Guide to Regulators

MATHESON

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ISO 9001 CERTIFIED

Introduction

Choosing the right regulator for your application is critical – and often difficult. Product application, gas service, and required delivery pressure all influence regulator selection. At MATHESON, we understand gases, and we understand the importance of using the appropriate equipment for each gas. MATHESON's Guide to Regulators is a valuable tool that will help you pick the right product for your application, and get the most reliable results.

Section 1

Regulator Primer

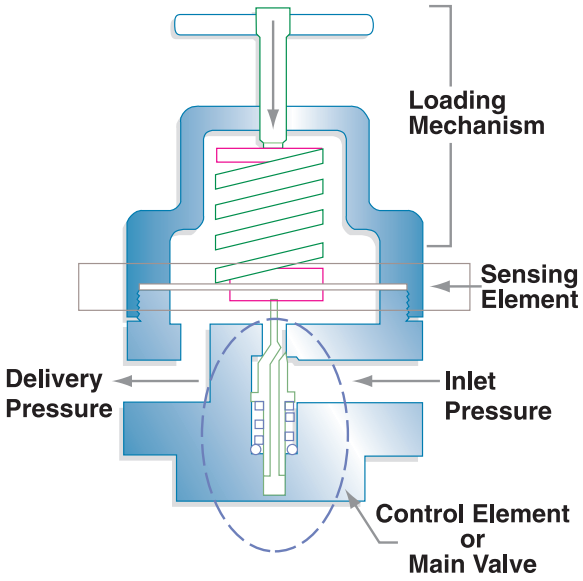
How a Regulator Works

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. Most regulators use a diaphragm as the sensing element. The diaphragms may be constructed of elastomers or metal. 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. High purity applications are sensitive to contamination from elements such as moisture, oxygen, and other gaseous vapors that may be present in ambient air. These contaminants enter the system when the regulator is removed from the cylinder during cylinder changeout, or they may enter through leaks or faulty seals.

The features of a regulator determine the type of service for which it can be used. A regulator intended for a high purity application has different features than a unit designed for general purpose use. Three main features determine the suitability of a regulator for high purity applications.

Barstock Construction

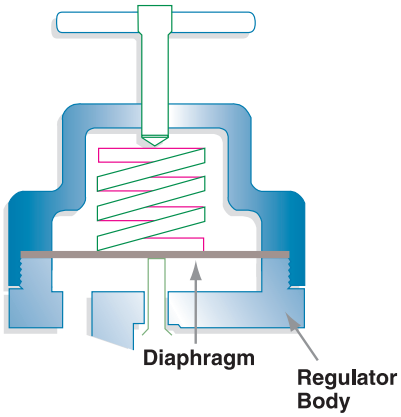
Forged Construction (Note the larger size of the forged body)

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:

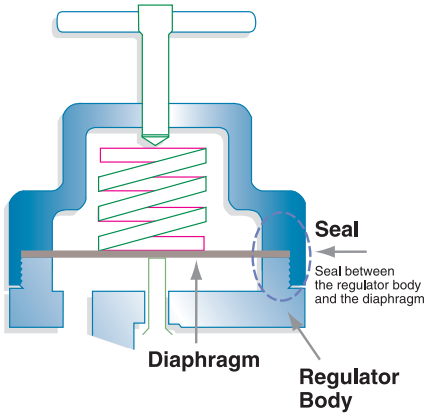
- Reduced internal volumes: Because barstock bodies are machined, it is possible to achieve a small internal cavity in the regulator body. The low internal volume makes purging the regulator easy, allowing for removal of contaminants like moisture and oxygen. It is difficult to achieve a low internal volume in the forging process; forged bodies have more "dead space" and tend to trap contaminants, and are more difficult to purge.

- Tight grain structure of the metal: The cold drawing process produces metal barstock with a very tight grain structure. This tight grain structure prevents the regulator's internal surfaces from adsorbing moisture and contaminants, allowing them to be purged easily. The forging process produces a more porous grain structure; the internal surfaces of a forged body regulator tend to adsorb contaminants, which eventually find their way into the system.

- Low Ra surface finish: The machining process allows for very low Ra (roughness average) surface finishes on the barstock. The low Ra finish minimizes particle shedding, which contributes to contamination. It is difficult to achieve a low Ra finish in the forging process, making forged bodies susceptible to particle shedding and contamination.



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. When a regulator is removed from a cylinder, it is exposed to ambient air. An elastomeric diaphragm will adsorb moisture and other contaminants from the air. When the regulator is put back into service, the elastomeric diaphragm releases these contaminants, which eventually find their way into the system. A stainless steel diaphragm is unable to adsorb any contaminants, so it does not contribute to system contamination.



Type of Seals: The seal between the body of the regulator and the diaphragm is important in maintaining purity. A poor seal creates a leakage point through which contaminants may enter the system. 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. Some regulator designs incorporate a stainless steel diaphragm that may be lined with an elastomer. Although the diaphragm is stainless steel, the seal is created between the regulator body and the elastomeric liner. Since the elastomeric liner may degrade, this seal is not as reliable as a metal to metal seal. Like an elastomeric diaphragm, the elastomeric liner may also adsorb and release contaminants into the system.

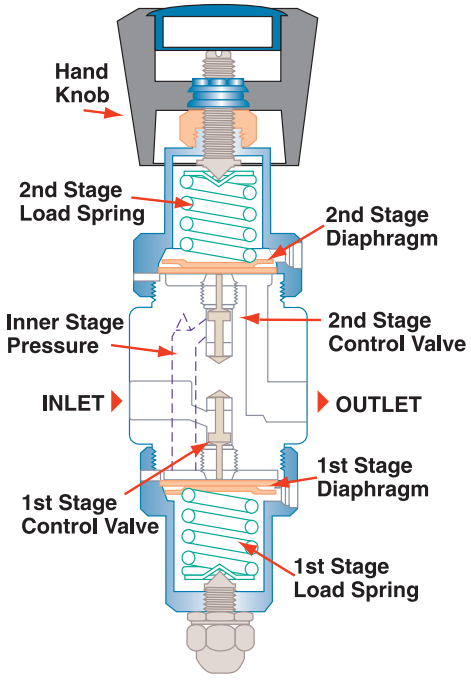
Features Influence Cost

A regulator designed for high purity applications is more costly than a regulator intended for general purpose use. Barstock bodies are more costly to produce than forged bodies due to the high amount of machining involved. Stainless steel is a more expensive diaphragm material than elastomers. It is important to remember that not all regulators are created equal when it comes to features.

Dual Stage Regulator

Dual Stage Regulators reduce the source pressure down to the desired delivery pressure in two steps. Each stage consists of a spring, diaphragm, and control valve. The first stage reduces the inlet pressure to about three times the maximum working pressure. The final pressure reduction occurs in the second stage.

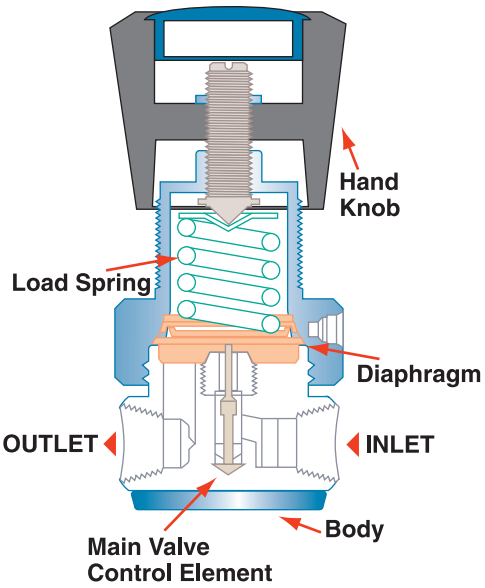
The advantage of a dual stage regulator is its ability to deliver a constant pressure, even with a decrease in inlet pressure. For example, as a cylinder of gas is depleted, the cylinder pressure drops. Under these conditions, single stage regulators exhibit **'decaying inlet characteristic';** the delivery pressure increases as a result of the decrease in inlet pressure. In a dual stage regulator, the second stage compensates for this increase, providing a constant delivery pressure regardless of inlet pressure. The dual stage regulator is recommended for applications such as gas supply to analytical instruments, where constant delivery pressure is critical.



Single Stage Regulator

Single Stage Regulators accomplish the pressure reduction in a single step. Delivery pressure cannot be as tightly controlled as with a dual stage regulator. Single stage regulators should only be used where an operator can monitor and adjust pressure as needed, or where the regulator is supplied with a nearly constant source pressure.

Line Regulators are single stage regulators that are used to provide point-of-use pressure monitoring and control. For example, a lab may have gas cylinders located in a room on the first floor. The gas may be piped up to instruments located in a lab on the second floor. In this case, it is difficult to monitor the gas pressure directly at the instruments, since the regulators are located on the cylinders on the first floor. A line regulator may be installed near the instruments for convenience of monitoring the delivery pressure at the point of use. These regulators are installed directly into gas lines, and have a single delivery pressure gauge.



MATHESON's Regulator Product

MATHESON's regulator products are grouped into three families: Basic Regulator Products, Specialty Regulator Products, and Transportable Cylinder Regulator Products.

Basic Regulator Products

General Purpose Regulators

- Used with gases that are less than 99.995% pure
- Used for applications where cost (not purity) is the main concern
- Economy and deluxe models

Model 18
General Purpose Regulator

Model 3810A
High Purity Stainless Steel Regulator

High Purity Regulators

- Used with gases that are 99.995% pure or higher purity
- Used for applications where maintaining system purity is the main concern
- Brass, aluminum, and stainless steel options
- Standard regulators or miniature regulators available

Model 9460
ULTRA-LINE® Regulator

ULTRA-LINE® Ultra High Purity Regulators

- Used for applications where the highest possible purity is critical, such as semiconductor manufacturing
- Designed to minimize the risk of contamination

Model 3430A
High Purity Line Regulator

Basic Line Regulators

- Line regulators for general purpose, high purity, and ultra high purity applications

Specialty Regulator Products

The specialty regulators are intended for use with applications that require particular capabilities, such as low delivery pressures or high flow rates. There are general purpose and high purity options within the specialty regulator family.

Model 3210A
Deluxe Corrosive Service Regulator

High Pressure Regulators

- Delivery pressures up to 6,000 psig
- 10,000 psig inlet pressure available

Corrosive Service Regulators

- Used with acid forming halogens (HCl, HBr, etc.)

High Flow Regulators

- Flow rates up to 250 scfm

Model 3396
Absolute Pressure Regulator

Low Pressure Regulators

- Low positive pressure and absolute pressure

Model 6342A
Back Pressure Regulator

Model 3590
Low Dead Volume Regulator

Back Pressure Regulators
- Prevent system overpressure

Low Dead Volume Regulators
- Low internal volume designed for high sensitivity applications

Lecture Bottle Regulators
- Corrosive and non-corrosive service units for use with small lecture bottles

Specialty Line Regulators
- Line regulators for high flow and low delivery pressure applications

Model 3345
Nickel Plated Brass Preset Flow Rate Regulator

Model 3359
Stainless Steel Preset Flow Rate Regulator

Model 3347 Series
Brass Variable Flow Rate Regulator

Model RFM-0029-XX
Aluminum Regulator with Flowmeter

MATHESON Portables™ Cylinder Regulator Products

These regulators are intended for use with MATHESON Portables™. Preset flow rate versions and a variable flow rate version are available, in a variety of materials.

Nickel Plated Brass Preset Flow Rate Regulators
- 30 psig delivery pressure, various CGA connections and preset flow rates

Stainless Steel Preset Flow Rate Regulators
- 30 psig delivery pressure, various CGA connections and preset flow rates

Brass Variable Flow Rate Regulators
- 50 psig delivery pressure, various CGA connections, 0-3 slpm adjustable flow rate

Aluminum Regulators
- Available with 1.5 slpm variable flow and rotameter, or with 0.5 slpm preset flow rate

Model 3120A
High Purity Brass, Dual Stage Regulator

Model 3420A
High Purity Brass Line Regulator

Detector Type	Detection Level	Regulator
Flame Ionization Detector (FID)	All Levels	Model 3530/3120A High Purity Brass Regulators, Model 3420 High Purity Brass Line Regulators
Thermal Conductivity Detector (TCD)	All Levels	
Nitrogen Phosphorus Detector (NPD)	All Levels	
Flame Photometric Detector (FPD)	All Levels	
Photoionization Detector (PID)	All Levels	
Helium Ionization Detector (HID)	All Levels	
Electrolytic Conductivity Detector (ELCD or Hall Detector)	Levels > 50 ppm	
Electron Capture Detector (ECD)	Levels > 50 ppm	

Model 3810A
High Purity Stainless Steel, Dual Stage Regulator

Model 3200
High Purity Stainless Steel Regulator

Detector Type	Detection Level	Regulator
Electrolytic Conductivity Detector (ELCD or Hall Detector)	Levels < 50 ppm	Model 3510/3810A High Purity Stainless Steel Regulators, Model 3200 High Purity Stainless Steel Regulators
Electron Capture Detector (ECD)	Levels < 50 ppm	
Mass Selective Detector or Mass Spec (MSD or MS)	All Levels	
Atomic Emission Detector (AED)	All Levels	

Basic Regulators

Regulator Family	Model Series	Gas Service	Stages	Max. Inlet (psig)	Outlet Range (psig)[1]	Design Features	Applications
General Purpose	18	Non-corrosive	1	3000	0-500	• Low cost forged brass bodies and neoprene diaphragms • Rugged construction • Large diaphragms provide good pressure control	• Calibration of pressure gauges, rotameters, and mass flow controllers • Applications with high duty cycle/demanding operating conditions
	18A	Acetylene	1	400	0-15		
	81	Non-corrosive	2	3000	2-250		
	81-F *(with flowmeter)*	Non-corrosive	2	3000	2-50		
Economical High Purity Brass	1250	Non-corrosive	2	3000	2-250	• Low cost forged brass body with high purity stainless steel diaphragm • PTFE seals • Rugged construction • 320, 350, 580, 590 CGA's only	• Supply of carrier gas or detector support gas for gas chromatography and other applications where low cost is the most important factor. The models 3120 (brass) and 3810 (stainless steel) should be used for the highest purity demanding applications as these models use barstock bodies and metal to metal seals.
High Purity Brass	3530A	Non-corrosive	1	3000	0-500	• Nickel plated brass barstock bodies • 316 stainless steel diaphragms • Metal to metal seals	• Supply of carrier gas/detector support gas for a variety of gas chromatography applications *(see chart on regulators for chromatography applications in 3530/3120 section)* • Supply of calibration standards to on-line process analyzers, emission monitoring standards, etc.
	3120A	Non-corrosive	2	3000	0-500		
High Purity Stainless Steel	3510A	Semi- & non-corrosive	1	3000	0-500	• 316 stainless steel barstock bodies • 316 stainless steel diaphragms • Metal to metal seals • Tied diaphragm (3610) for safety	• Supply of carrier gas/detector support gas for a variety of gas chromatography applications *(see chart on regulators for gas chromatography applications in 3510/3810 section)* • Supply of calibration standards to on-line process analyzers, emission monitoring standards, etc.
	3610A Tied Seat	Corrosive, toxic, and pyrophoric	1	3000	2-100		
	3810A	Semi- & non-corrosive	2	3000	0-500		
High Purity Miniature	3550 Brass	Non-corrosive	1	3000	0-100	• Brass or 316 stainless steel barstock bodies • 316 stainless steel diaphragms • Compact size	• Applications requiring high purity gases and a compact regulator due to space limitations
	3570 Stainless Steel	Corrosive	1	3000	0-100		
	3850 Brass	Non-corrosive	2	3000	0-100		
	3870 Stainless Steel	Corrosive	2	3000	0-100		
ULTRA-LINE® Ultra High Purity	9300	Semiconductor	1	3000	0-100	• 316L stainless steel or Hastelloy C-22 internals • Autogeneous butt-welded connections • 10-15 Ra surface finish • Assembled in class 100 clean room	• All semiconductor industry gas applications
	9360 Tied Seat	Semiconductor corrosive, toxic, and pyrophoric	1	3000	0-100		
	9370 Tied Seat	Semiconductor corrosive, toxic, and pyrophoric	1	3000	0-100		
	9460 Tied Seat	Semiconductor corrosive, toxic, and pyrophoric	2	3000	0-100		
	9470 Tied Seat	Semiconductor corrosive, toxic, and pyrophoric	2	3000	0-100		

Basic Regulators

Regulator Family	Model Series	Gas Service	Stages	Max. Inlet (psig)	Outlet Range (psig)[1]	Design Features	Applications
Basic Line Regulators	3470 General Purpose	Non-corrosive	1	350	2-200	• Cast zinc (3470), brass barstock (3420), 316 stainless steel (3430), or 316L stainless steel (9330) bodies • Neoprene (3470) or stainless steel diaphragms • Tied diaphragm (9330) for safety	• 3470: Point of use regulation of inert gases • 3420A & 3430A: Point of use regulation of high purity gases used in chromatography or other analytical applications *(see chart on regulators for gas chromatography applications in 3420A/3430A sections)* • 9330: Point of use regulation in semiconductor applications
	3420A High Purity Brass	Non-corrosive	1	400	0-250		
	3430A High Purity Stainless Steel	Semi- & non-corrosive	1	400	0-250		
	9330 Ultra Line Tied Seat	Semiconductor, corrosive, toxic, or pyrophoric	1	3000	0-100		

[1] *The outlet pressure ranges shown above include the minimum and maximum pressures available with respect to the entire model series. For delivery pressure ranges of individual regulator models, refer to appropriate catalog sections.*

Speciality Regulators

Regulator Family	Model Series	Gas Service	Stages	Max. Inlet (psig)	Outlet Range (psig)[1]	Design Features	Applications
High Pressure	3030 Brass	Non-corrosive	1	3000	100-1500	• Brass or stainless steel barstock bodies • 316 stainless steel piston	• Applications requiring up to 6000 psig delivery pressure • Manufacturing processes, charging of systems, purging • 3060 series available relieving and non relieving
	3040 Brass	Non-corrosive	1	3000	100-2500		
	3060A Brass	Non-corrosive	1	7500	200-6000		
	3060SA Stainless Steel	Non-corrosive	1	10,000	200-6000		
	3060AR Brass	Non-corrosive	1	7500	200-6000		
	3060SAR Stainless Steel	Non-corrosive	1	10,000	200-6000		
Standard Corrosive Service	3900	Corrosives: HBr, HF, Cl_2	1	3000	2-200	• Economical nickel plated forged brass body • Monel, Kel-F, and Teflon internals for corrosion resistance	• Use with acid forming halogen compounds (HBr, HF, Cl_2) • Use with low vapor pressure gases
Deluxe Corrosive Service	3210A	Corrosives: HCl, HF, HBr, Cl_2	1	3000	1-200	• Monel construction and Monel/Kel-F internals for superior corrosion resistance	• Applications requiring extended regulator lifespan in severe conditions
Fluorine Corrosive Service	3225A	Corrosives: F_2 and F_2 mixtures	1	1000	1-50	• Monel construction with bronze filled Teflon seat and Kel-F seals	• Use with fluorine and fluorine mixtures
High Flow	3200	Non-corrosive	1	3000	0-250	• Brass (3240) or stainless steel (3200) barstock bodies • 1/2" NPTF inlet and outlet ports	• Applications requiring a high flow rate, such as purging of large reactor or storage vessels
	3240	Non-corrosive	1	3000	0-250		

Speciality Regulators

Regulator Family	Model Series	Gas Service	Stages	Max. Inlet (psig)	Outlet Range (psig)[1]	Design Features	Applications
Low Pressure	81-2 General Purpose	Non-corrosive	2	3000	0.1-2	• Economical forged brass (81-2) or high purity brass barstock (3396) bodies • Economical Neoprene (81-2) or 316 stainless steel (3396) diaphragms	• 81-2: Applications requiring a reduction of full cylinder pressure down to a low working pressure, such as fuel supply to burners or purging low pressure environmental chambers • 3396: Applications requiring subatmospheric pressure control
	3396 Absolute Pressure	Non-corrosive	1	3000	28" Hg- 15 psig		
Back Pressure	6342A	Corrosive & non-corrosive	1	100	0-100	• 316L stainless steel body • 316 stainless steel diaphragm	• Used to relieve system overpressure, like a relief valve
Low Dead Volume	3590A	Non-corrosive	1	3000	2-100	• 7 cc internal volume minimizes contamination and adsorption • 316 stainless steel body & diaphragm	• Use with mixtures containing trace quantities of reactive and/or adsorptive gases or vapors • 3590-TO specially cleaned for use with TO-14 calibration standards
	3590-TO	High purity TO-14 calibration standards	1	3000	2-100		
Lecture Bottle[2]	3320	Non-corrosive	1	3000	2-60	• Forged brass (3230) or PVC (3330) bodies • Neoprene (3230) or Teflon (3330) diaphragm	• Use with lecture bottles. 3330 designed for use with low pressure applications (1-6 psig); if higher pressures are required, use 3570 Series Mini Regulators
	3330	Corrosive	1	3000	1-6		
MicroMATE™ Preset Flow Rate	3345 Brass	Non-corrosive	1	240-1000 depending on model	30 psig (fixed)	• Brass or 316 stainless steel bodies • Fixed flow rate 0.3 slpm to 2.5 LPM • Push button (brass) or control knob (SS) on/off • Hose barb outlet • 3347: selectable flow rates from 0-3 slpm	• Used with MicroMAT™-14, -58, -105, -221 cylinders for delivery of calibration gases at a fixed flow rate
	3359 Stainless Steel	Non-corrosive or Semi-corrosive	1	500 psig	30 psig (fixed)		
	3347 Brass Variable Flow	Non-corrosive	1	3000 psig	50 psig (fixed)		
Specialty Line Regulators	3450 High flow line regulator	Semi-corrosive: dichlorosilane, ammonia, amines	1	500	2-100	• High purity stainless steel body and diaphragm	• High purity, high flow applications (up to 730 SCFH)
	3491 Low delivery pressure line regulator	Non-corrosive	1	120	1 mm Hg - 1.8 psig	• Economical brass body and butyl rubber diaphragm	• Non-corrosive, absolute pressure applications
	3494 Absolute pressure line regulator	Corrosive/high purity gases	1	120	28" Hg - 15 psig	• High purity stainless steel body and diaphragm	• Corrosive/high purity absolute pressure applications
	3700 Low pressure line regulator	Non-corrosive	1	250	2" wc[3] - 10 psig	• Cast zinc body and natural rubber diaphragm • "Pancake" design	• Non-corrosive, low inlet pressure/low delivery pressure applications

[1]The outlet pressure ranges shown above include the minimum and maximum pressures available with respect to the entire model series. For delivery pressure ranges of individual regulator models, refer to appropriate catalog sections.
[2]Other regulators can be supplied with CGA 170/180 for use with lecture bottles. Consult Matheson technical support for more information.
[3]wc=water column

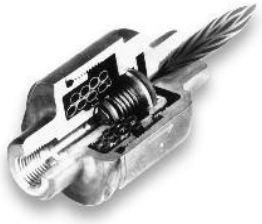
Helium Leak Testing

A helium leak test is used to determine the leak rate across the diaphragm or fittings on the regulator. The leak rate value should be as low as possible to prevent contamination by ambient air or escape of hazardous gases.

A complete helium leak test involves monitoring the inboard leakage and the outboard leakage of a regulator. This testing is available for a fee. Inboard leak testing involves drawing an internal vacuum on the regulator, and surrounding it with helium. The helium leak rate from the outside of the regulator to the inside of the regulator is then monitored. Outboard leak testing is performed by pressurizing the regulator with helium and analyzing the surrounding space for the presence of helium. Upon completion of the tests, a certificate is written and forwarded with the item to the customer.

Flash Arrestors

Flash arrestors are safety devices that shut off the gas flow if a flashback occurs in a system. A flashback is the combustion of a flammable mixture within the tubing or piping of a gas transfer system. If the flashback travels back through the piping and reaches the regulator, the regulator becomes a small bomb. If it reaches the gas cylinder, the cylinder becomes a large bomb.



Model 6104A
Flash Arrestor

As the flashback occurs, it is preceded by a shock wave. The flash arrestor senses the shock wave and closes a valve that shuts off the gas flow. The flame is detoured through three feet of spiral tubing in the flash arrestor, where it is extinguished. The flash arrestor also incorporates a reverse flow blocking mechanism that effectively prevents accidental mixing of gases in the regulator. Flash arrestors are available in brass (Model 6103) and stainless steel (Model 6104), and may be reset and reused up to three times after a flashback has occurred.

Purge Assemblies

A purge assembly is recommended for use with toxic, corrosive, or flammable gases. The assemblies are available in a cross purge configuration (Models 4774 and 4775) and a tee purge configuration (Models 4753-4756). The tee purge and the cross purge help to ensure safety when working with hazardous gases. The cross purge also protects the system from atmospheric contamination. The tee purge is used for general purpose corrosive applications; the cross purge is used for high purity applications where preventing contamination is critical.

Model 4774
Cross Purge Assembly, shown with a Model 3210 Deluxe Corrosive Service Regulator

Safety: When a regulator is removed from a cylinder of toxic or flammable gas, some gas is released into the work atmosphere. Some materials (such as silane) will spontaneously ignite when exposed to air. A purge assembly is used with an inert gas to flush all hazardous gases from the regulator, eliminating their release when the regulator is removed from the cylinder. Corrosive gases like hydrogen chloride present severe corrosion problems when they are exposed to moisture. The cross purge's valving configuration allows the regulator to be closed off completely from the atmosphere before removing it from the cylinder. Closing the valves prevents atmospheric moisture from contacting the gas, minimizing corrosion.

Purity: Atmospheric contaminants like moisture and oxygen cannot be tolerated in a high purity system. When a regulator is removed from a cylinder, atmospheric oxygen and moisture enter the regulator. When the regulator is put back into service, these contaminants enter the system. As mentioned above, the cross purge's valving configuration allows the regulator to be completely isolated from the atmosphere, preventing contaminants from entering the system.

Single Station Manifold

Single Station Manifolds

A single station manifold is used to mount a regulator to a wall. These units consist of a stainless steel bracket and a stainless steel flex hose with a CGA connection and integral check valve. Wall mounting the regulator eliminates the need to handle the regulator during cylinder changeout, minimizing the risk of it being improperly reinstalled. The check valve in the CGA connection prevents the release of gas when the cylinder is changed, and prevents ambient air from entering the system. The Model 53 has brass end connections, and the Model 54 has stainless steel end connections.

Model 6290
Excess Flow Valve

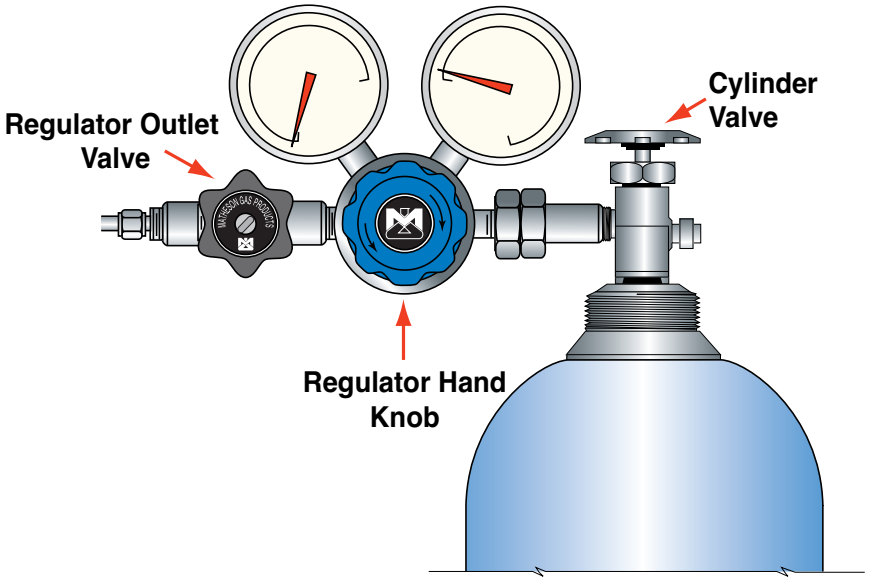
Excess Flow Valves

The excess flow valve (Model 6290 Series) is designed to shut down the gas supply in case of abnormal flow conditions caused by rupture, fire, or malfunctioning valves. The valve will automatically detect excess flow when the event occurs and will shut down the supply flow immediately so that the remaining contents of the cylinder(s) does not empty into the work or storage area. This feature is critical with toxic, poisonous, or flammable gases, but can also be important when dealing with inert gases in small, poorly ventilated areas where asphyxiation is a potential hazard.

Using Your Regulator

Installing the 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. The CGA prevents a regulator from being used on incompatible gases. For example, the CGA connection designated for use with oxygen (CGA 540) cannot be used on a cylinder of hydrogen. The table on page 18 lists common gases and their corresponding CGA connections.



Connecting the Regulator to the Cylinder and Setting the Delivery Pressure

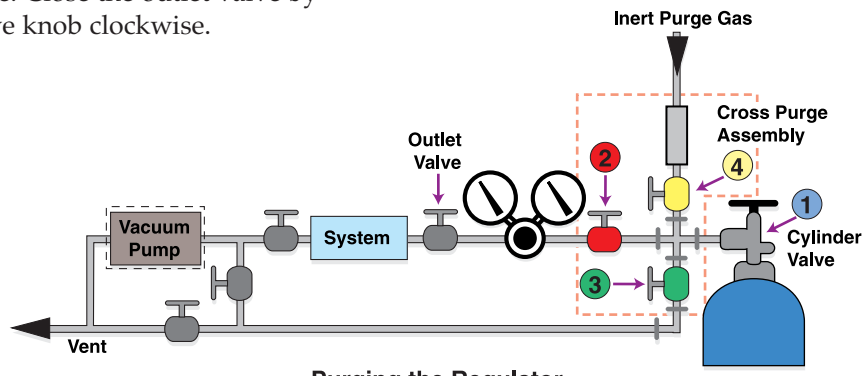
1. Close the regulator by rotating the hand knob in a counterclockwise direction.
2. Close the regulator outlet valve by rotating the valve knob in a clockwise direction.
3. Connect the regulator to the cylinder. The regulator should be attached to the cylinder without forcing the threads. If the inlet of the regulator does not fit the cylinder outlet, it is likely that the regulator is not intended for the gas service.
4. Slowly open the gas cylinder valve. Check the inlet pressure gauge to ensure that it registers the expected value. Low cylinder pressure may indicate a leaking valve, which can be a serious safety issue.
5. Check all high-pressure connections for leaks using an approved soap solution or leak detection device.
6. Open the cylinder valve completely.
7. Adjust the regulator hand knob to raise the delivery pressure to the desired value. Do not exceed the maximum delivery pressure indicated by the model number label on the regulator.
8. Open the outlet valve on the regulator to establish gas flow to the system. This valve is used to control the gas flow. The regulator itself should not be used as a flow controller by adjusting the pressure to obtain different flow rates. This practice defeats the purpose of the pressure regulator, and may result in a pressure setting that is in excess of the design pressure of the system.
9. After flow is established, the set delivery pressure may decrease slightly. Check to see that the delivery pressure is as desired and make any necessary adjustments.

Removing the Regulator from the Cylinder

For temporary shutdown (less than 30-minute duration), simply close the regulator outlet valve.

For extended shutdown (beyond 30-minute duration) follow these steps:

1. Shut off the gas cylinder valve completely.
2. Shut down any additional gas supplies that may be supplying gas to the system.
3. Open the regulator and the outlet valve to drain the contents of the regulator through the system in use. Both regulator gauges should descend to zero.
4. When using a toxic or other hazardous gas, purge the regulator and system with an inert gas (see instructions on Purging the Regulator, below).
5. Close the regulator by rotating the hand knob counterclockwise. Close the outlet valve by rotating the valve knob clockwise.
6. Disconnect the regulator from the system or downstream equipment.
7. Disassemble the regulator from the cylinder by slowly loosening the cylinder connection. Listen for gas seepage. If leakage is evident, re-tighten the cylinder connection immediately, and check the cylinder valve for proper closure. If leakage occurs when the cylinder valve is closed, and the regulator has been drained of all gases, contact the gas supplier immediately.
8. Replace the plug into the cylinder valve outlet (where applicable). Replace the cap on the cylinder over the valve. Remove the cylinder from the work place and put the cylinder into a safe storage area. Replace the empty cylinder with a new one and re-install the regulator.



Purging the Regulator

Purging the Regulator Using a Cross Purge Assembly

1. Close cylinder valve 1 and valve 2.
2. Open valves 3 and 4 allowing the inert purge gas to flush the Cross Purge Assembly.
3. Alternately close and open valve 3 a few times to dilute any gas trapped in the Cross Purge Assembly by pressurizing and venting.
4. Close valve 3. Close valve 4 until barely open. This will ensure a continuous small flow of inert purge gas during the time the inlet connection is open to the atmosphere.
5. Disconnect the regulator from the empty cylinder and reconnect it to the replacement cylinder.
6. Close valve 4.
7. Open valve 3. Evacuate the assembly, if possible, then re-close valve 3. If this is not possible, steps 2 and 3 should be repeated.
8. Open the cylinder valve 1 long enough to fill the Cross Purge Assembly with cylinder gas, and then re-close.
9. Repeat steps 7 and 8 once more if evacuation facilities are available; four more times if venting to atmosphere. At 225 psig cylinder pressure, this practice will dilute the purge gas to below 1 ppm.
10. Check to ensure that valves 3 and 4 are securely closed; the valve handles should be horizontal. Valve 2 may be opened. The handle will indicate the direction of the flow.

Performance Evaluation and Trouble Shooting

Several things are evaluated to determine a regulator's performance.

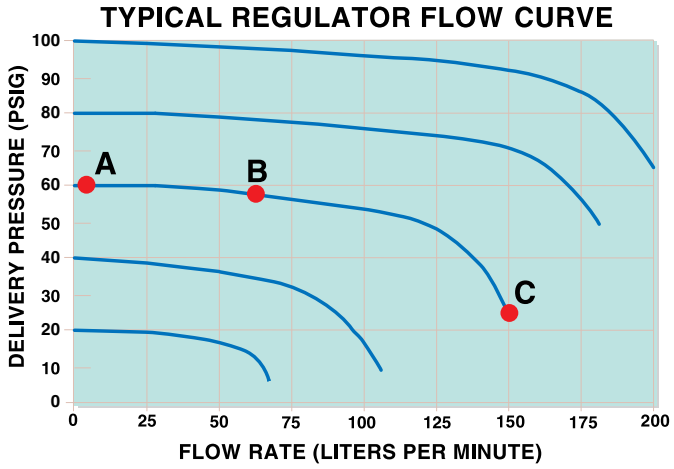
- **Pressure regulation as a function of flow:** All regulators experience some delivery pressure drop with increased flow rate. The smaller the drop as flow is increased, the better the performance.

- **Pressure regulation as a function of inlet pressure:** As a cylinder's contents are depleted and the inlet pressure drops, the regulator delivery pressure may either rise or fall depending on the regulator design. In both cases, this is known as regulator "droop." Two stage regulators generally provide better regulation under these circumstances.

- **"Lockup" of a regulator:** Lockup is the difference in pressure between a flowing and a non-flowing condition. If a regulator has its delivery pressure set while gas is flowing, and flow is suddenly stopped, a small rise in delivery pressure (lockup) will occur before the regulator's valve closes fully. The lower the lockup, the better the performance.

- **Seat leakage of the regulator:** Seat leakage is the tendency of gas to leak across the regulator seat, when the regulator outlet valve knob is fully closed (turned counterclockwise) and a high pressure source exists on the inlet side. A low leakage value is preferred.

- **Leakage rate across the diaphragm or fittings on the regulator:** This leakage value is normally measured using helium gas and a mass spectrometer or other type of helium leak detector. Regulators for specialty gas service may have published values of typical leakage rates either inboard (from the atmosphere into the regulator) or outboard (from the inside of the regulator to the atmosphere). For safety, it is important that this leak rate value be as low as possible in order to prevent possible contamination by ambient air and moisture or escape of hazardous gases.



Reading Flow Curves

The flow properties of a regulator are illustrated by the flow curve. The vertical axis indicates the delivery pressure at which the regulator is set, and the horizontal axis indicates the gas flow that the regulator passes. The curves are made by setting the delivery pressure while there is no gas flow, and then slowly opening the outlet valve downstream while measuring both the flow and the delivery pressure. Typically, as flow increases, delivery pressure drops. The portion of the curve to the far left is flat; in this range, the regulator demonstrates a stable pressure regulation although the flow is changing. For example, increasing the flow from point "A" to point "B" results in a slight decrease in pressure. The portion of the curve to the right shows a rapid drop in pressure with increasing flow rate, indicating that the regulator valve seat is almost wide open. If flow is increased from point "B" to point "C", there is a large drop in pressure that is typical for all regulators.

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	660*

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*
****For information on CGA 680 and 695 connections contact your nearest MATHESON office.*

Glossary of Regulator Terms

The following terms may be encountered when dealing with regulators.

Burst Pressure – A design test pressure which determines the ultimate structural strength of a regulator or valve. Permanent deformation and leakage are permitted, but parts must remain assembled (no sudden ruptures).

Captured Venting – A feature incorporated in a self-venting pressure reducing regulator which provides an additional port to permit the piping away of the expelled gas from the regulator's vent valve.

Control Element – One of the three basic elements of a pressure regulator. It acts to reduce a high inlet pressure to a lower working or delivery pressure. The control element is sometimes called a main valve, valve stem, or poppet.

Cv – See "Flow Capacity"

Decaying Inlet Characteristic – The effect of the set pressure of a regulator as a result of an inlet pressure change; normally an increase in outlet pressure due to a decrease in inlet pressure.

Diaphragm – A type of sensing element used in a regulator. Common diaphragm materials are Buna-N, Viton, Ethylene Propylene, 316 Stainless Steel, and Elgiloy.

Droop – The outlet pressure change (or offset) from the "set pressure" which occurs as flow rate increases.

Flow Capacity (Cv) – The maximum flow capability of a regulator or valve established at a specific set of conditions. The standard coefficient is the term 'Cv', which is defined as the flow of one GPM of water at one PSI pressure drop. The term Cv for gaseous service is dependent on the ratio of inlet to outlet pressure and must be determined by the use of the appropriate formulae.

Inlet Pressure (P1) – The pressure of the gas at the supply connection of a regulator or valve. Typical units of measure are psig, bar, or pascal.

Leakage, Inboard – Leakage through an external joint or seal where the direction of flow is from the outside into the regulator or valve. The leakage rate is measured in atm cc/sec He(lium).

Leakage, Outboard – Leakage through an external joint or seal where the direction of flow is from the inside of the regulator or valve to the outside. The leakage rate is measured in atm cc/sec He(lium), and the pressure inside the regulator should be stated.

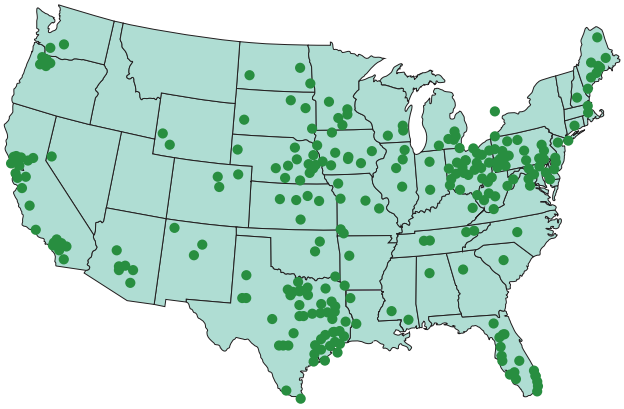
Load Element – One of the three basic elements of a pressure reducing regulator (usually a spring). It provides the means by which the operator can set the force that determines the outlet pressure of the regulator.

Lockup – The outlet pressure increase that occurs above the "set pressure" as the flow is decreased to zero.

Outlet Pressure (P2) – The pressure of the gas from the discharge connection of a regulator or valve.

Sensing Element – One of the three basic elements of a pressure reducing regulator, typically a diaphragm. It senses the changes in the outlet pressure, permitting the regulator to react in an attempt to return to the original "set pressure" by increasing or decreasing pressure.

Set Pressure – The desired operational outlet pressure for a regulator, normally stated at NO FLOW conditions.



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TECH TALK

with Steve Duren

Something to Consider When Choosing a Regulator

There are many things to consider when choosing a gas regulator for a specific application; desired range of outlet pressure, inlet pressure, gas purity, desired flow, gas compatibility, and so on. For this article, the focus will be on one, often overlooked, variable; Supply Pressure Effect.

