Gas Regulator

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How a Regulator Works

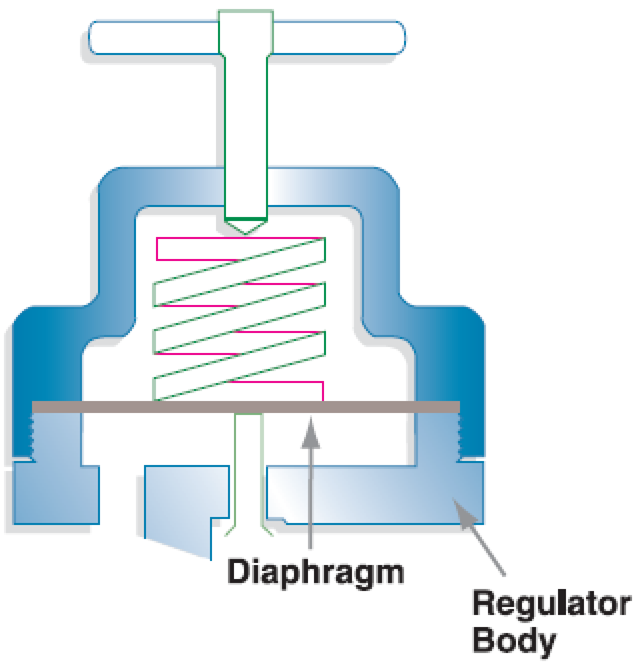
There are three basic operating components in most regulators: a loading mechanism, a sensing element, and a control element. These three components work together to accomplish pressure reduction.

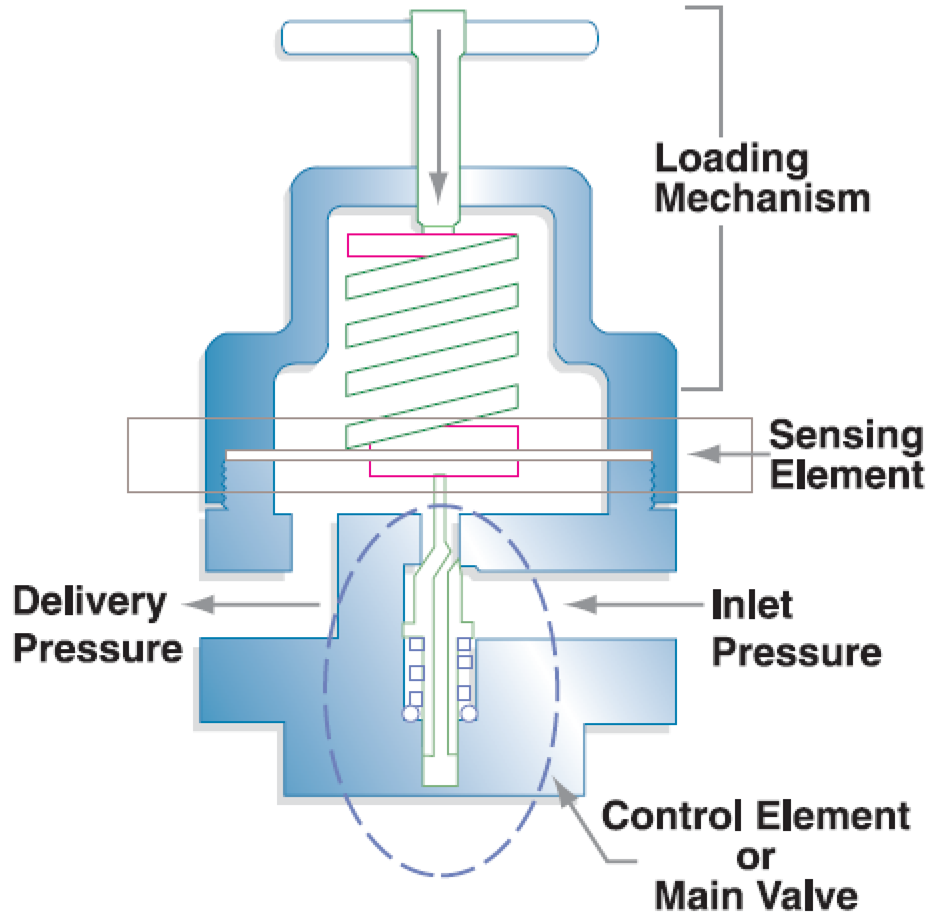
The **Loading Mechanism** determines the setting of the regulator delivery pressure. Most regulators use a spring as the loading mechanism. When the regulator hand knob is turned, the spring is compressed. The force that is placed on the spring is communicated to the sensing element and the control element to achieve the outlet pressure.

