

**NOTE:** This document describes the maintenance of Series T2 valves with bore sizes 8" and larger only. For valves smaller than 8" bore please refer to Document IOM-T2-A01.

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### I. INTRODUCTION

Series T2 Three-Piece Trunnion Mounted Ball Valves are designed and manufactured in accordance with API 6D specification and are available in a wide variety of materials, suitable for many oil/gas and industrial applications. The valve configuration may be noted on the nameplate and/or cast/stamped into the body, which includes valve size, pressure classification, trim/materials, maximum operating pressure, part number and serial number.

Series T2 Trunnion Mounted Ball Valves utilize bearings to maintain the ball in rigid alignment with the stem and lower trunnion support, assuring smooth, low operating torques. These valves are upstream sealing and have pressure-reactive seats. Seat springs are designed to assure initial drop-tight low-pressure sealing. In operation, line pressure energizes the seat thereby enhancing the seal between the upstream seat and the ball. Safety features include, anti-static devices, double envelope seals and emergency sealant injection fittings.

Several body, trim, seat and seal materials are available.

### Base Part Numbers

SIZE	Cl. 150	Cl. 300	Cl. 600	Cl. 900	Cl. 1500
8"FP	5112	5312	5612	5912	5712
10"RP	5113	5313	5613	5913	5713
10"FP	5114	5314	5614	5914	5714
12"RP	5115	5315	5615	5915	5715
12"FP	5116	5316	5616	5916	5716

### Trim Option Suffix Code

<b>XXXX</b>	-	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>XX</b>	<b>XX</b>
<b>Base Part No.</b> See chart above								<b>Options</b> 99 • None	
								<b>Pipe Size</b> 99 • Standard	
								<b>Actuation</b> 1 • Locking Handle 2 • Square Nut 3 • Gear Operator w/Locking Device 4 • Gear Operator 8 • Bare Stem w/Locking Device 9 • Bare Stem	
								<b>Seal Material</b> 1 • Buna-N 2 • Viton 3 • Low-Temp Buna-N 4 • HNBR 5 • Aflas 7 • James Walker® 8 • Peroxide-Cured Buna-N 9 • EPDM	
								<b>Seat Material</b> 1 • Devlon® 2 • RTFE 3 • Delrin® 4 • PEEK 5 • TFM 6 • Metal-to-Metal	
								<b>End Connections</b> 6 • Flanged RF 7 • Flanged RTJ 5 • Buttweld 8 • RF x BW 9 • RTJ x BW	
								<b>Trim Material (Ball &amp; Stem) - NACE MR0175 compliant</b> 1 • Carbon Steel 1 mil ENP Firesafe 2 • 316 SS / 316 SS Firesafe 3 • Low-Temp. Carbon Steel 1 mil ENP Firesafe 4 • Carbon Steel 3 mil ENP Firesafe 5 • Low-Temp. Carbon Steel 3 mil ENP Firesafe	
								<b>Body &amp; Adapter Material</b> 1 • Carbon Steel 2 • Stainless Steel (CF8M) 3 • Low-Temp. Carbon Steel (LCC)	

It is the user's responsibility to specify the materials appropriate to assure chemical/temperature/pressure suitability for their particular application.

## II. TRANSPORTATION & STORAGE

While loading or unloading, check for and adhere to any markings or arrows on the box/crate which may be present to indicate upward orientation. Valves should be stored, with protective end caps in place, in a suitably dry, clean environment, protected from the weather. Factory grease and end-cap protectors should be adequate for storage up to six months if properly protected. Longer term storage should include a suitable inspection process to assure valves have not been compromised and are suitably maintained in good condition.

## III. INSTALLATION

Before installation, remove the end protectors and clean the valve ends and bore, using solvent or as per the customer's specification. If valves are to be painted prior to installation, appropriate steps must be taken to prohibit the ingress of blast media, paint, solvents or any other foreign contamination that might cause damage to the valve's internal components. Assuring a properly clean valve bore will help to avoid possible seat damage during operation.

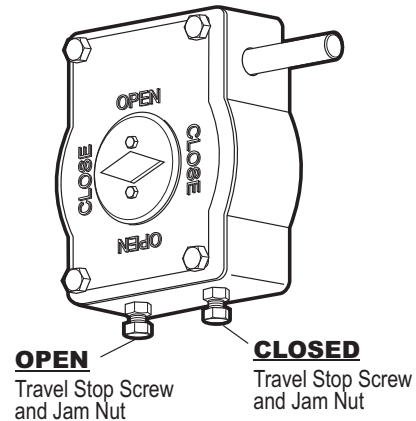
### ***Gear Operator/Actuator Travel Stops***

Although travel stops are set at the factory, the user should verify that they have not been tampered with, as improper travel stop settings will almost certainly cause premature failure of the valve seats. If the valve includes a gear operator or actuator, it is important to check that the travel stops are properly set prior to operation of the valve. If the valve includes a third-party actuator or gear operator, consult that manufacturer's documentation to assure proper travel stop setting.

