

JYV

Global

solution

digital

Design



JYV JAEYOU INDUSTRY CO., LTD.

It's prohibited to copy or transcribe arbitrarily.

CONTENT

■ Butterfly Valves

General

Certificate	2
Pictures	3
Specification	5
Features	6

Wafer, Lug, Flange type

Wafer	9
Lug	11
Flange	13

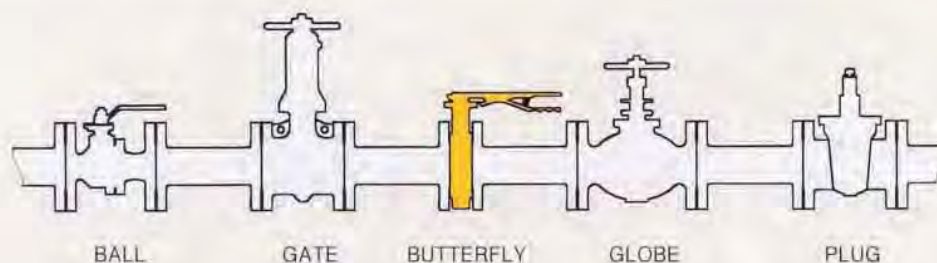
Actuator

Lever & Gear	15
--------------------	----

Reference data

Elastomer	16
Flow coefficient cv	17
Torque chart	18
Material Seletion Guide	19
Bolting Data	21
Correct Installion	22

Application



Valve Configurations scale drawing to actual size



Pictures



Specifications

- **Standard** according to ISO 5752 – BS 5155 – MSS SP 67 – API 609
- **Production range** 40mm up to 1200mm (1½" X 48")
- **Pressure range** designed for maximum working pressure of 16bar (240Psi)
- **Flange connections** TSV Butterfly valves are designed to fit without gaskets between flanges drilled to as below

ISO PN 6, 10, 16, 20
ANSI B 16.1 CL.
BS 4504 PN6, PN10, PN16
AS 2129 Table D and E

MSS SP 44 CL. 150
ANSI B 16.5 CL. 150
BS 10 Table D and E
JIS B 2210 5K, 10K, 16K and 20K

- **Face to face dimensions** in accordance with ISO 5752, BS 5155, MSS SP 67 and API 609
- **Actuator connection** valves can be fitted with any 1/4 turn actuator equipped with a mounting plate meeting the standard ISO 5211
- **Test inspection** TSV valves are guaranteed to seal perfectly (no visible leakage) in both flow direction. The test conforms to API 598
 - **Body test** : 1.5 times the maximum working pressure with water. The test is performed on the assembled valve with the disc in half open position.
 - **Seat and shaft seal test** : 1.1 times the maximum working pressure. The shaft seal test and inspection is conducted simultaneously with seat test.

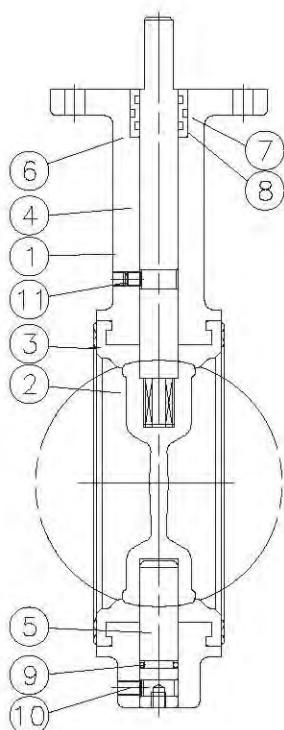
Standard materials

1 Body	• Cast iron • Ductile iron • Carbon steel • Stainless steel • Bronze	ASTM A 126 Cl.B, DIN 1619 – GG 25 ASTM A 536 Gr 65-45-12, DIN 1693 – GGG 40 ASTM A 216 WCB ASTM A 351 Gr CF8, CF8M ASTM B 62
2 Disc	• Ductile iron • Stainless steel • Aluminum bronze • Coated	ASTM A 536 Gr 65-45-12, GGG – 40 ASTM A 351 Gr CF8, CF8M ASTM B 148 Cl. C95500. AL-BC 2 EPDM, Viton, Buna-N, etc
3 Stem	• Stainless steel • K-Monel	ASTM A 276 410, 304, 316 ASTM B 164
4 Seat	Elastomer • EPDM • NBR • Viton • Silicon • Neoprene	Working temperature - 15°C ~ +110°C - 10°C ~ + 80°C - 20°C ~ +150°C - 20°C ~ +140°C - 10°C ~ + 90°C

* Valve discs in ductile iron and carbon steel are nickel plated

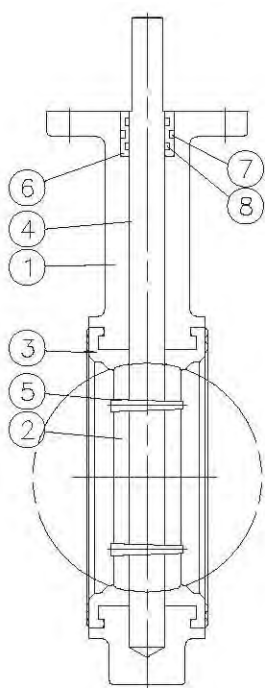
Features

2"~14"



STANDARD

1	BODY
2	DISC
3	SEAT RING
4	MAIN STEM
5	STUB STEM
6	O-RING HOLDER
7	O-RING
8	O-RING
9	O-RING
10	STOP BOLT
11	BOLT/O-RING/BOLT

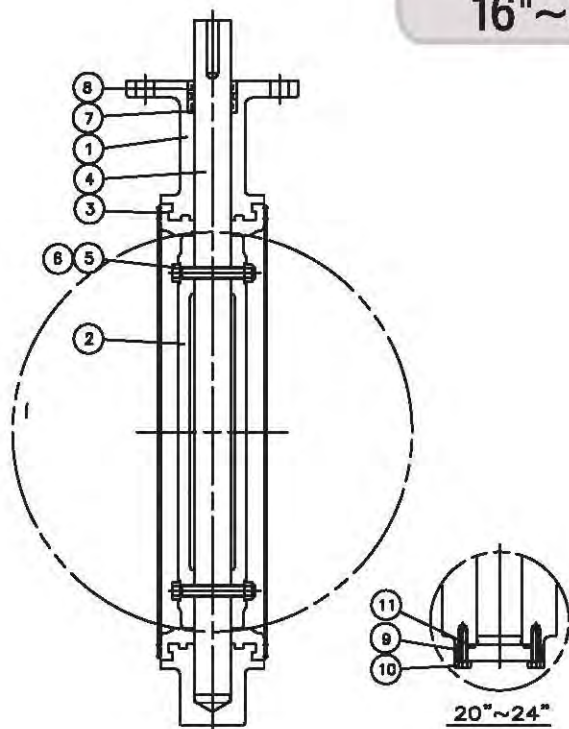


DUCTILE IRON DISC

1	BODY
2	DISC
3	SEAT RING
4	STEM
5	DISC PIN
6	O-RING HOLDER
7	O-RING
8	O-RING

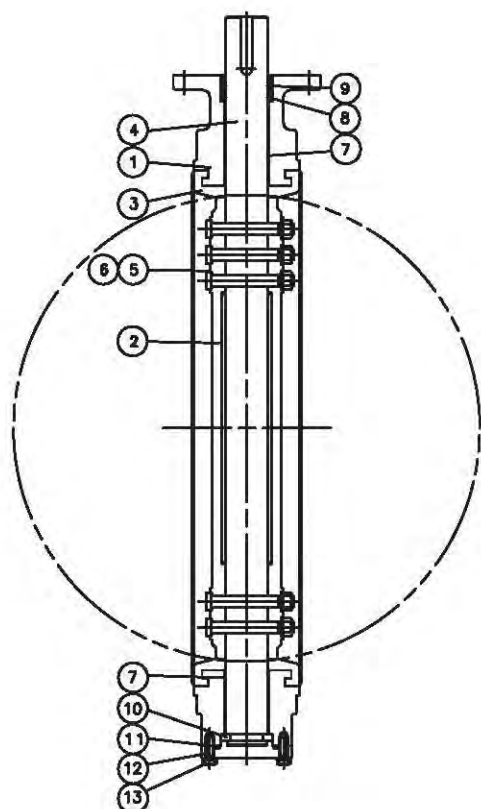
Features

16"~24"



