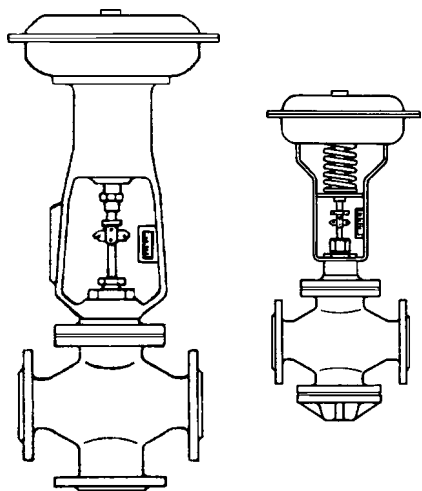

Diaphragm Control Valves **FLUXOTROL** Series “I” and Series “25” Installation and Maintenance Instructions



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- 1. General*
 - 2. Installation instructions*
 - 3. Maintenance instructions*
 - 4. Spare parts list*
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IMPORTANT

SAFETY INFORMATION: PLEASE READ CAREFULLY

Hazards to be considered when installing/using/ maintaining.

1. Access

Ensure safe access and if necessary a safe working platform before attempting to work on the product.

Arrange suitable lifting gear if required.

2. Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required e.g. electrical wiring.

3. Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider; flammable materials, substances hazardous to health, extremes of temperature.

4. Hazardous environment around the product

Consider; explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

5. The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolating valves, electrical isolation) put any other part of the systems or any other workers at risk? Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

6. Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking and/or labelling of shut valves. Do not assume the system is de-pressurized even the pressure gauge indicates zero.

7. Temperature

Allow time for temperature to normalise after isolation to avoid the danger of burns.

8. Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

9. Protective clothing

Consider whether any protective clothing is required to protect against the hazards of, for example, chemicals, high/low temperature, noise, falling, objects, dangers to eyes/face.

10. Permits to work

All work must be carried out or be supervised by a suitable competent person.

Where a formal permit to work system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person knows what work is going on and where necessary arrange to have an assistant whose primary responsibility is safety. Post warning notices if necessary.

11. Electrical work

Before starting work study wiring diagram and wiring instructions and note any special requirements.

Consider particularly; mains supply voltage and phase, local mains isolation, fuse requirements, earthing, special cables, cable entries/cable glands, electrical screening.

12. Commissioning

After installation or maintenance ensure that the system is fully functioning. Carry out tests on any alarms or protective devices.

13. Disposal

Unwanted equipment should be disposed of in a safe manner.

NOTE: The products supplied by Spirax Sarco are classified as components and are not generally affected by the Machinery Directive 89/ 392/EEC.

1. General

Diaphragm control valves are used to control the flow of water, liquids, gas and steam.

The valve is generally operated by a pilot controller which utilizes air as the operating medium or by a converter which changes the electric signal coming from the control system into a pneumatic signal.

The opening, closing and throttling action of the valve is obtained by variation of the controller outlet signal according to changes of controlled variable.

The diaphragm, the spring and the plug of valves are sized to obtain the desired flow dynamic characteristics and accurate response to specified working conditions.

Normally, the diaphragm and spring combinations fitted on the valve are set for a control signal pressure of 3 to 15 psi (0.2 to 1 bar) on the diaphragm. According to process requirements, higher signal ranges can be used, 6 to 30 psi (0.4 to 2 bar) or even partial signal ranges.

Fluxotrol diaphragm control valves can be

supplied with either direct or reverse acting actuators.

Direct acting valves (N.O.) are fitted with a plug which closes the valve by increase of the pneumatic signal pressure on the diaphragm and consequently the spring opens the valve on air failure, (in the case of three-way valves reference is made with respect to the straight through operation).

Reverse acting valves (N.C.) open by increase of the pneumatic signal pressure and therefore the spring closes the valve on air failure (in the case of three-way valves reference is made with respect to the straight through operation).

Serial number

Valve serial number is stamped on the plate attached to valve yoke. Always refer to such number when ordering spare parts or for servicing.

2. Installation

The following instructions cover shipment, storage and plant installation of Fluxotrol pneumatic valves.

1 - Shipment and storage

- Do not remove the protecting plugs from the flanges during the whole period of shipment and storage; ingress of foreign material into the valve interior could damage the inner parts and ultimately valve tightness.
- Avoid shocks to the actuator which could cause misalignment and therefore prevent proper operation of the valve.
- Avoid shocks and tampering with the pilot positioner set (if any) and to the control mechanisms and indicating manometers.

2 - Installation in the plant

- Before installing the valve, clean it by means of a water jet to remove possible scales and dirt due to storage; then thoroughly dry the interior by means of an air blast.
 - It is recommended that a protecting strainer be installed always upstream of the valve.
 - The most common and recommended method is to install valves vertically with the topwork upwards, however, for dimensional reasons, valves may be installed at an angle or horizontally, in such cases adequate support for the valve yoke should be provided.
- The horizontal position should not be employed for valves having large diameters and equipped

with heavy plugs.

- If continuous operation of the plant is required even during maintenance or replacement of the valve, a proper by-pass with appropriate isolating valves with manual control should be provided.
- During installation, ensure that enough clearance is left above and below the valve to permit removal of the inner parts.
- Make sure the valve is installed with the arrow cast on the body pointing in the direction of fluid through the pipe.
- When connecting pipe to counterflanges carefully tighten the bolts diagonally. Make sure that the alignment of the pipes is correct and that they are adequately supported to avoid strains on the valve when pipes are cold as well as hot.
- After installation and with the pneumatic valve in the open position, carefully clean the pipeline to eliminate foreign material, welding scale or dirt which could damage the valve seating.
- Connect the outlet pneumatic signal of the control system to the appropriate screwed connection on the diaphragm chamber by means of a copper or plastic tube 6x4 mm or 8x6 mm size. It is essential that the air line is perfectly airtight: check tightness of fittings and connections with water and soap solution or with special spray compound.
- If the valve is equipped with a positioner or converter, refer also to the instructions concerning the instrument.

3. Maintenance

Figures within brackets refer to part numbers indicated on drawings at the end of this bulletin showing the cross-section of the valve.

