



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

In 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 TESCO Corporation, which was an acronym for The Elmer Smith Company of Minnesota. TESCO consisted of four autonomous divisions, one of which was Smith Equipment Manufacturing, and in 1981 relocated to Watertown, South Dakota.

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 pilot 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.

In 1998, Illinois Tool Works (ITW) purchased Smith Equipment. Illinois Tool Works Inc. (NYSE:ITW) designs and manufactures an array of highly engineered products including fasteners and components, equipment and consumable systems, and specialty products and equipment for customers around the world. A Fortune 200 diversified manufacturing company with 110 years of history, ITW's 850 decentralized business units in 52 countries employ nearly 60,000 men and women who are focused on creating value-added products and innovative customer solutions.

Smith's Watertown operations consists of manufacturing cells for each product line, which incorporate machining, plating, swaging, assembly and testing. There are currently over 100 employees at its Watertown facility.

We strongly believe the "future history" of Smith Equipment depends on every employee subscribing to the ITW's 80/20 rule and it's five principles of focus, flow, simplification, empowerment, and trust!!

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HOW TO SELECT

A SMITH EQUIPMENT SPECIALTY GAS REGULATOR

STEP 1 Determine gas and materials 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 for the desired gas need 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 included general laboratory or plant use. These regulators contain a self-resetting safety relief valve vented to atmosphere to protect downstream equipment 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 downstream equipment 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 SMITH SPECIALTY GAS REGULATOR

STEP 3 Determine delivery pressure needs

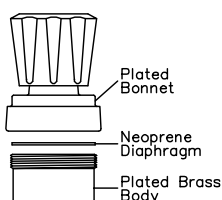
Single stage regulators reduce pressure by passing through one pressure reducing valve area in a single step to deliver a pressure within a specific range. Regulators designed in this way will show a slight increase in delivery pressure as the cylinder pressure falls during use. This phenomenon is known 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

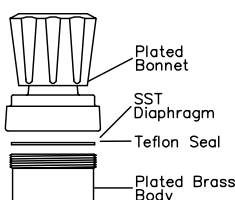
Specific outlet connections are determined by the gases used as well as application and down stream requirements. Most regulators are available with or without outlet fittings and are configured at the time of ordering. Smith Equipment offers a wide variety of outlet fittings including standard hose 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



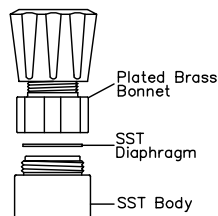
General Purpose
Low Leak Rate:
 1×10^{-5} ccs

200 Series



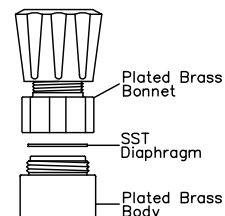
High Purity
Analytical
Low Leak Rate:
 1×10^{-5} ccs

300 Series



High Purity Stainless Steel
Corrosion Resistant
Low Leak Rate:
 2×10^{-8} ccs

600 Series



High Purity Brass
Corrosion Resistant
Low Leak Rate:
 2×10^{-8} ccs

REGULATOR QUICK REFERENCE CHART

		Materials of Construction												Catalog Page
		Body				Diaphragm								
		Stainless Steel	Nickel Plated Brass	Monel	Neoprene	Stainless Steel	Stainless Steel with Teflon Seals	Piston	Monel	Single Stage	Two Stage	Line	Other	
Regulator Series	Application													
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			Rear Entry	19
310 Series	High Purity Corrosion Resistant	X				X				X				21
320 Series	High Purity Corrosion Resistant	X				X					X			22
600 Series	High Purity		X			X						X		25
610 Series	High Purity		X			X				X				26
620 Series	High Purity		X			X					X			27
630 Series	High Purity Analytical		X			X		X				X	Piston	28
820 Series	High Pressure		X					X		X			Piston	30

