HP Series Control Valves

Design HP (Globe Valve)
Design HPA (Angle Valve)

- **Balanced High-Temperature Trim**
- **Balanced Tight Shutoff Trim**
- **Unbalanced Trim**

HP Series control valves (figure 1) are single-port, high-pressure, globe- or angle-style valves with metal seats, cage guides, and push-down-to-close valve plug action.

These valves are designed for high-pressure applications in process control industries such as power generation, hydrocarbon production, chemical processing, and refining.

HP Series valves are designed with corrosion allowance; NACE compliant materials are available. Extra valve body wall thickness provides a safety margin of protection against erosion, as well as extra protection against corrosion due to chemical attack. Because these valves feature a thicker valve body wall, they are available in higher intermediate ratings with weld-end fittings.

Unless otherwise noted, all NACE references are to NACE MR0175-2002 and MR0103.

Note

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.

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Figure 1. HP Valve with 667 Actuator and FIELDVUE® DVC6000 Digital Valve Controller

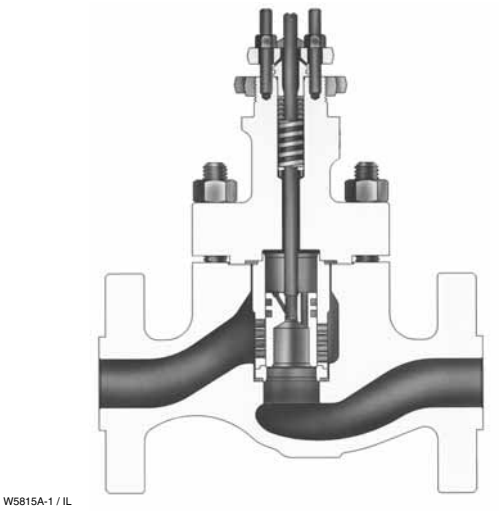


Figure 2. Design HPD Valve Assembly (NPS 2 to 6)

Contents

Figure 3. Typical WhisperFlo® Trim for Design HP Valve

Balanced High-Temperature Trim

HPD

These valves use a balanced valve plug and are well suited for general applications with process temperatures in excess of 232°C (450°F), where extremely tight shutoff is not required.

Balanced Tight Shutoff Trim

HPT and HPAT

These valves use a balanced valve plug and offer excellent shutoff with process temperatures below 232°C (450°F). The temperature limits of Design HPT can be extended above 232°C (450°F) to 316°C (600°F) by using PEEK (PolyEtherEtherKetone) anti-extrusion rings in combination with a spring-loaded PTFE seal. The PEEK anti-extrusion rings expand to help close off the clearance gaps on the plug outside diameter and the cage inside diameter where the PTFE seal may extrude at high temperatures and pressures.

Unbalanced Trim

HPS and HPAS

These valves have an unbalanced plug and provide excellent shutoff.

Expanded Ends

Expanded ends are available on the NPS 4 and 6 CL900 and 1500 HP valves. The NPS 4 HP valve body is offered with NPS 6 ends. The NPS 6 valve body is offered with NPS 8 ends. Both flanged and

buttweld end valve bodies are offered with expanded ends.

Cavitrol®, Whisper Trim®, and WhisperFlo® Cages

To eliminate cavitation damage in a properly-sized valve, a Cavitrol III cage is available with Design HPS, HPAS, HPT, and HPAT control valves.

To help attenuate aerodynamic noise in gaseous service, Whisper Trim III and WhisperFlo (figure 3) cages are available with Design HPD, HPS, HPAS, HPT, and HPAT control valves. Contact your Emerson Process Management™ sales office for more information.

Features

- **Valve Plug Stability—** Rugged cage guiding provides increased valve plug stability, which reduces vibration and mechanical noise.

- **Full Pressure Drop Capability—**Rugged Design HP and HPA valves have readily available trims capable of attaining full pressure drops.

- **Spiral-Wound Gaskets for Excellent Sealing Under All Service Conditions—**Premium materials are used in the construction of spiral-wound gaskets for HP Series valves. These premium materials, which make up the standard spiral-wound gaskets, are N06600 (alloy 600)/graphite or N07750 (alloy X750)/graphite.

- **Compliance with the Clean Air Act—**Optional ENVIRO-SEAL® packing systems (figure 5) provide an improved stem seal to help prevent the loss of valuable or hazardous process fluid. The ENVIRO-SEAL packing systems feature PTFE or graphite ULF.

- **Piping Economy—**The availability of expanded end connections on NPS 4 and 6 Design HP valves may eliminate the need for line swages while accommodating oversized piping arrangements.

- **Quick Change Trim—**Maintenance is simple and can easily be performed using common tools. Trim components can be quickly removed and changed with no need for special tools.

- **Standard Hard Trim Materials—**The cage, valve plug, and other trim parts are manufactured from hardened materials. This standard feature provides excellent wear resistance.

- **Control of Low Flow Rates/Tight Shutoff—**Micro-Flute and Micro-Form valve plugs (figures 7 and 8, respectively) provide superb rangeability in high-pressure, low-flow applications, while maintaining tight shutoff (table 4). A choice of several restricted port diameters helps to match valve body capacity to required flow, to provide necessary control with full travel, and to prevent throttling near the seat.

  In low-flow applications where cavitation damage may occur, the Micro-Flat valve plug can be used with a special Cavitrol III cage. Contact your Emerson Process Management sales office for more information.

- **Increased Pressure/Temperature Ratings—**Design HP Series valves with weld-end fittings have increased pressure/temperature ratings, called intermediate ratings, as defined in ASME B16.34. The extra strength of these valves allows ratings higher than the standard CL900 or 1500 ratings specified in B16.34. Contact your Emerson Process Management sales office for further information on intermediate ratings.

- **Trim Interchangeability—**Cavitrol III and Whisper Trim III trims (figures 9, 10, and 11) are interchangeable with standard trims.

- **Smooth Control at High Pressure Drops—**Available on NPS 2 through 6 valves, balanced trim provides smooth control at high pressure drops.

- **High-Temperature Capability with Class V Shutoff—**Use of C-seal™ trim (see figure 6) permits Class V shutoff up to 593°C (1100°F) for Design HPD valves.

- **Sour Service Trims Available—**Long-lasting, erosion- and corrosion-resistant trims are available for control of sour service. These trims are offered with either a standard cage, a Cavitrol III cage, or a Whisper Trim III cage. Spiral-wound gasket construction is standard.

Table 1. Available Constructions

DESIGN	VALVE SIZE, NPS	PRESSURE RATING	VALVE BODY MATERIAL AND END CONNECTION STYLE(1, 2)		
			WCC, WC9, and LCC Cast Steel Valves	CF8M (316 Stainless Steel) Valves	SA-105, SA-182-F22, and SA-182-F316 forged SST (for forged steel HPA CL2500 angle valves)
			RF or RTJ Flanged, Butt Weld, and Socket Weld(3)	RF or RTJ Flanged and Socket Weld(3)	Socket Weld
HPAS	1 to 2	CL900 and 1500	X	X	- - -
		CL2500	- - -	- - -	X
HPAT	1 to 2	CL900 and 1500	X	X	- - -
		CL2500	- - -	- - -	X
HPD	2 to 6	CL900 and 1500	X	X	- - -
	2	CL2500	X	X	- - -
HPS	1 to 3	CL900 and 1500	X	X	- - -
	1 to 2	CL2500	X	X	- - -
HPT	2 to 6	CL900 and 1500	X	X	- - -
	2	CL2500	X	X	- - -

X = Available Construction.
1. End connection style abbreviations: RF - Raised Face, RTJ - Ring Type Joint.
2. EN (or other valve body material) ratings and end connections can usually be supplied; consult your Emerson Process Management sales office.
3. Socket Weld available on NPS 1, 1-1/2, and 2 only.

Table 2. Typical Flow Coefficients(1)

Valve Size, NPS	Valve Style	Characteristic	Maximum Cv
1	HP	Modified Equal Percentage	15.4
2	HP	Linear	55.3
3	HP	Linear	127
4	HP	Linear	201
6	HP	Linear	425
1	HPA CL1500	Modified Equal Percentage	17
2	HPA CL1500	Linear	76
1	HPA CL2500	Modified Equal Percentage	14.3
2	HPA CL2500	Linear	47.4

1. See the section titled Coefficients in this bulletin and also Catalog 12 for a complete listing of flow coefficients.

Table 3. Increased Pressure/Temperature Ratings for Steel Valves with BWE and SWE Connections(1)

Valve Type	Valve Size, NPS	Pressure Rating	Intermediate Rating (ASME B16.34)
Globe Valves	1	CL900 and 1500	1675
		CL2500	2800
	2	CL900 and 1500	1694
	3	CL1500	1578
	4	CL1500	2017
	6	CL1500	1876

1. Contact your Emerson Process Management sales office for further information on intermediate ratings.

Table 4. Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4

Valve Design		Port Diameter, mm (Inches)		ASME Leakage Class
HPD		47.6 (1.875)		II
		58.7 (2.3125) to 92.1 (3.625)		II - Standard
				III - Optional
		111.1 (4.375) and larger		III - Standard
				IV - Optional
HPD w/ C-seal trim	**Valve Size, NPS**	**Port Diameter, mm (Inches)**	**Cage Style**	**ASME Leakage Class**
	3	73 (2.875)	Eq. %, Mod. Eq. %, Linear (std. cage), Linear (Whisper III, A1, B1)	V - Standard to 593°C (1100°F) (for port diameters from 73 mm [2.875 inch] through 136.5 mm [5.375 inch] with optional C-seal trim) IV - Optional (for port diameters 73 mm [2.875 inch] through 136.5 mm [5.375 inch]
	4	73 (2.875)	Linear (Whisper III, D3)	
			Linear (Cav III, 3-stage)	
		87.3 (3.4375)	Linear (Cav III, 2-stage)	
		92.1 (3.625)	Eq. %, Mod. Eq. %, Linear (std. cage), Linear (Whisper III, A1, B3, C3)	
	6	111.1 (4.375)	Linear (Whisper III, D3), Linear (Cav III, 3-stage)	
		136.5 (5.375)	Eq. %, Mod. Eq. %, Linear (std. cage), Linear (Whisper III, A1, B3, C3), Linear (Cav III, 2-stage)	
HPS, HPAS, HPT, HPAT		All	Cavitrol III and Micro-Flat	V - Standard
			Micro-Form, Micro-Flute, Eq. %, Mod Eq. %, Linear, Whisper III	IV - Standard V - Optional
HPS and HPT w/ TSO (Tight Shutoff trim)		See table 5	See table 5	TSO - Optional TSO is not an ASME leakage class. Valves with TSO trim are factory tested to a more stringent Fisher® test requirement of no leakage at time of shipment. Test medium is water. Specify service ΔP when ordering. Test procedure is ANSI/FCI Class V test procedure B
HPT and HPAT w/ PEEK(1) Anti-Extrusion Rings		47.6 (1.875) to 136.5 (5.375)	All	V - Standard (to 316°C [600°F]) IV - Optional (47.6 mm [1.875 inch] through 136.5 mm [5.375 inch] ports)

1. PEEK (PolyEtherEtherKetone), required for all boiler feedwater applications.

Table 5. Port Diameters, Valve Plug Travel, Yoke Boss Diameters for TSO (Tight Shutoff) Trim

VALVE TYPE	TRIM	MAX TRAVEL		YOKE BOSS SIZE		PORT DIAMETER				C_V REDUCTION AT 100% TRAVEL(1)
						Nominal		Actual TSO		
		mm	Inch	mm	Inch	mm	Inch	mm	Inch	
Balanced Plugs—Flow Down Only										
HPT NPS 3(2)	CAV III 3-Stage	63.5	2.5	90	3-9/16	47.6	1.875	42.9	1.6875	5%
HPT NPS 4	CAV III 3-Stage	76.2	3	90 127	3-9/16 5	73.0	2.875	68.3	2.6875	2%
HPT NPS 6	CAV III 3-Stage	102	4	90 127	3-9/16 5	116	4.5625	111	4.375	0%
	Standard	76.2	3	90 127	3-9/16 5	137	5.375	132	5.1875	4%
Unbalanced Plugs—Flow Down Only										
HPS NPS 2	CAV III 3-Stage	50.8	2	90	3-9/16	25.4	1	26.2	0.8125	0%

1. This column lists the percent reduction of published maximum C_V of the trim listed in the TRIM column.
2. Not available with 5-inch yoke boss.

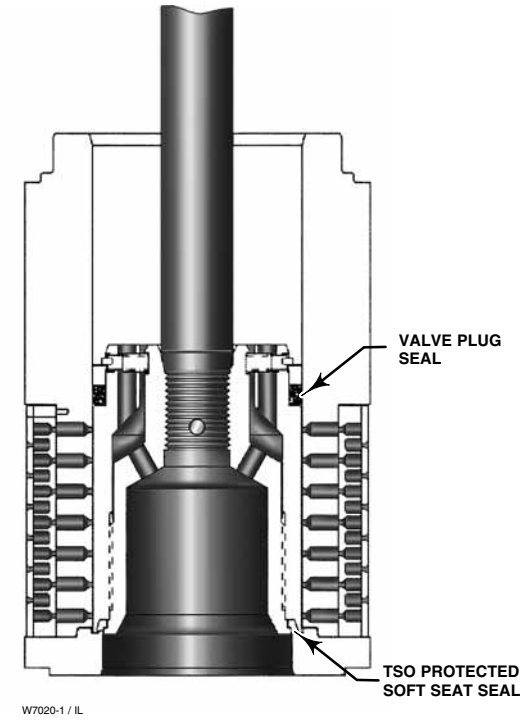


Figure 4. Typical Balanced TSO Trim

Material Selection Guidelines

Use the following steps as a guideline for the selection of materials:

1. Determine the pressure/temperature rating of the valve body size and material required. Inlet pressure and temperature must always be limited by the applicable ASME pressure/temperature rating.

2. Select the desired trim style from the Available Configurations specification and from table 4, Shutoff Classifications.

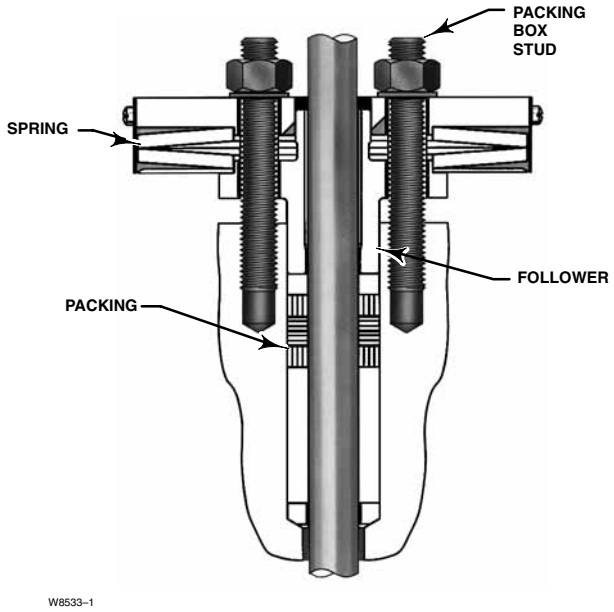
3. Select desired materials from tables 7, 8, 11, and 12 and figure 13. The temperature capabilities determined from figure 13 may be further limited by the temperature capabilities of materials selected from tables 7 and 12. Refer to figure 13 to determine pressure drop limits of the valve body-trim combinations selected.

4. Select the appropriate spiral-wound gasket material. N06600 is recommended for service up to 427°C (800°F). N07750 is recommended for service over 427°C (800°F) when improved corrosion resistance is required or when the valve is subject to severe temperature cycling service.

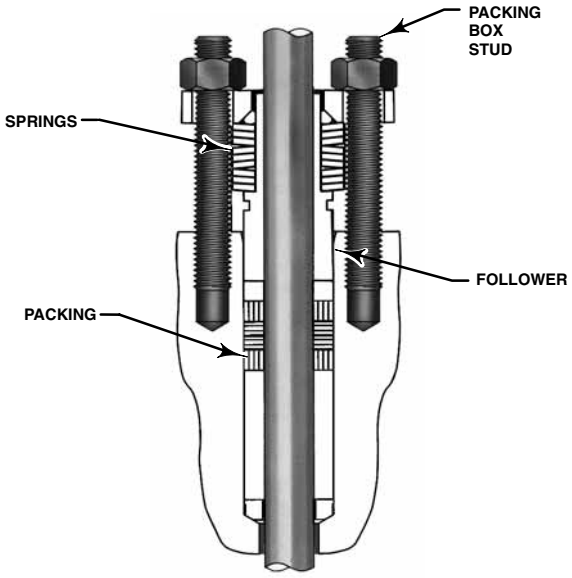
Installation

The valve must be installed so flow through the valve is as indicated by the flow direction arrow on the valve body. Consideration should be given to installing an upstream strainer, especially if the valve uses a Whisper Trim III or Cavitrol III cage.

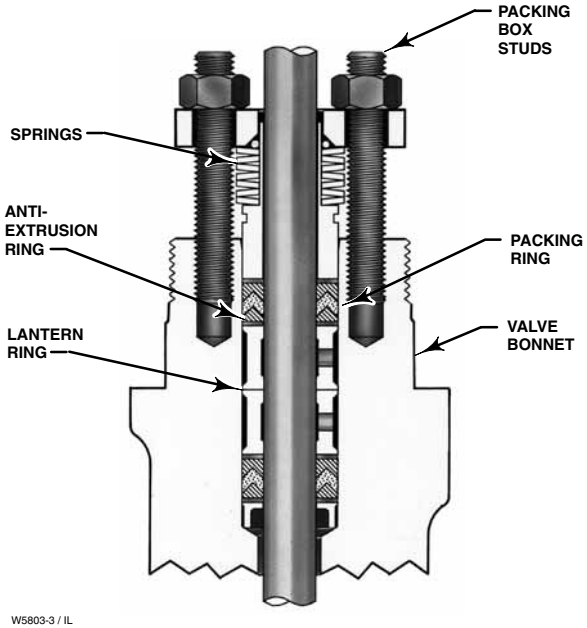
Overall dimensions are shown in figures 14, 15, and 16. Face-to-face dimensions are in compliance with ANSI/ISA-75.08.06. Actual end connection dimensions conform to ASME B16.25 for buttwelding ends and to ASME B16.5 for flanged ends.



