

21000 Series Control Valves

Complete Line of
Rugged, Top Guided,
Globe Valves with
Lo-dB[®] / Anti-Cavitation
Capabilities



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Features

21000 Series single ported unbalanced trim, heavy top guided control valves are designed with built in versatility making them well-suited to handle a wide variety of process applications. Standard features include:

Top Guided

Rugged, heavy top plug guiding provides maximum support to ensure plug stability.

Single and Double Stage Lo-dB®/Anti-cavitation Trim

Replacing the conventional plug with the Lo-dB®/Anti-cavitation design provides excellent noise attenuation or cavitation control.

Reduced Capacity and Low Flow Trim

A series of reduced area trim is available to provide wide flow range capabilities in all valve sizes. Optional trim to meet low flow requirements is also available.

High Pressure Capability

A variety of actuators are available to handle low to high pressure drop requirements. Allowable pressure drops for specific leakage classes are available in Masoneilan document PH1080, or can be calculated using the Masoneilan Valspeq® Sizing and Selection Program.

Tight Shutoff

Class IV leakage is standard. Optional constructions meet IEC 534-60534-4 and ANSI/FCI 70.2 Class V and VI.

Hardened Trim

Provided as standard to handle high pressure drop applications.

Trim Type

Standard construction offers either a quick change or threaded seat ring. This trim is unbalanced and uses no seals or pilots.

Environmental Packing

Low emission LE® Packing is available to assure compliance with latest environmental regulations.

Emissions Free

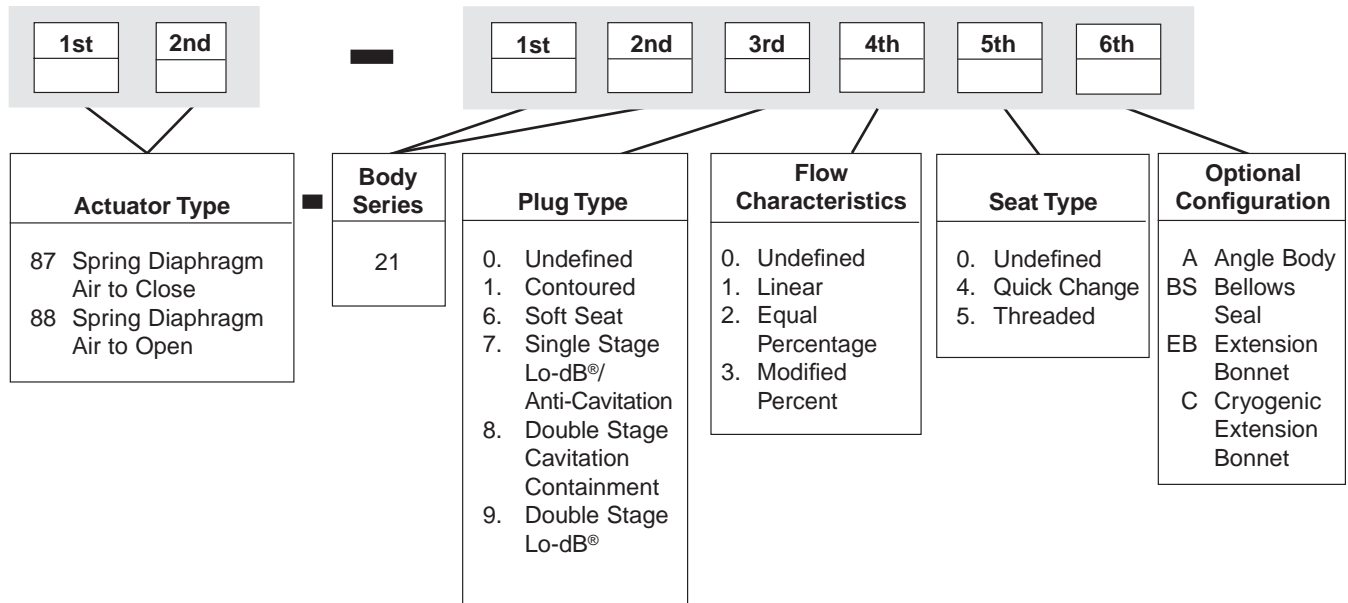
Bellows seal design option is available to meet zero emissions requirements.

NACE Compliance

The 21000 Series is available for Sour Service Applications using design and construction methods in accordance with NACE Standard MR 0103. Applications requiring compliance to MR 0175, 2003 Rev or ISO 15156 require engineering review.

Trade names noted throughout are for reference only. Masoneilan reserves the right to supply trade named material or its equivalent.

Numbering System



General Data

- Flow Direction**
 - contoured: flow-to-open/flow-to-close
 - Lo-dB®: flow-to-open
 - anti-cavitation: flow-to-close
- Body**
 - type: high capacity globe
high capacity angle
- Bonnet**
 - type: bolted standard
bolted extension
bolted cryogenic
- Body and Bonnet**
 - materials: carbon steel
316 stainless steel
chrome-molybdenum steel
others
- Trim**
 - plug type: contoured
soft seat
Lo-dB® (1 or 2 stages)
anti-cavitation (1 or 2 stages)
 - seat ring: threaded
quick change
 - guide: heavy top guided
 - capacity: full area
reduced capacity in all sizes
 - C_v ratio: 50:1
 - flow characteristic: linear
equal percentage
modified percent
- Actuator**
 - type: spring diaphragm
 - handwheel: optional

Temperature Range/Seat Leakage

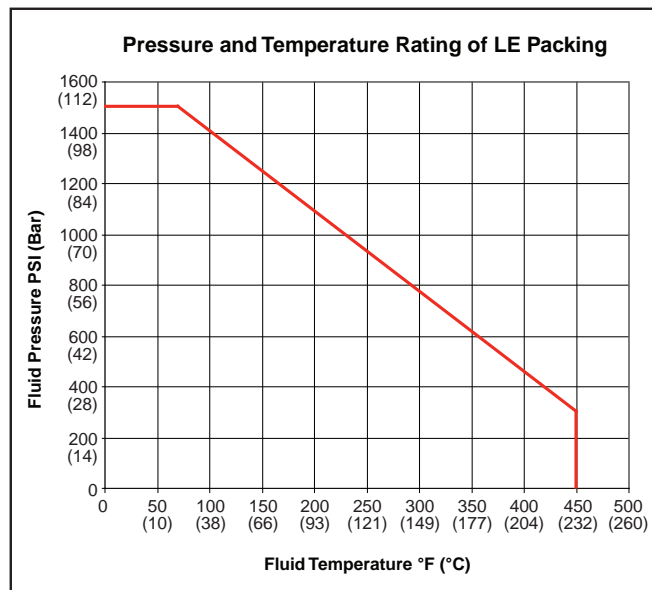
Contoured Trim

Valve Size		Body ⁽¹⁾ Rating	Seat Type ⁽⁵⁾	Packing Material	Temperature Range ⁽²⁾				Cryogenic Extension Bonnet		Seat Leakage IEC 60534-4 and ANSI/FCI 70.2 Class	
					Standard Bonnet		Extension Bonnet		min.	max.		
inch	mm				min.	max.	min.	max.			min.	max.
0.75 to 8	20 to 200	ASME Class 150 to 2500 and equivalent PN	Metal	PTFE or LE [®] Packing	-20°F (-29°C)	+450°F (+232°C)	-100°F (-73°C)	+800°F (+427°C)			IV	V
				Graphite Packing	-20°F (-29°C)	+800°F (+427°C)	-100°F (-73°C)	+800°F (+427°C)				
				V-RING					-320°F (-196°C)	+450°F (+232°C)		
			Soft Seat ⁽⁶⁾	Any	-20°F (-29°C)	+450°F (+232°C)	-100°F (-73°C)	+450°F (+232°C)				

Lo-dB[®]/Anti-Cavitation Trim (1 or 2 Stage Design)⁽³⁾

Valve ⁽⁴⁾ Size		Body ⁽¹⁾ Rating	Seat Type	Packing Material	Temperature Range ⁽²⁾				Cryogenic Extension Bonnet		Seat Leakage IEC 60534-4 and ANSI/FCI 70.2 Class	
					Standard Bonnet		Extension Bonnet		min.	max.		
inch	mm				min.	max.	min.	max.			min.	max.
0.75 to 8	20 to 200	ASME Class 150 to 2500 and equivalent PN	Metal	PTFE or LE [®] Packing ⁽⁵⁾	-20°F (-29°C)	+450°F (+232°C)	-100°F (-73°C)	+800°F (+427°C)			IV	V
				Graphite Packing	-20°F (-29°C)	+800°F (+427°C)	-100°F (-73°C)	+800°F (+427°C)				
				V-RING					-320°F (-196°C)	+450°F (+232°C)		

- ANSI Class 900-1500 available only in 0.75 to 4 inch (20 to 100 mm) sizes.
ANSI Class 2500 available only in 0.75 to 2 inch (20 to 50 mm) sizes.
- See Materials of Construction Tables for other temperature limitations.
- 2-Stage design only available with Quick Change seat rings.
- 2-Stage Anti-Cavitation Trim not available in 6 inch (150 mm) and 8 inch (200 mm) size.
- LE Packing for low emissions applications is limited to maximum pressure and temperature as shown in the chart below.
- Soft seat is limited to a maximum of 1000 psi (70 bar) pressure drop and a maximum of 450°F (232°C).



Ratings/Connections ⁽¹⁾

Valve Size		ANSI Class 150 (PN 20)					ANSI Class 300 (PN 50)					ANSI Class 600 (PN 100)				
Inch	mm	RF	SW	THD	RTJ	BW	RF	SW	THD	RTJ	BW	RF	SW	THD	RTJ	BW
0.75	20	X	X	X			X	X	X	X		X	X	X	X	
1	25	X	X	X			X	X	X	X		X	X	X	X	
1.5	40	X	X	X			X	X	X	X		X	X	X	X	
2	50	X	X	X		X	X	X	X	X	X	X	X	X	X	X
3	80	X				X	X			X	X	X			X	X
4	100	X				X	X			X	X	X			X	X
6	150	X				X	X			X	X	X			X	X
8	200	X				X	X			X	X	X			X	X

Valve Size		ANSI Class 900 (PN 150)					ANSI Class 1500 (PN 250)					ANSI Class 2500 (PN 420)				
Inch	mm	RF	SW	THD	RTJ	BW	RF	SW	THD	RTJ	BW	RF	SW	THD	RTJ	BW
0.75	20	X	X		X		X	X		X		X	X		X	
1	25	X	X		X		X	X		X		X	X		X	
1.5	40	X	X		X		X	X		X		X	X		X	
2	50	X	X		X	X	X	X		X	X	X	X		X	X
3	80	X			X	X	X			X	X					
4	100	X			X	X	X			X	X					

1. Standard flange of Ra 125-250. Other flange facings and surface finishes available.

C_V and F_L versus Travel

Contoured Trim

Direction: **FLOW-TO-OPEN (FTO)**
Flow Characteristic: **LINEAR**

Percent of Travel							10	20	30	40	50	60	70	80	90	100		
F _L							0.93	0.93	0.92	0.92	0.91	0.91	0.91	0.9	0.9	0.9	0.9	
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V											
			inch	mm	inch	mm												
inch	mm																	
Close Clearance 0.75 & 1	Close Clearance 20 & 25	150-1500	0.125	3.2	0.8	20.3	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.1		
			0.25	6.4	0.8	20.3	0.02	0.04	0.06	0.07	0.09	0.11	0.13	0.15	0.18	0.2		
			0.25	6.4	0.8	20.3	0.03	0.06	0.08	0.11	0.13	0.16	0.19	0.23	0.27	0.3		
			0.25	6.4	0.8	20.3	0.04	0.08	0.11	0.14	0.18	0.22	0.26	0.3	0.36	0.4		
			0.25	6.4	0.8	20.3	0.06	0.12	0.17	0.22	0.27	0.32	0.38	0.45	0.54	0.6		
			0.25	6.4	0.8	20.3	0.08	0.16	0.22	0.29	0.36	0.43	0.51	0.6	0.72	0.8		
0.75	20	150-1500	0.25	6.4	0.8	20.3	0.15	0.31	0.46	0.61	0.77	0.94	1.12	1.31	1.5	1.7		
			0.375	9.5	0.8	20.3	0.34	0.68	1.02	1.36	1.72	2.11	2.51	2.93	3.36	3.8		
			0.5	12.7	0.8	20.3	0.54	1.07	1.6	2.15	2.72	3.33	3.96	4.62	5.3	6		
			0.812	20.6	0.8	20.3	1.09	2.15	3.21	4.3	5.45	6.65	7.92	9.24	10.6	12		
1	25	150-1500	0.25	6.4	0.8	20.3	0.15	0.31	0.46	0.61	0.77	0.94	1.12	1.31	1.5	1.7		
			0.375	9.5	0.8	20.3	0.34	0.68	1.02	1.36	1.73	2.11	2.51	2.93	3.36	3.8		
			0.5	12.7	0.8	20.3	0.54	1.08	1.61	2.15	2.72	3.33	4	4.63	5.31	6		
			0.812	20.6	0.8	20.3	1.09	2.16	3.22	4.31	5.45	6.66	7.93	9.25	10.6	12		
1.5	40	150-1500	0.25	6.4	0.8	20.3	0.15	0.31	0.46	0.61	0.77	0.94	1.12	1.31	1.5	1.7		
			0.375	9.5	0.8	20.3	0.34	0.68	1.02	1.36	1.73	2.11	2.51	2.93	3.36	3.8		
			0.5	12.7	0.8	20.3	0.54	1.08	1.61	2.15	2.72	3.33	4	4.63	5.31	6		
			0.812	20.6	0.8	20.3	1.18	2.33	3.48	4.66	5.9	7.2	8.58	10	11.5	13		
			0.994	25.2	0.8	20.3	2.11	4.18	6.06	7.91	9.89	11.67	13.65	15.39	16.65	18		
			1.25	31.8	0.8	20.3	2.27	4.49	6.7	8.97	11.3	13.9	16.5	19.3	22.1	25		
2	50	150-1500	0.25	6.4	0.8	20.3	0.15	0.31	0.46	0.61	0.77	0.94	1.12	1.31	1.5	1.7		
			0.375	9.5	0.8	20.3	0.34	0.68	1.02	1.36	1.73	2.11	2.51	2.93	3.36	3.8		
			0.5	12.7	0.8	20.3	0.54	1.08	1.61	2.15	2.72	3.33	4	4.63	5.31	6		
			0.812	20.6	0.8	20.3	1.36	2.7	4.02	5.38	6.81	8.32	9.91	11.6	13.3	15		
			0.994	25.2	0.8	20.3	2.22	4.41	6.4	8.35	10.44	12.32	14.4	16.25	17.58	19		
			1.25	31.8	0.8	20.3	2.36	4.67	6.97	9.33	11.8	14.4	17.2	20.1	23	26		
3	63	150-1500	0.994	25.2	0.8	20.3	2.34	4.65	6.74	8.79	11	12.97	15.16	17.1	18.5	20		
			1.25	31.8	1.5	38.1	2.81	5.57	8.31	11.1	14.1	17.2	20.5	23.9	27.4	31		
			1.625	41.3	1.5	38.1	4.26	8.45	12.6	16.9	21.3	26.1	31.1	36.2	41.6	47		
			2	50.8	1.5	38.1	8.43	16.7	24.26	31.65	39.57	46.68	54.58	61.57	66.6	72		
			2.625	66.7	1.5	38.1	9.97	19.8	29.5	39.5	49.9	61	72.7	84.8	97.3	110		
4	100	150-1500	0.994	25.2	1.5	38.1	2.34	4.65	6.74	8.79	11	12.97	15.16	17.1	18.5	20		
			1.625	41.3	1.5	38.1	4.44	8.81	13.1	17.6	22.3	27.2	32.4	37.8	43.3	49		
			2	50.8	1.5	38.1	8.67	17.2	24.93	32.53	40.67	47.97	56.1	63.28	68.45	74		
			2.625	66.7	1.5	38.1	10.3	20.3	30.3	40.6	51.3	62.7	74.7	87.1	99.9	113		
			3.5	88.9	1.5	38.1	17.7	35.1	52.3	70	88.6	108	129	150	172	195		
6	150	150-600	2	50.8	2	50.8	9.5	18.8	27.3	35.6	44.5	52.5	61.4	69.3	74.9	81		
			2.625	66.7	2	50.8	11.4	22.7	33.8	45.2	57.2	69.9	83.2	97.2	111	126		
			3.5	88.9	2	50.8	18.9	37.4	55.7	74.6	94.5	115	137	160	184	208		
			4.375	111	2	50.8	35.13	69.7	101	131.9	164.9	194.5	227.4	256.5	277.5	300		
8	200	150-600	5	127	2	50.8	36.3	71.9	107	143	182	222	264	308	354	400		
			2.625	66.7	2	63.5	12	24	36	47	60	74	88	102	117	133		
			3.5	88.9	2	63.5	20	40	60	80	101	124	148	172	197	224		
			4.375	111	2	50.8	37	74	108	141	176	207	243	274	296	320		
			6.25	158.7	2.5	63.5	57	115	173	228	289	355	422	493	563	640		

