



GENERAL

This manual contains important information regarding the installation, operation, maintenance, and storage of rack and pinion pneumatic actuators. Please read these instructions carefully and retain them for future reference.

Note: Only properly trained personnel should assemble or disassemble the actuator.

DESCRIPTION OF VENUS SERIES ACTUATORS

The aluminum pneumatic actuator is a 90° rack and pinion system, available in either double-acting or spring-return configurations. It is designed for the operation of all types of quarter-turn valves and other 90° applications.

The actuator's internal surface is specially finished to a roughness of Ra 0.4–0.6 µm, reducing friction and wear. Combined with antifriction pads made from LAT LUB—a material with a very low coefficient of friction—mounted on the pistons, this design prevents metal-to-metal contact.

As a result, the actuators offer a long service life with minimal maintenance requirements.

ATEX Technical Parameter

- Applicable Zone: 1, 2 zone; 21, 22 zone
- Maximum surface temperature: T6 (85°C)
- Ambient Temperature: -20°C ~80°C
- ATEX Mark: II 2 GD c T6

Air-Supply Pressure

Minimum: 2 bar (30 psig)
Maximum: 8 bar (120 psig)

Operating Media

Clean, dry or lubricated compressed air
The maximum particle size must not exceed 30 µm.

Operating Temperature

Standard (NBR O-ring): -20°C to +80°C
High Temperature (Viton O-ring): -15°C to +150°C
Low Temperature (LNBR O-ring): -40°C to +80°C
Cold Temperature (LNBR + Silica O-ring): -60°C to +80°C

Caution:

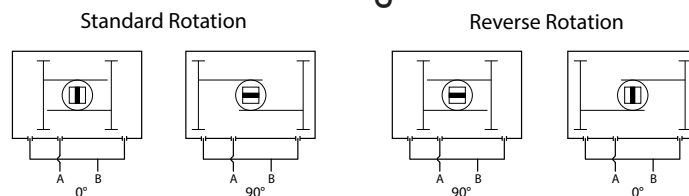
For low- or high-temperature applications, special grease is required.
Extreme temperatures can affect the performance of the actuator and may result in variations in output torque.

Lubrication and Safety Precautions

- The actuator is factory-lubricated and requires no additional lubrication under normal operating conditions.
- Do not operate the actuator using flammable, oxidizing, corrosive, explosive, or unstable gases.
- Operating the actuator beyond its specified temperature, pressure, or recommended media limits may result in serious hazards, including personal injury or death. It can also cause internal component failure and damage to the actuator housing.

PRINCIPLE OF OPERATION

Double Acting Actuator



Standard:

Air to Port A: Forces the pistons outward. The pinion turns counterclockwise while air is vented from Port B.

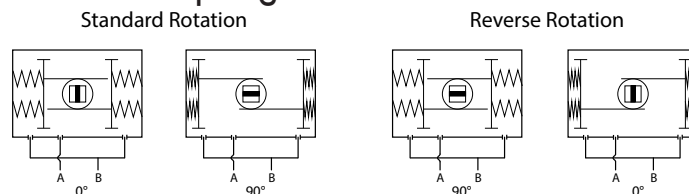
Air to Port B: Forces the pistons inward. The pinion turns clockwise while air is vented from Port A.

Reverse:

Air to Port A: Forces the pistons outward. The pinion turns clockwise while air is vented from Port B.

Air to Port B: Forces the pistons inward. The pinion turns counterclockwise while air is vented from Port A.

Spring Return Actuator



Standard:

Air to Port A: Forces the pistons outward, compressing the springs. The pinion turns clockwise while air is vented from Port B.

Loss of air pressure at Port A: The stored energy in the springs forces the pistons inward. The pinion turns counterclockwise while air is vented from Port A.

Reverse:

Air to Port A: Forces the pistons outward, compressing the springs. The pinion turns counterclockwise while air is vented from Port B.

Loss of air pressure at Port A: The springs push the pistons inward. The pinion turns clockwise while air is vented from Port A.

Note: Assembling the actuator and reversing the pistons' position can easily reverse the standard rotation.

