CONVALVE

SPECIALIST IN VALVE AUTOMATION

# 3 PIECE BALL VALVE
# USER MANUAL



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## INTRODUCTION

Thank you for purchasing Convalve products. Each product has been thoroughly inspected after its production to offer you the highest quality and reliable performance. Please read the product manual carefully before installing and commissioning the product.

- Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly.
- The manual should be provided to the end-user.
- The manual can be altered or revised without any prior notice. Any changes in product's specification, design, and/or any components may not be printed immediately but until the following revision of the manual.
- The manual should not be duplicated or reproduced for any purpose without prior approval from Convalve.
- In case of any other problems that are not stated in this manual, please make immediate contact with Convalve for assistance.

## TRANSPORTATION AND STORAGE

- Convalve recommends storing the ball valve in a clean and dry environment. For optimal storage conditions, it is recommended to store the ball valve indoors, safeguarding them against adverse weather conditions and other potentially harmful elements. Ball valves should be stored in the fully open position to protect the ball and seats. At Convalve, we prioritize the longevity and performance of our products, and these storage guidelines are meant to preserve the ball valve's functionality and reliability throughout its lifecycle.
- Handling the ball valves with care is of utmost importance to prevent any scratches, damage, or harm to the environment during transportation. Adequate protection should be provided to ensure the ball valves remain intact throughout the transportation process.