The **Sensing Element** senses the force placed on the spring to set the delivery pressure. The sensing element communicates this change in force to the control element.

The **Control Element** is a valve that actually accomplishes the reduction of inlet pressure to outlet pressure.

When the regulator hand knob is turned, the spring (loading mechanism) is compressed. The spring displaces the diaphragm (sensing element). The diaphragm then pushes on the control element, causing it to move away from the regulator seat. The orifice becomes larger in order to provide the flow and pressure required.





Features Determine Function

What makes a high purity regulator high purity?

High purity applications require equipment that will help maintain the purity of the system. Three main features determine the suitability of a regulator for high purity applications.

Body Type: Regulator bodies may be of forged or barstock construction. A forged body is formed by casting metal in a mold under pressure. A barstock body is made by machining out a solid piece of cold-drawn metal bar. Barstock bodies are used for high purity applications for the following reasons:

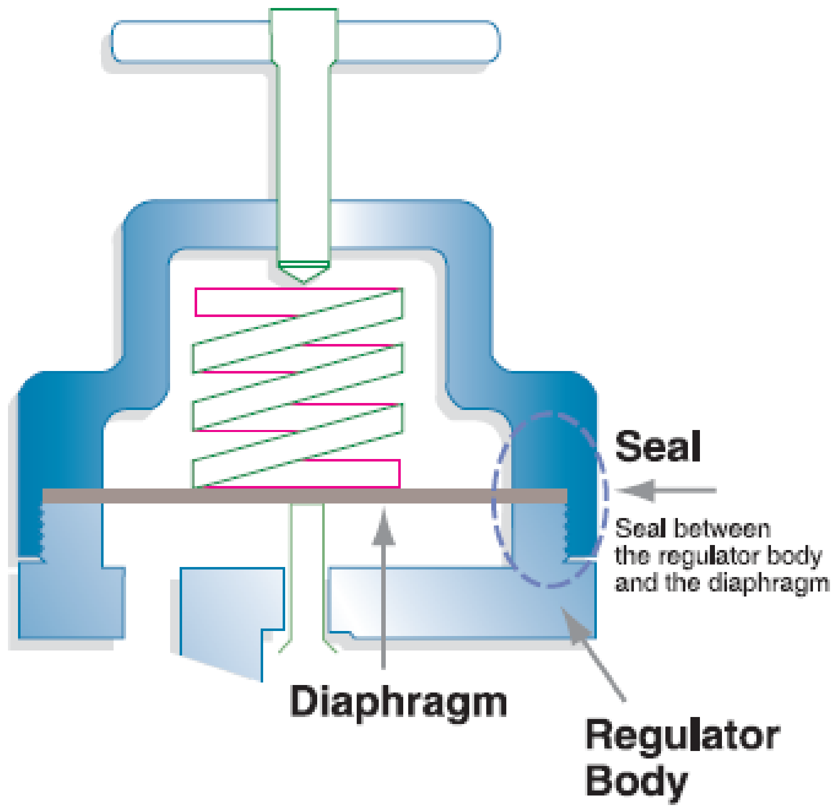
- **Reduced internal volumes**

- **Tight grain structure of the metal:** The cold drawing process produces metal barstock with a very tight grain structure.

