TABLE OF CONTENTS *(equipment listed in alphabetical order)*

TABLE OF CONTENTS *CONTINUED*

TABLE OF CONTENTS *CONTINUED*

Trademarks

Auto-Logic	- SGD Inc.	Leak-Tector	- SGD Inc.	Teflon	- E. I. DuPont de Nemours and Company, Inc.
Elgiloy	- Combined Metals of Chicago, LLC	Lexan	- GE Plastics	Ultra-Logic	- SGD Inc.
Hastelloy	- Haynes International	Monel	- Huntington Alloy Corp.	Viton	- DuPont Performance Elastomers
Kel-F	- 3M Company	Nylon	- E. I. DuPont de Nemours and Company, Inc.	Whisper Valve	- SGD Inc.

A BRIEF TUTORIAL ON GAS HANDLING EQUIPMENT

PRESSURE REGULATORS

Pressure regulators (often just called regulators) are used in a gas system to reduce the pressure from a high pressure source, such as a compressed gas cylinder or a gas supply pipeline, to a safe level consistent with the pressure rating of the system to which the gas is being supplied. They provide positive control of the source pressure in a gas system. This control of pressure permits better control of flow rates and helps to provide a safer operation.

There are two basic types of pressure regulators; two-stage and one-stage. The outward appearance of both types is very similar and it is often difficult for the novice to identify the two types.

Most two-stage and one-stage pressure regulators are fitted with two pressure gauges; one to monitor the inlet pressure and the other to monitor the delivery pressure. Line regulators and some regulators used on liquefied gases have only a delivery pressure gauge, because in these applications the inlet pressure is virtually constant. Historically, the compressed gas industry has established the convention of placing the inlet and high pressure gauge on the right and the low pressure and delivery pressure gauge on the left.

A pressure regulator **does not** control flow, but precise control of pressure is required for precise flow control. This is accomplished by the installation of a valve on the outlet side of the regulator in conjunction with a flowmeter or electronic mass flow controller.

What is the difference between a two-stage and one-stage pressure regulator? A two-stage regulator reduces the pressure in two steps. In the first stage the high pressure gas is reduced to a pre-set intermediate pressure level, then reduced again in the second stage to the manually adjusted value desired by the operator. This two step reduction provides steady gas delivery throughout the discharge of almost the full cylinder contents. This is why two-stage regulators are used whenever the discharge pressure of a system must be precisely maintained. Two-stage regulators are generally used whenever the compressed gas cylinder pressure exceeds 1000 psig. Cylinders having a pressure less than 1000 psig are generally fitted with a one-stage regulator since the advantage of the two-stage regulator is minimized by the lower inlet pressure.

One-stage regulators perform the same service as two-stage regulators, but in one step. Thus, the discharge pressure is not controlled with the same precision, because the discharge pressure will vary widely over the full range of cylinder pressures unless periodic adjustments are made to compensate for decreasing inlet pressures. One-stage regulators are economic alternatives in applications where precise control is not required or usage is intermittent over the life time of the source cylinder.

NOTE: See pages 130-146 for gas data and equipment recommendations.

RELIEF VALVES

Relief valves are installed in systems or regulators to protect against over pressurization of system components that are not capable of withstanding the higher pressures that could enter the protected region upon the failure of another system component or an operator error. Relief valves are generally offered in two types, adjustable or fixed pressure. Adjustable units can be set by the user at different pressures within a reasonably wide range. Fixed pressure units are preset at the factory for one pressure and cannot easily be changed.

PURGE DEVICES

Purge devices are valving systems usually installed on the inlet side of a pressure regulator, to maintain the integrity of a high purity gas system, remove toxic or corrosive residual gases from the regulator inlet, and/or protect the operator from exposure during cylinder changeovers or system shut-downs.

MANUAL CONTROLS

Manual controls are valves that have been designed for direct connection to a compressed gas cylinder valve outlet. They provide a simple means of transferring the contents of a cylinder to another system or vessel. They **do not control pressure** and should never be used without an operator in attendance at all times. A safety relief device should be installed in any system employing a manual control.

FLOWMETERS

Flowmeters are used in fluid systems to indicate the rate of flow of the fluid. They do not control the rate of flow unless they are equipped with a valve or flow controller. Rotameters and electronic mass flowmeters are the two basic types of flow measuring devices available. For more specific information see pages 31-39.

PURIFIERS

Purifiers are devices that are designed to remove specific impurities or components from a gas stream. They generally function by adsorption or catalytic action. Some are designed as housings that accept replaceable cartridges containing the adsorbing materials, others are sealed units that are replaced completely, while others require no replacement or can be regenerated in place.

PARTICULATE FILTERS

Gas line filters are devices designed to remove particles from the gas stream in which they are installed. The size of the particles removed is determined by the filter media used. A filter's rating is usually expressed in microns, referring to the maximum size diameter that will pass through the filter.

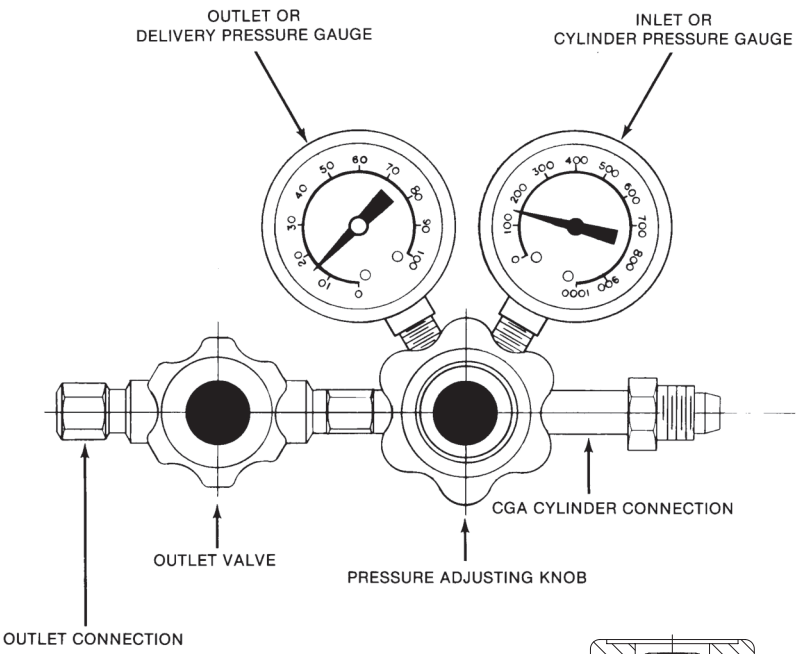
VALVES

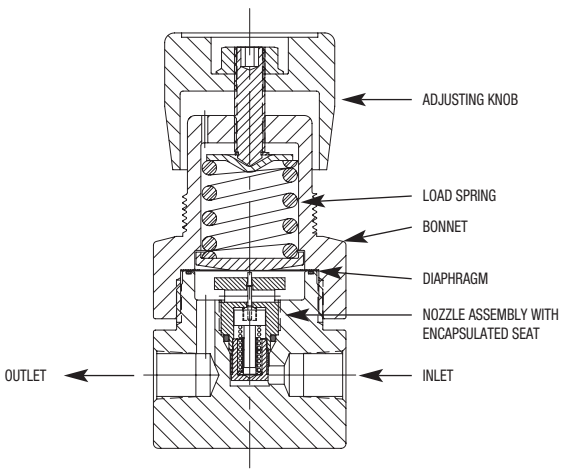
There are two basic types of valves used with gases; diaphragm packless and packed. Diaphragm, packless valves are used for on/off control or rough flow control in high purity applications. They are designed using a metal diaphragm to seal the gas cavity from the valve stem threads. Packed valves are designed with a packing gland that creates a seal on the valve stem. This packing may be above or below the threads of the valve, depending on the intended application.

CYLINDER SCALES

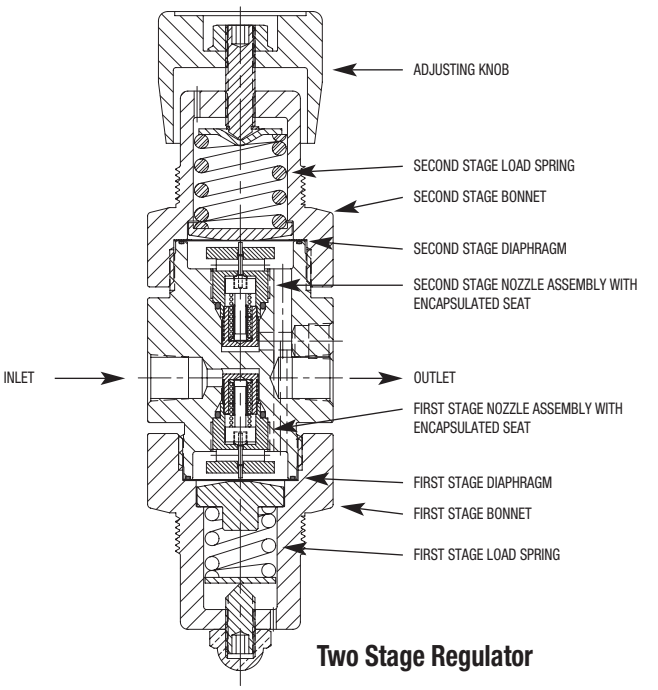
A cylinder scale is used to monitor the contents of a liquefied gas cylinder feeding a critical batch operation where a lack of gas during the run would cause the batch to fail. Cylinder scales are designed to provide a positive indication of the amount of product remaining in the cylinder. Two types are generally offered, mechanical and electronic. Electronic scales offer the added benefit of a low weight alarm and relay contacts to operate accessory equipment. Both types are offered in this catalog.

pressure regulator component designations





Single Stage Regulator



Two Stage Regulator

BRASS
HIGH PURITY 1-STAGE REGULATOR
Series 3100

DESCRIPTION

The Series 3100 single stage regulators are designed and constructed for both high purity, low volume use and general purpose applications. They provide outstanding performance, yet they are rugged and versatile enough for the laboratory or plant. The relative low cost of these units has established them as the pressure regulator of choice in many plants and laboratories.

FEATURES

- Small internal volume - less than 5 cc.
- High purity diffusion resistant, metal diaphragm construction.
- Encapsulated seat.
- Diffusion resistant, brass diaphragm packless control valve installed on outlet as standard.
- Designed to pass an inboard helium leak-rate test of $1x10^{-9}$ cc per sec.
- All parts ultrasonically cleaned prior to assembly.
- Rear panel mounting holes.

APPLICATIONS

The 3100 Series regulators are ideally suited for use with small cylinders of Research Purity or Ultra High Purity gases. The small internal volume and high purity design result in more efficient use of expensive materials because it takes less gas to fill the internal cavity. They are also useful for less critical pressure reduction applications, where the precise control of pressure or flow is not required.

Special 3103A model for acetylene.

NOTE: See pages 130-146 for gas data and equipment recommendations.

SPECIFICATIONS

Max. Inlet Pressure: 3000 psig
Operating Temp. Range: -40° to +185°F.
Flow Coefficient (C_V): 0.08 Standard, 0.2 optional **
Inlet and Outlet: 1/4" NPT female
Outlet Valve Standard

MATERIALS OF CONSTRUCTION

Body: brass
Nozzle Assembly: brass
Seat: Kel-F®
Diaphragm: stainless steel
Diaphragm Seal: Teflon®
Inlet Filter: stainless steel
Bonnet: nickel plated aluminum
Gauges: brass
Knob: aluminum - black anodized

HOW TO ORDER***

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3101-25-CGA*	5-25	0-60	0-4000
3101-50-CGA*	5-50	0-100	0-4000
3101-100-CGA*	10-100	0-200	0-4000
3101-250-CGA*	10-250	0-400	0-4000
3101-500-CGA*	100-500	0-600	0-4000
3102-25-CGA*	5-25	0-60	0-2000
3102-50-CGA*	5-50	0-100	0-2000
3102-100-CGA*	10-100	0-200	0-2000
3102-250-CGA*	10-250	0-400	0-2000
3103A-15-510	0-15	0-30 redline	0-400
3103-25-CGA*	5-25	0-60	0-400
3103-50-CGA*	5-50	0-100	0-400
3103-100-CGA*	10-100	0-200	0-400

*Specify CGA Connection Number when ordering.
** Add "HF" to basic model number (i.e., 3101HF -25-CGA).
***For panel mounting bonnet add "PM" to base number (i.e., 3101PM-25-CGA).

OUTLET OPTIONS

	P/N Suffix
No Outlet Valve	NV
1/4" Compression Fitting	T4F
1/8" Compression Fitting	T2F
1/4" NPT Male	P4M
1/4" Hose Barb	4HB

EZ3100 Bracket (see page 101).

BRASS
HIGH PURITY 2-STAGE REGULATOR
Series 3200

DESCRIPTION

The Series 3200 two stage regulators are designed and constructed for both high purity and general purpose applications. While compact in design these regulators provide outstanding performance, comparable to most larger diaphragm competitive models. They are ideally suited for use with gases and gas mixtures having a full cylinder pressure of 1000 psig or more. The construction is rugged enough for the plant, yet versatile enough for the laboratory.

FEATURES

- High purity diffusion resistant, metal diaphragm construction on both stages.
- Encapsulated seats on both stages.
- Diffusion resistant, brass diaphragm packless control valve installed on outlet as standard.
- Designed to pass an inboard helium leak-rate test of $1x10^{-9}$ cc per sec.
- All parts ultrasonically cleaned prior to assembly.
- Optional interstage safety relief valve available.

APPLICATIONS

The 3200 Series regulators are ideal for critical pressure reduction applications, where the precise control of pressure or flow is required. They are an excellent choice for use with high purity carrier gases or gas mixtures used with gas chromatographs and other instrumentation. Once you experience the improved control of gas to your gas chromatograph or other system, you will want to upgrade all your other regulators.

SPECIFICATIONS

Max. Inlet Pressure: 3000 psig
Operating Temp. Range: -40° to +185°F.
Flow Coefficient(C_V): 0.08 Standard, 0.2 optional**
Inlet and Outlet: 1/4" NPT female
Outlet Valve Standard
Delivery Pressure Rise: 0.02 psig max. per 100 psi inlet pressure decay.

MATERIALS OF CONSTRUCTION

Body: brass
Nozzle Assemblies: brass
Seat: 1st stage - Kel-F®
2nd stage - Kel-F®
Diaphragm: stainless steel
Diaphragm Seal: Teflon®
Inlet Filter: stainless steel
Bonnet: nickel plated aluminum
Gauges: brass
Knob: aluminum - black anodized

EZ3200 Bracket
(see page 101).

HOW TO ORDER***

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3201-10-CGA*	5-10	0-30	0-4000
3201-25-CGA*	5-25	0-30	0-4000
3201-50-CGA*	5-50	0-100	0-4000
3201-100-CGA*	10-100	0-200	0-4000
3201-250-CGA*	10-250	0-400	0-4000
3201-500-CGA*	100-500	0-600	0-4000

*Specify CGA connection number when ordering.
**Add "HF" to basic model number (i.e. 3201 HF-25-CGA).
***For panel mounting bonnet add "PM" to base number (i.e., 3201PM-50-CGA).

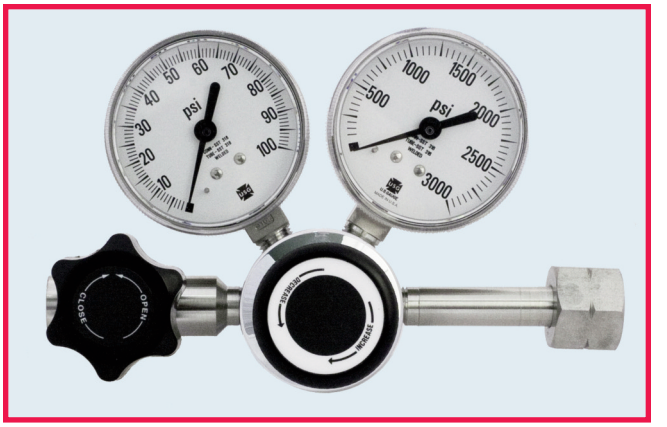
OUTLET OPTIONS

	P/N Suffix
No Outlet Valve	NV
1/4" Compression Fitting	T4F
1/8" Compression Fitting	T2F
1/4" NPT Male	P4M
1/4" Hose Barb	4HB

STAINLESS STEEL HIGH PURITY 1-STAGE REGULATOR Series 3400

DESCRIPTION

The Series 3400 single stage regulators are designed and constructed for both high purity and general purpose applications. They provide outstanding performance, yet they are rugged and versatile enough for the laboratory or plant.



FEATURES

- Low internal volume - less than 5 cc.
- High purity diffusion resistant, metal diaphragm construction.
- Encapsulated seat.
- Diffusion resistant, stainless steel diaphragm packless control valve installed on outlet as standard.
- Designed to pass an inboard helium leak-rate test of $1x10^{-9}$ cc per sec.
- All parts ultrasonically cleaned prior to assembly.
- Rear panel mounting holes.

APPLICATIONS

The 3400 Series regulators are ideal for use with many corrosive gases, such as ammonia, hydrogen sulfide, and sulfur dioxide. They are also very useful for controlling the pressure of gas mixtures containing reactive gas components and low levels of the corrosive halogen gases, like chlorine.

SPECIFICATIONS

Max. Inlet Pressure: 3000 psig
Operating Temp. Range: -40° to +185°F.
Flow Coefficient (C_V): 0.08 standard, 0.2 optional**
Inlet and Outlet: 1/4" NPT female
Outlet Valve Standard

MATERIALS OF CONSTRUCTION

Body: 316L stainless steel
Nozzle Assembly: 316 stainless steel
Seat: Kel-F®
Diaphragm: stainless steel
Diaphragm Seal: Teflon®
Inlet Filter: stainless steel
Bonnet: nickel plated aluminum
Gauges: 316 stainless steel
Knob: aluminum - black anodized

NOTE: See pages 130-146 for gas data and equipment recommendations.

HOW TO ORDER***

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3401-25-CGA*	5-25	0-60	0-3000
3401-50-CGA*	5-50	0-100	0-3000
3401-100-CGA*	10-100	0-200	0-3000
3401-250-CGA*	25-250	0-400	0-3000
3401-500-CGA*	100-500	0-600	0-3000
3402-25-CGA*	5-25	0-60	0-2000
3402-50-CGA*	5-50	0-100	0-2000
3402-100-CGA*	10-100	0-200	0-2000
3403-25-CGA*	5-25	0-60	0-400
3403-50-CGA*	5-50	0-100	0-400

*Specify CGA Connection Number when ordering.
** Add "HF" to basic model number (i.e. 3401HF -25-CGA).
***For panel mounting bonnet add "PM" to base number (i.e., 3401PM-50-CGA).

Warning: A Purge assembly (see pages 96 and 97) is strongly suggested when using the above regulators with any corrosive gas.

OUTLET OPTIONS

	P/N Suffix
No Outlet Valve	NV
1/4" Compression Fitting	T4F
1/8" Compression Fitting	T2F
1/4" NPT Male	P4M
1/4" Hose Barb	4HB

EZ3100 Bracket (see page 101).

STAINLESS STEEL
HIGH PURITY 2-STAGE REGULATOR
Series 3500

DESCRIPTION

The Series 3500 two stage regulators are designed and constructed for both high purity and general purpose applications. While compact in design these regulators provide outstanding performance, comparable to most larger diaphragm competitive models. They are an excellent choice for use with ultra high purity gases or gas mixtures having a full cylinder pressure of 1000 psig or more. They are rugged and versatile enough for the laboratory or plant.

FEATURES

- High purity diffusion resistant, metal diaphragm construction on both stages.
- Encapsulated seats on both stages.
- Diffusion resistant, stainless steel diaphragm packless control valve installed on outlet as standard.
- Designed to pass an inboard helium leak-rate test of $1x10^{-9}$ cc per sec.
- All parts ultrasonically cleaned prior to assembly.
- Optional interstage safety relief valve available.

APPLICATIONS

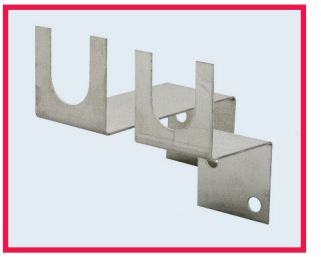
The 3500 Series regulators are ideal for critical pressure reduction applications, where the precise control of pressure or flow is required. They are also very useful for controlling the pressure of gas mixtures containing corrosive gases, such as ammonia, hydrogen sulfide, sulfur dioxide, and low levels of the corrosive halogen gases, like chlorine.

SPECIFICATIONS

Max. Inlet Pressure: 3000 psig
Operating Temp. Range: -40° to +185° F.
Flow Coefficient (C_V): 0.08 standard, 0.2 optional**
Inlet and Outlet: 1/4" NPT female
Outlet Valve Standard
Delivery Pressure Rise: 0.02 psig max. per 100 psi inlet pressure decay.

MATERIALS OF CONSTRUCTION

Body: 316 stainless steel
Nozzle Assemblies: 316 stainless steel
Nozzles: 316 stainless steel
Seat: 1st stage - Kel-F®
2nd stage - Kel-F®
Diaphragm: stainless steel
Diaphragm Seal: Teflon®
Inlet Filter: stainless steel
Bonnet: nickel plated aluminum
Gauges: 316 stainless steel
Knob: aluminum - black anodized



EZ Mounting Brackets (see page 101).

HOW TO ORDER***

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3501-10-CGA*	5-10	0-30	0-3000
3501-25-CGA*	5-25	0-30	0-3000
3501-50-CGA*	5-50	0-100	0-3000
3501-100-CGA*	10-100	0-200	0-3000
3501-250-CGA*	25-250	0-400	0-3000
3501-500-CGA*	100-500	0-1000	0-3000

*Specify CGA Connection Number when ordering.
**Add "HF" to basic model number (i.e. 3501 HF-25-CGA).
***For panel mounting bonnet add "PM" to base number (i.e., 3501PM-50-CGA).

OUTLET OPTIONS

	P/N Suffix
No Outlet Valve	NV
1/4" Compression Fitting	T4F
1/8" Compression Fitting	T2F
1/4" NPT Male	P4M
1/4" Hose Barb	4HB

Warning: A Purge assembly (see pages 96 and 97) is strongly suggested when using the above regulators with any corrosive gas.

ECONOMICAL, CORROSIVE GAS, HIGH PURITY 1-STAGE REGULATOR Series 3450

DESCRIPTION

The Series 3450 single stage regulators are specifically designed and constructed for use with difficult to handle gases, like chlorine and hydrogen chloride. The monel® internal parts installed in a 316L stainless steel body create an economical high purity corrosive gas regulator for most applications.

FEATURES

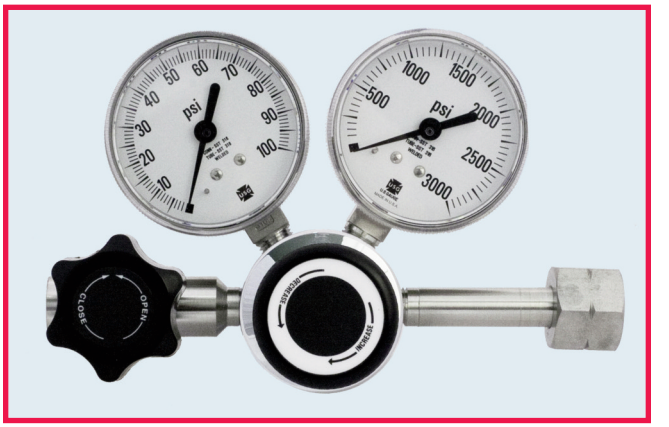
- Monel® internal parts for added corrosion resistance.
- Encapsulated seat.
- High purity diffusion resistant, metal diaphragm construction.
- Diffusion resistant, diaphragm packless control valve installed on outlet as standard.
- Designed to pass an inboard helium leak-rate test of $1x10^{-9}$ cc per sec.
- All parts ultrasonically cleaned prior to assembly
- Rear panel mounting holes.

APPLICATIONS

The 3450 Series regulators are ideal for use with many corrosive gases, such as chlorine, hydrogen chloride, boron trichloride, and boron triflouride. They are also useful for controlling the pressure of gas mixtures containing these corrosive gas components, particularly at higher concentration levels.

SPECIFICATIONS

Max. Inlet Pressure: 3000 psig
Operating Temp. Range: -40° to +185°F.
Flow Coefficient(C_V): 0.08
Inlet and Outlet: 1/4" NPT Female
Outlet Valve Standard



MATERIALS OF CONSTRUCTION

Body: 316L stainless steel
Seat Assembly: Monel®
Seat: Kel-F®
Diaphragm: Elgiloy
Diaphragm Seal: Teflon®
Inlet Filter: Monel®
Bonnet: nickel plated aluminum
Gauges: 316 stainless steel
Outlet Valve: 316 stainless steel
Outlet Connections: 316 stainless steel
Knob: aluminum - black anodized

NOTE: See pages 130-146 for gas data and equipment recommendations.

HOW TO ORDER***

Model Number+	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3451-25-CGA*	5-25	0-60	0-3000
3451-50-CGA*	5-50	0-100	0-3000
3451-100-CGA*	10-100	0-200	0-3000
3452-25-CGA*	5-25	0-60	0-1000
3452-50-CGA*	5-50	0-100	0-1000
3452-100-CGA*	10-100	0-200	0-1000
3453-25-CGA*	5-25	0-60	0-400
3453-50-CGA*	5-50	0-100	0-400
3454-25-CGA*	5-25	0-60	none
3454-50-CGA*	5-50	0-100	none

*Specify CGA Connection Number when ordering
***For panel mounting bonnet add "PM" to base number (i.e., 3451PM-50-CGA).

Warning: A Purge assembly (see pages 96 and 97) is strongly suggested when using the above regulators with any corrosive gas.

OUTLET OPTIONS

	P/N Suffix
No Outlet Valve	NV
1/4" Compression Fitting	T4F
1/8" Compression Fitting	T2F
1/4" NPT Male	P4M
1/4" Hose Barb	4HB

EZ3100 Bracket (see page 101).

ECONOMICAL, CORROSIVE GAS, HIGH PURITY 2-STAGE REGULATOR Series 3550

DESCRIPTION

The Series 3550 two stage regulators are designed and constructed for use with reactive and corrosive gases and gas mixtures. While compact in design these regulators provide outstanding performance, comparable to most larger diaphragm competitive models. The monel® internal parts installed in a 316L stainless steel body create an economical, high purity, corrosive gas regulator.

FEATURES

- Monel® internal parts for added corrosion resistance.
- High purity diffusion resistant, metal diaphragm construction on both stages.
- Encapsulated seats on both stages.
- Diffusion resistant, stainless steel diaphragm packless control valve installed on outlet as standard.
- Designed to pass an inboard helium leak-rate test of $1x10^{-9}$ cc per sec.
- All parts ultrasonically cleaned prior to assembly.

APPLICATIONS

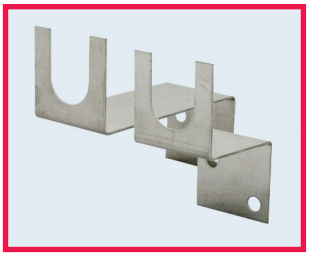
The 3550 Series regulators are ideal for critical pressure reduction applications involving higher pressure reactive and/or corrosive gases, where the precise control of pressure or flow is required. They are an excellent choice for use with gas mixtures of such components having a full cylinder pressure of 1000 psig or more.

SPECIFICATIONS

Max. Inlet Pressure: 3000 psig
Operating Temp. Range: -40° to +185°F.
Flow Coefficient(C_V): 0.08
Inlet and Outlet: 1/4" NPT female
Outlet Valve Standard
Delivery Pressure Rise: 0.02 psig max. per 100 psi inlet pressure decay.

MATERIALS OF CONSTRUCTION

Body: 316L stainless steel
Seat Assemblies: Monel®
Seats: First and Second Stage: Kel-F®
Diaphragms: Elgiloy
Diaphragm Seal: Teflon®
Inlet Filter: Monel®
Bonnet: nickel plated aluminum
Gauges: stainless steel
Outlet Valve: 316 stainless steel
Outlet Connections: 316 stainless steel



EZ Mounting Brackets (see page 101).

HOW TO ORDER***

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3551-25-CGA*	5-25	0-30	0-3000
3551-50-CGA*	5-50	0-100	0-3000
3551-100-CGA*	10-100	0-200	0-3000

*Specify CGA Connection Number when ordering.
***For panel mounting bonnet add "PM" to base number (i.e., 3551PM-50-CGA).

OUTLET OPTIONS

	P/N Suffix
No Outlet Valve	NV
1/4" Compression Fitting	T4F
1/8" Compression Fitting	T2F
1/4" NPT Male	P4M
1/4" Hose Barb	4HB

Warning: A Purge assembly (see pages 96 and 97) is strongly suggested when using the above regulators with any corrosive gas.

BRASS
HIGH PURITY LINE REGULATOR
Series 3101L

DESCRIPTION

The 3101L Series line regulators are designed to suit a large variety of applications. The high purity design makes them ideal for line drop regulators in instrumentation labs, with the 0.2 C_V orifice they are capable of very high flow rates.

FEATURES

- Small internal volume - less than 5cc.
- Capable of large flows with only a small pressure drop.
- High purity diffusion resistant, metal diaphragm construction.
- Encapsulated seat.
- Diffusion resistant, brass diaphragm packless control valve installed on the outlet as standard.
- Designed to pass an inboard helium leak-rate test of $1x10^{-9}$ cc per sec.
- All parts ultrasonically cleaned prior to assembly.
- Rear panel mounting holes.

APPLICATIONS

The 3101L Series is an excellent choice for gas flow applications with low inlet pressures and low differential pressure between regulator inlet and outlet.

SPECIFICATIONS

Max. Inlet Pressure: 3000 psig
Operating Temp. Range: -40° to +185°F.
Flow Coefficient(C_V): 0.08 standard, 0.2 Cv optional**
Inlet and Outlet: 1/4" NPT female
Outlet Valve Standard

MATERIALS OF CONSTRUCTION

Body: brass
Nozzle Assembly: brass
Diaphragm: stainless steel
Seat: Kel-F®
Diaphragm Seal: Teflon®
Inlet Filter: stainless steel
Bonnet: nickel plated aluminum
Gauge: brass
Knob: aluminum - black anodized

EZ3100 Bracket (see page 101).

HOW TO ORDER***

Model Number	Del. Press. Range psig	Del. Press. Gauge psig
3101L-10	5-10	0-30
3101L-25	5-25	0-60
3101L-50	5-50	0-100
3101L-100	10-100	0-200
3101L-250	20-250	0-400

** Add "HF" to basic model number (i.e. 3101LHF-25).
***For panel mounting bonnet add "PM" to base number (i.e., 3101LPM-50).

OUTLET OPTIONS

	P/N Suffix
No Outlet Valve	NV
1/4" Compression Fitting	T4F
1/8" Compression Fitting	T2F
1/4" NPT Male	P4M

STAINLESS STEEL HIGH PURITY LINE REGULATOR Series 3401L

DESCRIPTION

The 3401L Series line regulators are designed to suit a large variety of applications. The high purity design makes them ideal for line drop regulators in instrumentation labs, with the 0.2 Cv orifice they are capable of very high flow rates.

FEATURES

- Small internal volume - less than 5cc.
- Capable of large flows with only a small pressure drop.
- High purity diffusion resistant, metal diaphragm construction.
- Encapsulated seat.
- Diffusion resistant, stainless steel diaphragm packless control valve installed on the outlet as standard.
- Designed to pass an inboard helium leak-rate test of 1x10-9 cc per sec.
- All parts ultrasonically cleaned prior to assembly.
- Rear panel mounting holes.

APPLICATIONS

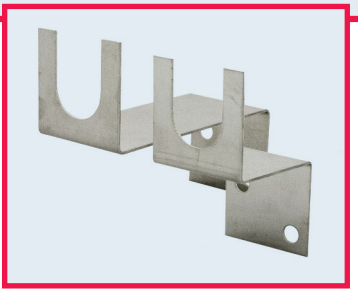
The 3401L Series is an excellent choice for gas flow applications with low inlet pressures and low differential pressure between inlet and outlet. The high inlet pressure rating makes also very suitable as a sensitive cylinder regulator for many low pressure corrosive gases when fitted with the proper CGA cylinder valve outlet connection.

SPECIFICATIONS

Max. Inlet Pressure: 3000 psig
Operating Temp. Range: -40° to +185°F.
Flow Coefficient(Cv): 0.08 standard, 0.2 Cv optional **
Inlet and Outlet: 1/4" NPT female
Outlet Valve Standard

MATERIALS OF CONSTRUCTION

Body: 316 stainless steel
Nozzle Assembly: 316 stainless steel
Diaphragm: stainless steel
Seat: Kel-F®
Diaphragm Seal: Teflon®
Inlet Filter: stainless steel
Bonnet: nickel plated aluminum
Gauge: stainless steel
Knob: aluminum - black anodized



EZ Mounting Brackets (see page 101).

HOW TO ORDER***

Model Number+	Del. Press. Range psig	Del. Press. Gauge psig
3401L-10	5-10	0-30
3401L-25	5-25	0-60
3401L-50	5-50	0-100
3401L-100	10-100	0-200
3401-250	20-250	0-400

**Add "HF" to basic model number (i.e. 3401LHF-25).
***For panel mounting bonnet add "PM" to base number (i.e., 3401LPM-50).

OUTLET OPTIONS

	P/N Suffix
No Outlet Valve	NV
1/4" Compression Fitting	T4F
1/8" Compression Fitting	T2F
1/4" NPT Male	P4M

ECONOMICAL CORROSIVE GAS HIGH PURITY LINE REGULATOR Series 3451L

DESCRIPTION

The 3451L Series line regulators are designed to suit a large variety of applications. The installation of Monel® internal parts into a stainless steel body creates an economical, high purity line regulator for corrosive gas service.

FEATURES

- Capable of large flows with only a small pressure drop.
- Monel® internal construction for increased corrosion resistance.
- High purity diffusion resistant, metal diaphragm construction.
- Encapsulated seat.
- Diffusion resistant, stainless steel diaphragm packless control valve installed on the outlet as standard.
- Designed to pass an inboard helium leak-rate test of $1x10^{-9}$ cc per sec.
- All parts ultrasonically cleaned prior to assembly.
- Rear panel mounting holes.

APPLICATIONS

The 3451L Series is an excellent choice for corrosive gas flow applications with low inlet pressures and low differential pressure between regulator inlet and outlet.

SPECIFICATIONS

Max. Inlet Pressure: 3000 psig
Operating Temp. Range: -40° to +185°F.
Flow Coefficient(C_V): 0.08 standard
Inlet and Outlet: 1/4" NPT female
Outlet Valve Standard

MATERIALS OF CONSTRUCTION

Body: 316L Stainless Steel
Seat Assembly: Monel®
Diaphragm: Elgiloy®
Seat: Kel-F®
Diaphragm Seal: Teflon®
Inlet Filter: Monel®
Bonnet: nickel plated aluminum
Gauge: stainless steel
Knob: aluminum - black anodized

HOW TO ORDER***

Model Number	Del. Press. Range psig	Del. Press. Gauge psig
3451L-25	5-25	0-60
3451L-50	5-50	0-100
3451L-100	10-100	0-200

***For panel mounting bonnet add “PM” to base number (i.e., 3451LPM-50).

OUTLET OPTIONS

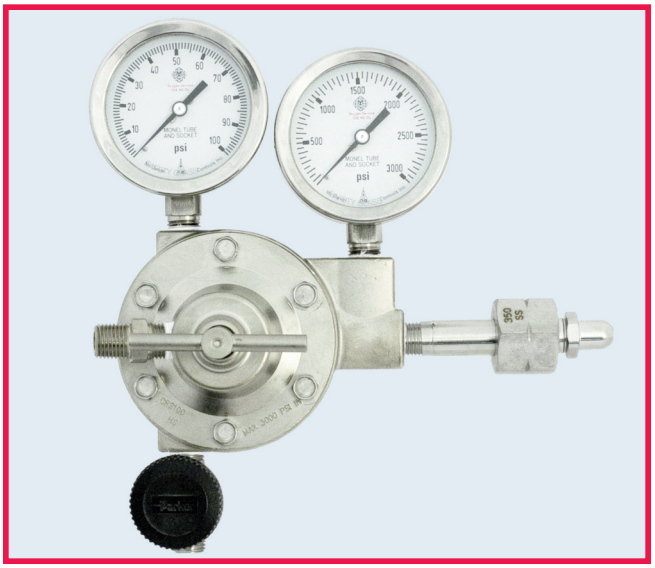
	P/N Suffix
No Outlet Valve	NV
1/4” Compression Fitting	T4F
1/8” Compression Fitting	T2F
1/4” NPT Male	P4M

EZ3100 Bracket (see page 101).

CORROSIVE GAS, 1-STAGE REGULATOR
Series 3470

DESCRIPTION

The Series 3470 single stage regulators are specifically designed and constructed for use with difficult to handle gases, such as chlorine and hydrogen chloride. The large monel nozzle and PCTFE® seat combined with the tied diaphragm assembly greatly reduces the possibility of failure due to creep so common in other corrosive gas regulators. A Teflon-lining on the stainless steel diaphragm forms a protective coating to extend regulator life. The electroless nickel-plated brass body is a major contributor to the economical nature of this regulator while providing corrosion protection.



FEATURES

- Four built-in PCTFE seats provide convenient maintenance and long regulator life.
- Large Teflon® lined 316L stainless steel diaphragm.
- Monel valve with Teflon packing installed on outlet.
- Captured vent bonnet provides for save venting in the event of a diaphragm failure.

APPLICATIONS

The 3470 Series regulators are ideal for use with many corrosive gases, such as chlorine, hydrogen chloride, boron trichloride, and boron triflouride. They are also useful for controlling the pressure of high concentration gas mixtures containing these corrosive gas components.

NOTE: See pages 130-146 for gas data and equipment recommendations.

MATERIALS OF CONSTRUCTION

Body: Electroless nickel-plated brass
Nozzle: Monel®
Seat: PCTFE
Diaphragm: Teflon® Lined 316L Stainless Steel
Inlet Filter: Electroless nickel-plated sintered bronze
Seals: Viton

SPECIFICATIONS

Max. Inlet Pressure - 3000 psig
Operating Temp. Range - 20° to +160°F
Flow Coefficient(C_V) 0.129
Body Inlet and Outlet - 1/4" NPT female
Valve outlet - 1/4" NPT male

HOW TO ORDER

Model Number*	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3470-80-CGA*	5-80	0-100	0-3000
3470-160-CGA*	10-160	0-300	0-3000
3471-80-CGA*	5-80	0-100	0-1000
3471-160-CGA*	10-160	0-300	0-1000
3472-80-CGA*	5-80	0-100	0-300

*Specify CGA Connection Number when ordering.

Warning: A Purge assembly (see pages 96 and 97) is strongly suggested when using the above regulators with any corrosive gas.

HIGH FLOW – HIGH PURITY REGULATOR
Series 3831H

DESCRIPTION

The 3831H series regulators are designed for high flow applications involving high purity gases. The series features a Cv of 0.55 and excellent regulation.

FEATURES

- Capable of high flows with only a small pressure drop.
- High purity metal diaphragm construction.
- All parts ultrasonically cleaned prior to assembly.
- Excellent pressure regulation – 1.6 psi/100 psi.
- Encapsulated seat with 10 micron filter.

APPLICATIONS

The 3831H series regulators are ideal as manifold, laser assist gas, or pipeline regulators for high flow systems of high purity or industrial gases.

SPECIFICATIONS

	3831H	**3831HL**
Max. Inlet Pressure:	3000 psig*	3000 psig*
Operating Temp. Range:	-40°F to +165°	-40°F to +165°
Flow Coefficient(Cv):	0.55	0.55
Inlet and Outlet:	1/2" NPT female	1/2" NPT female

MATERIALS OF CONSTRUCTION

	3831H	**3831HL**
Body:	brass barstock	brass barstock
Bonnet:	forged brass	forged brass
Diaphragm:	302 SS**	302 SS**
Seat:	PTFE Teflon	PTFE Teflon
Seals:	PTFE Teflon	PTFE Teflon
Nozzle:	brass	brass

HOW TO ORDER

Model	**Del. Press psig**	**Del. Press. Gauge psig**	**Inlet Press. Gauge psig**
3831H-015	0-15	0-30	0-600
3831H-050	0-50	0-100	0-4000
3831H-125	0-125	0-200	0-4000
3831H-250	0-250	0-400	0-4000
3831H-500	0-500	0-1000	0-4000
3831HL-015	0-15	0-30	none
3831HL-050	0-50	0-100	none
3831HL-125	0-125	0-200	none
3831HL-250	0-250	0-400	none
3831HL-500	0-500	0-600	none

*500 psig on the 0-15 psig models.

** 0-15 psig models have a neoprene diaphragm and seat.

HIGH FLOW – PISTON-SENSED REGULATOR
Series 3833

DESCRIPTION

The 3833 series regulators are designed for high flow applications. The series features a large main valve with a Cv of 2.0.

FEATURES

- Capable of high flows with only a small pressure drop from full to empty cylinder.
- Wide choice of delivery pressure ranges.
- Available in aluminum, brass and stainless steel.

APPLICATIONS

The 3833 series regulators are ideal to meet the requirements of systems where a high flow of gases needs to be delivered with good outlet pressure control.

3833

SPECIFICATIONS

	3833	3833L
Max. Inlet Pressure:	3000 psig	3000 psig
Operating Temp. Range:	-40ºF to +165º	-40ºF to +165º
Flow Coefficient(Cv):	2.0	2.0
Inlet and Outlet**:	1/2" NPT female	1/2" NPT female

**A 100 micron filter is recommended for installation on the regulator inlet. P/N 7510-100-P8MM or 7520-100-P8MM (see page 76)

MATERIALS OF CONSTRUCTION

	3833A	3833B	3833S
Body:	aluminum	brass	316 SS
Bonnet:	nickel plated brass	nickel plated brass	nickel plated brass
Main Valve Assembly	316 SS	316 SS	316 SS
Main Valve Seat:	Vespel	Vespel	CTFE
Seal:	Buna-N	Buna-N	PTFE (Teflon)
Main valve:	316 SS	316 SS	316SS
Gauges	brass	brass	SS

HOW TO ORDER*

Model Number	Del. Press. Range psig	Del. Press Gauge psig	Inlet Press. Gauge psig
3833A-25	0-25	0-60	0-4000
3833A-50	0-50	0-100	0-4000
3833A-100	0-100	0-200	0-4000
3833A-150	0-150	0-200	0-4000
3833A-200	0-200	0-400	0-4000
3833AL-25	0-25	0-60	none
3833AL-50	0-50	0-100	none
3833AL-100	0-100	0-200	none
3833AL-150	0-150	0-200	none
3833AL-200	0-200	0-400	none
3833B-25	0-25	0-60	0-4000
3833B-50	0-50	0-100	0-4000
3833B-100	0-100	0-200	0-4000
3833B-150	0-150	0-200	0-4000
3833B-200	0-200	0-400	0-4000
3833BL-25	0-25	0-60	none
3833BL-50	0-50	0-100	none
3833BL-100	0-100	0-200	none
3833BL-150	0-150	0-200	none
3833BL-200	0-200	0-400	none
3833S-25	0-25	0-60	0-4000
3833S-50	0-50	0-100	0-4000
3833S-100	0-100	0-200	0-4000
3833S-150	0-150	0-200	0-4000
3833S-200	0-200	0-400	0-4000
3833SL-25	0-25	0-60	none
3833SL-50	0-50	0-100	none
3833SL-100	0-100	0-200	none
3833SL-150	0-150	0-200	none
3833SL-200	0-200	0-400	none

*For panel mounting bonnet add “PM” to base number (i.e., 3833LPM-50).

HIGH PRESSURE – PISTON-SENSED REGULATOR SERIES 3832

DESCRIPTION

The 3832 series regulators are designed for high pressure applications up to 2500 psig involving applications with inlet pressures up to 3000 psig. The series features a main valve with a Cv of 0.08.

FEATURES

- Capable of high flows with only a small pressure drop.
- Available in brass or stainless steel construction.
- Unbalanced stem provides positive shut-off.

APPLICATIONS

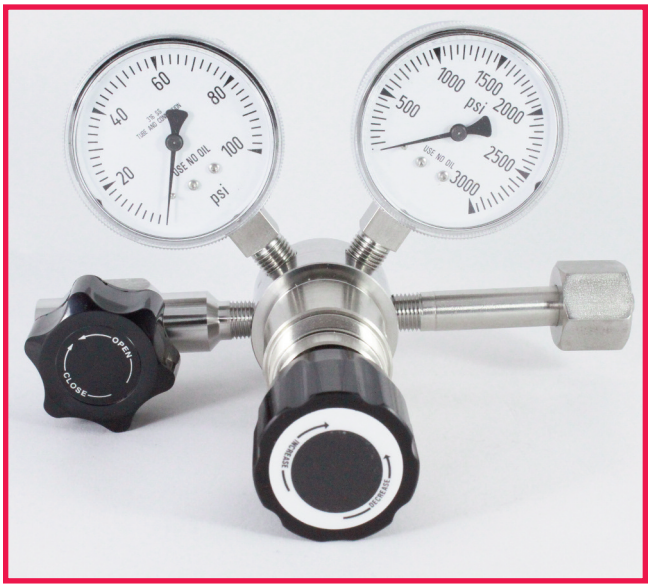
The 3833 series regulators are ideal to meet the requirements of systems where a high flow of gases needs to be delivered with good outlet pressure control.

SPECIFICATIONS

	3832	3832L
Max. Inlet Pressure:	3000 psig	3000 psig
Operating Temp. Range:	-40ºF to +165º	-40ºF to +165º
Flow Coefficient(Cv):	0.08	0.08
Inlet and Outlet:	1/4" NPT female	1/4" NPT female

MATERIALS OF CONSTRUCTION

	3832B	3832S
Body:	brass	316 SS
Bonnet:	nickel plated brass	nickel plated brass
Main Valve Assembly	Brass	316 SS
Main Valve Seat:	Kel-F	Kel-F
Seal:	Viton	PTFE (Teflon)
Gauges	Brass	Stainless Steel



3832

HOW TO ORDER***

Model Number	Del. Press. Range psig	Del. Press Gauge psig	Inlet Press. Gauge psig
3832B-250-CGA*	0-250	0-400	0-4000
3832B-500-CGA*	0-500	0-600	0-4000
3832B-1000-CGA*	0-1000	0-2000	0-4000
3832B-1500-CGA*	0-1500	0-2000	0-4000
3832B-2000-CGA*	0-2000	0-4000	0-4000
3832B-2500-CGA*	0-2500	0-4000	0-4000

Options:
Brass Diaphragm outlet valve installed: add suffix "DV" after model number.
Brass Packed outlet valve installed: add suffix "PV" after model number

3832S-250-CGA*	0-250	0-400	0-3000
3832S-500-CGA*	0-500	0-1000	0-3000
3832S-1000-CGA*	0-1000	0-2000	0-3000
3832S-1500-CGA*	0-1500	0-2000	0-3000
3832S-2000-CGA*	0-2000	0-3000	0-3000
3832S-2500-CGA*	0-2500	0-3000	0-3000

Options:
SS Diaphragm outlet valve installed: add suffix "DV" after model number.
SS Packed outlet valve installed: add suffix "PV" after model number

*Specify CGA connection when ordering.

HIGH PRESSURE – MONEL PISTON-SENSED REGULATOR SERIES 3835

DESCRIPTION

The 3835 series regulators are ideally designed for use in high pressure oxygen applications with delivery pressures up to 2500 psig involving applications with inlet pressures up to 3000 psig. The series features a main valve with a Cv of 0.08.

FEATURES

- Capable of high flows with only a small pressure drop.
- Monel construction.
- Unbalanced stem provides positive shut-off.

APPLICATIONS

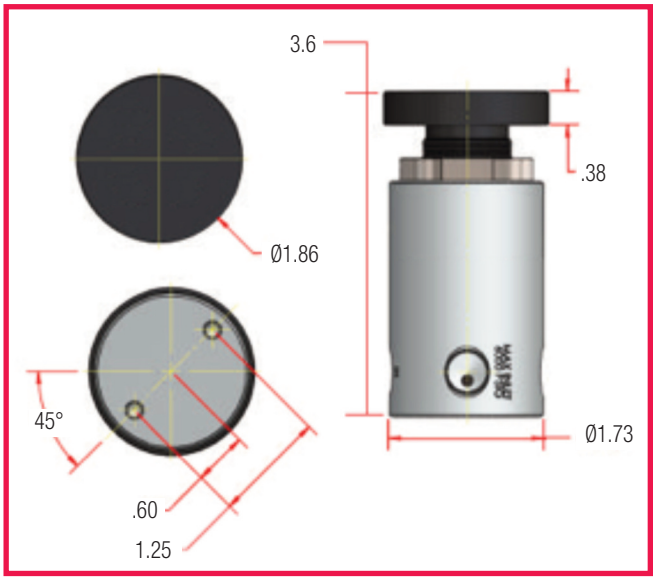
The 3833 series regulators are ideal to meet the requirements of systems where a high flow of gases needs to be delivered with good outlet pressure control.

