SPECIALTY

Gas Regulation Equipment Catalog

- General Purpose
- High Purity Analytical
- High Purity, Corrosion Resistant Stainless Steel
- High Purity, Brass
- High Pressure Regulator
- Cryogenic Regulator

24HR SHIPPING

For Most Regulator Configurations!

ISO 9001 Certified Quality System
MillerWelds.com

Miller | SMITH EQUIPMENT

Smith Equipment Manufacturing was founded by Elmer Smith in 1916. Initially called "Smith Inventions," its humble design and manufacturing operations were located in a garage in Minneapolis, MN. Though additional product lines have been added through the years, oxy-fuel gas apparatus has remained Smith's time tested primary product line.

In the 1950's, Smith's business expanded into the manufacture of high pressure gas regulation equipment. Looking for a more "high tech" sounding company name, Smith became TESCOM Corporation, which was an acronym for The Elmer Smith Company of Minnesota. TESCOM consisted of four autonomous divisions, one of which was Smith Equipment Manufacturing, which relocated to Watertown, South Dakota in 1981.

Smith Equipment offers an extensive line of cutting torches, tips, and gas regulators. Additionally, Smith serves the HVAC and jewelry industries with a line of specialty products developed specifically for the unique application requirements of these market segments. Other Smith products include gas mixing devices, aircraft pitot tubes, and a complete line of specialty gas regulators. Smith's products are used in a variety of industries, including: construction, steel fabrication, ship building, and maintenance.

Celebrating its 100-year anniversary in 2012, ITW (NYSE: ITW) is a Fortune 200 global diversified industrial manufacturer of value-added consumables and specialty equipment with related service businesses. The company focuses on profitable growth and strong returns across worldwide platforms and businesses. The businesses serve local customers and markets around the globe, with a significant presence in developed as well as emerging markets.

Smith's Watertown operation consists of manufacturing cells for each product line, which incorporate machining, plating, swaging, assembly and testing. We strongly believe the "future history" of Smith Equipment depends on every employee subscribing to ITW's 80/20 rule and its five principles of focus, flow, simplification, empowerment, and trust!!

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HOW TO SELECT

A MILLER|SMITH SPECIALTY GAS REGULATOR

STEP 1 Determine gas and material compatibility

Material compatibility between the purposed gas and the regulator's materials of construction is essential. Regulator components that come in contact with the gas stream called "wetted surfaces" must be compatible with the gas being used. Depending on the environment the regulator is being operated in, external materials of construction must be considered as well. Smith Equipment manufactures a wide variety of regulators constructed with various materials to meet most any application. For more information on materials compatibility please refer to the "Material Compatibility Reference" located on page 11 of this catalog.

Types of inlet connections (CGA connections) are determined by the type of gas that is used. You can determine the appropriate CGA connection you require by locating the gas you will be using in the "Regulator CGA Connections" guide located on page 12 of this catalog.

STEP 2 Determine gas purity needs

The higher the purity grade of gas selected, the more "diffusion resistant" the system components must be. Maintaining gas stream purity is directly related to the materials of construction in the equipment selected. For example, when high purity gas is required, regulators with non-stainless steel diaphragms should not be used. Elastomeric (rubber based) diaphragms tend to absorb and outgas which may compromise the gas purity. Regulators with stainless steel metal to metal diaphragms prevent particulates from being absorbed and later diffused into the gas stream maintaining gas purity. To define the grade of regulator purity required, consider the following as a guide:

GENERAL PURPOSE REGULATORS- Are recommended for use with non-corrosive and non-hazardous pure and mixed gas applications where elastomeric outgassing is not critical. These regulators are not recommended for analytical or high purity applications. Typical applications include general laboratory or plant use. These regulators contain a self-resetting safety relief valve vented to atmosphere to protect the regulator from over-pressurization and are available with optional needle valves.

HIGH PURITY ANALYTICAL REGULATORS- Are recommended for use with non-corrosive pure and mixed gas application. Typical applications include gas management of analytical instrumentation, chromatographic carrier gas, and process gas regulation. These units minimize outgassing and inboard diffusion through the use of stainless steel convoluted diaphragms and high purity seats and seal rings. These regulators contain a self resetting safety relief valve vented to atmosphere to protect the regulator from over-pressurization and are available with optional needle valves.

HIGH PURITY REGULATORS- Are recommended for use with non-corrosive pure and mixed gas application. Typical applications include gas management of analytical instrumentation, chromatographic carrier gas, and process gas regulation. These units minimize outgassing and inboard diffusion through the use of stainless steel convoluted diaphragms, high purity seats and seal rings. These regulators may be fitted with optional captured safety relief vents in the bonnet to safely vent away hazardous gases and protect from over-pressurization in the event the diaphragm fails. Optional packless diaphragm valves are also available for these regulators.

HIGH PURITY CORROSION RESISTANT REGULATORS- Are recommended for use with mildly corrosive and non-corrosive gas applications. The stainless steel convoluted metal to metal diaphragm seal provides superior leak performance and eliminates the need for seal rings. The metal to metal seal eliminates outgassing and inboard diffusion in the gas stream. These regulators may be fitted with optional captured relief vents in the bonnet to safely vent away hazardous gasses and protect from over-pressurization in the event of a diaphragm failure. Optional packless diaphragm valves are also available for these regulators.

HOW TO SELECT

A MILLER|SMITH SPECIALTY GAS REGULATOR

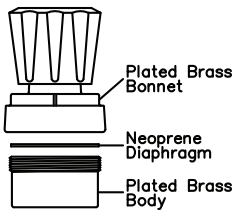
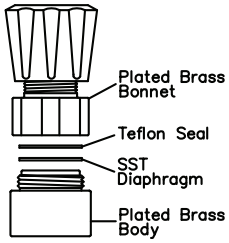
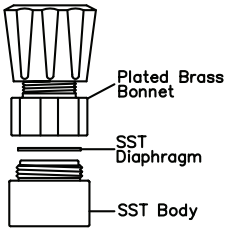
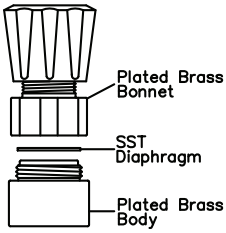
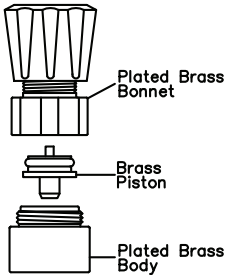
STEP 3 Determine delivery pressure needs

Single stage regulators reduce pressure by passing through one pressure reducing valve area in a single step to deliver a pressure within a specific range. Regulators designed in this way will show a slight increase in delivery pressure as the cylinder pressure falls during use. This phenomenon is known as decay rise. This reduced inlet pressure provides less force against the regulator valve causing it to open wider resulting in increased outlet pressure. If constant pressure is required, periodic adjustment of the regulator is required as the cylinder pressure is reduced. Two stage or dual stage regulators perform the same function as single stage regulators, however, they are actually two regulators in the same housing. In two stage regulators delivery pressure remains constant as the cylinder pressure decreases. Greater accuracy in pressure control is maintained because the pressure is reduced by passing through two pressure reducing valves instead of one. The first stage reduces the incoming high pressure into the second stage. The second stage is adjustable and reduces the remaining pressure to the desired working pressure. Because the inlet pressure on the second stage is relatively stable from the first stage, two stage regulators maintain stable delivery pressure and do not require periodic adjustment as the cylinder pressure decreases.

In summary, a single stage regulator will automatically increase outlet pressure as the cylinder pressure drops. A two stage regulator outlet pressure will remain constant when the cylinder pressure drops.

STEP 4 Determine outlet fitting requirements

Specific outlet connections are determined by the gases used as well as application and down stream requirements. Most regulators are available with or without outlet fittings and are configured at the time of ordering. Smith Equipment offers a wide variety of outlet fittings including standard hose fittings, needle valves, diaphragm valves, and tube fittings. Refer to the available options shown on the catalog page for the specific regulator chosen. Other options and accessories are also available as listed on specific regulator pages.

100 Series	*200 Series*	*300 Series*	*600 Series*	*800 Series*
				
	General Purpose Low Leak Rate: 1 x 10^{-5} ccs	High Purity Analytical Low Leak Rate: 1 x 10^{-5} ccs	High Purity Stainless Steel Corrosion Resistant Low Leak Rate: 1 x 10^{-5} ccs	High Purity Brass Corrosion Resistant Low Leak Rate: 1 x 10^{-5} ccs

REGULATOR QUICK REFERENCE CHART

		Materials of Construction										
		Body			Diaphragm							
Regulator Series	Application	Stainless Steel	Nickel Plated Brass	Monel	Neoprene	Stainless Steel	Stainless Steel FKM Seals	Piston	Monel	Single Stage	Two Stage	Line	Catalog Page
100 Series	General Purpose		X		X							X	13
110 Series	General Purpose		X		X					X			14
120 Series	General Purpose		X		X						X		15
200 Series	High Purity Analytical		X				X					X	16
210 Series	High Purity Analytical		X				X			X			17
220 Series	High Purity Analytical		X				X				X		18
250 Series	High Purity Analytical		X				X			X			19
310 Series	High Purity Corrosion Resistant	X				X				X			20
320 Series	High Purity Corrosion Resistant	X				X					X		21
600 Series	High Purity		X			X						X	22
610 Series	High Purity		X			X				X			23
620 Series	High Purity		X			X					X		24
630 Series	High Purity Analytical		X			X		X			X		25
810 Series	High Purity Analytical		X					X		X			26
820 Series	High Pressure		X					X		X			27
850 Series	High Pressure		X					X					28

REGULATOR SELECTION GUIDE

The following is a guide to assist you in determining which regulator should be used for a given gas and it's application. It should be noted however, this information is based on Smith Equipment's experience to date and is believed to be reliable. These applications are only suggestions by Smith Equipment and the user accepts full responsibility for their use and does so at their own discretion and risk.

Smith Equipment strongly recommends that tests be run under actual operating conditions to determine the regulator's performance and compatibility with the gas to be used.

PURE GASES	LINE REGULATOR	CYLINDER REGULATORS		
	SINGLE STAGE	SINGLE STAGE	TWO STAGE	CGA INLET
ACETYLENE				
Atomic absorption 99.6%	HP200	HP210	HP220	510
AIR				
Dry	GP100	GP110	GP120	590
Hydrocarbon Free	HP600/200	HP610/210	HP620/220	590
Zero	HP600/200	HP610/210	HP620/220	590
AMMONIA				
Anhydrous	None	HP 310	HP320	240/705
ARGON				
Research 99.9995%	HP600/200	HP610/210	HP620/220	580
U.H.P. 99.999%	HP600/200	HP610/210	HP620/220	580
Prepurified 99.998%	HP600/200	HP610/210	HP620/220	580
Zero 99.998%	HP600/200	HP610/210	HP620/220	580
High Purity 99.995%	HP600/200	HP610/210	HP620/220	580
BORON TRIFLUORIDE				
Minimum Purity 99.5%	None	HP310	HP320	330
1.3 BUTADIENE				
Instrument 99.5%	GP100	GP110	GP120	510
C.P. 99.0%	GP100	GP110	GP120	510
N-BUTAINE				
Research 99.9%	GP100	GP110	GP120	510
C.P. 99.0%	GP100	GP110	GP120	510
CARBON DIOXIDE				
Research 99.998%	HP600/200	HP610/210	HP620/220	320
Instrument (Coleman) 99.99%	HP600/200	HP610/210	HP620/220	320
C.P. 99.8%	GP100	GP110	GP120	320
CARBON MONOXIDE				
Ultra High Purity 99.9%	HP600/200	HP610/210	HP620/220	350
C.P. 99.0%	HP600/200	HP610/210	HP620/220	350
Commercial 98.0%	GP100	GP110	GP120	350
CHLORINE				
High Purity 99.5%	None	HP310	HP320	660
DEUTERIUM				
C.P. 99.5%	HP600/200	HP610/210	HP620/220	350
DIMETHYL ETHER				
Purity 99.5%	GP100	GP110	GP120	510
ETHANE				
Research 99.98%	HP600/200	HP610/210	HP620/220	350
C.P. 99.0%	HP600/200	HP610/210	HP620/220	350
Technical 97.5%	GP100	GP110	GP120	350
ETHYLENE				
Research 99.98%	HP600/200	HP610/210	HP620/220	350
C.P. 99.5%	HP600/200	HP610/210	HP620/220	350
Technical 98.55%	GP100	GP110	GP120	350
HELIUM				
Research 99.9995%	HP600/200	HP610/210	HP620/220	580
Ultra High 99.999%	HP600/200	HP610/210	HP620/220	580
Zero 99.995%	HP600/200	HP610/210	HP620/220	580
High Purity 99.995%	HP600/200	HP610/210	HP620/220	580