Standard Bellows Seal construction available for ANSI Class 150 - 300 (PN 20 - PN 50) and capacities of C_V = 1.7 and higher.

Quick Change Trim Only

C_V and F_L versus Travel

Contoured Trim

Direction: **FLOW-TO-OPEN (FTO)**
Flow Characteristic: **EQUAL PERCENTAGE**

Percent of Travel								10	20	30	40	50	60	70	80	90	100		
F _L								0.93	0.93	0.92	0.92	0.91	0.91	0.91	0.9	0.9	0.9	0.9	
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V												
			inch	mm	inch	mm													
inch	mm		inch	mm	inch	mm													
0.75	20	150-1500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7			
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8			
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6			
			0.812	20.6	0.8	20.3	0.43	0.6	0.86	1.22	2.32	4.3	6.8	9.13	10.7	12			
1	25	150-1500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7			
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8			
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6			
			0.812	20.6	0.8	20.3	0.4	0.6	0.86	1.22	2.32	4.3	6.8	9.13	10.7	12			
1.5	40	150-1500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7			
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8			
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6			
			0.812	20.6	0.8	20.3	0.4	0.59	0.82	1.34	2.32	3.87	6.01	8.57	11.1	13			
			0.994	25.2	0.8	20.3	0.43	0.73	1.14	1.73	2.69	4.61	6.93	10.76	14.84	18			
			1.25	31.8	0.8	20.3	0.77	1.13	1.58	2.58	4.46	7.45	11.6	16.5	21.4	25			
			1.625	41.3	0.8	20.3	1.3	1.7	2.51	3.56	6.76	12.5	19.8	26.6	31.3	35			
2	50	150-1500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7			
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8			
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6			
			0.812	20.6	0.8	20.3	0.46	0.68	0.95	1.55	2.68	4.47	6.93	9.88	12.9	15			
			0.994	25.2	0.8	20.3	0.46	0.77	1.2	1.82	2.84	4.87	7.32	11.36	15.67	19			
			1.25	31.8	0.8	20.3	0.8	1.17	1.64	2.68	4.64	7.75	12	17.1	22.3	26			
			1.625	41.3	0.8	20.3	1.7	2.3	3.29	4.69	8.88	16.5	26.1	35	41.2	46			
3	63	150-1500	0.994	25.2	0.8	20.3	0.48	0.81	1.26	1.92	2.99	5.13	7.7	11.96	16.49	20			
			1.25	31.8	1.5	38.1	0.95	1.4	1.96	3.2	5.53	9.24	14.3	20.4	26.6	31			
			1.625	41.3	1.5	38.1	1.45	2.12	2.97	4.85	8.39	14	21.7	31	40.3	47			
			2	50.8	1.5	38.1	1.73	2.93	4.55	6.91	10.76	18.45	27.72	43	59.36	72			
			2.625	66.7	1.5	38.1	4	5.5	7.88	11.2	21.2	39.4	62.3	83.7	98.5	110			
4	100	150-1500	0.994	25.2	1.5	38.1	0.74	1.14	1.76	2.07	2.99	5.13	7.7	11.96	16.49	20			
			1.625	41.3	1.5	38.1	1.51	2.21	3.09	5.06	8.74	14.6	22.7	32.3	42	49			
			2	50.8	1.5	38.1	2.73	4.22	6.51	7.66	11.1	18.97	28.49	44.24	61	74			
			2.625	66.7	1.5	38.1	3.47	5.09	7.14	11.7	20.2	33.7	52.2	74.5	96.8	113			
			3.5	88.9	1.5	38.1	7	9.7	14	19.9	37.6	69.8	110	148	175	195			
6	150	150-600	2	50.8	2	50.8	2.99	4.62	7.13	8.38	12.1	20.76	31.19	48.42	66.78	81			
			2.625	66.7	2	50.8	3.87	5.68	7.96	13	22.5	37.5	58.3	83	108	126			
			3.5	88.9	2	50.8	6.4	9.37	13.1	21.5	37.1	62	96.2	137	178	208			
			4.375	111	2	50.8	11	17.1	26.4	31	44.85	76.89	115.5	179.34	247.35	300			
			5	127	2	50.8	14.4	20	28.7	40.7	77.2	143	227	304	358	400			
8	200	150-600	2.625	66.7	2	63.5	4	6	9	14	24	43	66	91	117	133			
			3.5	88.9	2	63.5	7	10	15	24	40	72	112	154	197	224			
			4.375	111	2	63.5	8	13	20	31	48	82	123	191	264	320			
			5	127	2	63.5	13	19	28	44	74	133	207	285	365	415			
			6.25	158.7	2.5	63.5	20	30	43	68	115	205	320	440	562	640			

☐ Quick Change Trim Only

C_V and F_L versus Travel

Contoured Plug

Direction: **FLOW-TO-OPEN (FTO)**
Flow Characteristic: **MODIFIED PERCENT**

Percent of Travel								10	20	30	40	50	60	70	80	90	100		
F _L								0.53	0.53	0.55	0.63	0.72	0.8	0.8	0.8	0.8	0.8	0.8	
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V												
			inch	mm	inch	mm													
inch	mm		inch	mm	inch	mm													
0.75	20	150-1500	0.25	6.4	0.8	20.3	0.04	0.07	0.14	0.28	0.5	0.73	0.99	1.28	1.52	1.7			
			0.375	9.5	0.8	20.3	0.09	0.15	0.31	0.64	1.13	1.64	2.22	2.86	3.4	3.8			
			0.5	12.7	0.8	20.3	0.14	0.24	0.49	1	1.78	2.59	3.5	4.5	5.38	6			
			0.812	20.6	0.8	20.3	0.32	0.74	1.27	3.25	5.47	7.78	9.6	10.85	11.57	12			
1	25	150-1500	0.25	6.4	0.8	20.3	0.04	0.07	0.14	0.28	0.5	0.73	0.99	1.28	1.52	1.7			
			0.375	9.5	0.8	20.3	0.09	0.15	0.31	0.64	1.13	1.64	2.22	2.86	3.4	3.8			
			0.5	12.7	0.8	20.3	0.14	0.24	0.49	1	1.78	2.59	3.5	4.5	5.38	6			
			0.812	20.6	0.8	20.3	0.32	0.74	1.27	3.25	5.47	7.78	9.6	10.85	11.57	12			
1.5	40	150-1500	0.25	6.4	0.8	20.3	0.04	0.07	0.14	0.28	0.5	0.73	0.99	1.28	1.52	1.7			
			0.375	9.5	0.8	20.3	0.09	0.15	0.31	0.64	1.13	1.64	2.22	2.86	3.4	3.8			
			0.5	12.7	0.8	20.3	0.14	0.24	0.49	1	1.78	2.59	3.5	4.5	5.38	6			
			0.812	20.6	0.8	20.3	0.29	0.52	1.07	2.18	3.86	5.62	7.6	9.77	11.65	13			
			0.994	25.2	0.8	20.3	0.41	0.71	1.48	3.01	5.34	7.78	10.53	13.53	16.13	18			
			1.25	31.8	0.8	20.3	0.68	1.55	2.66	6.77	11.4	16.2	20	22.6	24.11	25			
2	50	150-1500	1.625	41.3	0.8	20.3	0.95	2.17	3.72	9.48	15.97	22.69	28	31.65	33.76	35			
			0.25	6.4	0.8	20.3	0.04	0.07	0.14	0.28	0.5	0.73	0.99	1.28	1.52	1.7			
			0.375	9.5	0.8	20.3	0.09	0.15	0.31	0.64	1.13	1.64	2.22	2.86	3.4	3.8			
			0.5	12.7	0.8	20.3	0.14	0.24	0.49	1	1.78	2.59	3.5	4.5	5.38	6			
			0.812	20.6	0.8	20.3	0.34	0.59	1.23	2.51	4.45	6.48	8.77	11.28	13.44	15			
			0.994	25.2	0.8	20.3	0.43	0.75	1.56	3.18	5.64	8.21	11.11	14.28	17	19			
3	63	150-1500	1.25	31.8	0.8	20.3	0.59	1.03	2.14	4.35	7.71	11.23	15.2	19.54	23.3	26			
			1.625	41.3	0.8	20.3	1.24	2.85	4.89	12.46	20.99	29.82	36.81	41.59	44.37	46			
			0.994	25.2	0.8	20.3	0.45	0.79	1.64	3.35	5.93	8.64	11.7	15	17.92	20			
			1.25	31.8	1.5	38.1	0.7	1.23	2.55	5.19	9.19	13.4	18.13	23.3	27.78	31			
			1.625	41.3	1.5	38.1	1.06	1.86	3.86	7.87	13.94	20.3	27.49	35.33	42.12	47			
4	100	150-1500	2	50.8	1.5	38.1	1.63	2.85	5.92	12.05	21.36	31.11	42.11	54.12	64.53	72			
			2.625	66.7	1.5	38.1	2.97	6.82	11.68	29.79	50.18	71.3	88	99.46	106.1	110			
			0.994	25.2	1.5	38.1	0.45	0.79	1.64	3.35	5.93	8.64	11.7	15	17.92	20			
			1.625	41.3	1.5	38.1	1.11	1.94	4.03	8.2	14.53	21.17	28.66	36.83	43.91	49			
			2	50.8	1.5	38.1	1.67	2.93	6.08	12.39	21.95	31.98	43.28	55.63	66.32	74			
6	150	150-600	2.625	66.7	1.5	38.1	2.56	4.48	9.29	18.92	33.52	48.83	66.09	84.94	101.27	113			
			3.5	88.9	1.5	38.1	5.27	12.1	20.7	52.8	88.96	126.4	156.04	176.32	188.08	195			
			2	50.8	2	50.8	1.83	3.21	6.66	13.56	24.02	35	47.38	60.89	72.6	81			
			2.625	66.7	2	50.8	2.85	4.99	10.36	21.1	37.37	54.44	73.7	94.7	112.92	126			
			3.5	88.9	2	50.8	4.71	8.25	17.1	34.82	61.69	89.88	121.66	156.35	186.41	208			
6	150	150-600	4.375	111	2	50.8	6.79	11.89	24.66	50.22	88.98	129.63	175.47	225.51	268.86	300			
			5	127	2	50.8	10.8	24.8	42.48	108.32	182.48	259.28	320.08	361.68	385.8	400			

