

Design NotchFlo[®] DST Control Valve

CL600 3-stage, CL900 and CL1500 4-stage, and CL2500 6-stage Design NotchFlo DST control valves (figure 1) with dirty service anti-cavitation trim (figure 2) offer excellent control of high pressure drop liquids with entrained solids while avoiding the damaging effects of cavitation and erosive solids.

Features

- **Long Trim Life**—NotchFlo DST control valves feature a protected seat design whereby the shutoff function is separate from the throttling areas of the trim.
- **Class V Shutoff**—Use of hardened metal seats provides tight shutoff to minimize seat erosion.
- **High Pressure Drops**—Rugged cage guiding of the plug, combined with a staged pressure drop, enables the NotchFlo DST control valve to be effective in a wide range of allowable high pressure drop applications. It can be operated by either spring and diaphragm or piston actuators, depending on plug design (balanced or unbalanced) and application requirements.
- **Sour Service Capability**—Materials are available for applications handling sour fluids. All references in this document are for NACE MR0175-2002 unless otherwise noted. Contact your Emerson Process Management™ sales office for information on NACE MR0175/ISO 15156 and NACE MR0103.
- **Availability**—NotchFlo DST control valves are available in both globe and angle valve body designs.

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.



W9050

Figure 1. Design NotchFlo[®] DST Control Valve

Principle of Operation

NotchFlo DST control valves utilize a high resistance, multi-stage, axial flow path (or passage) where fluid flow is parallel to the axis of the plug and cage (see figure 2).

Pressure reduction occurs throughout the length of the plug; thus individual stages aren't exposed to the full pressure differential. Therefore, trim life is enhanced.

NotchFlo DST trim utilizes a series of notched flow restrictions and expansions to control the pressure drop of the fluid. The amount of pressure drop per stage is controlled to prevent cavitation problems and minimize erosion issues on a properly sized valve.



NotchFlo DST Valve

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Flow passage configuration provided by the multi-stage plug and cage design make CL600 3-stage, CL900 and CL1500 4-stage, and CL2500 6-stage valves well-suited for applications involving fluids with entrained particles. This is a potentially serious problem for other anti-cavitation valve designs which are subject to clogged flow passages.

Design of the trim allows for high rangeability.

Characteristics

The NotchFlo DST control valve has a linear flow characteristic. See figure 3.

To maximize seat life, the trim is designed not to have significant flow for the first 15% of travel.

The multi-stage clearance flow design helps prevent high pressure drops in the seating area during throttling at low capacity. This design feature extends the shutoff capability significantly, while enhancing throttling control capability at low travels.

Trim Selection Guidelines

Refer to the following descriptions and tables 4, 5, and 6 as guidelines for the selection of appropriate trims. Trims 278, 278N, 279, 281, 282, and 283 should not be used in boiler feedwater due to amine corrosion problems associated with CoCr-A and R30006 (alloy 6).

- **Trim 277**—Trim 277 is the standard trim for carbon steel and alloy steel valve bodies and recommended for general and severe service applications up to 316°C (600°F). See tables 4 and 5 for operating temperature ranges per valve size. Typical applications for Trim 277 include services in boiler feedwater, water, non-sour hydrocarbons, and other non-sour liquids.

- **Trim 278**—Trim 278 is the standard trim for stainless steel valve bodies and is optional for use in carbon steel and alloy steel valve bodies. Trim 278 is recommended for use in moderately corrosive liquid applications. Trim 278 can be used up to 316°C (600°F). See tables 4 and 5 for operating temperature ranges per valve size. Not suitable for boiler feedwater use if amine problems exist.

- **Trim 278N**—Trim 278N should be used for sour liquid service in carbon steel, alloy steel, and stainless steel valve bodies. Trim 278N complies with the requirements of NACE MR0175-2002. Trim 278N can be used up to 316°C (600°F). See tables 4 and 5 for operating temperature ranges per valve size. Not suitable for boiler feedwater use if amine problems exist.

- **Trim 279**—Trim 279 is available with CL600 3-stage control valves only and should be used for sour liquid service in carbon steel, alloy steel, and stainless steel valve bodies. Trim 279 complies with the requirements of NACE

MR0175-2002. Trim 279 can be used up to 316°C (600°F). See table 4 for operating temperature ranges per valve size. Not suitable for boiler feedwater use if amine problems exist.

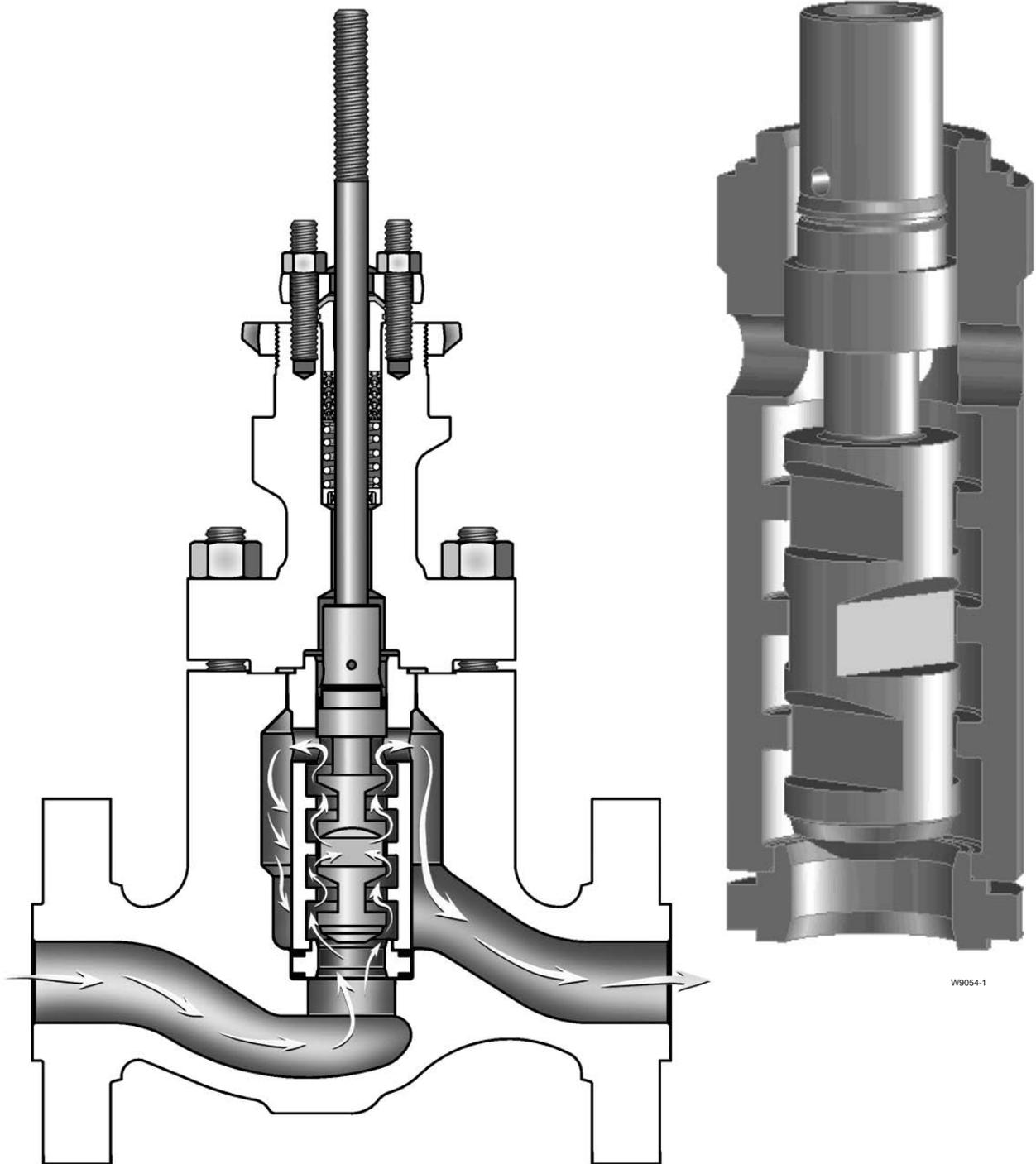
- **Trim 280**—Trim 280 is available with CL1500 ≥ NPS 6 and CL2500 control valves only and should be used in SA105 steel valve bodies. Trim 280 can be used up to 316°C (600°F). See table 5 for operating temperature ranges per valve size. Typical applications for Trim 280 include services in boiler feedwater, water, non-sour hydrocarbons, and other non-sour liquids.