REGULATOR SELECTION GUIDE

PURE GASES	LINE REGULATOR	CYLINDER REGULATORS		
	SINGLE STAGE	SINGLE STAGE	TWO STAGE	CGA INLET
HYDROGEN				
Research 99.9999%	HP600/200	HP610/210	HP620/220	350
Ultra High 99.999%	HP600/200	HP610/210	HP620/220	350
Zero 99.99%	HP600/200	HP610/210	HP620/220	350
Prepurified 99.99%	HP600/200	HP610/210	HP620/220	350
Extra Dry 99.95%	HP600/200	HP610/210	HP620/220	350
HYDROGEN CHLORIDE				
Chemical 99.0%	None	HP310	HP320	330
KRYPTON				
Research 99.995%	HP600/200	HP610/210	HP620/220	580
METHANE				
Research 99.99%	HP600/200	HP610/210	HP620/220	350
U.H.P. 99.97%	HP600/200	HP610/210	HP620/220	350
C.P. 99.0%	HP600/200	HP610/210	HP620/220	350
Technical 98.0%	GP100	GP110	GP120	350
Commercial 93.0%	GP100	GP100	GP120	350
NEON				
Research 99.999%	HP600/200	HP610/210	HP620/220	580
U.H.P. 99.996%	HP600/200	HP610/210	HP620/220	580
Purified 99.89%	HP600/200	HP610/210	HP620/220	580
NITROGEN				
Research 99.9995%	HP600/200	HP610/210	HP620/220	580
Ultra High 99.999%	HP600/200	HP610/210	HP620/220	580
Prepurified 99.998%	HP600/200	HP610/210	HP620/220	580
Zero 99.998%	HP600/200	HP610/210	HP620/220	580
High Purity 99.99%	HP600/200	HP610/210	HP620/220	580
Oxygen Free 99.99%	HP600/200	HP610/210	HP620/220	580
Extra Dry 99.7%	HP600/200	HP610/210	HP620/220	580
NITROUS OXIDE				
U.H.P. 99.99%	HP600/200	HP610/210	HP620/220	326
Atomic Absorption 99.0%	GP100	GP110	GP120	326
OXYGEN				
Research 99.995%	HP600/200	HP610/210	HP620/220	540
U.H.P. 99.99%	HP600/200	HP610/210	HP620/220	540
Zero 99.6%	HP600/200	HP610/210	HP620/220	540
Extra Dry 99.6%	HP600/200	HP610/210	HP620/220	540
PROPANE				
Research 99.99%	HP200	HP210	HP220	510
Instrument 99.5%	GP100	GP110	GP120	510
C.P. 99.0%	GP100	GP110	GP120	510
Natural 96.0%	GP100	GP110	GP120	510
PROPYLENE				
Research	HP200	HP210	HP220	510
C.P. 99.0%	GP100	GP110	GP120	510
SULFUR HEXAFLUORIDE				
Instrument 99.99%	HP600/200	HP610/210	HP620/220	590
C.P. 99.8%	GP100	GP110	GP120	590
XENON				
Research 99.995%	HP600/200	HP610/210	HP620/220	580

REGULATOR SELECTION GUIDE

MIXED GASES	LINE REGULATOR	CYLINDER REGULATORS		
	SINGLE STAGE	SINGLE STAGE	TWO STAGE	CGA INLET
AMMONIA				
in Argon	None	HP310	HP320	705
in Helium	None	HP310	HP320	705
in Hydrogen	None	HP310	HP320	705
in Nitrogen	None	HP310	HP320	705
ARGON				
in Helium	HP600/200	HP610/210	HP620/220	580
in Hydrogen	HP600/200	HP610/210	HP620/220	580
in Nitrogen	HP600/200	HP610/210	HP620/220	580
BUTANE				
in Argon	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	350
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	350
CARBON DIOXIDE				
in Air	HP600/200	HP610/210	HP620/220	580
in Argon	HP600/200	HP610/210	HP620/220	580
in Helium	HP600/200	HP610/210	HP620/220	580
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	580
CARBON MONOXIDE				
in Air	HP600/200	HP610/210	HP620/220	590
in Argon	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	350
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	350
CHLORINE				
in Argon	None	HP310	HP320	330
in Helium	None	HP310	HP320	330
in Nitrogen	None	HP310	HP320	330
ETHANE				
in Argon	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	350
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	350
ETHYLENE				
in Argon	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	350
HELIUM				
in Argon	HP600/200	HP610/210	HP620/220	580
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	580
HEXANE				
in Air	HP600/200	HP610/210	HP620/220	350
in Argon	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	350
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	350
HYDROGEN				
in Argon	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	350
HYDROGEN CHLORIDE				
in Argon	None	HP310	HP320	330
in Helium	None	HP310	HP320	330

REGULATOR SELECTION GUIDE

MIXED GASES	LINE REGULATOR	CYLINDER REGULATORS		
	SINGLE STAGE	SINGLE STAGE	TWO STAGE	CGA INLET
HYDROGEN CHLORIDE				
in Argon	None	HP310	HP320	330
in Helium	None	HP310	HP320	330
in Nitrogen	None	HP310	HP320	330
HYDROGEN SULFIDE				
in Argon	None	HP310	HP320	330
in Helium	None	HP310	HP320	330
in Nitrogen	None	HP310	HP320	330
ISOBUTANE				
in Argon	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	350
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	350
METHANE				
in Air	HP600/200	HP610/210	HP620/220	350 / 590
in Argon	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	350
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	350
NITRIC OXIDE				
in Argon	None	HP310	HP320	660
in Helium	None	HP310	HP320	660
in Nitrogen	None	HP310	HP320	660
NITROGEN				
in Argon	HP600/200	HP610/210	HP620/220	580
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	580
in Oxygen	HP600/200	HP610/210	HP620/220	296
NITROGEN DIOXIDE				
in Air	None	HP310	HP320	660
in Argon	None	HP310	HP320	660
in Helium	None	HP310	HP320	660
in Nitrogen	None	HP310	HP320	660
OXYGEN				
in Argon	HP600/200	HP610/210	HP620/220	590
in Helium	HP600/200	HP610/210	HP620/220	590
in Nitrogen	HP600/200	HP610/210	HP620/220	590
PROPANE				
in Air	HP600/200	HP610/210	HP620/220	590
in Argon	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	350
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	350
PROPYLENE				
in Air	HP600/200	HP610/210	HP620/220	590
in Argon	HP600/200	HP610/210	HP620/220	350
in Helium	HP600/200	HP610/210	HP620/220	350
in Hydrogen	HP600/200	HP610/210	HP620/220	350
in Nitrogen	HP600/200	HP610/210	HP620/220	350
SULFUR DIOXIDE				
in Air	None	HP310	HP320	660
in Argon	None	HP310	HP320	660
in Helium	None	HP310	HP320	660
in Nitrogen	None	HP310	HP320	660

REGULATOR SELECTION GUIDE

INSTRUMENT MIXTURES	LINE REGULATOR	CYLINDER REGULATORS		
	SINGLE STAGE	SINGLE STAGE	TWO STAGE	CGA INLET
CHROMATOGRAPH CARRIER GAS 8.5% Hydrogen 91.5% Helium	HP600/200	HP610/210	HP620/220	350
ELECTRON CAPTURE MIXTURE P-5 Gas Mixture 5 % Methane	HP600/200	HP610/210	HP620/220	350
FLAME IONIZATION FUEL MIXTURES 40 % Hydrogen 60 % Helium	HP600/200	HP610/210	HP620/220	350
40 % Hydrogen 60 % Nitrogen	HP600/200	HP610/210	HP620/220	350
FURNACE ATMOSPHERE MIXTURES 40 % Carbon Dioxide 60 % Carbon Monoxide	HP600/200	HP610/210	HP620/220	350
GEIGER GAS MIXTURE .95 % ISO Butane 99.05 % Helium	HP600/200	HP610/210	HP620/220	350
LEAK DETECTION MIXTURE 1 - 10 % Helium in Nitrogen	HP600/200	HP610/210	HP620/220	580

NUCLEAR COUNTER MIXTURE	LINE REGULATOR	CYLINDER REGULATOR		
	SINGLE STAGE	SINGLE STAGE	TWO STAGE	CGA INLET
P-10 Gas Mixture 10 % Methane 90 % Argon	HP600/200	HP610/210	HP620/220	350
Proportional Counting Mixture 4 % ISO Butane 96 % Helium	HP600/200	HP610/210	HP620/220	350
1.5 % ISO Butane 98.5% Helium	HP600/200	HP610/210	HP620/220	350

AUTO EMISSION TEST GASES	LINE REGULATOR	CYLINDER REGULATOR		
	SINGLE STAGE	SINGLE STAGE	TWO STAGE	CGA INLET
1-8 % Carbon Monoxide 500-5,000 ppm Propane in Nitrogen	HP600	HP610	HP620/220	350
1-8 % Carbon Monoxide 10-20 % Carbon Dioxide 500-5,000 ppm Propane in Nitrogen	HP600	HP610	HP620/220	350
I/M Field Calibration Gas 1.6 % Carbon Monoxide 11.0 % Carbon Dioxide 600 ppm Propane Balance Nitrogen	HP600	HP610	HP620/220	350

LASER GASES	LINE REGULATOR	CYLINDER REGULATOR		
	SINGLE STAGE	SINGLE STAGE	TWO STAGE	CGA INLET
EXCIMER LASER GAS MIXTURES Hydrogen Chloride in Helium	None	HP310	HP320	330
MOLECULAR LASER GAS MIXTURES 4.5 % Carbon Dioxide 13.5 % Nitrogen in Helium	HP600/200	HP610/210	HP620/220	580

MATERIAL COMPATIBILITY CHART

KEY

I = Insufficient data available to determine the compatibility with the intended gas.
S = Satisfactory for use with the intended gas (dry anhydrous) at normal operating temperature of 70°F
U = Unsatisfactory for use with the intended gas.
C = Compatibility depends on condition of use

NOTE: This chart is intended as a guide only. Actual applications may include variables which can effect the compatibility of certain materials with particular gases. Contact your gas supplier for additional compatibility information regarding the gases being used.
* The user should be thoroughly familiar with the specific properties of the gas material compatability depends on condition of use.

