KEEN

COMPRESSED GAS CO.

ISO/IEC 17025:2017 ACCREDITED

Gas Catalog

Volume 1

2022

KEEN
COMPRESSED GAS CO.
ISO/IEC 17025:2017 ACCREDITED

ilac-MRA

PJLA
Calibration and Testing
ACCREDITATION 103049

Accreditation to the ISO/IEC 17025:2017 standard is recognized as the highest quality standard in the world for testing and calibration laboratories. Accreditation determined Keen has implemented a quality management system, with personnel components to perform testing and calibrations within the scope of accreditation.

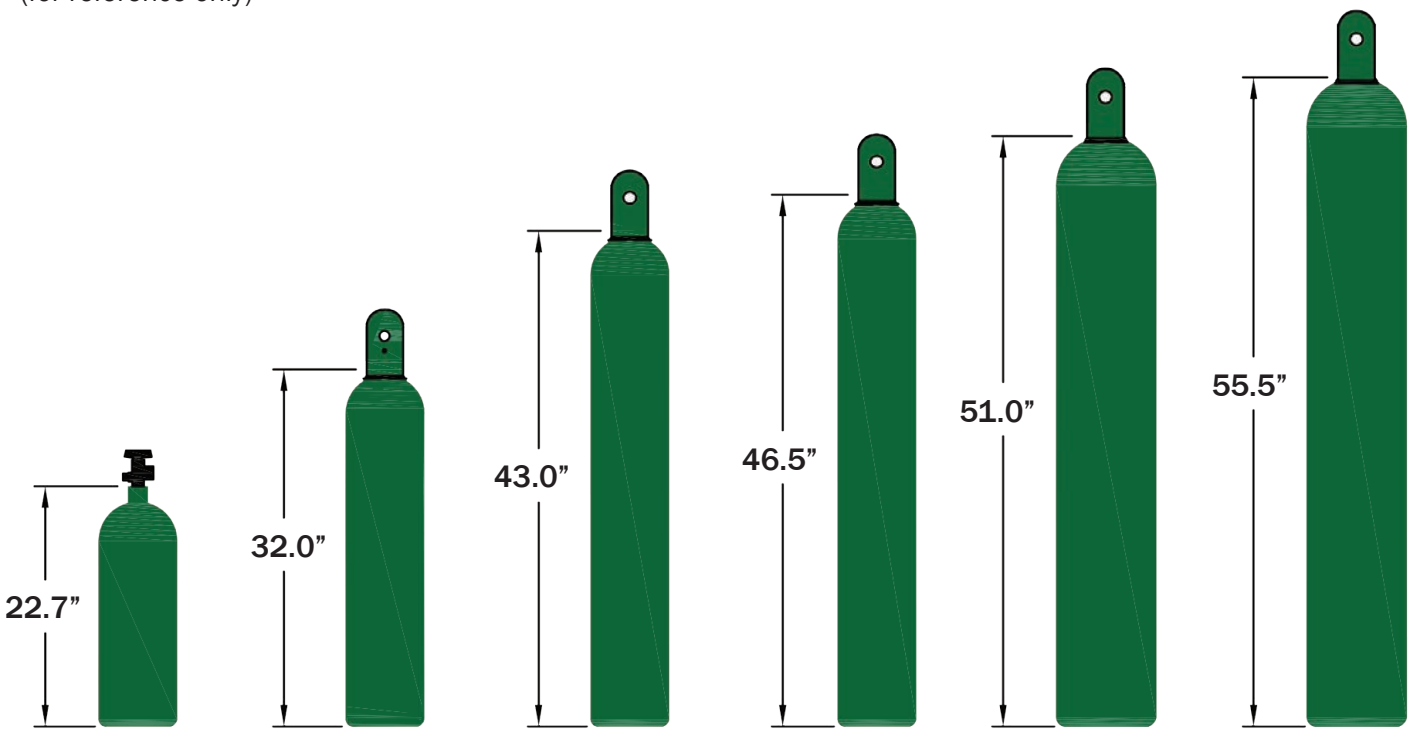
In 2018, Keen Compressed Gas began construction on a new automated $6 million fill plant, which includes capabilities for industrial, medical, cryogenic and specialty gases. The plant is fully automated and driven by the latest technology. Cylinders are filled via a gravimetric process that guarantees accurate and repeatable specialty gases that customers can rely on. Completed in the fall of 2019, this state-of-the-art fill plant is now backed by the ISO accreditation.

"This investment in our business, our systems, and our personnel reaffirms Keen's commitment to our customers. We will continue to provide the industry with the highest level of testing and certification of industrial and specialty pure and multi-component gas mixtures. This is another step toward our goal of being the best and most reliable supplier of specialty gases in our market."
Bryan Keen, President of Keen Compressed Gas Co.

Table of Contents

Cylinder Sizes and Data

(for reference only)



55 FT³	80 FT³	125 FT³	150 FT³	250 FT³	300 FT³
7” OD	7” OD	7” OD	7.3” OD	9.3” OD	9.3” OD

Cylinder Sizes and Data

Compressed Gas Cylinders

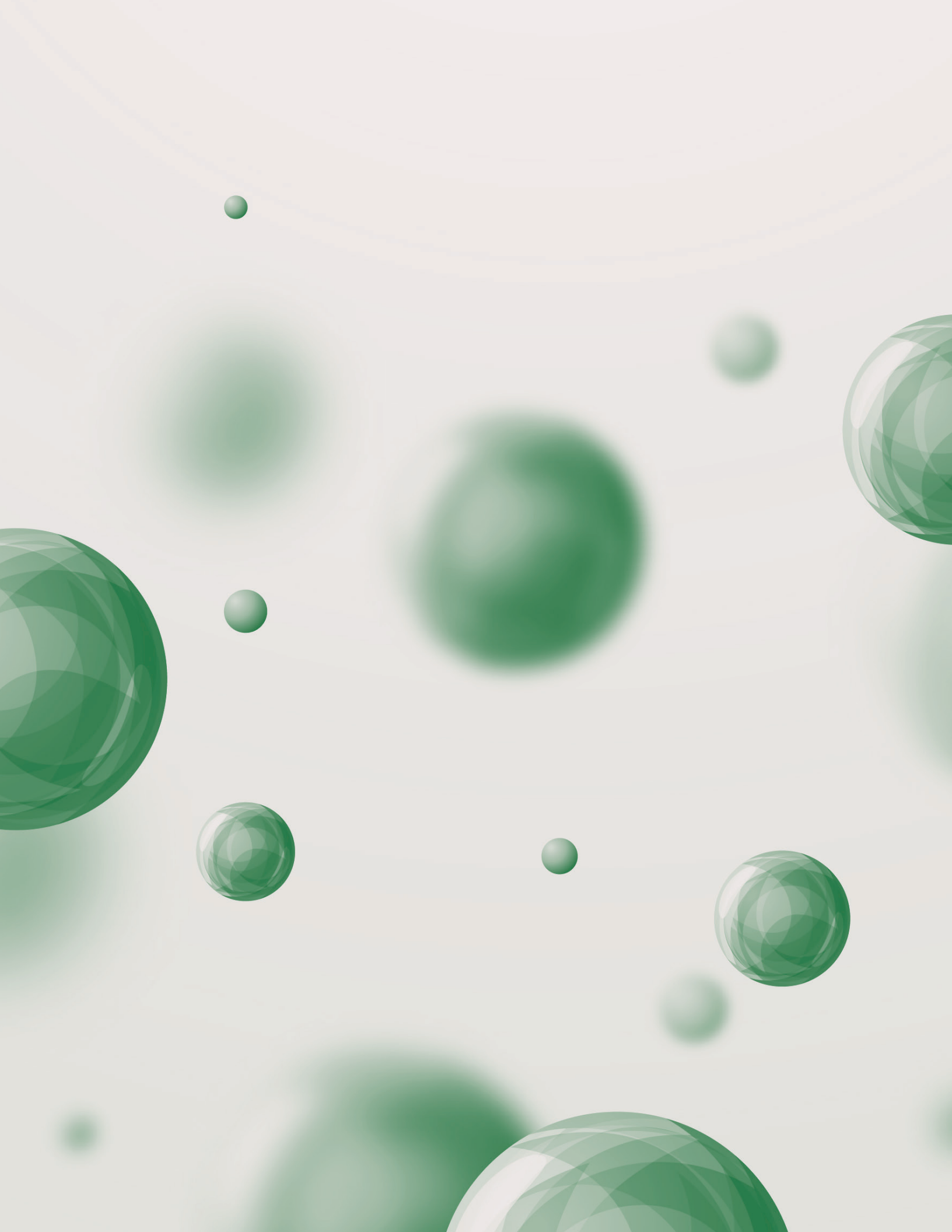
	Size	DOT Number	Size (inches)	Service Pressure	Cu Ft (10% Overfill)						
					Ar	He	H_2	O_2	N_2	CO_2	N_2O
STEEL	300	3AA2400	9x6	2400	331	262	--	332	300	--	--
	200	3AA2015	9x56	2215	246	219	196	249	227	--	--
	150			2015	153	135	131	153	140	--	--
	80	3AA2015	8.5x31	2015	92	80	72	92	83	--	--
	50 lbs				--	--	--	--	--		
	20 lbs				--	--	--	--	--		
ALUMINUM	AL 150	3AL2015	8x53	2015	149	133	129	150	138		

Note: CO_2, H_2, He and N_2O excludes 10% overfill

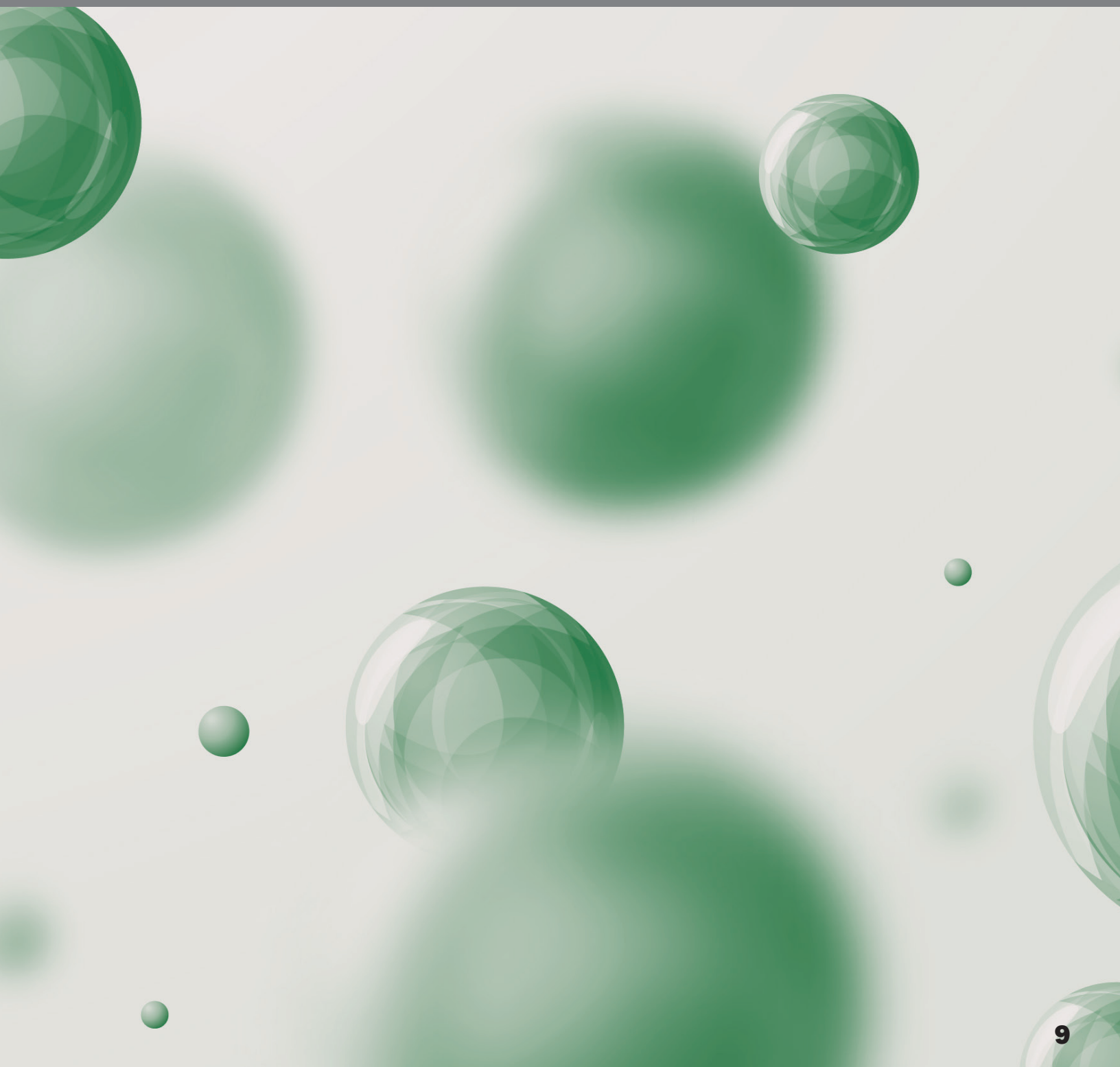
Low Pressure Cylinders

Model Size		180L MP	180L HP	230L MP	230L HP	265L MP	265L HP
Capacity							
Liquid (Gross)	(liters)	196	196	240	240	276	276
Liquid (Net)	(liters)	185	185	230	230	265	265
Gas (N_2)*	ft^3/Nm^3	4099 / 108	3864 / 102	5024 / 132	4734 / 124	5769 / 152	5438 / 143
Gas (O_2)*	ft^3/Nm^3	5096 / 134	4843 / 127	6244 / 165	5930 / 156	7186 / 189	6811 / 179
Gas (Ar)*	ft^3/Nm^3	4961 / 130	4709 / 124	6073 / 160	5763 / 151	6982 / 183	6634 / 175
Gas (CO_2)*	ft^3/Nm^3	--	3766 / 99	--	4614 / 121	--	5305 / 139
Gas (N_2O)*	ft^3/Nm^3	--	3574 / 94	--	4378 / 115	--	5034 / 132
Performance							
NER (N_2)	% per day	1.9	1.9	1.8	1.8	2	2
NER (O_2 - Ar)	% per day	1.3	1.3	1.2	1.2	1.4	1.4
NER (CO_2 - N_2O)	% per day	--	0.5	--	0.5	--	0.5
Gas Flow (N_2, O_2, Ar)	$ft^3/hr/Nm^3/hr$	350 / 9.2	350 / 9.2	400 / 10.5	400 / 10.5	400 / 10.5	400 / 10.5
Gas Flow (CO_2, N_2O)	$ft^3/hr/Nm^3/hr$	--	110 / 2.9	--	110 / 2.9	--	110 / 2.9
Dimensions & Pressure Ratings							
Relief Valve Setting	psig / barg	230 / 16	350 / 24	230 / 16	350 / 24	230 / 16	350 / 24
DOT/CTC Rating		4L200	4L292	4L200	4L292	4L200	4L292
Diameter	in / cm	20 / 50.8	20 / 50.8	26 / 66.0	26 / 66.0	26 / 66.0	26 / 66.0
Height	in / cm	64.3 / 163.3	64.3 / 163.3	52.9 / 131.9	52.9 / 131.9	57.8 / 146.8	57.8 / 146.8
Empty Weight	lb / kg	300 / 136.1	300 / 136.1	300 / 136.1	340 / 154.2	340 / 154.2	360 / 163.6
Full Weight (N_2)	lb / kg	580 / 263	580 / 263	664 / 301	683 / 310	758 / 344	754 / 343
(O_2)	lb / kg	701 / 318	701 / 318	817 / 370	831 / 377	935 / 424	924 / 420
(Ar)	lb / kg	787 / 357	787 / 357	928 / 421	936 / 242	1062 / 481	1046 / 475
(CO_2)	lb / kg	--	731 / 331	--	868 / 393	--	967 / 439

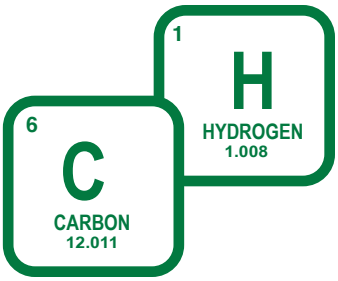
*At relief valve settings
NER = Normal Evaporation Rate %



PURE GASES



Acetylene (C_2H_2)



Acetylene is a colorless and tasteless gas with a garlic-like odor. It also is the hottest and most efficient of all fuel gases, providing high levels of productivity due to effective, localized heating with a minimum of thermal waste.

In our industry, acetylene is primarily used for Oxy-Fuel cutting and welding. Keen offers acetylene in bulk and single cylinder units.

In order to prevent explosive decomposition, acetylene is supplied in cylinders filled with a porous mass packing material that is saturated with acetone or other suitable solvent in which the acetylene is actually dissolved. The specifications shown are on a solvent free basis.

The specifications for acetylene are found in the Compressed Gas Association (CGA) Pamphlet G-1.1. Grade D is considered commercial acetylene.

Units in ppm (v/v) unless shown otherwise

Limiting Characteristics	CGA G-1.1 Grade D	Typical
Acetylene minimum, %	98	98.8
Phosphine	50	.04%
Arsine	50	None
Hydrogen Sulfide	50	None
Total Sulfur (calculated as H2S)	--	.006%
Chlorine (combined)	--	None
Oxygen	--	.01 - .1%
Nitrogen	--	.02 - .2%
Hydrogen	--	Trace
Methane	--	Trace
Ammonia	--	None
Stibine	--	.0007%

Certain acetylene plants do not purify the generated acetylene since for most purposes there is no demand for high purity acetylene.

Air

Air is a mixture of gaseous chemical elements and compounds used for respiration. A range of pure gases or mixtures of gases are used in breathing equipment and enclosed habitats such as scuba equipment, recompression chambers, medical life support and first aid equipment.

Air contains <0.1 ppm of hydrocarbons and is usually used as an oxidant. In many labs, air is synthetic air provided by a high-pressure gas cylinder.

Certificate of Conformance

	Industrial [1]	Dry Air [1]	Breathing (Grade D) [1]	Medical Air (USP) [1]	High Purity (2.0) [1,6]	Air Zero (1.0) [1,4,6]	Ultra High Purity (0.1) [1,4,6]
Percent (%) Oxygen [2,5]:	19.5 – 23.5	19.5 – 23.5	19.5 – 23.5	19.5 – 23.5	19.5 – 23.5	19.5 – 23.5	19.5 – 23.5
Percent (%) Nitrogen:	Balance	Balance	Balance	Balance	Balance	Balance	Balance
Carbon Dioxide [5,7]:	NT	NT	NT	NT	NT	NT	≤ 1.0 ppm
Carbon Monoxide [5,7]:	NT	NT	NT	NT	NT	NT	≤ 1.0 ppm
Odor [5]:	None	None	None	None	None	None	None
Oil [1]:	None	None	None	None	None	None	None
Total Hydrocarbon [5]:	NT	NT	NT	NT	≤ 2.0 ppm	≤ 1.0 ppm	≤ 0.1 ppm
Moisture [5]:	NT	≤ 7.8 ppm	≤ 10 ppm	NT	≤ 5.0 ppm	≤ 3.0 ppm	≤ 3.0 ppm
Dew Point:	-52°F	-80°F	-76°F	-76°F	-85°F	-92°F	-92°F
CGA Connection:	590	590	346	346 / 950	590	590	590
Lot Label Tracking:	No	No	Yes	Yes	Yes	Yes	Yes
Reference Item No:	CA2	CA2Dry	BA2	BA2USP	RSG 036	RSG 021	RSG 038
Cylinder Size:	240U	240U	240U	240U	230U	230U	230U

TECHNICAL INFORMATION			
UN ID:	1002	**Molecular Weight:**	28.96
DOT Classification:	2.2 Non-Flammable Gas	**Specific Volume:**	13.3 ft3/lb.
DOT Ship Name:	Air, Compressed	**CAS NO:**	132259-10-0

Notes:

1. Synthesized Air Components (Oxygen USP & Nitrogen NF) Produced by Air Liquefaction Process.
2. Oxygen Content Measured by Paramagnetic Analyzation
3. T – Not Tested
4. Zero Grade Refers to Total Hydrocarbon Less Than 1.0 ppm
5. Certificate of Batch or Individual Analysis Specification Results Available Upon Request
6. Meets MIL-BB-A-1034B, Source I, Grade B Specification
7. Specification Based on Raw Material Bulk Supplier Certificate of Analysis

Argon (Ar)

Argon is a colorless, odorless and tasteless inert gas which has no toxic properties. A member of the rare gas chemical family, argon constitutes less than 1% of the atmosphere and is heavier than air. Liquid argon at -302°F is clear and odorless.

Liquid argon is classified as Type II by the Compressed Gas Association (CGA). CGA G-11.1, Type II, Grade C is considered commercial liquid argon standards.