- **Trim 281**—Trim 281 is available with CL1500 ≥ NPS 6 and CL2500 control valves only and should be used in SA105 NACE steel valve bodies. Trim 281 complies with the requirements of NACE MR0175-2002. Trim 281 can be used up to 316°C (600°F). See table 5 for operating

temperature ranges per valve size. Not suitable for boiler feedwater if amine problems exist.

- **Trim 282**—Trim 282 is available with CL1500 ≥ NPS 6 and CL2500 control valves only and should be used in 316 stainless steel valve bodies. Trim 282 complies with the requirements of NACE MR0175-2002. Trim 282 can be used up to 316°C (600°F). See table 5 for operating temperature ranges per valve size. Not suitable for boiler feedwater if amine problems exist.

- **Trim 283**—Trim 283 is available with CL1500 ≥ NPS 6 and CL2500 control valves only and should be used in 347 stainless steel valve bodies. Trim 283 complies with the requirements of NACE MR0175-2002. Trim 283 can be used up to 316°C (600°F). See table 5 for operating temperature ranges per valve size. Not suitable for boiler feedwater if amine problems exist.



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W9054-1

Figure 2. NotchFlo® DST 3-Stage Trim

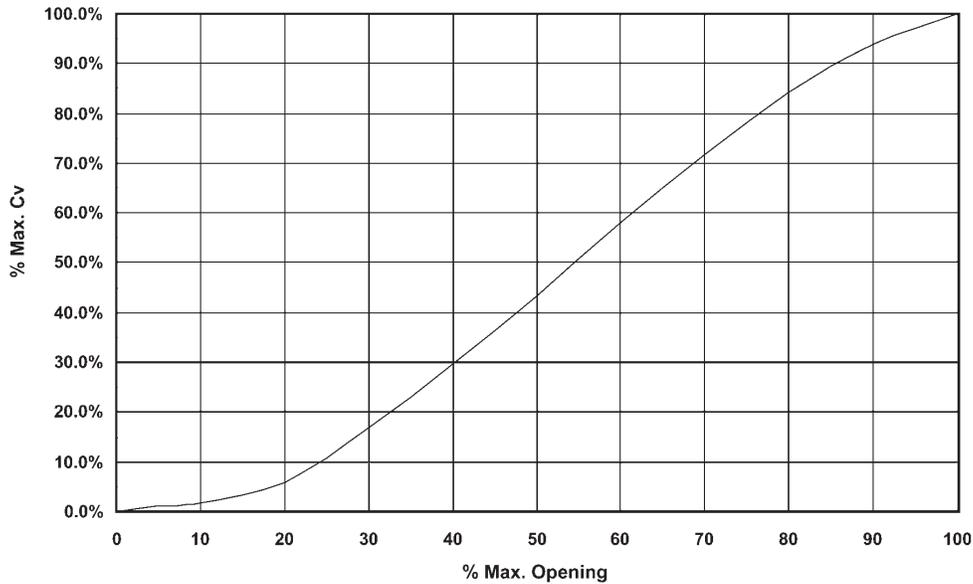


Figure 3. NotchFlo[®] DST Cv versus Travel

Table 1. CL600 3-Stage Available Constructions

VALVE STYLE	VALVE SIZE, NPS	VALVE BODY MATERIAL AND END CONNECTION STYLE ⁽¹⁾			
		WCC, WC9, LCC, CF8M (316 SST), and CD3MN (Duplex SST) Cast Steel Valves ⁽²⁾			
		Screwed	RF or RTJ Flanged CL600	Butt Weld	Socket Weld
Globe	1 or 2	X	X	X	X
	3 or 4	---	X	X	---

X = Available Construction.
 1. End connection style abbreviations: RF - Raised Face, RTJ - Ring Type Joint.
 2. LCC available as RF or RTJ Flanged only. Contact your Emerson Process Management sales office for other end connections.

Table 2. CL900 and CL1500 ≤ NPS 4, 4-Stage Available Constructions

VALVE STYLE	VALVE SIZE, NPS	PRESSURE RATING	VALVE BODY MATERIAL AND END CONNECTION STYLE ⁽¹⁾		
			WCC, WC9, and LCC Cast Steel Valves ⁽³⁾	CF8M (316 Stainless Steel) Cast Valves	SA-105, SA-182-F22, and SA-182-F316 forged SST (for forged steel angle valves)
			RF or RTJ Flanged, Butt Weld, and Socket Weld ⁽²⁾	RF or RTJ Flanged, Butt Weld, and Socket Weld ⁽²⁾	RF or RTJ Flanged and Socket Weld ⁽²⁾
Angle	1, 1-1/2, 2, 3, or 4	CL900 and CL1500	---	---	X
Globe	2, 3, or 4	CL900 and CL1500	X	X	---

X = Available Construction.
 1. End connection style abbreviations: RF - Raised Face, RTJ - Ring Type Joint.
 2. Socket Weld available on NPS 1, 1-1/2, and 2 only.
 3. LCC available as RF or RTJ Flanged only. Contact your Emerson Process Management sales office for other end connections.

