



# *TECHNICAL BULLETIN*

## ***Valtek Control Valves***

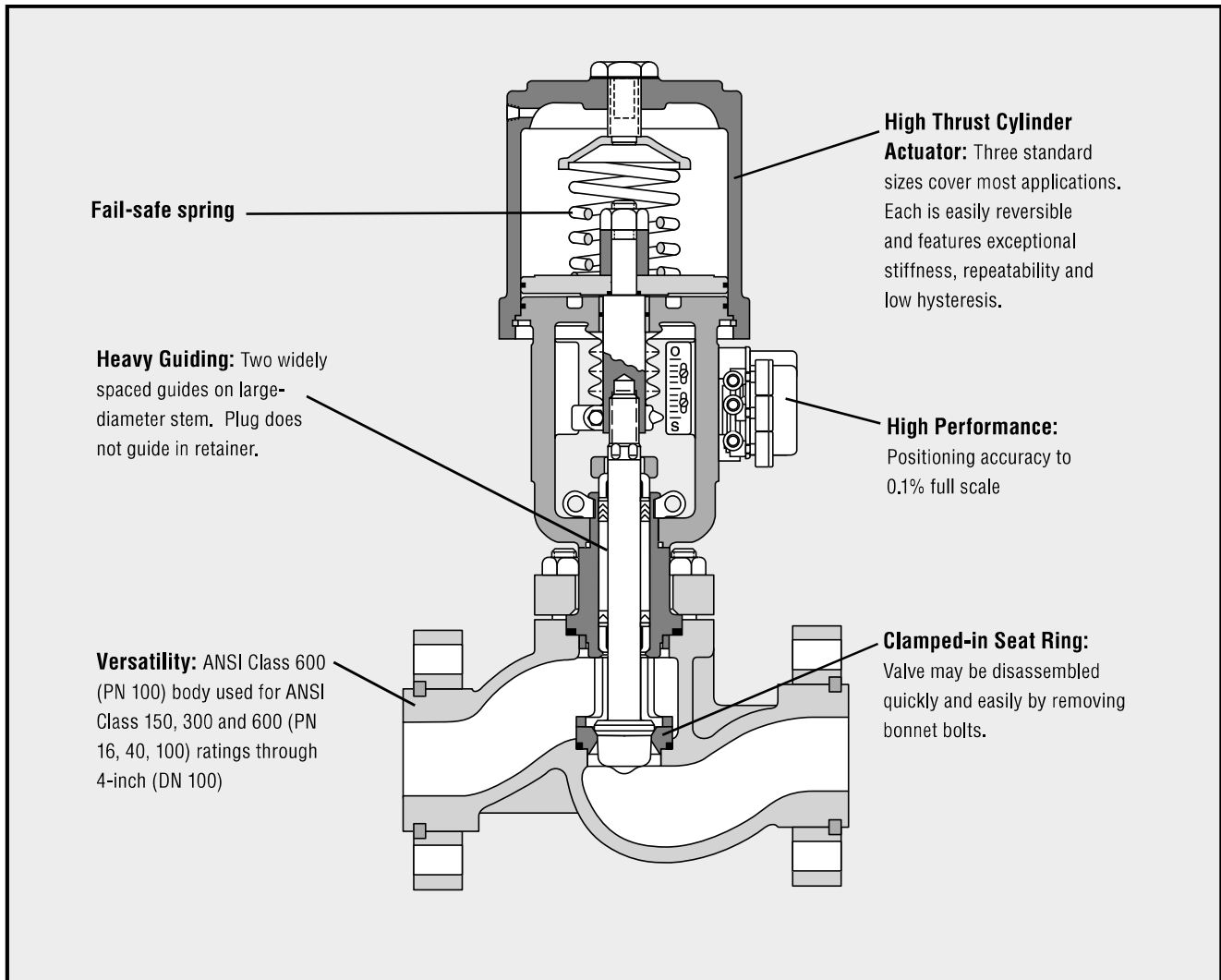
### **Mark One Control Valves**

FCD VLENTB0001-03-AQ 10/15



***Experience In Motion***

## Body Assembly



The Valtek® Mark One™ globe control valve offers superior performance in liquid and gaseous services, while also permitting easy, fast and inexpensive maintenance.

The spring-cylinder actuated Mark One valve provides stiffness and maintains high positioning accuracy, repeatability, controlled high speed, and faithful response. The Mark One valve handles up to 150 psig (10.3 barg) supply air and has the thrust to shut off against much higher fluid pressures.

The Mark One valve is designed so the spring, supply air pressure and fluid pressure itself combine to produce exceptionally tight shutoff. A self-aligning seat ring further enhances the shutoff capability of the Mark One valve.

The Mark One valve is typically double top-stem guided and completely avoids contact between the plug and seat retainer. Many globe valve maintenance problems can be traced to cage-guiding. The close metal-to-metal contact between the cage and plug often result in galling and sticking.

The clamped-in seat and top-entry trim permits easy, quick maintenance. Plus, with the Mark One valve's high degree of parts interchangeability, fewer inventory parts are required. In addition, the actuator is lighter, smaller and easier to handle than comparable diaphragm actuators.

The Valtek Mark One control valve is the industry choice for a simple, reliable, tough globe valve.

## Advantages and Features

Advantages	Features
Design provides lower total lifetime cost	<p>High interchangeability between sizes and other Valtek control products</p> <p>Valve design minimizes requirements for stocking spare parts</p> <p>Rugged, heavy-duty parts provide extended life</p> <p>Actuator design allows simple, easy maintenance</p>
Versatile	Globe, angle, three-way, and jacket styles offer multiple face-to-face standards
Trim that does not stick or gall	<p>Double-stem guiding located out of flow stream</p> <p>Generous clearance between plughead and seat retainer</p> <p>Eliminates galling associated with cage-guiding</p>
Easy, fast and inexpensive	<p>Top-entry servicing</p> <p>Clamped-in seat ring</p> <p>Evenly compressed gasket – controlled gasket compression</p> <p>Separable flanges</p> <p>High degree of parts interchangeability</p> <p>Small, lightweight design</p>
Leakproof when closed	<p>Self-aligning seat ring</p> <p>Assisted shutoff from fluid pressure, cylinder spring, cylinder pressure</p> <p>High-thrust, spring-cylinder actuator</p> <p>Spring fails valve to desired position, pneumatics provide additional force</p>
Built for toughest service	<p>Corrosion-resistant construction</p> <p>High thrust overcomes high pressures</p> <p>Anti-cavitation and noise-trim options</p> <p>Heavy-duty plug stem</p> <p>Factory Mutual approved as a fuel service valve (0.75 - 3-inch/DN 20 - 80)</p>
Compact and easy to install	<p>Cylinder actuator smaller than most competitor's actuators</p> <p>Lower center of gravity than comparable actuators</p> <p>Lighter weight means less pipe stress from static and dynamic loads</p> <p>Separable end flanges allow the valve to be installed in many orientations and compensate for flange misalignment</p>
Reliable, predictable service	<p>Stiff, high-thrust cylinder actuator</p> <p>Accurate positioning</p> <p>High repeatability</p> <p>Faithful response</p> <p>Controlled, high-speed stroking action</p>

## Components

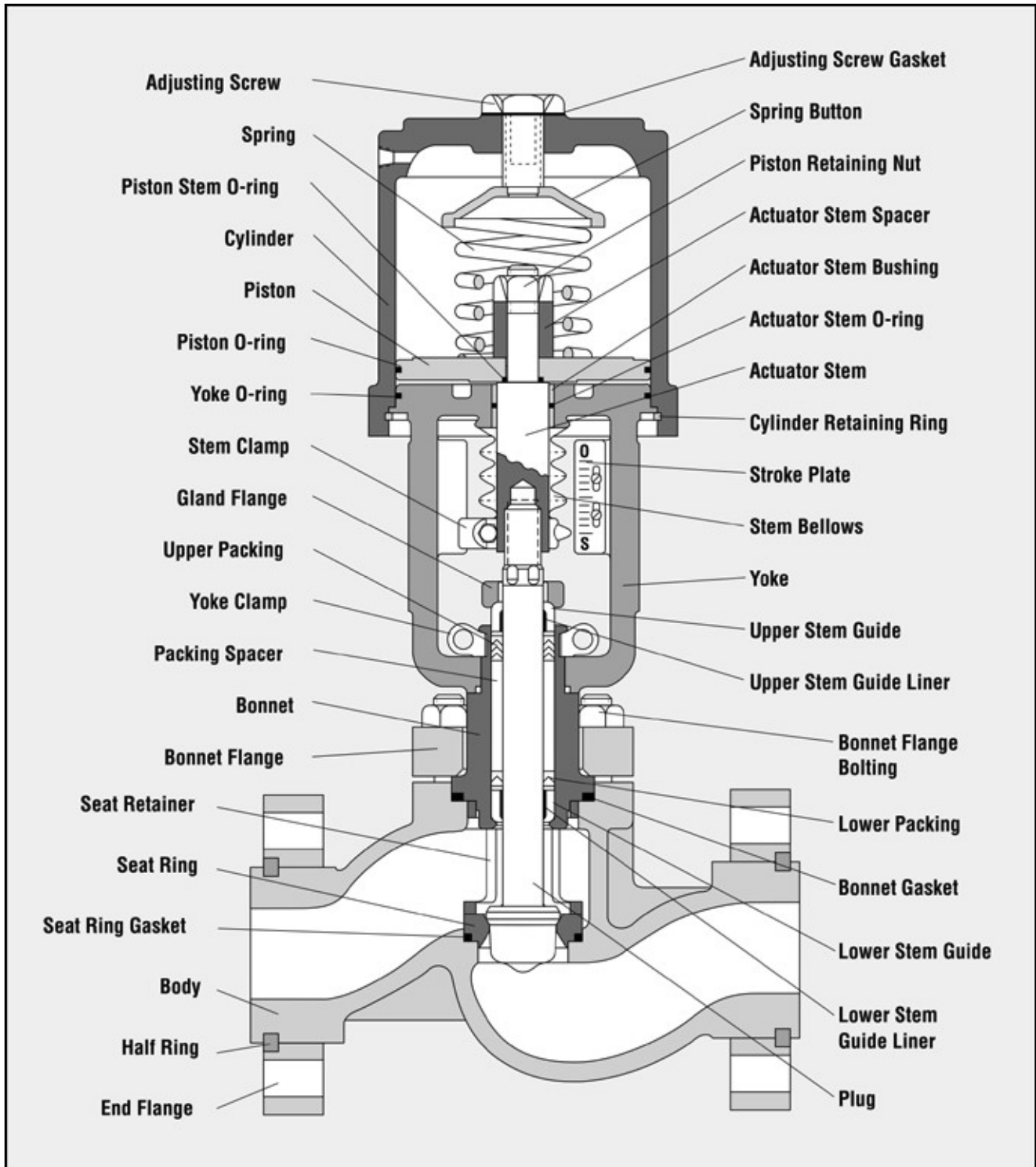
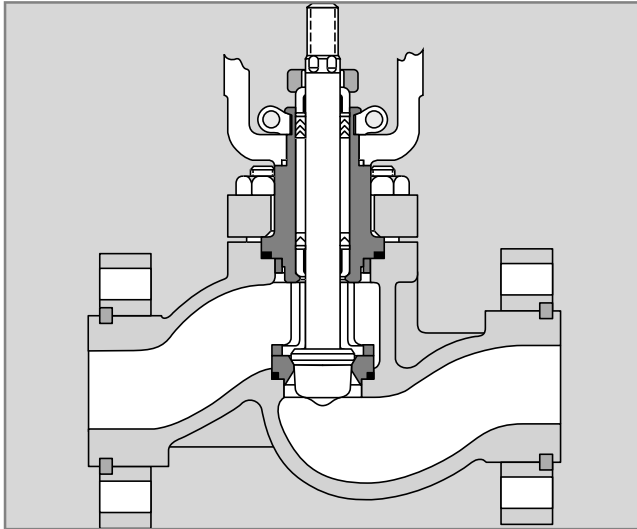