1 - Routine maintenance

- **After an initial period** in operation it is recommended that the **tightness of the nuts** (29) which fix the bonnet (32) and the bottom flange (38) to the valve body and which could have loosened due to the temperature variations, mechanical vibrations or stress, be checked.

This operation will avoid leakage of fluid through the body gaskets, which would be difficult to eliminate later.

- **The stuffing-box** must be checked frequently. During the **first hours** of operating, to eliminate possible leakage, screw-in the stuffing box nut (23) slightly (1/4 revolution only for **teflon/graphite or graphited** stuffing box), fluid pressure itself will assure tightness of the packing. Do not tighten the stuffing box nut excessively as this can then cause valve locking.
- To reduce stem friction, it is suggested that the stem (22) be lubricated with a special silicone oil at least once per month or when it becomes dry.

2 - Trouble shooting

In all cases of incorrect operation, check firstly that the pneumatic connections and fittings are airtight, then make sure of correct instrument adjustment (control action, proportional band, automatic reset, etc.).

Check also that the pneumatic signal to the valve is modulated and that control signal pressure changes in accordance with process requirements. For successful performance of the valve, the stem (22) of the valve must move freely according to the air pressure changes on the diaphragm. If this action is not obtained, check the following:

- **Stuffing box**
Check that the stuffing box packing (27) is not overtightened so as to prevent free movement of the valve stem (avoid high friction).
- **Diaphragm**
In case of diaphragm damage, the valve will no longer perform a complete stroke. If the diaphragm is no longer flexible or is damaged, replace it immediately (see paragraph 4).
- **Plug guides**
Check the guides of the plug.
If necessary, clean or grind them.
- **Leakage of fluid through the valve in the closed position.**
In case of insufficient tightness: it will be necessary to bear in mind the limits of maximum

leakage of fluid allowed with the valve in the closed position for the different types of valve construction (single port, single port with balanced plug, double port) with metal to metal seating or with gasket soft seating.

Such limits are indicated in the valve technical bulletins.

Check that between plug and seat no foreign material exists and that the contact area is not excessively damaged, if necessary carefully grind them by using fine grinding compound mixed with machine oil.

For extensive damage, replacement of seat and plug becomes necessary (for disassembling the valve, see paragraph 5).

3 - Replacement of stuffing box

- **Stuffing box fitted with teflon/graphite rings:** after several adjustments the compensating spring can reach the packing position and therefore rings must be replaced. For such an operation, disconnect the plug stem (22) from the diaphragm rod (5) by unscrewing the locknut (19) and by rotating the stem, by means of nuts (20) for "I" valves only.

At the same time accurately mark the bind thread length.

For two-way valves N.C. with downwards reverse plug and for three-way mixing valves N.C. and for diverting valves N.O., lift the plug from seat by 1-2 mm by introducing air into the actuator.

For two-way valves N.C. with upwards direct plug, lift the plug by the whole stroke by introducing air at 20 or at 35 psi into the actuator. For three-way mixing valves N.O. and for diverting valves N.C., air must be introduced at such a pressure to obtain an almost complete stroke without reaching the stop position.

With valves having bellows seal, it is necessary to remove the nuts (29) and keep the bonnet (32) lifted by some millimeters to avoid twisting the bellows.

Loosen the yoke locknut (24) and remove the actuator; unscrew the nuts (29) and take off the bonnet (32) taking care not to damage the ground stem surfaces and after having removed nuts (20) and indicator plate (21) (for "I" valves only).

Unscrew the stuffing box nut (23) and by means of a hooked tool made of a soft metal like aluminium or brass, take off the old stuffing box packing (27), the washers (70) and the self-adjusting spring (61).

Carefully clean the packing chamber and the stem, assemble the bonnet (32) and insert a new set of rings proceeding in the reverse sequence and keeping the original position of each component; take care that rings and adaptors are not damaged when passing over the threaded side of the stem.

The stuffing box nut (23) should be tightened till to reach the packing position and unscrewed two turns.

On reassembling, do not forget to lift the plug from the seat by introducing compressed air into the actuator before screwing the stem to the diaphragm rod.

For valves equipped with bellows seal, take care to avoid it being jammed and therefore twisted during this operation.

The indicating plate will be located with the valve in the rest position checking that the plug makes its full stroke with the full control signal variations. The rod must be greased with silicone oil.

Bear in mind that tightness will improve after the first few minutes of working and after the bedding in of new rings and of the self-adjusting spring.

After plant start-up and only when leakage owns at the stuffing box, screw-in the nut (23) by 1/4 revolution at a time, waiting between interventions up to leakage elimination.

- **Stuffing box fitted with pure graphite closed rings:** proceed exactly as per previous description for teflon/graphite rings.
- After several adjustments the locknut will become fully tightened and it will not be possible to compress the gaskets further.
To restore tightness it is possible for once only to insert new spare rings without removing the old ones, by removal of the tightening the nut (23). Precautionary measures as per paragraph "Routine maintenance" should be followed.
After this it is preferable to remove completely the old gaskets by using a hooked tool in aluminium or brass taking care not to damage the stem or packing chamber.
Carefully clean the stem and the stuffing box chamber and insert a complete new set of rings. During servicing of plant adjust the ring compression by operating lightly and gradually without causing excessive friction on valve stem.

4 - Diaphragm replacement

- **For N.O. two-way valves and direct acting actuator,** take off the pneumatic connection, loosen the adjusting screw (9) until the return spring (10) is no longer loaded, being careful for stem not to move (by means of nuts (20) eventually).
Loosen nuts and bolts (3) of diaphragm casing, take off the casing (1) and then the old diaphragm (4) and assemble the new one.
Reassemble the casing and tighten bolts.
At that point the spring must be reset (for such operation please refer to para. 7).
Restore the pneumatic connection.
- **For N.C. two-way valves and direct acting actuator,** take off the pneumatic connection, loosen nuts and bolts (3) of diaphragm casing, take off the casing (1), remove the old diaphragm (4) and assemble the new one.

Reassemble the casing and tighten bolts.
Restore the pneumatic connection.

