

Double Eccentric Disc Seated Butterfly Valves



ACE VALVE



Double Eccentric Disc Seated Butterfly Valves



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Technological Knowhow of

ACE VALVE



**A Top - ranking company in the 21st century by
challenging the potential**

ACE VALVE has provided the best quality products by using accumulated technological knowhow and the most advanced machinery.

Now we challenge the whole world market of butterfly valve.

Specification of Double Eccentric Disc Seated Butterfly Valve

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

TYPE NUMBERING SYSTEM

- AV-EWR Disc Seated Eccentric WAFER type Butterfly valves.
- AV-EFR Disc Seated Eccentric FLANGE type Butterfly valves.

STANDARD COMPLIANCE

- The face to face dimension in accordance with API, AWWA, KS/JIS, BS, ISO or other STANDARDS are available upon request.

PRODUCTION RANGE

- SIZE : DN 80mm (3 inch) ~ DN 4000mm (160 inch)
- WORKING PRESSURE : Up to 40bar
- WORKING TEMPERATURE : -20°C ~ +200°C

APPLICABLE FLANGE

- KS/JIS 10K, 16K, 20K, 30K, 42K
- ASME B 16.1 Class 125LB, 250LB
- ASME B 16.5 Class 150LB, 300LB
- AWWA C 207 Class B, D, E
- EN 1092 PN6, PN10, PN16, PN25, PN40
- ISO 7005 PN6, PN10, PN16, PN20, PN25, PN40



Double Eccentric Disc Seated Butterfly Valves

The Single or Double Eccentric Design

It is defined as single eccentric in case 'CENTER OF SHAFT' is in line with 'Center of Valve' while center of shaft is off set from center of valve in case double eccentric.

Applicable for butterfly valve with interchangeable soft seat.

- Circular unbroken seats on disc and in body.
- Simple maintenance.
- Change of seat ring by dismantling of the retaining ring only.
- Wide variety of seat materials available.

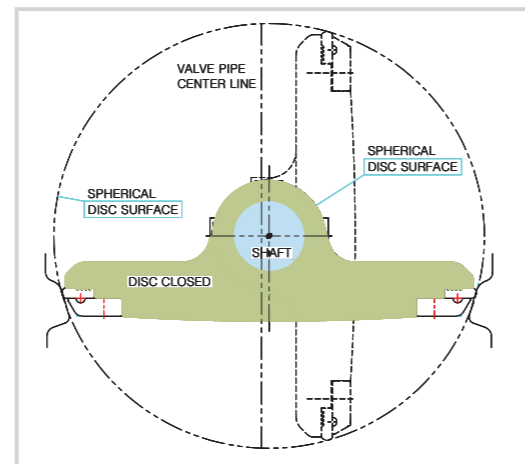
Suitable for installation in Medium Range Pressure System (<math><40\text{kg/cm}^2</math>)

No limitation on corrosiveness of medium when proper seat material chosen.

- Flow characteristics and pressure-drop less favorable than concentric design
- Operating torque of single eccentric is higher than concentric design but substantially lower than double eccentric design

Not suitable for FIRE SAFE.

Suitable for large size diameter valve.



Double Eccentric Disc Seated Butterfly Valves

Schema of Disc seated type



- Basic Design : AWWA C504, AWWAC516, BS 5155, JIS B 2064, KSB 2333.
- Application : pipeline for power plants, water works, desalination plants, etc.
- The valve shall be capable of bi-directional sealing
- Valves are constructed with two shafts and bearing with self lubrication, and operate with low torque.
- Wide variety of body materials available

Operations

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

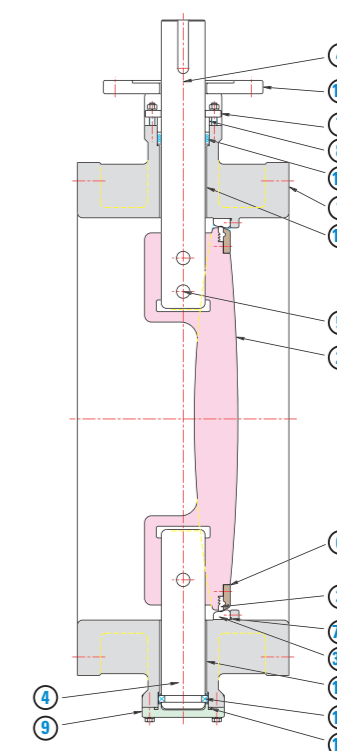
- Manual lever operation
- Manual worm gear operation
- Single or double acting pneumatic actuator operation
- Hydraulic actuator operation
- Electric motor actuator operation

