



Valve Type

- WAFER - TW Class Double & Triple Offset metal seated butterfly valves
- LUG - TL Class Double & Triple Offset metal seated butterfly valves
- FLANGE - TF Class Double & Triple Offset metal seated butterfly valves

Standard Compliance

- Conform to API 609, EN593 and MSS SP 67
- Fire Safe requirement meets BS 6755 part 2 / API6FA and API Std 607 4th edition.

Production Range

- Size : 50mm(2inch) ~ 3000mm (120 inch)
- Working Pressure : Maximum 2220psi (156 bar)
 - upto 156 bar for DN 80 ~ DN 600
 - upto 114 bar for DN 650 ~ DN 1000
 - upto 22 bar for DN 1200 ~ DN 2000
- Working Temperature : -196° C ~ +700° C

Connection Flange

- EN1092 PN10, PN16, PN25, PN40
- ANSI B16.5, 16.47 CL. 150LB, 300LB, 600LB, 900LB / MSS SP44 CL. 150LB, 300LB, 600LB, 900LB
- ISO 7005 PN10, PN16, PN25, PN40 / KS B 1511 / JIS B 2210 10K, 16K, 20K, 30K, 40K

Face to Face Dimensions

- Conform to API609, EN 558, ISO 5752 and ANSI B 16.34

Application

- Nuclear Power Plants
- Petrochemical Plants
- Petroleum Refinery
- Fossil Power Plants
- Desalination plants
- Food and beverage
- Paper industry
- Chemical processing
- Fire Safe line
- Exhaust Gas line & Steam line
- Cryogenic Services
- Ballast and bilge system
- Drinking water
- HAVC
- Thermo technical water treatment
- Mining industry



Standard Specification

Triple offset metal seated butterfly valves are widely used in plants and high pressure and high temperature piping system. The metal seat shall be consisted of laminated seat or solid seat.

Design : API 609, EN 593, ANSI B16.34

Pressure Class : Class 150, 300, 600, 900

Body Styles : Wafer, Lug, Double Flange, Butt Weld

Material

- Ductile Iron / Cast Steel / Stainless Steel
- Al-Bronze / Duplex / Monel / Inconel / Alloy Steel
- Other material on request

Pressure Test

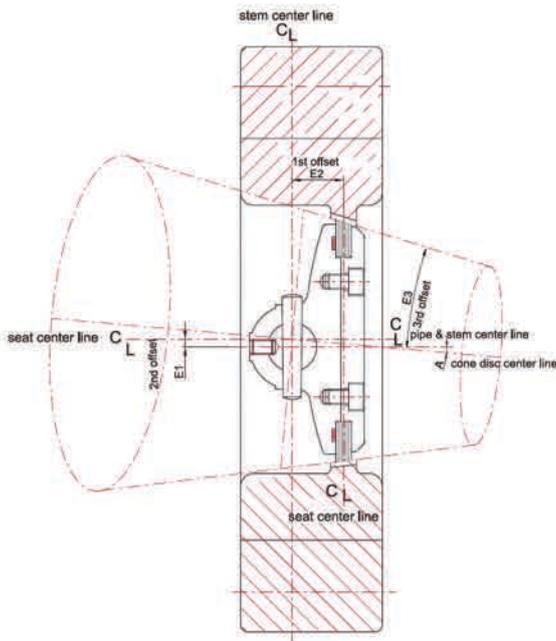
- Shell test, Seat test : API 598
- Seat leakage rate : API 598, ISO 5208 Rate A
- ANSI B16.104 (ANSI/FCI 70.2) Class VI

