CL Series ; Center Lined Butterfly valves

CLW Series Center Lined Butterfly Valves(WAFER Type)

- **APPLICATION** : General use :water, sea water, air, hydrocarbons, acids etc.,
- **SIZE** : DN40 to DN4000 (1.5 inch to 160 inch)
- **RATING** : ANSI 150LB, PN10/16, JIS5K/10K/16K etc.
- **CONNECTION FLANGE** : See next 7 page
- **WORKING PRESSURE** : Up to 16 bar
- **MATERIAL** : See next 8 page
- **OPERATOR** : Lever,gear,pneumatic,HYD actuator,electric motor ect.

CLL Series Center Lined Butterfly Valves(LUG Type)

- **APPLICATION** : General use :water, sea water, air, hydrocarbons, acids etc.,
- **SIZE** : DN40 to DN4000 (1.5 inch to 160 inch)
- **RATING** : ANSI 150LB, PN10/16, JIS5K/10K/16K etc.
- **CONNECTION FLANGE** : See next 7 page
- **WORKING PRESSURE** : Up to 16 bar
- **MATERIAL** : See next 8 page
- **OPERATOR** : Lever,gear,pneumatic,HYD actuator,electric motor ect.

CLF Series Center Lined Butterfly Valves(FLANGE Type)

- **APPLICATION** : General use :water, sea water, air, hydrocarbons, acids etc.,
- **SIZE** : DN40 to DN4000 (1.5 inch to 160 inch)
- **RATING** : ANSI 150LB, PN10/16, JIS5K/10K/16K etc.
- **CONNECTION FLANGE** : See next 7 page
- **WORKING PRESSURE** : Up to 16 bar
- **MATERIAL** : See next 8 page
- **OPERATOR** : Lever,gear,pneumatic,HYD actuator,electric motor ect.

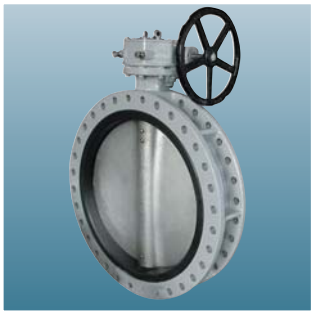
Hydraulic Operator

Pneumatic Operator

Electric Motor Operator

Control valve(Teflon seat)

Center Lined Butterfly Valve



100% Bi-directional tight shut off at full rated pressure.

Figure Number Abbreviation

- **CLW Series** Center Lined Butterfly Valves - WAFER Type
- **CLS Series** Center Lined Butterfly Valves - SEMI-LUG Type
- **CLL Series** Center Lined Butterfly Valves - LUG Type
- **CLF Series** Center Lined Butterfly Valves - FLANGE Type

Standard Compliance

Valve Center Lined Butterfly valves conform to ISO 5752,
MSS SP67, JIS B 2032, JIS B 2064, API 609, BS5155, in general.

Production Range

- SIZE : DN 50 to DN 4000 (2 inch ~ 160 inch)
- Working Pressure : Up to 16bar
- Working Temperature : -20℃ ~ +160℃

Connection Flange

- ANSI B16.1 CL. 125LB & B16.5 CL. 150LB / MSS SP44 CL. 150LB /
- AS2129 Table D & E / BS4504 PN6, PN10 & PN16 /
- BS10 Table D & E / DIN2501 PN6, PN10 & PN16 /
- ISO 2531 PN6, PN10 & PN16 / KS/JIS 5K, 10K & 16K /
- SABS 1123 Table 1000/3 & Table 1600/3

Face to Face Dimensions

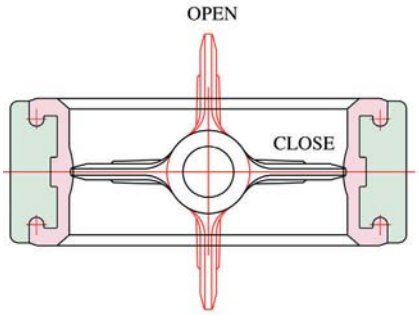
- Conform to BS5155, ISO 5752, MSS SP67, JIS B2032, and AP1609.

Application

- *Air conditioning*
- *Air line*
- *Water works*
- *Ballast and bilge system*
- *Chemical processing*
- *Power plants*
- *Desulination plants*
- *Desulphurisation plants*
- *Shipbuilding industry*
- *Drilling rigs*
- *Dry powder*
- *Food and beverage*
- *Gas plant*
- *Heating line*
- *Mining industry*
- *Paper industry*
- *Sand handling*
- *Sugar industry*
- *Thermo technical water treatmen*
- *Waste water*
- *Water and others*

Center Lined Butterfly Valve

Design Features



General Features

- 100% bi-directional tight shut off.
- Installation without restriction in direction of flow.
- Reduced weight and overall dimensions.
- Low pressure loss and reduced energy costs.
- High Kv/Cv values.
- Easy to clean and disinfect for portable water systems etc.
- Self cleaning(No residue will be trapped).
- Good resistance to corrosion.
- High reliability

No gasket required

O-rings or gaskets are not required when installation.

Low torque

Valve discs are spherical machined and polished. Every parts of sealing surface is spherical.
These fit together with a smooth and low torque when close and open. The raised center seat has the cosine-curve structure.

