9

Regulators

Introduction

The BOC range of scientific gases equipment within this section has been selected on the basis of its compatibility with the intended duty.

The key issues in the handling of scientific gases are:

- Safety (particularly very toxic gases) and
- Reticulation without change in purity.

The range allows great flexibility of design so please contact BOC Scientific to discuss your specific gas control requirements.

The BOC range of scientific gases equipment consists of:

- Regulators
- Manifolds
- Control valves
- Flow meters
- Purge assemblies
- The necessary installation services and accessories

Considerations When Specifying A Scientific Regulator

The following must be carefully considered when choosing a regulator for scientific applications:

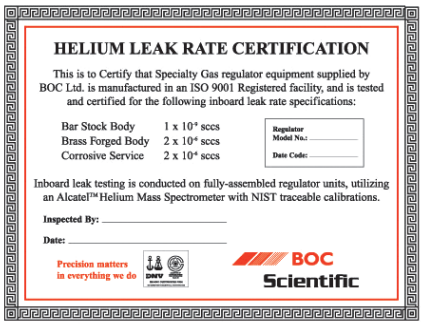
- Type of gas and its characteristics
- Compatibility of gas with materials of construction
- Maximum anticipated inlet pressure (kPa or psig)
- Outlet pressure range required (kPa or psig) and accuracy / tolerance
- Flow rate required and range (litres/minute)
- The importance of maintaining constant pressure throughout the application. This will determine whether a single or dual stage regulator should be used.

While all pressure regulators operate in a similar manner it is incorrect to assume that the same regulators may be suited to both industrial and high purity gas applications.

The significant differences in the design and materials of construction of scientific regulators differentiate them from industrial regulators.

The following information is provided to allow the users of high purity gases to determine the type of regulator that will best suit their intended application.

Our Scientific Sales Specialist and/or Scientific Support Centre can assist you in making the correct selection and also organise the supply of the required gas or gases in the optimum container size(s). For further details please contact 1800 658 278 (AUS) or 0800 111 949 (NZ).


HELIUM LEAK RATE CERTIFICATION

This is to Certify that Specialty Gas regulator equipment supplied by BOC Ltd. is manufactured in an ISO 9001 Registered facility, and is tested and certified for the following inboard leak rate specifications:

Bar Stock Body	1 x 10^{-9} sccs
Brass Forged Body	2 x 10^{-8} sccs
Corrosive Service	2 x 10^{-8} sccs

Regulator Model No.:
Date Code:

Inboard leak testing is conducted on fully-assembled regulator units, utilizing an Alcatel™ Helium Mass Spectrometer with NIST traceable calibrations.

Inspected By:

Date:

Precision matters in everything we do

BOC Scientific

Regulator Design For High Purity Duty (Scientific)

Scientific or high purity regulators are used to reduce and regulate the flow of high pressure gas from either a cylinder or pipeline and to deliver at desired pressure for the application to hand. They maintain the selected or set delivery pressure as the pressure in the gas cylinder decreases whilst gas is being withdrawn.

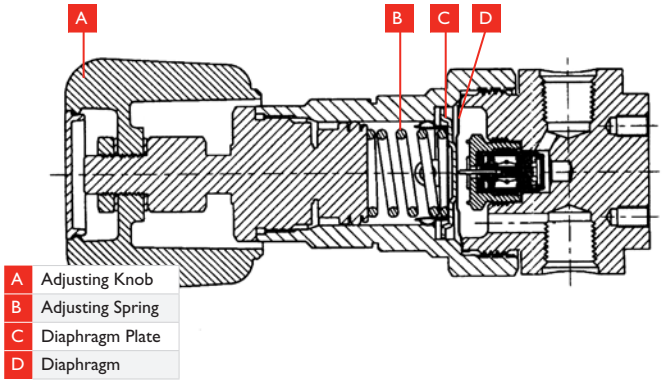
The primary objective of a scientific regulator is to maintain the quality and integrity of your high purity gas such that it is not contaminated by the materials with which the gas comes into contact with inside the regulator.

The regulator must not allow;

1. air to leak into the gas stream (atmospheric contamination)
2. gas to leak to the atmosphere or be absorbed within the regulator (potential workplace contamination)
3. off-gassing from materials of construction (internal contamination)

How Regulators Control Your Gas Flow

Single Stage Regulators



A	Adjusting Knob
B	Adjusting Spring
C	Diaphragm Plate
D	Diaphragm

The regulator controls the set pressure by balancing the outlet gas pressure on the diaphragm against the compressed spring.

When the adjusting knob is screwed in, the spring is forced down on to the diaphragm, which pushes down on the seat spindle. Once the spindle is forced away from its seat high pressure gas enters the low pressure chamber of the regulator.

If the outlet from the regulator is isolated, pressure builds up in the regulator low pressure chamber until the diaphragm compresses the main spring. This will cause the spindle to 'reseat', shutting off the gas flow from the high pressure gas inlet.

When the gas is used downstream the pressure in the low pressure chamber drops, allowing the main spring to force the diaphragm down again, opening the spindle and raising the pressure in the low pressure chamber.

Why delivery pressure gradually rises with single stage regulators

The set outlet pressure for a single stage regulator will remain constant as long as its inlet pressure remains constant. However, in the case where the regulator is used directly on a gas cylinder, the inlet pressure will decrease as the gas cylinder's content is depleted and the outlet pressure will rise.

The reason that this occurs is that decrease in the gas cylinder pressure (i.e. regulator inlet pressure) reduces the force on the high pressure side of the seat therefore causing a corresponding rise in the outlet pressure. The rise in outlet pressure (as inlet pressure decreases) of most single stage regulators is between 5–7 kPa per 1000 kPa.

This means that the outlet pressure will rise approximately 70–110 kPa over the life of a cylinder if the adjusting knob (i.e. spring compression) is not readjusted to compensate for the drop in the cylinder gas pressure.

