WILLIAMS VALVE

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

FLOATING BALL VALVE

WILLIAMS VALVE CORP.
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Revision	Effective Date	Description	Prepared by	Approved by
01	2025-09	Updated to new IOM format from legacy format	Eric Chen	Foster Voelker II

SAFETY GUIDELINES

Prior to commencing any valve maintenance or service work, it is essential to ensure that Operations has locked out, isolated, and fully depressurized all relevant piping and equipment to establish a safe working environment.

Maintenance must not proceed until Operations has formally confirmed that it is safe to do so.

All jobsite safety protocols, lockout/tagout procedures, and work permit requirements must be followed without exception. Special attention should be given to double-seated valves, such as ball valves and wedge gate valves, as the body cavity may remain pressurized even after the process lines have been depressurized. Therefore, personnel must exercise caution and verify that all valve cavities are completely depressurized before commencing any service or disassembly work.

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1 FOREWORD

The improper installation, operation, or maintenance of a valve can pose significant risk to personnel and the environment. The following instructions are offered as a reference to aid the valve user when installing, maintaining or operating Williams Floating Ball valves. This document consists of basic information should be of interest to the layman as well as the experienced valve user; however, it does not replace the need for an understanding of the particular application and is not intended to be a complete instruction for the inexperienced valve user.