Gas	Primary Hazards					Metals					Plastics				Elastomers		
	Asphyxiant	Toxic	Flammable	Corrosive	Oxidizer	Aluminum	Brass	Copper	Monel	Stainless Steel	Kel-F/PCTFE	Teflon	Tefzel	Kynar	Viton	Buna-N	Neoprene
Acetylene	•		•			S	S	U	S	S	S	S	S	S	S	S	S
Air					•	S	S	S	S	S	S	S	S	S	S	S	S
Ammonia		•	•	•		S	U	U	S	S	S	S	S	S	S	S	S
Argon	•					S	S	S	S	S	S	S	S	S	S	S	S
*Arsine		•	•			I	S	S	S	S	S	S	S	S	S	S	S
Boron Trichloride		•		•		U	C	C	S	S	S	S	S	I	I	I	I
Boron Trifluoride		•		•		I	C	C	S	S	S	S	S	I	I	I	I
Boron-11 Trifluoride		•		•		I	C	C	S	S	S	S	S	I	I	I	I
*Bromine Trifluoride		•		•	•	C	C	C	S	S	C	C	S	U	U	U	U
1,3-Butadiene		•	•			S	S	S	S	S	S	S	S	S	S	S	S
n-Butane	•		•			S	S	S	S	S	S	S	S	S	S	S	S
1-Butene			•			S	S	S	S	S	S	S	S	S	S	S	S
cis-2-Butene			•			S	S	S	S	S	S	S	S	S	S	S	S
trans-2-Butene			•			S	S	S	S	S	S	S	S	S	S	S	S
Carbon Dioxide	•					S	S	S	S	S	S	S	S	S	S	C	C
Carbon Monoxide		•	•			S	S	S	S	S	S	S	S	S	S	S	S
Chlorine		•		•		U	U	U	S	S	S	S	S	S	S	U	U
*Chlorine Trifluoride		•		•	•	U	I	I	S	S	C	C	S	U	U	U	U
Deuterium	•		•			S	S	S	S	S	S	S	S	S	S	S	S
Dichlorosilane		•	•	•		U	I	I	S	S	S	S	S	S	I	I	I
Di-, Mono-, and Trimethylamines		•	•	•		U	U	U	S	S	S	S	S	S	U	U	I
Disilane			•			S	S	S	S	S	S	S	S	S	S	S	S
Ethane	•		•			S	S	S	S	S	S	S	S	S	S	S	S
Ethyl Chloride			•			S	S	S	S	S	S	S	S	S	S	S	S
Ethylene	•		•			S	S	S	S	S	S	S	S	S	S	S	S
*Fluorine		•		•	•	C	C	C	S	S	C	C	C	C	U	U	U
Halobarbon-14						S	S	S	S	S	S	S	S	S	S	S	S
Halocargon-23	•					S	S	S	S	S	S	S	S	S	S	S	S
Halocarbon-116	•					S	S	S	S	S	S	S	S	S	S	S	S
Helium	•					S	S	S	S	S	S	S	S	S	S	S	S
Hydrogen	•		•			S	S	S	S	S	S	S	S	S	S	S	S
Hydrogen Bromide		•		•		U	U	U	S	S	S	S	S	S	S	U	U
Hydrogen Chloride		•		•		U	U	U	S	S	S	S	S	S	S	U	U
*Hydrogen Fluoride		•		•		U	U	U	S	S	S	S	S	S	U	U	U
*Hydrogen Sulfide		•	•	•		S	S	I	S	S	S	S	S	S	U	S	S
Isobutane	•		•			S	S	S	S	S	S	S	S	S	S	S	S
Isobutylene	•		•			S	S	S	S	S	S	S	S	S	S	S	S
Krypton	•					S	S	S	S	S	S	S	S	S	S	S	S
Methane	•		•			S	S	S	S	S	S	S	S	S	S	S	S
Methyl Chloride		•	•			U	S	S	S	S	S	S	S	S	S	U	U
Methyl Fluoride		•	•			S	S	S	S	S	S	S	S	S	I	I	I
Neon	•					S	S	S	S	S	S	S	S	S	S	S	S
Nitric Oxide		•		•	•	S	U	U	U	S	S	S	S	S	S	I	I
Nitrogen	•					S	S	S	S	S	S	S	S	S	S	S	S
Nitrogen Dioxide		•		•	•	S	U	U	U	S	S	S	I	I	U	U	U
Nitrogren Trifluoride		•			•	I	S	S	S	S	S	S	S	S	S	I	I
Nitrous Oxide					•	S	S	S	S	S	S	S	S	S	S	S	S
Octafluorocyclobutane	•					S	S	S	S	S	S	S	S	S	S	S	S
Octafluoropropane	•					S	S	S	S	S	S	S	S	I	I	S	S
*Oxygen					•	U	S	S	S	C	S	S	S	S	C	U	U
*Phosphine		•	•			S	I	I	S	S	S	S	S	I	I	I	I
Propane	•		•			S	S	S	S	S	S	S	S	S	S	S	S
Propylene	•		•			S	S	S	S	S	S	S	S	S	S	S	U
*Silane			•			S	S	S	S	S	S	S	S	S	S	S	S
Silicone Tetrachloride		•		•		U	U	U	S	S	S	S	S	S	U	U	U
Silicone Tetrafluoride		•		•		U	U	U	S	S	S	S	S	S	U	U	U
Sulfur Dioxide		•		•		S	U	S	S	S	S	S	S	S	S	U	U
Sulfur Hexafluoride	•					S	S	S	S	S	S	S	S	S	S	S	S
Sulfur Tetrafluoride		•		•		U	U	U	S	S	S	S	S	S	U	U	U
Tungsten Hexafluoride		•		•		U	U	U	S	S	S	S	S	S	U	U	U
Xenon	•					S	S	S	S	S	S	S	S	S	S	S	S

REGULATOR
CGA CONNECTIONS

GAS	CGA Inlet Connection
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 Trifluoride	670
Bromine Pentafluoride	670
Bromotrifluoroethylene	510
1-3 Butadine	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” (Monochloropentafluoroethane)	660
“Genetron 152A” (1, 1-Difluoroethylene)	350
“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 (Formerly1320)	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 the Compressed Gas Association

100 Silverline SERIES

GENERAL PURPOSE SINGLE STAGE LINE REGULATORS

DESIGN FEATURES

- Filtered seat for added gas stream purity and extended service life
- Large 1 - 7/8″ diaphragm for precise control of pressure
- Large 2 - 1/2″ easy to read single scale gauges
- Rugged brass construction with bar stock body
- Plated body, bonnet, and gauges for superior protection
- Body is tapped for rear panel mounting

General purpose single stage regulators are recommended for inert and non-corrosive gas applications where very or extremely precise control of delivery is not necessary. These regulators are not recommended for applications where inboard diffusion of air or outgassing of elastomeric components would adversely affect the work being done.

P/N 100-00-00 SHOWN

Sure-Seat™ technology for maximum life and gas purity

SPECIFICATIONS

Maximum Inlet Pressure	1200 PSIG
Outlet Pressure Ranges	0-15, 0-50, 0-100, 0-200 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (3)	1/4" FNPT
Design Leak Rate	Bubble tight (1 x 10-5 ccs Helium)
Flow Coefficient Cv	0.22
Flow Curve	Flow Chart #1
Inlet Decay Rate	0.138/100 PSIG
Weight	2.5 lbs.

100 - 00 - 00

Option 1: Model Series & Outlet Pressure	
100	15 PSIG
101	50 PSIG
102	100 PSIG
103	200 PSIG

Option 2: Outlet Fittings	
00	1/4″ FNPT
04	1/4" MPT x 1/4" brass tube fitting
80	1/4" MPT x 1/8" brass tube fitting
81	1/4" MPT x 1/8" stainless

Option 3: CGA Inlet Fittings	
00	1/4″ FNPT
04	1/4" MPT x 1/4" brass tube fitting
11	1/4" MPT x 1/8" brass tube fitting
12	1/4" MPT x 1/8" stainless steel tube fitting

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet	Nickel Plated
Seat	PFA
Seat Retainer	Brass
Diaphragm	Neoprene
Gauge	2-1/2" Nickel Plated
Filter	316 Stainless Steel
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel

Ordering Information For 100 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
100	1200	15	---	---	0-30	1
101	1200	50	---	---	0-60	1
102	1200	100	---	---	0-200	5
103	1200	200	---	---	0-400	10

110 Silverline SERIES

GENERAL PURPOSE SINGLE STAGE CYLINDER REGULATORS

DESIGN FEATURES

- Filtered seat for added gas stream purity and extended service life
- Large 1 - 7/8˝ diaphragm for precise control of pressure
- Large 2 - 1/2˝ easy to read single scale gauges
- Built in capturable preset safety relief valve
- Rugged brass construction with bar stock body
- Plated body, bonnet, and gauges for superior protection
- Body is tapped for rear panel mounting

General purpose single stage regulators are recommended for control of inert and non-corrosive gas applications. They are well suited for closely monitored analytical operations and are ideal for use with liquified hydrocarbon gases. These regulators are not recommended for applications where inboard diffusion of air or outgassing of elastomeric components would adversely affect the work being done. A preset safety relief valve vents to atmosphere, which makes this regulator suitable for only non-hazardous gases.

P/N 110-20-09 SHOWN

Sure-Seat™ technology for maximum life and gas purity

SPECIFICATIONS

Maximum Inlet Pressure	3500 PSIG
Outlet Pressure Ranges	0-15, 0-50, 0-100, 0-250 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (4)	1/4" FNPT
Design Leak Rate	Bubble tight (1 x 10-5 ccs Helium)
Flow Coefficient Cv	0.21
Flow Curve	Flow Chart #2
Inlet Decay Rate	0.58/100 PSIG
Weight	3.32 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet	Nickel Plated
Seat	PFA
Seat Retainer	Brass
Diaphragm	Neoprene
Gauge	2-1/2" Chrome Plated
Filter	316 Stainless Steel
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel
Outlet Valve	Nickel Plated Brass

110 - 20 - 09

Option 1: Model Series & Outlet Pressure	
110	15 PSIG
111	50 PSIG
112	100 PSIG
113	250 PSIG

Option 2: Outlet Fittings	
00	1/4" FNPT
20	Needle Valve with male 1/4" NPT outlet
40	Needle Valve with female 1/4" NPT outlet
41	Needle Valve with 1/8" brass tube fitting
42	Needle Valve with 1/8" stainless steel tube fitting
82	Nickel "B" fitting (9/16" - 18RH)
*84	Nickel Fuel Hose Connection (9/16" - 18LH)

*Only available and used with #110 body

Option 3: CGA Inlet Fittings	
00	1/4" FNPT
01	CGA 300*
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510*
08	CGA 540
09	CGA 580
10	CGA 590

*Only available and used with #110 body

Ordering Information For 110 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge		Relief Valve Setting PSIG
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG	
100	3500	15	0-4000	100	0-30	1	85
111	3500	50	0-4000	100	0-60	1	150
112	3500	100	0-4000	100	0-200	5	150
113	3500	250	0-4000	100	0-400	10	350

120 Silverline SERIES

GENERAL PURPOSE TWO STAGE CYLINDER REGULATORS

P/N 120-20-08 SHOWN

Sure-Seat™ technology for maximum life and gas purity

DESIGN FEATURES

- Filtered seat for added gas stream purity and extended service life
- Large 1 - 7/8″ diaphragm for precise control of pressure
- Large 2 - 1/2″ easy to read single scale gauges
- Built in capturable preset safety relief valve
- Rugged brass construction with bar stock body
- Plated body, bonnet, and gauges for superior protection

General purpose two stage regulators are recommended for control of inert and non-corrosive pure gases in laboratories, general plant and maintenance shops where constant delivery pressures are required. These regulators are not recommended for applications where inboard diffusion of air or outgassing of elastomeric components would adversely affect the work being done. A preset safety relief valve vents to atmosphere, which makes this regulator suitable for only nonhazardous gases.