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Table 3. CL1500 ≥ NPS 6, 4-Stage and CL2500 6-Stage Available Constructions

VALVE STYLE	VALVE SIZE, NPS	PRESSURE RATING	VALVE BODY MATERIAL AND END CONNECTION STYLE ⁽¹⁾
			SA-105, F316, and F347 Forged Steel Angle Valves
			RF or RTJ Flanged
Angle	6, 8	CL1500	X
Angle	4, 6	CL2500	X

X = Available Construction
 1. End connection style abbreviations: RF = Raised Face, RTJ = Ring Type Joint

Table 4. CL600 3-Stage Metal Trim Material Combinations and Valve Body/Trim Temperature Capabilities⁽¹⁾

TRIM DESIGNATION	VALVE PLUG	VALVE PLUG STEM	CAGE	SEAT RING	VALVE BODY MATERIAL	VALVE SIZE	OPERATING TEMPERATURE	
						NPS	°C	°F
277	S44004	S20910	S17400 H900	S44004	SA105, WCC, F22 WC9, LCC	1 and 2	-29 to 316	-20 to 600
						3 and 4	-29 to 288	-20 to 550
277	S44004	S20910	S17400 H900	S44004	S31600, CF8M	1	-29 to 149	-20 to 300
						2	-29 to 121	-20 to 250
						3 and 4	-29 to 93	-20 to 200
278	S41000 NACE ⁽²⁾ heat treated	S20910	S17400, double H1150 heat treated	S31600 with CoCr-A seat	SA105, WCC F22, WC9, LCC	1, 2, 3, and 4	-29 to 316	-20 to 600
						1	-29 to 204	-20 to 400
278	S41000 NACE ⁽²⁾ heat treated	S20910	S17400, double H1150 heat treated	S31600 with CoCr-A seat	S31600, CF8M	2	-29 to 177	-20 to 350
						3 and 4	-29 to 121	-20 to 250
						1, 2, 3, and 4	-29 to 316	-20 to 600
278N NACE ⁽²⁾	S41000 NACE ⁽²⁾ heat treated	S20910	S17400, double H1150 heat treated	S31600 with CoCr-A seat	SA105, WCC F22, WC9, LCC	1, 2, 3, and 4	-29 to 316	-20 to 600
278N NACE ⁽²⁾	S41000 NACE ⁽²⁾ heat treated	S20910	S17400, double H1150 heat treated	S31600 with CoCr-A seat	S31600, CF8M	1	-29 to 204	-20 to 400
						2	-29 to 177	-20 to 350
						3 and 4	-29 to 121	-20 to 250
279 ⁽²⁾	R30016 (Alloy 6B)	S20910	R30016 or R30006 (Alloy 6)	R30016 or R30006	S31600, CF8M	1	-29 to 232	-20 to 450
						2	-29 to 177	-20 to 350
					SA105, WCC, F22 WC9, LCC	3 and 4	-29 to 121	-20 to 250
						1, 2, 3, and 4	-29 to 316	-20 to 600
CD3MN (Duplex SST)	1, 2, 3, and 4	-29 to 316	-20 to 600					

1. For metal trim parts only.
 2. NACE MR0175-2002. Contact your Emerson Process Management sales office for information on NACE MR0175/ISO 15156 and NACE MR0103.

Table 5. CL900 and CL1500 ≤ NPS 4, 4-Stage Metal Trim Material Combinations and Valve Body/Trim Temperature Capabilities⁽¹⁾

TRIM DESIGNATION	VALVE PLUG	VALVE PLUG STEM	CAGE	SEAT RING	VALVE BODY MATERIAL	VALVE SIZE		OPERATING TEMPERATURE	
						NPS		°C	°F
277	S44004	S20910	S17400 H900	S44004	SA105, WCC, F22 WC9, LCC	1, 1-1/2, and 2		-29 to 316	-20 to 600
						3		-29 to 288	-20 to 550
						4		-29 to 260	-20 to 500
277	S44004	S20910	S17400 H900	S44004	S31600, CF8M	1		-29 to 177	-20 to 350
						1-1/2		-29 to 149	-20 to 300
						2		-29 to 121	-20 to 250
278	S41000 NACE ⁽²⁾ heat treated	S20910	S17400, double H1150 heat treated	S31600 with CoCr-A seat	SA105, WCC F22, WC9, LCC	1, 1-1/2, 2, 3, and 4		-29 to 316	-20 to 600
						1		-29 to 232	-20 to 450
						1-1/2		-29 to 205	-20 to 400
278	S41000 NACE ⁽²⁾ heat treated	S20910	S17400, double H1150 heat treated	S31600 with CoCr-A seat	S31600, CF8M	2		-29 to 177	-20 to 350
						3		-29 to 121	-20 to 250
						4		-29 to 93	-20 to 200
278N NACE ⁽²⁾	S41000 NACE ⁽²⁾ heat treated	S20910	S17400, double H1150 heat treated	S31600 with CoCr-A seat	SA105, WCC F22, WC9, LCC	1, 1-1/2, 2, 3, and 4		-29 to 316	-20 to 600
278N NACE ⁽²⁾	S41000 NACE ⁽²⁾ heat treated	S20910	S17400, double H1150 heat treated	S31600 with CoCr-A seat	S31600, CF8M	1		-29 to 232	-20 to 450
						1-1/2		-29 to 205	-20 to 400
						2		-29 to 177	-20 to 350
						3		-29 to 121	-20 to 250
						4		-29 to 93	-20 to 200

1. For metal trim parts only.
2. NACE MR0175-2002. Contact your Emerson Process Management sales office for information on NACE MR0175/ISO 15156 and NACE MR0103.

Table 6. CL1500 ≥ NPS 6, 4-Stage and CL2500 6-Stage Metal Trim Material Combinations and Valve Body/Trim Temperature Capabilities⁽¹⁾

TRIM DESIGNATION	VALVE PLUG	VALVE PLUG STEM	CAGE	SEAT RING	VALVE BODY MATERIAL	VALVE SIZE		OPERATING TEMPERATURE	
						Rating	NPS	°C	°F
280	S44004	S20910	S17400 H1075	S44004	SA105	CL1500	6, 8	-29 to 316	-20 to 600
						CL2500	4, 6	-29 to 316	-20 to 600
281 ⁽²⁾	S41000 NACE ⁽²⁾ heat treated	S20910	S17400, H1150 heat treated	S31600/ CoCr-A	SA105 NACE ⁽²⁾	CL1500	6, 8	-29 to 316	-20 to 600
						CL2500	4, 6	-29 to 316	-20 to 600
282 ⁽²⁾	S31600/ CoCr-A	S20910	S20910	S31600/ CoCr-A	S31600	CL1500	6, 8	-29 to 316	-20 to 600
						CL2500	4, 6	-29 to 316	-20 to 600
283 ⁽²⁾	S34700/ CoCr-A	S20910	S20910	S33700/ CoCr-A	S34700	CL1500	6, 8	-29 to 316	-20 to 600
						CL2500	4, 6	-29 to 316	-20 to 600

1. For metal trim parts only.
2. NACE MR0175-2002. Contact your Emerson Process Management sales office for information on NACE MR0175/ISO 15156 and NACE MR0103.

