

Concentric Butterfly Valves

 **JEIL CNS CO., LTD**



Concentric Butterfly Valves



Technological Knowhow of JEIL CNS



Specification of Concentric Butterfly Valves

The valve shall be capable of bi-directional flow with bubble tight shut-off at full rating pressure.

TYPE NUMBERING SYSTEM

- JC-CWR Concentric WAFLER type Rubber lined Butterfly Valves
- JC-CSR Concentric SEMI-LUG type Rubber lined Butterfly Valves
- JC-CLR Concentric LUG type Rubber lined Butterfly Valves
- JC-CFR Concentric FLANGE type Rubber lined Butterfly Valves

STANDARD COMPLIANCE

- JEIL CNS Concentric Butterfly valves conform to ISO 5752, KSV 7490, JIS F 7480, JIS B 2032, API 609, BS 5155, DIN2501.

PRODUCTION RANGE

- SIZE : DN 50mm (2 inch) ~ DN 4000mm (160 inch)
- RATING PRESSURE : UP to 20 bar depend on related size
- RATING TEMPERATURE : -40 °C ~ +230 °C

APPLICABLE FLANGE

- KS/JIS 5K, 10K, 16K
- ASME B 16.1 Class 125LB
- ASME B 16.5 Class 150LB
- EN 1092 PN6, PN10, PN16
- ISO 7005 PN6, PN10, PN16
- GB 2501/2506 PN6, PN10, PN16
- DIN 2501 PN6, PN10, PN16
- BS4504 PN6, PN10, PN16

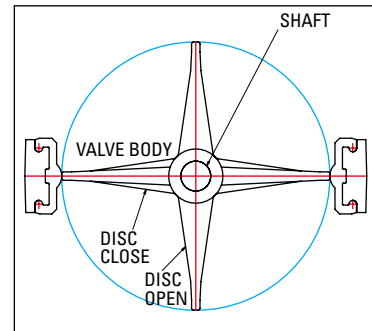


Concentric Butterfly Valves

The Concentric Design

CENTER OF SHAFT / Seat in the 'Center of Valve Body'
Applicable for BUTTERFLY VALVE WITH ELASTOMER LINING.

- Symmetric disc design ensures favorable flow characteristics and low pressure drop
- Concentric shaft ensures low operating torque
- Lining gives a good protection to valve body, and acts as flange gasket
 - Shaft penetrates the valve seat
 - Limited choice of seating materials(Elastomer, only)



Classification by Connection type

Appearance	Type	General Characteristics
	JC-CWR (WAFFER)	• General Applications - Shipbuilding, water works, heating and ventilation, power plants, oil refinery chemical plants etc. • Valve to be installed by long bolts between the flanges of adjacent pipe only • Easy handling and light weight. • Easy installation, less bolt quantity and low cost. • Inconvenient maintenance of adjacent pipe.
	JC-CSR (SEMI-LUG)	• General Applications - Shipbuilding, water works, heating and ventilation, power plants, oil refinery chemical plants etc. • Similar as wafer type except a pair of the tap bolt hole in way of upper and lower sides for easy maintenance of adjacent pipe. • Easy handling and light weight. • Easy installation, less bolt quantity and low cost. • Keep liquid remained during repairing adjacent pipe.
	JC-CLR (FULL-LUG)	• General Applications : general piping system pump outlets, tank drains, ship sides etc. • Ring shape bolt hole for bolting with flange of connecting pipe. • Keep pressure inside during repairing adjacent the other side pipe. • Different flange shape. • Possible damage on full face gasket. • Hard repairing of corroded bolt. • More man-hour for installation and body can be cracked by misaligned thread. • Heavy weight.
	JC-CFR (FLANGE)	• General Applications - Shipline valves, ballast valves, water works, power plants, etc all piping system. • Both ends with complete flange. • Suitable to general pipe flange. • Suitable for shipline valve in the ship. • Heavy weight. • Same installation as ordinary valve.

Schema of concentric type

The valve shall be a 90° turn clockwise to close, non-jamming, resilient seated valve for zero leakage service.

The valve shall be torque seated and designed in such a manner that the disc can not be rotated freely at the closed position.

Also this valve enables the fluid perfect shut-off regardless of the flow direction.



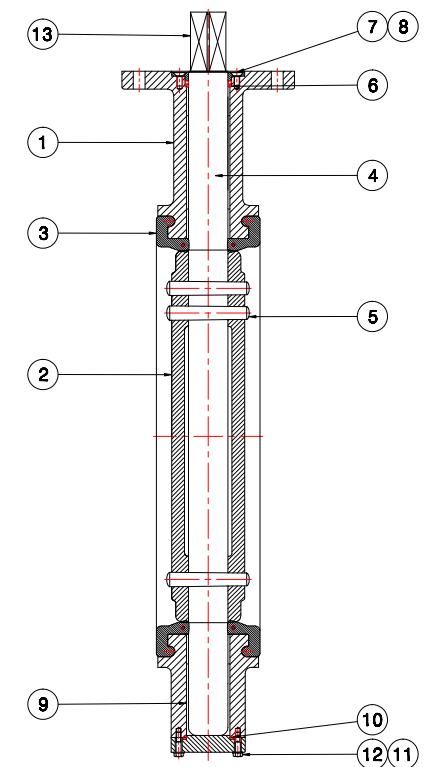
Operations

The various operator of the valve is available depend on the valve location, driving medium and dedicated service of the valve to be provided.

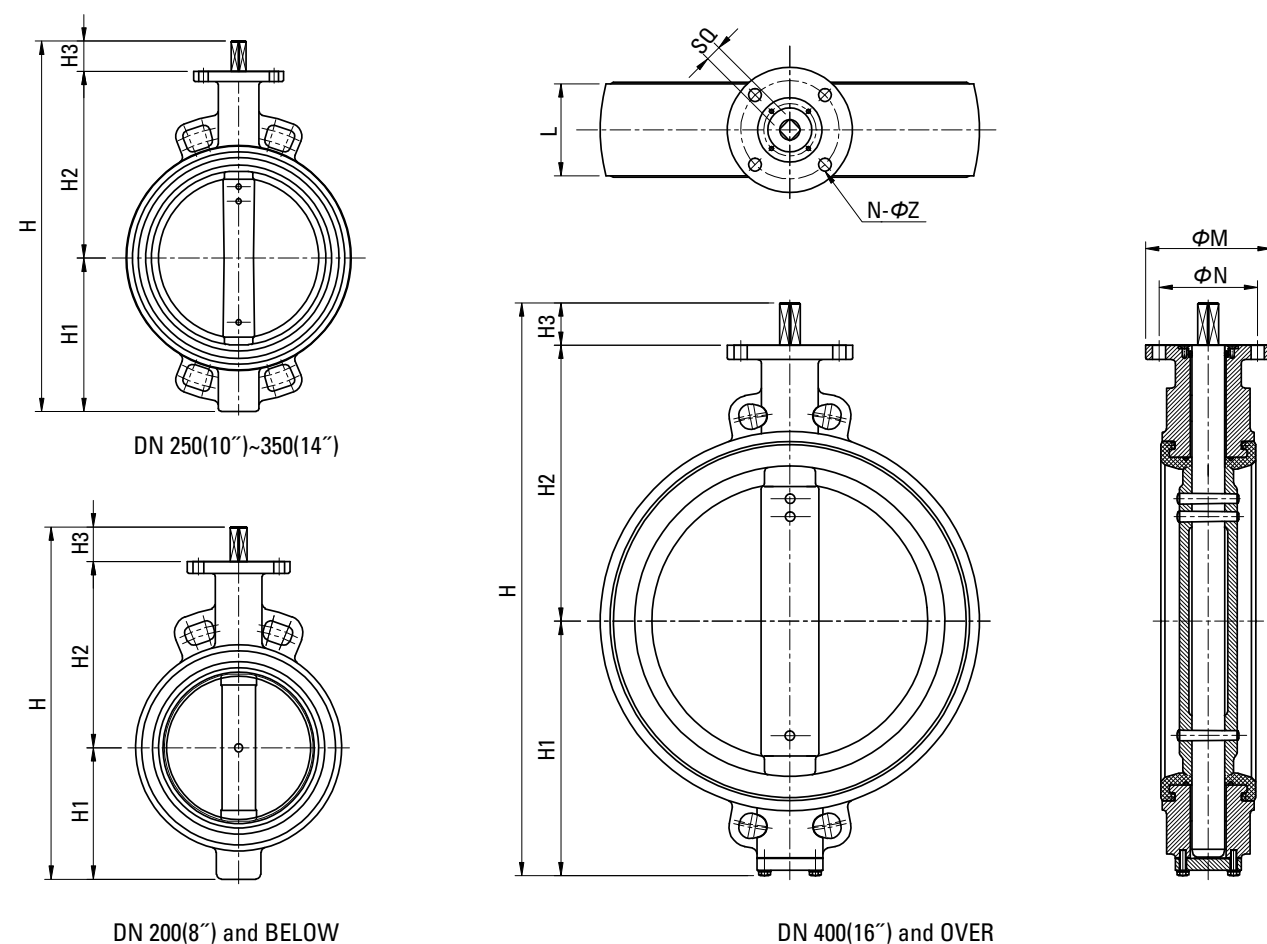
- Manual lever operation
- Manual worm gear operation
- Pneumatic actuator operation
- Hydraulic actuator operation
- Electric motor actuator operation

