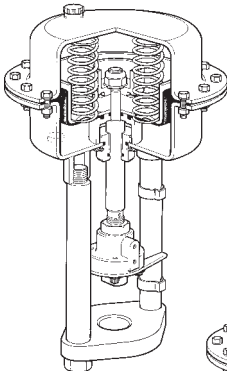


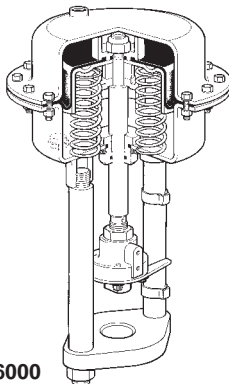
Pneumatic Actuators

Types - PN 5500, PN 5600, PN 6500 and PN 6600

Installation and Maintenance Instructions



PN 5000



PN 6000

1. *General*
2. *Installation*
3. *Commissioning*
4. *Reversal of actuator action*
5. *Spare parts*
6. *Maintenance*

1. General

PN 5000 series, spring extend pneumatic actuators

1.1 Available types

Spring extend spindle actuators PN 5500 and PN 5600 series, multi-spring, pillar mounted.

Description

A range of compact linear actuators having 2 diaphragm sizes for matching the requirements of different valves at various differential pressures. Each actuator is fitted with mechanical stroke indicators and incorporate a semi-rolling diaphragm to give linearity over the full operating stroke.

The actuators are designed for easy conversion to spring retract spindle operation (and vice versa) in the field using the same components and without the need of special tools.

These actuators are designed to operate with 2 Port KE and 3 Port QL valves as detailed below.

Actuator type	Valve type
20 mm travel	KE 43, KE 63, KE 71 and KE 73 (DN15-50)
	QL 43 and QL 73 (DN15-DN50)
30 mm travel	KE 43, KE 63 and KE 73
	QL 43 and QL 73 (DN65 - DN100)

Technical data

Temperature range	-20 to 110°C
Maximum operating pressure	
PN 5500, PN 5600	2.5 bar
Linearity	2%
Hysteresis	3% maximum

Air supply connection

Actuator type	Connection
PN 5500 and PN 5600 series	¼" BSP

Compressed air consumption

Actuator type	Travel	Volume - litres (normal)
5500 series	20 mm	6.2
	30 mm	7.1
5600 series	20 mm	8.4
	30 mm	9.6

Spring ranges

Actuator types	Spring range	Travel
PN 5520	0.2 (0.4) to 1.0 (1.2) bar	20 mm
PN 5524	0.8 to 1.5 bar	20 mm
PN 5525	0.4 to 2.0 bar	20 mm
PN 5530	0.2 (0.4) to 1.0 (1.2) bar	30 mm
PN 5534	0.8 to 1.5 bar	30 mm
PN 5535	0.4 to 2.0 bar	30 mm
PN 5620	0.2 (0.4) to 1.0 (1.2) bar	20 mm
PN 5624	0.8 to 1.5 bar	20 mm
PN 5625	0.4 to 2.0 bar	20 mm
PN 5630	0.2 (0.4) to 1.0 (1.2) bar	30 mm
PN 5634	0.8 to 1.5 bar	30 mm
PN 5635	0.4 to 2.0 bar	30 mm

