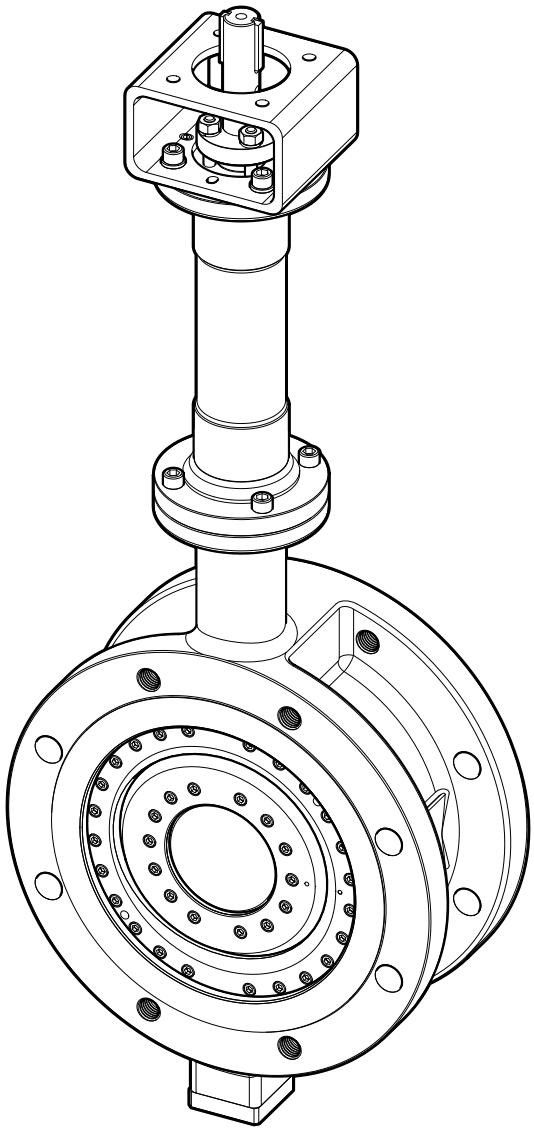
TRI LOK®

TRIPLE OFFSET CRYOGENIC VALVE

Installation, Operation and Maintenance Manual



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Read and Follow These Instructions
Save These Instructions

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.

1.0 INTRODUCTION

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

This manual covers Tri Lok valves in the following range:

ASME Class	Size	Body Style
150, 300, and 600	3" - 48" (80mm - 1200mm)	Wafer Lug Double Flange

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

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.

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

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

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

2.0 SAFETY INFORMATION

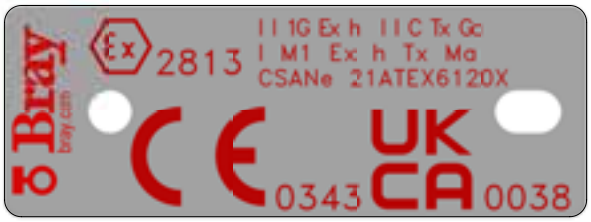
2.1 ATEX Directive 2014/34/EU

WARNING

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.

2.1.1 Marking

Certification Code:



Ambient Range: TX See Special Conditions for Safe Use

Serial Number: As appropriate

2.1.2 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.

Material Considerations

Titanium is not to be used in Group I mining applications and Group II Category 1 equipment, due to the potential of ignition from sparks caused by mechanical impacts. Please consult factory for details regarding material limitations.

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

$$T_{s(max)} = T_{a(max)} + T_{p(max)}$$

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. Additional protective devices may be required to ensure a sufficient thermal safety margin, including but not limited to: thermal shut-off devices and cooling devices.

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

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.

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.

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.

3.0 INSTALLATION

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 and lug configurations will protrude on both sides of the valve. In the double flange version and some gate sizes, 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.
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.

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. Whenever possible, install with the stem vertical. If this installation is not possible, orient the stem at an inclined angle with the actuator above the horizontal centerline.
5. Flange gaskets should conform to the requirements of ASME B16.20 (supersedes API Standard 601) for ASME B16.5 flanges. Spiral wound gaskets conforming to ASME B16.20 are recommended.
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	
In	mm	In	mm	In	mm	In	mm
3	80	2.4	61	2.1	53	Consult Factory	
4	100	3.1	80	1.5	38		
6	150	5.3	135	5.2	132		
8	200	7.1	180	6.8	173	4.3	109
10	250	9.0	228	8.9	226	6.2	158
12	300	11.0	278	11.0	279	8.1	206
14	350	12.2	310	11.8	300	10.6	269
16	400	14.2	359	13.7	348	11.2	284
18	450	15.9	403	15.5	394	12.8	326
20	500	17.9	454	16.9	429	14.4	366
24	600	21.8	554	21.5	546	16.3	414
28	700	24.3	616	24.1	613	Consult Factory	
30	750	27.0	686	27.2	691		
32	800	29.4	747	29.0	737		
36	900	33.3	846	32.6	828		
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.