□ Quick Change Trim Only

C_V and F_L versus Travel

Contoured Plug

Direction: **FLOW-TO-CLOSE (FTC)**
Flow Characteristic: **LINEAR TRIM**

Percent of Travel							10	20	30	40	50	60	70	80	90	100
F _L							0.53	0.56	0.6	0.68	0.75	0.78	0.81	0.84	0.85	0.86
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V									
			inch	mm	inch	mm										
inch	mm		inch	mm	inch	mm										
0.75	20	150-1500	0.25	6.4	0.8	20.3	0.225	0.39	0.46	0.61	0.77	0.94	1.12	1.31	1.5	1.7
			0.375	9.5	0.8	20.3	0.51	0.85	1.02	1.36	1.72	2.11	2.51	2.93	3.36	3.8
			0.5	12.7	0.8	20.3	0.81	1.34	1.6	2.15	2.72	3.33	3.96	4.62	5.3	6
			0.812	20.6	0.8	20.3	1.635	2.69	3.21	4.3	5.45	6.65	7.92	9.24	10.6	12
1	25	150-1500	0.25	6.4	0.8	20.3	0.225	0.39	0.46	0.61	0.77	0.94	1.12	1.31	1.5	1.7
			0.375	9.5	0.8	20.3	0.51	0.85	1.02	1.36	1.73	2.11	2.51	2.93	3.36	3.8
			0.5	12.7	0.8	20.3	0.81	1.35	1.61	2.15	2.72	3.33	4	4.63	5.31	6
			0.812	20.6	0.8	20.3	1.635	2.7	3.22	4.31	5.45	6.66	7.93	9.25	10.6	12
1.5	40	150-1500	0.25	6.4	0.8	20.3	0.225	0.39	0.46	0.61	0.77	0.94	1.12	1.31	1.5	1.7
			0.375	9.5	0.8	20.3	0.51	0.85	1.02	1.36	1.73	2.11	2.51	2.93	3.36	3.8
			0.5	12.7	0.8	20.3	0.81	1.35	1.61	2.15	2.72	3.33	4	4.63	5.31	6
			0.812	20.6	0.8	20.3	1.77	2.91	3.48	4.66	5.9	7.2	8.58	10	11.5	13
			0.994	25.2	0.8	20.3	3.15	5.22	6.1	7.91	9.89	11.67	13.65	15.39	16.65	18
			1.25	31.8	0.8	20.3	3.4	5.61	6.7	8.97	11.3	13.9	16.5	19.3	22.1	25
2	50	150-1500	1.625	41.3	0.8	20.3	4.76	7.86	9.38	12.6	15.9	19.4	23.1	27	31	35
			0.25	6.4	0.8	20.3	0.225	0.39	0.46	0.61	0.77	0.94	1.12	1.31	1.5	1.7
			0.375	9.5	0.8	20.3	0.51	0.85	1.02	1.36	1.73	2.11	2.51	2.93	3.36	3.8
			0.5	12.7	0.8	20.3	0.81	1.35	1.61	2.15	2.72	3.33	4	4.63	5.31	6
			0.812	20.6	0.8	20.3	2.04	3.38	4.02	5.38	6.81	8.32	9.91	11.6	13.3	15
			0.994	25.2	0.8	20.3	3.33	5.51	6.4	8.35	10.44	12.3	14.4	16.25	17.58	19
3	63	150-1500	1.25	31.8	0.8	20.3	3.54	5.84	6.97	9.33	11.8	14.4	17.2	20.1	23	26
			1.625	41.3	0.8	20.3	6.26	10.34	12.3	16.5	20.9	25.5	30.4	35.5	40.7	46
			0.994	25.2	0.8	20.3	3.5	5.8	6.74	8.79	11	12.97	15.2	17.1	18.5	20
			1.25	31.8	1.5	38.1	4.22	6.96	8.31	11.1	14.1	17.2	20.5	23.9	27.4	31
			1.625	41.3	1.5	38.1	6.39	10.56	12.6	16.9	21.3	26.1	31.1	36.2	41.6	47
4	100	150-1500	2	50.8	1.5	38.1	12.6	20.9	24.26	31.65	39.57	46.68	54.58	61.57	66.6	72
			2.625	66.7	1.5	38.1	14.96	24.75	29.5	39.5	49.9	61	72.7	84.8	97.3	110
			0.994	25.2	1.5	38.1	3.5	5.8	6.74	8.79	11	12.97	15.2	17.1	18.5	20
			1.625	41.3	1.5	38.1	6.66	11.01	13.1	17.6	22.3	27.2	32.4	37.8	43.3	49
			2	50.8	1.5	38.1	12.95	21.46	24.93	32.53	40.67	47.97	56.1	63.28	68.45	74
6	150	150-600	2.625	66.7	1.5	38.1	15.45	25.38	30.3	40.6	51.3	62.7	74.7	87.1	99.9	113
			3.5	88.9	1.5	38.1	26.55	43.88	52.3	70	88.6	108	129	150	172	195
			2	50.8	2	50.8	14.18	23.49	27.29	35.6	44.5	52.5	61.4	69.2	74.9	81
			2.625	66.7	2	50.8	17.1	28.38	33.8	45.2	57.2	69.9	83.2	97.2	111	126
			3.5	88.9	2	50.8	28.35	46.75	55.7	74.6	94.5	115	137	160	184	208
8	200	150-600	4.375	111	2	50.8	52.5	87	101	131.9	164.9	194.5	227.4	256.5	277.5	300
			5	127	2	50.8	54.45	89.88	107	143	182	222	264	308	354	400
			2.625	66.7	2	63.5	18	30	36	47	60	74	88	102	117	133
			3.5	88.9	2	63.5	30	50	60	80	101	124	148	172	197	224
			4.375	111	2	63.5	54.5	92.8	108	141	176	207	243	274	296	320
			5	127	2	63.5	55.5	93.75	112	148	187	230	274	319	365	415
			6.25	158.7	2.5	63.5	85.5	143.7	173	228	289	355	422	493	563	640

☐ Quick Change Trim Only

C_V and F_L versus Travel

Contoured Plug

Direction: **FLOW-TO-CLOSE (FTC)**
Flow Characteristic: **EQUAL PERCENT**

Percent of Travel								10	20	30	40	50	60	70	80	90	100		
F _L								0.53	0.53	0.55	0.63	0.72	0.8	0.8	0.8	0.8	0.8	0.8	
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V												
			inch	mm	inch	mm													
inch	mm		inch	mm	inch	mm													
0.75	20	150-1500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7			
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8			
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6			
			0.812	20.6	0.8	20.3	0.43	0.6	0.86	1.22	2.32	4.3	6.8	9.13	10.7	12			
1	25	150-1500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7			
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8			
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6			
			0.812	20.6	0.8	20.3	0.4	0.6	0.86	1.22	2.32	4.3	6.8	9.13	10.7	12			
1.5	40	150-1500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7			
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8			
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6			
			0.812	20.6	0.8	20.3	0.4	0.59	0.82	1.34	2.32	3.87	6.01	8.57	11.1	13			
			0.994	25.2	0.8	20.3	0.43	0.73	1.14	1.73	2.69	4.61	6.93	10.76	14.84	18			
			1.25	31.8	0.8	20.3	0.77	1.13	1.58	2.58	4.46	7.45	11.6	16.5	21.4	25			
			1.625	41.3	0.8	20.3	1.3	1.7	2.51	3.56	6.76	12.5	19.8	26.6	31.3	35			
2	50	150-1500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7			
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8			
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6			
			0.812	20.6	0.8	20.3	0.46	0.68	0.95	1.55	2.68	4.47	6.93	9.88	12.9	15			
			0.994	25.2	0.8	20.3	0.46	0.77	1.2	1.82	2.84	4.87	7.32	11.36	15.67	19			
			1.25	31.8	0.8	20.3	0.8	1.17	1.64	2.68	4.64	7.75	12	17.1	22.3	26			
			1.625	41.3	0.8	20.3	1.7	2.3	3.29	4.69	8.88	16.5	26.1	35	41.2	46			
3	63	150-1500	0.994	25.2	0.8	20.3	0.48	0.81	1.26	1.92	2.99	5.13	7.7	11.96	16.49	20			
			1.25	31.8	1.5	38.1	0.95	1.4	1.96	3.2	5.53	9.24	14.3	20.4	26.6	31			
			1.625	41.3	1.5	38.1	1.45	2.12	2.97	4.85	8.39	14	21.7	31	40.3	47			
			2	50.8	1.5	38.1	1.73	2.93	4.55	6.91	10.76	18.45	27.72	43	59.36	72			
			2.625	66.7	1.5	38.1	4	5.5	7.88	11.2	21.2	39.4	62.3	83.7	98.5	110			
4	100	150-1500	0.994	25.2	1.5	38.1	0.74	1.14	1.76	2.07	2.99	5.13	7.7	11.96	16.49	20			
			1.625	41.3	1.5	38.1	1.51	2.21	3.09	5.06	8.74	14.6	22.7	32.3	42	49			
			2	50.8	1.5	38.1	2.73	4.22	6.51	7.66	11.1	18.97	28.49	44.24	61	74			
			2.625	66.7	1.5	38.1	3.47	5.09	7.14	11.7	20.2	33.7	52.2	74.5	96.8	113			
			3.5	88.9	1.5	38.1	7	9.7	14	19.9	37.6	69.8	110	148	175	195			
6	150	150-600	2	50.8	2	50.8	2.99	4.62	7.13	8.38	12.1	20.76	31.19	48.42	66.78	81			
			2.625	66.7	2	50.8	3.87	5.68	7.96	13	22.5	37.5	58.3	83	108	126			
			3.5	88.9	2	50.8	6.4	9.37	13.1	21.5	37.1	62	96.2	137	178	208			
			4.375	111	2	50.8	11	17.1	26.4	31	44.85	76.89	115.5	179.34	247.35	300			
			5	127	2	50.8	14.4	20	28.7	40.7	77.2	143	227	304	358	400			
8	200	150-600	2.625	66.7	2	63.5	4	6	9	14	24	43	66	91	117	133			
			3.5	88.9	2	63.5	7	10	15	24	40	72	112	154	197	224			
			4.375	111	2	63.5	11.8	18.2	28.2	33.1	48	82	123	191	264	320			
			5	127	2	63.5	13	19	28	44	74	133	207	285	365	415			
			6.25	158.7	2.5	63.5	20	30	43	68	115	205	320	440	562	640			

☐ Quick Change Trim Only

C_V and F_L versus Travel

Contoured Plug

Direction: **FLOW-TO-CLOSE (FTC)**
Flow Characteristic: **MODIFIED PERCENT**

Percent of Travel							10	20	30	40	50	60	70	80	90	100		
F _L							0.53	0.53	0.55	0.63	0.72	0.8	0.8	0.8	0.8	0.8	0.8	
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V											
			inch	mm	inch	mm												
inch	mm		inch	mm	inch	mm												
0.75	20	150-1500	0.25	6.4	0.8	20.3	0.06	0.09	0.19	0.3	0.5	0.73	0.99	1.28	1.52	1.7		
			0.375	9.5	0.8	20.3	0.13	0.21	0.43	0.68	1.13	1.64	2.22	2.86	3.4	3.8		
			0.5	12.7	0.8	20.3	0.2	0.33	0.68	1.08	1.78	2.59	3.51	4.51	5.38	6		
			0.812	20.6	0.8	20.3	0.48	1.03	1.79	3.91	5.47	7.78	9.6	10.85	11.57	12		
1	25	150-1500	0.25	6.4	0.8	20.3	0.06	0.09	0.19	0.3	0.5	0.73	0.99	1.28	1.52	1.7		
			0.375	9.5	0.8	20.3	0.13	0.21	0.43	0.68	1.13	1.64	2.22	2.86	3.4	3.8		
			0.5	12.7	0.8	20.3	0.2	0.33	0.68	1.08	1.78	2.59	3.51	4.51	5.38	6		
			0.812	20.6	0.8	20.3	0.48	1.03	1.79	3.91	5.47	7.78	9.6	10.85	11.57	12		
1.5	40	150-1500	0.25	6.4	0.8	20.3	0.06	0.09	0.19	0.3	0.5	0.73	0.99	1.28	1.52	1.7		
			0.375	9.5	0.8	20.3	0.13	0.21	0.43	0.68	1.13	1.64	2.22	2.86	3.4	3.8		
			0.5	12.7	0.8	20.3	0.2	0.33	0.68	1.08	1.78	2.59	3.51	4.51	5.38	6		
			0.812	20.6	0.8	20.3	0.44	0.72	1.48	2.34	3.86	5.62	7.6	9.77	11.65	13		
			0.994	25.2	0.8	20.3	0.61	0.99	2.05	3.24	5.34	7.78	10.53	13.53	16.13	18		
			1.25	31.8	0.8	20.3	1	2.15	3.73	8.15	11.4	16.2	20	22.6	24.11	25		
2	50	150-1500	1.625	41.3	0.8	20.3	1.4	3	5.2	11.4	15.97	22.69	28	31.65	33.76	35		
			0.25	6.4	0.8	20.3	0.06	0.09	0.19	0.3	0.5	0.73	0.99	1.28	1.52	1.7		
			0.375	9.5	0.8	20.3	0.13	0.21	0.43	0.68	1.13	1.64	2.22	2.86	3.4	3.8		
			0.5	12.7	0.8	20.3	0.2	0.33	0.68	1.08	1.78	2.59	3.51	4.51	5.38	6		
			0.812	20.6	0.8	20.3	0.51	0.83	1.71	2.7	4.45	6.48	8.77	11.28	13.44	15		
			0.994	25.2	0.8	20.3	0.65	1.05	2.17	3.42	5.64	8.21	11.11	14.28	17	19		
3	63	150-1500	1.25	31.8	0.8	20.3	0.88	1.43	2.96	4.68	7.71	11.23	15.2	19.54	23.3	26		
			1.625	41.3	0.8	20.3	1.84	3.96	6.85	15	21	29.82	36.81	41.59	44.37	46		
			0.994	25.2	0.8	20.3	0.68	1.1	2.28	3.6	5.93	8.64	11.7	15	17.92	20		
			1.25	31.8	1.5	38.1	1.05	1.7	3.53	5.58	9.19	13.4	18.13	23.3	27.78	31		
			1.625	41.3	1.5	38.1	1.6	2.59	5.36	8.46	13.94	20.31	27.49	35.33	42.12	47		
4	100	150-1500	2	50.8	1.5	38.1	2.45	3.96	8.21	12.96	21.36	31.11	42.11	54.12	64.53	72		
			2.625	66.7	1.5	38.1	4.4	9.46	16.39	35.86	50.18	71.3	88	99.46	106.1	110		
			0.994	25.2	1.5	38.1	0.68	1.1	2.28	3.6	5.93	8.64	11.7	15	17.92	20		
			1.625	41.3	1.5	38.1	1.67	2.7	5.59	8.82	14.53	21.17	28.66	36.83	43.91	49		
			2	50.8	1.5	38.1	2.52	4.07	8.43	13.32	21.95	31.98	43.28	55.63	66.32	74		
6	150	150-600	2.625	66.7	1.5	38.1	3.84	6.22	12.88	20.34	33.52	48.83	66.94	84.94	101.27	113		
			3.5	88.9	1.5	38.1	7.8	16.77	29.1	63.57	88.96	126.4	156.04	176.32	188.08	195		
			2	50.8	2	50.8	2.75	4.46	9.23	14.58	24.02	35	47.38	60.89	72.59	81		
			2.625	66.7	2	50.8	4.28	6.93	14.36	22.68	37.37	54.44	73.7	94.71	112.92	126		
			3.5	88.9	2	50.8	7.07	11.44	23.71	37.44	61.69	89.88	121.66	156.35	186.41	208		
			4.375	111	2	50.8	10.2	16.5	34.2	54	88.98	129.63	175.47	225.51	268.86	300		
			5	127	2	50.8	16	34.4	59.6	130.4	182.48	259.28	320.1	361.68	385.8	400		