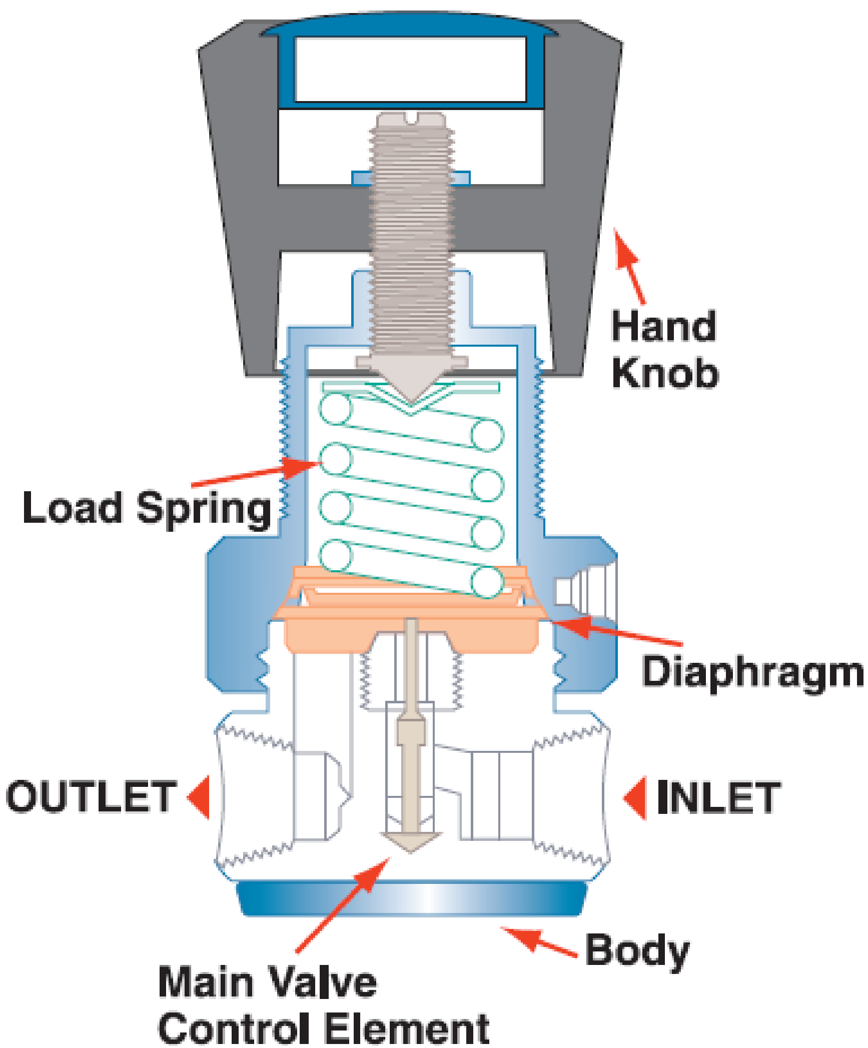
- **Low Ra surface finish:** The machining process allows for very low Ra (roughness average) surface finishes on the barstock.

Diaphragm Material: Diaphragms may be constructed of elastomers (neoprene, Viton, etc.) or stainless steel. Stainless steel diaphragms are used in high purity regulators because they do not adsorb and release (or "offgas") contaminants.

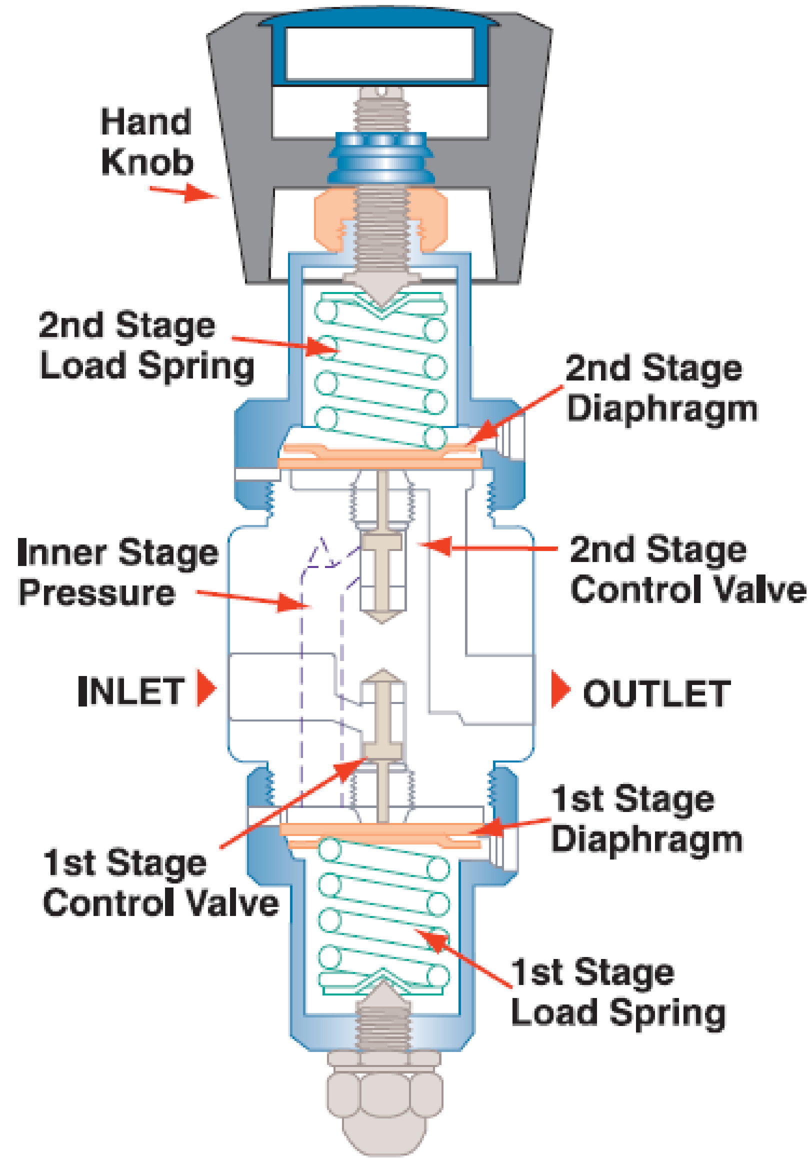
Type of Seals: A metal to metal seal (metal regulator body sealing to a metal diaphragm) is the most reliable, leak-free type of seal. An elastomeric diaphragm can degrade over time, compromising the integrity of this seal.



