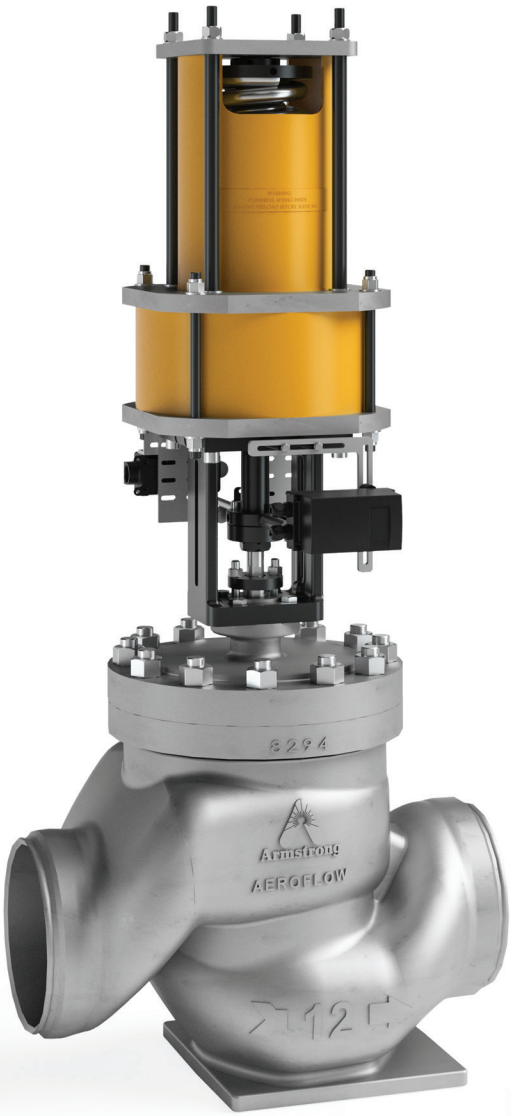
AEROFLOW

HIGH PERFORMANCE CONTROL VALVE SERIES

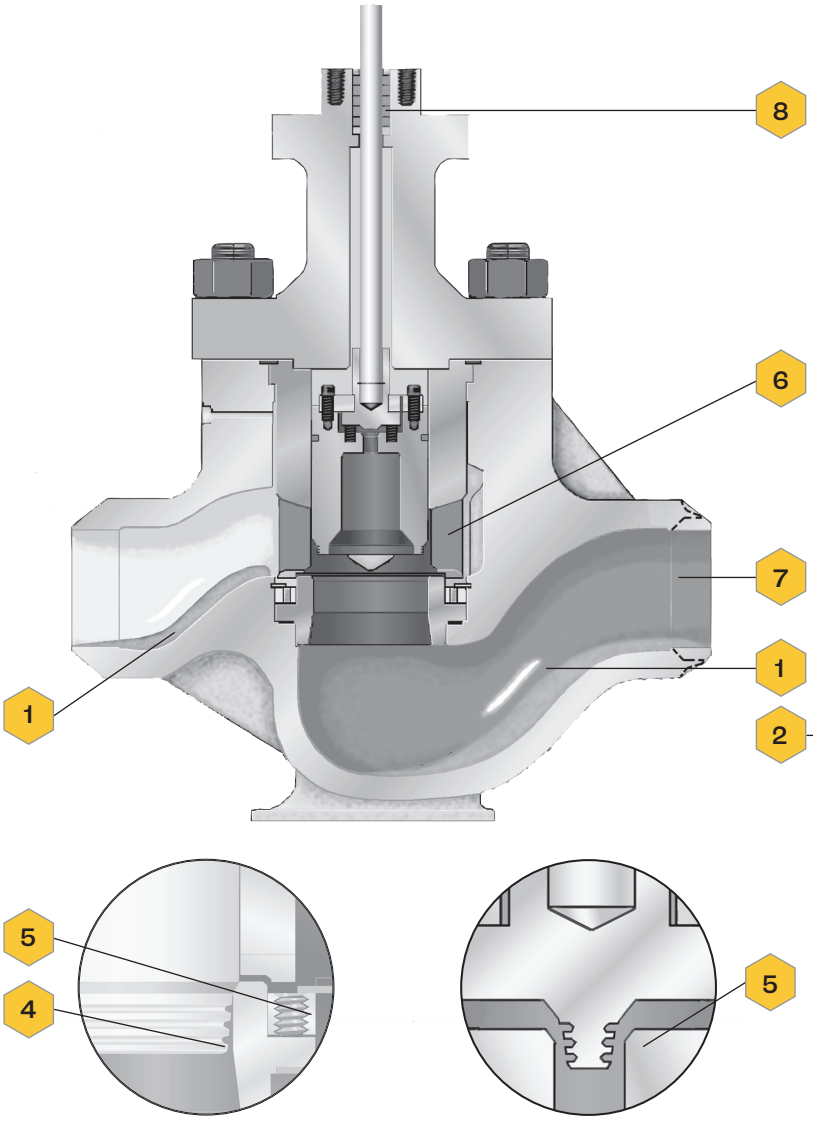


Armstrong®
EXPERIENCE MATTERS™

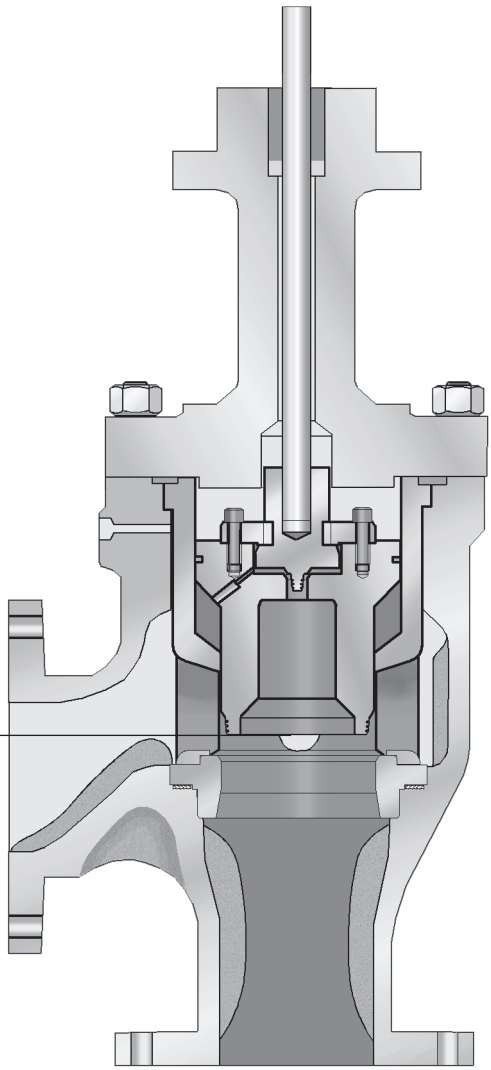
Innovative Technology for Critical Service Applications

The Armstrong Aeroflow control valve family represents an integrated valve solution. The Aeroflow integrates a proven state-of-the-art design into a modular design, aerodynamic/hydrodynamic flow, digital positioning, and "smart" valve technology. The benefits of the Aeroflow's technological advances is the most accurate and reliable control valve available in the world today.

Typical Globe Style Body w/ Pilot Balanced Trim



Typical Angle Style Body w/ High-Gain Trim 4" and Below



Armstrong International owns the exclusive rights to Aeroflow®, D-Boy™, DLO™, K-Max™, DOS, D-Series, and DOT™ Control Valves—all formerly sold by Leslie Controls. This includes the engineering and design of these product lines and all technical details.

Armstrong owns the exclusive rights to manufacture these legacy brands and OEM spare parts, adhering to the original specifications and drawings, and quality backed by the outstanding service, technical support and expertise Armstrong is known for. Armstrong International and its contractual representatives have exclusive rights to sell these product brands.

Solution-Engineered Features for Demanding Applications

1. Aerodynamic Flow Control
Aerodynamic flow control vanes are integrally cast into the inlet and outlet passages of Aeroflow bodies. Inlet vanes promote a steady state flow profile and divert flow around the far side of the cage to provide Cv/size ratios previously not offered in cage guided control valves. Outlet vanes reduce flow turbulence minimizing body scouring as well as reducing flow media generated noise.

2. Tight Shut-Off
Even small seat leaks can only get worse with time. The key to preventing seat erosion and wire drawing is to prevent leakage to begin with. Unlike competitive valves rated for Class IV, V, or VI shut-off, Aeroflow's pressure energized pilot balanced plug provides zero cc/min leak rates, without penalty of huge actuators, even with metal to metal seats at full body pressure/ temperature ratings. Aeroflow's shut-off capability is in a class all its own. The pilot balanced plug design minimizes actuator size and cost. Proven pilot design also eliminates the need for any piston seals to insure tight shut-off, greatly increasing the valve's reliability.

3. Parts Interchangeability
With the exception of bodies, all parts are interchangeable between globe and angle body styles with the same size and function. Balanced and unbalanced trim designs utilize the same body platforms. Facilities needing both globe and angle styles can minimize parts inventories, maintenance and training.

4. Tri-Sheer Protected Seat Design
Proven in more than 20 years of power plant service, Leslie's "protected" seat design protects Aeroflow's superior shut-off characteristic three ways. First, the protected seat prevents high velocity transients at opening or closure of the valve. Secondly, a five-stage pressure drop occurs near the seating position and last, the plug/seat surface is withdrawn from the direct flow to prevent direct particle impingement or clamping. The Tri-Sheer allows prolonged throttling at the seat without wire draw due to high clearance flow velocities.

5. Quick-Change Seat Design
In 4-16" body sizes, Aeroflow's seat ring is not threaded, welded, or loaded in place by the cage. Seat retention and seat gasket loading are accomplished with a stainless steel load ring and multiple silver-plated load screws for controlled seat gasket loading which is impervious to thermal shock.

6. Hung Cage for Thermal Expansion
The Quick-Change Seat features a cage which is hung in the body. This allows the cage to expand freely through sudden wide variations in fluid temperature. This tolerance for cage expansion solves the typical problems seen in cage retained designs such as cage warping, plug binding, galling, and crushed gaskets.

7. Custom Characterized Cage Throttling
Massive 400 Series stainless steel cage resists warping or deformation and provides plug/window throttling through closure. The flow window can be shaped to meet specific Cv requirements and system characteristics. This custom characterized cage is standard and is available with all plug/seat options.

LES-Sonic Cage
Single stage Les-Sonic cage can provide up to 25 dBA noise reduction in compressible fluid applications. When combined with a Les-Sonic Silencing Orifice (see bulletin 10/3.1.2) noise reductions of up to 35 dBA are possible.

LES-Cav Multi-Stage Cage
Les-Cav multi-stage trim is designed to throttle liquids with maximum pressure drops from 0-5000psi (345 bar) without damaging cavitation and resultant noise or vibration. Les-Cav is easily tailored to the exact requirements of each application.

Mini-P Multi-Stage Plug
The Mini-P multi-stage plug is designed for low-flow high- pressure drop cavitating services. The unique axial flow design will control cavitation and the resultant noise, vibration, and valve erosion damage. The pressure drop is taken along the length of the plug in the milled slots and chambered liner. The Mini-P can be easily tailored to the exact Cv requirements of each valve application.

C3 Combination Characterized Cage
Special characterized cages can be designed for applications that require high rangeability, with low end cavitation protection or low end noise abatement. This type of flexibility allows Armstrong to provide one valve where other manufacturers may require two. This lowers overall equipment, installation, and maintenance costs.

8. Packing – Laminated Graphite
Precision die-cut laminated graphite rings provide a reliable, tight stem seal up to operating temperatures of 1050°F (565°C). Braided Teflon Graphite (BTG) Split rings allow packing replacement without removal of actuator. Graphite impregnated PTFE provides 500°F (260°C) service temperature, better "memory" and sealing than pure PTFE rings, lowered stem hysteresis, and is ideal for fluids that contain suspended particles.