Fire safe

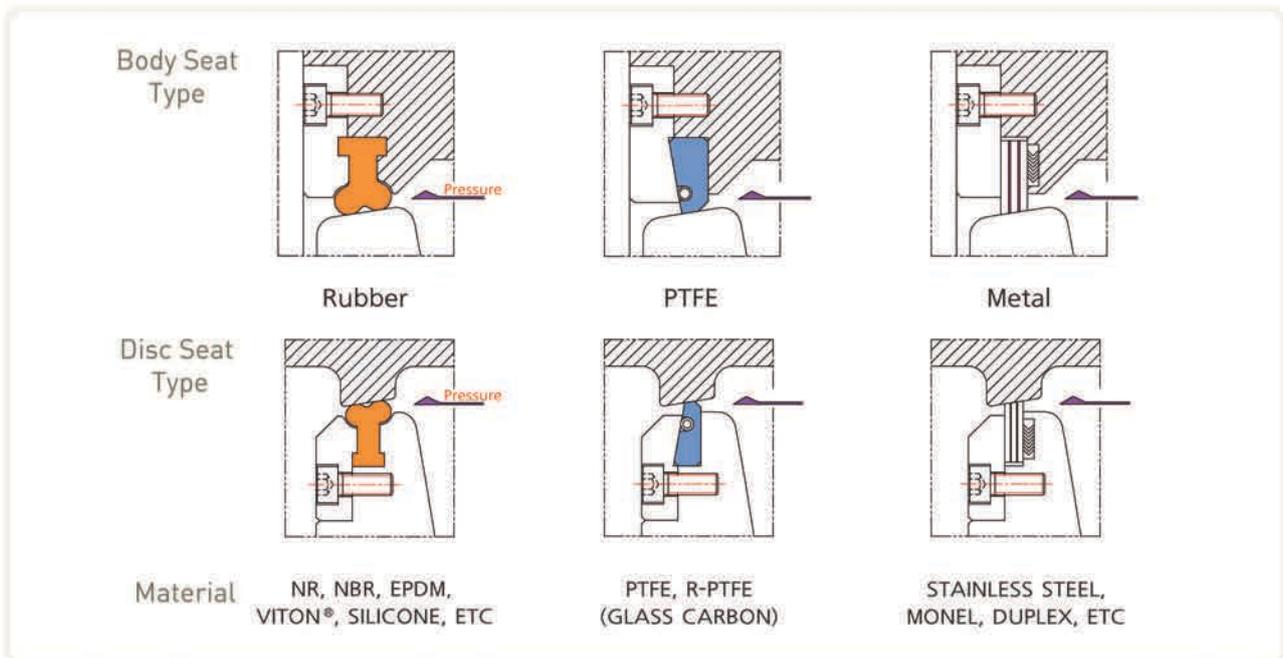
- BS 6755 Part 2
- API 6FA and API 607

Actuator

- Manual operation
- Hydraulic operation (driven by oil cylinder or oil motor)
- Pneumatic operation (driven by pneumatic cylinder)
- Electric motor operation



Design Features





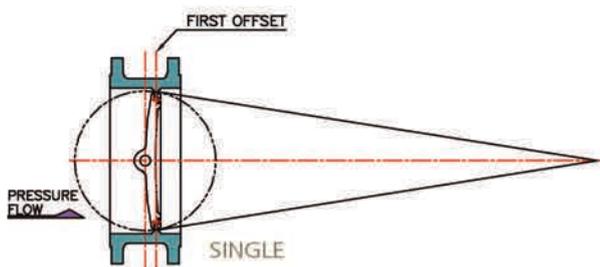
The New Concert For Metal Seated Valve

This product is of heavy load designed for high pressure flow application.

Excellent durability of seats area and low operating torque by non-rubbing characteristic with triple offset construction.

Achieved bubble tight service by the action of resilient metal seal and torque seating.

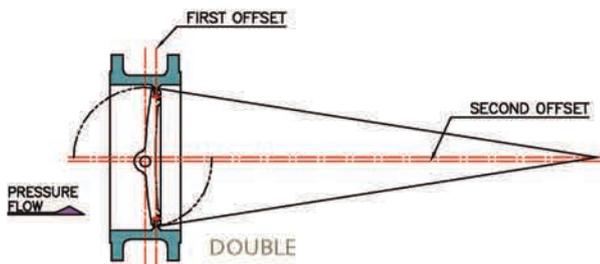
The seat rings both of body and disc are solid and real metal, can't be finished away as lamellar seat.



SINGLE OFFSET

The centre of rotation is moved back from the centreline of the valve disc.

The seat and seal are designed conically and on centre. This design relies on a frictional, interference seal and so is applicable only to soft seated valves.

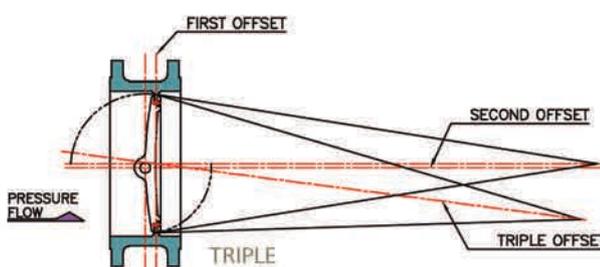


DOUBLE OFFSET

The centre of rotation is moved from the centerline of the valve body.

The seat and seal design remains conical and on centre. This design again relies on a frictional, interference seal, but the length of rotation over which this friction occurs is reduced, allowing a larger range of process resistant seat materials to be used.

However these materials must be relatively soft or highly elastic to prevent "jamming".

