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HANYANG

“Thinking of human and nature together”



韓陽밸브工業(株)
HAN YANG VALVE Ind. Co., Ltd.



www.hyvalve.kr



ISO 9001/ISO 14001(K/Q 01697, K/E 01111)

KS B 2813/KS B 2333(01-2165,04-0274)

API(6D-0334)

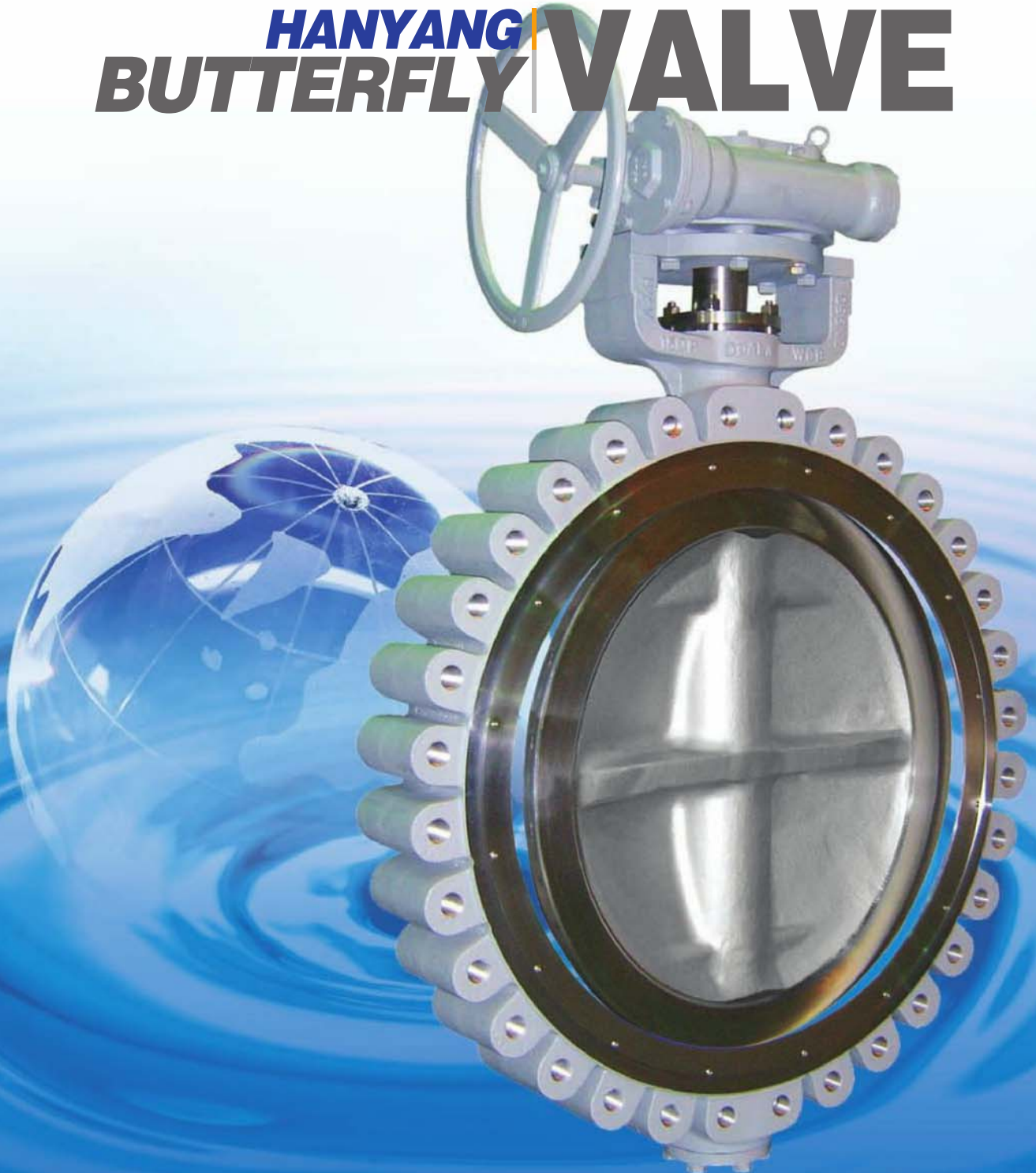
CE(BUTTERFLY VALVE, CHECK VALVE) (2611/3/2009-1,2)

Lloyd's Register Type Approval(01/10046(E1))

Single-PPM(1-02-2-1596)

INNO-BIZ(100201-00340)

HANYANG BUTTERFLY VALVE



HANYANG VALVE IND. CO., LTD.

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COMPANY HISTORY

- 1988.07. Established HANYANG VALVE IND.CO., LTD.
(Gupo-Dong, Buk-Gu, Busan, Republic of Korea)
1988.10. Cast steel GATE, GLOBE, SW-CHECK, Y-STRAINER
valves completion of self-model development.
1989.03. Butterfly valve completion of self-model development.
1989.04. Registration for Q.C part of group the Chamber Commerce
and Industry in Korea.
1989.10. Expansion of cast steel Gate valves production facility.
1990.02. Cast iron GATE, GLOBE, SW-CHECK, Y-STRAINER valves
completion of self-model development.
1992.06. Butterfly valve development for the use of high temperature
and pressure. (Metal to Metal)
1993.03. Cast steel 20K, 600# valve completion of self-model
development.
1994.06. Great engine for the use of tank truck butterfly valve
development.
1998.10. The company moved to Janggrim-dong Busan Korea.
1999.02. Acquired KSA-QA9001/ISO9001 Quality system. (QMS-0111)
1999.10. Acquired Korean Standard(KS) Certification :99-0956
2000.06. Acquired API Monogram Licence(API 6D-0334)
2001.06. Acquired Lloyd's Register Type Approved(01-10046)
2001.08. Acquired Korean Standard(KS) Certification(01-2165)
2002.02. Revised ISO9001:2000 Quality System(QMS-0111)
2002.08. Authorized Export Promotion Company
(Korea Small & Medium Enterprises Ministry)
2004.01.1 Revised Company Name(HANYANG VALVE IND CO.,LTD)
2004.07. Acquire KOREAN STANDARD(KS) Certification(04-0274)
2005.07. Export bright prospect company selection three Times
appointment(205-78, 2002-50, 2000-73)
2005.11. Acquire ISO14001 Environment Management System(ESC-0813)
2006.06. Selection Venture Quotation Business(BUSAN, ULSAN Small
& Medium Enterprises Ministry)
2008.12. Authorized Export promotion Company
(BUSAN • ULSAN Small & Medium Enterprises Ministry)
2008.12. Acquire Single PPM SYSTEM (1-02-2-1596)
2009.04. Acquire CE Certification
(Butterfly, Check valve) (2611/3/2009-1, 2)
2010.08. The company is moved to I-15-7 Hwajeon Industrial Complex,
Hwajeon-dong, Ganseo-gu, Busan, Korea

HANYANG BUTTERFLY VALVES

Wafer Type
Lever Operated



Lugged Type Gear Operated
(Locking Device Type)



Flange Type
Gear Operated



Wafer Teflon Seat Type
Lever Operated



Lugged Type
Hydraulic Operated



Flange Type
Pneumatic Cylinder Operated



High-Performance Lugged Type
Gear Operated PTFE Seat



High-Performance Flange Type
Gear Operated RTFE Seat



High-Performance Wafer Type
Gear Operated Metal Seat



HANYANG unique seat sealing design offers no frictional contact between valve disc and seat :

- Zero leakage, tight shut off
- Lower torque

This HANYANG butterfly valve excels other conventional valves such as gate valve and globe valve in all aspects, especially in terms of light weight(1/3-1/5 of conventional valves), less number of component parts, no flange gaskets required (but if Flange rating 10kg/cm² exceed, Flange gaskets are necessary)and economical operation and maintenance costs.

The valve seat is constructed by a strong replaceable synthetic rubber. HANYANG own seating mechanism of The pressure-touch system offers a very low torque, tight shut off with no leakage, compact actuator selection, long life service.

This valve is used successfully in a wide variety of applications such as industrial plants, ship, building, air conditioning of building, fire alarm system, water treatment and so on.



● VALVE SEAT SEALING STRUCTURE AND FEATURES

1. Lower torque

There is no frictional contact between disc and rubber seat, which makes frictional almost close to zero, thus markedly reducing operation torque.

2. Low torque with and fluid

There is no point at which frictional resistance occurs. Therefore, torque is always low, regardless of the fluid, air, water or oil

3. Long service life

When the disc contacts the tapered projection of the rubber seat, a complete seal is attained, which results in long service life.

4. Greater sealing capacity

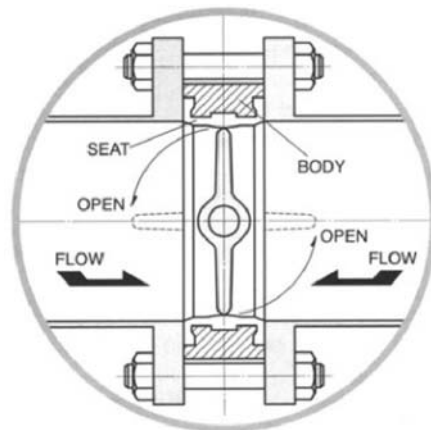
When the disc is pressed against the projection on the valve seat, the fully closed position becomes 90°+α to attain a more complete seal.

5. No leakage at a pressure of 10kgf/cm²

Is the disc sealed completely when it contacts the rubber seat?

There is no need to be concerned about that in lever handle valves, the lever stopper fixes the disc.