ASSEMBLY OF VALVES

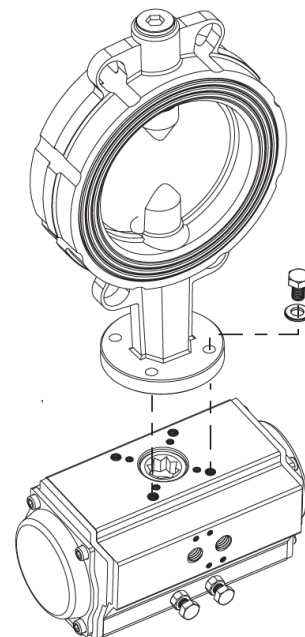
Pneumatic actuators are equipped with a double-square "star" pattern drive shaft and a mounting bolt pattern in accordance with ISO standards. This design allows for flexible mounting in 90° increments, enabling alignment either in-line or across the pipework. This ensures optimal space usage without affecting the actuator's performance.

Mounting Steps:

1. Insert the valve's square drive directly into the actuator's matching square drive.
2. Secure the actuator to the valve using bolts through the valve's ISO mounting pad.

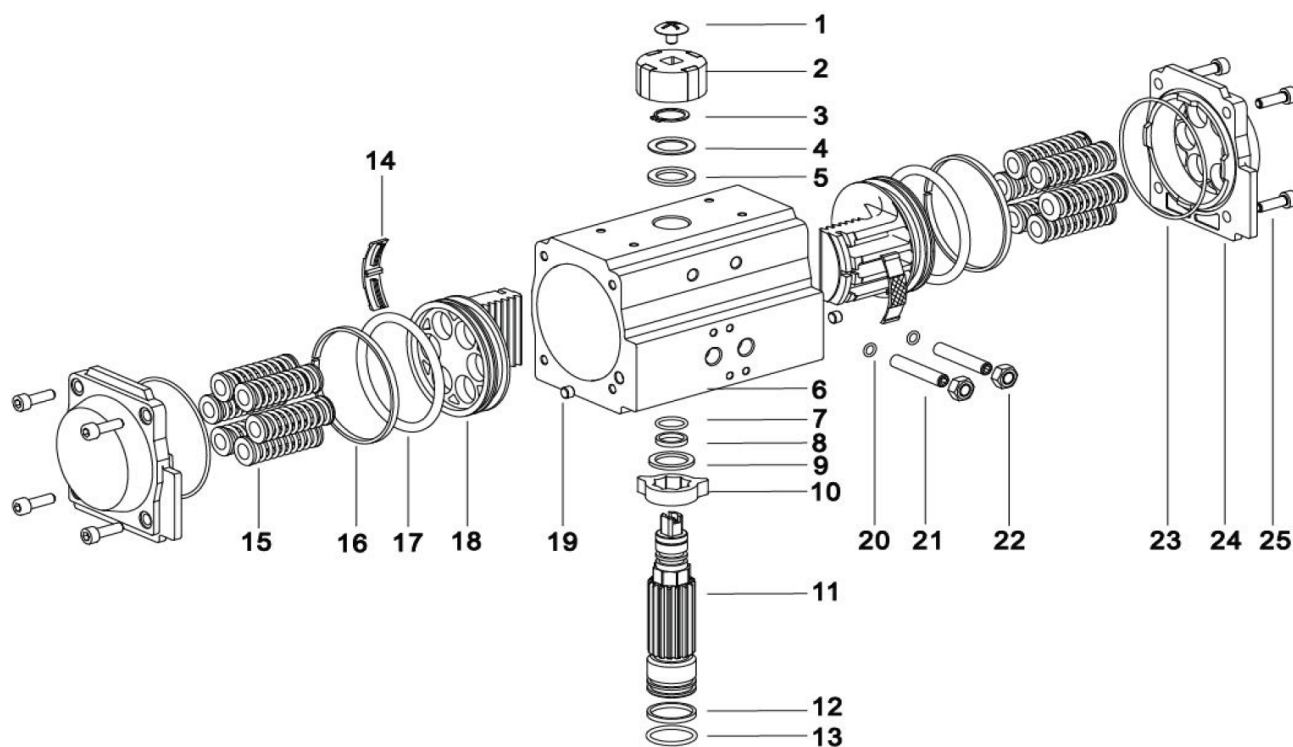
Before mounting the actuator to the valve, please ensure the following:

- Determine the desired function: Normally Closed (NC) or Normally Open (NO).
- Verify that both the valve and actuator are in the same position—open or closed.
- Confirm the proper alignment of all components: valve, connection piece, bracket, and actuator.
- When assembling, ensure the mounting screws are evenly tightened to distribute load proportionally.
- Adjust the position indicators so they accurately reflect the valve's status (open/closed).