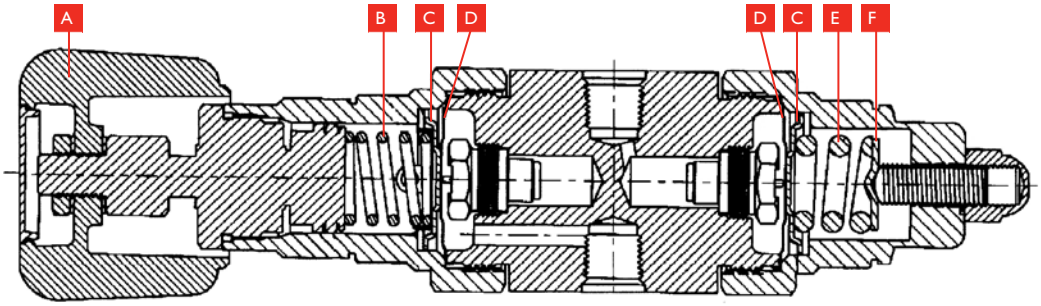
Single Stage Regulator Applications

Single stage regulators are suited for:

- Processes which are insensitive to the pressure increase. (i.e. as the cylinder pressure decreases).
- Short term gas delivery applications (typically <20 mins) e.g. the introduction of sample gas from a cylinder for analysis to an analytical instrument such as gas chromatograph, process analyser etc.
- Control of pressure from cylinders containing liquefied gases.

NOTE At constant ambient temperature, the pressure in gas cylinders containing liquefied gases remains constant until the liquid contents runs out.

Dual Stage Regulators



A	Adjusting Knob
B	L.P.Adj. Spring
C	Diaphragm Plate
D	Diaphragm
E	H.P.Adj. Spring
F	Spring Button

The main difference with dual stage pressure regulation is that the regulator is designed to maintain a more constant outlet pressure.

The first stage provides the initial primary pressure breakdown to a value slightly more than the maximum required outlet pressure.

This means the second stage has a smaller pressure differential to contend with and as a result the combined effect of using two stages will give finer pressure control with less variation.

A dual stage regulator is effectively two single stage regulators in one regulator body.

- The first stage is pre-set at an intermediate pressure, normally 3500 kPa or below.
- The second stage is adjustable and reduces the intermediate pressure to the desired pressure.

Since the second stage sees only minor variations in inlet pressure from the first stage, outlet pressure will remain constant throughout the life of a cylinder.

Dual Stage regulator applications

- Processes which are sensitive to small changes in pressure.
- Long term pressure control of cylinders of permanent gases

e.g. for use with carrier gases for gas chromatographs.

The Materials of Construction for Scientific Regulators

The primary consideration when selecting a regulator for a high purity gas service is to ensure that all materials which come in contact with the gas are stable and compatible with the gas. they should also be stable under the anticipated pressure and temperature range. It is also important to select regulators that keep to a minimum the number of materials which come in contact with the gas.

The Body

The body of the regulator has the largest surface area exposed to the gas. The two materials most commonly supplied for the body of a high purity gas service regulator are brass and 316 stainless steel.

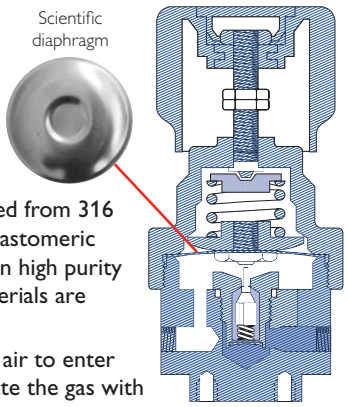
Brass Body: Regulator bodies made from brass are completely machined from a single piece of brass. Their body cavities are normally designed to minimise the internal area and permit thorough purging. Brass is recommended for inert and high purity gas service.

Stainless steel Body: Grades 316 and 316L offer the highest level of compatibility with a wide range of high purity gases.

Regulators with 316 stainless steel bodies are recommended for;

- Corrosive gas service
- Reactive gas mixtures
- Ultra high purity gas service.

The Diaphragm



The two key issues for material selections are the diaphragm and the method of sealing the diaphragm.

Diaphragms for all high purity applications must be manufactured from 316 stainless steel. Regulators with elastomeric diaphragms must never be used in high purity gas applications. Elastomeric materials are porous and will;

1. Allow significant quantities of air to enter the gas stream and contaminate the gas with air (mainly, oxygen, nitrogen and moisture).
2. Allow adsorption of some gases into the elastomeric diaphragm. This will also alter the composition of the gas mixture flowing over it.

The use of a 316 stainless steel diaphragm will eliminate both of these possibilities.

The body/diaphragm interface will determine the leak integrity of the regulator. A metal to metal seal, without an O ring or coatings, ensures the highest integrity. Metal to metal seals can limit helium leak rates to the range of $1x10^{-9}$ cc/sec He*. Regulators with secondary seals at the diaphragm typically have leak rates in the range of $1x10^{-8}$ cc/sec He.

* He (Helium gas) has a very small molecular size which means it is ideal for leak testing. The flow rates quoted are extremely low.

The Seat

Regulator seats must be made of a soft resilient material to ensure a high integrity seal between the high and low pressure sections of the regulator. The seat material must be compatible with the gas service. The best materials for high purity service are from the Teflon® family of materials.

®DuPont registered trademark

How Gas Characteristics Affect Regulator Selection

Other than dictating the type of material required for the regulator, the gas application determines the type of inlet connection that should be specified for the regulator. This makes it impossible to connect unsuitable equipment to a cylinder.

If any doubt exists as to the proper connection, a BOC Scientific Sales Specialist should be consulted.

High purity Gases may be separated into categories based on their properties as follows.