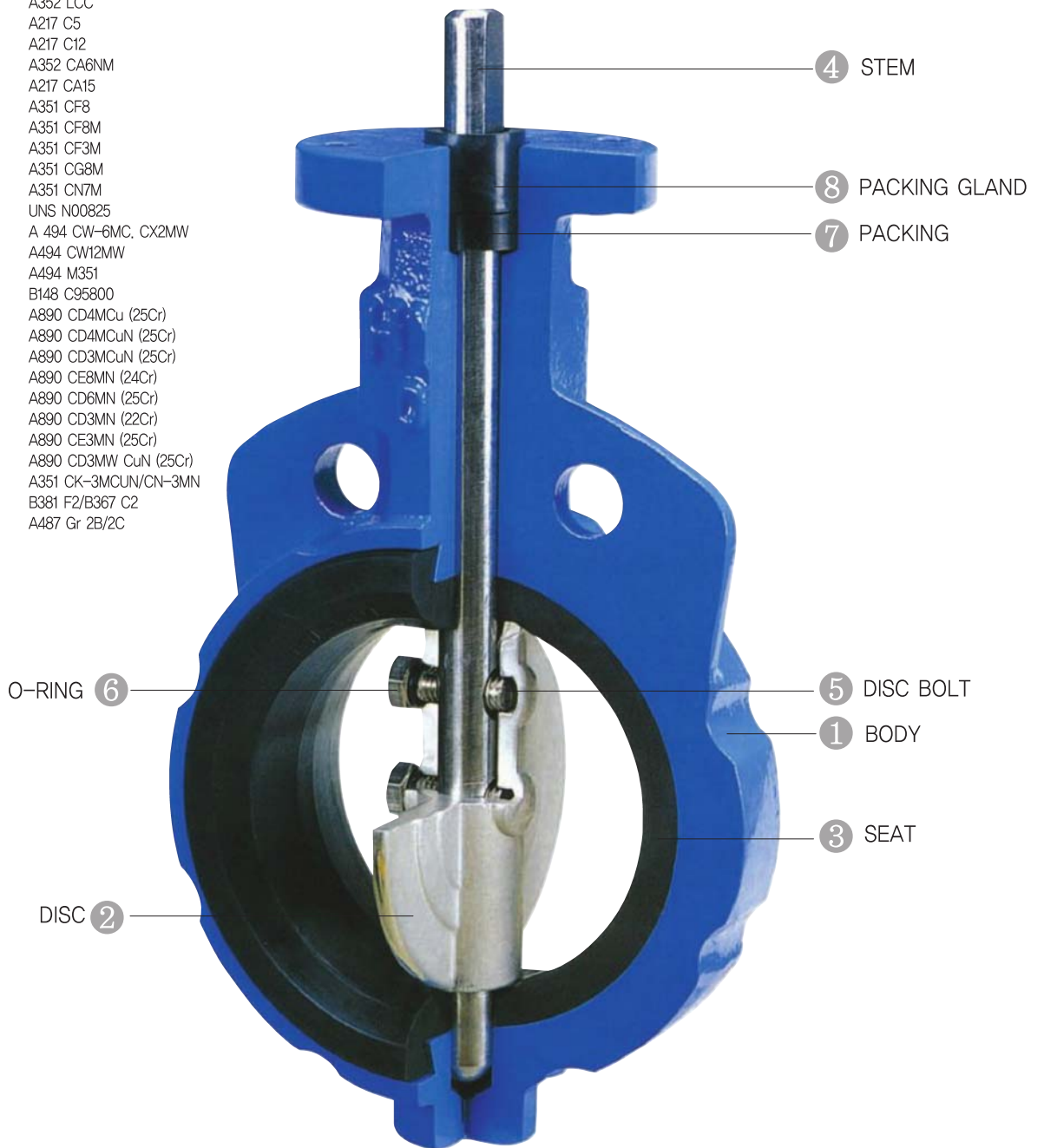
Gear operated valves employ worm gear. Therefore, there is no need to worry on the point.



HANYANG CONSTRUCTION

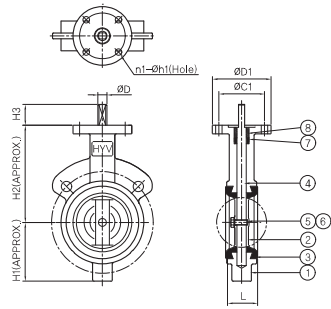
BODY/DISC MATEIRAL

Material	Specification (ASTM)
Gray Iron	A126 Class B
Douctile Iron	A536 65-45-12
Carbon steel	A216 WCB
Low Temp carbon	A352 LCB
Low Temp carbon	A352 LCC
5% Cr Steel	A217 C5
9% Cr Steel	A217 C12
Low Temp 13Cr 4n	A352 CA6NM
410 Stainless Steel	A217 CA15
304 Stainless Steel	A351 CF8
316 Stainless Steel	A351 CF8M
316L Stainless Steel	A351 CF3M
317 Stainless Steel	A351 CG8M
Alloy 20	A351 CN7M
Alloy 825	UNS N00825
Cast Nickel Alloy	A 494 CW-6MC, CX2MW
Hastelloy C276	A494 CW12MW
Monel 400	A494 M351
Nickel Al-Bz	B148 C95800
Douplex SS Gr 1A	A890 CD4MCu (25Cr)
Douplex SS Gr 1B	A890 CD4MCuN (25Cr)
Douplex SS Gr 1C	A890 CD3MCuN (25Cr)
Douplex SS Gr 2A	A890 CE8MN (24Cr)
Douplex SS Gr 3A	A890 CD6MN (25Cr)
Douplex SS Gr 4A	A890 CD3MN (22Cr)
Douplex SS Gr 5A	A890 CE3MN (25Cr)
Douplex SS Gr 6A	A890 CD3MW CuN (25Cr)
254 SMO	A351 CK-3MCUN/CN-3MN
Titanium Gr2	B381 F2/B367 C2
High Strength Low Alloy	A487 Gr 2B/2C
904L	

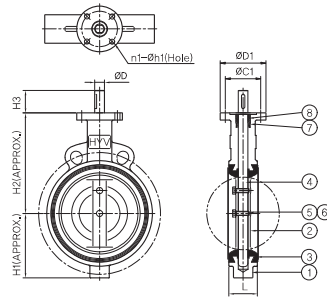


▶▶ BUTTERFLY VALVE CONSTITUTION TABLE

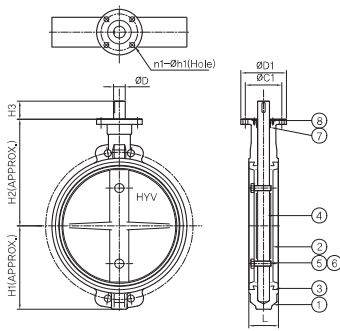
No.	Name of Part	Specific Character	Materials		Standard Materials
			JIS	ASTM	
1	BODY	Body can be used suitably for use, by selecting Wafer type, Lugged type, Flange type, etc, and special painting is treated to prevent corrosion	FC FCD SC SCS BC ALBC AC	A126 A536 A216 A351 B584 B148 B108	FC200 FCD450 SC480 SCS13 BC6 ALBC3 AC2A
2	DISC	Disc is produced with least coefficient of friction to fluid in use, by specific processing, in consideration of flow of fluid, by being adhered closely to seat.	SCS BC ALBC	A351 B584 B148	SCS13
3	SEAT	As seat does the kernel role in valve, so special attention should be given, when, selecting the material and there is hamper at projecting part for Disc to move, seat of flange part is pressed, and you may select the necessary material suitable for use, and in time of establishing Valve, and Stem does work for 1st. sealing of the stem	NBR EPDM VITON PTFE		NBR EPDM
4	STEM	Stem is designed by sufficient torque preventing corrosion even in high temperature as lough stainless of strong system against high intensity and corrosion resisting	SUS MONEL SUS630	A276	SUS410
5	DISC BOLT	Disc-fixing bolt is connected considering corrosion and intensity fully, and does the connecting work by coating compound.	SUS MONEL SUS630	A276	SUS304
6	O-RING	Bolt O-ring does a role to maintain secret	NBR EPDM VITON PTFE		NBR & EPDM
7	PACKING	Packing is made by special course, intercepting any pressure and maintain secret as 2nd sealing role or O-ring.	NBR EPDM VITON PTFE		NBR & EPDM Viton
8	PACKING GLAND	Bushing is material of(ACETAL) resin or steel, without friction, and easy to rotate among metals smoothly			ACETAL STEEL



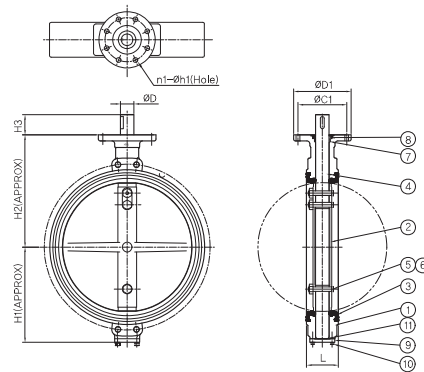
DN40~80(1½"~3")



DN100~150(4"~6")



DN200~600(8"~24")

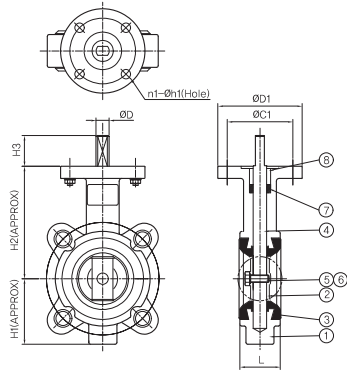


DN650~1200(26"~48")

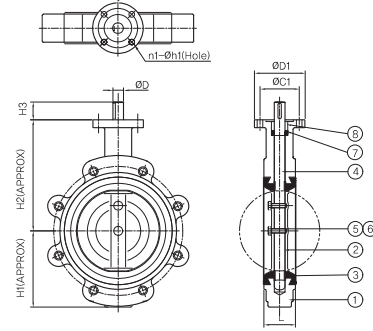
• FLANGE RATING : JIS, PN, ANSI B 16.5 CLASS 150
 • FACE TO FACE : ISO 5752 SERIES 20 (DN 1100, 1200 API 609 CATEGORY A)

Size		L	ØD	ØC1	ØD1	n1	Øh1	H1	H2	H3	Weight (kg)
DN	inch										
40	1.6	40	14	70	90	4	10	58	110	32	2.8
50	2	43	14	70	90	4	10	70	120	32	3.4
65	2 1/2	46	14	70	90	4	10	68	130	32	3.6
80	3	46	14	70	90	4	10	78	149	32	4.1
100	4	52	16	70	90	4	10	98	178	32	5.6
125	5	56	19	70	90	4	10	110	184	32	7.0
150	6	56	19	70	90	4	10	125	198	32	8.7
200	8	60	28	70	90	4	12	167	231	45	13.9
250	10	68	28	102	125	4	15	228	265	45	20
300	12	78	28	102	125	4	15	240	300	50	25
350	14	78	28	102	125	4	15	272	335	50	39
400	16	102	40	140	175	4	19	305	375	60	59
450	18	114	40	140	175	4	19	320	399	70	78
500	20	127	50	165	210	4	23	359	434	70	127
550	22	154	50	165	210	4	23	388	455	80	158
600	24	154	50	165	210	4	23	415	498	80	211
650	26	165	50	165	210	4	23	447	535	100	255
700	28	165	70	254	300	8	19	530	578	105	300
750	30	190	70	254	300	8	19	512	598	105	334
800	32	190	80	254	300	8	19	606	643	110	469
850	34	203	85	254	300	8	19	615	667	110	550
900	36	203	90	298	350	8	23	624	696	120	620
950	38	216	95	298	350	8	23	663	730	120	670
1000	40	254	100	298	350	8	23	703	763	130	740
1100	44	276	110	356	415	8	23	767	831	140	880
1200	48	276	120	356	415	8	23	830	900	150	1050