2 VALVE COMPONENTS

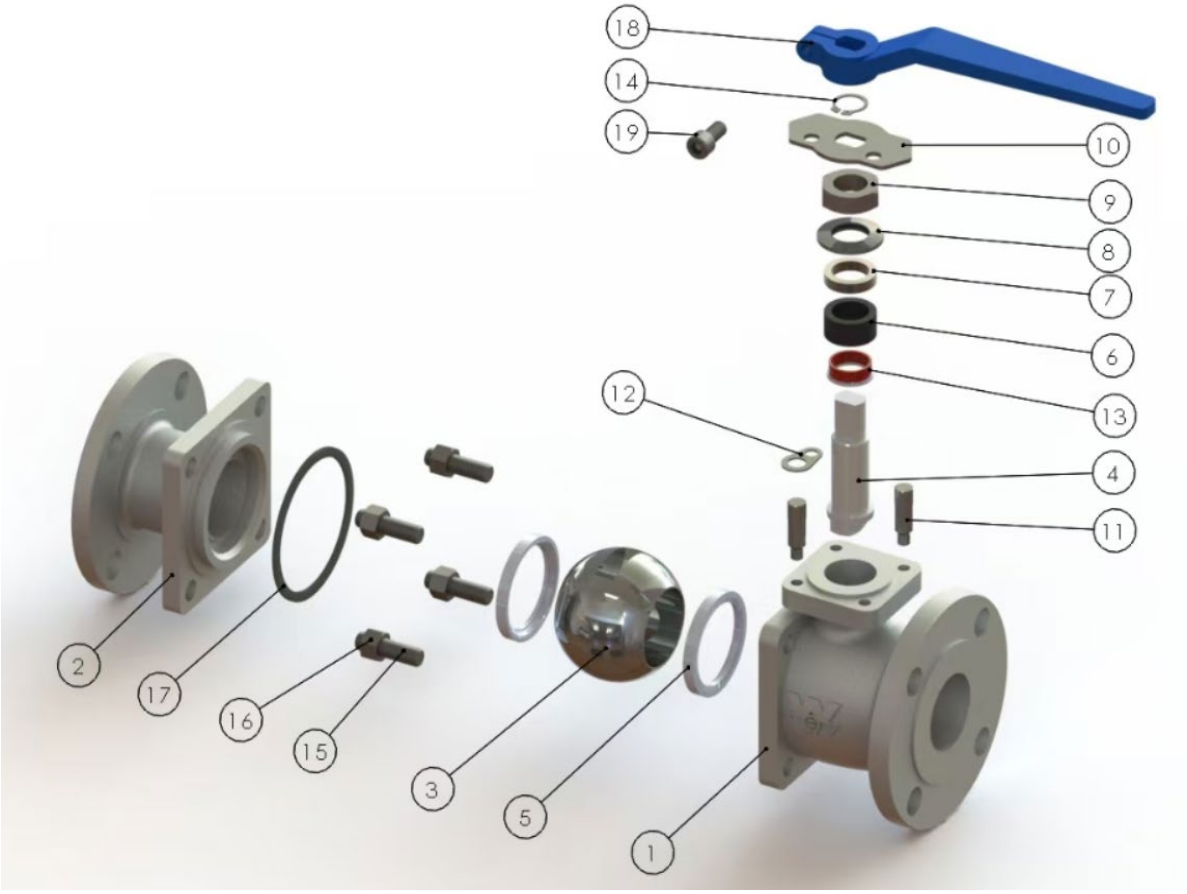

Figure 1: Belleville Spring Structure
(See Table 4)

No.	Part Name	No.	Part Name
1	Body	11	Stop Pin
2	End piece	12	Lock Washer
3	Ball	13	Stem sleeve
4	Stem	14	Retainer
5	Seat	15	Stud
6	Packing	16	Nut
7	Gland	17	Body gasket
8	Belleville Spring	18	Lever
9	Gland Nut	19	Bolt
10	Stop plate		

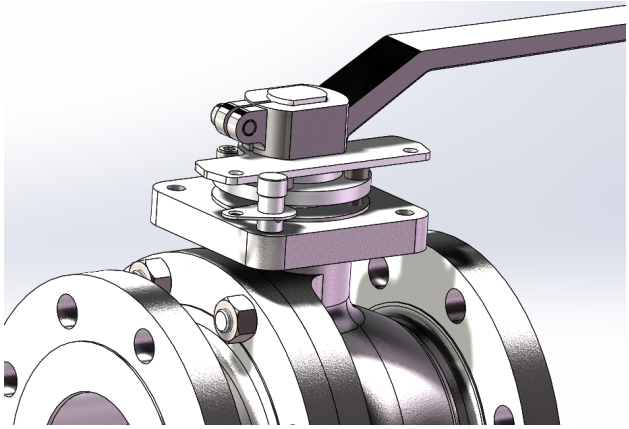

Figure 2: Gland Flange Structure
(See Table 4)

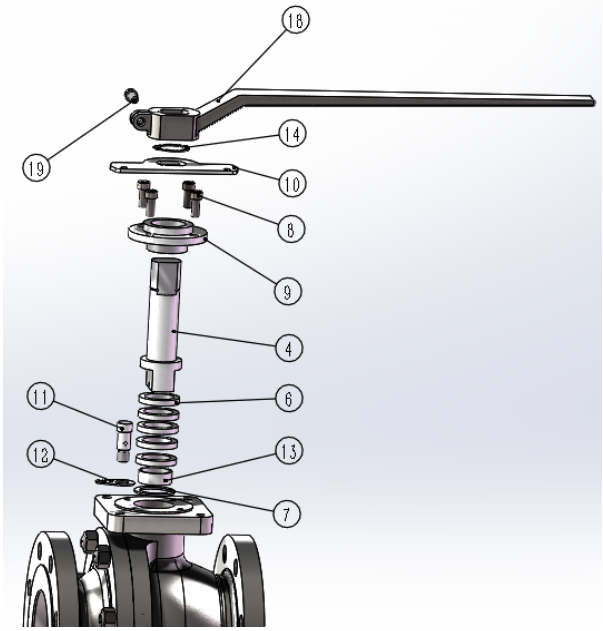

Figure 3: Exploded view
(See Table 4)

No.	Part Name	No.	Part Name
4	Stem	11	Stop Pin
6	Packing	12	Locking Plate
7	Thrust Bearing	13	Stem Sleeve
8	Gland Flange Bolt	14	Retainer
9	Gland Flange	18	Lever
10	Stop Plate	19	Screw

3 GENERAL INSTRUCTIONS

3.1 RECEIVING & HANDLING

A. Upon receipt, valves should be inspected for shipping damage. The areas to inspect are the pressure retaining shell, valve ends, and valve operating mechanisms such as handwheel, lever, actuator, stem, etc. Any damage observed during the inspection should be documented in an inspection report. Significant damage should be reported to Williams Valve Corporation to determine if repair or replacement of the equipment is necessary.