TYPICAL HIGH-SEAL PACKING SYSTEM WITH GRAPHITE ULF PACKING



TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH GRAPHITE ULF PACKING



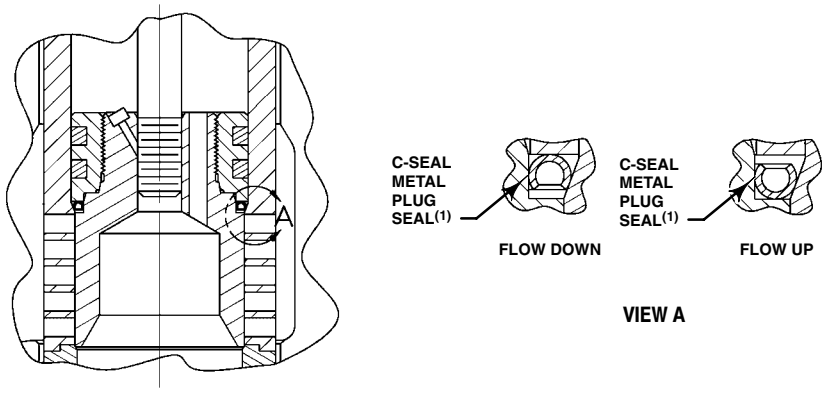
TYPICAL ENVIRO-SEAL PACKING SYSTEM WITH PTFE PACKING

Figure 5. ENVIRO-SEAL® and HIGH-SEAL Packing Systems

Table 6. Approximate Weights (Valve and Bonnet Assemblies)

VALVE TYPE	VALVE SIZE, NPS	PRESSURE RATING	KILOGRAMS		POUNDS	
			Flg	SWE, BWE	Flg	SWE, BWE
Globe Valves	1	CL900 and 1500	42	38	93	85
		CL2500	45	34	100	76
	1-1/2 x 2	CL2500	- - -	34	- - -	76
	2	CL900 and 1500	72	52	158	115
		CL2500	104	74	229	164
	3	CL900	125	- - -	276	- - -
		CL1500	129	97	284	213
	4	CL900	230	- - -	507	- - -
		CL1500	249	201	548	444
	6	CL900	511	- - -	1127	- - -
		CL1500	557	455	1228	1003
Angle Valves	1	CL900 and 1500	40	36	88	80
		CL2500	- - -	72(1)	- - -	160(1)
	2	CL900 and 1500	69	50	153	110
		CL2500	- - -	109(1)	- - -	240(1)

1. Only SWE is available for CL2500.



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NOTES
1. REVERSE THE ORIENTATION OF THE C-SEAL PLUG SEAL FOR PROPER SHUTOFF WHEN VALVE IS USED IN A PROCESS WITH DIFFERENT FLUID FLOW DIRECTION.

Figure 6. C-seal™ Trim

Table 7. Construction Materials and Temperature Capabilities for Parts Other than Valve Body and Trim

PART		MATERIAL	TEMPERATURE CAPABILITIES	
			°C	°F
Valve plug stem		S20910	–198 to 593	–325 to 1100
Design HPD piston ring		Graphite (FMS 17F27)	–254 to 427 (to 482 for nonoxidizing service)	–425 to 800 (to 900 for nonoxidizing service)
		Graphite (FMS 17F39)	–254 to 537 (to 593 for nonoxidizing service)	–425 to 1000 (to 1100 for nonoxidizing service)
Spring-loaded Design HPT or HPAT valve plug seal	Backup ring	S41600 (416 SST)	–29 to 427	–20 to 800
		S31600 (316 SST)	–198 to 593	–325 to 1100
	Retaining ring	S30200 (302 SST) N07750 (NACE)	–254 to 593	–425 to 1100
	Seal ring	PTFE with N10276 Spring	–73 to 232(5)	–100 to 450(5)
	Anti-extrusion rings	PEEK (PolyEtherEtherKetone)	- - -(6)	- - -(6)
Cage gasket		N06600/Graphite	–240 to 427	–400 to 800
TSO protected soft seat seal		Carbon-filled PTFE	–73 to 232	–100 to 450
Seat ring gasket		N06600/Graphite	–240 to 427	–400 to 800
Valve Body-to-bonnet bolting(1)	Studs Nuts	Steel SA193-B7 (all valve body materials) Steel SA194-2H (all valve body materials)	–29 to 427 (WCC and WC9) –46 to 371 (LCC) –48 to 427 (316 CF8M)(2)	–20 to 800 (WCC and WC9) –50 to 700 (LCC) –55 to 800 (316 CF8M)(2)
	Studs Nuts	Steel SA193-B7M for sour service Steel SA194-2HM for sour service	–29 to 427 (WCC) –46 to 371 (LCC)	–20 to 800 (WCC) –50 to 700 (LCC)
	Studs Nuts	Steel SA193-B16 (WC9 valve body mat'ls) Steel SA194-7	–29 to 537	–20 to 1000
	Studs Nuts	N07718 SST (SB637)(3) (WC9 valve body mat'ls) Steel SA194-7	–29 to 566	–20 to 1050
	Studs Nuts	S31600 stainless steel SA193-B8M (strain hardened) (CF8M valve body mat'ls)(4) S31600 stainless steel SA194-8M (CF8M valve body mat'ls)(4)	–198 to 427	–325 to 800
	Studs Nuts	S20910 SST (SA479-XM-19)(3) (CF8M valve body mat'ls) Steel SA194-7	–198 to 593	–325 to 1100
Packing		PTFE V-ring	–40 to 232	–40 to 450
		Graphite ribbon filament (oxidizing service to 371°C [700°F])	–254 to 537	–425 to 1000
		Graphite ribbon (high-temperature oxidizing service)	371 to 593	700 to 1100
Packing follower, spring, or lantern ring		S31600 stainless steel	–254 to 593	–425 to 1100
Packing box ring		S31600 stainless steel	–254 to 593	–425 to 1100
Packing flange, studs, or nuts		Steel	–29 to 427	–20 to 800
		S31600 stainless steel	–198 to 593	–325 to 1100

1. Valve body materials with which these bolting materials may be used are shown in parentheses.
2. Steel studs and nuts with NCF (non-corroding finish) coating are used with NPS 4 and 6 CF8M valve bodies.
3. These stud materials are not listed in ASME B16.34.
4. For valve sizes up through NPS 3.
5. If used with PEEK anti-extrusion rings, PTFE/carbon seal ring may be used in temperatures up to 316°C (600°F) for non-oxidizing service or up to 260°C (500°F) for oxidizing service.
6. These materials not limiting factors.

Table 8. Additional Globe Valve Specifications

VALVE SIZE, NPS	FLOW CHARACTERISTIC	VALVE BODY DESIGN AND PLUG STYLE	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches
1	Equal percentage	HPS w/Micro-Flute	6.4 12.7	0.25 0.5	19 19	0.75 0.75	12.7 12.7	1/2 1/2
		HPS w/Micro-Form	6.4 9.5 12.7 19.1	0.25 0.375 0.5 0.75	19 19 19 19	0.75 0.75 0.75 0.75	12.7 12.7 12.7 12.7, 19.1	1/2 1/2 1/2 1/2, 3/4
	Modified equal percentage	HPS w/Micro-Form	19.1 25.4	0.75 1	29 29	1.125 1.125	12.7, 19.1 12.7, 19.1	1/2,3/4 1/2, 3/4
	Linear (cage style: Cavitrol III, 2-stage)	HPS	22.2	0.875	38	1.5	12.7, 19.1	1/2, 3/4
2	Equal percentage	HPS w/Micro-Form	6.4 12.7 19.1	0.25 0.5 0.75	19 19 19	0.75 0.75 0.75	12.7 12.7 12.7, 19.1	1/2 1/2 1/2, 3/4
		HPS	47.6	1.875	29	1.125	12.7, 19.1, 25.4(1)	1/2, 3/4, 1(1)
	Linear (cage style: Std)	HPS, HPD, HPT	47.6	1.875	38	1.5	12.7, 19.1, 25.4(1)	1/2, 3/4, 1(1)
	Linear (cage style: Whisper Trim III, level A1)							
	Modified equal percentage	HPS w/Micro-Form	25.4 31.8 38.1	1 1.25 1.5	29 29 38	1.125 1.125 1.5	12.7,19.1, 25.4 12.7, 19.1, 25.4 12.7, 19.1, 25.4	1/2, 3/4, 1 1/2, 3/4, 1 1/2, 3/4, 1
		HPS, HPD, HPT	47.6	1.875	38	1.5	12.7, 19.1, 25.4(1)	1/2, 3/4, 1(1)
	Linear (cage style: Cavitrol III, 2-stage)	HPT	44.5	1.75	51	2	12.7, 19.1	1/2, 3/4
	Linear (cage style: Cavitrol III, 3-stage)	HPS	25.4	1	51	2	19.1	3/4
3	Modified equal percentage	HPD, HPT	73	2.875	51	2	12.7, 19.1, 25.4	1/2, 3/4, 1
	Linear (cage style: Std)							
	Linear (cage style: Whisper Trim III, level A1, B1)							
	Linear (cage style: Cavitrol III, 2-stage)	HPT	63.5	2.5	64	2.5	12.7, 19.1, 25.4	1/2, 3/4, 1
	Linear (cage style: Cavitrol III, 3-stage)	HPT	47.6	1.875	64	2.5	12.7, 19.1, 25.4	1/2, 3/4, 1
4	Modified equal percentage	HPD, HPT	92.1	3.625	51	2	19.1, 25.4	3/4, 1
	Linear (cage style: (Std)							
	Linear (cage style: Whisper Trim III level A1, A3, B3, C3)							
	Linear (cage style: Whisper Trim III level D3)	HPD, HPT	73	2.875	51	2	19.1, 25.4	3/4, 1
	Linear (cage style: Cavitrol III, 2-stage)	HPT	87.3	3.4375	76	3	19.1, 25.4	3/4, 1
	Linear (cage style: Cavitrol III, 3-stage)	HPT	73	2.875	76	3	19.1, 25.4	3/4, 1

-continued-

Table 8. Additional Globe Valve Specifications (Continued)

VALVE SIZE, NPS	FLOW CHARACTERISTIC	VALVE BODY DESIGN AND PLUG STYLE	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
			mm	Inches	mm	Inches	mm	Inches
6	Modified equal percentage(2)	HPD, HPT	136.5	5.375	76	3	19.1, 25.4, 31.8	3/4, 1, 1-1/4
	Linear (cage style: Std)							
	Linear (cage style: Whisper Trim III, level A1, B3, C3)	HPD, HPT	136.5	5.375	76	3	25.4, 31.8	1, 1-1/4
	Linear (cage style: Whisper Trim III, level D3)	HPD, HPT	111.1	4.375	76	3	25.4, 31.8	1, 1-1/4
	Linear (cage style: Cavitrol III, 2-stage)	HPD, HPT	133.4	5.25	102	4	19.1, 25.4, 31.8	3/4, 1, 1-1/4
	Linear (cage style: Cavitrol III, 3-stage)	HPD, HPT	115.9	4.5625	102	4	19.1, 15.4, 31.8	3/4, 1, 1-1/4

1. Available only with Design HPS valve.
2. The first 75% is equal percentage.

Table 9. Valve Stem Travels for CL2500 Globe Valves

VALVE SIZE, NPS	VALVE DESIGN / PLUG STYLE	CHARACTERISTIC	PORT DIAMETER		MAXIMUM VALVE STEM TRAVEL	
			mm	Inches	mm	Inches
1	HPS / Micro-Form or Micro-Flute	Equal Percentage	6.4, 9.5, 12.7, 19.1, 25.4	0.25, 0.375, 0.5, 0.75, 1	19.1	0.75
		Modified Equal Percentage	6.4, 9.5, 12.7, 19.1, 25.4	0.25, 0.375, 0.5, 0.75, 1	25.4	1
2	HPS / Micro-Form	Equal Percentage	9.5, 19.1, 25.4, 31.8	0.5, 0.75, 1, 1.25	19.1	0.75
		Modified Equal Percentage	9.5, 19.1, 25.4, 31.8	0.5, 0.75, 1, 1.25	28.6	1.125
	HPS / Micro-Form	Equal Percentage	38.1	1.5	28.6	1.125
		Modified Equal Percentage	38.1	1.5	38.1	1.5
	HPS	Linear	47.6	1.875	25.4	1
		Equal Percentage				
		Modified Equal Percentage	47.6	1.875	28.6	1.125
	HPD, HPT	Linear	47.6	1.875	25.4	1
		Equal Percentage				
		Modified Equal Percentage	47.6	1.875	28.6	1.125

Table 10. Globe and Angle Valve Yoke Boss and Valve Stem Diameter Combinations(1)

VALVE SIZE, NPS	STANDARD DIAMETERS				OPTIONAL DIAMETERS			
	mm		Inches		mm		Inches	
	Stem	Yoke Boss	Stem	Yoke Boss	Stem	Yoke Boss	Stem	Yoke Boss
1	12.7	71	0.5	2-13/16	19.1	90	0.75	3-9/16
2	12.7 19.1	71 90	0.5 0.75	2-13/16 3-9/16	25.4	127	1	5
3	19.1	90	0.75	3-9/16	12.7 25.4	71 127	0.5 1	2-13/16 5
4	19.1	90	0.75	3-9/16	25.4	127	1	5
6	25.4 31.8	127 127	1 1.25	5 5	19.1	71	0.75	3-9/16

1. See tables 8, 9, and 11 for valve stem diameters available for specific constructions.

Table 11. Additional Angle Valve Specifications

VALVE SIZE, NPS	FLOW CHARACTERISTIC	VALVE BODY DESIGN AND PLUG STYLE	FLOW DIRECTION	PORT DIAMETER		VALVE PLUG TRAVEL		VALVE STEM DIAMETER	
				mm	Inches	mm	Inches	mm	Inches
1	Equal percentage	HPAS w/Micro-Flute	Up(2)	6.4 9.5 12.7	0.25 0.375 0.5	19 19 19	0.75 0.75 0.75	12.7 12.7 12.7	1/2 1/2 1/2
		HPAS w/Micro-Form	Up	6.4 12.7 19.1	0.25 0.5 0.75	19 19 19	0.75 0.75 0.75	12.7 12.7 12.7, 19.1	1/2 1/2 1/2, 3/4
		HPAS, equal percentage characterized cage	Down	19.1	0.75	19	0.75	19.1	3/4
	Modified equal percentage	HPAS w/Micro-Form	Up	12.7 19.1 25.4	0.5 0.75 1	29 29 29	1.125 1.125 1.125	12.7 12.7, 19.1 12.7, 19.1	1/2 1/2, 3/4 1/2, 3/4
		HPAS	Down	19.1	0.75	29	1.125	19.1	3/4
	Linear (cage style: Std)	HPAS w/ Micro-Flat	Down	9.5 12.7 19.1	0.375 0.5 0.75	19 19 19	0.75 0.75 0.75	12.7 12.7 19.1	1/2 1/2 3/4
	Linear (cage style: Cavitrol III, 2-stage)	HPAS	Down	22.2	0.875	38	1.5	12.7, 19.1	1/2, 3/4
2	Equal percentage	HPAS w/Micro-Flute	Up(2)	6.4 9.5 12.7	0.25 0.375 0.5	19 19 19	0.75 0.75 0.75	12.7 12.7 12.7	1/2 1/2 1/2
		HPAS w/Micro-Form	Up	6.4 12.7 19.1 25.4	0.25 0.5 0.75 1	19 19 19 19	0.75 0.75 0.75 0.75	12.7 12.7 12.7, 19.1 12.7, 19.1, 25.4	1/2 1/2 1/2, 3/4 1/2, 3/4, 1
		HPAS, equal percentage characterized cage	Down	19.1 25.4 31.8 38.1	0.75 1 1.25 1.5	19 19 19 29	0.75 0.75 0.75 1.125	19.1 19.1 25.4 25.4	3/4 3/4 1 1
		HPAS	Up	47.6	1.875	29	1.125	12.7, 19.1, 25.4	1/2, 3/4, 1
		HPAT	Down	47.6	1.875	29	1.125	12.7, 19.1	1/2, 3/4
	Modified equal percentage	HPAS w/Micro-Form	Up	25.4 31.8 38.1	1 1.25 1.5	29 29 38	1.125 1.125 1.5	12.7, 19.1, 25.4 12.7, 19.1, 25.4 12.7, 19.1, 25.4	1/2, 3/4, 1 1/2, 3/4, 1 1/2, 3/4, 1
		HPAS, equal percentage characterized cage	Down	19.1 25.4 31.8 38.1	0.75 1 1.25 1.5	29 29 29 38	1.125 1.125 1.125 1.5	19.1 19.1 25.4 25.4	3/4 3/4 1 1
		HPAS	Up	47.6	1.875	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		HPAT	Down	47.6	1.875	38	1.5	12.7, 19.1	1/2, 3/4
	Linear (cage style: std)	HPAS w/Micro-Flat	Down	25.4	1	29	1.125	19.1	3/4
	Linear (cage style: std)	HPAS	Up	47.6	1.875	38	1.5	12.7, 19.1, 25.4	1/2, 3/4, 1
		HPAT	Down	47.6	1.875	38	1.5	12.7, 19.1	1/2, 3/4
	Linear (cage style: Whisper III, level A1)	HPAS, HPAT	Up	47.6	1.875	38	1.5	12.7, 19.1, 25.4(1)	1/2, 3/4, 1(1)
	Linear (cage style: Cavitrol III, 2-stage)	HPAT	Down	44.5	1.75	51	2	12.7, 19.1	1/2, 3/4
	Linear (cage style: Cavitrol III, 3-stage)	HPAS	Down	25.4	1	51	2	19.1	3/4

1. Available only with Design HPAS valves.
2. Micro-Flutes (1 flute and 0.5 inch port 2 flute) may be used flow down in flashing and erosive service.

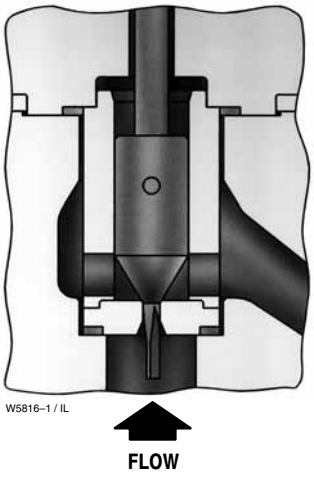


Figure 7. Design HPS Trim with Micro-Flute Valve Plug

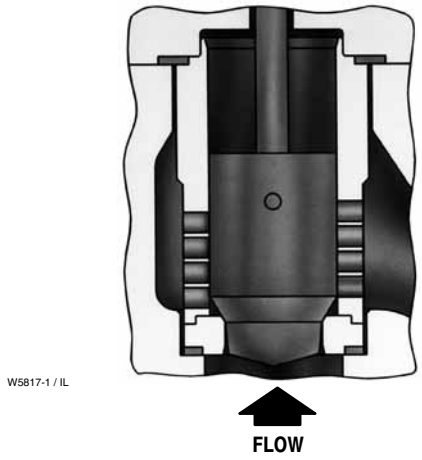


Figure 8. Design HPS Trim with Micro-Form Valve Plug

Trim Selection Guidelines

Refer to the following descriptions as a guideline for the selection of appropriate trims. Trims 204, 202, and 203 should not be used in boiler feedwater due to amine corrosion problems associated with CoCr-A and R30006 (alloy 6).

