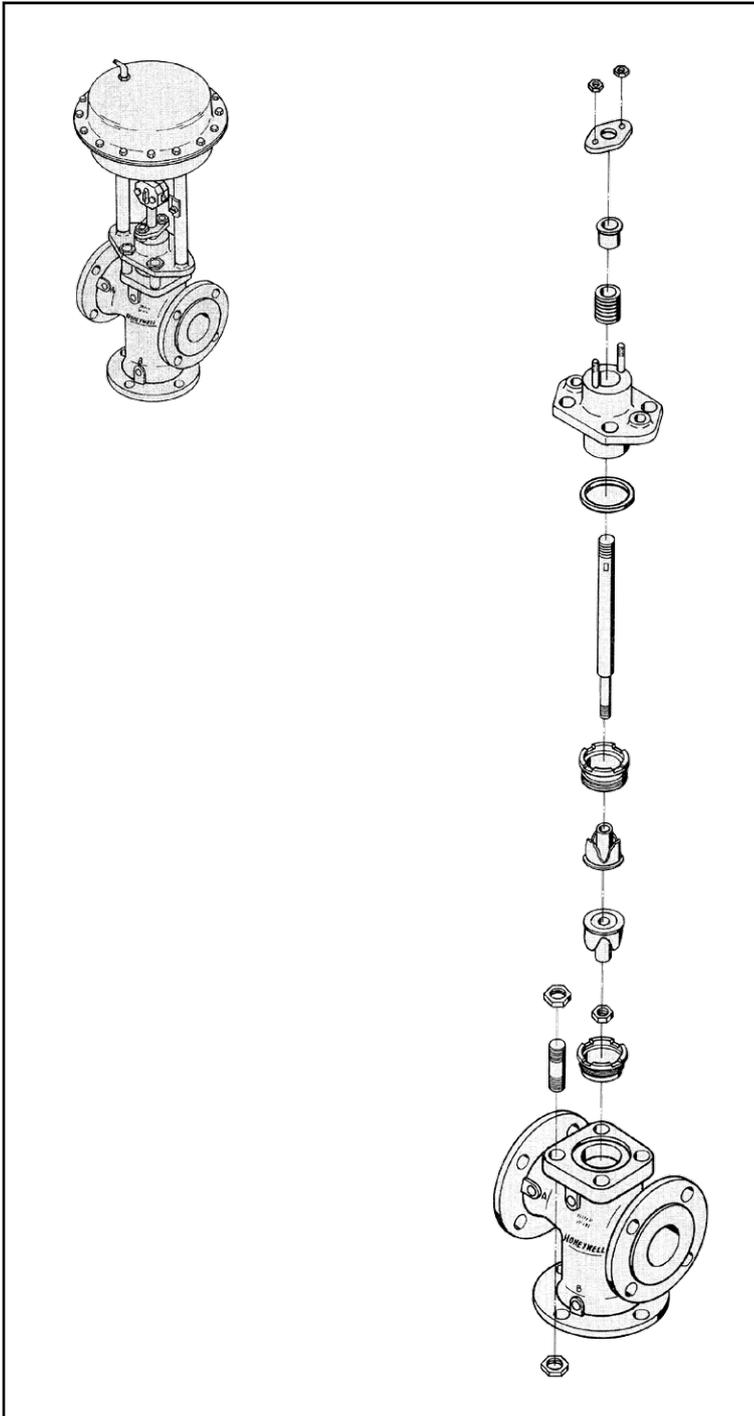


FIG1: Series 2003/13, control valve

Preventive maintenance

Preventive maintenance primarily consists of making a regular visual inspection of the valve assembly. This can reveal packing box leaks, loosening of air connections due to vibrations, and other visible defects. A suggested inspection includes the following:

1. Check packing box for leakages. If leakages are evident, do not tighten packing flange nuts beyond point required to stop leakage. If the packing box is too tight (and this can very easily happen when a wrench is used), excessive stem friction is created, due to the pressure of the packing against the stem. The excessive stem friction may cause the top of the diaphragm to require several additional pounds of air to stroke the valve. If tightening the packing flange nuts fails to stop the leakage, the packing box requires either additional packing or removal of the old packing and installation of new packing. Occasional cleaning of the valve stem will prevent dirt and grit from being carried into the packing.
2. Check all mechanical and air connections. In some applications, particularly where the valve is located in a line near a pump, vibrations may cause both mechanical and air connections to work loose.
3. If possible, stroke the valve through several cycles, noting the pressure required for stroking, and the normal action of the valve etc.
4. Check tightness of diaphragm case (seal and O-ring).
5. Check tightness of screws connecting body to bonnet.
6. Check tightness of actuator post nuts.
7. Check tightness of stem connector.

Overhauling procedure

To completely overhaul a pneumatically actuated valve, isolate the flow medium from the valve. Generally, when a valve is overhauled, the actuator and bonnet are removed from the valve body, the packing is removed from the valve body, the packing is removed from the packing box, and all parts are cleaned. Make a thorough inspection of the plug, seat rings, and stem to determine whether these parts should be re-used, re-worked, or replaced.

Note:

For a quick inspection of the valve trim, the bonnet may be removed from the valve body with the actuator still mounted and attached to the valve stem. To minimize the possibility of leakages, always replace the valve body gaskets whenever the valve is disassembled. For convenience sake, replacement kits are available that include these gaskets.

Removing actuator from valve

1. Loosen screws from the linking joint and remove it from actuator and valve stem.

Caution:

On three-way valves the pre-adjusted spring force is effective. Therefore, apply enough air pressure to the actuator to stroke the stem to middle position, before disconnecting the linking joint.

2. Reduce the loading pressure in the actuator to nil.

3. Disconnect the pneumatic connection to the actuator.

4. Remove the two hexagon nuts from the actuator rods.

5. Lift actuator off valve.

Mounting the actuator on to the valve

1. Push plug (that means the valve stem) by hand into lower position (= passage B closed).

2. Attach the actuator, without tightening the nuts at the bonnet bridge completely.

3. Connect the air supply to the actuator.

4. On direct-acting actuators, apply sufficient air pressure to fully stroke the actuator to nominal stroke + 5%.

5. On reverse-acting actuators adjust the desired starting point (e.g. 0.5 bar).

6. Attach stem connector at this point making sure that there is full engagement of the threads on the stems and that the stroke indicating pointer faces the lowest marking on the stroke indicator plate with the stem of the final control element in the fully closed position. Tighten screws of stem connector.

7. Completely tighten the actuator rod nuts, securing the actuator firmly to the bonnet.

8. Fine adjustments may be made (e.g. with the valve plug off the seat) by slightly slackening the stem connector screws and screwing the stem of the final control element towards or away from the actuator stem using spanners, fitted to the flats provided on both stems. Readjust the travel indicator plate when the valve is closed.

