

# Pure Gases

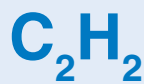
## How to Order

Acetylene	Ethane	Methyl Fluoride
Allene	Ethyl Chloride	Methyl Mercaptan
Air	Ethylene	Monomethylamine
Ammonia	Flourine	Neon
Arsine	Halocarbon 13	Nitric Oxide
Argon	Halocarbon 14	Nitrogen
Boron Trichloride	Halocarbon 22	Nitrogen Dioxide
Boron Trifluoride	Halocarbon 23	Nitrogen Trifluoride
1,3 – Butadiene	Halocarbon 116	Nitrous Oxide
n-Butane	Halocarbon 123	Oxygen
1-Butene	Halocarbon 134a	Perfluoropropane
cis-2-Butene	Helium	Phosgene
trans-2-Butene	Hydrogen	Phosphine
Carbon Dioxide	Hydrogen Bromide	Propane
Carbon Monoxide	Hydrogen Chloride	Propylene
Carbonyl Fluoride	Hydrogen Fluoride	Silane
Chlorine	Hydrogen Sulfide	Silicon Tetrachloride
Deuterium	Isobutane	Sulfur Dioxide
Dichlorosilane	Isobutylene	Sulfur Hexafluoride
Dimethylamine	Krypton	Sulfur Tetrafluoride
Dimethyl Ether	Methane	Trimethylamine
2,2 – Dimethylpropane	Methyl Bromide	Tungsten Hexafluoride
Disilane	Methanol	Vinyl Methyl Ether
	Methyl Chloride	Xenon

Linde Gas



# Acetylene



**General characteristics:** A colorless, flammable gas. Shipped and stored in dissolved acetone. Can decompose spontaneously if delivery pressure exceeds 15 PSIG.

**TLV-TWA:** A simple asphyxiant (ACGIH 1996)

**Health hazards:** A simple asphyxiant

**Flammable limits:** 2.3—100%

**Molecular weight:** 26.04

**CGA valve outlet:** 510

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 14.5 ft<sup>3</sup>/lb. at 60°F

**Specific gravity (Air = 1):** 0.91 at 70°F

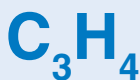
**Material recommendation:** Use steel and wrought iron. Avoid copper, silver, and mercury. Explosive acetylides can be formed on copper and aluminum bronze.

**CAS No.** 74-86-2

**UN No.** 1001

Product / Code	Purity	Cylinder Size	SAP	Volume SCF	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Acetylene</b> Atomic absorption 400100	99.8%	AC390 AC145	1215 1209	390 145	250 250	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage high purity regulator SGVHPS280A, see page 164. Flashback arrestor, see page 233.

# Allene



**General characteristics:** A colorless, flammable gas at room temperature and atmospheric pressure. It is shipped as a liquefied gas.

**Health hazards:** A simple asphyxiant and slight narcotic properties.

**TLV-TWA:** None established (ACGIH 1996)

**Flammable limits:** 1.5-11.5%

**Molecular weight:** 40.065

**CGA valve outlet:** 510/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 9.6 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.145 at 68°F

**Material recommendation:** Normal materials can be used. If used under pressure and high temperature, avoid copper and silver and their alloys.

**CAS No.** 463-49-0

**UN No.** 1075

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Allene</b> 407500	97% Liquid phase	003 LBS	— —	2.250 0.375	102 102	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage general purpose regulator, see page 155.

# Air

**General characteristics:** A colorless, nonflammable and odorless gas.

**Health hazards:** Non hazardous at atmospheric pressure.

**Flammable limits:** Not applicable

**Molecular weight:** 28.98

**CGA valve outlet:** 590/180

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 13.3 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.0 at 70°F

**Material recommendation:** Most common materials can be used.

**CAS No.** 132259-10-0

**UN No.** 1002

Product / Code	Purity	Cylinder Size	SAP	Volume SCF	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Air</b> Scientific synthetic 5.5	<0.05 ppm CO <0.1 ppm CO <sub>2</sub> <0.1 ppm NO <sub>x</sub> <0.05 ppm THC <2 ppm H <sub>2</sub> O	049	11697	287	2400	To maintain high purity quality at the point of use see high purity gas system page 139.
<b>Air</b> Ultra zero 405400	<0.1 ppm THC	B12 049 044 007 LBS	6107 6071 6067 5997 —	3445 287 215 35 2	2400 2400 2000 2000 1800	Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162.
<b>Air</b> Zero chromatographic 400300	<0.5 ppm THC	049 044 007 LBS	1321 1285 1245 —	287 215 35 2	2400 2000 2000 1800	Single stage gas supply panel, see page 172.
<b>Air</b> Zero 400400	<1.0 ppm THC	B12 049 044 007 LBS	1772 1726 1666 1612 —	3445 287 215 35 2	2400 2400 2000 2000 1800	
<b>Air</b> Dry 400600	<10 ppm H <sub>2</sub> O	049 044 007 LBS	2232 2192 1986 2308	287 215 35 2	2400 2000 2000 1800	3500 psig CGA valve outlet 347 6000 psig CGA valve outlet 702
<b>Air</b> 3500 PSIG 473900		043	4445	323	3500	High pressure regulator, see page 163.
<b>Air</b> 6000 PSIG 474000		046	4477	509	6000	

Available in tube trailer quantities and 12 cylinder pallet banks.

# Ammonia $\text{NH}_3$

**General characteristics:** A colorless, nonflammable and liquefied gas with a strong smell.

**Health hazards:** Toxic. Highly irritating to the mucous membranes and eyes. Contact with the skin causes severe burns.

**TLV-TWA:** 25 ppm (ACGIH 1996)

**TLV-STEL:** 35 ppm (ACGIH 1996)

**Flammable limits:** 15-28%

**Molecular weight:** 17.03

**CGA valve outlet:** 705/110 Anhydrous  
660 Electronic

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 22.7 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 0.597 at 70°F

**Material recommendation:** Use iron and steel. Avoid copper, tin, and zinc.

**CAS No.** 7664-41-7

**UN No.** 1005

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Ammonia Electronic 465100	99.999% Liquid phase	044 005	2314 2286	50 5	114 114	To maintain high purity quality at the point of use see high purity gas system page 139.
Ammonia Anhydrous 401400	99.99% Liquid phase	126 044 003 002	3578 3451 3372 3338	150 50 3 2	114 114 114 114	Single stage stainless steel regulator, see page 146. Lecture bottle regulator, see page 161.
Ammonia Anhydrous with diptube 401402	99.99% Liquid phase with diptube	126	9902	150	114	Single stage gas supply panel, see page 172.

# Arsine $\text{AsH}_3$

**General characteristics:** A colorless, flammable, and liquefied gas with an odor similar to garlic.

**Health hazards:** Very poisonous; 250 ppm can be fatal. Causes headache, vomiting, etc., symptoms can be delayed more than one day. If exposure suspected, call a physician.

**TLV-TWA:** 0.05 ppm (ACGIH 1996)

**Flammable limits:** 4-64% (approximate)

**Molecular weight:** 77.95

**CGA valve outlet:** 350

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison, Flammable Gas

**Specific volume:** 5.0 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 2.69 at 70°F

**Material recommendation:** Normal materials can be used. For safety reasons, we recommend acid-proof steel.

**CAS No.** 7784-42-1

**UN No.** 2188

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Arsine Research 466200	99.9995% Liquid phase	003	—	1	205	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Single stage stainless steel all welded connections regulator, see page 152.

# Argon Ar

**General characteristics:** A colorless, nonflammable and odorless gas.

**Health hazards:** A simple asphyxiant.  
**TLV-TWA:** A simple asphyxiant.  
 (ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 39.95

**CGA valve outlet:** 580/180

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific gravity (Air = 1):** 1.378 at 70°F

**Specific volume:** 9.68 ft<sup>3</sup>/lb. at 70°F

**Material**

**recommendation:** Normal materials can be used.

**CAS No.** 740-37-1

**UN No.** 1006

Product / Code	Purity	Cylinder Size	SAP	Volume SCF	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Argon</b> Scientific	99.9999%	049	10546	331	2640	To maintain research quality at the point of use see research gas system page 139.
<b>Argon</b> Research 474300	99.9995%	049 044 002	4698 4670 4602	331 224 4	2640 2000 1800	Two stage stainless steel regulator, see page 148. Single stage stainless steel regulator, see page 146. Lecture bottle regulator, see page 161. Ultra high purity panels, see page 182.
<b>Argon</b> Spectrographic 405500	99.9995%	B12 049 044 189 ** LBS	6209 6189 6165 6207 6215	3972 331 224 5624 2	2640 2640 2000 235 1800	
<b>Argon</b> Ultra high purity 401000	99.999%	B12 049 044 LBS	2840 2782 2608 2880	3972 331 224 2	2640 2640 2000 1800	To maintain high purity quality at the point of use see high purity gas system page 139.
<b>Argon</b> Zero 400800	99.998% <0.5 ppm THC	B12 049 044 LBS	— 2418 2364 —	3972 331 224 2	2640 2640 2000 1800	Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Single stage gas supply panel, see page 172.
<b>Argon</b> Prepurified 401200	99.998%	049 044 LBS	3232 3211 3292	331 224 2	2640 2000 1800	
<b>Argon</b> Prepurified 3500 PSIG 474100	99.998%	043	4483	384	3500	High pressure regulator, see page 163.
<b>Argon</b> UHP 6000 PSIG 474210	99.999%	046	14379	571	6000	
<b>Argon</b> Prepurified 6000 PSIG 474200	99.998%	046	4518	571	6000	3500 psig CGA valve outlet 680 6000 psig CGA valve outlet 677

**Available in tube trailer quantities and 12 cylinder pallet banks.**

\*\* 50 gallon liquid dewar.

# Boron Trichloride $\text{BCl}_3$

**General characteristics:** A colorless, corrosive, and liquefied gas which is broken down by water to hydrogen chloride and boric acid. Penetrating odor. Forms white smoke in humid air.

**Health hazards:** Toxic. Attacks eyes and the mucous membranes. Can cause lung damage.

**TLV-TWA:** None established

**Flammable limits:** None established

**Molecular weight:** 117.2

**CGA valve outlet:** 660/180

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas, Corrosive

**Specific volume:** 3.3 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 4.03 at 70°F

**Material recommendation:** Highly corrosive in the presence of moisture. Use copper, stainless steel, monel, and hastelloy.

**CAS No.** 10294-34-5

**UN No.** 1741

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Boron Trichloride</b> Electronic 466500	99.9% Liquid phase	044	2568	100	4.4	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Manual control valve monel, see page 212. Lecture bottle control valve monel, see page 210.
		007	2557	14	4.4	
		LBR	—	1	4.4	
<b>Boron Trichloride</b> C.P. 466300	99.5% Liquid phase	044	2516	100	4.4	
		007	2504	14	4.4	
		LBR	2524	1	4.4	

# Boron Trifluoride $\text{BF}_3$

**General characteristics:** A colorless, nonflammable, and compressed gas which is broken down by water to hydrogen fluoride and boric acid. Penetrating odor. Forms white smoke in humid air.

**Health hazards:** Toxic. Attacks eyes and the mucous membranes. Can cause lung damage and a high concentration will cause burns on the skin similar to those that are caused by hydrogen fluoride.