- **Trim 201—**Trim 201 is the standard trim for carbon steel and alloy steel valve bodies. Trim 201A, with an S41600 (416 stainless steel) heat-treated seat ring, is recommended for general and severe service applications up to 427°C (800°F) for the NPS 1 and 2 valve size and up to 343°C (650°F) for the NPS 3 through 6 valve size. Typical applications for Trim 201 include services in boiler feedwater (Trim 201A only), water, non-sour hydrocarbons, and steam. The S41600 heat-treated plug and seat ring have a minimum hardness of 38 HRC (Rockwell C), as compared to CoCr-A with a minimum hardness of 36 HRC.

- **Trim 204—**Trim 204 should be used for sour service or moderately corrosive service. Standard stem material, S20910 meets the metallurgical requirements of NACE MR0175-2002. Trim 204 should not be used in boiler feedwater service if amine problems exist.

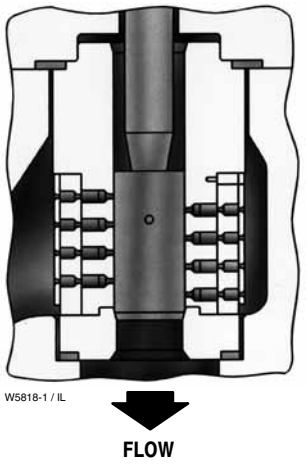


Figure 9. NPS 2 Design HPS Trim with Cavitrol® III 3-Stage Cage

- **Trim 202—**Trim 202 is designed primarily for use in all high temperature applications between 427°C (800°F) and 566°C (1050°F), but can also be used between -29°C (-20°F) and 427°C (800°F). Not for boiler feedwater use if amine problems exist. Trim 202 is recommended for use in NPS 6 valves between –29°C (–20°F) and 343°C (650°F). Trim 202H is recommended for use in NPS 6 valves between 260°C (500°F) and 566°C (1050°F).

- **Trim 203—**Trim 203 is the standard trim for stainless steel valve body materials and should only be used with stainless steel valve body materials. Not for boiler feedwater use if amine problems exist.

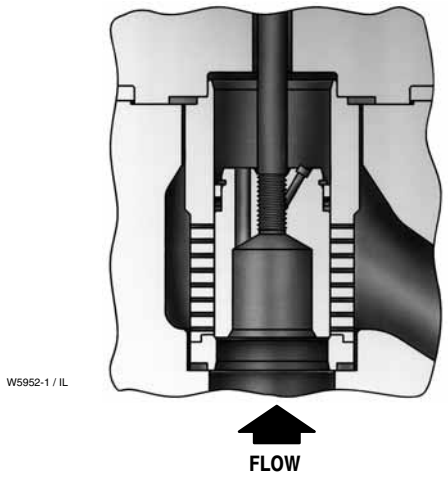


Figure 10. Design HPT Trim with Whisper Trim® III Level A1 Cage (Available in Design HPD [NPS 2-6] and Design HPS [NPS 2 and 3])

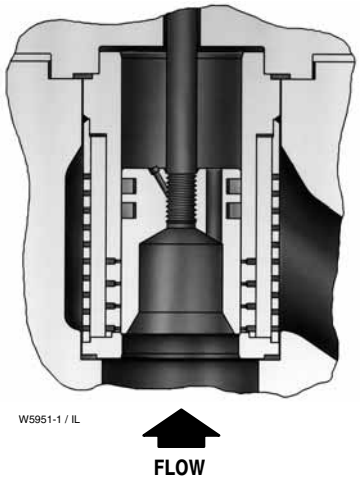


Figure 11. Design HPD Trim with Whisper Trim® III Level D Cage

Figure 12. Design HPAS Trim with Micro-Flat Valve Plug

C-seal Trim Description

C-seal trim is available for Design HPD valves with port diameters from 2.875 inches through 5.375 inches.

With C-seal trim, a balanced valve can achieve high-temperature, Class V shutoff. Because the C-seal plug seal is formed from metal (N07718 nickel alloy) rather than an elastomer, a valve equipped with the C-seal trim can be applied in processes with a fluid temperature of up to 593°C (1100°F).

Fisher® TSO (Tight Shutoff) Trim Capabilities

TSO trim is available for Design HPS and HPT valves with port diameters as defined in table 5. Also see figure 4 and table 4.

TSO trim consists of a protected soft seat plus PEEK anti-extrusion rings with a spring-loaded PTFE plug seal. Used only in flow down applications, TSO trim offers unparalleled shutoff integrity, resulting in longer plug and seat life. For additional information contact your Emerson Process Management sales office.

Table 12. Trim Material Combinations

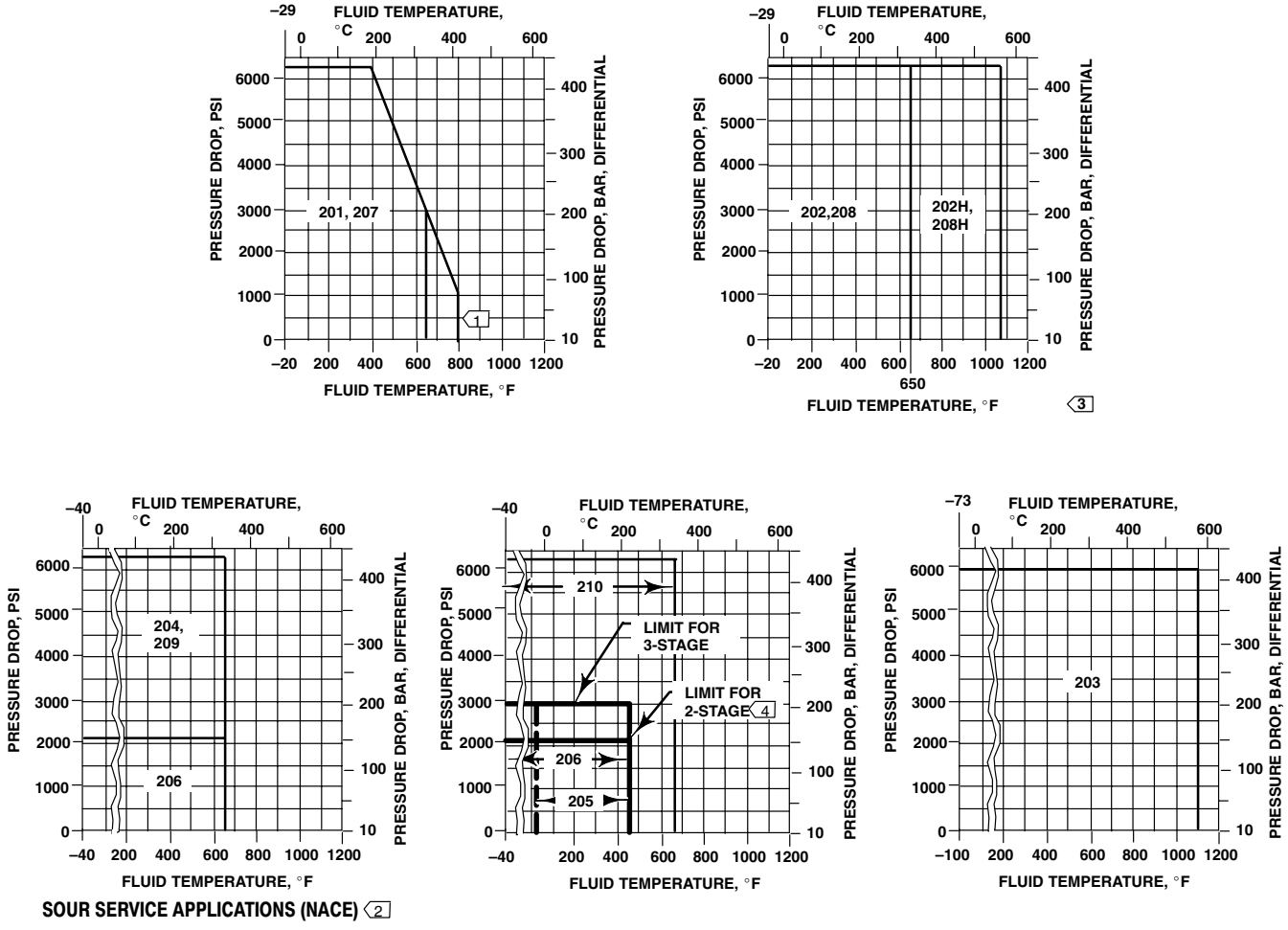
TRIM	USAGE	VALVE PLUG	CAGE	SEAT RING	VALVE BODY MATERIAL(1)	OPERATING TEMPERATURE RANGE	
						°C	°F
With Standard Cage							
201A	HP (NPS 1-6 CL900 and 1500 and NPS 1-2 CL2500) HPA (NPS 1-2 CL900,1500,2500)	S41600 heat-treated for HP, Micro-Form (HPA), and flow down HPAS)	S17400 (17-4 SST) H1075 heat-treated	S41600 heat-treated	WCC, LCC, WC9	–29 to 343 (NPS 3, 4, and 6) –29 to 427 (NPS 1 and 2)	–20 to 650 (NPS 3, 4, and 6) –20 to 800 (NPS 1 and 2)
		S44004 (440C SST) heat-treated for Micro-Flute and Micro-Flat (HPA only) valve plugs		HPA (S44004 heat-treated seat ring for Micro-Flat S44004 heat-treated seat and liner)			
202	HPD and HPS only (NPS 1-6 CL900 and 1500 and NPS 1 to 2 CL2500) HPAS (NPS 1-2 CL900, 1500, 2500)	S31600 (316 stainless steel) with CoCr-A seat and guide	F22 Cr-Mo alloy steel nitrided	S31600/CoCr-A	WCC, LCC, WC9	–29 to 566	–20 to 1050
				R30006 (Alloy 6) for Micro-Flat valve plugs R30006 seat, liner(6)			
202H(5)	HPD NPS 6 CL900 and 1500 only	S31600 (316 stainless steel) with CoCr-A seat and guide	F22 Cr-Mo alloy steel nitrided	S31600/CoCr-A	WCC, LCC, WC9	–29 to 566	–20 to 1050
203 (NACE)(1,2)	HP (NPS 1-6 CL900 and 1500 and NPS 1-2 CL2500) HPA (NPS 1-2 CL900,1500,2500)	S31600 with CoCr-A seat and guide	S31600/hard Cr coat	S31600/CoCr-A	CF8M	–73 to 593	–100 to 1100
				R30006 (Alloy 6) for Micro-Flat valve plugs R30006 seat, liner(6)			
204 (NACE)(1,2)		S31600 with CoCr-A seat and guide	S17400 Double H1150 heat-treated	S31600/CoCr-A	WCC, LCC, WC9	–46 to 343	–50 to 650
				R30006 (Alloy 6) for Micro-Flat valve plugs R30006 seat, liner(6)			
210		S31600 with CoCr-A seat and guide	S17400 H1075	S31600/CoCr-A	WCC, LCC, WC9	–29 to 343	–20 to 650
With Cavitrol III Cage							
205A	HP (NPS 1-6 CL900 and 1500 and NPS 1-2 CL2500) HPA (NPS 1-2 CL900,1500,2500)	S44004 heat-treated/ S20910 stem	S17400 H1075 heat-treated	S44004	WCC, LCC, WC9	0 to 232(3)	32 to 450(3)
205B		S44004 heat-treated/ S31600 stem	S17400 H1075 heat-treated	S44004	WCC, LCC, WC9	0 to 232(3)	32 to 450(3)
206 (NACE)(1,2)		S31600 with CoCr-A seat and guide	S17400 Double H1150 heat-treated	S31600/CoCr-A	WCC, LCC, WC9	–46 to 232(3)	–50 to 450(3)
With Whisper Trim III Cage							
207A	HP (NPS 1-6 CL900 and 1500 and NPS 1-2 CL2500) HPA (NPS 1-2 CL900,1500,2500)	S41600 heat-treated	S17400 H1075 heat-treated	S41600 heat-treated	WCC, LCC, WC9	–29 to 343(4)	–20 to 650(4)
207B	HP (NPS 1-6 CL900 and 1500 and NPS 1-2 CL2500	S41600 heat-treated	S17400 H1075 heat-treated	S31600/CoCr-A	WCC, LCC, WC9	343 to 427	650 to 800
208	HPD and HPS only (NPS 1-6 CL900 and 1500 and NPS 1 to 2 CL2500) HPAS (NPS 1-2 CL900, 1500, 2500)	S31600 with CoCr-A seat and guide	F22 steel nitrided	S31600/CoCr-A	WCC, LCC, WC9	–29 to 566	–20 to 1050
208H(5)	HPD (NPS 6 CL900 and 1500 only)	S31600 with CoCr-A seat and guide	F22 steel nitrided	S31600/CoCr-A	WCC, LCC, WC9	–29 to 566	–20 to 1050
209 (NACE)(1,2)	HP (NPS 1-6 CL900 and 1500 and NPS 1-2 CL2500) HPA (NPS 1-2 CL900,1500,2500)	S31600 with CoCr-A seat and guide	S17400 Double H1150 heat-treated	S31600/CoCr-A	WCC, LCC, WC9	–46 to 343	–50 to 650

1. If using valve body/trim combinations other than those listed, consult your Emerson Process Management sales office.
2. NACE MR0175-2002.
3. NPS 1 2 stage and NPS 2 3 stage HPS can be used at temperatures up to 343°C (650°F).
4. NPS 1 and 2 can be used at temperatures up to 427°C (800°F).
5. Trims 202H and 208H have clearances for high-temperature service.
6. For Design HPA valves.

Table 13. Flowing Pressure Drop Limits for NPS 6 HPD and HPT Valves (Without Cavitrol® III or Whisper Trim® III Cage)

FLOW MEDIA	STEM DIAMETER, mm (INCHES)	MAXIMUM FLOWING PRESSURE DROP			
		Bar		PSI	
		Flow Down	Flow Up	Flow Down	Flow Up
All except boiler feedwater	19 (3/4)	103	- - -	1500	- - -
	25.4 (1)	172	- - -	2500	- - -
	31.8 (1-1/4)	259	- - -	3750	- - -
	51.8 x 31.8(1) (2 x 1-1/4)	259	259	3750	3750
Boiler feedwater	31.8 (1-1/4)	69	- - -	1000	- - -
	51.8 x 31.8(1) (2 x 1-1/4)	138	259	2000	3750

1. Requires 31.8 mm (1-1/4 inch) S20910 stem with 52.8 mm (2-inch) plug-to-stem connection.



NOTES:
1 USE TRIM 207B IN NPS 3, 4, AND 6 HP ABOVE 343°C (650°F).
2 NACE MR0175-2002.
3 BE ESPECIALLY CAREFUL TO SPECIFY SERVICE TEMPERATURE IF TRIM 202 OR 208 IS SELECTED, AS DIFFERENT THERMAL EXPANSION RATES REQUIRE SPECIAL PLUG CLEARANCES.
4 THE LIMIT FOR 2-STAGE NPS 1 AND 2 VALVES IS 2160 PSIG. FOR NPS 3 TO 6 VALVES THE LIMIT IS 1800 PSIG.

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Figure 13. Pressure-Temperature Limits for Trim Material Combinations

Table 14. Globe Valve Dimensions with Standard Bonnet

VALVE SIZE, NPS	A(1)							
	ASME						EN	
	CL900		CL1500				PN160	PN250
	RF	RTJ	BWE	SWE	RF	RTJ		
	mm							
1	292	292	292	292	292	292	269	277
2	375	378	375	375	375	378	344	360
3	442	445	460	- - -	460	464	424	445
4	511	514	530	- - -	530	533	489	517
6	714	718	768	- - -	768	775	691	727
	CL2500							
1	- - -	- - -	318	318	318	318	- - -	- - -
2	- - -	- - -	400	400	413	416	- - -	- - -
	CL900		CL1500				PN160	PN250
	Inches							
1	11.50	11.50	11.50	11.50	11.50	11.50	10.58	10.90
2	14.75	14.88	14.75	14.75	14.75	14.88	13.56	14.18
3	17.38	17.50	18.12	- - -	18.12	18.25	16.71	17.50
4	20.12	20.25	20.88	- - -	20.88	21.00	19.27	20.38
6	28.12	28.25	30.25	- - -	30.25	30.50	27.19	28.61
	CL2500							
1	- - -	- - -	12.50	12.50	12.50	12.50	- - -	- - -
2	- - -	- - -	15.75	15.75	16.25	16.38	- - -	- - -

1. RF-raised-face flanges; RTJ-ring-type joint flanges; BWE-buttwelding ends; SWE-socketweld ends.

Table 15. Globe Valve Dimensions with Standard Bonnet

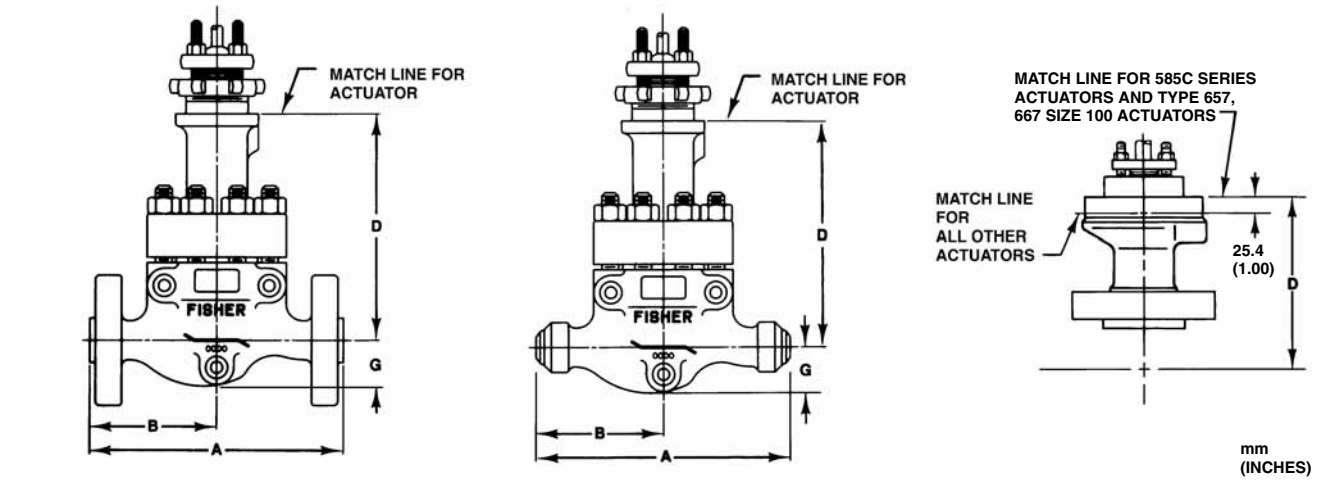
VALVE SIZE, NPS	B(1)							
	ASME						EN	
	CL900		CL1500				PN160	PN250
	RF	RTJ	BWE	SWE	RF	RTJ		
	mm							
1	146	146	146	146	146	146	134	138
2	187	189	187	187	187	189	172	180
3(2)	221	222	230	- - -	230	232	- - -	- - -
3(3)	200	202	210	- - -	210	211	192	202
4	229	230	238	- - -	238	240	218	232
6	310	311	337	- - -	337	340	298	316
	CL2500							
1	- - -	- - -	159	159	159	159	- - -	- - -
2	- - -	- - -	200	200	206	208	- - -	- - -
	CL900		CL1500				PN160	PN250
	Inches							
1	5.75	5.75	5.75	5.75	5.75	5.75	5.29	5.45
2	7.38	7.44	7.38	7.38	7.38	7.44	6.78	7.09
3(2)	8.69	8.75	9.06	- - -	9.06	9.12	- - -	- - -
3(3)	7.88	7.94	8.25	- - -	8.25	8.31	7.54	7.94
4	9.00	9.06	9.38	- - -	9.38	9.44	10.75	9.13
6	12.19	12.25	13.25	- - -	13.25	13.38	11.72	12.43
	CL2500							
1	- - -	- - -	6.25	6.25	6.25	6.25	- - -	- - -
2	- - -	- - -	7.88	7.88	8.12	8.19	- - -	- - -

1. RF-raised-face flanges; RTJ-ring-type joint flanges; BWE-buttwelding ends; SWE-socketweld ends.
2. Manufactured in U.S.A.
3. Manufactured in Europe and Japan.