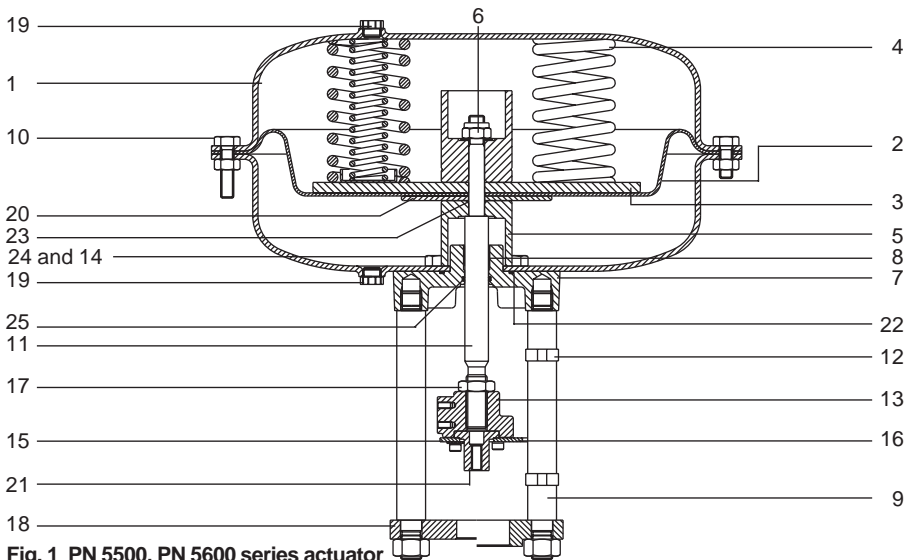


Fig. 1 PN 5500, PN 5600 series actuator

Materials

No.	Part	Material
1	Diaphragm housing	Pressed steel
2	Diaphragm	Fabric reinforced nitrile rubber
3	Piston	Steel
4	Spring	Spring steel
5	Travel stop	Aluminium
6	Nyloc nut	Steel
7	Base plate	Cast iron
8	DU bearing	PTFE / Steel composite
9	Pillars	Steel
10	Housing securing nuts and bolts	Steel
11	Spindle	Stainless steel
12	Travel indicators	Spring steel
13	Connector	Steel
14	'O' ring	Rubber
15	Lock plate	Steel
16	Indicator plate	Steel
17	Locknut	Steel
18	Mounting flange	Steel
19	Cap (with vent hole)	Plastic
20	Support plate	Steel
21	Adaptor (PN 5520, PN 5620 series)	Steel
22	'O' ring	Rubber
23	'O' ring	Rubber
24	Bolt	Steel
25	'O' ring	Rubber

1.2 PN 6000 series, spring retract pneumatic actuators

Available types

Spring retract spindle actuators.
PN 6500 and PN 6600 series, multi-spring,
pillar mounted.

Description

A range of compact linear actuators having 2 diaphragm sizes for matching the requirements of different valves at various differential pressures. Each actuator is fitted with mechanical stroke indicators and incorporate a semi-rolling diaphragm to give linearity over the full operating stroke.

The actuators are designed for easy conversion to spring extend spindle operation (and vice versa) in the field using the same components and without the need of special tools.

These actuators are designed to operate with 2 Port KE and 3 Port QL valves as detailed below.

Actuator Type	Valve Type
20 mm travel	KE 43, KE 63, KE 71 and KE 73 (DN15-50)
	QL 43 and QL 73 (DN15-DN50)
30 mm travel	KE 43, KE 63 and KE 73
	QL 43 and QL 73 (DN65 - DN100)

Spring ranges

Actuator types	Spring range	Travel
6520	0.2 to 1.0 bar	20 mm
6530	0.2 to 1.0 bar	30 mm
6620	0.2 to 1.0 bar	20 mm
6630	0.2 to 1.0 bar	30 mm

Technical data

Temperature range	-20 to 110°C
Maximum operating pressure PN 6500, PN 6600	2.5 bar
Linearity	2%
Hysteresis	3% maximum

Air supply connection

Actuator type	Connection
PN 6500 and PN 6600 series	¼" BSP

Compressed air consumption

Actuator type	Travel	Volume - litres (normal)
PN 6500 series	20 mm	6.2
	30 mm	7.1
PN 6600 Series	20 mm	8.4
	30 mm	9.6

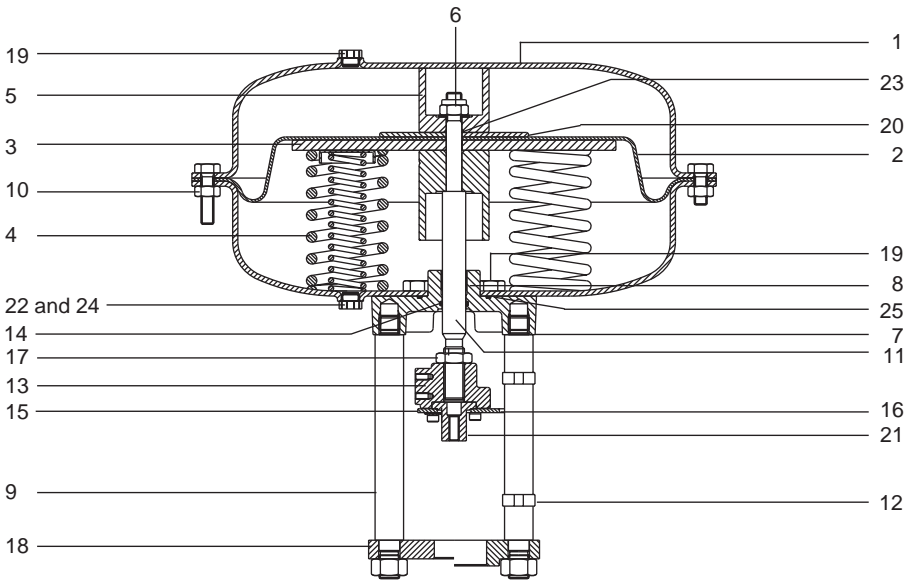


Fig. 2 PN 6500, PN 6600 series actuator

Materials

No.	Part	Material
1	Diaphragm housing	Pressed steel
2	Diaphragm	Fabric reinforced nitrile rubber
3	Piston	Steel
4	Spring	Spring steel
5	Travel stop	Aluminium
6	Nyloc nut	Cast steel
7	Base plate	Cast iron
8	DU bearing	PTFE / Steel composite
9	Pillars	Steel
10	Housing securing nuts and bolts	Steel
11	Spindle	Stainless steel
12	Travel indicators	Spring steel
13	Connector	Steel
14	'O' ring	Rubber
15	Lock plate	Steel
16	Indicator plate	Steel
17	Locknut	Steel
18	Mounting flange	Steel
19	Cap (with vent hole)	Plastic
20	Support plate	Steel
21	Adaptor (PN 5520, PN 5620 series)	Steel
22	'O' ring	Rubber
23	'O' ring	Rubber
24	Bolt	Steel
25	'O' ring	Rubber

2. Installation

See also separate Installation and Maintenance Instructions for the control valves. For details of differential pressures associated with KE valves refer to Technical Information Sheet TI-P357-03 for PN 5000 series actuators and TI-P357-02 for PN 6000 series actuators for QL valves refer to TI-P357-09 and TI-P357-10.

