

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

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USA ONLY

Installation and Maintenance Guidelines for NIBCO[®] Flanged Butterfly Valves with Rubber Seats

Figure Numbers

LD-7000 Series
LD-3000 Series

Pressure Rating

232 psi / 16 Bar CWP - LD-7000 Series
250 psi / 17.2 Bar CWP – LD-3000 Series

Valve Size Range

14" – 48" - LD-7000 Series
(DN 350 - DN 1200)

14" – 24" - LD-3000 Series
(DN 350 - DN 600)

For any technical inquiries please call NIBCO Technical Services

CAUTION: Only qualified personnel should undertake the procedures outlined in this document. NIBCO INC., its agents, representatives and employees assumes no liability for the use of these procedures. These procedures are offered as suggestions only.

NIBCO Technical Services • Phone: 1.888.446.4226 • Fax: 1.888.336.4226

I. SHIPMENT & STORAGE

NIBCO butterfly valves are packaged depending on valve size and quantity shipped. Smaller size butterfly valves are bulk crated, larger size butterfly valves are crated individually. The butterfly valve faces are covered with hardboard or plywood to protect flange sealing surfaces.

The disc is shipped in the nearly closed position to protect the sealing edge and prevent the liner from taking a temporary set. The stem bushings and disc edge have been coated with a factory-applied lubricant to prolong storage and service life.

Valves may be shipped or stored in any position. Storage should be limited to 10 years indoors with a temperature range of 40° F to 90° F (4°C to 32°C).

II. BUTTERFLY VALVE INSTALLATION GUIDELINES

Review valve pressure rating on nameplate and system pressure limits to ensure valve is rated for the intended service. Do not exceed the pressure rating of the valve.

NIBCO rubber-lined butterfly valves, depending on size and pressure rating, are designed to mate with Class 125/150 flange patterns in conformance to ASME B16.1, ASME B16.5, or ASME B16.47 Class 150 (Series A) flanges. Cast iron and steel flat-face flanges can be used with all NIBCO butterfly valves.

While flange standards specify flange OD, thickness, bolt size, bolt-circle diameter, and number of bolts, they may not specify flange opening ID. Care must be used when selecting mating components for use with NIBCO flange style butterfly valves. **The internal diameter of flanges, fittings, and pipe must be compatible with the butterfly valve for proper seal-face integrity and disc operation.**

When in the open position, the disc extends outward from the valve body. The internal diameter of connecting components must be large enough to allow clearance for the disc to fully open. The disc clearances specified in **TABLE 1** (below) are in accordance with MSS Standard Practice SP-67 Butterfly Valves, Table A1.

NIBCO 14" thru 48" size butterfly valves have an integral rubber face that seals to the attaching flange; therefore, a separate gasket is not necessary and should never be used.

The flange inside diameter must not be too large or it will not mate properly with this integral seal. See **TABLE 1** (below) for minimum and maximum inside diameters of connecting piping/flanges to assure proper seal-face integrity and full operation of NIBCO butterfly valves. Verify the inside diameter and clearance dimensions of all components connecting directly to a butterfly valve.

VALVE SIZE	MINIMUM PIPE / FLANGE ID FOR DISC CLEARANCE	MAXIMUM PIPE / FLANGE ID FOR PROPER SEAL	VALVE SIZE	MINIMUM PIPE / FLANGE ID FOR DISC CLEARANCE	MAXIMUM PIPE / FLANGE ID FOR PROPER SEAL
14"	12.88"	15.50"	30"	29.08"	31.28"
350 mm	327 mm	394 mm	750 mm	739 mm	795 mm
16"	15.06"	17.90"	36"	33.60"	36.77"
400 mm	383 mm	455 mm	900 mm	853 mm	934 mm
18"	17.02"	19.67"	42"	39.87"	44.96"
450 mm	432 mm	500 mm	1050 mm	1013 mm	1142 mm
20"	18.96"	21.05"	48"	44.86"	21.57"
500 mm	482 mm	535 mm	1200 mm	1139 mm	548 mm
24"	23.04"	25.57"			
600 mm	585 mm	649 mm			

TABLE 1

VALVE INSTALLATION GUIDELINES CONTINUED

Butterfly valves should be installed a minimum of six (6) pipe diameters from other line components and changes in direction in both the upstream and downstream piping. This assures disc clearance when opening the valve and reduces internal stress on disc by reducing flow turbulence. While not always practical, it is important to design in as much straight distance on either side of the butterfly valve as possible.

NIBCO butterfly valves are bi-directional and may be installed with flow in either direction. These valves can be installed in any horizontal or vertical position. If a choice of stem positions exists, the valve should be installed with the stem in the horizontal position; this will minimize seat wear by distributing the stem and disc weight evenly. Also, if the media is abrasive, the horizontal stem position is highly preferred, which will allow the disc to act as a “scoop” to sweep the line of the media when operated.

When using a valve with gear operator attached, it may be desirable to have the hand wheel positioned to allow easy access, or for use of an optional sprocket rim (chain wheel) for remote operation. It is the responsibility of the installer to determine if a Retaining Harness is needed when using a chain wheel. Before valve installation, review how to orient the gear operator hand wheel position in relation to the valve body and piping system. Pre-planning may save from having to remove a newly installed valve and reinstalling in another orientation.

Open and close the butterfly valve fully before attempting to install it into a piping system to ensure the gear operator stops are properly set and the valve is fully functional. If the gear operator is removed from the valve for any reason, prior to or during installation, the gear operator stops must be properly reset as per Section IV, on page 5.

III. VALVE INSTALLATION PROCEDURE

Always position the connecting pipe flanges accurately in the line, allowing sufficient space between the flanges for the valve. Make sure the pipe flange faces are clean of any foreign material such as scale, metal shavings or welding slag. Valves should be installed with the disc in the closed position to prevent damage to sealing surfaces. Rubber seated butterfly valves have an integral rubber face that seals to the attaching flanges, therefore **separate gaskets should not be used**.

