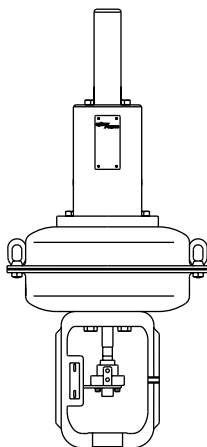
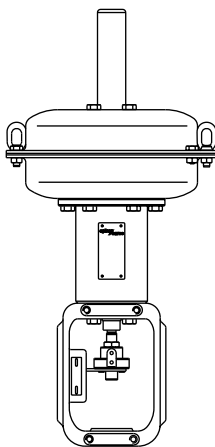


PN1000 and PN2000
Pneumatic Actuators
Installation and Maintenance Instructions



PN1000



PN2000

1. *General safety information*
2. *General product information*
3. *Installation*
4. *Commissioning*
5. *Maintenance*
6. *Spare parts*



— 1. *General safety information* —

Safe operation of these units can only be guaranteed if they are properly installed, commissioned and maintained by a qualified person in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

Isolation

Consider whether closing isolating valves will put any other part of the system or personnel at risk. Dangers might include; isolation of vents, protective devices or alarms. Ensure isolation valves are turned off in a gradual way to avoid system shocks.

Pressure

Before attempting any maintenance consider what is or may have been in the pipeline. Ensure that any pressure is isolated and safely vented to atmospheric pressure before attempting to maintain the product, this is easily achieved by fitting Spirax Sarco depressurisation valves type DV (see separate literature for details). Do not assume that the system is depressurised even when a pressure gauge indicates zero.

Temperature

Allow time for the temperature to normalise after isolation to avoid the danger of burns and consider whether protective clothing (including safety glasses) is required.

Disposal

The product is recyclable. No ecological hazard is anticipated with disposal of this product providing due care is taken.

— 2. General product information —

2.1 Description

A range of single spring linear actuators having 5 diaphragm sizes for matching the requirements of different valves at various differential pressures. Each actuator is fitted with a combined mechanical stroke indicator and anti-rotation guard. The actuators are designed for easy conversion from spring extend to spring retract, and vice versa, without the need for special tools. The PN1000 and PN2000 actuators are designed to be used with 'C' series 2-port control valves. A limited range is also available for use with the KE and KEA valves.

2.2 Available types

Spring extend spindle actuators:

PN1300, PN1400, PN1500, PN1600 and PN1700 series.

Spring retract spindle actuators:

PN2300, PN2400, PN2500, PN2600 and PN2700 series.

2.3 Technical data

Temperature range		-4°F to +230°F (-20°C to +110°C)
Maximum operating pressure	PN1000 series	65 psi (4.5 bar)
	PN2000 series	44 psi (3.0 bar)
Air supply connection	PN1300 to PN1600 and PN2300 to PN2600	¼" NPT
	PN1700 and PN2700	½" NPT

2.4 Materials

No. Part	Material
1 Diaphragm housing	Carbon steel
2 Diaphragm	Reinforced nitrile rubber
3 Diaphragm plate	Stainless steel
4 Spring	Spring steel
5 Spindle guide	Bronze
6 DU bearing	Hardened steel
7 Yoke	Cast steel
8 Housing securing nuts and bolts	Zinc plated steel
9 Spindle	Stainless steel
10 Connector	Zinc plated steel
11 Travel indicator/anti-rotation device	Stainless steel
12 Connector locking screws	Zinc plated steel
13 'O' ring	Nitrile rubber
14 Lock-nut	Zinc plated steel
15 Cap with vent hole	Nickel plated brass
16 Spring guide	Zinc plated steel
17 Valve spindle adapter	Stainless steel

