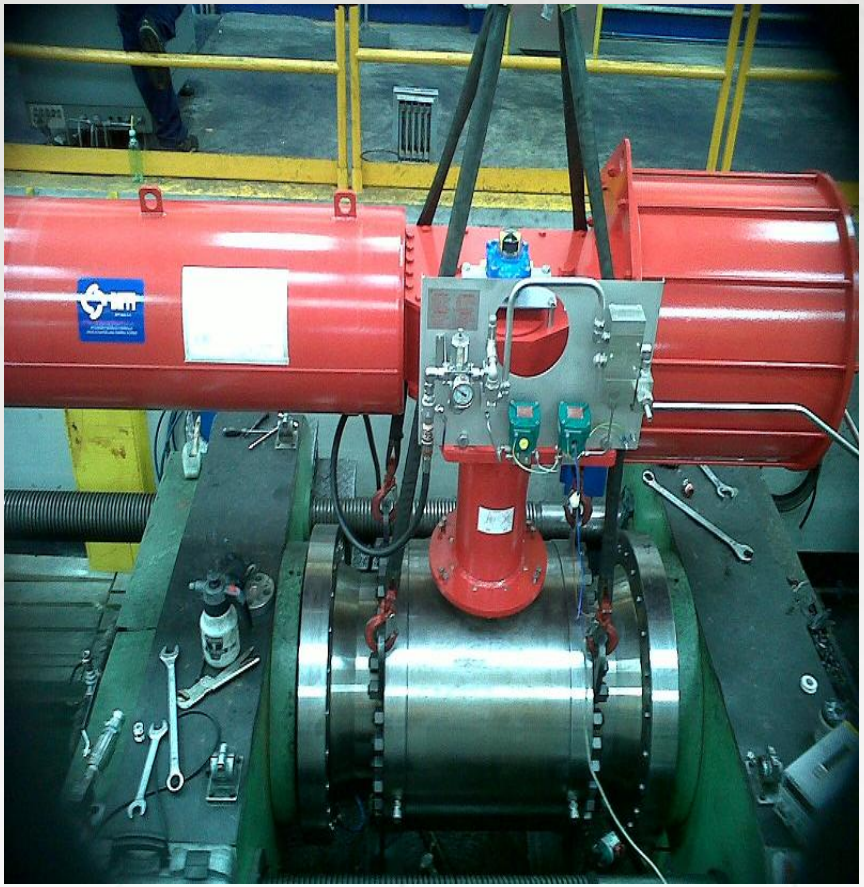
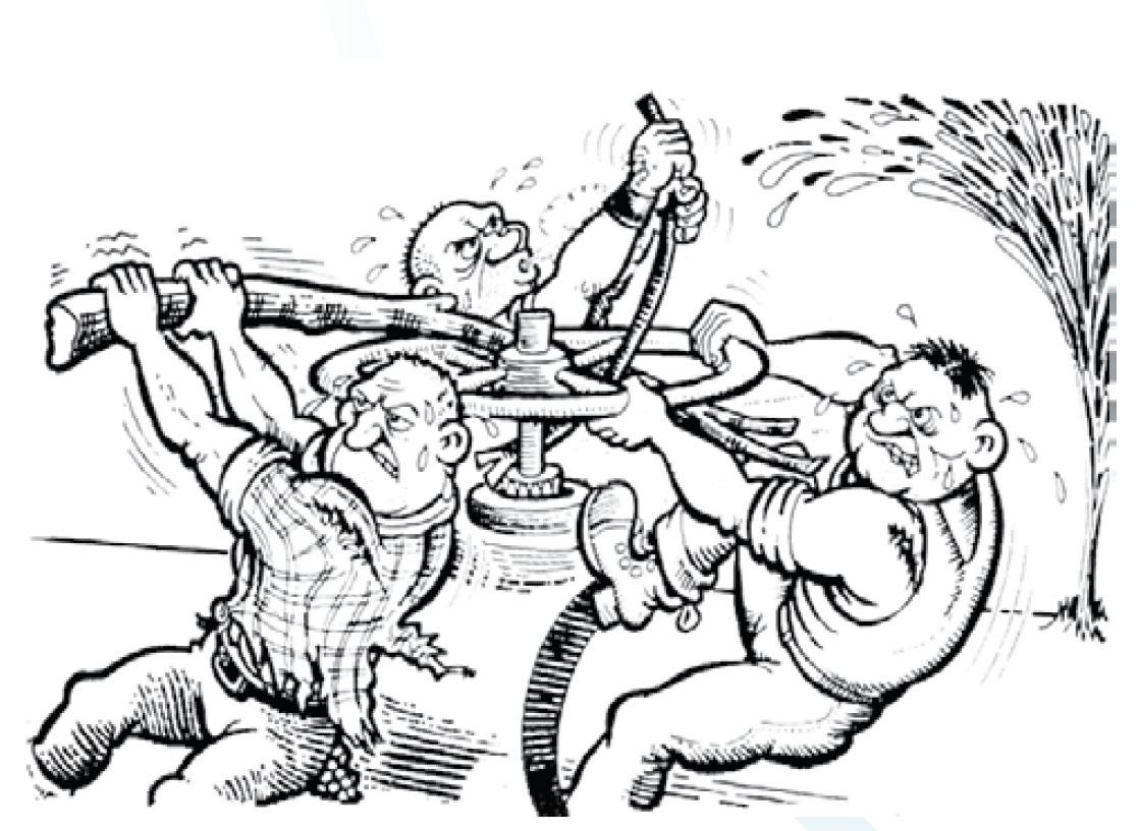
SHUTDOWN VALVES



TOPICS OF DISCUSSION

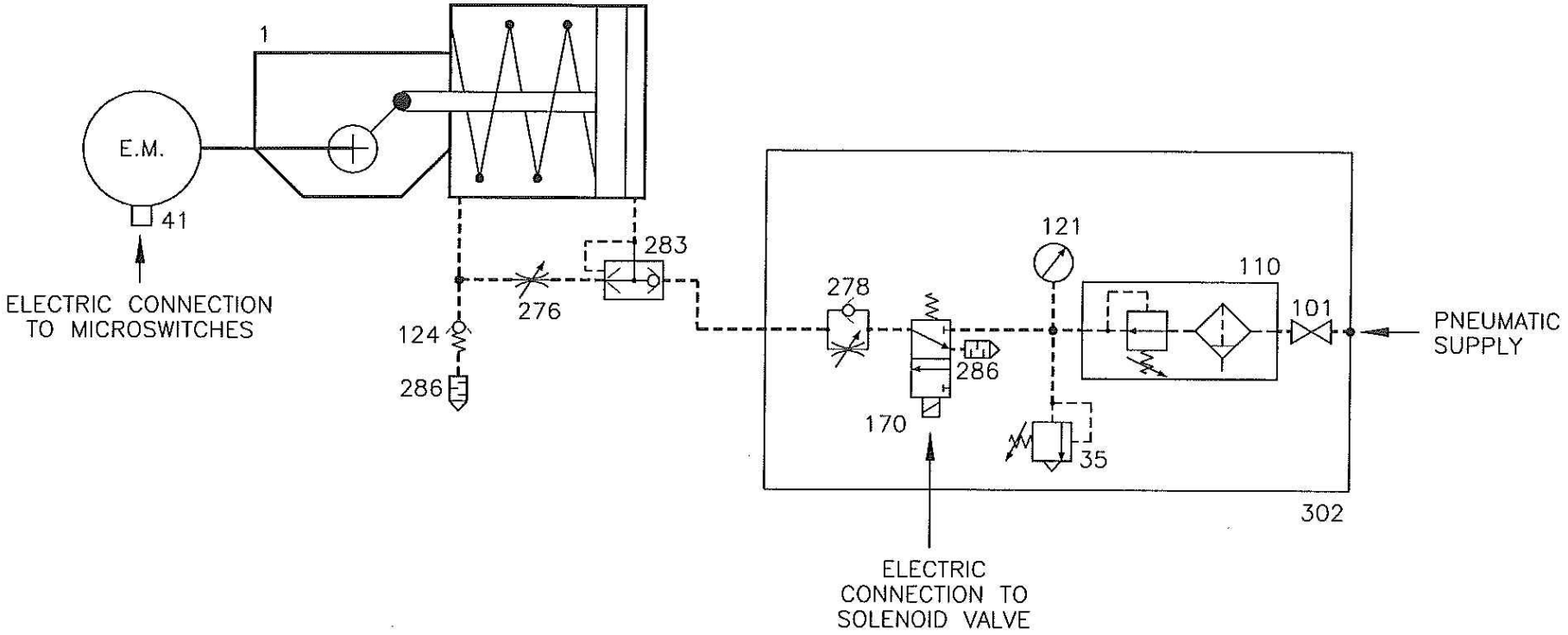
- Definitions
- Design guides
- Valve Types
- Special design
- Material Selection
- Inspection & Testing
- Actuators
- Limit Switches
- Solenoid Valves
- International Standards



Shut down valve

- Shut down valve (also referred to as SDV or Emergency shutdown valve, ESV, or ESDV) is an actuated valve installed in a pipe line.
- It isolates a process unit from an upstream or downstream (gaseous or liquid) inventory upon activation of the process unit alarm and shutdown system.
- Operate through electrical signals generated by a control or safety system
- Actuated valves are generally in metallic construction.

SHUTDOWN VALVE SCHEMATIC DIAGRAM



ELECTRIC REMOTE CONTROL TO OPEN
ENERGIZE PERMANENTLY THE SOLENOID VALVE 170.
THE OPENING TIME IS ADJUSTABLE BY THE FLOW REGULATOR 278.

ELECTRIC REMOTE CONTROL TO CLOSE
DE–ENERGIZE THE SOLENOID VALVE 170: THE AIR IS EXHAUSTED FROM THE CYLINDER THROUGH THE QUICK EXHAUST VALVE 283 AND THE ACTUATOR MOVES IN CLOSING WITH A TIME ADJUSTABLE BY THE FLOW REGULATOR 276.

PRESSURIZATION OF CYLINDER NOT ACTIVE CHAMBER
THE NOT ACTIVE CHAMBER OF PNEUMATIC CYLINDER IS KEPT PRESSURIZED AT VERY LOW PRESSURE TO AVOID THE CONTACT WITH THE ATMOSPHERE THROUGH THE CHECK VALVE 124.