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

Warning

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

Number of springs

All models have multi-springs. The number of springs fitted is dependent on the spring range. Refer to Table 1 below.

Table 1 PN 5500 / PN 5600 spring

Actuator type PN ----	Number of springs	Inside dia. (mm)	Length (mm)	Identification (vertical stripe)	Spring range	Travel
5520 / 6520	7	44	112	Black	0.2 - 1.0 bar	20 mm
5524 / 6524	7	45	125	Brown	0.8 - 1.5 bar	20 mm
5525 / 6525	14	44 / 21	112	Pink	0.4 - 2.0 bar	20 mm
5530 / 6530	7	44	115	White	0.2 - 1.0 bar	30 mm
5534 / 6534	7	47	135	Blue	0.8 - 1.5 bar	30 mm
5535 / 6535	7	47	112	Green	0.4 - 2.0 bar	30 mm
5620 / 6620	8	56	110	Black	0.2 - 1.0 bar	20 mm
5624 / 6624	8	56	123	Brown	0.8 - 1.5 bar	20 mm
5625 / 6625	16	33 / 56	109	Pink	0.4 - 2.0 bar	20 mm
5630 / 6630	8	56	113	White	0.2 - 1.0 bar	30 mm
5634 / 6634	8	57	134	Blue	0.8 - 1.5 bar	30 mm
5635 / 6635	16	56 / 38	112	Green	0.4 - 2.0 bar	30 mm

NB Springs are nested in pairs

3. 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.

3.1 Adjusting spring

The actuator spring range and lift off pressure will be indicated on the nameplate. Should it be necessary to check or adjust the lift off pressure the procedure is described in paragraphs 3.2 and 3.3.

Important

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

To prevent damage to the diaphragm ensure actuator spindle is not allowed to rotate when the diaphragm is assembled within its housing.

All models have multi-springs. The number of springs fitted is dependent on the spring range. Refer to Table 1, in section 2 above.

3.2 PN 5500 spring extend actuators

Note: Adjustment of the spring will only alter the pressure of the control signal air 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. i.e. 0.2 to 1.0 bar spring (range 0.8 bar) set to commence to lift at 0.4 bar will require a 1.2 bar air pressure (range 0.8 bar) to obtain valve full travel.

To adjust set point proceed as follows:-
 Ensure the control valve has been isolated and the actuator housing is pressure free.
 Loosen valve adaptor locknut. Loosen and remove socket screws, locking plate and drop anti-rotation / indicator plate over valve stem.
 Using two spanners whilst holding actuator connector loosen actuator locking nut.
 Apply the control signal pressure required to commence lifting the valve plug off its seat.
 With the valve plug remaining on its seat adjust with equal turns both the actuator connector and valve adaptor until the adaptor enters and presses tightly against the actuator connector.
 See Fig. 3 for correct installation.
 Attach the anti-rotation / indicator plate (14), locking plate (15) with socket screws to the actuator connector. Tighten screws. (See Fig. 6).
 Release the control air pressure signal and re-check that the valve just commences to move off its seat at the new spring range minimum pressure and is fully open at the spring range maximum pressure.
 After the test set the travel indicators to the end of travel positions. With the valve at mid travel using two spanners tighten actuator connector locknut. Tighten valve adaptor locknut.

Important Do not turn the valve plug on its seat when under pressure from the actuator. Do not allow the actuator spindle to rotate when the diaphragm is assembled within its housing.