Classification by Connection type

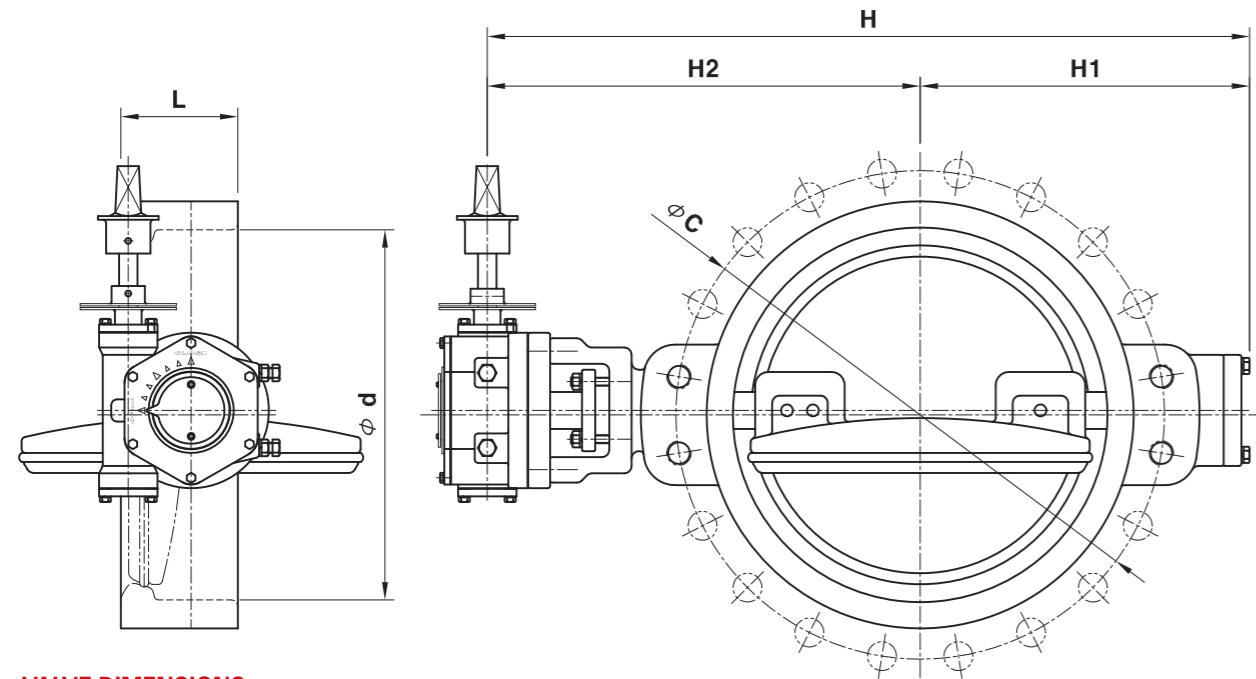
Appearance	Type	General Characteristics
	AV-EWR (WAFER)	<ul style="list-style-type: none"> • General Applications <ul style="list-style-type: none"> - Water works, power plants, heating and ventilation, Chemical plant, Shipbuilding etc. • Valve to be installed with long bolts between the flanges at adjacent pipe without flange on the valve. • Easy handling and light weight. • Easy installation, less bolt quantity and low cost. • Inconvenient maintenance of adjacent pipe.
	AV-EFR (FLANGE)	<ul style="list-style-type: none"> • General Applications <ul style="list-style-type: none"> - General piping, water works, power plants, large diameter piping. • Both ends with complete flange. • Suitable for general pipe flange. • Suitable for large diameter piping. • Heavy weight. • Same installation as ordinary valve.

Construction of Materials

NO.	PART NAME	MATERIAL
1	BODY	DUCTILE IRON / CAST STEEL STAINLESS STEEL / NI-AL BRONZE
2	DISC	DUCTILE IRON / CAST STEEL STAINLESS STEEL / NI-AL BRONZE
3	SEAT	NBR / EPDM / VITON
3.1	BODY SEAT	STAINLESS STEEL / NI-AL BRONZE
4	STEM	STAINLESS STEEL / MONEL
5	DISC PIN	STAINLESS STEEL / MONEL
6	RETAINER	STAINLESS STEEL / NI-AL BRONZE
7	PACKING GLAND	DUCTILE IRON / CAST STEEL STAINLESS STEEL / NI-AL BRONZE
8	GLAND RING	BRONZE / STAINLESS STEEL
9	BOTTOM COVER	DUCTILE IRON / CAST STEEL STAINLESS STEEL / NI-AL BRONZE
10	STAND	CARBON STEEL / CAST STEEL DUCTILE IRON / STAINLESS STEEL
11	STEM BEARING	STAINLESS STEEL / BRONZE / OILLESS BEARING
12	V-PACKING	NBR / EPDM / VITON
13	THRUST PLATE	BRONZE / STAINLESS STEEL
15	BOTTOM O-RING	NBR / EPDM / VITON
71	BODY SEAT O-RING	NBR / EPDM / VITON