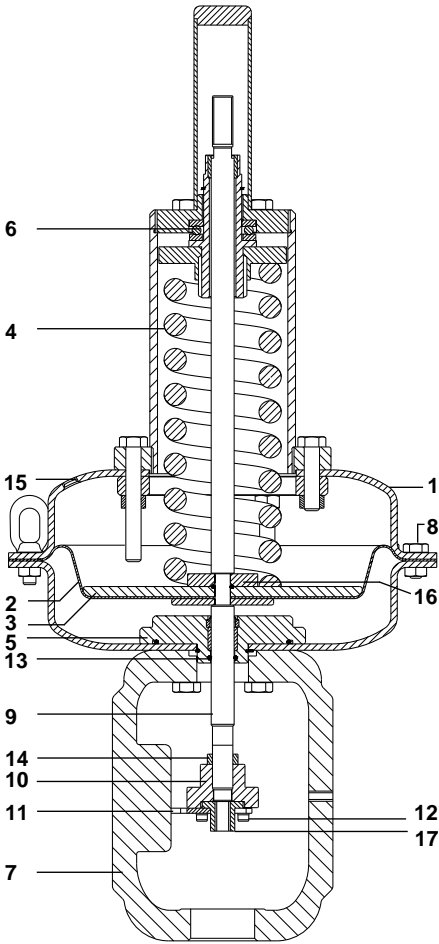


Fig. 1 PN1000 series

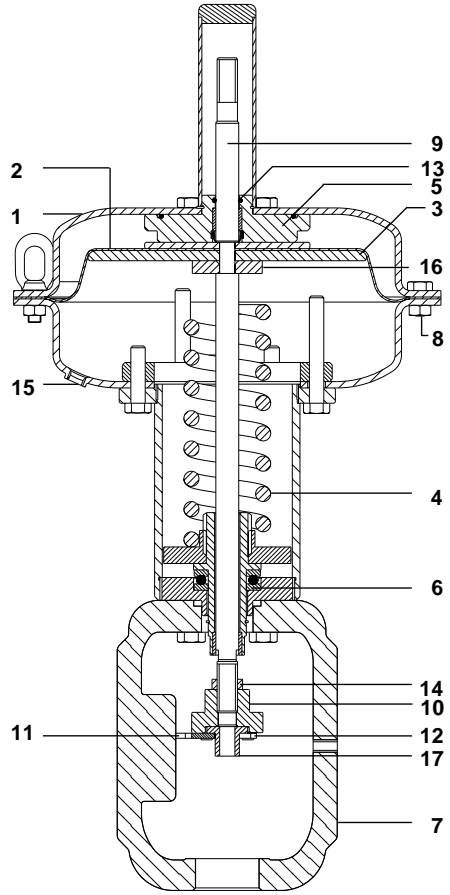


Fig. 2 PN2000 series

3. Installation

Note: Before actioning any installation observe the 'Safety information' in Section 1. See separate Installation and Maintenance Instructions for the appropriate control valve.

3.1 General information

Actuators should be installed in such a position as to allow full access to both actuator and valve for maintenance purposes. The preferred mounting position is with the actuator and valve spindle in the vertical position above or below the horizontal pipework.

The actuator ambient limits are -4°F to +230°F (-20°C to +110°C). For low temperature conditions the air supply must be dry. For high temperature conditions, insulate the control valve and pipework to protect the actuator.

Warning:

The actuator housing must only be pressurised on the opposite side of the diaphragm to the springs. The housing vent cap must be left unrestricted.

3.2 Fitting the PN1000 spring to extend series actuator to the valve (Refer to Figures 3 and 4):

- Loosen and remove the connector locking screws (12) and remove the anti-rotation plate (11).
- Fit the valve spindle adaptor (17) onto the valve spindle and manually push the valve plug to its closed position.
- Apply the control signal pressure required to bring the actuator spindle to mid-travel position.
- Place the actuator yoke over the valve spindle and locate onto the bonnet shoulder. Locate and tighten the valve mounting nut (20) to the recommended tightening torque (Table 1, page 10).
- Increase the air pressure until the upward travel stops (the diaphragm plate is against travel stoppers).
- Adjust the position of the valve spindle adaptor (17) so that the distance 'A', as shown in Figure 3, is equivalent to the desired travel indicated on the actuator travel indicator plate (18), then tighten the lock-nut (19).
- Release the control air signal to bring the actuator spindle against the valve spindle.
- Fit the anti-rotation plate (11). Fit the connector locking screws (12) and tighten to the recommended torque (Table 1, page 10).
- Check that the actuator stem and valve plug stem move freely in response to the air pressure change to the actuator.

3.3 Fitting the PN2000 spring to retract series actuator to the valve (Refer to Figures 3 and 4):

- Loosen and remove the connector locking screws (12) and remove the anti-rotation plate (11).
- Fit the valve spindle adaptor (17) onto the valve spindle and manually push the valve plug to its closed position.
- Place the actuator yoke over the valve spindle and locate onto the bonnet shoulder. Locate and tighten the valve mounting nut (20) to the recommended tightening torque (Table 1, page 10).
- Adjust the position of the valve spindle adaptor (17) so that the distance 'B' is equivalent to the value shown in Figure 3, then tighten the lock-nut (19).
- Increase the control air signal to bring the actuator spindle against the valve spindle.
- Fit the anti-rotation plate (11). Fit the connector locking screws (12) and tighten to the recommended torque (Table 1, page 10).
- Check that the actuator stem and valve plug stem move freely in response to the air pressure change to the actuator.

