



GENERAL-PURPOSE

ANALYTICAL

HIGH-PURITY CORROSION-RESISTANT

HIGH-PURITY

LOW-FLOW (LECTURE BOTTLE)

PISTON-SENSOR ANALYTICAL

HIGH-PRESSURE ANALYTICAL

SPECIALTY GAS REGULATORS CATALOG

SMITH™ HAS EARNED A REPUTATION FOR MANUFACTURING HIGH-QUALITY AND INNOVATIVE GAS CONTROL SOLUTIONS SINCE 1916.

From our humble beginning in Minneapolis, Minnesota to our current plant in Watertown, South Dakota, our customers have relied on our complete range of single- and dual-stage regulators for their specialty gas handling requirements.

Our specialty gas regulators are meticulously manufactured and tested under ISO 9001 Certified Management Systems. The regulators provide a high degree of accuracy for comprehensive applications including bio-tech, pharmaceuticals, chemical processing, analytical, research and development, instrument analysis, gas chromatography, mass-spectrometry, petrochemical, aerospace, emissions testing and semi-conductor manufacturing.

Smith specialty gas regulators are used with a wide range of corrosive, non-corrosive, toxic, high-purity, cryogenic and general-purpose gases designed for pipeline systems, cryogenic cylinders and lecture bottles. Different models can be configured with a wide variety of materials, accessories and inlet and outlet fittings for your exacting application. Specialty gas regulators are covered by a two-year warranty except for corrosive service.

We know when it comes to your specialty gas application there is no room for error. Smith has set the standard for reliability, quality and responsiveness. Our dedicated customer service team is here to assist you and provide solutions for all of your needs.

SMITH SPECIALTY GAS REGULATOR MANUFACTURER'S WARRANTY

GENERAL-PURPOSE, ANALYTICAL, HIGH-PURITY, LOW-FLOW (LECTURE BOTTLE), PISTON-SENSOR ANALYTICAL AND HIGH-PRESSURE ANALYTICAL REGULATORS

Smith Equipment, a brand of Miller Electric Mfg. LLC, 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 shipment from the factory.

HIGH-PURITY CORROSION-RESISTANT REGULATORS

Smith Equipment, a brand of Miller Electric Mfg. LLC, 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) 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: 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 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 will not pay for or warrant repairs made by anyone other than personnel authorized by Smith to make such repairs. Smith 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 contained herein and under any other warranties express or implied required by law.

CONTENTS

INTRO AND WARRANTY 2

REGULATOR FEATURES 3

HOW TO SELECT
A SPECIALTY GAS REGULATOR 4

REGULATOR SELECTION GUIDES
Pure Gases 6
Mixed Gases 8
Other Mixtures/Gases 10

CONVERSION TABLES 11

GENERAL-PURPOSE REGULATORS
100 Series Line 12
110 Series Single-Stage Cylinder 13
120 Series Two-Stage Cylinder 14

ANALYTICAL REGULATORS
200 Series Line 15
210 Series Single-Stage Cylinder 16
220 Series Two-Stage Cylinder 17

HIGH-PURITY CORROSION-RESISTANT
REGULATORS
310 Series Single-Stage Cylinder 18
320 Series Two-Stage Cylinder 19

HIGH-PURITY REGULATORS
600 Series Line 20
610 Series Single-Stage 21
620 Series Two-Stage 22

LOW-FLOW (LECTURE BOTTLE)
REGULATORS
630 Series Two-Stage 23

PISTON-SENSOR ANALYTICAL
REGULATORS
810 Series Single-Stage 24

HIGH-PRESSURE ANALYTICAL
REGULATORS
820 Series Single-Stage 25

REPLACEMENT PARTS 26/27

GLOSSARY 27

REGULATOR FEATURES



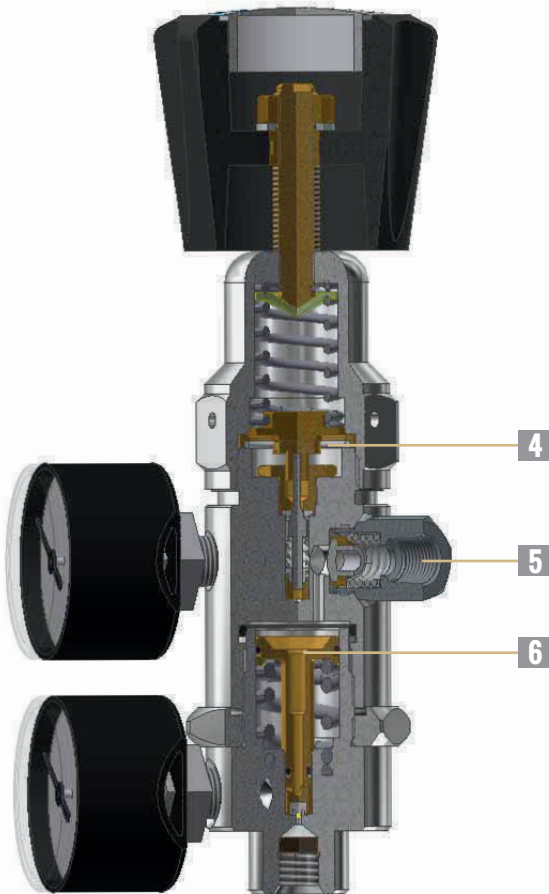
210 Series analytical single-stage cylinder regulator

ALL SERIES

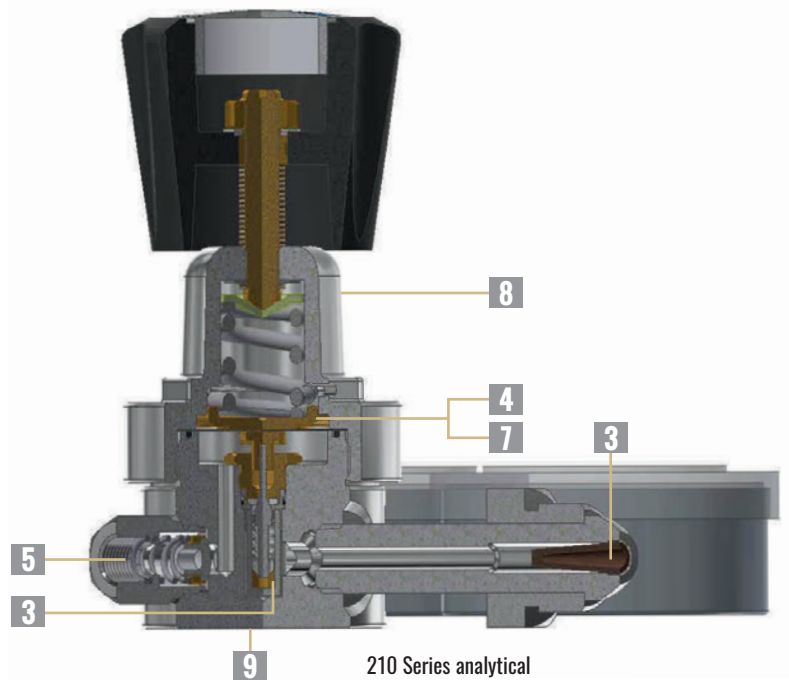
- 1** Easy-to-read 2.5-inch gauges with shatter-resistant polycarbonate lens covers.
- 2** Nickel-plated brass bonnet and bar stock body (except 310 and 320 Series with stainless steel body) protects against corrosion.
- 3** Dual filters protect high-pressure seat from debris for reliable operation and long service life.

SERIES SPECIFIC

- 4** Stainless steel diaphragm (200, 210, 220, 310, 320, 600, 610, 620, 630 Series) resists corrosion, leaking and freeze-up if used with liquid (cryogenic) gases, for extended service life. Recommended for high-purity gases.
- 5** External relief valve (110, 120, 210, 220, 630 Series) protects regulator from damage due to inadvertent high-pressure surge. Relief valve will release excessive pressure and automatically reset.
- 6** Piston-sensor design (630, 810, 820 Series) provides structural reliability in high-pressure use.
- 7** Neoprene composite diaphragm (100, 110, 120 Series) provides high sensitivity and resists corrosion for extended service life.
- 8** Threaded front bonnet (310, 320, 600, 610, 620, 810 Series) allows for front-panel mounting.
- 9** Tapped body (100, 110, 200, 210, 310, 600, 610, 810, 820 Series) or threaded bonnet (320, 620 Series) allows for rear-panel mounting.



630 Series low-flow (lecture bottle) two-stage regulator



210 Series analytical single-stage cylinder regulator

HOW TO SELECT

A SPECIALTY GAS REGULATOR

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 may be considered as well.

Smith manufactures a wide variety of regulators constructed with various materials to meet most any application. For more information on a regulator's materials of construction please refer to **Regulator Quick-Reference Chart** (page 5).

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

Recommended use:
Non-corrosive and non-hazardous pure and mixed gas applications where elastomeric outgassing is not critical

Typical applications:
General laboratory or plant use



ANALYTICAL REGULATORS

Recommended use:
Non-corrosive pure and mixed gas applications

Typical applications:
Gas management of analytical instrumentation, chromatographic carrier gas, and process gas regulation



HIGH-PURITY REGULATORS

Recommended use:
Non-corrosive pure and mixed gas applications

Typical applications:
Gas management of analytical instrumentation, chromatographic carrier gas, and process gas regulation



HIGH-PURITY CORROSION-RESISTANT REGULATORS

Recommended use:
Mildly corrosive and non-corrosive gas applications

Typical applications:
Gas management of analytical instrumentation, chromatographic carrier gas, process gas regulation, and mild corrosives

3 • SINGLE-STAGE VS. TWO-STAGE REGULATORS



SINGLE-STAGE REGULATORS

Automatically increase outlet pressure as the cylinder pressure drops. If constant pressure is required, periodic adjustment of the regulator is required as the cylinder pressure is reduced.



