MIWIVAL

Knowledge Sharing

Commonly Used Valve Terminologies

Contents

A

Absolute Pressure: The pressure expressed in bar, Pascal or PSI, as measured above a perfect vacuum.

Actuator: A device connected to the valve that allows remote movement of the valve. It can be an air, fluid or electrically powered device. Actuators may be used when valves are remotely located (e.g., on pipelines), valves are located in hazardous areas, or when manual operation would be time-consuming (e.g., with larger valves).

Aerodynamic Noise: Noise produced by a gas accelerating to supersonic velocity at critical or higher pressure drops through the valve trim.

Air-To-Close: An increase in air pressure to the actuator is required to cause the valve to close. This is another way of saying the valve is fail open or normally open.

Air-To-Open: An increase in air pressure to the actuator is required to cause the valve to open. This is another way of saying the valve is fail closed or normally closed.

Air Valve: Valve that is used to control air flow. This flow is generally small.

Air Vent: An opening in a penstock or other pipeline, covered tank, or well, that allows inflow or outflow of air.

(AISI) American Iron and Steel Institute: An association of steelmakers that sets standards for the chemical and physical properties of steel and iron in various shapes and forms – pipe, tubing, sheet, strip, and wire.

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.

Angle Valve: A globe style valve where the inlet and outlet ports are at 90°.

(ANSI) American National Standard Institute: The principle organization in the US that oversees the creation, promulgation and use of standards for a wide variety of items, including the design, fabrication, and testing of pressure piping, systems, and

components for various pipeline services.

(API) American Petroleum Institute: The principal US oil company trade association. It has some standards and specification writing functions, such as wellhead components and pipeline valves.

API SPEC 6FA: The API specification dealing with the fire testing of pipeline valves. Once a particular size and pressure class valve is tested and passes the API fire test, all such valves can be identified with the above monogram. API-6FA supersedes API-RP-6F.

API SPEC 6D: An API specification dealing with pipeline valves. Most pipeline valves are manufactured to this specification and, if so, can be identified with the API 6D monogram.

(ASME) American Society of Mechanical Engineers: This professional society publishes technical books, papers, codes, and standards. Of principal interest is the ASME Boiler and Pressure Vessel Code which is referenced for many aspects of valve making.

(ASTM) American Society for Testing and Materials: A professional society governing the detailed physical and chemical analysis of all basic metals and alloys used in construction. The valves of most manufacturers have components whose materials correspond to ASTM standards.

Atmospheric Pressure: The external pressure exerted on a body by the atmosphere, 14.7 psi (absolute) at sea level.

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.

B

Back Pressure: The pressure exerted on the downstream side of a valve.

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 packing box when the valve is fully opened.

Ball Valve: A valve design which uses a spherical ball as the closing element. Closure is achieved by turning the ball.

Bellows Seal Bonnet: A bonnet which uses a bellows for sealing against leakage around the valve plug stem.

Bi-Directional Shutoff: A valve having equivalent flow and shut-off capability to the rated pressure in both directions.

Body: The body of the valve is the main pressure boundary. It provides the pipe connecting ends and the fluid flow passageway.

Bonnet: The bonnet may be used to guide the stem. It is part of the valve pressure retaining boundary and contains the packing box and stem seal. The bonnet may be integral to the valve body or bolted or screwed. The bonnet is generally the means by which the actuator is connected to the valve body.

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.

Bubble Tight: A commonly used term to describe the ability of a control valve or regulator to shut off completely against any pressure on any fluid. Control valves are tested to ANSI B16.104 and FCI 70:2:1976 which is the American National Standard for Control Valve Seat Leakage. This standard uses six different classifications to describe a valve's seat leakage capabilities. Although valves rarely achieve perfect shut off, valves that meet Class VI requirements (allows a number of bubbles per minute leakage, depending on the port size of the valve) have passed the most rigorous testing.

Butt Weld Ends: Profiles that are machined on the ends of the pipework components, to allow the joining of components by circumferential weld.

Butterfly Valve: A quarter-turn valve design which includes a circular body. It has a rotary motion disk closure member, which is pivotally supported by its stem, allowing the disk to rotate 90° to open and close the valve. Butterfly valves come in various styles, including eccentric and high-performance (zero-leakage) valves. Butterfly valves are high recovery valves and thus tend to induce cavitation in liquid services at much lower pressure drops and fluid temperatures than the globe style valve.

C

Cage: A hollow cylindrical trim element that is sometimes used as a guide to align the movement of a valve plug with a seat ring. It can be modified for some types of valve, to characterize the flow through the valve. The cage may also act as a noise attenuation or anti-cavitation device.

Capacity: The mass flow rate through a valve under specified conditions.

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 1.0 to 1.5 %. 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.

Cavitation: Cavitation is a concern for liquid services where cavities or bubbles form and then collapse. It is the two-stage process of vaporization and condensation of a liquid. Vaporization is the boiling of liquid (also known as flashing), and occurs in control valves because the pressure of the liquid is lowered, instead of the raised. As fluid passes through a valve just downstream of the orifice area, there is an increase in velocity or kinetic energy that is accompanied by a substantial decrease in pressure or potential energy. This occurs in an area called the vena contracta. If the pressure in this area falls below that of the vapor pressure of the flowing fluid, vaporization (boiling) occurs. Vapor bubbles then continue downstream where the velocity of the fluid begins to slow and the pressure in the fluid recovers. The vapor bubbles then collapse or implode. Cavitation can cause a choked flow condition to occur and can cause mechanical damage to valves and piping.

