INSTRUCTION MANUAL
VACUUM GATE VALVE WITH ROTARY ACTUATOR

INTRODUCTION

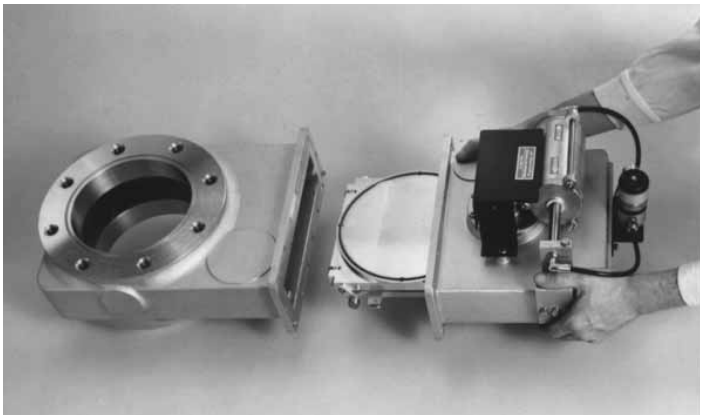
The uncomplicated design of these high vacuum gate valves makes servicing easier than on any other gate valve. The valves are welded from custom extrusions of aluminum. These extrusions have a very smooth and bright surface finish which is one of the reasons for the low outgassing and fast pump down of these valves. Dismantling requires no training or practice, and reassembly errors are almost impossible. There is only one way to put any part or assembly in place and there are no critical adjustments. With one motion the entire internal mechanism is lifted from the valve while the flanged port section stays bolted in the system. The short body sections make cleaning easier and faster. The centerline body flange makes this possible and reduces maintenance and servicing time to a minimum.

This diagram shows the rotary seal principle and the no-contact-gate action. The gate (disc) 0-ring seals in a motion perpendicular to its seat, without O-ring scuffing. The gate carriage assembly stays securely locked in position at the open or closed position because of the dead centers at the extremes of the 180° arc. The half circle swing of the cam is rapid at mid-way point, slowing to stop at top or bottom. This makes very fast action possible without the hammer effect of a plunger type operator. It is built-in cushioning for the stroke which means negligible wear and a long operating life without maintenance.

These valves will work equally well in any orientation. It should be determined that the valve and/or adjacent piping of the vacuum system will be adequately supported when assembled. Make certain the mating flanges are in-line, parallel and the correct distance apart to minimize the strain on the valve body. It is important to remember that the gate seal is on the operator or hub side of the valve on sizes 2" to 8". On sizes 10" and 12" the operator is on the opposite, or open side.

These valves will hold vacuum in either direction. However, no gate valve will open easily in a vacuum-to-atmosphere condition with the pressure of atmosphere on the open side, or against the back of the gate. If opening is necessary with a vacuum to atmosphere differential, make sure the gate faces upstream (toward atmosphere or higher pressures) or install a means of equalizing pressure prior to actuation. Gate valves will not close easily against atmosphere if the vacuum side is a very large chamber where the inrush of atmosphere may approach very high velocity.

MAINTENANCE: These valves do not require any routine maintenance. However, it is necessary to prevent the accumulation of dirt and debris inside the valve and if your vacuum system is extremely dusty or dirty, cleaning the interior of the valve will be required from time to time. When the valve is disassembled for cleaning, it is recommended that the O-rings be replaced. Note that cleaning O-rings with solvents is never recommended, because the solvent will be absorbed by the O-ring and will produce high outgassing for hours or even weeks after such cleaning. If vacuum grease is used on O-rings, it can also cause outgassing and 'burps' of gas. Only a thin, almost invisible, coating of grease should be used on O-rings in vacuum systems. Flange O-rings shipped with new valves and O-rings shipped as spare or replacement parts have not been greased prior to shipment.