REGULATOR SELECTION GUIDE

The following is a guide to assist you in determining which regulator should be used for a given gas and its 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 Hydrocarbon Free Zero	GP100 HP600/200 HP600/200	GP110 HP610/210 HP610/510	GP120 HP620/220 HP620/220	590 590 590
AMMONIA Anhydrous	HP300	HP 310	HP320	240/705
ARGON Research 99.9995% U.H.P. 99.999% Prepurified 99.998% Zero 99.998% High Purity 99.995%	HP600/200 HP600/200 HP600/200 HP600/200 HP600/200	HP610/210 HP610/210 HP610/210 HP610/210 HP610/210	HP620/220 HP620/220 HP620/220 HP620/220 HP620/220	580 580 580 580 580
BORON TRIFLUORIDE Minimum Purity 99.5%	HP300	HP310	HP320	330
1.3 BUTADIENE Instrument 99.5% C.P. 99.0%	GP100 GP100	GP110 GP110	GP120 GP120	510 510
N-BUTANE Research 99.9% C.P. 99.0%	GP100 GP100	GP110 GP110	GP120 GP120	510 510
CARBON DIOXIDE Research 99.998% Instrument (Coleman) 99.99% C.P. 99.8%	HP600/200 HP600/200 GP100	HP610/210 HP610/210 GP110	HP620/220 HP620/220 GP120	320 320 320
CARBON MONOXIDE Ultra High Purity 99.9% C.P. 99.0% Commercial 98.0%	HP600/200 HP600/200 GP100	HP610/210 HP610/210 GP110	HP620/220 HP620/220 GP120	350 350 350
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% C.P. 99.0% Technical 97.5%	NONE NONE NONE	HP610/210 HP610/210 GP110	HP620/220 HP620/220 GP120	350 350 350
ETHYLENE Research 99.98% C.P. 99.5% Technical 98.55%	NONE NONE NONE	HP610/210 HP610/210 GP110	HP620/220 HP620/220 GP120	350 350 350
HELIUM Research 99.9995% Ultra High 99.999% Zero 99.995% High Purity 99.995%	HP600/200 HP600/200 HP600/200 HP600/200	HP610/210 HP610/210 HP610/210 HP610/210	HP620/220 HP620/220 HP620/220 HP620/220	580 580 580 580

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	HP320/220	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
in Oxygen	HP600/200	HP610/210	HP620/220	296
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
in Oxygen	HP600/200	HP610/210	HP620/220	296
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
in Oxygen	HP/200	HP610/210	HP620/220	296
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

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	580
in Helium	HP600/200	HP610/210	HP620/220	350
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 / 296
in Helium	HP600/200	HP610/210	HP620/220	590 / 296
in Nitrogen	HP600/200	HP610/210	HP620/220	590 / 296
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

REGULATOR

SELECTION GUIDE

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
1/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
<i>EXCIMER LASER GAS MIXTURES</i> Hydrogen Chloride in Helium	None	HP310	HP320	330
<i>MOLECULAR LASER GAS MIXTURES</i> 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 compatibility 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
Halocarbon-14						S	S	S	S	S	S	S	S	S	S	S	S
Halocarbon-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
Nitrogen 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	GAS	CGA Inlet Connection	GAS	CGA Inlet Connection
Acetylene	510	"Freon 13" (Chlorotrifluoromethane)	660	Methyl Bromide	330
Air (Industrial)	590	"Freon 13B1" (Bromotrifluoromethane)	660	3-Methyl Butene-1	510
Air (Breathing Air)	346	"Freon 14" (Tetrafluoromethane)	580	Methyl Chloride	510
Allene	510	"Freon 22" (Chlorodifluoromethane)	660	Methyl Mercaptan	330
Ammonia	705, 240	"Freon 114" (1, 2 Dichlorotetrafluoroethane)	660	Monoethylamine	705
Argon	580	"Freon 116" (Hexafluoroethane)	660	Monomethylamine	705
Arsine	350	"Freon RC318" (Octafluorocyclobutane)	660	Natural Gas	350
Boron Trichloride	660	"Genetron 21" (Dichlorodifluoromethane)	660	Neon	580
Boron Trifluoride	330	"Genetron 23" (Fluoroform)	660	Nickel Carbonyl	660
Bromine Trifluoride	670	"Genetron 115" (Monochloropentafluoroethane)	660	Nitric Oxide	660
Bromine Pentafluoride	670	"Genetron 152A" (1, 1-Difluoroethylene)	350	Nitrogen	580
Bromotrifluoroethylene	510	"Genetron 1132A" (1, 1-Difluoroethylene)	350	Nitrogen Dioxide	660
1-3 Butadine	510	Germane	350	Nitrogen Trioxide	660
Butane	510	Helium	580	Nitrosyl Chloride	330
Butenes	510	Hexafluoroacetone	330	Nitrous Oxide (Formerly 1320)	326
Carbon Dioxide	320	Hexafluoropropylene	660	Oxygen	540
Carbon Monoxide	350	Hydrogen	350	Perfluoro-2-Butene	660
Carbonyl Fluoride	750	Hydrogen Bromide	330	Perfluoropropane	660
Carbonyl Sulfide	330	Hydrogen Chloride	330	Phosgene	660
Chlorine	660	Hydrogen Fluoride	670	Phosphine	350
Chlorine Trifluoride	670	Hydrogen Selenide	350	Phosphorous Pentafluoride	330
Chlorotrifluoroethylene	510	Hydrogen Sulfide	330	Propane	510
Cyanogen	750	Iodine Pentafluoride	670	Propylene	510
Cyanogen Chloride	750	Isobutane	510	Silane	350
Cyclopropane	510	Isobutylene	510	Silicon Tetrafluoride	330
Deuterium	350	Krypton	580	Sulfur Dioxide	660
Diborane	350	Methane	350	Sulfur Hexafluoride	590
1,2-Dibromodifluoromethane	668	Methyl Acetylene	510	Sulfur Tetrafluoride	330
Dimethylamine	705			Sulfuryl Fluoride	660
Dimethyl Ether	510			Tetrafluoroethylene	350
2-2 Dimethyl Propane	510			Trimethylamine	705
Ethane	350			Vinyl Bromide	510
Ethyl Acetylene	510			Vinyl Chloride	510
Ethyl Chloride	510			Vinyl Fluoride	350
Ethylene	350			Vinyl Methyl Ether	510
Ethylene Oxide	510			Xenon	580
Fluorine	679				
"Freon 12" (Dichlorodifluoromethane)	660				