9. Oversized Outlet Connection
Aeroflow's outlet can be machined to accept an outlet pipe nominally one size larger than valve body size. In many cases this saves the cost of an outlet reducer and eliminates one field weld.

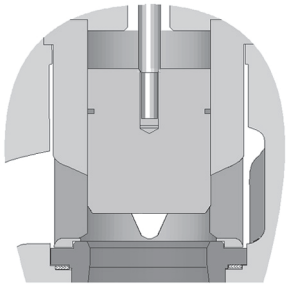
10. "Smart Valve" Provisions
The key to "smart" valve technology is accurate measurement of valve inlet and outlet pressures. Optional "dead zone" inlet/ outlet taps provide accurate, stable pressure measurements while eliminating adjacent piping penetration points.

Modular Trim

Aeroflow trim design allows you to choose the ideal cost/performance combination for each application. All trim modules are 100% field interchangeable providing extraordinary flexibility and value.

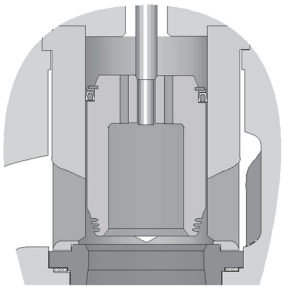
CAGE THROTTLING

UNBALANCED



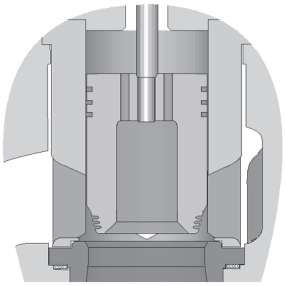
-20ºF — 1050ºF
-29ºC — 565ºC
Class IV/V/VI/Zero

BAL. LOW-TEMP



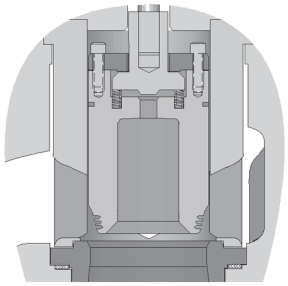
-20ºF — 500ºF -29ºC
— 260ºC
Class IV/V

BAL. HIGH-TEMP



-20ºF — 1050ºF -29ºC
— 565ºC
Class III

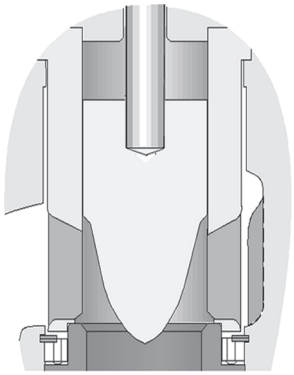
PILOT BALANCED



-20ºF — 1050ºF
-29ºC — 565ºC
Class IV/V/VI/Zero

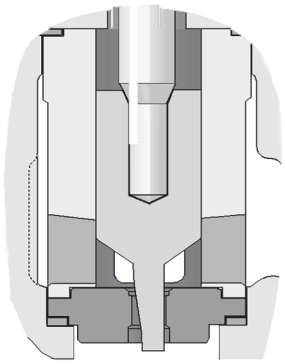
PLUG THROTTLING

UNBALANCED



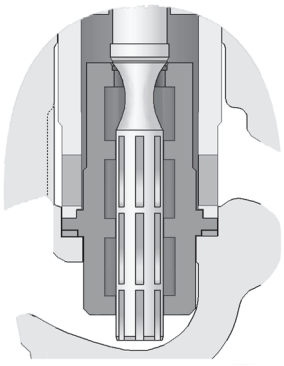
-20ºF — 1050ºF
-29ºC — 565ºC
Class IV/V/VI/Zero

MICROTAPER®



-20ºF — 1050ºF
-29ºC — 565ºC
Class IV/V/VI/Zero

MINI-P



-20ºF — 800ºF -29ºC
— 427ºC
Class IV/V/Zero

END CONNECTIONS

Globe Type

Valve Size in/mm	Unbalanced Cage Throttling	Balanced Cage Throttling	T2	Unbalanced Plug Throttling	Micro/Taper Mini-P
1 / 125				S RF RTJ	S RF RTJ
1.5 / 40				S RF RTJ	S RF RTJ
2 / 50	S B RF RTJ	S B RF RTJ	S B RF RTJ	S B RF RTJ	
3 / 75	B RF RTJ	B RF RTJ	B RF RTJ	B RF RTJ	
4 / 100	B RF RTJ	B RF RTJ	B RF RTJ		
6 / 150		B RF RTJ	B RF RTJ		
8 / 200		B RF RTJ	B RF RTJ		
10 / 250		B RF RTJ			
12 / 300		B RF RTJ			
14 / 350		B RF RTJ			
16 / 400		B RF RTJ			

Angle Type

Valve Size in/mm	Unbalanced Cage Throttling	Balanced Cage Throttling	T2	Unbalanced Plug Throttling	Micro/Taper Mini-P
1 / 125				S RF RTJ	S RF RTJ
1.5 / 40				S RF RTJ	S RF RTJ
2 / 50	S B RF RTJ	S B RF RTJ	S B RF RTJ	S B RF RTJ	
3 / 75	B RF RTJ	B RF RTJ	B RF RTJ	B RF RTJ	
4 / 100	B RF RTJ	B RF RTJ	B RF RTJ		
6 / 150		B RF RTJ	B RF RTJ		
8 / 200		B RF RTJ	B RF RTJ		

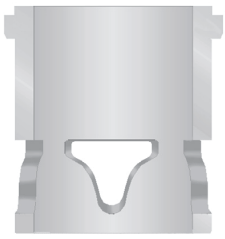
RF = Raised Face Flange S = Socket Weld End B = Butt Weld End RTJ = Ring Type Joint

FLOW CHARACTERISTICS What kind of flow response do you need from your valve? Characterized positioner cams or custom control software are only partial characteristic solutions as neither can change a valve's inherent rangeability. The only total solution is a custom valve characteristic, which Aeroflow can provide quickly and economically.

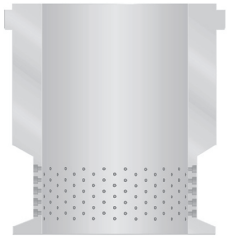
REDUCED TRIM - INFINITE OPTIONS - With Aeroflow's advanced SMART 3D DESIGN CAPABILITIES you can specify the capacity for your application needs, with no penalty in cost or delivery. Whether for future planning requirements, velocity control, or establishing a precise control band (i.e., 32-84% open), Aeroflow provides you with custom control at standard costs and lead times. If one of our eight "standard" reduced trim options isn't ideal, simply specify one that is. Standard reduced trim is available in reductions of .9,.8,.7,.6,.5,.4,.3, and.2 of full Cv.

CUSTOM CHARACTERIZED CONTROL UP TO 5 STAGES

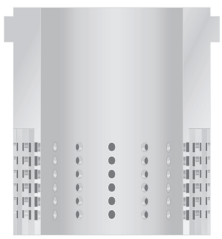
Standard Cage



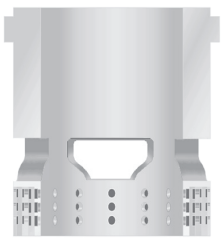
LES-Sonic Cage



LES-Cav V Cage



C³ Cage



CV TABLES – LINEAR CHARACTERISTICS

Unbalanced Plug Throttling / Flow Characteristics – Linear

Valve Size in/DN	Stroke in/mm	Stem Dia. in/mm	Seat Dia. in/mm	Min Cv STD/DPS[1]	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
1 / 25	1 / 25	0.75 / 20	1.00 / 25	0.20 / 0.06	0.32	0.64	0.96	1.28	1.6	1.92	2.24	2.56	2.88	3.2
					0.96	1.92	2.88	3.84	4.8	5.76	6.72	7.68	8.64	9.6
					1.6	3.2	4.8	6.4	8	9.6	11.2	12.8	14.4	16
1.5 / 40	1 / 25	0.75 / 20	1.50 / 40	0.20 / 0.10	0.6	1.2	1.8	2.4	3	3.6	4.2	4.8	5.4	6
					1.8	3.6	5.4	7.2	9	10.8	12.6	14.4	16.2	18
					3	6	9	12	15	18	21	24	27	30
2 / 50	1.5 / 40	0.50 / 13	2.25 / 57	0.30 / 0.10	1.14	2.28	3.42	4.56	5.7	6.84	7.98	9.12	10.26	11.4
					3.42	6.84	10.26	13.68	17.1	20.52	23.94	27.36	30.78	34.2
					5.7	11.4	17.1	22.8	28.5	34.2	39.9	45.6	51.3	57
3 / 80	2 / 50	0.75 / 20	3.00 / 80	0.40 / 0.20	2.4	4.8	7.2	9.6	12	14.4	16.8	19.2	21.6	24
					7.2	14.4	21.6	28.8	36	43.2	50.4	57.6	64.8	72
					12	24	36	48	60	72	84	96	108	120

Note: Minimum and Maximum Cv's are shown for reference. Custom Cv's are standard.

1 Minimum controllable Cv's are based on use of standard pneumatic positioner.

Cage Throttling / Flow Characteristics – Linear

Valve Size in/DN	Stroke in/mm	Stem Dia.[2] in/mm	Seat Dia. in/mm	Min Cv STD/DPS[1]	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
2 / 50	1.5 / 38	0.50 / 13	2.21 / 56	0.60 / 0.20	1.2	2.4	3.6	4.8	6	7.2	8.4	9.6	10.8	12
					3.6	7.2	10.8	14.4	18	21.6	25.2	28.8	32.4	36
					6	12	18	24	30	36	42	48	54	60
3 / 80	2 / 51	0.50 / 13	2.96 / 75	0.80 / 0.30	2.6	5.2	7.8	10.4	13	15.6	18.2	20.8	23.4	26
					7.8	15.6	23.4	31.2	39	46.8	54.6	62.4	70.2	78
					13	26	39	52	65	78	91	104	117	130
4 / 100	2 / 51	0.50 / 13	3.80 / 97	0.90 / 0.40	4	8	12	16	20	24	28	32	36	40
					12	24	36	48	60	72	84	96	108	120
					20	40	60	80	100	120	140	160	180	200
6 / 150	3 / 76	0.50 / 13	5.31 / 135	1.40 / 0.60	9	18	27	36	45	54	63	72	81	90
					27	54	81	108	135	162	189	216	243	270
					45	90	135	80	225	270	315	360	405	450
8 / 200	3 / 76	0.50 / 13	7.06 / 179	1.80 / 0.70	42	84	126	168	210	252	294	336	378	420
					70	140	210	280	350	420	490	560	630	700
8 / 200	4 / 102	0.50 / 13	7.06 / 179	1.80 / 0.70	80	160	240	320	400	480	560	640	720	800
10 / 250	3 / 76	1.25 / 32	8.5 / 216	5.02 / 2.00	61.2	122.4	183.6	244.8	306	367.2	428.4	489.6	550.8	612
					102	204	306	408	510	612	714	816	918	1020
12 / 300	4 / 102	1.25 / 32	8.5 / 216	5.02 / 2.00	116	232	348	464	590	696	812	928	1044	1160
12 / 300	4 / 102	1.25 / 32	10 / 254	6.00 / 2.60	78	15	234	312	390	468	546	624	702	780
					130	260	390	520	650	780	910	1040	1170	1300
12 / 300	4 / 102	1.25 / 32	10 / 254	6.00 / 2.60	147	294	441	588	735	882	1029	1176	1323	1470
14 / 350	3 / 76	1.25 / 32	11.86 / 301	7.50 / 3.75	99	198	297	396	495	594	693	792	891	990
					165	330	495	660	852	990	1155	1320	1485	1650
14 / 350	4 / 102	1.25 / 32	11.86 / 301	6.00 / 2.60	195	390	585	780	975	1170	1365	1560	1755	1950
16 / 400	3 / 76	1.25 / 32	12.5 / 318	7.50 / 3.75	111	222	333	444	555	666	777	888	999	1110
					185	370	55	740	925	1110	1295	1480	1665	1850
16 /400	4 / 102	1.25 / 32	12.5 / 318	7.50 / 3.75	220	440	660	880	1100	1320	1540	1760	1980	2200

Note: Standard travel maximum, 0.6 and 0.2 factor Cv's are shown for reference in 2-6" valve sizes. Standard travel maximum and 0.6 Cv's are shown for reference in 8-16" valves sizes. Maximum Cv's shown for extended travel. **Custom Cv's are standard.**

[1] Minimum controllable Cv's are based on use of standard pneumatic positioner (STD) or Armstrong Digital Positioning System (DPS).

