

Glossary/Conversion Charts/CGA Valve Data

- Conversion Factors
- Cylinder Valve Outlet & Connections
- Glossary of Terms

Conversion Factors

PRESSURE

Multiply Number of <i>b y</i> To Obtain	Atmosphere	Bar	Kg/cm2	PSI	KPa	Inch W.C.	mm Hg	mm W.C.	Inch Hg
Atmosphere	1	1.01325	1.0332274	14.695945	101.325	406.78244	760	10332.274	29.92126
Bar	0.98692333	1	1.01971.62	14.50377	100	401.463	750.0615	10197.162	29.53
Kg/cm2	0.9678411	0.980665	1	14.22334	98.0665	393.7	735.559	10000	28.959
PSI	0.068046	0.06894757	0.070307	1	6.894757	27.6807	51.7149	703.07	2.03602
Inch Hg (0 C)	0.0334211	0.03386389	0.03453152	0.491154	3.37685	13.5955	25.4	345.3152	1
KPa	0.00987	0.01	0.010197	0.14504	1	4.01463	7.500615	101.9716	0.296134
Inch W.C.	0.0024582	0.0024884	0.0254000	0.0361263	0.24884	1	1.86648	25.4	0.0735539
mm Hg (torr)	0.00131579	0.001333224	0.0013595	0.0193368	0.1333224	0.535255	1	13.5955	0.03937
mm W.C.	0.00009678	0.0000979685	0.0001	0.001422295	0.0097685	0.03937	0.073554	1	0.0028959

FLOW

Multiply Number of <i>b y</i> To Obtain	SCFH	SCFM	SCCM	SCCH	SLPM	SLPH	GPM
SCFH	1	.0166	471.947	28317	.4719	28.316	.1247
SCFM	60	1	28317	1,699,011	28.316	1699	7.481
SCCM	.0021	.000035	1	60	.001	.06	.00026
SCCH	.00003	.0000005	.0167	1	.000017	.001	.000004
SLPM	2.1189	.035	1000	60,000	1	60	.264
SLPH	.035	.00059	16.667	1000	.0167	1	.004
GPM	8.021	.1337	3,785.41	227,125	3.785	227.12	1

VELOCITY

Multiply Number of <i>b y</i> To Obtain	Feet per Second	Feet per Minute	Miles per Hour	Meters per Second	Meters per Minute	Kilometers per Hour
Feet per Second	1	60.00	0.6818	0.3048	18.29	1.097
Feet per Minute	0.01667	1	0.01136	0.005080	0.3048	0.01829
Miles per Hour	1.467	88.00	1	0.4470	26.82	1.609
Meters per Second	3.280	196.9	2.237	1	60.00	3.600
Meters per Minute	0.05468	3.281	0.03728	0.01667	1	0.06000
Kilometers per Hour	0.9113	54.68	0.6214	0.2778	16.67	1

TEMPERATURE

$$^{\circ}\text{F} = 9/5 (^{\circ}\text{C}) + 32$$

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) 5/9$$

$$^{\circ}\text{K} = ^{\circ}\text{C} + 273.16$$

$$^{\circ}\text{R} = ^{\circ}\text{F} + 459.69$$

VOLUME

To Obtain by Multiply Number of	Cubic Decimeters (Liters)	Cubic Inches	Cubic Feet	U.S. Quart	U.S. Gallon	Imperial Gallon	U.S. Barrel (Petroleum)
Cubic Meter	1	61,0234	35.31	1050.7	264.2	220.0	6.29
Cubic Inches	—	1	5.787×10^{-4}	0.01732	0.004329	0.003606	0.000103
Cubic Feet	.0283	1728	1	29.9221	7.48055	6.22888	0.1781
U.S. Quart	—	57.75	0.03342	1	0.25	0.2082	0.00595
U.S. Gallon	—	231	0.13368	4	1	0.833	0.02381
Imperial Gallon	—	277.274	0.16054	4.80128	1.20032	1	0.02877
U.S. Barrel (Petroleum)	.0159	9702	5.6146	168	42	34.973	1

1 cubic meter = 1,000,000 cubic centimeters.
1 liter = 1000 milliliters = 1000 cubic centimeters.