IMPORTANT: When using a spring return actuator for fail-safe functionality, it is essential to verify that the direction of rotation upon air or power failure matches the required fail-safe position for your application. Failure to do so may result in incorrect valve positioning, leading to operational or safety risks.

DISASSEMBLY OF THE ACTUATOR





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No.	Description	Qty.	Material
1	Indicator screw	1	Plastic(ABS)
2	Indicator	1	Plastic(ABS)
3	Circlip	1	Stainless steel(304)
4	Thrust washer	1	Stainless steel(304)
5	Outside washer	1	Polyoxymethylene
6	Body	1	Extruded aluminum alloy(6005-T5)
7	O-ring(pinion top)	1	NBR
8	Bearing(pinion top)	1	Polyoxymethylene
9	Inside washer	1	Polyoxymethylene
10	Cam	1	#45
11	Pinion	1	#45
12	Bearing (pinion bottom)	1	Polyoxymethylene
13	O-ring(pinion bottom)	1	NBR
14	Guide(piston)	2	Nylon66
15	Spring	0-12	Spring steel
16	Bearing (piston)	2	Polyoxymethylene
17	O-ring(piston)	2	NBR
18	Piston	2	Die-Cast aluminum(A380.1)
19	Plug	2	NBR
20	O-ring(adjust screw)	2	NBR
21	Adjust screw	2	Stainless steel(304)
22	Nut (adjust screw)	2	Stainless steel(304)
23	O-ring(end cap)	2	NBR
24	End-cap	2	Die-Cast aluminum(A380.1)
25	End-cap screw	8	Stainless steel(304)

1. **Disconnect Power and Supply Lines** - Safely disconnect all electrical power and pneumatic supply lines connected to the actuator and its accessories.
2. **Remove Accessories** - Detach all actuator-mounted accessories such as, Solenoid valve, Limit switch box, Positioners or other attachments.
3. **Detach Actuator from Valve** - Unbolt and carefully remove the actuator from the valve.
4. **Remove Position Indicator**
 - Remove the indicator screw (1) (if installed).
 - Gently lift the position indicator (2) off the shaft. If necessary, use a screwdriver to carefully pry it off—avoid applying excessive force.
5. **Remove End Caps** - Unscrew and remove the end cap screws (25) to begin opening the actuator body.

Caution: When the actuator is a spring return unit, make sure that the actuator is in the failed position before disassembling.

6. **Remove Stroke Adjustment Components** - Unscrew and remove the stroke adjustment screw (21) along with the nut (22) and O-rings (20).
7. **Remove End Caps** - Carefully remove both end caps (24) from the actuator body.
8. **Rotate Pinion to Eject Pistons** - Manually rotate the pinion (12) counterclockwise. This action will drive the pistons (18) outward, allowing them to exit the actuator body (6).

Caution: Air pressure should not be used to remove the pistons from body.

9. **Remove Retaining Hardware** - Remove the circlip (3) and the washers (4 and 5) from the top of the pinion.
10. **Remove Pinion Assembly** - Apply downward force to the top of the pinion (11) to remove the following components from the actuator body:
 - Pinion (11)
 - Cam (10)
 - Inside washer (9)
11. **Clean All Components Thoroughly** - Carefully clean all disassembled components to remove grease, debris, or wear residue. Ensure parts are free from damage before reassembly.

Inspection and Maintenance

12. **Inspect all actuator components for wear or damage.** Replace any parts as needed to ensure proper function.
13. **During maintenance, replace the following critical components:**
Circlip (3), O-rings (7, 13), washer (5), pinion bearings (8, 12), end cap O-ring (23), piston O-ring (17), piston guides (14), and piston bearings (16).
14. For spring return actuators, all springs (15) must be replaced during periodic maintenance to maintain safe and reliable operation.

Caution: At the same time, check whether the spring seat of the end cap (24) is worn. If so, replace the end cap (24).

Caution: Maintenance is recommended to be carried out each 500,000 complete cycles.