For adjustment of ViNtrol Gear Operated Valves use the following procedure;

Preferably, the valve should be isolated from system pressure prior to gear operator adjustment. If the valve is already installed inline, and it cannot be isolated from system pressure, assure that operation of valve from full open to full closed will not disrupt current system operation.

**CHECK OPEN SETTING:** The valve should be fully open. If possible, inspect the bore to assure proper alignment of the ball bore with the adjacent valve bore. Otherwise, remove the indicator cap from the



top of the gear operator and observe the position of the stem flats, key or keyway. Loosen the OPEN travel stop jam nut and then turn the travel stop screw counter-clockwise several turns (do not remove). Adjust the gear operator until the ball is in the full open position, as indicated when the stem flats are in perfect alignment with the bore. Once this position is found, screw the OPEN travel stop in (clockwise) until it contacts the segment gear. DO NOT OVERTIGHTEN. While holding the travel stop screw in position, firmly tighten the jam nut to secure the setting, taking care not to disturb the travel stop position.

**CHECK CLOSED SETTING:** Loosen the CLOSED travel stop jam nut and turn the travel stop screw several turns counter-clockwise (do not remove). Spin handwheel until the valve is in a fully-closed position, as indicated when the stem flats are perpendicular to the line bore. Once this position is achieved, turn the CLOSED travel stop screw clockwise until it contacts the segment gear. DO NOT OVERTIGHTEN. While holding the travel stop screw in position, firmly tighten the jam nut to secure the setting, taking care not to disturb the travel stop position.

Re-install the indicator cap on the top of the gear operator. Perform a seat test as described in Section V to assure proper sealing of the seats.

**IMPORTANT: Assure that the adjacent pipeline is clean of all debris, scale, weld slag, etc. Completely flushing the system of such debris prior to installation will greatly reduce the possibility of seat compromise at startup. Failure to do so may result in damage to the soft seat, metal seat and/or seals during operation.**

## CAUTION

The valve end connection necks and lifting lugs (if included) are the proper places to attach lifting slings if necessary. Care should be taken to assure that flange end faces are not damaged during lifting. Never lift the valve by handle, handwheel, gear operator or other appendage as doing so may result in damage to the valve and/or injury to the installer. End-cap protectors should always be left in place until the valve is actually being installed in the pipeline.

Series T2 valves are bi-directional and may be installed with flow from either direction. The valve should preferably be installed in a stem-up or stem-horizontal position. NEVER install the valve in a stem-down condition.

The valve should be adequately supported, especially when heavy actuators are included as this may cause a top-heavy, imbalanced condition. If necessary, support the valve and/or actuator as necessary with straps/brackets/piers to assure a rigid installation. Valve/actuator weight should not cause undue stress to the piping system when properly installed and supported.

Remove the end-cap protectors. When handling the valve without end-cap protectors, keep the ball in the open position to minimize the possibility of damaging an exposed ball surface.

### **Flanged-End Valves**

Utilize properly-specified gaskets/seal rings, studs and nuts (supplied by customer) for the particular valve flange size, securing the valve between appropriate mating flanges. Studs/nuts or bolts should be lubricated and then tightened in a crisscross fashion. After hand-tightening, final wrench torque should follow ASME or gasket manufacturer's specification for the particular size.

### **Buttweld-End Valves**

It is important to minimize heat and weld slag during the installation process to prevent damage to the seats and seals of the valve.

1. Clean all grease from the ball and bore of the valve body/adapter.
2. Electric welding is preferable. If oxygen-acetylene equipment is used extreme caution must be exercised to avoid excessive temperatures.
3. Orient the valve in the OPEN position. Use Tempil sticks or other suitable methods to assure that the

temperature in the seat and seal areas do not exceed 250°F (121°C).

4. Weld with continuous bead, avoiding application of excessive material.
5. IMPORTANT! Thoroughly clean all weld slag and debris from bore before turning the valve to the closed position. Failure to do so may result in damage to the soft seats.

