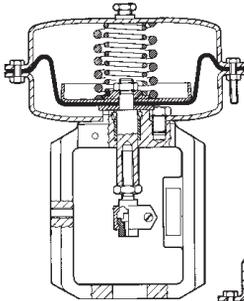
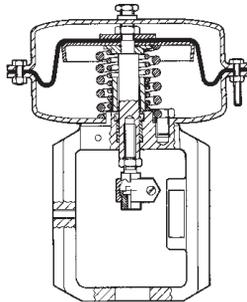


spirax /sarco

Types PN 3000 and PN 4000 Series Pneumatic Actuators Installation and Maintenance Instructions



PN3000



PN4000

1. *General*
2. *Installation*
3. *Commissioning*
4. *Spare Parts*
5. *Maintenance*

1. General

PN 3000 Series, Spring Extend Pneumatic Actuators

Available types

Spring extend spindle, multi spring, yoke mounted actuators 3200, 3300, 3400, 3500, and 3600 Series.

Description

A range of compact linear actuators having 5 diaphragm sizes for matching the requirements of different valves at various differential pressures. Each actuator is fitted with a stroke indicator and incorporates a semi-rolling diaphragm which gives good linearity over the operating stroke. These actuators are designed to operate with two port LE valves as detailed below.

Actuator Type	Valve Type
20 mm travel	LE Series (DN 15 - 50)
30 mm travel	LE Series (DN 65 - 100)

Technical Data

Temperature Range	-20° to 100°C
Max operating pressure	
PN3200/3300	6 bar
PN3400	4 bar
PN3500/3600	2.5 bar

Air Supply Connection

Actuator Type	Connection
PN 3200 to 3600 Series	1/4" NPT

Compressed Air Consumption

Actuator Type	Travel	Volume
		(NLitres)
3200 Series	20 mm	0.6
3300 Series	20 mm	1.0
3400 Series	20 mm	1.4
	30 mm	2.1
3500 Series	20 mm	2.4
	30 mm	3.6
3600 Series	20 mm	3.8
	30 mm	5.7

Spring ranges

Actuator Types	Spring Range	Travel
3220	0.2(0.4) to 1 (1.2) bar	20mm
3225	0.4 to 2 bar	20mm
3320	0.2(0.4) to 1 (1.2) bar	20mm
3325	0.4 to 2 bar	20mm
3326	1 to 3 bar	20mm
3420	0.2(0.4) to 1 (1.2) bar	20mm
3425	0.4 to 2 bar	20mm
3426	1 to 3 bar	20mm
3430	0.2(0.4) to 1 (1.2) bar	30mm
3435	0.4 to 2 bar	30mm
3436	1 to 3 bar	30mm
3520	0.2(0.4) to 1 (1.2) bar	20mm
3525	0.4 to 2 bar	20mm
3524	0.8 to 1.5 bar	20mm
3530	0.2(0.4) to 1 (1.2) bar	30mm
3535	0.4 to 2 bar	30mm
3534	0.8 to 1.5 bar	30mm
3620	0.2(0.4) to 1 (1.2) bar	20mm
3625	0.4 to 2 bar	20mm
3624	0.8 to 1.5 bar	20mm
3630	0.2(0.4) to 1 (1.2) bar	30mm
3635	0.4 to 2 bar	30mm
3634	0.8 to 1.5 bar	30mm