NotchFlo DST Valve

Table 7. Application Guidelines for NotchFlo® DST Trim

VALVE PRESSURE RATING	TRIM TYPE	VALVE SIZE, NPS	K _C = 1		K _C = 0.8	
			bar	psid	bar	psid
CL600	3-Stage, Level C	All	<103	<1500	N/A	N/A
CL900 and CL1500	4-Stage, Level A	All	<128	<1850	128 - 160	1850 - 2325
	4-Stage, Level B		<130	<1890	130 - 163	1890 - 2360
	4-Stage, Level C		<179	<2600	179 - 224	2600 - 3250
CL1500	4-Stage, Level C	All	<179	<2600	179 - 224	2600 - 3250
CL2500	6-Stage, Level C	All	<289	<4200	289 - 362	4200 - 5250

Table 8. Typical Applications

Oil Field	Well Control (produced and waste water injection) Water Injection Pump Recirculation. Separator Letdown
Refinery	H ₂ S Contactor Letdown Charge Pump Recirculation Separator Letdown Amine Pump Recirculation Sour Water Letdown
Power Industry	Feedwater Startup Regulators Boiler Feedpump Recirculation

Valve Sizing Guidelines

Standard ISA equations, sizing procedures from Catalog 12, or Fisher® Specification Manager can be used to size NotchFlo DST control valves.

Noise calculations are best performed by using Fisher Specification Manager. The serial stage configuration of the NotchFlo DST design reduces valve trim noise significantly. Select CAV III 2-Stage as the valve type in Fisher Specification Manager to perform the noise prediction calculation.

Selection of the correct trim can be made by determining the K_C value from table 7.

Ensure that the correct K_C value for the appropriate valve size, trim type, and pressure drop are selected.

Ordering Information

When ordering, specify:

Application Information

1. Process liquid—State particle size and type of entrained impurities, if any.
2. Specific gravity of liquid
3. Temperature and vapor pressure of liquid
4. Critical pressure
5. Range of flowing inlet pressures
6. Pressure drops
 - a. Range of flowing pressure drops
 - b. Maximum at shutoff
7. Flow rates
 - a. Minimum controlled flow
 - b. Normal flow
 - c. Maximum flow
8. Required C_v
9. Line size and schedule

Valve Body Information

To determine what information is needed for ordering the valve body and trim, refer to the Specifications section. Review the description at the right of each specification or in the referenced tables, figures, and bulletins, and indicate the desired choice wherever a selection is to be made.

Table 9. Construction Materials and Temperature Capabilities for Parts Other than Valve Body and Trim

PART		MATERIAL	TEMPERATURE CAPABILITIES	
			°C	°F
Valve plug stem		S20910 S31600	--(4)	--(4)
Spring-loaded valve plug seal ⁽⁶⁾	Backup ring	S41600 (416 SST) 316A FMS 20B64 (NACE) S41000 (410 SST) S34700 (347 SST)	-29 to ⁽⁴⁾	-20 to ⁽⁴⁾
	Retaining ring	18-8 20B15 SPGT N07750 (NACE)	--(4)	--(4)
	Seal ring	PTFE/Graphite with N10276 Spring UHMWPE (ultra high molecular weight polyethylene) ⁽⁵⁾ with N10276 Spring	-73 to 316 ⁽³⁾ -73 to 93	-100 to 600 ⁽³⁾ -100 to 200
	Anti-extrusion rings	PEEK (PolyEtherEtherKetone)	--(4)	--(4)
Bonnet gasket (CL600)		Graphite/316 SST	--(4)	--(4)
Bonnet gasket (CL900, CL1500, and CL2500)		N06600/Graphite	--(4)	--(4)
Seat ring gasket		N06600/Graphite	--(4)	--(4)
Cage gasket		N06600/Graphite	--(4)	--(4)
Valve Body-to-bonnet bolting ⁽¹⁾ See table 10 for NACE bolting materials and temperature limits.	Studs Nuts	Steel SA193-B7 (all valve body materials) Steel SA194-2H (all valve body materials)	-29 to ⁽⁴⁾ (WCC, WC9, SA105, F22) -48 to ⁽⁴⁾ (LCC, CF8M, S31600, and S34700)	-20 to ⁽⁴⁾ (WCC, WC9, SA105, F22) -55 to ⁽⁴⁾ (LCC, CF8M, S31600, and S34700)
	Studs Nuts	Steel SA193-B7M for sour service Steel SA194-2HM for sour service	-29 to ⁽⁴⁾ (WCC and SA105) -46 to ⁽⁴⁾ (LCC)	-20 to ⁽⁴⁾ (WCC and SA105) -50 to ⁽⁴⁾ (LCC)
	Studs Nuts	S31600 stainless steel SA193-B8M (strain hardened) (CF8M and S31600 valve body mat'ls) S31600 stainless steel SA194-8M (CF8M and S31600 valve body mat'ls)	(CF8M and S31600)--(4)	(CF8M and S31600)--(4)
	Studs Nuts	S20910 SST (SA479-XM-19) ⁽²⁾ (CF8M and S31600 valve body mat'ls) Steel SA194-7	(CF8M and S31600)--(4)	(CF8M and S31600)--(4)
Packing	PTFE V-ring		-40 to 232	-40 to 450
	Graphite ribbon filament (oxidizing service to 700°F)		--(4)	--(4)
	Graphite ULF (non-environmental service)		--(4)	--(4)
Packing follower, spring, or lantern ring		S31600 stainless steel	--(4)	--(4)
Packing box ring		S31600 stainless steel	--(4)	--(4)
Packing flange, studs, or nuts		S31600 stainless steel	--(4)	--(4)

1. Valve body materials with which these bolting materials may be used are shown in parentheses.
2. This stud material is not listed in ASME B16.34.
3. With PEEK anti-extrusion rings in non-oxidizing service. Maximum operating temperature limited to 260°C (500°F) in oxidizing service.
4. These materials are not limiting factors.
5. Standard
6. Not required for NPS 1 or 1-1/2 CL900 and CL1500 4-stage valves.