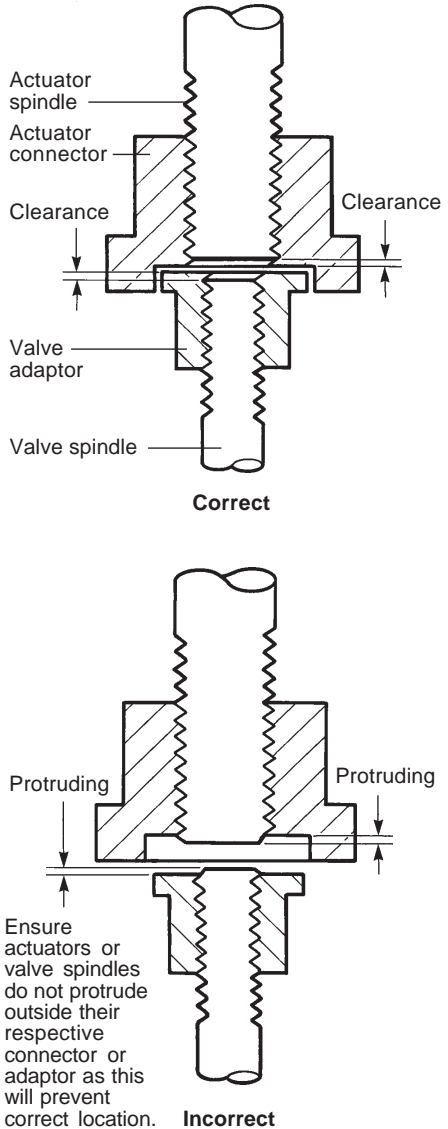


Fig. 3 Assembly of actuator adaptor and valve connector

3.3 PN 6000 series, spring retract actuators

Note: Adjustment of the spring will only alter the pressure of the control signal air at which the valve commences to close (set point) and will not alter the spring pressure range required to move the valve through its full travel. i.e. 0.2 to 1.0 bar spring (range 0.8 bar) set to commence to lift at 0.4 bar will require a 1.2 bar air pressure (range 0.8 bar) to obtain valve full travel.

To reset or adjust set point proceed as follows:-

Ensure the control valve has been isolated and the actuator housing is pressure free.

Loosen valve adaptor locknut. Loosen and remove socket screws, locking plate and drop anti-rotation / indicator plate over valve stem. Using two spanners whilst holding actuator connector loosen actuator connector locking nut.

Apply the control signal pressure required to move the valve plug to the closed position.

Ensuring the valve plug is in its fully closed position adjust with equal turns both the actuator connector and valve adaptor until the adaptor enters and presses tightly against the actuator connector. See Fig. 3 for correct installation. Attach the anti-rotation / indicator plate (14), locking plate (15) with socket screws to the actuator connector. Tighten screws. (See Fig. 4).

Release the control air pressure signal and re-check that the valve just commences to close at the new spring range minimum pressure and is fully closed at the spring range maximum pressure.

After the test set the travel indicators to the end positions. With the valve at mid travel using two spanners tighten actuator connector locking nut. Tighten valve adaptor locknut.

Important

Do not turn the plug on its seat when under pressure from the actuator. Do not allow the actuator spindle to rotate

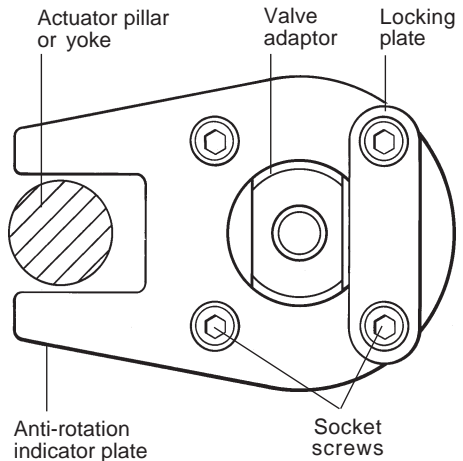
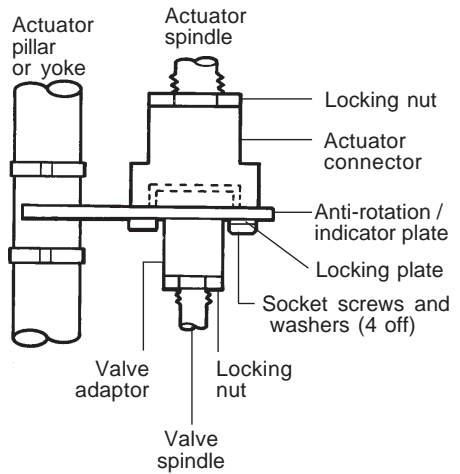


Fig. 4

4. Reversal of actuator action

The operation of each actuator can be reversed i.e. PN 5000 series spring extend can be converted to PN 6000 series spring retract and vice versa. No special equipment is required.

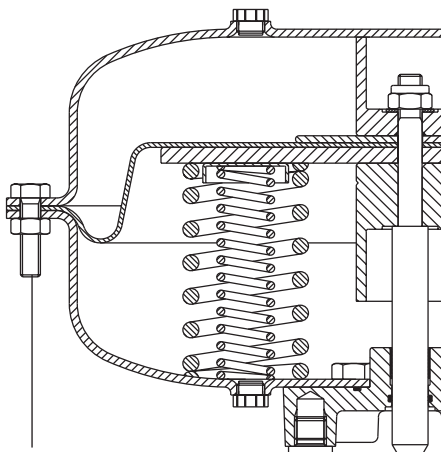
To reverse actuator operation proceed as follows:

4.1 Removing actuator from valve

Drive actuator into approximately mid-travel position with the air supply. Loosen valve adaptor locknut. Loosen and remove socket screws, locking plates and rest anti-rotation / indicator plate over valve stem. Using two spanners, whilst holding actuator connector loosen actuator locking nut.

