

Valve Terminology Glossary

Actuator - Device used to operate a valve using electric, pneumatic or hydraulic means. Often used for remote control or sequencing of valve operations.

Alloy steel - A steel consisting primarily of iron with some percentage of one or more other elements such as chromium, nickel, manganese, or vanadium deliberately added to enhance its properties.

Ambient temperature - The prevailing temperature of the environment immediately surrounding an object - generally considered to be -20° F to +100° F.

Austenitic stainless steel - The common stainless steel, where the primary microstructure is austenite and the composition primarily iron but also includes both chromium and nickel. The steels are designated as 300 series such as 304, 316, CF8M, etc.

Bevel gear operator - Device facilitating operation of a gate or globe valve by means of a set of bevel gears having the axis of the pinion gear at right angles to that of the larger ring gear. The reduction ratio of this gear set determines the multiplication of torque achieved.

Back seat - A shoulder on the stem of a gate or globe valve which seals against a mating surface inside the bonnet to prevent leakage of media through the bonnet stuffing box when the valve is fully opened.

Ball - The closure element of a ball valve.

Ball valve - A valve using a spherical closure element which is rotated through 90° to open and close the valve.

Body - The principle pressure containing part of a valve in which the closure element and seats are located.

Bolted bonnet - A bonnet which is connected to a valve body with bolts or studs and nuts.

Bolted construction - Describes a valve construction in which the pressure shell elements (such as body and closures of a trunnion ball valve) are bolted together and so can be taken apart and repaired in the field.

Bonnet - The top part of a valve, attached to the body, which contains the packing gland, guides the stem, and adapts to extensions or operators.

Bore (or port) - The inside diameter of the smallest opening through a valve, e.g., inside diameter of a seat ring, diameter of hole through ball in a ball valve.

Butt weld end - The end connection of a valve suitably prepared for butt welding to a connecting pipe.

Carbon steel Iron - containing carbon in the form of carbides, about 0.1 to 0.3 percent carbon with no other alloying elements other than the sulfur, phosphorus, and other elements present in almost all steels.

Cast iron - The common term for cast gray iron or iron containing flake carbon in the range of ___% to 2 ___%. Cast iron is brittle, exhibiting very little ductility before fracturing.

Casting - A product or the act of producing a product made by pouring molten metal into a mold and allowing it to solidify, thus taking the shape of the mold.

Charpy test - A destructive mechanical test conducted on a precisely machined coupon of steel to be tested. The coupon is clamped in a special machine and subjected to lateral hammer blow. The test provides a relative measure of the toughness of the steel or its resistance to shock or impact loads and is usually required for material used in low temperature applications.

Check valve A one-directional valve which is opened by the fluid flow in one direction and closed automatically when the flow stops or is reversed.

Clapper The hinged closure element of a swing check valve.

Class A pressure rating expressed as a dimensionless number. The class rating charts give actual pounds per square inch maximum allowable pressure at a given temperature.

Closure The ends of a bolted construction ball valve, bolted to the body, which often contain the seat rings.

Closure element The moving part of a valve, positioned in the flow stream, which controls the flow through the valve, e.g., wedge, plug, clapper, ball.

Cv Flow coefficient expressed as the number of gallons of water that would flow through an opening, such as a valve port, in 1 minute under a differential pressure of 1 psi.

CWP Cold working pressure - the maximum allowable pressure under nonshock conditions at ambient temperature (-20° F to +100° F).

Dezincification A form of pitting corrosion which attacks certain zinc bearing copper-based alloys, often called "yellow brasses", when in contact with sea water or fresh water that is high in oxygen and carbon dioxide. (ASTM B61 and B62 are "red brasses" and not susceptible to dezincification.)

Double block and bleed The capability of a valve under pressure to obtain a seal across both the upstream and downstream seat rings and to have its body cavity bled down to atmospheric pressure.

Drain plug A fitting at the bottom of a valve, the removal of which permits draining and flushing the body cavity.

Elastomer A natural or synthetic elastic material, often used for o-ring seals. Typical materials are viton, buna-n, EPDM (ethylene propylene dimonomer), etc.

Emergency seat seal A fitting on the valve body through which sealant can be injected to effect a seat seal in an emergency situation.

End connection The type of connection supplied on the ends of a valve which allows it to be connected to piping - may be weld end, flanged end, threaded or socket weld.

Face to face The overall dimension from the inlet face of a valve to the outlet face of a valve (one end to another) allowing valves of the same size and pressure class to be mutually interchangeable, regardless of manufacturer.

Facing The finish of the gasket contact surface of a flange.

Fitting Any component, other than valves, used with pipe as part of the pressure system and normally referring to items covered by a national standard.