Table 16. Globe Valve Dimensions with Standard Bonnet

STANDARD BONNETS				
VALVE SIZE, NPS	G	D		
		Yoke Boss Diameters, mm (Inches)		
		71 (2-13/16)	90 (3-9/16)	127 (5)
	mm			
	CL900 and 1500			
1	52	260	267	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	77	261	267	331
2 Cavitrol III 2-Stage	77	279	286	344
3(1)	121	322	311	370
3(2)	141	289	278	337
4	175	- - -	300	368
6	248	- - -	365	402
	CL2500			
1	63	35	35	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	84	303	303	352
2 Cavitrol III 2-Stage	84	320	320	40
	Inches			
	CL900 and 1500			
1	2.06	10.25	10.50	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	3.06	10.31	10.56	13.06
2 Cavitrol III 2-Stage	3.06	11.00	11.25	13.56
3(1)	4.75	12.69	12.25	14.56
3(2)	5.56	11.38	10.94	13.25
4	6.88	- - -	11.81	14.50
6	9.75	- - -	14.38	15.81
	CL2500			
1	2.47	10.07	10.07	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	3.31	11.91	11.91	13.85
2 Cavitrol III 2-Stage	3.31	12.59	12.59	14.53
EXTENSION BONNETS (CL900 AND 1500)				
VALVE SIZE, NPS	G	D		
		Yoke Boss Diameters, mm (Inches)		
		71 (2-13/16)	90 (3-9/16)	127 (5)
	mm			
1	52	384	400	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	77	430	446	505
	Inches			
1	2.06	15.12	15.75	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	3.06	16.94	17.56	19.88
2 Cavitrol III 2-Stage	3.06	17.62	18.25	20.38
2 Cavitrol III 2-Stage	77	448	464	518

1. Manufactured in U.S.A.
2. Manufactured in Europe and Japan.



FLANGED VALVE WITH 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

BUTTWELDING END VALVE WITH 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

127mm (5-INCH) DIAMETER YOKE BOSS FOR USE WITH ALL VALVES

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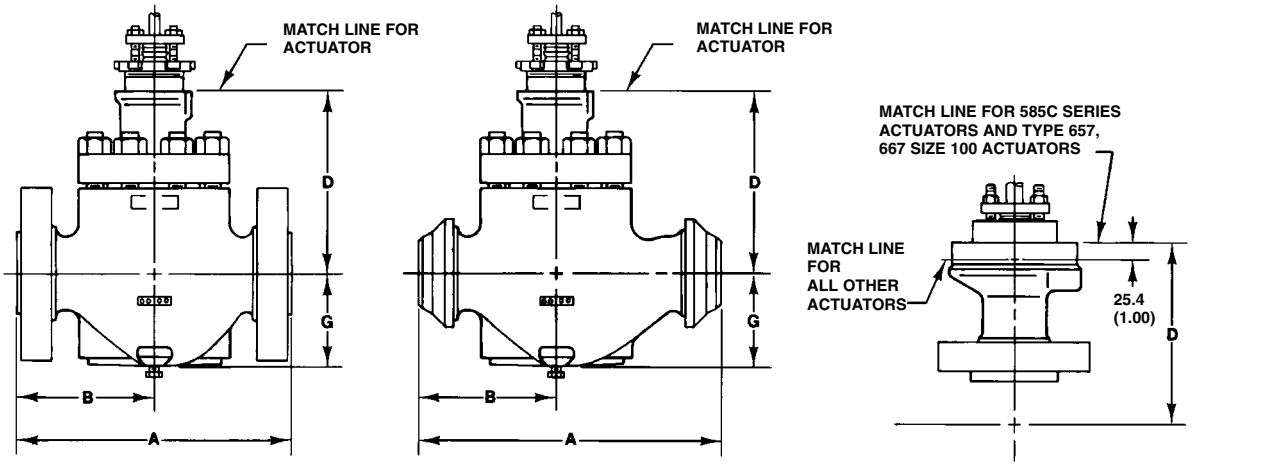
TYPICAL NPS 1, 2, AND 3



FLANGED VALVE WITH 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

BUTTWELDING END VALVE WITH 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

127mm (5-INCH) DIAMETER YOKE BOSS FOR USE WITH FLANGED OR BUTTWELDING VALVE

TYPICAL NPS 3 (EUROPE AND JAPAN MANUFACTURE), 4, AND 6

NOTE:
FOR DIMENSIONS OF VALVES WITH OTHER END CONNECTIONS, CONSULT YOUR EMERSON PROCESS MANAGEMENT SALES OFFICE.

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Figure 14. Globe Valve Dimensions with Standard Bonnet (also see tables 14, 15, and 16)

Table 17. Dimensions D for Style 1 Extension Bonnet (A, B, and G Dimensions Listed in Figure 14 Do Not Change When Extension Bonnet is Used)

VALVE SIZE, NPS	D		
	Yoke Boss Diameters, mm (Inches)		
	71 (2-13/16)	90 (3-9/16)	127 (5)
mm			
1 (std trim)	383	390	- - -
2 (std, Whisper III, Cavitrol III, 3-stage trim)	430	445	504
2 (Cavitrol III 2-stage trim)	447	463	517
Inches			
1 (std trim)	15.09	15.34	- - -
2 (std, Whisper III, Cavitrol III 3-stage trim)	16.91	17.53	19.84
2 (Cavitrol III 2-stage trim)	17.59	18.22	20.34

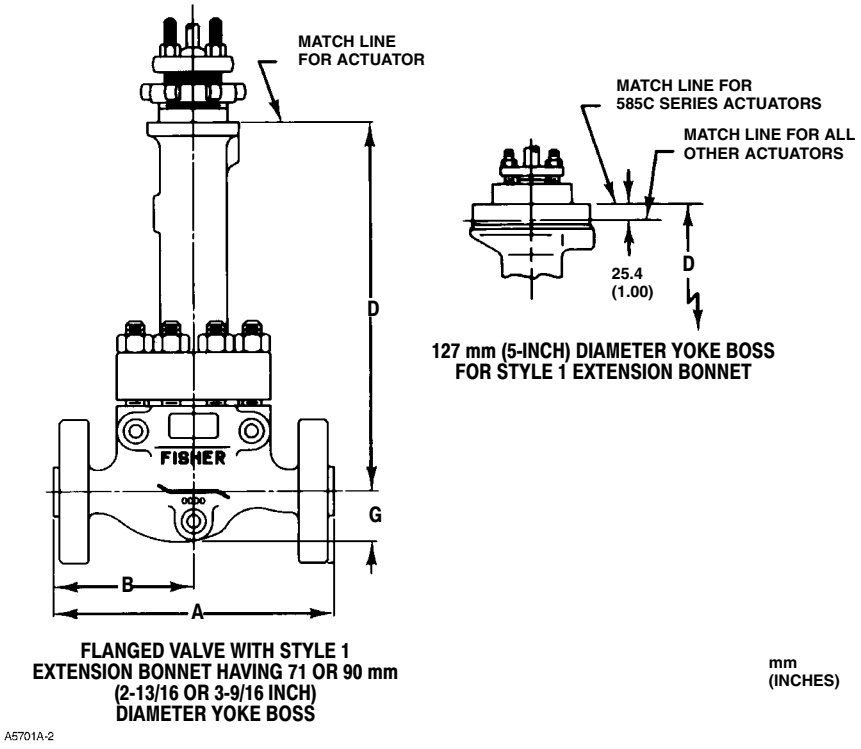


Figure 15. Dimensions D for Style 1 Extension Bonnet (A, B, and G Dimensions Listed in Figure 14 Do Not Change When Extension Bonnet is Used) (also see table 17)

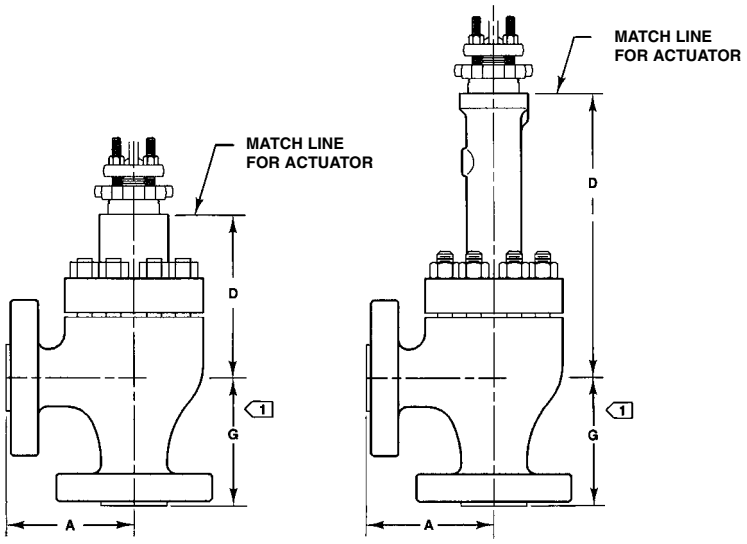
Table 18. Angle Valve Dimensions with Standard Bonnet

VALVE SIZE, NPS	D					
	Yoke Boss Diameters, mm (Inches)					
	71 (2-13/16)		90 (3-9/16)		127 (5)	
	CL900 and 1500	CL2500	CL900 and 1500	CL2500	CL900 and 1500	CL2500
STANDARD BONNETS						
mm						
1	230	204	238	210	- - -	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	227	240	233	229	297	288
2 Cavitrol III 2-Stage	244	257	251	246	314	305
Inches						
1	9.06	8.04	9.38	8.28	- - -	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	8.94	9.45	9.19	9.00	11.69	11.32
2 Cavitrol III 2-Stage	9.62	10.13	9.88	9.69	12.38	12.01
EXTENSION BONNETS						
VALVE SIZE, NPS	**D**					
	Yoke Boss Diameters, mm (Inches)					
	71 (2-13/16)		**90 (3-9/16)**		**127 (5)**	
	CL900 and 1500	**CL2500**	**CL900 and 1500**	**CL2500**	**CL900 and 1500**	**CL2500**
mm						
1	354	373	371	388	- - -	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	395	- - -	411	- - -	470	- - -
2 Cavitrol III 2-Stage	413	- - -	429	- - -	487	- - -
Inches						
1	13.94	14.67	14.62	15.28	- - -	- - -
2 Std, Whisper III, Cavitrol III 3-Stage	15.56	- - -	16.19	- - -	18.50	- - -
2 Cavitrol III 2-Stage	16.25	- - -	16.88	- - -	19.19	- - -

Table 19. Angle Valve Dimensions with Standard Bonnet

VALVE SIZE, NPS	G	A(1)						
		ASME					EN	
		CL2500		CL900 and 1500			PN160	PN250
	SWE	SWE	BWE	SWE	RF	RTJ		
mm								
1	141	102	141	141	141	141	130	134
2	184	124	178	178	178	179	163	170
Inches								
1	5.56	4.00	5.56	5.56	5.56	5.56	5.10	5.26
2	7.25	4.88	7.00	7.00	7.00	7.06	6.40	6.71

1. RF—raised-face flanges; RTJ—ring-type-joint flanges; BWE—buttwelding ends; SWE—socket-weld ends.



FLANGED VALVE WITH 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

FLANGED VALVE WITH STYLE 1 EXTENSION BONNET HAVING 71 OR 90 mm (2-13/16 OR 3-9/16 INCH) DIAMETER YOKE BOSS

1 **FOR CL900 AND 1500 VALVES, G = A. FOR CL2500 VALVES, SEE THE TABLE ON PAGE 24 FOR THE G DIMENSION.)**

NOTE:
FOR DIMENSIONS OF VALVES WITH OTHER END CONNECTIONS, CONSULT YOUR EMERSON PROCESS MANAGEMENT SALES OFFICE.

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Figure 16. Angle Valve Dimensions with Standard Bonnet (also see tables 18 and 19)

Coefficients

Table 20. Design HPAT, CL900, 1500, and 2500 (Linear and Equal Percentage Cages Without Liner, Flow Down through the Port)

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L (1)
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
CL900 and 1500																**Linear Characteristic**
2	47.6	1.875	38	1.5	C_v	- - -	3.32	13.8	26.5	37.7	46.3	52.8	58.0	62.0	64.3	0.88
					K_v	- - -	*2.87*	*11.9*	*22.9*	*32.6*	*40.0*	*45.7*	*50.2*	*53.6*	*55.6*	- - -
					X_T	- - -	0.813	0.518	0.508	0.548	0.595	0.633	0.630	0.613	0.612	- - -
					F_d	0.89	0.62	0.44	0.30	0.24	0.22	0.19	0.17	0.16	0.15	- - -
CL900 and 1500																**Equal Percentage Characteristic**
2	47.6	1.875	29	1.125	C_v	- - -	1.13	3.51	7.94	13.8	20.7	29.0	37.3	42.6	48.8	0.87
					K_v	- - -	*0.977*	*3.04*	*6.87*	*11.9*	*17.9*	*25.1*	*32.3*	*36.8*	*42.2*	- - -
					X_T	- - -	0.579	0.566	0.573	0.526	0.495	0.513	0.570	0.598	0.638	- - -
					F_d	1.00	0.76	0.50	0.40	0.31	0.28	0.24	0.22	0.20	0.19	- - -
CL900 and 1500																**Modified Equal Percentage Characteristic**
2	47.6	1.875	38	1.5	C_v	- - -	2.45	7.82	16.5	26.2	35.8	45.1	52.8	57.1	61.1	0.90
					K_v	- - -	*2.12*	*6.76*	*14.3*	*22.7*	*31.0*	*39.0*	*45.7*	*49.4*	*52.9*	- - -
					X_T	- - -	0.572	0.533	0.522	0.531	0.555	0.610	0.656	0.657	0.586	- - -
					F_d	0.99	0.49	0.40	0.30	0.26	0.22	0.20	0.18	0.16	0.16	- - -
CL2500																**Linear Characteristic**
2	47.6	1.875	38	1.5	C_v	- - -	3.32	13.8	24.2	32.1	37.6	41.5	44.2	46.0	47.4	0.88
					K_v	- - -	*2.87*	*11.9*	*20.9*	*27.8*	*32.5*	*35.9*	*38.2*	*39.8*	*41.0*	- - -
					X_T	- - -	0.813	0.518	0.672	0.716	0.766	0.816	0.851	0.862	0.832	- - -
					F_d	0.89	0.62	0.44	0.30	0.24	0.22	0.19	0.17	0.16	0.15	- - -
CL2500																**Equal Percentage Characteristic**
2	47.6	1.875	29	1.125	C_v	- - -	1.13	3.51	7.94	13.8	20.7	26.4	31.7	35.5	38.2	0.87
					K_v	- - -	*0.977*	*3.04*	*6.87*	*11.9*	*17.9*	*22.8*	*27.4*	*30.7*	*33.0*	- - -
					X_T	- - -	0.579	0.566	0.573	0.526	0.495	0.589	0.669	0.747	0.848	- - -
					F_d	1.00	0.76	0.50	0.40	0.31	0.28	0.24	0.22	0.20	0.19	- - -
CL2500																**Modified Equal Percentage Characteristic**
2	47.6	1.875	38	1.5	C_v	- - -	2.45	7.82	16.5	24.9	32.2	37.3	40.6	42.8	44.3	0.90
					K_v	- - -	*2.12*	*6.76*	*14.3*	*21.5*	*27.9*	*32.3*	*35.1*	*37.0*	*38.3*	- - -
					X_T	- - -	0.572	0.533	0.522	0.559	0.648	0.745	0.828	0.833	0.876	- - -
					F_d	0.99	0.49	0.40	0.30	0.26	0.22	0.20	0.18	0.16	0.16	- - -

1. At 100% travel.

Table 21. Design HPAT, CL900, 1500, and 2500 (Whisper Trim® III Cage, Flow Up through the Port)

CL900 and 1500

Linear Characteristic

Cage Level	Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										
		mm	Inches	mm	Inches		Minimum(1)	10	20	30	40	50	60	70	80	90	100
A1(2) $\Delta P/P1 \leq 0.6$	2	47.6	1.875	38	1.5	C_v	1.20	3.00	7.70	13.0	17.8	22.3	26.4	31.0	35.3	39.0	42.0
						K_v	*1.04*	*2.59*	*6.66*	*11.2*	*15.4*	*19.3*	*22.8*	*26.8*	*30.5*	*33.7*	*36.3*
						X_T	0.576	0.522	0.609	0.611	0.617	0.614	0.625	0.616	0.614	0.619	0.615

CL2500

Linear Characteristic

A1(2) $\Delta P/P1 \leq 0.6$	2	47.6	1.875	38	1.5	C_v	1.20	3.00	7.70	13.0	17.8	22.3	26.4	28.7	31.4	34.0	36.2
						K_v	*1.04*	*2.59*	*6.66*	*11.2*	*15.4*	*19.3*	*22.8*	*24.8*	*27.2*	*29.4*	*31.3*
						X_T	0.576	0.522	0.609	0.611	0.586	0.576	0.562	0.597	0.595	0.592	0.584

1. Valve should not be required to throttle at less than the minimum coefficient for an extended time, or erosion damage to the valve seat may result.
2. Larger capacities may be available with level A1 cages depending on service conditions.

