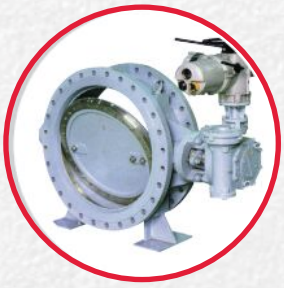
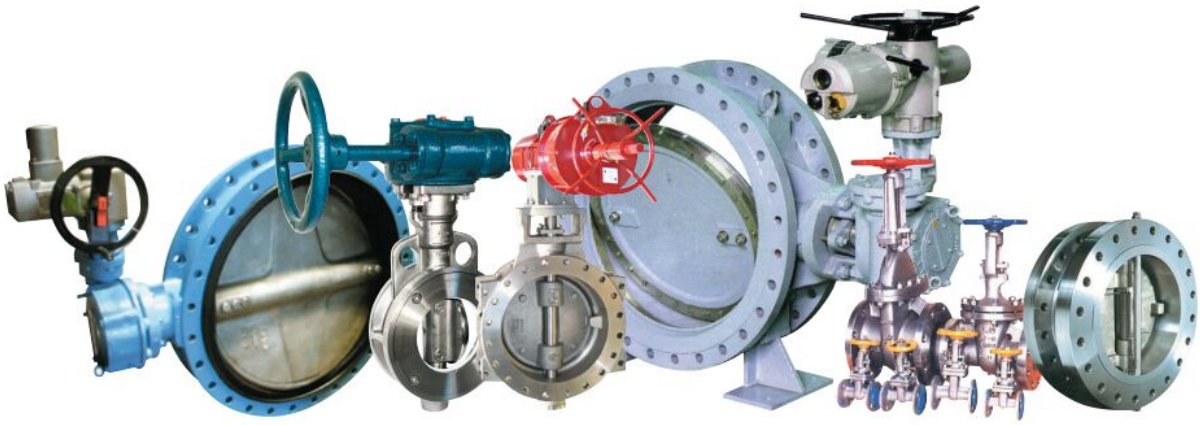
evo valves



Butterfly Valves

www.evovalves.com



About Us

Evo Valves manufactures valves for many industries including Power, Cogeneration, Oil and Gas, Chemicals & Petro-chemicals, Steel, Cement, Marine / Sea water, Steam, Onshore and Offshore, Fire, Aerospace,Nuclear, Water and Waste Water & many more markets based on various technical know-how. Our specialization is in the Triple offset butterfly valves providing tight shut-off and zero leakage, for all types of process applications.

Our Butterfly Valves manufacturing size ranging from 2 Inch to 120 Inches which have both Soft Seat and Metal-to-metal seated options available.

Evo Valves serves the world market with design, development, manufacturing and testing following International standards ISO, API, JIS, BS, AWWA, etc. Our specialty butterfly product range are as follows:

Main Products

- ✓ Concentric Type Butterfly Valves
- ✓ Double Eccentric High-performance Butterfly Valves
- ✓ Triple Offset Metal Seat Butterfly Valves
- ✓ Offset Type Butterfly Valves (For Steam)
- ✓ Water work Butterfly Valves

Contents

WCD Series: Center Lined Butterfly Valves

WCD 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.

WLCD 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.

FECD 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 Operated

Pneumatic Operated

Electric Operated

Teflon Lined Control Valve

WODT Series: High-Performance Butterfly Valves

WODT Series
High-Performance Teflon seat Butterfly Valves (WAFER Type)

- **APPLICATION**: General use : Chemical, petrochemicals, steam, powders etc.
- **SIZE** : DN50 to DN2000 (2 inch to 80 inch)
- **RATING** : ANSI150LB/300/600/900,PN10/16/25/40,JIS10K/16K/20K etc.
- **CONNECTION FLANGE**: See next 15 page
- **WORKING PRESSURE**: Up to 150 bar
- **MATERIAL**: See next 16 page
- **OPERATOR**: Lever,gear,pneumatic,HYD actuator,electric motor ect.

WLODT Series
High-Performance Teflon seat Butterfly Valves (LUG Type)

- **APPLICATION**: General use : Chemical, petrochemicals, steam, powders etc.
- **SIZE** : DN50 to DN2000 (2 inch to 80 inch)
- **RATING** : ANSI150LB/300/600/900,PN10/16/25/40,JIS10K/16K/20K etc.
- **CONNECTION FLANGE**: See next 15 page
- **WORKING PRESSURE**: Up to 150 bar
- **MATERIAL**: See next 16 page
- **OPERATOR**: Lever,gear,pneumatic,HYD actuator,electric motor ect.

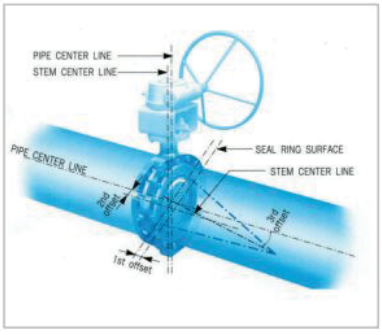
FEODT Series
High-Performance Teflon seat Butterfly Valves (FLANGE Type)

- **APPLICATION**: General use : Chemical, petrochemicals, steam, powders etc.
- **SIZE** : DN50 to DN2000 (2 inch to 80 inch)
- **RATING** : ANSI150LB/300/600/900,PN10/16/25/40,JIS10K/16K/20K etc.
- **CONNECTION FLANGE**: See next 15 page
- **WORKING PRESSURE**: Up to 150 bar
- **MATERIAL**: See next 16 page
- **OPERATOR**: Lever,gear,pneumatic,HYD actuator,electric motor ect.

WLTOM Series: Triple Offset Metal Seat Butterfly Valves

WLTOM Series ; Triple Offset Metal Seat Butterfly Valve

- Zero leakage
- Inherently Firesafe
- Zero seat/seal friction
- Extended service life
- Bi-Directional bubble tight shut-off by design
- Continued sealing through thermal cycling
- Excellent flow and throttling characteristics.
- Excellent control of fugitive emissions.
- Quarter turn operation
- Metal Seated
- Low operating torques.
- Torque sealed



WODT Series: Offset Type HP Butterfly Valves (For Steam)

- **APPLICATION**
  General use : Steam, Chemical, petrochemicals etc
- **SIZE**
  DN50 to DN600 (2 inch to 24 inch)
- **RATING**
  ANSI150LB,JIS10K/16K/20K etc.
- **CONNECTION FLANGE**
  See next 31 page
- **WORKING PRESSURE**
  Up to 25 bar
- **MATERIAL**
  See next 32 page
- **OPERATOR**
  Lever,gear,pneumatic,electric motor ect.

WW Series : Water Works Butterfly Valve

- **APPLICATION**
  - General fluids : portable water, sea water.
- **TYPE**
  - WWW Series : Short & long pattern. Flange connection.
- **CONSTRUCTION MATERIALS**
  - Body and Disc : cast iron, ductile iron, cast steel, stainless steel, steel.
  - Seat : EPDM, NBR, FPM(type Viton)
  - Stem : stainless steel, Monel.
- **COATING**
  - epoxy painting inside rubber lining
- **PRODUCT RANGE**
  - Sise : DN 80 to 4000 (3inch ~ 160inch)

- **TESTING**
  - According to AWWA C 504
- **CONNECTIONS**
  - ISO, JIS, ANSI, AWWA, DIN, etc
  - Other standard upon request.
- **HANDLING POSSIBILITIES**
  - Gear box with indicator.
  - Single or double acting pneumatic actuator.
  - Electrical actuator.

Center Lined Butterfly Valve

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

Figure Number Abbreviation

- **WCD Series** Center Lined Butterfly Valves - WAFER Type
- **WCDSL Series** Center Lined Butterfly Valves - SEMI-LUG Type
- **WLCD Series** Center Lined Butterfly Valves - LUG Type WLCD
- **FECD 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

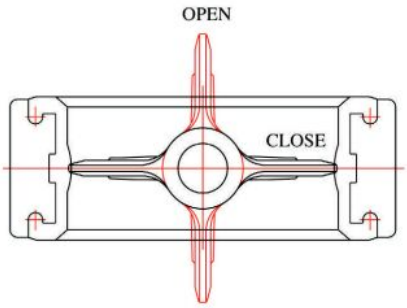
Conform to BS5155, ISO 5752, MSS SP67, JIS B2032, and AP1609.

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.

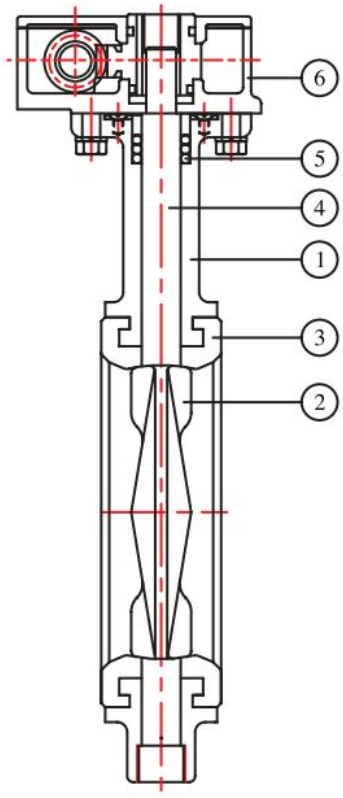
These fit together with a smooth and low torque when close and open. The raised center seat has the cosine-curve structure.

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.

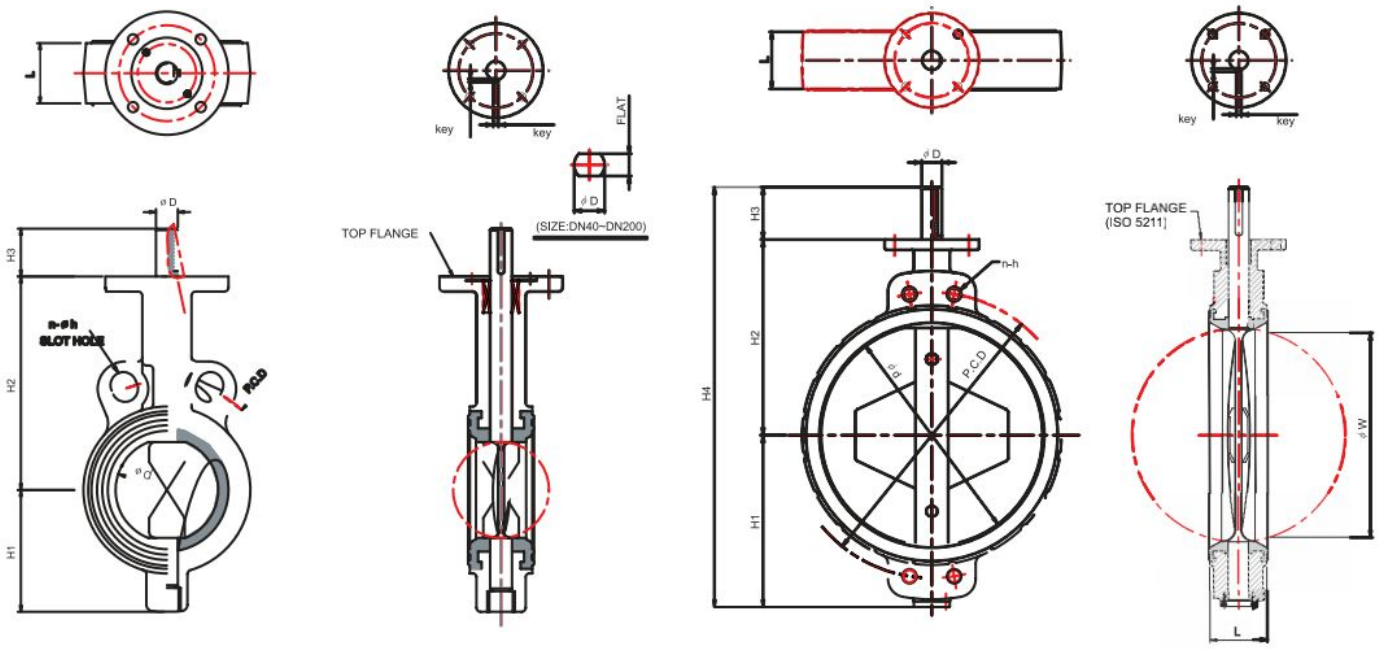
Operations

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

WCD Series Center Lined Butterfly Valve / Wafer Type Dimension



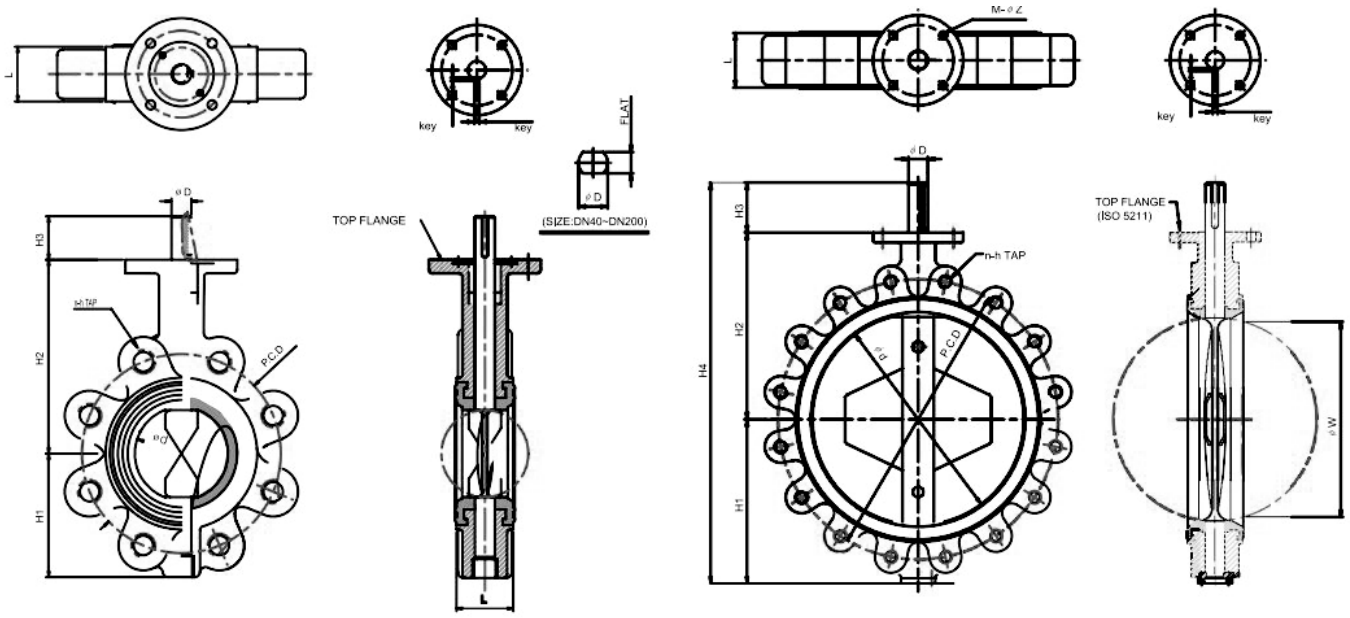
VALVE DIMENSIONS

unit : mm

SIZE		d	L	H1	H2	H3	STEM		TOP FLANGE (ISO5211)	JIS 10K			ANSI 150LB			BS 4504 PN10			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	692.0	20	35	-	-	-	180.0
24"	600	573	154	448	510	80	55	14 X 9	F 16	730	24	M30	749.5	20	35	725	20	M27	222.0
26"	650	624	165	463	530	80	55	14 X 9	F 16	780	24	M30	806.5	24	35	-	-	-	265.0
28"	700	674	165	500	580	110	65	18X11	F16	840	24	M30	863.5	28	35	840	24	M27	295.0
30"	750	716	190	520	590	110	65	18X11	F 25	900	24	M30	914.5	28	35	-	-	-	350.0
32"	800	767	190	565	630	110	75	20X12	F 25	950	28	M30	978.0	28	41	950	24	M30	430.0
36"	900	860	203	670	700	150	90	22X14	F 25	1050	28	M30	1086.0	32	41	1050	28	M30	600.0
40"	1000	970	216	725	750	150	90	22X14	F 25	1160	28	M36	1200.0	36	41	1160	28	M33	720.0
44"	1100	1010	216	780	840	150	90	22X14	F 25	1270	28	M36	1314.5	40	41	-	-	-	805.0
48"	1200	1173	254	860	900	150	90	22X14	F 25	1380	32	M36	1422.4	44	41	1380	32	M36	860.0
52	1300	1272	280	920	970	180	120	32X18	F 30	-	-	-	1537	44		-	-	-	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 1/3	2020	44	M45	1850.0

