

## INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

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# Installation and Maintenance Guidelines for NIBCO<sup>®</sup> Butterfly Valves with Rubber Seats

### Figure Numbers

LD-1000/2000/7000/8000 Series

LD/WD-2000/3000/5000 Series  
LC/WC-2000 Series

LD/WD-3500 Series

GD-4700 Series

FC/FD-2000 Series  
FC/FD-5000 Series

N-200 Series

*For any technical enquiries 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.

## **I. SHIPMENT & STORAGE**

NIBCO butterfly valves are individually boxed thru the 12" size. The 14" through 60" butterfly valves are shipped individually with the faces covered using cardboard or plywood to protect the flange sealing surfaces.

The disc is shipped in the nearly closed position to protect the sealing edge and prevents 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**

NIBCO butterfly valves are bi-directional and may be installed with flow in either direction.

Flanged, lug and wafer style valves are designed and suitable for installation between ASME Class 125 and/or 150 flanges. Cast iron flat-face, steel raised-face, both slip-on and weld-neck, and bronze or plastic flanges may be used (See Table 1 below). Generally raised-face flanges should not be used with cast iron lug style valves (NIBCO N200 and LC2000 series valves). Because of the unique seat design, NIBCO (2" – 48") lug and wafer style butterfly valves do not require the use of flange gaskets and are rated for dead end service without a downstream flange. However it is always good practice to use a downstream flange when a valve is being used for dead end service. Grooved style valves connect to metallic pipe of IPS per AWWA C606.

The valve 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.

These valves have been designed so that the disc, in the open position, will clear the inside diameter of the schedule 40 and 80 steel pipe. Care should be taken when installing a butterfly valve adjacent to lined pipe, as-cast fittings, or schedule 80 plastic pipe. In some cases the disc in the opened position will interfere with the adjacent component.

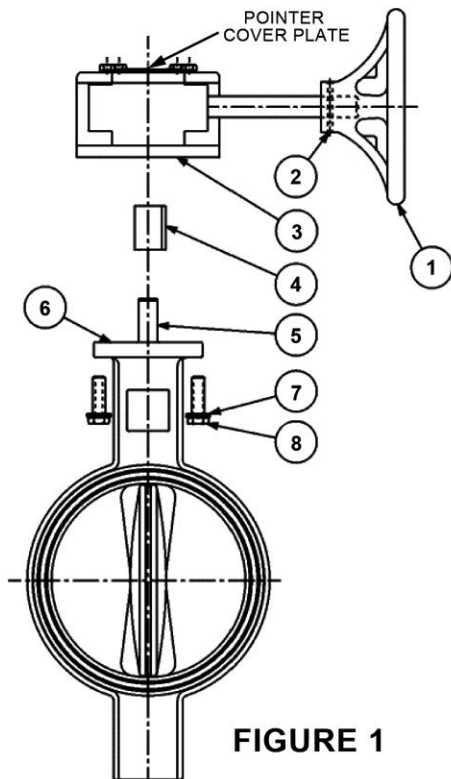
Butterfly valves should be installed a minimum of six (6) pipe diameters from other line components. This is not always practical but it is important to design in as much distance as possible. Interference may occur when valves are installed directly to the outlet flange of a swing check, silent check, or reducing flange. Check valve and butterfly valve combinations are very popular; normally a short spool piece is required between the valves.

When using a valve with gear operator attached, it may be desirable to have the handwheel positioned to allow easy access, or for use of an optional adjustable sprocket rim (chain wheel) for remote operation. Before valve installation, please review Gear Operator Installation and Handwheel Positioning section of this booklet. These instructions illustrate how to orient the gear operator handwheel 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.