Certificate of Conformance

	INDUSTRIAL [1,6]	ZERO [1,4,5,6]	GRADE 4.8 [1,5,6]	GRADE 5.0 [1,5,6]
Minimum Purity [3]:	99.997	99.998	99.998	99.999
Nitrogen [3]:	≤ 20 ppm	≤ 4.0 ppm	≤ 4.0 ppm	≤ 4.0 ppm
Oxygen [3]:	≤ 5.0 ppm	≤ 5.0 ppm	≤ 2.0 ppm	≤ 1.0 ppm
Odor:	NT	None	None	None
Total Hydrocarbon [3]:	NT	≤ 0.5 ppm	≤ 0.5 ppm	≤ 0.5 ppm
Moisture [3]:	≤ 10 ppm	≤ 3.0 ppm	≤ 2.0 ppm	≤ 1.0 ppm
Dew Point:	-76°F	-92°F	-97°F	-105°F
Boiling Point:	-302°F	-302°F	-302°F	-302°F
CGA Connection [7]:	580 / 677	580	580, 677	580
Lot Label Tracking:	No	Yes	Yes	Yes
Reference Item No:	AR3	RSG 091	RSG 069	RSG 085
Cylinder Size:	336U	250U	250U	250U

TECHNICAL INFORMATION			
UN ID:	1006	**Molecular Weight:**	39.95g/mol
DOT Classification:	2.2 Non-Flammable Gas	**Specific Volume:**	9.7 ft^3/lb.
DOT Ship Name:	Argon, Compressed	**CAS NO:**	7440-37-1

Notes:
1. Produced by Air Liquefaction Process Which Includes Trace Quantities of Neon & Helium
2. NT – Not Tested
3. Certificate of Batch or Individual Analysis Results Available Upon Request
4. Zero Grade Refers to Total Hydrocarbon Less Than 0.5 ppm
5. Meets MIL-A-18455C Type I, Specification
6. Meets AWS A5.32 (ISO 14175)-I1-Ar
7. CGA Connection 677 for 6000 PSI Cylinders

Conversion Data

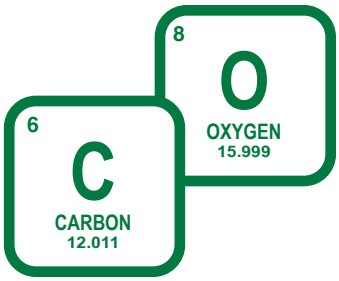
	WEIGHT		GAS		LIQUID	
	Pounds Lb	Kilograms Kg	Cubic Feet SCF	Cubic Meters Nm3	Gallons Gal	Liters L
1 Pound	1	0.4536	9.671	0.2543	0.086	0.3255
1 Kilogram	2.205	1	21.32	0.5605	0.18957	0.7176
1 Ton	2000	907.2	19342	508.6	172	651
1 SCF Gas	0.1034	0.0469	1	0.02628	0.008893	0.03366
1 Nm3 Gas	3.933	1.784	38.04	1	0.3382	1.2802
1 Gal Liquid	11.63	5.276	112.5	2.957	1	3.785
1 L Liquid	3.072	1.3936	29.71	0.7812	0.2642	1

SCF (standard cubic foot) and SM3 (standard cubic meter) gas measured at 1 atmosphere and 70°F.
Liquid measured at 0°F and saturated pressure.
Nm3 (normal cubic meter) gas measured at 1 atmosphere and 0°C.
All values round to the nearest 4/5 significant numbers.

Carbon Dioxide (CO_2)

Carbon Dioxide is a colorless gas with a slightly pungent odor and biting taste. It will not burn, support combustion or sustain life. It is about 1.5 times heavier than air. Normally stored as a liquid, carbon dioxide exists only as a solid or gas at room conditions. The solid CO2 snow transforms (sublimes) directly to a gas without passing through the liquid phase.

Carbon Dioxide is known in the food industry for carbonating drinks and preserving packaged foods. The non-flammable properties make it a popular pressurizing gas for aerosols.



Certificate of Conformance

	INDUSTRIAL [5,6]	BEVERAGE [4,6]	BONE DRY	COLEMAN	RESEARCH [6]	USP [1]
Minimum Purity:	99.9	99.9	99.8	99.99	99.999	99.0
Odor:	NT	NT	None	None	None	None
Moisture 3,6:	≤ 10 ppm	≤ 20 ppm	≤ 10 ppm	≤ 10 ppm	≤ 2.0 ppm	≤ 20 ppm
Ammonia3,6:	NT	NT	NT	NT	NT	≤ 25 ppm
Carbon Monoxide 3,6:	NT	≤ 10 ppm	NT	NT	≤ 1 ppm	≤ 10 ppm
Nitrogen Dioxide3,6:	NT	Sum ≤ 2.5 ppm	NT	NT	NT	≤ 2.5 ppm
Nitric Oxide 3,6:	NT		NT	NT	NT	≤ 2.5 ppm
Sulfur Dioxide 3,6:	≤ 5.0 ppm	≤ 5.0 ppm	NT	NT	NT	≤ 5.0 ppm
Dew Point:	-76°F	-68°F	-76°F	-76°F	-97°F	-68°F
CGA Connection:	320	320	320	320	320	320/970
Lot Label Tracking:	No	No	Yes	Yes	Yes	Yes
Cylinder Size:						

TECHNICAL INFORMATION			
UN ID:	1013	Molecular Weight:	44.01
DOT Classification:	2.2 Non-Flammable Gas	Specific Volume:	8.74 ft3/lb.
DOT Ship Name:	Carbon Dioxide	CAS NO:	124-38-9

Notes:
1. USP- Medical Carbon Dioxide, United States Pharmacopeia
2. NT – Not Tested
3. Certificate of Batch or Individual Analysis Specification Results Available Upon Request
4. Meets USDA and CGA G-6.2 Food Grade Specifications
5. Meets AWS A5.32 (ISO 14175)-C1 CO2 - Gaseous Use
6. Specification Based on Raw Material Bulk Supplier Certificate of Analysis

Conversion Data

	WEIGHT		GAS		LIQUID		SOLID
	Pounds Lb	Kilograms Kg	Cubic Feet SCF	Cubic Meters Nm3	Gallons Gal	Liters L	Cubic Feet Cu. Ft.
1 Pound	1	0.4536	9.671	0.2543	0.086	0.3255	0.3255
1 Ton	2.205	1	21.32	0.5605	0.18957	0.7176	0.7176
1 Kilogram	2000	907.2	19342	508.6	172	651	651
1 SCF Gas	0.1034	0.0469	1	0.02628	0.008893	0.03366	0.03366
1 Nm3 Gas	3.933	1.784	38.04	1	0.3382	1.2802	1.2802
1 Gal Liquid	11.63	5.276	112.5	2.957	1	3.785	3.785
1 L Liquid	3.072	1.3936	29.71	0.7812	0.2642	1	1
1 Cu. Ft. Solid							

SCF (standard cubic foot) and SM3 (standard cubic meter) gas measured at 1 atmosphere and 70°F.
Liquid measured at 0°F and saturated pressure.
Nm3 (normal cubic meter) gas measured at 1 atmosphere and 0°C.
All values round to the nearest 4/5 significant numbers.

Helium (He)

Helium is a colorless, odorless and tasteless inert gas which has no toxic properties. A member of the rare gas chemical family, it is 1/7 as heavy as air. Liquid Helium at -452°F is the coldest liquefied gas.

The Compressed Gas Association (CGA) specification G-9.1-1992, Type I, Grade D is considered the commercial gaseous helium standard.

Certificate of Conformance

	BALLOON GRADE	GRADE 4.7 [4,6]	GRADE ZERO [3,4,6]	GRADE 5.0 [4,6]	GRADE 5.5 [4,6]
Minimum Purity:	99.95	99.997	99.997	99.999	99.9995
Carbon Dioxide [5]:	NT	≤ 1.0 ppm	≤ 1.0 ppm	≤ 1.0 ppm	≤ 1.0 ppm
Carbon Monoxide [5]:	NT	≤ 1.0 ppm	≤ 1.0 ppm	≤ 1.0 ppm	≤ 1.0 ppm
Hydrogen [2,5]:	NT	≤ 1.0 ppm	≤ 1.0 ppm	≤ 1.0 ppm	≤ 1.0 ppm
Nitrogen [2]:	NT	≤ 5.0 ppm	≤ 5.0 ppm	< 4.0 ppm	≤ 1.0 ppm
Oxygen [2]:	NT	≤ 3.0 ppm	≤ 3.0 ppm	≤ 1.0 ppm	≤ 0.5 ppm
Odor [2]:	NT	None	None	None	None
Total Hydrocarbon [2]:	NT	≤ 1.0 ppm	≤ 0.5 ppm	≤ 0.5 ppm	≤ 0.2 ppm
Moisture [2]:	NT	≤ 3.0 ppm	≤ 3.0 ppm	≤ 1.0 ppm	≤ 1.0 ppm
Dew Point:	-72°F	-92°F	-92°F	-101°F	-101°F
Boiling Point:	-452°F	-452°F	-452°F	-452°F	-452°F
CGA Connection:	580	580	580	580	580
Lot Label Tracking:	No	Yes	Yes	Yes	Yes
Reference Item No:	HE2	RSG 218	RSG 217	RSG 220	RSG 221
Cylinder Size:	200U	219U	200U	219U	200U

TECHNICAL INFORMATION			
UN ID:	1046	**Molecular Weight:**	4 g/mol
DOT Classification:	2.2 Non-Flammable Gas	**Specific Volume:**	96.7 ft^3/lb.
DOT Ship Name:	Helium, Compressed	**CAS NO:**	7440-59-7

Notes:
1. NT – Not Tested
2. Certificate of Batch or Individual Analysis Specification Results Available Upon Request
3. Zero Grade Refers to Total Hydrocarbon Less Than 0.5 ppm
4. Meets MIL-PRF-27407D, Type 1, Grade A and B Specification
5. Specification Based on Raw Material Conformance to CGA QVL Grades (N&P) per CGA G.9.1-2018
   a. May Include Trace Argon Levels Not to Exceed 3 ppm
   b. May Include Trace Neon Levels Not to Exceed 23 ppm
   c. Actual Results Excluded from Conformance Guarantee
6. Meets AWS A5.32 (ISO 14175)-I2-He

Conversion Data

	WEIGHT		GAS		LIQUID	
	Pounds Lb	Kilograms Kg	Cubic Feet SCF	Cubic Meters Nm3	Gallons Gal	Liters L
1 Pound	1	0.4536	96.71	2.736	0.9593	3.631
1 Kilogram	2.205	1	213.2	6.039	2.115	8.006
1 SCF Gas	0.0103	0.00469	1	0.02832	0.009919	0.03754
1 Nm^3 Gas	0.3651	0.1656	35.31	1	0.3504	1.3257
1 Gal Liquid	1.0423	0.4728	100.8	2.854	1	3.785
1 L Liquid	0.2754	0.1249	26.63	0.7542	0.2642	1

SCF (standard cubic foot) and SM3 (standard cubic meter) gas measured at 1 atmosphere and 70°F.
Liquid measured at 0°F and saturated pressure.
Nm^3 (normal cubic meter) gas measured at 1 atmosphere and 0°C.
All values round to the nearest 4/5 significant numbers.

Hydrogen (H)

1
H
HYDROGEN
1.008

Hydrogen is the lightest gas known. It is a colorless, odorless and tasteless gas and is flammable and nontoxic at atmospheric temperatures and pressures. Lighter than air, hydrogen burns with an invisible, clean flame.

Hydrogen is often mixed with argon to create a range of argon/hydrogen shielding gases for TIG and plasma welding. It can also be combined with oxygen for underwater flame cutting. Hydrogen is used in the production of carbon steels, special metals and semiconductors; it powers flames and torches in laboratories in the chemical industry.

Certificate of Conformance

	INDUSTRIAL	ZERO [3,4]	GRADE 5.0 [5]
Minimum Purity:	99.95	99.995	99.999
Carbon Dioxide [2,6]:	NT	NT	Sum ≤ 2.0 ppm
Carbon Monoxide [2,6]:	NT	NT	
Nitrogen [2,6]:	NT	NT	≤ 4.0 ppm
Oxygen [2]:	NT	NT	≤ 1.0 ppm
Total Hydrocarbon [2]:	NT	≤ 0.5 ppm	≤ 1.0 ppm
Moisture [2]:	NT	≤ 8.0 ppm	≤ 3.0 ppm
Dew Point:	-60°F	-92°F	-96°F
Boiling Point	-432°F	-432°F	-432°F
CGA Connection:	350	350	350
Lot Label Tracking:	No	Yes	Yes
Reference Item No:	HY2	RSG 252	RSG 250
Cylinder Size:	197U	200U	200U

TECHNICAL INFORMATION			
UN ID:	1049	**Molecular Weight:**	2.016 g/mol
DOT Classification:	2.1 Flammable Gas	**Specific Volume:**	192 ft^3/lb.
DOT Ship Name:	Hydrogen, Compressed	**CAS NO:**	1333-74-0

Notes:
1. NT – Not Tested
2. Certificate of Batch or Individual Analysis Specification Results Available Upon Request
3. Zero Grade Refers to Total Hydrocarbon Less Than 0.5 ppm
4. Meets MIL-BB-H-886E Type 1, Grade A Specification
5. Meets MIL-BB-H-886E Type 1, Grade B and C Specification
6. Specification Based on Raw Material Conformance to CGA QVL Grade (F&L) per CGA G5.3.7 2017

Conversion Data

	WEIGHT		GAS		LIQUID	
	Pounds Lb	Kilograms Kg	Cubic Feet SCF	Cubic Meters Nm^3	Gallons Gal	Liters L
1 Pound	1	0.4536	192	5.047	1.6928	6.408
1 Kilogram	2.205	1	423.3	11.126	3.733	14.128
1 SCF Gas	0.005209	0.002363	1	0.02628	0.00882	0.03339
1 Nm^3 Gas	0.19815	0.08988	38.04	1	0.3355	1.2699
1 Gal Liquid	0.05906	0.2679	113.41	2.981	1	3.785
1 L Liquid	0.15604	0.07078	29.99	0.7881	0.2642	1

SCF (standard cubic foot) and SM3 (standard cubic meter) gas measured at 1 atmosphere and 70°F.
Liquid measured at 0°F and saturated pressure.
Nm^3 (normal cubic meter) gas measured at 1 atmosphere and 0°C.
All values round to the nearest 4/5 significant numbers.

Nitrogen (N)

Nitrogen constitutes 78% of the atmosphere and is a constituent of all living tissues. Under normal conditions, nitrogen is a colorless, odorless and tasteless inert gas which has no toxic properties and is slightly lighter than air. As a liquid at -320 °F it has a water-white appearance and must be handled with care due to its low temperature.

Liquid Nitrogen is classified as Type II by the Compressed Gas Association (CGA). CGA-10.1, Type II, Grade L or The National Formulary Specs (similar to USP) are considered commercial liquid nitrogen standards.

Certificate of Conformance

	INDUSTRIAL [1]	NF / FOOD GRADE [1,2,6,9]	ZERO [1,4,7]	GRADE 4.8 [1,7]	GRADE 5.0 [1,7]
Minimum Purity [5]:	99.0	99.0	99.998	99.998	99.999
Carbon Monoxide [5,9]:	NT	≤ 10.0 ppm	NT	NT	NT
Oxygen [5]:	NT	1%	≤ 5.0 ppm	≤ 5.0 ppm	≤ 1.0 ppm
Odor [5]:	NT	None	None	None	None
Total Hydrocarbon [5]:	NT	NT	≤ 0.5 ppm	≤ 0.5 ppm	≤ 0.5 ppm
Moisture [5]:	NT	NT	≤ 5.0 ppm	≤ 3.0 ppm	≤ 1.0 ppm
Dew Point:	-77°F	-77°F	-85°F	-92°F	-105°F
Boiling Point:	-320°F	-320°F	-320°F	-320°F	-320°F
CGA Connection [8]:	580, 677	580	580	580,677	580
Lot Label Tracking:	No	Yes	Yes	Yes	Yes
Reference Item No:	N2	N2NF/N2FG	RSG 404	RSG 412	RSG 402
Cylinder Size:		230U	230U	200U	200U

TECHNICAL INFORMATION			
UN ID:	1066	**Molecular Weight:**	28 g/mol
DOT Classification:	2.2 Non-Flammable Gas	**Specific Volume:**	13.89 ft^3/lb.
DOT Ship Name:	Nitrogen, Compressed	**CAS NO:**	7727-37-9

Notes:
1. Produced by Air Liquefaction Process Which Includes Trace Quantities of Neon, Helium & Argon
2. NF – Medical Nitrogen, National Formulary
3. NT – Not Tested
4. Zero Grade Refers to Total Hydrocarbon Less Than 0.5 ppm
5. Certificate of Batch or Individual Analysis Specification Results Available Upon Request
6. Meets USDA and CGA G-10.1 Food Grade Specifications
7. Meets MIL-PRF-27401G & MIL-A-A-59503C Specification
8. CGA Connection CGA 677 for 6000 PSI Cylinders
9. Specification Based on Raw Material Bulk Supplier Certificate of Analysis

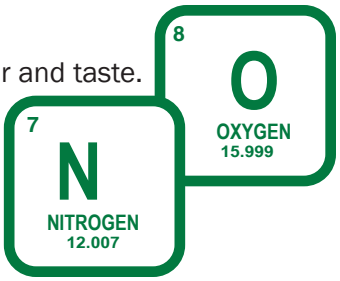
Conversion Data

	WEIGHT		GAS		LIQUID	
	Pounds Lb	Kilograms Kg	Cubic Feet SCF	Cubic Meters Nm3	Gallons Gal	Liters L
1 Pound	1	0.4536	13.803	0.3627	0.1481	0.5606
1 Kilogram	2.205	1	30.42	0.7996	0.3262	1.2349
1 Ton	2000	907.2	27606	725.4	296.2	1121
1 SCF Gas	0.07245	0.03286	1	0.02628	0.01074	0.04065
1 Nm^3 Gas	2.757	1.2506	38.04	1	0.408	1.5443
1 Gal Liquid	6.745	3.06	93.11	2.447	1	3.785
1 L Liquid	1.782	0.8083	24.6	0.6464	0.2642	1

SCF (standard cubic foot) and SM3 (standard cubic meter) gas measured at 1 atmosphere and 70°F.
Liquid measured at 0°F and saturated pressure.
Nm^3 (normal cubic meter) gas measured at 1 atmosphere and 0°C.
All values round to the nearest 4/5 significant numbers.

Nitrous Oxide (N_2O)

At room temperature, nitrous oxide is a colorless, non-flammable gas, with a lightly sweet odor and taste. It is also referred to as laughing gas, nitrous, nitro or NOS. It is an oxide of nitrogen.



Certificate of Conformance

	USP [1,2]
Minimum Purity:	99.0
Ammonia:	≤ 25 ppm
Carbon Dioxide:	≤ 300 ppm
Carbon Monoxide:	≤ 10 ppm
Nitric Oxide	≤ 1 ppm
Nitrogen Dioxide:	≤ 1 ppm
Halogens:	≤ 1 ppm
Moisture:	≤ 83 ppm
Dew Point:	-47°F
Boiling Point:	-127°F
CGA Connection:	326/910
Lot Label Tracking:	Yes
Reference Item No:	N2O2USP, N2O2OUSP, N2OEUSP
Cylinder Size:	200, 20, E

TECHNICAL INFORMATION			
UN ID:	1070	**Molecular Weight:**	44.013 g/mol
DOT Classification:	2.2 (5.1) Non-Flammable Gas, Oxidizing	**Specific Volume:**	8.69 ft^3/lb.
DOT Ship Name:	Nitrous Oxide	**CAS NO:**	10024-97-2

Notes:
1. USP - Medical Oxygen, United States Pharmacopeia
2. Certificate of Analysis specification results available upon request

Oxygen (O)

Oxygen is the most abundant element on the earth's surface and as a gas is indispensable in respiration. Composing almost 21% of the atmosphere, oxygen is a colorless, odorless and tasteless gas which supports combustion. As a liquid at -297°F, oxygen is light blue in color and is approximately 14% heavier than water.

Liquid oxygen is classified as a Type II by the Compressed Gas Association (CGA). CGA Pamphlet G-4.3, Type II, Grade B and the United States Pharmacopeia (USP) specs are considered standards for commercial liquid oxygen.

Certificate of Conformance

	INDUSTRIAL [1]	USP [1,2,6]	AVIATORS [1,3]	GRADE 2.6 [1,7]	ZERO GRADE [1,7]	GRADE 4.4 [1,7,8]	GRADE 4.7 UHP [1,7,8]
Minimum Purity [5]:	99.0	99.2	99.5	99.6	99.6	99.994	99.997
Argon [5]:	NT	NT	NT	NT	NT	≤ 35 ppm 8	≤ 10 ppm 8
Nitrogen [5]:	NT	NT	NT	NT	NT	≤ 10 ppm 8	≤ 5.0 ppm 8
Carbon Dioxide [5]:	NT	NT	NT	NT	NT	≤ 1.0 ppm 8	≤ 1.0 ppm 8
Carbon Monoxide [5]:	NT	NT	NT	NT	NT	≤ 1.0 ppm 8	≤ 1.0 ppm 8
Odor [5]:	NT	None	None	None	None	None	None
Total Hydrocarbon [5]:	NT	NT	NT	≤ 20 ppm	≤ 0.5 ppm	≤ 1.0 ppm	≤ 1.0 ppm
Moisture [5]:	NT	NT	≤ 6.6 ppm	≤ 5.0 ppm	≤ 5.0 ppm	≤ 3.0 ppm	≤ 1.0 ppm
Dew Point [5]:	NT	NT	-82°F	-86°F	-86°F	-92°F	-105°F
Boiling Point:	-361°F	-361°F	-361°F	-361°F	-361°F	-361°F	-361°F
CGA Connection:	540	540 /870	540	540	540	540	540
Lot Label Tracking:	No	Yes	Yes	Yes	Yes	Yes	Yes
Reference Item No:	OX2	OX2USP	OX2AV	RSG 470	RSG 450	RSG 472	RSG 458
Cylinder Size:		251U	282	251U	251U	251U	200U

TECHNICAL INFORMATION			
UN ID:	1072	**Molecular Weight:**	32 g/mol
DOT Classification:	2.2 (5.1) Non-Flammable Gas, Oxidizing	**Specific Volume:**	12.1 ft^3/lb.
DOT Ship Name:	Oxygen, Compressed	**CAS NO:**	7782-44-7

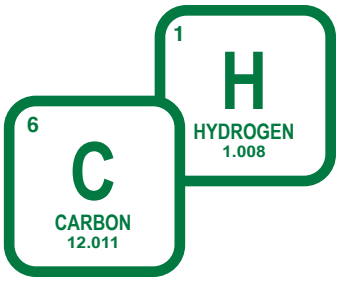
Notes:
1. Produced by Air Liquefaction Process
2. USP- Medical Oxygen, United States Pharmacopeia
3. Aviators Breathing Oxygen (ABO) Is Not A Medical Gas and Therefore Is Not Classified as a Drug (Rx)
4. NT – Not Tested
5. Certificate of Analysis Specification Results Available Upon Request
6. Food Chemical Codex for Food Grade Oxygen Does Not Exist. The USP and FCC Monographs Are Owned by The Same Organization, Therefore USP Monograph Will Be Used for Food Grade Oxygen
7. Meets MIL-PRF-25508J Type 1, Grade A and B Specification
8. Specification Based on Raw Material Conformance to UHP Grade 4.7 Certificate of Analysis
   a. Actual Results Excluded from Conformance Guarantee

Conversion Data

	WEIGHT		GAS		LIQUID	
	Pounds Lb	Kilograms Kg	Cubic Feet SCF	Cubic Meters Nm3	Gallons Gal	Liters L
1 Pound	1	0.4536	12.078	0.3173	0.105	0.3975
1 Kilogram	2.205	1	26.632	0.6996	0.2315	0.8762
1 Ton	2000	907.2	24157	635	209.9	794.5
1 SCF Gas	0.08279	0.03755	1	0.026269	0.008689	0.03289
1 Nm^3 Gas	3.1491	1.4282	38.04	1	33.05	1.2511
1 Gal Liquid	9.528	4.321	115.1	3.026	1	3.785
1 L Liquid	2.517	1.1416	30.41	0.7995	0.2642	1

SCF (standard cubic foot) and SM3 (standard cubic meter) gas measured at 1 atmosphere and 70°F.
Liquid measured at 0°F and saturated pressure.
Nm^3 (normal cubic meter) gas measured at 1 atmosphere and 0°C.
All values round to the nearest 4/5 significant numbers.