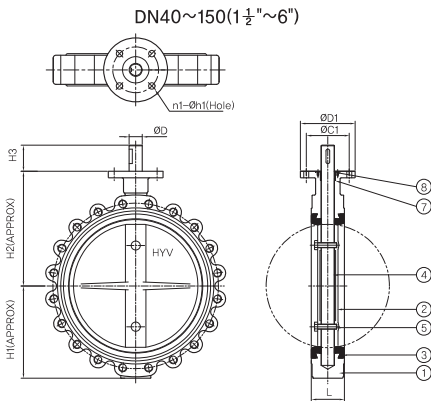
LUUGED TYPE BUTTERFLY VALVES (HY-L-Series)



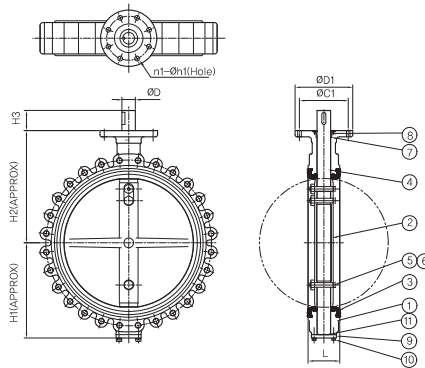
DN40~150(1½"~6")



DN100~150(4"~6")



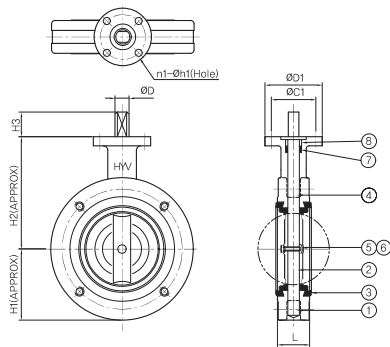
DN200~550(8"~22")



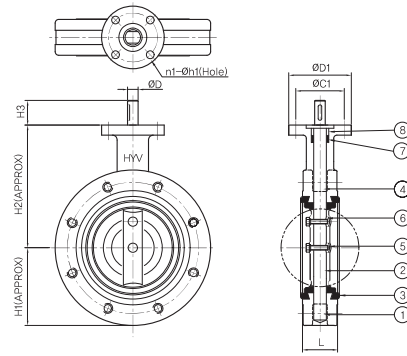
DN600~1200(24"~48")

· FLANGE RATING : JIS, PN, ANSI B 16.5 CLASS 150
 · FACE TO FACE : ISO 5752 SERIES 20 (DN 1100, 1200 API 609 CATEGORY A)

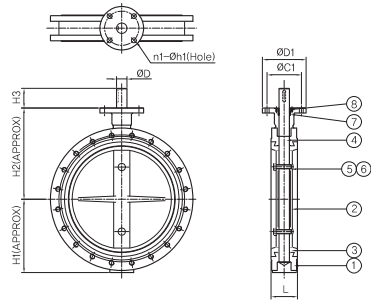
Size		L	ØD	ØC1	ØD1	n1	Øh1	H1	H2	H3	Weight (kg)
DN	inch										
40	1.6	40	14	70	90	4	10	58	110	32	3.8
50	2	43	14	70	90	4	10	70	120	32	4.1
65	2½	46	14	70	90	4	10	68	130	32	4.3
80	3	46	14	70	90	4	10	78	149	32	5.1
100	4	52	16	70	90	4	10	98	178	32	8
125	5	56	19	70	90	4	10	110	184	32	8.7
150	6	56	19	70	90	4	10	125	198	32	11.7
200	8	60	28	70	90	4	12	167	231	45	17
250	10	68	28	102	125	4	15	228	265	45	29.8
300	12	78	28	102	125	4	15	240	300	50	42.4
350	14	78	28	102	125	4	15	272	335	50	54
400	16	102	40	140	175	4	19	305	375	60	94
450	18	114	40	140	175	4	19	320	399	70	120
500	20	127	50	165	210	4	23	359	434	70	164
550	22	154	50	165	210	4	23	388	455	80	190
600	24	154	50	165	210	4	23	415	498	80	272
650	26	165	50	165	210	4	23	447	535	100	305
700	28	165	70	254	300	8	19	530	578	105	372
750	30	190	70	254	300	8	19	512	598	105	445
800	32	190	80	254	300	8	19	606	643	110	520
850	34	203	85	254	300	8	19	615	667	110	610
900	36	203	90	298	350	8	23	624	696	120	687
950	38	216	95	298	350	8	23	663	730	120	743
1000	40	254	100	298	350	8	23	703	763	130	821
1100	44	276	110	356	415	8	23	767	831	140	976
1200	48	276	120	356	415	8	23	830	900	150	1165



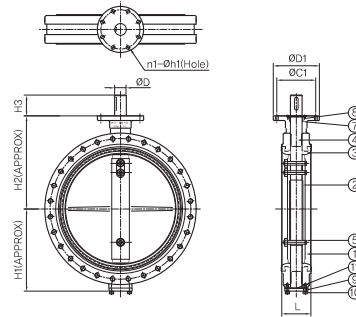
DN40~80(1½"~3")



DN100~150(4"~6")



DN200~550(8"~22")

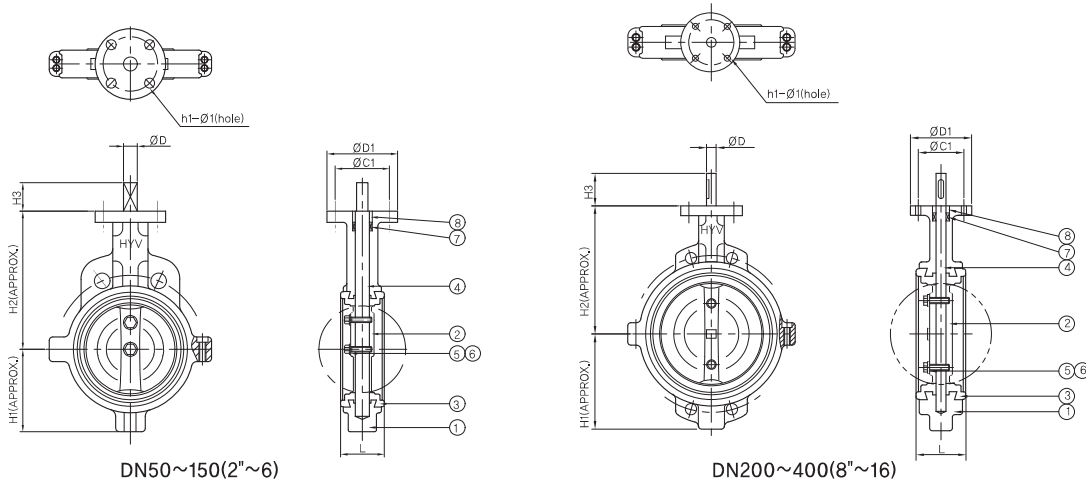


DN600~1200(24"~48")

· FLANGE RATING : JIS, PN, ANSI B 16.5 CLASS 150
 · FACE TO FACE : ISO 5752 SERIES 20 (DN 1100, 1200 API 609 CATEGORY A)

Size		L	ØD	ØC1	ØD1	n1	Øh1	H1	H2	H3	Weight (kg)
DN	inch										
40	1.6	40	14	70	90	4	10	58	110	32	5.2
50	2	43	14	70	90	4	10	70	120	32	5.8
65	2 1/2	46	14	70	90	4	10	68	130	32	6.5
80	3	46	14	70	90	4	10	78	149	32	8.1
100	4	52	16	70	90	4	10	98	178	32	10.4
125	5	56	19	70	90	4	10	110	184	32	12.5
150	6	56	19	70	90	4	10	125	198	32	16.4
200	8	60	28	70	90	4	12	167	231	45	29.5
250	10	68	28	102	125	4	15	228	265	45	37.8
300	12	78	28	102	125	4	15	240	300	50	55
350	14	78	28	102	125	4	15	272	335	50	62
400	16	102	40	140	175	4	19	305	375	60	85
450	18	114	40	140	175	4	19	320	399	70	114
500	20	127	50	165	210	4	23	359	434	70	135
550	22	154	50	165	210	4	23	388	455	80	180
600	24	154	50	165	210	4	23	415	498	80	242
650	26	165	50	165	210	4	23	447	535	100	260
700	28	165	70	254	300	8	19	530	578	105	341
750	30	190	70	254	300	8	19	512	598	105	403
800	32	190	80	254	300	8	19	606	643	110	520
850	34	203	85	254	300	8	19	615	667	110	620
900	36	203	90	298	350	8	23	624	696	120	700
950	38	216	95	298	350	8	23	663	730	120	760
1000	40	254	100	298	350	8	23	703	763	130	840
1100	44	276	110	356	415	8	23	767	831	140	990
1200	48	276	120	356	415	8	23	830	900	150	1180

CHEMICAL-RESISTANT OF BUTTERFLY VALVES (HY-C-Series)



● TECHNICAL DATA

Size range	2"(50A)-16"(400A)
Pressure Rating	7Bar, 10Bar
Temperature range	0°C to +80°C
Flange drilling	ANSI B16.5(CL,150), DIN 2532(PN10), BS 4504(PN10), JIS B2210(10K)
Face to Face dimension	ISO 5752, API609, MSS SP-67
Body style	WAFER, LUGGED(Two Pieces)
Top flange mounting	ISO 5211
Actuator	Lever handle, Worm gear, Electric actuator, Pneumatic actuator

PRESSURE RATING

For bi-directional bubble-tight shut off, disc in closed position:
 316 SS Disc/Stem & Teflon Molded Seat : 50mm-400mm 10bar, 2"-16" 150psi

Teflon Molded Disc & Seat : 50mm-400mm 7bar, 2"-16" 100psi
 Elastomer Coated Disc : 50mm-400mm 7bar, 2"-16" 100psi