Chainwheel: Manual actuator that uses a chain-driven wheel to turn a valve stem, handwheel, or gearing.

Choked Flow: Also known as critical flow, can occur in gas, steam, or liquid services. Choked flow happens when, at a fixed upstream pressure, the flow cannot be further increased by lowering the downstream pressure. Basic fluid flow equations show that flow is proportional to the square root of the pressure drop. This means that higher pressure drops allow more fluid to go through the valve. Fluids flow through a valve because of a difference in pressure between the inlet (Pl) and outlet (P2) of the valve. This pressure difference (Delta-P) or pressure drop is essential to moving the

fluid. However, if the pressure drop becomes too high, the flow reaches a point where it no longer increases, this is considered choked flow.
If the pressure drop is sufficiently high, the velocity in the flow stream at the vena contracta will reach the velocity of sound. Further decrease in the outlet pressure will not be felt upstream because the pressure wave can only travel at sonic velocity and the signal will never translate upstream. Choked Flow can also occur in liquids but only if the fluid is in a flashing or cavitating condition. The vapor bubbles block or choke the flow and prevent the valve from passing more flow by lowering the outlet pressure to increase the pressure drop. A good rule of thumb for gas and steam services is that if the pressure drop across the valve equals or exceeds one half the absolute inlet pressure, then there is a good chance of a choked flow condition.

Cladding: A method of coating metals by which the coating becomes an integral part of the material. This normally is done by welding. It is generally done on valves where special trims are required for difficult applications.

Clapper: The hinged closure element of a swing check valve.

Closure Member: The movable part of the valve which is positioned in the flow path to modify the rate of flow through the valve. Some of the different types of closure members are the Ball, Disk, Gate, and Plug.

Cold Rating: The maximum pressure that a valve or fitting is designed to withstand at room temperature.

Compressible Fluid: A gaseous fluid such as steam, which has a significant change in volume and density as pressure increases.

Concentric: Having the same centers.

Control Valve: Also known as the final control element. A power-operated device used to modify the fluid flow rate in a process control system. It usually consists of a body or valve and an actuator, which responds to a signal from the controlling system and changes the position of a flow controlling element in the valve.

Control Valve Gain: The relationship between valve travel and the flow rate through the valve. It is described by means of a curve on a graph expressed as an installed or inherent characteristic.

Controller: A device that directs and monitors the flow of a valve. Controllers can be either pneumatic or electronic. There are pressure, temperature, pH, level, differential and flow controllers. The job of the controller is to sense one of the above variables and compare it to a set point that has been established. The controller then outputs a signal, either pneumatic or electronic, to the control valve,

which then responds to bring the process variable to the desired set point.

Corrosion: The deterioration of a material due to chemical action.

Corrosion Allowance (CA): An additional amount of wall thickness that is added by calculation to account for planned corrosion over the lifetime of a pressure vessel.

Critical Flow: See the definition for choked flow.

Cryogenic Valve: A term used to describe valves designed to operate below –40°C.

C_V: The valve flow coefficient is the number of US gallons per minute of 60°F water that will flow through a valve at a specified opening with a pressure drop of 1psi across the valve.

Cycle: A single complete operation or process returning to the starting point. A valve, stroked from full open to full closed and back to full open, has undergone one cycle.

Cylinder Operator: A power-piston valve operator using either hydraulic or pneumatic pressure. A sealed piston converts applied pressure into a linear piston rod (stem) motion.

D

Delta-P: Differential Pressure. The inlet pressure (Pl) minus the outlet pressure (P2).

Design Pressure: The pressure used in calculating required wall thicknesses, flange ratings, and other variables. Generally, the design pressure is set at a value higher than the operating pressure, to include all the reasonable allowances for surge pressures and variation in operating conditions.

Design Temperature: The temperature that is used to determine allowable stresses for the purposes of design calculations. Generally, the design temperature is set at a value higher than the operating temperature and includes allowances for upsets and variation in operating conditions.

Diaphragm: A flexible pressure-responsive element that transmits force to the diaphragm plate and actuator stem.

Diaphragm Actuator: Is a fluid (usually pneumatic) pressure-operated, spring-opposed diaphragm assembly which positions the valve stem in response to

an input signal.

Diaphragm Valve: A bi-directional valve, operated by applying force to a diaphragm. They are often used in slurries as well as hygienic applications because they do not clog.

Differential Pressure: The maximum difference in pressure measured between the valve inlet and outlet, against which the valve is required to operate.

DIN: Deutsche Industries Norme German national standard organization.

Direct Acting: This term has several different meanings depending upon the device it is describing. A direct-acting actuator is one in which the actuator stem extends with an increase in diaphragm pressure. A direct-acting valve is one with a push-down-to-close plug and seat orientation. A direct-acting positioner or a direct-acting controller outputs an increase in signal in response to an increase in set point.