## IV. OPERATION

### WARNING!

**Unless specifically noted otherwise, ViNtrol Series T2 Ball Valves are NOT suitable for OXYGEN SERVICE. Using these valves in oxygen service may result in catastrophic failure resulting in equipment damage, as well as operator injury or death.**

Series T2 Ball Valves are intended for ON-OFF service only. As with any soft-seated ball valve, prolonged throttling or pinching flow will cause premature wear of the seat and ultimate failure. The valve operates within a 90° turn from fully open to fully closed. Handle or gear operator should be turned until it is against the stop pin or travel stops. Do not over-torque the operator against the stop as this could lead to operator damage. On gear-operated valves clockwise rotation of the handwheel will CLOSE the valve. Counter-clockwise rotation of the handwheel will OPEN the valve. The valve bore position may be noted by the orientation of the handle or position arrow on the gear operator if included. Alignment of the handle or arrow with the pipeline indicates an OPEN condition. Alignment of the handle or arrow 90° across the pipeline indicates a CLOSED position. Some gear operators/actuators may have different alignment devices. Consult specific device documentation for proper assessment of position when these devices are employed.

### **Hydrostatic Testing**

When Series T2 Valves are installed in a system requiring hydrostatic testing, user should use the following procedure to minimize possibility of damage to the valve:

1. Open the valve fully prior to introducing test fluid to allow flushing of any debris through valve bore and from the system.
2. Once the system is completely filled, the valve should be positioned in a partially-open condition (at least 20°) to allow the body cavity to completely fill with fluid.
3. Hydrostatically shell test to a maximum pressure not

exceeding 1.5 times the rated working pressure of the valve.

4. Bleed pressure from the system.
5. Close the valve completely.
6. The valve seats may be tested by introducing pressure, first from one side, and then from the other. During seat testing, pressure should not exceed 1.1 times the working pressure of the valve.
7. Upon completion of testing, purge the valve of all test fluid and open valve fully.

## V. MAINTENANCE

The Series T2 Valve is designed for long, continuous operation with minimal maintenance required. Nonetheless, valve sealing components (seats, o-rings, packing, gaskets) should periodically be checked for damage or wear. It is recommended that only genuine ViNtrol parts be used for replacement. Any repaired valve is subject to retesting prior to being placed back into service. On valves which include gear operators, periodic renewal of grease in the gear box will enhance the operation of the valve.

### Block and Bleed

Series T2 valves are equipped with a body cavity bleed valve or plug (23). This feature allows the operator to relieve pressure or drain the body cavity of the valve. It is also useful for assessing the seal integrity of the seats. With the valve in the closed position the bleed valve can be opened to evacuate pressure/media from the body cavity. To evaluate seat integrity, with pressure introduced to one side of the valve, open the bleed valve to fully drain the body cavity. Once the cavity is fully evacuated media should no longer flow from the bleed valve. If the flow persists, adjust operator stop settings to ensure the valve is fully closed or fully open. If this is unsuccessful then a seat or seat seal has been compromised and the valve should be repaired as soon as possible. Both seats can be assessed by alternating pressure to each side of the valve. If the valve cannot be immediately removed from service a short-term remedy may be achieved utilizing emergency sealant as described below.

### Emergency Sealant Injection for Temporary Sealing

Series T2 valves incorporate giant buttonhead sealant injection fittings in the stem and seat areas to allow temporary sealing should a seal or seat be inadvertently damaged. The fittings at the seat areas (on the side of the body and adapter) may also be used for seat lubrication. However, the fitting in the stem housing is NOT intended for lubrication and should be used only to apply emergency sealant in the event of a leak. CAUTION: Injecting lubricant into this fitting will almost

certainly damage the seals resulting in leakage through the valve or externally to atmosphere.

NOTE: When applying valve sealant always flush the port with suitable valve cleaner prior to injection of the sealant. Cycling the valve will almost certainly destroy the temporary seal and will require that the procedure be repeated. An emergency seal accomplished utilizing sealant injection is only a temporary remedy.

Numerous cleaners and sealants are available and your supplier should be able to recommend suitable products. If not, for specific recommendations contact ViNtrol for a list of recommended suppliers and products for common oil and gas application.