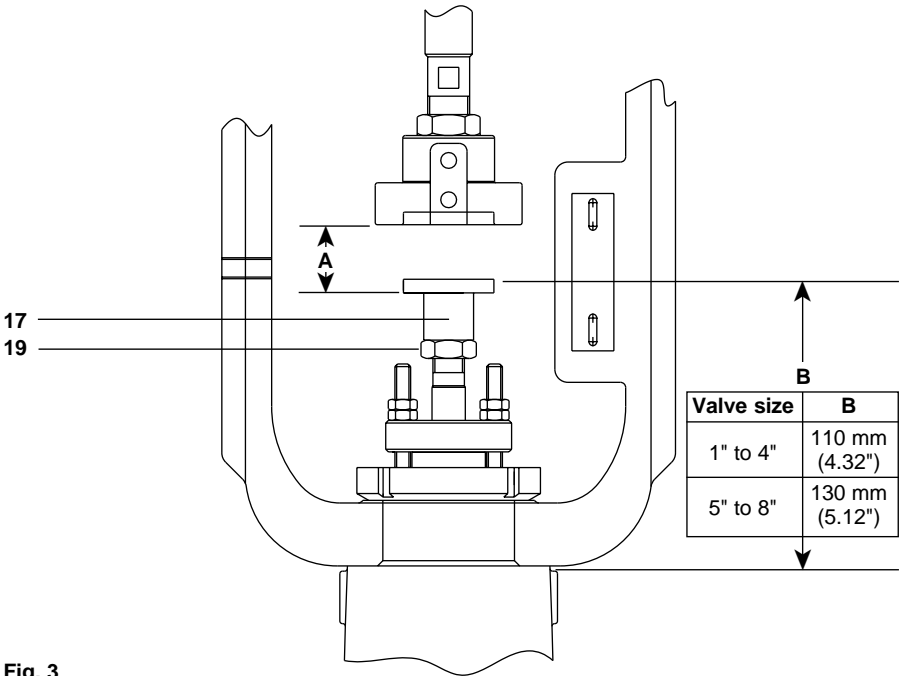


Fig. 3

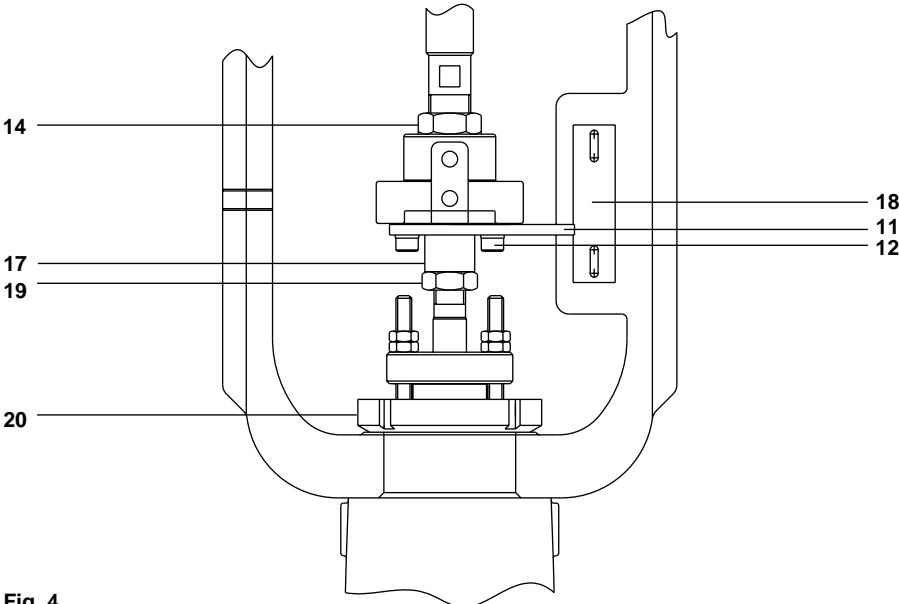


Fig. 4

4. Commissioning

If the actuator / valve has been supplied with a positioner, reference should be made to the separate Installation and Maintenance Instructions for this product.

4.1 Adjusting the actuator lift off pressure (set point)

The actuator spring range and lift off pressure will be indicated on the name-plate. Should it be necessary to check or adjust the lift off pressure, for example if the actuator has been removed for maintenance, the procedure is described in Sections 4.1.1 and 4.1.2 below.

Note: Adjustment of the spring will only alter the pressure of the air control signal at which the valve commences to move off its seat (set point) and will not alter the spring pressure range required to move the valve through its full travel. For example:

- **Metric** 0.2 to 1.0 bar spring (range 0.8 bar) set to start lifting at 0.4 bar will require a 1.2 bar air pressure (0.4 + 0.8) to obtain the valve full travel.
- **Imperial** 2.9 to 14.5 psi spring (range 11.6 psi) set to start lifting at 5.8 psi will require a 17.4 psi air pressure (5.8 + 11.6) to obtain the valve full travel.