Construction of Materials

NO.	PART NAME	MATERIAL
1	BODY	CAST IRON / DUCTILE IRON STAINLESS STEEL / CARBON STEEL (NICKEL) ALUMINUM BRONZE
2	DISC	STAINLESS STEEL / ALLOY STEEL (NICKEL) ALUMINUM BRONZE
3	SEAT	NBR / VITON / SILICON / EPDM
4	STEM	STAINLESS STEEL(SS304, 316, 410, 420, 17-4PH) / MONEL / DUPLEX
5	DISC PIN	STAINLESS STEEL or MONEL
6	O-RING	RUBBER SAME AS SEAT MATERIAL
7	PACKING GLAND	BRONZE / STAINLESS STEEL / STEEL(HOT DIP GALV.)
8	GLAND BOLT	STAINLESS STEEL
9	BEARING	PTFE + PB
10	O-RING	RUBBER SAME AS SEAT MATERIAL
11	BOTTOM COVER	CARBON STEEL / STAINLESS STEEL / AL-BRONZE / MILD STEEL
12	BOLT & WASHER	STEEL / STAINLESS STEEL
13	KEY or SQUARE	MILD STEEL / IF NECESSARY



Concentric Wafer Type

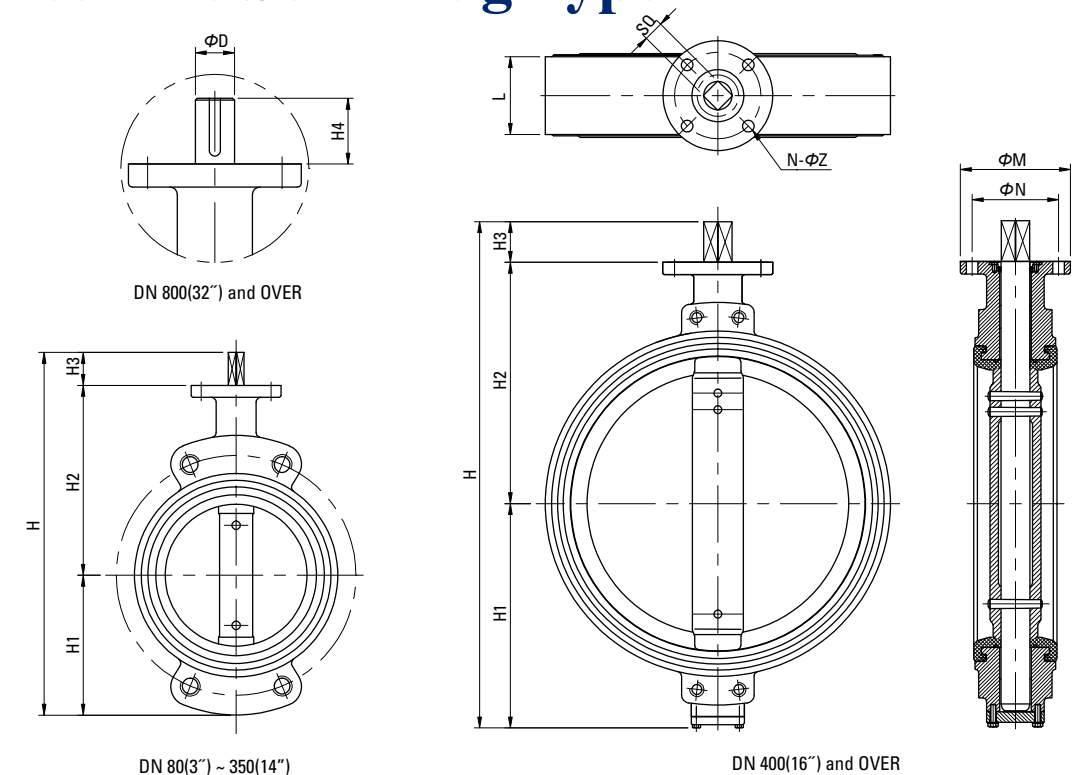


VALVE DIMENSIONS

SIZE		L	H	H1	H2	H3	STEM	TOP FLANGE				WEIGHT (APPROX.) (kg)
inch	mm						SQ	TYPE	φN	φM	N-φZ	
2"	50	43	216	55	128	33	9	F07	70	90	4-9	7
2.5"	65	46	239	66	140	33	9	F07	70	90	4-9	8
3"	80	46	258	75	150	33	9	F07	70	90	4-9	8
4"	100	52	293	95	165	33	12	F07	70	90	4-9	9
5"	125	56	326	115	178	33	12	F07	70	90	4-9	11
6"	150	56	353	130	190	33	12	F07	70	90	4-9	13
8"	200	60	435	155	230	50	17	F10	102	125	4-12	17
10"	250	68	535	215	270	50	17	F10	102	125	4-12	24
12"	300	78	611	251	310	50	22	F10	102	125	4-12	36
14"	350	78	655	270	335	50	27	F10	102	125	4-12	58
16"	400	102	755	325	370	60	27	F14	140	175	4-18	91
18"	450	114	797	347	390	60	27	F14	140	175	4-18	102
20"	500	127	883	383	420	60	36	F16	165	210	4-22	145