### Repair

## WARNING!

**Prior to removing valve from line, system pressure must be bled completely. The spring-loaded seat design inherent in all trunnion valves can cause pressure to be trapped in the body cavity between the two seats. Valve should be drained utilizing the body bleed valve or plug and the ball should be partially opened to assure no residual pressure is trapped in the body cavity. Failure to adhere to this warning may result in catastrophic leakage or damage to valve/surrounding equipment and/or injury or death.**

### Disassembly (Refer to illustration on Page 5)

Should the valve components need to be inspected/replaced, the valve can be disassembled as follows:

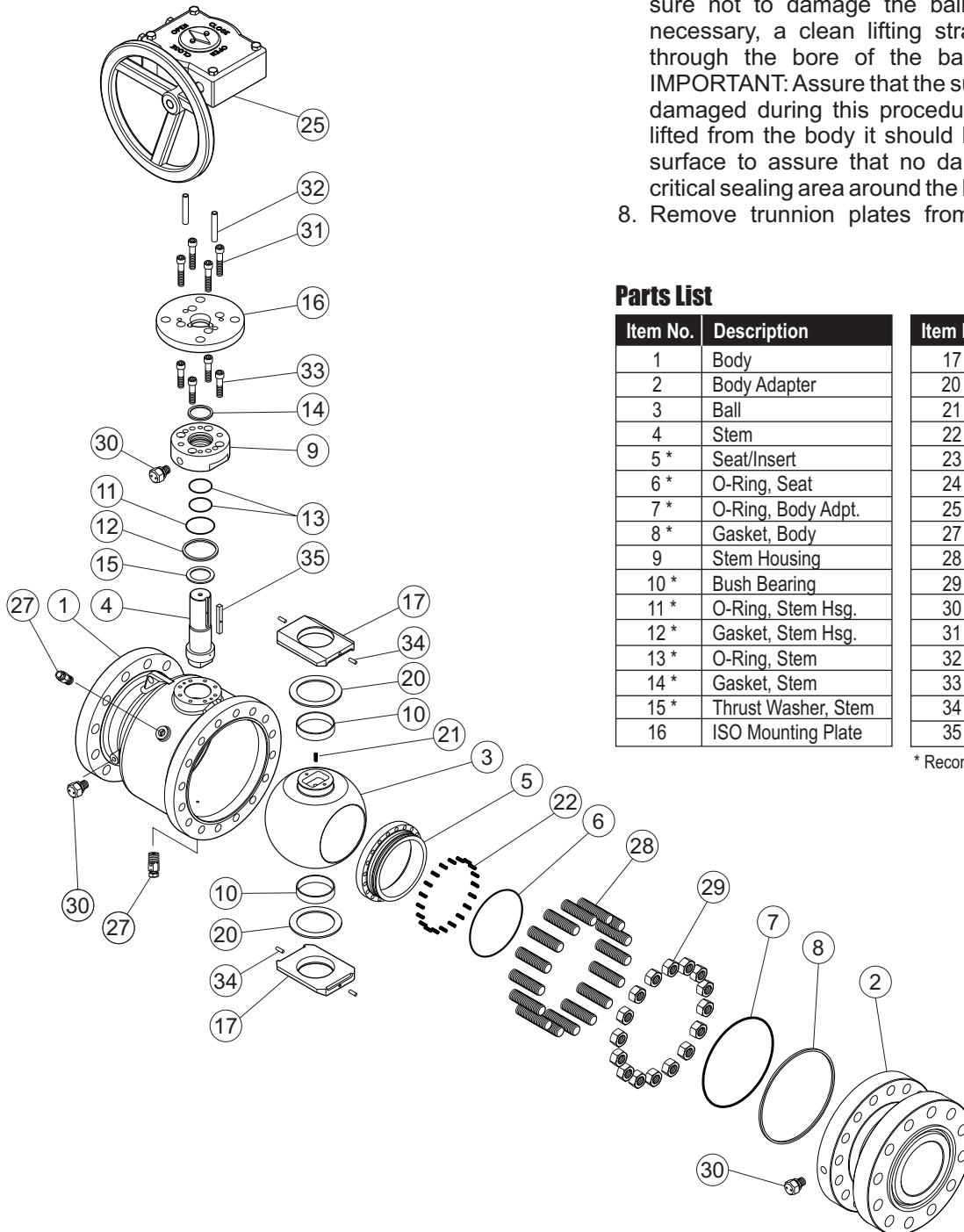
1. Operate the valve so that the ball is in full open position. Rest the valve on the body end in the vertical position on a clean surface, preferably wooden or plastic, making sure not to damage the flange face.
2. Remove the handle or gear operator.
3. Remove stem key (35). Loosen and remove the mounting plate bolts (31) thereby allowing the removal of the mounting flange (16). Remove the stem housing bolts (33) and the stem housing (9) and stem (4) as a unit.
4. Remove stem from stem housing. Remove stem thrust washer (15) from stem and stem o-ring/gaskets (13 & 14) from inside diameter of stem housing. Remove stem housing o-ring (11) and gasket (12). Clean and inspect parts for wear.
5. Loosen and remove the body nuts (29) in a crisscross manner, thereby allowing removal of the body

adapter, taking care to retain the seat (5), seat seal (6) and seat springs (22). Lay body adapter on a clean surface with the seat facing up. Remove the body seal (7) and body gasket (8) from the body adapter.