Inert gases

Inert gases are non-corrosive and generally compatible with most materials. However, for instrument calibration or purging applications, it is possible for high purity gases such as nitrogen, argon and helium to become contaminated by the diaphragm and/or sealant materials used in common industrial regulators.

High purity gas regulators which have a brass body with a 316 stainless steel diaphragm, are usually acceptable for inert gas service.

Ultra high purity gas applications require a regulator with a stainless steel body and a 316 stainless steel diaphragm.

Corrosive gases

Corrosive gases present special challenges in the selection of regulators.

Most of the gases classified as corrosive (e.g., HCl, Cl_2 and H_2S) are corrosive only in the presence of moisture.

Regulators made entirely of 316 stainless steel are recommended for high purity corrosive gas service, but these also must be kept dry to avoid rapid corrosion of the regulator's interior. Where wet corrosive gases are handled, it may be necessary to specify a regulator made of more exotic materials, such as Monel, Hastelloy, nickel plated brass or polyvinyl chloride.

Toxic gases

Toxic gases present a potential safety hazard in the work place and special care must be exercised to prevent their release into the atmosphere. Thus, it is extremely important that regulators selected for toxic gas service be equipped to capture any release.

Gas is most likely to leak from the spring case if the diaphragm fails. To prevent external leakage, a toxic gas regulator should be equipped with a sealed spring case and a captured vent assembly. This allows for venting the gas from the spring case to a safe location. A pressure relief valve must be fitted immediately after the regulator to protect low pressure components downstream should the regulator valve assembly fail to seal. The pressure relief valve must be piped to a suitable disposal system.

Inlet pressure

The standard high pressure inlet rating for regulators is 20,000 kPa settled. There are however, High Pressure (HP) and Extra High Pressure (EHP) cylinders with ratings of up to 40,000 kPa. In addition, many high purity gases are liquefied or are stored at low pressure. For these gases a regulator with an appropriately ranged inlet pressure gauge will enable the user to assess a cylinder's contents more accurately.

At Standard Temperature and Pressure (1 atmosphere and 15 degrees Centigrade)

Outlet pressure

Regulators are designed with different adjustment springs in the spring case to achieve a specific outlet pressure range. The low end range is normally 0–100 kPa but may be as low as 0–13 kPa. The upper limit in the diaphragm type regulator is usually about 3500 kPa.

Flow rate

Flow requirements for most High Purity Gas applications will be fairly low and are expressed in litres per minute (LPM). Flow curves display a graph of Maximum Flow as a function of Inlet Pressure and Outlet Pressure.

Graphs show the maximum flow obtainable from a regulator at a given outlet pressure for a set inlet pressure.

Although a regulator should not be used to control flow, they are designed for high, medium and low flow performance. Flow curves are used to determine if a regulator will meet the flow requirement of a specific application. A flowmeter and control valve can be incorporated into the process line to control and indicate flow.

Guide to BOC Part Numbering System

Example

H	P	S	5	0	0	-	1	2	5	-	5	8	0	-	4	S		
HPS			500				125				580				4S			

Regulator Series

Option

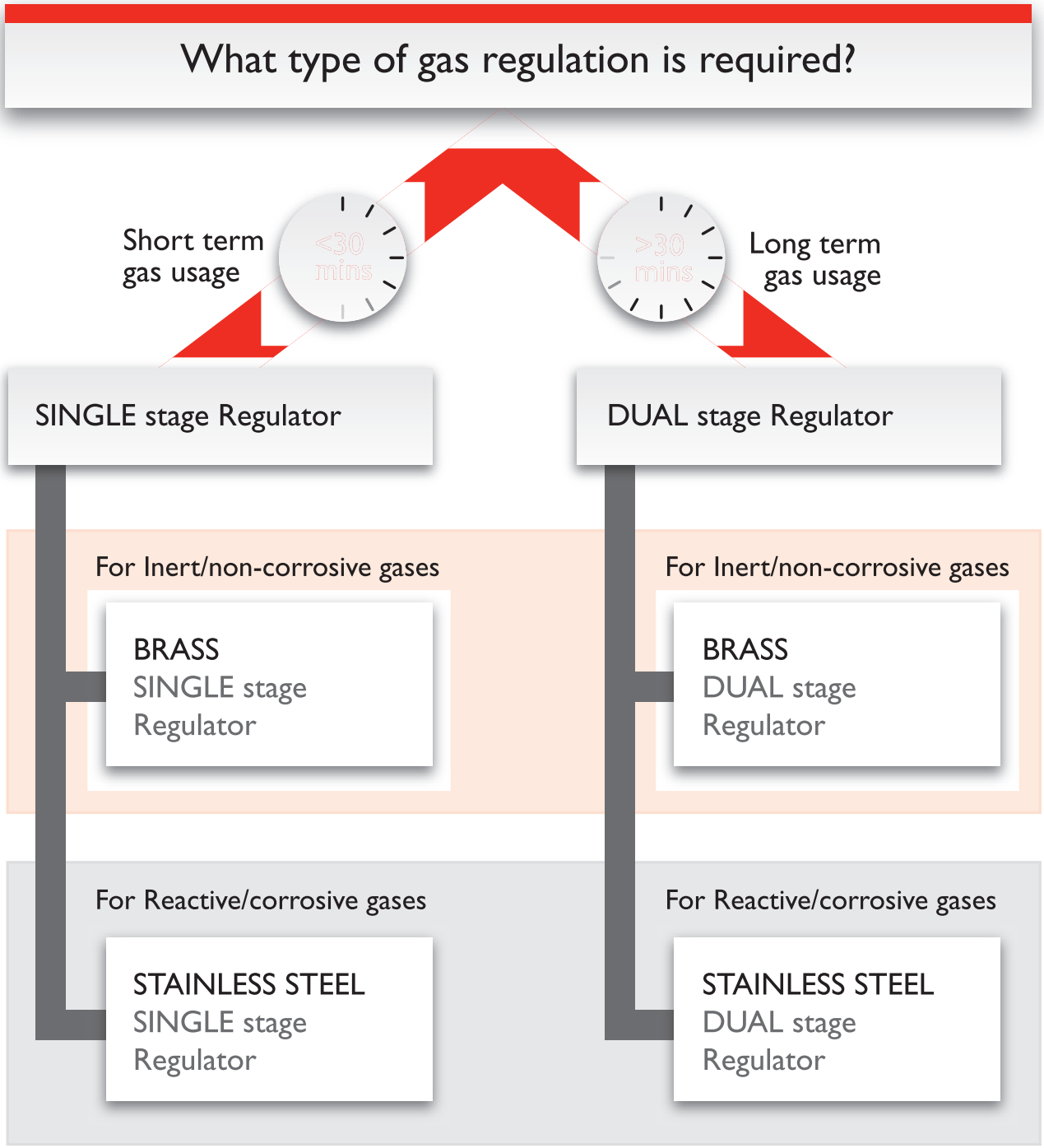
HPS	Type of Regulator
HPS	High Purity Single Stage
HPT	High Purity Dual Stage
HPL	High Purity Line
GPS	General Purpose Single Stage
SGS	Corrosion Resistant Single Stage
SGT	Corrosion Resistant Dual Stage
SGL	Corrosion Resistant Line
LB	Lecture Bottle

