

Ball Valve – Standard and Full Bore (Manual and Actuated)

Installation, Operation and Maintenance Manual

Reference Number:	IOM 004	Date:	16 August 2010	Issue:	A
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Bestobell Valves, President Park, President Way,
Sheffield, South Yorkshire, S4 7UR
Tel: +44 (0) 114 224 0000 Fax: +44 (0) 114 278 4974
info@bestobellvalves.com www.bestobellvalves.com

Bestobell Valves Inc, 270 Meadowlands Blvd
Washington, PA 15301
Tel: +1 724 746 3750 Fax: +1 724 746 0940
sales@confloflowusa.com www.bestobellvalves.com

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WARNING!

BEFORE ANY INSTALLATION AND MAINTENANCE WORK CAN COMMENCE ENSURE THE VALVE AND SURROUNDING SYSTEM IS DRAINED OF PRESSURE AND ISOLATED.

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Sheffield, South Yorkshire, S4 7UR
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Disclaimer

PLEASE NOTE:

If the valves produced by Bestobell Valves/LNG are refurbished by a third party organisation that is not approved by Bestobell Valves/LNG, then the safety and performance will not be guaranteed and the warranty may be invalid.

If unsure about the installation and operation procedures for this valve, please contact Bestobell Valves/LNG.

Bestobell Valves has produced this manual in order to provide engineering personnel with sufficient general information to enable the operation, installation and effective maintenance of the valve manufactured by Bestobell Valves.

In the interest of product development, the designs and specifications for our products are constantly under review and we therefore reserve the right to make changes and improvements without notice.

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Name:	<i>M. Robinson</i>
Title:	<i>ENGINEERING MANAGER</i>
Signed:	<i>M. Robinson</i>
Date:	<i>2/3/11</i>

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Introduction

Outline

This manual is broken down into separate sections:

- **Introduction**

This section provides information about important safety requirements as well as highlighting the precautions taken at Bestobell Valves to ensure the cleanliness of our products. Details regarding servicing are also introduced.

- **Installation**

This details the method of installing the valve on site, and includes information on storage, unpacking and inspection. Preparation of the valve and site is also discussed to allow ease of installation and operation.

- **Hardware Description**

Introduces the product as well as providing a more detailed description including operating conditions and suitable media. Any further requirements for the effective operation of the valve are also discussed.

- **Maintenance**

Provides information relating to the on-site maintenance of the supplied valve, as well as discussing common problems and solutions.

Safety

Read and understand these instructions before installing the valve. Improper installation, operation or maintenance by the owner or operator of this valve can result in personal injury.

Only use genuine Bestobell Valves spares to ensure safe and optimum performance.

Prior to the installation of the valve into the system and any maintenance work, ensure the system is de-pressurised and isolated for the duration of the installation and during any subsequent maintenance.

The valve must be installed within a system that has adequate draining and venting provisions.

In cryogenic applications the area of pipe-work to receive the valve must be allowed to reach ambient temperature.

It is essential that the installers and operators are conversant with all of the safety issues relating to the medium within the system, and are fully trained to an adequate standard.

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Wear safety glasses and gloves during any installation or operation of the valve.

Valves must only be used in a circuit protected by suitable equipment.

The valve should be inspected for wear as part of a regular system maintenance programme.

Cryogenic burns can occur if the valve is handled during or after the valve has operated.

Minor leaks from the outlet side of the valve, if allowed to build up in a confined area, can be hazardous. This can be avoided by dissipating into the atmosphere or a well ventilated area.

If valve is to be installed in hazardous climatic conditions or seismic areas, please inform Bestobell Valves Ltd.

Identify the intended flow direction and match the valve orientation with its flow direction arrow.

Ensure that all end connections to the valve are in line and that the pipe work is supported to reduce unwanted stresses, loading and vibration on the valve and system pipe work.

Ensure that all joining materials / components used during the installation of the valve are compatible, and will not cause any deterioration to the valve structure.