4.0 LONG TERM STORAGE

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 an enclosed, clean and dry environment.
2. Valve disc should be in the closed position and the body flange faces must be covered with appropriate protection.
3. Periodically, the valves should be checked to ensure the above conditions are maintained.
4. These are general guidelines for valve storage. Please consult the factory for information regarding specific requirements.

If the valves must be stored in an open area, for a limited time only, they must be packed in cases lined with tar paper and the valves wrapped in plastic with desiccant bags and vapor inhibitor papers within.

5.0 HANDLING REQUIREMENTS

Packed Valves

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.

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.

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.

6.0 TRAVEL STOP SETTING INSTRUCTIONS

Preface

Tri Lok is a quarter turn, metal-seated triple offset valve. There is no mechanical stop in the valve at the "closed" position.

Purpose

The following travel stop-setting instructions are designed to provide a maintenance or service person clear direction and procedures for executing these important adjustments.

Methodology

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.

CAUTION

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

Actuator Stop Settings

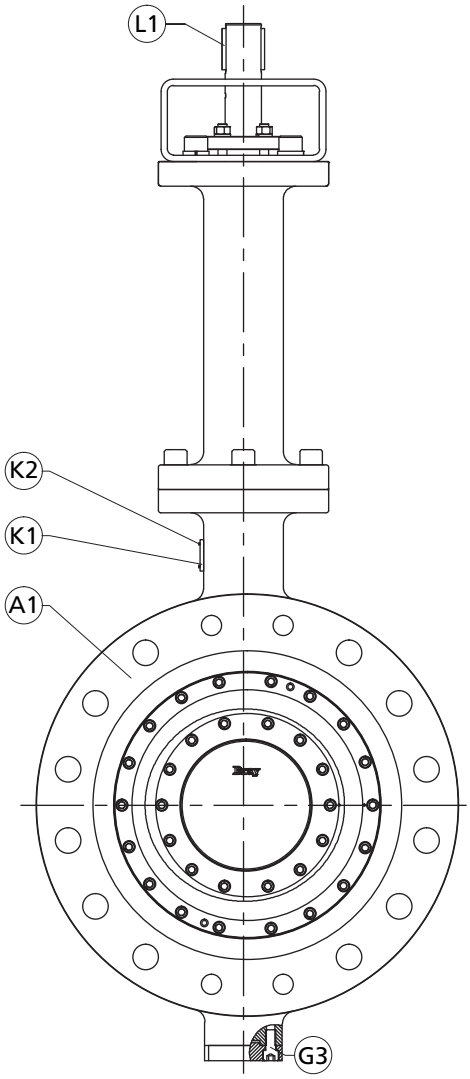
The Tri Lok valve is a torque seated valve. During normal operation, only the open mechanical stop on the actuator should function. Set the opening stroke stop to stop the disc rotation in the fully open (90°) position.

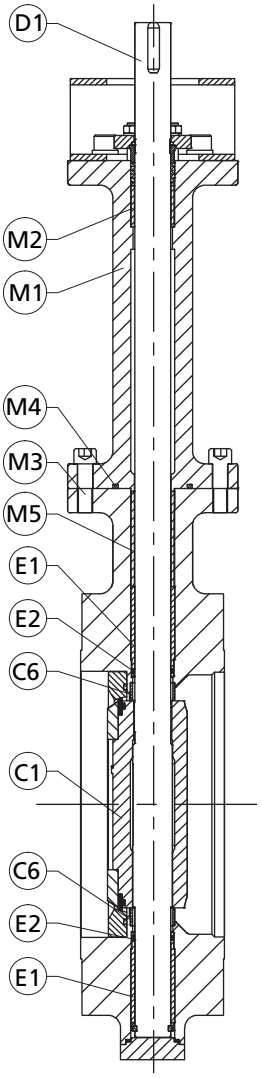
For safety reasons, the closed mechanical stop shall be set as follows:

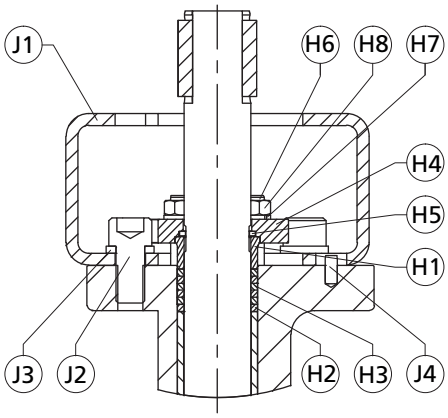
1. Unscrew the closing stroke mechanical stop.
2. Close the valve applying the correct end-to-close torque required for the particular service. Check that the mechanical stop is free.
3. Adjust mechanical stop until engagement.
4. Loosen the mechanical stop 1-1½ turns to ensure there is enough travel 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.