SPECIFICATIONS

Maximum Inlet Pressure	3500 PSIG
Outlet Pressure Ranges	0-15, 0-50, 0-100, 0-250 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (4)	1/4" FNPT
Design Leak Rate	Bubble tight (1 x 10-5 ccs Helium)
Flow Coefficient Cv	0.19
Flow Curve	Flow Chart #3
Inlet Decay Rate	0.042/100 PSIG
Weight	5 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet 1st & 2nd Stage	Nickel Plated
Seat	PFA
Seat Retainer	Brass
Diaphragm	Neoprene
Gauge	2-1/2" Chrome Plated
Filter	316 Stainless Steel
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel
Outlet Valve	Nickel Plated Brass

120 - 20 - 09

Option 1: Model Series & Outlet Pressure	
120	15 PSIG
121	50 PSIG
122	100 PSIG
123	250 PSIG

Option 2: Outlet Fittings	
00	1/4" FNPT
20	Needle Valve with male 1/4" NPT outlet
40	Needle Valve with female 1/4" NPT outlet
41	Needle Valve with 1/8" brass tube fitting
42	Needle Valve with 1/8" stainless steel tube fitting
82	Nickel "B" fitting (9/16" - 18RH)
*84	Nickel Fuel Hose Connection (9/16" - 18LH)

*Only available and used with #120 body

Option 3: CGA Inlet Fittings	
00	1/4" FNPT
01	CGA 300*
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510*
08	CGA 540
09	CGA 580
10	CGA 590

*Only available and used with #120 main body

Ordering Information For 120 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge		Relief Valve Setting PSIG
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG	
120	3500	15	0-4000	100	0-30	1	85
121	3500	50	0-4000	100	0-60	1	150
122	3500	100	0-4000	100	0-200	5	150
123	3500	250	0-4000	100	0-400	10	350

200 Silverline SERIES

HIGH PURITY ANALYTICAL BRASS LINE REGULATORS

P/N 200-00-00 Shown

Sure-Seat™ technology for maximum life and gas purity

DESIGN FEATURES

- Filtered seat for added gas stream purity and extended service life
- Stainless steel diaphragm for precise control of pressure
- Large 2 - 1/2˝ easy to read single scale gauges
- Rugged brass bar stock construction
- Plated body, bonnet, and gauges for superior protection
- Body is tapped for rear panel mounting

High purity single stage line regulators are recommended for low inlet pressure and pressure sensitive applications where diffusion resistance is required. They are recommended for low pressure pipelines supplying gas chromatographs, mass spectrometers, and research sampling systems where brass construction is acceptable. These regulators are recommended for high purity inert and non-corrosive gas applications. The regulators are able to withstand vacuums generated during purging operations.

SPECIFICATIONS

Maximum Inlet Pressure	1200 PSIG
Outlet Pressure Ranges	0-15, 0-50, 0-100 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (3)	1/4" FNPT
Design Leak Rate	Bubble tight (1 x 10-5 ccs Helium)
Flow Coefficient Cv	0.13
Flow Curve	Flow Chart #4
Inlet Decay Rate	0.23/100 PSIG
Weight	2.5 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet	Nickel Plated
Seat	PFA
Seat Retainer	Brass
Diaphragm	Stainless Steel
Gauge	2-1/2" Chrome Plated
Filter	316 Stainless Steel
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel
Seals	FKM

200 - 00 - 00

Option 1: Model Series & Outlet Pressure	
200	15 PSIG
201	50 PSIG
202	100 PSIG

Option 2: Outlet Fittings	
00	1/4" FNPT
04	1/4" MPT x 1/4" brass tube fitting
80	1/4" MPT x 1/8" brass tube fitting
81	1/4" MPT x 1/8" stainless steel tube fitting
82	Nickel "B" fitting (9/16"-18RH)
83	1/4" MPT x 1/4" stainless steel tubing

Option 3: CGA Inlet Fittings	
00	1/4" FNPT
04	1/4" MPT x 1/4" brass tube fitting
11	1/4" MPT x 1/8" brass tube fitting
12	1/4" MPT x 1/8" stainless steel tube fitting

Ordering Information For 200 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
200	1200	15	---	---	30" HG 0-30	1
201	1200	50	---	---	0-60	1
202	1200	100	---	---	0-200	5

210 Silverline SERIES

HIGH PURITY ANALYTICAL BRASS SINGLE STAGE CYLINDER REGULATORS

P/N 210-20-09 SHOWN

Sure-Seat™ technology for maximum life and gas purity

DESIGN FEATURES

- Filtered seat for added gas stream purity and extended service life
- Stainless steel diaphragm for precise control of pressure
- Large 2 - 1/2″ easy to read single scale gauges
- Rugged brass bar stock construction
- Plated body, bonnet, and gauges for superior protection
- Built in capturable preset safety relief valve
- Body is tapped for rear panel mounting

High purity single stage regulators are designed to control high purity, non-corrosive gases for applications where precise control of delivery pressure is not necessary. Recommended applications are in instrument analysis, automotive emissions testing, biological laboratories and chemical process plants where brass construction is acceptable. The materials of construction will not contaminate the gas stream, and are highly resistant to inboard diffusion of atmospheric contamination. These regulators are able to withstand vacuums generated during purging operations.

SPECIFICATIONS

Maximum Inlet Pressure	3500 PSIG
Outlet Pressure Ranges	0-15, 0-50, 0-100, 0-150 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (4)	1/4" FNPT
Design Leak Rate	Bubble tight (1 x 10-5 ccs Helium)
Flow Coefficient Cv	0.09
Flow Curve	Flow Chart #5
Inlet Decay Rate	0.35/100 PSIG
Weight	3.1 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet	Nickel Plated
Seat	PFA
Seat Retainer	Brass
Diaphragm	Stainless Steel
Gauge	2-1/2" Chrome Plated
Filter	316 Stainless Steel
Valve Stem	316 Stainless Steel
Outlet Valve	Nickel Plated Brass
Seals	FKM

210 - 20 - 09

Option 1: Model Series & Outlet Pressure	
210	15 PSIG
211	50 PSIG
212	100 PSIG
213	150 PSIG
214	15 PSIG

Acetylene model with red warning delivery gauge

Option 2: Outlet Fittings	
00	1/4" FNPT
01	1/4" FNPT Chrome Diaphragm Valve
20	Needle Valve with male 1/4" NPT outlet
40	Needle Valve with female 1/4" NPT outlet
41	Needle Valve with 1/8" brass tube fitting
42	Needle Valve with with 1/8" stainless steel tube fitting
82	Nickel "B" fitting (9/16"-18RH)
*84	Nickel Fuel Hose Connection (9/16"-18LH)

*Only available and used with #214 body

Option 3: CGA Inlet Fittings	
00	1/4" FNPT
01	CGA 300*
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510*
08	CGA 540
09	CGA 580
10	CGA 590

*Only available and used with #214 body

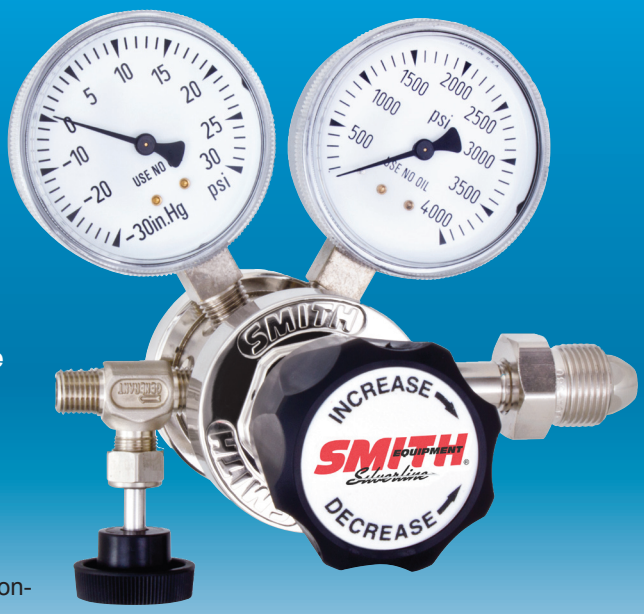
Ordering Information For 210 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge		Relief Valve Setting PSIG
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG	
210	3500	15	0-4000	100	30" HG 0-30	1	85
211	3500	50	0-4000	100	0-60	1	150
212	3500	100	0-4000	100	0-200	5	150
213	3500	150	0-4000	100	0-200	5	350
214	400	15	0-400	10	0-30*	1	--

* Red warning delivery gauge

220 Silverline SERIES

HIGH PURITY ANALYTICAL TWO STAGE BRASS CYLINDER REGULATORS



P/N 220-20-09 SHOWN

Sure-Seat™ technology for maximum life and gas purity

DESIGN FEATURES

- Filtered seat for added gas stream purity and extended service life
- Stainless steel diaphragm for precise control of pressure
- Large 2 - 1/2˝ easy to read single scale gauges
- Rugged brass bar stock construction
- Plated body, bonnet, and gauges for superior protection
- Built in capturable preset safety relief valve

These high purity two stage regulators are recommended for high purity, non-corrosive pure gases and mixtures in applications where constant delivery pressures are required. These regulators are ideally suited for the control of carrier gases or calibration mixtures used in gas chromatography such as thermal conductivity, flame ionization, flame photometry, and electron capture. This two stage design allows for precise control from full to nearly empty cylinders and is recommended in applications where constant delivery pressures, regardless of fluctuations in cylinder pressure, are required. An automatic reseating safety relief valve protects the regulator components from over pressurization. These regulators are able to withstand vacuums generated during purging operations.

SPECIFICATIONS

Maximum Inlet Pressure	3500 PSIG
Outlet Pressure Ranges	0-15, 0-50, 0-100 0-150 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (4)	1/4" FNPT
Design Leak Rate	Bubble tight (1 x 10-5 ccs Helium)
Flow Coefficient Cv	0.17
Flow Curve	Flow Chart #6
Inlet Decay Rate	0.025/100 PSIG
Weight	4.8 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet 1st & 2nd Stage	Nickel Plated
Seat	PFA
Seat Retainer	Brass
Diaphragm 1st Stage	Stainless Steel
Diaphragm 2nd Stage	Stainless Steel
Gauge	2-1/2" Chrome Plated
Filter	316 Stainless Steel
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel
Outlet Valve	Nickel Plated Brass
Seals	FKM

220 - 20 - 09

Option 1: Model Series & Outlet Pressure	
220	15 PSIG
221	50 PSIG
222	100 PSIG
223	150 PSIG

Option 2: Outlet Fittings	
00	1/4" FNPT
01	1/4" FNPT Chrome Diaphragm Valve
20	Needle Valve with male 1/4" NPT outlet
40	Needle Valve with female 1/4" NPT outlet
41	Needle Valve with 1/8" brass tube fitting
42	Needle Valve with 1/8" stainless steel tube fitting
82	Nickel "B" fitting (9/16"-18RH)
*84	Nickel Fuel Hose Connection (9/16"-18LH)

*Only available and used with #220 body

Option 3: CGA Inlet Fittings	
00	1/4" FNPT
01	CGA 300*
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510
08	CGA 540
09	CGA 580
10	CGA 590

*Only available and used with #220 body

Ordering Information For 220 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge		Relief Valve Setting PSIG
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG	
220	3500	15	0-4000	100	30" HG 0-30	1	85
221	3500	50	0-4000	100	0-60	1	150
222	3500	100	0-4000	100	0-200	5	150
223	3500	150	0-4000	100	0-200	5	350

250 Silverline SERIES

HIGH PURITY ANALYTICAL BRASS LIQUID CYLINDER REGULATORS

P/N 254-20-09 SHOWN

Sure-Seat™ technology for maximum life and gas purity

DESIGN FEATURES

- Filtered seat for added gas stream purity and extended service life
- Large 1 - 7/8″ stainless steel diaphragm for precise control of pressure
- Large 2 - 1/2″ easy to read single scale gauges
- Rugged brass bar stock construction
- Plated body, bonnet, and gauges for superior protection
- Built in capturable preset safety relief valve

These high purity single stage regulators are designed for use on liquid cylinders. The regulator has rear entry which allows for easy connection to the liquid cylinder. The stainless steel diaphragm will provide a long service life in cryogenic applications. This regulator controls the delivery of gases not liquids. Typical applications include high purity gas handling, bulk gas distribution, liquid cylinders and laboratories.