4.1.1 PN1000 spring to extend actuators

To adjust the set point refer to Figure 5, page 9 and proceed as follows:

- Ensure the control valve has been isolated and the actuator housing is pressure free.
- Increase the control signal pressure until the actuator starts to lift the actuator spindle. Check whether the signal pressure corresponds to the desired starting value.
- Completely release the air signal pressure. Tighten clockwise (loosen anticlockwise) slightly the spring set nut (**22**), to increase (decrease) the actual signal pressure starting value.
- Cycle the actuator to check that the valve just commences to move off its seat at the right spring range minimum pressure and is fully open at the spring range maximum pressure. For example: If the spring range is 0.4 to 1.2 bar (5.8 to 17.4 psi) the actuator should start to move at 0.4 bar (5.8 psi) and be fully open at 1.2 bar (17.4 psi).
- After the test check the position of the travel indicator plate (**18**) against the position of the anti-rotation plate and adjust its position accordingly.

Important note:

To prevent damage to the valve seat, please ensure the plug does not turn while pressing on the seat during assembling or adjustment.

4.1.2 PN2000 Spring to retract actuators

To adjust the set point refer to Figure 6, page 11 and proceed as follows:

- Ensure the control valve has been isolated and the actuator housing is pressure free.
- Apply the control signal pressure required to complete the full travel of the actuator spindle. Check whether the signal pressure corresponds to the desired full travel value.
- Completely release the air signal pressure. Tighten clockwise (loosen anticlockwise) slightly the spring set nut (**22**) to increase (decrease) the actual signal pressure starting value.
- Cycle the actuator to check that the valve just commences to move toward the seat at the right spring range minimum pressure and is fully closed at the spring range maximum pressure. For example: If the spring range is 0.2 to 1.0 bar (2.9 to 14.5 psi) the actuator should start to move at 0.2 bar (2.9 psi) and be fully open at 1.0 bar (14.5 psi).
- After the test check the position of the travel indicator against the position of the anti-rotation plate and adjust its position accordingly.

Important note:

To prevent damage to the valve seat, please ensure the plug does not turn while pressing on the seat during assembling or adjustment.

5. Maintenance

For PN1000 see Sections 5.1, 5.2 and 5.3

For PN2000 see Sections 5.1, 5.2 and 5.4

5.1 General information

The PN1000 and PN2000 series pneumatic actuators are maintenance free. To ensure satisfactory operation it is strongly recommended that the air control signal is filtered and supplied free of oil and water. A Spirax Sarco MPC2 air coalescing filter regulator is the approved device. Naturally actuator parts are subject to normal wear and must be inspected and replaced when necessary.

This procedure describes how to disassemble and reassemble the actuator.

When maintenance is required, disassemble only those parts necessary to accomplish the job.

5.2 Removing the actuator from the valve

(Refer to Figure 5):

Note: To remove the actuator from the valve it is recommended that a length of flexible plastic tube, together with a push in connector is available, so that the actuator can be disconnected from the pipework and be manually driven with the air supply.

- Isolate the control valve.
- Isolate the air supply to the actuator and disconnect the pipework from the actuator.
- Take out the compression fitting in the actuator and screw in the push in connector. Connect your flexible tubing to the air supply and to the actuator.
- Drive the actuator to approximately the mid travel position with the air supply.
- Loosen and remove the connector screws (12) and remove the anti-rotation plate (11).
- Loosen and remove yoke mounting nut (20) and lift the actuator off the valve.
- Isolate the air supply, noting that the actuator will now extend (PN1000) or retract (PN2000).
- Remove the tubing.