1	SINGLE ACTING SPRING RETURN PNEUMATIC ACTUATOR
35	RELIEF VALVE
41	ELECTRIC MICROSWITCHES
101	STOP VALVE
110	FILTER REGULATOR
121	PRESSURE GAUGE
124	CHECK VALVE
170	3/2 N.C. DIRECT ACTING SOLENOID VALVE
276	BIDIRECTIONAL FLOW REGULATOR (ADJUSTABLE SETTING)
278	UNIDIRECTIONAL FLOW REGULATOR (ADJUSTABLE SETTING)
283	QUICK EXHAUST VALVE
286	DUST EXCLUDER
302	PANEL

DESIGN GUIDES (BALL VALVES)

- Valve Size
  - Obtained from P&ID, the body size of the valves same as the line size
- Valve Type
  - Obtained from P&ID, Full bore / Reduced bore.
- Valve body design
  - Obtained from VMS/PMS, Side entry / Top entry.
- Trim design
  - Obtained from VMS/PMS, Trunnion mounted / Floating ball.
- Seat design
  - Obtained from VMS/PMS, Soft seated/ Metal seated.
- End connections
  - Obtained from VMS/PMS, Flanged / Socket weld / Butt weld / Wafer.

DESIGN GUIDES (BALL VALVES)

- Ratings
  - Obtained from VMS/PMS, ANSI Class 150#, 300#, 600#, 900#,1500# & 2500#
- Flange facings
  - Obtained from VMS/PMS, FF(Flat face), RF(Raised face) & RTJ (Ring type joint)
- Face to Face dimension
  - Obtained from VMS/PMS, Long pattern / Short pattern as per ASME B16.10 & API 6D
- Special design requirement
  - Obtained from VMS, Fire safe design, Anti-static, Anti-blowout stem etc

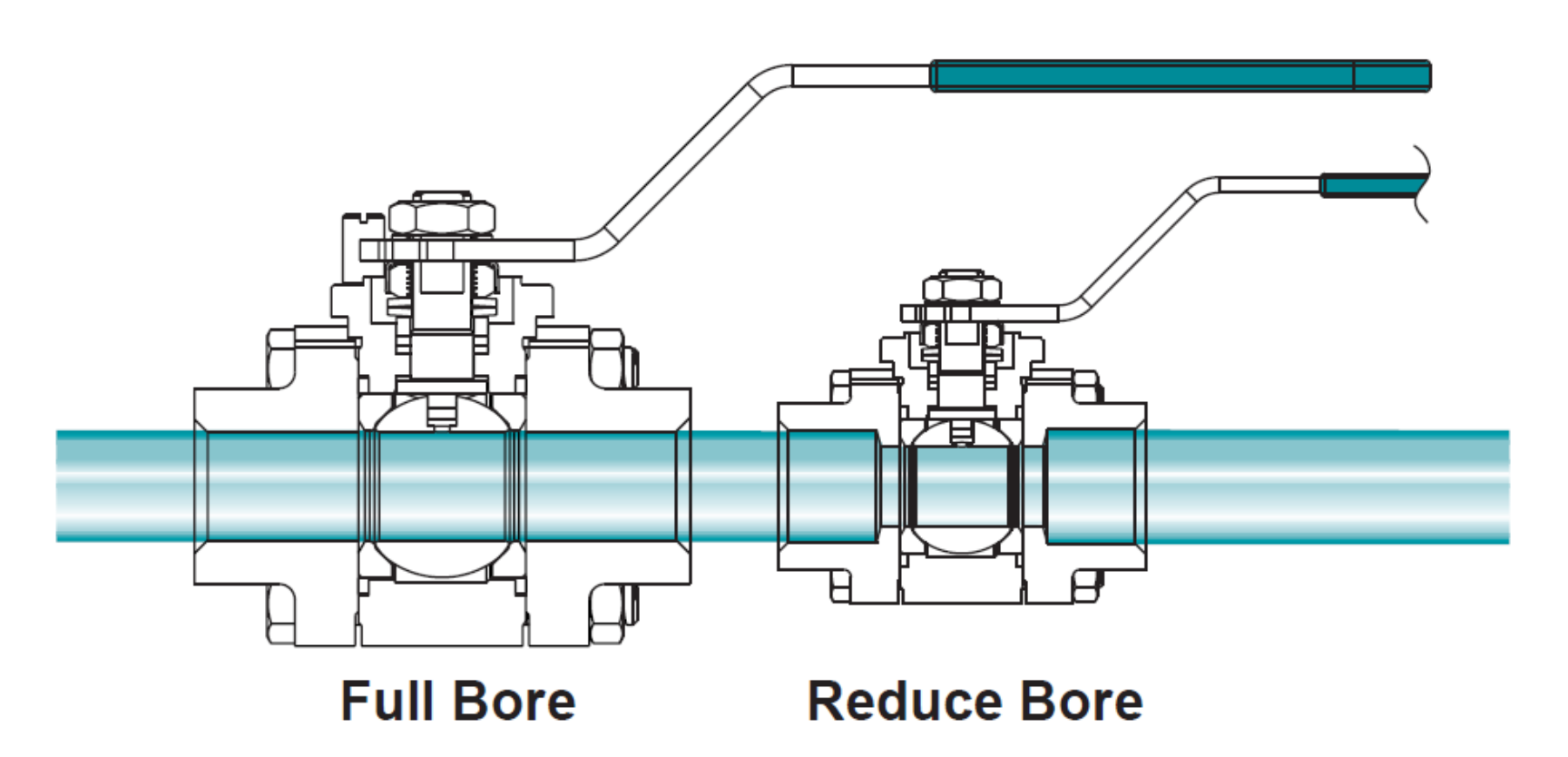
BALL VALVES

- Metal seated ball valves are used as shut-down valves (SDV's). Use of metal seated ball valves leads to overall lower costs when taking into account lost production and inventory, and valve repair costs resulting from the use of soft seated ball valves which have a lower initial cost.
- A ball valve is a valve that opens by turning a handle attached to a ball inside the valve.
- The ball valve is also called as quarter turn valves.
- The ball has a hole, or port, through the middle so that when the port is in line with both ends of the valve, flow will occur. When the valve is closed, the hole is perpendicular to the ends of the valve, and flow is blocked. The handle or lever will be in line with the port position letting you "see" the valve's position.

BALL VALVES

- Ball valves are durable and usually work to achieve perfect shutoff even after years of disuse.
- They are therefore an excellent choice for shutoff applications (and are often preferred to globe valves and gate valves for this purpose).
- They do not offer the fine control that may be necessary in throttling applications but are sometimes used for this purpose.
- Ball valves are used extensively in industry because they are very versatile, pressures up to 10,000 psi, temperatures up to 200 Deg C. Sizes from 1/4" to 12" are readily available They are easy to repair, operate manually or by actuators.

FULL BORE / REDUCED BORE



CONFIGURATION

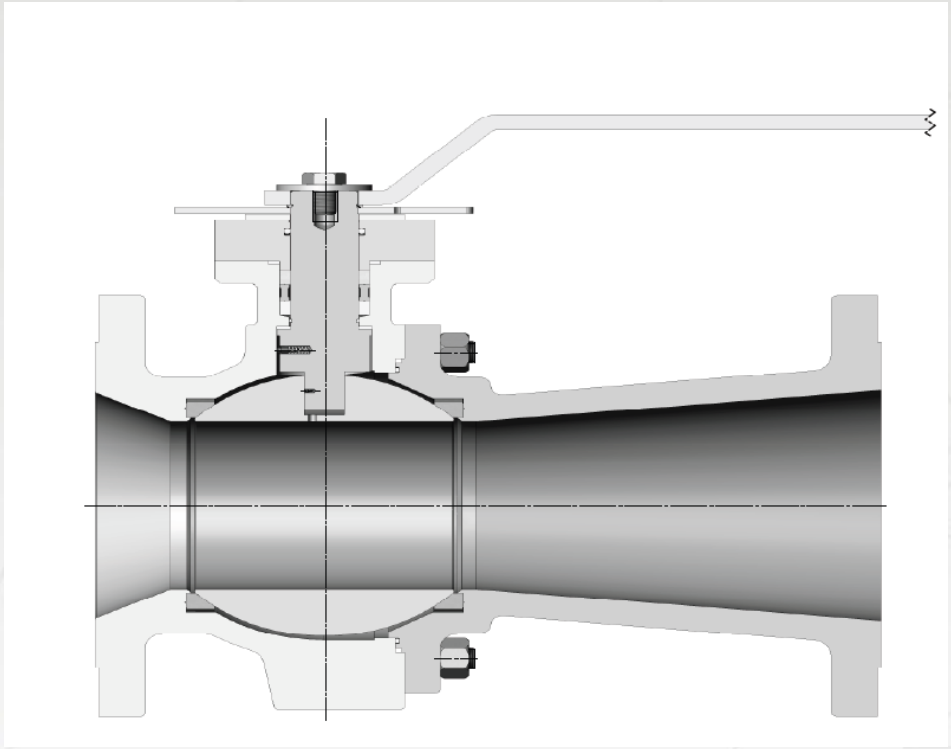
FULL PORT

- A full port ball valve has an over sized ball so that the hole in the ball is the same size as the pipe line resulting in lower friction loss. Flow is unrestricted, but the valve is larger.