125	Delivery Pressure (psi) Outlet Pressure Range
15	0–15 psi (104 kPa)
40	0–40 psi (276 kPa)
80	0–80 psi (552 kPa)
125	0–125 psi (863 kPa)
200	0–200 psi (1,380 kPa)
300	0–300 psi (2,070 kPa)
500	0–500 psi (3,450 kPa)
NOTE Delivery pressure must be quoted in psi.	

580	Inlet Fitting Cylinder to regulator
Brass (sometimes Chrome plated)	
10	Type (Australian Std)
20	
30	
50	
60	
110	CGA (International Std)
580	
350	
346	
540	
590	
Stainless Steel:	
15	Type (Australian Std)
32	
44	
705	CGA (International Std)
660	
330	
240	

4S	Outlet Fitting Regulator to the hose
BV	Shut-off Valve 1/4″
DK	DRK diaphragm 1/4″
4M	1/4″ male fitting
4F	1/4″ female fitting
2S	1/8″ Swagelok
4S	1/4″ Swagelok (most commonly used)
FM	Flowmeter

Scientific Regulator Selection Guide



Scientific Regulator Quick Reference Chart

If the following tables do not contain a regulator to suit your requirements, please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Regulator Model	Typical Usage	Regulator Description	Max. Inlet Pressure (kPa)	Outlet Pressures Available (kPa)	Refer Page No
Inert and Non-Corrosive Gases – Short Term Applications These single stage regulators may be used where a slight variance in delivery pressure is acceptable as cylinder pressure decreases. Typically for gas application time frames of <30 minutes.					
HPS500	For very High purity, non-corrosive gas applications Use with High Purity Hydrocarbons, Inert, Oxidising, Rare and Flammable Gases NOTE: Cannot be used for Acetylene	Single Stage Brass Regulator	20,000	0–105 0–280 0–560 0–875 0–1400 0–2800 0–3500	
HPS270	Use with High Purity, Inert and Rare Gases where better control over low delivery pressures is required.	Single Stage forged Brass Regulator	20,000	0–105	
HPS280	Use with High Purity Acetylene	Single Stage forged Brass Regulator	20,000	0–105	
Inert and Non-Corrosive Gases – Long Term Applications These dual stage regulators should be used where constant delivery pressure is critical and/or when the gas application time frame is more than 30 minutes.					
HPT500	For very High purity, non-corrosive gas applications where constant delivery pressure is required as cylinder pressure decreases. Use with High Purity Hydrocarbons, Inert, Oxidising, Rare and Flammable Gases NOTE: Cannot be used for Acetylene	Dual Stage Brass Regulator	20,000	0–280 0–560 0–875 0–1400 0–2800 0–3500	
HPT270	Use with High Purity, Inert, and Rare Gases where better control over low delivery pressures is required.	Dual Stage Forged Brass Regulator	20,000	0–105	
Reactive and Corrosive Gases – Short Term Applications These single stage regulators may be used where a slight variance in delivery pressure is acceptable as cylinder pressure decreases. Typically for gas application time frames of <30 minutes.					
SGS500	For very High purity, reactive gas applications where slight variance in delivery pressure is acceptable as cylinder pressure decreases. Use with critical High Purity, mild corrosive or toxic gas applications.	Single Stage Stainless Steel Regulator	20,000	0–105 0–280 0–560 0–875 0–1400 0–2800 0–3500	
LB165	Lecture bottles containing corrosive gases	Single Stage Regulator	20,000	0–105 0–280	
S455	Toughest demands. Usage with low pressure corrosive gases such as Chlorine and Hydrogen Chloride	Single Stage Corrosive Gas Regulator	20,000	0–100 0–280 0–840	
S408	For toxic, low pressure gases such as Ammonia and Sulphur Dioxide	Single Stage Mildly Corrosive Gas Regulator	20,000	0–105 0–350	

Regulator Model	Typical Usage	Regulator Description	Max. Inlet Pressure (kPa)	Outlet Pressures Available (kPa)	Refer Page No
Reactive Gases and Corrosive Gases – Long Term Applications These dual stage regulators should be used where constant delivery pressure is critical and/or when the gas application time frame is more than 30 minutes.					
SGT500	For very High purity, reactive gas applications. Use with critical High Purity, mild corrosive or toxic gas applications.	Dual Stage Stainless Steel Regulator	20,000	0–105 0–280 0–560 0–875 0–1400 0–2800 0–3500	