B. Valves should be stored in a sheltered environment providing adequate protection from weather, dirt, and damage. Materials attached to protect valves during shipment should not be removed until time of installation in the line.

C. Valves should only be handled with equipment that will safely support the valve assembly weight. Slings should never be placed around the handwheel, lever, stem or gland adjustment parts. Protect the valve ends by leaving end protectors in place until removal is necessary. Valves are shipped in the open position, to avoid damaging the ball surface.

D. Once the Equipment is installed, it is expected that the system will be operational within a reasonable time limit. No extraordinary care is required to maintain the equipment during idle time. However, prior to returning the equipment to service, it is recommended that it be checked for smooth operation and proper tightness of packing.

E. For installed equipment that is expected to be idle for more than six months it is recommended that the valve be cycled from fully closed to fully open and returned to the idle position of the valve. This valve cycling should be performed once every six months for the duration of the idle period.

3.2 VALVE TRANSPORTATION / STORAGE

A. Valves should be adequately packaged to ensure protection from atmospheric conditions prior to transportation or storage. If the packaging is damaged, repair it so that the valve can be safely stored and transported. Avoid rotating the handwheel or lever before installation if possible.

B. Actuator and valve may be packaged separately.

C. The paint, the nameplate and the sealing faces of the end flanges shall be protected during transportation. No part of the valve can be dragged on the ground and the valve must be adequately protected from abrasion and impact during transport.

The valve shall be stored at a safe location to protect against rain and dust if it will not be installed immediately. Valves shall be stored in a ventilated and dry warehouse for protection. It is not permitted to store the valve outdoors.

D. Ball valves must remain fully open during transportation and storage to avoid damage to the ball.

E. Inspect and clean the valve if it has been stored over six months. Pressure test prior to use if the valve has been stored over twelve months.

3.3 PREPARATION FOR INSTALLATION

A. Prior to installing the valve, clean out all dirt and foreign matter from inside the piping system. Wherever possible, the line should be blown out with clean compressed air or flushed out with water to remove all dirt and grit. The valve should be cleaned out in a similar manner.

B. Check for adequate clearance around the valve to ensure that it may be operated properly and that enough free space is available for maintenance of the valve.

C. Valves with actuators will require additional clearance around them for making service connections and maintenance to the actuator.

3.4 INSTALLATION

A. Precautions:

1. The valve body is a rugged structure but is not intended to be a means of aligning improperly fitted pipe. Care must be taken to ensure that any stresses caused by improper pipe alignment are relieved elsewhere in the piping system. Piping should be supported by hangers placed on either side of the valve and large heavy valves should be independently supported.

B. The following general rules should be followed when installing the valve in the pipeline:

1. Keep pipe ends free of dirt, spatter, and grit.

2. Install the valve with flow in the proper direction with regard to valve internals. Ball valves are normally installed in horizontal pipes with the stem facing up. However, there are no limitations regarding the pipe or stem orientation. Ball valves are designed for bidirectional flow unless the ball is prepared for cavity relief. For a ball with a cavity relief, ensure that the installation of the valve is correct with respect to the flow direction arrow marked on valve.

