PT 103
Definition of terms related to gas delivery
March 3, 2026

Overview

Proper understanding of verbal or written communications requires a clear understanding of the definition of the words being conveyed. Many terms are industry or manufacturer specific and subject to different interpretations - meaning wrong message conveyed if a word's meaning is misunderstood.

Definitions

Absolute: A pressure referenced to absolute zero rather than atmospheric pressure, with zero pressure being a perfect vacuum.

Absolute pressure regulator: A pressure regulator designed to deliver a media below one atmosphere with positive pressure to the inlet which differentiates it from a vacuum regulator.

Adiabatic compression: A thermodynamic process when a gas is rapidly compressed with no heat exchanged with the system and the surroundings resulting in a gas temperature increase.

Accuracy: The precision or difference of a given value to a true, reference value.

Accuracy - pressure regulator: The variation in outlet pressure from its dynamic set point and variation in outlet pressure during constant flow.

Across the seat leakage, pressure regulator: A continuous, uncontrolled rise in outlet pressure which is also referred to as internal leakage.

Across the seat leakage test: A test to determine leak integrity of shut off from the inlet to outlet side of a device.

Across the seat leakage, valve: Inability of a valve to shut off, close, and isolate the inlet from the outlet side.

Actuation pressure: The gas pressure applied to control a valve or to control a pneumatically operated pressure regulator.

Accumulation pressure: The increase in pressure in a system or vessel above working pressure rating during pressure relief.

Accumulation pressure, back pressure regulator: The increase in pressure above set point when the device is venting (open across the seat).

Ambient pressure: The pressure in the environment of a device. The standard condition for ambient pressure is at sea level.

Ambient temperature: The temperature of the environment of a device.

Angstrom: A unit of measure that is equal to one ten billionth of a meter.

AOD: Argon oxygen decarburization; a steel mill process used to manufacture stainless steel.

AOD/VAR: Argon oxygen decarburization / vacuum arc re-melt; a two-step mill melt process used to produce stainless steel that is more homogenous and lower in impurities.

AOP: Air operated, a device operated by a pneumatic control pressure.

Automatic valve: A valve that can be operated remotely, generally either with a pneumatic or electric actuator.

Back mount: A component mounted from the bottom.

Back pressure regulator: A device which controls an upstream pressure by venting pressure above set point.

Back pressure rating: In a valve it means that the pressure rating with traditional flow inlet to outlet is different, generally less, for reverse flow outlet to inlet.

Balanced poppet (valve): An internal valve where the inlet and outlet sides exert equal forces to the valve – balancing the pressures. Balanced pressure regulators eliminate supply pressure effect and increase flow capacity at the expense of UHP design rules.

Bar – pressure: A unit of pressure measurement - 1 bar = 14.5 psi, refer to PT XXX.

Bellows: A component with convoluted sides for extension and compression, often used in valves or as a pressure regulator sensing element.

Bell jar: An enclosure used for vacuum applications.

Bellows valve: A valve with a bellows employed to open and close and as a seal to atmosphere.

Bias: A variance in value from a reference value.

Bias – pressure regulator: The pressure difference between the dome pressure and the outlet pressure of a dome loaded regulator or an added spring to offset forces.

Bi-directional: In a valve, it means the valve can be used either flow direction, traditional inlet to outlet and outlet to inlet, to full pressure rating.

Bonnet: Part of a device which is clamped to the body which is also known as a spring housing or cap with a regulator.

BSPP: British Standard Parallel Pipe; a straight thread connection, also known as G, which seals on a ring.

BSPT: British Standard Pipe Taper; a tapered threaded connection, also known as R, where mating threads seal to each other with a sealant.

Bulk gases: Gases which are stored in larger vessels and volume than typical cylinders. Bulk gas systems are used to minimize the number of source vessel changeouts, which are a potential to introduce contamination to the system.

Burst pressure: The maximum pressure which a component can be subjected to without parts being thrown, but permanent deformation and leakage are permitted. Burst pressure is a ratio of maximum operating pressure, 3:1 at a minimum (meaning 300% of operating) A pressure regulator has two maximum operating pressures, inlet and outlet which means two burst pressures.