Specification and design are subject to change without notice

WLCD Series Center Lined Butterfly Valve / Lug Type Dimension



VALVE DIMENSIONS

unit : mm

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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
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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
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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
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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
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52	1300	1272	280	920	970	180	120	32X18	F 30	-	-	-	1537	44		-	-	-	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 1/3	2020	44	M45	1850.0

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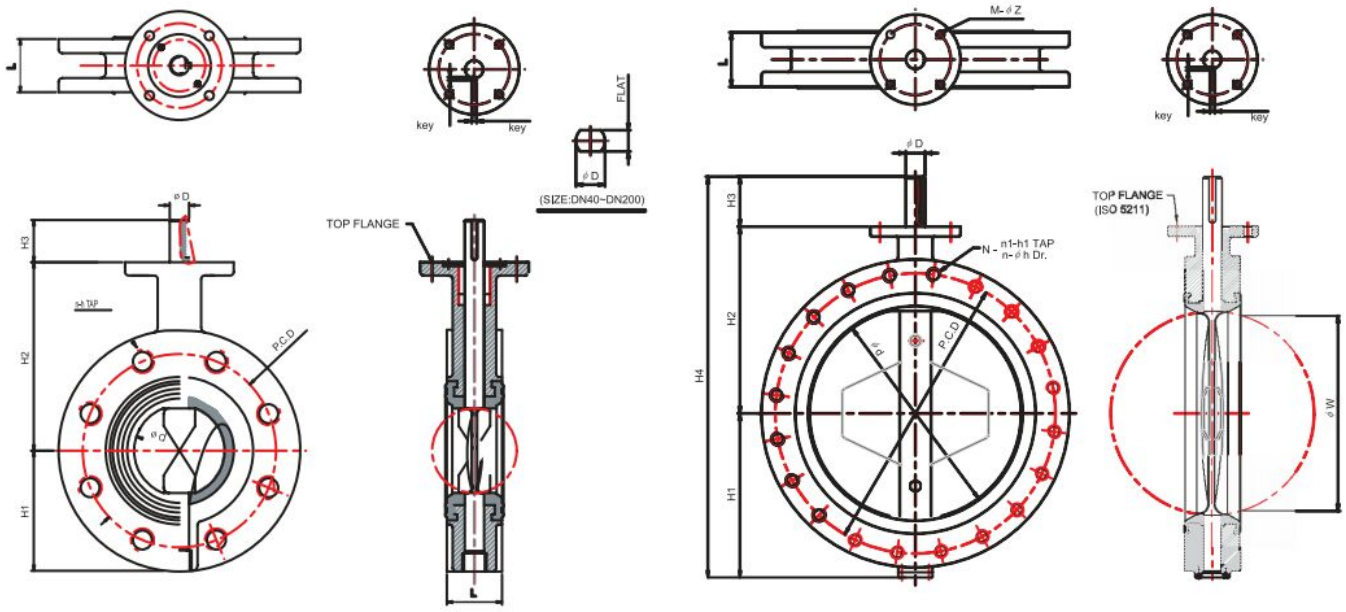
WFECD Series Center Lined Butterfly Valve /FlangeType Dimension



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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
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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
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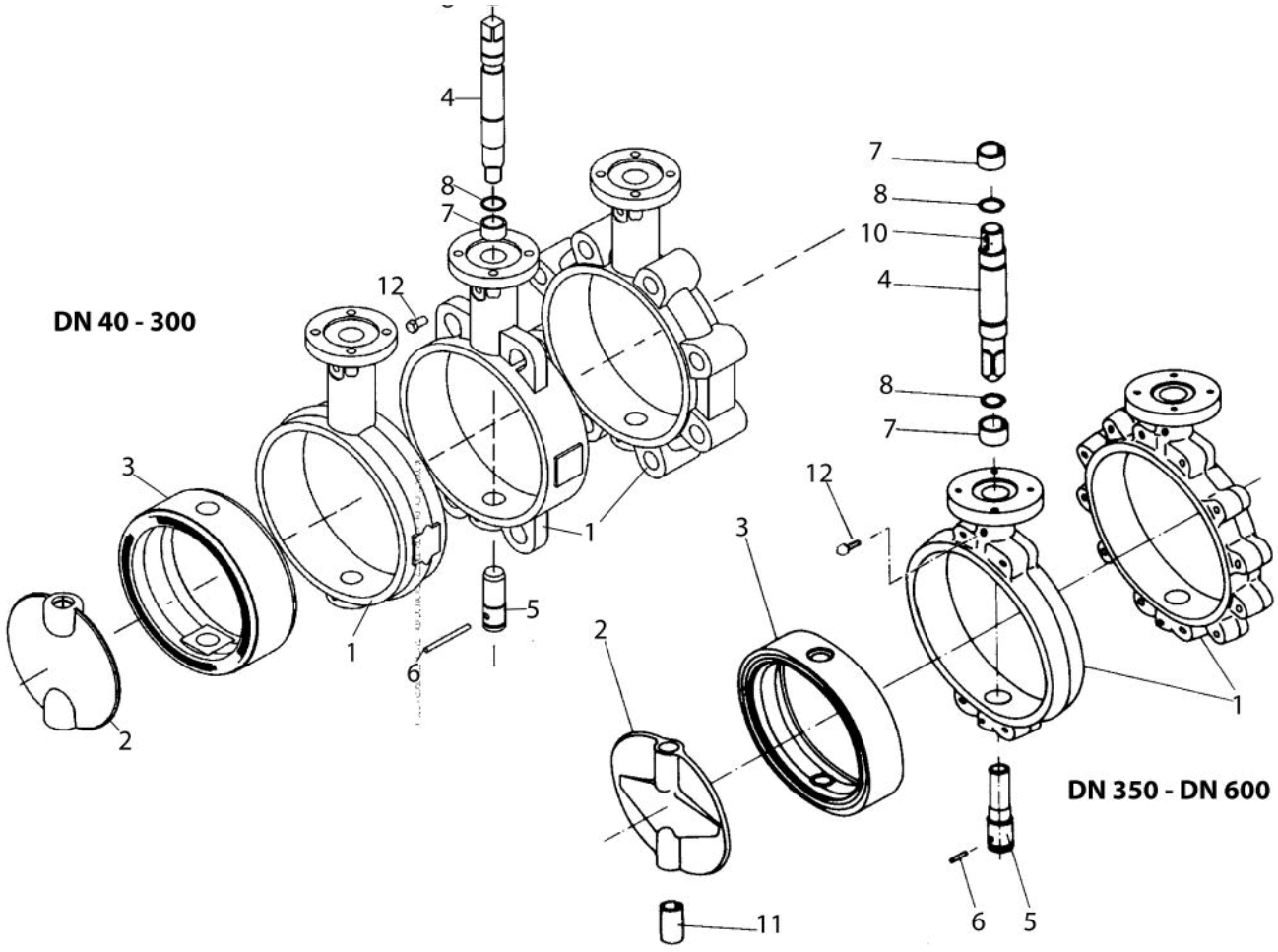
28"	700	674	165	500	580	110	65	18X11	F16	840	24	M30	863.5	28	35	840	24	M27	295.0
30"	750	716	190	520	590	110	65	18X11	F 25	900	24	M30	914.5	28	35	-	-	-	350.0
32"	800	767	190	565	630	110	75	20X12	F 25	950	28	M30	978.0	28	41	950	24	M30	430.0
36"	900	860	203	670	700	150	90	22X14	F 25	1050	28	M30	1086.0	32	41	1050	28	M30	600.0
40"	1000	970	216	725	750	150	90	22X14	F 25	1160	28	M36	1200.0	36	41	1160	28	M33	720.0
44"	1100	1010	216	780	840	150	90	22X14	F 25	1270	28	M36	1314.5	40	41	-	-	-	805.0
48"	1200	1173	254	860	900	150	90	22X14	F 25	1380	32	M36	1422.4	44	41	1380	32	M36	860.0
52	1300	1272	280	920	970	180	120	32X18	F 30	-	-	-	1537	44		-	-	-	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 1/3	2020	44	M45	1850.0

Specification and design are subject to change without notice

Material Selection - DN 40-600



	Component	Material Specification	Material No.
Parts not in contact with the medium	Body (1)	GJL-250 [1)] GJS-400-15 GJS-400-18-LT	JL-1040 JS-1030 JS-1025
	Upper Stem (4) and Lower Stem (5)	Chromium steel X20Cr13 Stainless steel X5CrNiMo 18/10	1.4021 1.4401
	Roll pin (6)	Spring steel, galvanized	
	Bushing (7)	DU/ plastics [2)]	
	Circlip (8)	Spring steel, galvanized	
	Key (10)	Steel	
	Bushing (11)	Bronze	
	Screw (12)	Galvanized steel	

1) only wafer body with centering lugs (DN 50-300).
2) according to the manufacturer's choice.

Material Selection - DN 40-600

	Component	Material Specification	Material No.	Temperature Range
Parts in contact with the medium	Disc (2)	Ductile Iron, Nickel-Plated GGG-40-gal Ni [1)]	JS-1030	-10°C top temperature limited by Seat material
		ECTFE-coated		-10°C top temperature limited by Seat material
		Ductile Iron,	UHMW-PE	-10°C to +70°C
		Stainless Steel, according to manufacturer's choice G-X5CrNiMo 19-11 G-X5CrNiMoNb 18/10	 1,4408 1,4581	Limited by Seat material
		Duplex steel	J93404	Limited by Seat material
		Hastelloy®* according to manufacturing choice	2.4883 9.4602	Limited by Seat material
	Cartridge Seat (3)	EPDM (Ethylene-Propylene-Terpolymer)		-10°C to +120°C
		EPDM-H (Ethylene-Propylene-Terpolymer)		-10°C to +140°C with KTW-drinking water approval
		NBR (Copolymer of Acrylonitrile-Butadiene Rubber)		-10°C to +80°C up to 100°C with intermittent operation
		HNBR (Hydrogenated Acrylonitrile-Butadiene Rubber)		-10°C to +120°C
		FPM (Viton)* (Copolymer of Vinyl Fluoride)		-10°C to +150°C
		EPDM (Food Grade)		-10°C to +120°C

* or equivalent.
1) only DN 200-600.

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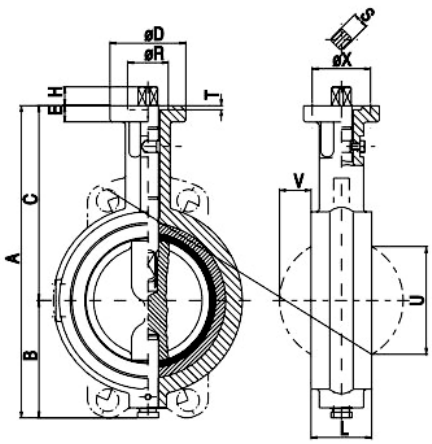
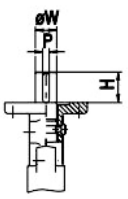
Dimention & Weights - DN 40-600

Wafer Body

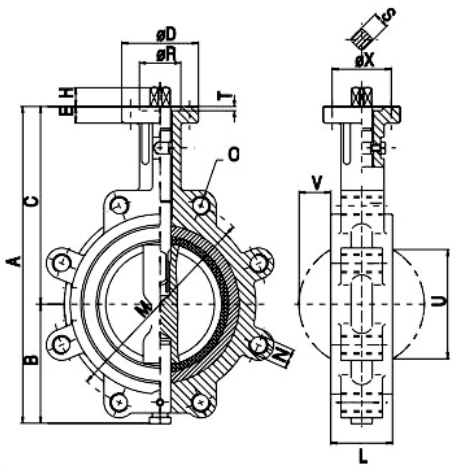


Shaft End
DN 40 - 300

Shaft End
DN 350-600



Lug Body



Dimensions in mm bare shaft

	Class	DN 40[3]	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 300	DN 350	DN 400	DN 450	DN 500	DN 600
A [1]		202	202	225	240	268	292	320	386	462	542	627	677	743	793	934
A [2]		202	202	225	251	286	314	342	401	462	542	-	-	-	-	-
B		72	72	79	86	101	112	125	156	192	242	277	302	341	366	424
C [1]		130	130	145	154	167	180	195	230	270	300	350	375	402	427	510
C [2]		130	130	145	165	185	202	217	245	270	300	-	-	-	-	-
D [4]		65	65	65	65	65	90	90	90	125	125	175	175	175	175	210
E [4]		14	14	14	14	14	15	15	15	18	18	23	23	23	23	25
H [4]		16	16	16	16	16	19	19	19	24	24	65	65	65	65	80
L [4]		43	43	45	45	52	56	56	60	68	78	78	102	114	127	154
M	PN 10	110	125	145	160	160	210	240	295	350	400	460	515	565	620	725
M	PN 16	110	125	145	160	180	210	240	295	355	410	470	525	585	650	770
M	ANSI 150	-	120,7	139,7	152,4	190,5	215,9	241,3	298,5	362	431,3	476,3	539,8	577,9	635	749,3
N	PN 10	M16	M16	M16	M16	M16	M16	M20	M20	M20	M20	M20	M24	M24	M24	M27
N	PN 16	M16	M16	M16	M16	M16	M16	M20	M20	M24	M24	M24	M27	M27	M30	M33
N	ANSI 150	-	5/8 - 11	5/8 - 11	5/8 - 11	5/8 - 11	3/4 - 10	3/4 - 10	3/4 - 10	7/8 - 9	7/8 - 9	1 - 8	1 - 8	1 1/8 - 8	1 1/8 - 8	1 1/4 - 8
O	PN 10	-	4	4	8	8	8	8	8	12	12	16	16	20	20	20
O	PN 16	4	4	4	8	8	8	8	12	12	12	16	16	20	20	20
O	ANSI 150	-	4	4	4	8	8	8	8	12	12	12	16	16	20	20
P		-	-	-	-	-	-	-	-	-	-	14	14	14	14	20
R		Ø35	Ø35	Ø35	Ø35	Ø35	Ø55	Ø55	Ø55	Ø70	Ø70	Ø100	Ø100	Ø100	Ø100	Ø130
S [4]		14-0,1	14-0,1	14-0,1	14-0,1	14-0,1	17-0,1	17-0,1	17-0,1	22-0,1	22-0,1	-	-	-	-	-
T		3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	3,5	5	5	5	5	7
U		39	39	56	71	93	117	144	191	240	291	327	371	423	472	575
V		7	7	13	19	27	37	49	70	90	111	129	141	162	181	221
W		-	-	-	-	-	-	-	-	-	-	Ø45	Ø45	Ø45	Ø45	Ø70
X		Ø50/4 x Ø7 F05					Ø70/4 x Ø9 F07			Ø102/4 x Ø11 F10		Ø140/4 x Ø18 F14				Ø165/4 x Ø22 F16

1) Body made of Ductile Iron.
2) Body made of Cast iron.
3) Inner parts DN 50.
4) Dimensions in accordance with DIN/ISO.