Perfect Sealing

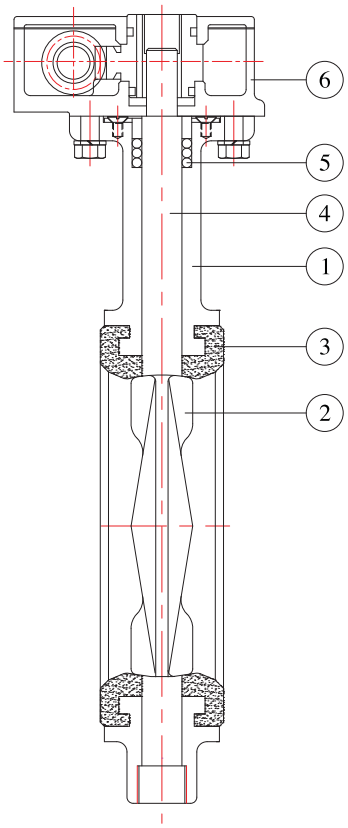
Seat and disc is sealed as flat surface matched both top and bottom shaft point.
This unique sealing gives perfect tight at low torque and smooth touch. And gasket with 3 molded O-rings gives self-adjusting and positive sealing in both directions.

Top Flange

Top Flange dimensions are in accordance with ISO5211 and it matches with any type of actuators.

Testing

Valve butterfly valves are confirm to API 598 and BS5155. Body pressure test to be done 150% and shell to be 110% of maximum working pressure.



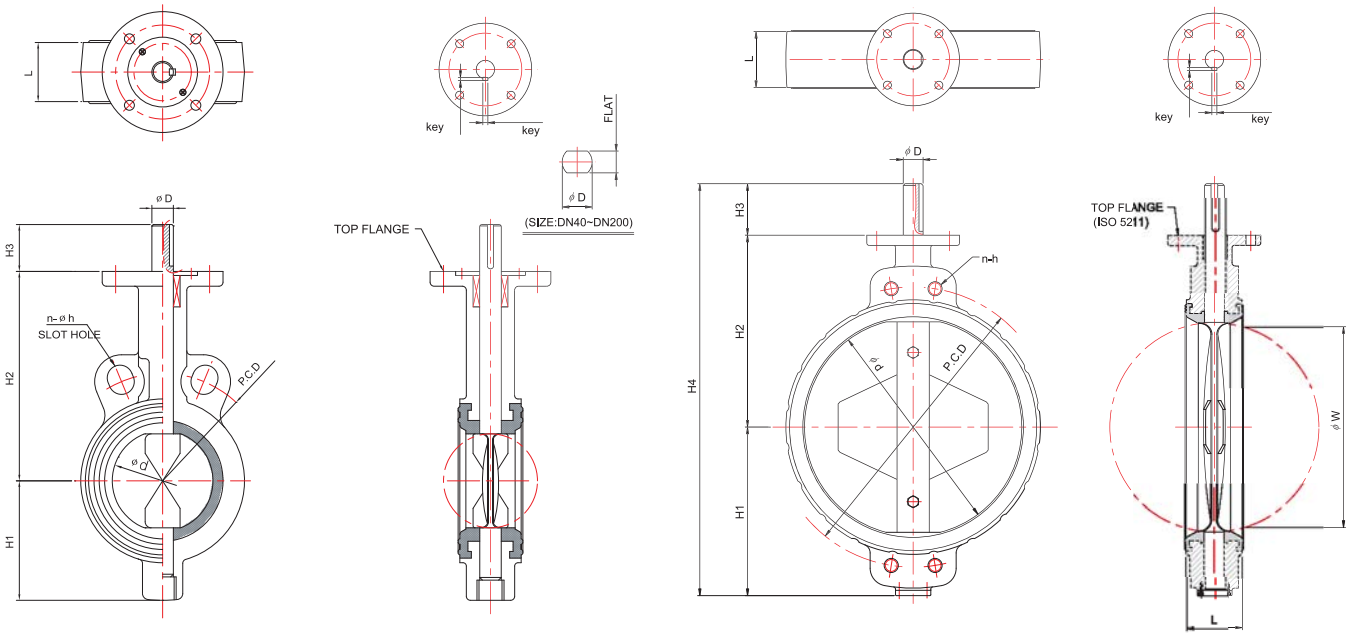
Operations

The following operation of the valves are possible, the choice is depending upon the valve location and the type of work and service for which the valve is used.

