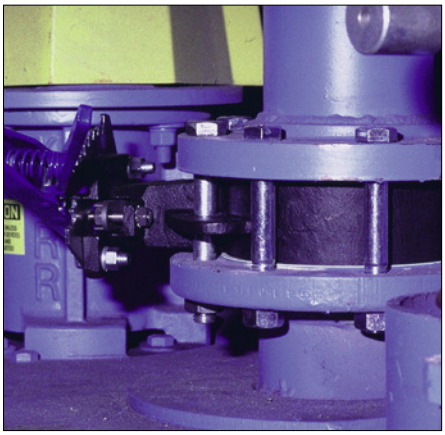
KEYSTONE

310 – Wafer high performance butterfly valve
312 – Lugged high performance butterfly valve

Features and Benefits

- Uninterrupted gasket surfaces help eliminate problems associated with seat retaining screws in the gasket surface and allows use of standard spiral wound gaskets.
- Unique interference seat design with energized elastomer O-ring allows bi-directional ANSI Class VI shut-off at lower pressures. The seat is further energized by line pressure, providing the same tight bi-directional shut-off at full-rated pressure.
- Heavy duty circular key holds the seat and retaining ring in place, providing bi-directional, dead-end service at full-rated pressure. This helps eliminate the need for easily corroded and hard-to-remove retention screws.
- Valve stem designed to API 609 standards is blow-out resistant.
- Seat retaining ring is housed within the flange gasket ID to eliminate potential emission path.
- Face-to-face conforms to MSS SP-68 and can be configured to ISO 5752 short.
- Adjustable packing utilizes unique rocker-shaped gland bridge that compensates for uneven adjustment of gland nuts.
- Extended neck allows for two inches of clearance for insulation.



General Application

High performance applications such as steam, chill water, water, utility lines, gasoline, natural gas, air, oil, jet fuels and process lines. Contact your sales representative for appropriate materials for specific services.

Industry Compliance

ASME B16.34
API 609
MSS-SP68
CRN Registration
PED Compliant in some configurations

Technical Data

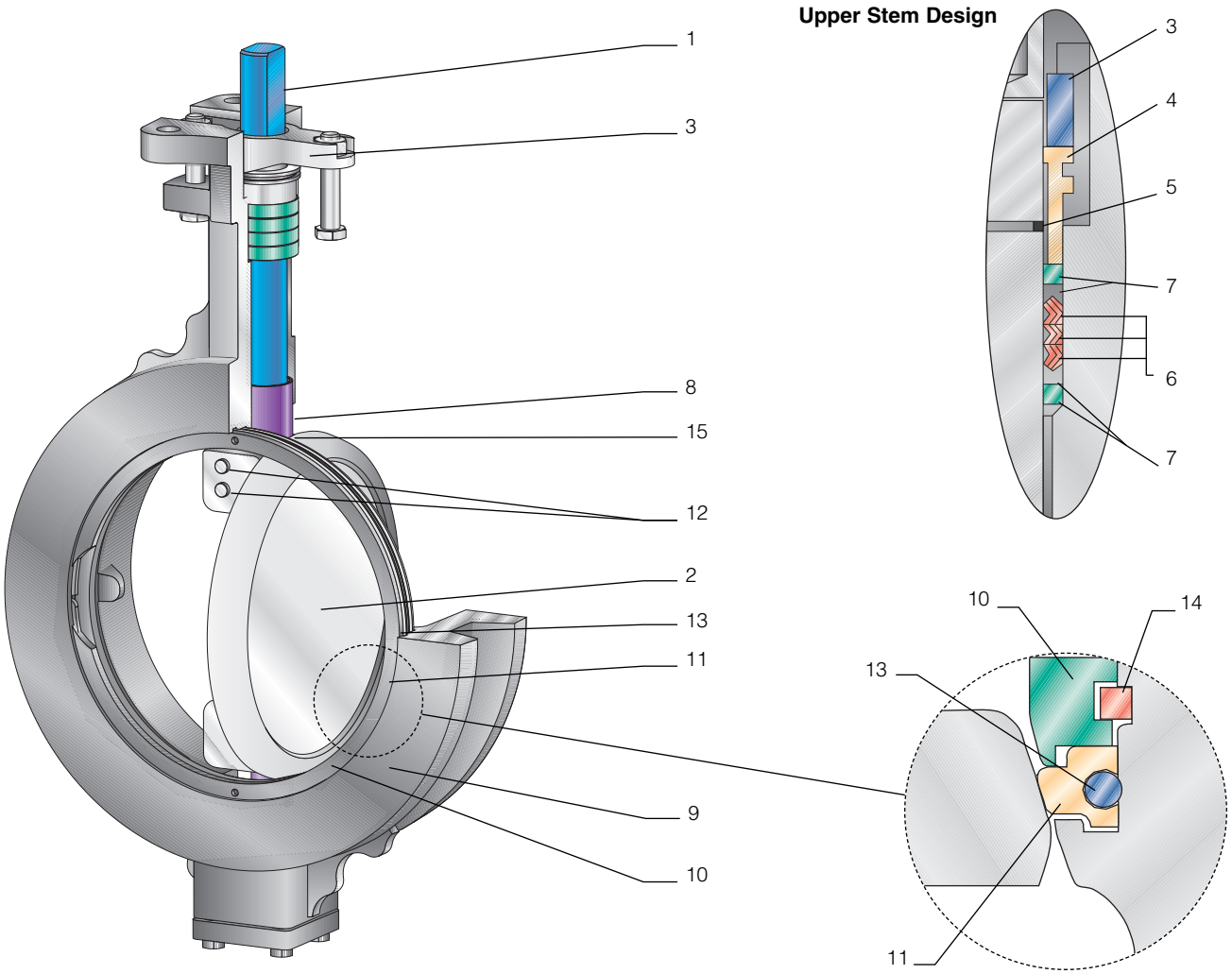
Size Range:	2" to 12" [50 to 300 mm]
Rating:	ASME Class 150
Pressure:	285 psi bi-directional, dead-end
Vacuum:	50 microns
Temperature:	-20°F to 350°F