□ Quick Change Trim Only

C_V and F_L versus Travel

Contoured Plug

Direction: **FLOW-TO-OPEN (FTO)**
 Flow Characteristic: **LINEAR**
 Rating: **ANSI 2500 (PN 420)**

Percent of Travel							10	20	30	40	50	60	70	80	90	100	
F _L							0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.91	0.91	0.91	0.9
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V										
inch	mm		inch	mm	inch	mm											
0.75	20	2500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7	
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8	
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6	
			0.812	20.6	0.8	20.3	0.29	0.41	0.56	0.9	1.5	2.9	4.5	6	7	8	
1	25	2500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7	
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8	
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6	
			0.812	20.6	0.8	20.3	0.36	0.51	0.7	1.1	1.9	3.6	5.6	7.4	9	10	
1.5	40	2500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7	
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8	
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6	
			0.812	20.6	0.8	20.3	0.4	0.59	0.82	1.34	2.32	3.87	6.01	8.57	11.1	13	
			0.994	25.2	0.8	20.3	0.43	0.73	1.14	1.73	2.69	4.61	6.93	10.76	14.84	18	
			1.25	31.8	0.8	20.3	0.72	1.02	1.4	2.2	3.8	7.2	11	15	18	20	
2	50	2500	1.625	41.3	0.8	20.3	0.9	1.28	1.76	2.8	4.7	9	14	19	22	25	
			0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7	
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8	
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6	
			0.812	20.6	0.8	20.3	0.46	0.68	0.95	1.55	2.68	4.47	6.93	9.88	12.9	15	
			0.994	25.2	0.8	20.3	0.46	0.77	1.2	1.82	2.84	4.87	7.32	11.36	15.67	19	

Direction: **FLOW-TO-OPEN (FTO)**
 Flow Characteristic: **EQUAL PERCENT**
 Rating: **ANSI 2500 (PN 420)**

Percent of Travel							10	20	30	40	50	60	70	80	90	100
F _L							0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.91	0.91	0.91
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V									
inch	mm		inch	mm	inch	mm										
0.75	20	2500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6
			0.812	20.6	0.8	20.3	0.29	0.41	0.56	0.9	1.5	2.9	4.5	6	7	8
1	25	2500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6
			0.812	20.6	0.8	20.3	0.36	0.51	0.7	1.1	1.9	3.6	5.6	7.4	9	10
1.5	40	2500	0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6
			0.812	20.6	0.8	20.3	0.4	0.59	0.82	1.34	2.32	3.87	6.01	8.57	11.1	13
			0.994	25.2	0.8	20.3	0.43	0.73	1.14	1.73	2.69	4.61	6.93	10.76	14.84	18
			1.25	31.8	0.8	20.3	0.72	1.02	1.4	2.2	3.8	7.2	11	15	18	20
2	50	2500	1.625	41.3	0.8	20.3	0.9	1.28	1.76	2.8	4.7	9	14	19	22	25
			0.25	6.4	0.8	20.3	0.05	0.08	0.11	0.18	0.3	0.5	0.8	1.1	1.5	1.7
			0.375	9.5	0.8	20.3	0.12	0.17	0.24	0.39	0.68	1.13	1.76	2.5	3.26	3.8
			0.5	12.7	0.8	20.3	0.18	0.27	0.38	0.62	1.07	1.79	2.77	3.95	5.14	6
			0.812	20.6	0.8	20.3	0.46	0.68	0.95	1.55	2.68	4.47	6.93	9.88	12.9	15
			0.994	25.2	0.8	20.3	0.46	0.77	1.2	1.82	2.84	4.87	7.32	11.36	15.67	19

Quick Change Trim Only

C_V and F_L versus Travel

Contoured Trim

Direction: **FLOW-TO-OPEN (FTO)**
Flow Characteristic: **MODIFIED PERCENT**
Rating: **ANSI 2500 (PN 420)**

Percent of Travel							10	20	30	40	50	60	70	80	90	100	
F _L							0.93	0.93	0.93	0.93	0.93	0.92	0.92	0.91	0.91	0.91	0.9
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V										
inch	mm		inch	mm	inch	mm											
0.75	20	2500	0.25	6.4	0.8	20.3	0.04	0.07	0.14	0.28	0.5	0.73	0.99	1.28	1.52	1.7	
			0.375	9.5	0.8	20.3	0.09	0.15	0.31	0.64	1.13	1.64	2.22	2.86	3.4	3.8	
			0.5	12.7	0.8	20.3	0.14	0.24	0.49	1	1.78	2.59	3.5	4.5	5.38	6	
			0.812	20.6	0.8	20.3	0.32	0.74	1.27	3.25	5.47	7.78	9.6	10.85	11.57	12	
1	25	2500	0.25	6.4	0.8	20.3	0.04	0.07	0.14	0.28	0.5	0.73	0.99	1.28	1.52	1.7	
			0.375	9.5	0.8	20.3	0.09	0.15	0.31	0.64	1.13	1.64	2.22	2.86	3.4	3.8	
			0.5	12.7	0.8	20.3	0.14	0.24	0.49	1	1.78	2.59	3.5	4.5	5.38	6	
			0.812	20.6	0.8	20.3	0.32	0.74	1.27	3.25	5.47	7.78	9.6	10.85	11.57	12	
1.5	40	2500	0.25	6.4	0.8	20.3	0.04	0.07	0.14	0.28	0.5	0.73	0.99	1.28	1.52	1.7	
			0.375	9.5	0.8	20.3	0.09	0.15	0.31	0.64	1.13	1.64	2.22	2.86	3.4	3.8	
			0.5	12.7	0.8	20.3	0.14	0.24	0.49	1	1.78	2.59	3.5	4.5	5.38	6	
			0.812	20.6	0.8	20.3	0.29	0.52	1.07	2.18	3.86	5.62	7.6	9.77	11.65	13	
			0.994	25.2	0.8	20.3	0.41	0.71	1.48	3.01	5.34	7.78	10.53	13.53	16.13	18	
			1.25	31.8	0.8	20.3	0.68	1.55	2.66	6.77	11.4	16.2	20	22.6	24.11	25	
2	50	2500	1.625	41.3	0.8	20.3	0.95	2.17	3.72	9.48	15.97	22.69	28	31.65	33.76	35	
			0.25	6.4	0.8	20.3	0.04	0.07	0.14	0.28	0.5	0.73	0.99	1.28	1.52	1.7	
			0.375	9.5	0.8	20.3	0.09	0.15	0.31	0.64	1.13	1.64	2.22	2.86	3.4	3.8	
			0.5	12.7	0.8	20.3	0.14	0.24	0.49	1	1.78	2.59	3.5	4.5	5.38	6	
			0.812	20.6	0.8	20.3	0.34	0.59	1.23	2.51	4.45	6.48	8.77	11.28	13.44	15	
			0.994	25.2	0.8	20.3	0.43	0.75	1.56	3.18	5.64	8.21	11.11	14.28	17	19	
1.25	31.8	0.8	20.3	0.59	1.03	2.14	4.35	7.71	11.23	15.2	19.54	23.3	26				

Single Stage Lo-dB® / Anti-Cavitation Trim Single Stage Cavitation Containment

Direction: **FLOW-TO-OPEN (FTO) Lo-dB**
FLOW-TO-CLOSE (FTC) ANTI/CAV
Flow Characteristic: **LINEAR**

Percent of Travel							10	20	30	40	50	60	70	80	90	100	
F _L							0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V										
inch	mm		inch	mm	inch	mm											
0.75	20	150-2500	0.812	20.6	0.8	20.3	0.24	0.56	0.96	1.44	2.08	2.68	3.2	3.56	3.84	4	
							0.48	1.12	1.92	2.88	4.16	5.36	6.4	7.12	7.68	8	
1	25	150-2500	0.812	20.6	0.8	20.3	0.24	0.56	0.96	1.44	2.08	2.68	3.2	3.56	3.84	4	
							0.48	1.12	1.92	2.88	4.16	5.36	6.4	7.12	7.68	8	
1.5	40	150-2500	1.25	31.8	0.8	20.3	0.48	1.12	1.92	2.88	4.16	5.36	6.4	7.12	7.68	8	
							0.9	2.1	3.6	5.4	7.8	10.1	12	13.4	14.4	15	
2	50	150-2500	1.25	31.8	0.8	20.3	0.48	1.12	1.92	2.88	4.16	5.36	6.4	7.12	7.68	8	
							0.9	2.1	3.6	5.4	7.8	10.1	12	13.4	14.4	15	
							1.625	41.3	0.8	20.3	1.5	3.5	6	9	13	16.8	20
3	80	150-1500	2	50.8	1.5	38.1	1.8	4.2	7.2	10.8	15.6	20.2	24	26.8	28.8	30	
							2.9	6.7	11.5	17.3	24.9	32.2	38.4	42.7	46.1	48	
							4.5	10.5	18	27	39	50.3	60	66.8	72	75	
4	100	150-1500	2	50.8	1.5	38.1	1.8	4.2	7.2	10.8	15.6	20.2	24	26.8	28.8	30	
							3.8	8.8	15.1	22.7	32.8	42.2	50.4	56.1	60.5	63	
							6	14	24	36	52	67	80	89	96	100	
6	150	150-600	5	127	2	50	9	21	36	54	78	101	120	134	144	150	
							12	28	48	72	104	134	160	178	192	200	
8	200	150-600	6.25	157.8	2.5	63.1	18	31	65	98	120	161	196	228	263	290	

 Quick Change Trim Only

C_V and F_L versus Travel

Double Stage Anti-Cavitation Trim

Direction: **FLOW-TO-CLOSE (FTC)**
Flow Characteristic: **LINEAR**

Percent of Travel							10	20	30	40	50	60	70	80	90	100	
F _L							0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975	0.975
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V										
inch	mm		inch	mm	inch	mm											
0.75	20	150-2500	0.812	20.6	0.8	20.3	0.14	0.32	0.55	0.83	1.2	1.54	1.84	2.05	2.21	2.3	
							0.27	0.63	1.08	1.62	2.34	3.02	3.6	4.01	4.3	4.5	
1	40	150-2500	0.812	20.6	0.8	20.3	0.14	0.32	0.55	0.83	1.2	1.54	1.84	2.05	2.21	2.3	
							0.27	0.63	1.08	1.62	2.34	3.02	3.6	4.01	4.3	4.5	
1.5	40	150-2500	0.812	20.6	0.8	20.3	0.14	0.32	0.55	0.83	1.2	1.54	1.84	2.05	2.21	2.3	
							0.27	0.63	1.08	1.62	2.34	3.02	3.6	4.01	4.3	4.5	
			1.25	31.8	0.8	20.3	0.51	1.19	2.04	3.06	4.42	5.7	6.8	7.57	8.16	8.5	
2	50	150-2500	1.25	31.8	0.8	20.3	0.27	0.63	1.08	1.62	2.34	3.02	3.6	4.01	4.3	4.5	
							0.51	1.19	2	3.06	4.42	5.7	6.8	7.57	8.16	8.5	
3	80	150-1500	2.625	66.7	1.5	38.1	1.6	3.8	6.4	9.7	14.1	18.1	21.6	24	25.9	27	
							2.5	5.9	10.1	15.1	21.8	28.1	33.6	37.4	40.3	42	
4	100	150-1500	2.625	66.7	1.5	38.4	2.4	5.6	9.6	14.4	20.8	26.8	32	35.6	38.4	40	
			3.5	88.9			3.7	8.7	14.9	22.3	32.2	41.5	49.6	55.2	59.5	62	

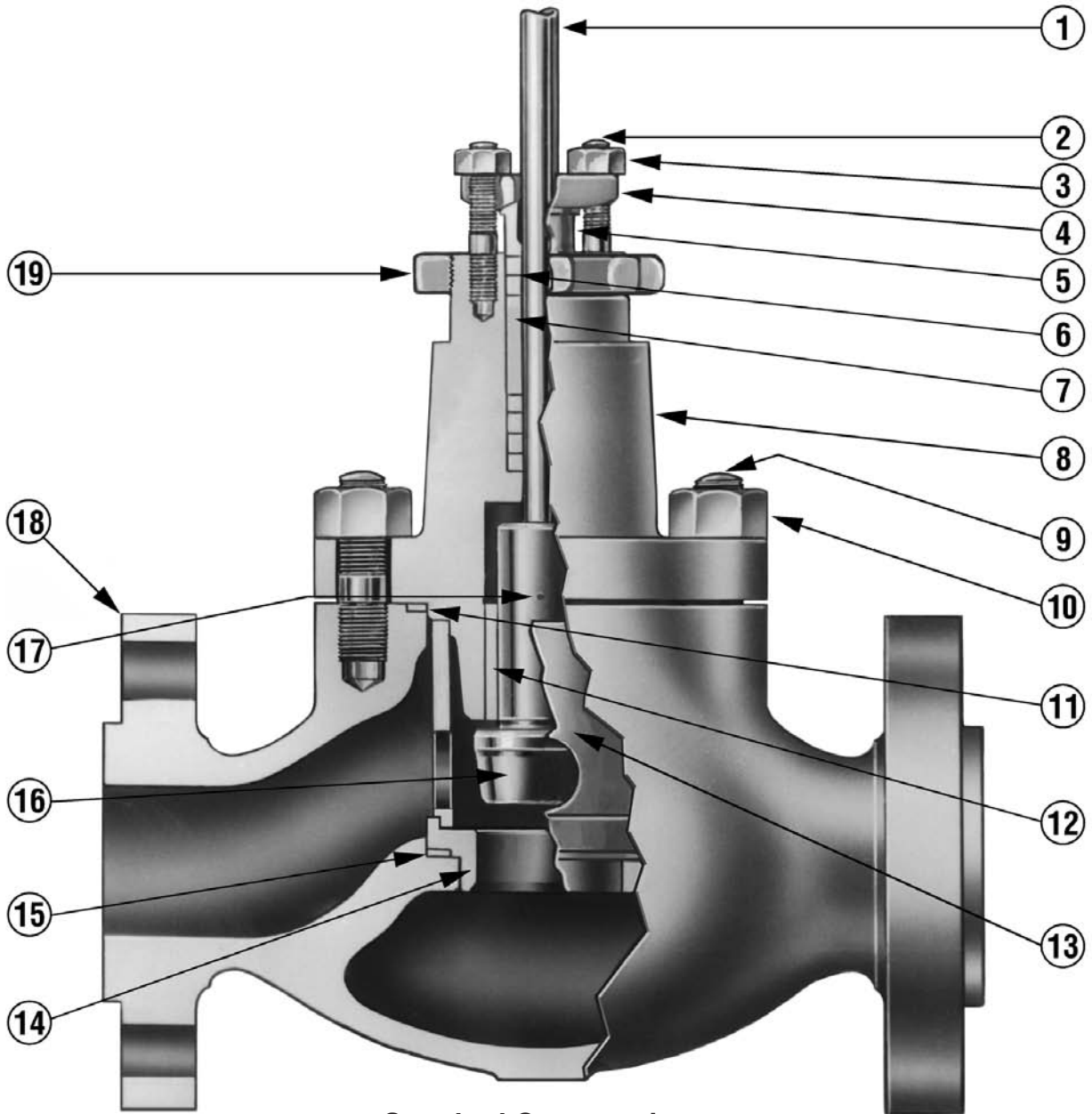
Double stage anti-cavitation trim not available with Bellows Seal construction.