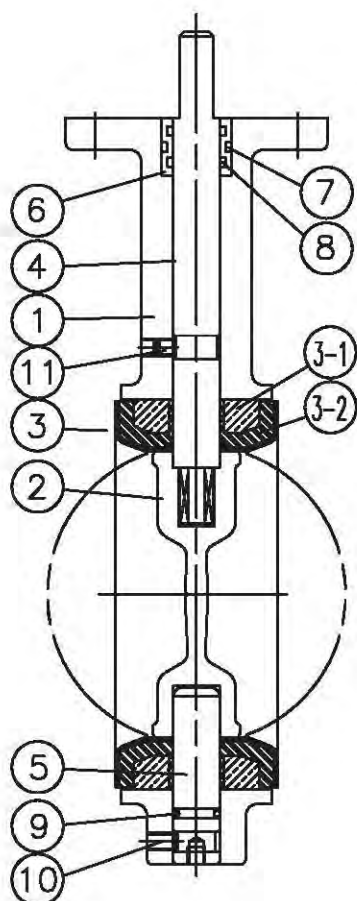
1	BODY
2	D:SC
3	SEAT R:NG
4	STEM
5	D:SC BOLT
6	NUT
7	O-R:NG HOLDER
8	O-R:NG
9	END COVER
10	BOLT
11	O-R:NG

28"~48"



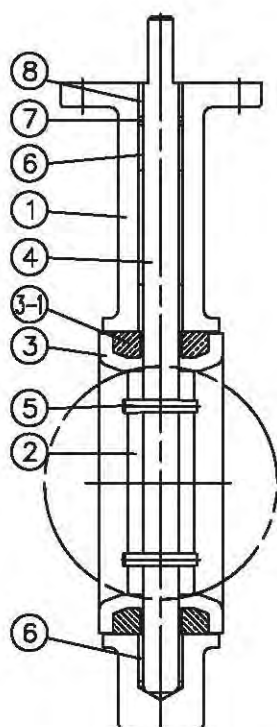
1	BODY
2	D:SC
3	SEAT R:NG
4	STEM
5	D:SC P:N
6	NUT
7	BUSH
8	O-R:NG HOLDER
9	O-R:NG
10	COLLAR
11	O-R:NG
12	END COVER
13	BOLT

Features



TEFLON LINED SEAT

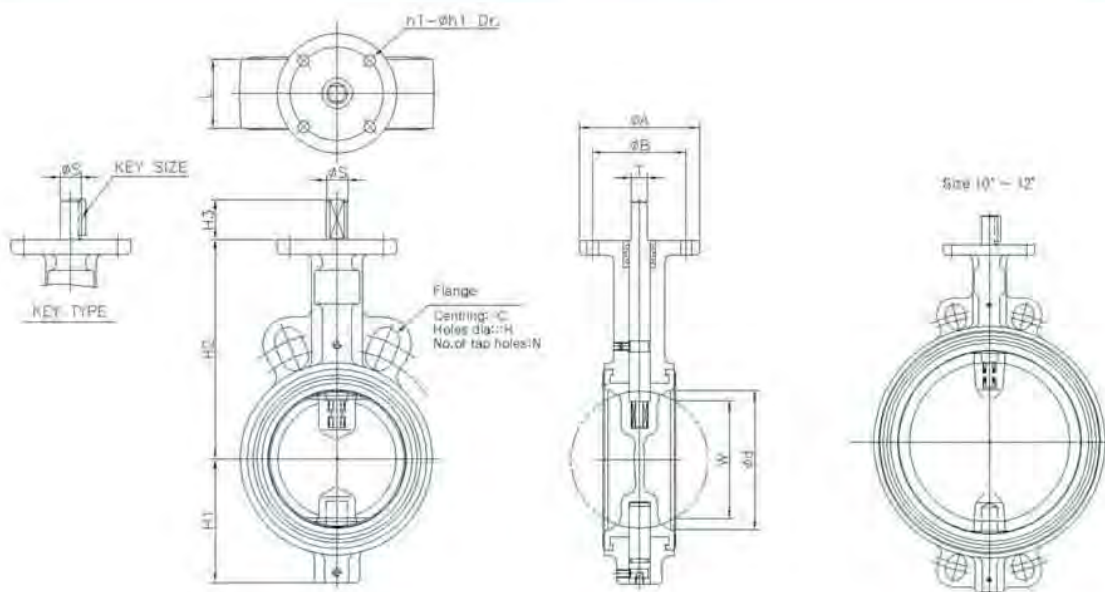
1	BODY
2	D:SC
3	TEFLON SEAT
3-1	BACKUP R:NG
3-2	BACKUP SEAT
4	MA:N STEM
5	STUB STEM
6	O-R:NG HOLDER
7	O-R:NG
8	O-R:NG
9	O-R:NG
10	STOP BOLT
11	BOLT/O-R:NG/BOLT



PHENOLIC BACKUP SEAT

1	BODY
2	D:SC
3	SEAT RING
3-1	BACKUP RING
4	STEM
5	DISC PIN
6	BUSH
7	O-R:NG
8	GLAND

WAFFER TYPE



- **Dimensions**

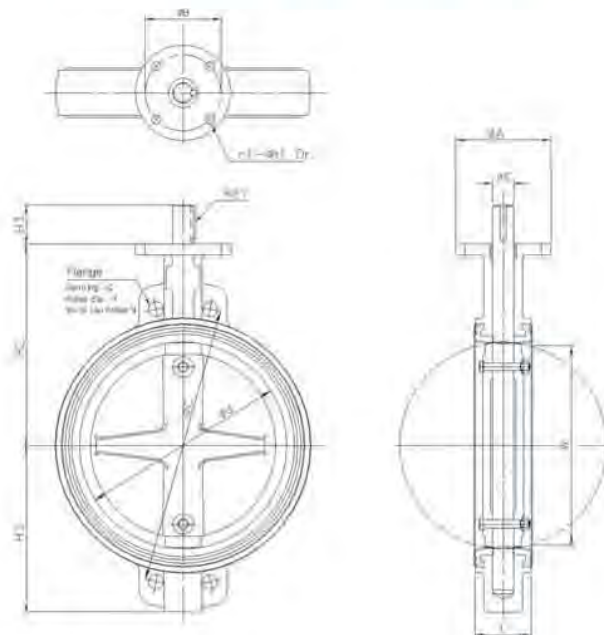
(Unit : mm)

Size		ød	L	H1	H2	H3	W	Stem		Top Flange			KEY SIZE	Weight (kg)
Inch	mm							øS	T	øA	øB	n1-øh1		
2"	50	50	43	61	128	33	28	14	9.8	90	70	4-10	5×5	3.2
2.5"	65	67	46	73	139	33	51	14	9.8	90	70	4-10	5×5	4.1
3"	80	79	46	80	150	33	67	14	9.8	90	70	4-10	5×5	4.5
4"	100	101	52	93	164	33	89	16	11.8	90	70	4-10	5×5	5.8
5"	125	124	56	113	176	33	113	18	13.8	90	70	4-10	6×6	7.8
6"	150	147	56	126	190	33	139	18	13.8	90	70	4-10	6×6	9.5
8"	200	197	60	157	230	40	191	22	16.8	125	102	4-12	8×7	17.0
10"	250	248	68	205	270	40	242	22	16.8	125	102	4-12	8×7	24.0
12"	300	297	78	240	305	40	290	28	21.8	125	102	4-12	8×7	40.0
14"	350	332	78	267	335	50	327	32	23.8	150	125	4-15	10×8	55

• Flange Drilling

Size		JIS 5K			JIS 10K			PN 10			PN 16			ANSI 150#			TABLE E		
inch	mm	ΦC	N	ΦH	ΦC	N	ΦH	ΦC	N	ΦH	ΦC	N	ΦH	ΦC	N	ΦH	ΦC	N	ΦH
2"	50	105	4	15	120	4	19	125	4	18	125	4	18	120.5	4	19	114	4	18
2.5"	65	130	4	15	140	4	19	145	4	18	145	4	18	139.5	4	19	127	4	18
3"	80	145	4	19	150	8	19	160	8	18	160	8	18	152.5	4	19	146	4	18
4"	100	165	8	19	175	8	19	180	8	18	180	8	18	190.5	8	19	178	8	18
5"	125	200	8	19	210	8	23	210	8	18	210	8	18	216	8	22	210	8	18
6"	150	230	8	19	240	8	23	240	8	18	240	8	23	241.5	8	22	235	8	22
8"	200	280	8	23	290	12	23	295	8	23	295	12	23	298.5	8	22	292	8	22
10"	250	345	12	23	355	12	25	350	12	23	355	12	27	362	12	25	356	12	22
12"	300	390	12	23	400	16	25	400	12	23	410	12	27	432	12	25	406	12	26
14"	350	435	12	25	445	16	25	460	16	23	470	16	27	476	12	29	470	12	26

