2 Way /3 Way **Control Valve** With **Electrical Actuator** **1750SERIES**

2 Way / 3 Way High Gain And High Powered **Pneumatic Control Valves** **1760SERIES**

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| Courteously | Attentively | Respectably | Effectively |

SUDE

SUDE Offer **Pneumatic Diaphragm / Motorised Control Valve**

Index

Introduction

Sude offer Pneumatic / Motorised diaphragm control valve series 1762/1763/1752/1753 by combining high technology engineering, modern manufacturing techniques & stringent quality control procedures. A wide variety of trim options, combined with design flexibility will satisfy majority of critical and non-critical applications found throughout the process, power and oil industries.

Control valve is the combination of valve body, bonnet and actuator which controls the flowing media based on the Input signal or in short it dispenses, dissipate or distribute energy in a system.

The **common terminology** used for the control valve along with its selection features

SUDE

Actuator:

A pneumatic or electrically powered device that supplies force and motion to a Valve closure Member.

Air Set:

Also known as supply pressure regulator is a device used to reduce plant air supply to Valve Positioner and other control equipment. Common reduced air supply pressures are 20 and 35 psig.

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.

In case of Electrical Actuator - Stay put type

ANSI:

An abbreviation for the American National Standards Institute.

API:

An abbreviation for the American Petroleum Institute.

ASME:

An abbreviation for the American Society of Mechanical Engineers.

ASTM:

An abbreviation for the American Society for Testing and Materials.

Bench Set:

The proper definition for bench set is the inherent Diaphragm pressure range, which are the high and low values of pressure applied to the diaphragm to produce rated valve plug travel with atmospheric pressure in the valve body. This test is often performed on a work bench in the instrument shop prior to placing the valve into service and is thus known as Bench Set.

Bonnet:

The bonnet or bonnet assembly is that portion of the valve pressure retaining boundary which may guide the stem and contains the Packing box and Stem seal. The bonnet may be integral to the valve body or bolted or screwed. The bonnet, if it is detachable, will generally provide the opening to the valve body cavity for removal and replacement of the internal trim. The bonnet is generally the means by which the actuator is connected to the valve body.

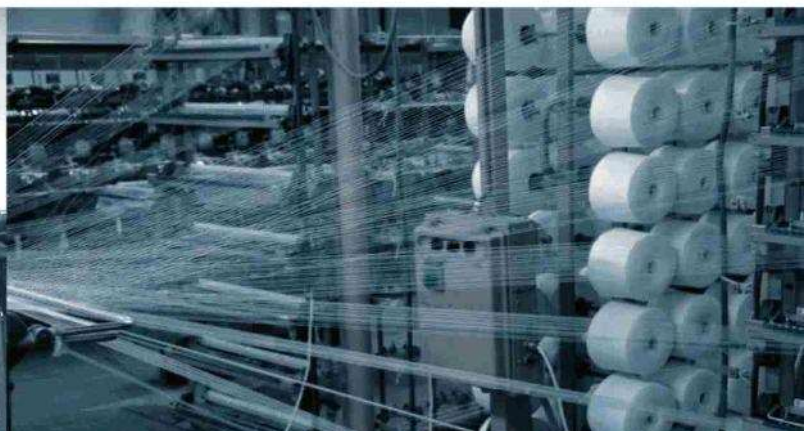
Bellow seal bonnet:

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

Extension Bonnet:

A bonnet with a packing box that is extended above the body to bonnet connection so as to maintain the temperature of the packing above (cryogenic service) or below (high-temp service) the temperature of the process fluid. The length of the extension depends on the amount of temperature differential that exists between the process fluid and the packing design temperature





Guide To **Bonnet Selection:**

Selection of the bonnet design is undertaken on the basis of both the operating temperature range and fluid media being handled. Table 2 below provides a general guide to the temperature limitations of various bonnet designs and packing materials available.

The Bellows Seal Bonnet option ensures absolute sealing of the process fluid within their rated pressure and temperature range. An auxiliary packing box in the upper bonnet serves as an emergency seal in the unlikely event of bellows failure. Table 1 shows a general guide when Bellows bonnet is used.

Valve Size		Travel		Maximum Working Pressure		Tempe-rature Range
Inch	mm	Inch	mm	psig	Barg	
1/2 - 2	15 - 50	1.1/8	28	740	51	-65° C
3 - 4	80 - 100	1.1/2	40	400	28	(-85°F)
6 - 8	150 - 200	2.1/4	57	345	24	427°C
10 - 12	250 - 300	3.1/2	89	300	21	(800°F)

Table 1 : Bellows Seals Working Conditions

Temperature Related Features:

The table 2 below gives a general guide to the limitations of various design features when associated with temperature.

Component	Temperature Range °C (°F)			
	-240 to -100 (-400 to -148)	-100 to -20 (-148 to 4)	-20 to 250 (4 to 482)	250 to 550 (482 to 1020)
Bonnet	Cryogenic	Normalising	Standard	Normalising
Packings	Tef	Tef	Tef	Graphite
Sealing Rings	Metalic or Resilient	Metalic of Resilient	Metalic or Resilent	Alloy 25

Table 2 : Temperature Related Features

Body:

The body of the valve is the main pressure boundary. It provides the pipe connecting ends and the fluid flow passageway. It can also support the seating surface and the valve Closure Member.

Booster:

A pneumatic relay that is used to reduce the time lag in pneumatic circuits by reproducing pneumatic signals with high-volume and or high-pressure output. These units may act as volume boosters or as amplifiers. It can provide the same stroking speed and can isolate the controller from the large capacitive load of the actuator.

Bubble Tight:

A commonly used term to describe the ability of a control valve to shut off completely against any pressure on any fluid. Unfortunately, it is completely unrealistic. Control valves are tested to ANSI B16.104 which is the American National Standard for Control Valve Seat Leakage. This standard uses six different classifications to describe the valves seat leakage capabilities.

Cavitations:

Occurs only in liquid service. In its simplest terms cavitations is the two-stage process of vaporization and condensation of a liquid. Vaporization is simply the boiling of a liquid, which is also known as flashing. In a control valve this vaporization takes place because the pressure of the liquid is lowered, instead of the more common occurrence where the temperature is 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. Cavitations can cause a Choked Flow condition to occur and can cause mechanical damage to valves and piping.

Choked Flow:

Also known as Critical flow. This condition exists when at a fixed upstream pressure the flow cannot be further increased by lowering the downstream pressure. This condition can occur in gas, steam, or liquid services. Fluids flow through a valve because of a difference in pressure between the inlet (PI) and outlet (P2) of the valve. This pressure difference (Delta-P) or pressure drop is essential to move the fluid. Flow is proportional to the square root of the pressure drop. Which means that the higher the pressure drop is the more fluid can be moved through the valve? If the inlet pressure to a valve remains constant, then the differential pressure can only be increased by lowering the outlet pressure. For gases and steam, which are compressible fluids, the maximum velocity of the fluid through the valve is limited by the velocity of the propagation of a pressure wave which travels at the speed of sound in the fluid. If the pressure drop is sufficiently high, 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 cavitations 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 on Gases and Steam service is that if the pressure drop across the valve equals or exceeds one half the absolute inlet pressures, then there is a good chance for a choked flow condition.

Example:

P1 100 psig
P2 25 psig

Delta P = 75

P1 (ABS)=100+14.7 or 114.7, 1/2 of 114.7=57.35
Actual pressure drop = 75
Choked Flow is probable.

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.

Co-efficient Flow:

A constant (Cv) that is used to predict the flow rate through a valve. It is related to the geometry of the valve at a given valve opening. See Cv for 2 way and 3 way valves

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 which tells a control valve what to do. 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 so as to bring the process variable to the desired set point.

Diaphragm:

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

Diaphragm Actuator:

Is a pressure-operated, spring-opposed diaphragm assembly which positions the valve stem in response to an input signal.

Diaphragm Pressure:

See Bench Set.

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:

Is one in which the actuator stem extends with an increase in diaphragm pressure.

Dual Seating:

A valve is said to have dual seating when it uses a resilient or composition material such as TFE or Buna-N, etc. for its primary seal and a metal-to-metal seat as a secondary seal. The idea is that the primary seal will provide tight shut-off Class VI and if it is damaged the secondary seal will backup the primary seal with Class IV shut-off.

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.

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 at 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.

End Connection:

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

Face-to-Face:

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.

In case of Electrical actuator - stay put type

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 fail closed, fail open or fail in place. For a spring-return operator to fail-in-place usually requires the use of a lock-up valve.

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.

Flashing:

Is the boiling or vaporizing of a liquid. See the definition of cavitations. When the vapor pressure downstream of a control valve is less than the upstream vapor pressure, part of the liquid changes to a vapor and remains as a vapor unless the downstream pressure recovers significantly, in which case cavitations 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.

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.

Hand wheel:

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

Hysteresis:

The difference between up-scale and down-scale results in instrument response when subjected to the same input approached from the opposite direction.

Example:

A control valve has a stroke of 1.0 inch and we give the valve a 9 psig signal. The valve travels 0.500 of an inch. We then give the valve a 12 psig signal, and the valve travels to 0.750 of an inch. When the valve is then given a 9 psig signal, the stroke is measured at 0.501. That represents hysteresis.

Hysteresis can be caused by a multitude of variables, packing friction, loose linkage, pressure drop, etc.

There are simply too many variables in the valve and the system to answer the question properly. The control valve only responds to the controller signal and will move to a position to satisfy the controller - thus negating the effects of hysteresis.

Installed Diaphragm Pressure:

The high and low values of pressure applied to the diaphragm to produce rated travel with stated conditions in the valve body. The "stated conditions" referred to here mean the actual pressure drops at operating conditions.

Example: A control valve may have an inherent Diaphragm pressure or Bench set of 8 to 15 psig. But when subjected to a 600 psig inlet pressure, it may start to open at 3 psig. and be full open at 15 psig. It is because of the forces acting on the valve plug and the direction of flow through the valve (FLOW-TO-OPEN or FLOW-TO-CLOSE) that the installed diaphragm pressure will differ from the inherent diaphragm pressure.

Instrument Pressure:

The output pressure from an automatic controller that is used to operate a control valve. It is the input signal to the valve.

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

I/P:

An abbreviation for current-to-pneumatic signal conversion. This term is commonly used to describe a type of transducer that converts an electric (4-20 mA) input signal to a pneumatic (3-15 psig.) output signal.

Lantern Ring:

A rigid spacer used in the packing with packing above and below it. The lantern ring is used to allow lubrication to the packing or allow access to a leak off connection. On some of the new fugitive emission packing systems, it also acts as a stem guide.

Lapped-In:

A term that describes a procedure for reducing the leakage rate on metal-to-metal seated valves and regulators. The plug and seat are lapped together with the aid of an abrasive compound in an effort to establish a better seating surface than would normally be achieved by means of machining.

Leakage Classification:

A term used to describe certain standardized testing procedures for control valves with a Flow coefficient greater then 0.1 (Cv). These procedures are outlined in ANSI Standard, 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.