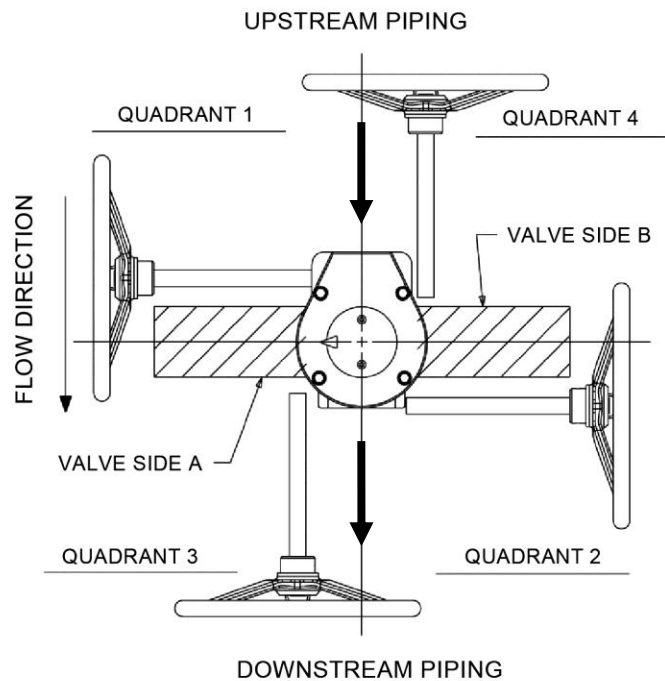
**TABLE 1**

Piping/Flange Inside Diameter Requirements - Flange, Lug, & Wafer BFVs Only						
Valve Series	LD/WD/LC/WC 1000/2000/3000/5000 Series		LD7000/8000 Series		N200 Series	
Valve Size	Minimum Pipe/Flange ID for Disc Clearance	Maximum Pipe/Flange ID for Proper Seal	Minimum Pipe/Flange ID for Disc Clearance	Maximum Pipe/Flange ID for Proper Seal	Minimum Pipe/Flange ID for Disc Clearance	Maximum Pipe/Flange ID for Proper Seal
2"	2.00	2.49	1.31	2.43	1.38	2.24
2½"	2.37	2.86	1.89	3.06	1.95	2.74
3"	2.67	3.43	2.64	3.65	2.66	3.33
4"	3.69	4.55	3.67	4.75	3.67	4.55
5"	4.76	5.62	4.44	5.54	4.48	5.50
6"	5.96	6.62	5.96	6.84	5.96	6.66
8"	8.01	8.62	7.85	8.89	7.85	8.61
10"	10.00	10.80	9.73	10.70	9.76	10.75
12"	11.99	13.12	11.71	12.74	11.72	12.79
14"	13.16	13.77	13.02	15.50	—	—
16"	15.34	16.30	15.20	17.90	—	—
18"	17.23	18.31	17.16	19.67	—	—
20"	19.04	20.08	19.10	21.05	—	—
24"	23.05	24.71	23.04	25.57	—	—
28"	—	—	27.10	29.31	—	—
30"	29.06	30.29	29.08	31.28	—	—
32"	—	—	30.91	33.93	—	—
36"	33.59	35.78	33.60	36.77	—	—
42"	39.83	42.77	39.87	44.96	—	—
48"	44.85	48.27	44.86	51.57	—	—
54"	—	—	50.67	54.25	—	—
60"	—	—	54.93	60.25	—	—

**III. GEAR OPERATOR INSTALLATION AND HANDWHEEL POSITIONING**



**FIGURE 1**



**FIGURE 2**

**TABLE 2**

<b>Tools Required</b>		
Fire Protection (UL/FM)	2" – 8"	9/16" Hex Wrench and 1/8" Hex Allen Wrench
	10" – 12"	3/4" Hex Wrench and 1/8" Hex Allen Wrench
Commercial	2" – 8"	9/16" Hex Wrench
	10" – 14"	3/4" Hex Wrench
	16" – 18"	1-1/8" Hex Wrench

1. Install handwheel (1) onto gear operator shaft and secure with pin (2). (If not already attached) See Figure 1.
2. Turn the handwheel (1) clockwise until in full SHUT position.
3. Remove 2 screws holding pointer cover plate to center of gear operator to expose bore. Retain pointer cover plate and screws for reinstallation later.
4. Assure valve is in full SHUT position, turn valve stem (5) to close disc if necessary.
5. Assure mounting base of gear operator (3) and the valve top flange (6) are both clean and dry.
6. Determine desired handwheel position in reference to the piping system and compare with Fig. 2. There are 2 mounting positions for the gear operator onto the valve and the valve can be mounted in either direction into the piping system. This will allow handwheel to be positioned in any of the 4 quadrants as shown in Fig. 2. Note that all Fire Protection and 10" and 12" size commercial valves allow for handwheel positioning in quadrants 1 and 2 only.
- 7a. Gear operators with adapter bushing:
  - Insert adapter bushing (4) into gear operator (3) bore aligning bushing key with desired keyway. Keyway selection will determine handwheel orientation position. (Note that Fire Protection model adapter bushings differ from illustration and only have 1 keyway position).
  - Align adapter bushing (4) bore with valve stem (5) and slide gear operator assembly onto valve stem (5) until seated with valve top flange.
- 7b. Gear operators without adapter bushing:
  - Align gear operator (3) bore with valve stem (5) and align with desired keyway. Keyway selection will determine handwheel orientation position.
  - Slide gear operator assembly onto the valve stem (5) until seated with valve top flange.
8. Tightly secure gear operator (3) to valve top flange (6) using supplied\* fasteners (7 & 8).
9. Reinstall pointer cover plate onto gear operator removed in Step 3 above. Arrow should be aligned to indicate SHUT position.
10. Install flag and secure with Allen Screw. (Fire Protection gear operators only).
11. Rotate handwheel from SHUT to Full OPEN positions several times to assure proper orientation. See Stop Adjustment Procedure Section of this instruction booklet if stop alignment adjustment is necessary.
12. Proceed with valve installation into piping system.

\* A minimum of two fasteners is required, installed in opposite diagonal corners.

**NOTES:**

- For Fire Protection gear operators, it is critical to use only the key supplied with gear operator in order to conform to UL, FM and ULC specifications.
- Connection of gear operator to valve stem varies depending on gear operator model, size and style. The adapter bushing and key may be different from Figure 1 illustration shown.