SPECIFICATIONS

	3835	3835L
Max. Inlet Pressure:	3000 psig	3000 psig
Operating Temp. Range:	-40ºF to +165º	-40ºF to +165º
Flow Coefficient(Cv):	0.08	0.08
Inlet and Outlet:	1/4" NPT female	1/4" NPT female

MATERIALS OF CONSTRUCTION

	3835
Body:	Monel
Bonnet:	Monel
Main Valve Assembly	Monel
Main Valve Seat:	Kel-F
Seal:	Viton
Gauges	Stainless Steel



3835

HOW TO ORDER***

Model Number	Del. Press. Range psig	Del. Press Gauge psig	Inlet Press. Gauge psig
3835-25-CGA*	0-25	0-60	0-4000
3835-50-CGA*	0-50	0-100	0-4000
3835-100-CGA*	0-100	0-200	0-4000
3835-250-CGA*	0-250	0-400	0-4000
3835-500-CGA*	0-500	0-1000	0-4000
3835-1000-CGA*	0-1000	0-1500	0-4000
3835-1500-CGA*	0-1500	0-2000	0-4000
3835-2000-CGA*	0-2000	0-3000	0-4000
3835-2500-CGA*	0-2500	0-3000	0-4000
3835L-25-CGA*	0-25	0-60	none
3835L-50-CGA*	0-50	0-100	none
3835L-100-CGA*	0-100	0-200	none
3835L-250-CGA*	0-250	0-400	none
3835L-500-CGA*	0-500	0-1000	none
3835L-1000-CGA*	0-1000	0-1500	none
3835L-1500-CGA*	0-1500	0-2000	none
3835L-2000-CGA*	0-2000	0-3000	none
3835L-2500-CGA*	0-2500	0-3000	none

Options:

Monel diaphragm outlet valve installed- add suffix "DV" to model number.
Monel packed outlet valve installed- add suffix "PV" to model number.

HIGH PRESSURE REGULATORS
Series 3800V

DESCRIPTION

These series 3800V regulators feature a compact, reliable piston design for precise gas control at higher inlet pressures. They are designed for non-corrosive gas service and are especially suited for dead-end pressurized systems, such as pressure vessel testing.

FEATURES

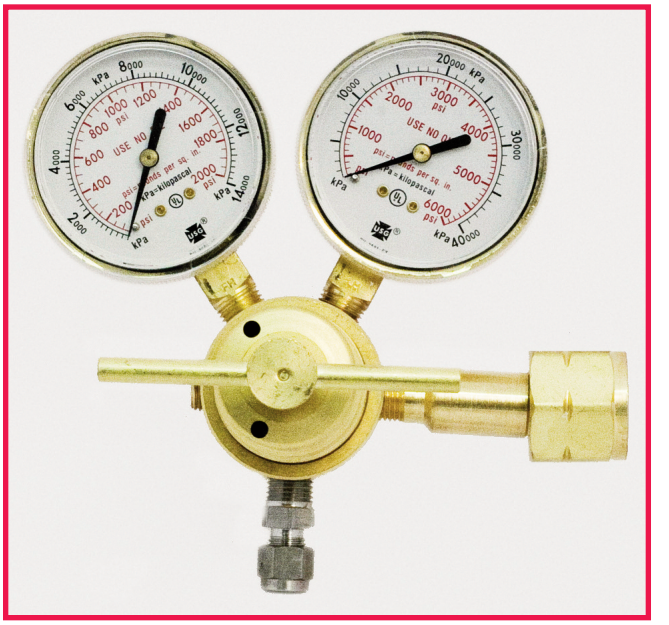
- Piston type actuation.
- Cartridge type seat assembly.
- Delrin cap bushing for smooth adjustment.
- Easily panel mounted with optional panel mount nuts.
- Double filter protection

SPECIFICATIONS

Maximum inlet:	up to 6000 psig
Operating temperature:	0° to 140°F.
Cv factor:	0.103
Outlet port:	1/4" NPT female
Outlet Connection:	1/4" stainless steel compression fitting
Weight:	4 lbs.
Dimensions:	6"W x 6-1/2"H x 6-1/4"

MATERIALS OF CONSTRUCTION

Body:	machined brass
Bonnet:	machined brass
Piston:	brass
Inlet filter:	bronze
Seat:	Kel-F®
Seals:	Viton®
Gauges:	brass



NOTE: See pages 130-146 for gas data and equipment recommendations.

HOW TO ORDER

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3800V-750-CGA*	50-750	0-1000	0-6000
3800V-1500-CGA*	100-1500	0-2000	0-6000
3800V-3000-CGA*	200-3000	0-4000	0-6000
3800V-4500-CGA*	300-4500	0-6000	0-6000

* Specify CGA Connection when ordering.

HIGH PRESSURE REGULATORS
Series 3860T

DESCRIPTION

The Series 3860T high pressure regulators are designed to safely reduce inlet pressures from cylinders filled with gases to 6000 psig. The self-venting feature of the regulator allows the operator to reduce the pressure setting in a closed system by venting the downstream pressure through the regulator.

FEATURES

- Full 6000 psig delivery pressure capability.
- Available in brass or stainless steel.
- Self-venting design for ease of pressure adjustment.
- Unbalanced stem assures positive shut-off.
- Removable valve assembly module permits ease of repairs.
- Large adjusting knob provides fast low-torque pressure. settings.

SPECIFICATIONS

Maximum Inlet:	
brass	6000 psig
stainless steel	10000 psig
Operating temperature:	40° to 165°F.
Cv factor:	0.2
Leakage:	bubble-tight
Inlet and Outlet ports:	1/4" NPT female
Weight:	5 lbs.

MATERIALS OF CONSTRUCTION

	3860TB	3860TS
Body:	brass	303 stainless steel
Bonnet:	brass	nickel plated brass
Main valve seat:	Vespel	Vespel
Vent valve seat:	Kel-F®	Kel-F®
Seals:	Buna-N	Buna-N
Back-up rings:	Buna-N and Teflon®	Buna-N and Teflon®
Gauges:	brass	316 stainless steel

HOW TO ORDER

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge** psig
3860TB-500-CGA*	0-500	0-600	0-7500
3860TB-1000-CGA*	0-1000	0-2000	0-7500
3860TB-1500-CGA*	10-1500	0-2000	0-7500
3860TB-2500-CGA*	15-2500	0-4000	0-7500
3860TB-4000-CGA*	25-4000	0-6000	0-7500
3860TB-6000-CGA*	50-6000	0-7500	0-7500
3860TS-500-CGA*	0-500	0-1000	0-10,000
3860TS-1000-CGA*	0-1000	0-2000	0-10,000
3860TS-1500-CGA*	10-1500	0-3000	0-10,000
3860TS-2500-CGA*	15-2500	0-3000	0-10,000
3860TS-4000-CGA*	25-4000	0-6000	0-10,000
3860TS-6000-CGA*	50-6000	0-10,000	0-10,000
3860TS-10,000-CGA*	100-10,000	0-10,000	0-10,000

*Specify CGA connection when ordering.
Add prefix "NV" to model number if self-venting feature is not desired (i.e. NV3860TB-6000-677).
Self-venting feature is not recommended with flammable or toxic gases.

**Regulators fitted with a CGA connection rated for 3000 psig will have a 0-4000 psig brass, or 0-3000 psig SS inlet pressure gauge.

HIGH PURITY LOW DELIVERY PRESSURE REGULATORS
Series 3700HP

DESCRIPTION

These regulators were designed to meet the needs of applications requiring reliable low-pressure control while maintaining gas purity. They are available in single and two stage versions to meet most non-corrosive gas applications. The low pressure stage has a large sensitive aluminum-faced neoprene diaphragm to provide delivery pressures as low as 2" of water.

Single Stage Line Regulators for Non-Corrosive Gases

MATERIALS OF CONSTRUCTION

Body & Bonnet: Zinc
Seat: Nitrile
Diaphragm: Aluminum-faced natural rubber
Internal parts: Steel, brass, and zinc

FEATURES

- Extremely low delivery pressures.
- Aluminum faced diaphragm for high purity applications.
- Maximum inlet pressure 250 psig.
- Diaphragm packless valve on outlet is standard.
- $C_V = 0.114$.

The Series 3700HP regulators are available in three delivery pressure ranges; 2-35" of water, and 0.8-2.7 psig and 2.7-5 psig. As a line regulator they have a maximum inlet pressure rating of
250 psig. Inlet and outlet connections are 1/4" NPT female. The Series 3700HP has an aluminum faced natural rubber diaphragm to provide a diffusion resistant metal barrier for high purity gas applications. If you do not desire the outlet valve ad suffix "NV" to the part number.

HOW TO ORDER

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3701HP	2-25" water	0-30" water	none
3702HP	2.7-5 psig	0-10 psig	none
3703HP	0.8-2.7 psig	0-3 psig	none

Two-stage High Purity Regulators for Low Pressure Delivery

When source gas pressures exceed 250 psig, this hybrid regulator created by coupling a Series 3700HP regulator with a Series 3101 single stage regulator is an ideal choice for such higher pressure applications

MATERIALS OF CONSTRUCTION

First Stage See model 3101 on page 4
2nd Stage See above

HOW TO ORDER

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3101HY3701-CGA*	2-25" water	0-30" water	0-4000 psig
3101HY3702-CGA*	2.7-5 psig	0-10 psig	0-4000 psig
3101HY3703-CGA*	0.8-2.7 psig	0-3 psig	0-4000 psig

*Specify CGA connection when ordering. If you do not desire the standard outlet valve add the suffix "NV" to the part number.

GENERAL PURPOSE LOW DELIVERY PRESSURE REGULATORS
Series 3700

DESCRIPTION

These regulators were designed to meet the needs of applications requiring reliable low-pressure control of non-high purity gases. They are available in single and two stage versions to meet most non-corrosive gas applications. The low pressure stage has a large sensitive neoprene diaphragm to provide delivery pressures as low as 2" of water.

Single Stage Line Regulators for Non-Corrosive Gases

MATERIALS OF CONSTRUCTION

Body & Bonnet: Zinc
Seat: Nitrile
Diaphragm: Natural rubber
Internal parts: Steel, brass, zinc

FEATURES

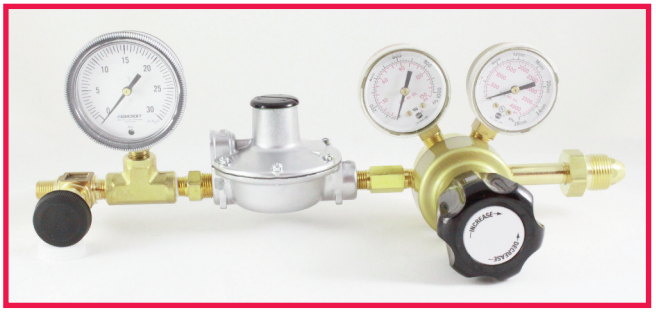
- Extremely low delivery pressures.
- Large sensitive diaphragm for reliable pressure control.
- Maximum inlet pressure 250 psig.
- Needle valve on outlet is standard.
- $C_V = 0.114$.

The Series 3700 regulators are available in three delivery pressure ranges; 2-35" of water, and 0.8-2.7 psig and 2.7-5 psig. As a line regulator they have a maximum inlet pressure rating of 250 psig. The inlet and outlet connections of the regulator are 1/4" NPT female, but with the standard needle valve installed the outlet connection is 1/4" NPT male. If you do not desire the outlet valve add suffix "NV" to the part number.

HOW TO ORDER

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3701	2-25" water	0-30" water	none
3702	2.7-5 psig	0-10 psig	none
3703	0.8-2.7 psig	0-3 psig	none

Two-stage General Purpose Regulators for Low Pressure Delivery



When source gas pressures exceed 250 psig, this hybrid regulator created by coupling a Series 3700 regulator with a Series 2401 single stage regulator is an ideal choice for such higher pressure applications.

MATERIALS OF CONSTRUCTION

First Stage: See model 2401 on page 20.
2nd Stage: See above.

HOW TO ORDER

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
2401HY3701-CGA*	2-25" water	0-30" water	0-4000 psig
2401HY3702-CGA*	2.7-5 psig	0-10 psig	0-4000 psig
2401HY3703-CGA*	0.8-2.7 psig	0-3 psig	0-4000 psig

*Specify CGA connection when ordering. If you do not desire the standard outlet valve add the suffix "NV" to the part number.

GENERAL PURPOSE NON-CORROSIVE GAS 1-STAGE REGULATOR Series 2400

DESCRIPTION

The Series 2400 single stage regulators are specifically designed as an economical instrument for use in non-critical applications involving inert and non-corrosive gases. They are particularly suited to closely monitored applications. The neoprene diaphragm provides good sensitivity for pressure control. The Series 2400 should not be used in applications where inboard diffusion of atmospheric impurities water and oxygen or the outgassing of hydrocarbon based impurities will negatively impact the work being performed.

FEATURES

- Neoprene diaphragm for sensitive pressure control.
- Needle valve installed in outlet.
- One piece encapsulated seats.

APPLICATIONS

The Series 2400 regulators are ideal for use with inert, flammable, and hydrocarbon gases used in non-critical specialty gas applications.

MATERIALS OF CONSTRUCTION

Body:	brass
Nozzles:	brass
Seats:	PTFE Teflon
Diaphragms:	neoprene
Inlet Filter :	nickel plated sintered bronze - 10 micron

SPECIFICATIONS

Max. Inlet Pressure:	3000 psig
Operating Temp. Range:	0° to +140° F
Body Inlet and Outlet:	1/4" NPT female
Valve outlet :	1/4" NPT male
Flow coefficient:	C_V = 0.17

NOTE: See pages 130-146 for gas data and equipment recommendations.

HOW TO ORDER

Model Number	Del. Press. Range psig	Del. Press. Gauge psig/kPa	Inlet Press. Gauge psig/kPa
2401-15-CGA*	0-15	0-30	0-4000
2401-50-CGA*	0-50	0-60	0-4000
2401-125-CGA*	0-125	0-150	0-4000
2401-250-CGA*	0-250	0-400	0-4000

*Specify CGA Connection Number when ordering.

GENERAL PURPOSE NON-CORROSIVE GAS 2-STAGE REGULATOR Series 2420

DESCRIPTION

The Series 2420 two-stage regulators are specifically designed as an economical instrument for use in non-critical applications involving inert and non-corrosive gases. They are particularly suited to applications which will not be closely monitored and a constant delivery pressure is required from full to empty cylinder. The neoprene diaphragm provides very sensitive pressure control. The Series 2420 should not be used in applications where inboard diffusion of atmospheric impurities water and oxygen or the outgassing of hydrocarbon based impurities will negatively impact the work being performed.

FEATURES

- Neoprene diaphragm for sensitive pressure control.
- Needle valve installed in outlet.
- One piece encapsulated seats.

APPLICATIONS

The Series 2420 regulators are ideal for use with inert, flammable, and hydrocarbon gases used in non-critical specialty gas applications when constant delivery pressure is required from full to empty cylinder.

MATERIALS OF CONSTRUCTION

Body:	brass
Nozzles:	brass
Seats:	PTFE Teflon
Diaphragms:	neoprene
Inlet Filter :	nickel plated sintered bronze - 10 micron

SPECIFICATIONS

Max. Inlet Pressure:	3000 psig
Operating Temp. Range:	0° to +140° F
Body Inlet and Outlet:	1/4" NPT female
Valve outlet:	1/4" NPT male
Flow coefficient:	$C_V = 0.15$

HOW TO ORDER

Model Number	Del. Press. Range psig	Del. Press. Gauge psig/kPa	Inlet Press. Gauge psig/kPa
2421-15-CGA*	0-15	0-30	0-4000
2421-50-CGA*	0-50	0-60	0-4000
2421-125-CGA*	0-125	0-150	0-4000
2421-250-CGA*	0-250	0-250	0-4000

*Specify CGA Connection Number when ordering.

NOTE: See pages 130-146 for gas data and equipment recommendations.

LASER CUTTING PRESSURE REGULATOR
Series 3870H

DESCRIPTION

The 3870H regulator is specifically designed to meet the high flow, high pressure assist gas requirements of the laser cutter. It has fast on-off-on response, high flow capacity, and delivers the pressures required for the job. Whether your source gas is cryogenic or high pressure, this regulator can handle the job. The regulator is actually two regulators in one body – a dome-loaded piston regulator with a sensitive diaphragm actuated dome loader built in.

FEATURES

- Rapid on-off-on response even at high flow rates.
- 1/2” NPT female inlet and outlet connections.
- High flow capacity Cv = 0.55.
- Minimal delivery pressure decay (0.3 psi/100 psi).
- Built-in dome loader regulator.
- Bonnet threaded to accept panel nut.
- Encapsulated seats with 10 micron filter.

SPECIFICATIONS AND MATERIALS OF CONSTRUCTION

Max. inlet pressure	3000 psig (optional 5500 psig available)
Outlet Pressure Ranges	0-250 psig, 0-500 psig, 0-1000 psig
Inlet and Outlet ports	1/2” NPT female
Inlet and Outlet Gauge Ports	1/4” NPT female
Body	brass
Dome Loader Diaphragm	PTFE Teflon® coated neoprene
Seat & seals	PTFE Teflon®

HOW TO ORDER

Model	Description		
	Del. Pressure psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3870H-250	0-250	0-400	0-4000
3870H-500	0-500	0-600	0-4000
3870H-1000	0-1000	0-2000	0-4000

Options

Panel mount nut P/N 9100887

LASER WELDING GAS SUPPLY SYSTEMS

DESCRIPTION

Each of the manufacturers of laser gas welding systems has their own specifications for the gas transfer system. The systems presented here generally meet or exceed the requirements of virtually all of the manufacturers. The manual, semi-automatic, and fully automatic systems have worked very successfully in many laser applications and contain all of the basic components required to protect the laser and maintain gas purity and flow. If for any reason, one of these systems does not meet your requirements contact us to discuss a custom system that is correct for your laser.

FEATURES

- All high purity construction.
- Purge assemblies installed on each pigtail to ensure cylinder-to-cylinder purity on change-outs. (Cylinder connections with integral check valves in place of purge assemblies are available as an option.)
- Built-in safety relief valve prevents laser over pressurization.
- Built-in 2 micron filter eliminate particulate contamination of the laser.
- Pigtails are 3' stainless steel flexible hose with stainless steel inner core to ensure contamination-free gas transfer and eliminate helium diffusion leakage.
- Convenient wall mounting bracket provided.
- High purity brass pressure regulator(s) with stainless steel diaphragms included.
- Designed to provide continuous gas flow to laser during cylinder change-outs.

SPECIFICATIONS AND MATERIALS OF CONSTRUCTION

Max. inlet pressure	3000 psig
Inlet pressure gauges	0-4000 psig
Outlet pressure range	0-100 psig
Outlet pressure gauge	0-200 psig
Safety relief valve	set @100 psig
Outlet line filter	2 micron sintered stainless steel
Body	brass
Diaphragms	stainless steel
Seats and seals	Teflon, Tefzel, or Kel-F
Pigtails	316 stainless steel with brass cylinder connections
Operating Temp.	-40 to 140˚F

HOW TO ORDER

Model*	Changeover Control
917-LASER-CGA-4610	manual system with purge assemblies on pigtails
917-LASER-CV-CGA	manual system with integral check valves, but no purge assemblies
914-LASER-CGA-4610	914 semi-automatic changeover manifold (see page 42) with purge assemblies
914-LASER-CV-CGA	914 semi-automatic changeover manifold (see page 42) with integral check valves, but no purge assemblies
918TS-LASER-CGA-4610	918TS Auto-Logic II changeover manifold (see page 40) with purge assemblies
918TS-LASER-CV-CGA	918TS Auto-Logic II changeover manifold (see page 40) with integral check valves, but no purge assemblies
919TS-LASER-CGA-4610	919TS Ultra-Logic changeover manifold (see page 38) with purge assemblies
919TS-LASER-CV-CGA	919TS Ultra-Logic changeover manifold (see page 38) with integral check valves, but no purge assemblies

* Specify CGA connection when ordering.

Options**	
917PS-XXX	pressure switch alarm assembly (XXX – specify pressure setting desired 300 psig recommended).
912-AVA	audio/visual alarm module for 917 gas transfer system (see page 40).
914-3B	pressure switch alarm assembly (XXX – specify pressure setting desired 300 psig recommended).
914-AVA	audio/visual alarm module for 914 changeover manifold (see page 40).

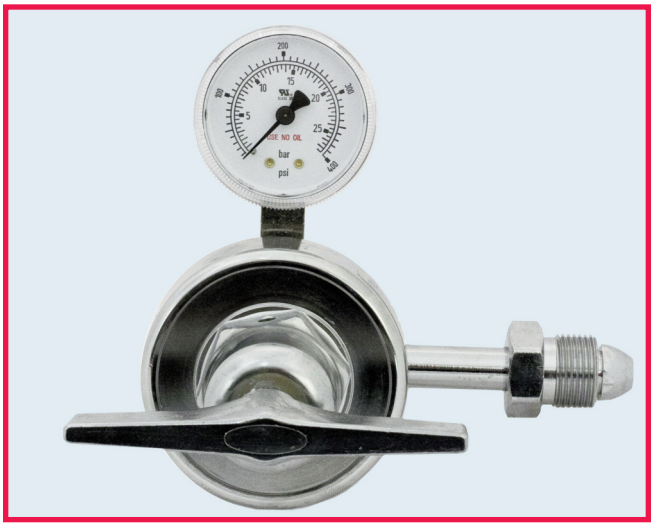
**918TS and 919TS changeover manifolds have a built-in alarm system as standard.

CRYOGENIC CONTAINER REGULATOR
Series HL3300

DESCRIPTION

This chrome plated brass single stage regulator is ideal for controlling the gaseous withdrawal from cryogenic containers.

The regulator boasts a large stainless steel diaphragm for better control and a 0.37 Cv to provide high flow if required.



FEATURES

- Available in three delivery pressure ranges, 0-125, 0-350, and 0-500 psig.
- Maximum inlet pressure – 3000 psig.
- One-piece encapsulated seat design with 10 micron filter to protect seat from particulate contamination.
- Inlet is required CGA connection or 1/4" NPT female.
- Outlet connection 1/4" NPT female.
- Cv = 0.37.

MATERIALS OF CONSTRUCTION

Body: Chrome plated brass forging
Bonnet: Chrome plated brass forging
Diaphragm: 302 stainless steel
Nozzle: brass
Seat & seals: PTFE Teflon
Filter: nickel plated sintered bronze
Seat return spring: PH 17-7 stainless steel

HOW TO ORDER

Model Number	Del. Press. Range psig	Del. Press. Gauge psig
HL3300-125-CGA*	0-125	0-200
HL3300-350-CGA*	0-350	0-400
HL3300-500-CGA*	0-500	0-1000

* For line regulator use with 1/4" NPT female inlet and outlet substitute "P4FF" for CGA.

OPTIONS:

1/4" compression outlet add "T4FS" to P/N.

SILENCED CRYOGENIC SAFETY RELIEF VALVE
Series 8636 Whisper Valve®

DESCRIPTION

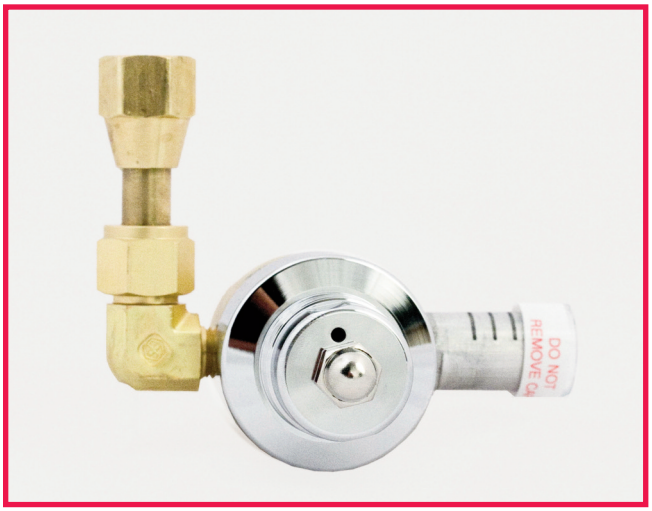
The Whisper Valve is a silenced safety device for use with cryogenic containers.

The valve solves the problem of the loud noise, over 100 dB, associated with the activation of the relief valve in cryogenic containers containing nitrogen, argon or carbon dioxide. Many users of gas in cryogenic containers complain to their suppliers that the loud activation noise scares their employees and causes work disruptions and results in damaged product.

The Whisper Valve is easily installed on the vent valve of any cryogenic container and silently relieves the container pressure slightly below the normally installed relief valve. Whisper Valve reduces the relief of gas pressure to a noise level of 40-50 dB under normal conditions. For reference the average library noise level is 40 dB.

The Whisper Valve also reduces the gas losses of your cryogenic container to average of less than 48 cubic feet over 24 hours.

Whisper Valves are available in four settings, 22, 230 psig, 350 psig, and 500 psig. Other settings available on request.



FEATURES

- Reduces cryogenic relief valve blow-off noise to 40-50 dB.
- Easily installs on any cryogenic argon, oxygen, or nitrogen container.
- Available in four ranges to prevent most container noisy blow-offs.
- Reduces gas losses to less than 48 cubic feet per 24 hours.
- Convenient wall mount kit available.
- Standard CGA 295 inlet connection for nitrogen and argon.
- CGA 440 inlet connection for oxygen.

HOW TO ORDER

Model Number	Description
8636-22	Whisper valve for cryogenic containers with 22 psig relief setting
8636-230	Whisper valve for cryogenic containers with 230 or 235 psig relief setting
8636-350	Whisper valve for cryogenic containers with 350 psig relief setting
8636-500	Whisper valve for cryogenic containers with 500 psig relief setting
8636-KIT	Wall mount bracket, panel mount nut, and six-foot hose with CGA 295
8636-02-22	Whisper valve for cryogenic containers of oxygen with 22 psig relief setting
8636-02-230	Whisper valve for cryogenic containers of oxygen with 230 or 235 psig relief setting
8636-02-350	Whisper valve for cryogenic containers of oxygen with 350 psig relief setting
8636-02-500	Whisper valve for cryogenic containers of oxygen with 500 psig relief setting
8636-02-KIT	Wall mount bracket, panel mount nut, and six-foot hose with CGA 440

* Also available for CO_2.

WHISPER VALVE TAKES THE POP OUT OF CRYOGENIC SAFETIES

LECTURE BOTTLE EQUIPMENT

Due to the small size and limited contents of lecture bottles, special equipment is recommended for use. This special equipment is described here and on the following page.

LECTURE BOTTLE REGULATORS SERIES 3900

The Series 3910 regulator is designed for use with non-corrosive, non-toxic gases in lecture bottles. The Series 3920 lecture bottle regulator is designed for use with corrosive, and/or toxic lecture bottle gases. These light weight, compact single stage regulators incorporate many features found in our larger high purity regulators.

Series 3910

Series 3900

FEATURES

- Small compact design.
- Needle valve installed on outlet.

SPECIFICATIONS

	Series 3910	Series 3900
Max. Inlet Pressure:	3000 psig	3000 psig
Operating Temp. Range:	0 to +140°F	-40 to +140°F
Flow Coefficient (Cv):	0.02	0.08
Body Inlet Connection:	1/8" NPT female	1/8" NPT female
Body Outlet Connection:	1/4" NPT female	1/8" NPT female
Outlet Valve Connection:	1/4" NPT male	1/8" NPT male

MATERIALS OF CONSTRUCTION

	Series 3910	Series 3920	Series 3900
Body:	chrome-plated brass	316 stainless steel	Aluminum
Internal Seals:	nylon	Teflon®	Teflon®
Seat:	polyurethane	Teflon®	Teflon®
Diaphragm:	neoprene	316 stainless steel	316 stainless steel
Filter:	50 micron sintered bronze	50 micron stainless steel	50 micron stainless steel
Bonnet:	chrome plated brass	anodized aluminum	anodized aluminum
Gauges:	chrome plated brass	stainless steel	brass
Outlet Valve:	chrome plated brass	stainless steel	brass

HOW TO ORDER

Model Number	Del. Press. Range psig	Del. Press. Gauge psig	Inlet Press. Gauge psig
3910-15-170	2-15	0-30	0-4000
3910-60-170	4-60	0-100	0-4000
3910-15-180	2-15	0-30	0-4000
3910-60-180	4-60	0-100	0-4000
3900-30-170	2-30	0-60	0-3000
3900-30-180	2-30	0-60	0-3000
3900-60-170	2-60	0-100	0-3000
3900-60-180	2-60	0-100	0-3000
T3920-30-180	2-30	0-60	0-3000
T3920-60-180	2-60	0-100	0-3000

LECTURE BOTTLE EQUIPMENT

LECTURE BOTTLE HOLDERS

Lecture bottles have rounded ends and require some means of support when in use. We provide two types of holders here that meet most requirements.

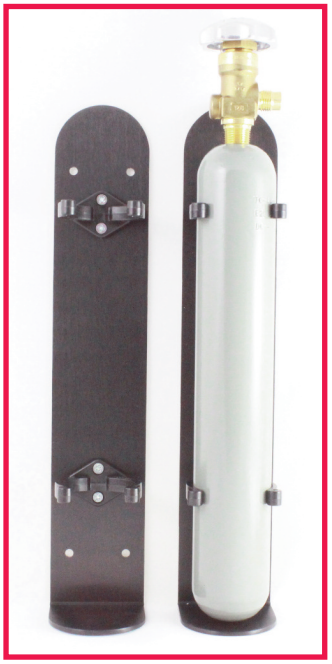
NON-TIP STAND - MODEL 475

This stand offers a convenient method of securing a lecture bottle on a table or lab bench. The stand is made of light weight brushed aluminum and, yet the large diameter base provides stability even when a regulator is installed on the bottle.

475

WALL MOUNT LECTURE BOTTLE BRACKET MODEL 480

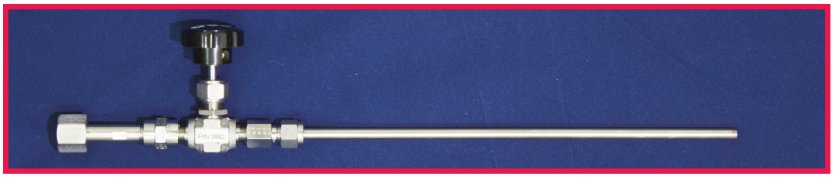
This bracket is made of anodized aluminum and has spring clips that provide firm, secure support to the lecture bottle. The bracket is ideal for securing lecture bottles to lab cart or bench set-ups, in carrying cases for portable systems, or in storage cabinets.



480

LECTURE BOTTLE CONTROL VALVES

These valves are specifically designed for attachment to lecture bottles to dispense their contents. They do not control pressure and should only be used when the operator is in attendance.



MATERIALS OF CONSTRUCTION

	3990	3991	3992
Body	brass	brass	316 stainless steel
Stem	303 stainless steel	303 stainless steel	316 stainless steel
Packing	Teflon®	Teflon®	Teflon®
Tubing	hose barb	brass	316 stainless steel

HOW TO ORDER

Model	Inlet Connection	Outlet Connection
3990-CGA	Specify CGA 170 or 180	1/4" O.D. hose barb
3991-CGA	Specify CGA 170 or 180	1/4" compression fitting w/10" long brass tubing
3992-180	CGA 180	1/4" compression fitting w/10" long SS tubing

GAS CONTROLS FOR DISPOSABLE CYLINDERS
Series 3960 – Fixed Flow Regulator for Non-Corrosive Gases

DESCRIPTION

These compact regulators are designed to provide a constant fixed flow rate of non-corrosive gases and mixtures from disposable cylinders fitted with a C-10 connection. If required they can also be provided with a standard CGA connection for other types of cylinders.

FEATURES

- Built-in on/off valve.
- Integral inlet and outlet connections provide convenient compact size.
- Outlet orifice and preset delivery pressure provide specific flow rate when on/off valve is opened.
- Pressure gauge monitors cylinder pressure.
- 40 micron inlet filter.

SPECIFICATIONS

Inlet pressure: 1000 psig max. with C10
3000 psig max. with CGA connection
Operating temperature: 0˚ to 160˚F
Inlet connection: C-10 (5/8”-18 UNF)
Outlet connection: 3/16” hose barb
Cylinder pressure gauge: 1200 psig with C10
0-3000 psig with CGA connection

MATERIALS OF CONSTRUCTION

Body: nickel-plated brass
Piston: brass
Seat: Teflon®
Seals: Viton®
Gauge: stainless steel case, brass connection

HOW TO ORDER

Model No.*	Pre-Set Flow Rate
3960-02	0.25 liters/min
3960-05	0.50 liters/min
3960-10	1.0 liters/min
3960-15	1.5 liters/min
3960-20	2.0 liters/min
3960-25	2.5 liters/min
3960-50	5.0 liters/min
3960-60	6.0 liters/min

*If standard CGA connection is desired add CGA connection number to the model number, i.e. 3960-15-180.

GAS CONTROLS FOR DISPOSABLE CYLINDERS
Series 3962 –
Stainless Steel Fixed Flow Regulator for Corrosive Gases

DESCRIPTION

These compact regulators are designed to provide a constant fixed flow rate of gas mixtures containing corrosive gas components from disposable cylinders fitted with a C-10 connection. If required they can also be provided with a standard CGA connection for other types of cylinders.

FEATURES

- Built-in on/off valve.
- Integral inlet and outlet connections provide convenient compact size.
- Outlet orifice and preset delivery pressure provide specific flow rate when on/off valve is opened.
- Pressure gauge monitors cylinder pressure.
- 40 micron inlet filter.

SPECIFICATIONS

Inlet pressure: 1000 psig max. with C10
3000 psig max. with CGA connection
Operating temperature: 0˚ to 160˚F
Inlet connection: C-10 (5/8”-18 UNF)
Outlet connection: 3/16” hose barb
Cylinder pressure gauge: 1200 psig with C10
0-3000 psig with CGA connection

MATERIALS OF CONSTRUCTION

Body: stainless steel
Piston: stainless steel
Seat: Teflon®
Seals: Viton®
Gauge: stainless steel

HOW TO ORDER

Model No.*	Pre-Set Flow Rate
3962-02	0.25 liters/min
3962-05	0.50 liters/min
3962-10	1.0 liters/min
3962-15	1.5 liters/min
3962-20	2.0 liters/min
3962-25	2.5 liters/min
3962-50	5.0 liters/min
3962-60	6.0 liters/min

*If standard CGA connection is desired add CGA connection number to the model number, i.e. 3962-15-180.

GAS CONTROLS FOR DISPOSABLE CYLINDERS
Series 3970 –Regulator for Non-Corrosive Gases

DESCRIPTION

These compact regulators are designed to provide a constant fixed flow rate of non-corrosive gases and mixtures from disposable cylinders fitted with a CGA 600 outlet connection. They provide both pressure and flow control. When regulator is supplied without 1/4" flow control hose barb the 3970 is an adjustable pressure regulator.

FEATURES

- Adjustable delivery pressure.
- Integral needle valve for shut-off and to control flow.
- Integral CGA 600 connection provides compactness and minimal loss of gas during installation and removal.
- 0-300 psig inlet pressure gauge to monitor cylinder pressure.

SPECIFICATIONS

Inlet pressure: 300 psig max.
Operating temperature: 0˚ to 160˚F
Inlet connection: CGA 600
Outlet connection: 1/4" NPT female or
1/4" hose barb with flow control orifice
Cylinder pressure gauge: 0-300 psig
Cv = 0.04

MATERIALS OF CONSTRUCTION

Body: aluminum
Diaphragm: neoprene
Seat: neoprene
CGA gasket: composite cork
Gauge: stainless steel case, brass connection

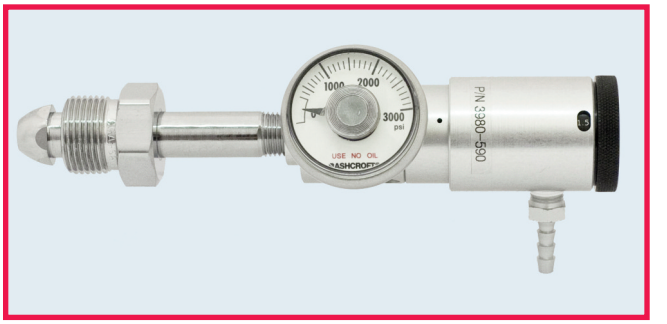
HOW TO ORDER

Model No.	Del. Press. Range psig	Outlet
3970	0-60	1/4" NPT female
3970HB	0-60	1/4" hose barb with flow control orifice

ADJUSTABLE FIXED FLOW REGULATOR
Series 3980

DESCRIPTION

The 3980 series provides the control of the single fixed flow regulators with the advantage of being able to change flow rates as required for different applications. This regulator eliminates the need to have multiple regulators on-site. There are models suitable for use with non-corrosive gases and mildly corrosive gases. Commonly called the “click” regulator it has 12 flow positions, OFF, 0.3, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 5.0, 6.0, 7.0, and 8.0 slpm. NOTE: Flow rates are estimated. Actual flow rates will vary depending on gas service and pressure.



FEATURES

- 12 fixed flow settings.
- 0-3000 psig cylinder pressure gauge.
- Max. inlet pressure 3000 psig.
- Available with standard C-10 (5/8”-18 UNF) or a standard CGA cylinder connection.
- 3/16” hose barb outlet.
- 40 micron inlet filter.

MATERIALS OF CONSTRUCTION

3981	3982
Body: clear anodized aluminum	Body: clear anodized aluminum
Piston: brass	Piston: stainless steel
Orifice plate: ceramic	Orifice plate: ceramic
Main valve seat: Teflon®	Main valve seat: Teflon®
Piston seals: Viton®	Piston seals: Viton®
Pressure gauge: SS case with brass socket	Pressure gauge: stainless steel

HOW TO ORDER

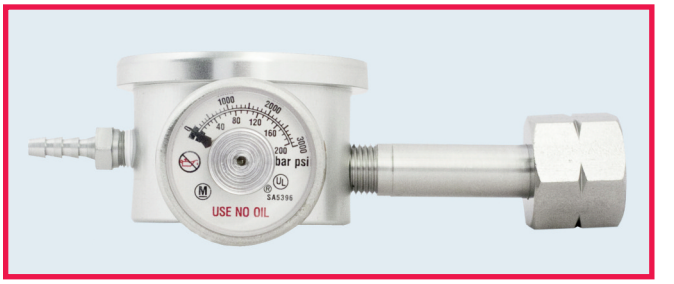
Model	Description
3981	non-corrosive gas regulator with C-10 connection
3981-CGA*	non-corrosive gas regulator with standard CGA connection
3982	corrosive gas regulator with C-10 connection
3982-3K	corrosive gas regulator with C-10 connection rated for 3000 psig
3982-CGA*	corrosive gas regulator with standard CGA connection

*Specify CGA connection when ordering.

DEMAND FLOW REGULATOR
Series 3950

DESCRIPTION

This new single stage design using balanced valve stem technology is more sensitive than older two stage technologies providing g better performance even with high inlet pressures. This regulator is designed for use with instruments that use a pump to draw the calibration gas into the instrument. The 3950 series demand flow regulator provides the exact amount of calibration gas the instrument pump requires. This simple to use regulator makes calibration quick and easy by eliminating the need for sample bags, flowmeters, or special operator training.



FEATURES

- Precise delivery of calibration gas required by instrument pump.
- New single stage balanced valve stem technology.
- Simple easy to use operation.
- Various cylinder connections available: C-10, CGA 600, other CGAs.
- 40 micron inlet filter.

SPECIFICATIONS

Outlet hose barb for 3/16" ID hose
Flow 0-3 slpm @ 3" of H_2O vacuum
Inlet pressure gauge: 0-3000 psig with GCA connection
0-1200 psig with C10 connection

MATERIALS OF CONSTRUCTION

	Model 3951	Model 3952
Body	clear anodized aluminum	clear anodized aluminum
Bonnet	clear anodized aluminum	clear anodized aluminum
Diaphragm	Buna-N	Viton®
Main valve seat	Viton® and Teflon®	Viton® and Teflon®
Inlet pressure gauge	stainless steel case with brass socket	stainless steel case with stainless steel socket

HOW TO ORDER

Model	Description
3951-C10	Demand Flow Regulator with C-10 inlet connection
3951-600	Demand Flow Regulator with CGA 600 inlet connection
3951-CGA	Demand Flow Regulator with selected CGA connection
3952-C10	Demand Flow Regulator with C-10 inlet connection
3952-CGA	Demand Flow Regulator with selected CGA connection

SPECIALTY APPLICATION POINT OF USE PANELS

Mass Spec Distribution Panel Model 22660

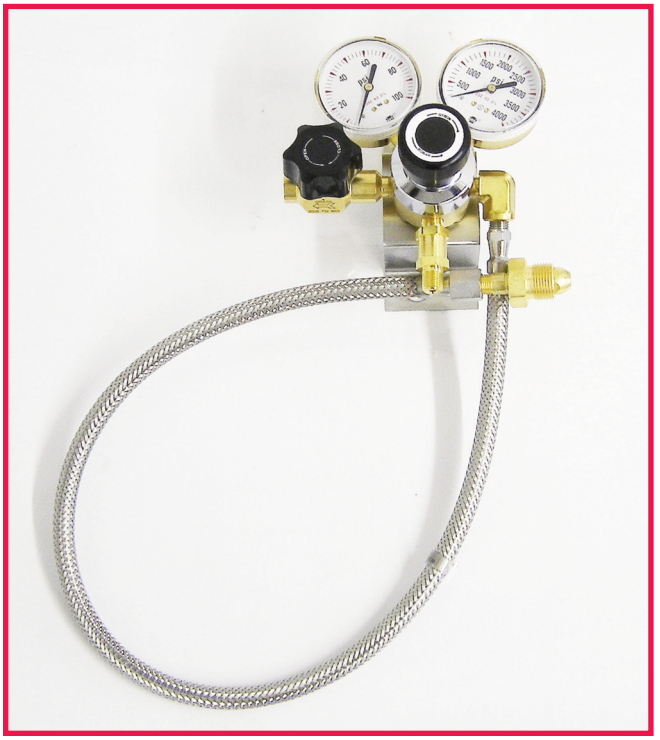
DESCRIPTION

This panel provides mass spec users with all the necessary gas handling equipment to properly install and operate their new mass spectrometer. The gas distribution panel provides all of the necessary controls to feed both air and nitrogen to the mass spec at the proper pressures for optimum operation. The valve arrangement provides the user with the option of using nitrogen for all the functions instead of air for the exhaust gas, Gas 1 and Gas 2 functions in the event that compressed air is not available. The panel is compact and easy to install. Simply mount the panel at a convenient location and connect your gas lines using the compression fittings provided.

FEATURES

- Total high purity gas construction.
- Brass high purity line regulators.
- HL3300-125-580 regulator included for LN2 container.
- Diaphragm valves.
- Valved for use with air and nitrogen or nitrogen only.
- 1/4" OD compression fitting outlet connections.
- 50 feet of 1/4" polyethylene tubing.
- System is mounted on a 23" high x 12" wide x 1/2" thick HDPE panel.

Generator Backup Panel Model 22687



DESCRIPTION

This panel is designed to automatically provide a reserve supply to a gas generator in the event of a power loss, or the generator cannot provide sufficient gas to the system. The system may be used with air, hydrogen, or nitrogen generators and are available constructed of brass or stainless steel. An alarm option is available.

FEATURES

- High purity two stage regulator to ensure constant delivery pressure as required.
- Stainless steel inner core flexible 3' pigtails with cylinder connections having integral check valves.
- Provided on a stainless steel wall mounting bracket.

HOW TO ORDER

Model	Description
22687B-XXX-CGA*	Brass Generator Backup Panel
22687S-XXX-CGA*	Stainless Steel Generator Backup Panel

XXX- Specify delivery pressure
*Specify CGA connection when ordering.

Options	
22657-AVA	Alarm Module

POINT OF USE PANELS
Multiple Source Panels
Series 223

Point of use panels provide a convenient organized method to deliver gas to your laboratory instruments or systems whether from a single source or multiple sources while providing individual pressure control for each application.

FEATURES

- High purity brass or stainless steel line regulators.
- Individual inlets and outlets for each regulator.
- Horizontal or vertical configuration.
- HDPE panel.
- Inlet and outlet connections 1/4”stainless steel compression fittings.

HOW TO ORDER

223M-X- PPP

M = 1 for brass
4 for stainless steel

X = H for horizontal configuration
V for vertical configuration

Y = number of regulators

C = center inlet

PPP = delivery pressure of each regulator on the panel. Show the range code for each regulator in order from top to bottom or left to right.
25 for 0-25 psig
50 for 0-50 psig
100 for 0-100 psig
150 for 0-150 psig

Example:

2231-H-25-25-50-100 describes a brass four-regulator panel in the horizontal orientation with the first regulator on the left having a 0-25 psig delivery pressure range followed in order by three others: 0-25 psig, 0-50 psig, and 0-100 psig.

four-regulator horizontal panel configuration

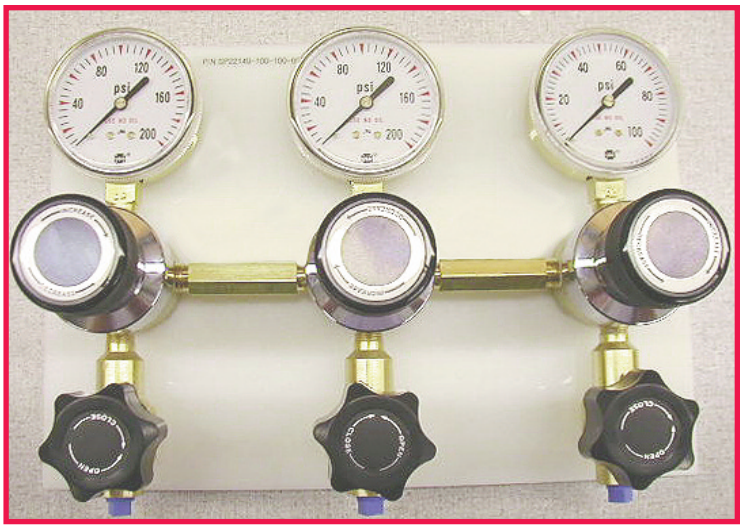
single regulator panel

three-regulator vertical panel configuration

POINT OF USE PANELS
Single Source Panels
Series 233

FEATURES

- High purity brass or stainless steel line regulators.
- One inlet with individual outlets for each regulator.
- Horizontal or vertical configuration.
- HDPE panel.
- Inlet and outlet connections 1/4”stainless steel compression fittings.



three-regulator panel – inlet may be from the left or the right

HOW TO ORDER

233M-X- PPP-C

M = 1 for brass
4 for stainless steel

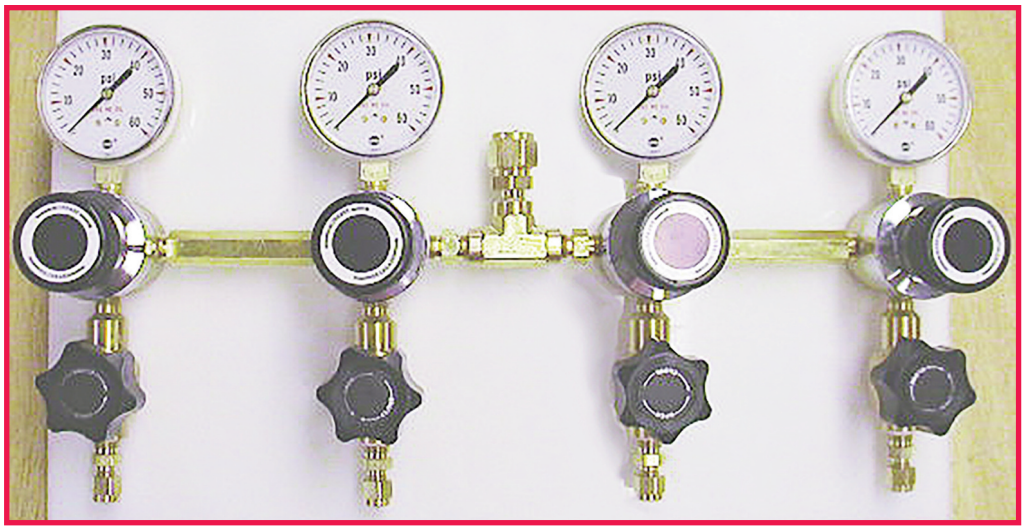
X = H for horizontal configuration
V for vertical configuration

Y = number of regulators

C = center inlet

PPP = delivery pressure of each regulator on the panel. Show the range code for each regulator in order from top to bottom or left to right.
25 for 0-25 psig
50 for 0-50 psig
100 for 0-100 psig
150 for 0-150 psig

Example:
2331-H-25-25-50-100-C describes a center inlet brass four-regulator panel in the horizontal orientation, with the first regulator on the left having a 0-25 psig delivery pressure range followed in order by three others: 0-25 psig, 0-50 psig, and 0-100 psig.



