



Pneumatic Rotary Actuator



Installation, Operation & Maintenance Manual

PNEUCON AUTOMATION PVT LTD

Plot No.1/235 B, Off Blossom High School,
Kolshet Balkum Road, Thane (W) – 400 607.

Tel: +91-22-25896384/25895129

Fax: +91-22-25894474

Email: info@pneuconautomation.com

Web: www.pneuconautomation.com

Index

Sr. No.	Description	Page No.
1.	Technical feature & data	
1.1	Actuator Features.....	3
1.2	Technical Data.....	3
1.3	Working Principle.....	3
2.	Actuator Installation.....	4
3.	Maintenance	
3.1	Exploded View.....	6
3.2	Part List.....	6
3.3	Disassembly procedure.....	7
4.	Assembly Procedure.....	9
5.	Storage.....	12
6.	Troubleshooting.....	13
7.	Warranty.....	13

Table of Content

1.	Table No.1 – Mounting PCDs.....	4
2.	Table No.2 – Bracket Bolt Tightening Torque.....	5
3.	Table No.3 – Repair Kit.....	5
4.	Table No.4 – Recommended Lubricants.....	9

1. Technical Features & Data

1.1 Product Features

- Double Acting & Spring Return
- External Open/Close indication
- All bodies are internally burnished.
- All internal & external surfaces are anodized for corrosion resistance.
- Angle of rotation $90^{\circ} \pm 5^{\circ}$
- All air connections are $\frac{1}{4}$ " NPT
- ISO 5211 dimensions on all sizes.
- Namur Accessory Mounting Configuration.
- Common End Caps for both sides.
- Star Female Drive.



WARNING

- It is important that the actuator should only be used within the pressure limits indicated in our technical specifications.
- Operating the actuator over pressure limits will damage internal parts as well as cause damage to the housing.
- Operating the actuator over temperature limits will damage internal and external components (disassembly of spring return actuator may become dangerous).
- Operating the actuator in corrosive environments with incorrect protection may damage the internal and external parts.
- Do not disassemble the individual spring cartridges. Disassembly may result in personal injury.

1.2 Technical Data

- Standard working temperature $-4^{\circ}\text{F}(-20^{\circ}\text{C})$ to $175^{\circ}\text{F}(80^{\circ}\text{C})$
- Low temperature and high temperature option
- Maximum working pressure 152 psig (10.5 Bar)
- Operating media: clean, dry air, non-corrosive gas or light hydraulic oil
- Rotation $90^{\circ} \pm 5^{\circ}$
- Dual travel stops standard
- Mounting dimensions
 - Accessories to Namur - VDI/VDE-3845
 - Valve mounting - ISO 5211
 - Custom configurations available in quantity
- Lubrication – Factory Lubricated for the life of the Actuator under Normal Conditions.
- Construction – Suitable for indoor & outdoor use.

1.3 Working Principle

Port 'A' – It is connected to the interior cavity between the pistons directing the airflow into/out of the interior cavity.

Port 'B' – It is connected to the end cap cavities directing airflow into/out of the end cap area.

1.3.1 Double Acting Actuator

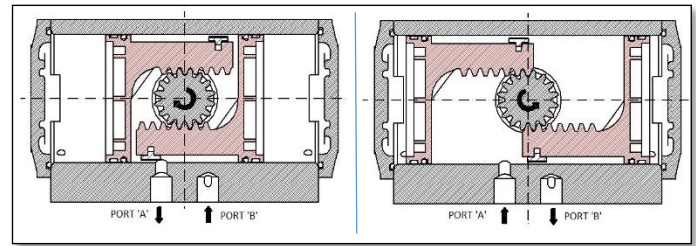


Fig No.1a

Fig No. 1b

CCW (Counter Clockwise)

Air is supplied to Port 'A' forcing the pistons away from each other (toward ends), rotating drive pinion counter clockwise and exhausting air out of Port 'B'. (refer Fig no.1b)

CW (Clockwise)

Air is supplied to Port 'B' forcing the pistons toward each other (toward centre), rotating drive pinion clockwise and exhausting air out of Port 'A'. (Refer Fig no.1a)

1.3.2 Spring Return Actuator

Fail Clockwise (FCW)

Air introduced through port 'A' forces the piston away from each other, compressing springs and causing the pinion to rotate counter clockwise (with exhaust air exiting through port 'B'). Upon loss /release of air pressure, springs forces the piston towards centre position causing pinion to rotate clockwise (FCW) (with exhaust air exiting through port 'A'). (refer Fig No.2)

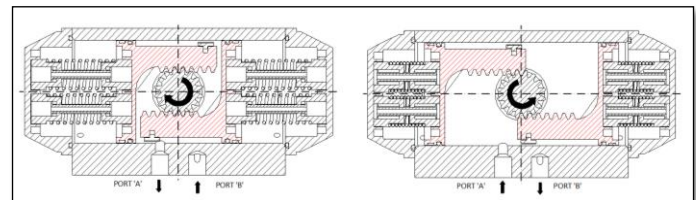


Fig No.2

Fail Counter Clockwise (FCCW)

Air introduced through port 'A' forces the piston away from each other, compressing springs and causing the pinion to rotate clockwise (with exhaust air exiting through port 'B'). Upon loss /release of air pressure, springs forces the piston towards centre position causing pinion to rotate counter clockwise (FCCW) (with exhaust air exiting through port 'A'). (refer Fig No.3)

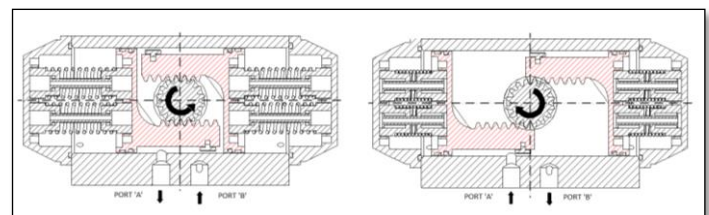


Fig No.3

2. Actuator Installation

Actuators can be fitted on many styles of quarter-turn valves, Including ball, butterfly and Plug valves. Actuators are designed to be easy to install & Actuator Body is equipped with ISO 5211 Drilling. (Refer Fig No.4)

