Yeary Controls

Innovative Valve Technologies
Chicago, IL 60610
(312) 335-1012

www.yearycontrols.com

Triple Offset Butterfly Valves

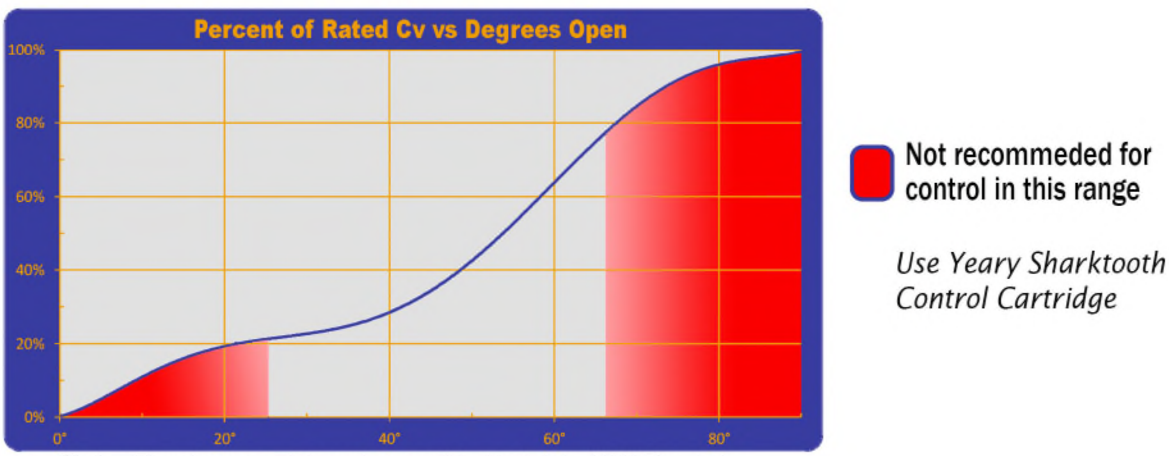
By BTL!

Flow Coefficient

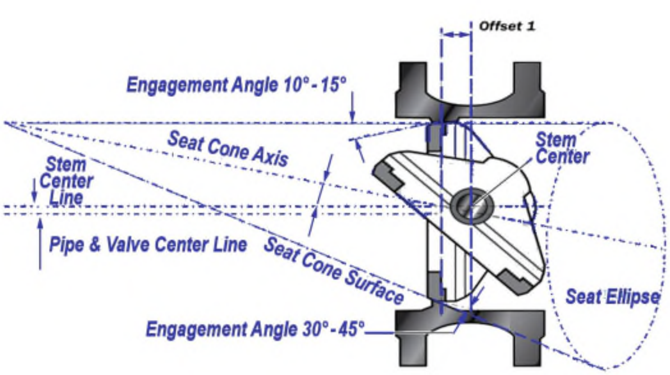
The flow coefficient or Cv value is used to describe the inherent flow capacity of a valve. Cv is defined as the number of U.S. gallons of water per minute at 60°F and 14.7 psia (STP) that will flow through a valve at a constant 1.0 PSI pressure drop.

Flow Coefficient (Cv)			
Size	Class 150	Class 300	Class 600
3	160	160	148
4	290	290	246
6	850	850	720
8	1710	1710	1450
10	2520	2520	2140
12	3940	3940	3350
14	5310	4820	4100
16	8400	7100	6035
18	10150	9360	7955
20	12540	11700	9940
24	18340	16900	14360

Utah State University Water Research Laboratory
Logan, Utah *United States*



Note: *The above graph based on empirical test data, USU Flow Lab*



***Offset #1-** The sealing plane is moved forward of the centerline of the shaft to provide a full 360° uninterrupted sealing surface.*

***Offset #2-** The centerline of the disc rotation is lateral from the centerline of the shaft. This provides an eccentric rotation of the disc which causes it to pull completely off the seat upon opening.*

***Offset #3-** The centerline of the seat cone angle is identical to the cone angle of the laminated seal ring on the disc. Additionally, the point of the centerline of cone rotation is moved laterally from the centerline of the rotation of the disc.*