WAFER TYPE



• Dimensions

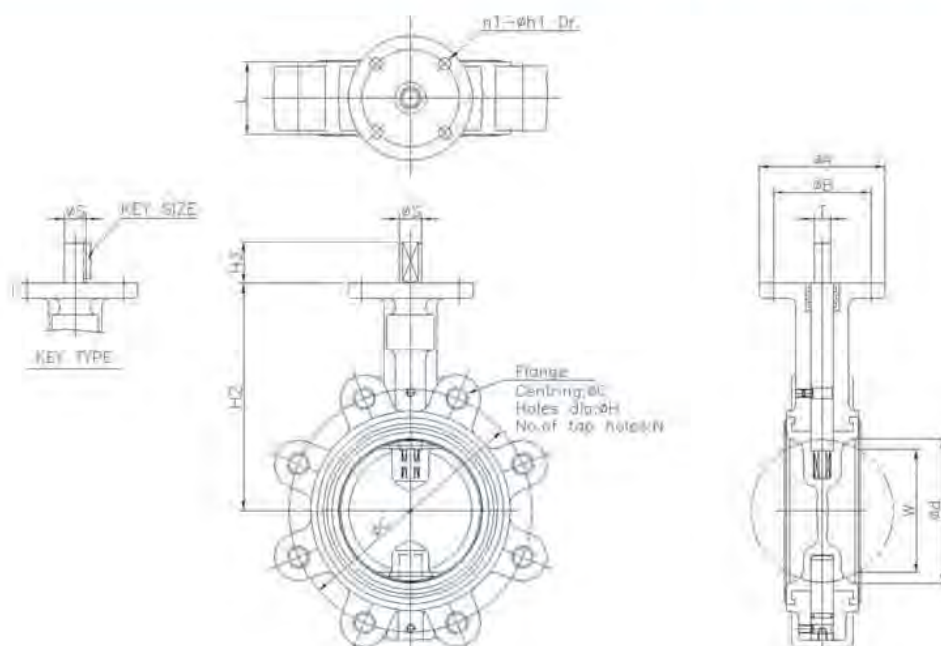
(Unit : mm)

Size		ϕd	L	H1	H2	H3	W	Stem	Top Flange			KEY SIZE	Weight (kg)
Inch	mm							ϕS	ϕA	ϕB	$n1-\phi h1$		
16"	400	376	102	303	370	60	366	38	175	140	4-18	12×8	84
18"	450	430	114	325	390	60	419	38	175	140	4-18	12×8	97
20"	500	488	127	360	430	75	475	45	210	165	4-22	14×9	142
22"	550	535	154	410	455	80	516	55	210	165	4-22	16×10	170
24"	600	568	154	445	495	80	551	55	210	165	4-22	16×10	195
28"	700	674	165	510	560	100	655	65	250	205	8-19	20×12	260
30"	750	748	170	550	590	120	730	80	250	205	8-19	22×14	310
32"	800	774	190	585	635	120	750	80	300	254	8-19	20×12	350
36"	900	897	203	645	680	130	874	90	300	254	8-19	25×14	470
40"	1000	975	216	705	750	140	951	105	300	254	8-19	28×16	600
48"	1200	1200	276	830	880	160	1168	130	350	298	8-23	32×18	910

• Flange Drilling

Size		JIS 5K			JIS 10K			PN 10			PN 16			ANSI 150#			TABLE E		
Inch	mm	ϕC	N	ϕH	ϕC	N	ϕH	ϕC	N	ϕH	ϕC	N	ϕH	ϕC	N	ϕH	ϕC	N	ϕH
16"	400	495	16	25	510	16	27	515	16	27	525	16	30	539.5	16	29	521	12	26
18"	450	555	16	25	565	20	27	565	20	27	585	20	30	578	16	32	584	16	26
20"	500	605	20	25	620	20	27	620	20	27	650	20	33	635	20	32	641	16	26
22"	550	665	20	27	680	20	33	—	—	—	—	—	—	692	20	35	699	16	30
24"	600	715	20	27	730	24	M30	725	20	30	770	20	36	749.5	20	35	756	16	33
28"	700	820	24	M24	840	24	M30	840	24	M30	840	24	M33	863.6	28	11/4"	845	20	M30
32"	800	930	24	M30	950	28	M30	950	24	M30	950	24	M36	978	28	11/2"	984	20	M33
36"	900	1030	24	M30	1050	28	M30	1050	28	M30	1050	28	M36	1085.9	32	11/2"	1092	24	M33
40"	1000	1130	28	M30	1160	28	M36	1160	28	M36	1160	28	M39	1200	36	11/2"	1175	24	M36
48"	1200	1350	32	M30	1380	32	M36	1380	32	M36	1390	32	M45	1422.4	44	11/2"	1410	32	M36

LUG TYPE



• Dimensions

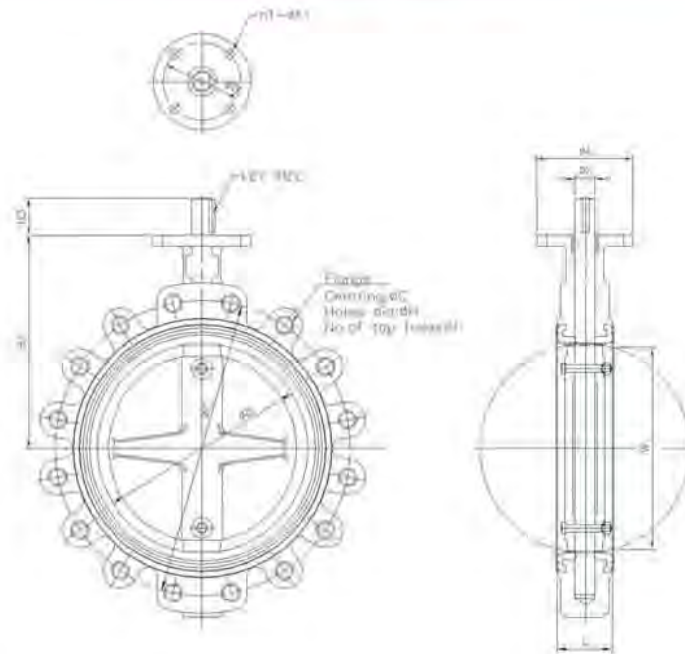
(Unit : mm)

Size		φd	L	H2	H3	W	Stem		Top Flange			KEY SIZE	Weight (kg)
Inch	mm						φS	T	φA	φB	n1-φh1		
2"	50	50	43	128	33	28	14	9.8	90	70	4-10	5×5	3.9
2.5"	65	67	46	139	33	51	14	9.8	90	70	4-10	5×5	4.8
3"	80	79	46	150	33	67	14	9.8	90	70	4-10	5×5	5.5
4"	100	101	52	164	33	89	16	11.8	90	70	4-10	5×5	8.2
5"	125	124	56	176	33	113	18	13.8	90	70	4-10	6×6	9.5
6"	150	147	56	190	33	139	18	13.8	90	70	4-10	6×6	12.5
8"	200	197	60	230	40	191	22	16.8	125	102	4-12	8×7	19.5
10"	250	248	68	270	40	242	22	16.8	125	102	4-12	8×7	28.0
12"	300	297	78	305	40	290	28	21.8	125	102	4-12	8×7	50.0
14"	350	332	78	335	50	327	32	23.8	150	125	4 15	10×8	64.0

• Flange Drilling

Size		JIS 5K			JIS 10K			PN 10			PN 16			ANSI 150#			TABLE E		
Inch	mm	φC	N	φH	φC	N	φH	φC	N	φH	φC	N	φH	φC	N	φH	φC	N	φH
2"	50	105	4	M12	120	4	M16	125	4	M16	125	4	M16	120.5	4	5/8"	114	4	M16
2.5"	65	130	4	M12	140	4	M16	145	4	M16	145	4	M16	139.5	4	5/8"	127	4	M16
3"	80	145	4	M16	150	8	M16	160	8	M16	160	8	M16	152.5	4	5/8"	146	4	M16
4"	100	165	8	M16	175	8	M16	180	8	M16	180	8	M16	190.5	8	5/8"	178	8	M16
5"	125	200	8	M16	210	8	M20	210	8	M16	210	8	M16	216	8	3/4"	210	8	M16
6"	150	230	8	M16	240	8	M20	240	8	M20	240	8	M20	241.5	8	3/4"	235	8	M20
8"	200	280	8	M20	290	12	M20	295	8	M20	295	12	M20	298.5	8	3/4"	292	8	M20
10"	250	345	12	M20	355	12	M22	350	12	M20	355	12	M24	362	12	7/8"	356	12	M20
12"	300	390	12	M20	400	16	M22	400	12	M20	410	12	M24	432	12	7/8"	406	12	M24
14"	350	435	12	M22	445	16	M22	460	16	M20	470	16	M24	476	12	1"	470	12	M24

