



# VALVES & MEASUREMENT

## TBV™

**OPERATION AND MAINTENANCE MANUAL**

**SERIES 2100: CRYOGENIC THREE PIECE BALL VALVE**

*For technical questions, please contact the following:*

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*TBV cryogenic ball valves are designed and engineered to provide long lasting, trouble-free service when used in accordance with these instructions and specifications.*

## **INSTALLATION**

- 1. Valve must be installed with extended bonnet within 30° of true vertical.*
- 2. TBV cryogenic ball valves are unidirectional and must be installed for flow in one direction as indicated by the flow arrow marked on the body.*
- 3. When installed with the flow arrow pointing downstream (opposite the side that you wish to maintain pressure), the valve cavity will self-relieve to the upstream side.*
- 4. During installation it is recommended that the valve ball be in the open position in order to prevent any possible damage to the ball.*
- 5. After installation, cycle valve several times before putting into service.*

## **CAUTION FOR BRAZING, SOLDERING OR WELDING**

- 1. If valve is to be brazed, soldered or welded, the seats and body seals must be removed before installation in the following manner:*
  - a. Rotate valve ball into open position.*
  - b. Remove four body bolts.*
  - c. Rotate valve ball back to closed position and remove seats and ball.*
  - d. Remove body seals from pipe ends.*
  - e. Place ball, seats, and body seals in a clean suitable container during installation.*
  - f. Reassemble end plates to body.*
- 2. When brazing, follow standard procedures for brazing minimizing a direct flame on the valve body (center section).*
- 3. When welding, it may be desirable to wrap a damp towel around the center section.*
- 4. After brazing or welding, allow the valve to cool. Reassemble the seats, seals and ball with the valve.*
- 5. Carefully tighten the body bolts diagonally across from each other before securing to the following recommended torque:*

<b>VALVE SIZE</b>	<b>RECOMMENDED BOLT TORQUE</b>
<i>1/2" – 3/4"</i>	<i>10-12 foot-pounds</i>
<i>1"</i>	<i>20-24 foot-pounds</i>
<i>1 1/2" – 2"</i>	<i>30-35 foot-pounds</i>

2 1/2"	45-50 foot-pounds
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6. *After installation, cycle valve several times to assure smooth operation.*

## **OPERATION**

1. *A quarter turn of the handle clockwise closes the valve and a quarter turn counterclockwise opens the valve. Visual indication of the ball position is determined by the handle or stem position: when the handle, or the stem flats, inline with the piping the valve is open; across the line, the valve is closed.*
2. *Cryogenic ball valves perform best with the ball either fully open or fully closed. Consult the factory regarding characteristics of the media or pressure drop for applications other than fully open or closed.*
3. *Any media that might solidify, crystallize or polymerize should not be allowed to stand in the ball valve cavities. In the event that this should happen, DO NOT force the valve in either direction; disassemble and clean before resuming service.*
4. *Break-away torque (i.e., force which must be exerted to start moving the valve ball) will vary depending on the media, pressure and length of time between cycles, as well as valve seat and packing materials. Consult the factory for specific values.*

## **MAINTENANCE**

*A repair kit containing the appropriate number of components is available for rebuilding each size and configuration of valve. Be sure to specify the complete valve model number, and the TBV Inc. sales order number that is stamped on the valve body, when ordering. Additional components, such as balls, stems, etc. are also available for repair purposes. Refer to illustration for part identification.*

### **AT ALL STAGES OF THE FOLLOWING DIS-ASSEMBLY AND RE-ASSEMBLY PROCEDURES, CARE MUST BE TAKEN TO AVOID DAMAGE TO ALL SEALING SURFACES.**

1. *Before removing valve from line, make absolutely certain that line pressure is shut down, and that the line is vented, to remove all pressure from the valve. Operate the valve to assure that there is no pressure or media trapped within the valve body cavity. Flush the line as appropriate to remove harmful chemicals that may be present.*
2. *Remove the valve from the line. Be certain to fully decontaminate the valve, if it has been used in services that have any degree of toxicity. Wear protective gloves and clothing as appropriate to avoid contact with potentially harmful chemicals.*
3. *Before removing valve from line rotate ball into the open position.*
4. *Remove four body bolts and disassemble from line making sure to allow sufficient pipe end clearance for center section removal.*
5. *Remove body seals from end plates.*