The Supply Pressure Effect (SPE) of a regulator can be defined as the change in outlet pressure as a result of the change in inlet pressure. For most regulators, as the supply pressure of the gas to the regulator decreases, the outlet pressure of the regulator will increase. SPE is typically measured as an outlet pressure rise per some inlet pressure decrease (i.e. 1psi per 100psi decrease). The SPE is unique to each manufacturer's regulator.

The two basic types of regulators, Single Stage and Two Stage, handle SPE very differently. Single Stage Regulators typically have a large SPE when compared to Two Stage Regulators, thus allowing for a greater rise in outlet pressure as the supply pressure decreases. Two Stage Regulators handle SPE much better and often times have an SPE 10 to 25 times less than that of a single stage regulator. As a result, two stage regulators can show little rise in outlet pressure as the inlet pressure decreases. This is due in part to the design of the two stage regulator which regulates the supply pressure down to an intermediate pressure before the final regulation of the outlet pressure.

How SPE affects regulator performance can be calculated using the equation below:

$$\Delta P(\text{outlet}) = \Delta P(\text{inlet}) \times \text{SPE}$$

Suppose you have a cylinder with an initial pressure of 2,200psi and the cylinder is used down to a pressure of 200psi. Now suppose the regulator being used is a single stage regulator with an SPE of 1psi per 100psi and is set to a desired outlet pressure of 100psi. The SPE performance of the regulator in this situation would be:

$$\Delta P(\text{outlet}) = (2{,}200\text{-}200)\text{psi} \times (1\text{psi}/100\text{psi})$$
$$\Delta P(\text{outlet}) = 2{,}200\text{psi} \times 0.01$$
$$\Delta P(\text{outlet}) = 20\text{psi}$$

In other words, if no adjustments were made to the regulator, the outlet pressure of the regulator would rise to 120psi over the course of using the cylinder from 2,200psi to 200psi.

If the same scenario above used a two stage regulator with an SPE of 0.02psi per 100psi, the regulator would perform as below:

$$\Delta P(\text{outlet}) = 2{,}200\text{-}200)\text{psi} \times (0.02\text{psi}/100\text{psi})$$
$$\Delta P(\text{outlet}) = 2{,}000\text{psi} \times 0.0002$$
$$\Delta P(\text{outlet}) = 0.4\text{psi}$$

In other words, if no adjustments were made to the regulator, the outlet pressure of the regulator would rise to 100.4psi over the course of using the cylinder.

So what does all this mean when selecting a regulator? Of course this is only one of many aspects to consider when selecting a regulator. But, in situations where the inlet pressure will vary and strict control of the outlet pressure is desired, choose a two stage regulator. In situations where the inlet pressure does not vary or if adjustments can be made frequently to the regulator; a single stage regulator may be adequate.

If you need help selecting the right regulator for your application, please don't hesitate to call a General Air representative.

9

Regulators

Introduction

The BOC range of scientific gases equipment within this section has been selected on the basis of its compatibility with the intended duty.

The key issues in the handling of scientific gases are:

- Safety (particularly very toxic gases) and
- Reticulation without change in purity.

The range allows great flexibility of design so please contact BOC Scientific to discuss your specific gas control requirements.

The BOC range of scientific gases equipment consists of:

- Regulators
- Manifolds
- Control valves
- Flow meters
- Purge assemblies
- The necessary installation services and accessories

Considerations When Specifying A Scientific Regulator

The following must be carefully considered when choosing a regulator for scientific applications:

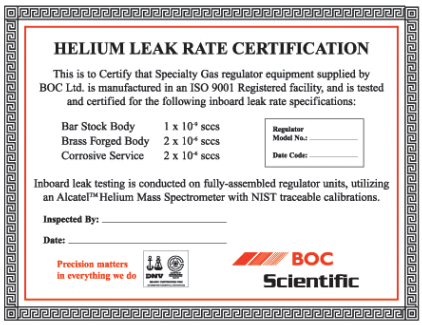
- Type of gas and its characteristics
- Compatibility of gas with materials of construction
- Maximum anticipated inlet pressure (kPa or psig)
- Outlet pressure range required (kPa or psig) and accuracy / tolerance
- Flow rate required and range (litres/minute)
- The importance of maintaining constant pressure throughout the application. This will determine whether a single or dual stage regulator should be used.

While all pressure regulators operate in a similar manner it is incorrect to assume that the same regulators may be suited to both industrial and high purity gas applications.

The significant differences in the design and materials of construction of scientific regulators differentiate them from industrial regulators.

The following information is provided to allow the users of high purity gases to determine the type of regulator that will best suit their intended application.

Our Scientific Sales Specialist and/or Scientific Support Centre can assist you in making the correct selection and also organise the supply of the required gas or gases in the optimum container size(s). For further details please contact 1800 658 278 (AUS) or 0800 111 949 (NZ).


HELIUM LEAK RATE CERTIFICATION

This is to Certify that Specialty Gas regulator equipment supplied by BOC Ltd. is manufactured in an ISO 9001 Registered facility, and is tested and certified for the following inboard leak rate specifications:

Bar Stock Body	1 x 10^{-9} sccs
Brass Forged Body	2 x 10^{-8} sccs
Corrosive Service	2 x 10^{-8} sccs

Regulator Model No.: _____
Date Code: _____

Inboard leak testing is conducted on fully-assembled regulator units, utilizing an Alcatel™ Helium Mass Spectrometer with NIST traceable calibrations.

Inspected By: _____

Date: _____

Precision matters in everything we do

BOC Scientific

Regulator Design For High Purity Duty (Scientific)

Scientific or high purity regulators are used to reduce and regulate the flow of high pressure gas from either a cylinder or pipeline and to deliver at desired pressure for the application to hand. They maintain the selected or set delivery pressure as the pressure in the gas cylinder decreases whilst gas is being withdrawn.

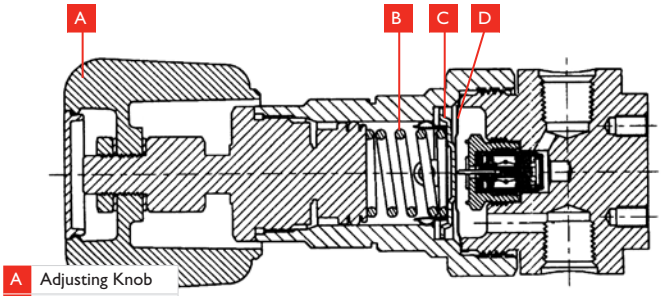
The primary objective of a scientific regulator is to maintain the quality and integrity of your high purity gas such that it is not contaminated by the materials with which the gas comes into contact with inside the regulator.

The regulator must not allow;

1. air to leak into the gas stream (atmospheric contamination)
2. gas to leak to the atmosphere or be absorbed within the regulator (potential workplace contamination)
3. off-gassing from materials of construction (internal contamination)

How Regulators Control Your Gas Flow

Single Stage Regulators



A	Adjusting Knob
B	Adjusting Spring
C	Diaphragm Plate
D	Diaphragm

The regulator controls the set pressure by balancing the outlet gas pressure on the diaphragm against the compressed spring.

When the adjusting knob is screwed in, the spring is forced down on to the diaphragm, which pushes down on the seat spindle. Once the spindle is forced away from its seat high pressure gas enters the low pressure chamber of the regulator.

If the outlet from the regulator is isolated, pressure builds up in the regulator low pressure chamber until the diaphragm compresses the main spring. This will cause the spindle to 'reseat', shutting off the gas flow from the high pressure gas inlet.

When the gas is used downstream the pressure in the low pressure chamber drops, allowing the main spring to force the diaphragm down again, opening the spindle and raising the pressure in the low pressure chamber.

Why delivery pressure gradually rises with single stage regulators

The set outlet pressure for a single stage regulator will remain constant as long as its inlet pressure remains constant. However, in the case where the regulator is used directly on a gas cylinder, the inlet pressure will decrease as the gas cylinder's content is depleted and the outlet pressure will rise.

The reason that this occurs is that decrease in the gas cylinder pressure (i.e. regulator inlet pressure) reduces the force on the high pressure side of the seat therefore causing a corresponding rise in the outlet pressure. The rise in outlet pressure (as inlet pressure decreases) of most single stage regulators is between 5–7 kPa per 1000 kPa.

This means that the outlet pressure will rise approximately 70–110 kPa over the life of a cylinder if the adjusting knob (i.e. spring compression) is not readjusted to compensate for the drop in the cylinder gas pressure.

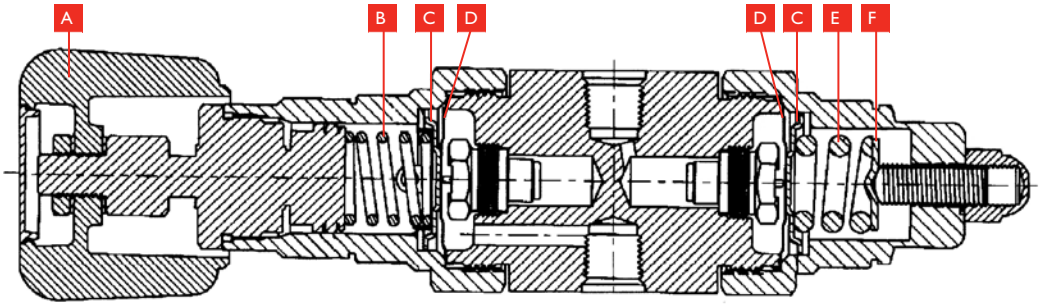
Single Stage Regulator Applications

Single stage regulators are suited for:

- Processes which are insensitive to the pressure increase. (i.e. as the cylinder pressure decreases).
- Short term gas delivery applications (typically <20 mins) e.g. the introduction of sample gas from a cylinder for analysis to an analytical instrument such as gas chromatograph, process analyser etc.
- Control of pressure from cylinders containing liquefied gases.

NOTE At constant ambient temperature, the pressure in gas cylinders containing liquefied gases remains constant until the liquid contents runs out.

Dual Stage Regulators



A	Adjusting Knob
B	L.P.Adj. Spring
C	Diaphragm Plate
D	Diaphragm
E	H.P.Adj. Spring
F	Spring Button

The main difference with dual stage pressure regulation is that the regulator is designed to maintain a more constant outlet pressure.

The first stage provides the initial primary pressure breakdown to a value slightly more than the maximum required outlet pressure.

This means the second stage has a smaller pressure differential to contend with and as a result the combined effect of using two stages will give finer pressure control with less variation.

A dual stage regulator is effectively two single stage regulators in one regulator body.

- The first stage is pre-set at an intermediate pressure, normally 3500 kPa or below.
- The second stage is adjustable and reduces the intermediate pressure to the desired pressure.

Since the second stage sees only minor variations in inlet pressure from the first stage, outlet pressure will remain constant throughout the life of a cylinder.

Dual Stage regulator applications

- Processes which are sensitive to small changes in pressure.
- Long term pressure control of cylinders of permanent gases

e.g. for use with carrier gases for gas chromatographs.

The Materials of Construction for Scientific Regulators

The primary consideration when selecting a regulator for a high purity gas service is to ensure that all materials which come in contact with the gas are stable and compatible with the gas. they should also be stable under the anticipated pressure and temperature range. It is also important to select regulators that keep to a minimum the number of materials which come in contact with the gas.

The Body

The body of the regulator has the largest surface area exposed to the gas. The two materials most commonly supplied for the body of a high purity gas service regulator are brass and 316 stainless steel.

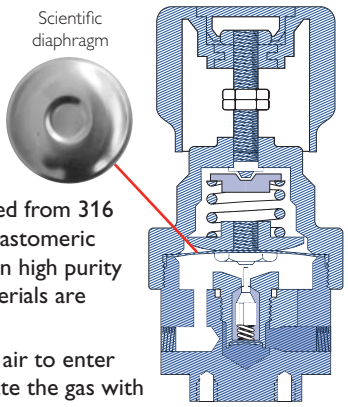
Brass Body: Regulator bodies made from brass are completely machined from a single piece of brass. Their body cavities are normally designed to minimise the internal area and permit thorough purging. Brass is recommended for inert and high purity gas service.

Stainless steel Body: Grades 316 and 316L offer the highest level of compatibility with a wide range of high purity gases.

Regulators with 316 stainless steel bodies are recommended for;

- Corrosive gas service
- Reactive gas mixtures
- Ultra high purity gas service.

The Diaphragm



The two key issues for material selections are the diaphragm and the method of sealing the diaphragm.

Diaphragms for all high purity applications must be manufactured from 316 stainless steel. Regulators with elastomeric diaphragms must never be used in high purity gas applications. Elastomeric materials are porous and will;

1. Allow significant quantities of air to enter the gas stream and contaminate the gas with air (mainly, oxygen, nitrogen and moisture).
2. Allow adsorption of some gases into the elastomeric diaphragm. This will also alter the composition of the gas mixture flowing over it.

The use of a 316 stainless steel diaphragm will eliminate both of these possibilities.

The body/diaphragm interface will determine the leak integrity of the regulator. A metal to metal seal, without an O ring or coatings, ensures the highest integrity. Metal to metal seals can limit helium leak rates to the range of $1x10^{-9}$ cc/sec He*. Regulators with secondary seals at the diaphragm typically have leak rates in the range of $1x10^{-8}$ cc/sec He.

* He (Helium gas) has a very small molecular size which means it is ideal for leak testing. The flow rates quoted are extremely low.

The Seat

Regulator seats must be made of a soft resilient material to ensure a high integrity seal between the high and low pressure sections of the regulator. The seat material must be compatible with the gas service. The best materials for high purity service are from the Teflon® family of materials.

®DuPont registered trademark

How Gas Characteristics Affect Regulator Selection

Other than dictating the type of material required for the regulator, the gas application determines the type of inlet connection that should be specified for the regulator. This makes it impossible to connect unsuitable equipment to a cylinder.

If any doubt exists as to the proper connection, a BOC Scientific Sales Specialist should be consulted.

High purity Gases may be separated into categories based on their properties as follows.

Inert gases

Inert gases are non-corrosive and generally compatible with most materials. However, for instrument calibration or purging applications, it is possible for high purity gases such as nitrogen, argon and helium to become contaminated by the diaphragm and/or sealant materials used in common industrial regulators.

High purity gas regulators which have a brass body with a 316 stainless steel diaphragm, are usually acceptable for inert gas service.

Ultra high purity gas applications require a regulator with a stainless steel body and a 316 stainless steel diaphragm.

Corrosive gases

Corrosive gases present special challenges in the selection of regulators.

Most of the gases classified as corrosive (e.g., HCl, Cl_2 and H_2S) are corrosive only in the presence of moisture.

Regulators made entirely of 316 stainless steel are recommended for high purity corrosive gas service, but these also must be kept dry to avoid rapid corrosion of the regulator's interior. Where wet corrosive gases are handled, it may be necessary to specify a regulator made of more exotic materials, such as Monel, Hastelloy, nickel plated brass or polyvinyl chloride.

Toxic gases

Toxic gases present a potential safety hazard in the work place and special care must be exercised to prevent their release into the atmosphere. Thus, it is extremely important that regulators selected for toxic gas service be equipped to capture any release.

Gas is most likely to leak from the spring case if the diaphragm fails. To prevent external leakage, a toxic gas regulator should be equipped with a sealed spring case and a captured vent assembly. This allows for venting the gas from the spring case to a safe location. A pressure relief valve must be fitted immediately after the regulator to protect low pressure components downstream should the regulator valve assembly fail to seal. The pressure relief valve must be piped to a suitable disposal system.

Inlet pressure

The standard high pressure inlet rating for regulators is 20,000 kPa settled. There are however, High Pressure (HP) and Extra High Pressure (EHP) cylinders with ratings of up to 40,000 kPa. In addition, many high purity gases are liquefied or are stored at low pressure. For these gases a regulator with an appropriately ranged inlet pressure gauge will enable the user to assess a cylinder's contents more accurately.

At Standard Temperature and Pressure (1 atmosphere and 15 degrees Centigrade)

Outlet pressure

Regulators are designed with different adjustment springs in the spring case to achieve a specific outlet pressure range. The low end range is normally 0–100 kPa but may be as low as 0–13 kPa. The upper limit in the diaphragm type regulator is usually about 3500 kPa.

Flow rate

Flow requirements for most High Purity Gas applications will be fairly low and are expressed in litres per minute (LPM). Flow curves display a graph of Maximum Flow as a function of Inlet Pressure and Outlet Pressure.

Graphs show the maximum flow obtainable from a regulator at a given outlet pressure for a set inlet pressure.

Although a regulator should not be used to control flow, they are designed for high, medium and low flow performance. Flow curves are used to determine if a regulator will meet the flow requirement of a specific application. A flowmeter and control valve can be incorporated into the process line to control and indicate flow.

Guide to BOC Part Numbering System

Example

H	P	S	5	0	0	-	1	2	5	-	5	8	0	-	4	S		
HPS			500				125				580				4S			

Regulator Series — **Option**

HPS	Type of Regulator
HPS	High Purity Single Stage
HPT	High Purity Dual Stage
HPL	High Purity Line
GPS	General Purpose Single Stage
SGS	Corrosion Resistant Single Stage
SGT	Corrosion Resistant Dual Stage
SGL	Corrosion Resistant Line
LB	Lecture Bottle

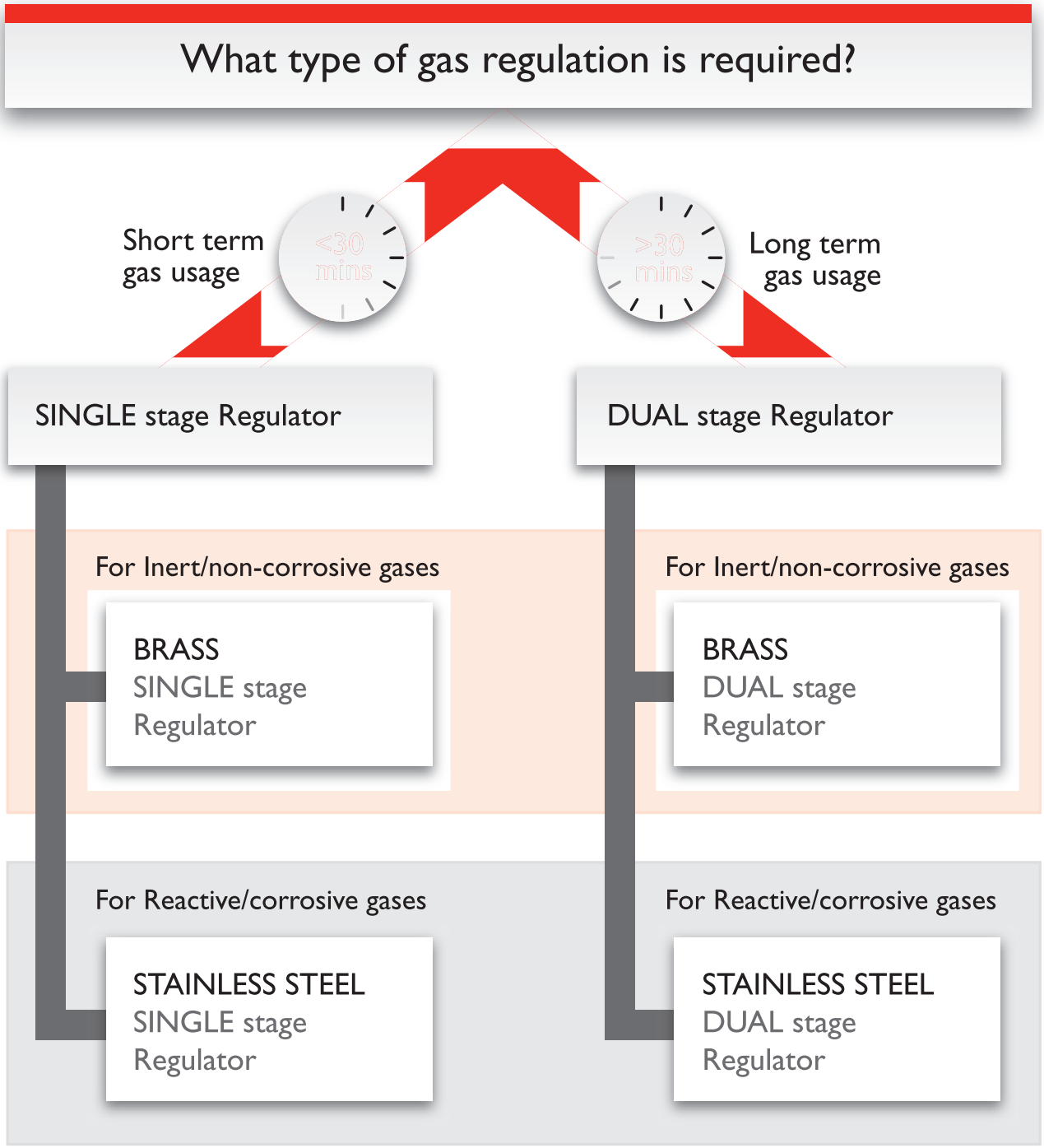
125	Delivery Pressure (psi) Outlet Pressure Range
15	0–15 psi (104 kPa)
40	0–40 psi (276 kPa)
80	0–80 psi (552 kPa)
125	0–125 psi (863 kPa)
200	0–200 psi (1,380 kPa)
300	0–300 psi (2,070 kPa)
500	0–500 psi (3,450 kPa)

NOTE Delivery pressure must be quoted in psi.

580	Inlet Fitting Cylinder to regulator
Brass (sometimes Chrome plated)	
10	Type (Australian Std)
20	
30	
50	
60	
110	CGA (International Std)
580	
350	
346	
540	
590	
Stainless Steel:	
15	Type (Australian Std)
32	
44	
705	CGA (International Std)
660	
330	
240	

4S	Outlet Fitting Regulator to the hose
BV	Shut-off Valve 1/4″
DK	DRK diaphragm 1/4″
4M	1/4″ male fitting
4F	1/4″ female fitting
2S	1/8″ Swagelok
4S	1/4″ Swagelok (most commonly used)
FM	Flowmeter

Scientific Regulator Selection Guide



Scientific Regulator Quick Reference Chart

If the following tables do not contain a regulator to suit your requirements, please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Regulator Model	Typical Usage	Regulator Description	Max. Inlet Pressure (kPa)	Outlet Pressures Available (kPa)	Refer Page No
Inert and Non-Corrosive Gases – Short Term Applications These single stage regulators may be used where a slight variance in delivery pressure is acceptable as cylinder pressure decreases. Typically for gas application time frames of <30 minutes.					
HPS500	For very High purity, non-corrosive gas applications Use with High Purity Hydrocarbons, Inert, Oxidising, Rare and Flammable Gases NOTE: Cannot be used for Acetylene	Single Stage Brass Regulator	20,000	0–105 0–280 0–560 0–875 0–1400 0–2800 0–3500	
HPS270	Use with High Purity, Inert and Rare Gases where better control over low delivery pressures is required.	Single Stage forged Brass Regulator	20,000	0–105	
HPS280	Use with High Purity Acetylene	Single Stage forged Brass Regulator	20,000	0–105	
Inert and Non-Corrosive Gases – Long Term Applications These dual stage regulators should be used where constant delivery pressure is critical and/or when the gas application time frame is more than 30 minutes.					
HPT500	For very High purity, non-corrosive gas applications where constant delivery pressure is required as cylinder pressure decreases. Use with High Purity Hydrocarbons, Inert, Oxidising, Rare and Flammable Gases NOTE: Cannot be used for Acetylene	Dual Stage Brass Regulator	20,000	0–280 0–560 0–875 0–1400 0–2800 0–3500	
HPT270	Use with High Purity, Inert, and Rare Gases where better control over low delivery pressures is required.	Dual Stage Forged Brass Regulator	20,000	0–105	
Reactive and Corrosive Gases – Short Term Applications These single stage regulators may be used where a slight variance in delivery pressure is acceptable as cylinder pressure decreases. Typically for gas application time frames of <30 minutes.					
SGS500	For very High purity, reactive gas applications where slight variance in delivery pressure is acceptable as cylinder pressure decreases. Use with critical High Purity, mild corrosive or toxic gas applications.	Single Stage Stainless Steel Regulator	20,000	0–105 0–280 0–560 0–875 0–1400 0–2800 0–3500	
LB165	Lecture bottles containing corrosive gases	Single Stage Regulator	20,000	0–105 0–280	
S455	Toughest demands. Usage with low pressure corrosive gases such as Chlorine and Hydrogen Chloride	Single Stage Corrosive Gas Regulator	20,000	0–100 0–280 0–840	
S408	For toxic, low pressure gases such as Ammonia and Sulphur Dioxide	Single Stage Mildly Corrosive Gas Regulator	20,000	0–105 0–350	

Regulator Model	Typical Usage	Regulator Description	Max. Inlet Pressure (kPa)	Outlet Pressures Available (kPa)	Refer Page No
Reactive Gases and Corrosive Gases – Long Term Applications These dual stage regulators should be used where constant delivery pressure is critical and/or when the gas application time frame is more than 30 minutes.					
SGT500	For very High purity, reactive gas applications. Use with critical High Purity, mild corrosive or toxic gas applications.	Dual Stage Stainless Steel Regulator	20,000	0–105 0–280 0–560 0–875 0–1400 0–2800 0–3500	

Scientific Regulator Selection Chart

Gas	Regulator Body/Series	Inlet Connection
Acetylene	HPS280	CGA 510 (1B, 2B), Type 20 (G,E,D)
Air zero grade Instrument grade	HPS500, HPT500, HP54	AS 2473 Type 60, Type 61
Alpha, Beta and Spectra-Seal™ Mixtures:		
Non Flammable	HPS500, HPT500	Type 10
Oxidising	HPS500, HPT500	Type 10
Flammable	HPS500, HPT500	Type 20
Flammable, Toxic	HPS500, HPT500	Type 20
Corrosive, Toxic	SGS500, SGT500	Type 44 (or BS No. 14)
Corrosive, Toxic, Flammable	SGS500, SGT500	BS No. 15
Ammonia	LB165 S408	CGA 180 (LB) CGA 660 (QF, UF) Type 32 (WT, WH, S,R)
Argon	HPS500, HPT500	Type 10 CGA 580 (B, 1A)
Arsine	SGS500	CGA 350
Boron Trichloride	Not required – use control valve	CGA 660
1,3 Butadiene	LB150	CGA 170 (LB) CGA 510
n-Butane	LB150	CGA 170 (LB) CGA 510
1-Butene	LB150	CGA 170 (LB) CGA 510
2-Butene (cis and trans)	LB150	CGA 170 (LB) CGA 510
Carbon Dioxide	HPS500, HPT500	AS 2473 Type 30 (D, E, F, G)
Carbon Monoxide	LB150 HPS500, HPT500	CGA 170 (LB) CGA 350 Type 20 (D)
Carbonyl Sulphide	LB165 SGS500, SGT500	CGA 180 (LB) CGA 330

Gas	Regulator Body/Series	Inlet Connection
Chlorine (high purity)	LB165 S455	CGA 180 (LB) CGA 660
Cyanogen	SGS500	CGA 660
Deuterium	LB150 HPS500, HPT500	CGA 170 (LB) CGA 350
Dichlorosilane	Not required – use control valve	CGA 678
Dimethylether	Not required – use control valve	CGA 170 (LB) CGA 510
Ethane	LB150 HPS500	CGA 170 (LB) CGA 350
Ethylene (technical grade)	LB150 HPS500, HPT500	CGA 170 (LB) CGA 350 AS2473 Type 20 (D, G)
Ethylene Oxide	Not required – use control valve	AS2473 Type 40
Germane	HPS501	CGA 350
Halocarbon 11, 12, 113, 114, 115, 142b, C318	Not required – use control valve	CGA 660 CGA 170 (LB)
Halocarbon 13, 1113, 116, 13B1, 115, 142b, 23,	LB150 HPS501	CGA 170 (LB) CGA 510
Helium	HPS500, HPT500, HP54	AS2473 Type 10 CGA 580 (1A, 6)
Hexafluoropropylene	LB150 SGS501	CGA 170 (LB) CGA 660
Hydrogen	HPS500, HPT500, HP54	CGA 350 AS2473 Type 20 (D, E, G)
Hydrogen Bromide	LB165 SGS500	CGA 180 (LB) CGA 330
Hydrogen Chloride (high purity)	LB165 SGS500 S455	CGA 180 (LB) CGA 330
Hydrogen Fluoride	Not required – use control valve	CGA 180 (LB) CGA 660
Hydrogen Selenide	HPS501	CGA 350
Hydrogen Sulphide	LB165 SGS500	CGA 180 (LB) CGA 330
Isobutane (research grade)	Not required – use control valve	CGA 170 (LB) CGA 510
Krypton	HPS500, HPT500	CGA 580
Methane (technical grade)	LB150 HPS500, HPT500	CGA 170 (LB) CGA 350 AS2473 Type 20 (D)
Methyl Bromide	Not required – use control valve	CGA 170 (LB) CGA 320
Methyl Chloride	Not required – use control valve	CGA 170 (LB) CGA 660
Methyl Fluoride	LB165 SGS501	CGA 180 (LB) CGA 350

Gas	Regulator Body/Series	Inlet Connection
Methyl Mercaptan	Not required – use control valve	CGA 180 (LB) CGA 330
Neon	LB165 HPS500, HPT500	CGA 180 (LB) CGA 580
Nitric Oxide	SGS500, SGT500	CGA 660 BS 15
Nitrogen	HPS500, HPT500, HP54	CGA 580 (1A,6) AS 2473 Type 50, 51
Nitrogen Dioxide	Not required – use control valve	CGA 660
Nitrogen Trifluoride	Not required – use control valve	BOC679
Nitrous Oxide (Atomic Absorption)	HPS500, HPT500 GPS270	AS 2473 Type 30 (D, E, G)
Oxygen	HPS500, HPT500 HP54	CGA 540 AS 2473 Type 10 (D, E G)
Perfluoropropane	Not required – use control valve	CGA 660
Phosgene	Not required – use control valve	CGA 660
Phosphine	SGS500, HPS500	CGA 350
Phosphorous Pentafluoride	SGS500	CGA 660
Propadiene (Allene)	LB150 HPS500, HPT500, HPS501, HPT501	CGA 170 (LB) CGA 510
Propane	LB150 HPS501	CGA 170 (LB) CGA 510
Propylene	LB150 HPS501	CGA 170 (LB) CGA 510
Silane	SGS530	CGA 350
Silicon Tetrafluoride	SGS500	CGA 330
Sulphur Dioxide	Use control valve or S408	CGA 180 CGA 660 AS 2473 Type 32 (P, R)
Sulphur Hexafluoride	LB150 HPS500	CGA 170 (LB) CGA 590 AS 2473 Type 31 (D, G)
Sulphur Tetrafluoride	SGS500, SGT500, HPS501, HPT501	CGA 330
Xenon	HPS500	CGA 580

Model HPS500

Single stage regulator with chrome plated brass body

Short Term Applications

- High purity hydrocarbons
- Inert gases
- Oxidising gases
- Rare gases
- Flammable gases (except acetylene)

Features

Single Stage Brass Chrome Plated for Corrosion Resistance – Regulator for Hydrocarbons Inert, Oxidising, Rare and Flammable Gases

- Metal to metal diaphragm seal
- Brass bar stock body with minimum gas wetted area for optimum purging
- Helium leak rate of $1x10^{-9}$ scc/sec
- Regulator fitted with pressure gauges, pressure relief valve, cylinder connection and outlet fitting

Applications

- Chromatography
- Reticulation systems
- Purge systems
- Instrument calibration
- Sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating temperature	-17°C to 65°C
Pressure rise	<4 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.083
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Chrome plated brass bar stock
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Teflon™

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G01921	0–875	AS Type 10	Non Flammable e.g. Oxygen, Argon
G0284	0–875	AS Type 50	Nitrogen
G0285	0–875	AS Type 60	Air
G10048	0–875	CGA 540	Oxygen
G01922	0–875	AS Type 20	Flammable e.g. Hydrogen
G01923	0–875	CGA 350	Carbon Monoxide, Deuterium, Ethane, Germane, Hydrogen Selenide, Methane
G01924	0–875	CGA 510	Allene, Halocarbons, Propane, Propylene
G10002	0–875	CGA 580	Rare and inert e.g. Argon, Helium, Krypton, Neon, Nitrogen, Xenon
G01991	0–875	CGA 590	Non flammable e.g. Sulphur hexafluoride
G10047	0–875	AS Type 30	Non flammable e.g. Carbon Dioxide, Nitrous oxide
G01989	0–875	CGA 320	Liquefiable gases e.g. Carbon Dioxide

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model HPS270

Single stage regulator with chrome plated brass body

Short Term Applications

- High purity gases
- Inert gases
- Rare gases
- Better control over low delivery pressures

Features

Single Stage Brass Regulator for Hydrocarbons, Inert, Oxidising, Rare and Flammable Gases

- Metal to metal diaphragm seal
- Brass forged body
- Helium leak rate of $1x10^{-8}$ scc/sec
- Regulator fitted with pressure gauges, pressure relief valve, cylinder connection and outlet fitting

Applications

- Chromatography
- Reticulation systems
- Purge systems
- Instrument calibration
- Sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-17°C to 65°C
Pressure rise	<3.5 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.05
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Chrome plated forged brass
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	PCTFE™ and Viton®

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G0345	0–105	AS Type 50	Nitrogen

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model HPS280

Short Term Applications

- High Purity Acetylene

Single stage regulator with chrome plated brass body

Features

Single Stage Brass Regulator for Acetylene

- Metal to metal diaphragm seal
- Brass forged body
- Helium leak rate of $1x10^{-8}$ scc/sec
- Regulator fitted with pressure gauges, cylinder connection and outlet fitting

Applications

- Atomic Absorption analytical instrumentation
- Reticulation systems
- Instrument calibration
- Sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-17°C to 65°C
Pressure rise	<3.5 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.05
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Chrome plated forged brass
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	PCTFE™ and Viton®

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G10038	105	Type 20	Acetylene

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model HPT500

Dual stage regulator with chrome plated brass body

Long Term Applications

- High purity hydrocarbons
- Inert gases
- Oxidising gases
- Rare gases
- Flammable gases (except acetylene)

Features

Two Stage Brass Chrome Plated Regulator for Hydrocarbons, Inert, Oxidising, Rare and Flammable Gases

- Metal to metal diaphragm seal
- Brass bar stock body with minimum gas wetted area for optimum purging
- Helium leak rate of $1x10^{-9}$ scc/sec
- Regulator fitted with pressure gauges, pressure relief valve, cylinder connection and outlet fitting

Applications

- Chromatography
- Reticulation systems
- Purge systems
- Instrument calibration
- Sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-17°C to 65°C
Pressure rise	<0.5 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.128
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Chrome plated brass bar stock
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Teflon™

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G01926	0–875	AS Type 10	Non Flammable e.g. Oxygen, Argon
G0294	0–875	AS Type 50	Nitrogen
G0295	0–875	AS Type 60	Air
G01947	0–875	AS Type 20	Flammable e.g. Hydrogen
G01948	0–875	CGA 350	Carbon Monoxide, Deuterium, Ethane, Germane, Hydrogen Selenide, Methane
G01950	0–875	CGA 510	Allene, Halocarbons, Propane, Propylene
G01949	0–875	CGA 580	Rare and inert e.g. Argon, Helium, Krypton, Neon, Nitrogen, Xenon
G01994	0–875	CGA 590	Non flammable e.g. Sulphur hexafluoride
G10049	0–875	AS Type 30	Non flammable e.g. Carbon Dioxide, Nitrous Oxide
G01993	0–875	CGA 320	Liquefiable gases e.g. Carbon Dioxide

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model HPT270

Dual stage regulator with brass body

Long Term Applications

- High purity gases
- Inert gases
- Rare gases
- Better control over low delivery pressures

Features

Two Stage Brass Regulator for Inert and Rare gases

- Metal to metal diaphragm seal
- Brass forged body
- Helium leak rate of $1x10^{-8}$ scc/sec
- Regulator fitted with pressure gauges, pressure relief valve, cylinder connection and outlet fitting

Applications

- Chromatography
- Reticulation systems
- Purge systems
- Instrument calibration
- Sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-17°C to 65°C
Pressure rise	<0.7 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.04
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

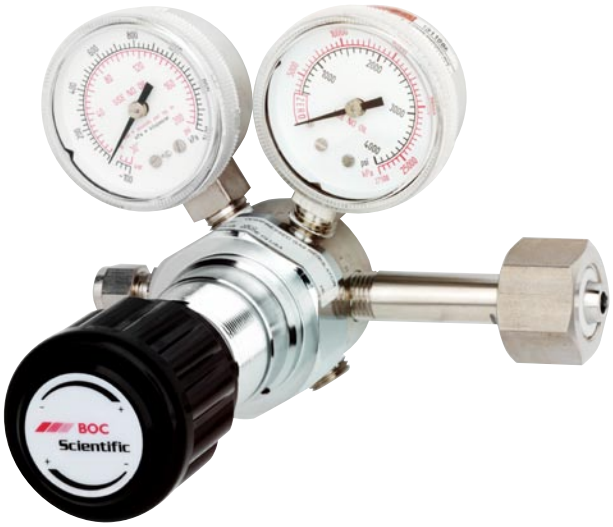
Body	Bar stock brass
Bonnet	Nickel-plated Brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Viton®

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G0346	0–105	AS Type 50	Nitrogen

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model SGS500



Single stage regulator with stainless steel body

Short Term Applications

- Reactive gases
- Mild corrosive gases
- Toxic gases

Features

Single Stage Stainless Steel Regulator for Reactive or toxic gas applications

- Metal to metal diaphragm seal
- Stainless Steel bar stock body with minimum gas wetted area for optimum purging
- Helium leak rate of $1x10^{-9}$ scc/sec
- Regulator fitted with pressure gauges, cylinder connection and outlet fitting

Applications

- Gas chromatography
- Regulation of Corrosive gases
- Epitaxial Reactors
- Diffusion furnaces
- Research sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-40°C to 65°C
Pressure rise	<4 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.083
Inlet and Outlet Ports	1/4″ NPT(F)

Materials of Construction

Body	Bar stock 316L Stainless steel
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Teflon™

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G01925	0–875	CGA 660	Corrosive, Toxic eg, Cyanogen, Halocarbons, Hexafluoropropylene, Nitric Oxide, Phosphorous Pentafluoride
G10003	0–875	CGA 330	Corrosive, Toxic e.g. Carbonyl Sulphide, Hydrogen Bromide, Hydrogen Chloride, Hydrogen Sulphide, Sulphur Tetrafluoride
G01952	0–875	BS15 – LH Spectra-Seal	Flammable, Corrosive, Toxic i.e. BOC Spectra Seal mixtures
G01951	0–875	Type 44 – RH Spectra-Seal	Corrosive, Toxic i.e. BOC Spectra Seal mixtures

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model LB165

Single stage regulator with stainless steel body

Short Term Applications

- Lecture bottles containing corrosive gases

Features

- Designed for use with corrosive lecture bottle service
- Compact and light weight
- Stainless steel needle outlet valve
- Helium leak rate of 2×10^{-9} scc/sec
- Outlet connection 1/4″ NPT male
- Regulator fitted with pressure gauges, pressure, cylinder connection and outlet fitting

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-17°C to 65°C
Pressure rise	<2 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.05
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Bar stock 316L Stainless steel
Bonnet	Nickel-plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Teflon®
Gauges	Stainless steel

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G01927	280	CGA 180	Corrosive e.g. Carbonyl Sulphide, Hydrogen Bromide, Hydrogen Chloride, Hydrogen Fluoride, Hydrogen Sulphide, Methyl Fluoride, Neon

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model S455

Short Term Applications

- Highly corrosive gases
- Chlorine
- Hydrogen Chloride

Single stage regulator with nickel plated brass body

Features

Constructed to resist attack from strong acid forming gases such as the Halogens

- Direct controlled seal for added safety and positive shut-off
- Special vented bonnet with connection for venting hazardous materials safely in the event of diaphragm failure
- Gauges, nozzles and outlet valve constructed of Monel®

Applications

- Precise regulation of low pressure corrosive gases

Specifications

Maximum inlet pressure	20,000 kPa
Adjustable outlet pressure range	0–100 kPa 0–280 kPa 0–840 kPa
Operating Temperature	-28°C to 60°C
Flow Coefficient	CV = 0.2
Inlet and Outlet Ports	1/4″ NPT (M)

Materials of Construction

Body	Nickel plated forged brass
Bonnet	Nickel plated brass
Diaphragm	316L stainless steel
Seat	PTFE®
Seals	PTFE®
Gauges	Monel
Body Porting	1/4″ NPT (F)

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G0758	0–840	CGA 330	Corrosive e.g. Hydrogen Chloride

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model S408

Short Term Applications

- Mildly corrosive gases
- Ammonia
- Sulphur Dioxide

Single stage regulator with anodised aluminium body

Features

Constructed to resist attack from mild acid forming gases

- 316L stainless steel diaphragm – no inboard diffusion
- Special vented bonnet with connection for venting hazardous materials safely in the event of diaphragm failure
- Gauges, nozzles and outlet valve constructed of Monel®
- Pipe away relief valve safely vent exhaust gases

Applications

- Precise regulation of low pressure corrosive gases

Specifications

Maximum inlet pressure	20,000 kPa
Adjustable outlet pressure range	0–100 kPa 0–350 kPa
Operating Temperature	-28°C to 60°C
Flow Coefficient	CV = 0.1
Inlet and Outlet Ports	1/4″ NPT (M)

Materials of Construction

Body	Anodised aluminium bar stock
Bonnet	Anodised aluminium bar stock
Diaphragm	316L stainless steel
Seat	PTFE®
Seals	PTFE®
Gauges	Stainless steel
Body Porting	1/4″ NPT (F)

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G0741	0–100	Type 32	Sulphur Dioxide
G0742	0–350	Type 32	Ammonia

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model SGT500

Dual stage regulator with stainless steel body

Long Term Applications

- Reactive gases
- Mild corrosive gases
- Toxic gases

Features

Two Stage Stainless Steel Regulator for Reactive or toxic gas applications:

- Metal to metal diaphragm seal
- Stainless Steel bar stock body with minimum gas wetted area for optimum purging
- Helium leak rate of $1x10^{-9}$ scc/sec
- Regulator fitted with pressure gauges, cylinder connection and outlet fitting

Applications

- Gas chromatography
- Regulation of Corrosive gases
- Epitaxial Reactors
- Diffusion furnaces
- Research sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-40°C to 65°C
Pressure rise	<0.5 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.128
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Bar stock 316L Stainless steel
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Teflon™

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G10001	0–875	CGA 660	Corrosive, Toxic e.g. Nitric Oxide
G10000	0–875	BS15 – LH Spectra-Seal	Flammable, Corrosive, Toxic i.e. BOC Spectra Seal mixtures
G01999	0–875	Type 44 – RH Spectra-Seal	Corrosive, Toxic i.e. BOC Spectra Seal mixtures

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Detectagas™ Regulators for Disposable Cylinders

Fixed Flow Regulators for disposable cylinders

Key Features and Benefits

- Flow rates: 0.5 LPM, 1.0 LPM or 2.0 LPM
- Knurled ON/OFF knob for easy grip with or without gloves
- Finer graduations for precise reading of cylinder contents
- Side outlet prevents tubing from kinking
- Wide choice of outlets and inlets available
- Rotate knob for audible click ON/OFF
- No set screw on knob, meaning knob won't strip out
- Stainless steel gauge
- All wetted surfaces have proprietary passivated coating to ensure non-reaction with calibration gas
- Unique diaphragm design to hold preset flow rate even when cylinder pressure is depleted
- 5/8″ – 18 UNF inlet
- 1/8″ hose barb outlet

Variable Flow Regulators for disposable cylinders

Key Features and Benefits

- Specific design for instruments with sample draw pumps
- Excellent repeatability of sensor response to calibration gas

Detectagas™ Regulators for refillable cylinders

Fixed Flow Regulators for refillable cylinders

Key Features and Benefits

- Flow rates: 0.5 LPM, 1.0 LPM, 1.5 LPM, 2.0 LPM or 5.0 LPM
- Brass or stainless steel body and fittings to ensure gas quality is not compromised
- Compact design for use in tough environment
- Compact low profile high pressure gauge provides easy check of cylinder contents
- Fine adjustment valve on regulator enables gas flow to be turned off without need to shut off cylinder valve
- Design and precision laser cut gas metering orifice provides flow accuracy during gas usage
- Single Stage
- 315L stainless steel diaphragm
- No ON/OFF valve version (use valve on cylinder)
- Contents gauge with 700 kPa refill marking
- Adapters available for use on disposable cylinders

Variable Flow Regulators for refillable cylinders

Key Features and Benefits

- Variable flow rate of 0.5–5.0 LPM
- Chrome plated brass body
- Neoprene diaphragm
- Single Stage
- Contents gauge with 700 kPa refill marking

Model HM120

Systems providing a continuous supply of gas

- Non-corrosive gases
- Connect 2 or more cylinders

The HM120 manifold is a compact gas supply system for installations requiring an uninterrupted low to medium flow of gas at constant pressure.