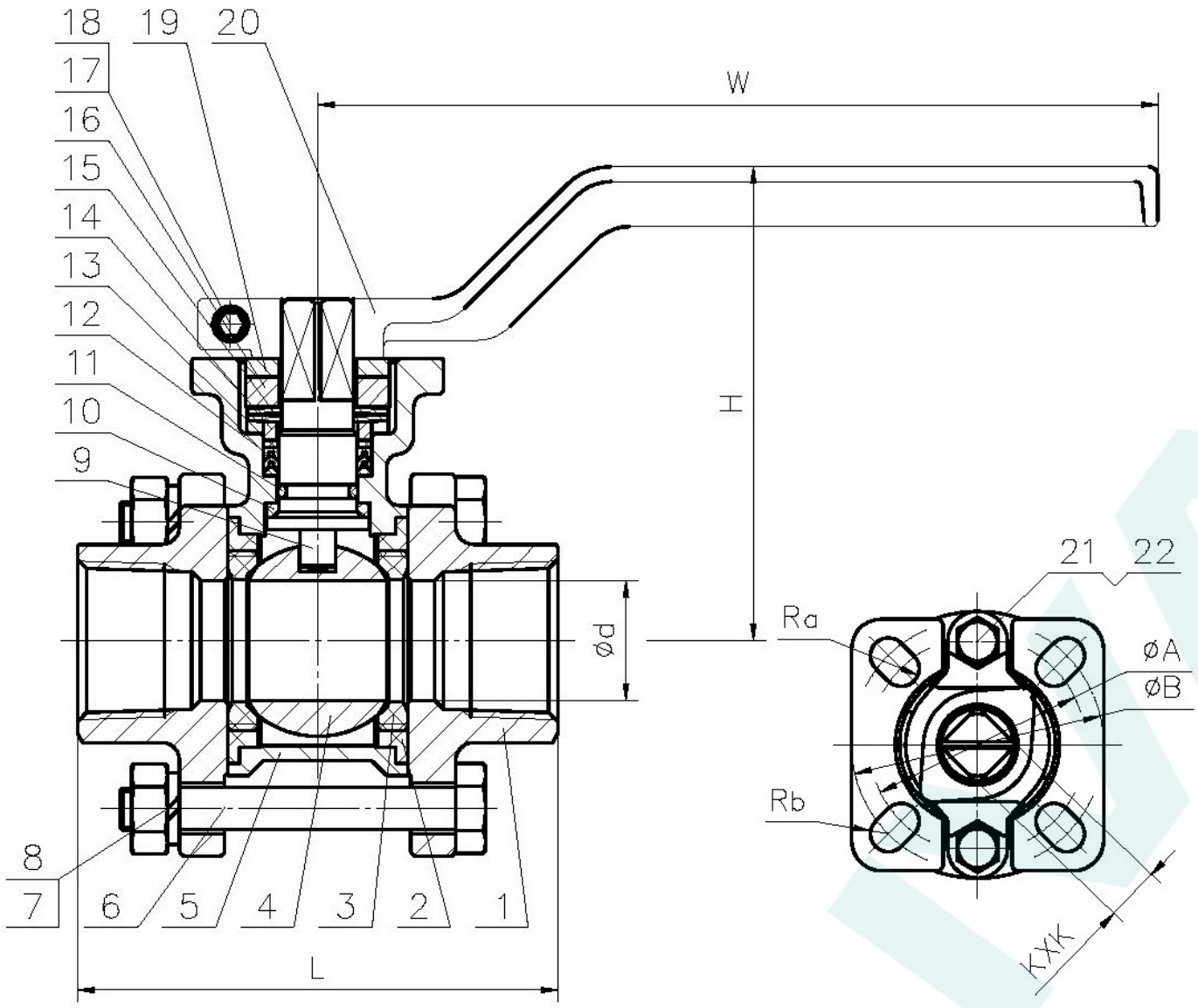
## DESCRIPTION

This precision-engineered valve exhibits a full-port, three-piece configuration, realized through the advanced investment casting method, employing a robust stainless steel composition for both the body and the ball. This construction ensures a consistent fluid flow with a substantially reduced pressure drop across the mechanism. The valve incorporates a finely adjustable live-loaded stem packing system, meticulously designed to counteract operational wear and the dynamic fluctuations of pressure and temperature, thereby significantly extending the functional longevity of the apparatus. Additionally, the stem is constructed with a blow-out-proof feature to enhance the safety parameters of the device. For maintenance efficiency, the valve's structural integrity is secured with strategically placed bolts, allowing for expedient disassembly and servicing.

## FEATURES

- Full port, 1/4"~4" (DN8~DN100)
- W.P.:1000WOG (PN63)
- W.T.:-20˚C~180 ˚C
- Investment casting
- Blow-out proof stem
- Live-loading design
- Anti-static device(option)
- Locking device handle
- ISO 5211 Direct mounting pad
- Automation accessories(option)
- Thread type: ASME B1.20.1(NPT), DIN 259 / DIN 2999, BS 21 ISO 288-1, ISO 7-1
- Socket weld type: ASME B16. 11& DIN3239 part2
- Butt weld type: ASME B16.25 & DIN3239 part1

## PARTS IDENTIFICATION




| ITEM | PARTS | MATERIAL | | |
|---|---|---|---|---|
| 1 | BONNET | WCB | CF8 | CF8M |
| 2 | GASKET | PTEE | | |
| 3 | SEAT | PTPE | | |
| 4 | BALL | 304 | 304 | 316 |
| 5 | BODY | WCB | CF8 | CF8M |
| 6 | BOLT | 304 | | |
| 7 | SPRING WASHER | 304 | | |
| 8 | NUT | 304 | | |
| 9 | STEM | 304 | 304 | 316 |
| 10 | STEM WASHER | PTFE+25% GF | | |
| 11 | 0 RING | FPM | | |
| 12 | PACKING | PTFE | | |
| 13 | WEAR WASHER | PTFE+25% GF | | |
| 14 | GLAND | 304 | | |
| 15 | DISC SPRING | 304 | | |
| 16 | PACKING GLAND | CF8 | | |
| 17 | HEX SOCKET BOLT | 304 | | |
| 18 | NUT | 304 | | |
| 19 | STOPPER | 304 | | |
| 20 | HANDLE | 201 | | |
| 21 | BOLT | 304 | | |
| 22 | NUT | 304 | | |

## GENERAL INFORMATION FOR INSTALLATION IN THE FIELD

The valve's design allows for versatile orientation during installation on the pipeline, with a recommendation for positioning it in the fully open state to ensure optimal performance. It is crucial to align the adjoining pipes accurately on both ends of the valve to avert the imposition of external piping stresses, which can lead to undue strain and potential leaks at the body joint.

Before valve installation, it is imperative to thoroughly purge the pipes of any contaminants, such as dirt, burrs, and welding detritus. Failure to do so can result in damage to the valve's seats and the surface of the ball. Should installation of the valve occur before the pipeline system has been adequately cleansed, the valve must be left in fully open condition until the system has been completely cleared of all foreign material.

In the context of hydrostatic testing for the pipeline system, the valves must be either fully or halfway open before the system is pressurized. This precautionary step is necessary to ensure the integrity of the valves during the testing process.