#### IV. VALVE INSTALLATION PROCEDURE – FLANGE, LUG & WAFER STYLE ONLY

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.

NOTE: Fully open and fully shut any butterfly valve before attempting to install it into a system, to ensure and confirm the valve is operational across its travel range and seating properly in the opened and shut positions.

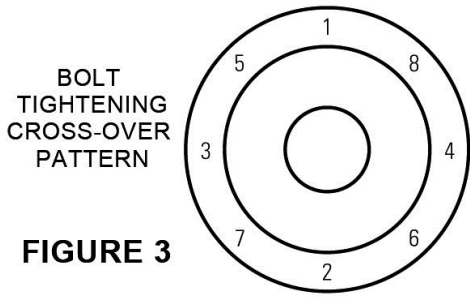
1. Carefully insert the valve between the pipe flanges. Do not apply any lubricants to the seat faces as this may damage them.
2. Line up, center and secure the valve between flanges using desired bolts or studs as listed in Table 4. Do not tighten bolts at this time.
3. Carefully open the valve to assure 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.
4. After proper operation is verified, tighten the bolts to the minimum recommended bolt torques listed in Table 3, below, using a cross-over pattern as shown in Figure 3. **NOTE:** When installing valves NPS 14" and larger between two flanges, it is critical that the cartridge liner be evenly compressed from both sides of the mating flanges. NIBCO recommends a multi-stepped process utilizing the cross-over pattern be used to draw the flanges against the liner from both side of the valve at the same rate, ensuring the liner is compressed evenly. This method differs from the practice used on smaller valves, wherein one flange side is completely tightened before moving to the opposite side.
5. 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 BELOW.
6. Recommended torques are made without warranty. Installer must verify proper strength bolts for application. Bolts shall be clean and un-lubricated.

#### NOTES:

- LUG STYLE VALVES – Extra care should be used when installing with raised faced flanges. Over tightening of bolts can result in broken valve lugs.
- Class 250 cast iron and Class 300 steel flanges **cannot** be used on these valves.
- Rubber faced or mechanical flanges are **not** recommended.
- These valves are **not** recommended for steam service.
- Valves should **not** be assembled to the flanges & then welded into the piping system.
- Lever-lock handles are **not** recommended for use on 8" and larger valves.
- Do **not** install valves with EPDM liner in compressed air lines.

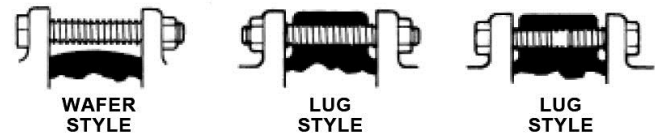
**TABLE 3**

Recommended Bolt Tightening Torques			
Flange Size	Bolt Size	Minimum Bolt Torque (ft./lbs.)	Maximum Bolt Torque (ft./lbs.)
2" – 4"	5/8"	20	70
5" – 8"	3/4"	30	120
10" and 12"	7/8"	50	200
14" and 16"	1"	70	240
18" and 20"	1-1/8"	100	380
24" – 30"	1-1/4"	140	520
32" – 48"	1-1/2"	200	800
54" – 60"	1-3/4"	350	1800