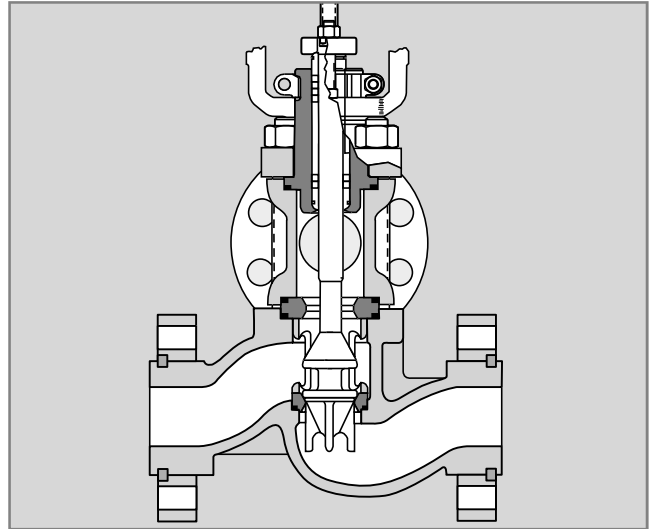
Figure 2: Mark One Control Valve

## Body Styles



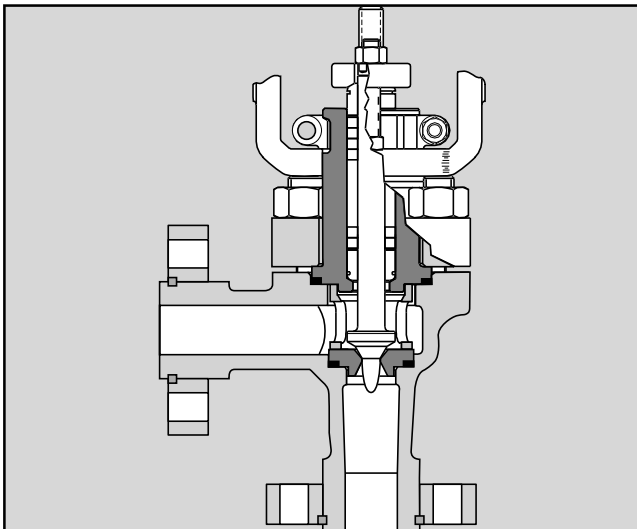
**Figure 3: Globe-style body**

Globe-style bodies feature smooth, streamlined, constant-area internal passages with no pockets, permitting high capacity with minimum turbulence. They are designed with nearly constant wall thickness, providing lower weight and cost when manufactured in expensive stainless or alloy steels.



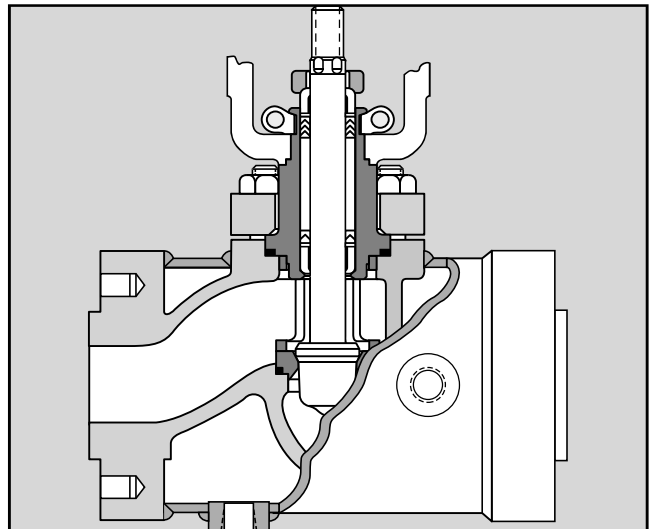
**Figure 4: Three-way Body**

Three-way bodies are used for either combining or diverting services. Due to Flowserve's excellent parts interchangeability, a standard globe valve easily converts to three-way service with the addition of a three-way adaptor, upper seat ring, two gaskets, three-way plug and longer bonnet flange studs.



**Figure 5: Angle-style Body**

Except for the body and 1.5-inch (DN 40) seat ring, the angle-style Mark One valve is completely interchangeable with the globe style – all other valve parts remain the same. For additional body protection, a venturi seat ring, extending to the outlet flange, is available.



**Figure 6: Steam-jacketed Body**

The steam-jacketed Mark One valve uses a standard globe style body with oversized, blind flanges for a full jacket or standard flanges for a partial jacket. The jacket is rated for 150 psig (10.3 barg) and is equipped with a 0.75-inch NPT supply and drain connection.

## End Connections, Flanges and Bolting

Mark One body facings come standard as raised face for either separable and integral flanges. To achieve better sealing with mating piping, the flange face is machined with spiral grooved serration. Other optional facings include smooth face, flat face, ring-joint, large and small tongue, and large and small groove.

### Separable End Flanges

Interchangeable separable flanges are standard for valve bodies 0.5- through 4-inch (DN 15 -100) in ANSI Class 150, 300 and 600 (PN 16, 40, 100). With separable end flanges, an ANSI Class 600 (PN 100) body can be adapted for ANSI Class 150, 300 or 600 (PN 16, 40, 100) service by simply changing the end flanges.

Separable flanges are usually furnished in carbon steel for maximum cost savings, although stainless steel can be specified if needed.

### Bonnet Flange

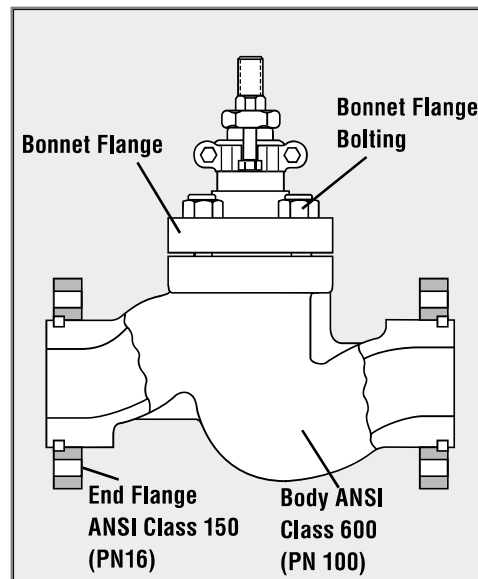
The bonnet flange incorporates the same separable design as the end flanges and is normally manufactured in carbon steel; however, it can be specified in stainless steel when required.

### Bonnet Flange Bolting

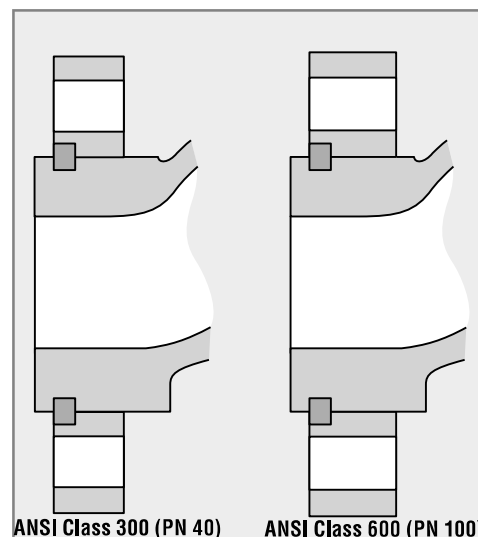
All sizes use studs and nuts that are furnished in 304 and 316 stainless steel, suitable for -423° to 1500° F (-253° to 816° C). These temperature limits are for maximum pressure permitted by ANSI B16.34, latest edition.