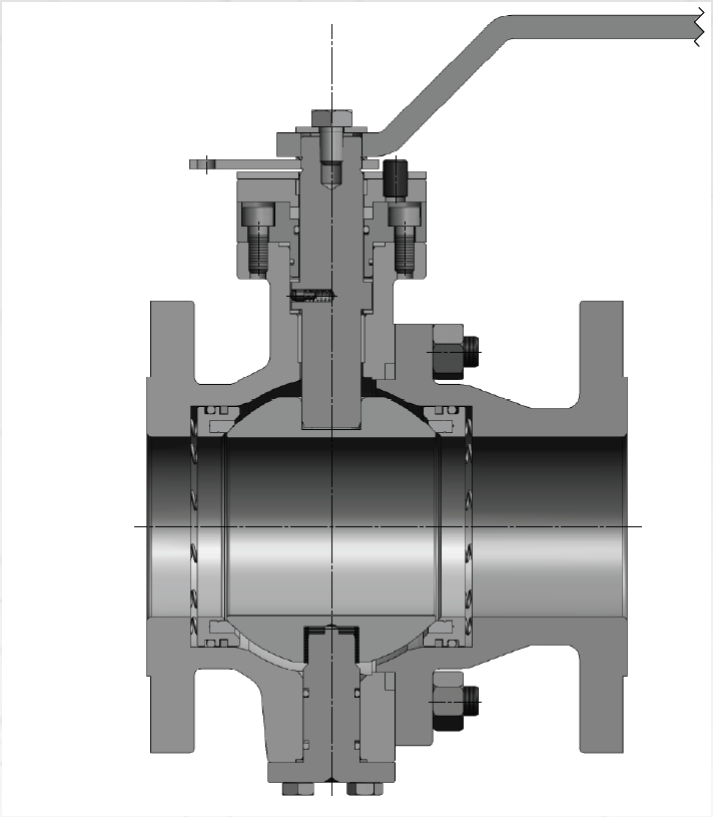
REDUCED PORT

- In reduced port ball valves, flow through the valve is one pipe size smaller than the valve's pipe size resulting in restricted flow.

TRIM DESIGN



Floating



Trunnion

FLOATING BALL VALVES

- In floating ball valves, the ball has some freedom to move along the axis of the valve while having no freedom to rotate against the stem.
- When line pressure is applied to the closed ball, it moves slightly (or floats) downstream to maintain contact with the downstream seat where primary sealing occurs.

TRUNNION BALL VALVE

- A trunnion ball valve has a mechanical means of anchoring the ball at the top and the bottom, this design is usually applied on larger and higher pressure valves (say 4" and above 600 psi and above).
- Trunnion Design is simply the use of upper and lower supports to retain the ball under pressure. Named for the "trunnion" historically used to support a cannon, a ball valve trunnion essentially doubles the safety and usability of a ball valve.

SEAT LEAKAGE CLASSIFICATIONS

There are actually six different seat leakage classifications as

defined by ANSI/FCI 70-2 1976(R1982) .

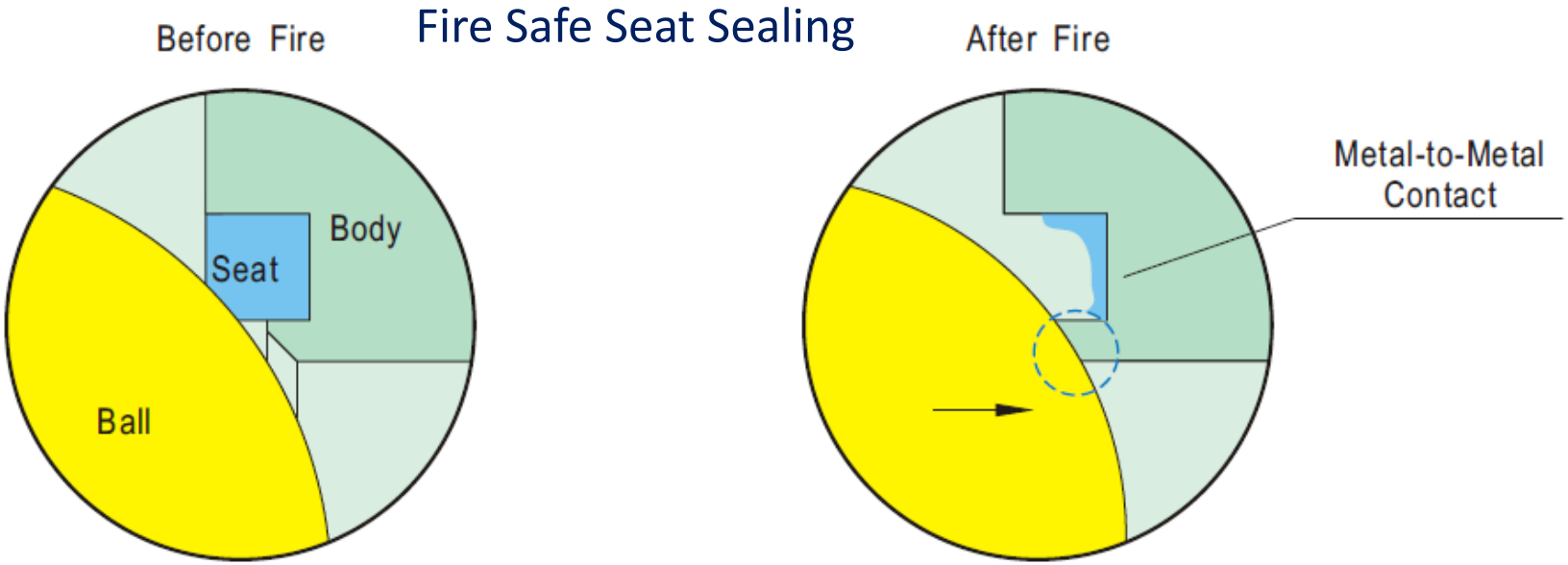
- CLASS I - Dust Tight
- CLASS II - 0.5% leakage of full open valve capacity
- CLASS III - 0.1% leakage of full open valve capacity.
- CLASS IV - 0.01% leakage of full open valve capacity.
- CLASS V - 5 x 10 ml per minute per inch of orifice diameter per psi differential.
- CLASS VI - 0.15 to 6.75 ml per minute for valve sizes 1 through 8 inches

SEAT LEAKAGE CLASSIFICATIONS

The most common used are:

- CLASS IV is also known as metal to metal. It is the kind of leakage rate you can expect from a valve with a metal plug and metal seat.
- CLASS VI is known as a soft seat classification. Soft Seat Valves are those where either the plug or seat or both are made from some kind of composition material such as Teflon or similar.

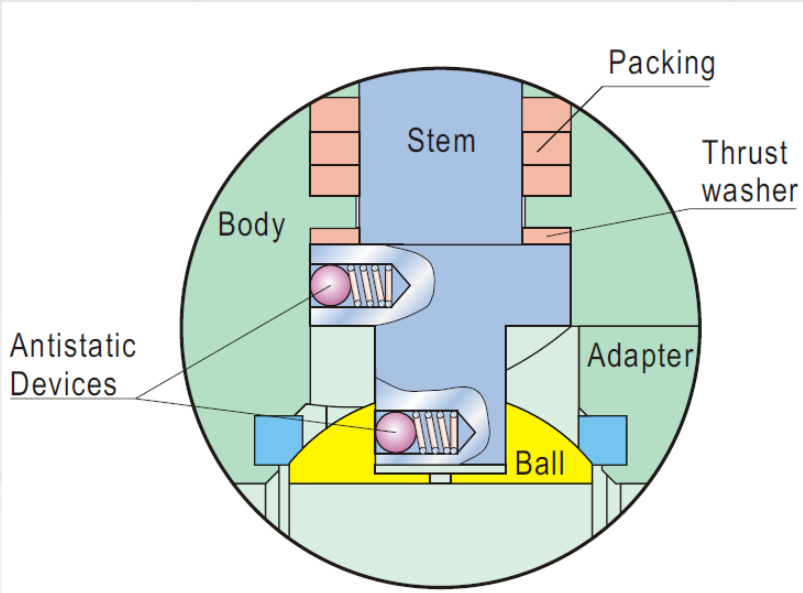
SPECIAL DESIGN



Fire safe is designed in accordance with API 607 & API SPEC 6FA.
When non-metal resilient seats are destroyed in a fire, the upstream medium pressure push the ball into the downstream metal seat lip to cut off the line fluid and prevent the internal leakage due to a secondary metal-to-metal seals

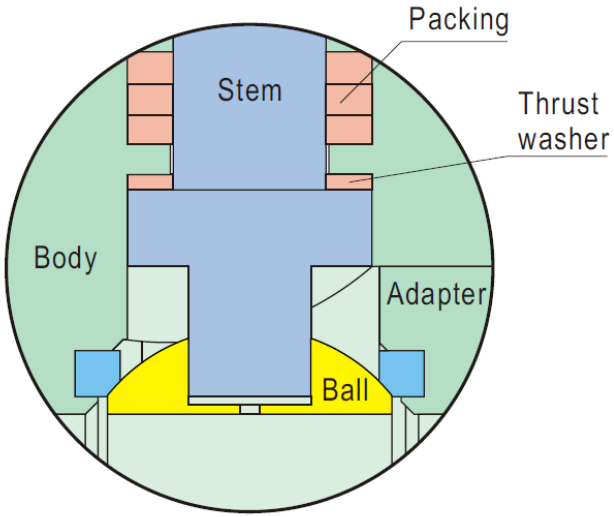
SPECIAL DESIGN

Anti-Static Device



Antic –static devices between ball & stem and stem & body are assembled by spring to avoid Sparks during stem movement.

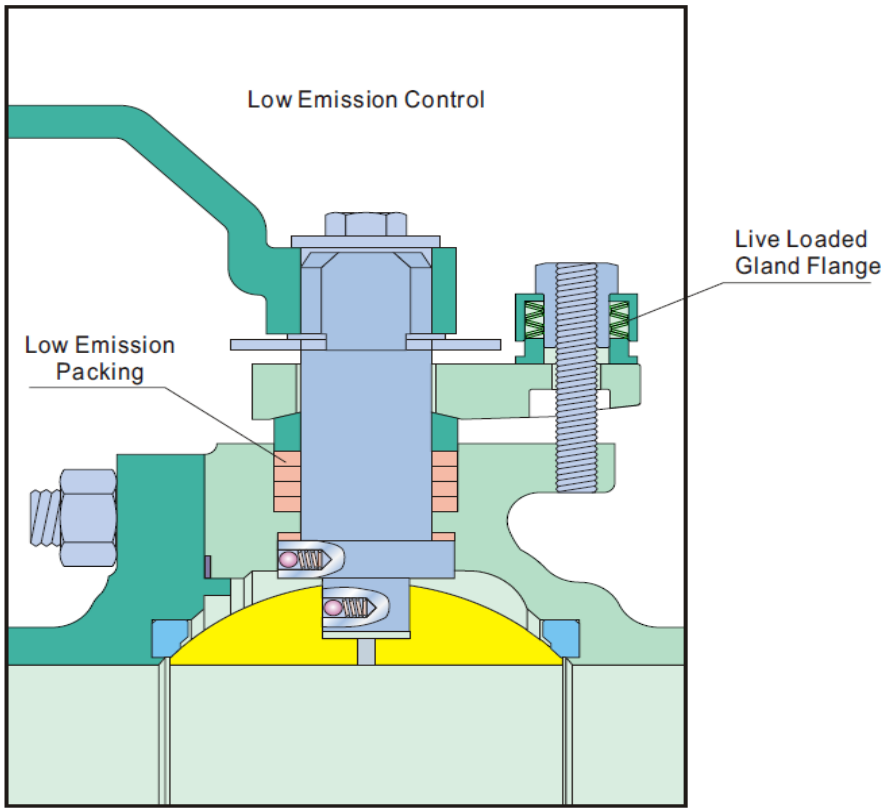
Anti-blowout stem



The stem is designed with integral T-type collar To provide blow-out proof effectively.