Double Stage Lo-dB® Trim

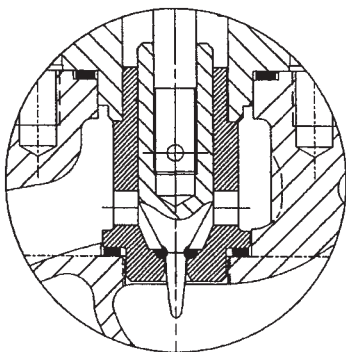
Direction: **FLOW-TO-OPEN (FTO)**
Flow Characteristic: **LINEAR**

Percent of Travel							10	20	30	40	50	60	70	80	90	100	
F _L							0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Valve Size		ANSI Rating	Orifice Diameter		Travel		Rated C _V										
inch	mm		inch	mm	inch	mm											
0.75	20	150-2500	0.812	20.6	0.8	20.3	0.21	0.49	0.84	1.26	1.82	2.35	2.8	3.12	3.36	3.5	
							0.34	0.8	1.37	2.05	2.96	3.82	4.56	5.07	5.47	5.7	
1	40	150-2500	0.812	20.6	0.8	20.3	0.21	0.49	0.84	1.26	1.82	2.35	2.8	3.12	3.36	3.5	
							0.34	0.8	1.37	2.05	2.96	3.82	4.56	5.07	5.47	5.7	
1.5	40	150-2500	1.25	31.8	0.8	20.3	0.42	0.98	1.68	2.52	3.64	4.69	5.6	6.23	6.72	7	
							0.8	1.8	3.1	4.7	6.8	8.7	10.4	11.6	12.5	13	
2	50	150-2500	1.25	31.8	0.8	20.3	0.8	1.8	3.1	4.7	6.8	8.7	10.4	11.6	12.5	13	
			1.625	41.3		0.8	38.1	1.3	2.9	5	7.6	10.9	14.1	16.8	18.7	20.2	21
3	80	150-1500	2.625	66.7	1.5	38.1	2.4	5.6	9.6	14.4	20.8	26.8	32	35.6	38.4	40	
							3.8	8.8	15.1	22.7	32.8	42.2	50.4	56.1	60.5	63	
4	100	150-1500	2.625	66.7	1.5	38.1	3.2	7.4	12.7	19.1	27.6	35.5	42.4	47.2	50.9	53	
			3.5	88.9			4.9	11.6	19.9	29.9	43.2	55.6	66.4	73.9	79.7	83	
6	150	150-600	3.5	88.9	1.5	38.1	7.5	17.5	30	45	65	84	100	111	120	125	

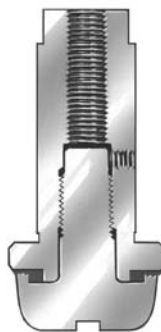
Materials of Construction



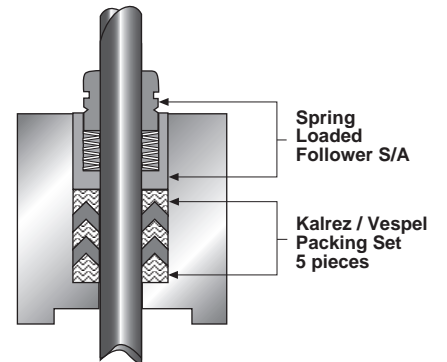
Standard Construction



21000 Close Clearance
Low Flow Trim



Soft Seated
Plug S/A



LE® Packing System (Optional)
Low Emission Stem Packing

Materials of Construction

Standard Carbon Steel Version

Ref. No.	Temperature Range	-20°F (-29°C)	450°F (232°C)	650°F (343°C)	800°F (427°C)
		Standard Materials			
1	Plug Stem	17-4 PH STAINLESS STEEL H1075 ⁽¹⁾			
		SOLUTION ANNEALED 316 STAINLESS STEEL			
		HARDENED ASTM A638 GRADE 660			
2	Packing Flange Stud	ASTM A193 GRADE B8 CLASS 1			
3	Packing Flange Nut	ASTM A194 GRADE 8			
4	Packing Flange	ASTM A216 GRADE WCC			
5	Packing Follower	AUSTENITIC STAINLESS STEEL			
6	Packing	PTFE ARAMID PACKING	FLEXIBLE GRAPHITE PACKING		
		PTFE ARAMID PACKING WITH EXTENSION BONNET			
7	Lantern Ring (Optional)	AUSTENITIC STAINLESS STEEL			
8	Valve Bonnet	ASTM A216 GRADE WCC or ASTM A105			
9	Body Stud	ASTM A193 GRADE B7			
10	Body Stud Nut	ASTM A194 GRADE 2H			
11	Body Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER			
12	Guide Bushing ⁽⁶⁾	HARDENED 440C STAINLESS STEEL ⁽²⁾			
		STELLITE NO. 6			
13	Cage / Retainer ⁽⁴⁾	SOLUTION ANNEALED 304 STAINLESS STEEL			
		CA6NM CLASS B STAINLESS STEEL ⁽³⁾			
	Close Clearance Cage/Seat	SOLUTION ANNEALED 316 STAINLESS STEEL			
		HARDENED 410 STAINLESS STEEL			
		STELLITE NO. 6			
14	Seat Ring	SOLUTION ANNEALED 316 STAINLESS STEEL			
		HARDENED 410 STAINLESS STEEL			
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING			
15	Seat Ring Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER			
16	Plug	SOLUTION ANNEALED 316 STAINLESS STEEL			
		HARDENED 410 STAINLESS STEEL			
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING ON SEAT ⁽⁵⁾			
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING ON SEAT AND GUIDE ⁽⁵⁾			
		STELLITE NO. 6 ⁽⁷⁾			
17	Plug Pin	SOLUTION ANNEALED 316 STAINLESS STEEL			
18	Valve Body	ASTM A216 GRADE WCC			
19	Drive Nut	ASTM A216 GRADE WCC			
Ref. No.	Temperature Range	-20°F (-29°C)	450°F (232°C)	650°F (343°C)	800°F (427°C)

1. 17-4 PH ST.ST will be substituted when required due to the differential pressure.
2. 440C bushing not used in combination with 316 trim.
3. Standard material for two stage lo-db (drilled hole) cages.
4. Required for Quick Change trim only.
5. Use Solid Stellite plug for Cv smaller than 1.7.
6. Guide bushings not used with close clearance trim.
7. Solid Stellite is not available for Lo-dB/Anti-Cavitation plugs.

Materials of Construction

Standard Stainless Steel Version

Ref. No.	Temperature Range	-20°F (-29°C)	450°F (232°C)	650°F (343°C)	800°F (427°C)
	Description	Standard Materials			
1	Plug Stem	SOLUTION ANNEALED 316 STAINLESS STEEL			
		HARDENED ASTM A638 GRADE 660			
2	Packing Flange Stud	ASTM A193 GRADE B8 CLASS 1			
3	Packing Flange Nut	ASTM A194 GRADE 8			
4	Packing Flange	ASTM A216 GRADE WCC			
5	Packing Follower	AUSTENITIC STAINLESS STEEL			
6	Packing	PTFE ARAMID PACKING	FLEXIBLE GRAPHITE PACKING		
		PTFE ARAMID PACKING WITH EXTENSION BONNET			
7	Lantern Ring (Optional)	AUSTENITIC STAINLESS STEEL			
8	Valve Bonnet	ASTM A351 GRADE CF8M			
9	Body Stud	ASTM A193 GR B7 – ZINC PLATING	ASTM A193 GRADE B7		
10	Body Stud Nut	ASTM A194 GR 2H – ZINC PLATING	ASTM A194 GRADE 2H		
11	Body Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER			
12	Guide Bushing ⁽⁴⁾	NITRONIC 60 ASTM A479			
		STELLITE NO. 6			
13	Cage / Retainer ⁽¹⁾	SOLUTION ANNEALED 304 STAINLESS STEEL			
		CA6NM CLASS B STAINLESS STEEL ⁽²⁾			
	Close Clearance Cage/Seat	SOLUTION ANNEALED 316 STAINLESS STEEL			
		HARDENED 410 STAINLESS STEEL			
STELLITE NO. 6					
14	Seat Ring	SOLUTION ANNEALED 316 STAINLESS STEEL			
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING			
15	Seat Ring Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER			
16	Plug	SOLUTION ANNEALED 316 STAINLESS STEEL			
		HARDENED 410 STAINLESS STEEL			
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING ON SEAT ⁽³⁾			
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING ON SEAT AND GUIDE ⁽³⁾			
STELLITE NO. 6 ⁽⁵⁾					
17	Plug Pin	SOLUTION ANNEALED 316 STAINLESS STEEL			
18	Valve Body	ASTM A351 GRADE CF8M			
19	Drive Nut	ASTM A216 GRADE WCC			
Ref. No.	Temperature Range	-20°F (-29°C)	450°F (232°C)	650°F (343°C)	800°F (427°C)

1. Required for Quick Change trim only.
2. Standard material for two stage lo-db (drilled hole) cages.
3. Use Solid Stellite plug for Cv smaller than 1.7.
4. Guide bushings not used with close clearance trim.
5. Solid Stellite is not available for Lo-dB/Anti-Cavitation plugs.

Materials of Construction

Standard Chrome Moly Version

Ref. No.	Temperature Range	-20°F (-29°C)	450°F (232°C)	650°F (343°C)	800°F (427°C)	
	Description	Materials				
1	Plug Stem	17-4 PH STAINLESS STEEL H1075 ⁽²⁾				
		SOLUTION ANNEALED 316 STAINLESS STEEL				
		HARDENED ASTM A638 GRADE 660				
2	Packing Flange Stud	ASTM A193 GRADE B8 CLASS 1				
3	Packing Flange Nut	ASTM A194 GRADE 8				
4	Packing Flange	ASTM A216 GRADE WCC CMS 1010 ZINC PLATED				
5	Packing Follower	AUSTENITIC STAINLESS STEEL				
6	Packing	PTFE ARAMID PACKING	FLEXIBLE GRAPHITE PACKING			
		PTFE ARAMID PACKING WITH EXTENSION BONNET				
7	Lantern Ring (Optional)	AUSTENITIC STAINLESS STEEL				
8	Valve Bonnet	ASTM A217 GRADE WC9 CLASS 3				
9	Body Stud	ASTM A193 GRADE B7				
10	Body Stud Nut	ASTM A194 GRADE 2H				
11	Body Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER				
12	Guide Bushing ⁽⁵⁾	HARDENED 440C STAINLESS STEEL				
		STELLITE NO. 6				
		SOLUTION ANNEALED 304 STAINLESS STEEL				
13	Cage / Retainer ⁽²⁾	SOLUTION ANNEALED 304 STAINLESS STEEL				
		CA6NM CLASS B STAINLESS STEEL ⁽³⁾				
	Close Clearance Cage/Seat	SOLUTION ANNEALED 316 STAINLESS STEEL				
		HARDENED 410 STAINLESS STEEL				
14	Seat Ring	STELLITE NO. 6				
		SOLUTION ANNEALED 316 STAINLESS STEEL				
		HARDENED 410 STAINLESS STEEL				
15	Seat Ring Gasket	316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING				
16	Plug	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER				
		SOLUTION ANNEALED 316 STAINLESS STEEL				
		HARDENED 410 STAINLESS STEEL				
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING ON SEAT ⁽⁴⁾				
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING ON SEAT AND GUIDE ⁽⁴⁾				
17	Plug Pin	STELLITE NO. 6 ⁽⁶⁾				
18	Valve Body	SOLUTION ANNEALED 316 STAINLESS STEEL				
19	Drive Nut	ASTM A217 GRADE WC9 CLASS 3				
19	Drive Nut	ASTM A216 GRADE WCC				
Ref. No.	Temperature Range	-20°F (-29°C)	450°F (232°C)	650°F (343°C)	800°F (427°C)	

1. 17-4 PH ST.ST will be substituted when required due to the differential pressure.
2. Required for Quick Change trim only.
3. Standard material for two stage lo-db (drilled hole) cages.
4. Use Solid Stellite plug for Cv smaller than 1.7.
5. Guide bushings not used with close clearance trim.
6. Solid Stellite is not available for Lo-db/Anti-Cavitation plugs.