AREA

To Obtain by Multiply Number of	Square Meters	Square Inches	Square Feet	Square Miles	Square Kilometers
Square Meters	1	1549.99	10.7639	3.861×10^{-7}	1×10^{-6}
Square Inches	0.0006452	1	6.944×10^{-3}	2.491×10^{-10}	6.452×10^{-10}
Square Feet	0.0929	144	1	3.587×10^{-8}	9.29×10^{-8}
Square Miles	2,589,999	—	27,878,400	1	2.59
Square Kilometers	1,000,000	—	10,763,867	0.3861	1

1 square meter = 10,000 square centimeters.
1 square millimeter = 0.01 square centimeter = 0.00155 square inches.

LENGTH

To Obtain by Multiply Number of	Meters	Inches	Feet	Millimeters	Miles	Kilometers
Meters	1	39.37	3.2808	1000	0.0006214	0.001
Inches	0.0254	1	0.0833	25.4	0.00001578	0.0000254
Feet	0.3048	12	1	304.8	0.00001894	0.0003048
Millimeters	0.001	0.03937	0.0032808	1	0.0000006214	0.000001
Miles	1609.35	63.360	5.280	1,609,350	1	1.60935
Kilometers	1,000	39,370	3280.83	1,000,000	0.62137	1

1 meter = 100 centimeters = 1000 millimeters = 0.001 kilometers = 1,000,000 micrometers
To convert metric units, merely adjust the decimal point.
1 millimeter = 1000 microns = 0.03937 inches = 39.37 mils.

DENSITY

To Obtain by Multiply Number of	Grams per Milliliter	Kilogram per Cubic Meter	Pounds per Cubic Foot	Pounds per Cubic Inch
Grams per Milliliter	1	1000	62.43	0.03613
Kilograms per Cubic Meter	0.001000	1	0.6243	0.00003613
Pounds per Cubic Foot	0.01602	16.02	1	0.0005787
Pounds per Cubic Inch	27.68	27.680	1728	1

FORCE

To Obtain by Multiply Number of	Kilo-newtons	Kilogram Force	Pound Force	Poundals
Kilonewtons	1	102.0	224.8	7233
Kilogram Force	0.009897	1	2.205	70.93
Pound Force	0.004448	0.4536	1	32.17
Poundals	0.0001383	0.01410	0.03108	1

CONVERSION FACTORS

DEW POINT — MOISTURE CONTENT

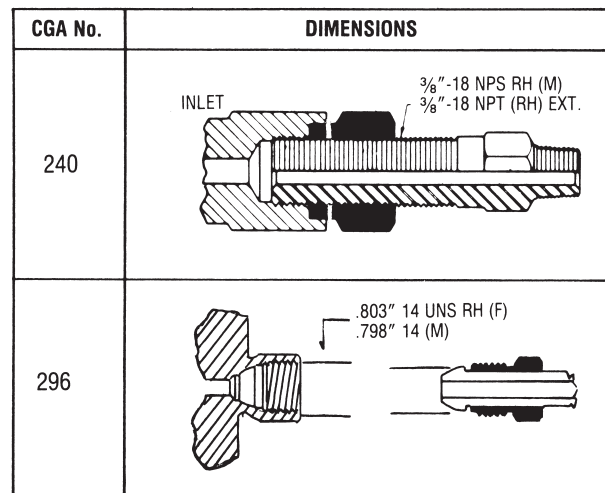
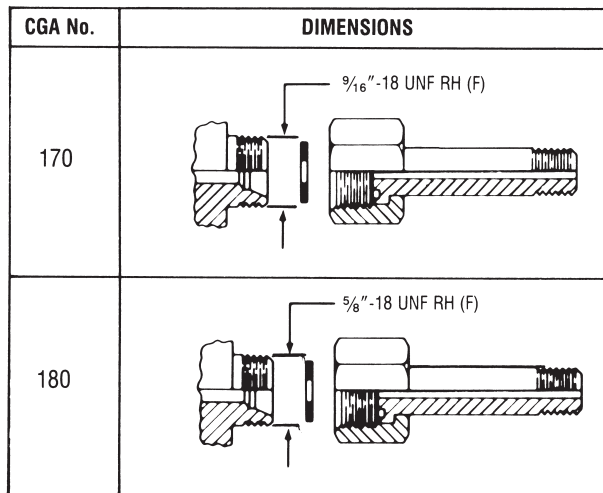
Dew Point, °F	Moisture, ppm (vol/vol)	Dew Point, °F	Moisture, ppm (vol/vol)
-130	0.10	-83	6.20
-120	0.25	-82	6.60
-110	0.63	-81	7.20
-105	1.00	-80	7.80
-104	1.08	-79	8.40
-103	1.18	-78	9.10
-102	1.29	-77	9.80
-101	1.40	-76	10.50
-100	1.53	-75	11.40
-99	1.66	-74	12.30
-98	1.81	-73	13.30
-97	1.96	-72	14.30
-96	2.15	-71	15.40
-95	2.35	-70	16.60
-94	2.54	-69	17.90
-93	2.76	-68	19.20
-92	3.00	-67	20.60
-91	3.28	-66	22.10
-90	3.53	-65	23.60
-89	3.84	-64	25.60
-88	4.15	-63	27.50
-87	4.50	-62	29.40
-86	4.78	-61	31.70
-85	5.30	-60	34.00
-84	5.70		

