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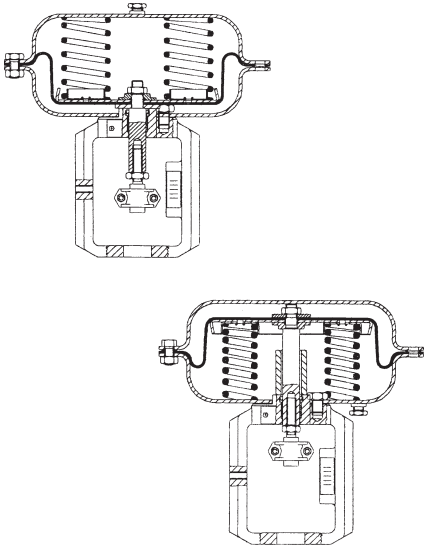
Types PN 3000 and PN 4000 Series Pneumatic Actuators Installation and Maintenance Instructions



ATTENZIONE

Lavorare in sicurezza con apparecchiature in ghisa e vapore
Working safely with cast iron products on steam

Informazioni di sicurezza supplementari - *Additional Informations for safety*

Lavorare in sicurezza con prodotti in ghisa per linee vapore

I prodotti di ghisa sono comunemente presenti in molti sistemi a vapore.

Se installati correttamente, in accordo alle migliori pratiche ingegneristiche, sono dispositivi totalmente sicuri.

Tuttavia la ghisa, a causa delle sue proprietà meccaniche, è meno malleabile di altri materiali come la ghisa sferoidale o l'acciaio al carbonio.

Di seguito sono indicate le migliori pratiche ingegneristiche necessarie per evitare i colpi d'ariete e garantire condizioni di lavoro sicure sui sistemi a vapore.

Working safely with cast iron products on steam

Cast iron products are commonly found on steam and condensate systems.

If installed correctly using good steam engineering practices, it is perfectly safe.

However, because of its mechanical properties, it is less forgiving compared to other materials such as SG iron or carbon steel.

The following are the good engineering practices required to prevent waterhammer and ensure safe working conditions on a steam system.

Movimentazione in sicurezza

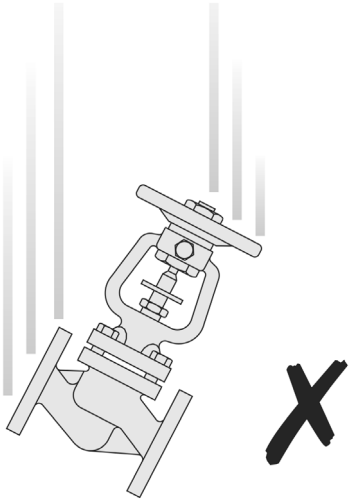
La ghisa è un materiale fragile: in caso di caduta accidentale il prodotto in ghisa non è più utilizzabile. Per informazioni più dettagliate consultare il manuale d'istruzioni del prodotto.

Rimuovere la targhetta prima di effettuare la messa in servizio.

Safe Handling

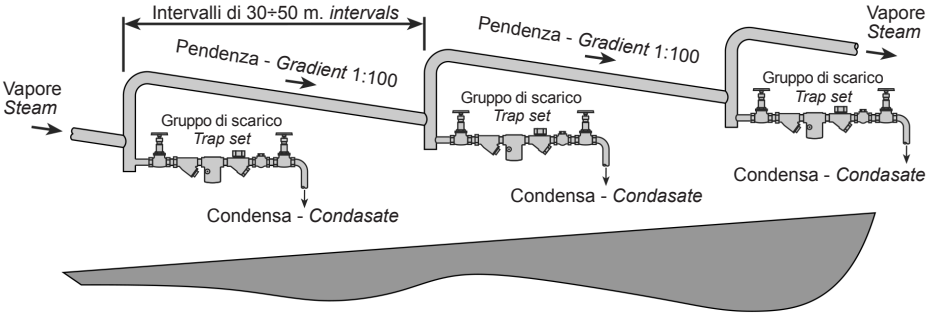
Cast Iron is a brittle material. If the product is dropped during installation and there is any risk of damage the product should not be used unless it is fully inspected and pressure tested by the manufacturer.

