PARSPANGAN
ENGINEERING COMPANY

CONTROL VALVE

General Catalogue 2023- 2024

Index

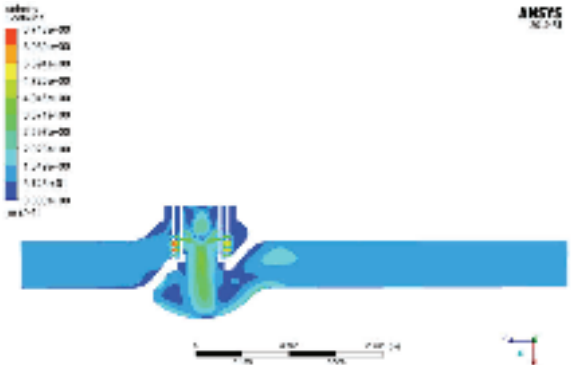
PARS PANGAN COMPANY

Pars Pangan was founded in 1993 as one of the subsidiaries of the Petroleum Equipment Industries Companies (PEIC). In this company, it is aimed to deliver the most reliable products with the best quality and efficiency to oil, gas, petrochemical, and power plants industries. Following the latest ideas, standards, technology, techniques, and based on prior experience in valve production, the newest types of control valves (Globe, Butterfly, and Ball) and actuators (Diaphragm, piston, scotch and Yoke) are designed and manufactured.

Pars Pangan plant is located in the Shams- Abad industrial zone in Tehran with 16,000 m^2 area that is including sizing, design, manufacturing, and testing department.

1- Design Department

In this department, R&D, engineering, and CFD analysis are done. The final design will be investigated according to existing standards and references.

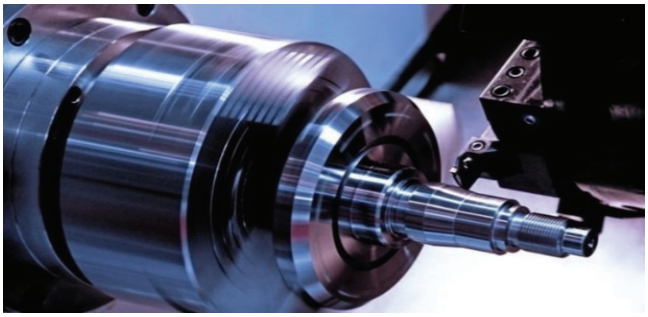


2- Molding and Casting Unit

In this unit, according to the dimensions of the part and different casting processes, a casting mold technical drawing is prepared, and then smelting will start.

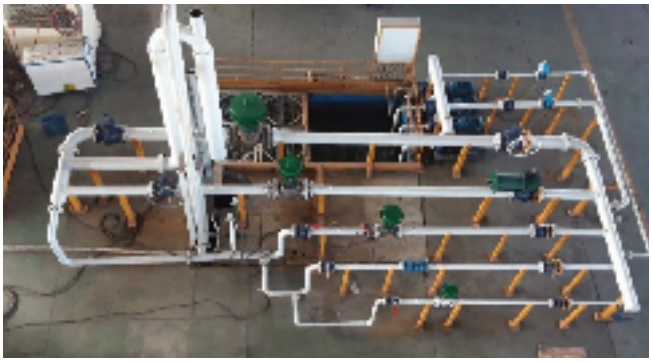
3- Machining Unit

This is the final stage of production which includes all kinds of manual and CNC lathes, milling, and drills. According to the final technical drawing, parts will be machined and prepared.



4- Test Unit

In this unit, the performance and leakage of valves based on different procedures and standards are evaluated. To do the measurement, high-precision equipment will be used.



Products Collection

Pars pangan company is capable of manufacturing various types of control valve and their actuators. The main products include Globe control valve, Butterfly control valve, Ball control valve, and linear and rotary actuators. Beside standard sizes and characteristics, the customer requirements can also be considered in design and manufacturing steps. It does not end here and we are developing our products without any limitation.

Globe Valve

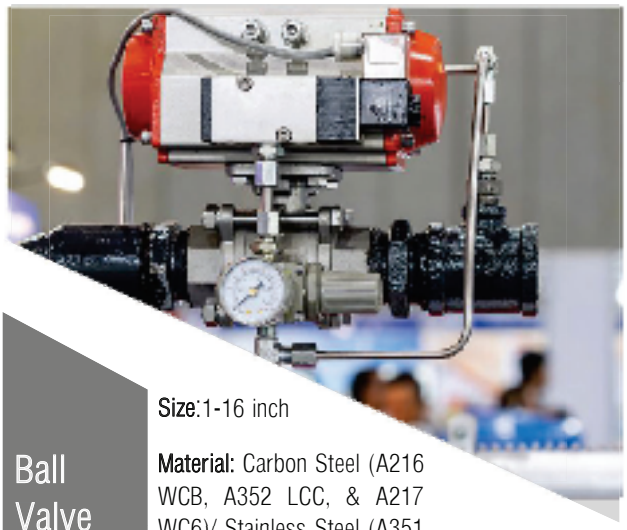
Size:1-16 inch

Material: Carbon Steel (A216 WCB, A352 LCC, & A217 WC6)/ Stainless Steel (A351 CF8M & A351 CF3M)/ A105/ A182/ F316/ F304/ NACE material on

Butterfly Valve

Size:3-32 inch

Material: Carbon Steel (A216 WCB, A352 LCC, & A217 WC6)/ Stainless Steel (A351 CF8M & A351 CF3M)/ A105/ A182/ F316/ F304/ NACE material on request



Ball Valve

Size:1-16 inch

Material: Carbon Steel (A216 WCB, A352 LCC, & A217 WC6)/ Stainless Steel (A351 CF8M & A351 CF3M)/ A105/ A182/ F316/ F304/ NACE material on request

Actuator for Valve

Act: Linear (Spring return and double act), Rotary (spring return and double act)

Types: Diaphragm, Cylinder and piston, Scotch-Yoke, and Rack and Pinion

Control Valve Coding System

Example 1: Globe valve- Contoured plug - Equal Percent- Fail to close- 6 inch valve- Standard bonnet

G - 01 2 1 06 S

Example 2: Butterfly valve- Double offset - Linear- Fail to close- 20 inch valve- Standard bonnet

T - 21 1 1 20 S

Valve Type

- G ▶ Globe Style
- T ▶ Butterfly
- B ▶ Ball
- P ▶ Plug
- V ▶ PCV
- O ▶ Other

Model Number

- 01 ▶ Contoured plug
- 02 ▶ Top guided plug
- 03 ▶ High-capacity cage
- 04 ▶ Low noise cage
- 05 ▶ High pressure low noise cage
- 06 ▶ Multi stage
- 21 ▶ Double offset butterfly valve
- 22 ▶ Triple offset butterfly valve
- 41 ▶ V-notch ball
- 99 ▶ Special Design

Characteristics

- 1 ▶ Linear
- 2 ▶ Equal percent
- 3 ▶ Quick open
- 4 ▶ Modified

Failed Position

- 0 ▶ Failed to open
- 1 ▶ Failed to close
- 2 ▶ Failed to Position

Valve Size

- 01 ▶ 1"
- 15 ▶ 1 ½"
- 02 ▶ 2"
- 04 ▶ 4"

Bonnet type

- S ▶ Standard
- E ▶ Extended
- F ▶ Finned

Control Valve Specification

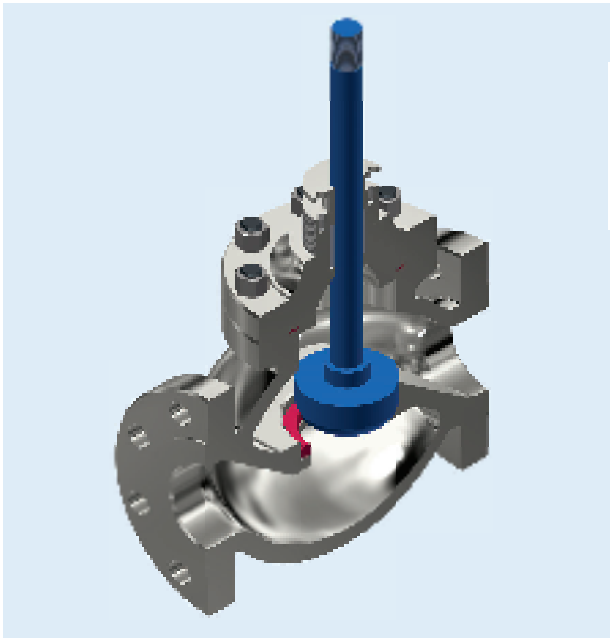
Globe Control Valve														
Model	Description	Valve Size (inch)											FL	XT
		1	1 ½	2	3	4	6	8	10	12	14	16		
		Flow Coefficient (Cv)- (min. and max.)												
01	Contoured Plug	13	33	52	118	209	472	839	1311	1888	2570	3357	0.84	0.71
		0.5	1.2	13	29	52	118	209	327	472	642	839	0.84	0.72
02	Top Guided Plug	12	31	48	109	195	439	780	1219	1756	2390	3122	0.80	0.72
		0.4	1.6	12	27	48	109	195	304	439	597	780	0.83	0.74
03	High-Capacity Cage				111	140	447	530	1050	1491	2100	2900	0.85	0.75
					27	49	111	199	310.9	447	609	796	0.80	0.71
04	Low Noise Cage	7.4	17	28	63	112	253	449	703	1012	1378	1799	0.84	0.75
		0.2	0.9	7	15	28	63	112	175	253	344	449	0.82	0.75
05	High Pressure Low Noise Cage	11	28	44	100	130	401	520					0.82	0.71
		0.4	1.5	11	25	44	100	178					0.79	0.70
06	Multi Stage				55	70	223	265	525	745	1050	1450	0.96	0.92
					13	24	55	99	155	223	304	398		

Butterfly Valve															
Model	Description	Flow Coefficient (Cv)												FL	XT
		Valve Size (inch)													
		3	4	6	8	10	12	14	16	18	20	24	28	32	
21	Double Offset	370	578	1387	2659	4162	6011	8439	10982	13872	17109	24970	34911	46471	0.65	0.35
22	Triple Offset			1470	2615	4567	6578	8953	11694	14800	18272	29417	40039	52296	0.65	0.35

Ball Valve														
Model	Description	Flow Coefficient (Cv)											FL	XT
		Valve Size (inch)												
		1	1 ½	2	3	4	6	8	10	12	14	16		
41	V-Notch	35	65	104	266	447	1116	1811	2774	4508	7109	11329	0.66	0.32

Common values of C_v and valve size are introduced in upper tables. For larger/ smaller values, special design will be done.

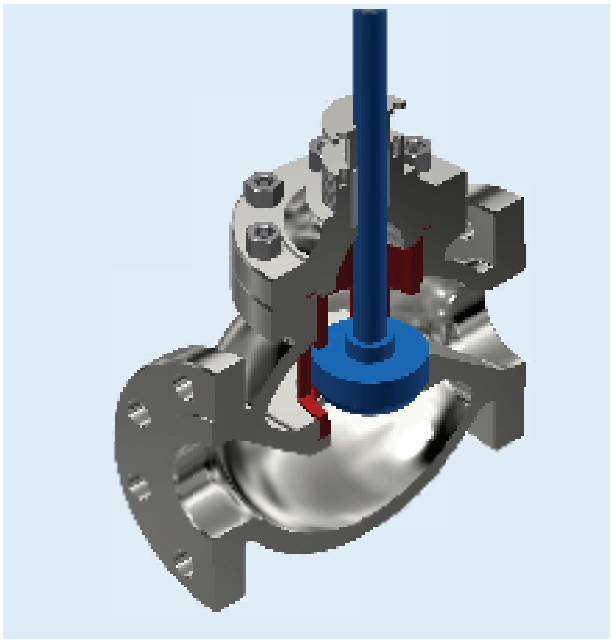
Globe Control Valve



G01. Contoured Plug

The contoured plug is used in the majority of applications. This trim is suitable for low-pressure drop and high-capacity applications in both gas and fluid medium. It has a particular profile plug head, which offers a smooth profile to the flow and permits high-pressure recovery.

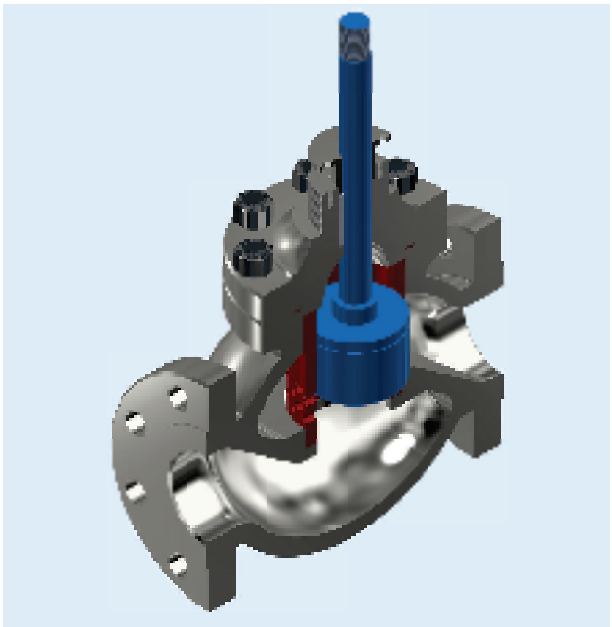
1	Type	Unbalanced Contoured Plug Type
2	Body Size	1”-16”
3	Plug Form	Contoured
4	Inherent Characteristic	Linear/Equal percent/ Quick opening/ Modified
5	Pressure Rating	150-600 up to 900
6	Body End Connection	RF, FF, SW, BW, Screwed, RTJ
7	Bonnet Type	Standard/ Extended T < - 6 (°C)/ Finned Extended T > 250 (°C)
8	Face To Face Dimension	ISA 75.08/ IEC 60534-3



G02. Top Guided Plug

The top Guided plug is one of the most used trims in control valves. This trim is appropriate for high pressure drop and low flow coefficient compared to a contoured plug.

