APV AUSTRALIAN PIPELINE VALVE®

ADELAIDE • BRISBANE • PERTH

VALVE TYPES

There are a large variety of valves and valve configurations to suit all services and conditions; different uses (on/off, control), different fluids (liquid, gas etc; combustible, toxic, corrosive etc) different materials and different pressure and temperature conditions. Valves are for starting or stopping flow, regulating or throttling flow, preventing back flow or relieving and regulating pressure in fluid or gaseous handling applications. Common valve types include: Ball, Butterfly,Check, Diaphragm, Gate, Globe, Knife Gate, Parallel Slide, Pinch, Piston, Plug, Sluice, etc.

The following types of valves are used in a variety of applications, these descriptions may provide a basic guideline in the selection of valves.

BALL VALVES

Because of their excellent operating characteristics, ball valves are used for the broadest spectrum of isolation applications and are available in a wide range of sizes and materials and are available in full flow and full through conduit. *Advantages* - quick acting, straight through flow in either direction, low pressure drop, bubble tight shut off & operating torque, easily actuated. *Disadvantages* - temperature limitations on seating material, long “relative” face to face dimension.

GLOBE VALVES

Globe/Stop Valves: - The flow path through globe valves follows a changing course, thereby causing increased resistance to flow and considerable pressure drop. Because of the seating arrangements, globe valves are the most suitable for throttling flow, however avoid extremely close throttling when the repeatable pressure drop exceeds 20%. Close throttling creates excess noise, vibration and possible damage to valves and piping. Consult us for special service valve solutions. The valve is named after is globular body. Compared to gate valves, globe valves are designed to open and close more quickly. Their flow characteristics can be changed by re-configuring their discs. Advantages - best shut off (not drip tight above 50NB) & regulating. Disadvantages - high pressure drop (head loss), unidirectional.

Stop Check Valves (SDNR): - Stop check valves are essentially the same as Globe valves, except there is no mechanical connection between the stem and the disc. They provide a combination Stop valve and a Piston check valve in one valve. However, they are not designed for throttling. They are used in steam boiler outlet piping when two or more boilers are connected to a common header. Valves must be installed with pressure under the disc, and when the stem is raised, only boiler pressure can raise the disc whenever boiler pressure exceeds header pressure. They prevent backflow from the header to boiler.

BUTTERFLY VALVES

The butterfly valve derives its name from the wing-like action of the disc which operates at right angles to the flow. It’s main advantage is a seating surface which is not critical. It is designed for flow isolation. The disc impinges against a resilient liner to provide bubble tightness with low operating torque. Compact and with a simple construction, butterfly valves facilitate easy pipe arrangement. Due to disc, they have slightly reduced flow characteristics. *Advantages* - quick acting, good regulating characteristics, compact & light, low pressure isolation. Butterfly valves are simple, reliable and range in size from 40mm to 1000mm and beyond. They can be controlled by a notched lever, handwheel as well as by pneumatic or electric actuator. A shaft turns a disc 90º within a pipe. The disc angle within the pipe can provide a restriction varying from drip-tight through to almost full flow (except very small sizes).

CHECK VALVES

Sometimes referred to as a non-return valve, the check valve prevents back-flow in the piping by constantly keeping fluid flowing in one direction. Check valves operate automatically. Some piston/disc check valves are spring loaded for fast operation, (minimum cracking pressure should be specified). Vertical downwards flow requires a spring loaded check valve.

Swing Check Valves: - Swing & Wafer checks cease reverse flow with a flap that swings onto a seat. Use swing checks only for forward flow that is horizontal or vertical upward.

Piston Check Valves: - Piston & Spring checks cease reverse flow with a spring loaded plunger.

Ball Check Valves: - Ball checks have a ball that slides into a hole as forward flow slows. Consider a ball check for semi-solids such as pulp or effluent.

Tilting Disc Check Valves: - Tilting Disc check valves are similar to Swing check valves but in most installations, slamming is minimised upon reversal of flow so noise and vibration are reduced.

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GATE VALVES

Wedge Gate Valves: - Commonly used in industrial piping for stop or isolating – to turn on and shut off the flow as opposed to regulating flow. Gate valves are named from the gate-like disc which operates at a right angle to the path of the flow. Gate valves are general service valves that can be made in a broad spectrum of sizes using a variety of different materials. Wedge gate valves are metal seated but are also available with resilient seat insert if drip tight shut off is required. They can meet the demands of a wide range of pressure and temperature conditions and is available in full port. *Advantages* - low pressure drop, straight through flow either direction. *Disadvantages* - slow acting, bulky. Not drip tight shut off (over 150NB). Do not partially open as this will cause damage to seat/disc.