[2] Stem diameter for T^2 trim is 1/2" fo 2-6" sizes and 3/4" for 8" sizes.

CV TABLES – EQUAL PERCENTAGES CHARACTERISTICS

Unbalanced Plug Throttling / Flow Characteristics – Linear

Valve Size in/DN	Stroke in/mm	Stem Dia. in/mm	Seat Dia. in/mm	Min Cv STD/DPS[1]	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
1 / 25	1 / 25	0.75 / 20	1.00 / 25	0.20 / 0.06	0.10	0.13	0.26	0.38	0.51	0.74	0.99	1.44	2.14	3.2
					0.29	0.38	0.77	1.15	1.54	2.21	2.98	4.32	6.43	9.6
					0.48	0.64	1.28	1.92	2.56	3.68	4.96	7.2	10.72	16
1.5 / 40	1 / 25	0.75 / 20	1.50 / 40	0.20 / 0.10	0.18	0.24	0.48	0.72	0.96	1.38	1.86	2.7	4.02	6
					0.54	0.72	1.44	2.16	2.88	4.14	5.58	8.1	12.06	18
					0.9	1.2	2.4	3.6	4.8	6.9	9.3	13.5	20.1	30
2 / 50	1.5 / 40	0.50 / 13	2.25 / 57	0.30 / 0.10	0.34	0.46	0.91	1.37	1.82	2.62	3.53	5.13	7.64	11.4
					1.03	1.37	2.74	4.1	5.47	7.87	10.6	15.39	22.91	34.2
					1.71	2.28	4.56	6.84	9.12	13.11	17.67	25.65	38.19	57
3 / 80	2 / 50	0.75 / 20	3.00 / 80	0.40 / 0.20	0.72	.096	1.92	2.88	3.84	5.52	7.44	10.8	16.08	24
					2.16	2.88	5.76	8.64	11.52	16.56	22.32	32.4	48.24	72
					3.6	4.8	9.6	14.4	19.2	27.6	37.2	54	80.4	120

Note: Minimum, Intermediate, and Maximum Cv's are shown for reference. Custom Cv's are standard.

1 Minimum controllable Cv's are based on use of standard pneumatic positioner (STD) or Armstrong Digital Positioning System (DPS).

Cage Throttling / Flow Characteristics – Linear

Valve Size in/DN	Stroke in/mm	Stem Dia.[2] in/mm	Seat Dia. in/mm	Min Cv STD/DPS[1]	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
2 / 50	1.5 / 38	0.50 / 13	2.21 / 56	0.60 / 0.20	0.3	0.4	0.8	1.2	1.6	2.3	3.1	4.5	6.7	10
					0.9	1.2	2.4	3.6	4.8	6.9	9.3	13.5	20.1	30
					1.5	2	4	6	8	11.5	15.5	22.5	33.5	50
3 / 80	2 / 51	0.50 / 13	2.96 / 75	0.80 / 0.30	0.72	0.96	1.92	2.88	3.84	5.52	7.44	10.8	16.1	24
					2.16	2.88	5.76	8.64	11.52	16.56	22.32	32.4	48.24	72
					3.6	4.8	9.6	14.4	19.2	27.6	37.2	54	80.4	120
4 / 100	2 / 51	0.50 / 13	3.80 / 97	0.90 / 0.40	1.08	1.44	2.88	4.32	5.76	8.28	11.16	16.2	24.1	36
					3.24	4.32	8.64	12.96	17.28	34.84	33.48	48.6	72.36	108
					5.4	7.2	14.4	21.6	28.8	41.4	55.8	81	121	180
6 / 150	3 / 76	0.50 / 13	5.31 / 135	1.40 / 0.60	2.4	3.2	6.4	9.6	12.8	18.4	24.9	36	53.6	80
					7.2	9.6	19.2	28.8	38.4	55.2	74.4	108	160.8	240
					12	16	32	48	64	92	124	180	268	400
8 / 200	3 / 76	0.50 / 13	7.06 / 179	1.80 / 0.70	12.96	17.28	34.56	51.84	69.12	99.36	133.9	194.4	289.4	432
					17.4	23.2	46.4	69.6	92.8	133.4	179.8	261	388.6	580
8 / 200	4 / 102	0.50 / 13	7.06 / 179	1.80 / 0.70	21.6	28.8	57.6	86.4	115.2	165.6	223.2	324	482.4	720
10 / 250	3 / 76	1.25 / 32	8.5 / 216	5.02 / 2.00	18.72	24.96	49.92	74.88	99.84	143.5	193.4	280.8	418.1	624
					25.5	34	68	102	136	195.5	263.5	382.5	569.5	850
12 / 300	4 / 102	1.25 / 32	8.5 / 216	5.02 / 2.00	31.2	41.6	83.2	124.8	166.4	239.2	322.4	468	696.8	1040
12 / 300	3 / 102	1.25 / 32	10 / 254	6.00 / 2.60	23.76	31.68	63.36	95.04	126.7	182.2	245.5	356.4	530.6	792
					32.4	43.2	86.4	129.6	172.8	248.4	334.8	486	723.6	1080
12 / 300	4 / 102	1.25 / 32	10 / 254	6.00 / 2.60	39.6	52.8	105.6	158.4	211.2	303.6	409.2	594	884.4	1320
14 / 350	3 / 76	1.25 / 32	11.86 / 301	7.50 / 3.75	31.5	42	84	126	168	241.5	325.5	472.5	703.5	1050
					41.1	54.8	109.6	164.4	219.2	315.1	424.7	616.5	917.9	1370
14 / 350	4 / 102	1.25 / 32	11.86 / 301	6.00 / 2.60	52.5	70	140	210	280	402.5	542.5	787.5	1173	1750
16 / 400	3 / 76	1.25 / 32	12.5 / 318	7.50 / 3.75	35.64	47.52	95.04	142.6	190.1	273.2	368.3	534.6	796	1188
					45.9	61.2	122.4	183.6	244.8	351.9	474.3	688.5	1025	1530
16 /400	4 / 102	1.25 / 32	12.5 / 318	7.50 / 3.75	59.4	79.2	158.4	237.6	316.8	455.4	613.8	891	1327	1980

Note: Standard travel maximum, 0.6 and 0.2 factor Cv's are shown for reference in 2-6" valve sizes. Standard travel maximum and 0.6 Cv's are shown for reference in 8-16" valves sizes. Maximum Cv's shown for extended travel. **Custom Cv's are standard.**

[1] Minimum controllable Cv's are based on use of standard pneumatic positioner (STD) or Armstrong Digital Positioning System (DPS).

[2] Stem diameter for T^2 trim is 1/2" of 2-6" sizes and 3/4" for 8" sizes.

Cv TABLES – ANTI-NOISE CHARACTERISTICS

Les Sonic Cage Throttling / Flow Characteristics – Linear							
Valve Size in/DN	Stroke in/mm	Stem Dia.[1] in/mm	Seat Dia. in/mm	Min Cv	ΔP /P1		
					≤ 0.6	> 0.6 ≤ 0.8	> 0.8 ≤ 0.99
2 / 50	1.5 / 38	0.50 / 13	2.21 / 56	0.60	45	30	17
2 / 50	2 / 51	0.50 / 13	2.21 / 56	0.60	60	40	23
3 / 80	2 / 51	0.50 / 13	2.96 / 75	0.80	100	55	30
3 / 80	2 / 51	0.50 / 13	2.96 / 75	0.80	150	82	45
4 / 100	2 / 51	0.50 / 13	3.80 / 97	0.90	150	75	40
4 / 100	3 / 76	0.50 / 13	3.80 / 97	0.90	225	110	60
6 / 150	3 / 76	1.00 / 25	5.31 / 135	1.40	330	150	85
6 / 150	4 / 102	1.00 / 25	5.31 / 135	1.40	440	200	115
8 / 200	3 / 76	0.50 / 13	7.06 / 179	1.80	430	200	110
8 / 200	4 / 102	1.25 / 32	7.06 / 179	1.80	575	265	150
8 /200	5 / 127	1.25 / 32	7.06 / 179	1.80	720	330	180
10 / 250	3 / 76	1.25 / 32	8.5 / 216	5.02	535	240	135
10 / 250	4 / 102	1.25 / 32	8.5 / 216	5.02	720	320	180
10 / 250	5 / 127	1.25 / 32	8.5 / 216	5.02	890	400	225
12 / 300	3 / 76	1.25 / 32	10 / 254	6.00	620	280	160
12 / 300	4 / 102	1.25 / 32	10 / 254	6.00	830	375	210
12 / 300	5 / 127	1.25 / 32	10 / 254	6.00	1030	470	270
14 / 350	3 / 76	1.25 / 32	11.86 / 301	7.50	760	340	190
14 / 350	4 / 102	1.25 / 32	11.86 / 301	7.50	1010	450	250
14 / 350	5 / 127	1.25 / 32	11.86 / 301	7.50	1270	570	315
16 / 400	3 / 76	1.25 / 32	12.5 / 318	7.50	790	350	200
16 / 400	3 / 76	1.25 / 32	12.5 / 318	7.50	1060	465	270
16 / 400	2	1.25 / 32	12.5 / 318	7.50	1320	585	335

[1] Stem diameter for T^2 trim is 1/2" of 2-6" sizes and 3/4" for 8" sizes.