TWO- OR DUAL-STAGE REGULATORS

The outlet pressure will remain constant as the cylinder pressure drops. Two-stage regulators do not require periodic adjustment as the cylinder pressure decreases.

4 • DETERMINE OUTLET AND INLET FITTING REQUIREMENTS

OUTLET FITTINGS

Specific outlet fittings are determined by the gases used, as well as application and downstream requirements. Most regulators are available with or without outlet fittings and are configured at the time of ordering. Smith 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.

Note: Not all inlet and outlet combinations are valid. Consult factory for details.



INLET FITTINGS

Types of inlet fittings (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 Selection Guides** (pages 6-10).

REGULATOR QUICK-REFERENCE CHART

Key: SS = Stainless Steel, NPB = Nickel-Plated Brass, Neo = Neoprene

Series	Page	Application	Type			Body Materials			Diaphragm Materials		Seat Materials		
			Line	Single Stage	Two Stage	SS	NPB	Neo	SS	Brass Piston	PFA	PCTFE	PTFE
100	12	General-purpose	●				●	●			●		
110	13	General-purpose		●			●	●			●		
120	14	General-purpose			●		●	●			●		
200	15	Analytical	●				●		● w/FKM seals		●		
210	16	Analytical		●			●		● w/FKM seals		●		
220	17	Analytical			●		●		● w/FKM seals		●		
310	18	High-purity corrosion-resistant		●		●			●			●	
320	19	High-purity corrosion-resistant			●	●			●			●	
600	20	High-purity	●				●		●		●		
610	21	High-purity		●			●		●		●		
620	22	High-purity			●		●		●		●		
630	23	Low-flow (lecture bottle)			●		●		● w/FKM seals (2nd stage)	● w/FKM seals (1st stage)	● (2nd stage)		● (1st stage)
810	24	Piston-sensor analytical		●			●			●		●	
820	25	High-pressure analytical		●			●			●		●	

100/110/120 Series

Plated brass bonnet
Neoprene diaphragm
Plated brass body

General-purpose
Design leak rate: 1×10^{-5} ccs helium

200/210/220 Series

Plated brass bonnet
Stainless steel diaphragm
FKM seal
Plated brass body

Analytical
Design leak rate: 1×10^{-5} ccs helium

310/320 Series

Plated brass bonnet
Stainless steel diaphragm
Stainless steel body

High-purity corrosion-resistant
Design leak rate: 2×10^{-8} ccs helium

600/610/620 Series*

Plated brass bonnet
Stainless steel diaphragm
Plated brass body

High-purity
Design leak rate: 2×10^{-8} ccs helium
**See page 23 for 630 Series*

810/820 Series

Plated brass bonnet
Buna-N seal
Brass piston
Plated brass body

Piston-sensor analytical and high-pressure analytical
Design leak rate: 1×10^{-5} ccs helium

REGULATOR SELECTION GUIDES

PURE GASES

Use this selection guide to help determine the recommended regulator to use for a given gas within the requirements of your specific application. The information provided is a compilation of the knowledge and experience gathered over many years by Smith Equipment engineers, production staff and product specialists. Due to extensive differences in applications and working environments, this guide

should be considered in conjunction with good operating practices as well as federal and state law requirements.

We strongly recommend 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 HP610/210	GP120 HP620/220 HP620/220	590 590 590
Ammonia Anhydrous	None	HP310	HP320	240/705
Argon Research 99.9995% Ultra high purity 99.9999% 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%	None	HP310	HP320	330
1.3 Butadiene Instrument 99.5% Chemically pure 99.0%	GP100 GP100	GP110 GP110	GP120 GP120	510 510
Carbon Dioxide Research 99.998% Instrument (Coleman) 99.99% Chemically pure 99.0%	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% Chemically pure 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 Chemically pure 99.0%	HP600/200	HP610/210	HP620/220	350
Dimethyl Ether Purity 99.5%	GP100	GP110	GP120	510
Ethane Research 99.98% Chemically pure 99.5% Technical 98.55%	HP600/200 HP600/200 GP100	HP610/210 HP610/210 GP110	HP620/220 HP620/220 GP120	350 350 350
Ethylene Research 99.98% Chemically pure 99.5% Technical 98.55%	HP600/200 HP600/200 GP100	HP610/210 HP610/210 GP110	HP620/220 HP620/220 GP120	350 350 350

PURE GASES	Line Regulator	Cylinder Regulators		
	Single Stage	Single Stage	Two Stage	CGA Inlet
Helium Research 99.9995% Ultra high purity 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
Hydrogen Research 99.9999% Ultra high purity 99.999% Zero 99.99% Prepurified 99.99% Extra dry 99.95%	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	350 350 350 350 350
Hydrogen Chloride Technical purity 99.0%	None	HP310	HP320	330
Krypton Research 99.995%	HP600/200	HP610/210	HP620/220	580
Methane Research 99.99% Ultra high purity 99.97% Chemically pure 99.0% Technical 98.0% Commercial 93.0%	HP600/200 HP600/200 HP600/200 GP100 GP100	HP610/210 HP610/210 HP610/210 GP110 GP110	HP620/220 HP620/220 HP620/220 GP120 GP120	350 350 350 350 350
Neon Research 99.99% Ultra high purity 99.996% Purified 99.89%	HP600/200 HP600/200 HP600/200	HP610/210 HP610/210 HP610/210	HP620/220 HP620/220 HP620/220	580 580 580
Nitrogen Research 99.999% Ultra high purity 99.999% Prepurified 99.9998% Zero 99.998% High purity 99.99% Oxygen free 99.99% Extra dry 99.7%	HP600/200 HP600/200 HP600/200 HP600/200 HP600/200 HP600/200 HP600/200	HP610/210 HP610/210 HP610/210 HP610/210 HP610/210 HP610/210 HP610/210	HP620/220 HP620/220 HP620/220 HP620/220 HP620/220 HP620/220 HP620/220	580 580 580 580 580 580 580
Nitrous Oxide Ultra high purity 99.99% Atomic absorption 99.0%	HP600/200 GP100	HP610/210 GP110	HP620/220 GP120	326 326
Oxygen Research 99.995% Ultra high purity 99.99% Zero 99.6% Extra dry 99.6%	HP600/200 HP600/200 HP600/200 HP600/200	HP610/210 HP610/210 HP610/210 HP610/210	HP620/220 HP620/220 HP620/220 HP620/220	540 540 540 540
Propane Research 99.99% Instrument 99.5% Chemically pure 99.0% Natural 96.0%	HP200 GP100 GP100 GP100	HP210 GP110 GP110 GP110	HP220 GP120 GP120 GP120	510 510 510 510
Propylene Research Chemically pure 99.0%	HP200 GP100	HP210 GP110	HP220 GP120	510 510
Sulfur Hexafluoride Instrument 99.99% Chemically pure 99.8%	HP600/200 GP100	HP610/210 GP110	HP620/220 GP120	590 590
Xenon Research 99.995%	HP600/200	HP610/210	HP620/220	580

REGULATOR SELECTION GUIDES

MIXED GASES

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 Hydrogen	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

MIXED GASES	Line Regulator	Cylinder Regulators		
	Single Stage	Single Stage	Two Stage	CGA Inlet
Hydrogen in Argon in Helium in Nitrogen	HP600/200 HP600/200 HP600/200	HP610/210 HP610/210 HP610/210	HP620/220 HP620/220 HP620/220	350 350 350
Hydrogen Chloride in Argon in Helium in Nitrogen	None None None	HP310 HP310 HP310	HP320 HP320 HP320	330 330 330
Hydrogen Sulfide in Argon in Helium in Nitrogen	None None None	HP310 HP310 HP310	HP320 HP320 HP320	330 330 330
Isobutane in Argon in Helium in Hydrogen in Nitrogen	HP600/200 HP600/200 HP600/200 HP600/200	HP610/210 HP610/210 HP610/210 HP610/210	HP620/220 HP620/220 HP620/220 HP620/220	350 350 350 350
Methane in Air in Argon in Helium in Hydrogen in Oxygen	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	350/590 350 350 350 350
Nitric Oxide in Argon in Helium in Nitrogen	None None None	HP310 HP310 HP310	HP320 HP320 HP320	660 660 660
Nitrogen in Argon in Helium in Hydrogen in Oxygen	HP600/200 HP600/200 HP600/200 HP600/200	HP610/210 HP610/210 HP610/210 HP610/210	HP620/220 HP620/220 HP620/220 HP620/220	580 580 350 296
Nitrogen Dioxide in Air in Argon in Helium in Nitrogen	None None None None	HP310 HP310 HP310 HP310	HP320 HP320 HP320 HP320	660 660 660 660
Oxygen in Argon in Helium in Nitrogen	HP600/200 HP600/200 HP600/200	HP610/210 HP610/210 HP610/210	HP620/220 HP620/220 HP620/220	590 590 590
Propane in Air in Argon in Helium in Hydrogen in Nitrogen	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	590 350 350 350 350
Propylene in Air in Argon in Helium in Hydrogen in Nitrogen	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	590 350 350 350 350
Sulfur Dioxide in Air in Argon in Helium in Nitrogen	None None None None	HP310 HP310 HP310 HP310	HP320 HP320 HP320 HP320	660 660 660 660

REGULATOR SELECTION GUIDES

OTHER MIXTURES/GASES

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 40% hydrogen/60% hydrogen	HP600/200 HP600/200	HP610/210 HP610/210	HP620/220 HP620/220	350 350
Furnace Atmosphere Mixture 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 MIXTURES	Line Regulator	Cylinder Regulators		
	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 1.5% ISO butane/98.5% helium	HP600/200 HP600/200	HP610/210 HP610/210	HP620/220 HP620/220	350 350

AUTO EMISSION TEST GASES	Line Regulator	Cylinder Regulators		
	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% carbon dioxide 600 ppm propane Balance nitrogen	HP600	HP610	HP620/220	350

LASER GASES	Line Regulator	Cylinder Regulators		
	Single Stage	Single Stage	Two Stage	CGA Inlet
Excimer Laser Gas Mixture Hydrogen chloride in helium	None	HP310	HP320	330
Molecular Laser Gas Mixture 4.5% carbon dioxide/13.5% nitrogen in helium	HP600/200	HP610/210	HP620/220	580

CONVERSION TABLES

VOLUME/PRESSURE/WEIGHT/FLOW/DENSITY

Note: Multiply unit in left column by select applicable factor at right.