SPECIAL DESIGN

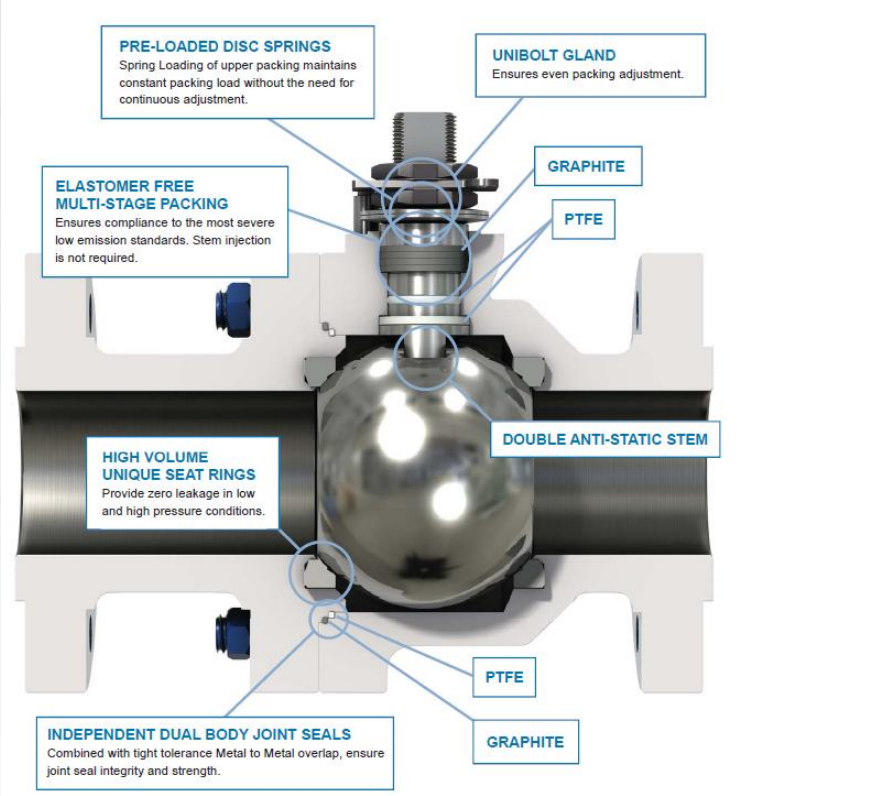
Low Emission Packing



Environmental Protection
Prevent poisonous, flammable medium from leaking to pollute the air

MATERIAL SELECTION GUIDES

- Body materials
- Ball material
- Stem material
- Seat / Seat insert material
- Seal material
- Gasket material
- Bolting material
- Stem packing / Fire seals



MATERIAL GUIDES (BALL VALVES)

- Body Material
  - Obtained from VMS, ASTM A216 WCB, A105 N, ASTM A351-CF8M,A352-LCB etc
  - Casting or Forging requirement as per VMS
- Ball Material
  - Obtained from VMS, ASTM A105+ENP, A182-F316, INC 625/825 etc
  - Casting or Forging requirement as per VMS
- Stem Material
  - Obtained from VMS, INC 718, INC 625, 17-4 PH, XM-19 etc
  - Selection based on torque requirement & fluid properties
- Seal Material
  - Obtained from VMS, Viton GLT AED, PTFE + Elgiloy etc

MATERIAL GUIDES (BALL VALVES)

No.	Part	Standard	Stainless Steel	Sour Service	Low Temperature Service
1	Body	ASTM A216-WCB	ASTM A351-CF8M	ASTM A216-WCB	ASTM A352-LCB
2	Closure	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
3	Ball	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
4	Seat Assembly	Assembled By No.5&6	Assembled By No.5&6	Assembled By No.5&6	Assembled By No.5&6
5	Seat Insert	Nylon 1010 +5% MoS2	Nylon 1010 +5% MoS2	Nylon 1010 +5% MoS2	Nylon 1010 +5% MoS2
6	Seat Ring	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
7	Spring Seat	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
8	Stem	ASTM A105/ENP	ASTM A182-F316	ASTM A105/ENP	ASTM A350-LF2/ENP
9	Shim	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316
10	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
11	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
12	Gasket	316SS + Graphite	316SS + Graphite	316SS + Graphite	316SS + Graphite
13	Gland Cap	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
14	Top Flange	ASTM A105	ASTM A182-F316	ASTM A105	ASTM A350-LF2
15	Thrust Washer	316 + PTFE + MoS2	316 + PTFE + MoS2	316 + PTFE + MoS2	316 + PTFE + MoS2
16	Shim	316 + PTFE + MoS2	316 + PTFE + MoS2	316 + PTFE + MoS2	316 + PTFE + MoS2
17	Bearing	316 + PTFE + MoS2	316 + PTFE + MoS2	316 + PTFE + MoS2	316 + PTFE + MoS2
18	Bearing	316 + PTFE + MoS2	316 + PTFE + MoS2	316 + PTFE + MoS2	316 + PTFE + MoS2
19	Vent Valve	Assembly	Assembly	Assembly	Assembly
20	Drain	S.S.	S.S.	S.S.	S.S.
21	Retainer Ring	PTFE	PTFE	PTFE	PTFE
22	Retainer Ring	PTFE	PTFE	PTFE	PTFE
23	Retainer Ring	PTFE	PTFE	PTFE	PTFE
24	Retainer Ring	PTFE	PTFE	PTFE	PTFE
25	Seat Spring	Inconel X-750	Inconel X-750	Inconel X-750	Inconel X-750
26	Grounding Spring	S.S.	S.S.	S.S.	S.S.
27	Grounding Plunger	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316	ASTM A182-F316
28	O-Ring	NBR	NBR	NBR	NBR
29	O-Ring	NBR	NBR	NBR	NBR
30	O-Ring	NBR	NBR	NBR	NBR
31	O-Ring	NBR	NBR	NBR	NBR
32	O-Ring	NBR	NBR	NBR	NBR
33	O-Ring	NBR	NBR	NBR	NBR
34	Body Stud	ASTM A193-B7	ASTM A193-B8	ASTM A193-B7M	ASTM A320-L7M
35	Body Nut	ASTM A194-2H	ASTM A194-8	ASTM A194-2HM	ASTM A194-7M
36	Screw	Carbon Steel	S.S.	Carbon Steel	ASTM A320-L7M
37	Screw	Carbon Steel	S.S.	Carbon Steel	ASTM A320-L7M
38	Gland Pin	Carbon Steel	S.S.	Carbon Steel	Carbon Steel
39	Gland Pin	Carbon Steel	S.S.	Carbon Steel	Carbon Steel
40	Key	Carbon Steel	S.S.	Carbon Steel	ASTM A182-F304
41	Spring Pin	Carbon Steel	S.S.	Carbon Steel	Carbon Steel
42	Seat Injection	Assembly	Assembly	Assembly	Assembly
43	Stem Injection	Assembly	Assembly	Assembly	Assembly

INSPECTION AND TESTING

As per Inspection and Test plan (ITP):

- Pre-assembling Inspection (Random witness & MTCS review)
- Visual and dimensional inspection – As per approved drawing
- NDE (UT, MPT & RT) / PMI
- Hydrostatic Shell test – API 6D/API 598
- Hydrostatic Seat test – API 6D/API 598
- Pneumatic Seat test – API 6D/API 598
- FET Production test (If applicable)
- Functional & Performance test
- Surface preparation and coating
- Final visual / Marking / tagging / Preservation

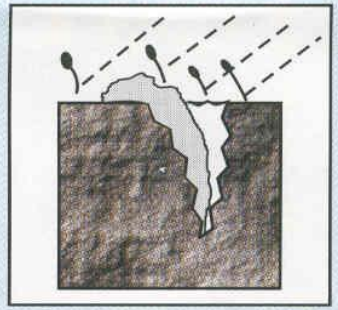
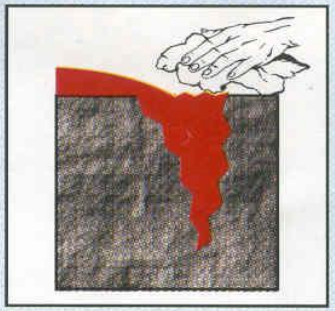
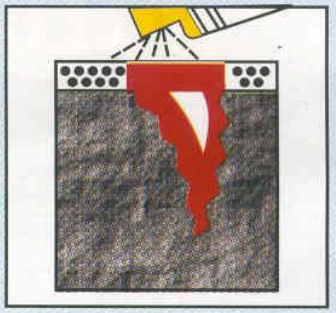
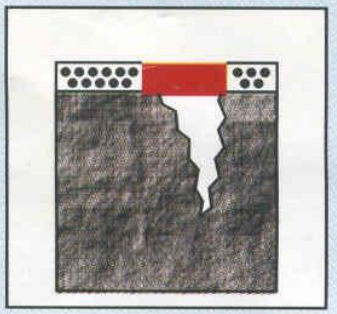
NDE METHODS

- Liquid Penetrated Testing (PT)
- Magnetic Particle Testing (MT)
- Ultrasonic Testing (UT)
- Radiography Testing (RT)