Leak-Off:

A term used to describe a threaded connection located on the bonnet of a valve that allows for the detection of leakage of the process fluid past the packing area.

Lock-up Valve:

A special type of regulator that is installed between the valve positioner and the valve actuator, where it senses the supply air pressure. If that pressure falls below a certain level, it locks or traps the air loaded into the actuator causing the valve to fail in place.

Low Recovery Valve:

A valve design that dissipates a considerable amount of flow stream energy due to turbulence created by the contours of the flow path. Consequently, pressure downstream of the valve vena contracta recovers to a lesser percentage of its inlet value than a valve with a more streamlined flow path.

P1:

Is used to designate Inlet Pressure.

P2:

Is used to designate Outlet Pressure.

Packing:

A sealing system that normally consists of a deformable material such as Teflon, graphite, asbestos, 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 which surrounds the stem and contains the packing and other stem-sealing components.

Packing Follower:

A part that transfers a mechanical load to the packing from the packing flange or nut.

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 Diaphragm actuator.

Plug:

Port-Guided: A valve plug that fits inside the seat ring, which acts as a guide bushing. Examples: Splined Plug, Hollow Skirt, and the Feather-Guide Plug.

Position Switch:

A switch that is linked to the valve stem to detect a single, preset valve stem position. Example: Full open or full closed. The switch may be pneumatic, hydraulic or 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 feed back 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). *Refer Figure 1*

Figure 1

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. *Refer figure 2*

Part List

No.	Name of the Part	No.	Name of the Part
1	Yoke	29	Stem Couplings
2	Spring Tube Assembly	30	Stem Coupling Screw
3	Diaphragm Case Assembly	31	Stem Coupling Screw Nut
4	Travel Stdp Nuts	32	Cover Plate Screws
5	Lower Travel Stdp	33	Diaphragm Case Screws
6	Spring Adjusting Screw	34	Diaphragm Case Screw Nuts
7	Actuator Atem	35	Grab Screws
8	Spring Carrier	36	Body
9	Spring Thrust Bearing	37	Bonnet
10	Spring Adjuster	38	Seat
11	Cover Plate	39	Spline Plug
12	Spring Cover Plate	40	Plug
13	Diaphragm Coller	41	Plug Stem
14	Ciller Nut	42	Body Stud
15	Stem Guide	43	Body Stud Nut
16	Spring	44	Body Joint Ring
17	Travel Stop Tube	45	Lubricator Plug
18	Diaphragm Bottom Plate	46	Packing Washer
19	Diaphragm	47	Packing Ring
20	Cover Plate Joint	48	Latern Ring
21	Seal Box	49	Gland
22	Seal Box 'O' Rings	50	Gland Flange
23	Diaphragm Coller 'O' Ring	51	Plug Guide
24	Travel Indicator Plate	52	Plug Stem Pin
25	Travel Indicator Pointer	53	Gland Stud
26	Felt Wiper	54	Gland Stud Locknut
27	Wiper Retainer	55	Locking Ring
28	Yoke Screws		

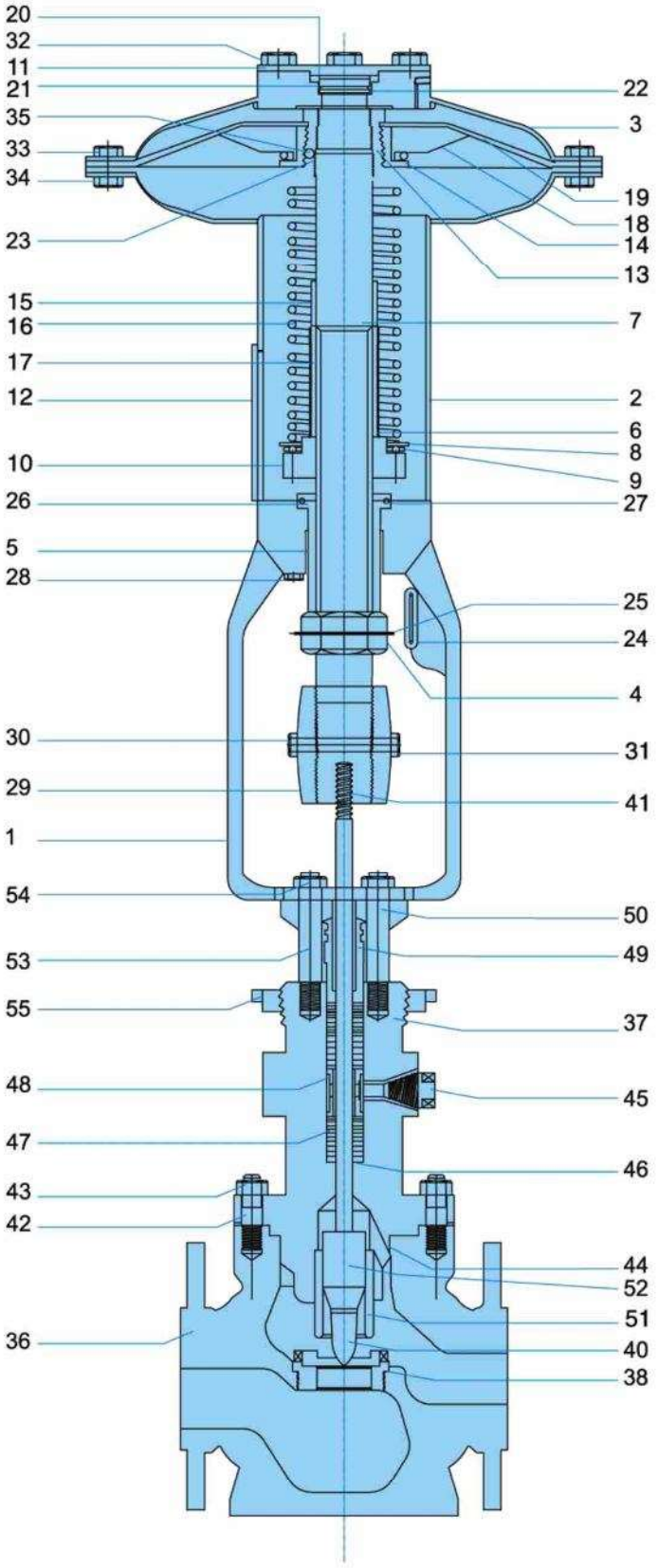


Figure : 2

Push-down-to-Open:

A term used to describe a linear or globe style valve that uses a reverse action plug and stem arrangement. The plug is located below the seat ring. When the plug is pushed down, the plug moves away from the seat, and the valve opens. *(Refer Figure 3)*

Part List

No.	Name of the Part	No.	Name of the Part
1	Yoke	29	Stem Couplings
2	Spring Tube Assembly	30	Stem Coupling Screw
3	Diaphragm Case Assembly	31	Stem Coupling Screw Nut
4	Travel Stdp Nuts	32	Cover Plate Screws
5	Lower Travel Stdp	33	Diaphragm Case Screws
6	Spring Adjusting Screw	34	Diaphragm Case Screw Nuts
7	Actuator Atem	35	Grab Screws
8	Spring Carrier	36	Body
9	Spring Thrust Bearing	37	Bonnet
10	Spring Adjuster	38	Seat
11	Cover Plate	39	Spline Plug
12	Spring Cover Plate	40	Plug
13	Diaphragm Coller	41	Plug Stem
14	Ciller Nut	42	Body Stud
15	Stem Guide	43	Body Stud Nut
16	Spring	44	Body Joint Ring
17	Travel Stop Tube	45	Lubricator Plug
18	Diaphragm Bottom Plate	46	Packing Washer
19	Diaphragm	47	Packing Ring
20	Cover Plate Joint	48	Latern Ring
21	Seal Box	49	Gland
22	Seal Box 'O' Rings	50	Gland Flange
23	Diaphragm Coller 'O' Ring	51	Plug Guide
24	Travel Indicator Plate	52	Plug Stem Pin
25	Travel Indicator Pointer	53	Gland Stud
26	Felt Wiper	54	Gland Stud Locknut
27	Wiper Retainer	55	Locking Ring
28	Yoke Screws		

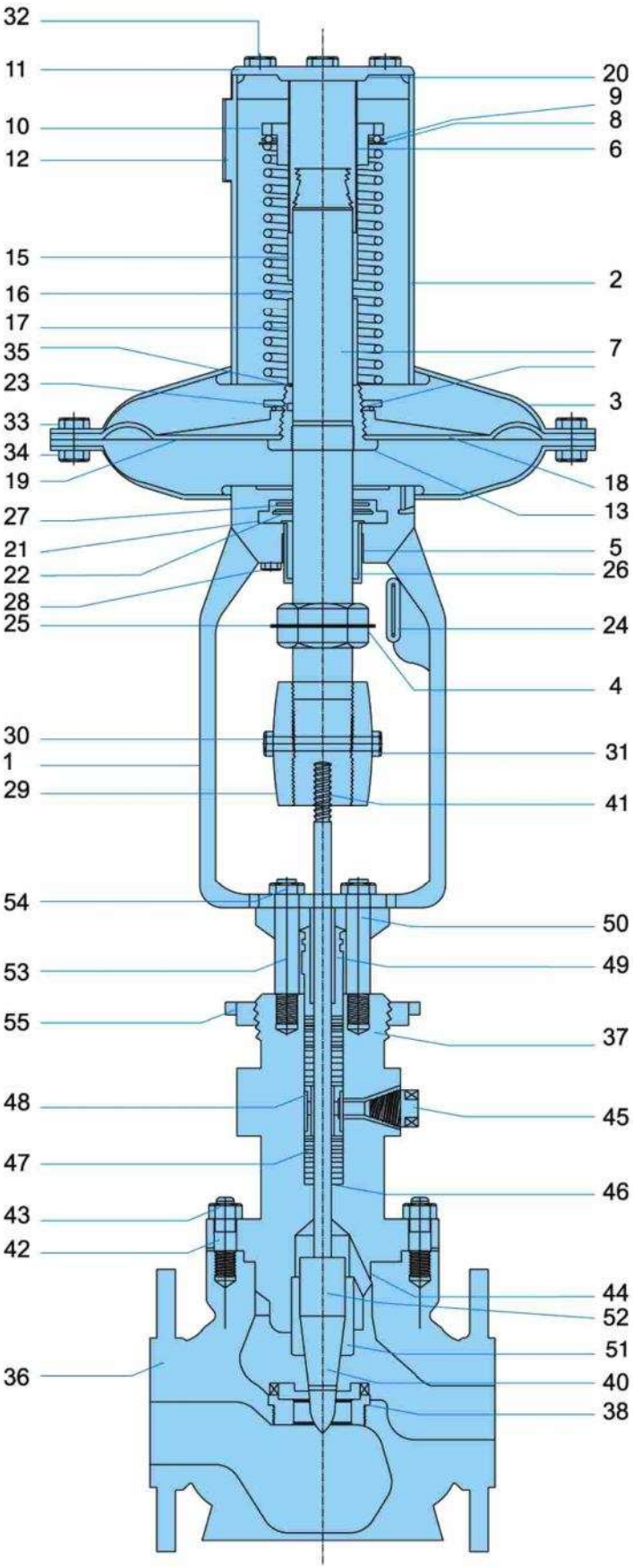


Figure : 3

Soft Seated:

A term used to describe valve trim with an elastomeric or plastic material used either in the valve plug or seat ring to provide tight shutoff with a minimal amount of actuator force. A soft seated valve will usually provide class VI seat leakage capability.