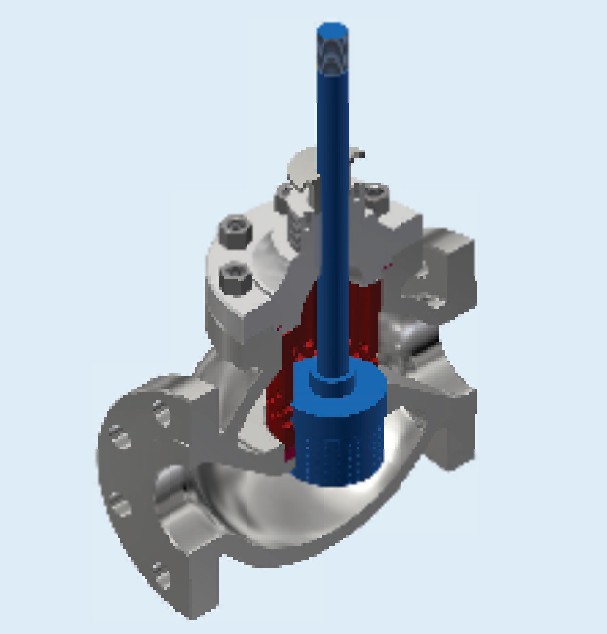
1	Type	Top guided Plug Type
2	Body Size	1”-16”
3	Plug Form	Contoured/ Parabolic
4	Inherent Characteristic	Linear/Equal percent/ Quick opening/ Modified
5	Pressure Rating	150-600 up to 900
6	Body End Connection	RF, FF, SW, BW, Screwed, RTJ
7	Bonnet Type	Standard/ Extended T < - 6 (°C)/ Finned Extended T > 250 (°C)
8	Face To Face Dimension	ISA 75.08/ IEC 60534-3



G03. High-Capacity Cage

High-capacity cage globe control valves are designed for critical service process control requirements of a diverse range of applications. This kind of trim is appropriate for applications that require high controllability.

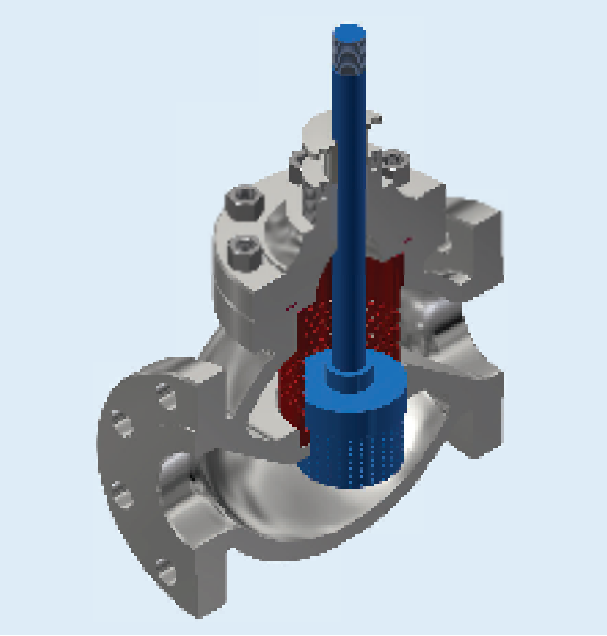
1	Type	High-capacity cage
2	Body Size	3”-16”
3	Plug Form	Perforated single plug/ Contoured
4	Inherent Characteristic	Linear/Equal percent/ Quick opening/ Modified
5	Pressure Rating	150-600 up to 900 by request
6	Body End Connection	RF, FF, SW, BW, Screwed, RTJ
7	Bonnet Type	Standard/ Extended T < - 6 (°C)/ Finned Extended T > 250 (°C)
8	Face To Face Dimension	ISA 75.08/ IEC 60534-3



G04. Low Noise Cage

Low noise cage is designed for noise reduction of a compressible gas. It has the advantage of the negligible loss of pressure drop and low noise. It can be especially applicable in severe gas service with high-pressure drop.

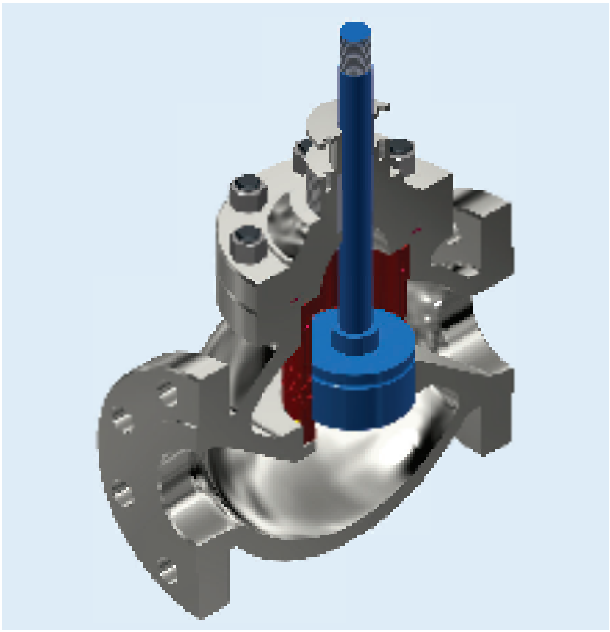
1	Type	Low noise cage
2	Body Size	1”-16”
3	Plug Form	Perforated single plug
4	Inherent Characteristic	Linear/Equal percent
5	Pressure Rating	150-600 up to 900 by request
6	Body End Connection	RF, FF, SW, BW, Screwed, RTJ
7	Bonnet Type	Standard/ Extended T < - 6 (°C)/ Finned Extended T > 250 (°C)
8	Face To Face Dimension	ISA 75.08/ IEC 60534-3



G05. High pressure- Low Noise Cage

High pressure- low noise cage is specially designed to reduce the noise of compressible fluid. Beside the low noise cage, it also features slight loss of pressure drop. It is suitable for services such as high- pressure air and steam.

1	Type	High pressure- low noise cage
2	Body Size	1”-8”
3	Plug Form	Perforated single plug
4	Inherent Characteristic	Linear/Equal percent
5	Pressure Rating	900 & 1500
6	Body End Connection	RF, RTJ
7	Bonnet Type	Standard/ Extended T < - 6 (°C)/ Finned Extended T > 250 (°C)
8	Face To Face Dimension	ISA 75.08/ IEC 60534-3

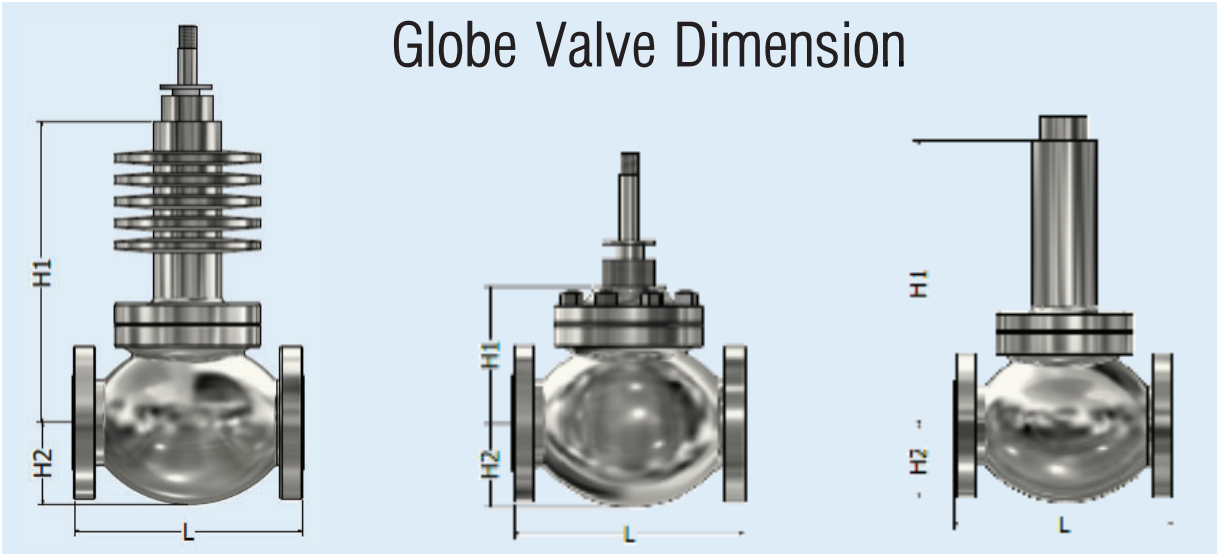


G06. Multistage

Multi-stage trims can help in the management of high-pressure drops and avoid cavitation and choking. The range includes various options offering up to 30 pressure drop stages and the ability to manage high levels of rangeability.

1	Type	Multi stage
2	Body Size	1”-16”
3	Plug Form	Perforated single plug/ Contoured
4	Inherent Characteristic	Linear/Equal percent/ Quick opening/ Modified
5	Pressure Rating	150-600 up to 900 by request
6	Body End Connection	RF, FF, SW, BW, Screwed, RTJ
7	Bonnet Type	Standard/ Extended T < - 6 (°C)/ Finned Extended T > 250 (°C)
8	Face To Face Dimension	ISA 75.08/ IEC 60534-3

Globe Valve Dimension



Valve Size (inch)	Pressure Rating	Dimension (mm)			
		L	H1		H2
			Standard	Extended/Finned	
1	150	184	105	167	57.5
	300	197			
	600	210			
1 ½	150	222	114	170	75
	300	235			
	600	251			
2	150	254	120	180	82.5
	300	267			
	600	286			
3	150	298	156	248	100
	300	318			
	600	337			
4	150	352	181	267	118
	300	368			
	600	394			
6	150	451	260	355	175
	300	473			
	600	508			
8	150	543	292	407	230
	300	568			
	600	610			
10	150	673	357	506	295
	300	708			
	600	752			
12	150	737	394	543	355
	300	775			
	600	819			
14	150	889	462	611	395
	300	927			
	600	972			
16	150	1016	518	667	443
	300	1057			
	600	1108			

G01. Contoured Plug Flow Coefficient

Valve Size (inch)	Seat Size (mm)	Rated Flow Coefficient (C_V)	Max Stroke (mm)	Flow Coefficient (C_V)																	
				Standard Linear Characteristic										Standard Equal Percentage Characteristic							
				Travel (%)										Travel (%)							
				10	20	30	40	50	60	70	80	90	100	10	20	30	40	50	60	70	80	90	100
1	25	13	14	1.5	3	4.1	5.3	6.6	7.9	9.2	10.4	11.7	13	0.4	0.6	0.8	1.3	1.8	2.7	4.0	5.9	8.8	13
	20	8		0.9	1.7	2.5	3.3	4.1	4.9	5.6	6.4	7.2	8	0.2	0.3	0.5	0.8	1.1	1.7	2.5	3.7	5.4	8
	15	4		0.5	0.9	1.3	1.7	2.1	2.5	2.8	3	3.6	4	0.1	0.2	0.3	0.4	0.6	1	1.2	1.8	2.7	4
	5	0.5		0.06	0.11	0.16	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.02	0.025	0.03	0.05	0.07	0.10	0.16	0.23	0.34	0.50
1 ½	40	33	16	3.9	7.1	10	13.5	16.8	20.1	23.3	26.5	29.7	33	1.0	1.4	2.1	3.2	4.6	6.9	10.2	16	22.3	33
	30	18		2.1	3.9	5.7	7.4	9.2	10.9	12.7	14.4	16.2	18	0.5		1.2	1.7	2.5	4	5.6	8.2	12.2	18
	20	7		0.8	1.5	2.2	2.9	3.6	4.3	4.9	5.6	6.3	7	0.2	0.3	0.5	0.7	1.0	1.5	2.2	3.2	4.7	7
	10	1.2		0.1	0.3	0.4	0.5	0.6	0.7	0.8	1.0	1.1	1.2	0.05	0.07	0.1	0.17	0.2	0.3	0.4	0.5	0.8	1
2	50	52	25	6.1	11.2	16.3	21.3	26.4	31.6	36.6	41.7	46.8	52	1.6	2.3	3.3	5.0	7.3	10.9	16.1	23.7	35.1	52
	38	29		3.4	6.2	9.1	11.9	14.7	17.6	20.4	23.3	26	29	0.9	1.3	1.9	2.8	4.1	6.1	9.0	13.2	19.6	29
	25	13		1.5	3	4.1	5.3	6.6	7.9	9.2	10.4	11.7	13	0.4	0.6	0.8	1.3	2.0	2.7	4.0	5.9	8.8	13
3	80	118	35	13.9	25.4	37.1	48	60.0	71.7	83.2	94.6	106.3	118	3.6	5.1	7.6	11.4	16.6	24.6	36.5	53.9	79.7	118
	60	66		8	14.2	20.7	27.0	33.6	40.1	46.5	52.9	59.5	66	2.0	3	4.2	6.4	9.3	13.8	20.4	30	46	66
	40	29		3.4	6.2	9.1	11.9	14.7	17.6	20.4	23.3	26	29	0.9	1.3	1.9	2.8	4.1	6.1	9.0	13.2	19.6	29
4	100	209	50	24.7	45.0	65.7	85.6	106.3	127.0	147.3	167.6	188.3	209	6.3	9.1	13.4	20.2	29.3	43.6	64.7	95.4	146	209
	75	118		13.9	25.4	37.1	48	60	71.7	83	94.6	106.3	118	3.6	5.1	7.6	11.4	16.6	24.6	36.5	53.9	79.7	118
	50	52		6.1	11.2	16.3	21.3	26.4	31.6	36.6	41.7	46.8	52	1.6	2.3	3.3	5.0	7.3	10.9	16.1	23.7	35.1	52
6	150	472	85	55.8	101.6	148.4	193.3	240.1	286.8	332.7	378.5	425.2	472	14.3	20.5	30.4	47	66.2	98.5	146.2	215.5	319.0	472
	115	277		32.7	59.6	87.1	113.4	140.9	168.3	195.2	222.1	249.6	277	8.4	12.1	17.8	26.7	38.9	57.8	85.8	126.4	187.2	277
	75	118		13.9	25.4	37.1	48	60	71.7	83	94.6	106.3	118	3.6	5.1	7.6	11.4	16.6	24.6	36.5	53.9	79.7	118
8	200	839	100	99.1	180.6	263.7	343.6	426.7	509.8	591.3	672.8	755.9	839	25.5	36.5	54.0	81.0	117.7	175.2	259.9	383.0	567.0	839
	150	472		55.8	101.6	148.4	193.3	240.1	286.8	332.7	378.5	425.2	472	14.3	20.5	30.4	46	66.2	98.5	146.2	215.5	319.0	472
	100	209		24.7	45.0	65.7	85.6	106.3	127.0	147.3	167.6	188.3	209	6.3	9.1	13.4	20.2	29.3	43.6	64.7	95.4	141	209
10	250	1311	120	154.9	282	412.1	536.9	666.8	796.6	924.0	1051.3	1181.1	1311	40	57.0	84	126.6	183.9	273.7	406.1	598.5	885.9	1311
	190	757		89.4	163.0	237.9	310.0	385.0	460.0	533.5	607.0	682.0	757	23.0	33	48.7	73.1	106.2	158.0	234.5	345.6	511.6	757
	125	327		38.6	70.4	102.8	133.9	166.3	198.7	230.5	262	294.6	327	9.9	14.2	21.0	31.6	45.9	68.3	101.3	149.3	221.0	327
12	300	1888	160	223	406.4	593	773.2	960.2	1147.2	1330.6	1514.0	1701.0	1888	57.3	82.1	121.4	182	264.8	394.2	585	861.8	1275.8	1888
	225	1062		125.5	228.6	333.8	434.9	540.1	645.3	748.5	851.6	956.8	1062	32.2	46.2	68.3	102.6	149.0	221.7	328.9	484.8	718	1062
	150	472		55.8	101.6	148.4	193.3	240.1	286.8	332.7	378.5	425.2	472	14.3	20.5	30.4	46	66.2	98.5	146.2	215.5	319.0	472
14	350	2570	180	304	553.2	807.8	1052.5	1307.1	1561.6	1811.3	2060.9	2315.4	2570	78.0	111.8	165.3	248.2	360.5	536.6	796.0	1173.2	1736.7	2570
	265	1445		170.7	311	454.2	591.8	734.9	878	1018.4	1158.8	1301.9	1445	43.8	62.9	92.9	140	202.7	301.7	447.6	659.6	976.5	1445
	175	642		75.8	138.2	201.8	262.9	326.5	390.1	452.5	514.8	578.4	642	19.5	27.9	41.3	62	90	134.0	198.8	293.1	434	642
16	400	3357	200	396.6	722.6	1055.1	1374.8	1707.3	2040	2365.9	2692.0	3024.5	3357	102	146.1	215.9	324.2	470.9	700.9	1040	1532.4	2268.5	3357
	300	1888		223.0	406.4	593	773.2	960.2	1147.2	1330.6	1514.0	1701.0	1888	57.3	82.1	121.4	182	264.8	394.2	585	861.8	1275.8	1888
	200	839		99.1	180.6	263.7	343.6	426.7	509.8	591.3	672.8	755.9	839	25.5	36.5	54.0	81.0	117.7	175.2	259.9	383.0	567.0	839