DYE PENETRANT TESTING – To detect Surface indications

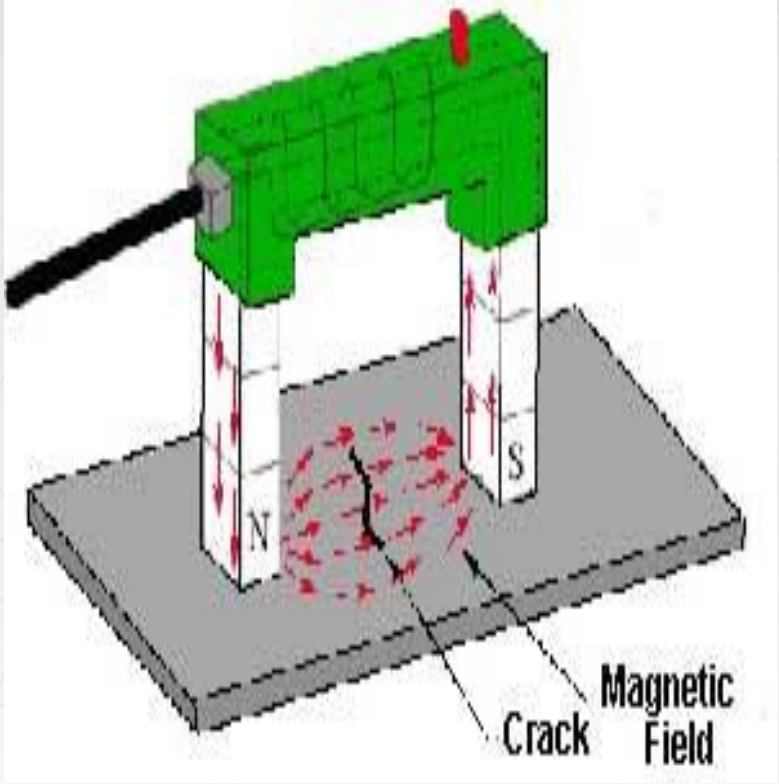
- The process can be applied only for surface defects or sub-surface defects open to the surface.

FLAW GUIDE PENETRANT TEST PROCEDURE

Step I	Step II	Step III	Step IV	Step V
				
Pre-treatment	**Apply Penetrant**	**Remove Penetrant**	**Apply Developer**	**Inspection**
Thoroughly clean the surface with Flaw-guide Cleaner to ensure removal of oil and dirt	Apply Flaw-Guide Dye penetrant on the surface to be inspected and allow it to remain for min. 10 minutes	Wipe out the excess penetrant cautiously with cloth soaked with Flaw-guide Cleaner	Apply Flaw-Guide Developer by Spraying uniformly over the surface.	Inspect the surface Flaws, if present shall be revealed as bright red indications on the white back-ground

Magnetic Particle Testing – To detect Sub-Surface indications

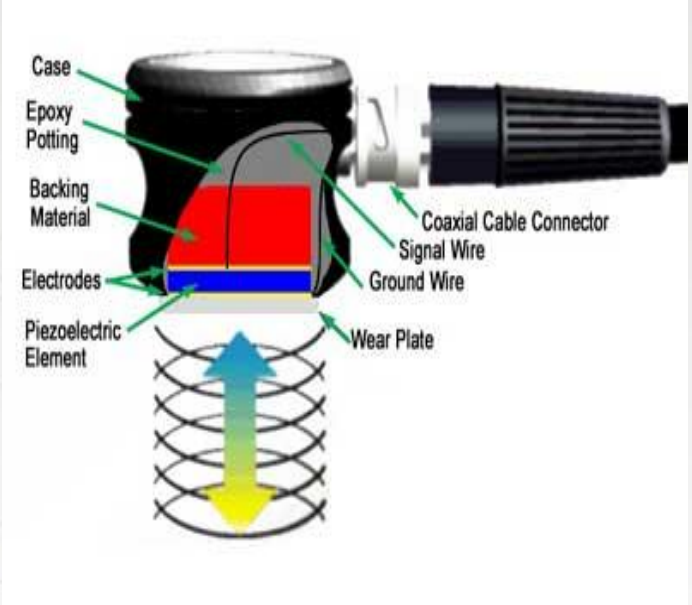
- Works on the principle of Magnetism of ferromagnetic materials
- Suitable for surface and subsurface defects
- Magnetic Flux Leaks when a magnetized ferromagnetic material encounters discontinuity at its surface or subsurface



Ultrasonic Testing (UT)

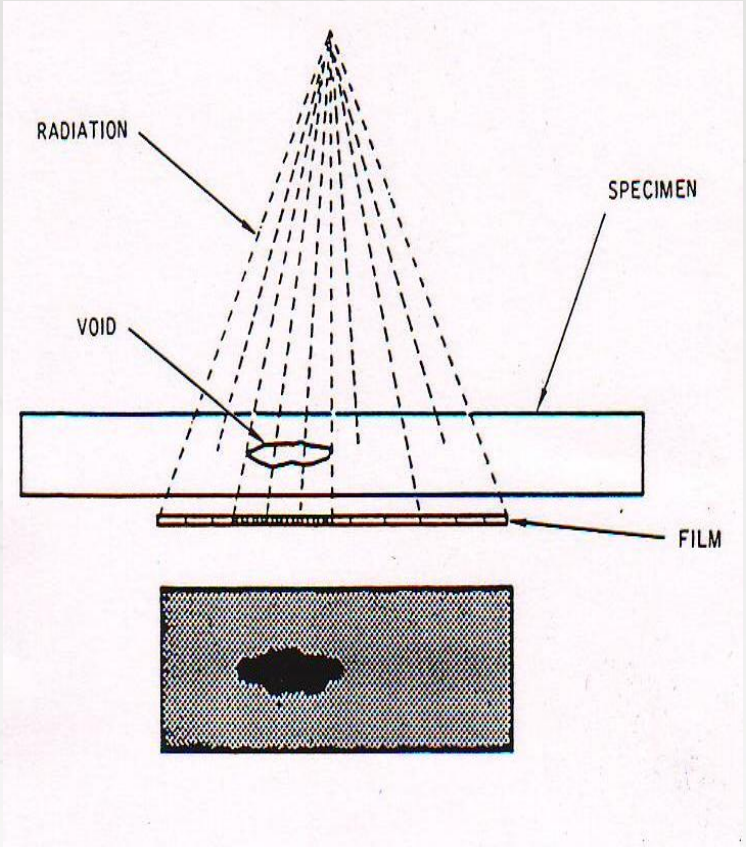
Ultrasonic Testing is an NDT method where defects are detected by passing very high frequency sound waves (Inaudible range) into the material to be tested

- Due to the difference in material density of specimen and the flaw ,it forms interface which reflect these waves.
- These reflected sound waves give the information about discontinuities in the material.



Radiography Testing (RT)

- Very Short electromagnetic radiation namely x-ray rays will penetrate through solid media.
- Absorption will occur depending on density and thickness of material and characteristic of radiation.
- Object with Flaw will have different absorption.



Available Non Destructive Tests

DESCRIPTION OF TEST	APPLICABLE STANDARDS	EXTENT OF TEST
Dye Penetrant	ASME V – Art. 6 and 24 ASTM E165 ASME B16.34 – Appendix III	10% on pressure containing parts For non magnetic materials (100% upon customer request)
Magnetic particles (dry and wet)	ASME V – Art. 7 and 25 ASTM E709 ASME B16.34 – Appendix II	10% on pressure containing parts For non magnetic materials (100% upon customer request)
X and Gamma ray	ASME V – Art. 2 and 22 ASME VIII – Div.1 ASME B16.34 – Appendix I ASTM E142 - E94 - E446 - E186 - E280	Upon customer request
Ultrasonic	ASME V – Art. 4 and 23 ASME VIII – Div.1 ASTM A388	Upon customer request
Hydrostatic and pneumatic	API 6D and API 6A BS 5146 and BS 6755 MSS-SP61 and customer specs	100% of all valves
Stem torque	API 6D and customer requirements	100% of actuated valves 10% of manual valves
Visual and dimensional	Applicable ASTM Stds MSS-SP44 and SP55 ASME B16.34, B16.5, B16.10 API 6D and 6A, BS 2080	100% of rough and finished machined components and assembled parts
Alloy verification	PIBIVIESSE procedures for Thermo Scientific Niton XLT 898 Spectro-Ametek SPECTROTEST CCD	Upon customer request
Hardness	NACE MR01-75	100% of wetted components
High pressure gas test	PIBIVIESSE procedures and customer specifications	Upon customer request

ACTUATORS

- An actuator is something that converts energy into motion. It can also be used to apply a force. An actuator typically is a mechanical device that takes energy, usually created by air, electricity, or liquid, and converts that into some kind of motion.
- An actuator is a mechanical device for moving or controlling a mechanism or system.

TYPES OF ACTUATORS

- Pneumatic Actuator.
- Electric Actuator.
- Hydraulic Actuator.

In Oil and Gas field we mostly preferred for pneumatic Actuator.

