

## Pneumatic Actuators

**Note:** See page 4 of this instruction manual for numbers in parenthesis

Apollo® supplies a range of pneumatic rotary actuators, 1/4 turn, Rack and Pinion Type, in double acting and spring return versions.

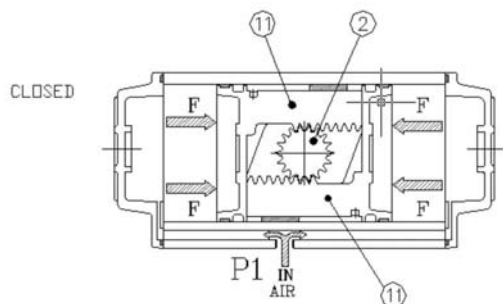
### 1 Main Characteristics

- **Maximum Air Supply:** 115 PSIG (8 bar)
- **Supply:** dry air (STANDARD). Special executions with other fluids or gases possible if compatible with actuator material.
- **Temperature:** from -4°F to 185°F (-20°C to 85°C) for standard version with NBR seals.  
from -4°F to 302°F (-20°C to 150°C) for HIGH TEMP version (Viton® seals)  
from -40°F to 185°F (-40°C to 85°C) for LOW TEMP version
- **Rotation:** 90° stroke with regulation  $\pm 5^\circ$  for open and closed position (double adjustment). Upon request full stroke regulation 0°/90°.
- **Lubrication:** during assembly, for actuator life

### 2 Operation Principle

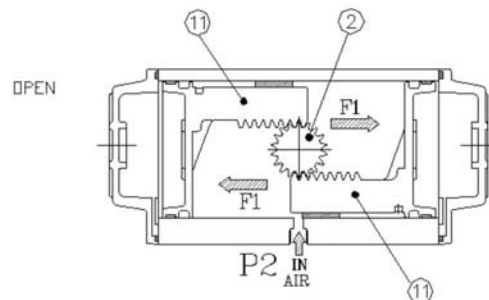
Apollo® actuator transforms the linear motion of the pistons (7), due to the thrust effected by the pressure on the surface area, to a rotary motion (90° std) of the pinion (2).

#### 2.1 Double Acting



Pressurizing port **P1**, the external chambers fill up and the action of the pressure on the pistons (11) surface creates a force (**F**) which pushes them inward to the pinion, generating a torque with a **CLOCKWISE ROTATION**

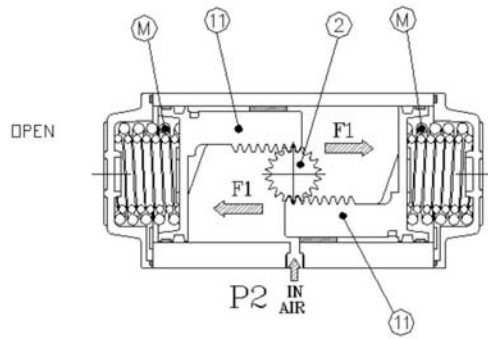
TOP VIEW



When the pistons (11) are closed to the pinion, pressurizing air port **P2**, the internal chamber fills up and the action of the pressure on the pistons surface creates a force (**F1**) which pushes them outward to the end caps, generating a torque with a **COUNTERCLOCKWISE ROTATION**

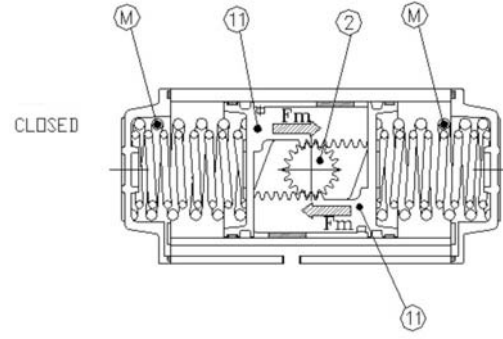
## Pneumatic Actuators

### 2.2 Spring Return



When the pistons (11) are closed to the pinion, pressurizing air port **P2**, the internal chamber fills up and the action of the pressure on the pistons surface creates a force (**F1**) which pushes them outward to the end caps, generating a torque with a **COUNTERCLOCKWISE ROTATION**

TOP VIEW



In this position the springs are compressed. By de-pressurizing air port **P2**, the springs (**M**) start the unfolding phase creating a force (**Fm**) which pushes the pistons (11) inward to the pinion, generating a torque with a **CLOCKWISE ROTATION**

## 3 Storage

For applications where the actuator is not put into immediate service, it is recommended that the actuator be kept in a clean and dry location with ample protection from the environments. The original packing box supplied by Apollo helps in optimising the storage.