Scientific Regulator Selection Chart

Gas	Regulator Body/Series	Inlet Connection
Acetylene	HPS280	CGA 510 (1B, 2B), Type 20 (G,E,D)
Air zero grade Instrument grade	HPS500, HPT500, HP54	AS 2473 Type 60, Type 61
Alpha, Beta and Spectra-Seal™ Mixtures:		
Non Flammable	HPS500, HPT500	Type 10
Oxidising	HPS500, HPT500	Type 10
Flammable	HPS500, HPT500	Type 20
Flammable, Toxic	HPS500, HPT500	Type 20
Corrosive, Toxic	SGS500, SGT500	Type 44 (or BS No. 14)
Corrosive, Toxic, Flammable	SGS500, SGT500	BS No. 15
Ammonia	LB165 S408	CGA 180 (LB) CGA 660 (QF, UF) Type 32 (WT, WH, S,R)
Argon	HPS500, HPT500	Type 10 CGA 580 (B, 1A)
Arsine	SGS500	CGA 350
Boron Trichloride	Not required – use control valve	CGA 660
1,3 Butadiene	LB150	CGA 170 (LB) CGA 510
n-Butane	LB150	CGA 170 (LB) CGA 510
1-Butene	LB150	CGA 170 (LB) CGA 510
2-Butene (cis and trans)	LB150	CGA 170 (LB) CGA 510
Carbon Dioxide	HPS500, HPT500	AS 2473 Type 30 (D, E, F, G)
Carbon Monoxide	LB150 HPS500, HPT500	CGA 170 (LB) CGA 350 Type 20 (D)
Carbonyl Sulphide	LB165 SGS500, SGT500	CGA 180 (LB) CGA 330

Gas	Regulator Body/Series	Inlet Connection
Chlorine (high purity)	LB165 S455	CGA 180 (LB) CGA 660
Cyanogen	SGS500	CGA 660
Deuterium	LB150 HPS500, HPT500	CGA 170 (LB) CGA 350
Dichlorosilane	Not required – use control valve	CGA 678
Dimethylether	Not required – use control valve	CGA 170 (LB) CGA 510
Ethane	LB150 HPS500	CGA 170 (LB) CGA 350
Ethylene (technical grade)	LB150 HPS500, HPT500	CGA 170 (LB) CGA 350 AS2473 Type 20 (D, G)
Ethylene Oxide	Not required – use control valve	AS2473 Type 40
Germane	HPS501	CGA 350
Halocarbon 11, 12, 113, 114, 115, 142b, C318	Not required – use control valve	CGA 660 CGA 170 (LB)
Halocarbon 13, 1113, 116, 13B1, 115, 142b, 23,	LB150 HPS501	CGA 170 (LB) CGA 510
Helium	HPS500, HPT500, HP54	AS2473 Type 10 CGA 580 (1A, 6)
Hexafluoropropylene	LB150 SGS501	CGA 170 (LB) CGA 660
Hydrogen	HPS500, HPT500, HP54	CGA 350 AS2473 Type 20 (D, E, G)
Hydrogen Bromide	LB165 SGS500	CGA 180 (LB) CGA 330
Hydrogen Chloride (high purity)	LB165 SGS500 S455	CGA 180 (LB) CGA 330
Hydrogen Fluoride	Not required – use control valve	CGA 180 (LB) CGA 660
Hydrogen Selenide	HPS501	CGA 350
Hydrogen Sulphide	LB165 SGS500	CGA 180 (LB) CGA 330
Isobutane (research grade)	Not required – use control valve	CGA 170 (LB) CGA 510
Krypton	HPS500, HPT500	CGA 580
Methane (technical grade)	LB150 HPS500, HPT500	CGA 170 (LB) CGA 350 AS2473 Type 20 (D)
Methyl Bromide	Not required – use control valve	CGA 170 (LB) CGA 320
Methyl Chloride	Not required – use control valve	CGA 170 (LB) CGA 660
Methyl Fluoride	LB165 SGS501	CGA 180 (LB) CGA 350

Gas	Regulator Body/Series	Inlet Connection
Methyl Mercaptan	Not required – use control valve	CGA 180 (LB) CGA 330
Neon	LB165 HPS500, HPT500	CGA 180 (LB) CGA 580
Nitric Oxide	SGS500, SGT500	CGA 660 BS 15
Nitrogen	HPS500, HPT500, HP54	CGA 580 (1A,6) AS 2473 Type 50, 51
Nitrogen Dioxide	Not required – use control valve	CGA 660
Nitrogen Trifluoride	Not required – use control valve	BOC679
Nitrous Oxide (Atomic Absorption)	HPS500, HPT500 GPS270	AS 2473 Type 30 (D, E, G)
Oxygen	HPS500, HPT500 HP54	CGA 540 AS 2473 Type 10 (D, E G)
Perfluoropropane	Not required – use control valve	CGA 660
Phosgene	Not required – use control valve	CGA 660
Phosphine	SGS500, HPS500	CGA 350
Phosphorous Pentafluoride	SGS500	CGA 660
Propadiene (Allene)	LB150 HPS500, HPT500, HPS501, HPT501	CGA 170 (LB) CGA 510
Propane	LB150 HPS501	CGA 170 (LB) CGA 510
Propylene	LB150 HPS501	CGA 170 (LB) CGA 510
Silane	SGS530	CGA 350
Silicon Tetrafluoride	SGS500	CGA 330
Sulphur Dioxide	Use control valve or S408	CGA 180 CGA 660 AS 2473 Type 32 (P, R)
Sulphur Hexafluoride	LB150 HPS500	CGA 170 (LB) CGA 590 AS 2473 Type 31 (D, G)
Sulphur Tetrafluoride	SGS500, SGT500, HPS501, HPT501	CGA 330
Xenon	HPS500	CGA 580

Model HPS500

Single stage regulator with chrome plated brass body

Short Term Applications

- High purity hydrocarbons
- Inert gases
- Oxidising gases
- Rare gases
- Flammable gases (except acetylene)