A **pneumatic actuator** converts energy (in the form of compressed air, typically) into motion. The motion can be rotary or linear, depending on the type of actuator. Some types of pneumatic actuators include:

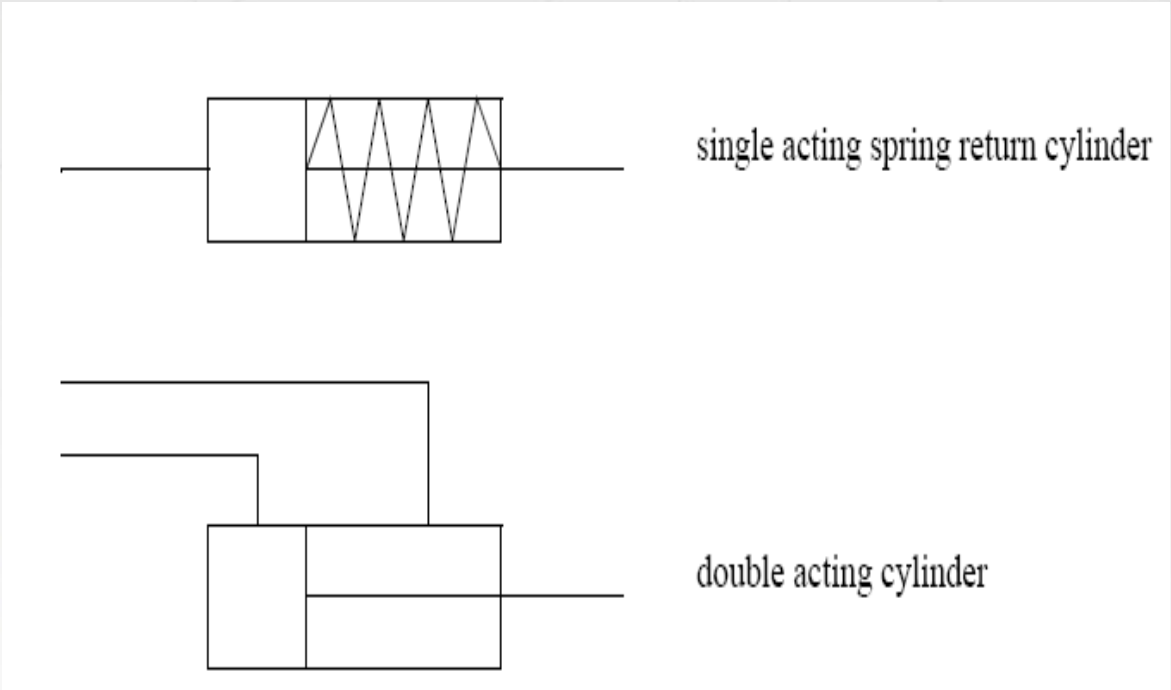
- Linear actuators
- Rotary actuators

ROTARY ACTUATOR

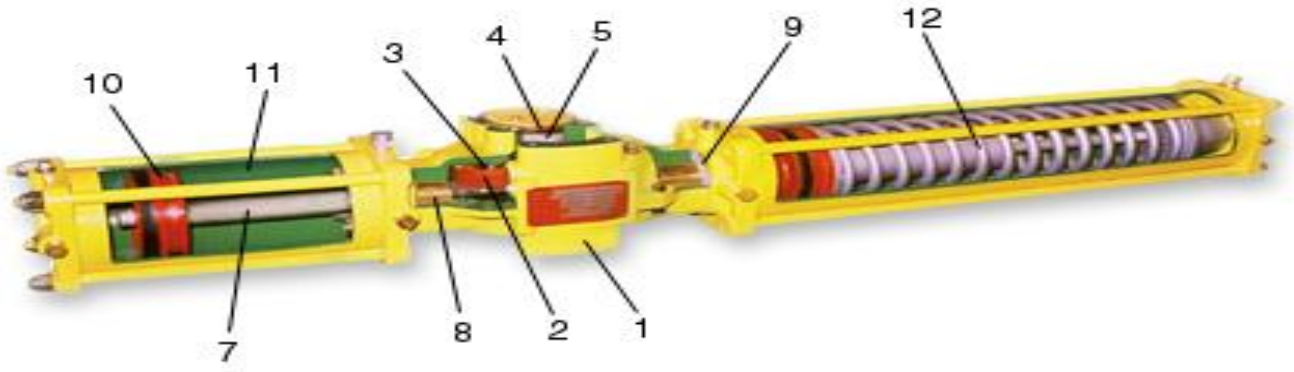
For shutdown valves the rotary actuator is used.

In that rotary action there is two type.

- Spring return
- Double acting



ROTARY ACTUATOR



MODULAR DESIGN

- This design has 3 parts.
- The first module is the center-body
- The second module is the power assembly
- The third is the spring assembly.

ROTARY ACTUATOR

1. **Body Assembly:** Heavy duty modular type body allows every actuator to be made spring return or double acting.
2. **Scotch-Yoke:** A balanced scotch-yoke mechanism provides optimum torque output and maintenance simplicity by transforming the linear travel of the piston into a 90 degree rotating movement.
3. **Thrust Pin & Roller:** A thrust pin is secured to the piston rod and rollers are placed over the pin to allow free movement within the slot of the torque plug.
4. **Torque Plug Seal:** O-rings are located both top and bottom preventing environments from entering the body housing.
5. **Yoke Bearings:** Located on both top and bottom of the scotch-yoke, these UHMW polyethylene replaceable bearings allow the actuator to cycle more than any actuator in its class and aid in applications where the actuators are left in one position for years.

ROTARY ACTUATOR

6. Stop Bolts with Jam Nuts: These bi-directional travel stops are an integral part of the actuator allowing 80 degree to 100 degree total travel adjustment. Internal travel stops are optional to prevent tampering.

7. Piston Rod: Instrument air directly touches the piston and in turn piston rod gets moved.

8. Rod Bearings: These are secured between the body and the cylinder adapter, or rod cover. The bearings are designed to minimize friction.

ROTARY ACTUATOR

9. Rod Seals: As the pressure increases, the loading is increased, maintaining an effective seal.

10. Piston: Instrument air directly touches the piston.

11. Cylinder: The piston and the piston rod is loaded inside the cylinder.

12. Spring: Each spring is self-contained and pre-loaded in the cylinder. This prevents any danger when the actuator is serviced and allows for field exchange of springs

MAST (MAXIMUM ALLOWABLE STEM TORQUE)

- What is MAST ?

  It is maximum allowable torque a stem of a quarter turn valve can be subjected to without mechanical failure. Engineering unit Nm OR lb-in

- Why MAST is important ?

  During valve operation, torque delivered by actuator (Pneumatic or electric) at any stage, should not exceed MAST value. If it happens stem may be subjected to mechanical failure.

- Who will provide MAST value ?

  This is valve manufactures responsibility to calculate and provide valve MAST during engineering stage and ensure torque delivered by actuator is always less than the valve MAST.

LIMIT SWITCH

The limit Switches are two types:

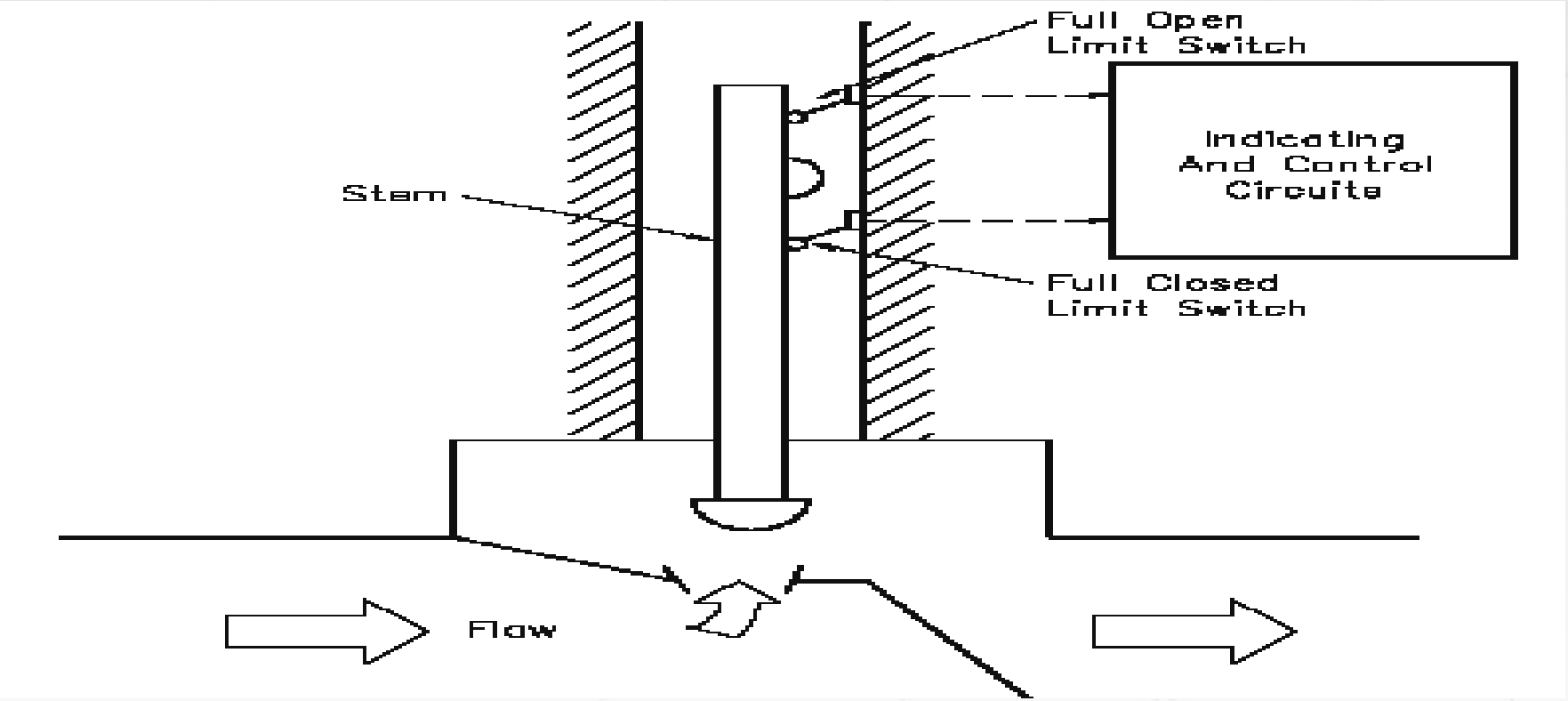
- Mechanical Limit switch
- Proximity Limit switch

Mechanical Limit Switches:

The Mechanical Limit Switch is a mechanical device which can be used to determine the physical position of the equipment. For Example an extension of valve shaft mechanically trips a limit switch as it moves from open to shut or shut to open. This limit switch gives ON / OFF output as corresponds to valve position.

- A mechanical limit switch interlocks a mechanical motion or position with an electrical circuit.
- Mechanical limit switches do have moving parts that eventually wear out. Also, they must actually touch targets for output.

