



# GLC

## Cryogenic

### Globe Control Valve

## INTRODUCTION

The VSI Controls GLC Series comprises globe-type cryogenic control valves with single seat, rugged trim and cryogenic extension welded to the body, making them the ideal choice for cold boxes in industrial gas plants, where operating temperatures may reach -425°F (-253°C).

The design of the bonnet cryogenic extension allows easy access to the valve's trim, making any maintenance activities easier and quicker; as the trim is assembled from the upper portion of the extension (top entry), removal and replacement of internal components are carried out without affecting the integrity of the cold box.

During operation a small fraction of the liquefied gas goes into the inner part of the extension where it is vaporized. This gas barrier created between the cryogenic liquid that flows through the body and the top of the extension isolates the valve packing, protecting it from the ultra-low temperatures and prevents the packing from freezing.

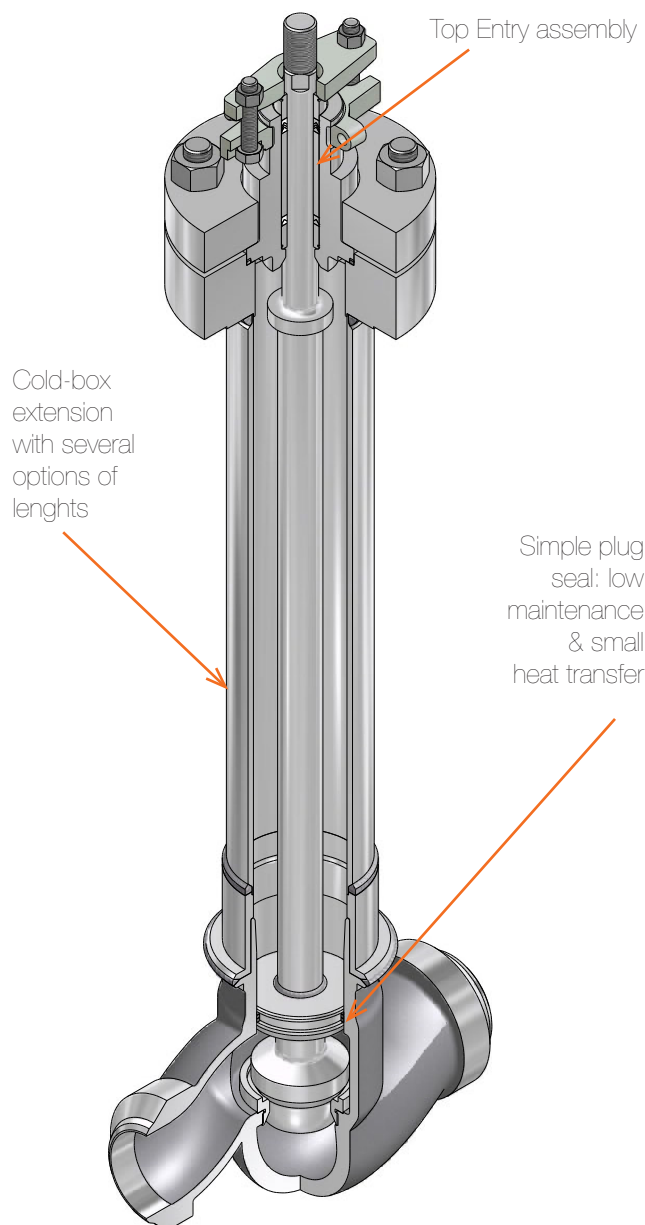
Pressure resulting from part of the liquid that is vaporized prevents that additional quantities of liquefied gas continue entering into the inner part of the extension. The design of the extension, plug and the sealing assures a small vaporization of the fluid during the cooling process of the valve.

The GLC Series is available in sizes from ½ to 10 inches and pressure classes from ANSI 150 to 600. Bodies of conventional globe-style or angle-style are designed with uniform wall thicknesses to reduce the total weight of the valve.

A spring-cylinder actuator offers excellent positioning accuracy and high actuating thrusts, which increases even more the notable sealing capacity of the GLC Series.

Adopting interchangeable components and sharing many design solutions already proven in the renowned GLS valves, make the GLC Series one of the most reliable and versatile cryogenic control valves in the market.

**GLC SERIES – BODY SUB-ASSEMBLY (FIGURE 1)**



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Rangeability: 30:1 (Typical)