VOLUME	cubic inch	cubic foot	cubic yard	cubic cm	cubic meter	liter	US gallon
1 cubic inch	1	–	–	16.39	–	0.016	0.004
1 cubic foot	1,728	1	0.037	28,317	0.028	28.32	7.481
1 cubic yard	46,656	27	1	–	0.765	764.5	202
1 cubic cm	0.061	–	–	1	–	0.001	–
1 cubic meter	61,024	35.31	1.308	1,000,000	1	1,000	264.2
1 liter	61.02	0.035	–	1,000	0.001	1	0.264
1 US gallon	231	0.134	0.005	3,785	0.004	3.785	1

WEIGHT	grain	ounce	pound	ton	gram	kilogram	metric ton
1 grain	1	0.002	–	–	0.065	–	–
1 ounce	437.5	1	0.063	–	28.35	0.028	–
1 pound	7,000	16	1	0.0005	453.6	0.454	–
1 ton	–	32,000	2,000	1	–	907.2	0.907
1 gram	15.43	0.035	–	–	1	0.001	–
1 kilogram	–	35.27	2.205	–	1,000	1	0.001
1 metric ton	–	35,274	2,205	1.102	–	1,000	1

PRESSURE	psi	bar	atm	mm Hg	inch Hg	inch water	kPa
1 psi	1	0.069	0.068	51.71	2.036	27.68	6.895
1 bar	14.50	1	0.987	750.1	29.53	401.5	100
1 atm	14.70	1.013	1	760	29.92	407.2	101.3
1 mm Hg (torr)	0.019	0.001	0.001	1	0.039	0.536	0.133
1 MPa	145	10	9.869	7,501	295.3	4,019	1,000
1 inch Hg	0.491	0.034	0.033	1.866	1	13.61	3
1 inch water	0.036	0.359	0.003	1.866	0.074	1	0.249
1 kPa	0.145	0.01	0.009	7.519	2.953	0.295	1

FLOW	SCC/minute	liters/minute	SCFM	liters/hour	Nm ³ /hour	SCFH
1 SCC/minute	1	0.001	–	0.06	–	0.002
1 liter/minute	1,000	1	0.035	60	0.06	2.119
1 SCFM	28,317	28.3	1	1,699	1,699	60
1 liter/hour	16.67	0.017	–	1	0.001	0.035
1 Nm ³ /hour	16.667	16.67	0.589	1,000	1	35.31
1 SCFH	472	0.472	0.017	28.32	0.028	1

SCC = Standard Cubic Centimeters SCFM = Standard Cubic Feet per Minute
Nm³ = Normal Cubic Meters SCFH = Standard Cubic Feet per Hour

DENSITY	pound/cubic inch	pound/cubic foot	pound/gallon	gram/centimeter ³	gram/liter
1 lb./cu. in.	1	1,728	231	27.68	27,680
1 lb./cu. ft.	–	1	0.134	0.016	16.02
1 lb./gallon	0.004	7.481	1	0.120	119.8
1 g/cm ³	0.036	62.43	8.345	1	1,000
1 g/liter	–	0.062	0.008	0.001	1

LIQUID TO GAS (ARGON/CARBON DIOXIDE/NITROGEN/OXYGEN)

Note: Multiply unit in left column by select applicable factor at right.

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.

ARGON	Weight		Gas		Liquid	
	pounds (lb.)	kilograms (kg)	cubic feet (SCF)	cu. meters (Nm ³)	gallons (gal.)	liters (L)
1 pound	1	0.454	9.671	0.254	0.086	0.326
1 kilogram	2.205	1	21.32	0.561	0.19	0.718
1 SCF (gas)	0.103	0.047	1	0.028	0.009	0.034
1 Nm ³ (gas)	3.933	1.784	38.04	1	0.338	1.28
1 gallon (liquid)	11.63	5.276	112.5	2.957	1	3.785
1 liter (liquid)	3.072	1.394	29.71	0.781	0.264	1

NITROGEN	Weight		Gas		Liquid	
	pounds (lb.)	kilograms (kg)	cubic feet (SCF)	cu. meters (Nm ³)	gallons (gal.)	liters (L)
1 pound	1	0.454	13.8	0.363	0.148	0.561
1 kilogram	2.205	1	30.42	0.8	0.326	1.235
1 SCF (gas)	0.072	0.033	1	0.028	0.011	0.041
1 Nm ³ (gas)	2.757	1.251	38.04	1	0.408	1.544
1 gallon (liquid)	6.745	3.06	93.11	2.447	1	3.785
1 liter (liquid)	1.782	0.808	24.6	0.646	0.264	1

CARBON DIOXIDE	Weight		Gas		Liquid	
	pounds (lb.)	kilograms (kg)	cubic feet (SCF)	cu. meters (Nm ³)	gallons (gal.)	liters (L)
1 pound	1	0.454	8.741	0.229	0.118	0.447
1 kilogram	2.205	1	19.25	0.506	0.26	0.986
1 SCF (gas)	0.114	0.052	1	0.028	0.014	0.051
1 Nm ³ (gas)	4.359	1.977	38.04	1	0.515	1.948
1 gallon (liquid)	8.47	3.842	74.04	1.943	1	3.785
1 liter (liquid)	2.238	1.015	19.56	0.513	0.264	1

OXYGEN	Weight		Gas		Liquid	
	pounds (lb.)	kilograms (kg)	cubic feet (SCF)	cu. meters (Nm ³)	gallons (gal.)	liters (L)
1 pound	1	0.454	12.08	0.317	0.105	0.398
1 kilogram	2.205	1	26.62	0.7	0.232	0.877
1 SCF (gas)	0.083	0.038	1	0.028	0.009	0.033
1 Nm ³ (gas)	3.151	1.429	38.04	1	0.331	1.253
1 gallon (liquid)	9.527	4.322	115.1	3.025	1	3.785
1 liter (liquid)	2.517	1.142	30.38	0.798	0.264	1

100 SERIES

GENERAL-PURPOSE LINE REGULATORS

FEATURES

- Sure-Seat™ technology provides a filtered seat for added gas-stream purity and extended service life
- Neoprene composite diaphragm provides high sensitivity and resists corrosion for extended service life
- Recommended for inert and non-corrosive gas applications



Model
103-0000

MODEL CONFIGURATION

1 **2** **3** Create your custom stock number by choosing one option from each of the three sections below.
Example: Regulator with 0–200 psig outlet pressure and no outlet or inlet fittings.

103 - **00** **00**

1

Outlet Pressure

100	0–15 psig
101	0–50 psig
102	0–100 psig
103	0–200 psig

2

Outlet Fittings

00	None
80	1/8" brass tube fitting
81	1/8" stainless steel tube fitting

3

Inlet Fittings

00	None
11	1/8" brass tube fitting
12	1/8" stainless steel tube fitting

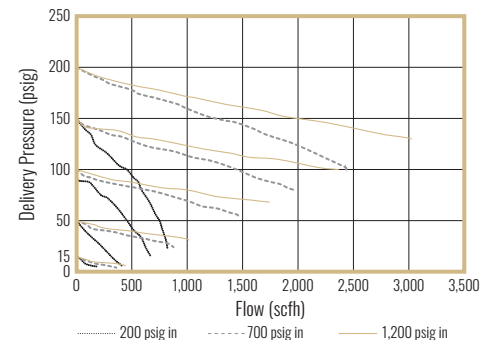
SPECIFICATIONS

Model	Delivery Gauge (psig)		Maximum Inlet Pressure 1,200 psig	Design Leak Rate Bubble tight, 1 x 10 ⁻⁵ ccs helium
	Range	Graduations		
100	0–30	1	Temp. Operating Range -20 to +140°F	Flow Coefficient (Cv) 0.09
101	0–60	1		
102	0–200	5	Ports (3) 1/4" FNPT	Inlet Decay Rate 0.138/100 psig
103	0–400	10		

MATERIALS

Body	Nickel-plated brass	Filter	316 stainless steel
Bonnet	Nickel-plated brass, bar stock	Valve Stem	316 stainless steel
Diaphragm	Neoprene	Valve Spring	316 stainless steel
Seat	PFA	Seal	FKM
Seat Retainer	Brass	Inner Friction Sleeve	PTFE
		Remaining Components	Brass or stainless steel

FLOW CURVE



110 SERIES

GENERAL-PURPOSE SINGLE-STAGE CYLINDER REGULATORS

FEATURES

- Sure-Seal™ technology provides a filtered seat for added gas-stream purity and extended service life
- Neoprene composite diaphragm provides high sensitivity and resists corrosion for extended service life
- Built-in capturable preset relief valve protects regulator components from over pressurization
- Ideal for use with liquefied hydrocarbon gases
- Only suitable for non-hazardous gases



Model
110-8208

MODEL CONFIGURATION

1 **2** **3** Create your custom stock number by choosing one option from each of the three sections below.
110 - **82** **08** Example: Regulator with 0–15 psig outlet pressure, nickel 9/16-18 RH “B” outlet fitting and CGA 540 inlet fitting.