Weights in kg

Bare Shaft Valve	DN 40	DN 50	DN 65	DN 80	DN 100	DN 125	DN 150	DN 200	DN 250	DN 300	DN 350	DN 400	DN 450	DN 500	DN 600
Wafer body*	2,2	2,2	2,8	3,4	4,7	6,8	7,6	11,5	19,6	31,2	50	72	92	111	195
Lug body	3,4	3,4	4,0	4,8	6,9	10,6	11,4	15,9	26,0	38,2	60	92	108	151	245

*Version with centering lugs made of Cast Iron up to DN 300.

Torques Required to Operate Centre 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.*

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

$Ts = CsD^2$

$Tb = 4.17D^2dfP$

$Td = CtD^3P$

$Th = 3.06D^4$

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

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-Valve

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 :

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

Where :

Q = valve flow rate in gpm (USGPM)

P = 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

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

Where :

Q = valve flow rate in m3/h

P = 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

High-Performance Butterfly Valve

UNI-directional tight shut off at full rated pressure.

Figure Number Abbreviation

- **WODR Series** High-performance Rubber seat Butterfly valves - WAFER type
- **WLODR Series** High-performance Rubber seat Butterfly valves - LUG type
- **FEODR Series** High-performance Rubber seat Butterfly valves - FLANGE type
- **WODT Series** High-performance Teflon seat Butterfly valves - WAFER type
- **WLODT Series** High-performance Teflon seat Butterfly valves - LUG type
- **FEPDT Series** High-performance Teflon seat Butterfly valves - FLANGE type
- **WODM Series** High-performance Metal seat Butterfly valves - WAFER type
- **WLODM Series** High-performance Metal seat Butterfly valves - LUG type
- **FEODM Series** High-performance Metal seat Butterfly valves - FLANGE type
- **WIDF Series** High-performance Fire safe seat Butterfly valves - WAFER type
- **WLODF Series** High-performance Fire safe seat Butterfly valves - LUG type
- **FEODF Series** High-performance Fire safe seat Butterfly valves - FLANGE type

Standard Compliance

Conform to BS 5155, MSS SP 67 and API 609

Production Range

- SIZE : DN 50 to DN 2000 (2 inch ~ 80 inch)
- Working Pressure : upto 25 bar
- Working Temperature : -100℃ ~ +450℃

Connection Flange

- BS4504 PN10, PN16, PN25 and PN40 / DIN2501 PN10, PN16, PN25 and PN40 /
- ANSI B16.5 CL. 150LB and 300LB / MSS SP44 CL. 150LB and 300LB /
- ISO 2531 PN10, PN16, PN25 and PN40 / KS/JIS 10K, 16K & 20K /

Face to Face Dimensions

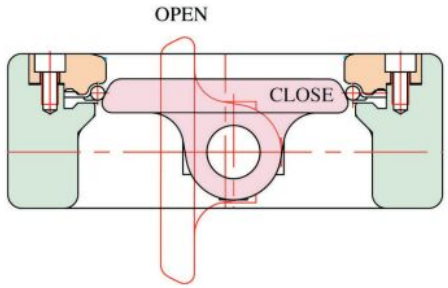
- Conform to BS5155, ISO5752, MSS SP67 and API609

Application

- Crude Oil
- Offshore Plant
- Petroleum Products
- Textile industry
- Sugar refining
- Fire safer Piping system
- Chemical and Petro-Chemical Plants
- Ethylene
- Sea Water
- Water and Others
- Food Plants
- LPG
- Steam
- Foundry
- Marine tankers- Ship building

High-Performance Butterfly Valve

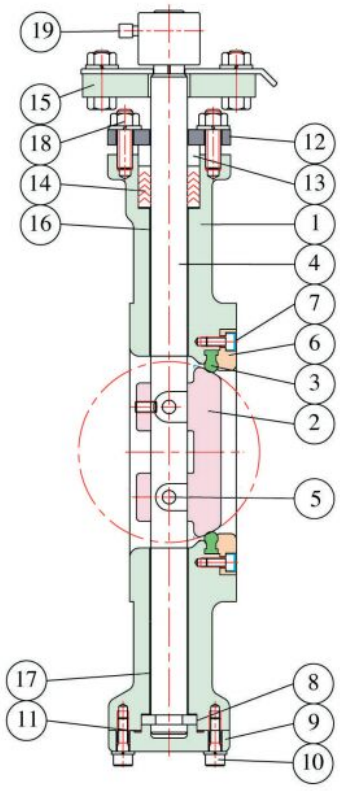
High-Performance Butterfly Valve



Design Features

- Bi-directional tight shut off.
- Reduced weight and overall dimensions.
- Low pressure loss and reduced energy costs.
- High Kv / Cv values. ▪ High reliability.
- Easy to clean and disinfect for potable water systems etc.
- Easy to handle, to install, and to dismantle.
- Less space in storage and installation.
- Insulation of noise and heat transfer.

P.NO.	PART NAME	MATERIAL
1	BODY	DUCTILE IRON, CAST STEEL, STAINLESS STEEL, AL-BRONZE, DUPLEX
2	DISC	CAST STEEL, STAINLESS STEEL, AL-BRONZE
3	SEAT	SS. STEEL, TEFLON, RUBBER
4	STEM	SS. STEEL (304, 316, 316L, 630, 17-4PH, Monel)
5	DISC PIN	STAINLESS STEEL
6	RETAINER	STAINLESS STEEL, DUCTILE IRON, MILD STEEL
7	RETAINER BOLT	STAINLESS STEEL
8	THRUST PLATE	BRONZE, STAINLESS STEEL
9	BOTTOM COVER	STAINLESS STEEL, AL-BRONZE
10	BOTTOM BOLT	STAINLESS STEEL
11	BOTTOM GASKET	TEFLON, GRAPHITE
12	PACKING GLAND	SS. STEEL
13	GLAND RING	BRASS, STAINLESS STEEL
14	PACKING	TEFLON, GRAPHITE, RUBBER
15	TOP FLANGE	SS. STEEL
16	STEM BEARING	METALOPLAST, STAINLESS STEEL
17	STEM BEARING	METALOPLAST, STAINLESS STEEL
18	BOLT & NUT	STAINLESS STEEL
19	LEVER	STEEL, DUCTILE IRON



High-Performance Butterfly Valve

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 bi-directional zero leakage 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.

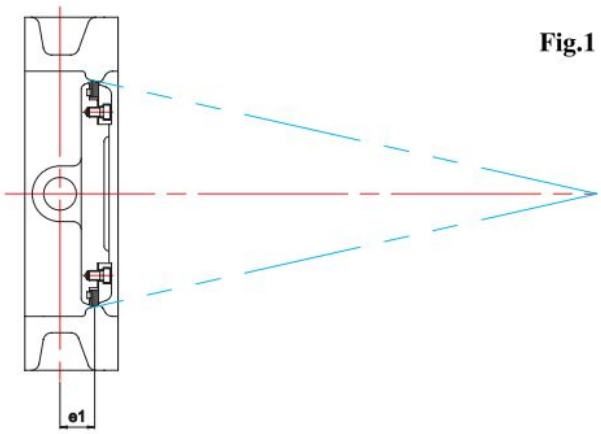


Fig.1

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.

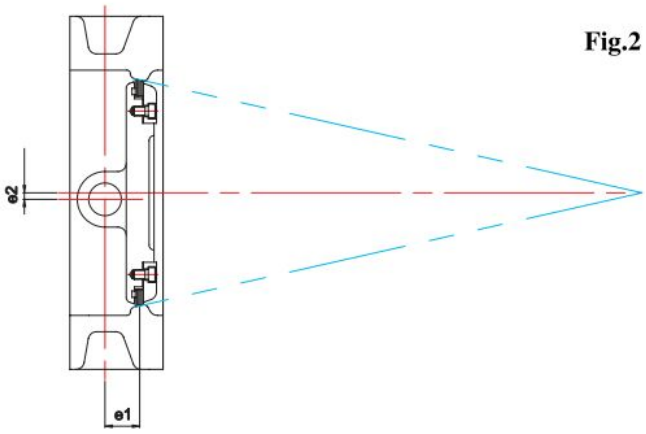


Fig.2

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".

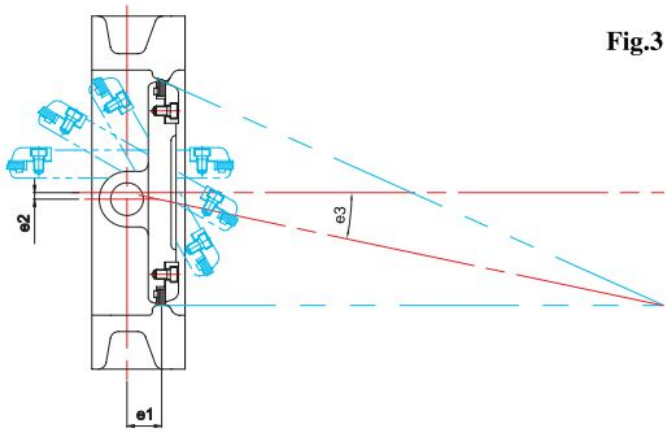


Fig.3

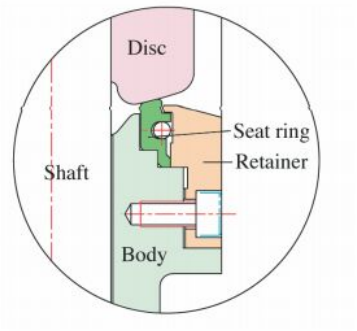
TRIPLE OFFSET

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.

High-Performance Butterfly Valve

Design Features

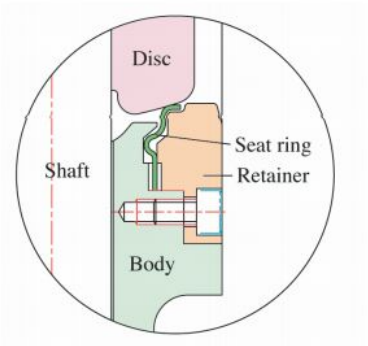
Soft Seated (-45°C ~ +180°C)



The RTFE seat ring is well-suited for extremely corrosive chemical solutions and high-temperature fluids of up to +210℃.

APPLICATIONS
Pharmaceuticals, water, jet fuel, Saturated steam, chlorine, ammonia, natural gas vacuum, oxygen, nitrogen, air-conditioning chilled, exhaust gas, town gas, hot water.
Abrasives, suspended solids, scaling mediums

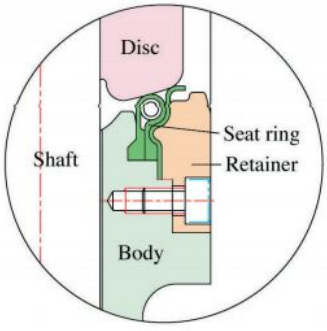
Metal Seated (up to 450°C)



The metal seat ring allows control of extremely high-temperature fluids, thereby replacing conventional gate valves, and ball valves.

APPLICATIONS
High temperature, low temperature, abrasives, fly ash, slurries, steam, air, combustion gas, exhaust gas, netroten gas, sulfurous-acid gas.

Fire Seated (-45°C ~ +210°C)



PTFE-metal-seat system
- Bidirectional sealing and fire safe design.

UNI-Directional
- The primary PTFE : seat ring will be replenished with a secondary metal back-up ring. This metal seat provides a mechanical load to energies the PTFE-seat. In combination with the line pressure a bidirectional sealing against the design pressure is obtained.

Fire safe design
- After a fire, when the PTFE-seat ring has burned away, the secondary metal seat gives bidirectional sealing. This sealing systems meets the fire test requirement

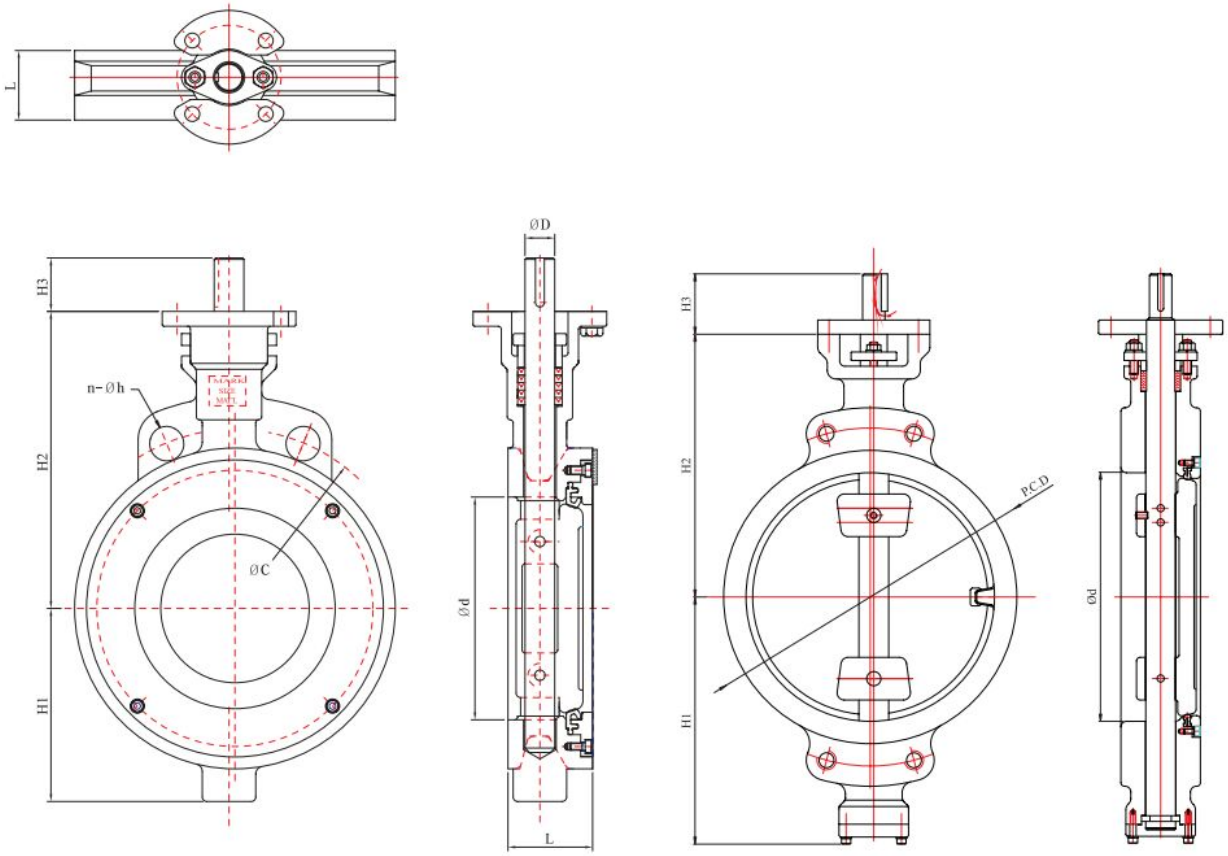
APPLICATIONS
Fire-safe installations, abrasives, slurries, steam