· FLANGE RATING : JIS, PN, ANSI B 16.5 CLASS 150
 · FACE TO FACE : ISO 5752 SERIES 20

Unit : mm

Size		L	ØD	ØC1	ØD1	n1	Øh1	H1	H2	H3	Weight (kg)
mm	inch										
-	-	-	-	-	-	-	-	-	-	-	-
50	2 ^{1/2}	43	14	70	90	4	10	70	115	35	3.8
65	2	46	14	70	90	4	10	74	126	35	4.0
80	3	46	14	70	90	4	10	90	147	35	4.6
100	4	52	16	70	90	4	10	97	169	35	6.8
125	5	56	19	70	90	4	10	117	180	35	7.5
150	6	56	19	70	90	4	10	127	195	35	9.7
200	8	60	22.3	82	100	4	12	170	220	50	15.5
250	10	68	28.6	98	120	4	15	202	265	55	27.6
300	12	78	28.6	98	120	4	15	238	285	55	37.5
350	14	78	30	98	120	4	15	255	325	60	50.8
400	16	102	35	98	120	4	15	300	340	60	75.6

Body

Cast Iron ASTM A126Class B
 316 Stainless Steel ASTM A351 CF8M
 Aluminium ASTM B26(Wafer only)
 Ductile Iron ASTM A536(Lug only)

Seat

Teflon-Molded EPDM
 EPDM
 Viton
 NBR

Disc/Stem

Teflon Molded 316 Stainless Steel ASTM A351 CF8M/ASTM A276 T316
 EPDM Molded 316 Stainless Steel/316 Stainless Steel ASTM A351 CF8M/ASTM A276 T316
 NBR Moled 316 Stainless Steel/316 Stainless Steel/ASTM A351 CF8M/ASTM A276 T316
 Viton Moled Stainless Steel/316 Stainless Steel ASTM A351 CF8M/ASTM A276 T316
 Nylon Coated Ductile Iron/316 Stainless Steel ASTM A536/ASTM A276 T316

● PART NAME AND MATERIALS

No.	PART NAME	MATERIAL	MATERIAL SPECIFICATION
1	BODY	CARBON STEEL STAINLESS STEEL	ASTM A216 WCB ASTM A351 CF8 ASTM A351 CF8M
2	DISC	STAINLESS STEEL ALUMINIUM BRONZE	ASTM A351 CF8 ASTM A351 CF8M ASTM B148 C954
3	SEAT	REINFORCED TFE	
4	STEM	STAINLESS STEEL	ASTM A276 T304/T316
5	TAPER PIN (REAMER BOLT)	17-4 PH STAINLESS STEEL	ASTM A564 T630
6	RETAINER	STAINLESS STEEL	ASTM A240 T304 ASTM A351 CF8
7	PACKING	TEFLON	
12	GASKET	GRAPHITE	A276
8	PACKING RING	STAINLESS STEEL	ASTM T304
9	PACKING GLAND	STAINLESS STEEL	ASTM A240 T304
13	END COVER	STAINLESS STEEL	
10	BUSH	STAINLESS STEEL+PTFE	ASTM A240 T316
11	MOUNTING FLANGE	STEEL	ASTM A36
14	STUD BOLT	STAINLESS STEEL	ASTM A193 B8

Butterfly Valve is designed to conform to the following standards where applicable:

- ANSI B16.5 Steel Pipe Flanges and Flange Fittings
- ANSI B16.34 Steel Valves
- ANSI B31.1 Power Piping
- ANSI B31.3 Chemical Plant and Petroleum Refinery Piping
- MSS-SP-6 Standard Finishes for Pipe Flanges
- MSS-SP-25 Standard Marking System for Valves
- MSS-SP-55 Quality Standard for Steel Castings
- MSS-SP-61 Pressure Testing of Steel Valves
- MSS-SP-67 Butterfly Valves
- API-598 Valve Inspection and Test
- API-609 Butterfly Valves
- DIN 3230 Technical conditions of delivery for valves
- ISO 5762 Metal valves for use in flanged pipe systems
- ISO 2084 Pipeline flanges for general use
- BS 4504 Flanges and bolting for pipes, valves and fittings
- JIS 2215 Basic dimensions for steel pipe flanges
- JIS F7480 Marine Rubber-seat Butterfly valve for Marine use

● PRESSURE-TEMPERATURE RATINGS

MATERIALS : A105, A216WCB, A350-LF2

VALVE CLASS	150	300	400	600	900
TEMPERATURE IN F°	WORKING PRESSURES IN PSI				
-20 TO 100	285	740	990	1480	2220
200	260	675	900	1350	2025
300	230	655	875	1315	1970
400	200	635	845	1270	1900
500	170	600	800	1200	1795
600	140	550	730	1095	1640
700	110	535	710	1065	1600
750	95	505	670	1010	1510
800	80	410	550	825	1235
750	65	270	355	535	515
900	50	170	230	345	515
950	335	105	140	205	310
1000	20	50	70	105	155

HYDROSTATIC TEST PRESSURES IN POUNDS PER SQUARE INCH GAGE(Psig)

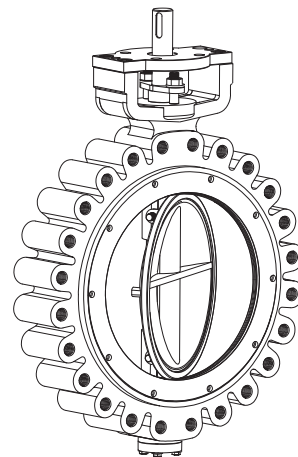
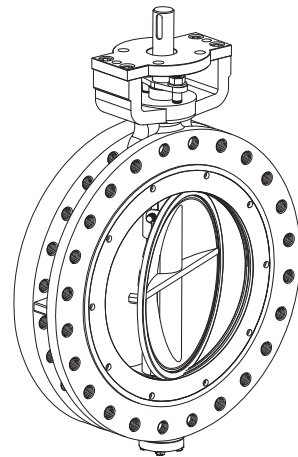
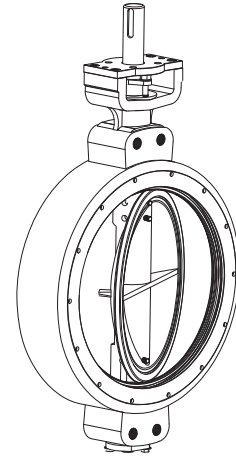
SHELL	450	1125	1500	2225	3350
SEAT	315	815	1085	1630	2440

MATERIALS : A351-CF8, A351-CF, A182-F304

VALVE CLASS	150	300	400	600	900
TEMPERATURE IN F°	WORKING PRESSURES IN PSI				
-20 TO 100	275	720	960	1440	2160
200	235	600	800	1200	1800
300	205	530	705	1055	1585
400	180	470	630	940	1410
500	170	435	585	875	1310
600	140	415	555	830	1245
650	125	410	545	815	1225
700	110	105	540	805	1210
750	95	100	530	795	1195
800	80	395	525	790	1180
750	65	390	520	780	1165
900	50	385	510	770	1150
950	35	375	430	645	965
1000	20	325	430	645	925

HYDROSTATIC TEST PRESSURES IN POUNDS PER SQUARE INCH GAGE(Psig)

SHELL	413	1080	1440	2160	3240
SEAT	303	792	1056	1584	2376



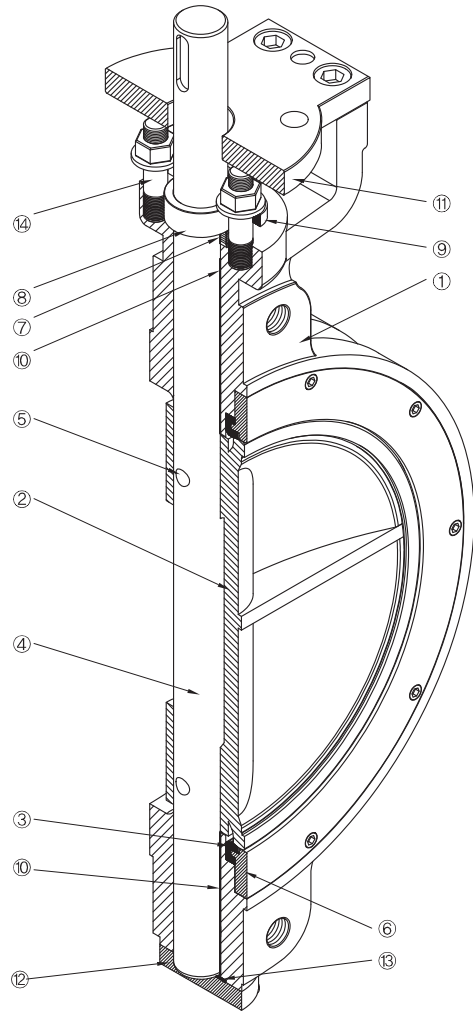
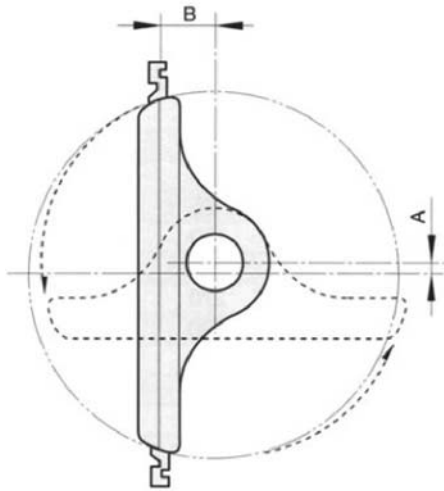
▶▶▶ HIGH-PERFORMANCE WITH PTFE/METAL SEAT VALVES

● ADVANTAGES OF HANYANG HIGH-PERFORMANCE BUTTERFLY VALVES

- Zero Leak Bi-Directionally
- Long Operation Life Cycle operating
- Pressure To 50kgf/cm² Temperature to +160°C RTFE Seat
- High Temperature to +450°C METAL Seat
- Ideal for Proportional Process Control

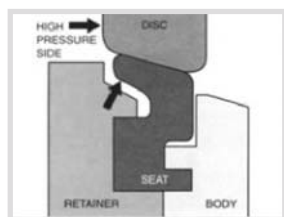
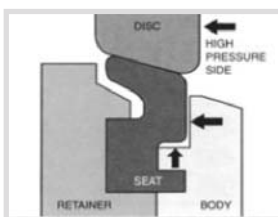
● DOUBLE ECCENTRIC MECHANISM

This allows friction-free contact between the body and the seat. Since the rotation axis(stem)of valve disc is shifted from the center by a distance of the width of A and B, a cam effect is produced which prevents wearing of the seal surface, lessens seating torque and offer longer service life and ease operation.