**Table 1: End Connections**

End Connection	Valve Size		Rating Class		ANSI/ISA Face-to-Face Standard
	inches	DN	ANSI	PN	
Separable Flange	0.5-4	15-100	150-600	16-100	S75.20
Integral Flange- Steel and Alloys	0.5-48	15-1200	150	16	S75.03
	0.5-48	15-1200	300-600	40-100	
	0.5-24	15-600	900-2500	160-400	S75.16
Screwed (NPT)	0.5-2	15-50	150-600	16-100	S75.12
	0.5-2	15-50	N/A	160-400	
Socketweld	0.5-4	15-50	150-600	16-100	S75.12
	0.5-4	15-50	900-2500	160-400	
Buttweld	0.5-4	15-100	150-600	16-100	S75.15
	6-36	150-900	150-600	16-100	
	0.5-24	15-600	900-2500	160-400	



**Figure 7: Separable End and Bonnet Flanges**



**Figure 8: End Flanges**

## Gaskets and Clamps

The Mark One valve is designed with the bonnet and seat ring gaskets fully retained. Since the bonnet bottoms metal-to-metal in the body, the bonnet gasket compression is determined by the depth of the gasket step on the bonnet, which is machined to provide the required gasket compression.

When the bonnet is fully installed, force is transmitted through the seat retainer to secure the seat ring in position. The body, seat retainer and seat ring are all machined to close tolerances to provide the proper gasket compression. Unlike the bonnet, the seat ring does not always bottom in the body, allowing this small clearance to compensate for manufacturing tolerances and thermal expansion.

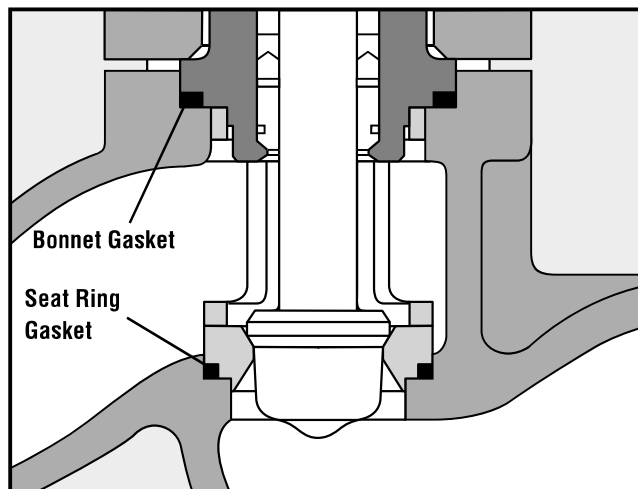


Figure 9: Body Gaskets

Table 2: Gasket Specifications

	Type	Gasket Material	Maximum Gasket Temp		Minimum Gasket Temp	
			°F	°C	°F	°C
<b>Standard Gaskets</b>	Flat	PTFE	350	177	-200	-130
	Spiral Wound	316 S.S./Graphite	1500 <sup>2</sup>	816 <sup>2</sup>	-320	-196
<b>Alternate Gaskets</b>	Flat	KEL-F	350	177	-320 <sup>1</sup>	-196 <sup>1</sup>
	Flat	FEP	400	204	-320	-196
	Spiral Wound <sup>3</sup>	316 S.S./Thermiculite®	1500	816	-20	-30
	Metal O-Ring	Inconel X-750	1500	816	-20 <sup>1</sup>	-30 <sup>1</sup>

<sup>1</sup> Lower temperature available upon request.

<sup>2</sup> Limited to 800° F (427° C) for oxidizing service.

<sup>3</sup> Alloy spiral windings available upon request

### Yoke Clamps

The actuator is typically attached to the Mark One body assembly with two precision-cast, stainless steel yoke clamps. In some cases, however, the actuator is bolted directly to the bonnet. Each clamp has an inclined plane surface which, when bolted together, securely fastens the actuator yoke to the bonnet. Unlike conventional threaded clamps, the clamp design permits easy removal even under extremely corrosive conditions.

Associated bolts and locknuts are supplied in plated carbon steel, although stainless steel is also available when required.

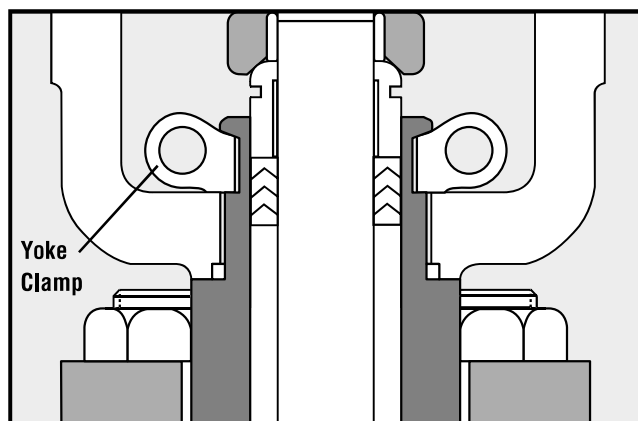


Figure 10: Yoke Clamp

## Bonnet Types

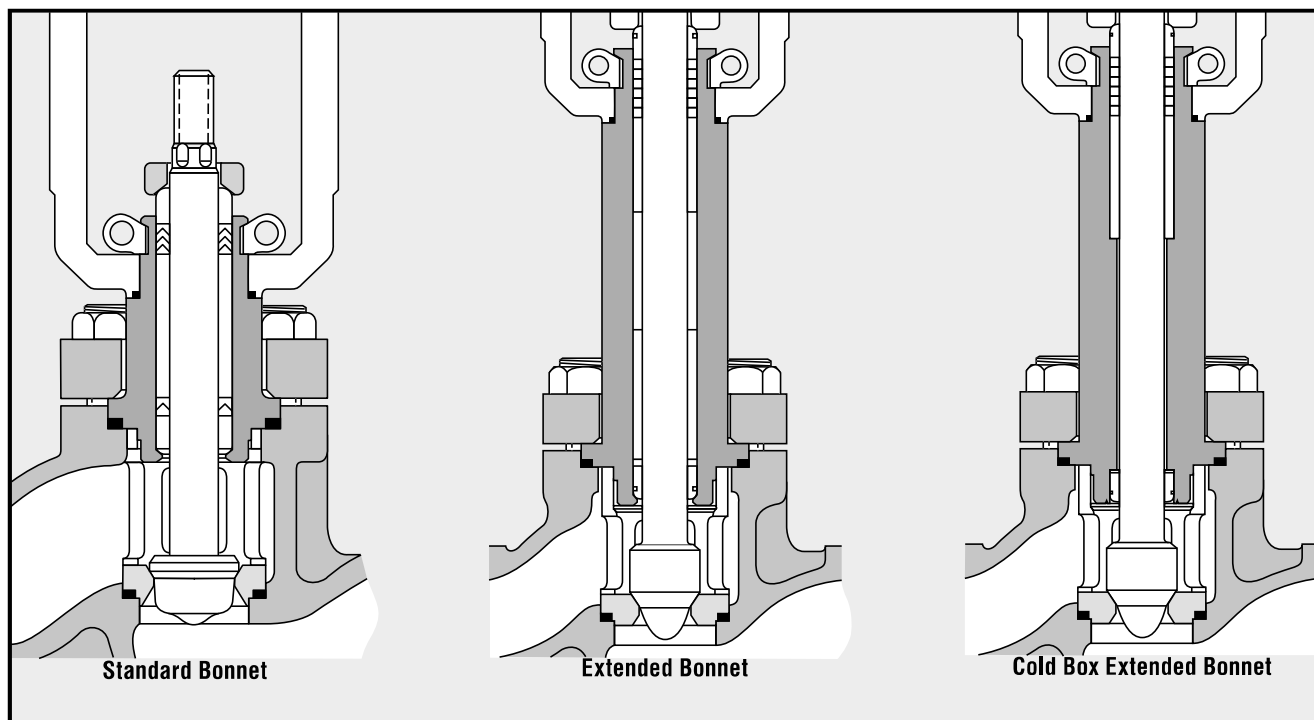


Figure 11: Mark One Bonnet Types

### Standard Bonnet

The Mark One bonnet is usually constructed of the same material as the body and handles temperatures from -20° to 750° F (-30° to 400° C). See Table 4 on page 9 for packing limitations.

### Extended Bonnet

The extended bonnet protects the packing from excessive heat or cold, which may inhibit valve performance. The bonnet is constructed of carbon steel for temperatures from -20° to 800° F (-30° to 427° C) and of 304 or 316 stainless steel for -150° to 1500° F (-100° to 816° C).

### Cold Box Extended Bonnet

The cold box extended bonnet permits stagnated, moderate temperature gas to form in the bonnet, which protects the packing from the service fluid. Typically manufactured from 304 or 316 stainless steel, it handles temperatures down to -423° F (-253° C). Standard construction consists of stainless steel bonnet flange and bolting.

### Guardian II Formed Metal Bellows Seal Bonnet

The Guardian II formed metal bellows seal can be used whenever service fluid leakage to atmosphere needs to be reduced to an absolute minimum. The standard metal bellows seal is rated for operation in processes ranging in temperature from -320° F to 1100° F (-196° to 593° C) and pressures to 1100 psig (75.9 barg).

The flexible metal bellows is typically constructed of Inconel 625 and is also available in Hastelloy C-22.

The Guardian II bellows seal allows for outside pressure to minimize bellows squirm, prolonging bellows life.

### Guardian Metal Bellows Seal Bonnet

The Guardian metal bellows seal provides protection against unwanted packing leakage to atmosphere in processes involving caustic liquids or gases.

The compact, lightweight design of the Guardian bellows assembly makes it ideal for services less than 650° F (343° C) and 310 psig (21.4 barg). The precision-formed bellows is available in Inconel or Hastelloy C materials.

**NOTE:** Bellows seals are designed for special service conditions and not to valve's design class; therefore, complete and accurate service conditions must be specified.