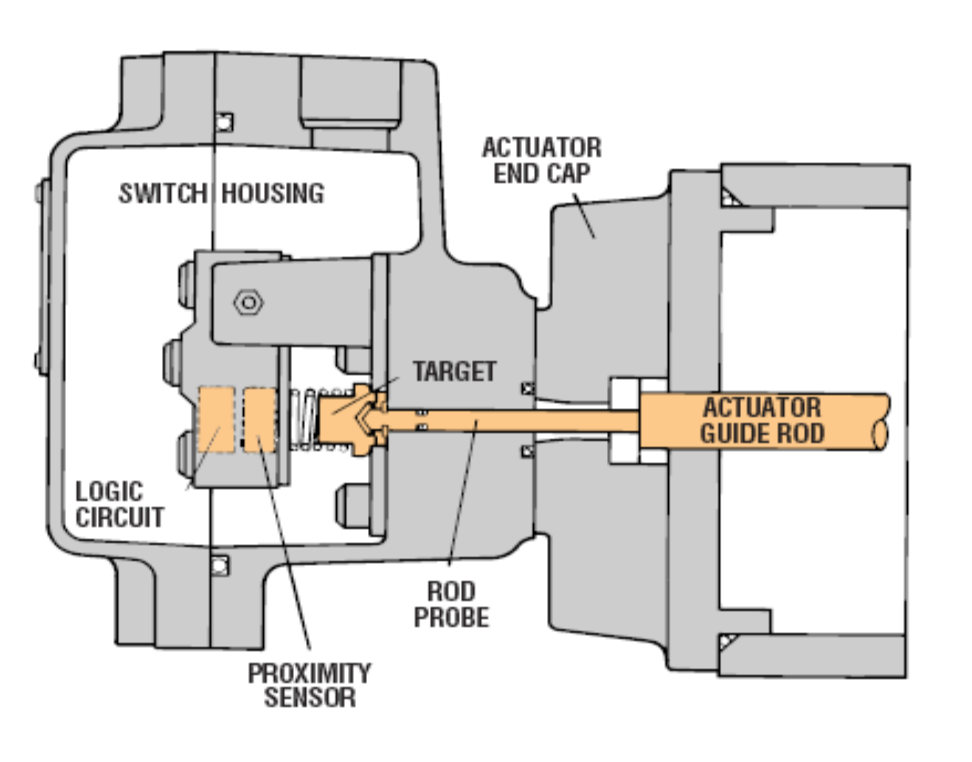
MECHANICAL LIMIT SWITCH

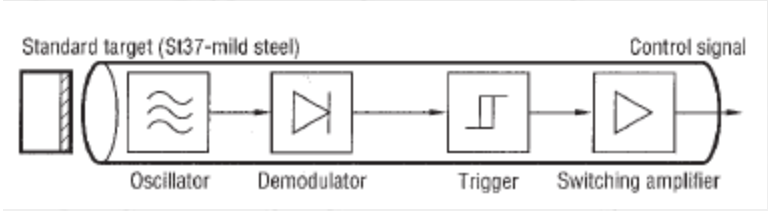


PROXIMITY LIMIT SWITCH

- The primary difference between a mechanical switch and a proximity switch is that in a mechanical switch, the actual switching mechanism has moving parts and metal contact points.
- In a proximity switch, nonphysical contact occurs between moving parts.
- They consist of an oscillator, demodulator, level and switching amplifier.
- Mode of operation: If a metal object enters the electromagnetic field of the oscillator coil, eddy currents are induced in this coil which change the amplitude of oscillation. The demodulator converts the change in the amplitude to a dc signal which causes the trigger stage to trip and the semi-conductor output stage to switch.
- The change in resistance is then sensed by a circuit and amplified, and the amplified signal triggers a transistor output for DC switches.

PROXIMITY LIMIT SWITCH





The Advantages Proximity Switch

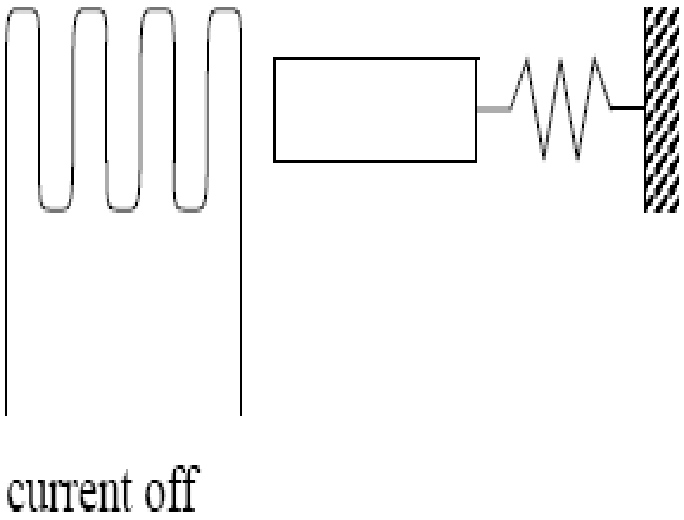
- Longer life cycle– Proximity switches have no moving parts to fail.
- Simultaneous tripping– There is an instantaneous switch reaction to a change in actuator position.
- No arc drawing– For “fire-safe” or hazardous environments, proximity switches offer the advantage of arc less switching. This eliminates the fire hazard inherent in mechanical switches. It also eliminates the possibility of a contact becoming welded in the closed position.
- No oxidation or corrosion– Since there are no contact points, pitting and corrosion do not occur.
- Extreme low current power transmission capability– The proximity switch requires very low current to operate. It can, therefore, be used with virtually any source of power, including photo cells

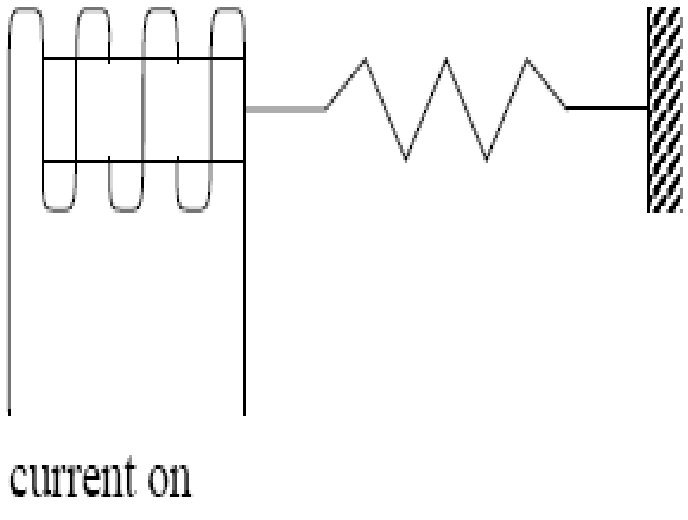
SOLENOID VALVES

Basic principle of solenoid valve:

- Solenoids are the most common actuator components.
- The basic principle of operation is there is a moving ferrous core (a piston) that will move inside wire coil as shown in Figure.
- Normally the piston is held outside the coil by a spring.
- When a voltage is applied to the coil and current flows, the coil builds up a magnetic field that attracts the piston and pulls it into the center of the coil.
- The piston can be used to supply a linear force.

SOLENOID VALVES





SOLENOID VALVES

Valve types are listed below.

In the standard terminology, the ’n-way’ designates the number of connections for inlets and outlets. In some cases there are redundant ports for exhausts. The normally open/closed designation indicates the valve condition when power is off. All of the valves listed are two position valves, but three position valves are also available.

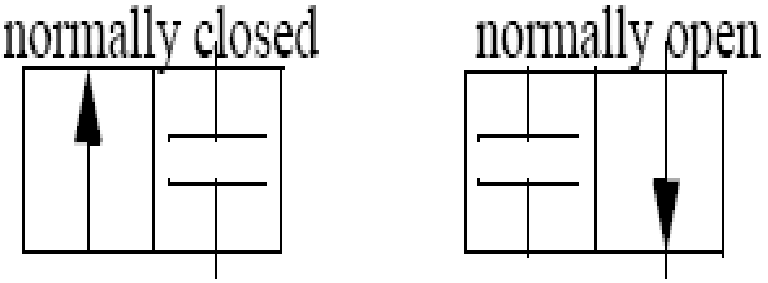
- 2-way normally closed - these have one inlet, and one outlet. When unenergized, the valve is closed. When energized, the valve will open, allowing flow. These are used to permit the flow.
- 2-way normally open - these have one inlet, and one outlet. When unenergized, the valve is open, allowing flow. When energized, the valve will close. These are used to stop flows. When system power is off, flow will be allowed.

SOLENOID VALVES

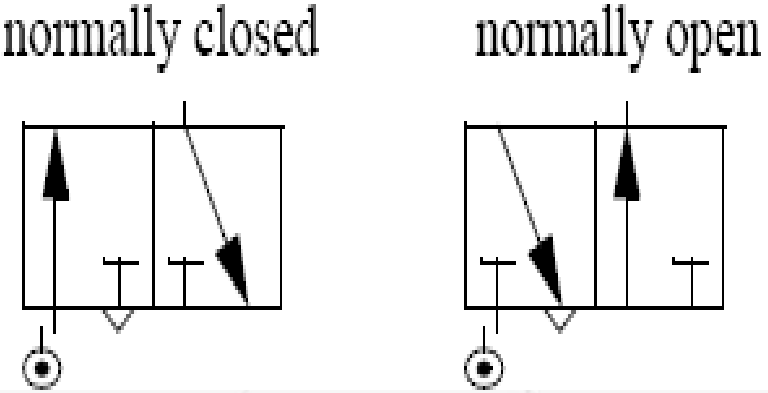
- 3-way normally closed - these have inlet, outlet, and exhaust ports. When unenergized, the outlet port is connected to the exhaust port. When energized, the inlet is connected to the outlet port. These are used for single acting cylinders.
- 3-way normally open - these have inlet, outlet and exhaust ports. When unenergized, the inlet is connected to the outlet. Energizing the valve connects the out-let to the exhaust. These are used for single acting cylinders
- 3-way universal - these have three ports. One of the ports acts as an inlet or outlet, and is connected to one of the other two, when energized/unenergized,. These can be used to divert flows, or select alternating sources. Some of the ISO symbols for valves are shown in Figure. When using the symbols in drawings the connections are shown for the unenergized state. The arrows show the flow paths in different positions. The small triangles indicate an exhaust port.

SOLENOID VALVES

Two way, two position



Three way, two position



PARTIAL STROKING

This is a widely used method to avoid sticking of a ball valve when it is not operated for some time.