Design Specifications

1. Basic Design Standards

a. In addition to the specific industry standard noted herein as a minimum the valve design will meet the applicable requirements of the following industry standards.

i. ASME B16.34 including the pressure / temperature ratings for valve body, disc and bottom cap materials: valve body minimum wall dimensions: nondestructive examination and markings.

ii. API STD 609 including basic design requirements applicable to Category B HP Butterfly Valves.

iii. API STD 598 including hydrostatic shell and hydrostatic and pneumatic seat testing.

iv. API STD 607, latest edition for fire testing.

v. MSS –SP- 55 for visual inspection of cast valve body, disc and bottom cap.

vi. ASME B16.5 for mating pipe flange dimensions for valve sizes 3” through 24”Class 150 & 300.

vii. ASME B16.47 for series B mating pipe flange dimensions for valve sizes 26” and larger Class 150 & 300.

viii. ISO-5752 Flange Dimension

2. Face-To-Face Dimensions

a. Lug Design – nominal dimension listed in API STD 609 Table 2 for category B valves.

b. Wafer Design – nominal dimension listed in API STD 609 Table 2 for category B valves.

c. Flanged (double flanged, short pattern) – nominal dimension in API STD 609, Table C and ISO 5752 basic series 13.

d. Flanged (double flanged, long pattern) – nominal dimension in API STD 609 , Table B and to Gate Valve Dimensions per ANSI 16.10 table A1 Column 7 for 150# valves and Table A2 Column 10 for 300# Valves

3. Seat Leakage Performance

a. Each valve exhibits the seat leakage performance as follows:

i. Preferred side (pressure entering the valve on the shaft side of the shut disc) - zero seat leakage at the low pressure and high pressure test. Each valve shall have an arrow on the external valve body indicating the direction of high pressure.

ii. Non preferred side (pressure entering the valve with the shaft on the opposite side of the shut disc) only – zero seat leakage at the low pressure closure test per API 598. High pressure closure test on application.

iii. Shell Test – Each unpainted valve assembly is hydrostatically shell tested in accordance with the applicable test requirements stated in API STD 598.

- Test Fluid – Filtered clean water (may contain a water- soluble oil or rust inhibitor). When testing austenitic stainless steel valves the chloride content does not exceed 100 parts per million.
- Test Leakage - No visually detectable leakage through the pressure boundary walls. Leakage through the adjustable shaft packing shall not be cause for rejection. However, the packing must be able to prevent any leakage at a test pressure equal to the 100° F (38°C) valve body rating.
- Standard Production Seat Leakage Test – Each production valve assembly, unless otherwise stated on the purchase order, shall be seat tested In accordance with the requirements listed in API STD 598, Table 1-A as follows:
- Test Leakage – Each valve tested shall exhibit zero leakage (no visible bubbles) for the duration of the test period.
- Fugitive Emissions Testing – Valves are capable of passing the fugitive emissions test requirements of ISO-15848-1.

Materials of Construction

Standard Cast Steel & Stainless Steel Valve Assemblies

Assy No.	Component	Carbon Steel Assembly	Stainless Steel Assembly
1	Screw	A193 B8M Class 1	A193 B8M Class 1
2	Body*	A216 Gr. WCB	A351 Gr. CF8M
3	Bottom Cap	A105	316 Sst
4	Shaft Bearing	316 SST/Nitrited	316 SST/Nitrited
5	Disc	A216 Gr. WCB	A351 Gr.Cf8m
6	Pin	17-4ph Cond. H1150D	17-4ph Cond. H1150D
7	Bearing Seal	Graphite	Graphite
8	Shaft Bearing	316 SST/Nitrited	316 SST/Nitrited
9	Bearing Seal	Graphite	Graphite
10	Packing Stud	A193 B8m Class 1	A193 B8m Class 1
11	Hex Nut	A194 8m	A194 8m
12	Yoke	A216 Gr. WCB	A216 Gr. WCB
13	Key	1045	1045
14	Manual Gear	Mfr Std	Mfr Std
15	Gear Stud	A193 B7	A193 B7
16	Hex Nut	A194 2h	A194 2h
17	Yoke Stud	A193 B7	A193 B7
18	Hex Nut	A194 2h	A194 8m
19	Gland Follower	A216 Gr. WCB	A216 Gr. WCB
20	Packing Gland	316 SST	ST
21	Shaft Packing	Graphite	Graphite
22	Shaft	17-4ph Cond. H1150D	17-4ph Cond. H1150D
23	Split Ring	316 SST	316 SST
24	Gasket Ring	316 SST/Graphite	316 SST/Graphite
25	Seal Ring	316 SST/Graphite	316 SST/Graphite
26	Retainer	A105	316 SST
27	Retainer Screw	A193 B8m Class 1	A193 B8m Class 1
*Stellite seat overlay in valve body			