LUG TYPE



• Dimensions

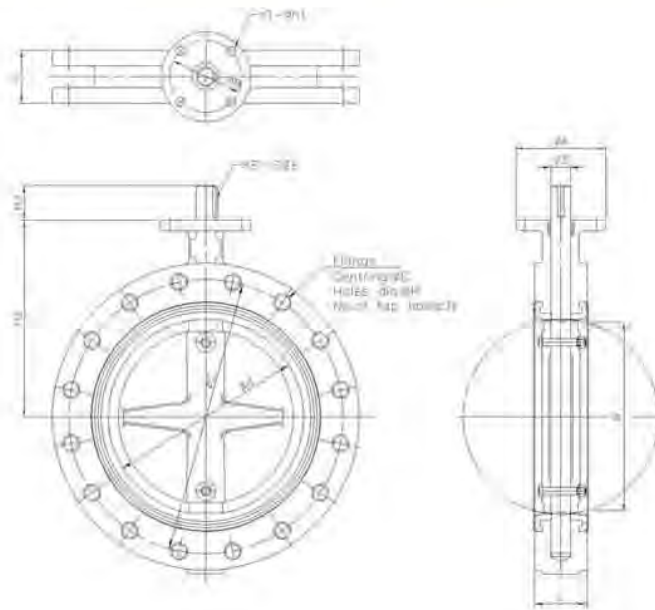
(Unit : mm)

Size		φd	L	H2	H3	W	Stem	Top Flange			KEY SIZE	Weight (kg)
Inch	mm						φS	φA	φB	n1-φh1		
16"	400	376	102	370	60	366	38	175	140	4-18	12×8	107
18"	450	430	114	390	60	419	38	175	140	4-18	12×8	115
20"	500	488	127	430	75	475	45	210	165	4-22	14×9	160
22"	550	535	154	455	80	516	55	210	165	4-22	16×10	220
24"	600	568	154	495	80	551	55	210	165	4-22	16×10	270
28"	700	674	165	560	100	655	65	250	205	8-19	20×12	340
30"	750	748	170	590	120	730	80	250	205	8-19	22×14	400
32"	800	774	190	635	120	750	80	300	254	8-19	20×12	460
36"	900	897	203	680	130	874	90	300	254	8-19	25×14	580
40"	1000	975	216	750	140	951	105	300	254	8-19	28×16	770
48"	1200	1200	276	880	160	1168	130	350	298	8-23	32×18	1200

• Flange Drilling

Size		JIS 5K			JIS 10K			PN 10			PN 16			ANSI 150#			TABLE E		
Inch	mm	φC	N	φH	φC	N	φH	φC	N	φH	φC	N	φH	φC	N	φH	φC	N	φH
16"	400	495	16	M22	510	16	M24	515	16	M24	525	16	M27	539.5	16	1"	521	12	M24
18"	450	555	16	M22	565	20	M24	565	20	M24	585	20	M27	578	16	11/8"	584	16	M24
20"	500	605	20	M22	620	20	M24	620	20	M24	650	20	M30	635	20	11/8"	641	16	M24
22"	550	665	20	M24	680	20	M30	...	...	...	...	...	...	692	20	11/4"	699	16	M27
24"	600	715	20	M24	730	24	M30	725	20	M27	770	20	M33	749.5	20	11/4"	756	16	M30
28"	700	820	24	M24	840	24	M30	840	24	M30	840	24	M33	863.6	28	11/4"	845	20	M30
32"	800	930	24	M30	950	28	M30	950	24	M30	950	24	M36	978	28	11/2"	984	20	M33
36"	900	1030	24	M30	1050	28	M30	1050	28	M30	1050	28	M36	1085.9	32	11/2"	1092	24	M33
40"	1000	1130	28	M30	1160	28	M36	1160	28	M36	1160	28	M39	1200	36	11/2"	1175	24	M36
48"	1200	1350	32	M30	1380	32	M36	1380	32	M36	1390	32	M45	1422.4	44	11/2"	1410	32	M36

FLANGE TYPE



• Dimensions

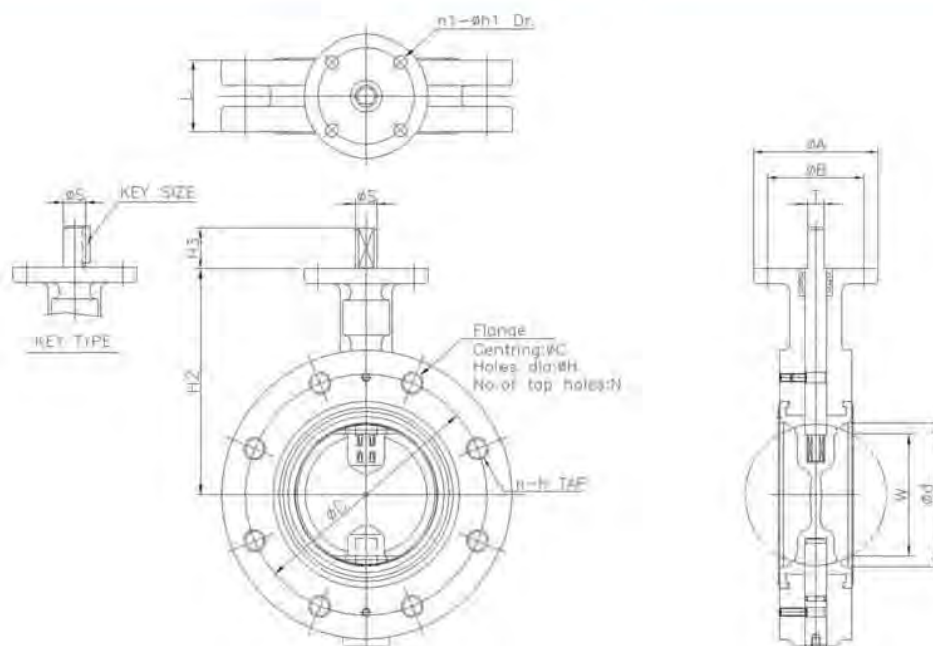
(Unit : mm)

Size		φd	L	H2	H3	W	Stem	Top Flange			KEY SIZE	Weight (kg)
Inch	mm						φS	φA	φB	n1-φh1		
16"	400	376	102	370	60	366	38	175	140	4-18	12×8	146
18"	450	430	114	390	60	419	38	175	140	4-18	12×8	205
20"	500	488	127	430	75	475	45	210	165	4-22	14×9	225
22"	550	535	154	455	80	516	55	210	165	4-22	16×10	250
24"	600	568	154	495	80	551	55	210	165	4-22	16×10	280
28"	700	674	165	560	100	655	65	250	205	8-19	20×12	350
30"	750	748	170	590	120	730	80	250	205	8-19	22×14	410
32"	800	774	190	635	120	750	80	300	254	8-19	20×12	480
36"	900	897	203	680	130	874	90	300	254	8-19	25×14	610
40"	1000	975	216	750	140	951	105	300	254	8-19	28×16	870
48"	1200	1200	276	880	160	1168	130	350	298	8-23	32×18	1250

• Flange Drilling

Size		JIS 5K			JIS 10K			PN 10			PN 16			ANSI 150#			TABLE E		
Inch	mm	φC	N	φH	φC	N	φH	φC	N	φH	φC	N	φH	φC	N	φH	φC	N	φH
16"	400	495	16	M22	510	16	M24	515	16	M24	525	16	M27	539.5	16	1"	521	12	M24
18"	450	555	16	M22	565	20	M24	565	20	M24	585	20	M27	578	16	11/8"	584	16	M24
20"	500	605	20	M22	620	20	M24	620	20	M24	650	20	M30	635	20	11/8"	641	16	M24
22"	550	665	20	M24	680	20	M30	-	-	-	-	-	-	692	20	11/4"	699	16	M27
24"	600	715	20	M24	730	24	M30	725	20	M27	770	20	M33	749.5	20	11/4"	756	16	M30
28"	700	820	24	M24	840	24	M30	840	24	M30	840	24	M33	863.6	28	11/4"	845	20	M30
32"	800	930	24	M30	950	28	M30	950	24	M30	950	24	M36	978	28	11/2"	984	20	M33
36"	900	1030	24	M30	1050	28	M30	1050	28	M30	1050	28	M36	1085.9	32	11/2"	1092	24	M33
40"	1000	1130	28	M30	1160	28	M36	1160	28	M36	1160	28	M39	1200	36	11/2"	1175	24	M36
48"	1200	1350	32	M30	1380	32	M36	1380	32	M36	1390	32	M45	1422.4	44	11/2"	1410	32	M36

FLANGE TYPE



• Dimensions

(Unit : mm)