tyco Flow Control

Keystone is either a trademark or registered trademark of Tyco International Services AG or its affiliates in the United States and/or other countries. All other brand names, product names, or trademarks belong to their respective holders.

Copyright © 2009 Tyco Flow Control. All rights reserved.

Specifications



Materials

No.	Description	Material	Material Standard	Optional Material
1	Stem	17-4PH	ASTM A 564 Cond. H1075 or H 1100	316 SS Cond. B
2	Disc	316 SS	ASTM A 351-CF8M	
3	Gland bridge	17-4SS HT	ASTM A747-CB 7C1-1	
4	Packing gland follower	316 SS	ASTM A 276-316	
5	Blowout-resistant ring	18-8 SS		
6	Packing	TFE	Die Formed TFE Braid	Graphite
7	Anti-extrusion ring	316 SS	ASTM A 276-316	
8	Bearings (upper and lower)	CS SS	TFE impregnated/fiber reinforced TFE impregnated/fiber reinforced	
9	Body	CS SS	ASTM A216-WCB ASTM A351-CF8M	
10	Seat retaining ring	CS SS	ASTM A36 ASTM A240	
11	Seat	RTFE	Reinforced polytetrafluoroethylene	PTFE
12	Wedge pins	17-4PH	ASTM A564	316 SS Cond. B
13	Seat backing O-ring		PFA Encapsulated FKM	
14	Circular key	304 SS	ASTM A240	
15	Thrust bearing (upper and lower)	316 SS	Nitrided	