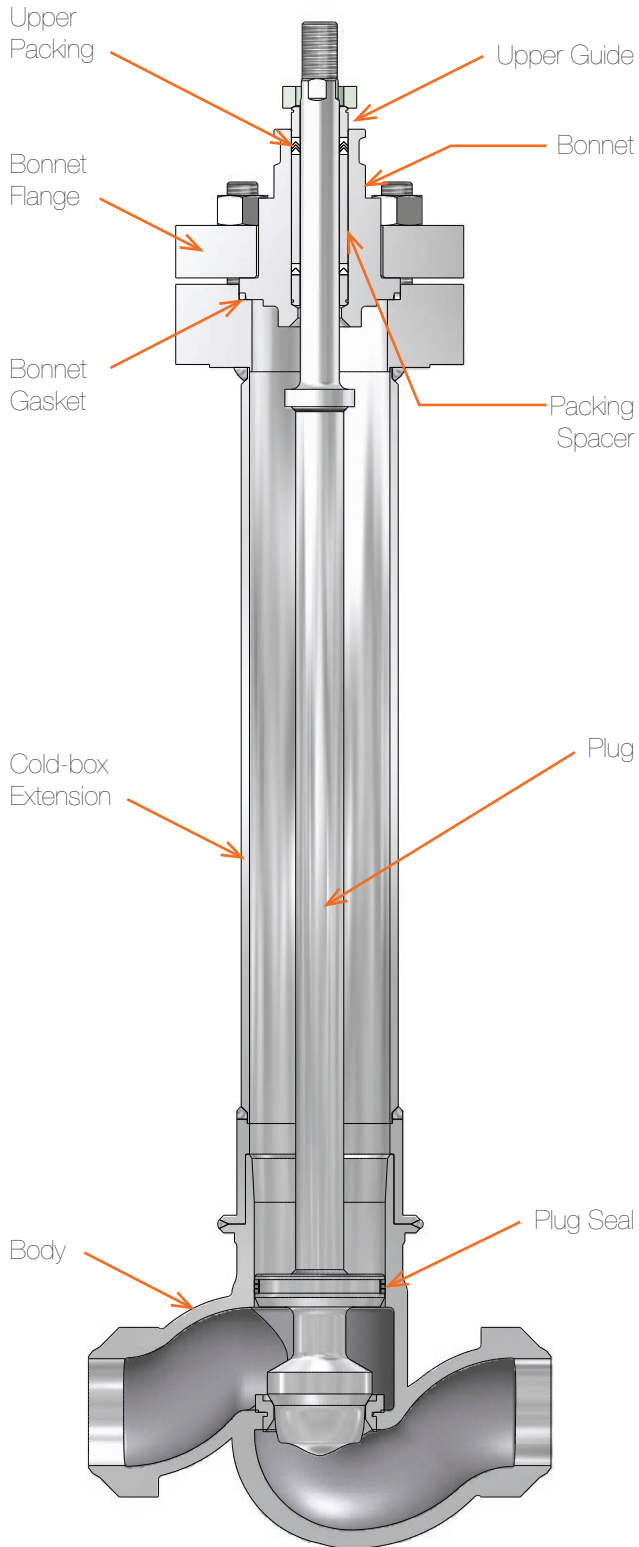
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ANSI Class IV Shutoff – Metal Seat

ANSI Class VI Shutoff – Soft Seat

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**GL̄ VALVE WITH GLOBE-STYLE BODY (FIGURE 2)**



## Body

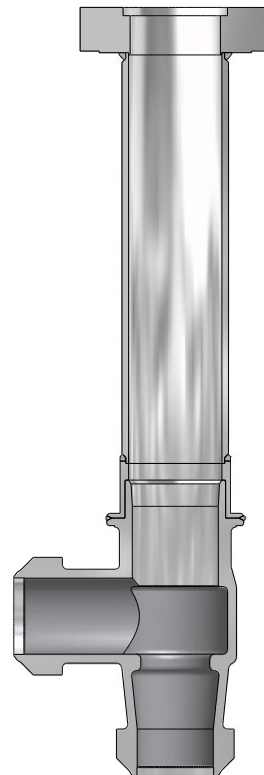
The optimized geometry of the GL̄ Series valve bodies presents smooth curves and a flow passageway nearly constant, which reduce the flowing fluid turbulence and increase the valve flow rate capacity.

In addition to the cryogenic extension welded to the body, the small number of internal components and their reduced weight enable the heat transfers during the valve operation to be kept within low levels, increasing the process thermal efficiency.

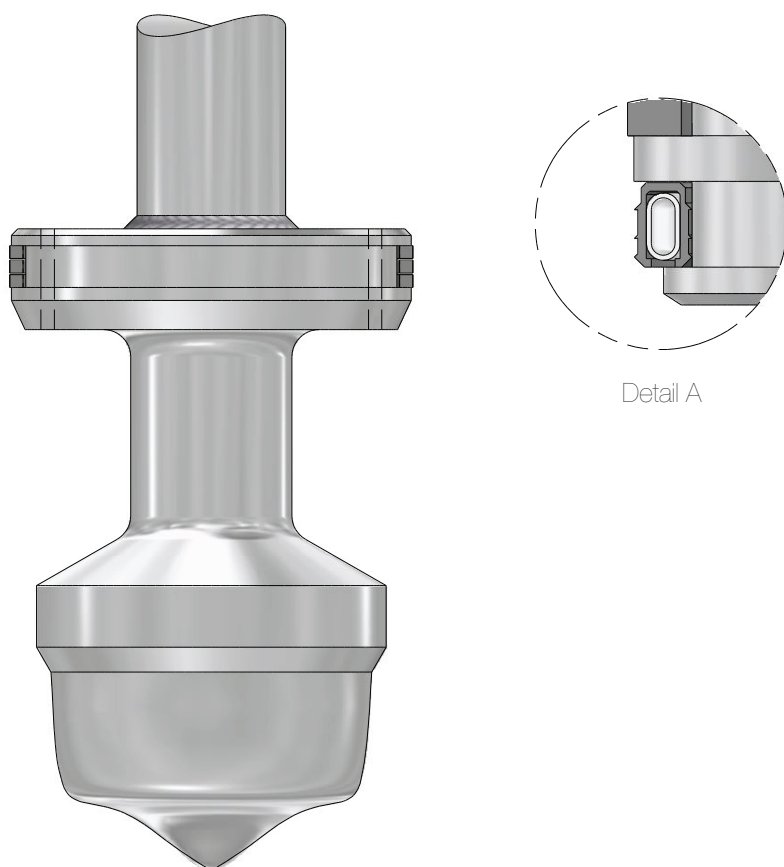
The construction of the body and the cryogenic extension in a single piece, with no gaskets or flanged connections eliminates the risk of leakage inside the cold box.