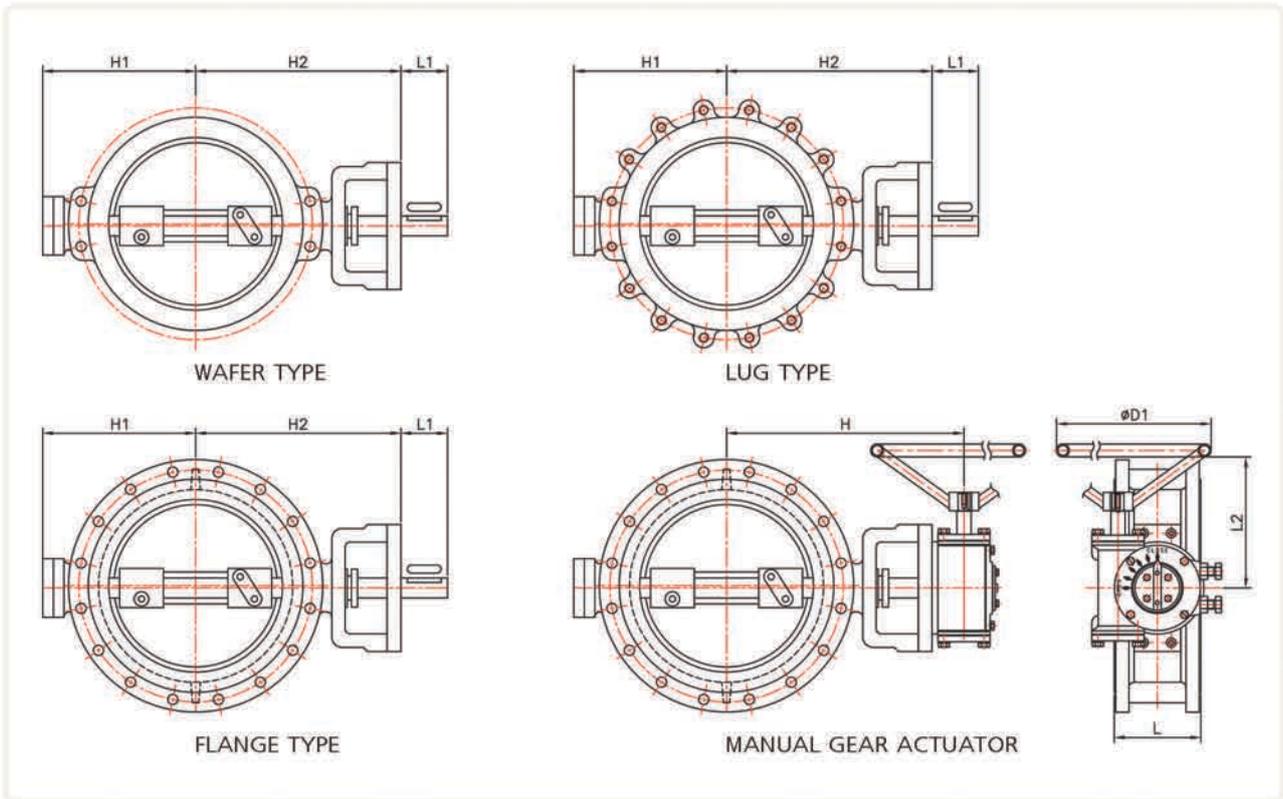


TRIPLE OFFSET

The centreline of the cone is rotated away from the valve centreline resulting in an ellipsoidal profile and providing the third offset. With this geometry, seat seal interference is completely eliminated ensuring long sealing life. The result is a torque seated, process pressure aided FRICTIONLESS seal.

The geometry allows the body seat to be used as the closed limit stop, aiding operator adjustment.

The Triple Offset design is ideally suited to metal seated valves providing bubble - tight performance on high temperature, high pressure and firesafe applications.