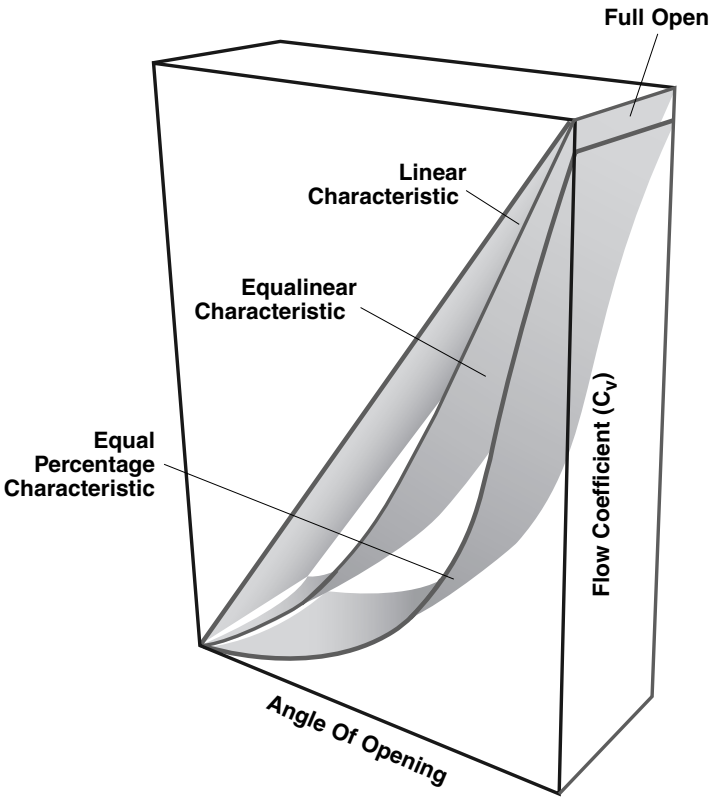
Copyright © 2009 Tyco Flow Control. All rights reserved.

Specifications

Principles of Design

K-LOK® is an ideal control valve designed to provide an inherent equalinear characteristic that is suitable for most linear and equal percentage applications. The valve offers a high flow capacity, thin profile disc with a rangeability of 33:1. The use of tangentially located disc/stem wedge pins removes engagement clearances and eliminates valve hysteresis.

While the valve is throttling, the stem's double offset location causes the disc to cam away from the seat, reducing wear and deformation. When the disc closes, a drop tight seal is assured. (See page 4 for additional information.)



Design Features

Stem (1) is manufactured from materials that provide maximum strength and stability. The stem surface is finished to better than Ra 31 for maximum sealing interface between the stem and the packing.

Gland bridge (3) incorporates a rocker shape to compensate for uneven adjustment of the gland nuts. The upper gland nuts are captured in the bridge for ease of maintenance.

Packing gland follower (4) has a circular groove for easy field removal.

Blowout-resistant ring (5) is standard on all Figure 310 and 312 valves.

Packing (6) utilizes a combination of force-dried, soft-braided rings and solid TFE "V" rings to provide a superior stem seal.

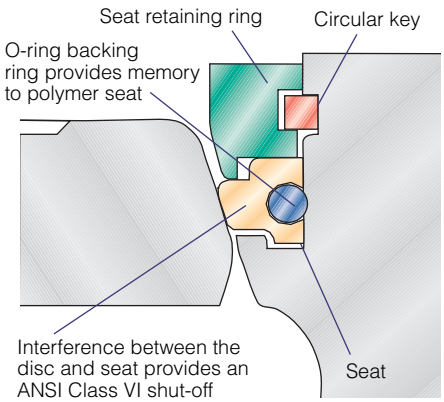
Bearings (8) of press fit steel or stainless steel are located near the disc to minimize the possibility of deflection.

Body (9) features an extended neck that allows for two inches of insulation and integral cast travel stop. Non-interrupted flange gasket surfaces allow for the use of standard spiral wound gaskets.

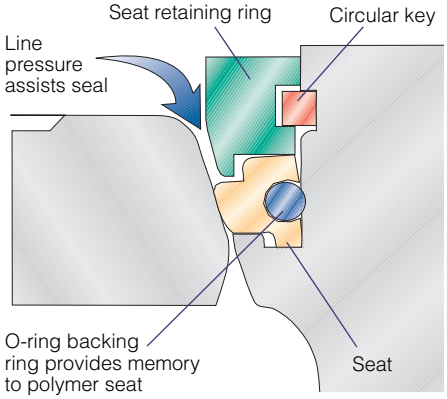
Seat retaining ring (10) is located within the flange gasket ID. This allows for an uninterrupted flange sealing surface and maximum emissions control.