- **For N.C. two way or three way valves and reverse acting actuator,** take off the pneumatic connection, loosen nuts and bolts (3) of diaphragm casing, take off the casing (1) and the travel stop (8), being careful for stem not to move (by means of nuts (20), eventually). Remove the old diaphragm (4) and assemble the new one. Reassemble the casing and tighten bolts.
Restore the pneumatic connection.

5 - Plug/s and seat/s replacement

This replacement is necessary if, with valve in closed position, there is a higher leakage than the minimum acceptable (0.01% of valve capacity for single port and metal to metal seating; 0.5% of valve capacity for double port and metal to metal seating).

In any case, when replacing the seat and plug take off from the body the actuator as well as the bonnet-stuffing box set, the bottom flange and, in case of three-way valves, the lower inlet/outlet adaptor (40) if fitted.

- **For N.O. two-way valves:** unscrew locknuts (29) of the bonnet (32) and of bottom flange (38), Loosen locknut (19) which fixes stem to diaphragm rod. Unscrew the stem (22), by means of nuts (20) eventually ("I" valves).
If valve is equipped with bellows seal, make sure this is not subjected to twisting by keeping the bonnet (32) lifted by means of suitable wooden spacers.
Remove indicator disc (21) with its locknuts (for "I" valves only) and take off the actuator by unscrewing the yoke locknut (24).
Take off the bonnet from the stem, taking care not to damage the ground surfaces of stem and stuffing box rings.
On valves equipped with single balanced plug installed upwards, it is essential to take off together with the plug the balanced chamber (55), while for valves with reversed plug installed downwards, unscrew the nut (42) by removing plug from stem.
The new plug must have its stem already tightened and locked by a pin (re-use of the old stem is not virtually possible).
The seat or seats are screwed into the valve body; unscrew them with a T tool which locates on the grooves provided.
To make the removal easier soak the threaded area with penetrating oil and before reassembling the new seat, clean with care the thread and the seat area to ensure alignment and tightness.
Be careful about two-way valves equipped with perforated trim because of cage seat (series 25 and single seated "I" valves) or double cage

seat (83) (single seated "I" valves).

Be careful about two-way valves equipped with perforated trim because of cage seat (series 25 and single seated "I" valves) or double cage seat (83) (single seated "I" valves).

As soon as replacement is done re-assemble by following the instructions given above but proceeding in the reverse sequence taking care not to damage the machined surfaces.

Valves equipped with single balanced plug need to replace body gaskets (34) as well as balanced chamber gasket (56).

Bear in mind that the connection between stem

and the diaphragm rod is very important. With valves equipped with direct plug positioned upwards and therefore with 591 or 599 actuators, the indicating plate must be placed on the stem so that it corresponds to the indication of the valve in the closed position when the plug is on the seat; then screw the stem to the diaphragm rod until the indicator plate reaches the open position, then tighten nut (19).

With valves equipped with reverse plug installed

downwards and therefore with 592 actuator, screw the stem until the plug rests on the seat, position the indicator plate corresponding to the valve in the closed position and unscrew the stem until the plate coincides with the valve in the open position, then tighten nut (19).

- **For N.C. two-way valves:** to avoid the plug rotating on the seat, lightly pressurise the diaphragm so that the valve makes a stroke of 1-2 mm; in the case of valves equipped with upwards direct plug and therefore with 592 actuator, valves must perform the whole stroke by means of a 20 or 35 psi pressure on the diaphragm.

Unscrew locknuts (29) of bonnet (32) and of bottom flange (38).

Eventually by using nuts (20) ("I" valves), loosen locknut (19) and unscrew stem (22). If the valve is equipped with bellows seal, make sure that this is not submitted to twisting by keeping the bonnet (32) lifted with suitable wooden spacers.

Remove indicator disc (21) with its locknuts ("I" valves) and take off the actuator by unscrewing the yoke locknut (24).

Take off the bonnet from the stem taking care not to damage the ground surfaces of the stem and stuffing box rings.

On valves equipped with balanced plug installed

upwards it is essential to take off together with the plug also the balanced chamber (55), while for valves with reversed plug installed downwards, unscrew the nut (42) by removing the plug from the stem.

The seat or seats are screwed into the valve

body; unscrew them with a T-tool which fits in the grooves provided on the seats.

To make the removal easier, soak the threaded area with penetrating oil and before reassembling the new seat, clean with care the thread and the seat area to ensure alignment and tightness.

The new plug must have its stem already tightened and locked by a pin.

Be careful about two-way valves equipped with perforated trim because of cage seat (series 25 and single seated "I" valves) or double cage seat (83) (single seated "I" valves).

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As soon as replacement is done, assemble by following the instructions given above but proceeding in the reverse sequence taking care not to damage the machined surfaces.

Valves equipped with single balanced plug need to replace body gaskets (34) as well as balanced chamber gasket (56).

Bear in mind that the connection between stem and diaphragm rod is very important.

Assemble nuts and indicator disc without locking them ("I" valves).

With valves equipped with reverse plug positioned downwards and therefore with 591 or 599 actuators, screw the stem to the diaphragm rod until the plug touches the seat (without undue pressure so as not to damage the seat area).

With valves equipped with direct plug positioned upwards and therefore with 592 actuator, screw the stem for some distance and then unscrew until the plug rests on the seat.

Then apply pressure on diaphragm so that the rod moves by 3-4 mm, screw the stem for about two threads (unscrew it in case of 592 actuator) and tighten it by means of nut (19); remove pressure from the diaphragm and adjust the indicator disc (21) ("I" valves) to correspond with the closed position of plate (14).

- **For three-way mixing valves:** to avoid the plug rotating on the seat, apply a light pressure on the diaphragm so that the stem makes a stroke of 1-2 mm for N.C. valves (straight way closes on air failure); for N.O. valves (straight way opens on air failure) introduce air at such a pressure in order to obtain an almost complete stroke without reaching the stop position.

Unscrew locknuts (29) of bonnet (32) and of the inlet adaptor (40) if fitted.

By using nuts (20) ("I" valves), loosen locknut (19) and unscrew stem (22). If valve is equipped with bellows seal, make sure that this is not submitted to twisting by keeping the bonnet (32) lifted with suitable wooden spacers.

Remove indicator disc (21) with its locknuts ("I" valves) and take off the actuator by unscrewing

the yoke locknut (24).