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.

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 an actuator must overcome.

Stellite:

Also called #6 Stellite or Alloy 6. A material used in valve trim known for its hardness, wear and corrosion resistance. Stellite is available as a casting, bar stock material and may be applied to a softer material such as 316 stainless steel by means of spray coating or welding.

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 Guide:

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

Supply Pressure:

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

Transducer: An element or device which receives information in the form of one quantity and coverts it to information in the form of the same or another quantity. (See I/P)

Turndown:

A term used to describe the ratio between the minimum and maximum flow conditions seen in a particular system. 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. This term is sometimes incorrectly applied to valves. See range ability.

Range ability:

The range over which a control valve can control. It is the ratio of the maximum to minimum controllable flow coefficients. This is also called turndown although technically it is not the same thing. There are two types of range ability - inherent and installed. Inherent range ability is a property of the valve alone and may be defined as the range of flow coefficients between which the gain of the valve does not deviate from a specified gain by some stated tolerance limit. Installed range ability is the range within which the deviation from a desired installed flow characteristic does not exceed some stated tolerance limit.

Reverse Acting:

This term has several deferent 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.

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.

Travel:

The distance the plug or stem moves in order to go from a full-closed to a full-open position, also called stroke.

Trim: Includes all the parts that are in flowing contact with the process fluid except the body, bonnet, and body flanges and gaskets. The plug, seats, stem, guides, bushings, and cage are some of the parts included in the term trim.

Reduced Trim:

Is an undersized orifice. Reduced or restricted capacity trim is used for several reasons. (1) It adapts a valve large enough to handle increased future flow requirement with trim capacity properly sized for present needs. (2) A valve with adequate structural strength can be selected and still retain reasonable travel vs. capacity relationships. (3) A valve with a large body using restricted trim can be used to reduce inlet and outlet fluid velocities. (4) It can eliminate the need for pipe reducers. (5) Errors in over sizing can be corrected by use of restricted capacity trim.

Balanced Trim:

A trim arrangement that tends to equalize the pressure above and below the valve plug to minimize the net static and dynamic fluid flow forces acting along the axis of the stem of a Globe valve.

Anti-Cavitations Trim:

A special trim used in control valves to stage the pressure drop through the valve, which will either prevent the cavitations from occurring or direct the bubbles that are formed to the center of the flow stream away from the valve body and trim. This is usually accomplished by causing the fluid to travel along a torturous path or through successively smaller orifices or a combination of both.

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 may also act to retain the seat ring in the valve body. On some types of valves, the cage may contain different shaped openings which act to characterize the flow through the valve. The cage may also act as a noise attenuation or anti cavitations device.

Cage Guided Valve:

A type of Globe style valve trim where the valve plugs with the seat.

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 in order 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 non-linearity in the control loop.

Inherent Flow Characteristic:

It is the relationship between valve capacity and valve travel and is 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 non-linearities in the control loop.

Equal Percentage, Linear & ON/OFF:

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, in case of linear the flow is directly proportional to the lift and finally on/off either the flow is fully on or fully closed.

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

Equal Percentage Characteristic:

We recommend that the trim be chosen that would be between 75 and 85 percent open at maximum flow conditions. However, should the trim size be selected on the normal flow conditions only then we recommend a trim be chosen that would be between 65 and 75 percent open.

If minimum flow condition is specified the selected trim should be checked with regard to being suitable to control this condition.

Cv Values					
Valve Size		Trim Size inch	Equal %	Linear	Quick Opening
inch	mm				
1	25	3/4	8.0	8.0	8.0
		1/2	5.0	5.0	5.0
		3/8	3.2	3.2	--
		1/4	2.0	2.0	--

Table: 3 High Friction (Solid only)

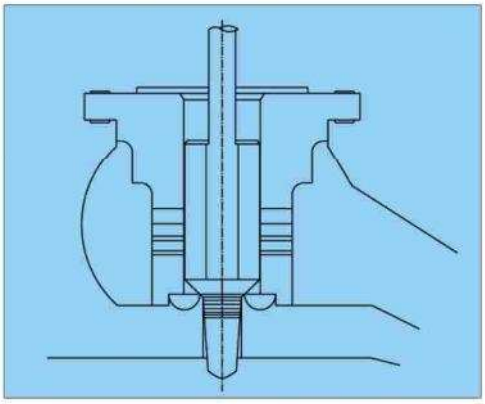


Figure 4

High Friction (Solid only), Refer Table 3

Where trim sizes are designated in inches this nominal size reference and does not signify any actual dimensions of the trim. In some case it may have a very approximate relationship to the seat bore this should never be assumed for calculation purposes. *(Refer Figure 4)*

Linear Characteristic:

We recommend that a trim be chosen which would be between 85 and 95 percent open at the maximum flow conditions, although the valve would control upto 100 percent open. This margin at the upper end allows for any contingency. However, should the trim size be selected on the normal flow conditions only then we recommend that a trim be chosen that would be between 75 and 85 percent open.

In short whenever we sized the valve even the climatic condition is also to be considered therefore the sizing is required to be considered at lift between 80 to 85 percent, the balance lift kept as a buffer for the climatic condition which will affect the flow characteristics. If a minimum flow condition is specified the selected trim should be checked with regard to being suitable to control this condition. Never have a modulating valve operating on minimum flow conditions below the maximum range ability levels stated as there will be a little or no control. If the flow condition can not be handled then two valves operating in parallel should be considered working on split range signal.

Cv Values			
Valve Size		Trim Size	Mod Equal %
in	mm		
1/2 3/4 1	15 20 25	No.a No.b No.c No.d No.e No.f No.g No.h No.i No.j No.k No.l No.m No.n No.o No.p	1.5 0.75 0.45 0.30 0.20 0.13 0.075 0.045 0.030 0.020 0.013 0.0075 0.0045 0.0030 0.0020 0.0013

Table: 4 Microspline plug, Refer figure 5

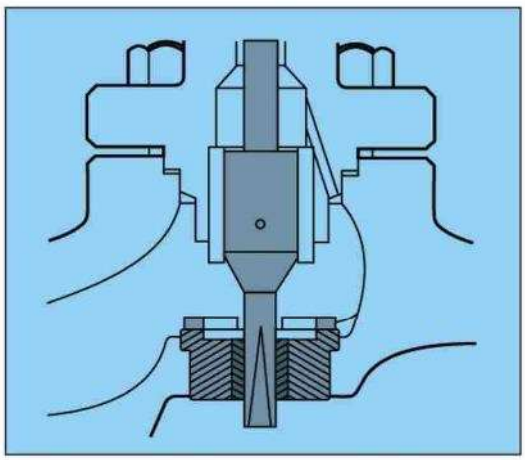
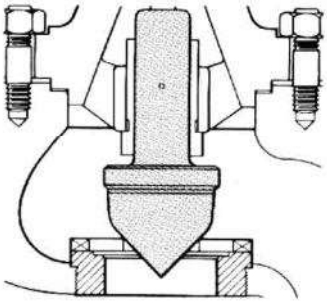


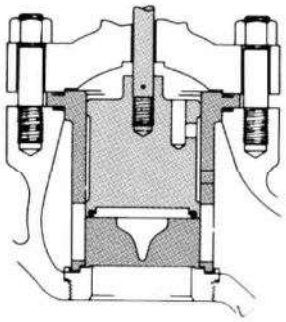
Figure : 5, Microspline trim

The pressure drop across the trim is split between the contoured nose and the clamped in characterized guide. Flow direction is under the plug, which incorporates a number of steps to help offset cavitations effects at low valve lifts.

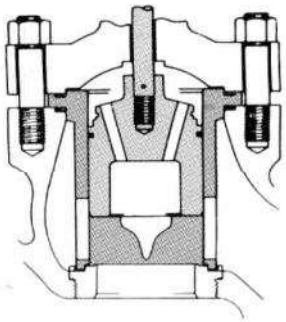
For arduous duty with extremely high pressure drops a protection sieve may be included around the trim guide. *(Refer figure 4)*



Contoured Trim
(Figure 6)



Ported Cage Trim
With unbalanced plug and resilient seating face option.
(Figure 7)



Ported Cage Trim with balanced plug and metallic piston Ring option. *(Figure 8)*

- **Trim Design Options:**

  Contoured, Microspline and Ported cage

- **Plug Options:**

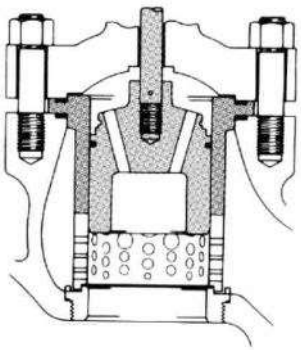
  Unbalanced with metal to metal or resilient seating face and balanced plug with metallic or resilient piston ring options.

Severe Duty :

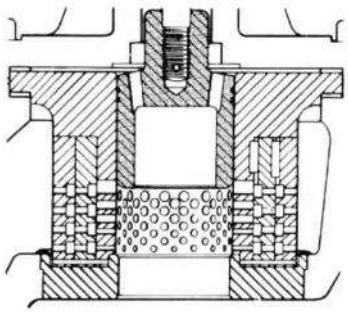
The High Friction 'HF' family of trim designs has been developed for high pressure drop applications to prevent the onset of cavitations and reduce the noise level generated as a result of both liquid and gas/vapor flow.

- Trim Design Options:

  HF, HFD & HFT



High Friction HF trim with balanced Plug and metallic piston Ring option.
(Figure 9)



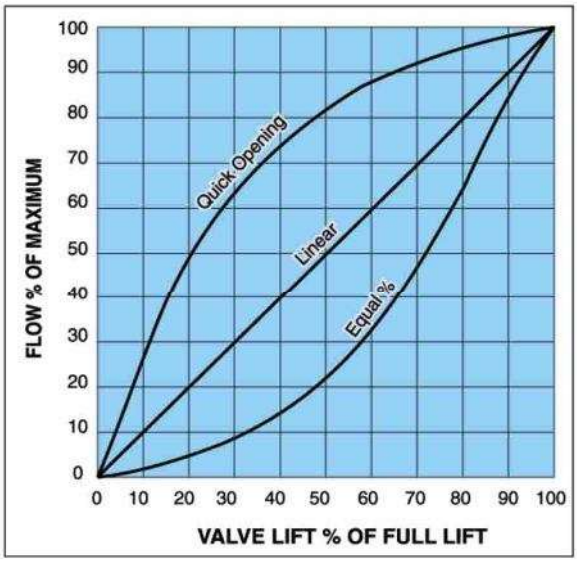
High Friction HFT trim with balanced plug and metallic piston Ring option.
(Figure 10)

Inherent Range ability :

The inherent range ability of a control valve is the ratio between maximum and minimum flow within the working characteristic at constant pressure drop.