## Packing and Guiding

### Packing Box

Standard Valtek packing boxes are deeper than most conventional types, providing the following advantages:

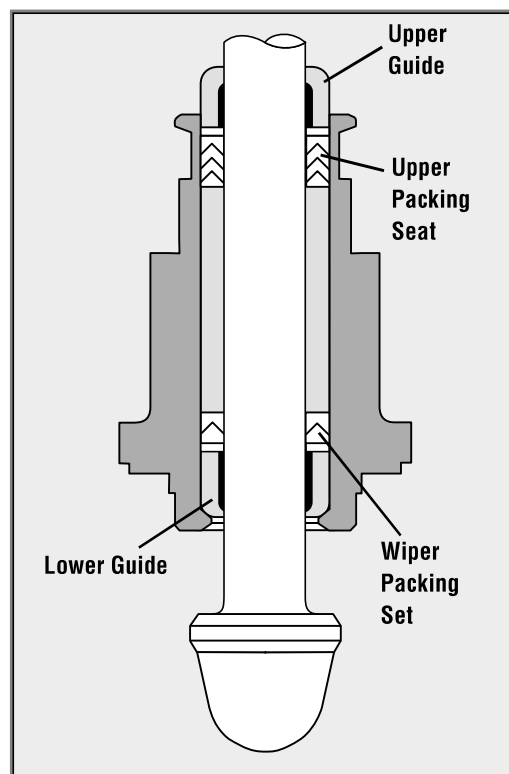
1. The spacing between the wiper set and the main upper packing set prevents contamination of the upper packing. The upper set is positioned far enough away from the wiper set to avoid contact with any part of the plug stem that has been exposed to the flowing medium. The wiper set is designed to minimize the amount of fluid on the plug stem.
2. Bonnets are designed to permit a wide variety of packing configurations, including a double set of packing, without changing bonnets.
3. Two widely spaced stem guides, when used with the Mark One's large plug stem diameter, provide exceptional guiding. The upper stem guide also acts as a packing follower; the lower guide is situated close to the plug head for additional guiding support, ensuring accurate alignment of plug and seat ring.
4. Graphite-lined stainless steel guides provide superior guiding over wide temperature ranges and completely eliminate guide/stem galling. A variety of guides are available for various applications, including solid brass, Alloy 6 and glass-filled PTFE-lined stainless steel.

**Table 3: Guides**

Standard Materials	Max. Temp.	Min. Temp.	Maximum Pressure
Graphite-lined SS***	1500° F 816° C	-320° F -196° C	1400 psig / 96.6 barg up to 2-in / DN 50 1000 psig / 69.0 barg 3-4 in / DN 80-100 850 psig / 58.6 barg 6 in DN 150 & up
Glass filled	300° F 148.9° C	-325° F -198.3° C	1400 psig / 96.5 barg @ 60°F / 15.5°C
Solid Bronze	500° F 260° C	-423° F -253° C	Same as body
Solid Alloy 6	1500° F 816° C	-423° F -253° C	Same as body

**Table 4: Packing**

Bonnet Type	Packing Material	Service Fluid Temperature Limitation	
Standard** Bonnet	PTFE, PTFE/AFP and Glass-filled PTFE	500° F 500° F	260° C 260° C
	Graphite/AFP	750° F	400° C
	Graphite/AFP, Inconel wire	750° F*	400° C*
	Graphite***	750° F*	400° C*
Extended** Bonnet	PTFE, PTFE/AFP and Glass-filled PTFE	600° F	316° C
	Graphite/AFP	1200° F	650° C
	Graphite/AFP, Inconel wire	1200° F	650° C
	Graphite***	1500° F	816° C
Cryogenic Extended Length**			
15, 18-inch (38, 46 cm)	PTFE	-320° F	-196° C
24, 27-inch (38, 46 cm)	PTFE	-423° F	-253° C



\* Temperatures assume environmental temperature is less than 90° F (32° C); 8–12-inch (DN 200-300) ANSI Class 150-600 (PN 160-400) and 3–12-inch (DN 80-300) ANSI Class 900-2500 (PN 160-400) handles temperatures to 850° F (454° C).

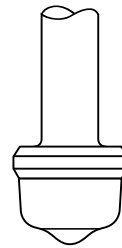
\*\* ANSI B16.34 specifies acceptable pressure temperature limits for pressure retaining materials. Consult the factory for additional information.

\*\*\* Do not use graphite above 800° F (427° C) in oxidizing service such as air or oxygen. The use of graphite packing may require oversize actuators or heavier springs due to added friction.

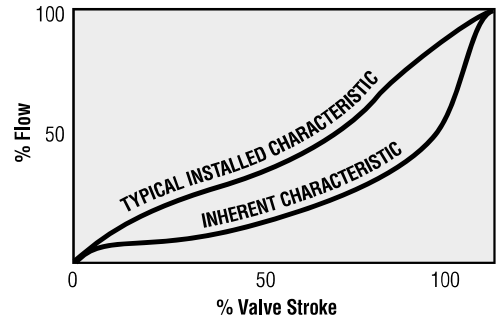
## Flow Characteristics, Trim Types

### Equal Percentage

Equal percentage is the characteristic most commonly used in process control. The change in flow per unit of valve stroke is directly proportional to the flow occurring just before the change is made. While the flow characteristic of the valve may be equal percentage, most control loops produce an installed characteristic, which approaches linear when the overall system pressure drop is large relative to that across the valve.

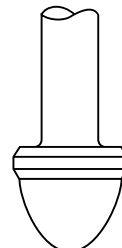


**Equal Percentage**

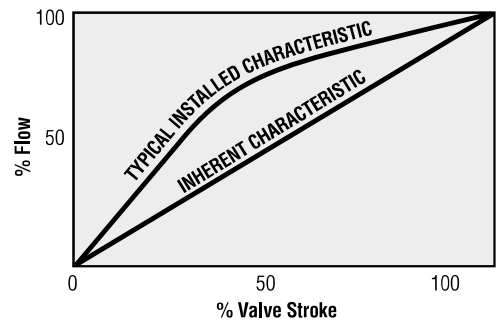


### Linear

Linear inherent characteristic produces equal changes in flow per unit of valve stroke regardless of plug position. Linear plugs are used on those systems where the valve pressure drop is a major portion of the total system pressure drop.

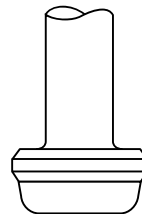


**Linear**

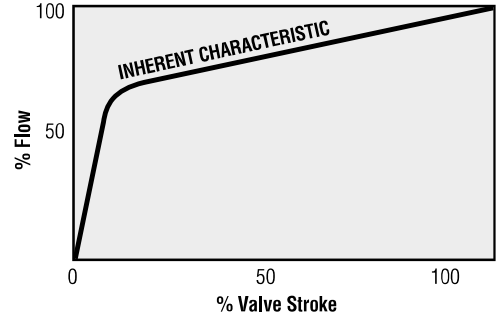


### Quick-open

Quick-open plugs are used for on-off service and are primarily designed to produce maximum flow quickly.



**Quick-open**

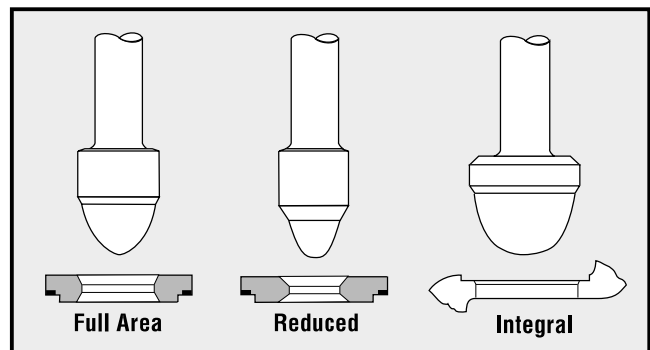


**Figure 13: Flow Characteristics**

### Trim Types

Three trim types are available. Standard full-area trim provides maximum  $C_v$ . Reduced trim is available in a wide variety of sizes when lower  $C_v$  values and large bodies are required. Integral trim uses a special seat machined into the body and an oversized plug to provide additional  $C_v$  beyond the capabilities of full-area trim.

Mark One valves can be converted from one trim type to another since all seat rings and plugs with a given size and pressure class are completely interchangeable. Integral trim is available by removing the seat ring and by changing the plug.



**Figure 14: Typical Trim Types**

## Standard Trim, Pressure-balanced Trim

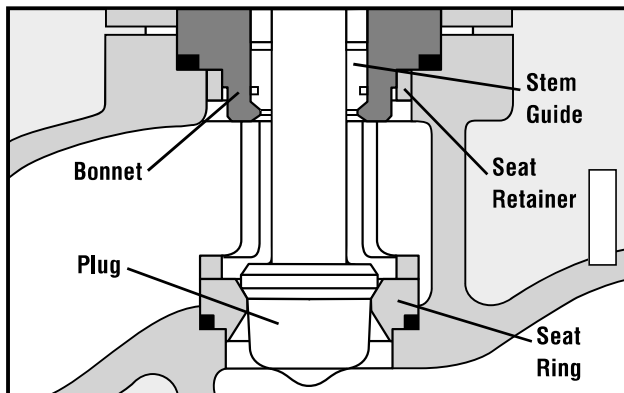


Figure 15: Standard Trim

Mark One valve trim is designed to avoid the difficulties associated with screwed-in seats and cage-guiding. The seat ring is clamped into the body by the bonnet and seat retainer; thus, removal of the seat is easy even under extremely corrosive conditions.

Unlike cage-guided trims that easily gall and stick, Mark One plugs are double-stem guided, avoiding contact between the seat retainer and plug. Because no contact is made with the plug, the retainer can be constructed of stainless steel rather than costly hard materials. The flow characteristic is determined by the plug contour, rather than by the opening in the retainer.

Low-noise seat designs have been developed for better noise control in standard Mark One valves.