6. Carefully lift the seat out of the body adapter and set

aside on a clean surface. Retrieve the seat springs and set aside. Remove the seat o-ring and inspect. Clean the seat and inspect the seat insert for wear. Make sure that the individual spring holes are clean of debris.

7. Reaching into the body cavity, manually rotate the ball (3) to a closed position and gently lift the ball with trunnion plates (17) attached out of the body making sure not to damage the ball in the process. If necessary, a clean lifting strap may be threaded through the bore of the ball to facilitate lifting. **IMPORTANT:** Assure that the surface of the ball is not damaged during this procedure. Once the ball is lifted from the body it should be placed on a clean surface to assure that no damage is done to the critical sealing area around the bore of the ball.
8. Remove trunnion plates from ball. Note the two



## Parts List

Item No.	Description	Item No.	Description
1	Body	17	Trunnion Plate
2	Body Adapter	20 *	Thrust Washer, Trun.
3	Ball	21	Anti-Static Spring
4	Stem	22	Spring, Seat
5 *	Seat/Insert	23	Drain Plug
6 *	O-Ring, Seat	24	Handle (not shown)
7 *	O-Ring, Body Adpt.	25	Gear Box
8 *	Gasket, Body	27	Bleed Valve
9	Stem Housing	28	Stud
10 *	Bush Bearing	29	Nut, Body Adapter
11 *	O-Ring, Stem Hsg.	30	Injection Fitting
12 *	Gasket, Stem Hsg.	31	Bolt, ISO Mtg. Flange
13 *	O-Ring, Stem	32	Dowel Pin
14 *	Gasket, Stem	33	Bolt, Stem Housing
15 *	Thrust Washer, Stem	34	Alignment Pin
16	ISO Mounting Plate	35	Stem Key

\* Recommended Spare Parts

See Page 7 for  
Repair Kit Part Numbers

alignment pins (34) in the body cavity and on the inboard face of the body adapter at 12 o'clock and 6 o'clock positions, just outside the seat pocket. The pins may pull free when the ball and trunnion plates are pulled from the body. Clean the ball surface with solvent and inspect the surface closely for wear.

9. Remove the bush bearings (10) from the trunnion plates. Clean and inspect both bush bearings and both trunnion plates.
10. Remove the remaining seat as described in Step 6.
11. Although not required, sealant injection fittings (30) and bleed valves (27) may be removed if desired for cleaning. Regardless of whether each is removed, they should be flushed with valve cleaner to assure proper function.