G02. Top Guided Plug Flow Coefficient

Valve Size (inch)	Seat Size (mm)	Rated Flow Coefficient (CV)	Max Stroke (mm)	Flow Coefficient (CV)																	
				Standard Linear Characteristic Travel (%)										Standard Equal Percentage Characteristic Travel (%)							
				10	20	30	40	50	60	70	80	90	100	10	20	30	40	50	60	70	80	90	100
1	25	12	14	1.4	3	3.8	4.9	6.1	7.3	8.5	9.6	10.8	12	0.4	0.5	0.8	1.2	1.7	2.5	3.7	5.5	8.1	12
	20	8		0.9	1.7	2.5	3.3	4.1	4.9	5.6	6.4	7.2	8	0.2	0.3	0.5	0.8	1.1	1.7	2.5	3.7	5.4	8
	15	4		0.5	0.9	1.3	1.7	2.1	2.4	2.8	3	3.6	4	0.1	0.2	0.3	0.4	0.6	1	1.2	1.8	2.7	4
	5	0.4		0.05	0.09	0.13	0.16	0.20	0.24	0.28	0.32	0.36	0.40	0.01	0.02	0.03	0.04	0.06	0.08	0.12	0.18	0.27	0.40
1 ½	40	31	16	3.7	6.7	10	12.7	15.8	18.8	21.8	24.9	27.9	31	0.9	1.3	2.0	3.0	4.3	6.5	9.6	16	20.9	31
	30	17		2.0	3.7	5.3	7.0	8.6	10.3	12.0	13.6	15.3	17	0.5	0.7	1.1	1.6	2.4	4	5.3	7.8	11.5	17
	20	6		0.7	1.3	1.9	2.5	3.1	3.6	4.2	4.8	5.4	6	0.2	0.3	0.4	0.6	0.8	1.3	1.9	2.7	4.1	6
	10	1.6		0.2	0.3	0.5	0.7	0.9	1.0	1.1	1.3	1.4	2	0.02	0.1	0.15	0.2	0.26	0.3	0.5	0.7	1.1	2
2	50	48	25	5.7	10.3	15.1	19.7	24.4	29.2	33.8	38.5	43.2	48	1.5	2.1	3.1	4.6	6.7	10.0	14.9	21.9	32.4	48
	38	27		3.2	5.8	8.5	11.1	13.7	16.4	19.0	21.7	24	27	0.8	1.2	1.7	2.6	3.8	5.6	8.4	12.3	18.2	27
	25	12		1.4	3	3.8	4.9	6.1	7.3	8.5	9.6	10.8	12	0.4	0.5	0.8	1.2	2.0	2.5	3.7	5.5	8.1	12
3	80	109	35	12.9	23.5	34.3	45	55.4	66.2	76.8	87.4	98.2	109	3.3	4.7	7.0	10.5	15.3	22.8	33.8	49.8	73.7	109
	60	61		7	13.1	19.2	25.0	31.0	37.1	43.0	48.9	55.0	61	1.9	3	3.9	5.9	8.6	12.7	18.9	28	46	61
	40	27		3.2	5.8	8.5	11.1	13.7	16.4	19.0	21.7	24	27	0.8	1.2	1.7	2.6	3.8	5.6	8.4	12.3	18.2	27
4	100	195	50	23.0	42.0	61.3	79.9	99.2	118.5	137.4	156.4	175.7	195	5.9	8.5	12.5	18.8	27.4	40.7	60.4	89.0	146	195
	75	109		12.9	23.5	34.3	45	55	66.2	77	87.4	98.2	109	3.3	4.7	7.0	10.5	15.3	22.8	33.8	49.8	73.7	109
	50	48		5.7	10.3	15.1	19.7	24.4	29.2	33.8	38.5	43.2	48	1.5	2.1	3.1	4.6	6.7	10.0	14.9	21.9	32.4	48
6	150	439	85	51.9	94.5	138.0	179.8	223.3	266.8	309.4	352.0	395.5	439	13.3	19.1	28.2	47	61.6	91.7	136.0	200.4	296.7	439
	115	258		30.5	55.5	81.1	105.7	131.2	156.8	181.8	206.9	232.4	258	7.8	11.2	16.6	24.9	36.2	53.9	79.9	117.8	174.3	258
	75	109		12.9	23.5	34.3	45	55	66.2	77	87.4	98.2	109	3.3	4.7	7.0	10.5	15.3	22.8	33.8	49.8	73.7	109
8	200	780	100	92.1	167.9	245.2	319.4	396.7	474.0	549.7	625.5	702.7	780	23.7	33.9	50.2	75.3	109.4	162.8	241.6	356.1	527.1	780
	150	439		51.9	94.5	138.0	179.8	223.3	266.8	309.4	352.0	395.5	439	13.3	19.1	28.2	42	61.6	91.7	136.0	200.4	296.7	439
	100	195		23.0	42.0	61.3	79.9	99.2	118.5	137.4	156.4	175.7	195	5.9	8.5	12.5	18.8	27.4	40.7	60.4	89.0	132	195
10	250	1219	120	144.0	262	383.1	499.2	620.0	740.7	859.1	977.5	1098.3	1219	37	53.0	78	117.7	171.0	254.5	377.6	556.5	823.8	1219
	190	704		83.2	151.5	221.3	288.3	358.0	427.8	496.2	564.5	634.3	704	21.4	31	45.3	68.0	98.7	147.0	218.1	321.4	475.7	704
	125	304		35.9	65.4	95.6	124.5	154.6	184.7	214.2	244	273.9	304	9.2	13.2	19.6	29.4	42.6	63.5	94.2	138.8	205.4	304
12	300	1756	160	207	378.0	552	719.2	893.1	1067.0	1237.6	1408.2	1582.1	1756	53.3	76.4	112.9	170	246.3	366.6	544	801.6	1186.6	1756
	225	987		116.6	212.5	310.2	404.2	502.0	599.7	695.6	791.5	889.2	987	29.9	42.9	63.5	95.3	138.4	206.1	305.7	450.6	667	987
	150	439		51.9	94.5	138.0	179.8	223.3	266.8	309.4	352.0	395.5	439	13.3	19.1	28.2	42	61.6	91.7	136.0	200.4	296.7	439
14	350	2390	180	282	514.5	751.2	978.8	1215.5	1452.2	1684.4	1916.6	2153.3	2390	72.5	104	153.7	230.8	335.2	499.0	740.3	1091.0	1615.1	2390
	265	1344		158.8	289	422.4	550.4	683.5	817	947.2	1077.8	1210.9	1344	40.8	58.5	86.4	130	188.5	280.6	416.3	613.5	908.2	1344
	175	597		70.5	128.5	187.6	244.5	303.6	362.8	420.7	478.7	537.9	597	18.1	26.0	38.4	58	84	124.6	184.9	272.5	403	597
16	400	3122	200	368.8	672.1	981.3	1278.6	1587.8	1897	2200.3	2503.6	2812.8	3122	95	136	200.8	301.5	437.9	651.8	967	1425.2	2109.7	3122
	300	1756		207.4	378.0	552	719.2	893.1	1067.0	1237.6	1408.2	1582.1	1756	53.3	76.4	112.9	170	246.3	366.6	544	801.6	1186.6	1756
	200	780		92.1	167.9	245.2	319.4	396.7	474.0	549.7	625.5	702.7	780	23.7	33.9	50.2	75.3	109.4	162.8	241.6	356.1	527.1	780

G03. High- Capacity Cage Flow Coefficient

Valve Size (inch)	Seat Size (mm)	Rated Flow Coefficient (CV)	Max Stroke (mm)	Flow Coefficient (CV)																	
				Standard Linear Characteristic Travel (%)										Standard Equal Percentage Characteristic Travel (%)							
				10	20	30	40	50	60	70	80	90	100	10	20	30	40	50	60	70	80	90	100
3	80	111	35	13.1	24	34.9	45.5	56.5	67.4	78.2	89.0	100.0	111	3.4	4.8	7.1	10.7	15.6	23.2	34.4	50.7	75.0	111
	60	62		7.3	13.3	19.5	25.4	31.5	37.7	43.7	49.7	55.9	62	1.9	2.7	4.0	6.0	8.7	12.9	19.2	28.3	41.9	62
	40	27		3.2	5.8	8.5	11	13.7	16	19.0	22	24.3	27	0.8	1.2	1.7	2.6	3.8	6	8.4	12.3	18.2	27
4	100	199	50	16.54	30.14	44.00	57.34	71.20	85.07	98.67	112.27	126.13	140.00	4.25	6.09	9.00	13.52	19.64	29.23	43.36	63.91	94.61	140
	75	111		13.1	23.9	35	45.5	56.5	67.4	78.2	89.0	100.0	111	3.4	4.8	7.1	10.7	15.6	23.2	34.4	16	75.0	111
	50	49		5.8	10.5	15.4	20.1	24.9	29.8	34.5	39.3	44.1	49	1.5	2.1	3.2	4.7	6.9	10	15.2	22.4	33.1	49
6	150	447	85	52.8	96.2	140.5	183.1	227.3	271.6	315.0	358.5	402.7	447	13.6	19.4	28.7	43.2	62.7	93.3	138.5	204.1	302.1	447
	115	263		31.1	56.6	82.7	107.7	134	159.8	185.4	210.9	237.0	263	8.0	11.4	16.9	25.4	36.9	54.9	81.5	120.1	177.7	263
	75	111		13.1	23.9	34.9	45.5	56.5	67.4	78.2	89.0	100.0	111	3.4	4.8	7.1	10.7	15.6	23.2	34.4	50.7	75.0	111
8	200	796	100	62.6	114.1	166.6	217.1	269.6	322.0	373.5	425.0	478	530	16.1	23.1	34.1	51.2	74.3	110.7	164.2	241.9	358.2	530
	150	447		52.8	96	140.5	183.1	227.3	271.6	315.0	358.5	402.7	447	13.6	19.4	28.7	43.2	2.0	93.3	138.5	204.1	302.1	447
	100	199		23.5	42.8	62.5	81	101.2	120.9	140.2	159.6	179.3	199	6.0	8.7	12.8	19.2	27.9	41.5	61.6	90.8	134.5	199
10	250	1243	120	124	226.0	330.0	430.0	534.0	638.0	740.0	842.0	946.0	1050	31.9	46	67.5	101.4	147.3	219.2	325.2	479	46	1050
	190	718.5		84.9	154.7	225.8	294.3	365.4	436.6	506.4	576.2	647	719	21.8	31.3	46.2	69.4	100.8	150.0	222.5	328.0	485.5	719
	125	310.9		36.7	66.9	97.7	127.3	158.1	188.9	219.1	249.3	280.1	311	9.4	13.5	20.0	30.0	43.6	64.9	96.3	141.9	146	311
12	300	1791	160	176.1	321.0	468.6	611	758	906.0	1051	1195.6	1343.3	1491	45.2	64.9	95.9	144.0	209.1	311.3	461.8	680.6	1007.6	1491
	225	1007		119.0	216.8	316.5	412.4	512.1	611.9	709.7	807.5	907.3	1007	30.6	43.8	64.8	97.2	141.2	210.2	311.9	459.7	680.5	1007
	150	447		52.8	96.2	140.5	183.1	227.3	271.6	315.0	358.5	402.7	447	13.6	19.4	28.7	47	62.7	93.3	138.5	204.1	302.1	447
14	350	2438	180	248.1	452.1	660.1	860.0	1068.0	1276.0	1480.0	1684.0	1892.0	2100	63.7	91.4	135.1	202.8	294.6	438.4	650.4	958.6	1419.1	2100
	265	1371		162.0	295.1	430.9	561	697	833.1	966	1099.4	1235.2	1371	41.6	59.7	88.2	132.4	192.3	286.2	424.6	625.8	926.5	1371
	175	609		71.9	131.1	191.4	249.4	309.7	370.0	429.2	488.4	548.7	609	18.5	26.5	39.2	58.8	85.4	127.1	188.6	278.0	411.5	609
16	400	3184	200	342.6	624.3	911.5	1187.7	1474.9	1762.1	2043.8	2325.5	2612.8	2900	88.0	126.2	186.5	280	406.8	605.5	898.2	1323.8	1959.7	2900
	300	1791		211.6	385.5	562.9	733.5	910.9	1088.3	1262.2	1436.2	1613.6	1791	54.3	77.9	115.2	172.9	251.2	373.9	554.7	817.6	1210	1791
	200	796		94	171	250.2	326.0	404.8	483.7	561.0	638.3	717.2	796	24	34.6	51	76.9	111.7	166.2	246.5	363.4	537.9	796