### Metal Seats

Metal seated valves handle Class IV shutoff (ANSI B16.104, 1976 – FCI 70-2). This class calls for maximum permissible seat leakage of 0.01 percent of rated valve capacity. All Valtek control valves are seat-leak tested after assembly and are substantially lower in leakage than called for by this class. This exceptional seat tightness is obtained by aligning the seat ring with the plug during assembly. Additional seat tightness using metal seats is available as an option.

Table 5: Standard Seal Temperature Ranges

PTFE Sleeve	-320° F (-196° C) @ full rating or 300° F (150° C) @ 150 psig (10.3 barg)	
Rene 41	800° to 1600° F	427° to 871° C
Spring-energized PTFE	-365° to 575° F	-221° to 302° C
Viton	-40° to 437° F	-40° to 225° C

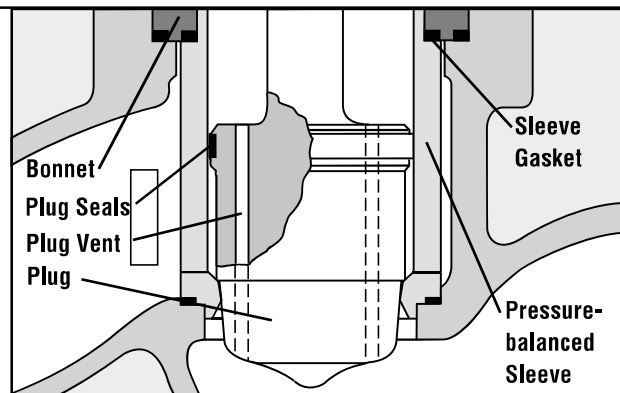


Figure 16: Pressure-balanced Trim

In high pressure drop applications, pressure-balanced trim is used to reduce the thrust necessary to stroke the plug by reducing the trim off-balance area. Because the pressure-balanced plug fits closely to the retainer, this trim should only be used in generally clean services.

Flow direction is under-the-plug for fail-closed and over-the-plug for fail-open. The seal area less the stem area is designed to be slightly larger than the seat area; therefore, the plug is off-balanced to close for flow under the seat and off-balanced to open for flow over the seat.

### Soft Seats

The Mark One soft seat is used in applications requiring ANSI Class VI 'bubble-tight' shutoff. Its design consists of an elastomer sandwiched between two metal pieces. The assembled soft seat is interchangeable with the hard seat for a given size and pressure rating. Inserts are often constructed of PTFE; therefore, maximum temperature should be below 300° F (150° C) at 290 psig (20 barg). For temperatures below -85° F (-65° C), PTFE soft seats can be used in high-pressure applications.

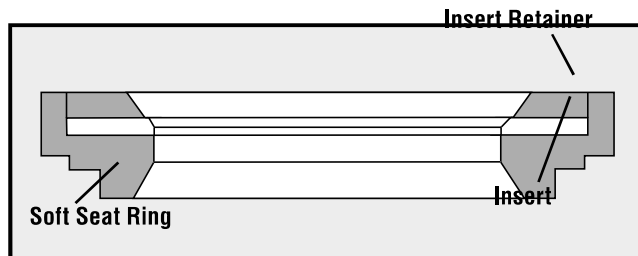


Figure 17: Typical Soft Seat Configuration

## Trim Materials, Data

Standard plug and seat ring material is 316 stainless steel, except special alloy bodies where trims are finished in the same material as the body. A wide variety of services are successfully handled by stainless steel trim parts. Nevertheless, a general rule is for temperatures above 600° F / 316° C. Alloy 6 is stocked for many valve trim parts. This material offers a good combination of relative hardness and corrosion resistance. Special alloys, such as Alloy 20, Hastelloy C and Monel, are also available.

**Table 6: Material Harness Ratings**

Trim Material	Hardness Rockwell C	Corrosion Resistance*
316 S.S.	8	Excellent
Alloy 6	44	Good to Excellent
416 S.S.	40	Fair
440C S.S.	56	Fair
17-4 PH	40	Excellent
Colmonoy	45-50	Fair to Good
Tungsten Carbide	72	Good on Bases Poor on Acids

\*General rule only. Check specific application

**Table 7: Standard Unbalanced Valve / Actuator Data**

Valve Size		Rating Class		Full Area Trim Size		Seat Area		Stem Diameter		Stem Area		Std. Act. Size*	Stroke	
inch	DN	ANSI	PN	inch	cm	in²	cm²	in²	cm²	in²	cm²		inch	cm
0.5	15	150-600	16-100	0.50	1.3	0.20	1.3	0.56	1.43	0.25	1.60	25	0.75	1.9
0.75	20	150-2500	16-400	0.72	1.8	0.41	2.6	0.56	1.43	0.25	1.60	25	0.75	1.9
1	25	150-600	16-100	0.81	2.1	0.52	3.3	0.56	1.43	0.25	1.60	25	0.75	1.9
		900-1500	160-250	0.81	2.1	0.52	3.3	0.56	1.43	0.25	1.60	25	0.75	1.9
		2500	400	0.72	1.8	0.41	2.6	0.56	1.43	0.25	1.6	25	0.75	1.9
1.5	40	150-600	16-100	1.25	3.2	1.20	7.9	0.88	2.22	0.60	3.88	25	1.00	2.5
		900-1500	160-250	1.25	3.2	1.20	7.9	0.88	2.22	0.60	3.88	50	1.00	2.5
		2500	400	1.00	2.5	0.79	5.1	0.88	2.22	0.60	3.88	50	0.75	1.9
2	50	150-600	16-100	1.62	4.1	2.07	13.4	0.88	2.22	0.60	3.88	25	1.50	3.8
		900-1500	160-250	1.62	4.1	2.07	13.4	0.88	2.22	0.60	3.88	50	1.50	3.8
		2500	400	1.25	3.2	1.23	7.9	0.88	2.22	0.60	3.88	50	1.00	2.5
3	80	150-600	16-100	2.62	6.7	5.41	34.9	1.13	2.86	0.99	6.39	50	2.00	5.1
		900-1500	160-250	2.62	6.7	5.41	34.9	1.50	3.81	1.77	11.40	100	2.00	5.1
		2500	400	2.00	5.1	3.14	20.3	1.13	2.86	0.99	6.39	100	1.50	3.8
4	100	150-600	16-100	3.50	8.9	9.62	62.1	1.13	2.86	0.99	6.39	50	2.50	6.4
		900-1500	160-250	3.50	8.9	9.62	62.1	1.50	3.81	1.77	11.40	100	2.50	6.4
		2500	400	2.62	6.7	5.41	34.9	1.50	3.81	1.77	11.40	100	2.00	5.1
6	150	150	16	5.00	12.7	19.63	126.7	1.13	2.86	0.99	6.39	50	3.00	7.6
		300-1500	40-250	5.00	12.7	19.63	126.7	2.00	5.08	3.14	20.30	100	3.00	7.6
		2500	400	4.00	10.2	12.57	81.1	2.00	5.08	3.14	20.30	100	3.00	7.6
8	200	150	16	6.25	15.9	30.68	197.9	1.50	3.81	1.77	11.40	100	4.00	10.2
		300-600	40-100	6.25	15.9	30.68	197.9	2.00	5.08	3.14	20.30	100	4.00	10.2
		900-1500	160-250	6.25	15.9	30.68	197.9	2.50	6.35	4.91	31.70	100	4.00	10.2
		2500	400	5.00	12.7	19.63	126.7	2.50	6.35	4.91	31.70	100	3.00	7.6
10	250	150	16	8.75	22.2	60.13	388.0	2.00	5.08	3.14	20.30	100	4.00	10.2
		300-600	40-100	8.75	22.2	60.13	388.0	2.50	6.35	4.91	31.70	100	4.00	10.2
		900-1500	160-250	8.00	20.3	50.27	324.3	3.00	7.62	7.07	45.60	100	4.00	10.2
		2500	400	6.25	15.9	30.68	197.9	3.00	7.62	7.07	45.60	100	4.00	10.2
12	300	150	16	9.50	24.1	70.88	457.3	2.00	5.08	3.14	20.30	100	4.00	10.2
		300-600	40-100	9.50	24.1	70.88	457.3	3.00	7.62	7.07	45.60	100	4.00	10.2
		900-2500	160-400	8.00	20.3	50.27	324.3	3.00	7.62	7.07	45.60	100	4.00	10.2
14	350	150	16	11.00	27.9	95.03	613.1	3.00	7.62	7.07	45.60	100	4.00	10.2
		300-600	40-100	11.00	27.9	95.03	613.1	3.00	7.62	7.07	45.60	100	4.00	10.2

\* Minimum standards actuator size. Oversized actuators may be required for large pressure drops.