NOTE: The above are standard CGA connections and are designated by the Compressed Air Association

100 Silverline SERIES

GENERAL PURPOSE SINGLE STAGE LINE REGULATORS



P/N 100-00-00 Shown

Sure-Seat™ technology for maximum life and gas purity

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.

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 threaded for rear panel mounting

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.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass Bar Stock
Bonnet	Nickel Plated
Seat	Teflon®
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

100 - 00 - 00

OPTION 1:	OPTION 2:	OPTION 3:
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS
100 15 PSIG	00 1/4" FNPT	00 1/4" FNPT
101 50 PSIG	04 1/4" MPT x 1/4" brass tube fitting	04 1/4" MPT x 1/4" brass tube fitting
102 100 PSIG	80 1/4" MPT x 1/8" brass tube fitting	11 1/4" MPT x 1/8" brass tube fitting
103 200 PSIG	81 1/4" MPT x 1/8" stainless	12 1/4" MPT x 1/8" stainless steel tube fitting

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	2
102	1200	100	--	--	0-200	5
103	1200	200	--	--	0-400	10

110 Silverline SERIES

GENERAL PURPOSE SINGLE STAGE CYLINDER REGULATORS



P/N 110-20-09 Shown

Sure-Seat™
technology for maximum life and gas purity

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.

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

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	Teflon®
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	Chrome Plated Brass

110 - 20 - 09

OPTION 1:	OPTION 2:	OPTION 3:
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS
110 15 PSIG	00 1/4" FNPT	00 1/4" FNPT
111 50 PSIG	20 Chrome Needle Valve with male 1/4" NPT outlet	01 CGA 300*
112 100 PSIG	40 Chrome Needle Valve with female 1/4" NPT outlet	02 CGA 320
113 250 PSIG	41 Chrome Needle Valve with 1/8" brass tube fitting	03 CGA 326
	42 Chrome Needle Valve with 1/8" stainless steel tube fitting	05 CGA 346
	82 Chrome "B" fitting (9/16" - 18RH)	06 CGA 350
	84 Nickel Fuel Hose Connection (9/16" - 18LH)	07 CGA 510
		08 CGA 540
		09 CGA 580
		10 CGA 590

* Only available and used with #110 main body

* 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	
110	3500	15	0-4000	100	0-30	1	85
111	3500	50	0-4000	100	0-60	2	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

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.