When using on CO₂, the internal atmosphere must be dry and moisture free as any bronze components could be affected by carbonic acid.

DO NOT check leaks with hands.

Cleanliness

Immediately after assembly in a controlled clean room, the valve is sealed in an airtight plastic bag to maintain cleanliness. As such, it is essential to maintain this cleanliness throughout all stages of installation. Particular care should be taken not to contaminate the internals of the valve with grease, moisture, grinding dust, weld/brazing spatter etc.

Clean practices will save time later with reduced 'flushing' and maintenance.

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Service Intervals

Bestobell Valves recommends that a major service is carried out on its valves in line with the procedures contained in this manual every 2 years.

In addition to this, a regular inspection should take place to ensure correct operational condition.

Regular inspections are suggested on a monthly basis and maintenance work should be carried out in line with this service manual.

In addition to the scheduled servicing, the valve gland packing should be replaced after 40 000 operations in cryogenic conditions.

It is recommended that the Service Record Sheet enclosed be fully completed at every service interval.

Installation

Personnel carrying out Assembly / Joining / Welding / Inspection must be adequately trained and hold the necessary approvals.

Valves should be installed in a vertical position and not less than 30° from horizontal. (for angles less than 30°, longer extension may be required, please contact Bestobell Valves)

Ensure that environmental conditions (atmospheric pollution) are compatible with the valve materials.

(NOTE: Ensure there is enough space around the valves installed position to allow the removal and refit of the headwork / valve)

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Installation Overview

The quality of performance in service is a function of the care taken to ensure good installation. A careful study of these instructions is therefore recommended, as properly installed equipment will normally operate for long periods without problems.

The most critical point in the lifetime of a valve is the time of installation, therefore, proper care at this stage and during any maintenance will increase the probability of trouble free valve service.

It is important to maintain cleanliness throughout all stages of the installation, with particular care being taken not to contaminate the internals of the valve with grease, moisture, grinding dust, weld / brazing spatter or other foreign matter.

Clean practices will save time later with reduced 'flushing' and maintenance.

STORAGE:

The equipment packing cases are **NOT** waterproof and should be stored in a weatherproof location before use.

UNPACKING:

It is recommended that before any item is unpacked, it should be moved as close as possible to its installed position. This will minimise the possibility of damage during handling.

It is further recommended that each item should only be unpacked immediately before it is required.

Before installation the engineer should check for:

- Damaged Packaging
- Bent or Distorted Items
- Scratches, Dents or Damage

Particular attention should be paid to the sealing faces on the end connection flanges.

TOOLS REQUIRED:

No special tooling is required for the installation of this valve.

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Preparation

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Remove the valve centre section before installation to protect the internals of the valve from particulate contamination.

Also ensure that enough room is left above / around the valve for the headwork once this is replaced after installation.

Identify the intended flow direction and ensure the valves flow direction matches this.

Ensure that all end connections to the valve are in line and that the pipe work is supported to reduce unwanted stresses, loading and vibration on the valve and system pipe work.

Ensure that all joining materials / components used during the installation of the valve are compatible, and will not cause any deterioration to the valve structure.

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Hardware Description

All materials used are selected for their suitability to function at cryogenic temperatures. All valves are degreased for oxygen duty, assembled in clean room conditions, and sealed in robust polythene bags prior to despatch.

Maximum Working Pressure: 50 Bar (725 psi).

Temperature Range: +65°C to –196°C or + 150°F to -320°F

Only suitable for operation with media: - O₂, N₂, Ar, CO₂, He, Kr, Ne, H₂, C₂H₄ and N₂O.

When using on CO₂, the internal atmosphere must be dry and moisture free as bronze could be affected by carbonic acid.

A stainless steel three-piece ball valve designed specifically for cryogenic applications. Available with socket weld and butt weld ends. A bronze body version is also available.

The valve can be operated either manually by a lever or an electric or pneumatic actuator can be fitted.