Propane (C_3H_8)



Propane — sometimes known as liquefied petroleum gas, or LPG — is a gas normally compressed and stored as a liquid. It is nontoxic, colorless, and virtually odorless; an identifying odor is added so it can be detected. Propane is commonly used for space and water heating, for cooking, and as fuel for engine applications such as forklifts, farm irrigation engines, fleet vehicles, and buses; however, its applications are rapidly growing due to new technology developments.

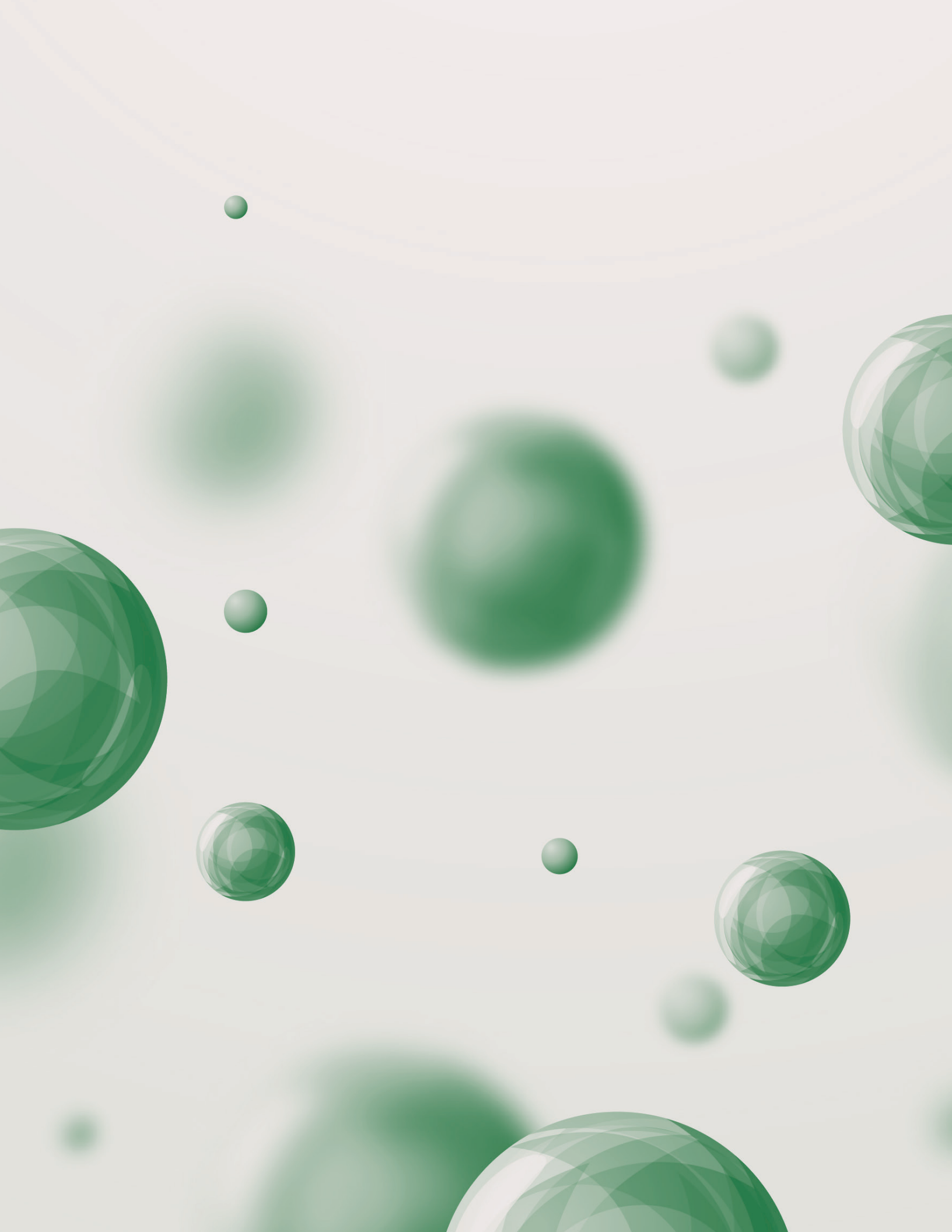
Propane is primarily a byproduct of domestic natural gas processing, though some propane is produced from crude oil refinement. U.S. propane supplies are becoming increasingly abundant due in large part to increased supplies of natural gas.

Certificate of Conformance

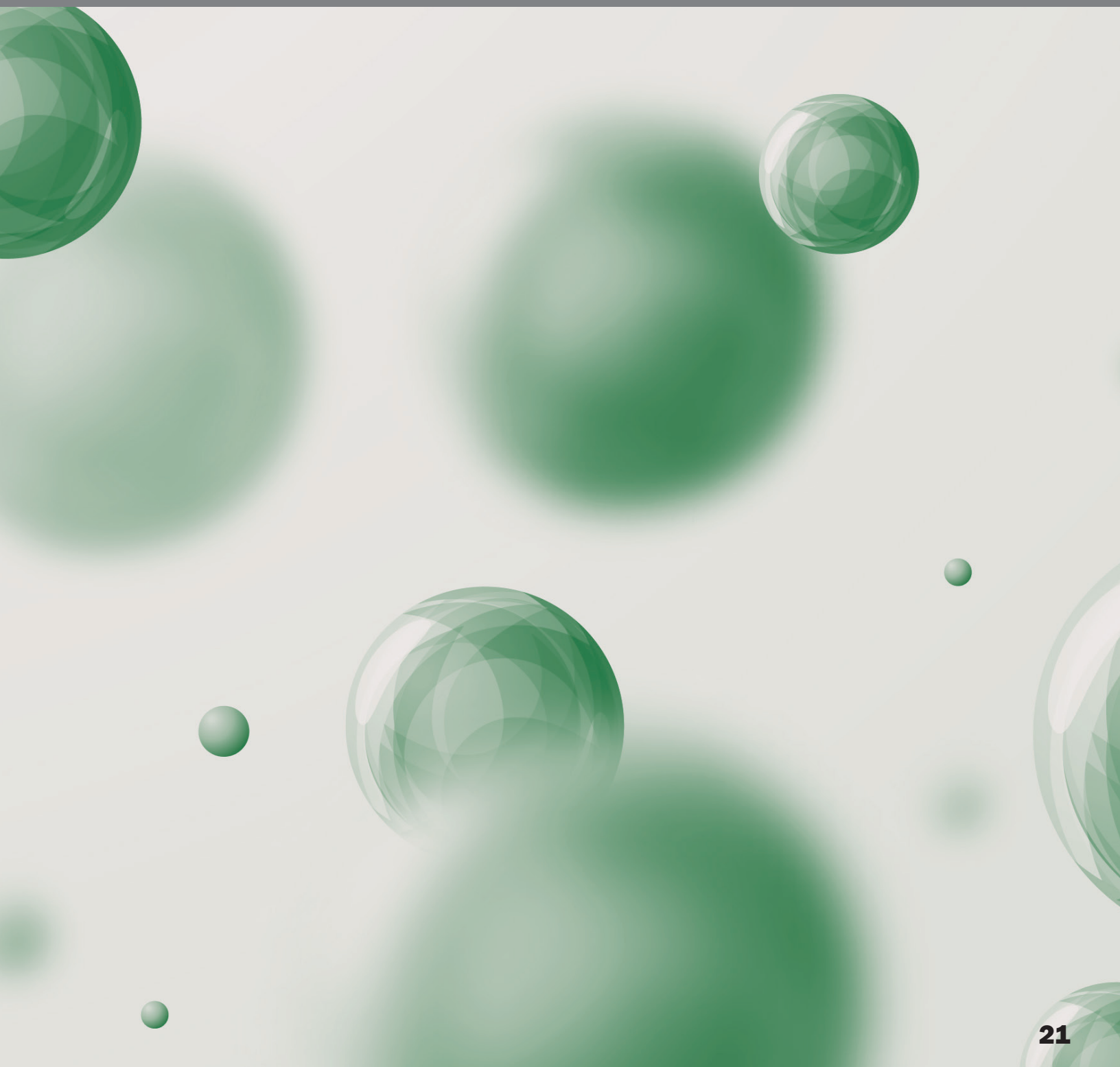
	INDUSTRIAL	INSTRUMENT [1,3]	INSTRUMENT [1,3]	RESEARCH [1,3]
Minimum Purity:	99.0	99.5	99.9%	99.999%
Carbon Dioxide:	NT	NT	≤ 2.0 ppm	≤ 1.0 ppm
Nitrogen:	NT	NT	≤ 10.0 ppm	≤ 2.0 ppm
Oxygen:	NT	NT	≤ 2.0 ppm	≤ 1.0 ppm
Propylene	NT	NT	≤ 10.0 ppm	≤ 2.0 ppm
Total Hydrocarbon:	NT	NT	≤ 80.0 ppm	≤ 8.0 ppm
Moisture:	NT	NT	≤ 3.0 ppm	≤ 2.0 ppm
Dew Point:	NT	NT	-92.0°F	-97.0°F
CGA Connection:	510	510	510	510
Lot Label Tracking:	N/A	N/A	Yes	Yes
Reference Item No:				
Cylinder Size:				

TECHNICAL INFORMATION			
UN ID:	1075	**Molecular Weight:**	44.10 g/mol
DOT Classification:	2.1 Flammable Gas	**Specific Volume:**	8.6214 ft^3/lb.
DOT Ship Name:	Liquified Petroleum	**CAS NO:**	74-98-6

Notes:
1. Sourced from 3rd party suppliers
2. NT – Not Tested
3. Certificate of Analysis specification results available upon request



MIXED GASES



Common Mixed Gases

Note: Common mixtures are based on our capabilities

MINOR COMPONENT	BALANCE GAS						
	Air	Argon	Carbon Dioxide	Helium	Hydrogen	Nitrogen	Oxygen
Argon				100 ppm to 50%		100 ppm to 50%	
Carbon Dioxide	100 ppm to 30%	100 ppm to 50%	100 ppm to 50%	100 ppm to 50%	100 ppm to 50%	100 ppm to 50%	100 ppm to 50%
Carbon Monoxide		100 ppm to 50%		100 ppm to 50%		100 ppm to 50%	
Helium		100 ppm to 50%	100 ppm to 50%			100 ppm to 50%	100 ppm to 50%
Hydrogen		100 ppm to 50%		100 ppm to 50%		100 ppm to 50%	
Methane		100 ppm to 50%		100 ppm to 50%		100 ppm to 50%	
Nitrogen		100 ppm to 50%	100 ppm to 50%	100 ppm to 50%	100 ppm to 50%		100 ppm to 50%
Oxygen		100 ppm to 50%	100 ppm to 50%	100 ppm to 50%		100 ppm to 50%	
CGA Connection	590	580	320 or 580	580	350	580	540 or 296

Industrial Component Tolerance Certified Component Tolerance Primary Standard Component Tolerance	5.0% - |0.5| Absolute, >5.0% +/-10% +/- 2% +/- 1%	Cylinder Sizes	80 cu ft to 300 cu ft Carbon Monoxide Mixtures - 150 cu ft Aluminum Cylinder

CONFORMANCE	Atmospheric Gases (Ar/N2/O2) produced by air liquefaction which includes trace quantities of Helium and Neon
	Balance Helium mixtures maximum PSIG 2000
	Air produced by reconstitution of Oxygen 19.5% - 23.0% / balance Nitrogen
	Raw material component shall meet applicable minimum pure gas purity requirements form (99.9 to 99.999) as applicable
	Welding gases shall meet AWS A5.32 and/or MIL specifications as applicable
	Food grade gases shall meet USDA and CGA specifications as applicable
	Certificate of Analysis available upon request (includes lot tracking)
	Component Homogenization results excluded from Industrial Conformance Guarantee

Argon (Ar)

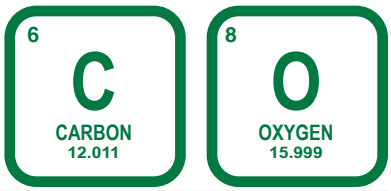
BALANCE GAS	SDS RANGE	SDS
Carbon Dioxide	500 ppm - 50%	PA 4574S
Helium	500 ppm - 50%	PA 4600S
Hydrogen	500 ppm - 50%	PA 4604S
Krypton	500 ppm - 50%	PA 46162S
Methane	500 ppm - 50%	PA 46722S
Nitrogen	500 ppm - 50%	PA 46312S
Oxygen	500 ppm - 50%	PA 4638A

BALANCE GAS	CONCENTRATION RANGE	CGA	KEEN GRADES			PRESSURE PSIG	CONTENTS	
			P	C	U		ft^3	m^3
Carbon Dioxide	500 ppm - 50%	580	• •	• •	• •	2000	300 200	8.3 5.5
Helium	500 ppm - 50%	580	• •	• •	• •	2000	300 200	8.3 5.5
Hydrogen	500 ppm - 50%	580	• •	• •	• •	2000	300 200	8.3 5.5
Krypton	500 ppm - 50%	580	• •	• •	• •	2000	300 200	8.3 5.5
Methane	5 - 10%	580	• •	• •	• •	2000	300 200	8.3 5.5
Nitrogen	500 ppm - 50%	580	• •	• •	• •	2000	300 200	8.3 5.5
Oxygen	500 ppm - 50%	TBD	• •	• •	• •	2000	300 200	8.3 5.5

Mixture Grades Key
P - Primary Standard
C - Certified Standard
U - Non-Certified Standard

Note(s):
For concentrations above 50%, the SDS for the higher product concentration in the mixture applies.

Carbon Dioxide (CO_2)



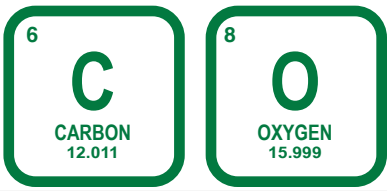
BALANCE GAS	SDS RANGE	SDS
Air	500 ppm - 50%	PA 4560S
Argon	500 ppm - 50%	PA 45632S
Nitrogen	500 ppm - 50%	PA 46312S
Oxygen	500 ppm - 50%	PA 4638A

BALANCE GAS	CONCENTRATION RANGE	CGA	KEEN GRADES			PRESSURE PSIG	CONTENTS ft^3
			P	C	U		
Air	500 ppm - 50%	590	•	•	•	2000	199
Argon	500 ppm - 50%	580	•	•	•	2000	199
Nitrogen	500 ppm - 50%	580	•	•	•	2000	199
Oxygen	500 ppm - 50%	TBD	•	•	•	2000	199

Mixture Grades Key
P - Primary Standard
C - Certified Standard
U - Non-Certified Standard

Note(s):
For concentrations above 50%, the SDS for the inver mixture applies (i.e. Helium in Argon).

Carbon Monoxide (CO)



BALANCE GAS	SDS RANGE	SDS
Air	500 ppm - 10%	PA 4560S
Argon	500 ppm - 11.1% 500 ppm - 50%	PA 45632S
Helium	500 ppm - 14.3% 500 ppm - 50%	PA 4600S
Hydrogen	500 ppm - 50%	PA 4604S
Nitrogen	500 ppm - 20% 500 ppm - 50%	PA 46312S
Oxygen	500 ppm - 50%	PA 4638A

BALANCE GAS	CONCENTRATION RANGE	CGA	KEEN GRADES			PRESSURE PSIG	CONTENTS ft³
			P	C	U		
Air	500 ppm - 50%	590	• •	• •	• •	2000	244 181
Argon	500 ppm - 50%	350	• •	• •	• •	2000	244 181
Helium	500 ppm - 50%	350	• •	• •	• •	2000	244 181
Hydrogen	500 ppm - 50%	350	• •	• •	• •	2000	244 181
Nitrogen	500 ppm - 50%	350	• •	• •	• •	2000	244 181
Oxygen	500 ppm - 50%	TBD	• •	• •	• •	2000	244 181

Mixture Grades Key
P - Primary Standard
C - Certified Standard
U - Non-Certified Standard

Note(s):
For concentrations above 50%, the SDS for the inver mixture applies (i.e. Helium in Argon).

Helium (He)

BALANCE GAS	SDS RANGE	SDS
Argon	500 ppm - 49%	PA 45632S
Carbon Dioxide	500 ppm - 49%	PA 4574S
Hydrogen	500 ppm - 50%	PA 4604S
Methane	500 ppm - 50%	PA 46722S
Nitrogen	500 ppm - 50%	PA 46312S
Oxygen	500 ppm - 50%	PA 4638A

BALANCE GAS	CONCENTRATION RANGE	CGA	KEEN GRADES			PRESSURE PSIG	CONTENTS ft^3
			P	C	U		
Argon	500 ppm - 50%	590	• •	• •	• •	2000	291 219
Carbon Dioxide	500 ppm - 50%	580	• •	• •	• •	2000	291 219
Hydrogen	500 ppm - 50%	350	• •	• •	• •	2000	291 219
Methane	5 - 10%	380	• •	• •	• •	2000	291 219
Nitrogen	500 ppm - 50%	580	• •	• •	• •	2000	291 219
Oxygen	500 ppm - 50%	TBD	• •	• •	• •	2000	291 219

Mixture Grades Key
P - Primary Standard
C - Certified Standard
U - Non-Certified Standard

Note(s):
For concentrations above 50%, the SDS for the inver mixture applies (i.e. Helium in Argon).

Hydrogen (H)

BALANCE GAS	SDS RANGE	SDS
Argon	500 ppm - 2.9% 500 ppm - 49.9%	PA 45632S
Helium	500 ppm - 3.9% 500 ppm - 49.9%	PA 4600S
Nitrogen	500 ppm - 5.7% 500 ppm - 49.9%	PA 46312S

BALANCE GAS	CONCENTRATION RANGE	CGA	KEEN GRADES			PRESSURE PSIG	CONTENTS ft^3
			P	C	U		
Argon	1 ppm - 99.9%	350	• •	• •	• •	2000	300 249
Helium	1 ppm - 99.9%	350	• •	• •	• •	2000	300 249
Nitrogen	1 ppm - 99.9%	350	• •	• •	• •	2000	300 249

Mixture Grades Key
P - Primary Standard
C - Certified Standard
U - Non-Certified Standard

Note(s):
For concentrations above 50%, the SDS for the inver mixture applies (i.e. Helium in Argon).

Nitrogen (N)

BALANCE GAS	SDS RANGE	SDS
Argon	500 ppm - 49%	PA 45632S
Helium	500 ppm - 49%	PA 4600S
Hydrogen	500 ppm - 49%	PA 4604S
Oxygen	500 ppm - 49.99%	PA 4638A

BALANCE GAS	CONCENTRATION RANGE	CGA	KEEN GRADES			PRESSURE PSIG	CONTENTS ft^3
			P	C	U		
Argon	500 ppm - 49%	580	• •	• •	• •	2000	304 230
Helium	500 ppm - 49%	580	• •	• •	• •	2000	304 230
Hydrogen	500 ppm - 49%	350	• •	• •	• •	2000	304 230
Oxygen	500 ppm - 49%	296	• •	• •	• •	2000	304 230

Mixture Grades Key
P - Primary Standard
C - Certified Standard
U - Non-Certified Standard

Note(s):
For concentrations above 50%, the SDS for the inver mixture applies (i.e. Helium in Argon).