Table 22. Design HPAS, CL900, 1500, and 2500 (Linear and Equal Percentage Cages, Flow Up through the Port)

CL900 and 1500

Linear Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L(1)
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
2	47.6	1.875	38	1.5	C_v	- - -	3.61	11.8	23.3	35.2	45.7	54.2	61.7	68.8	73.6	0.97
					K_v	- - -	*3.12*	*10.2*	*20.2*	*30.4*	*39.5*	*46.9*	*53.4*	*59.5*	*63.7*	- - -
					X_T	- - -	0.722	0.663	0.657	0.663	0.663	0.659	0.638	0.606	0.586	- - -
					F_d	0.89	0.62	0.44	0.30	0.24	0.22	0.19	0.17	0.16	0.15	- - -

CL2500

Linear Characteristic

2	47.6	1.875	38	1.5	C_v	- - -	3.61	11.8	23.3	33.8	41.0	46.5	50.7	53.8	56.2	0.97
					K_v	- - -	*3.12*	*10.2*	*20.2*	*29.2*	*35.5*	*40.2*	*43.9*	*46.5*	*48.6*	- - -
					X_T	- - -	0.722	0.663	0.657	0.623	0.607	0.589	0.576	0.573	0.565	- - -
					F_d	0.89	0.62	0.44	0.30	0.24	0.22	0.19	0.17	0.16	0.15	- - -

1. At 100% travel.

Table 23. Design HPAS, CL900 and 1500 (Equal Percentage Cages Without Liner, Flow Down through the Port)

Equal Percentage

Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	19.1	0.75	19	0.75	C_v	- - -	0.296	0.955	1.47	1.98	2.62	3.06	3.72	4.46	5.58	0.87
					K_v	- - -	*0.256*	*0.826*	*1.27*	*1.71*	*2.27*	*2.65*	*3.22*	*3.86*	*4.83*	- - -
					X_T	- - -	0.722	0.711	0.649	0.685	0.664	0.677	0.657	0.668	0.658	- - -
2	19.1	0.75	19	0.75	C_v	- - -	0.296	0.955	1.47	1.98	2.62	3.06	3.72	4.46	5.58	0.87
					K_v	- - -	*0.256*	*0.826*	*1.27*	*1.71*	*2.27*	*2.65*	*3.22*	*3.86*	*4.83*	- - -
					X_T	- - -	0.722	0.711	0.649	0.685	0.664	0.677	0.657	0.668	0.658	- - -

Modified Equal Percentage[2]

Modified Equal Percentage Characteristic

1	19.1	0.75	29	1.125	C_v	0.269	1.07	1.67	2.30	3.28	4.51	5.73	7.07	9.11	10.7	0.70
					K_v	*0.233*	*0.926*	*1.44*	*1.99*	*2.84*	*3.90*	*4.96*	*6.12*	*7.88*	*9.26*	- - -
					X_T	0.964	0.688	0.709	0.715	0.699	0.690	0.688	0.641	0.531	0.455	- - -
2	19.1	0.75	29	1.125	C_v	0.269	1.07	1.67	2.30	3.28	4.51	5.73	7.07	9.11	10.7	0.70
					K_v	*0.233*	*0.926*	*1.44*	*1.99*	*2.84*	*3.90*	*4.96*	*6.12*	*7.88*	*9.26*	- - -
					X_T	0.964	0.688	0.709	0.715	0.699	0.690	0.688	0.641	0.531	0.455	- - -
	25.4	1	29	1.125	C_v	- - -	0.100	0.890	1.90	3.50	6.50	11.0	15.0	19.0	21.0	0.81
					K_v	- - -	*0.087*	*0.770*	*1.64*	*3.03*	*5.62*	*9.52*	*13.0*	*16.4*	*18.2*	- - -
					X_T	- - -	0.689	0.666	0.691	0.692	0.667	0.646	0.686	0.646	0.690	- - -
	31.8	1.25	29	1.125	C_v	- - -	0.220	1.20	2.70	5.00	9.00	15.0	22.0	27.0	31.0	0.81
					K_v	- - -	*0.190*	*1.04*	*2.34*	*4.33*	*7.79*	*13.0*	*19.0*	*23.4*	*26.8*	- - -
					X_T	- - -	0.668	0.685	0.683	0.666	0.694	0.692	0.648	0.667	0.671	- - -
	38.1	1.5	38	1.5	C_v	- - -	0.880	2.80	6.30	13.5	22.5	31.0	38.0	43.5	48.0	0.81
					K_v	- - -	*0.761*	*2.42*	*5.45*	*11.7*	*19.5*	*26.8*	*32.9*	*37.6*	*41.5*	- - -
					X_T	- - -	0.682	0.670	0.677	0.678	0.703	0.698	0.684	0.703	0.703	- - -

1. At 100% travel.
2. Characteristic is equal percentage through 75% of travel.

Table 24. Design HPAS, CL2500 (Equal Percentage Cages Without Liner, Flow Down through the Port)

Equal Percentage

Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	19.1	0.75	19	0.75	C_v	- - -	0.296	0.955	1.47	1.98	2.62	3.02	3.66	4.36	5.38	0.87
					K_v	- - -	*0.256*	*0.826*	*1.27*	*1.71*	*2.27*	*2.61*	*3.17*	*3.77*	*4.65*	- - -
					X_T	- - -	0.722	0.711	0.649	0.685	0.664	0.662	0.658	0.653	0.648	- - -
2	19.1	0.75	19	0.75	C_v	- - -	0.296	0.955	1.47	1.98	2.62	3.06	3.72	4.46	5.58	0.87
					K_v	- - -	*0.256*	*0.826*	*1.27*	*1.71*	*2.27*	*2.65*	*3.22*	*3.86*	*4.83*	- - -
					X_T	- - -	0.722	0.711	0.649	0.685	0.664	0.677	0.657	0.668	0.658	- - -

Modified Equal Percentage[2]

Modified Equal Percentage Characteristic

1	19.1	0.75	29	1.125	C_v	0.269	1.07	1.67	2.30	3.28	4.51	5.73	6.93	8.06	9.73	0.70
					K_v	*0.233*	*0.926*	*1.44*	*1.99*	*2.84*	*3.90*	*4.96*	*5.99*	*6.97*	*8.42*	- - -
					X_T	0.964	0.688	0.709	0.715	0.600	0.542	0.574	0.580	0.584	0.469	- - -
2	19.1	0.75	29	1.125	C_v	0.269	1.07	1.67	2.30	3.28	4.51	5.73	7.07	9.11	10.7	0.70
					K_v	*0.233*	*0.926*	*1.44*	*1.99*	*2.84*	*3.90*	*4.96*	*6.12*	*7.88*	*9.26*	- - -
					X_T	0.964	0.688	0.709	0.715	0.699	0.690	0.688	0.641	0.531	0.455	- - -
	25.4	1	29	1.125	C_v	- - -	0.100	0.890	1.90	3.50	6.50	11.0	15.0	19.0	21.0	0.81
					K_v	- - -	*0.087*	*0.770*	*1.64*	*3.03*	*5.62*	*9.52*	*13.0*	*16.4*	*18.2*	- - -
					X_T	- - -	0.689	0.666	0.691	0.692	0.667	0.646	0.686	0.646	0.690	- - -
	31.8	1.25	29	1.125	C_v	- - -	0.220	1.20	2.70	5.00	9.00	15.0	22.0	27.0	31.0	0.81
					K_v	- - -	*0.190*	*1.04*	*2.34*	*4.33*	*7.79*	*13.0*	*19.0*	*23.4*	*26.8*	- - -
					X_T	- - -	0.668	0.685	0.683	0.666	0.694	0.692	0.648	0.667	0.671	- - -
	38.1	1.5	38	1.5	C_v	- - -	0.880	2.80	6.30	12.9	21.0	27.2	31.6	34.7	36.8	0.81
					K_v	- - -	*0.761*	*2.42*	*5.45*	*11.2*	*18.2*	*23.5*	*27.3*	*30.0*	*31.8*	- - -
					X_T	- - -	0.682	0.670	0.677	0.740	0.709	0.713	0.717	0.720	0.722	- - -

1. At 100% travel.
2. Characteristic is equal percentage through 75% of travel.

Table 25. Design HPAS, CL900 and 1500 (Equal Percentage Cages With Liner, Flow Down through the Port)

Equal Percentage

Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	19.1	0.75	19	0.75	C_v	0.200	0.296	0.955	1.47	1.98	2.62	3.02	3.66	4.36	5.37	0.87
					K_v	*0.173*	*0.256*	*0.826*	*1.27*	*1.71*	*2.27*	*2.61*	*3.17*	*3.77*	*4.65*	- - -
					X_T	0.563	0.714	0.702	0.642	0.677	0.657	0.658	0.650	0.644	0.641	- - -
2	19.1	0.75	19	0.75	C_v	0.200	0.296	0.955	1.47	1.98	2.62	3.06	3.72	4.46	5.58	0.87
					K_v	*0.173*	*0.256*	*0.826*	*1.27*	*1.71*	*2.27*	*2.65*	*3.22*	*3.86*	*4.83*	- - -
					X_T	0.563	0.714	0.702	0.642	0.677	0.657	0.669	0.649	0.660	0.651	- - -

Modified Equal Percentage(2)

Modified Equal Percentage Characteristic

1	19.1	0.75	29	1.125	C_v	0.269	1.07	1.67	2.30	3.28	4.51	5.73	6.93	8.06	9.73	0.70
					K_v	*0.233*	*0.926*	*1.44*	*1.99*	*2.84*	*3.90*	*4.96*	*5.99*	*6.97*	*8.42*	- - -
					X_T	0.952	0.680	0.700	0.706	0.593	0.535	0.570	0.574	0.577	0.464	- - -
2	19.1	0.75	29	1.125	C_v	0.269	1.07	1.67	2.30	3.28	4.51	5.73	7.07	9.11	10.7	0.70
					K_v	*0.233*	*0.926*	*1.44*	*1.99*	*2.84*	*3.90*	*4.96*	*6.12*	*7.88*	*9.26*	- - -
					X_T	0.952	0.680	0.700	0.706	0.690	0.682	0.680	0.633	0.525	0.450	- - -
	25.4	1	29	1.125	C_v	- - -	0.100	0.890	1.90	3.50	6.50	11.0	15.0	19.0	20.0	0.81
					K_v	- - -	*0.087*	*0.770*	*1.64*	*3.03*	*5.62*	*9.52*	*13.0*	*16.4*	*17.3*	- - -
					X_T	- - -	0.681	0.658	0.682	0.684	0.659	0.639	0.678	0.638	0.682	- - -
	31.8	1.25	29	1.125	C_v	- - -	0.220	1.20	2.70	5.00	9.00	15.0	22.0	25.7	27.9	0.81
					K_v	- - -	*0.190*	*1.04*	*2.34*	*4.33*	*7.79*	*13.0*	*19.0*	*22.2*	*24.1*	- - -
					X_T	- - -	0.660	0.676	0.675	0.658	0.686	0.684	0.640	0.659	0.663	- - -
	38.1	1.5	38	1.5	C_v	- - -	0.880	2.80	6.30	13.5	22.5	31.0	36.1	39.2	40.8	0.81
					K_v	- - -	*0.761*	*2.42*	*5.45*	*11.7*	*19.5*	*26.8*	*31.2*	*33.9*	*35.3*	- - -
					X_T	- - -	0.674	0.662	0.669	0.670	0.695	0.690	0.691	0.689	0.694	- - -

1. At 100% travel.
2. Characteristic is equal percentage through 75% of travel.

Table 26. Design HPAS, CL2500 (Equal Percentage Cages With Liner, Flow Down through the Port)

Equal Percentage

Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	19.1	0.75	19	0.75	C_v	0.200	0.296	0.955	1.47	1.98	2.62	3.02	3.66	4.36	5.37	0.87
					K_v	*0.173*	*0.256*	*0.826*	*1.27*	*1.71*	*2.27*	*2.61*	*3.17*	*3.77*	*4.65*	- - -
					X_T	0.569	0.722	0.711	0.649	0.685	0.664	0.665	0.658	0.653	0.648	- - -
2	19.1	0.75	19	0.75	C_v	0.200	0.296	0.955	1.47	1.98	2.62	3.06	3.72	4.46	5.58	0.87
					K_v	*0.173*	*0.256*	*0.826*	*1.27*	*1.71*	*2.27*	*2.65*	*3.22*	*3.86*	*4.83*	- - -
					X_T	0.569	0.722	0.711	0.649	0.685	0.664	0.677	0.657	0.668	0.658	- - -

Modified Equal Percentage[2]

Modified Equal Percentage Characteristic

1	19.1	0.75	29	1.125	C_v	0.269	1.07	1.67	2.30	3.28	4.51	5.73	6.93	8.06	9.73	0.70
					K_v	*0.233*	*0.926*	*1.44*	*1.99*	*2.84*	*3.90*	*4.96*	*5.99*	*6.97*	*8.42*	- - -
					X_T	0.964	0.688	0.709	0.715	0.600	0.542	0.574	0.580	0.584	0.469	- - -
2	19.1	0.75	29	1.125	C_v	0.269	1.07	1.67	2.30	3.28	4.51	5.73	7.07	9.11	10.7	0.70
					K_v	*0.233*	*0.926*	*1.44*	*1.99*	*2.84*	*3.90*	*4.96*	*6.12*	*7.88*	*9.26*	- - -
					X_T	0.964	0.688	0.709	0.715	0.699	0.690	0.688	0.641	0.531	0.455	- - -
	25.4	1	29	1.125	C_v	- - -	0.100	0.890	1.90	3.50	6.50	11.0	15.0	19.0	20.0	0.81
					K_v	- - -	*0.087*	*0.770*	*1.64*	*3.03*	*5.62*	*9.52*	*13.0*	*16.4*	*17.3*	- - -
					X_T	- - -	0.689	0.666	0.691	0.692	0.667	0.646	0.686	0.646	0.690	- - -
	31.8	1.25	29	1.125	C_v	- - -	0.220	1.20	2.70	5.00	9.00	15.0	22.0	25.7	27.9	0.81
					K_v	- - -	*0.190*	*1.04*	*2.34*	*4.33*	*7.79*	*13.0*	*19.0*	*22.2*	*24.1*	- - -
					X_T	- - -	0.668	0.685	0.683	0.666	0.694	0.692	0.648	0.667	0.671	- - -
	38.1	1.5	38	1.5	C_v	- - -	0.880	2.80	6.30	12.9	21.0	27.2	30.0	31.2	31.3	0.81
					K_v	- - -	*0.761*	*2.42*	*5.45*	*11.2*	*18.2*	*23.5*	*25.9*	*27.0*	*27.1*	- - -
					X_T	- - -	0.682	0.670	0.677	0.743	0.707	0.714	0.716	0.716	0.726	- - -

1. At 100% travel.
2. Characteristic is equal percentage through 75% of travel.

Table 27. Design HPAS, CL900 and 1500 (Micro-Flute Valve Plug)

Flow Up

Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	9.5	0.375	19	0.75	C_v	0.066	0.121	0.200	0.314	0.470	0.674	0.945	1.30	1.74	2.24	0.81
					K_v	*0.057*	*0.105*	*0.173*	*0.272*	*0.407*	*0.583*	*0.817*	*1.12*	*1.51*	*1.94*	- - -
					X_T	0.944	0.744	0.652	0.600	0.586	0.585	0.583	0.584	0.582	0.585	- - -
	12.7	0.5	19	0.75	C_v	0.105	0.184	0.314	0.488	0.716	1.04	1.53	2.30	3.20	4.21	0.84
					K_v	*0.091*	*0.159*	*0.272*	*0.422*	*0.619*	*0.900*	*1.32*	*1.99*	*2.77*	*3.64*	- - -
					X_T	0.974	0.792	0.654	0.638	0.630	0.580	0.547	0.497	0.523	0.549	- - -

Flow Down With or Without Liner

Equal Percentage Characteristic

1 and 2	6.4 1 Flute	0.25 1 Flute	19	0.75	C_v	0.0290	0.0377	0.0470	0.0624	0.0874	0.124	0.175	0.243	0.330	0.407	0.62
					K_v	*0.025*	*0.033*	*0.041*	*0.054*	*0.076*	*0.107*	*0.151*	*0.210*	*0.285*	*0.352*	- - -
					X_T	0.990	0.975	0.867	0.765	0.659	0.569	0.494	0.450	0.450	0.550	- - -
	12.7 1 Flute	0.5 1 Flute	19	0.75	C_v	0.078	0.090	0.116	0.161	0.228	0.320	0.445	0.641	0.950	1.40	0.72
					K_v	*0.067*	*0.078*	*0.100*	*0.139*	*0.197*	*0.277*	*0.385*	*0.554*	*0.822*	*1.211*	- - -
					X_T	0.995	0.990	0.986	0.932	0.846	0.775	0.719	0.653	0.581	0.537	- - -
	12.7 2 Flutes	0.5 2 Flutes	19	0.75	C_v	0.128	0.161	0.257	0.394	0.539	0.700	0.947	1.38	2.07	2.93	0.71
					K_v	*0.111*	*0.139*	*0.222*	*0.341*	*0.466*	*0.605*	*0.819*	*1.19*	*1.79*	*2.53*	- - -
					X_T	0.678	0.736	0.552	0.484	0.516	0.586	0.610	0.556	0.490	0.488	- - -

1. At 100% travel.

Table 28. Design HPAS, CL900, 1500, and 2500 (Micro-Flat Anti-Cavitation Valve Plug With or Without Liner, Flow Down through the Port)

Micro-Flat Anti-Cavitation

Linear Characteristic

Valve Size, NPS	Port Diameter[2]		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1 and 2	9.5 2 Flats	0.375 2 Flats	19	0.75	C_v	0.010	0.017	0.077	0.162	0.264	0.381	0.510	0.651	0.801	0.961	0.82
					K_v	*0.009*	*0.015*	*0.067*	*0.140*	*0.228*	*0.330*	*0.441*	*0.563*	*0.693*	*0.831*	- - -
					X_T	0.648	0.678	0.678	0.678	0.678	0.678	0.678	0.678	0.678	0.678	- - -
	12.7 2 Flats	0.5 2 Flats	19	0.75	C_v	0.027	0.031	0.144	0.301	0.491	0.708	0.947	1.21	1.48	1.71	0.82
					K_v	*0.023*	*0.027*	*0.125*	*0.260*	*0.425*	*0.612*	*0.819*	*1.05*	*1.28*	*1.48*	- - -
					X_T	0.703	0.678	0.678	0.678	0.678	0.678	0.678	0.678	0.678	0.678	- - -
	19.1 2 Flats	0.75 2 Flats	19	0.75	C_v	0.067	0.095	0.224	0.452	0.770	1.14	1.51	2.00	2.50	2.92	0.82
					K_v	*0.058*	*0.082*	*0.194*	*0.391*	*0.666*	*0.986*	*1.31*	*1.73*	*2.16*	*2.53*	- - -
					X_T	0.931	0.929	0.919	0.905	0.830	0.783	0.800	0.751	0.726	0.681	- - -
2	25.4 2 Flats	1 2 Flats	29	1.125	C_v	0.018	0.237	0.728	1.40	2.18	3.05	4.06	5.26	6.58	7.61	0.81
					K_v	*0.016*	*0.205*	*0.630*	*1.21*	*1.89*	*2.64*	*3.51*	*4.55*	*5.69*	*6.58*	- - -
					X_T	0.911	0.763	0.676	0.671	0.680	0.679	0.659	0.615	0.579	0.588	- - -

1. At 100% travel.
2. Micro-Flat Anti-Cavitation trims use a shutoff port diameter which is 0.125 inch larger than the flowing port diameter. Use the shutoff port diameter for actuator sizing.