Features and Benefits

- Spring loaded gland seal giving low torque levels under both ambient and cryogenic conditions.
- Precision investment cast body with a smooth surface finish.
- One piece anti blow-out stem.
- Relief hole to prevent trapping of liquefied gases.
- Designed to prevent incorrect, and hence dangerous, re-assembly after stripping for maintenance.
- Removable centre section designed to industry standard dimensions, allowing the interchange of assemblies in existing installations.
- Suitable for retro fitting of electric, or pneumatic, actuators allowing fast, remote automatic operation.
- Fast, easy maintenance of PTFE components.

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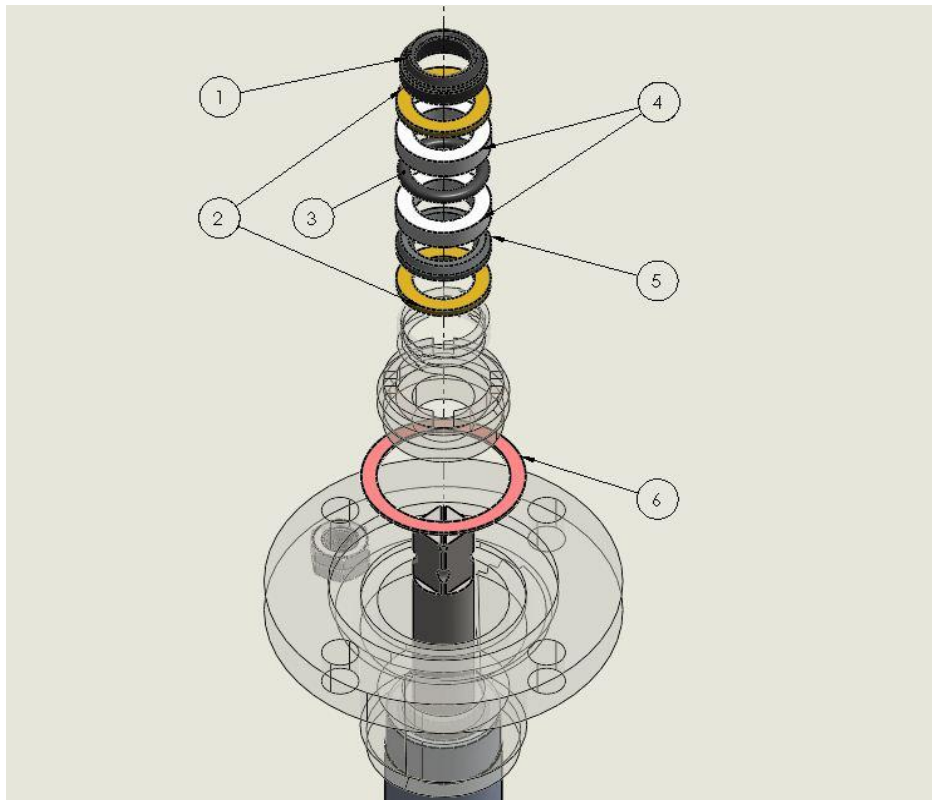
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Installation and Maintenance

Spares Kit



Reference	Description	Spares Kit
1	Wiper Seal	Contact Bestobell Valves Technical Sales
2	Plain Washer	
3	'O' Seal	
4	Top Chevron	
5	Bottom Chevron	
6	Gasket	
7	Wiper Seal	
	Seal to Ball	

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Torque Table – Joining Bolts

Valve Size		Bolt Torque
Full Bore (FB)	Standard Bore (RB)	
10	15	9 NM (6.7 lb.ft)
20	25	16 NM (12 lb.ft)
32	40	33 NM (24 lb.ft)
40	50	55 NM (41 lb.ft)
65	80	270 NM (200 lb.ft)

- Apply torques progressively and in sequence.
- Only use PTFE based lubricants.
- Torque specified is for lubricated Stainless Steel fasteners.
- On Cryogenic applications, ONLY use specified Stainless Steel fasteners.
- **NOTE:** For 65mm full and 80mm standard bore ball valves, see Appendix 1 for the assembly instructions when the flanges are fitted with Nordlock washers.