3. Handle the valve only with equipment that will adequately support it, using a safe and proper technique.

4. Install the valve using good piping practices as governed by the applicable code or specification.

5. Flanged End Valves

   a. Check and align pipe flanges before valve installation.
   b. Use proper gasket type and size.
   c. Clean debris, dirt, and any other foreign particles off the surface of the flanges.
   d. Do NOT ATTEMPT TO FIT TWO FLANGES THAT ARE NOT ALIKE TOGETHER. For example, flat face with flat face or raised face with raised face is the proper procedure.
   e. Do NOT TIGHTEN BOLTS IN A CIRCULAR PATTERN: bolts must be tightened in a crossover or star pattern to load the gasket evenly.

6. Butt-Weld End Valves

   a. Valve, pipe, and weld rod must all be of materials that are mutually compatible.
   b. Welding should be performed by a qualified welder using the correct welding equipment and following all applicable site and industry procedures.
   c. After completion of the weld, it should be stress relieved if required by the welding procedure and subjected to a pressure test to ensure a sound weld.
   d. For butt-weld end valves, a sleeve pipe design is recommended to prevent damage to the soft-seated sealing surfaces from excessive temperatures during welding of the valve to the pipeline.
   e. For additional information, refer to WEW-RP-001 Guidelines for Installation of Weld End Valves.

3.5 POST INSTALLATION

A. Standard valves may be installed in either direction. Valves with an upstream relief hole in the ball, are uni-directional and must be fitted with the flow arrow pointing downstream.

B. Ball valves shall be of quarter-turn design (90° rotation) with clockwise closing and counterclockwise opening (Fig. 4). For lever-operated valves, ensure adequate clearance for unobstructed operation. For gear operated valves, the position is indicated by the arrow-indicator (Fig. 5).

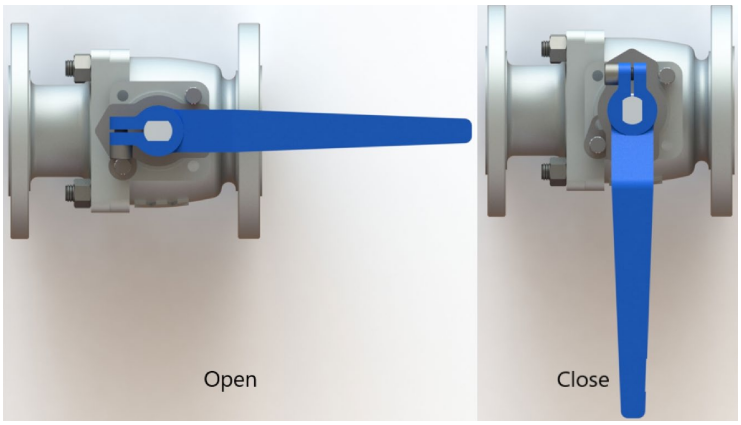

Figure 4

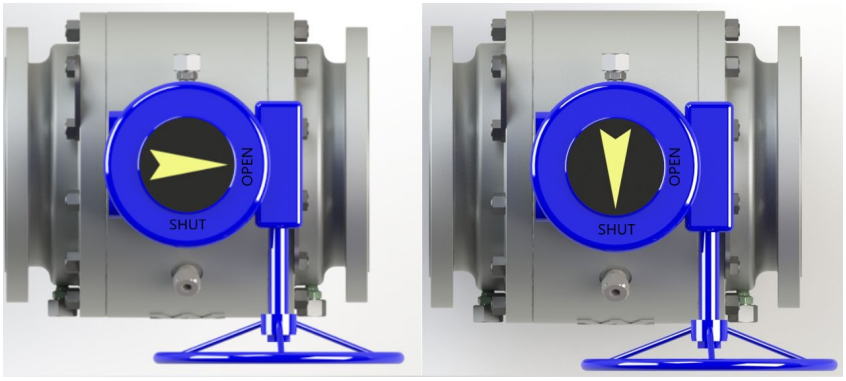

Figure 5

C. Verify the tightness of body/end piece joint and packing gland.
D. Operate valve to make sure that nothing is preventing proper operation.
E. Pressure test the system to prove quality of flange bolting, welding, etc.