Note: If △P exceeds 1000 psig, the life span of the Micro-Flat trim may be shortened.

Table 29. Design HPAS, CL900 and 1500 (Micro-Form Valve Plug, Flow Up through the Port)

Micro-Form

Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	6.4	0.25	19	0.75	C_v	0.089	0.123	0.175	0.242	0.331	0.456	0.643	0.910	1.24	1.58	0.93
					K_v	*0.077*	*0.106*	*0.151*	*0.209*	*0.286*	*0.394*	*0.556*	*0.787*	*1.07*	*1.37*	- - -
					X_T	0.658	0.666	0.611	0.603	0.613	0.613	0.588	0.578	0.616	0.651	- - -
	12.7	0.5	19	0.75	C_v	0.259	0.391	0.570	0.815	1.15	1.59	2.22	3.13	4.39	5.75	0.98
					K_v	*0.224*	*0.338*	*0.493*	*0.705*	*0.995*	*1.38*	*1.92*	*2.71*	*3.80*	*4.97*	- - -
					X_T	0.633	0.606	0.576	0.572	0.576	0.593	0.604	0.624	0.662	0.691	- - -
	19.1	0.75	19	0.75	C_v	0.464	0.695	0.987	1.43	2.12	3.16	4.71	6.89	9.56	11.4	0.97
					K_v	*0.401*	*0.601*	*0.854*	*1.24*	*1.83*	*2.73*	*4.07*	*5.96*	*8.27*	*9.86*	- - -
					X_T	0.670	0.628	0.624	0.615	0.600	0.594	0.600	0.622	0.669	0.729	- - -
2	6.4	0.25	19	0.75	C_v	0.089	0.123	0.175	0.242	0.331	0.456	0.643	0.910	1.24	1.58	0.93
					K_v	*0.077*	*0.106*	*0.151*	*0.209*	*0.286*	*0.394*	*0.556*	*0.787*	*1.07*	*1.37*	- - -
					X_T	0.658	0.666	0.611	0.603	0.613	0.613	0.588	0.578	0.616	0.651	- - -
	12.7	0.5	19	0.75	C_v	0.259	0.391	0.570	0.815	1.15	1.59	2.22	3.13	4.39	5.75	0.98
					K_v	*0.224*	*0.338*	*0.493*	*0.705*	*0.995*	*1.38*	*1.92*	*2.71*	*3.80*	*4.97*	- - -
					X_T	0.633	0.606	0.576	0.572	0.576	0.593	0.604	0.624	0.662	0.691	- - -
	19.1	0.75	19	0.75	C_v	0.464	0.695	0.987	1.43	2.12	3.16	4.71	6.89	9.56	11.4	0.97
					K_v	*0.401*	*0.601*	*0.854*	*1.24*	*1.83*	*2.73*	*4.07*	*5.96*	*8.27*	*9.86*	- - -
					X_T	0.670	0.628	0.624	0.615	0.600	0.594	0.600	0.622	0.669	0.729	- - -

1. At 100% travel.

Table 30. Design HPAS, CL900 and 1500 (Micro-Form Valve Plug, Flow Up through the Port)

Micro-Form

Modified Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	19.1	0.75	29	1.125	C_v	0.610	1.10	1.79	3.01	5.75	9.07	11.2	12.1	13.4	14.5	0.95
					K_v	*0.528*	*0.952*	*1.55*	*2.60*	*4.97*	*9.07*	*9.69*	*10.5*	*11.6*	*12.5*	- - -
					X_T	0.563	0.559	0.567	0.567	0.567	0.567	0.567	0.567	0.555	0.567	- - -
	25.4	1	29	1.125	C_v	0.973	1.86	3.18	5.86	9.22	12.4	14.6	16.1	18.2	19.5	0.89
					K_v	*0.842*	*1.61*	*2.75*	*5.07*	*7.98*	*10.7*	*12.6*	*13.9*	*15.7*	*16.9*	- - -
					X_T	0.680	0.634	0.568	0.571	0.571	0.571	0.571	0.571	0.567	0.571	- - -
2	25.4	1	29	1.125	C_v	0.973	1.86	3.18	5.86	10.5	16.6	21.8	24.8	26.3	27.5	0.89
					K_v	*0.842*	*1.61*	*2.75*	*5.07*	*9.08*	*14.4*	*18.9*	*21.5*	*22.7*	*23.8*	- - -
					X_T	0.680	0.634	0.568	0.571	0.591	0.635	0.667	0.660	0.602	0.553	- - -
	38.1	1.25	29	1.125	C_v	1.09	1.87	3.89	8.77	17.4	26.4	31.6	34.6	40.6	47.6	0.98
					K_v	*0.943*	*1.62*	*3.36*	*7.59*	*15.1*	*22.8*	*27.3*	*29.9*	*35.1*	*41.2*	- - -
					X_T	0.702	0.630	0.524	0.547	0.653	0.729	0.753	0.761	0.659	0.479	- - -
	31.8	1.5	38	1.5	C_v	2.43	4.43	9.01	17.2	27.9	37.5	44.2	50.0	56.9	58.3	0.97
					K_v	*2.10*	*3.83*	*7.79*	*14.9*	*24.1*	*32.4*	*38.2*	*43.3*	*49.2*	*50.4*	- - -
					X_T	0.619	0.520	0.499	0.583	0.691	0.749	0.758	0.723	0.640	0.623	- - -

1. At 100% travel.

Table 31. Design HPAS, CL2500 (Micro-Form Valve Plug, Flow Up through the Port)

Micro-Form

Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	6.4	0.25	19	0.75	C_v	0.089	0.123	0.175	0.242	0.331	0.456	0.643	0.910	1.24	1.58	0.93
					K_v	*0.077*	*0.106*	*0.151*	*0.209*	*0.286*	*0.394*	*0.556*	*0.787*	*1.07*	*1.37*	- - -
					X_T	0.658	0.666	0.611	0.603	0.613	0.613	0.588	0.578	0.616	0.651	- - -
	12.7	0.5	19	0.75	C_v	0.259	0.391	0.570	0.815	1.15	1.59	2.22	3.13	4.39	5.75	0.98
					K_v	*0.224*	*0.338*	*0.493*	*0.705*	*0.995*	*1.38*	*1.92*	*2.71*	*3.80*	*4.97*	- - -
					X_T	0.633	0.606	0.576	0.572	0.576	0.593	0.604	0.624	0.662	0.691	- - -
	19.1	0.75	19	0.75	C_v	0.464	0.695	0.987	1.43	2.12	3.16	4.71	6.89	9.37	10.9	0.97
					K_v	*0.401*	*0.601*	*0.854*	*1.24*	*1.83*	*2.73*	*4.07*	*5.96*	*8.11*	*9.43*	- - -
					X_T	0.670	0.628	0.624	0.615	0.600	0.594	0.600	0.622	0.670	0.737	- - -
2	6.4	0.25	19	0.75	C_v	0.089	0.123	0.175	0.242	0.331	0.456	0.643	0.910	1.24	1.58	0.93
					K_v	*0.077*	*0.106*	*0.151*	*0.209*	*0.286*	*0.394*	*0.556*	*0.787*	*1.07*	*1.37*	- - -
					X_T	0.658	0.666	0.611	0.603	0.613	0.613	0.588	0.578	0.616	0.651	- - -
	12.7	0.5	19	0.75	C_v	0.259	0.391	0.570	0.815	1.15	1.59	2.22	3.13	4.39	5.75	0.98
					K_v	*0.224*	*0.338*	*0.493*	*0.705*	*0.995*	*1.38*	*1.92*	*2.71*	*3.80*	*4.97*	- - -
					X_T	0.633	0.606	0.576	0.572	0.576	0.593	0.604	0.624	0.662	0.691	- - -
	19.1	0.75	19	0.75	C_v	0.464	0.695	0.987	1.43	2.12	3.16	4.71	6.89	9.56	11.4	0.97
					K_v	*0.401*	*0.601*	*0.854*	*1.24*	*1.83*	*2.73*	*4.07*	*5.96*	*8.27*	*9.86*	- - -
					X_T	0.670	0.628	0.624	0.615	0.600	0.594	0.600	0.622	0.669	0.729	- - -
	25.4	1	19	0.75	C_v	0.927	1.35	1.87	2.64	3.88	5.81	8.66	12.6	16.6	18.9	0.91
					K_v	*0.802*	*1.17*	*1.62*	*2.28*	*3.36*	*5.03*	*7.49*	*10.9*	*14.4*	*16.3*	- - -
					X_T	0.431	0.636	0.594	0.603	0.615	0.600	0.566	0.540	0.581	0.676	- - -

1. At 100% travel.

Table 32. Design HPAS, CL2500 (Micro-Form Valve Plug, Flow Up through the Port)

Micro-Form

Modified Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	25.4	1	29	1.125	C_v	0.973	1.86	3.18	5.86	8.94	11.9	13.9	14.1	14.2	14.3	0.89
					K_v	*0.842*	*1.61*	*2.75*	*5.07*	*7.73*	*10.3*	*12.0*	*12.2*	*12.3*	*12.4*	- - -
					X_T	0.680	0.634	0.568	0.571	0.568	0.569	0.569	0.569	0.569	0.569	- - -
2	25.4	1	29	1.125	C_v	0.973	1.86	3.18	5.86	10.5	16.1	20.7	23.3	24.6	25.6	0.89
					K_v	*0.842*	*1.61*	*2.75*	*5.07*	*9.08*	*13.9*	*17.9*	*20.2*	*21.3*	*22.1*	- - -
					X_T	0.680	0.634	0.568	0.571	0.591	0.635	0.669	0.661	0.601	0.559	- - -
	31.8	1.25	29	1.125	C_v	1.09	1.87	3.89	8.77	16.9	24.6	29.1	31.1	34.5	36.6	0.98
					K_v	*0.943*	*1.62*	*3.36*	*7.59*	*14.6*	*21.3*	25.2	*26.9*	*29.8*	*31.7*	- - -
					X_T	0.702	0.630	0.524	0.547	0.651	0.734	0.747	0.763	0.655	0.614	- - -
	38.1	1.5	38	1.5	C_v	2.43	4.43	9.01	16.7	25.9	32.6	35.4	38.5	41.0	43.0	0.97
					K_v	*2.10*	*3.83*	*7.79*	*14.4*	*22.4*	*28.2*	*30.6*	*33.3*	*35.5*	*37.2*	- - -
					X_T	0.619	0.520	0.499	0.581	0.693	0.747	0.751	0.721	0.646	0.587	- - -

1. At 100% travel.

Table 33. Design HPAS, CL900, 1500, and 2500 (Whisper Trim® III Cage, Flow Up through the Port)

CL900 and 1500

Linear Characteristic

Cage Level	Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel									
		mm	Inches	mm	Inches		Minimum[1]	10	20	30	40	50	60	70	80	90	100
A1[2] ΔP/P1≤0.6	2	47.6	1.875	38	1.5	C_v	1.00	2.50	7.50	12.8	17.7	22.3	26.6	31.2	35.5	39.5	42.6
						K_v	*0.865*	*2.16*	*6.49*	*11.1*	*15.3*	*19.3*	*23.0*	*27.0*	*30.7*	*34.2*	*36.8*
						X_T	0.727	0.686	0.605	0.609	0.613	0.607	0.613	0.606	0.607	0.603	0.607

CL2500

Linear Characteristic

A1[2] ΔP/P1≤0.6	2	47.6	1.875	38	1.5	C_v	1.00	2.50	7.50	12.8	17.7	22.3	26.6	28.7	31.4	34.0	36.2
						K_v	*0.865*	*2.16*	*6.49*	*11.1*	*15.3*	*19.3*	*23.0*	*24.8*	*27.2*	*29.4*	*31.3*
						X_T	0.727	0.686	0.605	0.609	0.593	0.576	0.554	0.597	0.595	0.592	0.595

1. Valve should not be required to throttle at less than the minimum coefficient for an extended time, or erosion damage to the valve seat may result.
2. Larger capacities may be available with level A1 cages depending on service conditions.

Table 34. Design HPAS and HPAT, CL900, 1500, and 2500 (Cavitrol® III Cages, Flow Down through the Port)

CL900 and 1500

Linear Characteristic

Trim Stage	Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Minimum Throttling C_v[2]	Valve Opening—Percent of Total Travel										F_L[3]
		mm	Inches	mm	Inches			10	20	30	40	50	60	70	80	90	100	
Two Stage	1[1]	22.2	0.875[1]	38	1.5	C_v	0.360	- - -	0.836	1.80	2.74	3.64	4.51	5.36	6.18	6.91	7.39	0.98
						K_v	*0.311*	- - -	*0.723*	*1.56*	*2.37*	*3.15*	*3.90*	*4.64*	*5.35*	*5.98*	*6.39*	- - -
	2	44.4	1.75	50	2	C_v	0.580	1.07	1.97	3.29	4.86	6.58	8.36	10.1	11.7	13.0	14.0	0.98
						K_v	*0.502*	*0.926*	*1.70*	*2.85*	*4.20*	*5.69*	*7.23*	*8.74*	*10.1*	*11.2*	*12.1*	- - -
Three Stage	2[1]	25.4	1[1]	50	2	C_v	0.590	0.272	1.10	1.98	2.82	3.63	4.46	5.30	6.07	6.61	6.73	0.99
						K_v	*0.510*	*0.235*	*0.952*	*1.71*	*2.44*	*3.14*	*3.86*	*4.58*	*5.25*	*5.72*	*5.82*	- - -

CL2500

Linear Characteristic

Two Stage	1[1]	22.2	0.875[1]	38	1.5	C_v	0.360	- - -	0.836	1.80	2.74	3.64	4.51	5.36	5.87	6.53	6.91	0.98
						K_v	*0.311*	- - -	*0.723*	*1.56*	*2.37*	*3.15*	*3.90*	*4.64*	*5.08*	*5.65*	*5.98*	- - -
	2	44.4	1.75	50	2	C_v	0.580	1.07	1.97	3.29	4.86	6.58	8.36	10.1	11.7	13.0	14.0	0.98
						K_v	*0.502*	*0.926*	*1.70*	*2.85*	*4.20*	*5.69*	*7.23*	*8.74*	*10.1*	*11.2*	*12.1*	- - -
Three Stage	2[1]	25.4	1[1]	50	2	C_v	0.590	0.272	1.10	1.98	2.82	3.63	4.46	5.30	6.07	6.61	6.73	0.99
						K_v	*0.510*	*0.235*	*0.952*	*1.71*	*2.44*	*3.14*	*3.86*	*4.58*	*5.25*	*5.72*	*5.82*	- - -

1. Cavitrol III trim in the NPS 1, two stage and the NPS 2, three stage are unbalanced valve plugs. These sizes and constructions are Design HPS valves; all others in this table are Design HPT valves.
2. Valves should not be required to throttle at a C_v less than the specified minimum C_v for an extended period. Erosion damage to the valve seats may result.
3. At 100% travel.