Take off the bonnet from the stem taking care not to damage the ground surfaces of the stem and stuffing box rings.

For valves without inlet adaptor (40) but with integral flange on the third way (three-way valves series 25 DN 65 to 100), before removing plug dismount the upper seat.

Seats are screwed into the valve body; unscrew them with a T-tool which locates in the grooves provided in the seat.

To make removal easier, soak the threaded area with penetrating oil and before reassembling the new seat, clean with care the thread and the seat area to ensure alignment and tightness.

As soon as replacement is done, assemble by following the instructions given above but proceeding in the reverse sequence and avoid damage to the machined surfaces.

Assemble nuts and indicator disc without locking them ("I" valves).

With N.C. valves, screw the stem on to the diaphragm rod until the plug reaches the seat (without forcing so as not to damage the seat areas).

With N.O. valves screw stem a good distance and thereafter unscrew until the plug rests on the lower seat.

Apply pressure on the diaphragm in order to move the rod by 3-4 mm, screw the stem by about two threads (unscrew in case of N.O. valve) and tighten it by means of nut (19); remove pressure from the diaphragm and adjust the indicator disc (21) ("I" valves) to correspond with end of travel on plate (14).

- **For three-way diverting valves:** to avoid plug rotating on the seat, apply a light pressure on the diaphragm so that the stem makes a stroke of 1-2 mm for N.O. valves (opens straight way on air failure); for N.C. valves (closes straight way on air failure); introduce air at such a pressure in order to obtain an almost complete stroke without reaching the stop position. Unscrew locknuts (42) of the lower plug, eventually using the nuts (20) ("I" valves) to hold the stem; then remove the plug. Unscrew locknuts (29) of the bonnet (32) and of the outlet adaptor (40) if fitted. By using nuts (20) ("I" valves) loosen locknut (19) and unscrew the stem (22). If valve is equipped with bellows seal, make sure that this is not submitted to twisting by keeping the bonnet (32) lifted with suitable wooden spacers. Remove indicator disc (21) with its locknuts ("I" valves) and take off the actuator by unscrewing yoke locknut (24). Take off the bonnet from the stem taking care not to damage the ground surfaces of stem and stuffing box rings. Seats are screwed into the valve body; unscrew them with a T-tool which locates in the grooves provided in the seat.

To make removal easier, soak the threaded area with penetrating oil and before reassembling the new seat clean with care the thread and seat area to ensure alignment and tightness.

As soon as replacement is done, assemble by following the instructions given but proceeding in the reverse sequence and avoid damage to the machined surfaces.

Assemble nuts and indicator disc without locking them ("I" valves).

With N.O. valves, screw the stem on the diaphragm rod until the lower plug reaches its seat (without forcing so as not to damage the seating areas).

For N.C. valves, screw stem along some distance and then unscrew until the upper plug rests on its seat.

Apply pressure on the diaphragm in order to move the rod by 3-4 mm, screw the stem by about two threads (unscrew it in case of N.C. valve) and lock it with nut (19); remove pressure from the diaphragm and adjust the indicator disc (21) ("I" valves) to correspond with end of travel indicated by plate (14).

After having assembled the valve and replaced the body gaskets and also the stuffing box rings, check and set the spring according to instructions indicated in paragraph 8.

6 - Replacement of bellows set

Proceed as per previous paragraph taking care always that when unscrewing or screwing the stem from the diaphragm rod, bellows twisting has to be avoided (unscrew the stuffing box ring 75, if any).

Replace stem/bellows set as well as gaskets (34) and (74) if any and carefully clean seating areas. On tightening bolts (29), proceed gradually and diagonally.

7 - Reversing the action

As a general rule the action of the valve is once and for all settled during the project phase but in exceptional cases it might happen that for plant requirements the action must be changed.

Before carrying out such an operation, it is always advisable to contact the manufacturer in order to check, according to the operating data, if the valve can operate under these new conditions.

- **For two-way valves** equipped with all kind of plugs except microflute, reverse action may be effected by turning body and plug through 180°. Such an operation is possible because the bodies of Fluxotrol valves are perfectly symmetrical, provided the plugs have been already prepared for reversal; the only part to be replaced is the stem. If the plug has not been previously prepared for reversal, arrange for it to be drilled and tapped.

To reverse the body and plug it is essential to remove from the body the topwork-bonnet set as well as the bottom flange and then follow the same procedures specified in paragraph 5 which refer to N.O. and N.C. valves.

Remove the valve body from the pipework and turn it and the plug through 180°.

To convert a N.O. valve into a N.C. valve travel stops must be fitted; in a reverse conversion they must be removed.

Install the new stem and reassemble the topwork-bonnet set and the bottom flange. Take care not to damage machined areas during these operations and furthermore for safety's sake, we also recommend the replacement of body gaskets (34).

In general, for such operations detailed above, a new setting of the return spring is required to meet the new operating conditions; therefore spring setting must **always** be done in order to accommodate the new duty of the valve.

For this last operation, refer to the following paragraph.

- **For three-way valves** reversing the action is effected only by replacing the complete actuator.

8 - Spring adjustment

The differential pressure of the installation cuts in the plug different ways according to the type of construction (single port, single port with balanced plug, double port, etc.).

Such pressure operates on the plug to oppose the actuator action. This has to be taken into consideration when sizing the actuator as well as during spring setting selection. During factory test the spring is preset on the bench without pressure in the valve, thus allowing the valve to perform the complete stroke at 3-15 psi signal (or 6-30 psi).

Spring set pressure values in psi are recorded in the technical file and must be obtained by specifying the serial number marked on the plate: such values refer respectively to the required pressure on the diaphragm before the valve begins to move, or it has already made its complete stroke when there is no pressure in the body.

It is then evident that each time the spring is released for maintenance reasons, re-setting of the spring is required according to the values recorded during the sizing phase.

Such adjustment is even more necessary when the action of valve has been changed. In fact, when the action is changed the stated values are no longer valid but it is essential that the manufacturer specifies the new setting values calculated according to the new working conditions.

For the manufacturer it is always essential to know the maximum working pressure and in particular the maximum differential pressure which valves must withstand when in the closed position.