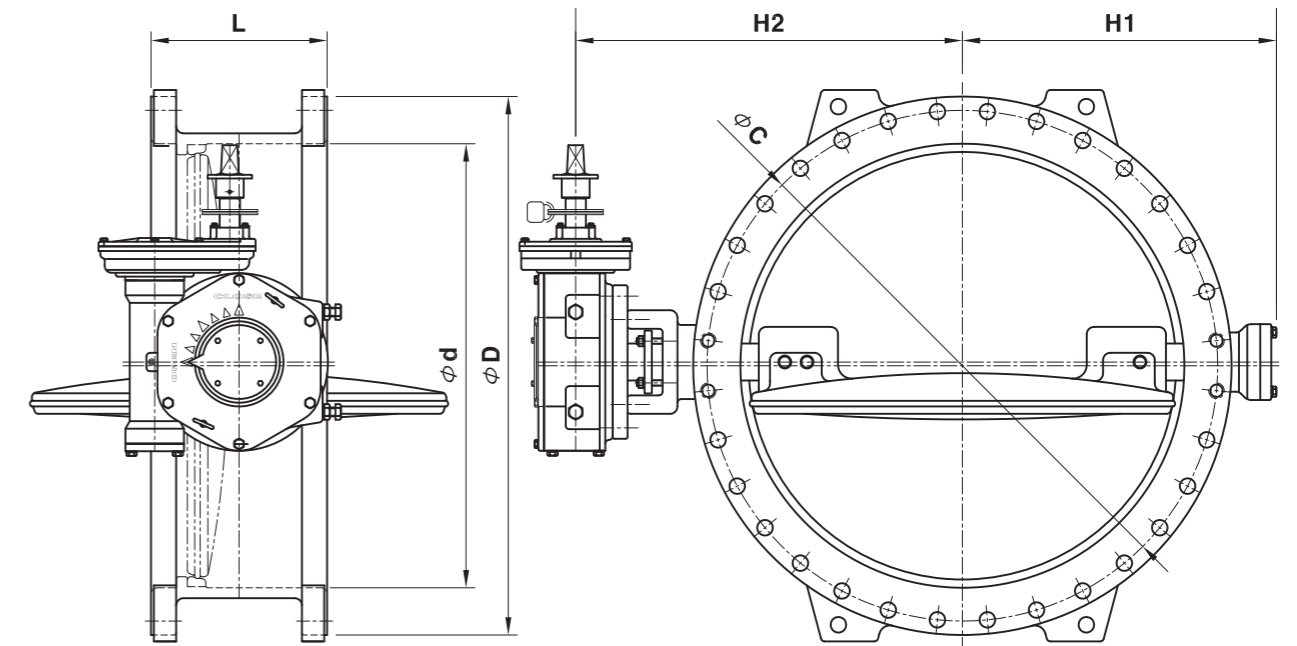
Double Eccentric Disc Seated Wafer Type



VALVE DIMENSIONS

SIZE		d	L	H	H1	H2	APPROX WEIGHT (kg)
inch	mm						
3"	80	80	64	375	150	225	12
4"	100	100	64	392	160	232	15
5"	125	125	70	445	175	270	18
6"	150	150	76	473	185	288	25
8"	200	200	89	584	235	349	36
10"	250	250	114	622	255	367	56
12"	300	300	114	733	305	428	68
14"	350	350	127	779	330	449	93
16"	400	400	140	829	350	479	121
18"	450	450	152	934	410	524	144
20"	500	500	152	1045	445	600	160
22"	550	550	152	1130	490	640	228
24"	600	600	178	1245	545	700	284
26"	650	650	178	1290	565	725	327
28"	700	700	229	1330	590	740	388
30"	750	750	229	1365	615	750	430
32"	800	800	241	1410	640	770	550
36"	900	900	241	1545	680	865	680
40"	1000	1000	300	1715	770	945	810
44"	1100	1100	300	1860	820	1040	940
48"	1200	1200	350	1945	875	1070	1225
52"	1300	1300	350	2080	925	1155	1315
54"	1350	1350	350	2120	950	1170	1430
56"	1400	1400	390	2205	1015	1190	1560
60"	1500	1500	390	2390	1075	1315	1650
64"	1600	1600	440	2550	1160	1390	1770
66"	1650	1650	440	2615	1190	1425	1980
72"	1800	1800	490	2795	1230	1565	2200
80"	2000	2000	540	2970	1355	1615	2330