Table 35. Design HPD, CL900 and 1500 (Linear and Equal Percentage Cages, Flow Down through the Port)

Linear

Linear Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
2	47.6	1.875	38	1.5	C_v	- - -	3.49	12.5	22.9	31.8	38.4	43.0	46.7	49.9	52.2	0.91
					K_v	- - -	*3.02*	*10.8*	*19.8*	*27.5*	*33.2*	*37.2*	*40.4*	*43.2*	*45.2*	- - -
					X_T	- - -	0.811	0.632	0.682	0.743	0.829	0.780	0.743	0.726	0.695	- - -
					F_d	0.89	0.62	0.44	0.30	0.24	0.22	0.19	0.17	0.16	0.15	- - -
3	73.0	2.875	50	2	C_v	- - -	8.72	31.5	55.1	74.6	89.4	101	110	117	121	0.93
					K_v	- - -	*7.54*	*27.2*	*47.7*	*64.5*	*77.3*	*87.4*	*95.2*	*101*	*105*	- - -
					X_T	- - -	0.589	0.580	0.653	0.728	0.775	0.795	0.791	0.777	0.773	- - -
					F_d	0.48	0.28	0.21	0.17	0.15	0.13	0.12	0.11	0.11	0.10	- - -
4	92.1	3.625	50	2	C_v	6.91	26.4	54.7	86.4	117	143	165	182	194	201	0.91
					K_v	*5.98*	*22.8*	*47.3*	*74.7*	*101*	*124*	*143*	*157*	*168*	*174*	- - -
					X_T	0.327	0.581	0.576	0.509	0.525	0.602	0.673	0.708	0.714	0.726	- - -
					F_d	0.28	0.21	0.15	0.13	0.11	0.098	0.090	0.082	0.077	0.073	- - -
6	136.5	5.375	76	3	C_v	8.78	63.3	149	231	298	350	385	408	424	425	0.91
					K_v	*7.59*	*54.8*	*129*	*200*	*258*	*303*	*333*	*353*	*367*	*368*	- - -
					X_T	0.763	0.613	0.544	0.574	0.621	0.671	0.721	0.745	0.709	0.726	- - -
					F_d	0.24	0.12	0.094	0.076	0.067	0.058	0.054	0.050	0.047	0.046	- - -

Modified Equal Percentage[2]

Modified Equal Percentage Characteristic

2	47.6	1.875	38	1.5	C_v	- - -	2.28	7.52	15.7	24.1	31.6	38.2	43.5	46.7	49.0	0.93
					K_v	- - -	*1.97*	*6.50*	*13.6*	*20.8*	*27.3*	*33.0*	*37.6*	*40.4*	*42.4*	- - -
					X_T	- - -	0.641	0.571	0.584	0.634	0.698	0.778	0.803	0.771	0.770	- - -
					F_d	0.99	0.49	0.40	0.30	0.26	0.22	0.20	0.18	0.16	0.16	- - -
3	73.0	2.875	50	2	C_v	0.475	3.07	11.8	26.8	46.6	69.3	89.5	100	103	114	0.95
					K_v	*0.411*	*2.66*	*10.2*	*23.2*	*40.3*	*59.9*	*77.4*	*86.5*	*89.1*	*98.6*	- - -
					X_T	0.949	0.712	0.550	0.604	0.682	0.697	0.706	0.762	0.856	0.783	- - -
					F_d	0.78	0.49	0.31	0.22	0.18	0.15	0.14	0.12	0.11	0.11	- - -
4	92.1	3.625	50	2	C_v	4.33	11.3	23.3	45.0	79.6	121	155	176	192	203	0.89
					K_v	*3.75*	*9.77*	*20.2*	*38.9*	*68.9*	*105*	*134*	*152*	*166*	*176*	- - -
					X_T	0.624	0.523	0.482	0.450	0.453	0.502	0.599	0.696	0.723	0.735	- - -
					F_d	0.29	0.34	0.24	0.18	0.13	0.11	0.094	0.084	0.077	0.073	- - -
6	136.5	5.375	76	3	C_v	5.22	16.6	30.8	55.0	100	168	241	299	351	378	0.89
					K_v	*4.52*	*14.4*	*26.6*	*47.6*	*86.5*	*145*	*208*	*259*	*304*	*327*	- - -
					X_T	0.883	0.725	0.571	0.597	0.592	0.514	0.526	0.623	0.667	0.725	- - -
					F_d	0.43	0.28	0.22	0.16	0.12	0.095	0.079	0.068	0.060	0.057	- - -

1. At 100% travel.
2. Characteristic is equal percentage through 75% of travel.

Table 36. Design HPD and HPT, CL2500 (Linear and Equal Percentage Cages, Flow Down through the Port)

Linear

Linear Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
2	47.6	1.875	25.4	1	C_v	0.686	0.937	4.03	10.1	17.3	24.0	29.0	32.6	35.5	37.9	0.81
					K_v	*0.593*	*0.811*	*3.49*	*8.74*	*15.0*	*20.8*	*25.1*	*28.2*	*30.7*	*32.8*	- - -
					X_T	0.888	0.675	0.533	0.566	0.616	0.656	0.702	0.733	0.747	0.722	- - -

Modified Equal Percentage

Modified Equal Percentage Characteristic

2	47.6	1.875	28.6	1.125	C_v	0.622	1.34	3.52	7.73	13.4	19.5	25.5	31.0	34.7	38.0	0.81
					K_v	*0.538*	*1.16*	*3.04*	*6.69*	*11.6*	*16.9*	*22.1*	*26.8*	*30.0*	*32.9*	- - -
					X_T	0.667	0.664	0.640	0.570	0.586	0.635	0.669	0.712	0.757	0.707	- - -

1. At 100% travel.

Table 37. Design HPD, CL900, 1500, and 2500 (Whisper Trim® III Cages, Flow Up through the Port)

Whisper Trim III—CL900 and 1500

Linear Characteristic

Cage Level	Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										
		mm	Inches	mm	Inches		Minimum(1)	10	20	30	40	50	60	70	80	90	100
A1(2) ΔP/P1≤0.6	2	47.6	1.875	38	1.5	C_v	1.20	3.00	7.70	13.0	17.8	22.3	26.4	31.0	35.3	39.0	42.0
						K_v	*1.04*	*2.59*	*6.66*	*11.2*	*15.4*	*19.3*	*22.8*	*26.8*	*30.5*	*33.7*	*36.3*
						X_T	0.569	0.516	0.602	0.604	0.610	0.607	0.618	0.608	0.607	0.612	0.608
	3	73.0	2.875	50	2	C_v	1.26	6.57	24.1	42.1	58.9	74.0	86.8	97.4	105	110	111
						K_v	*1.09*	*5.68*	*20.8*	*36.4*	*50.9*	*64.0*	*75.1*	*84.3*	*90.8*	*95.2*	*96.0*
						X_T	0.826	0.727	0.610	0.560	0.558	0.588	0.641	0.687	0.723	0.738	0.772
	4	92.1	3.625	50	2	C_v	1.88	7.56	27.3	50.1	71.5	90.8	109	126	142	155	162
						K_v	*1.63*	*6.54*	*23.6*	*43.3*	*61.8*	*78.5*	*94.3*	*109*	*123*	*134*	*140*
						X_T	0.538	0.625	0.586	0.545	0.519	0.520	0.542	0.577	0.614	0.640	0.674
	6	136.5	5.375	76	3	C_v	13.8	28.6	66.4	103	142	180	220	253	284	308	324
						K_v	*11.9*	*24.7*	*57.4*	*89.1*	*123*	*156*	*190*	*219*	*246*	*266*	*280*
						X_T	0.478	0.423	0.513	0.533	0.525	0.557	0.535	0.543	0.560	0.598	0.627

Whisper Trim III—CL2500

Linear Characteristic

A1(2) ΔP/P1≤0.6	2	47.6	1.875	38	1.5	C_v	- - -	3.1	8.4	13.1	17.3	21.4	25.1	28.3	30.8	32.9	34.9
						K_v	- - -	*2.68*	*7.27*	*11.3*	*15.0*	*18.5*	*21.7*	*24.5*	*26.6*	*28.5*	*30.2*
						X_T	0.569	0.516	0.602	0.604	0.610	0.607	0.618	0.608	0.607	0.612	0.608

Whisper Trim III—CL900 and 1500

Linear Characteristic

B1 ΔP/P1≤.75	3	73.0	2.875	50	2	C_v	0.796	3.00	9.00	14.4	18.6	23.4	28.5	34.6	40.2	45.0	48.8
						K_v	*0.689*	*2.59*	*7.79*	*12.5*	*16.1*	*20.2*	*24.7*	*29.9*	*34.8*	*38.9*	*42.2*
						X_T	0.796	0.615	0.618	0.592	0.622	0.622	0.633	0.620	0.624	0.622	0.622
B3 ΔP/P1≤.75	4	92.1	3.625	50	2	C_v	3.50	8.00	20.0	30.0	40.0	52.0	62.0	73.0	82.0	88.9	88.9
						K_v	*3.03*	*6.92*	*17.3*	*25.9*	*34.6*	*45.0*	*53.6*	*63.1*	*70.9*	*76.9*	*76.9*
						X_T	0.617	0.591	0.531	0.524	0.517	0.513	0.509	0.517	0.527	0.522	0.522
						F_d	- - -	0.13	0.087	0.062	0.053	0.048	0.042	0.039	0.036	0.034	0.034
B3 ΔP/P1≤.75	6	136.5	5.375	76	3	C_v	8.00	13	30	50	69	87	107	125	143	160	166
						K_v	*6.92*	*11.2*	*25.9*	*43.3*	*59.7*	*75.3*	*92.6*	*108*	*124*	*138*	*144*
						X_T	0.610	0.577	0.580	0.548	0.552	0.563	0.545	0.554	0.552	0.555	0.554
						F_d	- - -	0.087	0.051	0.042	0.034	0.031	0.028	0.026	0.024	0.022	0.022
C3	4	92.1	3.625	50	2	C_v	3.50	8.00	15.0	21.5	28.0	34.4	41.0	47.3	53.5	56.5	56.8
						K_v	*3.03*	*6.92*	*13.0*	*18.6*	*24.2*	*29.8*	*35.5*	*40.9*	*46.3*	*48.9*	*49.1*
						X_T	0.617	0.526	0.516	0.530	0.530	0.539	0.535	0.540	0.538	0.540	0.540
						F_d	- - -	0.14	0.11	0.079	0.064	0.060	0.053	0.047	0.046	0.042	0.042
C3	6	136.5	5.375	76	3	C_v	8.00	8.30	20.5	33.0	44.3	57.0	69.0	83.0	96.5	108	112
						K_v	*6.92*	*7.18*	*17.7*	*28.5*	*38.3*	*49.3*	*59.7*	*71.8*	*83.5*	*93.4*	*96.9*
						X_T	0.563	0.567	0.575	0.572	0.572	0.556	0.568	0.563	0.561	0.559	0.563
						F_d	- - -	0.093	0.067	0.051	0.045	0.039	0.036	0.032	0.031	0.029	0.028
D3	4	73.0	2.875	50	2	C_v	2.30	4.00	7.90	11.5	15.2	18.8	22.8	27.0	30.8	33.7	37.1
						K_v	*1.99*	*3.46*	*6.83*	*9.95*	*13.1*	*16.3*	*19.7*	*23.4*	*26.6*	*29.2*	*32.1*
						X_T	0.554	0.517	0.525	0.540	0.526	0.533	0.536	0.534	0.530	0.533	0.530
	6	111.1	4.375	76	3	C_v	2.30	7.00	14.0	20.7	28.0	34.8	41.6	48.5	55.7	62.5	69.6
						K_v	*1.99*	*6.05*	*12.1*	*17.9*	*24.2*	*30.1*	*36.0*	*42.0*	*48.2*	*54.1*	*60.2*
						X_T	0.579	0.563	0.557	0.572	0.557	0.569	0.564	0.566	0.562	0.566	0.564

1. Valve should not be required to throttle at less than the minimum coefficient for an extended time, or erosion damage to the valve seat may result.
2. Larger capacities may be available with level A1 cages depending on service conditions.

Notes: The coefficients on this page are also appropriate for the Design HPT.

Table 38. Design HPS, CL900, 1500, and 2500 (Linear and Equal Percentage Cages, Flow Up through the Port)

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
CL900 and 1500																**Linear Characteristic**
2	47.6	1.875	38	1.5	C_v	- - -	3.56	11.7	23.0	33.9	42.3	47.5	50.7	53.4	54.6	0.98
					K_v	- - -	*3.08*	*10.1*	*19.9*	*29.3*	*36.6*	*41.1*	*43.9*	*46.2*	*47.2*	- - -
					X_T	- - -	0.767	0.681	0.658	0.666	0.693	0.718	0.728	0.719	0.711	- - -
					F_d	0.89	0.62	0.44	0.30	0.24	0.22	0.19	0.17	0.16	0.15	- - -
CL2500																**Linear Characteristic**
2	47.6	1.875	25	1	C_v	0.645	0.996	3.51	8.74	15.9	23.5	30.0	34.3	37.0	40.9	>0.96
					K_v	*0.558*	*0.862*	*3.04*	*7.56*	*13.8*	*20.3*	*26.0*	*29.7*	*32.0*	*35.4*	- - -
					X_T	0.905	0.813	0.715	0.701	0.703	0.704	0.701	0.699	0.699	0.710	- - -
CL900 and 1500																**Equal Percentage Characteristic**
2	47.6	1.875	29	1.125	C_v	- - -	1.09	3.04	6.77	12.2	18.9	26.7	34.5	40.5	45.8	0.92
					K_v	- - -	*0.943*	*2.63*	*5.86*	*10.6*	*16.3*	*23.1*	*29.8*	*35.0*	*39.6*	- - -
					X_T	- - -	0.357	0.670	0.717	0.670	0.629	0.598	0.597	0.632	0.652	- - -
					F_d	1.00	0.76	0.50	0.40	0.31	0.28	0.24	0.22	0.20	0.19	- - -
CL2500																**Equal Percentage Characteristic**
2	47.6	1.875	25	1	C_v	0.653	0.977	2.35	5.14	9.18	14.2	20.1	26.2	30.7	35.7	>0.96
					K_v	*0.565*	*0.845*	*2.03*	*4.45*	*7.94*	*12.3*	*17.4*	*22.7*	*26.6*	*30.9*	- - -
					X_T	0.997	0.912	0.785	0.708	0.680	0.690	0.733	0.763	0.768	0.751	- - -
CL900 and 1500																**Modified Equal Percentage Characteristic**
2	47.6	1.875	38	1.5	C_v	- - -	2.19	6.69	14.5	24.1	33.7	42.4	48.9	51.9	54.4	0.95
					K_v	- - -	*1.89*	*5.79*	*12.5*	*20.8*	*29.2*	*36.7*	*42.3*	*44.9*	*47.1*	- - -
					X_T	- - -	0.594	0.741	0.648	0.592	0.602	0.641	0.660	0.663	0.670	- - -
					F_d	0.99	0.49	0.40	0.30	0.26	0.22	0.20	0.18	0.16	0.16	- - -
CL2500																**Modified Equal Percentage Characteristic**
2	47.6	1.875	29	1.125	C_v	0.654	1.21	3.18	7.07	12.4	18.4	25.1	31.5	35.6	40.0	>0.96
					K_v	*0.566*	*1.05*	*2.75*	*6.12*	*10.7*	*15.9*	*21.7*	*27.2*	*30.8*	*34.6*	- - -
					X_T	0.998	0.595	0.430	0.374	0.370	0.413	0.471	0.526	0.571	0.689	- - -

1. At 100% travel.

Table 39. Design HPS, CL900, 1500, and 2500 (Micro-Flute Valve Plug, Flow Up through the Port)

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
Micro-Flute																**Equal Percentage Characteristic**
1	6.4 1 Flute	0.25 1 Flute	19	0.75	C_v	0.039	0.046	0.056	0.072	0.094	0.124	0.162	0.212	0.278	0.354	0.87
					K_v	*0.034*	*0.040*	*0.048*	*0.062*	*0.081*	*0.107*	*0.140*	*0.183*	*0.240*	*0.306*	- - -
					X_T	0.778	0.734	0.690	0.653	0.642	0.635	0.637	0.634	0.632	0.656	- - -
	6.4 3 Flutes	0.25 3 Flutes	19	0.75	C_v	0.053	0.073	0.101	0.146	0.216	0.312	0.433	0.588	0.802	1.07	0.90
					K_v	*0.046*	*0.063*	*0.087*	*0.126*	*0.187*	*0.270*	*0.375*	*0.509*	*0.694*	*0.926*	- - -
					X_T	0.692	0.648	0.639	0.625	0.600	0.586	0.597	0.613	0.620	0.624	- - -
	12.7	0.5	19	0.75	C_v	0.105	0.184	0.314	0.488	0.716	1.04	1.53	2.30	3.20	4.21	0.84
					K_v	*0.091*	*0.159*	*0.272*	*0.422*	*0.619*	*0.900*	*1.32*	*1.99*	*2.77*	*3.64*	- - -
					X_T	0.974	0.792	0.654	0.638	0.630	0.580	0.547	0.497	0.523	0.549	- - -

1. At 100% travel.

Table 40. Design HPS, CL900 and 1500, (Micro-Form Valve Plug, Flow Up through the Port)

Micro-Form

Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L (1)
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	6.4	0.25	19	0.75	C_v	0.072	0.102	0.138	0.209	0.309	0.438	0.630	0.894	1.22	1.61	0.96
					K_v	*0.062*	*0.088*	*0.119*	*0.181*	*0.267*	*0.379*	*0.545*	*0.773*	*1.06*	*1.39*	- - -
					X_T	0.972	0.971	0.986	0.792	0.668	0.611	0.611	0.609	0.606	0.610	- - -
	12.7	0.5	19	0.75	C_v	0.269	0.404	0.555	0.738	1.03	1.52	2.18	3.10	4.23	5.39	0.97
					K_v	*0.233*	*0.349*	*0.480*	*0.638*	*0.891*	*1.31*	*1.89*	*2.68*	*3.66*	*4.66*	- - -
					X_T	0.789	0.708	0.702	0.650	0.626	0.572	0.583	0.606	0.646	0.713	- - -
	19.1	0.75	19	0.75	C_v	0.384	0.577	0.941	1.39	2.02	2.93	4.40	6.58	8.45	9.61	0.95
					K_v	*0.332*	*0.499*	*0.814*	*1.20*	*1.75*	*2.53*	*3.81*	*5.69*	*7.31*	*8.31*	- - -
					X_T	0.532	0.774	0.714	0.587	0.579	0.584	0.588	0.607	0.672	0.773	- - -
2	6.4	0.25	19	0.75	C_v	0.072	0.102	0.138	0.209	0.309	0.438	0.630	0.894	1.22	1.61	0.96
					K_v	*0.062*	*0.088*	*0.119*	*0.181*	*0.267*	*0.379*	*0.545*	*0.773*	*1.06*	*1.39*	- - -
					X_T	0.972	0.971	0.986	0.792	0.668	0.611	0.611	0.609	0.606	0.610	- - -
	12.7	0.5	19	0.75	C_v	0.269	0.404	0.555	0.738	1.03	1.52	2.18	3.10	4.23	5.39	0.97
					K_v	*0.233*	*0.349*	*0.480*	*0.638*	*0.891*	*1.31*	*1.89*	*2.68*	*3.66*	*4.66*	- - -
					X_T	0.789	0.708	0.702	0.650	0.626	0.572	0.583	0.606	0.646	0.713	- - -
	19.1	0.75	19	0.75	C_v	0.450	0.713	1.07	1.52	2.12	3.05	4.57	6.87	9.66	11.9	0.93
					K_v	*0.389*	*0.617*	*0.926*	*1.31*	*1.83*	*2.64*	*3.95*	*5.94*	*8.36*	*10.3*	- - -
					X_T	0.740	0.640	0.578	0.589	0.636	0.648	0.612	0.589	0.636	0.718	- - -

1. At 100% travel.

Table 41. Design HPS, CL2500, (Micro-Form Valve Plug, Flow Up through the Port)