**TLV-CEILING:** 1 ppm  
(ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 67.8

**CGA valve outlet:** 330/180

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas

**Specific volume:** 5.7 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 2.387 at 70°F

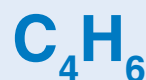
**Material recommendation:** Use copper, stainless steel, monel, and hastelloy. Avoid PVC.

**CAS No.** 7637-07-2

**UN No.** 1008

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Boron Trifluoride</b> C.P. 466700	99.5%	007	2590	10	1600	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Two stage stainless steel regulator, see page 148. Lecture bottle regulator, see page 161.
		044	2626	60	1600	
		LBR	2637	0.375	1600	

# 1,3-Butadiene



**General characteristics:** A colorless, flammable, liquefied, and odorous gas. Can form peroxide in the presence of air. Contains inhibitors to prevent polymerization.

**Health hazards:** Suspected carcinogen, irritant, and anesthetic at high concentrations.

**TLV-TWA:** 2 ppm  
(ACGIH 1996)

**Flammable limits:** 2-12.0%

**Molecular weight:** 54.1

**CGA valve outlet:** 510/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 6.9 ft<sup>3</sup>/lb. at 70°F

**Specific gravity:**  
(Air = 1): 1.915 at 60°F

**Material recommendation:** Normal materials can be used. Avoid plastic and rubber for liquids.

**CAS No.** 106-99-0

**UN No.** 1010

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>1,3-Butadiene</b> Research 466900	99.6% Liquid phase	002	2816	0.875	22	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Single stage high purity regulator, see page 146.
<b>1,3-Butadiene</b> C.P. 466800	99.0% Liquid phase	454 110 007 LBS	12334 2790 2776 2800	570 135 7 0.375	22 22 22 22	Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162.

# n-Butane



**General characteristics:** A colorless, flammable, liquefied gas with a faint odor.

**Health hazards:** Relatively non toxic anesthetic in high concentrations.

**TLV-TWA:** 800 ppm  
(ACGIH 1996)

**Flammable limits:** 1.8-8.5%

**Molecular weight:** 58.1

**CGA valve outlet:** 510/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 6.4 ft<sup>3</sup>/lb. at 70°F

**Specific gravity:**  
(Air = 1): 2.110 at 68°F

**Material recommendation:** Normal materials can be used. Avoid plastic and rubber for liquids.

**CAS No.** 106-97-8

**UN No.** 1011

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>n-Butane</b> Research 467000	99.9% Liquid phase	002	2830	0.875	16.3	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage high purity regulator, see page 146.
<b>n-Butane</b> Instrument 401500	99.5% Liquid phase	454 * 110 044 007 LBS	3758 3736 3718 3666 3772	540 120 40 6 0.375	16.3 16.3 16.3 16.3 16.3	Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162.
<b>n-Butane</b> C.P. 401600	99.0% Liquid phase	454 * 110 016 LBS	10116 3850 3808 3895	540 120 16 0.375	16.3 16.3 16.3 16.3	

\* Equipped with double valving to allow either liquid or gaseous withdrawal.

# 1-Butene $C_4H_8$

**General characteristics:** A colorless, flammable, and liquefied gas with a detectable odor.

**Health hazards:** A simple asphyxiant

**TLV-TWA:** None established.

**Flammable limits:** 1.6-10%

**Molecular weight:** 56.1

**CGA valve outlet:** 510/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 6.7 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.937 at 70°F

**Material recommendation:** Normal materials can be used for gas. Avoid plastic and rubber for liquids.

**CAS No.** 106-98-9

**UN No.** 1965

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>1-Butene</b> Research 467300	99.9%	002	2956	0.875	23.5	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage high purity regulator, see page 146.
<b>1-Butene</b> C.P. 467400	99.0% Min. Liquid phase	454 110 016 LBS	2966 — 2964 2970	540 128 17 0.375	23.5 23.5 23.5 23.5	Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162.

**Most Pure Gases and Gas Mixtures are available in Disposable Cylinders**  
See Page 120.

# cis-2-Butene $C_4H_8$

**General characteristics:** A colorless, flammable, and liquefied gas with a detectable odor.

**Health hazards:** A simple asphyxiant

**TLV-TWA:** None established.

**Flammable limits:** 1.6-9.7%

**Molecular weight:** 56.1

**CGA valve outlet:** 510/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 6.7 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.997 at 68°F

**Material recommendation:** Normal materials can be used for gas. Avoid plastic and rubber for liquids.

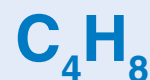
**CAS No.** 590-18-1

**UN No.** 1965

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>cis-2-Butene</b> Technical 467500	95.0% Min. Liquid Phase	110 016 007 LBS	2990 2986 2973 2992	135 17 7 0.375	13 13 13 13	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage general purpose line regulator, see page 155. Lecture bottle regulator, see page 162.



# trans-2-Butene



<b>General characteristics:</b>	A colorless, flammable, liquefied gas with a detectable odor.	<b>DOT class:</b>	2.1 (Flammable Gas)
<b>Health hazards:</b>	A simple asphyxiant	<b>DOT label:</b>	Flammable Gas
<b>TLV-TWA:</b>	None established	<b>Specific volume:</b>	6.7 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	1.6-9.7%	<b>(Air = 1):</b>	1.997 at 60°F
<b>Molecular weight:</b>	56.1	<b>Material recommendation:</b>	Normal materials can be used for gas. Avoid plastic and rubber for liquids.
<b>CGA valve outlet:</b>	510/180	<b>CAS No.</b>	624-64-6
		<b>UN No.</b>	1965

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>trans-2-Butene</b> Technical 467600	95.0% Liquid phase	110	3012	130	15	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162.
		016	3008	17	15	
		007	3006	7	15	
		LBS	3026	0.375	15	

# Carbon Dioxide



<b>General characteristics:</b>	A colorless, nonflammable, liquefied and odorless gas.	<b>DOT class:</b>	2.2 (Nonflammable Gas)
<b>Health hazards:</b>	In high concentrations can paralyze the respiratory center.	<b>DOT label:</b>	Nonflammable Gas
<b>TLV-STEL:</b>	30,000 ppm	<b>Specific volume:</b>	8.74 ft <sup>3</sup> /lb. at 70°F
<b>TLV-TWA:</b>	5000 ppm (ACGIH 1996)	<b>(Air = 1):</b>	1.522 at 70°F
<b>Flammable limits:</b>	Nonflammable	<b>Material recommendation:</b>	Normal materials can be used for dry gas.
<b>Molecular weight:</b>	44.0	<b>CAS No.</b>	124-38-9
<b>CGA valve outlet:</b>	320/180	<b>UN No.</b>	1013

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Carbon Dioxide</b> Supercritical fluid* (SFC) 407700	99.9995% Liquid phase	A31	6563	40	830 ***	Single stage gas supply panel, see page 172.
<b>Carbon Dioxide</b> Research 454600	99.996% Liquid phase	044 002	1900 1866	60 0.875	830 830	To maintain high purity quality at the point of use see high purity gas system page 139.  Two stage high purity regulator, see page 148.
<b>Carbon Dioxide</b> Coleman 405600	99.99% Liquid phase	044 016 007	6255 6253 6251	60 18 5	830 830 830	Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. CO <sub>2</sub> heater, see page 233.
<b>Carbon Dioxide</b> Bone dry 401700	99.8% Liquid phase	044 016 LBS	4112 4070 4117	60 18 0.5	830 830 830	Lecture bottle control valve, see page 210.

\*\* All grades available with full length eductor tube.

\*\*\* Can be supplied with 1500 psia helium headspace for higher pressure applications

# Carbon Monoxide CO

**General characteristics:** A colorless, flammable, and odorless gas.

**Health hazards:** Toxic, binds to the hemoglobin in the blood. Normally causes a headache as the first symptom.

**TLV-TWA:** 25 ppm  
(ACGIH 1996)

**Flammable limits:** 12.5-75%

**Molecular weight:** 28.0

**CGA valve outlet:** 350/180

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas, Flammable Gas

**Specific volume:** 13.8 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 0.986 at 70°F

**Material recommendation:** Low pressure: Normal materials can be used. High pressure: Wet product causes stress corrosion in a number of steels.

**CAS No.** 630-08-0

**UN No.** 1016

Product / Code	Purity	Cylinder Size	SAP	Volume SCF	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Carbon Monoxide</b> Scientific 401810	99.999%	049	11940	195	1600	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Two stage stainless steel regulator, see page 148.
<b>Carbon Monoxide</b> Research 401800	99.995%	049 044 A31 016 002	4322 4292 4354 4262 4209	195 144 120 49 3.9	1600 1340 1660 1340 1340	
<b>Carbon Monoxide</b> C.P. 401900	99.5%	049 044 016 007 LBS	4522 4502 4408 4406 4553	175 144 49 23 1.3	1600 1340 1340 1340 1200	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Single stage gas supply panel, see page 172.
<b>Carbon Monoxide</b> Commercial 402000	99.0%	049 044	4626 4601	195 144	1600 1340	

Available in tube trailer quantities and 12 cylinder pallet banks.

# Carbonyl Fluoride COF<sub>2</sub>

**General characteristics:** A colorless, nonflammable, and liquefied gas with a sharp odor. Broken down by water to hydrogen fluoride and carbon dioxide. Corrosive.

**Health hazards:** Highly toxic. Causes serious lung damage with delayed effect.

**TLV-STEL:** 5 ppm

**TLV-TWA:** 2 ppm  
(ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 66.0

**CGA valve outlet:** 660

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas

**Specific volume:** 5.70 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 2.29 at 68°F

**Material recommendation:** Dry gas: Steel, stainless steel, copper, and brass. Moist gas: Monel, copper, and nickel.

**CAS No.** 353-50-4

**UN No.** 2417

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Carbonyl Fluoride</b> Commercial 467700	97.0% Liquid phase	002	—	0.5	800	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Single stage stainless steel regulator, see page 146.

# Chlorine $\text{Cl}_2$

**General characteristics:** A yellow-greenish, oxidizing, and liquefied gas with an unpleasant, irritating smell. Corrosive.

**Health hazards:** Highly toxic. Attacks the eyes and mucous membranes. Causes lung damage.

**TLV-STEL:** 1 ppm  
**TLV-TWA:** 0.5 ppm  
(ACGIH 1996)

**Flammable limits:** Nonflammable  
**Molecular weight:** 70.9

**CGA valve outlet:** 660/110

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas

**Specific volume:** 5.4 ft<sup>3</sup>/lb. at 70°F

**Specific gravity:**

**(Air = 1):** 2.473 at 70°F

**Material recommendation:** Highly corrosive in moist conditions. Dry gas: Copper, Stainless Steel, Monel. Moist gas: Tantalum.

**CAS No.** 7782-50-5

**UN No.** 1017

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @ 70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Chlorine</b> Scientific 467910	99.999% Liquid phase	049	13434	125	85.3	
<b>Chlorine</b> Electronic 467900	99.99% Liquid phase	761 054 007 LBS	— 3062 3032 10976	2000 150 15 1	85.3 85.3 85.3 85.3	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Ultra high purity panels, see page 182. <b>Single stage monel regulator, see page 165.</b> Lecture bottle regulator, see page 161.
<b>Chlorine</b> C.P. 405200	99.5% Liquid phase	761 054 007 LBS	5879 5861 5816 5884	2000 150 15 1	85.3 85.3 85.3 85.3	<b>Single stage corrosive gas regulator, see page 166.</b> Lecture bottle regulator, see page 161. Lecture bottle control valve, see page 210.