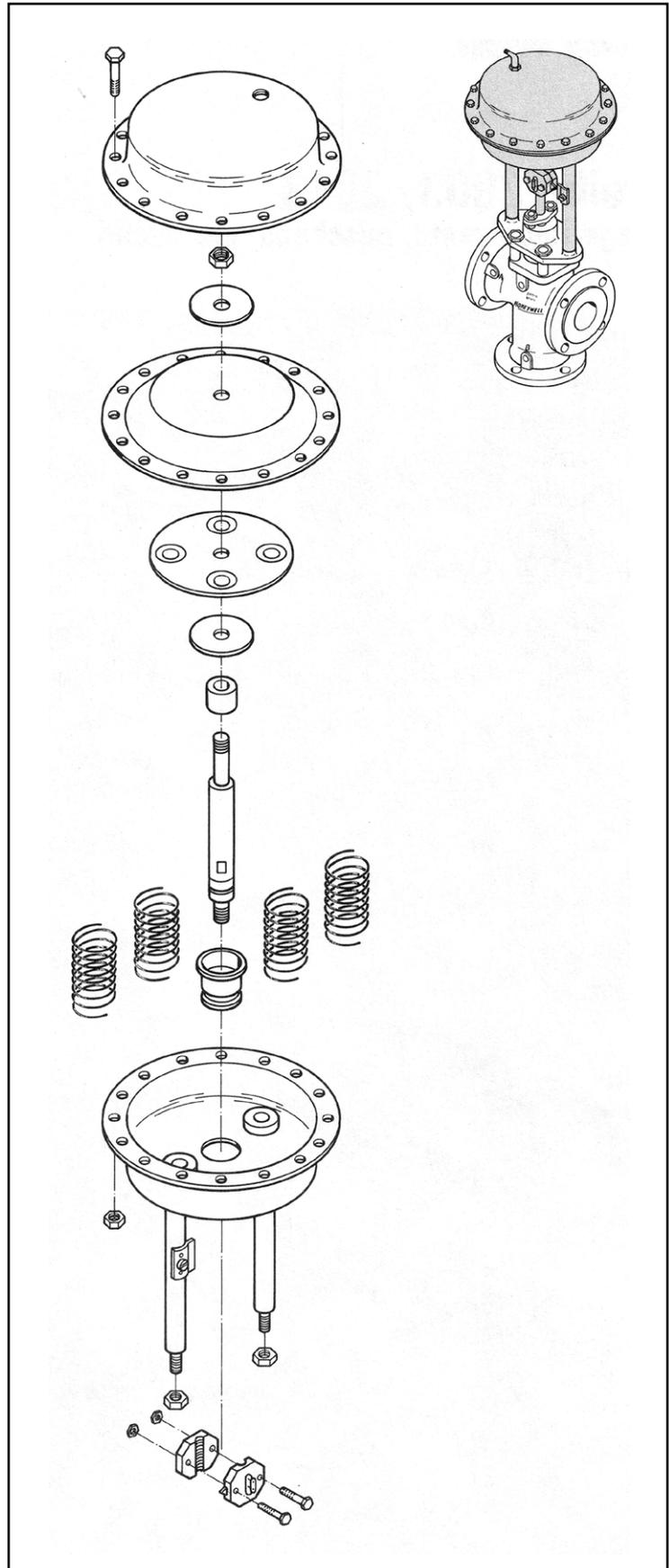


FIG2: Actuator, Series 2000

Servicing the valve

(A) Replacing the plug and seat rings in valves with standard or extended bonnets:

1. Loosen screws from the linking joint and remove it from actuator and valve stem.

Caution:

In three-way valves the pre-adjusted spring force is effective. Therefore, apply enough air pressure to the actuator to stroke the stem to the middle position, before disconnecting the linking joint.

2. Reduce the loading pressure in the actuator to nil.
3. Disconnect the pneumatic connections to the actuator.
4. Remove nuts securing bonnet to valve body.
5. Unscrew packing gland nuts until they are just finger-tight.
6. Remove actuator and bonnet vertically using a turning motion and without resorting to force to avoid damaging the packing.
7. Secure valve stem at the key faces using a spanner. Loosen the connecting nut at the valve stem using a wrench through the

lower valve outlet. On the nominal widths of 200 to 300 the connecting nut is secured by means of a pin. This must be removed first.

8. Pull out valve stem from above.

In mixing valves:

9. Unscrew upper seat ring using a seat ring tool and remove both halves of the plug from above.

10. Unscrew lower seat ring using a seat ring tool.

In diverting valves:

11. Pull out the upper part of the plug and unscrew the upper and lower seat ring using a seat ring tool. Remove lower part of the plug from above. On valves with nominal width 15 to 32, remove the spacer bush as well.

12. Reassemble valve in reverse order.

(B) Replacing the plug and seat rings in valves with bellows seal bonnet:

Caution:

In valves with bellows seal bonnet the valve stem must not be rotated to avoid damaging the bellows.

1. Loosen screws from linking joint end remove it from actuator end valve stem.

Caution:

In three-way valves the pre-adjusted spring force is effective. Therefore, apply enough air pressure to the actuator to stroke the stem to the middle position, before disconnecting the linking joint.