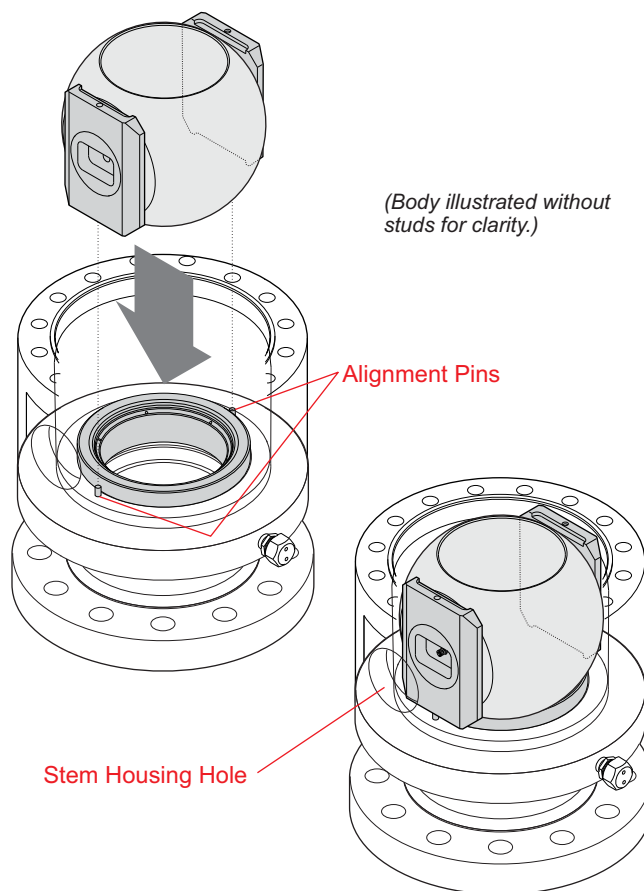
## Reassembly

Clean and inspect all parts for damage or wear. Pay particular attention to the body, body adapter, ball, seats, stem and trunnion bearing areas. Visible wear of the metal surface in the seat pockets of the body and/or body adapter will likely cause continued leakage, a possible unsafe condition and is grounds for disposal and replacement of the valve. However, light wear may possibly be re-dressed with light emery cloth or Scotch-brite®. Clean and inspect all other components, replacing them as necessary with ViNtrol factory-new parts. It is generally good practice to replace all o-rings and gaskets with new parts whenever the valve is disassembled.

1. Position the body and body adapter with the flanges down on a clean surface, preferably wooden or plastic, assuring not to damage the flange faces. Install two alignment pins in the appropriate holes in the body and body adapters.
2. Apply a light coating of grease to the surfaces of the seat pocket in the body and body adapter. Apply a thin coating of grease to the cleaned or new seats and install seat o-rings. Apply a dab of grease in each spring hole in each seat pocket and install a clean seat spring into each hole. Gently guide a seat assembly, with o-rings in place, into the seat pockets in the body and the body adapter, taking care not to extrude or cut the seat o-ring during installation. **IMPORTANT: The seat springs must be properly engaged in the holes in the seat. A loose spring may inhibit the seat from moving properly under pressure and could result in leakage.** Gently tap the seat down all the way around its diameter to assure complete seating, observing that it is seated evenly all around its diameter. Apply a light coat of grease to the face of the non-metal seat insert.
3. After cleaning and/or replacing the ball, apply a light coat of grease and install bush bearings into both trunnion plates. Care should be taken to assure that

the bearings are not bent or damaged during installation.

4. Assure that the bearing surfaces on the ball are clean and then apply a light coating of grease. Lightly grease the trunnion plates and install the trunnion plates/bush bearings with tapered sides outboard. Once mounted, spin them to assure free rotation and orient them such that the mating holes in each trunnion plate are in position to accept the two alignment pins in the body. Note which side of the ball has the stem-engaging keyhole and position the assembly such that it will be properly located beneath the adjacent stem housing hole in the body. Lower the ball/trunnion plates gently into the body, assuring that the trunnion plates properly engage the alignment pins, bringing the ball to rest on the previously-installed seat. Assure that the trunnion plates are fully seated and positioned properly on the alignment pins.



5. Apply a liberal coating of grease to the body-engaging diameter of the body adapter. Flip the body adapter (with seat installed) over, oriented such that the alignment pins are properly located at 6 o'clock

and 12 o'clock, allowing them to engage the corresponding holes in the trunnion plate. Gently lower onto the body, engaging the studs and taking care not to dislodge the seat from the body adapter during the process. Care should also be exercised to assure that o-rings/gaskets are not extruded/pinched or cut during installation. Continue lowering the body adapter, assuring proper engagement of the alignment pins, until it sits metal-to-metal on the body. Install body nuts on each stud and tighten them in a crisscross fashion.

6. Clean and inspect the stem housing. Apply a thin coating of grease to the stem o-rings and stem gasket and install in their appropriate grooves on the inside diameter of the stem housing. Once seal and gasket are installed, apply a thin coating of grease to the entire length of the inner diameter of the stem housing. Apply a thin coat of grease to the stem and install the stem thrust washer from the top, pushing it all the way down until it rests on the stem flange. Slowly Install the stem/thrust bearing assembly through the inboard side of the stem housing, taking care not to, 1) damage the anti-static plunger in the side of the stem, and 2) dislodge or pinch the stem seal and gasket. Continue pressing the stem into the stem housing until the thrust bearing seats firmly against the bottom of the stem housing.
7. Looking into the body through the stem housing hole, install the anti-static spring in its hole in the top of the ball holding it in place with a dab of grease. Lightly grease and install the stem housing gasket and o-ring in their appropriate positions on the outside diameter of the stem housing. Lightly grease the outside diameter of the stem housing and install the stem housing/stem sub-assembly onto the body, aligning it

properly with the dowel pins on each side of the body's stem housing hole. **IMPORTANT: Note the orientation of the engaging slotted hole in the ball and rotate the stem as necessary to allow the stem flats to properly engage the slot.** Slowly install the stem housing through the body hole and into the mating keyslot hole in the ball. Once the stem housing mates metal-to-metal with the body install the stem housing bolts, tightening in a crisscross fashion. Install the ISO mounting plate and install bolts, tightening in a crisscross fashion.