For a long storage period we recommend to effect periodically a complete cycling, pressurizing the chambers.

The actuators have two air ports which should be plugged during storage to avoid any intrusion.

## 4 Maintenance

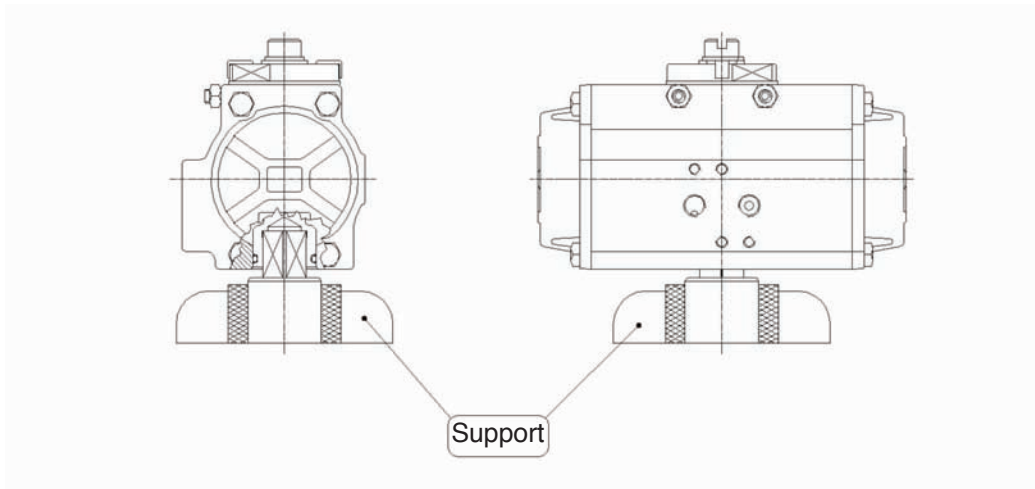
The lubrication supplied during the assembly and the self lubricating material used in the guides, guarantees during normal working conditions 1,000,000 cycles of the actuator. Supply air must be clean and dry.

During abnormal working conditions, where it is intended to proceed in replacing worn parts (seals), we recommend replacing the guides as well, to ensure ideal working conditions.

#### Pneumatic Actuators

#### 5 Disassembly

1. Disconnect pneumatic and electric supplies from the actuator
2. Remove any accessory which could be damaged
3. Remove the actuator from the valve (taking a note for correct re-assembly)
4. Place the actuator on a support with the same male drive of the pinion female connection, in order to execute the steps following



5. Before starting the disassembly, **verify** by the stamps on the body if the actuator is double acting (DA) or spring return (SR)