Knife Gate Valves: - Useful for many applications in larger sized pipework (50mm up). Unlike traditional gate valves, they are able to throttle (at lower pressures) depending on line media and degree of opening. Metal seated knife gate valves are not leak tight shut off. Some knife gate valves have a resilient seat in order to ensure they close drip-tight. Available in v-port, o-port and lined they are ideally suited for the control of effluent, slurries, waste products, semi solids, pulp, bulk powders. Most knife gate valves are designed for single flow direction.

Parallel Slide Gate Valves: - Popular in steam applications as the energised disc design handles thermal expansion without sticking like wedge gate valves. Another advantage is lower torque then wedge gate valves especially in venturi (Ferranti) reduced bore configuration. Parallel slide valves consist of two parallel gates that are energised against the seat at all times by springs or a wedging spreader bar between the two gates. No mechanical stress is exterted bewteen the discs, and the valve is not subjected to dangerous strains in opening and closing. This design of valve maintains fluid tightness without the aid of wedging action. These valves are used for saturated and super heated steam.

Pipeline Slab Gate Valves: - Available in parallel solid slab and expanding 2 piece wedging slab. Both styles protect the seat area from the flow in all operating positions. These valves have a full through conduit configuration with a hole in the slab. Slab style gate valves have seats that are spring energised. The expanding slab features two opposed sliding v-shape segments that maintain pressure against the seats. These valves are for API6D pipeline applications but are also used for API6A wellhead valves. All these valves are made in metal to metal and soft seat configuration.

PLUG VALVES

Plug valves are valves with cylindrical or conically-tapered “plugs” which can be rotated inside the valve body to control flow through the valve. The plugs in plug valves have one or more hollow passageways going sideways through the plug, so that fluid can flow through the plug when the valve is open. Plug valves are simple and often economical.

Characteristics of Valve by Type

Item	Gate Valve	Globe Valve	Ball Valve	Butterfly Valve
Disc actuation	Vertical	Vertical	Rotary	Rotary
Manual mode of operation	Round handle Gear operated	Round handle Gear operated	Lever handle Round handle Gear operated	Lever handle Gear operated
Automatic mode of operation	Pneumatic/ Hydraulic Electric actuator	Pneumatic/ Hydraulic Electric actuator	Pneumatic/ Hydraulic Electric actuator	Pneumatic/ Hydraulic Electric actuator
Application	On - off	On - off control	Automatic on - off Can be controlled	Automatic on - off Can be controlled
Operating temperature range	Wide	Wide	Narrow	Narrower
Operating pressure range	Wide	Wide	Wide	Narrower
Face-to-face dimension	Long	Longest	Long	Short
Weight	Heavy	Heavy	Heavy	Light

Common Metal Types used in Valve Manufacture

The following is a general review of common valve materials used in general industrial, commercial and process valve construction.

Aluminum - A non-ferrous metal, very lightweight, approximately one-third the weight of steel. Aluminum exhibits excellent atmospheric corrosion resistance, but can be very reactive with other metals. In valves, aluminum is mainly used as for exterior components such as a hand wheels or identification tags.

Copper - Among the most important properties of wrought copper materials is their thermal and electrical conductivity, corrosion resistance, wear resistance, and ductility. Wrought copper performs well in high temperature applications and is easily joined by soldering or brazing. Wrought copper is generally only used for fittings.

Bronze - One of the first alloys developed in the Bronze Age is generally accepted as the industry standard for pressure rated bronze valves and fittings. Bronze has a higher strength than pure copper, is easily cast, has improved machinability, and is very easily joined by soldering or brazing. Bronze is very resistant to pitting corrosion, with general resistance to a wide range of chemicals.

Silicone Bronze - Has the ductility of copper but much more strength. Silicon bronze has equal or greater corrosion resistance to that of copper. Commonly used as a stem material in pressure-rated valves, silicon bronze has greater resistance to stress corrosion cracking than common brasses.