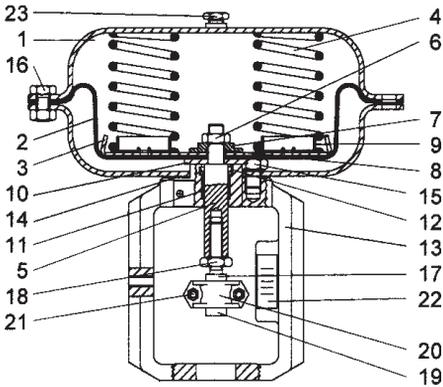


Fig. 1

Materials

No	Part	Material
1	Diaphragm Housing	Pressed Steel
2	Diaphragm	Reinforced Nitrile Rubber
3	Diaphragm Plate	Pressed Steel
4	Springs	Spring Steel
5	Spindle	Stainless Steel
6	Lock Nut	Stainless Steel
7	Spacer	Zinc Plated Steel
8	"O" Ring	Rubber
9	Spring Guide	Zinc Plated Steel
10	Diaphragm Clamp	Zinc Plated Steel
11	Bearing	Bronze
12	"V" Ring	Rubber
13	Yoke	Cast Iron
14	Gasket	Non Asbestos Fibre
15	Fixing Screws	Steel
16	Housing Bolts & Nuts	Steel
17	Top Adaptor	Steel
18	Lock Nut	Steel
19	Bottom Adaptor	Steel
20	Connectors	Stainless Steel
21	Connectors Bolts & Nuts	Stainless Steel
22	Travel Indicator	Aluminum
23	Cap (with vent hole)	Plastic

PN 4000 Series, Spring Retract Pneumatic Actuators

Available types

Spring retract spindle, multi spring, yoke mounted actuators 4200, 4300, 4400, 4500, and 4600 Series.

Description

A range of compact linear actuators having 5 diaphragm sizes for matching the requirements of different valves at various differential pressures. Each actuator is fitted with a stroke indicator and incorporates a semi-rolling diaphragm which gives good linearity over the operating stroke. These actuators are designed to operate with two port LE valves as detailed below.

Actuator Type	Valve Type
20 mm travel	LE Series (DN 15 - 50)
30 mm travel	LE Series (DN 65 - 100)

Technical Data

Temperature Range	-20° to 100°C
Max operating pressure	
PN4200/4300	6 bar
PN4400	4 bar
PN4500/4600	2.5 bar

Air Supply Connection

Actuator Type	Connection
PN 4200 to 4600 Series	1/4" NPT

Compressed Air Consumption

Actuator Type	Travel	Volume (NLitres)
4200 Series	20 mm	0.6
4300 Series	20 mm	1.0
4400 Series	20 mm	1.4
	30 mm	2.1
4500 Series	20 mm	2.4
	30 mm	3.6
4600 Series	20 mm	3.8
	30 mm	5.7

Spring ranges

Actuator Types	Spring Range	Travel
4220	0.2 to 1 bar	20mm
4320	0.2 to 1 bar	20mm
4420	0.2 to 1 bar	20mm
4430	0.2 to 1 bar	30mm
4520	0.2 to 1 bar	20mm
4530	0.2 to 1 bar	30mm
4620	0.2 to 1 bar	20mm
4630	0.2 to 1 bar	30mm

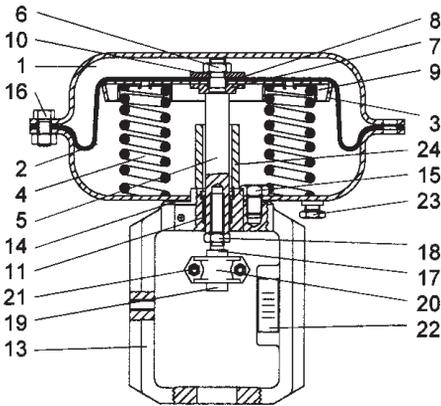


Fig. 2

Materials

No	Part	Material
1	Diaphragm Housing	Pressed Steel
2	Diaphragm	Reinforced Nitrile Rubber
3	Diaphragm Plate	Pressed Steel
4	Springs	Spring Steel
5	Spindle	Stainless Steel
6	Lock Nut	Stainless Steel
7	Spacer	Zinc Plated Steel
8	"O" Ring	Rubber
9	Spring Guide	Zinc Plated Steel
10	Diaphragm Clamp	Zinc Plated Steel
11	Bearing	Bronze
13	Yoke	Cast Iron
14	Gasket	Non Asbestos Fibre
15	Fixing Screws	Steel
16	Housing Bolts & Nuts	Steel
17	Top Adaptor	Steel
18	Lock Nut	Steel
19	Bottom Adaptor	Steel
20	Connectors	Stainless Steel
21	Connectors Bolts & Nuts	Stainless Steel
22	Travel Indicator	Aluminum
23	Cap (with vent hole)	Plastic
24	Spacer	Plastic

