

Absolute Pressure – A quantity of pressure measured in comparison to zero pressure (total vacuum). As gauge pressure is measured with respect to that of the atmosphere, absolute pressure equals a pressure gauge reading plus atmospheric pressure (760 mm Hg at sea level).

Absolute Zero – The temperature at which molecular motion is predicted to cease: 0° Kelvin, -273.6° C, or -459.69° F.

Absorption – The penetration of gas, liquids, or dissolved substances into a solid material.

Accuracy – The closeness of agreement between the result of a measurement and a true value of measurement. Accuracy is a qualitative concept, typically documented at the 95% confidence interval for specialty gas calibration mixtures.

Adiabatic – Characterized by no transfer of heat to or from a system.

Adsorption – The condensation of gases, liquids, or dissolved substances on the surface of a solid.

Analytical Tolerance – The maximum and minimum certification value relative range that a specialty gas producer will certify for an end user's calibration. This value is typically expressed as a percent.

Anhydrous – Without water.

Atmospheric Pressure – The pressure exerted by the weight of earth's atmosphere at sea level, equivalent to 14.7 psia, 101.3 kPa, or 760 mm Hg.

Autoignition Temperature – The lowest temperature at which a flammable gas or vapor-air mixture ignites from its own heat source or a contacted heated surface without spark or flame.

Blend Tolerance – The maximum and minimum preparation tolerance relative range that an end user's calibration standard is blended to as compared to the amount ordered.

Calibration – The process of adjusting an instrument by using a precise comparison to a known quantity.

Calibration Gas – A specialty gas mixture with a known pedigree specifying the:

- Certified gas concentration
- Traceability
- Blend tolerance
- Analytical certification accuracy
- Certification period used to calibrate an analytical instrument.

A calibration gas is used as a comparative standard for analytical instrumentation, and therefore may be referred to as a Certified Standard.

Calibration Gas Standard – A gas mixture with universally known qualities used for calibrating an analytical instrument or process.

Carrier Gas – A high purity gas or gas mixture used in chromatography to move a sample to be analyzed through the gas analysis system by providing a zero reference point.

Certificate of Analysis (COA) – A written document that states the certified concentration of a component found in a mixture or impurities in a pure gas.

Certified Reference Material (CRM) – A calibration product that is certified for specific chemical or physical properties, indicating the intended use of the material.

CGA Number – The cylinder/container valve outlet connection assigned by the Compressed Gas Association (CGA). CGA Numbers are generally followed by all specialty gas manufacturers.

Chemical Abstract Services (CAS) Number – An internationally recognized unique number identifying a chemical compound used to avoid potential errors associated with chemical nomenclature.

Chromatography – An analytical method used to separate mixtures based on observations of selective absorption or adsorption.

Compressed Gas – Any material or mixture that fulfills any of the following conditions:

- The container has an absolute pressure exceeding 40 psia (275.8 kPa) at 70°F (2.76 bar at 21.1°C)
- Regardless of the pressure at 70°F, the material or mixture has an absolute pressure exceeding 104 psia (717.1 kPa) at 130°F (7.17 bar at 54.4°C) in its container



- The material is any flammable liquid having a vapor pressure exceeding 40 psia at 100°F (2.76 bar at 37.74°C)

Types of Compressed Gas:

- **Flammable** – A gas which has a boiling point of 68°F (20°C) or less at 14.7 psia (101.3 kPa), which is ignitable at 14.7 psia (101.3 kPa) when in a mixture of 13% or less by volume with air, or has a flammable range at 14.7 psia (101.3 kPa) with air of at least 12% regardless of the lower limit.
- **Nonflammable** – A gas which exerts an absolute pressure of 40.6 psia (280 kPa) or greater at 68°F (20°C) and is not poisonous or flammable.
- **Poisonous by Inhalation** – Any material which has a boiling point of 68°F (20°C) or less at 14.7 psia (101.3 kPa), and is known to be toxic to humans.
- **Nonliquefied** – A gas, other than in solution, which in a packaging under the charged pressure is entirely gaseous at a temperature of 68°F (20°C).
- **Liquefied** – A gas which is partially liquid at a temperature of 68°F (20°C) when under the charged pressure.
- **Oxidizer** – A gas or liquid that accelerates combustion and that on contact with combustible material and a heat source may cause fire or explosion.

Compressibility Factor – The ratio between the real property (pressure, volume, temperature) and its value in the ideal state according to the ideal gas law.

Concentration – The amount-of-substance (SI unit: moles) of the subject compound within the cylinder. This is usually described as the amount-of-substance fraction (SI unit mol/mol) and reported by specialty gas manufacturers as micrograms per cubic meter ($\mu\text{g}/\text{m}^3$), parts per million (ppm) or percent (%) of a given gas component in a specified balance gas matrix.

Continuous Emissions Monitor (CEM) – An integrated system made up of analytical instruments and equipment required to continuously sample, condition, and analyze the concentration of specific gases in the sample of gases removed from or in a source of emissions, such as a stack or duct.

Critical Point – The highest pressure and temperature for a pure gas at which the liquid and vapor phases can exist in

equilibrium, where they cannot be distinguished from each other.

Critical Pressure – The pressure that must be exerted to produce liquefaction at the critical temperature.

Critical Temperature – The temperature above which a pure gas cannot be liquefied, regardless of the degree of compression.

Critical Volume – The volume of one mole of gas at its critical temperature and pressure.

Cryogenic Liquid – A refrigerated liquefied gas having a boiling point colder than -130°F (-90°C) at 14.7 psia (101.3 kPa).

Density – The ratio of a certain material's mass to its volume.

Department of Transportation (DOT) – The United States government agency that regulates the shipping of hazardous materials.