1. Fully close valve and inspect to assure disc is centered equally in the seat. Adjust gear operator CLOSE stop if necessary, to center disc in seat. See Section IV on page 5.
2. Carefully insert the valve between the pipe flanges. Do not apply any lubricants to the seat faces as this may damage them.
3. Line up, center & secure the valve between flanges using **customer supplied** desired bolts as listed in **TABLE 2** on next page. Do not tighten bolts at this time, hand tighten then “snug-up”.
4. Carefully open the valve to assure free unobstructed disc movement. Disc interference may result when valves are installed in pipelines having smaller than normal inside diameters, such as heavy wall pipe, plastic-lined pipe, as-cast flanges, or reducing flanges. Interference can also occur when connecting directly to a swing check or silent check. Suitable corrective measures must be taken to remove these obstructions, such as taper boring the pipe or installing a spacer or spool piece.
5. After proper operation is verified, tighten the bolts to the **minimum** recommended bolt torques listed in **TABLE 3**, next page, using a cross-over pattern as shown in **FIGURE 1**, next page.
6. A multi-stepped process utilizing the cross-over pattern should be used to draw flanges against the rubber seat from both sides of the valve at the same rate, ensuring even compression. This should be followed by 2 sets of chase patterns, alternating from one side of the valve to the other. Refer to **ASME PCC-1 GUIDELINES FOR PRESSURE BOUNDARY BOLTED FLANGE JOINT ASSEMBLY** for bolt tightening methodology.
7. Pressurize piping to valve and inspect for leakage. If leakage is observed, tighten bolts using cross-over pattern, increasing torque until leak stops.
DO NOT EXCEED MAXIMUM TORQUES LISTED IN TABLE 3 on next page.
8. Recommended torques are made without warranty. Installer must verify proper strength bolts for application.

VALVE INSTALLATION PROCEDURE - CONTINUED

RECOMMENDED BOLT LENGTHS							
VALVE SIZE	TOTAL VALVE BODY WIDTH	ASME B16.1 CLASS 125 CAST IRON FLANGE THICKNESS	ASME B16.5 CLASS 150 STEEL FLANGE THICKNESS	ASME B16.47 (SERIES A) CLASS 150 STEEL MSS SP-44 FLANGE THICKNESS	RECOMMENDED BOLT LENGTH	TOTAL QUANTITY CAP SCREWS/BOLTS (TO MOUNT VALVE BETWEEN 2 FLANGES)	BOLT THREAD SIZE
14"	3.01	1.38	1.38	—	2.5	24	1-8 UNC
16"	3.38	1.44	1.44	—	3	32	1-8 UNC
18"	4.12	1.56	1.56	—	3	32	1-1/8 – 7 UNC
20"	5.14	1.69	1.69	—	3.5	40	1-1/8 – 7 UNC
24"	5.98	1.88	1.88	—	4	40	1-1/4 – 7 UNC
30"	6.57	2.12	—	—	4.25	56	1-1/4 – 7 UNC
		—	—	2.94	5	56	
36"	8.00	2.38	—	—	5	64	1-1/2 – 6 UNC
		—	—	3.56	6	64	
42"	9.88	2.62	—	—	5.25	72	1-1/2 – 6 UNC
		—	—	3.81	6.5	72	
48"	10.87	2.75	—	—	5.5	88	1-1/2 – 6 UNC
		—	—	4.25	7	88	

TABLE 2

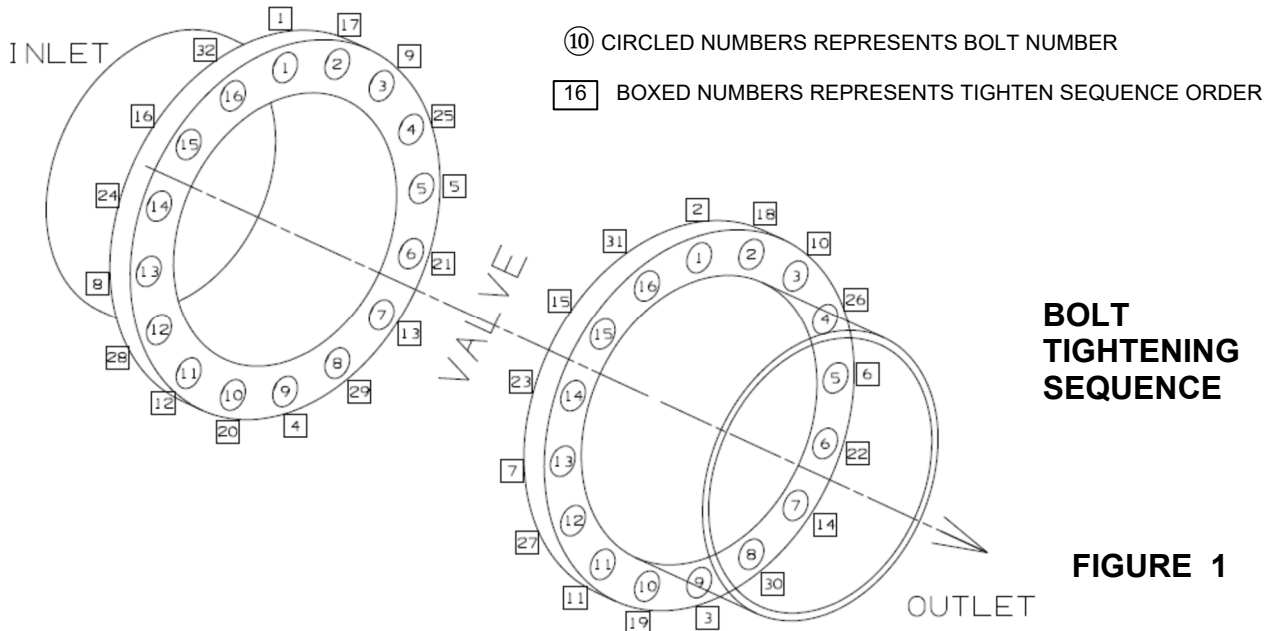


FIGURE 1


BOLT GRADE	BOLT HEAD MARKING		LUBRICATED BOLT SIZE				NON-LUBRICATED BOLT SIZE			
			1"-8	1 1/8"-7	1 1/4"-7	1 1/2"-6	1"-8	1 1/8"-7	1 1/4"-7	1 1/2"-6
ASTM A307 OR	TORQUE FT./LBS.	MINIMUM	45	70	100	170	75	100	150	240
SAE J429 GRADE 2		MAXIMUM	140	200	300	500	240	350	500	800

TABLE 3

IV. GEAR OPERATOR ADJUSTMENT

NOTE: It is best to visually check the valve disc OPEN and CLOSE positions before the valve is installed in the system piping to assure proper valve operation.