Dimensions

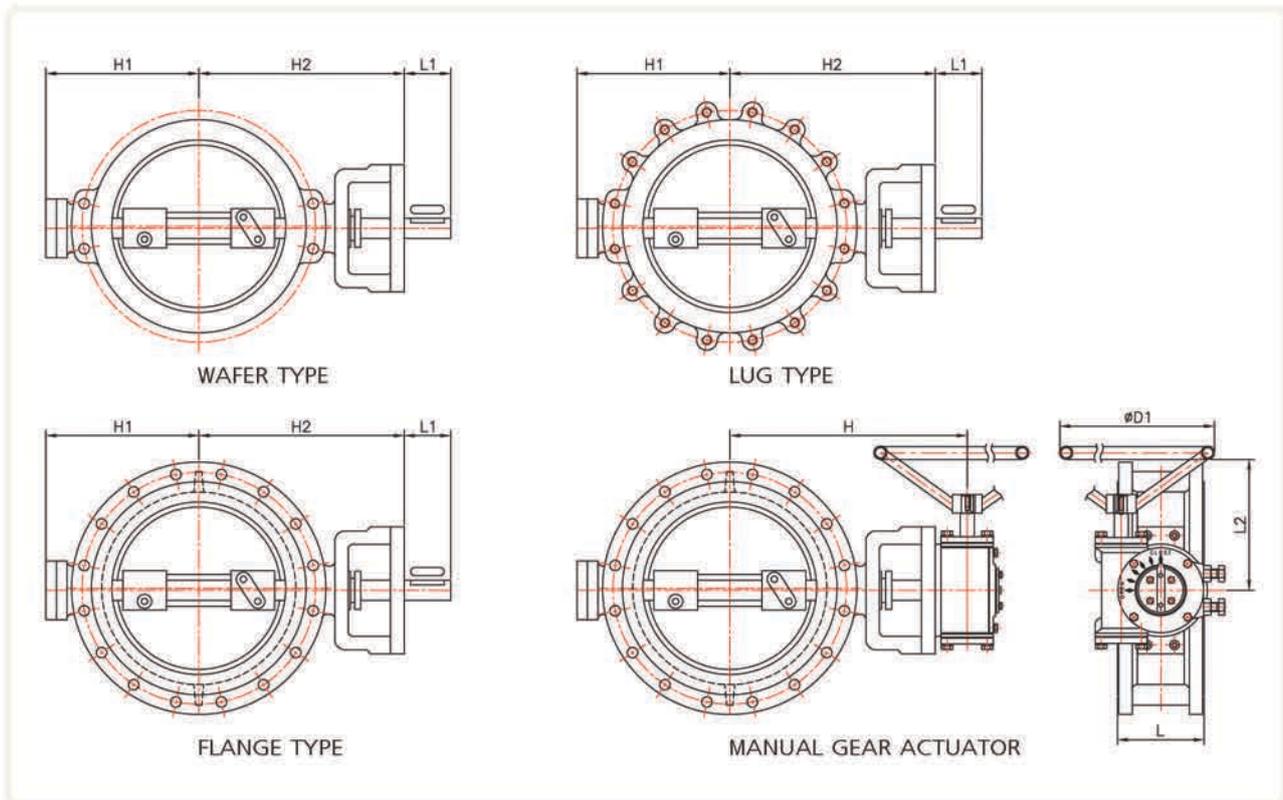
unit : mm

SIZE		H1 APPROX.	H2 APPROX.	H APPROX.	L1	L2	$\phi D1$	L (F To F)			WEIGHT : Kg (APPROX.)		
mm	inch							WAFFER	LUG	FLANGE	WAFFER	LUG	FLANGE
50	2	105	145	185	40	144	200	43	43	106	-	-	-
65	2 1/2	120	160	200	40	144	200	46	46	112	-	-	-
80	3	125	165	205	40	144	200	48	48	114	-	-	-
100	4	150	200	240	40	144	200	54	54	127	-	-	-
150	6	180	245	290	40	177	250	57	57	140	20	22	48
200	8	195	260	305	45	177	250	64	64	152	45	47	89
250	10	225	285	340	45	228	300	71	71	165	57	61	112
300	12	265	335	390	55	257	400	81	81	178	85	91	161
350	14	290	365	420	65	257	400	92	92	190	133	142	228
400	16	340	435	500	70	314	500	102	102	216	186	199	303
450	18	360	450	515	70	314	500	114	114	220	213	229	364
500	20	395	500	565	80	348	560	127	127	229	334	364	499
600	24	465	570	645	90	413	630	154	154	267	455	492	699
700	28	570	685	760	100	413	630	165	165	292	718	777	860
750	30	600	695	770	110	413	630	165	165	318	864	934	1085
800	32	630	750	830	120	443	710	190	190	318	1090	1119	1241
900	36	690	820	900	120	443	710	200	200	330	1418	1553	1716
1000	40	720	835	945	140	552	800	216	216	410	1743	1943	2208
1050	42	750	860	970	140	552	800	251	251	410	2108	2343	2488
1200	48	845	1020	1135	160	602	900	276	276	470	3004	3284	3440

* FLANGE RATING : ANSI B 16.5 / ASME B16.47 SERIES "A"