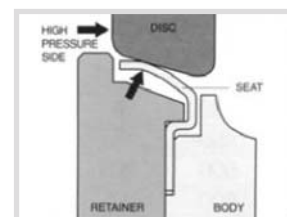
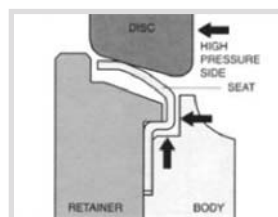
● PTFE SEAT DESIGN

Line pressure compresses the flexible seat against the disc, and positive shut-off assured. The body and retainer rigidly hold the seat in position and shield it from flow, protecting in against abrasion and erosion.



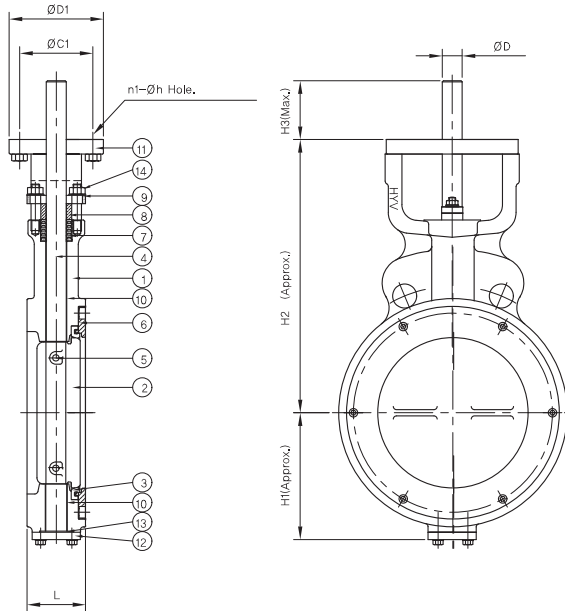
● SEALING PRINCIPLE(METAL SEAT)

Basically the same principle as with teflon seat applies to this metal seat valves, metal seat shall be used for application of excessive temperature range of teflon seat. Material Characteristics or metal seat against high temperature and rigidity as well as the spring effects perform excellent sealing by compressing onto the disc.

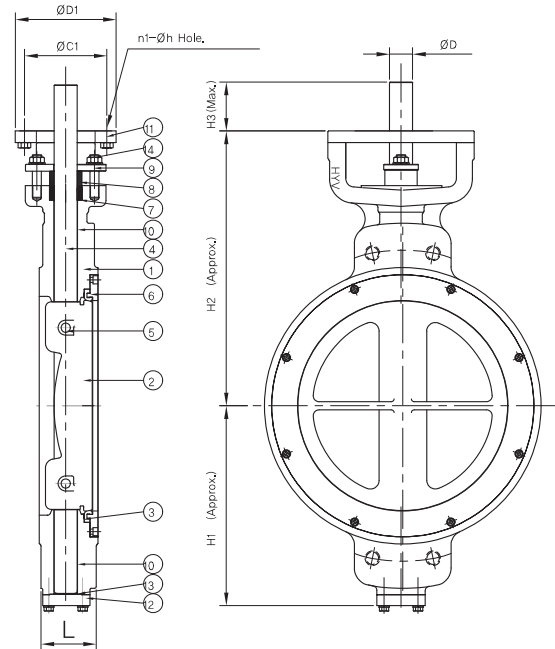


HANYANG WAFER TYPE BUTTERFLY VALVES (HY-HPW-Series)

DN 100 ~ DN 200
(4" ~ 8")



DN 50 (2") ~ DN 80 (3")
DN 250 ~ DN 1200 (10" ~ 48")



WAFER TYPE

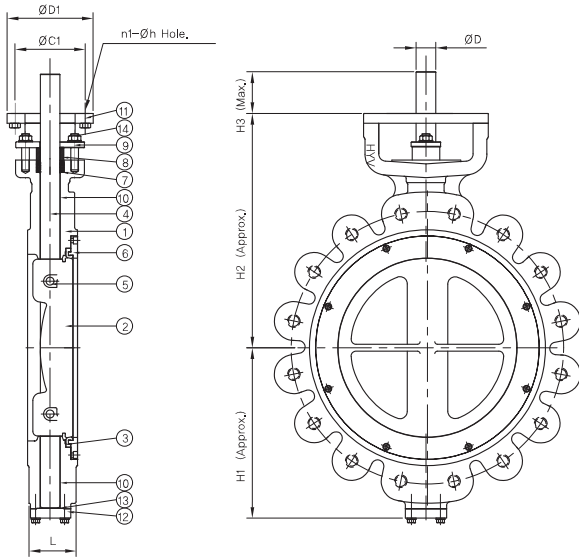
- FLANGE RATING : JIS, PN, ANSI B 16.5 CLASS 150
- FACE TO FACE : ISO 5752 SERIES 20 (DN 1100, 1200 API 609 CATEGORY A)

Size		L	ØD	ØC1	ØD1	n1	Øh1	H1	H2	H3	Weight (kg)
DN	inch										
50	2	43	14	70	90	4	10	90	162	56	8.5
65	2 1/2	46	14	70	90	4	10	100	172	56	11.0
80	3	46	14	70	90	4	10	110	185	56	12.5
100	4	52	16	70	90	4	10	138	223	56	23.0
125	5	56	19	70	90	4	10	152	222	56	30.0
150	6	56	19	70	90	4	10	169	261	56	44.0
200	8	60	28	102	125	4	12	205	306	70	55.0
250	10	68	28	102	125	4	12	223	335	70	63.0
300	12	78	35	102	125	4	12	266	364	70	74.0
350	14	78	35	140	175	4	19	302	450	85	86.0
400	16	102	40	165	210	4	23	347	477	85	102.0
450	18	114	45	165	210	4	23	371	515	110	146.0
500	20	127	50	165	210	4	23	405	531	110	270.0
550	22	154	55	165	210	4	23	439	589	110	390.0
600	24	154	60	254	300	8	19	475	627	110	520.0
650	26	165	65	254	300	8	19	507	647	110	560.0
700	28	165	70	254	300	8	19	542	707	125	640.0
750	30	190	75	254	300	8	19	575	720	125	710.0
800	32	190	80	254	300	8	19	610	765	125	840.0
850	34	203	85	254	300	8	19	620	779	125	920.0
900	36	203	90	298	350	8	23	620	790	145	1060.0
950	38	216	95	298	350	8	23	674	815	145	1320.0
1000	40	216	100	298	350	8	23	700	870	145	1520.0
1100	44	276	110	356	415	8	23	760	930	180	1690.0
1200	48	276	120	356	415	8	23	815	985	180	1820.0

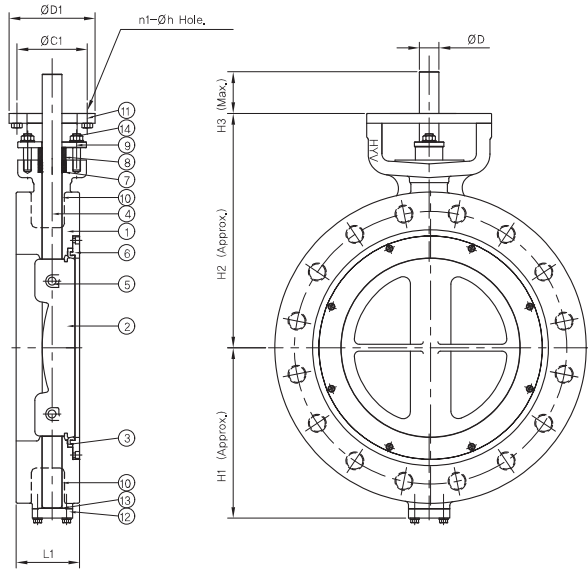
LUGGED & FLANGE TYPE BUTTERFLY VALVES (HY-HPL, HPF-Series)

DN 50 ~ DN 1200
(2" ~ 48")

DN 50 ~ DN 1200
(2" ~ 48")



LUGGED TYPE



FLANGE TYPE

- FLANGE RATING : JIS, PN, ANSI B 16.5 CLASS 300
- FACE TO FACE : WAFER & LUG TYPE(L) (DN 50~DN 600 → API 609 CATEGORY B)
- (DN 650~DN 1000 → ISO 5752 SERIES 20)
- (DN 1100, 1200 → API 609 CATEGORY A)
- FLANGE TYPE(L1) API 609 CATEGORY B (SHORT PATTERN), ISO 5752 SERIES 13

Size		LUGGED WAFER	FLG	ØD	ØC1	ØD1	n1	Øh1	H1	H2	H3	Weight (kg)
DN	inch	L	L1									
50	2	43	43	14	70	90	4	10	90	162	56	10.0
65	2 1/2	46	46	14	70	90	4	10	100	172	56	12.5
80	3	46	114	14	70	90	4	10	110	185	56	14.0
100	4	54	114	16	70	90	4	10	138	223	56	25.0
125	5	59	127	19	70	90	4	10	152	222	56	35.0
150	6	59	140	19	70	90	4	10	169	261	56	52.0
200	8	73	152	28	102	125	4	12	205	306	70	68.0
250	10	83	165	28	102	125	4	12	223	335	70	79.0
300	12	92	178	35	102	125	4	12	266	364	70	92.0
350	14	117	190	35	140	175	4	19	302	450	85	105.0
400	16	133	216	40	165	210	4	23	347	477	85	170.0
450	18	149	222	45	165	210	4	23	371	515	110	233.0
500	20	159	229	50	165	210	4	23	405	531	110	310.0
550	22	181	567	55	165	210	4	23	439	589	110	420.0
600	24	181	267	60	254	300	8	19	475	627	110	560.0
650	26	165	292	65	254	300	8	19	507	647	110	620.0
700	28	165	292	70	254	300	8	19	542	707	125	690.0
750	30	190	318	75	254	300	8	19	575	720	125	825.0
800	32	190	318	80	254	300	8	19	610	765	125	910.0
850	34	203	330	85	254	300	8	19	620	779	125	990.0
900	36	203	330	90	298	350	8	23	620	790	145	1145.0
950	38	216	410	95	298	350	8	23	674	815	145	1380.0
1000	40	216	410	100	298	350	8	23	700	870	145	1590.0
1100	44	276	470	110	356	415	8	23	760	930	180	1750.0
1200	48	276	470	120	356	415	8	23	815	985	180	1860.0

HANYANG TECHNICAL DATA

▶▶ BUTTERFLY VALVE DESIGN TYPE

● CONCENTRIC VALVE

The center of disc and the axis of body have the same position(see Fig.1). In this design a high interference is caused between the disc and the seal and therefore it is preferable to use for the valve with only soft seat(Eg. rubber.) The symmetric disc design ensures favourable flow characteristics and low pressure drop, and this type shaft ensures low operating torque. The seat gives a good protection to valve body and acts as flange gaskets.