GL̄ valve bodies are usually manufactured in bronze or austenitic stainless steel, materials that have a face-centered cubic (FCC) structure presenting high yield and tensile, as well as high impact strengths at cryogenic temperatures.

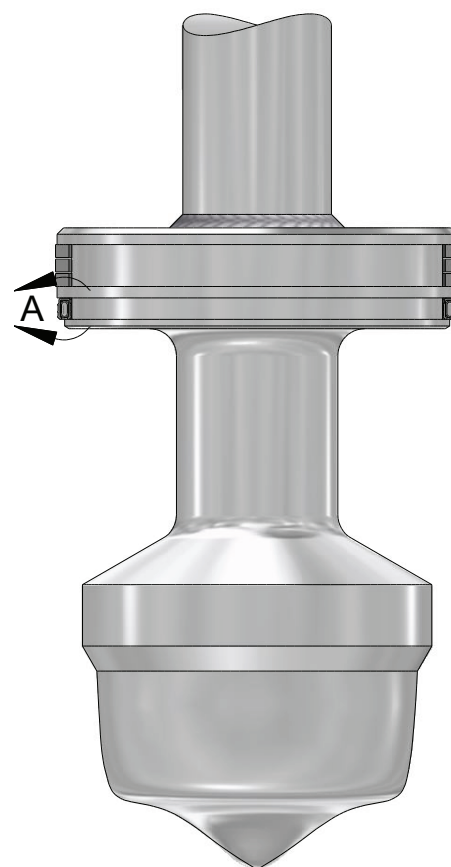
**GL̄ VALVE ANGLE-STYLE BODY (FIGURE 3)**



**PLUG WITH PRESSURE COMMUNICATION ORIFICES  
(FIGURE 4)**



**PLUG WITH SPRING ENERGIZED SEAL  
(FIGURE 5)**



## Sealing of the plug

The simple design of the plug sealing enables an efficient barrier of vapor to be created between the liquefied gas and the valve packing: a small fraction of the liquefied gas is vaporized when it enters into the bonnet cryogenic extension and the resulting pressure from this vapor barrier prevents that additional quantities of liquid penetrate the cryogenic extension.

In plugs provided with the pressure communication orifices, a small fraction of the liquid is vaporized when it penetrates the cryogenic extension through the small equalization holes in the plug head. In valves equipped with a plug assembled with soft sealing ring energized by spring, the sealing ring allows the passage of small quanti-

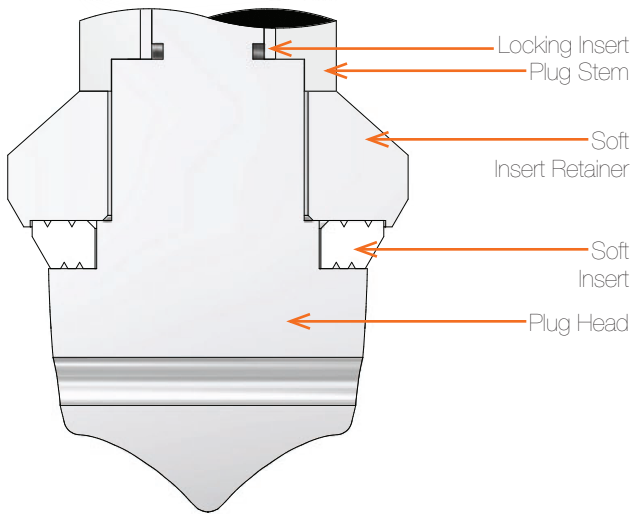
ties of liquid into the cryogenic extension during a certain period of time, and a period of up to 24 hours may be required for the pressure inside the extension to be equalized with the pressure of the fluid that flows through the valve body. In both instances, a soft sealing ring guides the plug head in the polished hole of the valve body.

Since the sealing of the plug comprises only a few pieces, the heat transfer to the process fluid is minimized. A fully retained bonnet gasket prevents the process fluid leakage to the atmosphere.

In addition to the standard trim, the GLC Series may be supplied with Alpha anti-cavitation trim, soft seated trim and non-sparking trim.