Cv TABLES – ANTI-CAVITATION CHARACTERISTICS

Les-Cav I Cage Throttling / Flow Characteristics – Linear

Valve Size in/DN	Stroke in/mm	Stem Dia.[1] in/mm	Seat Dia. in/mm	Min Cv STD / DPS[1]	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
2 / 50	1.5 / 38	0.50 / 13	2.2 / 56	0.60	2.4	4.8	7.2	9.6	12	14.4	16.8	19.2	21.6	24
					4	8	12	16	20	24	28	32	36	40
2 / 50	2 / 51	0.50 / 13	2.2 / 56	0.60	5.2	10.4	15.6	20.8	26	31.2	36.4	41.6	46.8	52
3 / 80	2 / 51	0.50 / 13	2.96 / 75	0.80	4.5	9	13.5	18	22.5	27	31.5	36	40.5	45
					7.5	15	22.5	30	37.5	45	52.5	60	67.5	75
3 / 80	3 / 76	0.50 / 13	2.96 / 75	0.80	11	22	33	44	55	66	77	88	99	110
4 / 100	2 / 51	0.50 / 13	3.80 / 93	0.90	5.7	11.4	17.1	22.8	28.5	34.2	39.9	45.6	51.3	57
					9.5	19	28.5	38	47.5	57	66.5	76	85.5	95
4 / 100	3 / 76	0.50 / 13	3.80 / 93	0.90	14	28	42	56	70	84	98	112	125	140
6 / 150	3 / 76	1 / 25	5.31 / 135	1.40	12	24	36	48	60	72	84	96	108	120
					20	40	60	80	100	120	140	160	180	200
6 / 150	4 / 102	1 / 25	5.31 / 135	1.40	26.5	53	79.5	106	132.5	159	185.5	212	238.5	265
8 / 200	3 / 76	1.25 / 32	7.06 / 179		27	54	81	108	135	162	189	216	243	270
8 / 200	4 / 102	1.25 / 32	7.06 / 179	1.80	34	68	102	136	170	204	238	272	306	340
8 / 200	5 /127	1.25 / 32	7.06 / 179	1.80	43	86	129	172	215	258	301	344	387	430
10 / 250	3 / 76	1.25 / 32	8.50 / 216		32	64	96	128	160	192	224	256	288	320
10 / 250	4 / 102	1.25 / 32	8.50 / 216	5.02	42.5	85	127.5	170	212.5	255	297.5	340	382.5	425
10 / 250	5 / 127	1.25 / 32	8.50 / 216	5.02	53	106	159	212	265	318	371	424	477	530
12 / 300	3 / 76	1.25 / 32	10 / 254		37	74	111	148	185	222	259	296	333	370
12 / 300	4 / 102	1.25 / 32	10 / 254	5.6	49	98	147	196	245	294	343	392	441	490
12 / 300	5 / 127	1.25 / 32	10 / 254	5.6	62	124	186	248	310	372	434	496	558	620
16 / 400	3 / 76	1.25 / 32	12.5 / 318	6.9	47	94	141	188	235	282	329	376	423	470
16 / 400	4 / 102	1.25 / 32	12.5 / 318	6.9	63	126	189	252	315	378	441	504	567	630
16 / 400	5 / 127	1.25 / 32	12.5 / 318	6.9	78	156	234	312	390	468	546	624	702	780

Note: Standard travel maximum and 0.6 factor Cv's are shown for reference in 2-6" valve sizes for reference. Maximum Cv's are shown otherwise. **Custom Cv's are standard.**

[1] Stem diameter for T[2] trim is 1/2" of 2-6" sizes and 3/4" for 8" sizes.

Les-Cav II Cage Throttling / Flow Characteristics – Linear

Valve Size in/DN	Stroke in/mm	Stem Dia.[1] in/mm	Seat Dia. in/mm	Min Cv STD / DPS[1]	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
2 / 50	1.5 / 38	0.50 / 13	2.21 / 56	0.60	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9
					1.5	3	4.5	6	7.5	9	10.5	12	13.5	15
2 / 50	2 / 51	0.50 / 13	2.21 / 56	0.60	2	4	6	8	10	12	14	16	18	1 20
3 / 80	2 / 51	0.50 / 13	2.96 / 75	0.80	1.68	3.36	5.04	6.72	8.4	10	11.76	13.4	15.1	16 8
					2.8	5.6	8.4	11.2	14	16.8	19.6	22.4	25.2	28
3 / 80	3 / 76	0.50 / 13	2.96 / 75	0.80	4.8	9.6	14.4	19.2	24	28.8	33.6	38.4	43.2	48
4 / 100	2 / 51	0.50 / 13	3.80 / 93	0.90	2.7	5.4	8.1	10.8	13.5	16.2	18.9	21.6	24.3	27
					4.5	9	13.5	18	22.5	27	31.5	36	40.5	45
4 / 100	3 / 76	0.50 / 13	3.80 / 93	0.90	7.6	15.2	22.8	30.4	38	45.6	53.2	60.8	68.4	76
6 / 150	3 / 76	1 / 25	5.31 / 135	1.40	6.6	13.2	19.8	26.4	33	39.6	46.2	52.8	59.4	66
					11	22	33	44	55	66	77	88	99	1 110
6 / 150	4 / 102	1 / 25	5.31 / 135	1.40	17.5	35	52.5	70	87.5	105	122.5	140	157.5	175
8 / 200	3 / 76	1.25 / 32	7.06 / 179	1.80	9	18	27	36	45	54	63	72	81	1 90
					15	30	45	60	75	90	105	120	135	150
8 / 200	3 / 76	1.25 / 32	7.06 / 179	1.80	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225
8 / 200	3 / 76	1.25 / 32	7.06 / 179	1.80	30	60	90	120	150	180	210	240	270	300
10 / 250	3 / 76	1.25 / 32	8.50 / 216	5.02	11.1	22.2	33.3	44.4	55.5	66.6	77.7	88.8	99.9	111
					18.5	37	55.5	74	92.5	111	129.5	148	166.5	185
10 / 250	4 / 102	1.25 / 32	8.50 / 216	5.02	25	50	75	100	125	150	175	200	225	250
10 / 250	5 / 127	1.25 / 32	8.50 / 216	5.02	31	62	93	124	155	186	217	248	279	310
12 / 300	3 / 76	1.25 / 32	10 / 254	6.0	12.6	25.2	37.8	50.4	63	75.6	88.2	100.8	113.4	126
					21	42	63	84	105	126	147	168	189.1	210
12 / 300	4 / 102	1.25 / 32	10 / 254	5.6	28	56	84	112	140	168	196	224	252	280
12 / 300	5 / 127	1.25 / 32	10 / 254	5.6	35	70	105	140	175	210	245	280	315	350

Note: Standard travel maximum and 0.6 factor Cv's are shown for reference. Maximum Cv's are shown otherwise. **Custom Cv's are standard.**

[1] Stem diameter for T[2] trim is 1/2" of 2-6" sizes and 3/4" for 8" sizes.

Cv TABLES – ANTI-CAVITATION CHARACTERISTICS (CONT'D)

Les-Cav III Cage Throttling / Flow Characteristics – Linear

Valve Size in/DN	Stroke in/mm	Stem Dia.[2] in/mm	Seat Dia. in/mm	Min Cv STD/DPS[1]	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
2 / 50	1.5 / 38	0.50 / 13	2.21 / 56	0.60	.54	1.08	1.62	2.16	2.7	3.24	3.78	4.32	4.86	5.4
					0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.0
2 / 50	2 / 51	0.50 / 13	2.21 / 56	0.60	1.2	2.4	3.6	4.8	6	7.2	8.4	9.6	10.8	12
3 / 80	2 / 51	0.50 / 13	2.96 / 75	0.80	1.08	2.16	3.24	4.32	5.4	6.48	7.56	8.64	9.72	10.8
					1.8	3.6	5.4	7.2	9	10.8	12.6	14.4	15.2	18
3 / 80	3 / 76	0.50 / 13	2.96 / 75	0.80	2.8	5.6	8.4	11.2	14	16.8	19.6	22.4	25.2	28
4 / 100	2 / 51	0.50 / 13	3.80 / 93	.90	1.62	3.24	4.86	6.48	8.1	9.72	11.3	13	14.6	16.2
					2.7	5.4	8.1	10.8	13.5	16.2	18.9	21.6	24.3	27
4 / 100	3 / 76	0.50 / 13	3.80 / 93	.90	4.6	9.2	13.8	18.4	23	27.6	32.2	36.8	41.4	46
6 / 150	3 / 76	1.00 / 25	5.31 / 135	1.40	3.48	6.96	10.4	13.9	17.4	20.9	24.4	27.8	31.3	34.8
					5.8	11.6	17.4	23.2	29	34.8	40.6	46.4	52.2	58
6 / 150	4 / 102	1.00 / 25	5.31 / 135	1.40	9	18	27	36	45	54	63	72	81	90
8 / 200	3 / 76	1.25 / 32	7.06 / 179	1.80	6.36	12.72	19.1	25.4	31.8	38.2	44.6	50.9	57.2	63.6
					10.6	21.2	31.8	42.4	53	63.6	74.2	84.8	95.4	106
8 / 200	4 / 1023	1.25 / 32	7.06 / 179	1.80	14	28	42	56	70	84	98	112	126	140
8 / 200	5 / 1273	1.25 / 32	7.06 / 179	1.80	18	36	54	72	90	108	126	144	162	180

Note: Maximum and 0.6 factor Cv's are shown for reference. **Custom Cv's are standard.**

[1] Stem diameter for T[2] trim is 1/2" of 2-6" sizes and 3/4" for 8" sizes.

Les-Cav IV Cage Throttling / Flow Characteristics – Linear

Valve Size in/DN	Stroke in/mm	Stem Dia.[2] in/mm	Seat Dia. in/mm	Min Cv STD/DPS[1]	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
2 / 50	1.5 / 38	0.50 / 13	2.21 / 56	0.60	0.36	0.72	1.08	1.44	1.8	2.16	2.52	2.88	3.24	3-6
					0.6	1.2	1.8	2.4	3	3.6	4.2	4.8	5.4	6
2 / 50	2 / 51	0.50 / 13	2.21 / 56	0.60	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7
3 / 80	2 / 51	0.50 / 13	2.96 / 75	0.80	0.6	1.2	1.8	2.4	3	3.6	4.2	4.8	5.4	6
					1	2	3	4	5	6	7	8	9	10
3 / 80	3 / 76	0.50 / 13	2.96 / 75	0.80	1.4	2.8	4.2	5.6	7	8.4	9.8	11.2	12.6	14
4 / 100	2 / 51	0.50 / 13	3.80 / 93	.90	1.08	2.16	3.24	4.32	5.4	6.48	7.56	8.64	9.72	10.8
					1.8	3.6	5.4	7.2	9	10.8	12.6	14.4	16.2	18
4 / 100	3 / 76	0.50 / 13	3.80 / 93	.90	2.6	5.2	7.8	10.4	13	15.6	18.2	20.8	23.4	26
6 / 150	3 / 76	1.00 / 25	5.31 / 135	1.40	2.28	4.56	6.84	9.12	11.4	13.7	16	18.2	20.5	22.8
					3.8	7.6	11.4	15.2	19	22.8	26.6	30.4	34.2	38
6 / 150	3 / 76	1.00 / 25	5.31 / 135	1.40	6	12	18	24	30	36	42	48	54	60
8 / 200	3 / 76	1.25 / 32	7.06 / 179	1.80	3.48	6.96	10.44	13.92	17.4	20.9	24.4	27.8	31.3	34.8
					5.8	11.6	17.4	23.2	29	34.8	40.6	46.4	52.2	58
8 / 200	4 / 102	1.25 / 32	7.06 / 179	1.80	8.7	17.4	26.1	34.8	43.5	52.2	60.9	69.6	78.3	87
8 / 200	5 / 127	1.25 / 32	7.06 / 179	1.80	11.6	23.2	34.8	46.4	58	69.6	81.2	92.8	104	116

Note: Maximum and 0.6 factor Cv's are shown for reference. **Custom Cv's are standard.**

[1] Stem diameter for T[2] trim is 1/2" of 2-6" sizes and 3/4" for 8" sizes.