Note: Use of caustics or other chemical agents to flush pipe and valve may require the removal of the valve packing and gasket based on the compatibility of the flushing agent, gasket and packing material utilized.

3.6 MAINTENANCE & TROUBLE SHOOTING

While valves typically require minimal attention during normal operation, establishing a program for periodic inspection can help ensure optimal service life and reduce the likelihood of unplanned maintenance.

The recommended maintenance schedule is tabulated below in Table 1.

Table 1 - Recommended Maintenance Procedure and Frequency

Area	Purpose	Procedure	Frequency
Stem	Prevention of leakage and improper function.	Visual check for scoring and seizing, especially along sliding surfaces of stem and packing.	When leak is detected or every 2 years.
Bolts &Nuts	Ensure proper tightness of joints.	Check bolt torque.	When leak is detected or annually.
Packing	Prevention of leakage.	Check gland bolting and retighten or adjust as necessary.	When leak is detected or annually.

Items to check on a periodic basis are:

A. In-line leakage: Check that the valve is fully closed. If it is, then any leakage will be due to damage to the body, end piece, ball or seat sealing surfaces and it will be necessary to repair it.

B. Stem leakage: Remove the wrench assembly, or gearbox, followed by the gland nut locking clip and retighten the gland nut to the recommended torque. If leakage still

persists then it will be necessary to dismantle the valve to establish the cause and/or replace the stem thrust seal and gland packing.

C. Body/end piece leakage: Check the tightness of the body bolting and tighten to the recommended torque values if necessary. If leakage still occurs it will be necessary to remove the valve from line to replace the body seal and to establish whether the seal faces of the body and end piece have been damaged.

Occasionally, valve age, type of service or other factors may result in problems such as packing leakage, Body/End piece joint leakage, seat leakage or loss of operation smoothness. The troubleshooting chart presented in the following Table 2 lists typical problems and methods for resolving them. It should be noted that this chart does not present all possible problems and all possible solutions and is not a substitute for regular periodic maintenance. It does, however, list the most common problems that can be encountered and the repair procedure that will most likely return the valve to its proper operational condition.

Table 2 - Troubleshooting Procedures

Observation	Possible Cause	Procedure
Body/End piece Joint Leakage	•Insufficient Bolting Tightness •Seal ring Damaged	•Check Bolting Torque •Replace Seal ring
Packing Leakage	•Packing Compression •Worn Packing •Stem Damage	•Tighten Packing •Replace Packing •Repair or Replace Stem
Seat Leakage	•The seat does not operate properly •The limit switch is improperly installed •Valve is not fully closed	•Clean or repair seat •Re-adjust the limit switch •Operate valve to full closed position
Stem Leakage	• Packing gland nut loose • Packing failure • Stem sealing surface is damaged	•Tighten the nuts evenly to press the packing tightly •Adjust or Replace Packing •Repair or Replace Stem

3.7 COMMON REPAIRS

The following general instructions are offered to make limited repairs to the valve. For major repairs, contact an authorized WILLIAMS VALVE CORPORATION representative for special instructions. Always give the information shown on the identification plate affixed to the valve.

A. Never use pipe wrenches to remove or replace bonnets on small valves, especially bronze. A pipe wrench will pinch or swage the body neck.

B. If leakage is observed through the gland packing, tighten the gland nuts slowly and evenly until the leakage stops.

Do not over-tighten the packing gland nuts, as excessive torque can significantly increase the effort required to operate the valve.

There are two types of packing gland designs:

The first utilizes gland nuts with Belleville springs. In this design, the gland nut should be tightened just enough to allow installation of the lock plate and further adjusted as needed to eliminate leakage during the shell test.