# Deuterium $\text{D}_2$

**General characteristics:** A colorless, flammable, and odorless gas.

**Health hazards:** A simple asphyxiant

**TLV-TWA:** None established

**Flammable limits:** 5-75%

**Molecular weight:** 4.0

**CGA valve outlet:** 350/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 96.0 ft<sup>3</sup>/lb. at 70°F

**Specific gravity**

**(Air = 1):** 0.139 at 32°F

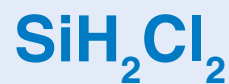
**Material recommendation:** Normal materials can be used.

**CAS No.** 7782-39-0

**UN No.** 1957

Product / Code	Purity	Cylinder Size	SAP	Volume Liters	Pressure @ 70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Deuterium</b> Ultra high purity 469300	99.995% (Chemical) 99.7% (Isotopic)	044 LBS	3094 3096	5000 50	1850 1740	To maintain high purity quality at the point of use see high purity gas system page 139.  Lecture bottle regulator, see page 162.
<b>Deuterium</b> C.P. 469400	99.99% (Chemical) 99.5% (Isotopic)	044 016 007 LBS	3188 13693 3104 3192	5000 1800 840 50	1850 2000 2000 1740	<b>Two stage high purity regulator, see page 148.</b> Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162.

# Dichlorosilane



**General characteristics:** A colorless, corrosive, liquefied, and flammable gas with a penetrating odor. Forms white smoke in moist air. Forms hydrogen chloride in contact with water.

**Health hazards:** Toxic. Attacks the eyes and the mucous membranes. Can cause lung damage.

**TLV-TWA:** None established

**Flammable limits:** 4.1-99%

**Molecular weight:** 101.0

**CGA valve outlet:** 678

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas, Flammable Gas

**Specific volume:** 3.83 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 3.52 at 77°F

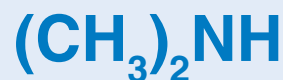
**Material recommendation:** Nickel, nickel alloys, and stainless steel. Highly corrosive in the presence of moisture.

**CAS No.** 4109-96-0

**UN No.** 2189

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Dichlorosilane</b> Electronic 469500	99.0%	049	—	90	9	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Stainless steel line regulator all welded connections, see page 159.
	Resistivity	044	—	50	9	
	capability	007	3214	10	9	
	>400 ohm-cm	003	—	5	9	
	N-type Liquid phase					

# Dimethylamine



**General characteristics:** A colorless, flammable and liquefied gas with a high ammonia and fish-like odor.

**Health hazards:** Toxic. Irritates the eyes and the mucous membranes. Can cause skin allergies.

**TLV-STEL:** 15 ppm

**TLV-TWA:** 5 ppm  
(ACGIH 1996)

**Flammable limits:** 2.8-14.4%

**Molecular weight:** 45.1

**CGA valve outlet:** 705/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 8.6 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.557 at 77°F

**Material recommendation:** Steel, stainless steel. Avoid copper, brass, zinc and tin.

**CAS No.** 124-40-3

**UN No.** 1032

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Dimethylamine</b> Anhydrous 411000	99.5% Liquid phase	110*	6721	125	11	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Manual control valve, see page 212. Lecture bottle control valve, see page 210.
		LBS	6737	0.375	11	
		454	12539	550	11	

\* Equipped with full length eductor tube.

# Dimethyl Ether $C_2H_6O$

<b>General characteristics:</b>	A colorless, flammable and liquefied gas with an ether-like odor.	<b>DOT class:</b>	2.1 (Flammable Gas)
<b>Health hazards:</b>	Has an anesthetic effect in high concentrations. Contact with a liquid can cause cold burns.	<b>DOT label:</b>	Flammable Gas
<b>TLV-TWA:</b>	None established	<b>Specific volume:</b>	8.4 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	3.4-27%	<b>Specific gravity (Air = 1):</b>	1.59 at 70°F
<b>Molecular weight:</b>	46.1	<b>Material recommendation:</b>	Normal materials can be used.
<b>CGA valve outlet:</b>	510/180	<b>CAS No.</b>	115-10-6
		<b>UN No.</b>	1033

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Dimethyl Ether Commercial 469600	99.8% Liquid phase	110	3234	100	62.3	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage general purpose regulator, see page 155.  Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
		016	3230	16	62.3	
		003	3228	2.5	62.3	
		LBS	—	0.5	62.3	

# 2,2-Dimethylpropane\* $C_5H_{12}$

<b>General characteristics:</b>	A colorless, flammable and liquefied gas with a gasoline-like odor.	<b>DOT class:</b>	2.1 (Flammable Gas)
<b>Health hazards:</b>	A simple asphyxiant	<b>DOT label:</b>	Flammable Gas
<b>TLV-TWA:</b>	None established	<b>Specific volume:</b>	5.3 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	1.4-7.5%	<b>Specific gravity (Air = 1):</b>	2.49 at 77°F
<b>Molecular weight:</b>	72.2	<b>Material recommendation:</b>	Normal materials can be used. Avoid plastic and rubber for liquids.
<b>CGA valve outlet:</b>	510	<b>CAS No.</b>	463-82-1
		<b>UN No.</b>	2044

Product / Code	Purity	Cylinder Size	SAP	Volume Grams	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
2,2-Dimethylpropane Research 469700	99.86% Liquid phase	002	3268	400	7	To maintain high purity quality at the point of use see high purity gas system page 139.  Manual control valve, see page 212.
		L20	10551	20	7	

\* Also known as Neopentane

# Disilane $\text{Si}_2\text{H}_6$

**General characteristics:** A colorless, flammable and liquefied gas.  
**Health hazards:** Irritating and destructive to tissues. Contact with skin may cause severe burns.  
**TLV-TWA:** None established  
**Flammable limits:** Pyrophoric  
**Molecular weight:** 62.2  
**CGA valve outlet:** 510

**DOT class:** 2.1 (Flammable Gas)  
**DOT label:** Flammable Gas  
**Specific volume:** 5.59 ft<sup>3</sup>/lb. at 70°F  
**Specific gravity (Air = 1):** 2.35 at 70°F  
**Material recommendation:** Non corrosive to most metals. Steel, stainless steel, copper, brass, and monel.  
**CAS No.** 1590-87-0  
**UN No.** 2189

Product / Code	Purity	Cylinder Size	SAP	Volume Grams	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Disilane Research 469800	97.0% Liquid phase	002	—	100	33	To maintain research gas quality at the point of use see research gas system page 139.  Single stage stainless steel regulator, see page 146.

PURITY		IMPURITIES	
99.99999%	=	0.00001%	= 100 ppb
99.9999%	=	0.0001%	= 1 ppm
99.999%	=	0.001%	= 10 ppm
99.99%	=	0.01%	= 100 ppm
99.9%	=	0.1%	= 1,000 ppm
99%	=	1%	= 10,000 ppm

# Ethane $\text{C}_2\text{H}_6$

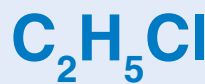
**General characteristics:** A colorless, flammable liquefied, and odorless gas.  
**Health hazards:** A simple asphyxiant.  
**TLV-TWA:** A simple asphyxiant. (ACGIH 1996)  
**Flammable limits:** 3.0-12.5%  
**Molecular weight:** 30.1  
**CGA valve outlet:** 350/180

**DOT class:** 2.1 (Flammable Gas)  
**DOT label:** Flammable Gas  
**Specific volume:** 12.8 ft<sup>3</sup>/lb. at 70°F  
**Specific gravity (Air = 1):** 1.048 at 60°F  
**Material recommendation:** Normal materials can be used.  
**CAS No.** 74-84-0  
**UN No.** 1035

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Ethane Scientific 404810	99.999% Liquid phase	044	5458	32	544	Single stage gas supply panel, see page 172.
Ethane Research 469900	99.95% Liquid phase	002	3272	0.875	544	To maintain high purity quality at the point of use see high purity gas system page 139. Single stage high purity regulator, see page 146.
Ethane C.P. 404800	99.0% Liquid phase	044 016 007 LBS	5396 5372 5364 5438	32 10 2 0.33	544 544 544 544	Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.

Available in tube trailer quantities and 12 cylinder pallet banks.

# Ethyl Chloride



<b>General characteristics:</b>	A colorless, flammable and liquefied gas with an ether-like odor.	<b>DOT class:</b>	2.1 (Flammable Gas)
<b>Health hazards:</b>	A simple asphyxiant. Has an anesthetic effect in high concentrations. Forms toxic products upon combustion or heating.	<b>DOT label:</b>	Flammable Gas
<b>TLV-TWA:</b>	100 ppm (ACGIH 1996)	<b>Specific volume:</b>	6.0 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	3.8-15.4%	<b>Specific gravity (Air = 1):</b>	2.22 at 68°F
<b>Molecular weight:</b>	64.5	<b>Material recommendation:</b>	Corrosive in moist conditions, use stainless steel. Dry gas: Normal materials can be used.
<b>CGA valve outlet:</b>	510/180	<b>CAS No.</b>	75-00-3
		<b>UN No.</b>	1037

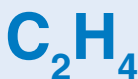
Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Ethyl Chloride</b> C.P. 404900	99.7% Liquid phase	454 *	5502	800	5.3	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Manual control valve, see page 212. Lecture bottle control valve, see page 210.
		110 **	10077	175	5.3	
		016	5461	25	5.3	
		LBS	5516	0.5	5.3	

\*Equipped with double valving to allow either liquid or gaseous withdrawal.

\*\* Available with full length eductor tube.

A high purity gas is only as good as the gas handling system's components. Recommendations for regulators, control valves and outlets are listed in the equipment section. If you have a special problem or need additional help in selecting control equipment contact one of our representatives.

# Ethylene



<b>General characteristics:</b>	A colorless, flammable gas with a faint odor.	<b>DOT class:</b>	2.1 (Flammable Gas)
<b>Health hazards:</b>	A simple asphyxiant.	<b>DOT label:</b>	Flammable Gas
<b>TLV-TWA:</b>	A simple asphyxiant. (ACGIH 1996)	<b>Specific volume:</b>	13.8 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	2.7-36%	<b>Specific gravity (Air = 1):</b>	0.978 at 32°F
<b>Molecular weight:</b>	28.1	<b>Material recommendation:</b>	Normal materials can be used.
<b>CGA valve outlet:</b>	350/180	<b>CAS No.</b>	74-85-1
		<b>UN No.</b>	1962

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Ethylene</b> Scientific 402130	99.999%	044	4860	30	1200	Single stage gas supply panel, see page 172.
<b>Ethylene</b> Research 470000	99.99%	044 002	3322 3294	30 0.5	1200 1200	To maintain high purity quality at the point of use see high purity gas system page 139. Two stage high purity regulator, see page 148.
<b>Ethylene</b> C.P. 402100	99.5%	044 016 007 LBS	4754 4700 4696 4814	30 11 4.5 0.25	1200 1200 1200 1000	Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.

Available in tube trailer quantities.

# Fluorine $F_2$

**General characteristics:** Pale yellow gas with a sharp odor. Ignites most organic materials and many metals. Strongest oxidizing agent known. Reacts violently with water. Do not use fluorine without having obtained complete handling instructions.