Fig. 1

● ECCENTRIC VALVE

The disc is mounted eccentrically, in comparison to the body's axis, with one eccentricity and the body's seat and the seal ring are machined according to a cone having an axis aligned with valve(see Fig.2) In this design interference is caused between the disc and the liner and therefore it is preferable to use for only soft lined valves(Eg. rubber).

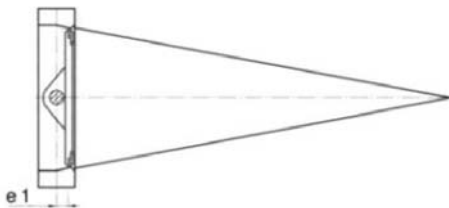


Fig. 2

● DOUBLE ECCENTRIC VALVE

The center of disc and the axis of body have the eccentric structure each other, with double eccentricity and the body's seat and the seal ring are machined according to a cone having an axis aligned with the valve(see Fig.3) In this case a low interference is noticed, therefore this design is preferably used only for soft lined valves(for example: in rubber, PTFE, etc.) as a rigid metal seat in this case would probably be restrained.

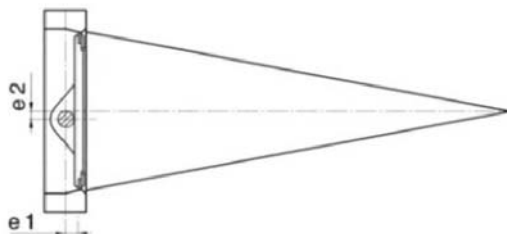


Fig. 3

● TRIPLE ECCENTRIC VALVE

The disc is mounted, in comparison to the body's axis, with triple eccentricity and the body's seat and the seal ring are machined with an elliptic profile obtained as a portion of a slanted cone, compared with the valve(see Fig.4). In this case no interference is noticed, therefore this design is preferably used for metal to metal seated valves.

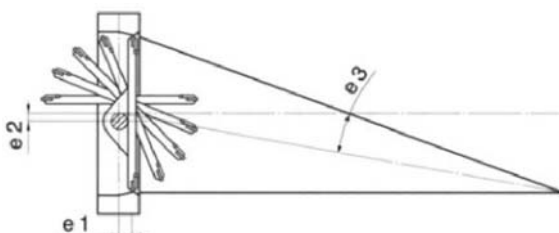


Fig. 4

TECHNICAL DATA

▶▶▶ SELECTION OF BUTTERFLY VALVES(Flow Co-efficient Cv)

Cv(pure number) is, in American units, the water flow rate is 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 co-efficient is called Kv and correspond to the flow rate in m³/h passing through the valve giving a pressure drop of 1 bar at a temperature of 20° C. The approximate corresponding formulas are:

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

Where :

Q= valve flow rate in gpm(USGPM)
ΔP=pounds per square inch(psi) pressure drop through valve
r= specific gravity(for water at 68° F=1)

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

Where :

Q= valve flow rate in m³/h
ΔP=pressure drop through the valve in bar
r= specific gravity (for water at 20° C = 1)

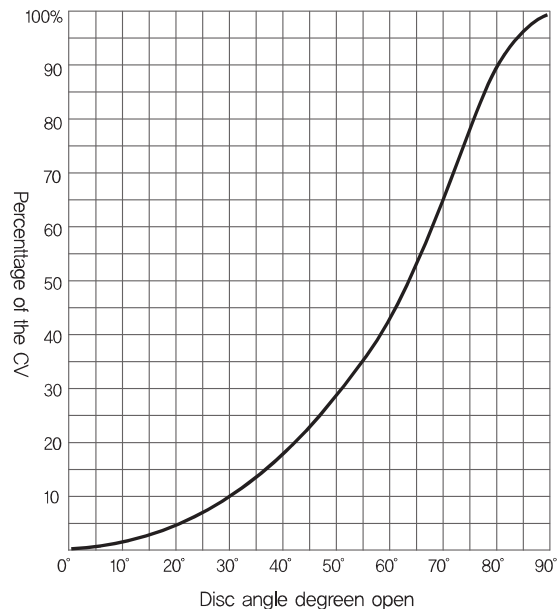
The relation between Cv and Kv, expressed in the above mentioned unit of measure is as follows : Cv=1.16Kv

● Flow rate Co-efficients Cv resilient seated butterfly valve

Flow rate Co-efficients Cv Values.									
Valve (inch)	Disc Opening(Degree)								
	10°	20°	30°	40°	50°	60°	70°	80°	90°
2	0.0	1.3	5	14	26	40	52	59	60
2½	0.0	1.4	6	21	44	74	107	138	151
3	0.7	1.5	8	29	67	115	175	234	262
4	1.7	12	48	107	196	318	463	589	647
5	3	32	99	206	365	579	832	1045	1141
6	4	47	745	295	510	810	1160	1450	1580
8	6	84	239	450	751	1190	1753	2385	2892
10	9	133	360	652	1064	1683	2524	3596	4593
12	12	192	509	899	1449	2288	3470	5085	6682
14	75	340	770	1400	2200	3400	5600	7900	10000
16	100	440	1000	1800	2800	4500	7400	10800	13000
18	130	570	1300	2300	3600	5800	9600	15000	18000
20	150	710	1600	2900	4600	7200	12000	18400	22000
24	220	1000	2300	4000	6400	10000	16500	25900	30000
30	340	1500	3600	6200	9900	16000	26000	42500	47000
36	500	2600	5200	9100	15000	23000	38000	65000	70000
40	870	2905	6270	11400	20148	30590	46310	59460	81580

Note : Cv=The flow rate of water in U.S. gpm that will pass through a valve with a pressure drop of 1 psi @ 60° F

● VALUE CHARACTERISTICS



The graph at side gives the percentage of the Cv value at any intermediate angle between 0° and 90°

HANYANG

INSTALLATION PROCEDURES

● 1. Shipment & Storage

- 1-1 The seat, disc, stem, and bushing of the butterfly valve should be coated with silicone lubricant in general.
- 1-2 The disc should be positioned at 10° open.
- 1-3 The faces of each valve should be covered with cardboard, plywood, plastic, etc. to prevent damage to the seat face, disc edge, or butterfly valve interior.
- 1-4 Valves should be stored indoors with face protectors intact. Temperature should preferably be 4°C to 45°C
- 1-5 When valves are stored for a long time, open and close the valves once every 3 months.

● 2. Installation Considerations. Piping and Valve Orientation and Placement

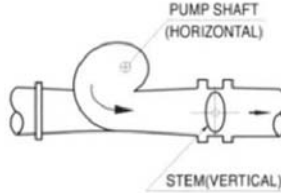
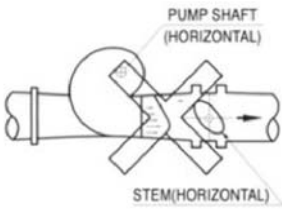
- 2-1 Piping and Flange Compatibilities– The butterfly valves have been designed to be suitable for all types of ANSI, JIS, BSI, DIN flanges, regardless of flat-faced, raised-face, slip on, weld-neck, etc. (Type C stub-end flanges conform to no standard for the flange face and are not recommended for use with resilient-seated butterfly valves). These valves have been engineered so that the critical disc chord dimension at the full open position will clear the adjacent inside diameter of most type of piping, including Schedule 40, lined pipe, heavy wall, etc. If in question, one should compare the minimum pipe I.D. with the published disc chord dimension at full open.
- 2-2 Valve Location and Orientation in Piping
 - A. Valve Location–Butterfly valves should be installed if possible a minimum of 6 pipe diameters from other line elements, i.e. elbows, pumps, valves, etc. of course, 6 pipe diameters is not always practical, but it is important to achieve as much distance as possible. Where the butterfly valve is connected to a check valve or pump, use an expansion joint between them to ensure the disc does not interfere with the adjacent equipment.
 - B. Valve Orientation
 - B-1. In general, HANYANG recommends that the valve be installed with the stem in the vertical position and the actuator mounted vertically directly above the valve; however there are those applications as discussed below where the stem should be horizontal. The valve should not be installed upside down.
 - B-2. For slurries, sludge, mine tailings, pulp stock, dry cement, and any media with sediment or particles, HANYANG recommends that the valve be installed with the stem in the horizontal position with the lower disc edge opening in the down stream direction.
 - B-3. For valve orientation located at down stem of pump, bend, etc.; see the figures(A,B,C) for the installation orientation on the next page.

● 3. Installation Procedure

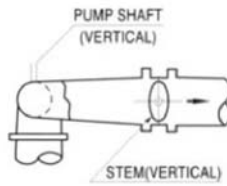
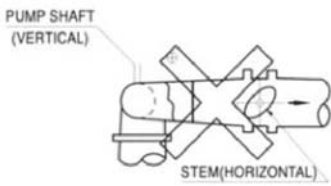
- 3-1 General Installation
 - A. Make sure the pipe line and pipe flange faces are clean. Any foreign material such as pipe scale, metal chips, welding rods, etc., can obstruct disc movement or damage the disc or seat.
 - B. The elastomer seat has moulded o-rings on the face of the seat. As a result, no gaskets are required (but if Flange rating 10kg/cm^2 exceeded, Flange gaskets are necessary) as these o-rings serve the function of a gasket.
 - C. Align the piping and then spread the pipe flanges a distance apart so as to permit the valve body to be easily dropped between the flanges without contacting the pipe flanges.
 - D. Check to see that the valve disc has been positioned to a partially open position, with the disc edge about 10mm from the face of the seat (approximately 10° open)
 - E. Insert the valve between the flanges, taking care not to damage the seat faces. Always pick the valve up by the locating holes or by using a nylon sling on the neck of the body. Never pick up the valve by the actuator or operator mounted on top of the valve.
 - F. Place the valve between the flanges, centre it, and then span the valve body with all flange bolts, but do not tighten the bolts. Carefully open the disc to the full open position, making sure the disc does not hit the adjacent pipe I.D. (Temporary assembly). And then flange systematically remove jack bolts or other flange spreaders, and hand-tighten the flange bolts. Very slowly close the valve disc to ensure disc edge clearance from the adjacent pipe flange I.D. Now open the disc to full open and tighten all flange bolts per specification. Finally repeat a full close to full open rotation of the disc to ensure proper clearances.