Cv TABLES – ANTI-CAVITATION CHARACTERISTICS (CONT'D)

Les-Cav V Cage Throttling / Flow Characteristics – Linear

Valve Size in/DN	Stroke in/mm	Stem Dia.[1] in/mm	Seat Dia. in/mm	Min Cv	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
2 / 50	1.5 / 38	0.50 / 13	2.21 / 56	0.60	0.24	0.48	0.72	0.96	1.2	1.44	1.68	1.92	2.16	2.4
					0.4	0.8	1.2	1.6	2	2.4	2.8	3.2	3.6	4
2 / 50	2 / 51	0.50 / 13	2.21 / 56	0.60	0.6	1.2	1.8	2.4	3	3.6	4.2	4.8	5.4	6
3 / 80	2 / 51	0.50 / 13	2.96 / 75	0.80	0.48	0.96	1.44	1.92	2.4	2.88	3.36	3.84	4.32	4.8
					0.8	1.6	2.4	3.2	4	4.8	5.6	6.4	7.2	8
3 / 80	3 / 76	0.50 / 13	2.96 / 75	0.80	1.2	2.4	3.6	4.8	6	7.2	8.4	9.6	10.8	12
4 / 100	2 / 51	0.50 / 13	3.80 / 93	.90	0.78	1.56	2.34	3.12	3.9	4.68	5.46	6.24	7.02	7.8
					1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	11.7	13
4 / 100	3 / 76	0.50 / 13	3.80 / 93	.90	2.2	4.4	6.6	8.8	11	13.2	15.4	17.6	19.8	22
6 / 150	3 / 76	1 / 25	5.31 / 135	1.40	1.68	3.36	5.04	6.72	8.4	10.1	11.8	13.4	15.1	16.8
					2.8	5.6	8.4	11.2	14	16.8	19.6	22.4	25.2	28
6 / 150	4 / 102	1 / 25	5.31 / 135	1.40	5.2	10.4	15.6	20.8	26	31.2	36.4	41.6	46.8	52
8 / 200	3 / 76	1.25 / 32	7.06 / 179	1.80	3	6	9	12	15	18	21	24	27	30
					5	10	15	20	25	30	35	40	45	50
8 / 200	4 / 102	1.25 / 32	7.06 / 179	1.80	7.5	15	22.5	30	37.5	45	52.5	6	67.5	75
8 / 200	5 / 127	1.25 / 32	7.06 / 179	1.80	10	20	30	40	50	60	70	80	90	100

Note: Maximum and 0.6 factor Cv's are shown for reference. Maximum Cv's shown for extended travel. **Custom Cv's are standard.**

[1] Stem diameter for T[2] trim is 1/2" of 2-6" sizes and 3/4" for 8" sizes.

Cv TABLES – MINI-P / MICROTAPER® CHARACTERISTIC

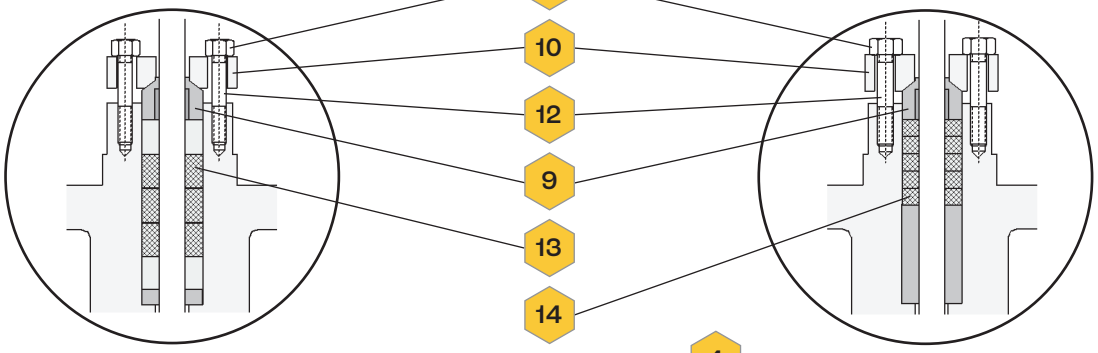
Mini-P (3-Stage) Plug Throttling / Flow Characteristic - Linear

Valve Size in/DN	Stroke in/mm	Stem Dia. in/mm	Seat Dia. in/mm	Min Cv	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
1 / 25	0.75 / 20	0.50 / 13	0.875 / 22	0.08	0.12	0.24	0.36	0.48	0.6	0.72	0.84	0.96	10.8	1.2
					0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3
					0.6	1.2	1.8	2.4	3	3.6	4.2	4.8	5.4	6
1 / 25	0.75 / 20	0.50 / 13	0.875 / 22	0.80	0.12	0.24	0.36	0.48	0.6	0.72	0.84	0.96	10.8	1.2
					0.3	0.6	0.9	1.2	1.5	1.8	2.1	2.4	2.7	3
					0.5	1	1.5	2	2.5	3	3.5	4	4.5	5

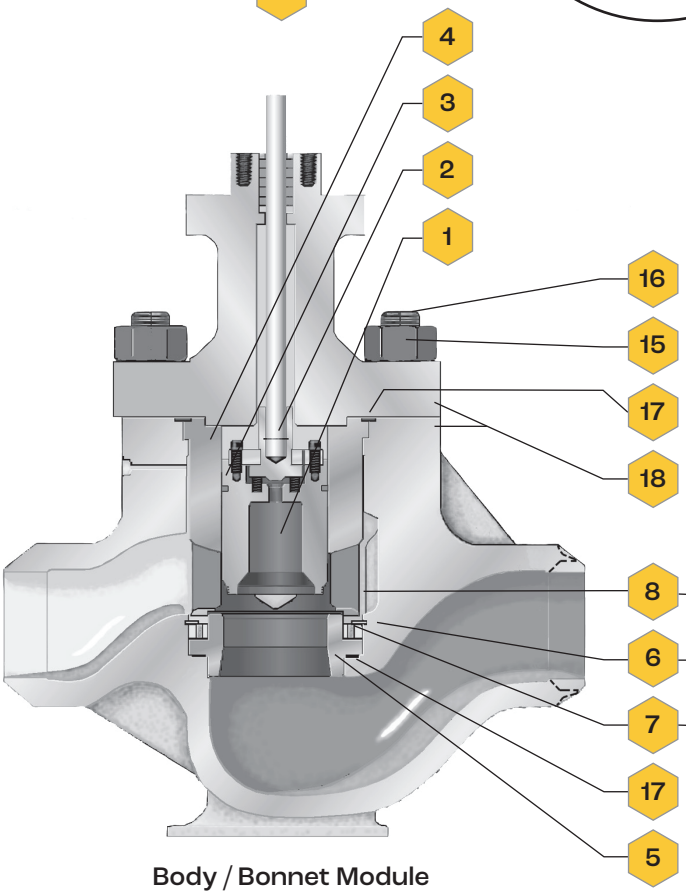
MicroTaper Plug Throttling / Flow Characteristic - Linear

Valve Size in/DN	Stroke in/mm	Stem Dia. in/mm	Seat Dia. in/mm	Min Cv	Rated Cv @ Percent of Stroke									
					10	20	30	40	50	60	70	80	90	100
1 / 25	0.75 / 20	0.50 / 13	0.375 / 9.5	0.01	0.03	0.06	0.09	0.12	0.15	0.18	0.21	0.24	0.27	0.3
					0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54	0.6
					0.12	0.24	0.36	0.48	0.6	0.72	0.84	0.96	1.08	1.2
1.5 / 40	75 / 20	0.50 / 13	0.375 / 9.5	0.02	0.03	0.06	0.09	0.12	0.15	0.18	0.21	0.24	0.27	0.3
					10 06	0.12	0.18	0.24	0.3	0.36	0.42 1	0.48 2	0.54 1	0.6
					0.12	0.24	0.36	0.48	0.6	0.72	0.84	0.96	1.08	1.2

Packing Box Detail w/ BTG Packing

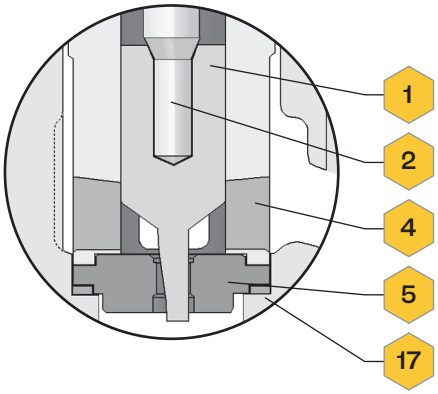


Packing Box Detail w/ Laminated Graphite Packing

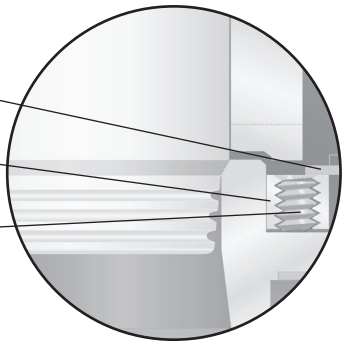


Body / Bonnet Module Shown with Unbalanced Cage Throttling Trim

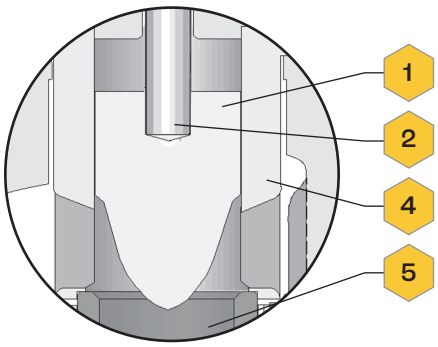
MicroTaper® Trim



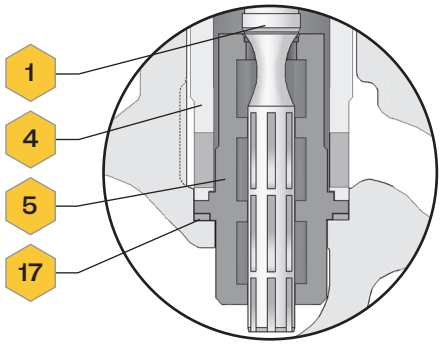
Load Ring Detail
(Cage Throttling 4" Valve Size Only)