FACE TO FACE DIMENSION : ISO 5752 / API 609 / EN558 / MAKER'S STANDARD / CUSTOMER'S REQUESTS

VALVE WEIGHT : EXCLUDING ACTUATOR



Dimensions

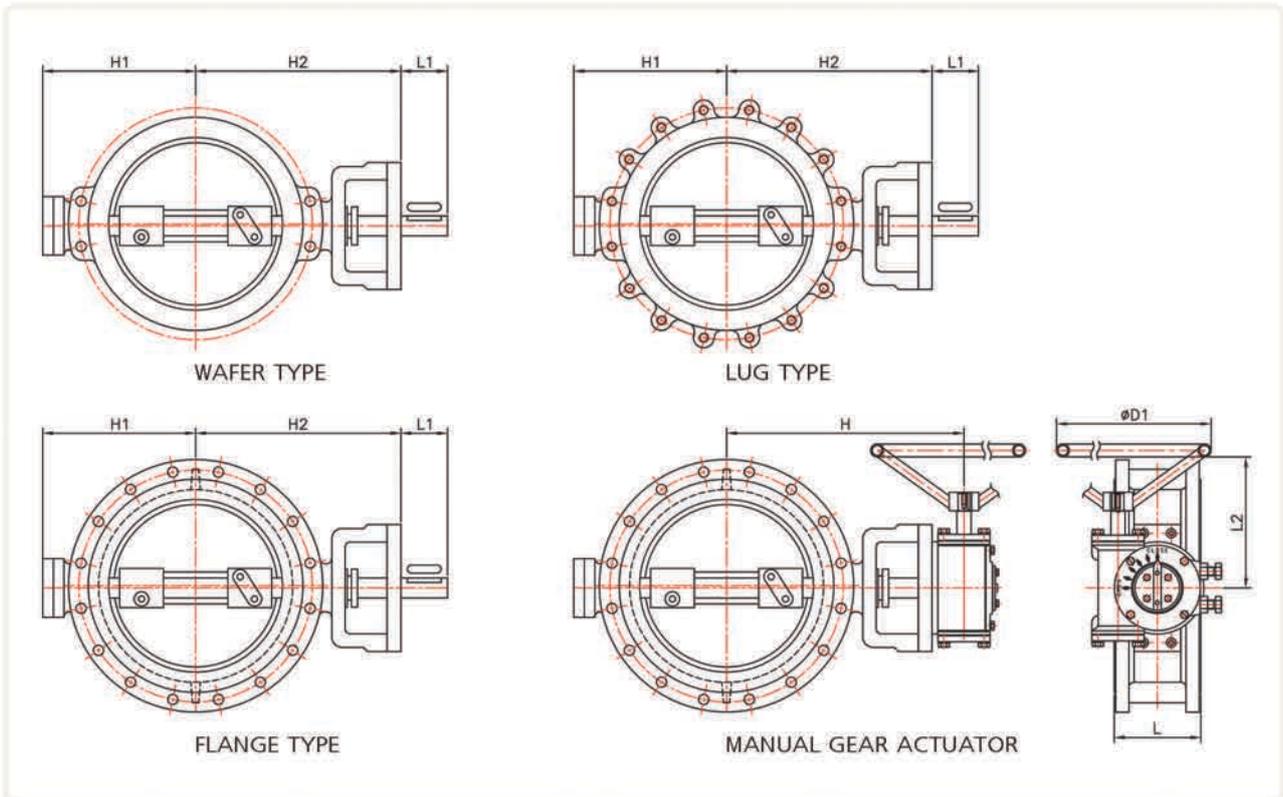
unit : mm

SIZE		H1 APPROX.	H2 APPROX.	H APPROX.	L1	L2	ØD1	L (F To F)			WEIGHT : Kg (APPROX.)		
mm	inch							WAFER	LUG	FLANGE	WAFER	LUG	FLANGE
50	2	115	155	195	40	144	200	43	43	106	-	-	-
65	2½	125	165	205	40	144	200	46	46	112	-	-	-
80	3	135	175	215	40	144	200	48	48	114	-	-	-
100	4	160	210	250	40	144	200	54	54	127	-	-	-
150	6	195	280	330	40	177	250	59	59	140	36	39	76
200	8	215	295	350	55	228	300	73	73	152	51	56	93
250	10	250	340	395	65	257	400	83	83	165	100	112	164
300	12	295	395	460	70	297	500	92	92	178	134	150	222
350	14	330	425	490	80	348	560	117	117	190	196	229	298
400	16	375	480	555	80	413	630	133	133	216	232	277	357
450	18	410	540	615	90	413	630	149	149	220	360	433	499
500	20	440	580	660	90	443	710	159	159	229	457	549	621
600	24	515	650	760	100	552	800	181	181	267	670	805	916
700	28	640	820	930	120	552	800	229	229	292	1193	1363	1417
750	30	690	850	965	130	552	900	230	230	318	1463	1658	1715
800	32	720	880	995	130	602	900	241	241	318	1661	1856	1957
900	36	780	960	1075	160	602	900	241	241	330	2281	2511	2590
1000	40	800	990	1115	180	741	1000	300	300	410	2214	2425	2585
1050	42	840	1050	1175	180	741	1000	300	300	410	2439	2649	2849
1200	48	950	1150	1300	200	781	1000	350	350	470	3384	3684	4106

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VALVE WEIGHT : EXCLUDING ACTUATOR