Single Stage Regulator



Dual Stage Regulator



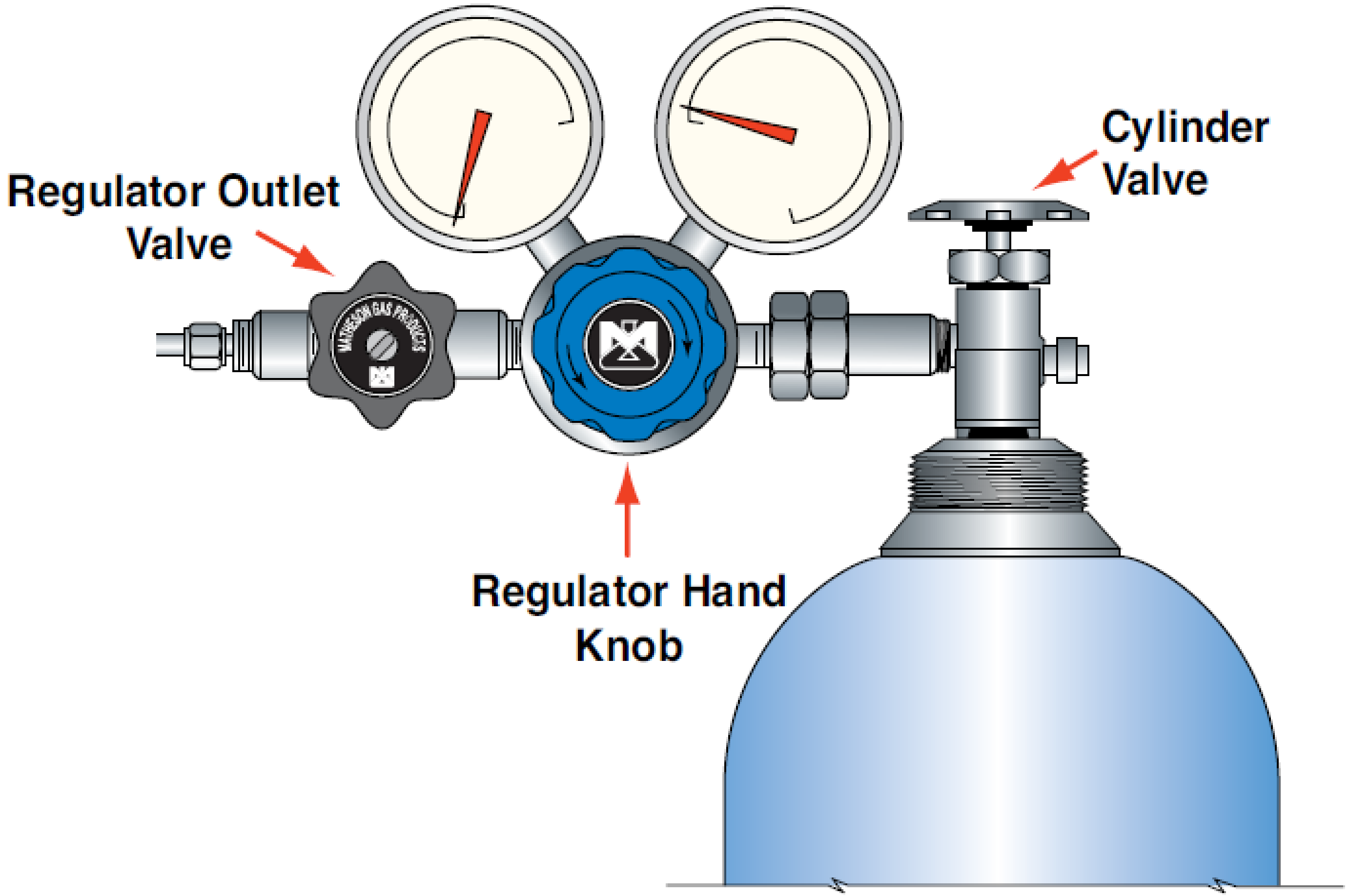
Regulators are equipped with CGA (Compressed Gas Association) fittings for connection to cylinders. Each CGA connection has a numerical designation, and a listing of gases with which it may be used.