7.0 VALVE PARTS DIAGRAM - CLASS 150, 300

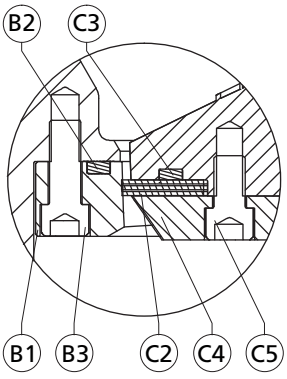
Sectional Drawing Cryogenic Configuration Tri Lok Valve



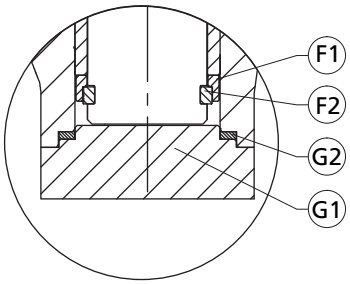




Packing Box & Bracket Detail



Seat & Seal Ring Detail

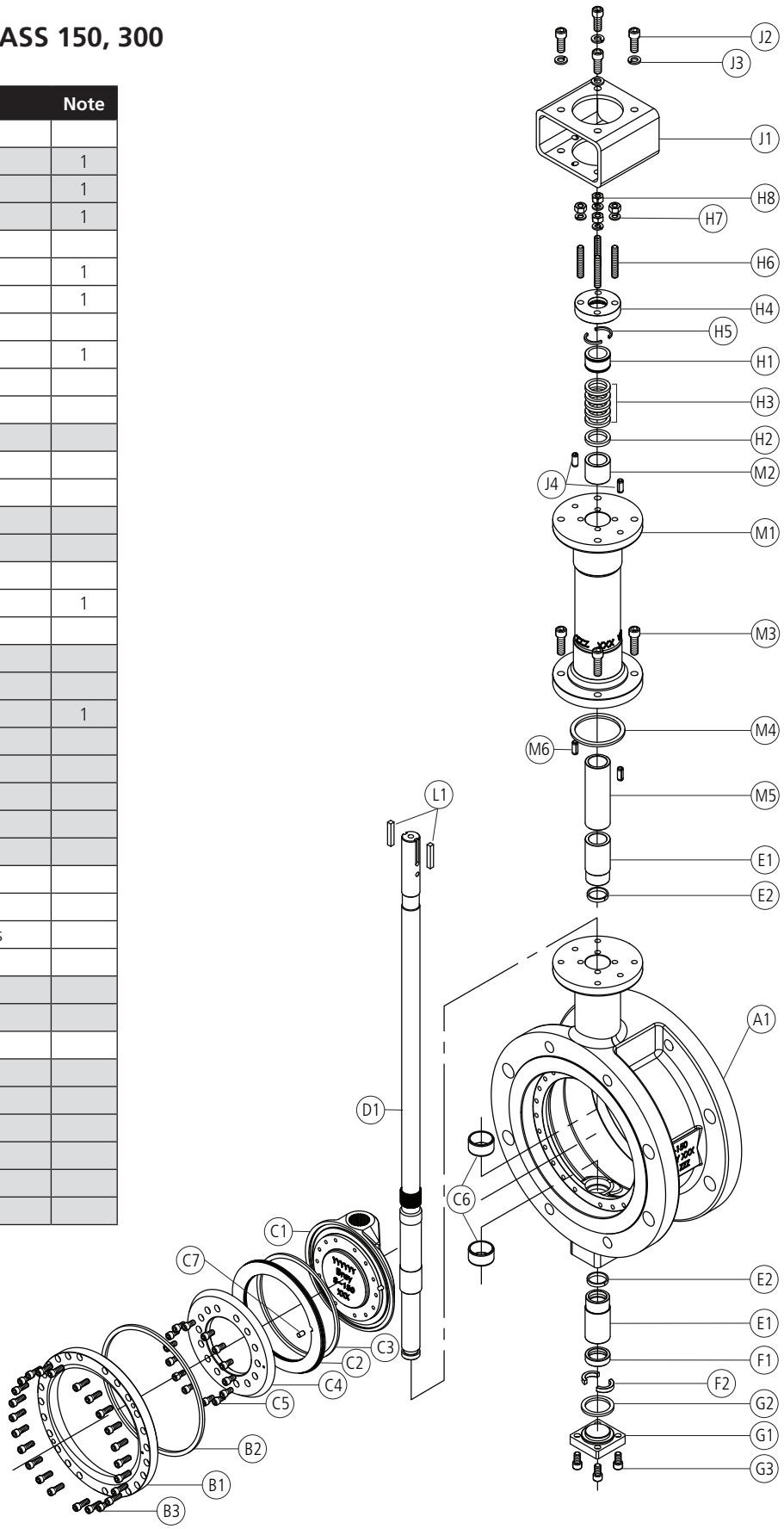


Bottom Plate Detail

7.1 EXPLODED VIEW - CLASS 150, 300

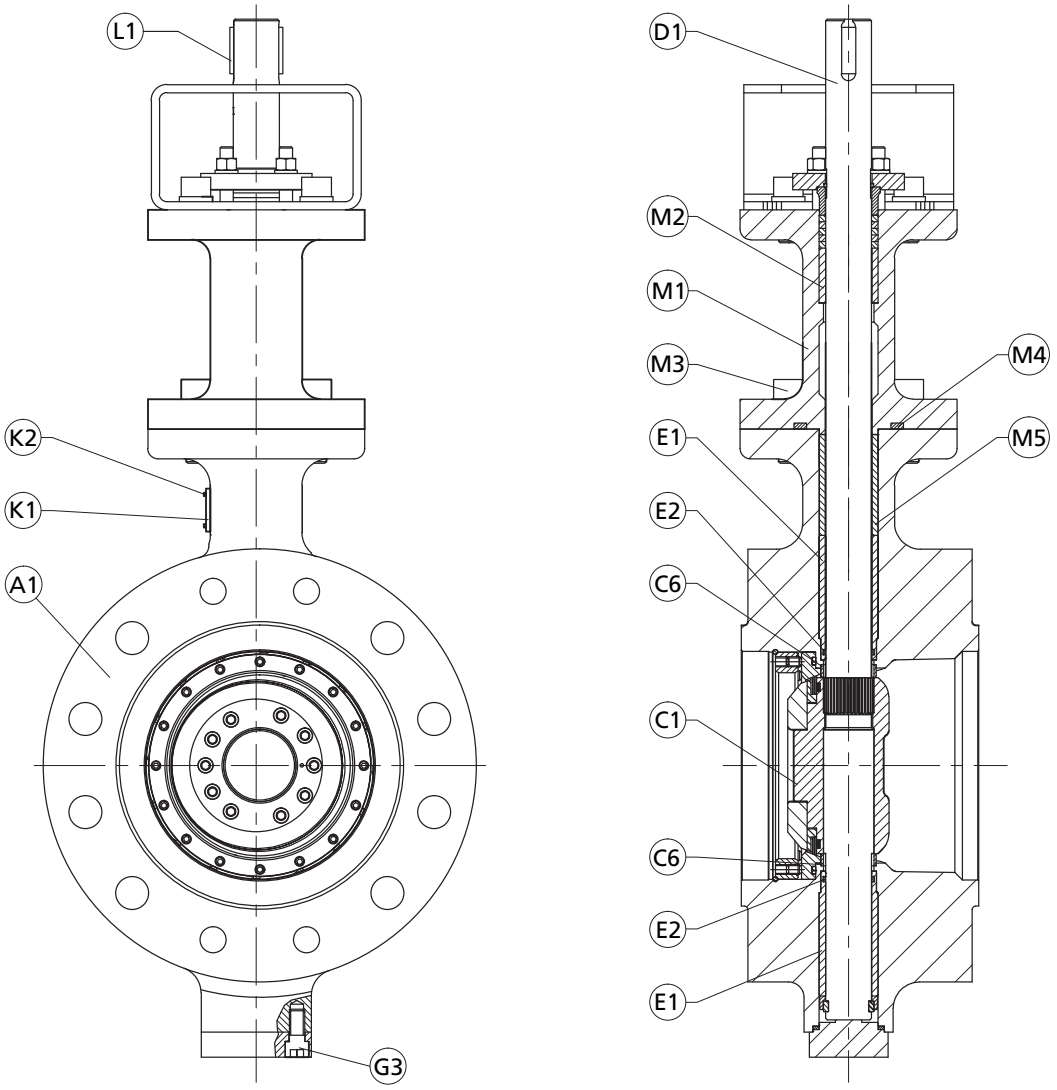
Item	Component Description	Note
A1	Body	
B1	Seat	1
B2	Seat Gasket	1
B3	Seat Cap Screws	1
C1	Disc	
C2	Seal Ring	1
C3	Seal Ring Gasket	1
C4	Seal Ring Retainer	
C5	Seal Ring Retainer Cap Screws	1
C6	Disc Spacer	
C7	Seal Ring Alignment Pin	
D1	Stem	
E1	Stem Bearing	
E2	Bearing Protector Gasket	
F1	Thrust 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	
J1	Mounting Bracket	
J2	Mounting Bracket Cap Screws	
J3	Mounting Bracket Lock Washers	
J4	Mounting Bracket Pins	
K1	Identification Tag	
K2	Drive Screws	
L1	Stem Keys	
M1	Bonnet	
M2	Bonnet Bearing	
M3	Bonnet Cap Screws	
M4	Bonnet Gasket	
M5	Bearing Spacer	
M6	Dowel Pins	

