

GD Engineering

AN SPX BRAND

Packaging - Processing
Bid on Equipment
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www.bid-on-equipment.com

Installation, Operation & Maintenance Manual Horizontal Bandlock™ 2 Closure



Read and understand this manual prior to operating or servicing this product.

SPX®

IMPORTANT NOTE:

No modifications, alterations or additions to this closure shall be made without the prior written agreement of GD Engineering.

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The Bandlock™2 Closure is designed to provide safe operation at the pressure/temperature rating shown on the nameplate and to comply fully with the design conditions stated in the purchase order.

“It is the responsibility of the end user to consider the effect or consequence of any other loading or operating conditions that might be applied in service.”

SAFETY WARNING: OBSERVE SAFETY PRECAUTIONS AT ALL TIMES

The parent vessel **MUST** be fully drained, isolated from any pressure source and vented before opening the vessel.

OBSERVE PERMIT TO WORK PROCEDURES AND SAFETY PRECAUTIONS AT ALL TIMES

1.0 HORIZONTAL CLOSURE COMPONENTS (Major components identification sketch)

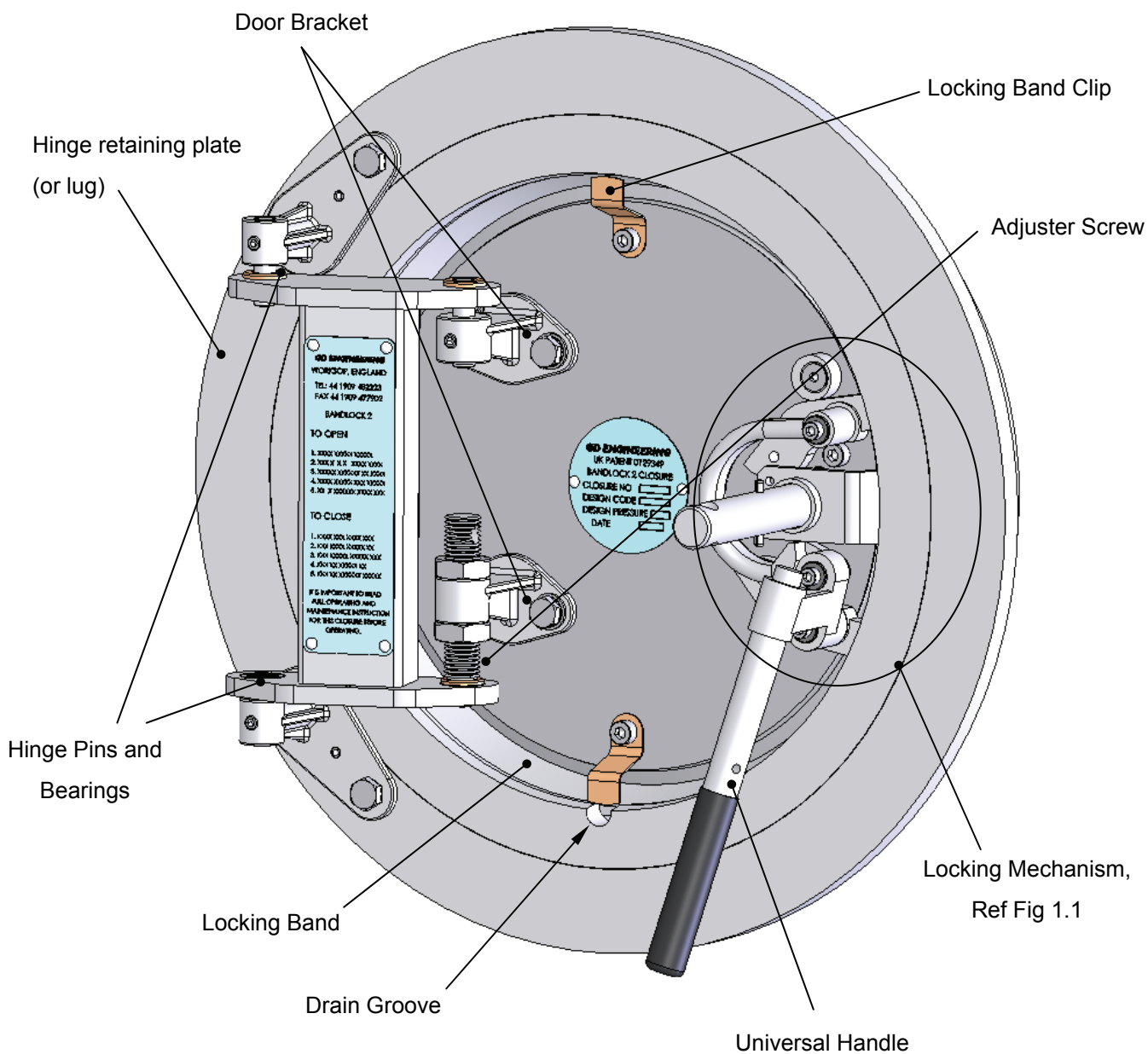


Fig 1.0 – Bandlock™ 2 Closure Components.