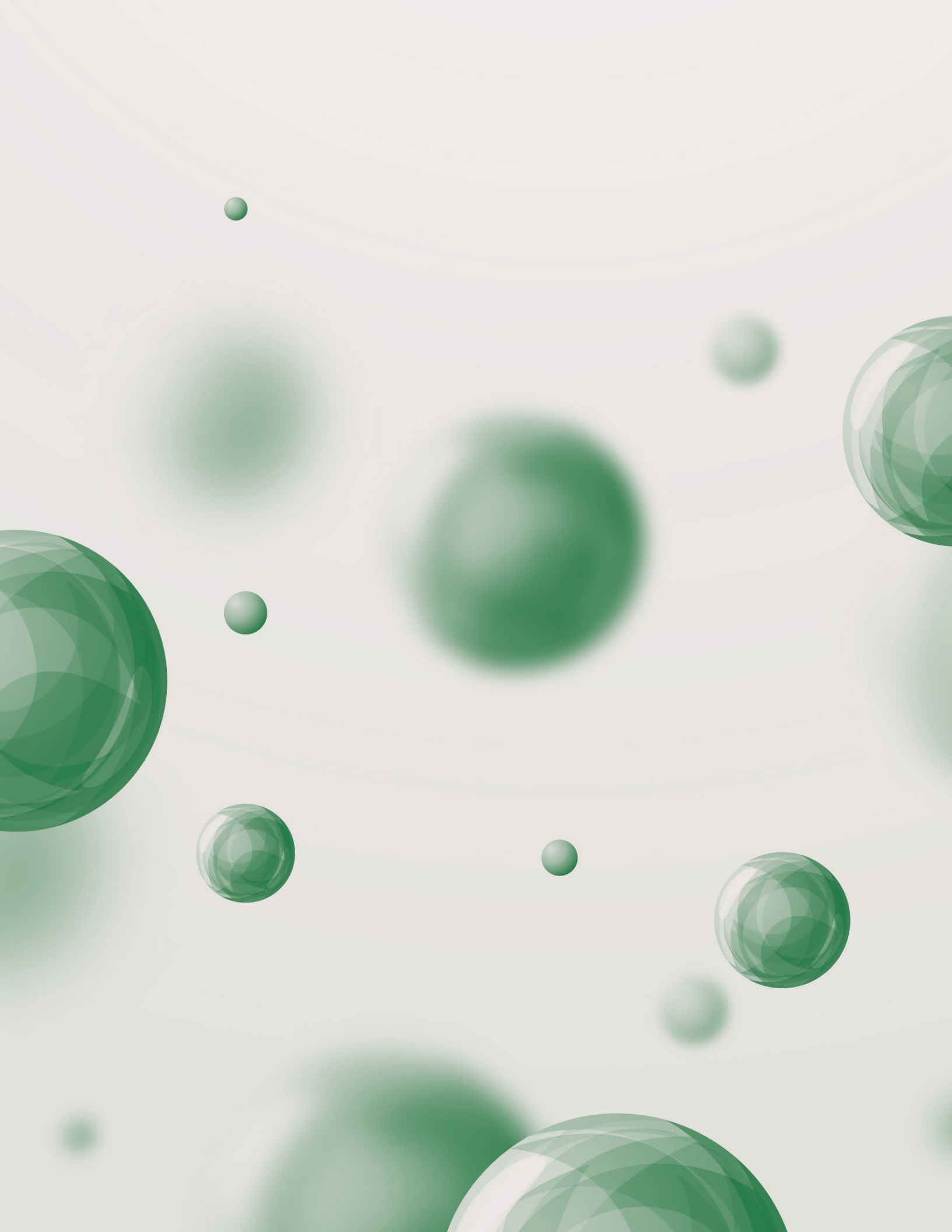
Oxygen (O)

BALANCE GAS	SDS RANGE	SDS
Argon	500 ppm - 49%	PA 45632S
Carbon Dioxide	500 ppm - 49%	PA 4574S
Helium	500 ppm - 49%	PA 4602S
Nitrogen	500 ppm - 49%	PA 46312S

BALANCE GAS	CONCENTRATION RANGE	CGA	KEEN GRADES			PRESSURE PSIG	CONTENTS ft^3
			P	C	U		
Argon	200 ppm - 99.9%	296	• •	• •	• •	2000	307 251
Carbon Dioxide	500 ppm - 49%	296	• •	• •	• •	2000	307 251
Helium	500 ppm - 49%	296	• •	• •	• •	2000	307 251
Nitrogen	500 ppm - 49%	296	• •	• •	• •	2000	307 251

Mixture Grades Key
P - Primary Standard
C - Certified Standard
U - Non-Certified Standard

Note(s):
For concentrations above 50%, the SDS for the inver mixture applies (i.e. Helium in Argon).



OTHER GASES

Other Gases Available

Keen Compressed Gas Co. is able to provide these gases from our quality partners.

Other Gases listed are commonly used gases, but not a complete listing

Ammonia (NH_3)

SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Ammonia, Anhydrous	2.2	Nonflammable Gas, Inhalation Hazard	99.995%

Butane (C_4H_{10})

SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Butane	2.1	Flammable Gas	99.5 wt% (liquid phase)

Butene (C_4H_8)

SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Butylene	2.1	Flammable Gas	99.0 wt% (liquid phase)

Carbon Monoxide (CO)

SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Carbon Monoxide, Compressed	2.3 (2.1)	Toxic Gas, Flammable Gas	

Chlorine (Cl_2)

SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Chlorine	2.3 (5.1) (8)	Toxic Gas, Oxidizer, Corrosive	

Ethane (C_2H_6)

SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Ethane	2.1	Flammable Gas	

Ethylene (C_2H_4)

SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Ethylene	2.1	Flammable Gas	

Methane (CH_4)

SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Methane, Compressed	2.1	Flammable Gas	

Neon (Ne)

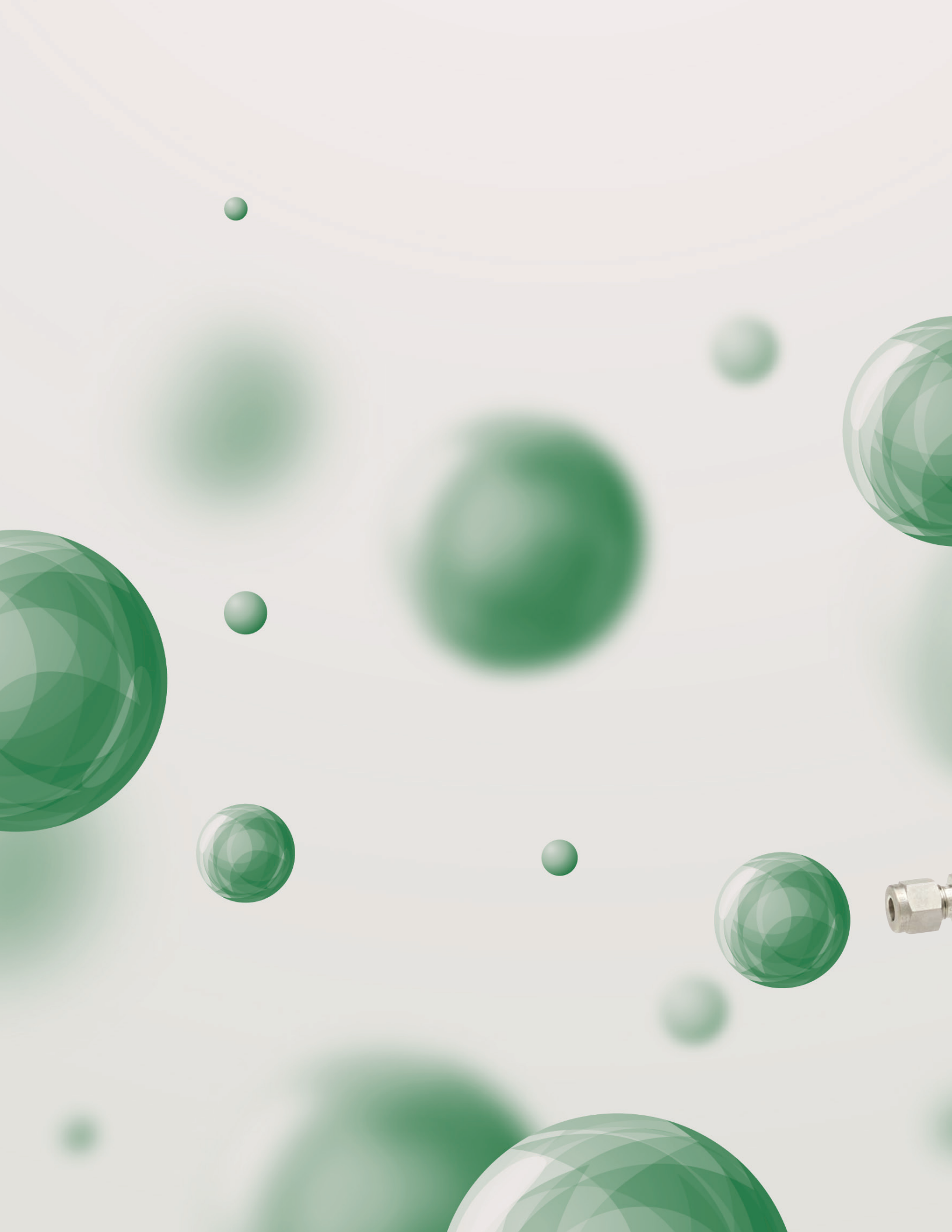
SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Neon, Compressed	2.2	Nonflammable Gas	100.00%

Nitric Oxide (NO)

SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Nitric Oxide, Compressed	2.3 (5.1) (8)	Toxic Gas, Oxidizing, Corrosive	99.50%

Nitrogen Dioxide (C_2H_6)

SHIPPING NAME	HAZARD CLASS	LABEL	PURITY
Dinitrogen Tetroxide	2.3 (5.1) (8)	Toxic Gas, Oxidizer, Corrosive	99.5% Liquid phase analysis



REGULATORS

High Purity Pressure Regulator Selection

Gases can be supplied in compressed gas high-pressure cylinders, liquid low-pressure cylinders or from low-pressure pipeline supply. The pressure from the supply source must be reduced to the desired working pressure for the application, to accomplish this a pressure reducing valve commonly referred to as a regulator needs to be selected. Proper selection is critical for a safe and effective transfer of the gas from the gas supply to the instrument. Regulators are designed to control pressure. Regulators will not measure or control flow. An external device such as a flowmeter or metering valve specifically designed for flow control should be used for that purpose.

Selection of the correct regulator involves many variables. All items must be considered in making the proper regulator selection.

Materials Compatibility

Materials used to construct the pressure regulator need to be compatible with the intended gas service. All the wetted areas (parts of the regulator in contact with the gas) must be selected to avoid any reaction with the gas that can cause contamination in the gas stream or deterioration of the regulator components.

Inlet Pressure Rating

Inlet pressures can range from low pressure in pipeline usage to high pressure from compressed gas cylinders. Regulators used in a pipeline will normally have only one gauge to indicate delivery pressure while a cylinder regulator will have two gauges; one to show inlet pressure and the other to show delivery pressure. An exception to this would be the use of regulators for liquid gas cylinders. In this application, only the delivery pressure gauge would be required since the supply pressure is generally constant. When selecting the regulator it must be capable of handling the incoming inlet pressure. When the gas is supplied from a cylinder the CGA (Compressed Gas Association) inlet connection number will dictate the maximum supply pressure. This pressure can range from 100 PSI to over 6000 PSI.

Delivery Pressure Range

The desired working pressure for the operation may range from low pressure up to 15 PSIG to a much higher working pressure (7500-PSIG). The regulator selected must be able to supply the proper working pressure consistent with the requirements of the process.

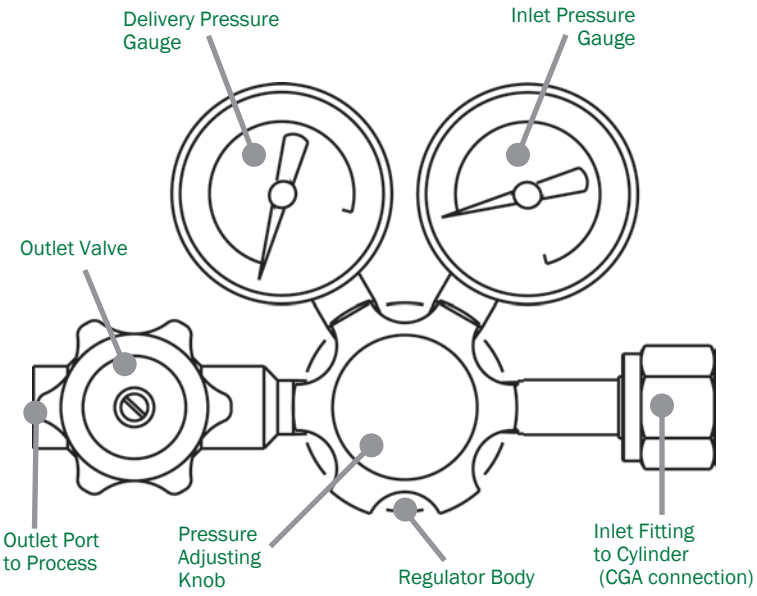
Gas Purity

Maintaining the purity level of the gas is of primary importance in the selection of the regulator. The selected regulator must be resistant to any introduction of contaminants that can be detrimental to the process. In addition to the proper selection of materials for gas compatibility, the design, assembly and testing of the regulator are critical items to consider in the selection process. Clean room assembly and Helium leak testing are common procedures used to ensure the integrity of the regulator.

Pressure Regulation, Single-Stage or Two-Stage Design

All regulators are designed to reduce the inlet pressure to a desired working pressure. The regulator can reduce the pressure in either one step or two steps. A single-stage regulator reduces the pressure in one step and a two-stage regulator reduces the pressure in two steps, either may be suitable for the application based on the desired pressure control. Single-Stage regulators are best suited for applications where manual periodic adjustment of the delivery pressure settings is not a problem and the inlet pressure remains constant, such as the case in gas withdrawal from liquid cylinders.

Two-stage regulators are two regulators built into a single regulator body. The first regulator (first stage) is preset at a non-adjustable pressure to reduce the incoming pressure to a lower pressure referred to as the intermediate stage. The second regulator (second stage) is adjustable within the desired delivery range. The two-stage regulator allows for steady delivery pressure without periodic adjustment, well suited for applications requiring constant pressure from full to nearly empty cylinder.



Operation of Pressure Regulators

Single-Stage Regulators

Gas enters the inlet (high-pressure) chamber and its pressure is indicated on the inlet pressure gauge. When the pressure adjusting knob is turned counterclockwise and completely backed out to the stop, a valve and seat assembly located between the inlet chamber and the delivery (low pressure) chamber prevents gas from moving any further. A filter located at the inlet to the valve and seat assembly, removes particulate matter from the gas stream to help protect the seat area.

Turning the pressure-adjusting knob clockwise causes the adjusting screw to push against a spring button that compresses the pressure adjusting spring. The force of the compressed spring, in turn, causes the diaphragm to flex and push against the valve. This opens the regulator allowing gas to flow from the inlet chamber to the delivery chamber of the regulator.

Gas entering the delivery pressure chamber begins to build pressure and creates a counter-force (counter to the pressure adjusting spring) on the diaphragm. This pressure is indicated on the delivery pressure gauge attached to the delivery chamber. When pressure builds sufficiently to counteract the spring tension, it pushes the diaphragm away from the poppet allowing the regulator valve to close. In this manner, pressure in the delivery chamber is controlled or regulated by the amount of spring tension placed on the diaphragm and is selectable by turning the pressure adjusting knob until desired pressure is indicated on the delivery pressure gauge.

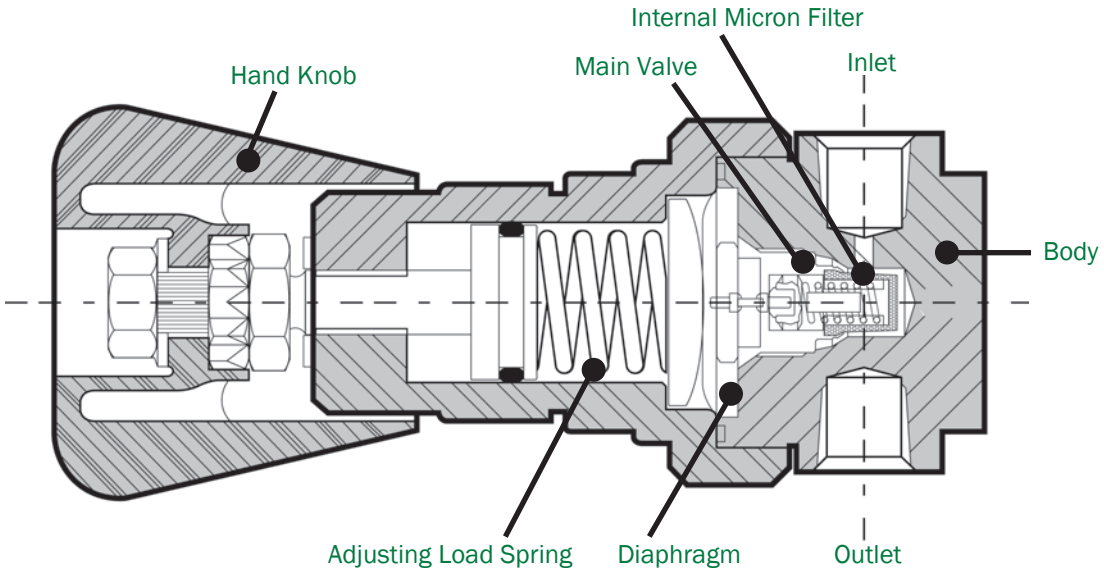
When gas from the delivery pressure chamber is sent to the end process, the resulting decrease in gas volume in the delivery chamber causes a pressure reduction in the chamber. When this occurs, the spring tension again causes the diaphragm to push the valve open, allowing additional gas to enter the delivery chamber.

Two-Stage Regulators

These regulators incorporate all components of a single-stage regulator. In addition, however, they also contain a second pressure adjusting spring, diaphragm, and valve seat assembly. The first stage is not user adjustable with the pressure adjusting spring “pre-compressed” at the factory. This allows the first stage to feed pressure to the second (adjustable) stage. The normal maximum delivery pressure for two-stage regulators is 500 PSI.

The second stage then performs in a manner similar to that of a single-stage regulator, except that the inlet pressure to the second stage is relatively constant. The two-step pressure reduction produces a final delivery pressure showing little effect from changes in cylinder pressure.

Components of a Single Stage Regulator



PURE GAS

Recommended Regulators for Pure Gas Service

Pure Gas Service - Recommended Regulators

GAS SERVICE	GRADE	CYLINDER PRESSURE (PSI)	CGA	RECOMMENDED EQUIPMENT
Acetylene (C2H2)	Atomic Absorption	250	510	HP717
	Commercial Grade, 98.0%		510	HP717
Air	Blended Air	3000	590	GP402
	CO2 Free	3000	590	HP702
	Compressed Air	3000	346	GP402
	Dry	3000	346/590 #	GP402
	High Pressure (4500 psig)	4500	347	HP8700
	High Pressure (6000 psig)	6000	702	HP8700
	Hydrocarbon Free	3000	346/590 #	HP702
	Ultra Pure Carrier 590 HPE 27	3000	590	HP722/HP722C
	Ultra Zero	3000	590	HP722/HP722C
	Vehicle Emission Zero	3000	590	HP702
	V.O.C. Free Air	3000	590	HP702
	Zero	3000	346/590 #	HP702
Allene (C3H4)		117	510	GP401
Ammonia (NH3)	Anhydrous	114	240/705	HP701EN
	Electronic		660	HP746 w/ Cross Purge
	Nitride		660	HP746 w/ Cross Purge
	Research		660	HP746 w/ Cross Purge
	Semiconductor		660	HP746 w/ Cross Purge
	Ultra High Purity		660	HP746 w/ Cross Purge
Argon (Ar)	High Pressure (4500 psig)	4500	680	HP8700
	High Pressure (6000 psig)	6000	677	HP8700
	High Purity	3000	580	HP702
	Prepurified	3000	580	HP702
	Research	3000	580	HP722/HP722C
	Semiconductor	3000	580	HP722/HP722C
	Sputtering	3000	580	HP722/HP722C
	Ultra High Purity	3000	580	HP722/HP722C
	Ultra Pure Carrier	3000	580	HP722/HP722C
	Zero	3000	580	HP722/HP722C
Arsine (AsH3)	Electronic	205	350	HP741
	ULSI Purity		350	HP741
Boron Trichloride (BCl3)	Chemically Pure	4.4	660	HP746 w/ Cross Purge
Boron Trifluoride (BF3)	Chemically Pure	800	330	HP746 w/ Cross Purge
1,3 Butadiene (C4H6)	Chemically Pure	21.4	510	GP401
	High Purity	21.4	510	HP701
	Instrument	21.4	510	HP701
	Research	21.4	510	HP7021 / HP721C
Butane (C4H10)		16		
n-Butane	Chemically Pure		510	GP401
	Research		510	HP701
	Instrument		510	GP401
1-Butene (1- C4H8)	Chemically Pure	23.5	510	GP401
	High Purity		510	HP701
	Instrument		510	HP721 / HP721C
2-Butene (2-C4H8)	Chemically Pure	15	510	GP401
cis-2-Butene (C4H8)	Chemically Pure	15.2	510	HP701

Pure Gas Service - Recommended Regulators

GAS SERVICE	GRADE	CYLINDER PRESSURE (PSI)	CGA	RECOMMENDED EQUIPMENT
trans-2-Butene (C4H8)	Chemically Pure	12.7	510	HP701
Carbon Dioxide (CO2)	Anaerobic	835	320	HP702
	Bone Dry	835	320	HP705
	Chemically Pure	835	320	HP705
	Instrument (Coleman)	835	320	HP705
	Pure Clean	835	320	HP722 / HP722C
	Research	835	320	HP722 / HP722C
	SFC	835	320	SFC/SFE Valve kit
	SFE	835	320	SFC/SFE Valve kit
Carbon Monoxide (CO)	Chemically Pure	1650	350	HP702
	Industrial	1650	350	HP702
	Research	1650	350	HP722 / HP722C
	Semiconductor	1650	350	HP722 / HP722C
	Ultra High Purity	1650	350	HP722 / HP722C
Carbonyl Sulfide (COS)		160	330	HP701EN
Chlorine (Cl2)	Electronic	85	660	HP746 w/ Cross Purge
	High Purity		660	HP746 w/ Cross Purge
	Ultra High Purity		660	HP746 w/ Cross Purge
Cyclopropane (C3H6)		75	510	GP401
Deuterium (D2)	Chemically Pure	Various	350	HP722 / HP722C
	Research	Various	350	HP722 / HP722C
Dichlorosilane (H2SiCl2)	Electronic	3.83	678	HP746 w/ Cross Purge
	Semiconductor Purity		678	HP746 w/ Cross Purge
Dimethylamine (C2H3)2NH		26		
			705	HP746 w/ Cross Purge
Dimethyl Ether (C2H6O)		8.4	510	GP401
Ethane (C2H6)	Chemically Pure	543	350	HP701
	Research		350	HP721/HP721C
	Technical		350	HP701
	Ultra High Purity		350	HP721/HP721C
Ethyl Chloride (C2H5Cl)	Chemically Pure	5.6	300	Manual Control Valve
Ethylene (C2H4)	Chemically Pure	1200	350	HP702
	Plant Growth		350	HP702
	Research		350	HP722/HP722C
	Ultra High Purity		350	HP722/HP722C
Ethylene Oxide (C2H4O)		6.5	510	Manual Control Valve
Halocarbon 12 (CCl2F2)		70	660	GP401
(Dichlorodifluoromethane)				
Halocarbon 13 (CClF3)		459	320/660 *	HP701
(Chlorotrifluoromethane)				
Halocarbon 13B1 (CBrF3)		189	320/660 *	GP401
(Bromotrifluoromethane)				
Halocarbon 14 (CF4)	Semiconductor		320/580 *	HP722/HP722C
(Tetrafluoromethane)	Ultra High Purity		320/580 *	HP722/HP722C
Halocarbon 21 (CHCl2F)		8.4	660	Brass Manual Control Valve
(Dichlorofluoromethane)				
Halocarbon 22 (CHClF2)		123	660	GP401
(Chlorodifluoromethane)				