6. Rotate valve ball to closed position and remove seats and ball.
7. If it is necessary to replace the stem seal, remove the handle nut, lockwasher, handle, packing nut, stop and follower in that order. Lower stem into body cavity, unscrew set screw and collar and remove thrust bearing. Lift stem through stem extension and replace stem seal assembly.
8. Clean and inspect all components to be sure that they are free from foreign matter and pit marks, paying particular attention to the areas that must maintain a seal (e.g., finished diameter on stem, inside pipe end surface, ball, and bonnet hole). These areas should be free from scratches and pitting.
9. Once all components have been cleaned, inspected, and replaced as necessary, the valve can be rebuilt using the factory repair kit recommended.
10. Reassemble new stem seal package (refer to illustration).
11. Replace follower, stop and stem seal adjusting nut loosely.
12. Assemble ball into body cavity while stem is in the closed position. Once ball is engaged with stem, rotate to open position. This will prevent the ball from falling out during assembly.
13. Insert new seats into body and body seals on pipe ends.
14. Assemble center section back into line again making sure there is sufficient clearance to avoid end plate sealing surface damage.

*NOTE: Reassembly of the center section can only be replaced one way. This has been designed to ensure valve relief to the upstream side will be maintained as originally installed.*

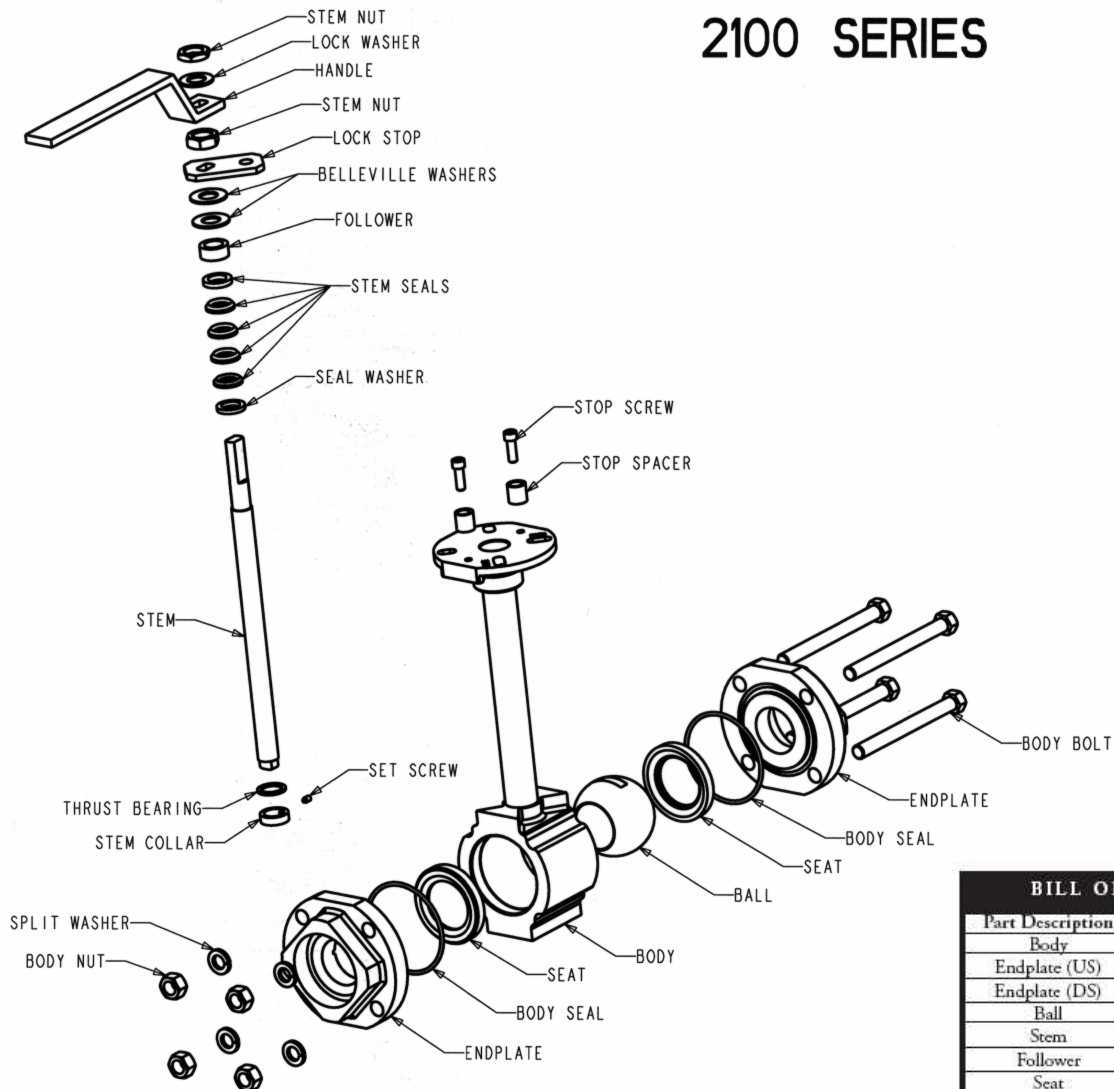
15. Assemble body bolts and nuts to valve. Tighten as indicated in Steps 5 & 6 of the installation procedure.
16. Adjust stem packing as follows:
  - a. Tighten packing nut firmly. The following approximate torque values are given as a guide. It is recommended that the packing be compressed, relaxed, and then re-compressed to these same values. This has been found to provide optimum life for the stem packing.