The manifold system consists of two banks of cylinders, one on each side of the pressure control assembly. The position of the lever determines which bank of cylinders is "in use" and which is "in reserve". The manifold draws gas from the "in use" cylinder bank until it is emptied. The manifold then automatically starts drawing gas from the "in reserve" cylinder bank. When the emptied cylinder bank has been replaced the lever should be moved to the other side to reset the manifold.

Application

The HM120 auto change-over manifold is designed to provide uninterrupted delivery of high purity gases or mixtures and liquefied gases with vapour pressures more than 950 kPa.

The manifold is constructed from chrome plated brass and is for use with non-corrosive gases. Models are available for industrial, medical, laboratory and high purity applications.

Features

Provides uninterrupted low to medium flow of gas

- Easy to use change-over lever indicates cylinder priority
- Two inlet gauges indicate supply/pressure in each cylinder bank
- Larger easy to read gauge indicates delivery pressure to your application
- Chrome plated brass construction
- Compact single body design
- Stainless steel diaphragms with metal to metal seal
- Supplied with cylinder connection leads
- Service connection point avoids need to disrupt gas supply when checking settings
- Modular inlet header design allows for future expansion of system
- Australian designed and manufactured

Specifications

Maximum inlet pressure	20,000 kPa
Outlet pressure (factory set)	1,000 kPa
Maximum flow rate	250 LPM@400 kPa
Helium leak rating	$2x10^{-8}$ ml/sec
Inlet connection	3/8″ BSP M
Outlet connection	1/4″ NPT F
Weight	7 kg

Materials of Construction

Body	Chrome plated brass bar stock
Bonnet	Chrome plated brass bar stock
Diaphragm	316L stainless steel
Seals	Metal to metal
Seats	PCTFE™
NRV seals	Viton®

Model HM120 (cont)

Example

BOC Part No.	Delivery Pressure (kPa)	Gas Type	Cylinder Connection
G0344	1000	Specify	Refer to table

Cylinder Connections available are:	
AS Type 10	Oxygen
AS Type 50	Nitrogen
AS Type 60	Air
AS Type 20	Flammable
CGA 350	Flammable

Cylinder Connections available are:	
CGA 510	Hydrocarbons
CGA 580	Rare and Inert
CGA 590	Non Flammable
AS Type 30	Non Flammable

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Flowmeters

Available upon request.

Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

VICTOR®
Specialty Products

SPECIALTY PRODUCTS EQUIPMENT

PRODUCT CATALOG

ISO 9001
REGISTERED FIRM

The Quality System at Thermadyne at our Denton, Roanoke and Hermosillo locations is registered to meet the requirements of ISO 9001

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Quality Statement

Victor®
is committed to
providing superior quality,
reliable apparatus that earn
our customers' confidence.
Victor apparatus and
services will be recognizably
better than those of our
competitors by consistently
meeting customers
expectations and by
providing safe, reliable
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Victor® has a proud heritage and long-standing reputation for quality manufacturing and service to the welding industry.

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Victor Specialty Products - *proven service to specialty gas and manifold markets for over 96 years*

Supported by manufacturing and engineering expertise of Victor Equipment Company and a dedicated assembly and testing facility, Victor Speciality Products provides unsurpassed product quality and performance in a timely manner.

With Victor Specialty Products, you will experience

- Expanded global product offering
- Improved product performance featuring “flow straighting technology”
- Guaranteed product quality and reliability
- Service excellence
- Global sales support

Victor Specialty Products is committed to exceeding industry standards with ongoing certifications and programs including:

- ISO9001 Registered
  The ISO 9001 standards focus on the major processes and place great emphasis on making quality management systems closer to the processes and on continual improvement, including the satisfaction of customers and quality manufacturing

- Helium Leak Rate Certification
  Helium leak testing is performed by conducting an outboard test immediately after the unit is assembled. The unit is then attached to a Mass Spectrometer, calibrated quarterly, where an inboard test is performed to ensure compliance with the minimum standard

- CGA compliant with all CGA E-4 testing, including E-4, 7.1 “Oxygen Ignition Test.”

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

How To Choose A Regulator:

Questions & Answers:

Questions to consider when selecting a VSP regulator:

Q. What gas will you be regulating?

A. This determines what type of regulator is best.

Q. What purity is that gas?

A. This determines the materials of construction of the regulator.

Q. Do you want constant delivery pressure?

A. This determines single or dual stage regulation

Q. What outlet pressure does your application require?

A. This determines the delivery range of the regulator as shown on page 5.

Q. What type of outlet connection do you need?

A. Connection is based on application and downstream apparatus.

Q. What additional options would you like installed?

A. All options are listed in the 'options' section of the "how to order" portion.

How To Order

Please call 800-569-0547 for more information.

Step 1 Refer to the regulator model legend below and the regulator selection guide on page 87 to identify the type of regulator that best fits your requirements. (Example **SGS** Series)

Step 2 Locate the specifications page for that particular regulator and use the Model Number System to select the model desired. (Example **SGS500**)

Step 3 Select the regulator delivery range you require. (Example SGS-500-**80**)

Step 4 Specify the CGA inlet connection required. (Example SGS-500-80-**330**)
***Note:** If no inlet is desired, please specify **"4F"** on your order.*

Step 5 Specify the outlet fitting you require. (Example SGS-500-80-330-**DK4S**)

Step 6 Add any one or more options you want. (Example SGS-500-80-330-DK4S-**04**)

NEW Model Number System

XXX500 - XXX - XXX - XXX - XX

Series

- **HPS** Brass Single Stage
- **HPT** Brass Two Stage
- **HPL** Brass Line (4-Port Body)
- **SGS** Stainless Steel Single Stage
- **SGT** Stainless Steel Two Stage
- **SGL** Stainless Steel Line (4-Port Body)

Delivery

- **15** (2-15 psig)
- **40** (2-40 psig)
- **80** (4-80 psig)
- **125** (5-125 psig)
- **200** (10-200 psig)
- **300** (10-300 psig)
- **500** (20-500 psig)

Inlet Fitting

- **CGA** 240, 330, 350, 540, 580, 660, 705
- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT

Inlet Protocol Option

- **B1P** 1 Pigtail
- **B2P** 2 Pigtail

Outlet Fitting

- **BV** 1/4" Shut-off valve
- **DK** 1/4" DRK valve
- **4M** 1/4" Male fitting
- **4F** 1/4" Female port
- **2S** 1/8 Swagelok®
- **4S** 1/4" Swagelok®
- **FM** Flowmeter

Options

- **00** Bare body
- **01** Cross purge
- **02** Helium Leak Certification
- **03** Certification
- **04** Captured Vent
- **05** Panel mount kit
- **06** W/O gauges
- **07** Relief Valve

Ordering Examples:

SGS500-125-580-DK
SGS500 regulator w/125 psig delivery pressure
CGA 580 inlet fitting, 1/4" Diffusion Resistant Valve outlet fitting. No options selected.

SGS500-500-4F-2S-02, 04
SGS500 regulator w/500 psig delivery pressure
1/4" Female NPT inlet port, 1/8" Swagelok® outlet fitting
Helium Leak Certification option, Captured Vent option.

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

Model & Ordering Information

Regulator and Manifold Model Identification Symbols

Legend	Type of Regulator	Legend	Type of Regulator	Legend	Type of Regulator
GPS	General Purpose Single Stage	**HPS**	High Purity Single Stage	**SGS**	Stainless Steel Single Stage
GPT	General Purpose Two Stage	**HPT**	High Purity Two Stage	**SGT**	Stainless Steel Two Stage
GPL	General Purpose Line	**HPL**	High Purity Line	**SGL**	Stainless Steel Line
DRK	Diffusion Resistant Valve	**PDS**	Switchover Manifold	**LB**	Lecture Bottle
DRL	1/4 Valve with Lever	**D-1**	Dome Loaded Regulator	**CRS**	Corrosion Resistant Regulators
		VHP	Victor High Purity Switchover Manifolds	**PR**	Calibration Gas Regulator
				PS	Protocol Station

Regulator Delivery Ranges

Regulator Delivery Ranges

15 ..... 2-15 PSIG
40 ..... 2-40 PSIG
80 ..... 4-80 PSIG
125 ..... 5-125 PSIG
200 ..... 10-200 PSIG
200 ..... 10-300 PSIG
500 ..... 20-500 PSIG

Gauge Ranges

15 ("A" Range) .....2-30 PSIG
40 ("B" Range) .....2- 60 PSIG
80 ("C" Range) .....4-100 PSIG
125 ("D" Range) .....5-200 PSIG
200 ("E" Range).....10-400 PSIG
300.....10-400 PSIG
500 (Brass).....20-600 PSIG
500 (Stainless) .....60-600 PSIG

Gauge Ranges

Regulator Gauges: Unless otherwise noted, high pressure gauges for all oxygen, inert gas, CO_2, N_2O, and hydrogen models are graduated 200-4000 psig. High pressure gauges for fuel gas models are graduated 20-400 psig. Low pressure or outlet gauge ranges are determined by the regulator delivery range selected.

Regulator Quick Reference Chart

	Material of Construction						Stage/Type			General Application
Model	Stainless Steel	Chrome Plated Brass	Chrome Plated Forged Brass	Brass	Electroless Nickel Plated Brass	Aluminum	Single Stage	Two Stage	Other	Type of Usage
SGS500	X						X			High purity (critical)
SGT500	X							X		High purity (critical)
SGL500	X								Line	High purity (critical)
HPS500		X					X			High purity (critical)
HPT500		X						X		High purity (critical)
HPL500		X							Line	High purity (critical)
HPS270/280		X	X				X			High purity
HPT270/280		X	X					X		High purity
HPL270/280		X	X						Line	High purity
HPT100		X						X		High purity
HPS 4				X					Piston	High pressure (High purity)
HPL700				X					Line	High flow
D-1 (Dome)			X						Dome	Assist gas
CRS100					X				Yoke-style	Corrosion resistant
PR150				X					Piston	Calibration gas
PR160		X							Piston	Calibration gas
LB150		X	X						Lecture	Non-corrosive gases
LB165	X								Lecture	Corrosion resistant (High purity)
GPS270/280		X					X			General purpose, non-corrosive
GPT270/280		X						X		General purpose, non-corrosive
GPL270/280		X							Line	General purpose, non-corrosive
GLC350		X							Liquid Cyl.	Specialty gas
SR310/311/312						X			High Flow CO_2	Carbon dioxide cyl.-non-siphoned
MBG-A		X						X		Special purpose

" Flow-Straightening Technology"

Introducing the New 500 Series³ High Purity Regulator

500 SERIES 3

Why "Series³"

The 500 Series³ is the third generation of the 500 Series regulator from Victor Specialty Products. It is a special blend of years of proven design concepts combined with brand new, innovative technologies to create a regulator that is lightyears ahead of previous models. Wrapped in a new, slimmer, more high tech looking package, the 500 Series³ has the looks, performance and reliability second to none.

Key attributes of the new design:

- New Patent Pending "Flow-Straightening Technology" reduces internal vibration and turbulence in the gas flow stream. The results of this is improved efficiency and overall performance, and a smoother, more consistent flow to downstream equipment.
- An all-new seat design improves sensitivity, increases delivery pressure precision and dramatically improves seat integrity.
- Slimmer, more compact lighter weight design improves visual "high-tech" appeal and reduces shipping cost (approx. 10% lighter than our current design in a 4F-4F configuration).
- Assembled in a state-of-the-art facility.
- Compliant with CGA_E4 testing, Including E-4, 7.1 "Oxygen Ignition Test".

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
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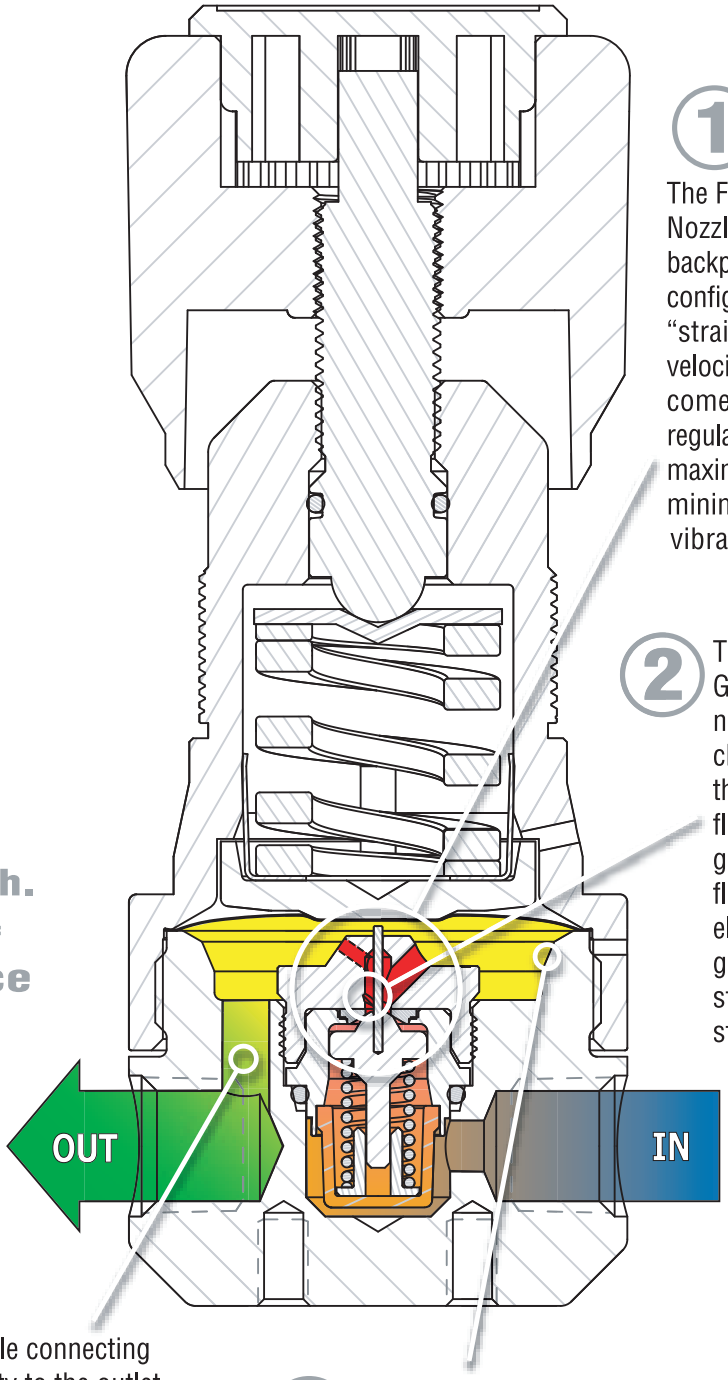

New look.
New tech.

New levels of performance and reliability.

1 The Flow-Straightening Nozzle uses internal backpressure with special configured outlet holes to "straighten" the high velocity flow stream as it comes through the regulator. This results in maximum efficiency with minimum turbulent vibration.

2 The Flow Channel Groove (part of the nozzle) creates a channel just above the high velocity inlet flow stream that gives any turbulent flows not already eliminated a "place to go"... so that the inlet stream remains straight and smooth.

3 The multi-angled low pressure cavity design acts as a diffuser to the high speed flow stream exiting the nozzle, breaking the stream up as quickly as possible and distributing it evenly throughout the low pressure cavity. This results in a "tighter", more responsive, more repeatable regulator.

4 Instead of a single hole connecting the low pressure cavity to the outlet port, the 500 Series^3 body uses dual offset outlet holes. Two parallel paths for gas flow results in a smoother transition of gas out of the regulator and downstream into the line.

SGS500

Single-Stage Stainless Steel Regulator

SGS500 regulators are recommended for very high purity, mild and non-corrosive gas applications where slight variances in delivery pressure is acceptable (as cylinder pressure decreases).

TYPICAL APPLICATIONS

- Gas chromatography
- Regulation of corrosive gases
- Research sampling systems
- Laser gas systems
- Process analyzers
- EPA protocol standards
- Emission monitoring

500 SERIES 3

FEATURES

Precision High Purity Performance

- Flow Straightening Technology
- Helium leak rate of 1 X 10^{-9} scc/sec
- 100% Helium outboard leak tested
- Control knob allows precise setting and resetting of the maximum delivery pressure

Quality Components

- Metal-to-metal diaphragm seal
- 2” dual scale gauges (psi/kp2)
- Cartridge type seat assembly with 10 micron inboard filter
- Resistant to inboard diffusion of atmospheric contaminants
- Materials of construction will not off-gas and contaminate the gas stream
- These regulators are able to withstand internal vacuums generated during purging operations and have minimal purge volumes for maximum safety

Installation Flexibility

- 1.6” stainless steel diaphragm for minimal footprint
- 6-port stainless steel bar stock body (3 high/ 3 low)
- Threaded housing cap for panel mounting
- Drilled and tapped body for rear bracket mounting
- Available fully configured for cylinder, OEM or bare-body for custom installation

Options

- Rotating captured vent for remote venting
- Diffusion resistant, packless diaphragm valve

MATERIALS OF CONSTRUCTION

Body	316 Stainless steel
Spring housing cap	Chrome-plated brass
Diaphragm	316 Stainless steel
Nozzle	316 Stainless steel
Seat	PCTFE™
Seals	Teflon™
Poppet	316 Stainless steel
Inboard filter	10 Micron sintered stainless steel
Seat return spring	316 Stainless steel
Pressure adjusting spring	Heat-treated spring steel
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	3000 psig
Inlet & outlet ports	1/4” NPT (F)
Temperature Operating Range:	-40 to 140°F (-40 to 60°C)
Delivery pressure rise:	<0.92 psig/100 psig inlet decay
Flow coefficient	C_V= 0.135
Weight	3.6 lbs (1.64kg)
Outlet pressure ranges	15 (2-15 psig)

40 (2-40 psig)	80 (4-80 psig)
125 (5-125 psig)	200 (10-200 psig)
300 (10-300 psig)	500 (20-500 psig)

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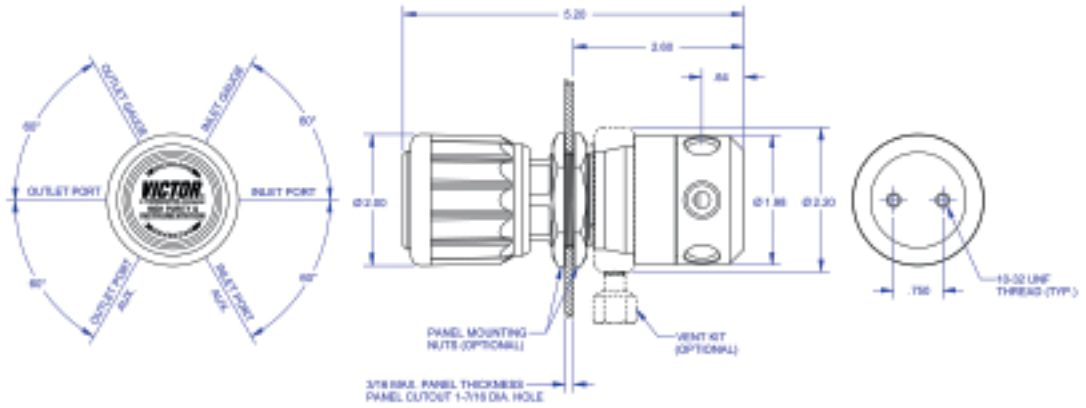
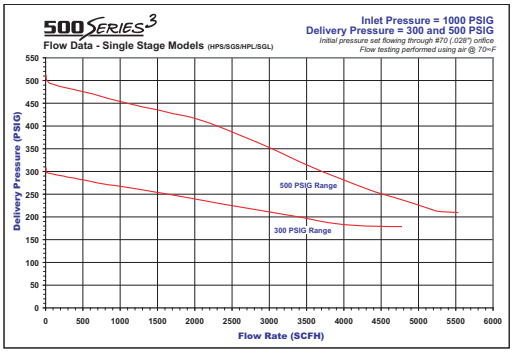
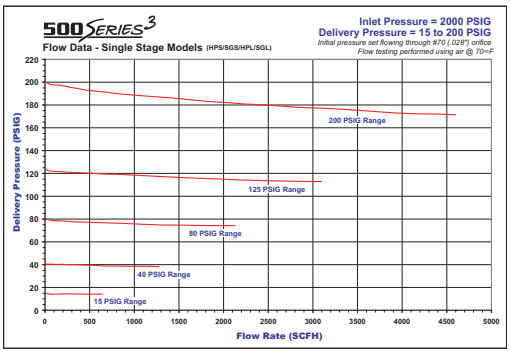
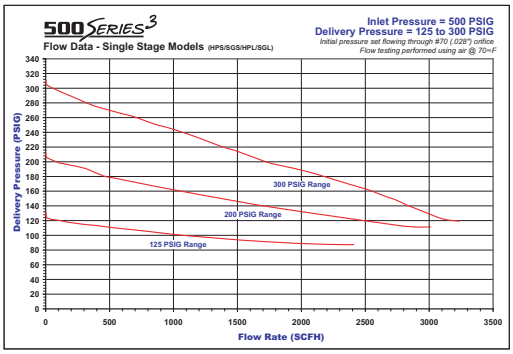
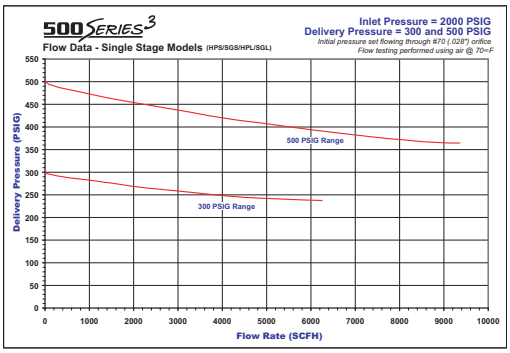
Canada Customer Care: 905-827-4515 / FAX 800-588-1714











SGS500 Series Model Number System

SGS500 - XXX - XXX - XXXX - XXXX

Single Stage 316L SS Barstock

SGS500
0-4000 psig inlet gauge

SGS501
0-400 psig inlet gauge

SGS502
0-600 psig inlet gauge

Outlet Pressure

15 (2-15 psig)
40 (2-40 psig)
80 (4-80 psig)
125 (5-125 psig)
200 (10-200 psig)
300 (10-300 psig)
500 (20-500 psig)

Inlet Connection

CGA
240, 296, 320, 326, 330, 346, 510, 500, 540, 580, 590, 660, 705
4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting

Outlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting
BV4M Needle Valve 1/4" Male NPT
DK4F Diaphragm Valve 1/4" Female NPT
DK4M Diaphragm Valve 1/4" Male NPT
DK4S Diaphragm Valve 1/4" Tube Fitting
DK2S Diaphragm Valve 1/8" Tube Fitting

Options

00 Bare Body
02 Helium Leak Test
03 Certification
04 Captured Vent
05 Panel Mount
07 Relief Valve

SGT500

Two-Stage Stainless Steel Regulator

SGT500 regulators are recommended for very high purity, corrosive and toxic gas applications where constant delivery pressure is required (as cylinder pressure decreases).

TYPICAL APPLICATIONS

- Gas chromatography
- Regulation of corrosive gases
- Diffusion furnaces
- Research sampling systems
- Laser gas systems
- Process analyzers
- CEM and EPA protocol standards

500 SERIES 3

FEATURES

Precision High Purity Performance

- Flow Straightening Technology
- Helium leak rate of 1 X 10^{-9} scc/sec
- 100% Helium outboard leak tested
- Control knob allows precise setting and resetting of the maximum delivery pressure

Quality Components

- Metal-to-metal diaphragm seal
- 2" dual scale gauges (psi/kp2)
- Cartridge type seat assembly with 10 micron inboard filter
- Resistant to inboard diffusion of atmospheric contaminants
- Materials of construction will not off-gas and contaminate the gas stream
- These regulators are able to withstand internal vacuums generated during purging operations and have minimal purge volumes for maximum safety

Installation Flexibility

- Stainless steel 1.6" diaphragm for minimal footprint
- 6-port stainless steel bar stock body (3 high/ 2 low/ 1 intermediate)
- Threaded housing cap for panel mounting
- Available for cylinder, OEM or barebody

Options

- Rotating captured vent for remote venting
- Diffusion resistant, packless diaphragm valve
- Relief valve on intermediate stage

MATERIALS OF CONSTRUCTION

Body	316L Stainless steel
Spring housing cap	Chrome-plated brass
Diaphragm	316 Stainless steel
Nozzle	316 Stainless steel
Seat	PCTFE™
Seals	Teflon™
Poppet	316 Stainless steel
Inboard filter	10 Micron sintered stainless steel
Seat return spring	316 Stainless steel
Pressure adjusting spring	Heat-treated spring steel
Adjusting knob	Acrylonitrile Butadiene Styrene (ABS)

SPECIFICATIONS

Maximum inlet pressure	3000 psig
Inlet & outlet ports	1/4" NPT (F)
Temperature operating range:	-40 to 140°F (-40 to 60°C)
Delivery pressure rise:	<0.92 psig/100 psig inlet decay
Flow coefficient	C_V= 0.111
Weight	4.5 lbs (2kg)
Outlet pressure ranges	15 (2-15 psig)

40 (2-40 psig)	80 (4-80 psig)
125 (5-125 psig)	200 (10-200 psig)
300 (10-300 psig)	500 (20-500 psig)

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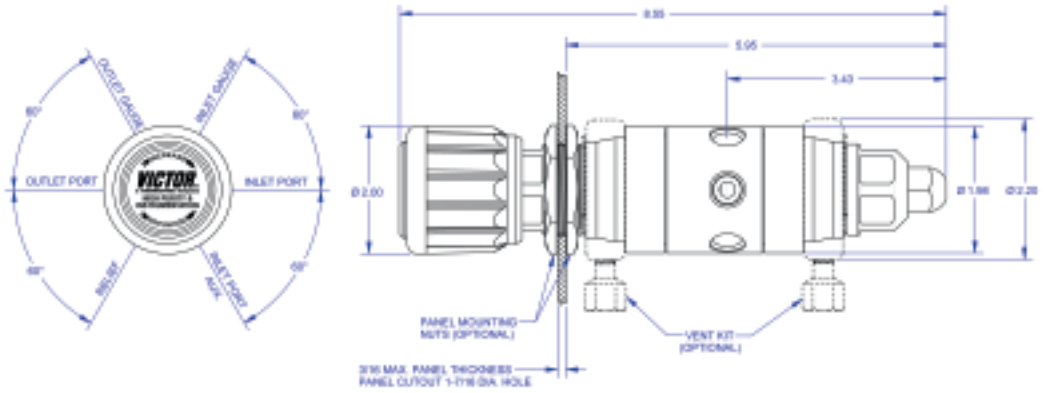

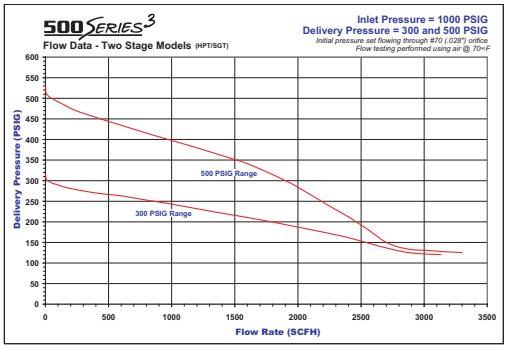

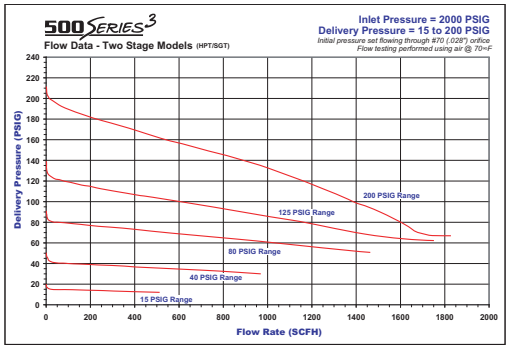

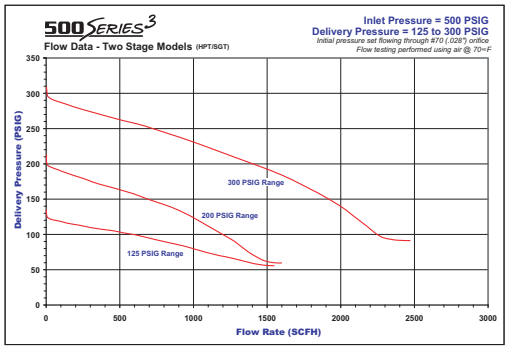

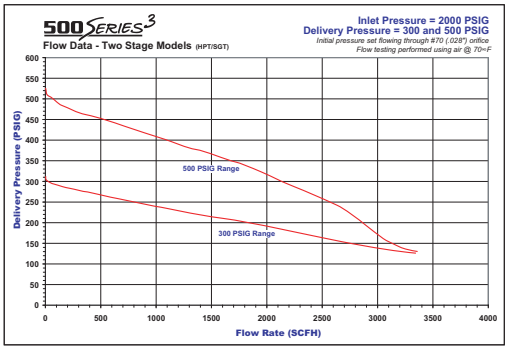

SGT500 Series Model Number System

SGT500 - XXX - XXX - XXXX - XXXX

Dual Stage 316L SS Barstock

SGT500
0-4000 psig inlet gauge

Outlet Pressure

- **15** (2-15 psig)
- **40** (2-40 psig)
- **80** (4-80 psig)
- **125** (5-125 psig)
- **200** (10-200 psig)
- **300** (10-300 psig)
- **500** (20-500 psig)

Inlet Connection

- **CGA** 240, 296, 320, 326, 330, 346, 510, 500, 540, 580, 590, 660, 705
- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting

Outlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting
- **BV4M** Needle Valve 1/4" Male NPT
- **DK4F** Diaphragm Valve 1/4" Female NPT
- **DK4M** Diaphragm Valve 1/4" Male NPT
- **DK4S** Diaphragm Valve 1/4" Tube Fitting
- **DK2S** Diaphragm Valve 1/8" Tube Fitting

Options

- **00** Bare Body
- **02** Helium Leak Test
- **03** Certification
- **04** Captured Vent
- **05** Panel Mount
- **07** Relief Valve

SGL500

Line Stainless Steel Regulator

SGL500 regulators are recommended for very high purity, corrosive and toxic, gas applications for gas distribution systems (pipeline).

TYPICAL APPLICATIONS

- High purity gas handling
- Gas chromatography
- Regulation of corrosive gases
- Diffusion furnaces
- Research sampling systems
- Laser gas systems
- Process analyzers

500 SERIES 3

FEATURES

Precision High Purity Performance

- Flow Straightening Technology
- Helium leak rate of 1 X 10^{-9} scc/sec
- 100% Helium outboard leak tested
- New control knob allows precise setting for maximum delivery

Quality Components

- Metal-to-metal diaphragm seal
- 2” dual scale gauges (psi/kp2)
- Cartridge type seat assembly with 10 micron inboard filter
- Resistant to inboard diffusion of atmospheric contaminants
- Materials of construction will not off-gas and contaminate the gas stream
- These regulators are able to withstand internal vacuums generated during purging operations and have minimal purge volumes for maximum safety

Installation Flexibility

- 1.6” stainless steel diaphragm for minimal footprint
- 4-port stainless steel bar stock body (1 high/ 3 low)
- Threaded housing cap for panel mounting
- Drilled and tapped body for rear bracket mounting

Options

- Rotating captured vent for remote venting
- Diffusion resistant, packless diaphragm valve

MATERIALS OF CONSTRUCTION

Body	316L Stainless steel
Spring housing cap	Chrome-plated brass
Diaphragm	316L Stainless steel
Nozzle	316L Stainless steel
Seat	PCTFE™
Seals	Teflon™
Poppet	316L Stainless steel
Inboard filter	10 Micron sintered stainless steel
Seat return spring	316L Stainless steel
Pressure adjusting spring	Heat-treated spring steel
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	3000 psig
Inlet & outlet ports	1/4” NPT (F)
Temperature operating range:	-40 to 140°F (-40 to 60°C)
Delivery pressure rise:	<0.92 psig/100 psig inlet decay
Flow coefficient	C_V= 0.135
Weight	2.7 lbs (1.23kg)
Outlet pressure ranges	15 (2-15 psig)

40 (2-40 psig)	80 (4-80 psig)
125 (5-125 psig)	200 (10-200 psig)
300 (10-300 psig)	500 (20-500 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
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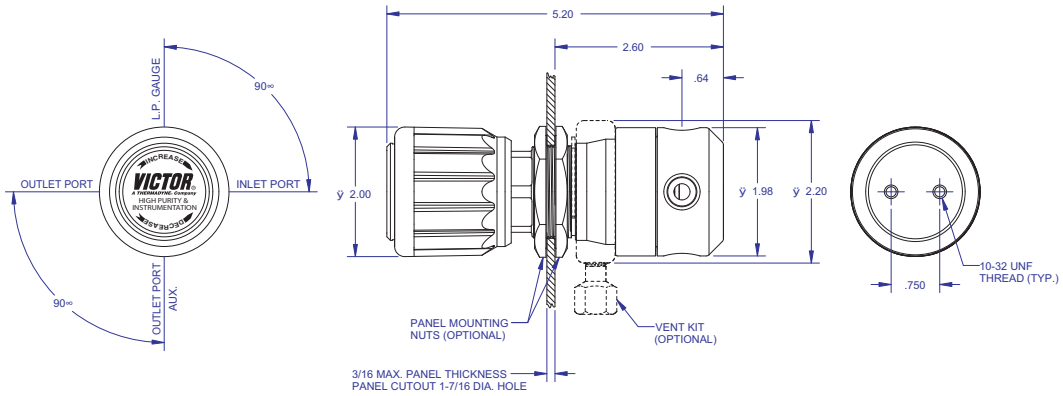

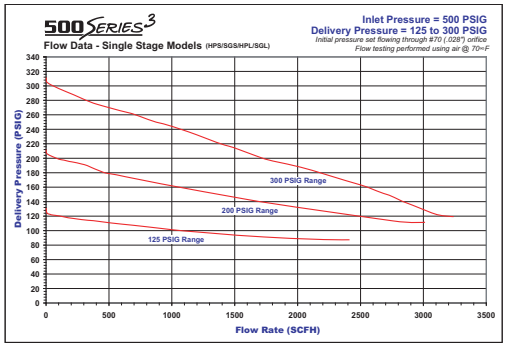

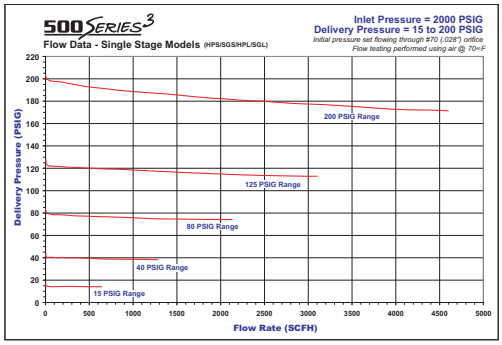

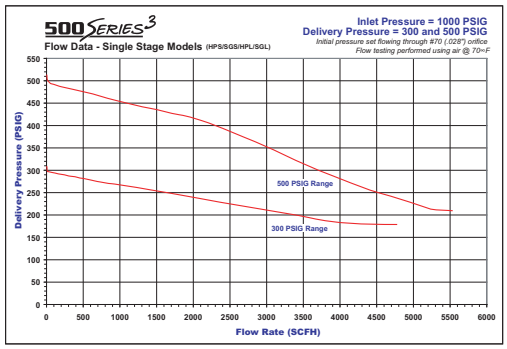

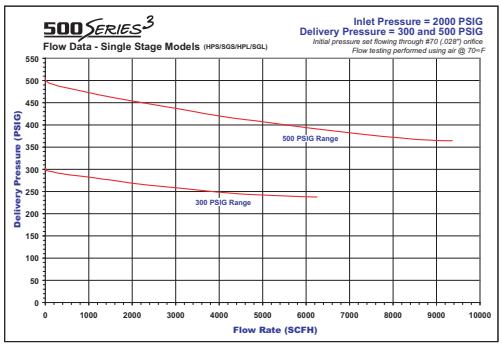

SGL500 Series Model Number System

SGL500 - XXX - XXX - XXXX - XXXX

Line Regulator 316L SS Barstock

SGL500
No Inlet Gauge

Outlet Pressure

- **15** (2-15 psig)
- **40** (2-40 psig)
- **80** (4-80 psig)
- **125** (5-125 psig)
- **200** (10-200 psig)
- **300** (10-300 psig)
- **500** (20-500 psig)

Inlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting

Outlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting
- **BV4M** Needle Valve 1/4" Male NPT
- **DK4F** Diaphragm Valve 1/4" Female NPT
- **DK4M** Diaphragm Valve 1/4" Male NPT
- **DK4S** Diaphragm Valve 1/4" Tube Fitting
- **DK2S** Diaphragm Valve 1/8" Tube Fitting

Options

- **00** Bare Body
- **02** Helium Leak Test
- **03** Certification
- **04** Captured Vent
- **05** Panel Mount
- **07** Relief Valve

HPS500

Single-Stage Chrome-Plated Brass Regulator

HPS500 regulators are recommended for very high purity, inert gas applications where slight variance in delivery pressure is acceptable (as cylinder pressure decreases).