1.1 HORIZONTAL CLOSURE LOCKING MECHANISM COMPONENTS (Major components identification sketch)

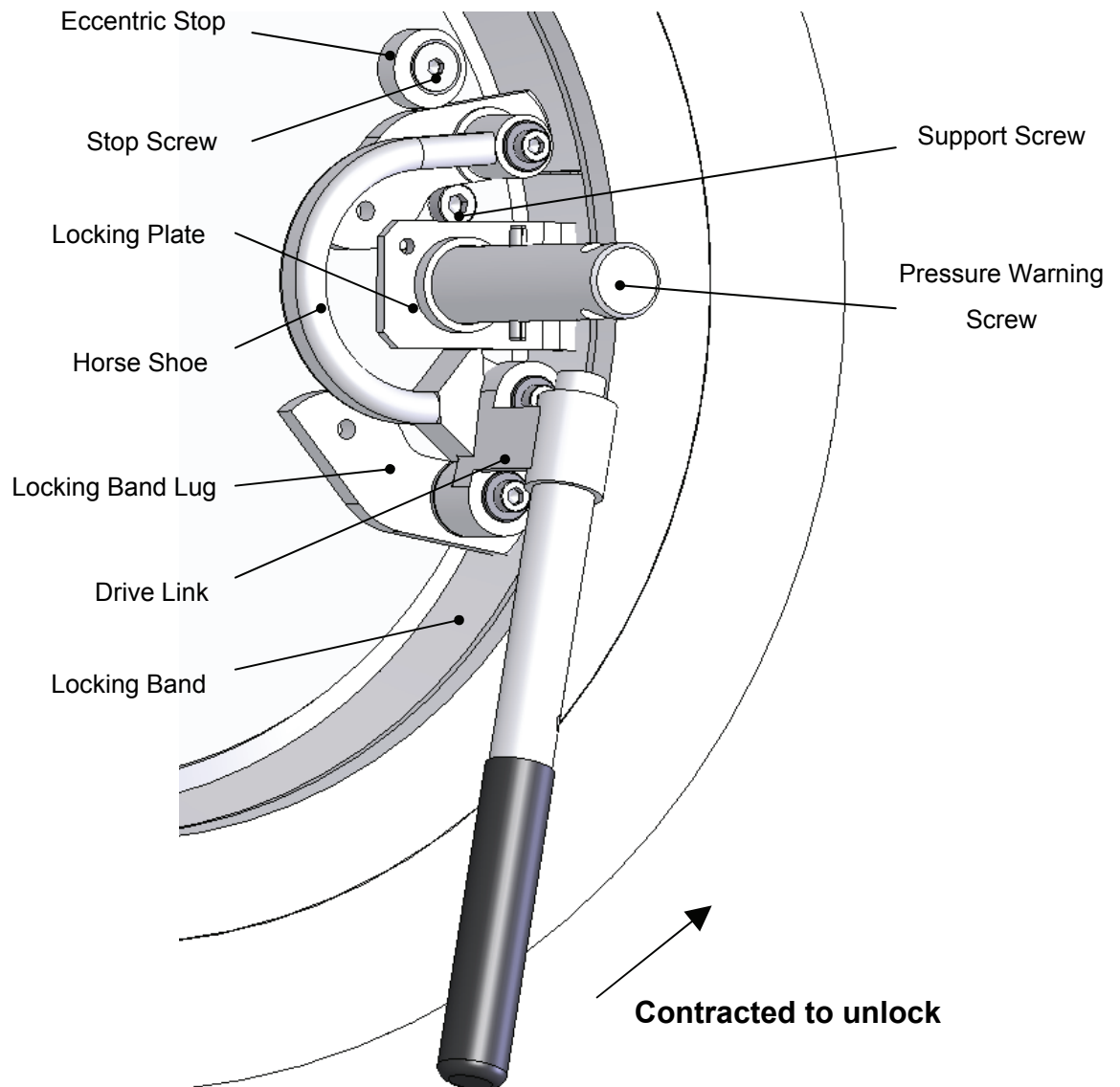


Fig 2.0 – Bandlock™ 2 Closure Locking Mechanism Components.