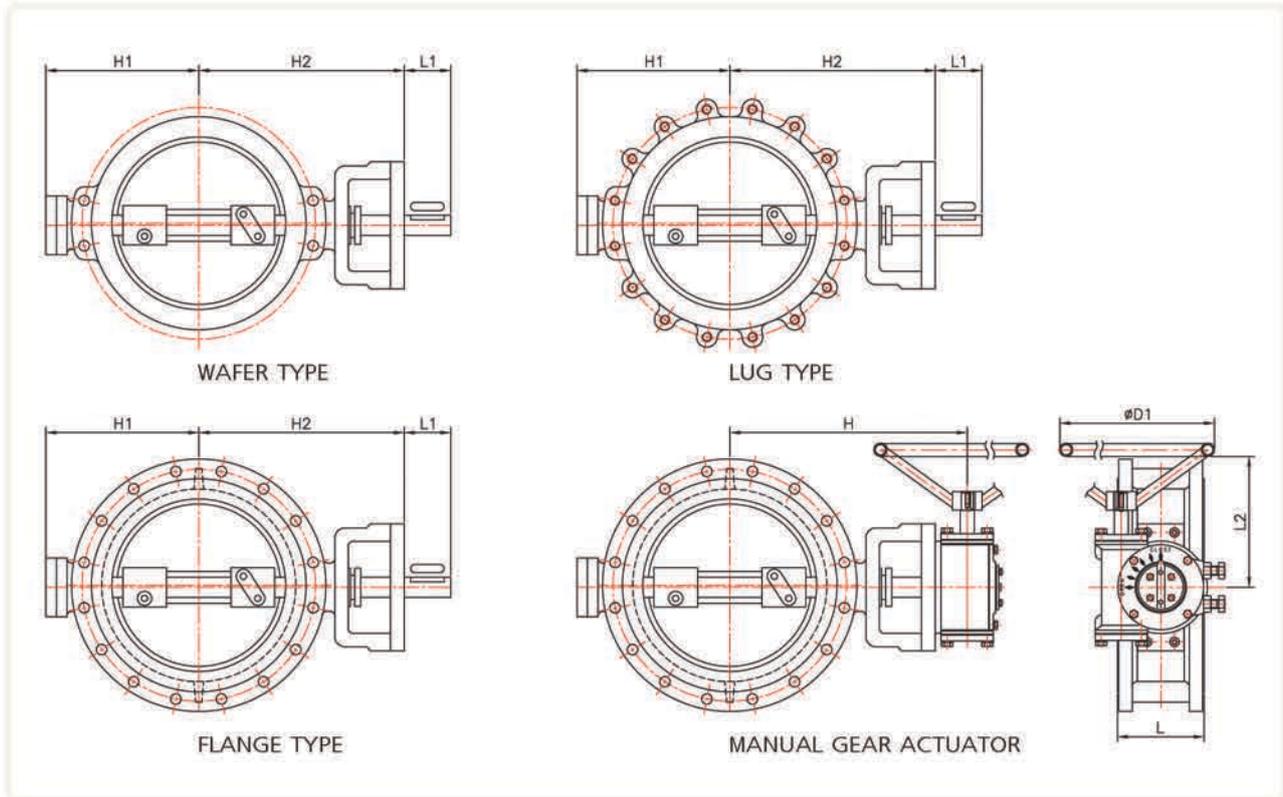


Dimensions

unit : mm

SIZE		H1 APPROX.	H2 APPROX.	H APPROX.	L1	L2	$\phi D1$	L (F To F)			WEIGHT : Kg (APPROX.)		
mm	inch							WAFER	LUG	FLANGE	WAFER	LUG	FLANGE
80	3	154	210	265	45	230	400	54	54	180	15	16	43
100	4	150	200	255	45	230	400	64	64	190	28	30	69
150	6	238	310	365	80	230	400	78	78	210	65	72	135
200	8	248	325	380	80	230	400	102	102	230	92	102	162
250	10	316	400	465	80	279	450	117	117	250	134	187	268
300	12	349	455	520	110	312	560	140	140	270	224	259	369
350	14	374	470	535	110	312	560	155	155	290	285	329	464
400	16	474	585	675	130	371	630	178	178	310	455	520	632
450	18	476	625	715	130	371	630	200	200	330	555	635	739
500	20	504	670	760	130	425	710	216	216	350	694	804	879
600	24	555	750	840	180	425	710	232	232	390	1093	1243	1423
700	28												
750	30												
800	32												
900	36												
FOR THESE & SIZES, PLEASE CONTACT US.													
1000	40												
1050	42												
1200	48												

* FLANGE RATING : ANSI B 16.5 / ASME B16.47 SERIES "A"
 FACE TO FACE DIMENSION : ISO 5752 / API 609 / EN558 / MAKER'S STANDARD / CUSTOMER'S REQUESTS
 VALVE WEIGHT : EXCLUDING ACTUATOR



Dimensions

unit : mm

SIZE		H1 APPROX.	H2 APPROX.	H APPROX.	L1	L2	ØD1	L (F To F)			WEIGHT : Kg (APPROX.)		
mm	inch							WAFER	LUG	FLANGE	WAFER	LUG	FLANGE
150	6	235	335	400	80	279	450	104	104	250	89	100	184
200	8	380	380	445	80	312	560	112	112	310	134	151	256
250	10	355	435	500	110	312	560	135	135	380	224	256	425
300	12	380	500	590	110	371	630	170	170	400	298	352	496
350	14	415	545	635	130	371	630	173	173	430	376	440	656
400	16	455	640	730	130	425	710	210	210	460	570	663	834
450	18	500	690	780	180	425	710	228	228	490	691	824	1044
500	20	550	710	830	180	513	800	250	250	530	905	1069	1273
600	24	656	820	950	200	513	800	275	275		1317	1704	2506
700	28												
750	30												
800	32												
900	36												
FOR THESE & SIZES, PLEASE CONTACT US.													
1000	40												
1050	42												
1200	48												

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FACE TO FACE DIMENSION : ISO 5752 / API 609 / EN558 / MAKER'S STANDARD / CUSTOMER'S REQUESTS