Seat (11) is an advanced patented bi-directional dual-lock seat design* that provides an interference disc/seat seal at vacuum-to-low pressures and utilizes line pressure to achieve maximum sealability at medium-to-high pressures.

Vacuum 50 microns to Low Pressure



Medium to High Pressure



Wedge pins (12) are tangentially located for maximum strength and then welded in place after final assembly and testing.

Seat backing O-ring (13) is available in a variety of materials to meet customer requirements. (Materials and applications are listed on page 8.)

Circular key (14) provides bi-directional, dead-end service at full-rated pressure. Removable in the field for quick seat replacement.

Integrally cast mounting pad allows direct mounting of Keystone actuators.

Flange location webs allow precise alignment of valve between pipe flanges during installation.

*Patented

Copyright © 2009 Tyco Flow Control. All rights reserved.

Specifications

Disc and Seat Design

K-LOK® disc geometry maximizes flow capacity by increasing the available flow area through the valve. This increase in disc efficiency results in a high valve C_V.

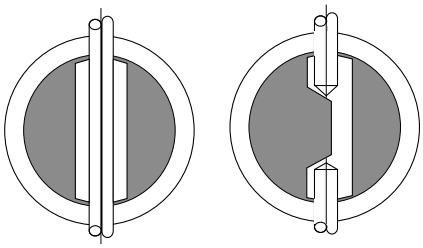
Two-piece stem vs. one-piece stem
The improved C_V may be easily explained by comparing the aspect ratio of the K-LOK® two-piece stem and disc arrangement to that of a through-stem design. This unique disc configuration provides a universal inherent flow characteristic which is referred to as equalinear.

Double offset disc/stem
The K-LOK® design uses a double offset disc/stem design. The first offset is achieved by locating the stems downstream of the centerline of the seat. This allows for a total unobstructed 360 degrees sealing surface.

The second offset locates the stems off the center of the vertical axis of the seat.

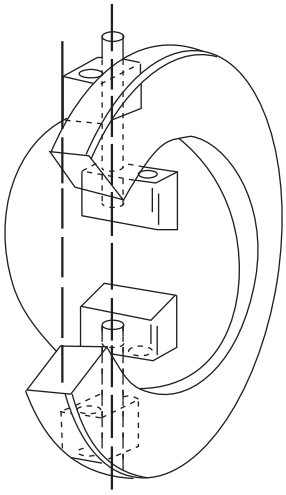
The combination of these two offsets creates a camming effect as the disc swings into and out of the seat. The disc lifts quickly out of the seat in the first few degrees of travel and does not contact the seat again until it is nearly closed. There is minimum wear between the seat and disc, so operating torques are reduced and seat life is extended.