The second design uses gland bolts and a gland flange. For this configuration, refer to the recommended torque values in Table 4. As with the first design, the gland flange should be compressed sufficiently to permit lock plate installation. If leakage is observed during the shell test, the bolts should be incrementally tightened until the leakage stops.

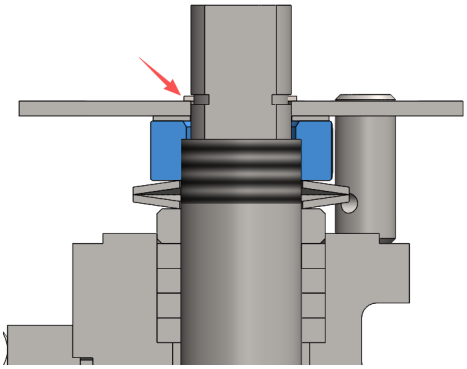

Fig 6a: Belleville Spring Design

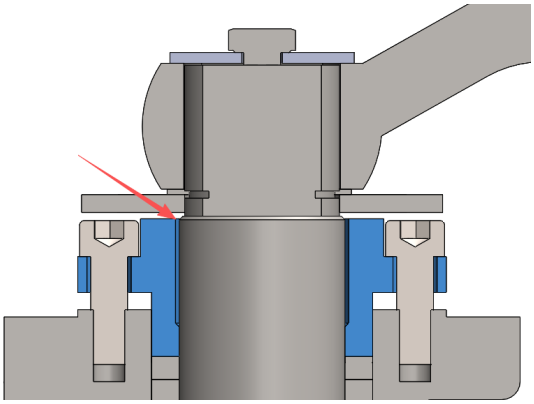

Fig 6b – Gland Flange Design

Replace the gland packing as and when necessary:

1. Unscrew the bolt (pos.19), remove the lever or gear operator (pos.18).
2. Remove the retainer (pos.14), lock washer (pos.12) and stop plate (pos.11).
3. Remove the gland nut (pos.9) and Belleville spring (pos.8), gland (pos.7).
4. Replace the gland packing (pos.6).

Reverse the procedure for re-assembly.

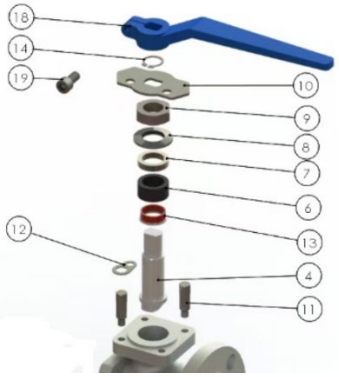

Figure 7

For Gland flange structure, replace the gland packing as and when necessary:
(Please refer to Fig 3)
1. Unscrew the bolt (pos.19), remove the lever or gear operator (pos.18).
2. Remove the retainer (pos.14), lock washer (pos.12) and stop plate (pos.11).
3. Remove the gland flange bolt (pos.8) and gland flange (pos.9)
4. Replace the gland packing (pos.6).
Reverse the procedure for re-assembly.

C. Any sign of leakage through the body joint seal should be addressed immediately by tightening the stud nuts until the leakage stops. Follow the torque table to ensure the correct torque is used when tightening the gland nut.

NOTE: Before removing the valve from the piping, ensure that the system has been fully depressurized and any dangerous fluids have been drained off. Failure to do so may cause serious bodily harm to personnel and/or damage to the valve.

D. Paint Repair - During coating repair, the intact area surrounding the damage must first be lightly abraded and then ground to form a smooth transition layer, ensuring uniform blending between the existing and repaired surfaces. Throughout the repair process, climatic conditions must be controlled in accordance with the parameters established in the original coating procedure. The repaired area shall achieve the specified dry film thickness as defined by the relevant standard, with air spraying or localized brushing recommended depending on the size and nature of the repair. Drying time for the repaired coating must align with the requirements for standard paint application, and no installation or packaging shall proceed until the coating is fully cured. All additional painting requirements must conform to the project-specific painting specifications or, where applicable, the Williams Valve Painting Specification.