G04. Low Noise Cage Flow Coefficient

Valve Size (inch)	Rated Flow Coefficient (C_V)	Max Stroke (mm)	Flow Coefficient (C_V)																			
			Standard Linear Characteristic										Standard Equal Percentage Characteristic									
			Travel (%)										Travel (%)									
			10	20	30	40	50	60	70	80	90	100	10	20	30	40	50	60	70	80	90	100
1	7.4	14	0.9	2	2.3	3.0	3.8	4.5	5.2	5.9	6.7	7	0.2	0.3	0.5	0.7	1.0	1.5	2.3	3.4	5.0	7
	4		0.5	0.9	1.3	1.6	2.0	2.4	2.8	3.2	3.6	4	0.1	0.2	0.3	0.4	0.6	0.8	1.2	1.8	2.7	4
	2.6		0.3	0.6	0.8	1	1.3	1.6	1.8	2	2.3	3	0.1	0.15	0.2	0.3	0.4	1	0.8	1.2	1.8	3
	0.2		0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.01	0.015	0.018	0.02	0.03	0.04	0.06	0.09	0.14	0.20
1 ½	17	16	2.0	3.7	5	7.0	8.6	10.3	12.0	13.6	15.3	17	0.5	0.7	1.1	1.6	2.4	3.5	5.3	16	11.5	17
	10		1.2	2.2	3.1	4.1	5.1	6.1	7.0	8.0	9.0	10	0.3	0.4	0.6	1.0	1.4	2	3.1	4.6	6.8	10
	4		0.5	0.9	1.3	1.6	2.0	2.4	2.8	3.2	3.6	4	0.1	0.2	0.3	0.4	0.6	0.8	1.2	1.8	2.7	4
	0.9		0.1	0.2	0.3	0.4	0.45	0.5	0.6	0.7	0.8	1	0.02	0.03	0.04	0.07	0.11	0.2	0.3	0.4	0.6	1
2	28	25	3.3	6.0	8.8	11.5	14.2	17.0	19.7	22.5	25.2	28	0.8	1.2	1.8	2.7	3.9	5.8	8.7	12.8	18.9	28
	15		1.8	3.2	4.7	6.1	7.6	9.1	10.6	12.0	14	15	0.5	0.7	1.0	1.4	2.1	3.1	4.6	6.8	10.1	15
	7		0.8	2	2.2	2.9	3.6	4.3	4.9	5.6	6.3	7	0.2	0.3	0.5	0.7	1.5	2	2.2	3.2	4.7	7
3	63	35	7.4	13.6	19.8	26	32.0	38.3	44.4	50.5	56.8	63	1.9	2.7	4.1	6.1	8.8	13.2	19.5	28.8	42.6	63
	35		4	7.5	11.0	14.3	17.8	21.3	24.7	28.1	31.5	35	1.1	2	2.3	3.4	4.9	7.3	10.8	16	46	35
	15		1.8	3.2	4.7	6.1	7.6	9.1	10.6	12.0	14	15	0.5	0.7	1.0	1.4	2.1	3.1	4.6	6.8	10.1	15
4	112	50	13.2	24.1	35.2	45.9	57.0	68.1	78.9	89.8	100.9	112	3.4	4.9	7.2	10.8	15.7	23.4	34.7	51.1	146	112
	63		7.4	13.6	19.8	26	32	38.3	44	50.5	56.8	63	1.9	2.7	4.1	6.1	8.8	13.2	19.5	28.8	42.6	63
	28		3.3	6.0	8.8	11.5	14.2	17.0	19.7	22.5	25.2	28	0.8	1.2	1.8	2.7	3.9	5.8	8.7	12.8	18.9	28
6	253	85	29.9	54.5	79.5	103.6	128.7	153.7	178.3	202.9	227.9	253	7.7	11.0	16.3	47	35.5	52.8	78.4	115.5	171.0	253
	148		17.5	31.9	46.5	60.6	75.3	89.9	104.3	118.7	133.3	148	4.5	6.4	9.5	14.3	20.8	30.9	45.8	67.6	100.0	148
	63		7.4	13.6	19.8	26	32	38.3	44	50.5	56.8	63	1.9	2.7	4.1	6.1	8.8	13.2	19.5	28.8	42.6	63
8	449	100	53.0	96.7	141.1	183.9	228.4	272.8	316.4	360.1	404.5	449	13.6	19.5	28.9	43.4	63.0	93.7	139.1	205.0	303.4	449
	253		29.9	54.5	79.5	103.6	128.7	153.7	178.3	202.9	227.9	253	7.7	11.0	16.3	24	35.5	52.8	78.4	115.5	171.0	253
	112		13.2	24.1	35.2	45.9	57.0	68.1	78.9	89.8	100.9	112	3.4	4.9	7.2	10.8	15.7	23.4	34.7	51.1	76	112
10	703	120	83.0	151	221.0	287.9	357.5	427.2	495.5	563.7	633.4	703	21	30.6	45	67.9	98.6	146.8	217.7	320.9	475.1	703
	406		48.0	87.4	127.6	166.3	206.5	246.7	286.1	325.6	365.8	406	12.3	18	26.1	39.2	56.9	84.8	125.8	185.3	274.4	406
	175			20.7	37.71	71.7	89.0	106.3	123.3	140	157.7	175	5.3	7.6	11.3	16.9	24.5	36.5	54.2	79.9	118.3	175
12	1012	160	120	217.8	318	414.5	514.7	614.9	713.2	811.5	911.8	1012	30.7	44.0	65.1	98	142.0	211.3	313	462.0	683.9	1012
	569		67.2	122.5	178.8	233.0	289.4	345.7	401.0	456.3	512.6	569	17.3	24.8	36.6	54.9	79.8	118.8	176.2	259.7	385	569
	253		29.9	54.5	79.5	103.6	128.7	153.7	178.3	202.9	227.9	253	7.7	11.0	16.3	24	35.5	52.8	78.4	115.5	171.0	253
14	1378	180	163	296.6	433.1	564.3	700.8	837.3	971.2	1105.0	1241.5	1378	41.8	60.0	88.6	133.1	193.3	287.7	426.8	629.0	931.2	1378
	775		91.6	167	243.6	317.4	394.2	471	546.2	621.5	698.2	775	23.5	33.7	49.8	75	108.7	161.8	240.0	353.8	523.7	775
	344		40.6	74.1	108.1	140.9	175.0	209.0	242.4	275.9	309.9	344	10.4	15.0	22.1	33	48	71.8	106.5	157.0	233	344
16	1799	200	212.5	387.3	565.4	736.8	914.9	1093	1267.9	1442.6	1620.8	1799	55	78.3	115.7	173.7	252.3	375.6	557	821.2	1215.7	1799
	1012		119.5	217.8	318	414.5	514.7	614.9	713.2	811.5	911.8	1012	30.7	44.0	65.1	98	142.0	211.3	313	462.0	683.9	1012
	449		53.0	96.7	141.1	183.9	228.4	272.8	316.4	360.1	404.5	449	13.6	19.5	28.9	43.4	63.0	93.7	139.1	205.0	303.4	449

G05. High Pressure Low Noise Cage Flow Coefficient

Valve Size (inch)	Rated Flow Coefficient (C_V)	Max Stroke (mm)	Flow Coefficient (C_V)																		
			Standard Linear Characteristic										Standard Equal Percentage Characteristic									
			Travel (%)										Travel (%)									
			10	20	30	40	50	60	70	80	90	100	10	20	30	40	50	60	70	80	90	100
1	11	14	1.3	2	3.5	4.5	5.6	6.7	7.8	8.8	9.9	11	0.3	0.5	0.7	1.1	1.5	2.3	3.4	5.0	7.4	11
	7		0.8	1.5	2.2	2.9	3.6	4.3	4.9	5.6	6.3	7	0.2	0.3	0.5	0.7	1.0	1.5	2.2	3.2	4.7	7
	4		0.5	0.9	1.3	1.7	2.1	2.3	2.8	3	3.6	4	0.1	0.2	0.3	0.4	0.6	1	1.2	1.8	2.7	4
	0.4		0.05	0.09	0.13	0.16	0.20	0.24	0.28	0.32	0.36	0.40	0.01	0.02	0.03	0.04	0.06	0.08	0.12	0.18	0.27	0.40
1 ½	28	16	3.3	6.0	9	11.5	14.2	17.0	19.7	22.5	25.2	28	0.8	1.2	1.8	2.7	3.9	5.8	8.7	16	18.9	28
	16		1.9	3.4	5.0	6.6	8.1	9.7	11.3	12.8	14.4	16	0.5	0.7	1.0	1.5	2.2	3	5.0	7.3	10.8	16
	6.2		0.7	1.3	1.9	2.5	3.2	3.8	4.4	5.0	5.6	6	0.2	0.3	0.4	0.6	0.9	1.3	1.9	2.8	4.2	6
	1.5		0.2	0.3	0.5	0.6	1	0.9	1.1	1.2	1.4	2	0.02	0.08	0.1	0.15	0.2	0.3	0.5	0.7	1.0	2
2	44	25	5.2	9.5	13.8	18.0	22.4	26.7	31.0	35.3	39.6	44	1.3	1.9	2.8	4.2	6.2	9.2	13.6	20.1	29.7	44
	25		3.0	5.4	7.9	10.2	12.7	15.2	17.6	20.0	23	25	0.8	1.1	1.6	2.4	3.5	5.2	7.7	11.4	16.9	25
	11		1.3	2	3.5	4.5	5.6	6.7	7.8	8.8	9.9	11	0.3	0.5	0.7	1.1	2.0	2.3	3.4	5.0	7.4	11
3	100	35	11.8	21.5	31.4	41	50.9	60.8	70.5	80.2	90.1	100	3.0	4.4	6.4	9.7	14.0	20.9	31.0	45.6	67.6	100
	56		7	12.1	17.6	22.9	28.5	34.0	39.5	44.9	50.5	56	1.7	2	3.6	5.4	7.9	11.7	17.3	26	46	56
	25		3.0	5.4	7.9	10.2	12.7	15.2	17.6	20.0	23	25	0.8	1.1	1.6	2.4	3.5	5.2	7.7	11.4	16.9	25
4	130	50	15.4	28.0	40.9	53.2	66.1	79.0	91.6	104.2	117.1	130	3.9	5.7	8.4	12.6	18.2	27.1	40.3	59.3	146	130
	100		11.8	21.5	31.4	41	51	60.8	70	80.2	90.1	100	3.0	4.4	6.4	9.7	14.0	20.9	31.0	45.6	67.6	100
	44		5.2	9.5	13.8	18.0	22.4	26.7	31.0	35.3	39.6	44	1.3	1.9	2.8	4.2	6.2	9.2	13.6	20.1	29.7	44
6	401	85	47.4	86.3	126.0	164.2	203.9	243.7	282.6	321.6	361.3	401	12.2	17.4	25.8	47	56.2	83.7	124.2	183.1	271.0	401
	235		27.8	50.6	73.9	96.2	119.5	142.8	165.6	188.4	211.7	235	7.1	10.2	15.1	22.7	33.0	49.1	72.8	107.3	158.8	235
	100		11.8	21.5	31.4	41	51	60.8	70	80.2	90.1	100	3.0	4.4	6.4	9.7	14.0	20.9	31.0	45.6	67.6	100
8	520	100	61.4	111.9	163.4	213.0	264.5	316.0	366.5	417.0	468.5	520	15.8	22.6	33.4	50.2	72.9	108.6	161.1	237.4	351.4	520
	401		47.4	86.3	126.0	164.2	203.9	243.7	282.6	321.6	361.3	401	12.2	17.4	25.8	39	56.2	83.7	124.2	183.1	271.0	401
	178		21.0	38.3	55.9	72.9	90.5	108.2	125.4	142.7	160.4	178	5.4	7.7	11.4	17.2	25.0	37.2	55.1	81.3	120	178