Flat Face (FF) A flange surface in which the gasket sealing area is the entire surface from the ID to the outside edge. Usually used for class 125 cast iron valves.

Fire safe A valve design that is capable of passing a fire test with specified limits on leakage to the atmosphere and downstream after being closed subsequent to fire exposure.

Floating ball A ball valve design in which the ball is not rigidly held on its rotational axis and so is free to float between the seat rings.

Forging A metalworking process that involves hammering or squeezing, with or without a die, at hot working temperatures to form a specific shape.

Full bore (full opening) Describes a valve in which the bore (port) is nominally equal to the bore of the connecting pipe.

Full penetration weld Describes the type of weld wherein the weld metal extends through the complete thickness of the parts being joined.

Gasket - A component whose purpose is to seal a joint between two larger components, softer than the surfaces of the joint being sealed and usually squeezed by means of bolting to effect the seal.

Gate - The closure element of a gate valve (sometimes called wedge or disc)

Gate valve - A straight through pattern valve in which closure element is a wedge situated between two fixed seating surfaces, with means to move it in or out of the flow stream in a direction perpendicular to the pipeline axis. Used as a block valve, or on-off valve.

Gland or gland bushing - The part of the valve which retains or compresses the stem packing in a stuffing box.

Gland follower or gland flange - The component used to hold down or retain the gland in the stuffing box.

Globe valve - A valve whose closure element is a flat disc or conical plug sealing on a seat which is usually parallel to the flow axis. Can be used for throttling services.

Graphite Flexible carbon material used to make gaskets and packing. The gaskets may be flat graphite sheet or have metal inserts for added strength. The packing is a combination of lattice braided rings used as anti-extrusion or wiper rings and die-formed rings which are compressed to effect the seal.

Grease fitting - A device which permits injection of grease into a bearing surface.

Handwheel - A wheel-shaped valve operating device intended to be grasped with one or both hands which allows turning the valve stem or operator shaft to which it is attached.

Hardfacing - A surface preparation in which an alloy is deposited on a metal surface usually by weld overlay to increase resistance to abrasion and or corrosion.

Heat analysis - A chemical analysis conducted by a foundry immediately prior to pouring which measures the exact chemical composition of a particular batch of molten metal.

Heat treatment Describes any process or procedure by which the internal structure of steel is altered by heating to produce desired physical and mechanical characteristics.

Hot tap - A connection made to a pipeline while the line is under pressure or in service. A special procedure is required to make an opening in the pipe without leaking any of the line contents.

Hot tears A defect occurring in castings caused where partially solidified or weak, newly solidified sections are subjected to a pull resulting from the contraction of thinner parts that have solidified earlier. A hot tear is an intergranular failure.

Huey test A corrosion resistance test for stainless steel, most useful for predicting resistance to intergranular corrosion.

Hydrostatic test A pressure test in which a valve is tested with water to detect leaks - may be a shell test or a seat closure test.

IBBM Iron body, bronze mounted - common term for valves with cast iron body and bonnet and bronze trim (seating surfaces, stem, bushings).

ID The measurement of the inside diameter of a circular part.

ISRS Inside screw, rising stem - common term for any valve design in which the stem threads are exposed to the fluid below the packing and the stem rises up through the packing when the valve is opened.

Lever An operating device for quarter-turn valves. **Liquid penetrant inspection** A nondestructive method of detecting the presence of surface cracks and imperfections through use of a special red dye. Abbreviated as LPI or PT.

Locking device Any valve attachment whose purpose is to prevent the operation of the valve by unauthorized persons.

Magnetic particle inspection A nondestructive method of detecting the presence of surface cracks and imperfections through use of fine iron particles in an electrical field. Abbreviated as MPI or MT.

Material Test Reports Certificates provided by the steel manufacturer indicating the chemical analysis and mechanical properties of a specific batch of steel traced by sequentially assigned heat numbers or codes.

Mold A hollow cavity, frequently in packed sand, for giving a desired shape to a material in a molten or plastic shape.

NPS Nominal pipe size - dimensionless number used to indicate sizes of pressure pipe and valves - used interchangeably with valve size in inches.

NPT National Pipe Thread - standard tapered thread for pressure pipe and components. Requirements defined in ASME B1.20.1.

NRS Non-rising stem - A gate valve having its stem threaded into the gate. As the stem turns the gate moves but the stem does not rise. Stem threads are exposed to the line fluid.

OD The measurement of the outside diameter of a circular part.

O-ring An elastomeric or synthetic seal ring of circular cross section.

OS&Y Outside Screw & Yoke - A valve design in which the stem threads are above the packing gland or outside the valve body and there is a yoke to support the top or outer end of the stem.

Packing The deformable sealing material inserted into a valve stuffing box which when compressed by the gland provides a tight seal about the stem.