Adjustment is effected by adjusting the spring compression by means of the threaded adjusting ring (9) to obtain valve movement over the prescribed signal variation range.

9 - Rotation of the topwork with respect to the valve body

If not otherwise specified by customer, the identification plate as well as accessories assembled on the valve yoke such as positioners, microswitches, side handwheels, etc. are installed by the manufacturer in a standard position (that is facing the operator when flow through the valve is from left to right). It can result therefore that, these accessories could be facing towards a wall or the side of a machine, where it is impossible to reach them.

To remedy this situation, rotate the topwork with respect to the valve body so that the accessories are facing the operator.

For N.O. two-way valves such a rotation is effected by loosening the yoke locknut (24) and then by rotating the yoke.

With N.C. two-way valves and three-way, before proceeding to this operation, it is necessary to apply pressure on the diaphragm so that the valve performs a travel of 2-3 mm to ensure that the plug, being integral with the topwork does not damage the seating surface when performing the rotation.

Attention: If the valve is equipped with a bellows seal, it is of the utmost importance to avoid twisting the bellows, thus it is essential to raise the stuffing box bonnet (32) by unscrewing bolts (29) before carrying out the rotation.

10 - Topmounted handwheel for manual control

On account of its simple construction and minimum need of maintenance, this kind of handwheel is the most commonly used as an emergency manual control.

By rotating the handwheel clockwise, the spring is compressed and the plug moves downwards with 591 and 599 actuators and upwards with 592 actuators.

By rotating the handwheel counterclockwise, the spring will be able to expand and the stem moves in the opposite direction.

Topmounted handwheels are often used as travel stops: if the valve has a plug which closes moving downwards by means of the handwheel, valve opening can be limited to any desirable extent. If the plug is installed on "air to open", it is possible to limit the maximum shut-off by means of the handwheel.

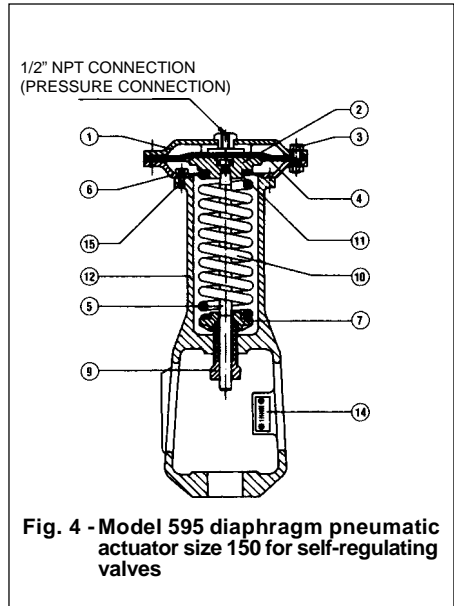
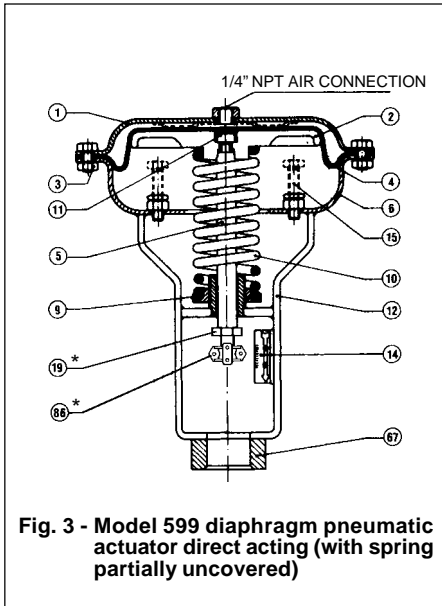
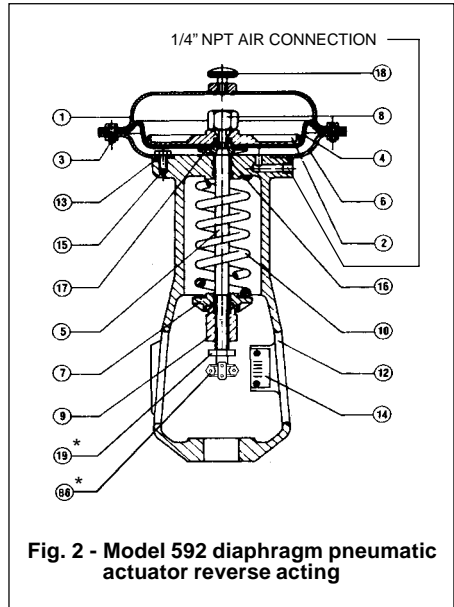
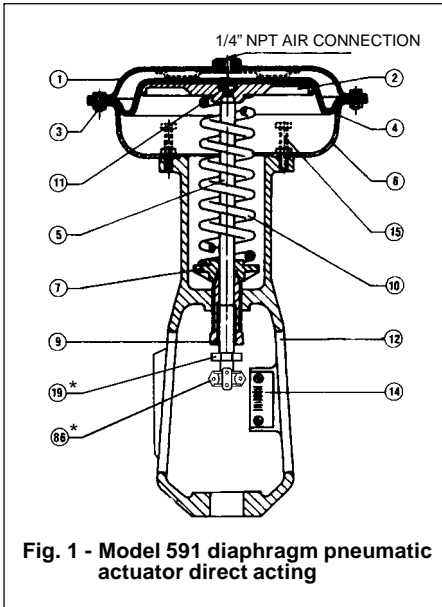
4. Spare parts

Fluxotrol diaphragm control valves

Always specify the serial number of control valves when ordering spare parts and in correspondence pertaining to the equipment.