Calibration gas: Reference gas used as a standard to adjust an equipment's output for accuracy.

Cap: Part which is clamped to the body of a regulator or valve to seal moving element such as a diaphragm and a protective or sealing cover such as for a fitting. Also known as a bonnet or spring housing for a regulator.

Cap nut: Typically a threaded part which clamps the cap to the body of a device, also known a bonnet nut.

Captured bonnet: A term meaning that the cap (bonnet) is sealed with a port that can be plumbed to safely vent a leak of process fluid into the cap.

CDA: Clean Dry Air, air treated to lower moisture and other contaminates.

CGA (Compressed Gas Association) connection: A fitting used to connect the gas system to a cylinder valve. The geometry and threads of the two mating surfaces of the fitting are unique to certain gases to reduce the chance for errors and connecting the incorrect gas to a system.

Check valve: A one way flow device to prevent backflow, reverse flow.

Choked flow: The condition with a constant inlet pressure where flow will not increase with any further decrease in outlet pressure. A pressure regulator, the point at which the flow exceeds the control capacity.

Cleanroom: An enclosed space where particulates in the air are controlled within specified parameters. The room generally has slightly higher pressure than the atmospheric pressure outside the room.

Compression fitting: Tube fitting with a ferrule to seal to the outside of a tube.

Constant bleed (CB): Continuous gas flow through a device that cannot be shut off. It is often an orifice providing a given flow at a given pressure.

Control element: A dynamic part of a pressure regulator which reduces inlet pressure (P1) to a lower outlet pressure (P2). The control element is also referred to as main valve, poppet or valve stem.

Cracking pressure – back pressure regulators: The set pressure when the device opens across the seat to allow flow.

Cracking pressure – check valves: The pressure difference between upstream and downstream of the seal required to open for forward flow.

Cracking pressure - relief valves: The pressure when venting starts and the device opens.

Creep: A pressure regulator term for a continuous, uncontrolled pressure downstream pressure increase, also known as an across the seat leak or internal leakage.

Crosstalk: A term for interaction between components in a gas system which impact function, such as between a mass flow controller (MFC) and pressure regulator.

Cylinder pressure: Source vessel pressure.

Cv: Flow coefficient for a device is defined as the flow of water in one minute with a one psi pressure drop inlet to outlet. The value is the gallons per minute (GPM) and there are also formulas for calculating with gases.

Diaphragm: A metallic or non-metallic membrane.

Diaphragm valve: A valve with a diaphragm that moves to open/close and to isolate the process fluid from the atmosphere.

Differential pressure regulator: A pressure regulator which is designed to provide a controlled pressure which is the sum of a signal (reference/dome) pressure and a bias pressure. The bias may be either positive or negative.

DIN: A European standard, similar to CGA, for fittings used to connect the gas system to a cylinder valve. The geometry and threads of the two mating surfaces of the fitting are unique to certain gases to reduce the chance for errors and connecting the incorrect gas to a system.

DISS: Diameter Index Safety System, a standard, similar to CGA, for fittings used to connect the gas system to a cylinder valve. The geometry and threads of the two mating surfaces of the fitting are unique to certain gases to reduce the chance for errors and connecting the incorrect gas to a system.

Distribution valves and regulators: Devices located downstream of the source regulator, also referred to as line or point of use (POU).

Dome loading: Controlling a regulator's outlet pressure using a pneumatic control pressure applied to the non-wetted side of a sensing element rather than a spring. As this method applies control pressure directly to the sensing element, the potential for mixing process gas with the control gas is a safety concern in the event of an outboard leak through the sensing element.

Droop: Regulator outlet pressure decrease, drop, with increasing flow.

Droop curve: A graph, also known as a flow curve, of a regulator's outlet pressure to flow with a specified gas and inlet pressure.

Dynamic pressure regulator adjustment: Setting (adjusting) a pressure regulator with flow through the device, rather than static, with no flow.

EAF: Electric Arc Furnace, a melting process for stainless steel and other metals production.

EFS: Excess flow switch, a safety device that sends a signal when flow exceeding normal operation in a gas system is detected.