ELECTRO PNEUMATIC (EP) ACTUATORS:
The 'EP' actuators include a 4-way solenoid valve actuator with 24" leads and are mounted, ready for wiring when valves are ordered for pneumatic operation. The one side of the solenoid bracket (stamped "C") is normally closed. The other side (stamped "D") is normally open. The "C" side Opens the gate valve; the "D" side closes it. Recommended minimum air pressure is 65 psi (4.6 kg/cm^2) for valves with 2 inch and 3 inch ANSI flanges (NW-50 to ISO 80). Recommended minimum air pressure for valves with 6 inch to 16 inch ANSI flanges (ISO 100 to ISO 400) is 85 psi. (6 kg/cm^2). Recommended maximum air pressure for all sizes is 100 psi. (7 kg/cm^2).

⚠ WARNING

The air supplied to these valves must be free of oil, water and dirt for proper operation. If the air at your facility is not clean and dry you must install filters and traps upstream of the valve.

Wiring: The preferred method to preclude human error, employs SPST switches as in Fig. 1. Connect two wire leads to source with a SPST toggle switch in either line.
When solenoid is energized, valve opens; when solenoid is de-energized, valve closes. Pressure remains in cylinder.

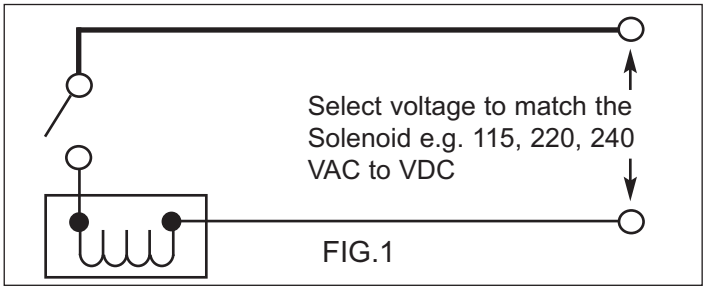
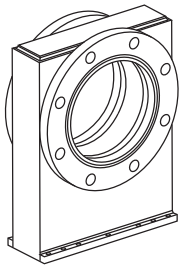
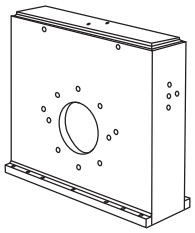


FIG.1

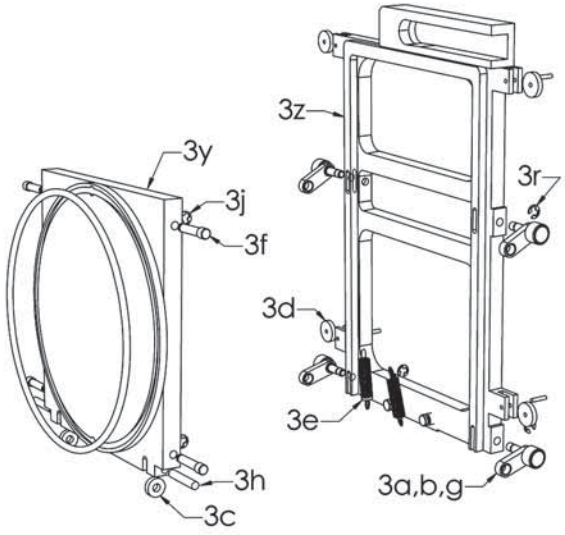
FAIL-SAFE: When connected this way, the valve will automatically close if power fails. To provide for manual operation during failure, a shut-off and a vent valve must be put in the air line to bleed off high pressure air in the cylinder. You can then operate the valve manually by turning the hex nut on stem with a wrench. With on/off switches, valves will open when power returns unless switched to "off: before power comes on.