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 gear operated
- valve with pneumatic actuator
- valve with 10position lever operated
- valve with electric actuator
- valve with hydraulic actuator

WOD Series High-Performance Butterfly Valve / Wafer Type Dimention



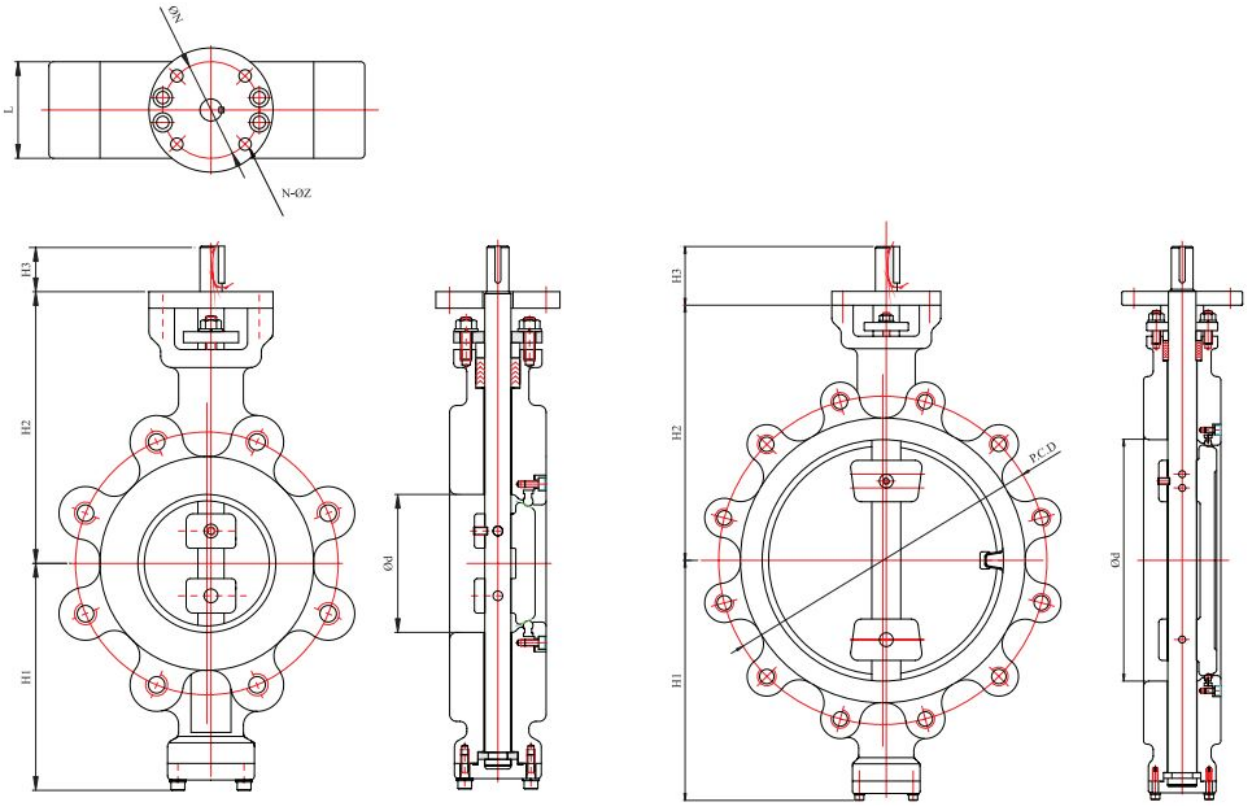
VALVE DIMENSIONS

unit : mm

SIZE		Ød	L		H1	H2	H3	ØD	TOP FLANGE TYPE	JIS 10K			ANSI 150LB			BS 4504 PN10			WEIGHT (APPROX.) (kg)
inch	mm		#150	#300						ØC	n	h	ØC	n	h	ØC	n	h	
2"	50	50	43	43	60	180	35	16	F 07	120	4	19	120.5	4	19	125	4	19	4.5
2.5"	65	65	46	46	70	180	35	16	F 07	140	4	19	139.5	4	19	145	4	19	5.5
3"	80	80	48	48	75	185	35	19	F 07	150	8	19	152.5	4	19	160	8	19	9.0
4"	100	100	54	54	100	200	35	19	F 07	175	8	19	190.5	8	19	180	8	19	10.0
5"	125	125	57	57	110	215	35	20	F 07	210	8	23	216.0	8	22	210	8	19	13.0
6"	150	150	57	59	130	235	35	20	F 07	240	8	23	241.5	8	22	240	8	23	17.0
8"	200	200	64	73	150	255	50	25	F 10	290	12	23	298.5	8	22	295	8	23	26.0
10"	250	250	71	83	245	300	50	32	F 10	355	12	25	362.0	12	25	350	12	23	40.0
12"	300	300	81	92	285	320	50	32	F 10	400	16	M22	432.0	12	25	400	12	23	68.0
14"	350	350	92	117	342	440	80	42	F 14	445	16	M22	476.0	12	29	460	16	M20	93.0
16"	400	400	102	133	380	460	80	42	F 14	510	16	M24	539.5	16	1"	515	16	M24	121.0
18"	450	450	114	149	402	492	120	50	F 16	565	20	M24	578.0	16	1 1/2	565	20	M24	144.0
20"	500	500	127	159	432	552	120	50	F 16	620	20	M24	635.0	20	1 1/2	620	20	M24	160.0
22"	550	550	154	159	465	572	120	65	F 16	680	20	M30	692.2	20	1 1/1	-	-	-	228.0
24"	600	600	154	181	510	610	120	65	F 16	730	24	M30	749.5	20	1 1/1	725	20	M27	284.0
26"	650	650	165	-	540	630	120	65	F 16	780	24	M30	806.5	24	1 1/1	-	-	-	327.0
28"	700	700	165	-	570	665	120	65	F 25	840	24	M30	863.5	28	1 1/1	840	24	M27	388.0
30"	750	750	190	-	595	695	140	80	F 25	900	24	M30	914.5	28	1 1/1	-	-	-	462.0
32"	800	800	190	-	640	740	140	80	F 25	950	28	M30	978.0	28	1 1/2	950	24	M30	607.0
36"	900	900	203	-	705	800	140	90	F 25	1050	28	M30	1086.0	32	1 1/2	1050	28	M30	860.0
40"	1000	1000	216	-	675	865	140	90	F 25	1160	28	M36	1200.0	36	1 1/2	1160	28	M33	1180.0
44"	1100	1100	254	-	830	925	170	120	F 30	1270	28	M36	1314.5	40	1 1/2	-	-	-	1460.0
48"	1200	1200	254	-	890	990	170	120	F 30	1380	32	M36	1422.4	44	1 1/2	1380	32	M36	1800.0
56"	1400	1400	280	-	950	1160	180	140	F 30	-	-	-	1651	48	1 1/3	1590	36	M39	2045.0
64"	1600	1600	360	-	1100	1260	180	140	F 35	-	-	-	-	-	-	1820	40	M45	2570.0
72"	1800	1800	360	-	1200	1370	200	170	F 35	-	-	-	2095.5	60	1 1/3	2020	44	M45	2895.0
80"	2000	2000	400	-	1275	1450	220	170	F 40	-	-	-	2230	48	1 1/3	2230	48	M45	3120.0

Specification and design are subject to change without notice

WLOD Series High-Performance Butterfly Valve / Lug Type Dimention



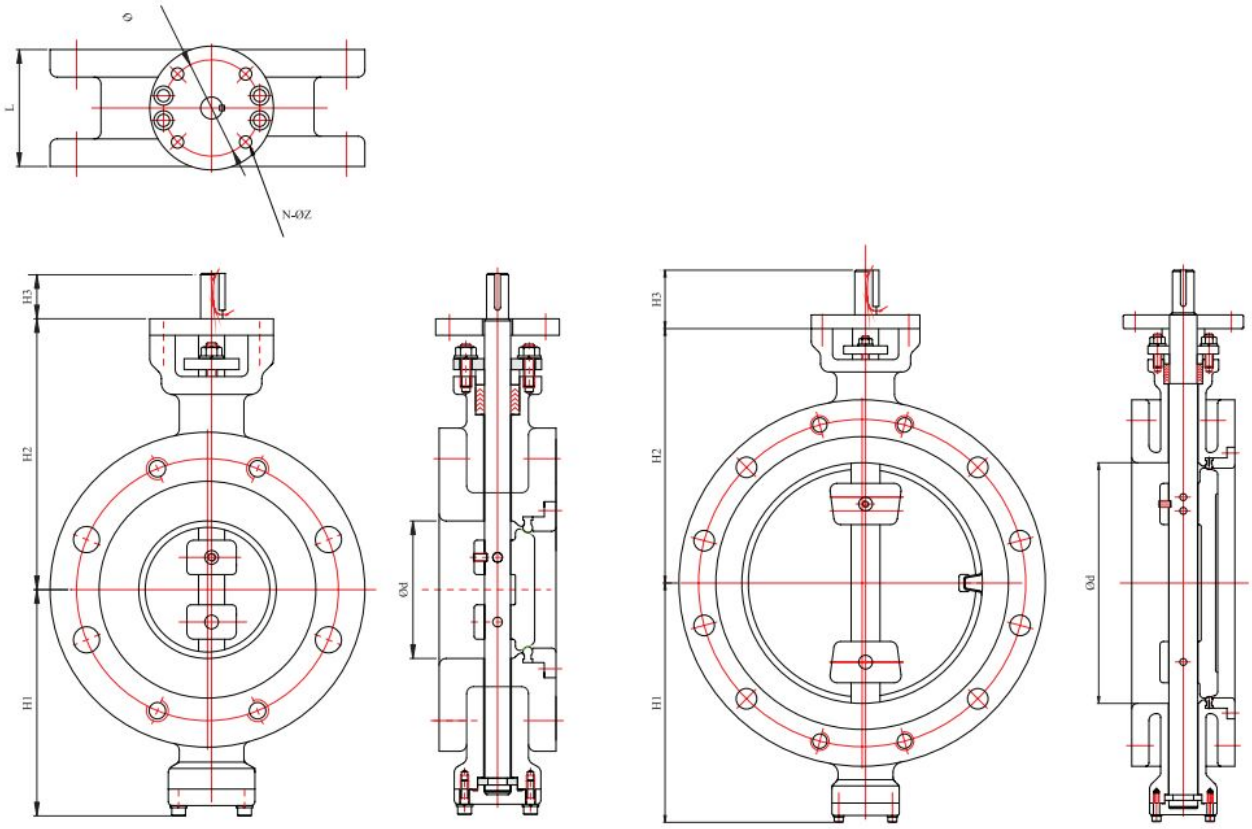
VALVE DIMENSIONS

unit : mm

SIZE		Ød	L		H1	H2	H3	D	TOP FLANGE TYPE	JIS 10K			ANSI 150LB			BS 4504 PN10			WEIGHT (APPROX.) (kg)
inch	mm		#150	#300						C	n	h	C	n	h	C	n	h	
2"	50	50	43	43	115	182	45	16	F 07	120	4	19	120.5	4	19	125	4	M16	4.5
2.5"	65	65	46	46	130	200	45	16	F 07	140	4	19	139.5	4	19	145	4	M16	5.5
3"	80	80	48	48	140	215	45	19	F 07	150	8	19	152.5	4	19	160	8	M16	9.0
4"	100	100	54	54	160	232	45	19	F 07	175	8	19	190.5	8	19	180	8	M16	10.0
5"	125	125	57	57	185	245	45	20	F 07	210	8	23	216.0	8	22	210	8	M16	13.0
6"	150	150	57	59	190	260	45	20	F 07	240	8	23	241.5	8	22	240	8	M20	17.0
8"	200	200	64	73	220	292	65	25	F 10	290	12	23	298.5	8	22	295	8	M20	26.0
10"	250	250	71	83	270	353	65	32	F 10	355	12	25	362.0	12	25	350	12	M20	40.0
12"	300	300	81	92	300	372	65	32	F 10	400	16	M22	432.0	12	25	400	12	M20	68.0
14"	350	350	92	117	342	440	80	42	F 14	445	16	M22	476.0	12	29	460	16	M20	93.0
16"	400	400	102	133	380	460	80	42	F 14	510	16	M24	539.5	16	1"	515	16	M24	121.0
18"	450	450	114	149	402	492	120	50	F 16	565	20	M24	578.0	16	1⅓	565	20	M24	144.0
20"	500	500	127	159	432	552	120	50	F 16	620	20	M24	635.0	20	1⅓	620	20	M24	160.0
22"	550	550	154	159	465	572	120	65	F 16	680	20	M30	392.2	20	1⅓	-	-	-	228.0
24"	600	600	154	181	510	610	120	65	F 16	730	24	M30	749.5	20	1⅓	725	20	M27	284.0
26"	650	650	165	-	540	630	120	65	F 16	780	24	M30	806.5	24	1⅓	-	-	-	327.0
28"	700	700	165	-	570	665	120	65	F 25	840	24	M30	863.5	28	1⅓	840	24	M27	388.0
30"	750	750	190	-	595	695	140	80	F 25	900	24	M30	914.5	28	1⅓	-	-	-	462.0
32"	800	800	190	-	640	740	140	80	F 25	950	28	M30	978.0	28	1½	950	24	M30	607.0
36"	900	900	203	-	705	800	140	90	F 25	1050	28	M30	1086.0	32	1½	1050	28	M30	860.0
40"	1000	1000	216	-	675	865	140	90	F 25	1160	28	M36	1200.0	36	1½	1160	28	M33	1180.0
44"	1100	1100	254	-	830	925	170	120	F 30	1270	28	M36	1314.5	40	1½	-	-	-	1460.0
48"	1200	1200	254	-	890	990	170	120	F 30	1380	32	M36	1422.4	44	1½	1380	32	M36	1800.0
56"	1400	1400	280	-	950	1160	180	140	F 30	-	-	-	1651	48	1⅓	1590	36	M39	2045.0
64"	1600	1600	360	-	1100	1260	180	140	F 35	-	-	-	-	-	-	1820	40	M45	2570.0
72"	1800	1800	360	-	1200	1370	200	170	F 35	-	-	-	2095.5	60	1⅓	2020	44	M45	2895.0
80"	2000	2000	400	-	1275	1450	220	170	F 40	-	-	-	2230	48	1⅓	2230	48	M45	3120.0