2. Reduce the loading pressure in the actuator to nil (spring closes).
3. Disconnect the pneumatic connections to the actuator.
4. Unscrew packing gland nuts until they are just finger-tight.
5. Remove nuts and bolts securing the bonnet to bellows housing.
6. Remove actuator end bonnet vertically using a turning motion end without resorting to force to avoid damaging the packing.
7. Loosen recessed head nut, which secures the bellows seal in the bellows seal bonnet
8. Remove nuts and bolts connecting the bellows seal bonnet to valve housing.
9. Remove bellows seal bonnet vertically.

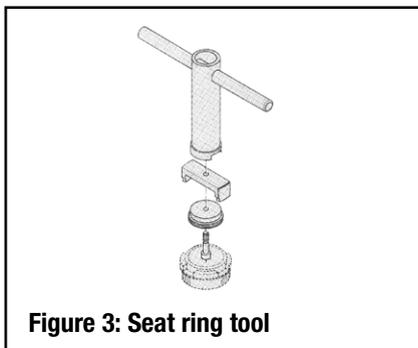


Figure 3: Seat ring tool

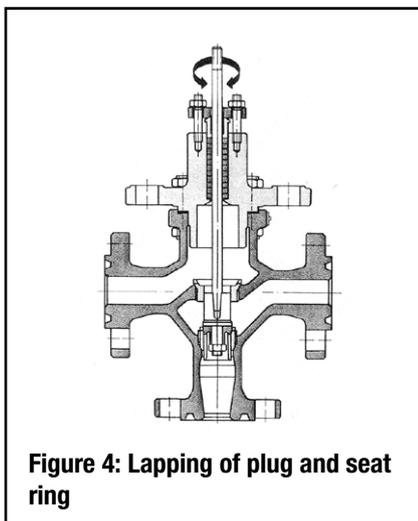
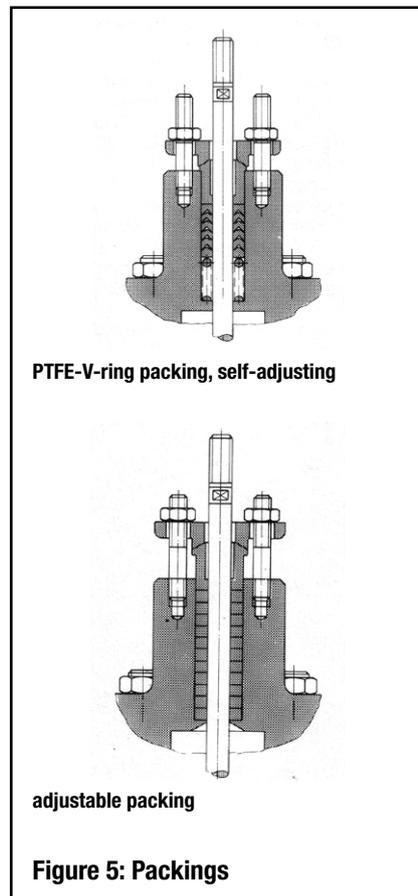


Figure 4: Lapping of plug and seat ring



PTFE-V-ring packing, self-adjusting

adjustable packing

Figure 5: Packings

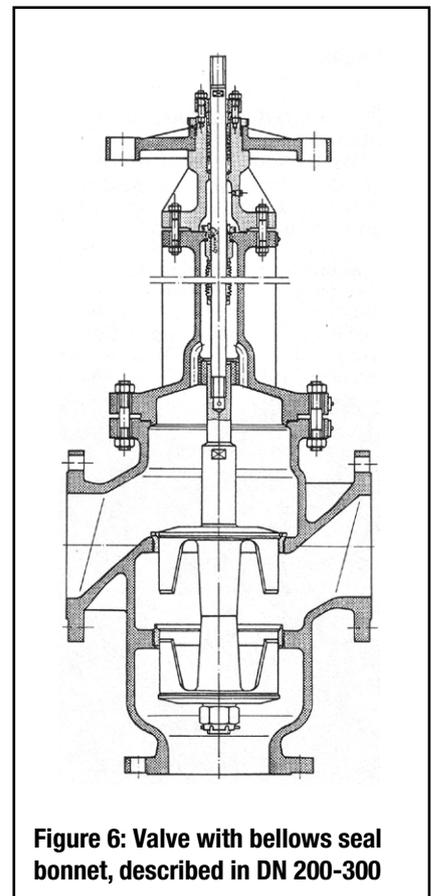


Figure 6: Valve with bellows seal bonnet, described in DN 200-300

10. Secure valve stem at the key faces using a spanner. Loosen the connecting nut at the valve stem through the lower valve outlet using a wrench.