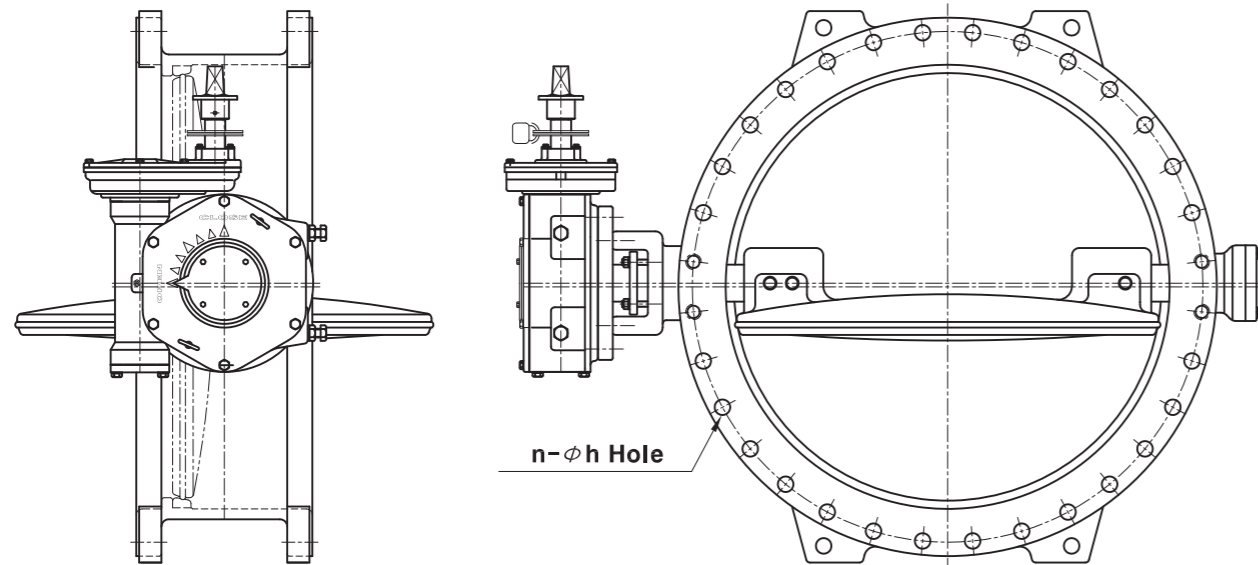
Double Eccentric Disc Seated Flanged Type



VALVE DIMENSIONS

SIZE		d	L			H	H1	H2	APPROX WEIGHT (kg)
inch	mm		AWWA C504	BS5155(Short)	BS5155(Long)				
3"	80	80	127	114	180	375	150	225	19
4"	100	100	127	127	190	392	160	232	25
5"	125	125	127	140	200	445	175	270	35
6"	150	150	127	140	210	473	185	288	52
8"	200	200	152	152	230	584	235	349	70
10"	250	250	203	165	250	622	255	367	84
12"	300	300	203	178	270	733	305	428	117
14"	350	350	203	190	290	779	330	449	148
16"	400	400	203	216	310	829	350	479	203
18"	450	450	203	222	330	934	410	524	265
20"	500	500	203	229	350	1045	445	600	391
22"	550	550	203	229	350	1130	490	640	487
24"	600	600	203	267	390	1245	545	700	620
26"	650	650	203	267	390	1290	565	725	685
28"	700	700	305	292	430	1330	590	740	813
30"	750	750	305	292	430	1365	615	750	897
32"	800	800	305	318	470	1410	640	770	1140
36"	900	900	305	330	510	1545	680	865	1302
40"	1000	1000	305	410	550	1715	770	945	1540
44"	1100	1100	305	410	550	1860	820	1040	1720
48"	1200	1200	381	470	630	1945	875	1070	2100
52"	1300	1300	381	470	630	2080	925	1155	2400
54"	1350	1350	381	470	630	2120	950	1170	2850
56"	1400	1400	381	530	710	2205	1015	1190	3350
60"	1500	1500	381	530	710	2390	1075	1315	3746
64"	1600	1600	381	600	790	2550	1160	1390	5200
66"	1650	1650	457	600	790	2615	1190	1425	5900
72"	1800	1800	457	670	870	2795	1230	1565	6700
80"	2000	2000	457	760	950	2970	1355	1615	7800
84"	2100	2100	457	760	950	3110	1430	1680	8900
96"	2400	2400	650	760	950	4085	1970	2115	14800
112"	2800	2800	650	760	950	4230	2050	2180	24000
120"	3000	3000	760	760	950	4310	2100	2210	31000
140"	3500	3500	760	800	1350	5460	2700	2760	40100
160"	4000	4000	900	900	1350	6210	3200	3010	48500