TYPICAL APPLICATIONS

- High-purity gas handling
- Gas chromatography
- Regulation of corrosive gases
- Diffusion furnaces
- Research sampling systems
- Laser gas systems
- Process analyzers

500 SERIES 3

FEATURES

Precision High Purity Performance

- Flow straightening technology
- Helium leak rate of 1 X 10^{-9} scc/sec
- 100% Helium outboard leak tested
- Control knob allows precise setting for maximum delivery

Quality Components

- Metal-to-metal diaphragm seal
- 2” dual scale gauges (psi/kp2)
- Cartridge type seat assembly with 10 micron inboard filter
- Resistant to inboard diffusion of atmospheric contaminants
- Materials of construction will not off-gas and contaminate the gas stream
- These regulators are able to withstand internal vacuums generated during purging operations and have minimal purge volumes for maximum safety

Installation Flexibility

- 1.6” diaphragm for minimal footprint
- 6-port brass bar stock body (3 high/ 3 low)
- Threaded housing cap for panel mounting
- Drilled and tapped body for rear bracket mounting

Options

- Rotating captured vent for remote venting
- Diffusion resistant, packless diaphragm shut-off valve

MATERIALS OF CONSTRUCTION

Body	Chrome-plated brass bar stock
Spring housing cap	Chrome-plated brass
Diaphragm	316 Stainless steel
Nozzle	Brass
Seat	PCTFE™
Seals	Viton™
Poppet	316 Stainless steel
Inboard filter	10 Micron sintered bronze
Seat return spring	Stainless steel
Pressure adjusting spring	Heat-treated spring steel
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	3000 psig
Inlet & outlet ports	1/4" NPT (F)
Temperature operating range:	-40 to 140°F (-40 to 60°C)
Delivery pressure rise:	<0.92 psig/100 psig inlet decay
Flow coefficient	C_V= 0.135
Weight	4.0 lbs (1.8kg)
Outlet pressure ranges	15 (2-15 psig)

40 (2-40 psig)	80 (4-80 psig)
125 (5-125 psig)	200 (10-200 psig)
300 (10-300 psig)	500 (20-500 psig)

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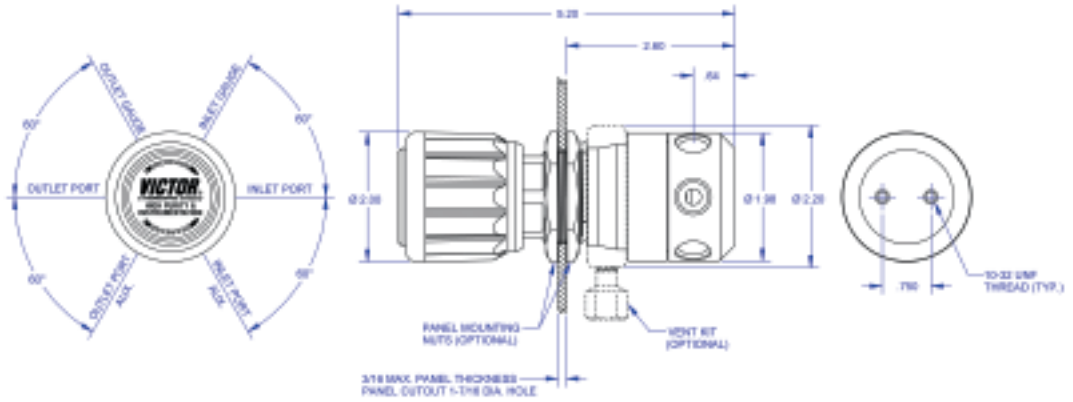

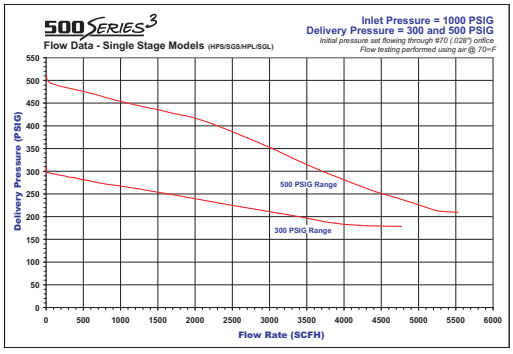

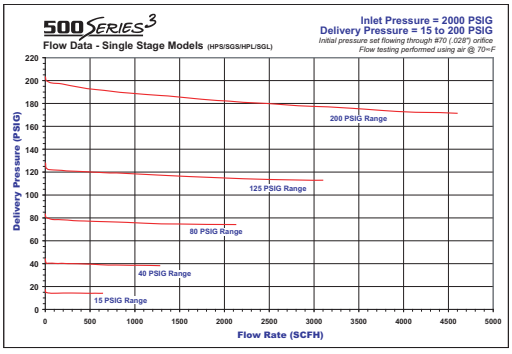

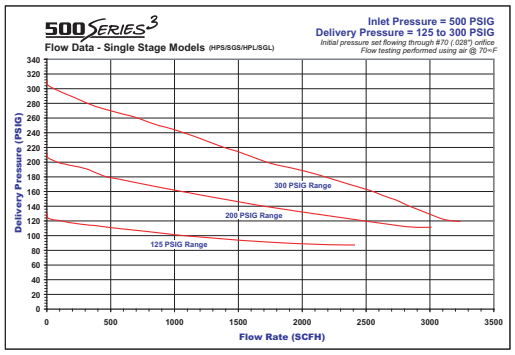

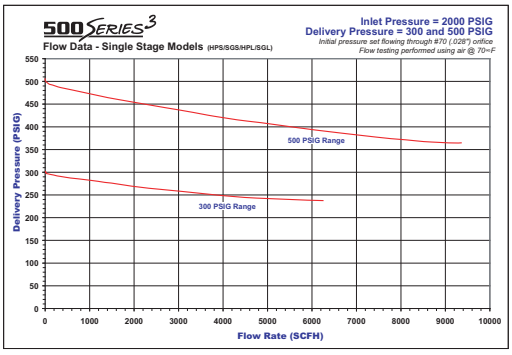

HPS500 Series Model Number System

HPS500 - XXX - XXX - XXXX - XXXX

Single Stage Brass Barstock

HPS500
0-4000 psig inlet gauge

HPS501
0-400 psig inlet gauge

HPS502
0-600 psig inlet gauge

Outlet Pressure

15 (2-15 psig)
40 (2-40 psig)
80 (4-80 psig)
125 (5-125 psig)
200 (10-200 psig)
300 (10-300 psig)
500 (20-500 psig)

Inlet Connection

CGA
580, 590
4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting

Outlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting
BV4M Needle Valve 1/4" Male NPT
DK4F Diaphragm Valve 1/4" Female NPT
DK4M Diaphragm Valve 1/4" Male NPT
DK4S Diaphragm Valve 1/4" Tube Fitting
DK2S Diaphragm Valve 1/8" Tube Fitting

Options

00 Bare Body
02 Helium Leak Test
03 Certification
04 Captured Vent
05 Panel Mount
07 Relief Valve

HPT500

Two-Stage Chrome-Plated Brass Regulator

HPT500 regulators are recommended for high purity, non-corrosive gas applications where constant delivery pressure is requires(as cylinder pressure decreases).

TYPICAL APPLICATIONS

- High-purity gas handling
- Gas chromatography
- Zero gases, span gases, and calibration mixtures
- Research sampling systems
- Laser gas systems

500 SERIES 3

FEATURES

Precision High Purity Performance

- Flow straightening technology
- Helium leak rate of 1 X 10^{-9} scc/sec
- 100% Helium outboard leak tested
- Control knob allows precise setting for maximum delivery

Quality Components

- Metal-to-metal diaphragm seal
- 2” dual scale gauges (psi/kp2)
- Cartridge type seat assembly with 10 micron inboard filter
- Resistant to inboard diffusion of atmospheric contaminants
- Materials of construction will not off-gas and contaminate the gas stream
- These regulators are able to withstand internal vacuums generated during purging operations and have minimal purge volumes for maximum safety

Installation Flexibility

- 1.6” stainless steel diaphragm for minimal footprint
- 6-port brass bar stock body (3 high/ 2 low/ 1 intermediate)
- Threaded housing cap for panel mounting

Options

- Rotating captured vent for remote venting
- Diffusion resistant, packless diaphragm shut-off valve

MATERIALS OF CONSTRUCTION

Body	Chrome-plated brass bar stock
Spring housing cap	Chrome-plated brass
Diaphragm	316L Stainless steel
Nozzle	Brass
Seat	PCTFE™
Seals	Teflon™
Poppet	Stainless steel
Inboard filter	10 Micron sintered stainless steel
Seat return spring	316L Stainless steel
Pressure adjusting spring	Heat-treated spring steel
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	3000 psig
Inlet & outlet ports	1/4” NPT (F)
Temperature operating range:	-40 to 140°F (-40 to 60°C)
Delivery pressure rise:	<0.07 psig/100 psig inlet decay
Flow coefficient	C_V= 0.111
Weight	4.5 lbs (2kg)
Outlet pressure ranges	15 (0-15 psig)

40 (0-40 psig)	80 (0-80 psig)
125 (0-125 psig)	200 (0-200 psig)
300 (0-300 psig)	500 (0-500 psig)

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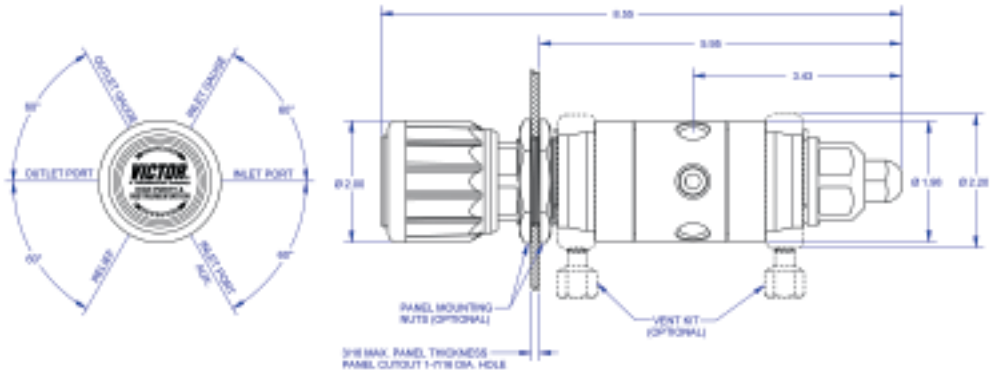

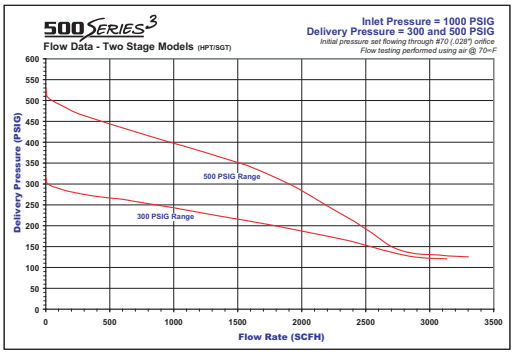

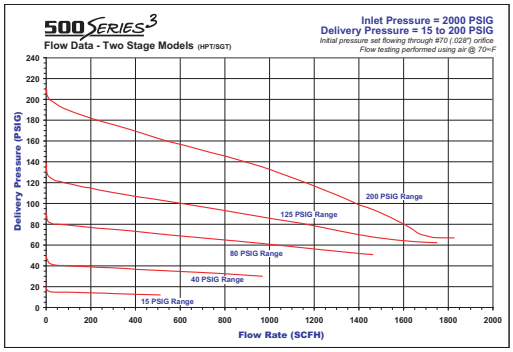

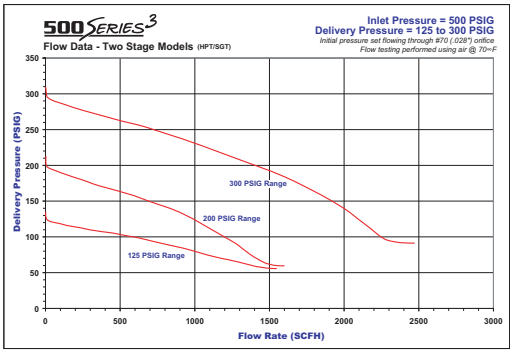

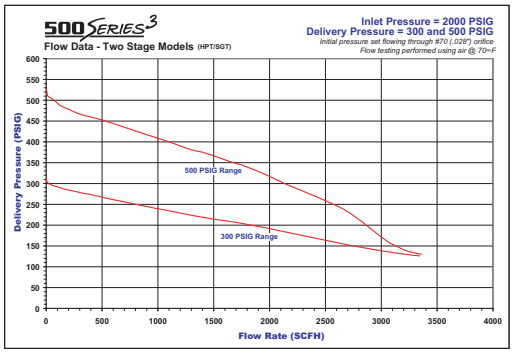

HPT500 Series Model Number System

HPT500 - XXX - XXX - XXXX - XXXX

Dual Stage Brass Barstock

HPT500
0-4000 psig inlet gauge

Outlet Pressure

- **15** (2-15 psig)
- **40** (2-40 psig)
- **80** (4-80 psig)
- **125** (5-125 psig)
- **200** (10-200 psig)
- **300** (10-300 psig)
- **500** (20-500 psig)

Inlet Connection

- **CGA** 580, 590
- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting

Outlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting
- **BV4M** Needle Valve 1/4" Male NPT
- **DK4F** Diaphragm Valve 1/4" Female NPT
- **DK4M** Diaphragm Valve 1/4" Male NPT
- **DK4S** Diaphragm Valve 1/4" Tube Fitting
- **DK2S** Diaphragm Valve 1/8" Tube Fitting

Options

- **00** Bare Body
- **02** Helium Leak Test
- **03** Certification
- **04** Captured Vent
- **05** Panel Mount
- **07** Relief Valve

HPL500

Line
Chrome-Plated Brass Regulator

HPL500 regulators are recommended for high purity, non-corrosive gas applications where gas is supplied through a distribution system (pipeline).

TYPICAL APPLICATIONS

- High-Purity gas handling
- Gas chromatography
- Research sampling systems
- Laser Gas Systems
- Process analyzers

500 SERIES 3

FEATURES

Precision High Purity Performance

- Flow straightening technology
- Helium leak rate of 1 X 10^{-9} scc/sec
- 100% Helium outboard leak tested
- Control knob allows precise setting for maximum delivery

Quality Components

- Metal-to-metal diaphragm seal
- 2” dual scale gauges (psi/kp2)
- Cartridge type seat assembly with 10 micron inboard filter
- Resistant to inboard diffusion of atmospheric contaminants
- Materials of construction will not off-gas and contaminate the gas stream
- These regulators are able to withstand internal vacuums generated during purging operations and have minimal purge volumes for maximum safety

Installation Flexibility

- 1.6” stainless steel diaphragm for minimal footprint
- 4-port brass bar stock body (1 high/ 3 low)
- Threaded housing cap for panel mounting
- Drilled and tapped body for rear bracket mounting

Options

- Rotating captured vent for remote venting
- Diffusion resistant, packless diaphragm shut-off valve

MATERIALS OF CONSTRUCTION

Body	Chrome-plated brass bar stock
Spring housing cap	Chrome-plated brass
Diaphragm	316L Stainless steel
Nozzle	Brass
Seat	PCTFE™
Seals	Teflon™
Poppet	Stainless steel
Inboard filter	10 Micron sintered stainless steel
Seat return spring	Heat-treated spring steel
Pressure adjusting spring	Heat-treated spring steel
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	3000 psig
Inlet & outlet ports	1/4" NPT (F)
Temperature operating range:	-40 to 140°F (-40 to 60°C)
Delivery pressure rise:	< 1.63 psig/100 psig inlet decay
Flow coefficient	C_V= 0.135
Weight	2.6 lbs (1kg)
Outlet pressure ranges	15 (0-15 psig)

40 (0-40 psig)	80 (0-80 psig)
125 (0-125 psig)	200 (0-200 psig)
300 (0-300 psig)	500 (0-500 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
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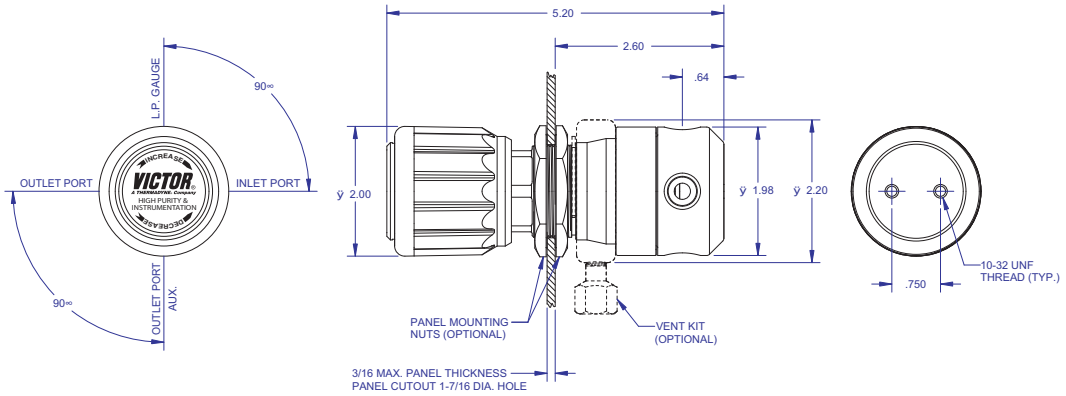
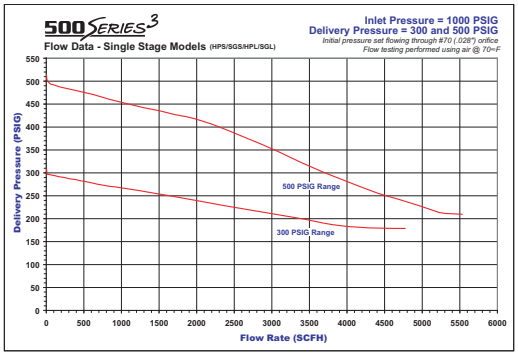
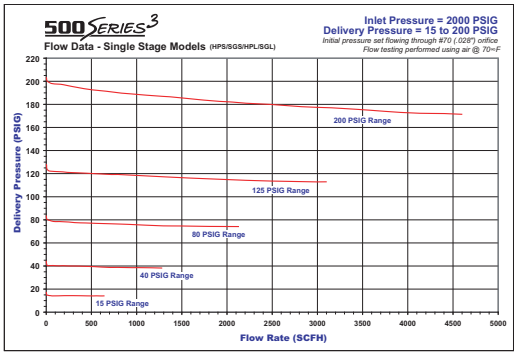
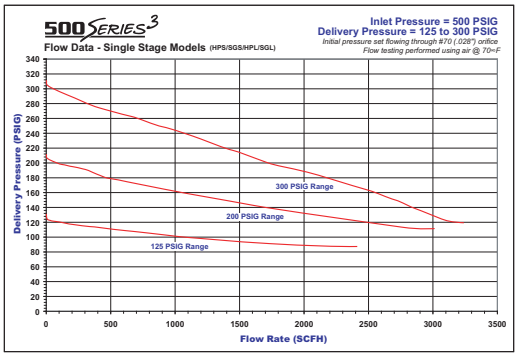
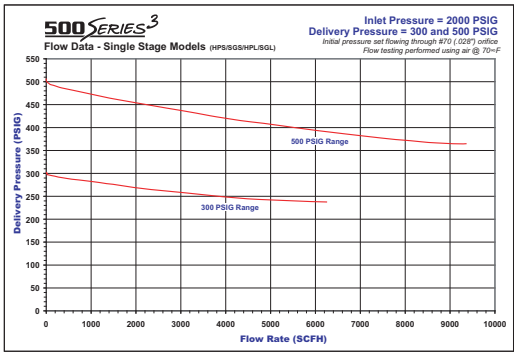










HPL500 Series Model Number System

HPL500 - XXX - XXX - XXXX - XXXX

Line Regulator Brass Barstock

HPL500
No inlet gauge

Outlet Pressure

- **15** (2-15 psig)
- **40** (2-40 psig)
- **80** (4-80 psig)
- **125** (5-125 psig)
- **200** (10-200 psig)
- **300** (10-300 psig)
- **500** (20-500 psig)

Inlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting

Outlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting
- **BV4M** Needle Valve 1/4" Male NPT
- **DK4F** Diaphragm Valve 1/4" Female NPT
- **DK4M** Diaphragm Valve 1/4" Male NPT
- **DK4S** Diaphragm Valve 1/4" Tube Fitting
- **DK2S** Diaphragm Valve 1/8" Tube Fitting

Options

- **00** Bare Body
- **02** Helium Leak Test
- **03** Certification
- **04** Captured Vent
- **05** Panel Mount
- **07** Relief Valve

HPS270/280

Single-Stage Chrome-Plated Brass Regulator

HPS270/280 regulators are recommended for high purity, non-corrosive gas applications where slight variances in delivery pressure is acceptable (as cylinder pressure decreases).

Series choice is dependent on gas:

- HPS270 - non-flammable and non-corrosive gases
- HPS272 - high pressure, flammable gases
- HPS280 - Acetylene gas
- HPS281 - LP gas

TYPICAL APPLICATIONS

- Gas chromatography
- Zero gases, auto emission, and span gases
- Research sampling systems
- Laser gas systems
- Process analyzers
- Purging systems
- Atomic absorption analysis

FEATURES

Precision High Purity Performance

- Helium leak rate of 1 X 10^{-8} scc/sec
- 100% Helium outboard leak tested

Quality Components

- 2.75” stainless steel diaphragm
- 2.50” dual scale gauges (psi/kp2)
- Cartridge type inlet with 10 micron filter
- Self reseating relief valve (vented) except 280/281 Not designed to protect downstream apparatus
- Resistant to inboard diffusion of atmospheric contaminants
- Materials of construction will not contaminate the gas stream

Options

- Diffusion resistant, packless diaphragm shut-off valve
- Panel mount kit

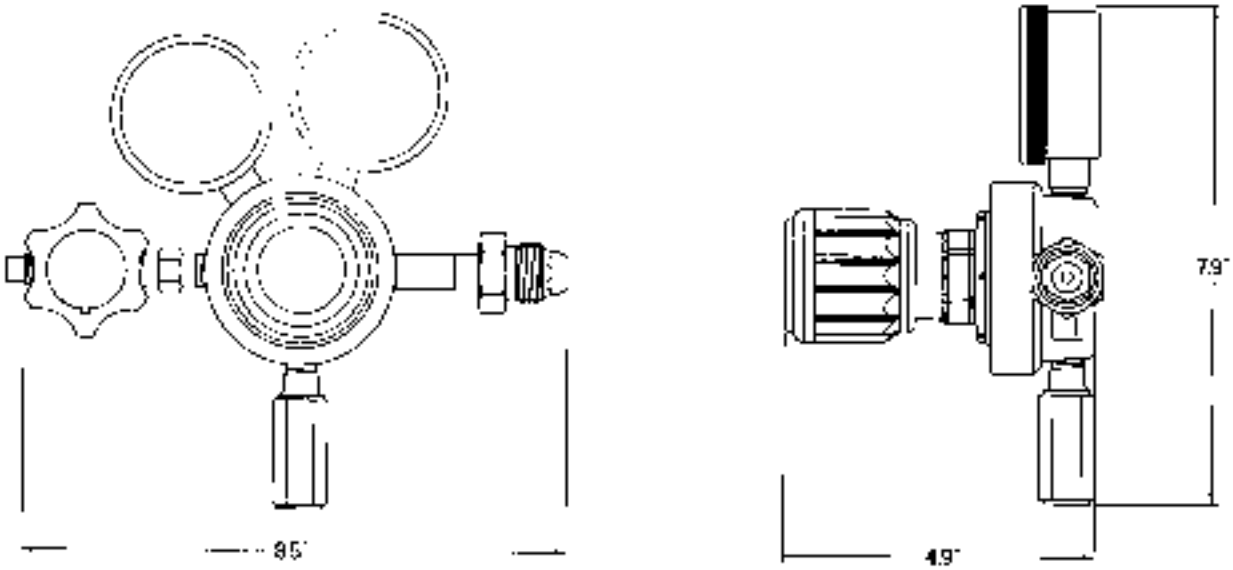
MATERIALS OF CONSTRUCTION

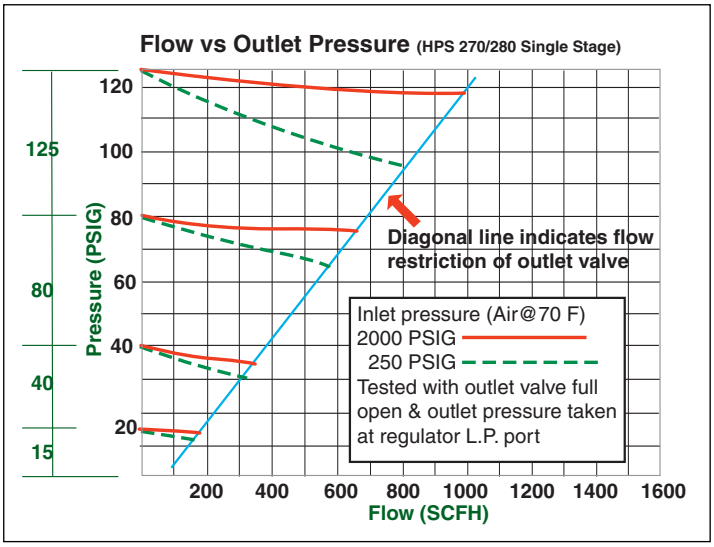
Body	Chrome-plated forged brass
Spring housing cap	Chrome-plated forged brass
Diaphragm	301 Stainless steel
Nozzle	Brass
Seat	PCTFE™
Seals	Viton™
Poppet	Brass CDA 360
Inboard filter	Cartridge - brass Inlet: 10 micron sintered stainless steel.
Seat return spring	316 Stainless steel
Pressure adjusting spring	Heat-treated spring steel
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	(HPS270/272) 3000 psig (HPS280/282) 350 psig
Temperature operating range:	0 to 140°F (-17 to 60°C)
Delivery pressure rise:	< 0.5 psig/100 psig inlet decay
Flow coefficient	C_V= 0.05
Valve outlet	1/4" NPT (F)
Outlet pressure ranges	15 (2-15 psig), 40 (2-40 psig) 80 (4-80 psig), 125 (5-125 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714





HPS270 Series Model Number System

HPS270 - XXX - XXX - XXXX - XXXX

Single Stage Chrome Forged Brass

HPS270
0-4000 psig inlet gauge

HPS272
0-4000 psig inlet gauge Hydrogen

HPS280
0-400 psig inlet gauge Acetylene (15 psig max outlet)

HPS281
0-400 psig inlet gauge, LP Gas

Outlet Pressure

15 (2-15 psig)
40 (2-40 psig)
80 (4-80 psig)
125 (5-125 psig)
200 (10-200 psig)

Inlet Connection

CGA
580, 590
4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting

Outlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting
BV4M Needle Valve 1/4" Male NPT
DK4F Diaphragm Valve 1/4" Female NPT
DK4M Diaphragm Valve 1/4" Male NPT
DK4S Diaphragm Valve 1/4" Tube Fitting
DK2S Diaphragm Valve 1/8" Tube Fitting

Options

00 Bare Body
03 Certification
05 Panel Mount
07 Relief Valve

HPT270/280

Two-Stage Chrome-Plated Brass Regulator

HPT270/280 regulators are recommended for high purity, non-corrosive gas applications where constant delivery pressure is required (as cylinder pressure decreases).

Series choice is dependent on gas:

- HPT270 - non-flammable and non-corrosive gases
- HPT272 - high pressure, flammable gases
- HPT280 - Acetylene gas
- HPT281 - LP gas

TYPICAL APPLICATIONS

- High-purity gas handling
- Gas chromatography
- Zero gases, span gases, and calibration mixtures
- Research sampling systems
- Laser gas systems
- Process analyzers

FEATURES

Precision High Purity Performance

- Helium leak rate of 1 X 10^{-8} scc/sec
- 100% Helium outboard leak tested

Quality Components

- 2.75” stainless steel diaphragm
- 2.50” dual scale gauges (psi/kp2)
- Cartridge type inlet with 10 micron filter
- Self reseating relief valve (vented) except 280/281 Not designed to protect downstream apparatus
- Resistant to inboard diffusion of atmospheric contaminants
- Materials of construction will not contaminate the gas stream

Options

- Diffusion resistant, packless diaphragm shut-off valve
- Panel mount kit

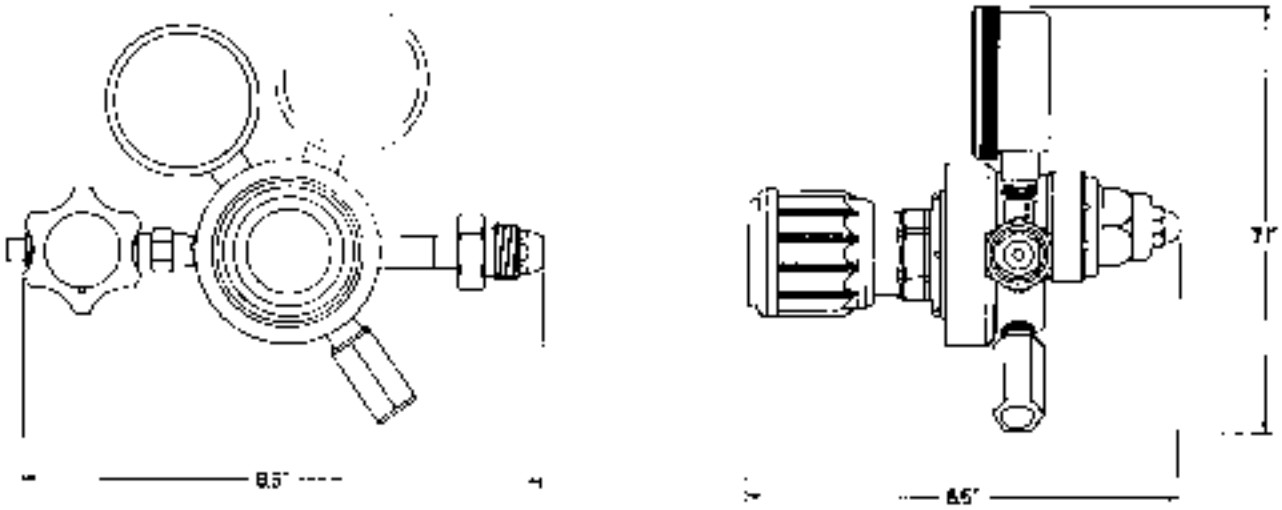
MATERIALS OF CONSTRUCTION

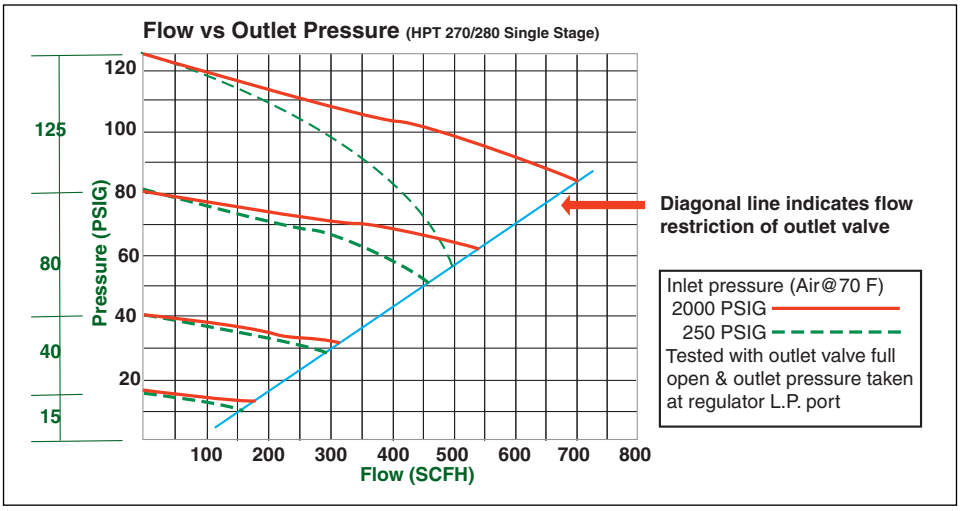
Body	Chrome-plated forged brass
Spring housing cap	Chrome-plated forged brass
Diaphragm	301 Stainless steel
Nozzle	Brass
Seat	1 stage PCTFE™ 2 stage Viton™
Seals	Viton
Poppet	Brass CDA 360
Inboard Filter	Cartridge - brass Inlet: 10 micron sintered stainless steel.
Seat Return Spring	316L Stainless steel
Pressure Adjusting Spring	Heat-treated spring steel
Adjusting Knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	(HPS270/272) 3000 psig (HPS280/282) 350 psig
Temperature operating range:	0 to 140°F (-17 to 60°C)
Delivery pressure rise:	<0.1 psig /100 psig inlet decay
Flow coefficient	C_V= 0.04
Valve outlet	1/4" NPT (F)
Outlet pressure ranges	15 (2-15 psig), 40 (2-40 psig) 80 (4-80 psig), 125 (5-125 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714





HPT270 Series Model Number System

HPT270 - XXX - XXX - XXXX - XXXX

Dual Stage Chrome Forged Brass

HPT270
0-4000 psig inlet gauge

HPT272
0-4000 psig inlet gauge Hydrogen

HPT280
0-400 psig inlet gauge Acetylene (15 psig max outlet

HPT281
0-400 psig inlet gauge, LP Gas

Outlet Pressure

15 (2-15 psig)
40 (2-40 psig)
80 (4-80 psig)
125 (5-125 psig)
200 (10-200 psig)

Inlet Connection

CGA
580, 590
4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting

Outlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting
BV4M Needle Valve 1/4" Male NPT
DK4F Diaphragm Valve 1/4" Female NPT
DK4M Diaphragm Valve 1/4" Male NPT
DK4S Diaphragm Valve 1/4" Tube Fitting
DK2S Diaphragm Valve 1/8" Tube Fitting

Options

00 Bare Body
03 Certification
05 Panel Mount
07 Relief Valve

HPL270/280

Line Chrome-Plated Brass Regulator

HPL270/280 regulators are recommended for high purity, inert and non-corrosive gas applications where gas is supplied through a distribution system (pipeline).

Series choice is dependent on gas:

- HPL270 - non-flammable and non-corrosive gases
- HPL272 - high pressure, flammable gases
- HPL280 - Acetylene gas
- HPL281 - LP gas

TYPICAL APPLICATIONS

- High-purity gas handling
- Gas chromatography
- Final pressure control in gas systems
- Research sampling systems
- Laser gas systems
- Process analyzers

FEATURES

Precision High Purity Performance

- Helium leak rate of 1 X 10^{-8} scc/sec
- 100% Helium outboard leak tested

Quality Components

- 2.75” stainless steel diaphragm
- 2.50” dual scale gauges
- 102 micron filter
- Materials of construction will not contaminate the gas stream

Options

- Diffusion resistant, packless diaphragm shut-off valve
- Panel mount kit

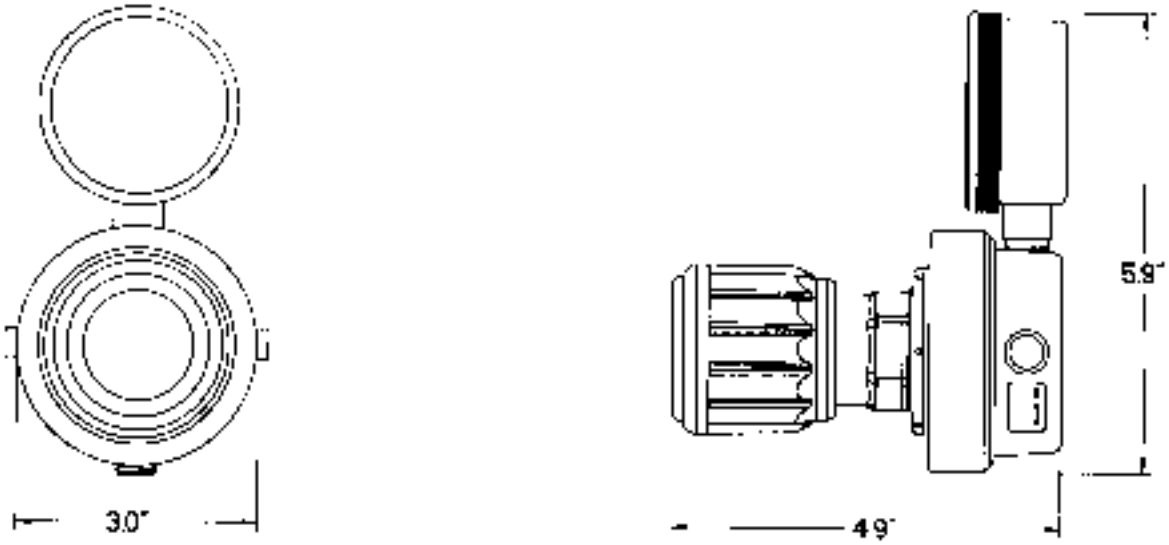
MATERIALS OF CONSTRUCTION

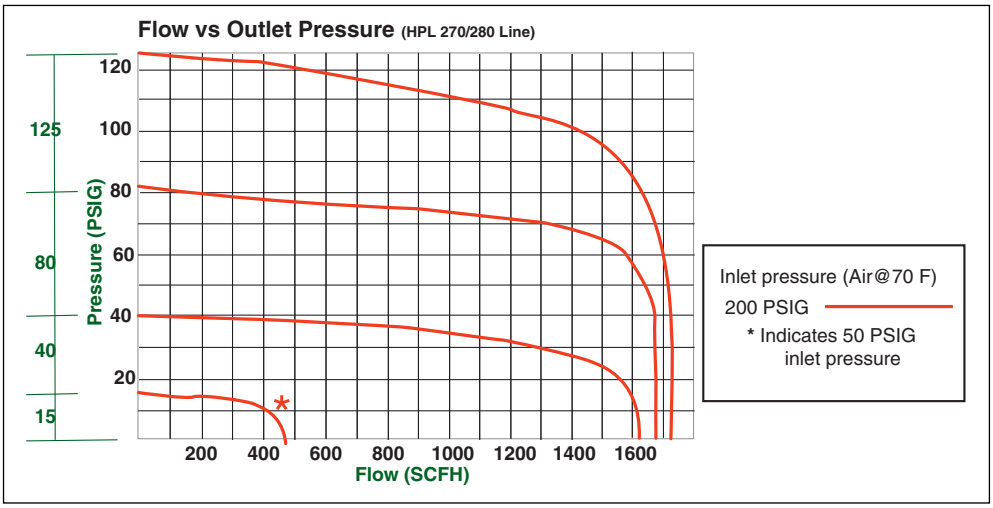
Body	Chrome-plated forged brass
Spring housing cap	Chrome-plated forged brass
Diaphragm	301 Stainless steel
Nozzle	Brass
Seat	Viton™
Seals	Viton
Poppet	Brass CDA 360
Inboard filter	Stainless steel screen 10 micron rating
Seat Return Spring	316L Stainless steel
Pressure Adjusting Spring	Heat-treated spring steel
Adjusting Knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	350 psig
Temperature Operating Range:	0 to 140°F (-17 to 60°C)
Delivery pressure rise:	< 0.1 psig/100 psig inlet decay
Flow coefficient	C_V= 0.19
Valve outlet	1/4" NPT (F)
Outlet pressure ranges	15 (2-15 psig) 40 (2-40 psig) 80 (4-80 psig) 125 (5-125 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714





HPL270 Series Model Number System

HPL270 - XXX - XXX - XXXX - XXXX

Line Regulator Chrome Forged Brass

- **HPL270** No inlet gauge
- **HPL272** No inlet gauge Hydrogen
- **HPL280** No inlet gauge Acetylene
- **HPL281** No inlet gauge, LP Gas

Outlet Pressure

- **15** (2-15 psig)
- **40** (2-40 psig)
- **80** (4-80 psig)
- **125** (5-125 psig)
- **200** (10-200 psig)
- **300** (10-300 psig)
- **500** (20-500 psig)

Inlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting

Outlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting
- **BV4M** Needle Valve 1/4" Male NPT
- **DK4F** Diaphragm Valve 1/4" Female NPT
- **DK4M** Diaphragm Valve 1/4" Male NPT
- **DK4S** Diaphragm Valve 1/4" Tube Fitting
- **DK2S** Diaphragm Valve 1/8" Tube Fitting

Options

- **00** Bare Body
- **03** Certification
- **05** Panel Mount
- **07** Relief Valve

HPT100

Two Stage Chrome-Plated Brass Regulator

HPT100 regulators are recommended for very high purity, gas applications where compact design and consistent delivery pressure are required (as cylinder pressure decreases).