Compressed Gas Association Valve Outlet Listing

Gas	CGA Valve Outlet & Conn. No. CGA/UHP CGA
Acetylene	510
Air, Breathing	346
Air, Industrial	590*
Allene	510**
Ammonia, Anhydrous	705**
Ammonia, Electronic	660/720
Argon	580*/718
Argon-3500 psig	680***
Argon-6000 psig	677
Arsine	350/632
Boron Trichloride	660**/634
Boron Trifluoride	330**/642
1,3-Butadiene	510*
Butane	510*
Butenes	510*
Carbon Dioxide	320*/716
Carbon Monoxide	350*/724
Carbonyl Fluoride	660
Carbonyl Sulfide	330**
Chlorine	660**/728
Cyanogen	660
Cyanogen Chloride	660
Cyclopropane	510*
Deuterium	350*
Dichlorosilane	678/636
Dimethylamine	705**
Dimethyl Ether	510*
2,2-Dimethylpropane	510
Ethane	350*
Ethyl Chloride	300*
Ethylene	350*
Ethylene Oxide	510**
Fluorine	679
Germane	350/632
Halocarbon 12 (Dichlorodifluoromethane)	660*/716
Halocarbon 13 (Chlorotrifluoromethane)	660/716
Halocarbon 13B1 (Bromotrifluoromethane)	660
Halocarbon 14 (Tetrafluoromethane)	320*/716
Halocarbon 22 (Chlorodifluoromethane)	660*
Halocarbon 23 (Fluoroform)	660/716
Halocarbon 114 (2,2-Dichlorotetrafluoroethane)	660*
Halocarbon 115 (Chloropentafluoroethane)	660*/716
Halocarbon 116 (Hexafluoroethane)	660
Halocarbon 142B (1-Chloro-1,1-difluoroethane)	510
Halocarbon 1113 (Chlorotrifluoroethylene)	510
Helium-3500 psig	680***
Helium	580*/718
Hexafluoropropylene	

Gas	CGA Valve Outlet & Conn. No. CGA/UHP CGA
Hydrogen	350*/724
Hydrogen-3500 psig	695***
Hydrogen Bromide	330**/634
Hydrogen Chloride	330**/634
Hydrogen Fluoride	660**/638
Hydrogen Iodide	330**
Hydrogen Selenide	350
Hydrogen Sulfide	330**/722
Isobutane	510*
Isobutylene	510*
Krypton	580/718
"Manufactured Gas B"	350
Methane	350*
Methyl Bromide	330
3-Methyl-1-butene	510
Methyl Chloride	660*/510
Methyl Fluoride	350/724
Methyl Mercaptan	330**
Monomethylamine	705**
Neon	580*/718
Nitric Oxide	660/712/728
Nitrogen	580*/718
Nitrogen-3500 psig	680***
Nitrogen-6000 psig	677
Nitrogen Dioxide	660
Nitrogen Trioxide	660
Nitrous Oxide	326*/712
Octafluorocyclobutane	660*/716
Oxygen	540*/714
Oxygen Mixtures Over 23%	296
Perfluoropropane	660*/716
Phosgene	660
Phosphine	350/632
Phosphorus Pentafluoride	330/642/660**
Propane	510*
Propylene	510*/791/810
Silane (High Pressure)	350/632
Silicon Tetrafluoride	330**/642
Sulfur Dioxide	660**
Sulfur Hexafluoride	590*/716
Sulfur Tetrafluoride	330**
Trimethylamine	705**
Vinyl Bromide	510
Vinyl Methyl Ether	510
Xenon	580**/718

**Lecture bottles use CGA No. 170*
***Lecture bottles use CGA No. 180*
) and 695 connections contact your nearest MATHESON office.


Regulator Outlet Valve
Cylinder Valve
Regulator Hand Knob

Thank you