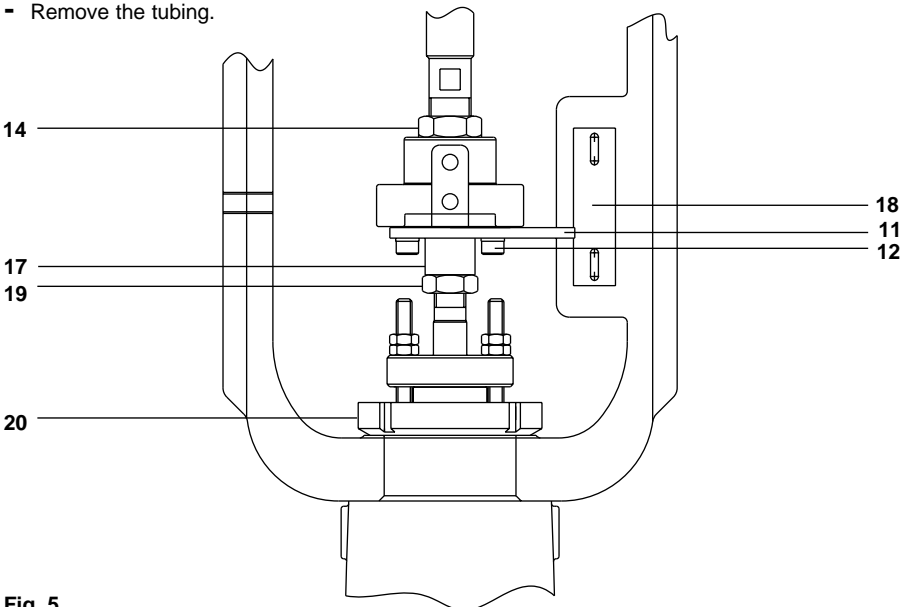


Fig. 5

5.3 PN1000 series (Refer to Figure 6):

5.3.1 Disassembly to replace the spring:

- Remove the actuator from the valve as described in Section 5.2.
- Completely loosen (anticlockwise) the spring set nut (22) to reduce the spring load to the minimum value.
- Loosen the connector lock-nut (14) and remove the connector (10) and lock-nut.
- Loosen and remove the diaphragm housing nuts and bolts (8) and remove the housing lid (1).
Note: On certain spring ranges longer housing bolts are fitted. These should be removed after all other bolts are removed and should be loosened evenly to prevent distortion.
- Remove the spring.

5.3.2 Disassembly to replace the diaphragm and the spindle seal:

- Remove the following parts: auxiliary spindle (23), spring guide (16), diaphragm plate (3), diaphragm (2), spacer (24), actuator spindle (9). Be careful in withdrawing the actuator spindle to avoid damaging the 'O' ring with the threads of the spindle.
- By using two spanners, loosen the auxiliary spindle from the actuator spindle to separate the parts of the assembly.
- Remove cap screws (25) and separate the lower housing from the yoke (7).
- Remove the snap ring (26) and remove the spindle guide and housing (5).
- Remove the 'V' ring (27) and 'O' ring (13) taking care not to damage the grooves.

5.3.3 Assembly:

- Smear new 'V' ring and 'O' ring with silicon grease and place in the seal bushing.
- Place a new gasket (28) in the spindle guide (5), position the guide in the lower housing, align the holes and secure with snap ring (26).
- Assemble the yoke to the lower housing with the cap screws (25).
- Assemble the actuator spindle, spacer, diaphragm, diaphragm plate, spacer and auxiliary spindle. Using two spanners, whilst holding the actuator spindle, tighten the auxiliary spindle. Refer to Table 1 for recommended tightening torques.
- Refit the actuator spindle taking care not to damage the 'V' ring and 'O' ring or spindle surface.
- Refit the spring.
- Refit the diaphragm housing nuts and bolts (8).

Note 1: On certain spring ranges longer housing bolts are fitted (8). Where supplied, these should be positioned evenly apart and tightened evenly prior to fitting the remaining bolts.

Note 2: To avoid distortion of the diaphragm do not fully tighten housing bolts until all bolts have been fitted. Final tightening should then be carried out evenly. Refer to Table 1 below for the recommended tightening torques.

Table 1 Recommended tightening torques

Item No.	Part		N m	lbf ft
8	Housing securing nuts and bolts		15 ± 2	11 ± 1.5
9	Actuator spindle/auxiliary spindle		40 - 50	29 - 37
12	Connector locking screws		25 - 30	18 - 22
14	Actuator spindle lock-nut		40 - 50	29 - 37
19	Valve spindle lock-nut		40 - 50	29 - 37
20	Valve mounting nut (not shown)	M50	70 - 80	52 - 59
		M70	140 - 150	104 - 111
25	Yoke to housing cap screws		40 - 50	29 - 37