Part. N°	Description
1	Upper diaphragm casing
2	Diaphragm plate
3	Diaphragm casing bolts and nuts
(4)	Diaphragm
5	Diaphragm rod
6	Lower diaphragm casing
7	Spring adjusting ring nut
8	Travel stop (for 592 type only)
9	Spring adjusting screw
10	Actuator spring
11	Hexagon socket cap screw (except 592 type)
12	Diaphragm gasket (for 592 type only)
(13)	Yoke
14	Travel indicator plate
15	Fixing or travel stop bolts
(16)	Rod "O" rings (2 pieces, for 592 type only)
17	Lower diaphragm plate (for 592 type only)
18	Vent assembly (for 592 type only)
19	Stem hexagon locknut
20	Travel disc hexagon locknut (for "I" valves only)
21	Travel indicator disc (for "I" valves only)
(22)	Stem
23	Stuffing box nut
24	Yoke locknut
25	Packing follower (for series 25 only)
(27)	Stuffing box packing assembly
29	Body nuts
30	Lantern (not for series 25 and cast iron valves)
31	Plug fixing pin (where fitted)
32	Bonnet
(33)	Valve plug
(34)	Body gaskets
35	Valve body
(36)	Seat rin(s)
37	Guide bushing (where fitted)
38	Bottom flange
39	Body studs
40	Inlet/outlet adaptor (third way): for three-way only except series 25 DN 65 to DN 100
42	Plug locknuts
43	Lock washer (for three-way and series 25 DN 65 to DN 100 sizes only)
44	Bellows seal assembly
55	Balanced chamber
56	Balanced chamber gasket
61	Self-adjusting spring
67	Spacer only for 599 type (for series 25 only)
70	Washers
(74)	Stuffing box gasket (only with bellows)
75	Stuffing box ring (only with bellows)
83	Cage (integral part of seat)
86	Coupling assembly (for series 25 only)

() Part numbers within parentheses mean: "Recommended spare parts"



* For series 25 only

1/2" NPT CONNECTION
(PRESSURE CONNECTION)

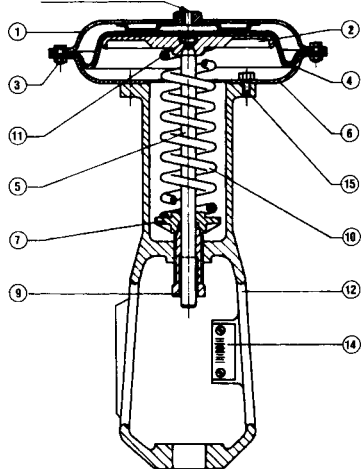


Fig. 5 - Model 595 diaphragm actuator sizes 250 - 300 - 400 and 500 for self-regulating valves

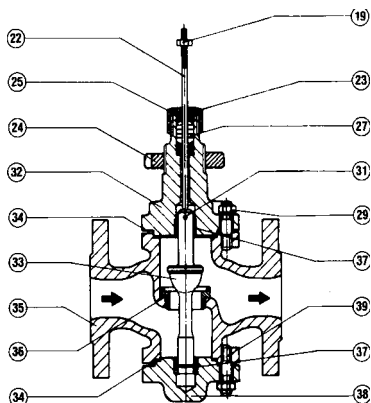


Fig. 6 - Model 21 single seated valve body direct acting DN 15 to DN 50

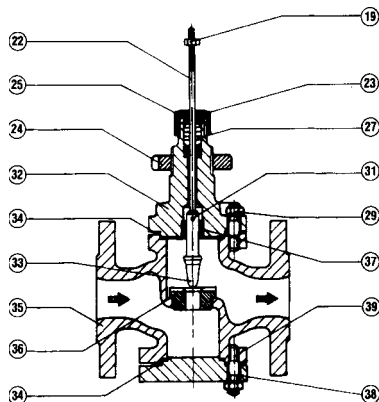


Fig. 7 - Model 21 single seated non-reversible valve body direct acting DN15 to DN 50

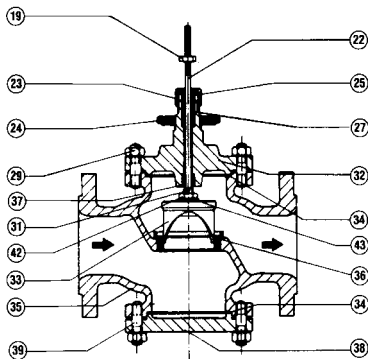


Fig. 8 - Model 21 single seated valve body direct acting DN 65 to DN 100

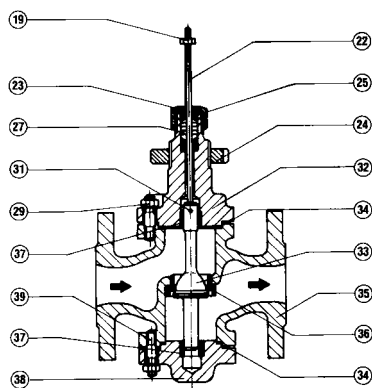


Fig. 9 - Model 22 single seated valve body reverse acting DN 15 to DN 50

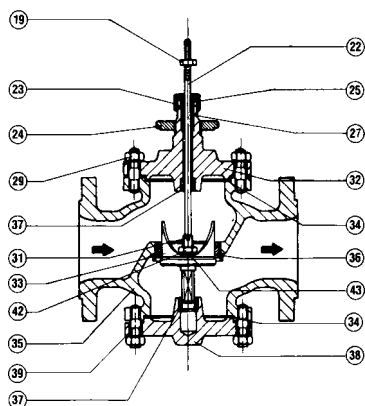


Fig.10 - Model 22 single seated valve body reverse acting DN 65 to DN 100

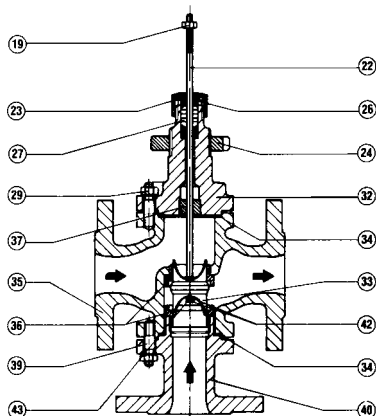


Fig. 11- Model 25 three-way mixing valve body (with inlet adaptor)