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

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	Teflon®
Seat Retainer.	Brass
Diaphragm	Neoprene
Gauge.	2-1/2" Chrome Plated
Filters (2).	316 Stainless Steel/Brass
Valve Stem.	316 Stainless Steel
Valve Spring.	316 Stainless Steel
Outlet Valve.	Chrome Plated Brass

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OPTION 1:

MODEL SERIES & OUTLET PRESSURE

120	15 PSIG
121	50 PSIG
122	100 PSIG
123	250 PSIG

OUTLET FITTINGS

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

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

* Only available and used with #120 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	2	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

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.

DESIGN FEATURES

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

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	Teflon®
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	Teflon®

200 - 00 - 00

OPTION 1:	OPTION 2:	OPTION 3:
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS
200 15 PSIG	00 1/4" FNPT	00 1/4" FNPT
201 50 PSIG	04 1/4" MPT x 1/4" brass tube fitting	04 1/4" MPT x 1/4" brass tube fitting
202 100 PSIG	80 1/4" MPT x 1/8" brass tube fitting	11 1/4" MPT x 1/8" brass tube fitting
	81 1/4" MPT x 1/8" stainless steel tube fitting	12 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 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	2
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

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.

DESIGN FEATURES

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

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	Teflon®
Seat Retainer.	Brass
Diaphragm	Stainless Steel
Gauge.	2-1/2" Chrome Plated
Filter	316 Stainless Steel
Valve Stem.	316 Stainless Steel
Outlet Valve.	Chrome Plated Brass
Seals	Teflon®

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OPTION 1:	OPTION 2:	OPTION 3:
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS
210 15 PSIG	00 1/4" FNPT	00 1/4" FNPT
211 50 PSIG	01 1/4" FNPT Chrome Diaphragm Valve	01 CGA 300*
212 100 PSIG	20 Chrome Needle Valve with male 1/4" NPT outlet	02 CGA 320
213 150 PSIG	40 Chrome Needle Valve with female 1/4" NPT outlet	03 CGA 326
	41 Chrome Needle Valve with 1/8" brass tube fitting	05 CGA 346
	42 Chrome Needle Valve with 1/8" stainless steel tube fitting	06 CGA 350
214 15 PSIG	82 Nickel "B" fitting (9/16" - 18RH)	07 CGA 510
Acetylene model with Red Warning Delivery Gauge	*84 Nickel Fuel Hose Connection (9/16" - 18LH)	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	2	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

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.

DESIGN FEATURES

- Filtered seat for added gas stream purity, and extended service life
- Convoluted 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

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 Brass Bar Stock
Seat	Teflon®
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	Chrome Plated Brass
Seals	Teflon®

220 - 20 - 09

OPTION 1:	OPTION 2:	OPTION 3:
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS
220 15 PSIG	00 1/4" FNPT	00 1/4" FNPT
221 50 PSIG	01 1/4" FNPT Chrome Diaphragm Valve	01 CGA 300*
222 100 PSIG	20 Chrome Needle Valve with male 1/4" NPT outlet	02 CGA 320
223 150 PSIG	40 Chrome Needle Valve with female 1/4" NPT outlet	03 CGA 326
	41 Chrome Needle Valve with 1/8" brass tube fitting	05 CGA 346
	42 Chrome Needle Valve with 1/8" stainless steel tube fitting	06 CGA 350
225 15 PSIG	82 Nickel "B" fitting (9/16" - 18RH)	07 CGA 510
Acetylene model with Red Warning Delivery Gauge	*84 Nickel Fuel Hose Connection (9/16" - 18LH)	08 CGA 540
		09 CGA 580
		10 CGA 590

* Only available and used with #225 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	2	150
222	3500	100	0-4000	100	0-200	5	150
223	3500	150	0-4000	100	0-200	5	350
225	400	15	0-400	10	0-30*	1	--

* Red warning delivery gauge



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

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 gasses not liquids. Typical applications include high purity gas handling, bulk gas distribution, liquid cylinders and laboratories.