unit : mm

Concentric Semi-Lug Type

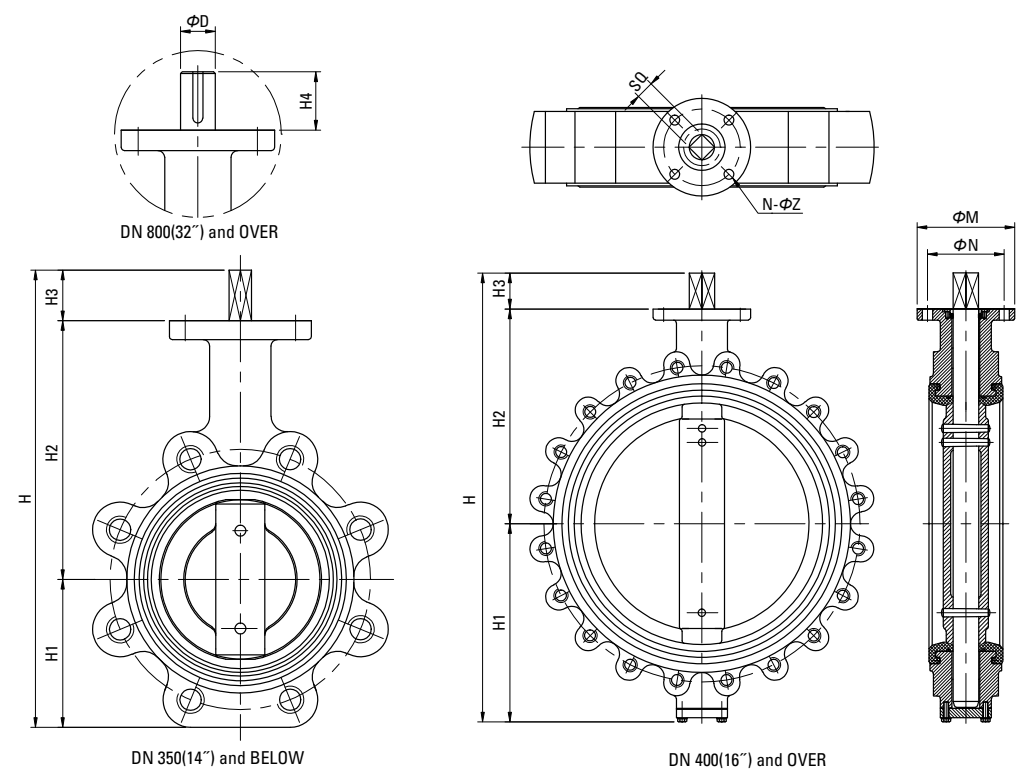


VALVE DIMENSIONS

SIZE		L	H	H1	H2	H4	STEM				TOP FLANGE				WEIGHT (APPROX.) (kg)
inch	mm						φD	KEY SIZE	SQUARE		TYPE	φN	φM	N-φZ	
									SQ	H3					
2"	50	43	216	55	128	33	14	5x5	9	33	F07	70	90	4-9	10
2.5"	65	46	239	66	140	33	14	5x5	9	33	F07	70	90	4-9	11
3"	80	46	258	75	150	33	14	5x5	9	33	F07	70	90	4-9	11
4"	100	52	293	95	165	33	19	6x6	12	33	F07	70	90	4-9	12
5"	125	56	326	115	178	33	19	6x6	12	33	F07	70	90	4-9	13
6"	150	56	353	130	190	33	19	6x6	12	33	F07	70	90	4-9	15
8"	200	60	435	155	230	50	22	8x7	17	50	F10	102	125	4-12	19
10"	250	68	535	215	270	50	25	8x7	17	50	F10	102	125	4-12	37
12"	300	78	611	251	310	50	32	10x8	22	50	F10	102	125	4-12	47
14"	350	78	655	270	335	50	32	10x8	27	50	F10	102	125	4-12	67
16"	400	102	755	325	370	60	40	12x8	27	60	F14	140	175	4-18	91
18"	450	114	797	347	390	60	40	12x8	27	60	F14	140	175	4-18	104
20"	500	127	883	383	420	80	45	14x9	36	80	F16	165	210	4-22	154
22"	550	154	967	425	462	80	50	14x9	36	80	F16	165	210	4-22	191
24"	600	154	1028	453	495	80	65	20x12	50	80	F16	165	210	4-22	240
26"	650	165	1095	490	525	80	65	20x12	50	80	F16	165	210	4-22	272
28"	700	165	1150	515	555	80	65	20x12	50	80	F16	165	210	4-22	305
30"	750	190	1230	550	590	80	65	20x12	50	90	F16	165	210	4-22	373
32"	800	190	1352	592	640	90	65	20x12	-	-	F25	254	300	8-18	403
34"	850	210	1382	612	650	120	80	22x14	-	-	F25	254	300	8-18	526
36"	900	203	1488	658	700	130	80	22x14	-	-	F25	254	300	8-18	607
40"	1000	216	1645	725	770	150	95	25x14	-	-	F30	298	350	8-23	829
44"	1100	240	1740	760	830	150	95	25x14	-	-	F30	298	350	8-23	1031
48"	1200	254	1880	840	890	150	95	25x14	-	-	F30	298	350	8-23	1212

unit : mm

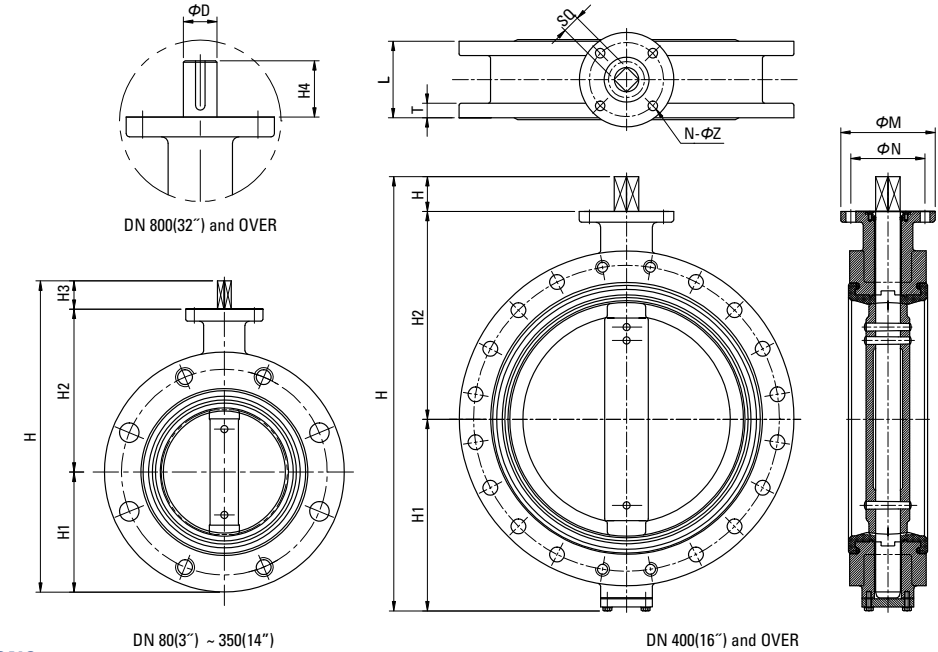
Concentric Lug Type



VALVE DIMENSIONS

SIZE		L	H	H1	H2	H4	STEM				TOP FLANGE				WEIGHT (APPROX.) (kg)
inch	mm						ΦD	KEY SIZE	SQUARE		TYPE	ΦN	ΦM	N-ΦZ	
									SQ	H3					
2"	50	43	216	55	128	33	14	5x5	9	33	F07	70	90	4-9	10
2.5"	65	46	239	66	140	33	14	5x5	9	33	F07	70	90	4-9	11
3"	80	46	258	75	150	33	14	5x5	9	33	F07	70	90	4-9	13
4"	100	52	293	95	165	33	19	6x6	12	33	F07	70	90	4-9	15
5"	125	56	326	115	178	33	19	6x6	12	33	F07	70	90	4-9	20
6"	150	56	353	130	190	33	19	6x6	12	33	F07	70	90	4-9	22
8"	200	60	435	155	230	50	22	8x7	17	50	F10	102	125	4-12	31
10"	250	68	535	215	270	50	25	8x7	17	50	F10	102	125	4-12	47
12"	300	78	611	251	310	50	32	10x8	22	50	F10	102	125	4-12	59
14"	350	78	655	270	335	50	32	10x8	27	50	F10	102	125	4-12	85
16"	400	102	755	325	370	60	40	12x8	27	60	F14	140	175	4-18	130
18"	450	114	797	347	390	60	40	12x8	27	60	F14	140	175	4-18	154
20"	500	127	883	383	420	80	45	14x9	36	80	F16	165	210	4-22	263
22"	550	154	967	425	462	80	50	14x9	36	80	F16	165	210	4-22	270
24"	600	154	1028	453	495	80	65	20x12	50	80	F16	165	210	4-22	314
26"	650	165	1095	490	525	80	65	20x12	50	80	F16	165	210	4-22	377
28"	700	165	1150	515	555	80	65	20x12	50	80	F16	165	210	4-22	389
30"	750	190	1230	550	590	80	65	20x12	50	90	F16	165	210	4-22	493
32"	800	190	1352	592	640	90	65	20x12	-	-	F25	254	300	8-18	597
34"	850	210	1382	612	650	120	80	22x14	-	-	F25	254	300	8-18	912
36"	900	203	1488	658	700	130	80	22x14	-	-	F25	254	300	8-18	956
40"	1000	216	1645	725	770	150	95	25x14	-	-	F30	298	350	8-23	1209
44"	1100	240	1740	760	830	150	95	25x14	-	-	F30	298	350	8-23	1753
48"	1200	254	1880	840	890	150	95	25x14	-	-	F30	298	350	8-23	2053