TYPICAL APPLICATIONS

- High-purity gas handling
- Gas chromatography
- Continuous emissions monitoring
- Research sampling systems
- Laser gas systems
- Process analyzers

FEATURES

Precision High Purity Performance

- Helium leak rate of 1 X 10^{-6} scc/sec
- 100% Helium outboard leak tested
- Low dead space (internal volume) minimizes particle generation

Quality Components

- 1.375” stainless steel diaphragm
- 1.50” chrome gauges
- 10 micron sintered stainless steel filter
- Resistant to inboard diffusion of atmospheric contaminants
- Self reseating relief valve. Not designed to Protect downstream apparatus

Installation Flexibility

- 1.375” diaphragm for minimal footprint

Options

- Rotating captured vent for remote venting
- Diffusion resistant, packless diaphragm shut-off valve

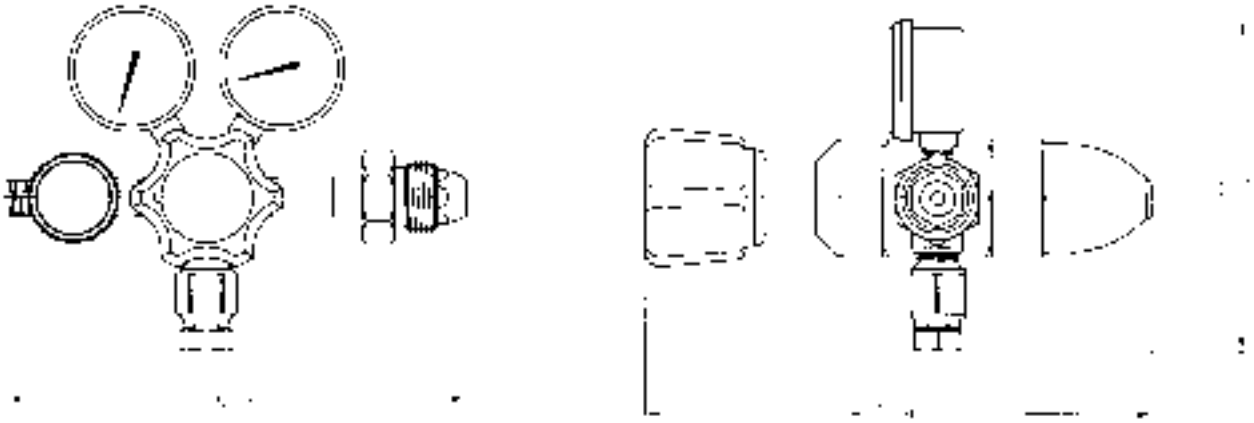
MATERIALS OF CONSTRUCTION

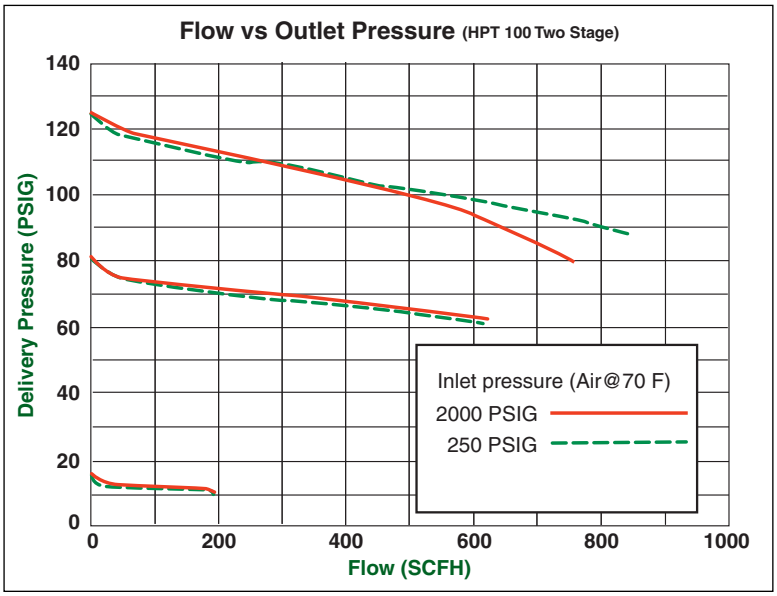
Body	Chrome-plated brass bar stock
Spring housing cap	Chrome-plated bar stock
Diaphragm	301 Stainless steel
Nozzle	Brass
Seat	1st stage PCTFE™ 2nd stage Viton™
Seals	Nylon and Viton
Poppet	Brass CDA 360
Inboard filter	10 Micron sintered stainless steel
Seat return spring	302 Stainless steel
Pressure adjusting spring	Heat-treated spring steel
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	3000 psig
Temperature operating range:	0 to 140°F (-17 to 60°C)
Delivery pressure rise:	< 0.1 psig/100 psig inlet decay
Outlet pressure ranges	15 (2-15 psig) 80 (4-80 psig) 125 (5-125 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714





HPT100 Series Model Number System

HPT100 - XXX - XXX - XXXX - XXXX

Dual Stage Chrome Forged Brass

HPT100
0-4000 psig inlet gauge

Outlet Pressure

15 (2-15 psig)
80 (4-80 psig)
125 (5-125 psig)

Inlet Connection

CGA
580, 590
4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting

Outlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting
BV4M Needle Valve 1/4" Male NPT
DK4F Diaphragm Valve 1/4" Female NPT
DK4M Diaphragm Valve 1/4" Male NPT
DK4S Diaphragm Valve 1/4" Tube Fitting
DK2S Diaphragm Valve 1/8" Tube Fitting

Options

00 Bare Body
03 Certification
07 Relief Valve

HPS4

High Pressure Piston Machined Brass Regulator

HPS4 regulators are recommended for high purity, non-corrosive gas applications where precise control of higher delivery pressures is required.

TYPICAL APPLICATIONS

- High-purity gas handling
- Research sampling systems
- High pressure testing
- High pressure purging
- Accelerated aging

FEATURES

Designed for High Pressures

- Piston type actuation
- Delrin bushing for smooth adjustment
- Adjustable relief valves on 750/1500 outlets.
- Not designed to protect downstream apparatus

Quality Components

- 2.25” brass gauges
- Double inlet filters

Installation Flexibility

- Designed for panel mounting

Options

- Flush/adjustable panel mount

MATERIALS OF CONSTRUCTION

Body	Machined brass
Housing cap	Machined brass
Piston	Brass
Nozzle	PCTFE™
Seals	Viton™
Inlet Filter	Bronze
Pressure adjusting spring	Heat treated spring steel
Adjusting Screw	Machined brass

SPECIFICATIONS

Maximum inlet pressure .....6000 psig without inlet fitting
5500 psig with CGA 680, 347
3000 psig with CGA 580, 346, 350

Temperature Operating range: .....0 to 140°F (-17 to 60°C)

Delivery pressure rise:
750/1500 range < 2.4 psig/100 psig inlet decay
3000 range < 4.8 psig/100 psig inlet decay

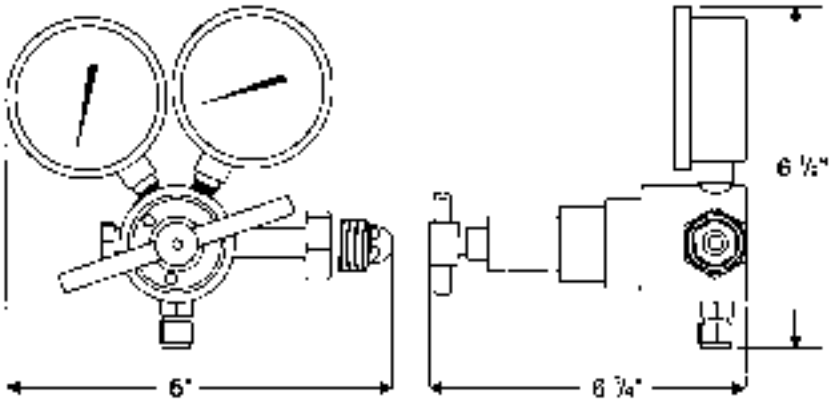
Flow coefficient .....C_V= 0.103

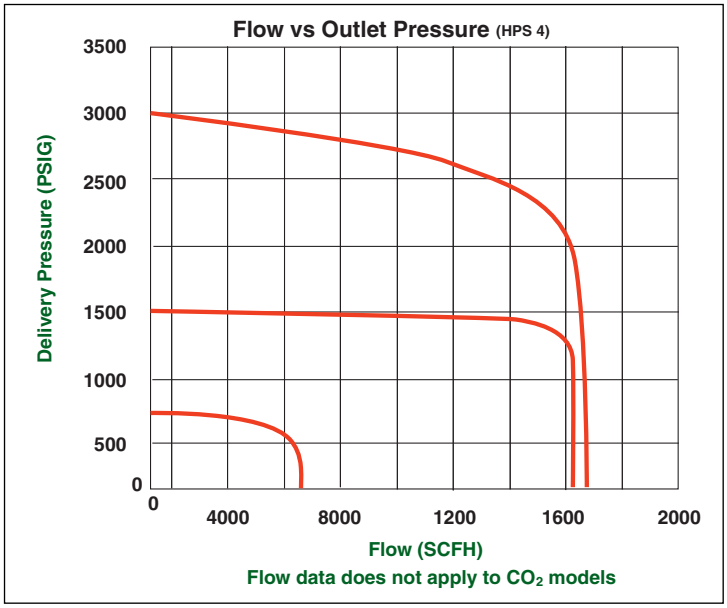
Weight.....4 lbs. (1.8kg)

Outlet .....1/4" Swagelok® fitting

Outlet pressure ranges .....750 (50-750 psig)
1500 (100-1500 psig)
3000 (200-3000 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714





HPS4 Series Model Number System

HPS4 - XXX - XXX - XXXX - XXXX

Single Stage Brass Barstock

HPS4 Inlet Pressure Gauge dependent on CGA Connection

Outlet Pressure

- **750** (25-750 psig)
- **1500** (50-1500 psig)
- **3000** (100-3000 psig)
- **4500** (100-4500 psig)

Inlet Connection

- **CGA** 296, 320, 326, 346, 347, 350, 540, 580, 590, 677, 680
- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting

Outlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting
- **BV4M** Needle Valve 1/4" Male NPT*
- **DK4F** Diaphragm Valve 1/4" Female NPT*
- **DK4M** Diaphragm Valve 1/4" Male NPT*
- **DK4S** Diaphragm Valve 1/4" Tube Fitting*
- **DK2S** Diaphragm Valve 1/8" Tube Fitting*

Options

- **00** Bare Body
- **03** Certification
- **05** Panel Mount
- **07** Relief Valve

* BV and DK Valves not available with 4500 psig outlet pressure

HPL700

Line Forged Brass Regulator

HPL700 regulators are recommended for high purity, inert and non-corrosive gas applications where gas is supplied through a distribution system (pipeline) and high flow is required.

TYPICAL APPLICATIONS

- Laser gas systems
- High-purity gas handling
- High flow non-corrosive gases

FEATURES

High Flow Delivery

- 3.25" stainless steel diaphragm
- Delrin bushing for smooth adjustment

Precision High Purity Performance

- Helium leak rate tested at 1 x 10^{-6} scc/sec.

Quality Components

- 2.5" dual brass gauges
- Resistant to inboard diffusion of atmospheric contaminants

Note: The HPL700 is designed for use downstream of the vaporizer on bulk (liquid) systems. The regulator controls the delivery of gases, not liquids.

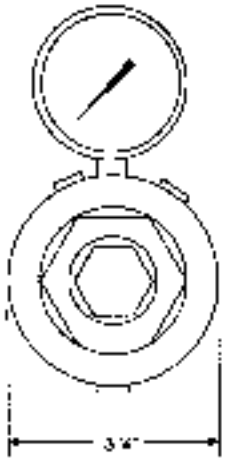
MATERIALS OF CONSTRUCTION

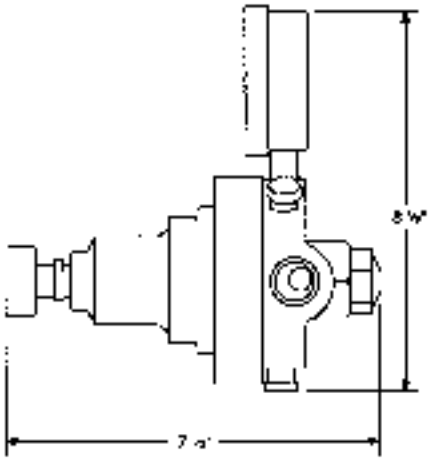
Body	Forged brass
Housing cap	Forged brass
Diaphragm	301 Stainless steel
Nozzle	Brass CDA 360
Seat	Viton™
Seals	Nylon & Viton
Seat holder	Brass
Adjusting knob	Brass nut
Seat return spring	316 Stainless steel
Pressure adjusting spring	316 Stainless steel
Filter	Nickel

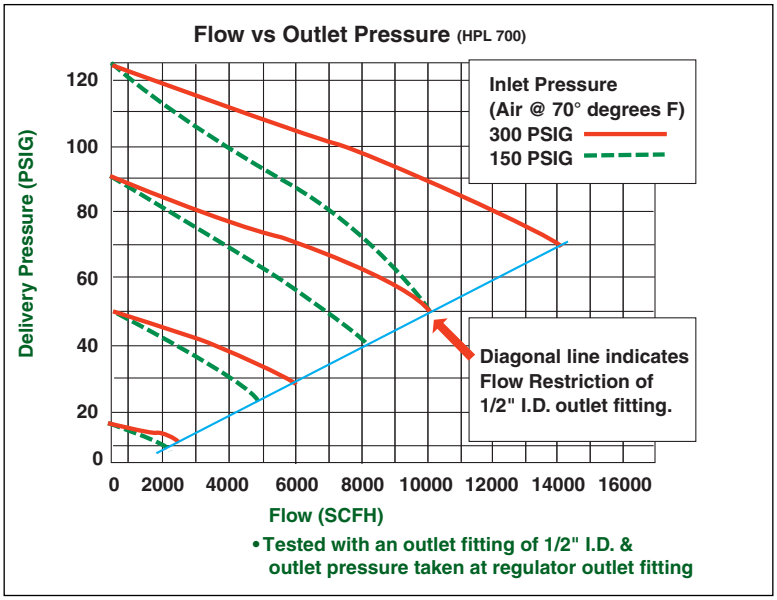
SPECIFICATIONS

Maximum inlet pressure	(HPL-700-400) 500 psig (HPL-700-200) 350 psig
Inlet	1/2" NPT(F)
Outlet	1/2" NPT(F)
Temperature operating range:	0 to 140°F (-17 to 60°C)
Delivery pressure rise:	< 4.9 psig/100 psig inlet decay
Flow coefficient	C_V= 1.67
Weight	5.5 lbs (2.5kg)
Outlet pressure ranges	0-200 psig 0-400 psig

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714







HPL700 Series Model Number System

HPL700 - XXX - XXX - XXXX - XXXX

Line Regulator
Forged Brass

HPL700
No inlet gauge

Outlet Pressure
125 (5-125 psig)
200 (10-200 psig)
400 (5-125 psig)

Inlet Connection
8F 1/2" Female NPT

Outlet Connection
8F 1/2" Female NPT

Options
00 Bare Body
03 Certification

D1- Dome

Dome Regulator

The D1 Dome Regulator is a compact brass regulator designed for applications, such as laser delivery systems, that require constant delivery pressure throughout varying flow ranges and inlet pressures

TYPICAL APPLICATIONS

- Very high flow
- Assist or process gas delivery in laser systems
- Bulk systems, transfilling
- Manifold applications
- Automated cutting systems

FEATURES

- Combines dome and pilot regulator into one unit
- Lighter and more compact than traditional two regulator unit
- Fully adjustable delivery range 50-550 psig
- Bracket for wall mounting included
- 2” chrome gauges

High Flow Delivery

- Capable of delivery 10,000-20,000 scfh

Installation Flexibility

- Cylinder mountable
- Panel mount (included)
- Weight

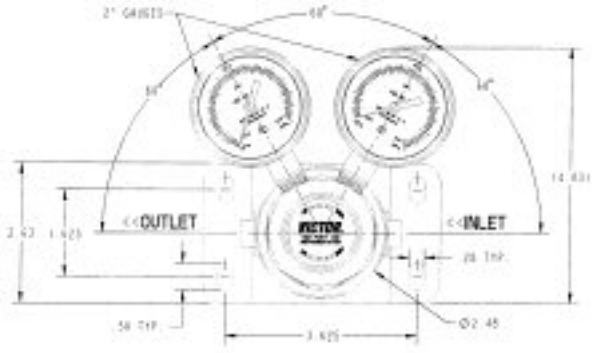
MATERIALS OF CONSTRUCTION

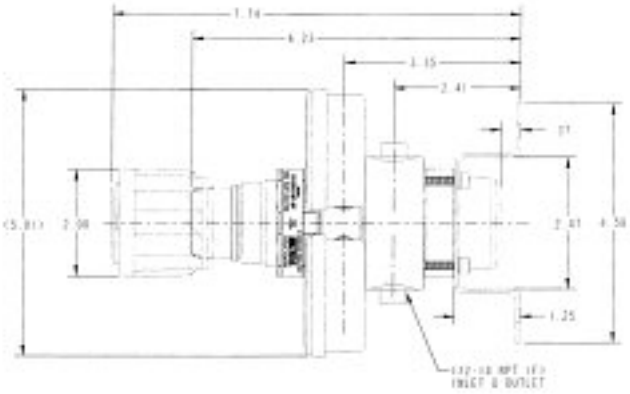
Body	CDA 360 brass
Pilot housing cap	Chrome plated CDA brass
Dome housing cap	CDA 360 brass
Pilot diaphragm	Brass CGA 360
Nozzle/seat	CDA 360 brass
Pilot seat	PTCFE
Dome seat	Viton™
Seals/piston O-ring	Viton
Dome seat backup ring	Teflon™
Filter	102 Micron stainless steel
Seat return spring	302/316 Stainless steel
Pressure adjusting spring	Spring steel
Adjusting knob	Acrylonitrile Butadiene Styrene

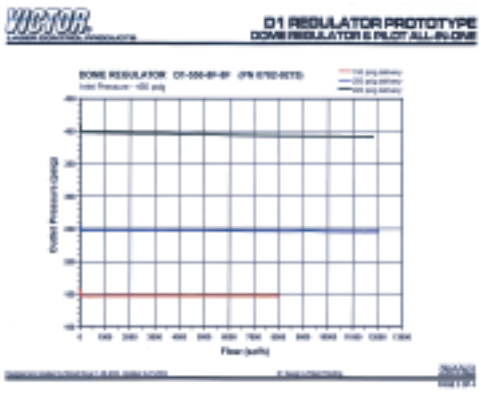
SPECIFICATIONS

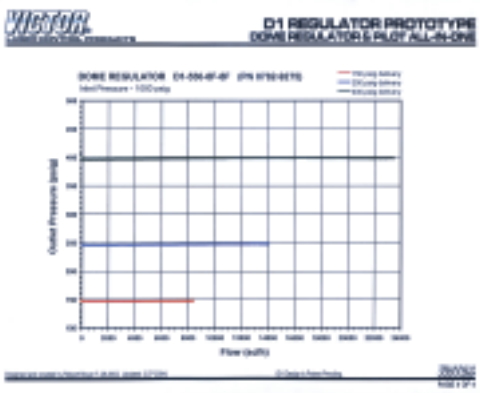
Inlet pressure	3000 psig
Delivery pressure	50-550 psig
Inlet & outlet ports	1/2"-14 NPT (F)
Gauges	H.P. 2" 4000 psig/28000 kPa
	L.P. 2" 600 psig/4200 kPa
Temperature operating range	0°-140°F
Outlet pressure rise	1.04 psig per 100 psig inlet decay
Flow coefficient	C_V= 1.02
Weight	5 lbs (2.3kg)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714









D1 Dome Model Number System

XXX - XXX - XXX - XXX

Series	Delivery	Inlet Fitting	Outlet Fitting
D1 Dome Regulator	**550** 50-550 psig	8F - 1/2"NPT (F)	8F - 1/2"NPT (F)

Description	Part No.
D1-550-8F-8F	0782-9276

Victor Laser Products

Victor offers a selection of high quality equipment to deliver the lasing, assist and beam purge gases to $C0_2$ industrial laser equipment.

Features

- Stainless steel diaphragm regulators
- High purity assist gas delivery pressures up to 550 psig
- High purity manifolds
- High flow, constant delivery pressure

Product Menu

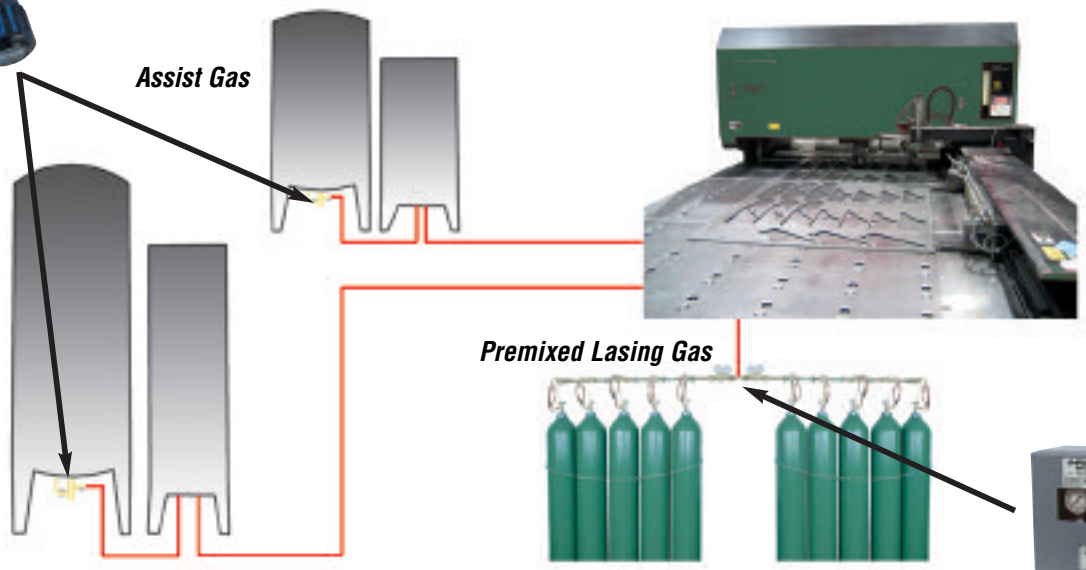
Model Number	Description	Applications	Page
HPT500	High Purity Line Regulator	Beam Purge	16
D1 Regulator	Dome Load Regulator	Assist Gas	32
GLC350	Liquid Cylinder Regulator	Assist Gas, Beam Purge	50
PDS600	High Purity Semi-Automatic Switchover Manifold	Lasing Gas	56
VHP2100	Pressure Differential Semi-Automatic Switchover Manifold	Lasing Gas	60
PSB-1 or PSB-2	Laser Gas Protocol Station	Lasing Gas	64

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

Typical Industrial Laser Applications

Recommended Product:

Dome Load Regulator

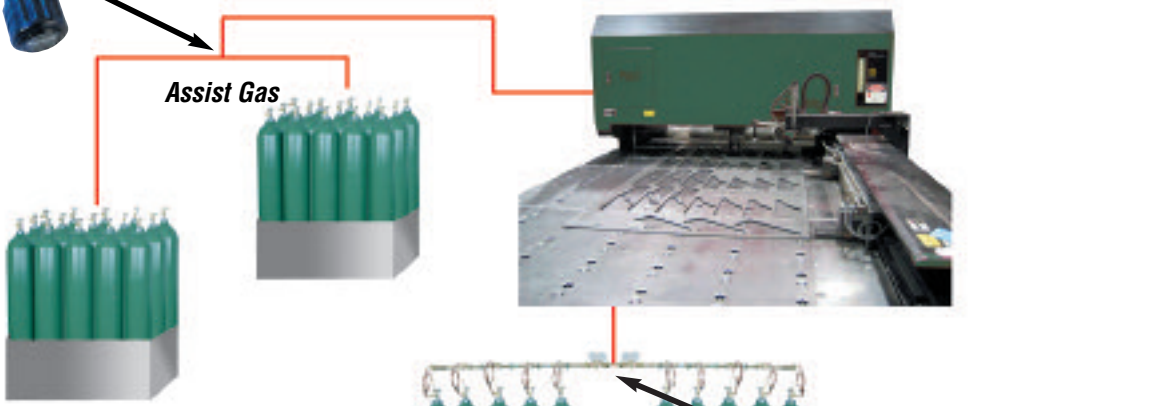


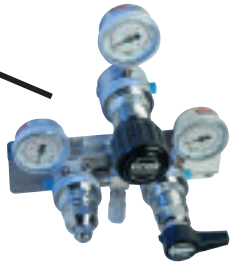
Recommended Product:

VHP2100 Dome Load

Recommended Product:

Dome Load Regulator





Recommended Product:

PDS600

CRS100

Corrosion Resistant Brass & Chrome-Plated Regulators

CRS100 regulators are recommended for high purity, highly corrosive gas applications with restricted space requirements.

TYPICAL APPLICATIONS

- High-purity, corrosive gas handling including
  - Boron trichloride/boron trifluoride
  - Carbonyl fluoride
  - Chlorine/chlorine trifluoride
  - Hydrogen bromide/hydrogen chloride/hydrogen fluoride
  - Nitrosyl chloride
  - Phosphorous pentafluoride
  - Silicon tetrafluoride
  - Sulfur tersfluoride

FEATURES

Durable for Corrosive Gas

- Captured vent allows for remote venting of gas
- Electroless nickel-plated brass body and sintered bronze filter
- 2.19" Teflon™ lined stainless steel diaphragm
- Monel™ nozzle

Precision High Purity Performance

- Yoke connects diaphragm and seat block for instant response
- 100% Helium outboard leak tested
- 100% inboard leak checked with precision helium mass spectrometer

Quality Components

- 2.70" dual scale gauges

Installation Flexibility

- Multi-seat design with rotatable seat block
- Small size to meet space requirements

Options

- Diffusion resistant, packless diaphragm shut-off valve
- Outlet valve with Monel body, stem, tip and Teflon packing

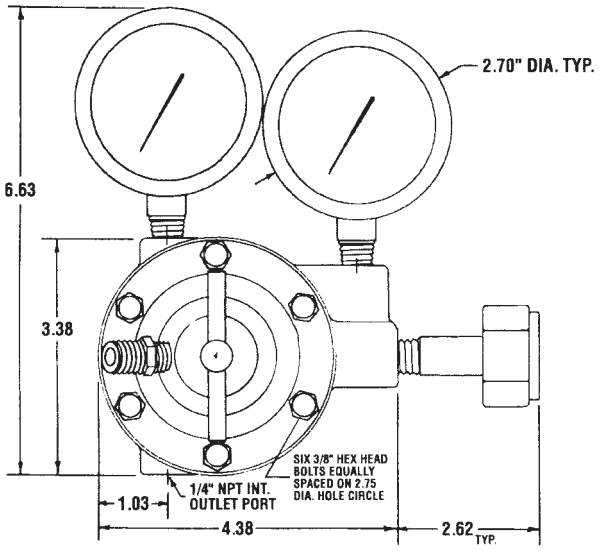
MATERIALS OF CONSTRUCTION

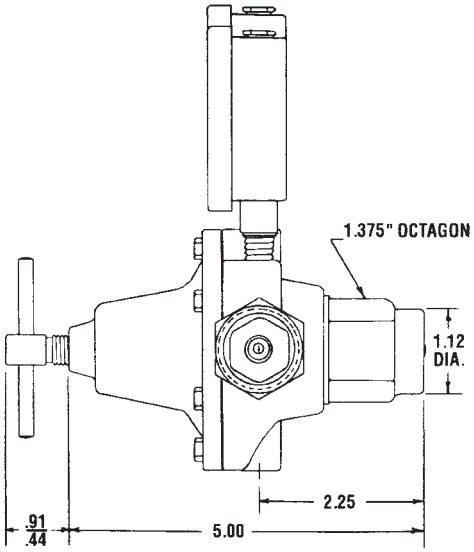
Body	Electroless nickel-plated brass
Spring housing cap	Electroless nickel-plated brass
Diaphragm	Teflon lined 316L stainless steel
Nozzle	Monel
Seat	PCTFE™
Seals	Viton™
Filter	Electroless nickel-plated sintered bronze
Adjusting screw	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	3000 psig (crs100) 1000 psig (crs110)
Valve outlet	1/4" MNPT
Temperature operating range:	-20 to 160°F (-28 to 60°C)
Outlet pressure ranges	0-80 psig 0-160 psig

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

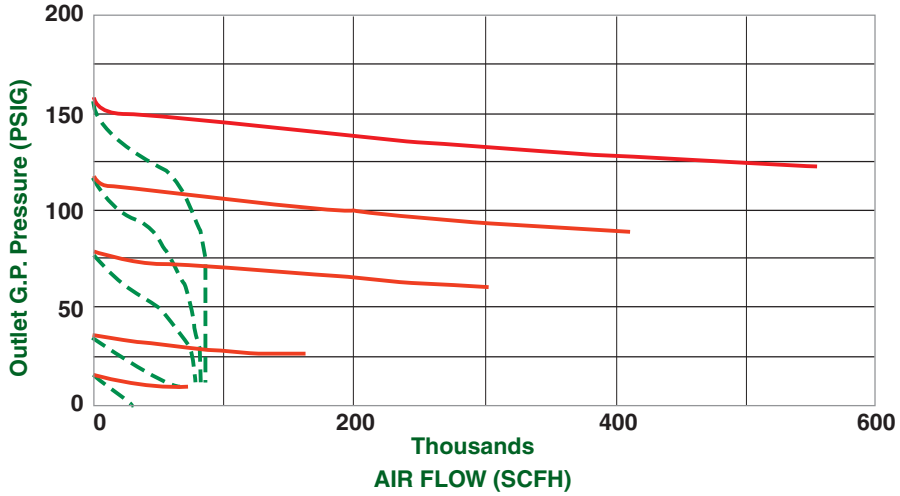




† Inlet pressure
(Nitrogen @ 70°F)

2000 psig

250 psig



- Tested with outlet valve full open and outlet pressure taken at regulator L.P. gauge port.

CRS100 Series Model Number System

CRS100 - XXX - XXX - XXXX - XXXX

Line Forged Brass

CRS100
0-4000 psig inlet gauge

CRS110
0-1000 psig inlet gauge

Outlet Pressure

80 (2-160 psig)
160 (10-160 psig)

Inlet Connection

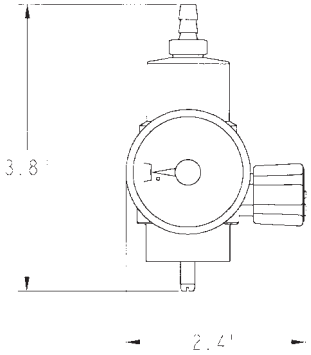
CGA
240, 330, 346, 350, 660, 705
4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting

Outlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting
BV4M Needle Valve 1/4" Male NPT
DK4F Diaphragm Valve 1/4" Female NPT
DK4M Diaphragm Valve 1/4" Male NPT
DK4S Diaphragm Valve 1/4" Tube Fitting
DK2S Diaphragm Valve 1/8" Tube Fitting

Options

00 Bare Body
03 Certification



PR150

Calibration Gas Regulators

PR150 regulators are recommended for non-corrosive gas applications with disposable cylinders using a CGA 600 valve.

TYPICAL APPLICATIONS

- Disposable cylinders of non-corrosive gases

FEATURES

Durable for Corrosive Gas

- CGA 600 valve

User Friendly

- Control valve permits constant flow and easy on/off

Quality Components

- 1.5" gauges

Options

- (4) preset flows: 0.5 lpm,1.0 lpm, 1.5 lpm, 2.5 lpm

MATERIALS OF CONSTRUCTION

Body.....Brass bar stock
Spring housing cap .....Chrome-plated brass bar stock
Diaphragm .....Teflon™ lined 316L stainless steel
Seat.....PCTFE™
Piston.....Brass
Piston "O" rings.....Buna-N®

SPECIFICATIONS

Maximum inlet pressure.....500 psig
Temperature operating range: .....0 to 40°F (-17 to 60°C)
Outlet fitting.....3/16" Hose barb
Inlet fitting .....CGA 600

Model PR150 Ordering Information

Part No.	Model Number	Flow Rate
0781-1170	PR150-025-600	0.25 LPM Air
0781-1171	PR150-025-600	0.5 LPM Air
0781-1172	PR150-05-600	1.0 LPM Air
0781-1173	PR150-1-600	1.5 LPM Air

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

PR160

Calibration Gas Regulators

PR160 regulators are recommended for non-corrosive gas applications with disposable cylinders using a 5/8”-18 valve.

TYPICAL APPLICATIONS

- Disposable cylinders of non-corrosive gases

FEATURES

Durable for Corrosive Gas

- 5/8”-18

User Friendly

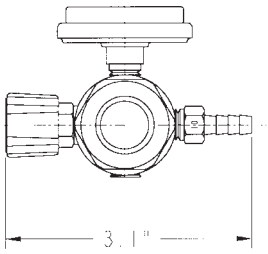
- Control valve permits constant flow and easy on/off

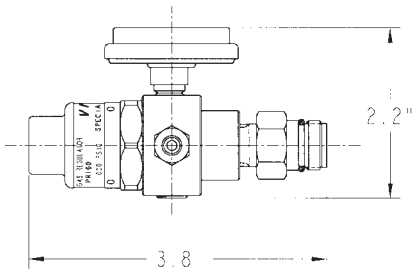
Quality Components

- 1.5” gauges

Options

- (9) preset flows: 0.25 lpm, 0.3 lpm, 0.5 lpm, 1.0 lpm 1.5 lpm, 2.0 lpm, 2.5 lpm, 5.0 lpm, 6.0 lpm





MATERIALS OF CONSTRUCTION

Body	Brass bar stock
Spring housing cap	Chrome-plated brass bar stock
Diaphragm	Teflon™ lined 316L stainless steel
Seat	PCTFE™
Piston	Brass
Piston “O” rings	Buna-N®

SPECIFICATIONS

Maximum inlet pressure	1000 psig
Temperature operating range:	0 to 140°F (-17 to 60°C)
Inlet fitting	5/8”-18 UNF (C-10)
Outlet fitting	3/16” Hose barb

Model PR150 Ordering Information

Part No.	Model Number	Flow Rate
0781-1080	PR160-025	0.25 LPM Air
0781-1087	PR160-03	0.5 LPM Air
0781-1081	PR160-05	1.0 LPM Air
0781-1082	PR160-1	1.5 LPM Air
0781-1085	PR160-5	1.5 LPM Air
0781-1086	PR160-6	1.5 LPM Air

LB150

Lecture Bottle
Chrome-Plated Brass Regulators

LB150 regulators are recommended for non-corrosive gas applications with lecture bottles.

TYPICAL APPLICATIONS

- Lecture bottles of non-corrosive gas
- EPA protocol
- Calibration
- Sampling

FEATURES

Precision Performance

- 1.25” neoprene diaphragm provides greater sensitivity

Quality Components

- 1.50” chrome-plated gauges
- Lightweight adjusting knob
- Self seating type relief valve. Not designed to protect downstream apparatus

Options

- Outlet valve
  - Body ..... Chrome-plated brass
  - Stem ..... Brass
  - Packing ..... Teflon®

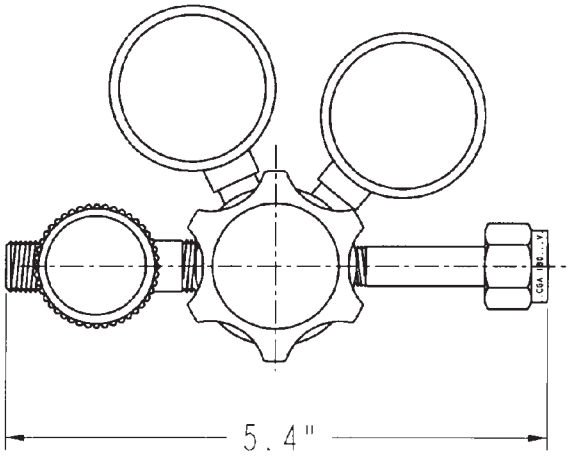
MATERIALS OF CONSTRUCTION

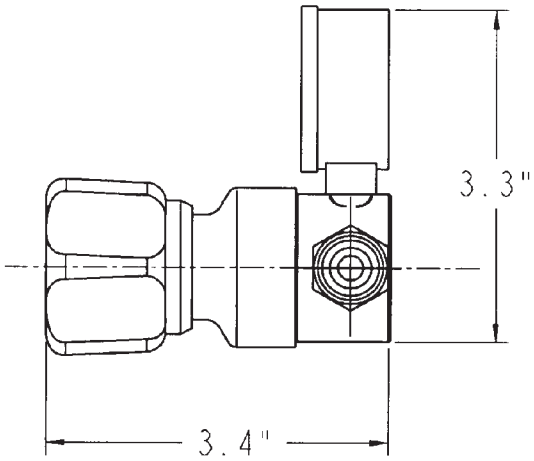
Body	Chrome-plated brass
Spring housing cap	Chrome-plated brass
Diaphragm	Neoprene
Nozzle	Brass
Seat	Polyurethane
Seals	Nylon
Poppet	Brass
Filter	50 micron sintered bronze
Seat return Spring	Stainless steel
Pressure adjusting spring	Music wire
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	3000 psig
Temperature operating range:	0 to 1140°F (-17 to 60°C)
Delivery pressure rise:	<0.3 psig/100 psig inlet decay
Outlet pressure ranges	15 (2-15 psig) 60 (4-60 psig)
Valve outlet	1/4" NPT (F)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714



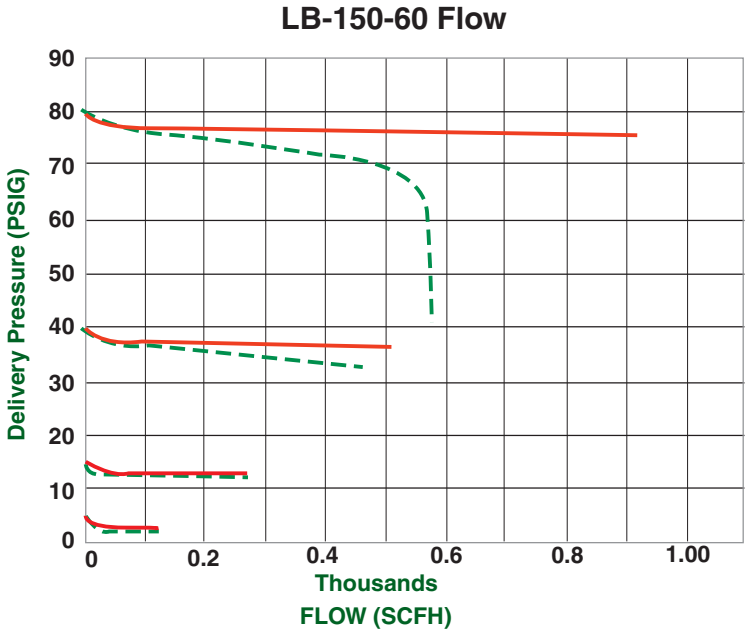


Flow vs Outlet Pressure

Inlet pressure
(AIR @ 70°F)

2000 psig

250 psig



LB150 Series Model Number System

LB150 - XXX - XXX - XXXX - XXXX

Chrome Brass Barstock

LB150 0-4000 psig inlet gauge

Outlet Pressure

15 (2-15 psig)
60 (2-60 psig)

Inlet Connection

CGA 170, 180, 350, 580, 590
2F 1/8" Female NPT
4F 1/4" Female NPT

Outlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting
BV4M Needle Valve 1/4" Male NPT
DK4F Diaphragm Valve 1/4" Female NPT
DK4M Diaphragm Valve 1/4" Male NPT
DK4S Diaphragm Valve 1/4" Tube Fitting
DK2S Diaphragm Valve 1/8" Tube Fitting

Options

00 Bare Body
03 Certification

LB165

Corrosion Resistant Lecture Bottle Chrome-Plated Brass Regulators

LB165 regulators are recommended for high purity, corrosive and toxic gas applications with lecture bottles.