## Trim Data, Hard Facing

Table 8: Standard Pressure-balanced Valve/Actuator Data

Valve Size		Rating Class		Full Area Trim Size*		Seat Area		Stem Center Diameter		Stem Area		Sleeve Area		Off-balance Area				Std. Actuator	Stroke	
														Flow-under To Close		Flow-over to Open				
in.	DN	ANSI	PN	in.	cm	in <sup>2</sup>	cm <sup>2</sup>	in	cm	in <sup>2</sup>	cm <sup>2</sup>	in <sup>2</sup>	cm <sup>2</sup>	in <sup>2</sup>	cm <sup>2</sup>	in <sup>2</sup>	cm <sup>2</sup>	Size	in.	mm.
2	50	600	100	1.62	4.1	2.07	14.4	0.562	3.63	0.25	3.63	2.58	16.6	0.26	1.7	0.51	3.3	25	1	3
		1500	250	1.62	4.1	2.07	14.4	0.562	3.63	0.25	3.63	2.41	15.5	0.09	0.6	0.34	2.2	50	1	3
		2500	400	1.25	3.2	1.23	7.9	0.562	3.63	0.25	3.63	1.55	10.0	0.07	0.5	0.32	2.1	50	1	3
3	80	600	100	2.62	6.7	5.41	34.9	0.875	5.65	0.60	3.88	6.77	43.7	0.76	4.9	1.36	8.8	50	1.5	4
		1500	250	2.62	6.7	5.41	34.9	0.875	5.65	0.60	3.88	6.49	41.9	0.48	3.1	1.08	7.0	100	2	5
		2500	400	2.00	5.0	3.14	20.3	0.875	5.65	0.60	3.88	3.86	24.9	0.12	0.8	0.72	4.6	100	1.5	4
4	100	600	100	3.50	9.0	9.62	62.0	0.875	5.65	0.60	3.88	11.41	73.6	1.19	7.7	1.79	11.5	50	2	5
		1500	250	3.50	9.0	9.62	62.0	1.125	7.26	0.99	6.41	11.41	73.6	0.80	5.2	1.79	11.5	100	2	5
		2500	400	2.62	6.7	5.41	34.9	1.125	7.26	0.99	6.41	6.77	43.7	0.37	2.4	1.36	8.8	100	2	5
6	150	150	16	5.00	13.0	19.63	126.7	1.125	7.26	0.99	6.41	22.69	146.4	2.06	13.3	3.06	19.7	50	2.5	6
		600	100	5.00	13.0	19.63	126.7	1.5	9.70	1.77	11.40	23.76	153.3	2.36	15.2	4.13	26.6	100	2.5	6
		1500	250	5.00	13.0	19.63	126.7	1.5	9.70	1.77	11.40	22.69	146.4	1.29	8.3	3.06	19.7	100	2.5	6
		2500	400	4.00	10.0	12.57	81.1	1.5	9.70	1.77	11.40	15.03	97.0	0.69	4.4	2.46	15.9	100	2.5	6
8	200	600	100	6.25	15.9	30.68	197.9	1.5	9.70	1.77	11.40	35.78	230.9	3.33	21.5	5.10	32.9	100	3	19
		1500	250	6.25	15.9	30.68	197.9	2.0	13.00	3.14	20.30	35.78	230.9	1.96	12.6	5.10	32.9	100	4	26
		2500	400	5.00	13.0	19.63	126.7	2.0	13.00	3.14	20.30	23.76	153.3	0.99	6.4	4.13	26.6	100	3	19
10	250	600	100	8.00	20.0	50.27	324.3	2.0	13.00	3.14	20.30	58.36	376.5	4.95	31.9	8.09	52.2	100	3	19
		1500	250	8.00	20.0	50.27	324.3	2.5	16.00	4.91	31.70	58.36	376.5	3.18	20.5	8.09	52.2	100	4	26
		2500	400	6.25	15.9	30.68	197.9	2.5	16.00	4.91	31.70	37.12	239.5	1.53	9.9	6.44	41.6	100	4	26
12	300	600	100	9.50	24.0	70.88	457.3	2.5	16.00	4.91	31.70	82.52	532.4	6.73	43.4	11.64	75.1	100	4	26
		1500	250	9.50	24.0	70.88	457.3	2.5	16.00	4.91	31.70	79.53	513.1	3.74	24.1	8.65	55.8	100	4	26
		2500	400	8.00	20.0	50.27	324.3	2.5	16.00	4.91	31.70	56.75	366.2	1.57	10.1	6.48	41.8	100	4	26
14	350	150	16	11.00	28	95.03	613.1	2.5	16.00	4.91	31.70	108.43	699.6	8.49	54.8	13.40	86.5	100	8	52
		600	100	11.00	28.0	95.03	613.1	3.0	19.00	7.07	45.60	106.05	684.2	3.95	25.5	11.02	71.1	100	8	52
		1500	250	11.00	28.0	95.03	613.1	3.0	19.00	7.07	45.60	103.87	670.2	1.77	11.4	8.84	57.0	100	8	52
16	400	600	100	12.75	32.4	127.68	823.8	3.0	19.00	7.07	45.60	148.49	958.1	13.74	88.7	20.81	134.3	100	8	52
		1500	250	12.75	32.4	127.68	823.8	3.0	19.00	7.07	45.60	140.61	907.2	5.86	37.8	12.93	83.4	100	8	52

\* This data does not apply to ChannelStream or MegaStream trim.

\*\* Minimum standard actuator size. Oversized actuators may be required for large pressure drops.

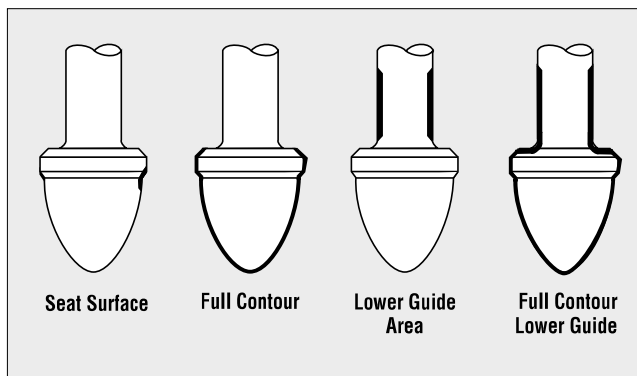


Figure 18: Hard Facing Variations - Plug

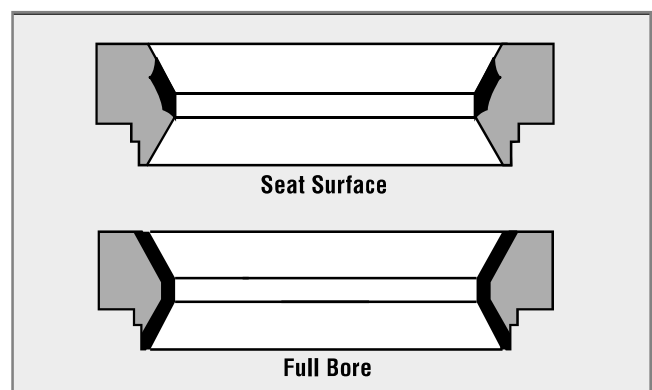


Figure 19: Hard Facing Variations - Seat

### C<sub>v</sub> Data

Use Performance! valve sizing software for C<sub>v</sub> data according to trim characteristic, body rating, and flow direction.

## Standard Materials of Construction, Estimated Shipping Weights

**Table 9: Body Materials**

Sizes	0.5-48 inch (DN 15-1200); Class 150 - 600 (PN 16-100) 0.5-24 inch (DN 15-600); Class 900-2500 (PN 160-400) 0.5-12 inch (DN15-300) Class 4500 (PN 700)
Forms	Globe, angle, three-way
ANSI Ratings	Class 150, 300, 600, 900, 1500, 2500 (PN 16, 40, 100, 160, 250, 400)
Materials	Carbon steel, stainless steel, Monel, nickel, chrome-moly, Titanium, Alloy 20, bronze, Hastelloy B, Hastelloy C, other castable materials
End Connections	Separable flange: 0.5-4 inch (DN 15-100); Class 150-600 (PN 16-100) Integral flange; all sizes NPT: 0.5-2 inch (DN 15-50) Socketweld: 0.5-4 inch (DN 15-100) Grayloc: all sizes
Separable End Flange	Carbon steel, 316 stainless steel; other material as required

**Table 10: Bonnet Materials**

Types	Standard, standard extension, special length extension, bellows seal, cryogenic
Flange	Separable
Materials	Bonnet: same as body Bellows: stainless steel, other materials as required Bellows Housing: carbon steel, 316 stainless steel, other materials as required Bonnet flange: carbon steel, 316 stainless steel, other materials as required

### Name plate

Valves are equipped with stainless steel name plates. An example is illustrated below.

<b>Flowserve Corporation</b>	
CLASS _____	S/N _____ MARK _____ SIZE _____
T/N _____	Cv _____ CHAR _____
○ AIR TO _____	SIGNAL _____
BODY _____	TRIM _____
TAG _____	
P.O. _____	

**Table 11: Estimated Shipping Weights**  
**Globe, Flanged Valves with Cylinder Actuators and Positioners**

Weight in Pounds (Kilograms)														Add for	
Size		CI 150 PN 16		CI 300 PN 40		CI 600 PN 100		CI 900 PN 160		CI 1500 PN 250		CI 2500 PN 400		Extd.	Bonnet
inch	DN														
0.5-0.75	15-20	40	18	40	18	40	18							5	2
1	25	50	23	50	23	50	23	100	45	120	54	150	68	5	2
1.5	40	65	30	65	30	65	30	170	77	180	82	210	95	5	2
2	50	75	34	75	34	75	34	200	91	220	100	300	136	5	2
3	80	160	73	170	77	180	82	400	182	430	195	500	227	15	7
4	100	240	109	250	114	265	120	590	268	610	277	940	427	20	9
6	150	360	163	570	259	600	272	1000	454	1170	531	1400	636	40	18
8	200	590	268	790	359	830	377	1100	499	1320	599	1740	790	65	30
10	250	1050	477	1405	638	1600	726	2050	931	2200	999	2600	1180	90	41

### Part Identification

Nearly every part on a Valtek control valve has an identification number, along with material code number. For example, on the plug stem flats, the trim number and flow characteristic of the plug are identified.