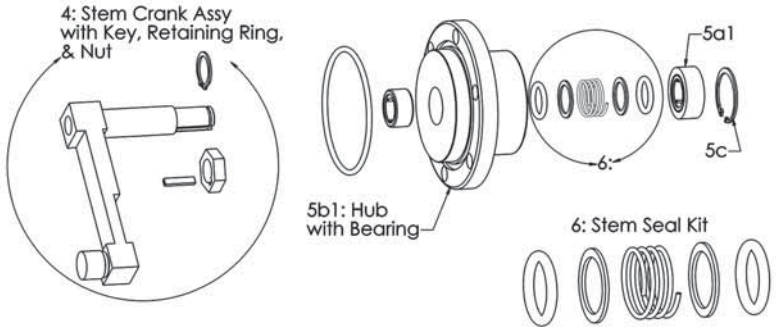
2. Body, Port Section

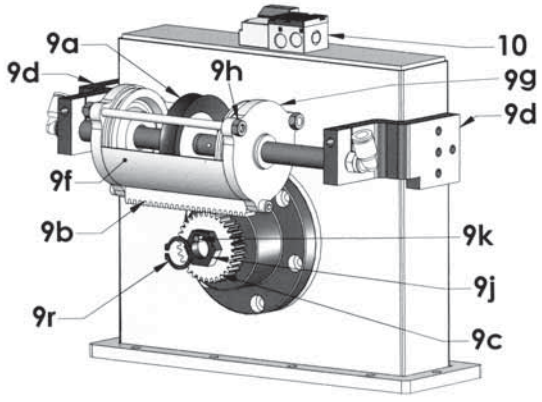


1. Body, Bonnet Section

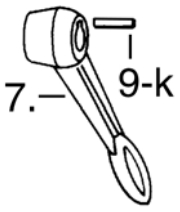


3. Gate-Carriage Assembly with O-Ring





9. Pneumatic Actuator



7. Manual Lever Kit

Part Name Prices subject to change w/o notice.	LPWA 2 & 3 Built Before Sept. 2005 ISO-80 ANY DATE Price P/N
Clean & Test Valves Returned to Pgh.	$ 86.00
Complete O-Ring Kits, BUNA-N..... 2 ea. Stem Seal & 2 Flange O-Rings; 1 ea. Hub, Gate & Body O-Rings	$15.00 X701WA200B (LPWA-2) $15.00 X701WA300B (LPWA-3)
Complete O-Ring Kits, VITON..... 2 ea. Stem & 2 Flange O-Rings; 1 ea. Hub, Gate & Body O-Rings	$54.00 X701WA200V (LPWA-2) $54.00 X701WA300V (LPWA-3)
Piston & Seal Kit for 'EP' Actuators For Valves Shipped 1989 or before..... Piston Tee Seal, 2 Shaft & 2 End Cap O-Rings	$29.00 X701201B
For Valves Shipped 1990 or Later..... Piston Cup, 2 Shaft & 2 End Cap O-Rings	$29.00 X701204B
1. Body, Bonnet Section.....	200.00
2. Body, Port Section	LPWA-2 / LPWA-3
N1 Style, no neck.....	271.00 / 363.00
N6 Style, on seal side.....	311.00 / 398.00
N8 Style, neck on open side.....	311.00 / 398.00
N5 Style, neck both sides.....	398.00 / 444.00
	LPWA-2 & LPWA-3
3. Gate-Carriage Assembly with O-ring.....	318.00 X706103rev1
3a,b,g. Kit of 4 each Carriage Shaft,..... Roller and Link Assembly with Bushings and Retaining Ring.	87.00 X806500
3c. Gate Rollers - Set of 2.....	15.00 X706102
3d. Carriage Side Rollers - Set of 4.....	22.00 X706108
3e. Spring (set).....	7.00 X706106
3f. Gate Link Shafts - Set of 4.....	44.00 X706110rev1
3h. Roll Pin-Set of 6 (2 Gate, 4 Carriage)	2.00 X706105
3j. Retaining Ring (gate shafts) - Set/4	1.00 X706119
3r. Retain, Ring (carriage shafts) - Set/4	1.00 X706119
3y. Gate w/o Shafts, Links, Rollers.....	98.00 X02WA116
3z. Carriage w/o Shafts, Links, Rollers..	98.00 X02LP117rev1
4. Stem-Crank Assy, with key, Retaining ring & nut.....	65.00 X706116rev2
5. Hub Assy (spacer design) w/o seal kit	96.00 X706WA117
5-a1. Gland spacer with bearing.....	14.00 X02LP108A
5-b1. Modified hub with bearing.....	80.00 X02WA118
5c. Retaining Ring (internal type).....	1.00 X702176
6. Stem Seal Kit: 2 O-rings, (BUNA-N).....	11.00 X706118
2 washers, 1 spring (VITON).....	17.00 X706118V
LPWA16, 3 quad Ring, 3 Spacers	
7. Manual Lever Kit Includes Handle, Washer, Key, Retaining Ring.....	70.00 X706112rev1
8. Body Bolts, S.S.Complete set with nuts...	11.00 1/4-20X1(6)
9. Pneumatic Operator (without solenoid)	317.00 X806104rev1
9a. Piston Assy (w/o O-Rings & Piston Cup)	138.00 X02LP200
9b. Rack Assembly.....	42.00 X706114
9c. Pinion Gear Assembly.....	42.00 X706126
9d. Mounting Brackets (2).....	96.00 X706131
9e. Cylinder Air Lines (2).....	15.00 X701101
9f. Cylinder.....	20.00 X02LP150
9g. Cylinder End Caps (2).....	47.00 X706132
9h. Cylinder Studs & Nuts.....	21.00 X706130
9i. Guard, OSHA Style.....	80.00 X02WA152
9j. Hex Nut.....	19.00 X02LP202
9k. Key.....	3.00 X02LP203
9r. Retaining ring (ext. fits stem crank)...	1.00 X702170
	92.00 X134010 -220VAC
10. Solenoid Valve only (specify voltage)....	92.00 X703005 -115VAC
4 Way (3 Way available)	92.00 X703031 - 24VDC
11. Solenoid Mounting Hardware with Air Line Fittings (1/4" O.D. Airline)	140.00 X706094