Loosen and remove hexagon nuts on columns and lift actuator off the valve.

Reduce air supply pressure until housing is pressure free. Disconnect air supply from the actuator.



Note
Longer housing bolts with some spring ranges.

Fig. 5

4.2 Reversing PN 5000 series spring extend to PN 6000 spring retract.

Loosen and remove housing screws (10) and remove housing lid (1).

Note 1: On certain spring ranges 3 off longer housing bolts are fitted (10). These should be removed after all other bolts are removed and should be loosened evenly to prevent distortion.

Ensure that the locknut (17) is tightened onto the actuator connector (13). Using two spanners whilst holding actuator connector, loosen Nyloc nut (6).

Remove spring (s) (4), Nyloc nut, fibre washer, travel stop (5), support plate (20), piston (3), diaphragm (2), 'O' ring (23) and bottom travel stop(5).

Reassemble in the following order:

Refit bottom travel stop, turn piston upside down and refit spring (s) and piston ensuring on multi-spring actuators that the springs are correctly located over piston spring locations. (See Fig. 6, page 10).

Refit diaphragm support plate and top travel stop. Fit fibre washer and Nyloc nut.

Using two spanners, whilst holding actuator connector tighten Nyloc nut.

Refer to Table 2 for torque rating. Ensuring that the top housing bolt holes line up with the bottom housing holes. Refit top housing and securing nuts and bolts.

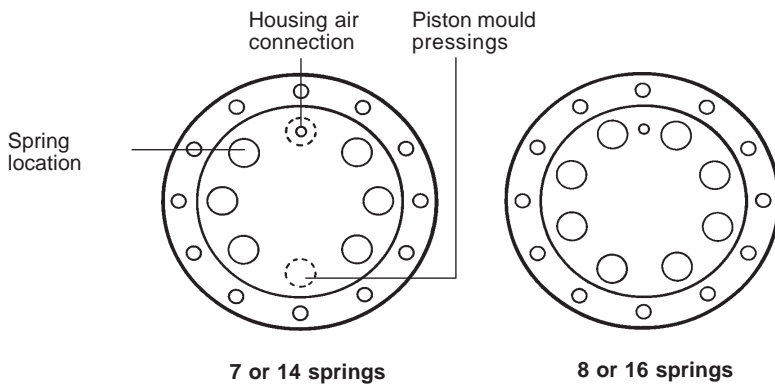
Note 2: Housing securing bolts should be tightened evenly to avoid distortion. On some spring ranges 3 off longer housing bolts are provided to span the longer spring. If supplied, these should be positioned 120° apart and tightened evenly prior to fitting the remaining bolts. (See Fig. 5)

Note 3: 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 2 for torque rating. Remove plastic cap (19) from top housing and refit into bottom housing.

Refer to Section 4.4, reference refitting of actuator to valve.

Table 2 Recommended tightening torques

Actuator series	Housing bolts (12)		Nyloc nut (14)	
	Size	Torque N m	Size	Torque N m
PN 5500 / PN 6500	M10	10 N m ±1	M12	40 ± 3
PN 5600 / PN6600	M10	10 N m ±1	M12	40 ± 3



Note: Arrange springs as shown to avoid interference with housing air connection.

Fig. 6 Position of multi-springs

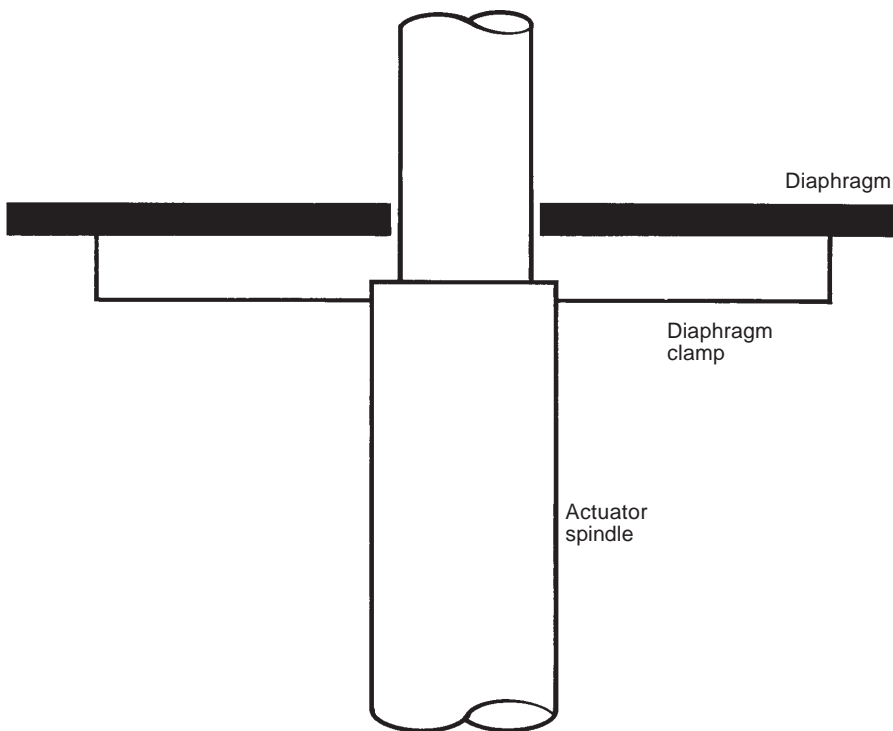


Fig. 7 Location of diaphragm

4.3 Reversing PN 6000 series spring retract to PN 5000 series spring extend

(See Fig. 1 and 2)

Loosen and remove housing screws (10) and remove housing lid (1).