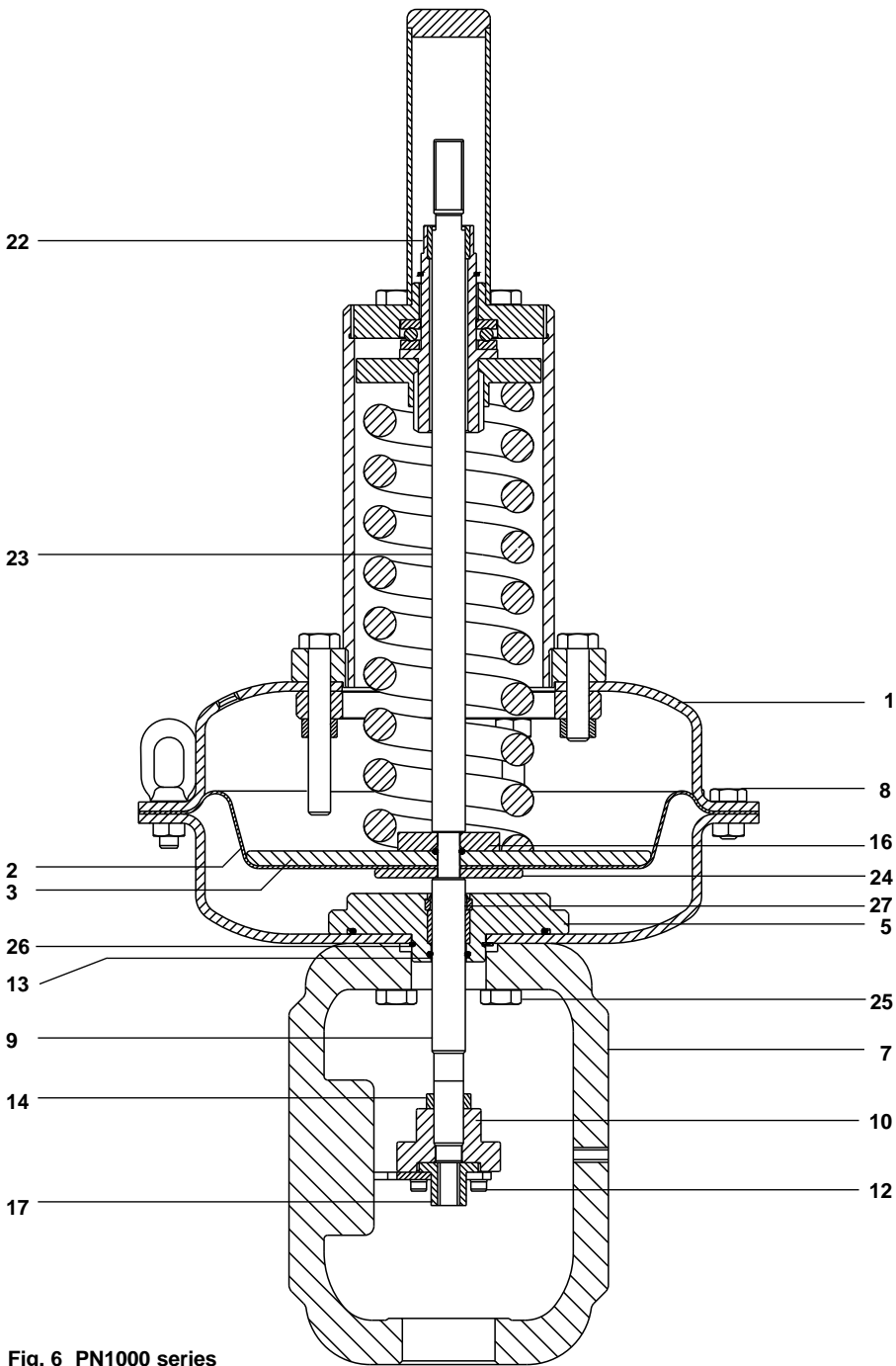


Fig. 6 PN1000 series

5.4 PN2000 Series (Refer to Figure 7):

5.4.1 Disassembly to replace the spring

- Remove the actuator from the valve as described in Section 5.2.
- Completely loosen (anticlockwise) the spring set nut (22) to reduce the spring load to the minimum value.
- Loosen the connector lock-nut (14) and remove the connector (10) and lock-nut.
- Loosen and remove the diaphragm housing nuts and bolts (8) and remove the housing lid (1).
Note: On certain spring ranges longer housing bolts are fitted. These should be removed after all other bolts are removed and should be loosened evenly to prevent distortion.
- Remove the spring.

5.4.2 Disassembly to replace the diaphragm and the spindle seal:

- Remove the assembly constituted by the following parts: auxiliary spindle (9), spindle guide (5), diaphragm plate (3), diaphragm (2), spacer (24), actuator spindle (10). Be careful in withdrawing the actuator spindle to avoid damaging the 'O' ring with the threads of the spindle.
- By using two spanners, loosen the auxiliary spindle from the actuator spindle to separate the parts of the assembly.
- Remove cap screws (25), the snap ring (26) and remove the seal bushing (27).
- Remove the 'V' ring (20) and 'O' ring (21) taking care not to damage the grooves.

5.4.3 Assembly:

- Smear new 'V' ring and 'O' ring with silicon grease and place in the seal bushing.
- Place a new gasket 'O' ring (13) in the seal bushing groove, position the bushing in the lower housing, align the holes and secure with snap ring (26). Refit the cap screws (25).
- Assemble the actuator spindle, spacer, diaphragm, diaphragm plate, spacer and auxiliary spindle. Using two spanners, whilst holding the actuator spindle, tighten the auxiliary spindle. Refer to Table 1 on page 10, for recommended tightening torques.
- Refit the actuator spindle taking care not to damage the 'V' ring and 'O' ring or spindle surface.
- Refit the spring.
- Refit the top housing and securing nuts and bolts (8).