Materials of Construction

NACE Materials Construction

Ref. No.	Temperature Range	-20°F (-29°C)	450°F (232°C)
	Description	NACE Materials ⁽¹⁾	
1	Plug Stem	SOLUTION ANNEALED 316 STAINLESS STEEL	
		ASTM B637 ALLOY ⁽²⁾	
2	Packing Flange Stud	ASTM A193 GRADE B8 CLASS 1 ⁽³⁾	
		ASTM A193 GR B7M ZINC PLATING ⁽⁴⁾	
3	Packing Flange Nut	ASTM A194 GRADE 8 ⁽³⁾	
		ASTM A194 GR 2HM ZINC PLATING ⁽⁴⁾	
4	Packing Flange	ASTM A216 GRADE WCC	
5	Packing Follower	SOLUTION ANNEALED 304 STAINLESS STEEL	
6	Packing	PTFE ARAMID PACKING	
7	Lantern Ring (Optional)	SOLUTION ANNEALED 304 STAINLESS STEEL	
8	Valve Bonnet	ASTM A216 GRADE WCC	
		ASTM A105	
		ASTM A351 GRADE CF8M	
9	Body Stud	ASTM A193 GR B7 – ZINC PLATING ^{(3) (7)}	
		ASTM A193 GR B7M ZINC PLATING ^{(4) (7)}	
		ASTM A193 GRADE B7 ⁽³⁾	
		ASTM A193 GRADE B7M ⁽⁴⁾	
10	Body Stud Nut	ASTM A194 GR 2H – ZINC PLATING ^{(3) (7)}	
		ASTM A194 GR 2HM ZINC PLATING ^{(4) (7)}	
		ASTM A194 GRADE 2H ⁽³⁾	
		ASTM A194 GRADE 2HM ⁽⁴⁾	
11	Body Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER	
12	Guide Bushing ⁽⁸⁾	STELLITE NO. 6	
13	Cage / Retainer ⁽⁴⁾	SOLUTION ANNEALED 304 STAINLESS STEEL	
	Close Clearance Cage/Seat ⁽⁶⁾	SOLUTION ANNEALED 316 STAINLESS STEEL	
		STELLITE NO. 6	
14	Seat Ring	SOLUTION ANNEALED 316 STAINLESS STEEL	
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING	
15	Seat Ring Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER	
16	Plug	SOLUTION ANNEALED 316 STAINLESS STEEL	
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING ON SEAT	
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING ON SEAT AND GUIDE	
		STELLITE NO. 6 ^{(6) (9)}	
17	Plug Pin	SOLUTION ANNEALED 316 STAINLESS STEEL	
18	Valve Body	ASTM A351 GRADE CF8M	
19	Drive Nut	ASTM A216 GRADE WCC	

1. Materials and processes in accordance with the requirements of NACE specification MR0103.
Applications requiring compliance to MR0175, 2003 Rev. or ISO 15156 would require engineering review.
2. Inconel 718 will be substituted in applications when required due to the differential pressure.
3. Materials designated for these parts conform to NACE Class III (unexposed) bolting requirements.
4. Materials designated for these parts conform to NACE Class I or Class II (exposed) bolting requirements.
5. Consult Masoneilan for NACE Applications above ANSI Class 600 (PN 100) rating or above 450°F (232°C).
6. Optional component and materials for Close Clearance low flow trim option.
7. To be used with stainless steel body and bonnet.
8. Guide bushing not used with close clearance trim.
9. Solid Stellite is not available for Lo-dB/Anti-Cavitation plugs.

Materials of Construction

Cryogenic Construction

Ref. No.	Temperature Range	-320°F (-196°C)	-50°F (-46°C)	-20°F (-29°C)
	Description ⁽³⁾ ⁽⁴⁾	Standard Materials ⁽¹⁾ ⁽²⁾ ⁽⁵⁾		
1	Plug Stem	SOLUTION ANNEALED 316 STAINLESS STEEL		
		HARDENED ASTM A638 GRADE 660		
2	Packing Flange Stud	ASTM A193 GRADE B8 CLASS 1		
3	Packing Flange Nut	ASTM A194 GRADE 8		
4	Packing Flange	ASTM A351 GRADE CF8M		
5	Packing Follower	AUSTENITIC STAINLESS STEEL		
6	Packing	Teflon V-Ring		
7	Lantern Ring (Optional)	AUSTENITIC STAINLESS STEEL		
8	Valve Bonnet	ASTM A351 GRADE CF8M [163C](163)		
		ASTM A312 GRADE TYPE 316		
		ASTM A479 TYPE 316		
		ASTM A352 GRADE LCC		
9	Body Stud ⁽⁶⁾	ASTM A193 GRADE B8 CLASS 2 (≤ 3/4" Ø) ≤ 3/4" Ø OR .75" - 2" Class 150, 300 & 600 3" - 4" Class 150 & 300 ; 3" Class 600		
		ASTM A453 GRADE 660 CLASS A (3/4" < Ø < 1") 3/4" < Ø < 1" OR 1.5" - 2" Class 900 / 1500 ; 1.5" Class 2500		
		AMS 4676 (≥ 1") ≥ 1" Ø OR .75" - 1" Class 900 / 1500 & 2500 4" - 6" Class 600 ; 2" Class 2500		
10	Body Stud Nut	ASTM A194 GRADE 8		
11	Body Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER		
12	Guide Bushing	STELLITE NO. 6 (STANDARD)		
		NITRONIC 60 ASTM A479 (OPTIONAL)		
13	Cage	SOLUTION ANNEALED 304 STAINLESS STEEL (STANDARD)		
		SOLUTION ANNEALED 316 STAINLESS STEEL (OPTIONAL)		
14	Seat Ring	SOLUTION ANNEALED 316 STAINLESS STEEL		
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING		
15	Seat Ring Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER		
16	Plug	SOLUTION ANNEALED 316 STAINLESS STEEL		
		316 STAINLESS STEEL WITH STELLITE NO. 6 HARDFACING ON SEAT		
17	Plug Pin	SOLUTION ANNEALED 316 STAINLESS STEEL		
18	Valve Body	ASTM A351 GRADE CF8M		
		ASTM A352 GRADE LCC		
19	Drive Nut	ASTM A216 GRADE WCC		
Ref. No.	Temperature Range	-320°F (-196°C)	-50°F (-46°C)	-20°F (-29°C)

1. Materials recommended for Cryogenic Liquid Natural Gas (LNG) applications -320°F (-196°C).

Consult factory for suitability in other cryogenic applications.

2. Consult factory for NACE applications.

3. Trim offerings limited to Quick Change designs only.

4. Consult factory for proper actuator sizing to provide correct valve shut-off.

5. JIS and EN material equivalents are available.

6. Body stud materials also satisfy the requirements of the pressure equipment directive 97/23/EC.

Table of Contents

Bellows Seal Design Features - 21000 BS Series

Standard Construction

Bellows seal configuration is fully compatible with the standard 21000 Series trim and actuator options providing equivalent capacity capabilities for each valve size. The standard packing box design and packing design options are used as a secondary stem seal.

Rugged Design

The formed bellows construction is an externally pressurized design that is capable of operating up to the full valve ANSI B16.34 pressure rating. Guides are located above and below the bellows providing excellent stability to withstand flow induced and mechanical vibration.

Maximum Life

The bellows assembly is designed for 50% compression/extension (zero stress) at the valve mid-stroke position for maximum cycle life. Bellows torsional stresses are also minimized with the anti-rotation feature provided by flats on the plug stem.

High Quality

Each bellows subassembly is helium leak tested to verify weld integrity, and is also hydro-statically tested as part of the

complete valve assembly. Mechanical travel stops are also designed into both the bellows and valve assemblies to prevent over compression or extension.

Smart Solution

Bellows installed cycle life can be monitored in the field by utilizing Masoneilan's SVI® Digital Positioner with actual process data. This unique preventative maintenance option will help improve plant safety by identifying potential hazardous failures before they happen, and reduce cost by eliminating premature Bellows replacement.

Bellows Materials

Standard Material

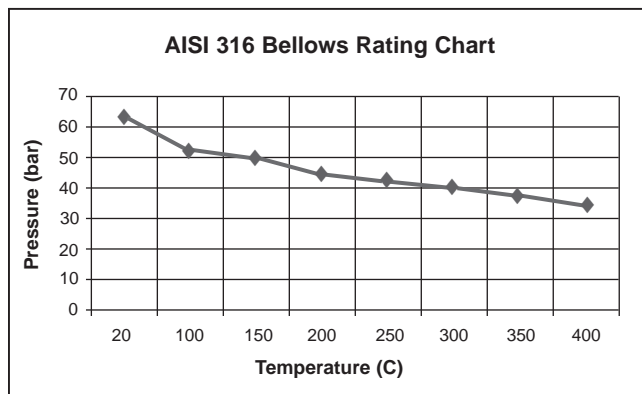
316/316L Stainless Steel

Optional Materials

Hastelloy C276

Monel 400

Inconel 625

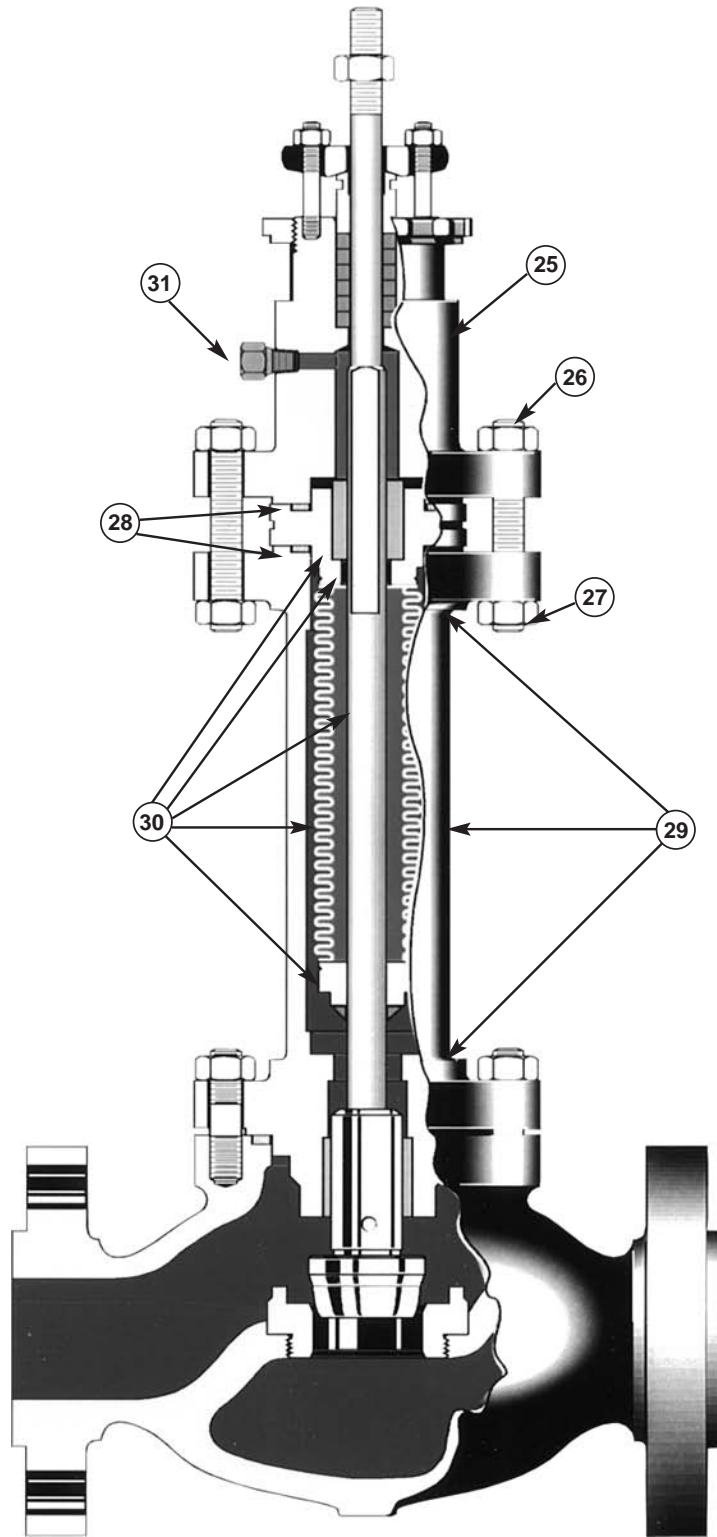


Size and Ratings

Pressure Ratings: ANSI Class 150 and 300 – PN 20 and PN 50

Valve Size	Bellows Design Stroke		Life Cycle Ratings ⁽¹⁾		
	inches	mm	Maximum Stroke		
			100%	50%	25%
.75"-2"	.75	19	100,000 Full Cycles	600,000 Full Cycles	3,000,000 Full Cycles
3"-4"	1.50	38.1			
6"	2.00	50.8			

1. Minimum expected average cycle life for Class 300 (PN 50) bellows operating at constant pressure.
2. Consult Masoneilan for Bellows applications above ANSI Class 300 (PN 50).



Bellows Seal Construction

Materials of Construction

Bellows Seal - Carbon Steel Body Version ⁽¹⁾

Ref. No.	Temperature Range	-20°F (-29°C)	800°F (427°C)
Ref. No.	Description	Materials	
25	Valve Bonnet	ASTM A216 GRADE WCC or ASTM A105	
26	Bonnet Stud	ASTM A193 GRADE B7	
27	Bonnet Stud Nut	ASTM A194 GRADE 2H	
28	Bonnet Spacer Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER	
29	Carbon Steel Bonnet Extension Assembly	Upper Flange	ASTM A216 GRADE WCC or ASTM A105
		Spacer	ASTM A106 GRADE B HRC 22 MAXIMUM
		Lower Flange	ASTM A216 GRADE WCC
30	Stainless Steel Bellows and Stem Assembly	Stem	SOLUTION ANNEALED 316 STAINLESS STEEL
		Guide Bushing	ASTM A479
		Bellows	316 ST. ST. ASTM A240/A312
		Upper Adapter Lower Adapter	GENERAL SERVICE ANNEALED 316L ST ST
	Hastelloy C ⁽³⁾ Bellows and Stem Assembly	Stem	ASTM B574
		Guide Bushing	STELLITE NO. 6
		Bellows	Hastelloy C276 ASTM B575/B622
		Upper Adapter Lower	ASTM B574
	Monel 400 ⁽³⁾ Bellows and Stem Assembly	Stem	ASTM B164 CLASS A
		Guide Bushing	STELLITE NO. 6
		Bellows	ASTM B164 CLASS A
		Upper Adapter Lower	ASTM B164 CLASS A
	Inconel 625 ⁽³⁾ Bellows and Stem Assembly	Stem	INCONEL X-750
		Guide Bushing	STELLITE NO. 6
		Bellows	ASTM B446
		Upper Adapter Lower	ASTM B446
31	Plug – 1/8" NPT	ASTM A234 GRADE WPB	
Ref. No.	Temperature Range	-20°F (-29°C)	800°F (427°C)

1. Materials for other components are same as listed for Standard Carbon Steel Construction.
2. Items No. 1 (plug stem) and 8 (bonnet) in Standard Materials of Construction tables are replaced by items above.
3. Optional Hastelloy C, Monel 400 and Inconel 625 Bellows Construction available.

