

C²H² ACETYLENE

Acetylene is a colorless and tasteless gas with a garlic-like odor. It is flammable and can be an asphyxiant. In order to prevent explosive decomposition, acetylene is supplied in cylinders filled with a porous mass packing material that is saturated with acetone or other suitable solvent in which the acetylene is actually dissolved. The specifications shown are on a solvent free basis.

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

Acetylene

(Units in ppm (v/v) unless show otherwise)

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

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

AR ARGON LAR

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

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

Liquid Argon

(Units in ppm (v/v) unless show otherwise)

Limiting Characteristics	CGA G-11.1 Type II, Grade C	Typical
Argon minimum, %	99.997	99.998
Water	10.5	3.5
Dew point, °F	-76	-90
Oxygen	5	2
Nitrogen	20	10
Hydrogen	1	1
Combined total hydrocarbons (as methane) and carbon dioxide	3	3

Keen guarantees commercial grade product delivered as a liquid meets the commercial CGA specification listed. Keen does not normally guarantee commercial grade product delivered as a compressed gas meets the gaseous specification listed because gas purities are affected by normal cylinder filling practices and process procedures which may compromise the integrity of the product.

CO² CARBON DIOXIDE

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

The Compressed Gas Association (CGA) specification G-6.2, Grade H is considered standard for commercial carbon dioxide.

Carbon Dioxide

(Units in ppm (v/v) unless show otherwise)

Limiting Characteristics	CGA G-6.2 Grade H	Typical
Carbon Dioxide minimum, % (mole/mole)	99.8	99.9
Water (vapor)	32	32
Dew point, °F	-60	-60
Total hydrocarbons (as methane)	50	50
Oxygen	30	30
Carbon Monoxide	10	10
Hydrogen Sulfide	0.5*	0.5
Nitric Oxide	2.5	5
Nitrogen Dioxide	2.5	
Sulfur Dioxide	5	5
Carbonyl Sulfide	.05"	0.5
Nonvolatile Residues, ppm (wt/wt)	10	10
Odor	Free of Foreign** Odor	
Noncondensable (Volatile)	--	50
Inerts	--	1000
Ammonia	--	25
Foreign Taste	--	None detected

* Total sulfides in QVLH shall not exceed 0.5 ppm as hydrogen sulfide

** In gas phase or water solution

HE HELIUM HE

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

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

Gaseous Helium

(Units in ppm (v/v) unless show otherwise)

Limiting Characteristics	CGA G-9.2 Type I, Grade L	Typical
Helium minimum, %	99.995	99.995
Maximum guaranteed impurities	--	50
Water	15	15
Dew point, °F	--	--
Gaseous Hydrocarbons (as methane)	--	--
Oxygen	5	5
Nitrogen	--	--

Type II liquid helium, when passed through a 10 micron absolute filter at less than 5.2°K is pure helium for which no analysis is necessary.

The water content of helium required for any particular grade and application may vary with intended use. If a specific limit is required, it should be specified as a limiting concentration expressed in ppm (v/v) or the dew point equivalent. Also note that the water content of grades 4.5 and higher will be about 10 ppm higher when supplied in Pyrex glass flasks.

The Quality Verification Levels apply only to gaseous helium. Impurity limits for liquid helium are not specified since sufficient technical data and analytical procedures are not available to warrant a definitive quantitative specification. The requirement for insuring that the loaded fluid in a container is liquid helium can be satisfied by analyzing the shipping container vent gas or by demonstrating that the temperature of the loaded fluid is below the hydrogen triple point (13.88K).

H² HYDROGEN LH²

Hydrogen is the lightest gas known. It is a colorless, odorless and tasteless gas and is flammable and nontoxic at atmospheric temperatures and pressures.

The Compressed Gas Association (CGA) specification G-5.3 is the industry standard. Type II, Grade A is considered commercial liquid hydrogen and Type I, Grade B is considered commercial gaseous hydrogen.

Hydrogen

(Units in ppm (v/v) unless show otherwise)

Limiting Characteristics	Gaseous	Liquid	Liquid*
	CGA G-5.3 Type I, Grade B	CGA G-5.3 Type II, Grade A	Typical
Hydrogen minimum, %	99.95	99.995	99.999
Water	32.0	--	1
Dew point, °F	-60	--	--
Oxygen	10	1.0	1
Argon	--		
Nitrogen	400	9.0**	1
Total Hydrocarbons	10		
Helium	--	39	--
Carbon dioxide	10	1.0	.5
Carbon Monoxide	10		
Para Content Minimum %	--	95	--
Permanent Particulate	--	Filtering Required	--

* For vaporized liquid, the typical analyses are Hydrogen, 99.995%; O²/Ar, 1.0 ppm; N²/Total Hydrocarbons, 9.0 ppm; CO²/CO, 1.0 ppm.

** Includes water

Keen guarantees commercial grade product delivered as a liquid meets the commercial CGA specification listed. Keen does not normally guarantee commercial grade product delivered as a compressed gas meets the gaseous specification listed because gas purities are affected by normal cylinder filling practices and process procedures which may compromise the integrity of the product.

N² NITROGEN LIN

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

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

Nitrogen

(Units in ppm (v/v) unless show otherwise)

Limiting Characteristics	National Formulary Spec	Liquid	Liquid	Gaseous
		CGA G-10.1 Type II, Grade L	Typical	CGA G-10.1 Type I, Grade F
Nitrogen minimum, % *	99.0	99.998	99.999	99.9
Water	N/A	4	1.5	32.0
Dew point, °F	N/A	-90	-100	-60
Carbon Monoxide	10	--	--	--
Oxygen	1.0%	10	5	1000
Odor	None	--	--	--

* N² includes trace quantities of neon, helium and small quantities of argon.

Currently the United States Department of Agriculture (USDA) has no specification for liquid nitrogen in food applications. However, the Food and Drug Administration (FDA) considers nitrogen a G.R.A.S. substance, Generally Regarded As Safe as a good additive.

Nitrogen is also available in high purity VLSI grade for customers requiring stringent purity standards.

Keen guarantees commercial grade product delivered as a liquid meets the commercial CGA specification listed. Keen does not normally guarantee commercial grade product delivered as a compressed gas meets the gaseous specification listed because gas purities are affected by normal cylinder filling practices and process procedures which may compromise the integrity of the product.

O² OXYGEN LOX

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

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

Oxygen

(Units in ppm (v/v) unless show otherwise)

Limiting Characteristics	USP Spec	Liquid	Liquid	Gaseous
		CGA G-4.3 Type II, Grade B	Typical	CGA G-4.3 Type I, Grade B
Oxygen minimum, %	99.0	99.5	99.7	99.5
Water	N/A	6.6	1	None condensed
Dew point, °F	N/A	-82	-105	
Total hydrocarbons as methane	N/A	N/A	30	

Oxygen is also available in high purity VLSI grade and ultra high purity ELSI grade (99.9999) liquid oxygen for customer requiring stringent purity standards.

Keen guarantees commercial grade product delivered as a liquid meets the commercial CGA specification listed. Keen does not normally guarantee commercial grade product delivered as a compressed gas meets the gaseous specification listed because gas purities are affected by normal cylinder filling practices and process procedures which may compromise the integrity of the product.