Specification and design are subject to change without notice

FEOD Series High-Performance Butterfly Valve / Flanged Type Dimention



VALVE DIMENSIONS

unit : mm

SIZE		d	L		H1	H2	H3	D	TOP FLANGE TYPE	JIS 10K			ANSI 150LB			BS 4504 PN10			WEIGHT (APPROX.) (kg)
inch	mm		#150	#300						C	n	h	C	n	h	C	n	h	
2"	50	50	108	108	115	182	45	16	F 07	120	4	19	120.5	4	19	125	4	19	4.5
2.5"	65	65	112	112	130	200	45	16	F 07	140	4	19	139.5	4	19	145	4	19	5.5
3"	80	80	114	180	140	215	45	19	F 07	150	8	19	152.5	4	19	160	8	19	9.0
4"	100	100	127	190	160	232	45	19	F 07	175	8	19	190.5	8	19	180	8	19	10.0
5"	125	125	140	190	185	245	45	20	F 07	210	8	23	216.0	8	22	210	8	19	13.0
6"	150	150	140	210	190	260	45	20	F 07	240	8	23	241.5	8	22	240	8	23	17.0
8"	200	200	152	230	220	292	65	25	F 10	290	12	23	298.5	8	22	295	8	23	26.0
10"	250	250	165	250	270	353	65	32	F 10	355	12	25	362.0	12	25	350	12	23	40.0
12"	300	300	178	270	300	372	65	32	F 10	400	16	M22	432.0	12	25	400	12	23	68.0
14"	350	350	190	290	342	440	80	42	F 14	445	16	M22	476.0	12	29	460	16	M20	93.0
16"	400	400	216	310	380	460	80	42	F 14	510	16	M24	539.5	16	1"	515	16	M24	121.0
18"	450	450	222	330	402	492	120	50	F 16	565	20	M24	578.0	16	1/3	565	20	M24	144.0
20"	500	500	229	350	432	552	120	50	F 16	620	20	M24	635.0	20	1/1	620	20	M24	160.0
22"	550	550	229	350	465	572	120	65	F 16	680	20	M30	392.2	20	1/1	-	-	-	228.0
24"	600	600	267	390	510	610	120	65	F 16	730	24	M30	749.5	20	1/1	725	20	M27	284.0
26"	650	650	267	410	540	630	120	65	F 16	780	24	M30	806.5	24	1/1	-	-	-	327.0
28"	700	700	292	430	570	665	120	65	F 25	840	24	M30	863.5	28	1/1	840	24	M27	388.0
30"	750	750	292	450	595	695	140	80	F 25	900	24	M30	914.5	28	1/1	-	-	-	462.0
32"	800	800	318	470	640	740	140	80	F 25	950	28	M30	978.0	28	1/2	950	24	M30	607.0
36"	900	900	330	510	705	800	140	90	F 25	1050	28	M30	1086.0	32	1/2	1050	28	M30	860.0
40"	1000	1000	410	550	675	865	140	90	F 25	1160	28	M36	1200.0	36	1/2	1160	28	M33	1180.0
44"	1100	1100	410	550	830	925	170	120	F 30	1270	28	M36	1314.45	40	1/2	-	-	-	1460.0
48"	1200	1200	470	630	890	990	170	120	F 30	1380	32	M36	1422.4	44	1/2	1380	32	M36	1800.0
56"	1400	1400	280	950	950	1160	180	140	F 30	-	-	-	1651	48	1/3	1590	36	M39	2045.0
64"	1600	1600	360	1100	1100	1260	180	140	F 35	-	-	-	-	-		1820	40	M45	2570.0
72"	1800	1800	360	1200	1200	1370	200	170	F 35	-	-	-	2095.5	60	1/3	2020	44	M45	2895.0
80"	2000	2000	400	1275	1275	1450	220	170	F 40	-	-	-	2230	48	1/3	2230	48	M45	3120.0

Specification and design are subject to change without notice

Triple Offset Metal Seated Butterfly Valves

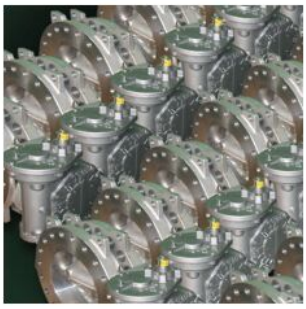
UNI-directional tight shut off at full rated pressure.

Figure Number Abbreviation

- **WTOM Series** Triple Offset wafer type metal seated butterfly valve
- **WLTOM Series** Triple Offset lug type metal seated butterfly valves
- **FETOM Series** Triple Offset flange type metal seated butterfly valves

Standard Compliance

- Conform to API 609, ISO 5752, BS 5155, and MSS SP 67
- Firesafe requirement meets BS 6755 part 2 / API6FA and API Std 607 4th edition.



Production Range

- SIZE : 50mm(2inch) ~ 2000mm(80inch)
- Working Pressure : Maximum 2220psi (156Kg/)
  (Standard) upto 25 bar for DN 80 ~ DN 600
  upto 16 bar for DN 650 ~ DN 1000
  upto 10 bar for DN 1200 ~ DN 2000
- Working Temperature : -29℃ ~ +538℃(Standard)
  -100℃ ~ +700℃(Seleciton Meterial)

Connection Flange

- BS4504 PN10, PN16, PN25 and PN40 / DIN2501 PN10, PN16, PN25 and PN40 /
- ANSI B16.5, 16.47 / 150LB, 300LB, 600LB and 900LB / MSS SP44 CL / 150LB, 300LB, 600LB, 900LB
- ISO 2531 PN10, PN16, PN25 and PN40 / KS/JIS 10K, 16K & 20K / 30K / 40K

Face to Face Dimensions

- Conform to API609, BS 5155, ISO 5752 and ANSI B 16.34

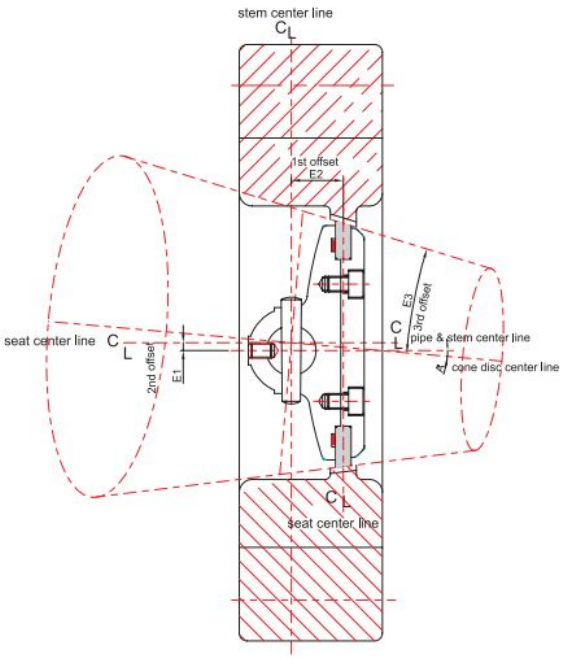
Application

- Nuclear power Plants
- Petroleum refinery
- Fire safe line
- Cryogenic services
- Petrochemical plants
- Fossil power plants
- Exhaust gas line & Steam line

Triple Offset Metal Seated Butterfly Valves

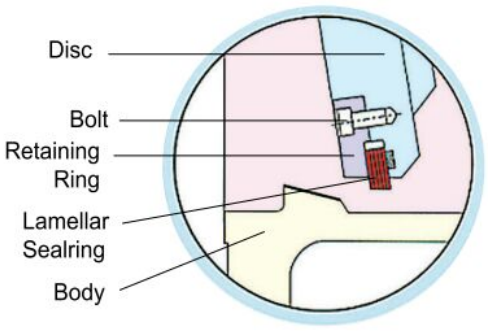
Standard Specificaiton

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.

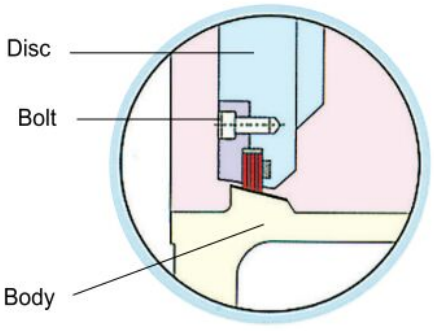


Design	: API 609, BS 5155, ANSI B16.34 and DIN 3840
Pressure Class	: Class 150, 300, 600, 900, 1500, 2500
Body Styles	: Lugged, Wafer, Double Flange, Butt Weld
Material	: Carbon Steel (ASTM A216-WCB) Stainless Steel (ASTM A351-CF8M) NI-Albronze(ASTM B 148-C95800) Other material on request
Pressure Test	: Shell test, seat test API 598 Seat leakage rate API 598, ISO 5208 Rate A ANSI B16.104 (ANSI/FCI 70.2) Class VI
Firesafe	: Certified firesafe to BS 6755 Part 2 / API 6FA and API 607
Marking	: API 609, MSS SP-25
Operators	: API 609, MSS SP-25 - Manual operation - Hydraulic operation (driven by oil cylinder or oil motor) - Pnenumatic operation (driven by pnenumatic syslinder) - Electirc motor operation

Design Features



OPEN



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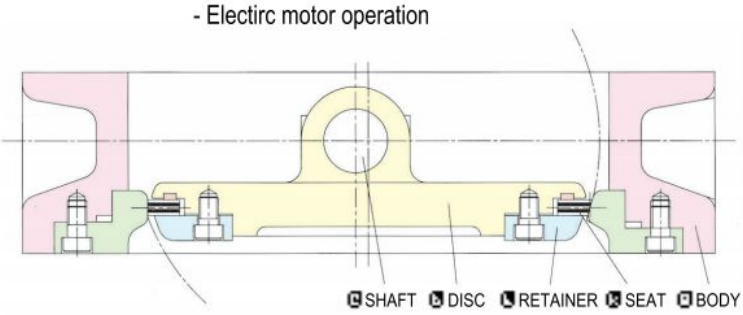
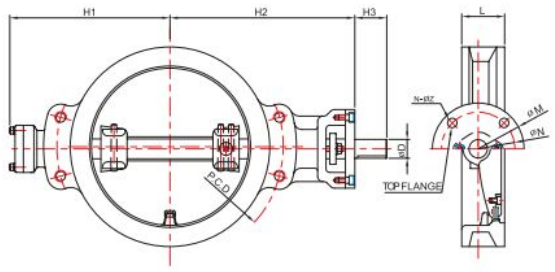


Construction and Material

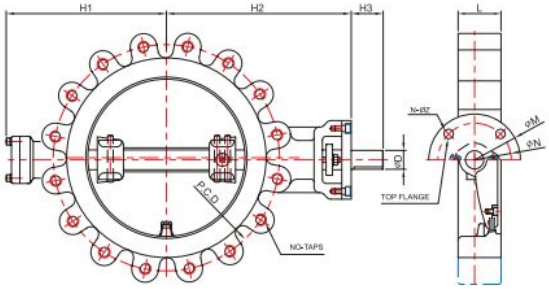
P.NO.	PART NAME	MATERIAL
1	BODY	A216 WCB/A351 CF8M
2	DISC	A216 WCB/A351 CF8M
3	SEAT	LAMINATED STAINLESS STEEL+GRAPHITE
4	SHAFT	STAINLESS STEEL (316/630/420/410/ETC)
5	RETAINER	STAINLESS STEEL (304/316/316L)

TQ Series Triple Offset Metal Seated Butterfly Valves

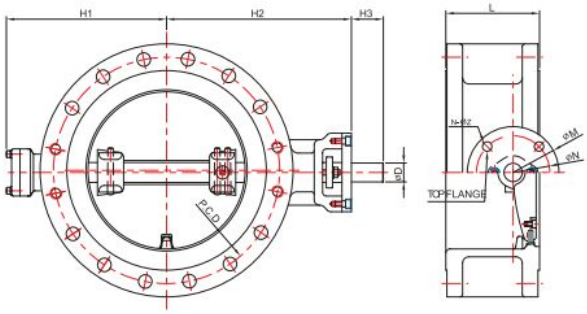
Class 150LB / Wafer Lug Flange Type Dimension Table



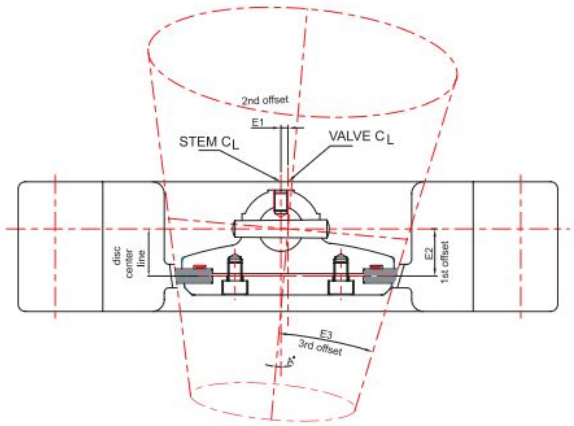
WAFER TYPE



LUG TYPE



FLANGE TYPE



DESIGN

VALVE DIMENSIONS

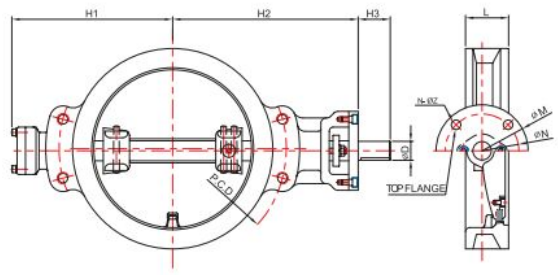
unit : mm

SIZE		L			H1	H2	H3	ØD	TOP FLANGE			
inch	mm	Wafer	Lug	Flange					TYPE	N	ØM	N ØZ
4"	100	54	54	127	160	190	45	19	F 07	70	90	4-9
5"	125	57	57	140	185	210	45	19	F 07	70	90	4-9
6"	150	57	57	140	200	230	45	22	F 07	70	90	4-9
8"	200	64	64	152	220	260	60	25	F 10	102	125	4-12
10"	250	71	71	165	265	310	60	32	F 10	102	125	4-12
12"	300	81	81	178	300	350	75	32	F 14	140	175	4-18
14"	350	92	92	190	340	385	75	42	F 14	140	175	4-18
16"	400	102	102	216	380	440	75	42	F 16	165	210	4-22
18"	450	114	114	222	400	480	100	50	F 16	165	210	4-22
20"	500	127	127	229	440	495	100	50	F 16	165	210	4-22
24"	600	154	154	267	100	560	100	65	F 16	165	210	4-22
26"	650	165	165	292	540	630	100	65	F 25	254	300	8-18
28"	700	165	165	292	560	660	100	65	F 25	254	300	8-18
30"	750	190	190	318	610	690	150	80	F 25	254	300	8-18
32"	800	190	190	318	640	730	150	80	F 30	298	350	8-23
36"	900	203	203	330	700	800	150	90	F 30	298	350	8-23
40"	1000	216	216	410	765	860	150	100	F 35	356	415	8-33
44"	1100	240	240	470	830	925	180	120	F 35	356	415	8-33
48"	1200	254	254	470	890	990	180	120	F 40	406	475	8-39

