

**CONCEPT** PSI stands for “pounds per square inch,” which is a unit of pressure measurement. It refers to the amount of force exerted on one square inch of surface area. In pneumatics, psi is commonly used to measure the pressure of compressed air or gas that is used to power machines and equipment, such as pneumatic cylinders and tools. The higher the psi, the more forceful the compressed air or gas, which can impact the performance and efficiency of pneumatic systems.

## TERMINOLOGY

**PRESSURE GAUGES** - Measure the psi of compressed air or gas and display the readings on a dial or digital display.

**REGULATORS** - Used to control the pressure of compressed air or gas to a desired level. They typically consist of a diaphragm, spring and valve that work together to regulate the flow of air or gas.

**RELIEF VALVES** - Designed to release excess pressure in the event that the pressure in a pneumatic system exceeds a safe level. They prevent damage to equipment and ensure the safety of operators.

**FITTINGS AND CONNECTORS** - Used to connect pneumatic hoses, cylinders, and other equipment to the compressed air or gas source. They come in a variety of shapes and sizes and are designed to withstand the high pressures.

**PNEUMATIC CYLINDERS** - Convert compressed air or gas pressure into linear motion. They consist of a cylinder, piston, and rod, and are commonly used in a variety of industrial applications.



## BACKGROUND

The use of psi can be traced back to the development of the steam engine in the 18th century. As engineers began to design more complex steam-powered machinery, they needed a way to measure and control the pressure of the steam used to power these machines. The term “pounds per square inch” was first used in the mid-19th century to describe the pressure of steam and other gasses. With the development of compressed air technology in the early 20th century, psi became an important unit of measurement in the field of pneumatics. Today, psi is used to measure the pressure of compressed air and gas in a wide range of industrial applications, including manufacturing, automotive, and construction industries.

*Make sure it measures up*

## FORMULAS

Pressure formula:

$$P = \frac{F}{A}$$

P - Pressure in psi  
F - Force in pounds  
A - Area in square inches

Boyle's Law: Boyle's law states that the pressure of a gas is inversely proportional to its volume, given a constant temperature.

$$P_1 \times V_1 = P_2 \times V_2$$

P1, V1 - initial pressure & volume  
P2, V2 - final pressure & volume

Charles's Law: Charles's law states that the volume of a gas is directly proportional to its temperature, given a constant pressure.

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

V1, T1 - initial volume & temperature  
V2, T2 - final volume & temperature

Ideal Gas Law: The ideal gas law relates the pressure, volume, temperature, and number of moles of an ideal gas.

$$PV = nRT$$

P - pressure  
V - volume  
n - number of moles of gas  
R - universal gas constant  
T - temperature

## APPLICATION

Air compressors are commonly used to power pneumatic equipment such as tools, machines, and assembly lines. The pressure output of an air compressor is typically measured in psi, with different applications requiring different pressure levels.

For example, a small air compressor may have a maximum output pressure of 120 psi, which is suitable for powering pneumatic tools such as nail guns or impact wrenches. On the other hand, larger compressors may be capable of producing pressures of up to 200 psi or more, which is necessary for powering more complex machinery such as air brakes or heavy-duty manufacturing equipment.

Proper monitoring and control of air compressor pressure is essential to ensure safe and efficient operation. Pressure gauges and regulators are used to monitor and adjust the air pressure output to match the needs of the equipment being powered. This allows operators to ensure that their equipment is operating optimally and safely, while also minimizing downtime and maximizing productivity.

## REAL WORLD CONNECTIONS

An example of psi is in the operation of pneumatic tools, such as impact wrenches and nail guns, commonly used in automotive repair and construction industries. These tools require a specific amount of air pressure, measured in psi, to operate effectively. For example, an impact wrench may require 90 psi of air pressure to operate at maximum power. Without the proper amount of air pressure, the tool may not function correctly, which can result in increased repair times, decreased productivity, and potential safety hazards. By using pressure gauges and regulators to monitor and adjust the air pressure, operators can ensure that their pneumatic tools are functioning optimally and safely.



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