Note 1: On certain spring ranges longer housing bolts are fitted (8). Where supplied, these should be positioned evenly apart and tightened evenly prior to fitting the remaining bolts.

Note 2: To avoid distortion of the diaphragm do not fully tighten housing bolts until all bolts have been fitted. Final tightening should then be carried out evenly. Refer to Table 1, on page 10 for the recommended tightening torques.

- Adjust the position of the adaptor (10), so that distance from the bottom of the yoke is equivalent to the dimension 'X', and tighten the lock-nut (14).

Note 3: The travel is marked on the actuator label.

Table 2 Dimension 'X' approximate in mm (inches) (See Figure 7)

Actuator type	Travel			
	20 mm (¾")	30 mm (1 ³ / ₁₆ ")	38 mm (1½")	50 mm (2")
PN1300 to PN1600	130 (5.1)	140 (5.5)	148 (5.8)	160 (6.3)
PN2300	133 (5.2)	143 (5.6)	151 (5.9)	163 (6.4)
PN2400	138 (5.4)	148 (5.8)	156 (6.1)	168 (6.6)
PN2500 and PN2600	145 (5.7)	155 (6.1)	163 (6.4)	175 (6.9)

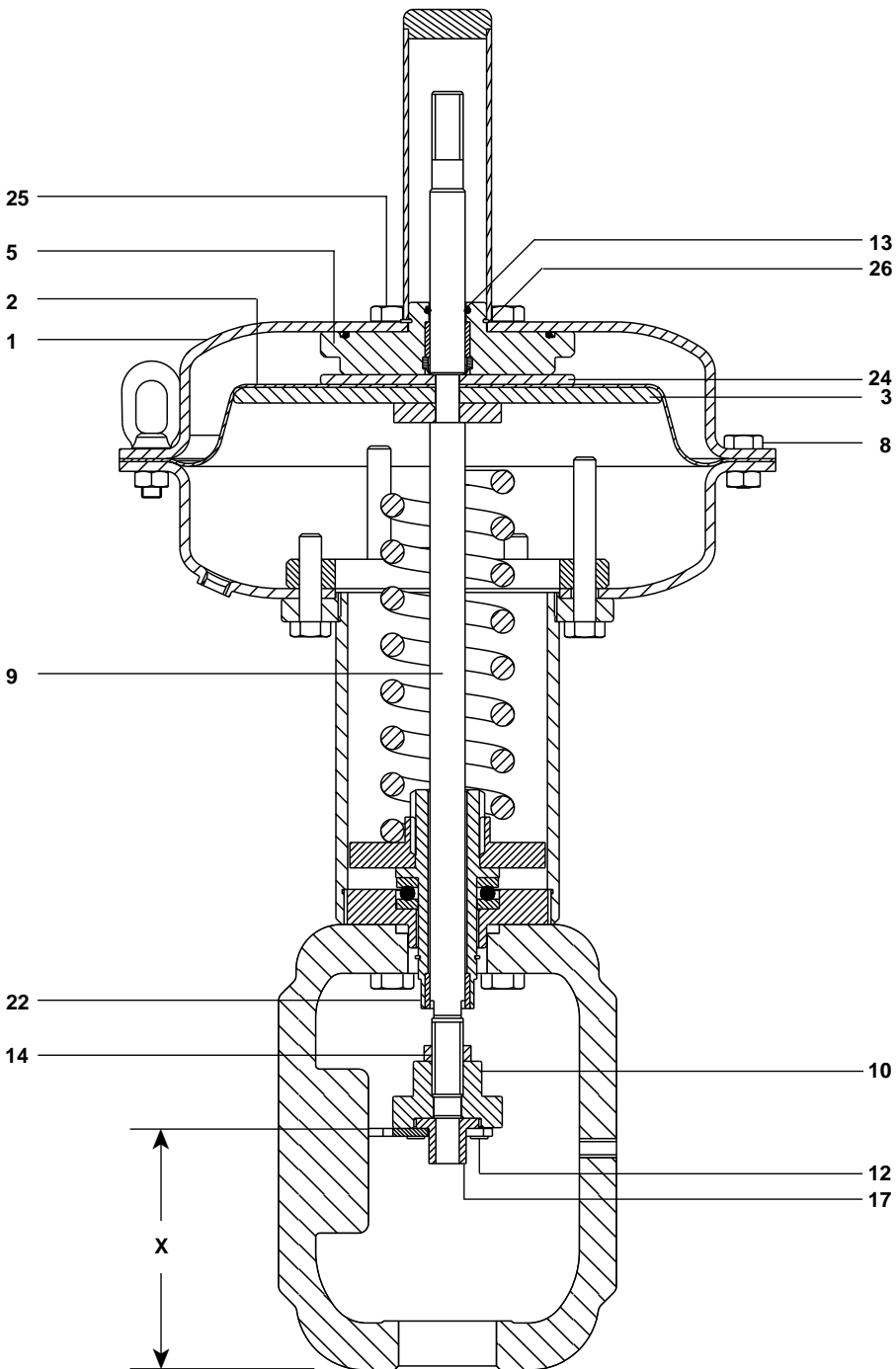