Inherent Flow Characteristics

The inherent flow characteristic of a control valve is the relationship between the flow and the valve travel at constant pressure drop. As with all caged multi hole trims the actual characteristic may vary slightly from the true curve



Inherent Flow Characteristic Curves *(Figure 11)*

Definitions:

- Linear

  Flow is directly proportional to valve lift.

- Equal %

  Flow changes by a constant percentage of its instantaneous value for each unit of Valve lift.

- Quick Opening

  Flow increases rapidly with initial travel reaching near its maximum at a low lift.

Guide To Trim Options Available

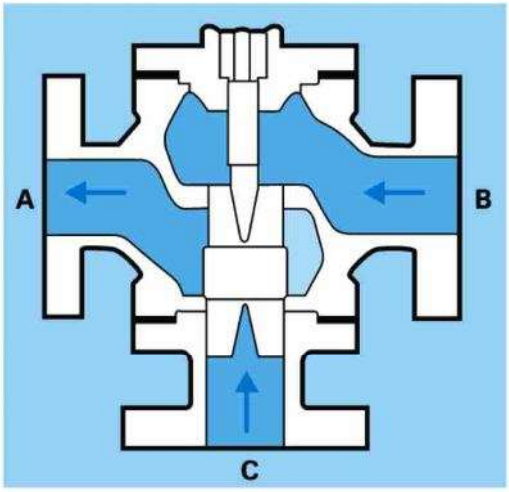
Standard Duty

The Contoured and Ported cage design are the standard trim option available, being suitable for modulating or on/off applications, satisfying a large percentage of process requirements.

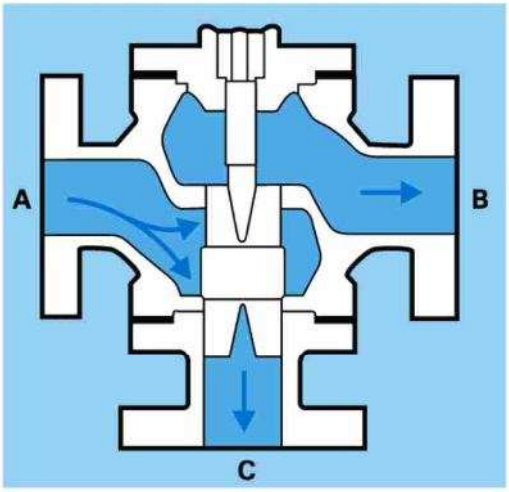
1 inch Trim with soft face plug Cv = 11.0

Cv Values					
Valve Size		Trim Size inch	Equal %	Linear	Quick Opening
inch	mm				
1/2	15	1/16	0.040	0.040	-
		1/8	0.63	0.63	-
		3/16	1.2	1.2	-
		1/4	2.0	2.0	-
		3/8	3.2	3.2	-
		1/2	5.0	5.0	5.0
3/4	20	1/16	0.040	0.040	-
		1/8	0.63	0.63	-
		3/16	1.2	1.2	-
		1/4	2.0	2.0	-
		3/8	3.2	3.2	-
		1/2	5.0	5.0	5.0
		3/4	8.0	8.0	8.0
1	25	1/16	0.040	0.040	-
		1/8	0.63	0.63	-
		3/16	1.2	1.2	-
		1/4	2.0	2.0	-
		3/8	3.2	3.2	-
		1/2	5.0	5.0	5.0
		3/4	8.0	8.0	8.0
		1	13.5*	13.5*	13.5*

Contoured (Table 5)



Mixing Service *(Figure 12)*



Diverting Service Selected Applications *(Figure 13)*

Inherent Range ability

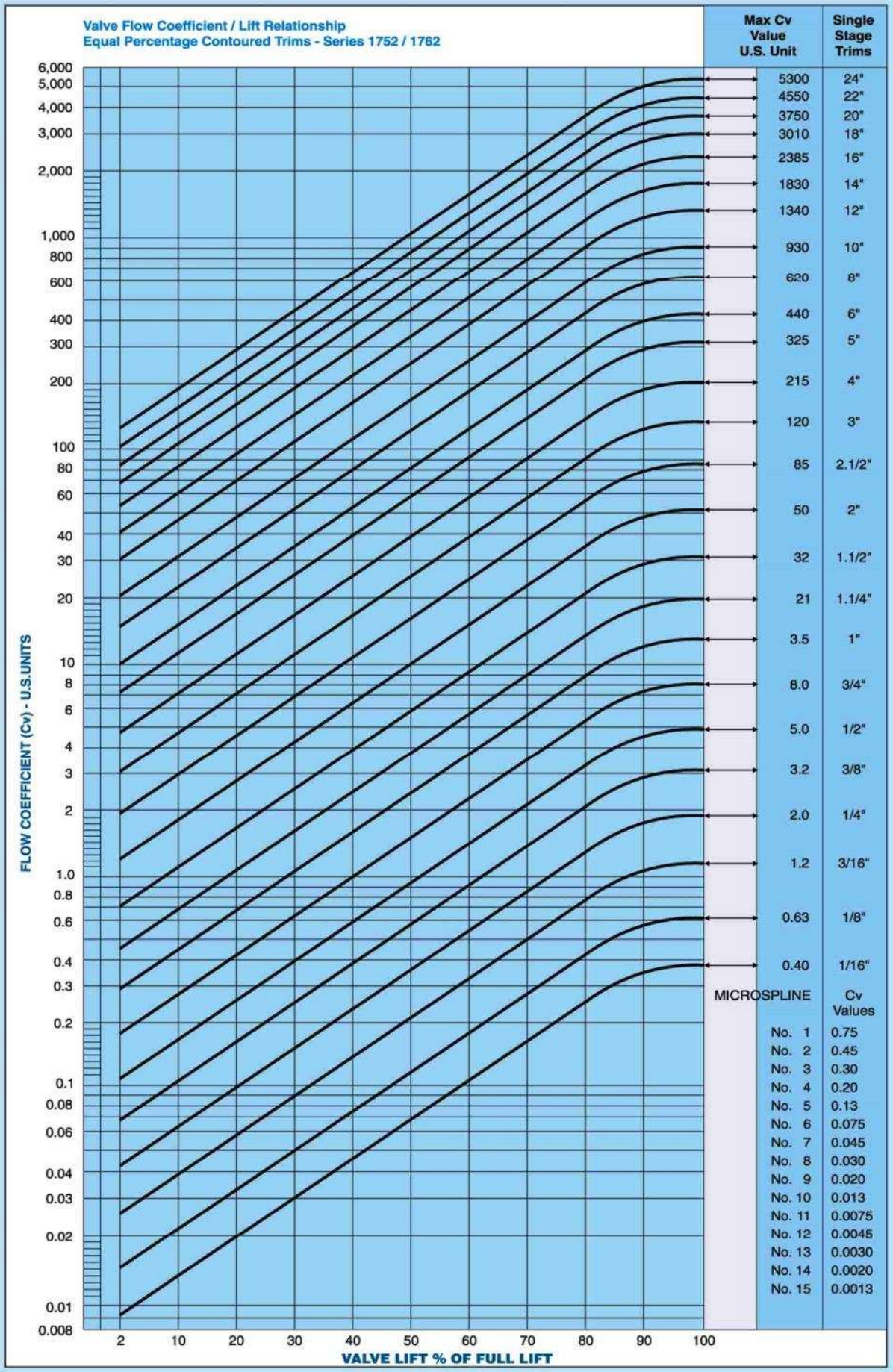
The inherent range ability of a control valve is the ratio between the maximum and minimum flow within the working characteristic at constant pressure drop. The range ability of plugs is given in Table 6.

Range ability of Series 1753 / 1763 Three Way Valves

TRIM SIZE	RANGEABILITY
1/4" - 3/4"	33:1
1" - 3"	48:1
4" - 12"	65:1

(Table 6)

Valve Flow Coefficient / Lift Relationship



Plug Options:

Unbalanced with metal to metal or resilient seating face and balanced plug with metallic or resilient piston ring options

Valve Size **Inch** *(mm)*	Trim Size Inch	Contoured Equal % / Linear	Quick Open	Ported	HF		HFD		HFT	
					Equal %	Linear	Equal %	Linear	Equal %	Linear
1.1/2	1.1/2	28	32	28	*	*	*	*	*	*
	1.1/4	21	23	21	23	23	*	*	*	*
(40)	1	13.5	13.5	13.5	15	15	10	10	8	8
	3/4	8	8	8	8	8	*	*	*	*
2	2	50	55	50	*	*	*	*	*	*
	1.3/4	*	*	*	44	44	*	*	*	*
	1.1/2	28	32	28	35	35	24	24	20	20
(50)	1.1/4	21	23	21	23	23	16	16	*	*
	1	13.5	13.5	13.5	15	15	10	10	8	8
3	3	120	130	105	*	*	*	*	*	*
	2.1/2	85	92	85	92	92	*	*	*	*
	2	50	55	50	55	55	38	38	32	32
(80)	1.3/4	*	*	*	44	44	*	*	*	*
	1.1/2	28	32	28	35	35	24	24	20	20
4	4	185	215	170	170	170	*	*	*	*
	3.1/2	*	*	*	145	145	*	*	*	*
	3	120	130	120	130	130	95	95	*	*
(100)	2.1/2	85	92	85	92	92	65	65	*	*
	2	50	55	50	55	55	38	38	32	32
6	6	440	470	375	380	380	*	*	*	*
	5	325	335	300	320	320	*	*	*	*
	4	185	215	185	235	235	140	155	*	*
(150)	3.1/2	*	*	*	170	170	*	*	*	*
	3	120	130	120	130	130	95	95	75	75
8	8	620	740	550	*	*	*	*	*	*
	6	440	470	420	460	460	*	*	*	*
(200)	5	325	335	300	360	360	225	225	*	*
	4	185	215	185	235	235	140	155	136	136
10	10	930	1140	930	*	*	*	*	*	*
	9	-	*	*	790	890	*	*	*	*
	8	620	740	620	680	740	520	560	*	*
(250)	6	440	470	420	480	480	320	330	*	*
	5	325	335	300	360	360	225	225	208	208
12	12	1340	1640	1300	*	*	*	*	*	*
	11	-	*	*	1070	1150	*	*	*	*
	10	930	1140	930	1020	1140	*	*	*	*
(300)	8	620	740	620	680	740	520	560	393	427
	6	440	470	420	490	490	320	330	270	280
14	14	1830	2230	1550	*	*	*	*	*	*
	12	1340	1*640	1340	1280	1375	1075	1160	*	*
	11	*	*	*	1120	1200	*	*	*	*
(350)	10	930	1140	930	1020	1140	820	890	590	658
	8	620	740	620	680	740	520	560	393	427
16	16	2385	2920	2040	*	*	*	*	*	*
	14	1830	2230	1830	1690	1800	1450	1520	*	*
	12	1340	1640	1340	1500	1600	1075	1160	877	947
(400)	11	*	*	*	1150	1230	*	*	*	*
	10	930	1140	930	1020	1140	820	890	590	658

Table : 7

Velocity Limitations

In selecting a valve for either a liquid or gas/vapor application one of the major considerations is the effect of fluid velocity. High velocity could lead to operational problems including erosion, excessive vibration and instability. The following tables indicate the maximum recommended velocity values for liquid and gas/vapor service,. Refer figure 8 & 9.