Direct Actuator: An actuator in which the stem extends with an increase in diaphragm pressure.

Disc: The closure member in a gate, globe, check, or butterfly valve.

DN: Nominal Diameter-standard abbreviation for pipe size used in ISO standards.

Double Acting Actuator: Characteristic of a piston or diaphragm system in which the energizing pressure acts on both faces of the piston or diaphragm and operates the system in forward and reverse to open or close.

Double Block & Bleed (DBB): A single valve with two seating surfaces that, in the closed position, provides a seal against pressure from both ends of the valve with a means of venting/bleeding the cavity between the seating surfaces.

Double Isolation & Bleed (DIB): A single valve with two seating surfaces, each of which, in the closed position, provides a seal against pressure from a single source, with a means of venting/bleeding the cavity between the seating surfaces.

Dual Disc: A check valve utilizing two discs. The discs are half circle in shape, hinged on their straight edge and mounted to a hinge pin on the valve's center line.

Ductile Iron: A type of cast iron with special treatment during the casting process to enhance its metallurgical graphite structure to provide carbon nodules and higher mechanical properties and improved ductility similar to steel.

Dye Penetrant Inspection: Also known as Liquid Penetrant Inspection. A non-destructive method of detecting the presence of surface cracks and imperfections through use of a special colored dye.

Dynamic Unbalance: The total force produced on the valve plug in any stated open position by the fluid pressure acting upon it. The particular style of valve, i.e. single-ported, double-ported, flow-to-open, flow-to-close, has an effect on the amount of dynamic unbalance.

E

Eccentric Plug Valve: A quarter tum shut-off valve in which the plug or disc has a pivot axis off center from the valve's seat or body. The Eccentric Action of the disc allows movement of the plug in and out of the seat without rubbing.

Effective Area: For a diaphragm actuator, the effective area is that part of the diaphragm area that is effective in producing a stem force. Usually the effective area will change as the valve is stroked – being at a maximum at the start and a minimum at the end of the travel range. Flat sheet diaphragms are most affected by this; while molded diaphragms will improve the actuator performance, and a rolling diaphragm will provide a constant stem force throughout the entire stroke of the valve.

Elastomer: A natural or synthetic elastic material often used for O-ring seals. Typical materials are Viton, Buna-n, EPDM (ethylene propylene di-monomer), etc.

Electric Actuator: Also known as an Electro-Mechanical Actuator uses an electrically operated motor-driven gear train or screw to position the actuator stem. The actuator may respond to either a digital or analogue electrical signal.

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

Emergency Shut Down Valve (ESD): A valve that uses energy which is stored in the actuator to close rapidly in an emergency.

End Connection: The configuration provided to make a pressure-tight joint to the pipe carrying the fluid being controlled. The most common of these connections are threaded, flanged, or welded.

Equal Percentage: A term used to describe a type of valve flow characteristic where, for equal increments of valve plug travel, the change in flow rate with respect to

travel may be expressed as a constant percent of the flow rate at the time of the change. The change in flow rate observed with respect to travel will be relatively small when the valve plug is near its seat and relatively high when the valve plug is nearly wide open.

Explosion-Proof: Characteristic of a device or enclosure that inherently contains or prevents an explosion.

Extension Stem: The equipment applied to buried valves to provide above grade accessibility to operating gear, blow down, and seat sealant systems.

F

Face-To-Face Dimension: Is the distance between the face of the inlet opening and the face of the outlet opening of a valve or fitting. These dimensions are governed by ANSI/ISA specifications.

Fail-Closed: Or Normally Closed: Another way of describing an Air-To-Open actuator. Approximately 80% of all spring-return diaphragm operators in the field are of this construction.

Fail-In-Place: A term used to describe the ability of an actuator to stay at the same percent of travel it was in when it lost its air supply. On spring return actuators this is accomplished by means of a lock-up valve. On piston actuators a series of compressed air cylinders must be employed.

Fail-Open or Normally Open: Another way of describing an air-to-close actuator.

Fail-Safe: A term used to describe the desired failure position of a control valve. It could be fail-closed, fail-open, or fail-in-place.

Feedback Signal: The return signal that results from a measurement of the directly controlled variable. An example would be where a control valve is equipped with a positioner. The return signal is usually a mechanical indication of valve plug stem position which is fed back into the positioner.

Female Thread: An internal screw thread designed to mate with a component having male (external) threads of the same size and type.

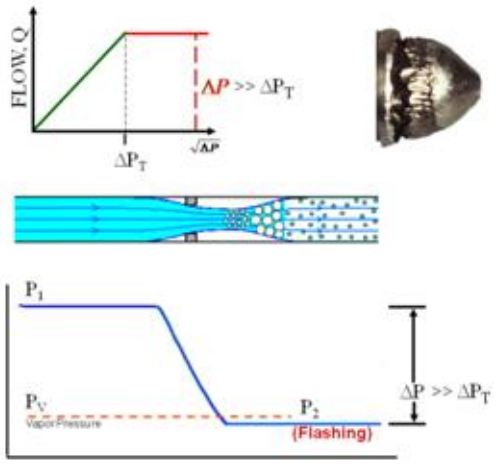
Fire Safe: A valve design that is capable of passing a fire test with specified limits on leakage to the atmosphere and downstream after being closed subsequent to fire

exposure.