Pure Gas Service - Recommended Regulators

GAS SERVICE	GRADE	CYLINDER PRESSURE (PSI)	CGA	RECOMMENDED EQUIPMENT
Halocarbon 23 (CHF3)	Electronic	635	660	HP721/HP721C
(Trifluoromethane)	Semiconductor		660	HP721/HP721C
	Technical		660	HP701
Halocarbon 114 (C2Cl2F4)		13	660	GP401
(1,2-Dichlorotetrafluoroethane)				
Halocarbon 115 (C2ClF5)		102	660	GP401
(Chloropentafluoroethane)				
Halocarbon 116 (C2F6)	Semiconductor	417	660	HP721/HP721C
(Hexafluoroethane)				
Halocarbon 142B (C2H3ClF2)		28	510	GP401
(1-Chloro-1,1-Difluoroethane)				
Halocarbon 152A (C2H4F2)		63	510	GP401
(1,1-Difluoroethane)				
Halocarbon -218 (C3F8)	Semiconductor	100	660	HP721/HP721C
(Perfluorpropane)				
Halocarbon C-318 (C4F8)		25	660	GP401
(Octafluorocyclobutane)				
Halocarbon 500		82.3	510/660 *	GP401
(73.8 wt.% Halocarbon 12				
26.2 wt.% Halocarbon 152A)				
Halocarbon 502		132	320/660 *	GP401
(48.8 wt.% Halocarbon 22				
51.2 wt.% Halocarbon 115)				
Halocarbon 503		613	320	GP401
(60 wt.% Halocarbon 23				
40 wt.% Halocarbon 13)				
Halocarbon 1113 (C2ClF3)		62	510	GP401
(Chlorotrifluoroethylene)				
Halocarbon 1132A (C2H2F2)		518	350	GP401
(1,1-Difluoroethylene)				
Halocarbon 1216 (C3F6)		85	660	HP721/HP721C
(Hexafluoropropylene)				
Helium (He)	Carrier Grade	3000	580	HP702
	Chromatographic	3000	580	HP722/HP722C
	High Pressure (4500 psig)	4500	680	HP8700
	High Pressure (6000 psig)	6000	677	HP8700
	High Purity	3000	580	HP722/HP722C
	Research	3000	580	HP722/HP722C
	Semiconductor	3000	580	HP722/HP722C
	Ultra High Purity	3000	580	HP722/HP722C
	Ultra Pure Carrier	3000	580	HP722/HP722C
	Zero	3000	580	HP722/HP722C
Hexafluoropropylene (C3F6)		85	660	HP702
Hydrogen (H2)	Carrier Grade	3000	350	HP702
	Extra Dry	3000	350	HP702
	High Pressure (4500 psig)	4500	695	HP8700
	High Pressure (6000 psig)	6000	703	HP8700
	High Purity	3000	350	HP722/HP722C

Pure Gas Service - Recommended Regulators

GAS SERVICE	GRADE	CYLINDER PRESSURE (PSI)	CGA	RECOMMENDED EQUIPMENT
	Prepurified	3000	350	HP722/HP722C
	Research	3000	350	HP722/HP722C
	Semiconductor	3000	350	HP722/HP722C
	Ultra High Purity	3000	350	HP722/HP722C
	Ultra Pure Carrier	3000	350	HP722/HP722C
	Zero	3000	350	HP722/HP722C
Hydrogen Bromide (HBr)		320	330	HP741
Hydrogen Chloride (HCl)	Electronic	611	330	HP746 w/ Cross Purge
	Research		330	HP746 w/ Cross Purge
	Technical		330	HP746 w/ Cross Purge
	Ultra High Purity		330	HP746 w/ Cross Purge
Hydrogen Selenide (H2Se)	Research	125	660	HP746 w/ Cross Purge
	Semiconductor		350	HP746 w/ Cross Purge
Hydrogen Sulfide (H2S)	Chemically Pure	247	330	HP741
	Research		330	HP741
	Technical		330	HP741
Isobutane (C4H10)	Chemically Pure	31	510	GP401
	Research		510	HP701
	Technical		510	GP401
Isobutylene (C4H8)	Chemically Pure	24	510	GP401
	Research		510	HP701
	Technical		510	GP401
Isopentane (C5H12)	Chemically Pure		510	Brass Manual Control Valve
Krypton (Kr)	Purified	220-1050	580	HP722 / HP722C
	Research		580	HP722 / HP722C
	Window		580	HP722 / HP722C
Methane (CH4)	Commercial	3000	350	GP402
	Chemically Pure	3000	350	HP702
	High Pressure (4500 psig)	4500	695	HP8700
	High Pressure (6000 psig)	6000	703	HP8700
	Instrument	3000	350	HP722/HP722C
	Research	3000	350	HP722/HP722C
	Technical	3000	350	HP722/HP722C
	Ultra High Purity	3000	350	HP722/HP722C
Methyl Bromide (CH3Br)		13	320/330 #	HP701
Methyl Chloride (CH3Cl)	Chemically Pure	59	510/660 #	HP701
Methyl Mercaptan (CH3SH)		15	330	HP741
Monomethylamine (CH3NH2)	Chemically Pure	30	705	HP746 w/ Cross Purge
Natural Gas		300	350	GP402
Neon (Ne)	Chemically Pure	Various	580	HP702
	High Purity	Various	580	HP722/HP722C
	Research	Various	580	HP722/HP722C
Nitric Oxide (NO)	Chemically Pure	500	660	HP741 / HP742
Nitrogen (N2)	Continuous Emission Monitoring	3000	580	HP722/HP722C
	Extra Dry	3000	580	HP702
	High Pressure (4500 psig)	4500	680	HP8700
	High Pressure (6000 psig)	6000	677	HP8700
	High Purity	3000	580	HP722/HP722C

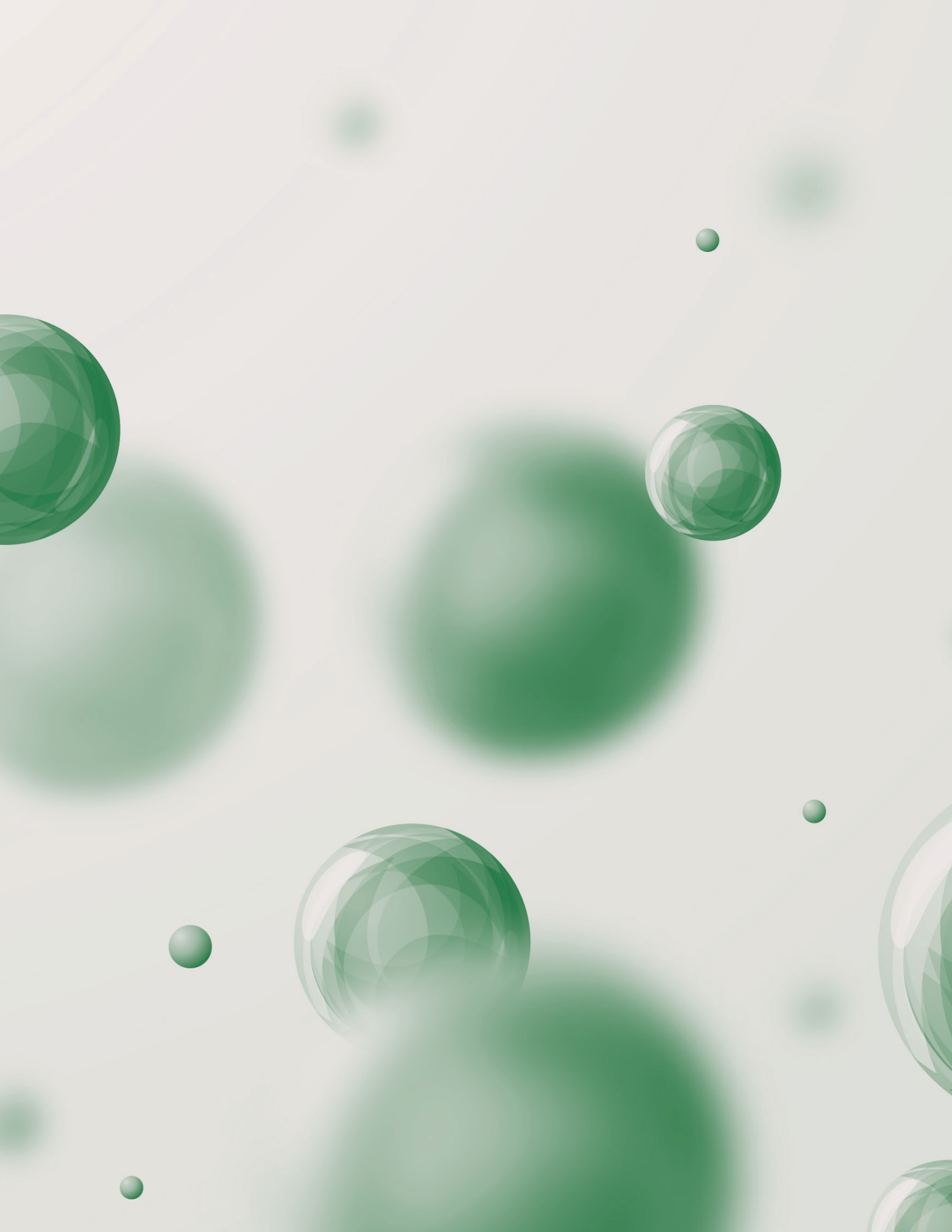
Pure Gas Service - Recommended Regulators

GAS SERVICE	GRADE	CYLINDER PRESSURE (PSI)	CGA	RECOMMENDED EQUIPMENT
	Prepurified	3000	580	HP722/HP722C
	Research	3000	580	HP722/HP722C
	Semiconductor	3000	580	HP722/HP722C
	Ultra High Purity	3000	580	HP722/HP722C
	Ultra Pure Carrier	3000	580	HP722/HP722C
	Ultra Zero Ambient Monitoring Zero	3000	580	HP722/HP722C
	Vehicle Emission Zero	3000	580	HP722/HP722C
	VOC Free Nitrogen	3000	580	HP722/HP722C
	Zero	3000	580	HP722/HP722C
Nitrogen Dioxide (NO2)		0	660	Manual Control Valve
Nitrous Oxide (N2O)	Atomic Absorption	745	326	HP705
	Chemically Pure		326	HP705
	Electronic		326	HP721/HP721C
	High Purity		326	HP721/HP721C
	Industrial		326	HP702
	Research		326	HP721/HP721C
	Semiconductor		326	HP721/HP721C
	Technical		326	HP702
	Ultra High Purity		326	HP721/HP721C
Oxygen (O2)	Extra Dry	3000	540	HP702
	Hydrocarbon Free	3000	540	HP702
	Research	3000	540	HP722/HP722C
	Ultra High Purity	3000	540	HP722/HP722C
	Ultra Pure Carrier	3000	540	HP722/HP722C
	Ultra Zero	3000	540	HP722/HP722C
	Zero	3000	540	HP722/HP722C
Perfluoropropane (C3F8)	Semiconductor	100	660	HP701
Phosgene (COCl2)		11	660	Manual Control Valve
Phosphine (PH3)	Electronic	593	350	HP746 w/ Cross Purge
Phosphorous (PF5)		400	330/660 #	HP746 w/ Cross Purge
Propane (C3H8)		110		
	Chemically Pure		510	HP701
	Instrument		510	HP701
	Research		510	HP721/HP721C
Propylene (C3H6)	Chemically Pure	138	510	HP701
	Electronic		510	HP701
	Polymer Purity		510	HP701
	Research		510	HP721/HP721C
Silane (SiH4)	Electronic	1250	350	HP746 w/ Cross Purge
	Semiconductor	1250	350	HP746 w/ Cross Purge
	Solar	1250	350	HP746 w/ Cross Purge
Silicon Tetrafluoride (SiF4)	Semiconductor	1000	330	HP741
Sulfur Dioxide (SO2)	Anhydrous	34	660	HP741
	Commercial		660	HP741
Sulfur Hexafluoride (SF6)	Commercial	298	590	HP701
	Chemically Pure		590	HP701
	Electronic		590	HP721/HP721C

Pure Gas Service - Recommended Regulators

GAS SERVICE	GRADE	CYLINDER PRESSURE (PSI)	CGA	RECOMMENDED EQUIPMENT
	Instrument		590	HP701
	Technical		590	HP721/HP721C
Sulfur Tetrafluoride (SF4)	Technical	140	330	HP746 w/ Cross Purge
Trimethylamine (C3H3)3N	Chemically Pure	13	705	HP746 w/ Cross Purge
Vinyl Methyl Ether (C3H6O)		11	290	Manual Control Valve
Xenon (Xe)	Propulsion	800	580	HP722/HP722C
	Purified	800	580	HP722/HP722C
	Research	800	580	HP722/HP722C
# CGA connection may vary upon cylinder size or gas manufacturer - check with your gas supplier to determine the CGA connection.				

For assistance with upgrading your compressed gas delivery systems, please contact Keen Gas
302.594.4545 or email Service@KeenGas.com



MIXTURES

Recommended Regulators for Mixtures

Mixtures - Recommended Regulators

Minor Component Balance Gas	CGA Connection Number	Equipment Recommendations
Acetaldehyde		
In Helium	350	HP742
In Nitrogen	350	HP742
Acrylonitrile		
In Helium	350	HP742
In Nitrogen	350	HP742
Ammonia		
In Air	590/660/705 *	HP742
In Argon	705	HP742
In Helium	705	HP742
In Hydrogen	330/660/705 *	HP742
In Nitrogen	330/660/705 *	HP742
Argon		
In Helium	580	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	580	HP702/HP722/HP722C
In Oxygen	296	HP702/HP722/HP722C
Benzene		
In Air	590	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Butane		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Carbon Dioxide		
In Air	580/590 *	HP702/HP722/HP722C
In Argon	580	HP702/HP722/HP722C
In Carbon Monoxide	350	HP702/HP722/HP722C
In Helium	580	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	580	HP702/HP722/HP722C
In Oxygen	296/540 *	HP702/HP722/HP722C
Carbon Disulfide		
In Argon	330	HP742
In Helium	330	HP742
In Nitrogen	330	HP742
Carbon Monoxide		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Carbonyl Sulfide		
In Argon	330	HP742
In Helium	330	HP742

Minor Component Balance Gas	CGA Connection Number	Equipment Recommendations
Carbonyl Sulfide		
In Nitrogen	330	HP742
Chlorine		
In Argon	660	HP742
In Helium	660	HP742
In Nitrogen	330/660 *	HP742
Ethane		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Ethanol		
In Nitrogen	350	HP702/HP722/HP722C
Ethylene		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Ethylene Oxide		
In Air	590	HP742
In Nitrogen	350	HP742
Halocarbon 12		
In Air	590	HP702/HP722/HP722C
In Argon	580	HP702/HP722/HP722C
In Helium	580	HP702/HP722/HP722C
In Nitrogen	580	HP702/HP722/HP722C
Helium		
In Argon	580	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	580	HP702/HP722/HP722C
In Oxygen	296	HP702/HP722/HP722C
Hexane		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Hydrogen		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Hydrogen Chloride		
In Argon	330	HP746
In Helium	330	HP746
In Nitrogen	330	HP746

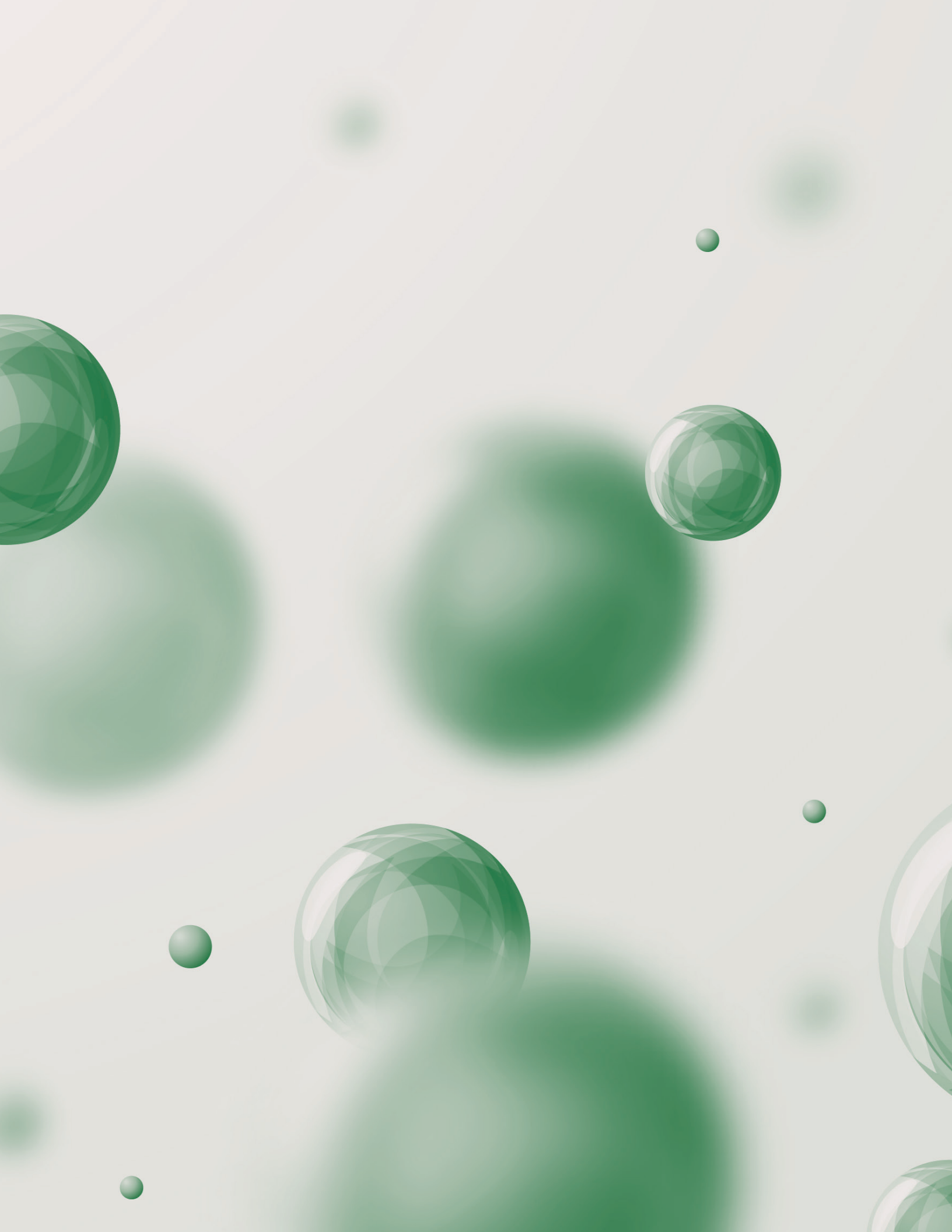
Mixtures - Recommended Regulators

Minor Component Balance Gas	CGA Connection Number	Equipment Recommendations
Hydrogen Cyanide		
In Helium	350	HP746
In Nitrogen	350	HP746
Hydrogen Sulfide		
In Air	330	HP742
In Argon	330	HP742
In Helium	330	HP742
In Hydrogen	330	HP742
In Methane	330	HP742
In Nitrogen	330	HP742
Isobutane		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Methane		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Methanol		
In Nitrogen	350	HP702/HP722/HP722C
Methyl Mercaptan		
In Helium	330/350 *	HP742
In Nitrogen	330/350 *	HP742
Moisture		
In Argon	580	HP702/HP722/HP722C
In Helium	580	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	580	HP702/HP722/HP722C
Nitric Oxide		
In Argon	660	HP742
In Helium	660	HP742
In Nitrogen	660	HP742
Nitrogen		
In Argon	580	HP702/HP722/HP722C
In Helium	580	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Oxygen	296	HP702/HP722/HP722C
Nitrogen Dioxide		
In Air	660	HP742
In Argon	660	HP742
In Helium	660	HP742
In Nitrogen	660	HP742

Minor Component Balance Gas	CGA Connection Number	Equipment Recommendations
Nitrous Oxide		
In Air	590	HP702/HP722/HP722C
In Nitrogen	590	HP702/HP722/HP722C
Oxygen		
In Argon	**	HP702/HP722/HP722C
In Helium	**	HP702/HP722/HP722C
In Nitrogen	**	HP702/HP722/HP722C
Pentane		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Propane		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Propylene		
In Air	590	HP702/HP722/HP722C
In Argon	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Hydrogen	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C
Sulfur Dioxide		
In Air	330/660 *	HP742
In Argon	660	HP742
In Helium	660	HP742
In Nitrogen	330/660 *	HP742
Sulfur Hexafluoride		
In Air	590	HP702/HP722/HP722C
In Argon	580	HP702/HP722/HP722C
In Helium	580	HP702/HP722/HP722C
In Nitrogen	580	HP702/HP722/HP722C
Toluene		
In Air	350	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Nitrogen	350/510 *	HP702/HP722/HP722C
Vinyl Chloride		
In Air	590	HP702/HP722/HP722C
In Helium	350	HP702/HP722/HP722C
In Nitrogen	350	HP702/HP722/HP722C

* CGA connection may vary upon cylinder size or gas manufacturer - check with your gas supplier to determine the CGA connection.

** Cylinder valve <5% Oxygen - CGA 580; 5% -<23.5% Oxygen - CGA 590; >-23.5% Oxygen - CGA 296



REGULATORS

Recommended Regulators

GP 403 General Purpose Series

General Purpose Brass Line Regulator

Non-Corrosive Applications

These non-corrosive general-purpose brass bar stock single stage line regulators provide a constant pressure at the point of use when the inlet pressure does not vary. The Neoprene diaphragm is perfect to provide greater sensitivity.

Model Number	Delivery Pressure (PSI)
GP 403-015	15
GP 403-050	50
GP 403-125	125
GP 403-250	250

GP 401 General Purpose Series

Single-Stage General Purpose Brass Regulator

Non-Corrosive Applications

These non-corrosive general-purpose brass bar stock single-stage cylinder regulators are suitable for closely monitored, short-run applications. The Neoprene diaphragm is perfect to provide greater sensitivity.

Model Number	Delivery Pressure (PSI)
GP 401-015	15
GP 401-050	50
GP 401-125	125
GP 401-250	250

GP 402 General Purpose Series

Two-Stage General Purpose Brass Regulator

Non-Corrosive Applications

These non-corrosive general-purpose brass two-stage cylinder regulators will provide a precise pressure control from full to an almost empty cylinder. The Neoprene diaphragm is perfect for general plant, and pilot plant.