**Health hazards:** Highly toxic. Attacks the eyes and mucous membranes. Causes lung damage.

**TLV-STEL:** 2 ppm  
**TLV-TWA:** 1 ppm  
(ACGIH 1996)

**Flammable limits:** Strong oxidizer  
**Molecular weight:** 38.0

**CGA valve outlet:** 679-Tied Diaphragm  
**DOT class:** 2.3 (Poison Gas)  
**DOT label:** Poison Gas  
**Specific volume:** 10.20 ft<sup>3</sup>/lb. at 70°F  
**Specific gravity (Air = 1):** 1.312 at 77°F  
**Material recommendation:** Only use equipment which is carefully cleaned and inert. Nickel and Monel are recommended.

**CAS No.** 7782-41-4  
**UN No.** 1045

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Fluorine C.P. 470200	98.0%	007	3368	0.5	300	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Single stage Monel regulator, call for information. Manual control valve Monel, see page 212.

# Halocarbon 13 (Chlorotrifluoromethane) $CClF_3$

**General characteristics:** A colorless, nonflammable, noncorrosive gas. Decomposes at high temperatures to toxic substances.

**Health hazards:** A simple asphyxiant  
**TLV-TWA:** None established

**Flammable limits:** Nonflammable  
**Molecular weight:** 104.5  
**CGA valve outlet:** 660/180

**DOT class:** 2.2 (Nonflammable Gas)  
**DOT label:** Nonflammable Gas  
**Specific volume:** 3.5 ft<sup>3</sup>/lb. at 70°F  
**Specific gravity (Air = 1):** 3.70 at 70°F  
**Material recommendation:** Steel, brass, copper, and stainless steel.

**CAS No.** 75-72-9  
**UN No.** 1022

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Halocarbon 13 C.P. 454300	99.85% Liquid phase	044 016 007 LBS	1750 1746 1734 1754	80 23 9 0.75	456.9 456.9 456.9 456.9	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage general purpose regulator, see page 155. Lecture bottle control valve, see page 210. Lecture bottle regulator, see page 162.



# Halocarbon 14

## (Tetrafluoromethane) $CF_4$

<b>General characteristics:</b>	A colorless, nonflammable, and odorless gas.	<b>DOT class:</b>	2.2 (Nonflammable Gas)
<b>Health hazards:</b>	A simple asphyxiant	<b>DOT label:</b>	Nonflammable Gas
<b>TLV-TWA:</b>	None established	<b>Specific volume:</b>	4.39 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	Nonflammable	<b>Specific gravity:</b>	
<b>Molecular weight:</b>	88.0	<b>(Air = 1):</b>	3.038 at 70°F
<b>CGA valve outlet:</b>	580	<b>Material recommendation:</b>	Normal materials with the exceptions of zinc and magnesium/aluminum alloys can be used.
		<b>CAS No.</b>	75-73-0
		<b>UN No.</b>	1982

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Halocarbon 14</b> Electronic 407800	99.999%	044	6589	70	2000	To maintain high purity quality at the point of use see high purity gas system page 139. Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146.
		016	6585	6	500	
		007	6583	2.3	500	
<b>Halocarbon 14</b> C.P. 431300	99.99%	044	7107	70	2000	Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146.
		016	7097	6	500	
		007	7075	2.3	500	

# Halocarbon 22

## (Chlorodifluoromethane) $CHClF_2$

<b>General characteristics:</b>	A colorless, nonflammable, liquefied, and odorless gas. Decomposes at high temperatures to toxic substances.	<b>DOT class:</b>	2.2 (Nonflammable Gas)
<b>Health hazards:</b>	Narcotic at high concentrations.	<b>DOT label:</b>	Nonflammable Gas
<b>TLV-TWA:</b>	1000 ppm (ACGIH 1996)	<b>Specific volume:</b>	4.4 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	Nonflammable	<b>Specific gravity:</b>	
<b>Molecular weight:</b>	86.5	<b>(Air = 1):</b>	3.08 at 70°F
<b>CGA valve outlet:</b>	660/180/1/4 inch flare	<b>Material recommendation:</b>	Steel, brass, copper, aluminum, and stainless steel. At high temperatures some metals may act as catalysts for thermal decomposition.
		<b>CAS No.</b>	75-45-6
		<b>UN No.</b>	1018

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Halocarbon 22</b> C.P. 423300	99.9% Liquid phase	Bulk	—	Bulk	121.4	To maintain high purity quality at the point of use see high purity gas system page 139. Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
		761	7001	1750	121.4	
		056	6997	125	121.4	
		DRD *	7007	50	121.4	
		DRE *	7011	30	121.4	
		LBS *	7015	0.75	121.4	

\* Nonreturnable container.

# Halocarbon 23

## (Trifluoromethane) CHF<sub>3</sub>

<b>General characteristics:</b>	A colorless, nonflammable, and liquefied gas.	<b>DOT class:</b>	2.2 (Nonflammable Gas)
<b>Health hazards:</b>	Causes dizziness in high concentrations.	<b>DOT label:</b>	Nonflammable Gas
<b>TLV-TWA:</b>	None established	<b>Specific volume:</b>	5.5 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	Nonflammable	<b>Specific gravity:</b> (Air = 1):	2.430 at 70°F
<b>Molecular weight:</b>	70.01	<b>Material recommendation:</b>	Normal materials can be used.
<b>CGA valve outlet:</b>	660/180	<b>CAS No.</b>	75-46-7
		<b>UN No.</b>	1984

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Halocarbon 23</b> Electronic 407900	99.995% Liquid phase	044 016 002	6615 6611 6607	70 20 3	635 635 635	To maintain high purity quality at the point of use see high purity gas system page 139.  Two stage high purity regulator, see page 148.
<b>Halocarbon 23</b> C.P. 465500	99.0% Liquid phase	044 016 LBS	2380 2378 2382	70 20 0.5	635 635 635	Two stage general purpose regulator, see page 154. Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.

# Halocarbon 116

## (Hexafluoroethane) C<sub>2</sub>F<sub>6</sub>

<b>General characteristics:</b>	A colorless, nonflammable, liquefied, and odorless gas.	<b>DOT class:</b>	2.2 (Nonflammable Gas)
<b>Health hazards:</b>	Narcotic at high concentrations	<b>DOT label:</b>	Nonflammable Gas
<b>TLV-TWA:</b>	None established	<b>Specific volume:</b>	2.8 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	Nonflammable	<b>Specific gravity:</b> (Air = 1):	4.733 at 70°F
<b>Molecular weight:</b>	138.0	<b>Material recommendation:</b>	Normal materials can be used.
<b>CGA valve outlet:</b>	660/180	<b>CAS No.</b>	75-16-4
		<b>UN No.</b>	2193

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Halocarbon 116</b> Electronic 408000	99.95% Liquid phase	044 016 002	6630 — 10453	90 26 3	430 430 430	To maintain high purity quality at the point of use see high purity gas system page 139.  Two stage high purity regulator, see page 148.
<b>Halocarbon 116</b> C.P. 454200	99.9% Liquid phase	044 016 LBS	1668 1658 1730	90 26 0.5	430 430 430	Two stage general purpose regulator, see page 154. Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162.

# Halocarbon 123

## (Dichlorotrifluoroethane) $\text{CHCl}_2\text{F}_3$

**General characteristics:** A colorless, nonflammable, and noncorrosive gas. Decomposes at high temperatures to toxic substances.

**Health hazards:** A simple asphyxiant.

**TLV-TWA:** None established

**Flammable limits:** Nonflammable

**Molecular weight:** 152.9

**CGA valve outlet:** N/A

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 2.76 ft<sup>3</sup>/lb. at 70°F

**Specific gravity:**  
(Air = 1): 5.3 at 70°F

**Material recommendation:** Steel, brass, copper, and stainless steel.

**CAS No.** 306-83-2

**UN No.** None

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Halocarbon 123</b> C.P. 408100	99.8%	Bulk	—	Bulk	28	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage general purpose regulator, see page 155.
		DRA*	—	625	28	
		DRB*	6633	200	28	
		DRC*	—	100	28	

\* Nonreturnable container.

# Halocarbon 134a

## (Tetrafluoroethane) $\text{CH}_2\text{FCF}_3$

**General characteristics:** A colorless, nonflammable, and noncorrosive gas. Decomposes at high temperatures to toxic substances.

**Health hazards:** A simple asphyxiant.

**TLV-TWA:** None established

**Flammable limits:** Nonflammable

**Molecular weight:** 102.0

**CGA valve outlet:** 660<sup>1</sup>/<sub>4</sub> inch flare

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 3.166 ft<sup>3</sup>/lb. at 70°F

**Specific gravity:**  
(Air = 1): 3.18 at 70°F

**Material recommendation:** Steel, brass, copper, and stainless steel.

**CAS No.** 811-97-2

**UN No.** 3159

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Halocarbon 134a</b> C.P. 408200	99.8%	Bulk	13840	Bulk	110	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage general purpose regulator, see page 155.
		761	6661	2000	110	
		056	6657	125	110	
		DRE*	6663	30	110	

\* Nonreturnable container.

# Helium He

**General characteristics:** A colorless, nonflammable, and odorless gas.

**Health hazards:** A simple asphyxiant.

**TLV-TWA:** A simple asphyxiant.  
(ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 4.0

**CGA valve outlet:** 580/180

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 96.7 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 0.138 at 70°F

**Material recommendation:** Normal materials can be used.

**CAS No.** 7440-59-7

**UN No.** 1046

Product / Code	Purity	Cylinder Size	SAP	Volume SCF	Pressure @ 70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Helium Scientific	99.9999%	049	10547	291	2640	To maintain research gas quality at the point of use see research gas system page 139.  Two stage stainless steel regulator, see page 148. Single stage stainless steel regulator, see page 146. Ultra high purity panels, see page 182.
Helium Electronic 454400	99.9999%	049 044 016	1828 1794 1774	291 200 67	2640 2000 2000	
Helium Research 402200	99.9995%	049 044 016 002	5000 4874 4870 4916	291 200 67 4	2640 2000 2000 1800	
Helium Ultra high purity 402300	99.999%	B12 049 044 016	5242 5202 5160 5117	3492 291 200 67	2640 2640 2000 2000	To maintain high purity quality at the point of use see high purity gas system page 139.  Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.  Single stage gas supply panel, see page 172.
Helium Zero 402500	99.998% <0.5 ppm THC	B12 049 044 016	5815 5806 5756 5726	3492 291 200 67	2640 2640 2000 2000	
Helium Prepurified 402310	99.997%	B12 049 044 016 LBS	14355 14354 14353 14408 —	3492 291 200 67 2	2640 2640 2000 2000 1800	
Helium 3500 PSIG 473400	99.995%	043	4260	331	3500	High pressure regulator, see pages 163.  3500 psig CGA valve outlet 680 6000 psig CGA valve outlet 677
Helium 6000 PSIG 473500	99.995%	046	4288	515	6000	

Available in tube trailer quantities and 12 cylinder pallet banks.

A high purity gas is only as good as the gas handling system's components. Recommendations for regulators, control valves and outlets are listed in the equipment section. If you have a special problem or need additional help in selecting control equipment contact one of our representatives.