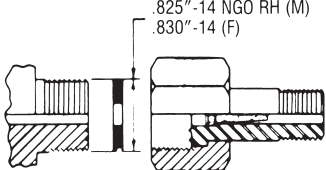
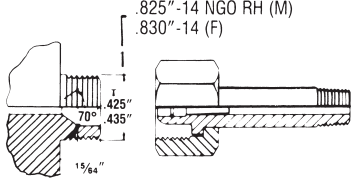
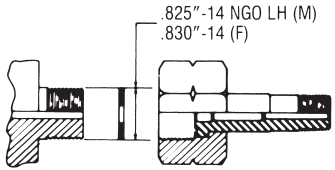
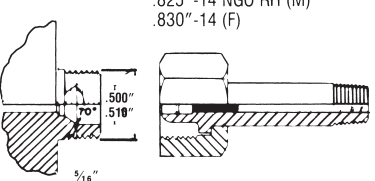
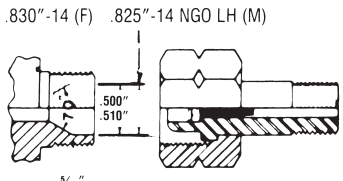
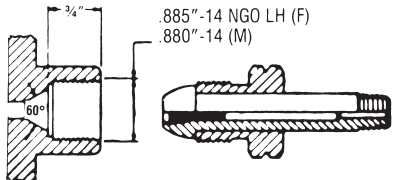
Cylinder Valve Outlets & Connections