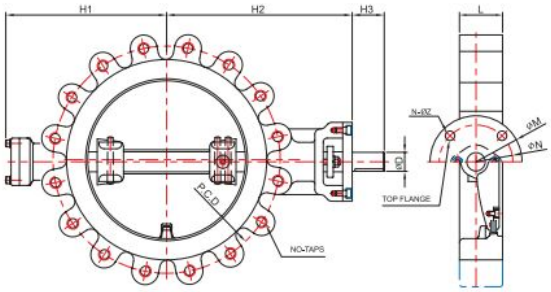
Specification and design are subject to change without notice

TO Series Triple Offset Metal Seated Butterfly Valves

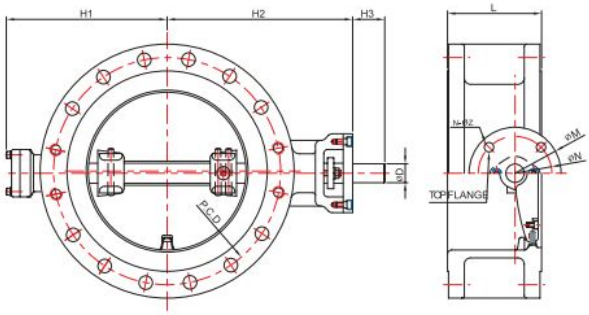
➧ Class 300LB / Wafer Lug Flange Type Dimension Table



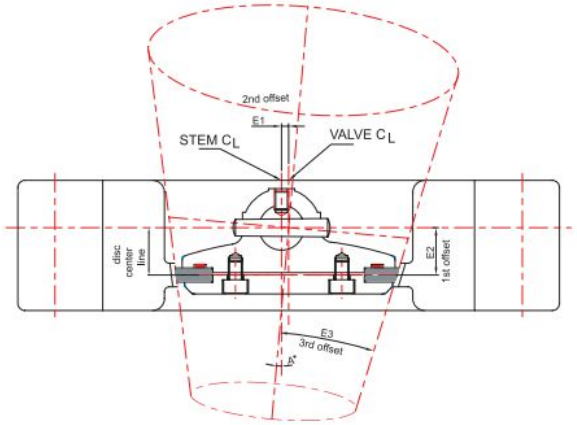
WAFER TYPE



LUG TYPE



FLANGE TYPE



DESIGN

VALVE DIMENSIONS

unit : mm

SIZE		L			H1	H2	H3	ØD	TOP FLANGE			
inch	mm	Wafer	Lug	Flange					TYPE	ØN	M	N ØZ
4"	100	54	54	190	170	210	45	19	F 07	70	90	4-9
5"	125	59	59	210	190	220	45	19	F 07	70	90	4-9
6"	150	61	61	210	220	250	45	25	F 07	70	90	4-9
8"	200	73	73	230	245	300	60	32	F 10	102	125	4-12
10"	250	83	83	250	290	340	60	35	F 10	102	125	4-12
12"	300	92	92	270	315	380	75	35	F 14	140	175	4-18
14"	350	117	117	290	360	400	75	45	F 14	140	175	4-18
16"	400	133	133	310	390	480	75	45	F 16	165	210	4-22
18"	450	149	149	330	430	510	100	60	F 16	165	210	4-22
20"	500	159	159	350	470	570	100	60	F 16	165	210	4-22
24"	600	182	182	390	540	640	100	75	F 25	254	300	8-18
26"	650	182	182	410	570	660	100	75	F 25	254	300	8-18
28"	700	210	210	430	630	710	100	75	F 30	298	350	8-23
30"	750	210	210	450	660	740	150	100	F 30	298	350	8-23
32"	800	210	210	470	680	770	150	100	F 35	356	415	8-33
36"	900	227	227	510	750	840	150	120	F 35	356	415	8-33
40"	1000	245	245	550	770	870	150	120	F 40	406	475	8-39
44"	1100	305	305	550	880	965	180	150	F 40	406	475	8-39
48"	1200	308	308	630	920	1020	180	150	F 40	406	475	8-39

Specification and design are subject to change without notice

Torquest Required To Operate High-performance Butterfly Valves

TORQUE TABLE

unit : kg-m/Nm/ft-lb

mm	inch	Working Pressure								
		5 bar			10 bar			16 bar		
		kg-m	Nm	ft-lb	kg-m	Nm	ft-lb	kg-m	Nm	ft-lb
50	2	0.95	9.31	6.87	1.16	11.32	8.39	1.80	17.65	127.68
65	2.5	1.40	13.72	10.13	1.89	18.52	13.67	2.31	22.65	163.85
80	3	2.05	20.09	14.83	2.86	27.99	20.69	4.03	39.52	285.85
100	4	3.70	36.26	26.76	4.87	47.75	35.22	6.38	62.57	452.54
125	5	6.50	63.70	47.01	7.98	78.20	57.72	10.50	102.97	744.78
150	6	11.00	107.80	79.56	15.54	152.29	112.40	21.00	205.94	1489.55
200	8	24.50	240.10	177.21	28.56	279.89	206.57	35.28	345.98	2502.45
250	10	32.00	313.60	231.46	44.52	436.30	322.01	54.60	535.44	3872.84
300	12	43.50	426.30	314.63	60.48	592.70	437.45	91.56	897.89	6494.45
350	14	62.00	607.60	448.45	86.52	847.90	625.80	128.52	1260.35	9116.07
400	16	83.00	813.40	600.34	115.92	1136.06	838.45	173.04	1696.94	12273.92
450	18	99.50	975.10	716.07	150.36	1473.53	1087.55	230.16	2257.09	16325.50
500	20	129.00	1264.20	933.06	210.00	2058.00	1518.93	299.88	2940.81	21270.82
600	24	223.00	2185.40	1612.96	328.44	3218.71	2375.60	496.44	4868.40	35213.04
700	28	335.00	3283.00	2423.05	483.84	4741.63	3499.61	733.32	7191.39	52015.20
800	32	480.80	4711.84	3477.62	677.04	6634.99	4897.02	1030.68	10107.48	73107.28

▶ 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.

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

$Ts = CsD^2$

$Tb = 4.17D^2dfP$

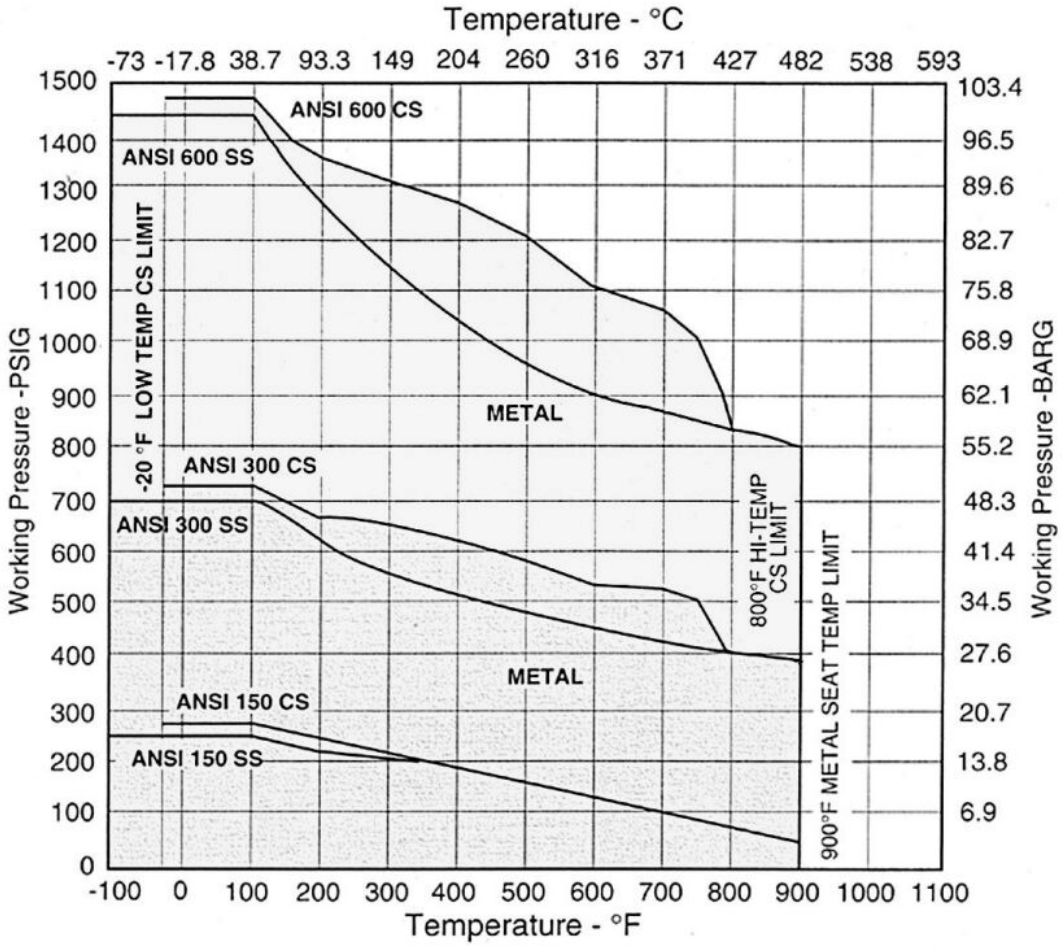
$Td = CtD^3P$

$Th = 3.06D^4$

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

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

ANSI B16.34 Body & Flowseal Metal Seat Pressure - Temperature Ratings



The heavy lines define the ratings of the carbon steel and stainless steel valve body(or"shell")in conformance to ANSI B16.34. The shaded areas define the rating of the metal seat.
Seat rating are based on differential pressure with the disc in fully closed position.

TYPICAL METAL SEAT SPECIFICATION

1.0 Scope

This specification covers the design and testing of high pressure triple offset seat butterfly valves.

2.0 Applicable Standards

The following standards shall apply

ISO 5752: Metal Valves for use in Flanged Pipe Systems- Face-to-Face and Centre-to-Face Dimensions

ISO 5208: Testing of Valves

ISO 5209: Marking of General Purpose Industrial Valves

BS 4504: Circular Flanges for Pipes, Valves and Fittings

API 598: Valve inspections and Testing

API 607: Fire Test for Soft-Seated Quarter-turn Valves

API 609: Butterfly Valve Wafer and Lug type

3.0 Design Requirement

3.1 Valves shall be High Performance Butterfly with triple offset seat and eccentric shaft. They shall be capable of Class IV sealing in either flow direction.

3.2 Valve seat shall be both self and pressure energized

3.3 Valve shall have retained top and bottom bearings.

3.4 Shaft design shall be single or dual piece

3.5 Retainer rings must be recessed in the body so that the line gasket prevents any potential external leakage

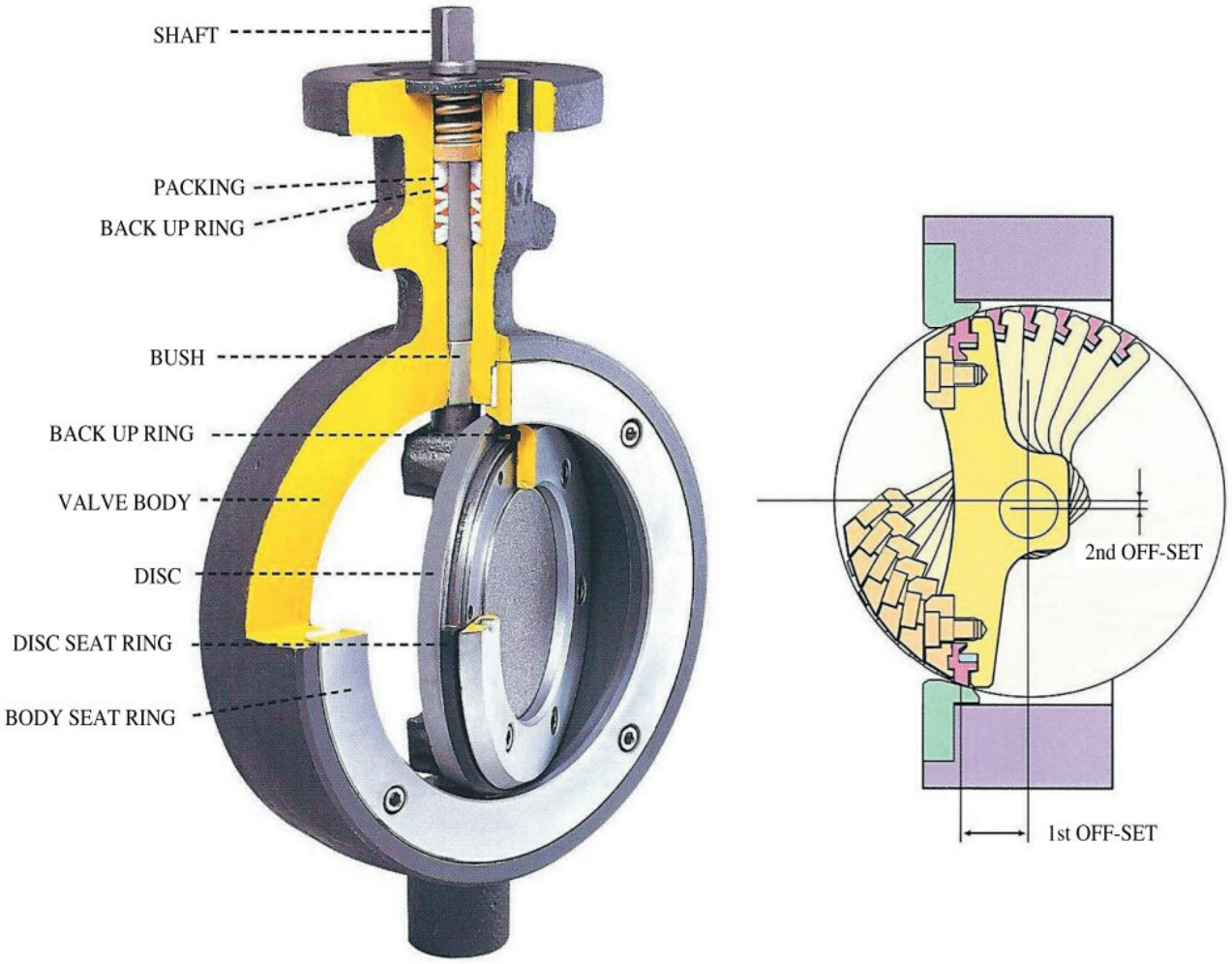
4.0 Inspection and Test

5.1 Valves shall be hydrostatically shell tested per ISO5208

5.2 Valves shall be seat tested per ANSI/FCI 70-2, class IV

WODT Series : Off Set Type HP Butterfly Valve(For Steam)

VALVE BODY STRUCTURE

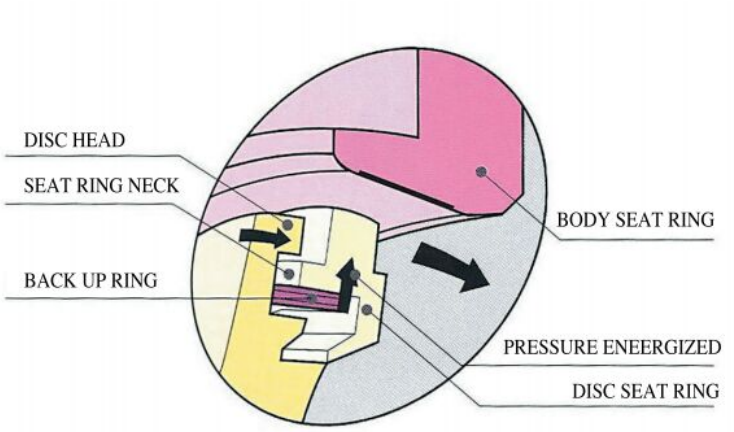


Double Eccentric Disc	Shaft	Packing / Back Up Ring	Bush
Rotating without contact with body ring provides long life time.	Solid single piece stainless steel	Stainless steel reinforced PTFE or Graphite practices maintenance free operation.	Oil impregnated low friction bearing.