Concentric Flange Type



VALVE DIMENSIONS

SIZE		L	H	H1	H2	H4	STEM				TOP FLANGE				WEIGHT (APPROX.) (kg)
inch	mm						ΦD	KEY SIZE	SQUARE		TYPE	ΦN	ΦM	N-ΦZ	
									SQ	H3					
2"	50	40	249	88	128	33	14	5x5	9	33	F07	70	90	4-9	14
2.5"	65	40	271	98	140	33	14	5x5	9	33	F07	70	90	4-9	14
3"	80	60	288	105	150	33	14	5x5	9	33	F07	70	90	4-9	16
4"	100	60	318	120	165	33	19	6x6	12	33	F07	70	90	4-9	22
5"	125	100	351	140	178	33	19	6x6	12	33	F07	70	90	4-9	29
6"	150	100	388	165	190	33	19	6x6	12	33	F07	70	90	4-9	35
8"	200	100	470	190	230	50	22	8x7	17	50	F10	102	125	4-12	47
10"	250	110	535	215	270	50	25	8x7	17	50	F10	102	125	4-12	66
12"	300	110	611	251	310	50	32	10x8	22	50	F10	102	125	4-12	78
14"	350	120	655	270	335	50	32	10x8	27	50	F10	102	125	4-12	100
16"	400	130	755	325	370	60	40	12x8	27	60	F14	140	175	4-18	147
18"	450	150	797	347	390	60	40	12x8	27	60	F14	140	175	4-18	174
20"	500	160	883	383	420	80	45	14x9	36	80	F16	165	210	4-22	222
22"	550	170	967	425	462	80	50	14x9	36	80	F16	165	210	4-22	271
24"	600	170	1028	453	495	80	65	20x12	50	80	F16	165	210	4-22	323
26"	650	170	1095	490	525	80	65	20x12	50	80	F16	165	210	4-22	364
28"	700	180	1150	515	555	80	65	20x12	50	80	F16	165	210	4-22	415
30"	750	190	1230	550	590	80	65	20x12	50	90	F16	165	210	4-22	525
32"	800	200	1352	592	640	90	65	20x12	50	90	F25	254	300	8-18	599
34"	850	210	1382	612	650	120	80	22x14	-	-	F25	254	300	8-18	708
36"	900	230	1488	658	700	130	80	22x14	-	-	F25	254	300	8-18	854
40"	1000	250	1645	725	770	150	95	25x14	-	-	F30	298	350	8-23	1071
44"	1100	280	1740	760	830	150	95	25x14	-	-	F30	298	350	8-23	1240
48"	1200	300	1880	840	890	150	95	25x14	-	-	F30	298	350	8-23	1553
52"	1300	300	2048	938	950	160	115	32x18	-	-	F30	298	350	8-23	1744
56"	1400	330	2129	949	1000	180	130	32x18	-	-	F35	356	415	8-33	2052
60"	1500	330	2259	1024	1055	180	140	36x20	-	-	F35	356	415	8-33	2781
64"	1600	360	2450	1120	1150	180	140	36x20	-	-	F35	356	415	8-33	3587
72"	1800	360	2701	1221	1270	210	160	40x22	-	-	F35	356	415	8-33	4116
80"	2000	457	3020	1390	1400	230	190	45x25	-	-	F48	483	560	12-38	4905
88"	2200	500	3155	1465	1450	240	210	50x28	-	-	F48	483	560	12-38	6051
96"	2400	550	3365	1565	1550	250	220	50x28	-	-	F48	483	560	12-38	7197
104"	2600	550	3575	1665	1650	260	230	50x28	-	-	F60	603	686	20-38	8106
112"	2800	600	3780	1755	1755	270	240	56x32	-	-	F60	603	686	20-38	10161
120"	3000	600	4120	1880	1940	300	240	56x32	-	-	F60	603	686	20-38	11018
128"	3200	600	4320	1980	2040	300	260	56x32	-	-	F60	603	686	20-38	13222
136"	3400	600	4790	2270	2220	300	260	56x32	-	-	F60	603	686	20-38	18280
144"	3600	600	5110	2400	2360	350	260	56x32	-	-	F60	603	686	20-38	20124
152"	3800	600	5430	2550	2480	400	280	63x32	-	-	F60	603	686	20-38	21968
160"	4000	600	5740	2680	2610	450	280	63x32	-	-	F60	603	686	20-38	23812

* For DN 4000 and larger, It is available upon request.

Butterfly Valve with Teflon Lining

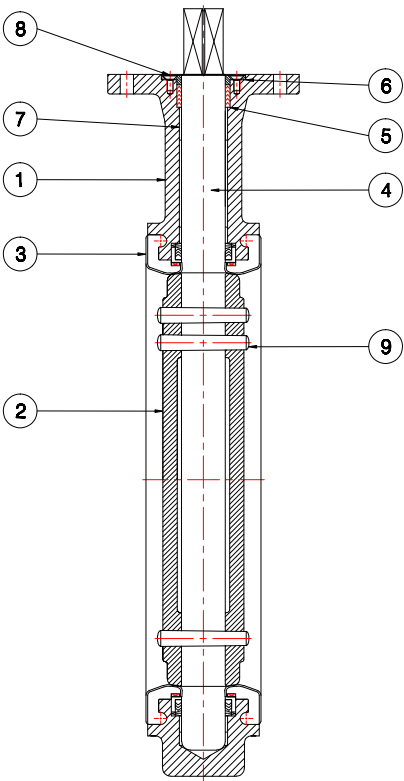
Range of Applications

Butterfly valves provide a bubble tight seal. They are used to shut-off, throttle and regulate highly corrosive gases, liquids, slurries and powders. Butterfly valves are designed to handle a variety of applications to the semi conductor, chemical, petrochemical, pulp and paper, mining, food and beverage, sugar refining, sewage, air pollution control, oil and gas, and chemical carrier, shipbuilding industries etc.

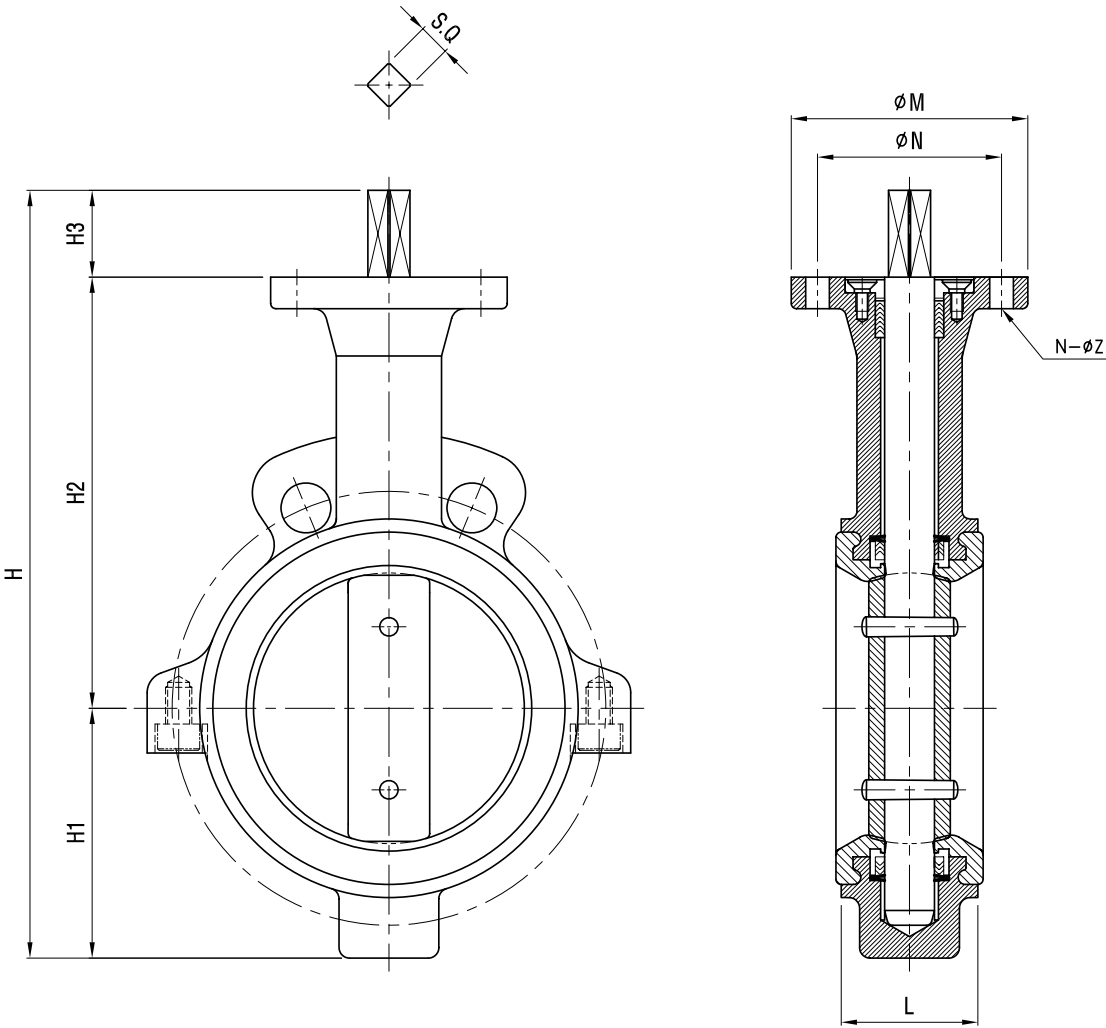
VALVE TYPE	KS-TLW(WAFER)	KS-TLL(LUG)	KS-TLF(FLANGE)
Valve Nominal Size	50A-500A(2"~20")	50A-600A(2"~24")	50A-600A(2"~24")
Applicable Flange	JIS / KS 5K, 10K ASME B 16.5 CLASS 150LB		
Working Temperature Range	-20 ℃ ~ +250 ℃		
Allowable Temperature in continuous use	-10 ℃ ~ +230 ℃		
Face to Face	KSV 7490, JIS F7480, ISO 5752 (Table 6)		
Operations	LEVER, WORM GEAR, PNEUMATIC CYLINDER ELECTRIC MOTOR, HYDRAULIC ACTUATOR		