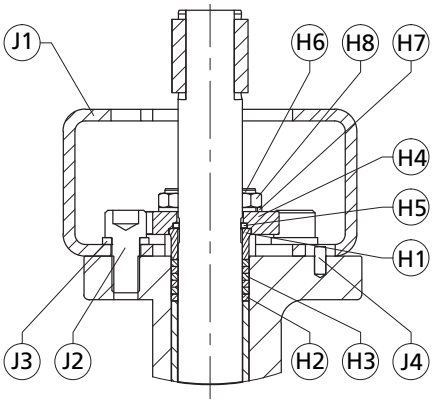
Note 1: Suggested Spare Part



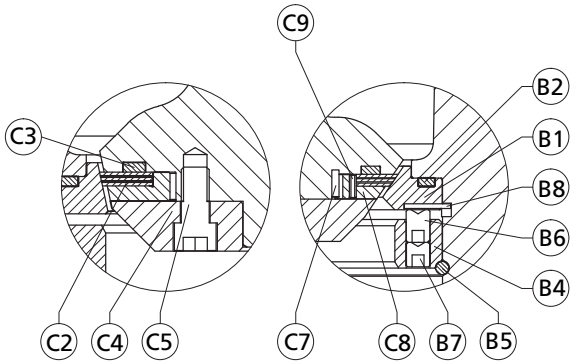
8.0 VALVE PARTS DIAGRAM - CLASS 600

Sectional Drawing Cryogenic Configuration Tri Lok Valve

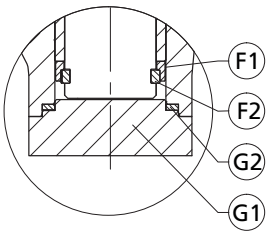




Packing Box & Bracket Detail



Seat & Seal Ring Detail

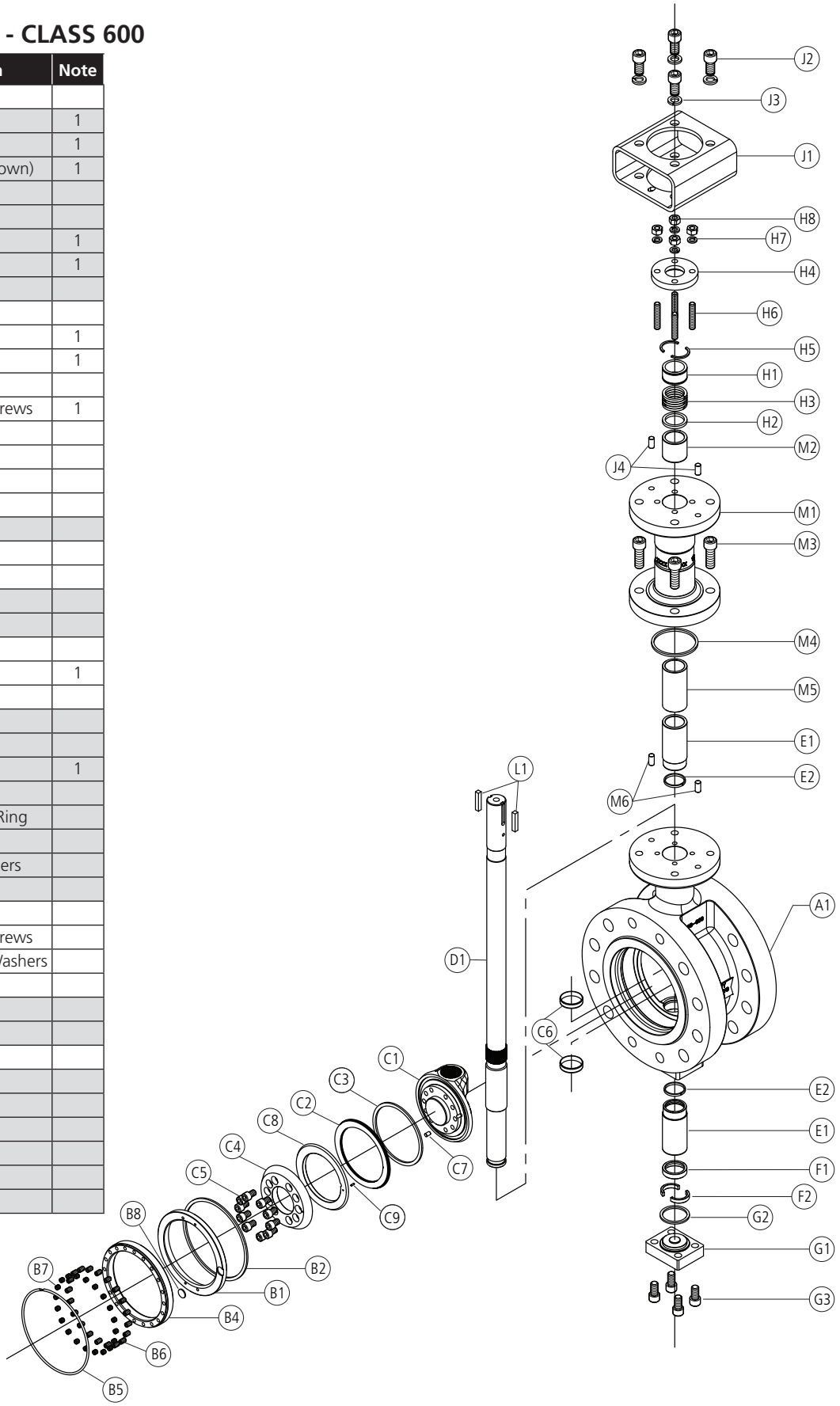


Bottom Plate Detail

9.1 EXPLODED VIEW - CLASS 600

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	
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	
J1	Mounting Bracket	
J2	Mounting Bracket Cap Screws	
J3	Mounting Bracket Lock Washers	
J4	Mounting Bracket Pins	
K1	Identification Tag	
K2	Drive Screws	
L1	Stem Keys	
M1	Bonnet	
M2	Bonnet Bearing	
M3	Bonnet Cap Screws	
M4	Bonnet Gasket	
M5	Bearing Spacer	
M6	Dowel Pins	

Note 1: Suggested Spare Part



10.0 STANDARD MAINTENANCE

WARNING

Verify if the valves are required to be cleaned for oxygen service. Depending on application valve may need to be cleaned and assembled at a qualified oxygen cleaning facility.

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 replacing the seat and/or seal ring in a dead-end service, or with the piping on the body seat side removed, depressurize the line and partially open the disc before loosening any of the valve trim fasteners.

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

10.1 RECOMMENDED LUBRICANTS

PTFE Thread Lubricant for non-oxygen service.

PTFE Thread Lubricant Krytox GPL226 for oxygen service.

10.2 Packing Replacement

Refer to parts diagram for parts identification by reference numbers. (Pg. 7, 9)

1. If the valve is installed, relieve line pressure. Remove actuator from the valve. Remove socket head cap screws and lock washers (J2 & J3). Remove mounting bracket or mounting plate (J1), depending on valve size. Note assembly positions of the actuator and the mounting hardware for reinstallation.
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).
3. Remove all packing (H3), taking care not to scratch the stem or the bore of the bonnet. Do not remove the thrust washer (H2) unless further valve disassembly is required.
4. Examine the bonnet packing bore and the stem surface. Clean as necessary to remove any corrosion, foreign matter and minor surface imperfections.
5. Install new packing rings (H3) in valve body packing bore one at a time. First the external ring (H2), then internal rings (H2) and last the second external ring (H2).
6. 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 (pg. 15).
7. Reinstall mounting bracket or mounting plate (J1) with cap screws and lock washers (J2 & J3). Remount actuation device on top of the mounting bracket.
8. 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 (pg. 15).
9. Install the key(s). Then mount actuator, paying attention that the actuator is properly oriented.

10.3 Seat Replacement

Refer to parts diagrams. (Pgs. 7 and 9)

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.