8. If the sealant injection fittings and bleed valve/plug were removed, reinstall each in their appropriate ports.
9. Operate the valve, slowly turning the stem/ball in a full 90° sweep several times to assure smooth operation and proper positioning of the seats on the ball. DO NOT turn the ball quickly, as damage may occur to the seat before it is able to properly conform to the ball surface.
10. Reinstall handle or gear operator. If valve is gear-operated, recheck the travel stop settings as described in the INSTALLATION portion of this document to assure proper setting.

### Ordering Repair Kits

Repair Kits are available for Series T2 Ball Valves. All kits are firesafe and NACE MR0175 compliant. The Kit Assembly Part Number may be configured as shown below to include the desired combination of ball, stem, seats and seals.

### EXAMPLE:

Part No: **REPAIR-5314-211** • Includes Stainless Steel Ball, Stem, Seat Carrier, Buna-N Seals, Devlon® Seats for a 10"FP Class 300 Valve.

### Base Part Numbers

SIZE	Cl. 150	Cl. 300	Cl.600	Cl.900	Cl.1500
8"FP	5112	5312	5612	5912	5712
10"RP	5113	5313	5613	5913	5713
10"FP	5114	5314	5614	5914	5714
12"RP	5115	5315	5615	5915	5715
12"FP	5116	5316	5616	5916	5716

## VI. TECHNICAL INFORMATION

### Flow Efficiency • Cv Ratings

SIZE	Cl. 150	Cl. 300	Cl.600	Cl.900	Cl.1500
8"FP	9500	9400	9000	8500	7400
10"RP	4300	4300	4300	4300	3800
10"FP	15000	15000	14700	14500	11500
12"RP	7550	7550	7550	8000	9000
12"FP	23000	23000	22500	21100	18000

### REPAIR - Base No. - X X X

<p><b>Trim Material (Ball, Stem, Seat Carrier)</b></p> <p>None • X Carbon Steel 1 mil ENP • 1 316 SS / 316 SS • 2 Low-Temp. Carbon Steel 1 mil ENP • 3 Carbon Steel 3 mil ENP • 4 Low-Temp. Carbon Steel 3 mil ENP • 5</p>	<p><b>Seal Material</b></p> <p>X • None 1 • Buna-N 2 • Viton 3 • Low-Temp Buna-N 4 • HNBR 5 • Atlas 7 • James Walker® 8 • Peroxide-Cured Buna-N 9 • EPDM</p>
<p><b>Seat Insert Material</b></p> <p>X • None 1 • Devlon® 2 • RTFE 3 • Delrin® 4 • PEEK 5 • TFM 6 • Metal-to-Metal</p>	

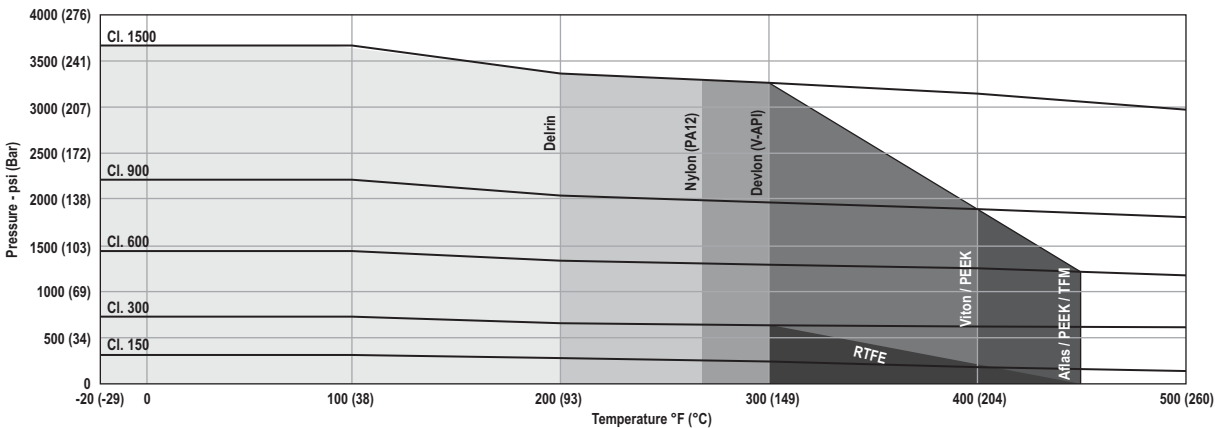
## Operating Torque at Full Rated Pressure (in-lbs)