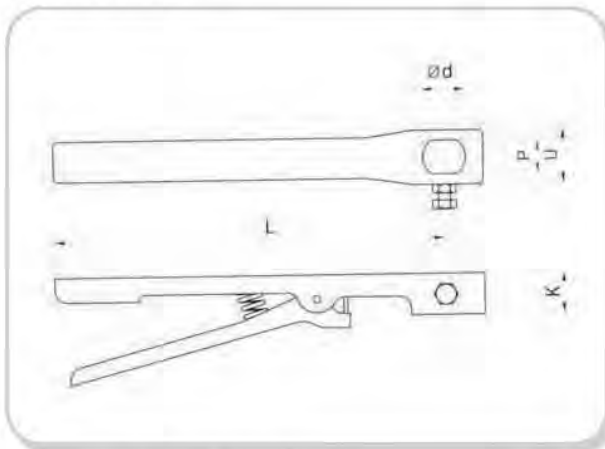
Size		Ød	L	H2	H3	W	Stem		Top Flange			KEY SIZE	Weight (kg)
Inch	mm						ØS	T	ØA	ØB	n1-Øh1		
2"	50	50	43	128	33	28	14	9.8	90	70	4-10	5×5	4.7
2.5"	65	67	46	139	33	51	14	9.8	90	70	4-10	5×5	5.8
3"	80	79	46	150	33	67	14	9.8	90	70	4-10	5×5	6.6
4"	100	101	52	164	33	89	16	11.8	90	70	4-10	5×5	10.0
5"	125	124	56	176	33	113	18	13.8	90	70	4-10	6×6	11.5
6"	150	147	56	190	33	139	18	13.8	90	70	4-10	6×6	15.0
8"	200	197	60	230	40	191	22	16.8	125	102	4-12	8×7	23.0
10"	250	248	68	270	40	242	22	16.8	125	102	4-12	8×7	34.0
12"	300	297	78	305	40	290	28	21.8	125	102	4-12	8×7	60.0
14"	350	332	78	335	50	327	32	23.8	150	125	4-15	10×8	98.0

• Flange Drilling

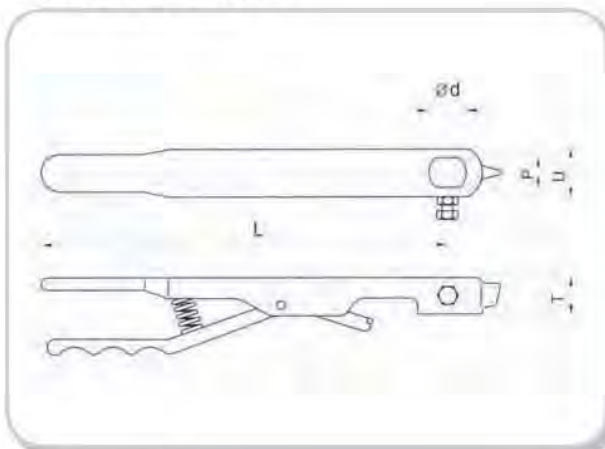
Size		JIS 5K			JIS 10K			PN 10			PN 16			ANSI 150#			TABLE E		
Inch	mm	ØC	N	ØH	ØC	N	ØH	ØC	N	ØH	ØC	N	ØH	ØC	N	ØH	ØC	N	ØH
2"	50	105	4	M12	120	4	M16	125	4	M16	125	4	M16	120.5	4	5/8	114	4"	M16
2.5"	65	130	4	M12	140	4	M16	145	4	M16	145	4	M16	139.5	4	5/8	127	4"	M16
3"	80	145	4	M16	150	8	M16	160	8	M16	160	8	M16	152.5	4	5/8	146	4"	M16
4"	100	165	8	M16	175	8	M16	180	8	M16	180	8	M16	190.5	8	5/8	178	8"	M16
5"	125	200	8	M16	210	8	M20	210	8	M16	210	8	M16	216	8	3/4	210	8"	M16
6"	150	230	8	M16	240	8	M20	240	8	M20	240	8	M20	241.5	8	3/4	235	8"	M20
8"	200	280	8	M20	290	12	M20	295	8	M20	295	12	M20	298.5	8	3/4	292	8"	M20
10"	250	345	12	M20	355	12	M22	350	12	M20	355	12	M24	362	12	7/8	356	12"	M20
12"	300	390	12	M20	400	16	M22	400	12	M20	410	12	M24	432	12	7/8	406	12"	M24
14"	350	435	12	M22	445	16	M22	460	16	M20	470	16	M24	476	12	1	470	12"	M24

LEVER & GEAR

• Steel lever



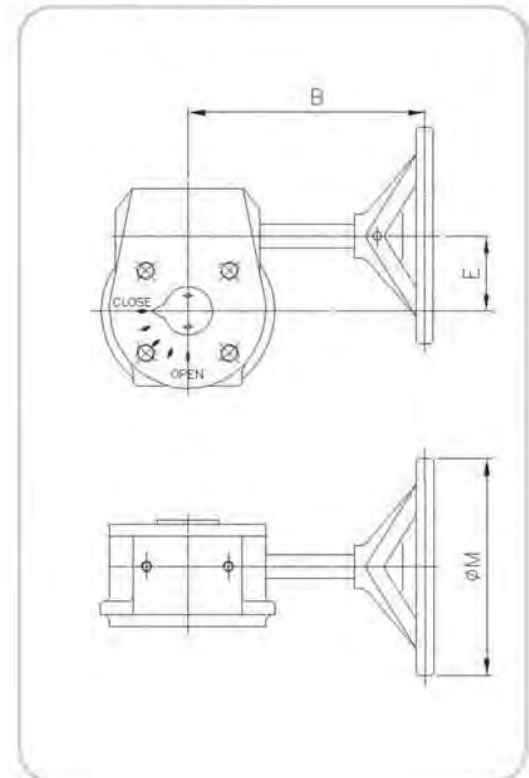
• Ductile iron lever



• Dimensions

Mode	Size	T	U	P	L	Ød
Steel Lever	1½"	28	38	10	207	14
	2" ~ 3"	28	38	10	207	14
	4"	28	38	12	267	16
	5" ~ 6"	28	38	14	267	18
Ductile Iron Lever	2" ~ 3"	23	31	10	265	14
	4"	23	31	12	265	16
	5" ~ 6"	23	31	14	265	18
	8" ~ 10"	25	37	17	367	22
	12"	25	40	22	515	28

• Worm gear box



• Dimensions

Model no.	Size	E	B	ØM
G-24	40A~80A	45	180	150
G-24	100A	45	180	150
G-24	125A~150A	45	180	200
G-32	200A~250A	66	250	240
G-32	300A	66	250	285
G-50	350A	70	250	285
G-70	400A	100	280	385
G-80	450A	120	300	385
G-80	500A	120	300	430
G-120	600A	41	300	430

ELASTOMER PROPERTIES

Elastomer's characteristic and properties are derived from the manufactures and purely indicative. It means that actual working conditions and limit may differ from the values referred. Since many factors influence corrosion and abrasion due to type of fluid, concentration, temperature, turbulence, impurities and etc, the final choice is to be taken care by the customer.

Elastomers	Chemical group	General Application	Service Temperature
EPDM Ethylene propylene	Ethylene Propylene Terpolymer	Water–Steam Sea Water Brine Esters Alkalis Ozone Ketones Alcohols Brake Fluid Treated Water With Caustic soda	–15°C to + 110°C
NBR/ BUNA–N Nitrile rubber	Butadiene Acrylonitrile Copolymer	Hydrocarbons Natural Gas Oil and Fat Air Gasoline	–10°C to + 80°C
SBR		Acids and Alkalis	–20°C to + 80°C
FPM Viton	Fluorocarbon polymer Viton	Acids Oils Hydrocarbon	–20°C to + 150°C
SI Silicone	Organic silicon polymer	Food Beverage	–20°C to + 140°C
PTFE Teflon	Polytetrafluoroethylene	Solvents Corrosive Products	–10°C to + 200°C
CR Neoprene	Chloroprene polymer	Acid, Ozone, Oils Fats Solvents	–10°C to + 90°C

OPERATING CHARACTERISTICS FOR SIZING

Flow coefficient cv

[US GPM]

Size		Valve opening degree							
Inch	mm	20°	30°	40°	50°	60°	70°	80°	90°
40	1½	3	6	10	16	29	45	70	80
50	2	8	9	17	27	54	72	110	135
65	2½	9	14	28	43	89	110	168	210
80	3	15	24	36	65	130	165	250	310
100	4	27	44	79	118	230	300	465	540
125	5	56	82	152	248	480	610	980	1100
150	6	96	144	243	409	785	1010	1615	1910
200	8	166	244	412	689	1275	1715	2670	3185
250	10	257	388	651	1134	2100	2700	4250	4900
300	12	370	547	951	1574	3050	3950	5950	7350
350	14	450	758	1310	2218	4080	5610	8078	11200
400	16	646	907	1726	2798	5000	7650	10770	12900
450	18	732	1251	2297	3708	7050	9180	13900	17500
500	20	909	1589	2859	4632	8600	11500	17540	22400
600	24	1252	2290	4009	6077	12500	16500	23590	28300