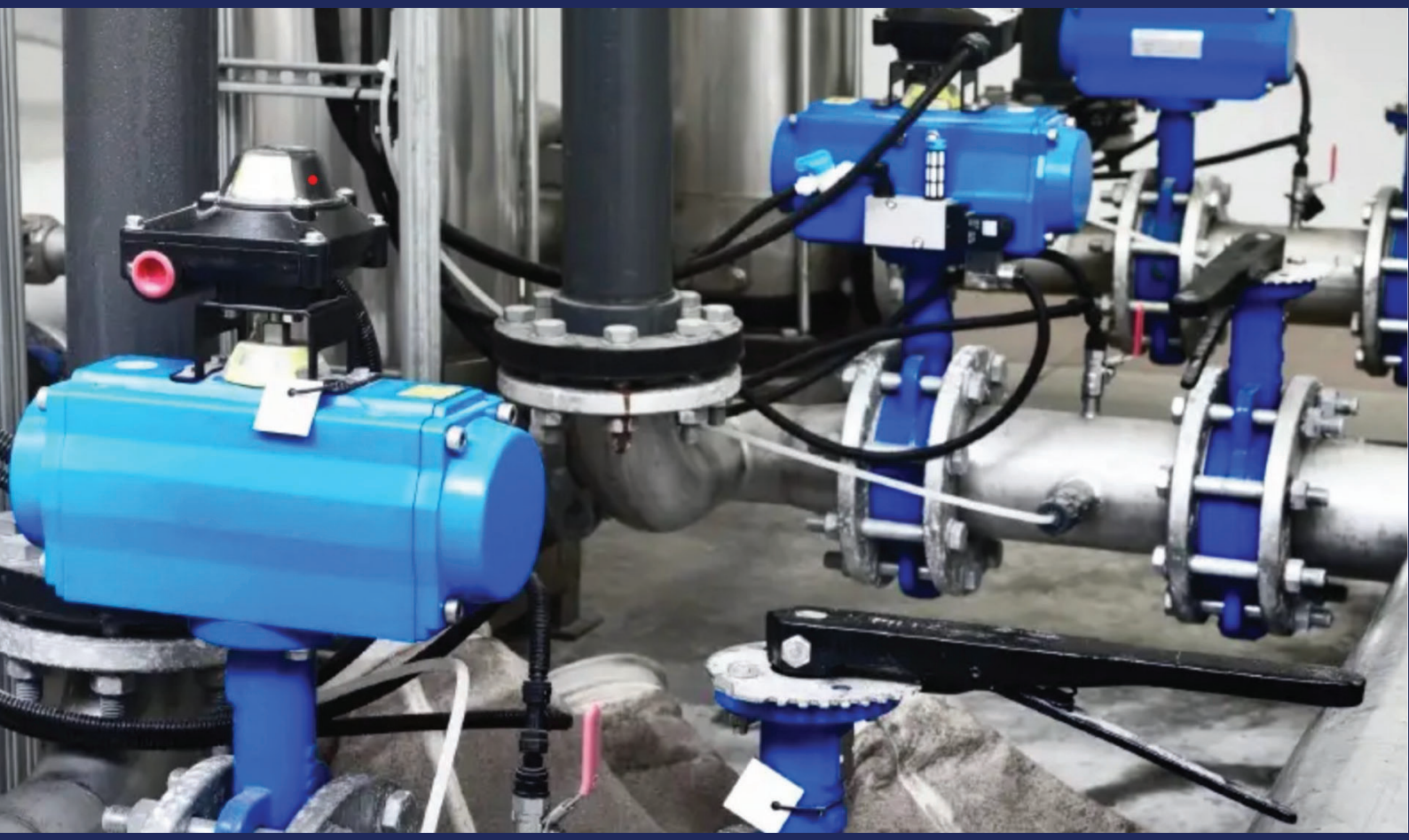
G06. Multistage Flow Coefficient

Valve Size (inch)	Seat Size (mm)	Rated Flow Coefficient (C_V)	Max Stroke (mm)	Flow Coefficient (C_V)																	
				Standard Linear Characteristic										Standard Equal Percentage Characteristic							
				Travel (%)										Travel (%)							
				10	20	30	40	50	60	70	80	90	100	10	20	30	40	50	60	70	80	90	100
3	80	55	35	6.5	12	17.3	22.5	28.0	33.4	38.8	44.1	49.6	55	1.7	2.4	3.5	5.3	7.7	11.5	17.0	25.1	37.2	55
	60	31		3.7	6.7	9.7	12.7	15.8	18.8	21.8	24.9	27.9	31	0.9	1.3	2.0	3.0	4.3	6.5	9.6	14.2	20.9	31
	40	13		1.5	2.8	4.1	5	6.6	8	9.2	10	11.7	13	0.4	0.6	0.8	1.3	1.8	3	4.0	5.9	8.8	13
4	100	70	50	8.27	15.07	22.00	28.67	35.60	42.53	49.33	56.13	63.07	70.00	2.12	3.05	4.50	6.76	9.82	14.62	21.68	31.95	47.30	70.00
	75	55		6.5	11.8	17	22.5	28.0	33.4	38.8	44.1	49.6	55	1.7	2.4	3.5	5.3	7.7	11.5	17.0	16	37.2	55
	50	24		2.8	5.2	7.5	9.8	12.2	14.6	16.9	19.2	21.6	24	0.7	1.0	1.5	2.3	3.4	5	7.4	11.0	16.2	24
6	150	223	85	26.3	48.0	70.1	91.3	113.4	135.5	157.2	178.8	200.9	223	6.8	9.7	14.3	21.5	31.3	46.6	69.1	101.8	150.7	223
	115	131		15.5	28.2	41.2	53.6	67	79.6	92.3	105.1	118.0	131	4.0	5.7	8.4	12.6	18.4	27.4	40.6	59.8	88.5	131
	75	55		6.5	11.8	17.3	22.5	28.0	33.4	38.8	44.1	49.6	55	1.7	2.4	3.5	5.3	7.7	11.5	17.0	25.1	37.2	55
8	200	265	100	31.3	57.0	83.3	108.5	134.8	161.0	186.8	212.5	239	265	8.0	11.5	17.0	25.6	37.2	55.3	82.1	121.0	179.1	265
	150	223		26.3	48	70.1	91.3	113.4	135.5	157.2	178.8	200.9	223	6.8	9.7	14.3	21.5	30.5	46.6	69.1	101.8	150.7	223
	100	99		11.7	21.3	31.1	41	50.4	60.2	69.8	79.4	89.2	99	3.0	4.3	6.4	9.6	13.9	20.7	30.7	45.2	66.9	99
10	250	525	120	62	113.0	165.0	215.0	267.0	319.0	370.0	421.0	473.0	525	15.9	23	33.8	50.7	73.6	109.6	162.6	240	460	525
	190	359		42.4	77.3	112.8	147.0	182.6	218.1	253.0	287.9	323	359	10.9	15.6	23.1	34.7	50.4	75.0	111.2	163.9	242.6	359
	125	155		18.3	33.4	48.7	63.5	78.8	94.2	109.2	124.3	139.6	155	4.7	6.7	10.0	15.0	21.7	32.4	48.0	70.8	146	155
12	300	745	160	88.0	160.4	234.2	305	379	452.7	525	597.4	671.2	745	22.6	32.4	47.9	71.9	104.5	155.5	230.8	340.1	503.4	745
	225	503		59.4	108.3	158.1	206.0	255.8	305.6	354.5	403.4	453.2	503	15.3	21.9	32.3	48.6	70.6	105.0	155.8	229.6	339.9	503
	150	223		26.3	48.0	70.1	91.3	113.4	135.5	157.2	178.8	200.9	223	6.8	9.7	14.3	24.7	31.3	46.6	69.1	101.8	150.7	223
14	350	1050	180	124.0	226.0	330.0	430.0	534.0	638.0	740.0	842.0	946.0	1050	31.9	45.7	67.5	101.4	147.3	219.2	325.2	479.3	709.5	1050
	265	685		80.9	147.5	215.3	281	348	416.2	483	549.3	617.2	685	20.8	29.8	44.1	66.1	96.1	143.0	212.2	312.7	462.9	685
	175	304		35.9	65.4	95.6	124.5	154.6	184.7	214.2	243.8	273.9	304	9.2	13.2	19.6	29.4	42.6	63.5	94.2	138.8	205.4	304
16	400	1450	200	171.3	312.1	455.8	593.8	737.5	881.1	1021.9	1162.8	1306.4	1450	44.0	63.1	93.3	140	203.4	302.7	449.1	661.9	979.9	1450
	300	895		105.7	192.7	281.3	366.5	455.2	543.8	630.8	717.7	806.4	895	27.2	38.9	57.6	86.4	125.5	186.9	277.2	408.6	605	895
	200	398		47.0	86	125.1	163.0	202.4	241.8	280.5	319.2	358.6	398	12	17.3	26	38.4	55.8	83.1	123.3	181.7	269.0	398

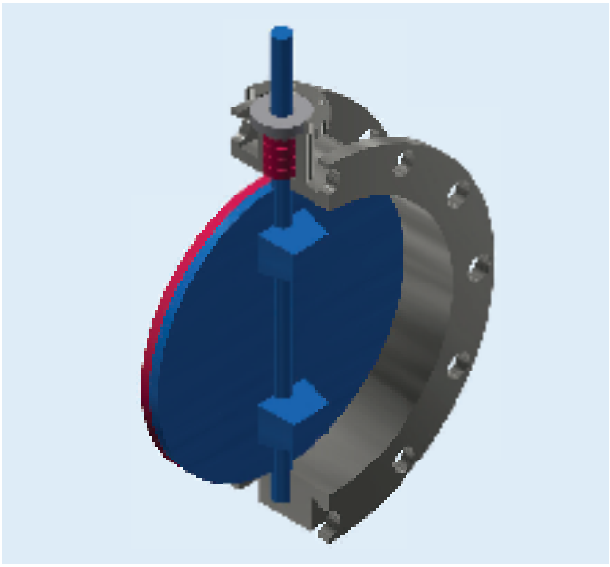
Globe Control Valve Thrust Force

Valve Size (inch)	Rated Flow Coefficient (C_V)	Max Stroke (mm)	Thrust* (kN)																			
			Leakage Class IV										Leakage Class V									
			Shut off Pressure (barg)										Shut off Pressure (barg)									
			10	20	30	40	50	60	70	80	90	100	10	20	30	40	50	60	70	80	90	100
1	7.4	14	0.7	1.3	1.8	2.4	2.9	3.4	4.0	4.5	5.1	5.6	2.0	2.5	3.1	3.6	4.2	4.7	5.2	5.8	6.3	6.9
	4		0.5	0.8	1.2	1.5	1.9	2.2	2.6	2.9	3.3	3.6	1.5	1.9	2.2	2.6	2.9	3.2	3.6	3.9	4.3	4.6
	2.6		0.3	0.5	0.7	0.9	1.1	1.3	1.5	1.7	1.9	2.1	1.1	1.3	1.5	1.7	1.9	2	2.2	2.4	2.6	2.8
	0.2		0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5
1 ½	17	16	1.7	3.1	4.5	5.8	7.2	8.6	10	11.4	12.7	14.1	3.7	5.1	6.5	7.9	9.3	10.6	12	13.4	14.8	16.2
	10		1.0	1.8	2.6	3.3	4.1	4.9	5.7	6.5	7.2	8	2.5	3.3	4.1	4.9	5.6	6.4	7.2	8	8.8	9.5
	4		0.5	0.8	1.2	1.5	1.9	2.2	2.6	2.9	3.3	3.6	1.5	1.9	2.2	2.6	2.9	3.2	3.6	3.9	4.3	4.6
	0.9		0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.9	0.7	0.8	0.8	0.9	1	1.1	1.2	1.3	1.4	1.5
2	28	25	2.6	4.7	6.9	9	11.2	13.3	15.5	17.7	19.8	22	5.1	7.3	9.4	11.6	13.7	15.9	18	20.2	22.4	24.5
	15		1.5	2.8	4	5.3	6.5	7.8	9	10.3	11.5	12.8	3.5	4.7	6	7.2	8.5	9.7	11	12.2	13.5	14.7
	7		0.7	1.3	1.8	2.4	2.9	3.4	4	4.5	5.1	5.6	2	2.5	3.1	3.6	4.2	4.7	5.2	5.8	6.3	6.9
3	63	35	6.2	11.7	17.2	22.7	28.3	33.8	39.3	44.8	50.4	55.9	10.2	15.8	21.3	26.8	32.3	37.9	43.4	48.9	54.4	60
	35		3.6	6.7	9.8	12.9	16	19.1	22.2	25.3	28.4	31.6	6.6	9.7	12.9	16	19.1	22.2	25.3	28.4	31.5	34.6
	15		1.7	3.1	4.5	5.8	7.2	8.6	10	11.4	12.7	14.1	3.7	5.1	6.5	7.9	9.3	10.6	12	13.4	14.8	16.2
4	112	45	9.4	18.1	26.7	35.3	44	52.6	61.2	69.9	78.5	87.1	14.5	23.1	31.8	40.4	49	57.7	66.3	75	83.6	92.2
	63		5.4	10.3	15.2	20	24.9	29.7	34.6	39.4	44.3	49.2	9.3	14.1	19	23.8	28.7	33.5	38.4	43.3	48.1	53
	28		2.6	4.7	6.9	9	11.2	13.3	15.5	17.7	19.8	22	5.1	7.3	9.4	11.6	13.7	15.9	18	20.2	22.4	24.5
6	253	90	21.8	41.2	60.6	80.1	99.5	118.9	138.4	157.8	177.2	196.6	28.2	47.7	67.1	86.5	106	125.4	144.8	164.2	183.7	203.1
	148		13.2	24.6	36.1	47.5	58.9	70.3	81.7	93.2	104.6	116	18.2	29.6	41	52.4	63.9	75.3	86.7	98.1	109.5	121
	63		5.4	10.3	15.2	20	24.9	29.7	34.6	39.4	44.3	49.2	9.3	14.1	19	23.8	28.7	33.5	38.4	43.3	48.1	53
8	449	100	37.7	72.2	106.8	141.3	175.8	210.4	244.9	279.5	314	348.5	46.3	80.8	115.4	149.9	184.4	219	253.5	288.1	322.6	357.1
	253		21.8	41.2	60.6	80.1	99.5	118.9	138.4	157.8	177.2	196.6	28.2	47.7	67.1	86.5	106	125.4	144.8	164.2	183.7	203.1
	112		9.4	18.1	26.7	35.3	44	52.6	61.2	69.9	78.5	87.1	14.5	23.1	31.8	40.4	49	57.7	66.3	75	83.6	92.2
10	703	120	57.9	111.9	165.8	219.8	273.8	327.7	381.7	435.7	489.6	543.6	68.7	122.6	176.6	230.6	284.5	338.5	392.5	446.4	500.4	554.4
	406		34.1	65.3	96.5	127.7	158.8	190	221.2	252.4	283.5	314.7	42.3	73.5	104.7	135.9	167	198.2	229.4	260.5	291.7	322.9
	175		15.5	28.9	42.4	55.9	69.4	82.9	96.4	109.9	123.4	136.9	20.8	34.3	47.8	61.3	74.8	88.3	101.8	115.3	128.8	142.3
12	1012	160	82.4	160.1	237.8	315.6	393.3	471	548.7	626.4	704.1	781.9	95.3	173.1	250.8	328.5	406.2	483.9	561.6	639.3	717.1	794.8
	569		47.2	91	134.7	178.4	222.1	265.8	309.5	353.2	397	440.7	56.9	100.6	144.4	188.1	231.8	275.5	319.2	362.9	406.6	450.4
	253		21.8	41.2	60.6	80.1	99.5	118.9	138.4	157.8	177.2	196.6	28.2	47.7	67.1	86.5	106	125.4	144.8	164.2	183.7	203.1
14	1378	180	111.3	217	322.8	428.6	534.4	640.2	745.9	851.7	957.5	1063.3	126.3	232.1	337.9	443.7	549.5	655.2	761	866.8	972.6	1078.3
	775		64.8	125.4	186.1	246.7	307.3	368	428.6	489.3	549.9	610.5	76.2	136.8	197.5	258.1	318.8	379.4	440	500.7	561.3	622
	344		29.2	55.6	82.1	108.5	135	161.4	187.9	214.3	240.7	267.2	36.7	63.2	89.6	116.1	142.5	168.9	195.4	221.8	248.3	274.7
16	1799	200	144.4	282.6	420.7	558.9	697.1	835.2	973.4	1111.5	1249.7	1387.9	161.7	299.8	438	576.1	714.3	852.5	990.6	1128.8	1266.9	1405.1
	1012		82.4	160.1	237.8	315.6	393.3	471	548.7	626.4	704.1	781.9	95.3	173.1	250.8	328.5	406.2	483.9	561.6	639.3	717.1	794.8
	449		37.7	72.2	106.8	141.3	175.8	210.4	244.9	279.5	314	348.5	46.3	80.8	115.4	149.9	184.4	219	253.5	288.1	322.6	357.1

*In thrust calculation, the actuator spring force has been excluded.



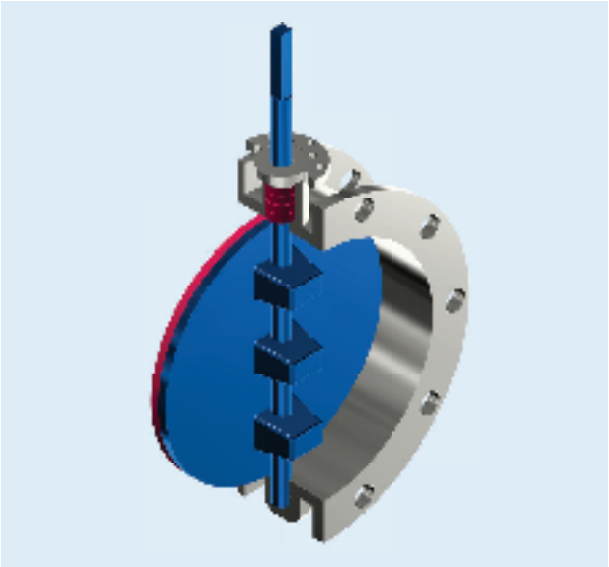
Butterfly Control Valve



B21. Double Offset Butterfly Valve

Double offset butterfly valve is used for rough flow control. These series are designed for operation with tough industrial conditions demanding safety, reliability, and minimum maintenance like water treatment, chemical industry, and gas pipe-works.