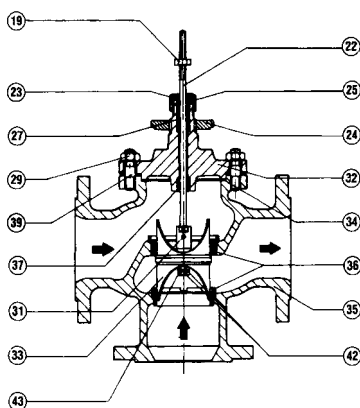


Fig.12 - Model 25 three-way mixing valve body

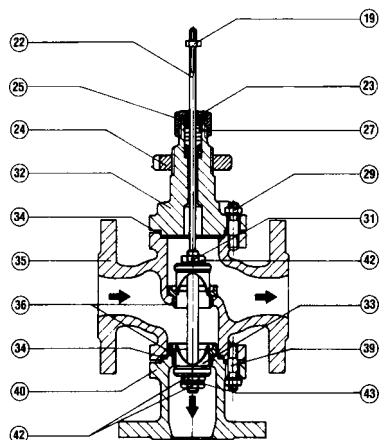


Fig.13 - Model 26 three-way diverting valve body (with outlet adaptor)

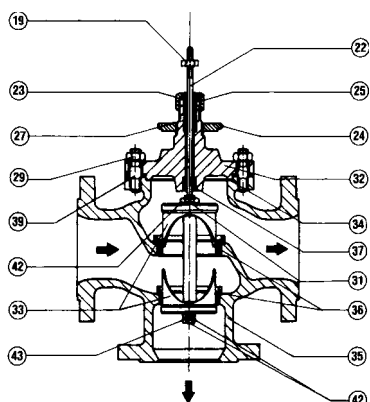


Fig.14 - Model 26 three-way diverting valve body

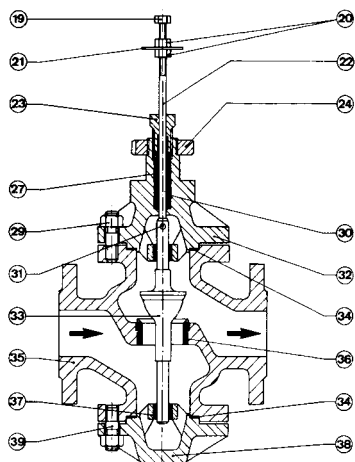


Fig.15 - Model 1 single seated reversible valve body direct acting

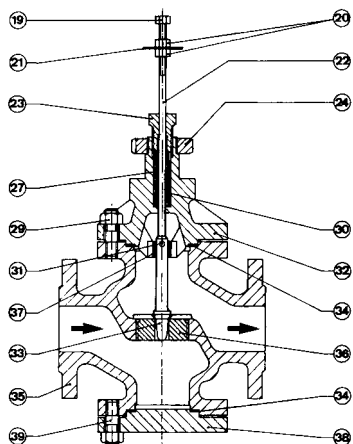


Fig.16 - Model 1 single seated non-reversible valve body direct acting

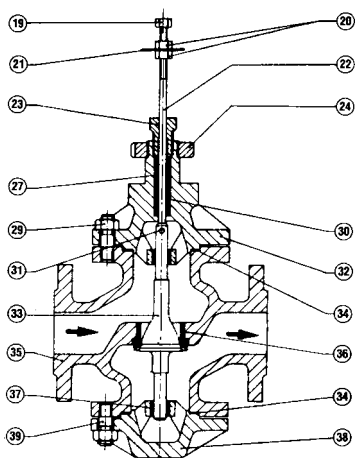


Fig.17- Model 2 single seated reversible valve body reverse acting

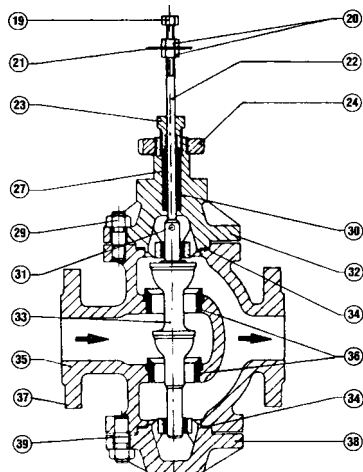


Fig.18 - Model 3 double seated valve body direct acting

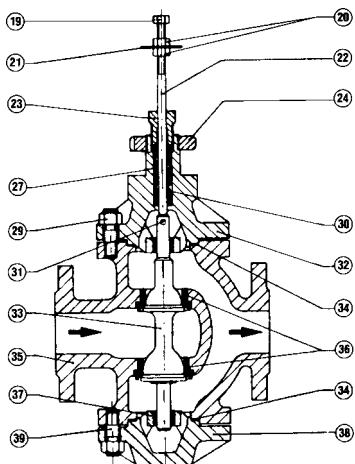


Fig.19 - Model 4 double seated valve body reverse acting

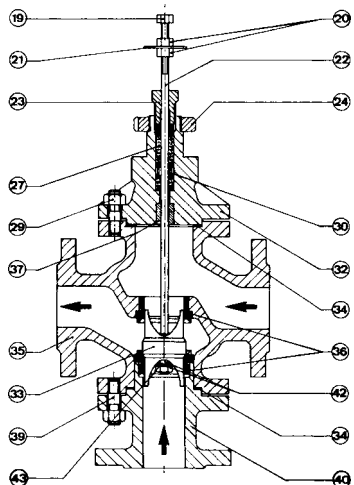


Fig. 20 -Model 5 three-way mixing valve body (with inlet adaptor)

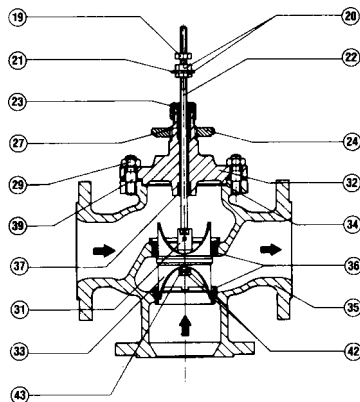


Fig. 21 - Model 5 three-way mixing valve body (type with integral third way)

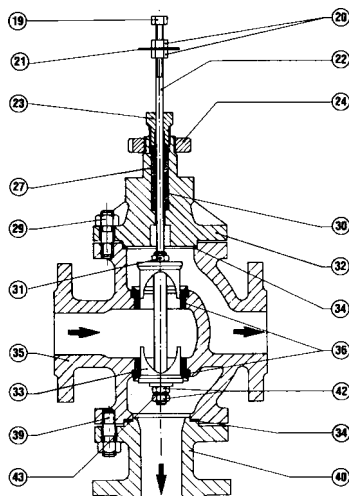


Fig. 22 - Model 6 three-way diverting valve body (with outlet adaptor)