Double Eccentric Disc Seated Butterfly Valves



FLANGE DIMENSIONS

SIZE	150LB			300LB			JIS 10K			JIS 16K			PN6			PN10			PN16			PN25						
	inch	mm	C	n	h	C	n	h	C	n	h	C	n	h	C	n	h	C	n	h	C	n	h	C	n	h		
3	80	152.4	4	5/8	168.1	8	3/4	150	8	M16	160	8	M20	160	4	M16	160	8	M16	160	8	M16	160	8	M16	160	8	M16
4	100	190.5	8	5/8	200.2	8	3/4	175	8	M16	185	8	M20	180	4	M16	180	8	M16	180	8	M16	190	8	M20	190	8	M20
5	125	215.9	8	3/4	235	8	3/4	210	8	M20	225	8	M22	210	8	M16	210	8	M16	210	8	M16	220	8	M24	220	8	M24
6	150	241.3	8	3/4	269.7	12	3/4	240	8	M20	260	12	M22	240	8	M16	240	8	M20	240	8	M20	250	8	M24	250	8	M24
8	200	298.5	8	3/4	330.2	12	7/8	290	12	M20	305	12	M22	295	8	M16	295	8	M20	295	12	M20	310	12	M24	310	12	M24
10	250	362	12	7/8	387.4	16	1	355	12	M22	380	12	M24	350	12	M16	350	12	M20	355	12	M20	370	12	M27	370	12	M27
12	300	431.8	12	7/8	450.9	16	1 1/8	400	16	M22	430	16	M24	400	12	M20	400	12	M20	410	12	M24	430	16	M27	430	16	M27
14	350	476.3	12	7/8	514.4	20	1 1/8	445	16	M22	480	16	M30	460	12	M20	460	16	M20	470	16	M24	490	16	M30	490	16	M30
16	400	539.8	16	1	571.5	20	1 1/2	510	16	M24	540	16	M30	515	16	M20	515	16	M24	525	16	M27	550	16	M33	550	16	M33
18	450	577.9	16	1	628.7	24	1 1/2	565	20	M24	605	20	M30	565	16	M20	565	20	M24	585	20	M27	600	20	M33	600	20	M33
20	500	635	20	1 1/8	685.8	24	1 1/2	620	20	M24	660	20	M30	620	20	M20	620	20	M24	650	20	M30	660	20	M33	660	20	M33
22	550	692.2	20	1 1/8	742.9	24	1 1/2	680	20	M30	720	20	M36	665	20	M24	690	20	M30	720	20	M36	735	20	M36	735	20	M36
24	600	749.3	20	1 1/2	812.8	24	1 1/2	730	24	M30	770	24	M36	725	20	M24	725	20	M27	770	20	M33	770	20	M36	770	20	M36
26	650	806.5	24	1 1/2	876.3	28	1 1/2	780	24	M30	820	24	M36	770	24	M24	780	24	M30	820	24	M36	830	24	M39	830	24	M39
28	700	863.6	28	1 1/2	939.8	28	1 5/8	840	24	M30	875	24	M39	840	24	M24	840	24	M27	840	24	M33	875	24	M39	875	24	M39
30	750	914.4	28	1 1/2	997	28	1 3/4	900	24	M30	935	24	M39	880	24	M30	900	24	M30	935	24	M39	960	24	M45	960	24	M45
32	800	977.9	28	1 1/2	1054.1	28	1 7/8	950	28	M30	990	24	M45	950	24	M27	950	24	M30	950	24	M36	990	24	M45	990	24	M45
36	900	1085.9	32	1 1/2	1168.4	32	2	1050	28	M30	1090	28	M45	1050	24	M27	1050	28	M30	1050	28	M36	1090	28	M45	1090	28	M45
40	1000	1200.2	36	1 1/2	1155.7	32	1 5/8	1160	28	M36	1210	28	M52	1160	28	M27	1160	28	M33	1170	28	M39	1210	28	M52	1210	28	M52
44	1100	1314.5	40	1 1/2	1263.6	32	1 3/4	1270	28	M36	1310	32	M52	1240	28	M30	1270	28	M36	1310	32	M52	1315	32	M52	1315	32	M52
48	1200	1422.4	44	1 1/2	1371.6	32	1 7/8	1380	32	M36	1420	32	M52	1380	32	M30	1380	32	M36	1390	32	M45	1420	32	M52	1420	32	M52
52	1300	1536.7	44	1 3/4	1479.6	32	2	1420	32	M36	1470	32	M52	1400	32	M30	1420	32	M36	1470	32	M52	1500	32	M52	1500	32	M52
54	1350	1593.9	44	1 3/4	1549.4	28	2 1/4	1540	36	M42	1590	32	M56	1505	32	M30	1540	36	M42	1590	32	M56	1610	32	M56	1610	32	M56
56	1400	1651	48	1 3/4	1600.2	28	2 1/2	1590	36	M39	1590	36	M45	1590	36	M33	1590	36	M39	1590	36	M45	1640	36	M56	1640	36	M56
60	1500	1759	52	1 3/4	1701.8	32	2 1/2	1700	40	M42	1750	36	M56	1660	36	M30	1700	40	M42	1750	36	M56	1750	36	M56	1750	36	M56
64	1600	1930.4	52	1 3/4	1820	32	2 1/2	1820	40	M36	1820	40	M36	1820	40	M33	1820	40	M45	1820	40	M52	1860	40	M56	1860	40	M56
66	1650	1930.4	52	1 3/4	1880	32	2 1/2	1870	40	M36	1870	40	M36	1870	40	M36	1870	40	M36	1870	40	M36	1910	40	M64	1910	40	M64
72	1800	2095.5	60	1 3/4	2160	36	2 1/2	2020	44	M45	2020	44	M45	2020	44	M36	2020	44	M45	2020	44	M52	2070	44	M64	2070	44	M64
80	2000	2425.7	64	2	2250	36	2 1/2	2230	48	M45	2230	48	M45	2230	48	M39	2230	48	M45	2230	48	M45	2300	48	M64	2300	48	M64
84	2100	2425.7	64	2	2500	40	1 1/2	2340	48	M45	2340	48	M45	2340	48	M45	2340	48	M45	2340	48	M45	2530	48	M64	2530	48	M64
88	2200	2705.1	68	2 1/4	2720	44	1 1/2	2	52	M52	2440	52	M52	2440	52	M39	2440	52	M52	2440	52	M52	2760	52	M64	2760	52	M64
96	2400	2755.9	68	2 1/4	3120	44	1 1/2	2650	56	M52	2650	56	M52	2650	56	M39	2650	56	M52	2650	56	M52	3160	56	M64	3160	56	M64
104	2600	3067	72	2 1/2	3360	48	2 1/4	2850	60	M52	2850	60	M52	2850	60	M45	2850	60	M52	2850	60	M52	3400	60	M64	3400	60	M64
112	2800	3219.5	72	2 1/2	3520	52	2 3/4	3020	64	M52	3020	64	M52	3020	64	M45	3020	64	M52	3020	64	M52	3570	64	M68	3570	64	M68
120	3000	3371.8	76	2 3/4	3670	52	3	3220	68	M52	3220	68	M52	3220	68	M45	3220	68	M52	3220	68	M52	3720	68	M68	3720	68	M68
140	3400	4019.5	84	3 1/4	4320	52	3 1/2	3640	76	M52	3640	76	M52	3640	76	M45	3640	76	M52	3640	76	M52	4370	76	M72	4370	76	M72
160	4000	4430	84	3 1/4	4730	60	3 1/2	4270	84	M64	4270	84	M64	4270	84	M52	4270	84	M64	4270	84	M64	4780	84	M72	4780	84	M72

