"Apollo" Valves

# INSTALLATION AND OPERATING INSTRUCTIONS

## FOR MOD. 32-160-200-270

## 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.

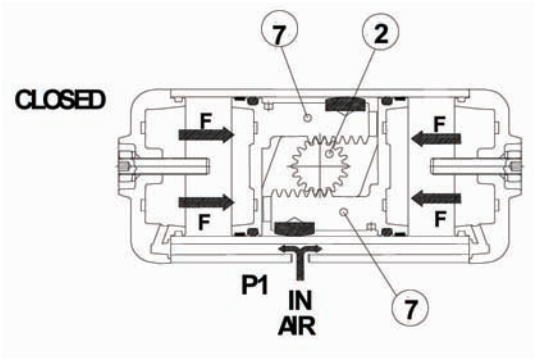
## 1 Main Characteristics

- **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 ±10° in open position
  Upon request full stroke regulation 0° / 90°
  Upon request regulation ±5° in closed position
- **Lubrication:** during asembly, for actuator life

## 2 Operation Principle

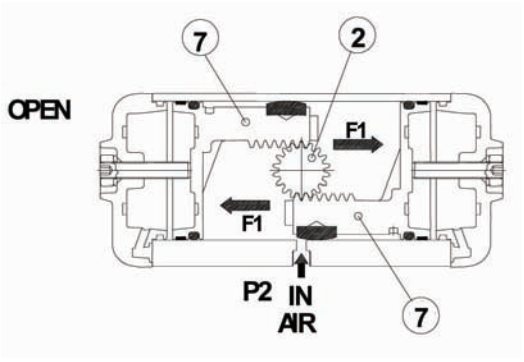
Apollo® actuator transforms the linear motion of the pistons (7), due to the thrust effected by the pressure on the surface area, to a rotary motion (90° std) of the pinion (2).

## 2.1 Double Acting




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

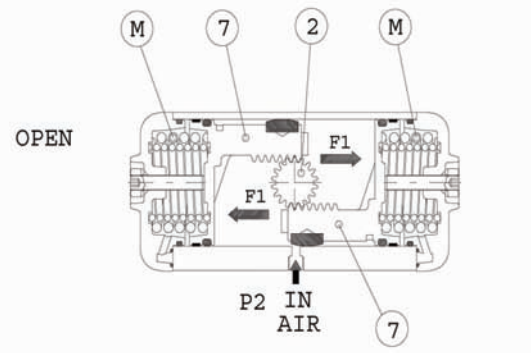
**TOP VIEW**




When the pistons (**7**) 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**

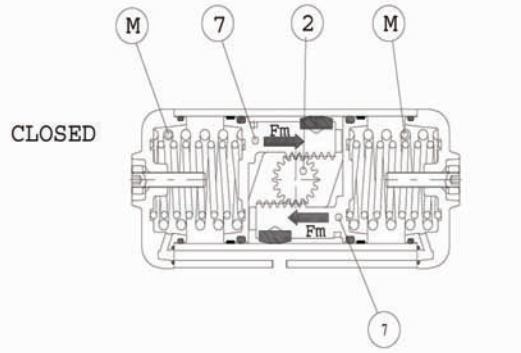
**Pneumatic Actuators**

## 2.2 Spring Return




When the pistons (**7**) 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 closed 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 (**7**) closed 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 intrsion.

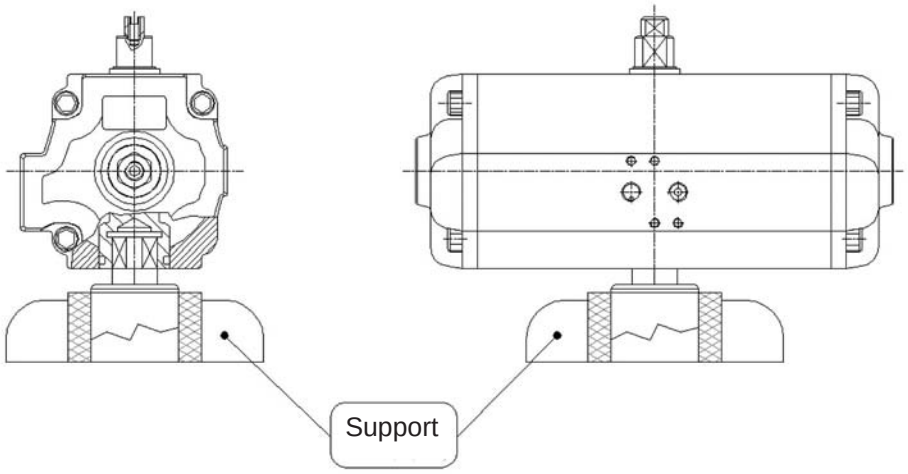
## 4 Maintenance

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.