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RECOMMENDED REPLACEMENT PARTS

- End Cap O-Ring (23)
- Piston O-Ring (17)
- Piston Bearing (16)
- Piston Guide (14)
- Spring (15)
- Pinion Washer (5)
- Pinion Circlip (3)
- Pinion Upper O-Ring (7)
- Pinion Lower O-Ring (13)
- Pinion Upper Bearing (8)
- Stroke Adjustment Screw O-Rings (20)
- Pinion Lower Bearing (12)

ASSEMBLY INSTRUCTIONS

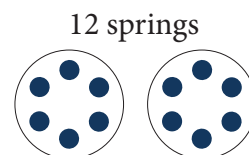
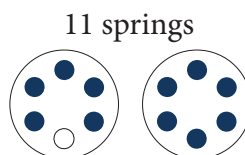
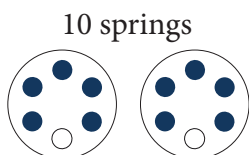
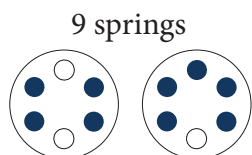
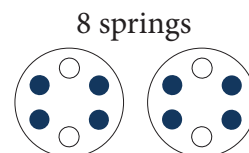
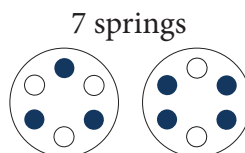
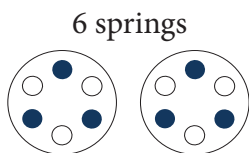
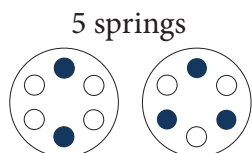
VERY IMPORTANT:

Before beginning assembly, always verify that all O-rings and gaskets—compatible with Buna (NBR) or nitrile rubber—are correctly seated in their grooves. Ensure all components are properly greased using a standard commercial-grade lubricant.

1. Insert the pinion (11) into the actuator body (6), ensuring the cam (10) is properly positioned. The pinion must rotate both clockwise and counterclockwise after the stroke adjustment screws (21) are installed.
2. Install washers (5 and 4) and the circlip (3) onto the top of the pinion.
3. Insert both pistons (18) into the body (6), ensuring they engage the pinion gear (11) simultaneously.
4. For standard rotation, rotate the pinion (11) approximately 40–50° clockwise to fully retract the pistons. Confirm that the pinion's output end is square to the body and correctly aligned.

Obtaining the correct gear tooth and piston alignment could require more than one attempt.

5. Mount the end cap (24) to the actuator body and tighten the screws (25) evenly, applying uniform force to ensure the end cap seats properly. **Caution: Take care not to pinch the O-rings during installation.**
For spring return actuators, insert the spring cartridges correctly into their positions within the end caps, according to the required spring quantity (refer to spring configuration detail).



6. Fit the stroke adjustment screw (21) with the nut (22) and O-Ring (20) in the body.



ENDSTOP ADJUSTMENT

Clockwise Rotation (Right Adjusting Screw)

1. Loosen the lock nut (22) on the right-hand external stroke adjustment screw.
2. Adjust the stroke screw (21) by tightening or loosening it to set the desired stop position.
3. Retighten the lock nut (22) to secure the setting.

Counterclockwise Rotation (Left Adjusting Screw)

1. Loosen the lock nut (22) on the left-hand external stroke adjustment screw.
2. Adjust the stroke screw (21) to achieve the required position.
3. Retighten the lock nut (22) to lock the adjustment.

PRESSURE TEST

Test the actuator using 6 bar (90 psi) compressed air.

Spray a soap and water solution on all joints and rotating shafts.

Check for bubbles to detect air leaks.

STORAGE GUIDELINES

To properly store the pneumatic actuator:

- Ensure the actuator is completely dry and free of moisture.
- Seal air passages using original or replacement plastic plugs.
- Protect the unit from dust, dirt, and physical damage by sealing it in a box or plastic bag.

All pneumatic actuators are 100% factory tested for both operational performance and watertight integrity. Each unit is fitted with an individual quality control stamp to certify inspection and approval.

Important Safety Warnings

A. Isolation Before Maintenance

Before performing any repair or maintenance, ensure all pressure supply lines and electrical connections are safely isolated and disconnected by authorized personnel. The actuator must never be pressurized during installation, as this may cause serious injury.

B. Personal Safety

Never place any part of your body in or near the opening or port of the controlled valve or device.

C. Spring Return Precautions

Spring return actuators contain stored energy. Do not disassemble individual spring cartridges, as this may result in serious personal injury.

D. Correct Alignment

Before installation, verify that the rotation direction of the actuator matches the valve, and ensure the position indicator is correctly aligned.

E. Proper Sizing

Ensure the actuator is correctly sized for the valve and application, with a sufficient safety margin of torque for reliable operation.

NOTE: Maintenance must only be carried out by authorized and trained personnel.