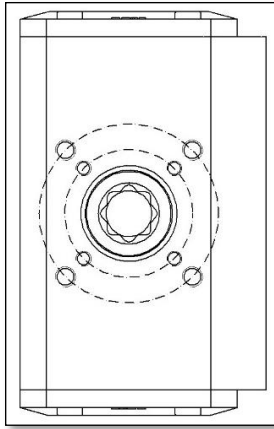


Fig No.4

Actuator Size	Mounting PCDs
045	F05(Ø50) & F07(Ø70)
055	F05(Ø50) & F07(Ø70)
065	F05(Ø50) & F07(Ø70)
075	F05(Ø50) & F07(Ø70)
085	F05(Ø50) & F07(Ø70)
100	F07(Ø70) & F10(Ø102)
115	F07(Ø70) & F10(Ø102)
125	F10(Ø102) & F12(Ø125)
150	F10(Ø102) & F12(Ø125)
175	F10(Ø102) & F12(Ø125)
200	F12(Ø125) & F16(Ø165)

Table No.1

The pinion presents a Star Female drive to allow a large flexibility in mounting, it allows the assembling on valves stem, or coupling, with square key at 45° or at 90° indifferently.



Star Female Drive

On the top face of Actuator there is a NAMUR standard mounting pattern for easy installation of accessories for position indication, control devices.

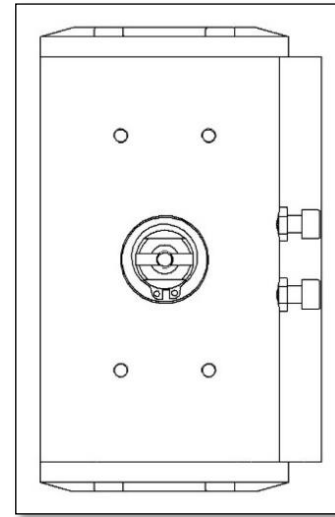


Fig No.5

2.1 Installation Procedure

- Make sure that the valve and the actuator are both in the **closed** position before proceeding.
- Direct Mounting**
Position the actuator on valve; use caution while inserting the valve stem into the double square female pinion drive. Insert the screws from the bottom side of flange and manually tighten them and align the assembly in order to eliminate the forces on the system; tighten all assembly fasteners. (Max. tightening Torque See table) (See Fig No.6)

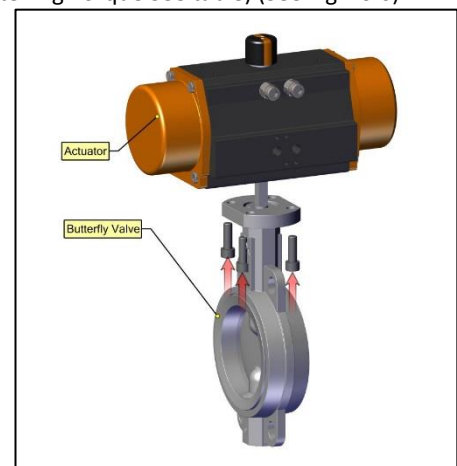


Fig No.6

Mounting with Brackets

Place coupling on valve stem and the actuator on mounting bracket. Align valve and actuator in order to eliminate forces on the system; tighten all the Assembly fasteners. (Max. tightening Torque See table) (See Fig no.7)

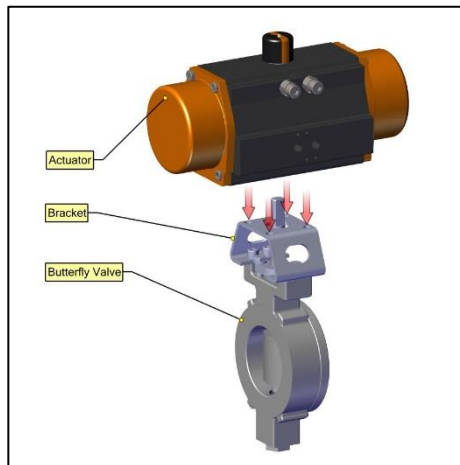


Fig No.7

- c) Install mounting bracket on the valve and hand tighten all fasteners; be sure not to fully torque bolts until entire assembly is correctly aligned and installed.
- d) Actuate the unit several times to ensure that it works properly. If the unit does not work properly, disassemble the unit and repeat steps a) to c).
- e) After the completion of the mounting operations, it is necessary to set the actuator stroke through the travel stops to ensure that the valve works properly. Actuators rotation is $90^{\circ} \pm 5^{\circ}$.
- f) Rotate the actuator & valve assembly to desired degree.

Bracket Bolt Tightening Torque

Tightening Torque required for tighten the Fasteners are mentioned in the table no. 2.

Tightening Torque Table	
Bolt/Nut Size	Torque Range (Nm)
M5	5 → 6
M6	10 → 11
M8	23 → 25
M10	48 → 52
M12	82 → 86
M20	390 → 410

Table No.2

Assembly of Accessories: Solenoid Valve & Limit Switch box

(See Fig No.8)

Solenoid Valve Mounting

- Before mounting a solenoid valve, ensure that the actuator is in Closed Position with pistons inwards.
- For standard rotation type Fail Clockwise assembly: the groove on the drive shaft must be horizontal to the longitudinal axis of the actuator in closed position.

- Fit the solenoid valve onto the actuator using the provided screws (max. tightening torque see table).

Limit Switch Mounting

- Fit the switchbox and bracket 1 onto the actuator 3 using four provided screws (max. tightening torque See Table No.2).