2. Installation

See also separate Installation and Maintenance Instructions for the control valves. For details of differential pressures associated with KE and LE valves refer to Technical Information Sheet TIS 1.312 for PN3000 series actuators and TIS 1.313 for PN4000 series actuators.

The 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 -20°C to $+110^{\circ}\text{C}$. 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 pressurized on the opposite side of the diaphragm to the springs. The housing vent cap must left be unrestricted.

2.1 Fitting Actuator to Valve PN3000 (Refer to fig. 1)

Loosen and remove connectors locking screws and nuts (21) and remove connectors (20).

Fit the valve spindle adaptor (19) onto the valve spindle and push manually the valve plug to its closed position. Adjust the distance of the adaptor (19) from the bonnet shoulder at the value indicated in fig. 3.

Apply the control signal pressure required to bring the spindle at mid-travel position.

Place actuator yoke over valve spindle and locate on bonnet shoulder. Locate and tighten valve mounting nut to 50 Nm.

Apply the minimum signal pressure to the bottom of the actuator, and then adjust the top adaptor (17) so that it touches the bottom adaptor (19).

Release the control air signal. Fit the connectors across the adaptors (17) and (19). Fit connectors locking screws and nuts and tighten to 2 Nm.

Note-Before mounting the connectors It may be necessary to adjust the position of the actuator spindle adaptor. Follow the spring adjust procedure as described in Section 3.

PN4000 (Refer to fig. 2)

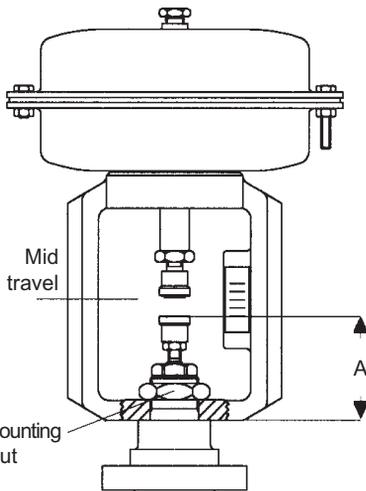
Loosen and remove connectors locking screws and nuts (21) and remove connectors (20).

Fit the valve spindle adaptor (19) onto the valve spindle and push manually the valve plug to its closed position. Adjust the distance of the adaptor (19) from the bonnet shoulder at the value indicated in fig. 3.

Place actuator yoke over valve spindle and locate on bonnet shoulder. Locate and tighten valve mounting nut to 50 Nm.

Apply the minimum signal pressure to the top of the actuator, and then adjust the top adaptor (17) to give a gap with the bottom adaptor (19) of the valve travel (20 or 30 mm).

Apply the control air signal to bring the actuator spindle against the valve spindle. Fit the connectors across the adaptors (17) and (19). Fit connectors locking screws and nuts and tighten to 2 Nm.