CAUTION

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

1. Close the valve and remove the actuator. Place the valve on a flat stable surface with the body seat (B1) facing up.
2. 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.
3. Using a wrench, remove all seat retainer set cap screws (B3).
4. 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.
5. 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).
6. Using non-abrasive tools, carefully clean any remnants of old gasket and foreign matter within the retaining cavity. Blow out all threaded holes and gasket grooves with compressed air.
7. Remove the seal ring retainer cap screws (C5) from seal ring retainer (C4). Remove disc seal ring retainer (C4). If the old seal ring (C2) is to be reinstalled, extract it carefully. Wipe the seal ring (C2) clean, removing all remnants of old gasket and foreign matter. Place the old seal ring (C2) aside for reinstallation.
8. Using soft tools and a suitable wire brush, carefully clean any remnants of old gasket and foreign matter from the face of the disc (C1). Blow out all threaded holes and the gasket groove with compressed air.
9. Place a new disc gasket (C3) into the groove on the disc face (C1). Place the seal ring alignment pin (C7) into the disc. Place the seal ring (C2) onto the disc such that the notch is aligned. Place the seal retainer (C4) over the seal ring. Apply PTFE Thread Lubricant to the seal ring retainer cap screws (C5). Install all disc seal ring retainer cap screws (C5). The seal ring retainer 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°.
10. Place the seat gasket (B2) into the groove 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 PTFE Thread Lubricant to seat retaining cap screws (B3) and install the screws (B3) finger-tight.
11. Verify that all four alignment marks match (body, seat, seal ring and seal ring retainer) and then tighten the seat retainer cap screws (B3) evenly and firmly using a cross bolting technique to the torque specified in Table 3 (Pg. 15).
12. Reinstall actuation device and test the valve.
13. Using a suitable actuator, 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 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.
14. Close the valve. Tighten at least four screws in the seal ring retainer to prevent the seal ring from further movement. Open the valve approximately five degrees. Tighten all seal ring retainer screws (C5) using a cross bolting technique, to the torque specified in Table 3 (Pg. 15).

10.4 Seal Ring Replacement

Refer to parts diagram. (Pg. 7, 9)

CAUTION

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

The seal ring (C2) may be replaced in two ways: without removing the seat (B1); or replacing the seal ring (C2) with the seat (B1) removed.

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. **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.**

10.4.1.1 Seal ring replacement with the seat in the valve (Class 150/300)

1. Remove valve from the pipeline. Remove the actuator from the valve.
2. 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).
3. 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).
4. Using a wrench, rotate the valve stem (D1) counterclockwise past the fully open position far enough so the disc is in a position 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).
5. Remove the seal ring retaining cap screws (C5) and extract disc seal ring retainer (C4) and the seal ring (C2).
6. 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 old gasket and foreign matter from the face of the disc (C1). Blow out all threaded holes and the gasket groove with compressed air.
7. 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). 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 PTFE Thread Lubricant to the seal ring retainer cap screws (C5). 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.
8. 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.
9. Orient the valve with the seat side facing up. Verify that all four alignment marks (body, seat, seal ring and seal ring retainer) are aligned.
10. Tighten the seal ring retainer cap screws (C5) using a cross bolting technique to the torque specified in Table 3 (Pg. 15).
11. Reinstall operator or actuator and test the valve.

10.4.1.2 Seal ring replacement with the seat in the valve (Class 600)

1. Remove valve from the pipeline. Remove the actuator from the valve.
2. 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).
3. 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).
4. Using the appropriate size hex key, completely remove the upper set screws (B7) from the seat retaining ring (B3).
5. Below these dowels are seat retainer lower set screws (B6) that compress the seat (B1) against the valve body. Unscrew them until the Seat retainer ring (B5) above the retaining ring is free to move. Remove the seat retainer ring (B5) from the body. Carefully clean the seat retaining ring (B4) and upper set screws (B7).
6. Extract the seat ring retainer (B4), remove the seat alignment button (B8) that retains the seat within the body and then remove the seat (B1).

7. Install the new seat gasket (B2), 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).
8. Replace set screws if necessary.
9. Adjust the seat retaining ring lower dowels (B6) until they are flush with the bottom of the seat retaining ring (B4). Install the seat retaining ring (B4) in its groove in the body.
10. Using a cross bolting technique, tighten the seat retainer lower set screws (B5) to 50% of torque specified in Table 5 (Pg. 16). Once all set screws are tightened to the same torque, proceed to fully tighten them to 100% of the listed torque value.
11. Assemble the seat retaining ring upper dowels (B7) and using a cross bolting technique, tighten them according to the torque specified in Table 5 (Pg. 16).
12. Rotate the disc (C1) to its previous position to facilitate installation of the seal ring (C2). Place a new disc seal gasket (C3) into the groove on the disc face (C1). Be sure that the new seal ring (C2) is assembled with the seal ring collar (C8) and kept together with the seal ring collar pin (C9). Place the seal ring and collar onto the disc making sure the collar groove is aligned with the seal ring alignment pin (C7). Place the seal ring retainer (C4) over the seal ring. Apply PTFE Thread Lubricant to the seal ring retainer cap screws (C5). All of the cap screws (C5) need to be fully threaded into the disc (C1), but remain only finger-tight at this time.

10.4.2 Seal ring replacement with the seat removed from the valve

This procedure follows the instructions for replacement of the seat (B1) described above. If the old 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 old 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.