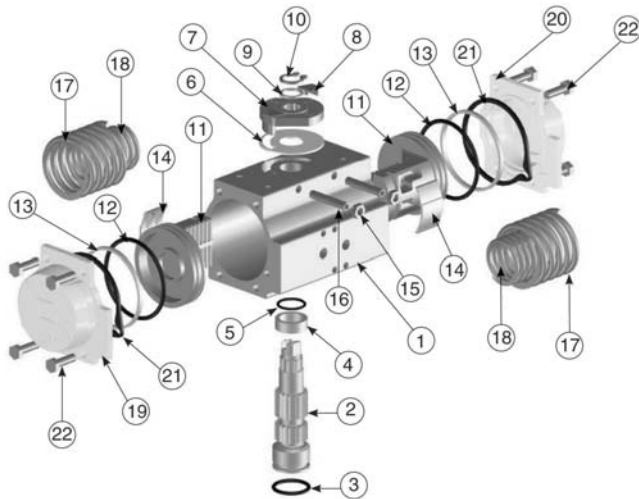
For **DOUBLE ACTING** actuator

For **SPRING RETURN** actuator

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>6. Remove slowly and diagonally the end cap screws (22) from each end cap (19-20)</li> <li>8. Remove the end caps (19-20)</li> <li>9. Remove snap ring (10) from its place on the pinion (2).</li> <li>10. Remove pinion washer (9).</li> <li>11. Remove the cam (7) and spacer ring (6)</li> <li>12. Rotate the actuator body (1) in a clockwise direction respect to the pinion (2) so that the pistons move towards body ends.<br/>Now it is possible to remove the two pistons.</li> <li>13. Remove pinion (2) carefully from the body (1).</li> </ol> | <ol style="list-style-type: none"> <li>7. Diagonally remove, slowly and partially, the screws (22) from each end cap (19-20).<br/><b>N.B.</b> length of the screws permit the springs to be de-compressed fully, proving the actuator is in closed position.</li> </ol> |
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#### Pneumatic Actuators

#### 6 Actuator Parts



Mod. From 52 to 140

#### Spring Setting

Set	External Spring	Internal Spring	Air Supply (bar)
01	1	1	2,5 - 3
02	2	-	3 - 4
03	1	2	4 - 5
04	2	1	5 - 5,5
05	2	2	5,5 - 6

ITEM	DESCRIPTION	MATERIAL	TREATMENT	QTY. DA	QTY. SR
1	Body	Extruded aluminium	Hard anodized	1	1
2	Anti-blowout pinion	Steel	Nickel plated	1	1
• 3	Lower pinion o-ring	NBR		1	1
• 4	Pinion bearing	POM		1	1
• 5	Top pinion o-ring	NBR		1	1
• 6	Cam bearing	POM		1	1
7	Cam	Stainless steel		1	1
8	Position indicator	Nylon		2	2
9	Pinion washer	Stainless steel		1	1
••• 10	Pinion snap ring	Steel	Nickel plated	1	1
11	Piston	Die cast aluminium		2	2
• 12	Piston o-ring	NBR		2	2
• 13	Bearing - piston head	POM		2	2
• 14	Bearing - piston back	POM		2	2
15	Travel stop screw retaining nut	Stainless steel		2	2
16	Travel stop screw	Stainless steel		2	2
17	External spring	Steel	Zinc-phosphate	0	see spring setting above
18	Internal spring	Steel	Zinc-phosphate	0	
19	Left endcap	Die cast aluminium	Painted	1	1
20	Right end cap	Die cast aluminium	Painted	1	1
21	End cap seal	NBR		2	2
22	End cap screw	Stainless steel		8	8

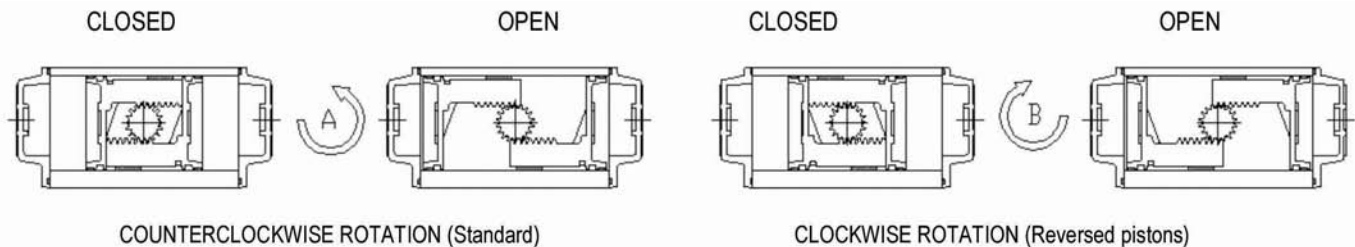
• Parts subject to wear    \*\* Reinforced series DIN 471-UNI 7436

#### Pneumatic Actuators

### 7 Assembly

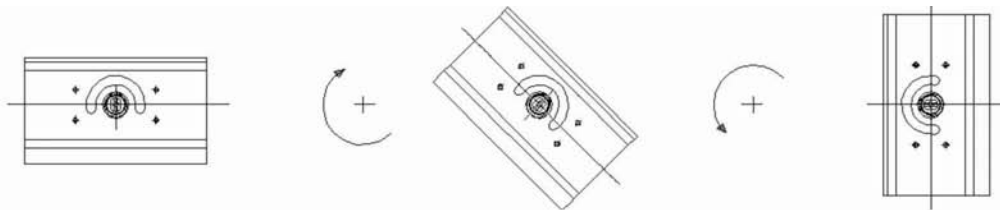
1. Clean the components before proceeding with the assembly
2. Grease lightly the internal chamber of the body (1) and the seals on the pistons. We suggest the use of grease like **TRIBOSTAR 1 EP "KLUBER"**, calcium sulfonate grease, or lithium complex grease.
3. Introduce carefully the pinion (2) into the body (1) so that the two pinion flat surfaces are parallel to the axis of the body.
4. Insert the pistons (pre-assembled and greased) into the body as shown here below.