1.2 BANDLOCK™2 CLOSURE PRESSURE WARNING SCREW & LOCKING SEGMENT ASSEMBLY (Major components identification sketch)

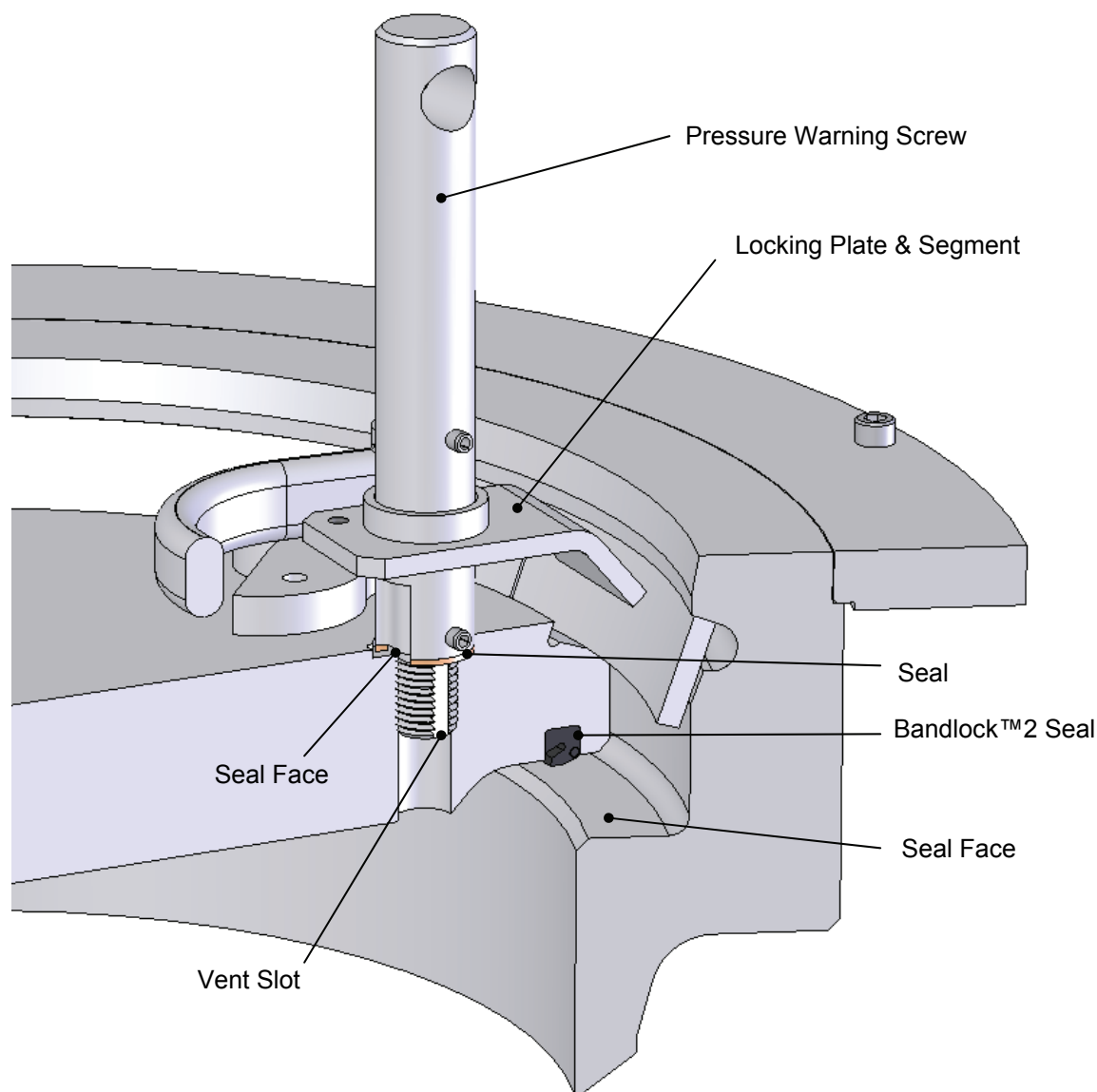


Fig 3.0 – Seal and pressure warning screw details

WARNING

Never put the Bandlock™2 closure into service without the locking plate and pressure warning screw being fitted

2.0 INITIAL INSTALLATION

2.1 CLOSURE ORIENTATION

The GD Engineering horizontal Bandlock™2 closure must be installed truly horizontal, ensuring that the drain groove (Fig.1.0) is located at the lowest position for right/left hand hinge orientation. Vessels which are required for inclined or declined installations (nominally 1° to 10° from the horizontal) should be accommodated with a mitred closure weld preparation. This leaves the closure horizontal whilst accounting for the nominal angle of the vessel.

WARNING

DO NOT INSTALL CLOSURES WHICH ARE NOT IN A TRULY HORIZONTAL POSITION

IMPORTANT NOTE:

Prior to commencement of initial installation and fabrication of the closure to any pressure vessel, it is vital that you refer to sections 2.4 and 2.5 of this manual which provides important details in respect of distortion and recommendations for closures that require post weld heat-treatment.

The Bandlock™2 closure door must always be removed prior to welding the closure to a vessel. Reference should be made to section 2.2 of this manual - Instructions for Door Removal.

IMPORTANT NOTE

If you are in any doubt about the installation, maintenance or operation of this equipment, please contact the GD Engineering Service Department.
TEL +44 (0)1909 482323 email: gd@spx.com

2.2 CLOSURE DOOR REMOVAL

When it is necessary during initial installation, vessel fabrication or routine maintenance, to remove the Bandlock™2 closure door, the following procedure should be followed:

IMPORTANT NOTE

The Bandlock™2 closure door must always be removed prior to welding the closure to any pressure vessel