**FIGURE 3**

**SUGGESTED BOLTING METHODS**



**FIGURE 4**

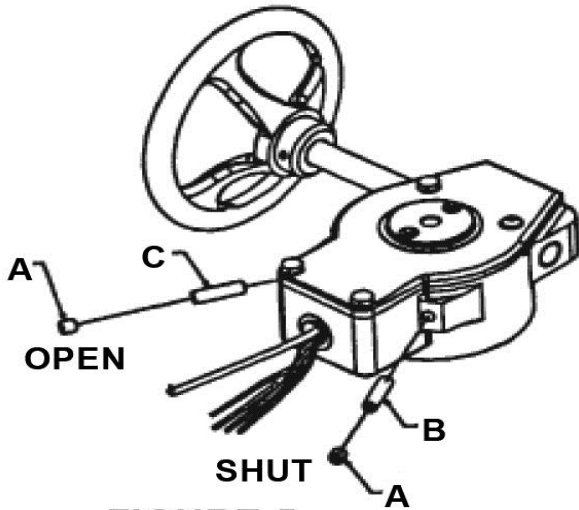
**TABLE 4**

Recommended Bolt Lengths								
VALVE SIZE 1000 / 2000 / 3000 5000 / 7000 / 8000 SERIES ONLY	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 CAP SCREW LENGTH (LUG & FLANGE STYLE VALVES)	RECOMMENDED BOLT LENGTH (WAFER VALVES)	TOTAL QUANTITY CAP SCREWS / BOLTS (TO MOUNT VALVE BETWEEN 2 FLANGES)	CAP SCREW SIZE
2"	1.69	0.63	—	—	1.25	4.00	8	5/8 – 11 UNC
		—	0.75	—	1.50	4.00	8	
2-1/2"	1.81	0.69	—	—	1.50	5.00	8	5/8 – 11 UNC
		—	0.88	—	1.75	5.00	8	
3"	1.81	0.75	—	—	1.50	5.00	8	5/8 – 11 UNC
		—	0.94	—	1.75	5.00	8	
4"	2.06	0.94	0.94	—	1.75	5.00	16	5/8 – 11 UNC
5"	2.19	0.94	0.94	—	1.75	5.00	16	3/4 – 10 UNC
6"	2.19	1.00	1.00	—	2.00	6.00	16	3/4 – 10 UNC
8"	2.38	1.12	1.12	—	2.25	6.00	16	3/4 – 10 UNC
10"	2.69	1.19	1.19	—	2.25	7.00	24	7/8 – 9 UNC
12"	3.00	1.25	1.25	—	2.50	7.00	24	7/8 – 9 UNC
14"	3.01	1.38	1.38	—	2.50	7.00	24	1 – 8 UNC
16"	3.38	1.44	1.44	—	3.00	8.00	32	1 – 8 UNC
18"	4.12	1.56	1.56	—	3.00	9.00	32	1-1/8 – 7 UNC
20"	5.14	1.69	1.69	—	3.50	10.00	40	1-1/8 – 7 UNC
24"	5.98	1.88	1.88	—	4.00	11.00	40	1-1/4 – 7 UNC
28"	6.42	—	—	—	—	—	56	1-1/4 – 7 UNC
		—	—	—	4.00	—	56	
		—	—	—	4.00	—	56	
		—	—	2.81	5.00	—	56	
30"	6.57	2.12	—	—	3.50	—	56	1-1/4 – 7 UNC
		—	—	—	3.00	—	56	
		—	—	—	3.50	—	56	
		—	—	2.94	4.25	—	56	
32"	7.40	—	—	—	—	—	56	1-1/2 – 6 UNC
		—	—	—	4.00	—	56	
		—	—	—	4.00	—	56	
		—	—	3.91	5.00	—	56	
36"	8.00	2.38	—	—	4.00	—	64	1-1/2 – 6 UNC
		—	—	—	3.50	—	64	
		—	—	—	4.00	—	64	
		—	—	3.56	5.00	—	64	
42"	9.88	2.62	—	—	4.50	—	72	1-1/2 – 6 UNC
		—	—	—	4.00	—	72	
		—	—	—	4.50	—	72	
		—	—	3.81	5.50	—	72	
48"	10.87	2.75	—	—	4.50	—	88	1-1/2 – 6 UNC
		—	—	—	4.50	—	88	
		—	—	—	5.00	—	88	
		—	—	4.25	6.00	—	88	
54"	15.00	3.00	—	—	7.00	—	88	1-3/4 – 5 UNC
		—	—	—	7.00	—	88	
		—	—	—	7.50	—	88	
		—	—	4.75	8.50	—	88	
60"	15.00	3.12	—	—	7.00	—	104	1-3/4 – 5 UNC
		—	—	—	7.00	—	104	
		—	—	—	8.00	—	104	
		—	—	5.19	9.00	—	104	

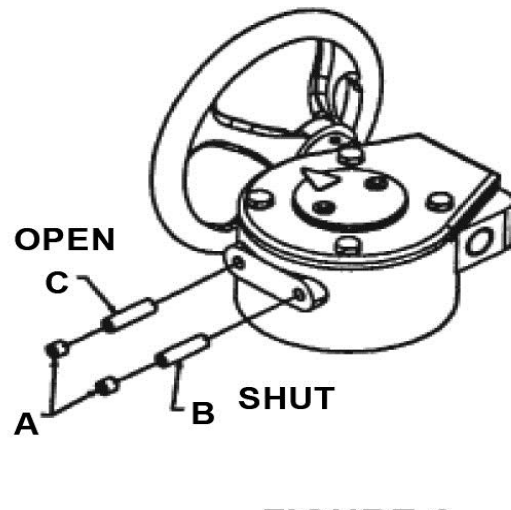
## GEAR OPERATOR PART NUMBERS

2" – 12" UL/FM VALVE GEAR OPERATOR			2" – 24" COMMERCIAL VALVE GEAR OPERATOR		
Part Number	Valve Size	Valve Series	Part Number	Valve Size	Valve Series
T117166 PP	2" – 4" 2-1/2" – 3"	WD/LD-3510 GD-4765	T117118 PP	2" – 6" 2" – 5"	WD/LD-2000/3000 FC/FD/GD-2000/5000/4000
T117167 PP	5" – 6" 4" – 6"	WD/LD-3510 GD-4765	T117119 PP	8" 6" – 8"	WD/LD-2000/3000 FC/FD/GD-2000/5000/4000
T117890 PP	8" 8"	WD/LD-3510 GD-4765	T117120 PP	10"	WD/LD-2000/3000
T117168 PP	10" – 12" 10"	WD/LD-3510 GD-4765	T117121 PP	12" 10" – 12"	WD/LD-2000/3000 FC/FD/GD-2000/5000/4000
			T116697 PP	14"	LD-1000/2000
			T026150 PP	16"	
			T026151 PP	18"	
			T026211 PP	20"	
			T026212 PP	24"	