VALVE WEIGHT : EXCLUDING ACTUATOR



Torque Table

unit : Nm

SIZE		10BAR		16BAR		22BAR	
mm	inch	UNSEATING	SEATING	UNSEATING	SEATING	UNSEATING	SEATING
50A	2	9	10	13	15	17	21
65A	2 1/2	15	18	21	26	30	35
80A	3	22	27	33	39	45	54
100A	4	38	45	55	65	75	90
150A	6	96	115	140	167	192	230
200A	8	219	263	318	381	437	524
250A	10	382	459	555	666	763	915
300A	12	609	731	884	1060	1214	1456
350A	14	908	1090	1318	1581	1809	2171
400A	16	1291	1549	1872	2246	2569	3083
450A	18	1898	2270	2752	3302	3776	4532
500A	20	2508	3009	3865	4638	5303	6364
600A	24	4087	4905	6250	7499	8570	10284
700A	28	6216	7460	9442	11330	12940	15527
750A	30	7870	9444	11378	13654	15588	18706
800A	32	9384	11261	13561	16273	18572	22287
900A	36	12972	15566	18725	22470	25629	30755
1000A	40	19367	23241	27953	33543	38255	45906
1050	42	21687	26024	31279	37535	42790	51348
1200	48	30388	36466	43748	52498	59780	71736

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 torque can be calculated using the following formulas.

$T_a = T_b + T_s + T_h = 1.2T_b \pm T_d$	Ta : The required actuator torque (lb-ft)	d : Diameter of Shaft (inch)
$T_s = C_s D^2$	Ts : Seating or unseating torque (lb-ft)	P : Pressure drop across valve (psi)
$T_b = 4.17D^2 dfP$	Td : Dynamic torque (lb-ft)	Cs : Coefficient of Seating/unseating torque
$T_d = C_t D^3 P$	Th : Hydrostatic torque (lb-ft)	Ct : Coefficient of dynamic torque
$T_h = 3.06D^4$	Q : Flow (cubic foot per second)	Cf : Coefficient of flow
$V = C_f \sqrt{P} = \frac{Q}{0.785D^2}$	V : Velocity (feet per second)	f : Bearing friction coefficient
	D : Diameter of valve (feet)	



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 :

Where :

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

- 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

Where :

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

- 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

SIZE		DISC OPENING										
mm	inch	5°	10°	20°	30°	40°	50°	60°	70°	80°	85°	90°
50	2	3	6	12	18	27	45	72	116	179	204	214
65	2½	5	10	20	30	46	75	122	197	302	345	362
80	3	7	15	30	45	70	114	184	298	458	522	548
100	4	12	23	46	70	109	178	288	466	715	815	856
150	6	26	52	104	158	246	401	647	1048	1610	1835	1927
200	8	46	93	186	280	437	713	1151	1863	2862	3262	3426
250	10	72	145	290	438	682	1114	1798	2911	4472	5096	5353
300	12	104	208	418	630	983	1604	2589	4192	6439	7339	7708
350	14	142	283	569	858	1338	2183	3523	5705	8764	9989	10491
400	16	185	370	743	1121	1747	2852	4602	7452	11447	13047	13703
450	18	234	468	940	1418	2211	3609	5824	9431	14488	16513	17343
500	20	289	578	1161	1751	2730	4456	7191	11644	17886	20386	21411
600	24	416	833	1672	2522	3931	6416	10355	16767	25756	29356	30832
700	28	566	1133	2275	3432	5351	8733	14094	22821	35057	39956	41965
750	30	650	1301	2612	3940	6142	10025	16179	26198	40244	45868	48175
800	32	739	1480	2972	4483	6989	11406	18408	29807	45788	52188	54812
900	36	936	1873	3761	5674	8845	14436	23298	37725	57951	66050	69371
1000	40	1155	2313	4643	7005	10920	17822	28963	46574	71544	81544	85644
1050	42	1274	2550	5119	7723	12039	19649	31711	51348	78877	89902	94422
1200	48	1664	3331	6686	10087	15725	25664	41419	67067	103024	117423	123327



Recommended Standard and Specifications

Butterfly valve manufactured according to most severe quality control standards

ANSI	B16.5 B16.34	Steel pipeline flanges Steel valves
MSS	SP-6 SP-25 SP-44 SP-55 SP-61 SP-67 narrow (C1-D1)	Standard finishes for pipe flanges Standard marking system for valves Steel pipeline flanges Quality standard for steel castings Pressure testing of steel valves Butterfly valves
API	598 609	Valve inspections and testing Butterfly valves Wafer and Lug type (face to face on valve)
ISO	7005 5208 5209 5211/1 5752 Tab.5 (20series)	Metallic flanges Industrial valves - pressure testing of valves General purpose industrial valves - marking Part-turn valve actuator attachment -top flange dimensions Face-to-face and centre-to-face dimensions
EN	558 593 1092	Face-to-face and centre-to-face dimensions of metal valves for use in flanged pipe systems. Industrial valves - Metallic butterfly valves. Circular flanges for pipes, valves, fittings and accessories, PN designated.
AWWA	C504	Rubber Seated Butterfly valves
JIS	B2002 B2003	Face to face dimensions Valve Test

Inspection and testing in according to ISO5208, MSS SP61, AWWA C504, JIS B2003, API 598, and EN 593.