Construction of Materials

NO.	PART NAME	MATERIAL
1	BODY	DUCTILE IRON STAINLESS STEEL CARBON STEEL
2	DISC	STAINLESS STEEL
3	SEAT	PTFE
4	STEM	STAINLESS STEEL
5	PACKING	PTFE
6	GLAND	STAINLESS STEEL
7	BUSH	STAINLESS STEEL
8	GLAND BOLT	STAINLESS STEEL
9	DISC PIN	STAINLESS STEEL



Butterfly Valve with Teflon Lining



VALVE DIMENSIONS

VALVE DIMENSIONS

unit : mm

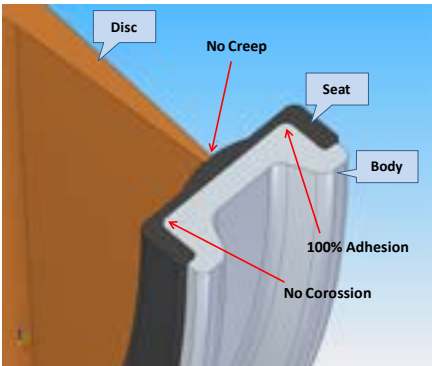
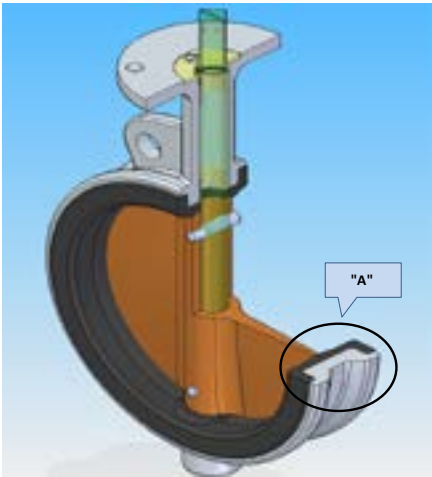
SIZE		L	H	H1	H2	H3	STEM	TOP FLANGE				WEIGHT (APPROX.) (kg)
inch	mm						SQ	TYPE	ΦN	ΦM	N - ΦZ	
2"	50	43	216	55	128	33	9	F07	70	90	4-9	3
2.5"	65	46	239	66	140	33	9	F07	70	90	4-9	4
3"	80	46	258	75	150	33	9	F07	70	90	4-9	4
4"	100	52	293	95	165	33	12	F07	70	90	4-9	5
5"	125	56	326	115	178	33	12	F07	70	90	4-9	6
6"	150	56	353	130	190	33	12	F07	70	90	4-9	8
8"	200	60	435	155	230	50	17	F10	102	125	4-12	12
10"	250	68	535	215	270	50	17	F10	102	125	4-12	19
12"	300	78	611	251	310	50	22	F10	102	125	4-12	30
14"	350	78	655	270	335	50	27	F10	102	125	4-12	43
16"	400	102	755	325	370	60	27	F14	140	175	4-18	70
18"	450	114	797	347	390	60	27	F14	140	175	4-18	86
20"	500	127	883	383	420	80	36	F16	165	210	4-22	128
24"	600	154	1028	453	495	80	50	F16	165	210	4-22	211

unit : mm

Vulcanized Rubber Lined Butterfly Valve

Design Features

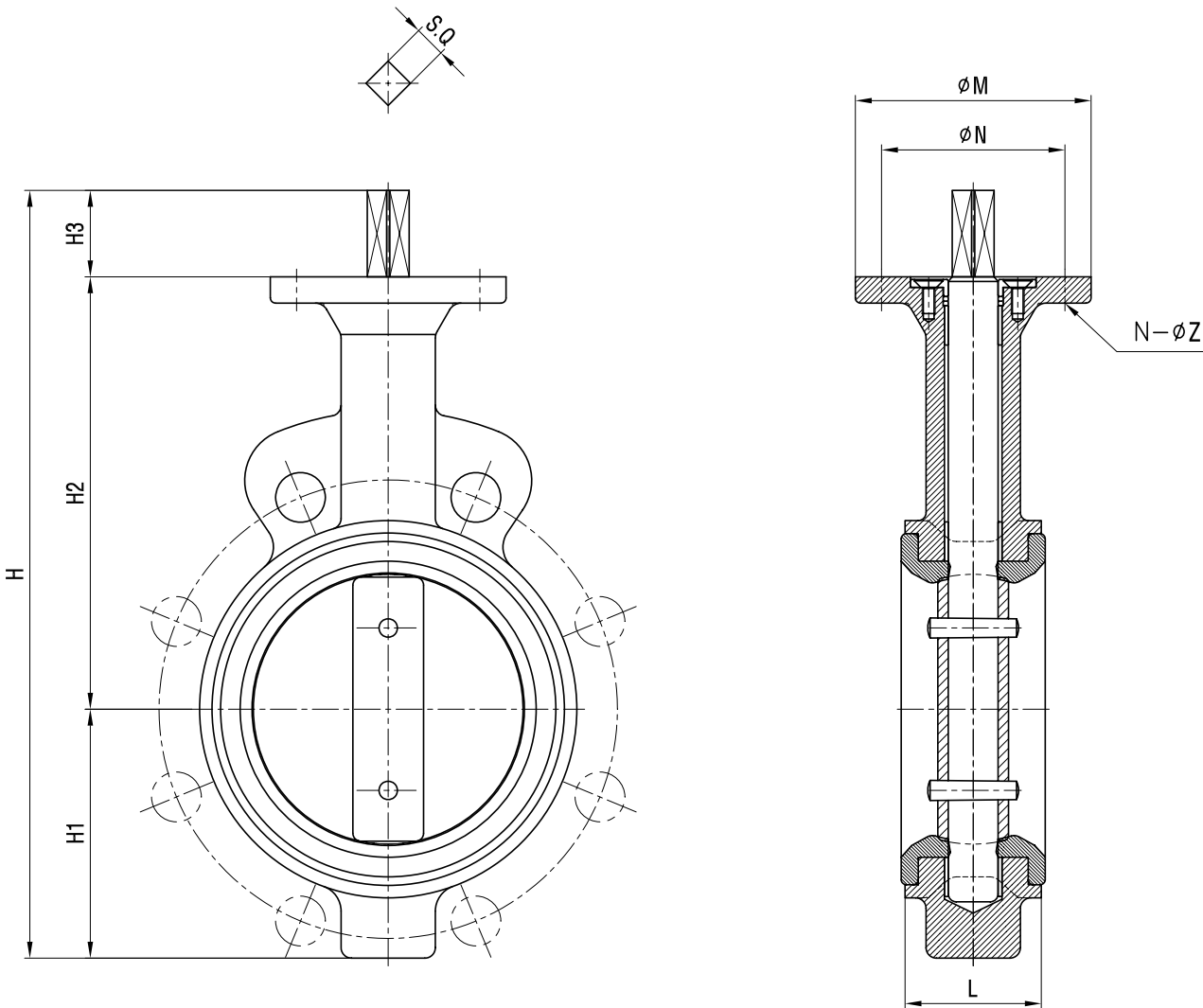
- High accuracy molded-in seat fully vulcanized to the body.
- Suitable for vacuum and high fluid velocity.
 - Vulcanized seat type ensures that the valves are suitable for use on applications having high velocities and for applications under vacuum(negative pressure) conditions.
- No corrosion between seat and body.
 - Vulcanised seat type valve body and stem are completely isolated against the contact with the medium which eliminates corrosion.
- No collapsible, blow out proof seat
 - Vulcanized seat type to the entire body interior prevents distortion (creep) during the operation of the valve.
- Low torque, Non replaceable seat design
 - Torque figures are lower with a Vulcanized seat type. The contour of the rubber remains fixed. The loose lining is subjected to distortion.
- Correct installation
 - Sealing face both sides of the valve ensures correct installation and compression of the rubber, this acts again to ensure no distortion of the liner as does complete vulcanized seat type
- Ball shape rubber design
 - Ball shape rubber to be provided to contact with flat shape disc which gives central position of disc because shorter distance at center line compare to longer diagonal length at disc end.