1. Attach gear operator to the top of the valve and securely tighten bolts, or verify bolts are securely tight if you received a valve with the gear operator already attached.
2. Fully close valve and inspect seat to assure disc is centered equally in seat. If not, CLOSE stop adjustment is necessary.

IF VALVE DISC DOES NOT FULLY CLOSE

3. Loosen CLOSE stop nut on gear operator one turn by turning counterclockwise or remove outer set screw. See **FIGURE 2, 3, 4, & 5** on next pages.
4. Loosen CLOSE stop set screw 2 turns by turning counterclockwise.
5. Turn handwheel clockwise until valve disc is centered equally in seat.
6. Tighten CLOSE stop set screw by turning clockwise until it stops.
7. Tighten CLOSE stop nut until it is tight or reinstall outer set screw and tighten.

IF VALVE DISC TRAVELS PAST CLOSE POSITION

8. Turn handwheel counterclockwise until disc is centered in seat.
9. Loosen CLOSE stop nut on gear operator one turn by turning counterclockwise or remove outer set screw.
10. Tighten CLOSE stop set screw, or inner set screw, by turning clockwise until it stops.
11. Tighten CLOSE stop nut until it is tight or install outer set screw and tighten.
12. If the valve is installed in the system piping and cannot be removed, it is possible to adjust the stops, but is a little more difficult. The only difference is that instead of visually checking the actual disc in the valve; you must visually check the pointer position. Because the exact pointer position is more difficult to determine, it may take a couple tries to set the CLOSE stop. OPEN stop adjustment is not critical; $\pm 5^\circ$ travel is adequate.

NOTE: The gear operator's OPEN and CLOSE positions have been set at time of shipping. These instructions should be used for slight adjustment as needed.

GEAR OPERATOR DIMENSIONS

VALVE SIZE	AA	BB	CC	DD	EE	FF	GG	HH	JJ	PIN / KEY	WEIGHT
14"	4.72	3.94	2.13	2.36	.94	10.63	10.24	19.69	9.84	.236" X 2.17"	58 lbs.
350 mm	120	100	54	60	24	270	260	500	250	6 X 55 mm	26 Kg.
16", 18" 20"	4.13	7.28	2.52	2.36	.94	14.96	11.42	11.81	9.84	.236" X 1.57"	90 lbs.
400, 450, 500 mm	105	185	64	60	24	380	290	300	250	6 X 40 mm	41 Kg.
24"	5.51	5.91	3.31	2.52	.94	14.25	13.78	19.69	11.81	.236" X 2.17"	145 lbs.
600 mm	140	150	84	64	24	362	350	500	300	6 X 55 mm	66 Kg.
30", 36"	6.37	6.95	3.46	4.05	1.10	9.74	7.66	17.68	13.91	.315" X 1.57"	339 lbs.
750, 900 mm	162	177	88	103	28	248	195	450	354	8 X 40 mm	154 Kg.
42", 48"	13.56	9.74	5.89	5.78	1.41	16.27	9.35	19.65	28.45	.315" X 1.57"	924 lbs.
1050, 1200 mm	345	248	150	147	36	414	238	500	724	8 X 40 mm	420 Kg.

TABLE 4

See **FIGURE 2, FIGURE 3, FIGURE 4,** and **FIGURE 5** on next pages for drawings