Table 10. CL600 3-Stage Bolting Materials and Temperature Limits for Bolting Compliance with NACE MR0175-2002, NACE MR0175/ISO 15156, and NACE MR0103

VALVE BODY MATERIAL		BOLTING MATERIAL	TEMPERATURE CAPABILITIES	
			°C	°F
Non-exposed bolting (Standard)				
WCC, CF8M (316 SST), and CD3MN (Duplex SST)	Studs	Steel SA-193-B7	-48 ⁽²⁾ to 427 (WCC and CF8M) -29 to 316 (CD3MN [Duplex SST])	-55 ⁽²⁾ to 800 (WCC and CF8M) -20 to 600 (CD3MN [Duplex SST])
	Nuts	Steel SA-194-2H		
Exposed bolting (Optional) May require derating of valve ⁽¹⁾ when these body-to-bonnet bolting materials are used				
WCC, CF8M (316 SST), and CD3MN (Duplex SST)	Studs	Steel SA-193-B7M	-48 ⁽²⁾ to 427 (WCC and CF8M) -29 to 316 (CD3MN [Duplex SST])	-55 ⁽²⁾ to 800 (WCC and CF8M) -20 to 600 (CD3MN [Duplex SST])
	Nuts	Steel SA-194-2HM		
1. Derating may be required for valves rated at CL600. Contact your Emerson Process Management sales office for assistance in determining the derating of valves when these body-to-bonnet bolting materials are used. Derating is not required for CL900 and CL1500 valves. 2. -29° C (-20° F) with WCC valve body material.				

Table 11. Approximate Weights (Valve and Bonnet Assemblies)

VALVE DESIGN	VALVE SIZE, NPS	PRESSURE RATING	KILOGRAMS		POUNDS	
			Flanged	Socket Weld ⁽¹⁾ , Butt Weld ⁽³⁾ , Screwed ⁽²⁾	Flanged	Socket Weld ⁽¹⁾ , Butt Weld ⁽³⁾ , Screwed ⁽²⁾
3-Stage Globe Valves	1	CL600	19	15	42	34
	2	CL600	40	31	88	68
	3	CL600	72	51	158	112
	4	CL600	120	80	264	176
4-Stage Globe Valves	2	CL900 and CL1500	93	83	204	184
	3	CL900	177	---	391	---
		CL1500	185	140	408	308
	4	CL900	327	---	722	---
CL1500		338	282	745	622	
4-Stage Angle Valves	1	CL900 and CL1500	48	41	105	91
	1-1/2	CL900 and CL1500	55	43	121	94
	2	CL900 and CL1500	93	97	206	214
	3	CL900 and CL1500	174	---	384	---
	4	CL900 and CL1500	285	---	628	---
	6	CL1500	562	---	1240	---
	8	CL1500	1260	---	2770	---
6-Stage Angle Valves	4	CL2500	467	---	1030	---
	6	CL2500	1060	---	2340	---
1. SWE available on NPS 1, 1-1/2, and 2 only. 2. Screwed end available on NPS 1 and 2 CL600 only. 3. BWE available on globe valves only.						

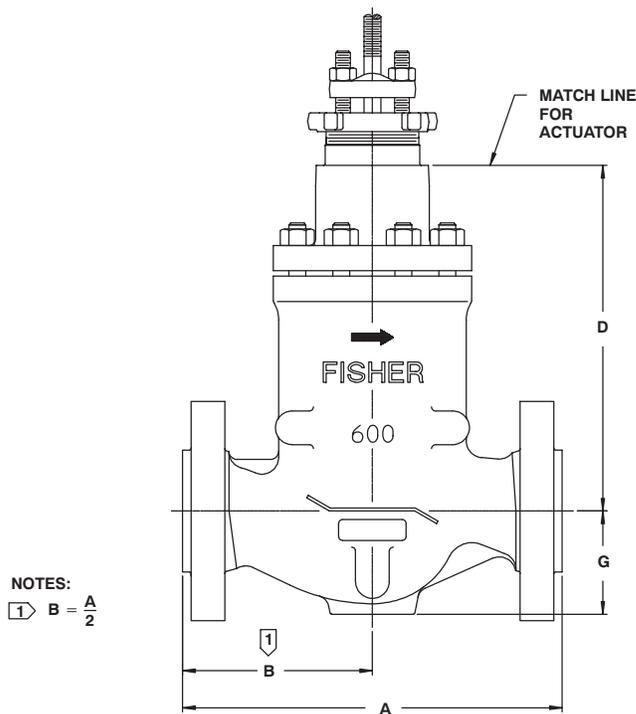


Figure 4. Typical CL600 3-Stage NotchFlo® DST Valve Dimensions (also see tables 12 and 13)

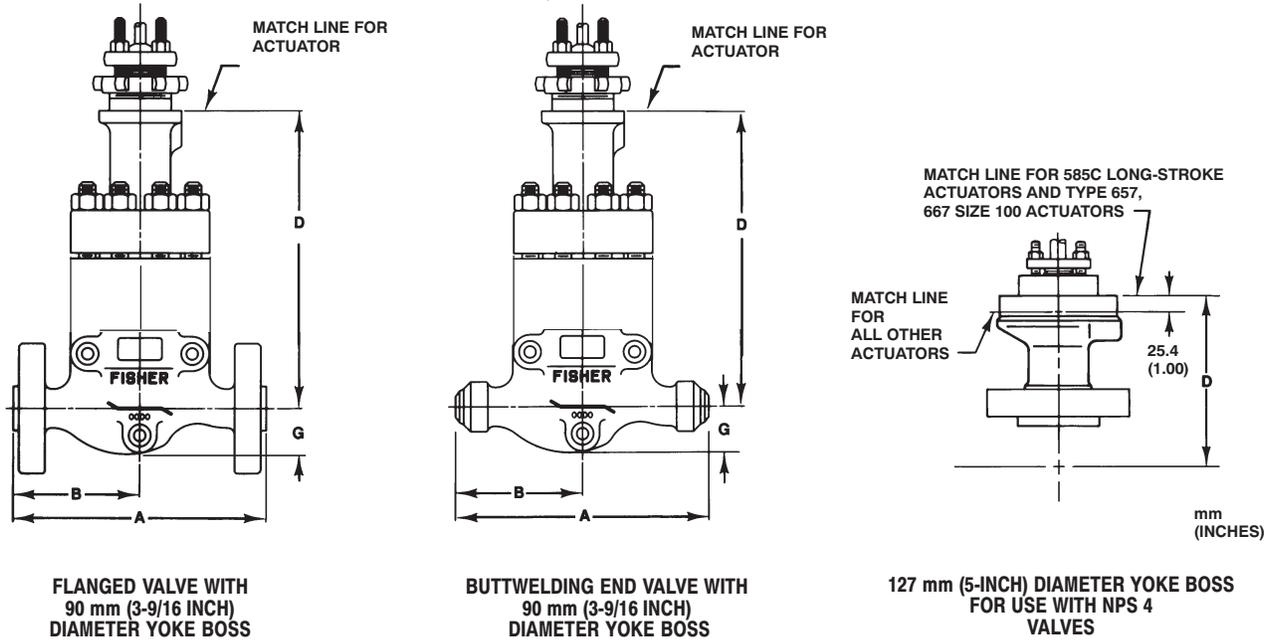
Table 12. CL600 3-Stage Globe Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A ⁽¹⁾			
	CL600			
	Scrd or SWE	BWE	RF	RTJ
	mm			
1	209.6	209.6	209.6	209.6
2	285.8	285.8	285.8	289.1
3	NA	336.6	336.6	339.9
4	NA	393.7	393.7	396.7
Inches				
1	8.25	8.25	8.25	8.25
2	11.25	11.25	11.25	11.38
3	NA	13.25	13.25	13.38
4	NA	15.50	15.50	15.62