SPECIFICATIONS

Maximum Inlet Pressure	3500 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (3)	1/4" FNPT
Design Leak Rate	Bubble tight (1 x 10-5 ccs Helium)
Flow Coefficient Cv	0.13
Flow Curve	Flow Chart #19
Inlet Decay Rate	0.23/100 PSIG
Weight	2.5 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet	Nickel Plated
Diaphragm	Stainless Steel
Seat	PFA
Seat Retainer	Brass
Gauge	2-1/2" Chrome Plated
Filter	316 Stainless Steel
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel
Seals	FKM

254 - 20 - 09

Option 1: Model Series & Outlet Pressure	
252	100 PSIG
254	200 PSIG
255	350 PSIG
256	500 PSIG

Option 2: Outlet Fittings	
00	1/4" FNPT
20	Nickel Needle Valve with male 1/4" NPT outlet
82	Nickel "B" fitting (9/16"-18RH)

Option 3: CGA Inlet Fittings	
00	1/4" FNPT
02	CGA 320
08	CGA 540
09	CGA 580

Ordering Information For 250 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Delivery Gauge		Relief Valve Setting PSIG
			Range PSIG	Graduations PSIG	
252	3500	100	0-200	5	150
254	3500	200	0-400	10	350
255	3500	350	0-400	10	575
256	3500	500	0-1000	20	575

310 Silverline SERIES

HIGH PURITY CORROSION RESISTANT STAINLESS STEEL SINGLE STAGE REGULATOR

P/N 310-70-24-00-00 SHOWN

Sure-Seat™ technology for maximum life and gas purity

DESIGN FEATURES

- 316 Stainless steel filtered seat for added gas stream purity, and extended service life
- Convoluted stainless steel diaphragm for precise control of pressure
- Metal to metal diaphragm seal for maximum leak integrity
- 316 stainless steel bar stock body
- Large 2 - 1/2˝ easy to read single scale gauges
- Captured vent port in bonnet (1/16˝ FNPT) allows for safe venting of hazardous gases
- Bonnet is threaded for front panel mounting
- Body is tapped for rear panel mounting

This single stage high purity regulator is designed to prevent contamination of high purity systems and provide accurate regulation of corrosive, non-corrosive or toxic gases. For corrosive applications, all parts in this regulator exposed to the flowing media are constructed of 316 PCTFE. The specially designed and convoluted stainless steel diaphragm gives maximum accuracy and provides stable regulation of delivery pressure. This regulator is capable of withstanding an internal vacuum and available with diffusion resistant, packless diaphragm outlet valve to maintain system purity. A capturable 1/16" FNPT port in the bonnet is provided to vent hazardous gases in the event of a diaphragm failure.

NOTE: A Cross Purge Assembly must be used with this series of regulators to ensure effective purging of hazardous gas traces during cylinder changes.

SPECIFICATIONS

Maximum Inlet Pressure	3500 PSIG
Outlet Pressure Ranges	0-25, 0-50, 0-100, 0-250 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (5)	1/4" FNPT
Design Leak Rate	(2 x 10-8 ccs Helium)
Flow Coefficient Cv	0.12
Flow Curve	Flow Chart #8
Inlet Decay Rate	0.75/100 PSIG
Weight	3.32 lbs.

MATERIALS OF CONSTRUCTION

Body	316 Stainless Steel, Bar Stock
Bonnet	Nickel Plated Brass, Bar Stock
Seat	PCTFE
Seat Retainer	316 Stainless Steel
Diaphragm	Stainless Steel
Gauge	2-1/2" Stainless Steel
Filter	316 Stainless Steel
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel
Outlet Valve	316 Stainless Steel

310 - 70 - 24 - 00 - 00

Option 1: Model Series & Outlet Pressure	
310	25 PSIG
311	50 PSIG
312	100 PSIG
313	250 PSIG

Option 2: Outlet Fittings	
00	1/4" FNPT
66	1/4" MPT Stainless Steel Needle Valve
67	1/4" MPT Stainless Steel Diaphragm Valve
68	1/4" FPT Stainless Steel Needle Valve with 1/8" Tube Fitting
69	1/4" FPT Stainless Steel Diaphragm Valve with 1/8" Tube Fitting
70	1/4" FNPT Stainless Steel Diaphragm Valve
81	1/4" MPT x 1/8" Stainless Steel Tube Fitting
83	1/4" MPT x 1/4" Stainless Steel Tube Fitting
85	1/4" FPT Stainless Steel Diaphragm Valve with 1/4" Tube Fitting

Option 3: CGA Inlet Fittings	
00	1/4" FNPT
20	CGA SS 320
21	CGA SS 326
22	CGA SS 330
23	CGA SS 350
24	CGA SS 580
25	CGA SS 660
30	CGA SS 240
31	CGA SS 705
32	CGA SS 590

Option 4: Accessories	
00	None
01	Panel Mount Kit
02	Helium Leak Certification
03	Panel Mount Kit and Certification

Option 5: Options	
00	None
01	Captured Vent Fitting 1/16" MPT x 1/8" Tube

Ordering Information For 310 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
310	3500	25	0-4000	100	30° HG 0-30	1
311	3500	50	0-4000	100	0-100	2
312	3500	100	0-4000	100	0-200	5
313	3500	250	0-4000	100	0-400	10

320 Silverline SERIES

HIGH PURITY CORROSION RESISTANT STAINLESS STEEL TWO STAGE REGULATOR

P/N 320-70-24-00-00 SHOWN

Sure-Seat™ technology for maximum life and gas purity

DESIGN FEATURES

- 316 Stainless steel filtered seat for added gas stream purity and extended service life
- Convoluted stainless steel diaphragm for precise control of pressure
- Metal to metal diaphragm seal for maximum leak integrity
- 316 stainless steel bar stock body
- Large 2 - 1/2˝ easy to read single scale gauges
- Captured vent port in bonnet (1/16˝ FNPT) allows for safe venting of hazardous gases
- Front and rear bonnet are threaded for front panel mounting

This high purity two stage regulator is designed for corrosive and non-corrosive gases requiring precise and stable delivery pressure control. These regulators provide constant delivery pressure regardless of inlet pressure fluctuations. This stainless steel regulator offers high corrosion resistance and wetted parts of 316 Stainless Steel and PCTFE for high purity applications. This regulator also features a unique metal diaphragm seal. Captured vent ports are provided for both stages to allow for venting of hazardous gases in the event of a diaphragm failure. This regulator is designed to withstand internal vacuums during purging operations.

Note: A Cross Purge Assembly must be used with this series of regulators to ensure effective purging of hazardous gas traces during cylinder changes.

SPECIFICATIONS

Maximum Inlet Pressure	3500 PSIG
Outlet Pressure Ranges	0-25, 0-50, 0-100, 0-250 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (5)	1/4" FNPT
Design Leak Rate	(2 x 10-8 ccs Helium)
Flow Coefficient Cv	0.10
Flow Curve	Flow Chart #9
Inlet Decay Rate	0.04/100 PSIG
Weight	5 lbs.

MATERIALS OF CONSTRUCTION

Body	316 Stainless Steel, Bar Stock
Bonnet 1st Stage	Nickel Plated Brass, Bar Stock
Bonnet 2nd Stage	Nickel Plated Brass, Bar Stock
Seat	PCTFE
Seat Retainer	316 Stainless Steel
Diaphragm 1st Stage	Stainless Steel
Diaphragm 2nd Stage	Stainless Steel
Gauge	2-1/2" Stainless Steel
Filters	316 Stainless Steel
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel

320 - 70 - 24 - 00 - 00

Option 1: Model Series & Outlet Pressure

320	25 PSIG
321	50 PSIG
322	100 PSIG
323	250 PSIG

Option 2: Outlet Fittings

00	1/4" FNPT
66	1/4" MPT Stainless Steel Needle Valve
67	1/4" MPT Stainless Steel Diaphragm Valve
68	1/4" FPT Stainless Steel Needle Valve with 1/8" Tube Fitting
69	1/4" FPT Stainless Steel Diaphragm Valve with 1/8" Tube Fitting
70	1/4" FNPT Stainless Steel Diaphragm Valve
81	1/4" MPT x 1/8" Stainless Steel Tube Fitting
83	1/4" MPT x 1/4" Stainless Steel Tube Fitting
85	1/4" FPT Stainless Steel Diaphragm Valve with 1/4" Tube Fitting

Option 3: CGA Inlet Fittings

00	1/4" FNPT
20	CGA SS 320
21	CGA SS 326
22	CGA SS 330
23	CGA SS 350
24	CGA SS 580
25	CGA SS 660
30	CGA SS 240
31	CGA SS 705
32	CGA SS 590

Option 4: Accessories

00	None
01	Panel Mount Kit
02	Helium Leak Certification
03	Panel Mount Kit and Certification

Option 5: Options

00	None
02	Captured Vent Fitting 1/16" MPT x 1/8" Tube (includes 2)

Ordering Information For 320 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
320	3500	25	0-4000	100	30" HG 0-30	1
321	3500	50	0-4000	100	0-100	2
322	3500	100	0-4000	100	0-200	5
323	3500	250	0-4000	100	0-400	10

600 Silverline SERIES

HIGH PURITY BRASS LINE REGULATORS

DESIGN FEATURES

- Filtered seat for added gas stream purity
- Stainless steel diaphragm
- Metal to metal body to diaphragm seal
- 2 1/2˝ single scale gauge
- 316 stainless steel filter
- Brass nickel plated bar stock body
- Capturable vent in bonnet (1/16˝ FNPT)
- Threaded bonnet for panel mounting
- Body is tapped for rear panel mounting

P/N 600-00-00-00 SHOWN

Sure-Seat™ technology for maximum life and gas purity

These brass high purity, single stage line regulators are recommended for applications where diffusion resistance is required. These regulators are recommended for chromatographs, mass spectrometers, research sampling systems and semiconductor processing that is being serviced by a low pressure pipeline system. These regulators are able to withstand internal vacuums generated during purging operations. There is a 1/16" FNPT bonnet port to allow for the venting of hazardous gases. This regulator may be panel mounted by using a bonnet mounting nut or the threaded holes in the back of the regulator.

SPECIFICATIONS

Maximum Inlet Pressure	1200 PSIG
Outlet Pressure Ranges	0-25, 0-50, 0-100 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (3)	1/4" FNPT
Outlet	1/4" FNPT
Design Leak Rate	(2 x 10-8 ccs Helium)
Flow Coefficient Cv	0.13
Flow Curve	Flow Chart #7
Weight	2.39 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar stock
Bonnet	Nickel Plated Brass, Bar stock
Seat	PFA
Seat Retainer	Brass
Diaphragm	Stainless Steel
Gauge	2-1/2" Chrome Plated
Filters	316 Stainless Steel/Brass
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel

600 - 00 - 00 - 00 - 00

Option 1: Model Series & Outlet Pressure		Option 2: Outlet Fittings		Option 3: CGA Inlet Fittings		Option 4: Accessories		Option 5: Options	
600	25 PSIG	00	1/4" FNPT	00	1/4" FNPT	00	None	00	1/4" None
601	50 PSIG	04	1/4" MNPT x 1/4" Brass Tube Fitting	04	1/4" MNPT x 1/4" Brass Tube Fitting	01	Panel Mount Kit	01	Captured Vent Fitting 1/16" MPT x 1/8" Tube
602	100 PSIG	80	1/4" MNPT x 1/8" Brass Tube Fitting	11	1/4" MNPT x 1/8" Brass Tube Fitting	02	Helium Leak Certification		
		81	1/4" MNPT x 1/8" Stainless Steel Tube Fitting	12	1/4" MNPT x 1/8" Stainless Steel Tube Fitting	03	Panel Mount Kit and Certification		
		83	1/4" MNPT x 1/4" Stainless Steel Tube Fitting						

Ordering Information For 600 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
600	1200	25	---	---	30" HG 0-30	1
601	1200	50	---	---	0-60	1
602	1200	100	---	---	0-200	5

610 Silverline SERIES

HIGH PURITY BRASS SINGLE STAGE REGULATORS

DESIGN FEATURES

- Filtered seat for added gas stream purity
- Stainless steel diaphragm
- Metal to metal body to diaphragm seal
- 2 1/2˝ single scale gauge
- 316 stainless steel filter
- Brass nickel plated bar stock body
- Capturable vent in bonnet (1/16˝ FNPT)
- Threaded bonnet for panel mounting
- Body is tapped for rear panel mounting

P/N 610-01-09-00-00 SHOWN

Sure-Seat™ technology for maximum life and gas purity

This single stage high purity regulator is designed to prevent contamination of high purity systems and provide accurate regulation of non-corrosive gases. The specially designed stainless steel diaphragm gives maximum accuracy and provides stable regulation of delivery pressure. This regulator is capable of withstanding an internal vacuum and is available with a diffusion resistant, packless diaphragm outlet valve to maintain system purity. A 1/16" FNPT port in the bonnet is provided to vent hazardous gases in the event of a diaphragm failure.