- Bare stem type valve only
- valve with 10position lever operated
- valve with gear operated
- valve with electric actuator
- valve with pneumatic actuator
- valve with hydraulic actuator

P.NO.	PART NAME	MATERIAL
1	BODY	CAST IRON / DUCTILE IRON CARBON STEEL / SS304 / SS316 ALUMINUM / ALUMINUM BRONZE
2	DISC	DUCTILE IRON(+NICKEL PLATED) CARBON STEEL(+NICKEL PLATED) SS304 / SS316 / ALUMINUM BRONZE
3	SEAT	RUBBER (NBR / SILICON / EPDM / VITON / NEOPRENE)
4	STEM	STAINLESS STEEL (SS410 / SS304 / SS316 / SS630 / MONEL)
5	PACKING	NBR, RUBBER
6	ACTUATOR	LEVER / GEAR, MOTOR PNEUMATIC ETC

CLW Series Center Lined Butterfly Valve / Wafer Type Dimension



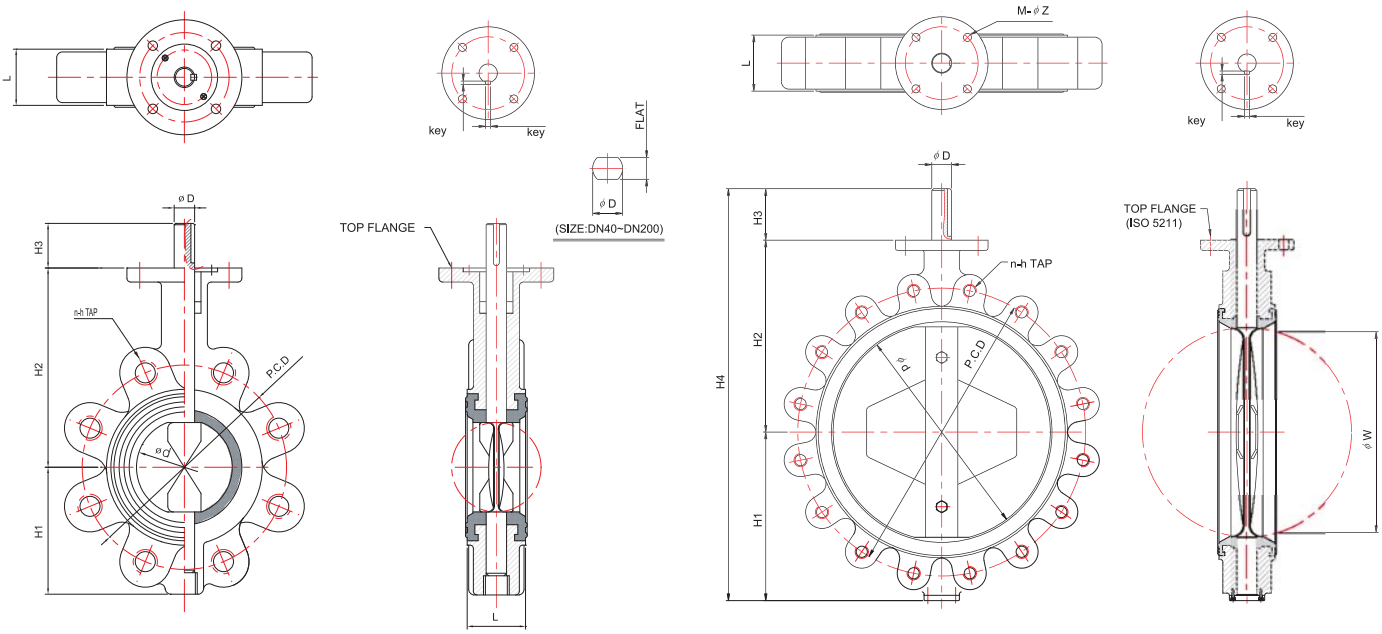
VALVE DIMENSIONS

unit : mm

SIZE		⌀d	L	H1	H2	H3	STEM		TOP FLANGE (ISO5211)	JIS 10K			ANSI 150LB			BS 4504 PN 10			WEIGHT (APPROX.) (kg)
inch	mm						D	key		⌀C	n	h	⌀C	n	h	⌀C	n	h	
1.5"	40	40	40	54	120	33	14	FL'10	F 07	105	4	19	98.5	4	16	110	4	19	2.5
2"	50	52	43	68	130	33	14	FL'10	F 07	120	4	19	120.5	4	19	125	4	19	3.0
2.5"	65	64	46	77	138	33	14	FL'10	F 07	140	4	19	139.5	4	19	145	4	19	4.0
3"	80	76	46	84	157	33	16	FL'12	F 07	150	8	19	152.5	4	19	160	8	19	4.5
4"	100	101	52	105	170	33	16	FL'12	F 07	175	8	19	190.5	8	19	180	8	19	5.0
5"	125	126	56	120	186	33	19	FL'15	F 07	210	8	23	216.0	8	22	210	8	19	6.5
6"	150	149	56	135	200	33	19	FL'15	F 07	240	8	23	241.5	8	22	240	8	23	8.0
8"	200	196	60	183	237	33	22	FL'18	F 07	290	12	23	298.5	8	22	295	8	23	12.5
10"	250	244	68	223	286	50	22	8 X 7	F 10	355	12	25	362.0	12	25	350	12	23	19.5
12"	300	294	78	255	314	50	28	8 X 7	F 10	400	16	25	432.0	12	25	400	12	23	30.5
14"	350	333	78	280	340	50	28	8 X 7	F 10	445	16	25	476.0	12	29	460	16	23	55.0
16"	400	384	102	310	378	60	38	12 X 8	F14	510	16	27	539.5	16	29	515	16	28	70.0
18"	450	435	114	350	400	60	38	12 X 8	F14	565	20	27	578.0	16	32	565	20	28	95.0
20"	500	485	127	380	440	80	45	14 X 9	F 16	620	20	27	635.0	20	32	620	20	28	128.0
22"	550	534	142	396	485	80	55	14 X 9	F 16	680	20	M30	392.2	20	1 1/4	-	-	-	180.0
24"	600	573	154	448	510	80	55	14 X 9	F 16	730	24	M30	749.5	20	1 1/4	725	20	M27	222.0
26"	650	624	165	463	530	80	55	14 X 9	F 16	780	24	M30	806.5	24	1 1/4	-	-	-	265.0
28"	700	674	165	500	580	110	65	18X11	F16	840	24	M30	863.5	28	1 1/4	840	24	M27	295.0
30"	750	716	190	520	590	110	65	18X11	F 25	900	24	M30	914.5	28	1 1/4	-	-	-	350.0
32"	800	767	190	565	630	110	75	20X12	F 25	950	28	M30	978.0	28	1 1/2	950	24	M30	430.0
36"	900	860	203	670	700	150	90	22X14	F 25	1050	28	M30	1086.0	32	1 1/2	1050	28	M30	600.0
40"	1000	970	216	725	750	150	90	22X14	F 25	1160	28	M36	1200.0	36	1 1/2	1160	28	M33	720.0
44"	1100	1010	216	780	840	150	90	22X14	F 25	1270	28	M36	1314.5	40	1 1/2	-	-	-	805.0
48"	1200	1173	254	860	900	150	90	22X14	F 25	1380	32	M36	1422.4	44	1 1/2	1380	32	M36	860.0
52	1300	1272	280	920	970	180	120	32X18	F 30	-	-	-	1537	44	1 1/2	-	-	-	940.0
56	1400	1371	280	970	1010	180	120	32X18	F 30	-	-	-	-	-	-	1590	36	M39	1100.0
64	1600	1572	360	1120	1160	180	140	32X18	F 35	-	-	-	-	-	-	1820	40	M45	1450.0
72	1800	1740	360	1210	1270	200	170	40X22	F 40	-	-	-	2095.5	60	1 1/2	2020	44	M45	1850.0