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

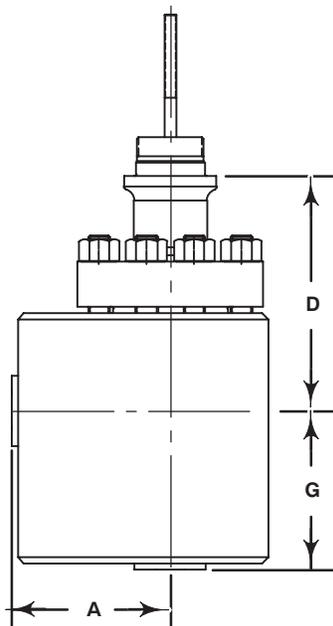
Table 13. CL600 3-Stage Globe Valve Dimensions

VALVE SIZE, NPS	YOKE BOSS DIAMETER	D	G
		Plain Bonnet	
		mm	
1	71	220.7	60.5
	71	260.4	77.7
2	90	257.3	77.7
	90	318.5	96.8
3	90	329.4	128.5
	127	375.4	128.5
Inches			
1	2-13/16	8.69	2.38
2	2-13/16	10.25	3.06
	3-9/16	10.13	3.06
3	3-9/16	12.54	3.81
4	3-9/16	12.97	5.06
	5	14.78	5.06



E0856-1

Figure 5. Typical CL900 and CL1500 ≤ NPS 4, 4-Stage NotchFlo® DST Globe Valve Dimensions (also see tables 14 and 15)



E0892

Figure 6. Typical CL900 and CL1500 ≤ NPS 4, 4-Stage NotchFlo® DST Angle Valve Dimensions (also see tables 16 and 17)

Table 14. CL900 and CL1500 ≤ NPS 4, 4-Stage Globe Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A ⁽¹⁾					
	CL900		CL1500			
	RF	RTJ	BWE	SWE	RF	RTJ
	mm					
2	375	378	375	375	375	378
3	442	445	460	---	460	464
4	511	514	530	---	530	533
	Inches					
2	14.75	14.88	14.75	14.75	14.75	14.88
3	17.38	17.50	18.12	---	18.12	18.25
4	20.12	20.25	20.88	---	20.88	21.00
VALVE SIZE, NPS	B					
	CL900		CL1500			
	RF	RTJ	BWE	SWE	RF	RTJ
	mm					
2	187	189	187	187	187	189
3	221	222	230	---	230	232
4	229	230	238	---	238	240
	Inches					
2	7.38	7.44	7.38	7.38	7.38	7.44
3	8.69	8.75	9.06	---	9.06	9.12
4	9.00	9.06	9.38	---	9.38	9.44
1. RF: raised-face flanges, RTJ: ring-type-joint flanges, BWE: buttwelding ends, SWE: socketweild ends						

Table 15. CL900 and CL1500 ≤ NPS 4, 4-Stage Globe Valve Dimensions

VALVE SIZE, NPS	D		G
	Plain Bonnet		
	90 mm (3-9/16 Inch) Yoke Boss	127 mm (5-Inch) Yoke Boss	
	mm		
2	333	---	77
3	412	---	121
4	427	495	175
	Inches		
2	13.12	---	3.06
3	16.24	---	4.75
4	16.79	19.48	6.88

Table 16. CL900 and CL1500 ≤ NPS 4, 4-Stage Angle Valve Dimensions with Plain Bonnet

VALVE SIZE, NPS	A ⁽¹⁾		
	CL900 - CL1500		
	RF	RTJ	SWE
	mm		
1	115	115	74
1-1/2	140	140	74
2	99	100	102
3	120	122	---
4	140	142	---
Inches			
1	4.50	4.50	2.88
1-1/2	5.50	5.50	2.88
2	3.88	3.94	4.00
3	4.75	4.81	---
4	5.50	5.56	---

1. RF: raised-face flanges, RTJ: ring-type-joint flanges, SWE: socketweld ends

Table 17. CL900 and CL1500 ≤ NPS 4, 4-Stage Angle Valve Dimensions

VALVE SIZE, NPS	YOKE BOSS DIAMETER	D		G
		Plain Bonnet		
	mm			
1	71	260		70 (FLG) or 64 (SWE)
1-1/2	71	274		83 (FLG) or 70 (SWE)
2	90	251		153
3	90	294		197
4	90	319		223
	127	387		223
Inches				
1	2-13/16	10.25		2.75 (FLG) or 2.50 (SWE)
1-1/2	2-13/16	10.75		3.25 (FLG) or 2.75 (SWE)
2	3-9/16	9.87		6.00
3	3-9/16	11.56		7.75
4	3-9/16	12.54		8.75
	5	15.23		8.75

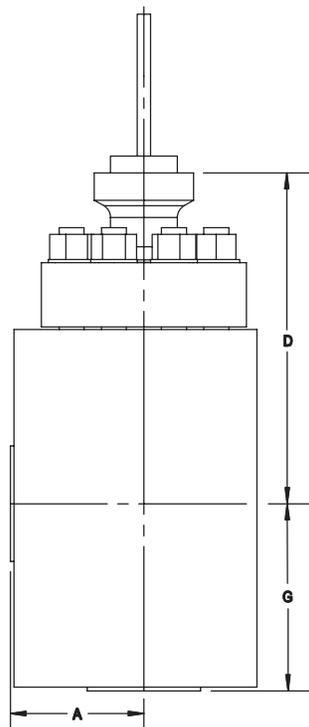


Figure 7. Typical CL1500 ≥ NPS 6, 4-Stage or CL2500 6-Stage NotchFlo® DST Angle Valve Dimensions (also see table 18)

Table 18. CL1500 ≥ NPS 6, 4-Stage and CL2500 6-Stage Angle Valve Dimensions with Plain Bonnet