Range of Applications

VALVE TYPE	WAFER	LUG	FLANGE
Valve Nominal Size	50A~500A(2"~20")	50A~600A(2"~24")	50A~600A(2"~24")
Applicable Flange	JC/JIS 5K,10K,16K, ASME B 16.1 CLASS 125LB, ASME B 16.5 150LB ISO 7005 & BS4504 & DIN2501 & GB2501/2506 PN6, PN10, PN16		
Working Temperature Range	-40℃~+230℃		
Face to Face	KSV7490, JIS F7480, ISO 5752(Table.6)		
Operations	LEVER, WORM GEAR, PNEUMATIC CYLINDER ELECTRIC MOTOR, HYDRAULIC ACTUATOR		

Vulcanized Rubber Lined Butterfly Valve



VALVE DIMENSIONS												unit : mm
SIZE		L	H	H1	H2	H3	STEM	TOP FLANGE				WEIGHT (APPROX.) (kg)
inch	mm						SQ	TYPE	ΦN	ΦM	N - ΦZ	
2"	50	43	216	55	128	33	9	F07	70	90	4-9	7
2.5"	65	46	239	66	140	33	9	F07	70	90	4-9	8
3"	80	46	258	75	150	33	9	F07	70	90	4-9	8
4"	100	52	293	95	165	33	12	F07	70	90	4-9	9
5"	125	56	326	115	178	33	12	F07	70	90	4-9	11
6"	150	56	353	130	190	33	12	F07	70	90	4-9	13
8"	200	60	435	155	230	50	17	F10	102	125	4-12	17
10"	250	68	535	215	270	50	17	F10	102	125	4-12	24
12"	300	78	611	251	310	50	22	F10	102	125	4-12	36
14"	350	78	655	270	335	50	27	F10	102	125	4-12	58
16"	400	102	755	325	370	60	27	F14	140	175	4-18	91
18"	450	114	797	347	390	60	27	F14	140	175	4-18	102
20"	500	127	883	383	420	60	36	F16	165	210	4-22	145

unit : mm

Basic Formulas for obtaining Cv-Value

Rated flow coefficient (Cv) is a number which represents a valve’s ability to pass flow.

The bigger Cv, the more flow can pass the valve with a given pressure drop. Rate Cv means the volume of water in United States gallons per minute that will pass through a given valve opening with a pressure drop of 1 pound per square inch at Water temp of 60°F . A Cv of 1900 means a valve will pass 1900 gpm of 60°F water with a dp of 1 psi.

Formula 1
FLOW RATE LBS/HR(Stem or Water)

$$dp = (\frac{F\sqrt{V}}{63.5C_v})^2 \quad \text{or} \quad C_v = \frac{F\sqrt{V}}{63.5\sqrt{dp}}$$

Where :

dp = pressure drop in PSI

F = flow rate in lbs./hr.

*V*_v= square root of specific volume in ft. ³/lb.
(downstream of valve)

Formula 2
FLOW RATE GPM(Water or Other Liquids)

$$dp = (\frac{Q}{C_v})^2 \quad \text{or} \quad C_v = \sqrt{\frac{Sg}{dp}}$$

Where :

dp = pressure drop in PSI

Sg = specific gravity

Q = Flow rate in GPM

The relation between *Cv* and *k_v*, expressed in the above mentioned unit of measure are as follows

Cv=1.16*k_v*

FLOW COEFFICIENT

SIZE		DISC OPENING							
		20°	30°	40°	50°	60°	70°	80°	90°
inch	mm	Cv	Cv	Cv	Cv	Cv	Cv	Cv	Cv
2"	50	11.6	17.5	27.3	44.6	72.0	116.0	179.0	214.0
2.5"	65	19.6	29.6	46.0	75.0	122.0	197.0	302.0	362.0
3"	80	29.7	44.8	70.0	114.0	184.0	298.0	458.0	548.0
4"	100	45	70	109	178	289	466	715	866
5"	125	73	109	171	278	449	728	1118	1338
6"	150	104	158	246	401	650	1048	1610	1927
8"	200	186	280	437	713	1155	1863	2862	3426
10"	250	290	438	682	1114	1805	2911	4472	5353
12"	300	418	630	983	1604	2599	4192	5439	7708
14"	350	569	858	1338	2183	3523	5705	8764	10491
16"	400	743	1121	1747	2852	4620	7452	11447	13703
18"	450	940	1418	2211	3609	5847	9431	14488	17343
20"	500	1161	1751	2730	4456	7219	11644	17886	21411
22"	550	1405	2119	3303	5391	8701	14089	21642	25907
24"	600	1672	2522	3931	6416	10395	16767	25756	30832
26"	650	1962	2960	4614	7530	12152	19678	30227	36184
28"	700	2275	3432	5351	8733	14094	22821	35057	41965
30"	750	2612	3940	5142	10025	16242	26198	40244	48175
32"	800	2972	4483	6989	11406	18408	29807	45788	54812
34"	850	3355	5061	7890	12876	20781	33650	51691	61878
36"	900	3761	5674	8845	14136	23389	37725	57951	69371
38"	950	4191	6322	9588	16084	25958	42033	64569	77293
40"	1000	4643	7005	10920	17822	28763	46574	71544	85644
42"	1050	5119	7723	12176	19649	31711	51348	78877	94422
44"	1100	5618	8476	13213	21565	34803	56355	86568	103629
46"	1150	6141	9264	14441	23570	38039	61594	94617	113264
48"	1200	6683	10087	15725	25664	41419	67067	103024	123327
52"	1300	7888	11906	18560	30291	48887	79160	121600	145564
56"	1400	9324	14074	21940	35808	57790	93576	143745	172072
60"	1500	10671	16106	25108	40977	66133	107085	164497	196915
64"	1600	12179	18382	28657	46769	75481	122221	187748	224748
72"	1800	15781	23819	37132	60602	97805	158369	243277	291219
80"	2000	19483	29406	45842	74817	120747	195517	300341	359529
88"	2200	23574	35581	55469	90529	146104	236576	363412	435030
96"	2400	28055	42345	66013	107737	173876	281545	432491	517723

Torques Required to Operate Valve

► The torques listed are applicable to water, sea water, lubricant type of Hydrocarbons and most media at temperature 0~80℃(32~180°F).

► The operating speed of the actuator must be properly adjusted into consideration to avoid water hammer which may request in valve damage when the valve is closed quickly.

Actuator torques can be calculated with the following formulas.