TYPICAL APPLICATIONS

- Lecture bottles of corrosive gas
- Semiconductor
- Moist analysis
- Trace hydrocarbon analysis
- Emissions analysis

FEATURES

Durable for Corrosive Gas

- 2” Stainless steel body with 4 ports
- 1.50” stainless steel diaphragm

Precision High Purity Performance

- Helium leak rate of 1 X 10^{-9} scc/sec.
- 100% Helium outboard leak tested

Quality Components

- Unique diaphragm reduces potential leak paths
- 2” dual scale 316 stainless steel gauges (psi/kp2)
- Cartridge type seat assembly with 10 micron filter
- Resistant to inboard diffusion of atmospheric contaminants

Options

- Captured vent allows for remote venting of gas

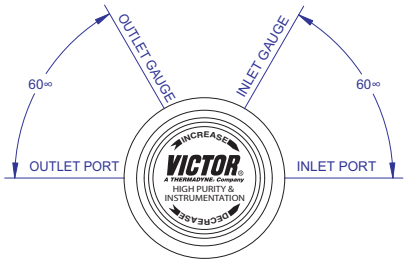
MATERIALS OF CONSTRUCTION

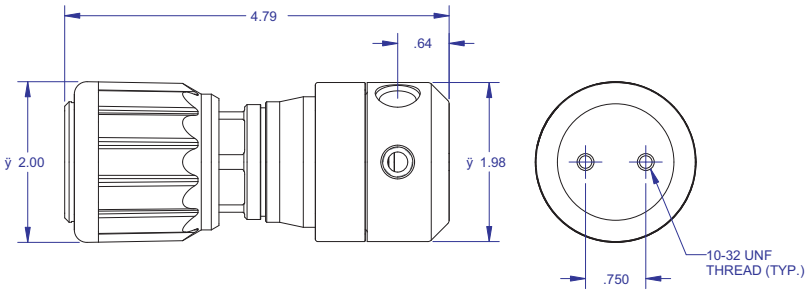
Body	316 Stainless steel
Spring housing cap	Nickel-plated brass
Diaphragm	316 Stainless steel
Nozzle	316 Stainless steel
Seat	PCTFE™
Seals	Teflon™ and PCTFE
Poppet	316 Stainless steel
Filter	10 Micron sintered stainless steel
Seat return spring	316 Stainless steel
Pressure adjusting knob	Music wire
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	3000 psig
Outlet	1/4" MNPT (M)
Temperature operating range:	0 to 140°F (-17 to 60°C)
Delivery pressure rise:	<0.92 psig/100 psig inlet decay
Flow coefficient	C_V= 0.135
Outlet pressure ranges	15 (2-15 psig) 40 (4-40 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714



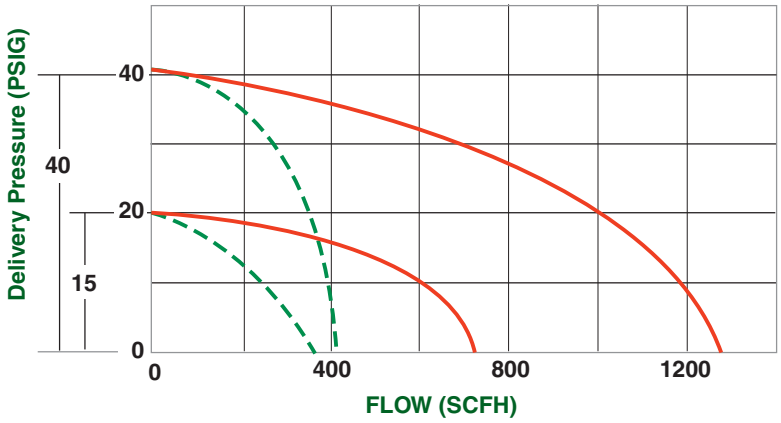


Flow vs Outlet Pressure

Inlet pressure
(AIR @ 70°F)

2000 psig

250 psig



LB165 Series Model Number System

LB165 - XXX - XXX - XXXX - XXXX

316L Stainless Steel

LB165
0-4000 psig inlet gauge

Outlet Pressure

- **15** (2-15 psig)
- **40** (2-40 psig)
- **80** (4-80 psig)
- **125** (5-125 psig)

Inlet Connection

- **CGA** 110, 170, 180
- **2F** 1/8" Female NPT

Outlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting
- **BV4M** Needle Valve 1/4" Male NPT
- **DK4F** Diaphragm Valve 1/4" Female NPT
- **DK4M** Diaphragm Valve 1/4" Male NPT
- **DK4S** Diaphragm Valve 1/4" Tube Fitting
- **DK2S** Diaphragm Valve 1/8" Tube Fitting

Options

- **00** Bare Body
- **02** Helium Leak Test
- **03** Certification
- **04** Captured Vent
- **05** Panel Mount

GPS270/280

General Purpose, Single Stage Chrome-Plated Brass Regulators

GPS270/280 regulators are recommended for inert and non-corrosive gas applications where slight variance in delivery pressure is acceptable (as cylinder pressure decreases).

Series choice is dependent on gas:

- GPS270 - Oxygen and inert gas
- GPS272 - High pressure, flammable gases
- GPS280 - Acetylene gas
- GPS281 - LP gas

TYPICAL APPLICATIONS

- Non-critical speciality gases
- Purging
- Pressure testing
- Gas shielding
- Liquefied hydrocarbon analysis

FEATURES

Quality Components

- 2.75” nylon reinforced diaphragm
- 2.50” dual scale gauges (psi/kp2)
- Chrome plated body, housing cap, fittings and gauges

Options

- Outlet valve
  - Body ..... Chrome-plated forged brass
  - Stem ..... Brass
  - Packing ..... Teflon®
  - Tip ..... Stainless steel ball

Note: These general purpose regulators should not be used in applications sensitive to inboard air diffusion or elastomeric out-gassing.

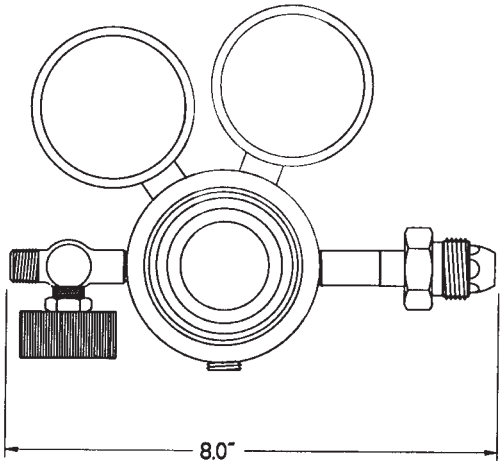
MATERIALS OF CONSTRUCTION

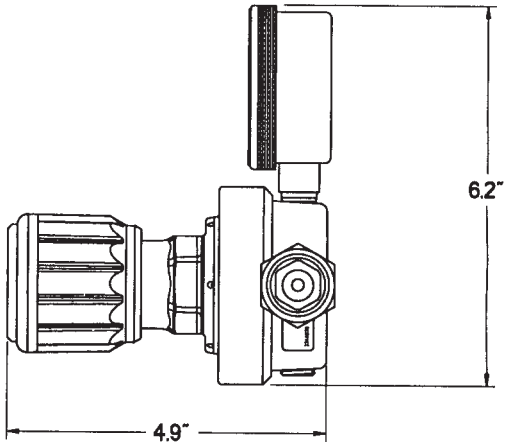
Body	Chrome-plated forged brass
Spring housing cap	Chrome-plated forged brass
Diaphragm	Nylon reinforced neoprene
Nozzle	Brass
Seat	GPS270, 272 Polyurethane GPS280, 282 Neoprene
Seals	Nylon™
Filter	Sintered bronze
Seat return Spring	Stainless steel
Pressure adjusting knob	Music wire
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	(GPS270, 272) 3000 psig (GPS280, 282) 400 psig
Temperature operating range:	0 to 140°F (-17 to 60°C)
Delivery pressure rise:	<0.85 psig/100 psig inlet decay
Flow coefficient	C_V= 0.18
Outlet pressure ranges	15 (2-15 psig) 40 (2-40 psig) 80 (4-80 psig) 125 (5-125 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714





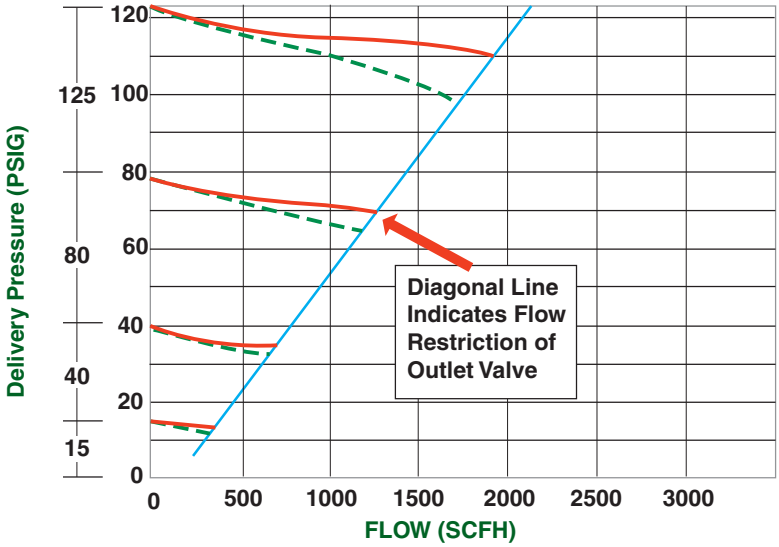
Flow vs Outlet Pressure

Inlet pressure
(AIR @ 70°F)

2000 psig ——————

250 psig - - - - - -

* Tested with outlet valve full open & outlet pressure taken at regulator L.P. gauge port.



GPS270 Series Model Number System

GPS270 - XXX - XXX - XXXX - XXXX

Single Stage Chrome Forged Brass

GPS270 0-4000 psig inlet gauge

GPS272 0-4000 psig inlet gauge Hydrogen

GPS280 0-400 psig inlet gauge Acetylene (15 psig max outlet

GPS281 0-400 psig inlet gauge, LP Gas

Outlet Pressure

15 (2-15 psig)
40 (2-40 psig)
80 (4-80 psig)
125 (5-125 psig)
200 (10-200 psig)

Inlet Connection

CGA 580, 590
4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting

Outlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting
BV4M Needle Valve 1/4" Male NPT
DK4F Diaphragm Valve 1/4" Female NPT
DK4M Diaphragm Valve 1/4" Male NPT
DK4S Diaphragm Valve 1/4" Tube Fitting
DK2S Diaphragm Valve 1/8" Tube Fitting

Options

00 Bare Body
03 Certification
05 Panel Mount
07 Relief Valve

GPT270/280

General Purpose, Two Stage Chrome-Plated Brass Regulators

GPT270/280 regulators are recommended for inert and non-corrosive gas applications where constant delivery pressure is required (as cylinder pressure decreases).

Series choice is dependent on gas:

- GPT270 - Oxygen and inert gas
- GPT272 - High pressure, flammable gases
- GPT280 - Acetylene gas
- GPT281 - LP gas

TYPICAL APPLICATIONS

- Non-critical speciality or lasing gases
- Blanketing
- Purging
- Pressure testing
- Gas shielding
- Hydrocarbon service

FEATURES

Quality Components

- Nylon reinforced diaphragm
- 2.50” dual scale gauges (psi/kp2)
- Chrome plated body, housing cap, fittings and gauges

Options

- Outlet valve
  - Body ..... Chrome-plated forged brass
  - Stem ..... Brass
  - Packing ..... Teflon®
  - Tip ..... Stainless steel ball

Note: These general purpose regulators should not be used in applications sensitive to inboard air diffusion or elastomeric out-gassing.

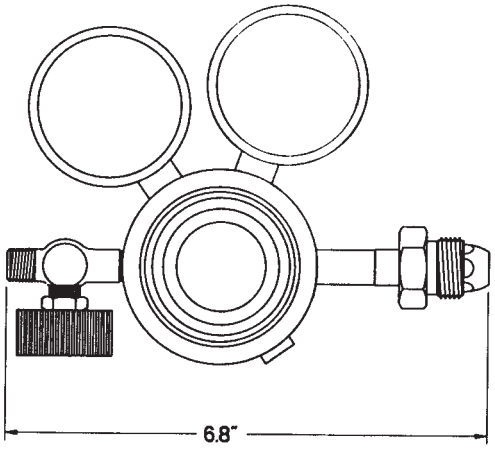
MATERIALS OF CONSTRUCTION

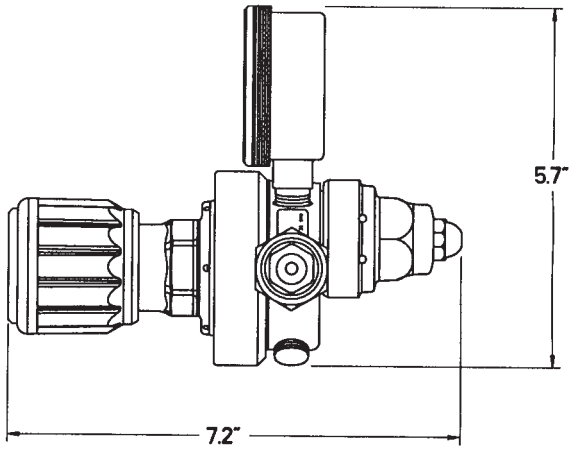
Body	Chrome-plated forged brass
Spring housing cap	Chrome-plated forged brass
Diaphragm	Nylon reinforced neoprene
Nozzle	Brass
Seat	GPT270, 272 Polyurethane GPT280, 282 Neoprene
Seals	Nylon™
Filter	Sintered bronze
Seat return Spring	Stainless steel
Pressure adjusting knob	Music wire
Adjusting knob	Acrylonitrile Butadiene Styrene

SPECIFICATIONS

Maximum inlet pressure	(GPT270, 272) 3000 psig (GPT280, 282) 350 psig
Outlet valve	1/4" NPT (M)
Temperature operating range:	0 to 140°F (-17 to 60°C)
Delivery pressure rise:	<0.1 psig/100 psig inlet decay
Flow coefficient	C_V= 0.08
Outlet pressure ranges	15 (2-15 psig) 40 (2-40 psig) 80 (4-80 psig) 125 (5-125 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714





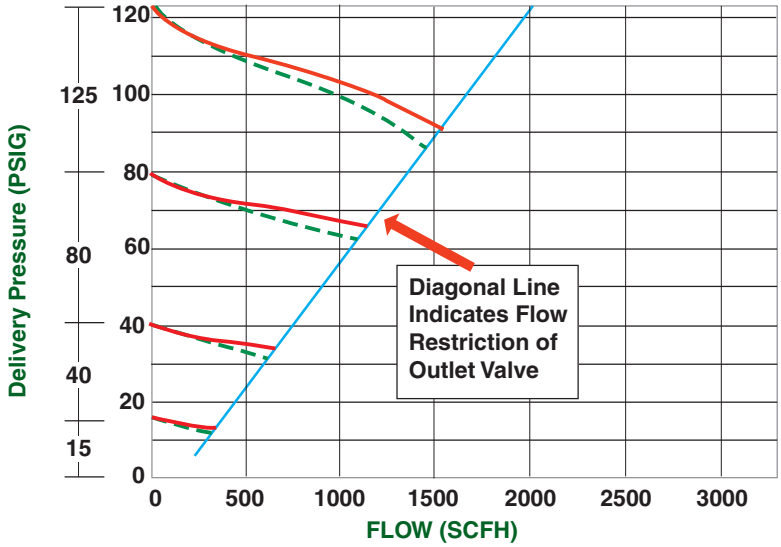
Flow vs Outlet Pressure

Inlet pressure
(AIR @ 70°F)

2000 psig ——————

250 psig - - - - - -

* Tested with outlet valve full open & outlet pressure taken at regulator L.P. gauge port.



GPT270 Series Model Number System

GPT270 - XXX - XXX - XXXX - XXXX

Dual Stage Chrome Forged Brass

GPT270 0-4000 psig inlet gauge

GPT272 0-4000 psig inlet gauge Hydrogen

GPT280 0-400 psig inlet gauge Acetylene (15 psig max outlet

GPT281 0-400 psig inlet gauge, LP Gas

Outlet Pressure

15 (2-15 psig)
40 (2-40 psig)
80 (4-80 psig)
125 (5-125 psig)
200 (10-200 psig)

Inlet Connection

CGA 580, 590
4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting

Outlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting
BV4M Needle Valve 1/4" Male NPT
DK4F Diaphragm Valve 1/4" Female NPT
DK4M Diaphragm Valve 1/4" Male NPT
DK4S Diaphragm Valve 1/4" Tube Fitting
DK2S Diaphragm Valve 1/8" Tube Fitting

Options

00 Bare Body
03 Certification
05 Panel Mount
07 Relief Valve

GPL270/280

Line Regulator

Chrome-Plated Brass Regulators

GPL270/280 regulators are recommended for inert and non-corrosive gas applications where gas is supplied through a distribution system (pipeline).

Series choice is dependent on gas:

- GPL270 - Oxygen and inert gas
- GPL272 - High pressure, flammable gases
- GPL280 - Acetylene gas

TYPICAL APPLICATIONS

- Point of use laboratory systems
- Non-critical specialty gases
- Purging
- Cryogenic gases
- Bulk gas distribution
- Liquified hydrocarbon analysis

FEATURES

Quality Components

- 2.75” Nylon reinforced diaphragm
- 2.50” dual scale gauges (psi/kp2)
- Chrome plated body, housing cap, fittings and gauges

Options

- Outlet valve
  - Body ..... Chrome-plated forged brass
  - Stem ..... Brass
  - Packing ..... Teflon®
  - Tip ..... Stainless steel ball

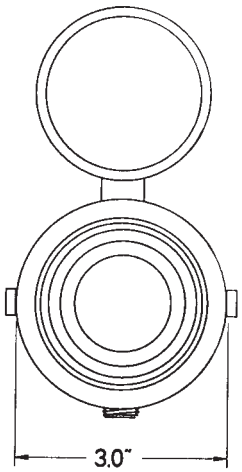
MATERIALS OF CONSTRUCTION

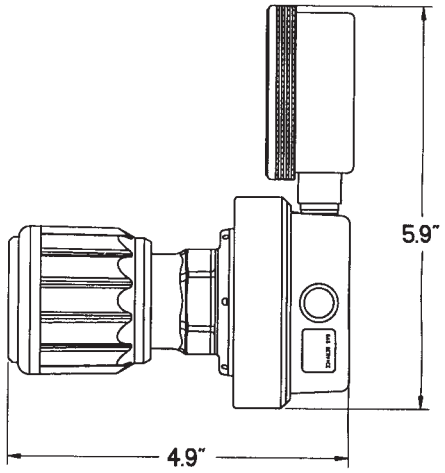
Body	Chrome-plated forged brass
Spring housing cap	Chrome-plated forged brass
Diaphragm	Nylon reinforced neoprene
Nozzle	Brass
Seat	Polyurethane
Seals	Nylon™
Filter	102 micron stainless steel
Seat return Spring	Stainless steel
Pressure adjusting knob	Music wire
Adjusting knob	Acrylonitrile Butadiene Styrene (ABS)

SPECIFICATIONS

Maximum inlet pressure	350 psig
Temperature operating range:	0 to 140°F (-17 to 60°C)
Flow coefficient	C_V= 0.33
Ports	1/4" NPT (F)
Outlet pressure ranges	15 (2-15 psig) 40 (2-40 psig) 80 (4-80 psig) 125 (5-125 psig)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714



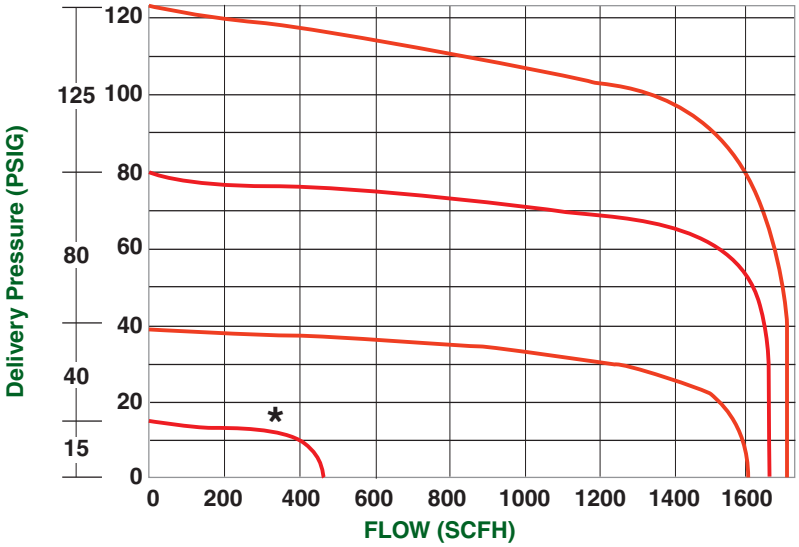


Flow vs Outlet Pressure

Inlet pressure
(AIR @ 70°F)

2000 psig

* Indicated 50 psig inlet pressure



GPL270 Series Model Number System

GPL270 - XXX - XXX - XXXX - XXXX

Line Regulator Chrome Forged Brass

GPL270 No inlet gauge
GPL272 No inlet gauge Hydrogen
GPL280 No inlet gauge Acetylene
GPL281 No inlet gauge, LP Gas

Outlet Pressure

15 (2-15 psig)
40 (2-40 psig)
80 (4-80 psig)
125 (5-125 psig)
200 (10-200 psig)
300 (10-300 psig)
500 (20-500 psig)

Inlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting

Outlet Connection

4F 1/4" Female NPT
4M 1/4" Male NPT
4S 1/4" Tube Fitting
2S 1/8" Tube Fitting
BV4M Needle Valve 1/4" Male NPT
DK4F Diaphragm Valve 1/4" Female NPT
DK4M Diaphragm Valve 1/4" Male NPT
DK4S Diaphragm Valve 1/4" Tube Fitting
DK2S Diaphragm Valve 1/8" Tube Fitting

Options

00 Bare Body
03 Certification
05 Panel Mount
07 Relief Valve

GLC350

Liquid Cylinder Chrome-Plated Brass Regulators

GLC350 regulators are recommended for liquid gas cylinders.

TYPICAL APPLICATIONS

- Bulk gas distribution
- Laser gas systems
- Laboratories

Note: For high flow applications, see HPL700 pages 30-31

FEATURES

Quality Components

- 2.75” stainless steel diaphragm
- 2.50” chrome plated,dual scale gauges
- Chrome plated body, housing cap, fittings and gauges
- Self reseating relief valve

MATERIALS OF CONSTRUCTION

Body.....Chrome-plated forged brass

Spring housing cap.....Chrome-plated forged brass

Diaphragm.....Stainless steel

Nozzle.....Brass

Seat.....Neoprene™

Seals.....Buna-N and Viton™

Filter.....102 micron stainless steel

Seat return Spring.....Stainless steel

Pressure adjusting knob.....Music wire

Adjusting knob.....Acrylonitrile Butadiene Styrene (ABS)

SPECIFICATIONS

Maximum inlet pressure.....500 psig

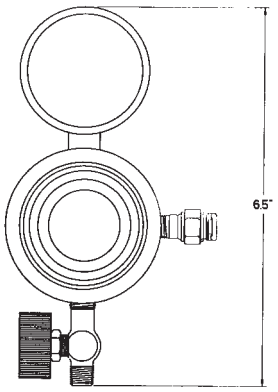
Temperature operating range: .....0 to 140°F (-17 to 60°C)

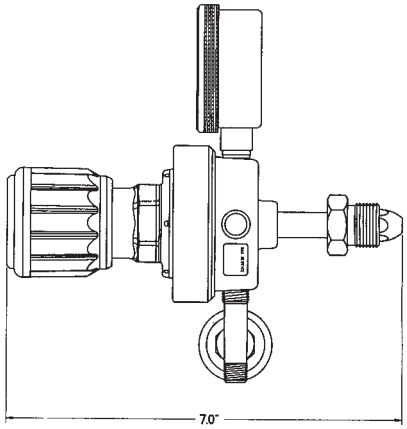
Inlet .....CGA 580, 4F 320, 540

Outlet pressure ranges.....40 (2-40 psig) 200 (10-200 psig)

Outlet.....1/4" NPT (M)

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714



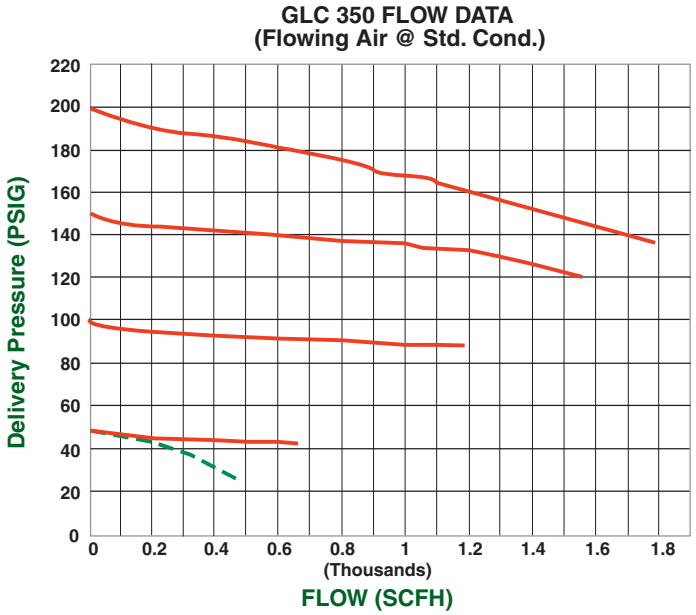


Flow vs Outlet Pressure

Inlet pressure
(AIR @ 70°F)

2000 psig ——————

200 psig - - - - - -



GLC350 Series Model Number System

GLC350 - XXX - XXX - XXXX - XXXX

Single Stage Chrome Forged Brass

GLC350 No inlet gauge

Outlet Pressure

- **15** (2-15 psig)
- **40** (2-40 psig)
- **80** (4-80 psig)
- **125** (5-125 psig)
- **200** (10-200 psig)

Inlet Connection

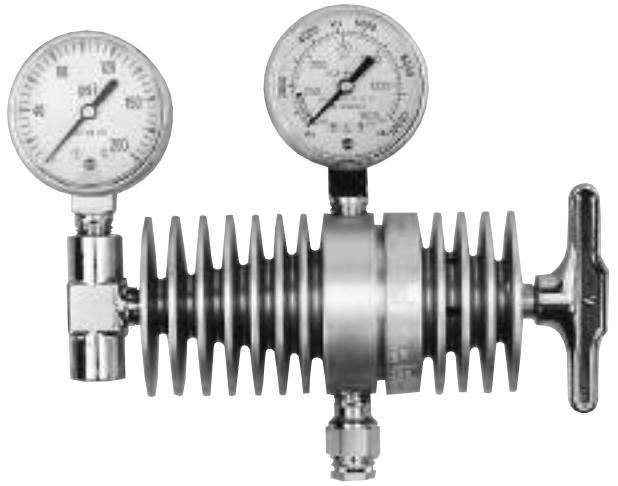
- **CGA** 320, 540, 580
- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting

Outlet Connection

- **4F** 1/4" Female NPT
- **4M** 1/4" Male NPT
- **4S** 1/4" Tube Fitting
- **2S** 1/8" Tube Fitting
- **BV4M** Needle Valve 1/4" Male NPT
- **DK4F** Diaphragm Valve 1/4" Female NPT
- **DK4M** Diaphragm Valve 1/4" Male NPT
- **DK4S** Diaphragm Valve 1/4" Tube Fitting
- **DK2S** Diaphragm Valve 1/8" Tube Fitting

Options

- **00** Bare Body
- **03** Certification
- **05** Panel Mount
- **07** Relief Valve



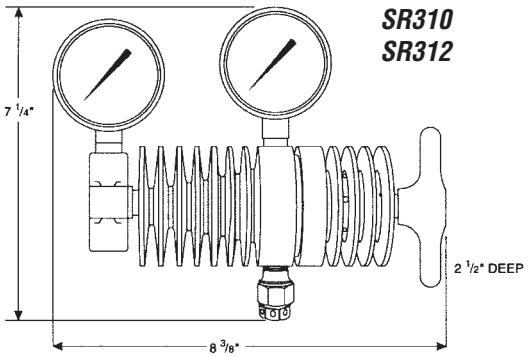
SR300 Series

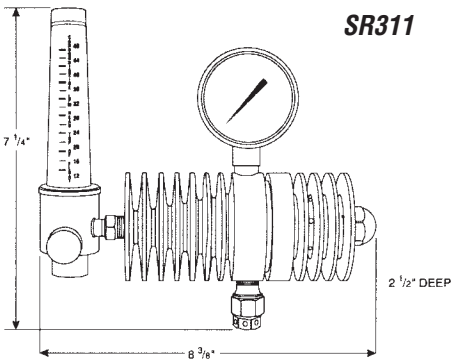
SR310, SR311, SR312 High Flow CO_2 Aluminum Regulators

SR310 regulators are designed for use with standard (non-siphoned) carbon dioxide cylinders.

TYPICAL APPLICATIONS

- Carbon dioxide flow/pressure monitoring





FEATURES

Designed for Carbon Dioxide

- Aluminum heat sink fins permit consistent high flow without freeze-up

Quality Components

- Fabric reinforced neoprene diaphragms
- 2" gauges, high pressure dual scale, low pressure single scale
- Aluminum body and housing cap
- Self reseating relief valve. Not designed to protect downstream equipment

MATERIALS OF CONSTRUCTION

Body .....Aluminum

Spring housing cap .....Aluminum

Diaphragm.....Fabric reinforced neoprene

Inlet Filter .....Bronze

Specifications

Maximum inlet pressure .....1500 psig

Weights: SR310 .....2.3 lbs (1.0kg)
SR311 .....2.9 lbs (1.3kg)
SR312 .....2.9 lbs (1.3kg)

Outlet range: SR 310 .....10-150 psig
Maximum outlet ranges: SR 310 .....200 SCFH
SR 311 .....100 SCFH
SR 312 .....100 SCFH
Outlet connection .....5/8-18" (F) RH
Optional 1/4" NPT (M) connection available.
Order part no. 0950-0163 if required

Model SR300 Ordering Information

Part No.	Model Number	Delivery Range	Max SCFH	CGA
0781-0355	SR310-320 Adjustable/Flowgauge	0-150 psig	200	CGA 320
0781-0353	SR311-320 Flow meter	Preset@ 80 psig	100	CGA 320
0781-0354	SR312-320 Flow meter	100 psig @ 100 SCFH	100	CGA 320

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

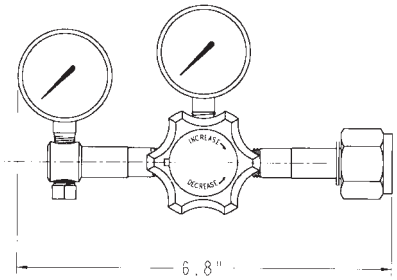
MBG-A

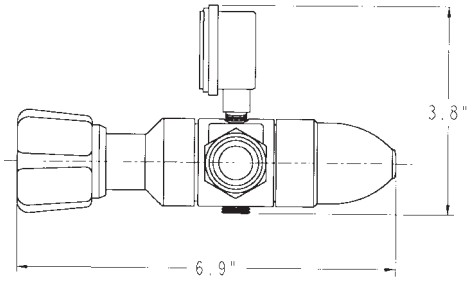
Special Purpose Regulator

The MBG-A regulator is designed for blood gas analysis or similar type apparatures requiring a high degree of pressure control.

TYPICAL APPLICATIONS

- Blood gas analysis





FEATURES

Quality Components

- 1.25” neoprene diaphragm
- 2” chrome-plated gauges
- Self reseating relief valve. Not designed to protect downstream equipment

MATERIALS OF CONSTRUCTION

Body .....Chrome-plated brass
Spring housing cap.....Chrome-plated brass
Diaphragm .....Neoprene™
Seat.....Polyurethane
Seals.....Nylon®
Filter: .....Inlet-sintered bronze, Cartridges-sintered stainless steel, 50 micron rating
Seat return spring .....Stainless steel
Pressure adjusting spring .....Music wire
Adjusting knob .....Acrylonitrile Butadiene Styrene (ABS)

Specifications

Maximum inlet pressure .....3000 psig
Temperature operating range: .....0 to 140°F (-17 to 60°C)
Outlet range.....2-15 psig
Outlet port.....1/8" NPT (F)

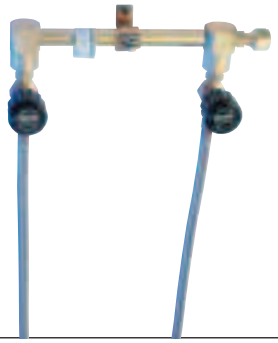
MBG-A Ordering Information

Model Number	Series	Delivery Range	Outlet Range	Inlet Fitting	Outlet fitting	Options
0781-0355	MBG-A	15 2-15 psig	1/8” NPT (F)	CGA 200	2F 1/8” Female NPT	None

Switchover Manifold Systems & Accessories

Standard Features

- High Purity Regulators
- 100% tested
- Easy to order, user friendly model number system
- All systems designed to provide expandability in the event of future growth requirements
- All manifolds cleaned for oxygen service
- Worldwide field sales and technical support

PDS PDS manifolds are designed to change between a primary side, or bank, and a reserve bank of high pressure cylinders. They are available with (600) or without (500) a delivery pressure regulator and are offered in brass or stainless steel.	
VHP VHP manifolds are enclosed in a cabinet for security and cleanliness. They are available with both fully and semi-automatic switchover functionality. Other options include indicator lights, remote alarms and an LCD screen	
Brass Brass manifolds are designed for non-corrosive applications where two or more cylinders are needed to supply critical processes.	
Stainless Stainless manifolds are suitable for corrosive gas applications where two or more cylinders are needed to supply critical processes.	

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

How To Order - High Purity Manifolds

Victor Manifold Systems are designed to make your ordering experience simple and easy to understand. Despite a product line which appears to be complex, this ordering system will allow you to get the right product to your customer.

The key to ordering is having the right information and knowing what your needs are for the particular application. We have provided a checklist below of the key information you will need to make the ordering process trouble-free.

Should you require additional information, please contact our Customer Service Department at (US) 1-800-569-0547. Additionally, we offer a worldwide network of trained District and Regional Managers who would be glad to assist you.

MODEL NUMBER SYSTEM

XXXXX - XXX - XXX - XXX - XXXXXXX

Center Section	Header (RIGHT)	Header (LEFT)	CGA	Length/Style
PDS500B (Brass) **PDS500S** (Stainless Steel) **PDS600B** (Brass) **PDS600S** (Stainless Steel) **VHP200B** (Brass) **VHP200S** (Stainless Steel) **VHP2100B** (Brass w/lights) **VHP2100S** (Stainless Steel w/lights) **PSB** (Brass) **PSS** (Stainless Steel)	1RW 2RW 3RW 4RW 5RW 6RW *Optional header configurations are available	1RW 2RW 3RW 4RW 5RW 6RW *Optional header configurations are available	240 330 **Air** (Industrial) 590 **Air** (Breathing) 346 **Argon** 580 **Carbon Dioxide** 320 **Helium** 580 **Hydrogen** 350 **Nitrogen** 580, **Methane** 350 **Nitrous Oxide** 326 **Oxygen** 540 660 705	**24FTCVFA** 24"Flexible Teflon Lined Check Valve **24FS** 24" Flexible ST. ST. Lined **24RC** 24" Rigid Copper **24RCCV** 24" Rigid Copper Check Valve **24FTL** 24" Flexible Teflon Lined

Ordering Example #1:

Acetylene VHP2100B-2RW-2LW-580-24FTLV

VHP2100B Manifold with 2 cylinders per side, CGA 580 connections on 24" flexible Teflon lined pigtails with check valves.

Ordering Example #2:

Oxygen VHP2100B-IRWC-ILWC-540-72FPCV

VHP2100B Manifold with 1 cylinder per side, CGA 540 connections on 72" flexible pigtails with check valves.

500 SERIES 3

PDS600

Switchover Manifold
Brass and Stainless Steel

The PDS600 is an automatic switchover manifold system that changes between a primary side, or bank, and the secondary side using the pressure differential between the two sides of high pressure gas supply.

The PDS600 is designed to continuously supply the downstream process with high purity gas from two individual cylinders, or from two entire banks of cylinders manifolded together.

The PDS600 is designed with an outlet regulator to maintain a constant downstream pressure. The PDS600 is available with brass or with stainless steel bar stock regulators for use with high purity or corrosive gases.

FEATURES

- Metal-to-metal diaphragm seals
- Helium leak rate of 1 X 10^{-9} scc/sec. All high purity regulators are inboard leak checked with a helium mass spectrometer
- 100% Helium outboard leak tested
- 2" dual scale gauges (psi/kp2)
- Cartridge-type seat assemblies with 10 micron inboard filter
- 180° lever with arrow indicates which side of the manifold is the active side
- Rotating captured vent for remote venting of process gases (optional)
- Regulator bodies are mounted on rear bracket
- Audible and visual alarms (optional)
- Control knob allows precise setting for maximum delivery and locking is easily attained by pressing in the cap

SPECIFICATIONS

Maximum inlet pressure ..... 3000 psig
Maximum output flow rat ..... See Performance Data
Outlet pressure ranges ..... 15 (2-15 psig)
40 (2-40 psig)
80 (4-80 psig)
125 (5-125 psig)
Switchover Pressures .....Right to Left Bank: 200 psig
Left to Right Bank: 165 psig
Inlet & Outlet ports .....1/4" Female NPT
Temperature Operating Range ... -40 to 140°F (-40 to 60°C)
Outlet pressure rise ..... PDS 600: None
Flow coefficient ..... C_V = 0.05
Weight. ..... 12 lbs. (5.4kg)
Mounting Hole Spacing. ..... 8.5"H x 2.5"V

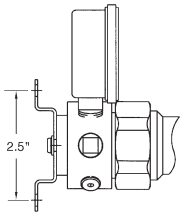
BRASS Model
MATERIALS OF CONSTRUCTION

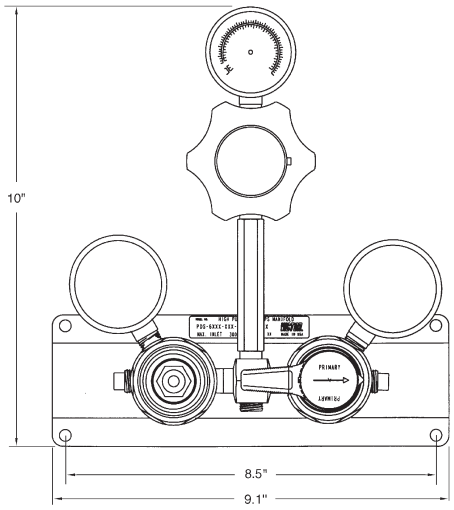
Body .....Brass bar stock
Spring housing cap .....Nickel-plated brass
Diaphragm .....316L Stainless steel
Nozzle .....Brass
Seat.....PCTFE™
Seals .....Teflon™
Poppet .....Brass bar stock
Inboard filter.....10 Micron sintered stainless steel
Seat return spring .....Stainless steel
Pressure adjusting spring.....Heat-treated spring steel
Adjusting knob .....Polypropylene

STAINLESS Model
MATERIALS OF CONSTRUCTION

Body .....316L Stainless steel bar stock
Spring housing cap .....Nickel-plated brass
Diaphragm .....316L Stainless steel
Nozzle .....316L Stainless steel
Seat .....PCTFE
Seals .....Teflon
Poppet.....316L Stainless steel
Inboard filter.....10 Micron sintered stainless steel
Seat return spring .....316L Stainless steel
Pressure adjusting spring.....Heat-treated spring steel
Adjusting knob .....Polypropylene

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714



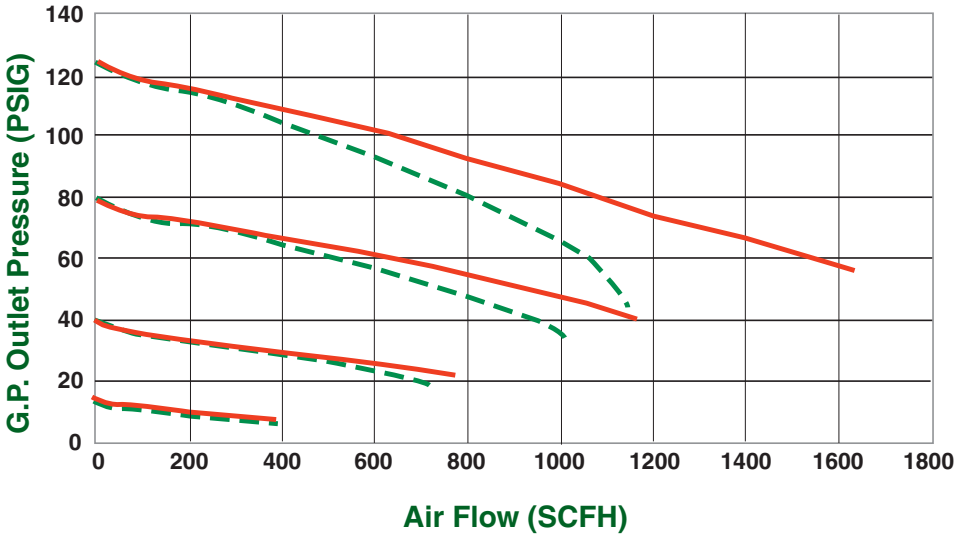


Flow vs Outlet Pressure
Inlet pressure
(Nitrogen @ 70°F)

2000 psig ——

250 psig - - - - -

PDS 600 Flow Data



PDS600 Series Model Number System

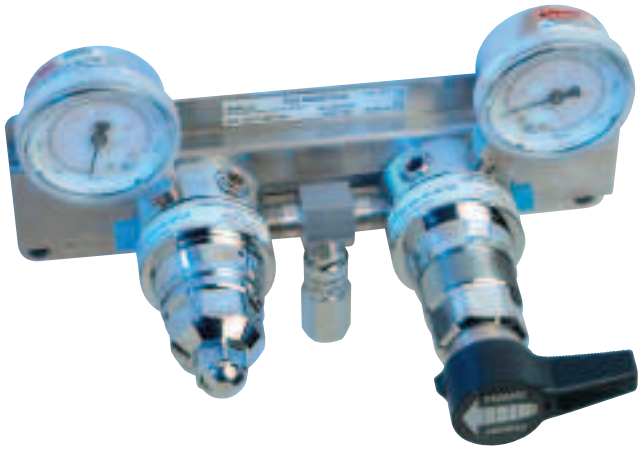
PDS600 - XXX - XXX - XXX - XXX - XX

Center Section	Delivery	Header Right	Header Left	CGA INLET	Stainless Steel Pigtail
PDS600B Brass	15	1 RW	1 LW	**Brass** 320, 346, 350, 540, 580, 590	**24"** Flex
PDS600S Stainless Steel	40	2 RW	2 LW		**36"** Flex
	80	3 RW	3 LW	**Stainless Steel** 240, 330, 660, 705	See note†
	125	4 RW	4 LW		
		6 RW	6 LW		
		See note*	See note*		

Ordering Examples: **PDS600B-40-1 RW-2 LW-350-36**
PDS600 manifold w/40 psi delivery pressure, 1 header right, 2 headers left, CGA 350 brass inlet and 36" flex stainless steel pigtail.