## 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 actator is double acting (DA) or spring return (SR)

For **DOUBLE ACTING** actuator

6. Remove slowly and diagonally the end cap screws (**20**) from each end cap (**18-19**)

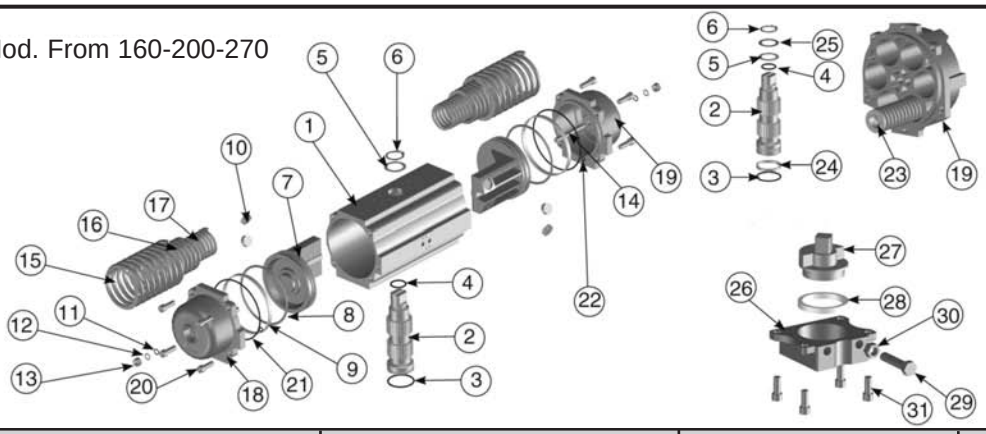
For **SPRING RETURN** actuator

7. Diagonally remove, slowly and partially, the screws (**20**) from each end cap (**18-19**). **N.B.** length of the screws permit the springs to be de-compressed fully, proving the actuator is in closed position.

8. Rotate the actuator body (**1**) in a clockwise direction in respect of the pinion (**2**), so that the pistons (**7**), pushing the adjustment screws (**14**), will eject the end caps (**18-19**) and that at the end of the rotation the pistons (**7**) will be disconnected from the pinion (**2**).
9. Take out the pistons (**7**) from the body (**1**).
10. Remove the pinion snap ring (**6**) from its place on the pinion (**2**).
11. Take away the spacer ring (**5**).
12. Remove the pinion (**2**), carefully from the body (**1**).