Specification and design are subject to change without notice

CLL Series Center Lined Butterfly Valve / Lug Type Dimension



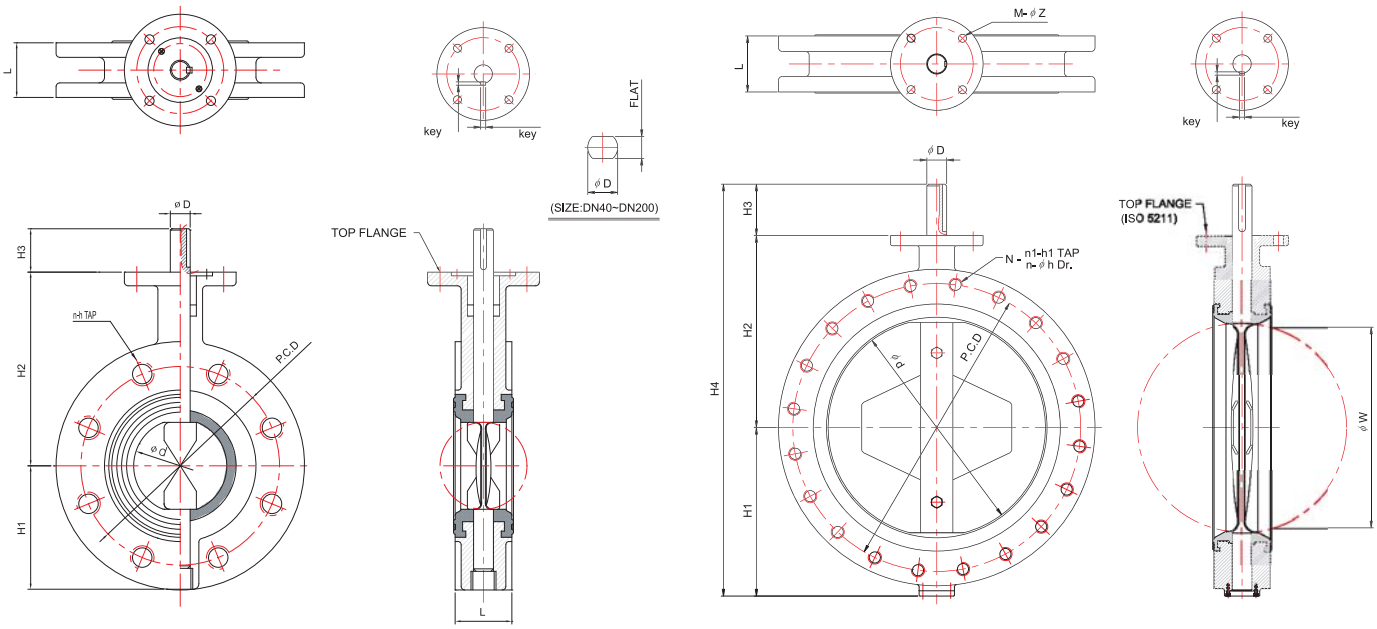
VALVE DIMENSIONS

unit : mm

SIZE		ød	L	H1	H2	H3	STEM		TOP FLANGE (ISO5211)	JIS 10K			ANSI 150LB			BS 4504 PN10			WEIGHT (APPROX.) (kg)
inch	mm						D	key		øC	n	h	øC	n	h	øC	n	h	
1.5"	40	40	40	54	120	33	14	FL'10	F 07	105	4	M16	98.5	4	5/8	110	4	M16	3.0
2"	50	52	43	68	130	33	14	FL'10	F 07	120	4	M16	120.5	4	5/8	125	4	M16	3.5
2.5"	65	64	46	77	138	33	14	FL'10	F 07	140	4	M16	139.5	4	5/8	145	4	M16	4.7
3"	80	76	46	84	157	33	16	FL'12	F 07	150	8	M16	152.5	4	5/8	160	8	M16	5.5
4"	100	101	52	105	170	33	16	FL'12	F 07	175	8	M16	190.5	8	5/8	180	8	M16	7.5
5"	125	126	56	120	186	33	19	FL'15	F 07	210	8	M20	216.0	8	3/4	210	8	M16	9.5
6"	150	149	56	135	200	33	19	FL'15	F 07	240	8	M20	241.5	8	3/4	240	8	M20	12
8"	200	196	60	183	237	33	22	FL'18	F 07	290	12	M20	298.5	8	3/4	295	8	M20	16
10"	250	244	68	223	286	50	22	8 X 7	F 10	355	12	M22	362.0	12	7/8	350	12	M20	27
12"	300	294	78	255	314	50	28	8 X 7	F 10	400	16	M22	432.0	12	7/8	400	12	M20	44
14"	350	333	78	280	340	50	28	8 X 7	F 10	445	16	M22	476.0	12	1	460	16	M20	67
16"	400	384	102	310	378	60	38	12 X 8	F14	510	16	M24	539.5	16	1	515	16	M24	100
18"	450	435	114	350	400	60	38	12 X 8	F14	565	20	M24	578.0	16	1 1/8	565	20	M24	130
20"	500	485	127	380	440	80	45	14 X 9	F 16	620	20	M24	635.0	20	1 1/8	620	20	M24	162
22"	550	534	142	396	485	80	55	14 X 9	F 16	680	20	M30	392.2	20	1 1/4	-	-	-	185
24"	600	573	154	448	510	80	55	14 X 9	F 16	730	24	M30	749.5	20	1 1/4	725	20	M27	220
26"	650	624	165	463	530	80	55	14 X 9	F 16	780	24	M30	806.5	24	1 1/4	-	-	-	300
28"	700	674	165	500	580	110	65	18X11	F16	840	24	M30	863.5	28	1 1/4	840	24	M27	345
30"	750	716	190	520	590	110	65	18X11	F 25	900	24	M30	914.5	28	1 1/4	-	-	-	390
32"	800	767	190	565	630	110	75	20X12	F 25	950	28	M30	978.0	28	1 1/2	950	24	M30	480
36"	900	860	203	670	700	150	90	22X14	F 25	1050	28	M30	1086.0	32	1 1/2	1050	28	M30	630
40"	1000	970	216	725	750	150	90	22X14	F 25	1160	28	M36	1200.0	36	1 1/2	1160	28	M33	750
44"	1100	1010	216	780	840	150	90	22X14	F 25	1270	28	M36	1314.5	40	1 1/2	-	-	-	860
48"	1200	1173	254	860	900	150	90	22X14	F 25	1380	32	M36	1422.4	44	1 1/2	1380	32	M36	915
52	1300	1272	280	920	970	180	120	32X18	F 30	-	-	-	1537.0	44	1 1/2	-	-	-	1010
56	1400	1371	280	970	1010	180	120	32X18	F 30	-	-	-	-	-	-	1590	36	M39	1245
64	1600	1572	360	1120	1160	180	140	32X18	F 35	-	-	-	-	-	-	1820	40	M45	1550
72	1800	1740	360	1210	1270	200	170	40X22	F 40	-	-	-	2095.5	60	1 1/2	2020	44	M45	2100