Please remove label before commissioning

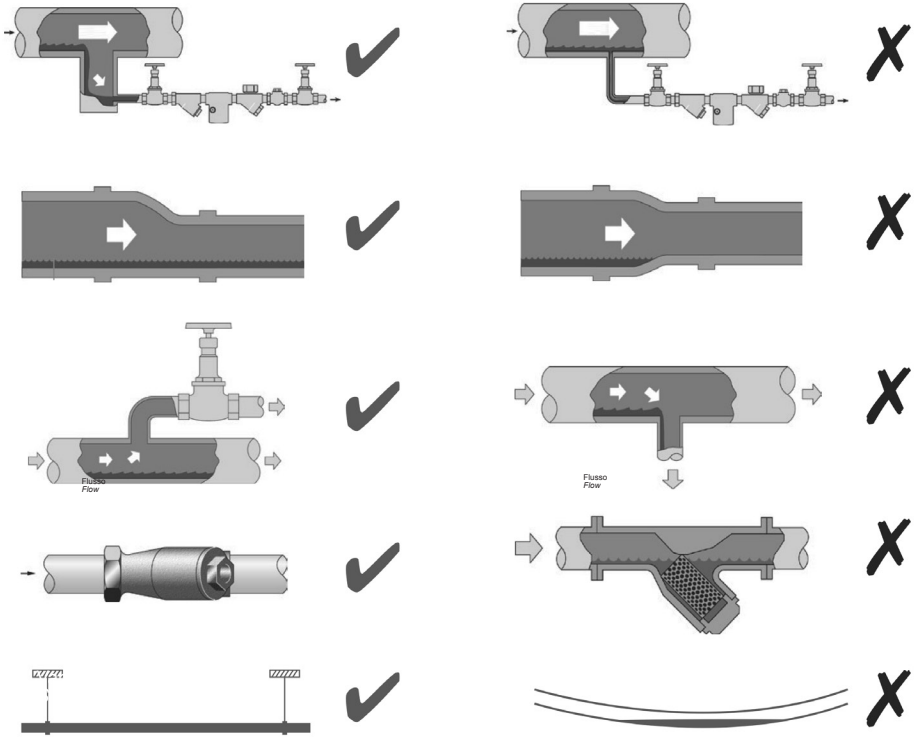


Prevenzione dai colpi d'ariete - *Prevention of water hammer*

Scarico condensa nelle linee vapore - *Steam trapping on steam mains:*



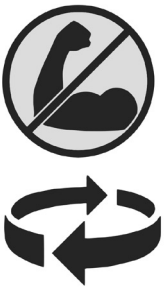
Esempi di esecuzioni corrette (✔) ed errate (✗) sulle linee vapore: *Steam Mains - Do's and Dont's:*



Prevenzione delle sollecitazioni di trazione
Prevention of tensile stressing

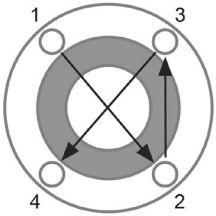
Evitare il disallineamento delle tubazioni - *Pipe misalignment:*

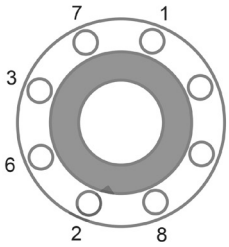
Installazione dei prodotti o loro rimontaggio post-manutenzione:
Installing products or re-assembling after maintenance:



Evitare l'eccessivo serraggio. Utilizzare le coppie di serraggio raccomandate.

Do not over tighten. Use correct torque figures.





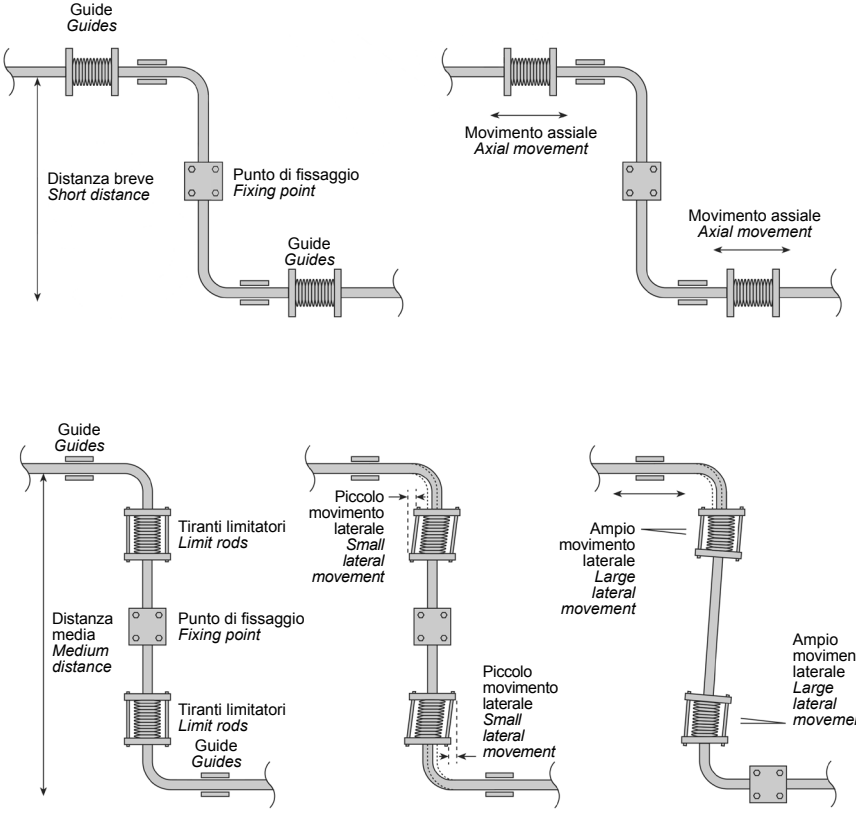
Per garantire l'uniformità del carico e dell'allineamento, i bulloni delle flange devono essere serrati in modo graduale e in sequenza, come indicato in figura.