#### ASSEMBLY POSSIBILITIES - TOP VIEW



5. Push the pistons (11) into the body (1) until the pistons teeth are stopped by the teeth of the pinion (2).
6. Keeping a soft pressure with the hands on the pistons (11) rotate the body (1) in clockwise rotation in respect to the pinion (2) until feeling 3 clicks, when the pistons engage with the pinion (2).
7. Now rotate the body (1) in counterclockwise rotation and verify that at the end of the rotation the two pinion "NAMUR" flats surfaces are about 7° rotated to the axis of the body.

**N.B correct assembly gives symmetric stroke of the pistons, verifiable by measuring their equal distance from each end face of the body.**



8. Assemble the cam spacer ring (6) and the cam (7).
9. Assemble the pinion washer (9) and insert the snap ring (10) in its place on the pinion (2).
10. Proceed making the adjustment of the stroke, acting on adjusting screws (16), fixing then their position securing the nuts (15).

#### For Double Acting Actuator

11. Assemble the end caps (19-20) and the screws (22) diagonally

#### For Spring Return Actuator

11. Insert the springs set (M) into the body (1) putting them in the piston recess (11), then assemble the end cap (19) on the springs, centering them in the recess.

**N.B The pistons must be in CLOSED position**  
Partially assemble the screws (22) diagonally, compressing uniformly the springs until the end cap (19) is completely closed.

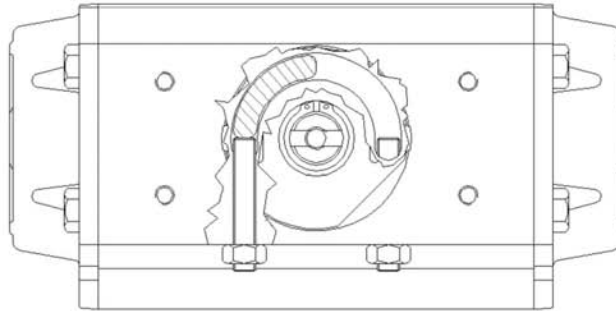
**N.B.: THIS OPERATION IS SUGGESTED WITH A PRESS AND A GUARD.**

9. Repeat the operation on the other side.
10. Operate the actuator to verify the correct functioning before re-installing it.

#### Pneumatic Actuators

### 8 Stroke Adjustment

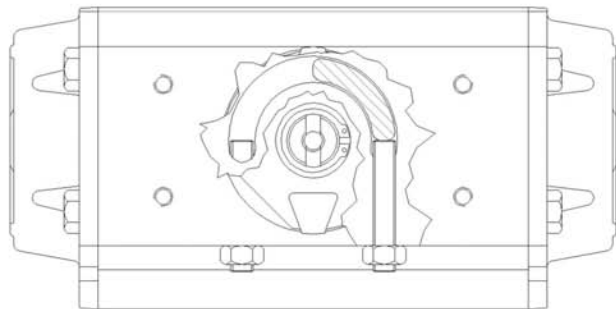
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By adjusting **LEFT** stop bolt it will be adjusted

**Open** position (Standard version)

**Closed** position (reversed pistons version)



By adjusting **RIGHT** stop bolt it will be adjusted

**Closed** position (Standard version)

**Open** position (reversed pistons version)

#### 8.1 Stroke Adjustment Procedure (when pistons are in open position)

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- Remove air supply or move the pistons to the closed position.
- Adjust the corresponding stop bolt.
- Move the pistons to the open position and verify the new adjustment.
- Repeat this operation until desired adjustment is achieved.

#### 8.2 Stroke Adjustment Procedure (when pistons are in closed position)

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- Remove air supply or move the pistons to the position. (necessary for SR)
- Adjust the corresponding stop bolt.
- Move the pistons to the closed position and verify the new adjustment.
- Repeat this operation until desired adjustment is achieved.