Dew Point – The temperature at which the partial pressure of a vapor in a gas is equal to the saturation pressure. Condensation will occur if the temperature continues to decrease.

Diaphragm Valve – A packless valve that utilizes clamped, flexible disks to seal the opening through which internal parts are installed.

Diameter-Index Safety System (DISS) – A system used in low pressure medical gas connections and high pressure outlet connections, which presents a concept in design for low and high pressure compressed gas connections where non-interchangeability indexing is achieved by a series of increasing and decreasing diameters in the component parts of the connections.

Dopant Gas/Semiconductor – A gas or gas mixture used to incorporate a metallic impurity into a semiconductor substrate to impart desired electrical properties.

Endothermic – Characterized by heat absorption. An endothermic reaction is one in which heat is absorbed, and an endothermic compound is formed by the absorption of heat.

Enthalpy – The heat content of a system at constant pressure.

Entropy – A measure of the degree of disorder in a system, wherein every change that occurs and results in an increase of disorder is said to be a positive change in entropy. According to the second law of thermodynamics, all spontaneous processes are accompanied by an increase in entropy.

Environmental Protection Agency (EPA) – The United States government agency responsible for promulgating environmental regulations under the Clean Air Act and its amendments.

Exothermic – Characterized by heat release. An exothermic reaction is one in which heat is given off, and an exothermic compound is formed by heat escalation.

Flammable Range – The difference between the lower and upper flammable limits of a material, expressed in terms of percentage of vapor or gas in air or oxygen by volume.

Freon – The registered trade name for hydrocarbons where most of the hydrogen atoms have been replaced by fluorine or a mixture of chlorine and bromine, or both.

Gas Pressure – The force exerted by a gas on its surroundings. This value can be denoted in pounds per square inch (psi) and kilopascals (kPa). The term psi refers to absolute pressure, which is based on a zero reference point, or a perfect vacuum.

Good Manufacturing Practice (GMP) – A term used extensively in the medical gases service industry, usually in the context of U.S. Food and Drug Administration requirements for manufacturing drugs. GMP practices are specified by CFR regulation 210 and 211.

Heat Capacity – A measurable physical quantity that characterizes the ability of a material to store heat as its temperature changes.

Hydrocarbons – Organic compounds composed solely of carbon and hydrogen, such as propane (C₃H₈) and methane (CH₄).

Inert Gas – A nonreactive gas, such as argon (Ar), helium (He), neon (Ne), and krypton (Kr).

LAR – Liquid argon.

Laser – A device which emits light in a narrow, low-divergence beam through a specific mechanism. Laser is an acronym for light amplification by stimulated emission of radiation. The light beam emitted by the laser is amplified as it repeatedly bounces back and forth between two mirrors in the laser's optical cavity, which is held within a gain medium consisting of a gas, liquid, solid, or free electrons. One of these mirrors is partially transparent so that the light can escape in the form of a laser beam.

Latent Heat of Fusion – The heat required to convert a given mass of solid to liquid at its melting point.

Latent Heat of Vaporization – The heat required to convert a material from its liquid state to its gaseous state at a given pressure and temperature.

LIN – Liquid nitrogen.

LC50 – A concentration of substance in air which is expected to cause death of 50% of the entire defined experimental animal population when exposure lasts a specified length of time.

Lower Explosive Limit (LEL) – The lower limit of flammability of a gas or vapor at ordinary ambient temperatures and pressures expressed in percent of the gas or vapor in air by volume. This limit varies with temperature and pressure.

LOX – Liquid oxygen.

Metal Organic Chemical Vapor Deposition (MOCVD) – A chemical vapor deposition method for compound semiconductors involving the surface reaction between organic compounds and metal hybrids.

Molecule – The smallest (generally) identifiable particle of a substance that can exist after the chemical combination of two or more like or unlike atoms.

Packed Valve – A valve that utilizes compressed packings to seal the openings through which the valve internal parts are installed.

Parts Per Million (ppm) – A measure of concentration.

Pressure – The force applied to, or distributed over a sur-



face measured as force per unit of area.

Pressure Relief Device – A pressure/temperature-actuated device used to prevent the pressure of a system from rising above a predetermined maximum and thereby prevent rupture.

Rare Gas – Any noble gas from group 18 of the Periodic Table of Elements, such as argon (Ar), helium (He), neon (Ne), krypton (Kr), or xenon (Xe). Argon (Ar) is the most common rare gas, making up around 1% of the earth's atmosphere, while the rest are found in vastly smaller quantities. Rare gases are noted for their stability.

Specific Gravity – The ratio of the mass of a unit volume of a substance to the mass of the same volume of a standard substance at a standard temperature. The liquid standard is water at 4°C (39.2°F) and the gas standard is dry air at the same temperature and pressure of the gas.

Specific Heat – The heat required to raise the temperature of a given mass of a material one degree Kelvin or Celsius.

Specific Volume – The volume of a material per unit of its mass.

Static Pressure – The pressure exerted against the wall of a containing vessel in all directions by a liquid at rest.

Temperature – The condition of a body that determines the transfer of heat to or from other bodies, and is a result of the average kinetic energy produced by a substance on the molecular level.

Threshold Limit Value (TLV) – The time-weighted exposure level under which most people can work for eight hours a day, day after day, with no harmful effects.

Triple Point – The only temperature and pressure at which three phases (gas, liquid, and solid) in a one-component system can exist in equilibrium.

Vapor – The gaseous form of substances that are normally in the solid or liquid state at room temperature and pressure. The vapor can be changed back to the solid or liquid state either by increasing the pressure or decreasing the temperature alone.

Vapor Pressure – The pressure exerted by a vapor. If a vapor is kept in confinement so the vapor can accumulate above the liquid, the vapor pressure approaches a fixed limit called the maximum.