

Pneumatics

Pneumatic cylinders are devices which allow air pressure to do useful work. Compressed air is routed into a cylinder, where it pushes on an internal plunger. A rod tied to the plunger is either extended or retracted, depending upon which side of the plunger was pressurized.

Pneumatic cylinders are available as either **single acting** or **double acting**. A single-action cylinder can only be actuated in one direction. It often incorporates a spring in order to return it to its resting position once air pressure is removed.

Double acting cylinders can be moved in either direction with air pressure. A double acting cylinder has two input ports; one to extend the rod, and one to retract it. Note that, when the rod is being extended, the 'retract' port **must be vented**, otherwise the cylinder will not move.

Single Action diagram:

Double Action diagram:

The amount of force with which a cylinder can move is a function of the pressure of the air, multiplied by the area of the plunger. A 90psi pressure acting over a 1in² plunger will exert 90lbs of force. The same pressure acting on a plunger with twice the surface area will exert 180lbs of force.

Pneumatic cylinders are specified in terms of **bore** and **throw** distance. The bore is the diameter of the plunger, while throw distance is the range of travel of the rod.

The amount of force exerted by the cylinder can be found with the following formula:

$$(\text{air pressure}) * (3.1415)(\text{bore} / 2)^2$$

Note also that air pressure can be used to power other pneumatic devices, such as motors. Air-powered tools, such as the air ratchet, are very common in shops.