HOW TO SELECT

A SMITH EQUIPMENT 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 SMITH EQUIPMENT SPECIALTY GAS REGULATOR

STEP 3 Determine delivery pressure needs

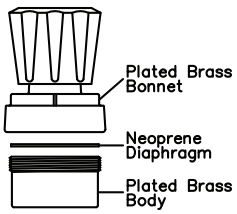
Single stage regulators reduce pressure by passing through one pressure reducing valve area in a single step to deliver a pressure within a specific range. Regulators designed in this way will show a slight increase in delivery pressure as the cylinder pressure falls during use. This phenomenon is known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

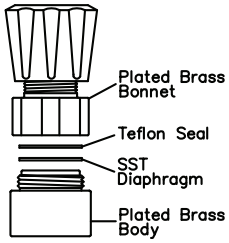
STEP 4 Determine outlet fitting requirements

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

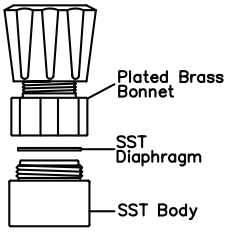


200 Series



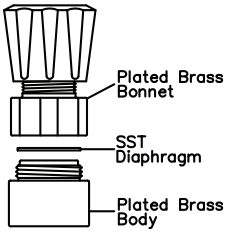
General Purpose
Low Leak Rate:
1 x 10^{-5} ccs

300 Series



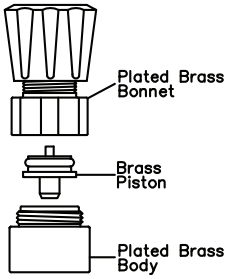
High Purity
Analytical
Low Leak Rate:
1 x 10^{-5} ccs

600 Series



High Purity Stainless Steel
Corrosion Resistant
Low Leak Rate:
1 x 10^{-5} ccs

800 Series



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

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