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 all brass bar stock construction
- Plated body, bonnet, and gauges for superior protection
- Built in capturable preset safety relief valve

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 #4
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	Teflon®
Seat Retainer	Brass
Gauge	Chrome Plated
Filter	316 Stainless Steel
Valve Stem	316 Stainless Steel
Valve Spring	316 Stainless Steel

254 - 20 - 09

OPTION 1:		OPTION 2:		OPTION 3:	
MODEL SERIES & OUTLET PRESSURE		OUTLET FITTINGS		CGA INLET FITTINGS	
252	100 PSIG	00	1/4" FNPT	00	1/4" FNPT
254	200 PSIG	20	Chrome Needle Valve with male 1/4" NPT outlet	02	CGA 320
255	350 PSIG	82	Nickel "B" fitting 9/16"-18RH	08	CGA 540
256	500 PSIG			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 313-70-24-00-00 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 corrosive, non-corrosive or toxic gases. For corrosive applications, all parts in this regulator exposed to the flowing media are constructed of 316 Stainless Steel and Teflon®. 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.

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
- Large 2 - 1/2" easy to read single scale gauges
- Bonnet is threaded for front panel mounting
- Body is tapped for rear bracket mounting
- 316 stainless steel bar stock body
- Captured vent port in bonnet (1/16" FNPT) allows for safe venting of hazardous gases

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
Seat	Teflon®
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

313 - 70 - 24 - 00 - 00

OPTION 1:		OPTION 2:		OPTION 3:		OPTION 4:		OPTION 5:	
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS	ACCESSORIES	OPTIONS					
310 25 PSIG	00 1/4" FNPT	00 1/4" FNPT	00 None	00 1/4" FNPT					
311 50 PSIG	66 1/4" MPT Stainless Steel Needle Valve	20 CGA SS 320	01 Panel Mount Kit	01 Captured vent fitting 1/16" MPT x 1/8" tube					
312 100 PSIG	67 1/4" MPT Stainless Steel Diaphragm Valve	21 CGA SS 326	02 Helium Leak Certification						
313 250 PSIG	68 1/4" FPT Stainless Steel Needle Valve with 1/8" tube fitting	22 CGA SS 330	03 Panel Mount Kit and Certification						
	69 1/4" FPT Stainless Steel Diaphragm Valve with 1/8" tube fitting	23 CGA SS 350							
	70 1/4" FNPT Stainless Steel Diaphragm Valve	24 CGA SS 580							
	81 1/4" MPT x 1/8" Stainless Steel tube fitting	25 CGA SS 660							
	83 1/4" MPT x 1/4" Stainless Steel tube fitting	30 CGA SS 240							
	85 1/4" FPT Stainless Steel Diaphragm Valve with 1/4" tube fitting	31 CGA SS 705							
		32 CGA SS 590							

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

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 Teflon® 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.

DESIGN FEATURES

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

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
 Bonnet 2nd Stage Nickel Plated Brass
 Seat Teflon®
 Seat Retainer. 316 Stainless Steel
 Diaphragm 1st Stage. Stainless Steel
 Diaphragm 2nd Stage. Stainless Steel
 Gauge. 2-1/2" Stainless Steel
 Filters (2). 316 Stainless Steel
 Valve Stem. 316 Stainless Steel
 Valve Spring. 316 Stainless Steel

320 - 70 - 24 - 00 - 00

OPTION 1:		OPTION 2:		OPTION 3:		OPTION 4:		OPTION 5:	
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS	ACCESSORIES	OPTIONS					
320 25 PSIG	00 1/4" FNPT	00 1/4" FNPT	00 None	00 1/4" None					
321 50 PSIG	66 1/4" MPT Stainless Steel Needle Valve	20 CGA SS 320	01 Panel Mount Kit	02 Captured vent fitting 1/16" MNPT x 1/8" tube (includes 2)					
322 100 PSIG	67 1/4" MPT Stainless Steel Diaphragm Valve	21 CGA SS 326	02 Helium Leak Certification						
323 250 PSIG	68 1/4" FPT Stainless Steel Needle Valve with 1/8" tube fitting	22 CGA SS 330	03 Panel Mount Kit and Certification						
	69 1/4" FPT Stainless Steel Diaphragm Valve with 1/8" tube fitting	23 CGA SS 350							
	70 1/4" FNPT Stainless Steel Diaphragm Valve	24 CGA SS 580							
	81 1/4" MPT x 1/8" Stainless Steel tube fitting	25 CGA SS 660							
	83 1/4" MNPT x 1/4" Stainless Steel Tube Fitting	30 CGA SS 240							
	85 1/4" FPT x 1/4" Stainless Steel Diaphragm Valve with 1/4" tube fitting	31 CGA SS 705							
		32 CGA SS 590							

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



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.