PARTIAL-STROKE TEST METHODOLOGY

There are three basic types of partial-stroke test equipment:

- Mechanical limiting
- Position control
- Solenoids

Each type involves different levels of sophistication and risk.

MECHANICAL LIMITING

- Mechanical limiting methods involve the installation of a mechanical device to limit the degree of valve travel.
- The mechanical devices used for partial stroke testing include collars, valve jacks, and jammers.
- Valve collars are slotted pipes that are placed around the valve stem of a rising stem valve. The collar prevents the valve from traveling any farther than the top of the collar. Any fabrication shop can build a valve collar, suitable for test use.
- A valve jack is a screw that is turned until it reaches a set position.
- The valve jack limits the actuator movement to the screw set position.
- The valve jack is ordered from the valve manufacturer when the valve is purchased.
- Valve jacks work with both rising stem valves and rotary valves.

MECHANICAL LIMITING

- Mechanical jammers are integrated into the rotary valve design.
- They are essentially slotted rods that limit valve rotation when placed in position using an external key switch.
- Since the jammer is integrated into the rotary valve, the jammer must be purchased from a valve manufacturer.
- A contact can be provided for the key switch to allow annunciation in the control room whenever the key is used.
- Mechanical limiting methods are inexpensive in terms of capital and installation costs.
- These methods are manually initiated in the field and are manpower intensive.
- A limit switch or visual inspection is used to confirm valve movement.
- Successful implementation and return to normal operational status are completely procedure driven.

MECHANICAL LIMITING

- For valve collars and jacks, bypass notification to the control room is entirely procedural. For the jammer, automatic notification using the key switch contact can be provided.
- One of the biggest drawbacks to these methods is the lack of assurance that the valve is in or has been returned to normal status. There is no way to know for certain that the jack or jammer has been completely retracted without actuating the valve.
- Furthermore, unauthorized use of the valve jack or jammer cannot be determined by casual inspection.
- This means that the valve could potentially be out of service with operations personnel unaware of the situation.

POSITION CONTROL

- Position control uses a positioner to move the valve to a pre-determined point.
- This method can be used on rising stem and rotary valves.
- Since most emergency block valves are not installed with a positioner, this method does require installation of additional hardware.
- Positioner operation also requires an analog output which is typically not installed in SIS applications. Consequently, cost is a major drawback for the position control method.
- A limit switch or position transmitter can be used to determine and document the successful completion of the tests.
- If a smart positioner is used for the position control, a HART maintenance station can collect the test information and generate test documentation.
- Of course, the use of a smart positioner and maintenance station further increases the capital cost.

POSITION CONTROL

- Some vendors have promoted the use of the positioner in lieu of a solenoid for valve actuation. However, most positioners do not have a large enough vent port (Cv) for rapid valve closure. Consequently, a solenoid should still be used for valve actuation. This solenoid valve must be installed between the positioner and the actuator.

SOLENOID

- A partial-stroke test can be accomplished by pulsing a solenoid valve.
- The solenoid can be the same solenoid used for valve actuation, resulting in a low capital and installation costs for the method.
- If the actuation solenoid valve is used, this method will also test the solenoid valve functionality.
- The time of the pulse must be adjusted for each valve and solenoid pair to achieve the desired valve travel. Valve travel confirmation is accomplished by a limit switch or position transmitter, allowing automatic documentation of test status.
- Since a serious failure of the valve may result in more movement of the valve during the pulse than desired, the pulse timer should be voted with the limit switch or position transmitter.
- If the valve reaches its desired travel point before the pulse timer is finished, the solenoid valve should be reset.
- The test can be programmed in the SIS logic solver with the test being implemented automatically based on a programmed cycle time or initiated by the operator on a maintenance schedule.

ACCESSORIES

Quick Exhaust Valve:

- Quick exhaust valve can increase the reaction of actuator spring when valve is required to fail safe.
- This is achieved by releasing the exerting fluid inside the actuator into the open line, rather than back through the supply line which is more restrictive as it has to pass flow regulator valve and solenoid valve.

Bug Screen/Silencer/Dust Excluder:

This prevents bug or dust entering the pneumatic system from ports open to the atmosphere.

INTERNATIONAL STANDRADS

API – AMERICAN PETROLEUM INSTITUTE

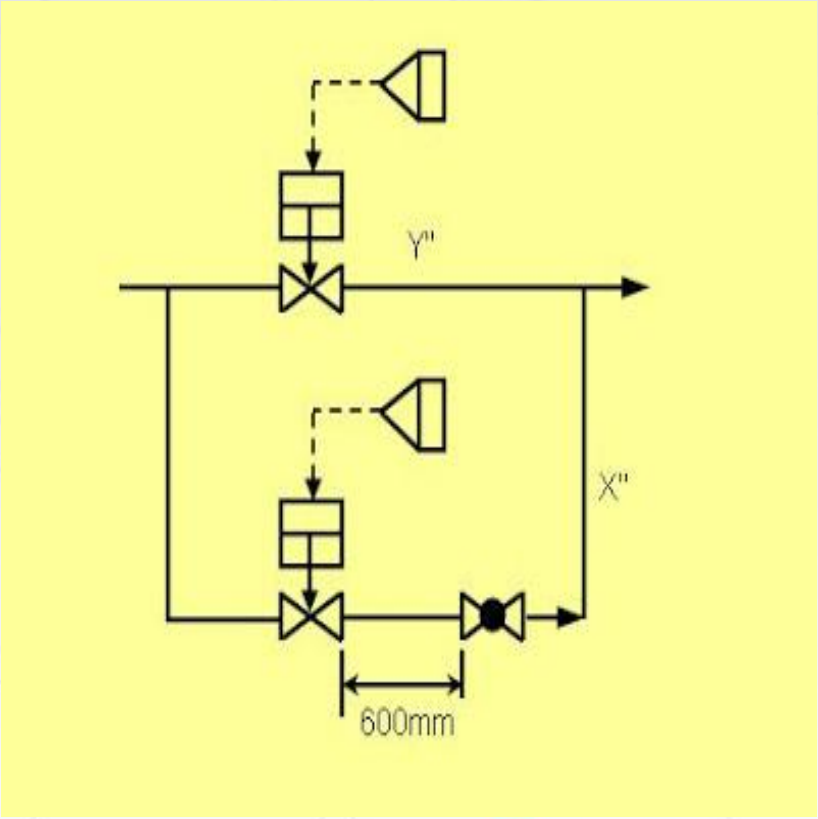
- API 6D – Pipeline Valves
- API 598 – Valve Inspection and test
- API 607 – Fire test for soft seated ball valves
- API 6FA – Fire Test Valves
- API 6D – Pipe Line Valves

ASME – AMERICAN SOCIETY OF MECHANICAL ENGINEERS

- B16.5 – Steel Pipe flanges and flanged fittings
- B16.10 – Face to Face and end to end dimension of valves
- B16.34 – Valves : Flanged, threaded and welding ends.

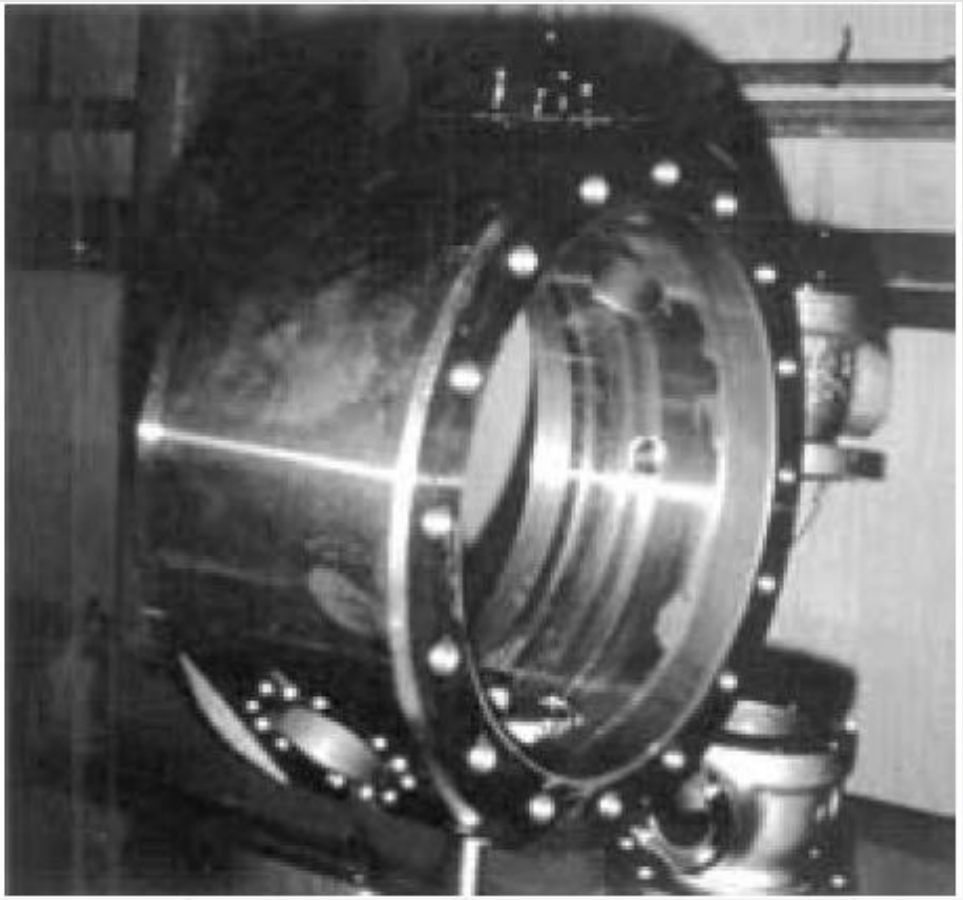
Requirements of SDV in Bypass Bypass Pressurization Line

- Bypass Pressurization Line.
- Shutdown Bypass Valve during Emergency
- Distance between Bypass Shutdown Valve and Throttling Valve
- Heat Tracing Downstream of Shutdown valve



ELECTROLESS NICKEL PLATING

- thickness uniformity, corrosion resistance and Wear resistance of deposits
- The coating also provides an excellent surface condition for ball plugs and improves the sealing at the seat areas



THANK YOU