The Body Test is performed at 1.5 times the nominal pressure while the Seat Test at 1.1 times the nominal pressure, using for both emulsified water at room temperature. While testing, no leakage shall be noticed from the stems, as for the Body Test, not from upstream to downstream, as for the Seat Test.

For the Pneumatic Test with disc closed the butterfly is covered with water and soap on that side where the visual control if the seal is performed, in order to show up a possible leak. Our valves are tested 100% before being delivered.

Pressure / Temperature Rating

Temperature		Class 150				Class 300				Class 600				Class 900			
		Carbon Steel		Stainless Steel		Carbon Steel		Stainless Steel		Carbon Steel		Stainless Steel		Carbon Steel		Stainless Steel	
°F	°C	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig	barg	psig
-200 - 100	-29 - 38	19.6	285	18.9	275	51	740	49.6	720	102	1480	99.3	1440	153.1	2220	148.9	2160
200	93	17.9	260	16.5	240	46.5	675	42.7	620	93.1	1350	85.5	1240	139.6	2025	128.2	1860
300	149	15.8	230	14.8	215	45.1	655	38.6	560	90.6	1315	77.2	1120	135.8	1970	115.8	1680
400	204	13.7	200	13.4	195	43.7	635	35.5	515	87.5	1270	71	1030	131	1900	106.2	1540
500	260	11.7	170	11.7	170	41.3	600	33.1	480	82.7	1200	65.8	955	123.7	1795	98.9	1435
600	316	9.6	140	9.6	140	37.9	550	31	450	75.5	1095	62.4	905	113.1	1640	93.4	1355
650	343	8.6	125	8.6	125	36.8	535	30.6	445	74.1	1075	61.3	890	111	1610	91.7	1330
700	371	7.5	110	7.5	110	36.8	535	29.6	430	73.3	1065	59.6	865	110.3	1600	89.3	1295
750	399	6.5	95	6.5	95	34.8	505	29.3	425	69.6	1010	58.2	845	104.1	1510	87.5	1270
800	427	5.5	80	5.5	80	28.2	410	28.6	415	56.8	825	57.2	830	85.1	1235	85.8	1245
850	454	4.4	65	4.4	65	18.6	270	27.9	405	36.8	535	55.8	810	55.5	805	83.7	1215
900	482	3.4	50	3.4	50	11.7	170	27.2	395	23.7	345	54.4	790	35.5	515	81.3	1180
950	510	2.4	35	2.4	35	7.2	105	26.5	385	14.1	205	53.4	775	21.3	310	80	1160
1000	538	1.3	20	1.3	20	3.4	50	25.1	365	7.2	105	50	725	10.6	155	75.1	1090
1050	566	-	-	1.3(1)	20(1)	-	-	24.8	360	-	-	49.6	720	-	-	74.4	1080
1100	593	-	-	1.3(1)	20(1)	-	-	22.4	325	-	-	44.4	645	-	-	66.5	965
1150	621	-	-	1.3(1)	20(1)	-	-	18.9	275	-	-	37.9	550	-	-	56.8	825
1200	649	-	-	1.3(1)	20(1)	-	-	14.1	205	-	-	28.2	410	-	-	42.7	620

* WCB permissible but not recommended for prolonged use above 426°C (800°F)

For welding end valves only, flanged end ratings terminates at 538°C (1000°F)



General

- Valve can be installed in the pipeline in any position.
- Before installing valves, the pipeline must be cleaned from dirt and welding residues. Otherwise seat may be damaged.
- The pipeline must be free from tension and electric current.
- When handling valves, be careful to avoid contact with or impact by other equipment, vault walls or trench walls.
- Check carefully to see if valve seat/disc surface, as well as mating face, is all clean.
- Tighten again, if any, all bolts loosened during transport and/or handling.
- Open and close valves to check for proper operation.
- If possible, install valves in the direction of arrow mark on it for easier access and maintenance.
- Do not use valve as a substitute for jack when putting pipes in alignment.
- The span of pipeline having connection between valve and pipe should be free from such excessive loading as may cause serious bending.

Installation 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 at least two flange-bolts through the two bottom pipe flange holes to rest valves on during installation.
- Close valve disc partially so that disc edge is at least 10 mm within the body.
- Insert valve in between two flanges. Flange gaskets should be positioned, aligned with valve bore.
- Valve will be held by the two flange-bolts previously fitted in the lower part of flanges.
- 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 of the new pipeline

- Shut partially valve disc until disc profile is at least 10 mm within the body.
- Align the two flanges with the valves body. Flange gaskets should be positioned, aligned with valve bore.
- 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 bolts and the valve from the flanges. Just perform tack-welding only when the valve is inserted, high heat temperature can damage valve seat.
- Weld flange 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.