Cv is the water flow rate in U.S gallon per minute(USGPM) which pass through the valve giving a pressure drop of 1psi at a temperature of 68°F. In metric unit Kv in m3/h passing through the valve giving a pressure drop of 1 bar at a temperature of 20° C. The relation between Cv and Kv, expressed in the above mentioned unit of measure is as follows :

$$Cv = 1.16 Kv$$

Basic Formulas For Cv value and Flow Date

Liquids

$$Q = 0.86 Cv \sqrt{\frac{\Delta P}{G}}$$

Gases

$$\Delta P < \frac{P_1}{2} \quad Q = 272 Cv \sqrt{\frac{\Delta P (P_1 + P_2)}{G(273+T)}}$$

$$\Delta P < \frac{P_1}{2} \quad Q = \frac{236 Cv P_1}{\sqrt{G(273+T)}}$$

Steam

$$\Delta P < \frac{P_1}{2} \quad W = \frac{13.5 Cv \sqrt{\Delta P (P_1 + P_2)}}{K}$$

$$\Delta P \geq \frac{P_1}{2} \quad W = \frac{11.9 Cv P_1}{K}$$

Steam in general

$$W = 1210 Cv \sqrt{\frac{\Delta P}{V_1 + V_2}}$$

Q : Volume rate of flow (liquid m³/h, gas N m³/h)

W : Volume rate of flow (steam kg/h)

P₁ : Inlet pressure (liquid kgf/cm², gas/steam kgf/cm², abs.)

P₂ : Outlet pressure (liquid kgf/cm², gas/steam kgf/cm², abs.)

ΔP : Pressure drop P₁ - P₂ (kgf/cm²)

G : Specific gravity of fluid (Water = 1, air = 1)

T : Temperature of fluid (°C)

K : 1 + (0.0013 x TSH)

TSH (°C) = Total temperature minus saturation temperature

V₁ : Specific volume (cm³/g...P₁)

V₂ : Specific volume (cm³/g...P₂)

notes : When $P_2 < \frac{P_1}{2}$, use $\frac{P_1}{2}$ instead of ΔP

For V₂, use V₂ in accordance with $\frac{P_1}{2}$

Sample Computation For Water

which is flow rate of water at ambient temperature through 4" butterfly valves, 70° opening, when pressure drop is 0.035 bar?

Solution

$$Q = 0.86 Cv \sqrt{\frac{\Delta P}{G}} \quad \text{The water density at 20°C is 1}$$

$$Q = 0.86 Cv \sqrt{\frac{0.035}{1}}$$

$$Q = 0.86 \times 300 \times 0.187 = 48.3 \text{ m}^3/\text{h}$$

OPERATING CHARACTERISTICS FOR SIZING

Torques

The factors affect the torque required to operate the valves.

- Valve diameter
- Shaft diameter
- Bearing friction coefficient
- Type of seat material

(Unit : Nm)

Size		Shut off pressure in Bar		
inch	mm	3 Bar	6 Bar	10 Bar
1 ½	40	7	10	14
2	50	20	23	25
2 ½	65	24	28	30
3	80	31	36	41
4	100	45	51	58
5	125	52	77	84
6	150	93	108	120
8	200	120	155	195
10	250	185	245	328
12	300	320	405	465
14	350	460	685	810
16	400	640	795	1035
18	450	830	1055	1480
20	500	1220	1640	2150
24	600	1670	2470	3370
28	700	2710	3300	4050
30	750	3010	3950	4600
32	800	3550	4350	5000
36	900	4650	5370	6950
40	1000	6300	7810	9950

Actuator torques can be calculated using the following formulas.

$$T_a = T_b + T_s + T_h = 1.2T_b \pm T_d$$

$$T_s = C_s D^2$$

$$T_b = 4.17 D^2 d f P$$

$$T_d = C_t D^3 P$$

$$T_h = 3.06 D^4$$

$$V = C_f \sqrt{P} = \frac{Q}{0.758 D^2}$$

T_a : The required actuator torque (lb-ft)

T_s : Seating or unseating torque (lb-ft)

T_d : Dynamic torque (lb-ft)

T_h : Hydrostatic torque (lb-ft)

Q : Flow (cubic foot per second)

V : Velocity (feet per second)

D : Diameter of valve (feet)

d : Diameter of Shaft (inch)

P : Pressure drop across valve (psi)

C_s : Coefficient of Seating or unseating torque

C_t : Coefficient of dynamic torque

C_f : Coefficient of flow

f : Bearing friction coefficient

MATERIAL SELECTION GUIDE

E-Excellent
G-Good
F-Fair
U-Unsatisfactory

Metal Elastomer

Chemical agents	Iron	316SS	AL Bronze	Monel	EPDM	NBR	Viton	Natural Rubber
Acetaldehyde	U	E	U	F	G	U	-	F
Acetic acid 50% 50°C	U	E	U	F	G	U	U	F
Acetic acid Anhydride	U	E	U	F	U	U	U	F
Acetone	G	E	E	E	G	U	U	F
Acetylene	G	E	E	-	U	F	U	-
Acrylonitrile	G	E	E	E	U	U	U	U
Air(Dry)	E	E	E	E	E	E	-	-
Alcohol Amyl	F	E	E	E	-	F	G	-
Alcohol Butyl	F	E	E	E	-	F	-	-
Alcohol Ethyl	U	E	E	E	E	G	G	G
Alcohol Methyl	U	E	E	E	E	G	U	G
Ammonium	U	G	-	-	-	G	G	F
Ammonium Chrome	U	G	-	-	-	G	G	F
Ammonium Potassium	U	G	-	-	-	-	-	-
Ammonia	G	G	G	G	E	E	G	G
Aluminum Chloride	U	U	U	E	E	E	E	E
Aluminum Fluoride	U	G	-	G	-	G	G	-
Aluminum Hydroxide	U	G	-	-	-	G	G	-
Aluminum Sulfate	U	G	U	-	-	E	-	-
Amines	U	E	-	-	-	F	-	-
Ammonia, Anhydrous	F	E	U	-	E	G	U	-
Ammonia gas 150° F	U	E	U	-	G	-	-	-
Ammonia solutions	F	E	U	G	E	G	U	G
Ammonia Chloride 50% 180° F	U	G	U	G	-	-	-	-
Ammonia Hydroxide	U	E	U	F	E	U	G	U
Ammonia Nitrate 5% 60° F	F	E	U	G	-	E	-	-
Ammonia Phosphate	U	G	U	G	E	E	-	G
Ammonia Sulfate	U	G	U	G	E	E	-	-
Amyl Acetate	F	E	E	G	-	U	F	U
Amyl chloride	F	E	E	-	U	U	U	U
Aniline 90% 70° F	F	E	F	-	G	U	G	U
Asphalt	E	E	E	E	-	U	E	U
Barium Carbonate 60° F	U	-	G	G	E	E	-	-
Barium Chloride	U	-	-	G	E	E	E	E
Barium Hydroxide	F	E	U	-	-	E	-	U
Barium Sulfate	U	E	G	G	E	E	E	E
Barium Sulfate	F	E	U	-	-	E	-	-
Beer (beverage)	U	E	U	-	E	-	-	-
Beer sugar solution	U	E	U	-	-	E	-	-
Benzaldehyde	F	E	E	-	G	U	U	U
Benzene(benzol) 70° F	F	E	E	G	U	U	G	U
Benzoic Acid 5%	U	E	-	G	-	F	-	-
Borax	U	E	U	E	-	G	-	G
Boric acid 5% 200° F	U	E	F	G	E	E	-	-
Brine	U	-	-	G	E	E	-	-
Bromine Gas	U	U	U	F	U	U	G	U
Bromine Water	U	U	U	F	U	U	G	U
Butadiene	F	E	E	-	-	G	G	-
Butane Butylac	G	E	E	E	U	G	G	U
Butyl Acetate	G	E	E	-	E	U	U	U