Unbalanced Plug Throttling Trim



Mini-P Multi-Stage Plug Throttling Trim

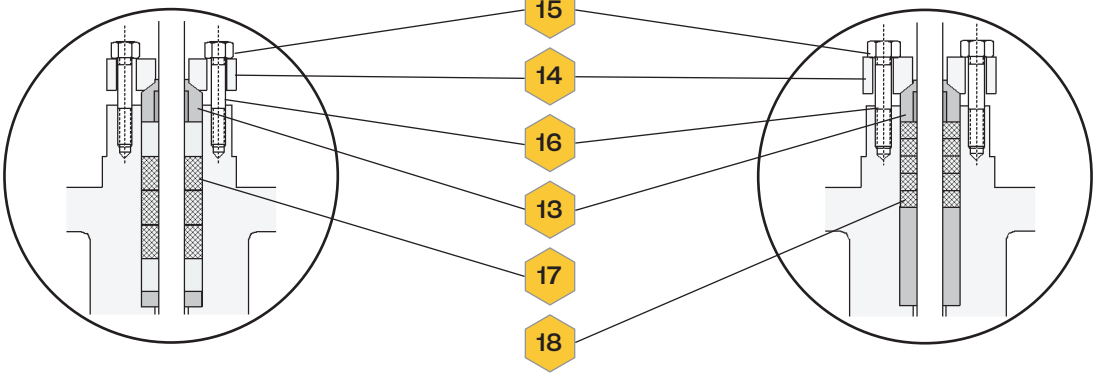


MATERIALS/TEMPERATURE SPECIFICATIONS – UNBALANCED TRIM

No.	Description	Material Specifications	Operational Temperature Range
Trim Modules – Standard Materials			
Unbalanced Cage Throttling			
1	*Valve Plug	AISI 420 Stainless Steel	-20 – 1050°F (-29 – 565°C)
2	*Valve Stem	Nitronic 60®	-20 – 1050°F (-29 – 565°C)
3	Piston Ring	Stellite®	-20 – 1050°F (-29 – 565°C)
4	*Cage	AISI 440 Stainless Steel	-20 – 800°F (-29 – 427°C)
4	*Cage	AISI 440 Stainless Steel (Malcomized)	800 – 1050°F (-29 – 565°C)
5	*Seat Ring	AISI 440 Stainless Steel	-20 – 1050°F (-29 – 565°C)
6	[1]Load Ring	SISI 410 Stainless Steel	-20 – 1050°F (-29 – 565°C)
7	[1]Load Screws	300 Series Stainless Steel	-20 – 1050°F (-29 – 565°C)
8	[1]Retaining Ring	AISI 302 Stainless Steel	-20 – 1050°F (-29 – 565°C)
Mini-P			
1	Valve Plug	13-8 MO Stainless Steel	-20 – 800°F (-29 – 427°C)
5	Seat Ring	AISI 440 Stainless Steel	-20 – 800°F (-29 – 427°C)
MicroTaper®			
1	Valve Plug	AISI 431 Stainless Steel	-20 – 1050°F (-29 – 565°C)
Trim Modules – NACE Materials			
Unbalanced Cage Throttling			
1	Valve Plug	AISI 316 SST (hardfacing available)	-20 – 600°F (-29 – 315°C)
2	*Valve Stem	AISI 316 Stainless Steel	-20 – 600°F (-29 – 315°C)
3	Piston Ring	Stellite®	-20 – 600°F (-29 – 315°C)
4	*Cage	AISI 410 Stainless Steel (w/coating)	-20 – 600°F (-29 – 315°C)
5	*Seat Ring	AISI 316 SST (hardfacing available)	-20 – 600°F (-29 – 315°C)
6	[1]Load Ring	Inconel X750®	-20 – 600°F (-29 – 315°C)
7	[1]Load Screws	AISI 316 Stainless Steel	-20 – 600°F (-29 – 315°C)
8	[1]Retaining Ring	AISI 302 Stainless Steel	-20 – 600°F (-29 – 315°C)
Unbalanced Plug Throttling			
1	Valve Plug	AISI 316 Stainless Steel	-20 – 600°F (-29 – 315°C)
5	Seat Ring	AISI 316 Stainless Steel	-20 – 600°F (-29 – 315°C)
Mini-P			
1	Valve Plug	17-4 PH Stainless Steel	-20 – 600°F (-29 – 315°C)
5	Seat Ring	AISI 410 Stainless Steel	-20 – 600°F (-29 – 315°C)
MicroTaper®			
1	Valve Plug	Stellite®	-20 – 600°F (-29 – 315°C)
Packing Modules (Standard & NACE)			
9	*Packing Follower	AISI 416 Stainless Steel	-20 – 1050°F (-29 – 565°C)
10	*Packing Flange	AISI 416 Stainless Steel	-20 – 1050°F (-29 – 565°C)
11	*Hex Nut	AISI 416 Stainless Steel	-20 – 1050°F (-29 – 565°C)
12	*Studs	ASTM A-193	-20 – 1050°F (-29 – 565°C)
13	*Packing Set	BTG	-20 – 1050°F (-29 – 565°C)
14	*Packing Set	Laminated Graphite	-20 – 1050°F (-29 – 565°C)
Body / Bonnet Modules (Standard & NACE)			
15	Hvy Hex Nut	ASTM A-194 Gr.7	-20 – 1050°F (-29 – 565°C)
15	Hvy Hex Nut (WCB Body)	ASTM A-194 Gr.2H	-20 – 800°F (-29 – 427°C)
16	Stud	ASTM A-193 Gr.B16	-20 – 1050°F (-29 – 565°C)
16	Stud (WCB Body)	ASTM A-193 Br. B7	-20 – 800°F (-29 – 427°C)
17	*Gasket	Inconel® 600 Graphite	-20 – 1050°F (-29 – 565°C)
18	Body/Bonnet	ASTM A-216 Gr.WCB	-20 – 800°F (-29 – 427°C)
18	Body/Bonnet	ASTM A-351 Gr.CF8M	-20 – 1050°F (-29 – 565°C)
18	Body/Bonnet	ASTM A-217 Gr.WC9	-20 – 1050°F (-29 – 565°C)

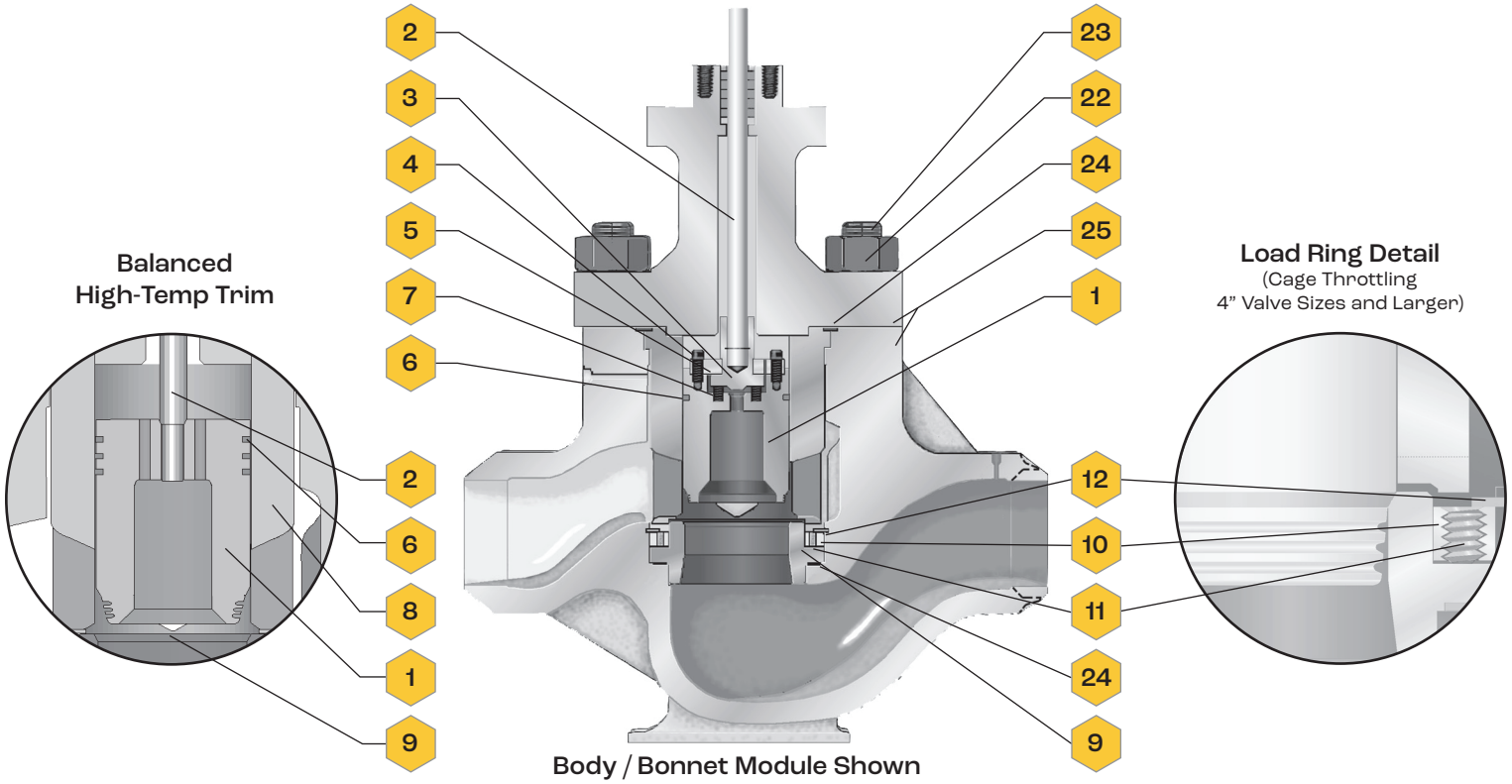
*Included in all other trim modules unless otherwise listed.
[1] Cage Guided 4" valve size only.

Packing Box Detail w/ BTG Packing



Packing Box Detail w/ Laminated Graphite Packing

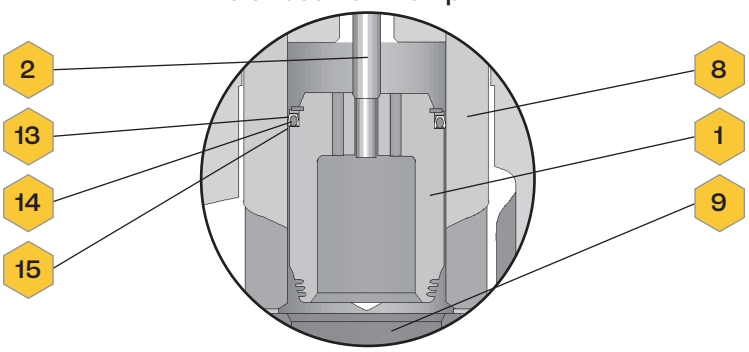
Balanced High-Temp Trim



Load Ring Detail
(Cage Throttling
4" Valve Sizes and Larger)

Body / Bonnet Module Shown with Pilot Balanced Trim

Balanced Low-Temp Trim



MATERIALS/TEMPERATURE SPECIFICATIONS – TRIM MODULES

No.	Description	Material Specifications	Operational Temperature Range
Trim Modules – Standard Materials			
Pilot Balanced / T2 / Balanced High-Temp			
1	*Valve Plug	AISI 420 Stainless Steel	-20 – 1050°F (-29 – 565°C)
2	*Valve Stem	Nitronic 60®	-20 – 1050°F (-29 – 565°C)
3	Pilot Plug	AISI 431 Stainless Steel	-20 – 1050°F (-29 – 565°C)
4	Socket Heat Cap Screw	AISI 18-8 Stainless Steel	-20 – 1050°F (-29 – 565°C)
5	Pilot Plate	AISI 416 Stainless Steel	-20 – 1050°F (-29 – 565°C)
6	*Piston Ring	Stellite®	-20 – 1050°F (-29 – 565°C)
7	Spring	Inconel®	-20 – 1050°F (-29 – 565°C)
8	*Cage	AISI 440 Stainless Steel	-20 – 800°F (-29 – 427°C)
8	*Cage	AISI 440 Stainless Steel (Malcomized)	800 – 1050°F (427 – 565°C)
9	*Seat Ring	AISI 440 Stainless Steel	-20 – 1050°F (-29 – 565°C)
10	[1]Load Ring	AISI 410 Stainless Steel	-20 – 1050°F (-29 – 565°C)
11	[1]Load Screws	300 Series Stainless Steel	-20 – 1050°F (-29 – 565°C)
12	[1]Retaining Ring	AISI 302 Stainless Steel	-20 – 1050°F (-29 – 565°C)
Balanced Low Temp			
13	Retaining Ring	AISI 302 Stainless Steel	-20 – 1050°F (-29 – 565°C)
14	Seal Retainer	AISI 303	-20 – 1050°F (-29 – 565°C)
15	Seal	PTFE	-20 – 500°F (-29 – 260°C)
Trim Modules – NACE Materials			
Pilot Balanced / T2 / Balanced High-Temp			
1	*Valve Plug	AISI 316 SST (hardfacing available)	-20 – 600°F (-29 – 315°C)
2	*Valve Stem	AISI 316 Stainless Steel	-20 – 600°F (-29 – 315°C)
3	Pilot Plug	AISI 316 Stainless Steel	-20 – 600°F (-29 – 315°C)
4	Socket Cap Head Screw	AISI 18-8 Stainless Steel	-20 – 600°F (-29 – 315°C)
5	Pilot Plate	AISI 316 Stainless Steel	-20 – 600°F (-29 – 315°C)
6	*Piston Ring	Stellite®	-20 – 600°F (-29 – 315°C)
7	Spring	Inconel®	-20 – 600°F (-29 – 315°C)
8	*Cage	AISI 410 SST w/ Coating	-20 – 600°F (-29 – 315°C)
9	*Seat Ring	AISI 316 Stainless Steel	-20 – 600°F (-29 – 315°C)
10	[1]Load Ring	Inconel X750®	-20 – 600°F (-29 – 315°C)
11	[1]Load Screws	300 Series Stainless Steel	-20 – 600°F (-29 – 315°C)
12	[1]Retaining Ring	AISI 302 Stainless Steel	-20 – 600°F (-29 – 315°C)
Balanced Low Temp			
13	*Packing Follower	300 Series Stainless Steel	-20 – 600°F (-29 – 315°C)
14	*Packing Flange	300 Series Stainless Steel	-20 – 600°F (-29 – 315°C)
15	*Hex Nut	PTFE	-20 – 500°F (-20 – 260°C)
Packing Modules (Standard & NACE)			
16	*Packing Follower	AISI 416 Stainless Steel	-20 – 1050°F (-29 – 565°C)
17	*Packing Flange	AISI 416 Stainless Steel	-20 – 1050°F (-29 – 565°C)
18	*Hex Nut	AISI 416 Stainless Steel	-20 – 1050°F (-29 – 565°C)
19	*Studs	ASTM A-193 B16	-20 – 1050°F (-29 – 565°C)
20	*Packing Set	BTG	-20 – 500°F (-20 – 260°C)
21	*Packing Set	Laminated Graphite	-20 – 1050°F (-29 – 565°C)
Body / Bonnet Modules (Standard & NACE)			
22	Hvy Hex Nut	ASTM A-194 Gr.7	-20 – 1050°F (-29 – 565°C)
22	Hvy Hex Nut (WCB Body)	ASTM A-194 Gr.2H	-20 – 800°F (-29 – 427°C)
23	Stud 1 1/4-8	ASTM A-193 Gr.B16	-20 – 1050°F (-29 – 565°C)
23	Stud 1 1/4-8 (WCB Body)	ASTM A-193 Br.B7	-20 – 800°F (-29 – 427°C)
24	Gasket	Inconel® 600 Graphite	-20 – 1050°F (-29 – 565°C)
25	Body/Bonnet	ASTM A-216 Gr.WCB	-20 – 800°F (-29 – 427°C)
25	Body/Bonnet	ASTM A-351 Gr.CF8M	-20 – 1050°F (-29 – 565°C)
25	Body/Bonnet	ASTM A-217 Gr.WC9	-20 – 1050°F (-29 – 565°C)