BORE	TYPE	Cl. 150	Cl. 300	Cl. 600	Cl. 900	Cl. 1500
8" (200)	BTO	7869	12479	21606	29706	47802
	ETC	6298	9983	17292	23769	38232
10" (250)	BTO	10524	16302	27750	37851	60490
	ETC	8422	13041	22205	30281	48387
12" (300)	BTO	13179	19838	33123	48896	110515
	ETC	10546	15866	26496	39117	88412

BTO = Break To Open torque (under rated pressure)  
ETC = End To Close torque (reseating torque)

## Pressure/Temperature Chart

Pressures and temperatures are based on ANSI B16.34 and the trim material of the valve.



## Operating Torque at Full Rated Pressure (Nm)

BORE	TYPE	Cl. 150	Cl. 300	Cl. 600	Cl. 900	Cl. 1500
8" (200)	BTO	889	1410	2441	3357	5401
	ETC	712	1128	1954	2686	4320
10" (250)	BTO	1189	1842	3136	4277	6835
	ETC	952	1474	2509	3422	5468
12" (300)	BTO	1489	2242	3743	5525	12488
	ETC	1192	1793	2994	4420	9900

### NOTES:

1. Torque values are in in-lbs/Nm and are for Primary Soft Seated valves with seat insert material as Devlon® (API).
2. Torque values for PEEK seat inserts are 100% higher than the corresponding listed values.
3. Torque values are at ambient temperature, media being clear water.
4. Use a 1.3 multiplier for dry gas service.
5. For Reduced Bore valves, take torque values corresponding to the lower size (Ball Bore size), e.g. 8"x6" Reduced Port valve, take torque values corresponding to 6".

## Troubleshooting

Symptom	Probable Cause	Solution
Valve will not operate (open or close)	<ol style="list-style-type: none"> <li>1. Foreign matter in line/valve</li> <li>2. Iced up due to pressure drop or low temperatures</li> <li>3. Gear Operator travel stops out of adjustment</li> </ol>	<ol style="list-style-type: none"> <li>1. Flush line to remove debris. Valve may have to be removed from line to facilitate cleaning.</li> <li>2. Flush line with warm liquid.</li> <li>3. Reset travel stops.</li> </ol>
Valve difficult to operate	<ol style="list-style-type: none"> <li>1. Foreign matter in line/valve</li> <li>2. Lack of lubrication</li> </ol>	<ol style="list-style-type: none"> <li>1. Flush line to remove debris. Valve may have to be removed from line to facilitate cleaning.</li> <li>2. Lubricate seats utilizing sealant injection fittings. DO NOT inject lubricant into stem or trunnion fittings. Check lubricant in gear operator and renew as necessary.</li> </ol>
Leakage through valve (past seats)	<ol style="list-style-type: none"> <li>1. Valve not fully closed</li> <li>2. Foreign matter caught between seat and ball</li> <li>3. Damaged seat seals or seat insert</li> </ol>	<ol style="list-style-type: none"> <li>1. Check to assure that valve is in fully closed position - may require re-setting travel stops.</li> <li>2. Clean and lubricate seats utilizing cleaner and grease as described in Section V - Maintenance. Cycle valve from closed to full open and back several times.</li> <li>3. Disassemble valve to locate damaged component(s). Reassemble with new components.</li> </ol>
Leakage from stem or trunnion	<ol style="list-style-type: none"> <li>1. Worn or damaged seal(s)</li> </ol>	<ol style="list-style-type: none"> <li>1. Disassemble valve to locate damaged component(s). Reassemble with new components.</li> </ol>
External leakage from valve	<ol style="list-style-type: none"> <li>1. Damaged seal(s)</li> </ol>	<ol style="list-style-type: none"> <li>1. Disassemble valve to locate damaged component(s). Reassemble with new components. During reassembly, care should be exercised to assure proper tightening of fasteners.</li> </ol>
Leakage from Bleed Valve or Injection Fitting	<ol style="list-style-type: none"> <li>1. Foreign matter caught in fitting or fitting is loose</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten fitting. Inject a small amount of cleaner or grease to dislodge foreign matter. If leak persists, replace fitting. NOTE: Leakage from stem or trunnion injection fitting indicates a compromised seal in that area. Valve should be disassembled to investigate and repair.</li> </ol>