# Hydrogen $H_2$

**General characteristics:** A colorless, flammable, and odorless gas.

**Health hazards:** A simple asphyxiant.

**TLV-TWA:** A simple asphyxiant.  
(ACGIH 1996)

**Flammable limits:** 4-75%

**Molecular weight:** 2.02

**CGA valve outlet:** 350/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 192 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 0.0696 at 70°F

**Material recommendation:** Normal materials can be used.

**CAS No.** 1333-74-0

**UN No.** 1049

Product / Code	Purity	Cylinder Size	SAP	Volume SCF	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Hydrogen Scientific	99.9999%	049	13816	258	2400	To maintain research gas quality at the point of use see research gas system page 139.  Two stage stainless steel regulator, see page 148. Single stage stainless steel regulator, see page 146.
		044	15361	196	2000	
Hydrogen Research 402600	99.9995%	049	5932	258	2400	
		044	5911	196	2000	
		002	5855	4	1800	
Hydrogen ECD 402950	99.999%	049	1694	258	2400	
Hydrogen Ultra high purity 402700	99.999%	049	6182	258	2400	Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
		044	6123	196	2000	
		016	6096	66	2000	
Hydrogen Zero 402900	99.995% <0.5 ppm THC	049	1480	258	2400	
		044	1373	196	2000	
		016	1350	66	2000	
Hydrogen Prepurified 402710	99.995%	B12	14407	3096	2400	Single stage gas supply panel, see page 172.
		049	14406	258	2000	
		044	14375	196	2000	

Available in tube trailer quantities and 12 cylinder pallet banks.

# Hydrogen Bromide $HBr$

**General characteristics:** A colorless, nonflammable, liquefied and corrosive gas with a penetrating odor. Fumes in moist air. Highly corrosive in the presence of moisture.

**Health hazards:** Toxic. Attacks the mucous membranes and the eyes. Can cause lung damage.

**TLV-CEILING:** 3 ppm  
(ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 80.9

**CGA valve outlet:** 330/110

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas, Corrosive

**Specific volume:** 4.8 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 2.812 at 77°F

**Material recommendation:** Dry gas: Stainless steel. In the presence of moisture: platinum, tantalum, high pressure steel, and monel valves.

**CAS No.** 10035-10-6

**UN No.** 1048

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Hydrogen Bromide Technical 470500	99.8% Liquid phase	044	3412	130	320	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Single stage stainless steel regulator, see pg. 146. Lecture bottle control valve, see page 210. Lecture bottle regulator, see page 161.
		016	3384	30	320	
		007	3380	10	320	
		LBS	3432	1	320	

# Hydrogen Chloride HCl

**General characteristics:** A colorless, nonflammable, liquefied gas with a penetrating odor. Fumes in moist air. Corrosive in the presence of moisture.

**Health hazards:** Toxic. Attacks the mucous membranes and the eyes. Causes lung damage.

**TLV-CEILING:** 5 ppm  
(ACGIH 1996)

**Flammable limits:** Nonflammable  
**Molecular weight:** 36.5  
**CGA valve outlet:** 330/110

**DOT class:** 2.3 (Poison Gas)  
**DOT label:** Poison Gas, Corrosive  
**Specific volume:** 10.6 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.268 at 68°F

**Material recommendation:** Dry gas: Stainless steel, mild steel. In the presence of moisture: silver, platinum and tantalum.

**CAS No.** 7647-01-0  
**UN No.** 1050

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Hydrogen Chloride Research 470600	99.999% Liquid phase	044 007	3452 3446	60 8	613 613	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Two stage Monel regulator, see page 165.
Hydrogen Chloride Electronic 403000	99.995% Liquid phase	450 044 007	1819 1722 1726	600 60 8	613 613 613	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Two stage stainless steel regulator, see page 148.
Hydrogen Chloride Technical 403100	99.0% Liquid phase	450 044 007 LBS	2066 1924 1842 2128	600 60 8 0.5	613 613 613 613	Lecture bottle regulator, see page 161. Lecture bottle control valve, see page 210. Manual control valve, see page 212.

Available in tube trailer quantities.

# Hydrogen Fluoride HF

**General characteristics:** A colorless, nonflammable, and liquefied gas with a penetrating odor.

**Health hazards:** Toxic. This gas attacks the eyes and mucous membranes.

**TLV-CEILING:** 3 ppm  
(ACGIH 1996)

**Flammable limits:** Nonflammable  
**Molecular weight:** 20.0  
**CGA valve outlet:** 670/110

**DOT class:** 8 (Corrosive)  
**DOT label:** Corrosive, Poison  
**Specific volume:** 19.2 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.858 at 77°F

**Material recommendation:** Dry hydrogen fluoride gas: Steel. Liquid or moist gas: Monel and nickel.

**CAS No.** 7664-39-3  
**UN No.** 1052

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Hydrogen Fluoride Anhydrous 431900	99.9% Liquid phase	056 007 003	7225 7213 7209	100 9 3.5	0.9 0.9 0.9	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Manual control valve, see page 212.

# Hydrogen Sulfide $H_2S$

<b>General characteristics:</b>	A colorless, flammable, and liquefied gas with a detectable odor.	<b>Molecular weight:</b>	34.1
<b>Health hazards:</b>	Toxic. Causes headaches, discomfort, diarrhea, and breathing paralysis. Warning: the sense of smell is anesthetized quickly by hydrogen sulfide.	<b>CGA valve outlet:</b>	330/110
<b>TLV-CEILING:</b>	15 ppm	<b>DOT class:</b>	2.3 (Poison Gas)
<b>TLV-TWA:</b>	10 ppm (ACGIH 1996)	<b>DOT label:</b>	Poison Gas, Flammable Gas
<b>Flammable limits:</b>	4.3-45%	<b>Specific volume:</b>	11.23 ft <sup>3</sup> /lb. at 70°F
		<b>Specific gravity (Air = 1):</b>	1.189 at 59°F
		<b>Material recommendation:</b>	Stainless steel and aluminum.
		<b>CAS No.</b>	7783-06-4
		<b>UN No.</b>	1053

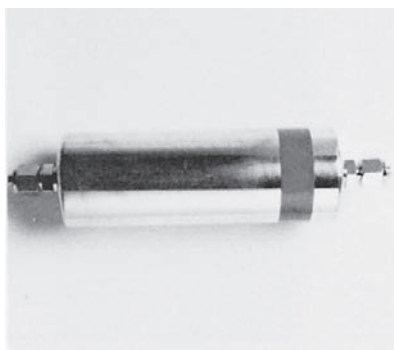
Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Hydrogen Sulfide</b> Research 405300	99.9% Liquid phase	082	14433	115	259	To maintain gas quality and safety at the point of use see toxic gas system page 139.
		044	5923	60	252	
		016	5903	20	252	
		LBS	5969	0.5	252	
<b>Hydrogen Sulfide</b> C.P. 405350	99.5% Liquid phase	082	14431	115	259	Single stage stainless steel regulator, see page 146. Lecture bottle regulator, see page 161. Lecture bottle control valve, see page 210. Single stage gas supply panel, see page 172.
		044	10251	60	252	
		016	10079	20	252	
		LBS	10141	0.5	252	
<b>Hydrogen Sulfide</b> Technical 470900	99.0% Liquid phase	082	14434	115	259	
		044	3488	60	252	
		016	3486	20	252	

# Isobutane $C_4H_{10}$

<b>General characteristics:</b>	A colorless, flammable, and liquefied gas with a faint odor.	<b>DOT class:</b>	2.1 (Flammable Gas)
<b>Health hazards:</b>	A simple asphyxiant.	<b>DOT label:</b>	Flammable Gas
<b>TLV-TWA:</b>	None established	<b>Specific volume:</b>	6.5 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	1.8-8.5%	<b>Specific gravity (Air = 1):</b>	2.01 at 70°F
<b>Molecular weight:</b>	58.1	<b>Material recommendation:</b>	Noncorrosive, most common materials can be used.
<b>CGA valve outlet:</b>	510/180	<b>CAS No.</b>	75-28-5
		<b>UN No.</b>	1969

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @ 70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Isobutane</b> Research 467100	99.99% Liquid phase	002	2838	0.875	31	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage high purity regulator, see page 146. Manual control valve, see page 212.
<b>Isobutane</b> Instrument 405000	99.5% Liquid phase	454 * 110 044 016 007 LBS	5603 5596 5576 5544 5524 5630	485 116 35 15 5 0.375	31 31 31 31 31 31	Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
<b>Isobutane</b> C.P. 467200	99.0% Liquid phase	454 * 110 044 016 007 LBS	2898 2882 2877 2862 2857 2904	485 116 35 15 5 0.375	31 31 31 31 31 31	

\* Equipped with double valving to allow either liquid or gaseous withdrawal.



Disposable Gas Purifier. See page 231.



# Isobutylene $C_4H_8$

**General characteristics:** A colorless, flammable, and liquefied gas with an odor.

**Health hazards:** A simple asphyxiant.

**TLV-TWA:** None established

**Flammable limits:** 1.8-9.6%

**Molecular weight:** 56.11

**CGA valve outlet:** 510/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 6.7 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.997 at 70°F

**Material**

**recommendation:** Noncorrosive, most common materials can be used.

**CAS No.** 115-11-7

**UN No.** 1055

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Isobutylene</b> Research 471100	99.9% Liquid phase	002	3582	0.875	24.3	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage high purity regulator, see page 146.
<b>Isobutylene</b> C.P. 431700	99.0% Liquid phase	110 044 016 007 LBS	7152 7149 7145 7130 7157	126 40 16 7 0.375	24.3 24.3 24.3 24.3 24.3	Single stage general purpose regulator, see page 155. Lecture bottle control valve, see page 210.

# Krypton $Kr$

**General characteristics:** A colorless, nonflammable, and odorless gas. Non reactive.

**Health hazards:** A simple asphyxiant.

**TLV-TWA:** None established

**Flammable limits:** Nonflammable

**Molecular weight:** 83.8

**CGA valve outlet:** 580

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 4.6 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 2.899 at 70°F

**Material**

**recommendation:** Normal materials can be used.

**CAS No.** 7439-90-9

**UN No.** 1056

Product / Code	Purity	Cylinder Size	SAP	Volume Liters	Net Weight Lbs.	Equipment Recommendation Ordering Information on Reference Page
<b>Krypton</b> Research 422900	99.995%	049 044 016 007 002 LBS	10349 10347 10345 10343 10338 10353	7500 5000 1000 500 100 50	57.5 38.3 7.7 3.85 0.77 0.38	To maintain research gas quality at the point of use see research gas system page 139.  Two stage stainless steel regulator, see page 148. Single stage stainless steel regulator, see page 146.
<b>Krypton</b> UHP 422950	99.97%	049 044	10354 10357	7500 5000	57.5 38.3	Single stage gas supply panel, see page 172.

# Methane $\text{CH}_4$

**General characteristics:** A colorless, odorless, and flammable gas.

**Health hazards:** A simple asphyxiant.  
**TLV-TWA:** A simple asphyxiant.

(ACGIH 1996)

**Flammable limits:** 5-14%

**Molecular weight:** 16.0

**CGA valve outlet:** 350/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 23.7 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 0.554 at 70°F

**Material recommendation:** Normal materials can be used.

**CAS No.** 74-82-8

**UN No.** 1971

Product / Code	Purity	Cylinder Size	SAP	Volume SCF	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Methane</b> Research 477900	99.995%	002	5201	4	1800	To maintain high purity quality at the point of use see high purity gas system page 139.  Two stage stainless steel regulator, see page 148.
<b>Methane</b> Ultra high purity 432600	99.99%	049 044 016 LBS	1243 1239 1233 1283	360 300 100 2	2400 2000 2000 1800	To maintain high purity quality at the point of use see high purity gas system page 139.
<b>Methane</b> C.P. 403200	99.3%	049 044 016 007 LBS	2348 2249 2220 2130 2435	360 300 100 40 2	2400 2000 2000 2000 1800	Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
<b>Methane</b> Technical 403300	98.0%	049 044	2526 2492	360 300	2400 2000	Single stage gas supply panel, see page 172.
<b>Methane</b> Commercial 403400	93.0% (Natural Gas) (Odorized)	588 049 044	2740 2686 —	4320 360 300	2400 2400 2000	Two stage general purpose regulator, see page 154. Single stage general purpose regulator, see page 155.