Shaft Packing

The stem packing top and bottom end rings are an interlaced, braided, graphite filament with a non-metallic inorganic passivating corrosion inhibitor. The middle rings of the packing set are made from a compressed flexible graphite material.

Valve End Facing

All valve end faces shall be standard 1/16"raised face for class 150 and 300 valves per ANSI B16.5

Certifications

a. **Certified material test reports with traceability by a heat number are provided for each valve body, cap, disc and shaft.**

b. **A certificate of compliance is provided for each valve assembly certifying compliance with the applicable purchase order requirements and to the design standards and testing noted herein.**

When requested on the purchase order a certified shell and seat leakage test report shall also be included in the document package.

Torque Values

CLASS 150		Δ150	Preferred Direction		Non-Preferred Direction	
VALVE SIZE	I.D. PIPE	DP PSI	TO OPEN IN-LBS	TO CLOSE IN-LBS	TO OPEN IN-LBS	TO CLOSE IN-LBS
3"	3.068	150	425	350	325	774
4"	4.026	150	707	575	532	1,282
6"	6.065	150	1,400	1,016	844	2,416
8"	7.981	150	2,359	1,519	1,329	3,878
10"	10.020	150	3,614	2,110	2,014	5,724
12"	12.000	150	5,572	2,920	3,223	8,492
14"	13.250	150	7,945	4,269	4,266	12,214
16"	15.250	150	11,115	5,552	6,167	16,667
18"	17.250	150	16,374	8,344	8,670	24,718
20"	19.250	150	22,743	11,790	11,613	34,533
24"	23.250	150	38,683	19,542	19,841	58,226

CLASS 150		Δ285	Preferred Direction		Non-Preferred Direction	
VALVE SIZE	I.D. PIPE	DP PSI	TO OPEN IN-LBS	TO CLOSE IN-LBS	TO OPEN IN-LBS	TO CLOSE IN-LBS
3"	3.068	285	582	440	392	1,021
4"	4.026	285	983	733	650	1,716
6"	6.065	285	2,246	1,517	1,189	3,762
8"	7.981	285	4,040	2,446	2,084	6,486
10"	10.020	285	6,407	3,549	3,368	9,957
12"	12.000	285	10,075	5,034	5,610	15,109
14"	13.250	285	14,565	7,580	7,575	22,144
16"	15.250	285	20,573	10,005	11,174	30,578
18"	17.250	285	30,535	15,278	15,898	45,813
20"	19.250	285	42,618	21,807	21,471	64,425
24"	23.250	285	72,868	36,500	37,068	109,369

CLASS 300		Δ500	Preferred Direction		Non-Preferred Direction	
VALVE SIZE	I.D. PIPE	DP PSI	TO OPEN IN-LBS	TO CLOSE IN-LBS	TO OPEN IN-LBS	TO CLOSE IN-LBS
3"	2.900	500	1,015	752	664	1,767
4"	3.826	500	1,306	943	823	2,249
6"	5.761	500	3,768	2,296	1,961	6,064
8"	7.625	500	6,934	3,821	3,623	10,755
10"	9.750	500	12,662	5,935	7,297	18,596
12"	11.750	500	19,691	8,516	11,765	28,207
14"	13.000	500	27,887	12,737	15,755	40,625
16"	15.000	500	42,516	20,147	23,009	62,663
18"	17.000	500	59,407	25,596	34,471	85,002
20"	19.000	500	83,207	37,326	46,582	120,533
24"	23.000	500	138,899	62,177	77,521	201,076