VACUUM RESEARCH 'LPWA' SERIES VALVES

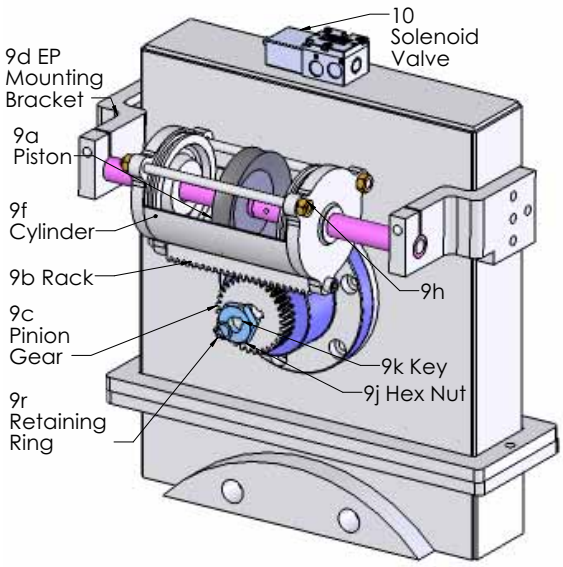
LPWA 2 & 3 Built Sept. 2005 and Later ISO-100 ANY DATE Price P/N	LPWA-4 ISO-160 Price P/N	LPWA-6 & LPWA-8 ISO-200 Price P/N	LPWA-10 & LPWA-12 ISO-250 & 320 For Valves With Extruded Bodies (Sept. 01 & Later) Price P/N	LPWA-10 & LPWA-12 ISO-250 & 320 For Valves With Bodies Fabricated From Plates (Aug. 01 & Before) Price P/N	LPWA-16 ISO-400 Price P/N
$86.00	$ 86.00	$144.00	$144.00	$144.00	$231.00
11.00 X810604B No Centering Rings	$23.00 X701WA400B	$ 42.00 X701WA600B (6") $ 42.00 X701WA800B (8")	$ 59.00 X701WA1000BR1 (10") $ 62.00 X701WA1200BR1 (12")	$ 59.00 X701WA1000B (10") $ 62.00 X701WA1200B (12")	$62.00 X810394 BUNA N
46.00 X810604V No Centering Rings	$82.00 X701WA400V	$120.00 X701WA600V (6") $120.00 X701WA800V (8")	$143.00 X701WA1000VR1 (10") $146.00 X701WA1200VR1 (12")	$143.00 X701WA1000V (10") $146.00 X701WA1200V (12")	$159.00 X810395 VITON
29.00 X701201B	$29.00 X701401B	$ 29.00 X701401B	NA	$ 40.00 X7011001B	NA
29.00 X701204B	$29.00 X701404B	$ 29.00 X701404B	$ 40.00 X7011004B	$ 40.00 X7011004B	$106.00 X810396
200.00	323.00	455.00	1287.00	1287.00	CONTACT FACTORY