1

Outlet Pressure

110	0–15 psig
111	0–50 psig
112	0–100 psig
113	0–250 psig

2

Outlet Fittings

00	None
20	1/4" MNPT chrome needle valve
40	1/4" FNPT chrome needle valve
41	1/4" FNPT chrome needle valve with 1/8" brass tube fitting
42	1/4" FNPT chrome needle valve with 1/8" stainless steel tube fitting
82	Nickel 9/16-18 RH “B” fitting
84	Nickel 9/16-18 LH “B” fitting <i>Only available and used with 110 body</i>

3

Inlet Fittings

00	None
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510 <i>Only available and used with 110 body</i>
08	CGA 540
09	CGA 580
10	CGA 590

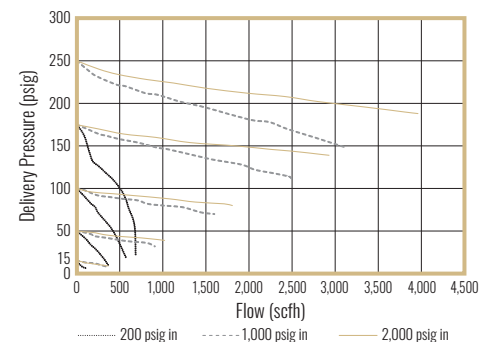
SPECIFICATIONS

Model	Delivery Gauge (psig) Range Graduations	Relief Valve Setting (psig)	Maximum Inlet Pressure	Design Leak Rate
110	0–30 1	75	3,500 psig	Bubble tight, 1 x 10 ⁻⁵ ccs helium
111	0–60 1	135	Inlet Gauge Range 0–4,000 psig	Flow Coefficient (Cv) 0.08
112	0–200 5	135	Inlet Gauge Graduations 100 psig	Inlet Decay Rate 0.058/100 psig
113	0–400 10	365	Temp. Operating Range -20 to +140°F	Base Weight 2.485 lb.
			Ports (4) 1/4" FNPT	

MATERIALS

Body Nickel-plated brass	Filter 316 stainless steel
Bonnet Nickel-plated brass, bar stock	Seal FKM
Diaphragm Neoprene	Inner Friction Sleeve PTFE
Seat PFA	Relief Valve Seat FKM
	Remaining Components Brass or stainless steel

FLOW CURVE



120 SERIES

GENERAL-PURPOSE TWO-STAGE CYLINDER REGULATORS



Model
120-2009

FEATURES

- Sure-Seat™ technology provides a filtered seat for added gas-stream purity and extended service life
- Neoprene composite diaphragms provide high sensitivity and resists corrosion for extended service life
- Built-in capturable preset relief valve protects regulator components from over pressurization
- Only suitable for non-hazardous gases

MODEL CONFIGURATION

1 **2** **3**
120 - **20** **09**

Create your custom stock number by choosing one option from each of the three sections below.

Example: Regulator with 0-15 psig outlet pressure, 1/4" MNPT chrome needle valve outlet fitting and CGA 580 inlet fitting.

1

Outlet Pressure

120	0-15 psig
121	0-50 psig
122	0-100 psig
123	0-250 psig

2

Outlet Fittings

00	None
20	1/4" MNPT chrome needle valve
40	1/4" FNPT chrome needle valve
41	1/4" FNPT chrome needle valve with 1/8" brass tube fitting
42	1/4" FNPT chrome needle valve with 1/8" stainless steel tube fitting
82	Nickel 9/16-18 RH "B" fitting
84	Nickel 9/16-18 LH "B" fitting <i>Only available and used with 120 body</i>

3

Inlet Fittings

00	None
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510 <i>Only available and used with 120 body</i>
08	CGA 540
09	CGA 580
10	CGA 590

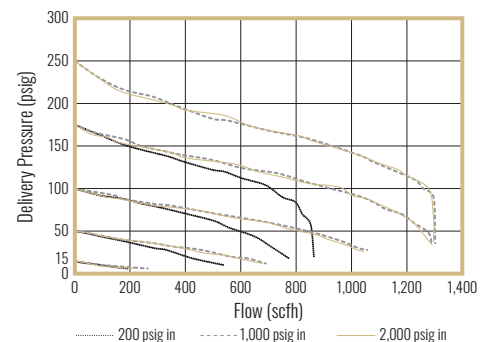
SPECIFICATIONS

Model	Delivery Gauge (psig)		Relief Valve Setting (psig)	Maximum Inlet Pressure 3,500 psig	Design Leak Rate Bubble tight, 1 x 10 ⁻⁵ ccs helium
	Range	Graduations			
120	0-30	1	75	Inlet Gauge Range 0-4,000 psig	Flow Coefficient (Cv) 0.06
121	0-60	1	135		
122	0-200	5	135	Inlet Gauge Graduations 100 psig	Inlet Decay Rate 0.042/100 psig
123	0-400	10	365		
				Temp. Operating Range -20 to -140°F	Base Weight 3.885 lb.
				Ports (4) 1/4" FNPT	

MATERIALS

Body	Nickel-plated brass	Filter	316 stainless steel
Bonnets	Nickel-plated brass, bar stock	Seal	FKM
Diaphragms	Neoprene	Inner Friction Sleeve	PTFE
Seat	PFA	Relief Valve Seat	FKM
		Remaining Components	Brass or stainless steel

FLOW CURVE



200 SERIES

ANALYTICAL LINE REGULATORS

FEATURES

- Sure-Seal™ technology provides a filtered seat for added gas-stream purity and extended service life
- Stainless steel diaphragm resists corrosion, leaking and freeze-up if used with liquid (cryogenic) gases, for extended service life
- Recommended for low inlet pressure and pressure-sensitive applications, such as low-pressure pipelines supplying gas chromatographs, mass spectrometers and research samples
- Recommended for high-purity inert and non-corrosive gas applications
- Highly resistant to inboard diffusion of atmospheric contamination
- Designed to withstand an internal vacuum for a more efficient purging process



Model
200-8100

MODEL CONFIGURATION

1 **2** **3**
200 - **81** **00**

Create your custom stock number by choosing one option from each of the three sections below.

Example: Regulator with 0–15 psig outlet pressure, 1/8" stainless steel tube outlet fitting and no inlet fitting.

1

Outlet Pressure	
200	0–15 psig
201	0–50 psig
202	0–100 psig

2

Outlet Fittings	
00	None
80	1/8" brass tube fitting
81	1/8" stainless steel tube fitting
82	Nickel 9/16-18 RH "B" fitting
83	1/4" stainless steel tube fitting

3

Inlet Fittings	
00	None
11	1/8" brass tube fitting
12	1/8" stainless steel tube fitting

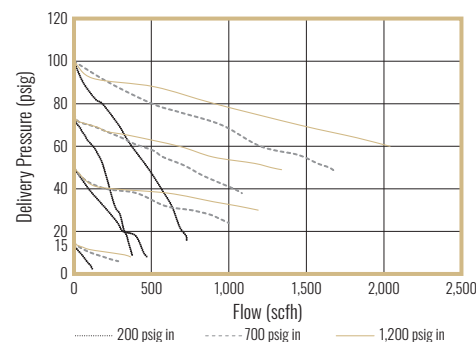
SPECIFICATIONS

Model	Delivery Gauge (psig)		Maximum Inlet Pressure 1,200 psig	Design Leak Rate Bubble tight, 1×10^{-5} ccs helium
	Range	Graduations		
200	0–30 (30" HG)	1	Temp. Operating Range -20 to +140°F	Flow Coefficient (Cv) 0.07
201	0–60	1		
202	0–200	5	Ports (3) 1/4" FNPT	Inlet Decay Rate 0.023/100 psig
				Base Weight 2.165 lb.

MATERIALS

Body Nickel-plated brass	Filter 316 stainless steel
Bonnet Nickel-plated brass, bar stock	Seal FKM
Diaphragm 316 stainless steel	Inner Friction Sleeve PTFE
Seat PFA	Remaining Components Brass or stainless steel

FLOW CURVE



210 SERIES

ANALYTICAL SINGLE-STAGE CYLINDER REGULATORS



Model
213-4102

FEATURES

- Sure-Seal™ technology provides a filtered seat for added gas-stream purity and extended service life
- Stainless steel diaphragm resists corrosion, leaking and freeze-up if used with liquid (cryogenic) gases, for extended service life
- Built-in capturable preset relief valve protects regulator components from over pressurization
- Highly resistant to inboard diffusion of atmospheric contamination

MODEL CONFIGURATION

1 **2** **3** Create your custom stock number by choosing one option from each of the three sections below.
213 - **41** **02** Example: Regulator with 0–150 psig outlet pressure, 1/4" FNPT chrome needle valve with 1/8" brass tube outlet fitting and CGA 320 inlet fitting.

1

Outlet Pressure

210	0–15 psig
211	0–50 psig
212	0–100 psig
213	0–150 psig
214	0–15 psig

Acetylene model with red warning delivery gauge

2

Outlet Fittings

00	None
20	1/4" MNPT chrome needle valve
40	1/4" FNPT chrome needle valve
41	1/4" FNPT chrome needle valve with 1/8" brass tube fitting
42	1/4" FNPT chrome needle valve with 1/8" stainless steel tube fitting
82	Nickel 9/16-18 RH "B" fitting
84	Nickel 9/16-18 LH "B" fitting

Only available and used with 214 body

3

Inlet Fittings

00	None
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510

Only available and used with 214 body

08	CGA 540
09	CGA 580
10	CGA 590

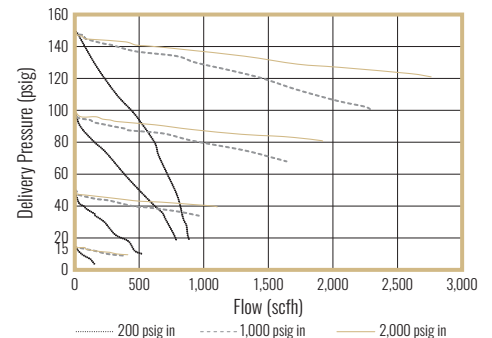
SPECIFICATIONS

Model	Delivery Gauge (psig)		Relief Valve Setting (psig)	Maximum Inlet Pressure	Temp. Operating Range
	Range	Graduations			
210	0–30 (30" HG)	1	75	3,500 psig (except model 214: 400 psig)	-20 to -140°F
211	0–60	1	135	Inlet Gauge Range	Ports (4) 1/4" FNPT
212	0–200	5	135	0–4,000 psig (except model 214: 0–400 psig)	Design Leak Rate
213	0–200	5	365	Inlet Gauge Graduations	Bubble tight, 1 x 10 ⁻⁵ ccs helium
214	0–30 (red warning delivery gauge)	1	–	100 psig (except model 214: 10 psig)	Flow Coefficient (Cv) 0.07
					Inlet Decay Rate
					0.035/100 psig
					Base Weight 2.525 lb.