Note 1: On certain spring ranges 3 off longer housing bolts are fitted, positioned evenly apart. These should be loosened after all other bolts are removed and should be loosened evenly to prevent distortion. This is necessary to relieve all spring force before removing housing lid.

Ensuring that the locknut (17) is tightened onto the actuator connector (13), using two spanners whilst holding actuator connector, loosen and remove Nyloc nut (6), fibre washer, travel stop (5), 'O' ring (23), diaphragm (2), piston (3), spring(s) (4) and support plate (20). Reassemble in the following order:-

Turn diaphragm upside down and refit ensuring that diaphragm lip is correctly located (See Fig. 7). Turn piston upside down and refit ensuring it is pressing tightly against diaphragm.

Refit travel stop, fibre washer and Nyloc nut. Using 2 spanners, whilst holding actuator connector, tighten Nyloc nut to the torque rating given in Table 2. Refit spring (s) ensuring that on multi-spring actuators the springs are correctly located over the piston spring locations (See Fig. 6).

Ensuring that top housing bolt holes line up with the bottom housing holes, refit top housing and securing nuts and bolts.

Note 2: Housing fixing bolts should be tightened evenly to avoid distortion. On some spring ranges 3 off longer housing bolts are

provided to span the longer spring. If fitted, these should be positioned 120° apart and tightened evenly before fitting and tightening the remaining bolts (See Fig. 5)

Note 3: 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 2 for torque rating.

Remove plastic cap (19) from bottom housing and refit into top housing.

Refer to Section 4.4. reference refitting of Actuator to valve.

4.4 Refitting actuator to valve

Position actuator pillars over valve bonnet flange fixing holes and locate.

Note 1: On some spring ranges due to the high spring tension being exerted it may be necessary to counter-balance the spring pressure with an air signal onto the actuator housing to realign actuator pillars. If this is necessary, apply an air pressure signal equal to the lower value of the spring range rating. (Refer to actuator nameplate for spring pressure range). Fit pillar nuts and tighten to 35 ± 2 N m.

Note 2: It may be necessary to adjust the position of the valve adaptor and actuator connector to correctly locate the actuator on the valve.

4.5 Recommissioning

On completion of reversal of operation it will be necessary to recommission the valve / actuator.

Refer to Section 3 regarding commissioning following Section 3.2 - Spring extend actuators or, Section 3.3 - Spring retract actuators, as appropriate.

5. Spare parts

These spares are for PN 5500, PN 5600, PN 6500 and PN 6600 series multi-spring actuators.

Available spares

Stem seal kit	
(Piston guide bearing and 'O' ring's)	A,C,H
Diaphragm kit	D,E,F,H
(Diaphragm, Nyloc nut and washer and 'O' ring's)	
Travel Indicator kit	G
(2 off indicators)	
Spring kit	B,J
(Set of springs - includes 3 off longer Hexagonal head bolts, washers and nuts on some spring ranges).	

How to order

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

Example: 1 - Stem seal kit for PN 5520 pneumatic actuator.

How to fit

Full fitting instructions are given in the operating and maintenance instructions supplied with the actuator.