If roughing ports are required specify as R1-NW-16 etc. as described in the Valve Catalog and add the cost to the bonnet section prices shown above.

LPWA ISO 100	LPWA-4	LPWA-6	LPWA-8	LPWA-10	LPWA-12	LPWA-10	LPWA-12	
363.00	427.00	750.00	1233.00	1489.00	1725.00	1489.00	1725.00	CONTACT FACTORY
398.00	507.00	837.00	1258.00	1604.00	1841.00	1604.00	1841.00	
398.00	507.00	837.00	1258.00	1604.00	1841.00	1604.00	1841.00	
444.00	594.00	940.00	1298.00	1720.00	1956.00	1720.00	1956.00	

LPWA ISO 100	LPWA-4	LPWA-6 & LPWA-8	LPWA-10 & LPWA-12	LPWA-10 & LPWA-12	LPWA-16 & ISO-400
335.00 X810084	362.00 X706203rev2	481.00 X706303rev2	1009.00 X810439	1009.00 X810507	3650.00 X810624
87.00 X806500	87.00 X806500	87.00 X806500	363.00 X806502	363.00 X806502	524.00 X810397
15.00 X706102	15.00 X706202	22.00 X706302	34.00 X810536	34.00 X810536	100.00 X810398
25.00 X706108 LIST	22.00 X706108	22.00 X706108	52.00 X706408	52.00 X706408	265.00 X810635
7.00 X706206	7.00 X706206	16.00 X706306	22.00 X706406	22.00 X706406	54.00 X810636
44.00 X706110rev1	44.00 X706110rev1	44.00 X706110rev1	121.00 X706410rev1	121.00 X706410rev1	121.00 X810637
2.00 X706105	2.00 X706205	2.00 X706205rev1	3.00 X706405rev1	3.00 X706405rev1	149.00 X810638
1.00 X706119	1.00 X706119	1.00 X706119	1.00 X706419	1.00 X706419	8.00 X810639
1.00 X706119	1.00 X706119	1.00 X706119	1.00 X706419	1.00 X706419	6.00 X810640
103.00 X700051	129.00 X04WA116	161.00 X406116	403.00 X700269	403.00 X10WA116	1031.00 ea X700206
103.00 X700270	104.00 X04LP117rev1	110.00 X06LP117rev1	346.00 X700285	346.00 X10WA117	1143.00 X740057
151.00 X810657	111.00 X706216rev2	129.00 X706316rev2	258.00 X706WA416	258.00 X706WA416	313.00 X810641
96.00 X706WA117	121.00 X706WA210	149.00 X706WA317	176.00 X706WA417	176.00 X706WA417	296.00 X810642
14.00 X02LP108A	21.00 X04LP108A	21.00 X04LP108A	26.00 X10LP108A	26.00 X10LP108A	52.00 X810643
80.00 X02WA118	92.00 X04WA118	111.00 X06WA118	140.00 X10WA118	140.00 X10WA118	259.00 X810644
1.00 X702176	1.00 X702177	1.00 X702177	1.00 X702177	1.00 X702177	NA
11.00 X706118	11.00 X706318	11.00 X706318	17.00 X706418	17.00 X706418	86.00 X810645
17.00 X706118V	20.00 X706318V	20.00 X706318V	29.00 X706418V	29.00 X706418V	78.00 X810646
70.00 X706112rev1	70.00 X706312rev2	70.00 X706312rev1	70.00 X706412rev1	70.00 X706412rev1	149.00 X810647
11.00 1/4-20X1(6)	11.00 1/4-20X1 1/4(6)	16.00 1/4-20X1 1/4(14)	19.00 1/4-20X1 3/4(16)	19.00 1/4-20X1 3/4(16)	18.00 3/8-16X2(12)
317.00 X810089	363.00 X806204rev1	363.00 X806304rev2	663.00 X806404rev3	663.00 X806404rev2	2,193.00 X810648
138.00 X02LP200	138.00 X04LP200	138.00 X06LP200	241.00 X10LP200rev2	241.00 X10LP200rev1	335.00 X810649
42.00 X706114	42.00 X706214	42.00 X706314	59.00 X706414rev1	59.00 X706414	66.00 X810650
42.00 X706126	45.00 X706226	54.00 X706326	91.00 X706426rev1	91.00 X706426	190.00 X810651