**Table 12: Oversize Actuator Weights (lbs/kgs)**

Original Size	Oversize	Add
25	50	30/14
50	100	90/41
100	200	125/57

## Standard Materials of Construction

**Table 13: Packing**

Configurations	Standard, Twin seal, Vacuum seal
Materials	PTFE V-ring, PTFE/AFP*, AFP/Inconel wire, glass-filled PTFE V-ring, braided PTFE, graphite, other materials as required.
Lubrication (optional)	Lubricator with integral isolation valve Lubricator with additional isolation valve

**Table 14: Trim**

Characteristics	Equal percentage, linear, quick-open
Materials	316 stainless steel Alloy 20 304 stainless steel Nickel 347 stainless steel Titanium 416 stainless steel Monel Hastelloy B 17-4 PH Hastelloy 440C
Hard Facings	Materials: Alloy 6, No. 5 Colmonoy Types: seat surface, full contour, full bore, lower stem guide area.
Soft Seat	PTFE, FEP, KEL-F, polyurethane, PEEK
Pressure-balanced	Sizes: 2-inch (DN 50) and larger, Seal types: elastomer, metal

**Table 15: Guides**

Type	Double-top stem
Materials	Glass-filled PTFE, graphite, Alloy 6, bronze, other materials as required

**Table 16: Gaskets**

Types	Spiral wound: 304 or 316 stainless steel/non-asbestos filler, PTFE, graphite Flat: PTFE, soft metal Metal O-ring: Inconel X750/silver plated
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**Table 17: Actuators**

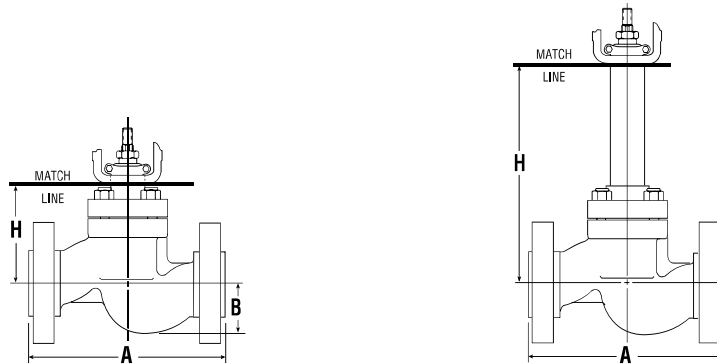
Types	Double-acting cylinder with positive fail-safe spring action Manual handwheel Electro-hydraulic Electro-mechanical
Sizes	Cylinder: 25, 50, 100 (standard); 200, 300, 400, 500, 600 (optional) Manual Handwheel: 9, 12, 18, 24 inch (23, 20, 46, 61 cm) diameter
Auxiliary	Side mounted: continuously connected Top mounted: continuously connected, push-only, limit stops
Materials	Cylinder: anodized aluminum Piston: anodized aluminum Actuator stem: 416 stainless steel Yoke: ductile iron O-rings: nitrile
Action	Air-to-open, air-to-close (field reversible)
Max. Working Pressure	150 psig (10.3 barg) (Refer to IOM 2 for pressure limitations).

**Table 18: Positioner**

Types	Digital, pneumatic, electro-pneumatic
Input Signals	Digital: 4-20 mA, HART/FF communication Pneumatic: 3-15, 3-9, 9-15, 6-30 psig (0-1, 0-0.6, 0.6-1, 0.4-2.1 barg) and split ranges Electro-pneumatic: 4-20, 10-50 mA
Supply Pressure	40-150 psig (2.8-10.3 barg) (no supply regulator required)
Standard Materials	Aluminum, stainless steel, nitrile, nickel-plated brass
Adjustments	Stroke range, zero, balance pressure
Action	Air-to-open, air-to-close (field reversible)

\*Asbestos Free Packing (AFP)

## Dimensions



**Table 19: Globe Body Dimensions - ASME Class 150, 300 and 600 (inches/mm)**

Body Size		A								B		H				Clearance Above Actuator Required for Disassembly	
		ISA 75.08.07 (S75.20) *		ISA 75.08.01 (S75.03) **													
		Class 150-600; PN 16-100		Class 150; PN 16		Class 300; PN 40		Class 600; PN 100				Standard Bonnet		Extended Bonnet			
NPS	DN	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm		
0.5	15	8.5 <sup>1</sup>	216 <sup>1</sup>	7.3	184	7.5	191	8.0	203	1.5	38	3.8	97	8.3	212	2.5	64
0.75	20	8.5 <sup>1</sup>	216 <sup>1</sup>	7.3	184	7.6	194	8.1	206	1.5	38	3.8	97	8.3	212	2.5	64
1	25	8.5	216	7.3	184	7.8	197	8.3	210	1.8	44	3.8	97	8.3	212	2.5	64
1.5	40	9.5	241	8.8	222	9.3	235	9.9	251	2.3	59	5.2	132	9.7	246	4.0	102
2	50	11.5	292	10.0	254	10.5	267	11.3	286	2.3	57	5.4	138	9.9	252	4.5	114
3	80	14.0	356	11.8	298	12.5	318	13.3	337	3.4	86	6.8	172	12.3	312	5.8	147
4	100	17.0	432	13.9	353	14.5	368	15.5	394	5.2	133	8.4	214	13.9	354	7.5	190
6	150			17.8	451					5.5	139	10.1	256	15.6	395	10.0	254
6	150					18.6	473	20.0	508	5.8	146	12.3	311	17.8	451	10.0	254
8	200			21.4	543					7.1	180	12.5	318	18.0	457	10.9	277
8	200					22.4	568	24.0	610	7.5	190	14.4	365	19.9	505	11.4	290
10	250			26.5	673					8.4	214	14.1	359	19.6	498	11.9	302
10	250					27.9	708	29.6	752	8.9	227	14.1	359	20.6	524	12.1	308
12	300			29.0	737					9.6	243	14.1	359	19.6	498	12.6	320
12	300					30.5	775	32.3	819			16.3	413	22.8	578	12.6	320

\* Separable Flange \*\*Integral Flange <sup>1</sup>Valtek Standard

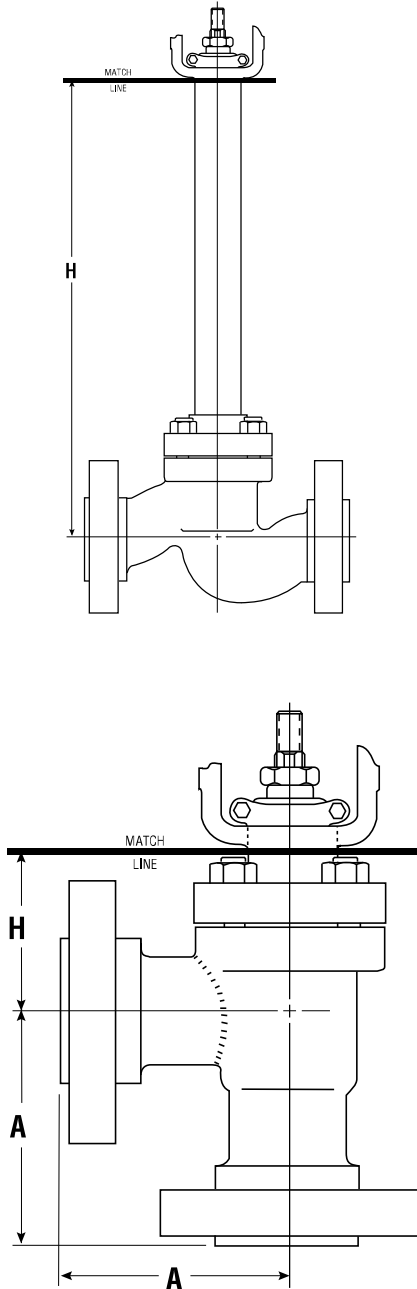
**Table 20: Globe Body Dimensions - ASME Class 900, 1500 and 2500 (inches/mm)**

Body Size		A						B				H								Clearance Above Actuator Required for Disassembly			
		ISA 75.08.06 (S75.16 LONG) *										Standard Bonnet				Extended Bonnet							
		Class 900		Class 1500		Class 2500		Class 900 & 1500		Class 2500		Class 900 & 1500		Class 2500		Class 900 & 1500		Class 2500					
NPS	DN	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
0.5-1	15-25	11.5	292	11.5	292	12.5	318	1.8	46	1.8	46	5.6	124	6.8	173	10.1	257	11.3	287	3.6	91	3.6	91
1.5	40	13.1	333	13.1	333	15.0	381	2.7	69	2.4	61	8.7	221	8.7	221	13.2	335	13.2	335	5.6	142	5.6	142
2	50	14.8	375	14.8	375	16.3	413	2.8	71	3	76	8.7	221	8.7	221	13.2	335	13.2	335	6.1	155	6.1	155
3	80	17.4	441	18.1	460	26.0	660	4.2	107	3.7	94	11.4	290	12.9	328	18.4	467	19.9	506	8.4	213	8.3	211
4	100	20.1	511	20.9	530	29.0	737	4.4	112	5.4	137	12.4	315	14.6	371	19.4	493	21.6	549	9.7	246	10.7	272
6	150	28.1	714	30.3	768	34.0	864	7.2	183	7.3	185	19.4	493	17.4	442	26.4	671	27.3	693	12.2	310	13.6	345
8	200	36.0	914	38.3	972	40.3	1022	9.4	239	10.3	262	18.6	472	24.3	617	24.2	615	31.3	795	16.7	424	17.8	452
10	250	39.0	991	42.0	1067	54.0 <sup>1</sup>	1372 <sup>1</sup>	11.2	285	10	254	21.9	556	26	660	28.9	734	33	838	18.3	465	19.5	495
12	300	44.5	1130	48.0	1219	62.0 <sup>1</sup>	1575 <sup>1</sup>	14	356	12.9	328	26.6	676	28	711	33.6	853	35	889	19.4	493	20.5	521
14	350	49.5	1257	49.5	1257								630			31.8	808			20.5	521		

\* Integral Flange <sup>1</sup> Valtek Standard



## Dimensions



**Table 21: Globe Cold Box Extended Bonnet (inches/mm)\***

Body Size		Body Rating		H					
inch	DN	ANSI Class	PN	Standard Cold Box Extension					
0.5-1	15-20	150-600	16-100	15.0	381	24.0	610	27.0	686
1.5	40	150-600	16-100	15.0	381	24.0	610	27.0	686
2	50	150-600	16-100	15.3	387	24.3	616	27.3	692
3	80	150-600	16-100	18.0	457	24.0	610	27.0	686
4	100	150-600	16-100	18.0	457	24.0	610	27.0	686
6	150	150	16	18.0	457	24.0	610	27.0	686