*Common to all trim modules including Les-Cav/Les-Sonic unless otherwise listed. [1]4"-6"valve sizes only. [2]Malcomized® in applications over 800°F (427°C).

FLOW COEFFICIENTS GLOBE VS. ANGLE

Flow Coefficients / Allowable ΔP for Aeroflow Anti-Cav Trim Configurations					
	Globe		Angle		Maximum Pressure Differential psi (bar)*
	FL	XT	FL	XT	
Unbalanced Plug Throttling (Flow under seat)	0.92	0.80	0,90	0.76	N/A
Unbalanced Plug Throttling (Flow over seat)**	0.75	0.50	0.65	0.40	N/A
Cage (UBC / LT / HT) Throttling (Flow under seat)	0.88	0.76	0.85	0.72	N/A
Cage (LT / HT / PB / T2) Throtttling (Flow over seat)	0.85	0.72	0.83	0.70	N/A
Les-Sonic (Flow under seat)	N/A	0.68	N/A	0.64	N/A
Les-Sonic (Flow over seat)	N/A	0.66	N/A	0.62	N/A
Les-Cav I (Flow over seat)	0.94	N/A	0.92	N/A	400 (27.6)
Les-Cav II (Flow over seat)	0.96	N/A	0.94	N/A	750 (51.7)
Les-Cav III (Flow over seat)	0.98	N/A	0.96	N/A	2000 (138)
Les-Cav IV (Flow over seat)	0.99	N/A	0.97	N/A	3000 (207)
Les-Cav V (Flow over seat)	0.99	N/A	0.98	N/A	4000 (276
MicroTaper® (Flow under seat)	0.92	0.80	0.90	0.78	N/A
MicroTaper® (Flow over seat)**	0.70	0.45	0.60	0.35	N/A
Mini-P (Flow under seat)	0.98	N/A	0.96	N/A	2000 (138)

* Other trim Configurations Maximum Pressure Differential will be limited on Allowable Liquid Velocities
** Consult factory for limitations of using unbalanced trim to flow over seat.

How to Specify Aeroflow Control Valves

Valve Body

1.1.1 Body should have integrally cast flow control vanes in the inlet, outlet and body gallery to reduce turbulence and allow maximum Cv/Size ratios.
1.1.2 Body should be designed with pressure taps on the inlet and outlet side so that adjacent piping penetration points are not needed.
1.1.3 Globe and angle body configurations should be designed so that trim modules are fully interchangeable.
1.1.4 High pressure body designs (900-2500#) should allow for machining to accept an outlet pipe nominally one size larger than the valve body size.

Valve Trim

1.2.1 Pilot balance trim to have capability to shutoff to ANSI Class VI or Zero (cc/min) Leakage utilizing metal-to-metal seats.
1.2.2 Valve plug should be designed with a three stage labyrinth style plug tip.
1.2.3 Trim design should allow for reduction down to a 0.2 factor of full Cv, without changing the original plug or seat ring
1.2.4 Cage design should allow for modification of flow window for a desired flow characteristic without reducing plug assembly.
1.2.5 Unbalanced designs should allow for reduction of Cv without reducing seat ring diameter.

Actuators

2.1.1 Actuator should be designed in a steel or composite construction that is rated for 150 psig working pressure.
2.1.2 Air failure spring should be mounted outside air cylinder to minimize residual air volume.
2.1.3 Spring cartridge should be mounted so that accessibility for reversing failure modes is easily accomplished.
2.1.4 Actuator/spring assembly shall be designed to provide a low center of gravity for areas of seismic activity.

Electro-Pneumatic Positioners

3.1.1 Positioner design should include as a standard: built in limit switch contacts and a 4-20mA position transmitter output.
3.1.2 Positioner should have a guaranteed accuracy of +0.0012" of calibrated span.
3.1.3 Positioner should have a guaranteed repeatability of +0.0012" of span.
3.1.4 Hysteresis including dead band should be 0.0%.
3.1.5 Positioner steady state air consumption should be 0.00 SCFM.

Accessories

Magnum Series Actuators
- Double Acting
- Spring Return
- Double Acting

Electric & Electro-Hydraulic
- Actuators
- EIM, Rotork, Limitorque & Others
- Rexa L&T Series

Pneumatic Positioners
- Siemens
- ABB

Electropneumatic Positioners
- Moore 760E
- Moore 760P
- ABB

Controllers
- PMC Electropneumatic - Press/Temp (See Product Data Sheet #26/0.1.1
- PDAP/PRAP (See Product Data Sheet #20/2.1.1)

Solenoid Valves
- ASCO, Versa and others

Limit Switches
- Namco, Westlock & others

Air Regulators
- AFG-2 Airset (See Product Data Sheet #30/1.1.1.)
- S-Transfer Valve (See Product Data Sheet #20/7.2.1)
- Lockup Valve

Additional Options
- Body materials
- Trim materials
- Snubber mechanism
- Limit stops
- Volume tank w/trip system
- Electropneumatic transducers
- Pipe reducers & expanders
- Low noise plates
- Hydraulic overrides

Applicable Industry Standards

Armstrong control valves are 100% factory tested and serialized. Our quality assurance program is accredited and certified to ISO 9001. All control valves are also designed, built and tested to meet the following industry standards.

ANSI B1.20.1
Pipe Threads - Conforms to pipe thread require-meets.

ANSI B16.11
Socket Weld Ends - Conforms to socket weld end requirements.

ANSI B16.5
Pipe Flanges and Flanged Fittings - Conforms to flange thickness, diameter and drilling requirements.

ANSI B16.25
Butt-welding Ends - Conforms to requirements of all schedule pipe, without backing rings.

ANSI B16.34
Valves, Flanged and Butt-weld - Integral flanged valve conforms to wall thickness, materials, pressure/temperature ratings, markings, and hydrostatic test requirements.

ANSI B16.37
Hydrotesting of Control Valves - Conforms to hydrotesting requirements.

ANSI/ISA 70-2*
Control Valve Seat Leakage - Conforms to Class II,111, IV, V, and VI shutoff requirements.

ISA S75.01
Flow Equations for Sizing Control Valves.

ISA S75.02
Control Valve Capacity Test Procedure - Conforms to flow capacity test procedure requirements.

ISA S75.12
Face-To-Face Dimensions for Socket-weld End and Screwed End Globe Style Control Valves - Conforms to face-to- face dimension requirements.

ISA S75.15
Face-To-Face Dimensions for Butt-weld End Globe Style Control Valves – Conforms to face-to-face dimension requirements.

MSS SP25
Standard Marking System for Valves, Fittings, and Unions - Conforms to marking requirements for flanged, screwed and weld end fittings.

MSS SP84
Steel Valves, Socket-weld End and Threaded End- Conforms to end connection requirements.

In addition, when required, Armstrong control valves can be manufactured and supplied in compliance with:

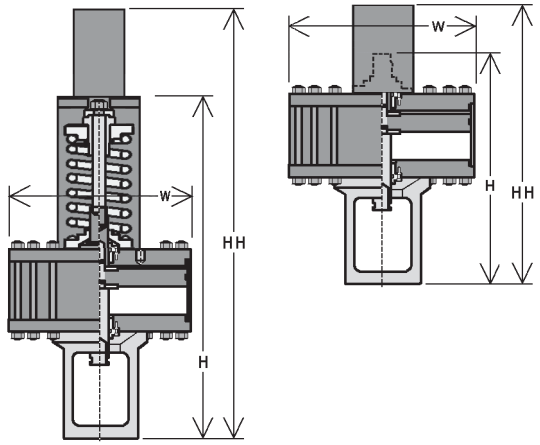
CAN 3 Z299.3
ANSI N45.2
MIL-STD-45662
MIL-1-45208
ASME Sec.1
B 31.1

* Formerly listed as B16.104

DIMENSIONS

Actuator Assembly

(12" minimum clearance required to disassemble.)



Double-Acting – inches (mm)							
Model	(H)	HH	(W)	Nominal Diameter	Nominal Area in^2 (cm^2)	Weight*	Shipping Volume* ft^3 (m^3)
P28DA	16¾ (425)	25 15/16 (659)	7 (178)	6 (152)	28 (181)	82 137	2.1 (0.06)
P80DA	17½ (444)	26 11/16 (678)	10½ (267)	10 (254)	78 (503)	132 (60)	3.7 (0.11)
PP130DA	28 (711)	39 (991)	14 (356)	13 (330)	130 (839)	232 (105)	8.1 (0.23)
P200DA	24¾ (628)	35¾ (908)	16½ (419)	16 (406)	201 (1297)	295 (134)	9.7 (0.27)
P300DA	24¾ (628)	35¾ (908)	20½ (521)	20 (508)	314 (2026)	415 (193)	13.8 (0.39)

Spring Return– inches (mm)							
Model	(H)	HH	(W)	Nominal Diameter	Nominal Area in^2 (cm^2)	Weight*	Shipping Volume* ft^3 (m^3)
P28SR	27¼ (692)	26 7/16 (926)	7 (178)	6 (152)	28 (181)	122 (155)	2.8 0.08
P80SR	28 (711)	37 3/16 (945)	10½ (267)	10 (254)	78 (503)	172 (78)	5 (0.14)
P130SR	48 (1219)	59 (1499)	14 (356)	13 (330)	130 (839)	352 (160)	11.8 (0.33)
P200SR	24¾ (628)	35¾ (908)	16½ (419)	16 (406)	201 (1297)	295 (134)	9.7 (0.27)
P300SR	42⅛ (1070)	53⅛ (1349)	20½ (521)	20 (508)	314 (2026)	535 (243)	20 (0.56)