Competitor: with one-piece stem | **K-LOK®: with two-piece stem**

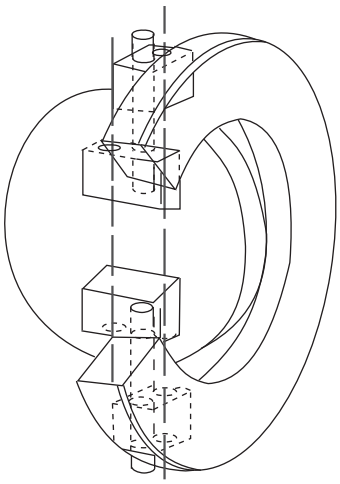


Aspect Ratio = Open Area ÷ Disc Area

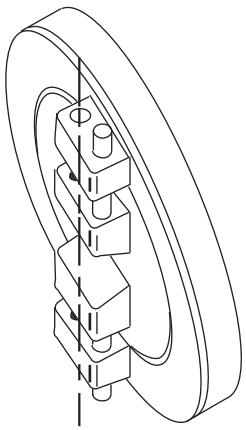
First Offset



Second Offset



Double Offset



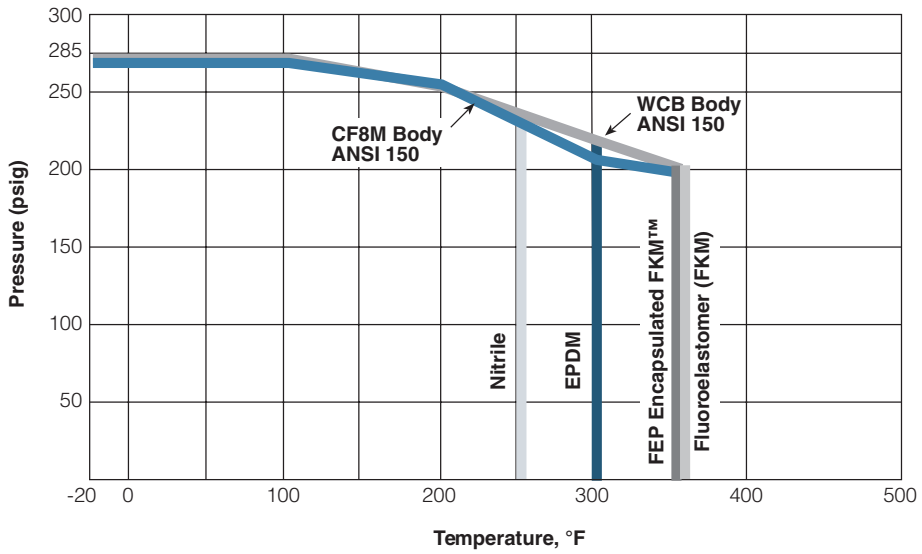
Copyright © 2009 Tyco Flow Control. All rights reserved.

Specifications

C_V Valves vs. Travel Position (installed in the preferred flow direction)

	Angle of Opening								
Size (in.)	10°	20°	30°	40°	50°	60°	70°	80°	90°
2	0	4	14	25	35	42	46	50	52
2½	0	12	26	47	72	95	121	137	142
3	0	14	30	53	82	111	142	161	168
4	11	39	79	123	183	260	347	443	496
5	24	66	133	202	295	425	574	755	859
6	32	85	170	255	371	538	729	968	1,106
8	36	148	302	457	677	1,016	1,423	2,034	2,344
10	41	221	455	691	1,032	1,571	2,228	3,271	3,781
12	45	288	596	907	1,358	2,082	2,968	4,409	5,102

Pressure/Temperature Rating for Body and Backing Ring Materials



PTFE and RTFE Bi-directional Seating and Un-seating Torque Values (clean water service)

		Seating and Un-seating Torque (lbs. in.) System Shut-off Pressure (psig)						
Size (in.)	Shaft Mounting Code	0	50	100	150	200	250	285
2	BBG	92	101	109	118	126	135	141
2½	BAC	142	158	175	191	208	224	236
3	BAC	175	195	215	235	255	274	288
4	BAC	260	296	333	369	406	442	468
5	BAD	327	411	495	579	664	748	807
6	BAD	448	563	677	792	906	1,021	1,101
8	CAE	500	760	1019	1,279	1,539	1,798	1,980
10	CAF	678	1,119	1,560	2,000	2,441	2,882	3,191
12	CAF	970	1,604	2238	2,873	3,507	4,141	4,585

Notes:

1. Torques are applicable to PTFE and RTFE seats.
2. For other service conditions, select the torque applicable for the maximum differential pressure and multiply by the following factor:

Water:	x 1.0
Lubricious Service:	x 0.75
Dry Service:	x 1.9
Heavy Solids:	x 2.5

Seating and Un-seating Torque

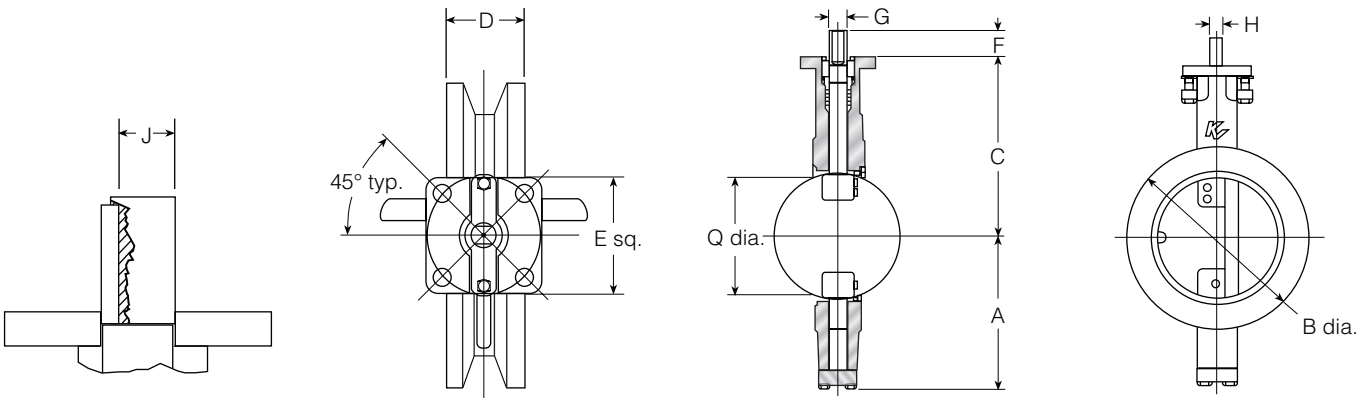
Seating and un-seating torques are a function of the size of the valve and the shut-off pressure of the system.

Specific torque ratings can be found in the Seating/Un-seating chart at the intersection of the “size” row and the “shut-off pressure” column.

All torques listed are for normal service conditions (i.e. operating frequency is a minimum of once per month; disc corrosion is expected to be mild or minor, the media is a clean gas, liquid or steam, and is non-abrasive) and the chemical effects upon the seat are minor.

Copyright © 2009 Tyco Flow Control. All rights reserved.

Dimensions – Wafer Style

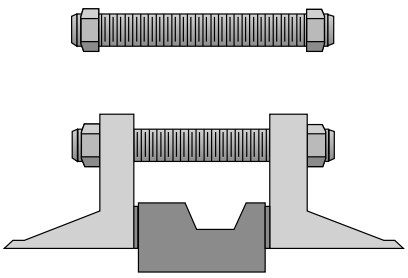


Wafer Style

Size (in.)	Valve Dimensions MSS A	B	C	Q	E	D	F	G	H	J	Top Plate Drilling KEY	Bolt Circle	No. Holes	Hole Dia.	Weight (lbs.)	Adapt. Code
2	3.78	6.38	4.94	1.97	3.19	1.69	0.87	0.47	3/8	N/A	N/A	3 1/4	4	7/16	8	BBG
2 1/2	4.17	7.17	5.39	2.64	3.19	1.89	1.22	0.62	7/16	N/A	N/A	3 1/4	4	7/16	9	BAC
3	4.65	7.87	5.73	2.91	3.19	1.89	1.22	0.62	7/16	N/A	N/A	3 1/4	4	7/16	12	BAC
4	5.24	9.21	6.71	3.86	3.19	2.13	1.22	0.62	7/16	N/A	N/A	3 1/4	4	7/16	19	BAC
5	6.34	10.87	7.28	5.00	3.19	2.25	1.22	0.75	1/2	N/A	N/A	3 1/4	4	7/16	25	BAD
6	7.01	12.20	8.01	5.75	3.19	2.25	1.22	0.75	1/2	N/A	N/A	3 1/4	4	7/16	31	BAD
8	8.03	14.25	9.41	7.64	4.65	2.50	1.22	0.87	5/8	N/A	N/A	5	4	9/16	50	CAE
10	9.45	16.77	10.83	9.21	4.65	2.81	2.00	1.12	N/A	0.98	1/4 x 1/4	5	4	9/16	68	CAF
12	10.59	19.29	12.07	11.42	4.65	3.19	2.00	1.12	N/A	0.98	1/4 x 1/4	5	4	9/16	99	CAF