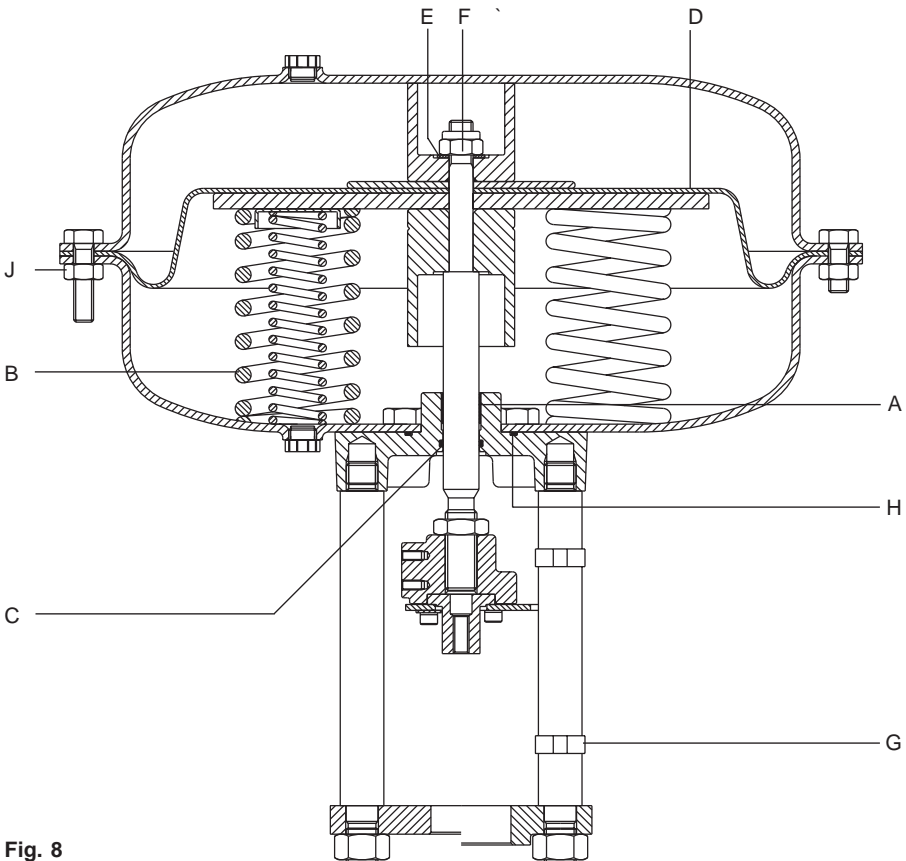


Fig. 8

6. Maintenance

The PN 5000 and PN 6000 series pneumatic actuators are maintenance free. To ensure satisfactory operation it is strongly recommended that the control signal air is filtered and supplied free of oil and water. Should it be necessary to replace spare parts the following procedure should be followed.

6.1 PN 5000 series

6.1.1 Diaphragm kit - How to fit (See Fig. 9)
Remove actuator from valve as described in Section 4.1.

Remove top housing (1). As described in Section 4.2. Remove spring / springs. Tighten nut (17) onto connector (13). Using two spanners whilst holding actuator connector, to prevent actuator spindle rotating, loosen and remove Nyloc nut (6) and fibre washer.

Remove travel stop (5). Remove piston (3) and diaphragm (2) and 'O' ring (23).

Refit new 'O' ring and diaphragm (See Fig. 7) and reassemble all items in reverse order fitting new fibre washer and Nyloc nut.

Refit top housing and tighten screws evenly. Refer to Table 2 for torque ratings.

Note : Certain spring pressure ranges require three longer housing bolts to span the longer spring ranges fitted - (See Fig. 5). If supplied these should be fitted 120° apart and tightened evenly. The remaining housing bolts should then be fitted and tightened evenly.

6.1.2 Spring kit - How to fit

 (See Fig. 9)

Remove actuator from valve as described in section 4.1.

Remove top housing as described in section 4.2. Remove springs.

Replace new springs, refit top housing and tighten bolts evenly. (Refer to Table 2 for torque ratings). Note: Some spring ranges require 3 off longer housing bolts. These will be supplied with the spare spring kits as appropriate.

Longer housing bolts should be fitted as described in section 6.1.1.

Refit actuator to valve as described in section 4.4 and recommission spring adjustment as described in section 3.

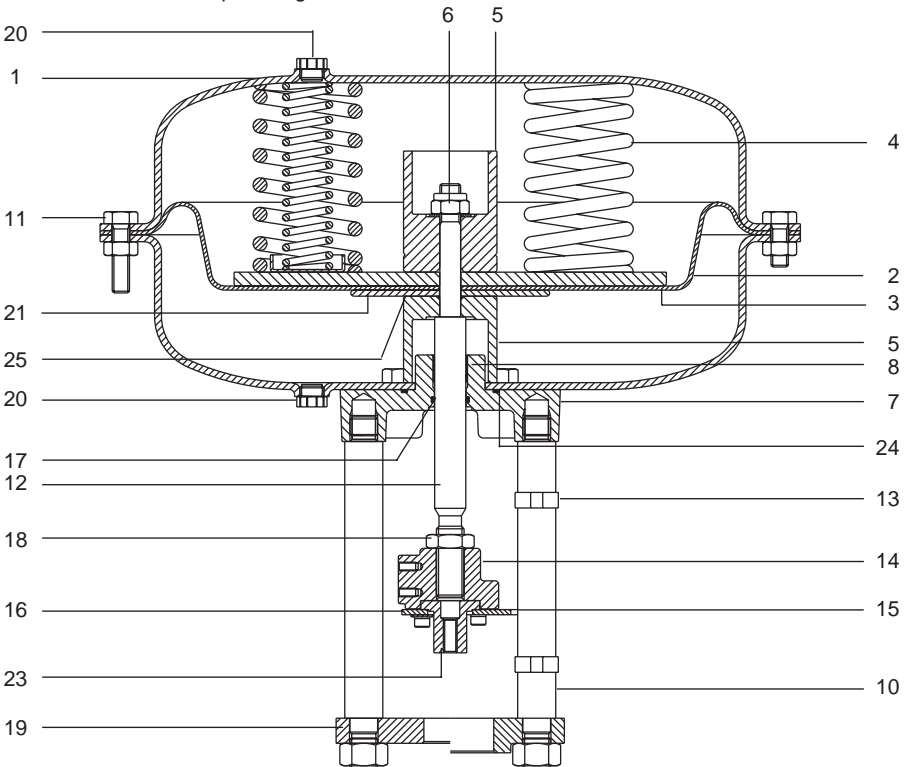


Fig. 9 PN 5500, PN 5600 series actuator

6.2 PN 6000 Series

6.2.1 Diaphragm kit - How to fit (See Fig. 10)
Remove actuator from valve as described in Section 4.1. All other details as 6.1.1 above reversed.