Aluminum Bronze - The most widely accepted disc material used in butterfly valves, aluminum bronze is heat treatable and has the strength of steel. Formation of an aluminum oxide layer on exposed surfaces makes this metal very corrosion resistant. Not recommended for high pH wet systems.

Brass - Generally good corrosion resistance. Susceptible to de-zincification in specific applications; excellent machinability. Primary uses for wrought brass are for ball valve stems and balls, and iron valve stems. A forging grade of brass is used in commercial ball valve bodies and end pieces.

Grey Iron - An alloy of iron, carbon and silicon; easily cast; good pressure tightness in the as-cast condition. Gray iron has excellent dampening properties and is easily machined. It is the standard material for bodies and bonnets of Class 125 iron body valves. Gray iron has corrosion resistance that is improved over steel in certain environments.

Ductile Iron - Has composition similar to gray iron. Special treatment modifies metallurgical structure, which yields higher mechanical properties; some grades are heat treated to improve ductility. Ductile iron has the strength properties of steel using similar casting techniques to that of gray iron and is used for class 250 (as well as class 125 in larger sizes).

Carbon Steel - Very good mechanical properties; good resistance to stress corrosion and sulfides. Carbon steel has high and low temperature strength, is very tough and has excellent fatigue strength. Mainly used in gate, globe, and check valves for applications up to 454ºC, and in one-, two-, and three-piece ball valves. Can be forged or cast, with forgings being superior especially for larges sizes in very high classes.

3% Nickel Iron - Improved corrosion resistance over gray and ductile iron. Higher temperature as well as corrosion resistance and mechanical properties. Very resistant to oxidising atmospheres.

Nickel-Plated Ductile Iron - Nickel coatings have received wide acceptance for use in chemical processing. These coatings have very high tensile strength, 50 to 225 ksi. To some extent, the hardness of a material is indicative of its resistance to abrasion and wear characteristics. Nickel plating is widely specified as a disc coating for butterfly valves. For industrial and petroleum ball valves, superior electroless nickel plating (ENP) is used in carbon steel valve components and is in fact superior to stainless steel in hardness but with similar corrosion properties.

400 Series Stainless Steel - An alloy of iron, carbon, and chromium. This stainless is normally magnetic due to its martensitic structure and iron-content. 400 series stainless steel is resistant to high temperature oxidation and has improved physical and mechanical properties over carbon steel. Most 400 series stainless steels are heat-treatable. The most common applications in valves are, for stem material in butterfly valves, and trim components such as seat, backseat bushings, discs, wedges etc. in cast steel gate, globe and check valves.

316 Stainless Steel - An alloy of iron, carbon, nickel, and chromium. A non-magnetic stainless steel with more ductility than 400 series SS. Austenitic in structure, 316 stainless steel has very good corrosion resistance to a wide range of environments, is not susceptible to stress corrosion cracking (however it is not suitable for higher levels of H2S typically found in wellhead applications) and is not affected by heat treatment. Very commonly used in valve body and/or trim material.

17-4 PH Stainless Steel - Is a martensitic precipitation/age hardened stainless steel offering high strength and hardness. 17.4 PH withstands corrosive attack better than any of the 400 series stainless steels and in most conditions its corrosion resistance closely approaches that of 300 series stainless steel. 17.4 PH is primarily used as a stem material for butterfly and ball valves as well as any valve application requiring a superior strength stem.