Specification and design are subject to change without notice

CLF Series Center Lined Butterfly Valve / Flange Type Dimension



VALVE DIMENSIONS

unit : mm

SIZE		⍁d	L		H1	H2	H3	STEM		TOP FLANGE (ISO5211)	JIS 10K			ANSI 150LB			BS 4504 PN 10			WEIGHT (APPROX.) (kg)
inch	mm		Short	Long				D	key		⍁C	n	h	⍁C	n	h	⍁C	n	h	
1.5"	40	40	40	40	70	120	33	14	FL'10	F 07	105	4	M16	98.5	4	½	110	4	M16	4.0
2"	50	52	43	40	68	130	33	14	FL'10	F 07	120	4	M16	120.5	4	½	125	4	M16	5.5
2.5"	65	64	46	40	90	138	33	14	FL'10	F 07	140	4	M16	139.5	4	½	145	4	M16	8.0
3"	80	76	46	60	98	157	33	16	FL'12	F 07	150	8	M16	152.5	4	½	160	8	M16	10
4"	100	101	52	60	110	170	33	16	FL'12	F 07	175	8	M16	190.5	8	½	180	8	M16	13
5"	125	126	56	100	130	186	33	19	FL'15	F 07	210	8	M20	216.0	8	½	210	8	M16	16
6"	150	149	56	100	145	200	33	19	FL'15	F 07	240	8	M20	241.5	8	½	240	8	M20	18
8"	200	196	60	100	183	237	33	22	FL'18	F 07	290	12	M20	298.5	8	½	295	8	M20	31
10"	250	244	68	110	223	286	50	22	8 X 7	F 10	355	12	M22	362.0	12	½	350	12	M20	45
12"	300	294	78	110	255	314	50	28	8 X 7	F 10	400	16	M22	432.0	12	½	400	12	M20	58
14"	350	333	78	120	280	340	50	28	8 X 7	F 10	445	16	M22	476.0	12	1	460	16	M20	65
16"	400	384	102	130	310	378	60	38	12 X 8	F14	510	16	M24	539.5	16	1	515	16	M24	94
18"	450	435	114	150	350	400	60	38	12 X 8	F14	565	20	M24	578.0	16	1½	565	20	M24	145
20"	500	485	127	160	380	440	80	45	14 X 9	F 16	620	20	M24	635.0	20	1½	620	20	M24	160
22"	550	534	142	170	396	485	80	55	14 X 9	F 16	680	20	M30	392.2	20	1½	-	-	-	185
24"	600	573	154	170	448	510	80	55	14 X 9	F 16	730	24	M30	749.5	20	1½	725	20	M27	280
26"	650	624	165	170	463	530	80	55	14 X 9	F 16	780	24	M30	806.5	24	1½	-	-	-	300
28"	700	674	165	180	500	580	110	65	18X11	F16	840	24	M30	863.5	28	1½	840	24	M27	345
30"	750	716	190	190	520	590	110	65	18X11	F 25	900	24	M30	914.5	28	1½	-	-	-	390
32"	800	767	190	200	565	630	110	75	20X12	F 25	950	28	M30	978.0	28	1½	950	24	M30	480
36"	900	860	203	230	670	700	150	90	22X14	F 25	1050	28	M30	1086.0	32	1½	1050	28	M30	630
40"	1000	970	216	250	725	750	150	90	22X14	F 25	1160	28	M36	1200.0	36	1½	1160	28	M33	750
44"	1100	1010	216	280	780	840	150	90	22X14	F 25	1270	28	M36	1314.5	40	1½	-	-	-	860
48"	1200	1173	254	280	860	900	150	90	22X14	F 25	1380	32	M36	1422.4	44	1½	1380	32	M36	915
52	1300	1272	280	280	920	970	180	120	32X18	F 30	-	-	-	1537.0	44	1½	-	-	-	1010
56	1400	1371	280	280	970	1010	180	120	32X18	F 30	-	-	-	-	-	-	1590	36	M39	1245
64	1600	1572	360	360	1120	1160	180	140	32X18	F 35	-	-	-	-	-	-	1820	40	M45	1550
72	1800	1740	360	400	1210	1270	200	170	40X22	F 40	-	-	-	2095.5	60	1½	2020	44	M45	2100