**ATTENTION!**

**Conducting hydrostatic testing of the system with the valve in a closed configuration can lead to damage to the valve seats. This damage has the potential to compromise the valve's capacity to form an effective seal. Non-compliance with the specified installation and testing guidelines that lead to valve malfunction will invalidate the product's warranty protection.**

**Valves dispatched from the manufacturing facility may be treated with a silicone-based lubricant intended for initial break-in purposes. If this lubricant is unsuitable for the intended application, it can be eliminated by disassembling the valve and performing a solvent wash.**

To guarantee an extended service life, the valve should be included in a systematic preventative maintenance routine, adhering to the manufacturer's guidelines for pressure, temperature, and corrosion resistance. For optimal preservation during shipment, storage, and operation, the valve should be positioned in either a completely open or closed state, with a fully open position being favored for shipping and storage. The valve should not be employed for modulating flow service without a thorough examination of flow dynamics and pressure conditions.

Before the installation of this apparatus, it is essential to verify its compatibility with the intended operational service. The attached identification tags provide detailed information regarding the maximum permissible service conditions for this product. Ensure that the installation includes proper pressure control and safety mechanisms to guarantee that the established acceptable limits are maintained and not surpassed.

## OPERATION

To operate the valve, the handle should be rotated a quarter turn (90 degrees). Turn the handle clockwise to close and counter-clockwise to open.

**Valve Open Position:** When the valve is in the open position, the handle aligns parallel to the pipeline.

**Valve Closed Position:** In the closed position, the handle is positioned perpendicular to the pipeline.

For valves equipped with actuators, it is crucial to verify the alignment between the actuator and the valve. Any misalignment can lead to increased operational torque, potentially causing damage to the valve stem and seals.

## ADJUSTMENT OF THE STEM SEAL

1. **Leakage Detection:** If a slight leakage is observed at the stem, begin by straightening the tab on the lock washer.
2. **Tightening:** Adjust the stem gland nut in ¼-turn increments. This action compresses the Belleville washers to stop the leakage.
3. **Belleville Washer Compression:** If the Belleville washers become fully compressed (lying flat), loosen the stem gland nut by 1/4 turn to avoid over-tightening.
4. **Securing the Adjustment:** Once the adjustment is completed and the leakage has stopped, secure the lock washer tabs against the stem gland nut to maintain the setting.

**For Valve Sizes Larger than 2½ :**

1. **Even Tightening:** Simply tighten the gland bolts evenly, using 1/4 turn increments, until the leakage ceases.
2. **Avoid Over-Tightening:** Take care not to over-tighten the packing as it can lead to increased operating torque and faster wear of the packing material.

**General Guidelines :**

1. **Torque Reference:** Refer to **Table 1** for the recommended stem gland nut and gland bolt torque settings for a new valve assembly.
2. **Service Adjustments:** Be aware that when making packing adjustments while the valve is in service, the torque values may vary due to factors such as cycle frequency, temperature, and other operating conditions.

**ATTENTION!**

**It is critically important for safety to never remove the stem gland nut, gland bolts, or any other components that contain pressure while the line is pressurized. Tampering with these parts under pressure can lead to dangerous situations, including the risk of injury or damage to the equipment. Always ensure the line is completely depressurized before performing any maintenance or adjustments involving pressure-containing components of the valve. Safety must always be the primary consideration in all maintenance and operational procedures.**

Stem seal leakage can often be rectified without the need to disassemble the entire valve. This can be achieved by adjusting the tightness of the stem gland nut or gland bolts, depending on the size of the valve, until the leakage ceases.

**Follow these steps:**

1. **Identify the Correct Component:** For smaller valves, this will typically involve the stem gland nut, whereas for larger valves, the gland bolts are the focus.
2. **Gradual Tightening:** Incrementally tighten the stem gland nut or gland bolts until the leakage stops. This process should be done carefully to avoid over-tightening.
3. **Monitor Valve Operation:** After adjusting, observe the valve's operation. If the leakage persists or if you notice an excessive increase in the operating torque, this is indicative of worn seals.
4. **Seal Replacement:** In cases where tightening does not resolve the leakage, or if there is a noticeable increase in operational difficulty, the seals have likely worn out and require replacement.