A= 71 mm for DN 15 to DN 50 Valves
91 mm for DN 65 to DN 100 Valves

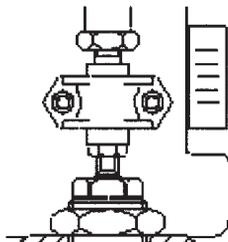


Fig. 3

Table 1: PN3000/PN4000 Spring

Actuator Type	Spring		Numb. of Springs	Ins. Dia. (mm)	Length (mm)	Identification (Vert.Stripe)
	Range	Travel				
3220/4220	0.2-1.0 bar	20 mm	1	42	73	Black
			1	29	73	Red
3225	0.4-2.0 bar	20 mm	1	42	73	Yellow
			1	29	73	Violet
3320/4320	0.2-1.0 bar	20 mm	4	42	84	Black
3325	0.4-2.0 bar	20 mm	4	42	84	Yellow
3326	1.0-3.0 bar	20 mm	4	42	84	Yellow
			4	29	84	Red
3420/4420	0.2-1.0 bar	20 mm	2	42	84	Yellow
			2	42	84	Black
3425	0.4-2.0 bar	20 mm	5	42	84	Yellow
			4	29	84	Red
3426	1.0-3.0 bar	20 mm	5	42	104	White
3430/4430	0.2-1.0 bar	30 mm	2	54,5	107	White
			2	36	107	Green
3435	0.4-2.0 bar	30 mm	4	54,5	107	White
			4	36	107	Green
3436	1.0-3.0 bar	30 mm	4	54,5	125	White
			5	36	125	Green
3520/4520	0.2-1.0 bar	20 mm	6	54,5	107	White
			2	36	107	Green
3525	0.4-2.0 bar	20 mm	8	42	104	White
3524	0.8-1.5 bar	20 mm	7	45	125	Brown
3530/4530	0.2-1.0 bar	30 mm	4	54,5	125	White
			2	36	125	Green
3535	0.4-2.0 bar	30 mm	6	54,5	125	White
			6	36	125	Green
3534	0.8-1.5 bar	30 mm	7	47	135	Blue
3620/4620	0.2-1.0 bar	20 mm	8	54,5	125	White
			6	36	125	Green
3625	0.4-2.0 bar	20 mm	12	42	104	White
3624	0.8-1.5 bar	20 mm	8	56	123	Brown
3630/4630	0.2-1.0 bar	30 mm	6	54,5	125	White
			2	36	125	Green
3635	0.4-2.0 bar	30 mm	9	54,5	125	White
			8	36	125	Green
3634	0.8-1.5 bar	30 mm	8	57	134	Blue

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.

3.2 PN3000 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 require 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 (0.4 + 0.8) to obtain valve full travel.

To adjust set point refer to fig. 2 and proceed as follows:-

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

Loosen and remove connector nuts and screws (21) and remove connectors (20).

Using two spanners whilst holding actuator spindle loosen actuator adaptor lock nut (18).

Apply the control signal pressure required to commence lifting the actuator spindle.

With the valve plug remaining on its seat adjust the actuator spindle adaptor until it presses tightly against the valve spindle. See Fig. 4 for correct installation.

Release the control air signal. Fit the connectors across the adaptors (17) and (19). Fit connectors locking screws and nuts and tighten to 2 Nm. Recheck 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.

After the test check the position of the travel indicator against the "arrow" of the connector and adjust its position accordingly.

Important

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

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

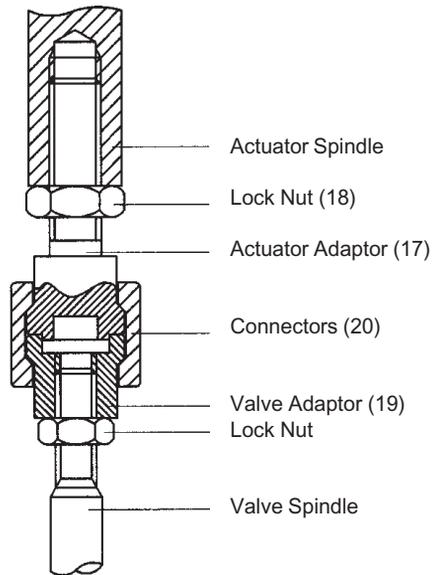
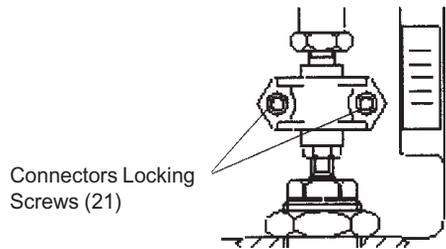


Fig. 4 Assembly of Actuator Adaptor, Valve Adaptor and Connectors



3.3 PN4000 Spring Retract 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 require 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 (0.4 + 0.8) to obtain valve full travel.