GEAR OPERATOR FOR 14" SIZE BUTTERFLY VALVES

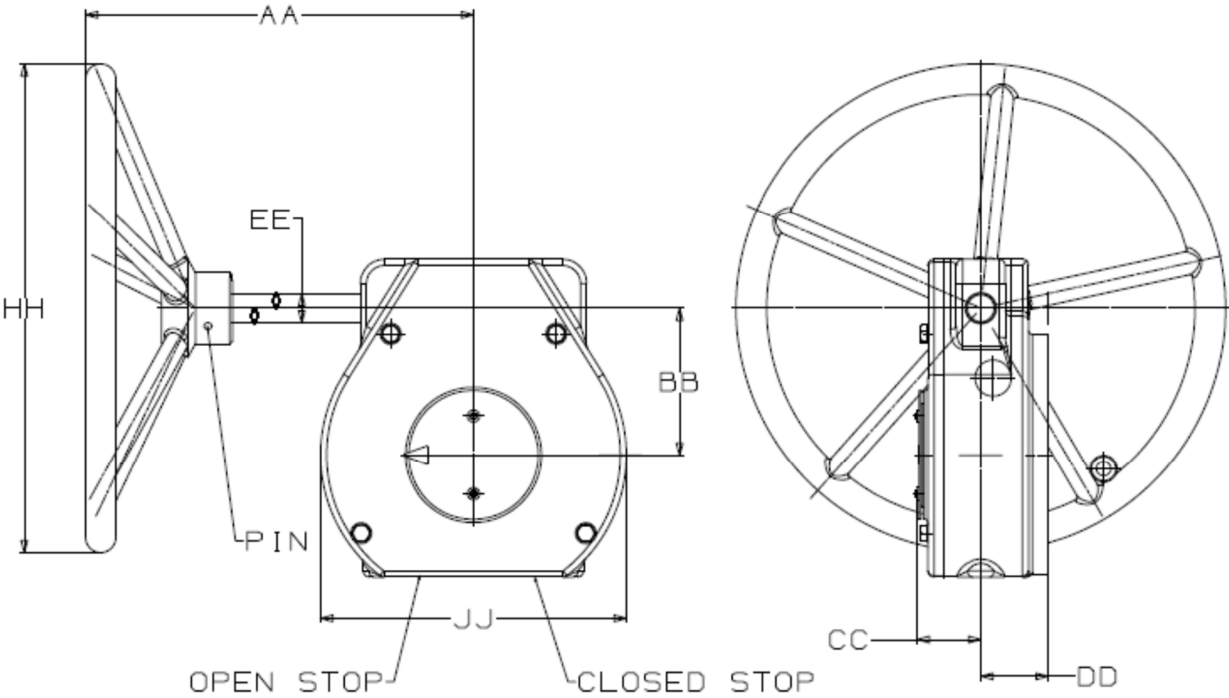


FIGURE 2

GEAR OPERATOR FOR 16" THRU 24" SIZE BUTTERFLY VALVES

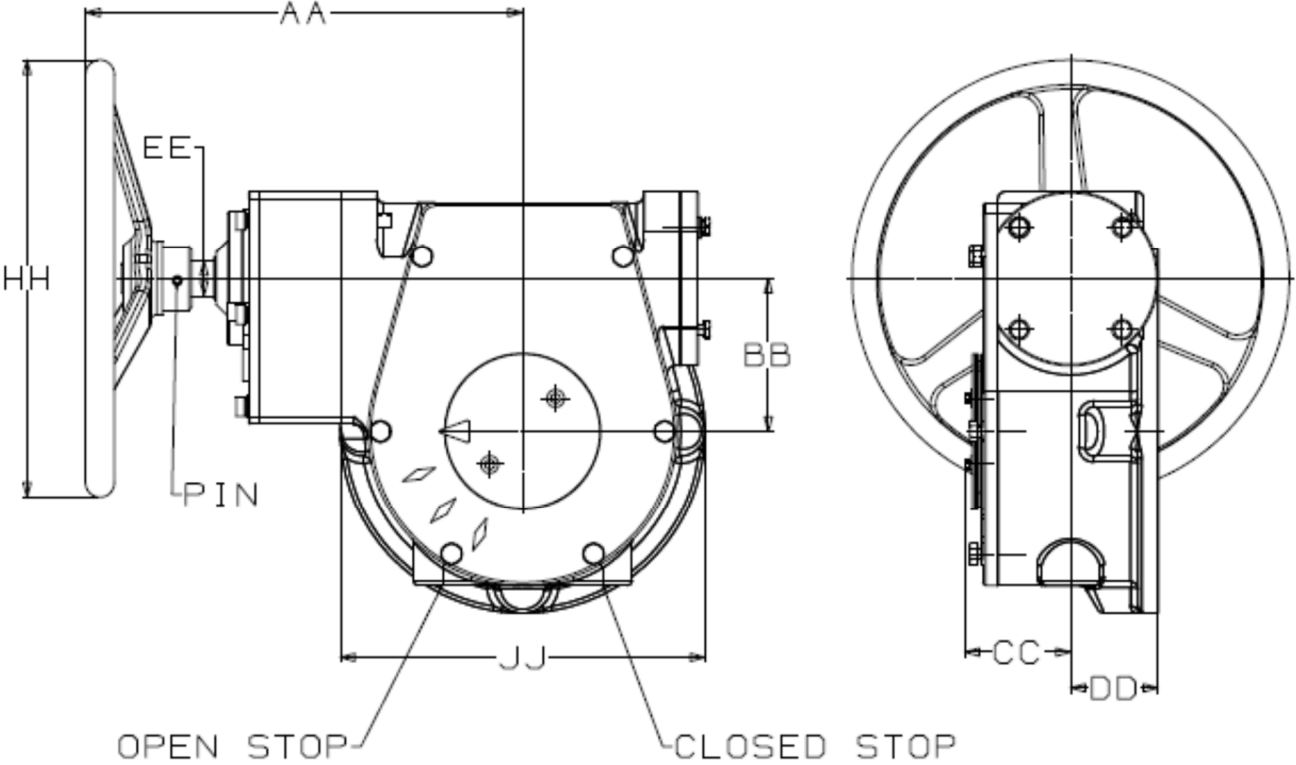
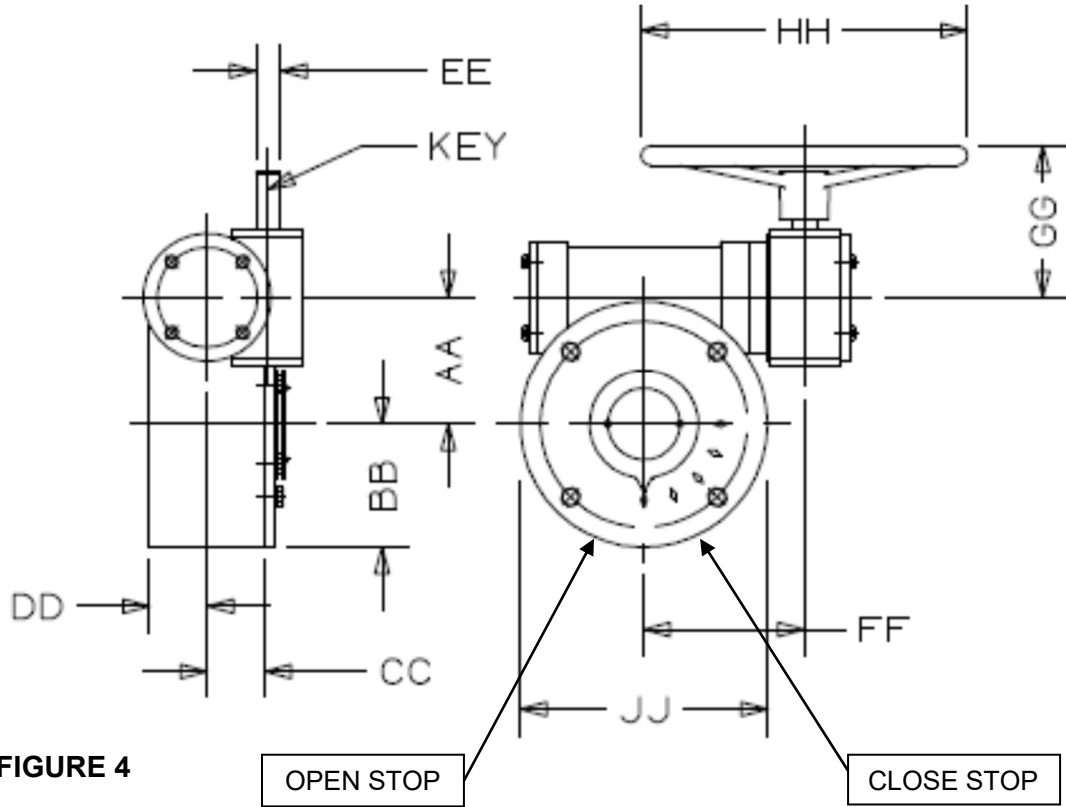
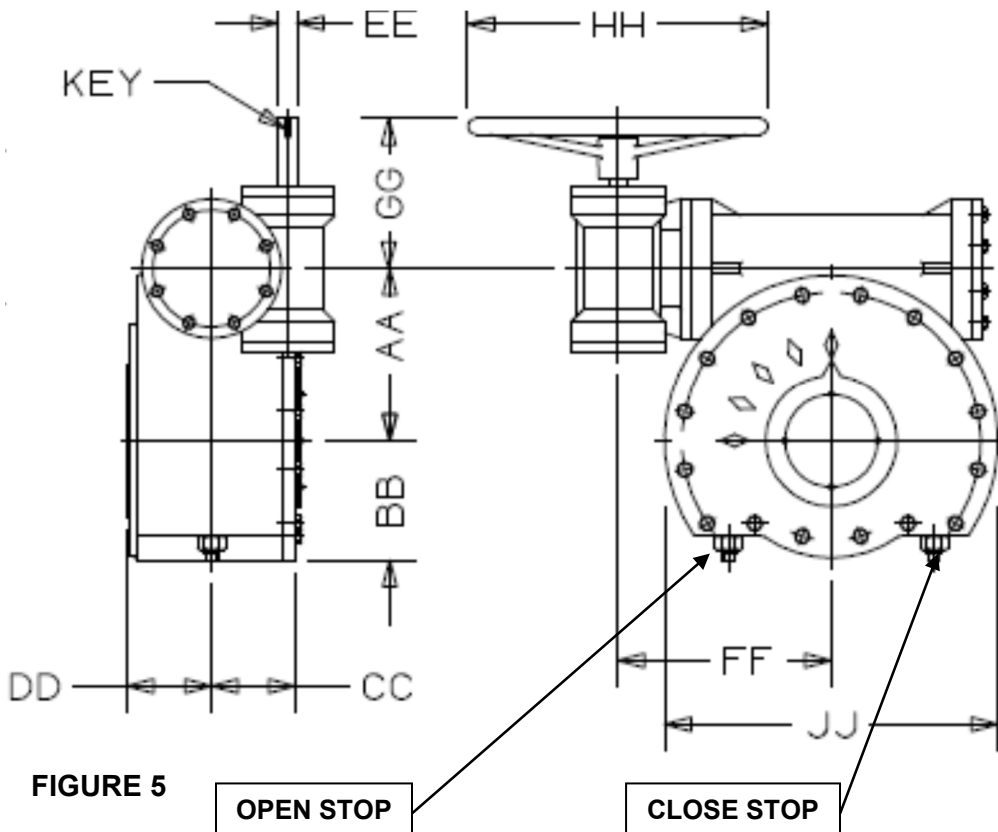