Model Number	Delivery Pressure (PSI)
GP 402-015	15
GP 402-050	50
GP 402-125	125
GP 402-250	250

HP 703 High-Purity Series

High Purity Brass Line Regulator

Non-Corrosive Applications

The high-purity brass bar stock single-stage line regulators are perfect for non-corrosive gases for chromatographic carrier gas applications. The stainless steel diaphragm is perfect for industrial and analytical applications.

Model Number	Delivery Pressure (PSI)
HP 703-015	15
HP 703-050	50
HP 703-125	125
HP 703-250	250

HP 701 High-Purity Series

Single-Stage High Purity Brass Regulator

Non-Corrosive Applications

These high-purity brass bar stock single-stage cylinder regulators are suitable for closely monitored, short-run applications. The stainless steel diaphragm is perfect for analytical applications.

Model Number	Delivery Pressure (PSI)
HP 701-015	15
HP 701-050	50
HP 701-125	125
HP 701-250	250

HP 702 High-Purity Series

Two-Stage High Purity Brass Regulator

Non-Corrosive Applications

This high-purity brass bar stock two-stage cylinder regulators will provide a precise pressure control from full to an almost empty cylinder. The stainless steel diaphragm is perfect for analytical applications.

Model Number	Delivery Pressure (PSI)
HP 702-015	15
HP 702-050	50
HP 702-125	125
HP 702-250	250

HP 723C Ultra High-Purity Series

Ultra High-Purity Brass Regulator

Non-Corrosive Applications

The ultra high purity chrome plated brass bar stock single stage line regulators are perfect for non-corrosive gasses for chromatography carrier gas applications. This chrome plated brass regulator offers a low internal volume and eliminates large cavities that are associated with forged-body designs.

Model Number	Delivery Pressure (PSI)
HP 723C-015	15
HP 723C-050	50
HP 723C-125	125
HP 723C-250	250
HP 723C-500	500

HP 721C Ultra High-Purity Brass Series

Single-Stage Ultra High-Purity Brass

Non-Corrosive Applications

These chrome plate brass, single-stage, ultra high-purity regulators are recommended for non-corrosive analytical and process applications where precise flow control is not critical. A specially designed, convoluted, stainless steel diaphragm provides good regulating performance and maximum purity integrity. These regulators are capable of withstanding an internal vacuum and can be provided with a diffusion-resistant valve.

Model Number	Delivery Pressure (PSI)
HP 721C-015	15
HP 721C-050	50
HP 721C-125	125
HP 721C-250	250
HP 721C-500	500

HP 722C Ultra High-Purity Series

Two-Stage Ultra High-Purity Brass

Non-Corrosive Applications

This series of two-stage, ultra high-purity regulators is designed for non-corrosive analytical and process applications requiring precise, stable delivery pressure control. The two-stage design yields a delivery pressure of less than 0.05/100 psi inlet change.

This regulator also has both a front and rear panel mount bonnet to allow for easy panel mounting. Convoluted stainless steel diaphragms provide excellent regulating characteristics and allow for internal vacuum purging. The diaphragm prevents contamination and provides a leak-rate design of less than 2 x 10-9 ccs helium. This minimizes cleanup time in vacuum purging and yields lower residual contaminant levels. Captured bonnet ports with optional vent adaptors are standard on both stages and allow for the venting of hazardous gases in the event of diaphragm failure. These regulators are ultrasonically cleaned for the most demanding high-purity service.

Model Number	Delivery Pressure (PSI)
HP 722C-015	15
HP 722C-050	50
HP 722C-125	125
HP 722C-250	250
HP 722C-500	500

HP 743 High-Purity Stainless Steel Series

High-Purity Stainless Steel Line Regulator

Non-Corrosive and Corrosive Applications

These stainless steel high-purity single-stage line regulators are recommended for applications where diffusion resistance is required. This regulator is perfect for applications that require low-pressure pipelines serving gas chromatograph, mass spectrometers, research sampling and semiconductor processing. The specially-designed, convoluted 316L stainless steel diaphragm provides accurate, stable delivery pressure at the point of use when the inlet pressure does not vary. This regulator is capable of withstanding internal vacuum purging and is easily mounted to panels using the optional panel mounting nuts with threaded bonnets. There are two 10 x 32 UNF-thread holes in the body which allow for bracket or external panel mounting.

Model Number	Delivery Pressure (PSI)
HP 743-015	15
HP 743-050	50
HP 743-125	125
HP 743-250	250
HP 743-500	500

HP 741 High-Purity Stainless Steel Series

Single-Stage Stainless Steel Regulator

Non-Corrosive and Corrosive Applications

These stainless steel high-purity single-stage cylinder regulators are recommended for closely monitored, short-run applications for non-corrosive and mildly corrosive gases. The specially-designed, convoluted 316L stainless steel diaphragm provides accurate, stable delivery pressure at the point of use when the inlet pressure does not vary. This regulator is capable of withstanding internal vacuum purging. The bonnet vent port enables venting hazardous gases in the event of diaphragm failure.

Model Number	Delivery Pressure (PSI)
HP 741-015	15
HP 741-050	50
HP 741-125	125
HP 741-250	250
HP 741-500	500

HP 742 High-Purity Stainless Steel Series

Two-Stage Stainless Steel Regulator

Non-Corrosive and Corrosive Applications

These stainless steel high-purity two-stage cylinder regulators are recommended for applications where precise pressure control from full to an almost empty cylinder are required for non-corrosive and mildly corrosive gases.

The specially-designed, convoluted 316L stainless steel diaphragm provides accurate, stable delivery pressure at the point of use when the inlet pressure does not vary. This regulator is capable of withstanding internal vacuum purging. The optional bonnet vent adapter enables venting hazardous gases in the event of diaphragm failure.

Model Number	Delivery Pressure (PSI)
HP 742-015	15
HP 742-050	50
HP 742-125	125
HP 742-250	250
HP 742-500	500

Regulator Mounting

EZ Mount Option

Brass and Stainless Steel

The EZ Mount option enables a practical and safe wall-mounted installation of any analytical, high-purity, or ultra high-purity cylinder regulator. This allows out-of-the box installation of the regulator assembly onto a wall or existing structure. The convenient, compact design significantly minimizes the amount of valuable wall space normally required to wall mount regulators. EZ Mount options include 36" stainless steel flexible pigtails, an appropriate wall-mount bracket, a stainless steel street elbow fitting and a CGA connection with integrated check valve to prevent contaminates from entering the gas delivery supply during cylinder change out. The wall-mount brackets are fabricated from 304 stainless steel for durable, long-life service and are suitable for most environments and locations.

NOTE: Only available with the ultra high purity brass & high-purity stainless steel regulators. Regulator is not included; must be ordered separately.

Model Number	# Cyls	Material
SG910EZB1	1	Brass
SG910EZB2	2	Brass
SG910EZS1	1	Stainless Steel
SG910EZS2	2	Stainless Steel

Special Application Regulators
HP 8700 High Delivery Pressure Models

Designed for a wide range of pressure settings, these single-stage regulators are recommended for use in petroleum field applications, research laboratories for hydrogenation, catalytic reduction, accelerated age testing, calorimetric testing, component testing, and pressure charging applications. These regulators feature a rugged brass piston, which provides increased safety and reliability at high delivery pressures. A 10 micron inlet filter protects internal components.

Model Number	Delivery Pressure (PSI)
8700-1500	1500
8700-2500	2500
8700-3000	3000
8700-4500	4500
8700-6000	6000

HP 705 High Purity Two-Stage Electrically Heated Regulators

This regulator can be used with gases that encounter the Joule-Thompson effect created in pressure drops across the internal orifices in a regulator. The regulator will maintain the gas in the vapor phase by supplying heat at the regulator's internal orifice while providing a constant delivery pressure.

Model Number	Max Inlet (PSI)	Max outlet (PSI)
HP705-125	3,000	125
This regulator is not suitable for flammable gases.		

HP 9200 Ultra-Low Delivery Pressure

This two-stage regulator is recommended for use with non-corrosive gases in applications where an ultra-low delivery pressure is required. It maintains an accurate delivery pressure over the life of the cylinder. The two-stage design limits the variations in the outlet pressure to 0.06 psig for every 100 psig of inlet pressure decay. Made of durable, long-lasting forged brass, this regulator is perfect for non-corrosive, ultra-low delivery pressure gases. A needle valve is included on the outlet.

Model Number	Delivery Pressure (PSI)
9200-002	2
9200-006	6

HP 750 High-Flow Dome-Loaded Regulator

The Special Service Regulator is a high-flow dome-loaded design. This regulator has an integral remote sensing pilot which yields high flow capacity with near perfect pressure regulation, unique in a compact unit. Since this regulator is dome loaded by a remote sensing pilot regulator, it becomes a servo-regulator, and the overall performance is determined by the performance of the pilot regulator. This Regulator is a key component in laser applications.

Model Number	Max Inlet (PSI)	Max Outlet (PSI)
750-250	3,000	250
750-500	3,000	500
750-1000	3,000	1,000

701EN Single Stage Regulator

The Model HP 701EN is a single stage regulator with a electroless nickel plated brass body for primary pressure control of corrosive and acid forming gases or gas mixtures.

Model Number	Del Press (PSI)
HP701EN-015	0 - 15
HP701EN-050	0 - 50
HP701EN-125	0 - 125
HP701EN-250	0 - 250

3520 High Flow Two Gauge Regulator

Model HP3520 is a brass bar-stock manifold regulator for pipeline and other applications up to 3000 PSIG inlet pressure. The two gauge style allows the operator to read inlet pressure. This regulator is recommended for non-corrosive gases and purity levels 99.999% and higher.

Model Number	Del Press (PSI)
HP3520-050	0 - 50
HP3520-125	0 - 125
HP3520-250	0 - 250
HP3520-500	0 - 500

3530 High Flow Single Gauge Regulator

Model HP3530 is a brass bar-stock manifold regulator for pipe line and other applications up to 3000 PSIG inlet pressures. The single gage style allows the operator to read the delivery pressures easily. This regulator is recommended for non-corrosive gases and purity levels 99.999% and higher.

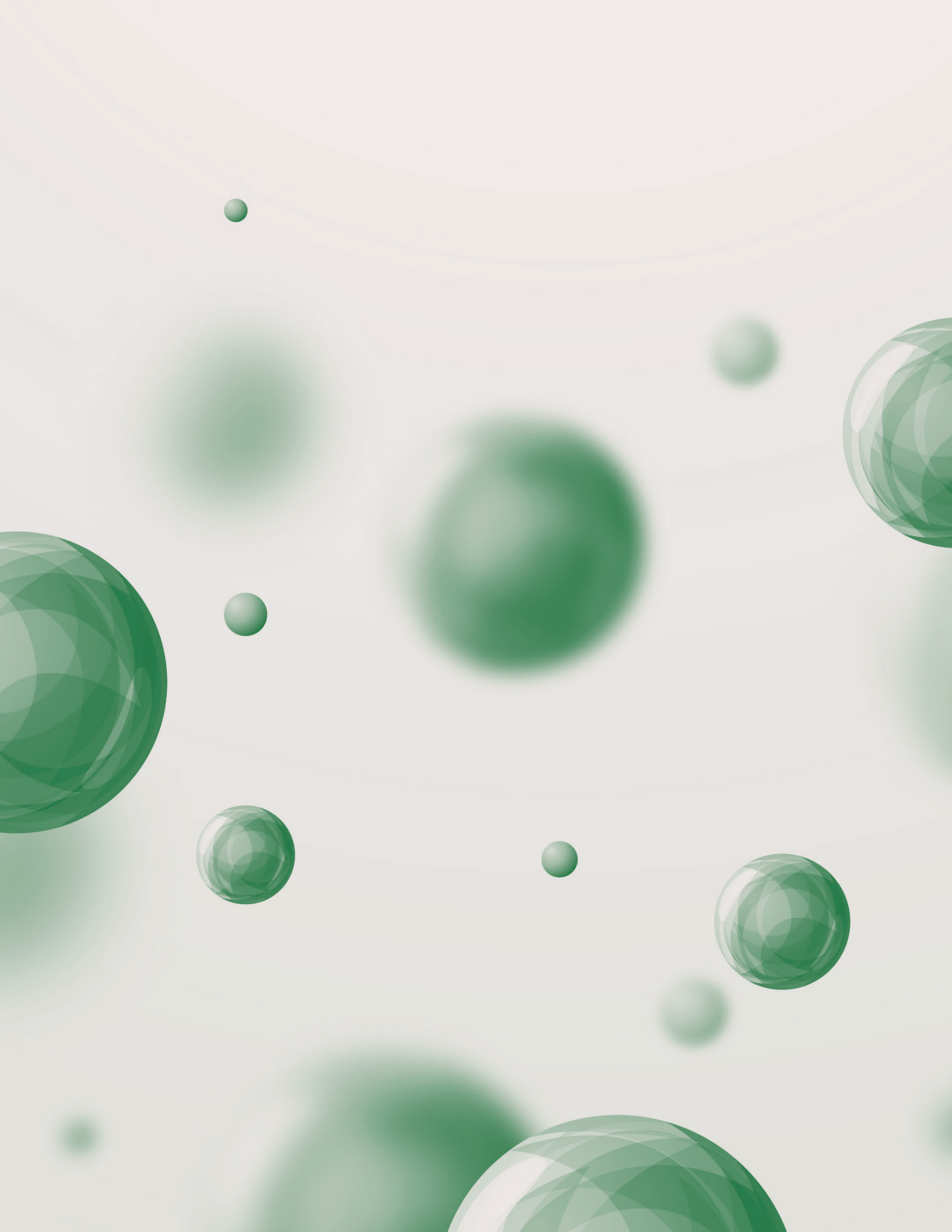
Model Number	Del Press (PSI)
HP3530-050	0 - 50
HP3530-125	0 - 125
HP3530-250	0 - 250
HP3530-500	0 - 500

Specialty Gas Regulator Selection Guide

X 1 = Single Stage 2 = Two Stage 3 = Line

SERIES	MODEL NO.	PRODUCT TYPE	BODY MATERIAL	BONNET MATERIAL	DIAPHRAGM MATERIAL	Cv (FLOW CAPACITY)	AVAILABLE DELIVERY PRESSURE	RECOMMENDED FOR GAS PURITY LEVELS OF:
40X	GP 401 GP 403	GENERAL PURPOSE REGULATOR	BRASS BARSTOCK	PAINTED DIE CAST	NEOPRENE	0.17	0-15 0-50 0-125 0-250	UP TO GRADE 4.0
	GP 402		FORGED BRASS			0.15		
70X	HP 701 HP 703	HIGH PURITY	BRASS BARSTOCK	CHROME PLATED DIE CAST	316L STAINLESS STEEL	0.17	0-15 0-50 0-125 0-250	UP TO GRADE 5.0
	HP 702		FORGED BRASS			0.15		
72X	HP 721 HP 723	ULTRA HIGH PURITY	BRASS BARSTOCK	BRASS BARSTOCK	316L STAINLESS STEEL	0.08	0-15 0-50 0-125 0-250 0-500	UP TO GRADE 5.0
	HP 722					0.06		
72XC	HP 721C HP 723C	ULTRA HIGH PURITY	CHROME PLATED BRASS BARSTOCK	CHROME PLATED BRASS BARSTOCK	316L STAINLESS STEEL	0.08	0-15 0-50 0-125 0-250 0-500	UP TO GRADE 5.0
	HP 722C					0.06		
74X	HP 741 HP 743	RESEARCH GRADE AND / OR CORROSIVE	316L STAINLESS STEEL	CHROME PLATED BRASS BARSTOCK	316L STAINLESS STEEL	0.08	0-15 0-50 0-125 0-250 0-500	GRADE 6.0 AND HIGHER
	HP 742					0.06		

For assistance with upgrading your compressed gas delivery systems, please contact Keen Compressed Gas Co.
302.594.4545 or email Service@KeenGas.com



MANIFOLDS

Recommended Manifolds

High Purity Switchover Manifold

HARRIS
A LINCOLN ELECTRIC COMPANY

900B Brass
900S Stainless

This semi-automatic barstock manifold prevents downtime by automatically switching gas supply from the primary cylinder bank to the reserve cylinder bank. The user resets the primary bank by turning the lever. Manual adjustment of the individual regulators is not required.

GAS SERVICE	APPLICATIONS	FEATURES
Non-Corrosive Corrosive Flammable Toxic	Life Science CO2 Central gas supply for laboratory 99.99 to 99.9999% purity	Two inlet regulators, one preset and one adjustable Stainless steel diaphragms User friendly priority valve Integrated CGA check valves to eliminate atmospheric contamination Outlet line regulator assures consistent delivery pressure during change over

Changeover Manifold

905B Brass
905S Stainless

This automatic switch over panel is designed to supply a continuous supply of high-purity gas at a constant delivery pressure. This unit has an adjustable outlet line regulator. The pigtails are 316 corrugated bellows with check valve cylinder connections. There are optional alarms and purges available.

GAS SERVICE	APPLICATIONS	FEATURES
Non-Corrosive Corrosive Flammable Toxic	Life Science CO2 Central gas supply for laboratory 99.99 to 99.9999% purity ICP mass spec	One body with two different inlet ports Stainless steel diaphragms User friendly priority valve Compact design Integrated CGA check valves to eliminate atmospheric contamination Outlet line regulator assures consistent delivery pressure during change over

High Purity Changeover Manifold

920B Brass
920S Stainless

These high-purity changeover manifolds are available in brass and 316 stainless steel construction. These changeover manifolds are adjustable form 10-200 PSI. The pigtails that are supplied with these units are leak-tight 316 stainless steel with check valve cylinder connections. The flow rate is rated at 200 SCFH of air. Alarm boxes sold separately. Comes standard with inlet/outlet isolation valve sand alarm gauges.

GAS SERVICE	APPLICATIONS	FEATURES
Non-Corrosive Corrosive Flammable Toxic	Life Science CO2 Central gas supply for laboratory 99.99 to 99.9999% purity ICP mass spec	One body with two different inlet ports Stainless steel diaphragms User friendly priority valve Enclosed box design to protect inter parts and better appearance Integrated CGA check valves to eliminate atmospheric contamination Outlet line regulator assures consistent delivery pressure during change over Inlet diaphragm isolation valves for bank shut off Outlet diaphragm isolation valves for bank shut off

Automatic Pressure Differential Cylinder Gas Phase Changeover Manifold

HARRIS
A LINCOLN ELECTRIC COMPANY

Model 200 (30-125 psig), Acetylene (0-15 psig)
Model 200HL (CO_2 & N_2O with heaters 30-125 psig)
Model 220HP (50-200 psig)

The Series 200 Single Regulator Manifold features the high-flow Model 3510 regulator. The 1/2" brass headers are available in left and right configurations. The outlet regulator is ordered separately based on the required delivery pressure.

The Series 220 Manifold prevents downtime by automatically switching gas supply from the primary cylinder bank to the reserve cylinder bank. All components are enclosed and protected inside a tamper-resistant case. A green light indicates the primary cylinder bank is functioning and the reserve cylinder bank is ready for service. A red light alerts the user that the unit has changed over and one or both banks are depleted (except on fuel gas units). The user resets the primary bank by turning the lever whenever the empty cylinders are replaced.

GAS SERVICE	APPLICATIONS	FEATURES
Non-Corrosive	Industrial welding and cutting 99.99% purity	Enclosed box design to protect inter parts and better appearance User friendly priority valve Integrated CGA check valves to eliminate atmospheric contamination Outlet line regulator assures consistent delivery pressure during change over Indicating lights to notify the operator when the bank is full or empty

Liquid Cylinder Gas Manifold

Model 240 (For 230 dewars 40-85 psig)
Model 240HP (For 350 dewars 40-180 psig)

A LINCOLN ELECTRIC COMPANY

The Series 240 Manifold is designed specifically to regulate and monitor vaporized gas from cryogenic cylinders. The Series 240 Manifold prevents downtime by automatically switching over when the primary cylinder banks is depleted.

A green light indicates the primary cylinder service bank is functioning and the reserve cylinder bank is ready for service. A red light signals that the system has changed over and one or both banks are depleted. The user resets the primary bank by turning the knob.

GAS SERVICE	APPLICATIONS	FEATURES
Non-Corrosive	Liquid Cylinders (vapor phase) Industrial welding and cutting 99.99% purity	Enclosed box design to protect inter parts and better appearance User friendly priority valve Integrated CGA check valves to eliminate atmospheric contamination Outlet line regulator assures consistent delivery pressure during change over Indicating lights to notify the operator when the bank is full or empty Built in Economizer to utilize the back up head pressure Standard 72” pigtails

MODEL 763

HARRIS
A LINCOLN ELECTRIC COMPANY

DATASMART™

TAKE FULL CONTROL OF YOUR GAS USAGE

The HARRIS Model 763B DataSmart is a fully-automatic, electronically controlled gas switchover system that can provide continuous supply of gas from a variety of sources including high pressure cylinders, liquid cylinders or bulk gas containers. DataSmart includes a built-in WiFi-based telemetry system that allows the user to view and manage all aspects of the gas system. It is ideal for both industrial and high purity gases used in a variety of applications. The on-board software ensures optimal gas use and savings especially from liquid cylinders and can greatly reduce or eliminate venting and residual gas return.

Annual subscription service for telemetry can be ordered using P/N 9504630.