Recommended Maximum Velocities for Liquid Service (Table 8)

Valve Size		Trim	Maximum Velocity			
			Carbon Steel		Alloy Steel	
inch	mm		ft/s	m/s	ft/s	m/s
1/2 - 2	15 - 50	Contoured/	41	12.5	46	14
3 - 6	80 - 150	Microspline	34	10.4	34	10.4
8 - 12	200 - 300		29	8.9	29	8.9
All Sizes		HF Range	43	13.1	52	15.8

Recommended Maximum Velocities for Gas/Vapour Services in Carbon and Alloy Steel valves (Table 9)

Valve Size		Trim	Maximum Inlet Velocity		Maximum Outlet Velocity		Maximum Outlet Mach No.
inch	mm		ft/s	m/s	ft/s	m/s	
1/2 - 2	15 - 50	Contoured/	340	104	830	253	0.65
3 - 6	80 - 150	Microspline	295	90			
8 - 12	200 - 300		265	81			
All Sizes		HF Range	475	144			

Series 1752 / 1763 Cv Values. (Table 10)

Valve Size in	mm	Trim size in	Cv Values Linear 'V' Port
1/2	15	1/2 3/8 1/4	5.0 3.2 2.0
3/4	20	3/4	8.0
1	25	1	11.0
1.1/2	40	1.1/2 1.1/4	28 17
2	50	2 1.1./2	42 28
3	80	3 2.1/2	105 70
4	100	4 3	170 105
6	150	6 5	375 275
8	200	8 6	605 405
10	250	10 8	880 605
12	300	12 10	1260 880

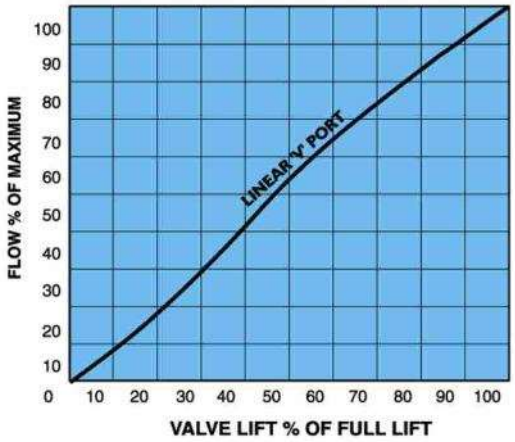
Plug Options :

Unbalanced with metal to metal or resilient seating face and balanced plug with metallic or resilient piston ring options

Plug Characteristic :

The inherent flow characteristic of the control valve is the relationship between the flow and lift of the plug at a constant pressure drop.

The characteristic of the linear 'V' port plug heads is shown in (Fig. 14)



Lift Characteristic linear 'V' port *(Figure 14)*

PERFORMANCE FEATURES :

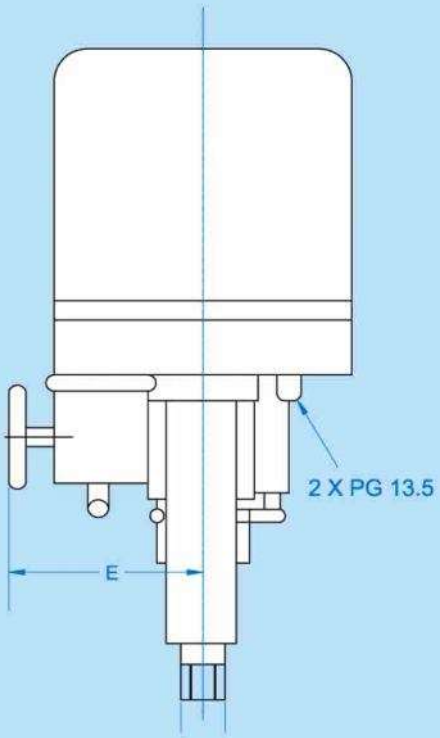
- High flow capacity.
- Tight shut-off.
- High range ability.
- Equal percentage, linear and quick open flow characteristics.
- Streamlined flow passages.
- Reliable operation.
- Suitable for high pressure drop and other critical application.

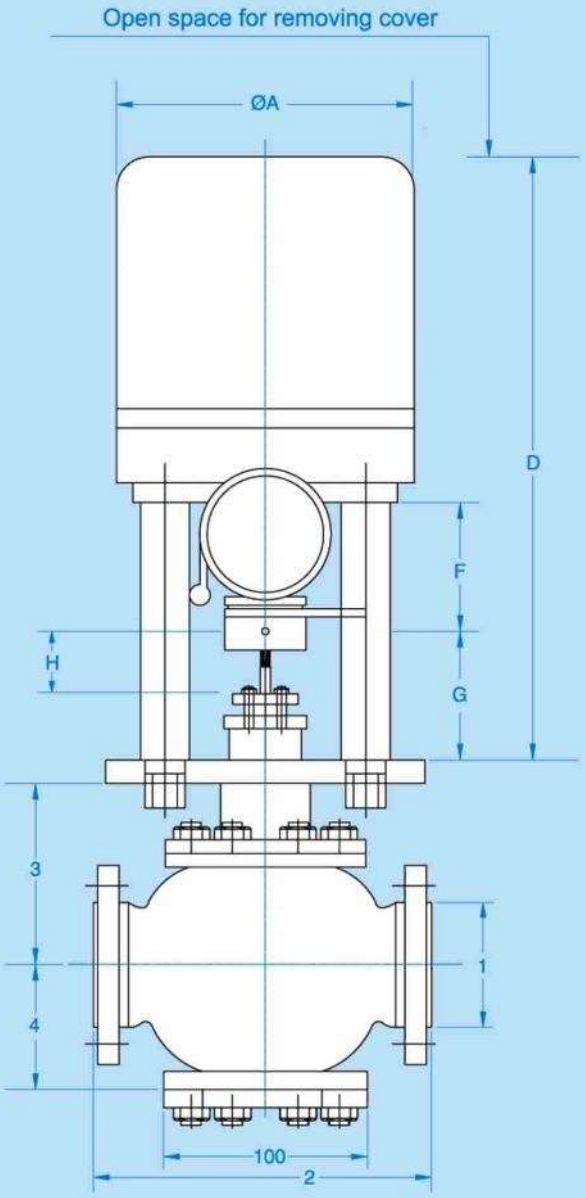
DESIGN FEATURES :

- Wide range of body sizes, ½" 16" (15 400 mm).
- ANSI rating of 150 to 2500 (PN 20 PN 420).
- End connection to suit any pipe work configuration as per standards.
- Full range of body & trim material options based on the flowing media.
- Wide variety of interchangeable trim including low noise and anti-cavitations trim, to handle large range of process parameters.
- Range of supplementary noise control options.
- All internals removable from top for ease of maintenance.
- Constructed with heavy duty parts for longer life.
- Various pneumatic diaphragm or cylinder actuator options available along with accessories.

Engineering Data / Series 1752 / 1753 / 1762 / 1763

Valve Sizes	:	½" to 16" (15 400 mm)
End Connection	:	ANSI, DIN and BS flanged RF, FF, RTJ Butt weld, Socket, and Screwed.
Body Ratings	:	ANSI 150 to ANSI 2500 (PN20 to PN420) DIN/BS 4504 PN 10 to PN 400
Design Standard	:	ANSI B 16.34
Trim Design Options	:	Full and reduced Contoured, Microspline, Ported cage, HF, HFD, and HFT
Plug Design Options	:	Unbalanced with metal/metal or resilient seating, Balanced with metallic or resilient seal rings.
Inherent Characteristics	:	Equal percentage, Linear or Quick Open.
Material Combinations	:	A wide range of body/bonnet and trim materials are available.
Bonnet Options	:	Standard, Normalising, Bellows Seal and Cryogenic bonnet design options available.
Actuator	:	Spring opposed pneumatic diaphragm (field reversible direct/reverse action) as standard. Manually operated, pneumatic cylinder available on request.
Type of valve	:	2 way [normally closed / normally opened] 3 way [3 way mixing / 3 way diverting]
Accessories	:	Valve positioner, Air set, Limit Switches, I/P converter, Air Lock, Volume booster, Solenoid valves and Position transmitter Manual hand wheel.