Double Eccentric Disc Seated Butterfly Valves

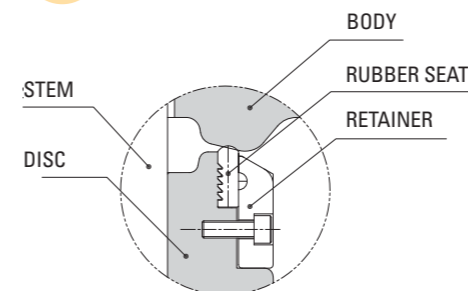
Applications

- Desalination
- Power plant
- District heating and cooling
- Other
- Pump Isolation
- Salt water service
- Sea water

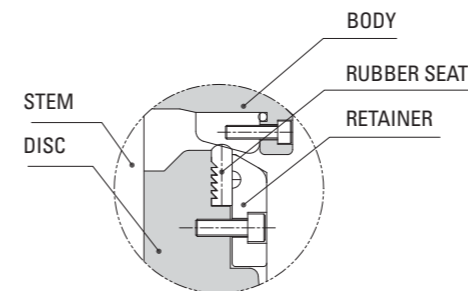
Hydro Test Specifications

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 maximum service pressure	maximum service pressure

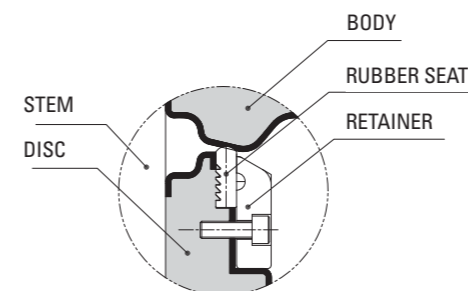
Seat Design



- 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.