Fig. 7 PN2000 series

6. Spare parts

Spare parts PN1000 series

The spare parts available are detailed below. No other parts are supplied as spares.

Available spares

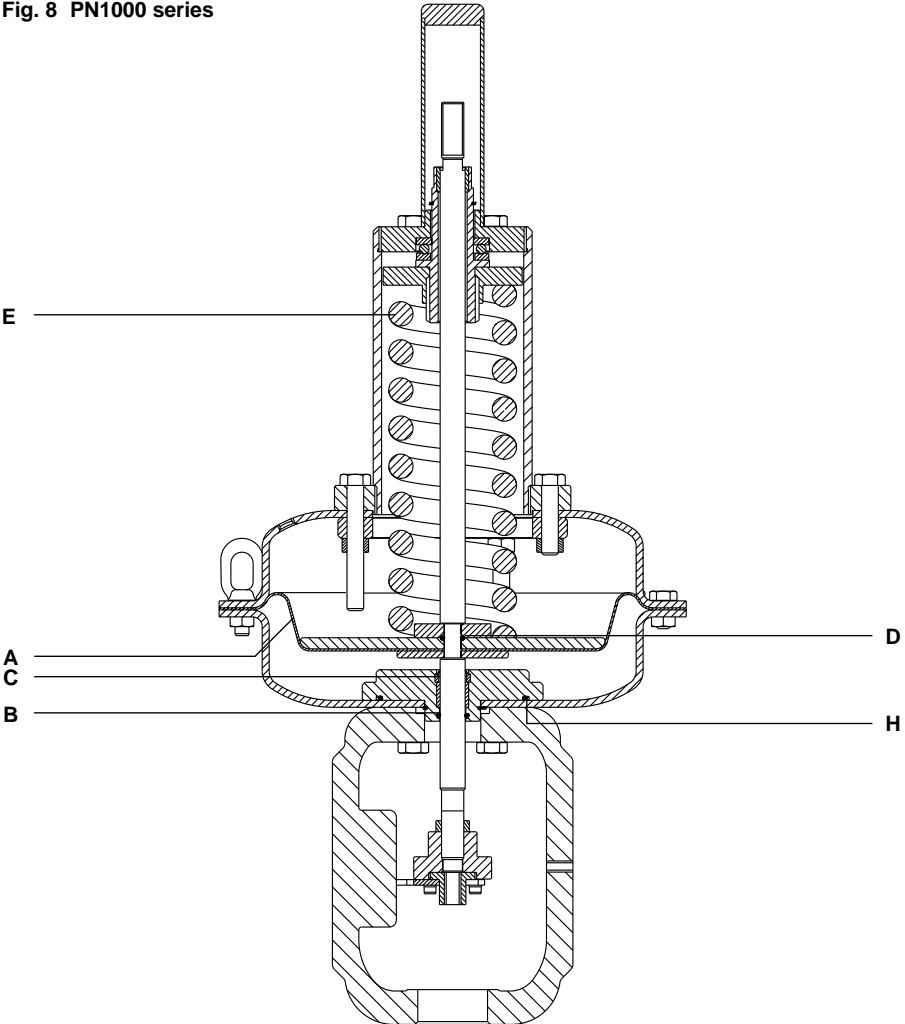
Stem seal kit	Spindle 'O' ring and 'V' ring, diaphragm plate 'O' ring and spring guide gasket	B, C, D, H
Diaphragm kit	Diaphragm	A
Spring kit	Replacement spring	E

How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state the actuator type.

Example for PN1000: 1 Stem seal kit for PN1520A2 pneumatic actuator.

Fig. 8 PN1000 series



Spare parts PN2000 series

The spare parts available are detailed below. No other parts are supplied as spares.

Available spares

Stem seal kit	Spindle 'O' ring and 'V' ring, diaphragm plate 'O' ring, and spring guide gasket	B, C, D, H
Diaphragm kit	Diaphragm	A
Spring kit	Replacement spring	E

How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state the actuator type.

Example for PN2000: 1 Stem seal kit for PN2520A2 pneumatic actuator.

Fig. 9 PN2000 series