Features

Single Stage Brass Chrome Plated for Corrosion Resistance – Regulator for Hydrocarbons Inert, Oxidising, Rare and Flammable Gases

- Metal to metal diaphragm seal
- Brass bar stock body with minimum gas wetted area for optimum purging
- Helium leak rate of $1x10^{-9}$ scc/sec
- Regulator fitted with pressure gauges, pressure relief valve, cylinder connection and outlet fitting

Applications

- Chromatography
- Reticulation systems
- Purge systems
- Instrument calibration
- Sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating temperature	-17°C to 65°C
Pressure rise	<4 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.083
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Chrome plated brass bar stock
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Teflon™

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G01921	0–875	AS Type 10	Non Flammable e.g. Oxygen, Argon
G0284	0–875	AS Type 50	Nitrogen
G0285	0–875	AS Type 60	Air
G10048	0–875	CGA 540	Oxygen
G01922	0–875	AS Type 20	Flammable e.g. Hydrogen
G01923	0–875	CGA 350	Carbon Monoxide, Deuterium, Ethane, Germane, Hydrogen Selenide, Methane
G01924	0–875	CGA 510	Allene, Halocarbons, Propane, Propylene
G10002	0–875	CGA 580	Rare and inert e.g. Argon, Helium, Krypton, Neon, Nitrogen, Xenon
G01991	0–875	CGA 590	Non flammable e.g. Sulphur hexafluoride
G10047	0–875	AS Type 30	Non flammable e.g. Carbon Dioxide, Nitrous oxide
G01989	0–875	CGA 320	Liquefiable gases e.g. Carbon Dioxide

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model HPS270

Single stage regulator with chrome plated brass body

Short Term Applications

- High purity gases
- Inert gases
- Rare gases
- Better control over low delivery pressures

Features

Single Stage Brass Regulator for Hydrocarbons, Inert, Oxidising, Rare and Flammable Gases

- Metal to metal diaphragm seal
- Brass forged body
- Helium leak rate of $1x10^{-8}$ scc/sec
- Regulator fitted with pressure gauges, pressure relief valve, cylinder connection and outlet fitting

Applications

- Chromatography
- Reticulation systems
- Purge systems
- Instrument calibration
- Sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-17°C to 65°C
Pressure rise	<3.5 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.05
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Chrome plated forged brass
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	PCTFE™ and Viton®

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G0345	0–105	AS Type 50	Nitrogen

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model HPS280

Short Term Applications

- High Purity Acetylene

Single stage regulator with chrome plated brass body

Features

Single Stage Brass Regulator for Acetylene

- Metal to metal diaphragm seal
- Brass forged body
- Helium leak rate of $1x10^{-8}$ scc/sec
- Regulator fitted with pressure gauges, cylinder connection and outlet fitting

Applications

- Atomic Absorption analytical instrumentation
- Reticulation systems
- Instrument calibration
- Sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-17°C to 65°C
Pressure rise	<3.5 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.05
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Chrome plated forged brass
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	PCTFE™ and Viton®

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G10038	105	Type 20	Acetylene

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model HPT500

Dual stage regulator with chrome plated brass body

Long Term Applications

- High purity hydrocarbons
- Inert gases
- Oxidising gases
- Rare gases
- Flammable gases (except acetylene)

Features

Two Stage Brass Chrome Plated Regulator for Hydrocarbons, Inert, Oxidising, Rare and Flammable Gases

- Metal to metal diaphragm seal
- Brass bar stock body with minimum gas wetted area for optimum purging
- Helium leak rate of $1x10^{-9}$ scc/sec
- Regulator fitted with pressure gauges, pressure relief valve, cylinder connection and outlet fitting

Applications

- Chromatography
- Reticulation systems
- Purge systems
- Instrument calibration
- Sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-17°C to 65°C
Pressure rise	<0.5 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.128
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Chrome plated brass bar stock
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Teflon™

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G01926	0–875	AS Type 10	Non Flammable e.g. Oxygen, Argon
G0294	0–875	AS Type 50	Nitrogen
G0295	0–875	AS Type 60	Air
G01947	0–875	AS Type 20	Flammable e.g. Hydrogen
G01948	0–875	CGA 350	Carbon Monoxide, Deuterium, Ethane, Germane, Hydrogen Selenide, Methane
G01950	0–875	CGA 510	Allene, Halocarbons, Propane, Propylene
G01949	0–875	CGA 580	Rare and inert e.g. Argon, Helium, Krypton, Neon, Nitrogen, Xenon
G01994	0–875	CGA 590	Non flammable e.g. Sulphur hexafluoride
G10049	0–875	AS Type 30	Non flammable e.g. Carbon Dioxide, Nitrous Oxide
G01993	0–875	CGA 320	Liquefiable gases e.g. Carbon Dioxide

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model HPT270

Dual stage regulator with brass body

Long Term Applications

- High purity gases
- Inert gases
- Rare gases
- Better control over low delivery pressures

Features

Two Stage Brass Regulator for Inert and Rare gases

- Metal to metal diaphragm seal
- Brass forged body
- Helium leak rate of $1x10^{-8}$ scc/sec
- Regulator fitted with pressure gauges, pressure relief valve, cylinder connection and outlet fitting

Applications

- Chromatography
- Reticulation systems
- Purge systems
- Instrument calibration
- Sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-17°C to 65°C
Pressure rise	<0.7 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.04
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