Pattern A duplicate made of wood or metal of a part to be cast. Used to form the mold into which the molten metal is poured.

Pinhole Numerous small gas holes at the surface or just below the surface of castings, generally occurring in the thicker parts of the casting as a reduction in the solubility of gases in the metal as the metal cools.

Pinion shaft The external input shaft of certain gear operators which drive the internal reduction gearing.

Plastics A broad classification covering a variety of non-metallic, synthetic or organic materials capable of being molded or formed into desired shapes. Typical materials include nylons and tetrafluoroethylenes such as DuPont's Teflon" .

PMI Positive material identification - a method for cross checking the identity of a piece of material, often using a portable spectrometer, usually with x-rays (TN 9266, nuclear analyzer) or a welding arc (Arc Met 900, optical spectrometer).

Pneumatic test A test in which a valve is tested with air - usually a seat closure test.

Porosity A defect found in castings or welds consisting of gas bubbles or voids in the solidified metal.

Position indicator Any external device which visually indicates the open and closed position of valve.

Pressure-Temperature Ratings The maximum allowable working pressures at specified temperatures. For steel valves, the ratings are defined by "classes" and found in ASME B16.34. For iron and bronze valves, the ratings are defined in the applicable MSS specifications.

Product Analysis The chemical analysis of a material done on a finished component to show compliance with the material specifications. Usually has tolerances defined for each element to allow for differences in the completed product compared to the molten metal.

PSI Pounds per square inch - the force per unit area exerted against a resisting body.

Ra Abbreviation for "arithmetic average roughness height" - the measure of the roughness of a surface expressed in microinches. The higher the number, the rougher the surface. Used to designate the desired surface finish for end flange raised faces.

Radiographic inspection A nondestructive inspection method using x-rays to locate internal flaws in castings, fabricated parts and welds. Abbreviated as RT.

Raised faced (RF) The raised area of a flange face which is the gasket sealing surface between mating flanges. Defined in ASME B16.5. Class 150 and 300 valves have 0.06" RF and Class 600 and up have a 0.25" RF.

Reduced port A valve port opening that is smaller than the line size or the valve end connection size.

Ring type joint (RTJ) A flange connection using a specially shaped soft metal ring as a gasket. Generally used on high pressure valves. May be the body and bonnet connection and/or the end flange connection.

Resilient seat A valve seat containing a soft seal such as an o-ring or plastic to assure tight shut-off.

Rim pull The force required at the edge of the handwheel to generate the required torque at the center of the handwheel.

RS Rising stem - A valve stem with threads arranged so that as the stem turns, the threads engage a stationary threaded area and lift the stem along with the closure element attached to it.

Schedule A system for indicating the wall thickness of pipe. The higher the schedule number, the thicker the wall for a certain pipe size.

Seal weld A weld that does not contribute anything to the mechanical integrity of an assembly, but is made purely to seal or prevent leakage from, for instance, a threaded joint.

Seat The part of a valve against which the closure element effects a tight shut-off.

Self-relieving The process by which excessive internal body cavity pressure is automatically relieved either into the upstream or downstream line - generally found in ball valves

Shrinkage Internal defect in castings that are internal voids, irregular in shape, caused by volume contraction during solidification. Can be caused by not maintaining a fluid channel to the riser during solidification.

Socket weld end (SW) The end connection of a valve suitably prepared for Socket welding to a connecting pipe.

Sour gas Natural gas containing significant amounts of hydrogen sulfide (H₂S). Requires special material treatments to avoid valve failures from sulfide corrosion cracking.

Specification A document that defines the requirements that a finished product must conform to - may include chemical and mechanical properties, tolerances, marking, shipping, etc.

Spur gear The simplest of gears - in a gear set, the pinion and ring gear are aligned on parallel shafts. Can be added to another gear operator to further increase the mechanical advantage afforded by the gear.

Square operating nut A nut, usually 2" x 2", which is attached to a valve stem or the pinion shaft of a gear operator allowing use of wrenches to quickly operate the valve.

Stainless steel Any of a number of types of iron alloy with chrome, nickel, or other elements that does not oxidize in free air.

Stem The rod or shaft transmitting motion from an operator (handwheel or gear operator) to the closure element of the valve.

Stem nut (yoke nut) The threaded nut that surrounds a reciprocating valve stem and causes the stem to move when the nut is rotated.

Stud A bolt, threaded on both ends, often used in bolting together bodies and bonnets or bodies and closures.

Stuffing box The annular chamber provided around a valve stem in a sealing system into which deformable packing is placed. Sometimes called packing chamber.

Swing check valve A check valve in which the closure element is a hinged clapper which swings or rotates about a supporting shaft.

Tensile strength The highest tensile stress that a material can withstand before failure or rupture occurs - the force being applied in a direction tending to elongate the material.