On nominal widths of 200 to 300 the connecting nut is secured by a pin.

This must be removed first.

11. Pull out valve stem with bellows seal from above.

In mixing valves:

12. Unscrew upper seat ring using a seat ring tool and remove both halves of the plug from above.

13. Unscrew lower seat ring using a seat ring tool.

In diverting valves:

14. Pull out the upper part of the plug and unscrew the upper and lower seat ring using a seat ring tool. Remove lower part of the plug from above. On valves with nominal width 15 to 32 remove the spacer bush as well.

15. Reassemble valve in reverse order.

Lapping the plug and seat ring

1. The sealing of the surfaces can be improved by lapping, using a good quality carborundum paste with 280 grit size.

2. Apply lapping compound to seating surfaces of plug and seat ring.

3. Lap plug into seat ring (Figure 4), so that both have good seating surfaces. Do not remove too much metal; stop the lapping after seating surfaces of 1/32 inch (0.8 mm) wide have been obtained. Check that seating of plug is good.

4. Thoroughly remove all traces of lapping compound.

Replacing the packing

1. Disconnect actuator from valve stem (see „Replacing plug“ 1 to 2);

2. Remove the packing gland nuts, flange and follower. Pull out the old packing with a hook, being careful to avoid scratching the wall of the packing box.

3. Clean packing box and all metal pans.

4. Install new packing and associated parts in the correct sequence (Figure 5).

Replace the follower, flange and nuts.

With PTFE spring loaded packing, tighten gland nuts fully until limited by the travel stop, fitted to the packing follower in this type of packing. In the case of PTFE-asbestos or graphite-asbestos packing, tighten just enough to prevent gland leakage.

Replacing the bellows seal in valves with bellows sealbonnet

Caution:

*The stem must **not** be rotated.*

1. Remove bellows seal bonnet (Figure 6) with actuator and plug from housing (see „Replacing plug and seat rings“ B.1. to B.11.).

2. The bellows seal stem is screwed to the plug stem and secured by a pin. Remove the pin and unscrew the plug stem from the bellows seal stem.

3. Exchange bellows seal (incl. bellows seal stem) and assemble valve in reverse order.

4. Test valve for efficiency of bellows seal prior to refitting it into the pipeline by applying approx. 5 bar air supply to the valve body and checking for any leakages at the test connection below the packing

chamber.

Reversing valve action

1. Remove the stem clamp and disconnect the air supply (see “Replacing plug“ A.1. to A.3.)

2. Remove the short bolts around the diaphragm chamber. Gradually loosen each of the long bolts, slackening each bolt alternatively by one or two turns, to progressively relieve the compression of the actuator springs inside the chamber.

Warning:

Long bolts must always be removed last to ensure that the spring compression is fully released before the diaphragm upper casing is removed.

3. Remove diaphragm upper casing.

4. Remove actuator stem nut, using a spanner on the flats provided on the lower end of the stem to prevent rotation. The spring plate, clamp plates, springs, spacer and diaphragm may now be removed.

5. Assemble the internal parts in accordance with Figure 7 (direct-acting) or Figure 8 (reverse-acting). To reassemble, follow points 1 to 4 in reverse order. Ensure that the actuator springs are evenly distributed inside the casing and vertically located by the spring buttons of the diaphragm plate.