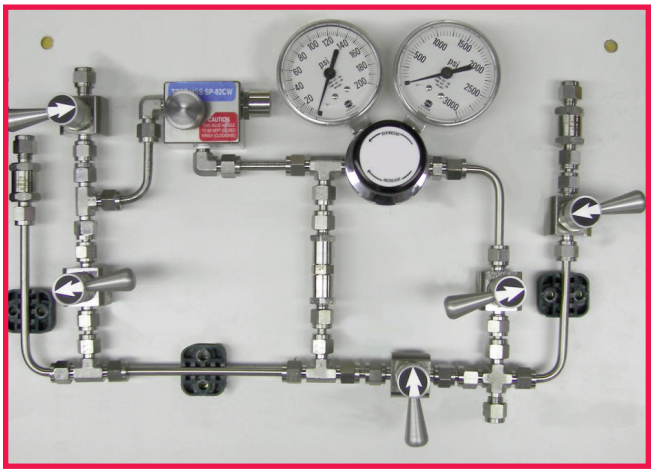
four-regulator panel with center inlet

CUSTOM SYSTEMS

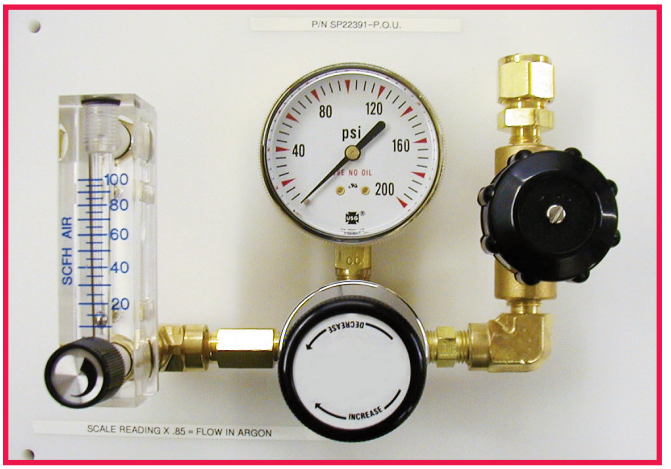
Most of the components in this catalog are used in combination with other components in their final application. Often it is convenient to combine these components on a panel, in a cabinet, or some other system configuration prior to the shipment of the components. This service offers convenience and often saves both time and money while ensuring that the user has all of the capability he requires when the product is received.

To take advantage of this service provide us with a flow sketch of the system and a brief written commentary of the system requirements; pressures, flow rates, gas, desired materials of construction, purification requirements, etc. or contact our technical service personnel to discuss your needs.

Some typical systems are shown on this page.



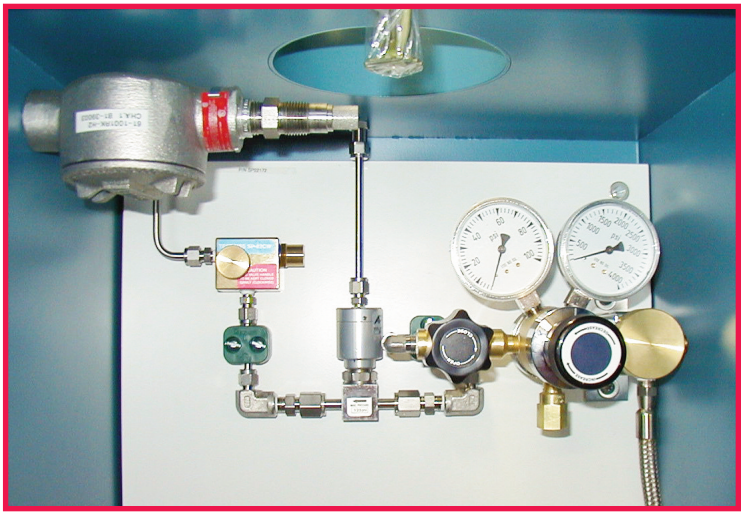
Five-Valve Panel



Regulator Flowmeter Panel

Flowmeter with Timer

Gas Purifier Panel



Hydrogen Gas Cabinet with Controls

LEAK-TECTOR™ TESTING SOLUTION

DESCRIPTION

Leak-Tector is specially formulated for testing lines, cylinders, and systems carrying oxygen and other compressed gases for leaks. The formulation contains no oil, grease, fatty acids, ammonias, or any other ingredient that could combine with pure oxygen to form either a flammable or explosive mixture.

Leak-Tector is simple to use. Apply the solution to a connection or surface suspected of leaking and watch for bubble clusters. Large leaks form large bubble clusters. Very fine leaks form white foam that builds up for several minutes, making detection easy and certain. Solution dries clean with no greasy residue and does not need to be removed after testing. Tests have shown that Leak-Tector clearly detects leaks as small as one pound of gas in 100 years, a leak rate of 1.16 x 10-4 cc/sec of nitrogen.

Leak-Tector is available in convenient 8 oz. squeeze bottles or 1 gallon containers.

SPECIFICATIONS

Temperature range: +35° to +160°F
Meets Air Force Spec. MIL-L-25567

HOW TO ORDER

Model	Description
LT-8	8 oz squeeze bottle of Leak-Tector
LT-8X12	case of 12 8 oz bottles of Leak-Tector
LT-1G	one gallon bottle of Leak-Tector
LT-1GX4	case of four one gallon bottle of Leak-Tector

LOW GAS PRESSURE ALARM
Series 9900

DESCRIPTION

The Series 9900 complies with the requirements of NFPA 99 2002 paragraph 5.1.10.5.5 that mandates the continuous monitoring of purge gas while welding or brazing gas lines.

These alarms are ideal for any gas application where a decrease in gas pressure could be detrimental to the operation.

Rated for 3000 psig the Series 9900 can be installed between the cylinder valve and the user's pressure regulator or system. At low pressure, the Series 9900 provides both and audible and visual alert to the user when the container pressure reaches the pre-set level. Units are available in brass or stainless steel with the appropriate CGA connections for easy installation between an existing cylinder and regulator, or with pipe threads or compression fittings for permanent installation into a gas supply system.

Standard models require 110 VAC power. For remote locations or where power is not readily available there are battery-powered models that operate on a standard 9V battery.

Regulator sold separately.

FEATURES

- Wide range of alarm pressure selection.
- Available in brass or stainless steel.
- Available with CGA connections or 1/4" NPT female inlet and outlet.
- Complies with the requirements of NFPA 99 2002 paragraph 5.1.10.5.5.
- Choice of power source – 110 VAC, 9V battery.
- Provides both an audio (~90 dB @ 10 feet) and a visual alarm.
- Mating inlet and outlet connections.

HOW TO ORDER

(Replace the PSI in P/N with the desired activation pressure.)

Model Number	Description
9910-PSI-CGA	110 VAC brass unit with audio/visual alarm and silence button
9911-PSI-CGA	9 volt brass unit with audio/visual alarm and on/off switch (no silence button)
9910-PSI-P4FF	110 VAC brass unit with audio/visual alarm and silence button – 1/4" NPTF
9911-PSI-P4FF	9 volt brass unit with audio/visual alarm and on/off switch (no silence button)
9920-PSI-CGA	110 VAC SS unit with audio/visual alarm and silence button
9921-PSI-CGA	9 volt SS unit with audio/visual alarm and on/off switch (no silence button)
9920-PSI-P4FF	110 VAC SS unit with audio/visual alarm and silence button – 1/4" NPTF
9921-PSI-P4FF	9 volt SS unit with audio/visual alarm and on/off switch (no silence button)

CHANGEOVER MANIFOLD TUTORIAL

Many applications require a continuous supply of gas to the process, stopping the flow of gas during operations to replace empty cylinders is not an option. The laser welding operation is a perfect example of an application that may operate on a single 8 hour shift basis but requires continuous flow throughout the operating period. Stopping production to replace empty cylinders can be costly – time is money.

There are many other applications where the flow of gas must be maintained 24/7. Helium for gas chromatographs and carbon dioxide for incubators are two simple, but good examples where loss of gas flow can have very unwelcome results. These applications require continuous flow for long periods of time not only during working hours, but when the system is unattended in the evening and during weekends and holidays. Running a gas chromatograph out of helium carrier gas can result in costly repairs and days without analytical results. An incubator without carbon dioxide can result in destroyed samples and the loss of years of research.

WHAT IS A CHANGEOVER MANIFOLD?

A changeover manifold is a system of valves and pressure regulators that delivers gas to a process without gas flow interruption. Most changeovers consist of a regulator scheme that reduces the pressure in two stages to achieve a constant outlet pressure.

Users should be aware that there are systems offered that do not provide two stages of pressure reduction and that the resultant outlet pressure will fluctuate considerably as the system operates, thus requiring the addition of a line regulator down stream from the changeover to provide a consistent pressure to the process.

SELECTION CRITERIA FOR CHANGEOVER MANIFOLDS

Each application has a different set of operating parameters that must be evaluated and satisfied. Let's take a look at some key parameters that users need to understand when selecting a changeover manifold.

1. **Automatic or semi-automatic? What's the difference?**
   Some suppliers use semi-automatic and automatic interchangeably when describing a changeover manifold. In fact, they are two distinctly different systems.

   A **semi-automatic** changeover normally operates by opposing pressure differential. It switches from the "in-service" side to the "reserve" side automatically, but requires an action by the operator to switch it back from the new "in-service" side to the "reserve side." Typically this is accomplished by flipping a knob, a lever, or operating a series of valves after replacing the empty cylinders. The model 914 and 916 are typical semi-automatic changeovers.

   An **automatic** changeover manifold functions electronically. The only action required by an operator for this unit to reverse the changeover is to replace empty cylinders and to re-pressurize the depleted side. The model 918TS and 919TS are typical fully automatic changeovers.

2. **The gas supply source is important.**
   The gas supply source to a changeover may include any combination of the following:
   - A standard high pressure cylinder, such as nitrogen or helium,
   - A cylinder of liquefied gas, such as carbon dioxide,
   - A six pack, 12 pack, manifold of cylinders,
   - A cryogenic container of argon, nitrogen, oxygen, or carbon dioxide,
   - A tube trailer,
   - A bulk storage tank.

   While you have all of the above choices and perhaps others, your choice of gas source drives your choice of changeover manifolds. If high pressure cylinders are always to be your source, you have the choice of virtually any automatic or semi-automatic changeover system. Substitute a cryogenic container on one side with a high pressure source on the other side and your choices narrow depending on the operating parameters of delivery pressure and flow.

   Automatic changeovers like the **AUTO-LOGIC II** and **ULTRA-LOGIC** allow the user to start with high pressure cylinders on both sides, and then expand to a cryogenic source on one side and a high pressure source on the other side. If even higher consumption rates become required, users can easily switch to cryogenic sources on both sides. The automatic changeover may have a higher upfront cost but be more economical in the long term.

3. **What is the maximum required flow?**
   This is often the most difficult parameter for the user to specify. Knowing the maximum flow is important for two reasons. First, you must ensure that the changeover has sufficient capacity to feed the process. A greatly oversized changeover may lead to premature failure. Second, you must ensure that the gas sources are sufficient to meet the operating parameters of the application.

4. **Determine the desired gas source change out frequency.**
   To determine the gas source frequency change out time, consider the flow rate, the total hours of operation, and the time period to obtain full containers to replace the empty side of the changeover.

SUMMARY

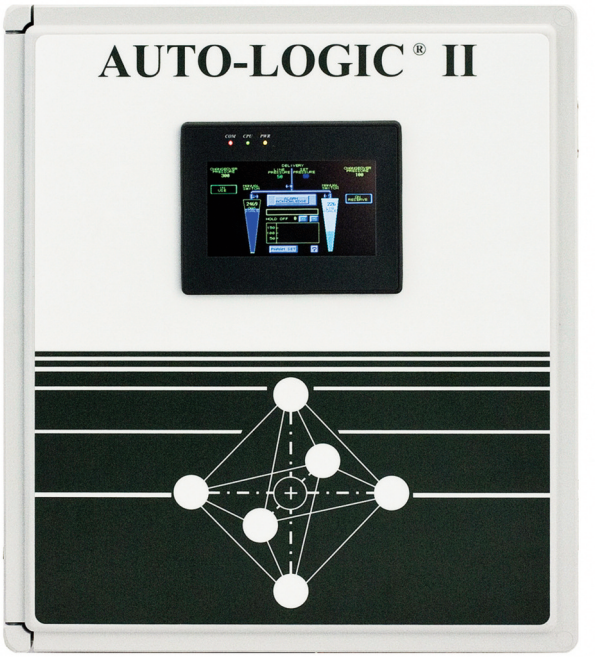
Whatever your requirements, be sure to consider all of the elements in choosing your changeover manifold. Proper planning up front will provide benefits and smooth operations for many years. It is a good idea to discuss your application details with your supplier to ensure that you choose the correct changeover manifold with respect to your application.

AUTO-LOGIC® II FULLY AUTOMATIC ELECTRONIC TOUCH SCREEN CHANGEOVER MANIFOLD

DESCRIPTION

This advanced electronically operated 918 Series AUTO-LOGIC II changeover manifold is truly fully automatic. It provides the user with simple, intuitive operation via a color touch screen – no buttons to push and no knobs to turn. Like its forerunner, the AUTO-LOGIC, users can switch from high pressure cylinders on both sides to low pressure cryogenic containers on one side and high pressure cylinders on the other side, or cryogenic containers on both sides with just a few screen touches. Once you have set the operating parameters, you need only change cylinders as necessary. The system takes care of everything else. There is no need to make pressure adjustments or flip a knob after the system has switched from one side to the other. Just replace the empty cylinders and open the valves. The system is now set to change in the opposite direction. These systems are truly automatic and hassle free. The AUTO-LOGIC II capabilities provide customers with the best changeover system to suit their current operation and future expanded requirements without having to buy another system.

The 918TS is available constructed with brass or stainless steel high purity gas components. It has digital pressure readouts for inlet pressures and outlet delivery pressure, built-in alarms, and dry contacts to operate external equipment, such as remote alarms or an auto-dialer. Entire system is housed in a NEMA 4X enclosure.



FEATURES

- Fully automatic, simple, hassle free operation via a color touch screen.
- Constant digital and graphic gas supplies on both sides.
- Delivery pressure monitor displays any unusual variances.
- High and low adjustable delivery pressure alarm settings .
- Designed for high purity gas service.
- May be used with any type gas source.
- “Leak-Check monitoring alerts the user to low reserve side pressure of either high pressure or cryogenic containers while in standby via audible and visual alarms.
- “Gas-Check” feature ensures efficient use of gas supplies when cryogenic containers are in service.
- Built-in audio and visual alarm.
- External dry contacts provided to activate optional equipment or remote alarms.
- System housed in a NEMA 4X enclosure.
- Available in either brass or stainless steel construction.

SPECIFICATIONS

Max inlet pressure: 3000 psig
Power required: 120 VAC/60Hz
Outlet connection: 1/2” NPT femaie
Inlet connections: 1/4” NPT female*
* When unit is ordered with accompaning pigtails the inlet connections will be the mating CGA connection of the pigtail.

AUTO-LOGIC® II FULLY AUTOMATIC ELECTRONIC TOUCH SCREEN CHANGEOVER MANIFOLD *CONTINUED*

HOW TO ORDER

Model	Description	Delivery Pressure
918TS-1-200	brass electronic high purity changeover manifold	25-200 psig
918TS-2- 200	stainless steel electronic high purity changeover manifold	25-200 psig

Options

918TSE-email notifies recipient that a changeover has occurred. (Provide email address when ordering.)

912-AVA audio/visual alarm module for remote alarm

AVD-45B auto dialer

914/918-HUB - this hub device allows for multiple dry contact connections to operate auxiliary devices

Pigtails for 918TS Changeover Manifolds (2 per set)

For Brass Manifolds	
918-FPB601-Y-CGA*	two flexible Teflon lined stainless steel braided pigtails with brass fittings and no check valves
918-FPB601-Y-CV-CGA*	two flexible Teflon lined stainless steel braided pigtails with brass fittings and check valves
918-FPB604-Y-CGA*	two flexible all stainless steel braided pigtails with brass fittings and no check valves
918-FPB604-Y-CV-CGA*	two flexible all stainless steel braided pigtails with brass fittings and check valves
For Stainless Steel Manifolds	
918-FP604-Y-CGA*	two flexible all stainless steel braided pigtails without check valves
918-FP604-Y-CV-CGA*	two flexible all stainless steel braided pigtails with check valves

* Specify CGA connection when ordering.
Y = pigtail length in feet.

WARNING: The standard 919TS changeover unit is not suitable for use with flammable or corrosive gases. Units are available for use with a flammable, toxic, or corrosive gas. Such units are designed specifically for the intended gas to be controlled. Please contact us to discuss your specific requirement.

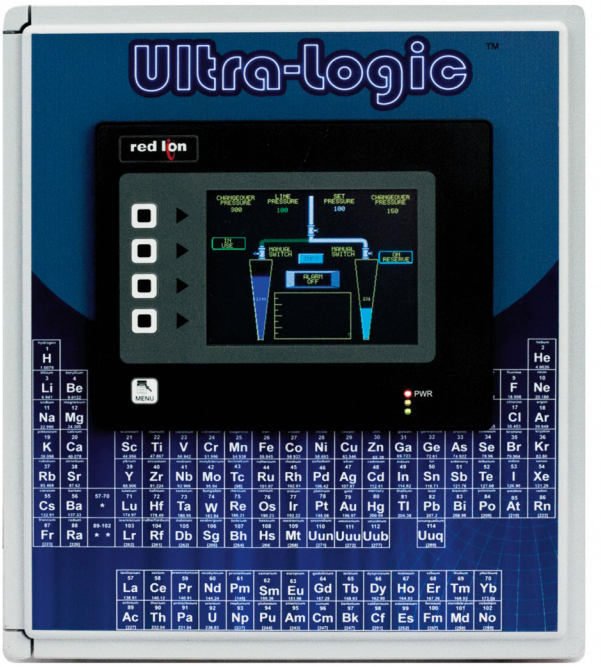
ULTRA-LOGIC® – ADVANCED FULLY AUTOMATIC ELECTRONIC TOUCH SCREEN CHANGEOVER MANIFOLD
Series 919TS

DESCRIPTION

The 919 Series Ultra-logic changeover manifold is an advanced version of the AUTO-LOGIC II. It provides the user with simple, intuitive operation via a color touch screen – no buttons to push and no knobs to turn. Like its forerunner, the AUTO-LOGIC II, users can switch from high pressure cylinders on both sides to low pressure cryogenic containers on one side and high pressure cylinders on the other side, or cryogenic containers on both sides with just a few screen touches. Once you have set the operating parameters, you need only change cylinders as necessary. The system takes care of everything else. There is no need to make pressure adjustments or flip a knob after the system has switched from one side to the other. Just replace the empty cylinders and open the valves. The system is now set to change in the opposite direction. These systems are truly automatic and hassle free.

The additional Ultra-logic capabilities provide customers with the best changeover system to suit their current operation and future expanded requirements without having to buy another system.

The 919TS is available constructed with brass or stainless steel high purity gas components. It has digital pressure readouts for inlet pressures and outlet delivery pressure, built-in alarms, and dry contacts to operate external equipment, such as remote alarms or an auto-dialer. Entire system is housed in a NEMA 4X enclosure.



FEATURES

- Fully automatic, simple, hassle free operation via a large color touch screen.
- Can be controlled via network.
- Provides full data logging capability for all functions to aid in 21CFR11 compliance.
- Operating parameters are password protected for multiple users.
- Constant digital and graphic gas supplies for both sides.
- Delivery pressure monitor displays any unusual variances.
- High and low adjustable delivery pressure alarm settings.
- Designed for high purity gas service.
- May be used with any type gas source.
- “Leak-Check monitoring alerts the user to low reserve side pressure of either high pressure or cryogenic containers while in standby via audible and visual alarms.
- “Gas-Check” feature ensures efficient use of gas supplies when cryogenic containers are in service.
- Built-in audio and visual alarm.
- External dry contacts provided to activate optional equipment or remote alarms.
- System housed in a NEMA 4X enclosure.
- Available in either brass or stainless steel construction.

SPECIFICATIONS

Max inlet pressure: 3000 psig
Power required: 120 VAC/60Hz
Outlet connection: 1/2” NPT femaie
Inlet connections: 1/4” NPT female*
* When unit is ordered with accompaning pigtails the inlet connections will be the mating CGA connection of the pigtail.

ULTRA-LOGIC® – ADVANCED FULLY AUTOMATIC ELECTRONIC TOUCH SCREEN CHANGEOVER MANIFOLD CONTINUED
Series 919TS

HOW TO ORDER

Model	Description	Delivery Pressure
919TS-1-200	brass electronic high purity changeover manifold	25-200 psig
919TSP-1- 200	brass electronic high purity changeover manifold with automatic purging	25-200 psig
919TS-2-200	stainless steel electronic high purity changeover manifold	25-200 psig

Options

912-AVA audio/visual alarm module for remote alarm
AVD-45B auto dialer

Pigtails for 919TS Changeover Manifolds (2 per set)

For Brass Manifolds	
919-FPB601-Y-CGA*	two flexible Teflon lined stainless steel braided pigtails with brass fittings and no check valves
919-FPB601-Y-CV-CGA*	two flexible Teflon lined stainless steel braided pigtails with brass fittings and check valves
919-FPB604-Y-CGA*	two flexible all stainless steel braided pigtails with brass fittings and no check valves
919-FPB604-Y-CV-CGA*	two flexible all stainless steel braided pigtails with brass fittings and check valves
For Stainless Steel Manifolds	
919-FP604-Y-CGA*	two flexible all stainless steel braided pigtails without check valves
919-FP604-Y-CV-CGA*	two flexible all stainless steel braided pigtails with check valves

* Specify CGA connection when ordering.
Y = pigtail length in feet.

WARNING: The standard 919TS changeover unit is not suitable for use with flammable or corrosive gases. Units are available for use with a flammable, toxic, or corrosive gas. Such units are designed specifically for the intended gas to be controlled. Please contact us to discuss your specific requirement.

HIGH PURITY SEMI-AUTOMATIC CHANGEOVER MANIFOLD Series 913

DESCRIPTION

The 913 Series is an upscale version of the 914 Series semi-automatic changeover manifold. Like the 914 it is constructed of high purity components and is suitable for use in both high purity and general purpose applications. Using pressure differential to change from the empty supply side of the changeover, to the full supply side of the changeover these manifolds can provide an uninterrupted supply of gas to your instrumentation or process. Units are available in both brass and stainless steel construction.

The units are housed in a NEMA4X box and are suitable for both indoor and outdoor installations. The box houses the gas controls, electronic control module, a pre-set safety relief valve with vent port with a ¼" NPT female outlet connection. Status lights on the front provide for easy monitoring of gas supplies to the application (Green for full and Red for empty). The outlet connection is ½" NPT female. A 110 VAC power cord is provided. The package is completed with a set of two 3' stainless steel inner core flexible hose pigtails with check valves installed in the CGA cylinder connections.

Remote alarm functionality requires the specially designed 913-AVA alarm module powered by the base unit. The 913 or the 913-AVA will not work with any other alarm system.

SPECIFICATIONS

Max. inlet pressure	3000 psig
Inlet ports	1/4" NPT female*
C_V	0.08 standard (0.2 optional)
Operating temperature	-40° to +165°F
Weight	28 lbs.

* When unit is ordered with accompaning pigtails the inlet connections will be the mating CGA connection of the pigtail.

HOW TO ORDER

Model	Description
Brass Units	
913-1-25-CGA*	Brass construction, 0-25 psig delivery pressure range, two stainless steel 3' flexible hose pigtails with brass CGA connections having integral check valves
913-1-50-CGA*	Brass construction, 0-50 psig delivery pressure range, two stainless steel 3' flexible hose pigtails with brass CGA connections having integral check valves
913-1-100-CGA*	Brass construction, 0-100 psig delivery pressure range, two stainless steel 3' flexible hose pigtails with brass CGA connections having integral check valves
913-1-150-CGA*	Brass construction, 0-150 psig delivery pressure range, two stainless steel 3' flexible hose pigtails with brass CGA connections having integral check valves
Stainless Steel Units	
913-2-25-CGA*	Stainless steel construction, 0-25 psig delivery pressure range, two stainless steel 3' flexible hose pigtails with stainless steel CGA connections having integral check valves
913-2-50-CGA*	Stainless steel construction, 0-50 psig delivery pressure range, two stainless steel 3' flexible hose pigtails with stainless steel CGA connections having integral check valves
913-2-100-CGA*	Stainless steel construction, 0-100 psig delivery pressure range, two stainless steel 3' flexible hose pigtails with stainless steel CGA connections having integral check valves
913-2-150-CGA*	Stainless steel construction, 0-150 psig delivery pressure range, two stainless steel 3' flexible hose pigtails with stainless steel CGA connections having integral check valves
Options	
913-AVA	Alarm module

*Specify CGA cylinder connection required when ordering.

HIGH PURITY SEMI-AUTOMATIC CHANGEOVER MANIFOLD Series 914

DESCRIPTION

The Series 914 semi-automatic changeover manifold is another solution for providing an uninterrupted supply of gas to your instrumentation or process. It incorporates a specially machined two-regulator in one body that simplifies changeover operation and reduces the wall space required. The feed and line regulators are of high purity construction with stainless diaphragms and diffusion resistant construction capable of passing a helium leak rate test of $1x10^{-9}$.

Available in both brass and 316SS construction, the 914 Series is provided complete with changeover regulator and line regulator installed on a mounting bracket for easy installation. **Pigtails and/or manifold sections are ordered separately.**

The manifold is assembled using the 914 central control section shown on this page and two manifold sections from pages 48 and 49 or a pigtail set from the list below to provide the supply banks. A simple two station semi-automatic manifold commonly used to ensure a continuous supply of carrier gas to a gas chromatograph employs a central control section with a pigtail installed on both inlets.

SPECIFICATIONS

Max. inlet pressure	3000 psig
Inlet and Outlet ports	1/4" NPT female*
C_V	0.08 standard (0.2 optional)
Operating temperature	-40° to +165°F
Weight	7.75 lbs.

* When unit is ordered with accompaning pigtails the inlet connections will be the mating CGA connection of the pigtail.

HOW TO ORDER

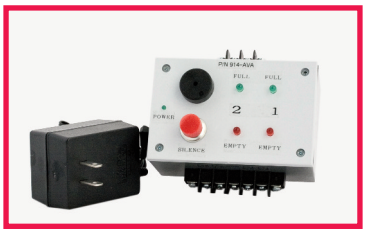
Model**	Description
Brass Central Control Section (header only - no pigtails)	
914-1-025	line regulator delivery range 0-25 psig
914-1-050	line regulator delivery range 0-50 psig
914-1-100	line regulator delivery range 0-100 psig
914-1-150	line regulator delivery range 0-150 psig
Stainless Steel Central Control Section (header only - no pigtails)	
914-2-025	line regulator delivery range 0-25 psig
914-2-050	line regulator delivery range 0-50 psig
914-2-100	line regulator delivery range 0-100 psig
914-2-150	line regulator delivery range 0-150 psig
Optional Accessories	
914-3B	Brass pressure switches (one each side)
914-3BEX	Brass pressure switches for flammable gases (one each side)
914-3S	Stainless Steel pressure switches (one each side)
914-3SEX	Stainless Steel pressure switches for flammable gases (one each side)
914-AVA	Audio/visual alarm system

**Add "HF" to base part number for high flow unit

Pigtails Sets for Brass Changeover Manifolds (2 per set)	
914-FP601-Y-CGA*	two flexible Teflon-lined stainless steel braided pigtails with brass fittings and no check valve
914-FP601-Y-CV-CGA*	two flexible Teflon-lined stainless steel braided pigtails with brass fittings and check valve
914-FPB604-Y-CGA*	two flexible all stainless steel braided pigtails with brass fittings and no check valve
914-FPB604-Y-CV-CGA*	two flexible all stainless steel braided pigtails with brass fittings and check valve

Pigtails Sets for Stainless Steel Changeover Manifolds (2 per set)	
914-FP604-Y-CGA*	two flexible all stainless steel braided pigtails without check valve
914-FP604-Y-CV-CGA*	two flexible all stainless steel braided pigtails with check valve

*Specify CGA connection when ordering.
Y = pigtail length in feet.



914 AVA

ECONOMICAL HIGH PURITY SEMI-AUTOMATIC CHANGEOVER MANIFOLD
Series 916 BX

The 916 BX Series semi-automatic changeover manifold provides an economic solution for providing an uninterrupted gas supply to your instrumentation or process when the working environment requires the changeover to be enclosed. The entire system is housed in a NEMA4x box. Available in brass or 316 stainless steel, the 916 Series offers the convenience of a simple flip knob to readjust pressures after a changeover and a line regulator to ensure a constant delivery pressure to your system.

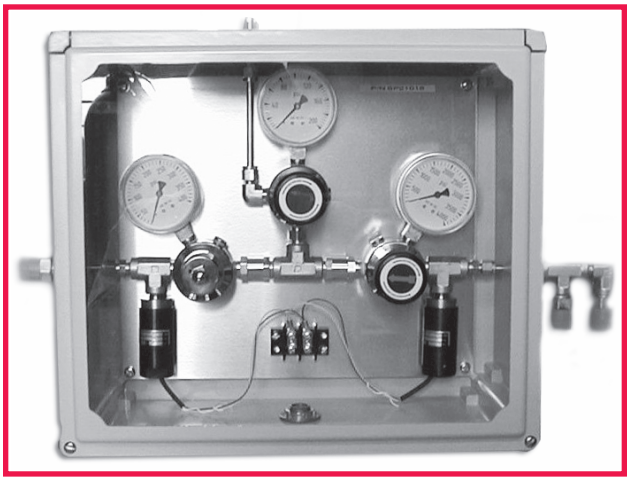
A pressure switch alarm assembly is available to notify the user that a changeover has taken place, the manifold needs to be set to switch the other way, and the empty cylinders should be changed.

The system can simply be used with one pigtail on each side, or connected to larger manifolds such as those shown on pages 59 and 60. Pigtails and/or manifolds sections are ordered separately.

SPECIFICATIONS

Max. Operating Press.	3000 psig
Inlet and outlet ports:	1/4" NPT female*
Operating Temperature:	-40ºF to +165ºF
Flow coefficient Cv	0.08

* When unit is ordered with accompaning pigtails the inlet connections will be the mating CGA connection of the pigtail.



916 BX

HOW TO ORDER

Model	Description
Brass Central Control Section (Control section only – no pigtails)	
916BX-1-025	line regulator delivery range 0-25 psig
916BX-1-050	line regulator delivery range 0-50 psig
916BX-1-100	line regulator delivery range 0-100 psig
Stainless Steel Central Control Section (Control section only – no pigtails)	
916BX-2-025	line regulator delivery range 0-25 psig
916BX-2-050	line regulator delivery range 0-50 psig
916BX-2-100	line regulator delivery range 0-100 psig
Options	
916-3B	brass pressure switch alarm assembly (one each side)
916-3BEX	brass pressure switch alarm assembly for flammable gases (one each side)
916-3S	stainless steel pressure switch alarm assembly (one each side)
916-3SEX	stainless steel pressure switch alarm assembly for flammable gases (one each side)
914-AVA	audio/visual alarm module
Pigtails for Brass Manifolds	
916-FP601-Y-CGA*	flexible Teflon-lined stainless steel braided pigtail with brass fittings and no check valve
916-FP601-Y-CV-CGA*	flexible Teflon-lined stainless steel braided pigtail with brass fittings and check valve
916-FPB604-Y-CGA*	flexible all stainless steel braided pigtail with brass fittings and no check valve
916-FPB604-Y-CV-CGA*	flexible all stainless steel braided pigtail with brass fittings and check valve
Pigtails for Stainless Steel Manifolds	
916-FP604-Y-CGA*	flexible all stainless steel braided pigtail without check valve
916-FP604-Y-CV-CGA*	flexible all stainless steel braided pigtail with check valve

*Specify CGA connection when ordering.
Y = pigtail length in feet.

914 AVA

ECONOMICAL HIGH PURITY SEMI-AUTOMATIC CHANGEOVER MANIFOLD
Series 916 HF (High Flow) and 916 HP (High Pressure)

The 916 HF and HP Series semi-automatic changeover manifold provides a low cost solution for providing an uninterrupted gas supply to your process. Available in brass, the 916 Series offers the convenience of a simple flip knob to readjust pressures after a changeover and a line regulator to ensure a constant delivery pressure to your system.

A pressure switch alarm assembly is available to notify the user that a changeover has taken place, the manifold needs to be set to switch the other way, and the empty cylinders should be changed.

The system can simply be used with one pigtail on each side, or connected to larger manifolds such as those shown on pages 59 and 60. Pigtails and/or manifolds sections are ordered separately.

SPECIFICATIONS

Max. Operating Press.	3000 psig
Inlet and outlet ports:	916 HF 1/2" NPT female
	916 HP 1/4" NPT female*
Operating Temperature:	-40ºF to +165ºF
Flow coefficient Cv	for HP 0.08
	for HF 0.55

* When unit is ordered with accompaning pigtails the inlet connections will be the mating CGA connection of the pigtail.

916 HF

916 HP

HOW TO ORDER

Model	Description
HP Brass Central Control Section	
(Control section only – no pigtails)	
916HP-1-500	line regulator delivery range 0-500 psig
916HP-1-750	line regulator delivery range 0-750 psig
916HP-1-1000	line regulator delivery range 0-1000 psig
916HP-1-1500	line regulator delivery range 0-1500 psig
HF Brass Central Control Section	
(Control section only – no pigtails)	
916HF-1-050	line regulator delivery range 0-50 psig
916HF-1-125	line regulator delivery range 0-125 psig
916HF-1-250	line regulator delivery range 0-250 psig
916HF-1-350	line regulator delivery range 0-350 psig
Options	
916-3B	brass pressure switch alarm assembly (one each side)
916-3BEX	brass pressure switch alarm assembly for flammable gases (one each side)
914-AVA	audio/visual alarm module
Pigtails for Brass Manifolds	
916-FP601-Y-CGA*	flexible Teflon-lined stainless steel braided pigtail with brass fittings and no check valve
916-FP601-Y-CV-CGA*	flexible Teflon-lined stainless steel braided pigtail with brass fittings and check valve
916-FPB604-Y-CGA*	flexible all stainless steel braided pigtail with brass fittings and no check valve
916-FPB604-Y-CV-CGA*	flexible all stainless steel braided pigtail with brass fittings and check valve

*Specify CGA connection when ordering.
Y = pigtail length in feet.

914 AVA

PROTOCOL STATIONS
Series 917

DESCRIPTION

The 917 protocol station is designed to provide a convenient way to mount virtually any pressure regulator that has a CGA connection or 1/4" NPT female inlet. The wall mounting of a regulator makes changing cylinders safer and hassle-free, while protecting the regulator from damage during the changing process because the operator handles only the flexible pigtail.

The 917 series is available in brass or 316 stainless steel in both single cylinder and double cylinder configurations. Pressure regulators are connected to the system with regular CGA cylinder connections rather than be rigidly mounted; this mounting system provides the virtual universality of the 917 and makes changing a regulator easy should it need to be replaced for any reason. A pressure switch alarm option is available to alert users that the cylinder in use is approaching empty. When check valves are selected they are integral with the CGA connection to the cylinder. All models are rated for 3000 psig operating pressure.

The 917H protocol station is designed for use with helium and hydrogen and mixtures containing them. This model maintains the economy of the brass unit, but replaces the Teflon-lined pigtail with an all stainless steel pigtail to eliminate the diffusion of these small molecule gases trough the Teflon lining.

MATERIALS OF CONSTRUCTION

	917B	**917H**	**917S**
Bracket:	stainless steel	stainless steel	stainless steel
Manifold block:	brass	brass	stainless steel
Flexible hose:	Teflon-lined w/SS braid	All stainless steel	All stainless steel
CGA connections:	brass	brass	stainless steel
Check valves:	brass with buna-N seals	brass with buna-N seals	SS with Viton seals
Valves:	brass diaphragm type	brass diaphragm type	SS diaphragm type

Regulator is not included and should be ordered separately. Pressure switch is optional.

PROTOCOL STATIONS *CONTINUED*
Series 917

HOW TO ORDER

Model*	Description
917B-2-CGA	protocol station w/brass fittings and 2' pigtail
917B-3-CGA	protocol station w/brass fittings and 3' pigtail
917B-2-CV-CGA	protocol station w/brass fittings, 2' pigtail w/check valve
917B-3-CV-CGA	protocol station w/brass fittings, 3' pigtail w/check valve
917BV-2-CGA	protocol station w/brass fittings, isolation valve, and 2' pigtail
917BV-3-CGA	protocol station w/brass fittings, isolation valve, and 3' pigtail
917BV-2-CV-CGA	protocol station w/brass fittings, isolation valve, and 2' pigtail w/ check valve
917BV-3-CV-CGA	protocol station w/brass fittings, isolation valve, and 3' pigtail w/ check valve
917H-2-CGA	protocol station w/brass fittings and 2' stainless steel pigtail
917H-3-CGA	protocol station w/brass fittings and 3' stainless steel pigtail
917H-2-CV-CGA	protocol station w/brass fittings, 2' stainless steel pigtail w/check valve
917H-3-CV-CGA	protocol station w/brass fittings, 3' stainless steel pigtail w/check valve
917HV-2-CGA	protocol station w/brass fittings, isolation valve, and 2' stainless steel pigtail
917HV-3-CGA	protocol station w/brass fittings, isolation valve, and 3' stainless steel pigtail
917HV-2-CV-CGA	protocol station w/brass fittings, isolation valve, and 2' stainless steel pigtail w/ check valve
917HV-3-CV-CGA	protocol station w/brass fittings, isolation valve, and 3' stainless steel pigtail w/ check valve
917S-2-CGA	protocol station w/stainless steel fittings and 2' pigtail
917S-3-CGA	protocol station w/stainless steel fittings and 3' pigtail
917S-2-CV-CGA	protocol station w/stainless steel fittings, 2' pigtail w/check valve
917S-3-CV-CGA	protocol station w/stainless steel fittings, 3' pigtail w/check valve
917SV-2-CGA	protocol station w/stainless steel fittings, isolation valve, and 2' pigtail
917SV-3-CGA	protocol station w/stainless steel fittings, isolation valve, and 3' pigtail
917SV-2-CV-CGA	protocol station w/stainless steel fittings, isolation valve, and 2' pigtail w/ check valve
917SV-3-CV-CGA	protocol station w/stainless steel fittings, isolation valve, and 3' pigtail w/ check valve

*Specify CGA connection when ordering. For dual cylinder units, add prefix "D" to the model number, i.e. D917S-2-CV-660.

Options

P/N 4610-P4FF	brass tee purge assembly
P/N 4620-P4FF	stainless steel tee purge assembly
P/N 917B-XXX	brass pressure switch alarm assembly (XXX = desired alarm pressure setting)
P/N 917BEX-XXX	brass pressure switch alarm assembly for flammable gases (XXX = desired alarm pressure setting)
P/N 917S-XXX	pressure switch alarm assembly (XXX = desired alarm pressure setting)
P/N 917SEX-XXX	pressure switch alarm assembly for flammable gases (XXX = desired alarm pressure setting)

P/N 912-AVA audio visual alarm module

MANIFOLD ALARM ACCESSORIES

912-AVA Single Point Audio/Visual Alarm Module

FEATURES

- 70 dB audio alarm.
- Red light visual alarm.
- Silence button.
- Operates on 110 VAC.

AVD-45 Auto-Dialer

FEATURES

- Dials up to four numbers when alarm is activated to notify required individuals.
- On-site programmable message.
- Requires dedicated analog phone line.
- Operates on 110 VAC.

UPS Power Battery Backup – CS350

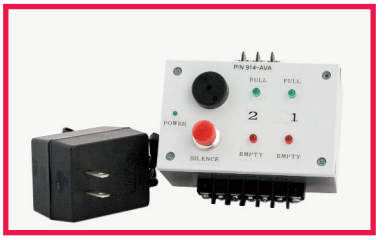
FEATURES

- Maintains operation during power failure .
- Provides power to 918 and 919 changeovers for approximately 5 hours.
- Requires 110 VAC power source to maintain full charge while in standby and for recharging.

914-AVA Changeover Audio/Visual Alarm Module

FEATURES

- 70 dB audio alarm.
- Red light visual alarm for each side.
- Green in service light for each side.
- Silence button.
- Dry contacts for additional devices.
- Operates on 110 VAC



914/918 HUB

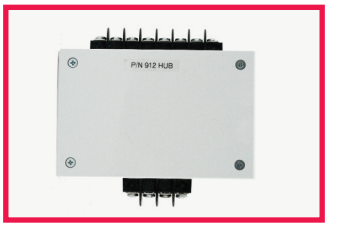
FEATURES

Hubs allow users to add additional devices (up to 3 per hub) to each changeover. Requires 110 VAC. For use with 914, 918, and 919 Series changeover manifolds.

912HUB

FEATURES

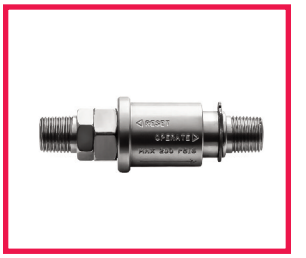
This hub allows the addition of up to 3 devices to be connected to the pressure switch alarm of a 917 protocol station or 9900 series low gas pressure alarm. No power required.



EXCESS FLOW VALVES
Series EFV

DESCRIPTION

The EFV Series are gas valves are designed to automatically shut off the flow of gas when flow exceeds a preset level. They are used to protect systems and/or people in the event of a line failure downstream of the valve. The Series consists of three valves that are remarkably flexible to meet a broad range of applications. All valves are set at the factory to customer specifications. Each valve has a built-in slide switch or knob to quickly rest the valve once the system leak has been repaired.



Compact EFV-C
Range 30-200 psig

High Pressure EFV-HP
Range 100-3000 psig

MATERIALS OF CONSTRUCTION

Wetted Parts*=X	Seals = Y	Trip Point = Z
A = 360 Brass	V = Viton®	Specify flow rate
B = 303 SS	N = neoprene	and operating pressure
*Internal parts are 303 SS in all units	E = EPDM	

High Sensitivity EFV-HS
Range 5-200 psig

HOW TO ORDER

Model (choose X, Y, and Z from table above)
EFV-C-P2MM-X-Y-Z
EFV-HP-P4MM-X-Y-Z
EFV-HP-P4FF-X-Y-Z
EFV-HP-P4MF-X-Y-Z
EFV-HP-P4FM-X-Y-Z
EFV-HS-P2MM-X-Y-Z

CYLINDER CLEANROOM COVERS
Series CYL-C

DESCRIPTION

These reusable cylinder covers are suitable for use in semiconductor, pharmaceutical, food processing, and laboratory areas where cleanliness is a must. The covers are fabricated from non-woven Tyvek® and polypropylene combination with a high-grade Velcro seal. Fabrication is done in a clean room environment. The upper area is large enough to accommodate a pressure regulator or other gas control device.

HOW TO ORDER

P/N	Description
CYL-C-9.55	Clean Room cylinder cover for T, K, A, H type cylinders*

*Other sizes are available please provide cylinder dimensions.

DISPLAY PRESSURE SWITCH
DPS Series

DESCRIPTION

The DPS is the ideal combination of pressure switch and transmitter with a pressure display. The settings in combination with a comprehensive set of options make this switch suitable for a wide range of demanding applications.

FEATURES

- Analog output switchable to Volts or Ma
- Two switching outputs PNP
- Threefold overpressure resistance, measuring principle thin film on steel
- Display and electrical connection are independently rotatable 335°/343°

TECHNICAL DATA

Measuring principle	Thin film on steel	Media Temperature	-25ºC...+85ºC
Inlet connections	1/4" NPTM	Ambient temperature	-25ºC...+85ºC
Output signal	4-20mA, 0-5 VDC, 1-5 VCD	Pressure unit for display	bar, psi, MPa, kPa, m WC, mm WC
	0-10 VOC, Switch ABLE mA or V	Logger	Ring buffer: 3518 data points
Switching output	2 transistors PNP		Sampling time: 0.1...999.9 x, Off (0)
Accuracy @ 25 C typ.	± 0.5% FS typ.		

HOW TO ORDER

Model	Measuring Range*
DSP-0400-P4M	0-400 psig
DSP-3000-P4M	0-3000 psig

*Other pressure ranges available.

PRESSURE SWITCH
Series PS500

DESCRIPTION

The PS500 series pressure switches are designed for high pressure applications up to 3000 psig. The switch features materials of construction that are compatible with a wide variety of gases (high purity, flammable, and many corrosives).

FEATURES

- Activation switch is UL recognized.
- May be set to activate to open or close for either declining or rising pressures.

SPECIFICATIONS

Max. Inlet Pressure:	3000 psig
Set Pressure Range:	50-500 psig Specify setting when ordering
Operating Temp. range:	-40°F to +140°F
Pressure Connection:	1/4" NPT male
Electrical Rating:	4A-250VAC
Electrical Connection:	18" flying leads with 1/2" conduit connection

MATERIALS OF CONSTRUCTION

Body:	316 SS
Bonnet:	clear anodized aluminum
Diaphragm	316 SS
Seal:	Buna-N (Teflon® is an available option)

HOW TO ORDER

Model	
PS500-D-XXX	activates on decreasing pressure
PS500-I-XXX	activates on increasing pressure

*Specify activation pressure when ordering.
If optional Teflon® seal is required add suffix "T" to P/N.

PRESSURE TRANSDUCERS
Model PT825

DESCRIPTION

The PT825 pressure transducers are a very convenient way to monitor the pressure of a system electronically. They are used in a large variety of applications including process monitoring, hydraulics, HVAC, and water treatment.

SPECIFICATIONS

Output:	0-5 VDC
Input:	13-30 VDC
Construction:	stainless steel
Inlet Connection:	¼" Male NPT

HOW TO ORDER

Model	Pressure Range
PT825-0400	0-400 psig
PT825-3000	0-3000 psig

MANIFOLD TUTORIAL

Manifolds are used to connect two or more cylinders of gas together to increase the supply volume available to provide a continuous flow when one cylinder is not sufficient and a tube trailer or other bulk supply is not practical. Manifolds are also used when a single cylinder of gas is not capable of supplying the required flow rate required by a process.

WARNING: Never mix gases on a manifold. Only one type of gas should be connected to a manifold.

Manifolds are commonly fabricated in a single row configuration designed for wall mounting with a row of cylinders in line beneath or in front of it. Double row manifolds and other custom configurations are available on request.

Station valves are used to isolate individual cylinders on a manifold from service. Station valves are recommended for most laboratory applications as they are a valuable back-up device in the event of a leaking pigtail or a defective check valve. It is most important that station valves used in high purity gas service be of the diaphragm packless type to maintain gas purity. Many commercial manifolds use packed valves that may cause atmospheric impurities to enter the gas stream as contaminants.

Two types of **pigtails** are used to connect cylinders to the manifold header; rigid pigtails made of brass or stainless steel tubing, or flexible made of stainless steel braided hose with either Teflon-lining or stainless steel inner core. Teflon-lined pigtails are used for routine applications, while the stainless steel inner core pigtails are used for ultra high purity applications. One special note, either rigid pigtails or stainless steel inner core flexible pigtails are recommended for helium and hydrogen because these gases will diffuse through the wall of a Teflon®-lined pigtail.

Check valves on the cylinder end of each pigtail should always be installed on manifolds used for flammable, toxic, or corrosive gases. In some cases purge assemblies are installed to ensure that highly toxic gases are not released to the working environment during cylinder change outs.

Many applications require that gas always be supplied to the process and the flow can not be shut down to replace empty cylinders or must feed gas for long periods when the system is unattended, i.e. helium to a gas chromatography laboratory. In these instances a changeover manifold is the solution. Changeover manifold control sections available in this catalog (see pages 38-43, can be used with any of the multiple station manifolds or with a single pigtail on each side.

BRASS MANIFOLDS

FEATURES:

- Diaphragm packless station valves for high purity.
- 3000 psig service pressure.
- Cleaned for high purity service.
- Standard CGA 346 header pigtail connections when valves are installed, non-valve headers are provided with mating connections on the pigtails.

DESCRIPTION

These manifolds are constructed of 1/2" brass pipe silver-brazed at each joint. Station valves are the diaphragm packless type for high purity service and are installed with Teflon tape so that they may be easily replaced in the field if necessary. All header pigtail connections are CGA 346 to help ensure that pigtails are installed properly. A plug is inserted in the last tee to allow for the addition of future cylinder stations if required. Suitable brackets for mounting the manifold to a wall are provided.

SPECIFICATIONS

Header and Valves:	brass
Pigtails:	24" flexible type 316 stainless steel inner core with brass CGA connections.
Check valves:	brass
Pressure rating:	3000 psig
Header outlet:	mating connection to pigtail cylinder CGA
Stations:	10” on center

HOW TO ORDER

Model	Description
910-1-X-CGA*-FPB604-2	single row manifold without station valves, but with check valves in the pigtails
910-2-X-CGA*-FPB604-2	single row manifold with station valves, but no check valves in pigtails
910-3-X-CGA*-FPB604-2	single row manifold with station valves and check valves in the pigtails.
920-1-X-CGA*-FPB604-2	double row manifold without station valves, but with check valves in the pigtails
920-2-X-CGA*-FPB604-2	double row manifold with station valves, but no check valves in pigtails
920-3-X-CGA*-FPB604-2	double row manifold with station valves and check valves in the pigtails.

*Complete the model number by inserting the number of cylinders to be connected to the manifold in place of the X and specifying the CGA connection.

OPTIONS

Flexible pigtails - 36” long - change suffix “2” to “3”
Outlet connection - 1/2” NPT female - add suffix “P8F”
Master shut off valve - add “MV” to P/N

STAINLESS STEEL MANIFOLDS

FEATURES:

- Diaphragm packless station valves for high purity.
- 3000 psig service pressure(4500 and 6000 psig available).
- Cleaned for high purity service.
- Standard CGA 346 header pigtail connections when valves are installed, non-valve headers are provided with mating connections on the pigtails.

DESCRIPTION

These manifolds are constructed of 1/2" 316 stainless steel pipe and fittings heliarc welded at each joint. Station valves are the diaphragm packless type for high purity service and are installed with Teflon tape so that they may be easily replaced in the field if necessary. All header pigtail connections are CGA 346 to help ensure that pigtails are installed properly. A plug is inserted in the last tee to allow for the addition of future cylinder stations if required. Suitable brackets for mounting the manifold to a wall are provided.