### BUTTERFLY VALVE GEAR OPERATOR SETTING INSTRUCTIONS



**FIGURE 5**



**FIGURE 6**

**TABLE 5**

Tools Required	
2" – 8" valves	4mm or 5mm Hex Allen Wrench
10" – 18" valves	6mm Hex Allen Wrench
20" – 24" valves	8mm Hex Allen Wrench

### V. STOP ADJUSTMENT PROCEDURE

**NOTE:** It is best to visually check the valve disc OPEN and SHUT 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. Rotate the handwheel clockwise until it stops. Visually check to see that the valve disc is centered in the valve seat for proper seal. Note that the indicator flag (Fire Protection) or pointer (Commercial) on top of gear operator represents the disc position. If the stop location is not correct, proceed to step 5.

3. Rotate the handwheel counter-clockwise until it stops. Visually check to see that the valve disc is centered in the valve opening. Note that the indicator flag (Fire Protection) or pointer (Commercial) on top of gear operator represents the disc position. If the stop location is not correct, proceed to step 5.
4. If both stops are set correctly, valve is ready for installation.
5. Stop adjustment – Using a proper size hex Allen wrench, remove both locking set screws (A) as shown in Figures 5 and 6.
  - SHUT stop adjustment - Using proper size hex Allen wrench, turn set screw (B) counter-clockwise 2 turns. Rotate handwheel until disc is centered in valve seat. Turn set screw (B) clockwise until it stops. Secure set screw “B” by replacing only one locking set screw (A) in same hole and tightening it until it stops.
  - OPEN stop adjustment – Using proper size hex Allen wrench, turn set screw (C) counter-clockwise 2 turns. Rotate handwheel until disc is centered in valve opening. Turn set screw (C) clockwise until it stops. Secure set screw (C) by replacing second locking set screw (A) in same hole and tightening it until it stops.
6. Again visually verify both OPEN and SHUT stops are correctly set. Repeat step 5 if necessary.
7. 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 have to visually check the flag (Fire Protection) or pointer (Commercial) position. Because the exact flag or pointer position is more difficult to determine, it may take a couple tries to set the SHUT stop. OPEN stop adjustment is not critical;  $\pm 5^\circ$  travel is adequate.

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

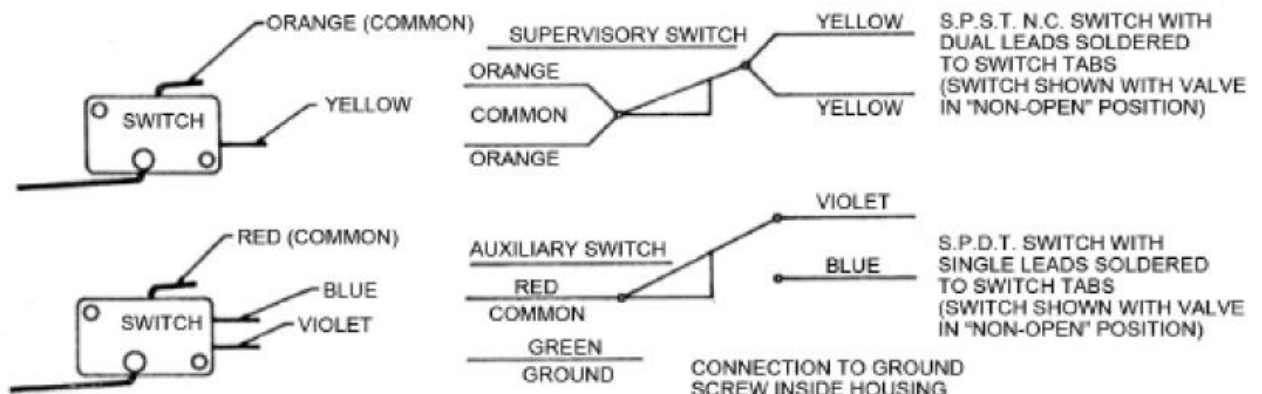
## VI. TS-4 SWITCH SPECIFICATIONS – UL/FM FIRE PROTECTION GEAR OPERATORS

1 – S.P.S.T. / 1 – S.P.D.T.

