

**CONCEPT** An actuator is a mechanical device that converts compressed air into motion. Pneumatic actuators use the force of compressed air to create linear or rotary motion, which can be used to control valves, move mechanical components, or perform other tasks. They typically consist of a piston or diaphragm that is connected to a rod, which moves in response to changes in air pressure.



## TERMINOLOGY

**PISTON OR DIAPHRAGM** - This is the component that converts compressed air into motion.

**CYLINDER** - The piston or diaphragm is typically housed within a cylinder, which provides a stable and secure environment for the actuator to operate.

**SOLENOID VALVES** - These are used to control the flow of compressed air into and out of the actuator, allowing it to move in a specific direction.

**POSITION SENSORS** - These are used to detect the position of the actuator and provide feedback to a control system, which can be used to adjust its operation.

**FITTINGS AND TUBING** - These are used to connect the actuator to the rest of the pneumatic system, allowing compressed air to flow in and out of the actuator.

**LINEAR ACTUATORS** - These convert compressed air into linear motion and are commonly used in applications such as pushing, pulling, lifting, and lowering.

**ROTARY ACTUATORS** - These convert compressed air into rotary motion and are commonly used in applications such as turning, indexing, and positioning.

## BACKGROUND

The history of pneumatic actuators dates back to the 3rd century BC when the Greek mathematician and inventor, Ctesibius, created the first known air-powered device – a water clock that used a float-operated valve to control the flow of water. The concept of using compressed air to power mechanical devices was further developed by scientists and engineers throughout the centuries, including Hero of Alexandria and Blaise Pascal. In the late 19th century, the introduction of efficient compressors and the development of reliable seals and valves made it possible to create practical pneumatic actuators for industrial applications. Today, pneumatic actuators are widely used in a range of industries, including manufacturing, automotive, aerospace, and more, due to their reliability, low cost and ease of use.



*Make sure it measures up*

## APPLICATION

In the food and beverage manufacturing industry, pneumatic actuators are used in a variety of ways, including controlling the movement of conveyor belts, opening and closing packaging machines, and filling containers with product.

In the packaging process, pneumatic actuators can be used to control the movement of a packaging machine's sealing jaws, which seal the product inside the packaging material. The actuators are connected to a control system that directs compressed air to move the jaws to the correct position and apply the correct amount of force to create a proper seal. The actuators can also be used to control the speed of the sealing jaws, ensuring that the packaging machine operates efficiently and accurately.

In this application, pneumatic actuators offer several advantages. They are reliable, cost-effective and easy to maintain, making them a popular choice in the food and beverage packaging industry. Additionally, they are ideal for use in cleanroom environments, as they do not produce sparks or generate heat, which could pose a risk to sensitive products or processes. Overall, pneumatic actuators play a critical role in ensuring the quality and efficiency of the manufacturing process and are a key component of modern consumer goods production.

## REAL WORLD CONNECTIONS

Pneumatic actuators are used in the automotive industry to control the opening and closing of engine valves. In an internal combustion engine, the intake and exhaust valves must open and close at precise times to allow air and fuel to enter the combustion chamber and exhaust gasses to exit. Pneumatic actuators, in the form of pneumatic valve actuators, are used to control the movement of these valves. When compressed air is directed to the actuator, it expands and moves a piston, which is connected to the valve. This causes the valve to open or close, depending on the direction of the airflow. By using pneumatic actuators, engine manufacturers can achieve precise valve timing and improve engine performance and efficiency.



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