DESIGN FEATURES

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

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
 Bonnet Nickel Plated Brass
 Seat Teflon®
 Seat Retainer Brass
 Diaphragm Stainless Steel
 Gauge 2-1/2" Nickel Plated Brass
 Filters (2) 316 Stainless Steel/Brass
 Valve Stem 316 Stainless Steel
 Valve Spring 316 Stainless Steel

600 - 80 - 11 - 01 - 00

OPTION 1:		OPTION 2:		OPTION 3:		OPTION 4:		OPTION 5:	
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS	ACCESSORIES	OPTIONS					
600 25 PSIG	00 1/4" FNPT	00 1/4" FNPT	00 None	00 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	2
602	1200	100	--	--	0-200	5



610 Silverline SERIES

HIGH PURITY BRASS SINGLE STAGE REGULATORS



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.

DESIGN FEATURES

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

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 Rate75/100 PSIG
Weight	3.32 lbs.

MATERIALS OF CONSTRUCTION

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

610 - 01 - 09 - 09 - 09

OPTION 1:	OPTION 2:	OPTION 3:	OPTION 4:	OPTION 5:
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS	ACCESSORIES	OPTIONS
610 25 PSIG	00 1/4" FNPT	00 1/4" FNPT	00 None	00 None
611 50 PSIG	01 1/4" FNPT Chrome Diaphragm Valve	02 CGA 320	01 Panel Mount Kit	01 Captured vent fitting 1/16" MNPT x 1/8" tube
612 100 PSIG	02 1/4" FNPT Chrome Diaphragm Valve with 1/8" Tube Fitting	03 CGA 326	02 Helium Leak Certification	
613 250 PSIG	03 1/4" FNPT Diaphragm Valve with 1/4" tube fitting	05 CGA 346	03 Panel Mount Kit and Certification	
614 500 PSIG	20 1/4" MNPT Chrome Needle Valve	06 CGA 350		
	42 1/4" FNPT Chrome 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 610 SERIES REGULATORS

Product Number	Max. Inlet Pressure PSIG	Max. Outlet Pressure PSIG	Inlet Gauge		Delivery Gauge	
			Range PSIG	Graduations PSIG	Range PSIG	Graduations PSIG
610	3500	25	0-4000	100	30" Hg 0-30	1
611	3500	50	0-4000	100	0-60	2
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



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.

DESIGN FEATURES

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

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 Rate02/100 PSIG
Weight	5.22 lbs.

MATERIALS OF CONSTRUCTION

Body.	Nickel Plated Brass Bar Stock
Bonnet 1st Stage	Nickel Plated Brass
Bonnet 2nd Stage	Nickel Plated Brass
Seat	Teflon®
Seat Retainer.	Brass
Diaphragm 1st Stage.	Stainless Steel
Diaphragm 2nd Stage.	Stainless Steel
Gauge.	2-1/2" Nickel Plated Brass
Filters (2).	316 Stainless Steel/Brass
Valve Stem.	316 Stainless Steel
Valve Spring.	316 Stainless Steel

620 - 01 - 09 - 00 - 00

OPTION 1:	OPTION 2:	OPTION 3:	OPTION 4:	OPTION 5:
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS	ACCESSORIES	OPTIONS
620 25 PSIG	00 None	00 None	00 None	00 None
621 50 PSIG	01 1/4" FNPT Chrome Diaphragm Valve	02 CGA 320	01 Panel Mount Kit	02 Captured vent fitting 1/16" MNPT x 1/8" tube (includes 2)
622 100 PSIG	02 1/4" FNPT Chrome Diaphragm Valve with 1/8" Tube Fittings	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 Chrome Needle Valve	06 CGA 350		
	42 1/4" FNPT Chrome Needle Valve with 1/8" Tube Fittings	07 CGA 510		
	81 1/4" MPT x 1/8" Stainless Steel Tube Fittings	08 CGA 540		
	83 1/4" MPT x 1/4" Stainless Steel Tube Fittings	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	2
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

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 included 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

DESIGN FEATURES

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

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 ccs Helium
Flow Coefficient Cv	0.088
Flow Curve	Flow Chart #10
Inlet Decay Rate026/100 PSI
Weight	3 lbs.