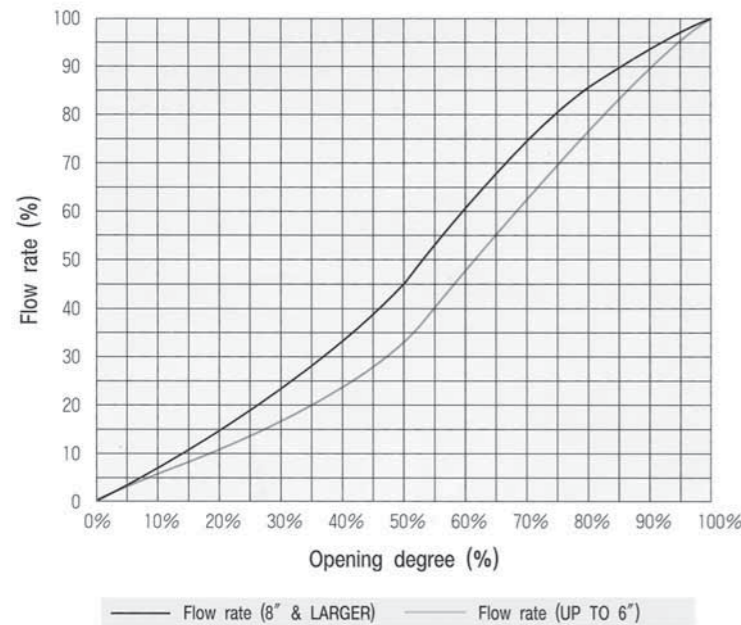


- It is designed rubber seat to be inserted in the disc.
- More suitable rubber seat can be adopted in accordance with characteristics of fluids.
- Rubber seat can be exchanged without dismantling of pipeline.
- An additional ring is inserted in the body to replace seat ring on the contacting area between body seat and disc seat.
- The respective maintenance work is possible for seat and disc seat.



- 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.

Flow Characteristic curve



FLOW DATA

Cv of a valve is defined as the flow of water at 60°F in gallons per minute(GPM) at a pressure drop of one pound per square inch (1psi) across the valve

$$Q = Cv \sqrt{(\Delta P (62.4/\rho))}$$

Where

- Q : Flow rate(GPM)
- Cv : Flow coefficient value
- ΔP: Pressure Drop (PSI)
- ρ : Density of fluid (for water at 60°F ρ=62.4)

Therefore

$$Q = Cv \sqrt{\Delta P}$$

Installation Instructions

General

- Valves 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.
- Also the pipeline must be free from tension and electric current.
- When handling valves, be careful to avoid contact with or impact by other equipment.
- Check carefully whether valve seat / disc surface, as well as mating face, are all clean.
- Tighten again, if any, all bolts loosened during transport and / or handling.
- Open and close valves to check proper operation.
- Do not put a weight on the lever or gear handle during valve 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.
- Do not weld the piping around the valve area under the condition that the valve is installed.

Installation on new pipeline

- Shut partially valve disc until disc profile is at least 10mm within the body.
- Align the two flanges with the valve body.
- Flange gaskets should be positioned, aligned with 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, as high heat temperature can damage valve seat.
- Weld flanges to the pipe and wait until completely cooled down.
- Install the valve in accordance with the instruction.

Replacement of Packing

- Before replacing gland packing or a seat ring, close upstream valve and detach the valve from the piping.