MATERIALS

Body	Nickel-plated brass	Filter	316 stainless steel
Bonnet	Nickel-plated brass, bar stock	Seal	FKM
Diaphragm	316 stainless steel	Inner Friction Sleeve	PTFE
Diaphragm Seal	FKM	Relief Valve Seat	FKM
Seat	PFA	Remaining Components	Brass or stainless steel

FLOW CURVE



220 SERIES

ANALYTICAL TWO-STAGE CYLINDER REGULATORS

FEATURES

- Sure-Seat™ technology provides a filtered seat for added gas-stream purity and extended service life
- Stainless steel diaphragms resist corrosion, leaking and freeze-up if used with liquid (cryogenic) gases, for extended service life
- Built-in capturable preset relief valve protects regulator components from over pressurization
- 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
- Designed to withstand an internal vacuum for a more efficient purging process
- Designed for precise control from full to nearly empty cylinders, and where constant outlet pressures are required, regardless of inlet pressure fluctuations



Model
220-4206

MODEL CONFIGURATION

1 **2** **3**
220 - **42** **06**

Create your custom stock number by choosing one option from each of the three sections below.

Example: Regulator with 0-15 psig outlet pressure, 1/4" FNPT chrome needle valve with 1/8" stainless steel tube outlet fitting and CGA 350 inlet fitting.

1

Outlet Pressure	
220	0-15 psig
221	0-50 psig
222	0-100 psig
223	0-150 psig

2

Outlet Fittings	
00	None
20	1/4" MNPT chrome needle valve
40	1/4" FNPT chrome needle valve
41	1/4" FNPT chrome needle valve with 1/8" brass tube fitting
42	1/4" FNPT chrome needle valve with 1/8" stainless steel tube fitting
82	Nickel 9/16-18 RH "B" fitting
84	Nickel 9/16-18 LH "B" fitting <i>Only available and used with 220 body</i>

3

Inlet Fittings	
00	None
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510 <i>Only available and used with 220 body</i>
08	CGA 540
09	CGA 580
10	CGA 590

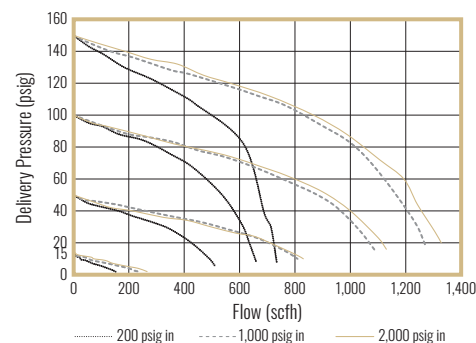
SPECIFICATIONS

Model	Delivery Gauge (psig) Range	Graduations	Relief Valve Setting (psig)	Maximum Inlet Pressure 3,500 psig	Ports (4) 1/4" FNPT
220	0-30 (30" HG)	1	75	Inlet Gauge Range 0-4,000 psig	Design Leak Rate Bubble tight, 1 x 10 ⁻⁵ ccs helium
221	0-60	1	135	Inlet Gauge Graduations 100 psig	Flow Coefficient (Cv) 0.05
222	0-200	5	135	Temp. Operating Range -20 to +140°F	Inlet Decay Rate 0.025/100 psig
223	0-200	5	365		Base Weight 3.965 lb.

MATERIALS

Body	Nickel-plated brass	Filter	316 stainless steel
Bonnets	Nickel-plated brass, bar stock	Seal	FKM
Diaphragms	316 stainless steel	Inner Friction Sleeve	PTFE
Seat	PFA	Relief Valve Seat	FKM
		Remaining Components	Brass or stainless steel

FLOW CURVE



310 SERIES

HIGH-PURITY CORROSION-RESISTANT SINGLE-STAGE CYLINDER REGULATORS

FEATURES

- Sure-Seat™ technology provides a filtered seat for added gas-stream purity and extended service life
- Stainless steel diaphragm resists corrosion, leaking and freeze-up if used with liquid (cryogenic) gases, for extended service life
- Metal-to-metal body-to-diaphragm seal for maximum leak integrity
- Captured vent port (1/16" FNPT) in bonnet allows for venting of hazardous gases in the event of a diaphragm failure
- Designed to withstand an internal vacuum for a more efficient purging process

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



Model
310-69250000

MODEL CONFIGURATION

1 **2** **3** **4** **5**
310 - **69** **25** **00** **00**

Create your custom stock number by choosing one option from each of the five sections below.

Example: Regulator with 0–25 psig outlet pressure, 1/4" FNPT stainless steel diaphragm valve with 1/8" tube outlet fitting, CGA SS 660 inlet fitting and no accessories or options.

1	2	3	4	5
Outlet Pressure	Outlet Fittings	Inlet Fittings	Accessories	Options
310 0–25 psig	00 None	00 None	00 None	00 None
311 0–50 psig	66 1/4" MNPT stainless steel needle valve	20 CGA 320 SS	01 Panel mount kit	01 Captured vent fitting 1/16" MNPT x 1/8" tube
312 0–100 psig	67 1/4" MNPT stainless steel diaphragm valve	21 CGA 326 SS		
313 0–250 psig	68 1/4" FNPT stainless steel needle valve with 1/8" tube fitting	22 CGA 330 SS		
	69 1/4" FNPT stainless steel diaphragm valve with 1/8" tube fitting	23 CGA 350 SS		
	70 1/4" FNPT stainless steel diaphragm valve	24 CGA 580 SS		
	81 1/8" stainless steel tube fitting	25 CGA 660 SS		
	83 1/4" stainless steel tube fitting	31 CGA 705 SS		
	85 1/4" FNPT stainless steel diaphragm valve with 1/4" tube fitting	32 CGA 590 SS		

SS = stainless steel

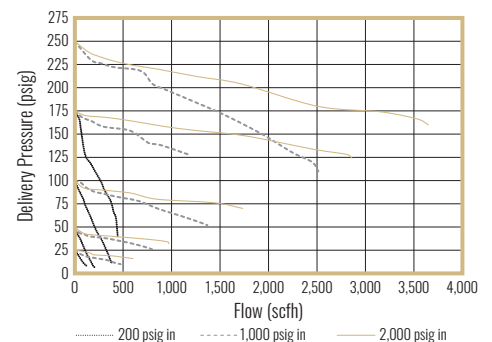
SPECIFICATIONS

Model	Delivery Gauge (psig)		Maximum Inlet Pressure 3,500 psig	Design Leak Rate 2×10^{-8} cc/s helium
	Range	Graduations		
310	0–30 (30" HG)	1	Inlet Gauge Range 0–4,000 psig	Flow Coefficient (Cv) 0.06
311	0–100	2	Inlet Gauge Graduations 100 psig	Inlet Decay Rate 0.75/100 psig
312	0–200	5	Temp. Operating Range -20 to +140°F	Base Weight 2.54 lb.
313	0–400	10	Ports (5) 1/4" FNPT	

MATERIALS

Body 316 stainless steel, bar stock	Filter 316 stainless steel
Bonnet Nickel-plated brass, bar stock	Seal FKM
Diaphragm 316 stainless steel	Inner Friction Sleeve PTFE
Seat PCTFE	Remaining Components Stainless steel

FLOW CURVE



320 SERIES

HIGH-PURITY CORROSION-RESISTANT TWO-STAGE CYLINDER REGULATORS

FEATURES

- Sure-Seal™ technology provides a filtered seat for added gas-stream purity and extended service life
- Stainless steel diaphragms resist corrosion, leaking and freeze-up if used with liquid (cryogenic) gases, for extended service life
- Metal-to-metal body-to-diaphragm seal for maximum leak integrity
- Captured vent ports (1/16" FNPT) in both bonnet stages allow for venting of hazardous gases in the event of a diaphragm failure
- Designed to withstand an internal vacuum for a more efficient purging process
- Designed for precise control from full to nearly empty cylinders, and where constant outlet pressures are required, regardless of inlet pressure fluctuations

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



Model
322-85220000

MODEL CONFIGURATION

1 **2** **3** **4** **5**
322 - **85** **22** **00** **00**

Create your custom stock number by choosing one option from each of the five sections below.

Example: Regulator with 0–100 psig outlet pressure, 1/4" FNPT stainless steel diaphragm valve with 1/4" tube outlet fitting, CGA SS 330 inlet fitting and no accessories or options.