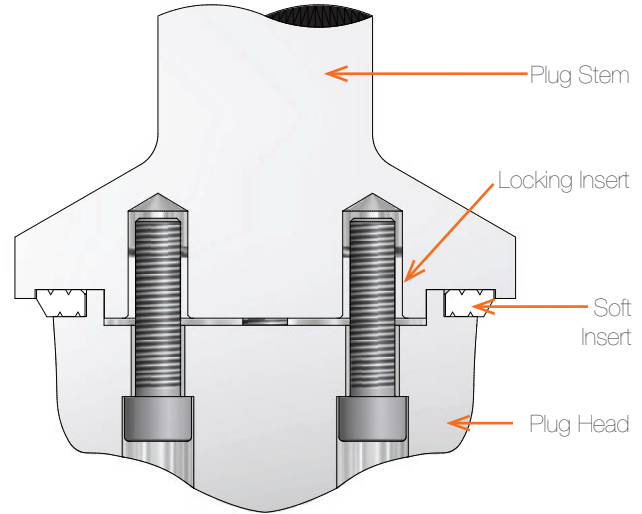


**SOFT SEATED PLUG  
(FIGURE 6)**



Valves with sizes up to 1.5"

**SOFT SEATED PLUG  
(FIGURE 7)**



Valves with sizes 2" and larger

### Plug with soft sealing

Leakage in accordance to Class VI\* may be obtained using a PTFE or KEL-F (PCTFE) insert mounted in the seating surface of the plug. Valves with sizes up to 1.5 inch use a plug design with threaded head that secures the polymer soft insert between the head and the insert retainer. Plugs of valves with sizes 2 inches and larger use a design provided with bolts that secures the head and the insert in the plug stem. In both versions, self-locking elements are used to prevent that the plug head is released from the stem. Plugs with soft inserts are interchangeable with plugs with metal-to-metal seating for a given trim number and valve size.

### Seat

Most of the GLC Series control valves use threaded seats, and the variation of nominal  $C_v$  is preferably obtained by changing the plug head contour. If a higher flow rate coefficient is necessary, integral seats, machined in the valve body, are available as an option.

### Packings

Valve packing may be easily accessed from the external side of the cold box, as well as the bonnet flange studs and nuts.

The standard packing consists of virgin PTFE V-rings, but optionally can be supplied with fiberglass reinforced PTFE (PTFEG) V-rings.

### Guides

The two guides used in the packing box of the GLC valves can be easily removed, and the upper guide acts also as a packing gland. Guides are widely spaced, providing great stability for the plug stem. Solid guides manufactured in bronze or PTFEG-lined stainless steel guides completely eliminate the possibility of wear and galling between the guides and the plug stem. Solid guides manufactured with Alloy #6 are available optionally.

### Bonnet Gasket

The GLC Series bonnet seats metal-to-metal in the valve body, keeping its gasket thoroughly retained. The compression of the gasket is determined by the height of an existing shoulder in the bottom of the bonnet, which is machined with precise tolerances to assure the proper compression required by the gasket. GLC valves can be supplied with PTFE or KEL-F (PCTFE) flat gaskets.

\* ANSI B16.104/FCI-70.2

**GLC SERIES - SPECIFICATIONS & MATERIALS OF CONSTRUCTION (TABLE I)**

<b>BODY</b>	<b>Sizes</b>		0.5 to 10 inches
	<b>ANSI Ratings</b>		150, 300 and 600
	<b>Forms</b>		Globe, angle
	<b>Materials of Construction</b>		Stainless steels AISI-316 (standard), AISI-316L, AISI-304 and AISI-304L, bronze
	<b>End Connections</b>	Socketweld (0.5 to 1 inch)	
		Buttweld (all sizes)	
		Integral flanges (all sizes)	
	<b>Flat Gaskets</b>		PTFE, PCTFE (KEL-F)
<b>BONNET</b>	<b>Type</b>		Cryogenic bonnet extension welded to valve body, with several options of lengths (see Table V)
	<b>Materials</b>		Same as body
	<b>Bonnet Flange</b>		Separable, made from 316 stainless steel
	<b>Guides</b>	<b>Type</b>	Double upper guide on plug stem, out of flow path
		<b>Materials</b>	316 SS with PTFEG* insert or solid guides in bronze
	<b>Packing</b>	<b>Type</b>	Standard with "V" rings, twin seal, packing for vacuum applications, packing for fugitive emissions control
		<b>Materials</b>	PTFE, PTFEG and other materials upon request
<b>TRIM</b>	<b>Type</b>		Unbalanced. Plugs with pressure communication orifices or energized sealing rings
	<b>Flow Characteristics</b>		Equal Percentage, Linear or Quick Open
	<b>Plug Materials</b>		316 SS, 17-5PH (standard), 17-4PH Nitrided, Monel
	<b>Plug Sealing</b>		PTFE, PCTFE (KEL-F), FEP/316 SS energized by spring
	<b>Seat Materials</b>		17-4PH (standard), 17-4PH Nitrided, Monel
	<b>Hard Facings</b>	<b>Material</b>	Alloy #6
		<b>Type</b>	Hardening of seating surfaces, hardening of plug full contour and seat full bore
	<b>Soft Seat Insert</b>	<b>Materials</b>	PTFE or PCTFE (KEL-F), mounted on seating surface of the plug
<b>ACTUATOR</b>	<b>Types</b>	<b>Pneumatic</b>	Double-acting cylinder with positive spring for failsafe action. Field reversible and available on sizes 25, 50, 100 and 200 (larger sizes upon request). Options: manual handwheel, limit stops and others (see the technical bulletin of linear actuators).
		<b>Others</b>	Manual, electro-mechanical or electro-hydraulic upon request
<b>POSITIONER</b>	<b>Types</b>		Pneumatic, analog electro-pneumatic or digital electro-pneumatic with multiple communication protocols

\* PTFEG: Glass-filled PTFE

# FLOW CHARACTERISTICS

## Equal Percentage

The Equal Percentage is the most common characteristic used in processes control. The flow rate change by valve stroke unit is directly proportional to the flow rate passing through the valve at the moment immediately before the stroke movement. When installed, a valve with an Equal Percentage characteristic will present in most control loops, a characteristic close to the Linear characteristic, whenever the total differential pressure of the system is large compared to the differential pressure through the valve.