FIGURE 3

GEAR OPERATOR FOR 30" & 36" SIZE BUTTERFLY VALVES



GEAR OPERATOR FOR 42" & 48" SIZE BUTTERFLY VALVES



V. VALVE CONSTRUCTION - 14" THRU 24" SIZE BUTTERFLY VALVES

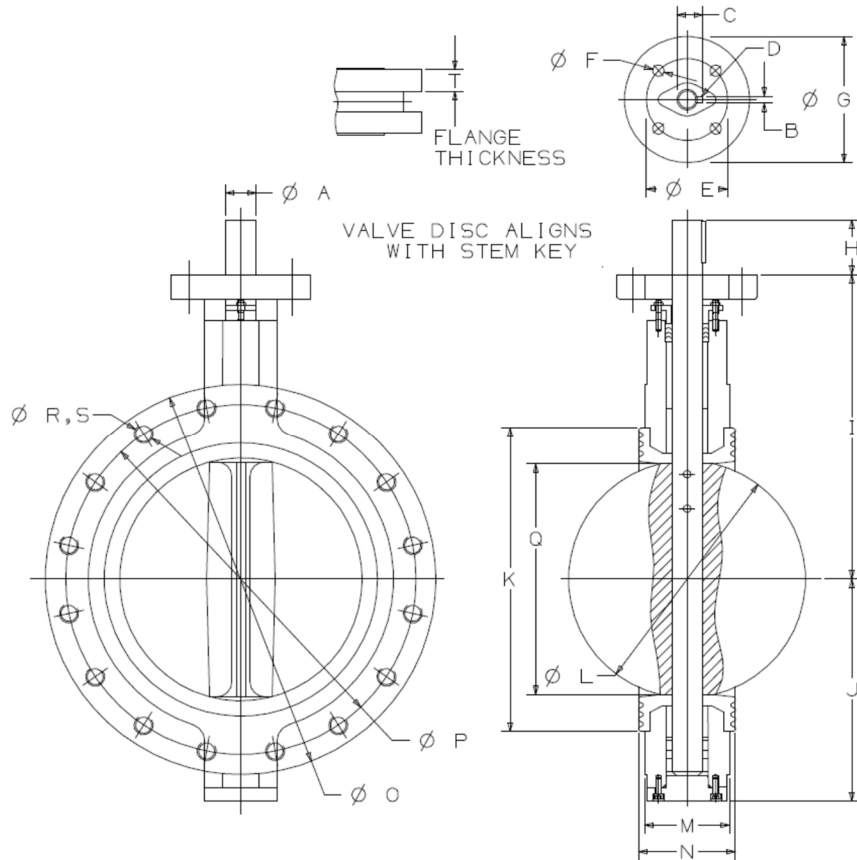


FIGURE 6

VALVE SIZE	UNITS	A	B	C	D (KEY)	E	F	G	H	I	J	K
14"	INCHES	1.687	0.472	1.81	.487 X .315 X 1.61	4.02	0.47	5.51	1.81	15.67	11.30	16.50
350 mm	mm	42.86	12	45.86	12 X 8 X 40	102	12	140	46.0	398	287	419
16"	INCHES	1.993	0.630	2.15	.630 X .394 X 2.75	5.51	0.71	7.76	2.99	16.97	13.74	18.90
400 mm	mm	50.62	16	54.62	16 X 10 X 70	140	18	197	76.0	431	349	480
18"	INCHES	2.125	0.630	2.28	.630 X .394 X 2.75	5.51	0.71	7.76	2.99	17.83	14.45	20.67
450 mm	mm	53.98	16	57.98	16 X 10 X 70	140	18	197	76.0	453	367	525
20"	INCHES	2.494	0.709	2.65	.709 X .433 X 3.15	5.51	0.71	7.76	3.39	18.90	15.91	22.05
500 mm	mm	63.35	18	67.35	18 X 11 X 80	140	18	197	86.0	480	404	560
24"	INCHES	2.756	0.787	2.93	.784 X .472 X 3.15	10.00	0.71	10.87	3.39	22.13	18.15	26.57
600 mm	mm	70.00	20	74.50	20 X 12 X 80	254	18	276	86.0	562	461	675