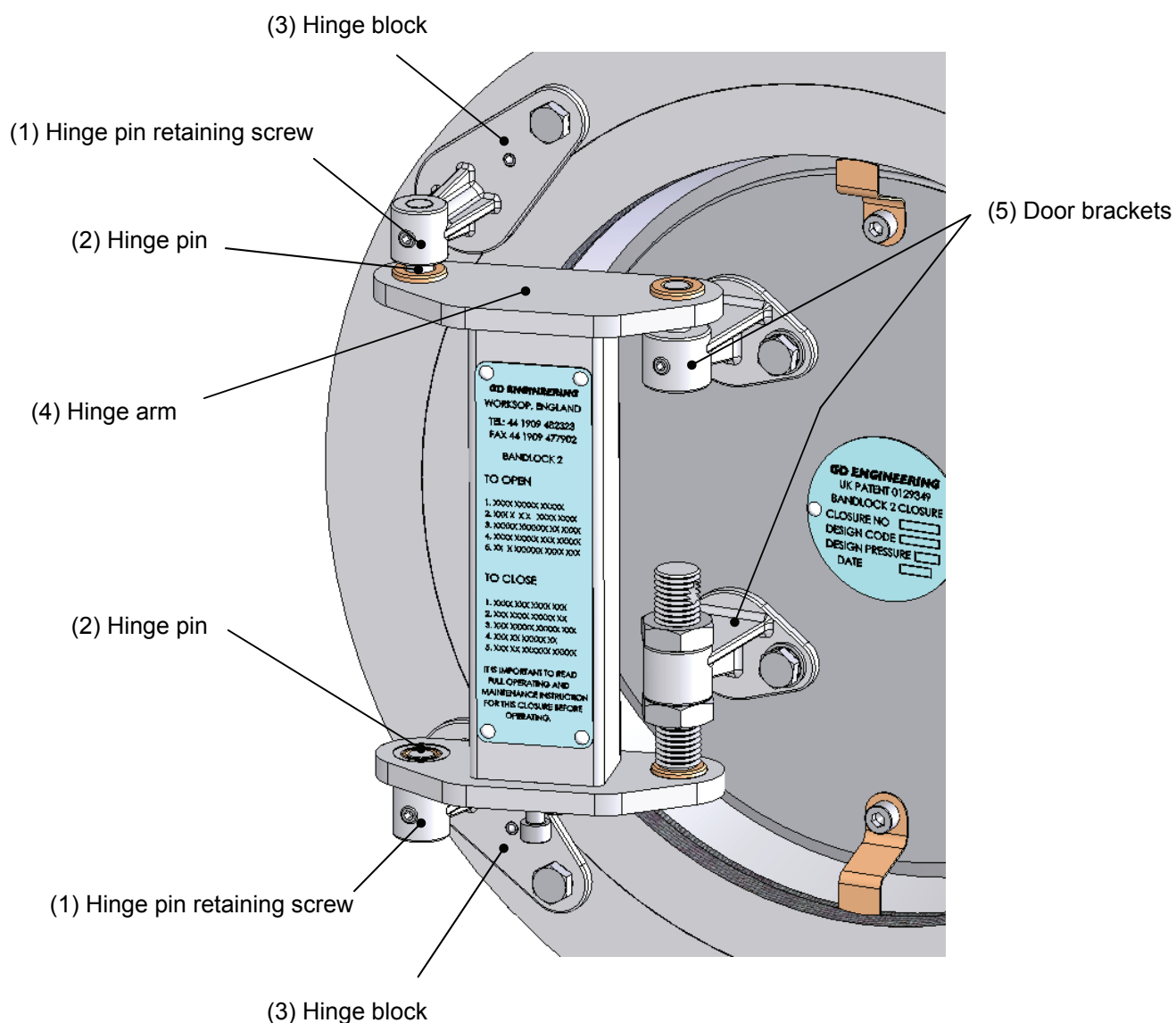


Fig 4.0 – Closure Door Removal / Re-installation

- 1 Remove the Pressure Warning Screw and Locking Plate and contract the locking band to its 'door open' position (reference section 3.1 and 3.2 for unlocking and locking procedure).
- 2 Ensure that the Bandlock™2 closure door is adequately supported in an approved sling (some larger doors may have a lifting eye provided for additional safety). Referring to Fig. 4.0, loosen the hinge pin retaining screw (item 1) and remove the hinge pin (item 2) connecting the hinge block (item 3) to hinge arm (item 4).
- 3 It is now safe to remove the door from the closure.

IMPORTANT NOTE

When storing the door it is important to always make sure that the seal and all machined surfaces are adequately protected from damage

On no account must the hinge block (item 3) or door bracket, (item 5), fasteners be removed when it is required to remove the closure door (i.e. for fabrication or painting). These have been factory set and should not require adjustment. In the event that these brackets have been removed, contact GD Service Department for further resetting instructions.

Ensure that the hinge pin bearings are fully protected from ingress of paint (reference section 2.6 for full instructions)

- 4 Strictly adhering to the above procedure will ensure ease of re-alignment of the closure door following installation.

2.3 HYDROSTATIC TESTING.

1. The closure must not be hydrostatically tested at a pressure greater than 1.5x Design Pressure (stamped on the closure nameplate). Prior to performing the hydrostatic test, the seal must be removed and both the seal and sealing groove cleaned thoroughly and a thin layer of general purpose grease applied.
- 2 After Hydrostatic testing:
 - Ensure that closure internal surfaces, paying particular attention to the seal groove, are thoroughly dried and greased to prevent corrosion.
 - It is advisable to inspect the seal for damage. This is particularly important for closures with a design pressure of 425Barg (#2500) and above. The seal must be replaced if damaged.