Rating: 11 amps @ 125 VAC 60 Hz or  
1 amp @ 28 VDC non-inductive

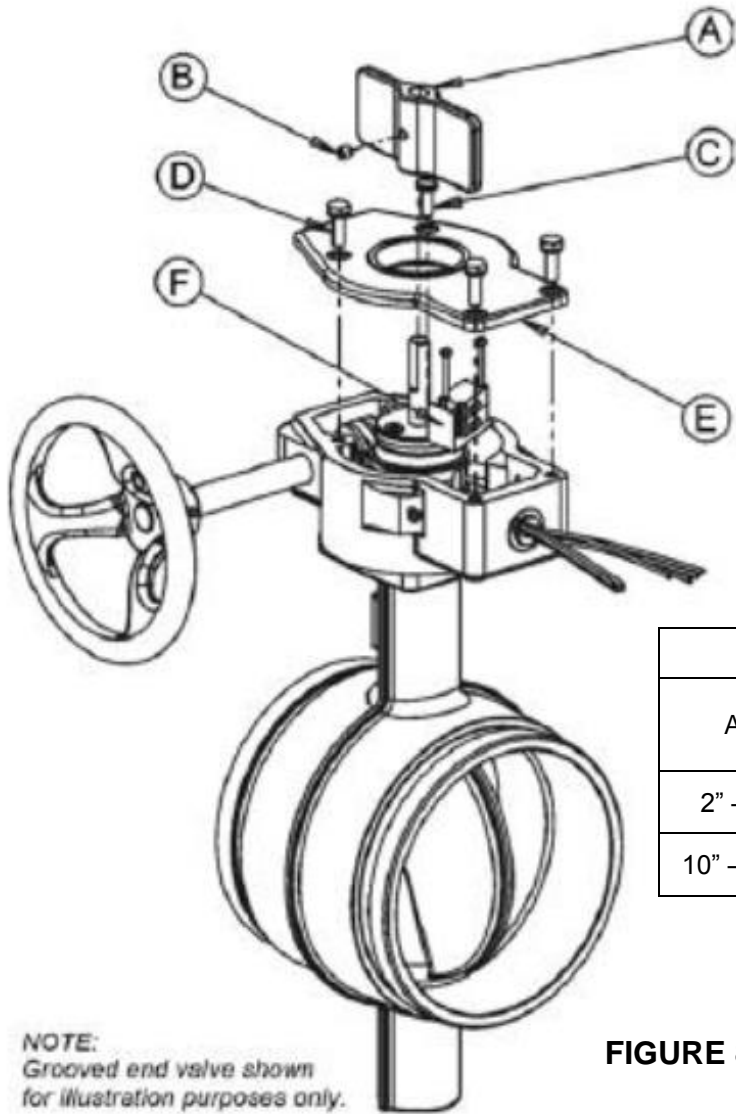
FIGURE 7

Wiring: All lead wires are 18 AWG, 18 inches long and exit actuator housing through a single hole designed for 1/2" conduit fittings.





**VII. TS-4 SWITCH REPLACEMENT INSTRUCTIONS  
 FACTORY INSTALLED SWITCHES FOR NIBCO GD4765-8N, GD4765C-8N,  
 WD/LD3510-8, WD/LD3510C-8 (2002 & Later Wafer & Lug UL/FM Butterfly Valves)**



**TABLE 6**

Tools Required	
All valves	1/8" Hex Allen Wrench Standard Flat Blade Screwdriver Continuity Tester
2" – 8" valves	5/32" Pin Head Wrench 9/16" Socket Wrench
10" – 12" valves	3/16" Pin Head Wrench 3/4" Socket Wrench

**FIGURE 8**

1. Remove flag (A) by backing out (approx. 2 turns) hex set screw (B). See Figure 8.
2. Remove one tamper-proof pin head screw (C), three hex head screws (D), and gear operator cover (E).
3. Remove the two screws holding the switch assembly into the housing, and one screw holding the green ground wire to housing, and remove complete switch assembly.
4. Feed electrical wires of new switch assembly through the conduit hole in rear of housing.
5. Place two screws (with lock washers) thru the switch mounting holes, then thru the mounting holes of the insulation paper. Place switch assembly (F) into gear housing with switch actuating arms against quadrant gear. Tighten two screws to secure switches, and one screw to secure green ground wire to housing.
6. Conduct continuity test on switches to make sure they are functioning properly. Refer to Figure 7.
7. Reinstall cover plate, screws, and flag. Tighten all screws.
8. Use end connection of auxiliary switch to be reviewed and accepted by local authority having jurisdiction.

**NOTE:** Instructions are the same regardless of valve end connections.

## VIII. KEY DRIVE REPLACEMENT INSTRUCTIONS – 2” THRU 12” UL / FM BUTTERFLY VALVES

### NOTES:

- All replacement parts must be obtained from your NIBCO distributor. Key drive material and size is specifically designed to meet performance requirements of UL and FM. Failure to use the properly sized replacement parts may void the UL and FM ratings.
- Drive Key (section of weakness) will shear if excessive torque is applied to the input of the gear operator while the disc is blocked partially open.