10.5 Bottom Plate Gasket Replacement

Refer to parts diagram. (Pg. 7, 9)

1. If the valve is installed, remove line pressure.
2. Completely remove the bottom plate screws (G3). Remove the bottom plate (G1) and the bottom plate gasket (G2).
3. Clean the bearing area of residual gasket and foreign materials.
4. Place the new gasket (G2) on the bottom plate (G1) and install it onto the body.
5. Reinstall the bottom plate screws (G3) and using a cross bolting technique, tighten them according to the torque specified in Table 3 (Pg. 15).

Table 2 - Torque Values for Packing Gland Hex Nuts

Valve Size		Class 150		Class 300		Class 600	
in	mm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm
3	80	22	2	22	2	CF	CF
4	100	31	4	31	4	CF	CF
6	150	31	4	46	5	51	6
8	200	35	4	55	6	110	12
10	250	50	6	60	7	126	14
12	300	55	6	80	9	254	29
14	350	80	9	141	16	279	31
16	400	80	9	254	29	303	34
18	450	141	16	279	31	328	37
20	500	141	16	303	34	378	43
24	600	279	31	328	37	619	70
28	700	328	37	619	70	CF	CF
30	750	328	37	950	107	CF	CF
32	800	378	43	950	107	CF	CF
36	900	619	70	1046	118	CF	CF
40	1000	950	107	CF	CF	CF	CF
42	1050	950	107	CF	CF	CF	CF
48	1200	1046	118	CF	CF	CF	CF

Table 3 - Torque Values for Seat Retaining Cap Screws and Seal Retainer Cap Screws and Bottom Plate

Valve Size		Class 150						Class 300						Class 600							
		Seat		Seal Ring Retainer		Bottom Plate Cap Screw		Seat		Seal Ring Retainer		Bottom Plate Cap Screw		Seat		Seal Ring Retainer		Bottom Plate Cap Screw		Seat Retainer Set Screw	
in	mm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm
3	80	22	2	19	2	96	11	22	2	19	2	96	11	CF	CF	CF	CF	CF	CF	CF	CF
4	100	55	6	45	5	96	11	55	6	45	5	96	11	CF	CF	CF	CF	CF	CF	CF	CF
6	150	55	6	45	5	96	11	55	6	95	11	171	19	204	23	95	11	422	48	204	23
8	200	55	6	45	5	96	11	110	12	95	11	171	19	204	23	171	19	848	96	204	23
10	250	204	23	95	11	171	19	204	23	171	19	422	48	499	56	422	48	848	96	499	56
12	300	204	23	171	19	171	19	204	23	171	19	422	48	499	56	848	96	1,522	172	499	56
14	350	204	23	171	19	423	48	204	23	422	48	422	48	499	56	848	96	1,522	172	499	56
16	400	204	23	171	19	423	48	204	23	422	48	848	96	499	56	848	96	1,522	172	499	56
18	450	320	36	171	19	423	48	204	23	422	48	848	96	1,008	114	848	96	2,464	278	499	56
20	500	320	36	422	48	423	48	499	56	422	48	1,522	172	1,008	114	1,522	172	2,464	278	1008	114
24	600	320	36	422	48	849	96	499	56	848	96	2,464	278	1,008	114	1,522	172	3,703	418	1008	114
28	700	499	56	848	96	848	96	499	56	848	96	1,522	172	Consult Factory							
30	750	499	56	848	96	848	96	499	56	848	96	2,464	278								
32	800	499	56	848	96	1,522	172	499	56	848	96	2,464	278								
36	900	499	56	848	96	1,522	172	499	56	1,522	172	2,464	278								
40	1000	499	56	848	96	1,522	172	CF	CF	CF	CF	CF	CF								
42	1050	499	56	848	96	1,522	172	CF	CF	CF	CF	CF	CF								
48	1200	499	56	848	96	1,522	172	CF	CF	CF	CF	CF	CF								

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

Table 4 - Torque Values for Bracket/Bonnet Fasteners

Valve Size		Class 150		Class 300		Class 600	
in	mm	Lb-in	Nm	Lb-in	Nm	Lb-in	Nm
3	80	171	19	171	19	CF	CF
4	100	171	19	171	19	CF	CF
6	150	171	19	422	48	848	96
8	200	171	19	1522	172	1522	172
10	250	422	48	1522	172	1522	172
12	300	1522	172	1522	172	848	96
14	350	1522	172	848	96	1522	172
16	400	1522	172	848	96	1522	172
18	450	1522	172	848	96	1522	172
20	500	1522	172	1522	172	3703	418
24	600	848	96	1522	172	7473	844
28	700	1522	172	3703	418	Consult Factory	
30	750	1522	172	7473	844		
32	800	3703	418	7473	844		
36	900	3703	418	7473	844		
40	1000	7473	844	CF	CF		
42	1050	7473	844	CF	CF		
48	1200	7473	844	CF	CF		

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