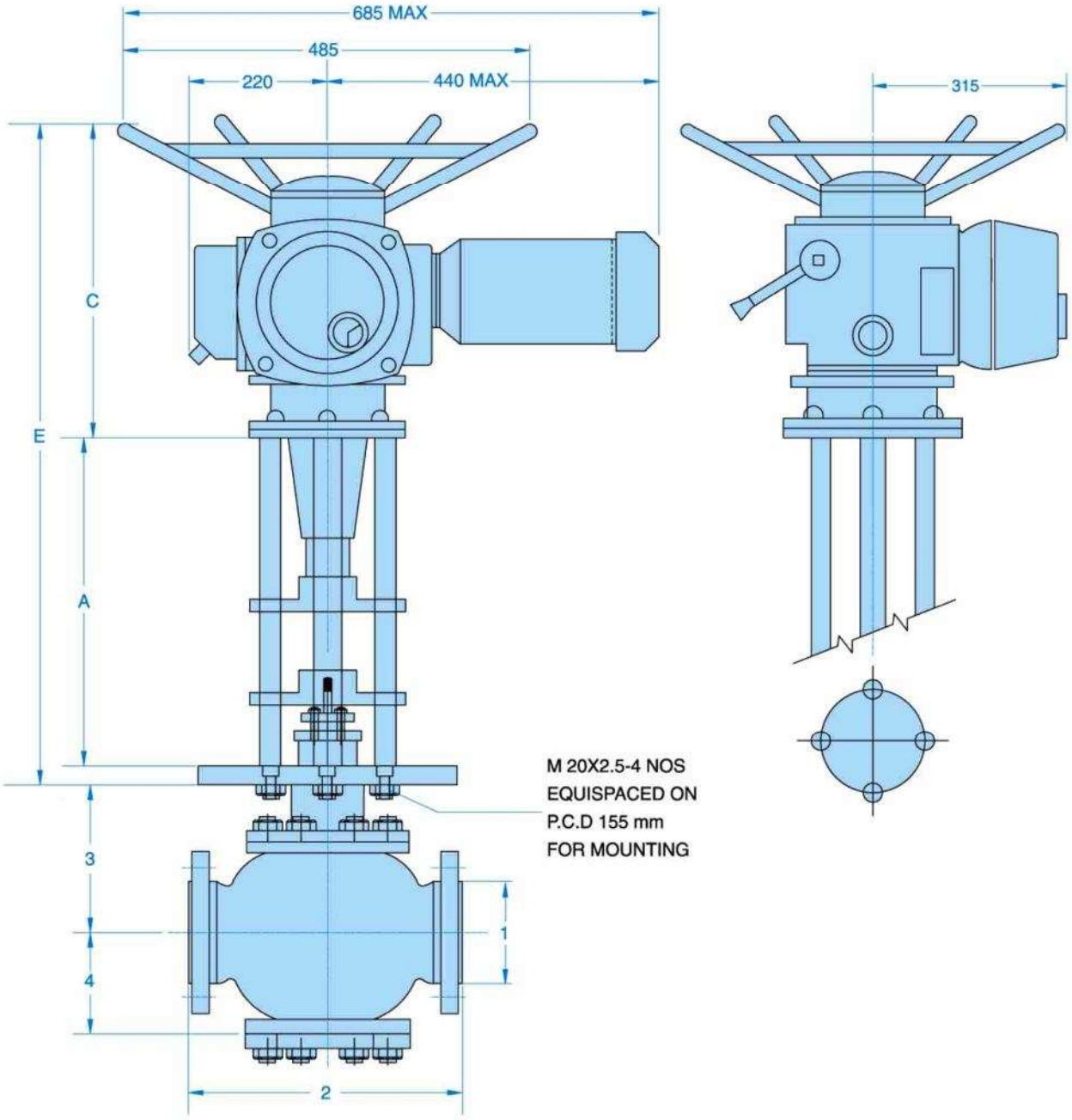




Model No.	Size in mm	Face to Face mm			Height From Centre Line			Centre Line to Base	Stem Travel	ØA	C	D	E	F	G	H	Approx. Weight in Kg.	Operating Speed in mm/sec.
		ANSI 150 IS/NP 10.16 BSIO-D.E.	ANSI 300 IS/NP 25.40 BSIO-F.H.J.	ANSI 600 IS/NP 64.100 BSIO-K.R.														
	1	2			3			4										
					S	N	B	(MAX)										
1752/15/200	15	184	190	203	140	222	324	67	28	165	160	445	100	115	130	40/60	29.5	0.26-0.52
1752/20/200	20	184	194	206	140	222	324	67	28	165	160	445	100	115	130	40/60	33.5	0.26-0.52
1752/25/200	25	184	197	210	140	222	324	67	28	165	160	445	100	115	130	40/60	37.5	0.26-0.52
1752/40/200	40	223	235	251	159	292	353	83	28	165	160	445	100	115	130	40/60	38.5	0.26-0.52
1752/50/200	50	254	267	286	168	298	362	86	28	165	160	445	100	115	130	40/60	40.5	0.26-0.52
1752/80/200	80	299	318	337	206	327	467	111	38	165	160	445	100	115	130	40/60	75.5	0.26-0.52
1752/100/600	100	352	368	394	206	357	467	146	38	210	200	495	133	115	130	60/75	106.5	0.8-0.45
1752/150/600	150	451	473	508	276	391	676	171	57	210	200	495	133	115	130	60/75	161.5	0.8-0.45

S=Standard Bonnet, N=Normalising Bonnet, B=Bellow Seal Bonnet.

The Company Reserve the right to confirm the dimensions on certified drawing.

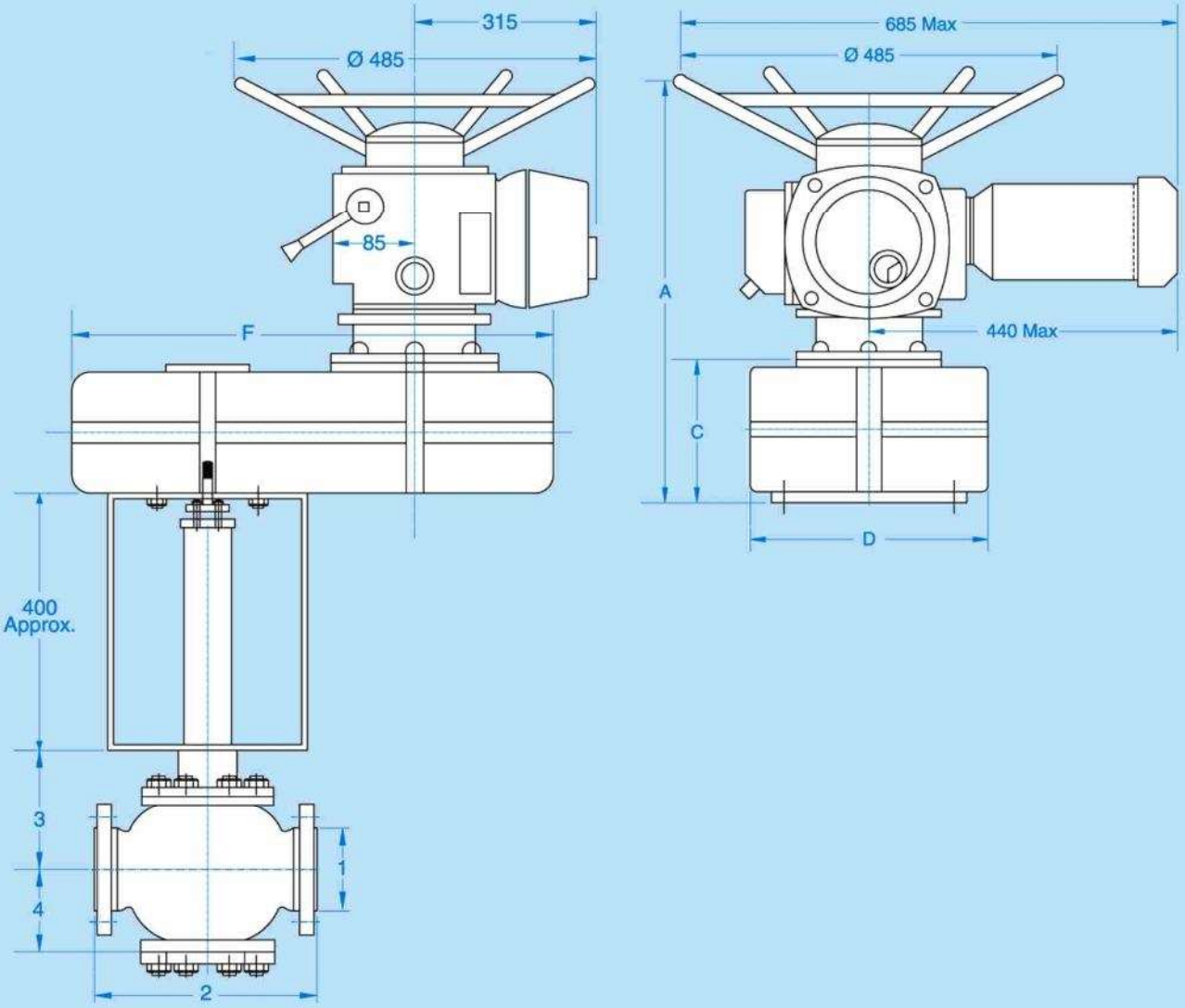


Model No.	Size in mm	Face to Face mm			Height From Centre Line			Centre Line to Base	Stem Travel	A	C	E	Approx. Weight in Kg.	Operating Speed in mm/sec.
	1	ANSI 150 IS/NP 10.16 BSIO-D.E.	ANSI 300 IS/NP 25.40 BSIO-F.H.J.	ANSI 600 IS/NP 64.100 BSIO-K.R.	3			4						
		2			S	N	B	(MAX)						
1752/200/6000/3000	200	543	568	610	610	292	435	203	57	400	340	790	376	1.0-36.5
1752/250/6000/4000	250	673	690	708	390	632	921	238	89	425	448	923	384	1.0-12.0

S=Standard Bonnet, N=Normalising Bonnet, B=Bellow Seal Bonnet.

The Company Reserve the right to confirm the dimensions on certified drawing.

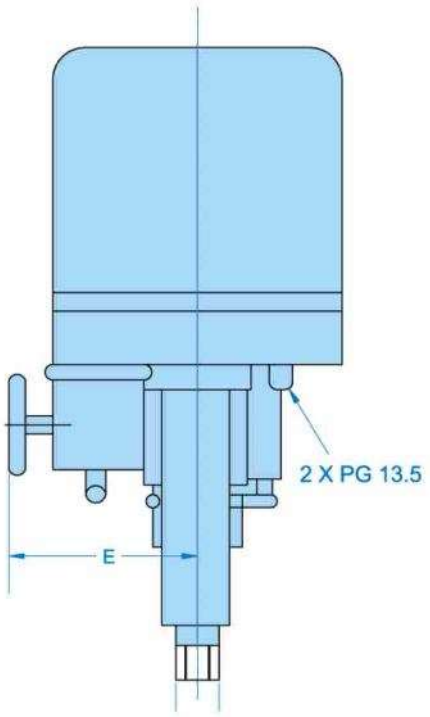
2 Way Valve With Three Phase Multi Turn Actuator SUDE | **CV**1750

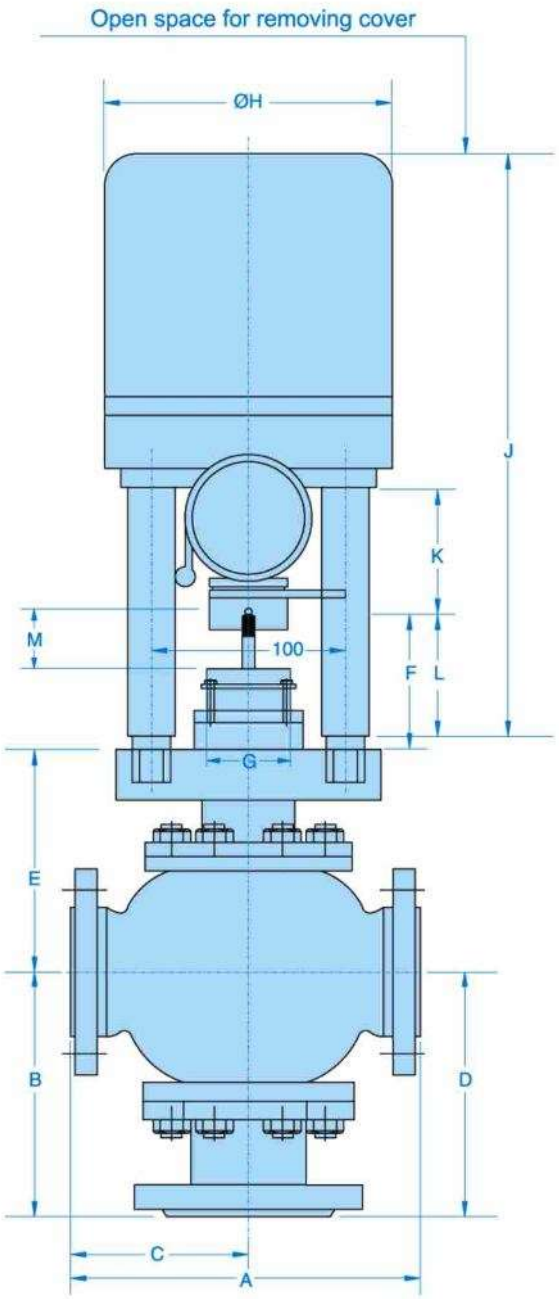


Model No.	Size in mm	Face to Face mm			Height From Centre Line			Centre Line to Base	Stem Travel	A	C	D	F	Approx. Weight in Kg.	Operating Speed in mm/sec.	
		ANSI 150 IS/NP 10.16 BSIO-D.E.	ANSI 300 IS/NP 25.40 BSIO-F.H.J.	ANSI 600 IS/NP 64.100 BSIO-K.R.											O/P Speed of Basic Actuator	Effective O/P Speed with SG
	1		2			3		4								
					S	N	B	(MAX)								
1752/300/30000/20SG04	300	737	775	819	390	673	-	251	89	670	142	258	530	519	10-20	2.5-30
1752/350/30000/20SG08	350	890	927	972	490	822	-	292	89	695	165	380	604	639	10-120	1.25-15
1752/400/30000/20SG12	400	1016	1057	1108	622	927	-	352	100	615	615	490	720	754	10-120	0.8-10