Flange: A cast or formed pipe fitting with bolt holes to provide means of attachment to piping components having a similar fitting.

Flangeless: A valve that does not have integral line flanges, sometimes referred to as a Wafer Style valve. The valve is installed by bolting it between the companion flanges with a set of bolts or studs, called line bolting. Care should be taken that strain-hardened bolts and nuts are used in lieu of all-thread, which can stretch when subjected to temperature cycling.

Flashing: Is the boiling or vaporizing of a liquid. See the definition of Cavitation. When the vapor pressure downstream of a control valve is less than the upstream vapor pressure, part of the liquid changes to a vapor. If the pressure downstream continues to decrease, the downstream pressure will eventually become less than the vapor pressure of the liquid. It remains as a vapor unless the downstream pressure recovers significantly, in which case cavitation occurs. Flashing will normally cause a choked flow condition to occur. In addition, the vapor bubbles can also cause mechanical damage to the valve and piping system in the form of smooth rivers and valves.



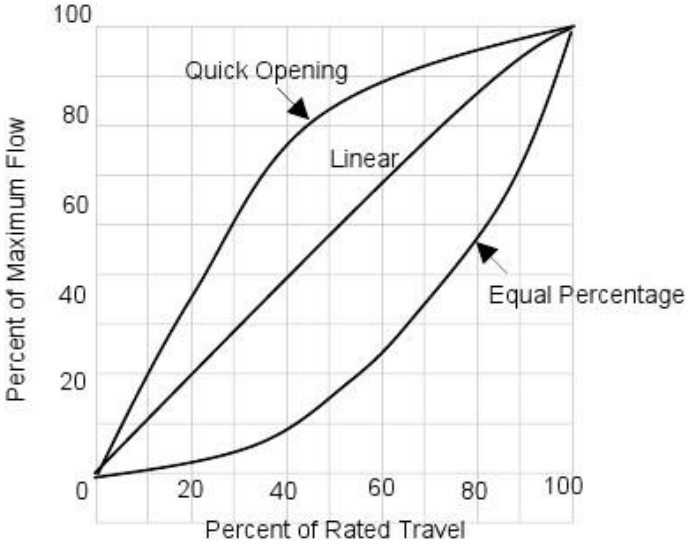
Flat Face: (FF) A flange surface in which the gasket sealing area is the entire surface from the inside diameter to the outside edge of the flange.

Float Valve: A valve in which the closure to an opening, such as a plug or gate, is actuated by a float to control the flow into a tank.

Floating Ball Valve: A ball valve where the ball is free to float between the seat rings.

Flow Characteristic: The relationship between valve capacity and valve travel. It is usually expressed graphically in the form of a curve. Control valves have two types of characteristics: inherent and installed. The inherent characteristic is derived from

testing the valve with water as the fluid and a constant pressure drop across the valve. When valves are installed into a system with pumps, pipes and fittings, the pressure dropped across the valve will vary with the travel. When the actual flow in a system is plotted against valve opening, the curve is known as the Installed flow characteristic. Valves can be characterized by shaping the plugs, orifices or cages to produce a particular curve. Valves are characterized to try to alter the valve gain. Valve gain is the flow change divided by the control signal change. This is done in an effort to compensate for nonlinearities in the control loop.



Flow Coefficient: See the definition for C_V.

Foot Valve: A check valve with an inlet screen placed in the bottom of the suction pipe of a pump, which opens to allow water to enter the suction pipe but closes to prevent water from passing out of it at the bottom end.

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

Full Bore or Full Port: Indicates that the internal diameter of the valve opening is that same as the pipe it is connected to.

G

Gain: The relationship of input to output. If the full range of the input is equal to the full range of the output, then the gain is 1. Gain is another way to describe the sensitivity of a device.

Gasket: A component softer than the parts to be sealed, which is compressed

between two flanges to prevent the system fluid leaking to atmosphere.

Gate Valves: A multi-turn valve which as a gate-like disk and two seats to close the valve. This valve is used in fully open/ fully closed applications and the gate disk moves linearly, perpendicular to the direction of flow.

Gear Operated: The actuation of a valve thru a gear set which multiplies the torque applied to the valve stem.

Gland: The component that is used to compress the gland packing.

Gland Nut: The gland nuts are used to exert a force on the gland.

Gland Packing: A soft conformable material fitted to a valve stuffing box to create a seal between the process fluid and the atmosphere.

Globe Valve: A valve with a linear motion, push-pull stem, whose one or more ports and body are distinguished by a globular-shaped cavity around the port region. This type of valve is characterized by a torturous flow path and is also referred to as a low recovery valve because some of the energy in the flow stream is dissipated; and the inlet pressure will not recover to the extent that it would in a more streamlined high recovery valve.

Graphite: Flexible carbon material used to make gaskets and packing. The gaskets may be flat graphite sheet or have metal inserts for added strength.

Gray Iron: Cast iron which has a high carbon content which causes a fractured section to appear to be dark gray.