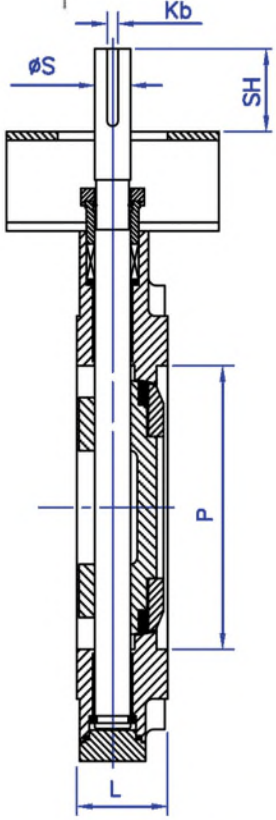
Note: Torque values do not include safety factors, which should be added based on customer experience and line media.

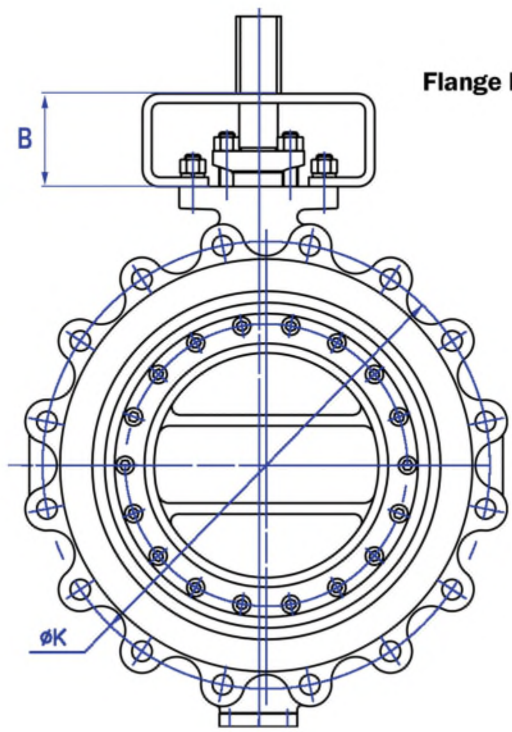
CLASS 300		Δ740	Preferred Direction		Non-Preferred Direction	
VALVE SIZE	I.D. PIPE	DP PSI	TO OPEN IN-LBS	TO CLOSE IN-LBS	TO OPEN IN-LBS	TO CLOSE IN-LBS
3"	2.900	740	1,311	921	790	2,231
4"	3.826	740	1,712	1,176	997	2,888
6"	5.761	740	5,341	3,164	2,668	8,505
8"	7.625	740	10,017	5,410	5,117	15,427
10"	9.750	740	18,466	8,510	10,526	26,975
12"	11.750	740	28,859	12,320	17,130	41,179
14"	13.000	740	40,983	18,561	23,027	59,544
16"	15.000	740	62,616	29,510	33,746	92,126
18"	17.000	740	87,605	37,565	50,700	125,170
20"	19.000	740	122,811	54,906	68,605	177,717
24"	23.000	740	205,186	91,638	114,348	296,824

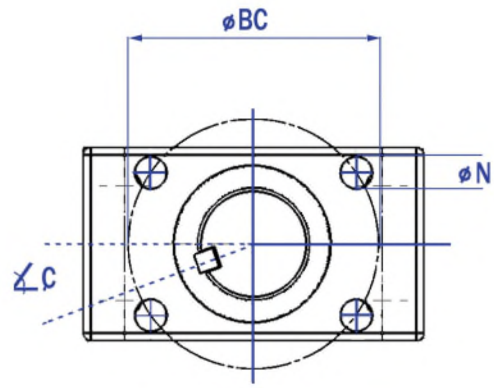
Valve Dimensions

Size: 3" thru 60"
Class: 150 thru 600

Valve Design: API 609
Flange Dimensions: ASME B16.5, B16.47 (Series A)
Tested in Accordance with: API 598