1	Type	Double offset butterfly valve
2	Body Size	3”-32”
3	Disk Form	Inclined conical surface
4	Inherent Characteristic	Linear/Equal percent
5	Pressure Rating	150 & 300
6	Body End Connection	Wafer/ Flange

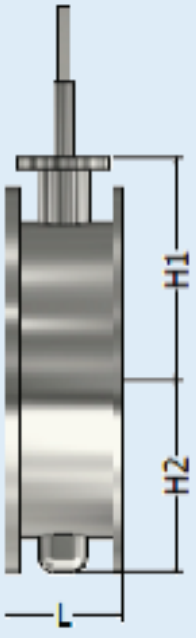


B22. Triple Offset Butterfly

Triple offset butterfly valve is characterized by the structure of triple offset which has dramatic excellence with no friction on the sealing surface in open and closed position. Additionally, with lower torque, the valve is generally applicable to the field of metallurgy, petroleum, chemical industry, and natural gas.

1	Type	Triple offset butterfly valve
2	Body Size	6”-32”
3	Disk Form	Inclined conical surface
4	Inherent Characteristic	Linear/Equal percent
5	Pressure Rating	150 & 300
6	Body End Connection	Wafer/ Lug/ Flange

Butterfly Valve Dimension

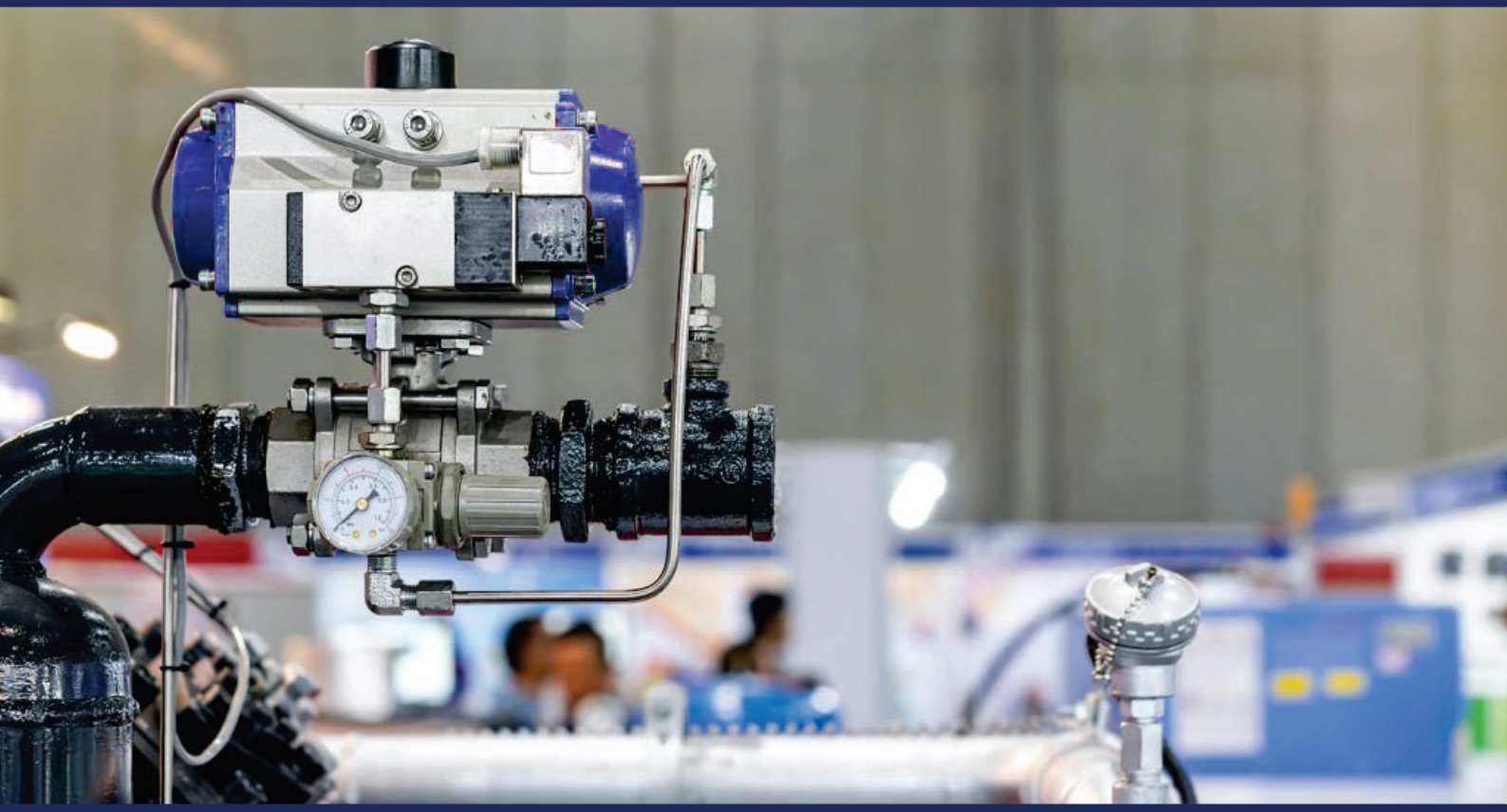


Valve Size (inch)	Pressure Rating	Dimension (mm)			
		L		H1	H2
		Short	Wafer/ Lug		
3	150	114	48	138	125
	300			138	125
4	150	127	54	158	148
	300			158	148
6	150	140	57	158	165
	300			200	192
8	150	152	64	225	215
	300			243	236
10	150	165	71	250	240
	300			275	260
12	150	178	81	291	283
	300			307	297
14	150	191	92	318	303
	300			340	330
16	150	216	102	348	338
	300			375	361
18	150	222	114	392	380
	300			422	407
20	150	229	127	425	410
	300			470	441
24	150	267	154	525	495
	300			553	511
28	150	292	165	620	573
	300			656	612
32	150	325	198	700	645
	300			720	665

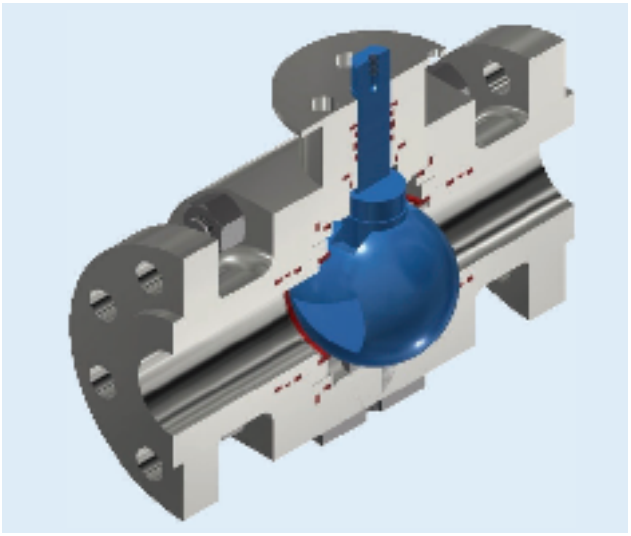
Butterfly Valve Flow Coefficient

Double Offset Butterfly Valve										
Valve Size (inch)	Rated Flow Coefficient (C_V)	Flow Coefficient (C_V)								
		Opening Degree								
		10°	20°	30°	40°	50°	60°	70°	80°	90°
3	370	2	22	49	72	113	172	246	317	370
4	578	5	43	81	134	201	282	379	511	578
6	1387	16	83	146	243	395	601	909	1214	1387
8	2659	50	158	279	421	664	1032	1606	2296	2659
10	4162	97	208	425	707	1162	1737	2522	3482	4162
12	6011	124	306	602	1134	1789	2606	3736	4913	6011
14	8439	148	349	707	1239	2021	3121	4676	6971	8439
16	10982	253	453	884	1611	2626	4059	6087	9072	10982
18	13872	362	566	1168	2035	3318	5138	7687	11456	13872
20	17109	630	717	1445	2532	4185	6497	9653	14369	17109
24	24970	937	1040	2173	3688	6069	9364	13988	21039	24970
28	34911	1203	1445	2959	5144	8381	13005	19594	29154	34911
32	46471	1632	1965	3930	6901	11098	17594	26126	39593	46471

Triple Offset Butterfly Valve										
Valve Size (inch)	Rated Flow Coefficient (C_V)	Flow Coefficient (C_V)								
		Opening Degree								
		10°	20°	30°	40°	50°	60°	70°	80°	90°
6	1470	43	84	158	252	393	610	992	1290	1470
8	2615	75	151	282	449	699	1085	1763	2294	2615
10	4567	118	236	440	701	1092	1697	2755	3729	4567
12	6578	170	340	635	1009	1572	2443	3966	5371	6578
14	8953	231	462	864	1373	2140	3325	5399	7311	8953
16	11694	302	603	1128	1794	2795	4343	7052	9549	11694
18	14800	383	764	1428	2270	3537	5497	8924	12084	14800
20	18272	472	943	1762	2803	4367	6786	11018	14919	18272
24	29417	680	1358	2537	4036	6290	9876	15866	22438	29417
28	40039	925	1850	3454	5493	8561	13301	21595	30542	40039
32	52296	1208	2416	4512	7175	11182	17372	28206	39890	52296



Ball Control Valve

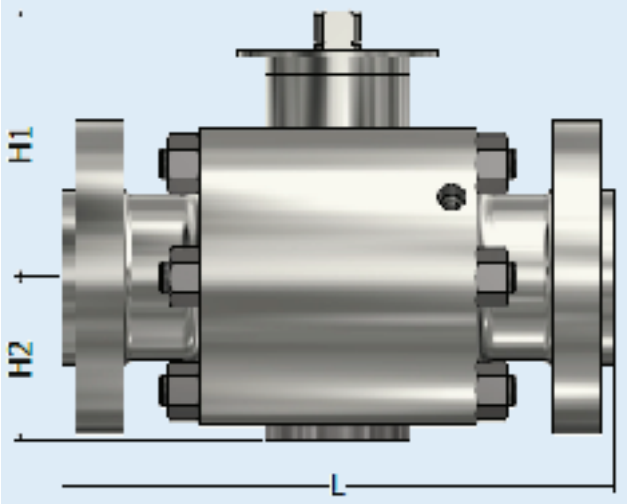


A41. V- Notch Ball

The V-notch ball is a new concept and structure. Its primary specialty is adopting an integer body, a valve body with more bear pressure capability. In this model, both of metal seat and a soft seal are used and both of them can mate with the same body.

1	Type	V-notch ball valve
2	Body Size	1”-16”
3	Disk Form	V-notch half ball
4	Inherent Characteristic	Modified/Equal percent
5	Pressure Rating	150 & 300
6	Body End Connection	Flange

V-Notch Ball Valve Dimension



Valve Size (inch)	Pressure Rating	Dimension (mm)		
		L	H1	H2
1	150	127	73	81
	300	165		
	600	216		
1 ½	150	165	80	90
	300	190		
	600	241		
2	150	178	90	93
	300	216		
	600	292		
3	150	203	118	123
	300	283		
	600	356		
4	150	229	130	138
	300	305		
	600	432		
6	150	394	170	170
	300	403		
	600	559		
8	150	457	201	200
	300	502		
	600	660		
10	150	533	237	240
	300	568		
	600	787		
12	150	610	282	286
	300	648		
	600	838		
14	150	686	337	330
	300	762		
	600	889		
16	150	762	372	367
	300	838		
	600	991		

Valve Size (inch)	Rated Flow Coefficient (C_V)	Flow Coefficient (C_V)									
		Travel (%)									
		10	20	30	40	50	60	70	80	90	100
1	35	1.1	1.5	2.2	3.3	4.9	7.2	10.7	15.8	23.4	35
1 ½	65	2.0	2.8	4.2	6.3	9.1	13.5	20.1	29.6	43.7	65
2	104	3.2	4.5	6.7	10.0	14.6	22	32.2	47.5	70.3	104
3	266	8.1	11.6	17.1	25.7	37.3	55.5	82.3	121.4	179.7	265.9
4	447	13.6	19.5	28.8	43.2	62.8	93.4	138.6	160	302.3	447
6	1116	33.9	48.5	71.7	107.7	156.5	233	345.5	509.2	753.8	1116
8	1811	55.0	78.8	116.5	174.9	254.1	378.2	561.1	826.9	1224.1	1812
10	2774	84.2	120.7	178.4	267.9	389.2	579.2	859.3	1266.5	1874.8	2774
12	4508	136.8	196.2	290.0	435.3	632.4	941.3	1396.4	2058.0	3046.6	4508
14	7109	215.7	309.3	457.2	686.5	997.2	1484.3	2202	3245.4	4804.3	7109
16	11329	343.8	492.9	728.6	1094.0	1800	2365.2	3508.9	5171.5	7655.6	11329

Control Valve Actuator

Actuator Calculation Procedure

PROCESS STEP 1

Flow direction, failed condition and travel must be determined.

01

PROCESS STEP 2

The value of valve trust or torque must be calculated.

02

03

PROCESS STEP 3

Actuator features specification, i.e., the value of diaphragm or piston area and spring stiffness must be calculated.

PROCESS STEP 4

Value of actuator thrust or torque in specified travel and air supply pressure must be calculated.

04

No

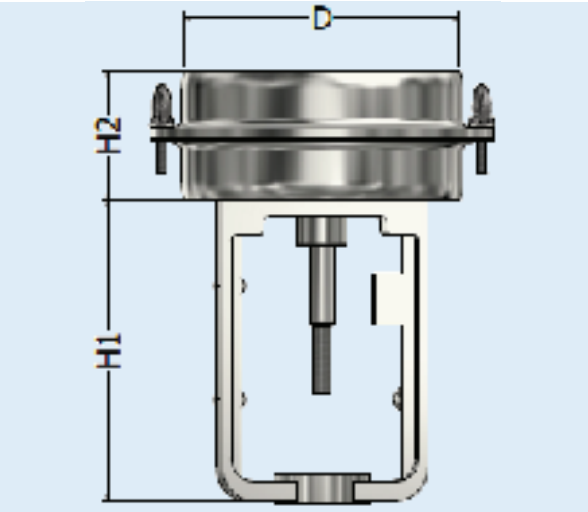
YES

05

END

PROCESS STEP 5

The value of actuator thrust or torque must be bigger than the value of ((valve trust or torque) × Safety factor).