### TABLE 1 - RECOMMENDED STEM NUT/BOLT TORQUES

| VALVE SIZE NPS | RECOMMENDED TORQUE LB-IN |
|---|---|
| **1/4** | 50 |
| **1/2** | 50 |
| **3/4** | 50 |
| **1** | 90 |
| **1-1/4** | 90 |
| **1-1/2** | 170 |
| **2** | 170 |
| **2-1/2** | 240 |
| **3** | 180 |
| **4** | 180 |

| VALVE SIZE DN | RECOMMENDED TORQUE NM |
|---|---|
| **8** | 5.65 |
| **15** | 5.65 |
| **20** | 5.65 |
| **25** | 10.16 |
| **32** | 10.16 |
| **40** | 19.20 |
| **50** | 19.20 |
| **65** | 27.11 |
| **80** | 20.33 |
| **100** | 20.33 |

## TECHNICAL INSTRUCTIONS FOR VALVE INSTALLATION

### 1. INSTALLATION OF THREADED END VALVES

**Thread Sealant Application:**
- **Recommendation:** Use conventional sealants such as hemp core or Teflon for best results.
- **Purpose:** Ensures a secure and leak-proof connection in threaded valve installations.

**Correct Wrench Usage:**
- **Method:** Apply the wrench only on the hex/octagon nearest to the valve end being tightened.
- **Warning Against Misapplication:** Avoid applying torque to the opposite end cap or other valve components to prevent damage.
- **Best Practice:** Utilize a wrench on both the near-end cap and the pipe, thereby avoiding undue torque on the valve body through the bolting.

**Back-Welding Threaded End Valves:**
- **Alignment and Spacing:** Confirm alignment of end cap bolt holes with the body bolt holes and ensure end caps are parallel and correctly spaced.
- **Pre-Welding Assembly:** Assemble the threaded connections normally, then remove the body assembly as detailed in Section 2 for weld-end connections before back welding.
- **Important Caution:** Do not use body bolts/studs for pulling pipe ends together or aligning them.

### 2. INSTALLATION OF WELD-END VALVES

**Welding Procedure Compatibility:**
- **Essential Requirement:** Use welding procedures that are compatible with the valve materials.

**Tack Welding the Valve:**
- **Initial Step:** Securely tack weld the valve to the pipe at four points on both end caps.
- **Valve Positioning:** The valve should be in the open position (handle parallel to the valve and pipe axis) during this phase.

**Component Removal for Welding:**
- **Process:** Loosen all body bolts, and remove the valve body, seats, and gaskets.
- **Ball Removal:** Shift the handle to the closed position to remove the ball.
- **Storage:** Keep all removed parts in a clean and secure area.

**Reassembly Precautions:**
- **Partial Reassembly:** Reinsert and slightly tighten the body and all body bolts between the end caps. This step ensures that the body and end caps remain parallel, preventing leakage at the body joint post-welding.
- **Final Welding:** Complete the welding of both end caps onto the pipe.

**Post-Welding Actions:**
- **Cooling and Cleaning:** After cooling, remove the body, and clean the end caps.
- **Reassembly:** Follow the reassembly instructions provided in Page 7.

**Notice on Body Gasket Usage:**
- **Gasket Replacement:** Use a spare body gasket for reassembly, as the original is likely to be compressed during the initial assembly and tightening.

**Final Assembly Steps:**
- **Positioning:** Place the body between the two end connections.
- **Bolt Replacement and Tightening:** Reinsert all body bolts and tighten them in a cross or star pattern, as per the torque values in **Table 2** This pattern is crucial to prevent uneven loading of the body seal.

### TABLE 2 - RECOMMENDED TORQUE FOR BODY BOLTS/BODY NUTS

| VALVE SIZE NPS | RECOMMENDED TORQUE LB-IN |
|---|---|
| **1/4** | 70 |
| **1/2** | 130 |
| **3/4** | 130 |
| **1** | 130 |
| **1-1/4** | 200 |
| **1-1/2** | 200 |
| **2** | 200 |
| **2-1/2** | 820 |
| **3** | 530 |
| **4** | 996 |

| VALVE SIZE DN | RECOMMENDED TORQUE NM |
|---|---|
| **8** | 7.90 |
| **15** | 14.69 |
| **20** | 14.69 |
| **25** | 14.69 |
| **32** | 22.60 |
| **40** | 22.60 |
| **50** | 22.60 |
| **65** | 92.65 |
| **80** | 59.88 |
| **100** | 112.53 |