Specification and design are subject to change without notice

Torques Required to Operate Center Lined Butterfly Valves

TORQUE TABLE

unit : kg.m/Nm/in-lb

Size		Working Pressure (bar)											
		3 bar			5 bar			10 bar			16 bar		
mm	inch	kg-m	Nm	in-lb	kg-m	Nm	in-lb	kg-m	Nm	in-lb	kg-m	Nm	in-lb
50A	2	1.2	11.7	104.0	1.5	14.7	130.1	1.8	17.6	156.1	2.3	22.5	199.5
65A	2 1/2	1.5	14.7	130.1	1.8	18.3	162.6	2.5	24.5	216.8	2.7	26.4	234.1
80A	3	2.5	24.5	216.8	2.7	27.6	240.0	3.0	29.4	260.2	3.5	34.3	303.5
100A	4	3.5	34.3	303.5	4.3	42.8	379.4	5.0	49.0	433.6	5.0	49.0	433.6
125A	5	5.0	49.0	433.6	6.2	61.2	542.1	6.5	63.7	563.7	8.0	78.4	693.9
150A	6	8.0	78.4	693.9	10.0	98.0	867.3	12.0	117.6	1040	15	147	1300
200A	8	14.0	137.2	1214.3	16.0	156.8	1387.8	18.0	176.4	1561.2	24.0	235.2	2081.7
250A	10	23.0	225.4	1994.9	26	254.9	2256	29.0	284.2	2515.3	36.0	352.8	3122.5
300A	12	31.0	303.8	2688.8	34.0	333.2	2949.0	53.0	519.4	4597.0	72.0	705.6	6245.0
350A	14	45.0	441.0	3903.1	50.0	490.0	4336.8	63.0	617.4	5464.4	115.0	1127.0	9974.8
400A	16	61.0	597.8	5290.9	70.0	686.0	6071.6	80.0	784.0	6938.9	144.0	1411.2	12490.1
450A	18	81.0	793.8	7025.7	92.0	901.6	7979.8	117.0	1146.6	10148.2	190.0	1862.0	16480.1
500A	20	106.0	1038.8	9194.1	120.0	1176.0	10408.4	150.0	1470.0	13010.6	220.0	2156.0	19082.2
550A	22	130.0	1274.0	11275.8	162.5	1592.5	14094.8	181.0	1773.8	15699.4	295.0	2891.0	25587.5
600A	24	221.0	2165.8	19168.9	240.0	2352.0	20816.9	260.0	2548.0	22551.7	355.0	3479.0	30791.7
650A	26	182.0	1783.6	15786.2	245.0	2401.0	21250.6	288.0	2822.4	24980.3	345.6	3386.8	29976.4
700A	28	215.0	2107.0	18648.5	315.0	3087.0	27322.2	355.0	3479.0	30791.7	426.0	4174.8	36950.1
750A	30	255.0	2499.0	22118.0	342.0	3351.6	29664.1	390.0	3822.0	33827.5	468.0	4586.4	40593.0
800A	32	290.0	2842.0	25153.8	405.0	3969.0	35128.6	460.0	4508.0	39899.1	552.0	5409.6	47879.0
850A	34	325.0	3185.0	28189.6	495.0	4851.0	42934.9	538.0	5272.4	46664.6	645.6	6326.8	55997.6
900A	36	405.0	3969.0	35128.6	578.0	5664.4	50134.1	660.0	6468.0	57246.6	792.0	7761.6	68695.9
1000A	40	565.0	5537.0	49006.6	880.0	8624.0	76328.8	1050.0	10290.0	91074.2	1260.0	12348.0	109289.0
1200A	48	968	9486	83961	1210	11858	104952	1760	17248	152657	2110	21658	191689
1350A	54	1135	11123	98446	1400	13720	121432	2024	19835	175556	2211	21667	191776
1800A	72	1970	19306	170872	2260	22148	196026	2780	27244	241129	3813	37367	330729
3000A	120	10500	102900	910742	12367	121196	1072680	20850	204330	1808473	28630	280574	2483290
4000A	160	39800	390040	3452146	41500	406700	3599600	48850	478730	4237119	67300	659540	5837423