310 Wafer – Recommended Flange Bolt Lengths

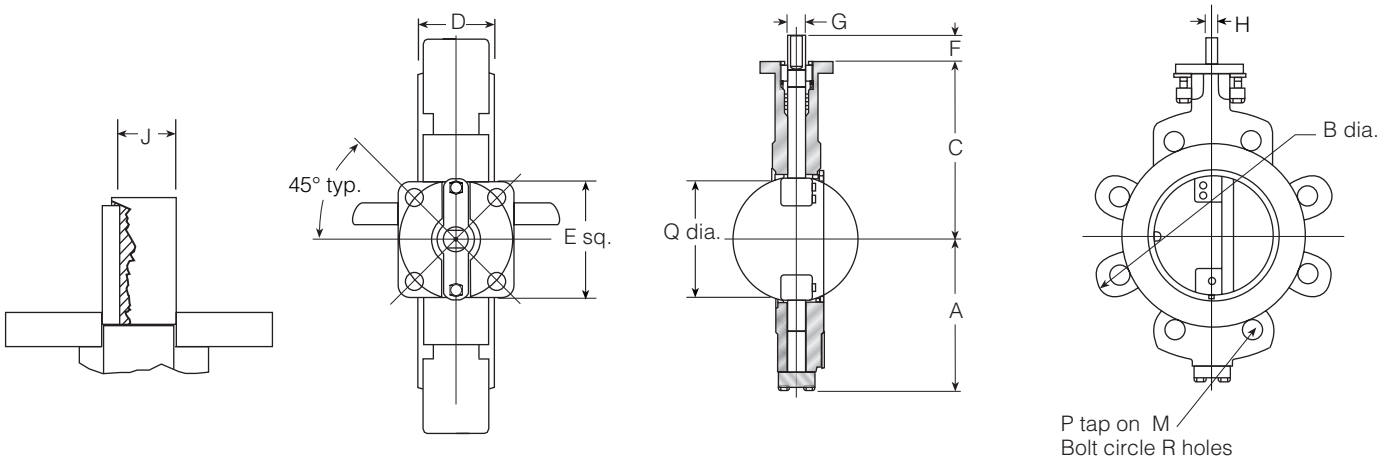
Size (in.)	Qty.	Bolt Size	Lengths of Fasteners (in.) Bolts	All-thread Studs
2	4	5/8 - UNC	4 1/2	5
2 1/2	4	5/8 - UNC	4 1/2	5
3	4	5/8 - UNC	4 1/2	5 1/4
4	8	5/8 - UNC	4 3/4	5 1/2
5	8	3/4 - UNC	5	6
6	8	3/4 - UNC	5 1/4	6
8	8	3/4 - UNC	5 3/4	6 1/2
10	12	7/8 - UNC	6 1/4	7 1/4
12	12	7/8 - UNC	7	7 3/4



Note: Bolt lengths are based on ANSI Class 150 weld neck flanges per ANSI B16.5 and a gasket thickness of 0.062 inch.

Copyright © 2009 Tyco Flow Control. All rights reserved.