## Linear

The Linear characteristic creates equal changes in flow rate per unit of valve stroke, regardless of plug position. Linear plugs are frequently used in systems where the differential pressure through the valve corresponds to the major part of the total differential pressure of the system.

## Quick-open

Quick-open plugs are used in on-off services and are designed to create large increments of flow rate, even from small opening percentages.

## Trim Sizes

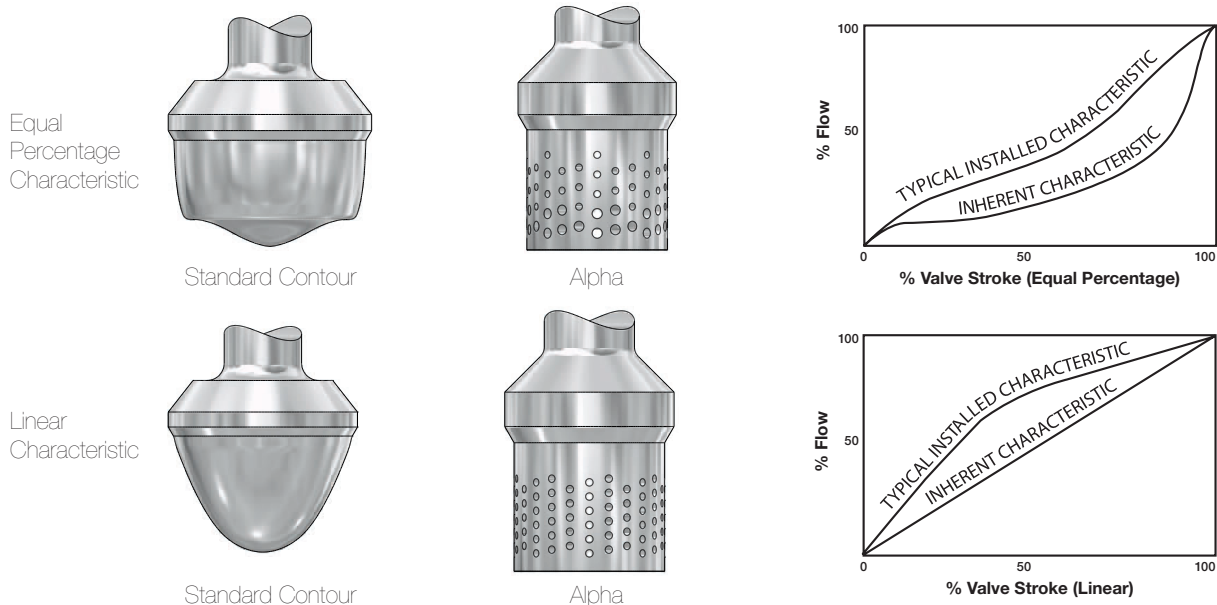
There are three trim sizes available for the GLC Series valves: standard trim, with full area; reduced trim, available in a large range of sizes, and; trim with integral area, whose seat is machined in the valve body itself.

## Alpha Anti-Cavitation Trim

Alpha trim minimize the damage caused by fluid cavitation, directing the turbulent liquid jets to the center of the plug and causing the implosion of the bubbles far from the metallic surfaces. Alpha trim uses a certain number of small holes diametrically opposed and carefully distributed along the plug head.

As the plug is moving away from the seat, an increasing number of hole pairs are opened, and the cavitating jet of liquid that passes through each hole collides at the center of the plug head with the jet that enters through the opposite hole. The design of this special plug enables the creation of a non-cavitating fluid barrier around metallic surfaces, while moving away the pressure recovery area and the subsequent bubbles collapsing.