H

Handwheel: A manual override device used to stroke a valve or limit its travel. The handwheel is sometimes referred to as a hand jack. It may be top-mounted, side-mounted, in-yoke mounted or shaft-mounted and declutchable.

Hydrostatic Test: Pressure tests that are carried out on every valve when built to test the integrity of the pressure-containing parts.

Hysteresis: The difference between up-scale and down-scale results in instrument response when subjected to the same input approached from the opposite direction. Hysteresis can be caused by a multitude of variables, such as packing friction, loose

linkage and pressure drop.

I

Incompressible Flow: A fluid such as water, which has no significant change in volume and density as the pressure increases.

Inherent Diaphragm Pressure: The high and low values of pressure applied to the diaphragm to produce rated valve plug travel with atmospheric pressure in the valve body.

Inherent Flow Characteristic: The relationship between valve capacity and valve travel, usually expressed graphically. It is derived from testing a valve with water as the fluid and with a constant pressure drop across the valve. The most common types of inherent flow characteristics are linear, equal percentage, modified parabolic, and quick opening.

Installed Flow Characteristic: The flow characteristic when the pressure drop across the valve varies with flow and related conditions in the system in which the valve is installed. The purpose of characterizing a control valve is to help compensate for nonlinearities in the control loop.

Integral Flange: A valve body whose flange connection is an integral or cast part of the body.

Integral Seat: The flow control orifice and seat that is an integral part of the valve body or cage. The seat is machined directly out of the valve body and is normally not replaceable without replacing the body itself – although some can be repaired by welding and re-machining.

(ISO) International Standards Organization: An organization that sets minimum international standards for facilitating the international exchange of goods and services, including goods manufactured and used in pipeline services.

J

JIS: Japan Industrial Standard-designation for standards published by the national

standards organization of Japan.

K

Knife Gate Valve: Type of gate valve using a thin, flat gate usually used in controlling slurries.

L

Leakage Classification: A term used to describe certain standardized testing procedures for control valves with a flow coefficient greater than 0. 1 (Cv). These procedures are outlined in ANSI Standard B16.104:1976, which gives specific tests and tolerances for six seat leakage classifications. It should be remembered that these tests are used to establish uniform acceptance standards for manufacturing quality and are not meant to be used to estimate leakage under actual working conditions. Nor should anyone expect these leakage rates to be maintained after a valve is placed in service.

Lever: A manual operating device for quarter-turn valves.

Lift-Check Valve: A valve that prevents reverse flow by means of a suspended disk that is pushed out of the way by forward flow, but is forced closed against a seat if reverse flow occurs.

Limit Switch: An electrical device providing a signal to a control system to prevent the travel of the valve past a predetermined point. Usually a component of a valve operator.

Linear Flow Characteristic: A characteristic where flow capacity or (Cv) increases linearly with valve travel. Flow is directly proportional to valve travel. This is the preferred valve characteristic for a control valve that is being used with a distributive control system (DCS) or programmable logic controller (PLC).

Linear Valve: Another name for a globe valve. It refers to the linear or straight-line movement of the plug and stem.

Loading Pressure: The pressure used to position a pneumatic actuator. It is the

pressure that is actually applied to the actuator diaphragm or piston. It can be the instrument pressure if a valve positioner is not used or is bypassed.

Locking Device: A mechanism provided on valve operators to prevent unauthorized operation or tampering.

Lubricated Plug Valve: Type of plug valve in which the plug rotation and sealing can be assisted by sealant applied under external pressure.

Lug connection: A way for valve and pipeline connection, which is characterized by the valve body installed on both sides of the flange through the bolt, to avoid the bolt on the valve body and sealing surface extrusion, thereby extending the seal life .

M

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.

Manual Override: A mechanical device provided on actuators that allows the manual positioning of the actuator.

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.

Metal-to-Metal Seal: The seal produced by metal-to-metal contact between the sealing face of the seat ring and the closure elements, without benefit of a synthetic seal.

Modified Parabolic: A flow characteristic that lies somewhere between linear and equal percentage. It provides fine throttling at low flow capacity and an approximately linear characteristic at higher flow capacities.

N

NACE: National Association of Corrosion Engineers.

NDE: Non-Destructive Examination(or NDT, Non-Destructive Testing). A collective term used to describe non-intrusive examination techniques such as radiographic and ultrasonic examination.

Needle Valve: A multi-turn device with a needle-shaped closing element. Similar in design to globe valves, but often much smaller.

Noise: May arise from vibration, cavitation or aerodynamic flow through the valve.

Normally Closed: See Air-To-Open.

Normally Open: See Air-To-Close.

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.

O

OD Outside Diameter: The distance of a straight line pasting through the center from one outside wall of the pipe to the other outside wall.

On-Off Valve: any number of valve types used for either full open or shutoff service.

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

Operating Time: The time required for a power operator to stroke the valve from a fully open to fully closed position or vice versa.

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.

Oxygen Cleaning: Method of cleaning equipment intended for use with either liquid or gaseous oxygen. Oxygen cleaning eliminates fire or explosion danger due to flammable contaminants.

P

P1: Used to designate Inlet Pressure.

P2: Used to designate Outlet Pressure.