3.8 TOOLS & EQUIPMENT

Standard wrenches and tools are generally suitable for servicing valves. Common tools are:

A. Hoist to lift large or heavy items.

B. One set of box-end, open-end, or socket wrenches.

C. One set Allen-type hex key wrenches.

D. Standard packing tool or blunt hook to remove packing rings.

E. Combination oilstone, coarse and fine grit, to polish wedge and seat ring sealing surfaces.

F. Hammer and punches to drive out pins.

3.9 OPERATION

The following is general information on the operation of valves:

A. It is not good practice to leave a soft seated ball valve in the partially open(throttled) position as this will damage the seats and reduce valve life.

B. Any media, which may solidify, crystallise or polymerise, should not be allowed to stand in the ball cavity, as this is detrimental to valve performance and life.

C. When operating the valve, avoid using excessive side loading on the wrench.

D. The operation of the valve consists of turning the wrench a quarter turn clockwise to close. When the handle and the flats of the stem are in line with the pipeline the valve is open.

4 VALVE SPECIFIC STORAGE, INSTALLATION AND MAINTENANCE PROCEDURES

4.1 2-Piece Floating Ball Valve

A. Periodic Inspections

1. Prior to commencing any work on the valve or removing it from line, refer to the "Health & Safety" instructions.

2. Never remove or maintain a valve or joint unless the line has been fully de-pressurised, drained and where necessary, purged of toxic/explosive / flammable media.

B. Valve disassembly

1. With the valve securely clamped and in the open position, undo the fastenings retaining the two body parts.
2. Tap one of the flanges sharply with a mallet to break the joint and separate.
3. With the valve in the closed position remove the ball. If there is a large buildup of solid scale or media in the cavity it may be necessary to tap it out using a soft drift.
4. Using a suitable hook to get under the seat face, remove the seats from the body and the body connector. Care must be taken to avoid damaging the seal faces.
5. Remove the body seal from the interface housing.
6. To dismantle the stem assembly, remove:

For the Disassembly of Gland Packing procedure, please refer to Section 3.7B and Fig 7.
1)Lever or Gearbox (pos.18)
2)Retainer (pos.14)
3)Lock washer (pos.12)
4)Stop Plate (pos.11)
5)Gland nut (pos.9), Belleville spring (pos.8), gland (pos.7)
6)Gland packing (pos.6)
7)Stem (pos.4)

For Gland flange structure, the Disassembly of Gland Packing procedure, please refer to Section 3.7B and Fig 3.
1) Step 1~4, same as the Belleville spring as below.
2) Gland flange bolt (pos.8), Gland flange (pos.9)
3) Gland packing (pos.6)
4) Stem (pos.4)

7. Tap the stem down into the valve cavity and withdraw. The gland packing, location washer, secondary stem seal and thrust seal can now the removed
8. All components not replaced by items in the repair kit should be thoroughly cleaned and stored in a clean secure area. All sealing faces on the body, insert and ball must be checked for corrosion, erosion and scratches. If damage is found or there is any doubt, replace the component.
9. Cleaning the valve parts should be carried out using a suitable degreasing agent. Hard deposits can be removed using wire wool. Care should be taken on all seal faces to avoid damaging them.

C. Valve re-assembly

1. Before re-assembling ensure the repair kit and/or components used are suitable or the valve requirement. When rebuilding, cleanliness is essential for long life. The seats may be lightly lubricated with a light oil to aid bedding in. Ensure that the lubricant is compatible with the pipeline media gear operated valves.
2. Fit a new thrust seal onto the stem shoulder and insert the stem through the valve body form inside the valve cavity.
3. Place the secondary stem seal into the bottom of the gland housing, followed by the location ring, gland packing, gland and stop plate followed by the gland nut.
4. Tighten the gland nut until the specified stem assembly torque or gland nut tightening torque has been achieved.
5. Ensure the valve is in the closed position.
6. Secure the valve in the vertical position and place the seat in the body housing.
7. Locate the body seal into the interface housing.
8. Slide the ball into the body, locating the stem drive tang, and operate to the valve open position.
9. Locate the end piece seat in its housing.
10. Fit the end piece to the body, being careful not to damage the body seal.
11. Replace interface fastenings and tighten evenly to the recommended torque.