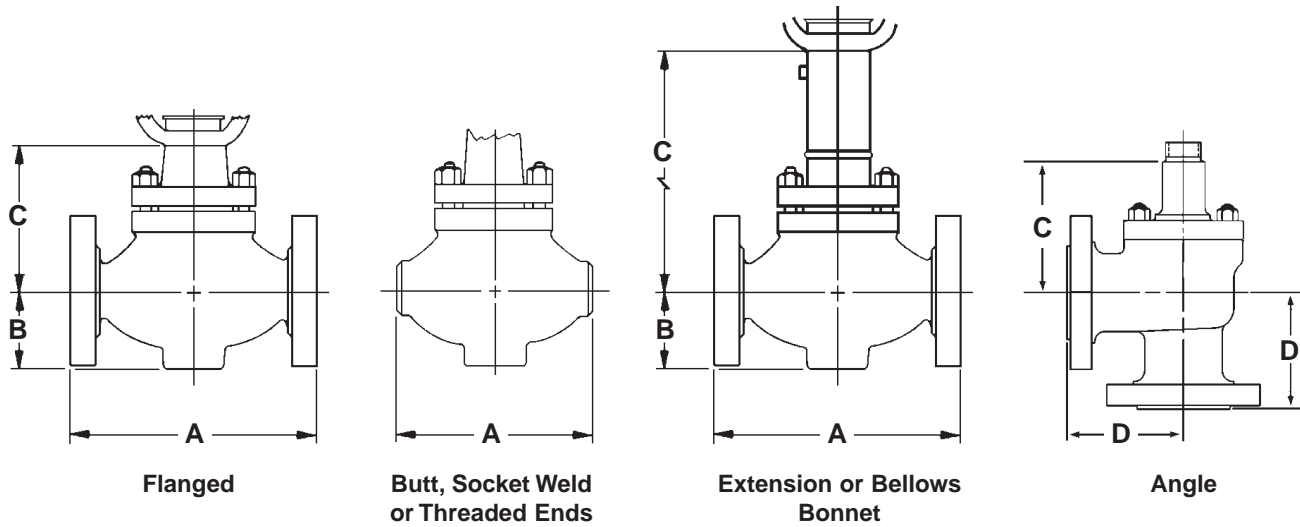
Materials of Construction

Bellows Seal - Stainless Steel Body Version ⁽¹⁾

Ref. No.	Temperature Range	-20°F (-29°C)	650°F (343°C)	800°F (427°C)
No.	Description	Materials		
25	Valve Bonnet	ASTM A351 GRADE CF8M or ASTM A182 GRADE F 316		
26	Bonnet Stud	ASTM A193 GR B7 – ZINC PLATING	ASTM A193 GRADE B7	
27	Bonnet Stud Nut	ASTM A194 GR 2H – ZINC PLATING	ASTM A194 GRADE 2H	
28	Bonnet Spacer Gasket	316L ST ST SPIRAL WOUND GASKET WITH GRAPHITE FILLER		
29	Carbon Steel Bonnet Extension Assembly	Upper Flange	ASTM A351 GRADE CF8M or ASTM A182 GRADE F 316	
		Spacer	316 St. St. ASTM A269 TY 316	
		Lower Flange	ASTM A351 GRADE CF8M	
30	Stainless Steel Bellows and Stem Assembly	Stem	SOLUTION ANNEALED 316 STAINLESS STEEL	
		Guide Bushing	ASTM A479	
		Bellows	316 St. St. ASTM A240/A312	
		Upper Adapter Lower Adapter	GENERAL SERVICE ANNEALED 316L ST ST	
	Hastelloy C ⁽³⁾ Bellows and Stem Assembly	Stem	ASTM B574	
		Guide Bushing	STELLITE NO. 6	
		Bellows	Hastelloy C276 ASTM B575/B622	
		Upper Adapter Lower	ASTM B574	
	Monel 400 ⁽³⁾ Bellows and Stem Assembly	Stem	ASTM B164 CLASS A	
		Guide Bushing	STELLITE NO. 6	
		Bellows	ASTM B164 CLASS A	
		Upper Adapter Lower	ASTM B164 CLASS A	
Inconel 625 ⁽³⁾ Bellows and Stem Assembly	Stem	INCONEL X-750		
	Guide Bushing	STELLITE NO. 6		
	Bellows	ASTM B446		
	Upper Adapter Lower	ASTM B446		
31	Plug – 1/8" NPT	AUSTENITIC STAINLESS STEEL		
Ref. No.	Temperature Range	-20°F (-29°C)	650°F (343°C)	800°F (427°C)

1. Materials for other components are same as listed for Standard Stainless Steel Construction.
2. Items No. 1 (plug stem) and 8 (bonnet) in Standard Materials of Construction tables are replaced by items above.
3. Optional Hastelloy C, Monel 400 and Inconel 625 Bellows Construction available.

Dimensions (inches)

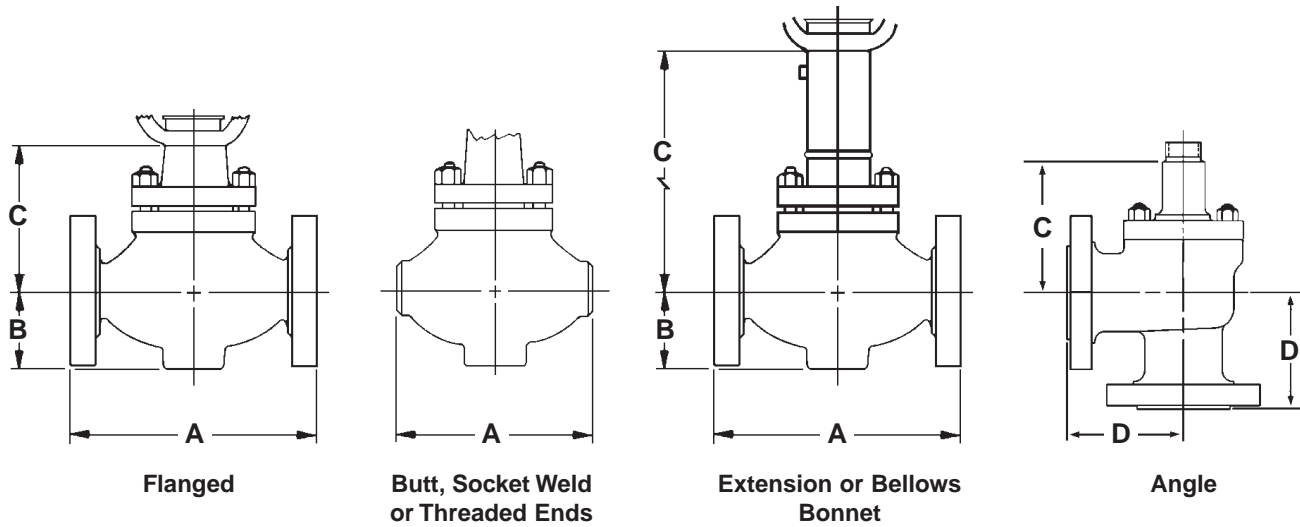


21000 Series Dimensions (inches)

Valve Size (inches)	A																	
	ANSI Class 150-600 (PN 20-100)		ANSI Class 900-1500 (PN 150-250)		ANSI Class 2500 (PN 420)		ANSI Class 150 (PN 20)		ANSI Class 300 (PN 50)		ANSI Class 600 (PN 100)		ANSI Class 900 (PN 150)		ANSI Class 1500 (PN 250)		ANSI Class 2500 (PN 420)	
	BW, SW, THD	BW, SW, THD	BW, SW, THD	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	
0.75	8.24	8.5	12.5	7.25		7.46	8.11	8.11	8.11	10.75	10.75	10.75	10.75	12.12	12.12			
1	8.24	8.5	12.5	7.25		7.76	8.26	8.26	8.26	11.5	11.5	11.5	11.5	12.5	12.5			
1.5	9.88	9.25	13	8.75		9.25	9.76	9.88	9.88	13.12	13.12	13.12	13.12	14.12	14.25			
2	11.24	11.5	14.75	10		10.51	11.1	11.26	11.38	14.75	14.75	14.88	14.88	16.25	16.37			
3	13.24	12.52		11.73		12.52	13.11	13.27	13.39	15.24	15.95	15.98	16.06					
4	15.5	14.49		13.86		14.49	15.12	15.51	15.36	18.27	18.34	19.02	19.09					
6	20			17.76		18.62	19.25	20	20.12									
8	24			21.38		22.36	22.83	24	24.09									

Valve Size (inches)	B																					
	ANSI Class 150-300 (PN 20-50)		ANSI Class 600 (PN 100)		ANSI Class 150-600 (PN 20-100)		ANSI Class 900-1500 (PN 150-250)		ANSI Class 2500 (PN 420)		ANSI Class 150 (PN 20)		ANSI Class 300 (PN 50)		ANSI Class 600 (PN 100)		ANSI Class 900 (PN 150)		ANSI Class 1500 (PN 250)		ANSI Class 2500 (PN 420)	
	BW	BW	SW & THD	BW	SW	BW	SW	BW	SW	RF	RTJ	RF & RTJ	RF & RTJ	RF & RTJ	RF & RTJ	RF & RTJ	RF & RTJ	RF & RTJ	RF & RTJ			
0.75			1.83		1.76			1.87	1.94			2.32	2.32	2.56	2.56	2.75						
1			1.83		2.06			2.22	2.13			2.45	2.45	2.94	2.94	3.13						
1.5			2.50		2.68			2.93	2.50			3.06	3.06	3.50	3.50	4.00						
2	3.00	3.00	3.00	3.37	3.37	3.70	3.70	3.00				3.25	3.25	4.25	4.25	4.63						
3	3.69	3.69		4.14				3.75				4.13	4.13	4.73	5.22							
4	4.63	5.50		5.58				4.50				5.00	5.00	5.71	6.10							
6	6.26	7.38						5.50				6.25	7.00									
8	6.62	6.62						6.79				7.48	8.27									

Dimensions (inches)



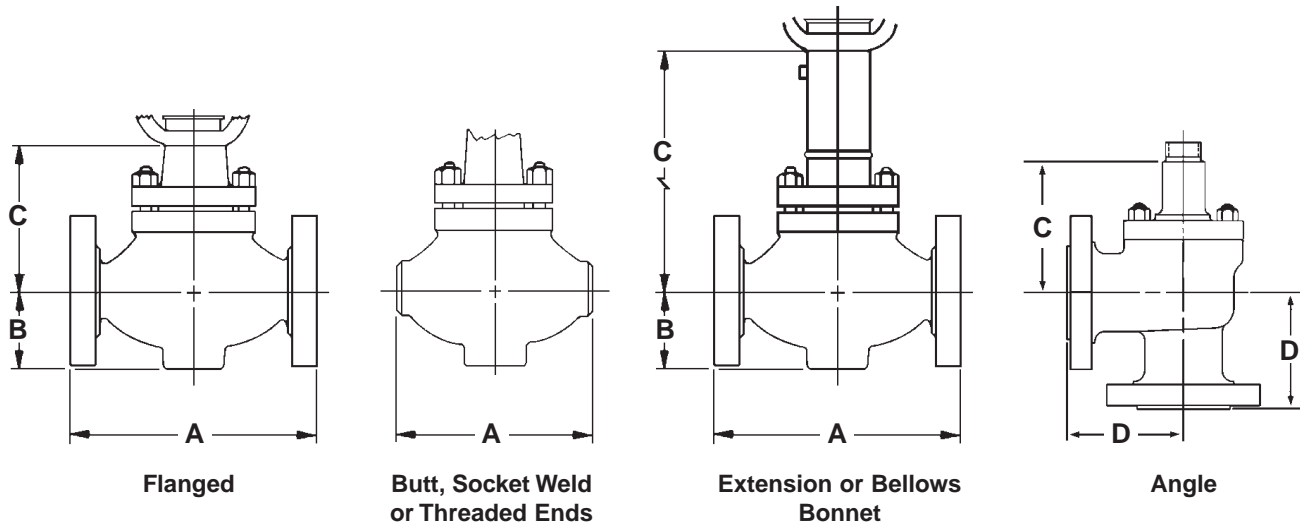
21000 Series Dimensions (inches)

Valve Size (inches)	C									
	Standard Bonnet			Extension Bonnet			Cryogenic Extension Bonnet			Bellows Bonnet
	ANSI Class 150-600 (PN 20-100)	ANSI Class 900-1500 (PN 150-250)	ANSI Class 2500 (PN 420)	ANSI Class 150-600 (PN 20-100)	ANSI Class 900-1500 (PN 150-250)	ANSI Class 2500 (PN 420)	ANSI Class 150-600 (PN 20-100)	ANSI Class 900-1500 (PN 150-250)	ANSI Class 2500 (PN 420)	ANSI Class 150-300 (PN 20-50)
0.75	5.51	7.6	7.6	9.92	10.7	10.7	23.7	23.71	23.71	16.83
1	5.51	7.6	7.6	9.92	10.7	10.7	23.7	23.71	23.71	16.83
1.5	5.51	9	9	9.92	11.7	11.7	23.68	23.69	23.69	15.22
2	5.51	9	10.7	9.92	11.7	12.3	23.68	23.69	23.69	15.22
3	8	11.23		13.9	13.57		27.64	27.66		23.87
4	8.07	14.74		15.87	17.24		27.64	27.58		23.87
6	11.18			16.69			31.83			29.76
8	16.6			22.72			34.77			

Valve Size (inches)	D														
	ANSI Class 150-600 (PN 20-100)	ANSI Class 900-1500 (PN 150-250)	ANSI Class 2500 (PN 420)	ANSI Class 150 (PN 20)		ANSI Class 300 (PN 50)		ANSI Class 600 (PN 100)		ANSI Class 900 (PN 150)		ANSI Class 1500 (PN 250)		ANSI Class 2500 (PN 420)	
	BW, SW, THD	BW, SW, THD	BW, SW, THD	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ
0.75 ⁽¹⁾	4.13	4.25	6.25	3.62		3.88	4.13	4.13	4.13	5.38	5.38	5.38	5.38	6.06	6.06
1 ⁽¹⁾	4.13	4.25	6.25	3.62		3.88	4.13	4.13	4.13	5.75	5.75	5.75	5.75	6.25	6.25
1.5	4.94	4.63	6.5	4.37		4.62	4.88	4.94	4.94	6.56	6.56	6.56	6.56	7.06	7.12
2	5.62	5.57	7.38	5		5.25	5.56	5.62	5.69	7.38	7.38	7.44	7.44	8.13	8.19
3	6.62	6.26		5.88		6.25	6.56	6.62	6.69	7.62	7.98	7.65	8.03		
4	7.75	7.25		6.94		7.25	7.56	7.75	7.81	9.14	9.17	9.17	9.55		
6	10			8.88		9.31	9.62	10	10.06						
8	12			10.69		11.18	11.41	12	12.04						

1. 0.75" and 1" 21000 angle body is forged only.