96.00 X706131	112.00 X706231	112.00 X706231	112.00 X706431rev1	112.00 X706431rev1	286.00 X810652
15.00 X701101	15.00 X701101	15.00 X701101	30.00 X701101	30.00 X701101	30.00 X810653
20.00 X02LP150	20.00 X04LP150	20.00 X06LP150	30.00 X700337	30.00 X10LP150	83.00 X700581
47.00 X706132	53.00 X706232	53.00 X706232	83.00 X706432	83.00 X706432	415.00 X810654
21.00 X706130	26.00 X706230	26.00 X706330	37.00 X706430rev1	37.00 X706430	67.00 X810655
80.00 X703042	104.00 X04WA152	121.00 X06WA152	144.00 X700284	144.00 X10WA152	392.00 X700545
19.00 X02LP202	19.00 X04LP202	19.00 X04LP202	24.00 X10LP202	24.00 X10LP202	37.00 X700569
3.00 X02LP203	3.00 X04LP203	3.00 X04LP203	3.00 X04LP203	3.00 X04LP203	6.00 X700568
1.00 X702170	1.00 X702171	1.00 X702171	1.00 X702172	1.00 X702172	4.00 X702092
92.00 X134010 -220VAC	92.00 X134010 -220VAC	92.00 X134010 -220VAC	92.00 X134010 -220VAC	92.00 X134010 -220VAC	129.00 X134019
92.00 X703005 -115VAC	92.00 X703005 -115VAC	92.00 X703005 -115VAC	92.00 X703005 -115VAC	92.00 X703005 -115VAC	129.00 X134012
92.00 X703031 - 24VDC	92.00 X703031 - 24VDC	92.00 X703031 - 24VDC	92.00 X703031 - 24VDC	92.00 X703031 - 24VDC	129.00 X134016
140.00 X706094	140.00 X706094	140.00 X706094	140.00 X706094	140.00 X706094	177.00 X810656

PNEUMATIC OPERATOR ADJUSTMENT:



⚠ WARNING !

Disconnect electrical & air supply before making any adjustment or repairs.

(1) Be sure that the air and power lines are disconnected. (2) This alignment procedure requires the valve to be completely assembled with gate carriage installed and the port and bonnet bolted together. (3) If your valve is equipped with position indicator switches remove them by removing the 3 screws that hold the switch bracket to the EP mounting bracket. Remove the protective EP cover so that the actuator cylinder and gears are visible. (4) Using a wrench rotate the hex nut clockwise to move the cylinder (9F) to the full closed position. (Far right side, see the label on the air cylinder.) Remove the E clip, hex nut, key, and top guide washer and pull the pinion gear off of the valve stem (Part No. 4). (5) After the pinion is removed, move the cylinder back toward the open position by the space of approximately 1/2 or 1 full gear tooth. (6) Now replace the pinion on the stem and engage it with the rack without moving the cylinder. Re-install the top guide washer, hex nut, key, and E-clip on the stem. (7) To ensure that rack and pinion properly engage without binding or skipping teeth you may tap lightly on the EP brackets to move the rack closer or farther from the pinion. (8) Be sure that all bolts on EP bracket are tight (Part No. 9D). (9) Reconnect electrical and air supply. (10) Operate valve and listen for gate locking in closed position.