SPECIFICATIONS

Maximum Inlet Pressure	3500 PSIG
Outlet Pressure Ranges	0-25, 0-50, 0-100, 0-250, 0-500 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (5)	1/4" FNPT
Design Leak Rate	(2 x 10-8 ccs Helium)
Flow Coefficient Cv	0.12
Flow Curve	Flow Chart #8
Inlet Decay Rate	.75/100 PSIG
Weight	3.32 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet	Nickel Plated Brass, Bar Stock
Seat	PFA
Seat Retainer	Brass
Diaphragm	Stainless Steel
Gauge	2-1/2" Chrome Plated
Filters (2)	316 Stainless Steel/Brass
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel
Outlet Valve	Nickel Plated Brass

610 - 01 - 09 - 00 - 00

Option 1: Model Series & Outlet Pressure	
610	25 PSIG
611	50 PSIG
612	100 PSIG
613	250 PSIG
614	500 PSIG

Option 2: Outlet Fittings	
00	1/4" FNPT
01	1/4" FNPT Diaphragm Valve
02	1/4" FNPT Diaphragm Valve with 1/8" Tube Fitting
03	1/4" FNPT Diaphragm Valve with 1/4" Tube Fitting
20	1/4" MNPT Needle Valve
42	1/4" FNPT Needle Valve with 1/8" Tube Fitting
81	1/4" MPT x 1/8" Stainless Steel Tube Fitting
83	1/4" MPT x 1/4" Stainless Steel Tube Fitting

Option 3: CGA Inlet Fittings	
00	1/4" FNPT
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510
08	CGA 540
09	CGA 580
10	CGA 590

Option 4: Accessories	
00	None
01	Panel Mount Kit
02	Helium Leak Certification
03	Panel Mount Kit and Certification

Option 5: Options	
00	1/4" None
01	Captured Vent Fitting 1/16" MPT x 1/8" Tube

Ordering Information For 610 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge Range PSIG	Inlet Gauge Graduations PSIG	Delivery Gauge Range PSIG	Delivery Gauge Graduations PSIG
610	3500	25	0-4000	100	30" HG 0-30	1
611	3500	50	0-4000	100	0-60	1
612	3500	100	0-4000	100	0-200	5
613	3500	250	0-4000	100	0-400	10
614	3500	500	0-4000	100	0-1000	20

620 Silverline SERIES

HIGH PURITY BRASS TWO STAGE REGULATORS

DESIGN FEATURES

- Filtered seat for added gas stream purity
- Stainless steel diaphragm
- Metal to metal body to diaphragm seal
- 2 1/2˝single scale gauge
- 316 stainless steel filter
- Brass nickel plated bar stock body
- Capturable vent in bonnet (1/16˝ FNPT)
- Threaded front and rear bonnet for panel mounting

P/N 620-01-09-00-00 SHOWN

Sure-Seat™ technology for maximum life and gas purity

This high purity two stage regulator is designed for non-corrosive gases requiring precise and stable delivery pressure control. These regulators provide constant outlet pressure regardless of inlet pressure fluctuations. This regulator features a unique, specially designed stainless steel diaphragm that gives maximum accuracy and provides stable regulation of delivery pressure. A nickel plated brass, diffusion resistant, packless diaphragm shut-off valve is available for flow control and to maintain system purity. Captured 1/16" FNPT vent ports are provided for both stages to allow for venting of hazardous gases in the event of a diaphragm failure. This regulator is capable of withstanding internal vacuums during purging operations.

SPECIFICATIONS

Maximum Inlet Pressure	3500 PSIG
Outlet Pressure Ranges	0-25, 0-50, 0-100, 0-250 PSIG
Temp. Operating Range	-40°F to +165°F
Ports (4)	1/4" FNPT
Design Leak Rate	(2 x 10-8 ccs Helium)
Flow Coefficient Cv	0.10
Flow Curve	Flow Chart #9
Inlet Decay Rate	.02/100 PSIG
Weight	5.22 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet 1st Stage	Nickel Plated Brass, Bar Stock
Bonnet 2nd Stage	Nickel Plated Brass, Bar Stock
Seat	PFA
Seat Retainer	Brass
Diaphragm 1st Stage	Stainless Steel
Diaphragm 2nd Stage	Stainless Steel
Gauge	2-1/2" Chrome Plated
Filters	316 Stainless Steel/Brass
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel

620 - 01 - 09 - 00 - 00

Option 1: Model Series & Outlet Pressure		Option 2: Outlet Fittings		Option 3: CGA Inlet Fittings		Option 4: Accessories		Option 5: Options	
620	25 PSIG	00	1/4" FNPT	00	1/4" FNPT	00	None	00	None
621	50 PSIG	01	1/4" FNPT Diaphragm Valve	02	CGA 320	01	Panel Mount Kit	02	Captured Vent Fitting 1/16" MPT x 1/8" Tube (includes 2)
622	100 PSIG	02	1/4" FNPT Diaphragm Valve with 1/8" Tube Fitting	03	CGA 326	02	Helium Leak Certification		
623	250 PSIG	03	1/4" FNPT Diaphragm Valve with 1/4" Tube Fitting	05	CGA 346	03	Panel Mount Kit and Certification		
		20	1/4" MNPT Needle Valve	06	CGA 350				
		42	1/4" FNPT Needle Valve with 1/8" Tube Fitting	07	CGA 510				
		81	1/4" MPT x 1/8" Stainless Steel Tube Fitting	08	CGA 540				
		83	1/4" MPT x 1/4" Stainless Steel Tube Fitting	09	CGA 580				
				10	CGA 590				

Ordering Information For 620 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
620	3500	25	0-4000	100	30" HG 0-30	1
621	3500	50	0-4000	100	0-60	1
622	3500	100	0-4000	100	0-200	5
623	3500	250	0-4000	100	0-400	10

630 Silverline SERIES

HIGH PURITY TWO STAGE BRASS LECTURE BOTTLE REGULATORS

DESIGN FEATURES

- 1˝ 316 stainless steel diaphragm
- Large adjusting knob for easy yet precise control of pressure
- 1-1/2˝ Chrome plated gauges
- Built in capturable preset safety relief valve
- Rugged brass bar stock construction
- Plated body, bonnet and gauges for superior protection.

These two stage regulators are ideal where precise delivery pressure is critical in low flow applications of non-corrosive gases. The slim design makes it ideal for lab applications where space constraints exist. The design features include a stainless steel diaphragm in the second stage, brass piston first stage, capturable preset safety relief vent, sintered brass filters for added protection of internal components.

P/N 631-20-08 SHOWN

Sure-Seat™ technology for maximum life and gas purity

SPECIFICATIONS

Maximum Inlet Pressure	3000 PSIG
Outlet Pressure Ranges	0-10, 0-50, 0-100 PSIG
Temp. Operating Range	-20°F to +140°F
Ports (4)	1/8" FNPT & 1/4" FMPT
Inlet	1/4" FNPT
Outlet	1/4" FNPT
Design Leak Rate	1x10-4 css Helium
Flow Coefficient Cv	0.088
Flow Curve	Flow Chart #10
Inlet Decay Rate	.026/100 PSI
Weight	3 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet	Nickel Plated Brass, Bar Stock
Seat	PFA
Seat Retainer	Brass
Valve Stem	316 Stainless Steel
Piston	Brass
Piston O-ring	Viton-AR
Diaphragm	316 Stainless Steel
Gauge	1-1/2" Chrome plated steel
Filters	Brass
Outlet	1/4" FNPT

631 - 20 - 08

Option 1: Model Series & Outlet Pressure	
631	10 PSIG
632	50 PSIG
633	100 PSIG

Option 2: Outlet Fittings	
00	1/4" FNPT
20	1/4" MNPT Needle Valve
40	Nickel Needle Valve with 1/4" FNPT Outlet
41	Nickel Needle Valve with male 1/8" Brass Tube Fitting
42	1/4" FNPT Nickel Needle Valve with 1/8" Tube Fitting
82	Nickel "B" Fitting (9/16"-18H)

Option 3: CGA Inlet Fittings	
00	1/4" FNPT
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
08	CGA 540
09	CGA 580
10	CGA 590

Ordering Information For 630 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
631	3000	10	0-3000	50	0-15	0.2
632	3000	50	0-3000	50	0-100	2
633	3000	100	0-3000	50	0-200	5

810 Silverline SERIES

HIGH PURITY ANALYTICAL BRASS SINGLE STAGE REGULATOR

P/N 812-00-00-00-00 SHOWN

Sure-Seat™ technology for maximum life and gas purity

DESIGN FEATURES

- Adjustable knob for easy low torque adjustment of pressure
- Nickel plated body and bonnet for superior protection
- 2-1/2" single scale gauges for easy and accurate reading
- Capturable vent port in bonnet to capture and vent away gases 1/16" FNPT
- Bonnet is threaded for a front panel mounting
- Body is tapped for rear panel mounting

These regulators are designed to control high pressures from a wide variety of non-corrosive gases. Typical applications for this regulator include purging and charging, calibration kits, R&D laboratories, high pressure testing, chemical plants and manufacturing processes. The piston sensor design provides structural reliability in high pressure use. Low torque control adjusting knob permits easy adjustment of pressures in closed or dead end systems.

SPECIFICATIONS

Maximum Inlet Pressure	3500 PSIG
Outlet Pressure Ranges	0-50, 100, 250, 500 PSIG
Ports (4)	1/4" FNPT
Outlet	1/4" FNPT
Design Leak Rate	$1x10^{-5}$ ccs
Flow Coefficient Cv	0.16
Flow Curve	Flow Chart #21
Weight	8 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Bar Stock
Bonnet	Nickel Plated Brass, Bar Stock
Seat	PFA
O-Rings	Buna-N
Piston	Brass
Gauge	2-1/2" Chrome Plated
Filters	Brass
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel
Outlet Valve	Nickel Plated Base

812 - 00 - 00 - 00 - 00

Option 1: Model Series & Outlet Pressure		Option 2: Outlet Fittings		Option 3: CGA Inlet Fittings		Option 4: Accessories		Option 5: Options	
811	100 PSI (Self-Venting)	00	1/4" FNPT	00	1/4" FNPT	00	None	00	None
812	250 PSI (Self-Venting)	01	1/4" FNPT Diaphragm Valve	02	CGA 320	01	Panel Mount Kit	01	Captured Vent Fitting 1/16" MNPT x 1/8" Tube
813	500 PSI (Self-Venting)	02	1/4" FNPT Diaphragm Valve w/1/8" Tube Fitting	03	CGA 326	02	Helium Leak Certification		
816	100 PSI (Non-Venting)	03	1/4" FNPT Diaphragm Valve w/1/4" Tube Fitting	05	CGA 346	03	Panel Mount Kit and Certification		
817	250 PSI (Non-Venting)	20	1/4" MNPT Needle Valve	06	CGA 350				
818	500 PSI (Non-Venting)	42	1/4" MNPT Needle Valve w/1/8" Tube Fitting	07	CGA 510				
		81	1/4" MPT x 1/8" Stainless Steel Tube Fitting	08	CGA 540				
		82	1/4" MPT x 1/8" Stainless Steel Tube Fitting	09	CGA 580				

Ordering Information For 600 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
811	3500	100	0-4000	100	0-200	5
812	3500	250	0-4000	100	0-400	10
813	3500	500	0-4000	100	0-1000	20
816	3500	100	0-4000	100	0-200	5
817	3500	250	0-4000	100	0-400	10
818	3500	500	0-4000	100	0-1000	20

820 Silverline SERIES

HIGH PRESSURE ANALYTICAL BRASS SINGLE STAGE REGULATORS

P/N 825-00-09 SHOWN

DESIGN FEATURES

- Self relieving adjusting screw for easy low torque adjustment of pressure
- Nickel plated body, bonnet, and gauges for superior protection
- 2-1/2″ single scale gauges for easy and accurate readings
- Capturable vent port in bonnet to capture and vent away gases 1/16" FNPT
- Body is tapped for rear panel mounting

These regulators are designed to control high pressures from a wide variety of non-corrosive inert gases. Typical applications for this regulator include purging and charging, calibration kits, R&D laboratories, high pressure testing, chemical plants and manufacturing processes. The piston sensor design provides structural reliability in high pressure use. Low torque control adjusting screw permits easy adjustment of pressures in closed or dead end systems.