SPECIFICATIONS

Header and Valves: 316 stainless steel
Pigtails: 24" flexible type 316 stainless steel inner core w/ stainless steel CGA connections.
Check valves: 316 stainless steel
Pressure rating: 3000 psig
Header outlet: mating connection to pigtail cylinder CGA
Stations: 12” on center

HOW TO ORDER

Model	Description
911W-1-X-CGA*-FP604-2	single row manifold without station valves, but with check valves in the pigtails
911W-2-X-CGA*-FP604-2	single row manifold with station valves, but no check valves in pigtails
911W-3-X-CGA*-FP604-2	single row manifold with station valves and check valves in the pigtails.
921W-1-X-CGA*-FP604-2	double row manifold without station valves, but with check valves in the pigtails
921W-2-X-CGA*-FP604-2	double row manifold with station valves, but no check valves in pigtails
921W-3-X-CGA*-FP604-2	double row manifold with station valves and check valves in the pigtails.

* Complete the model number by inserting the number of cylinders to be connected to the manifold in place of the X and specifying the CGA connection.

OPTIONS

Flexible pigtails - 36” long - change suffix “2” to “3.”
Outlet connection - 1/2” NPT female - add suffix “P8F.”

Manifolds for 4500 or 6000 psig service are also available.

FLOWMETER TUTORIAL

Flowmeters are used to measure the rate of flow of liquids or gases. They do not control the rate of flow unless they are equipped with a control valve or flow controller. There are two basic types of flowmeters; rotameters and electronic mass flowmeters. Mass flowmeters and mass flow controllers can be found on pages 60-62.

ROTAMETERS

Rotameters are a simple, precise and economical way to measure flow rates. They consist of a precision tapered glass tube containing one or more spherical floats. A measuring scale is etched on the glass tube. The diameter of the tube at the bottom, or inlet is approximately equal to the diameter of the float.

As fluid enters the tube, the float rises to a point where the area between the float and the tube wall is large enough to permit unrestricted flow, and the float is stationary. This position corresponds to a point on the tube scale and thus permits a reading of the rate of flow.

The capacity, or flow range of a tube can be varied by changing the float material. Materials of a lower density such as pyrex glass or sapphire give a lower flow capacity than materials of a higher density like tantalum or stainless steel (see Figure1).

Rotameters, unlike mass flowmeters, are affected by temperature and pressure variation (see Figure 2). When equipped with a control valve on the inlet, readings are correct as long as the outlet pressure is equal to the pressure at which the tube was calibrated. When a valve is installed on the outlet, the tube calibration pressure must match the inlet pressure to the flowmeter unit.

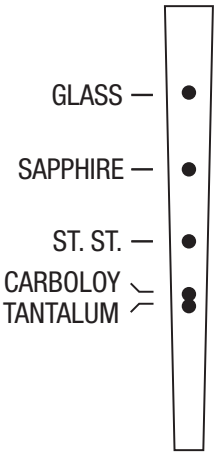


Figure 1
Relative positions of floats of various densities for the same rate of flow with 1 atmosphere outlet pressure.

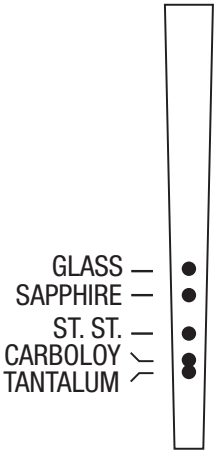
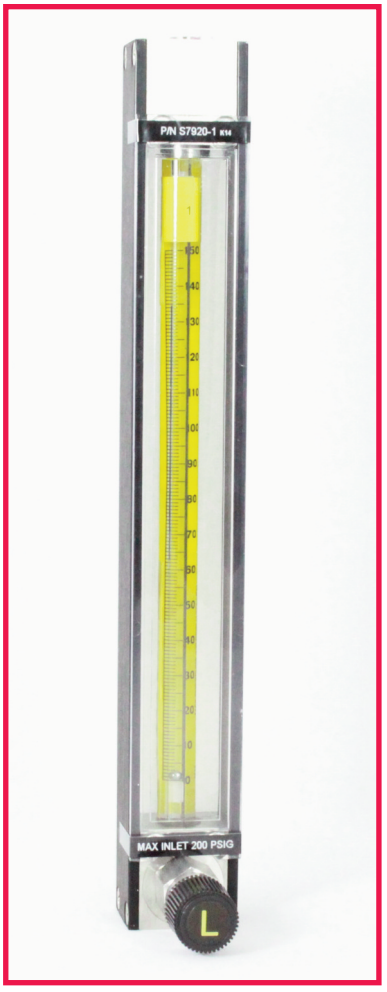


Figure 2
Effect of float position for the same rate of flow in Figure 1, but with increased pressure at the flowmeter outlet.



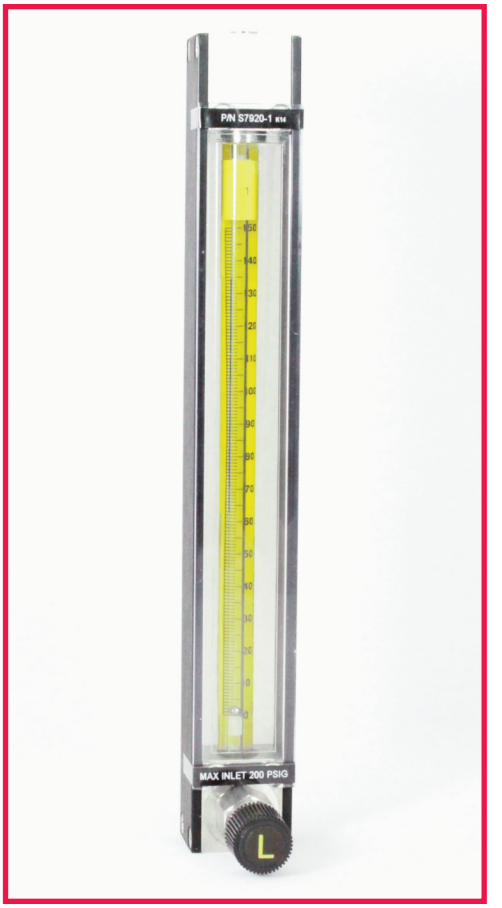
FLOWMETER - Series 7920

DESCRIPTION

The 7920 flowmeters provide the most accurate indication and precise control of fluids available for a wide range of applications. This versatile meter is functionally and dimensionally interchangeable with other current designs while incorporating many innovative features.

All 7920 glass metering tubes have integral float guides to assure the accuracy of ±5% of full scale. Glass and stainless steel floats are standard. The meters are available in a wide range of flows.

Front window incorporates a 1.5 X scale magnification factor for more accurate tube reading. End seals in the design are direct-acting and nonrotating for fast alignment and convenient service access.



APPLICATIONS

- Carrier and fuel gas chromatography
- Atomic absorption
- Semiconductor manufacture
- Chemical processing
- General research and industrial uses

DESIGN FEATURES

- High resolution 150mm scale length.
- Many standard direct reading scales available.
- Precision taper, fluted metering tube.
- Lowest available pressure drop via maximum flow path area increases available flow rates at low feed pressures.
- Standard front panel mounting requires minimum hardware - easy installation, quick access.
- Available utility and high precision metering valves do not require special fittings.
- Simplified; direct acting non-rotating compression seal.
- 1/4" NPT female connections are standard.

MATERIALS OF CONSTRUCTION

End Blocks: Chrome plated Brass or 316 Stainless
"O" Rings & packing: Viton® - standard
Buna-N, EPR rubber and teflon are available options
Side Plates: Anodized Aluminum

SPECIFICATIONS

Maximum Pressure: 200 psig
Temperature Range: -20°F to +250°F
-30°C to +120°C
Accuracy: ±5% of full scale
Repeatability: ±0.25% of scale reading

Series 7920 *CONTINUED*

Model	Material	Valve Type
B7920*	Brass	None
B7920V*	Brass	Standard
B7920HA*	Brass	High Accuracy
S7920	316 Stainless Steel	None
S7920V*	316 Stainless Steel	Standard
S7920HA*	316 Stainless Steel	High Accuracy

Each model includes one tube from the table below; specify your choice when ordering.

Options:	**P/N Suffix:**
• 1/4" hose barbs inlet and outlet - add suffix "4HB"	4HB
• 1/4" compression tube fittings inlet and outlet	T4FF
• 1/8" compression tube fittings inlet and outlet	T2FF

Bench stand - Model 7920B

HOW TO ORDER

Model -X-Y	
X = tube required	1, 2, 3, 4, 5, 6, 7, 8, 10
Y = optional fittings	4HB = hose bards T4FF = 1/4" compression T2FF = 1/8" compression
Example:	B7920V-2-T4FF is a brass unit with a 7920-2 flow tube and 1/4" compression fittings on inlet and outlet.

FLOWMETER TUBES

Model	Typical Flow Range*	
	Float	Air scc/min.
7920-1	Glass St. Steel	8 - 47 14 - 138
7920-2	Glass St. Steel	9- 92 25- 264
7920-3	Glass St. Steel	37- 370 80- 816
7920-4	Glass St. Steel	82- 817 170- 1665
7920-5	Glass St. Steel	550- 2214 1070- 4494
7920-6	Glass St. Steel	610- 3780 1330- 7467
7920-7	Glass St. Steel	820- 8555 2090- 16493
7920-8	Glass St. Steel	2220- 23105 4190- 42860
7920-10	St. Steel	1.0- 100

Selected Correction Factors
flow = air flow x correction factor

Gas	*Correction Factors*
air	1.00
acetylene	1.054
ammonia	1.304
argon	0.851
n-butane	0.706
carbon dioxide	0.811
carbon monoxide	1.017
ethane	0.981
ethylene	1.016
helium	2.689
hydrogen	3.810
methane	1.343
nitrogen	1.017
nitrous oxide	0.811
oxygen	0.951
propane	0.810

*Actual flow rates will vary from one manufacturing lot to another.
Calibration data is supplied for each tube shipped.
All calibrations are for air @ 0 psig outlet and 70°F.

GAS PROPORTIONER
Series 7950

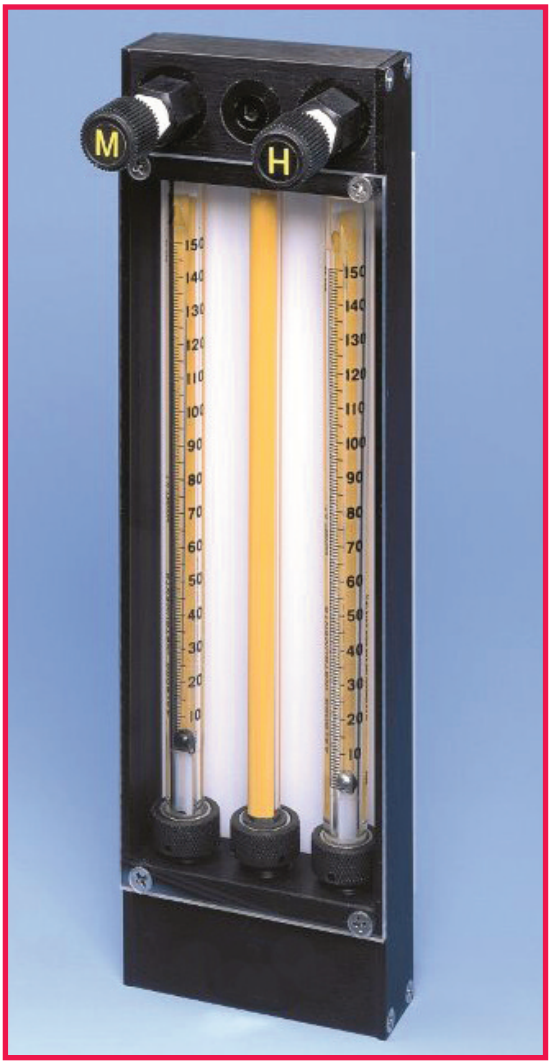
The gas proportioner meters the flow of each of two gases and mixes them thoroughly in a special mixing tube to produce homogeneous two-component mixtures. Concentration accuracies of 10% of component value are maintained with a standard unit using typical calibration curves. (In a desired mixture of 1% of gas A and 99% of gas B, a concentration between .9% and 1.1% is maintained.) Individual units can be calibrated for non-corrosive gases to attain an accuracy of 5% of the component value. Individual calibration curves are supplied with these specially calibrated units.

The control valves are installed at the outlets making these gas proportioners back pressure compensated. The readings on the tubes are accurate regardless of the downstream pressure, so long as the inlet pressures are maintained at the levels for which the tubes were calibrated.

The unit is recommended for 50 psig pressure but can be used at any pressure between 10 and 200 psi.*

These proportioners are available in both aluminum and stainless steel construction. When ordering a gas proportioner, specify the composition of the desired mixture, the gases, the discharge rate, and inlet pressure in addition to the model number.

* For best performance, it is recommended that tubes have only one float.



HOW TO ORDER

All models include baseplate, mixing tube and two flowmeter tubes of your choice selected from page 53.*

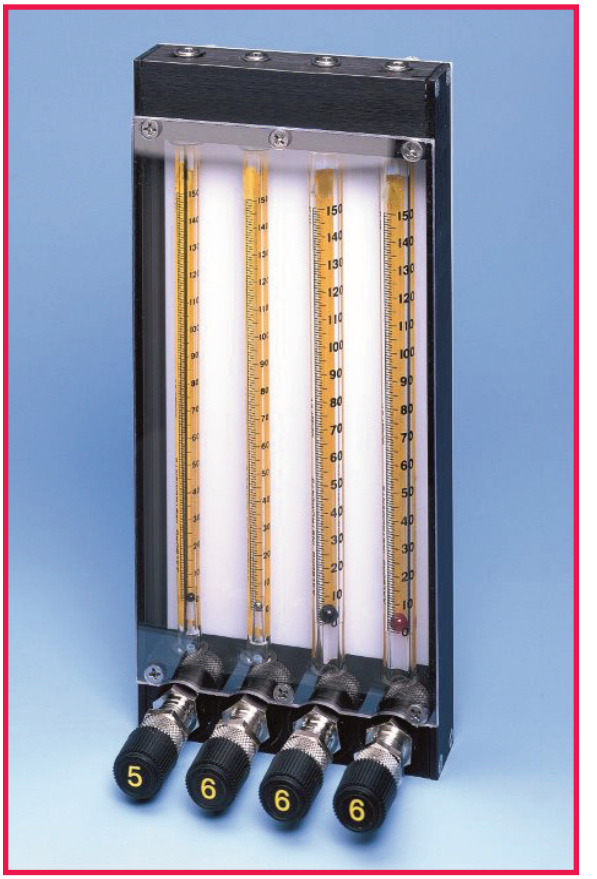
* If unsure of correct tubes, provide the composition range of intended mixtures, total outlet flow and operating inlet pressure. We will select the tubes.

Model	Material	Valve	Connections
7951	Aluminum	Standard	1/8" NPT female
7951H	Aluminum	Standard	1/4" hose barb
7951T	Aluminum	Standard	1/4" compression
7952	Aluminum	High Accuracy	1/8" NPT female
7952H	Aluminum	High Accuracy	1/4" hose barb
7952T	Aluminum	High Accuracy	1/4" compression
7953	Stainless Steel	Standard	1/8" NPT female
7953H	Stainless Steel	Standard	1/4" hose barb
7953T	Stainless Steel	Standard	1/4" compression
7954	Stainless Steel	High Accuracy	1/8" NPT female
7954H	Stainless Steel	High Accuracy	1/4" hose barb
7954T	Stainless Steel	High Accuracy	1/4" compression

MULTI-TUBE UNITS AND MIXERS
Series 7940 and 7941

The Series 7940 multitube flowmeters are available in either Aluminum or 316 Stainless Steel and in two basic configurations.

- 7940 Series has four flowmeter tubes with individual outlets to permit the metering of four separate gas streams. It comes complete with four tubes.
- 7941 Series mixers have three flowmeter tubes and a mixing tube with a single outlet to produce homogenous mixture of three gases to an accuracy of ±10%. The tubes have a single glass float and calibration curves for most common gases are available at no extra cost.
- All units are back pressure compensated by mounting the control valves on the outlet.
- All are available with a standard valve cartridge or a high accuracy valve to permit very accurate setting of low flow rates.
- All units are provided with a bench stand.



SPECIFICATIONS

Connections: 1/8" NPTF or 1/4" tube fitting
Maximum Inlet Pressure: 200 psig
Operating Temperature: 20°F to 250°F
Dimensions: 10"H x 4 1/4"W x 1 1/4"D
(not including base)
Shipping Weight: 6 3/4 lbs.

Series 7940 4- Tube Flowmeter (2 and 3 tube units are available on request)*

Model*	Material	Valve	Connections
A7940	Aluminum	Standard	1/8" NPT female
A7940T	Aluminum	Standard	1/4" compression fitting
A7940HA	Aluminum	High Accuracy	1/8" NPT female
A7940THA	Aluminum	High Accuracy	1/4" compression fitting
S7940	316 Stainless Steel	Standard	1/8" NPT female
S7940T	316 Stainless Steel	Standard	1/4" compression fitting
S7940HA	316 Stainless Steel	High Accuracy	1/8" NPT female
S7940THA	316 Stainless Steel	High Accuracy	1/4" compression fitting

*Series 7941 Mixing Units**

Model*	Material	Valve	Connections
A7941	Aluminum	Standard	1/8" NPT female
A7941T	Aluminum	Standard	1/4" compression fitting
A7941HA	Aluminum	High Accuracy	1/8" NPT female
A7941THA	Aluminum	High Accuracy	1/4" compression fitting
S7941	316 Stainless Steel	Standard	1/8" NPT female
S7941T	316 Stainless Steel	Standard	1/4" compression fitting
S7941HA	316 Stainless Steel	High Accuracy	1/8" NPT female
S7941THA	316 Stainless Steel	High Accuracy	1/4" compression fitting

*Specify your choice of Flowmeter tubes from the table on page 53.

FLOWMETER Series 7965

The Series 7965 flowmeters use 65mm flow tubes with a single float. They are calibrated to read directly in SCCM, SLPM or SCFH of air. Correction factors are available for a number of common gases. The Series 7965 flowmeters are available in chrome plated brass or stainless steel.

SPECIFICATIONS

Maximum Inlet Pressure: 200 psig
Temperature Range: -20° to +250°F
Valve: Standard or high accuracy needle valve
Dimensions: 1 1/4"W x 5 1/2"H x 2 3/4"D
Accuracy: ±5% full scale
Repeatability: ±0.25% of scale reading
Inlet and Outlet: 1/4" NPT female standard

FRAME WITH VALVE

Model	Material
7965B*	Chrome plated brass with standard valve
7965BHA*	Chrome plated brass with high accuracy valve
7965S*	316 Stainless Steel with standard valve
7965SHA*	316 Stainless Steel with high accuracy valve

*Select flow tube from table on right.

HOW TO ORDER

Model – X – Y

X=tube required
Y=optional fittings

Example: 7965B-J03G-T4FF

Options:	**P/N Suffix:**
• 1/4" hose barbs inlet and outlet - add suffix "4HB"	4HB
• 1/4" compression tube fittings inlet and outlet	T4FF
• 1/8" compression tube fittings inlet and outlet	T2FF

Bench stand - Model 7920B

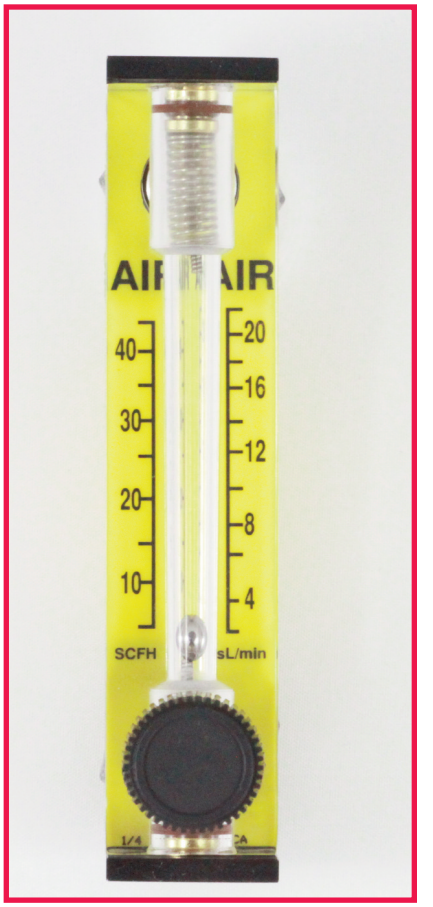
65MM TUBE CUBE SELECTION

Tube Number	Float Material	Flow Range*†
J07G	glass	0.7-7 sscm
J15G	SS	5-50 sccm
J15S	SS	7-75 sccm
J15ST	glass	10-100 sccm
J13ST	SS	13-130 sccm
J03C	carboloy	25-250 sccm
J10ST	carboloy	50-500 sccm
J01G	glass	100-1000 sccm
J04G	glass	0.1-1 slpm
J75T	SS	0.2-2 slpm
J03G	glass	0.5-5 slpm
J02ST	SS	1-10 slpm
J11ST	SS	1-16 slpm
J01ST	SS	2-25 slpm
J03ST	SS	4-40 slpm
J05G	glass	0.2-2.2 SCFH
J18G	glass	0.5-6 SCFH
J019ST	SS	1-10 SCFH
J61ST	SS	2-18 SCFH
J18ST	SS	3-25 SCFH
J102ST	SS	5-50 SCFH
J14G	SS	10-90 SCFH
J02C	corboloy	10-150 SCFH

*Other ranges available.
†All calibrations are for air @ 0 psig outlet and 70°F.

ECONOMIC MACHINED ACRYLIC FLOWMETER
Series 7923

The Series 7923 acrylic flowmeters are an ideal low cost tool for measuring flow rates of inert and non-reactive gases. The 1/8" female standard inlet and outlet connections are contained in brass inserts to ensure a leak-free connection to prevent cracking of the acrylic body. A needle valve to control the flow rate is included. Flowmeters have a dual scale for air in SLPM and SCFH.



SPECIFICATIONS

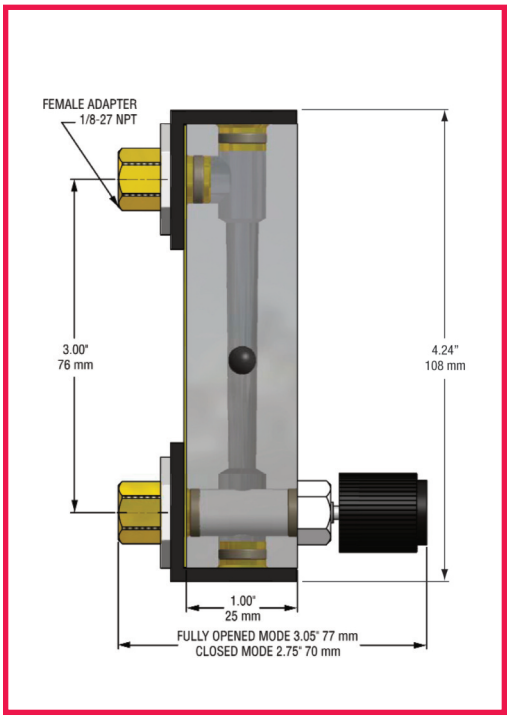
Maximum inlet pressure: 100 psig
Maximum operating temperature: 150°F
Accuracy: ±5% full scale
Inlet and Outlet: 1/8" NPT female standard on 3" centers
Seals: buna-N

Model	Flow Range (Air)* SLPM	SCFH	Float
7923-1V01	0-1.4	0-2.8	glass
7923-1V02	0-2.5	0-5.5	SS
7923-1V03	0-3.5	0-7.0	carboloy
7923-1V08	0-8.5	0-18.0	glass
7923-1V16	0-16.0	0-32.5	SS
7923-1V22	0-22.0	0-45.0	carboloy
7923-1V50	0-50.0	0-100.0	SS

*All calibrations are for air @ 0 psig outlet and 70°F.

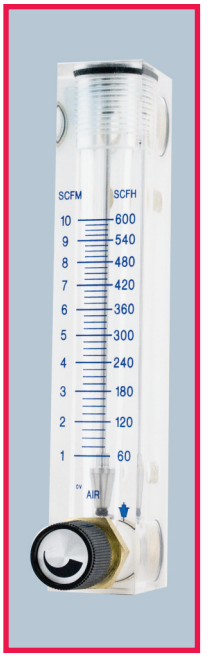
Options:

- 1/4" hose barbs inlet and outlet - add suffix "4HB."
- 1/4" compression tube fittings inlet and outlet - add suffix "T4FF."
- 1/8" compression fitting inlet and outlet - add suffix "T2FF."

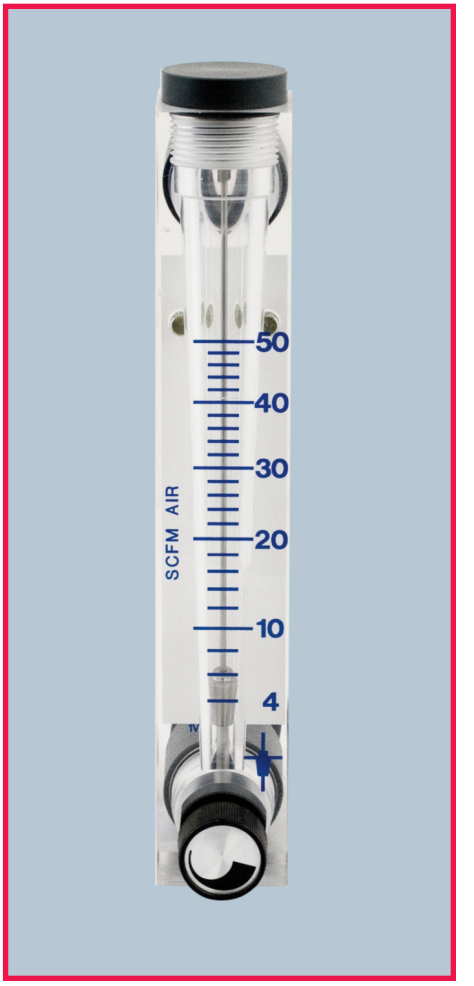


LARGE FLOW ACRYLIC FLOWMETERS
Series 7974 & 7975

The Series 7974 and 7975 acrylic flowmeters are useful in a wide varied of applications involving non-corrosive gases where flow rates exceed those of traditional laboratory models. All units have direct reading scales in either liters/minute or cubic feet/minute of air. Correction factors for other gases can be provided.



Series 7974



Series 7975

FEATURES

- Easy to read scales.
- Air ranges from 14 lpm to 3400 lpm (0.5 to 100 scfm).
- Durable one-piece clear acrylic construction.
- Optional built-in cartridge type valve available.

MATERIALS OF CONSTRUCTION

Body: clear acrylic
Fittings: 7974 series - brass
7975 series - PVC
Valve: brass
Seals: Buna-N

SPECIFICATIONS

Max. Operating Pressure: 100 psig
Operating Temp. Range: 0° to +150° F
Body Inlet and Outlet: 7974 - 1/4" NPT female
7975 - 1" NPT female
Accuracy: 7974 Series - ±3% of full scale
7975 Series - ±2% of full scale

HOW TO ORDER

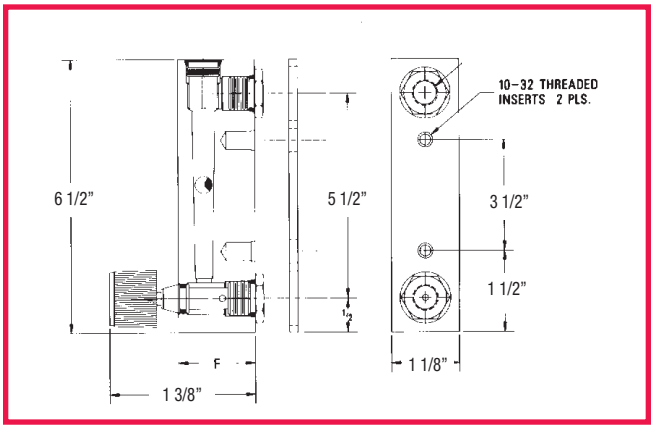
Model Number	Flow Range*
B7974-1	0.5- 5 SCFM
B7974-2	1- 10 SCFM
B7974-3	2- 20 SCFM
B7974-4	14- 140 lpm
B7974-5	30- 280 lpm
B7974-6	60- 560 lpm

Option: Inlet needle valve - add suffix "V" to model number, i.e. 7974V-1

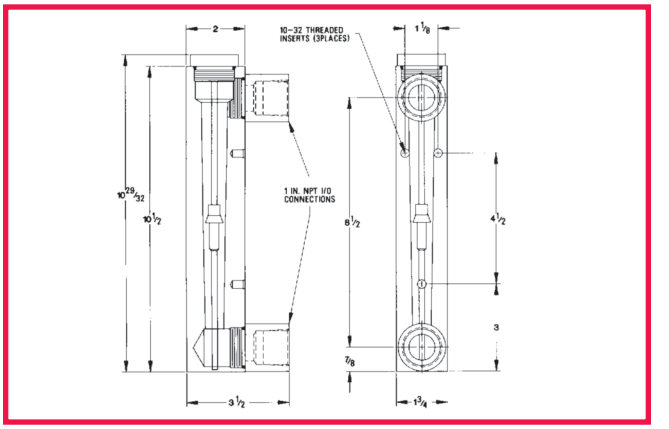
Model Number	Flow Range*
7975-1	3- 25 SCFM
7975-2	4- 50 SCFM
7975-3	10- 100 SCFM
7975-4	100- 700 lpm
7975-5	100-1400 lpm
7975-6	400-3400 lpm

Option: Inlet needle valve - add suffix "V" to model number

*All calibrations are for air @ 0 psig outlet and 70°F.



Series 7974



Series 7975

MASS FLOW TUTORIAL

INTRODUCTION

Like variable area flowmeters, electronic mass flow equipment measures and controls the flow of gases. Unlike variable area flowmeters mass flow equipment measurement is not compromised by the variation of pressure or temperature within stated limits of each unit. The technology of mass flow measurement offers a host of solutions to gas control and the possibility of preparing gas mixtures on site in the laboratory or in the manufacturing process. Accuracy is generally + 1% FS compared to + 5% fS for a variable area meter.

MASS FLOW PRINCIPLE OF OPERATION

Metered gases are divided into two laminar flow paths, one through the primary flow conduit, and the other through a capillary sensor tube. Both flow conduits are designed to ensure laminar flows and therefore the ratio of their flow rates is constant.

Two precision temperature sensing windings on the sensor tube are heated, and when flow takes place, gas carries heat from the upstream to the downstream windings. The resultant temperature differential is proportional to the change in resistance of the sensor windings.

A Wheatstone bridge design is used to monitor the temperature dependent resistance gradient on the sensor windings which is linearly proportional to the instantaneous rate of flow.

Output signals of 0 to 5Vdc and 4 to 20mA are generated indicating mass molecular based flow rates of the metered gas.

Flow rates are unaffected by temperature and pressure variations within stated limitations.

MASS FLOWMETERS

A mass flowmeter consists of a transducer and a readout like the unit picture here. Mass flow units are factory calibrated with an NIST traceable certified systems, have a high level of leak integrity (normally 10-9sccs helium) and can be fitted with a totalizer that provides the current flow rate and the total volume of gas passed over time.

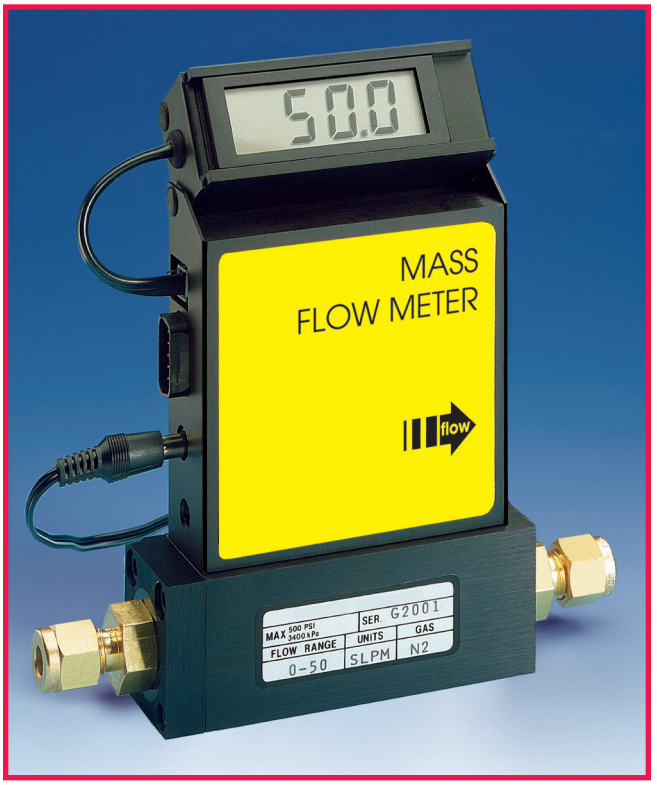
MASS FLOW CONTROLLERS

A mass flow controller is a mass flow transducer combined with an electronic control valve. A typical mass flow controller is pictured here. With the control valve the user is able to set and maintain a specified flow rate regardless of pressure and temperature variations within the designated limitations of the device. The mass flow controller has all the features of a mass flowmeter with regard to calibration, leak integrity, and totalizing.

ELECTRONIC MASS FLOWMETERS
Series A820

DESCRIPTION

The Series A820 electronic mass flowmeters are compact, self-contained units designed to indicate the flow rate of gases. Unlike variable area meters, flow rates are unaffected by variations in temperature and pressure within specified limits. The mechanical layout of the design includes an LCD readout built into the top of the transducer. This readout module is tiltable over 90 degrees to provide optimum reading comfort. The readout is connected by a standard modular plug, and is readily removable and extended for remote reading installations. Units are available in aluminum or stainless steel.



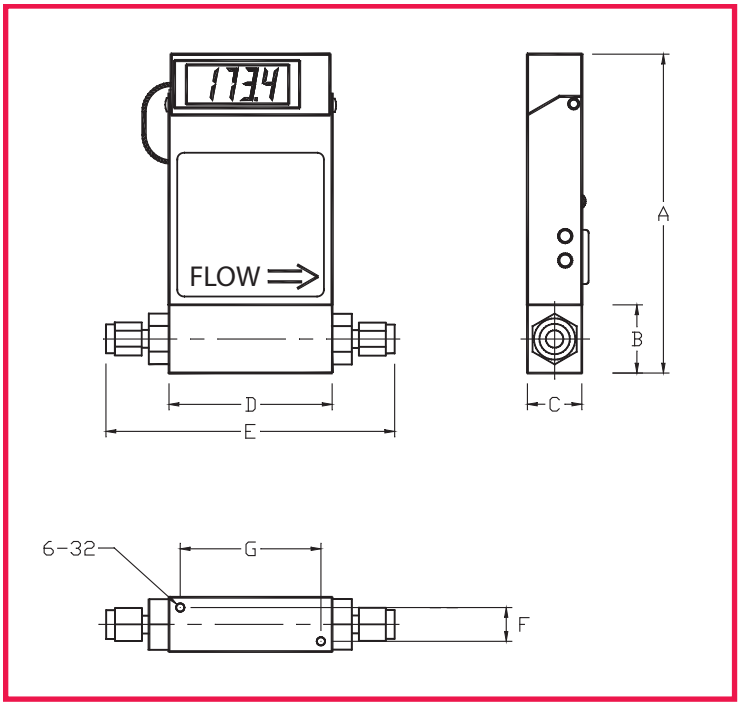
FEATURES

- Rigid metal construction.
- Maximum operating pressure – 1000 psig.
- NIST traceable calibration certification.
- Leak integrity 1 X 10^{-9} sccm helium.
- 0-5 VDC or 4-20mA signals.
- Built-in tiltable readout display in engineering units.
- Circuit protection.
- Totalizer option available.

SPECIFICATIONS

Accuracy:	±1% of full scale, including linearity for gas temperatures of 59˚F to 77˚F and pressures of 5 to 60 psia
Repeatability:	±0.5% of full scale
Response time:	Generally 2 seconds to within ±2% of actual flow
Temperature coefficient:	0.15% of full scale/˚C
Pressure coefficient:	0.01% of full scale/psi
Maximum pressure drop:	0.04 to 3.23 psid depending on flow range
Gas and ambient Temp:	32˚ to 122˚F
Output signals:	Linear 0-5 VDC (1000 ohms min load impedance) or 4-20 mA (0-250 ohms loop resistance)
Transducer input power:	12 VDC; 200 mA of maximum
Time constant:	800 ms
Materials in fluid contact:	Aluminum units: anodized aluminum, 316 SS, brass, Viton o-rings Stainless steel units: 316 SS and Viton o-rings
Attitude sensitivity:	No greater than + 15 degrees from horizontal to vertical: Standard calibration is in horizontal position.
Connections:	1/4” compression fittings
Leak integrity:	1 X 10^{-9} sccm of helium maximum to the outside environment
CE compliant:	EN 55011 class, class B: EN50082-1

ELECTRONIC MASS FLOWMETERS *CONTINUED*
Series A820



Series A820C Dimensional Drawing

A820 Dimensions

	Up to 10 slpm	15 to 50 slpm
A	5.60	5.98
B	1.00	1.37
C	1.00	1.25
D	3.00	4.13
E	5.02	6.15
F	0.69	0.69
G	2.69	2.63
H	4.50	4.88

HOW TO ORDER

A820-W-X-Y-Z
(Select W, X, Y, and Z parameters from the table below. Also when ordering specify the gas, inlet pressure and operating temperature for the calibration.)

T = Totalizer	(insert T if totalizer is required)
W = material:	A = aluminum S = stainless steel
X = Seals:	V = Viton® B = Buna-N E = EPR T = TBFE/KALREZ

Y = flow range: Specify flow and gas as shown in example below. Use table below as a guide to standard ranges for air.

0-10 sccm	0-500 sccm	0-15 slpm
0-20 sccm	0-1 slpm	0-20 slpm
0-50 sccm	0-2 slpm	0-30 slpm
0-100 sccm	0-5 slpm	0-40 slpm
0-200 sccm	0-10 slpm	0-50 slpm

Z = Output signal:	V = 0-5 VDC A = 4-20 mA

Example: A820(T)-A-V-(50CFH)-(gas)-Y
A820(T)-A-V-100LPM-N_2-Y

ELECTRONIC MASS FLOW CONTROLLERS
Series A810

DESCRIPTION

The Series A810 electronic mass flow controllers are compact, self-contained units designed to indicate and control a set flow rate of gas. They are unaffected by temperature and pressure variations within specified limits. The mechanical layout of the design includes an LCD readout built into the top of the transducer. This readout module is tiltable over 90 degrees to provide optimum reading comfort. The readout is connected by a standard modular plug, and is readily removable and extended for remote reading installations. Units are available in aluminum or stainless steel.

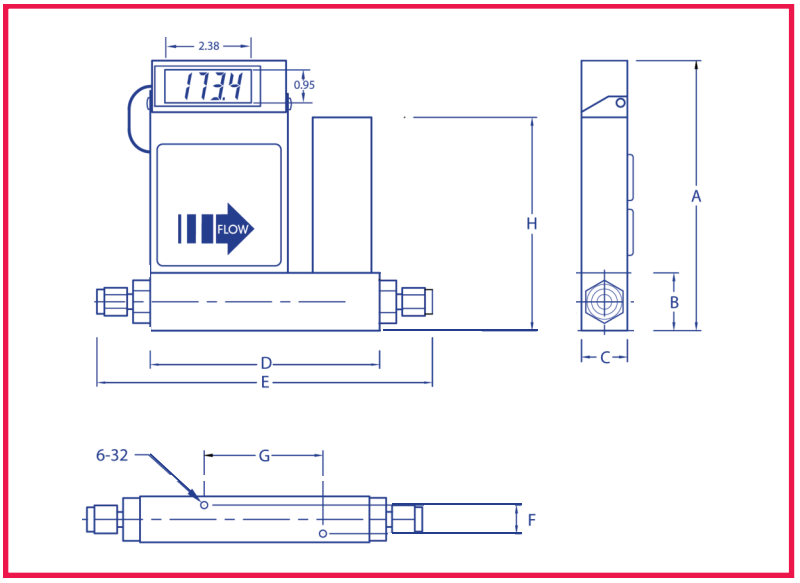
FEATURES

- Rigid metal construction.
- Maximum operating pressure – 1000 psig.
- NIST traceable calibration certification.
- Built-in set point control.
- Leak integrity 1 X 10^{-9} sccm helium.
- 0-5 VDC or 4-20mA signals.
- Built-in tiltable readout display in some models.
- Circuit protection.
- Totalizer option available.
- 50 ΔP max.

SPECIFICATIONS

Accuracy:	±1.5% of full scale, including linearity for gas temperatures of 59°F to 77°F and pressures of 5 to 60 psia
Repeatability:	±0.5% of full scale
Response time:	Generally 2 seconds to within ±2% of actual flow
Temperature coefficient:	0.15% of full scale/°C
Pressure coefficient:	0.01% of full scale/psi
Maximum pressure drop:	1.06 to 8.0 psid depending on flow range
Maximum pressure differential:	50 psi
Gas and ambient Temp:	41° to 122°F
Output signals:	Linear 0-5 VDC (1000 ohms min load impedance) or 4-20 mA (0-250 ohms loop resistance)
Transducer input power:	11-26V; 800 mA
Materials in fluid contact:	Aluminum units: anodized aluminum, 316 SS, brass, Viton o-rings Stainless steel units: 316 SS and Viton o-rings
Attitude sensitivity:	No greater than + 15 degrees from horizontal to vertical: Standard calibration is in horizontal position.
Connections:	1/4” compression fittings. Higher flow rate units may have different connections.
Leak integrity:	1 X 10^{-9} sccm of helium maximum to the outside environment
CE compliant:	EN 55011 class, class B: EN50082-1

ELECTRONIC MASS FLOW CONTROLLERS *CONTINUED*
Series A810



Series A810 Dimensional Drawing

A810 Dimensions

	Up to 20 slpm	30 to 50 slpm
A	5.60	5.98
B	1.00	1.37
C	1.00	1.25
D	4.27	5.19
E	6.29	7.21
F	0.69	0.69
G	2.69	2.63
H	4.50	4.88

HOW TO ORDER

A810-W-X-Y-Z
(Select W, X, Y, and Z parameters from the table below. Also when ordering specify the gas, inlet pressure and operating temperature for the calibration.)

T = Totalizer	(insert T if totalizer is required)
W = material:	A = aluminum S = stainless steel
X = Seals:	V = Viton® B = Buna E = EPR T = Teflon®

Y = flow range: Specify flow and gas as shown in example below. Use table below as a guide to standard ranges for air.

0-10 sccm	0-500 sccm	0-15 slpm
0-20 sccm	0-1 slpm	0-20 slpm
0-50 sccm	0-2 slpm	0-30 slpm
0-100 sccm	0-5 slpm	0-40 slpm
0-200 sccm	0-10 slpm	0-50 slpm

Z = Output signal:	V = 0-5 VDC A = 4-20 mA

Example: A810(T)-A-V-(50CFH)-(gas)-Y
A810(T)-A-V-100LPM-N_2-Y

GAS PURIFIERS-Model 8010 *(for pressure applications up to 3000 psig)*

DESCRIPTION

The model 8010 replaceable cartridge gas purifier is useful in many laboratory and industrial applications where the introduction of oil and/or water can result in poor performance or equipment shut-down. It is not uncommon to find varying levels of these impurities in some industrial gases and occasionally even in specialty carrier gases. The small daily operating costs are easily justified by the prevention of a system shut-down and the subsequent cleaning and/or repair costs.

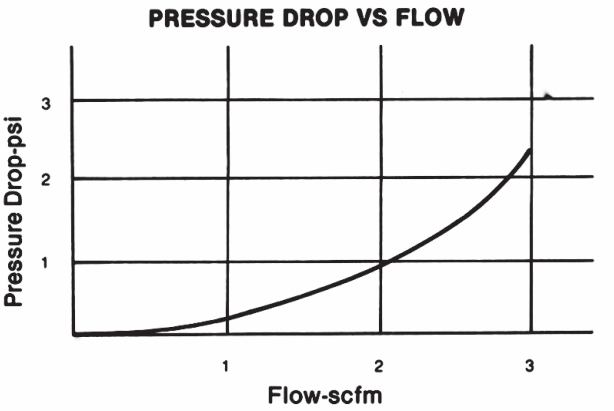
The units are especially useful in GC carrier gas lines to ensure that undesirable moisture does not enter the instrument. Water can contribute to inaccurate results and the rapid deterioration of expensive chromatography column separation phases.

The model 8010 purifier shell must be used in conjunction with specially designed replaceable cartridges.

Models 8010-1, 8010-2, or 8010-3 are filled with various adsorbents. Model 8010-4 contains a 5 micron sintered bronze filter element. These are described below. These cartridges are shipped in hermetically sealed cans in a dry nitrogen atmosphere with convenient screw caps for easy opening. This improved packaging ensures full retention of capacity in storage until the time of use.

MATERIALS OF CONSTRUCTION

Shell body: anodized aluminum
Shell head: nickel plated brass
O-ring seal: buna-N
Cartridges:* 8010-1 Molecular Sieve 13x
8010-2 Molecular Sieve 4A
8010-3 Activated Charcoal
8010-4 Sintered Bronze
8010-5 Molecular Sieve 3A
8010-6 Molecular Sieve 5A
Other materials available on request.
*O-ring seal is buna-N



SPECIFICATIONS

Max. Operating Pressure: 3000 psig (500 psig for oxygen)
Operating Temperature: -40° to +165°F.
Inlet and Outlet Ports: 1/4" NPT female
Dimensions: 2" dia. x 5 3/4" long
Weight with Cartridge: 1.5 lbs.
Dew Point Achievable: -100°F.

HOW TO ORDER

Model	Description	Absorption Capacity	General Application
8010	Purifier Shell Only		
8010-1	Molecular Sieve 13x	6.5 grams water	Removal of oil & water
8010-2	Molecular Sieve 4A	7.2 grams water	Removal of water from inert gases and saturated hydrocarbons
8010-3	Activated Charcoal (Warning: Do not use with oxygen concentrations in excess of 21%)		Removal of heavy hydrocarbons acetone level control in acetylene used for atomic absorption
8010-4	5 micron sintered bronze element (other micron sizes available)		Particulate removal
8010-5	Molecular Sieve 3A		Removal of water from unsaturated hydrocarbons such as acetylene
8010-6	Molecular Sieve 5A		

GAS PURIFIERS-Model 8000A *(high capacity units)*

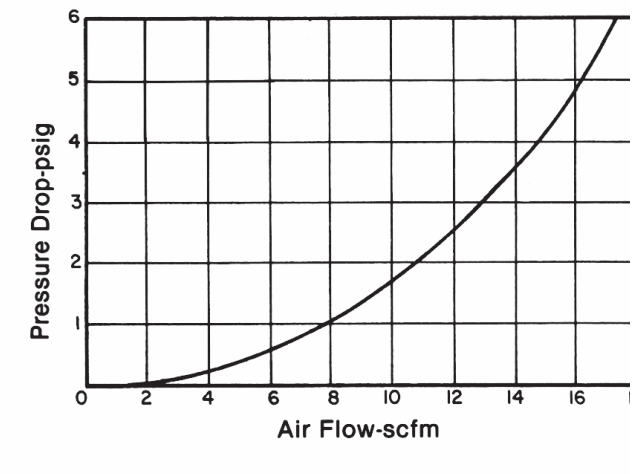
DESCRIPTION

The model 8000A replaceable cartridge gas purifier is similar to the Model 8010 but is designed for higher capacities and a lower working pressure. The Model 8000A is constructed of a machined aluminum shell that accepts a large capacity cartridge. This shell may be permanently mounted when installed in the gas line and can be serviced without disturbing the line connections. Spring pressure holds the replaceable cartridge tightly against the bottom gasket to prevent the gas to be purified from bypassing the cartridge. The side inlet is located at the bottom of the unit oriented 90° from the outlet located at the top of the unit.

The model 8000A purifier shell must be used in conjunction with specially designed replaceable cartridges (Model 8000-1, 8000-2, or 8000-3)filled with various adsorbents. These are described below. These cartridges are shipped in hermetically sealed cans with convenient pull-tab ends for easy opening. This improved packaging ensures full retention of capacity in storage until the time of use.

MATERIALS OF CONSTRUCTION

Shell body: anodized aluminum
Gaskets: buna-N
Cartridges: 8000-1 Molecular Sieve 13x
8000-2 Molecular Sieve 4A
8000-3 Activated Charcoal
8010-5 Molecular Sieve 3A
8010-6 Molecular Sieve 5A



SPECIFICATIONS

Max. Operating Pressure: 1500 psig
Operating Temperature: -40° to +200°F.
Inlet and Outlet Ports: 1/4" NPT female
Dimensions: 4 1/2" dia. x 15 9/16" long
Weight with Cartridge: 12.4 lbs.
Dew Point Achievable: -100°F.