Flange bolts should be gradually tightened across diameters to ensure even load and alignment.

Dilatazioni termiche - *Thermal expansion:*

Gli esempi mostrano l'uso corretto dei compensatori di dilatzione. Si consiglia di richiedere una consulenza specialistica ai tecnici dell'azienda che produce i compensatori di dilatazione.

Examples showing the use of expansion bellows. It is highly recommended that expert advise is sought from the bellows manufacturer.



1.1 Intended use

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended use/application. The products listed below comply with the requirements of the European Pressure Equipment Directive 97/23/EC. The products fall within the following Pressure Equipment Directive categories:

Product: Series PN3000 & PN4000 Actuators	PS (bar)	V (litres)	Group 2 Gas	Group 2 Liquid
Model PN3200 - PN4200	6.0	0.6	*SEP	-
Model PN3300 - PN4300 (H)	6.0	1.0	*SEP	-
Model PN3400 - PN4400 (H)	4.0	2.1	*SEP	-
Model PN3500 - PN4500 (H)	2.5	3.6	*SEP	-
Model PN3600 - PN4600 (H)	2.5	5.7	*SEP	-

*** SEP= not subjected to CE marking as per paragraph 3.3 of Directive 97/23/EC.**

i) The products have been specifically designed for use on compressed air or condensate which are in Group 2 of the above mentioned Pressure Equipment Directive. The products' use on other gas within Group 2 may be possible but, if this is contemplated, Spirax Sarco should be contacted to confirm the suitability of the product for the application being considered.

ii) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous overpressure or overtemperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.

iii) Determine the correct installation situation and direction of fluid flow.

iv) Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.

v) Remove protection covers from all connections before installation.

1.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

1.3 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

1.4 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.

1.5 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.

1.6 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel 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.

1.7 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labelling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.8 Temperature

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

1.9 Tools and consumables

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

1.10 Protective clothing

Consider whether you and/or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high/low temperature, radiation, noise, falling objects, and dangers to eyes and face.

1.11 Permits to work

All work must be carried out or be supervised by a suitably competent person.
Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.
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 should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.
Post "warning notices" if necessary.

1.12 Handling

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

1.13 Residual hazards

In some cases the product is provided with pre-compressed springs.
Any operation to open the spring housing is to be carried on strictly following the correct procedure given in the Instalaltion and Maintenance Instructions.

1.14 Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

1.15 Disposal

Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

1.16 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

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	¼" 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
3229	1 to 2 bar	20mm (15mm on-off)
3320	0.2 (0.4) to 1 (1.2) bar	20mm
3325	0.4 to 2 bar	20mm
3326	1 to 3 bar	20mm
3339	1 to 2 bar	30mm (20mm on-off)
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

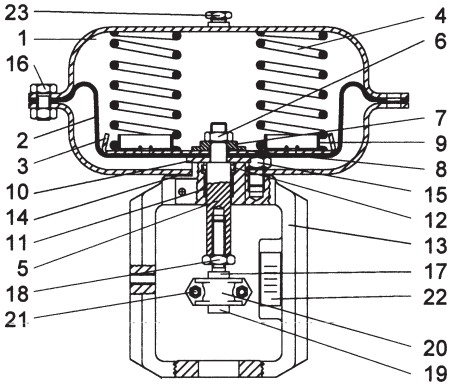


Fig. 1

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 3200 to 3600 Series	¼" 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

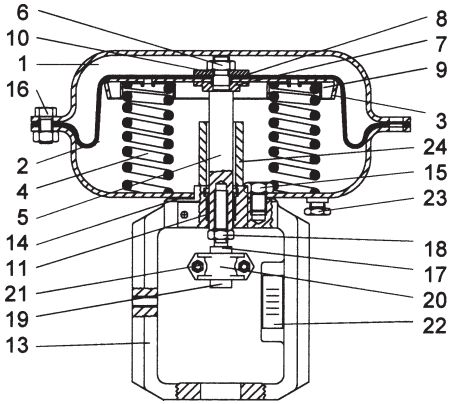


Fig. 2

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

3. 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.