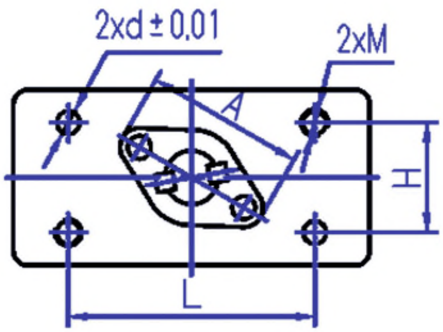


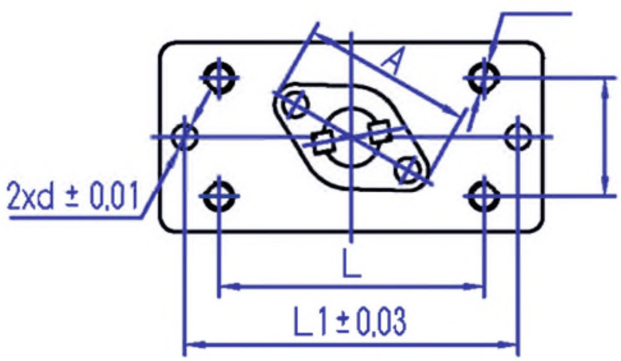
Class 150										
Size	P	L	K	B	SH	S	BC	Kb x Key	N x No.	Wgt
3	3.00	1.88	6.00	2.4	1.77	0.71	2.75	0.23 x 1	0.35 x 4	28.6
4	4.00	2.13	7.50	2.4	1.77	0.71	2.75	0.23 x 1	0.35 x 4	41.8
6	6.00	2.25	9.50	2.4	2.16	0.87	4.02	0.31 x 1	0.43 x 4	66.0
8	8.00	2.50	11.75	3.2	2.55	1.02	4.92	0.31 x 1	0.51 x 4	99.0
10	10.00	2.80	14.25	3.9	2.55	1.18	6.50	0.31 x 2	0.83 x 4	143.0
12	12.00	3.18	17.00	3.9	3.15	1.42	6.50	0.39 x 2	0.83 x 4	209.0
14	13.25	3.62	18.75	3.9	3.35	1.57	6.50	0.47 x 2	0.83 x 4	319.0
16	15.25	4.00	21.25	4.6	3.35	1.77	10.00	0.55 x 2	0.67 x 8	448.8
Dimension C (Stem Offset) = 5 Degrees										

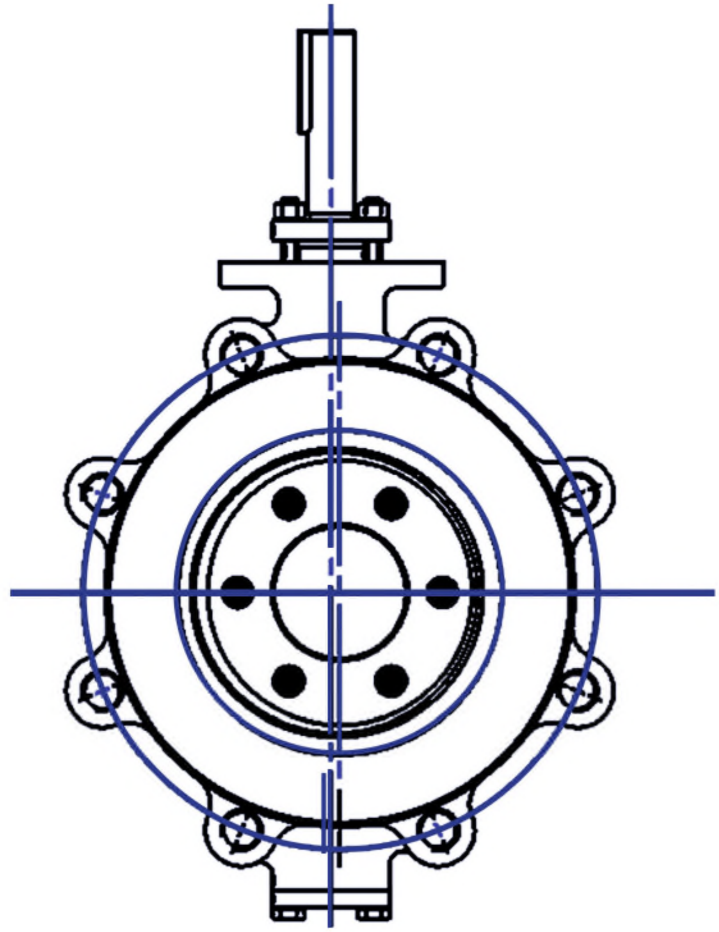
Class 300										
Size	P	L	K	B	SH	S	BC	Kb x Key	N x No.	Wgt
3	3.00	1.88	6.00	2.4	1.77	0.71	4.02	0.23 x 1	0.43 x 4	35.2
4	4.00	2.13	7.87	2.4	1.77	0.71	4.02	0.23 x 1	0.43 x 4	59.4
6	6.00	2.32	10.63	3.2	2.20	1.02	4.92	0.31 x 1	0.51 x 4	88.0
8	8.00	2.88	13.00	3.9	2.76	1.18	6.50	0.31 x 2	0.83 x 4	125.4
10	10.00	3.25	15.25	3.9	2.76	1.57	6.50	0.47 x 2	0.83 x 4	187.0
12	12.00	3.62	17.75	4.7	3.94	1.77	10.00	0.55 x 2	0.67 x 8	270.6
Dimension C (Stem Offset) = 5 Degrees										