1	2	3	4	5
Outlet Pressure	Outlet Fittings	Inlet Fittings	Accessories	Options
320 0–25 psig	00 None	00 None	00 None	00 None
321 0–50 psig	66 1/4" MNPT stainless steel needle valve	20 CGA 320 SS	01 Panel mount kit	01 Captured vent fitting
322 0–100 psig	67 1/4" MNPT stainless steel diaphragm valve	21 CGA 326 SS		1/16" MNPT x 1/8" tube (includes 2)
323 0–250 psig	68 1/4" FNPT stainless steel needle valve with 1/8" tube fitting	22 CGA 330 SS		
	69 1/4" FNPT stainless steel diaphragm valve with 1/8" tube fitting	23 CGA 350 SS		
	70 1/4" FNPT stainless steel diaphragm valve	24 CGA 580 SS		
	81 1/8" stainless steel tube fitting	25 CGA 660 SS		
	83 1/4" stainless steel tube fitting	31 CGA 705 SS		
	85 1/4" FNPT stainless steel diaphragm valve with 1/4" tube fitting	32 CGA 590 SS		

SS = stainless steel

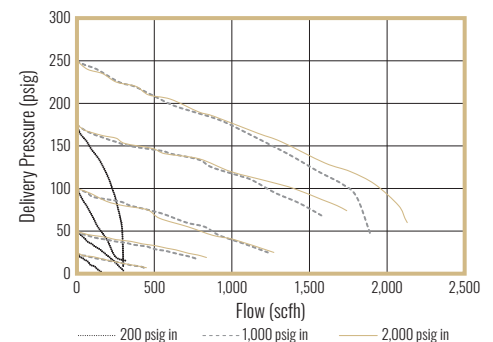
SPECIFICATIONS

Model	Delivery Gauge (psig)		Maximum Inlet Pressure 3,500 psig Inlet Gauge Range 0–4,000 psig Inlet Gauge Graduations 100 psig Temp. Operating Range -20 to +140°F	Ports (5) 1/4" FNPT Design Leak Rate 2 x 10 ⁻⁸ ccs helium Flow Coefficient (Cv) 0.04 Inlet Decay Rate 0.04/100 psig Base Weight 3.945 lb.
	Range	Graduations		
320	0–30 (30" HG)	1		
321	0–100	2		
322	0–200	5		
323	0–400	10		

MATERIALS

Body 316 stainless steel, bar stock	Filter 316 stainless steel
Bonnets Nickel-plated brass, bar stock	Seal FKM
Diaphragms 316 stainless steel	Inner Friction Sleeve PTFE
Seat PCTFE	Remaining Components Stainless steel

FLOW CURVE



600 SERIES

HIGH-PURITY LINE REGULATORS

FEATURES

- Sure-Seat™ technology provides a filtered seat for added gas-stream purity and extended service life
- Stainless steel diaphragm resists corrosion, leaking and freeze-up if used with liquid (cryogenic) gases, for extended service life
- Metal-to-metal body-to-diaphragm seal for maximum leak integrity
- Captured vent port (1/16" FNPT) in bonnet allows for venting of hazardous gases in the event of a diaphragm failure
- Designed to withstand an internal vacuum for a more efficient purging process



Model
602-00000000

MODEL CONFIGURATION

1 **2** **3** **4** **5**
602 - **00** **00** **00** **00**

Create your custom stock number by choosing one option from each of the five sections below.

Example: Regulator with 0-100 psig outlet pressure, no outlet or inlet fittings and no accessories or options.

1

Outlet Pressure

600 0-25 psig
 601 0-50 psig
 602 0-100 psig

2

Outlet Fittings

00 None
 80 1/8" brass tube fitting
 81 1/8" stainless steel tube fitting
 83 1/4" stainless steel tube fitting

3

Inlet Fittings

00 None
 11 1/8" brass tube fitting
 12 1/8" stainless steel tube fitting

4

Accessories

00 None
 01 Panel mount kit

5

Options

00 None
 01 Captured vent fitting
 1/16" MNPT x 1/8" tube

SPECIFICATIONS

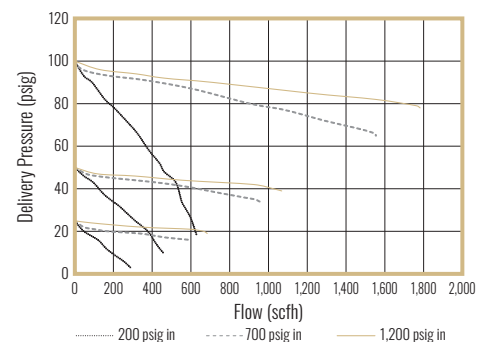
Model	Delivery Gauge (psig)		Maximum Inlet Pressure 1,200 psig	Flow Coefficient (Cv) 0.06
	Range	Graduations		
600	0-30 (30" HG)	1	Ports (4) 1/4" FNPT	Base Weight 2.385 lb.
601	0-60	1	Design Leak Rate 2 x 10 ⁻⁸ ccs helium	
602	0-200	5		

MATERIALS

Body Nickel-plated brass, bar stock
Bonnet Nickel-plated brass, bar stock
Diaphragm 316 stainless steel
Seat PFA

Filter 316 stainless steel
Seal FKM
Inner Friction Sleeve PTFE
Remaining Components Brass or stainless steel

FLOW CURVE

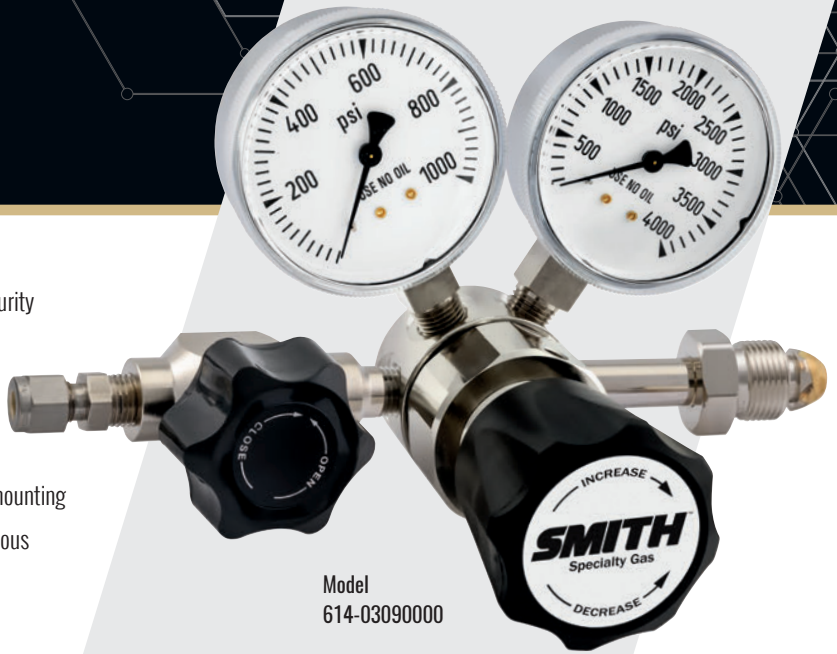


610 SERIES

HIGH-PURITY SINGLE-STAGE REGULATORS

FEATURES

- Sure-Seat™ technology provides a filtered seat for added gas-stream purity and extended service life
- Stainless steel diaphragm resists corrosion, leaking and freeze-up if used with liquid (cryogenic) gases, for extended service life
- Metal-to-metal body-to-diaphragm seal for maximum leak integrity
- Threaded bonnet for panel mounting and tapped body for rear-panel mounting
- Captured vent port (1/16" FNPT) in bonnet allows for venting of hazardous gases in the event of a diaphragm failure
- Designed to withstand an internal vacuum for a more efficient purging process



Model
614-03090000

MODEL CONFIGURATION

1 **2** **3** **4** **5**
614 - **03** **09** **00** **00**

Create your custom stock number by choosing one option from each of the five sections below.

Example: Regulator with 0–500 psig outlet pressure, 1/4" FNPT chrome diaphragm valve with 1/4" stainless steel tube outlet fitting, CGA 580 inlet fitting and no accessories or options.

1

Outlet Pressure
610 0–25 psig
611 0–50 psig
612 0–100 psig
613 0–250 psig
614 0–500 psig

2

Outlet Fittings
00 None
01 1/4" FNPT chrome diaphragm valve
02 1/4" FNPT chrome diaphragm valve with 1/8" stainless steel tube fitting
03 1/4" FNPT chrome diaphragm valve with 1/4" stainless steel tube fitting
20 1/4" MNPT chrome needle valve
42 1/4" FNPT chrome needle valve with 1/8" stainless steel tube fitting
81 1/8" stainless steel tube fitting
83 1/4" stainless steel tube fitting

3

Inlet Fittings
00 None
02 CGA 320
03 CGA 326
05 CGA 346
06 CGA 350
07 CGA 510
08 CGA 540
09 CGA 580
10 CGA 590

4

Accessories
00 None
01 Panel mount kit

5

Options
00 None
01 Captured vent fitting 1/16" MNPT x 1/8" tube

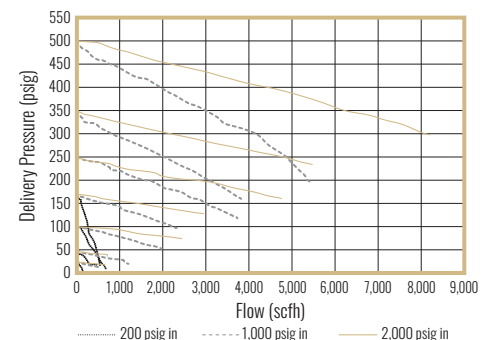
SPECIFICATIONS

Model	Delivery Gauge (psig)		Maximum Inlet Pressure 3,500 psig	Design Leak Rate 2 x 10 ⁻⁸ ccs helium
	Range	Graduations		
610	0–30 (30" HG)	1	Inlet Gauge Range 0–4,000 psig	Flow Coefficient (Cv) 0.11
611	0–60	1	Inlet Gauge Graduations 100 psig	Inlet Decay Rate 0.75/100 psig
612	0–200	5	Temp. Operating Range -20 to -140°F	Base Weight 2.65 lb.
613	0–400	10	Ports (5) 1/4" FNPT	
614	0–1,000	20		

MATERIALS

Body Nickel-plated brass, bar stock	Filter 316 stainless steel
Bonnet Nickel-plated brass, bar stock	Seal FKM
Diaphragm 316 stainless steel	Inner Friction Sleeve PTFE
Seat PFA	Remaining Components Brass or stainless steel

FLOW CURVE



620 SERIES

HIGH-PURITY TWO-STAGE REGULATORS

FEATURES

- Sure-Seat™ technology provides a filtered seat for added gas-stream purity and extended service life
- Stainless steel diaphragms resist corrosion, leaking and freeze-up if used with liquid (cryogenic) gases, for extended service life
- Metal-to-metal body-to-diaphragm seal for maximum leak integrity
- Threaded front and rear bonnet for panel mounting
- Captured vent ports (1/16" FNPT) in both bonnet stages allow for venting of hazardous gases in the event of a diaphragm failure
- Designed to withstand an internal vacuum for a more efficient purging process
- Designed for precise control from full to nearly empty cylinders, and where constant outlet pressures are required, regardless of inlet pressure fluctuations



Model
623-00060000

MODEL CONFIGURATION

1 **2** **3** **4** **5**
623 - **00** **06** **00** **00**

Create your custom stock number by choosing one option from each of the five sections below.