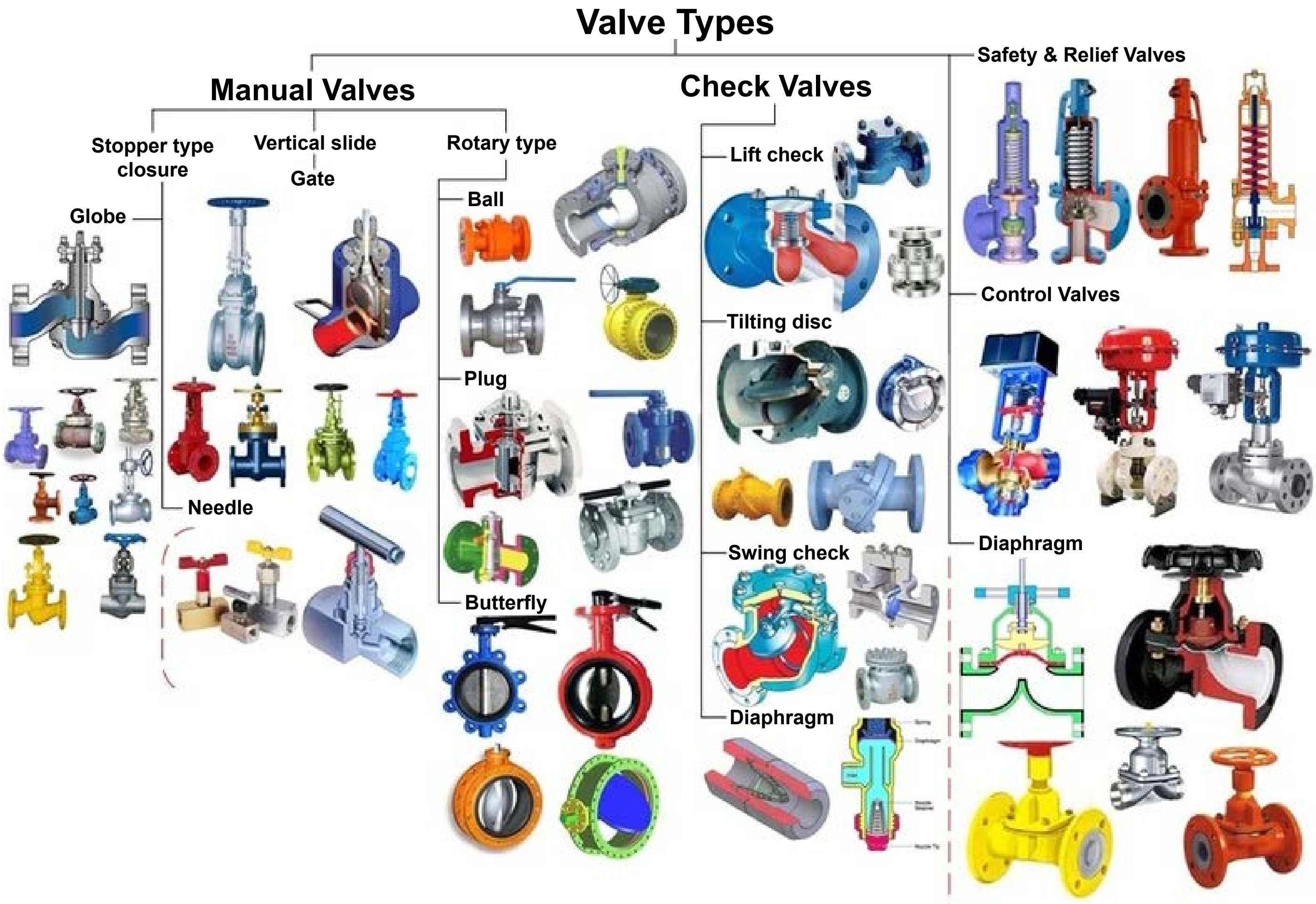
Alloy 20Cb-3 - This alloy has higher amounts of nickel and chromium than 300 series stainless steel and with the addition of columbium, this alloy retards stress corrosion cracking and has improved resistance to sulfuric acid. Alloy 20 is widely used in all phases of chemical processing.

Monel - Is a nickel-copper alloy used primarily as interior trim on all types of valves. One of the most specified materials for corrosion resistance to sea and salt water. Monel is also very resistant to strong caustic solutions.

Stellite - Cobalt base alloy, one of the best all-purpose hard facing alloys. Very resistant to heat, abrasion, corrosion, impact, galling, oxidation, thermal shock and erosion. Stellite takes a high polish and is used in steel valve seat rings. Normally applied with transfer plasma-arc; Stellite hardness is not affected by heat treatment.

Hastelloy C - A high nickel-chromium molybdenum alloy, which has outstanding resistance to a wide variety of chemical process environments including strong oxidisers such as wet chlorine, chlorine gas, and ferric chloride. Hastelloy C is also resistant to nitric, hydrochloric, and sulfuric acids at moderate temperatures.

DISCLAIMER: -
This is a general overview. Information provided should not be used to make your operational or design decision. We accept no liability or responsibility for the information and do not guarantee it's correctness.


Valve Types
Manual Valves
Stopper type closure
Vertical slide
Rotary type
Gate
Globe
Ball
Plug
Needle
Butterfly
Check Valves
Lift check
Tilting disc
Swing check
Diaphragm
Safety & Relief Valves
Control Valves
Diaphragm