DISASSEMBLY: With valve in open position, remove centerline body flange bolts and lift the bonnet section free. The entire internal mechanism comes free with this one motion. Then turn the manual lever, or the hex nut above the pinion gear on pneumatic valves, to release the carriage from its locked position. Pull on carriage and it will come out and slide off the crank roller. The flanged section stays bolted in the system unless the gate seat is damaged and needs polishing or machining. When the stem seal area is also to be cleaned or needs new seals, the steps are easy: (1) Take off manual lever or pinion gear. (2) Use appropriate snap ring pliers to remove retaining ring 9-r and remove the gland spacer (5-a1} and hub flange screws. (3) Lift out hub by sliding over stem, which will bring stem seal assembly with it, which can then be lifted out with a finger. (4) The stem crank comes out easily through the centerline flange opening.

ASSEMBLY: Apply a very thin film of vacuum grease to the shaft and: (1} Grasp the stem crank by the roller end, tip the stem to the side, insert in the bonnet flange opening and bring the stem out through the hub opening. (2) Place hub O-ring seal in hub flange and slide hub onto stem while holding stem-crank up to make it easy to insert. (3) Replace and tighten the 1/4-20 hub flange screws evenly. (4) While holding the stem crank up with one hand and pushing to the farthest point through the stem housing in the hub, insert the stem seal assembly and be sure of the proper order. Slide over stem first, one O-ring; next, a washer. Then slide the spring over the stem; next a washer, and last, the second O-ring. Make sure this second O-ring is down over the shoulder on the stem. (5) While still holding up the stem, replace the stem gland spacer (push downward to overcome spring tension). Hold the internal retaining ring 5-C in position and seat it in the modified hub groove using appropriate snap ring pliers. (6) Replace manual lever or pinion gear of pneumatic operator with key in its slot. Retaining ring 9-r fits onto the stem crank. (7) Insert gate seal evenly, and with crank turned to expose its roller, slide carriage slot overroller and retract into bonnet by turning stem counterclockwise (with manual lever or a wrench on pinion head nut). (8) Insert body flange seal evenly and position the bonnet assembly on the flanged section—Gate toward its seat, with locator pins lined up with holes. (9) Replace and evenly tighten body bolts in centerline flanges.

⚠ WARNING !

A valve wired to automatically close on power failure will also automatically open when power is restored. This reopening may be unsafe, and it is recommended that a latching relay be installed so that the valve will not just automatically reopen when power is restored, but will remain closed until an operator decides it is safe to reopen.

CONVERTING FROM MANUAL TO ELECTROPNEUMATIC (EP) OPERATOR: Operators for conversion of manual valves are factory assembled, aligned and tested before shipment, with piston shafts tight to brackets. Simply tighten brackets to valve body, with “D” bracket on the “closed” side—to the right as you look at the face of the valve, with centerline flange down. If operators are removed from pneumatic valves, it is generally unnecessary to disassemble them. Leave the shaft tightened to brackets for easiest reassembly. With cylinder in place, brackets tightened, replace pinion gear parts on the stem in this order: (1) bronze thrust washer, (2) gear washer without key slot, (3) pinion gear, (4) key, (5) gear washer with key slot, (6) hex nut, (7) retaining ring. When placing pinion gear, engage the nearest rack tooth with it, with cylinder at farthest right, toward the “closed” side, and stem and gear key slots aligned. Slight movement of the cylinder may help to align key slots when inserting key (as in 4). Then proceed with (4) through (7). Secure solenoid actuator to the valve body, with “C” and “D” sides matching “C” and “D” on cylinder. Install air lines and tighten fittings, “C” with “C” and “D” with “D”.

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