Packing: A sealing system that normally consists of a deformable material such as PTFE, graphite, etc. It is usually in the form of solid or split rings contained in a packing box that are compressed so as to provide an effective pressure seal.

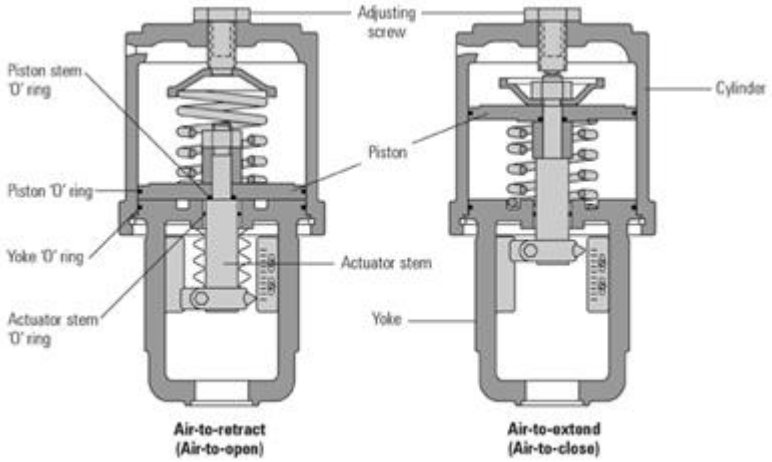
Packing Box: The chamber located in the bonnet that surrounds the stem and contains the packing and other stem-sealing components.

PEEK: Polyether Ether Ketone is a crystalline thermoplastic with excellent mechanical and chemical resistance properties that are retained to high temperatures.

Pilot Valve: Device acting between the source of air pressure and the actuator that directs air flow to the required actuator air inlet ports.

Pinch Valve: A flexible hose, pinched between two or more moving elements to stop flow. It is commonly used in slurry applications since it does not easily clog.

Piston Actuator: A fluid-powered, normally pneumatic device in which the fluid acts upon a movable cylindrical member, the piston, to provide linear motion to the actuator stem. These units are spring or air-opposed, and operate at higher supply pressures than a spring return actuator.



Plug: See Closure Member.

Plug Valve: A multi-turn device which uses a rotating plug as the closing element. When the valve is open, the media flows through a hole in the plug, which can be

cylindrical or truncated.

PN: Nominal pressure, standard abbreviation for pressure rating used in ISO standards.

Pneumatic Actuator: Device that converts pneumatic pressure into mechanical motion and force to move a valve’s closure member.

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

Position Switch: A switch that is normally fitted on the actuator to detect extremes of valve travel. The switch is normally electric.

Position Transmitter: A device that is mechanically connected to the valve stem and will generate and transmit either a pneumatic or electric signal that represents the valve stem position.

Positioner: A device used to position a valve with regard to a signal. The positioner compares the input signal with a mechanical feedback link from the actuator. It then produces the force necessary to move the actuator output until the mechanical output position feedback corresponds with the pneumatic signal value. Positioners can also be used to modify the action of the valve (reverse-acting positioner), alter the stroke or controller input signal (split-range positioner), increase the pressure to the valve actuator (amplifying positioner) or alter the control valve flow characteristic (characterized positioner).

Pressure Sealed Bonnet: A type of bonnet design where the fluid pressure is used to produce the seal between the body and bonnet.

PSI (psi): An abbreviation for “pounds per square inch”. The force per unit area exerted against a resisting body.

PTFE (Polytetrafluoroethylene): a soft polymer that is compatible with almost any substance.

Push-Down-To-Close: A term used to describe a linear or globe style valve that uses a direct acting plug and stem arrangement. The plug is located above the seat ring. When the plug is pushed down, the plug contacts the seat and the valve closes. Note: Most control valves are of this type.

Push-Down-To-Open: A term used to describe a linear or globe style valve that uses a reverse acting plug and stem arrangement. The plug is located below the seat ring. When the plug is pushed down, it moves away from the seat and the valve opens.

Q

Quarter-turn: A method of valve operation involving a 90 degree turn of the stem to move from fully open to fully closed. This describes valves such as ball, plug, and butterfly.

Quick Closing: Quick closing and quick opening refers to a valve designed to require a smaller turn to be fully closed or opened.

Quick Opening: A flow characteristic that provides maximum change in flow rate at low travels. The curve is basically linear through the first 40% of travel. It then flattens out indicating little increase in flow rate as travel approaches the wide open position. This decrease occurs when the valve plug travel equals the flow area of the port. This normally happens when the valve characteristic is used for on/off control.

R

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: An NDE technique that uses X-rays to detect internal flaws that are not detectable using other externally applied methods.

Rangeability: The range over which a control valve can operate. It is the ratio of the maximum to minimum controllable flow coefficients. Rangeability is affected by three factors: the geometry of the valve, the seat leakage and the actuator's accuracy or stiffness at near closure of the valve. Geometry is inherent due to the design of the seat and closure and excessive seat leakage can cause instability in the valve as it lifts off the seat.

Raised Face (RF): A flange sealing surface in which the gasket seating area is a portion of the diameter covering the region from the inside diameter to some radius lying just inside the bolt holes, with that portion raised slightly above the remainder of the flange surface. This increases the effective load on the gasket and increases the sealing effectiveness.