Ta=Tb+Ts+Th=1.2Tb±Td

Ts=CsD2

Tb=4.17D2 dfp

Td=CtD3P

Th=3.06D4

V=Cf√p= Q/0.785D2

- Ta: The required actuator torque (lb-ft)
- Ts: Seat or unseating torque (lb-ft)
- Td: Dynamic torque (lb-ft)
- Q: Flow (cubic for per second)
- V: Velocity (feet per second)
- D: Diameter of valve (feet)
- d: Diameter of shaft (inch)
- P: Pressure drop across valve (psi)
- Cs: Coefficient of seating or unseating torque
- Ct: Coefficient of dynamic torque
- Cf: Coefficient of flow
- f: Bearing friction coefficient

TORQUE TABLE

SIZE		CONCENTRIC TYPE									
		3bar		5bar		10bar		13bar		16bar	
		kg-m	Nm	kg-m	Nm	kg-m	Nm	kg-m	Nm	kg-m	Nm
2"	50	0.72	7.09	0.90	8.86	1.13	11.08	1.36	13.29	1.58	15.51
2.5"	65	0.90	8.86	1.13	11.08	1.58	15.51	1.90	18.61	2.20	21.60
3"	80	1.18	11.52	1.47	14.40	2.03	19.94	2.44	23.93	2.77	27.14
4"	100	1.36	13.29	1.70	16.62	2.26	22.16	2.71	26.59	2.88	28.25
5"	125	2.08	20.38	2.60	25.48	3.39	33.23	4.07	39.88	4.52	44.31
6"	150	2.53	24.82	3.17	31.02	4.30	42.10	5.15	50.52	5.60	54.84
8"	200	6.44	63.15	8.06	78.99	18.48	181.13	22.18	217.36	25.40	248.92
10"	250	12.66	124.08	16.73	163.96	29.05	284.71	34.86	341.65	38.50	377.30
12"	300	22.16	217.13	27.70	271.42	39.57	387.74	47.48	465.29	54.83	537.30
14"	350	37.08	363.37	46.35	454.21	65.57	642.54	79.02	774.37	81.96	803.17
16"	400	46.12	451.99	57.65	564.99	81.39	797.63	97.67	957.16	99.35	973.55
18"	450	59.46	582.72	72.01	705.69	111.35	1091.21	133.62	1309.45	170.70	1672.82
20"	500	76.53	750.00	95.52	936.11	156.00	1528.80	187.20	1834.56	209.13	2049.48
22"	550	85.55	838.40	106.94	1048.00	175.22	1717.13	210.26	2060.56	243.04	2381.83
24"	600	122.09	1196.45	152.61	1495.57	224.96	2204.57	269.95	2645.49	310.87	3046.52
26"	650	161.88	1586.41	202.35	1983.01	288.26	2824.96	345.91	3389.95	373.04	3655.83
28"	700	194.43	1905.46	243.04	2381.83	351.57	3445.34	421.88	4134.41	469.13	4597.48
30"	750	235.13	2304.28	293.91	2880.35	427.30	4187.58	512.77	5025.10	559.57	5483.74
32"	800	284.87	2791.72	356.09	3489.65	503.04	4929.83	603.65	5915.79	661.30	6480.78
34"	850	321.04	3146.23	401.30	3932.78	582.17	5705.30	698.61	6846.37	768.70	7533.22
36"	900	393.39	3855.23	491.74	4819.04	723.48	7090.09	869.39	8520.07	949.57	9305.74
40"	1000	596.87	5849.32	688.70	6749.22	970.00	9506.00	1315.83	12895.10	1330.43	13038.26
44"	1100	723.48	7090.09	834.78	8180.87	1200.00	11760.00	1560.00	15288.00	1617.39	15850.43
48"	1200	1094.26	10723.76	1367.83	13404.70	1989.57	19497.74	2387.48	23397.29	2498.26	24482.96
54"	1350	1283.04	12573.83	1582.61	15509.57	2288.00	22422.40	2745.60	26906.88	3157.44	30942.91
56"	1400	1497.44	14674.95	1841.86	18050.18	2728.67	26741.00	3274.41	32089.20	3765.57	36902.58
64"	1600	1923.01	18845.49	2177.87	21343.09	3058.28	29971.15	3669.94	35965.38	4220.43	41360.19
72"	1800	2704.14	26500.62	3102.22	30401.73	3816.00	37396.82	4579.20	44876.18	5266.08	51607.61
80"	2000	3995.10	39151.97	4583.21	44915.46	5637.76	55250.00	6765.31	66300.00	7780.10	76245.00
88"	2200	5064.13	49628.47	5809.61	56934.18	7146.34	70034.09	8575.60	84040.91	9861.94	96647.04
96"	2400	6376.19	62486.66	7314.82	71685.21	8997.87	88179.16	10797.45	105814.99	12417.07	121687.24
104"	2600	7270.21	71248.02	8340.44	81736.30	10259.48	100542.90	12311.38	120651.48	14158.08	138749.20

Elastomer General Chart

The following chart shall be used as a general guide.

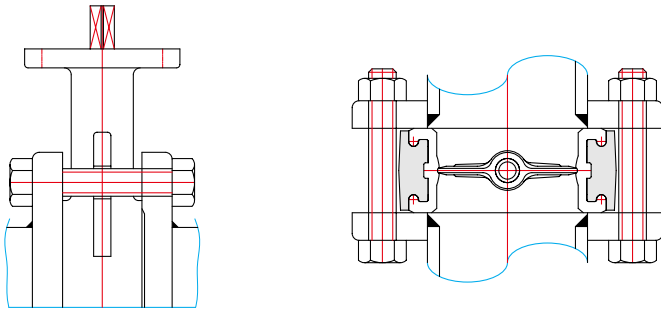
Application suggested derives from recommendation given by elastomer manufacturer.

The resistance can be affected by type of fluid, concentration, temperature, pressure, flow rate or evaporation of the medium.

The final choice is to be taken by the customer, in consideration of characteristics and specific application.

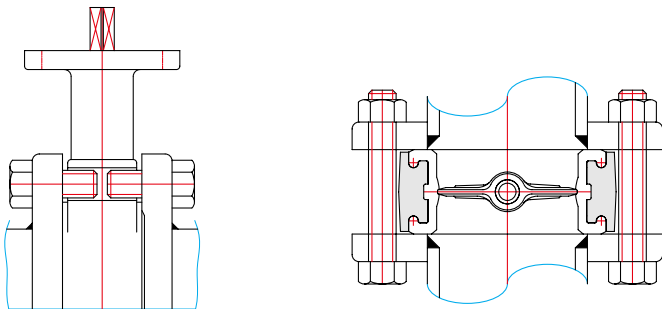
MATERIAL	GENERAL APPLICATION	SERVICE TEMPERATURE	NOT RECOMMENDED FOR
EPDM	Fresh Water	-40 °C ~ + 120 °C (for intermittent operation) 0 °C ~ + 100 °C (Allowable temperature in continuous use)	Hydrocarbons Oils Fats Greases
	Sea Water		
	Brine		
	Esters		
	Alkalies		
	Ozone		
NBR	Alcohols	-20 °C ~ + 100 °C (Allowable temperature in continuous use) 0 °C ~ + 70 °C (L-NBR -50 °C ~ 70 °C)	Solvents Benzene Xylol
	Brake Fluid		
	Treated Water With Caustic Soda		
	Fresh Water		
	Sea Water		
	Treated Water With Caustic Soda		
SBR	Hydrocabons	-35 °C ~ + 80 °C	
	Natural Gas		
	Oil and Fat		
	Air		
	Gasoline		
	Alkalis		
VITON	Acids	-35 °C ~ + 230 °C	Steam Ester Freon22 Alkalies Solvents Ketones
	Oils		
	Hydrocarbons		
SILICONE	Food	-15 °C ~ + 150 °C	Steam Solvents Hydrocarbons
	Beverage		
TEFLON	Solvents	-60 °C ~ +230 °C (PTFE -196 °C ~ + 230 °C)	Fluid Containing Powders Alkaline Gaseous Fluorine
	Corrosive Products		
	Ketones		
NEOPRENE	Acid	-20 °C ~ + 90 °C	Ketones Thinners Concentrated Acids
	Ozone		
	Oils		
	Fats		
	Greases		
	Solvents		