Note: For the Gland Flange structure, the contents of **Step 3** and **Step 4** shall be revised as follows.

Step 3: Place the secondary stem seal into the bottom of the gland housing, followed by the location ring, stem sleeve, gland packing, gland flange and followed by the gland flange bolts.
Step 4: Tighten the gland flange bolts until the specified stem assembly torque or gland flange bolts tightening torque has been achieved.

5 VALVE ASSEMBLY TORQUES

5.1 Table 3 Bolting torques(N.m):

It is a requirement of all body bolts to give a metal to metal contact between the body and end piece surface of the body connectors.

Bolts& Nuts Torque Data					
Valve Size	Nut Size	Torque(Nm)	Valve Size	Nut Size	Torque(Nm)
2x1.5-150	1/2-13UNC	50 ~ 60	4x3-150	1/2-13UNC	50 ~ 60
2x1.5-300	1/2-13UNC	50 ~ 60	4x3-300	5/8-11UNC	100 ~ 130
2x1.5-600	1/2-13UNC	50 ~ 60	4x3-600	5/8-11UNC	100 ~ 130
2-150	1/2-13UNC	50 ~ 60	4-150	1/2-13UNC	50 ~ 60
2-300	1/2-13UNC	50 ~ 60	4-300	1/2-13UNC	50 ~ 60
2-600	1/2-13UNC	50 ~ 60	4-600	3/4-10UNC	160 ~ 210
3x2-150	1/2-13UNC	50 ~ 60	6x4-150	1/2-13UNC	50 ~ 60
3x2-300	1/2-13UNC	50 ~ 60	6x4-300	1/2-13UNC	50 ~ 60
3x2-600	1/2-13UNC	50 ~ 60	6x4-600	3/4-10UNC	160 ~ 210
3-150	1/2-13UNC	50 ~ 60	6-150	5/8-11UNC	100 ~ 130
3-300	5/8-11UNC	100 ~ 130	6-300	3/4-10UNC	160 ~ 210
3-600	5/8-11UNC	100 ~ 130			

5.2 Table 4 Gland Flange Type

Valve Size	**Gland Type**	**Valve Size**	**Gland Type**
2x1.5-150	Belleville Spring Design	4x3-150	Belleville Spring Design
2x1.5-300	Belleville Spring Design	4x3-300	Belleville Spring Design
2x1.5-600	Belleville Spring Design	4x3-600	Gland Flange Design
2-150	Belleville Spring Design	4-150	Gland Flange Design
2-300	Belleville Spring Design	4-300	Gland Flange Design
2-600	Belleville Spring Design	4-600	Gland Flange Design
3x2-150	Belleville Spring Design	6x4-150	Gland Flange Design
3x2-300	Belleville Spring Design	6x4-300	Gland Flange Design
3x2-600	Belleville Spring Design	6x4-600	Gland Flange Design
3-150	Belleville Spring Design	6-150	Gland Flange Design
3-300	Belleville Spring Design	6-300	Gland Flange Design
3-600	Gland Flange Design		

5.3 Table 5 Recommended Torque Of Gland Flange Bolts

Valve Size	Nut Size	Torque(Nm)
3-600	M6	5
4x3-600	M6	5
4-150	M8	12
4-300	M8	12
4-600	M8	12
6x4-150	M8	12
6x4-300	M8	12
6x4-600	M8	12
6-150	M10	25
6-300	M10	25