SPECIFICATIONS

Maximum Rated Inlet Pressure	6000 PSIG
Outlet Pressure Ranges	0-500, 1000, 2000, 4000, 6000 PSIG
Ports (4)	1/4" FNPT
Inlet	1/4" FNPT
Outlet	1/4" FNPT
Design Leak Rate	$1x10^{-5}$ ccs
Weight	8 lbs.
Flow Coefficient	.0.19
Flow Curve	Flow Chart #14

825 - 00 - 09

Option 1: Model Series & Outlet Pressure	
823	500 PSIG
824	1000 PSIG
825	2000 PSIG
826	4000 PSIG
827	6000 PSIG

Option 2: Outlet Fittings	
00	1/4" FNPT
66	1/4" Male NPT Stainless Steel Needle Valve*

*max outlet pressure 6000 psi

Option 3: CGA Inlet Fittings	
00	1/4" FNPT
09	CGA 580 Brass*
26	CGA 347 SST
27	CGA 677 SST
28	CGA 680 SST

*max inlet pressure 3000 psi

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Brass Bar Stock
Bonnet	Nickel Plated Brass, Brass Bar Stock
Seat	PCTFE
O-Rings	Buna-N
Valve Stem	316 Stainless Steel
Piston	Brass
Valve Spring	316 Stainless Steel
Gauge	2-1/2" Chrome Plated Brass
Filter	Brass
Outlet	1/4" FNPT

Ordering Information For 820 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
823	6000	500	0-10000	200	0-1000	100
824	6000	1000	0-10000	200	0-4000	100
825	6000	2000	0-10000	200	0-4000	100
826	6000	4000	0-10000	200	0-6000	100
827	6000	6000	0-10000	200	0-6000	100

850 Silverline SERIES

HIGH PRESSURE ANALYTICAL BRASS SINGLE STAGE REGULATOR

P/N 850-00-00-00-00 SHOWN

DESIGN FEATURES

- Adjustable knob for easy low torque adjustment of pressure
- Nickel plated body and bonnet for superior protection
- 2-1/2" single scale gauges for easy and accurate reading
- Capturable vent port in bonnet to capture and vent away gases 1/16" FNPT

These regulators are designed to control high pressures from a wide variety of non-corrosive gases. Typical applications for this regulator include purging and charging, calibration kits, R&D laboratories, high pressure testing, chemical plants and manufacturing processes. The piston sensor design provides structural reliability in high pressure use. Low torque control adjusting knob permits easy adjustment of pressures in closed or dead end systems.

SPECIFICATIONS

Maximum Inlet Pressure	6000 PSIG
Outlet Pressure Ranges	0-500, 1000, 2000, 4000, 6000
Ports (4)	1/4" FNPT
Inlet	1/4" FNPT
Outlet	1/4" FNPT
Design Leak Rate	$1x10^{-5}$ ccs
Flow Coefficient Cv	0.19
Flow Curve	Flow Chart #14
Weight	8 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass, Brass Bar Stock
Bonnet	Nickel Plated Brass, Brass Bar Stock
Seat	PCTFE
O-Rings	Buna-N
Piston	Brass
Gauge	2-1/2" Chrome Plated
Filters	Brass
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel

850 - 00 - 00 - 00 - 00

Option 1: Model Series & Outlet Pressure

850	500 PSI (Self-Venting)
851	1000 PSI (Self-Venting)
852	2000 PSI (Self-Venting)
853	4000 PSI (Self-Venting)
854	6000 PSI (Self-Venting)
855	500 PSI (Non-Venting)
856	1000 PSI (Non-Venting)
857	2000 PSI (Non-Venting)
858	4000 PSI (Non-Venting)
859	6000 PSI (Non-Venting)

Option 2: Outlet Fittings

00	1/4" FNPT
66	1/4" Male NPT Stainless Steel Needle Valve*

* 6000 PSI max inlet

Option 3: CGA Inlet Fittings

00	1/4" FNPT
09	CGA 580 Brass
26	CGA 347 SST
27	CGA 677 SST
28	CGA 680 SST

*Max inlet pressure 3000 PSI

Option 4: Accessories

00	None
02	Helium Leak Certification

Option 5: Options

00	None
01	Captured Vent Fitting 1/16" MNPT x 1/8" Tube

Ordering Information For 600 Series Regulators

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
850	6000	500	0-10000	200	0-1000	100
851	6000	1000	0-10000	200	0-4000	100
852	6000	2000	0-10000	200	0-4000	100
853	6000	4000	0-10000	200	0-4000	100
854	6000	6000	0-10000	200	0-6000	100
855	6000	500	0-10000	200	0-1000	100
856	6000	1000	0-10000	200	0-4000	100
857	6000	2000	0-10000	200	0-4000	100
858	6000	4000	0-10000	200	0-4000	100
859	6000	6000	0-10000	200	0-6000	100

ACCESSORIES

Nickel Plated Brass CGA Connections

CGA	Nipple	Nut	Filter	Washer
300	16072	16071	8203	
320	E99-320C13	CGA320-1P	Factory Installed	Factory Installed
326	E99-326C13	CGA320-1P	H713-23	
346	Y99-346C13C	CGA320-1P	8203	
350	CGA350-2EP	CGA350-1P	Factory Installed	
540	CGA540-2EP	CGA540-1P	H713-23	
580	CGA510-2EP	CGA580-1P	H713-23	
590	CGA510-2EP	CGA590-1P	H713-23	

Panel Mounting Test

Part Number	Description
14791	Panel Mounting Kit (Includes 2 Nuts)

Gauges

Part Number	2 1/2" Chrome Plated, 1/4" MNPT
GA062-07	0-30 PSIG
GA086-07	30-0-30 PSIG
GA087-07	0-60 PSIG
GA088-07	0-200 PSIG
GA056-07	0-400 PSIG
GA116-07	0-1000 PSIG
GA067-07	0-6000 PSIG
GA068-07	0-10000PSIG
GA090-07	0-4000 PSIG

Stainless Steel CGA Connections

CGA	Nipple	Nut	Washer	Filter
320	E99-320C43	E99-320C44	15200	14491
326	E99-326C43	E99-320C44		14491
330	E99-330C43	E99-330C44	15200	14491
347	E99-347C43	E99-347C44		14491
350	E99-350C43	E99-350C44		14491
540	16083	16082		14491
580	E99-580C43	E99-580C44		14491
590	E99-580C43	E99-590C44		14491
660	E99-660C43	E99-660C44	E99-660W5	14491
677	E99-677C43	E99-677C44		14491
680	E99-680C43	E99-680C44		14491

Gauges

Part Number	2 1/2" Stainless Steel, 1/4" MNPT
GA096-07	30-0-30 PSIG
GA097-07	0-100 PSIG
GA098-07	0-200 PSIG
GA099-07	0-400 PSIG
GA100-07	0-4000 PSIG

Tube Fittings

Part Number	Description
14324	1/4" MNPT x 1/8" tube, brass
14745	1/16" MNPT x 1/8" tube, stainless steel
15188	1/4" MNPT x 1/4" tube, brass
15166	1/4" MNPT x 1/4" tube, stainless steel
Y99-26462	1/4" MNPT x 1/8" tube, stainless steel

NEEDLE VALVES

These instrument valves are used in a wide variety of laboratory and industrial applications. All valves come with PCTFE packing for leak proof performance.

SPECIFICATIONS

Maximum Inlet Pressure. . . . . 6000 PSIG
SST Valves

Maximum Inlet Pressure. . . . . 3000 PSIG
Brass Valves

Temp. Operating Range . . . . . -65°F to +165°F

Materials of Construction						
Body	**Stem**	**Part Number**	**Outlet**	**Inlet**	**Orifice**	**Cv**
Brass Nickel Plated	316 SST	15535	1/4" MNPT	1/4" MNPT	0.170	0.35
Brass Nickel Plated	316 SST	15536	1/4" FNPT	1/4" MNPT	0.170	0.35
Monel	Monel	Y34-311	1/4" FNPT	1/4" MNPT	0.140	0.27
316 Stainless Steel	316 SST	15552	1/4" MNPT	1/4" MNPT	0.140	0.27
316 Stainless Steel	316 SST	14803	1/4" FNPT	1/4" MNPT	0.140	0.27

DIAPHRAGM VALVES

The multiple metal diaphragm design and PCTFE seats are key elements to the high success of these valves. These valves are recommended where the diffusion of atmospheric gases and moisture into the gas stream are undesirable. They are a must in all high purity applications including gas chromatography carrier gases, samples, and calibration standards. Available in multi-turn version that has a hand wheel which operates from full open to fully closed in 3/4 turn.

Multi-Turn Valve

SPECIFICATIONS

Maximum Inlet Pressure . . . . . 3000 PSIG
Temp. Operating Range . . . . . -40°F to +200°F
Body . . . . . Brass or 316 Stainless Steel
Seat. . . . . PCTFE

Materials of Construction					
Body	**Part Number**	**Outlet**	**Inlet**	**Orifice**	**Cv**
Brass	15503	1/4" FNPT	1/4" MNPT	0.140	0.27
316 Stainless Steel	14804	1/4" MNPT	1/4" MNPT	0.094	0.13
316 Stainless Steel	14805	1/4" FNPT	1/4" MNPT	0.094	0.13