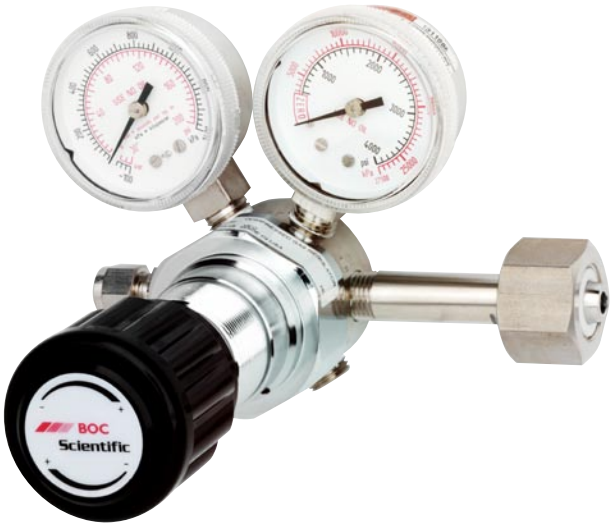
Body	Bar stock brass
Bonnet	Nickel-plated Brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Viton®

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G0346	0–105	AS Type 50	Nitrogen

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model SGS500



Single stage regulator with stainless steel body

Short Term Applications

- Reactive gases
- Mild corrosive gases
- Toxic gases

Features

Single Stage Stainless Steel Regulator for Reactive or toxic gas applications

- Metal to metal diaphragm seal
- Stainless Steel bar stock body with minimum gas wetted area for optimum purging
- Helium leak rate of $1x10^{-9}$ scc/sec
- Regulator fitted with pressure gauges, cylinder connection and outlet fitting

Applications

- Gas chromatography
- Regulation of Corrosive gases
- Epitaxial Reactors
- Diffusion furnaces
- Research sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-40°C to 65°C
Pressure rise	<4 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.083
Inlet and Outlet Ports	1/4″ NPT(F)

Materials of Construction

Body	Bar stock 316L Stainless steel
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Teflon™

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G01925	0–875	CGA 660	Corrosive, Toxic eg, Cyanogen, Halocarbons, Hexafluoropropylene, Nitric Oxide, Phosphorous Pentafluoride
G10003	0–875	CGA 330	Corrosive, Toxic e.g. Carbonyl Sulphide, Hydrogen Bromide, Hydrogen Chloride, Hydrogen Sulphide, Sulphur Tetrafluoride
G01952	0–875	BS15 – LH Spectra-Seal	Flammable, Corrosive, Toxic i.e. BOC Spectra Seal mixtures
G01951	0–875	Type 44 – RH Spectra-Seal	Corrosive, Toxic i.e. BOC Spectra Seal mixtures

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model LB165

Single stage regulator with stainless steel body

Short Term Applications

- Lecture bottles containing corrosive gases

Features

- Designed for use with corrosive lecture bottle service
- Compact and light weight
- Stainless steel needle outlet valve
- Helium leak rate of 2×10^{-9} scc/sec
- Outlet connection 1/4″ NPT male
- Regulator fitted with pressure gauges, pressure, cylinder connection and outlet fitting

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-17°C to 65°C
Pressure rise	<2 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.05
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Bar stock 316L Stainless steel
Bonnet	Nickel-plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Teflon®
Gauges	Stainless steel

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G01927	280	CGA 180	Corrosive e.g. Carbonyl Sulphide, Hydrogen Bromide, Hydrogen Chloride, Hydrogen Fluoride, Hydrogen Sulphide, Methyl Fluoride, Neon

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model S455

Short Term Applications

- Highly corrosive gases
- Chlorine
- Hydrogen Chloride

Single stage regulator with nickel plated brass body

Features

Constructed to resist attack from strong acid forming gases such as the Halogens

- Direct controlled seal for added safety and positive shut-off
- Special vented bonnet with connection for venting hazardous materials safely in the event of diaphragm failure
- Gauges, nozzles and outlet valve constructed of Monel®

Applications

- Precise regulation of low pressure corrosive gases

Specifications

Maximum inlet pressure	20,000 kPa
Adjustable outlet pressure range	0–100 kPa 0–280 kPa 0–840 kPa
Operating Temperature	-28°C to 60°C
Flow Coefficient	CV = 0.2
Inlet and Outlet Ports	1/4″ NPT (M)

Materials of Construction

Body	Nickel plated forged brass
Bonnet	Nickel plated brass
Diaphragm	316L stainless steel
Seat	PTFE®
Seals	PTFE®
Gauges	Monel
Body Porting	1/4″ NPT (F)

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G0758	0–840	CGA 330	Corrosive e.g. Hydrogen Chloride

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model S408

Short Term Applications

- Mildly corrosive gases
- Ammonia
- Sulphur Dioxide

Single stage regulator with anodised aluminium body

Features

Constructed to resist attack from mild acid forming gases

- 316L stainless steel diaphragm – no inboard diffusion
- Special vented bonnet with connection for venting hazardous materials safely in the event of diaphragm failure
- Gauges, nozzles and outlet valve constructed of Monel®
- Pipe away relief valve safely vent exhaust gases

Applications

- Precise regulation of low pressure corrosive gases

Specifications

Maximum inlet pressure	20,000 kPa
Adjustable outlet pressure range	0–100 kPa 0–350 kPa
Operating Temperature	-28°C to 60°C
Flow Coefficient	CV = 0.1
Inlet and Outlet Ports	1/4″ NPT (M)

Materials of Construction

Body	Anodised aluminium bar stock
Bonnet	Anodised aluminium bar stock
Diaphragm	316L stainless steel
Seat	PTFE®
Seals	PTFE®
Gauges	Stainless steel
Body Porting	1/4″ NPT (F)

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G0741	0–100	Type 32	Sulphur Dioxide
G0742	0–350	Type 32	Ammonia

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Model SGT500

Dual stage regulator with stainless steel body

Long Term Applications

- Reactive gases
- Mild corrosive gases
- Toxic gases

Features

Two Stage Stainless Steel Regulator for Reactive or toxic gas applications:

- Metal to metal diaphragm seal
- Stainless Steel bar stock body with minimum gas wetted area for optimum purging
- Helium leak rate of $1x10^{-9}$ scc/sec
- Regulator fitted with pressure gauges, cylinder connection and outlet fitting