MATERIALS OF CONSTRUCTION

Body	Nickel Plated Brass Brass Bar Stock
Bonnet	Nickel Plated Brass Brass Bar Stock
Seat	Teflon®
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	Monel
Outlet	1/4" FNPT

631 - 20 - 08

OPTION 1:		OPTION 2:		OPTION 3:	
MODEL SERIES & OUTLET PRESSURE		OUTLET FITTINGS		CGA INLET FITTINGS	
631	10 PSIG	00	1/4" FNPT	00	1/4" FNPT
632	50 PSIG	20	Chrome Needle Valve with 1/4" MNPT outlet	02	CGA 320
633	100 PSIG	40	Chrome Needle Valve with 1/4" FNPT outlet	03	CGA 326
		41	Chrome Needle Valve with male 1/8" brass tube fitting	05	CGA 346
		42	Chrome Needle Valve with male 1/8" stainless steel tube fitting	06	CGA 350
		82	Nickel "B" fitting (9/16" - 18H)	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	30" Hg 0-15	0.2
632	3000	50	0-3000	50	0-100	2
633	3000	100	0-3000	50	0-200	5

820 Silverline SERIES

SERIES HIGH PRESSURE ANALYTICAL BRASS SINGLE STAGE REGULATORS



P/N 825-00-09 Shown

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 screws permits easy adjustment of pressures in closed or dead end systems.

DESIGN FEATURES

- Self relieving adjusting knob 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

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
Weight	8 lbs.
Flow Coefficient	0.19
Flow Curve	Flow Chart #14

MATERIALS OF CONSTRUCTION

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

825 - 00 - 09

OPTION 1:	OPTION 2:	OPTION 3:
MODEL SERIES & OUTLET PRESSURE	OUTLET FITTINGS	CGA INLET FITTINGS
823 500 PSIG	00 1/4" FNPT	00 1/4" FNPT
824 1000 PSIG	66 1/4" Male NPT Stainless Steel Needle Valve*	09 CGA 580 Brass*
825 2000 PSIG	* max inlet pressure 3000 psi	26 CGA 347 SST
826 4000 PSIG		27 CGA 677 SST
827 6000 PSIG		28 CGA 680 SST
		* max inlet pressure 3000 psi

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

NEEDLE VALVES

These instrument valves are used in a wide variety of laboratory and industrial application. All valves come with Teflon[®] packing for leak proof performance.



SPECIFICATIONS

Maximum Inlet Pressure 3000 PSIG
Temp. Operating Range -65°F to +165°F

MATERIALS OF CONSTRUCTION

Body	Stem	Part Number	Outlet	Inlet	Orifice	Cv
Brass Nickel Plated	316 SST	I5535	¼" MNPT	¼" MNPT	0.170	0.35
Brass Nickel Plated	316 SST	I5536	¼" FNPT	¼" MNPT	0.170	0.35
Monel	Monel	Y34-311	¼" FNPT	¼" MNPT	0.140	0.27
316 Stainless Steel	316 SST	I5552	¼" MNPT	¼" MNPT	0.140	0.27
316 Stainless Steel	316 SST	I4803	¼" FNPT	¼" 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

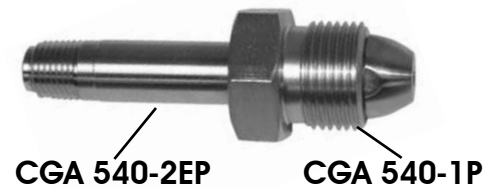
MATERIALS OF CONSTRUCTION

Body	Part Number	Outlet	Outlet	Inlet	Orifice	Cv
Brass	I5503	Multi-Turn	¼" FNPT	¼" MNPT	0.140	0.27
316 Stainless Steel	I4804	Multi-Turn	¼" MNPT	¼" MNPT	0.094	0.13
316 Stainless Steel	I4805	Multi-Turn	¼" FNPT	¼" MNPT	0.094	0.13