Lever Operation Torques

Valve Size	Maximum Torque
DN15 (RB)	17.5 NM (13 lb.ft)
DN25 (RB)	23 NM (17 lb.ft)
DN40 (RB)	40 NM (30 lb.ft)
DN50 (RB)	62 NM (46 lb.ft)
DN80 (RB)	102 NM (75 lb.ft)

Installation Method

STEP 1:

Welded End Connections:

If welding of pipe work to end covers is to take place, it is recommended that the valve centre section is removed. To remove the centre section, ensure the valve is in the open position and remove the body connector bolts. Then carefully remove the centre section from the end covers. Ensure all parts removed are protected from weld spatter and other debris.

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Weld the end covers into the pipeline, ensuring that the correct separation is achieved between the end covers and that the pipe work and bolt holes are aligned correctly. After completion, check the welded end connections, ensure the gasket surfaces are clean and system pipe work is thoroughly flushed. Replace the centre section of the valve carefully; ensuring that the gasket faces are not damaged. Replace the connector bolts, locking washers and nuts. Tighten sequentially to the torque values shown in the table.

Note: Please ensure that the relief hole in the ball is facing upstream when the valve is in the closed position. Also ensure when the valve is installed in the pipeline that the flow arrow is pointing downstream.

Ensure all end connections to the valve are in line and that pipe work is supported to reduce unwanted stresses / loading and vibration on the valve and system pipe work.

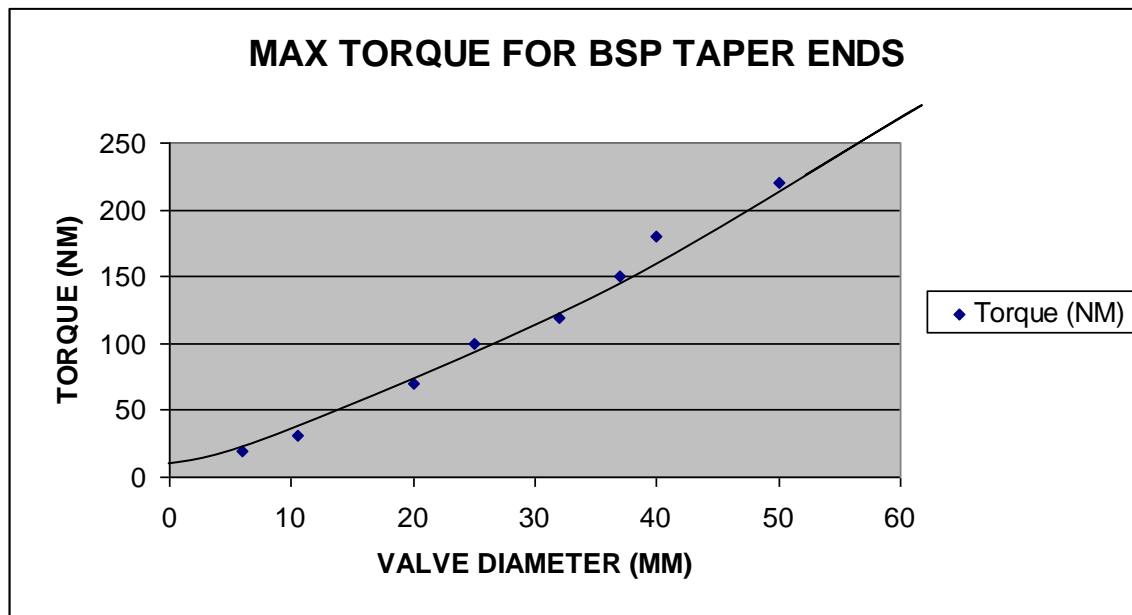
Ensure that all joining materials / components used during the installation of the valve are compatible and will not cause any deterioration to the valve structure.