* Optional header configurations are available.

† Standard pigtails are stainless steel lined and include a check valve.



500 SERIES 3

PDS500

Switchover Manifold
Brass and Stainless Steel

The PDS500 is an automatic switchover manifold system that uses the pressure differential between each side, or bank, of the manifold to determine which side is active. The PDS500 is designed to continuously supply the down-stream process with high purity gas from two individual cylinders, one primary and one secondary, or from a bank of cylinders manifolded together.

The PDS500 is available with brass or stainless steel bar stock regulators for use with high purity or corrosive gases.

FEATURES

- Metal-to-metal diaphragm seals
- Helium leak rate of 1 X 10^{-9} scc/sec. All high purity regulators are inboard leak checked with a helium mass spectrometer
- 100% Helium outboard leak tested
- 2" dual scale gauges (psi/kp2)
- Cartridge-type seat assemblies with 10 micron inboard filter
- 2" brass bar stock body regulators with ports for high and low pressure transducers or alarm switches
- 180° lever with arrow indicates which side of the manifold is the active side
- 360° rotating captured vent for remote venting of process gases (optional)
- Regulator bodies are mounted on rear bracket
- Audible and visual alarms (optional)

SPECIFICATIONS

Maximum inlet pressure ..... 3000 psig
Maximum output flow rate ..... See Performance Data
Outlet pressure ranges:
Right as primary: ..... 250 psig
Left as primary ..... 165 psig
Left bank preset: ..... 200 psig
Switchover Pressures:
Right to left bank: 200 psig
Left to right bank: 165 psig
Inlet & outlet ports ..... 1/4" Female NPT
Temperature operating range ... -40 to 140°F (-40 to 60°C)
Outlet pressure rise ..... <0.53 psig/100 psig inlet decay
Flow coefficient ..... C_V = 0.05
Weight ..... 8.5 lbs. (3.8kg)
Mounting hole spacing ..... 8.5"W x 2.5"H

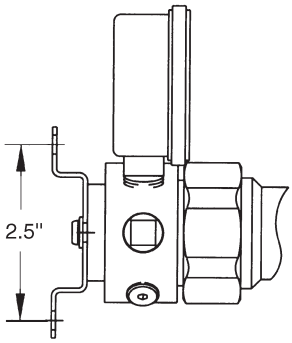
BRASS Model
MATERIALS OF CONSTRUCTION

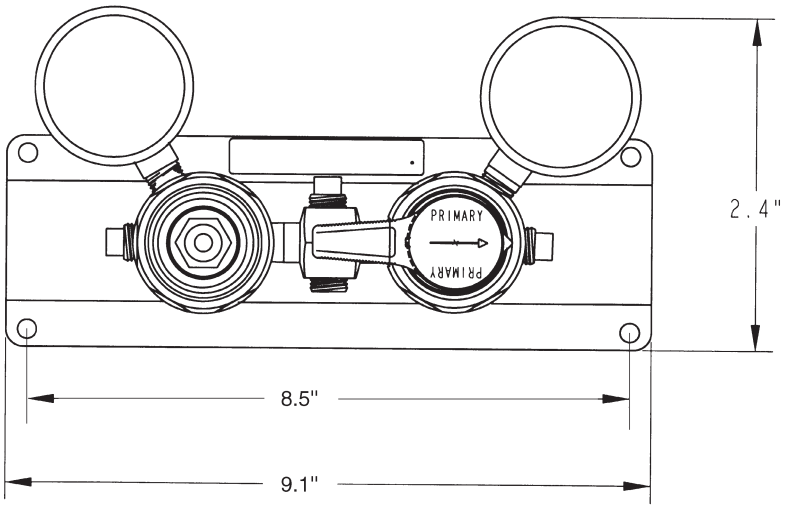
Body	Chrome-plated brass bar stock
Spring housing cap	Chrome-plated brass
Diaphragm	316L Stainless steel
Nozzle	Brass bar stock
Seat	PCTFE™
Seals	Teflon™
Poppet	Brass bar stock
Inboard filter	10 Micron sintered stainless steel
Seat return spring	316L Stainless steel
Pressure adjusting spring	Heat-treated spring steel
Adjusting knob	Polypropylene

STAINLESS Model
MATERIALS OF CONSTRUCTION

Body	316L Stainless steel bar stock
Spring housing cap	Chrome-plated brass
Diaphragm	316L Stainless steel
Nozzle	316L Stainless steel
Seat	PCTFE
Seals	Teflon
Poppet	316L Stainless steel
Inboard filter	10 Micron sintered stainless steel
Seat return spring	316L Stainless steel
Pressure adjusting spring	Heat-treated spring steel
Adjusting knob	Polypropylene

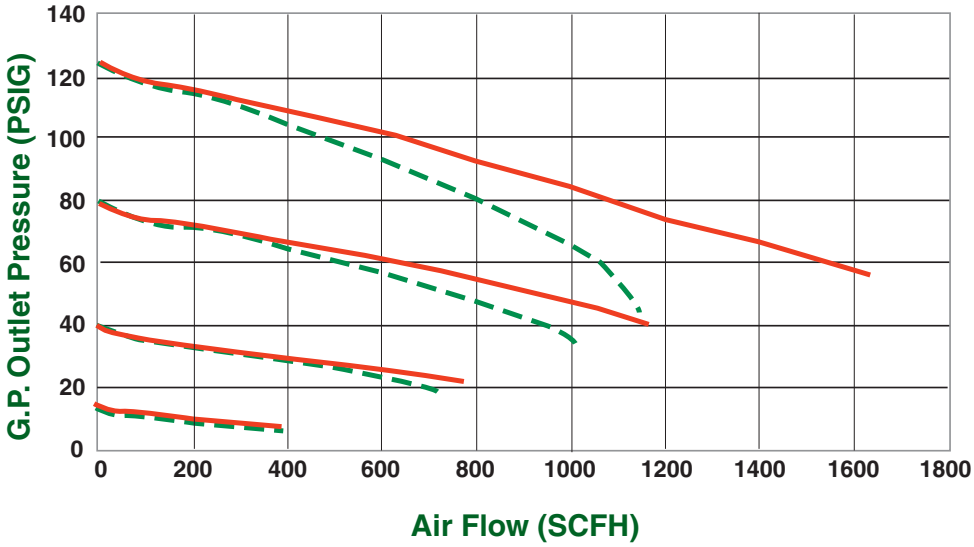
U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714





Flow vs Outlet Pressure
Inlet pressure
(Nitrogen @ 70°F)
2000 psig
250 psig

PDS 500 Flow Data



PDS500 Series Model Number System

PDS500 - XXX - XXX - XXX - XX

Center Section	Header Right	Header Left	CGA INLET	Stainless Steel Pigtail
PDS500B Brass **PDS500S** Stainless Steel	1 RW 2 RW 3 RW 4 RW 6 RW See note*	1 LW 2 LW 3 LW 4 LW 6 LW See note*	**Brass** 320, 346, 350, 540, 580, 590 **Stainless Steel** 240, 330, 660, 705	**24"** Flex **36"** Flex See note†

Ordering Examples: **PDS500B-40-1 RW-2 LW-350-36**
PDS500 manifold 1 header right, 2 headers left, CGA 350 brass inlet and 36" flex stainless steel pigtail.

* Optional header configurations are available.

† Standard pigtails are stainless steel lined and include a check valve.

VHP Manifolds

High Purity Switchover Manifolds

VHP2100 Manifold System

The VHP2100 is a deluxe manifold system for high purity gases. The system is highly recommended for laboratory and process plant applications where depletion of gas supply is unacceptable.

The VHP2100 is designed with an outlet regulator to maintain a constant downstream pressure. The system is available in brass or 316L stainless steel. In-service and reserve indicator lights are standard on the VHP2100 manifold.

VHP2000 Manifold System

The VHP2000 manifold is the same manifold without the in-service and reserve indicator lights.

FEATURES

- 500 Series barstock regulators - High Purity for critical applications
- In-service and reserve indicator lights standard†
- Metal-to-metal seals for high helium leak integrity
- Adjustable line regulator for constant delivery
- Line regulator enclosed in box for tamper - resistant protection
- Easy 180° lever to select primary gas source
- VHP2100 Model incorporates pressure switches for remote alarm activation to indicate gas depletion†

† *VHP2100 model only*

SPECIFICATIONS

Maximum inlet pressure ..... 3000 psig
Outlet pressure ranges ..... 15 (2-15 psig)
40 (2-40 psig)
80 (4-80 psig)
125 (5-125psig)
Switchover Pressures:
Right to Left Bank: 200 psig
Left to Right Bank: 165 psig
Inlet & outlet ports ..... 1/4" NPT (F)
Temperature operating range ... -40 to 140°F (-40 to 60°C)
Outlet pressure rise ..... None
Flow coefficient 0.05
Weight ..... 30 lbs

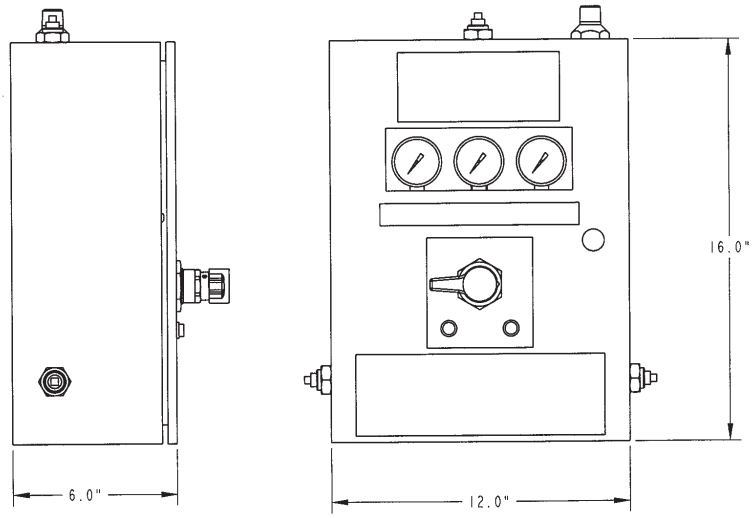
BRASS Model
MATERIALS OF CONSTRUCTION

Body.....Brass bar stock
Spring housing cap .....Nickel-plated brass
Diaphragm.....316L Stainless steel
Nozzle.....Brass
Seat .....PCTFE™
Seals.....Teflon™
Poppet.....Brass bar stock
Inboard filter .....10 Micron sintered stainless steel
Seat return spring.....316L Stainless steel
Pressure adjusting spring .....Heat-treated spring steel
Adjusting knob.....Polypropylene
Enclosure .....16 Gauge powder coated
Tubing .....1/4" Copper
Fittings .....Brass

STAINLESS STEEL Model
MATERIALS OF CONSTRUCTION

Body.....316L stainless steel BAR STOCK
Spring housing cap .....Nickel-plated brass
Diaphragm.....316L Stainless steel
Nozzle .....316L Stainless steel
Seat.....PCTFE
Seals .....Teflon
Poppet .....316L Stainless steel
Inboard filter .....10 Micron sintered stainless steel
Seat return spring.....316L Stainless steel
Pressure adjusting spring .....Heat-treated spring steel
Adjusting knob.....Polypropylene
Enclosure .....16 Gauge powder coated
Tubing.....1/4" Stainless steel
Fittings.....Stainless steel tube

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

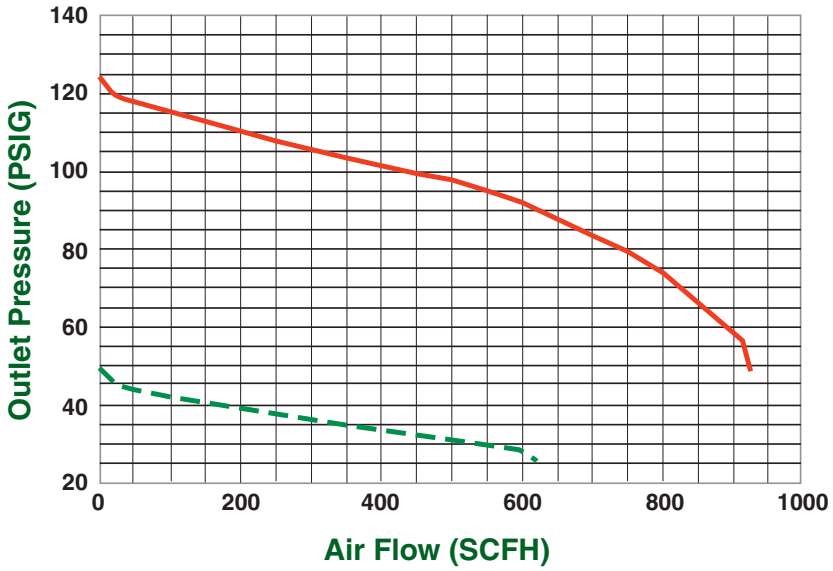


Flow vs Outlet Pressure

Inlet pressure
(Nitrogen @ 70°F)

2000 psig

250 psig



VHP Manifold Model Number System

XXX - PDS500 - XXX - XXX - XXX - XX

CGA INLET

Brass
320, 346, 350, 540, 58, 590

Stainless Steel
240, 330, 660, 705

Center Section

VHP2000B Brass

VHP2000S Stainless Steel

VHP2100B Brass

VHP2100S Stainless Steel

Delivery Pressure

15
40
80
125
300

Header Right

1 RW
2 RW
3 RW
4 RW
6 RW
See note*

Header Left

1 LW
2 LW
3 LW
4 LW
6 LW
See note*

Stainless Steel Pigtail

24" Flex
36" Flex
See note†

* Optional header configurations are available.

† Standard pigtails are stainless steel lined and include a check valve.

HPRB & HPLB

Brass Manifolds

Our brass manifolds are designed for high purity non-corrosive gas applications where two or more cylinders are needed to supply critical processes.

The materials of construction will not off-gas and contaminate the gas stream. The design is highly resistant to inboard diffusion of atmospheric conditions. Flexible braided stainless steel pigtails, lined with stainless steel are standard.

TYPICAL APPLICATIONS

- Gas Chromatography
- Process Analyzers
- Laser Gas Systems
- High Purity Gas Systems
- Non-Corrosive Gases
- Corrosive Gases

FEATURES

- Brazed construction for maximum leak protection
- 7/8" O.D. brass pipe with bar stock tees
- DRK packless diaphragm shut off valves
- Flexible braided stainless steel pigtails, lined with stainless steel, with check valves
- Rated for hydrogen and helium service
- Easily connected to PDS, VHP and PDM switchover manifolds

SPECIFICATIONS

Maximum inlet pressure .....3000 psig
Inlet connections .....Standard CGA's
Outlet connections .....Standard CGA's

MATERIALS OF CONSTRUCTION

Pipe .....Brass
Tees .....Brass bar stock
Valves.....Packless diaphragm
Pigtails .....Stainless steel braided, stainless steel lined

Brass Manifold Model Number System

XXXX - XXX - XXX - XXX - XXXX

HEADER	Header Right	Header Left	CGA INLET	Pigtail
HPRB	2 RW	2 LW	CGA 320, 346, 350, 540, 580, 590	24FSCV
HPLB	3 RW	3 LW	4F	
	4 RW	4 LW	4M	
	6 RW	6 LW		
	See note*	See note*		

* Optional header configurations are available.

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

HPRS & HPLS

Stainless Steel Manifolds

Our stainless steel manifolds are designed for corrosive and non-corrosive gas applications where two or more cylinders are needed to supply critical processes.

The materials of construction will not off-gas and contaminate the gas stream. The design is highly resistant to inboard diffusion of atmospheric conditions. Victor DRK diffusion resistant shut off valves. Flexible braided stainless steel pigtails, lined with stainless steel are standard.

TYPICAL APPLICATIONS

- Gas Chromatography
- Process Analyzers
- Laser Gas Systems
- High Purity Gas Systems
- Non-Corrosive Gases

FEATURES

- Tig welded construction for maximum leak protection
- 7/8" O.D. stainless steel pipe with forged tees
- DRK packless diaphragm shut off valves
- Flexible braided stainless steel pigtails, lined with stainless steel, with check valves
- Rated for hydrogen and helium service
- Easily connected to PDS, VHP and PDM switchover manifolds

SPECIFICATIONS

Maximum inlet pressure .....3000 psig
Inlet connections .....Standard CGA's
Outlet connections.....Standard CGA's

MATERIALS OF CONSTRUCTION

Pipe.....303 Stainless steel
Tees.....304 Forged stainless steel
Valves.....Packless diaphragm
Pigtails.....Stainless steel braided, stainless steel lined

Stainless Steel Manifold Model Number System

XXXX - XXX - XXX - XXX - XXXX

HEADER	Header Right	Header Left	CGA Inlet	Pigtail
HPRS	2 RW	2 LW	CGA 240, 330, 350, 540, 580, 590, 660.705	24FSCV
HPLS	3 RW	3 LW	4F	
	4 RW	4 LW	4M	
	6 RW	6 LW		
	See note*	See note*		

* Optional header configurations are available.

Protocol Stations

The Point of Use (Protocol Station) is a regulator option designed for convenient bracket mounting to any surface. Wall mounting improves safety, prevents regulator damage and provides ease of use.

The protocol station is available in both brass and 316 stainless steel construction. Point of Use comes complete with a 24" long flexible hose with check valves.

TYPICAL APPLICATIONS

- Protocol Gases
- Laboratory
- CEM
- Laser

FEATURES

- Designed to accommodate single or two stage regulators
- Constructed of stainless steel or brass
- Regulator: CGA inlet connection designates stainless steel (corrosive) or brass (non-corrosive) block gas service
- Standard pigtails are stainless steel braided, stainless steel lined, flexible hose with check valves prevent contamination during cylinder changeout

SPECIFICATIONS

Maximum inlet pressure .....3000 psig
Temperature range .....See regulator specifications
Protocol station weight .....3.1 lbs. (less regulator)

MATERIALS OF CONSTRUCTION

Gas block ..... 316 Stainless steel or chrome-plated brass bar stock

Inlet connection .....316 Stainless steel or brass bar stock

Protocol Station Model Number System

XXXX - XXX - XXX - XXX - XXXX

Protocol Station	Number of Cylinders	CGA Inlet	Pigtail	Option
PSB* Brass	1	**CGA** 320, 350, 510, 540, 580, 590 660	**24FSCV**	**CV** Check Valve
PSS** Stainless Steel	2			

* PSB = Protocol Station, Brass w/Bracket
** PSS = Protocol Station, Stainless Steel w/Bracket

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

Protocol Stations Without Regulators

BRASS

Part No.	*Description*
1130-1233	PSB-1-580-24FSCV*
1130-1241	PSB-2-580-24FSCV*
1130-1242	PSB-1-590-24FSCV*
1130-1243	PSB-2-590-24FSCV*
1130-1244	PSB-1-350-24FSCV*
1130-1245	PSB-2-350-24FSCV*
1130-1246	PSB-1-320-24FSCV*
1130-1247	PSB-2-320-24FSCV*
1130-1239	PSB-1-540-24FSCV*
1130-1240	PSB-2-540-24FSCV*

STAINLESS STEEL

Part No.	*Description*
1130-1248	PSS-1-660SS-24FSCV**

* PSB = *Protocol Station, Brass, with Bracket*

** PSS = *Protocol Station, Stainless, with Bracket*

Protocol Components List

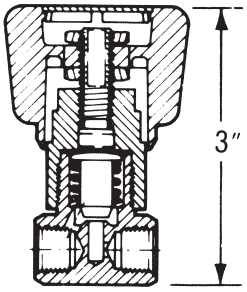
Regulator	(Single or Two Stage)	
CGA Chrome	CGA580 Adapter	0973-0041
Brass	CGA540 Adapter	0967-0131
	CGA510 Adapter	0970-0062
	CGA590 Adapter	0974-0026
	CGA350 Adapter	0983-0048
	CGA320 Adapter	0985-0039
Stainless Steel	CGA660 Adapter	0995-0026
Alarm Port	Pipe Plug (Chrome)	1105-0012
	Pipe Plug (Stainless)	1105-0021
Bracket	Bracket (Stainless)	1106-0085
	Screws (2 needed)	1400-0164
Block	Chrome Block	1131-0100
	Stainless Steel Block	1131-0101
Nipple	Nipple (Chrome)	0901-0081
	Nipple (Stainless)	0901-0070
Elbow	(Single or Two Cylinder)	
DRK Valve	DRK Valve (Chrome)	0660-0513
	DRK Valve (Stainless)	0660-0200
Pigtail (Brass)	580 x 24" Pigtail	1123-0630
	540 x 24" Pigtail	1123-0632
	590 x 24" Pigtail	1123-0650
	350 x 24" Pigtail	1123-0631
	320 x 24" Pigtail	1123-0634
Pigtail (Stainless Steel)	580SS x 24" Pigtail	1123-0640
	540SS x 24" Pigtail	1123-0648
	590SS x 24" Pigtail	1123-0642
	350SS x 24" Pigtail	1123-0644
	660SS x 24" Pigtail	1123-0635

DRK

Chrome-Plated Diffusion Resistant Valve

The packless, diffusion resistant shut off valve DRK series assists in maintaining system purity. The copper diaphragm feature is enveloped between two stainless steel diaphragms and is available in both brass or chrome-plated brass.

These outlet valves have a 1/4" NPT(F) inlet and outlet and are capable of being certified to inboard helium leak rates down to 1 x 10^{-9} scc/sec.



FEATURES

- Metal to metal seal
- 1.375” Hex bar stock body
- Multiple diaphragms
- Helium leak rate of 1 x 10^{-9} scc/sec. All high purity regulators are inboard leak checked with a helium mass spectrometer

SPECIFICATIONS

Maximum inlet	3000 psig
Temperature Operating Range	0 to 140°F (-17 to 60°C)
Inlet and outlet port	1/4” NPT (F)
Flow coefficient	Cv = 0.33
Weight	13 oz.

MATERIAL OF CONSTRUCTION

Body	Chrome-plated brass or brass
Seat	PCTFE™
Seat holder	Brass
Gasket	PCTFE
Diaphragm contacting gas	316L Stainless steel
Spring	316L Stainless steel
Knob	Glass filled polypropylene
Seat guide holder	PCTFE

Ordering information

DRK Chrome-Plated Diffusion Resistant Valve

Model No.	Description
DRK-2-4C	Chrome-plated brass 2 1/4”-18 Female NPT ports
DRK-2-4	Brass 2 1/4”-18 Female NPT ports
0910-0081	Adapter, 1/4 NPTM x 1/4” NPTM, Chrome

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

DRK

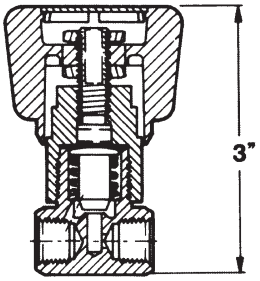
Stainless Steel with Center Purge Valves

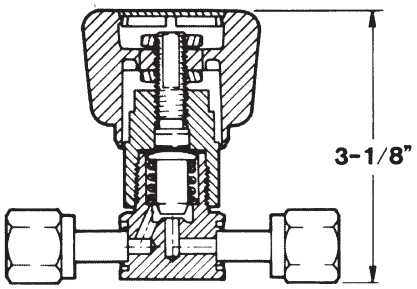
The DRK packless diffusion resistant shut-off valve is designed for use in purge systems. It is available with four (4) 1/4" -18 NPT (F) ports. The bodies are threaded for rear panel mounting.

Center valves are capable of being certified to inboard helium leak rates down to 1 x 10^{-9} scc/sec.

FEATURES

- Metal to metal seal
- 1.625" Hex bar stock body (1/4" - 18 NPT ports)
  1.25" Round bar stock body (1/4" - 18 VCR® fittings)
- Bonnet leak test port
- Multiple diaphragms
- Helium leak rate of 1 x 10^{-9} scc/sec. All high purity regulators are inboard leak checked with a helium mass spectrometer
- Welded fitting models have VCR® compatible fittings semi-automatically butt welded
- All valves are 100% helium leak tested





SPECIFICATIONS

Maximum inlet	3000 psig
Temperature Operating Range	0 to 140°F (-17 to 60°C)
Inlet and outlet port	1/4" NPT (F)
Flow coefficient	Cv = 0.33
Weight	13 oz.

MATERIAL OF CONSTRUCTION

Body	1/4"-18 NPT (F) ports 316L Stainless steel or 1/4" VCR® fittings 316L Stainless steel
Seat	PCTFE
Seat holder	316L Stainless steel
Gasket	PCTFE
Diaphragm contacting gas	316L Stainless steel
Spring	316L Stainless steel
Knob	Glass filled polypropylene
Seat guide holder	PCTFE

Ordering information

DRK Stainless Steel with Center Purge Valves

Model No.	Description
DRK-4-4S	Stainless steel Four (4) 1/4" -18 Female NPT ports

DRK

Stainless Steel Full Turn Valve

The DRK series packless diffusion resistant shut-off valves help maintain system purity and leak integrity. The bodies are threaded for rear panel mounting. All welded vacuum coupled ring (VCR®) high performance face seal fittings or 1/4" NPT (F) versions are available.

These outlet valves are capable of being certified to inboard helium leak rates down to 1 x 10^{-9} scc/sec.

FEATURES

- Metal to metal seal
- 1.375" Hex bar stock body (1/4" NPT ports)
  1.25" Round bar stock body (VCR® fittings)
- Bonnet leak test port
- Multiple diaphragms
- Reset feature on 1/4 turn valve
- Design capable of passing 1 x 10^{-9} scc/sec inboard helium leak rate (production models are tested to 1 x 10^{-7} scc/sec)
- Welded fitting models have VCR® compatible fittings semi-automatically butt welded
- Welded models are electro-polished
- All valves are 100% helium leak tested

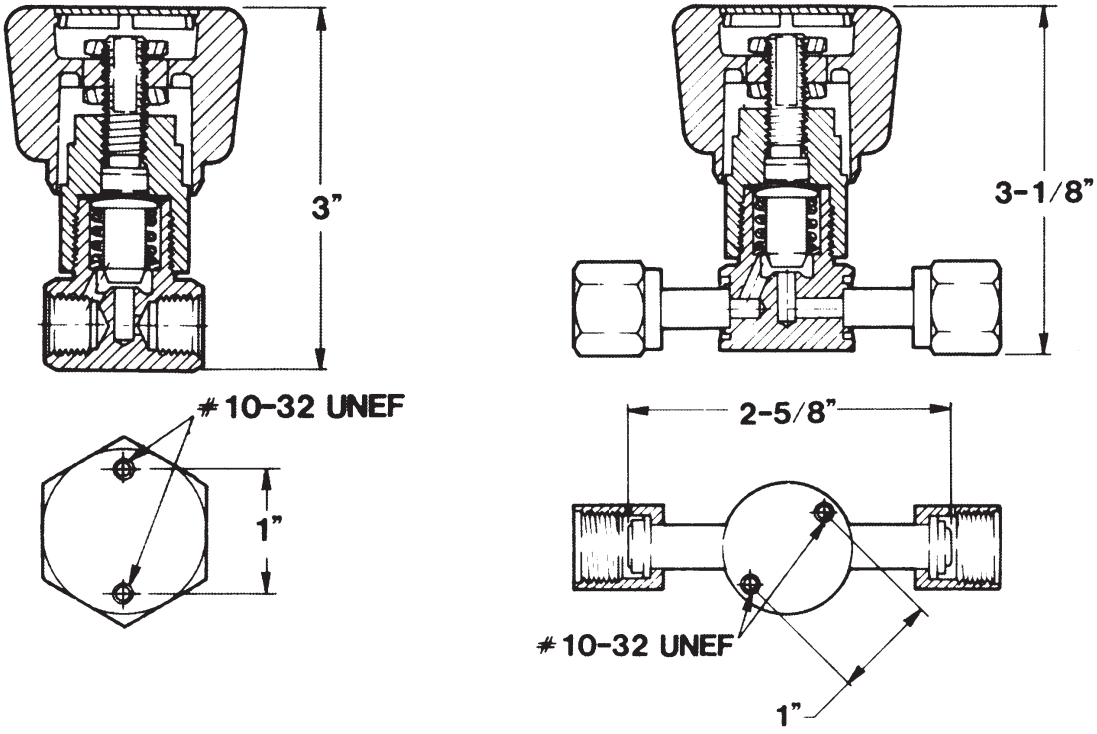
SPECIFICATIONS

Maximum inlet	3000 psig
Available porting - Choice of:	1/4" NPT (F) ports or 1/4" VCR®(F) fittings
Maximum leak rate across seat	1 x 10^{-9} scc/sec
Temperature Operating Range	- 40°F to +165°F
Flow coefficient	DRK - Cv = 0.33 DRL - Cv = 0.17

MATERIAL OF CONSTRUCTION

Body: Choice of	1/4" - 18 NPT (F) ports 316L Stainless steel or 1/4" VCR® fittings 316L Stainless steel
Seat	PCTFE™
Seat holder	316L Stainless steel
Gasket	PCTFE
Diaphragm contacting gas	316L Stainless steel
Spring	316L Stainless steel
Knob	Glass filled polypropylene
Seat guide holder	PCTFE

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714



Ordering information

DRK Stainless Steel Full Turn Valve

Model No.	Description
DRK-2-4S	Stainless steel 2 1/4"-18 Female NPT ports
DRK-2-VCR-FS	Stainless steel 2 1/4"-18 Female NPT ports
0910-0070	Adapter, 1/4" NPTM x 1/4" NPTM, Chrome

Accessories

Regulator Parts and Accessories

Miniature Metering Valve

Description

This miniature needle valve is forged brass with 303 stainless steel stems and Teflon® packing.

SPECIFICATIONS

Maximum outlet ..... 3000 psi

Temperature operating range ..... -25°F to 250°F

Ordering Information

Part No.	Material	Connection	Orifice	Length	Height
0660-0081	Brass	1/4" NPT (M) x 1/4" NPT (M)	0.170	2.25"	2.25"
0660-0091	Stainless				
0660-0080	Chrome				

Swagelok®
Brass Tube Fittings/ Compression Type

Description

Brass Swagelok® tube fittings provide a leak resistant seal for copper or brass tubing connections. Swagelok® fittings come completely assembled and finger-tight. Installation is made easy by inserting the tube until tubing rests firmly against the shoulder and the nut is finger-tight. Hold the fitting body with a back-up wrench and tighten the nut one-and-one quarter turns.

Ordering Information

Part No.	Material	Tube O.D.	Pipe Size	Swagelok P/N
0910-0062	Brass	1/4"	1/4" NPT (M)	B-400-1-4
0910-0092		1/8"	1/4" NPT (M)	B-200-1-4

Compression Type Fitting

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

Gauges

Gauges for G.P. Regulators

Diameter	Description	Part Number
2.50”	4000#/28000 KPA	1424-0210
2.50”	400#/2800 KPA	1424-0211
2.50”	200#/1400 KPA	1424-0212
2.50”	100#/700 KPA	1424-0213
2.50”	60#/400 KPA	1424-0214
2.50”	30#/200 KPA (red line)	1424-0216
2.50”	30#/200 KPA	1424-0217

Note: All gauges listed above have chrome plated brass case and one piece Lexan lens. Inlet connection 1/4” NPT (M)

Gauges for H.P. Regulators

Diameter	Description	Part Number
2.50”	4000#/28000 KPA	1424-0285
2.50”	400#/2800 KPA	1424-0295
2.50”	200#/1400 KPA	1424-0286
2.50”	100#/700 KPA	1424-0287
2.50”	60#/400 KPA	1424-0288
2.50”	30#/200 KPA (red line)	1424-0279
2.50”	30 HG VAC/30#/200 KPA	1424-0289

Note: All gauges listed above have chrome plated brass case and one piece Lexan lens. Inlet connection 1/4” NPT (M)

Gauges for S.S. Regulators

Diameter	Diameter	Part Number
2”	3000#/20000 KPA	1424-0311
2”	400#/2800 KPA	1424-0316
2”	30 HG VAC/200#/1400 KPA	1424-0315
2”	30 HG VAC/100#/700 KPA	1424-0314
2”	30 HG VAC/60#/400 KPA	1424-0313
2”	30 HG VAC/30#/200 KPA	1424-0312

Note: All gauges listed above have stainless steel case and one piece Lexan lens. Inlet connection 1/4” NPT (M)

Gauges for M.B.G. Regulators

Diameter	Diameter	Part Number
2”	30#	1424-0120
2”	4000#	1424-0166

Note: All gauges listed above have chrome plated brass case and one piece Lexan lens. Inlet connection 1/4” NPT (M)

Cylinder Valve Outlets And Connections

GAS	CGA Valve Outlet & Conn.
Acetylene	510
Air (Industrial)	590
Air (Breathing Air)	346
Allene	510
Ammonia	705, 240
Argon	580
Arsine	350
Boron Trichloride	660
Boron Trifluoride	330
Bromine Pentafluoride	670
Bromine Trifluoride	670
Bromotrifluoroethylene	510
1-3 Butadiene	510
Butane	510
Butenes	510
Carbon Dioxide	320
Carbon Monoxide	350
Carbonyl Fluoride	750
Carbonyl Sulfide	330
Chlorine	660
Chlorine Trifluoride	670
Chlorotrifluoroethylene	510
Cyanogen	750
Cyanogen Chloride	750
Cyclopropane	510
Deuterium	350
Diborane	350
1,2-Dibromodifluoromethane	668
Dimethylamine	705
Dimethyl Ether	510
2-2 Dimethyl Propane	510
Ethane	350
Ethyl Acetylene	510
Ethyl Chloride	510
Ethylene	350
Ethylene Oxide	510
Fluorine	679
“Freon 12” (Dichlorodifluoromethane)	660
“Freon 13” (Chlorotrifluoromethane)	660
“Freon 13B1” (Bromotrifluoromethane)	660
“ Freon 14” (Tetrafluoromethane)	580
“Freon 22” (Chlorodifluoromethane)	660
“Freon 114” (1, 2 Dichlorotetrafluoroethane)	660
“Freon 116” (Hexafluoroethane)	660
“Freon RC318” (Octafluorocyclobutane)	660
“Genetron 21” (Dichlorofluoromethane)	660
“Genetron 23” (Fluoroform)	660
“Genetron 115” (Mono-chloropentafluoroethane)	660
“Genetron 152A” (1, 1-Difluoroethane)	510
“Genetron 1132A” (1, 1-Difluoroethylene)	350
Germane	350
Helium	580
Hexafluoroacetone	330
Hexafluoropropylene	660
Hydrogen	350
Hydrogen Bromide	330
Hydrogen Chloride	330
Hydrogen Fluoride	670
Hydrogen Selenide	350
Hydrogen Sulfide	330
Iodine Pentafluoride	670
Isobutane	510
Isobutylene	510
Krypton	580
Methane	350
Methyl Acetylene	510
Methyl Bromide	330
3-Methyl Butene-1	510
Methyl Chloride	510
Methyl Mercaptan	330
Monoethylamine	705
Monomethylamine	705
Natural Gas	350
Neon	580
Nickel Carbonyl	660
Nitric Oxide	660
Nitrogen	580
Nitrogen Dioxide	660
Nitrogen Trioxide	660
Nitrosyl Chloride	330
Nitrous Oxide (Formerly 1320)	326
Oxygen	540
Perfluoro-2-Butene	660
Perfluoropropane	660
Phosgene	660
Phosphine	350
Phosphorous Pentafluoride	330
Propane	510
Propylene	510
Silane	350
Silicon Tetrafluoride	330
Sulfur Dioxide	660
Sulfur Hexafluoride	590
Sulfur Tetrafluoride	330
Sulfuryl Fluoride	660
Tetrafluoroethylene	350
Trimethylamine	705
Vinyl Bomide	510
Vinyl Chloride	510
Vinyl Fluoride	350
Vinyl Methyl Ether	510
Xenon	580

NOTE: The above are standard CGA connections and are designated by Compressed Gas Association, Standard V-1. For alternate and latest standards and connections, contact Compressed Gas Association, 1235 Jefferson Davis Hwy., Arlington, VA 22202.

U.S. Customer Care: 800-569-0547 / FAX 800-535-0557
Canada Customer Care: 905-827-4515 / FAX 800-588-1714

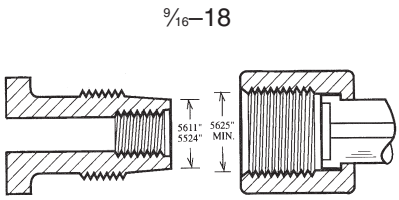
These dimensional drawings illustrate cylinder valve outlet and connections. The drawing at the left side illustrates the cylinder valve outlet. The one at right illustrates its mating regulator or valve connection.