INSTALLATION PROCEDURES

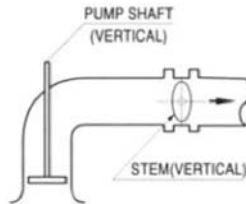
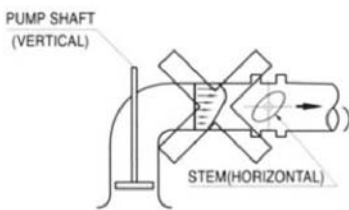
A. Butterfly valves located at the discharge of a pump should be orientated as follows:



i) For Centrifugal Pump—Pump shaft horizontal and stem vertical

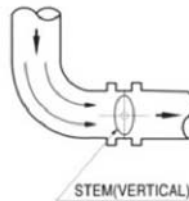
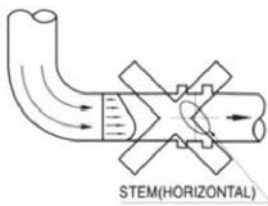


ii) Centrifugal Pump—Pump shaft vertical & stem horizontal

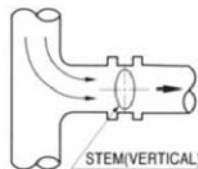
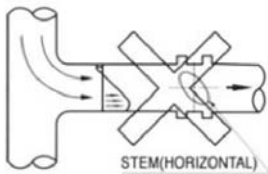


iii) Axial Pump—Pump shaft vertical & stem

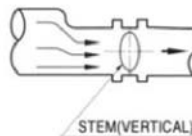
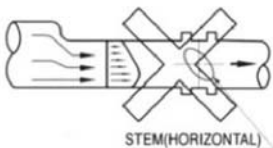
B. Butterfly valves located down stream of a bend or pipe reducer should be orientated as follows:



i) Bend



ii) Tee



iii) Pipe Reducer

HANYANG INSTALLATION PROCEDURES

C. Butterfly valve is combination for control isolation applications should be as UP:

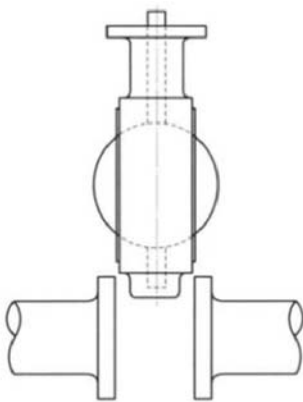


3-2 Installation with Flange Welding—When butterfly valves are to be installed between ANSI welding type flanges, care should be taken to abide by the following procedure to ensure no damage will occur to the seat:

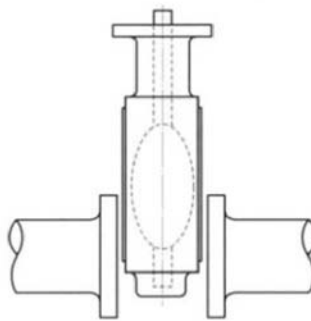
- A. Place the valve between the flanges with the flange bores and valve body bore aligned properly. The disc should be in the 10° open position.
- B. Span the body with the bolts.
- C. Take this assembly of flange—body—flange and align it properly to the pipe
- D. Take weld the flanges to the pipe.
- E. When tack welding is complete, remove the bolts and the valve from the Pipe flanges and complete the welding of the flanges. Be sure to let the pipe and flanges cool before installing the valve. NOTE: Never complete the welding process(after tacking) with the valve between the pipe flanges. This causes severe seat damage due to heat transfer.

Figure 1—Insert Butterfly Valve Between Flanges

Figure 2—Recommended Bolt Tightening Sequence



WRONG



RIGHT

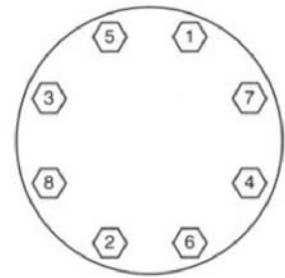
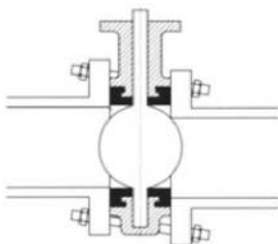
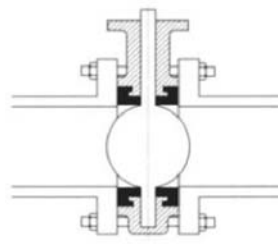


Figure 3—Final Aligning of Flange bolts



WRONG

Piping misaligned: Results—Disc O.D. strikes pipe I.D. causing disc edge damage, increased torque & leakage. Seat face o-ring seal improperly w/out engagement



RIGHT

Piping aligned properly when bolts tightened, disc in full open position: Results—disc cleansers adjacent pipe I.D, seat face seals properly, no excessive initial torque.

Butterfly valves for piping inspection blind flange should not be used for the substitution. (All plumbing pressure tested when the state opened the valve on the test should be conducted.)

버터플라이 밸브의 파이핑 검사를 할 때는 블라인더 플랜지 대체용으로 사용해서는 안된다. (배관 전체의 수압테스트를 할 때는 밸브를 OPEN한 상태에서 TEST를 실시해야 한다.)

▶▶ BUTTERFLY VALVE TORQUE VALUES

Valve sizing torque value for fully rated resilient seated butterfly valves.
Anticipated Seating & Unseating Torque Values–Kg.m(Fully Rated)

Torque Valves (kg-m)									
Valve Size (mm)	Normal service(Shut Off Pressure Kg/cm ² (PSI))				Valve Size (mm)	Normal service(Shut Off Pressure Kg/cm ² (PSI))			
	0 (0)	3 (50)	6 (85)	10 (150)		0 (0)	3 (50)	6 (85)	10 (150)
40	0.8	0.8	1.2	1.5	450	79.6	98.8	117.9	158.2
50	2.6	2.6	2.6	2.7	500	98.1	125.0	152.0	226.5
65	3.2	3.3	3.3	3.4	550	107.1	123.5	188.8	310.2
80	3.7	3.8	3.9	4.0	600	112.4	167.3	205.1	391.2
100	5.5	5.7	5.9	6.2	650	125.5	285.7	316.3	391.8
125	7.4	7.9	8.3	8.8	700	148.0	324.5	402.0	595.9
150	10.0	10.9	11.0	13.3	750	173.0	338.8	413.3	708.2
200	17.3	18.5	19.5	21.0	800	292.9	367.3	515.3	801.0
250	26.5	28.8	30.9	33.9	850	241.8	387.0	590.8	887.8
300	35.7	39.0	42.1	49.0	900	310.0	428.6	622.4	989.8
350	49.6	58.2	66.6	83.7					
400	63.5	76.6	89.7	107.1					

For conditions that vary from those noted. then apply the following Application Factor Multipliers:

Operated less than once per day	×1.2
Dry Service with abrasives, cement	×1.7
Lubrication oils	×0.5
Temperature – lower than minus 4.5° C	×1.2
– higher than 93° C	×1.2
Chemical attack: Consult factory	

Note:

To apply the as noted Application Factor Multipliers

- Find the base torque value by selecting the required valve size from the left hand column and read across to the intended line pressure column. Note the torque value, you can interpolate between line pressure values.
- Find the zero pressure torque for the same valve on the same row and subtract this zero pressure torque from the value in step 1.
- Multiply the zero pressure torque value by the expected Application Factors.
- Add the difference between the zero pressure torque and line pressure torque(value of step2 plus value of step3) to have the new torque value specific to the actual service conditions.

Example:

A. 150mm valve is to be used in a clean water application. The line pressure is 10kg/cm² (150 PSI) @ 100° C The valve may only cycle twice per month.

- Using the Normal Service Torque values table Base torque value for 150mm @10kg/cm² (150PSI)= 13.3kg . m
- Find torque value at zero kg/cm²= 10kg . m
Subtract 13.3–10 = 3.3 kg . m
- Multiply zero pressure torque value by Application Factors
Application Factors
Operated less than one per day = ×1.2
Temperature higher than 93° C = ×1.2
10×1.4 = 14kg . m
- Add the difference between zero pressure and line pressure, as per step 2 to the value determined in step 3, 3.3+14= 17.3kg . m
The new torque value for this valve, specific to the actual service conditions is 17.3kg . m

● NBR

Suitable for :
 · Excellent resistance to petroleum products.
 · Water
 · Generally resistant to many hydrocarbons, fats, oils, greases, hydraulic fluids, ethylene glycol and chemicals.
 Not Suitable for :
 · Acetone, Ketones, strong acids, ozone, brake fluid, phosphates esters, carbon tetrachloride, trichloroethylene and phosphate ester hydraulic fluid.
 Temperature Range :
 -10°C to +70°C Continuous
 -10°C to +80°C Intermittent

● EPDM

Suitable for :
 · Excellent resistance to low pressure steam(30 PSI max), hot and cold water.
 · Generally resistant to animal and vegetable oils, ozone strong and oxidizing chemicals.
 · Phosphate ester hydraulic fluid.
 Good for dilute acids and alkalies, brake fluid and ketones (MEK acetone).
 Not Suitable for :
 · Petroleum, oils, Di-ester based lubricants, aromatic hydrocarbons, mineral oils, solvents.
 Temperature Range :
 -10°C to +80°C Continuous
 -10°C to +90°C Intermittent

● HYPALON

Suitable for :
 · Excellent resistance to moderate chemicals, acids, ozone, fats, greases and solvents.
 Not suitable for :
 · Strong, oxidizing acids, esters, ketones, chlorinated, aromatic and nitro hydrocarbons, Not recommended for steam service.
 Temperature Range :
 -5°C to +60°C Continuous
 -5°C to +70°C Intermittent

● VITON

Suitable for :
 · Excellent resistance to chemicals at elevated temperature including aliphatic, aromatic and halogenated hydrocarbons, animal and vegetable oils.
 · Good for most gasoline, fuel, solvents, petroleum, oils and ozone.
 Not suitable for :
 · Steam, ketones, hot hydrofluoric acid, anhydrous ammonia, low molecular weight esters and nitro containing compounds.
 Temperature Range(On Epoxy) :
 -10°C to +110°C Continuous
 -10°C to +120°C Intermittent