HOW TO ORDER

Model	Description	Absorption Capacity	General Application
8000A	Purifier Shell Only		
8000-1	Molecular Sieve 13x	126 grams water	Removal of oil and water from inert gases and saturated hydrocarbons
8000-2	Molecular Sieve 4A	134 grams water	Removal of water
8000-3	Activated Charcoal (Warning: Do not use with oxygen concentrations in excess of 21%)		Removal of heavy hydrocarbons acetone level control in acetylene used for atomic absorption
8000-5	Molecular Sieve 3A		Removal of water from unsaturated hydrocarbons such as acetylene
8000-6	Molecular Sieve 5A		

OXYGEN TRAPS
Series 6300

DESCRIPTION

These Series 6300 oxygen traps contain a highly active, metal-containing, inert supported reagent filled into a one-piece aluminum container. The trap is capable of reducing the oxygen content of a gas stream down to 99.99998% of its original concentration. Each unit is filled under a heated flow of ultra high purity helium to eliminate the need for extensive purging prior to GC or GC/MS operation.

The Series 6300 units are ideal for use with hydrogen and inert carrier gases commonly used with TC and FID gas chromatographs as well as argon-methane mixtures used with electron capture gas chromatographs. The all metal housing virtually eliminates contamination and resultant signal noise that often occur with traps constructed of other materials. These units can also be used to treat carbon monoxide, carbon dioxide, alkanes, alkenes, aliphatic hydrocarbon gases and low boiling point aromatics, like benzene and toluene.

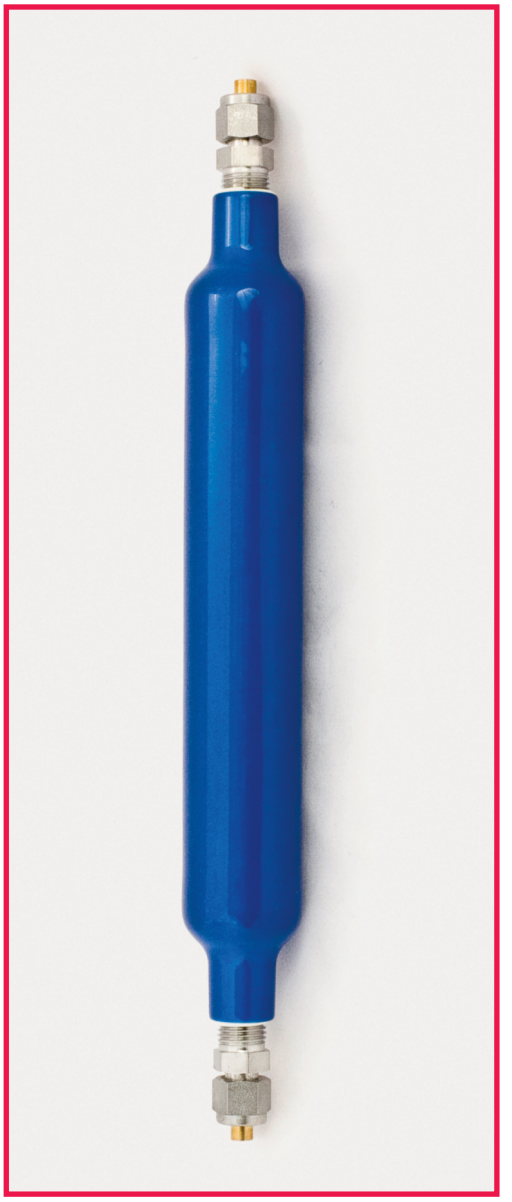
FEATURES

- Reduces oxygen levels to less than 15ppb.
- Scrubbing agent sphere size optimized to achieve maximum surface area and capacity to provide twice the surface area and capacity of "look-alike" units.
- Filter design and aspect ratio prevents channeling and promotes even flow and efficient scrubbing.
- Inlet and outlet fitted with 40 micron stainless steel frits.
- All metal construction.
- Bed material treated with ultra high purity helium.
- Operating pressure: 250 psig
- Oxygen removal capacity: 6300 525 mg
  6350 4200 mg
- Dimensions: 6300 1.25” O.D. x 11.25” long
  6350 2 3/8” O.D. x 17” long

HOW TO ORDER

Model	Connections
6300-2*	1/8" tubing compression
6300-4*	1/4" tubing compression
6350-8*	1/2” tubing compression
8012C	mounting clip
8050C	mounting clip for 6350

*Available with stainless steel compression fittings - add “SS” to part number.



Gas traps should be mounted in a vertical position to ensure proper contact of the gas with the adsorbent. Use model 8012C mounting clip with 6300 Series oxygen trap.

8012C Mounting Clip

INDICATING MOISTURE TRAPS
Series 8012, 8020, and 8040, 8050

DESCRIPTION

These units are designed to remove water, oil and organics from gases commonly used as gas chromatography carrier gases. They are constructed from Lexan® polycarbonate tubing with aluminum end caps sealed with Viton® o-rings, except for the 8050 which has a solid aluminum housing and is thus non-indicating. All units are filled with a mixture of molecular sieve 13X and indicating molecular sieve 4A. These are the highest capacity molecular sieves available and the preferred choice for gas drying. The blue indicating sieves turn buff color at 20% relative humidity.

FEATURES

- Reduces water to less than 20 ppb.
- Available in 3 sizes (120cc, 200cc, 400cc, 1600cc) that can easily be refilled.
- Inlet and outlet o-ring sealed connectors are equipped with 40 micron sintered stainless steel frits to prevent particulates from entering your system.
- Mixed spherically shaped 13X and 4A adsorbents provides superior bed packing with less resistance to flow.
- Mounting clip available for convenient installation.
- Moisture removal capacity:

8012	21.6 grams
8020	36.0 grams
8040	72.0 grams
8050	132 grams

- Dimensions:

8012-2 or -4	1.5" O.D. x 9.0" long
8020-2 or -4	1.5" O.D. x 12.5" long
8040-2 or -4	1.75" O.D. x 17.5" long
8050-8	2 3/8" O.D. x 17" long

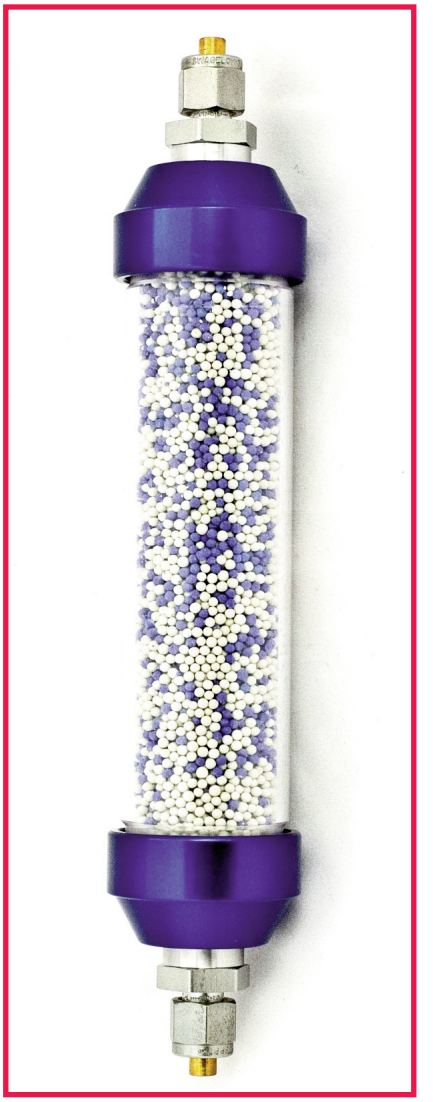
- Working Pressure:

8012, 8020, 8040	125 psig
8050	250 psig

HOW TO ORDER

Model	Capacity	Connections
8012-2*	120 cc	1/8" tubing compression fittings
8012-4*	120 cc	1/4" tubing compression fittings
8020-2*	200 cc	1/8" tubing compression fittings
8020-4*	200 cc	1/4" tubing compression fittings
8040-2*	400 cc	1/8" tubing compression fittings
8040-4*	400 cc	1/4" tubing compression fittings
8040R	400 cc	Provides enough for three 120 cc, two 200 cc, or one 400 cc refill
8050-8*+	735 cc	1/2" tubing compression fitting
8050R	1500 cc	provides enough for two refill
8012C		for mounting 8012 and 8020 units
8040C		for mounting 8040 units only
8050C		for mounting 8050 units only

+8050 is a non-indicating trap
*Available with stainless steel compression fittings - add "SS" to part number.



8012C
Mounting Clip

Gas traps should be mounted in a vertical position to ensure proper contact of the gas with the adsorbent. Use model 8012C, 8040C or 8050C mounting clip with 8012, 8020 and 8040 Series moisture traps.

CO2 TRAP
Series 6400

DESCRIPTION

The 6400 Series carbon dioxide trap is designed to remove CO2 gas from air, argon, helium, hydrogen, or nitrogen. The trap body is constructed of borosilicate glass with nickel plated end fittings with stainless steel sintered frits.* The absorption media is a formulation of sodium hydroxide and calcium hydroxide with an high absorptive capacity and indicating properties. Typically, this material will absorb 15-20% of its weight in carbon dioxide before the material is saturated and needs to be replaced. Replacement is indicated when the normally white color of the material turns violet. If moisture is detrimental to your system, a moisture trap should be installed down stream from this unit to adsorb water evolved from the absorption of the carbon dioxide (see page 69.)

*Units with stainless steel fittings are also available. Add"SS" to part number.

FEATURES

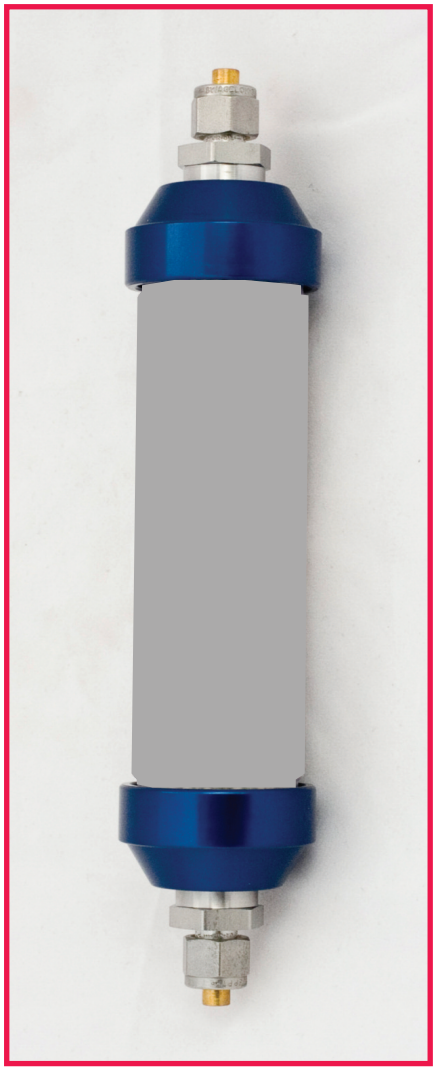
- Removes carbon dioxide to less than 0.5 ppm.
- Inlet and outlet fitted with 40 micron stainless steel frits.
- Reaction with carbon dioxide indicted by color change from white to violet.
- Inlet and outlet connections are 1/4" or 1/8" stainless steel compression fittings.
- Operating pressure: 125 psig max.
- CO2 removing capacity: 6410 45 grams CO2
  6425 90 grams CO2
- Dimensions: 6410 1.5" O.D. x 12.5" long
  6425 1.75" O.D. x 16.5" long

8012C
Mounting Clip

8040C
Mounting Clip

HOW TO ORDER

Model	Description	End Fittings
6410-2	carbon dioxide trap - 100 cc	1/8" compression
6410-4	carbon dioxide trap - 100 cc	1/4" compression
8012C	mounting clip for 6410 trap	
6425-2	carbon dioxide trap - 250 cc	1/8" compression
6425-4	carbon dioxide trap - 250 cc	1/4" compression
8040C	mounting clip for 6425 trap	



Gas traps should be mounted in a vertical position to ensure proper contact of the gas with the adsorbent. Use model 6400C or 8040C mounting clip with 6400 Series carbon dioxide trap.

HYDROCARBON TRAPS
Series 8200

DESCRIPTION

These units are designed to remove organics, such as alcohols, aromatics, chlorinated hydrocarbons, esters, ethers, hydrocarbons, and ketones from air, hydrogen, and inert carrier gases used in gas chromatography. They are constructed of aluminum and filled with extremely high surface area coconut shell based activated carbon.

The 8200 is a refillable purifier. Since impregnated carbons do not readily desorb all compounds, we recommend that the units be changed or refilled on a regular schedule using our 8200R refill kit that provides enough material for two charges of an 8200 or the 8250R which provides one charge of an 8250.

FEATURES

- Removes organics from air, hydrogen, and inert carrier gases. Does not remove light hydrocarbons like methane.
- Highly active coconut shell based carbon efficiently removes many types of hydrocarbon compounds.
- All metal housing.
- Refillable 200 cc or 1600 cc capacity.
- 40 micron filters on the inlet and outlet.
- Mounting clip available for convenient installation.
- Working pressure: 250 psig.
- Dimensions: 8200 1.5" O.D. x 12.5" overall length
  8250 2 3/8" O.D. x 17" overall length

HOW TO ORDER

Model	Connections
8200-2*	1/8" tubing compression fittings
8200-4*	1/4" tubing compression fittings
8250-8*	1/2" tubing compression fittings
8250R	Refill kit - contains 3 charge
8200R	Refill kit - contains 2 charges
8012C	Mounting clip
8050C	Mounting clip for 8250

*Available with stainless steel compression fittings - add "SS" to part number.

Gas traps should be mounted in a vertical position to ensure proper contact of the gas with the adsorbent. Use model 8012C mounting clip with 8200 Series hydrocarbon trap.

8012C
Mounting Clip

OXYGEN REMOVING PURIFIER FOR HYDROGEN
Series 6210

DESCRIPTION

The Series 6210 Purifiers remove oxygen from hydrogen by catalytic action. They are capable of removing up to 1% oxygen from a hydrogen stream down to a level of less than 1ppm. This reaction is normally accomplished at room temperature. At higher oxygen impurity concentrations, somewhat elevated temperatures may be experienced depending on operating conditions.

The purification is carried out by the formation of water from the oxygen impurity and the hydrogen background. If water presents a problem in your system it is suggested that a Model 8010 or 8000 purifier be installed in the system after the Series 6210 unit (see pages 64 and 65.)

The catalytic materials do not require regeneration and will function indefinitely providing that they are not contaminated. Sulfur and halogens are the primary contaminants of concern.

HOW TO ORDER

Model	Max. Flow SCFH	Max. Oper. Press. psig	Connections female	Dimensions inches
6210-10	10	2000	1/4" compression	1.05" dia. x 9.5" long
6210-25	25	2200	1/4" compression	1.32" dia. x 14.5" long
6210-50	50	1200	1/4" compression	1.66" dia. x 15" long
6210-100	100	1400	1/4" compression	2.38" dia. x 15.5" long
6210-200	200	1300	1/4" compression	2.88" dia. x 19.5" long
6210-500	500	900	1/2" compression	4.0" dia. x 23" long

MOLECULAR SIEVES

DESCRIPTION

Molecular sieves have a wide variety of uses in gas and chemical purification processes. We offer Types 3A, 4A, 5A, and 13X beads in a variety mesh sizes in the standard container sizes shown below. Custom packaging is also available.

Beads offer some distinct advantages over pellets that are offered by competitors.

- Beads provide a greater surface area per cubic foot resulting in more efficient adsorption for equivalent sized beds.
- Beads are stronger than pellets, thus they maintain their size and shape for more efficient adsorption.
- Beads do not create dust to the degree that pellets do; this results in a cleaner system with less frequent clogging of system filters.
- Beads offer an equivalent pressure drop to pellets.

Molecular Sieve 3A Formula $K_{12}[(AlO_2)_{12}].X\ H_2O$

The potassium form of the Type A Crystal structure, is an alkalai metal alumino-silicate. Type 3A is used for drying polar liquids such as ethanol and methanol and the dehydration of unsaturated hydrocarbons such as acetylene, butadiene, and propylene.

Molecular Sieve 4A Formula $Na_{12}[(AlO_2)_{12}].X\ H_2O$

The sodium form of the Type A Crystal structure, is an alkalai metal alumino-silicate. Type 4A is used for drying inert gases and saturated hydrocarbons, such as methane, ethane, and propane.

Molecular Sieve 5A Formula $Ca_4,5Na_3[(AlO_2)_{12}].X\ H_2O$

The calcium form of the Type A Crystal structure, is an alkalai metal alumino-silicate. Type 5A is used for separating normal paraffins from branched-chain and cylic hydrocarbons through a selective adsorption process.

Molecular Sieve 13X Formula $Na_{86}[(AlO_2)_{86}(SiO_2)_{106}].X\ H_2O$

The sodium form of the Type X Crystal structure, is an alkalai metal alumino-silicate. Type 13X is used for general drying of inert gases and saturated hydrocarbons, purification of air through removal of water and carbon dioxide, and the removal of H2S and mercaptans from natural gas.

HOW TO ORDER

Quantity		Type 3A	4A	5A	13X
1/16" beads	**8 x 12 mesh**				
1 x 1 lb.		MS1-3A001	MS1-4A001	MS1-5A001	MS1-13X001
6 x 1 lb		MS1-3A6X1	MS1-4A6X1	MS1-5A6X1	MS1-13X6X1
1 x 5 lbs.		MS1-3A005	MS1-4A005	MS1-5A005	MS1-13X005
4 x 5 lbs.		MS1-3A4X5	MS1-4A4X5	MS1-5A4X5	MS1-13X4X5
1 x 25 lbs.		—	—	—	MS1-13X025
1 x 30 lbs.	MS1-3A030	MS1-4A030	MS1-5A030		
1 x 55 lbs.		—	—	—	MS1-13X055
1 x 60 lbs.	MS1-3A060	MS1-4A060	MS1-5A060		
1/8" beads	**4 x 8 mesh**				
1 x 1 lb.		MS2-3A001	MS2-4A001	MS2-5A001	MS2-13X001
6 x 1 lb		MS2-3A6X1	MS2-4A6X1	MS2-5A6X1	MS2-13X6X1
1 x 5 lbs.		MS2-3A005	MS2-4A005	MS2-5A005	MS2-13X005
4 x 5 lbs.		MS2-3A4X5	MS2-4A4X5	MS2-5A4X5	MS2-13X4X5
1 x 25 lbs.		—	—	—	MS2-13X025
1 x 30 lbs.	MS2-3A030	MS2-4A030	MS2-5A030		
1 x 55 lbs.		—	—	—	MS2-13X055
1 x 60 lbs.	MS2-3A060	MS2-4A060	MS2-5A060		

FILTER APPLICATIONS

GAS CHROMATOGRAPHY

Particulates in an instrument carrier gas stream can reduce the overall performance of laboratory analytical work. Removing particles can reduce background noise levels and enhance instrument accuracy and precision.

PHARMACEUTICAL MANUFACTURING

The capability of these filters to remove bacteria and other particulate matter enables pharmaceutical manufacturers to install a filter in gas lines to those systems requiring process, purge, or blanket gases, thus ensuring a virtually sterile gas atmosphere.

PNEUMATIC OPERATED DEVICES

Because of the small orifices normally associated with these devices, they often malfunction and require frequent servicing. Installation of a particulate filter in the air or nitrogen feed lines helps to ensure longer trouble free operation, thus reducing down-time.

SEMICONDUCTOR MANUFACTURING

With increasing levels of device density the effect of particulate contamination becomes more damaging to potential yields. Semiconductor manufacturers install these filters in virtually all their gas lines to reduce the effects of particulates and improve their production yields.

TEFLON® MEMBRANE GAS LINE FILTER 0.003 MICRONS
Series 5010

The Teflon® medium in this filter efficiently traps particles down to 0.003 microns. These units may be installed in gas lines supplied by cylinders or bulk sources. Both the materials and manner of construction render the Series 5010 units compatible with a wide variety of gases.

FEATURES

- 99.9999999% efficient at 0.003 micron level.
- Filter medium - porous PTFE Teflon® membrane.
- All welded 316L stainless steel construction.
- Internal finish - less than 10 R_a.
- 0.5 sq. ft. filter area provides high particle retention capacity.
- Excellent compatibility with a wide variety of gases.
- Helium leak tested to 1 x 10^{-9} cc/sec.

SPECIFICATIONS

Filtration: 99.9999999% @ 0.003 microns
Max. Operating Pressure: 250 psig @ 250°F.
Max. Operating Temperature: 250°F.
Max. Flow: 200 slpm @ 5 psi ΔP with 30 psig inlet

HOW TO ORDER

Type of End Connection	Model Number	Connection Size		Dimensions	
		Inlet**	Outlet**	Length Inch	Diameter Inch
Standard Pipe	5010-P4FF	1/4 " NPT female	1/4" NPT female	3.58	2.0
Tubing Compression	5010-T4FF 5010-T8FF	1/4" tubing compression 1/2" tubing compression	1/4" tubing compression 1/2" tubing compression	3.82 5.17	2.0 2.0
VCR® Compatible Face Seal	5010-V4MM	1/4" face seal male	1/4" face seal male	3.73	2.0

**Other end fitting configurations available on request.

DEPTH GAS FILTERS - 0.01 MICRONS
Series 7010

DESCRIPTION

The Series 7010 depth filters are the workhorses of laboratories and many high purity industrial processes. They are routinely used in critical gas lines and as pre-filters to extend the lifetime of more expensive filtration units. They are designed to provide high filtration efficiency at an economical cost.

The Series 7010 filters employ a microporous fiberglass media held in a 316 stainless steel all welded housing. They are available in two sizes that accommodate most flow requirements.

FEATURES

- 99.9999% filtration efficiency at 0.01 micron level.
- All welded 316 stainless steel construction provides compatibility with a variety of gases.
- Long service life - particles are collected in the filter matrix throughout the depth of the filter.
- Helium leak tested to 1 x 10^{-9} cc/sec.

SPECIFICATIONS

Filtration: 99.9999% @ 0.01 microns
Max. Operating Pressure: 250 psig @ 250°F
Operating Temperature: 0° to 750°F.

HOW TO ORDER

Type of End Connection	Model Number	Connection Size		Dimensions		Max. Flow@ 5 PSI ΔP Inlet SLPM
		Inlet**	Outlet**	Inches Length	Dia.	
Standard Pipe	7010-P4FF	1/4 " NPT female	1/4" NPT female	2.68	2.0	50
Tubing	7010-T4FF	1/4" tubing compression	1/4" tubing compression	3.125	2.0	50
VCR® Compatible Face Seal	7010-V4MM	1/4" face seal male	1/4" face seal male	3.125	2.0	50

**Other end fitting configurations available on request.

HIGH EFFICIENCY COALESCING FILTER
Series 7300

DESCRIPTION

These filters are ideal for removing liquid and solid contaminates, such as water, oil, and particulates, from air and inert gas streams. They are an excellent choice for purifying the air from oil lubricated compressors. Housing are constructed of aluminum with porting from 1/4" NPT female to 3" NPT female. A large range of flow rates are accommodated by this variety of size.

FILTER ELEMENTS

Coalescer Type 70C: These elements have an efficiency rating of 95% against 0.1 micron particles and aerosols. They are a good choice for general purpose applications requiring clean compressed gas for powering valves, cylinders, air tools, etc.

Coalescer Type 50C: These elements have an efficiency rating of 99.99% against 0.1 micron particles and aerosols and should be used for the most demanding applications requiring a high quality clean gas. For the best performance, a Type 70C coalescer should be used as a pre-filter to the 50C.

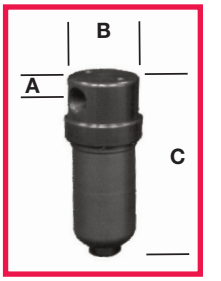
Adsorption Type CC: Coalescing filters can only remove the oil and water present in gas lines as liquid aerosols. They cannot remove the small fraction of oil present as a true vapor or water vapor. Type CC cartridges are vapor adsorption filters which will remove such gaseous contamination. It is important to remember that Type CC cartridges must always be preceded by a Type 50C coalescing pre-filter.

FEATURES

- Complete removal of oil, water and solids.
- High flow rates with low pressure drop.
- Low cost, completely disposable filter elements.
- Wide selection of sizes.
- Available with manual or fully automatic drains.

MATERIALS OF CONSTRUCTION

Housing	aluminum
Seals	Buna-N
Internals	models 7315, 7360 - nylon models 7370, 7380, 7385, 7390, 7395 SS/aluminum



SPECIFICATIONS

Max. operating pressure: 500 psig

Max. operating temperature: 240°F

Elements P/N			
12-32-70C	25-127-70C	38-152-50C	51-476-50C
12-32-50C	25-127-50C	38-152-CC**	51-476-CC**
12-32-CC**	25-178-70C	51-230-70C	63-762-70C
25-64-70C	25-178-50C	51-230-50C	63-762-50C
25-64-50C	25-178-CC**	51-230-CC**	63-762-CC**
25-64-CC**	38-152-70C	51-476-70C	

*CC cartridges are not used with automatic drains.

HIGH EFFICIENCY COALESCING FILTER *CONTINUED*
Series 7300

HOW TO ORDER (Filter housings and filter elements are ordered as separate items.)

Model	Port Size	Max. Pressure psig	Drain type	Dimensions (inches) A	B	C	Filter Element P/N (inches)
7315A-P4FF	1/4" NPTF	500	manual	0.39	1.57	4.72	12-32-xxx*
7360A-P4FF	1/4" NPTF	500	manual	0.61	2.74	6.50	25-64-xxx*
7360A-P8FF	1/2" NPTF	500	manual	0.61	2.74	6.50	25-64-xxx*
7360AF-P4FF	1/4" NPTF	250	automatic	0.61	2.74	6.94	25-64-xxx*
7360AF-P8FF	1/2" NPTF	250	automatic	0.61	2.74	6.94	25-64-xxx*
7370A-P8FF	1/2" NPTF	500	manual	0.61	2.74	10.38	25-178-xxx*
7370AF-P8FF	1/2" NPTF	250	automatic	0.61	2.74	10.38	25-127-xxx*
7380A-P12FF	3/4" NPTF	1500	manual	1.34	4.33	12.09	38-152-xxx*
7380AF-P12FF	3/4" NPTF	250	automatic	1.34	4.33	12.09	38-152-xxx*
7380A-P16FF	1" NPTF	1500	manual	1.34	4.33	12.09	38-152-xxx*
7380AF-P16FF	1" NPTF	250	automatic	1.34	4.33	12.09	38-152-xxx*
7385A-P24FF	1.5" NPTF	1000	manual	1.57	5.51	17.24	51-230-xxx*
7385AF-P24FF	1.5" NPTF	250	automatic	1.57	5.51	17.24	51-230-xxx*
7390A-P32FF	2" NPTF	1000	manual	1.57	5.51	24.92	51-476-xxx*
7390AF-P32FF	2" NPTF	250	automatic	1.57	5.51	24.92	51-476-xxx*
7395A-P48FF	3" NPTF	250	manual	2.56	7.48	42.32	63-762-xxx*
7395AF-P48FF	3" NPTF	250	automatic	2.56	7.48	42.32	63-762-xxx*

* Select element from table on previous page.

AIR FLOW RATES IN SCFM AT 2 PSI PRESSURE DROP

Housing Model	Line Size	Element Grade	Air Line Pressure (psig) 2	15	30	60	100	150	200	250	500
		70C	3.0	6.0	9	14	23	31	46	47	91
7315A	1/4"	50C	1.0	2.0	3	4	6	9.0	12	13	25
		CC	1.0	2.0	3	4	6	9.0	12	13	25
7360A		70C	6	11	16	26	44	58	88	89	173
and	1/4" or	50C	3	6	8	13	21	29	42	45	87
7360AF	1/2"	CC	6	6	8	13	21	29	42	45	87
7370A		70C	8	13	19	32	50	68	100	106	209
and	1/2"	50C	6	10	15	25	40	55	80	83	
7370AF		CC	6	10	15	25	40	55	80	83	163
7380A		70CS	28	33	47	77	122	167	244	261	502
and	3/4" or	50CS	13	25	36	61	99	134	194	203	406
7380AF	1"	CC	13	25	36	61	99	134	194	203	406
7385A		70CS		79	116		314	460	628	667	1334
and	1 1/2"	50CS		38	56		151	209	302	319	650
7390A		70CS	205	425	670	910	1160	1400	2010	2620	3230
and	2"	50CS	51	106	167	230	290	350	505	655	810
7395A		70CS	99	174	285	441	708	975	1416	1508	
and	3"	50CS	70	128	250	319	511	708	1022	1091	

STAINLESS STEEL HIGH EFFICIENCY COALESCING FILTER Series 7130 and 7140

DESCRIPTION

These filters are ideal for removing liquid and solid contaminates, such as water, oil, and particulates, from air, inert, and reactive gas streams. They are an excellent choice for purifying gas streams containing corrosive components. These filters fitted with a Type K fluorocarbon resin element are particularly suited for use in gas streams where highly reactive gases are being analyzed, since these elements exhibit very low levels of adsorption. Housing are constructed without welds of 316L stainless steel. They are available with porting of 1/4" NPT female and 1/2" NPT female.

FILTER ELEMENTS

Coalescer Type 70K: These elements have an efficiency rating of 95% against 0.1 micron particles and aerosols. They are a good choice for general purpose applications requiring clean compressed gas.

Coalescer Type 50K: These elements have an efficiency rating of 99.99% against 0.1 micron particles and aerosols and should be used for the most demanding applications requiring a high quality clean gas. For the best performance, a Type 70K element should be used as a pre-filter to the 50K.

Stainless Steel Type 01: These elements are constructed of sintered stainless steel or stainless steel mesh. They are especially useful in highly contaminated gas streams as they may be cleaned and reused. They are available in filtering efficiencies of 1, 10, 25 and 100 microns.

FEATURES

- Complete removal of solid and liquid contaminates from gas streams.
- High flow rates with low pressure drop.
- Selection of non-reactive or stainless steel filter elements.
- Wide selection of sizes.
- Relatively low internal volume.

MATERIALS OF CONSTRUCTION

Housing	316L stainless steel
Seals	Viton

SPECIFICATIONS

Max. operating pressure: 1500 psig
HP models 3000 psig

Max. operating temperature: 400°F

STAINLESS STEEL HIGH EFFICIENCY COALESCING FILTER CONTINUED
Series 7130 and 7140

HOW TO ORDER (Filter housings and filter elements are ordered as separate items.)

Model	Port Size	Drain Port	Max. Pressure (psig)	Dimensions (inches) A	B	C	Filter Element P/N
7130-P4FF	1/4" NPTF	1/4" NPTF	1500	0.59	2.36	4.80	25-64-xxx* or SS-130-xx*
7132-P8FF	1/2" NPTF	1/4" NPTF	1500	0.59	2.36	4.80	25-64-xxx* or SS-130-xx*
7132HP-P8FF	1/2" NPTF	1/4" NPTF	3000	0.59	2.52	5.04	25-64-xxx* or SS-130-xx*
7140-P4FF	1/4" NPTF	1/4" NPTF	1500	0.59	2.36	9.29	25-178-xxx* or SS-140-xx*
7142-P8FF	1/2" NPTF	1/4" NPTF	1500	0.59	2.36	9.29	25-178-xxx* or SS-140-xx*
7142HP-P8FF	1/2" NPTF	1/4" NPTF	3000	0.59	2.52	9.53	25-178-xxx* or SS-140-xx*

* Select element from table below.

Elements

P/N	P/N
25-64-70K	SS-130-xx **
25-64-50K	SS-140-xx **
25-178-70K	** Select micron size desired
25-178-50K	

**Size Suffix	Micron Size
01	1
10	10
25	25
100	100

AIR FLOW RATES IN SCFM AT 1.5 PSI PRESSURE DROP

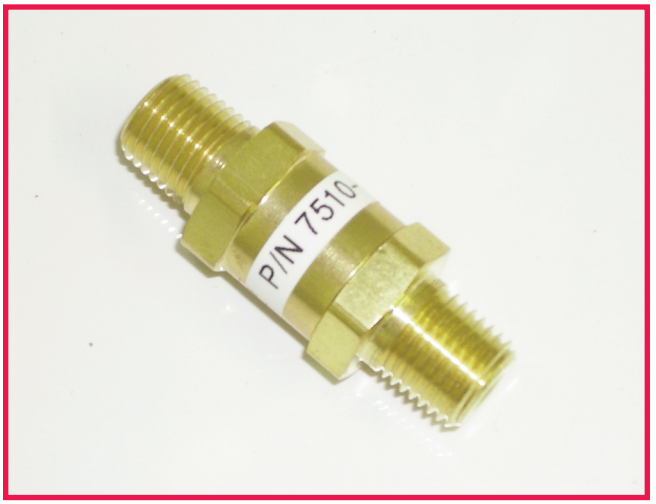
FILTER HOUSINGS USING ELEMENT SIZES 25-64 OR SS-130

Model	Element Grade Fluorocarbon	SS	Air Pressure (psig) 15	30	60	100	150	250	500	1500	3000
	50K, 50C	01	64	125	160	256	354	546	1091	3248	-
7130 Series	70K, 70C	10	87	221	221	354	488	754	1508	4466	-

FILTER HOUSINGS USING ELEMENT SIZES 25-148 OR SS-140

Model	Element Grade Fluorocarbon	SS	Air Pressure (psig) 15	30	60	100	150	250	500	1500	3000
	50K, 50C	01	10	15	25	40	55	83	163	488	988
7140 Series	70K, 70C	10	13	19	32	50	68	106	209	627	1247

IN-LINE FILTER
Series 7500



In-line Filter - Series 7500

FEATURES

- Compact in-line design with large filtration area.
- Sintered 316 stainless steel element.
- Choice of 1, 2, 5, 10, 50, or 100 micron filter element.

SPECIFICATIONS

Operating Pressure:	Brass: 3000 psig
	316 SS: 6000 psig*
Operating Temp.:	Brass: -30°F to 275°F
	316 SS: -15°F to 400°F

MATERIALS OF CONSTRUCTION

Model	Body	Seals	Filter Element
7510	brass	Buna-N	316 stainless steel
7520	316 SS	Viton	316 stainless steel

HOW TO ORDER

Model	Inlet and Outlet Connections
7510-X-P4MM	1/4" NPT male x 1/4" NPT male
7510-X-P4FF	1/4" NPT female x 1/4" NPT female
7510-X-T4FF	1/4" compression x 1/4" compression
7510-X-P8MM	1/2" NPT male x 1/2" NPT male
7510-X-P8FF	1/2" NPT female x 1/2" NPT female
7520-X-P4MM	1/4" NPT male x 1/4" NPT male
7520-X-P4FF	1/4" NPT female x 1/4" NPT female
7520-X-T4FF	1/4" compression x 1/4" compression
7520-X-P8MM**	1/2" NPT male x 1/2" NPT male
7520-X-P8FF**	1/2" NPT female x 1/2" NPT female

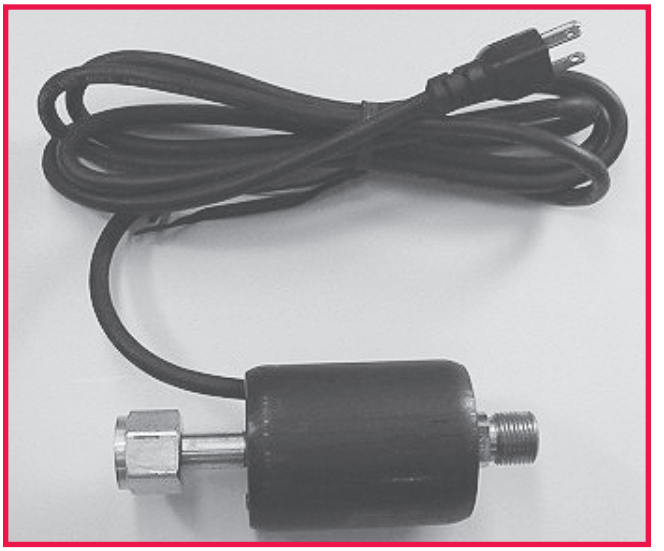
Other end fitting configurations are available.

X - Specify filter element 1, 2, 5, 10, 50, or 100 microns.

* 2 micron filter operating pressure is 3000 psig.

** 2 micron filter not available in 1/2" units.

GAS HEATERS
Series 6284



DESCRIPTION

The series 6284 gas heaters when installed between the cylinder and the regulator are designed to reduce the problem of regulator icing that is associated with high flow withdrawal rates of some gases due to their expansion from high pressure to low pressure.

This thermostatically controlled heater will not overheat the gas and can be left unattended without any gas flow. A pilot light indicates when the thermostat is closed and the heating element is operative.

SPECIFICATIONS

Material:	Steel case with black oxide finish covering a solid brass body
Max. flow:	90 cubic feet/hour
Voltage:	115 volt single phase 60 hz, 200 watts provided through a 5-foot grounded cord with molded plug.
Heating Range:	Thermostat between 160º - 190ºF. Outer case temperature 85ºF
Dimensions:	6-5/8" overall length, 2-1/2" diameter.
Weight:	2 pounds

HOW TO ORDER

Model	Application
6284-320	Carbon Dioxide
6284-326	Nitrous Oxide
6284-580	Argon

AUTOMATIC ELECTRIC GAS HEATERS
For Compressed Gases Series 1000

DESCRIPTION

Many liquefied gases cool dramatically under even moderate flow conditions due to the heat of vaporization when the liquid is converted to gas. This effect causes "freezing" in pressure regulators and other equipment resulting in pressure and flow fluctuations. These thermostatically controlled heaters maintain a constant temperature within close limits regardless of load variations, thus assuring a uniform temperature and constant gas flow at all times. All units are completely automatic and can be left on indefinitely, even under no-flow conditions without damage.

APPLICATIONS

- Welding Operations
- Hospitals/Anesthegeology
- Bottling Plants/Wineries
- Foundries
- Food Packaging
- Semiconductor
- Gas Freeze-up Applications

FEATURES:

- Prevents regulator freeze-up.
- Thermostatically controlled.
- Double protection against thermal or electrical overload.
- Continuous high pressure tubing –no internal joints.
- Working pressures up to 4600 psig.
- Completely dry - heat exchange medium is aluminum.
- Heavily insulated - cabinet remains "cool."
- Can be left on, even under no-flow conditions.
- Unlike ambient devices, not affected by adverse atmospheric conditions.
- Flow can be in either direction, without loss of efficiency.
- C.S.A. Approved.
- One year guarantee on material and workmanship.

SPECIFICATIONS

- 11" high x 5.5" wide x 4.25" deep
- 5/16" x .049 continuous copper tubing
- 5/16" x .049 304 stainless tubing optional
- Working pressure: up to 2500 psig (stainless steel: 4600 psig)
- 11 lbs. actual weight; 13 lbs. shipping weight
- 6' 3-wire UL/CSA cord
- 120/240 volts A.C., single phase
- 8.3/4.2 amps (1000 watts)
- Mounting holes 3" on center

CAPACITY (FOR CARBON DIOXIDE, CO 2)**

- Heating : 1000 CFH; 17 CFM; 467 liters/minute; 115 lbs./hr. (Heating valves are based on initial gas temperature of 0°F and outlet temperature of 170°F)
- Vaporizing: 184CFH; 3 CFM; 84 liters/minute; 22 lbs./hr. (Vaporization valves are based upon initial liquid temperature of 0°F and outlet temperature of 170°F)

** Capacities for other gases will vary, depending on their specific heat.

HOW TO ORDER

1. Select basic model

Model	Number Description
1000	1000 watts, 120 volts A.C., copper tubes
SS1000	1000 watts, 120 volts A.C., stainless steel tubes
SS1000A	Same as SS1000, but with adjustable thermostat

2. Select fittings (add to end of basic model #)

Fittings	Suffix Description
-320	CGA 320 female x male (Carbon Dioxide, CO_2)
-326	CGA 326 female x male (Nitrous Oxide, N_2O)
-580	CGA 580 male x female (Nitrogen, N_2)
-4	1/4" NPT male x male (brass)
-4SS	1/4" NPT male x male (stainless)

Other fittings available on request.

CYLINDER HEATING SYSTEM
HB120 Series

DESCRIPTION

The HB-120 heater is an electrical appliance which supplies supplemental heat to replace the heat of evaporation normally lost when a liquefied gas changes state from liquid to gas inside steel cylinders. Freezing typically occurs with a change of state from liquid to gas is made at a rate faster than the liquid can absorb ambient heat. The use of a heater increases the speed at which the gas may be discharged from the cylinder.

The heater is designed to heat the lower part of the cylinder where freezing usually occurs. For larger flows the use of multiple heaters spaced over the length of the cylinder may be required.

The use of a single HB120 strap is ideal for preventing condensation of low volatility components in gas mixtures to help ensure that the mixture remains homogenous.

An insulating blanket is available to aid in ensuring that the heat is transferred into the cylinder and to aid in holding the heat on the cylinder.

Each heating belt is thermostatically controlled to 130˚F to prevent overheating of the cylinder.

The heater has an adjustable Velcro® strap making it easy to apply band to cylinders with diameters of 8” to 10”.

SPECIFICATIONS

- 500 watt heating capacity.
- Thermostatically controlled to130°F .
- Power – 120VAC/60Hz.
- Dimensions – 27” long x 8” wide.
- Weight less than 1 pound.

HOW TO ORDER

Model Number	Description
HB120A	cylinder heater with 4’ power cord and 130°F thermostat
HB120-BLK	insulating blanket 48” high x 36” wide

Heater bands sold individually.

GAS CYLINDER WARMING BLANKETS
Series CWB-130

DESCRIPTION

The Series CWB-130 cylinder warming blankets are used to warm cylinders of gas mixtures to maintain a uniform composition. They are particularly useful when the mixture contains low vapor pressure components that may partially condense and change the mixture composition if exposed to lower temperatures, thus making the mixtures analysis unreliable. These blankets are a combination of cylinder heater and insulating blanket. The blanket creates a convection current in the cylinder to maintain a homogenous composition by heating the lower portion of the cylinder more than the upper portion. Models available for both hazardous and non-hazardous areas. Sizes available to accommodate 15", 10", 9", and 8" diameter cylinders. Optional cylinder base insulation pads valve cover are available to further reduce heat loss.

SPECIFICATIONS

- Self-regulating grounded heating element.
- Power rating: 75 watts, 0.45 amps.
- Power: 120 VAC, 5-60 Hz standard, 220 VAC optional.
- 2" thick side and 0.5" top insulation of moisture and oil resistant rigid fiberglass to create insulation jacket.
- Velcro® fasteners for ease of installation.
- CSA approved (optional ATEX approval available).
- Power cord: non-hazardous area – 10 foot SJOW cord
  hazardous area – 10 foot Teck 90 cable.
- Hazardous area rating: Class 1, Division 1, Groups B, C, & D.

HOW TO ORDER

Model	Description
For non-hazardous areas	
CWB-130-8	warming blanket for 8" X 48" aluminum cylinders
CWB-130-9	warming blanket for 9" X 51" steel cylinders
CWB-130-15	warming blanket for 15" X 43" steel cylinders
For hazardous areas	
CWB-130H-8	warming blanket for 8" X 48" aluminum cylinders
CWB-130H-9	warming blanket for 9" X 51" steel cylinders
CWB-130H-15	warming blanket for 15" X 43" steel cylinders
Accessories for both types of blankets	
130FP-9	insulating floor pad for 8" and 9" diameter cylinders
130FP-15	insulating floor pad for 15" diameter cylinders

ELECTRONIC CYLINDER SCALES FOR LIQUEFIED AND CRYOGENIC GASES

FEATURES

- Controller has large 1" high LCD digital display in water resistant housing.
- Rugged load cell weighing technology with 300, 500, or 1000 pound capacity.
- Weight resolution up to 0.1 pound.
- Accuracy 0.1% of full scale.
- Built-in visual alarm and audible alarm with silence function.
- Built-in solid state relay.
- 0-100% of full scale tare weight adjustment.
- 0-100% of full scale alarm set point adjustment.
- Both large and small platform sizes available.
- Easy unit conversion from pounds to kilograms.

DESCRIPTION

The pressure of a liquefied gas remains constant as material is withdrawn as long as a liquid phase remains in the cylinder. When the liquid phase is exhausted the pressure drops very quickly and the cylinder empties without warning. This phenomenon renders a cylinder pressure gauge virtually useless. A similar situation arises when using cryogenic containers of liquid nitrogen, oxygen, and argon. The only way to monitor the contents of a cylinder of liquefied gas or a cryogenic container is by weight.

The Series 620 and 320 electronic scales are designed to give a positive indication of the amount of product remaining in the cylinder as material is being withdrawn. These units allow the user to electronically subtract the tare weight of the cylinder so that only the net contents can be read directly. The built-in alarm can be set for any weight value from 0-100% of the scales capacity. The units provide a red LED visual alarm and an audible alarm with silence function. An integral solid state relay is provided for the activation of external alarms or other equipment when the alarm set point is reached.

The scales are ruggedly constructed using one or more load cells in a sturdy stainless steel and/or aluminum diamond plate platform with mechanical stops at 150% of capacity to prevent damage.

320 Series

620G-300

The model 620G-300 with a capacity of 300 pounds has a 9.5" x 9.5" stainless steel platform that accommodates most compressed gas cylinders. For larger diameter cylinders, the 320DL-500 is available with a capacity of 500 pounds has a 36" x 36" diamond plate steel platform. The model 320ML-1000 has a 1000 pound capacity and accommodates cryogenic containers with its 36" x 36" aluminum diamond plate steel platform. A ramp is available for each model so that cylinders can easily be rolled on and of the scale platform without lifting.

APPLICATIONS

Recommended for use with all liquefied and cryogenic containers in applications where running out of gas will cause a serious disruption in operations or a loss of product.

HOW TO ORDER

Model	Total Capacity Pounds	Resolution pounds	Platform Dimensions
620G-300	300	0.1	9.25" w x 9.25" d x 1.5" h
320DL-500	500	0.1	36" w x 36" d x 1-7/8" h
320ML-1000	1000	0.2	36" w x 36" d x 1-7/8" h
620R	ramp for 620G		9" w x 5.5" d x 1.5" h
320RL	ramp for 320DL & 320ML		36" w x 18" d x 1-7/8" h

CYLINDER SCALE FOR LIQUEFIED GASES
Model 900

FEATURES

- Heavy duty 16 gauge.
- Stainless steel cover.
- Dual dial scale - pounds and kilograms.
- Color-coded easy to read dial.

DESCRIPTION

The pressure of a liquefied gas remains constant as material is withdrawn as long as a liquid phase remains in the cylinder. When the liquid phase is exhausted the pressure drops very quickly and empties without warning. This phenomenon renders a cylinder pressure gauge virtually useless. The only way to monitor the contents of a cylinder containing a liquefied gas is by weight.

The Model 900 cylinder scale is designed to give a positive indication of the amount of product remaining in the cylinder. It allows the user to subtract the tare weight of the cylinder so that the net contents can be read directly. A color coded dial reads in pounds and kilograms. A non-skid ramp is available to make loading cylinders convenient and easy.

The scale is ruggedly constructed and features a stainless steel cover for durability.

APPLICATIONS

Recommended for use with all liquefied gases such as carbon dioxide, ammonia, nitrous oxide, fluorocarbons, hydrogen sulfide, sulfur dioxide, propane and heavier hydrocarbon gases.

SPECIFICATIONS

Tare weight range: 150 lbs. (0-68 kg.)
Product weight range: 0-150 lbs. (0-68 kg.)
Total capacity: 300 lbs (136 kg.) in 10 lb. (5 kg.) divisions.
Readability: 1 lb. (0.5 kg.) by estimation
Dimensions: 10 3/4" x 10 1/2" x 1 3/4" high

HOW TO ORDER

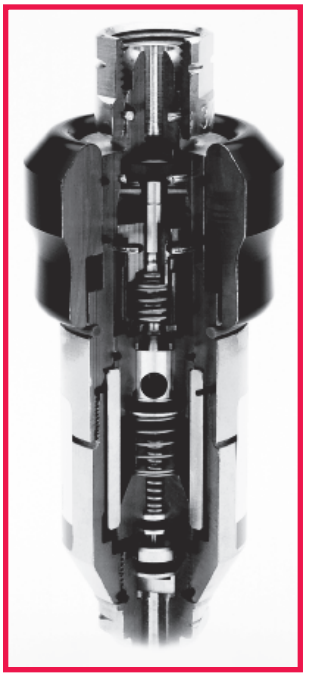
Model	Description
900	Scale with non-skid ramp
900-5	Scale only
900-6	Ramp only

900-6 Scale Ramp

FLASH ARRESTOR
SERIES 8491 – BRASS

DESCRIPTION

The new 8491 Series re-settable flashback arrestors offer four (4) safety devices in each unit. Safety features include protection against flashbacks with a wide range of mixtures of oxygen or air with flammable gases including hydrogen, acetylene, methane, and LPG gases. The design includes a built-in non-return (check) valve to stop reverse flow and a thermal shut off which stops gas flow in the event a of hose or pipe line fire. An easily re-settable pressure control stops gas flow in the event of reverse flow or a flashback that creates 10 psig back pressure. This feature alerts the user that a reverse flow or a flashback of greater than 10 psig has occurred. These units are easily re-set by pulling up on the pressure control ring (shown at right), no disassembly of the gas line or special tools are needed. The 8491 Series high flow capacity makes them suitable for a broad range of applications (see flow table). Units are UL listed and meet ISO 5175, EN 730, BS 6158, and AS 4603 standards.