Dimensions (mm)

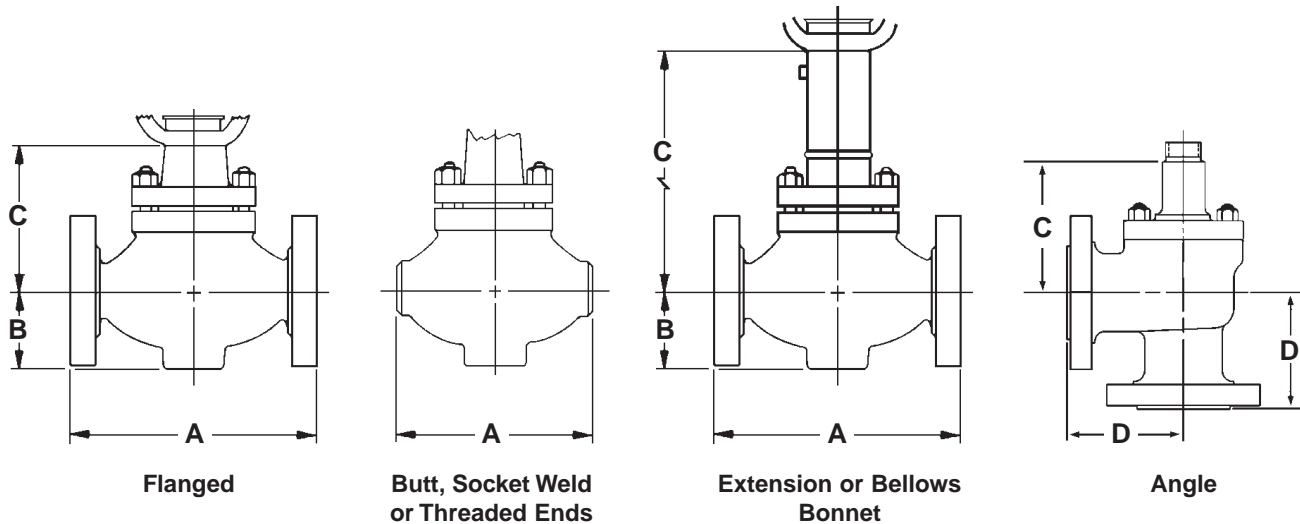


21000 Series Dimensions (mm)

Valve Size (mm)	A																		
	ANSI Class 150-600 (PN 20-100)		ANSI Class 900-1500 (PN 150-250)		ANSI Class 2500 (PN 420)		ANSI Class 150 (PN 20)		ANSI Class 300 (PN 50)		ANSI Class 600 (PN 100)		ANSI Class 900 (PN 150)		ANSI Class 1500 (PN 250)		ANSI Class 2500 (PN 420)		
	BW, SW, THD	BW, SW, THD	BW, SW, THD	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ
20	209	216	318	184		189	206	206	206	273	273	273	273	308	308				
25	209	216	318	184		197	210	210	210	292	292	292	292	318	318				
40	251	235	330	222		235	248	251	251	333	333	333	333	359	362				
50	285	292	375	254		267	282	286	289	375	375	378	378	413	416				
80	336	318		298		318	333	337	340	387	405	406	408						
100	394	368		352		368	384	394	390	464	466	483	485						
150	508			451		473	489	508	511										
200	610			543		568	580	610	612										

Valve Size (mm)	B															
	ANSI Class 150-300 (PN 20-50)		ANSI Class 600 (PN 100)	ANSI Class 150-600 (PN 20-100)		ANSI Class 900-1500 (PN 150-250)		ANSI Class 2500 (PN 420)		ANSI Class 150 (PN 20)		ANSI Class 300 (PN 50)	ANSI Class 600 (PN 100)	ANSI Class 900 (PN 150)	ANSI Class 1500 (PN 250)	ANSI Class 2500 (PN 420)
	BW	BW	SW & THD	BW	SW	BW	SW	RF	RTJ	RF & RTJ	RF & RTJ	RF & RTJ	RF & RTJ	RF & RTJ	RF & RTJ	
20			46		45			47	49			59	59	65	65	70
25			46		52			56	54			62	62	75	75	80
40			64		68			74	64			78	78	89	89	102
50	76	76	76	86	86	94	94	76				83	83	108	108	118
80	94	94		105				95				105	105	120	132	
100	118	140		142				114				127	127	145	155	
150	159	187						140				159	178			
200	168	168						172				190	210			

Dimensions (mm)



21000 Series Dimensions (mm)

Valve Size (mm)	C									
	Standard Bonnet			Extension Bonnet			Cryogenic Extension Bonnet			Bellows Bonnet
	ANSI Class 150-600 (PN 20-100)	ANSI Class 900-1500 (PN 150-250)	ANSI Class 2500 (PN 420)	ANSI Class 150-600 (PN 20-100)	ANSI Class 900-1500 (PN 150-250)	ANSI Class 2500 (PN 420)	ANSI Class 150-600 (PN 20-100)	ANSI Class 900-1500 (PN 150-250)	ANSI Class 2500 (PN 420)	ANSI Class 150-300 (PN 20-50)
20	140	193	193	252	272	272	602	602	602	427
25	140	193	193	252	272	272	602	602	602	427
40	140	229	229	252	297	297	601	602	602	387
50	140	229	272	252	297	312	601	602	602	387
80	203	285		353	345		702	703		606
100	205	374		403	438		702	701		606
150	284			424			808			756
200	422			577			883			

Valve Size (mm)	D																	
	ANSI Class 150-600 (PN 20-100)		ANSI Class 900-1500 (PN 150-250)		ANSI Class 2500 (PN 420)		ANSI Class 150 (PN 20)		ANSI Class 300 (PN 50)		ANSI Class 600 (PN 100)		ANSI Class 900 (PN 150)		ANSI Class 1500 (PN 250)		ANSI Class 2500 (PN 420)	
	BW, SW, THD	BW, SW, THD	BW, SW, THD	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	RF	RTJ	
20 ⁽¹⁾	105	108	159	92		99	105	105	105	137	137	137	137	154	154			
25 ⁽¹⁾	105	108	159	92		99	105	105	105	146	146	146	146	159	159			
40	125	118	165	111		117	124	125	125	167	167	167	167	179	181			
50	143	141	187	127		133	141	143	145	187	187	189	189	207	208			
80	168	159		149		159	167	168	170	194	203	194	204					
100	197	184		176		184	192	197	198	232	233	233	243					
150	254			226		236	244	254	256									
200	305			272		284	290	305	306									

1. 20mm and 25mm 21000 angle body is forged only.

Weights

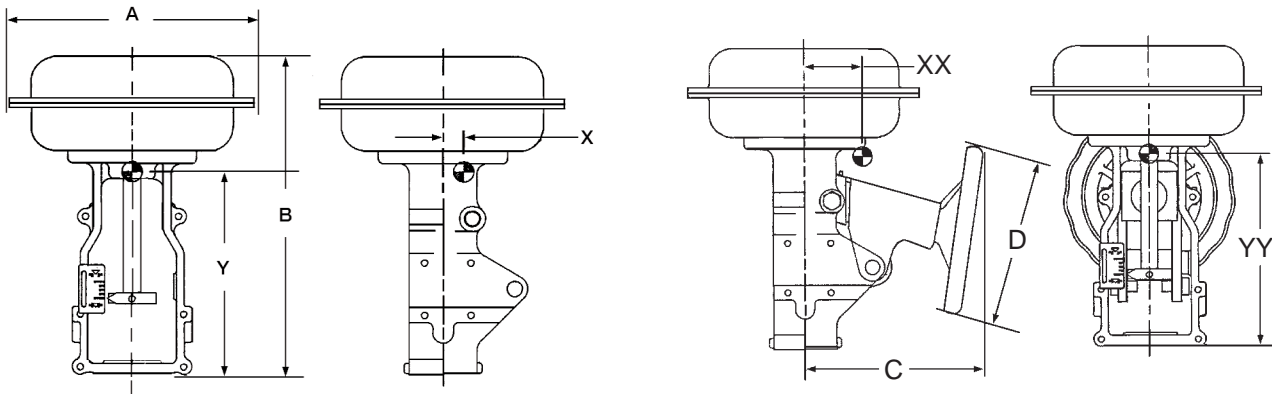
Body S/A with Standard Bonnet (lbs)

Valve Size (inches)	ANSI Class 150 – 300 (PN 20 – 50)		ANSI Class 600 (PN 100)		ANSI Class 900 – 1500 (PN 150 – 250)		ANSI Class 2500 (PN 420)	
	FLG	BW, SW & THD	FLG	BW, SW & THD	FLG	BW, SW & THD	FLG	BW, SW & THD
0.75	36	27	38	27	57	44	70	44
1	36	27	38	27	75	44	90	44
1.5	49	36	53	36	100	57	118	57
2	57	44	64	44	144	82	255	154
3	127	73	128	99	199	146		
4	196	121	216	135	409	318		
6	355	238	450	272				
8	682	610	771	610				

Body S/A with Standard Bonnet (kg)

Valve Size (mm)	ANSI Class 150 – 300 (PN 20 – 50)		ANSI Class 600 (PN 100)		ANSI Class 900 – 1500 (PN 150 – 250)		ANSI Class 2500 (PN 420)	
	FLG	BW, SW & THD	FLG	BW, SW & THD	FLG	BW, SW & THD	FLG	BW, SW & THD
20	16	12	17	12	26	20	32	20
25	16	12	17	12	34	20	41	20
40	22	16	24	16	45	26	53	26
50	26	20	29	20	65	37	116	70
80	58	33	58	45	90	66		
100	89	55	98	61	186	144		
150	161	108	204	123				
200	309	277	350	277				

Dimensions and Weights (in./lbs)



Shown with optional Handwheel

Dimensions and Weights

Actuator Size	Actuator Dimensions (inches)				Weights (lbs.)	
	A	B (Model 88)	C	D	Standard	w/Handwheel
6	11.50	15.54 (17.52)	10.00	9.00	45	60
10	14.50	19.58 (21.54)	10.90	12.00	85	105
16	18.75	28.22 (30.79)	14.00	18.00	210	245
23	21.63	30.71 (33.27)	16.00	18.00	265	320

Actuator Removal Clearance = 6 inches

Center of Gravity (inches)

Without Handwheel

Size	X	Y
6	.19	9.75
10	.0	12.88
16	.13	18.50
23	.06	21.13

With Handwheel

Size	XX	YY
6	1.25	9.13
10	0.88	12.00
16	1.38	16.75
23	1.38	19.00

Limit Stops (inches)

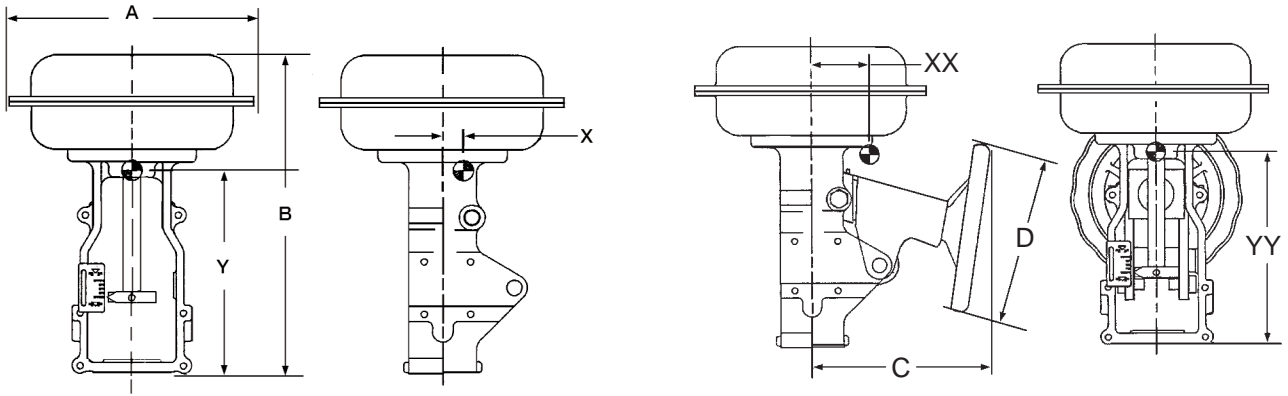
Up Stop

Size	Model	Overall Height B
6	87	19.45
10		25.43
16		36.42
23		38.84
6	88	19.16
10		25.06
16		35.48
23		38.65

Down Stop

Size	Model	Overall Height B
6	87	19.80
10		25.98
16		37.20
23		39.90
6	88	19.74
10		25.85
16		37.46
23		40.33

Dimensions and Weights (mm/kg)



Dimensions and Weights

Shown with optional Handwheel

Actuator Size	Actuator Dimensions (mm)				Weights (kg)	
	A	B (Model 88)	C	D	Standard	w/Handwheel
6	292	395 (445)	254	229	20	27
10	368	497 (547)	277	305	39	48
16	476	717 (782)	356	457	95	111
23	549	780 (845)	406	457	120	145

Actuator Removal Clearance = 152mm

Center of Gravity (mm)

Without Handwheel

Size	X	Y
6	5	248
10	0	327
16	3	470
23	2	537

With Handwheel

Size	XX	YY
6	32	232
10	22	305
16	35	425
23	35	483

Limit Stops (mm)

Up Stop

Size	Model	Overall Height B
6	87	494
10		646
16		925
23		987
6	88	487
10		636
16		901
23		982

Down Stop

Size	Model	Overall Height B
6	87	503
10		660
16		945
23		1014
6	88	501
10		657
16		952
23		1024

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