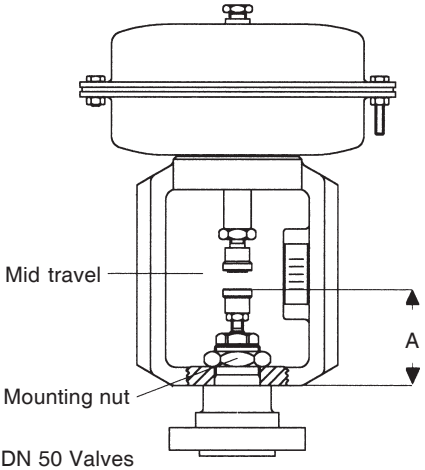
The actuator ambient limits are -20°C to +110°C. For low temperature conditions the air supply must be dry. For high temperature conditions, insulate the control valve and pipework to protect the actuator.

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.

3.1 Fitting Actuator to Valve (Ref. to fig. 1, 2, 3 & 4)

1. Locate valve in support fixture and secure in position. Remove the actuator mounting nut from the valve.
2. Remove the connector clamp brackets (20) from the actuator spindle by removing the 2 nuts and bolts (21). Remove the valve spindle adaptor (19).
3. Assemble the valve spindle adaptor to the valve spindle ensuring the valve is on its seat. Adjust the distance between the adaptor top face and the bonnet shoulder to the value indicated in Fig. 3.
   Secure in this position with the spindle locknut.
   Do not tighten.
4. Slacken actuator adaptor lock nut (18) & screw adaptor (17) up the actuator spindle as far as possible.
   Do not tighten locknut.
5. Assemble air fitting to actuator housing and locate complete actuator onto the valve assembly.
6. **For PN3000 series actuators only.**
   Apply the maximum air signal pressure (refer to actuator label) to the actuator and assemble the mounting nut on to valve bonnet.
   Tighten to within ~1 full turn of fully tight.
7. **For PN3000 series actuators only.**
   Apply the minimum air signal pressure (refer to actuator label) to the actuator.
8. **For PN4000 series actuators only.**
   Apply the maximum air signal pressure (refer to actuator label), to the actuator.
9. Adjust the top adaptor until it locates with the spindle adaptor.
   Do not tighten locknut.
10. Re-assemble the connector clamp brackets with the threaded holes of the bracket at the same side as the travel indicator plate.
    Secure with the 2 nuts and bolts. Torque to 2 nm.
11. Open & close valve 3 times to allow all components to self align (this is why locknuts are left untightened at this stage).
12. Apply air signal to position valve @ ~ 50% lift position.
13. Tighten both adaptor locknuts. **Caution:** take care not to turn actuator spindle as this may cause damage to diaphragm.
14. Tighten mounting nut to secure actuator to valve and torque to 50 nm.
15. This completes the main assembly. However, to check the spindle alignment is perfect, temporarily remove the connector clamp brackets & inflate the actuator to separate upper & lower spindle adaptors.
    If correctly aligned the connectors will meet each other in perfect alignment. If not, slacken all tightened nuts & repeat assembly sequence.
    Note than some lateral movement between the actuator yoke & the valve bonnet is provided on more recent PN3000 & PN4000 actuators.
16. Finally, check actuator signal range and stroke at open/closed positions by applying air signal pressure to the actuator in line with actuator nameplate.
    Check for smooth operation and adjust travel indicator on yoke if necessary.

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 4.



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

Fig. 3

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 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 descibed in paragraphs 4.2 and 4.3.

4.2 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. Finger tighten lock nut (18). 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. Finally bring the spindle at mid travel and tighten lock nut (18) to the right torque.
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.