Applications

- Gas chromatography
- Regulation of Corrosive gases
- Epitaxial Reactors
- Diffusion furnaces
- Research sampling systems

Generally for research and development laboratories

Specifications

Maximum inlet pressure	20,000 kPa
Operating Temperature	-40°C to 65°C
Pressure rise	<0.5 kPa per 700 kPa inlet decay
Flow Coefficient	CV = 0.128
Inlet and Outlet Ports	1/4″ NPT (F)

Materials of Construction

Body	Bar stock 316L Stainless steel
Bonnet	Chrome plated brass
Diaphragm	316L stainless steel
Seat	PCTFE™
Seals	Teflon™

Common Examples

BOC Part No.	Delivery Pressure (kPa)	Cylinder Connection	Typical Gas Type
G10001	0–875	CGA 660	Corrosive, Toxic e.g. Nitric Oxide
G10000	0–875	BS15 – LH Spectra-Seal	Flammable, Corrosive, Toxic i.e. BOC Spectra Seal mixtures
G01999	0–875	Type 44 – RH Spectra-Seal	Corrosive, Toxic i.e. BOC Spectra Seal mixtures

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Detectagas™ Regulators for Disposable Cylinders

Fixed Flow Regulators for disposable cylinders

Key Features and Benefits

- Flow rates: 0.5 LPM, 1.0 LPM or 2.0 LPM
- Knurled ON/OFF knob for easy grip with or without gloves
- Finer graduations for precise reading of cylinder contents
- Side outlet prevents tubing from kinking
- Wide choice of outlets and inlets available
- Rotate knob for audible click ON/OFF
- No set screw on knob, meaning knob won't strip out
- Stainless steel gauge
- All wetted surfaces have proprietary passivated coating to ensure non-reaction with calibration gas
- Unique diaphragm design to hold preset flow rate even when cylinder pressure is depleted
- 5/8″ – 18 UNF inlet
- 1/8″ hose barb outlet

Variable Flow Regulators for disposable cylinders

Key Features and Benefits

- Specific design for instruments with sample draw pumps
- Excellent repeatability of sensor response to calibration gas

Detectagas™ Regulators for refillable cylinders

Fixed Flow Regulators for refillable cylinders

Key Features and Benefits

- Flow rates: 0.5 LPM, 1.0 LPM, 1.5 LPM, 2.0 LPM or 5.0 LPM
- Brass or stainless steel body and fittings to ensure gas quality is not compromised
- Compact design for use in tough environment
- Compact low profile high pressure gauge provides easy check of cylinder contents
- Fine adjustment valve on regulator enables gas flow to be turned off without need to shut off cylinder valve
- Design and precision laser cut gas metering orifice provides flow accuracy during gas usage
- Single Stage
- 315L stainless steel diaphragm
- No ON/OFF valve version (use valve on cylinder)
- Contents gauge with 700 kPa refill marking
- Adapters available for use on disposable cylinders

Variable Flow Regulators for refillable cylinders

Key Features and Benefits

- Variable flow rate of 0.5–5.0 LPM
- Chrome plated brass body
- Neoprene diaphragm
- Single Stage
- Contents gauge with 700 kPa refill marking

Model HM120

Systems providing a continuous supply of gas

- Non-corrosive gases
- Connect 2 or more cylinders

The HM120 manifold is a compact gas supply system for installations requiring an uninterrupted low to medium flow of gas at constant pressure.

The manifold system consists of two banks of cylinders, one on each side of the pressure control assembly. The position of the lever determines which bank of cylinders is "in use" and which is "in reserve". The manifold draws gas from the "in use" cylinder bank until it is emptied. The manifold then automatically starts drawing gas from the "in reserve" cylinder bank. When the emptied cylinder bank has been replaced the lever should be moved to the other side to reset the manifold.

Application

The HM120 auto change-over manifold is designed to provide uninterrupted delivery of high purity gases or mixtures and liquefied gases with vapour pressures more than 950 kPa.

The manifold is constructed from chrome plated brass and is for use with non-corrosive gases. Models are available for industrial, medical, laboratory and high purity applications.

Features

Provides uninterrupted low to medium flow of gas

- Easy to use change-over lever indicates cylinder priority
- Two inlet gauges indicate supply/pressure in each cylinder bank
- Larger easy to read gauge indicates delivery pressure to your application
- Chrome plated brass construction
- Compact single body design
- Stainless steel diaphragms with metal to metal seal
- Supplied with cylinder connection leads
- Service connection point avoids need to disrupt gas supply when checking settings
- Modular inlet header design allows for future expansion of system
- Australian designed and manufactured

Specifications

Maximum inlet pressure	20,000 kPa
Outlet pressure (factory set)	1,000 kPa
Maximum flow rate	250 LPM@400 kPa
Helium leak rating	$2x10^{-8}$ ml/sec
Inlet connection	3/8″ BSP M
Outlet connection	1/4″ NPT F
Weight	7 kg

Materials of Construction

Body	Chrome plated brass bar stock
Bonnet	Chrome plated brass bar stock
Diaphragm	316L stainless steel
Seals	Metal to metal
Seats	PCTFE™
NRV seals	Viton®

Model HM120 (cont)

Example

BOC Part No.	Delivery Pressure (kPa)	Gas Type	Cylinder Connection
G0344	1000	Specify	Refer to table

Cylinder Connections available are:	
AS Type 10	Oxygen
AS Type 50	Nitrogen
AS Type 60	Air
AS Type 20	Flammable
CGA 350	Flammable

Cylinder Connections available are:	
CGA 510	Hydrocarbons
CGA 580	Rare and Inert
CGA 590	Non Flammable
AS Type 30	Non Flammable

When ordering please refer to the above table. Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).

Flowmeters

Available upon request.

Please contact your local Scientific Sales Specialist or our Scientific Support Centre for further details (refer to back cover for contact details).