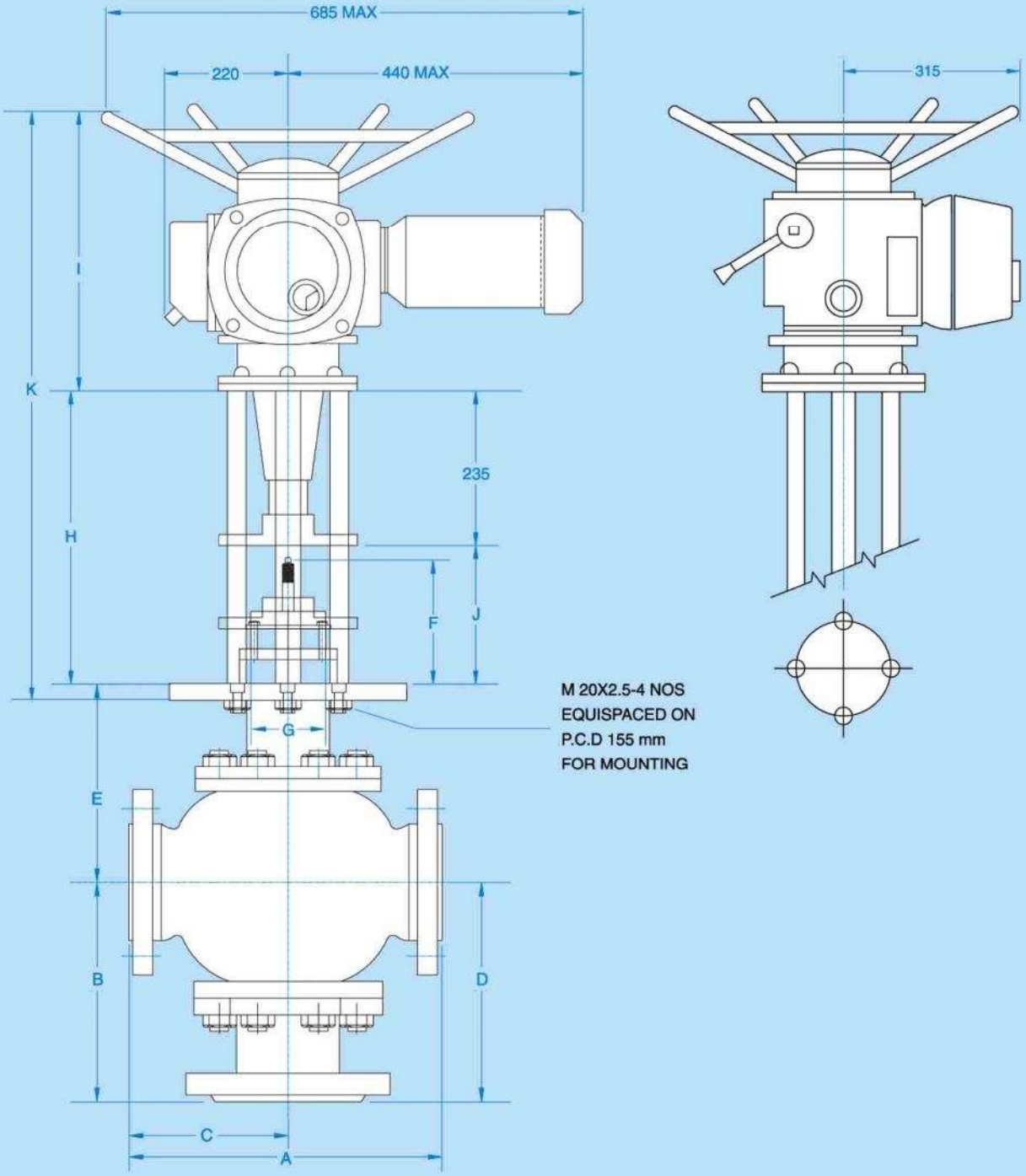
S=Standard Bonnet, N=Normalising Bonnet, B=Bellow Seal Bonnet.