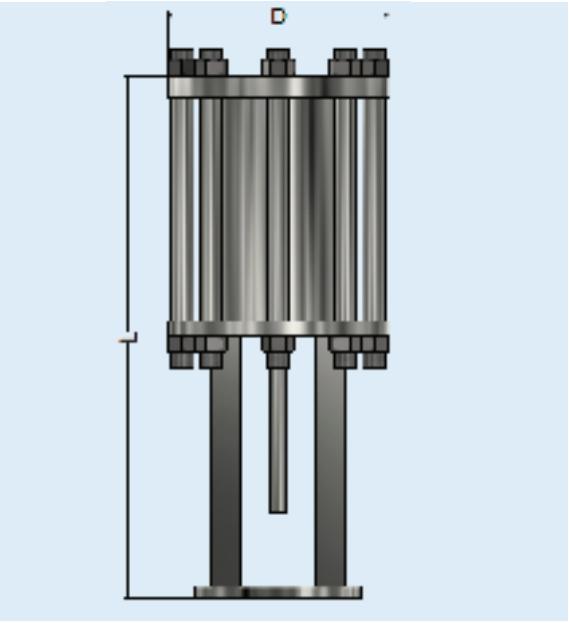


DLA- Diaphragm linear Actuator

Diaphragm actuators are pneumatically operated and use an air supply from the control system or other sources. The most common styles for diaphragm actuators are known as “direct-acting” and “reverse-acting.”

No.	Diaphragm Linear Actuator Models	Dimension (mm)		
		H1	H2	D
1	DLA1	220	78	360
2	DLA2	320	120	480
3	DLA3	320	199	640
4	DLA4	418	337	750
5	DLA5	503	713	800

Model	Actuator Effective Area (cm^2)	Rated Travel (mm)	Number of Spring	Spring force at 0 mm travel (kN)	Spring force at rated travel (kN)	Air Supply Pressure (barg)						
						2	3	4	5	6	7	8
						Thrust (kN)						
DLA1	314	30	3	0.18	1.26	5.0	8.2	11.3	14.4	17.6	20.7	23.9
				0.27	1.89	4.4	7.5	10.7	13.8	17.0	20.1	23.2
			6	0.36	2.52	3.8	6.9	10.0	13.2	16.3	19.5	22.6
				0.54	3.78	2.5	5.6	8.8	11.9	15.1	18.2	21.3
			9	0.54	3.78	2.5	5.6	8.8	11.9	15.1	18.2	21.3
				0.81	5.67	0.6	3.8	6.9	10.0	13.2	16.3	19.5
DLA2	706	60	3	0.54	3.78	10.4	17.4	24.5	31.5	38.6	45.7	52.7
				0.72	5.04	9.1	16.2	23.2	30.3	37.4	44.4	51.5
				0.90	6.3	7.8	14.9	22.0	29.0	36.1	43.2	50.2
			6	1.08	7.56	6.6	13.6	20.7	27.8	34.8	41.9	49.0
				1.44	10.08	4.1	11.1	18.2	25.2	32.3	39.4	46.4
				1.80	12.6	1.5	8.6	15.7	22.7	29.8	36.9	43.9
			9	1.62	11.34	2.8	9.9	16.9	24.0	31.1	38.1	45.2
				2.16	15.12	-	6.1	13.1	20.2	27.3	34.3	41.4
				2.70	18.9	-	2.3	9.4	16.4	23.5	30.6	37.6
			12	2.16	15.12	-	6.1	13.1	20.2	27.3	34.3	41.4
				2.88	20.16	-	1.0	8.1	15.2	22.2	29.3	36.4
				3.60	25.2	-	-	3.1	10.1	17.2	24.3	31.3
DLA3	1256	80	3	0.90	8.1	17.0	29.6	42.1	54.7	67.3	79.8	92.4
				1.08	9.72	15.4	28.0	40.5	53.1	65.6	78.2	90.8
			6	1.80	16.2	8.9	21.5	34.0	46.6	59.2	71.7	84.3
				2.16	19.44	5.7	18.2	30.8	43.4	55.9	68.5	81.0
			12	3.60	32.4	-	5.3	17.8	30.4	43.0	55.5	68.1
DLA4	1962	100	3	1.62	12.42	26.8	46.5	66.1	85.7	105.3	125.0	144.6
				1.89	14.49	24.8	44.4	64.0	83.6	103.3	122.9	142.5
			6	3.24	24.84	14.4	44.5	34.0	64.1	53.7	83.7	73.3
				3.78	28.98	10.3	29.9	49.5	69.1	88.8	108.4	128.0
			12	6.48	49.68	-	9.2	28.8	48.4	68.1	87.7	107.3
				7.56	57.96	-	0.9	20.5	40.2	59.8	79.4	99.0
DLA5	2826	160	3	2.52	22.68	33.8	62.1	90.4	118.6	146.9	175.1	203.4
				2.88	25.92	30.6	58.9	87.1	115.4	143.6	171.9	200.2
			6	5.04	45.36	11.2	39.4	67.7	95.9	124.2	152.5	180.7
				5.76	51.84	4.7	32.9	61.2	89.5	117.7	146.0	174.2
			12	10.08	90.72	-	-	22.3	50.6	78.8	107.1	135.4
				11.52	103.68	-	-	9.4	37.6	65.9	94.1	122.4

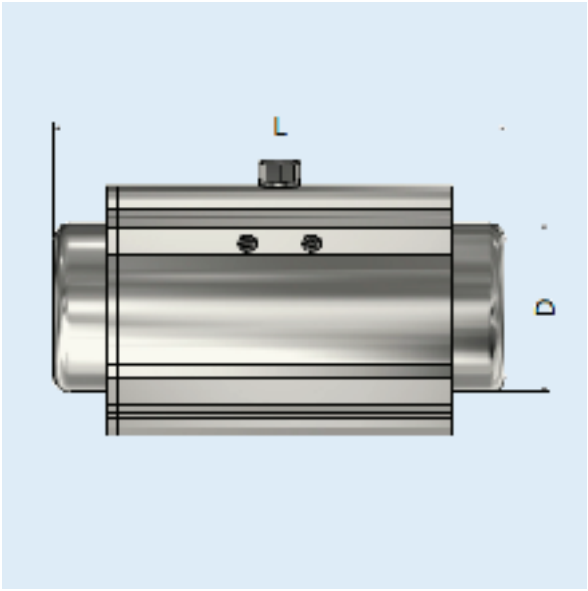


PLA- Piston linear Actuator

Piston linear actuator uses air pressure or natural gas to provide the force required to open, close and control rising stem valves. To provide proper failure position, spring cartridges allow for fail open or fail closed valve applications. This is extremely important in emergency shutdown applications.

Piston Linear Actuator Models	Dimension (mm)	
	H	D
PLA1	584	373
PLA2	920	461
PLA3	982	573
PLA4	1773	670
PLA5	1810	911
PLA6	1900	1180

Model	Actuator Effective Area (cm^2)	Rated Travel (mm)	Spring force range at zero mm travel (kN)	Spring force range at rated travel (kN)	Air Supply Pressure (barg)								
					2	3	4	5	6	7	8	9	10
					Thrust range (kN)								
PLA1	706	120	0.9	11.7	2.4	9.5	16.6	23.6	30.7	37.8	44.8	51.9	59.0
			1.1	14.3	-	6.9	14.0	21.0	28.1	35.2	42.2	49.3	56.4
			1.4	18.2	-	3.0	10.1	17.1	24.2	31.3	38.3	45.4	52.5
PLA2	1256	180	0.9	12.7	8.0	20.6	33.1	45.7	58.3	70.8	83.4	95.9	108.5
			1.1	17.0	4.2	16.8	29.3	41.9	54.5	67.0	79.6	92.1	104.7
			1.4	20.5	-	11.1	23.6	36.2	48.8	61.3	73.9	86.4	99.0
PLA3	1962	240	2.3	12.7	10.0	29.6	49.3	68.9	88.5	108.1	127.8	147.4	167.0
			2.9	17.0	2.2	21.8	41.5	61.1	80.7	100.3	120.0	139.6	159.2
			3.6	20.5	-	12.1	31.7	51.3	71.0	90.6	110.2	129.8	149.5
PLA4	2826	280	3	45	11.5	39.8	68.0	96.3	124.6	152.8	181.1	209.3	237.6
			3.8	57	-	27.8	56.0	84.3	112.6	140.8	169.1	197.3	225.6
			4.8	72	-	12.8	41.0	69.3	97.6	125.8	154.1	182.3	210.6
PLA5	3846	300	3	63	13.9	52.4	90.9	129.3	167.8	206.3	244.7	283.2	321.7
			3.3	69.3	7.6	46.1	84.6	123.0	161.5	200.0	238.4	276.9	315.4
			3.9	81.9	0.0	33.5	72.0	110.4	148.9	187.4	225.8	264.3	302.8
PLA6	5024	320	4	64	36.5	86.7	137.0	187.2	237.4	287.7	337.9	388.2	438.4
			4.4	70.4	30.1	80.3	130.6	180.8	231.0	281.3	331.5	381.8	432.0
			5.2	83.2	17.3	67.5	117.8	168.0	218.2	268.5	318.7	369.0	419.2

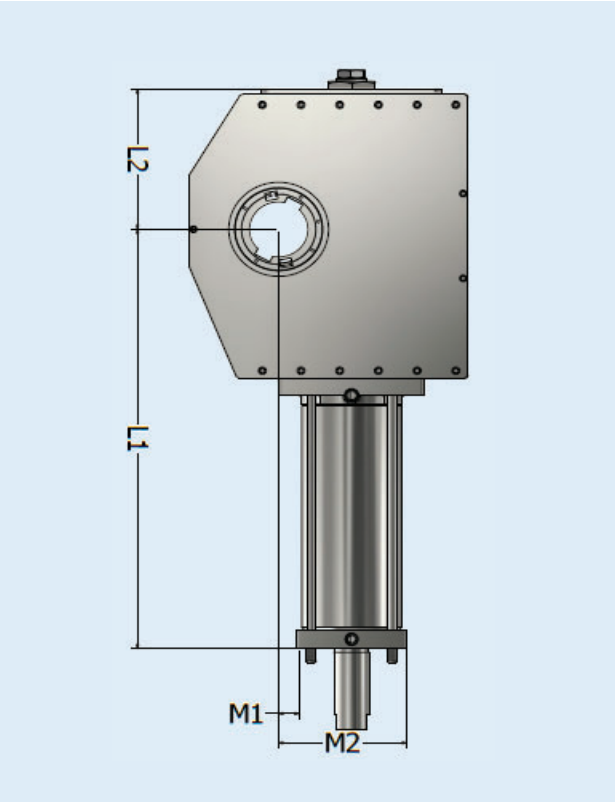


RAR- Rack and Pinion Rotary Actuator

Rack-and-pinion pneumatic actuators are rotary actuators used for turning, opening, closing, mixing, oscillating, positioning, steering, and many more mechanical functions involving restricted rotation. These actuators convert the energy of compressed air using pneumatic cylinder to an oscillating rotary motion.

Rack and Pinion Rotary Actuator Models	Act	Dimension (mm)	
		L	D
RAR1	DA	372	191.5
	SR	473	
RAR2	DA	461	242.5
	SR	601	
RAR3	DA	510	276.5
	SR	702	
RAR4	DA	518	356
	SR	738	
RAR5	DA	630	415
	SR	940	

Model	Actuator Effective Area (cm^2)	Act	Spring Arrangement Model	Air Supply Pressure (barg)											
				3		4		5		6		7		8	
				Torque (Nm)											
				0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°
RAR1	201	Double Act (DA)	-	359		479		598		718		837		957	
		Spring Return (SR)	03	260	209	380	328	500	448	619	568	739	687	858	807
			04	227	159	347	278	467	398	586	518	706	637	826	757
			05	-	-	314	228	434	348	553	467	673	587	793	707
			06	-	-	-	-	401	298	521	417	640	537	760	657
			07	-	-	-				488	367	607	487	727	607
RAR2	345	Double Act (DA)	-	707		924		1178		1413		1649		1884	
		Spring Return (SR)	03	477	349	712	584	948	820	1183	1055	1419	1291	1654	1526
			04	400	229	636	465	871	700	1107	936	1342	1171	1578	1407
			05			559	345	795	581	1030	816	1266	1052	1501	1287
			06					718	461	954	697	1189	933	1425	1168
			07					642	342	877	578	1113	813	1348	1049
RAR3	452	Double Act (DA)	-	1087		1448		1810		2127		2534		2896	
		Spring Return (SR)	03	702	509	1064	871	1426	1233	1788	1595	2150	1957	2512	2319
			04	574	316	936	678	1298	1040	1660	1402	2022	1764	2384	2126
			05			808	486	1170	848	1532	1210	1894	1572	2256	1934
			06					1042	655	1404	1017	1766	1379	2128	1741
			07					914	463	1276	825	1638	1187	2000	1549
RAR4	706	Double Act (DA)	-	1730		1876		2453		3029		3606		3929	
		Spring Return (SR)	03	1299	1045	1876	1622	2453	2199	3029	2775	3606	3352	4183	3929
			04	1155	816	1732	1393	2309	1970	2886	2547	3462	3124	4039	3700
			05			1588	1165	2165	1742	2742	2318	3319	2895	3895	3472
			06			1444	936	2021	1513	2598	2090	3175	2667	3752	3243
			07					1877	1285	2454	1861	3031	2438	3608	3015
RAR5	907	Double Act (DA)	-	2408		3210		4013		4816		5618		6421	
		Spring Return (SR)	04	1549	880	2351	1683	3154	2485	3956	3288	4759	4091	5068	4399
			05			2136	1301	2939	2104	3742	2906	4544	3709	4853	4017
			06					2724	1722	3527	2524	4329	3327	4638	3636
			07							3312	2142	4115	2945	4423	3254

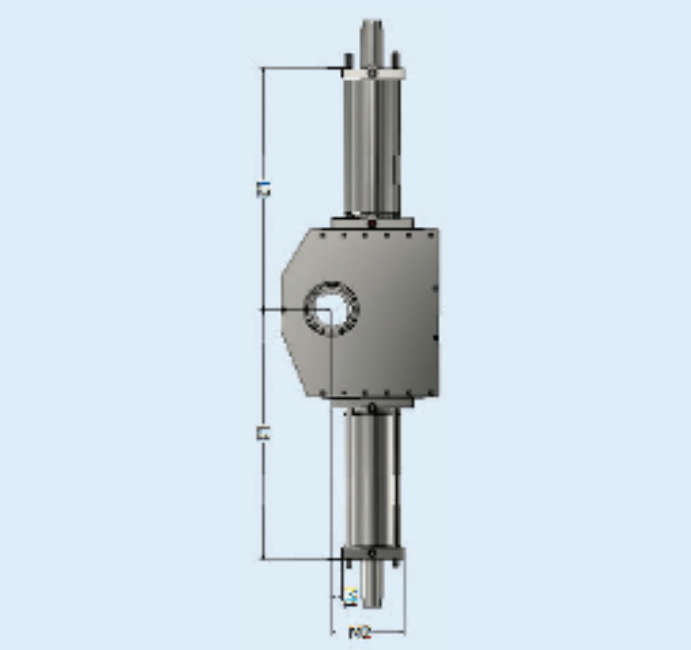


SAR-DA. Double Act Scotch & Yoke Rotary Actuator

The scotch yoke is a mechanism that converts a linear motion of a bar sliding back-and- forth into a rotational motion. The sliding bar is directly coupled to a piston and a yoke with a slot that engages a sliding block.