Available in tube trailer quantities and 12 cylinder pallet banks.

# Methyl Bromide $\text{CH}_3\text{Br}$

**General characteristics:** A colorless, poisonous, odorless, and liquefied gas.

**Health hazards:** Toxic. Attacks the central nervous system and will result in dizziness, nausea, and headaches. Contact with skin causes burns.

**TLV-TWA:** 5 ppm  
(ACGIH 1996)

**Flammable limits:** 13.5-14.5%

**Molecular weight:** 94.9

**CGA valve outlet:** 330/180

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas

**Specific volume:** 4.1 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 3.355 at 77°F

**Material recommendation:** Normal materials except for aluminum can be used.

**CAS No.** 74-83-9

**UN No.** 1062

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Methyl Bromide</b> C.P. 471300	99.5% Liquid phase	L60 L20 LBS	— — 11526	100 50 1	13 13	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Lecture bottle control valve, see page 210. Manual control valve, see page 212.

\* Not for Agricultural use.

# Methanol $\text{CH}_3\text{OH}$

<b>General characteristics:</b>	A colorless, flammable liquid and repulsive pungent odor.	<b>DOT class:</b>	3 (Flammable Liquid)
<b>Health hazards:</b>	Toxic. Irritates eyes, causes dizziness, nausea, possible carcinogen.	<b>DOT label:</b>	Flammable Liquid, Poison
<b>TLV- CEILING:</b>	250 ppm	<b>Specific volume:</b>	11.843 ft <sup>3</sup> /lb. at 70°F
<b>TLV-TWA:</b>	200 ppm (ACGIH 1991-1992)	<b>Specific gravity (Air = 1):</b>	1.11 at 70°F
<b>Flammable limits:</b>	6.0-36.5%	<b>Material recommendation:</b>	Normal materials except lead, aluminum and zinc coated material.
<b>Molecular weight:</b>	32.05	<b>CAS No.</b>	67-56-1
<b>CGA valve outlet:</b>	Bung/510	<b>UN No.</b>	1230

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Methanol</b> Metallurgical 408500	99.9% Liquid phase	Bulk 454* DRA	— 6669 —	Bulk 750 363	1.4 1.4	<b>None Required</b> Container Specification: 1 gallon drum 6.75" x 8.5" (DRE) 5 gallon drum 12" x 14" (DRF) 55 gallon drum 23" x 35" (DRA) Conversion: 6.6 lbs. per gallon.

\* Equipped with double valving to allow either liquid or gaseous withdrawal.



## 454 CONTAINER

For high purity in large volume, the 454-size container with a fork lift bottom is recommended.

# Methyl Chloride $\text{CH}_3\text{Cl}$

**General characteristics:** A colorless, flammable, liquefied gas with a sweet-like odor.

**Health hazards:** Toxic. Odor does not give adequate warning of presence. Affects the central nervous system.

**TLV-CEILING:** 100 ppm  
**TLV-TWA:** 50 ppm (ACGIH 1996)

**Flammable limits:** 8-17%

**Molecular weight:** 50.5

**CGA valve outlet:** 510/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 7.6 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.74 at 32°F

**Material recommendation:** Normal materials except aluminum can be used.

**CAS No.** 74-87-3

**UN No.** 1063

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Methyl Chloride</b> Instrument 405100	99.5% Liquid phase	761 *	5774	1300	59	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
		454 *	5748	800	59	
		110	5725	100	59	
		016	5666	25	59	
		LBS	5791	0.5	59	

\* Equipped with double valving to allow either liquid or gaseous withdrawal.

# Methyl Fluoride\* $\text{CH}_3\text{F}$

**General characteristics:** A colorless, flammable, and liquefied gas.

**Health hazards:** A simple asphyxiant.

**TLV-TWA:** None established

**Flammable limits:** Not known

**Molecular weight:** 34.0

**CGA valve outlet:** 350

\* Also known as Halocarbon 41

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 11.36 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.195 at 68°F

**Material recommendation:** Normal materials can be used.

**CAS No.** 593-53-3

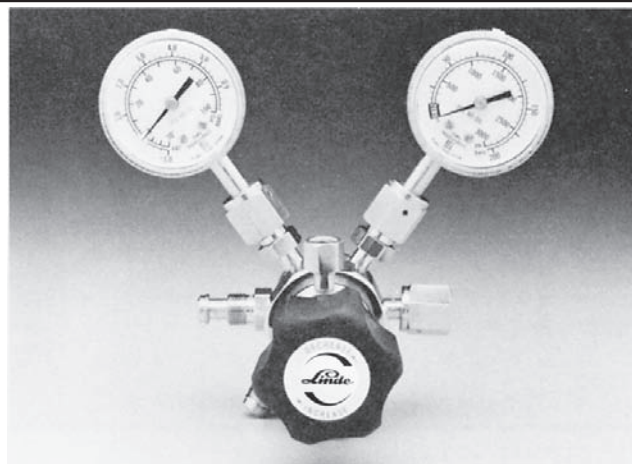
**UN No.** 2454

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Methyl Fluoride</b> C.P. 471400	99.0% Liquid phase	007	—	2.2	538	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage high purity regulator, see page 146.
		LBS	—	0.125	538	

## STAINLESS STEEL REGULATOR

See page 150

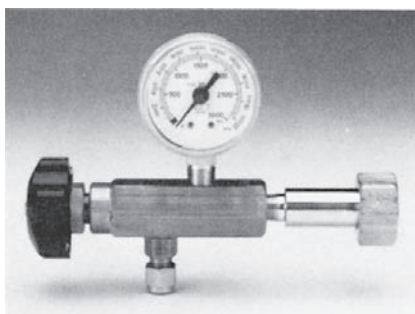
- Maintains Ultra High Purity
- Maintains Pressure Control within .1 PSIG per 100 PSIG inlet decay
- Resists Inboard Diffusion
- Corrosion Resistant



# Methyl Mercaptan $\text{CH}_3\text{SH}$

<b>General characteristics:</b>	A colorless, flammable, and liquefied gas with an extremely strong and repulsive odor.	<b>DOT class:</b>	2.3 (Poison Gas)
<b>Health hazards:</b>	Highly toxic; affects the central nervous system.	<b>DOT label:</b>	Poison Gas, Flammable Gas
<b>TLV-TWA:</b>	0.5 ppm (ACGIH 1996)	<b>Specific volume:</b>	8.0 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	4-22%	<b>Specific gravity (Air = 1):</b>	1.66 at 68°F
<b>Molecular weight:</b>	48.1	<b>Material recommendation:</b>	Stainless steel
<b>CGA valve outlet:</b>	110	<b>CAS No.</b>	74-93-1
		<b>UN No.</b>	1064

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Methyl Mercaptan C.P. 471500	99.5% Liquid phase	LBS	3720	0.50	15	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Lecture bottle regulator, see page 161. Manual control valve, see page 212.



Manual Control Valve. See page 212.

# Monomethylamine $\text{CH}_3\text{NH}_2$

<b>General characteristics:</b>	A colorless, flammable, and liquefied gas with an ammonia-type, fish-like odor.	<b>CGA valve outlet:</b>	705/110
<b>Health hazards:</b>	Toxic. Irritates eyes, mucous membranes, and skin. Carcinogenic.	<b>DOT class:</b>	2.3 (Poison Gas)
<b>TLV-STEL:</b>	15 ppm	<b>DOT label:</b>	Poison Gas, Flammable Gas
<b>TLV-TWA:</b>	5 ppm (ACGIH 1996)	<b>Specific volume:</b>	12.1 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	5-21%	<b>Specific gravity (Air = 1):</b>	1.61 at 70°F
<b>Molecular weight:</b>	31.058	<b>Material recommendation:</b>	Stainless steel and monel. Avoid copper, tin, and zinc.
		<b>CAS No.</b>	74-89-5
		<b>UN No.</b>	1061

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Monomethylamine C.P. 471200	99.5% Liquid phase	110 * LBS 454	3612 3632 12560	125 0.375 550	29 29 29	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Manual control valve, see page 212. Lecture bottle control valve, see page 210.

\* Equipped with full length eductor tube.

# Neon Ne

**General characteristics:** A colorless, nonflammable, odorless, and inert gas.

**Health hazards:** A simple asphyxiant.  
**TLV-TWA:** A simple asphyxiant. (ACGIH 1996)

**Flammable limits:** Nonflammable  
**Molecular weight:** 20.2  
**CGA valve outlet:** 580

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 19.2 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 0.696 at 70°F

**Material recommendation:** Normal materials can be used.

**CAS No.** 7440-01-9

**UN No.** 1065

Product / Code	Purity	Cylinder Size	SAP	Volume Liters	Net Weight Lbs.	Equipment Recommendation Ordering Information on Reference Page
<b>Neon</b> Research 405800	99.999%	049	10330	7500	13.8	To maintain high purity quality at the point of use see high purity gas system page 139.  Two stage stainless steel regulator, see page 148. Single stage stainless steel regulator, see page 146.
		044	10328	5000	9.2	
		016	10304	1000	1.84	
		007	10302	500	0.92	
		002	10297	100	0.184	
		LBS	10321	50	0.092	
<b>Neon</b> Electronic 405850	99.997%	049	10334	7500	13.8	Single stage gas supply panel, see page 172.
		044	10332	5000	9.2	

# Nitric Oxide NO

**General characteristics:** A colorless, flammable gas with a slight odor.

**Health hazards:** Toxic. Odor is insufficient to provide adequate warning.

**TLV-TWA:** 25 ppm (ACGIH 1996)

**Flammable limits:** Nonflammable  
**Molecular weight:** 30.006  
**CGA valve outlet:** 660

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas

**Specific volume:** 12.9 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.04 at 70°F

**Material recommendation:** Dry gas: Most common materials can be used. In the presence of moisture: Stainless steel.

**CAS No.** 10102-43-9

**UN No.** 1660

Product / Code	Purity	Cylinder Size	SAP	Volume SCF	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Nitric Oxide</b> C.P. 403600	99.5%	044	2922	56	500	To maintain gas purity and safety at the point of use see toxic gas system page 139.  Two stage stainless steel regulator, see page 148. Single stage stainless steel regulator, see page 146.
		016	2812	19	500	
		007	2808	8	500	
		002	2770	1.2	500	

PURITY		IMPURITIES	
99.99999%	=	0.00001%	= 100 ppb
99.9999%	=	0.0001%	= 1 ppm
99.999%	=	0.001%	= 10 ppm
99.99%	=	0.01%	= 100 ppm
99.9%	=	0.1%	= 1,000 ppm
99%	=	1%	= 10,000 ppm

# Nitrogen $N_2$

**General characteristics:** A colorless, nonflammable, odorless, and compressed gas.

**Health hazards:** A simple asphyxiant.  
**TLV-TWA:** A simple asphyxiant.  
 (ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 28.0