Example: Regulator with 0–250 psig outlet pressure, no outlet fitting, CGA 350 inlet fitting and no accessories or options.

1

Outlet Pressure

620	0–25 psig
621	0–50 psig
622	0–100 psig
623	0–250 psig

2

Outlet Fittings

00	None
01	1/4" FNPT chrome diaphragm valve
02	1/4" FNPT chrome diaphragm valve with 1/8" stainless steel tube fitting
03	1/4" FNPT chrome diaphragm valve with 1/4" stainless steel tube fitting
20	1/4" MNPT chrome needle valve
42	1/4" FNPT chrome needle valve with 1/8" stainless steel tube fitting
81	1/8" stainless steel tube fitting
83	1/4" stainless steel tube fitting

3

Inlet Fittings

00	None
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510
08	CGA 540
09	CGA 580
10	CGA 590

4

Accessories

00	None
01	Panel mount kit

5

Options

00	None
01	Captured vent fitting 1/16" MNPT x 1/8" tube (includes 2)

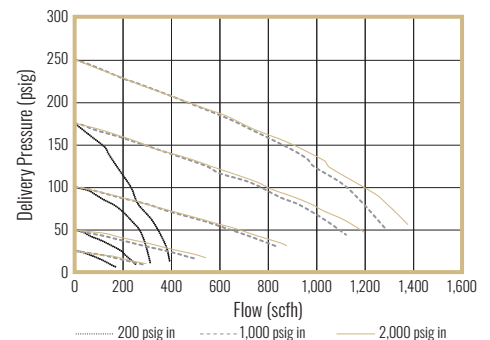
SPECIFICATIONS

Model	Delivery Gauge (psig)		Maximum Inlet Pressure 3,500 psig	Design Leak Rate 2×10^{-8} ccs helium
	Range	Graduations		
620	0–30 (30" HG)	1	Inlet Gauge Graduations 100 psig	Flow Coefficient (Cv) 0.04
621	0–60	1	Temp. Operating Range -20 to +140°F	Inlet Decay Rate 0.05/100 psig
622	0–200	5	Ports (4) 1/4" FNPT	Base Weight 3.975 lb.
623	0–400	10		

MATERIALS

Body	Nickel-plated brass, bar stock	Filter	316 stainless steel
Bonnets	Nickel-plated brass, bar stock	Seal	FKM
Diaphragms	316 stainless steel	Inner Friction Sleeve	PTFE
Seat	PFA	Remaining Components	Brass or stainless steel

FLOW CURVE



630 SERIES

LOW-FLOW (LECTURE BOTTLE) TWO-STAGE REGULATORS

FEATURES

- Stainless steel diaphragm resists corrosion, leaking and freeze-up if used with liquid (cryogenic) gases, for extended service life
- Built-in capturable preset relief valve protects regulator components from over pressurization
- Slim design makes it ideal for lab applications where space constraints exist
- Designed for precise control from full to nearly empty cylinders, and where constant outlet pressures are required, regardless of inlet pressure fluctuations



Model
631-4110

MODEL CONFIGURATION

1 **2** **3**
631 - **41** **10**

Create your custom stock number by choosing one option from each of the three sections below.

Example: Regulator with 0–10 psig outlet pressure, 1/4" FNPT chrome needle valve with 1/8" brass tube outlet fitting and CGA 590 inlet fitting.

1

Outlet Pressure
631 0–10 psig
632 0–50 psig
633 0–100 psig

2

Outlet Fittings
00 None
20 1/4" MNPT chrome needle valve
40 1/4" FNPT chrome needle valve
41 1/4" FNPT chrome needle valve with 1/8" brass tube fitting
42 1/4" FNPT chrome needle valve with 1/8" stainless steel tube fitting
82 Nickel 9/16-18 RH "B" fitting

3

Inlet Fittings
00 None
02 CGA 320
03 CGA 326
05 CGA 346
06 CGA 350
08 CGA 540
09 CGA 580
10 CGA 590

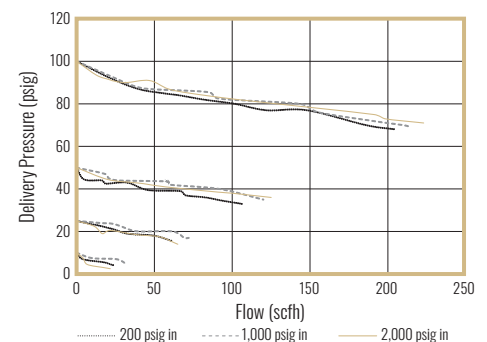
SPECIFICATIONS

Model	Delivery Range	Gauge (psig) Graduations	Relief Valve Setting (psig)	Maximum Inlet Pressure	Inlet Gauge Range	Inlet Gauge Graduations	Temp. Operating Range	Ports (4)	Inlet and Outlet	Design Leak Rate	Flow Coefficient (Cv)	Inlet Decay Rate	Base Weight
631	0–15	0.2	365	3,000 psig	0–3,000 psig	50 psig	-20 to +140°F	1/8" and 1/4" FNPT	1/4" FNPT	1 x 10 ⁻⁴ ccs helium	0.01	0.26/100 psig	2.33 lb.
632	0–100	2	365										
633	0–200	5	365										

MATERIALS

Body	Nickel-plated brass, bar stock	Filters	Bronze
Bonnets	Nickel-plated brass, bar stock	Seals	FKM
Piston (1st stage)	Brass	Inner Friction Sleeve	PTFE
Diaphragm (2nd stage)	316 stainless steel	Relief Valve Seat	TPE
Seats	PTFE (1st stage), PFA (2nd stage)	Remaining Components	Nickel-plated brass

FLOW CURVE



810 SERIES

PISTON-SENSOR ANALYTICAL SINGLE-STAGE REGULATORS

FEATURES

- Sure-Seat™ technology provides a filtered seat for added gas-stream purity and extended service life
- Captured vent port (1/16" FNPT) in bonnet allows for venting of hazardous gases in the event of a diaphragm failure
- Piston-sensor design provides structural reliability in high-pressure use



Model
812-02030000

MODEL CONFIGURATION

1 **2** **3** **4** **5**
812 - **02** **03** **00** **00**

Create your custom stock number by choosing one option from each of the five sections below.
 Example: Regulator with self-venting 0-250 psig outlet pressure, 1/4" FNPT chrome diaphragm valve with 1/8" stainless steel tube fitting outlet fitting, CGA 326 inlet fitting and no accessories or options.

1

Outlet Pressure

811	0-100 psig (self-venting)
812	0-250 psig (self-venting)
813	0-500 psig (self-venting)
816	0-100 psig (non-venting)
817	0-250 psig (non-venting)
818	0-500 psig (non-venting)

2

Outlet Fittings

00	None
01	1/4" FNPT chrome diaphragm valve
02	1/4" FNPT chrome diaphragm valve with 1/8" stainless steel tube fitting
03	1/4" FNPT chrome diaphragm valve with 1/4" stainless steel tube fitting
20	1/4" MNPT chrome needle valve
42	1/4" FNPT chrome needle valve with 1/8" stainless steel tube fitting
81	1/8" stainless steel tube fitting

3

Inlet Fittings

00	None
02	CGA 320
03	CGA 326
05	CGA 346
06	CGA 350
07	CGA 510
08	CGA 540
09	CGA 580

4

Accessories

00	None
01	Panel mount kit

5

Options

00	None
01	Captured vent fitting 1/16" MNPT x 1/8" tube

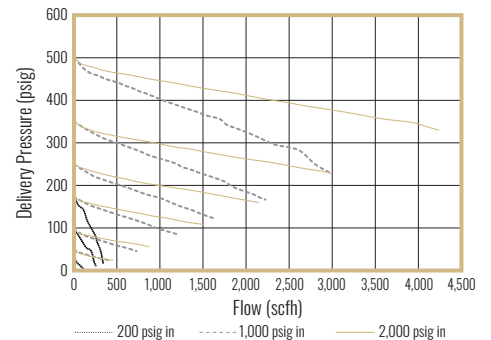
SPECIFICATIONS

Model	Delivery Gauge (psig)		Maximum Inlet Pressure 3,500 psig	Outlet 1/4" FNPT
	Range	Graduations		
811	0-200	5	Inlet Gauge Range 0-4,000 psig	Flow Coefficient (Cv) 0.06
812	0-400	10	Inlet Gauge Graduations 100 psig	Inlet Decay Rate 0.02/100 psig
813	0-1,000	20	Temp. Operating Range -20 to -140°F	Base Weight 2.915 lb.
816	0-200	5	Ports (4) 1/4" FNPT	
817	0-400	10		
818	0-1,000	20		

MATERIALS

Body Nickel-plated brass, bar stock	Filter 316 stainless steel
Bonnet Nickel-plated brass, bar stock	Seal Buna-N
Diaphragm Brass piston	Inner Friction Sleeve PTFE
Seat PFA	Remaining Components Brass or stainless steel

FLOW CURVE



820 SERIES

HIGH-PRESSURE ANALYTICAL SINGLE-STAGE REGULATORS

FEATURES

- Built to withstand inlet pressures up to 6,000 psi
- Designed to control high pressures from a wide variety of non-corrosive inert gases
- Captured vent port (1/16" FNPT) in bonnet allows for venting of hazardous gases in the event of a piston failure
- Resin bonnet insert allows smooth, easy adjustment even at high-pressure levels
- Piston-sensor design provides structural reliability in high-pressure use



Model
827-6627

MODEL CONFIGURATION

1 **2** **3**
827 - **66** **27**

Create your custom stock number by choosing one option from each of the three sections below.