VALVE SIZE	UNITS	L	M	N	O	P	Q	R QTY	U THREADS	T	GEAR MOUNT	WEIGHT
14"	INCHES	13.15	3.62	3.94	20.98	18.75	12.87	24	1"- 8 UNC	1.18	F10	220 lbs.
350 mm	mm	334.0	92	100	533	476.3	327			30		100 Kg.
16"	INCHES	15.36	4.02	4.33	23.50	21.25	15.08	32	1"- 8 UNC	1.26	F14	288 lbs.
400 mm	mm	390.1	102	110	597	539.8	383			32		131 Kg.
18"	INCHES	17.37	4.49	4.80	25.00	22.75	17.01	32	1½"- 7 UNC	1.38	F14	354 lbs.
450 mm	mm	441.1	114	122	635	577.9	432			35		161 Kg.
20"	INCHES	19.37	5.00	5.31	27.52	25.00	18.98	40	1½"- 7 UNC	1.57	F14	471 lbs.
500 mm	mm	192.1	127	135	699	635.0	482			40		214 Kg.
24"	INCHES	23.34	6.06	6.38	32.01	29.50	23.03	40	1 ¼"- 7 UNC	1.77	F25	929 lbs.
600 mm	mm	592.8	154	162	813	749.3	585			45		422 Kg.

TABLE 5

14" THRU 24" SIZE BUTTERFLY VALVES

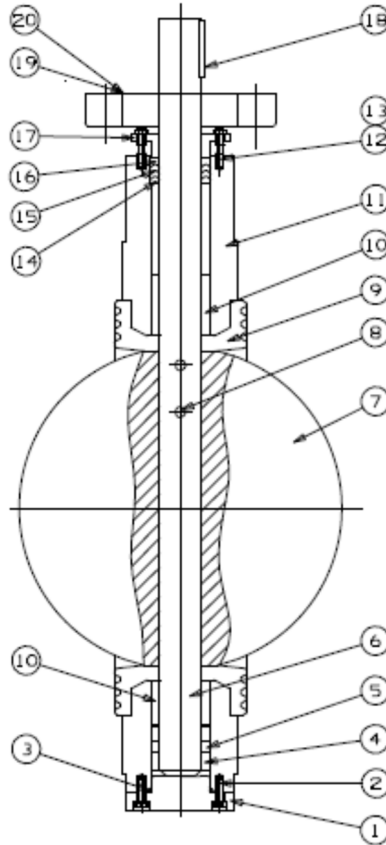


FIGURE 7

ITEM	QTY	DESCRIPTION	MATERIAL SPECIFICATIONS
1	1	END CAP COVER	DUCTILE IRON ASTM A536 65-45-12
2	2	SCREW	STEEL
3	1	O-RING	NITRILE ASTM D2000
4	2	BUSHING SHORT	BRONZE ASTM B584 C83600
5	1	O-RING	NITRILE ASTM D2000
6	1	STEM	STAINLESS STEEL ASTM A276 S42000 STAINLESS STEEL ASTM A564 S63000
7	1	DISC	DUCTILE IRON A536 65-45-12 NYLON 11 COATED ALUM BRZ ASTM A148 C95400 STAINLESS STEEL CF8M
8	2	TAPER PIN	STAINLESS STEEL ASTM A276 S42000 STAINLESS STEEL ASTM A564 S63000
9	1	SEAT	EPDM ASTM D2000 NITRILE ASTM D2000
10	2	BUSHING LONG	BRONZE ASTM B584 C83600
11	1	BODY	DUCTILE IRON ASTM A536 65-45-12
12	2	STUD	STEEL
13	2	NUT	STEEL
14	1	PACKING RING	BRONZE ASTM B584 C83600
15	2	V-CUP PACKING	NITRILE ASTM D2000
16	1	UPPER PACKING	NITRILE ASTM D2000
17	1	PACKING GLAND	DUCTILE IRON ASTM A536 65-45-12
18	1	KEY	STEEL
19	1	RETAINER PLATE	STEEL
20	2	SCREW	STEEL