**TYPICAL CONFIGURATIONS OF GLC VALVE PLUGS (FIGURE 8)**



# FLOW COEFFICIENTS

FLOW COEFFICIENTS (C <sub>v</sub> ) VALVES WITH STANDARD TRIM <sup>(1)</sup> (TABLE II)					
VALVE SIZE (inches)	TRIM SIZE (TN)	STROKE		RATED C <sub>v</sub>	
		in.	mm	=%	Linear
0.5	0.38-20 (10-20)	0.75	19.05	2.5	2.5
	0.38-18 (10-18)	0.75	19.05	1.95	1.95
	0.38-16 (10-16)	0.75	19.05	1.48	1.48
	0.25 (6.5)	0.75	19.05	1.10	1.10
	0.12-12 (3.2-12)	0.50	12.70	0.51	0.51
	0.12-10 (3.2-10)	0.50	12.70	0.30	0.30
0.75	1.00-30 (25-30)	0.75	19.05	9.1	9.1
	1.00-28 (25-28)	0.75	19.05	6.0	6.0
	1.00-26 (25-26)	0.75	19.05	4.1	4.1
	0.38-20 (10-20)	0.75	19.05	2.5	2.5
	0.38-18 (10-18)	0.75	19.05	1.95	1.95
	0.38-16 (10-16)	0.75	19.05	1.48	1.48
	0.25 (6.5)	0.75	19.05	1.10	1.10
	0.12-12 (3.2-12)	0.50	12.70	0.51	0.51
	0.12-10 (3.2-10)	0.50	12.70	0.30	0.30
1	1.00-30 (25-30)	0.75	19.05	15.5	15.5
	1.00-28 (25-28)	0.75	19.05	11.9	11.9
	1.00-26 (25-26)	0.75	19.05	9.1	9.1
	1.00-24 (25-24)	0.75	19.05	6.0	6.0
	1.00-22 (25-22)	0.75	19.05	4.1	4.1
	0.38-20 (10-20)	0.75	19.05	1.95	1.95
	0.38-18 (10-18)	0.75	19.05	1.48	1.48
	0.38-16 (10-16)	0.75	19.05	1.10	1.10
	0.25 (6.5)	0.75	19.05	1.00	1.00
	0.12-12 (3.2-12)	0.50	12.70	0.51	0.51
	0.12-10 (3.2-10)	0.50	12.70	0.30	0.30
1.5	1.50 (38)	1.00	25.4	34	34
	1.25-38 (32-38)	1.00	25.4	30	30
	1.25-36 (32-36)	1.00	25.4	15.2	15.2
	1.25-34 (32-34)	1.00	25.4	11.9	11.9
	1.25-32 (32-32)	1.00	25.4	6.1	6.1

FLOW COEFFICIENTS (C <sub>v</sub> ) VALVES WITH STANDARD TRIM <sup>(1)</sup> (TABLE II-CONT.)					
VALVE SIZE (inches)	TRIM SIZE (TN)	STROKE		RATED C <sub>v</sub>	
		in.	mm	=%	Linear
2	2.00 (51)	1.50	38.1	64	64
	1.63-50 (41-50)	1.50	38.1	47	47
	1.63-48 (41-48)	1.50	38.1	30	30
	1.63-46 (41-46)	1.50	38.1	21	21
	1.63-44 (41-44)	1.50	38.1	15.3	15.3
	1.63-42 (41-42)	1.00	25.4	11.6	11.6
3	2.63-60 (67-60)	2.00	50.8	115	115
	2.63-58 (67-58)	2.00	50.8	79	79
	2.63-56 (67-56)	2.00	50.8	61	61
	2.63-54 (67-54)	2.00	50.8	30	30
4	3.50-70 (89-70)	2.50	63.5	226	226
	3.50-68 (89-68)	2.50	63.5	194	194
	3.50-66 (89-66)	2.50	63.5	132	132
	3.50-64 (89-64)	2.50	63.5	121	121
	3.50-62 (89-62)	2.50	63.5	60	60
6	4.00-76 (102-76)	3.00	76.2	399	399
	4.00-74 (102-74)	3.00	76.2	261	261
	4.00-72 (102-72)	3.00	76.2	200	200
8	7.44-82 (189-82)	4.00	101.6	859	859
	7.44-80 (189-80)	4.00	101.6	601	601
	7.44-78 (189-78)	4.00	101.6	516	516
10	9.75-88 (248-88)	4.00	101.6	1331	1331
	9.75-86 (248-86)	4.00	101.6	995	995
	9.75-84 (248-84)	4.00	101.6	795	795

<sup>(1)</sup> Consult VSI Controls to obtain information regarding the C<sub>v</sub> of valves equipped with Quick-open trim.