EFV: Excess flow valve, a safety device that automatically closes to shut off flow when flow exceeds the trip point setting.

Electropolish (EP): An electrolytic process that changes the surface characteristics and chemistry of a metal such as stainless steel. The process erodes and frees surface ions, producing a smoother a more chemically inert surface.

[1] **Elgiloy ®**: A Ni Co alloy, UNS R30003, commonly used for a spring or diaphragm.

ESO: Emergency shut off, a valve, typically closest to the source vessel in a purge manifold, that is used to shut off gas flow in the event of an emergency.

Face seal fitting: UHP metallic fitting compatible with a [2] VCR ®.

FFKM: Perfluoroelastomer seal material, [3] Kalrez ® and [4] Chemraz ® are trademarks for common FFKM materials.

FKM: Fluoroelastomer seal material, [5] Viton ® is a trademark for common FKM material.

Flatbottom: Another term for Integrated gas system (IGS) and surface mount with connecting devices by bolting with seals.

Flow capacity: The usable flow range, minimum and maximum, of a device with set conditions.

Flow curve: A graph, also known as a droop curve, of a regulator's outlet pressure to flow with a specified gas and inlet pressure.

Flow rate: The volume of fluid in a given time period that passes through a device. Common units of measure include: SCFM, SCFH, SLPM, SCCM, GPM and GPH.

Free poppet regulator: A regulator design where the main valve, poppet, and sensing element, typically a diaphragm, are not physically connected.

Galling: A type of wear between mating surfaces when surface material transfers between two sliding or rotating surfaces. Thread galling is a common example, the parts under rotation and compression seize as material transfers between the mating parts.

Gas cabinet: An evacuated, metal enclosure for gas delivery equipment to safely contain a hazardous gas in the event of a leak.

Gas cylinder: A vessel for compressed or liquified gases.

GIB - gas interface box: Gas distribution system contained in a cabinet downstream of the source gas cabinet, often closely coupled to a process tool.

Gas Tungsten Arc welding - GTAW: An electric welding process, also known as TIG (Tungsten Inert Gas), with a non-consumable tungsten for the arc. The process can be autogenous, fusion without a filler metal, or with a filler metal. Semiconductor welding is most common without filler metals and with specialized orbital welding equipment for tubing.

GPM: Gallons per minute flow rate.

GPH: Gallons per hour flow rate.

[6] **Hastelloy ®**: A NiCrMo super alloy UNS 06022, utilized for enhanced corrosion resistance over 316L stainless steel.

Helium leak detector: A mass spectrometer used to detect low levels of He.

Hysteresis: A change in state, difference, created by approaching a point two different ways, such as regulator flow curves generated with increasing flow compared to one generated with decreasing flow – any difference between the curves is the hysteresis.

Hazardous gas: A dangerous gas such as flammable, pyrophoric, reactive, corrosive or toxic.

High purity: Applications for gases with a minimum 99.99% purity, also known as 4 nines.

IGS (Integrated gas system): A method of connecting devices by bolting rather than traditional fittings, also known as surface mount or down mount.

Inboard leak test: A helium leak test where the tracer gas, He, passes through a leak path from outside to inside. Vacuum is pulled on the component by the He leak detector with He applied, usually sprayed, to the exterior.

Inert gas: A gas that does not react chemically with other materials.

Inlet pressure: The source pressure to the inlet side of a device.

InHg (inch of mercury): A unit of pressure measurement.

Internal leakage: Refer to across the seat leakage, it is an uncontrolled passing of media from the inlet to outlet side of a device.

Internal face seal: A female face seal port machined into the body of a device. The female body threads are typically not silver plated, unlike a female face seal nut, which makes galling a concern. The male mating nut must be swivel type to reduce the possibility of galling.

Joule-Thomson effect: The cooling effect as a gas expands from one pressure to a lower pressure, a function of gas characteristics and pressure drop.

kPa (kilopascal): A unit of pressure measurement - one kPa = 0.1451 psia.

[7] **KYNAR ®**: Polyvinylidene fluoride material also known as PVDF.