The operating speed of the actuator must be considered in order to avoid water hammer when the valve is closed in junction with Liquid.

The factors affect the torque required to operate Butterfly valves.

- Valve Diameter
- Shaft Diameter
- Bearing Friction Coefficient
- Type of Seat Material
- Shut off Pressure
- Velocity
- Shape of Disc
- System Head Characteristics
- Piping Arrangement

Actuator torques can be calculated using the following formulas.

$Ta = Tb + Ts + Th = 1.2Tb \pm Td$

$Ts = CsD^2$

$Tb = 4.17D^2dfP$

$Td = CtD^3P$

$Th = 3.06D^4$

$V = Cf\sqrt{p} = \frac{Q}{0.785D^2}$

Ta : The required actuator torque(lb-ft)
Ts : Seating or unseating torque(lb-ft)
Td : Dynamic torque(lb-ft)
Th : Hydrostatic 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

CL Series ; Basic Formulas for obtaining Cv-Value

Cv is in imperial units, the water flow in U.S. gallons per minute which passes through the valve giving a pressure drop of 1 PSI at a temperature of 68° F

In metric units the same coefficient is called Kv and correspond to the flow rate in m3/h passing through the valve giving a pressure drop of 1bar at a temperature of 20° C

The approximate corresponding formulas are :

$$Q = Cv \cdot \sqrt{\frac{\Delta P \cdot 62.4}{D}}$$

Where :

Q = valve flow rate in gpm (USGPM)

ΔP = pounds per square inch (psi) pressure drop through the valve

62.4 = conversion factor for fluids computed in relation to water

D = is pounds per cu.ft (pct) fluid density

$$Q = Cv \cdot \sqrt{\frac{\Delta P \cdot 1000}{D}}$$

Where :

Q = valve flow rate in m3/h

ΔP = pressure drop through the valve in bar

1000 = conversion factor for fluids computed in relation to water

D = kg/m3 fluid density

The relation between Cv and Kv, expressed in the above mentioned unit of measure is as follows :