Dimensions – Lug Style

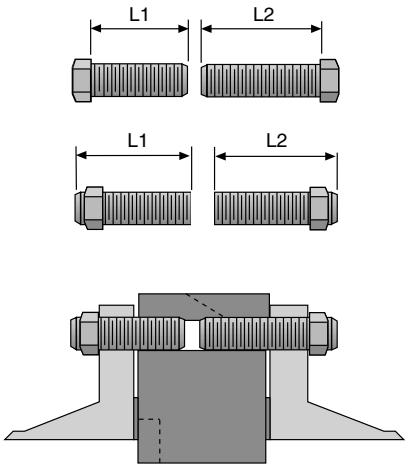


Lug Style

Size (in.)	Valve Dimensions MSS A	B	C	Q	E	D	F	G	H	J	Tapped Lug Data M	P	R	Top Plate Data Bolt Circle	No. Holes	Hole Dia.	Weight (lbs.)	Adapt. Code
2	3.78	6.25	4.94	1.97	3.19	1.69	0.87	0.50	3/8	N/A	4.750	5/8 - 11UNC-2B	4	3 1/4	4	7/16	12	BBG
2 1/2	4.17	7.01	5.39	2.64	3.19	1.89	1.22	0.62	7/16	N/A	5.500	5/8 - 11UNC-2B	4	3 1/4	4	7/16	15	BAC
3	4.65	7.50	5.73	2.91	3.19	1.89	1.22	0.62	7/16	N/A	6.000	5/8 - 11UNC-2B	4	3 1/4	4	7/16	18	BAC
4	5.24	9.65	6.71	3.86	3.19	2.13	1.22	0.62	7/16	N/A	7.500	5/8 - 11UNC-2B	8	3 1/4	4	7/16	32	BAC
5	6.34	11.02	7.28	5.00	3.19	2.25	1.22	0.75	1/2	N/A	8.500	3/4 - 10UNC-2B	8	3 1/4	4	7/16	40	BAD
6	7.01	11.73	8.01	5.75	3.19	2.25	1.22	0.75	1/2	N/A	9.500	3/4 - 10UNC-2B	8	3 1/4	4	7/16	46	BAD
8	8.03	13.50	9.41	7.64	4.65	2.50	1.22	0.87	5/8	N/A	11.750	3/4 - 10UNC-2B	8	5	4	9/16	69	CAE
10	9.45	16.93	10.83	9.21	4.65	2.81	2.00	1.12	N/A	0.98	14.250	7/8 - 9UNC-2B	12	5	4	9/16	121	CAF
12	10.59	19.02	12.07	11.42	4.65	3.19	2.00	1.12	N/A	0.98	17.000	7/8 - 9UNC-2B	12	5	4	9/16	159	CAF

312 Lug – Recommended Flange Bolt Lengths

Size (in.)	Qty.	Bolt Size	Length of fasteners (in.) Up Stream Side - L1 Bolts	Up Stream Side - L1 All-thread Studs	Down Stream Side - L2 Bolts	Down Stream Side - L2 All-thread Studs
2	4	5/8 - UNC	1 1/2	2 1/2	1 3/4	2 1/2
2 1/2	4	5/8 - UNC	1 3/4	2 1/2	2	2 1/2
3	4	5/8 - UNC	1 3/4	2 1/2	2	2 3/4
4	8	5/8 - UNC	1 3/4	2 1/2	2	2 3/4
5	8	3/4 - UNC	2	3	2 1/4	3
6	8	3/4 - UNC	2	3	2 1/4	3 1/4
8	8	3/4 - UNC	2	3	2 1/4	3 1/4
10	12	7/8 - UNC	2 1/4	3 1/2	2 1/2	3 3/4
12	12	7/8 - UNC	2 1/2	3 3/4	2 3/4	4



Note: Bolt lengths are based on ANSI Class 150 weld neck flanges per ANSI B16.5 and a gasket thickness of 0.062 inch.

Copyright © 2009 Tyco Flow Control. All rights reserved.

Options

Optional Flange Standards

Standard	Size (in.)																	
	2		2½		3		4		5		6		8		10		12	
	310	312	310	312	310	312	310	312	310	312	310	312	310	312	310	312	310	312
ASME 300	Y	N	Y	N	Y	N	Y	Y	Y	Y	Y	N	Y	N	Y	N	Y	N
DIN 2632 PN-10	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
DIN 2633 PN-16	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
DIN 2634 PN-25	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N
JIS B 2212 10K	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N
JIS B 2213 16K	Y	N	Y	N	Y	N	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	N

Notes:

1. Optional flange standard must be specified at time of order.
2. Valve is rated to 285 psi. Do not exceed pressure rating.

Tyco Flow Control (TFC) provides the information herein in good faith but makes no representation as to its comprehensiveness or accuracy. This data sheet is intended only as a guide to TFC products and services. Individuals using this data sheet must exercise their independent judgment in evaluating product selection and determining product appropriateness for their particular purpose and system requirements. TFC MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT(S) TO WHICH THE INFORMATION REFERS. ACCORDINGLY, TFC WILL NOT BE RESPONSIBLE FOR DAMAGES (OF ANY KIND OR NATURE, INCLUDING INCIDENTAL, DIRECT, INDIRECT, OR CONSEQUENTIAL DAMAGES) RESULTING FROM THE USE OF OR RELIANCE UPON THIS INFORMATION. Patents and Patents Pending in the U.S. and foreign countries. Tyco reserves the right to change product designs and specifications without notice. All registered trademarks are the property of their respective owners. Printed in the USA.

Copyright © 2009 Tyco Flow Control. All rights reserved.