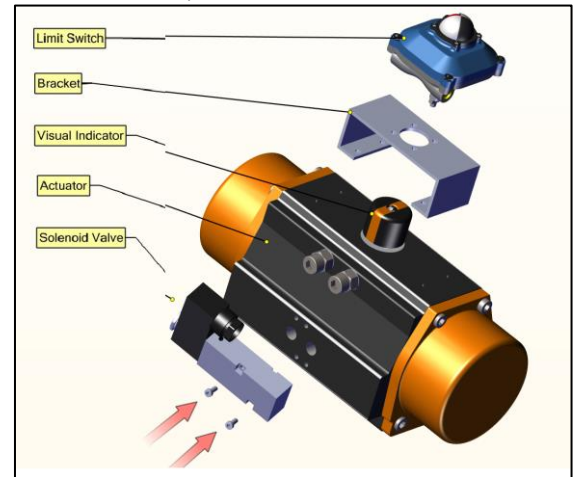


Fig No.8

Repair Kit

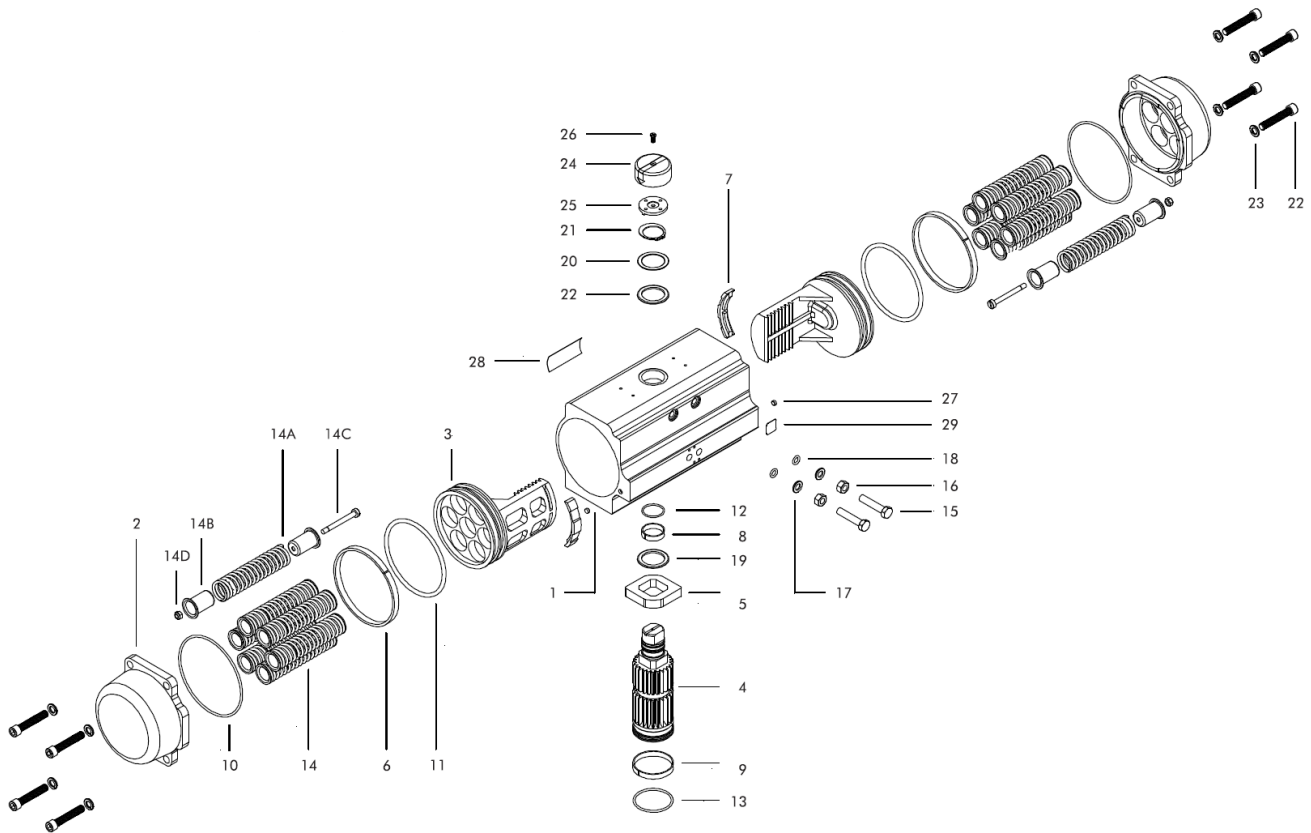
General	Part Name	Material	Ref. no.	Quantity
End Cap (ref no. 2)	'O' Ring For End Cap	NBR	10	2
	'O' Ring For Piston	NBR	11	2
Piston (ref no.3)	Piston Guide Band	Engineering Plastic	06	2
	Piston Pad	Engineering Plastic	07	2
Pinion (ref No.2)	'O' Ring For Pinion Top	NBR	12	1
	'O' Ring For Pinion Bottom	NBR	13	1
	Top Guide For Pinion	Engineering Plastic	08	1
	Bottom Guide For Pinion	Engineering Plastic	09	1
	Washer For Pinion	Engineering Plastic	19	1
Stroke adjustment	'O' Ring For Stroke Bolt	NBR	18	2
	Vent Plug	NBR	27	2

Table no. 3

Actuator Size	Repair Kit No.
045	SKS00450XXX
055	SKS00550XXX
065	SKS00650XXX
075	SKS00750XXX
085	SKS00850XXX
100	SKS01000XXX
110	SKS01100XXX
125	SKS01250XXX
150	SKS01500XXX
175	SKS01750XXX
200	SKS02000XXX

3. Maintenance

3.1 Exploded View



SR. No.	PART NAME	PART REF. No	STANDARD MATERIAL	TOTAL QUANTITY
01	BODY	01	EXTRUDED ALUMINIUM ALLOY	1
02	END CAP	02	ALUMINIUM	2
03	RACK PISTON	03	ALUMINIUM	2
04	PINION	04	CARBON STEEL	1
05	PINION CAM	05	STAINLESS STEEL	1
06	PISTON GUIDE	06	ENGINEERING PLASTIC	2
07	PISTON PAD	07	ENGINEERING PLASTIC	2
08	TOP GUIDE FOR PINION	08	ENGINEERING PLASTIC	1
09	BOTTOM GUIDE FOR PINION	09	ENGINEERING PLASTIC	1
10	'O' RING FOR END CAP	10	NBR	2
11	'O' RING FOR PISTON	11	NBR	2
12	'O' RING FOR PINION TOP	12	NBR	1
13	'O' RING FOR PINION BOTTOM	13	NBR	1
14	SPRING ASSEMBLY	14		5-12
14A	SPRING	14A	II D	5-12
14B	RETAINER FOR SPRING	14B	MS-ZINC PLATING	10-24
14C	STUD FOR RETAINER	14C	STAINLESS STEEL	5-12
14D	NYLOCK NUT	14D	STAINLESS STEEL + NYLON	5-12
15	HEX BOLT FOR STROKE ADJUSTING	15	STAINLESS STEEL	2
16	NUT FOR STROKE ADJUSTING	16	STAINLESS STEEL	2
17	FLAT WASHER FOR STROKE ADJUSTING	17	STAINLESS STEEL	2
18	'O' RING FOR STROKE ADJUSTING	18	NBR	2
19	WASHER FOR PINION	19	DELFIN	2
20	PINION WASHER	20	STAINLESS STEEL	1
21	CIRCLIP	21	SPRING STEEL	1
22	ALLEN CAP BOLT FOR END CAP	22	STAINLESS STEEL	8
23	SPRING WASHER	23	STAINLESS STEEL	8
24	INDICATOR	24	ENGINEERING PLASTIC	1
25	INDICATOR GUIDE	25	ENGINEERING PLASTIC	1
26	INDICATOR COUNTER BOLT	26	STAINLESS STEEL	1
27	VENT PLUG	27	NBR	2
28	NAME PLATE	28	STICKER	1
29	CAUTION LOGO	29	DOMESTIC STICKER	1

3.3 Disassembly Procedure

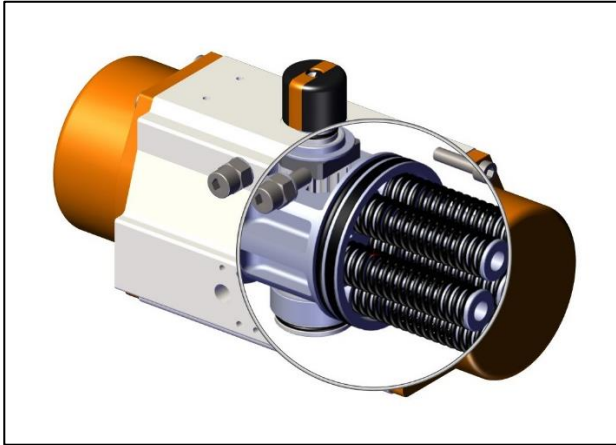


Fig No.9

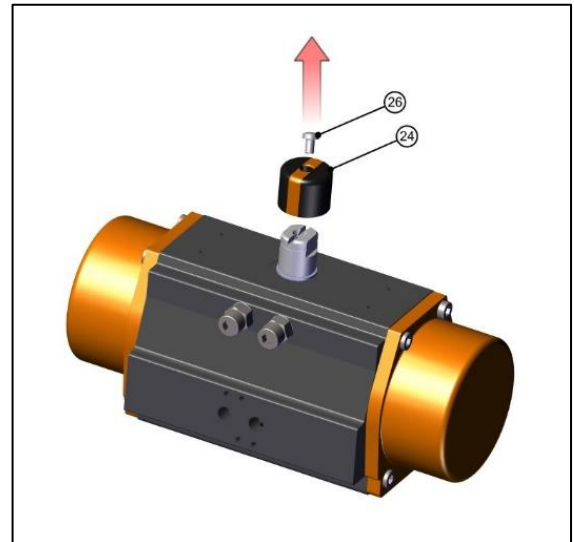


Fig No.10 (b)

3.3.1 Before Starting

In Case of **Spring Return Actuator**, Rotate Actuator to “fail Safe Position.” (See the pointer of visual indicator is pointing towards the operator) (Refer fig no.9)

Disconnect All the power Supplies, including air, hydraulic & electric, before removal or disassembly of valve actuator. Remove all accessories such as limit switches, solenoid valves, positioners, etc.



WARNING

Do not disassemble an actuator that is under pressure. Massive leakage could result in serious personal injury, severe property damage or even death.



WARNING

Ball Valve and plug valves can trap pressurized media in their cavities. Isolate the piping system in which the actuator valve assembly is mounted and relieve any pressure on the valve. Contact with media under pressure could result in serious personal injury, severe property damage or even death.

3.3.2 Removal of Visual Indicator

- Remove indicator bolt (26) of indicator (24) as shown in Fig No.10 (a) & remove the visual indicator up from Pinion (02) as shown in Fig No.10 (b)

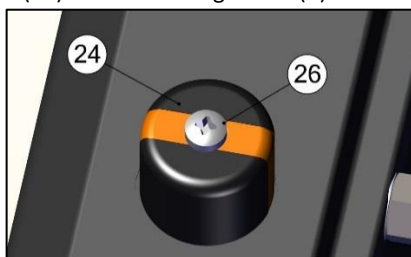


Fig No.10 (a)

3.3.3 Removal of Stroke Bolt

- Remove Both Stroke Bolts (15), Nuts (16) & Washers (17).
- Remove Stroke Bolt O-Ring (18) & discard if replacing all soft parts. (refer fig no.11)

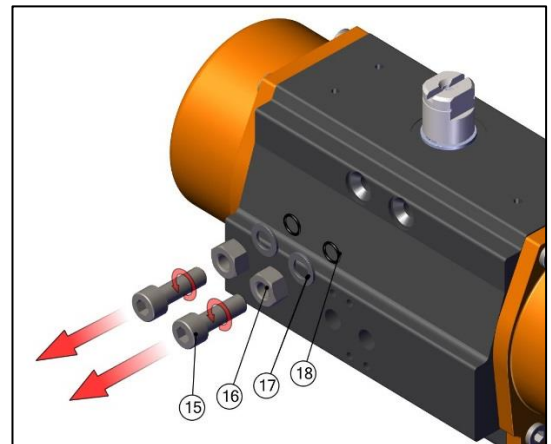


Fig No.11

3.3.4 End Cap Disassembly

Spring Return Actuator

- Unscrew the End Cap bolts (22) with the help of Allen key as per sequence shown in Fig No.12 until the end is free from springs force.
- Then completely unscrew the bolts & remove the end cap & spring assembly (14). (refer Fig No.13)

Double Acting Actuator

- Remove the End Cap bolts (22) as per the sequence shown in fig no.12 until the bolt is completely unscrewed & end cap is completely free.



CAUTION

Spring Return Actuator Contains Springs in Compression Be Sure the Actuator is in the "FAIL" Position, piston Together, before removing endcaps. Flying Debris could result in serious personal injury, severe property damage or even death.

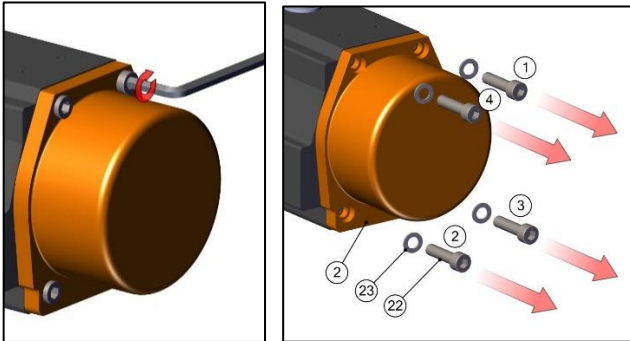


Fig No.12

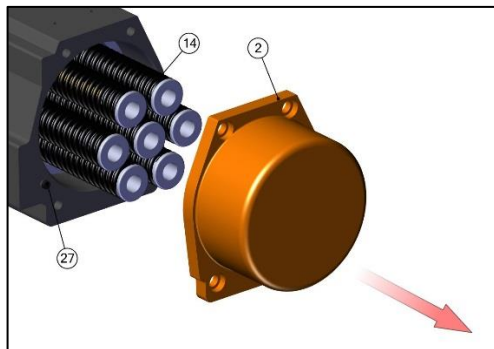


Fig No.13

- d) Take out the end cap (02) & Remove the End Cap O-ring (10) using screw driver & replace O-ring. (refer fig no.14)



Fig No.14

- e) Remove Transfer plug (27) from body from both side & Replace.

3.3.5 Piston Disassembly

- a) Hold the Body (01) in Vice or Similar Device, Rotate the Pinion (04) until the Piston (03) is released. (refer Fig no.15)



Fig No.15



CAUTION

Air pressure should not be used to remove piston from Body.

- b) Remove the Piston O-ring (11) using screw Driver. (refer Fig No.16)
c) Remove the Piston Guide Band (06) & Piston Pad (07) for replacement. (refer fig no.16)

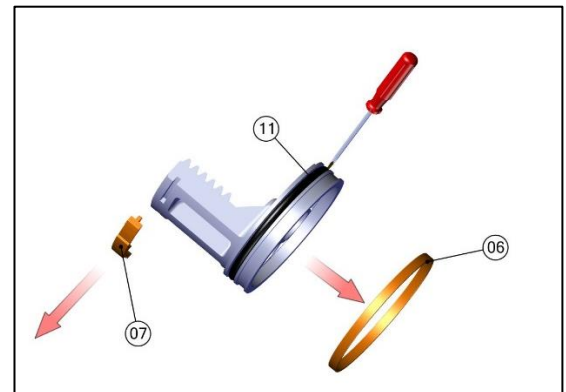


Fig No.16

3.3.6 Pinion Disassembly

- a) Remove the Circlip (21) using a Circlip plier.
b) Remove the pinion washer (20). (refer fig no.17)

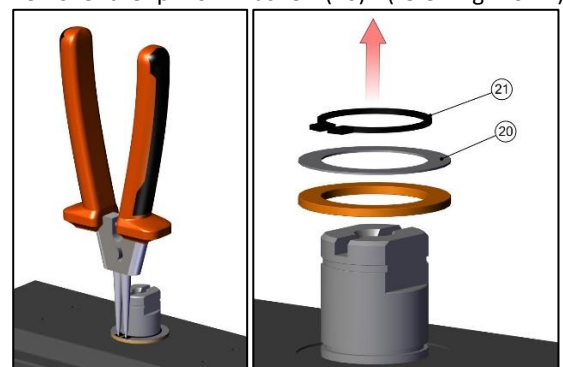


Fig No.17

- c) Apply a downward force to top of the pinion (04) so that the pinion will move Downward (towards bottom of body). If the Pinion (04) does not move freely, gently tap with a plastic mallet. (refer Fig no.18)



Fig No.18

- d) Hold the Pinion inside the Body (01) remove washer (19) & Pinion Cam (05) from the top of Pinion. (Refer Fig. No.19)

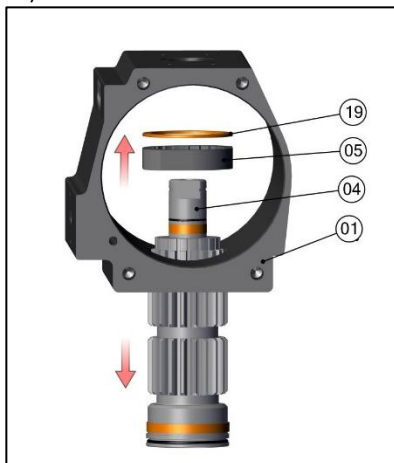


Fig No. 19

- e) After removal of Washer (19) & Cam (05), Remove Pinion (04) completely from the bottom of Body (01) (refer Fig no.20)

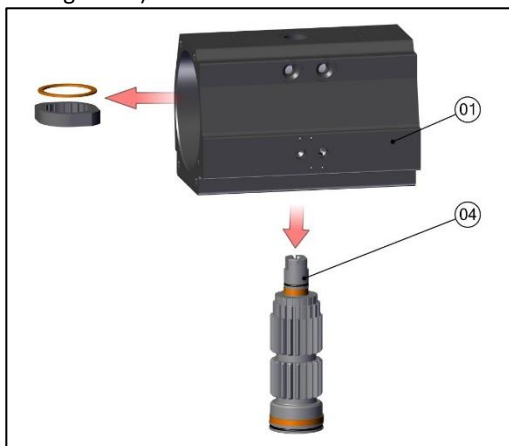


Fig No.20

- f) Remove the top and bottom 'O' rings (12, 13). Discard & replace all soft parts. (refer fig no.21)

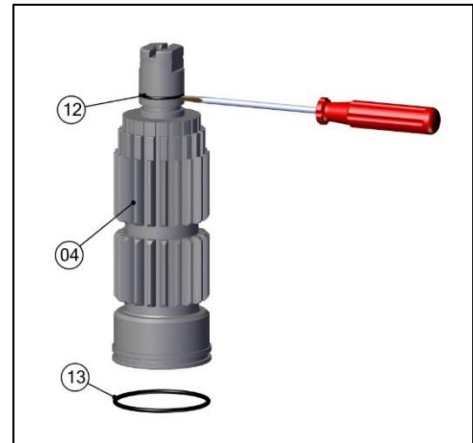


Fig No.21

- g) Observe the cam surface, where the stroke adjustment bolts are resting for excessive wear & the Cam ID. Replace the Cam (05), if excessive wear is observed.

3.3.7 Cleaning & Inspection

When all components are disassembled, those not being replaced should be properly cleaned & inspected for wear prior to reassembly.

4. Assembly

4.1 Before Starting

Prior to assembly, ensure that:

- All the components are perfectly clean and in good Condition.
- The Proper spare parts are available which need to assemble or replace.
- Apply light film of grease to all O rings & on the gear tooth.

Table 4: Recommended Lubricants

General Use	CASTROL GREASE - AP3
-------------	----------------------

4.3 Pinion Assembly

- a) Install top & bottom Pinion O rings (12, 13) and Guide Bands (08, 09) on to the Pinion (04). (refer fig. no.22)

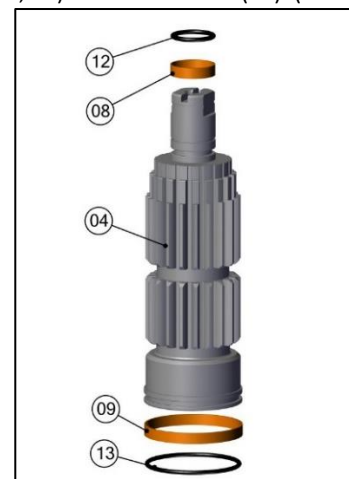


Fig No. 22

- b) Insert the pinion (04) inside the Body (01) from bottom side. (refer Fig no.23)

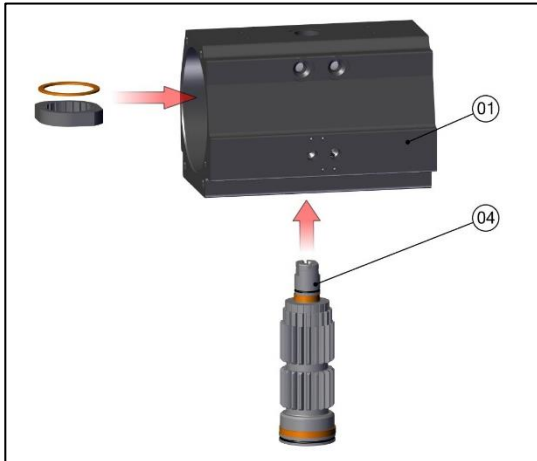


Fig No.23

- c) Cam (05) should be inserted by taking reference of identification mark "L" on the Cam surface, Cam inserted in such a way that Marking "L" should be on left hand side of Assembler. (Assembler is on stroke adjustment bolt side) (refer Fig no.24)

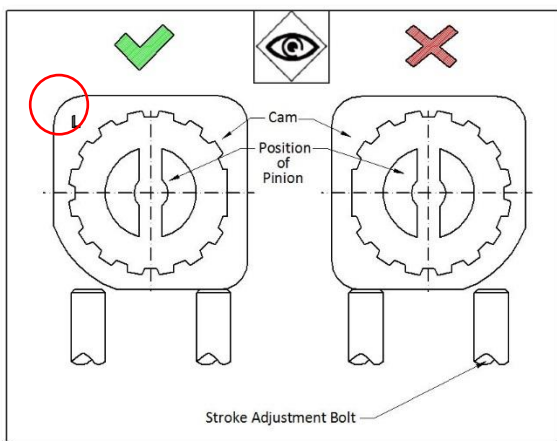


Fig No.24

- d) Keep the pinion inside the body & Insert the Cam (05) & Washer (19) from top side of Pinion (04). (refer Fig no.25)

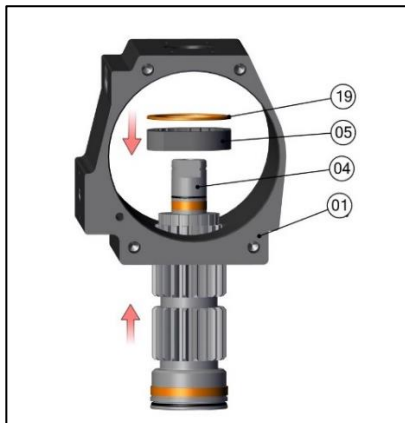


Fig no.25

- e) Now, further insert the Pinion (04) into the body up to the top (refer fig. No.26)



Fig No.26

- f) Place the pinion washer (20) & Circlip (21) from top of the pinion.
g) Thrust bearing rest on the body on which Circlip is placed which restrict upward movement of pinion (04). (refer fig no.27)

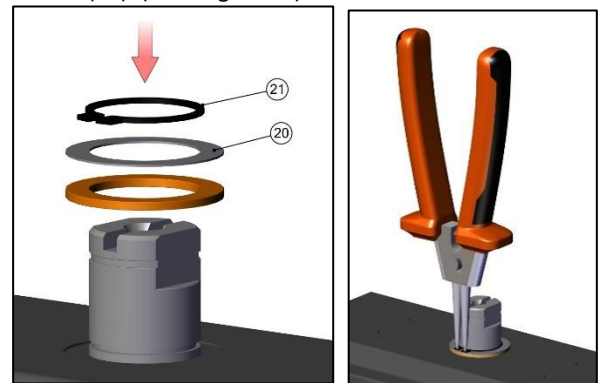


Fig no.27

4.4 Piston Assembly

- a) Fit piston pad (07), piston guide band (06), and piston O-rings (11) on the pistons (03).
b) Apply grease to the internal bore of the body (01) & to the piston rack teeth.
c) Press the two pistons simultaneously in the body bore until the pinion racks are engaged and rotate the pinion until the stroke is completed. Take care that the pistons are oriented correctly as per the fail position of the actuator. (refer Fig No.28)

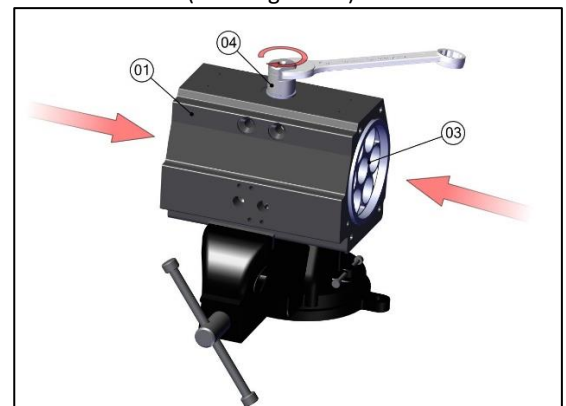


Fig No. 28

- d) To ensure that the piston (03) teeth are evenly engaged, fully compress both the pistons inward and measure the distance from the edge of the body to the piston (03) face on each side, shown as dimension 'A' in fig No.29. If a different value is obtained on each side, remove the pistons and repeat from step 4.4 C).

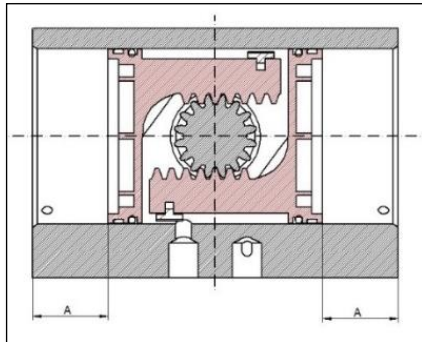


Fig No.29

- e) Temporarily install the local position indicator onto the pinion (02) to determine whether the correct stroke is obtained. Ensure that the arrow in the local position indicator will rotate a minimum of 5° beyond the 90° vertical centreline of the actuator body (01) and a minimum of 5° beyond the 0° horizontal centreline of the actuator body as shown in fig No.30. If the proper stroke is not obtained, remove the pistons and repeat from step 4.4 C). Once proper stroke is obtained, remove the local position indicator.

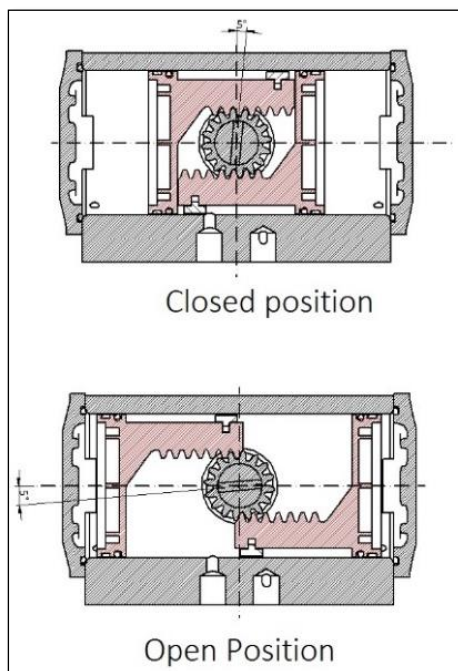


Fig No.30

4.5 End Cap Assembly

- a) Fit the transfer plug (27) inside the Body on each side (refer fig no.31)

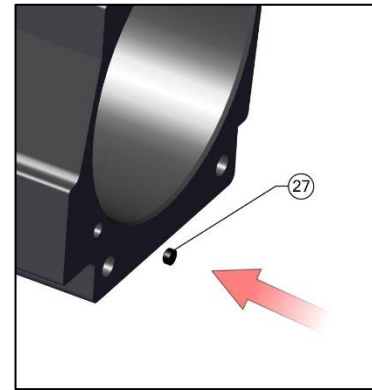


Fig No.31

- b) In case of **Spring Return Actuator** insert proper quantity of Springs Cartridge according to the pattern shown in the Fig no. 32

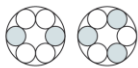
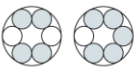
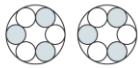
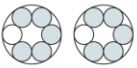
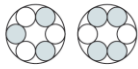
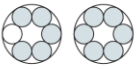
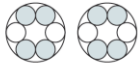
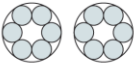
Spring Quantity	Spring Installation Mode	Spring Quantity	Spring Installation Mode
5		9	
6		10	
7		11	
8		12	

Fig No.32

- c) Place the Spring Cartridge (14) in pockets of piston. (refer Fig No.33)

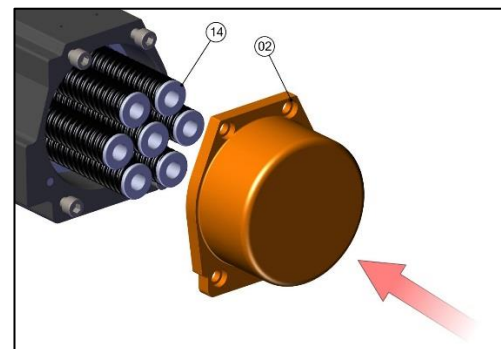


Fig No.33

For **Double Acting Actuator**, there is no need to follow Step b) & c) for Double Acting Actuator follow the Step a), d) & e)

- d) Apply grease to the end cap 'O' rings (10). Fit the 'O' rings (10) into the groove in each end cap (02).