FEATURES

- 100% flashback tested after assembly.
- UL listed and meets strict international standards .
  UL Approved Working Pressures:
  Acetylene @15.0 psig
  Hydrogen/oxygen @50.0 psig
  Hydrogen/air @150.0 psig
  LPG @50.0 psig
  Oxygen @143.0 psig
- Alerts user by shutting off gas flow in the event of a reverse flow or flashback exceeding 10 psig back pressure (captures back pressure in the housing, no flame or gas is exhausted to the atmosphere).
- Stainless steel flame barrier positively extinguishes flame within the housing.
- Checks reverse flow and provides positive shut-off of reverse flow over 10 psig.
- Thermal cut-off @ 165°C.
- Built-in 100 micron stainless steel sintered filter on inlet.
- High flow capacity (see flow performance table).

MATERIALS OF CONSTRUCTION

Body: Alloy 360 brass
Internals: brass
Flame barrier: stainless steel
Elastomers: Neoprene

WORKING PRESSURE

Gas	Pressure psig	
	UL	BAM
Acetylene	15.0	22.0
Hydrogen/oxygen	50.0	58.0
Hydrogen/air	150.0	-
Methane/LPG	50.0	72.0
Oxygen	143.0	217.0

FLOW PERFORMANCE

Inlet Press. psig	Air Flow SCFH
7.3	231.0
14.5	465.0
21.8	725.0
36.3	1041.0
2.5	1933.0

HOW TO ORDER

		Connections	
Model	Gas Service	Inlet	Outlet
8491-F	flammables	1/4” NPT female	1/4” NPT female
8491-O	oxidizers	1/4” NPT female	1/4” NPT female
8491-FL	flammables	9/16-18 LH female	9/16-18 LH male
8491-OR	oxidizers	9/16-18 RH female	9/16-18 RH male

STAINLESS STEEL FLASH ARRESTOR
Model 8492-P4FM

DESCRIPTION

The model 8492 is an ideal choice where stainless steel is desired as the material of construction. It my be used on flammable gases other than those approved by UL providing the materials of construction are compatible. When installed in a line containing a flammable gas these units will prevent reverse flow, stop, and extinguish a flashback. The unit shuts off the flow of gas in the event of a flashback or reverse flow in excess of 7 psig. Re-setting is automatic when the down stream pressure is relieved. There is no need to open the gas line and no disassembly or special tools are required.

FEATURES

- UL listed for:
  Acetylene @15.0 psig
  Hydrogen/air @ 50.0 psig
  LPG @50.0 psig
  Oxygen @143.0 psig.
- May be used on compatible corrosive flammable gases.
- Reusable – can be reused after a flashback without opening the system or removing from service.
- Stainless steel flame barrier positively extinguishes flame within the housing.
- Checks reverse flow and provides positive shut-off of reverse flow over 7 psig.
- Thermal cut-off.
- Built-in 100 micron filter on inlet.
- High flow capacity.

MATERIALS OF CONSTRUCTION

Body:	316L stainless steel
Internals:	stainless steel
Flame barrier:	stainless steel
Elastomers:	Neoprene

FLASHBACK APPROVALS

UL
ISO 5175. BS 6158
EN 730 (BAM/DIN)
AS 4603

WORKING PRESSURE

Gas	Pressure psig	
	UL	BAM
Acetylene	15.0	22.0
Hydrogen/oxygen	50.0	58.0
Hydrogen/air	150.0	-
Methane/LPG	50.0	72.0
Oxygen	143.0	217.0

FLOW PERFORMANCE

Inlet Press. psig	Air Flow SCFH
7.3	231.0
14.5	465.0
21.8	725.0
36.3	1041.0
2.5	1933.0

HOW TO ORDER

Model	Gas Service	Connections	
		Inlet	Outlet
8492-P4FM-F	flammables	1/4" NPT female	1/4" NPT male
8492-P4FM-O	oxidizers	1/4" NPT female	1/4" NPT male

PURGE ASSEMBLIES

DESCRIPTION

The installation of a purge assembly on the inlet of your pressure regulator, pigtail inlet, or gas control system is highly recommended anytime a toxic, corrosive, flammable, or ultra high purity gas is to be used in the system. Purge assemblies perform the following multiple functions in your gas system during cylinder change-overs:

- Eliminate the release of toxic, corrosive, or flammable gases into the workplace.
- Maintain the integrity of an ultra high purity system.
- Protect equipment in corrosive gas service from exposure to moisture, thus preventing destructive corrosion.

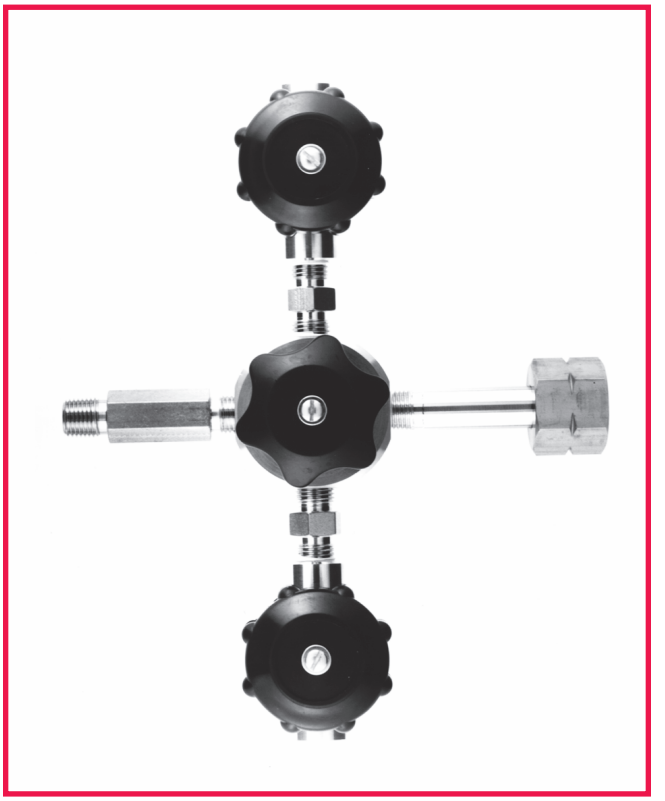
DEEP PURGE VALVE SYSTEM
Series 4800

DESCRIPTION

The Series 4800 deep purge valve system provides the ultimate in purging capability in a compact design with a very small internal volume. These units can be used in a wide variety of applications where contamination must be avoided during cylinder changeovers.

The deep purge valve system is an ideal accessory installed between the cylinder and the regulator of ultra high purity carrier lines for gas chromatography systems that cannot tolerate even a minimum amount of oxygen and moisture that can enter the system during cylinder changeovers.

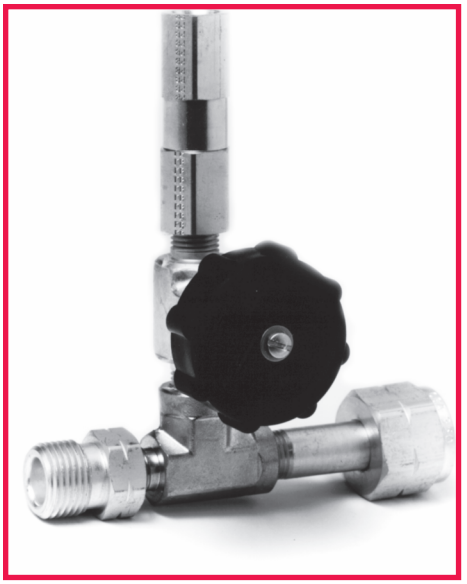
The deep purge valve system can be used with gas mixtures containing reactive components to ensure that no moisture enters the sampling system to cause deterioration of the reactive components that can lead to concentration inaccuracies. Use of the 4820 also provides protection from the release of toxic gases into the atmosphere during cylinder changeovers.



HOW TO ORDER

Model	Material of Construction	Valve Type	Connections Inlet	Outlet	
4820-P4FF	stainless steel	multi-turn	1/4" NPT female	1/4" NPT female	
4820-P4FM	stainless steel	multi-turn	1/4" NPT female	1/4" NPT male	(3" nipple)
4820-CGA	stainless steel	multi-turn	specify CGA	1/4" NPT male	(3" nipple)
4821-P4FF	stainless steel	90˚ lever	1/4" NPT female	1/4" NPT female	
4821-P4FM	stainless steel	90˚ lever	1/4" NPT female	1/4" NPT male	(3" nipple)
4821-CGA	stainless steel	90˚ lever	specify CGA	1/4" NPT male	(3" nipple)
4822-CGA	stainless steel	multi-turn	specify CGA	mating CGA	
4823-CGA	stainless steel	90˚ lever	specify CGA	mating CGA	

TEE PURGE ASSEMBLIES
Series 4500



Series 4500

DESCRIPTION

The Series 4500 tee purge assemblies are designed to be installed between the cylinder valve and the pressure regulator. They enable the user to purge the system through the regulator with an inert gas.

The Series 4500 units feature multi-turn diaphragm packless valves and a check valve installed on the purge gas inlet. They are rated for 3000 psig.

HOW TO ORDER

Model	Material of Construction
4510-CGA*	brass
4520-CGA*	stainless steel
4550-CGA*	monel® and Al-Si-Bronze

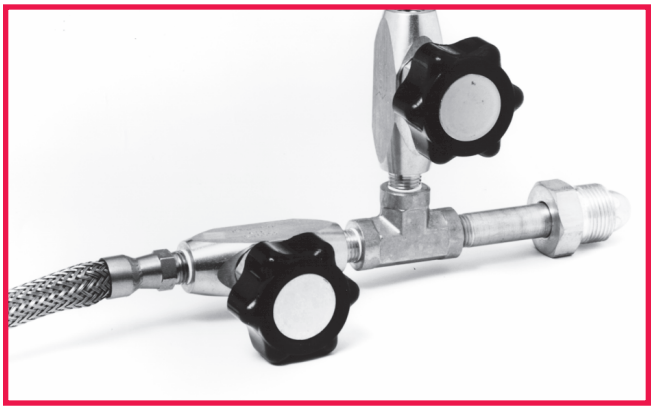
*Specify CGA connection required when ordering.

TEE PURGE ASSEMBLIES
Series 4600

DESCRIPTION

The Series 4600 tee purge assembly was designed for use with inert gases such as argon, helium, and nitrogen. When installed either on the inlet to a pressure regulator or on the cylinder end of a pigtail they are an ideal device for purging the cylinder inlet connection after cylinder changeover to eliminate the introduction of oxygen and water to the system. These tee purges conveniently use the gas in the cylinder for purging.

The Series 4600 can be constructed either with multi-turn or 90º lever actuated diaphragm packless valves. This entire assembly is designed to pass a helium leak rated of 1 x 10^{-8} sccm. They are rated for 3000 psig.



Series 4600

HOW TO ORDER

Model*	Mat. of Constr.	Connections	
		Inlet	Outlet
4610-P4FF multi-turn	brass	1/4" NPT female	1/4" NPT female
4611-P4FF 90° lever	brass	1/4" NPT female	1/4" NPT female
4610-CGA multi-turn	brass	specify CGA	1/4" NPT female
4611-CGA 90° lever	brass	specify CGA	1/4" NPT female
4611M-CGA multi-turn	brass	specify CGA	1/4" NPT male
4611M-CGA 90° lever	brass	specify CGA	1/4" NPT male
4612-CGA multi-turn	brass	specify CGA	mating CGA
4613-CGA 90° lever	brass	specify CGA	mating CGA
4620-P4FF multi-turn	ss	1/4" NPT female	1/4" NPT female
4621-P4FF 90° lever	ss	1/4" NPT female	1/4" NPT female
4620-CGA multi-turn	ss	specify CGA	1/4" NPT female
4621-CGA 90° lever	ss	specify CGA	1/4" NPT female
4620M-CGA multi-turn	ss	specify CGA	1/4" NPT male
4621M-CGA 90° lever	ss	specify CGA	1/4" NPT male
4622-CGA multi-turn	ss	specify CGA	mating CGA
4623-CGA 90° lever	ss	specify CGA	mating CGA

*Specify CGA connection required when ordering.

MINIATURE FORGED NEEDLE VALVES
Series 8100

DESCRIPTION

These valves are used in a wide variety of industrial and laboratory applications. They offer excellent flow control and both the brass and stainless steel models have Teflon® packing.

SPECIFICATIONS

Max. operating pressure: brass 3000 psig
stainless steel 6000 psig
Monel® 3500 psig
Operating temperature range: -65° to 100°F
Flow coefficient(C_V): brass 0.048
stainless steel 0.48
Monel® 0.24

HOW TO ORDER

Model			Pattern	Connections
Brass	316 SS	Monel		
8111	8121	--	Straight	1/8" NPT male
8112	8122	8152	Straight	1/4" NPT male
8113	8123	--	Straight	1/4" compression

CHECK VALVES
Series 8400

DESCRIPTION

Check valves prevent the return flow of gas, thus keeping foreign substances out of lines, regulators, and cylinders located upstream of the valve.

These valves are a spring loaded design with the spring on the high pressure side to protect it from foreign substances. The positive stop prevents over-stressing of the spring by sudden surges of gas pressure. An o-ring at the valve seat provides quick, efficient sealing.

HOW TO ORDER

Model	Materials of Construction	Cracking Pressure PSIG	End Connections	Operating Pressure PSIG
8410V	Brass body, Viton® o-ring, st. st. spring	~ 1	1/4" NPT female	3000
8410V-5-P4MM	Brass body, Viton® o-ring, st. st. spring	~ 5	1/4" NPT male	3000
8420E	316 st. st., EPR o-ring, st. st. spring	~ 1	1/4" NPT female	3000
8420V	316 st. st., Viton® o-ring, st. st spring	~ 1	1/4" NPT female	3000
8420V-5-P4MM	316 st. st., Viton® o-ring, st. st spring	~ 5	1/4" NPT male	6000
8450V	Monel® , Viton® o-ring, st. st. spring	~ 1	1/4" NPT female	3000

Note: Check valves with other o-ring materials are available.

HIGH PURITY DIAPHRAGM PACKLESS VALVES
Series 8300

DESCRIPTION

The multiple metal diaphragm design and Kel-F® seat are the key elements to the high purity success of these valves. They are available in a variety of styles and fitting configurations to meet virtually any application.

The 90° lever operated option provides the inherent benefits of a diaphragm packless valve with the quick open/close action and easily identifiable operational status of a lever actuated valve.

FEATURES

- Metal diaphragm packless construction for diffusion resistant operation.
- Capable of passing a helium leak-rate test to 10^{-10}cc/sec.
- Available in multiple turn and 90° lever operated designs.

APPLICATIONS

The Series 8300 valves are recommended whenever the diffusion of atmospheric gases and moisture into a gas system is undesirable. They are a must in all ultra high purity gas transfer systems, particularly those used for gas chromatography carrier gases, samples, and calibration standards.

MATERIALS OF CONSTRUCTION

	Series 8310	Series 8320
Body	Brass	316 Stainless Steel
Seat	Kel-F®	Kel-F®
Diaphragm	Stainless Steel	Stainless Steel

SPECIFICATIONS

Operating pressure: brass - 3000 psig
stainless steel - 3000 psig
Operating temperature range: -65° to 150°F
Flow coefficient(C_V): 0.13

HOW TO ORDER

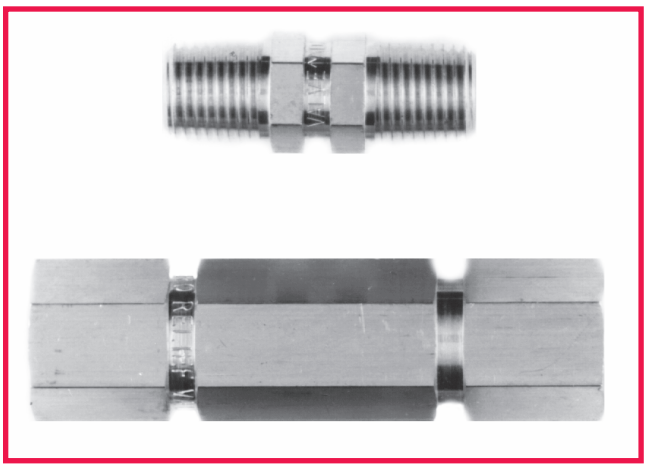
		Connections	
Model*	**Actuation**	**Inlet**	**Outlet**
8310-P4FF	Multi-turn	1/4" NPT female	1/4" NPT female
8310L-P4MF	Multi-turn	1/4" NPT male long	1/4" NPT female
8310-P4MM	Multi-turn	1/4" NPT male	1/4" NPT male
8310-T4FF	Multi-turn	1/4" compression	1/4" compression
8311-P4FF	90° lever	1/4" NPT female	1/4" NPT female
8311L-P4MF	90° lever	1/4" NPT male long	1/4" NPT female
8311-P4MM	90° lever	1/4" NPT male	1/4" NPT male
8311-T4FF	90° lever	1/4" compression	1/4" compression
8320-P4FF	Multi-turn	1/4" NPT female	1/4" NPT female
8320L-P4MF	Multi-turn	1/4" NPT male long	1/4" NPT female
8320-P4MM	Multi-turn	1/4" NPT male	1/4" NPT male
8320-T4FF	Multi-turn	1/4" compression	1/4" compression
8321-P4FF	90° lever	1/4" NPT female	1/4" NPT female
8321L-P4MF	90° lever	1/4" NPT male long	1/4" NPT female
8321-P4MM	90° lever	1/4" NPT male	1/4" NPT male
8321-T4FF	90° lever	1/4" compression	1/4" compression

*Other end connection configurations available on request.

RELIEF VALVES
Series 8600

DESCRIPTION

These easily field adjustable relief valves provide for the protection of equipment components installed in systems where they may be exposed to over pressurization due to the failure of another component or an operator error.



FEATURES

- Working pressure to 3000 psig.
- Wide range of pressure adjustment.
- 100% tested for crack and reseal performance.
- Available in brass and stainless steel.

SPECIFICATIONS

Maximum Working Pressure @ 70ºF: 3000 psig
Flow Coefficient (C_V): 0.35
Temperature Rating:

	with Buna-N o-ring	-10 to 250ºF.
	with Viton® o-ring	-10 to 375ºF.
O-ring Material:	brass	Buna-N
	stainless steel	Viton®

HOW TO ORDER

Model	Material	Adjustable Range	Connections inlet x outlet
8614-3-P4MM	brass	3-20 psig	1/4" NPT male x 1/4" NPT male
8614-20-P4MM	brass	20-65 psig	1/4" NPT male x 1/4" NPT male
8614-65-P4MM	brass	65-175 psig	1/4" NPT male x 1/4" NPT male
8614-175-P4MM	brass	175-350 psig	1/4" NPT male x 1/4" NPT male
8614-350-P4MM	brass	350-600 psig	1/4" NPT male x 1/4" NPT male
8614-3-P4FF	brass	3-20 psig	1/4" NPT female x 1/4" NPT female
8614-20-P4FF	brass	20-65 psig	1/4" NPT female x 1/4" NPT female
8614-65-P4FF	brass	65-175 psig	1/4" NPT female x 1/4" NPT female
8614-175-P4FF	brass	175-350 psig	1/4" NPT female x 1/4" NPT female
8614-350-P4FF	brass	350-600 psig	1/4" NPT female x 1/4" NPT female
8624-3-P4MM	stainless	3-20 psig	1/4" NPT male x 1/4" NPT male
8624-20-P4MM	stainless	20-65 psig	1/4" NPT male x 1/4" NPT male
8624-65-P4MM	stainless	65-175 psig	1/4" NPT male x 1/4" NPT male
8624-175-P4MM	stainless	175-350 psig	1/4" NPT male x 1/4" NPT male
8624-350-P4MM	stainless	350-600 psig	1/4" NPT male x 1/4" NPT male
8624-3-P4FF	stainless	3-20 psig	1/4" NPT female x 1/4" NPT female
8624-20-P4FF	stainless	20-65 psig	1/4" NPT female x 1/4" NPT female
8624-65-P4FF	stainless	65-175 psig	1/4" NPT female x 1/4" NPT female
8624-175-P4FF	stainless	175-350 psig	1/4" NPT female x 1/4" NPT female
8624-350-P4FF	stainless	350-600 psig	1/4" NPT female x 1/4" NPT female

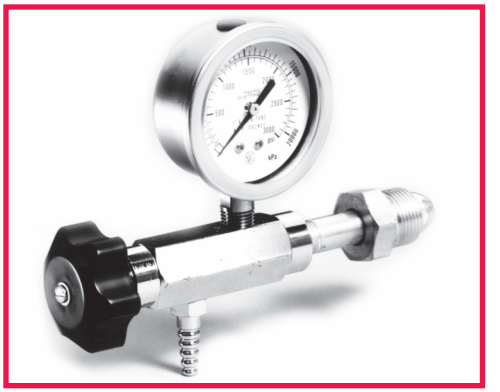
MANUAL CONTROL VALVES
Series 8500

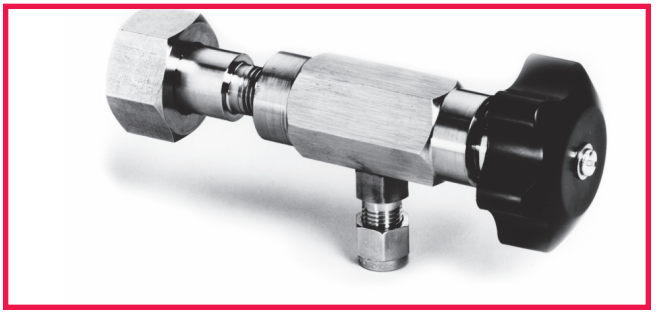
DESCRIPTION

Manual controls are designed for direct connection to a compressed gas cylinder valve outlet. They provide a simple means of transferring the contents of a cylinder to another system or vessel. They **DO NOT** control pressure and should never be used without an operator in attendance at all times.

Four models are presented here with the following basic design features:

- Maximum inlet pressure - 3000 psig.
- Teflon® packing for smooth leak-free operation.
- Finger-tip control of flow from only a few cc per minute to very rapid withdrawal.





HOW TO ORDER

Series 8520 - 303 Stainless Steel

Model	Outlet Connection
8520H*	1/4" hose barb
8520T*	1/4" compression fitting
8520PF*	1/4" NPT female

*Specify CGA connection number when ordering.

Series 8523 - 303 Stainless Steel with 0-3000 psig Cylinder Pressure Gauge

Model	Outlet Connection
8523H*	1/4" hose barb
8523T*	1/4" compression fitting
8523PF*	1/4" NPT female

*Specify CGA connection number when ordering.

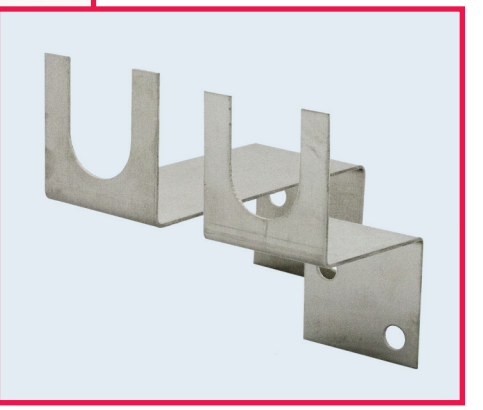
Series 8550 - Monel®

Model	Outlet Connection
8550H*	1/4" hose barb
8550T*	1/4" compression fitting
8550PF*	1/4" NPT female

*Specify CGA connection number when ordering.

EASY-MOUNT REGULATOR BRACKET
Series EZ3000

This bracket allows either single stage or two stage regulators to be mounted or removed without removing the adjusting knob or resetting the delivery pressure provided the regulator is supplied by the factory with the panel mount nut installed. The bracket will accommodate any bar stock panel mountable regulator shown in this catalog.



HOW TO ORDER

Model	Description
EZ3100	For single stage regulators
EZ3200	For two stage regulators

GAS DETECTION SYSTEMS
Fixed Installation Type –
Beacon 110, Beacon 200, Beacon 410A, and Beacon 800

DESCRIPTION

Gas detection should not be complicated. The Beacon™ Series is gas detection simplified. The Beacon™ Series are powerful, low cost fixed system controllers for one, two, or up to eight points of gas detection. They are microprocessor controlled, versatile, simple to install and operate, and priced to be the industry's best value single and multiple gas detection controllers.

The wide variety of sensor heads available for the Beacon Series can provide protection for many of the gases commonly used in industry or laboratories today. A comprehensive list of available detectors is provided below.

Sensors can be mounted directly at the Beacon™ housing, or can be wired remote from the controller. The digital displays have backlighting and simultaneous readout of the gas type(s) and concentration(s). The bottom mounted wiring hubs make wiring easy. An external reset switch allows alarms to be silenced from outside the controller housing.

With 10 or 12 amp rated relays, the Beacon Series can be wired directly to a variety of devices like horns, buzzers, or lights eliminating the need for costly external relays from the controller to devices.

The Beacon™ Series is housed in a NEMA 4X rated case for a weather tight seal. This case design complies with the new lock out / tag out standard and can be fully secured. An external reset switch allows the alarm to be silenced from outside of the controller housing. The Beacon™ units ship complete with a wall mounting kit for easy installation.

FEATURES

- Low cost versatile solution!!
- Compact, weatherproof, NEMA 4X enclosure.
- 115 VAC or 12 VDC operation.
- Long life sensors (2+ years typical).
- Accepts LEL/O 2 /H 2 S/CO direct wire sensors (Beacon 110, 200, and 410A).
- Accepts any 4-20 mA transmitter.
- Audible alarm with reset button.
- Three programmable alarm levels.
- Built-in trouble alarm with relay.
- Relay rating 10 or12 amps, form C.
- Provides 4-20 mA output.

INDUSTRY APPLICATIONS

- Laboratories
- Semiconductor manufacturing facilities
- Petrochemical plants & refineries
- Water & wastewater treatment plants
- Pulp & paper mills
- Gas, telephone, & electric utilities
- Parking garages
- Manufacturing facilities

ABOUT SENSORS

The sensor is the actual device that is sensing the gas. Three sensor types are available for use with the Beacon Series Controller: direct wire, gas diffusion, and sample draw. Sensors typically last 2 to 4 years, but can last for a longer or shorter time depending on the nature of the application.

GAS DETECTION SYSTEMS
Fixed Installation Type –
Beacon 110, Beacon 200, Beacon 410A, and Beacon 800

DIRECT WIRE DETECTORS

Direct wire detectors are hard wired diffusion sensors to the controller and do not require a transmitter. They are, therefore, more economical than detectors requiring a transmitter. Direct wire detectors can only be used with the Beacon 110, 200, and 410A controllers. While the choice of gases is limited for hard wire detectors they can be an economical choice when available. In general, the use of a transmitter is preferred for distances over 300' to 500' to simplify calibration.

SAMPLE DRAW DETECTORS

Sample draw detectors have an integral pump, which draws the surrounding air to the detector. They are the preferred choice when used in larger areas where there is no specific point at which one can expect a gas leak. All sample draw detectors used with the Beacon Series have transmitters.

HOW TO ORDER

When ordering a Beacon system please specify the following components:

1. Controller part number (see list below)
2. Detector assemblies required. Provide gas, detection range from the list below so that we can provide the best combination for your application.

Model	Description
72-2110RK	Beacon 110 single point controller
72-2102RK	Beacon 200 two point controller
72-2104A	Beacon 410A four point controller
72-2108RK	Beacon 800 eight point controller

DIFFUSION DETECTORS

Diffusion detectors rely on the natural flow of air to bring the sample to the detection head. These are an excellent choice for gas cabinets or other forced flow environments where the detector is situated in a constant air flow from the potential gas release to the detector. All diffusion type detectors used with the Beacon Series have transmitters.

TRANSMITTERS

Most sensors require a transmitter to amplify the sensor signal, and to convert the gas sensor signals into a standardized output, such as 4-20 mA, for transmitting the signal to a controller. The transmitter is usually in close proximity to the sensor, and zero and span adjustments must be done at the transmitter. Note that some sensors and controllers do not require the use of a transmitter for LEL or Oxygen detection (Beacon 110, 200, and Beacon 410A), and also one is not needed for short distance wiring of H2S or CO sensors for the Beacon 110, 200, and Beacon 410A. All transmitters used with the Beacon Series are operated from 24 VDC, and utilize either 2 or 3 wires. In general, even if a sensor can be used with out a transmitter, the use of a transmitter is often preferred for distances over 300' to 500' to simplify calibration.

Measurable Gases	Standard Range	Diffusion Detector Assembly	Sample Draw Detector Assembly	Sensors For 110	200	410A	800
Ammonia NH3	0 - 75 ppm	GD-K88AI-NH3	GD-70D-NH3	X	X	X	X
Carbon Dioxide CO2	0-5000 ppm	61-1007RK-02	-	X	X	X	–
Carbon Dioxide CO2	0-5000 ppm	65-2397RK-02	-	X	X	X	X
Carbon Monoxide (XP) CO	0 - 300 ppm	65-2336RK	-	X	X	X	X
Chlorine CL2	0 - 3 ppm	GD-K88AI-CL2	GD-70D-CL2	X	X	X	X
Combustibles (XP) LEL	0 - 100 %	61-1000RK	-	X	X	X	–
Combustibles (4-20mA) (XP) LEL	0 - 100 %	65-2405RK	-	X	X	X	X
Hydrogen (Direct) H2	0 - 2000 ppm	65-2442RK-2000	-	X	X	X	–
Hydrogen (Specific) H2LEL	0 - 100%	61-1001RK	-	X	X	X	–
Hydrogen Chlorine HCL	0 - 15 ppm	GD-K88AI-HCL	GD-70D-HCL-15	X	X	X	X
Hydrogen Sulfide H2S	0 - 1 ppm	-	GD-70D-H2S-01	X	X	X	X
Hydrogen Sulfide H2S	0 - 100 ppm	65-2331RK	-	X	X	X	X
Nitrogen Dioxide NO2	0 - 15 ppm	GD-K88AI-NO2	GD-70D-NO2-15	X	X	X	X
Oxygen (4-20mA) O2	0 - 25 %	65-2322RK	-	X	X	X	X
Oxygen (Direct) O2	0 - 25 %	65-2497RK	-	X	X	X	–
Sulfur Dioxide SO2	0 - 6 ppm	GD-K88AI-SO2	GD-70D-SO2	X	X	X	X

Detectors for many other gases are availalbe. Tell us your requirements.

SF6 LEAK DETECTOR
Model 3-033-R002

DESCRIPTION

The remarkable sensitivity of this hand held unit allows the user to detect sulfur hexafluoride to levels equivalent to 0.1 oz/year (3 grams/year). An advanced microprocessor is the heart of this unit. Its digital signal processing provides excellent management of the circuitry and sensing tip signal. The microprocessor monitors the sensing tip and battery voltage levels 4000 times per second, compensating for even the most minor fluctuations in signal. This translates into a stable and dependable tool in almost any environment.

Convenience features have been incorporated into the 3-033-R002 to enhance its operation. Seven levels of sensitivity provide and increase of 64 times from level 1 to level 7. Unique tri-color LEDs show a progressive and wide range of leak size indication, communicate the sensitivity level, and provide a true voltage indication of battery power level. A tactile keypad controls all functions. The housing design provides the user with a secure grip and control and places the visual indicators in direct sight during use.

FEATURES

- Microprocessor control with advanced signal processing.
- Seven sensitivity levels.
- Tactile keypad controls.
- Real-time SF6 sensitivity adjustment.
- Battery test function with battery voltage indication.
- True mechanical pumping ensures positive air flow through the sensing tip.
- Cordless and portable.
- 14” flexible stainless steel probe.
- Built-in mute feature.

SPECIFICATIONS

- Power supply: 3V DC - two “C” cell alkaline batteries.
- Max. Sensitivity: 0.1 oz/year (3 grams/year) SF6
- Operating temperature: 30º to 125º F.
- Life: Approximately 30 hours normal use
- Response time: Instantaneous
- Reset time: one second
- Warm-up time: Approximately 2 seconds
- Unit weight: 1.2 pounds
- Dimensions: 9” x 2.5” x 2.5”

HOW TO ORDER

Model	Description
3-033-R002	SFL Leak Detector
	Replace sensing tip
XP-2	Maintenance Kit
	(3 sensing tips and 3 tip protectors)

MINI GAS LEAK DETECTOR
Model 21-070

DESCRIPTION

The model 21-070 gas leak detector easily and quickly pinpoints gas leaks emitting from pressurized systems. Using a thermal conductivity detector with signal amplification, the instrument is zeroed in ambient air and responds to any gas mixture with a thermal conductivity different from that of air. The instrument is highly sensitive, having an intrinsically high signal to noise ratio with amplification that provides a maximum usable sensitivity.*

The model 21-070 can be operated with little or no training. Turn it on, zero, probe for leaks: its that simple. As the instrument probe passes over the leak, a sample is drawn into the conductivity cell. When a leak is discovered a signal is registered on the LED bar graph. No messy soap solution, so system contamination

CAUTION

This leak detector in NOT designed to be used to determine leaks of combustible gases. It is designed to determine low level leaks of any gas having a different thermal conductivity than air. Utilizing this property it is, therefore, not specific to any gas or vapor. A combustible gas leak detector should be used for determination of combustible gas leaks in possible hazardous conditions.

SPECIFICATIONS

Detector: thermal conductivity w/thermistors
Readout: LED bar graph with yellow and red segments
Line Voltage: 115 V, 60 Hz
Battery: Rechargeable NiCCd, 7.2 V/800 mAh
Battery Life: 3.5 hours; may be recharged to 95% in 1 hour
Dimensions: 3.25" W x 1.75" H x 5.25" L
Weight: Instrument 1.05 lbs
Charger 0.61 lbs

*SENSITIVITY

Helium	1.0×10^{-5} cc/sec
Argon	1.0×10^{-4} cc/sec
CO02	1.0×10^{-4} cc/sec
Refrigerant	1.0×10^{-4} cc/sec

HOW TO ORDER

Model	Description
21-070	mini gas leak detector
59-050	carrying case

WELDING PURGE MONITOR
Model PE-100

DESCRIPTION

The PE-100 is an advanced instrument to detect the level of oxygen in purging gas to indicate when the oxygen content is at a satisfactory level to weld. The exact oxygen level is provided, thus preventing the excessive use of purge gas to ensure that the weld will be oxidation free. The monitor provides a continuous oxygen level readout during welding to detect unforeseen purge problems that can cause low quality welds.

The monitor may also be used to check confined spaces for safe oxygen levels before personnel enter the area and while they are working.

PE-100 has an innovative push button auto-calibration feature that allows the user to calibrate at atmospheric oxygen levels and again at the lowest oxygen reading for increased accuracy.

FEATURES

- Oxygen Detection range 0.01 to 20.94%
- Push button self-calibration
- Low battery indicator
- Low sensor indicator
- Large digit readout
- Optional Tripod mount
- Quick connect/disconnect fittings for gas purge tubing

SPECIFICATIONS

Detection range:	0.01 to 20.94% oxygen
Accuracy:	At 20.0% = + 0.2%
	At 2% = + 0.02%
Approx. Dimensions:	7.8” high x 3.7” wide x 2.5” deep
Power:	2 AA batteries
Weight:	7.4 ounces

HOW TO ORDER

PE-100 welding purge monitor in rugged carrying case includes: SS probe for sampling, two meter sampling hose, sampling bulb, carrying strap for neck or wrist, 2 AA batteries, and user instruction book.

KITAGAWA GAS DETECTION SYSTEM

DESCRIPTION

The Kitagawa Gas Pump and detector tube system is a simple, inexpensive, on the spot means of gas sampling and analysis. With a minimum of training, non-technical employees can perform day to day industrial hygiene screenings, perform QC analysis for process control, and many other analyses. There are over 300 detector tubes covering a long list of gases and concentrations.

The Kitagawa system has been developed to be a reliable method of on the spot gas analysis. It has been constantly improved to ensure accuracy and simplicity of use. An accurate analysis can be obtained in a few minutes.

With a single stroke of the Kitagawa pump fitted with a selected detector tube an accurate analytical result can be read directly from the detector tube scale without the use of any other instrumentation.

FEATURES

- A complete sampling and analysis system for determining the concentration of gases and vapors on the spot.
- Only two components required – sampling pump and detector tube.
- No calibration required.
- No batteries required.
- Low cost per analysis.
- May be used in hazardous classification areas.
- Over 300 detector tubes available.
- Manufactured with ultra-high purity reagents.
- Scale on each tube provides a direct reading of the concentration.
- Detector tubes have a thin plastic coating to prevent shattering and dispersement of reagents in the event of breakage.
- Most analyses require only one pump stroke.

SA-10-AP20
One Hand Operation Switch

AP-20 Air Sampling Pump Kit

B-191 Tube Tip Cutter

AS-1 Air Flow Indicator determines the velocity and direction of air flow.

EQUIPMENT AND TUBES ARE SHOWN PAGES 108-111

HOW TO ORDER

P/N	Description
AP-20	Aspirating pump with carrying case, two rubber tube connectors, a container of lubricant, and an instructions sheet.
SGD-BK-346	Consists of a pressure regulator-flowmeter with CGA 346 cylinder connection, the specially calibrated flowmeter that provides ease of measuring carbon monoxide, carbon dioxide, oil mist, oxygen, and water vapor, an adjustable wrench, a timer, a tube tip cutter, and instruction manual. **Note: Detector tubes are not included and must be ordered separately.**
SGD-BK-590	Consists of a pressure regulator-flowmeter with CGA 590 cylinder connection, the specially calibrated flowmeter that provides ease of measuring carbon monoxide, carbon dioxide, oil mist, oxygen, and water vapor, an adjustable wrench, a timer, a tube tip cutter, and instruction manual. **Note: Detector tubes are not included and must be ordered separately.**
SGD-BK-P4M	Consists of a pressure regulator-flowmeter with 1/4" NPT male inlet connection, the specially calibrated flowmeter that provides ease of measuring carbon monoxide, carbon dioxide, oil mist, oxygen, and water vapor, an adjustable wrench, a timer, a tube tip cutter, and instruction manual. **Note: Detector tubes are not included and must be ordered separately.**
SGD-BK-SCUBA	Consists of a pressure regulator-flowmeter with a standard scuba yoke connection with a bleeder valve, the specially calibrated flowmeter that provides ease of measuring carbon monoxide, carbon dioxide, oil mist, oxygen, and water vapor, an adjustable wrench, a timer, a tube tip cutter, and instruction manual. **Note: Detector tubes are not included and must be ordered separately.**
AS-1	Air flow indicator kit. Spot test system to determine the direction of air flow. Kit consists of aspirating bulb, carrying case and one box of No. 300 tubes.
SA-10	One-hand operation switch. This device is useful for sampling on a ladder or narrow spaces where two-hand operation of the pump is not practical.
B-191	Tube tip cutter – provides a safer means of removing tube tips. Pieces do not scatter and are accumulated in the container body.
BOOK	Kitagawa detector tube handbook.

COMPRESSED BREATHING AIR TEST TUBES

600SP	Carbon monoxide - Breathing air, 5-100 ppm
601SP	Carbon dioxide - Breathing air, 100-3000 ppm
602SP	Oil mist - Breathing air, 0.3-5 mg/m^3
603SPA	Water vapor - Breathing air, 20-160 mg/m^3
604SP**	Oxygen - Breathing air, 2-24%

**A 50 ml plastic syringe and a 1 meter vinyl tube are optionally necessary.

DETECTOR TUBES FOR DISSOLVED SUBSTANCES IN SOLUTION

10 tubes per box

200SA	Sulphide ion, 2-1000 ppm
200SB	Sulphide ion, 0.5-10 ppm
201SA	Chloride ion, 10-2000 ppm
201SB	Chloride ion, 3-200 ppm
203S	Copper ion, 1-100 mg/L
204S	Cyanide ion, 0.2-5 ppm
205SL	Salinity, 0.01-0.8%
234SA	Free residual chlorine, 0.4-5 ppm

SGD-BK-CGA Compressed Breathing Air Sampling Kit

ALPHABETICAL DETECTOR TUBE LIST

DETECTOR TUBES 10 tubes per box except as noted

133A	Acetaldehyde, 0.004-1.0% (concentration chart method)
133SB	Acetaldehyde, 5-140 ppm
216S	Acetic Acid, 1-50 ppm
216S	Acetic anhydride, 1-15 ppm
102SA	Acetone, 0.1-5.0%; Tetrahydrofuran
102SC	Acetone, 0.01-4.0%
102SD	Acetone, 20-5000 ppm
101S	Acetylene, 50-1000 ppm
280S*	Acetylene-Ethylene, C2H2 20-300 ppm; C2H4 200-2000 ppm
136	Acrolein, 0.005-1.8%
216S	Acrylic acid, 1-50 ppm
128SA	Acrylonitrile, 0.1-3.5%
128SB	Acrylonitrile, 10-500 ppm
128SC	Acrylonitrile, 1-120 ppm
128SD	Acrylonitrile, 0.2-20 ppm
300	Air flow indicator tube
184S	Allyl alcohol, 10-160 ppm
132SC(1)*	Allyl chloride, 0.1-12.0 ppm
105SA	Ammonia, 0.5-10%
105SB	Ammonia, 50-900 ppm
105SC	Ammonia, 5-260 ppm
105SE	Ammonia, 1-200 ppm
105SD	Ammonia, 0.2-20 ppm
105SH	Ammonia, 0.5-30%
105SM	Ammonia, 0.1-1.0%
181S	Aniline, 1-30 ppm
140SA	Arsine, 5-160 ppm
121U	Arsine, Phosphine, 0.05-2.0 ppm
190U(6)	Benzaldehyde, 5-500 ppm
118SB*	Benzene, 5-200 ppm
118SC	Benzene, 1-100 ppm
118SD*	Benzene, 0.1-75 ppm
118SE*	Benzene, 0.2-80 ppm
132SC(2)*	Benzyl chloride, 0.1-12.0 ppm
114	Bromine, 1-20 ppm
157SB(1)	Bromochloromethane, 0.4-80 ppm
157SB(2)	Bromoform, 0.4-80 ppm
168SA	Butadiene, 0.03-2.6%
168SB	Butadiene, 30-600 ppm
168SC	Butadiene, 2.5-100 ppm
168SD*	Butadiene, 0.5-10.0 ppm
221SA	n-Butane, 0.05-0.6%
190U	1-Butanol, 5-100 ppm
189U	2-Butanol, 4-300 ppm
138U	Butyl acetate, 10-400 ppm
139SB	Butyl acetate, 0.01-1.0%
211U	Butyl acrylate, 5-60 ppm
105SD	Butylamine, 1-20 ppm
190U	Butyl cellosolve, 10-1000 ppm
111U(1)	Butyl ether, 10-1000 ppm
130U	tert-Butyl mercaptan, 0.5-10 ppm
111U(2)	Butyl methacrylate, 10-1000 ppm
111U(3)	tert-Butyl methyl ether, 10-1000 ppm
216S	Butyric acid, 3-60 ppm
126B	Carbon Dioxide, 0.01-0.7%
126SA	Carbon dioxide, 0.1-5.2%
126SB	Carbon dioxide, 0.05-1.0%
126SF	Carbon dioxide, 100-4000 ppm
126SG	Carbon dioxide, 0.02-1.4%
126SH	Carbon dioxide, 1-20%
126UH	Carbon Dioxide, 5-50%

Model #	Description
141SA*	Carbon disulfide, 30-500 ppm
141SB*	Carbon disulfide, 0.8-50 ppm
100	Carbon monoxide, 5-1000 ppm (concentration chart method)
106B	Carbon monoxide in the presence of ethylene, 10-1000 ppm
106C	Carbon monoxide in the presence of ethylene and nitrogen oxides, 10-1000 ppm
106S	Carbon monoxide, 10-250 ppm
106SA	Carbon monoxide, 5-2000 ppm
106SC	Carbon monoxide, 1-50 ppm
106SH	Carbon monoxide, 0.1-2.0%
106SS	Carbon monoxide, 30-500 ppm
106UH	Carbon monoxide, 0.1-20%
147S*	Carbon tetrachloride, 0.5-60 ppm
239S*	Carbonyl sulfide, 5-60 ppm
109SA	Chlorine, 1-40 ppm
109SB	Chlorine, 0.1-10.0 ppm
109U	Chlorine, 0.05-2 ppm
116	Chlorine dioxide, 1-20 ppm
178SB*	Chlorobenzene, 1-140 ppm
152S*	Chloroform, 23-500 ppm
172S*	Chloropicrin, 0.05-16.0ppm
169S*	Chloroprene, 0.5-20 ppm
132SC(3)*	m-Chlorotoluene, 0.1-12.0 ppm
132SC(4)*	o-Chlorotoluene, 0.1-12.0 ppm
132SC(5)*	p-Chlorotoluene, 0.1-12.0 ppm
183U	Cresol, 0.5-25.0 ppm
190U(1)	Crotonaldehyde, 5-500 ppm
111U(4)	Cumene, 10-1000 ppm
115S	Cyclohexane, 0.01-0.6%
206U	Cyclohexanol, 5-500 ppm
197U	Cyclohexanol, 2-100 ppm
197U(1)	Cyclohexanone, 2-100 ppm
111U(5)	Cyclohexene, 10-1000 ppm
105SD	Cyclohexylamine, 1-20 ppm
111U(6)	Decahydronaphthalene,10-1000 ppm
111U(7)	n-Decane,10-1000 ppm
190U	diacetone alcohol, 10-250 ppm
242S	Diborane, 0.02-5.0 ppm
105SD	Dibutylamine, 2-20 ppm
214S	o-Dichlorobenzene, 5-100 ppm
215S	p-Dichlorobenzene, 10-150 ppm
235S*	1,1-Dichioroethane, 10-160 ppm
230S*	1,2-Dichioroethane, 5-50 ppm
223S*	2,2-Dichloroethyl ether, 2-30 ppm
132SC(6)*	1,1-Dichloroethylene, 0.1-12.0 ppm
145S*	1,2-Dichloroethylene, 5-400 ppm
180S*	Dichloromethane, 10-1000 ppm
157SB(3)	1,2-Dichloropropane, 0.4-80 ppm
132SC(7)*	1,3-Dichloropropane, 0.1-12.0 ppm
194S*	1,3-Dichloropropane, 10-500 ppm
190U(2)	Dicyclopentadiene, 5-500 ppm
222S*	Diethyl amine, 1-20 ppm
111U(8)	Diethyl benzene,10-1000 ppm
107SA	Diethyl ether, 0.04-1.4%
107U	Diethyl ether, 20-400 ppm
105SD	Diisopropyl amine, 1-16 ppm
229S	N,N-Dimethylacetamide, 5-70 ppm
227S	Dimethyl amine, 1-20 ppm
105SD	N,N-Dimethylaniline, 0.5-9 ppm
123S	Dimethyl ether, 0.01-1.2%

ALPHABETICAL DETECTOR TUBE LIST *CONTINUED*

Model #	Description
196S	N,N-Dimethylformamide, 1-30 ppm
119U	Dioxane, 20-1000 ppm
139SB	Dioxane, 0.05-2.5%
192S*	Epichlorohydrine, 5-50 ppm
111SA	Ethyl acetate, 0.1-5.0%
111U	Ethyl acetate, 10-1000 ppm
104SA	Ethyl alcohol, 0.05-5.0%
227S	Ethylamine,1-20 ppm
179S	Ethyl benzene, 10-500 ppm
157SB(4)	Ethyl bromide, 0.4-80 ppm
190U	Elthyl cellosolve, 5-500 ppm
190U	Ethyl cellosolve acetate, 5-150 ppm
108B	Ethylene, 0.1-100 ppm (color intensity)
108SA	Ethylene, 20-1200 ppm
166S*	Ethylene dibromide, 1-50 ppm
232SA*	Ethylene glycol, 20-250 mg/m^3
232SB*	Ethylene glycol, 3-40 mg/m^3
122SA	Ethylene oxide, 0.01-4.0%
122SC*	Ethylene oxide, 1-15 ppm
122SL	Ethylene oxide, 50-2600 ppm
122SD*	Ethylene oxide, 0.1-14.0 ppm
122SM	Ethylene oxide, 5-100 ppm
165SA	Ethyl mercaptan, 1-160 ppm
165SB	Ethyl mercaptan, 2.5-80 ppm
130U	Ethyl mercaptan, 0.5-10 ppm
111U(8)	Ethyl methacrylate, 10-1000 ppm
171SA*	Formaldehyde, 20-1500 ppm
171SB*	Formaldehyde, 1-35 ppm
171SC	Formaldehyde, 0.05-4.0 ppm
216S	Formic acid, 1-50 ppm
122SA	Furan, 0.01-4.0%
238S	Furfuryl alcohol, 2-25 ppm
110S	Gasoline, 0.05-0.6%
187S	General hydrocarbons, 50-1400 ppm
113SB	Heptane, 100-2000 ppm
113SA	n-Hexane, 0.05-1.32%
113SB	n-Hexane, 50-1400 ppm
113SC	n-Hexane, 5-800 ppm
219S	Hydrazine, 0.05-10 ppm
137U	Hydrogen, 0.05-0.8%
173SA*	Hydrogen chloride, 20-1200 ppm
173SB*	Hydrogen chloride, 0.4-40 ppm
112SA	Hydrogen cyanide, 0.01-3.0%
112SB	Hydrogen cyanide, 0.5-100 ppm
112SC*	Hydrogen cyanide, 0.3-8 ppm
156S	Hydrogen fluoride, 0.17-30 ppm
247S	Hydrogen peoxide, 0.5-10.0 ppm
167S	Hydrogen selenide, 1-600 ppm
120GR	Hydrogen sulfide, 0.025-0.4 gr/100 cf
120GT	Hydrogen sulfide, 0.25-4 gr/100 cf
120SB	Hydrogen sulfide, 0.75-300 ppm
120SC	Hydrogen sulfide, 0.005-0.16%
120SD	Hydrogen sulfide, 1-60 ppm
120SE	Hydrogen sulfide, 0.5-40 ppm
120SF	Hydrogen sulfide, 25-2000 ppm
120SH	Hydrogen sulfide, 0.1-4.0%
120SM	Hydrogen sulfide, 0.05-1.2%
120U	Hydrogen sulfide, 0.2-6.0 ppm
120UH	Hydrogen sulfide, 2-20%
120UT	Hydrogen sulfide, 2.5-40%
282S	Hydrogen sulfide-Mercaptans, H2S 1-30 ppm; R•SH 0.5-5 ppm