## DISASSEMBLY PROCEDURE

**ATTENTION!**

1. **Depressurizing the Line: Always ensure the line is depressurized before starting disassembly. Cycle the valve after draining to relieve any trapped pressure.**
2. **Handling Pressurized Media: Ball valves can trap pressurized media when closed. Half-open the valve to flush the line and remove hazardous media. Decontaminate the valve if it controlled hazardous media.**
3. **Safety Precaution: Never attempt to remove packing components or other parts while the line is pressurized.**
4. **Valve Support: Properly support the valve during disassembly, especially larger sizes, to prevent injury from swinging or falling.**
5. **Actuation and Power Disconnection: Remove actuation air and power connections. Ensure no stored energy (like compressed springs or trapped air) remains in the actuation system.**

**DISASSEMBLY FOR STEM AND SEAL SERVICE**

**FLANGE REMOVAL NOT REQUIRED:**

- Removing flanges from the pipeline is unnecessary for this service. Detaching actuation and controls may ease the service process.
- Remove one upper body bolt and loosen the others.
- The center body will swing out for service, leaving end caps in place on the pipe ends.

**NOTE:** In-line service by swinging the center section out is not recommended for valves larger than 4 inches due to size and weight.

**COMPLETE VALVE REMOVAL:**

- To fully remove the valve, take out the remaining upper body bolt and lift the body free.
- Support the body gently in a vise, holding it horizontally across its diameter to avoid damaging seal surfaces.

**COMPONENT REMOVAL:**

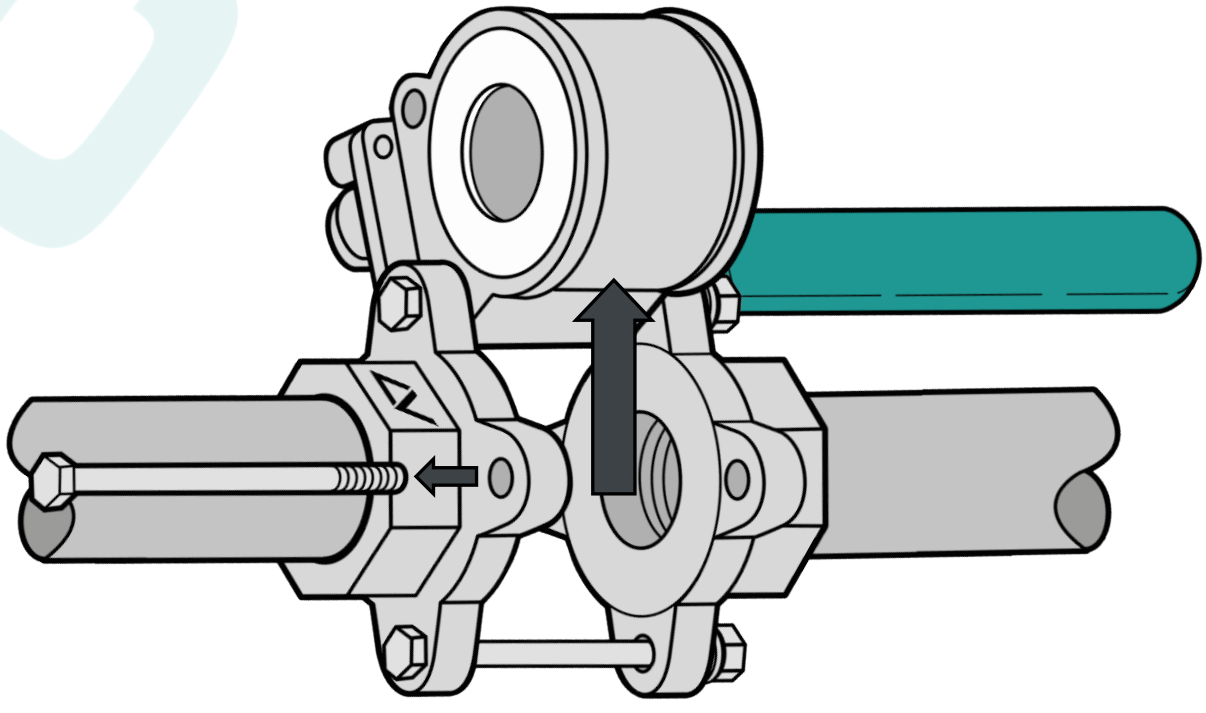
**Seats, Seals, and Supports:**
- Remove the seats, body seals, and seat supports.
- Remove the handle nut and handle.
- Straighten the tab lock washer, remove the stem gland nut, Belleville washers, and packing gland.