**CGA valve outlet:** 580/180

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 13.8 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 0.967 at 70°F

**Material**

**recommendation:** Normal materials can be used.

**CAS No.** 7727-37-9

**UN No.** 1066

Product / Code	Purity	Cylinder Size	SAP	Volume SCF	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Nitrogen</b> Scientific	99.9999%	049	10548	304	2640	To maintain research gas quality at the point of use see research gas system page 139.
<b>Nitrogen</b> Research 406300	99.9995%	049 044 002	6487 6479 6469	304 210 4	2640 2000 1800	Two stage stainless steel regulator, see page 148. Single stage stainless steel regulator, see page 146.
<b>Nitrogen</b> ECD 406350	99.9995%	049	6519	304	2640	
<b>Nitrogen</b> Ultra high purity 403700	99.999%	B12 049 044 016	3176 3110 3053 3002	3648 304 210 80	2640 2640 2000 2000	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage gas supply panel, see page 172.
<b>Nitrogen</b> Zero 403800	99.998% <0.5 ppm THC	B12 049 044 016	3444 3420 3388 3350	3648 304 210 80	2640 2640 2000 2000	Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
<b>Nitrogen</b> Prepurified 430900	99.998%	049 044 016	7065 7057 7041	304 210 80	2640 2000 2000	
<b>Nitrogen</b> Prepurified 3500 PSIG 473700	99.998%	043	4382	339	3500	High pressure regulator, see page 163.
<b>Nitrogen</b> Prepurified 6000 PSIG 473800	99.998%	046	4414	485	6000	3500 psig CGA valve outlet 680 6000 psig CGA valve outlet 677
<b>Nitrogen</b> UHP 6000 PSIG 403700	99.999%	046	14382	485	6000	

Available in tube trailer quantities and 12 cylinder pallet banks.  
 50 gallon liquid dewar available upon request.

# Nitrogen Dioxide $\text{NO}_2^*$

**General characteristics:** A reddish brown, nonflammable, and liquefied gas with an odor.

**Health hazards:** Highly toxic. Causes serious lung damage with a delayed effect.

**TLV-STEL:** 5 ppm  
**TLV-TWA:** 3 ppm  
 (ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 46.0

**CGA valve outlet:** 660/110

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas, Oxidizer

**Specific volume:** 4.7 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.58 at 70°F

**Material recommendation:** Stainless steel

**CAS No.** 10102-44-0

**UN No.** 1067

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Nitrogen Dioxide</b> C.P. 417000	99.5% Liquid phase	044	6743	100**	0	To maintain high purity quality at the point of use see high purity gas system page 139. Manual control valve, see page 212.
		007	6741	10**	0	
		LBS	6769	0.5	0	

\* Shipping name - Dinitrogen Tetroxide

\*\* Equipped with full length eductor tubes.



**Stainless Steel Two Stage Regulator.**

See page 148.

# Nitrogen Trifluoride $\text{NF}_3$

**General characteristics:** A colorless and nonflammable, compressed gas with a detectable odor.

**Health hazards:** Toxic. Irritates the air passages. A strong oxidizer.

**TLV-TWA:** 10 ppm  
 (ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 71.0

**CGA valve outlet:** 330

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas, Oxidizer

**Specific volume:** 5.44 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 2.46 at 68°F

**Material recommendation:** Stainless steel, copper, and brass. With elevated temperature: Nickel and monel. All equipment must be made inert before utilization.

**CAS No.** 7783-54-2

**UN No.** 2451

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Nitrogen Trifluoride</b> C.P. 471600	99.0 wt%	007	—	10	1450	To maintain high purity quality at the point of use see high purity gas system page 139. Single stage monel regulator, call for information. Manual control valve, see page 212.
		003	3722	3	1450	
		044	3740	44	1450	
		049	9796	50	1450	



# Nitrous Oxide $N_2O$

**General characteristics:** A colorless, nonflammable, odorless, and liquefied gas.

**Health hazards:** A simple asphyxiant and an anesthetic, a mild oxidizer.

**TLV-TWA:** 50 ppm  
(ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 44.0

**CGA valve outlet:** 326/180

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 8.7 ft<sup>3</sup>/lb. at 70°F

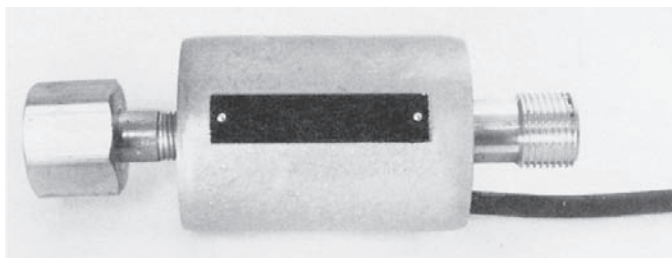
**Specific gravity (Air = 1):** 1.53 at 68°F

**Material recommendation:** Normal materials can be used.

**CAS No.** 10024-97-2

**UN No.** 1070

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Nitrous Oxide</b> Research 431870	99.998% Liquid phase	044	7187	60	745	To maintain research gas quality at the point of use see research gas system page 139. Two stage stainless steel regulator, see page 148. Single stage stainless steel regulator, see page 146.
<b>Nitrous Oxide</b> UHP 431880	99.99% Liquid phase	044	7191	60	745	Single stage gas supply panel, see page 172.
<b>Nitrous Oxide</b> Atomic Absorption/C.P. 431800	99.5% Liquid phase	044 LBS	7175 7179	60 0.5	745 745	Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146. N <sub>2</sub> O heater, see page 233.



**N<sub>2</sub>O Heater**, See page 233.

# Oxygen $O_2$

**General characteristics:** A colorless, nonflammable, and odorless gas. Sustains combustion of many materials which normally cannot burn in air. Increases the combustion rate when compared to air.

**TLV-TWA:** None established  
**Flammable limits:** Strong oxidizer  
**Molecular weight:** 32.0  
**CGA valve outlet:** 540/180

**DOT class:** 2.2 (Nonflammable Gas)  
**DOT label:** Nonflammable Gas, Oxidizer  
**Specific volume:** 12.1 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.105 at 77°F

**Material recommendation:** Copper, brass, nickel alloys, steel, and stainless steel. All equipment must be cleaned for oxygen service.

**CAS No.** 7782-44-7  
**UN No.** 1072

Product / Code	Purity	Cylinder Size	SAP	Volume SCF	Pressure @ 70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Oxygen</b> Scientific	99.9999%	049	10549	337	2640	To maintain research gas quality at the point of use see research gas system page 139. Two stage stainless steel regulator, see page 148. Single stage stainless steel regulator, see page 146.
<b>Oxygen</b> Research 432000	99.999%	049 044 002	7256 7254 7246	337 225 4	2640 2000 1800	
<b>Oxygen</b> Ultra high purity 404200	99.995%	B12 049 044	4194 4152 4094	4044 337 225	2640 2640 2000	
<b>Oxygen</b> Zero 404300	99.98% <0.5 ppm THC	B12 049 044 LBS	4358 4304 4278 4358	4044 337 225 2	2640 2640 2000 1800	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage gas supply panel, see page 172.  Two stage high purity regulator, see page 148. Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
<b>Oxygen</b> Extra dry 404400	99.6%	049 044 016 LBS	4528 4464 4428 4562	337 225 86 2	2640 2000 2000 1800	

Available in tube trailer quantities and 12 cylinder pallet banks.

# Perfluoropropane



**General characteristics:** A colorless, nonflammable, and liquefied gas.

**Health hazards:** A simple asphyxiant.

**TLV-TWA:** None established

**Flammable limits:** Nonflammable

**Molecular weight:** 188.0

**CGA valve outlet:** 660/180

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 2.02 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 6.69 at 68°F

**Material recommendation:** Most common materials can be used.

**CAS No.** 76-19-7

**UN No.** 2424

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Perfluoropropane Instrument 471700	99.5% Liquid phase	007	—	15	100	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
		003	3744	5	100	
		LBS	3760	1	100	
Perfluoropropane C.P. 431500	99.0% Liquid phase	016	—	30	100	
		007	7123	15	100	
		003	7119	5	100	
		LBS	7135	1	100	

\* Shipping name - Octafluoropropane.

# Phosgene



**General characteristics:** A colorless, nonflammable, and liquefied gas with an odor similar to moist hay.

**Health hazards:** Highly toxic. Causes serious lung damage with delayed effect even with concentrations below the odor threshold.

**TLV-TWA:** 0.1 ppm (ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 98.9

**CGA valve outlet:** 660

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas, Corrosive

**Specific volume:** 3.8 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 3.48 at 77°F

**Material recommendation:** Dry gas: Stainless steel, copper, and brass. Moist gas: Monel.

**CAS No.** 75-44-5

**UN No.** 1076

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Phosgene C.P. 471800	99.0% Liquid phase	044 *	—	95	10.7	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Manual control valve, see page 212.
		007 *	3794	10	10.7	
		003 *	3787	5	10.7	
		002	3769	1	10.7	

\* Equipped with full length eductor tube.

# Phosphine



**General characteristics:** A colorless, flammable, and liquefied gas with an odor similar to rotten fish.

**Health hazards:** Highly toxic, attacks the central nervous system and the lungs.

**TLV-STEL:** 1 ppm

**TLV-TWA:** 0.3 ppm  
(ACGIH 1996)

**Flammable limits:** Not established

**Molecular weight:** 34.0

**CGA valve outlet:** 350 or DISS 632

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas and Flammable Gas

**Specific volume:** 11.4 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.174 at 70°F

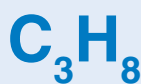
**Material recommendation:** Noncorrosive; most materials except aluminum can be used.

**CAS No.** 7803-51-2

**UN No.** 2199

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Phosphine Electronic 471900	99.999% Liquid phase	044	—	20	594	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Two stage stainless steel regulator all welded connections, see page 150 Single stage stainless steel regulator all welded connections, see page 151.
		016	9454	3	594	
		LBR	9797	0.04	594	

# Propane



**General characteristics:** A colorless, flammable, liquefied and odorless gas.

**Health hazards:** A simple asphyxiant.

**TLV-TWA:** A simple asphyxiant.  
(ACGIH 1996)

**Flammable limits:** 2.2-9.5%

**Molecular weight:** 44.10

**CGA valve outlet:** 510/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas

**Specific volume:** 8.5 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.55 at 68°F

**Material recommendation:** Normal materials can be used. Avoid plastic and rubber for liquid.

**CAS No.** 74-98-6

**UN No.** 1978

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Propane* Research 472100	99.99% Liquid phase	016	3842	13	109	To maintain high purity quality at the point of use see high purity gas system page 139.
		002	3814	0.875	109	
Propane* Instrument 404500	99.5% Liquid phase	454 **	4758	420	109	Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
		110	4725	100	109	
		044	4665	35	109	
		016	4614	13	109	
		007	4588	5	109	
		LBS	4820	0.30	109	
Propane* C.P. 432900	99.0% Liquid phase	454 **	1382	420	109	Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162.
		110	1325	100	109	
		044	1323	35	109	
		LBS	1444	0.30	109	

\*Available with eductor tube, except cylinder sizes 002 and LBS.

\*\*Equipped with double valving to allow liquid or gaseous withdrawal.