Dimensional data on sizes and pressures not shown is available upon request.

Topworks Dimensions







Class 150						
Size	L	H	M	L1	d	A
3	3.14	0.59	M10	-	0.31	2.28
4	3.14	0.59	M10	-	0.31	2.28
6	3.14	0.59	M10	-	0.31	2.53
8	4.33	1.10	M10	4.72	0.31	3.03
10	5.12	1.26	M16	6.30	0.47	3.30
12	5.12	1.26	M16	6.30	0.47	3.70
14	5.12	1.26	M16	6.30	0.47	3.86
16	7.48	1.57	M20	8.86	0.63	4.60

Class 300						
Size	L	H	M	L1	d	A
3	3.14	0.59	M10	-	0.31	2.28
4	3.14	0.59	M10	-	0.31	2.28
6	4.33	1.10	M10	4.72	0.31	3.03
8	5.12	1.26	M16	6.30	0.47	3.30
10	5.12	1.26	M16	6.30	0.47	3.80
12	7.48	1.57	M20	8.86	0.63	4.60

Dimensional data on sizes and pressures not shown is available upon request.

Exceptional flow control can be achieved by simply attaching a Yeary Controls *Sharktooth*™ Control Cartridge to one of our triple offset butterfly valves. This combination results in a metal seated, tight shut-off control valve that will have an excellent equal percentage flow characteristic, plus noise and cavitation attenuation features. Since their introduction in 2001, *Sharktooth*™ control valves have been providing exceptional preformance in many gas, liquid, steam & cryogenic applications.

Learn more about *Sharktooth* at:
www.yearycontrols.com

Z-DISC CONTROL VALVES

When pressures and temperatures are moderate, a Yeary *SharkFin* Resiliant Seated Butterfly Control Valve may very well prove to be the best value for solving your fluid control needs. These valves are proving themselves to be an excellent performance value in such industries as food & beverage, pharmaceutical, and many of the process industries. Our food grade sanitary disc and stem option is saving many of our customers literally thousands of dollars.

Learn more about *SharkFin* at:
www.yearycontrols.com

ABOUT YEARY CONTROLS

Yeary Controls specializes in the development, integration, and applicaiton of innovative valve technologies. We have focused on valve solutions for the energy and process industries for over fifty years.

Our range of control valves and actuators extends from 1/2" to 72", in ANSI Classes 150 through 900.

Our engineering team will be pleased to assist you to find the best products to handle your flow control requirements.

YEARY CONTROLS
1050 North State St.
Suite M-4
Chicago, IL 60610
Phone: +1(312) 335-1012
Email: ayeary@ yearycontrols.com

Represented by: