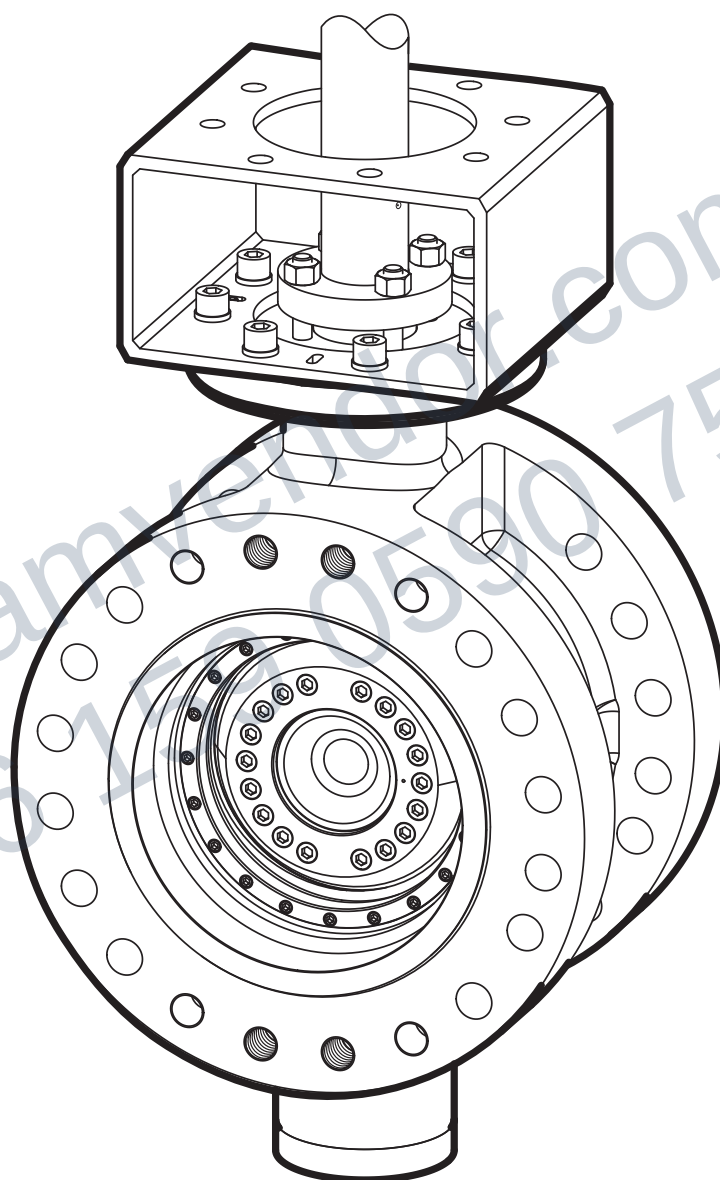

TRI LOK® **TRIPLE OFFSET VALVE**

Installation, Operation and Maintenance Manual
ASME Pressure Class



Bray®

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For information on this product and other Bray products please visit us at our web page - www.bray.com

**READ AND FOLLOW THESE INSTRUCTIONS CAREFULLY.
SAVE THIS MANUAL FOR LATER USE.**

1.0 DEFINITION OF TERMS

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Used without the safety alert symbol, indicates a potential situation which, if not avoided, may result in an undesirable result or state, including property damage.

2.0 INTRODUCTION

2.1 **Information provided in this manual is for standard Tri Lok configuration only. Specific instructions for non-standard materials of construction, temperature range, etc. should be referred to the factory.**

2.2 This manual covers Tri Lok valves in the following range:

ASME Classes	Sizes	Body Style
150, 300, 600 and 900	3" - 48" (80mm - 1200mm)	Wafer, Lug, Double Flange, Gate

2.3 The Tri Lok metal seated valve is fully rated to ASME B16.34, and complies with API 609.

2.4 Tri Lok is torque-seated. Torque must be continually applied by an actuation device (manual gearbox or power valve actuator) to the valve stem to ensure the valve seals against the line pressure.

WARNING

Do not remove or de-energize actuation devices while the valve is under line pressure.

2.5 The valve is inherently fire safe, and has been qualified to ISO 10497 and API 607 standards

2.6 The preferred direction of valve installation is with the upstream line pressure on the stem side and the body seat on the downstream side.

2.7 The preferred direction of flow is indicated by an arrow on the valve nameplate.

3.0 SAFETY INFORMATION

3.1 ATEX Directive 2014/34/EU - Equipment For Use in Potentially Explosive Atmospheres

UKSI 2016:1107 - The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations

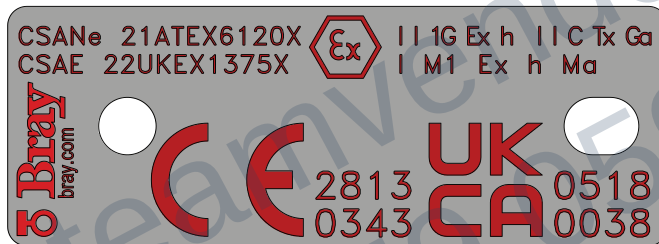
The requirements of the equivalent ATEX and UKCA standards are similar; therefore, any references in the following instructions can be regarded as referring to either format unless stated otherwise.



When using this product in hazardous environments, the national directives and laws which apply in your country for hazardous areas must be followed. The specifications of the examination certificate valid in country of operation must be also observed.

3.2 Marking

Certification Code:



Ambient Range: TX See Special Conditions for Safe Use

Serial Number: As appropriate

Year of Manufacture:

Warnings:

The requirements of the equivalent ATEX and UKCA standards are similar; therefore, any references in the following instructions can be regarded as referring to either format unless stated otherwise.

3.3 Special Conditions for Safe Use

The following factors must be carefully considered in order to ensure the valve is compatible with the atmosphere in which it is applied. The system designer and/or end user should formally address each item and carefully document the reasoning behind specific measures taken to ensure continued compliance throughout the life of the Tri Lok valve.

3.4 Material Considerations

Please consult factory for details regarding material limitations.

3.5 Temperature Considerations

The surface temperature of the Tri Lok valve is wholly dependent on the ambient temperature in combination with the temperature of the process medium. The maximum surface temperature of the Tri Lok valve may be calculated from the maximum ambient temperature plus the maximum process medium temperature as shown below:

Equation 1 - Surface Temperature Calculation

$$T_x(\text{max}) = T_a(\text{max}) + T_p(\text{max})$$

$T_x(\text{max})$ = Surface Temperature

$T_a(\text{max})$ = Ambient Temperature = -20°C to + 40°C (-4°F to +104°F).

$T_p(\text{max})$ = Temperature of Process Medium

Group I equipment

The maximum surface temperature shall not exceed:

- a. 150 °C (302°F) on any surface where coal dust can form a layer;
- b. or 450 °C (842°F) where coal dust is not expected to form a layer, in which case:
 1. the actual maximum surface temperature is marked on the equipment and
 2. the symbol "X" marking is placed on the equipment and the Specific Conditions of Use is given in the instructions

The system designer is responsible for ensuring the maximum temperature, either inside the valve body or on the external surface, will remain well below the ignition temperature of the atmosphere.

For operating temperatures above 200°C (392°F) Bray recommends thermal insulation of the valve body.

3.6 Static Electricity Considerations

Where the process medium is a liquid or semi-solid material with a surface resistance in excess of 1 G-ohms, special precautions should be taken to ensure the process does not generate electro-static discharge. This may be done through ensuring the flow rate of the process media remains below 1 m/s or providing sufficient discharge points along the process path to eliminate electrostatic build-up. Consultation to EN 50404 is recommended.

Appropriate grounding may be necessary through the use of grounding straps or other means.

3.7 Stray Electric Current Considerations

When the Tri Lok valve is used near sources of high current or magnetic radiation, a secure bonding to earth ground should be made so as to prevent ignition due to inductive currents or a rise in temperature due to these currents.

3.8 Filtration of Process Medium Considerations

Special consideration should be made regarding the filtration of the process medium if there is a potential for the process medium to contain solid particulates. The process medium is recommended to be filtered to allow particles no greater than 1.0 mm in diameter through the valve assembly where there is a high probability of solid particulates. Larger particulate sizes may be deemed appropriate based on the possibility of particulates within the process medium and the area classification. The decision regarding filtration levels and limits should be well-documented by the system designer and/or end user to ensure continued compliance through the life of the valve.

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4.0 INSTALLATION

- 4.1 Tri Lok is designed to be installed between ASME B16.5, B16.47 flanges. When the valve is open, a portion of the disc may protrude into the pipe. Wafer, lug and some double flange configurations will protrude on both sides of the valve. In double flange and some gate configurations, the open disc may protrude into the pipe on the seat side of the valve. Adjacent piping must be large enough to allow the open disc to clear the pipe. Table 1 shows the minimum allowable pipe ID.
- 4.2 The valve closes with clockwise rotation of the stem and opens with counterclockwise rotation.



CAUTION

Avoid uncontrolled rotation of the disc beyond fully-open position (counterclockwise) as this could damage the sealing surfaces.

- 4.3 To benefit from the most favorable low operating torque and best sealing conditions, install the valve with the stem on the upstream (pressure side) of the installation. The valve tag is marked with an arrow indicating the preferred direction of flow.
- 4.4 Whenever possible, install with the stem horizontal. If this installation is not possible, orient the stem at an inclined angle above the horizontal centerline.
- 4.5 Flange gaskets should conform to the requirements of ASME B16.20 for ASME B16.5/ASME B16.47 flanges. Spiral wound gaskets conforming to ASME B16.20 are recommended.
- 4.6 When bolting the valve into the line, use standard bolting torque as recommended by applicable piping standards. The valve body seat is independent of the flange bolting. Additional force from the flange bolts is not required.

Table 1 - Minimum Allowable Pipe ID for Tri Lok Installation

Valve/Pipe Size		Minimum Pipe ID							
		Class 150		Class 300		Class 600		Class 900 Flanged	
In	mm	In	mm	In	mm	In	mm	in	mm
3	80	2.4	61	2.5	64	2.0	52	Consult Factory	Consult Factory
4	100	3.3	84	3.6	91	2.0	52	Consult Factory	Consult Factory
6	150	5.3	135	5.4	137	3.9	100	Consult Factory	Consult Factory
8	200	7.1	180	7.3	185	4.6	117	6.63	168
10	250	9.0	228	9.6	244	6.2	158	8.25	210
12	300	11.0	278	11.7	297	8.1	206	10.13	257
14	350	12.2	310	12.4	315	10.6	269	9.00	229
16	400	14.2	359	14.6	371	11.2	284	Consult Factory	Consult Factory
18	450	15.9	403	16.4	417	12.8	326	Consult Factory	Consult Factory
20	500	17.9	454	18.4	467	14.4	366	Consult Factory	Consult Factory
24	600	21.8	554	20.8	528	16.3	414	Consult Factory	Consult Factory
28	700	24.3	616	24.1	613	Consult Factory			
30	750	27.0	686	28.7	729				
32	800	29.4	747	29.0	737				
36	900	33.3	846	35.0	889				
40	1000	36.8	834	36.4	925				
42	1050	39.1	992	Consult Factory					
48	1200	44.9	1140						

Notes for Table 1

- > Minimum allowable ID of pipe with recommended clearances (per API 609).
- > This table assumes that the valve is centered in the pipe flanges.
- > A minimum of 1/16" (1.6 mm) thick gasket is used between the pipe flange and the face of the valve body.

5.0 LONG TERM STORAGE

- 5.1 If valves are to be stored before installation, storage must be carried out in a controlled manner as follows:
1. Valves must be stored in a closed, clean and dry environment.
 2. Valve disc to be in closed position and the body end faces must be covered with appropriate flange protection. Flange protectors should only be removed at the time of installation.
 3. Valves should be stored indoors with a preferred temperature range from 40°F (4°C) to 85°F (29°C).
 4. The valves should be checked to ensure the above conditions are maintained every three months.
 5. These are general guidelines for valve storage. Please consult the factory for information regarding specific requirements.

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6.0 HANDLING REQUIREMENTS

6.1 Packed Valves

1. Crates: Lifting and handling of the packed valves in crates will be carried out by a fork lift truck, by means of the appropriate fork hitches.
2. Cases: The lifting of packed valves in cases will be carried out in the lifting points and in the center of gravity position which have been marked. The transportation of all packed material must be carried out safely and following the local safety regulations.

6.2 Unpacked Valves

1. Lifting and handling of valves should be carried out by using appropriate means and observing the carrying limits. Handling must be carried out on pallets, protecting all machined surfaces to avoid any damage.
2. With large bore valves, rigging the load must be carried out by using the appropriate tools to prevent the valve from falling or moving during the lifting and handling.

CAUTION

For valve handling and/or lifting, the lifting equipment (fasteners, hooks, etc.) must be sized and selected while taking into account the valve weight indicated in our packing list and/or delivery note. Lifting and handling must be made only by qualified personnel.

Fasteners must be protected by plastic covers in sharp corner areas.

Caution must be taken during the handling to avoid this equipment passing over the workers or over any other place where a possible fall could cause injury or damage. In any case, local safety regulations must be respected.

7.0 ACTUATION AND TRAVEL STOP SETTING INSTRUCTIONS

- 7.1 Tri Lok is a quarter turn, metal-seated triple offset valve. There is no mechanical stop in the valve at the “closed” position.
- 7.2 When installing ANY type of actuator on a Tri Lok valve, the following general instructions should be followed closely. These general instructions include all actuation types: manual gear, pneumatic, hydraulic and electric actuators.
1. Select a desired orientation for the actuator mounting relative to the valve. The disc should be oriented with the disc indicator marked on the stem.
 2. Rotate BOTH valve and actuator to either the full “open” or full “closed” position to establish a common reference point.
 3. Mount actuator to the valve and secure.

Notes:

- > With valve/actuator in the closed position, it may be necessary to loosen the “closed” mechanical stop to allow the mounting holes to align properly.
- > Special applications may require more specific instructions. Please consult the factory for further instruction.



Valves can be damaged if proper care is not exercised during the setting of Open and /or Closed stops.

7.3 Actuator Stop Settings

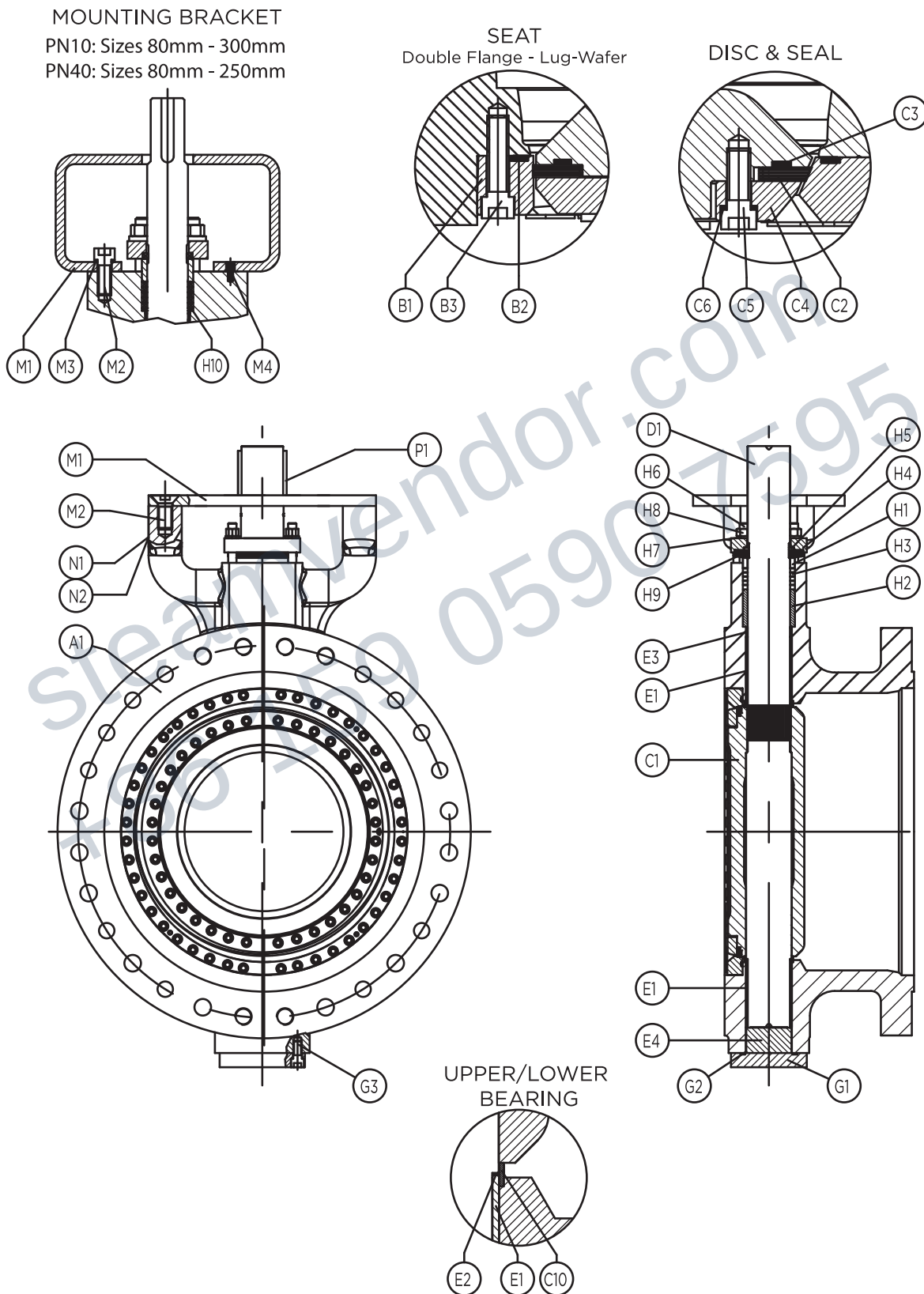
The Tri Lok valve is a torque seated valve. During normal operation, only the open mechanical stop on the actuator should function. Set the opening stroke stop to stop the disc rotation in the fully open (90°) position.

For safety reasons, the closed mechanical stop shall be set as follows:

1. Unscrew the closing stroke mechanical stop.
2. Close the valve applying the correct end-to-close torque required for the particular service. Check that the mechanical stop is free.
3. Adjust mechanical stop until engagement.
4. Loosen the mechanical stop 1-1½ turns to ensure there is enough travel for the valve to receive the required torque and to protect the valve from excessive torque.
5. Tighten the stop lock nut with the torque specified in the actuator operating manual.
6. Mark the closing stop set position.

8.0 VALVE PART DIAGRAM - CLASS 150, 300

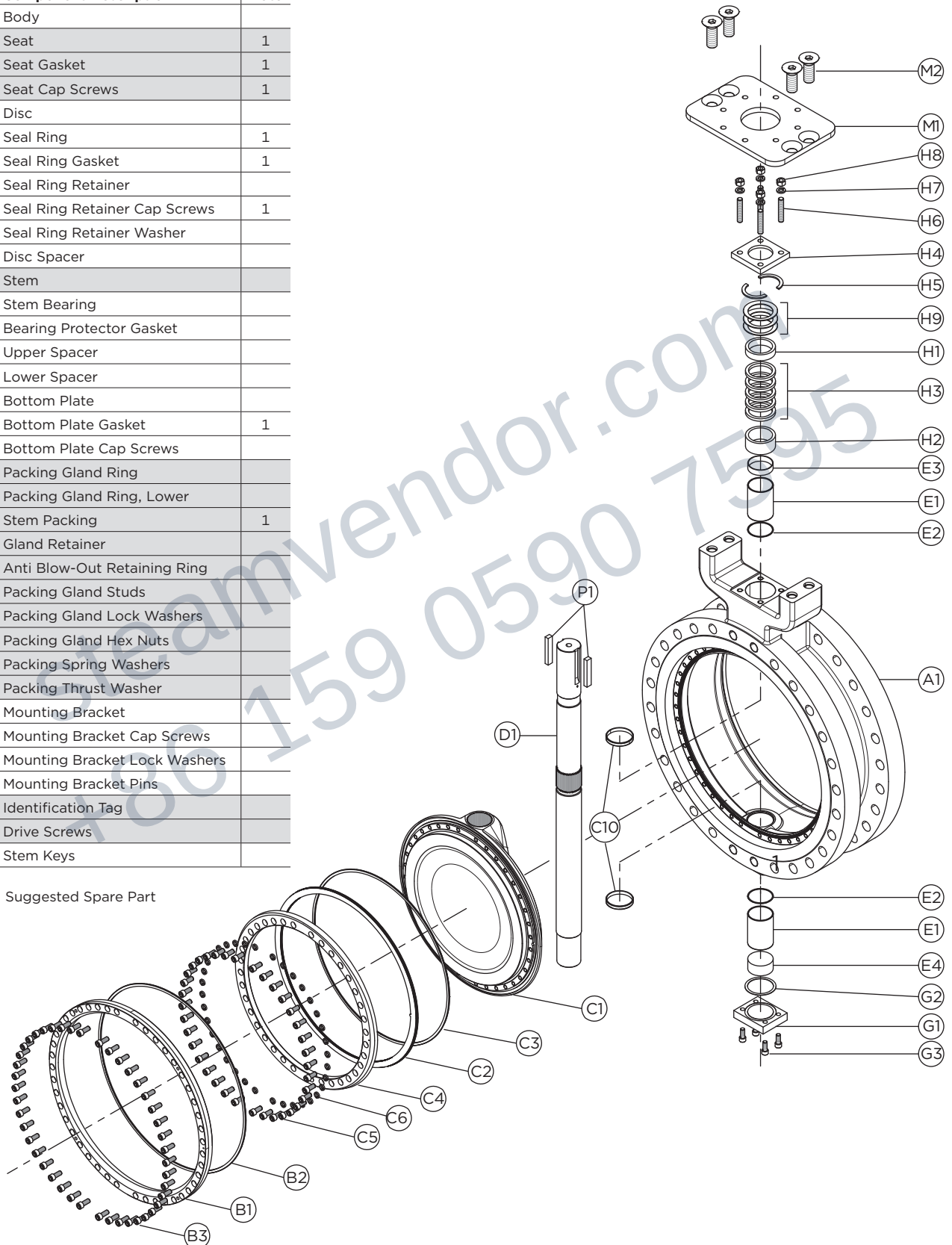
Sectional Drawing Standard Configuration Tri Lok Valve



9.0 EXPLODED VIEW - CLASS 150, 300

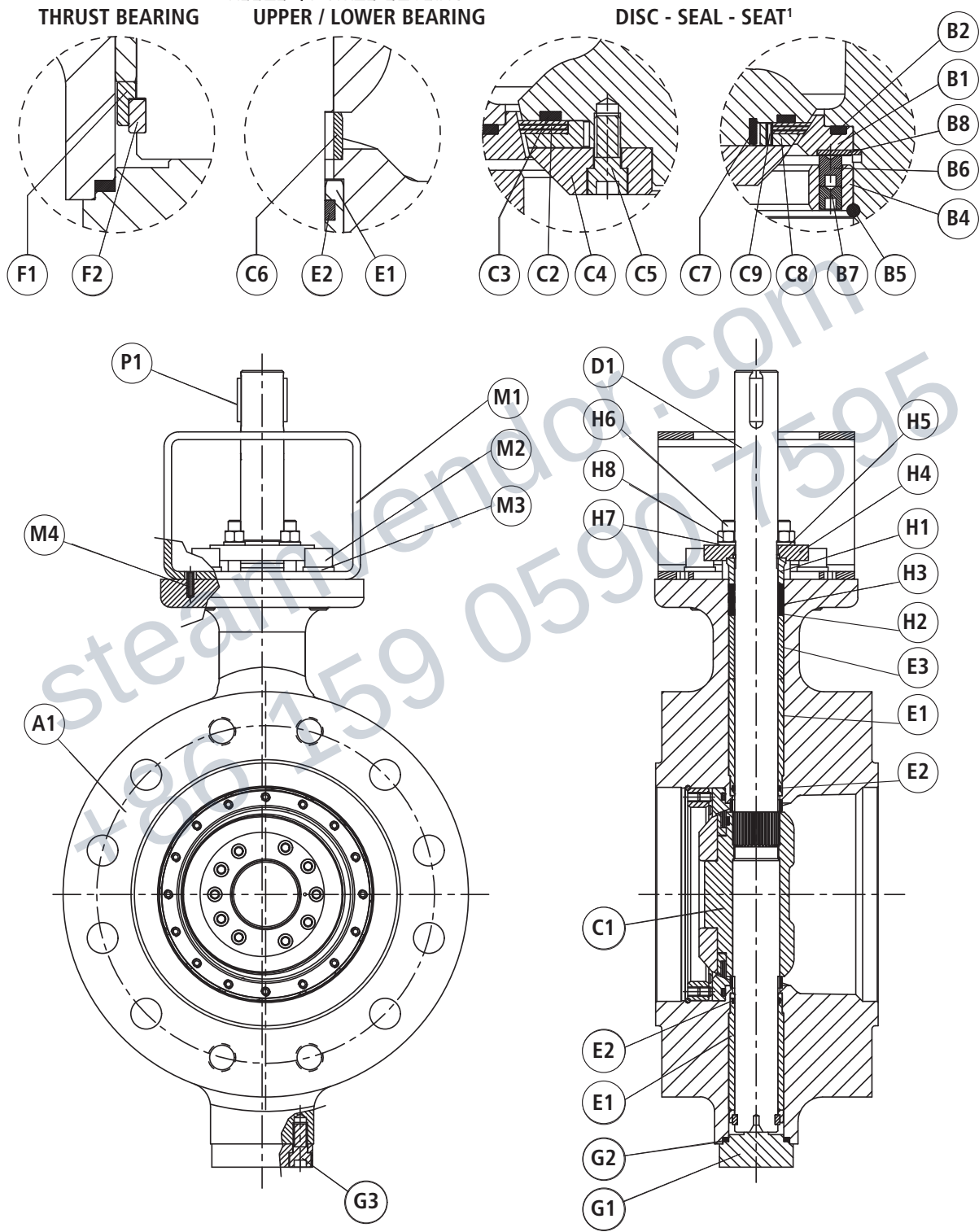
Item	Component Description	Note
A1	Body	
B1	Seat	1
B2	Seat Gasket	1
B3	Seat Cap Screws	1
C1	Disc	
C2	Seal Ring	1
C3	Seal Ring Gasket	1
C4	Seal Ring Retainer	
C5	Seal Ring Retainer Cap Screws	1
C6	Seal Ring Retainer Washer	
C10	Disc Spacer	
D1	Stem	
E1	Stem Bearing	
E2	Bearing Protector Gasket	
E3	Upper Spacer	
E4	Lower Spacer	
G1	Bottom Plate	
G2	Bottom Plate Gasket	1
G3	Bottom Plate Cap Screws	
H1	Packing Gland Ring	
H2	Packing Gland Ring, Lower	
H3	Stem Packing	1
H4	Gland Retainer	
H5	Anti Blow-Out Retaining Ring	
H6	Packing Gland Studs	
H7	Packing Gland Lock Washers	
H8	Packing Gland Hex Nuts	
H9	Packing Spring Washers	
H10	Packing Thrust Washer	
M1	Mounting Bracket	
M2	Mounting Bracket Cap Screws	
M3	Mounting Bracket Lock Washers	
M4	Mounting Bracket Pins	
N1	Identification Tag	
N2	Drive Screws	
P1	Stem Keys	

Note 1: Suggested Spare Part



10.0 VALVE PARTS DIAGRAM - CLASS 600, 900

Sectional Drawing Standard Configuration Tri Lok Valve

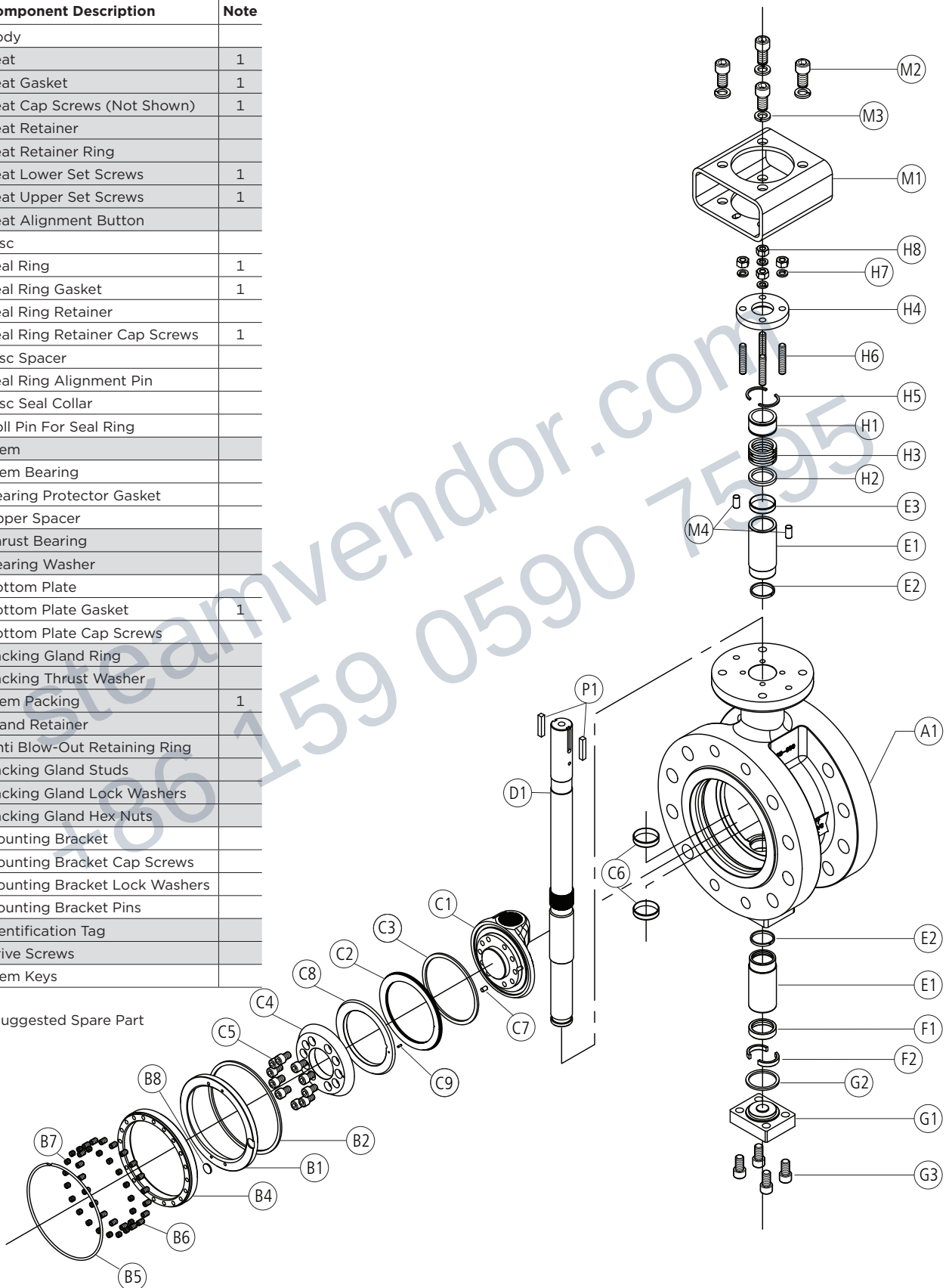


¹Disc - Seal - Seat illustrations depict bolted and push designs

11.0 EXPLODED VIEW - CLASS 600, 900

Item	Component Description	Note
A1	Body	
B1	Seat	1
B2	Seat Gasket	1
B3	Seat Cap Screws (Not Shown)	1
B4	Seat Retainer	
B5	Seat Retainer Ring	
B6	Seat Lower Set Screws	1
B7	Seat Upper Set Screws	1
B8	Seat Alignment Button	
C1	Disc	
C2	Seal Ring	1
C3	Seal Ring Gasket	1
C4	Seal Ring Retainer	
C5	Seal Ring Retainer Cap Screws	1
C6	Disc Spacer	
C7	Seal Ring Alignment Pin	
C8	Disc Seal Collar	
C9	Roll Pin For Seal Ring	
D1	Stem	
E1	Stem Bearing	
E2	Bearing Protector Gasket	
E3	Upper Spacer	
F1	Thrust Bearing	
F2	Bearing Washer	
G1	Bottom Plate	
G2	Bottom Plate Gasket	1
G3	Bottom Plate Cap Screws	
H1	Packing Gland Ring	
H2	Packing Thrust Washer	
H3	Stem Packing	1
H4	Gland Retainer	
H5	Anti Blow-Out Retaining Ring	
H6	Packing Gland Studs	
H7	Packing Gland Lock Washers	
H8	Packing Gland Hex Nuts	
M1	Mounting Bracket	
M2	Mounting Bracket Cap Screws	
M3	Mounting Bracket Lock Washers	
M4	Mounting Bracket Pins	
N1	Identification Tag	
N2	Drive Screws	
P1	Stem Keys	

Note 1: Suggested Spare Part



12.0 STANDARD MAINTENANCE

WARNING

- > Precautions should be taken before beginning any work on the valve assembly.
- > Protective clothing, as required by appropriate safety codes, should be worn.
- > Relieve line pressure and close valve before:
 - > Removing any actuation
 - > Loosening any packing gland nuts
- > Do not pressurize the line without an actuation device properly installed and working on the valve.

CAUTION

The Tri Lok valve must be in the closed position to be removed from the line to prevent damaging the disc seal ring.

When handling the valve, care should be taken not to scratch the seal ring, seat and gasket faces on both sides of the valve. Replacement seat, disc seal ring, and other parts are available from authorized Tri Lok sales and service locations.

Recommended Lubricants

Molykote® Plus CU-7439 (grease) or equivalent for Fasteners Molykote® Spray 321 R (dry lubricant) or equivalent for Disc Seal Ring Light Mineral Oil for Packing and Gasket interface areas (Disc Seal Ring and gasket grooves).

12.1 Packing Replacement

Refer Part diagram 8.0 & 10.0

- 12.1.1 If the valve is installed, relieve line pressure. Remove actuator from the valve. Remove the Keys (P1). Remove socket head cap screws and lock washers (M2 & M3). Remove mounting bracket or mounting plate (M1), depending on valve size. Note assembly positions of the actuator and the mounting hardware for reinstallation.
- 12.1.2 Remove packing gland retainer nuts (H8) and lock washers (H7). Remove gland retainer (H4), anti-blowout retaining ring/split ring (H5) and gland ring (H1). Remove all packing (H3), taking care not to scratch the stem or the bore of the valve body. Do not remove the thrust washer (H12) unless further valve disassembly is required.
- 12.1.3 Examine the valve body packing bore and the stem surface. Clean as necessary to remove any corrosion, foreign matter and minor surface imperfections.
- 12.1.4 Apply a small amount of grease to the stem end. Lubricate each packing ring (H3) install them in to the valve body packing bore one at a time. First the external ring (H3), then internal rings (H3) and last the second external ring (H3).

- 12.1.5 Reinstall gland ring (H1), anti-blowout retaining ring (H5) and gland retainer (H4). Re-install lock washers (H7) and nuts (H8). Tighten gland nuts (H8) utilizing a cross bolting technique to the proper torque value given in Table 2. Reinstall mounting bracket or mounting plate (M1) with cap screws and lock washers (M2 & M3). Tighten them according to the torque specified in table 5. Install the key(s) (P1) and remount actuation device on top of the valve, paying attention that the actuator is properly oriented
- 12.1.6 Operate the valve open and closed several times to check for binding and to set the seal rings. Loosen gland nuts (H8) and retighten, utilizing a cross bolting technique, to torque value given in Table 2.

12.2 Seat & Seal Replacement in Class 150/300 Valves

Refer part diagram 8.0 and 9.0

It is highly recommended that both the seat (B1) and seal ring (C2) be replaced at the same time. However, individual components are not matched in pairs and may be replaced separately if desired.



Exercise extra care when handling the seat and seal ring to avoid damage to the sealing surfaces

12.2.1 Both Seat & Seal ring Replacement (Class 150/300 Valves)

- 12.2.1.1 Remove the valve with the disc in the closed position from line. Place the valve on a flat stable surface with the body seat (B1) facing up.
- 12.2.1.2 If valve is actuated with fail close or fail open pneumatic/hydraulic actuator (without manual override), remove it from the valve. A suitable gearbox must be installed to perform maintenance on the valve
- 12.2.1.3 Carefully clean the surface of the seat and remove all foreign matter from the hex sockets of seat retaining cap screws (B3). Use compressed air to blow out the gap between the seat OD and the wall of the retaining cavity in valve body (A1). Apply a suitable penetrant into the gap between the seat OD (B1) and the body (A1) to help in extracting the seat (B1) from the body cavity
- 12.2.1.4 Open the valve a few degrees until the seal ring is disengaged from the seat Using a wrench, remove all seat retainer socket cap screws (B3)
- 12.2.1.5 Using a hardwood or aluminum drift and a light hammer, tap the top of the seat (B1) lightly all around to loosen the seat in the retaining cavity. Using full-threaded bolts or suitable threaded rod matched to the threads in all tapped jacking holes, begin jacking the seat (B1) evenly out from the retaining cavity. Tap the seat lightly with the drift as necessary to keep it in alignment with the walls of the retaining cavity in the body (A1). Remove the seat (B1) from the body (A1).

- 12.2.1.6 Close the valve, disc face facing parallel to top surface. Remove the seal ring retainer screws (C5) and lock washers (C6) from seal ring retainer (C4). Remove disc seal ring retainer (C4). Remove the seal ring gasket (C3) from the disc groove. Wipe the seal ring (C2) clean, removing all remnants of removed gasket and foreign matter.
- 12.2.1.7 Using soft tools and a suitable wire brush, carefully clean any remnants of removed gasket and foreign matter within the retaining cavity of the body (A1) and face of the Disc (C1). Blow out all threaded holes and the gasket groove with compressed air.
- 12.2.1.8 Place a new disc gasket (C3) into the groove on the disc face (C1). The mating side of the disc gasket may be lightly greased to improve retention in the groove. Apply a suitable lubricant to the sealing surfaces of the seal ring (C2). Place the new seal ring (C2) onto the disc such that the notch is aligned. Place the seal retainer (C4) over the seal ring. Apply anti-seize compound to the seal ring retainer cap screws (C5). Replace the screws if required. Install all disc seal ring retainer cap screws (C5) with lock washers (C6). The seal retaining flange cap screws (C5) should be fully threaded into the disc (C1), but remain only finger-tight at this time. Open the valve to approximately 20°.
- 12.2.1.9 Place the seat gasket (B2) into the groove of the seat (B1). It is highly recommended to apply grease to the mating side of the seat gasket to secure its position in the groove. Apply a suitable lubricant to the sealing surfaces of the seat (B1). Insert the seat (B1) into the body (A1) making sure the alignment dimples in the seat (B1) and the retaining cavity in the body (A1) match. Apply anti-seize compound to seat retaining cap screws (B3) and install the screws (B3) finger tight. Replace the screws if required. Using a cross bolting technique, to 50% of the torque specified in Table 3. Once all screws are tightened, proceed to fully tighten them to 100% of the listed torque value
- 12.2.1.10 Using a suitable actuation device , close and open the valve 2-3 times, only closing the valve to the point where the seal ring engages with the seat. Check each time that the disc seal ring makes full contact without torqueing into the seat. Attention should be paid in the closing stroke that the seat does not scratch the seal ring. This will allow the seal ring and seat to be properly aligned
- 12.2.1.11 Close the valve. Tighten at least four screws in the seal ring retainer to prevent the seal ring from further movement. Open the valve sufficient enough to tighten the seal ring retainer screws. Tighten all seal ring retainer screws (C5) using a cross bolting technique, to 50% of the torque specified in Table 3. Once all screws are tightened, proceed to fully tighten them to 100% of the listed torque value.
- 12.2.1.12 Re-apply lubricant to the sealing surfaces of the valve. Reinstall actuation device (wherever applicable) and test the valve

12.2.2 Only Seal Ring replacement (Class 150/300 Valves)

The seal ring (C2) may be replaced in two ways; Without the seat (B1) removal or with the seat (B1) removal

12.2.2.1 Seal ring replacement without the Seat Removal from the valve

12.2.2.1.1 This procedure is not suitable if the seal ring (C2) is to be replaced while the valve is installed in the pipeline. In addition, this procedure is not recommended for large valves where manipulating the valve may be more difficult than removing the seat (B1) and installing the seal ring (C2) solely from the seat side of the body.

12.2.2.1.2 To remove the seal ring (C2) without removing the seat (B1), the actuation device must be removed and the valve oriented in a manner that allows access to both sides.

12.2.2.1.3 Remove the valve with the disc in the closed position from line. Clean the surface of the valve with compressed air, blow out all debris around the seal ring retainer (C4) and clean out the hex sockets of the seal ring retainer cap screws (C5).

12.2.2.1.4 Open the valve a few degrees until the seal is disengaged from the seat

12.2.2.1.5 Loosen all seal ring retainer cap screws (C5), but leave them in the valve with the seal ring retainer (C4) attached to the disc (C1).

12.2.2.1.6 Using a wrench, rotate the valve stem (D1) counterclockwise past the fully open position far enough so the disc's position is able to allow seal ring retainer and seal ring removal (C2). Be careful not to over-rotate the stem (D1) to the point where the seal ring (C2) or disc edge (C1) contact the body (A1). Make sure the packing gland retainer nuts (H8) are tight enough to prevent the valve stem (D1) from rotating on its own under the eccentric weight of the disc (C1).

12.2.2.1.7 Remove the seal ring retaining cap screws (C5), lock washers (C6), disc seal ring retainer (C4), seal ring (C2) and the seal ring gasket (C3)

12.2.2.1.8 Rotate the disc (C1) as necessary to access the seal face on the disc (C1). Using soft tools and suitable wire brush, carefully clean any remnants of removed gasket and foreign matter from the face of the disc (C1). Blow out all threaded holes and the gasket groove with compressed air.

- 12.2.2.1.9 Rotate the disc (C1) to its previous position to facilitate installation of the seal ring (C2). Place a new seal ring gasket (C3) into the groove on the disc face (C1). The mating side of the seal ring gasket can be lightly greased to improve retention in the groove. Lubricate the sealing surfaces of the seal ring (C2) and place the seal ring (C2) onto the disc (C1) making sure the alignment line on the disc seal ring matches the locating dimple on the disc face. Place the seal ring retainer (C4) over the seal ring. Apply anti-seize compound to the seal ring retainer cap screws (C5). Install all seal ring retainer cap screws (C5) with lock washers (C6). Replace the screws if required. The cap screws (C5) should be fully threaded into the disc (C1), but remain only finger-tight at this time.
- 12.2.2.1.10 Lubricate the sealing surfaces of the seat (B1). Using a suitable actuator, close and open the valve 2-3 times, only closing the valve to the point where the seal ring engages the seat. Check each time that the seal ring makes full contact without torquing into the seat. Attention should be paid in the closing stroke that the seat does not scratch the seal ring. This will allow the seal ring and seat to be properly aligned.
- 12.2.2.1.11 Close the valve. Orient the valve with the seat side facing up
- 12.2.2.1.12 Tighten at least four screws in the seal ring retainer to prevent the seal ring from further movement. Open the valve sufficient enough to tighten the seal ring retainer screws. Tighten all seal ring retainer screws (C5) using a cross bolting technique, to 50% of the torque specified in Table 3. Once all screws are tightened proceed to fully tighten them to 100% of the listed torque value. Re-apply lubricant to the sealing surfaces of the valve

12.2.2.2 Seal ring replacement with the Seat Removal from the valve

- 12.2.2.2.1 To replace the seal ring by removing the seat from the valve, refer section "Both Seat & Seal ring Replacement (Class 150/300 Valves)" where the existing seat removed from the valve can be reused. However, the existing seat gasket (B2) has to be replaced. Exercise extra care when extracting the seat (B1) from the retaining cavity in the valve body (A1). When using jacking bolts to extract the seat, avoid forcing the jack screws unevenly which could result in permanent deformation of the seat (B1). Ensure that the seat (B1) slides out of the retaining cavity easily in a balanced and level manner

12.2.3 Only Seat Replacement (Class 150/300 Valves)

- 12.2.3.1 To replace the seat and to reuse the existing seal ring, refer section "Both Seat & Seal ring Replacement (Class 150/300 Valves)" where the existing seal ring removed from the valve can be reused. However, the existing seal ring gasket (C3) has to be replaced while using the existing seal ring. Exercise extra care when handling the seal ring to prevent it from any damage.

12.3 Seat & Seal Ring Replacement in Class 600/900 Valves

Refer part diagram 10.0 and 11.0



Exercise extra care when handling the seat and seal ring to avoid damage to the sealing surfaces

Seal ring replacement without seat removal is not possible in the class 600/900 valves.

12.3.1 Only Seal Ring Replacement (or) Both Seat & Seal Ring Replacement (Class 600/900 Valves)

- 12.3.1.1 Remove the valve with the disc in the closed position from line. Place the valve on a flat stable surface with the body seat (B1) facing up.
- 12.3.1.2 If valve is actuated with fail close or fail open pneumatic/hydraulic actuator (without manual override), remove it from the valve. A suitable gearbox must be installed to perform maintenance on the valve.
- 12.3.1.3 Clean the surface of the valve with compressed air, blow out all debris around the seal ring retainer (C4) and clean out the hex sockets of the seal ring retainer cap screws (C5) & Seat Upper Set Screws (B7)
- 12.3.1.4 Open the disc until the seal ring is disengaged from the seat. Clean the surface of the valve, blow out all debris and clean out all the hex sockets of the seal ring retainer cap screws
- 12.3.1.5 Using the appropriate size hex key, completely remove the upper set screw fasteners (B7) from the seat retainer ring (B4). Unscrew the lower set screws (B6) until the Seat retainer ring (B5) is free to move. Remove the seat retainer ring (B5) from the body. Extract the seat retainer (B4), remove the seat alignment button (B8)
- 12.3.1.6 Using a hardwood or aluminum drift and a light hammer, tap the top of the seat (B1) lightly all around to loosen the seat in the retaining cavity
- 12.3.1.7 If the existing seat (B1) is to be reused, exercise extra care when extracting it from the retaining cavity in the valve body (A1). When using jacking bolts to extract the seat, avoid forcing the jack screws unevenly which could result in permanent deformation of the seat (B1). If the existing seat (B1) is to be reused, make absolutely certain that the seat (B1) slides out of the retaining cavity easily; in a balanced and level manner.
- 12.3.1.8 Close the valve, disc face facing parallel to top surface
- 12.3.1.9 Loosen all the seal ring retainer cap screws (C5). Remove the seal ring retainer cap screws (C5), extract the seal ring retainer (C4), the seal ring with collar (C2 & C8) and the seal ring gasket (C3)

- 12.3.1.10 Using soft tools and a suitable wire brush, carefully clean any remnants of removed gasket and foreign matter within the retaining cavity of the body (A1) and face of the Disc (C1). Blow out all remnants and foreign matter with compressed air.
- 12.3.1.11 Apply a suitable lubricant to the sealing surfaces of the seal ring (C2). Place a new seal ring gasket (C3) into the groove on the disc face (C1). The mating side of the seal ring gasket can be lightly greased to improve retention in the groove. Place the seal ring alignment pin (C7) into the disc (C1) slot. Place the seal ring (C2) on disc seal collar (C8), (wherever applicable) ensuring the smaller ellipse dimension side rests on the disc seal collar (C8). Align the notch on seal ring (C2) and drill hole on disc seal collar (C8) and install the dowel pin (C9) and hold in place. (If necessary, a small amount of grease or wax can be used to hold). Place the seal ring with seal collar (C2 & C8) onto the disc (C1) making sure the notch on the disc seal collar matches the locating pin on the disc face. Place the seal ring retainer (C4) over the seal ring collar. Apply anti-seize compound to the seal ring retainer cap screws (C5). Replace the screws if required. Install all seal ring retainer cap screws (C5). The cap screws (C5) should be fully threaded into the disc (C1), but remain only finger-tight at this time
- 12.3.1.12 Open the valve disc position to minimum of 20 deg
- 12.3.1.13 If the existing seat planned to be used, remove the seat gasket from existing seat and carefully clean any remnants of removed gasket and foreign matter within the gasket groove. Also clean the seating surface gently without scratching the seating surface
- 12.3.1.14 Slightly grease the gasket groove in the existing seat/New seat, install the new seat gasket (B2). Apply a suitable lubricant to the sealing surfaces of the seat (B1). Place this seat/gasket sub-assembly into the valve body paying attention that the groove of the seat is aligned with the body groove and insert the seat alignment button (B8). Replace seat set screws if necessary. Adjust the seat retainer ring lower set screws (B6) until they are flush with the bottom of the seat retainer (B4). Install the seat retainer (B4) and the seat retainer ring (B5) in its groove in the body. Using a cross bolting technique, tighten the seat retainer lower set screws (B6) to 50% of torque specified in Table 4 . Once all set screws are tightened, proceed to fully tighten them to 100% of the listed torque value
- 12.3.1.15 Using a suitable actuation device, close and open the valve 2-3 times, only closing the valve to the point where the seal ring engages with the seat. Check each time that the disc seal ring makes full contact without torqueing into the seat. Attention should be paid in the closing stroke that the seat does not scratch the seal ring. This will allow the seal ring and seat to be properly aligned.

12.3.1.16 Close the valve. Tighten at least four screws in the seal ring retainer to prevent the seal ring from further movement. Open the valve sufficient enough to tighten the seal ring retainer screws. Tighten all seal ring retainer screws (C5) using a cross bolting technique, to 50% of the torque specified in Table 4. Once all screws are tightened, proceed to fully tighten them to 100% of the listed torque value

12.3.1.17 Re-apply lubricant to the sealing surfaces of the valve. Reinstall actuation device (wherever applicable) and test the valve

12.3.2 Only Seat Replacement (Class 600/900 Valves)

12.3.2.1 To replace the seat and to reuse the existing seal ring, refer section "Only Seal Ring Replacement (or) Both Seat & Seal Ring Replacement (Class 600/900 Valves)" where the existing seal ring removed from the valve can be reused. However, the existing seal ring gasket (C3) has to be replaced while using the existing seal ring. Exercise extra care when handling the seal ring to prevent it from any damage.

12.4 Bottom Flange Gasket Replacement

Refer part diagram 8.0 and 10.0. Packing gland nuts should be in tightened condition while replacing the bottom plate gaskets during inline maintenance

12.4.1 Bottom Plate

12.4.1.1 If the valve is installed, remove line pressure.

12.4.1.2 Completely remove the bottom plate screws (G3). Remove the bottom plate (G1) and the bottom plate gasket (G2). Clean the bearing area of residual gasket and foreign materials.

12.4.1.3 Grease the body/bottom plate gasket groove area. Place the new gasket (G2) on the bottom plate (G1) and install it onto the body.

12.4.1.4 Reinstall the bottom plate screws (G3) and using a cross bolting technique, tighten them according to the torque specified in Table 3 or 4

12.4.2 Bottom Plug

12.4.2.1 If the valve is installed, remove line pressure.

12.4.2.2 Remove the bottom plug (G1) and the bottom plug gasket (G2). Clean the bearing area of residual gasket and foreign materials. Grease the body/bottom plug gasket area.

12.4.2.3 Place the new gasket (G2) on the bottom plug (G1) and install it onto the body.

12.4.2.4 Tighten the bottom plug according to the torque specified in Table 3

Table 2 - Torque Values for Packing Gland Hex Nuts

Valve Size		Class 150		Class 300		Class 600 Flanged Valves		Class 600 Lug/Wafer		Class 900 Flanged Valve	
in	mm	lb-in	Nm	lb-in	Nm	lb-in	Nm	lb-in	Nm	lb-in	Nm
3	80	48	5	48	5	84	9	Consult Factory		Consult Factory	
4	100	55	6	55	6	133	15	84	9	Consult Factory	
6	150	63	7	84	9	295	33	136	15	Consult Factory	
8	200	84	9	102	12	337	38	295	33	680	77
10	250	99	11	159	18	680	77	337	38	896	101
12	300	111	13	183	21	746	84	680	77	2362	267
14	350	80	9	183	21	813	92	746	84	3473	392
16	400	183	21	342	39	879	99	813	92	Consult Factory	
18	450	203	23	342	39	1012	114	879	99	Consult Factory	
20	500	342	39	401	45	1657	187	1012	114	Consult Factory	
24	600	401	45	654	74	2546	288	1657	187	Consult Factory	
28	700	401	45	654	74	Consult Factory					
30	750	654	74	1107	125						
32	800	654	74	1107	125						
36	900	859	97	1216	137						
40	1000	1107	125								
42	1050	1107	125								
48	1200	1216	137								

Table 3 - Torque Values for Seat Retaining Cap Screws and Seal Retainer Cap Screws and Bottom Plate (Class 150/300)

Valve Size		Class 150						Class 300					
		Seat		Seal Ring Retainer		Bottom Plate Cap Screw		Seat		Seal Ring Retainer		Bottom Plate Cap Screw	
in	mm	lb-in	Nm	lb-in	Nm	lb-in	Nm	lb-in	Nm	lb-in	Nm	lb-in	Nm
3	80	22	2	19	2	720	81	22	2.5	20	2.3	720	81
4	100	55	6	45	5	720	81	55	6.2	45	5	720	81
6	150	55	6	95	11	840	95	110	12.4	95	11	960	108
8	200	110	12	95	11	960	108	204	23	171	19	1080	122
10	250	204	23	171	19	1080	122	204	23	171	19	1440	163
12	300	204	23	171	19	1200	136	204	23	171	19	423	48
14	350	204	23	171	19	423	48	320	36	274	31	423	48
16	400	204	23	274	31	423	48	320	36	274	31	848	96
18	450	320	36	274	31	848	96	320	36	422	48	848	96
20	500	320	36	422	48	848	96	499	56	422	48	848	96
24	600	320	36	422	48	848	96	499	56	422	48	848	96
28	700	1008	114	848	96	848	96	499	56	422	48	848	96
30	750	1008	114	848	96	848	96	1008	114	848	96	1523	172
32	800	1008	114	848	96	848	96	1008	114	848	96	1523	172
36	900	1008	114	848	96	1523	172	1008	114	848	96	1523	172
40	1000	1008	114	848	96	1523	172	Consult Factory					
42	1050	1008	114	848	96	1523	172						
48	1200	1008	114	848	96	1523	172						

Table 4a - Torque Values for Seat Retaining Cap Screws and Seal Retainer Cap Screws and Bottom Plate (Class 600)

Valve Size		Class 600 - Flanged Valves						Class 600 - Lug/Wafer					
		*Seat Retainer Set Screw		Seal Ring Retainer		Bottom Plate Cap Screw		Seat		Seal Ring Retainer		Bottom Plate Cap Screw	
in	mm	lb-in	Nm	lb-in	Nm	lb-in	Nm	lb-in	Nm	lb-in	Nm	lb-in	Nm
3	80	64	7	55	6	274	31	Consult Factory					
4	100	69	8	95	11	274	31	100	11	55	6	422	48
6	150	124	14	171	19	848	96	204	23	171	19	422	48
8	200	127	14	422	48	848	96	204	23	171	19	848	96
10	250	294	33	848	96	1522	172	499	56	422	48	848	96
12	300	288	33	848	96	1522	172	499	56	848	96	1522	172
14	350	297	34	848	96	1522	172	499	56	848	96	1522	172
16	400	304	34	848	96	2464	278	499	56	848	96	1522	172
18	450	273	31	1522	172	2464	278	1008	114	848	96	2464	278
20	500	544	61	1522	172	3703	418	1008	114	1522	172	2464	278
24	600	597	67	1522	172	5504	622	1008	114	1522	172	3703	418

*Seat upper dowels require 1/3 the torque of the seat lower dowel fasteners

Table 4b - Torque Values for Seat Retaining Cap Screws and Seal Retainer Cap Screws and Bottom Plate (Class 900)

Valve Size		Class 900 - Flanged Valves					
		Seat Retainer Set Screw		Seal Ring Retainer		Bottom Plate Cap Screw	
in	mm	lb-in	Nm	lb-in	Nm	lb-in	Nm
3	80	Consult Factory		Consult Factory		Consult Factory	
4	100	Consult Factory		Consult Factory		Consult Factory	
6	150	Consult Factory		Consult Factory		Consult Factory	
8	200	291	33	422	48	1522	172
10	250	321	36	848	96	2464	278
12	300	361	41	1522	172	3703	418
14	350	376	42	1522	172	5504	622
16	400	Consult Factory		Consult Factory		Consult Factory	
18	450	Consult Factory		Consult Factory		Consult Factory	
20	500	Consult Factory		Consult Factory		Consult Factory	
24	600	Consult Factory		Consult Factory		Consult Factory	

Table 5 - Torque Values for Bracket Fasteners

Valve Size		Class 150		Class 300		Class 600 Flanged Valve		Class 600 Lug		Class 900 Flanged Valve	
in	mm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm
3	80	300	34	300	34	422	48	Consult Factory		Consult Factory	
4	100	300	34	300	34	422	48	423	48	Consult Factory	
6	150	300	34	300	34	1,522	172	Consult Factory		Consult Factory	
8	200	300	34	750	85	1,522	172	1,522	172	848	96
10	250	750	85	750	85	848	96	1,522	172	3703	418
12	300	750	85	1,500	169	1,522	172	848	96	1522	172
14	350	1,500	169	2,600	294	1,522	172	1,522	172	3703	418
16	400	2,600	294	2,600	294	1,522	172	1,522	172	Consult Factory	
18	450	2,600	294	3,600	407	3,703	418	1,522	172	Consult Factory	
20	500	2,600	294	3,600	407	7,473	844	3,703	418	Consult Factory	
24	600	6,300	712	14,250	1,610	7,473	844	7,473	844	Consult Factory	
28	700	2,600	294	14,250	1,610	Consult Factory		Consult Factory			
30	750	14,250	1,610	14,250	1,610						
32	800	14,250	1,610	14,250	1,610						
36	900	14,250	1,610	14,250	1,610						
40	1,000	14,250	1,610	14,250	1,610						
42	1,050	14,250	1,610	14,250	1,610						
48	1,200	14,250	1,610	14,250	1,610						

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