Replacing the actuator diaphragm

1. Remove the stem clamp and disconnect the air supply (see “Replacing plug“ A.1. to A.3.).

2. Remove the short bolts around the diaphragm chamber. Gradually loosen each of the long bolts, slackening each bolt alter-

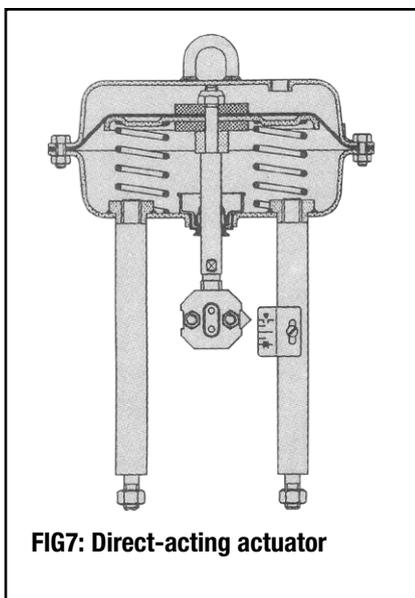


FIG7: Direct-acting actuator

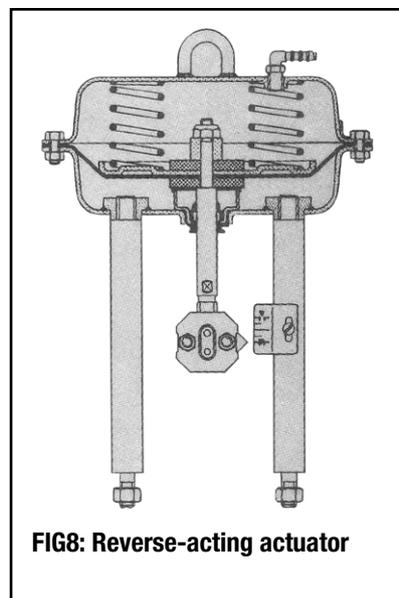


FIG8: Reverse-acting actuator

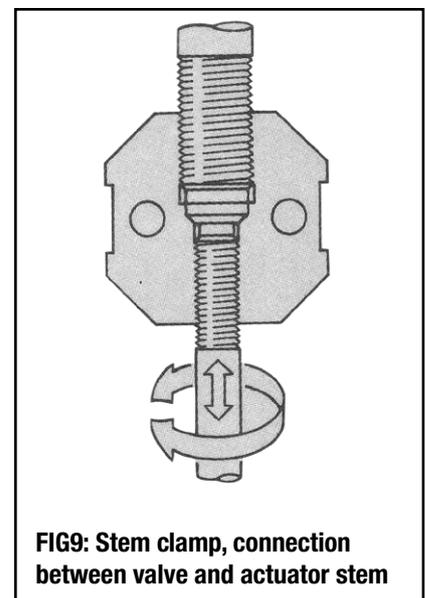


FIG9: Stem clamp, connection between valve and actuator stem

natively by one or two turns, to progressively relieve the compression of the actuator springs inside the chamber.

Warning:

The long bolts must always be removed last to ensure that the spring compression is fully released before the diaphragm upper casing is removed.

3. Remove the diaphragm upper casing.
4. Remove the actuator stem nut, using a spanner on the flats provided on the lower end of the stem to prevent rotation. The spring plate, clamp plates, springs, spacer and diaphragm may now be removed.
5. A new actuator diaphragm and assemble the internal parts in accordance with Figure 7 (direct-acting) or Figure 8 (reverse-acting). To reassemble, follow points 1 to 4 in reverse order. Ensure that the actuator springs are evenly distributed inside the casing and vertically located by the spring buttons of the diaphragm plate.

Replacing the stem seal

1. Disassemble actuator as described in “Replacing the actuator diaphragm” procedures 1 to 4.
2. Remove actuator from the valve by removing the hexagon nuts from the two actuator rods.
3. Remove the actuator stem through the bottom of the lower case of the diaphragm.
4. Renew the stem seal and replace actuator stem from below through the bottom of the lowercase, after applying silicone based grease to the two chambers in the stem seal.
5. Reassemble the actuator as described in “Reversing valve action”, point 5.

Adjusting starting point

The start point is adjusted simply by altering the distance between the ends of the valve stem and actuator stem within the split stem clamp (Figure 9):

1. Remove the stem clamp (see “Removing actuator from valve”, points 1 to 3).
2. Adjust the starting point by following “Mounting actuator on to valve”, points 1, 3 to 6 and 8.



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