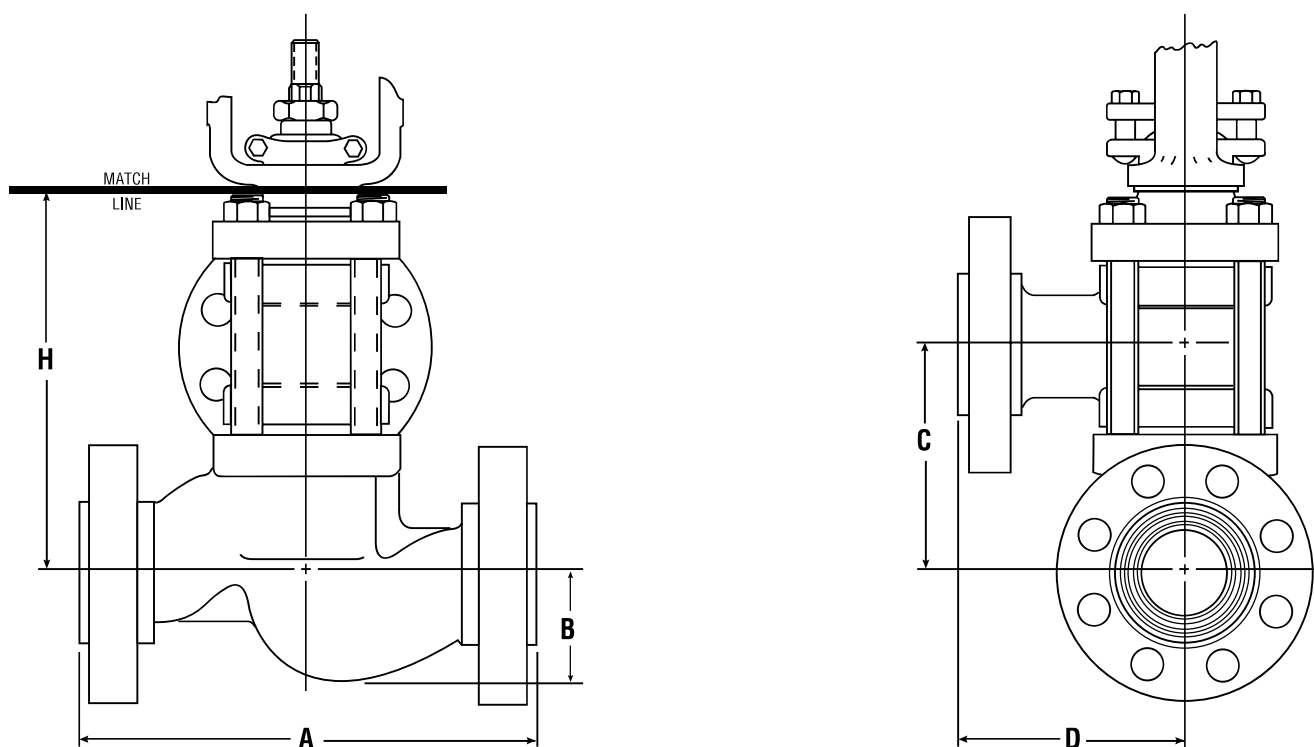
\*For all other body styles consult factory

**Table 22: Angle Body (inches/mm)**

Body Size		Body Rating		A		H				Clearance Required for Disassembly	
inch	DN	ANSI Class	PN			Standard Bonnet		Extended Bonnet			
0.5-1	15-25	150-600	16-100	4.3	108	3.1	78	7.6	192	2.5	64
1.5	40	150-600	16-100	4.8	121	3.6	92	8.1	206	4.0	102
2	50	150-600	16-100	5.8	146	3.9	100	8.2	214	4.5	114
3	80	150-600	16-100	7.0	178	4.9	124	10.4	264	5.8	147
4	100	150-600	16-100	8.8	222	6.2	156	11.7	295	7.5	190
6	150	150	16	8.9	226	7.1	180	12.6	320	10.0	254
		300-600	40-100	11.0	279	9.5	241	15.0	381	10.0	254
8	200	150	16	13.0	330	9.0	229	14.5	368	13.8	349
		300-600	40-100	13.0	330	10.8	275	16.3	414	13.8	349

0.5-1	15-25	900-1500	160-250	5.5	140	4.7	119	9.2	234	3.6	90
		2500	400	6.0	152	5.8	147	10.3	262	3.6	90
1.5	40	900-1500	160-250	6.5	165	6.5	165	11.0	279	5.6	142
		2500	400	7.5	191	7.0	178	11.5	292	5.6	142
2	50	900-1500	160-250	7.3	185	7.1	180	11.6	295	6.1	155
		2500	400	8.9	226	7.9	201	12.4	315	6.1	155
3	80	900-1500	160-250	9.3	236	9.8	249	16.8	427	8.4	213
		2500	400	13.0	330	11.2	284	18.2	462	8.3	211
4	100	900-1500	160-250	12.5	318	11.1	282	18.1	460	9.7	246
		2500	400	14.5	368	12.6	320	19.6	498	10.7	272
6	150	900-1500	160-250	13.9	353	13.3	338	20.3	516	12.2	310
		2500	400	17.0	432	16.1	409	23.1	537	13.6	345
8	200	900-1500	160-250	16.4	417	14.5	368	21.5	547	16.7	424
		2500	400	20.1	511	20.8	528	27.8	706	17.8	452
10	250	900-1500	160-250	19.5	495	15.6	396	22.6	574	18.3	465
		2500	400	25.0	635	21.1	536	28.1	714	16.3	414

# Dimensions



**Table 23: Three-way Body (inches/mm)**

Body Size		A								B		C		D		H				Clearance Required for Disassembly	
		Sep. Flange Class* 150-600 PN 16-150		Integral Flange*												Standard Bonnet		Extended Bonnet			
in	DN			Class 150 PN 16		Class 300 PN 40		Class 600 PN 100													
0.5-0.75	15-20	8.5	216	7.3	184	7.6	194	8.1	206	1.5	38	3.4	87	4.3	108	6.7	170	11.2	284	3.4	86
1	25	8.5	216	7.3	184	7.8	197	8.3	210	1.8	44	3.4	87	4.3	108	6.7	170	11.2	284	3.4	86
1.5	40	9.5	241	8.8	222	9.3	235	9.9	251	2.3	59	5.4	137	4.8	121	9.1	230	13.4	341	5.0	127
2	50	11.5	292	10.0	254	10.5	267	11.3	286	2.3	59	5.6	143	5.8	146	9.3	236	13.7	347	5.5	140
3	80	14.0	356	11.8	298	12.5	318	13.3	337	3.4	86	7.6	194	7.0	178	13.0	329	18.5	470	7.1	181
4	100	17.0	432	13.9	353	14.5	368	15.5	394	5.2	133	9.9	251	8.5	216	16.7	423	22.1	562	9.4	240
6	150			17.8	451					5.5	139	14.0	356	8.9	226	21.6	548	26.6	675	11.6	294
6	150					18.6	473	20.0	508	5.8	146	16.0	406	10.0	254	25.8	654	31.3	794	11.6	294
8	200			21.4	543					7.0	179	15.0	381	10.7	272	23.9	608	29.4	748	12.2	310
8	200					22.4	568	24.0	610	7.5	191	18.3	464	12.0	305	30.2	767	35.7	907	12.2	310

\* ANSI/ISA B16.10, latest edition

\*\* Per ANSI/ISA S75.03, latest edition

## Applications



A 4-inch Mark One with side-mounted handwheel operates a boiler feedwater system at a pulp plant.



This 2-inch Guardian II operates in a chemical plant.



This cryogenic Mark One is used for aerospace testing as an O<sub>2</sub> vent.



This 8-inch back-pressure control valve operates in a liquid hydrocarbon plant with a 580 psi/40 bar upstream pressure

(Right) A liquid nitrogen loading facility in Australia uses two Mark One valves for its emergency fire water system.



(Left) Mark One valves used to operate a PSA skid.



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**USA**

Flowserve Flow Control Division  
1350 N. Mt. Springs Parkway  
Springville, UT 84663  
USA  
Phone: +1 801 489 8611  
Fax: +1 801 489 3719

**Austria**

Flowserve Control Valves GmbH  
Kasernengasse 6  
9500 Villach  
Austria  
Phone: 43 (0) 4242 41 181 0  
Fax: 43 (0) 4242 41181 50  
France  
Flowserve France S.A.S.  
BP 60 63307 Thiers Cedex  
France  
Phone: 33 4738 04266  
Fax: 33 4738 01424

**India**

Flowserve India Controls Pvt Ltd.  
Plot # 4, 1A, Road #8 EPIP  
Whitefield  
Bangalore, Karnataka, 560066  
India  
Phone: 91 80 40146200  
Fax: 91 80 28410286

**China**

Flowserve Fluid Motion and  
Control (Suzhou) Co., Ltd.  
No. 35, Baiyu Road  
Suzhou Industrial Park, Suzhou  
Jiangsu Province, P.R. 215021  
China  
Phone: 86 512 6288 8790  
Fax: 86 512 6288 8736

**Singapore**

Flowserve Pte. Ltd.  
12 Tuas Avenue 20  
Republic of Singapore 638824  
Phone: 65 6879 8900  
Fax: 65 6862 4940

**Saudi Arabia**

Flowserve Abahsain Flow Control  
Co., Ltd.  
Makkah Road, Phase 4  
Plot 10 & 12, 2nd Industrial City  
Dammam, Kingdom of Saudi  
Arabia  
Phone: +966 3 857 3150 ext. 243  
Fax: +966 3 857 4243