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Taper Threaded End Connections:

For valves with taper threaded end connections a good quality PTFE thread tape may be used. Firstly, tighten the end connections by hand to reduce the risk of cross threads before finally tightening with a suitable torque wrench. (See torque graph for female taper threads).



Flanged End Connections:

Tighten the flange fasteners progressively and in sequence, at the same time as checking the alignment of mating flanges.

STEP 2 (Re-fitting the Centre Section):

After completion, check the welded end connections, ensure the gasket surfaces are clean and system pipe work is thoroughly flushed. Replace the centre section of the valve carefully; ensuring gasket faces are not damaged. Replace the connector bolts, locking washers and nuts. Tighten sequentially to the torque values shown in the table.

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STEP 3 (Testing):

Before introducing pressure to the valve, carry out a thorough inspection of all connections: welded and/or threaded. Once pressure is introduced to the valve, a method appropriate to the medium being carried by the system should be employed to test for leaks.

Never use hands to test for leaks!

Step 4 (Operation):

Check that the valve fully opens and closes smoothly by hand. If difficulty is experienced, refer to the troubleshooting section of this manual.

Note: If unsure about the installation and operation of this valve please contact Bestobell Valves before you continue.

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Refit / Refurbishment Method

PLEASE NOTE:

Depending upon the size of the valve that is to be refurbished, the method of refurbishment may vary.

For actuated valves, please follow **steps 1 and 2** for details of how to remove the actuator prior to the refurbishment of the gland.

For manual valves, please start at **step 3**.

STEP 1:

With the ball valve assembly securely clamped in place, unscrew the actuator securing screws from the top of the valve cover and store in a safe place.

Carefully lift off the actuator and store in a safe place.



STEP 2:

Remove the securing pin from the adapter coupling and store in a safe place.

Remove the adaptor coupling and store in a safe place.

GO TO STEP 4



STEP 3:

Remove the hand lever from the valve stem.



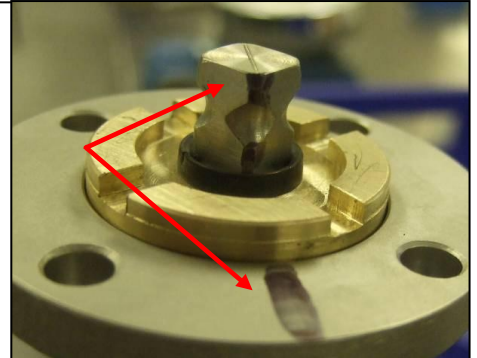
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STEP 4:

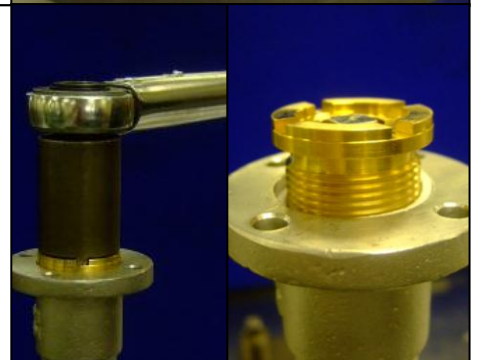
Mark the stem and the body, as shown.

These marks are to be used as a reference point and will ensure that the stem and ball remain in the correct orientation when the valve is re-assembled.



STEP 5:

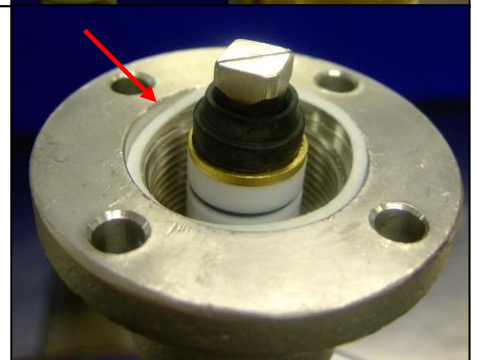
Using a torque wrench fitted with an appropriate adapter, to minimise the risk of damage to the gland follower, unscrew the gland follower from the cover.