Rating: An alpha numeric classification used to define the pressure capability of a pipework system.

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

Reducing Valve: A spring- or lever-loaded valve similar to a safety valve, by which a lower and constant pressure may be maintained beyond the valve.

Reflux Valve: A non-return valve used in a pipeline at a rising gradient to prevent water that is ascending the gradient from flowing back in the event of a burst lower down.

Relief Valve: A self-actuating valve designed to open when the pressure under the seat reaches a preset value, by means of a spring or a poppet or any one of several other devices.

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

Reverse-Acting: This term has several different meanings depending upon the device it is describing. A reverse-acting actuator is one in which the actuator stem retracts with an increase in diaphragm pressure. A reverse-acting valve is one with a push-down-to-open plug and seat orientation. A reverse-acting positioner or a reverse-acting controller outputs a decrease in signal in response to an increase in set point.

Reverse Flow: Flow of fluid in the opposite direction from that normally considered the standard direction. Some rotary valve are considered to be bi-directional although working pressure drop capabilities may be lower and leakage rates may be higher in reverse flow.

Rising Stem: A valve stem that rises as the valve is opened.

RJ or RTJ: Ring joint or ring-type joint-a flange sealing surface in which the gasket seating area is two narrow lines of metal-to-metal contact along a metal ring, softer than the flange, that is set into a groove in each flange face.

Rotary Valve: A valve style in which the flow closure member is rotated in the flow stream to modify the amount of fluid passing through the valve (i.e. Ball Valve).

S

Safety Factor: The ratio between an ultimate property (typically strength) and that required under design conditions.

Safety Valve: A valve design to relieve over pressure. Mechanically the same as a relief valve, but the reasons for locating one versus the other are not always the same.

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

Seat Load: The contact force between the seat and the valve plug. When an actuator is selected for a given control valve, it must be able to generate enough force to overcome static, stem and dynamic unbalance with an allowance made for seat load.

Seat Ring: A part of the flow passageway that is used in conjunction with the closure member to modify the rate of flow through the valve.

Shaft: The valve component through which outside motion is applied to the closure member, also called as stem.

Screwed Ends: Internally threaded end connections supplied on some valves. Usually tapered pipe threads. See “NPT”.

Socket Weld: A connection made by entering a pipe into a matching socket in the end of a valve fitting, and welding the two together.

Sonic Velocity: The local speed of sound in the fluid. See Flashing.

Special Class: A term applied to a Class designated threaded or weld end valve, where the body and cover have been subjected to non-destructive examination (NDE) and any defects removed. This allows the valve to have a higher pressure capacity than a standard class valve.

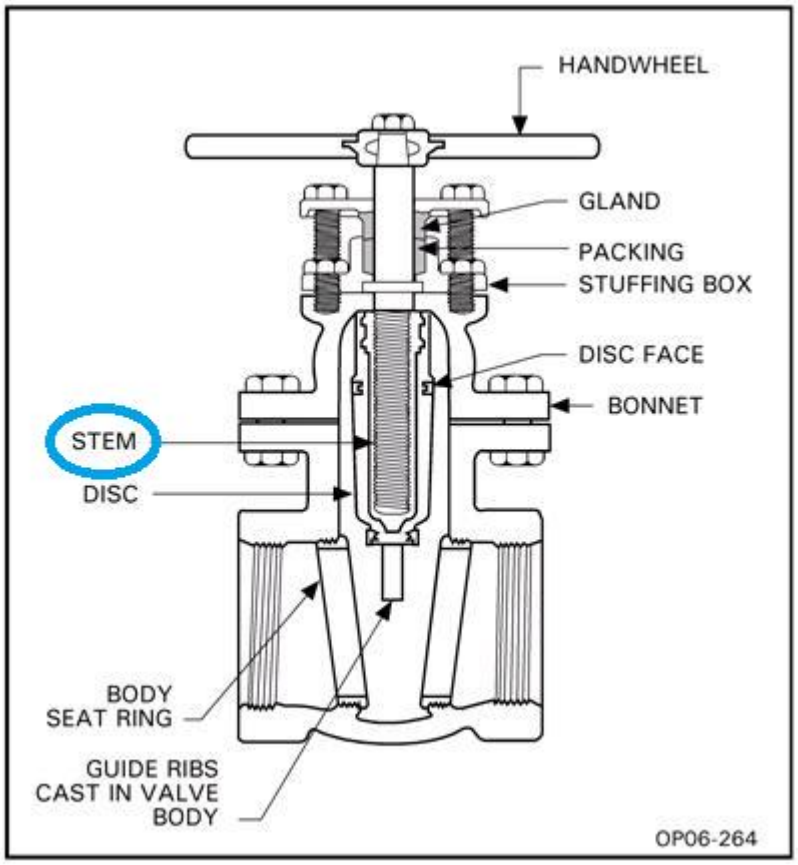
Split Body: A valve whose body is split. This design allows for easy plug and seat removal. Split-bodied valves are made in both the straight-through and angle versions.