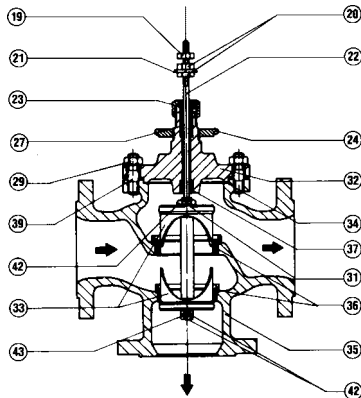
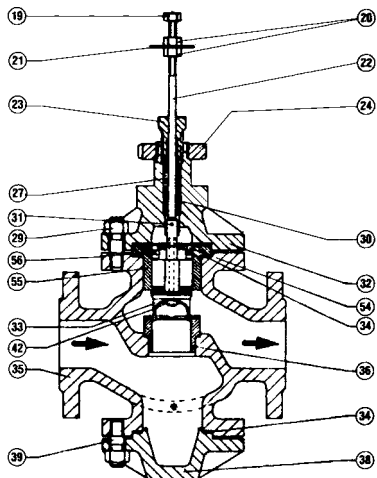


Fig. 23 - Model 6 three-way diverting valve body



* DN 250 and 300 series are without bottom flange

Fig. 24 - Model 7 single seated valve body with "balanced" plug, direct acting

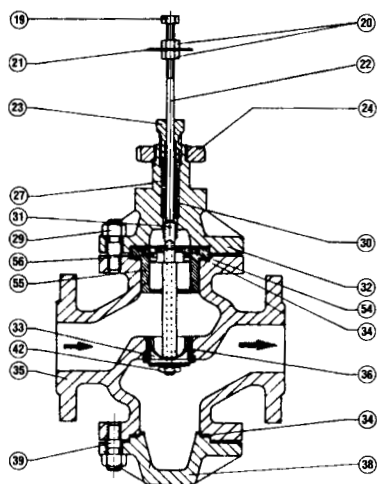


Fig. 25 - Model 7R single seated valve body reverse acting with "balanced" plug

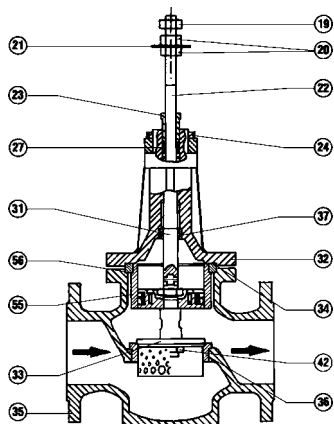


Fig. 26 - Model 7 single seated valve body direct acting, with cage seat and perforated trim

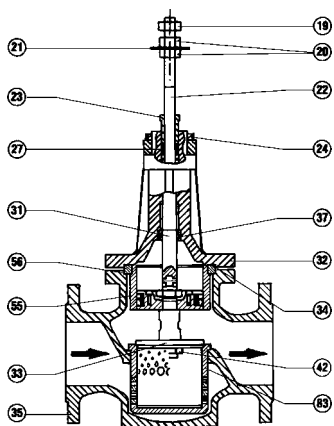


Fig. 27 - Model 7 single seated valve body direct acting, with double cage seat and perforated trim

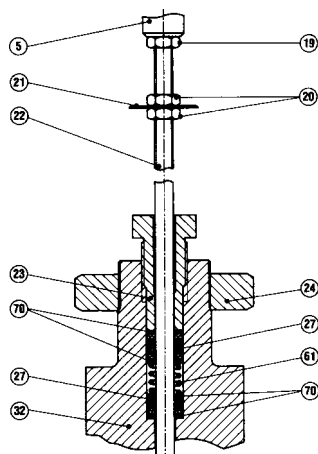


Fig. 28 - Stuffing box assembly with teflon/graphite rings (for "I" valves only)

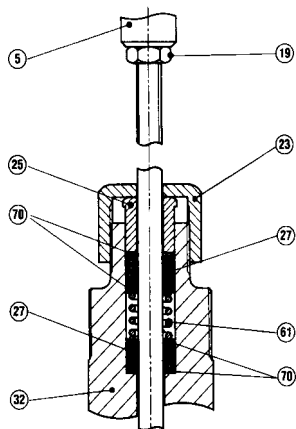


Fig. 29 - Stuffing box assembly with teflon/graphite rings (for series 25 valves only)

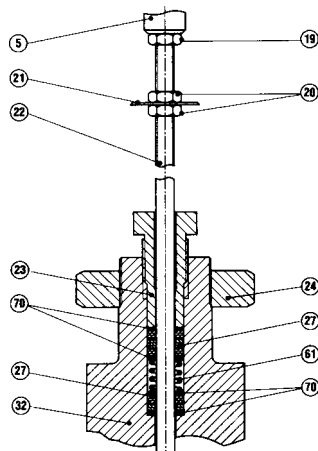


Fig. 30 - Stuffing box assembly with graphite rings (for "I" valves only)

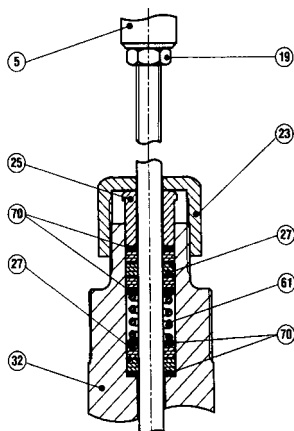


Fig. 31 - Stuffing box assembly with graphite rings (for series 25 valves only)

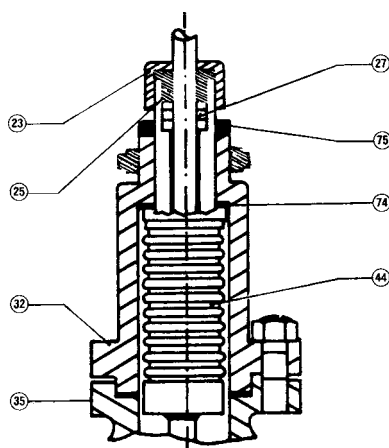


Fig. 32 - Bellows seal assembly