● TEFLON ON BUNA-N BASE

Suitable for :
 · Excellent resistance to high temperature, oils, acids, solvents, and most chemicals.
 Not Suitable for :
 · Fuming acids, gases or cryogenic service.
 Temperature Range :
 -0°C to +80°C Continuous
 -0°C to +90°C Intermittent

● NEOPRENE

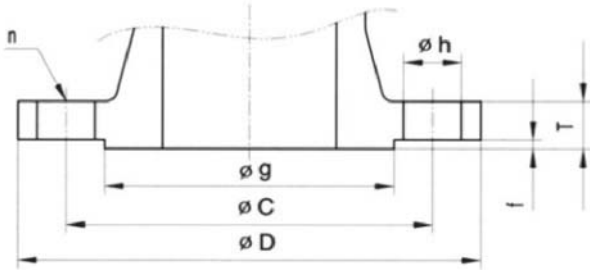
Suitable for :
 · Generally resistant to moderate chemicals and acids, ozone, oils, fats, greases, and solvents.
 Not Suitable for :
 · Strong oxidizing acids, esters, ketones, chlorinated, aromatic and nitro hydrocarbons.
 Temperature range :
 -10°C to +80°C Continuous
 -10°C to +90°C Intermittent

▶▶▶ RESILIENT SEAT COMPARISON DATA RATING : 1.EXCELLENT 2.GOOD 3.FAIR 4.POOR

	BUNA-N	EPDM	HYPALON	VITON	TEFLON	NEOPRENE
PHYSICAL PROPERTIES						
Tensile						
Elongation	2	2	3	3	N/A	1
Compression Set	2	2	3	3	N/A	2
Resilience	2	3	2	1	N/A	2
Electrical Resistivity	2	2	2	3	3	2
MECHANICAL RESISTANCE	4	1	2	2	N/A	3
Tear						
Abrasion	2	4	2	3	2	2
Cut Growth	1	2	2	2	4	2
TEMPERATURE RESISTANCE	2	2	2	3	4	2
Heat						
Low Temperature	2	1	1	1+	1	3
ENVIRONMENTAL RESISTANCE	3	2	2	4	2	3
Water	1	1	2	2	1	2
Acid	2	1	1	1	1	3
Alkali	2	1	1	3	1	3
Aliphatic Hydrocarbons	1	4	2	2	1	4
Aromatic Hydrocarbons	2	3	1	1	1	4
Chlorinated Solvents	4	4	1	3	1	4
Ketones	4	1	3	4	1	4
Alcohol	1	4	2	1	1	4
Lubricating Oils	1	4	4	2	1	4
Synthetic oils	2	3	4	2	1	4
Hydraulic Oils	3	2	2	2	1	4
Fuels	1	4	3	1	1	4
Weather	2	1	1	1	1	2
Oxidation	2	2	1	1+	1	2
Ozone	4	1	1+	1+	1	3

· To be used as a general application guide, consult factory when in doubt.

FLANGE DIMENSION TABLE


 $\phi D \times \phi C \times \phi g \times$
 $n \times \phi h \times T$

Unit : mm

Size		JIS 5K (KS 5K)	JIS 10K (KS 10K)	JIS 16K/20K (KS 16K/20K)	ANSI 150P	ANSI 300P	DIN 2532 PN 10	DIN 2533 PN 16
mm	inch							
40	1 ^{1/2}	120×95×75× 4×15×2×12	140×105×81× 4×19×2×16	140×105×81× 4×19×2×18	127.0×98.5×73.1× 4×15.7×1.6×14.2	155.4×114.3×73.1× 4×22.3×1.6×20.5	150×110×88× 4×18×3×18	150×110×88× 4×18×3×18
50	2	130×105×85× 4×15×2×14	155×120×96× 4×19×2×16	155×120×96× 8×19×2×18	152.4×120.7×91.9× 4×19.0×1.6×15.7	165.1×127.0×91.9× 8×19.0×1.6×22.3	165×125×102× 4×18×3×20	165×125×102× 4×18×3×20
65	2 ^{1/2}	155×130×110× 4×15×2×14	175×140×116× 4×19×2×18	175×140×116× 8×19×2×20	177.8×139.7×104.6× 4×19.0×1.6×17.5	190.5×149.3×104.6× 8×22.3×1.6×25.4	185×145×122× 4×18×3×20	185×145×122× 4×18×3×20
80	3	180×145×121× 4×19×2×14	185×150×126× 8×19×2×18	200×160×132× 8×23×2×22	190.5×152.4×127.0× 4×19.0×1.6×19.0	209.5×168.1×127.0× 8×22.3×1.6×28.4	200×160×138× 8×18×3×22	200×160×138× 8×18×3×22
100	4	200×165×141× 8×19×2×16	210×175×151× 8×19×2×18	225×185×160× 8×23×2×24	228.6×190.5×157.2× 8×19.0×1.6×23.8	254.0×200.1×157.2× 8×22.3×1.6×31.7	220×180×158× 8×18×3×24	220×180×158× 8×18×3×24
125	5	235×200×176× 8×19×2×16	250×210×182× 8×23×2×20	270×225×195× 8×25×2×26	254.0×215.9×185.6× 8×22.3×1.6×23.8	279.4×234.9×185.6× 8×22.3×1.6×35.0	250×210×188× 8×18×3×26	250×210×188× 8×18×3×26
150	6	265×230×206× 8×19×2×18	280×240×212× 8×23×2×22	305×260×230× 12×25×2×28	279.4×241.3×215.9× 8×22.3×1.6×25.4	317.5×269.7×215.9× 12×22.3×1.6×36.5	285×240×212× 8×22×3×26	285×240×212× 8×22×3×26
200	8	320×280×252× 8×23×2×20	330×290×262× 12×23×2×22	350×305×275× 12×25×2×30	342.9×298.4×269.7× 8×22.3×1.6×28.4	381.0×330.2×269.7× 12×25.4×1.6×41.1	340×295×268× 8×22×3×26	340×295×268× 12×22×3×26
250	10	385×345×317× 12×23×2×22	400×355×324× 12×25×2×24	430×380×345× 12×27×2×34	406.4×361.9×323.8× 12×25.4×1.6×30.2	444.5×387.3×323.8× 16×28.4×1.6×47.7	395×350×320× 12×22×3×28	405×355×320× 12×26×3×32
300	12	430×390×360× 12×23×3×22	445×400×368× 16×25×3×24	480×430×395× 16×27×3×36	482.6×431.8×381.0× 12×25.4×1.6×31.7	520.7×450.8×381.0× 16×31.7×1.6×50.8	445×400×370× 12×22×4×28	460×410×378× 12×26×4×32
350	14	480×435×403× 12×25×3×24	490×445×413× 16×25×3×26	540×480×440× 16×33×3×40	533.4×476.2×412.7× 12×28.4×1.6×35.0	584.2×514.3×412.7× 20×31.7×1.6×53.8	505×460×430× 16×22×4×30	520×470×438× 16×26×4×36
400	16	540×495×463× 16×25×3×24	560×510×475× 16×27×3×28	605×540×495× 16×33×3×46	596.9×539.7×469.9× 16×28.4×1.6×36.5	647.7×571.5×469.9× 20×35.0×1.6×57.1	565×515×482× 16×26×4×32	580×525×490× 16×30×4×38
450	18	605×555×523× 16×25×3×24	620×565×530× 20×27×3×30	675×605×560× 20×33×3×48	635.0×577.8×533.4× 16×31.7×1.6×39.6	711.2×628.6×533.4× 24×35.0×1.6×60.4	615×565×532× 20×26×4×32	640×585×550× 20×30×4×40
500	20	655×605×573× 20×25×3×24	675×620×585× 20×27×3×30	730×660×615× 20×33×3×50	698.5×635.0×584.2× 20×31.7×1.6×42.9	774.7×685.8×584.2× 24×35.0×1.6×63.5	670×620×585× 20×26×4×34	715×650×610× 20×33×4×42
550	22	720×665×630× 20×27×3×26	745×680×640× 20×33×3×32	795×720×670× 20×39×3×52	749.3×692.2×641.4× 20×35.0×1.6×46	838.2×743.0×641.4× 24×41×1.6×66.5	-	-
600	24	770×715×680× 20×27×3×26	795×730×690× 24×33×3×32	845×770×720× 24×39×3×54	812.8×749.3×692.1× 20×35.0×1.6×47.7	914.4×812.8×692.1× 24×41.1×1.6×69.8	780×725×685× 20×30×5×36	840×770×725× 20×36×5×48
650	26	825×770×735× 24×27×3×26	845×780×740× 24×33×3×34	945×850×790× 24×48×5×60	870.0×806.5×749.3× 24×35.0×1.6×68.3	971.6×876.3×849.3× 28×44.5×1.6×79.2	-	-
700	28	875×820×785× 24×27×3×26	905×840×800× 24×33×3×34	995×900×840× 24×48×5×64	927.1×863.6×800.1× 28×35×1.6×71.4	1035.1×939.8×800.1× 28×44.5×1.6×85.9	895×840×800× 24×30×5×40	910×840×795× 24×36×5×54
750	30	945×880×840× 24×33×3×28	970×900×855× 24×33×3×36	1080×970×900× 24×56×5×68	984.3×914.4×857.3× 28×35×1.6×74.7	1092.9×997×857.3× 28×47.8×1.6×91.9	-	-
800	32	995×930×890× 24×33×3×28	1020×950×905× 28×33×3×36	1140×1030×960× 24×56×5×72	1060.5×978×914.4× 28×41×1.6×81	1149.4×1054.1×914.4× 28×50.8×1.6×98.6	1015×950×905× 24×33×5×44	1025×950×900× 24×39×5×58
850	34	1045×980×940× 24×33×3×28	1070×1000×955× 28×33×3×36	1200×1090×1020× 24×56×5×74	1111.3×1028.7×965.2× 32×41×1.6×80.6	1206.5×1104.9×965.2× 28×50.8×1.6×101.6	-	-
900	36	1095×1030×990× 24×33×3×30	1120×1050×1005× 28×33×3×38	1250×1140×1070× 28×56×5×76	1168.4×1086×1022.4× 32×41×1.6×90.4	1270×1168.4×1022.4× 36×53.8×1.6×104.6	1115×1050×1005× 28×33×5×46	1125×1050×1000× 28×39×5×62



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