

Pneumatic Valves and Actuators: A Complete Guide

Pneumatic valves and pneumatic actuators are essential for the control and automation of compressed air systems. Used across construction, mining, manufacturing, rail, and energy sectors, these components manage air flow, pressure, and direction to perform precise mechanical tasks—without relying on ignition or electricity.

What Are Pneumatic Valves?

Also known as directional control valves, pneumatic valves are used to start, stop, divert, or modulate the flow of compressed air or inert gas in a system. They can be operated manually, electrically (solenoid-actuated), or pneumatically, and are often integrated with controllers, positioners, and actuators for automated processes.

Key Pneumatic Valve Types

Directional Control Valves

Control the start, stop, and direction of air flow in pneumatic circuits. Available in 2/2, 3/2, 5/2, or 5/3 configurations, depending on the number of ports and switching positions.

Non-Return Valves

Prevent reverse airflow. Common types include:

- Check valves
- Shuttle valves
- Quick exhaust valves
- Two-pressure valves

Flow Control Valves

Regulate the volume or rate of airflow, typically by restricting the exhaust port or inlet port to manage cylinder speed.

Pressure Control Valves

Maintain system pressure at a desired level. Common types include:

- Pressure reducing valves
- Pressure relief (limiting) valves
- Sequence valves

Pneumatic Solenoid Valves

Electrically operated valves using a solenoid coil to trigger airflow. Solenoid valves are ideal for remote, automated control, eliminating the need for manual intervention or air logic.

Proportional Valves

Provide variable pressure or flow output in proportion to an electrical signal. Useful in precise applications requiring continuous adjustment rather than on/off switching.

Pilot Valves

Control large flows with minimal input by using pilot pressure. These valves are spark-free and suitable for explosive environments, commonly used in oil, gas, and hazardous process control.

Inline Valves

Modular valves designed for manifold mounting. Their compact footprint makes them ideal for industrial automation setups with limited space.

Quick Exhaust Valves

Rapidly vent air from pneumatic cylinders to increase cycle speed. Used in high-speed applications such as robotics, offshore systems, and mobile plant equipment.

Brands We Supply:

- Rhodes
- Air-Pro
- KELM
- Parker
- Lorch
- Festo
- Metal Work
- Norgren
- Camozzi
- Pneumax
- VSL
- Vamein Butterfly Valves
- J+J Electric Actuators
- Prisma Pneumatic Actuators

What Are Pneumatic Actuators?

Pneumatic actuators—also known as air actuators, air cylinders, or pneumatic cylinders—convert compressed air into mechanical motion. Depending on the design, this motion can be linear (straight-line) or rotary (turning).

They are often used with angle-seat valves or quarter-turn valves, depending on the motion type required.

Types of Pneumatic Actuators

Linear Pneumatic Actuators

Used to create push or pull force in a straight line. Often paired with globe valves, diaphragm valves, or angle seat valves.

Rotary Pneumatic Actuators

Used to create rotational motion, ideal for ball valves, butterfly valves, and plug valves that require quarter-turn actuation.

Key Operating Principles

Pneumatic actuators function by filling a chamber with compressed air. Once pressure exceeds a threshold, it drives a piston or diaphragm, producing mechanical movement. When air is vented, a return spring or opposite pressure restores the actuator to its original position.

Piston vs Diaphragm Actuators

- **Piston Actuators:** Use a piston that is pushed by air pressure and returned by spring or opposing pressure. Suitable for high-force and long-stroke applications.
- **Diaphragm Actuators:** Use a flexible membrane to separate air from the mechanical chamber. Preferred in compact designs or systems where sealing integrity is critical.

Valve Actuator Options

Valve actuators can be:

- **Pneumatic** (compressed air)
- **Hydraulic** (pressurised fluid)
- **Electric** (motors or solenoids)

They may be:

- **Linear or rotary**
- **Direct acting** (air closes valve, spring opens)

- **Reverse acting** (air opens valve, spring closes)

Factors for Selecting a Valve Actuator

- Valve type and torque requirements
- Available power source (air, electricity, oil)
- Operating temperature and pressure
- Required speed and precision
- Duty cycle and life expectancy
- Manual override or fail-safe function

For expert help in choosing the correct pneumatic valve or actuator for your application, **contact our technical team.**