TYPICAL APPLICATIONS

Analytical Laboratory
Calibration Gases
Welding/Metal Fabrication
Research
Food Processing
Chemical Processes
Laser Assist Gases
Manufacturing
Pharma

FEATURES

+ LCD Touchscreen control
+ Built-in, Wifi-based telemetry system and data acquisition via a remote server (connection to a Wifi network required)
+ Customized alerts and notifications via email and SMS
+ Check Back Feature for liquid dewars
+ Economizer for reserve side liquid dewars
+ Secure login to protect settings
+ Optional mass flow meter to measure current gas usage or usage over time
+ 500 scfh heater for CO2 and N2O or mixtures
+ Optional Remote A/V Alarm
+ Modular, expandable header system for multiple cylinders
+ Designed for high purity or industrial grade gases
+ Brass and SS models available

SPECIFICATIONS

+ Max inlet pressure up to 4500 psi
+ Outlet pressures up to 450 psi
+ Output flows up to 3000 scfh (air)
+ Programmable switchover pressure for both right and left side from 70 to 1500 psig
+ Class 1, Division 2 NEMA enclosures
+ Filter - 10 Micron
+ Electrical Requirement 120VAC 50/60Hz
+ Inlet ports 1/2" NPT
+ Outlet Port 1/2" NPT
+ Temperature range 0 F to +140 F
+ Weight 68 lbs

MATERIALS

+ Regulator body brass or 316L SS
+ Diaphragms 300 series SS
+ Regulator Seats - PCTFE
+ Seals - PTFE
+ Valve seat - PTFE
+ Valve stem - SS
+ Enclosures NEMA 4x powder coated steel

A LINCOLN ELECTRIC COMPANY

ORDERING INFORMATION

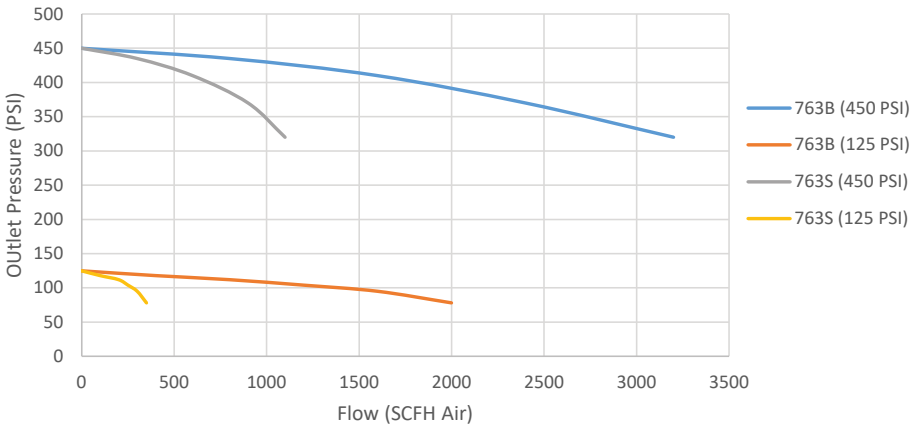
Example:

763B D 3R 48 1L 72 580 DF 1

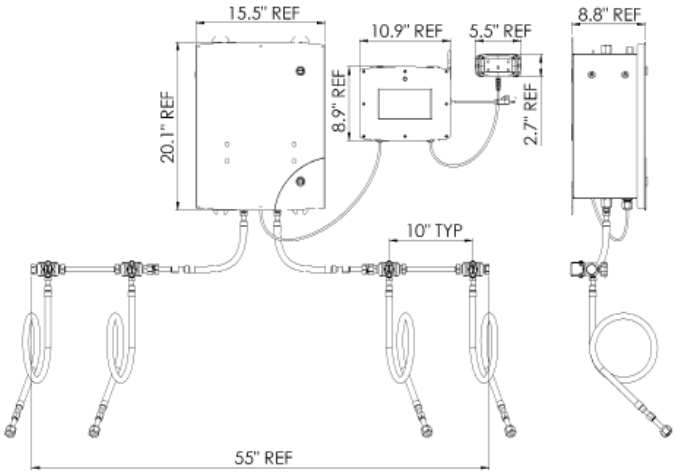
(Brass DataSmart, 125 psi outlet, 3 right side cylinders w/48" pigtails, 1 left side cylinder with 72" pigtail, CGA 580, with inlet isolation valves and standard outlet fitting, Remote alarm w/10' cable

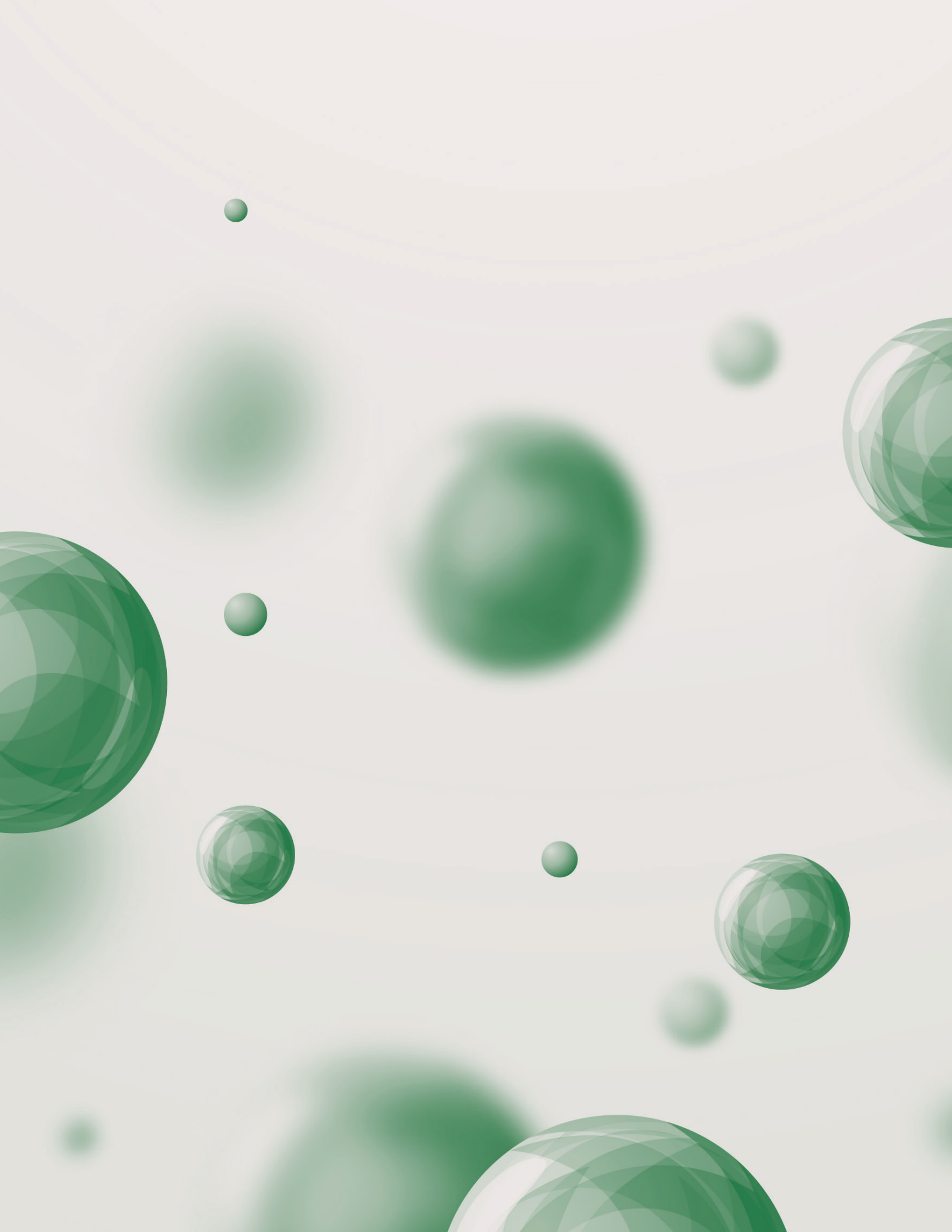
Series	Cylinder Spacing	Pigtail Type	Right # of Cylinders	Right Pigtail Length	Left # of Cylinders	Left Pigtail Length	Gas Service (CGA Connection)	Accessories	Options	Crossover Header
763B (Brass, 125 psi outlet) 763BEX (Brass, 500 psi outlet) 763S (SS, 125 psi outlet) 763SEX (SS, 500 psi outlet)	Leave blank for STD (10") Add "S" for opt 5" spacing	D - PTFE Lined Double Braid SS A - SS Armor Cased	up to 25	24" 36" 48" 72" 120"	up to 25	24" 36" 48" 72" 120"	000 (No CGA) 240 (SS Only) 280 296 320 320HT (Hand Tight) 326 330 (SS only) 346 346HT (Hand Tight) 350 500 510P 540 540HT (Hand Tight) 555 580 580HT (Hand Tight) 590 347 660 (SS Only) 680 705 (SS Only)	A - 1/8" Inlet Compression Fitting B - 1/4" Inlet Compression Fitting C - 3/8" Inlet Compression Fitting D - Inlet Isolation Valve E - Inlet Purge Valves F - Std Outlet Fitting (CGA 1340/1350) G - 1/8" Outlet Compression Fitting H - 1/4" Outlet Compression Fitting J - 3/8" Outlet Compression Fitting K - Outlet Isolation Valve M - Outlet Purge Valve N - Mass Flowmeter P - Ethernet Router	1 - A/V Alarm w/10' Cable 2 - A/V Alarm w/50' Cable 4 - A/V Alarm w/100' Cable 8 - Assemble Headers	Y Leave blank for No

MODEL 763 FLOW CURVES



MODEL 763 MOUNTING DIMENSIONS





Telemetry and Gas Monitoring

How It Works

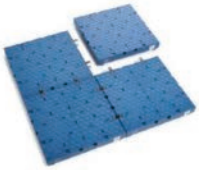
Pulsa's hub and spoke model simplifies setup and maintenance

Pulsa

Measure	Communicate	Automate
	 	
Pressure & Weight Sensors	Cellular, WiFi, & Ethernet Gateways	Cloud Intelligence
No wires No pairing No maintenance	Works with Verizon, AT&T, T-Mo & intl. (incl. Canada, Mexico, EU, APAC) carriers	Near real time levels and depletion dates Accessible on web & mobile OS

Pulsa Sensors

No wires. No pairing. No maintenance.

Differential pressure	Industrial weight	Weight tile	High pressure
			
Differential pressure 35ft height ~500 readings / day 5-7 yr battery	2'x2' & 3'x3' steel platform 1500+ LB capacity ~500 readings / day 5-7 yr battery	12"x12" modular platform 260 LB capacity ~500 readings / day 5-7 yr battery	High pressure 2900 PSI ~500 readings / day 5-7 yr battery

Pulsa high pressure

High pressure cylinder monitoring




Specs:

- Measures up to 2900psi[1] with ±0.25% accuracy
- Weatherproof design. Wetted components: 316 stainless steel and viton
- 1/4 inch NPT fitting
- Can be cleaned for Oxygen use

Great for:

- Specialty / laboratory gases
- Manifolded industrial gases
- Medical gases
- Beverage gases

Bulk and Micro Bulk Telemetry

Bulk and Micro Bulk telemetry systems

- Measuring liquid levels for 24/7 visibility
- Prevent low product events
- Ability to set multiple notification limits
- Multiple reading per day

DPW900 TANK MONITORING

Anova's flagship monitor for bulk cryo, ISO, and other challenging applications

DIMENSIONS:
170 x 140 x 95mm (6.7" x 5.5" x 3.7")

RADIO:
4G LTE (3G or 2G fallback) and/or Iridium Satellite with optional GPS

POWER INPUTS:
Primary lithium battery, solar or mains with rechargeable battery backup, mains only

MATERIAL:
Polycarbonate body
Polyurethane gasket

TEMPERATURE RANGE:
-40° to 80°C (-40° to 175°F)

SENSOR & GAUGE INPUTS:
2 4-20mA and 2 serial inputs expandable up to 6 4-20mA

DIGITAL I/O:
Expandable to support 4 digital inputs and 2 digital outputs

BATTERY LIFE:
Configuration dependent, up to 5 years with typical configuration

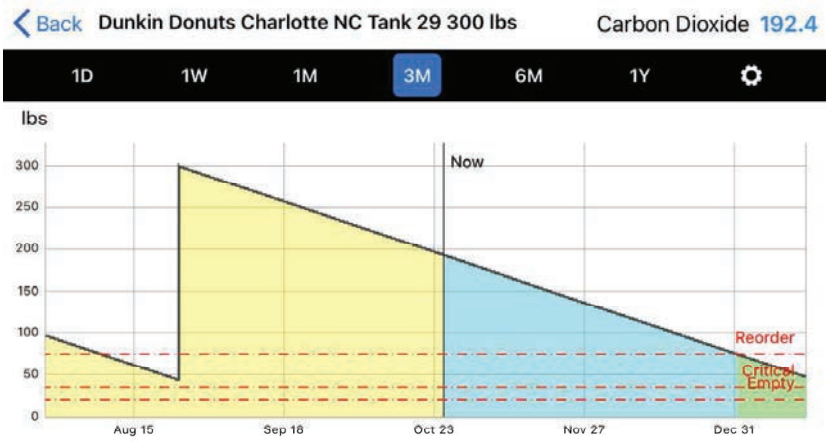
REPORTING SCHEDULE:
Hourly log, daily text

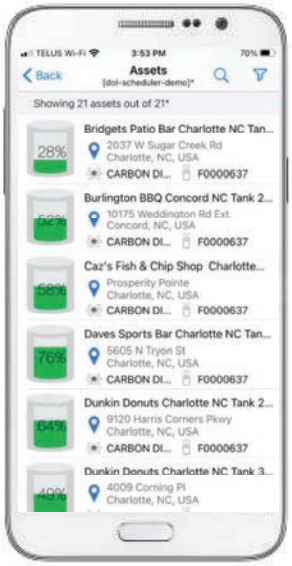
INTERNATIONAL PROTECTION MARKING:
NEMA 4X, IP66

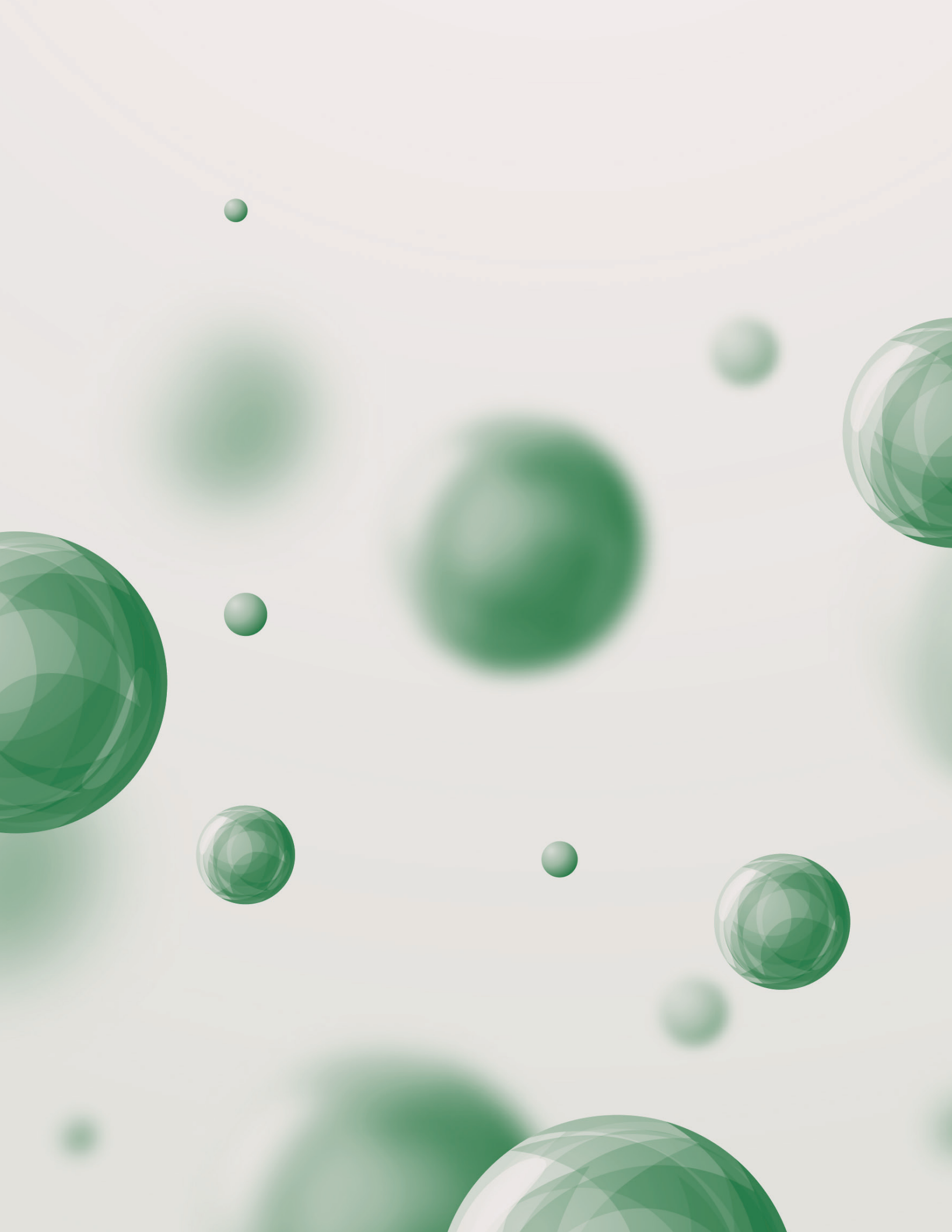
CERTIFICATIONS:
FM approved, non-incendive, Class I Division 2, Groups A,B,C, or D

DPW914 DPW924

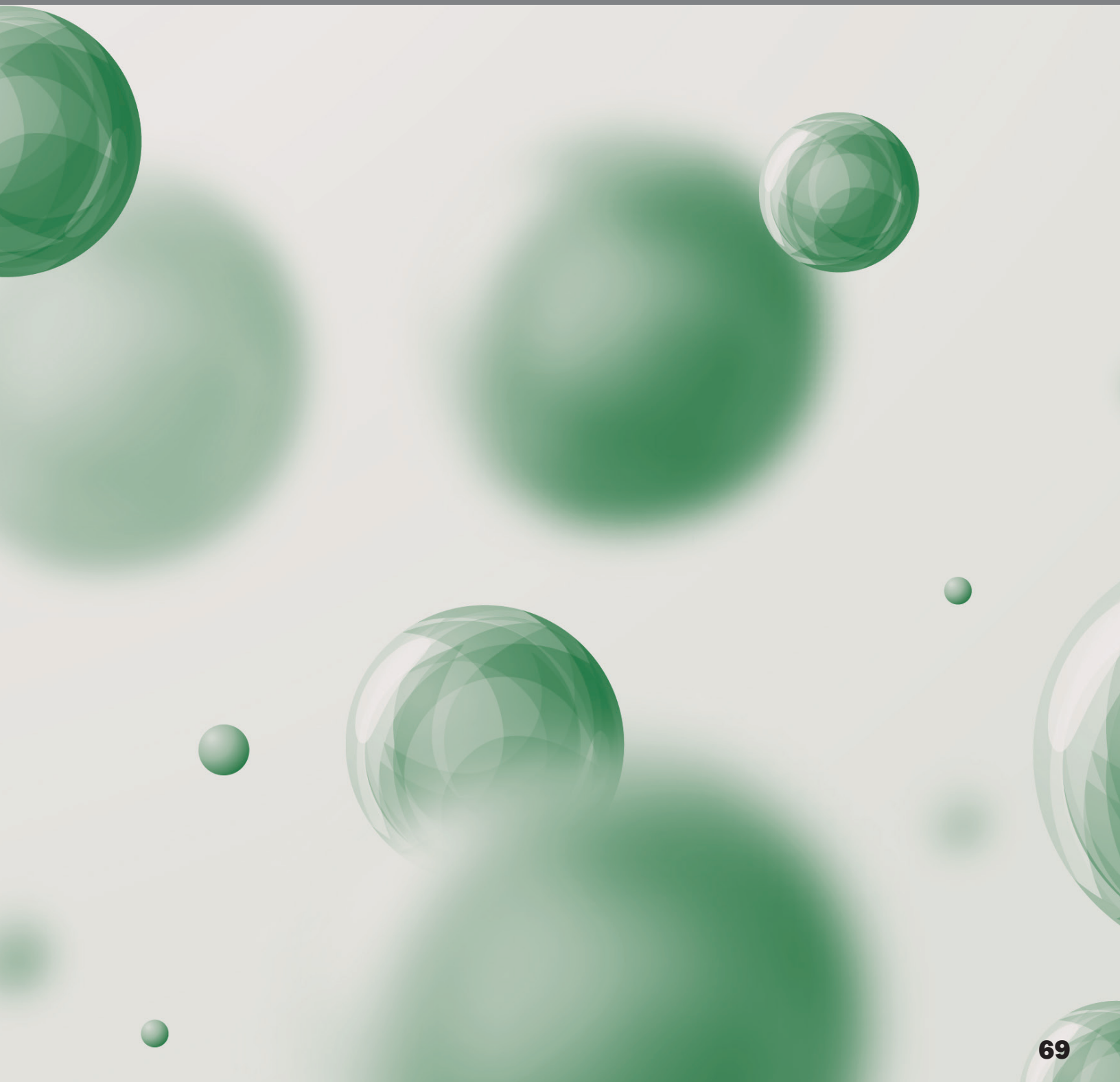
ASSET VIEWER MOBILE APP







Gas Storage and Detection



Perma-Cyl® MicroBulk Systems

On-Site Storage System - MicroBulk Solutions

CHART®

The Perma-Cyl® MicroBulk Storage system allows users to enjoy the benefits of on-site gas delivery. Gone are the hassles, waste and expense of full-for-empty gas cylinders. Using Perma-Cyl® tanks, there are no cylinders to change, no residual gas losses, no back, hand or foot injuries from handling cylinders, and no lost or damaged cylinders.

The Perma-Cyl® tank is reliable, efficient and more economical than comparable transportable cylinders. Designed for a higher level of thermal efficiency, it can hold its gas contents longer with lower pressure rise than other similar-type vessels. The Perma-Cyl® tank's extraordinary thermal quality limits product losses during extended periods of little or no gas use.

This innovative storage system incorporates a top fill float designed to allow single-hose filling without losses under normal conditions. It automatically shuts off the Orca™ MicroBulk Delivery System for a safe and reliable fill.