## 6 Actuator Parts

Mod. From 160-200-270



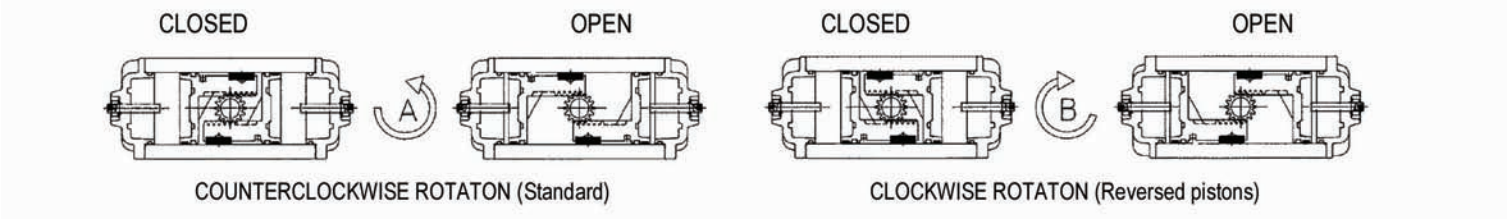

| ITEM | DESCRIPTION | MATERIAL | TREATMENT | DA | SR |
|---|---|---|---|---|---|
| 1 | Body | Exruded Aluminium | Hard Anodized | 1 | 1 |
| 2 | Anti-Blowout Pinion | Steel | Nickel Plated | 1 | 1 |
| • 3 | Lower Pinion O-ring | NBR | | 1 | 1 |
| • 4 | Top Pinion O-ring | NBR | | 1 | 1 |
| • 5 | Pinion Spacer Ring | POM | | 1 | 1 |
| 6 | Pinion Snap Ring | Steel | Nickel Plated | 1 | 1 |
| 7 | Piston | Die Cast Aluminium | | 2 | 2 |
| • 8 | Piston O-ring | NBR | | 2 | 2 |
| • 9 | Antifriction Ring | PTFE 15% Graphite | | 2 | 2 |
| • 10 | Piston Thrust Block | POM | | 4 [6] | 4 [6] |
| • 11 | Stop Bolt O-ring | NBR | | 2 | 2 |
| 12 | Washer | Stainless Steel | | 2 | 2 |
| 13 | Stop Bolt Retaining Nut | Stainless Steel | | 2 | 2 |
| 14 | Stop Bolt | Stainless Steel | | 2 | 2 |
| 15 | External Spring | Steel | Zinc-Phosphate | 0 | |
| 16 | Central Spring | Steel | Zinc-Phosphate | 0 | |
| 17 | Internal Spring | Steel | Zinc-Phosphate | 0 | |
| 18 | Left End Cap | Die Cast Aluminium | Painted | 1 | 1 |
| 19 | Right End Cap | Die Cast Aluminium | Painted | 1 | 1 |
| 20 | End Cap Screw | Stainless Steel | | 8 (12) | 8 (12) |
| 21 | End Cap O-ring | NBR | | 2 | 2 |
| 22 | End Cap O-ring, Transfer | NBR | | 2 | 2 |
| 23 *** | Precompressed Spring | Steel | Zinc-Phosphate | 0 | |
| • 24 *** | Antifriction Ring | PTFE 15% Graphite | | 1 | 1 |
| 25 *** | Pinion Washer | Stainless Steel | | 1 | 1 |
| | **UPON REQUEST CLOSED POSITION ADJUSTMENT** | | | | |
| 26 | Plate GGG40 | | Painted | 1 | 1 |
| 27 | Coupling | SteelNickel Plated | | 1 | 1 |
| • 28 | Antifriction Ring | PTFE | | 1 | 1 |
| 29 | Stop Screw | Steel | Zinc Plated | 1 | 1 |
| 30 | Stop Bolt Retaining Nut | Stainless Steel | | 1 | 1 |
| 31 | Fixing Screws | Stainless Steel | | 4 | 4 |

• Parts subject to wear [6] (12) *** Valid for mod. 270 only

## 7 Assembly

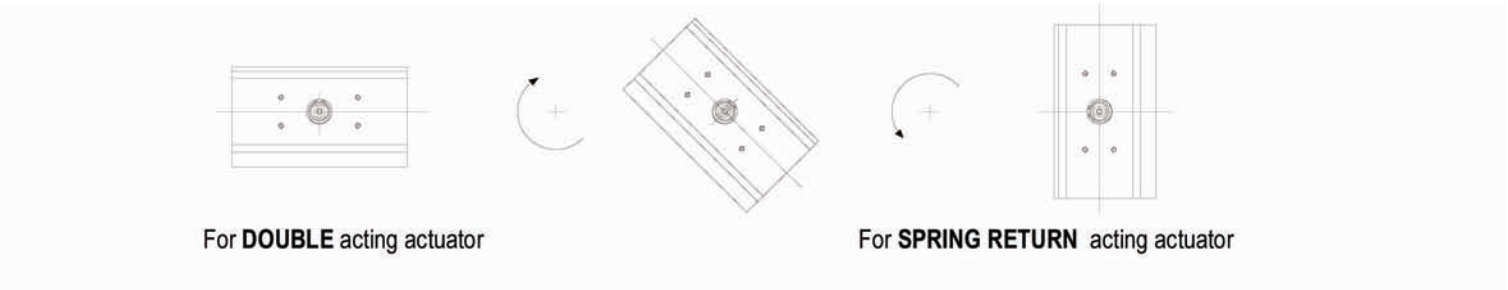
1. Clean the components before proceeding with the assembly
2. Grease lightly the internal chamber of the body (**1**) and the seals on the pistons. We suggest the use of grease like **TRIBOSTAR 1 EP "KLUBER"**, calcium sulfonate grease, or lithium complex grease.
3. Introduce carefully the pinion (**2**) into the body (**1**) so that the two pinion flat surfaces are parallel to the axis of the body, and secure with spacer ring (**5**) and pinion snap ring (**6**).
4. Insert the pistons (pre-assembled and greased) into the body as shown here below.

**ASSEMBLY POSSIBILITIES - TOP VIEW**




5. Push the pistons (**7**) 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 (**7**) 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 flats surfaces are right angles to the axis of the body.