CAUTION

Ensure that end cap O- rings are in place properly on both sides in the grooves

- e) Fit the end caps. Insert all the end cap bolts (22) and hand tighten. Complete tightening by following the sequence indicated in Fig. No. 34

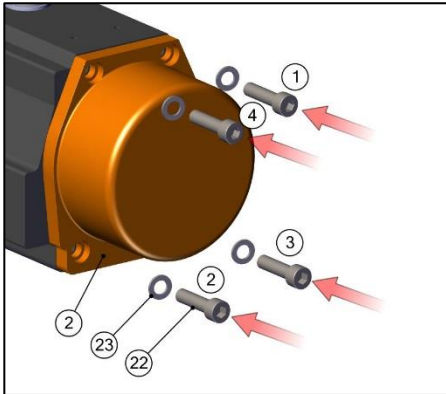


Fig. No. 34

Tightening Torque required for tighten the End Cap Fasteners properly.

4.6 Assembly of Stroke Adjustment Bolt

- a) Insert the Stroke Bolt O-ring (18), Washer (17) & Nut (16) on to the Stroke adjustment bolt (15).
- b) Tighten the Bolt (15) into the Body (01). (refer fig no.35).

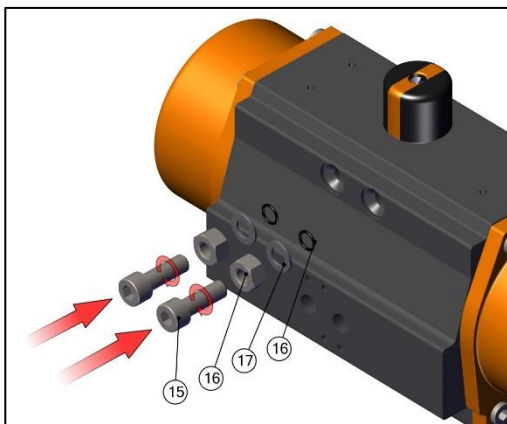


Fig No.35

5. Storage

The ports are plugged to prevent material from entering the actuator during shipment.

If the actuator is not for immediate use, following precaution must be taken during storage.

- a) Store in a dry environment.
- b) It is recommended that the actuator be stored in its original box.
- c) Do not remove the plastic plugs on the air supply ports

6. Troubleshooting:

Actuator is manufactured of high quality materials and is designed to give long, trouble free service life. It is not uncommon for these actuators to produce over one million complete cycles before maintenance or replacement is required. Below is a table of possible problems and solutions that may occur during start-up or life cycle. Please consult your local representative or the manufacturer if this guide does not rectify any problem with the actuator.

Problem	Possible error	Solution
Feedback position and actual position is not the same	Actuator and valve are Mounted 90° rotated in relation to each other.	Remove actuator from valve. Check assembly code of actuator. Put both valve and actuator in "Closed" position. Mount actuator on valve.
Valve is in "Closed" position, actuator is in "Open" position and will not move anymore.		
Valve does not reach the completely "Closed" or "Open" position.	Limit stop screws are not set correctly	Readjust the limit stop screws.
	Supply Pressure is too low.	Apply pressure as per sizing.
	Sizing is wrong.	Check valve torque data and actuator torque data.
	Pinion is mounted in the wrong position	Reassemble actuator
Actuator too "Slow".	Supply Pressure is too low.	Apply pressure as per sizing.
	Sizing is wrong.	Check valve torque data and actuator torque data.
	Less Lubrication	Apply Grease.
Actuator too "Fast"	Supply Pressure is too high.	Apply pressure as per sizing.
Actuator rotates, valve does not.	No coupling between Actuator shaft and valve Spindle.	Install a coupling between actuator shaft and valve spindle.
Actuator does not cycle	Air piping incorrect.	Check Air Piping.
	Air Ports blocked.	Detach air lines and remove debris
	Pilot Valve malfunction.	Check proper operation of pilot valve /replace
	Seals are worn.	Rebuild with new seal kit.

7. Warranty:

Pneucan Automation Pvt Ltd covers the following warranty conditions regarding products manufactured by it. We warrant our products to be free from defects in materials and workmanship when these products are used for the purposes for which they were designed and manufactured. Pneucan Automation Pvt Ltd does not warrant its products against chemical or stress corrosion or against any other failure other than from defects in material or workmanship. The warranty period is 12 (twelve) months from shipment date.

Any claim regarding this warranty must be in writing and received by Pneucan Automation Pvt Ltd before the last effective date of the warranty period. Upon Pneucan Automation Pvt Ltd receipt of a warranty claim, Pneucan Automation Pvt Ltd reserves the right to inspect the product(s) in question either at the field location or at Pneucan Automation Pvt Ltd manufacturing plant. If, after inspection of such product(s),

Pneucan Automation Pvt Ltd determines that the purchaser's claim is covered by this warranty, Pneucan Automation Pvt Ltd's sole liability and the purchaser's sole remedy under this warranty is limited to the refunding of the purchase price or repair or replacement.

Pneucan Automation Pvt Ltd will not be liable for any repairs, labour, material or other expenses that are not specifically authorized in writing by Pneucan Automation Pvt Ltd, and in no event shall Pneucan Automation Pvt Ltd be liable for any direct or consequential damages arising out of any defect from any cause whatsoever.

This warranty is null and void in the following cases:

- Any Pneucan Automation Pvt Ltd product is disassembled, modified or altered at any location other than Pneucan Automation Pvt Ltd.
- Improper installation
- If products are used for purposes for which they were not designed and manufactured.

Any product sold by Pneucan Automation Pvt Ltd but manufactured by companies other than Pneucan Automation Pvt Ltd, is not covered by this warranty. The warranty for such products shall be subject only to the warranty relief, if any, provided by the suppliers and/or manufactures of such products.

NOTE: in continuing research to improve and expand the range of its product, Pneucan Automation Pvt Ltd reserves the right to change or modify product design or construction without prior notice and without incurring in any obligation to make such changes or modifications on products previously or subsequently sold.