Product Advantages

- Sizes, pressures and configurations to meet most applications
- Capacities from 230 liters to 7000 liters (60.8 gal to 1840 gal)
- Supply pressures up to 450 psig
- Automatic fill shut-off feature with optional fill box allows for remote filling from outside the building or compound when a Perma-Cyl® tank is installed indoors.
- Orca truck automatically safely stops the fill process when Perma-Cyl® tank is full
- WIKA liquid level gauge with connections for telemetry
- High-pressure, high flow models available for laser assist gas applications
- Outdoor or indoor installation and operation

MicroBulk

- Cyl-Tel® Digital Liquid Level Gauge
- Phase line isolation valves
- Bulk 1-1/2" CGA fill fitting on Perma-Cyl® 1000 and larger
- Isolation valves for remote telemetry
- VJ valve available on Perma-Cyl® 1000 and larger

SPECIFICATIONS					
MODEL	450L HP Plate Base	450L VHP Plate Base	700L HP Plate Base	1000L HP/VHP Plate Base	1500L HP/VHP Pallet Base
CAPACITY (LITERS)					
Gross Net	450 420	450 420	688 645	1,056 950	1,550 1,455
MAWP					
psig	350	500	350	350/500	350/500
DESIGN SPECIFICATIONS					
DOT/ASME	DOT/ASME	DOT/ASME	ASME	ASME	ASME
STORAGE CAPACITY (SCF)					
Nitrogen	8875/10332	7922/10332	15,860	24,350	35,790
Oxygen	11124/12760	11124/12760	19,600	30,070	44,220
Argon	10812/12478	10812/12478	19,160	29,400	43,220
THERMAL PERFORMANCE (NER% / DAY)					
N_2 O_2, -Ar	1.9% / 1.6% 1.2% / 1%	1.9% / 1.6% 1.2% / 1%	1% 0.62%	1% 0.62%	1% 0.62%
GAS DELIVERY RATE (LIN/LAR/LOX)					
SCFH	575	575	660	960	1,350
DIMENSIONS (INCHES)					
Diameter	30	30	42	42	48
Height	69	69	62.5	82	92/91
Tare Weight	688	812	1,250	1500/1750	2200/2500

SPECIFICATIONS					
MODEL	2000L HP/VHP Pallet Base	3000L HP/VHP Pallet Base	3000L HP/VHP Horizontal Forklift Base	5500L MP/VHP Pallet Base	7000L VHP Pallet Base
CAPACITY (LITERS)					
Gross Net	2,042 1,945	2,911 2,707	2,911 2,707	5,510/5,434 5,262/5,110	6,965 6,662
MAWP					
psig	350/500	350/500	350/500	250/500	500
DESIGN SPECIFICATIONS					
DOT/ASME	ASME	ASME	ASME	ASME	ASME
STORAGE CAPACITY (SCF)					
Nitrogen	47,847	66,592	66,592	128700/125000	163,800
Oxygen	59,089	82,239	82,239	159400/154900	202,500
Argon	57,786	80,425	80,425	156200/151700	197,900
THERMAL PERFORMANCE (NER% / DAY)					
N_2 O_2, -Ar	1% 0.62%	1% 0.62%	1% 0.62%	.7% .43%	.7% .43%
GAS DELIVERY RATE (LIN/LAR/LOX)					
SCFH	1350/2000	1350/2000	2,000	4,000	4,000
DIMENSIONS (INCHES)					
Diameter	48	58	58	80	98
Height	118.5/119.6	122/122.25	71	119	123
Tare Weight	2600/3860	3300/4500	3800/4250	6800/9100	13,300

Cabinets

CONCOA PRECISION GAS CONTROLS

The CONCOA C-Series Gas Cabinet Systems are designed to provide unparalleled protection to both the mounted gas supply system and their attached gas cylinders. Constructed with sturdy 11-gauge thick steel, the cabinets are built to meet international fire codes. Cabinets come pre-installed with a 165°F (74°C) sprinkler head near the exhaust vent. Cabinet doors and windows are made to close and latch automatically. The welded unibody construction and rigid cylinder brackets increase sturdiness of the cabinet in the event of fires or earthquakes.

FEATURES

All Welded 11-Gauge Steel Construction
Protects cylinders and valves from damage

Epoxy Painted
Touch, protective coating

Sprinkler Head
Isolated fire protection

Removable White Back Panel
Facilitates ease of maintenance

Adjustable Brackets
Allow for precise hose alignment

Automatic Closing Door and Windows with Keyed Door Latch
Prevent unwanted access to cylinder and gas system

Ventilation Louvers
Provides cabinet interior with adequate air flow circulation

MATERIALS

Enclosure
11-gauge (3 mm) thick steel

Paint
Epoxy
Smooth interior, textured exterior

Fasteners
Stainless Steel

SPECIFICATIONS

Exhaust Duct
6” (152 mm) diameter
3” (76 mm) high

Sprinkler Head
165°F (74°C) activation point
Beeswax coated

Adjusted Cylinder Brackets
Accommodates 7” (177 mm) to 9” (228 mm) diameter cylinders
Chain and strap included

Fire-Rated Window
1/4” thick clear wire glass

Empty Weight
C1: 250 lbs (113 kg)
C2: 275 lbs (125 kg)
C3: 375 lbs (170 kg)
C4: 470 lbs (213 kg)

CUSTOM CABINETS

CONCOA designs and manufactures cabinets to suit any laboratory or analytical requirement. Possibilities include:

- Cabinets with separate pressure controls to deliver multiple gases of similar composition that can be stored in the same location.
- Cabinets for flammable gases that include emergency shut-off valves, gas detectors, and excess flow switches that can be integrated with a 585 Series emergency shut-off controller.
- Cabinets for reactive gases that support a variety of purging options.

Emergency Shut Off Controller

585 Series

The CONCOA 585 Series emergency shut off controller is designed to automatically shut down up to eight independent flammable, toxic, corrosive, or high purity gas sources for safety or process control. The Controller includes an integral emergency stop button, audible and visual alarm, six programmable input relays, and up to eight programmable pneumatic output ports for control of high purity CONCOA 586 Series emergency shut off valves. Eight additional output relays are configurable as normally open or normally closed for integration with a building or master alarm system. The status of all eight inputs and outputs are displayed with high visibility, multicolor LEDs so that the triggering event is identified and the status of all output ports is shown. Ideal for flammable or toxic gas shutdown control in the event of fire or leak detection, the controller can be configured to operate the eight pneumatic outputs in unison or independently. The system comes with on board and web server for monitoring and program status with email and real time display.

FEATURES	MATERIALS	SPECIFICATIONS
Highly Programmable Controller Customize for specific installations **Eight Integrated Solenoid Valves** Easy system installation **Integral Emergency Stop Button** Manual activation at the controller **Six Input Relays** Accommodate multiple gas streams **Onboard Web and Mailer Server** Enables remote monitoring and notification **Eight Output Relays** Flexible system integration **Event Log** Auditable trail of uptime and failure	**Enclosure** Polycarbonate resin (flame retardant and UV stabilized) **Cover Assembly** Screw closure **Mounting Assembly** Polycarbonate resign (flush) **Weight** 9.8 lbs (4.45 kg)	**Sound** 93 db audible alarm **Power Input** 90-264 VAC external power supply (US, UK, European, Australian and Chinese adapters included) **Pneumatic Outputs (8)** 1/8” FPT bulkheads (hose barb and plug supplied) **Pneumatic Inputs (1)** 1/8” FPT **Dry Contact Outputs (8)** NO or NC (field adjustable) **Relay Inputs (8)** 6 NO or NC (field adjustable) 1 NO (emergency stop button) 1 NO (pneumatic air pressure switch) **Relay Contact Rating** .5A @ 24V

Emergency Stop Button

585 Series

CONCOA PRECISION GAS CONTROLS

The 585 Series Emergency Stop Button provides a remote means of initiating emergency shutdown of any gas supply connected to the 585 series Emergency Shut Off Controller with 586 Series Emergency Shutdown valves. With a highly visible red push to lock, twist to reset stop button, the normally closed relay is safely housed inside a bright yellow NEMA 4 control box. Once pushed, the normally closed relay opens and signals shutdown to the controller. Easy installation is achieved with multiple knockouts for conduit or cable wiring, and custom units may be ordered on request. The emergency stop button is ideal for point of use or emergency exit locations that are remote from the controller and gas sources.

SPECIFICATIONS	
Mechanical Life:	300,000 operations
Operating Force:	1.8 lbs (0.8 kg)
Mounting Adapter:	The adapter is fixed to the mounting surface by means of incorporated screws
Construction:	Polyamide and polycarbonate
Environmental Rating:	IP65; NEMA 4, 13
Relay:	Single pole, single throw, normally closed (NC)
Operating Temperature:	-13°F to 140°F (-25°C to 60°C)

Excess Flow Switches

580 Series

The 580 Series Excess Flow Switches are designed to precisely detect increasing flow rates of gases in critical processes. When connected to the 585 Series Emergency Shut Off controller, they ensure immediate shutdown of any gas line in the event of a pipeline break or abnormal flow condition. The electrical switch is operated by a high energy permanent magnet. All wetted parts are 316L stainless steel for compatibility with any gas service. They are explosion proof, compact, field adjustable and linear with a wide range of flows and inlet pressures to suit any installation where excess flow shutdown is required.

END FITTINGS	BODY AND WETTED PARTS	MAX INLET	FLOW RANGE
1/4" FPT x 1/4" FPT	316L stainless steel	3000 PSIG (210 BAR)	1 to 10 lpm (2 SCFH to 20 SCFH)
1/4" FPT x 1/4" FPT	316L stainless steel	1000 PSIG (69 BAR)	1 to 120 lpm (2 SCFH to 240 SCFH)
1/4" FPT x 1/4" FPT	316L stainless steel	3000 PSIG (210 BAR)	1 to 20 lpm (2 SCFH to 40 SCFH)

Emergency Shut Off Valves

586 Series

The 586 Series Emergency Shut Off Valve kits are ideal for use as safety devices in high purity, flammable, toxic, or corrosive gas systems where fail-safe shutdown of gas supply and flow is required. The pneumatically-actuated packless diaphragm valves feature long life Egiloy® diaphragms, metal to metal seals, and nickel-plated aluminum actuators. Designed for out of the box control by the CONCOA 585 Emergency Shut Off Controller, these normally closed valves can be integrated into any CONCOA gas delivery system to provide instantaneous shut off. The single valve kit comes with one valve, hose barb connections, and tubing to support a single gas source such as a regulator. The dual valve kit is supplied with two valves, hose barbs, hose barb tee, and tubing to control both headers on a switchover from a single pneumatic source.

MATERIALS AND SPECIFICATIONS	
Maximum Inlet Pressure	3500 PSIG (240 BAR)
Temperature Range	-40°F to 140°F (-40°C to 60°C)
Helium Leak Integrity	1 x 10^{-9} scc/sec
Maximum Seat Leakage	2 x 10^{-8} scc/sec helium
Bodies and Fittings	316L stainless steel
Actuator Housing	Nickel-plated aluminum
Cv	0.17 or 0.30 (high flow)
Actuation Pressure	70 to 125 PSIG (5 to 8 BAR) air to open

ITEM#	DESCRIPTION
81-1198	RP-3R pump w/ 10' hose, 10 inch probe, and tapered red nozzle
72-RA-C 72-RA-C-56	4 gas, LEL / O2 / combo H2S & CO w/ 100-240 VAC charger GX-3R for LEL/O2/CO/H2S bundled with 100-240 VAC charger, 34AL cylinder CH4/O2/H2S/CO, 0.25 LPM regulator, tubing, screwdriver, and carrying case
81-SDM3R101	SDM-3R calibration station with 1 solenoid, AC adapter, flash drive, USB cable, and tubing

GX-3R

Four Gas Personal Monitor

- Smallest & lightest 4 gas monitor
  — 2.2" W x 2.55" H x 1.02" D, 3.52 oz.
- Simultaneous detection of 4 gases
  — LEL, O2, H2S & CO
  — H2 Compensated CO sensor available
- Simple 2-button operation
- Non-Compliance Indicator
- Alarms: audible, visual, & vibration
- 3 user adjustable alarm levels
- Impact resistant body w/ removable rubber boot
- Large LCD Auto-backlit display
- 25 hours of operation (Lithium-ion battery)
- Field replaceable sensors & filters
- Water and dust resistant design, IP66/68
- *3 Year warranty*

RP-3R

Clip-On Sampling Pump

- Available for the GX-3R and GX-3R Pro
- 100' sampling range
- Independent power supply

SDM-3R

Calibration Station

- Compatible with the GX-3R or GX-3R Pro
- Automate bump tests, calibrations, charging and data retrieval
- Operate up to 10 stations with 1 set of cal equipment

Standard Confined Space Gases	
Gas Detected	**Detection Range**
Combustible Gases (Methane as standard)	0 - 100% LEL (1% LEL)
Oxygen (O2)	0 - 40.0% vol. (0.1% vol.)
Carbon Monoxide (CO)	0 - 2000 ppm (1 ppm)
Hydrogen Sulfide (H2S)	0 - 200.0 ppm (0.1 ppm)
Carbon Monoxide (CO) H2 Compensated	0 - 2000 ppm (1 ppm)

OX-600
Intelligent Gas Detector

- Common platform (main unit / sensor / pump) for all detection methods
- Sensors include:
  - — Electro Chemical for 35 toxics
  - — Semiconductor for H_2, CH_4, IPA, Methanol, R-32
  - — Galvanic for O_2
  - — Catalytic for CH4, H2, and other HC's
  - — Pyrolysis-particle for TEOS
- Plug and play intelligent sensors retain calibration and sensor data

Yellow=Alarm 1 | Green=Normal | Red=Alarm 2

ITEM#	DESCRIPTION
72-1005	OX-600 oxygen monitor, 0-25%, 24 VDC operation

Direct Connect
Explosion / Non Explosion Proof Sensor

- Connect directly to a Beacon controller
- Explosion proof housing
- Stainless steel enclosures available
- IR sensors available for LEL & CO2, % vol. CH4 & HC
- Patented water repellent sensor coating
- Remotely mount sensor with calibration adapter

ITEM#	DESCRIPTION
61-1000RK	Sensor, LEL combustible (catalytic) w/ explosion proof j-box (no transmitter), (specify calibration), UL version
61-1004RK-03	Sensor, IR, (CO2) 0 - 5%, explosion proof w/ j-box, UL version

RI-600
Stand Alone CO2 Monitor

- Measures Carbon Dioxide CO2 in the air
- Operates with or without a controller
- Long life NDIR sensor
- Large easy to read digital display
- Two power options: 115 VAC, 24 VDC
- Compact wall mount design
- Tri-color visual alarm display:
  - Green=Normal
  - Yellow=Alarm 1
  - Red= Alarm 2

Yellow=Alarm 1 | Green=Normal | Red=Alarm 2

ITEM#	DESCRIPTION
73-1205-02K	RI-600 carbon dioxide monitor, 0-2000 ppm, 24 VDC operation

S2
Transmitter

- Explosion proof housing
- Stainless steel enclosures available
- Patented water repellent sensor coating
- IR sensors available for LEL & CO2, % vol. CH4 & HC
- H2 Specific LEL and ppm versions available
- Remotely mount sensor with calibration adapter

ITEM#	DESCRIPTION
65-2405RK	S2 Series LEL 0-100% sensor (catalytic) / transmitter w/ explosion proof j-box, UL version, (specify calibration)
65-2396RK-03	S2 Series IR (CO2) 0-5% sensor / transmitter, explosion proof with j-box, UL version

EC-600
Sensor / Transmitter

- Operates with or without a controller
- Tri-color visual alarm display: Green=Normal, Yellow=Alarm 1, Red=Alarm 2
- Large easy to read digital display
- Three power options: 115 VAC, 24 VDC, or 2 AA alkaline batteries
- Operates up to 1 year on one set of alkaline batteries
- Remote mount sensor cable available
- Compact wall mount design

Yellow=Alarm 1 | Green=Normal | Red=Alarm 2

ITEM#	DESCRIPTION
73-1202	EC-600 carbon monoxide monitor, 0-150 ppm, battery operated (2 AA batteries)

M2A
Stand Alone Transmitter

- Direct digital readout
- H2 Specific version available
- Explosion proof housing
- Operates independently or with any controller, PLC or DCS
- Non intrusive calibration via magnetic wand
- 2 programmable alarm relays, plus fail relay
- Auto zero drift correction
- Remotely mount sensor with calibration adapter
- IR sensors available for LEL & CO2, % vol. CH4 & HC

ITEM#	DESCRIPTION
65-2640RK-05	M2A, LEL 0-100% sensor (catalytic) / transmitter with j-box, (specify calibration), cCSAus version
65-2660RK-03	M2A, IR (CO2) 0-5%, sensor / transmitter with j-box, cULus version

RKI Instruments Gas Detectors
Wall Mount Controllers

RKI INSTRUMENTS

Instruments	Channels	Alarm levels per channel	Relays per channel	Common relays	Direct connect sensors
Beacon 110	1	2	3	N/A	Yes
Beacon 200	2	2	2	3	Yes
Beacon 410A	4	3	3	5	Yes
Beacon 800	8	2	2	3	No

Beacon Series

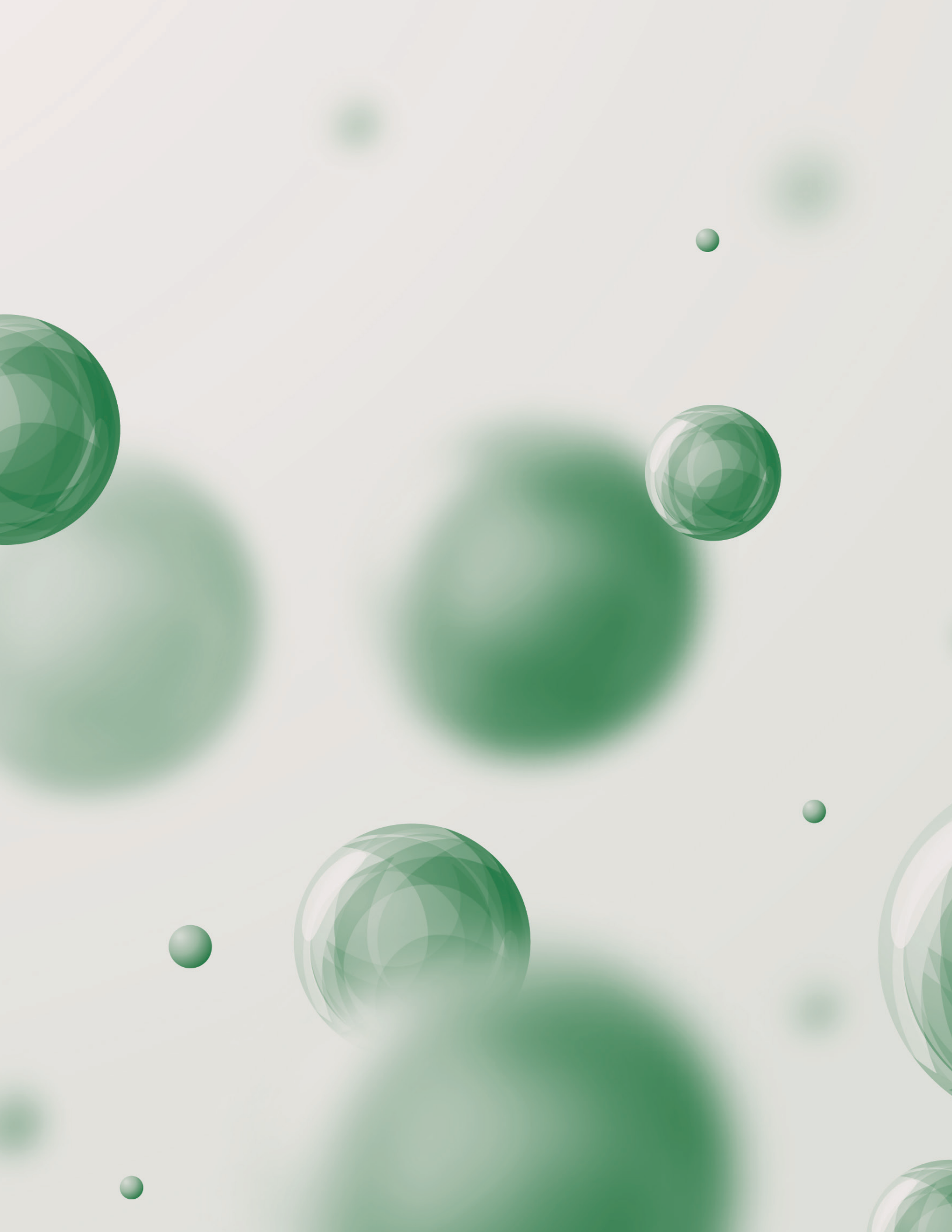
The Beacon 110, 200 and 410A controllers can monitor any combination of direct connect sensors as well as any 4-20mA transmitter. The Beacon 800 works with 4-20mA transmitters only. Available in 1, 2, 4, and 8 channels, respectively, each channel has configurable alarm points. Audible and visual indications alert you to alarm conditions.

Each channel also has dedicated fully configurable relays and each controller has a bank of common relays. The common relays can be configured as additional relays on the Beacon 410A allowing for more alarm relays, optional on Beacon 800. Each channel provides a 4-20mA output signal. A digital Modbus interface for remote communication of data via a Modbus network is standard on the Beacon 410A.

A fully configurable, high visibility strobe is available as an option (except Beacon 800). The unit can be powered from 115/220 VAC, or an external 24 VDC source. A trickle charging battery backup feature with battery assembly is also available.

FEATURES

- 1-64 Channel fixed system controllers
- Digital display of gas and concentration
- Programmable alarm levels
- Configurable alarm relays per channel
- Programmable common relays — Beacon 410A
- Built-in trouble alarm with relay
- Audible alarm
- Alarm reset button
- Accepts any 4-20 mA transmitter
- Provides 4-20 mA output
- Modbus communication (MC-6400)
- 115/220 VAC or 24 VDC operation
- Optional strobe & battery backup
- Weather proof NEMA 4X enclosure
- RFI / EMI resistant



KEEN
COMPRESSED GAS CO.
ISO/IEC 17025:2017 ACCREDITED

Locations

Wilmington, DE
4063 New Castle Avenue
302.594.4545

Dover, DE
226 South New Street
302.736.6814

Newark, DE
42-A Albe Drive
302.292.2215

Millville, NJ
601 Orange Street
856.327.3077

Mickleton, NJ
223 Democrat Road
856.599.1744

Oxford, PA
338 South Street
610.998.0200

Concordville, PA
1760 Wilmington Pike
610.459.3525

Downingtown, PA
251 Norwood Road
484.593.4431

New Holland, PA
580 East Main Street
717.354.6837

Bristol, PA
6409 MacPherson Avenue
610.583.8770

Elkton, MD
339 Curtis Avenue
410.392.4554

Salisbury, MD
1801-05 Northwood Drive
410.219.5888

Baltimore, MD
8301 A Pulaski Highway
443.772.9955

KeenGas.com | 302.594.4545