Model	Dimension (mm)			
	L1	L2	M1	M2
SAR-DA1	350	124	85	123
SAR-DA2	423	165	68	188
SAR-DA3	499	190	80	230
SAR-DA4	499	190	107.5	257.5
SAR-DA5	582	222	117.5	297.5
SAR-DA6	582	222	172.5	322.5
SAR-DA7	705	287	148	368
SAR-DA8	705	287	175	395
SAR-DA9	832	326	170	450
SAR-DA10	970	388	165	505
SAR-DA11	970	388	216	556
SAR-DA12	1130	440	239	639
SAR-DA13	1420	3150	220	760
SAR-DA14	1420	3150	270	810
SAR-DA15	1420	3150	320	860

Model	Actuator Effective Area (cm^2)	Air Supply Pressure (bar)									
		3		4		5		6		7	
		Torque (Nm)									
		Open-Close	Running	Open-Close	Running	Open-Close	Running	Open-Close	Running	Open-Close	Running
SAR-DA1	177	293	176	391	235	489	293	586	352	-	-
SAR-DA2	314	822	499	1096	665	1370	831	1643	997	1918	1163
SAR-DA3	491	1590	964	2120	1286	2650	1607	3180	1929	3710	2250
SAR-DA4	707	2289	1389	3053	1851	3816	2315	-	-	-	-
SAR-DA5	962	3847	2333	5130	3112	6412	3890	7695	4668	-	-
SAR-DA6	1256	4884	2963	6513	3950	8141	4938	-	-	-	-
SAR-DA7	1590	7556	4583	10074	6111	12328	7478	15112	9167	-	-
SAR-DA8	1962	9329	5659	12439	7546	15549	9433	-	-	-	-
SAR-DA9	2375	14367	8715	19156	11621	23944	14526	28734	17431	33523	20337
SAR-DA10	2826	20762	12595	27683	16793	34604	20993	41526	25192	48446	29390
SAR-DA11	3847	28259	17143	37680	22859	47101	28574	56521	34288	65940	40004
SAR-DA12	5024	43425	26343	57899	35125	72375	43907	86851	52689	101325	61471
SAR-DA13	6359	74196	45011	98928	60016	123659	75020	148392	90024	173124	105028
SAR-DA14	7850	91600	55570	122133	74094	152666	92617	183200	111141	213733	129664
SAR-DA15	9499	110835	67240	147781	89653	184726	112067	221671	134480	258616	156893



SAR-SR. Spring Return Scotch & Yoke Rotary Actuator

Model	Dimension (mm)			
	L1	L2	M1	M2
SAR-SR1	335	465	75	143.5
SAR-SR2	442	619	68	188
SAR-SR3	507	775	80	230
SAR-SR4	507	775	107.5	257.5
SAR-SR5	587	940	117.5	297.5
SAR-SR6	590	940	172.5	322.5
SAR-SR7	715	1165	148	368
SAR-SR6	707	1165	175	395
SAR-SR8	842	1511	170	450
SAR-SR9	976	1760	165	505
SAR-SR10	980	1760	216	556
SAR-SR11	1405	3100	169	709
SAR-SR12	335	465	75	143.5
SAR-SR13	1416	3100	220	760
SAR-SR14	1422	3100	270	810
SAR-SR15	1444	3100	320	860

Model	Actuator Effective Area (cm^2)	Air Supply Pressure (barg)	Torque (Nm)					
			Air Break	Air Running	Air End	Spring Break	Spring Running	Spring End
SAR-SR1	177	3	172	84	108	176	86	111
		5	285	145	199	276	139	189
		6	325	160	209	360	182	245
SAR-SR2	314	3	518	258	315	506	251	304
		5	868	451	588	781	398	501
		6	1027	513	627	1018	507	617
SAR-SR3	491	3	1056	508	524	1081	503	601
		5	1675	872	1139	1537	787	1001
		6	1998	1033	1335	1877	958	1215
SAR-SR4	707	3	1430	720	893	1420	714	883
		5	2414	1201	1457	2397	1190	1440
		6	3014	1572	2056	2569	1297	1613
SAR-SR5	962	3	2323	1242	1551	2227	1141	1455
		5	3788	2024	2376	3920	1993	2509
		6	4587	2379	2650	4905	2441	2969
SAR-SR6	1256	3	3058	1558	1884	2966	1501	1876
		5	5256	2658	3318	4905	2441	2969
		6	6181	3034	3607	6263	3086	3689
SAR-SR7	1590	3	4773	2377	2895	4738	2355	2860
		5	7813	3961	4873	7850	3928	4820
		6	9502	4802	5986	9281	4665	5766
SAR-SR8	1962	3	5924	2903	3440	5984	2939	3500
		5	9942	5074	6425	9281	4665	5766
		6	11842	6003	7537	11312	5684	7021
SAR-SR9	2375	3	9167	4523	5425	9088	4475	5346
		5	15372	7830	9884	14305	7169	8818
		6	18383	9117	11025	18003	8880	10644
SAR-SR10	2826	3	12940	6484	7973	13000	6520	8033
		5	21428	10904	13745	21212	10770	13529
		6	25289	12671	15316	26364	13337	16660
SAR-SR11	3847	3	18378	9527	12352	16195	8173	10169
		5	29011	14529	17866	29715	14969	18569
		6	35635	17875	22026	35071	17525	21462
SAR-SR12	5024	3	35441	18195	21587	36432	18293	22577
		5	60825	29997	35939	62764	31200	37878
		6	70017	34123	40354	78089	39313	48725
SAR-SR13	6359	3	47388	23465	28306	46647	23006	27564
		5	76197	38139	46832	78089	39313	48725
		6	92311	45658	54974	94932	47283	57595
SAR-SR14	7850	3	54655	26172	29770	62764	31199	37878
		5	96629	48336	59292	94932	47283	57595
		6	114023	58233	73824	111245	56510	71046
SAR-SR15	9499	3	63242	34913	33877	78089	34505	48725
		5	115566	59189	75366	111245	56510	71046
		6	-	-	-	-	-	-

Appendix I- Material Selection

Overview

Part No.	Part Name	Material												
		Carbon steel ASTM A216*			High Temperature Service ASTM A217			Stainless Steel ASTM A351				Low temperature service ASTM A352		High resistance service including sea water & sewage ASTM B148
		WCA	WCB	WCC	WC6	WC9	C5	CF3	CF3M	CF8	CF8M	LCB	LCC	C95800
1	Body	A216-WCA	A216-WCB	A216-WCC	A217-WC6	A217-WC9	A217-C5	A351-CF3	A351-CF3M	A352-CF8	A352-CF8M	A352-LCB	A352-LCC	B148-C95800
2	Seat Ring	A105			SS 304 or SS 316			SS 304 or SS 316				LF2		C95800
	Seat Surface	13% Cr, HF (Stellite), 304, 316, Monel, Hastelloy B (Based on Trim Material Chart)												Alu-Br
3	Disk/Plug/ Ball	A216-WCA	A216-WCB	A216-WCC	A217-WC6	A217-WC9	A217-C5	A351-CF3	A351-CF3M	A352-CF8	A352-CF8M	A352-LCB	A352-LCC	C95800
	Disk/ Plug/ Ball Surface	13% Cr, HF (Stellite), 304, 316, Monel, Hastelloy B (Based on Trim Material Chart)												Alu-Br
4	Valve stem/ Cover	13% Cr, HF (Stellite), 304, 316, Monel, Hastelloy B (Based on Trim Material Chart)												C95200
5	Bonnet/ Cover Gasket	Graphite+ SS 304, Ring Joint												C.A.F, Graphite + SS 304
6	Bonnet/ Cap/ Cover	A216-WCA	A216-WCB	A216-WCC	A217-WC6	A217-WC9	A217-C5	A351-CF3	A351-CF3M	A352-CF8	A352-CF8M	A352-LCB	A352-LCC	B 148-C95800
7	Bolts	A193-B7			A193-B16			A193-B8				A320-L7		A193-B7
8	Nuts	A194-2H			A194-7			A194-8				A194-4		A194-2H
9	Stem Packing	Reinforced Graphite & Die Formed Graphite Ring, PTFE, Viton												
10	Gland	13% Cr, 304, 316 (Based on Trim Material Chart)												C95200
11	Handwheel	Ductile Iron												

*The NACE material also is available

Body Material

Material	Classification Steel	ASTM REF.	Recommended Temperature Limits	Application
WCB (A 105)	Carbon Steel	A216 Grade WCB	-29 to 425	Steam, Water, Oil, Vapor, gas, and general service
LCB (LF2)	Carbon Steel	A352 Grade LCB	-46 to 350	Low temperature
LCC	Carbon Steel	A352 Grade LCC	-46 to 350	Low temperature
WC6 (F11)	Chromium Molybdenum Steel 1.25% Cr, 0.5% Mo	A217 Grade WC6	-29 to 590	Steam, Water, oil, oil vapor, gas and general service
WC9 (F22)	Chromium Molybdenum Steel 2.25% Cr, 1% Mo	A217 Grade WC9	-29 to 590	Steam, Water, oil, oil vapor, gas and general service
C5	Chromium Molybdenum Steel 5% Cr, 0.5% Mo	A217 Grade C5	-29 to 650	Corrosive/erosive oil
CF8M (316)	Stainless Steel 18% Cr, 10% Ni, 2% Mo	A351 Grade CF8M	-196 to 815	Refinery service
CF8 (304)	Stainless Steel 18% Cr, 10% Ni	A351 Grade CF8	-196 to 815	High and low temperature corrosion resistance
CF3M (316L)	Low Carbon Stainless Steel 18% Cr, 10% Ni, 2% Mo	A351 Grade CF3M	-196 to 815	High and low temperature corrosion resistance
CF3 (304L)	Low Carbon Stainless Steel 18% Cr, 10% Ni	A351 Grade CF3	-196 to 815	Cryogenic service is also available upon request
CN7M Alloy20	Stainless Steel 19% Cr, 29% Ni	A351 Grade CN7M	-196 to 425	Corrosion resistance

Trim Material Chart

Trim Abbreviation	Stem	Disk/ Plug/ Ball Faces	Seat Faces	Recommended for:
C	13Cr	13Cr	13Cr	Oil and oil vapor services for temperature to 1000°F and for most corrosive and unrefined oils regardless of temperature.
S304	18 Cr-8Ni	18 Cr-8Ni	18 Cr-8Ni	Corrosive fluids and temperature from 150°F to 1100°F.
C/HF	13Cr	67 Co-28 Cr-4W	67 Co-28 Cr-4W	Steam, water, gas, and other fluids above 850°F to 1100°F, the preceding oil and oil vapors in sever service (dirty fluid or frequent cycling) from -20°F to 110°F.
C/Seat HF	13Cr	13Cr	67 Co-28 Cr-4W	Steam, water, gas, and other relatively non-corrosive fluids in general up to 850°F , oil and oil vapor up to 1100°F.
M	NiCu	NiCu	NiCu	Sever corrosive service, especially sea water, up to 850°F .
S316	18Cr-10Ni-2Mo	18Cr-10Ni-2Mo	18Cr-10Ni-2Mo	Corrosive fluids and temperature from 150°F to 1500°F.
M/Seat HF	NiCu	NiCu	67 Co-28 Cr-4W	
S316/Seat HF	18Cr-10Ni-2Mo	18Cr-10Ni-2Mo	67 Co-28 Cr-4W	Moderately corrosive fluids (including oil) up to 850°F.
S316/HF	18Cr-10Ni-2Mo	67 Co-28 Cr-4W	67 Co-28 Cr-4W	
M/HF	NiCu	67 Co-28 Cr-4W	67 Co-28 Cr-4W	
HB	NiMo	NiMo	NiMo	The Hastelloy B alloys have low chromium and high (28%) molybdenum contents. Here the chromium level is too low permit the formation of a protective chromium oxide film, so that these materials are not corrosion resistant in oxidizing environments. However, the presence of molybdenum provides them with superior corrosion resistance in hydrochloric acid and very good resistance to many non-oxidizing acids and most organic as well as non-oxidizing salts.
C/M	13Cr	NiCu	NiCu	

Bolting Materials

ASTM Specification	Bolting is always of alloy steel
A193 Gr. B7	ASTM A193 Grade B7 bolting material is a chromium-molybdenum alloy steel with a minimum tensile strength of 125000 psi for sizes up to 2 ½ inch diameter. It retains its strength and resist creep at elevated temperatures. The quench and draw heat treatment give a dense, uniform, fine grain; and high physical properties. These bolts are filled with ASTM A194 Gr. 2H hardened medium carbon steel nut with a hardness of 248 to 352 BHN. These nuts are capable of developing the full strength of the bolts. This alloy steel bolting is used for body-bonnet joints of carbon and low alloy steel body valves.
Other available Body-Bonnet Bolting Materials	
A193 Gr. B8	ASTM A 193 Gr. B8 bolting material is a chromium nickel alloy steel with a minimum tensile strength of 125000 psi for sizes up to ¾ inch diameter. Corrosion resistance of this steel especially in acidic environment is very good. These bolts are fitted with ASTM 194 Gr.8. This alloy steel is used for body-bonnet joints of stainless-steel body valves. (On request)
A320 Gr. L7	These bolts are fitted with ASTM A194 Gr.4. This alloy steel bolting is used for body-bonnet joints of carbon steel and suitable for low temperature service down to -50°F.
A193-B16	Alloy ASTM A193 Grade B16 is bolting specification for high temperature service. It is a heat-treated Chromium-Molybdenum- Vanadium steel. The specification calls for minimum strength and maximum hardness levels. It is considered to be most suitable for bolts used at temperatures below 450°C

Optional Flange Gasket Materials

Depending on the service conditions, various materials are available optionally for bonnet cover flange gasket.

Gasket Materials
Soft iron gasket
Spiral wound metal, graphite filled
Ring joint metal
Corrugated metal
Flexible graphite (grafoil*)
Virgin PTFE
Glass filled PTFE

*Grafoil is a registered trademark of Union Caride Corp.

Optional Gland Packing Materials

Depending on the service conditions, various materials are available optionally for gland packing.

Packing Materials	Service conditions
PTFE impregnated asbestos	232°C corrosion resistant
Inconel wire asbestos	650°C heat resistance
Virgin PTFE	232°C corrosion resistant
Graphite asbestos	343°C corrosion resistant
Flexible graphite (grafoil)	815°C heat and corrosion resistant

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