To adjust set point refer to fig. 2 and proceed as follows:-

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

Loosen and remove connectors nuts and screws

(21) and remove connectors (20).
 Using two spanners whilst holding actuator spindle loosen actuator adaptor lock nut (18).
 Apply the control signal pressure required to complete the full travel of the actuator spindle.
 With the valve plug remaining on its seat adjust the actuator spindle adaptor until it presses tightly against the valve spindle. See Fig. 4 for correct installation.
 Fit the connectors across the adaptors (17) and

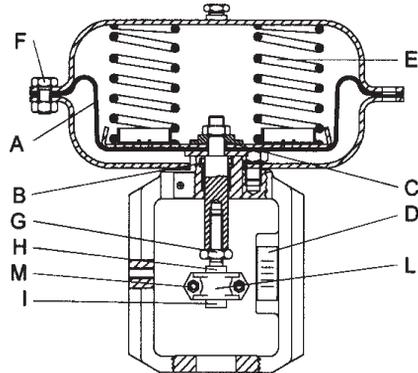
(19). Fit connectors locking screws and nuts and tighten to 2 Nm.
 Release the air control pressure and recheck that the valve just commences to move toward the seat at the right spring range minimum pressure and is fully closed at the spring range maximum pressure.
 After the test check the position of the travel indicator against the "arrow" of the connector and adjust its position accordingly.

4. Spare Parts

The spare parts available are indicated by capital letters. The other parts are not supplied as spares.

Available Spares

Stem seal kit (“V” ring and “O” ring)	B,C
Diaphragm kit (Diaphragm, “V” ring, “O” ring)	A,B,C
Travel indicator kit	D
Spring kit (Set of springs - includes 3 off longer Hex. Head bolts and nuts on some spring ranges)	E,F
Linkage kit (Lock nut, Top adaptor, bottom adaptor, connectors, bolts and nuts)	G,H,I,L,M



How to order

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

Example: - Stem seal kit for PN3220
 pneumatic actuator

Table 2 Recommended tightening torques

Actuator Series	Housing Bolts (16)		Lock Nut (6)	
	Size	Torque Nm	Size	Torque Nm
PN3200/4200	M6	5 +/- 0.5	M12	40 +/- 3
PN3200/4200 to PN3600/4600	M10	15 +/- 2	M12	40 +/- 3

5. Maintenance

The PN3000 and PN4000 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 used.

5.1 Removing Actuator from Valve

Drive actuator into approximately mid-travel position with the air supply. Loosen and remove connectors nuts and screws (21) and remove connectors (20).

Loosen and remove yoke mounting nut and lift actuator off the valve.

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

5.2 PN3000 Series

5.2.1 Diaphragm Kit - How to Fit

Remove actuator from valve as described in Section 5.1. Loosen and remove housing screws (16) and remove housing lid (1).

Note 1 - On certain spring ranges 3 off longer housing bolts are fitted (16). These should be removed after all other bolts are removed and should be loosened evenly to prevent distortion. Using two spanners whilst holding actuator spindle (5), loosen plate locknut (6). Remove springs (4), spacer (7), "O" ring (8), diaphragm plate (3) and diaphragm (2).

Refit new diaphragm and "O" ring reassembling all items in reverse order. Using two spanners, whilst holding actuator spindle tighten plate lock nut. Refer to Table 1 for torque rating.

Refit top housing and securing nuts and bolts.