Example: Regulator with 0–6,000 psig outlet pressure, 1/4" MNPT stainless steel needle valve outlet fitting and a CGA 677 stainless steel inlet fitting.

1	Outlet Pressure
823	0–500 psig
824	0–1,000 psig
825	0–2,000 psig
826	0–4,000 psig
827	0–6,000 psig

2	Outlet Fittings
00	None
66	1/4" MNPT stainless steel needle valve

3	Inlet Fittings*/Maximum Inlet Pressure
00	None
09	CGA 580 brass 3,000 psig
26	CGA 347 SS 4,700 psig
27	CGA 677 SS 6,400 psig
28	CGA 680 SS 4,700 psig

*Additional inlet fittings available
SS = stainless steel

SPECIFICATIONS

Model	Delivery Gauge (psig)		Maximum Inlet Pressure 6,000 psig Inlet Gauge Range 0–10,000 psig Inlet Gauge Graduations 200 psig	Temp. Operating Range -20 to -140°F Ports (4) 1/4" FNPT	Inlet and Outlet 1/4" FNPT Design Leak Rate 1 x 10 ⁻⁵ ccs Inlet Decay Rate 7.3/100 psig Base Weight 3.545 lb.
	Range	Graduations			
823	0–1,000	100			
824	0–4,000	100			
825	0–4,000	100			
826	0–6,000	100			
827	0–6,000	100			

MATERIALS

Body Nickel-plated brass, bar stock
Bonnet Nickel-plated brass, bar stock

Diaphragm Brass piston
Seat PCTFE

Filter Bronze
Seal Buna-N

Inner Friction Sleeve PTFE
Remaining Components Brass or stainless steel

REPLACEMENT PARTS

Gauges — 2-1/2" Chrome-Plated Brass, 1/4" MNPT

Part Number	Range
GA086-07	30-0-30 psig
GA062-07	0-30 psig
GA087-07	0-60 psig
GA088-07	0-200 psig
GA056-07	0-400 psig
GA116-07	0-1,000 psig
GA090-07	0-4,000 psig
GA068-07	0-10,000 psig

Gauges — 2-1/2" Stainless Steel, 1/4" MNPT

Part Number	Range
GA096-07	30-0-30 psig
GA097-07	0-100 psig
GA098-07	0-200 psig
GA099-07	0-400 psig
GA100-07	0-4,000 psig

CGA Connections — Nickel-Plated Brass

CGA	Nipple	Nut	Filter	Washer
320	E99-320C13	CGA320-1P	Factory-installed	Factory-installed
326	E99-326C13	CGA320-1P	H713-23	—
346	—	CGA320-1P	8203	—
350	CGA350-2EP	CGA350-1P	Factory-installed	—
510	CGA510-2EP	CGA510-1P	—	—
540	CGA540-2EP	CGA540-1P	H713-23	—
580	CGA510-2EP	CGA580-1P	H713-23	—
590	CGA510-2EP	CGA590-1P	H713-23	—

CGA Connections — Stainless Steel

CGA	Nipple	Nut	Washer
320	E99-320C43	E99-320C44	15200
326	E99-326C43	E99-320C44	—
330	E99-330C43	E99-330C44	15200
347	E99-347C43	E99-347C44	—
350	E99-350C43	E99-350C44	—
580	E99-580C43	E99-580C44	—
590	E99-580C43	E99-590C44	—
660	E99-660C43	E99-660C44	E99-660W5
677	E99-677C43	E99-677C44	—
680	E99-680C43	E99-680C44	—



NEEDLE VALVES

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

SPECIFICATIONS

Maximum Inlet Pressure

SST Valves 6,000 psig
Brass Valves 3,000 psig

Temp. Operating Range -65° to +165°F

Materials of Construction

Part Number	Body	Stem	Outlet	Inlet	Orifice	Cv
15535	Nickel-plated brass	316 SST	1/4" MNPT	1/4" MNPT	0.170	0.35
15536	Nickel-plated brass	316 SST	1/4" FNPT	1/4" MNPT	0.170	0.35
15552	316 stainless steel	316 SST	1/4" MNPT	1/4" MNPT	0.140	0.27
14803	316 stainless steel	316 SST	1/4" FNPT	1/4" MNPT	0.140	0.27



DIAPHRAGM VALVES

The multiple-metal diaphragm design and PCTFE seats are key elements to the high success of these valves, which 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.

SPECIFICATIONS

Maximum Inlet Pressure 3,000 psig
Temp. Operating Range -40° to +200°F
Body Brass or stainless steel
Seat PCTFE

Materials of Construction

Part Number	Body	Outlet	Inlet	Orifice	Cv
15503	Brass	1/4" FNPT	1/4" MNPT	0.140	0.27
14804	316 stainless steel	1/4" MNPT	1/4" MNPT	0.094	0.13
14805	316 stainless steel	1/4" FNPT	1/4" MNPT	0.094	0.13

REPLACEMENT PARTS

Tube Fittings

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

Panel Mounting Kit

Part Number	Description
14791	Panel mounting kit (includes 2 nuts) For 300, 600 and 810 Series regulators

GLOSSARY

Bar Stock Body — A body made by machining out a solid piece of cold-drawn metal bar. This body is used for high-purity applications to reduce internal volume (smaller internal cavities). The tight grain structure of the metal prevents internal surfaces from absorbing moisture and provides easy purging to remove contaminants like moisture and oxygen.

Inert Gas — A gas that is noncombustible and incapable of supporting combustion. Contains less than two percent oxygen and combustible constituents of less than 50 percent of the lower explosive limit of the combustible being purged.

Mixed Gas — A blend of two or more gases in a shared volume.

Captured Venting — An additional port in a regulator design that allows piping away of expelled gas from the regulator's vent valve. It is a feature in self-venting pressure reducing regulators.

Decay-Rise — Phenomenon in single-stage regulators when inlet pressure drops and outlet pressure automatically increases. This is caused by a drop in back-pressure against the high-pressure seat, allowing the bonnet spring to push the seat further open. The amount is determined by the regulator design and size. Ranges run from 1/4 to 2 psig per 100 psig in cylinder pressure drop.

Diaphragm — A regulator component that senses the force placed on the spring to set the delivery pressure. Common diaphragm materials are Buna-N, FKM, ethylene propylene, 316 stainless steel and Elgiloy.

Diffusion — Occurs when gas molecules disperse throughout the container.

Droop — The outlet pressure changes from the set pressure as the flow rate increases.

Flow Chart/Curve — Shows the correlation between flow rate and delivery pressure of the regulator at a given inlet pressure. See below for how to read a flow chart.

Flow Coefficient (Cv) — The Cv represents the regulator's maximum flow capacity. At maximum flow, a regulator can no longer control pressure. The standard coefficient Cv is defined as the flow of 1 gpm of water at 1 psi pressure drop. In gaseous service, it is dependent on the ratio of inlet to outlet pressure.

Elastomers — Material construction of regulator diaphragm – neoprene, FKM, etc. When a regulator is detached from the gas source, it is exposed to ambient air. An elastomeric diaphragm will absorb moisture and contaminants from the air. Compared to a stainless steel diaphragm, an elastomeric diaphragm releases contaminants into the system when the regulator is put back in service.

Inlet Pressure — The pressure of the gas at the supply connection of a regulator or valve. Measured in units of psig, bar or pascal.

Lockup — The increase in outlet pressure above the set pressure as the flow is decreased to zero.

Offgas or Outgas — Release of contaminants.

Outlet Pressure — The pressure of the gas from the discharge connection of a regulator or valve.

Purge — The act of removing the content of a pipe or container and replacing it with another gas or liquid.

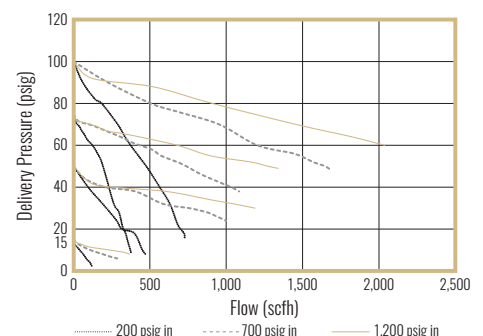
Seals — A regulator seal is between the body and the diaphragm. Seals maintain system purity by blocking the leakage point through which contaminants may enter. A metal-to-metal seal is the most reliable and leak-free seal.

Stratification — Process of different gases settling into layers.

Wetted Surface — Regulator components that come in contact with the gas stream. The regulator's material of construction should be compatible with the gas used.

How to Read a Flow Chart — There are multiple ways to use a flow chart. Each method relies on a pair of known values for inlet pressure, outlet pressure, or flow rate to determine the third. For example, if the inlet and outlet pressures are known and you wish to know the flow rate, the following steps may be used:

1. Identify curve corresponding to the system's inlet pressure. Different colors or symbols may be used to differentiate one inlet pressure from another.
2. Find desired delivery pressure on vertical axis.
3. Move horizontally across the chart until the line corresponding to the desired outlet pressure intersects the curve corresponding to the inlet pressure.
4. Read the flow rate marked along the horizontal axis.



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