ACCESSORIES

Chrome 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	



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



14791

Accessories

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

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



15166

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
GA090-07	0-4000 PSIG

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
GA0100-07	0-4000 PSIG



GA056-07

SAFETY & TECHNICAL

GAS PROPERTIES

Product	Formula	State	THERMOPHYSICAL PROPERTIES							HAZARDOUS PROPERTIES			
			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 ₂ H 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 ₄ H 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 ₂ H ₆	Compress Gas	27.67	*	0.95	62.1	581			100	0.8-98	0.05	Highly Toxic
Ethane	C ₂ H ₆	Liquefied Gas	30.07	543	1.047	90.1	708	12.8	12.6	986	3-12.4	SA	
Ethyl Chloride	C ₂ H ₅ Cl	Liquefied Gas	64.52			368.96	764.4				3.8-15.4	1000	
Ethylene	C ₂ H 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 ₂ S	Liquefied Gas	34.08	252	1.189	212.7	1308	11.2	8.2	500	4.3-45	10	Irritant and Toxic
Isobutane	C ₄ H 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 ₃ Cl	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 ₂ O	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 ₃ H 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 in Hg	0.4912	0.0339	0.0334	25.4	1	13.596	3
1 in water	5.202	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		scc/min	Standard Cubic Centimeters per Minute			
SCFH	Standard Cubic Feet per Hour		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 TABLES

PARTS PER MILLION CONVERSION OF WATER VAPOR TO DEW POINTS

Dew Point at 1 atm		Water Vapor ppm (vol/vol)	Dew Point at 1 atm		Water Vapor ppm (vol/vol)	Dew Point at 1 atm		Water Vapor ppm (vol/vol)
(F°)	(C°)		(F°)	(C°)		(F°)	(C°)	
-130	-90	0.1	-74	-59	12.3	-40	-40	128
-120	-84	0.25	-73	-58	13.3	-39	-39	136
-110	-79	0.63	-72	-58	14.3	-38	-39	144
-105	-76	1.00	-71	-57	15.4	-37	-38	164
-104	-76	1.08	-70	-57	16.6	-36	-38	164
-103	-75	1.18	-69	-56	17.9	-35	-37	174
-102	-74	1.29	-68	-56	19.2	-34	-37	185
-101	-74	1.40	-67	-55	20.6	-33	-36	196
-100	-73	1.53	-66	-54	22.1	-32	-36	210
-99	-73	1.66	-65	-54	23.6	-31	-35	222
-98	-72	1.81	-64	-53	25.6	-30	-34	235
-97	-72	1.96	-63	-53	27.5	-29	-34	250
-96	-71	2.15	-62	-52	29.4	-28	-33	265
-95	-71	2.35	-61	-52	31.7	-27	-33	283
-94	-70	2.54	-60	-51	34.0	-26	-32	300
-93	-69	2.76	-59	-51	36.5	-25	-32	317
-92	-69	3.00	-58	-50	39.0	-24	-31	338
-91	-68	3.28	-57	-49	41.8	-23	-31	358
-90	-68	3.53	-56	-49	44.6	-22	-30	378
-89	-67	3.84	-55	-48	48.0	-21	-29	400
-88	-67	4.15	-54	-48	51	-20	-29	422
-87	-66	4.50	-53	-47	55	-19	-28	448
-86	-66	4.78	-52	-47	59	-18	-28	475
-85	-65	5.30	-51	-46	62	-17	-27	500
-84	-64	5.70	-50	-46	67	-16	-27	530
-83	-64	6.20	-49	-45	72	-15	-26	560
-82	-63	6.60	-48	-44	76	-14	-26	590
-81	-63	7.20	-47	-44	82	-13	-25	630
-80	-62	7.80	-46	-43	87	-12	-24	660
-79	-62	8.40	-45	-43	92	-11	-24	700
-78	-61	9.10	-44	-42	98	-10	-23	740
-77	-61	9.80	-43	-42	105	-9	-23	780
-76	-60	10.5	-42	-41	113	-8	-22	820
-75	-59	11.4	-41	-41	119	-7	-22	870

Conversion of parts per million (ppm) to percent:

1 ppm	=	0.0001%
10 ppm	=	0.001%
100 ppm	=	0.01%
1,000 ppm	=	0.1%
10,000 ppm	=	1%

Temperature scale conversions

°F	=	(1.8 °C) + 32
°F	=	1.8 (K) - 459.67
°C	=	$\frac{°F - 32}{1.8}$
°C	=	K - 273.15
K	=	°C + 273.15
K	=	$\frac{°F + 459.67}{1.8}$

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

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 two years from the date of installation of the equipment or two years from the date of shipment from the factory, whichever comes first.

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.