The Company Reserve the right to confirm the dimensions on certified drawing

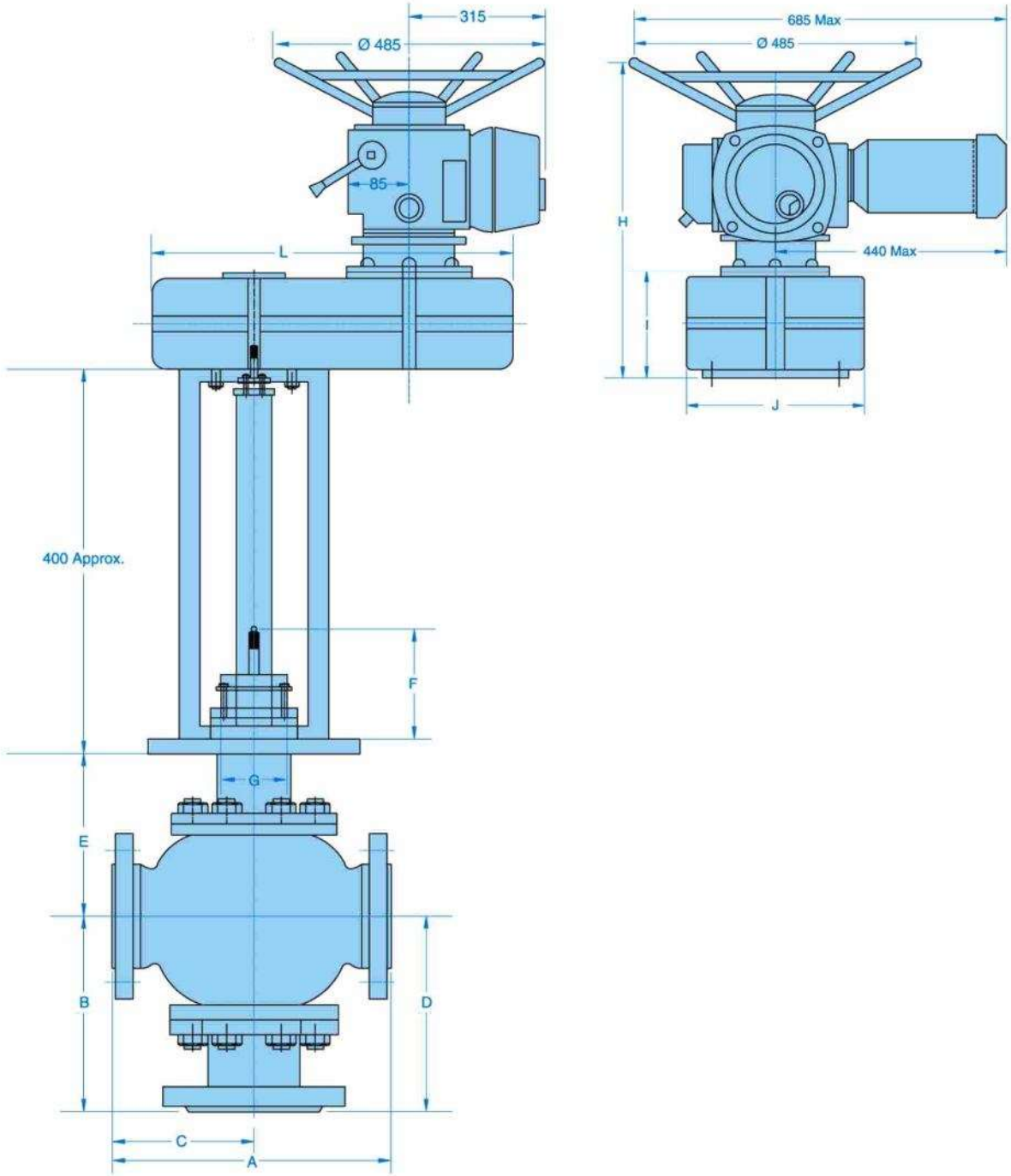




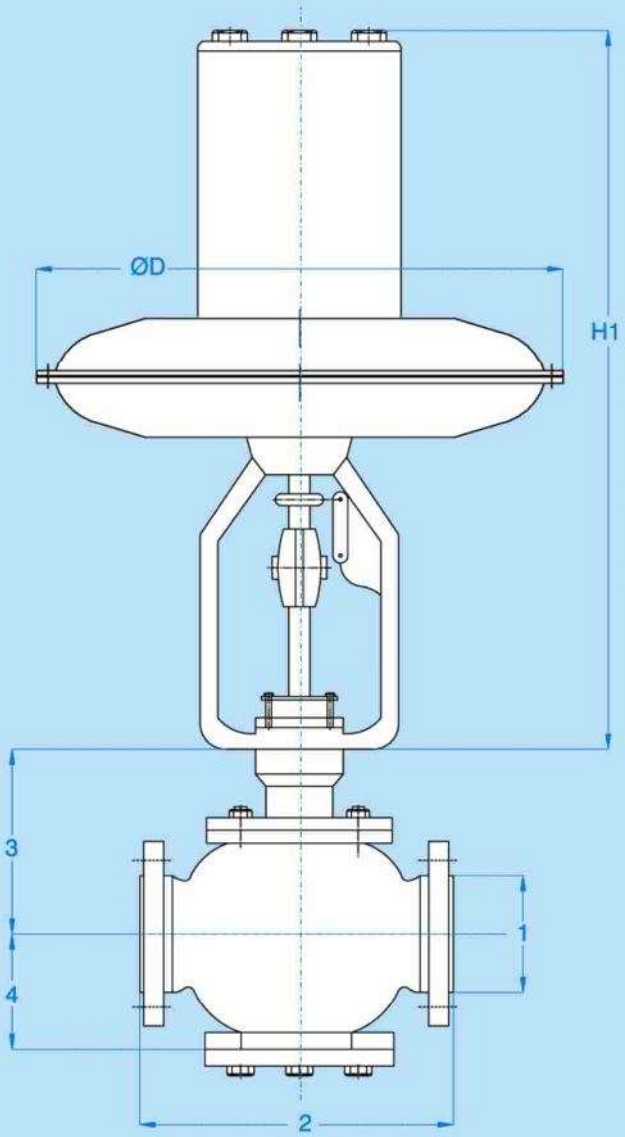
Model No.	Body Size	FLANGED CONNECTIONS																						STEM UP POSITION	BON-NET MOUNT DIA	TRAVEL	STEM CONN. DIA	HØ	I	J	K	L	M	N	Operting time in mm cc	Appx. Wt. in Kg.
		ANSI CLASS 150 RF NP 10-16							ANSI CLASS 300 RF NP 25-40							ANSI CLASS 600 RF NP 64-100																					
						STANDER	NORMALSIN	BELLOW					STANDER	NORMALSIN	BELLOW					STANDER	NORMALSIN	BELLOW															
		A	B	C	D	E	E	E	A	B	C	D	E	E	E	A	B	C	D	E	E	E	F	G											
1753/15/200	15	184	159	92	92	140	222	324	191	159	95.5	95.5	140	222	324	203	159	101.5	101.5	140	222	324	117	54	28	9.5	165	160	445	115	130	40/60	100	0.26-0.52	29
1753/20/200	20	184	159	92	92	140	222	324	194	159	97	97	140	222	324	206	159	103	103	140	222	324	117	54	28	9.5	165	160	445	115	130	40/60	100	0.26-0.52	34.5
1753/25/200	25	184	159	92	92	140	222	324	197	159	98.5	98.5	140	222	324	210	159	105	105	140	222	324	117	54	28	9.5	165	160	445	115	130	40/60	100	0.26-0.52	39.5
1753/40/200	40	223	162	111.5	111.5	159	292	354	235	162	117.5	117.5	159	292	354	251	162	125.5	125.5	159	292	354	117	54	28	12.7	165	160	445	115	130	40/60	100	0.26-0.52	52.5
1753/50/200	50	254	180	127	127	168	298	362	267	180	133.5	133.5	168	298	362	286	180	143	143	168	298	362	117	54	28	12.7	165	160	445	115	130	40/60	100	0.26-0.52	54.5
1753/80/200	80	299	208	133	276	203	327	465	318	208	143	276	203	327	465	337	208	152	276	203	327	465	143	71	38	16	165	160	445	115	130	40/60	100	0.26-0.52	121.5
1753/100/600	100	325	265	157	333	206	356	467	368	265	165	333	206	356	467	394	265	178	333	206	356	467	143	71	38	19	210	200	495	115	130	60/75	133	0.8-4.5	162.5
1753/150/600	150	451	325	202	397	276	390	683	473	325	213	397	276	390	683	508	352	229	414	276	390	683	197	90	57	25.4	210	200	495	115	130	60/75	133	0.8-4.5	201.5



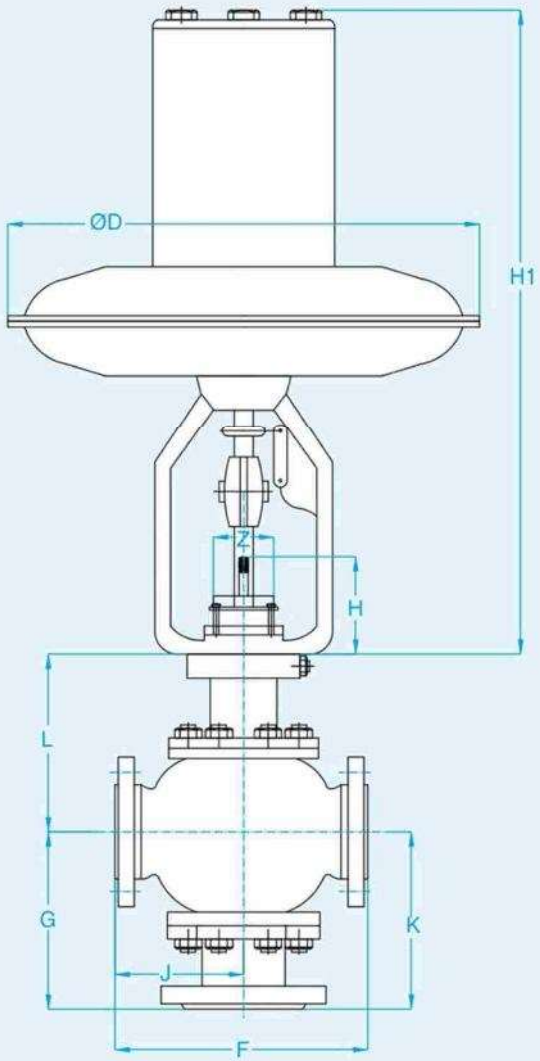
Model No.	Body Size	FLANGED CONNECTIONS																							H	I	J	K	Operting time in mm cc	Appx. Wt. in Kg.
		ANSI CLASS 150 RF NP 10-16							ANSI CLASS 300 RF NP 25-40							ANSI CLASS 600 RF NP 64-100							STEM UP POSITION	BON-NET MOUNT DIA	TRAVEL	STEM CONN. DIA					
						STANDER	NORMALISIN	BELLOW					STANDER	NORMALISIN	BELLOW					STANDER	NORMALISIN	BELLOW										
		A	B	C	D	E	E	E	A	B	C	D	E	E	E	A	B	C	D	E	E	E	F	G						
1753/200/6000-3000	200	543	398	235	483	298	441	694	568	398	248	483	298	694	694	610	418	270	503	298	441	694	197	90	57	25.4	400	340	165	790	1.0-36.5	346
1753/250/6000-4000	250	673	418	267	540	394	635	926	708	418	394	540	394	635	926	752	440	306	562	394	635	926	229	90	89	31.8	425	448	190	923	1.6-12.0	453



Model No.	Body Size	FLANGED CONNECTIONS																									Operting time in mm cc		Appx. Wt. in Kg.
		ANSI CLASS 150 RF NP 10-16							ANSI CLASS 300 RF NP 25-40							ANSI CLASS 600 RF NP 64-100							STEM UP POSITION	BON-NET MOUNT DIA	TRAVEL	STEM CONN. DIA	H	I	J	L		
						STANDER	NORMALISIN	BELLOW					STANDER	NORMALISIN	BELLOW					STANDER	NORMALISIN	BELLOW										O/P Speed of Basic Actutor	Effective O/P Speed with SG	
		A	B	C	D	E	E	E	A	B	C	D	E	E	E	A	B	C	D	E	E	E	F	G								
1753/300/3000-20SG04	300	737	433	283	562	394	678	938	775	433	302	562	394	678	938	819	455	324	584	394	678	938	229	90	89	31.8	670	142	258	530	10-12	2.5-30	612



Model No.	Size in mm	Face to Face mm			Height from Centre Line			Centre Line to Base	Stem Travel	Ø D	H1	Approx. Weight in Kg.
		ANSI 150 IS / NP 10.16 BSIO-D.E.	ANSI 300 IS / NP 25.40 BSIO-F.H.J.	ANSI 600 IS / NP 64.100 BSIO-K.R.								
	1	2			3			4	5	7	8	9
					Standard	Normalising	Bellow Seal					
1762/15	15	184	190	203	140	222	324	67	28	260	482	30
1762/20	20	184	194	206	140	222	324	67	28	260	482	34
1762/25	25	184	197	210	140	222	324	67	28	260	482	38
1762/40	40	223	235	251	159	292	353	83	28	330	502	48
1762/50	50	254	267	286	168	298	362	86	28	330	502	50
1762/80	80	299	318	337	206	327	467	111	38	457	635	110
1762/100	100	352	368	394	206	357	467	146	38	457	635	135
1762/150	150	451	473	508	276	391	676	171	57	457	762	190
1762/200	200	543	568	610	610	292	435	203	57	457	762	315
1762/250	250	673	708	752	390	632	921	238	89	616	997	400
1762/300	300	737	775	819	390	673	N.A.	251	89	616	997	475
1762/350	350	890	927	972	490	822	N.A.	292	89	616	997	560
1762/400	400	1016	1057	1108	622	927	N.A.	352	100	616	1014	640



Model No.	Body Size	FLANGED CONNECTIONS																									Ø D	H1	Appx. Wt. in Kg.
		ANSI CLASS 150 RF NP 10-16							ANSI CLASS 300 RF NP 25-40							ANSI CLASS 600 RF NP 64-100							STEM UP POSI-TION	BON-NET MOUNT DIA	TRA VEL	STEM CONN. DIA			
						STANDER	NORMALISN	BELLOW					STANDER	NORMALISN	BELLOW					STANDER	NORMALISN	BELLOW							
		F	G	J	K	L			F	G	J	K	L			F	G	J	K	L			N	Z					
1763/15	15	184	159	92	92	140	222	324	191	159	95.5	95.5	140	222	324	203	159	101.5	101.5	140	222	324	117	54	28	9.5	260	482	39.5
1763/20	20	184	159	92	92	140	222	324	194	159	97	97	140	222	324	206	159	103	103	140	222	324	117	54	28	9.5	260	482	45
1763/25	25	184	159	92	92	140	222	324	197	159	98.5	98.5	140	222	324	210	159	105	105	140	222	324	117	54	28	9.5	260	482	50
1763/40	40	223	162	111.5	111.5	159	292	354	235	162	117.5	117.5	159	292	354	251	162	125.5	125.5	159	292	354	117	54	28	12.7	330	502	63
1763/50	50	254	180	127	127	168	298	362	267	180	133.5	133.5	168	298	362	286	180	143	143	168	298	362	117	54	28	12.7	330	502	63.5
1763/80	80	299	208	133	276	203	327	465	318	208	143	276	203	327	465	337	208	152	276	203	327	465	143	71	38	16	457	635	141
1763/100	100	352	265	157	333	206	356	467	368	265	165	333	206	356	467	394	265	178	333	206	356	467	143	71	38	19	457	635	173
1763/150	150	451	325	202	397	276	390	683	473	325	213	397	276	390	683	508	352	229	414	276	390	683	197	90	57	25.4	457	762	237
1763/200	200	543	398	235	483	298	446	694	568	398	248	483	298	483	694	610	418	270	503	298	441	694	197	90	57	25.4	457	762	400
1763/250	250	673	418	267	540	394	635	926	708	418	284	540	394	635	926	752	440	306	562	394	635	926	229	90	89	31.8	616	997	484
1763/300	300	737	433	283	562	394	678	938	775	433	302	562	394	678	938	819	455	324	584	394	678	938	229	90	89	31.8	616	997	583

NOTE : TECHNICAL SPECIFICATIONS, DETAILS & DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT PRIOR NOTICE. DIMENSIONS IN THE TABLE ARE APPROXIMATE SUBJECT TO FINAL CONFIRMATION BY SUDE.

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SUDE ENGINEERING CORPORATION

Registered Office / Works :
Shop No. 1106, 10th Main Road, R.P.C. Layout,
Near R.P.C. Layout Bus Stop, Hampinagar,
Bangalore 560 104. (Old Pin 560040) Karnataka, India
Tel. : +91 80 2330 2145 / 2314 1104 / 2340 2297
Fax : +91 80 2330 5729

Pune Office / Works :
Gat No. 94/2, Plot No.1, Alandi Markal Road,
Village - Dhanore, Tal - Khed, Pune 412105.
Maharashtra, India
Tel. : +91 9763719689, 9763719690