Bolting Dimensions (Wafer & Semi-Lug Type)



WAFER TYPE

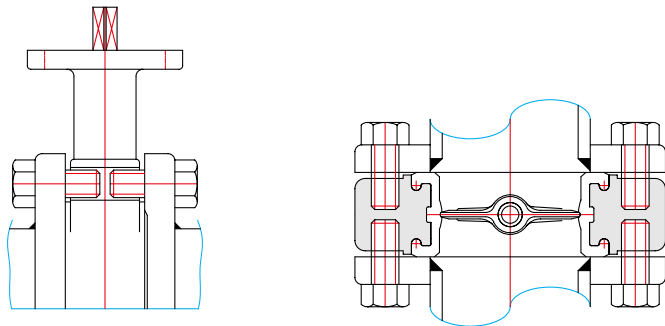
SIZE		FACE TO FACE	NUT(T) 5K	NUT(T) 10K	FLANGE(T) 5K		FLANGE(T) 10K		JIS 5K		JIS 10K	
inch	mm				CAST IRON	CAST STEEL	CAST IRON	CAST STEEL	Q'TY	BOLT SIZE	Q'TY	BOLT SIZE
2"	50	43	10	13	16	14	20	16	4	M12	4	M16
2.5"	65	46	10	13	18	14	22	18	4	M12	4	M16
3"	80	46	13	13	18	14	22	18	4	M16	8	M16
4"	100	52	13	13	20	16	24	18	8	M16	8	M16
5"	125	56	13	16	20	16	24	20	8	M16	8	M20
6"	150	56	13	16	22	18	26	22	8	M16	8	M20
8"	200	60	16	16	24	20	26	22	8	M20	12	M20
10"	250	68	16	18	26	22	30	24	12	M20	12	M22
12"	300	78	16	18	28	22	32	24	12	M20	16	M22
14"	350	78	18	18	30	24	34	26	12	M22	16	M22
16"	400	102	18	19	30	24	36	28	16	M22	16	M24
18"	450	114	18	19	30	24	38	30	16	M22	20	M24
20"	500	127	18	19	32	24	40	30	20	M22	20	M24



SEMI-LUG TYPE

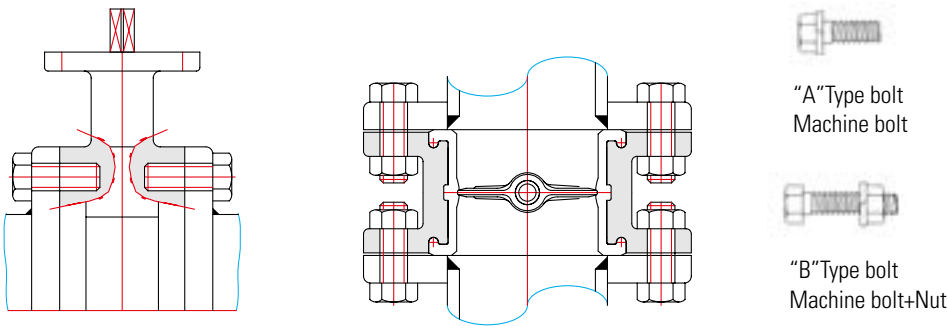
SIZE		FACE TO FACE	JIS 5K		JIS 10K		ASME 150LB	
inch	mm		Q'TY	BOLT	Q'TY	BOLT	Q'TY	BOLT
2"	50	43	4	M12	4	M16	4	5/8"
2.5"	65	46	4	M12	4	M16	4	5/8"
3"	80	46	4	M16	8	M16	4	5/8"
4"	100	52	8	M16	8	M16	8	5/8"
5"	125	56	8	M16	8	M20	8	3/4"
6"	150	56	8	M16	8	M20	8	3/4"
8"	200	60	8	M20	12	M20	8	3/4"
10"	250	68	12	M20	12	M22	12	7/8"
12"	300	78	12	M20	16	M22	12	7/8"
14"	350	78	12	M22	16	M22	12	1"
16"	400	102	16	M22	16	M24	16	1"
18"	450	114	16	M22	20	M24	16	1 1/8"
20"	500	127	20	M22	20	M24	20	1 1/8"
22"	550	154	20	M24	20	M30	20	1 1/4"
24"	600	154	20	M24	24	M30	20	1 1/4"
26"	650	165	24	M24	24	M30	24	1 1/4"
28"	700	165	24	M24	24	M30	28	1 1/4"
30"	750	190	24	M30	24	M30	28	1 1/4"
32"	800	190	24	M30	28	M30	28	1 1/2"
34"	850	210	24	M30	28	M30	32	1 1/2"
36"	900	203	24	M30	28	M30	32	1 1/2"
40"	1000	216	28	M30	28	M36	36	1 1/2"

Bolting Dimensions (Lug Type)



SIZE		FACE TO FACE	FLANGE(T) 5K		FLANGE(T) 10K		JIS 5K		JIS 10K	
inch	mm		CAST IRON	CAST STEEL	CAST IRON	CAST STEEL	Q'TY	BOLT SIZE	Q'TY	BOLT SIZE
2"	50	43	16	14	20	16	4	M12	4	M16
2.5"	65	46	18	14	22	18	4	M12	4	M16
3"	80	46	18	14	22	18	4	M16	8	M16
4"	100	52	20	16	24	18	8	M16	8	M16
5"	125	56	20	16	24	20	8	M16	8	M20
6"	150	56	22	18	26	22	8	M16	8	M20
8"	200	60	24	20	26	22	8	M20	12	M20
10"	250	68	26	22	30	24	12	M20	12	M22
12"	300	78	28	22	32	24	12	M20	16	M22
14"	350	78	30	24	34	26	12	M22	16	M22
16"	400	102	30	24	36	28	16	M22	16	M24
18"	450	114	30	24	38	30	16	M22	20	M24
20"	500	127	32	24	40	30	20	M22	20	M24
22"	550	154	32	26	42	32	20	M24	20	M30
24"	600	154	32	26	44	32	20	M24	24	M30
26"	650	165	34	26	46	34	24	M24	24	M30
28"	700	165	34	26	48	34	24	M24	24	M30
30"	750	190	36	28	50	36	24	M30	24	M30
32"	800	190	36	28	52	36	24	M30	28	M30
36"	900	203	38	30	54	38	24	M30	28	M30
40"	1000	216	40	32	58	40	28	M30	28	M36

Bolting Dimensions (Flange Type)



SIZE		FACE TO FACE	FLANGE(T) 5K		FLANGE(T) 10K		JIS 5K		JIS 10K	
inch	mm		CAST IRON	CAST STEEL	CAST IRON	CAST STEEL	Q'TY	BOLT SIZE	Q'TY	BOLT SIZE
2"	50	40	-	-	-	-	4	M12	4	M16
2.5"	65	40	-	-	-	-	4	M12	4	M16
3"	80	60	18	14	22	18	4	M16	8	M16
4"	100	60	20	16	24	18	8	M16	8	M16
5"	125	100	20	16	24	20	8	M16	8	M20
6"	150	100	22	18	26	22	8	M16	8	M20
8"	200	100	24	20	26	22	8	M20	12	M20
10"	250	110	26	22	30	24	12	M20	12	M22
12"	300	110	28	22	32	24	12	M20	16	M22
14"	350	120	30	24	34	26	12	M22	16	M22
16"	400	130	30	24	36	28	16	M22	16	M24
18"	450	150	30	24	38	30	16	M22	20	M24
20"	500	160	32	24	40	30	20	M22	20	M24
22"	550	170	32	26	42	32	20	M24	20	M30
24"	600	170	32	26	44	32	20	M24	24	M30
26"	650	170	34	26	46	34	24	M24	24	M30
28"	700	180	34	26	48	34	24	M24	24	M30
30"	750	190	36	28	50	36	24	M30	24	M30
32"	800	200	36	28	52	36	24	M30	28	M30
34"	850	210	38	28	52	36	24	M30	28	M30
36"	900	230	38	30	54	38	24	M30	28	M30
40"	1000	250	40	32	58	40	28	M30	28	M36

OPERATOR POSITION

GEAR TYPE		
	G1	G3
LEVER TYPE		
	T1	T3
LEVER TYPE		
	L1	L3