CGA No. 170

Order No.'s
Nut
0980-0000
0980-0004*

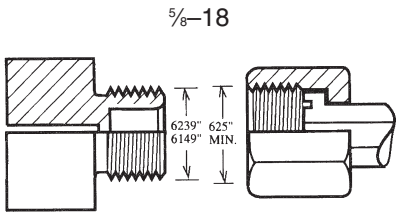
Washer
1408-0071

SWIVEL
0980-0003
0980-0005*



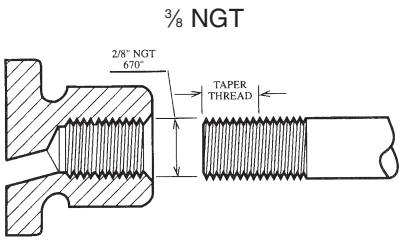
CGA No. 180

Order No.'s
Nut
0981-0002
0981-0006**
0981-0004*
Washer
1408-0070
Swivel
0981-0000
0981-0005**
0981-0003*



CGA No. 240

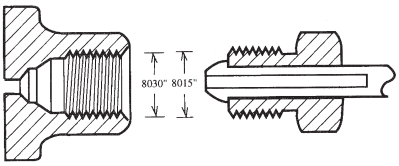
Order No.'s
Swivel
0998-0003**



CGA No. 296

Order No.'s
Nut
0976-0003

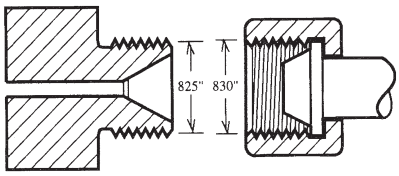
Swivel
0976-0002



CGA No. 300

Order No.'s
Nut
0968-0003
0968-0006*

Swivel
0968-0014
0968-0051*

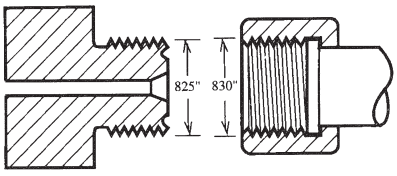


CGA No. 320

Order No.'s
Nut
0985-0030
0985-0031*

Washer
1408-0065

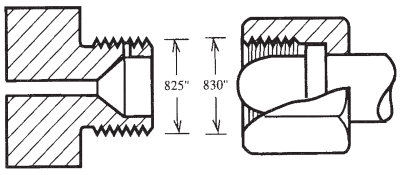
Swivel
0985-0004
0985-0008*



CGA No. 326

Order No.'s
Nut
0963-0015
0963-0016*

Swivel
0963-0004*
0963-0010

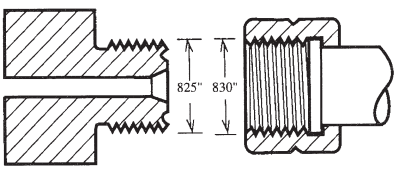


CGA No. 330

Order No.'s
Nut
0986-0007*
0986-0008**

WASHER
1408-0023

Swivel
0985-0006**

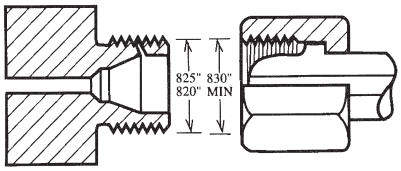


* Chrome
** Stainless Steel

CGA No. 346

Order No.'s
Nut
0972-0015
0972-0016*
0972-0036**

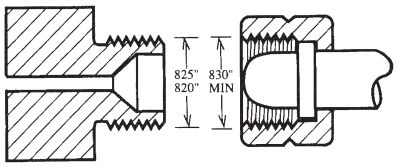
Swivel
0972-0010
0972-0017*
0972-0035**



CGA No. 350

Order No.'s
Nut
0983-0003
0983-0039*
0983-0013**

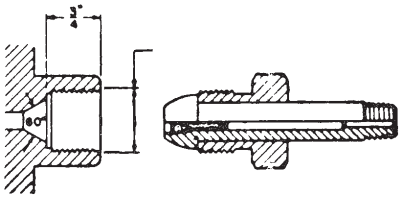
Swivel
0983-0008
0983-0040*
0983-0014**



CGA No. 500

Order No.'s
Nut
0976-0000

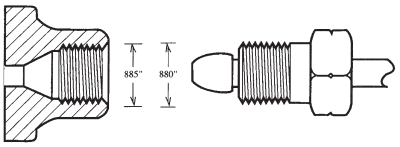
Swivel
0970-0017*



CGA No. 510

Order No.'s
Nut
0970-0003
0970-0011*
0970-0006**

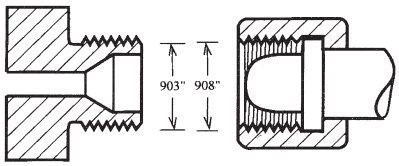
Swivel
0970-0005
0970-0017*
0970-0051**



CGA No. 540

Order No.'s
Nut
0967-0044
0967-0045*
0967-0052**

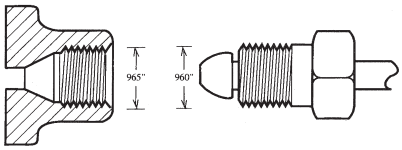
Swivel
0967-0034
0967-0042*
0967-0022**



CGA No. 580

Order No.'s
Nut
0973-0003
0973-0005*
0973-0004**

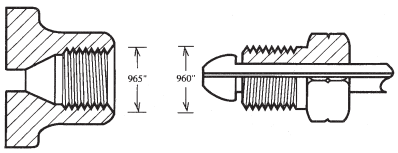
Swivel
0970-0005
0970-0017*
0970-0051**



CGA No. 590

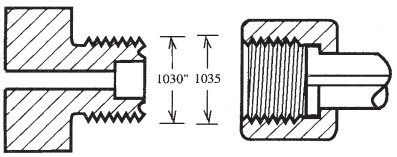
Order No.'s
Nut
0974-0003
0974-0010*
0974-0004**

Swivel
0970-0005
0970-0017*



CGA No. 660

Order No.'s
Nut
0995-0016*
0995-0003
0995-0007**
Washer
1408-0024
Swivel
0995-0017**
0995-0018*



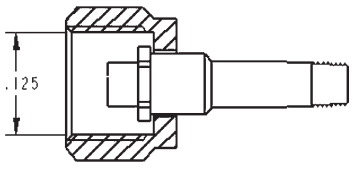
* Chrome
** Stainless Steel

CGA No. 705

Order No.'s
Nut
0998-0012**

Washer
1408-0032

Nipple
0998-0011**



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Glossary of Terms

Absolute Zero - The lowest temperature attainable. All molecular activity is considered ceased. It's value is -459.7 degrees F or -273.15 degrees C.

Aerobic Mixture - Gas mixture containing oxygen. A control atmosphere for the growth of biological cultures.

AIT (Auto Ignition Temperature) - The lowest temperature at which a material will ignite and sustain combustion in the absence of a spark or flame.

Anaerobic Mixture - Oxygen free gas mixture with carbon dioxide used as an atmosphere for the growth of biological cultures.

Anhydrous - Describes a material that contains no water.

Annealing Gas - A hydrogen-nitrogen mixture used to provide a reducing atmosphere during heating of metals to render them less brittle on cooling.

Asphyxiant Gas - A gas which has little or no positive toxic effect but which can bring about unconsciousness and death by replacing the air and thus depriving an organism of oxygen.

Atomic Absorption Spectrophotometer - Instrument for measuring energy distribution from light sources. Uses purified acetylene and nitrous oxide.

Blood Gas - A mixture of Carbon Dioxide in Oxygen for calibration of Blood Gas Analyzers.

Boiling Point - The temperature at which the pressure of the vapor is equal to the pressure exerted on the liquid. The normal boiling point is the temperature at which the vapor pressure of the liquid is 14.7 psia (1 atmosphere).

Calibration Gas - A gas or gas mixture of accurately known composition used as a comparative standard in analytical instrumentation.

Carrier Gas - High purity gases, primarily Helium, Hydrogen, Nitrogen and Argon for carrying either samples for analytical instrumentation (such as gas chromatography) or for carrying small quantities of reactive components into reaction area (such as doping gas mixtures for manufacturing semiconductor devices).

Chromatography - A method of separation of gaseous or chemical mixtures bases on selective absorption. Used widely in analytical technology.

Corrosive - A substance that erodes and deteriorates materials with which it comes in contact, such as metals, fabrics and human tissue.

Creep - The increase in outlet pressure of a pressure regulator. Gas from the high pressure side of the regulator is leaking into the low pressure side causing the delivery set pressure to increase. Usually this malfunction is more detectable when the regulator is in a static (no flow) or low flow condition.

Critical Pressure - The vapor of a liquid at the critical temperature.

Critical Temperature - The highest temperature at which a distinct liquid phase exists. When the temperature of a substance is below its critical temperature, its vapor can be liquefied by raising the pressure. Above the critical temperature, however, it can't be liquefied thus it behaves as a gas no matter what the pressure is because only one phase can exist.

Density - The ratio of a substances mass to its volume or the mass of a substance to unit volume.

Droop - The decrease in outlet set pressure of a pressure regulator as the flow rate increases.

Flammable Gas - Any gas that will ignite easily and burn rapidly.

Flow Coefficient (C_V) - The flow in gallons of water per minute at 60 degrees F when the inlet is 1 psig and the outlet pressure is atmospheric (14.7 psia).

Forming Gas - Usually mixtures of Hydrogen or Carbon Monoxide with Nitrogen. The mixtures are used as furnace atmospheres to prevent oxidation and are commonly called reducing gases.

Inert Gas - Gases which do not react with other materials at ordinary temperature and pressure. These gases are also sometimes called the noble gases.

Inlet Pressure - The upstream or supply pressure to a device.

Ion - An electrically charged atom or group of atoms; electrically charged molecules in gases. Usually an atom or molecule that has lost one or more of its electrons is left with a positive electrical charge. Those that have gained one or more extra electrons are left with a negative charge.

Lockup - The increase in outlet set pressure of a pressure regulator when the flow is stopped.

Lecture Bottle - Small steel cylinder 2" in diameter and 15" long.

Lung Diffusion Gas - Mixtures of either Carbon Monoxide and Air or Carbon Monoxide, Helium, Oxygen and Nitrogen to test the efficiency of lungs.

NTP (Normal Temperature and Pressure) - A gas industry reference set of conditions of temperature and pressure. Normal temperature is 70 degrees F and 14.7 psia (1 atmosphere).

Outlet Pressure - The delivery pressure of a device.

Oxidizer - Gases which do not burn, but which support combustion.

psia - Abbreviation for pounds per square inch absolute. One atmosphere equals 14.7 psia = psig plus 14.7.

psig - Abbreviation for pounds per square inch gauge. Gauge pressure always ignores the first atmosphere absolute (14.7).

Pyrophoric - The ability of a chemical to ignite in air at temperatures below 130 degrees F.

Glossary of Terms

Rare Gas - Refers to those constituents of air which comprise less than 1% of air and are generally considered inert such as argon, helium, krypton, neon, and xenon.

Rise - The increase in delivery pressure as the cylinder pressure decreases. Rise is sometimes stated as the amount of psig increase in delivery pressure per 100 psig decrease in cylinder pressure.

Span Gas - Usually a gas mixture used to span or calibrate a process or analyzer at intermediate points to full scale after a zero base line has been established.

Specific Gravity - The ratio of a given volume of a substance to the weight of an equal volume of a reference material. Usually gases are compared to air (air = 1) while liquids are compared to water (water = 1).

STP (Standard Temperature and Pressure) - An internationally accepted reference set of conditions of temperature and pressure. Standard temperature is 0 degrees C and 14.7 psia (1 atmosphere).

THC (Total Hydrocarbon Content) - THC is used to describe the quantity of hydrocarbon impurities present, expressed a methane equivalents.

Toxic Gas - Poisonous gas or gas that can cause physical harm in relatively small concentrations.

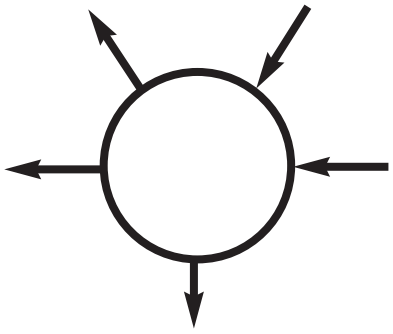
Triple Point - The temperature at the liquid, solid and vapor phase are in equilibrium.

Vapor Pressure - The pressure exerted by the vapor above a pure liquid when the two phases are in equilibrium. The value depends on the temperature of the system, but at any temperature it is independent of the amount of liquid present.

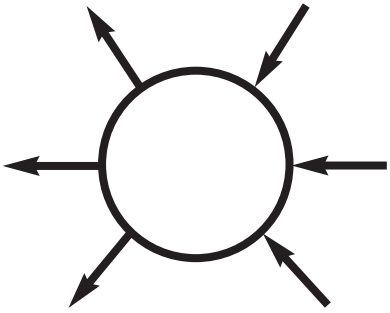
Zero Gas - Gases which have low THC and are used as reference point to "zero" a THC analyzer.

Port Configuration Data

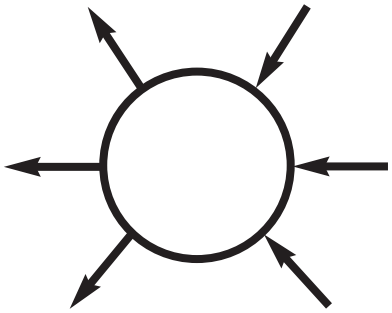
The following port configurations are used in high purity regulators.



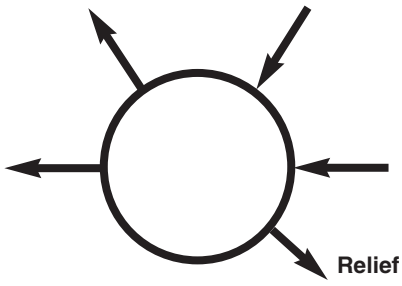
HPS 270, GPS 270, HPS 4



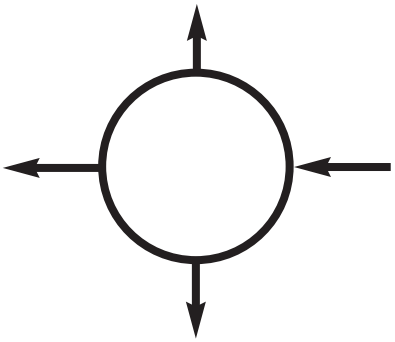
SGS 500, HPS 500



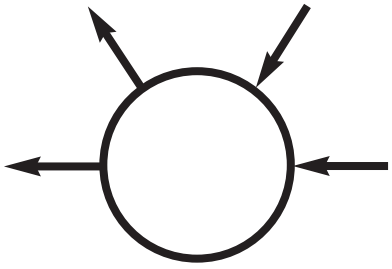
SGT 500, HPT 500



HPT 270, CPT 270



HPL, GPL, SGL



LB 150, LB 165

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Conversion Factors

Flow Conversions

If flow is given In	Multiply by	To obtain
ml/min.	1.0×10^{-3}	L.P.M.
ml/min.	3.5316×10^{-5}	S.C.F.M.
ml/min.	2.1189×10^{-3}	S.C.F.H.
ml/min.	2.6418×10^{-4}	G.P.M.
ml/min.	1.5852×10^{-2}	G.P.H.
L.P.M.	1.0×10^{3}	cc/min.
L.P.M.	3.5316×10^{-2}	S.C.F.M.
L.P.M.	2.11896	S.C.F.H.
L.P.M.	2.6418×10^{-1}	G.P.M.
L.P.M.	1.58508×10^{1}	G.P.H.
S.C.F.H.	.47192	L.P.M.

Pressure Conversions

If pressure is given in	Multiply by	To obtain
Inches of Mercury at 70ºF	4.912×10^{-1}	PSIA
Inches of Water at 4ºC	3.613×10^{-2}	PSIA
PSIA	2.036	Inches of Mercury
PSIA	27.73	Inches of Water at 70ºF
PSIA	6.804×10^{-2}	Atmospheres
Atmosphere	1.47×10^{1}	PSIA
Bars 14.29	1.45×10^{1}	PSIA
Inches of Mercury at 70ºF	13.57	Inches of Water at 70ºF
Millimeters of Water at 70ºF	3.937×10^{-2}	Inches of Water at 70ºF
Millimeters of Mercury at 70ºF	5.343×10^{1}	Inches of Water at 70ºF
Atmospheres (PSIG)	407.631	Inches of Water at 70ºF

Temperature Conversions

If temperature is given In	Multiply by	To obtain
Degrees Centigrade	(ºC + 17.78) x 1.8	Fahrenheit
Degrees Centigrade	(ºC + 273.16) x 1.8	Rankine
Degrees Fahrenheit	(ºF - 32.0) x 5.56×10^{-1}	Centigrade
Degrees Fahrenheit	(ºF x 1.0) + 459.70	Rankine
Degrees Rankine	(ºR x 1.0) - 459.70	Fahrenheit
Degrees Rankine	(ºR x 5.56×10^{1}) - 273.16	Centigrade

Density Conversions

If density is given In	Multiply by	To obtain
Pounds / ft^3	5.787×10^{-4}	Pounds / in^3
Pounds / ft^3	1.602×10^{-2}	Grams / cm^3
Pounds / in^3	1.728×10^{3}	Pounds / ft^3
Pounds / in^3	2.768×10^{1}	Grams / cm^3
Grams / cm^3	3.613×10^{-2}	Pounds / in^3
Grams / cm^3	6.243×10^{1}	Pounds / ft^3

How to estimate the flow of gases other than air based on air flow data and gas temperature.

Calculate Using Formula: $Q_2 = \dfrac{Q_1 (f_1)}{f_2}$

Where: Q_2 = Flow (SCFH) of gas being estimated
Q_1 = Flow (SCFH) of air from flow curves
f_1 = Temperature correction factor (See Table 1)
f_2 = Specific gravity correction factor (See Table 2)

Table 1. Temperature Correction Factors (f_1)

Operating Temperature - Degrees F												
0	10	20	30	40	50	60	70	80	90	100	110	0120
0.932	0.942	0.952	0.962	0.971	0.981	0.991	1.000	1.009	1.018	1.028	1.037	1.046

Operating Temperature - Degrees F												
130	140	150	160	170	180	190	200	210	220	230	240	250
1.055	1.064	1.072	1.081	1.090	1.099	1.107	1.116	1.124	1.133	1.141	1.149	1.157

Conversion Factors

Table 2. General Gas Data and Specific Gravity Correction Factors (f_2)

Gas Name	Symbol	Specific Gravity @ 14.7 psia & 70ºF	f_2 $(f2)2$ =SP.GR.	Full Cylinder pressure @ 70ºF (psig)	Hazards in Handling	Auto-Ignition Temp (ºF)
Acetylene	C_2H_4	0.907	0.952	205 2 ②	Highly Flammable	635º
Air	--	1.000	1.000	1775-2200	--	--
Ammonia	NH_3	0.596	0.772	114.1 ③	Highly Irritant & Toxic	1204º
Argon	Ar	1.380	1.175	1775-2490	Asphyxiant	--
Boron Trifluoride	BF_3	2.217	1.489	1600-1800	Highly Irritant & Toxic	--
Butane	C_4H_{10}	2.071	1.439	16.3 ③	Highly Flammable	761º
Carbon Dioxide	CO_2	1.529	1.236	830 ③	Solid Form May Severely Burn	--
Carbon Monoxide	CO	.0967	0.983	1650	Highly Toxic & Flammable	1128º liq
Cyclopropane	C_3H_6	1.354	1.164	75 ③	Highly Flammable/Moderately Toxic	928º
Dimethyl Ether	$(CH_3)_2O$	1.484	1.218	62.3 ③	Highly Flammable	662º
Ethane	C_2H_6	1.049	1.024	543 ③	Flammable	959º
Helium	HE	0.138	0.372	2490	Asphyxiant	--
Hydrogen	H_2	0.0695	0.624	2200	Highly Flammable & Explosive	1075º
Hydrogen Bromide	BHr	2.575	1.605	320 ③	Highly Irritant & Toxic	--
Hydrogen Sulfide	H_2S	1.087	1.043	252 ③	Highly Irritant & Toxic	500º
Methane	CH_4	0.554	0.744	2265	Severe Fire Hazard & Explosive	1000º
Methylacetylene	C_3H_4	1.292	1.137	60 ③	Flammable & Moderately Toxic	--
Natural Gas	--	0.610 ④	0.781	1775-2665	Flammable & Explosive	900-1100º
Neon	Ne	0.638	0.799	225-1800	Asphyxiant	--
Nitric Oxide	NO	0.950	0.974	500	Highly Irritant & Toxic	--
Nitrogen	N_2	0.967	0.983	2000-2490	--	--
Nitrous Oxide	N_2O	1.530	1.236	745 ③	Supports Combustion/Anesthetic	--
Oxygen	O_2	1.105	1.051	2200	Accelerates Combustion/Fire Hazard	--
Propane	C_3H_8	1.554	1.246	109 ③	Flammable	874º
Propylene	C_3H_6	1.381	1.175	136.5 ③	Highly Flammable & Explosive	874º
Sulfur Tetrafluoride	SF_4	3.525	1.878	140 ③	Highly Flammable & Explosive	927º
Xenon	Xe	4.169	2.042	800	Asphyxiant	--

① Referred to air at 14.7 psia and 70ºF
② Cylinder pressure of the dissolved gas (in acetone)
③ Vapor pressure of the liquefied gas
④ This number is an average of a variance specific gravity

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Regulator Selection Guide

Use this guide to match gas service requirements with available regulator model.

IMPORTANT NOTICE/PLEASE READ CAREFULLY

Any use or application of these regulators which VICTOR may suggest is based on VICTOR's experience to date and is believed to be reliable. It should be understood, however, that reliance by the user on any such suggestion is at the user's own discretion and risk. VICTOR strongly recommends that tests be run under actual operation conditions to ascertain the regulator's performance ability with the gas to be used.

NOTE: CGA connections are designated by Compressed Gas Association, Standard V-1. For latest standards and connections, contact Compressed Gas Association, 1235 Jefferson Davis Hwy., Arlington, VA 22202.

PURE GASES	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
ACETYLENE (C_2H_2)					
PURIFIED 99.6%	HPS280	None	510	HPL280	1/4" NPT (F)
AIR					
DRY	GPS270	GPT270	590	GPL270	1/4" NPT (F)
HYDROCARBON FREE	HPS500/270	HPT500/270	590	HPL500/270	1/4" NPT (F)
ZERO	HPS500/270	HPT500/270	590	HPL500/270	1/4" NPT (F)
AMMONIA (NH_3)					
ANHYDROUS	SGS500/550	SGT500	240/705	SGL500	1/4" NPT (F)
ARGON (Ar)					
RESEARCH 99.9995%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
U.H.P. 99.999%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
PREPURIFIED 99.998%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
ZERO 99.998%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
02 FREE 99.996%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
HIGH PURITY 99.995%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
ARSINE (AsH_3)					
MINIMUM PURITY 99.9995%	None	None	None	SGL500	1/4" NPT (F)
BORON TRIFLUORIDE (BF_3)					
MINIMUM PURITY 99.5%	CRS100/200	None	330	SGL500	1/4" NPT (F)
1,3 BUTADIENE (C_4H_6)					
INSTRUMENT 99.5%	GPS281	None	510	GPL270	1/4" NPT (F)
C.P. 99.0%	GPS281	None	510	GPL270	1/4" NPT (F)
N-BUTANE (C_4H_{10})					
RESEARCH 99.9%	GPS281	None	510	GPL270	1/4" NPT (F)
C.P. 99.0%	GPS281	None	510	GPL270	1/4" NPT (F)
CiS-2 BUTENE (C_4H_8)					
C.P. 99.0%	GPS281	None	510	NONE	N/A
TRANS-2-BUTENE (C_4H_8)					
C.P. 99.0%	GPS281	None	510	NONE	N/A
CARBON DIOXIDE (CO_2)					
RESEARCH 99.998%	HPS500/270	HPT500/270	320	HPL500/270	1/4" NPT (F)
INSTRUMENT (COLEMAN) 99.99%	HPS500/270	HPT500/270	320	HPL500/270	1/4" NPT (F)
BONE DRY 99.9%	GPS270*	GPT270	320	GPL270	1/4" NPT (F)
CARBON MONOXIDE (C0)					
RESEARCH 99.99%	HPS500/272	HPT500/272	350	NONE	N/A
C.P. 99.0%	HPS500/272	HPT500/272	350	NONE	N/A
TECHNICAL 98.0%	GPS272*	GPT272	350	NONE	N/A
CHLORINE (Cl_2)					
HIGH PURITY 99.5%	CRS100/200		660	SGL500	1/4" NPT (F)

*Oxygen greater than 23% use CGA 296, and less than 23% use CGA 590.

PURE GASES	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
DEUTERIUM (D_2)					
C.P. 99.5%	HPS500/272	HPT500/270	350	None	None
DIMETHYL ETHER (C_2H_{60})					
PURITY 99.5%	GPS281	None	510	None	None
ETHANE (C_2H_6)					
RESEARCH 99.98%	HPS500/272	HPT500/272	350	None	None
C.P. 99.0%	HPS500/272	HPT500/272	350	None	None
TECHNICAL 97.5%	GPS272	GPT272	350	None	None
ETHYLENE (C_2H_4)					
RESEARCH 99.98%	HPS500/272	HPT500/272	350	None	None
C.P. 99.5%	HPS500/272	HPT500/272	350	None	None
TECHNICAL 98.55%	GPS272	GPT272	350	None	None
ETHYLENE OXIDE (C_2H_{40})	None	None	510/350	None	None
FLUORINE (F_2)	None	None	679	None	None
HALOCARBON 12 ($CCIF_2$)					
PURITY 99.0%	None	None	660	None	None
HALOCARBON 13 ($CCIF_3$)					
PURITY 99.0%	None	None	660	None	None
HALOCARBON 13B1 ($CBrF_3$)					
PURITY 99.0%	None	None	660	None	None
HALOCARBON 14 (CF_4)					
PURITY 99.7%	GPS270	GPT270	580	GPL270	1/4" NPT (F)
HALOCARBON 22 ($CHCIF_2$)					
PURITY 99.9%	None	None	660	None	None
HALOCARBON 116 (C_2F_6)					
PURITY 99.95%	None	None	660	None	None
HELIUM (He)					
RESEARCH 99.9995%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
ULTRA HIGH 99.999%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
ZERO 99.995%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
HIGH PURITY 99.995%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
HEXAFLUOROPROPYLENE (C_3F_6)					
PURITY 99.5%	None	None	660	NONE	None
HYDROGEN (H_2)					
RESEARCH 99.9999%	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
ULTRA HIGH 99.999%	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
ZERO 99.99%	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
PREPURIFIED 99.99%	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
EXTRA DRY 99.95%	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
HYDROGEN CHLORIDE (HCl)					
TECHNICAL 99.0%	CRS100/200	None	330	SGL500	1/4" NPT (F)
HYDROGEN SULFIDE (H_2S)					
C.P. 99.5%	None	None	330	SGL500	1/4" NPT (F)
ISOBUTANE (C_2H_{10})					
RESEARCH 99.96%	HPS281	None	510	None	None
INSTRUMENT 99.5%	GPS281	None	510	None	None
C.P. 99.0%	GPS281	None	510	None	None

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PURE GASES	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
ISOBUTYLENE (C_4H_8)					
RESEARCH 99.6%	HPS281	NONE	510	NONE	None
C.P. 99.0%	GPS 281	NONE	510	NONE	None
KRYPTON (Kr)					
RESEARCH 99.995%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
METHANE (CH_4)					
RESEARCH 99.99%	HPS500/270	HPT500/270	350	None	None
U.H.P. 99.97%	HPS500/270	HPT500/270	350	None	None
C.P. 99.0%	HPS500/270	HPT500/270	350	None	None
TECHNICAL 98.0%	GPS272	GPT272	350	None	None
COMMERCIAL 93.00%	GPS272	GPT272	350	None	None
METHYLACETYLENE (C_3H_4)					
PURITY 96.0%	GPS281	None	510	None	None
METHYL CHLORIDE (CH_3Cl)					
C.P. 99.5%	None	None	510	None	None
NEON (Ne)					
RESEARCH 99.999%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
U.H.P. 99.996%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
PURIFIED 99.89%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
NITRIC OXIDE (NO)					
C.P. 99.0%	SGS500/550	SGT500	660	SGL500	1/4" NPT (F)
NITROGEN (N_2)					
RESEARCH 99.9995%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
ULTRA HIGH 99.999%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
PREPURIFIED 99.998%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
ZERO 99.998%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
HIGH PURITY 99.99%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
OXYGEN FREE 99.99%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
EXTRA DRY 99.7%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
NITROUS OXIDE (N_2O)					
U.H.P. 99.99%	HPS500/270	HPT500/270	326	HPL500/270	1/4" NPT (F)
ATOMIC ABSORPTION 99.0%	GPS270	GPT270	326	GPL270	1/4" NPT (F)
OXYGEN (O_2)					
RESEARCH 99.995%	HPS500/270	HPT500/270	540	HPL500/270	1/4" NPT (F)
U.H.P. 99.99%	HPS500/270	HPT500/270	540	HPL500/270	1/4" NPT (F)
ZERO 99.6%	HPS500/270	HPT500/270	540	HPL500/270	1/4" NPT (F)
EXTRA DRY 99.6%	HPS500/270	HPT500/270	540	HPL500/270	1/4" NPT (F)
PERFLUOROPROPANE (C_3F_8)					
PURITY 99.0%	None	None	660	None	None
PROPANE (C_3H_8)					
RESEARCH 99.99%	HPS281	NONE	510	None	None
INSTRUMENT 99.5%	GPS281	NONE	510	None	None
C.P. 99.0%	GPS281	NONE	510	None	None
NATURAL 96.0%	GPS281	NONE	510	None	None
PROPYLENE (C_3H_6)					
RESEARCH	HPS281	None	510	None	None
C.P. 99.0%	GPS281	None	510	None	None

PURE GASES	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
SILANE (SiH_4)					
PURITY 99.9%	None	SGT500	350	None	None
SULFUR DIOXIDE (SO_2)					
ANHYDROUS 99.98%	None	None	660	SGL500	1/4" NPT (F)
COMMERCIAL 99.9%	None	None	660	SGL500	1/4" NPT (F)
SULFUR HEXAFLUORIDE (SF_6)					
INSTRUMENT 99.99%	HPS500/270	None	590	HPL500/270	1/4" NPT (F)
C.P. 99.8%	GPS270	None	590	GPL270	1/4" NPT (F)
XENON (Xe)					
RESEARCH 99.995%	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)

MIXED GASES	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
AMMONIA					
IN ARGON	SGS500	SGT500	705 or 240	SGL500	1/4" NPT (F)
IN HELIUM	SGS500	SGT500	705 or 240	SGL500	1/4" NPT (F)
IN HYDROGEN	SGS500	SGT500	705 or 240	SGL500	1/4" NPT (F)
IN NITROGEN	SGS500	SGT500	705 or 240	SGL500	1/4" NPT (F)
ARGON					
IN HELIUM	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
IN HYDROGEN	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
IN NITROGEN	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
IN OXYGEN*	HPS500/270	HPT500/270	296/590	HPL500/270	1/4" NPT (F)
BUTANE					
IN ARGON	HPS500/272	HPT500/272	350	None	None
IN HELIUM	HPS500/272	HPT500/272	350	None	None
IN HYDROGEN	HPS500/272	HPT500/272	350	None	None
IN NITROGEN	HPS500/272	HPT500/272	350	None	None
CARBON DIOXIDE					
IN AIR	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
IN ARGON	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
IN HELIUM	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
IN HYDROGEN	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
IN NITROGEN	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
IN OXYGEN (>23% O_2)*	HPS500/270	HPT500/270	296	HPL500/270	1/4" NPT (F)
CARBON MONOXIDE (>23% O_2 = 580)					
IN AIR	HPS500/270	HPT500/270	350	HPL500/270	1/4" NPT (F)
IN ARGON	HPS500/270	HPT500/270	350	HPL500/270	1/4" NPT (F)
IN HELIUM	HPS500/270	HPT500/270	350	HPL500/270	1/4" NPT (F)
IN HYDROGEN	HPS500/270	HPT500/270	350	HPL500/270	1/4" NPT (F)
IN NITROGEN	HPS500/270	HPT500/270	350	HPL500/270	1/4" NPT (F)

*Oxygen greater than 23% use CGA 296, and less than 23% use CGA 590.

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MIXED GASES	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
CHLORINE					
IN ARGON	SGS500				
	CRS100/200	SGT500	330	SGL500	1/4" NPT (F)
IN HELIUM	SGS500				
	CRS100/200	SGT500	330	SGL500	1/4" NPT (F)
IN NITROGEN	SGS500				
	CRS100/200	SGT500	330	SGL500	1/4" NPT (F)
ETHANE					
IN ARGON	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN HELIUM	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN HYDROGEN	HPS500//272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN NITROGEN	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
ETHYLENE					
IN ARGON	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN HELIUM	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN NITROGEN	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
HELIUM					
IN ARGON	HPS500/272	HPT500/272	580	HPL500/272	1/4" NPT (F)
IN HYDROGEN	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN NITROGEN	HPS500/272	HPT500/272	580	HPL500/272	1/4" NPT (F)
IN OXYGEN (>23% O_2)*	HPS500/272	HPT500/272	296	HPL500/272	1/4" NPT (F)
HEXANE					
IN AIR	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN ARGON	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN HELIUM	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN HYDROGEN	HPS500//272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN NITROGEN	HPS500//272	HPT500/272	350	HPL500/272	1/4" NPT (F)
HYDROGEN					
IN ARGON	HPS500//272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN HELIUM	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN NITROGEN	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
HYDROGEN CHLORIDE					
IN ARGON	SGS500				
	CRS100/200	None	330	SGL500	1/4" NPT (F)
IN HELIUM	SGS500/				
	CRS100/200	None	330	SGL500	1/4" NPT (F)
IN NITROGEN	SGS500				
	CRS100/200	None	330	SGL500	1/4" NPT (F)
HYDROGEN SULFIDE					
IN ARGON	SGS500	SGT500	330	SGL500	1/4" NPT (F)
IN HELIUM	SGS500	SGT500	330	SGL500	1/4" NPT (F)
IN NITROGEN	SGS500	SGT500	330	SGL500	1/4" NPT (F)
ISOBUTANE					
IN ARGON	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN HELIUM	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN HYDROGEN	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
IN NITROGEN	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)

*Oxygen greater than 23% use CGA 296, and less than 23% use CGA 590.

	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
METHANE					
IN AIR	HPS500/270	HPT500/270	350/590	HPL500/270	1/4" NPT (F)
IN ARGON	HPS500/270	HPT500/270	350	HPL500/270	1/4" NPT (F)
IN HELIUM	HPS500/270	HPT500/270	350	HPL500/270	1/4" NPT (F)
IN HYDROGEN	HPS500/270	HPT500/270	350	HPL500/270	1/4" NPT (F)
IN NITROGEN	HPS500/270	HPT500/270	350	HPL500/270	1/4" NPT (F)
NITRIC OXIDE					
IN ARGON	SGS500	SGT500	660	SGL500	1/4" NPT (F)
IN HELIUM	SGS500	SGT500	660	SGL500	1/4" NPT (F)
IN NITROGEN	SGS500	SGT500	660	SGL500	1/4" NPT (F)
NITROGEN					
IN ARGON	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
IN HELIUM	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)
IN HYDROGEN	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
IN OXYGEN (>23% O_2)*	HPS500/272	HPT500/272	296	HPL500/270	1/4" NPT (F)
NITROGEN DIOXIDE					
IN AIR	SGS500	SGT500	660	SGL500	1/4" NPT (F)
IN ARGON	SGS500	SGT500	660	SGL500	1/4" NPT (F)
IN HELIUM	SGS500	SGT500	660	SGL500	1/4" NPT (F)
IN NITROGEN	SGS500	SGT500	660	SGL500	1/4" NPT (F)
OXYGEN					
IN ARGON	HPS500/270	HPT500/270	296/590*	HPL500/270	1/4" NPT (F)
IN HELIUM	HPS500/270	HPT500/270	296/590	HPL500/270	1/4" NPT (F)
IN NITROGEN	HPS500/270	HPT500/270	296/590	HPL500/270	1/4" NPT (F)
PROPANE					
IN AIR	HPS500/270	HPT500/270	350/590	HPL500/270	1/4" NPT (F)
IN ARGON	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
IN HELIUM	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
IN HYDROGEN	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
IN NITROGEN	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
PROPYLENE					
IN AIR	HPS500/270	HPT500/270	350/590	HPL500/270	1/4" NPT (F)
IN ARGON	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
IN HELIUM	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
IN HYDROGEN	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
IN NITROGEN	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
SULFUR DIOXIDE					
IN AIR	SGS500	SGT500	660	SGL500	1/4" NPT (F)
IN ARGON	SGS500	SGT500	660	SGL500	1/4" NPT (F)
IN HELIUM	SGS500	SGT500	660	SGL500	1/4" NPT (F)
IN NITROGEN	SGS500	SGT500	660	SGL500	1/4" NPT (F)

*Oxygen greater than 23% use CGA 296, and less than 23% use CGA 590.

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STERILIZING GASES	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
ETHYLENE OXIDE IN CARBON DIOXIDE	HPS500/270	HPT500/270	350	HPL500/270	1/4" NPT (F)

LASER GASES	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
EXCIMER LASER GAS MIXTURES					
HYDROGEN CHLORIDE IN HELIUM	CRS100/200	SGT500	330	None	None
MOLECULAR LASER GAS MIXTURES					
4.5% CARBON DIOXIDE 13.5% NITROGEN IN HELIUM	HPS500/270	HPT500/270	580	HPL500/270	1/4" NPT (F)

INSTRUMENT MIXTURES	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
CHROMATOGRAPH CARRIER GAS 8.5% HYDROGEN 91.5% HELIUM	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
FLAME IONIZATION FUEL MIXTURES 40% HYDROGEN 60% HELIUM	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
40% HYDROGEN 60% NITROGEN	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
FURNACE ATMOSPHERE MIXTURE 40% CARBON DIOXIDE 60% CARBON MONOXIDE	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)
GEIGER GAS MIXTURE 0.95% ISO BUTANE 99.05% HELIUM	HPS500/272	HPT500/272	350	HPL500/272	1/4" NPT (F)

INSTRUMENT MIXTURES	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
LEAK DETECTION MIXTURE 1-10% HELIUM IN NITROGEN	HPS500/272	HPT500/270	580	HPL500/270	1/4" NPT (F)

ELECTRON CAPTURE MIXTURE	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
P-5 GAS MIXTURE 5% METHANE	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)

NUCLEAR COUNTER MIXTURE	CYLINDER REGULATOR			LINE REGULATOR	
	SINGLE STAGE	TWO STAGE	CGA INLET	SINGLE STAGE	PORT SIZE
P-10 GAS MIXTURE 10% METHANE 90% ARGON	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
PROPORTIONAL COUNTING GAS MIX 4% ISO BUTANE 96% HELIUM	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
1.5% ISO BUTANE 98.5% HELIUM	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
QUENCH GAS 1.3% n-BUTANE 98.7% HELIUM	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)
SPARK CHAMBER MIXTURES 10% HELIUM 90% NEON	HPS500/272	HPT500/270	580	HPL500/270	1/4" NPT (F)
20% HELIUM 80% NEON	HPS500/272	HPT500/270	580	HPL500/270	1/4" NPT (F)
X-RAY FLUORESCENCE SPECTROSCOPY 1% n-BUTANE 49% HELIUM 50% NEON	HPS500/272	HPT500/272	350	HPL500/270	1/4" NPT (F)

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Notes

Notes

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STATEMENT OF WARRANTY

LIMITED WARRANTY: THERMADYNE warrants that its products will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within the time period applicable to the THERMADYNE products as stated below, THERMADYNE shall, upon written notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with THERMADYNE's specifications, instructions, recommendations and recognized standard industry practice, and not been subject to misuse, repair, neglect, alteration, or accident, correct such defects by suitable repair or replacement, at THERMADYNE's sole option, of any components or parts of the product determined by THERMADYNE to be defective.

THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: THERMADYNE shall not under any circumstances be liable for special, indirect or consequential damages, such as, but not limited to, damage or loss of purchased or replacement goods, business interruption or loss of profit, or claims of customers of distributor (hereinafter the "Purchaser") for service interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of THERMADYNE with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any goods covered by or furnished by THERMADYNE whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which such liability is based.

THIS WARRANTY BECOMES INVALID IF REPLACEMENT PARTS OR ACCESSORIES ARE USED WHICH MAY IMPAIR THE SAFETY OR PERFORMANCE OF ANY THERMADYNE PRODUCT.

THIS WARRANTY IS INVALID IF THE PRODUCT IS SOLD BY NON-AUTHORIZED PERSONS.

This warranty is effective for the time stated in the Warranty Schedule beginning on the date that the authorized distributor delivers the products to the Purchaser.

Warranty repairs or replacement claims under this limited warranty must be submitted by an authorized THERMADYNE repair facility within thirty (30) days of the repair. No transportation costs of any kind will be paid under this warranty. Transportation charges to send products to an authorized warranty repair facility shall be the responsibility of the Purchaser. All returned goods shall be at the Purchaser's risk and expense. This warranty supersedes all previous THERMADYNE warranties.

WARRANTY SCHEDULE

The warranty is effective below for the time stated in the Warranty Schedule beginning on the date that the authorized distributor delivers the products to the purchaser. THERMADYNE reserves the right to request documented evidence of date of purchase.

VICTOR SPECIALTY PRODUCTS EQUIPMENT	PARTS AND LABOR
HP&I BRASS REGULATORS / MANIFOLDS	2 YEARS / NA
HP&I STAINLESS STEEL REGS / MANIFOLDS	1 YEAR / NA
HP&I CORROSIVE GAS REGS / MANFOLDS	90 DAYS / NA
REPAIR PARTS	90 DAYS / NA

ISO 9001
REGISTERED FIRM

The Quality System of Thermadyne at our Denton, Roanoke and Hermosillo locations is registered to meet the requirements of ISO 9001

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