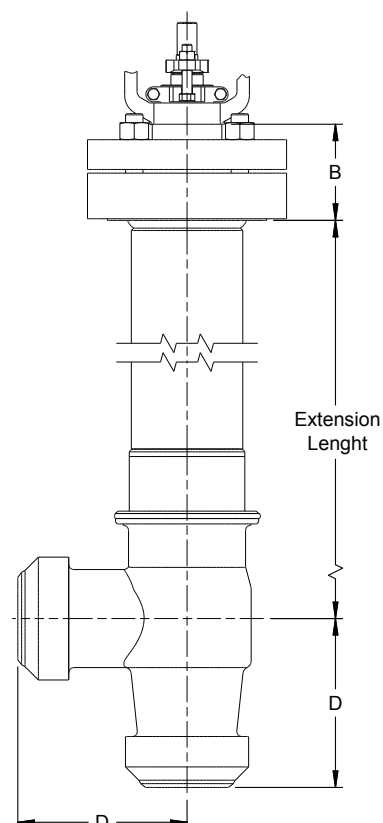
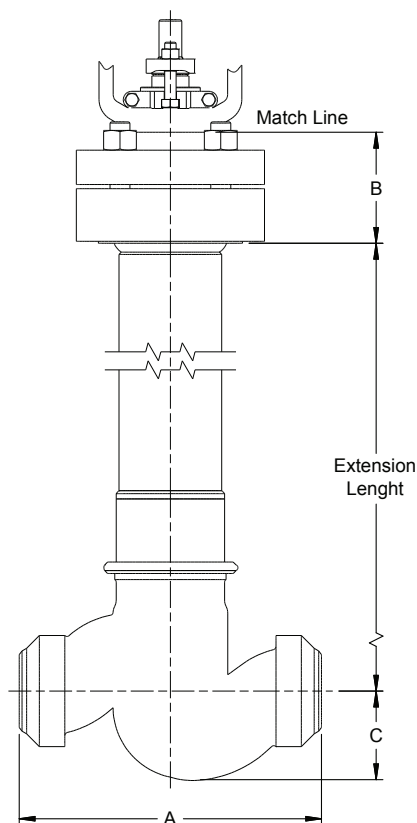
FLOW COEFFICIENTS, (C <sub>v</sub> ) VALVES WITH ALPHA TRIM <sup>(1)</sup> <sup>(2)</sup> (TABLE III)					
VALVE SIZE (inches)	TRIM SIZE (TN)	STROKE		RATED C <sub>v</sub>	
		in.	mm	=%	Linear
0.5	0.75-20 (19-20)	1.00	25.4	9.1	9.9
	0.75-18 (19-18)	0.75	19.05	7.0	8.1
	0.75-16 (19-16)	0.75	19.05	6.0	6.1
	0.75-14 (19-14)	0.75	19.05	3.9	4.0
	0.75-12 (19-12)	0.75	19.05	2.5	2.5
	0.75-10 (19-10)	0.75	19.05	1.51	1.51
0.75	0.75-20 (19-20)	0.75	19.05	9.1	9.9
	0.75-18 (19-18)	0.75	19.05	7.0	8.1
	0.75-16 (19-16)	0.75	19.05	6.0	6.1
	0.75-14 (19-14)	0.75	19.05	3.9	4.0
	0.75-12 (19-12)	0.75	19.05	2.5	2.5
	0.75-10 (19-10)	0.75	19.05	1.51	1.51
1	0.75-20 (19-20)	0.75	19.05	9.1	9.9
	0.75-18 (19-18)	0.75	19.05	7.0	8.1
	0.75-16 (19-16)	0.75	19.05	6.0	6.1
	0.75-14 (19-14)	0.75	19.05	3.9	4.0
	0.75-12 (19-12)	0.75	19.05	2.5	2.5
	0.75-10 (19-10)	0.75	19.05	1.51	1.51
1.5	1.25-26 (32-26)	0.75	19.05	9.7	9.9
	1.25-24 (32-24)	0.75	19.05	6.0	6.1
	1.25-22 (32-22)	0.75	19.05	3.9	4.0

FLOW COEFFICIENTS, (C <sub>v</sub> ) VALVES WITH ALPHA TRIM <sup>(1)</sup> <sup>(2)</sup> (TABLE III-CONT.)					
VALVE SIZE (inches)	TRIM SIZE (TN)	STROKE		RATED C <sub>v</sub>	
		in.	mm	=%	Linear
2	1.63-34 (41-34)	2.00	50.8	39	45
	1.63-32 (41-32)	1.50	38.1	34	34
	1.63-30 (41-30)	1.00	25.4	24	24
	1.63-28 (41-28)	1.00	25.4	15	16
	1.25-26 (32-26)	0.75	19.05	9.7	9.9
	1.25-24 (32-24)	0.75	19.05	6.0	6.1
	1.25-22 (32-22)	0.75	19.05	3.9	4.0
3	2.50 (64)	2.00	50.8	71	91
	2.25-44 (57-44)	1.50	38.1	46	64
	2.25-42 (57-22)	1.50	38.1	43	43
	1.88-40 (48-40)	1.00	25.4	28	29
	1.88-38 (48-38)	1.00	25.4	15	16
	1.50 (38)	0.75	19.05	10	10
4	3.00-54 (76-54)	2.00	50.8	95	96
	3.00-52 (76-52)	2.00	50.8	65	66
	1.88-50 (48-50)	1.50	38.1	43	44
	1.88-48 (48-48)	1.50	38.1	28	29
6	4.75-62 (121-62)	3.00	76.2	311	351
	4.75-60 (121-60)	2.50	63.5	194	241
	4.75-58 (121-58)	2.50	63.5	159	160
	3.25 (83)	2.00	50.8	111	111

<sup>(1)</sup> Alpha trim is not available with Quick-open characteristic.

<sup>(2)</sup> Flow over is mandatory whenever Alpha trim is used (see additional information on technical brochure of severe service trim).