Valve Body	Disc	Disc Ring / Back Up Ring	Body Seat Ring
Compact and light weight wafer type provides low cost and space utility.	Tapered pin fixed double eccentric disc rotates with minimum friction of each seat ring.	Stainless steel back up ring reinforced seat ring keep constant spherical figure with no regard to the expansion or contraction of disc.	Stainless steel seat ring provides tight shut off with disc seat ring with no regard to thermal deformation of valve body.

WODT Series : Off Set Type HP Butterfly Valve (For Steam)

Characteristic



Standard OS HP Butterfly valve is designed for medium low pressure and temperature 9(15BarG/203℃) ratings using carbon filed TFE.

Unique construction of dual seat ring provides excellent endurance to the thermal deformations of body, valve disc and seatring.

This enables OS HP Butterfly valve to be applied to medium low pressure saturated steam shut off service.

Specifications

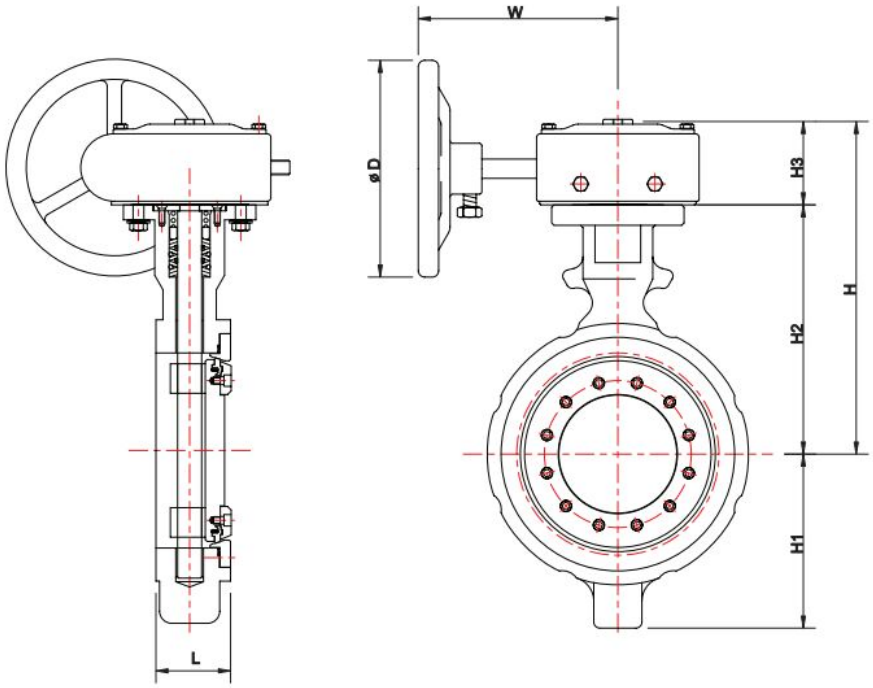
P / T Rating	20kg/㎠/40℃ ~ 16kg/㎠/203℃
Velocity (max)	49m/sec (constant)
Flow Characteristics	Standard
Tightness	ANSI Class VI (Soft Seated)
Operating	Quarter Turn Single Acting & Double Acting
Rangeability	15 : 1
End Connection	JIS 10K, 20K WAFER

CV VALUE

Size(mm) / Opening	50	65	80	100	125	150	200	250	300	350	400	450	500	600
20%	7	13	21	38	62	90	169	268	384	552	720	944	1144	1400
30%	12	22	36	67	108	158	295	470	670	966	1260	1650	2000	2100
40%	19	35	57	105	169	248	646	737	1060	1520	1980	2600	3150	3300
50%	29	54	88	161	262	383	717	1140	1630	2350	3060	4012	4860	5190
60%	41	77	125	228	370	540	1012	1610	2300	3312	4320	5660	6860	7345
100%	85	160	260	475	770	1125	2110	3350	4800	6900	9000	11800	14300	18500

WODT Series : Off Set Type HP Butterfly Valve (For Steam)

CONSTRUCTION & DIMENSION



No	PART NAME	Q'ty	MATERIAL
01	GEAR BOX	1	ALDC / CI / DI
02	PACKING SPRING	1	SWP
03	BUSHING	1	BsBD / PTFE
04	PACKING	1	PTFE
05	BODY RETAINER	1	SUS304
06	DISC COVER	1	SS41+HARD Cr
07	DISC	1	SCS13
08	SHAFT	1	SUS304
09	SEAT	1	r-TFE
10	DU BEARING	1	STEEL + Carbon
11	BOTTM COVER	1	SS41
12	VALVE BODY	1	D.I/WCB/SS STEEL

RULES OF INSPECTION : KS B 2304

TEST	BODY	SEAT
METHOD	HYDRAULIC	AIR LEAKAGE
JIS 10K	15Kg/cm2	6Kg/cm2
JIS 20K	30Kg/cm2	6Kg/cm2
HOLD TIME	~50A : 15sec	~50A : 15sec
	65~200A : 60sec	65~200A : 30sec
	250A~ : 180sec	250~450A : 60sec

PAINT SPECIFICATION (MAKER STANDARD)

	1ST	2ND
PAINT NAME	EPOXY #5	URETHANE TOP
COLOR(MUNSELL No)	RED BROWN	0.2PB 4.4/1.0
D.F.T(micron)	15	20
FINAL COLOR	GRAY	
FINAL THICKNESS	35 micron	

OUTLINE DIMENSION

(unit : mm)

VALVE SIZE		L	REFERENCE					
			H1	H2	H3	H	W	ø D
125A	5"	62	124	194	70	264	170	170
150A	6"	62	144	207	70	277	170	170
200A	8"	84	171	235	70	305	170	190
250A	10"	91	205	240	70	310	170	190
300A	12"	101	278	342	110	452	295	300
350A	14"	114	306	357	110	467	295	300
400A	16"	114	338	384	110	494	295	300

Water Works Butterfly Valve

UNI-directional tight shut off at full rated pressure.

Figure Number Abbreviation

- **WOD Series** Eccentric Butterfly valves - WAFER type
- **FEOD Series** Eccentric Butterfly valve - FLANGE type

Standard Compliance

- The face to face dimension shall be in accordance with BS5155, AWWA, C504 or other STANDARDS are available upon request.
- Valve body & disc lined by rubber are available to manufacture according to customer's request.

Production Range

- SIZE : DN 50 to DN 4000 (4 inch ~ 160 inch)
- Working Pressure : upto 25 bar for DN 80 ~ DN 600
  (Standard) upto 16 bar for DN 650 ~ DN 1000
  upto 10 bar for DN 1200 ~ DN 4000
- Working Temperature : -20℃ ~ +160℃

Connection Flange

- BS4504 PN10, PN16 / DIN2501 PN10, PN16 / ANSI B 16.1 CL. 125LB & B16.5 CL. 150LB
- MSS SP44 CL. 150LB
- AWWA C207 Class D & E
- ISO 2531 PN10 PN16 / KS/JIS 10K, 16K and 20K

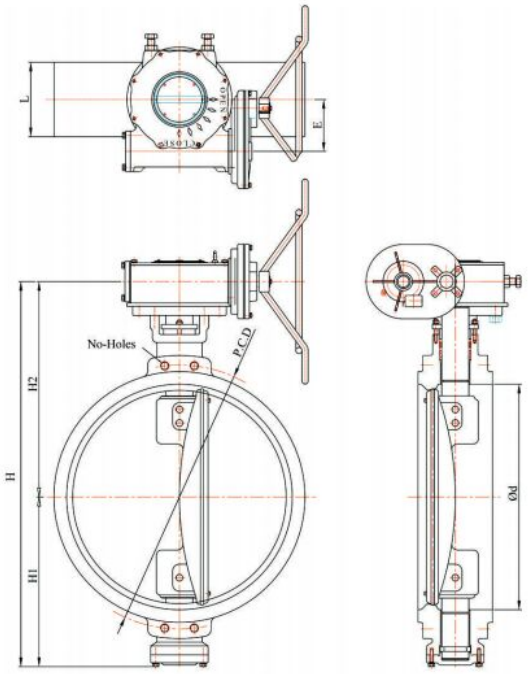
Face to Face Dimensions

- Conform to BS5155, ISO 5752, AWWA C504

Application

- Water works
- Sewage plant
- Desulination plant
- Air conditioning
- Irrugation
- Power Plant
- Heating and Ventilation
- Chemical Industry etc.
- Shipbuilding Industry
- Gas Plant

WOD Series Water Works Butterfly Valve / Water Type Dimention



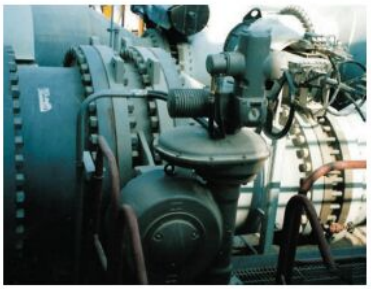
VALVE DIMENSIONS

unit : mm

SIZE		Ød	L	FLANGE (150LB)			H	H1	H2	E	WEIGHT (APPROX) (kg)
inch	mm			OD	PCD	No-Hole					
2"	50	50	43	152	120.5	4-19	325	115	210	66	7.2
3"	80	80	64	190	152.5	4-19	395	145	250	66	10
4"	100	100	64	229	190.5	8-19	427	162	265	66	39
6"	150	150	76	279	241.5	8-22	492	192	300	66	46
8"	200	200	89	343	298.5	8-22	526	209	317	80	50
10"	250	250	114	406	362	12-25	619	254	365	80	72
12"	300	300	114	483	432	12-25	692	278	414	120	81
14"	350	350	127	533	476	12-29	789	324	465	120	102
16"	400	400	140	597	539.5	16-29	844	349	495	120	128
18"	450	450	152	635	578	16-32	942	402	540	120	170
20"	500	500	152	698	635	20-32	1035	427	608	120	198
22"	550	550	170	749	692.2	20-35	1090	470	620	120	222
24"	600	600	178	813	749.5	20-35	1165	502	663	203	308
28"	700	700	229	927	863.5	28-35	1240	537	703	203	380
30"	750	750	230	984.5	914.5	28-35	1325	575	750	203	570
32"	800	800	241	1060.5	978	28-41	1370	605	765	203	730
36"	900	900	300	1168	1086	32-41	1512	682	830	203	880
40'	1000	1000	300	1289	1200	36-41	1710	752	958	203	1040
44"	1100	1100	350	1403	1314	40-41	1800	800	1000	203	1195
48"	1200	1200	350	1511	1422	44-41	1945	865	1080	203	1410
52"	1300	1300	350	1625	1537	44-47	2060	920	1140	270	1780
54"	1350	1350	350	1683	1594	44-48	2140	940	1200	270	2100
56"	1400	1400	390	1746	1651	48-48	2217	956	1261	270	2400
60"	1500	1500	390	1854	1759	52-48	2360	1050	1310	270	2800
64"	1600	1600	440	-	-	-	2500	1120	1380	270	3500
66"	1650	1650	440	2032	1930.4	52-48	2630	1180	1450	270	3900
72"	1800	1800	490	2197	2095.5	60-48	2740	1230	1510	550	4450
80"	2000	2000	540	2325	2230	48-48	2890	1290	1600	550	5830
84"	2100	2100	540	2534	2425.7	64-57	2950	1330	1620	550	6560
96"	2400	2400	650	2876.5	2756	68-70	4155	1980	2175	550	10600
112"	2800	2800	650	NOTE			4650	2145	2495	700	18500
120"	3000	3000	800	For 2800A and large			5600	2695	2985	700	23800
140"	3500	3500	850	It is available upon request			6600	3145	3440	700	28800
160"	4000	4000	900				7450	3590	3800	700	34900

Specification and design are subject to change without notice

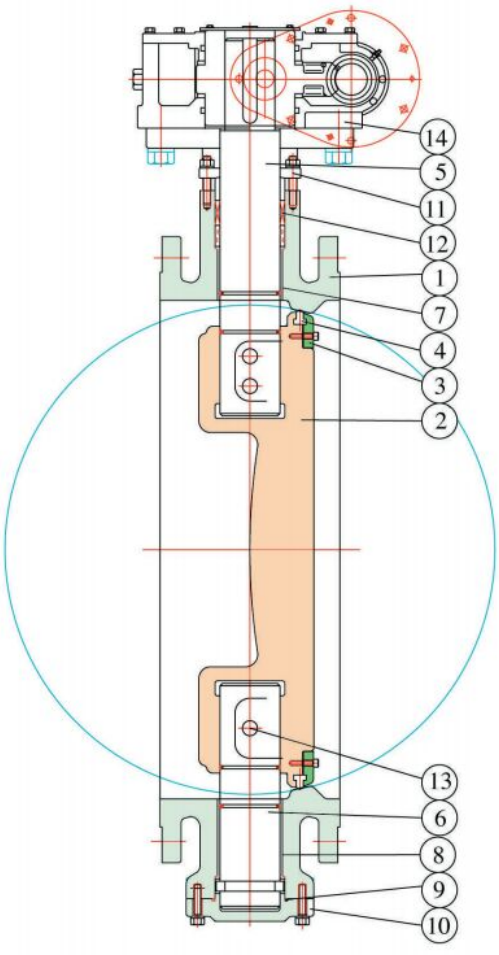
Water Works Butterfly Valve



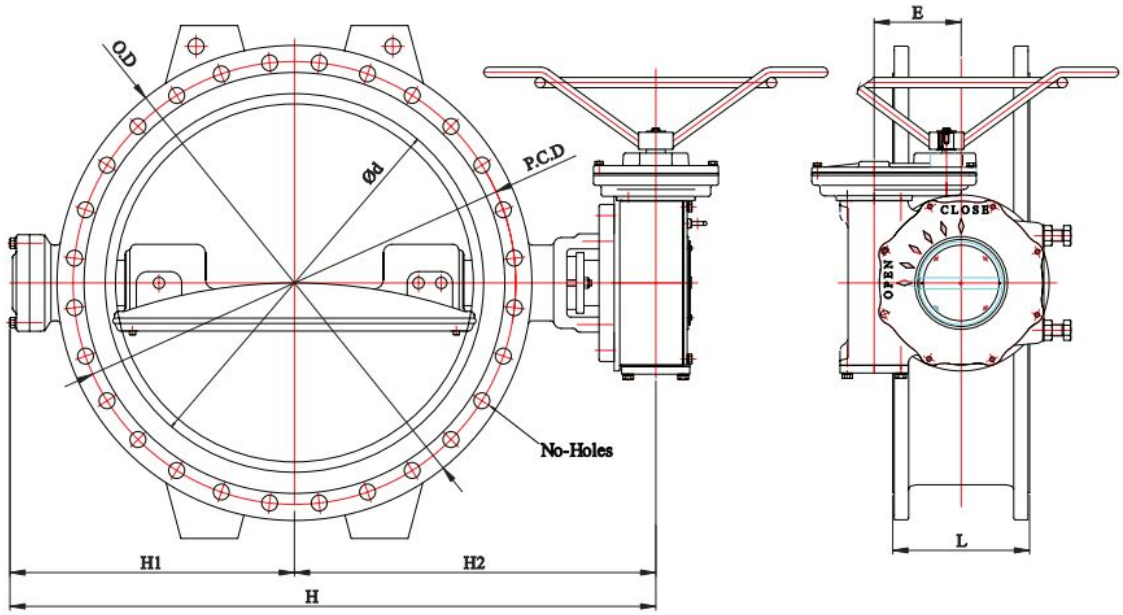
Schema of Eccentric type

- Basic Design : AWWA C-504 or BS 5155
- Employs an advanced lining procedure, this valves be designed and manufactured in accordance with AWWA C-504 or BS 5155 for use in corrosive service, that is, circulating water service, condenser partititon and condenser isolation for the Electric Utilities, Seawater Applications, Desalination plants, Chemical Processes, and so on. Operation is easy and suited for heavy duty services.
- The valve shall be capable of bi-directional sealing
- Valves are constructed with rugged shaft and bearing with self lubrication, and operate with low torque.
- Wide variety of body materials available.