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

Static Unbalance: The net force produced on the valve stem by the fluid pressure acting on the closure member and stem within the pressure retaining boundary. The

closure member is at a stated opening with a stated flow condition. This is one of the forces that an actuator must overcome.

Stem: The valve plug stem is a rod extending through the bonnet assembly to permit positioning of the plug or closure member. The actuator stem is a rod or shaft which connects to the valve stem and transmits motion or force from the actuator to 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.

Stem Guide: A guide bushing closely fitted to the valve stem and aligned with the seat. Good stem guiding is essential to minimize packing leakage.

Stroke: See Travel.

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

Supply Pressure: The pressure at the supply port of a device such as a controller, positioner or transducer. Common values of control valves supply pressure are 20 psig. for a 3-15 psig. output and 35 psig. for a 6-30 psig. output.

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

T

Tensile Strength: The maximum stress a material subjected to a stretching load can withstand without fracturing.

Three Way Valve: Type of valve with three ports arranged to control the direction of flow through the valve.

Throttling: Modulating control as opposed to on/off control.

Thrust: A linear force applied to the shaft of a valve, usually expressed in units of pounds (kilograms).

Tilted Disc Check Valve: A check valve with an eccentrically mounted discallowing flow above and below the disc. It can be supplied with top or bottom mounted dash pots to further reduce any slamming potential, especially in high head applications.

Torque: The rotational force imposed on or through a shaft.

Transducer: An element or device that receives information in the form of one quantity and coverts it to information in the form of the same or another quantity.

Travel: The distance the plug or stem moves to go from a fully closed to a fully open position. Also called Stroke.

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.

Triple Eccentric (or Butterfly Valve): A particular design of a butterfly valve where the stem is located behind the disc and below the centerline of the disc, and its cone axis is offset from the centerline of the disc. This particular design is capable of a very tight shutoff at temperatures well above 1000° F (538° C).

Trunnion: The part of a ball valve which holds the ball on a fixed vertical axis and about which the ball turns. The torque requirements of a trunnion mounted ball valve are significantly less than for a floating ball design.

Turndown: A term used to describe the ratio between the minimum and maximum flow conditions seen in a particular system. For example, if the minimum flow were 10 G.P.M. and the maximum flow were 100 G.P.M. the turndown would be 10:1. See Rangeability.

U

(UL) Underwriters Laboratory: An impartial testing laboratory concerned with the safety of electrical components. Products surviving the tests are included on a certified listing of products by manufacturer. This does not imply UL approval.

Ultrasonic Inspection: An inspection procedure using high-frequency sound waves to detect voids and imperfections throughout the thickness of metal parts.

V

Vacuum: A space from which air or gas has been exhausted until its pressure is less than atmospheric pressure, e.g., any pressure below 14.7 psi absolute.

Valve: A device that dispenses, dissipates or distributes energy or matter in a system.

(VDS) Valve Data Sheet: A data sheet defining the minimum level of a valve design, including the materials, testing, inspection, and certification requirements.

Valve Flow Coefficient: See C_V.

Valve Plug: See Closure Member.

Vapor Pressure: A pressure at which, for a given temperature, vapor bubbles form in the liquid.

Velocity: The speed at which a fluid flows through a line in a specified direction. Usually expressed in ft./sec.

Vena Contracta: The location where the cross-sectional area of the flow stream is at its minimum size, where fluid velocity is at its highest level, and where fluid pressure is at its lowest level. The vena contracta normally occurs just downstream of the

actual physical restriction in a control valve.

Venturi Valve: A reduced-bore valve. A valve having a bore smaller in diameter than the inlet or outlet. For example, an 8" x 6" x 8" ball valve has 8" inlet and outlet connections, while the ball and seats are 6". The flow through a Venturi valve will be reduced because of the smaller port. Venturi valves often can be economically substituted for plug valves.

Viscosity： A measure of the internal friction of a fluid or the resistance of a flow. Two fluids of identical specific gravity may have quite different viscosities.

W

Wafer: A flangeless valve designed for installation between mating pipe flanges.

Wall Thickness: The thickness of the wall of a pressure vessel or the thickness of the wall of a pipe.

Water Hammer: Shock waves generated in a pipework system caused by a valve closing too quickly.

Wedge Gate: A type of gate valve in which the gate or disc is wedge shaped, thinner at the bottom, to wedge itself tightly between the two seats when closed.

Weld Neck Flange: A flanged piping element with a weld neck used in pipeline construction to provide a companion for installation of flanged valves. Also used to convert weld end valves to flanged valves or vice versa.

WOG: Water-oil-gas---one of the early rating designations, still in use today for small valves, chiefly in low ratings. Also called nonshock rating. Normally this rating is meant to be the maximum working pressure at ambient temperature (32 to 100°F).

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 rotary valves.

WP: The maximum anticipated sustained operating pressure applicable to a pipe. Working pressure-synonym for operating pressure.

Y

Yield Strength: The limiting stress (psi) beyond which a material will sustain permanent deformation. Up to the yield strength, the material will spring back to its original dimension when the pressure is removed. Often in valves specs, the yield strength will be designated; this allows proper material selection.

Yoke: That part of a valve assembly used to position the Stem Nut or to mount the valve actuator.