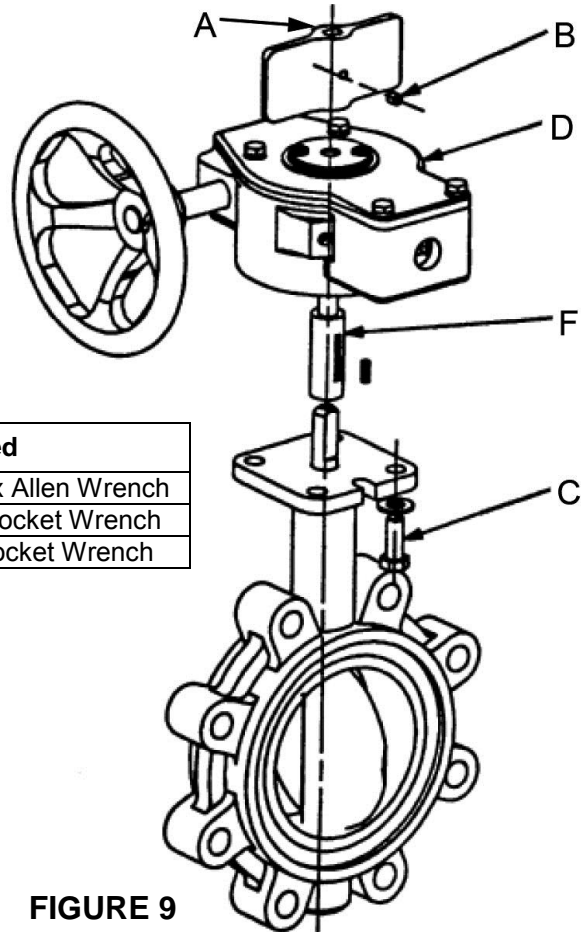


TABLE 7

Tools Required	
All valves	1/8" Hex Allen Wrench
2" – 8" valves	9/16" Socket Wrench
10" – 12" valves	3/4" Socket Wrench

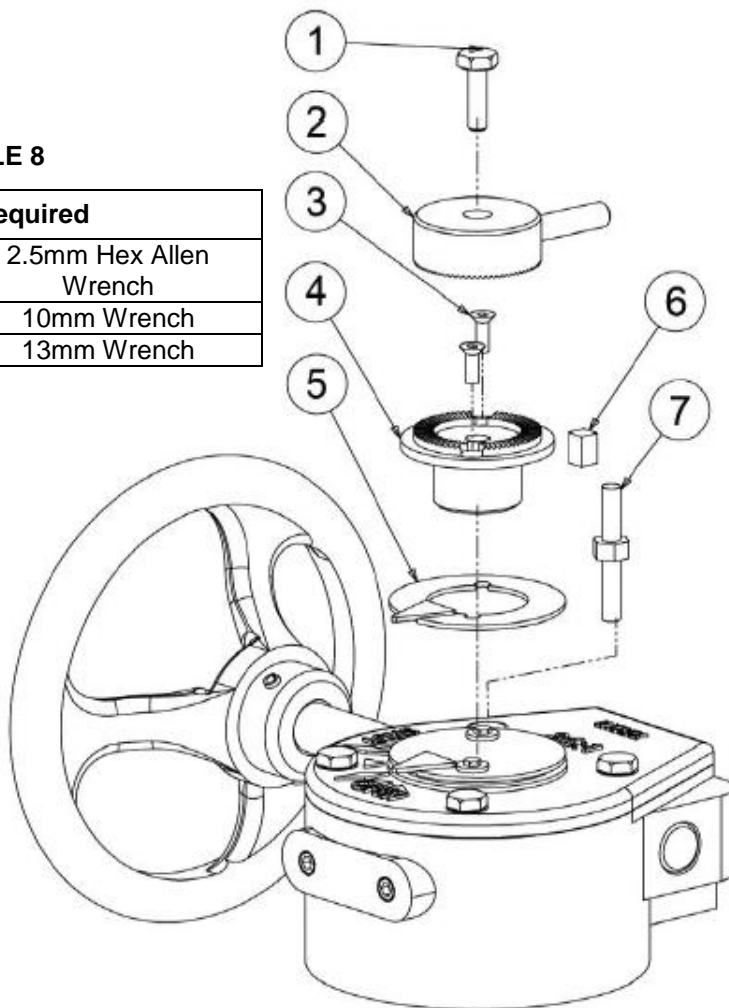
FIGURE 9

1. Loosen the set screw (B) that secures the flag (A) to the stem. Remove the flag. See Fig. 9.
2. Remove the four (4) hex head cap screws (C) that fasten the gear operator (D) to the valve.
3. Lift the gear operator straight up from the valve. In most cases the adapter bushing (F) will stay in the segment quadrant gear because the broken key causes interference between the gear and adapter bushing.
4. Pull the adapter bushing from the gear. Some force may be required.
5. After removing the adapter bushing, remove the broken key.
6. Place the new key in keyway of adapter bushing (F).
7. With drive adapter bushing and key in place within gear operator, carefully slide the gear operator over stem until it rests flush on the valve operator mounting flange. The handwheel may need to be turned in order to align bolt holes and the orientation pin.
8. Secure gear operator with four (4) hex head screws (securely tighten), replace flag on stem and then tighten set screw on flag.
9. Check operation of valve by turning handwheel from fully OPEN to fully SHUT position.