No	PART NAME	METERIAL
1	BODY	Ductile iron / Cast steel Stainless steel / Ni-AL Bronze
2	DISC	Stainless steel / Ductile iron Ni-AL Bronze
3	RETAINER	Cast steel Stainless steel / Ni-AL Bronze
4	SEAT	NBR. EPDM. VITON
5	UPPER-STEM	Stainless steel (304, 316, 316L, 630(17-4PH), Super duplex, monel)
6	LOWER-STEM	Stainless steel (304, 316, 316L, 630(17-4PH), Super duplex, monel)
7	BEARING	Oilless Bearing
8	BEARING	Oilless Bearing
9	GASKET	Non ASBESTOS / O-RING
10	BOTTOM COVER	Ductile iron / Cast steel Stainless steel / Ni-AL Bronze
11	PACKING GLAND	Ductile iron / Cast steel Stainless steel / Ni-AL Bronze
12	PACKING	PTFE, GRAPHITE, Rubber
13	DISC PIN	Stainless steel
14	GEAR BOX	ASS'Y



FEOD Series : Water Works Butterfly Valve / Flanged Type Dimention



VALVE DIMENSIONS

unit : mm

SIZE		Ø d	L	FLANGE (150LB)			H	H1	H2	E	WEIGHT (APPROX) (kg)
inch	mm			OD	PCD	No-Hole					
2"	50	50	43	152	120.5	4-19	325	115	210	66	9.5
3"	80	80	64	190	152.5	4-19	395	145	250	66	15
4"	100	100	127	229	190.5	8-19	427	162	265	66	52
6"	150	150	127	279	241.5	8-22	492	192	300	66	61
8"	200	200	153	343	298.5	8-22	526	209	317	80	68
10"	250	250	203	406	362	12-25	619	254	365	80	99
12"	300	300	203	483	432	12-25	692	278	414	120	110
14"	350	350	203	533	476	12-29	789	324	465	120	134
16"	400	400	203	597	539.5	16-29	844	349	495	120	170
18"	450	450	203	635	578	16-32	942	402	540	120	230
20"	500	500	203	698	635	20-32	1035	427	608	120	266
22"	550	550	203	749	692.2	20-35	1090	470	620	120	298
24"	600	600	203	813	749.5	20-35	1165	502	663	203	410
28"	700	700	203	927	863.5	28-35	1240	537	703	203	510
30"	750	750	305	984.5	914.5	28-35	1325	575	750	203	758
32"	800	800	305	1060.5	978	28-41	1370	605	765	203	980
36"	900	900	305	1168	1086	32-41	1512	682	830	203	1180
40'	1000	1000	305	1289	1200	36-41	1710	752	958	203	1395
44"	1100	1100	305	1403	1314	40-41	1800	800	1000	203	1588
48"	1200	1200	381	1511	1422	44-41	1945	865	1080	203	1890
52"	1300	1300	381	1625	1537	44-47	2060	920	1140	270	2385
54"	1350	1350	381	1683	1594	44-48	2140	940	1200	270	2800
56"	1400	1400	381	1746	1651	48-48	2217	956	1261	270	3250
60"	1500	1500	457	1854	1759	52-48	2360	1050	1310	270	3705
64"	1600	1600	457	-	-	-	2500	1120	1380	270	4675
66"	1650	1650	457	2032	1930.4	52-48	2630	1180	1450	270	5200
72"	1800	1800	457	2197	2095.5	60-48	2740	1230	1510	550	5960
80"	2000	2000	457	2325	2230	48-48	2890	1290	1600	550	7780
84"	2100	2100	457	2534	2425.7	64-57	2950	1330	1620	550	8750
96"	2400	2400	650	2876.5	2756	68-70	4155	1980	2175	550	14650
112"	2800	2800	650	NOTE			4650	2145	2495	700	25800
120"	3000	3000	800	For 2800A and large			5600	2695	2985	700	32000
140"	3500	3500	850	It is available upon request			6600	3145	3440	700	39800
160"	4000	4000	900				7450	3590	3800	700	47680

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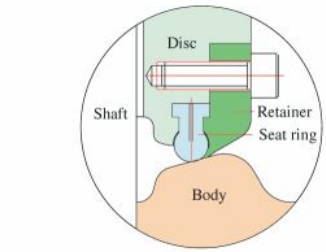
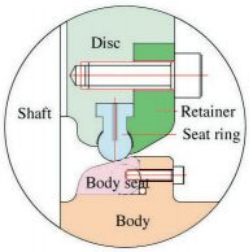
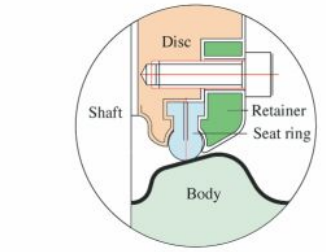
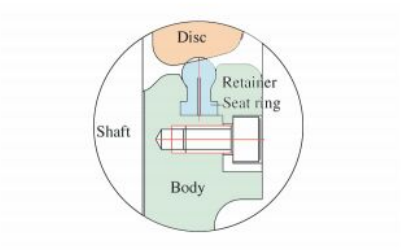
Water Works Butterfly Valve

Design Features

Disc Seat Design	Disc Seat Body Seat Design
	
- It is designed rubber seat to be inserted in the disc. - More suitable rubber seat can be adopted in accordance with characteristics of fluids. - Rubber seat can be exchanged without dismantling of pipeline	- It is designed rubber seat to be inserted in the disc. - More suitable rubber seat can be adopted in accordance with characteristics of fluids. - Rubber seat can be exchanged without dismantling of pipeline - An additional ring is inserted in the body to replace seat ring on the contacting area between body seat and disc seat. - The respective maintenance work is possible for seat and disc seat.
Rubber Lined Design	**Body Seat Design**
	
- It is designed rubber seat to be inserted in the disc. - More suitable rubber seat can be adopted in accordance with characteristics of fluids. - Rubber seat can be exchanged without dismantling of pipeline - No corrosion prevention is available with special coating on the body and disc.	- It is designed rubber seat to be inserted in the body - It is more effetive design for the disc material of stainless steel. - More suitable rubber seat can be adopted in accordance with characteristics of fluids. - No sealing provision is required on the disc.

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

Water Works Butterfly Valve

Torques Required to Operate Water Works Butterfly Valve

TORQUE TABLE

unit : kg.m/Nm/in-lb

Size		Working Pressure (bar)											
		3 bar			5 bar			10 bar			20 bar		
mm	inch	kg-m	Nm	in-lb	kg-m	Nm	in-lb	kg-m	Nm	in-lb	kg-m	Nm	in-lb
100A	4	1.00	9.80	86.74	1.50	14.70	130.11	3.50	34.30	303.58	5.20	50.96	451.03
125A	5	2.20	21.56	190.82	3.00	29.40	260.21	7.00	68.60	607.16	8.40	82.32	728.59
150A	6	3.00	29.40	260.21	4.00	39.20	346.95	10.50	102.90	910.74	14.00	137.20	1214.32
200A	8	5.50	53.90	477.06	9.00	88.20	780.64	20.00	196.00	1734.75	28.00	274.40	2428.65
250A	10	13.00	127.40	1127.59	18.00	176.40	1561.27	48.00	470.40	4163.39	65.00	637.00	5637.93
300A	12	18.50	181.30	1604.64	32.00	313.60	2775.60	65.00	637.00	5637.93	88.00	862.40	7632.89
350A	14	27.50	269.50	2385.28	45.00	441.00	3903.18	88.00	862.40	7632.89	135.00	1323.00	11709.54
400A	16	44.00	431.20	3816.44	80.00	784.00	6938.99	115.00	1127.00	9974.80	182.00	1783.60	15786.20
450A	18	62.00	607.60	5377.72	100.00	980.00	8673.74	165.00	1617.00	14311.66	232.00	2273.60	20123.07
500A	20	75.00	735.00	6505.30	132.00	1293.60	11449.33	202.00	1979.60	17520.94	305.00	2989.00	26454.89
550A	22	130.00	1274.00	11275.86	182.00	1783.60	15786.20	240.00	2352.00	20816.96	408.00	3998.40	35388.84
600A	24	142.00	1391.60	12316.70	220.00	2156.00	19082.22	305.00	2989.00	26454.89	495.00	4851.00	42934.99
650A	26	160.00	1568.00	13877.98	285.00	2793.00	24720.14	408.00	3998.40	35388.84	602.00	5899.60	52215.88
700A	28	225.00	2205.00	19515.90	340.00	3332.00	29490.70	515.00	5047.00	44669.74	805.00	7889.00	69823.57
750A	30	260.00	2548.00	22551.71	415.00	4067.00	35996.00	601.00	5889.80	52129.15	910.00	8918.00	78930.99
800A	32	305.00	2989.00	26454.89	470.00	4606.00	40766.55	695.00	6811.00	60282.46	1005.00	9849.00	87171.04
850A	34	348.00	3410.40	30184.60	530.00	5194.00	45970.80	875.00	8575.00	75895.18	1310.00	12838.00	113625.93
900A	36	388.00	3802.40	33654.09	635.00	6223.00	55078.22	980.00	9604.00	85002.60	1450.00	14210.00	125769.16
1000A	40	420.00	4116.00	36429.69	690.00	6762.00	59848.77	1195.00	11711.00	103651.13	1625.00	15925.00	140948.19
1200A	48	1113.20	10909.36	96556.02	1391.50	13636.70	120695.02	2112.00	20697.60	183189.28	2917.20	28588.56	253030.20
1350A	54	1305.25	12791.45	113213.93	1652.00	16189.60	143290.10	2428.80	23802.24	210667.68	2918.52	28601.50	253144.69
1800A	72	2265.50	22201.90	196503.47	2666.80	26134.64	231311.16	3336.00	32692.80	289355.80	5033.16	49324.97	436562.96
3000A	120	12075.00	118335.00	1047353.50	14593.06	143011.99	1265763.35	25020.00	245196.00	2170168.50	37791.60	370357.68	3277943.24
4000A	160	45770.00	448546.00	3969968.51	48970.00	479906.00	4247528.03	58620.00	574476.00	5084543.46	88836.00	870592.80	7705399.22

- 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 follwing 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

Water Works Butterfly Valve

Hydro Test Specifications

Series	ISO Series	AWWA Series
"Hydrostatic Shell test"	1.5 x maximum service pressure	2.0 x maximum service pressure
"Hydrostatic Seat test"	1.1 x working service pressure	working service pressure

WW Series Basic Formulas For Obtaining Cv-Valve

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 Water Works Butterfly Valves

VALVE SIZE		DISC OPENING																	
		10°		20°		30°		40°		50°		60°		70°		80°		90°	
mm	inch	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv	Kv	Cv
2	50	1.7	2	9.5	11	12.9	15	27.6	32	41.4	48	50.9	59	56.0	65	61.2	71	71.6	83
2	65	3.4	4	11.2	13	18.1	21	29.3	34	45.7	53	69.0	80	95.7	111	120.7	140	131.9	153
3	80	6.0	7	15.5	18	30.2	35	50.0	58	77.6	90	118.1	137	155.2	180	203.4	236	225.0	261
4	100	12	14	30	35	54	63	95	110	145	168	191	222	254	295	341	395	397	460
5	125	19	22	50	58	91	105	151	175	227	263	345	400	461	535	569	660	647	750
6	150	28	32	95	110	155	180	241	280	353	410	500	580	690	800	875	1015	948	1100
8	200	50	58	138	160	250	290	379	440	603	700	858	995	1207	1400	1595	1850	1810	2100
10	250	73	85	198	230	379	440	578	670	905	1050	1293	1500	1879	2180	2457	2850	2802	3250
12	300	103	120	276	320	500	580	819	950	1293	1500	1897	2200	2629	3050	3466	4020	3879	4500
14	350	161	187	414	480	845	980	1155	1340	1983	2300	2543	2950	3724	4320	4397	5100	5216	6050
16	400	207	240	534	620	1138	1320	1569	1820	2491	2890	3586	4160	5198	6030	6991	8110	8190	9500
18	450	260	302	690	800	1345	1560	2060	2390	3259	3780	4603	5340	6681	7750	8603	9980	10328	11980
20	500	328	380	849	985	1722	1997	2505	2906	3966	4600	5626	6526	8326	9658	11276	13080	13879	16100
24	600	457	530	1207	1400	2310	2680	3569	4140	5759	6680	8293	9620	11121	12900	15862	18400	18819	21830
28	700	672	780	1853	2150	3362	3900	5440	6310	8608	9985	12069	14000	17250	20010	22586	26200	25862	30000
30	750	724	840	1931	2240	3897	4520	5862	6800	9401	10905	14526	16850	18996	22035	25147	29170	29741	34500
32	800	905	1050	2759	3200	4888	5670	7707	8940	11940	13850	17707	20540	24224	28100	29483	34200	34483	40000
36	900	1103	1280	2948	3420	5905	6850	9914	11500	15500	18000	21552	25000	31034	36000	38578	44750	46720	54195
40	1000	1629	1890	3879	4500	8319	9650	13750	15950	13750	22900	27931	32400	39698	46050	50690	58800	59526	69050

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