# Propylene $C_3H_6$

**General characteristics:** A colorless, flammable, and liquefied gas with an odor.

**Health hazards:** A simple asphyxiant.  
**TLV-TWA:** A simple asphyxiant. (ACGIH 1996)

**Flammable limits:** 2-11%  
**Molecular weight:** 42.1  
**CGA valve outlet:** 510/180

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas  
**Specific volume:** 9.4 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.48 at 68°F

**Material recommendation:** Most common materials can be used.  
**CAS No.** 115-07-1  
**UN No.** 1077

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Propylene Research 472200	99.6% Liquid phase	002	3852	0.875	136	To maintain high purity quality at the point of use see high purity gas system page 139. Single stage high purity regulator, see page 146.
Propylene* Polymer 408600	99.5% Liquid phase	110 044 016 007	6687 6673 11876 6671	105 35 13 5	136 136 136 136	Single stage general purpose regulator, see page 155. Lecture bottle regulator, see page 162. Lecture bottle control valve, see page 210.
Propylene* C.P. 432400	99.0% Liquid phase	110 LBS	1213 1227	105 0.30	136 136	

\* Available with eductor tube, except cylinder size 002 and LBS.

# Silane $SiH_4$

**General characteristics:** A colorless and extremely reactive compressed gas.

**Health hazards:** Ignites spontaneously in air.  
**TLV-TWA:** 5 ppm (ACGIH 1996)

**Flammable limits:** Pyrophoric  
**Molecular weight:** 32.1  
**CGA valve outlet:** 350 or DISS 632

**DOT class:** 2.1 (Flammable Gas)

**DOT label:** Flammable Gas  
**Specific volume:** 12.10 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 1.114 at 70°F

**Material recommendation:** Noncorrosive to most metals. Stainless steel, aluminum, iron, brass, and steel.

**CAS No.** 7803-62-5  
**UN No.** 2203

Product / Code	Purity	Cylinder Size	SAP	Volume Grams	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Silane Electronic 472300	99.997%	044 A31 007 LBR LBS	3893 3931 3888 12168 9466	13000 5000 600 55 55	1205 875 150 150 150	To maintain gas quality and safety at the point of use see toxic gas system page 139. Two stage stainless steel regulator all welded connections, see page 150. Single stage stainless steel regulator, all welded connections, see page 151.

# Silicon Tetrachloride $\text{SiCl}_4$

**General characteristics:** A colorless, nonflammable, liquid with a penetrating odor.

**Health hazards:** Highly toxic. Inhalation will cause coughing and throat irritation; may cause lung damage.

**TLV-TWA:** None established

**Flammable limits:** Nonflammable

**Molecular weight:** 169.9

**DOT class:** 8 (Corrosive Liquid)

**DOT label:** Corrosive

**Specific volume:** 2.28 ft<sup>3</sup>/lb. at 70°F

**Material recommendation:** Corrosive in moist conditions. Stainless steel, monel

**CAS No.** 10026-04-7

**UN No.** 1818

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Silicon Tetrachloride Electronic 472410	99.99% Liquid phase	208 *	—	600	0	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Single stage stainless steel regulator all welded connections, see page 151.

\* Equipped with double valving to allow either liquid or gases withdrawal.

# Sulfur Dioxide $\text{SO}_2$

**General characteristics:** A colorless, nonflammable, and liquefied gas with a penetrating odor.

**Health hazards:** Toxic. Irritates eyes and air passages.

**TLV-STEL:** 5 ppm

**TLV-TWA:** 2 ppm  
(ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 64.1

**CGA valve outlet:** 660/110

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas

**Specific volume:** 5.9 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 2.262 at 70°F

**Material recommendation:** Dry gas in not corrosive. Most structural metals except zinc. Moist gas: Stainless steel.

**CAS No.** 7446-09-5

**UN No.** 1079

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Sulfur Dioxide Anhydrous 404600	99.98% Liquid phase	761 054 016 007 LBS	15006 4958 4910 4845 5026	2000 150 40 5 1	34 34 34 34 34	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Single stage stainless steel regulator, see page 146. Lecture bottle regulator, see page 161. Lecture bottle control valve, see page 210.

# Sulfur Hexafluoride $\text{SF}_6$

**General characteristics:** A colorless, nonflammable, liquefied, and odorless gas.

**Health hazards:** A simple asphyxiant.  
**TLV-TWA:** 1000 ppm (ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 146.1

**CGA valve outlet:** 590/180

**DOT class:** 2.2 (Nonflammable Gas)

**DOT label:** Nonflammable Gas

**Specific volume:** 2.5 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 5.11 at 68°F

**Material recommendation:** Most common materials can be used.

**CAS No.** 2551-62-4

**UN No.** 1080

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Sulfur Hexafluoride</b> Research 4047100	99.999% Liquid phase	044 016	14589 14588	115 38	320 320	To maintain high purity quality at the point of use see high purity gas system page 139.  Single stage high purity regulator, see page 146. Lecture bottle regulator, see page 162. Manual control valve, see page 212.
<b>Sulfur Hexafluoride</b> Instrument 472500	99.99% Liquid phase	044 016 007	4108 4074 4044	115 38 10	320 320 320	
<b>Sulfur Hexafluoride</b> C.P. 404700	99.8% Liquid phase	B12 044 016 007 LBS	5280 5152 5112 5094 5333	1560 115 38 10 0.50	320 320 320 320 320	
<b>Sulfur Hexafluoride</b> Dielectric Grade 404700	99.8% Liquid phase Meets D2472 ASTM	B12 044	13139 14410	1560 115	320 320	

# Sulfur Tetrafluoride $\text{SF}_4$

**General characteristics:** A colorless, nonflammable, and liquefied gas with a sharp irritating odor.

**Health hazards:** Toxic. Irritating to eyes and air passages. Skin contact with the liquid can cause serious burns.

**TLV-CEILING:** 0.1 ppm (ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 108.1

**CGA valve outlet:** 330/110

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas

**Specific volume:** 3.6 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 3.783 at 68°F

**Material recommendation:** Stainless steel, nickel and monel.

**CAS No.** 7783-60-0

**UN No.** 2418

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
<b>Sulfur Tetrafluoride</b> Technical 472600	98% Liquid phase	003 * LBS	4226 4234	5 1	140 140	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Single stage stainless regulator all welded connections, see page 152. Lecture bottle control valve, see page 210.

\* Available with full length eductor tube.

# Trimethylamine $(\text{CH}_3)_3\text{N}$

**General characteristics:** A colorless, flammable, and liquefied gas with an ammonia-type, fish-like odor.

**Health hazards:** Toxic. Irritates eyes, mucous membranes, and skin. Carcinogenic.

**TLV-STEL:** 10 ppm

**TLV-TWA:** 5 ppm  
(ACGIH 1996)

**Flammable limits:** 2-12%

**Molecular weight:** 59.4

**CGA valve outlet:** 705/110

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas, Flammable Gas

**Specific volume:** 6.54 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 2.04 at 70°F

**Material recommendation:** Stainless steel and monel. Avoid copper, tin, and zinc.

**CAS No.** 75-50-3

**UN No.** 1083

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Trimethylamine C.P. 471200	99.5% Liquid phase	454 *	12560	550	29	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Manual control valve, see page 212. Lecture bottle control valve, see page 210.
		110 **	3612	125	29	
		LBS	3632	0.5	29	

\* Equipped with double valving to allow either liquid or gases withdrawal.

\*\* Equipped with full length eductore tube.

# Tungsten Hexafluoride $\text{WF}_6$

**General characteristics:** A pale, yellow, nonflammable, and liquefied gas.

**Health hazards:** Toxic, irritating and corrosive to tissue.

**TLV-STEL:** 3 mg/m<sup>3</sup>

**TLV-TWA:** Soluble compound (as W)  
1 mg/m<sup>3</sup>  
(ACGIH 1996)

**Flammable limits:** Nonflammable

**Molecular weight:** 297.84

**CGA valve outlet:** 670

**DOT class:** 2.3 (Poison Gas)

**DOT label:** Poison Gas

**Specific volume:** 1.24 ft<sup>3</sup>/lb. at 70°F

**Specific gravity (Air = 1):** 10.0 at 70°F

**Material recommendation:** Monel and nickel are preferred

**CAS No.** 7783-82-6

**UN No.** 2196

Product / Code	Purity	Cylinder Size*	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Tungsten Hexafluoride Electronic 472800	99.88% Liquid phase	N07	—	40	35	To maintain gas quality and safety at the point of use see toxic gas system page 139.  Stainless steel low pressure line regulator with all welded connections, see page 159.
Tungsten Hexafluoride C.P. 408700	98.0% Liquid phase	N07	—	40	35	

\* Specially distilled product in nickel cylinders.



# Vinyl Methyl Ether $C_3H_6O$

<b>General characteristics:</b>	A colorless, flammable, and liquefied gas with an ether-like odor.	<b>DOT class:</b>	2.1 (Flammable Gas)
<b>Health hazards:</b>	A simple asphyxiant.	<b>DOT label:</b>	Flammable Gas
<b>TLV-TWA:</b>	None established	<b>Specific volume:</b>	6.7 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	2.6-39%	<b>Specific gravity (Air = 1):</b>	1.99 at 68°F
<b>Molecular weight:</b>	58.1	<b>Material recommendation:</b>	Normal materials, except copper and its alloys can be used.
<b>CGA valve outlet:</b>	510/110	<b>CAS No.</b>	107-25-5
		<b>UN No.</b>	1087

Product / Code	Purity	Cylinder Size	SAP	Volume Lbs.	Pressure @70°F PSIG	Equipment Recommendation Ordering Information on Reference Page
Vinyl Methyl Ether C.P. 473200	99.5% Liquid phase	007 LBS	— 12934	7 0.5	11 11	To maintain high purity quality at the point of use see high purity gas system page 139.  Lecture bottle control valve, see page 210.

# Xenon $Xe$

<b>General characteristics:</b>	A colorless, nonflammable, and odorless gas.	<b>DOT class:</b>	2.2 (Nonflammable Gas)
<b>Health hazards:</b>	A simple asphyxiant.	<b>DOT label:</b>	Nonflammable Gas
<b>TLV-TWA:</b>	None established	<b>Specific volume:</b>	2.9 ft <sup>3</sup> /lb. at 70°F
<b>Flammable limits:</b>	Nonflammable	<b>Specific gravity (Air = 1):</b>	4.560 at 70°F
<b>Molecular weight:</b>	131.3	<b>Material recommendation:</b>	Normal materials can be used.
<b>CGA valve outlet:</b>	580	<b>CAS No.</b>	7440-63-3
		<b>UN No.</b>	2036

Product / Code	Purity	Cylinder Size	SAP	Volume Liters	Net Weight Lbs.	Equipment Recommendation Ordering Information on Reference Page
Xenon Research 422800	99.999%	049 044 016 007 002 LBS	10380 10378 10375 10373 10367 10386	7500 5000 1000 500 100 50	90.40 60.30 12.06 6.030 1.206 0.603	To maintain research gas quality at the point of use see research gas system page 139.  Two stage stainless steel regulator, see page 148. Single stage stainless steel regulator, see page 146.

PURITY		IMPURITIES	
99.99999%	=	0.00001%	= 100 ppb
99.9999%	=	0.0001%	= 1 ppm
99.999%	=	0.001%	= 10 ppm
99.99%	=	0.01%	= 100 ppm
99.9%	=	0.1%	= 1,000 ppm
99%	=	1%	= 10,000 ppm