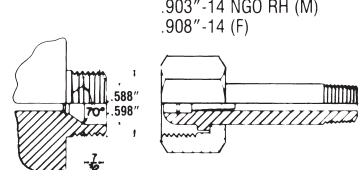
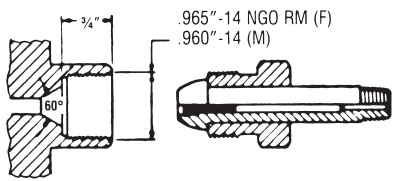
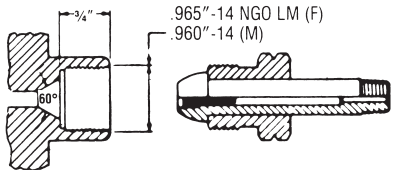
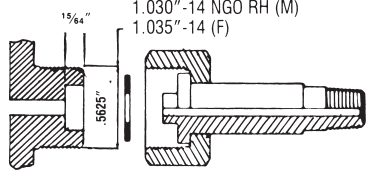
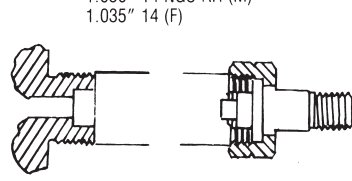
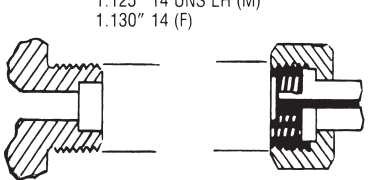
GAS	CGA VALVE OUTLET & CONNECTION	GAS	CGA VALVE OUTLET & CONNECTION	GAS	CGA VALVE OUTLET & CONNECTION
Acetylene	510	Halocarbon 13 (Chlorotrifluoromethane)	660	Methyl Bromide	330
Air (Industrial)	590	Halocarbon 13B1 (Bromotrifluoromethane)	660	3-Methyl Butene-1	510
Air (Breathing Air)	346	Halocarbon 14 (Tetrafluoromethane)	580	Methyl Chloride	510
Alene	510	Halocarbon 22 (Chlorodifluoromethane)	660	Methyl Mercaptan	330
Ammonia	705	Halocarbon 114 (1, 2-Dichlorotetrafluoromethane)	660	Monoethylamine	705
Argon	580	Halocarbon 116 (Hexafluoroethane)	660	Monomethylamine	705
Arsine	350	Halocarbon RC318 (Octafluorocyclobutane)	660	Natural Gas	350
Boron Trichloride	660	Halocarbon 21 (Dichlorofluoromethane)	660	Neon	580
Boron Trifluoride	330	Halocarbon 23 (Fluoroform)	660	Nickel Carbonyl	660
Bromine Pentafluoride	670	Halocarbon 115 (Monochloropentafluoroethane)	660	Nitric Oxide	660
Bromine Trifluoride	670	Halocarbon 152A (1, 1-Difluoroethane)	510	Nitrogen	580
Bromotrifluoroethylene	510	Halocarbon 1132A (1, 1-Difluoroethylene)	350	Nitrogen Dioxide	660
1-3 Butadiene	510	Germane	350	Nitrogen Trioxide	660
Butane	510	Helium	580	Nitrosyl Chloride	330
Butenes	510	Hexafluoroacetone	330	Nitrous Oxide (Formerly 1320)	326
Carbon Dioxide	320	Hexafluoropropylene	660	Oxygen	540
Carbon Monoxide	350	Hydrogen	350	Ozone	755
Carbonyl Fluoride	660	Hydrogen Bromide	330	Perfluoro-2-Butene	660
Carbonyl Sulfide	330	Hydrogen Chloride	330	Perfluoropropane	660
Chlorine	660	Hydrogen Fluoride	660	Phosgene	660
Chlorine Trifluoride	670	Hydrogen Selenide	350	Phosphine	350
Chlorotrifluoroethylene	510	Hydrogen Sulfide	330	Phosphorous Pentafluoride	330
Cyanogen	660	Iodine Pentafluoride	670	Propane	510
Cyanogen Chloride	660	Isobutane	510	Propylene	510
Cyclopropane	510	Isobutylene	510	Silane	350
Deuterium	350	Krypton	580	Silicon Tetrafluoride	330
Diborane	350	Methane	350	Sulfur Dioxide	660
1, 2-Dibromodifluoromethane	668	Methyl Acetylene	510	Sulfur Hexafluoride	590
Dimethylamine	705			Sulfur Tetrafluoride	330
Dimethyl Ether	510			Sulfuryl Fluoride	660
2-2 Dimethyl Propane	510			Tetrafluoroethylene	350
Ethane	350			Trimethylamine	705
Ethyl Acetylene	510			Vinyl Bromide	510
Ethyl Chloride	300			Vinyl Chloride	510
Ethylene	350			Vinyl Fluoride	350
Ethylene Oxide	510			Vinyl Methyl Ether	510
Fluorine	679			Xenon	580
Halocarbon 12 (Dichlorodifluoromethane)	660				

NOTE: The above are standard CGA connections and are designated by Compressed Gas Association, Standard V-1. For alternate and latest standards and connections, contact Compressed Gas Association, 1235 Jefferson Davis Hwy., Arlington, VA 22202.

These Dimensional drawings illustrate cylinder valve outlets and connections. The drawing at the left illustrates the cylinder valve outlet. The one at right illustrates its mating regulator or valve connection.



CGA No.	DIMENSIONS
320	 <p>.825"-14 NGO RH (M) .830"-14 (F)</p>
326 (Formerly) 1320	 <p>.825"-14 NGO RH (M) .830"-14 (F)</p> <p>70° .425" .435" 1/16"</p>
330	 <p>.825"-14 NGO LH (M) .830"-14 (F)</p>
346 (Formerly) 1340	 <p>.825"-14 NGO RH (M) .830"-14 (F)</p> <p>70° .500" .510" 1/16"</p>
350	 <p>.830"-14 (F) .825"-14 NGO LH (M)</p> <p>70° .500" .510" 1/16"</p>
510	 <p>.885"-14 NGO LH (F) .880"-14 (M)</p> <p>3/4" 60°</p>

CGA No.	DIMENSIONS
540	 <p>.903"-14 NGO RH (M) .908"-14 (F)</p> <p>70° .588" .598"</p>
580	 <p>.965"-14 NGO RM (F) .960"-14 (M)</p> <p>3/4" 60°</p>
590	 <p>.965"-14 NGO LM (F) .960"-14 (M)</p> <p>3/4" 60°</p>
660	 <p>1.030"-14 NGO RH (M) 1.035"-14 (F)</p> <p>1/16" 5/65°</p>
679	 <p>1.030" 14 NGO RH (M) 1.035" 14 (F)</p>
705	 <p>1.125" 14 UNS LH (M) 1.130" 14 (F)</p>

GLOSSARY OF TERMS

Anhydrous - Describes a material that contains no water.