Metal Elastomer

Chemical agents	Iron	316SS	AL Bronze	Monel	EPDM	NBR	Viton	Natural Rubber
Butyric Acid 5%	U	E	-	-	U	U	U	U
Calcium carbonate 60° F	F	-	-	E	E	E	E	E
Calcium chlorate 20%	-	E	-	G	-	-	-	-
Calcium chloride	F	G	F	G	E	E	E	G
Calcium chloride solution	F	E	F	-	E	E	E	G
Calcium Hydroxide 50% 175° F	F	E	U	E	E	E	E	E
Calcium Hypochlorite	-	G	-	-	-	F	-	-
Calcium Sulfate	F	E	E	G	E	E	E	E
Carbon Dioxide	F	E	E	-	G	G	E	G
Carbon Tetrachloride	U	G	F	G	U	U	E	U
Carbonic Acid	U	G	-	G	-	E	-	-
Chlorine gas dry 70° F	U	G	F	F	U	U	E	U
Chlorobenzene 90%	F	E	E	E	U	U	G	U
Chromic Acid 5% 70° F	U	E	U	-	U	U	E	U
Citric acid 5% 150° F	U	E	F	G	E	G	E	U
Coffee(food)	U	E	U	-	E	U	E	E
Copper Sulfate	F	E	U	U	E	E	E	G
Cyclohexane	F	E	E	-	U	E	E	U
Dezrose(food)	U	E	-	-	-	E	-	-
Diacetone	U	-	E	-	E	U	U	U
Dichloroethane	U	F	-	-	U	U	G	U
Diesel Fuels	F	E	G	E	U	E	E	-
Diethyl Amine	F	E	E	-	F	U	U	F
Dowtherms	G	E	E	-	U	U	E	U
Drying Mud	G	E	-	E	U	E	-	U
Ethers	U	E	E	G	U	U	-	U
Ethyl Acetate	F	E	-	E	G	U	U	U
Ethyl Chloride 5%	F	E	E	G	E	E	E	F
Ethyl Glycol	G	E	E	E	E	E	E	G
Ethylene Oxide	G	E	-	-	U	U	U	U
Fats	E	E	E	-	U	E	-	-
Ferric Chloride	U	-	U	E	-	F	-	-
Ferric Nitrate	U	E	-	E	G	F	-	-
Ferric Sulfate 5%	U	G	U	E	-	E	E	-
Ferric Sulfate	F	E	U	-	G	E	G	G
Fluorine	U	U	U	G	-	G	-	-
Fluosiilic Acid	U	G	E	-	-	E	-	-
Formaldehyde 70° F	U	E	E	G	E	G	E	-
Formic acid 5% 150° F	U	E	E	G	-	U	U	U
Freon	F	E	E	E	U	G	G	U
Fruit Juices(food)	U	E	U	-	G	G	-	-
Fuel Oil	F	E	E	G	U	F	E	U
Gaolic Acid 5% 200° F	U	E	-	-	-	G	G	-
Gasoline	F	E	G	G	U	E	E	U
Glucose	U	E	G	G	-	E	E	-
Glycerine/Gycero	F	E	G	G	-	E	E	-
Heptane	F	E	E	-	U	E	E	U
Hexane	F	E	E	-	U	G	E	U
Hydrobromic Acid 200° F	U	U	U	U	U	U	U	U
Hydrochloric Acid 15% 60° F	U	U	U	U	E	U	E	-

MATERIAL SELECTION GUIDE

E-Excellent
G-Good
F-Fair
U-Unsatisfactory

Metal Elastomer

Metal Elastomer

Chemical agents

Iron	316SS	AL Bronze	Monel	EPDM	NBR	Viton	Natural Rubber
------	-------	-----------	-------	------	-----	-------	----------------

Hydrochloric Acid 37% 60° F	U	U	U	U	U	E	U
Hydrochloric Acid 20%	U	U	U	F	-	U	E
Hydrochloric Acid 20-60%	U	U	U	U	-	U	E
Hydrogen	F	E	F	-	E	E	E
Hydrogen Peroxide 90%	U	G	U	E	-	U	G
Hydrogen Sulfide	F	G	F	-	E	U	U
Iodine Solution	U	U	U	E	-	U	F
Isooctane	F	E	E	E	U	E	E
Isopropyl Alcohol	F	E	E	E	-	G	E
Isopropyl Ether	F	E	E	E	U	E	U
Kerosene	E	E	E	E	U	E	U
Lactic Acid 5%	U	G	U	G	-	F	-
Lubricating Oil	E	E	E	E	U	E	U
Magnesium Chloride 4%	F	G	F	G	E	E	E
Magnesium Hydroxide	F	E	G	-	E	G	E
Magnesium Sulfate	F	E	E	E	E	E	G
Mercuric Chloride 3%	U	F	U	G	E	E	-
Mercury	E	E	U	E	E	E	E
Methane	U	E	E	-	U	E	E
Methyl Acetate	F	E	E	-	F	U	U
Methyl Acetone	F	E	E	-	G	U	U
Methyl Chloride	G	E	E	-	U	U	U
Methyl Ether Ketone	E	E	E	-	U	U	U
Milk (food)	U	E	-	-	E	E	E
Mineral Oil	F	F	-	-	U	E	U
Mosses (food)	U	E	U	-	E	-	-
Naphthalene	F	E	E	-	U	U	G
Natural Gas	G	E	E	-	U	E	U
Nickel Chloride	U	F	-	-	-	E	-
Nitric Acid less 40% 70° F	U	-	U	U	U	U	U
Nitric Acid more 40% 70° F	U	U	U	U	U	U	F
Nitrobenzene	U	E	-	-	U	U	G
Oil	U	F	-	-	U	U	E
Olive Oil	-	E	-	-	G	E	U
Oxalic Acid	U	G	U	-	G	U	U
Oxygen 200° F	E	E	E	E	E	G	E
Oxygen 300° F	E	E	E	E	U	U	G
Palmitic Acid	U	E	G	-	-	E	-
Perchloroethylene	F	E	-	-	U	F	E
Petroleum	U	G	F	G	U	E	U
Phenol	U	E	-	E	U	U	E
Phosphoric Acid 5%	U	G	U	G	F	F	E
Phosphoric Acid 85% 70° F	U	G	U	-	F	F	-
Picric Acid 80%	U	E	-	F	U	-	-
Potassium Cyanide	F	E	U	-	-	E	E
Potassium Hydroxide 5%	F	E	U	E	-	E	E
Potassium Nitrate	F	E	F	G	E	E	E
Potassium Phosphate	U	G	-	-	-	E	E
Potassium Sulfide	U	E	-	-	-	E	-
Potassium Sulfite	U	E	-	-	G	F	-

Chemical agents

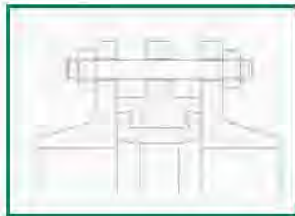
Iron	316SS	AL Bronze	Monel	EPDM	NBR	Viton	Natural Rubber
------	-------	-----------	-------	------	-----	-------	----------------

Propane	F	E	E	-	U	E	E
Resins	U	E	E	-	-	-	G
Sea Water 70° F	U	G	G	E	E	G	E
Soap Solution (Searate)	U	E	E	G	E	E	E
Sodium Acetate 5%	U	E	E	G	E	G	U
Sodium Bisulfate	U	E	-	-	-	E	E
Sodium Carbonate	U	E	G	E	E	E	E
Sodium Chloride 30% 180° F	U	E	E	E	E	E	E
Sodium Cyanide	U	E	U	-	-	E	E
Sodium Fluoride 5% 60° F	U	-	F	G	-	-	E
Sodium Hydroxide 50% 122° F	U	G	U	G	E	U	U
Sodium Hydroxide 50% 176° F	U	G	U	G	G	U	U
Sodium Hypochlorite 50% 60° F	U	G	U	E	G	U	U
Sodium Nitrate	U	E	G	G	E	G	-
Sodium Perborate	U	E	-	-	-	G	E
Sodium Peroxide	U	E	U	-	E	G	E
Sodium Phosphate 5%	U	E	-	G	E	E	E
Sodium Silicate	U	E	G	G	E	E	E
Sodium Sulfide 70%	U	E	U	-	-	-	-
Sodium Sulfite	U	-	U	G	G	E	E
Sodium Sulfate 80% 60° F	U	F	G	G	E	E	E
Steam 300° F	U	E	G	E	E	U	U
Steric Acid 90% 200° F	U	E	F	F	-	G	-
Sulfur (Mofen)	U	G	U	U	E	-	E
Sulfur Dioxide	U	E	F	E	G	U	U
Sulfur Trioxide	U	E	-	-	-	U	E
Sulfuric Acid 10%	U	G	U	U	E	U	E
Sulfuric Acid 50%	U	U	U	U	F	U	U
Sulfuric Acid 93% 70° F	U	U	U	U	U	U	U
Sulfurous Acid 80% 100° F	U	U	U	U	U	U	U
Tannic Acid 10% 150° F	U	E	G	-	-	U	E
Tar	F	E	E	E	U	U	G
Tartaric Acid 150° F	U	E	G	-	-	E	-
Thinner	U	E	E	E	U	U	U
Toluene and Toluene	U	E	E	-	U	U	G
Tributyl Phosphate	U	E	-	-	U	U	F
Trichloroethylene	-	E	E	-	U	U	E
Tricresyl Phosphate	U	U	U	-	G	U	E
Triethanolamine	U	-	-	G	E	G	U
Turpentine	U	E	G	-	U	U	E
Vinegar 70° F	U	E	-	-	G	E	E
Water Demineralized	U	E	E	E	E	G	E
Water Distilled	U	E	U	-	E	G	-
Water Fresh	F	E	E	E	E	G	-
Water Mineral	F	E	E	E	E	G	-
Water Sewage	U	E	E	E	E	G	-
Whiskey and Wines	U	E	G	E	E	E	-
Xylene, Xylo	F	E	E	-	U	U	E
Zinc Chloride 5% 160° F	U	F	U	G	E	E	E
Zinc Sulfate 25% 180° F	U	E	E	G	-	E	-