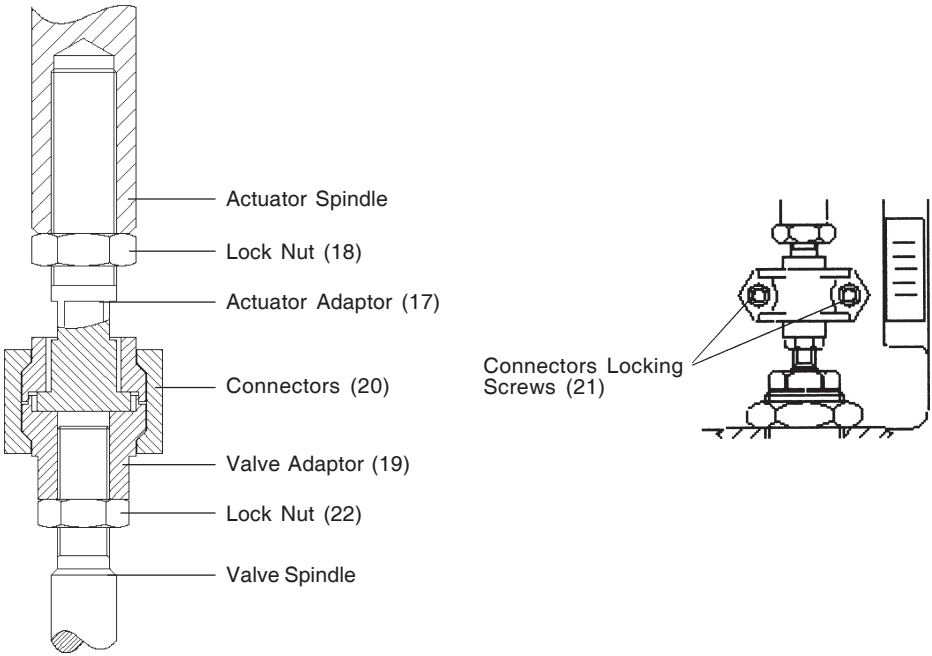


Fig. 4 Assembly of Actuator Adaptor, Valve Adaptor and Connectors

4.3 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. Finger tighten lock nut (18).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.
Finally bring the spindle at mid travel and tighten lock nut (18) to the right torque.
After the test check the position of the travel indicator against the "arrow" of the connector and adjust its position accordingly.

Table 1: PN3000/PN4000 Spring

Actuator Type	Spring Range	Travel	Numb. of Springs	Ins. Dia. (mm)	Length (mm)	Identification (Vert.Stripe)
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
3229	1.0-2.0 bar	20 mm (15mm on-off)	1	54	84	Black
			1	69		Black
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
3339	1.0-2.0 bar	30 mm (20mm on-off)	4	54	84	Black
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

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 monting 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 hosing 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 psitioned 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.

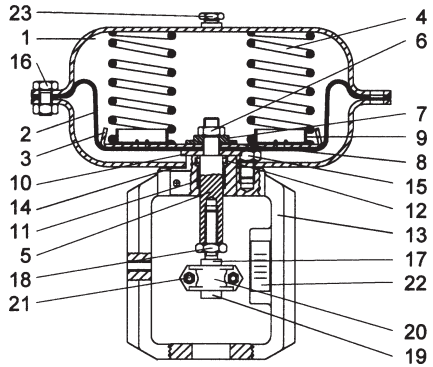


Fig. 5

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
PN3300/4300 to PN3600/4600	M10	15 +/- 2	M12	40 +/- 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 descrlbed 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. Re-assemble 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 3 and recommission as described in Section 4.

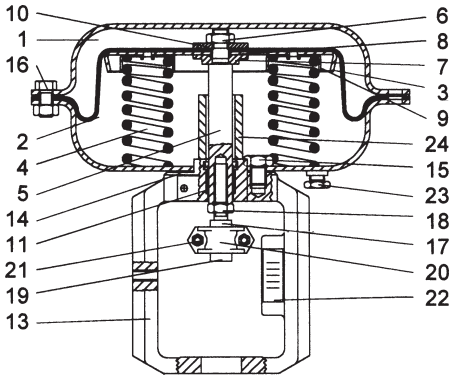


Fig. 6

6. Spare Parts

The spare parts available are indicated by capital letters. The othe 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

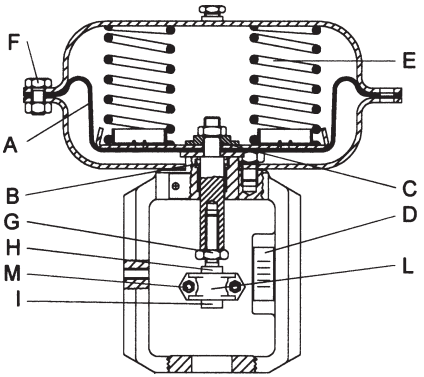


Fig. 7

REPAIR
Please contact our nearest Branch Office or Agent, or directly Spirax-Sarco S.r.l.
Via per Cinisello 18 - 20834 Nova Milanese (MB) - Tel.: 0362 49 17.1 - Fax: 0362 49 17 315

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