Tensile test A destructive test performed on a specially machined specimen taken from material in its delivered condition to determine mechanical properties, such as tensile strength, yield strength, and percent elongation.

Throttling The intentional restriction of flow by partially closing or opening a valve.

Thrust The net force applied to a part in a particular direction - e.g., on the end of a valve stem

Torque The rotational force imposed on or through a shaft, usually expressed in foot-pounds.

Trim Commonly refers to the valve's working parts and to their materials. Usually includes seat ring sealing surfaces, closure element sealing surfaces, stems, and back seats. Trim numbers which specify the materials are defined in API 600 and API 602.

Trunnion The part of a ball valve which holds the ball on a fixed vertical axis and about which the ball turns.

Turns to operate The number of complete revolutions of a handwheel or the pinion shaft of a gear operator required to stroke a valve from fully open to fully closed or vice versa.

Ultrasonic inspection An inspection procedure using high frequency sound waves to detect wall thickness or flaws throughout the thickness of metal parts. Abbreviated as UT.

Union bonnet A type of valve construction in which the bonnet is held on by a union nut with threads on the body.

Valve A device used to control the flow of fluid contained in a pipe line.

WOG Water-oil-gas - a rating designation generally used for small valves chiefly in low ratings.

Indicates maximum working pressure at ambient + 32° F to +100° F. Also called Nonshock Rating.

Working pressure The pressure (pounds per square inch) at which a valve is designed to operate.

Wall thickness The thickness of the wall of the pressure vessel or valve.

For steel valves, minimum thickness requirements are defined in ASME B16.34, API 600, and API 602.

Worm gears A gear set in which the input shaft is offset from and perpendicular to the output shaft, and driving gear is very small and perpendicular to the driven gear. Worm gear operators are used on ball valves.

Yield strength The limiting stress beyond which a material will sustain permanent deformation.

Yoke The part of gate or globe valve which acts as a bracket to support the top or outer end of the stem and stem bearing.

VALVE SPECIFICATIONS

Below is a listing of the basic specifications used in the design and manufacture of valves and fittings.

American Petroleum Institute

API Q1 Specification for quality programs

API 6D Specification for pipeline valves

API 6FA Fire test for valves

API 598 Valve inspection and testing

API 600 Steel gate valves, flanged and butt welding ends, bolted and pressure seal bonnets

API 602 Compact steel gate valves - flanged, threaded, welding, and extended body ends

API 607 Fire test for soft seated quarter turn valves

API 608 Metal ball valves - flanged and butt welding ends

American Society of Mechanical Engineers/

American National Standards Institute

ASME/ANSI B16.34 Valves - flanged, threaded and welding end

ASME/ANSI B16.5 Pipe flanges and flanged fittings

ASME/ANSI B16.10 Face-to-face and end-to-end dimensions of valves

ASME/ANSI B16.11 Forged fittings, socket-welding and threaded

ASME/ANSI B16.25 Butt welding ends

ASME/ANSI B16.47 Large diameter steel flanges

Note: This specification for flanges larger than 24" replaces MSS SP-44 and API 605 with the designations of Series A (MSS SP-44) and Series B (API605).

ASME B31.3 Chemical plant and petroleum refinery piping

ANSI B31.4 Liquid petroleum transportation piping system

ANSI B31.8 Gas transmission and distribution piping system

Manufacturers Standardization Society of the Valves and Fittings Industry

MSS SP-25 Standard marking system for valves, fittings, flanges and unions

MSS SP-55 Quality standard for steel castings for valves, flanges, and fittings, and other piping components - visual method

MSS SP-70 Cast iron gate valves, flanged and threaded ends

MSS SP-71 Cast iron swing check valves, flanged and threaded ends

MSS SP-79 Socket-welding reducer inserts

MSS SP-80 Bronze gate, globe, angle and check valves

MSS SP-83 Class 3000 steel pipe unions, socket-welding and threaded

MSS SP-85 Cast iron globe and angle valves, flanged and threaded ends

National Association of Corrosion Engineers

NACE MR0175 Standard material requirements for sulfide stress cracking resistant metallic materials for oilfield equipment.

British Standards Institute

BSI 1414 Steel wedge gate valves (flanged and butt welding ends) for the petroleum, petrochemical, and allied industries

BSI 1868 Steel check valves (flanged and butt welding ends) for the petroleum, petrochemical, and allied industries

BSI 1873 Steel globe and globe stop and check valves (flanged and butt welding ends) for the petroleum, petrochemical, and allied industries

BSI 5352 Steel wedge gate, globe and check valves 50 mm and smaller for the petroleum, petrochemical, and allied industries

International Organization for Standardization

ISO 9001/9002 Quality system - Model for Quality Assurance