

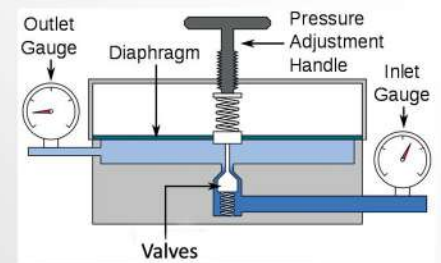
## The Difference Between Single And Two Stage Regulators

A pressure regulator is a control valve that reduces the input pressure of a fluid to the desired value at its output. Regulators are used for gases and liquids. Can be an integral device with an output pressure setting, a restrictor and a sensor all in the one body, or consist of a separate pressure sensor, controller and flow valve. A pressure regulator's primary function is to match the flow of gas through the regulator to the demand for gas placed upon it, whilst maintaining a constant output pressure. If the load flow decreases, then the regulator flow must decrease. If the load flow increases, then the regulator flow must increase to keep the controlled pressure from decreasing due to a shortage of gas in the pressure system.

### Single Stage

High-pressure gas from the supply enters into the regulator through the inlet valve. The gas then enters the body of the regulator, which is controlled by the needle valve. The pressure rises, which pushes the diaphragm, closing the inlet valve to which it is attached, and preventing any more gas from entering the regulator. The outlet side is fitted with a pressure gauge.

As gas is drawn from the outlet side, the pressure inside the regulator body falls. The diaphragm is pushed back by the spring and the valve opens, letting more gas in from the supply until equilibrium is reached between the outlet pressure and the spring. The outlet pressure, therefore, depends on the spring force, which can be adjusted by means of an adjustment handle or knob.



The outlet pressure and the inlet pressure hold the diaphragm/valve assembly in the closed position against the force of the large spring. If the supply pressure falls, it is as if the large spring compression is increased allowing more gas and higher pressure to build in the outlet chamber until an equilibrium pressure is reached. Thus, if the supply pressure falls, the outlet pressure will increase, provided the outlet pressure remains below the falling supply pressure. This is the cause of end-of-tank dump where the supply is provided by a pressurised gas tank. With a single-stage regulator, when the supply tank gets low, the lower inlet pressure causes the outlet pressure to climb. If the spring compression is not adjusted to compensate, the valves can remain open and allow the tank to rapidly dump its remaining contents. In other words, the lower the supply pressure, the lower the pressure differential the regulator can achieve for a given spring setting.

### Two Stage

Two-stage regulators are two single-stage regulators in one that operates to reduce the pressure progressively in two stages. The first stage, which is preset,

reduces the pressure of the supply gas to an intermediate stage; gas at that pressure passes into the second stage. The gas now emerges at a pressure (working pressure) set by the pressure adjusting control knob attached to the diaphragm. Two-stage regulators have two safety valves so that if there is any excess pressure there will be no explosion. A major objection to the single-stage regulator is the need for frequent torque adjustment. If the supply pressure falls, the outlet pressure increases, necessitating torque adjustment. In the two-stage regulator, there is automatic compensation for any drop in the supply pressure. Single-stage regulators may be used with pipelines and cylinders. Two-stage regulators are used with cylinders and manifolds. Dual-staged regulators are recommended for applications that require a constant outlet pressure for the life of a gas cylinder.