# DIMENSIONS, ESTIMATED SHIPPING WEIGHTS

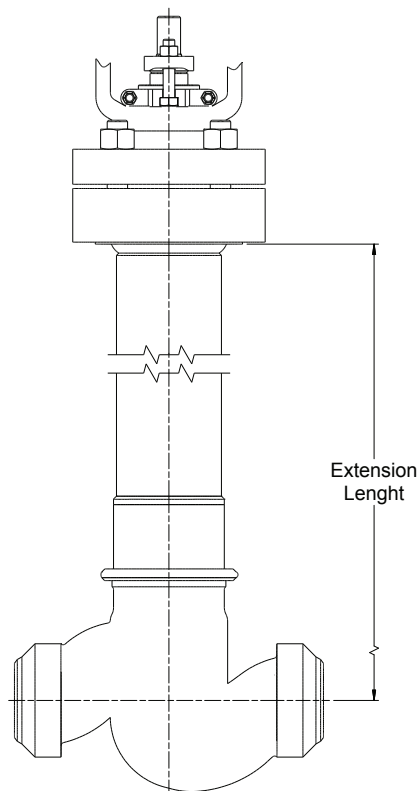


**DIMENSIONS - GLOBE AND ANGLE VALVES<sup>(1)</sup> - ANSI CLASS 150, 300 & 600 (TABLE IV)**

Valve Size (inches)	ANSI Class	A <sup>(2)</sup>		B		C		D		Clearance Required Above Actuator for Disassembly	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
<b>0.5</b>	150-600	8.00	203	3.80	97	1.77	45			6.8	173
<b>0.75</b>	150-600	8.25	210	3.80	97	1.75	44			6.8	173
<b>1</b>	150-600	8.25	210	3.80	97	1.75	44	4.25	108	6.8	173
<b>1.5</b>	150-600	9.88	251	3.93	100	2.31	59	4.75	121	8.9	226
<b>2</b>	150-600	11.25	286	4.06	103	2.25	57	5.75	146	9.1	231
<b>3</b>	150-600	13.25	337	5.34	136	3.39	86	7.00	178	11.3	287
<b>4</b>	150-600	15.50	394	6.06	154	5.22	133	8.75	222	14.1	358
<b>6</b>	150	20.00	508	6.04	153	5.48	139	8.88	226	16.1	409
<b>6</b>	300-600	20.00	508	8.19	208	5.75	146	11.0	279	18.2	462
<b>8</b>	150	24.00	610	6.94	176	7.08	180	13.0	330	20.0	508
<b>8</b>	300-600	24.00	610	8.75	222	7.48	190	13.0	330	21.8	554
<b>10</b>	150	29.62	752	7.37	187	8.44	214			21.4	544
<b>10</b>	300-600	29.62	752	7.37	187	8.93	227			21.4	544

<sup>(1)</sup> GL̄ valves equipped with plugs having pressure communication orifices should always be mounted with the extension and actuator within 15° of vertical. Actuators should be pointing up.

<sup>(2)</sup> According to ANSI/ISA-75-08-05, last edition.



**ESTIMATED SHIPPING WEIGHTS\*  
(TABLE VI)**

Valve Size (inches)	Class 150		Class 300		Class 600	
	lbs	kg	lbs	kg	lbs	kg
<b>0.5</b>	70	32	70	32	70	32
<b>0.75</b>	70	32	70	32	70	32
<b>1</b>	70	32	70	32	70	32
<b>1.5</b>	85	39	85	39	85	39
<b>2</b>	95	43	95	43	95	43
<b>3</b>	190	86	200	91	210	95
<b>4</b>	275	125	285	129	300	136
<b>6</b>	400	181	610	277	640	290
<b>8</b>	640	290	840	381	880	399
<b>10</b>	1110	504	1465	665	1660	753

**DIMENSIONS - BONNET EXTENSION LENGTH  
(TABLE V)**

Valve Size (inches)	ANSI Class	Standard Extension Length		Optional Extension Length					
		in.	mm	in.	mm	in.	mm	in.	mm
<b>0.5</b>	150-600	27	686	15	381	18	457	24	610
<b>0.75</b>	150-600	27	686	15	381	18	457	24	610
<b>1</b>	150-600	27	686	15	381	18	457	24	610
<b>1.5</b>	150-600	27	686	18	457	24	610	30	762
<b>2</b>	150-600	30	762	18	457	24	610	36	914
<b>3</b>	150-600	30	762	21	533	24	610	36	914
<b>4</b>	150-600	36	914	21	533	24	610	30	762
<b>6</b>	150	36	914	24	610	27	686	30	762
<b>6</b>	300-600	36	914	24	610	27	686	30	762
<b>8</b>	150	36	914	24	610	27	686	30	762
<b>8</b>	300-600	36	914	24	610	27	686	30	762
<b>10</b>	150	36	914	30	762	33	838	42	1067
<b>10</b>	300-600	36	914	30	762	33	838	42	1067

**ADDITIONAL WEIGHT  
FOR OVERSIZED ACTUATORS (TABLE VII)**

Standard Original Size	Oversized Actuator Required	Add	
		lbs	kg
25	50	30	14
50	100	90	41
100	200	125	57

\* Globe-style valve equipped with standard size actuator and positioner.

The information and specification contained in this bulletin are considered accurate. However, they are provided only for information purposes and should not be considered as certified. VSI Controls products are continuously improved and upgraded and the specification, dimensions and information contained herein are subject to change without notice. For further information or to confirm these presented here, contact your VSI Controls representative. The specific instructions for installation, operation and maintenance of the GLC control valve are provided in Maintenance Bulletin #08.



WorldWide presence through the Companies of the Group:  
italy - uk - the netherlands - norway - usa - brazil - singapore - australia - russia - kazakhstan