Cv=1.16kv

Flow coefficient for Center Lined Butterfly Valves

VALVE SIZE		DISC OPENING															
		20°		30°		40°		50°		60°		70°		80°		90°	
inch	mm	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv
2"	50	10.0	11.6	15.1	17.5	23.5	27.3	38.4	44.6	62.1	72	100.0	116	154.3	179	184.5	214
2½"	65	16.9	19.6	25.5	29.6	39.7	46	64.7	75	105.2	122	169.8	197	260.3	302	312.1	362
3"	80	25.6	29.7	38.6	44.8	60.3	70	98.3	114	158.6	184	256.9	298	394.8	458	472.4	548
4"	100	39	45	60	70	94	109	153	178	249	289	402	466	616	715	738	856
5"	125	63	73	94	109	147	171	240	278	387	449	628	728	964	1118	1153	1338
6"	150	90	104	136	158	212	246	346	401	560	650	903	1048	1388	1610	1661	1927
8"	200	160	186	241	280	377	437	615	713	996	1155	1606	1863	2467	2862	2953	3426
10"	250	250	290	378	438	588	682	960	1114	1556	1805	2509	2911	3855	4472	4615	5353
12"	300	360	418	543	630	847	983	1383	1604	2241	2599	3614	4192	4689	5439	6645	7708
14"	350	491	569	740	858	1153	1338	1882	2183	3037	3523	4918	5705	7555	8764	9044	10491
16"	400	641	743	966	1121	1506	1747	2459	2852	3983	4620	6424	7452	9868	11447	11813	13703
18"	450	810	940	1222	1418	1906	2211	3111	3609	5041	5847	8130	9431	12490	14488	14951	17343
20"	500	1001	1161	1509	1751	2353	2730	3841	4456	6223	7219	10038	11644	15419	17886	18458	21411
22"	550	1211	1405	1827	2119	2847	3303	4647	5391	7501	8701	12146	14089	18657	21642	22334	25907
24"	600	1441	1672	2174	2522	3389	3931	5531	6416	8961	10395	14454	16767	22203	25756	26579	30832
26"	650	1691	1962	2552	2960	3978	4614	6491	7530	10476	12152	16964	19678	26058	30227	31193	36184
28"	700	1961	2275	2959	3432	4613	5351	7528	8733	12150	14094	19673	22821	30222	35057	36177	41965
30"	750	2252	2612	3397	3940	5295	6142	8642	10025	14002	16242	22584	26198	34693	40244	41530	48175
32"	800	2562	2972	3865	4483	6025	6989	9833	11406	15869	18408	25696	29807	39472	45788	47252	54812
34"	850	2892	3355	4363	5061	6802	7890	11100	12876	17915	20781	29009	33650	44561	51691	53343	61878
36"	900	3242	3761	4891	5674	7625	8845	9859	11436	20163	23389	32522	37725	49958	57951	59803	69371
38"	950	3613	4191	5450	6322	8496	9855	13866	16084	22378	25958	36235	42033	55663	64569	66632	77293
40"	1000	4003	4643	6039	7005	9414	10920	15364	17822	24796	28763	40150	46574	61676	71544	73831	85644
42"	1050	4413	5119	6658	7723	10497	12176	16939	19649	27337	31711	44266	51348	67997	78877	81398	94422
44"	1100	4843	5618	7307	8476	11391	13213	18591	21565	30003	34803	48582	56355	74628	86568	89335	103629
46"	1150	5294	6141	7986	9264	12449	14441	20319	23570	32792	38039	53098	61594	81566	94617	97641	113264
48"	1200	5761	6683	8696	10087	13556	15725	22124	25664	35706	41419	57816	67067	88814	103024	106316	123327
54"	1350	6006	6967	9061	10511	14126	16386	23055	26744	37208	43162	60250	69890	92552	107360	110792	128519
72"	1800	12540	14546	18918	21945	29491	34210	48133	55834	77682	90111	125786	145991	193224	214140	226106	262283
160"	4000	62770	72813	94695	109846	147620	171240	240929	279478	388834	451047	629617	730356	967177	1121926	1157784	1343030

Installation Instructions

Storage of Valves

Store the valve in dry, dark and cool conditions, preferably indoors with the actual valve temperature higher than the dew point.
If outdoor storage in unavoidable, support the valves off the ground and protect the valves with a watertight cover.
Do not remove the valve packaging or end port protection, until necessary for inspection or installation.
Store the valve in the slightly open position to avoid deformation of the rubberlining.

Installation Instructions

General

Before shipment, the seat surface is lubricated with silicone grease. If it is considered not necessary for special usage, it can be removed with solvent. In case valves are for chlorine, oxygen hydrogen, valves should be cleaned and degreased perfectly.
Valves can be installed in the pipeline in any position.
Before installation of valves, the pipeline must be cleaned from dirt and welding residues. Otherwise seat may be damaged.
Pipes must be free of tension.
Wafer and lug type butterfly valves can be installed directly in between flanges without any gaskets.

Installation in line related to wafer butterfly valve (on the existing pipeline)

Verify the distance between two flanges to be equal to face to face valve dimension.
In order to facilitate installation of the valve, allow a sufficient room with adequate tools in between two flanges.
Insert the lower part of flanges at least two flange-bolts.
Close valve disc partially so that disc edge is at least 10mm within the body.
Insert valve in between two flanges. Valve will be held by the two flange-bolts previously fitted in the lower part of flanges.
Insert the flange-bolts through centering lugs of valve.
Insert the remaining flange-bolts aligning the valve with the flanges and tightening flange-bolts manually.
Maintain the valve aligned, remove gradually flange spreaders and tighten bolts partially.
Control open and close operation of valve to be easy and smooth.
Open the valve completely and cross tighten the bolts to adequate torque.

Installation of lug type butterfly valves has the same procedure with wafer type except using cap screws instead of bolts and nuts.

Installation in line related to wafer butterfly valve (on the new pipeline)

Shut partially valve disc until disc profile is at least 10mm within the body.
Align the two flanges with the valve body.
Span the body with some flange-bolts and tighten the bolts partially. Finish tightening by uniform cross bolting.
Use the flange-valve-flange unit for pipe centering.
Tack-weld the flanges to the pipe.
Remove the bolting and the valve from the flanges. Just perform tack-welding only when the valve is inserted, as high heat temperature can damage valve seat.
Weld flanges to the pipe and wait until completely cooled down.
Install the valve by applying the same instruction procedure as the installation instruction on the existing pipeline.