TABLE 6

30" THRU 48" SIZE BUTTERFLY VALVES

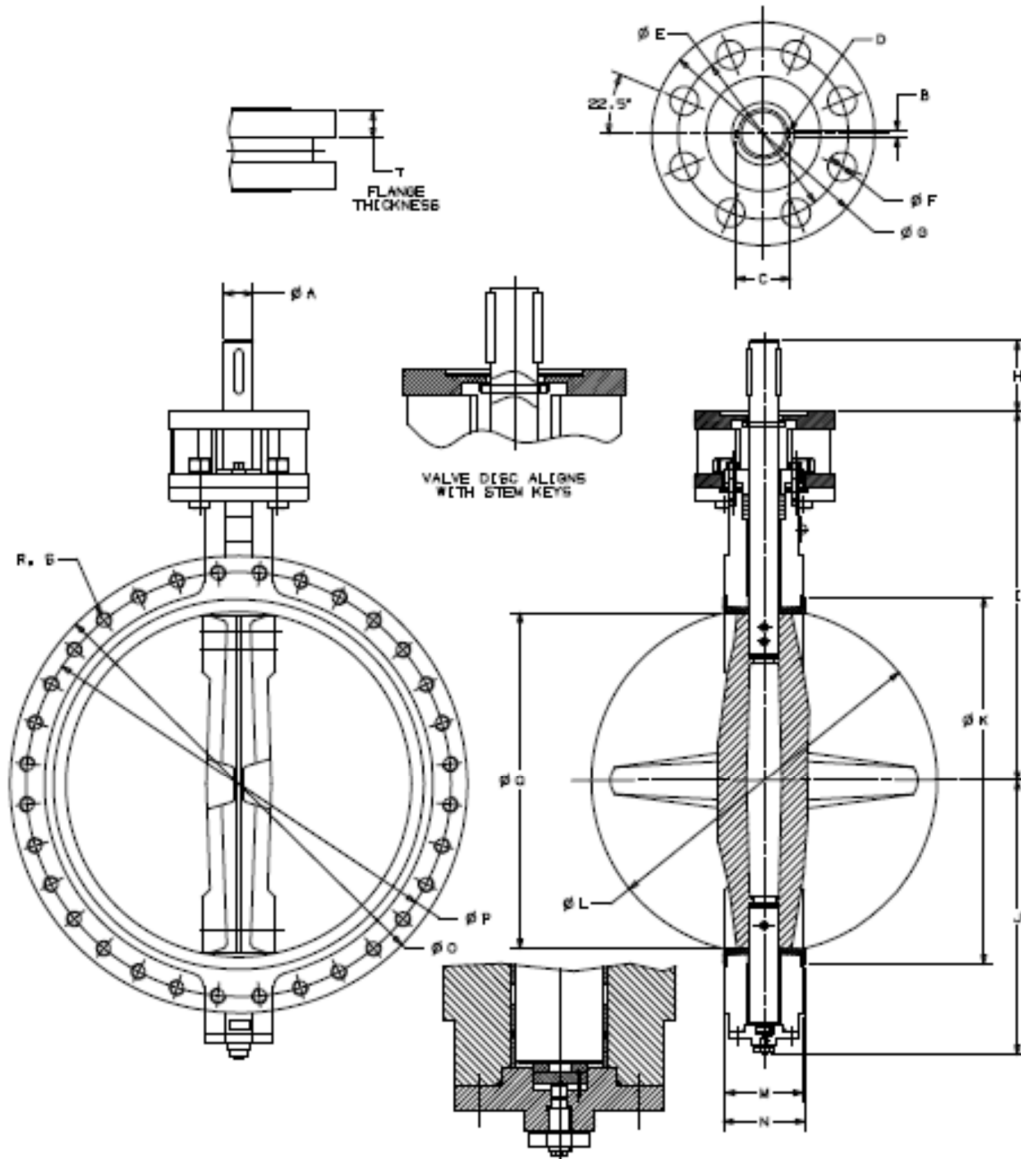


FIGURE 8

VALVE SIZE	UNITS	A	B	C	D (2 KEYS)	E	F	G	H	I	J	K
30"	INCHES	2.953	0.787	3.31	.787 X .472 X 2.50	11.73	0.87	13.78	2.60	33.31	24.33	32.28
750 mm	mm	75	20	84	20 X 12 X 63	298	22	350	66	846	618	820
36"	INCHES	3.543	0.984	3.94	.984 X .551 X 4.00	11.73	0.87	13.78	4.65	36.67	29.25	38.27
900 mm	mm	90	25	100	25 X 14 X 100	298	22	350	118	906	743	972
42"	INCHES	4.134	1.102	4.61	1.102 X .630 X 5.50	14.02	1.30	16.34	5.91	41.10	34.02	46.46
1050 mm	mm	105	28	117	28 X 16 X 140	356	33	415	150	1044	864	1180
48"	INCHES	4.724	1.260	5.28	1.260 X .709 X 5.50	14.02	1.30	16.34	5.91	44.37	37.44	53.07
1200 mm	mm	120	32	134	32 X 18 X 14	356	33	415	150	1127	951	1348

VALVE SIZE	UNITS	L	M	N	O	P	Q	R QTY	S THREADS	T	GEAR MOUNT	WEIGHT
30"	INCHES	29.33	6.57	7.09	38.74	36.00	29.09	56	1 1/4" - 7 UNC	2.13	F30	1109 lbs.
750 mm	mm	745	167	180	984	914.4	739			54		504 Kg.
36"	INCHES	34.06	7.99	8.31	45.98	42.75	33.62	64	1 1/2" - 6 UNC	2.40	F30	1762 lbs.
900 mm	mm	865	203	211	1168	1085.9	854			61		801 Kg.
42"	INCHES	40.59	9.88	10.28	52.99	49.50	39.88	72	1 1/2" - 6 UNC	2.60	F35	2746 lbs.
1050 mm	mm	1031	251	261	1346	1257.3	1013			66		1248 Kg.
48"	INCHES	45.67	10.87	11.26	59.49	56.00	44.84	88	1 1/2" - 6 UNC	2.76	F35	3498 lbs.
1200 mm	mm	1160	276	286	1511	1422.4	1139			70		1590 Kg.