Double Eccentric Disc Seated Butterfly Valve Torque Table

SIZE		WORKING PRESSURE (bar)											
		5bar			10bar			16bar			25bar		
inch	mm	kg-m	Nm	ft-lb	kg-m	Nm	ft-lb	kg-m	Nm	ft-lb	kg-m	Nm	ft-lb
3"	80	2.0	19.5	14.3	2.6	26.0	18.2	3.6	35.1	26.0	5.2	50.7	37.7
4"	100	2.6	26.0	18.2	5.2	50.7	37.7	6.9	67.6	49.4	9.1	89.7	66.3
5"	125	4.2	40.3	29.9	7.5	74.1	54.6	9.1	89.7	66.3	14.3	140.4	104.0
6"	150	5.9	57.2	42.9	11.7	114.4	84.5	15.5	150.8	111.8	20.8	204.1	150.8
8"	200	11.1	107.9	79.3	22.1	215.8	158.6	28.9	283.4	209.3	44.2	432.9	319.8
10"	250	23.4	228.8	169.0	46.8	456.3	336.7	61.5	603.2	444.6	74.1	726.7	535.6
12"	300	36.4	353.6	261.3	71.5	703.3	518.7	94.6	928.2	683.8	118.3	1159.6	855.4
14"	350	49.4	484.9	357.5	97.5	960.7	708.5	129.1	1264.9	933.4	169.0	1656.2	1222.0
16"	400	68.9	677.3	500.5	136.5	1339.0	988.0	179.9	1762.8	1300.0	248.3	2433.6	1795.3
18"	450	100.1	980.2	722.8	197.6	1933.1	1426.1	259.7	2545.4	1877.2	362.7	3554.2	2622.1
20"	500	133.9	1309.1	965.9	263.9	2580.5	1903.2	346.8	3398.2	2506.4	477.1	4676.1	3448.9
22"	550	166.4	1632.8	1205.1	327.6	3209.7	2367.3	430.8	4222.4	3114.8	600.6	5886.4	4340.7
24"	600	209.3	2046.2	1509.3	409.5	4011.8	2958.8	538.6	5278.0	3892.2	741.0	7261.8	5356.0
26"	650	269.1	2633.8	1942.2	526.5	5154.5	3801.2	691.9	6779.5	5001.1	941.2	9223.5	6802.9
28"	700	319.8	3135.6	2312.7	625.3	6121.7	4514.9	821.2	8048.3	5935.8	1153.1	11300.9	8334.3
30"	750	377.0	3695.9	2726.1	734.5	7192.9	5305.3	964.6	9452.3	6971.9	1394.9	13669.5	10082.8
32"	800	440.7	4316.0	3183.7	854.1	8375.9	6177.6	1122.4	10999.3	8113.3	1632.8	16001.7	11802.7
36"	900	586.3	5751.2	4241.9	1132.3	11091.6	8180.9	1484.7	14550.9	10731.5	2228.2	21836.1	16105.7
40"	1000	761.8	7468.5	5508.1	1459.9	14311.7	10556.0	1913.7	18755.1	13833.3	3000.4	29403.4	21686.6
44"	1100	1086.8	10653.5	7857.2	2082.6	20407.4	15051.4	2728.2	26735.8	19719.7	3948.1	38691.9	28537.6
48"	1200	1371.5	13434.2	9908.6	2609.1	25573.6	18861.7	3415.4	33471.1	24687.0	5502.9	53927.9	39776.1
52"	1300	1743.3	17087.2	12602.2	3304.6	32390.8	23890.1	4322.8	42363.1	31245.5	6705.4	65712.4	48467.9
56"	1400	2106.0	20637.5	15221.7	3967.6	38876.5	28674.1	5182.5	50788.4	37459.5	8490.3	83205.2	61369.1
60"	1500	2488.2	24378.9	17981.6	4652.7	45597.5	33631.0	6741.8	66069.9	48730.5	11302.2	110761.3	81693.3
64"	1600	2945.8	28874.3	21296.6	5475.6	53657.5	39575.9	7952.1	77931.1	57478.2	13088.4	128265.8	94604.9
66"	1650	3630.9	35579.7	26243.1	6728.8	65946.4	48639.5	8804.9	86287.5	63642.8	13604.5	133324.1	98334.6
72"	1800	4266.6	41813.2	30839.9	7865.0	77071.8	56845.1	10437.7	102289.2	75444.2	17297.8	169518.7	125030.1
80"	2000	5562.7	54518.1	40210.3	10107.5	99049.6	73054.8	13923.0	136445.4	100636.9	22868.3	224109.6	165295.0
84"	2100	6706.7	65728.0	48478.3	12174.5	119315.3	88002.2	15802.8	154867.7	114224.5	27462.5	269132.5	198502.2
88"	2200	7616.7	74646.0	55056.3	13742.3	134669.6	99326.5	17911.4	175531.2	129465.7	29525.6	289351.4	213414.5
96"	2400	9696.7	95024.8	70086.9	17279.6	169339.3	124897.5	22428.9	219802.7	162119.1	37092.9	363509.9	268112.0
100"	2500	11121.5	108985.5	80384.2	19753.5	193585.6	142781.6	25093.9	245919.7	181381.2	41319.2	404927.9	298659.4
112"	2800	15145.0	148415.8	109466.5	26373.1	258460.8	190630.7	34525.4	338348.4	249553.2	69729.4	683347.6	504354.5
120"	3000	18916.3	185376.1	136726.2	32671.6	320186.1	236156.7	42467.1	416305.5	307050.9	86204.3	844798.5	623517.7
136"	3400	24853.4	243562.8	179643.1	37369.8	366224.3	270112.7	83683.6	820099.8	605285.2	134433.0	1317447.3	972355.8
160"	4000	45007.3	441071.8	325317.2	81283.8	796577.6	587927.6	125264.1	1227588.7	906037.6	202161.7	1981187.0	1462238.7