STEP 6:

Remove all of the packings from the gland, including the wiper seal, brass washers and the gasket, taking care not to damage the stem or gland area.

Discard the gland packings and the gasket.



STEP 7:

Remove the spring from the gland and clean.

Once the spring has been cleaned, place back over the stem and slide down into the gland.



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STEP 8:

Take the plain washer from the spares kit and slide it over the stem.



STEP 9:

Take the bottom chevron from the spares kit and slide it over the stem.



STEP 10:

Take the top chevron from the spares kit and slide it over the stem.



STEP 11:

Slide the 'O' seal, from the spares kit, down into the gland.



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STEP 12:

Slide the second top chevron, from the spares kit, down the stem.



STEP 13:

Slide the second plain washer from the spares kit down the stem.



STEP 14:

Slide the wiper seal from the spares kit onto the stem.

Replace the gasket in the cover groove with a new one from the spares kit.



STEP 15:

Using a torque wrench fitted with an appropriate adapter, to minimise the risk of damage to the gland follower, screw the gland follower into the cover to the torque specified in the table below.

Valve Size	Gland Follower Tightening Torque
DN15 (½") – DN25 (1")	50 NM (37 lb.ft)
DN40 (1½") – DN50 (2")	70 NM (52 lb.ft)



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STEP 16:

Unscrew the securing nuts and remove the bolts, nuts and washers from the body.



STEP 17:

With the valve in the closed position:
Gently tap one side of the ball using a soft impact hammer taking care to ensure that the ball doesn't get damaged.

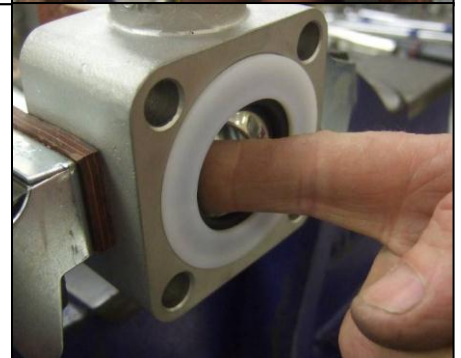
The seal should then fall from the main body of the valve. This can then be discarded.



STEP 18:

If a soft impact hammer is not available:

- Open the valve very slightly, as shown in the picture.
- Using the small gap that is created, ease the seal out from the body, taking care not to damage the ball.



STEP 19:

Ensure the valve is in the closed position.

Slide the ball out from the body.

The remaining seal can be removed by pushing on the seal from the inside of the valve body.



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STEP 20:

The centre section of the valve is now fully disassembled.



STEP 21:

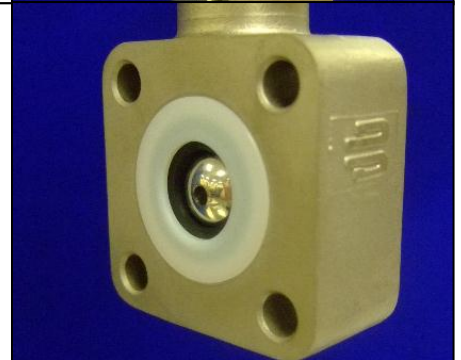
Insert one of the replacement seals into the valve body.



STEP 22:

Ensure the valve lever is in the closed position.

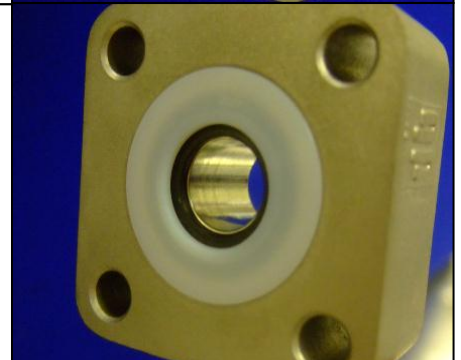
Insert the ball into the body so that the small hole is visible from the left hand side (with the stamp to the front of the body).



STEP 23:

Open the valve.