Annealing Gas - A hydrogen-nitrogen mixture used to provide a reducing atmosphere during heating of metals to render them less brittle on cooling.

Autoignition Temperature - The lowest temperature at which a material will ignite and sustain combustion in the absence of a spark or flame.

Boiling Point - The temperature at which the pressure of the vapor is equal to the pressure exerted on the liquid. The normal boiling point is the temperature at which the vapor pressure of the liquid is 14.7 psia (1 atm).

British Thermal Unit - B.T.U. - The amount of heat required to raise the temperature of one pound of water one degree Fahrenheit at one atmosphere.

Calorie - The amount of heat required to raise the temperature of one gram of water one degree centigrade at one atmosphere.

Compressed Gas - Any material or mixture that, when enclosed in a container, has an absolute pressure exceeding 40 psi at 70°F or has an absolute pressure exceeding 104 psi at 130°F.

Corrosive - A substance that erodes and deteriorates materials with which it comes in contact, such as metals, fabrics, and human tissue.

C.P. - Abbreviation for Chemically Pure. Indicated a grade and purity of a product. However, the purity may not be the same from product to product.

Critical Pressure - The pressure at the critical temperature.

Critical Temperature - The highest temperature at which a substance can exist as a liquid.

Cryogenic Liquid - A liquid having a normal boiling point below -200°F.

Density - The mass of a substance divided by its volume, or the mass of a substance per unit volume.

Dew Point - Temperature at which air is saturated with moisture, or in general, temperature at which the water vapor in the air begins to condense.

Doping Gas - A gas or gas mixture used by the electronics industry to add controlled amounts of impurities to silicon or other semiconductors.

DOT - Abbreviation for Department of Transportation whose Title 49, Code of Federal Regulations regulates the movement of hazardous materials.

Filling Density - The percent ratio of the weight of gas in a container to the weight of water that the container will hold at 60°F.

Flammable Gas - Any gas that will ignite easily and burn rapidly.

Flammable Limits - The minimum concentration of vapor in air or oxygen below which propagation of a flame does not occur on contact with a source of ignition, and the maximum proportion of vapor or gas in air above which propagation of a flame does not occur; usually expressed in

terms of percentage by volume of gas or vapor in air. A change in temperature or pressure may vary the flammable limits of a gas.

Flash Point - The lower temperature at which a liquid will give off enough flammable vapor to form an ignitable mixture with air.

Frangible Disc - A non-reclosing pressure relief device actuated by inlet static pressure and designed to function by the bursting of a disc at a predetermined pressure.

Fusible Plug Safety Device - A non-reclosing pressure relief device designed to function by the yielding or melting of a plug at a predetermined temperature.

Heat of Fusion - The heat energy required to transform one mole of solid into one mole of liquid at one atmosphere of pressure.

Heat of Vaporization - The heat energy required to transform one mole of substance from the liquid phase to the vapor phase at one atmosphere of pressure.

Hydrolysis - A double decomposition reaction involving the splitting of water into its ions and the formations of a weak acid or base or both.

Hydrostatic Test - A cylinder test required by the Department of Transportation to determine the wall thickness by measuring the elastic expansion of the cylinder.

Inert - Gases which do not react with other materials at ordinary temperature and pressure are classified as inert. They do not represent a hazard unless they are released in a confined place, thereby displacing the amount of oxygen necessary to support life. Use of adequate ventilation and monitoring of the oxygen content in confined places will minimize the danger of asphyxiation.

L.E.L. - Abbreviation for Lower Explosive Limit. The minimum percent by volume of a gas which, when mixed with air at N.T.P., will form a flammable mixture.

Liquefied Compressed Gas - A gas which, under the charged pressure, is partially liquid at a temperature of 70°F.

Melting Point - The temperature at which the solid and liquid phase of a substance are in equilibrium with each other. At the normal melting point, pressure is 1 atm.

Mole - A constant, specified number of molecules of a substance as defined by convention. A gram-mole is the weight.

Molecular weight - The relative weight of a molecule on the atomic weight scale.

MSDS - (Material Safety Data Sheets) Describe the physical and health hazards of each gas. These data sheets also provide precautionary information on the safe handling of the gas as well as emergency and first aid procedures.