Model #	Description
131	Inorganic gas qualitative detector tube
139SB	Isobutyl acetate, 0.01-1.4%
153U	Isobutyl acetate, 10-400 ppm; Naphthalene
211U	Isobutyl acrylate, 5-60 ppm
208U	Isobutyl alcohol, 5-100 ppm
113SB	Isobutylene, 0.03-2.0%
216SC	Isobutyric acid,3-50 ppm
188U	Isopentyl acetate, 10-400 ppm
209U	Isopentyl alcohol, 5-100 ppm
190U	Isoprene, 1-16 ppm
139SB	Isopropyl acetate, 0.01-1.2%
122SA	Isopropyl alcohol, 0.05-2.5%
111U	Isopropyl acetate, 10-1000ppm
150U	Isopropyl alcohol, 20-1200 ppm
222S(1)	Isopropylamine, 1-20 ppm
190U(3)	Isopropyl cellosolve, 5-500 ppm
111U(9)	Isopropyl ether, 10-1000 ppm
130U	isopropyl mercaptan, 0.5-10 ppm
216S	Isovaleric acid, 3-50 ppm
216S	Maleic anhydride, 0.2-10 ppm
142S	Mercury vapor, 0.1-10 mg/m^3
190U	Mesityl oxide, 5-100 ppm
216S	Methacrylic acid, 1-50 ppm
111SA	Methyl acetate, 0.1-5.0%
211U	Methyl acrylate, 5-60 ppm
119SA	Methyl alcohol, 0.05-6.0%
119U	Methyl alcohol, 20-1000 ppm
227S	Methylamine, 1-20 ppm
105SD	n-Methyl analine, 0.5-6 ppm
157JS	Methyl bromide, 3-70 g/m^3
157SA	Methyl bromide, 10-500 ppm
157SB	Methyl bromide, 0.4-80 ppm
237S(1)	Methyl butyl ketone, 5-120 ppm
190U	Methyl Cellosolve, 5-500 ppm
160S	Methyl chloroform, 15-400 ppm
113SB	Methyl cyclohexane, 100-1600 ppm
199U	Methyl cyclohexanol, 5-200 ppm
198U	Methyl cyclohexanone, 2-100 ppm
122SA	Methyl ethyl ketone, 0.05-5.0%
139SB	Methyl ethyl ketone, 0.01-1.4%
139U	Methyl ethyl ketone, 20-1500 ppm
176S*	Methyl iodide, 2-40 ppm
122SA	Methyl isobutyl ketone, 0.01-0.6%
155U	Methyl isobutyl ketone, 5-300 ppm
111U(10)	Methyl isothiocyanate, 10-1000 ppm
164SA	Methyl mercaptan, 5-140 ppm
164SH	Methyl mercaptan, 50-1000 ppm
130U	Methyl mercaptan, 0.5-10 ppm
184S	Methyl methacrylate, 10-160 ppm
193S	Methyl styrene, 10-500 ppm
111U(11)	Mineral turpentine, 10-1000 ppm
224SA	Monoethanol amine, 0.5-50 ppm
105SD	Morpholine, 2-22 ppm
153U	Napthalene, 10-100 ppm
129	Nickel carbonyl, 20-700 ppm
233S	Nitric acid vapor, 1-20 ppm
117SA	Nitrogen dioxide, 20-1000 ppm
117SB	Nitrogen dioxide, 0.5-30.0 ppm
117SD*	Nitrogen dioxide, 0.1-1.0 ppm
174A	Nitrogen oxide and dioxide, NO 10-300 ppm; NO2 1-40 ppm

ALPHABETICAL DETECTOR TUBE LIST *CONTINUED*

Model #	Description
174B*	Nitrogen oxide and dioxide, NO 10-300 ppm; NO2 1-40 ppm
175SA	Nitrogen oxides, 20-250 ppm
175SH	Nitrogen oxides, 100-2500 ppm
175U	Nitrogen oxides, 0.5-30 ppm
111U(12)	n-Nonane, 10-1000 ppm
186	Organic gas checker
186B	Organic gas qualitative detector tube
159SA*	Oxygen, 2-24%
159SB*	Oxygen, 2-24% (for explosion hazard areas)
159SC*	Oxygen, 1.5-24% (non-heating type)
281S*	Oxygen, O2 2-10%; CO2 1-20% (separation measurement)
182SA	Ozone, 50-1000 ppm
182SB	Ozone, 2.5-100 ppm
182U	Ozone, 0.025-3.0 ppm
113SB	Pentane, 50-1000 ppm
210U	Pentyl acetate, 10-200 ppm
105SD	Pentylamine, 2-22 ppm
183U	Phenol, 0.5-25.0 ppm
146S	Phosgene, 0.1-20 ppm
121SA	Phosphine in acetylene, 20-800 ppm
121SB	Phosphine in acetylene, 5-90 ppm
121SC	Phosphine, 20-1400 ppm
121SD	Phosphine, 0.25-20.0 ppm
121SH	Phosphine, 100-3200 ppm
121U	Phosphine, 0.05-2.0 ppm
121SS	Phosphine for fumigation, 200-6000 ppm
125SA	Propane, 0.02-0.5%
190U(4)	1-Propanol, 5-500 ppm
216SC	Propionic acid 3-50 ppm
139SB	Propyl acetate, 0.01-1.4%
151U	Propyl acetate, 20-1000 ppm
105SD	Propylamine, 1-20 ppm
185S	Propylene, 50-1000 ppm
122SC(2)	Propylene glycol, 1-15 ppm
163SA	Propylene oxide, 0.05-5.0%
122SC(1)	Propylene oxide, 1-15 ppm
219S(1)	Pyridine, 0.05-10 ppm
105SD	Pyridine, 0.5-10 ppm
240S	Silane, 0.5-50 ppm
158S	Styrene, 2.5-300 ppm
158S(1)	Styrene, 2.5-300 ppm
158SB*	Styrene, 1-100 ppm
103SA	Sulfur dioxide, 0.1-3.0%
103SB	Sulfur dioxide, 0.02-0.3%
103SC	Sulfur dioxide, 20-300 ppm
103SD	Sulfur dioxide, 1-60 ppm
103SE	Sulfur dioxide, 0.25-10 ppm
103SF	Sulfur dioxide, 0.02-0.3%
103SG	Sulfur dioxide in Carbon dioxide, 0.1-25 ppm
103SF*	Sulfur dioxide in flue gas, 0.02-.03%
244U	Sulphuric acid, 0.5-5 mg/m^3
135SA	Tetrachloroethylene, 5-300 ppm
135SB	Tetrachloroethylene, 0.2-10 ppm
135SG	Tetrachloroethylene, 0.1-2.0%
135SM	Tetrachloroethyene for process control, 50-1250 ppm
243U	Tetraethoxysilane, 5-200 ppm
102SA	Tetrahydrofuran, 0.2-5.0%
162U	Tetrahydrofuran, 20-400 ppm
190U(5)	Tetrahydrothiophen, 5-500 ppm
124SA	Toluene, 10-500 ppm
124SB	Toluene, 2-100 ppm124SH Toluene, 100-3000 ppm
105SD	o-Toluidine, 2-22 ppm
105SD	p-Toluidine, 2-20 ppm
236S*	1,1,2-Trichloroethane, 10-100 ppm
236S(1)*	1,1,2-Trichloroethane, 10-100 ppm
134SA	Trichloroethylene, 5-300 ppm
134SB	Trichloroethylene, 0.2-36.8 ppm
134SG	Trichloroethylene, 0.05-2.0%
132SC(8)*	Trichlorotoluene, 0.1-12.0 ppm
213S	Triethylamine, 1-20 ppm
222S	Trimethylamine, 1-20 ppm
111U	1,2,4-Trimethyl benzene, 10-1000 ppm
113SB	2,2,4 Trimethyl pentane, 100-4000 ppm
216S	n-Valeric acid, 3-70 ppm
237S	Vinyl acetate, 5-120 ppm
132SA	Vinyl chloride, 0.05-1.0%
132SB	Vinyl chloride, 5-500 ppm
132SC	Vinyl chloride, 0.1-12.0 ppm
177SA	Water vapor, 1.7-33.8 mg/L
177U	Water vapor, 0.05-2.0 mg/L
177UL	Water vapor, 3-80 LB/MMCF
177UR	Water vapor, 2-12 LB/MMCF
143SA	Xylene, 5-1000 ppm
143SB	Xylene, 5-200 ppm

*Each box contains tubes for 5 measurements

COMPRESSED BREATHING AIR TEST TUBES

600SP	Carbon monoxide - Breathing air, 5-100 ppm
601SP	Carbon dioxide - Breathing air, 100-3000 ppm
602SP	Oil mist - Breathing air, 0.3-5 mg/m^3
603SPA	Water vapor - Breathing air, 20-160 mg/m^3
604SP**	Oxygen - Breathing air, 2-24%

**A 50 ml plastic syringe and a 1 meter vinyl tube are optionally necessary.

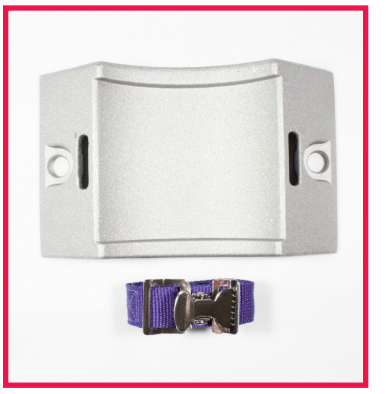
DETECTOR TUBES FOR DISSOLVED SUBSTANCES IN SOLUTION

10 tubes per box

200SA	Sulphide ion, 2-1000 ppm
200SB	Sulphide ion, 0.5-10 ppm
201SA	Chloride ion, 10-2000 ppm
201SB	Chloride ion, 3-200 ppm
203S	Copper ion, 1-100 mg/L
204S	Cyanide ion, 0.2-5 ppm
205SL	Salinity, 0.01-0.8%
234SA	Free residual chlorine, 0.4-5 ppm

CYLINDER HOLDING DEVICES

OSHA regulations require compressed gas cylinders to be secured from toppling when in storage or in use. The devices shown here will help you comply with these regulations.

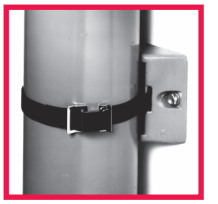


WALL MOUNT CYLINDER HOLDER - MODEL 400

This cast aluminum cylinder holder provides an easy way to secure cylinders to a wall, in a gas storage cabinet,or other stable surface.The holder is attached with bolts or lag screws using the pre-formed holes 7 inches apart. The holder can be used with cylinders from 4 to 14 inches in diameter. Cylinders are held firmly in place with a nylon strap fitted with a sturdy buckle, with an optional steel chain and hook, or both strap and chain

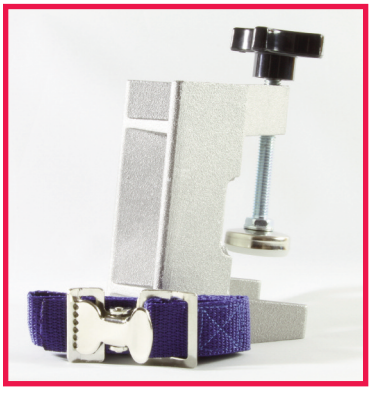
HOW TO ORDER

Model	Description
400	Wall mount cylinder holder with strap
400C	Wall mount cylinder holder with chain and hook
400CS	Wall mount cylinder holder with strap, chain and hook
400 RS	Replacement strap.



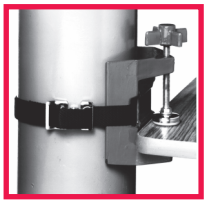
BENCH TYPE CYLINDER HOLDER - MODEL 420

This holder is designed to prevent toppling of cylinders when they are next to a lab or work bench and cannot be secured to a wall. The special screw clamp holds securely to a table top without marring the surface. The holder can be used with cylinders from 4 to 14 inches in diameter. Cylinders are held firmly in place with a nylon strap fitted with a sturdy buckle, with an optional steel chain and hook, or with both strap and chain.



HOW TO ORDER

Model	Description
420	Bench mount cylinder holder with strap
420C	Bench mount cylinder holder with chain and hook
420CS	Bench mount cylinder holder with strap, chain and hook
400 RS	Replacement strap.



SMALL CYLINDER STAND Model 450

DESCRIPTION

This stand provides increased stability to cylinders with diameters of 4" to 7-3/8". It is constructed of stainless steel. Four thumb screws hold the stand securely to the cylinder. Stand height is 10".

LECTURE BOTTLE HOLDERS

Lecture bottles have rounded ends and require some means of support when in use. We provide two types of holders here that meet most requirements.

NON-TIP STAND - MODEL 475

This stand offers a convenient method of securing a lecture bottle on a table or lab bench. The stand is made of light weight brushed aluminum, yet the large diameter base provides stability even when a regulator is installed on the bottle.

WALL MOUNT LECTURE BOTTLE BRACKET - MODEL 480

This bracket is made of anodized aluminum and has spring clips that provide firm, secure support to the lecture bottle. The bracket is ideal for securing lecture bottles to lab cart or bench set-ups, in carrying cases for portable systems, or in storage cabinets

LARGE CYLINDER STAND Model 460

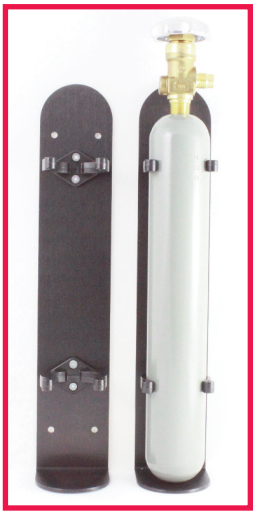
DESCRIPTION

This stand provides increased stability to cylinders with a diameter of 7"-9.5" in situations where it is not possible to secure the cylinder to a wall or a bench with the model 400 or 420 cylinder holders. The cylinder can be rolled on and off with ease and is firmly held in place or quickly released by the cylinder holding band. With this unique design the cylinder rests on a steel plate and uses the cylinder's own weight to help keep the cylinder and stand stable and eliminate unsafe cylinder "ride up" that is common in some competitive models. Constructed of steel painted green.

Dimensions: 18" x 18" x 12.5" high

Weight: 13 lbs.

475



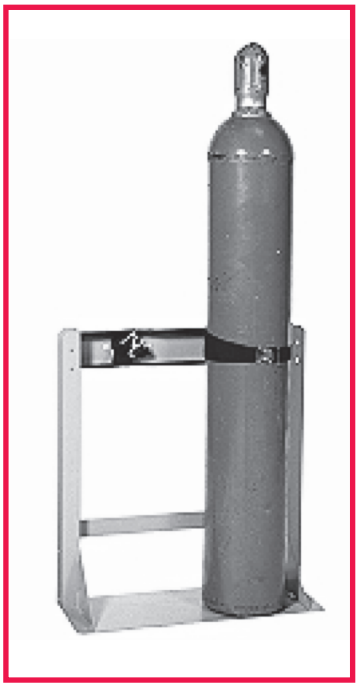
480

CYLINDER FLOOR STANDS
Series 465

Available in two and three cylinder models, these floor stands are designed and built to provide safe storage of compressed gas cylinders with diameters up to 12" when a wall, post or bench is not available to the secure the cylinder. Fully welded construction from 11 gauge and heavier plate steel and a quality epoxy powder paint finish provide structural integrity and long service life. Surfaces coming in contact with the cylinders are protected with vinyl edge guards. Cylinders are held securely in place with 1.5" polypropylene straps with steel cinch buckles. Shipped assembled via UPS.

HOW TO ORDER

Model	Description	Dimensions	Weight
465-2	Two cylinder floor stand	28" wide x 30" high x 12" deep	41 lbs
465-3	Three cylinder floor stand	40" wide x 30" high x 12" deep	56 lbs



"GAS STATION" PROCESS STANDS
Series 495

DESCRIPTION

There are many situations where it would be more convenient to locate gas cylinders and distribution systems near the process, but away from a wall or other secure fixture. The "Gas Station" solves this problem. It can be located in any open area and support two or three cylinders and the associated gas distribution equipment. The stand is secured to the floor with bolts through the four pre-drilled holes provided in the base. Cylinders sit on the base plate and are securely held to the steel frame with sturdy nylon belts. A changeover manifold or other distribution equipment can be conveniently mounted to the plate above the cylinders. Unit is painted gray. The unit is shipped unassembled via UPS. Assembly is easily accomplished in 10-15 minutes.

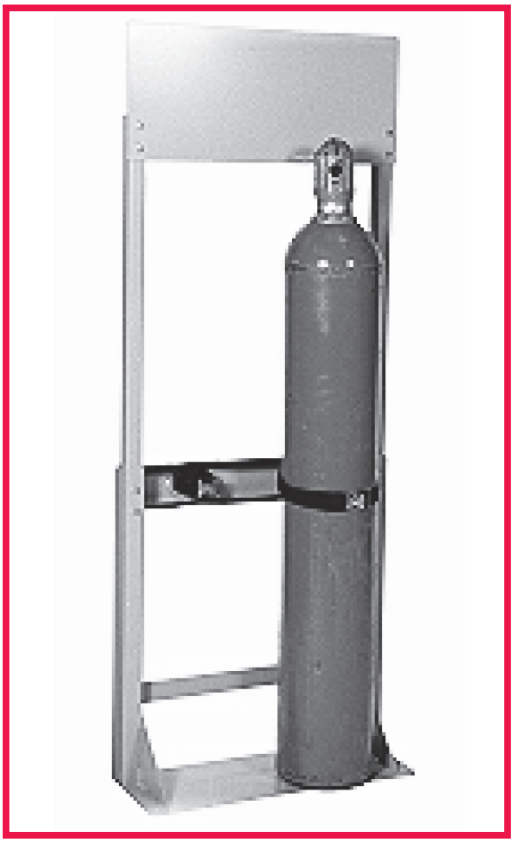
HOW TO ORDER

Model 495-2 Two Cylinder Gas Station

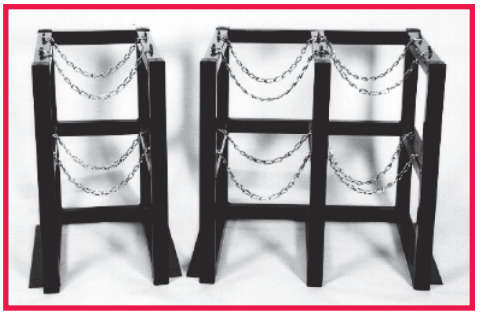
Dimensions: 28" W x 72 1/2" H x 12" D
Weight: 56 pounds

Model 495-3 Three Cylinder Gas Station

Dimensions: 40" W x 72" H x 12" D
Weight: 78 pounds



CYLINDER STORAGE RACKS
Series 490



FEATURES

- Safe cylinder restraint
- Organized gas cylinder storage
- Simple installation
- Uses space efficiently
- Removable and relocatable

DESCRIPTION

The storage of compressed gas cylinders to comply with Federal, State and Local regulations often presents a number of problems. These new cylinder storage racks can help organize your cylinder storage and help you comply with the myriad of regulations.

Because the frame is predrilled to accommodate anchoring the rack to the floor they are ideal for situations where cylinder must be located away from a wall or other securing fixture. Racks are available in standard sizes to hold one to nine cylinders. Custom racks are available. Standard rack configurations are shown below.

The unique design of square steel tubing (2" x 2") components welded together to form the frame provides the rigidity necessary to allow the frame to be constructed without a bottom. This allows cylinders to be rolled into the frame without lifting.

Racks are provided with either single or dual restraint steel chains to secure the cylinders. Single restraint racks secure the individual cylinders with a chain for each cylinder located at the top of the rack. Dual restraint models have a set of chains for each cylinder at 15" and 30" from the floor.

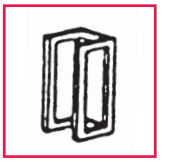
Racks are finished with a black powder coating to provide long lasting protection. These cylinder storage racks meet the requirements of the National Fire Protection Association, National Fire Codes, Uniform Fire Codes, Uniform Building Codes and Seismic Zone 4 Restraint Regulations, Compressed Gas Association, and OSHA.

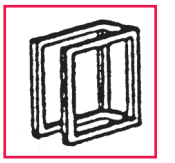
HOW TO ORDER (other configurations available on request)

Model	Description	Nominal Dimensions
Single restraint models		
490-111	1 cyl wide x 1 cyl deep	16" W x 16" D x 30" H
490-121	2 cyl wide x 1 cyl deep	30" W x 16" D x 30" H
490-131	3 cyl wide x 1 cyl deep	44" W x 16" D x 30" H
490-112	1 cyl wide x 2 cyl deep	16" W x 26" D x 30" H
490-122	2 cyl wide x 2 cyl deep	30" W x 26" D x 30" H
490-132	3 cyl wide x 2 cyl deep	44" W x 26" D x 30" H
490-113	1 cyl wide x 3 cyl deep	16" W x 38" D x 30" H
490-123	2 cyl wide x 3 cyl deep	30" W x 38" D x 30" H
490-133	3 cyl wide x 3 cyl deep	44" W x 40" D x 30" H
Dual Restraint Models		
490-211	1 cyl wide x 1 cyl deep	16" W x 16" D x 30" H
490-221	2 cyl wide x 1 cyl deep	30" W x 16" D x 30" H
490-231	3 cyl wide x 1 cyl deep	44" W x 16" D x 30" H
490-212	1 cyl wide x 2 cyl deep	16" W x 26" D x 30" H
490-222	2 cyl wide x 2 cyl deep	30" W x 26" D x 30" H
490-232	3 cyl wide x 2 cyl deep	44" W x 26" D x 30" H
490-213	1 cyl wide x 3 cyl deep	16" W x 38" D x 30" H
490-223	2 cyl wide x 3 cyl deep	30" W x 38" D x 30" H
490-233	3 cyl wide x 3 cyl deep	44" W x 40" D x 30" H

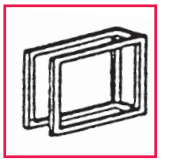
All cylinder racks must ship motor freight.

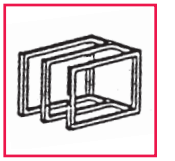
Gas cylinder restraint and storage

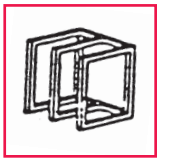

490-111

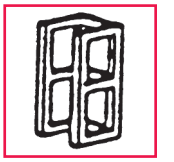

490-112

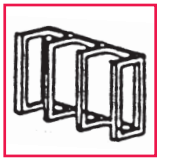

490-121

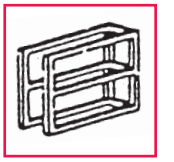

490-113

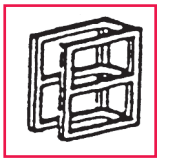

490-123

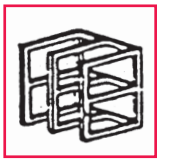

490-122


490-211


490-131


490-213


490-212


490-222


490-221


490-231


490-223

GAS SAFETY STORAGE CABINETS
Series 7000

DESCRIPTION

Gas safety storage cabinets are designed to provide local exhaust gas control to enhance the safety of storing or using hazardous gases. The use of gas cabinets provides a convenient way to achieve separation of gases by their classifications to satisfy both national and local fire and building codes.

When connected to a suitable exhaust system, air is drawn though the cabinet ensuring that any gas leakage is carried away and does not accumulate in the storage or work area. The cabinets can be fitted with manifolds or other gas controls so that both the cylinder and the control system are enclosed. When operators access the controls through the access window and a proper exhaust system is in operation, the cabinet has the capacity to allow 150-200 linear feet per minute of air to pass across the open window face to ensure that workers are not exposed.

FEATURES

- All welded construction using 11 gauge steel, epoxy painted. Texture finish outside, smooth finish on inside of cabinet.
- Exhaust vent located on top of cabinet is 6" diameter x 3" high.
- 165° F. sprinkler head with bee's wax coating located in cabinet top.
- Cylinder brackets accommodate 7"-9" diameter cylinders. The brackets can move vertically and horizontally for precise pigtail alignment.
- Self-latching and closing window(s) with 1/4" thick wire glass.
- Self-latching and closing door(s) with bottom louvers and flush mounted stainless steel paddle latch(es). Optional keyed latches available.
- All stainless steel fasteners.
- Meets or exceeds the Uniform Fire Code.

HOW TO ORDER

Model	Description
7100	one cylinder cabinet
7200	two cylinder cabinet
7300	three cylinder cabinet
7400	four cylinder cabinet

OPTIONS:	Model
• Keyed door latch(es)	7000-1
• Keyed window latch(es)	7000-2
• Adjustable small cylinder shelf	7000-3
• Fusible link to close door louvers	7000-4

CABINET PHYSICAL DATA

Model	Cylinder Capacity	Dimensions* Outside		Door Opening	Weight	Exhaust Flow Required (SCFM)
7100	one	18"w x 18"d x 72"h		16"w x 70"h	235 lbs.	175
7200	two	24"w x 18"d x 72"h		22"w x 70"h	283 lbs.	250
7300	three	36"w x 18"d x 72"h	left	22"w x 70"h	331 lbs.	450
			right	16"w x 70"h		
7400	four	48"w x 18"d x 72"h	left	22"w x 70"h	391 lbs.	600
			right	22"w x 70"h		

*Overall cabinet height including exhaust vent is 75".

CYLINDER HAND TRUCKS

These hand trucks are specially designed to hold and easily transport heavy compressed gas cylinders by persons of moderate strength. They feature arc welded tubular steel construction for strength. All models roll quietly and smoothly on large semi-pneumatic or solid rubber tired wheels and casters for better maneuverability over rough or uneven surfaces. Trucks are finished with green, scratch resistant, high gloss, electrostatically applied, oven baked powder coat.

MODEL 6114
SINGLE CYLINDER HAND TRUCK

This unit is designed to handle one T or K type cylinder. It has two 4" rear casters, that fall into place when in use, to provide greater stability. The operator carries no load and has greater control over the truck. The rear wheel assembly is easily returned to the retracted position for storage. The cylinder is held securely on the truck by a safety chain.

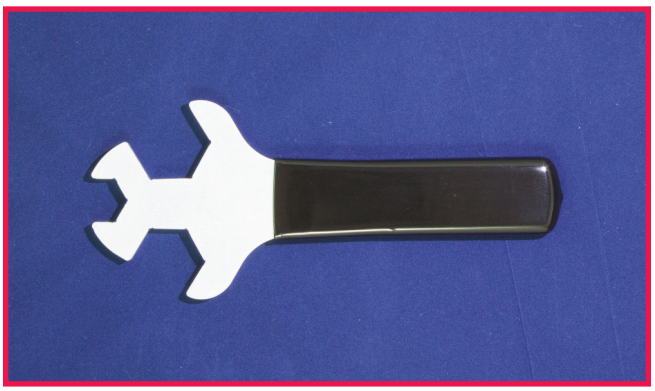
MODEL 6214
TWO CYLINDER HAND TRUCK

Designed to handle two T or K type cylinders the 6214 has longer handles for ease of mobility and good load control. Retractable 4" rear casters drop into place when needed for extra load handling safety or collapse and lock into the frame for storage. The truck has dual binding chains for extra security and solid 10" rubber front wheels.

SPECIAL CYLINDER WRENCHES

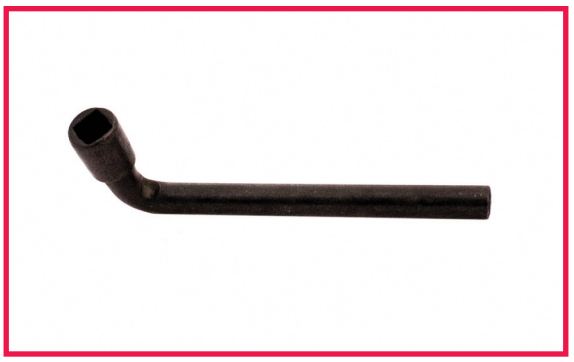
MODEL 90001A

This universal cylinder wrench has 3 openings (3/4", 1-1/8", 1-1/4") for tightening the various cylinder valve connections and most commonly used gas connections. Not non-sparking.



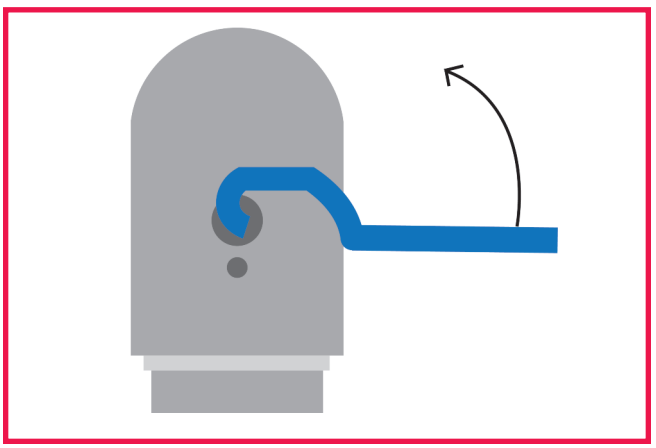
MODEL 90002

This wrench is a basic 3/8" square for opening cylinder valves that do not have hand wheels, such as chlorine and hydrogen sulfide.

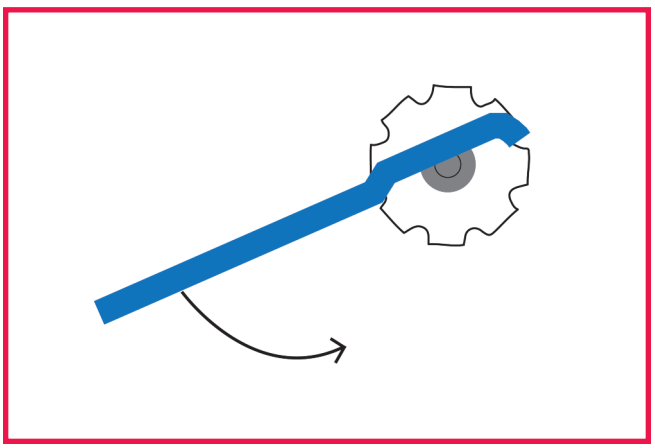


MODEL 90003

The special configuration of this wrench provides an easy method of opening extra tight, hand wheel operated cylinder valves and removing difficult cylinder caps.



Remove difficult cylinder caps



Open tight valves easily

316 STAINLESS STEEL FLEXIBLE HOSES
Series 601, 604, and 605

DESCRIPTION

Series 601 hoses are constructed of 1/4” I.D. teflon® lined stainless steel braid, rated for 3000 psig. The 601 hoses are fitted with 1/4” NPT brass end connections; they make excellent economical manifold pigtails.

The Series 604 hoses are constructed of double braided stainless steel, fitted with stainless steel 1/4” NPT end connections, rated for 3000 psig, and cleaned for oxygen service.

SERIES 601

- 1/4" I.D. Teflon® lined 316 stainless steel braided hose
- Rated for 3000 psig
- 601 1/4” NPT female x 1/4” NPT female
  601MF 1/4” NPT male x 1/4” NPT female
- Cleaned for oxygen service.

SERIES 604 AND 605

- 1/4" I.D. 316 stainless steel fitting and inner core with 304SS or 321SS double braided hose. (605 Series has protective outer armor to provide greater safety and kink resistance.)
- Rated for 3000 psig
- 1/4" NPT female or male stainless steel end connections
- Cleaned for oxygen service.

SPECIAL HOSES

We can provide any of the hoses on this page in different lengths and with a wide variety of end fittings.

HOW TO ORDER

Model	Length
601-2	2.0 feet
601MF-2	2.0 feet
601-3	3.0 feet
601MF-3	3.0 feet
601-6	6.0 feet
601MF-6	6.0 feet
604-2	2.0 feet
604M-2	2.0 feet

Model	Length
604MF-2	2.0 feet
604-3	3.0 feet
604M-3	3.0 feet
604MF-3	3.0 feet
604-6	6.0 feet
604M-6	6.0 feet
604MF-6	6.0 feet
605-2	2.0 feet

Model	Length
605M-2	2.0 feet
605MF-2	2.0 feet
605-3	3.0 feet
605M-3	3.0 feet
605MF-3	3.0 feet
605-6	6.0 feet
605M-6	6.0 feet
605MF-6	6.0 feet

CRYOGENIC TRANSFER HOSES – Series 607C

- 1/2" I.D. 316 stainless steel double braided hose with 304SS protective outer armor to provide greater safety and kink resistance
- Rated for 2150 psig
- 1/2" 45º flare female stainless steel connections (CGA 295) or 5/8" 45º flare (CGA 440) for oxygen
- Cleaned for oxygen service.

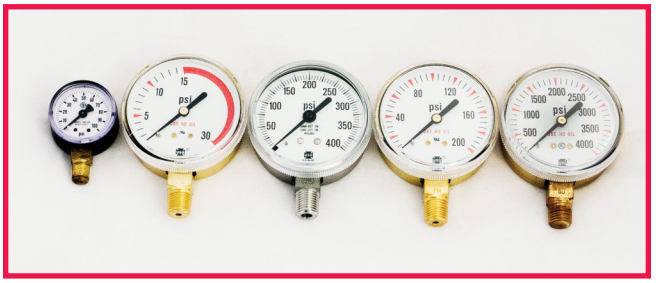
SPECIAL HOSES

We can provide any of the hoses on this page in different lengths and with a wide variety of end fittings.

HOW TO ORDER

Model		Length
607C-4	for nitrogen and argon	4.0 feet
607C-6	for nitrogen and argon	6.0 feet
607C-4-440	for oxygen	4.0 feet
607C-6-440	for oxygen	6.0 feet

PRESSURE GAUGES



DESCRIPTION

The selection of brass, stainless steel, and monel® gauges presented here represent those used on pressure regulators offered in this catalog. They can be used as repair parts or for installation in other systems.

FEATURES

- 1/4" NPT lower male connection.
- Cleaned for oxygen service - brass and stainless steel only.

HOW TO ORDER

BRASS WITH BRASS CASE - 2 1/2" DIA.

Model	Pressure Range - psig
9131-4PM-0015RL	0-30 (15RL)
9131-4PM-0030	0-30
9131-4PM-0060	0-60
9131-4PM-0100	0-100
9131-4PM-0200	0-200
9131-4PM-0400	0-400
9131-4PM-2000	0-2000
9131-4PM-6000	0-6000
9131-4PM-7500	0-7500

316 STAINLESS STEEL WITH STAINLESS STEEL CASE - 2 1/2" DIA.

Model	Pressure Range - psig
9132-4PM-3030	30" 0-30
9132-4PM-0030	0-30
9132-4PM-0060	0-60
9132-4PM-0100	0-100
9132-4PM-0200	0-200
9132-4PM-0400	0-400
9132-4PM-1000	0-1000
9132-4PM-2000	0-2000
9132-4PM-3000	0-3000
9132-4PM-6000	0-6000
9132-4PM-10000	0-10000

MONEL® WITH STAINLESS STEEL CASE - 2 1/2" DIA.

Model	Pressure Range - psig
9133-4PM-0100	0-100
9133-4PM-0300	0-300
9133-4PM-1000	0-1000
9133-4PM-3000	0-3000

Other sizes and ranges available.

GAUGES WITH FACE SEAL FITTINGS

DESCRIPTION

On some high purity regulators the gauges are connected to the regulator body by using face seal fittings rather than NPT threads.

FEATURES

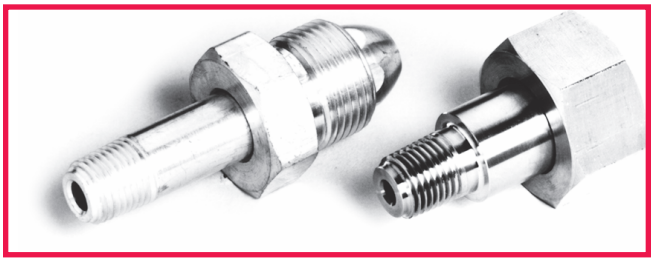
- 1/4" female face seal connection.
- Dual scale dial psig/bar.
- Cleaned for oxygen service.

HOW TO ORDER

316 stainless steel with stainless steel case 2" dia.

Model	Pressure Range
9122-4VF-3030	30" vac.- 0-30 psig (-1.0 - 2 bar)
9122-4VF-3060	30" vac.- 0-60 psig (-1.0 - 4 bar)
9122-4VF-3100	30" vac. – 0-100 psig (-1.0 - 7 bar)
9122-4VF-0200	0-200 psig (0-14 bar)
9122-4VF-0400	0-400 psig (0-28 bar)
9122-4VF-1000	0-1000 psig (0-70 bar)
9122-4VF-4000	0-4000 psig (0-280 bar)

CGA
CYLINDER CONNECTIONS



DESCRIPTION

The standard cylinder connections shown in the table below convert CGA cylinder valve outlets to 1/8" NPT male, or 1/4" NPT male, or 1/4" face seal male.

Caution: When changing the gas service of a regulator or gas system by changing the cylinder connections, the regulator or system must be thoroughly cleaned prior to the introduction of the new gas. It is strongly recommended that you consult with your supplier before attempting any conversion to confirm that the intended conversion can indeed be performed safely, or that such equipment be returned to your supplier for conversion.

HOW TO ORDER

Order by CGA No. and description, i.e."CGA 350 brass cylinder connection". "X" indicates availability.

CGA No.	Chrome Brass	Brass 1/4" NPT	St. St. 1/4" NPT	St. St. 1/4" Face Seal	Monel® 1/4" NPT
170	X*	—	X*	—	—
180	X*	X*	X*	—	X*
240	—	—	X	—	—
280	—	X	X	—	—
290	—	—	X	—	—
296	X	X	—	X	—
300	—	X	—	—	—
320	X	X	X	—	—
326	X	X	X	X	—
330	—	X	X	X	X
346	X	X	X	—	—
347	—	—	X	—	—
350	X	X	X	X	—
510	X	X	X	X	—
540	X	X	X	X	—
580	X	X	X	X	—
590	X	X	X	X	—
622	—	X	X	—	—
626	—	—	X	—	—
660	—	X	X	X	X
670	—	—	X	X	X
677	—	—	X	—	—
678	—	—	X	X	—
679	—	—	X	X	X
680	—	X	X	—	—
695	—	X	X	—	—
702	—	—	X	—	—
703	—	X	X	—	—
705	—	—	X	—	

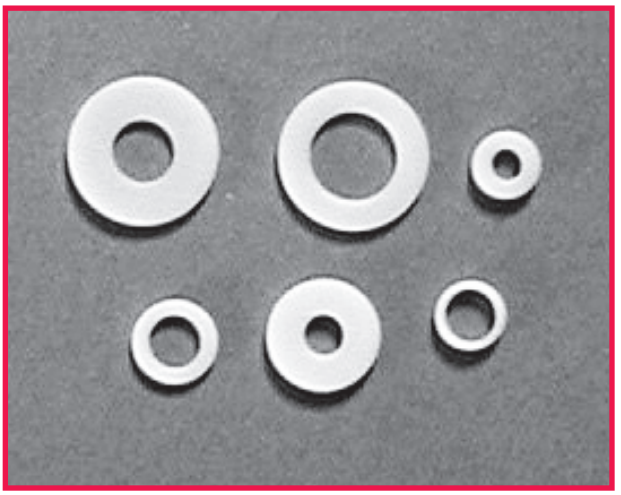
*Fitting has 1/8" NPT male instead of 1/4" NPT male

CGA
CONNECTIONS GASKETS

Some standard connections and all DISS connections require a gasket to achieve a leak-free connection. Gaskets should be changed each time the connection is attached to the cylinder valve.

HOW TO ORDER

Model	Description
CGA110WA	Teflon gasket for CGA 110 & 679
CGA170WA	Teflon gasket for CGA 170
CGA180WA	Teflon gasket for CGA 180
CGA 240 WA	Teflon gasket for CGA 240
CGA320/330WA	Teflon gasket for CGA 320 & 330
CGA660/670WA	Teflon gasket for CGA 660 & 670
CGA 678/680WA	Teflon gasket for CGA 678 & 680
CGA679PB	Lead washer for CGA 679
CGA 705WA	Teflon gasket for CGA 705
DISS-NI	Nickel gasket for CGA 632 thru 726
DISS-K	Kel-F gasket for CGA 632 thru 726



UHP (DISS) CYLINDER CONNECTIONS

DESCRIPTION

This special group of cylinder connections was developed through the cooperation of industry and the Compressed Gas Association for use with ultra purity gases primarily used in conjunction with semiconductor chip manufacturing applications. The sealing surfaces are similar to a face seal connection used with tubing and they require either a nickel gasket or Kel-F gasket to achieve a seal. They are only available in stainless steel.

FEATURES

- Available with in three mating connection styles:
  - 1/4" face seal male
  - 1/4" NPT male
  - 1/4" tube stub.
- ·Supplied as a set nut, nipple, and nickel gasket.

DISS GASKETS

All DISS connections require a gasket to achieve a leak-free connection. Gaskets should be changed each time the connection is attached to the cylinder valve.

HOW TO ORDER

Model	Description
DISS-NI	Nickel gasket for CGA 632 thru 726
DISS-K	Kel-F gasket for CGA 632 thru 726

HOW TO ORDER

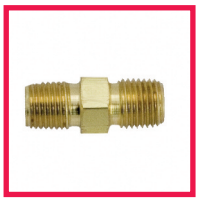
Model	Description
DISS632-P4M	632 x 1/4" NPT male
DISS632-V4M	632 x 1/4" male face seal
DISS632-T4S	632 x 1/4" tube stub
DISS634-P4M	634 x 1/4" NPT male
DISS634-V4M	634 x 1/4" male face seal
DISS634-T4S	634 x 1/4" tube stub
DISS636-P4M	636 x 1/4" NPT male
DISS636-V4M	636 x 1/4" male face seal
DISS636-T4S	636 x 1/4" tube stub
DISS638-P4M	638 x 1/4" NPT male
DISS638-V4M	638 x 1/4" male face seal
DISS638-T4S	638 x 1/4" tube stub
DISS640-P4M	640 x 1/4" NPT male
DISS640-V4M	640 x 1/4" male face seal
DISS640-T4S	640 x 1/4" tube stub
DISS642-P4M	642 x 1/4" NPT male
DISS642-V4M	642 x 1/4" male face seal
DISS642-T4S	642 x 1/4" tube stub
DISS712-P4M	712 x 1/4" NPT male
DISS712-V4M	712 x 1/4" male face seal
DISS712-T4S	712 x 1/4" tube stub
DISS714-P4M	714 x 1/4" NPT male
DISS714-V4M	714 x 1/4" male face seal
DISS714-T4S	714 x 1/4" tube stub
DISS716-P4M	716 x 1/4" NPT male
DISS716-V4M	716 x 1/4" male face seal
DISS716-T4S	716 x 1/4" tube stub
DISS718-P4M	718 x 1/4" NPT male
DISS718-V4M	718 x 1/4" male face seal
DISS718-T4S	718 x 1/4" tube stub
DISS720-P4M	720 x 1/4" NPT male
DISS720-V4M	720 x 1/4" male face seal
DISS720-T4S	720 x 1/4" tube stub
DISS722-P4M	722 x 1/4" NPT male
DISS722-V4M	722 x 1/4" male face seal
DISS722-T4S	722 x 1/4" tube stub
DISS724-P4M	724 x 1/4" NPT male
DISS724-V4M	724 x 1/4" male face seal
DISS724-T4S	724 x 1/4" tube stub
DISS726-P4M	726 x 1/4" NPT male
DISS726-V4M	726 x 1/4" male face seal
DISS726-T4S	726 x 1/4" tube stub

INSTRUMENT GRADE PIPE FITTINGS

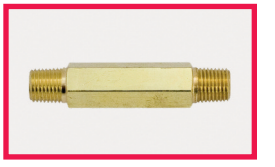
Pipe fittings are commonly used in constructing gas handling systems to join operating components together in a rigid configuration instead of compression fittings. They are well suited to high purity, high pressure, or high vacuum applications. All of the fittings shown below have a minimum pressure rating of 3000 psig. Some stainless steel fittings may be rated at higher operating pressures.

HOW TO ORDER

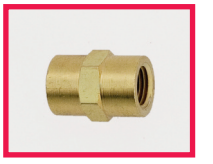
BRASS P/N	STAINLESS STEEL P/N	DESCRIPTION
Male Hex Nipple (For connecting female pipe threads)		
2-2MHN-B	2-2MHN-SS	1/8” NPT male x 1/8” NPT male
4-2MHN-B	4-2MHN-SS	1/4” NPT male x 1/8” NPT male
4-4MHN-B	4-4MHN-SS	1/4” NPT male x 1/4” NPT male
8-4MHN-B	8-4MHN-SS	1/2” NPT male x 1/4” NPT male
8-8MHN-B	8-8MHN-SS	1/2” NPT male x 1/2” NPT male



Male Hex Long Nipple (For connecting female pipe threads at extended lengths)		
4-4MHLN-2.0-B	4-4MHLN-2.0-SS	1/4” NPT male x 1/4” NPT male (2” long)
4-4MHLN-2.5-B	4-4MHLN-2.5-SS	1/4” NPT male x 1/8” NPT male (2.5” long)
4-4MHLN-3.0-B	4-4MHLN-3.0-SS	1/4” NPT male x 1/4” NPT male (3.0” long)
4-4MHLN-4.0-B	4-4MHLN-4.0-SS	1/4” NPT male x 1/4” NPT male (4.0” long)

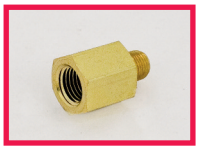


Female Hex Coupling (for connecting male pipe threads)		
2-2FHC-B	2-2FHC-SS	1/8” NPT female x 1/8” NPT female
4-2FHC-B	4-2FHC-SS	1/4” NPT female x 1/8” NPT female
4-4FHC-B	4-4FHC-SS	1/4” NPT female x 1/4” NPT female
8-4FHC-B	8-4FHC-SS	1/2” NPT female x 1/4” NPT female
8-8FHC-B	8-8FHC-SS	1/2” NPT female x 1/2” NPT female



Reducing Bushing (for joining pipe threads of different sizes)		
4-2RB-B	4-2RB-SS	1/4” NPT male x 1/8” NPT female
8-4RB-B	8-4RB-SS	1/2” NPT male x 1/4” NPT female

Reducing Adapter (for joining pipe threads of different sizes)		
4-2RA-B	4-2RA-SS	1/4” NPT female x 1/8” NPT male
8-4RA-B	8-4RA-SS	1/2” NPT female x 1/4” NPT male



INSTRUMENT GRADE PIPE FITTINGS *CONTINUED*

HOW TO ORDER

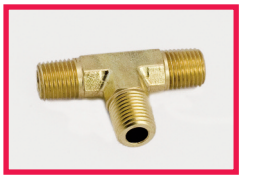
BRASS P/N	STAINLESS STEEL P/N	DESCRIPTION
Male Elbow (for connecting female pipe threads at right angles)		
2-2ME-B	2-2MEL-SS	1/8" NPT male x 1/8" NPT male
4-4ME-B	4-4MEL-SS	1/4" NPT male x 1/4" NPT male

Female Elbow (for connecting male pipe threads at right angles)		
2-2FE-B	2-2FE-SS	1/8" NPT female x 1/8" NPT female
4-4FE-B	4-4FE-SS	1/4" NPT female x 1/4" NPT female

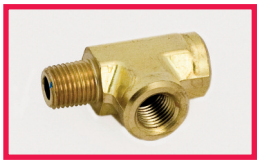
Street Elbow (for connecting male to female pipe threads at right angles)		
2-2SE-B	2-2SE-SS	1/8" NPT male x 1/8" NPT female
4-4SE-B	4-4SE-SS	1/4" NPT male x 1/4" NPT female

Female Tee (for connecting male pipe threads in a "T" configuration)		
2-2-2FT-B	2-2-2FT-SS	1/8" NPT female all ends
4-4-4FT-B	4-4-4FT-SS	1/4" NPT female all ends

Male Tee (for connecting male pipe threads in a "T" configuration)		
2-2-2MT-B	2-2-2MT-SS	1/8" NPT male all ends
4-4-4MT-B	4-4-4MT-SS	1/4" NPT male all ends



Street Tee (for connecting pipe threads in a "T" configuration female x male x male)		
4-4-4ST-B	4-4-4ST-SS	1/4" NPT male x 1/4" NPT female x 1/4" female



Male Branch Tee (for connecting pipe threads in a "T" configuration male x female x male)		
4-4-MBT-B	4-4-MBT-SS	1/4" NPT male x 1/4" NPT female x 1/4" female

Pipe Cross (for making a 4-way connection of male pipe threads)		
4FX-B	4FX-SS	1/4" NPT female all ends

Hollow Hex Pipe Plug (to plug a female pipe thread)		
2PHH-B	2PHH-SS	1/8" NPT male
4PHH-B	4PHH-SS	1/4" NPT male

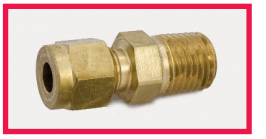
COMPRESSION FITTINGS FOR METAL TUBING

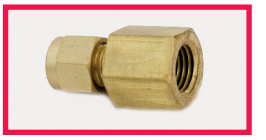
Compression fittings are commonly used with metal tubing in constructing gas handling systems using tubing. They are particularly suited to high purity, high pressure, or high vacuum applications. They need no special tools, welding, or soldering and can be made and remade repeatedly.