TABLE 7

30" THRU 48" SIZE BUTTERFLY VALVES

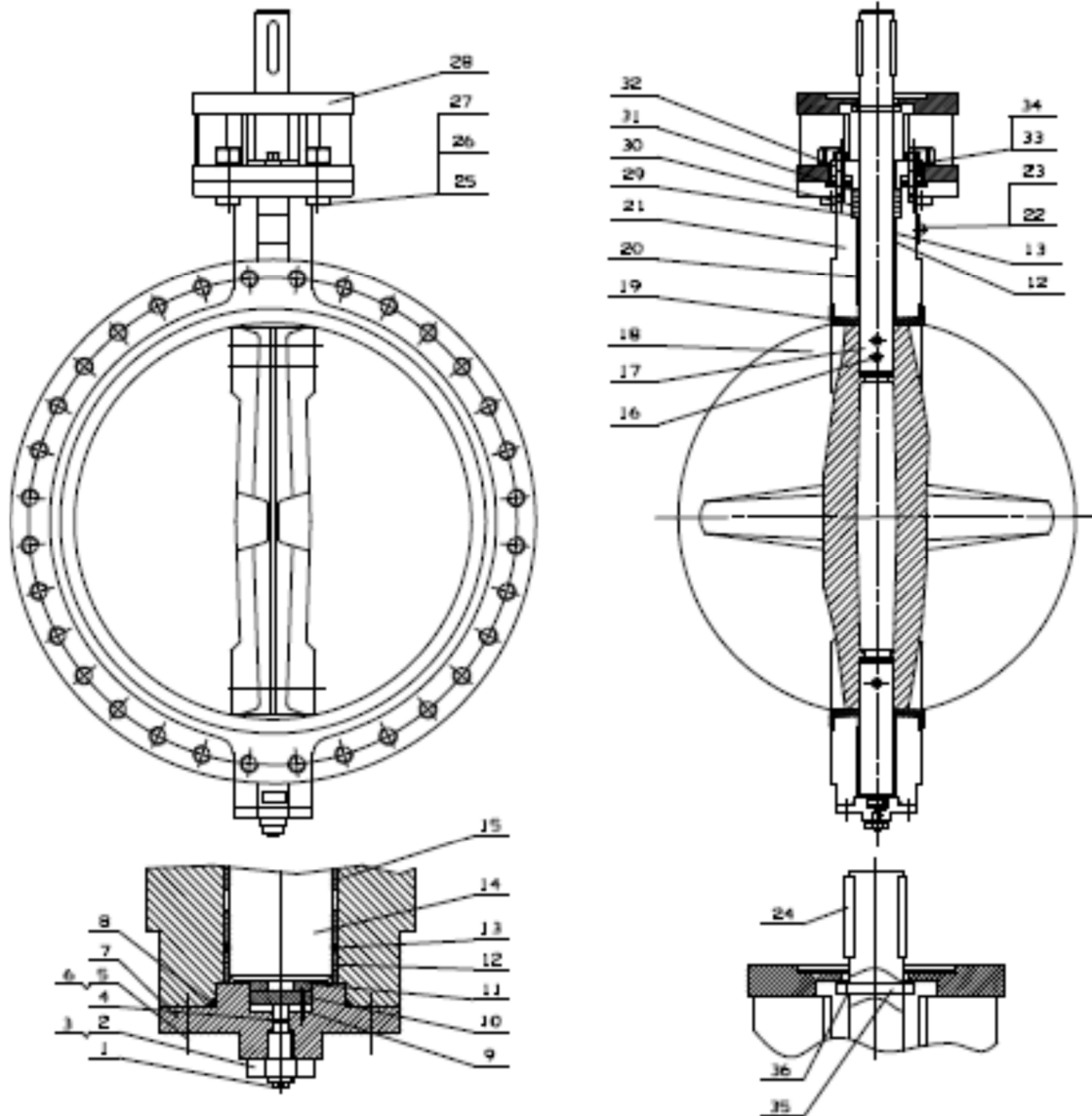


FIGURE 9

ITEM	QTY	DESCRIPTION	MATERIAL SPECIFICATIONS
1	1	SCREW	STEEL
2	1	NUT	STEEL
3	1	WASHER	STEEL
4	1	O-RING	NITRILE ASTM D2000
5	4	SCREW	STEEL
6	4	WASHER	SPRING STEEL
7	1	END CAP COVER	DUCTILE IRON A536 65-45-12
8	1	O-RING	NITRILE ASTM D2000
9	1	ROLL PIN	STEEL
10	2	SPACER	STEEL
11	1	THRUST BEARING	STEEL
12	4	BUSHING SHORT	BRONZE ASTM B584 C83600
13	2	O-RING	NITRILE ASTM D2000
14	1	STEM LOWER	STAINLESS ST ASTM A276 S42000 STAINLESS ST ASTM A564 S63000
15	1	BUSHING MID.	BRONZE ASTM B584 C83600
16	3	TAPER PIN	STAINLESS STL ASTM A276 S42000 STAINLESS ST ASTM A564 S63000
17	1	STEM UPPER	STAINLESS STL ASTM A276 S42000 STAINLESS ST ASTM A564 S63000
18	1	DISC	DI ASTM A536 NYLON COAT.

ITEM	QTY	DESCRIPTION	MATERIAL SPECIFICATIONS
18	1	DISC	ALUM BRZ ASTM A148 C95400 STAINLESS STL CF8M
19	1	SEAT	EPDM ASTM D2000 NITRILE ASTM D2000
20	1	BUSHING LONG	BRONZE ASTM B584 C83600
21	1	BODY	DUCTILE IRON A536 65-45-12
22	1	I.D. PLATE	ALUMINIM
23	2	RIVIT	ALUMINIM
24	2	KEY	STEEL
25	8	SCREW	STEEL
26	8	WASHER	SPRING STEEL
27	8	NUT	STEEL
28	1	TOP CONNECTION SPT	DUCTILE IRON A536 65-45-12
29	1	PACKING RING	BRONZE ASTM B584 C83600
30	4	V-CUP PACKING	NITRILE ASTM D2000
31	1	UPPER PACKING	NITRILE ASTM D2000
32	1	PACKING GLAND	DUCTILE IRON A536 65-45-12
33	2	STUD	STEEL
34	2	NUT	STEEL
35	1	PIN	STEEL
36	1	RETAINING RING	STEEL

TABLE 8

VI. OPERATION

Rotate the gear operator handwheel in the counter-clockwise direction to open the valve. Rotate the handwheel in the clockwise direction to close the valve. Disc position can be determined by looking at the pointer plate located on top of the gear operator. Note that the keys in the stem also align with the sealing edges of the disc.

VII. REPAIR

No regular scheduled lubrication or maintenance is required except for regular exercising of the valve. The valve needs to be fully cycled every 6 months, at a minimum, and inspected for smooth operation and external leakage.

VIII. TROUBLESHOOTING

ISSUE	POSSIBLE REASONS	SOLUTIONS
LEAKAGE AT VALVE SEAT	DISC IS NOT FULLY CLOSED	ADJUST GEAR OPERATOR OR ACTUATOR CLOSE STOP - SEE SECTION IV
	CONTAMINATION ADHERED TO SEALING SURFACES OF SEAT	CLEAN BOTH SEALING SEAT SURFACES
	RUBBER SEAT HAS ERODED	CHECK MEDIA TO SEE IF COMPATIBLE WITH RUBBER SEAT MATERIAL
EXTERNAL LEAKAGE AT LOWER STEM	END CAP O-RING DAMAGED	REPLACE O-RING
	RETAINING COVER O-RING DAMAGED	REPLACE O-RING
	ADJUSTING SCREW O-RING DAMAGED	REPLACE O-RING
EXTERNAL LEAKAGE AT UPPER STEM	STEM V-CUP PACKING WORN	EVENLY TIGHTEN PACKING GLAND NUTS - DO NOT OVERTIGHTEN!
	STEM V-CUP PACKING ASSEMBLY DAMAGED	REPLACE STEM V-CUP PACKING ASSEMBLY
LEAKAGE AT FLANGE CONNECTION	FLANGE BOLTS ARE NOT TIGHT OR NOT TIGHTENED PROPERLY	EVENLY TIGHTEN ALL FLANGE BOLTS USING CROSS-OVER / CRISS-CROSS PATTERN
	VALVE CONNECTED TO IMPROPER SIZE FLANGE	REVIEW FLANGE DIMENSIONS AND COMPARE TO TABLE 1 , INSTALL PROPER SIZE FLANGE
	SURFACES OF FLANGE ARE CONTAMINATED	INSPECT AND CLEAN FLANGES
	SURFACES OF FLANGES ARE DAMAGED	INSPECT AND REPAIR FLANGE DAMAGE