Laser Beam Welding – LBW: A welding process utilizing a laser as the heat source. Compared to TIG welding, it joins metal with a much smaller, focused heat affected zone

Leakage: Media moving from a contained area to another area.

Leakage – outboard: Leakage of media from inside, internal, the component to the outside, external.

Liquified gases: Gas stored in a liquid phase by combination of temperature and pressure.

Load element: A part that exerts a force upon another part, such as an adjustment spring in a pressure regulator.

Lock-up: Regulator term, also known as static increment, which is the pressure rise above the adjusted, set pressure when a low flow (<5% of flow rating) is stopped.

LOTO: Lock out tag out; a means of preventing operation (locking) of a device and noting it is locked.

M^3/hr: Cubic meters per hour, a flow measurement.

Mass flow controller (MFC): A flow control device that also measures flow.

Mass flow meter (MFM): A flow measurement device that does not control flow.

Micro inch (µ inch): Unit of measure, one millionth of an inch - 10 µ inch = 0.25 micron.

Micron (µ meter): Unit of measure, one millionth of a meter – 1 micron = 40 µ inches.

Minimum controllable flow: The smallest volume of a media that a device can meter while maintain some tolerance on the flow.

Minimum controllable pressure: The lowest pressure a device can control steady state, maintaining some tolerance.

[8] **Monel ®**: A super alloy, UNS N04400, commonly used in petro-chemical applications for external corrosion resistance. UHP applications are limited due to the copper content leaching in certain corrosive gases.

Monoblock: A common body for multiple devices, such as two valves in one body block.

mmHg (millimeter of mercury): A unit of pressure measurement - one mmHg = one torr.

MPa (megapascal): A unit of pressure measurement - one MPa = 145.01 psi.

Multi-port: A term for valves indicating more than two ports, an inlet and outlet. It is any combination of inlet and outlet ports allowing the valve to become part of the plumbing. It is often confused with three way due to having more than two ports.

NC - normally closed: An air operated device (AOP) that normal state is closed in the absence of control pressure.

NO – normally open: An air operated device (AOP) that the normal state is open in the absence of control pressure.

Non-relieving: A regulator, also known as non-venting, that does not vent outlet pressure to atmosphere as the outlet pressure rises above set point.

Nozzle: A part, often tapered, that impacts the flow of a fluid, either accelerating or directing. A venturi nozzle increases the velocity and decreases the pressure of a fluid.

Nozzle – pressure regulator: A term for part that constrains the seat to the body.

NPT: National Pipe Thread; a tapered thread form in inches that requires a sealant.

Outboard leakage: An external leak where fluid passes from inside to outside the device.

Outboard bell jar helium leak test: A test utilizing a vacuum chamber, bell jar, to evacuate the environment outside a device under test (DUT). The DUT is pressurized with helium inside the vacuum chamber connected to a helium leak detector.

Outboard sniffer probe helium leak test: A leak test utilizing a vacuum wand connected to a helium leak detector to detect helium leaking from a device pressurized with helium.

Outgassing: The release of an absorbed material.

Outlet pressure (P2): Delivery pressure measurement of a fluid media downstream (outlet) of a device.

Overshoot / undershoot: Pressure regulator outlet pressure upon opening with flow going below or above set point before settling to set point. Pressure not settling, going higher and lower than set point repeatedly is termed ringing.

Oxygen cleaned: Wetted areas and parts free of hydrocarbons and other contaminates that can ignite in the presence of an oxidizer, such as oxygen. Semiconductor UHP cleaning exceeds requirements for oxygen cleaned, which is why it is not typically stated in data sheets.

P1: The pressure to the inlet, upstream, side of a device, see "Inlet Pressure."

P2: The pressure to the outlet, downstream, side of a device, see "Outlet Pressure."

Panel mount: Installing a device on a panel such that only the knob is on the front side of the panel.

Pascal: A unit of measurement - 1000 pascal = 0.145 psi. Refer to PN 438 for further information.

Passivation: A process to remove surface iron (Fe) commonly with a dilute nitric acid immersion. Passivation is also a process of slowly exposing surfaces to increasing concentrations of a chemical.

PCTFE: A fluoropolymer, polychlorotrifluoroethylene, formerly known as [9] Kel-F 81 ®.