2 - While supporting the actuator spindle so that the diaphragm sits evenly in the lower housing, tighten evenly housing securing bolts to avoid distortion. On some spring ranges 3 off longer housing bolts are provided to cater for the longer spring. If supplied, these should be positioned 120° apart and tightened evenly prior to fitting the remaining bolts.

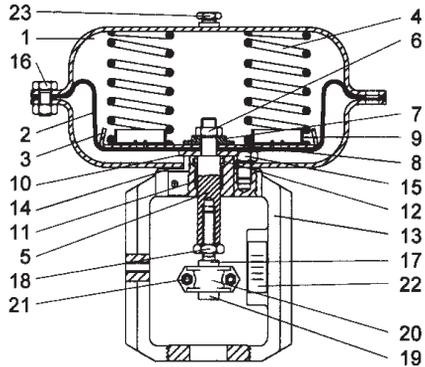
3 - To avoid distortion of the diaphragm do not fully tighten housing bolts until all bolts have been fitted. Final tightening should then be carried out evenly. Refer to Table 2 for torque rating.

5.2.2 Spring Kit - How to Fit

Remove actuator from valve as described in Section 5.1. Loosen and remove housing screws (16) and remove housing lid (1) as described in Section 5.2.1.

Remove springs.

Replace new springs; While supporting the actuator spindle so that the diaphragm sits evenly in the lower housing, refit top housing and tighten bolts evenly. Refer to Section 5.2.1. Note 2 and 3.



5.3 PN4000 Series

5.3.1 Diaphragm Kit - How to Fit

Remove actuator from valve as described in Section 5.1. Loosen and remove housing screws (16) and remove housing lid (1), as described in Section 5.2.1.

Using two spanners whilst holding actuator spindle (5), loosen plate locknut (6). Remove diaphragm clamp (10) and diaphragm (2).

Refit new diaphragm reassembling all items in reverse order. Using two spanners, whilst holding actuator spindle tighten plate lock nut. Refer to Table 1 for torque rating.

While supporting the actuator spindle so that the diaphragm sits evenly in the lower housing, refit top housing and securing nuts and bolts, as described in Section 5.2.1.

5.3.2 Spring Kit - How to Fit

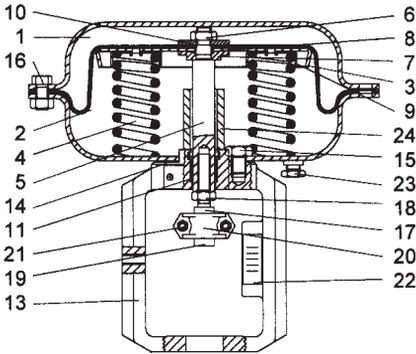
Remove actuator from valve as described in Section 5.1. Loosen and remove housing screws (16) and remove housing lid (1), as described in Section 5.2.1.

Using two spanners whilst holding actuator spindle (5), loosen plate locknut (6). Remove diaphragm clamp (10), diaphragm (2), diaphragm plate (3), spacer (7) and "O" ring (8). Remove springs taking note of their location..

Replace new springs locating in the same position of the previous set.

Refit all other items in reverse order. Using two spanners, whilst holding actuator spindle tighten plate lock nut. Refer to Table 1 for torque rating. While supporting the actuator spindle so that the diaphragm sits evenly in the lower housing,

refit top housing and securing nuts and bolts, as described in Section 5.2.1.



5.4 PN3000 & PN4000 Series

5.4.1 Stem Seal Kit - How to Fit

Remove actuator from valve as described in Section 5.1.

Remove top housing and dismantle as described in Section 5.2, removing all components including springs and diaphragm plate clamp.

Withdraw actuator spindle. Remove "V" ring (12) taking care not to damage spindle bearing (11).

Smear new "V" ring with silicon grease and replace. Refit actuator spindle taking care not to damage "V" ring or bearing. Reassemble components in reverse order. Refer to Section 5.2.1 or 5.3.1 for longer housing bolts fitted. Refit actuator as described in Section 2 and recommission as described in Section 3.