**IX. MEMORY STOP INSTALLATION INSTRUCTIONS –  
2” THRU 24” SIZE VALVES ONLY**

**TABLE 8**

Tools Required	
All valves	2.5mm Hex Allen Wrench
2” – 8” valves	10mm Wrench
10” – 24” valves	13mm Wrench



**FIGURE 10**

1. Remove the two screws holding the top cover (Indicator Pointer) onto segment gear. Discard cover and screws. See Figure 10.
2. Place indicator (5), supplied with kit, around bottom hub (4). Align key (6) on bottom hub with slot in segment gear and slide into place.
3. Attach with two supplied M4 x 12 flat head screws (3).
4. Remove one cap screw (1) holding cover onto gear operator housing and replace with stop pin (7).
5. Use cap screw (1) you just removed to secure the top hub (2) to the bottom hub (4). Top hub can be moved 360 degrees in 5 degree increments.
6. Tighten cap screw (1) once top hub is appropriately set.  
**NOTE:** The gear operator provides a large mechanical advantage. Be careful to stop turning the handwheel when the pointer of top hub (2) contacts stop pin (7) to prevent damage.

**X. MAINTENANCE AND REPAIR – LD/WD-2000/3000/5000 SERIES –  
2” THRU 12” SIZE VALVES ONLY**

Due to the many unique features in the NIBCO butterfly valve design, there is no regular maintenance or lubrication required. These valves are field repairable with the stem, disc, seat and body, collar bushing and O-ring seals available as individual components.

## XI. VALVE REPAIR

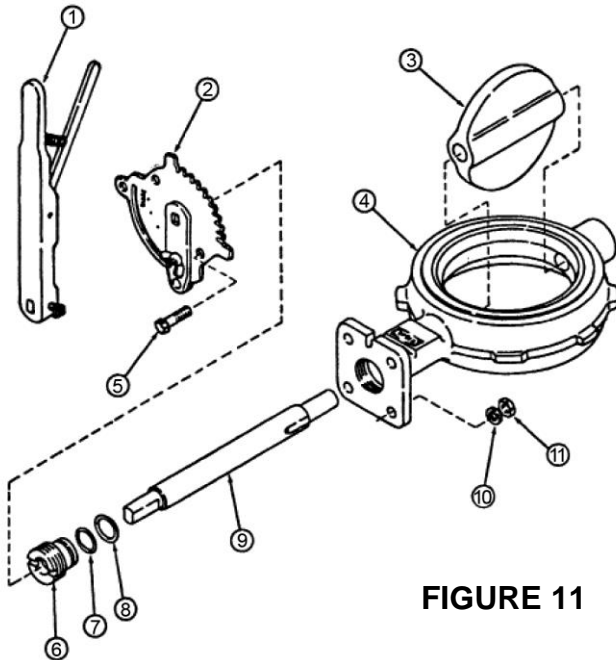
Remove handle, gear operator or actuator from the cast-mounting pad. Unscrew the collar bushing\*\* and pull out the stem; this will allow the disc to be removed as well. See Figure 11.

Replacement of the damaged component can be accomplished at this time. The body, seat and bushings are provided from the factory as one assembly rather than three separate components.

To reassemble, place the disc inside the seat in the open position. Align the stem hole through the body and disc. Insert the stem into the body and disc, making sure to align the geometric drive flats between the stem and disc.

Replace both stem and body O-ring seals on the collar bushing and insert over the stem. Screw the bushing into the body until flush with top of mounting pad. Replace lever, gear or actuator and check for function before reinstalling in line.

Refer to assembly drawing below for individual components.



**FIGURE 11**

**TABLE 9**

MATERIAL LIST	
ITEM	DESCRIPTION
1	Lever Handle
2	Throttle Plate*
3	Disc
4	Wafer Body and Liner
5	Hex Bolt (3/8 x 2)
6	Collar Bushing
7	O-ring Body Seal
8	O-ring Stem Seal
9	Stem
10	Washer (3/8 x 2)
11	Nut (3/8-16 x 2)
* Shown with optional Infinite-Position Kit.	

\*\* Never remove the collar bushing with the system under pressure.

## XII. GEAR OPERATOR SERVICE

During installation, customer should carefully adjust gear operator stops for proper valve OPEN and SHUT positioning.

NIBCO gear operators are suitable for both indoor and outdoor service. However, outdoor service can be harsh depending upon the conditions that the unit is exposed to. For example; constant exposure to high heat, humidity, rain, snow, salt spray, or other corrosive media may lead to corrosion of the iron castings, steel handwheel shaft, or other components.

NIBCO recommends that gear operators exposed to these extreme conditions be checked and serviced on a regular basis. This can be accomplished during normal exercising or operation of the valve (Butterfly Valves should be operated at least once per year or depending upon conditions, as often as quarterly).

NIBCO tries to balance the needs of our customers and provide a gear operator that fits most service conditions. It is the responsibility of the ultimate installer / owner to specify the valve and gear operator based upon the application and conditions that it will be exposed to.

For harsh outdoor service refer to NIBCO Technical Bulletin NTB-0208-02 to address maintenance that can be performed in the field for units installed outdoors in extreme conditions.

For installations where spare parts are held on site, it is suggested that a spare gear operator be held as an interchangeable item.