* values are approximate; includes manual override

ANSI CLASS 900-2500 – DIMENSIONS

Dimensions in Inches					Shipping Info[1]		Dimensions in Millimeters					Shipping Info[1]	
Size	A	B	C[2]	D	Weight (lb.)	Volume (ft^3)	Size	A	B	C[2]	D	Weight (kg)	Volume (m^3)
ANSI Class 900 / 1500 – PN160-250 BWE / SWE							ANSI Class 900 / 1500 – PN160-250 BWE / SWE						
1	11	5½	9½	3⅛	87	2	25	279	140	241	79	39	0.1
1½	13	6½	9⅞	3½	125	3	40	330	165	251	89	57	0.1
2	14¾	7⅜	12¾	4 1/16	230	4	50	400	200	323	379	104	0.1
3	18⅛	9 1/16	14½	6⅛	346	7	75	460	251	368	156	157	0.2
4 Gib	20⅞	11 1/16	15¾	7¾	484	10	100	574	308	400	197	220	0.3
4 Angl	N/A	11 3/16	15¾	7¾	484	10	100	574	308	400	197	220	0.3
6	30¼	15⅛	20¾	10 3/16	1311	24	150	819	384	527	259	595	0.7
8	32¾	16⅜	23 9/16	13¼	3069	34	200	1022	416	598	337	1392	1.0
10	39	19½	28½	16½	3800	52	250	991	495	724	419	1723	1.5
12	44½	22¼	30½	19¾	5700	74	300	1130	565	775	502	2585	2.1
16	56	28	34½	26	8100	134	400	1422	711	876	660	3674	3.8
ANSI Class 2500 – PN400 BWE / SWE							ANSI Class 2500 – PN400 BWE / SWE						
1	12½	6¼	9½	3⅛	90	3	25	318	159	241	79	41	0.1
1½	14⅛	7½	9⅞	3½	130	3	40	359	191	251	89	59	.01
2	15¾	7⅞	12¾	4 15/16	250	5	50	375	187	323	379	113	0.1
3	19⅝	9 13/16	14½	6⅛	511	8	75	460	230	368	156	232	0.2
4 Gib	22⅝	12 1/16	15¾	8	625	11	100	530	301	400	203	283	0.3
4 Angl	N/A	11 5/16	15¾	8	625	11	100	530	301	400	203	283	0.3
6	32¼	16⅛	20¾	11	1590	27	150	768	409	527	280	721	0.8
8	40¼	20⅛	23 9/16	14¼	4059	51	200	832	511	598	362	1841	1.4
10	50	25	28½	17½	4900	84	250	1270	635	724	419	2223	2.4
12	56	28	30½	20¾	7100	115	300	1422	711	775	502	3221	3.3
16	Call	Call	34½	27	10600	Call	400	Call	Call	876	660	4808	Call
ANSI Class 900 – PN160 Flanged (RF and RTJ)							ANSI Class 900 – PN160 Flanged (RF and RTJ)						
1	17¼	8⅝	9½	3⅛	105	4	25	438	219	241	79	48	0.1
1½	20	10	9⅞	3½	150	6	40	508	254	251	89	68	0.2
2	23¼	11⅝	12¾	4 15/16	280	9	50	591	295	323	379	113	0.3
3	26⅝	13 5/16	14½	6⅛	551	13	75	676	338	368	156	232	0.4
4 Gib	30⅜	15⅞	15¾	8	680	18	100	770	379	400	203	283	0.5
4 Angl	N/A	15 3/16	15¾	8	680	Call	100	N/A	386	400	203	283	Call
6	41¾	20⅞	20¾	11	1680	43	150	1060	530	527	280	721	1.2
8	46⅛	23 1/16	23 9/16	14¼	4189	78	200	1172	586	598	362	1841	1.9
10	54	27	28½	17½	5070	106	250	1372	686	724	419	2300	2.8
12	60¾	30⅜	30½	20¾	7300	147	300	1543	772	775	502	3311	3.8
16	73½	36¾	34½	27	10840	225	400	1867	933	876	660	4917	6.5

NOTE: DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.
Request certified drawings for piping laout and construction purposes.

1 Approximate weight and volume
2 Consult factory for extended travel (C dimension)

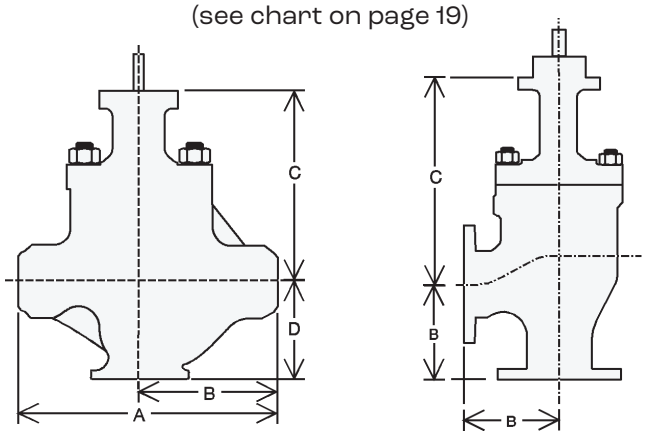
ANSI CLASS 900-2500 – DIMENSIONS (CONTINUED)

Dimensions in Inches					Shipping Info[1]		Dimensions in Millimeters					Shipping Info[1]	
Size	A	B	C[2]	D	Weight (lb.)	Volume (ft^3)	Size	A	B	C[2]	D	Weight (kg)	Volume (m^3)
ANSI Class 1500 – PN250 Flanged (RF and RTJ)							ANSI Class 1500 – PN250 Flanged (RF and RTJ)						
1	17¼	8⅝	9½	3⅛	105	4	25	438	219	241	79	48	0.1
1½	20	10	9⅞	3½	150	6	40	408	254	251	89	68	0.2
2	23¾	11⅝	12¾	4 15⁄16	280	9	50	591	295	323	379	113	0.3
3	25⅝	13 15⁄16	14½	6⅛	561	14	75	708	354	368	156	254	0.4
4 Gib	31⅞	16 1⁄16	15¾	8	690	19	100	791	389	400	203	313	0.5
4 Angl	N/A	15 9⁄16	15¾	8	690	Call	100	N/A	395	400	203	313	Call
6	44¼	22⅛	20¾	11	1685	47	150	1124	562	527	280	764	1.4
8	50⅛	25 1⁄16	23 9⁄16	14¼	4199	90	200	1273	637	598	362	1905	2.2
10	59½	29¾	28½	17½	5100	126	250	1511	756	724	419	2313	3.3
12	67¼	33⅝	30½	20¾	7360	176	300	1708	854	775	502	3338	4.6
16	81	40½	34½	27	10980	271	400	2057	1029	876	660	4980	7.7
ANSI Class 2500 – PN400 Flanged (RF and RTJ)							ANSI Class 2500 – PN400 Flanged (RF and RTJ)						
1	20	10	9½	3⅛	110	6	25	508	254	241	79	50	0.2
1½	23⅜	11 11⁄16	9⅞	3½	160	8	40	594	297	251	89	73	0.2
2	26¼	13⅛	12¾	4 15⁄16	290	12	50	667	333	323	379	113	0.3
3	33⅝	16 11⁄16	14½	6⅛	578	27	75	848	424	368	156	232	0.6
4 Gib	38⅛	19 9⁄16	15¾	8	710	37	100	968	562	400	203	283	0.8
4 Angl	N/A	19 1⁄16	15¾	8	710	Call	100	N/A	484	400	203	283	Call
6	54¼	27⅛	20¾	11	1745	73	150	1378	689	527	280	721	2.0
8	65¾	32⅝	23 9⁄16	14¼	4249	124	200	1670	829	598	362	1841	3.6
10	83½	41¾	28½	17½	5180	240	250	2121	1060	724	419	2350	6.2
12	93	46½	30½	20¾	7460	336	300	2362	1181	775	502	3384	8.5
16	C/F	C/F	34½	27	11120	C/F	400	C/F	C/F	876	660	5044	C/F

NOTE: DIMENSIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.
Request certified drawings for piping laout and construction purposes.

1 Approximate weight and volume
2 Consult factory for extended travel (C dimension)

Body/Bonnet Assembly
(see chart on page 19)



Accessories

Moore Series 760 Positioners
- Pneumatic: Model 760P
- Electropneumatic: Model 760E
- Digital: Model 760D
- Optional internal limit switches
- Optional valve position transmission

Other Positioners
- PMV Series 1200, 2000 and P5
- Hartmann & Braun/Sensycon TZID
- SMAR FY302 Fieldbus
- Siemens PS2
- Bailey AV Series

Process Controllers
- Electropneumatic: PMC-2
- Pneumatic: PDAP/PRAP

Solenoid Valves
- ASCO 8320G174 is standard
- Other Asco models, Versa, Skinner, as required Electric Actuators
- Jordan

Electrohydraulic Actuators
- Rexa L & T Series

Limit Switches
- Westlock
- National Acme (NAMCO)
- Honeywell (Micro)
- GO Proximity Switches

Noise Reduction Devices
- Noise Suppressor
- ARM-Sonic Silencing Orifice

Air Regulators
- AFG-2
- Bellofram Type 50

Instruments
- Lockup Valves
- S-Transfer Valve

Other Options
- Handwheels
- Hydraulic Manual
  - Override System
- Limit Stops
- Special Connections
  - Socketweld
  - Buttweld
  - Stub Ends
  - Pipe Reducers
  - Smooth Flange Faces - Ring Type Joints

Aeroflow Specification Form

Armstrong
EXPERIENCE MATTERS

Project/Job _____
Unit/Customer _____
P.O./LCO File # _____
Item _____
Contract _____
MFR Serial # _____

Data Sheet _____ of _____
Spec _____
Tag _____
Dwg _____
Service _____

FLUID ☐ Steam ☐ Water ☐ Gas _____ ☐ Liquid _____ Crit Pres PC _____

SERVICE CONDITIONS

Flow ☐ #/hr ☐ gpm ☐ scfh ☐ _____
Inlet Pressure ☐ psig ☐ psia ☐ _____
Outlet Pressure ☐ psig ☐ psia ☐ _____
Temperature ☐ °C ☐ °F _____
Max Press/Temperature: _____/_____
Density/MW/SG _____/_____/_____
Viscosity _____ CP
Vapor Pressure ☐ psia ☐ _____
Required C_V _____ Noise (dBA) Allowable _____

Max. Flow	Norm. Flow	Min. Flow	Shut-off Pressure

LINE INFO Pipe Size In: _____ /Sch _____ Pipe Size Out: _____ /Sch _____

VALVE BODY & BONNET

Body Size in. ☐ 2 ☐ 2½ ☐ 3 ☐ 4 ☐ 6 ☐ 8
ANSI Class ☐ 125 ☐ 150 ☐ 250 ☐ 300 ☐ 600 ☐ Other _____
Body/Bonnet Material ☐ Cast Iron ☐ Cast Steel ☐ Cr Mo ☐ Other _____
End Conn. Inlet/Outlet: ☐ NPT ☐ SWE ☐ BWE Sch. _____ ☐ Int. Flanges ☐ Other _____

TRIM SIZE ☐ 100% ☐ 40% ☐ Les-Cav ☐ Les-sonic ☐ Other _____

ACTUATOR

Spring Action: ☐ Air to Open ☐ Air to Close ☐ Last Position ☐ Other _____ ☐ None
Available Air Supply Pressure: Max. _____ Min. _____
Manual Override: ☐ Yes ☐ No ☐ Type _____

SOLENOID ☐ Yes ☐ No ☐ Type_____ ☐ Voltage _____

POSITIONER ☐ Yes ☐ No ☐ Type_____ ☐ Pneu _____ ☐ E/P

SWITCH ☐ Yes ☐ No ☐ Type_____ ☐ Voltage _____

AIR SET ☐ Yes ☐ No ☐ Type_____ ☐ Range _____

OTHER ACCESSORIES ☐ Yes ☐ No ☐ Type_____

TEST ANSI/FCI Leakage Class: ☐ III ☐ IV ☐ V ☐ VI

Questions? Call (269) 279-3631.
Please submit completed form to: LCV@armstronginternational.com

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