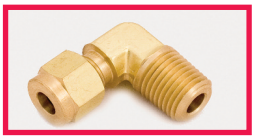
Please note that the tubing size designation in the ordering information below refers to the outside diameter of the tubing. Also, only the most common fittings are listed here; many other connections are available on request.

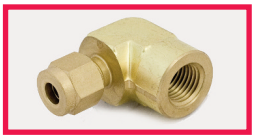
HOW TO ORDER

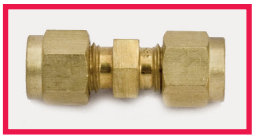
BRASS P/N	STAINLESS STEEL P/N	DESCRIPTION
Male Connectors (For connecting female pipe threads to tubing)		
2MSC2N-B	2MSC2N-316	1/8” compression x 1/8” NPT male
2MSC4N-B	2MSC4N-316	1/8” compression x 1/4” NPT male
4MSC2N-B	4MSC2N-316	1/4” compression x 1/8” NPT male
4MSC4N-B	4MSC4N-316	1/4” compression x 1/4” NPT male
4MSC8N-B	4MSC8N-316	1/4” compression x 1/2” NPT male
8MSC4N-B	8MSC4N-316	1/2” compression x 1/4” NPT male
8MSC8N-B	8MSC8N-316	1/2” compression x 1/2” NPT male
Female Connectors (for connecting male pipe threads to tubing)		
2FSC2N-B	2FSC2N-316	1/8” compression x 1/8” NPT female
2FSC4N-B	2FSC4N-316	1/8” compression x 1/4” NPT female
4FSC2N-B	4FSC2N-316	1/4” compression x 1/8” NPT female
4FSC4N-B	4FSC4N-316	1/4” compression x 1/4” NPT female
4FSC8N-B	4FSC8N-316	1/4” compression x 1/2” NPT female
8FSC4N-B	8FSC4N-316	1/2” compression x 1/4” NPT female
8FSC8N-B	8FSC8N-316	1/2” compression x 1/2” NPT female
Male Elbow (for connecting female pipe threads to tubing at right angles)		
2MSEL2N-B	2MSEL2N-316	1/8” compression x 1/8” NPT male
2MSEL4N-B	2MSEL4N-316	1/8” compression x 1/4” NPT male
4MSEL2N-B	4MSEL2N-316	1/4” compression x 1/8” NPT male
4MSEL4N-B	4MSEL4N-316	1/4” compression x 1/4” NPT male
Female Elbow (for connecting male pipe threads to tubing at right angles)		
2FSEL2N-B	2FSEL2N-316	1/8” compression x 1/8” NPT female
2FSEL4N-B	2FSEL4N-316	1/8” compression x 1/4” NPT female
4FSEL2N-B	4FSEL2N-316	1/4” compression x 1/8” NPT female
4FSEL4N-B	4FSEL4N-316	1/4” compression x 1/4” NPT female
Union (for joining tubing)		
2SC2-B	2SC2-316	1/8” compression x 1/8” compression
4SC4-B	4SC4-316	1/4” compression x 1/4” compression
Reducing Union (for joining tubing of different sizes)		
4RU2-B	4RU2-316	1/4” compression x 1/8” compression
8RU4-B	8RU4-316	1/2” compression x 1/4” compression
Bulkhead Union (for connecting tubing through a panel or bulkhead)		
2BC2-B	2BC2-316	1/8” compression x 1/8” compression
4BC4-B	4BC4-316	1/4” compression x 1/4” compression
8BC8-B	8BC8-316	1/2” compression x 1/2” compression
Union Elbow (for joining tubing at right angles)		
2EE2-B	2EE2-316	1/8” compression x 1/8” compression
4EE4-B	4EE4-316	1/4” compression x 1/4” compression
8EE8-B	8EE8-316	1/2” compression x 1/2” compression
Union Tee (for joining tubing in “T” configurations)		
2ET2-B	2ET2-316	1/8” compression all ends
4ET4-B	4ET4-316	1/4” compression all ends
8ET8-B	8ET8-316	1/2” compression all ends

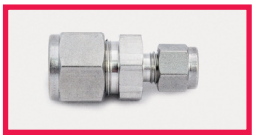


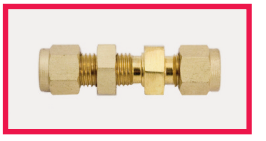


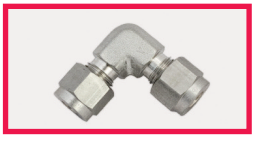


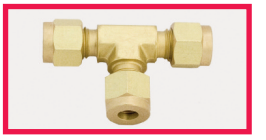












THE CONTROL AND SAFE HANDLING OF COMPRESSED GASES DVD

We have created this 118 minute video to provide you with an understanding of the basic principles of handling and controlling compressed gases and cryogenic liquids. The video is segmented into chapters so that the viewer may go to any of the primary subjects quickly without having to go through the complete presentation. This video is a "must" for any company's training library.

DISC ONE

Chapter	1.0	Basic Safe Handling Rules for Cylinder Gases
Chapter	2.0	Understanding the Compressed Gas Cylinder
Chapter	3.0	Cylinder Storage and Security
Chapter	4.0	Cryogenic Liquids
Chapter	5.0	Personal Protection Gas Monitoring
Chapter	6.0	The Most Common OSHA Violations

DISC TWO

Chapter	7.0	The Proper Selection and Use of Pressure Regulators
Chapter	8.0	Delivery Systems
	8.1	Protocol Stations
	8.2	Changeover Manifolds
	8.3	Discharge Manifolds
Chapter	9.0	All About Transfer Lines
Chapter	10.0	Purging for Purity and Safety
Chapter	11.0	Accessory Equipment
	11.1	Valves
	11.2	Flowmeters
	11.3	Flash Arrestors
	11.4	Low Pressure Alarms
	11.5	Cylinder Heaters and Warmers
	11.6	Cylinder Hand Trucks
	11.7	Purifiers and Filters
Chapter	12.0	Application Equipment Summary

GAS SAFETY AND MATERIAL COMPATIBILITY DATA CHART

This data has been compiled from the best information available and is offered as a guide to proper material selection. The data presented are generalized for average conditions of temperature and pressure. The user should always investigate the characteristics of the gas being handled and take all the proper precautions. Our technical staff will be pleased to give free advice and technical information on any gas or chemical product of interest.

	HAZARDS FOR HUMANS				MATERIALS OF CONSTRUCTION								
GAS	Toxic	Flammable	Corrosive		Aluminum	Copper	Brass	Steel	Stainless Steel	Monel®	Kel-F®	Teflon®	SPECIAL CHARACTERISTICS
Acetylene		◊			R	N	R	R	R		R	R	Do not use at pressures exceeding 15psig
Air					R	R	R	R	R	R	R	R	
Ammonia	◊	◊	◊		R	N	N	X	R		R	R	Causes stress cracking of copper and copper alloys
Argon					R	R	R	R	R		R	R	
Arsine*	◊	◊			X	N	X	X	R		R	R	Highly toxic, excessive exposure may have delayed effect
Boron Trichloride	◊		◊		N	X	X	X	X	X	R	R	
Boron Trifluoride	◊		◊		X	R	R	R	R	R	R	R	
1-3, Butadiene		◊			R	R	R	R	R		R	R	
Butane		◊			R	R	R	R	R		R	R	
Butenes		◊			R	R	R	R	R		R	R	
Carbon Dioxide					R	R	R	R	R		R	R	
Carbon Monoxide	◊	◊			R	R	R	R	R		R	R	
Carbonyl Sulfide	◊	◊			R	N	N	X	R		R	R	Treat as Hydrogen Sulfide, affects central nervous system
Chlorine	◊		◊		N	N	N	X	X	X	R	R	Very toxic and damaging to the respiratory system
Cyanogen*	◊	◊			X			R	R		R	R	Treat as cyanides
Deuterium		◊			R	R	R	R	R		R	R	
Dimethylamine	◊	◊	◊		X	N	N	R	R		X	R	Attacks copper and copper alloys rapidly.
Dimethyl Ether		◊			R	R	R	R	R		R	R	
Ethane		◊			R	R	R				R	R	
Ethyl Chloride	◊	◊					R	R	R		R	R	
Ethylene		◊			R	R	R	R	R		R	R	
Ethylene Oxide	◊	◊				N	N	R	R		R	R	Exposure of liquid on skin or clothing can cause dermatitis
Fluorine*	◊		◊		R	R	X		R	R	N	X	Strong oxidant, can ignite combustible materials and metals
Helium					R	R	R	R	R		R	R	
Hydrogen		◊			R	R	R	R	R		R	R	
Hydrogen Bromide	◊		◊		N	X	N	X	X	X	R	R	Steel or stainless steel serviceable in dry liquid or gas service
Hydrogen Chloride	◊		◊		N	X		X	X	X	R	R	Steel or stainless steel serviceable in dry liquid or gas service
Hydrogen Fluoride*	◊		◊		X	R	R	R	R		R	R	Exposure can attack skin, bones and fingernails
Hydrogen Selenide	◊	◊			N	N	N	X	R		R	R	Extremely toxic, odor deadens the olfactory nerves
Hydrogen Sulfide*	◊	◊			N	N	N	X	R		R	R	Odor deadens olfactory nerves, can cause paralysis
Isobutane		◊			R	R	R	R	R		R	R	
Isobutylene		◊			R	R	R	R	R		R	R	
Krypton					R	R	R	R	R		R	R	

*It is recommended that users thoroughly familiarize themselves with the specific properties of this gas.

LEGEND

◊ - Primary Hazard
R - Recommended
N - Not Recommended
X - Depends on conditions

GAS SAFETY AND MATERIAL COMPATIBILITY DATA CHART

	HAZARDS FOR HUMANS				MATERIALS OF CONSTRUCTION								
GAS	Toxic	Flammable	Corrosive		Aluminum	Copper	Brass	Steel	Stainless Steel	Monel®	Kel-F®	Teflon®	SPECIAL CHARACTERISTICS
Methane	◊	◊			R	R	R	R	R		R	R	
Methyl Acetylene		◊			R	N	X	R	R		R	R	
Methyl Bromide	◊	◊			X	R	R	R	R		R	R	
Methyl Chloride	◊	◊			N	X	R	R	R		R	R	Forms explosive compounds with aluminum
Methyl Mercaptan	◊	◊			R	N	X	R	R		R	R	
Monoethylamine	◊	◊			X	N	N	R	R		X	R	Attacks copper and copper alloys rapidly
Monomethylamine	◊	◊			X	N	N	R	R		X	R	Attacks copper and copper alloys rapidly
Neon					R	R	R	R	R		R	R	
Nitric Oxide	◊		◊		R	N	N	X	R	N	R	R	Readily reacts with Oxygen to form Nitrogen Dioxide
Nitrogen					R	R	R	R	R		R	R	
Nitrosyl Chloride	◊		◊		N	N	N	N	N	R		R	Very corrosive, attacks most metals except nickel
Nitrous Oxide					R	R	R	R	R		R	R	
Oxygen*					R	R	R	R	R		R	R	Strong oxidant, ignites combustible matter spontaneously
Phosgene	◊		◊		N	N	N	X	X	R	R	R	Very toxic
Phosphine*	◊	◊			R	X	X	R	R		R	R	Highly toxic, high concentrations are pyrophoric
Propane		◊			R	R	R	R	R		R	R	
Propylene		◊			R	R	R	R	R		R	R	
Silane*	◊	◊			R	R	R	R	R		R	R	Pyrophoric
Silicon Tetrafluoride	◊		◊		R	R	R	R	R		R	R	
Sulfur Dioxide	◊		◊		R	R	R	R	R		R	R	
Sulfur Hexafluoride					R	R	R	R	R		R	R	
Sulfur Tetrafluoride	◊		◊		R	R	R	R	R		R	R	
Trimethylamine	◊	◊			R	N	N	R	R		X	R	Attacks copper and copper alloys rapidly
Xenon					R	R	R	R	R		R	R	

*It is recommended that users thoroughly familiarize themselves with the specific properties of this gas.

All data presented are considered accurate and reliable but supplier assumes no liability or responsibility of any kind.

LEGEND

◊ - Primary Hazard
R - Recommended
N - Not Recommended
X - Depends on conditions

GAS DATA & EQUIPMENT RECOMMENDATIONS

The following information is provided as a guide to assist you in selecting the correct gas control for use with each of your cylinder gases. The listing is divided into three distinct groups - Pure Gases, Pure Gases in Lecture Bottles, and Two-Component Gas Mixtures.

To use this guide, simply locate the gas or gas mixture you are using within the appropriate group. The tables for Pure Gases and Pure Gases in Lecture Bottles have their information initially arranged alphabetically by the gas of interest, and then secondarily alphabetized by the specific grade of that gas. The information in the Two-Component Gas Mixtures table is listed first alphabetically by minor component and then alphabetically by the balance gas, or major component. For example, 2% Ammonia, 98% Helium would be listed first under Ammonia (the minor component), then under "In Helium" (the balance gas) within the Ammonia grouping.

Across from each individual listing you will find that product's normal corresponding valve outlet connection number (CGA Connection), the recommended regulator model, and a reference page number directing you to the page in our catalog where additional information and complete specifications on that regulator can be found. In the Pure Gas Table you will also find certain physical properties of the gas, such as chemica lformula, molecular weight, vapor pressure (liquefied gases), specific gravity and specific volume. In certain cases, where pressure reduction is not desired or required, such as with very low pressure products such as borontrichloride, a manual control valve has been recommended instead of a pressure regulator. Please remember that Manual Control Valves control flow, not pressure.

You should note that the recommendations contained herein are valid, and generally preferred for the more common applications of the products indicated; and consideration has been given to safety, materials compatibility, as well as to convenience and suitability for these common applications. However, the recommendations shown may not be the only models that are suitable, and your specific application may have subtleties that would indicate that a different selection is a more preferable choice. If you need assistance in making your selection, or wish to confirm that your choice is correct, please contact us.

If you are using a product that is not listed within these tables, please do not hesitate to contact us to discuss your requirements.

PURE GASES

Gas Grade	Mol. Weight	Vapor Pressure (psig at 70°F)	Specific Gravity (Air-1)	Specific Volume (ft3/lb. at 70°F)	CGA Connection Number	Equipment Recommendation	Page #
Acetylene (C H)	**26.038**	**—**	**0.91 at 32 F**	**14.5**			
Atomic Absorption					510	3101A	6
Commercial Grade, 98.0%					510	3101A	6
Purified					510	3101A	6
Technical					510	3101A	6
Air	**28.975**	**—**	**1.00**	**13.3**			
Blended Air (<99.999)					590	2401 or 2421	24, 25
CO Free					590	3101 or 3201	6, 7
Compressed Air (<99.999)					346	2401 or 2421	24, 25
Dry (<99.999)					346/590*	2401 or 2421	24, 25
High Pressure (3500 psig)					347	3800V or 3860TB	20, 21
High Pressure (6000 psig)					702	3800V or 3860TB	20, 21
Hydrocarbon Free					346/590*	3101 or 3201	6, 7
USP (<99.999)					346/950*	2401 or 2421	20, 21
Ultra Pure Carrier					590	3201	7
Ultra Zero					590	3201	7
Vehicle Emission Zero					590	3201	7
V.O.C. Free Air					590	3201	7
Zero					346/590*	3201	7
Allene (C3H4)	**40.065**	**116.7**	**1.415 at 68 F**	**9.6**	510	3103	6

*CGA Connection may vary depending upon cylinder size or gas manufacturer. Check with your gas supplier to determine actual CGA Connection.

PURE GASES

Gas Grade	Mol. Weight	Vapor Pressure (psig at 70°F)	Specific Gravity (Air-1)	Specific Volume (ft3/lb. at 70°F)	CGA Connection Number	Equipment Recommendation	Page #
Ammonia (NH_3)	**17.031**	**114.1**	**0.597**	**22.7**			
Anhydrous					705	3403	8
Electronic					660	3403	8
Nitride					660	3403	8
Research					660	3403	8
Semiconductor Purity					660/720*	3403	8
SFC Grade					660	3403	8
ULSI Purity					660/720*	3403	8
Ultra High Purity					660/720*	3403	8
Argon (Ar)	**39.948**	**1.378**	**9.68**				
Grade 6™					580	3201	7
High Pressure (3500 psig)					680	3800V or 3860TB	20, 21
High Pressure (6000 psig)					677	3800V or 3860TB	20, 21
High Purity					580	3201	7
Oxygen Free					580	3201	7
Prepurified					580	3201	7
Research					580	3201	7
Semiconductor Purity					580	3201	7
Sputtering					580	3201	7
ULSI Purity					580	3201	7
Ultra High Purity					580	3201	7
Ultraplus™					580	3201	7
Ultra Pure Carrier					580	3201	7
Zero					580	3201	7
Arsine (AsH_3)	**77.946**	**05**	**2.69**	**5.0**			
Electronic					350/632*	3403	8
ULSI Purity					350/632*	3403	8
Boron Trichloride (BCl_3)	**117.169**	**4.4**	**4.03**	**3.3**			
CP					660	3472	15
Electronic					660	3472	15
Semiconductor Purity					660/634*	3472	15
VLSI Etchant					660	3472	15
Boron Trifluoride (BF_3)	**67.805**	**—**	**2.387**	**5.7**			
CP					330	3470	15
1,3 Butadiene (C_4H_6)	**54.092**	**21.4**	**1.915 at 60 F**	**6.9**			
CP					510	3103	6
High Purity (Inhibited)					510	3103	6
Instrument					510	3103	6
Research					510	3103	6
Butane (C H)	**58.123**	**16.3**	**2.110 at 68 F**	**6.4**			
CP					510	3103	6
Instrument					510	3103	6
Technical					510	3103	6
n-Butane See Butane							
iso-Butane See Isobutane							
1-Butene (C H)	**56.108**	**23.5**	**1.937**	**6.7**			
CP					510	3103	6
High Purity					510	3103	6
Research					510	3103	6

PURE GASES

Gas Grade	Mol. Weight	Vapor Pressure (psig at 70°F)	Specific Gravity (Air-1)	Specific Volume (ft3/lb. at 70°F)	CGA Connection Number	Equipment Recommendation	Page #
cis-2-Butene (C H)	**56.108**	**13**	**1.997 at 68 F**	**6.7**			
High Purity					510	3103	6
Technical					510	3103	6
trans-2-Butene (C H)	**56.108**	**15**	**1.997 at 68 F**	**6.7**			
High Purity					510	3103	6
Technical					510	3103	6
(cis & trans) 2-Butene (C H)	**56.108**	**14**	**1.997 at 68 F**	**6.7**			
Technical					510	3103	6
iso-Butylene See Isobutylene							
Carbon Dioxide (CO)	**44.011**	**830**	**1.522**	**8.76**			
Anaerobic					320	3101	6
Bone Dry (<99.999)					320	2401	24
CP (<99.999)					320	2401	24
Commercial					320	2401	24
Electronic					320	3101	6
Instrument (Coleman)					320	3101	6
Precision Aquarator®					320	3101	6
Research					320	3101	6
SFC Grade					320	3101	6
SFE					320	3101	6
Spectra-Clean®, Grade 5™					320	3101	6
USP (<99.999)					320/940*	2401	24
Carbon Monoxide (CO)	**28.010**	**—**	**0.968**	**13.8**			
CP					350	2421	25
Commercial					350	2421	25
Research					350	2421	25
Technical (<99.999)					350	2421	25
Ultra High Purity					350	3201	7
Carbon Tetrafluoride - See Halocarbon 14							
Carbonyl Sulfide (COS)	**60.070**	**160**	**2.10 at 68 F**	**6.4**			
					330	3403	8
Chlorine (Cl)	**70.906**	**85.3**	**2.473 at 68 F**	**5.4**			
High Purity					660	3472	15
Research					660	3472	15
Semiconductor Purity					660/728*	3472	15
ULSI Purity					660/728*	3472	15
Ultra High Purity					660/728*	3472	15
Cyclopropane (C H)	**42.081**	**75.0**	**1.453 at 68 F**	**9.2**			
					510	3103	6
Deuterium (D)	**4.032**	**—**	**0.139 at 32 F**	**95.9**			
CP					350	3201	7
Research					350	3201	7
Dichlorosilane (H SiCl)	**101.010**	**9.1**	**3.52 at 77 F**	**3.83**			
Electronic					678	3403	8
Semiconductor Purity					678/636*	3403	8
ULSI Purity					678/636*	3403	8
Ultraplus™					678/636*	3403	8

*CGA Connection may vary depending upon cylinder size or gas manufacturer. Check with your gas supplier to determine actual CGA Connection.

PURE GASES

Gas Grade	Mol. Weight	Vapor Pressure (psig at 70°F)	Specific Gravity (Air-1)	Specific Volume (ft3/lb. at 70°F)	CGA Connection Number	Equipment Recommendation	Page #
Dimethylamine (C H N)	**45.085**	**11.3**	**1.557 at 77 F**	**8.6**			
					705	3403 or 8520	8, 101
Dimethyl Ether (C H O)	**46.069**	**62.3**	**1.59**	**8.4**			
					510	3103	8
2,2-Dimethylpropane (C H)	**72.151**	**7.0**	**2.49 at 77 F**	**5.3**			
Research					510	3103	6
Ethane (C H)	**30.07**	**544**	**1.047 at 60 F**	**12.8**			
CP					350	3102	7
Research					350	3102	7
Technical					350	3102	7
Ultra High Purity					350	3102	7
Ethyl Acetylene (C H)	**54.092**	**8.5**	**1.93 at 77 F**	**7.2**			
					510	3103A	6
Ethyl Chloride (C H Cl)	**64.515**	**5.3**	**2.22 at 68 F**	**6.0**			
High Purity					300	8520	101
Ethylene (C H)	**28.054**	**—**	**0.978 at 32 F**	**13.8**			
CP					350	3101	6
Polymer Grade					350	3101	6
Research					350	3101	6
Technical					350	2401	24
Ethylene Oxide (C H O)	**44.054**	**6.5**	**1.52**	**8.78**			
99.90%					510	8520	101
Halocarbon 12 (CCl F)	**120.914**	**70.2**	**4.26**	**3.14**			
(Dichlorodifluoromethane)					660	3103	6
Halocarbon 13 (CClF)	**104.459**	**458.7**	**3.70**	**3.61**			
(Chlorotrifluoromethane)					320/660*	3102	7
Halocarbon 13B1 (CBrF)	**148.910**	**189**	**5.30**	**2.6**			
(Bromotrifluoromethane)					320/660*	3103	6
Halocarbon 14 (CF)	**88.005**	**—**	**3.038**	**4.39**			
(Tetrafluoromethane)							
Electronic					320/660*	3501	9
Semiconductor Purity					320/580*	3501	9
Ultraplus™					320/660*	3501	9
VLSI					580	3501	9
Halocarbon 21 (CHCl F)	**102.923**	**8.4**	**3.82 at 68 F**	**3.5**			
(Dichlorofluoromethane)					660	8520	101
Halocarbon 22 (CHClF)	**86.469**	**123**	**3.08**	**4.4**			
(Chlorodifluoromethane)					660	3103	6
Halocarbon 23 (CHF)	**70.014**	**635**	**2.43**	**5.5**			
(Trifluoromethane)							
Technical					660	3101	6
Ultraplus™					320/660*	3101	6
99.90%					320/660*	2401	24

PURE GASES

Gas Grade	Mol. Weight	Vapor Pressure (psig at 70°F)	Specific Gravity (Air-1)	Specific Volume (ft3/lb. at 70°F)	CGA Connection Number	Equipment Recommendation	Page #
Halocarbon 114 (C Cl F)	**170.922**	**12.9**	**5.93 at 77 F**	**2.3**			
(1,2-Dichlorotetrafluoroethane)					660	3103	6
Halocarbon 115 (C ClF)	**154.467**	**102**	**5.569**	**2.4**			
(Chloropentafluoroethane)					660	3103	6
Halocarbon 116 (C F)	**138.012**	**430.3**	**4.773**	**2.8**			
(Hexafluoroethane)						3102	6
99.90%					320/660*	2401	24
Semiconductor Purity					660	3102	6
Halocarbon 142B (C H ClF)	**100.496**	**27.8**	**3.63**	**3.68**			
(1-Chloro-1,1-Difluoroethane)					510	3103	6
Halocarbon 152A (C H F)	**66.05163**	**2.36**	**5.85**				
(1,1-Difluoroethane)					510	3103	6
Halocarbon C-318 (C F)	**200.031**	**25**	**7.33**	**1.85**			
(Octafluorocyclobutane)					660	3103	6
Halocarbon 500	**100.1**	**82.3**	**3.5**	**3.82**			
(73.8 wt.% Halocarbon 12							
26.2 wt.% Halocarbon 152A)					660/510*	3103	6
Halocarbon 502	**111.63**	**132.2**	**3.87**	**3.45**			
(48.8 wt.% Halocarbon 22							
51.2 wt.% Halocarbon 115)					320/660*	3103	6
Halocarbon 503	**87.247**	**613**	**3.07**	**4.3**			
(60 wt.% Halocarbon 23							
40 wt.% Halocarbon 13)					320	2401	24
Halocarbon 1113 (C ClF)	**116.47**	**62**	**4.13**	**3.30**			
(Chlorotrifluoroethylene)					510	3103	6
Halocarbon 1132A (C H F)	**64.035**	**518**	**2.21 at 77 F**	**6.0**			
(1,1-Difluoroethylene)					350	2401	24
Helium (He)	**4.003**	**—**	**0.138**	**96.7**			
Carrier Grade					580	3201	7
Chromatographic					580	3201	7
ECD Grade					580	3201	7
Grade 6™					580	3201	7
High Pressure (3500 psig)					680	3800V or 3860TB	20, 21
High Pressure (6000 psig)					677	3800V or 3860TB	20, 21
High Purity					580	3201	7
Oxygen Free					580	3201	7
Research					580	3201	7
Semiconductor Purity					580	3201 or 3501	7, 9
Ultra High Purity					580	3201	7
Ultraplus™					580	3201	7
Ultra Pure Carrier					580	3201	7
ULSI					580	3201 or 3501	7, 9
USP (<99.999)					580/930*	2421	25
Zero					580	3201	7

 *CGA Connection may vary depending upon cylinder size or gas manufacturer. Check with your gas supplier to determine actual CGA Connection.

PURE GASES

Gas Grade	Mol. Weight	Vapor Pressure (psig at 70°F)	Specific Gravity (Air-1)	Specific Volume (ft3/lb. at 70°F)	CGA Connection Number	Equipment Recommendation	Page #
Hexafluoropropylene (C F)	**150.023**	**85**	**5.18 at 68 F**	**2.58**			
					660	3103	6
Hydrogen (H)	**2.016**	**—**	**0.0696**	**191.7**			
Carrier Grade					350	3201	7
Extra Dry (<99.999)					350	3201	7
High Pressure (3500 psig)					695	3800V or 3860TB	20, 21
High Pressure (6000 psig)					703	3800V or 3860TB	20, 21
High Purity					350	3101 or 3201	6, 7
Prepurified					350	3101 or 3201	6, 7
Purified					350	3101 or 3201	6, 7
Research					350	3201 or 3501	7, 9
Semiconductor Purity					350	3201 or 3501	7, 9
ULSI Purity					350	3201 or 3501	7, 9
Ultra High Purity					350	3201	7
Ultraplus™					350	3201	7
Ultra Pure Carrier					350	3201	7
Zero					350	3201	7
Hydrogen Bromide (HBr)	**80.912**	**320**	**2.812 at 77 F**	**4.8**			
Grade 2.8™					330	3471	15
ULSI Purity					330/634*	3471	15
Hydrogen Chloride (HCl)	**36.461**	**613**	**1.268 at 68 F**	**10.6**			
Electronic					330	3471	15
Research					330	3471	15
Technical					330	3471	15
ULSI Purity					330/634*	3471	15
Ultra High Purity					330/634*	3471	15
Hydrogen Selenide (H Se)	**80.976**	**124.9**	**2.80 at 77 F**	**4.8**			
Research					660	3403	8
Semiconductor Purity					350/632*	3403	8
ULSI Purity					350/632*	3403	8
Hydrogen Sulfide (H S)	**34.076**	**252**	**1.189 at 59 F**	**11.23**			
CP					330	3402	8
Research					330	3402	8
Technical					330	3402	8
Isobutane (C H)	**58.124**	**30.7**	**2.01**	**6.5**			
CP					510	3103	6
Instrument					510	3103	6
Research					510	3103	6
Technical					510	3103	6
Isobutylene (C H)	**56.108**	**24.3**	**1.997**	**6.7**			
CP					510	3103	6
High Purity					510	3103	6
Research					510	3103	6
Isopentane (C H)	**72.151**	**-3.2**	**2.48**	**—**			
CP					510	8520	101

PURE GASES

Gas Grade	Mol. Weight	Vapor Pressure (psig at 70°F)	Specific Gravity (Air-1)	Specific Volume (ft3/lb. at 70°F)	CGA Connection Number	Equipment Recommendation	Page #
Krypton (Kr)	**83.800**	**—**	**2.899**	**4.6**			
Purified					580	3101 or 3201	6, 7
Research					580	3101 o 3201	6, 7
Methane (CH)	**16.043**	**—**	**0.554 at 32 F**	**23.7**			
Commercial					350	2401 or 2421	24, 25
CP					350	2401 or 2421	24, 25
High Pressure (3500 psig)					695	3800V or 3860TB	20, 21
High Pressure (6000 psig)					703	3800V or 3860TB	20, 21
Instrument					350	3101 or 3201	6, 7
Purified					350	3101 or 3201	6, 7
Research					350	3101 or 3201	6, 7
Technical					350	2401 or 2421	24, 25
Ultra High Purity					350	3101 or 3201	6, 7
Ultra Pure					350	3101 or 3201	6, 7
Methyl Bromide (CH Br)	**94.939**	**13**	**3.355 at 77 F**	**4.1**			
					330/320*	8520	101
Methyl Chloride (CH Cl)	**50.488**	**58.7**	**1.74 at 32 F**	**7.6**			
					510/660*	3403	8
Methyl Mercaptan (CH SH)	**48.107**	**15**	**1.66 at 68 F**	**8.0**			
					330	3403 or 8520	8, 101
Monomethylamine (CH NH)	**31.058**	**28.8**	**1.08 at 68 F**	**12.1**			
					705	3403 or 85201	8, 101
Natural Gas	**17.656**	**—**	**0.55**	**24.0**			
					350	2401 or 2421	24, 25
Neon (Ne)	**20.183**	**—**	**0.696**	**19.2**			
CP					580	3101 or 3201	6, 7
First Run					580	3101 or 3201	6, 7
High Purity					580	3101 or 3201	6, 7
Research					580	3101 or 3201	6, 7
Ultra High Purity					580	3101 or 3201	6, 7
Ultra Pure					580	3101 or 3201	6, 7
Nitric Oxide (NO)	**30.006**	**—**	**1.04**	**1.04**			
CP					660	3401 or 3501	8, 9

*CGA Connection may vary depending upon cylinder size or gas manufacturer. Check with your gas supplier to determine actual CGA Connection.

PURE GASES

Gas Grade	Mol. Weight	Vapor Pressure (psig at 70°F)	Specific Gravity (Air-1)	Specific Volume (ft3/lb. at 70°F)	CGA Connection Number	Equipment Recommendation	Page #
Nitrogen (N)	**28.013**	**—**	**0.967**	**13.8**			
ECD Grade					580	3201	7
Extra Dry (<99.999)					580	3201	7
Grade 6™					580	3201	7
High Pressure (3500 psig)					680	3800V or 3860TB	20, 21
High Pressure (6000 psig)					677	3800V or 3860TB	20, 21
High Purity					580	3201	7
Low Oxygen					580	3201	7
NF–High Purity					580/960*	3201	7
Oxygen Free					580	3201	7
Prepurified (<99.999)					580	2421	24
Research					580	3201	7
Semiconductor Purity					580	3201 or 3501	7, 9
Ultra High Purity					580	3201	7
Ultra Plus™					580	3201	7
Ultra Pure Carrier					580	3201	7
Ultra Zero Ambient Monitoring Zero					580	3201	7
Vehicle Emission Zero					580	3201	7
VOC Free Nitrogen					580	3201	7
Zero					580	3201	7
Nitrogen Dioxide (NO)	**46.005**	**0.0 psig**	**1.58**	**4.7**			
CP					660	8520	101
Nitrous Oxide (N O)	**44.013**	**745**	**1.53 at 68 F**	**8.7**			
Atomic Absorption					326	2401	24
CP					326	2401	24
Electronic Grade					326	3101 or 3401	6, 8
High Purity					326	3101	6
Industrial					326	2401	24
Research					326	3101	6
Semiconductor Purity					326/712*	3101 or 3401	6, 8
SFC Purity					326	3101	6
Technical					326	2401	24
Ultra High Purity					326/712*	3101	6
Ultraplus™					326	3101	6
USP					326/910*	2401	24
Sulfur Dioxide (SO)	**64.063**	**34.4**	**2.262**	**5.9**			
Anhydrous					660	3403	8
Commercial					660	3403	8
Sulfur Hexafluoride (SF)	**146.051**	**320**	**5.11 at 68 F**	**2.5**			
Commercial					590	2401	24
CP					590	2401	24
Electronic					590	3102 or 3402	6, 8
Etchant					590	3102 or 3402	6, 8
Grade 3™					590	2401	24
Grade 4™					590	2401	24
Instrument Purity					590	3102	6
SFC					590	3102	6
ULSI Purity					590	3102 or 3402	6, 8
Ultraplus™					590	3102 or 3402	6, 8

PURE GASES

Gas Grade	Mol. Weight	Vapor Pressure (psig at 70°F)	Specific Gravity (Air-1)	Specific Volume (ft3/lb. at 70°F)	CGA Connection Number	Equipment Recommendation	Page #
Sulfur Tetrafluoride (SF)	**108.058**	**140**	**3.783 at 68 F**	**3.6**			
Technical					330	3471	15
Trimethylamine (C H N)	**59.112**	**13.3**	**2.087 at 68 F**	**6.4**			
					705	3403 or 8520	8, 101
Vinyl Methyl Ether (C H O)	**58.080**	**10.6**	**1.99 at 68 F**	**6.7**			
					290	3401	8
Xenon (Xe)	**131.300**	**—**	**4.560**	**2.9**			
Purified					580	3101 or 3201	6, 7
Research					580	3101 or 3201	6,7

*CGA Connection may vary depending upon cylinder size or gas manufacturer. Check with your gas supplier to determine actual CGA Connection.

PURE GASES IN LECTURE BOTTLES

Gas Grade	CGA Connection Number	Equipment Recommendation	Page #
Air			
Zero	170	3900	30
Dry	170/180*	3910	30
Allene			
	170	3910	30
Ammonia			
Anhydrous, 99.99%	110/180*	T3920	30
Argon			
Prepurified	170/180*	3910	30
Ultra High Purity	180	3900	30
Boron Trichloride			
CP	180	3992-180	31
Boron Trifluoride			
CP	180	T3920	30
1, 3 Butadiene			
CP	170	3910	30
Instrument	170	3910	30
Butane			
CP	170	3910	30
Instrument	180	3910	30
1-Butene			
CP	170	3910	30
cis-2-Butene			
Technical	170	3910	30
trans-2-Butene			
Technical	170	3910	30
(cis & trans) 2-Butene			
Technical	170	3910	30
Carbon Dioxide			
Bone Dry	170/180*	3910	30
CP	180	3910	30
Carbon Monoxide			
Commercial	170	3910	30
CP	170/180*	3910	30
Research	180	3900	30
Carbonyl Sulfide			
	180	T3920	30
Chlorine			
High Purity	110/180*	T3920	30
Ultra High Purity	180	T3920	30
Cyclopropane			
	170	3910	30

PURE GASES IN LECTURE BOTTLES

Gas Grade	CGA Connection Number	Equipment Recommendation	Page #
Deuterium			
CP	170/180*	3900	30
Dimethylamine			
	180	T3920	30
Dimethyl Ether			
	170	3910	30
Ethane			
CP	170/180*	3910	30
Ethyl Chloride			
CP	170	3992-170	31
Ethylene			
CP	170/180*	3910	30
Technical	170	3910	30
Ethylene Oxide			
	180	3991-180	31
Halocarbon 12 (Dichlorodifluoromethane)	170	3991	31
Halocarbon 13 (Chlorotrifluoromethane)	180	3991	31
Halocarbon 14 (Tetrafluoromethane)	170	3910	30
Halocarbon 22 (Chlorodifluoromethane)	170	3910	30
Halocarbon 114 (1,2-Dichlorotetrafluoroethane)	170	3910	30
Halocarbon 142B (1-Chloro-1, 1-Difluoroethane)	170	3910	30
Halocarbon C-318 (Octafluorocyclobutane)	170	3910	30
Halocarbon 1113 (Chlorotrifluoroethylene)	170	3910	30
Helium			
High Purity	170/180*	3900	30
Hexafluoropropylene			
	170	3910	30
Hydrogen			
Prepurified	170/180*	3910	30
Purified	170	3910	30
Ultra High Purity	180	3900	30
Hydrogen Bromide			
	110/180*	T3920	30

 *CGA Connection may vary depending upon cylinder size or gas manufacturer. Check with your gas supplier to determine actual CGA Connection.

PURE GASES IN LECTURE BOTTLES

Gas Grade	CGA Connection Number	Equipment Recommendation	Page #
Hydrogen Chloride			
Electronic	180	T3920	30
Technical	110/180*	T3920	30
Hydrogen Fluoride			
CP	180	3992-180	31
99.90%	180	3992-180	31
Hydrogen Sulfide			
CP	110/180*	T3920	30
Isobutane			
CP	170	3910	30
Instrument	170	3910	30
Isobutylene			
CP	170	3910	30
Krypton			
Research	180	3900	30
Methane			
CP	170/180*	3910	30
Instrument	180	3900	30
Purified	170	3910	30
Technical	170	3910	30
Ultra High Purity	170	3900	30
Ultra Pure	170	3900	30
Methyl Bromide			
	170	3992-170	31
Methyl Chloride			
	110/170/180*	3992	31
Methyl Mercaptan			
	180	2992	31
Monomethylamine			
	110/180*	3992	31
Nitrogen			
Prepurified	170/180*	3910	30
Ultra High Purity	170/180*	3900	30
Nitrous Oxide			
CP	170	3910	30
Oxygen			
Extra Dry	170/180*	3910	30
Zero	170	3900	30
Phosphorous Pentafluoride			
	330	T3920	30
Propane			
CP	170	3910	30
Instrument	170/180*	3900	30

PURE GASES IN LECTURE BOTTLES

Gas Grade	CGA Connection Number	Equipment Recommendation	Page #
Propylene			
CP	170/180*	3910	30
Sulfur Dioxide			
Anhydrous	180	T3920	30
Sulfur Hexafluoride			
CP	170	3910	30
Sulfur Tetrafluoride	110/180*	T3920	30
Trimethylamine	180	3992	30
Vinyl Bromide	180	3992	31
Vinyl Methyl Ether	180	3992	31

*CGA Connection may vary depending upon cylinder size or gas manufacturer. Check with your gas supplier to determine actual CGA Connection.

TWO COMPONENT GAS MIXTURES

Minor Component Balance Gas	CGA Connection Number	Equipment Recommendation	Page #
Acetaldehyde			
In Helium	350	3401 or 3501	8, 9
In Nitrogen	350	3401 or 3501	8, 9
Acrylonitrile			
In Helium	350	3401 or 3501	8, 9
In Nitrogen	350	3401 or 3501	8, 9
Ammonia			
In Air	660/705*	3401 or 3501	8, 9
In Argon	705	3401 or 3501	8, 9
In Helium	705	3401 or 3501	8, 9
In Hydrogen	330/660/705*	3401 or 3501	8, 9
In Nitrogen	330/660/705*	3401 or 3501	8, 9
Argon			
In Helium	580	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	580	3101 or 3201	6, 7
In Oxygen	296	3101 or 3201	6, 7
Benzene			
In Air	590	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Butane			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Carbon Dioxide			
In Air	580/590*	3101 or 3201	6, 7
In Argon	580	3101 or 3201	6, 7
In Carbon Monoxide	350	3101 or 3201	6, 7
In Helium	580	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	580	3101 or 3201	6, 7
In Oxygen	296/540*	3101 or 3201	6, 7
Carbon Disulfide			
In Argon	330	3401 or 3501	8, 9
In Helium	330	3401 or 3501	8, 9
In Nitrogen	330	3401 or 3501	8, 9
Carbon Monoxide			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Hydrogen			
In Nitrogen	350	3101 or 3201	6, 7
Carbonyl Sulfide	350	3101 or 3201	6, 7
In Argon	330	3401 or 3501	8, 9
In Helium	330	3401 or 3501	8, 9
In Nitrogen	330	3401 or 3501	8, 9

TWO COMPONENT GAS MIXTURES

Minor Component Balance Gas	CGA Connection Number	Equipment Recommendation	Page #
Chlorine			
In Argon	660	3470	15
In Helium	660	3470	15
In Nitrogen	330/660*	3470	15
Ethane			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Ethanol			
In Nitrogen	350	3101 or 3201	6, 7
Ethylene			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Ethylene Oxide			
In Air	590	3401 or 3501	8, 9
In Nitrogen	350	3401 or 3501	8, 9
Halocarbon 12			
In Air	590	3101 or 3201	6, 7
In Argon	580	3101 or 3201	6, 7
In Helium	580	3101 or 3201	6, 7
In Nitrogen	580	3101 or 3201	6, 7
Helium			
In Argon	580	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	580	3101 or 3201	6, 7
In Oxygen	296	3101 or 3201	6, 7
Hexane			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Hydrogen			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Hydrogen Chloride			
In Argon	330	3470	15
In Helium	330	3470	15
In Nitrogen	330	3470	15
Hydrogen Cyanide			
In Helium	350	3470	15
In Nitrogen	350	3470	15

*CGA Connection may vary depending upon cylinder size or gas manufacturer. Check with your gas supplier to determine actual CGA Connection.

TWO COMPONENT GAS MIXTURES

Minor Component Balance Gas	CGA Connection Number	Equipment Recommendation	Page #
Hydrogen Cyanide			
In Helium	350	3470	15
In Nitrogen	350	3470	15
Hydrogen Sulfide			
In Air	330	3401 or 3501	8, 9
In Argon	330	3401 or 3501	8, 9
In Helium	330	3401 or 3501	8, 9
In Hydrogen	330	3401 or 3501	8, 9
In Methane	330	3401 or 3501	8, 9
In Nitrogen	330	3401 or 3501	8, 9
Isobutane			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Methane			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Methanol			
In Nitrogen	350	3101 or 3201	6, 7
Methyl Mercaptan			
In Helium	330/350*	3401 or 3501	8, 9
In Nitrogen	330/350*	3401 or 3501	8, 9
Moisture			
In Argon	580	3101 or 3201	6, 7
In Helium	580	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	580	3101 or 3201	6, 7
Nitric Oxide			
In Argon	660	3401 or 3501	8, 9
In Helium	660	3401 or 3501	8, 9
In Nitrogen	660	3401 or 3501	8, 9
Nitrogen			
In Argon	580	3101 or 3201	6, 7
In Helium	580	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Oxygen	296	3101 or 3201	6, 7
Nitrogen Dioxide			
In Air	660	3401 or 3501	8, 9
In Argon	660	3401 or 3501	8, 9
In Helium	660	3401 or 3501	8, 9
In Nitrogen	660	3401 or 3501	8, 9
Nitrous Oxide			
In Air	590	3101 or 3201	6, 7
In Nitrogen	590	3101 or 3201	6, 7

TWO COMPONENT GAS MIXTURES

Minor Component Balance Gas	CGA Connection Number	Equipment Recommendation	Page #
Oxygen			
In Argon	**	3101 or 3201	6, 7
In Helium	**	3101 or 3201	6, 7
In Nitrogen	**	3101 or 3201	6, 7
Pentane			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Propane			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Propylene			
In Air	590	3101 or 3201	6, 7
In Argon	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Hydrogen	350	3101 or 3201	6, 7
In Nitrogen	350	3101 or 3201	6, 7
Sulfur Dioxide			
In Air	330/660*	3401 or 3501	8, 9
In Argon	660	3401 or 3501	8, 9
In Helium	660	3401 or 3501	8, 9
In Nitrogen	330/660*	3401 or 3501	8, 9
Sulfur Hexafluoride			
In Air	590	3101 or 3201	6, 7
In Argon	580	3101 or 3201	6, 7
In Helium	580	3101 or 3201	6, 7
In Nitrogen	580	3101 or 3201	6, 7
Toluene			
In Air	350	3101 or 3201	6, 7
In Helium	350	3101 or 3201	6, 7
In Nitrogen	350/510*	3101 or 3201	6, 7
Vinyl Chloride			
In Air	590	3401 or 3501	8, 9
In Helium	350	3401 or 3501	8, 9
In Nitrogen	350	3401 or 3501	8, 9

*CGA Connection may vary depending upon cylinder size or gas manufacturer. Check with your gas supplier to determine actual CGA Connection.
**CGA 590 when oxygen concentration is ≤ 23%. CGA 296 when oxygen concentration is >23%.

NUMERICAL INDEX

USEFUL CONVERSION FACTORS

Multiply	By	To Obtain
	Temperature	
°Fahrenheit (F) + 459.72	1	°F Absolute, or Rankine
°Fahrenheit (F) - 32	5/9	°Celsius (C)
°Celsius (C) + 273.16	1	°C Absolute, or Kelvin (K)
°Celsius (C) +17.78	1.8	°Fahrenheit (F)
°Rankine (R) - 459.72	1	°Fahrenheit (F)
°Kelvin (K) - 273.16	1	°Celsius (C)
	Pressure	
Atmospheres	760	Millimeters of Mercury
	29.921	Inches of Mercury
	33.93	Feet of Water
	10332	kg/m^2
	14.696	lbs.sq. in (psi)
	2216.2	lbs./sq. ft.
	1.0133	Bars
	1.0332	kg/cm^2
Centimeters of Mercury	5.3524	Inches of Water
	0.4460	Feet of Water
	0.1934	lbs./sq. in. (psi)
	27.854	lbs./sq. ft.
	135.95	kg/m^2
Feet of Water	0.02947	Atmospheres
	0.4335	lbs./sq. in. (psi)
	62.378	lbs./sq. ft.
Inches of Mercury	0.03342	Atmospheres
	13.60	Inches of Water
	1.133	Feet of Water
	0.4912	lbs./sq. in. (psi)
	70.727	lbs./sq. ft.
	345.32	kg/m^2
Inches of Water	0.03609	lbs./sq. in. (psi)
	5.1981	lbs./sq. ft.
	25.38	kg/m^2
Kilograms per square Centimeter (kg/cm^2)	0.9678	Atmospheres
	14.22	lbs./sq. in. (psi)
Kilograms per square Meter (kg/m^2)	0.00142	lbs./sq. in. (psi)
	0.20482	lbs./sq. ft.
	0.00328	Feet of Water
	0.1	g/cm^2
	9.80665	Pascals
Kilopascals	0.00987	Atmospheres
	0.29613	Inches of Mercury (60°F)
	0.33456	Feet of Water
	101.97162	kg/m^2
	0.14504	lbs./sq. in. (psi)
	20.88543	lbs./sq. ft.
	0.01000	Bars
	0.01020	kg/cm^2
Pounds per square inch (psi)	70.31	g/cm^2
	2.036	Inches of Mercury (60°F)
	2.311	Feet of Water
	6.8948	Kilopascals
	Flow	
Cubic Centimeters/min	0.000035	cubic feet/min
	0.0021	cubic feet/hour
	0.001	liters/min
Cubic Feet/hour	471.947	cubic centimeters/min
	0.4719	liters/min
	0.0166	cubic feet/min
Cubic Feet/min	60	cubic feet/hour
	28.316	liters/min
	28317	cubic centimeters/min
Liters/min	1000	cubic centimeters/min
	0.035	cubic feet/min
	2.119	cubic feet/hour

Dew Point – Moisture Content

Dew Point °F	Moisture, ppm (vol/vol.)
-130	0.1
-120	0.25
-110	0.63
-105	1.00
-104	1.08
-103	1.18
-102	1.29
-101	1.40
-100	1.53
-99	1.66
-98	1.81
-97	1.96
-96	2.15
-95	2.35
-94	2.54
-93	2.76
-92	3.00
-91	3.28
-90	3.53
-89	3.84
-88	4.15
-87	4.50
-86	4.78
-85	5.3
-84	5.7
-83	6.2
-82	6.6
-81	7.2
-80	7.8
-79	8.4
-78	9.1
-77	9.8
-76	10.5
-75	11.4
-74	12.3
-73	13.3
-72	14.3
-71	15.4
-70	16.6
-69	17.9
-68	19.2
-67	20.6
-66	22.1
-65	23.6
-64	25.6
-63	27.5
-62	29.4
-61	31.7
-60	34.0

Parts Per Million – Percent

1 ppm	=	0.0001%
10 ppm	=	0.001%
100 ppm	=	0.01%
1000 ppm	=	0.1%
10000 ppm	=	1.0%
100000 ppm	=	10.0%
1000000 ppm	=	100.0%

Volume

Cubic Feet	28317	Cubic Centimeters
	28.32	Liters
	0.0283	Cubic Meters
	1728	Cubic Inch