BOLTING DATA

Wafer type va ve

Stud length for tightening DHC wafer design valves between flanges



Valve size		J'S 5kg/cm2 flanges		J'S 10kg/cm2 flanges		D'N PN 10 flanges		D'N PN 16 flanges		ANS 150 flanges	
nch	mm	Studs dia. and length mm	N° Studs	Studs dia. and length mm	N° Studs	Studs dia. and length mm	N° Studs	Studs dia. and length mm	N° Studs	Studs dia. and length mm	N° Studs
1½"	40	M 12 X 83	4	M 16 X 90	4	M 16 X 110	4	M 16 X 110	4	½" X 4 ½"	4
2"	50	M 12 X 100	4	M 16 X 110	4	M 16 X 130	4	M 16 X 130	4	¾" X 5 ½"	4
2½"	65	M 12 X 100	4	M 16 X 115	4	M 16 X 130	4	M 16 X 130	4	¾" X 5 ½"	4
3"	80	M 16 X 110	4	M 16 X 115	8	M 16 X 140	4	M 16 X 140	8	¾" X 5 ½"	4
4"	100	M 16 X 120	8	M 16 X 125	8	M 16 X 150	8	M 16 X 150	8	¾" X 5 ½"	8
5"	125	M 16 X 125	8	M 20 X 140	8	M 16 X 150	8	M 16 X 150	8	¾" X 6 ½"	8
6"	150	M 16 X 130	8	M 20 X 145	8	M 20 X 180	8	M 20 X 160	8	¾" X 6 ½"	8
8"	200	M 20 X 145	8	M 20 X 150	12	M 20 X 170	8	M 20 X 170	12	¾" X 6 ½"	8
10"	250	M 20 X 165	12	M 22 X 175	12	M 20 X 180	12	M 24 X 190	12	¾" X 7 ½"	12
12"	300	M 20 X 170	12	M 22 X 180	16	M 20 X 190	12	M 24 X 200	12	¾" X 8 ½"	12
14"	350	M 20 X 190	12	M 22 X 195	16	M 20 X 230	16	M 24 X 220	16	1" X 8 ½"	12
16"	400	M 22 X 205	16	M 24 X 215	16	M 22 X 230	16	M 27 X 240	16	1" X 10"	16
18"	450	M 22 X 215	16	M 24 X 230	20	M 24 X 250	20	M 27 X 250	20	1½" X 11½"	16
20"	500	M 22 X 240	16	M 24 X 255	20	M 24 X 250	20	M 30 X 280	20	1½" X 12"	20
24"	600	M 24 X 260	16	M 30 X 280	20	M 27 X 300	16	M 33 X 300	16	1½" X 13½"	16
		M 24 X 50	8VITI	M 30 X 53	8VITI	M 27 X 45	8VITI	M 33 X 45	8VITI	1½" X 13½"	8VITI

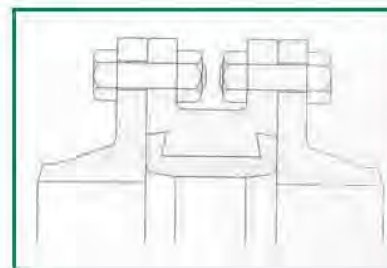
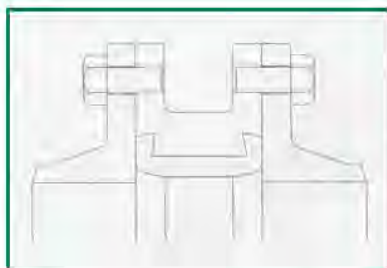
Lug type va ve

Screws length for tightening DHC lug design valve between flanges



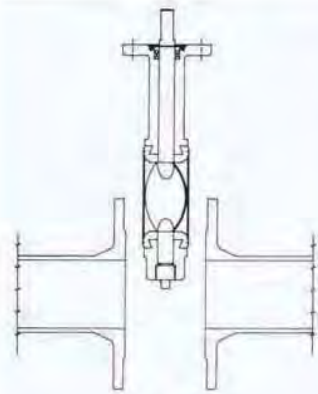
Valve size		JIS 5kg/cm ² flanges		JIS 10kg/cm ² flanges		DIN PN 10 flanges		DIN PN 16 flanges		ANSI 150 flanges	
Inch	mm	Studs dia. and length mm	N° Studs	Studs dia. and length mm	N° Studs	Studs dia. and length mm	N° Studs	Studs dia. and length mm	N° Studs	Studs dia. and length mm	N° Studs
1½"	40	M 12 X 26	8	M 16 X 30	8	M 16 X 30	8	M 16 X 30	8	¾" X 1 ¾"	8
2"	50	M 12 X 33	8	M 16 X 35	8	M 16 X 35	8	M 16 X 35	8	¾" X 1 ¾"	8
2½"	65	M 12 X 34	8	M 16 X 38	8	M 16 X 35	8	M 16 X 35	8	¾" X 1 ¾"	8
3"	80	M 16 X 34	8	M 16 X 38	16	M 16 X 35	8	M 16 X 35	16	¾" X 1 ¾"	8
4"	100	M 16 X 39	16	M 16 X 40	16	M 16 X 40	16	M 16 X 40	16	¾" X 1 ¾"	16
5"	125	M 16 X 41	16	M 20 X 45	16	M 16 X 45	16	M 16 X 45	16	¾" X 1 ¾"	16
6"	150	M 16 X 43	16	M 20 X 47	16	M 20 X 45	16	M 20 X 45	16	¾" X 2"	16
8"	200	M 20 X 47	16	M 20 X 50	24	M 20 X 50	16	M 20 X 50	24	¾" X 2 ¼"	16
10"	250	M 20 X 53	24	M 22 X 55	24	M 20 X 55	24	M 24 X 55	24	¾" X 2 ¼"	24
12"	300	M 20 X 58	24	M 22 X 60	32	M 20 X 60	24	M 24 X 60	24	¾" X 2 ¼"	24
14"	350	M 20 X 60	24	M 22 X 60	32	M 20 X 60	32	M 24 X 60	32	1" X 2 ½"	24
16"	400	M 22 X 72	32	M 24 X 76	32	M 24 X 70	32	M 27 X 70	32	1" X 3 ¼"	32
18"	450	M 22 X 78	32	M 24 X 84	40	M 24 X 80	40	M 27 X 80	40	1 ½" X 3 ¼"	32
20"	500	M 22 X 84	32	M 24 X 90	40	M 24 X 80	40	M 30 X 80	40	1 ½" X 3 ¼"	40
24"	600	M 24 X 100	32	M 30 X 106	40	M 27 X 90	32	M 33 X 80	32	1 ½" X 3 ½"	32
		M 24 X 50	8	M 30 X 53	8	M 27 X 45	8	M 33 X 45	8	1 ½" X 1 ¾"	8

Double Flange design va ve

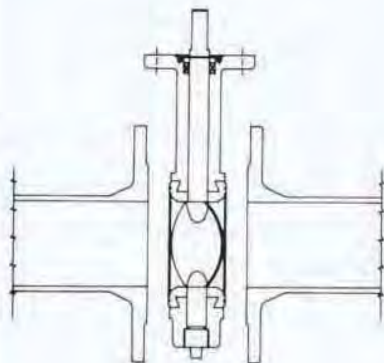


CORRECT INSTALLATION

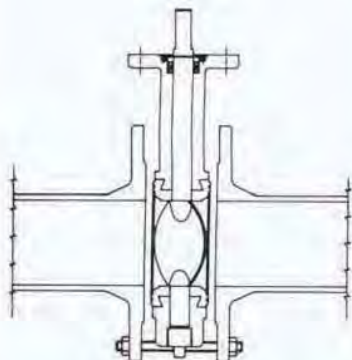
Correct Installation



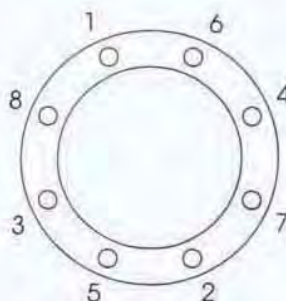
1. Spread flanges enough to allow the valves with disc in semi-closed position. This prevents the damage of disc and seat during installation and reduces initial torque



2. Flange gaskets are not needed and should not be used.



3. Insert bolts through the two bottom pipe flange holes to rest valves on during installation



4. Tighten the flange bolts evenly to prevent the leakage between flange and valve

Incorrect Installation