6.2.2 Spring kit - How to fit (See Fig. 10)
Remove actuator from valve as described in Section 4.1. All further details as 6.1.2 above reversed.

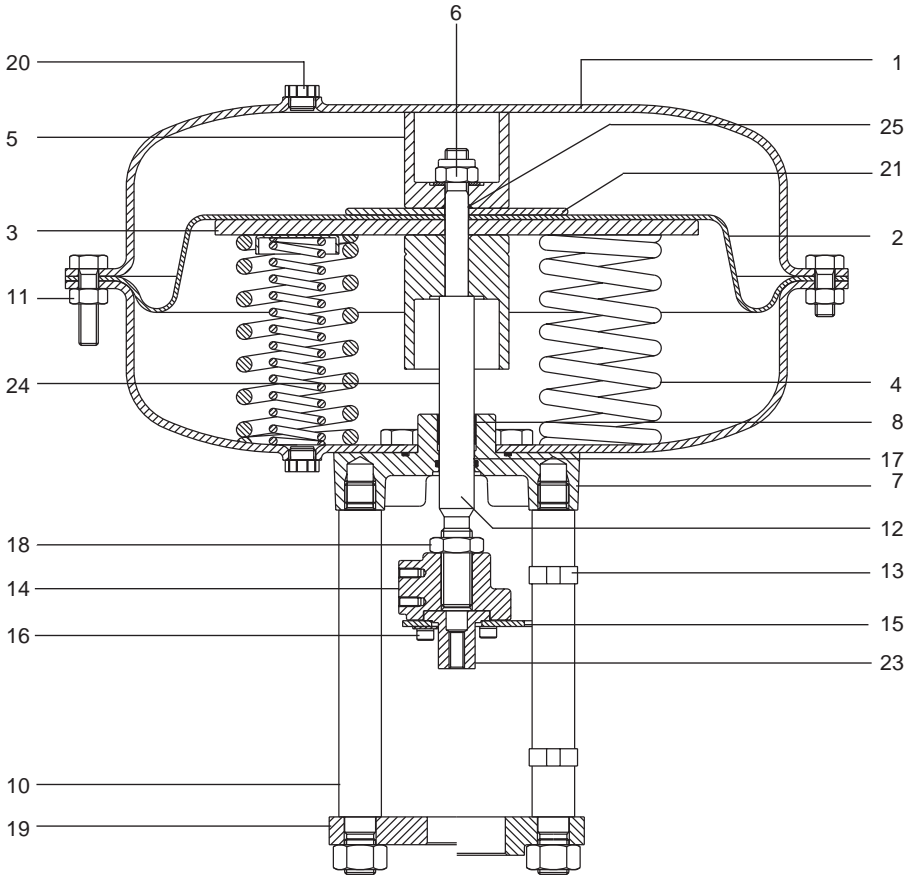


Fig. 10 PN 6500, PN 6600 series actuator

6.3 PN 5000 and PN 6000 series

6.3.1 Stem seal kit - How to fit (See Fig. 11)
Remove actuator from valve as described in section 4.1.

Remove top housing and dismantle as described in section 4.2 removing all components including support plate and bottom travel stop (5).

Withdraw actuator spindle. Remove 'O' ring (16) and tap out DU guide bearing (8) taking care not to damage piston guide (7).

Smear new 'O' ring with silicon grease and replace. Replace new DU guide bearing which may require gentle tapping to locate.

Refit actuator spindle taking care not to damage 'O' ring or bearing surface with spindle threaded end. Reassemble components in reverse order.

Refer to section 6.1.1 reference longer spindle screws if fitted. Refit actuator to valve as described in section 4.4 and recommission as described in section 3.

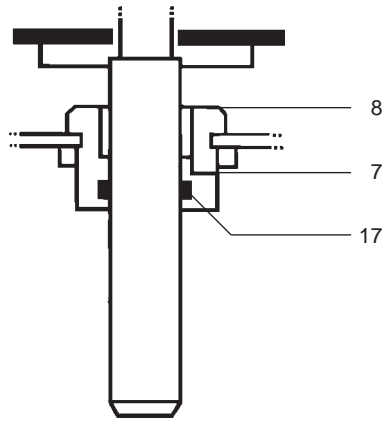


Fig. 11 PN 5500, PN 5600, PN 6500 and PN 6600 series