PRESSURE RATING	VALVE SIZE, NPS	A ⁽¹⁾		D	G ⁽¹⁾	
		RF	RTJ	Plain Bonnet	RF	RTJ
mm						
CL1500	6	184.2	186.7	497.2	287.0	290
	8	260.0	262.5	613.2	400.0	403
CL2500	4	190.0	192.5	529.2	250.0	253
	6	254.0	256.5	620.8	350.0	353
Inches						
CL1500	6	7.25	7.35	19.57	11.30	11.40
	8	10.24	10.33	24.14	15.75	15.85
CL2500	4	7.48	7.58	20.83	9.84	9.94
	6	10.00	10.10	24.44	13.78	13.88

1. RF: Raised-face flanges, RTJ: Ring-type-joint flanges

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Table 19. CL600 3-Stage Port Diameter, Travel, Stem, Yoke Boss Diameter, and Unbalance Area

VALVE SIZE, NPS	PORT DIAMETER	TRAVEL	STEM DIAMETER	YOKE BOSS DIAMETER	UNBALANCE AREA
					cm ²
mm					
1	25.4	9.5	12.7	71	0.1 ⁽²⁾
2	38.1	9.5	12.7	71	0.3 ⁽²⁾
			19.1 ⁽¹⁾	90 ⁽¹⁾	
3	55.6	15.9	19.1	90	0.5 ⁽²⁾
4	73.2	19.1	19.1	90	0.4 ⁽²⁾
			25.4 ⁽¹⁾	127 ⁽¹⁾	
Inch					
1	1.0	0.375	1/2	2-13/16	0.02 ⁽²⁾
2	1.5	0.375	1/2	2-13/16	0.05 ⁽²⁾
			3/4 ⁽¹⁾	3-9/16 ⁽¹⁾	
3	2.19	0.625	3/4	3-9/16	0.07 ⁽²⁾
4	2.88	0.75	3/4	3-9/16	0.06 ⁽²⁾
			1 ⁽¹⁾	5 ⁽¹⁾	

1. Optional.
2. Balanced trim, PTTC (pressure tends to close).

Table 20. CL900 and CL1500 ≤ NPS 4, 4-Stage Port Diameter, Travel, Stem, Yoke Boss Diameter, and Unbalance Area

VALVE SIZE, NPS	PORT DIAMETER	TRAVEL	STEM DIAMETER	YOKE BOSS DIAMETER	UNBALANCE AREA
					cm ²
mm					
1	17.8	6.4	12.7	71	2.5 ⁽¹⁾
1-1/2	25.4	6.4	12.7	71	5.1 ⁽¹⁾
2	38.1	9.5	19.1	90	0.3 ⁽²⁾
3	55.6	15.9	19.1	90	0.5 ⁽²⁾
4	73.2	19.1	19.1	90	0.4 ⁽²⁾
			25.4 (optional)	127 (optional)	
Inch					
1	0.7	0.25	1/2	2-13/16	0.39 ⁽¹⁾
1-1/2	1.0	0.25	1/2	2-13/16	0.79 ⁽¹⁾
2	1.5	0.375	3/4	3-9/16	0.05 ⁽²⁾
3	2.19	0.625	3/4	3-9/16	0.07 ⁽²⁾
4	2.88	0.75	3/4	3-9/16	0.06 ⁽²⁾
			1 (optional)	5 (optional)	

1. Unbalanced trim, PTTO (pressure tends to open).
2. Balanced trim, PTTC (pressure tends to close).

Table 21. CL1500 ≥ NPS 6, 4-Stage and CL2500 6-Stage Port Diameter, Travel, Stem, Yoke Boss Diameter, and Unbalance Area

VALVE SIZE, NPS	PORT DIAMETER	TRAVEL	STEM DIAMETER	YOKE BOSS DIAMETER	UNBALANCE AREA
					cm ²
mm					
4	73.0	19.1	25.4	127	0.4 ⁽¹⁾
6	111.1	25.4	25.4	127	0.6 ⁽¹⁾
8	136.5	31.8	31.8	127	0.7 ⁽¹⁾
Inch					
4	2.88	0.75	1.00	5.00	0.06 ⁽¹⁾
6	4.38	1.00	1.00	5.00	0.09 ⁽¹⁾
8	5.38	1.25	1.25	5.00	0.10 ⁽¹⁾

1. Balanced trim, PTTC (pressure tends to close).

Coefficients

Table 22. CL600 -- 3-Stage, Linear

CL600 -- 3-Stage, Level C																	Linear Characteristic	
Valve Size, NPS	Port Diameter		Maximum Travel		Level	Flow Coefficient	Valve Opening—Percent of Total Travel											F _L ⁽¹⁾
	mm	Inch	mm	Inch			Min	10	20	30	40	50	60	70	80	90	100	
1 Balanced	25.4	1.0	9.5	0.375	C	C _v	0.100	(2)	0.226	0.615	1.28	2.13	3.02	3.80	4.34	4.58	4.58	0.99
2 Balanced	38.1	1.5	9.5	0.375	C	C _v	0.150	(2)	0.545	1.45	2.64	3.85	5.17	6.50	7.75	8.75	9.30	0.99
3 Balanced	55.6	2.19	15.9	0.625	C	C _v	0.250	(2)	1.17	3.12	5.68	8.28	11.1	14.0	16.7	18.8	20.0	0.99
4 Balanced	73.2	2.88	19.1	0.75	C	C _v	0.430	(2)	1.99	5.30	9.65	14.1	18.9	23.8	28.3	32.0	34.0	0.99