**Ball and Stem Removal:**

**1. Ball Removal:**
- Fully close the ball by rotating the stem.
- Lift the ball from the body, using a strap and lift device if necessary.
- **Be extremely cautious to avoid damaging the ball.**

**2. Stem Removal:**
- Tap the top of the stem to loosen and remove it from inside the body.
- The thrust washer, washer protector, and bearing (if applicable) should come out with the stem.
- Remove the stem packing set and protector from the packing box, using tools like a screwdriver or pick carefully to avoid scratching the inner diameter of the packing box.

**NOTE:** The valve can be disassembled for servicing seats and stem seals without removing the end flanges from the pipeline. This allows valve removal from service without disturbing piping connections.



## VISUAL INSPECTION

**Cleaning and Inspection of Metal Parts:**
- Thoroughly clean and inspect all metal components of the valve.
- Assess the condition of the ball and stem, focusing on their sealing surfaces.

**Assessment for Replacement:**
- Ball and Stem: Replace these parts only if they have been damaged by abrasion or corrosion.
- Soft Parts: Strongly recommended to replace all soft parts whenever the valve is disassembled for reconditioning. This is crucial to prevent leakage after reassembling the valve.

**Ordering Replacement Parts**: Replacement soft goods can be ordered in kit form for convenience.

**NOTE:**

**Dry Assembly and Operation:**
- The valve can be assembled and operated dry, which is essential in systems where lubricants are not permitted.
- However, lightly lubricating mating parts can facilitate assembly and reduce initial operating torque.

**Lubricant Compatibility:** If used, the lubricant must be compatible with the intended line fluid to avoid any adverse reactions or contamination.

## VALVE REASSEMBLE

1. **Securing the Valve Body :** Hold the body horizontally in a vise. Ensure it's secure but not crushed.

2. **Stem Assembly:**
- Place the thrust washer protector and thrust washer on the valve stem.
- Insert the stem into the stem bore from inside the valve body.
- Slide the stem packing set onto the stem into the packing box.
- Add the packing protector and packing gland onto the stem.

3. **Installation of Washers and Nut:**
- Install Belleville washers (in alternating orientation), tab lock washer, and stem gland nut. Tighten by hand.
- Note: Belleville washers should have their concave sides facing each other.

4. **Positioning the Stem and Ball:**
- Turn the stem so its upper flat is perpendicular to the valve centerline (closed position).
- Install the ball in the valve body, aligning lower stem flats with the slot on the ball.
- Turn the stem to open the ball (preventing it from falling out).

5. **Installing Seats and Body Seals:** Install seats and body seals into the body ends, ensuring the spherical side of the seat faces the ball.

6. **Positioning the Valve in Pipeline:**
- Lift the valve between the flanges in the pipeline.
- Install body bolts, spring lock washers, and nuts. Cross-tighten all nuts as per values in Table 2.

7. **Using a Bore Alignment Tool:**
- Insert a bore alignment tool through the end cap and ball to prevent ball rotation while tightening the stem gland nut.
- The tool should be slightly smaller than the internal diameter of the end cap and ball, and made from a material softer than 300 Series SS, like aluminum T6061 or a suitable hard polymer/plastic.

8. **Final Tightening:**
- Tighten the stem gland nut to values in Table 1.
- If a leak is noticed at the stem, tighten the stem gland nut in 1/4 turn increments until sealed.
- Bend tabs on the tab lock washer to secure it against the stem gland nut.

9. **Handle Installation:** Place the handle onto the stem, securing it with the handle nut.

10. **Cycling the Valve:** Slowly cycle the valve several times to allow seats to align and conform to the ball. Avoid fast turning initially to prevent seat damage.

**POST-RE-ASSEMBLY COMMISSIONING**

**Operational and Stem Seal Adjustment:** Refer to provided instructions to commission the valve after re-installation, if necessary.

**Automated Installations:** Follow instructions accompanying actuation instrumentation for correct setup and recalibration.