SAFETY & TECHNICAL

GAS PROPERTIES

			THERMOPHYSICAL PROPERTIES							HAZARDOUS PROPERTIES			
Product	Formula	State	Molecular Weight	Vapor Pressure at 70˚ F (psig)	Specific Gravity at 70˚ F (1atm)	Critical Temp. (˚F)	Critical Pressure (psia)	Specific Volume (cf/lb)	Heat Capacity (Btu/lb. Mole ˚F)	Ignition Temp., (˚F)	Flammable Limits in Air (Vol.%)	Threshold Limit Value (ppm)	Physiological Properties
Acetylene	C_2H_2	Dissolved Gas	26.04	635	0.905	97.3	905.3	14.7	10.6	581	2.5-81	SA	
Air		Compressed Gas	28.97	*	1.00	-221.1	546.8	13.3					Oxidant
Ammonia	NH_3	Liquefied Gas	17.03	114	0.60	270.4	1639	22.6	8.6	1204	15-28	25	Corrosive and Toxic
Argon	Ar	Compressed Gas	39.95	*	1.38	-188.1	710	9.7	4.97			SA	Inert
Arsine	AsH_3	Liquefied Gas	77.95	205	2.69	211.8	957	5.0			4-64	0.05	Poison
n-Butane	C_4H_{10}	Liquefied Gas	58.12	16	2.08	305.6	550.8	6.4		788	1.8-8.4	800	Narcotic
Carbon Dioxide	CO_2	Liquefied Gas	44.01	838	1.52	87.8	1071	8.74	8.97			5,000	Inert
Carbon Monoxide	CO	Compressed Gas	28.01	*	0.97	-220.4	507.4	13.8	6.96	1204	12.5-74	50	Toxic
Chlorine	Cl_2	Liquefied Gas	70.91	85.3	2.47	291.2	1118.7	5.4	8.2			1	Oxidant and Toxic
Deuterium	D_2	Compressed Gas	4.03	*	0.139	-390.7	241	96.0	6.97	1058	4.9-75	SA	
Diborane	B_2H_6	Compress Gas	27.67	*	0.95	62.1	581			100	0.8-98	0.05	Highly Toxic
Ethane	C_2H_6	Liquefied Gas	30.07	543	1.047	90.1	708	12.8	12.6	986	3-12.4	SA	
Ethyl Chloride	C_2H_5Cl	Liquefied Gas	64.52			368.96	764.4				3.8-15.4	1000	
Ethylene	C_2H_4	Compressed Gas	28.05	*	0.974	49.8	742	13.8	10.4	1009	3.1-32	SA	
Helium	He	Compressed Gas	4.003	*	0.138	-450.3	33.2	96.7	4.98			SA	Inert
Hydrogen	H_2	Compressed Gas	2.02	*	0.0696	-399.96	190.8	192	6.89	1085	4-75	SA	
Hydrogen Chloride	HCl	Liquefied Gas	36.46	613	1.27	124.6	1200	10.6	6.9			5	Corrosive and Toxic
Hydrogen Sulfide	H_2S	Liquefied Gas	34.08	252	1.189	212.7	1308	11.2	8.2	500	4.3-45	10	Irritant and Toxic
Isobutane	C_4H_{10}	Liquefied Gas	58.12	30.8	2.0	275	592.2	6.5		864	1.8-8.4	SA	Anaesthetic
Krypton	Kr	Compressed Gas	83.8	*	2.898	-82.8	798	4.6	5.0			SA	Inert
Methane	CH_4	Compressed Gas	16.04	*	0.555	-115.8	673	23.7		1000	5-15	SA	
Methyl Chloride	CH_3Cl	Liquefied Gas	50.49	58.7	1.74	289.6	968	7.6	9.97	1170	10.7-17.4	50	Toxic
Neon	Ne	Compressed Gas	20.18	*	0.696	-379.8	384.9	19.2	4.97			SA	Inert
Nitrogen	N_2	Compressed Gas	28.01	*	0.967	-232.4	492.9	13.8	6.97			SA	Inert
Nitrous Oxide	N_20	Liquefied Gas	44.01	745	1.53	97.6	1054	8.7	9.2			25	Oxidant
Oxygen	O_2	Compressed Gas	32.0	*	1.105	-181.1	736.9	12.1	7.03				Oxidant
Phosphine	PH_3	Liquefied Gas	34.0	592.7	1.184	124.3	948	11.4		122	Treat as Pyrophoric	0.3	Poison
Propane	C_3H_8	Liquefied Gas	44.1	109	1.55	206.2	617.4	8.5	17.4	874	2.1-9.5	SA	
Silane	SiH_4	Compressed Gas	32.12	*	1.11	24.8	702.7	12.0			Pyrophoric	0.5	
Sulfur Dioxide	SO_2	Liquefied Gas	64.06	34.4	2.26	315	1143	5.9	9.6			2	Irritant and Toxic
Sulfur Hexafluoride	SF_6	Liquefied Gas	146.05	310	5.11	114	545	2.5				1000	Inert
Xenon	Xe	Compressed Gas	131.3	*	4.56	61.9	852.6	2.9	5.02			SA	Inert

* Above critical temperature @ 21.1 ˚C. SA Simple asphyxiant

CONVERSION TABLES

Multiply unit in left column by select applicable factor at right

VOLUME

	cu in	cu ft	cu yd	cu cm	cu meter	liter	US gal
1 cu in	1	-	-	16.387	-	0.02	-
1 cu ft	1,728.0	1	0.0370	28,317	0.0283	28.32	7.481
1 cu yd	46,656	27	1	-	0.7646	764.5	202.0
1 cu cm	0.06	-	-	1	-	0.001	-
1 cu meter	61,024	35.31	1.308	1,000,000	1	1,000	264.2
1 liter	61.024	0.0353	-	1,000	0.001	1	0.2642
1 gallon (US)	231	0.1337	0.00495	3,785.4	0.00379	3.785	1

PRESSURE

	psi	bar	atm	mm Hg	inch Hg	inch water	kPa
1 psi	1	0.0689	0.0680	51.713	2.0359	27.68	6.895
1 bar	14.504	1	0.9869	750.06	29.530	401.48	100
1 atm	14.696	1.01325	1	760	29.921	406.8	101.325
1 mm Hg (torr)	0.0193	0.0013	0.00132	1	0.0394	0.5352	0.133
1 MPa	145.038	10.00	9.8692	7500.62	295.30	4014.63	1000
1 in Hg	0.4912	0.0339	0.0334	25.4	1	13.596	3
1 in water	.0361	0.3587	0.0025	269.02	10.591	1	35.808
1 kPa	0.145	0.01	0.0099	7.519	0	4.015	1

WEIGHT

	grain	oz	lb	ton	gram	kg	metric ton
1 grain	1	0.00229	-	-	0.0648	-	-
1 ounce	437.5	1	0.0625	-	28.35	0.02835	-
1 pound	7,000	16.00	1.00	0.0005	453.60	0.4536	-
1 ton	-	32,000	2,000	1	-	907.2	0.9072
1 gram	15.43	0.04	-	-	1	0.001	-
1 kilogram	-	35.274	2.205	-	1,000	1	0.001
1 metric ton	-	35.274	2,205	1.102	-	1,000	1

FLOW

	scc/min	LPM	SCFM	L/hr	Nm^3/hr	SCFH
1 scc/min	1	0.001	-	0.06	-	0.00212
1 LPM	1,000	1	0.0353	60	0.06	2.119
1 SCFM	28,317	28	1	1,699	1.699	60
1 L/hr	16.667	0.01667	-	1	0.001	0.0353
1 Nm^3/hr	16,667	16.667	0.589	1,000	1	35.314
1 SCFH	471.95	0.472	0.0167	28.317	0.0283	1

SCFM Standard Cubic Feet per Minute
SCFH Standard Cubic Feet per Hour

scc/min Standard Cubic Centimeters per Minute
LPM Liters per Minute
Nm^3/hr Normal Cubic Meters per Hour

DENSITY

	lb/cu in	lb/cu ft	lb/gal	g/cm^3	g/liter
1 lb/cu in	1	1,728	231.00	27.68	27,680
1 lb/cu ft	-	1	0.1337	0.0160	16.019
1 lb/gal	0.00433	7.481	1	0.1198	119.83
1 g/cm^3	0.03613	62.43	8.345	1	1,000
1 g/liter	-	0.06243	0.008345	0.001	1

CONVERSION
LIQUID TO GAS

ARGON

	WEIGHT		GAS		LIQUID	
	Pounds (lbs)	Kilograms (Kg)	Cubic Feet (SCF)	Cubic Meters (Nm3)	Gallons (Gal)	Liters (L)
1 Pound	1	0.4536	9.671	0.2543	0.086	0.3255
1 Kilogram	2.205	1	21.32	0.5605	0.18957	0.7176
1 SCF Gas	0.1034	0.0469	1	0.02832	0.008893	0.03366
1 Nm^3 Gas	3.933	1.784	38.04	1	0.3382	1.2802
1 Gal Liquid	11.63	5.276	112.5	2.957	1	3.785
1 L Liquid	3.072	1.3936	29.71	0.7812	0.2642	1

CARBON DIOXIDE

	WEIGHT		GAS		LIQUID	
	Pounds (lbs)	Kilograms (Kg)	Cubic Feet (SCF)	Cubic Meters (Nm3)	Gallons (Gal)	Liters (L)
1 Pound	1.0	0.4536	8.741	0.2294	0.11806	0.4469
1 Kilogram	2.205	1.0	19.253	0.5058	0.2603	0.9860
1 SCF Gas	0.1144	0.05189	1.0	0.02832	0.013506	0.05113
1 Nm^3 Gas	4.359	1.9772	38.04	1.0	0.5146	1.9480
1 Gal Liquid	8.470	3.842	74.04	1.9431	1.0	3.785
1 L Liquid	2.238	1.0151	19.562	0.5134	0.2642	1.0

NITROGEN

	WEIGHT		GAS		LIQUID	
	Pounds (lbs)	Kilograms (Kg)	Cubic Feet (SCF)	Cubic Meters (Nm3)	Gallons (Gal)	Liters (L)
1 Pound	1.0	0.4536	13.803	0.3627	0.1481	0.5606
1 Kilogram	2.205	1.0	30.42	0.7996	0.3262	1.2349
1 SCF Gas	0.07245	0.03286	1.0	0.02832	0.01074	0.04065
1 Nm^3 Gas	2.757	1.2506	38.04	1.0	0.408	1.5443
1 Gal Liquid	6.745	3.060	93.11	2.447	1.0	3.785
1 L Liquid	1.782	0.8083	24.60	0.6464	0.2642	1.0

OXYGEN

	WEIGHT		GAS		LIQUID	
	Pounds (lbs)	Kilograms (Kg)	Cubic Feet (SCF)	Cubic Meters (Nm3)	Gallons (Gal)	Liters (L)
1 Pound	1.0	0.4536	12.076	0.3174	0.1050	0.3977
1 Kilogram	2.205	1.0	26.62	0.6998	0.2316	0.8767
1 SCF Gas	0.08281	0.03756	1.0	0.02832	0.008691	0.0329
1 Nm^3 Gas	3.151	1.4291	38.04	1.0	0.3310	1.2528
1 Gal Liquid	9.527	4.322	115.1	3.025	1.0	3.785
1 L Liquid	2.517	1.1417	30.38	0.7983	0.2642	1.0

SCF (Standard Cubic Foot) gas measured at 1 atmosphere and 70°F. Nm3 (normal cubic meter) measured at 1 atmosphere and 0°C. Liquid Argon, Oxygen and Nitrogen measured at 1 ATM and Boiling Point of Liquid Carbon Dioxide measured at 21.42 ATM and 1.7°F.

WARRANTY

MILLER|SMITH SPECIALTY GAS REGULATOR MANUFACTURERS WARRANTY

SMITH EQUIPMENT SPECIALTY GAS REGULATOR MANUFACTURERS WARRANTY

General Purpose, High Purity Analytical, and High Purity Regulators

Smith Equipment warrants the initial user of the products sold that such products are free from defects in material and workmanship under normal use and service for a period of (2) two years from the date of shipment from the factory.

Corrosive Service Regulators

Smith Equipment warrants the initial user of the products sold that such products are free from defects in material and workmanship under normal use and service (see note #1) for a period of three months from the date of installation of the equipment or three months from the date of shipment from the factory, whichever comes first.

Note #1 A Cross-Purge Assembly must be used in conjunction with these models in order to ensure effective purging of hazardous gas traces during cylinder change out.

Within said warranty period, Smith Equipment agrees to replace or repair free of charge at its factory, any product or part that is found to have defects in workmanship or materials.

Smith Equipment will not pay for or warrant repairs made by anyone other than personnel authorized by Smith Equipment to make such repairs. SMITH EQUIPMENT SHALL NOT BE LIABLE FOR CONSEQUENTIAL, SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES, TO THE EXTENT PERMITTED BY LAW. EXCEPT AS OTHERWISE PROVIDED BY LAW, THIS EXPRESS WARRANTY SHALL BE THE EXCLUSIVE WARRANTY AND SHALL BE IN LIEU OF ALL IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES OF FITNESS FOR PARTICULAR PURPOSE AND MERCHANTABILITY. The warranty and remedies provided in this express warranty shall not apply to any product which has been damaged by accident, abuse or misuse, or modified or changed in any way except by personnel authorized by Smith Equipment. THE REMEDIES STATED HEREIN SHALL BE EXCLUSIVE REMEDIES OF THE INITIAL USER UNDER THE EXPRESS WARRANTY CONTAINED HEREIN AND UNDER ANY OTHER WARRANTIES EXPRESS OR IMPLIED REQUIRED BY LAW.

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2601 Lockheed Avenue • Watertown, SD 57201
1-800-843-7912 • 1-605-882-3200
FAX 1-800-685-3370 • FAX 1-605-882-2100

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