Oxidant - Gases which do not burn, but which support combustion are classified as oxidants. It is essential that all possible sources of ignition be eliminated when handling oxygen and other oxidants. Do not allow oil, grease, or other readily combustible materials to come in contact with cylinder or equipment used for oxidant services. Do not store combustible oxidizer materials with oxidants.

Polymerization - A chemical reaction in which two or more relatively simple molecules combine to form larger molecules.

ppm - The abbreviation for parts per million, a convenient means of expressing very low concentrations of a substance in a mixture, or as a low level contaminant in a pure product.

Pressure (or Safety) Relief Devices - A device designed to prevent rupture of a normally charged cylinder when it is inadvertently exposed to a fire or intense heat.

Pressure Relief Valve - A pressure relief device which is designed to open and close at a predetermined pressure.

Propagation of Flame - The spread of flame from the source of ignition through a combustible mixture.

psia - Abbreviation for pounds per square inch absolute. One atmosphere pressure equals 14.696 psia. psia = psig + 14.696.

psig - Abbreviation for pounds per square inch gauge. Gauge pressure always ignores the first atmosphere absolute (14.696 psia).

Pyrophoric Substance - A substance that will ignite in air at or below room temperature in the absence of added heat, shock, or friction.

Rare gases - Refers to those constituents of air which comprise less than 1% of air and are generally considered inert: argon, helium, krypton, neon, and xenon.

Solubility of a Gas - The ratio of concentration of gas in the solution to the concentration of gas above the solution.

Span Gas - Usually a gas mixture used to “span” or calibrate a process or laboratory instrument.

Specific Heat - The ratio of the heat capacity of a substance to the heat capacity of water; or the quantity of heat required for one degree temperature change in a unit weight of material.

Specific Gravity - The ratio of the weight of a given volume of a substance to the weight of an equal volume of a reference material, namely water for solids and liquids, and air for gases.

Specific Volume - Volume of a unit mass of a substance at a given temperature. Expressed as cubic feet per pound at 70°F, as used in this catalog.

Stable Isotope - Forms of the same element which are not radioactive having the same atomic number but different atomic weights due to the variation in the number of neutrons in the nucleus. These differences cause very slight changes in physical properties.

S.T.P. - Refers to standard temperature and pressure which is defined at 0°C and 760 mm of Mercury (14.696 psia).

Sublimation - The condition where a substance passes directly from the solid phase to the vapor phase without passing through the liquid phase.

THC - Refers to total hydrocarbon content. Usually used to describe the quantity of a hydrocarbon impurity present, expressed as methane equivalents.

Threshold Limit Value (TLV) - Ceiling - The airborne concentration of substances that should never be exceeded, not even instantaneously.

Threshold Limit Value-Time - Weighted Average (TWA) - The time-weighted average airborne concentration of substances for a normal 8-hour workday or 40-hour work-week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

Toxicity - The ability of a chemical compound to produce injury once it reaches a susceptible site in or on the body.

Triple Point - The temperature at which the liquid, solid, and vapor phase of a substance are in equilibrium.

UN (United Nations) Number - Is the DOT (Department of Transportation) Number found on the cylinder label. For example: UN1066, the “UN” prefix to this number indicates that the 1066 is recognized throughout the world at identifying nitrogen. Sometimes “NA” (North America) will appear as a prefix. NA identification numbers are only recognized in the US and Canada.

USP - Abbreviation for United States Pharmacopoeia. An organization which sets standards of purity, packaging, etc. for materials, many of which are recognized by the Food and Drug Administration.

Vapor Pressure - The pressure exerted by the vapor above a pure liquid when the two phases are in equilibrium. The value depends on the temperature of the system, but at any temperature it is independent of the amount of liquid present.

Zero Gas - Gases which have low THC content and are used as a reference point to “zero” a THC analyzer.

Abbreviations

CAS	Chemical Abstract Service Number
CP	Chemically Pure
DCH	Chilton Can Disposable
DEM	Disposable E Medical
DEX	Disposable E Industrial
DDM	Disposable D Medical
DDX	Disposable D Industrial
FDA	Food & Drug Administration
LBS	Lecture Bottle Steel
Liq	Liquid Container
LPD	Low Pressure Disposable
MSDS	Material Safety Data Sheet
NF	National Formulary
NPT	National Pipe Tapered
SS	Stainless Steel
UN	United Nations Number
USP	United States Pharmacopoeia