1. At 100% travel.
2. Clearance flow only.

Table 23. CL900 and CL1500 ≤ NPS 4, 4-Stage, Linear

CL900 and CL1500 ≤ NPS 4, 4-Stage, Levels A, B, and C																	Linear Characteristic	
Valve Size, NPS	Port Diameter		Maximum Travel		Level	Flow Coefficient	Valve Opening—Percent of Total Travel											F _L ⁽¹⁾
	mm	Inch	mm	Inch			Min	10	20	30	40	50	60	70	80	90	100	
1 Unbalanced	17.8	0.7	6.4	0.25	A	C _v	0.040	(2)	0.030	0.150	0.270	0.390	0.520	0.640	0.76	0.88	1.00	0.99
					B		0.040	(2)	0.042	0.210	0.378	0.546	0.728	0.896	1.06	1.23	1.40	0.99
					C		0.040	(2)	0.051	0.255	0.459	0.663	0.884	1.09	1.29	1.50	1.70	0.99
1-1/2 Unbalanced	25.4	1.0	6.4	0.25	A	C _v	0.080	(2)	0.057	0.285	0.513	0.741	0.988	1.22	1.44	1.67	1.90	0.99
					B		0.080	(2)	0.075	0.375	0.675	0.975	1.30	1.60	1.90	2.20	2.50	0.99
					C		0.080	(2)	0.096	0.480	0.864	1.25	1.66	2.05	2.43	2.82	3.20	0.99
2 Balanced	38.1	1.5	9.5	0.375	A	C _v	0.120	(2)	0.400	0.960	1.54	2.20	2.86	3.42	3.92	4.32	4.55	0.99
					B		0.120	(2)	0.460	1.10	1.85	2.63	3.39	4.26	5.19	5.99	6.63	0.99
					C		0.120	(2)	0.570	1.53	2.62	3.85	5.00	6.16	7.29	8.19	8.85	0.99
3 Balanced	55.6	2.19	15.9	0.625	A	C _v	0.200	(2)	0.580	1.84	3.20	4.57	6.23	7.35	8.25	8.82	8.90	0.99
					B		0.200	(2)	0.620	2.00	3.78	5.45	7.30	9.32	11.5	13.4	14.6	0.99
					C		0.200	(2)	0.416	2.19	4.41	6.90	9.80	12.4	14.7	16.4	16.8	0.99
4 Balanced	73.2	2.88	19.1	0.75	A	C _v	0.350	(2)	0.462	2.31	4.16	6.01	8.01	9.86	11.7	13.6	15.4	0.99
					B		0.350	(2)	0.723	3.62	6.51	9.40	12.5	15.4	18.3	21.2	24.1	0.99
					C		0.350	(2)	0.879	4.40	7.91	11.4	15.2	18.8	22.3	25.8	29.3	0.99

1. At 100% travel.
2. Clearance flow only.

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Table 24. CL1500 ≥ NPS 6, 4-Stage and CL2500 6-Stage, Linear

CL1500 ≥ NPS 6, 4-Stage and CL2500 6-Stage, Level C																		Linear Characteristic
Valve Size, NPS/ Rating	Port Diameter		Maximum Travel		Level	Flow Coeffi- cient	Valve Opening—Percent of Total Travel											F _L ⁽¹⁾
	mm	Inch	mm	Inch			Min	10	20	30	40	50	60	70	80	90	100	
⁶ CL1500	111.1	4.38	25.4	1	C	C _v	0.5	(2)	1.8	7.7	16	25	34	42	50	56	61	0.99
⁸ CL1500	136.5	5.38	31.8	1.25	C	C _v	0.7	(2)	3.5	16	32	50	67	82	96	107	117	0.99
⁴ CL2500	73.0	2.88	19.1	0.75	C	C _v	0.3	(2)	0.7	2.8	5.6	8.8	12	15	18	21	23	0.99
⁶ CL2500	111.1	4.38	25.4	1	C	C _v	0.4	(2)	1.4	5.9	12	19	26	33	40	45	49	0.99

1. At 100% travel.
2. Clearance flow only.

Specifications

Available Valves

CL600 3-Stage: Level C only
CL900 and CL1500 ≤ NPS 4, 4-Stage: Levels A, B, and C
CL1500 ≥ NPS 6, 4-Stage and CL2500 6-Stage: Level C only

Valve Sizes and End Connection Styles

CL600 3-Stage: See table 1
CL900 and CL1500 ≤ NPS 4, 4-Stage: See table 2
CL1500 ≥ NPS 6, 4-Stage and CL2500, 6-Stage: See table 3

Shutoff Classification

Class V: $[5 \times 10^{-12} \text{m}^3/\text{sec}/\text{bar}/\text{mm}$ of port diameter (0.0005 mL/min/psid/in) of water at service pressure drop] per ANSI/FCI 70-2 and IEC 60534-4

Maximum Inlet Pressures and Temperatures⁽¹⁾

Consistent with applicable CL600, CL900, CL1500, and CL2500 pressure/temperature ratings according to ASME B16.34 unless limited by individual temperature limits shown in tables 4, 5, 6, 8, 9, or 10

Maximum Pressure Drop⁽¹⁾

See table 7

Construction Materials

Valve Body and Bonnet:
CL600, CL900, and CL1500: ■ WCC steel, ■ WC9 Cr-Mo steel, ■ CF8M SST, and ■ LCC for low temperature service
CL600 only: ■ Duplex SST ASME SA995 CD3MN, FMS 20B70
CL1500 ≥ NPS 6 and CL2500 only: ■ SA105, ■ F316, and ■ F347
Valve Plug: ■ S44004 SST (440C SST), ■ S41000 SST (NACE) (410 SST), or ■ Alloy 6 (CL600 only), ■ S31600 with CoCr-A (CL1500 ≥ NPS 6 and CL2500 only), or ■ S34700 with CoCr-A (CL1500 ≥ NPS 6 and CL2500 only)

Seat Ring: ■ S44004 SST (440C SST), ■ S31600 SST with hardface (NACE) (316 SST), or ■ Alloy 6 (CL600 only), or ■ S34700 with CoCr-A (CL1500 ≥ NPS 6 and CL2500 only)
Cage: ■ S17400 SST with H900 heat-treat condition, ■ S17400 H1150 DBL (NACE), or ■ Alloy 6 (CL600 only), ■ S17400 SST with H1075 heat-treat (CL1500 ≥ NPS 6 and CL2500 only), or ■ S20910/CR PL (CL1500 ≥ NPS 6 and CL2500 only)

Other Parts: See table 9

Temperature Capabilities⁽¹⁾

3-Stage, 4-Stage, and 6-Stage: See tables 4, 5, 6, 8, 9, and 10

Valve Body/Trim Combinations: See tables 4, 5, and 6

Bolting for Sour Applications: See table 10 (CL600 -- 3-Stage only). For all other valve pressure ratings, contact your Emerson Process Management sales office

All Other Parts: See table 9

Flow Coefficients

See tables 22, 23, and 24

Flow Characteristic

Linear

Flow Direction

Flow up

Port Diameter, Travel, Stem, Yoke Boss Diameters, Unbalance Area

See tables 19, 20, and 21

Minimum Seating Force

Use Class V seat load requirements (refer to Catalog 14)

Noise Level

Use Fisher liquid noise prediction methods available in the Fisher sizing program

(continued)

Specifications (continued)

Bonnet Style

Plain Bonnet: See figures 4, 5, 6, and 7

Packing Arrangements

Standard Material: Single PTFE V-ring

Optional Material: See table 9

Approximate Weights

See table 11

Dimensions

Globe Valve CL600, CL900, and CL1500: See tables 12, 13, 14, and 15

Angle Valve CL600: Contact your Emerson Process Management sales office

Angle Valve CL900 and CL1500 \leq NPS 4: See tables 16 and 17

Angle Valve CL1500 \geq NPS 6 and CL2500: See table 18

1. The pressure/temperature limits in this bulletin and any applicable standard or code limitation for valve should not be exceeded.

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