**NOTE: Periodic stem packing adjustment may be required depending on pressure and temperature and number of cycles. Refer to the recommended stem nut torque chart located below**

<i>VALVE SIZE</i>	<i>STEM NUT TORQUE</i>
<i>1/2" – 3/4"</i>	<i>80-100 inch-pounds</i>
<i>1"</i>	<i>140-180 inch-pounds</i>
<i>1 1/2" – 2"</i>	<i>250-300 inch-pounds</i>
<i>3" – 4"</i>	<i>75-95 foot-pounds</i>
<i>6" – 8"</i>	<i>90-110 foot-pounds</i>

- b. Cycle valve several times to assure smooth operation.
- c. It is recommended that the rebuilt valve be pressure tested prior to re-installation. Perform seat and shell tests using media compatible with the service, checking for any evidence of leakage. If necessary, adjust packing nut in 1/6 turn increments as necessary to stop leakage. Do not over-tighten, as this will shorten the life of the packing. If there is leakage at the flange joint due to body seal leakage, verify proper and consistent body bolt torque. If leakage persists, check for proper installation of the body seals.
- d. Install valve in line following procedures described above.

17. Valve is now ready for service.



Repair Kit Items: seats, stem seal, body seals and thrust bearing. When ordering a repair kit, customer must provide valve code and sales order number stamped on the body of valve: Example: Repair kit for 10S 21 150 6L6L CT 0 (Part Number) S16754-3 (Sales Order Number)

BILL OF MATERIALS		
Part Description	Qty.	Material
Body	1	ASTM A351
Endplate (US)	1	TYPE CF3M
Endplate (DS)	1	
Ball	1	ASTM A479
Stem	1	TYPE 316
Follower	1	300 SS
Seat	2	Cryofil
Stem Seal	1	Virgin P.T.F.E.
Body Seal	2	Virgin P.T.F.E.
Stop	1	300 SS
Stem Nut	2	300 SS
Handle	1	300 SS
Thrust Bearing	1	Filled P.T.F.E.
Body Bolt	4	300 SS
Body Nut	4	300 SS
Lockwasher	1	400 SS
Collar	1	300 SS
Set Screw	1	300 SS
Seal Washer	1	300 SS
Belleville Washer	1	17-7 SS