Fit the second replacement seal to the other side of the valve.



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STEP 24:

Fit the covers to the valve.

Insert the bolts.



STEP 25:

Place a nut and washer onto the end of each bolt.

Tighten all of the nuts to the torque specified on page 11.

After tightening, ensure that the vent hole is facing upstream when the valve is closed and also that the flow direction arrow is pointing downstream.



STEP 26:

Place the hand lever back on top of the stem.



STEP 27:

Place the coupling adapter back onto the top of the actuator stem and secure in place with the securing pin.



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STEP 28:

With the ball valve assembly securely clamped in place, carefully position the actuator back on top of the valve assembly, ensuring that the reference marks are correctly aligned.

Screw the actuator securing screws back into place and tighten to 9NM.



The valve has now been fully refurbished.



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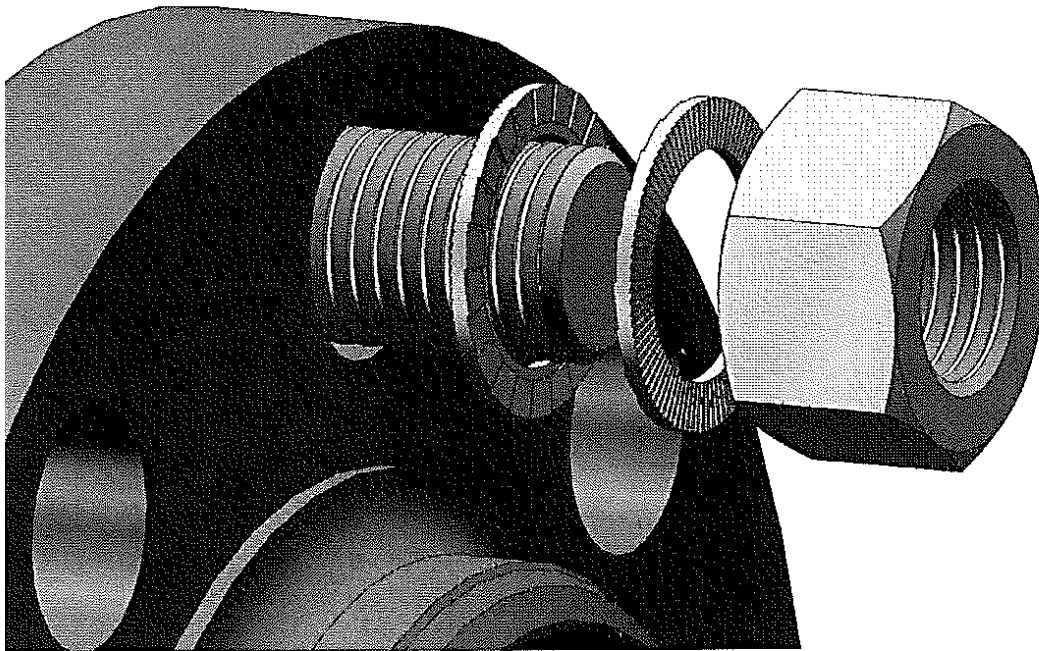
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Appendix 1 – Nordlock Washers

Assemble the Nordlock washers in pairs, as shown, so that the angled serrations lock together. Screw nuts onto the studs loosely and ensure the valve body, gaskets and flanges are in the correct position.

The nuts should then be progressively tightened to the torque specified in the table on page 19.

A periodic check should be carried out on fasteners once every 6 months to ensure that the nuts are tight to the specified torque.



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Troubleshooting

Symptom:	Fault:	Solution:

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Contact Details

For further maintenance instructions and spares contact:

United Kingdom Enquiries:

Bestobell Valves/LNG
President Park,
President Way,
Sheffield,
South Yorkshire,
S4 7UR,
England.

Tel: +44(0)114 2240263

Fax: +44(0)114 2784974

Email: info@bestobell-lng.com / sales@bestobellvalves.com

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United States Enquiries:

Bestobell Valves Inc
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