Micro-Form — **Equal Percentage Characteristic**

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	6.4	0.25	19	0.75	C_v	0.072	0.102	0.138	0.209	0.309	0.438	0.630	0.894	1.22	1.61	0.96
					K_v	*0.062*	*0.088*	*0.119*	*0.181*	*0.267*	*0.379*	*0.545*	*0.773*	*1.06*	*1.39*	- - -
					X_T	0.972	0.971	0.986	0.792	0.668	0.611	0.611	0.609	0.606	0.610	- - -
	12.7	0.5	19	0.75	C_v	0.269	0.404	0.555	0.738	1.03	1.52	2.18	3.10	4.23	5.39	0.97
					K_v	*0.233*	*0.349*	*0.480*	*0.638*	*0.891*	*1.31*	*1.89*	*2.68*	*3.66*	*4.66*	- - -
					X_T	0.789	0.708	0.702	0.650	0.626	0.572	0.583	0.606	0.646	0.713	- - -
	19.1	0.75	19	0.75	C_v	0.384	0.577	0.941	1.39	2.02	2.93	4.40	6.58	8.45	9.61	0.95
					K_v	*0.332*	*0.499*	*0.814*	*1.20*	*1.75*	*2.53*	*3.81*	*5.69*	*7.31*	*8.31*	- - -
					X_T	0.532	0.774	0.714	0.587	0.579	0.584	0.588	0.607	0.672	0.773	- - -
2	6.4	0.25	19	0.75	C_v	0.062	0.095	0.137	0.209	0.309	0.438	0.630	0.894	1.22	1.61	0.96
					K_v	*0.054*	*0.082*	*0.119*	*0.181*	*0.267*	*0.379*	*0.545*	*0.773*	*1.06*	*1.39*	- - -
					X_T	0.972	0.971	0.986	0.792	0.668	0.611	0.611	0.609	0.606	0.610	- - -
	12.7	0.5	19	0.75	C_v	0.269	0.404	0.555	0.738	1.03	1.52	2.18	3.10	4.23	5.39	0.97
					K_v	*0.233*	*0.349*	*0.480*	*0.638*	*0.891*	*1.31*	*1.89*	*2.68*	*3.66*	*4.66*	- - -
					X_T	0.789	0.708	0.702	0.650	0.626	0.572	0.583	0.606	0.646	0.713	- - -
	19.1	0.75	19	0.75	C_v	0.450	0.713	1.07	1.52	2.12	3.05	4.57	6.87	9.66	11.9	0.93
					K_v	*0.389*	*0.617*	*0.926*	*1.31*	*1.83*	*2.64*	*3.95*	*5.94*	*8.36*	*10.3*	- - -
					X_T	0.740	0.640	0.578	0.589	0.636	0.648	0.612	0.589	0.636	0.718	- - -

1. At 100% travel.

Table 42. Design HPS, CL900 and 1500, (Extended Travel Micro-Form Valve Plug, Flow Up through the Port)

Micro-Form — **Modified Equal Percentage Characteristic**

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	19.1	0.75	29	1.125	C_v	0.480	0.940	1.71	2.93	5.49	8.45	10.5	11.5	12.0	12.5	0.95
					K_v	*0.415*	*0.813*	*1.48*	*2.53*	*4.75*	*7.31*	*9.08*	*9.95*	*10.4*	*10.8*	- - -
					X_T	0.741	0.660	0.561	0.535	0.599	0.685	0.655	0.632	0.626	0.594	- - -
	25.4	1	29	1.125	C_v	0.85	1.73	3.22	5.71	8.81	11.6	13.7	15.5	16.5	17.1	0.85
					K_v	*0.735*	*1.50*	*2.79*	*4.94*	*7.62*	*10.0*	*11.9*	*13.4*	*14.3*	*14.8*	- - -
					X_T	0.741	0.660	0.561	0.535	0.600	0.685	0.699	0.632	0.626	0.594	- - -
2	25.4	1	29	1.125	C_v	0.884	1.67	2.86	4.96	9.08	15.6	20.9	23.0	23.9	24.2	0.92
					K_v	*0.765*	*1.44*	*2.47*	*4.29*	*7.85*	*13.5*	*18.1*	*19.9*	*20.7*	*20.9*	- - -
					X_T	0.696	0.700	0.698	0.700	0.696	0.700	0.697	0.745	0.714	0.700	- - -
	31.8	1.25	29	1.125	C_v	1.19	1.90	3.60	8.17	16.9	23.9	29.0	31.0	32.0	33.0	0.91
					K_v	*1.03*	*1.64*	*3.11*	*7.07*	*14.6*	*20.7*	*25.1*	*26.8*	*27.7*	*28.5*	- - -
					X_T	0.584	0.603	0.552	0.668	0.731	0.654	0.657	0.670	0.667	0.632	- - -
	38.1	1.5	38	1.5	C_v	1.98	3.83	7.96	16.0	27.2	37.4	43.3	46.9	51.5	52.2	0.97
					K_v	*1.71*	*3.31*	*6.89*	*13.8*	*23.5*	*32.4*	*37.5*	*40.6*	*44.5*	*45.2*	- - -
					X_T	0.584	0.603	0.554	0.668	0.731	0.654	0.682	0.691	0.634	0.632	- - -

1. At 100% travel.

Table 43. Design HPS, CL2500, (Extended Travel Micro-Form Valve Plug, Flow Up through the Port)

Micro-Form

Modified Equal Percentage Characteristic

Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										F_L[1]
	mm	Inches	mm	Inches		10	20	30	40	50	60	70	80	90	100	
1	19.1	0.75	29	1.125	C_v	0.480	0.940	1.71	2.93	5.49	8.45	10.5	11.5	12.0	12.5	0.95
					K_v	*0.415*	*0.813*	*1.48*	*2.53*	*4.75*	*7.31*	*9.08*	*9.95*	*10.4*	*10.8*	- - -
					X_T	0.741	0.660	0.561	0.535	0.599	0.685	0.655	0.632	0.626	0.594	- - -
	25.4	1	29	1.125	C_v	0.500	1.54	3.61	5.83	7.44	8.86	10.6	12.4	13.1	13.8	0.88
					K_v	*0.433*	*1.33*	*3.12*	*5.04*	*6.44*	*7.66*	*9.17*	*10.7*	*11.3*	*11.9*	- - -
					X_T	0.489	0.848	0.556	0.544	0.709	0.820	0.714	0.588	0.644	0.580	- - -
2	25.4	1	29	1.125	C_v	0.884	1.67	2.86	4.96	9.08	15.6	20.9	23.0	23.9	24.2	0.92
					K_v	*0.765*	*1.44*	*2.47*	*4.29*	*7.85*	*13.5*	*18.1*	*19.9*	*20.7*	*20.9*	- - -
					X_T	0.696	0.700	0.698	0.700	0.696	0.700	0.697	0.745	0.714	0.700	- - -
	31.8	1.25	29	1.125	C_v	1.19	1.90	3.60	8.17	16.9	23.9	29.0	31.0	32.0	33.0	0.91
					K_v	*1.03*	*1.64*	*3.11*	*7.07*	*14.6*	*20.7*	*25.1*	*26.8*	*27.7*	*28.5*	- - -
					X_T	0.584	0.603	0.552	0.668	0.731	0.654	0.657	0.670	0.667	0.632	- - -
	38.1	1.5	38	1.5	C_v	1.87	3.75	8.23	16.5	26.2	33.4	38.0	41.7	43.4	44.2	>0.96
					K_v	*1.62*	*3.24*	*7.12*	*14.3*	*22.7*	*28.9*	*32.9*	*36.1*	*37.5*	*38.2*	- - -
					X_T	0.609	0.515	0.520	0.626	0.751	0.790	0.718	0.653	0.668	0.644	- - -

1. At 100% travel.

Table 44. Design HPS, CL900, 1500, and 2500, (Whisper Trim® III Cage, Flow Up through the Port)

Whisper Trim III—CL900 and 1500

Linear Characteristic

Cage Level	Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Valve Opening—Percent of Total Travel										
		mm	Inches	mm	Inches		Minimum[1]	10	20	30	40	50	60	70	80	90	100
A1[2] ΔP/P1≤0.6	2	47.6	1.875	38	1.5	C_v	1.00	2.50	7.50	12.8	17.7	22.3	26.6	31.2	35.5	39.5	42.6
						K_v	*0.865*	*2.16*	*6.49*	*11.1*	*15.3*	*19.3*	*23.0*	*27.0*	*30.7*	*34.2*	*36.8*
						X_T	0.718	0.68	0.60	0.60	0.61	0.60	0.61	0.60	0.60	0.60	0.60
	3	73.0	2.875	50	2	C_v	1.25	6.00	21.0	34.6	49.0	62.7	77.0	89.7	98.8	105	108
						K_v	*1.08*	*5.19*	*18.2*	*29.9*	*42.4*	*54.2*	*66.6*	*77.6*	*85.5*	*90.8*	*93.4*
						X_T	0.839	0.87	0.80	0.83	0.81	0.82	0.82	0.81	0.82	0.81	0.82

Whisper Trim III—CL2500

Linear Characteristic

A1[2] ΔP/P1≤0.6	2	47.6	1.875	38	1.5	C_v	- - -	3.1	8.4	13.1	17.3	21.4	25.1	28.3	30.8	32.9	34.9
						K_v	- - -	*2.68*	*7.27*	*11.3*	*15.0*	*18.5*	*21.7*	*24.5*	*26.6*	*28.5*	*30.2*
						X_T	0.718	0.68	0.60	0.61	0.60	0.61	0.60	0.60	0.60	0.60	0.60

Whisper Trim III—CL900 and 1500

Linear Characteristic

B1 ΔP/P1≤.75	3	73.0	2.875	50	2	C_v	0.900	3.00	9.00	14.0	18.6	23.4	28.6	34.7	40.0	45.0	48.7
						K_v	*0.778*	*2.59*	*7.79*	*12.1*	*16.1*	*20.2*	*24.7*	*30.0*	*34.6*	*38.9*	*42.1*
						X_T	0.622	0.62	0.62	0.63	0.62	0.62	0.63	0.62	0.63	0.62	0.63

1. Valve should not be required to throttle at less than the minimum coefficient for an extended time, or erosion damage to the valve seat may result.
2. Larger capacities may be available with level A1 cages depending on service conditions.

Table 45. Design HPS and HPT, CL900, 1500, and 2500, (Cavitrol® III Cages, Flow Down through the Port)

CL900, 1500, and 2500

Linear Characteristic

Trim Stage	Valve Size, NPS	Port Diameter		Maximum Travel		Flow Coefficient	Minimum Throttling C_v(2)	Valve Opening—Percent of Total Travel										F_L(3)
		mm	Inches	mm	Inches			10	20	30	40	50	60	70	80	90	100	
Two Stage	1(1)	22.2	0.875(1)	38	1.5	C_v	0.360	0.163	0.836	1.80	2.74	3.64	4.51	5.36	6.18	6.91	7.39	0.98
						K_v	*0.311*	*0.141*	*0.723*	*1.56*	*2.37*	*3.15*	*3.90*	*4.64*	*5.35*	*5.98*	*6.39*	- - -
	2	44.4	1.75	50	2	C_v	0.580	1.07	1.97	3.29	4.86	6.58	8.36	10.1	11.7	13.0	14.0	0.98
						K_v	*0.502*	*0.926*	*1.70*	*2.85*	*4.20*	*5.69*	*7.23*	*8.74*	*10.1*	*11.2*	*12.1*	- - -
Three Stage	2(1)	25.4	1(1)	50	2	C_v	0.590	0.272	1.10	1.98	2.82	3.63	4.46	5.30	6.07	6.61	6.73	0.99
						K_v	*0.510*	*0.235*	*0.952*	*1.71*	*2.44*	*3.14*	*3.86*	*4.58*	*5.25*	*5.72*	*5.82*	- - -

CL900 and 1500

Linear Characteristic

Two Stage	3	63.5	2.5	64	2.5	C_v	0.720	1.46	4.98	9.24	13.2	17.0	20.7	24.7	28.5	31.9	34.4	0.98
						K_v	*0.623*	*1.26*	*4.31*	*7.99*	*11.4*	*14.7*	*17.9*	*21.4*	*24.7*	*27.6*	*29.8*	- - -
	4	87.3	3.4375	76	3	C_v	0.900	2.61	9.01	15.6	21.8	28.3	34.8	40.4	46.4	52.2	58.1	0.98
						K_v	*0.778*	*2.26*	*7.79*	*13.5*	*18.9*	*24.5*	*30.1*	*34.9*	*40.1*	*45.2*	*50.3*	- - -
	6	133.3	5.25	102	4	C_v	1.72	7.50	20.7	33.8	47.0	60.1	73.3	87.0	100	112	123	0.98
						K_v	*1.49*	*6.49*	*17.9*	*29.2*	*40.7*	*52.0*	*63.4*	*75.3*	*86.5*	*96.9*	*106*	- - -
Three Stage	3	47.6	1.875	64	2.5	C_v	1.20	0.747	2.02	3.92	6.15	8.01	9.50	11.0	12.8	14.9	16.5	0.99
						K_v	*1.04*	*0.646*	*1.75*	*3.39*	*5.32*	*6.93*	*8.22*	*9.52*	*11.1*	*12.9*	*14.3*	- - -
	4	73.0	2.875	76	3	C_v	1.70	2.80	5.50	8.30	11.0	13.9	16.7	19.4	22.2	25.0	27.8	0.99
						K_v	*1.47*	*2.42*	*4.76*	*7.18*	*9.52*	*12.0*	*14.4*	*16.8*	*19.2*	*21.6*	*24.0*	- - -
	6	115.9	4.5625	102	4	C_v	3.10	6.10	13.2	19.8	26.1	34.1	41.5	48.2	54.5	60.9	65.0	0.99
						K_v	*2.68*	*5.28*	*11.4*	*17.1*	*22.6*	*29.5*	*35.9*	*41.7*	*47.1*	*52.7*	*56.2*	- - -

1. Cavitrol III trim in the NPS 1, two stage and the NPS 2, three stage are unbalanced valve plugs. These sizes and constructions are Design HPS valves; all others in this table are Design HPT valves.
2. Valves should not be required to throttle at a C_V less than the specified minimum C_V for an extended period. Erosion damage to the valve seats may result.
3. At 100% travel.

Specifications

Available Configurations(1) and Valve Sizes

See table 1.

Common Characteristics: Designed according to: ■ ASME B16.34 Valve-Flanges, Threaded and Welding End and ■ ANSI/ISA-75.08.06

End Connections Styles(1)

See table 1

Maximum Inlet Pressure and Temperature(1,2)

Flanged, Socketwelding, or Buttwelding: Consistent with CL900, 1500, and 2500 according to ASME B16.34, unless limited by maximum pressure drop or material temperature capabilities

In addition, both steel HP and HPA valves with BWE and SWE connections have increased pressure/temperature ratings as shown in table 3

Maximum Pressure Drop(1)

Valve with Standard Cage: See figure 13.

Valve with Cavitrol III Cage: 149 bar (2160 psi) for two-stage and 207 bar (3000 psi) for three-stage cage. Consult Fisher Bulletin 80.2:030, Cavitrol III One-, Two-, and Three-Stage trims, for more information

Valve with Whisper Trim III Cage:

- 0.6 $\Delta P/P_1$ maximum for level A1
- 0.75 $\Delta P/P_1$ maximum for levels B1 and B3
- 0.85 $\Delta P/P_1$ maximum for level C3
- 0.99 $\Delta P/P_1$ maximum for level D3

Shutoff Classifications

See table 4

Construction Materials

Valve Body and Bonnet:
WCC steel(3), WC9 Cr-Mo steel(3), CF8M stainless steel, and LCC for low temperature service

Trim: See table 12.
Other Parts: See table 7.

Consult your Emerson Process Management sales office for special trim and valve body material availability.

Material Temperature Capabilities(1)

Designs HPD, HPS, and HPAS: Up to 566°C (1050°F) unless limited (see tables 7 or 12 and figure 13)
Designs HPT and HPAT: Up to 232°C (450°F) unless limited (see tables 7 or 12 and figure 13)

Flow Characteristics(4)

Standard Cages: ■ Linear, ■ equal percentage, ■ modified equal percentage(5).
Cavitrol and Whisper Trim III Cages: Linear
Micro-Flute: Equal percentage
Micro-Flat: Linear
Micro-Form: ■ Equal percentage, ■ modified equal percentage

Flow Direction

Standard Cage
- ■ *Design HPD:* Normally flow down
- ■ *Design HPS, HPAS:* Normally flow up(6)
- ■ *Design HPAS Micro-Flat:* Flow down
- ■ *Design HPS, HPAS Micro-Form:* Flow up only
- ■ *Design HPT, HPAT:* Normally flow down

Cavitrol III Cage: Flow down
Whisper Trim III Cage: Flow up

Flow Coefficients

See table 2, the section titled Coefficients in this bulletin, and also Catalog 12

Noise Levels

See Catalog 12, Section 3 for noise prediction methods

Port Diameters, Valve Plug Travel, and Stem Diameters

See tables 5, 8, 9, and 11

- continued -

Specifications (continued)

Bonnet Style and Mounting(1)

■ **Standard Bonnet:** See figures 1 or 2
Yoke Temperature Limit: Standard bonnet with cast iron yoke is limited to 537°C (1000°F)
■ **Optional Style 1—Extension Bonnet:** Used for NPS 1 and 2 valves for CL900 or 1500, and NPS 1 valves for CL2500 (see figures 15 and 16)

Packing Arrangements

■ Single, ■ Double, and ■ Leakoff standard packing, or optional ■ ENVIRO-SEAL and ■ HIGH-SEAL packing systems. See figure 5. Also see bulletin 59.1:061, ENVIRO-SEAL and HIGH-SEAL Packing System for Sliding-Stem Valves

Yoke Boss Diameter for Actuator Mounting

See tables 5 and 10, and figures 14, 15, and 16

Approximate Weight

See table 6

Options(1)

■ Valves with weld-end fittings have increased pressure/temperature ratings, called intermediate ratings(7), ■ Class V(6) shutoff for HPT to 316°C (600°F) using PEEK anti-extrusion rings(8), ■ Class V shutoff for HPD to 593°C (1100°F) using C-seal trim, ■ expanded ends(7) for NPS 4 and 6 valves (NPS 4 valves are available with NPS 6 ends, and NPS 6 valves are available with NPS 8 ends), ■ lubricator or lubricator/isolating valve(7)

1. The pressure/temperature limits in this bulletin and any applicable standard limitations should not be exceeded.
2. EN (or other valve body material) ratings and end connections can usually be supplied; consult your Emerson Process Management sales office.
3. SA-105 and SA-182-F22 are used for CL2500 HPA valves instead of WCC and WC9.
4. Special characterized cages are available. Contact your Emerson Process Management sales office.
5. Modified equal percentage characteristic is equal percentage for the first 75% of travel, then opens quickly for additional capacity.
6. Design HPS valves may be used flow down for on-off service only. Design HPAS valves may be used for flow down in erosive service.
7. For more information contact your Emerson Process Management sales office.
8. Required for all boiler feedwater applications.

Note

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.

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