[10] PEEK ®: Polyetheretherketone

PFA: A fluoropolymer, perfluoroalkoxy alkanes

Pigtail: A section of piping (tubing) used to connect a cylinder of gas to a gas system.

Pilot regulator: A regulator used to control another regulator with gas pressure that is dome loaded or pneumatically actuated.

Piston: A cylindrical part that moves with force of fluid or combustion. It is a type of regulator sensing element with dynamic seals to atmosphere and common for delivery pressures above 500 psig.

Pneumatically actuated regulator: A regulator with a gas controlled actuating mechanism to control outlet pressure pneumatically. The actuator isolates the control gas from process gas unlike dome loading where a failure can allow the gases to mix.

Point of use (POU): A location downstream of the source, closer to where the media is being delivered.

Poppet: A main valve part that seals to a seat.

Pressure decay test: A test of trapped, pressurized media with pressure monitored for a period of time, same as a static pressure test.

Proof pressure: A pressure above a device's rating to test structural integrity. The device must function after this test with no outboard leakage or deformation. The typical test ratio 1.5:1 (150%) of the maximum rated operating pressure, which a regulator has two, inlet and outlet.

psia (absolute pressure): A measure of pressure in pounds per square inch (psi), referenced to zero absolute pressure.

Psid: Pressure differential, such as the cracking pressure of a check valve which is a pressure difference inlet to outlet, in pounds per square inch.

psig: A measure of pressure in pounds per square inch (psi) that is referenced to atmospheric pressure and also referred to as gauge pressure.

PTFE: A fluoropolymer, polytetrafluoroethylene, material.

Q: See "Flow Rate."

Ra – (Ra average): Quantifies a surface texture with a linear measurement of the arithmetic average of the surface profile, averaging the peaks to valley over a cutoff, sample length. Multiple readings on a sample are also averaged.

Ra max: Defines the maximum Ra value of multiple readings on a sample - the highest (worst) reading is the rating.

R max: The maximum peak to the maximum valley measurement over sample (cutoff) length.

RM: A product or material return authorization, typically purchaser returning to the manufacturer.

Regulator: A type of valve that reduces an inlet pressure to a lower outlet pressure.

Relief valve: A pressure device that opens to vent pressure at a set point.

Repeatability: The ability of a device to return to the same point, free of hysteresis.

Replaceable seat: A seat that is designed to be easily replaced, without damaging parts.

Reseat pressure – back pressure regulator: The pressure at which a venting regulator reseals across the seat and stops flow.

Reseat pressure – check valve: The pressure differential from inlet to outlet when an open check valve with flow, reseals and flow stops.

Resolution – in general: The finest increment (reading) of a device.

Resolution – in regulators: Outlet pressure change as a function of adjustment knob turns (rotation).

Sanitary fitting: A clamp type, flange fitting design enabling easy assembly and disassembly of a process line, common in pharmaceutical and bio-tech applications.

SCCM: Cubic centimeters per minute, a volumetric flow with standard conditions.

SCFM: Cubic feet per minute, a volumetric flow with standard conditions.

Seat: A surface that mates with another part. It is part of a regulator's main valve where the poppet mates with it to seal. In a valve, it is the sealing point for closure.

Seat abrasion: Seat material wearing, shedding or transferring to another part. It is common in regulators if a closely coupled valve is cycled downstream, such as in a process tool with IGS.

Self-relieving: A feature that automatically vents pressure above set point, also referred to as self-venting.

Sensing element: Something that reacts to changes in the outlet pressure to open or close the internal valve, typically a diaphragm, piston or bellows.

Sensitivity: A devices' ability to respond to change in conditions. In the case of a regulator, outlet pressure change.

Set pressure: The adjusted outlet pressure of a regulator, adjusted either under no flow or flowing conditions.

Set-ability: The smallest increment which can be reasonably adjusted.

Shutoff valve: A valve intended to stop the flow of media.

Single stage regulator: A regulator that only incorporates one pressure reduction.

SLPM: Liters per minute, a volumetric flow with standard ambient conditions.