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

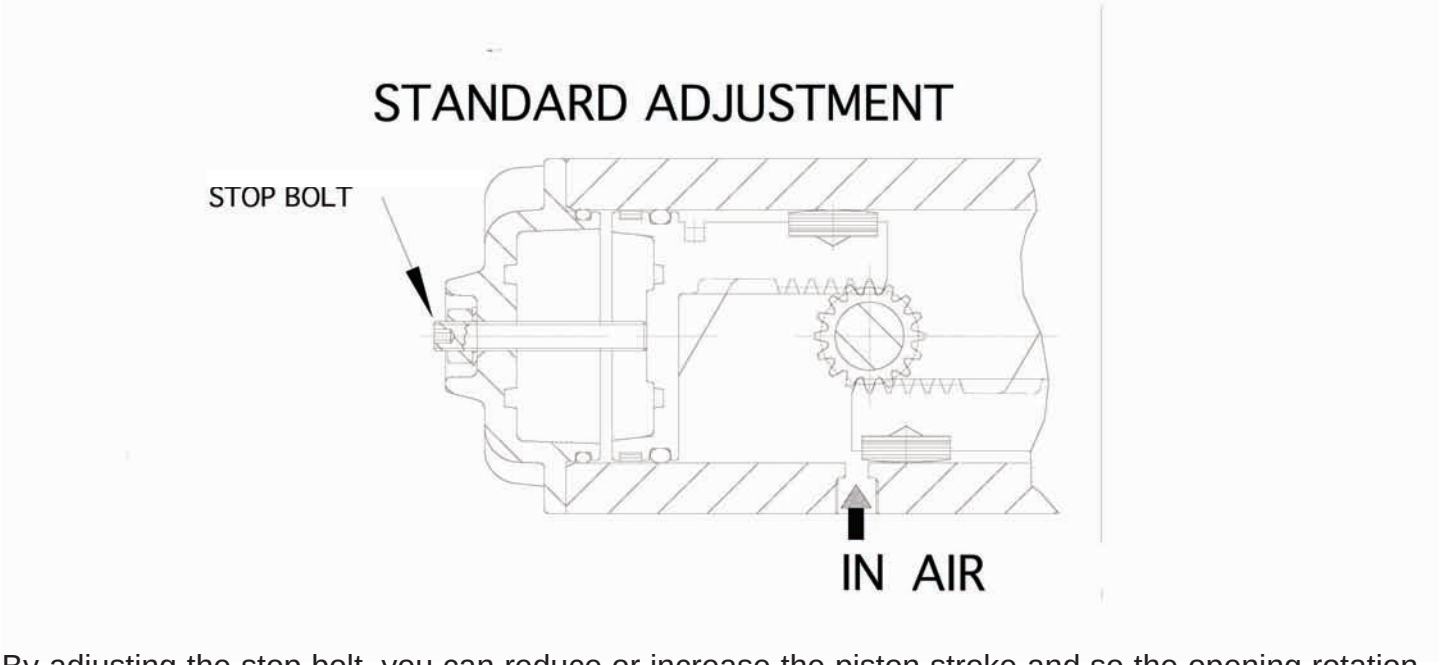



8. Assemble the end caps (**18-19**) and the screws (20) diagonally

8. Insert the springs set (**M**) into the body (**1**) putting them in the pistons recess (**7**), then assemble the end caps (**22**) on the springs, centering them in the recess.
   **N.B The pistons must be in CLOSED position**
   Partially assemble the screws (**20**) diagonally, compressing uniformly the springs until the end cap (**18**) 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.

## 8 Stroke Adjustment




By adjusting the stop bolt, you can reduce or increase the piston stroke and so the opening rotation.

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

- Remove air supply or move the pistons to the closed position.
- Adjust one bolt only.
- Move the pistons to the open position and verify the new adjustment.
- Repeat this operation until desired adjustment is achieved.
- Restore air supply, and adjust the second bolt until it touches the piston.

## 8.2 Mounting Scheme for Double Adjustment Plate (±5°) Available Upon Request - Mod. 160-200-270

Place the pinion as shown in the above picture (pistons in closed position).
For standard actuators insert the adjusting bolt in the threaded hole on the right (as shown).
For actuators with reversed pistons insert the adjusting bolt in the threaded hole on the left.
Wrong assembly might cause damage to the adjusting system.

## 8.3 Adjusting Procedure Actuator in Closed Position

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