SLPH: Liters per hour, a volumetric flow with standard conditions.

Specialty gases: A gas with at least 99.99%, four nines, purity level, common grades are high purity, 99.99% and ultra high purity, 99.999% minimum.

Specific gravity – gas (Sg): The ratio of the mass of a gas to the mass of the same volume of air at the same temperature.

Specific gravity – liquid (SL): The ratio of the specific weight of any liquid to that of water in the same volume at ambient temperature.

Source regulators / valves: Devices used to connect a gas source vessel and operated at full cylinder pressure.

Springless regulator: A regulator does not have a wetted poppet spring.

Standard conditions: Pressure and temperature values for testing uniformity - one atmosphere (14.7 psia) and 0° C (32°F). Pure T standard conditions for testing are 14.7 psia and 21°C (70° F)

Static increment: Also known as lock up, pressure increase in a regulator the set point as the flow stops from a low flow (<5% of device's flow rating).

Static pressure testing: Leak testing by trapping a test gas, generally N2, at pressure for a period of time and monitoring for a change in pressure. The gas, pressure, trapped volume, time and temperature are factors for test sensitivity.

Static pressure regulator adjustment: Adjusting the outlet set pressure of a regulator without flow through the device.

Supply pressure effect: The change in outlet pressure of a regulator as a result of a change in supply pressure, generally specified as a rise in outlet pressure per unit change in supply pressure.

Surface mount: A method of connecting devices by bolting rather than with traditional fittings, also commonly referred to as IGS (integrated gas system).

Test port: An access point to enhance leak testing of a joint, such as a hole in a nut that aligns with a mechanical joint, also referred to as a weep hole.

Three way: A type of valve that has three states, off to all ports, on to one port and on to a second port.

Torr: A unit of pressure measurement in vacuum applications - one torr = one mmHg.

Tied diaphragm regulator: A regulator where the internal valve, poppet, is physically attached to the sensing element for positive shutoff in source applications.

Trip point: The point at which a signal indicates excess flow or excess pressure.

Two stage regulator: Two pressure regulators in series, housed in a common body, providing pressure reduction in two steps.

Two stage regulation: Two discrete pressure regulators in series (not a common body) providing pressure reduction in two steps.

Two step valve: A dual mode valve providing another operation beyond on/off control, such as metered flow and full flow. Also known as a soft vent valve in vacuum chamber applications providing low flow to start venting with low turbulence prior to full flow to complete the venting process.

Two way: A type of valve with two states, open or closed.

Ultra high purity (UHP): Applications designed for minimum gas purity of 99.999% where the gas system does not contribute contamination to the gas stream.

Unbalanced poppet: A valve design with unequal forces, such as a poppet in a regulator with inlet pressure to one side and outlet pressure to the other.

Vacuum generator: A venturi that generates vacuum with the flow of gas through the device.

Valve: A device that controls the flow or pressure of a media such as shut off, metering, pressure regulating or pressure relief.

VAR: Vacuum arc remelt, a secondary metal melting process to lower impurities with the primary melt process typically VIM or AOD.

[2]**VCR ®:** Name of face seal fitting trademarked by [11] Swagelok ®.

Venturi: A conical orifice that causes a fluid to increase velocity and decrease pressure.

[12] **Vespel ®**: A polyimide material.

VIM/VAR: A double melting process for metals with vacuum induction melt followed by vacuum arc re-melt. A dual melt process is used to minimize the level of impurities in a material such as 316 stainless steel.

VMB (valve manifold box): A manifold housed in an evacuated enclosure (box) to contain the process media in the event of a leak.

VMP (valve manifold panel): A manifold that is mounted to a plate and not housed in an enclosure (box).

Weep hole: A test port to provide access for leak testing.

Wetted parts: Parts in contact with a media, such as internal parts a device exposed to the process gas.

Xt: A ratio of the inlet pressure of a device in psia to the point at which any further pressure drop across a device does not yield additional flow. It is utilized in determining Cv for devices with gases.

Trademarks

1. Elgiloy ® is a registered trademark of Combined Metals of Chicago, L.L.C.
2. VCR ® is a registered trademark of Swagelok Company.
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