2.4 DISTORTION

It is important that distortion due to fabrication, welding and subsequent post weld heat treatment (PWHT) is minimised. The following recommendations should be followed to minimise this risk:

- 1 Branch connections (in particular set-in type) should not be located within close proximity of the joining weld (not less than the nominal diameter (ID) of the branch, between the edges of the weld).
- 2 The closure hub with the door removed should always be welded after the fabrication of the vessel branch connections.
- 3 A minimum pre-heat temperature of 20°C should always be used, but this is dependant upon the welding parameters of the weld procedure qualification record utilised.
- 4 Automatic or semi-automatic processes should be used to maintain constant heat input.
- 5 A staggered welding sequence should be used when the manual metallic arc process is used.
- 6 On larger closures fitted with separate hinge retaining lugs, a lifting lug is provided to aid positioning for welding. This lifting lug must be removed after welding (Fig 5.0)

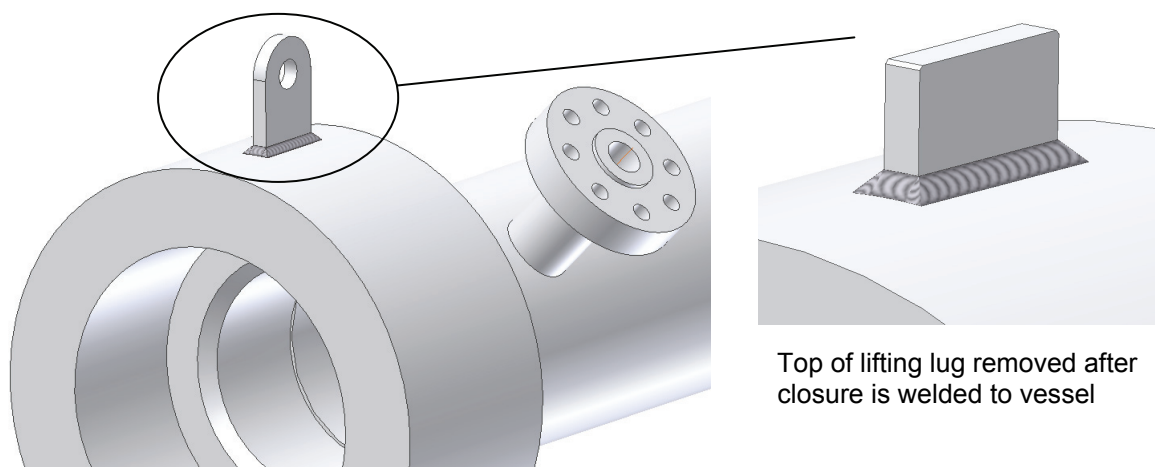


Fig 5.0 – Removal of lifting lug

WARNING

ON NO ACCOUNT SHOULD THIS LIFTING LUG BE USED AS A LIFTING LUG FOR THE ATTACHED VESSEL.

2.5 PWHT RECOMMENDATIONS:

- 1 When storing the door, it is important to always make sure that the machined surfaces are adequately protected from damage.
- 2 PWHT should be carried out generally in accordance with ASME VIII.
- 3 After PWHT, lightly emery cloth (smooth finish paper) the closure hub sealing face to remove any deposit build up.
- 4 Note: do not place any loads on the hinge mounting plate during or after the PWHT process.

IMPORTANT NOTE

The closure door, seal and locking band assembly must always be removed before any welding is carried out

2.6 MASKING PROCEDURE FOR PAINTING THE BANDLOCK™2 CLOSURE

- 1 When painting is required the areas shown "masked" should not be painted but protected with a blast proof masking material.
- 2 To prepare the closure for painting the locking band, pressure warning screw assembly and seal must be removed from the door. (These components are stainless steel and do not require painting).
- 3 Closure door hinge bearings and all threaded holes must be suitably protected from ingress of shot blast and paint material.

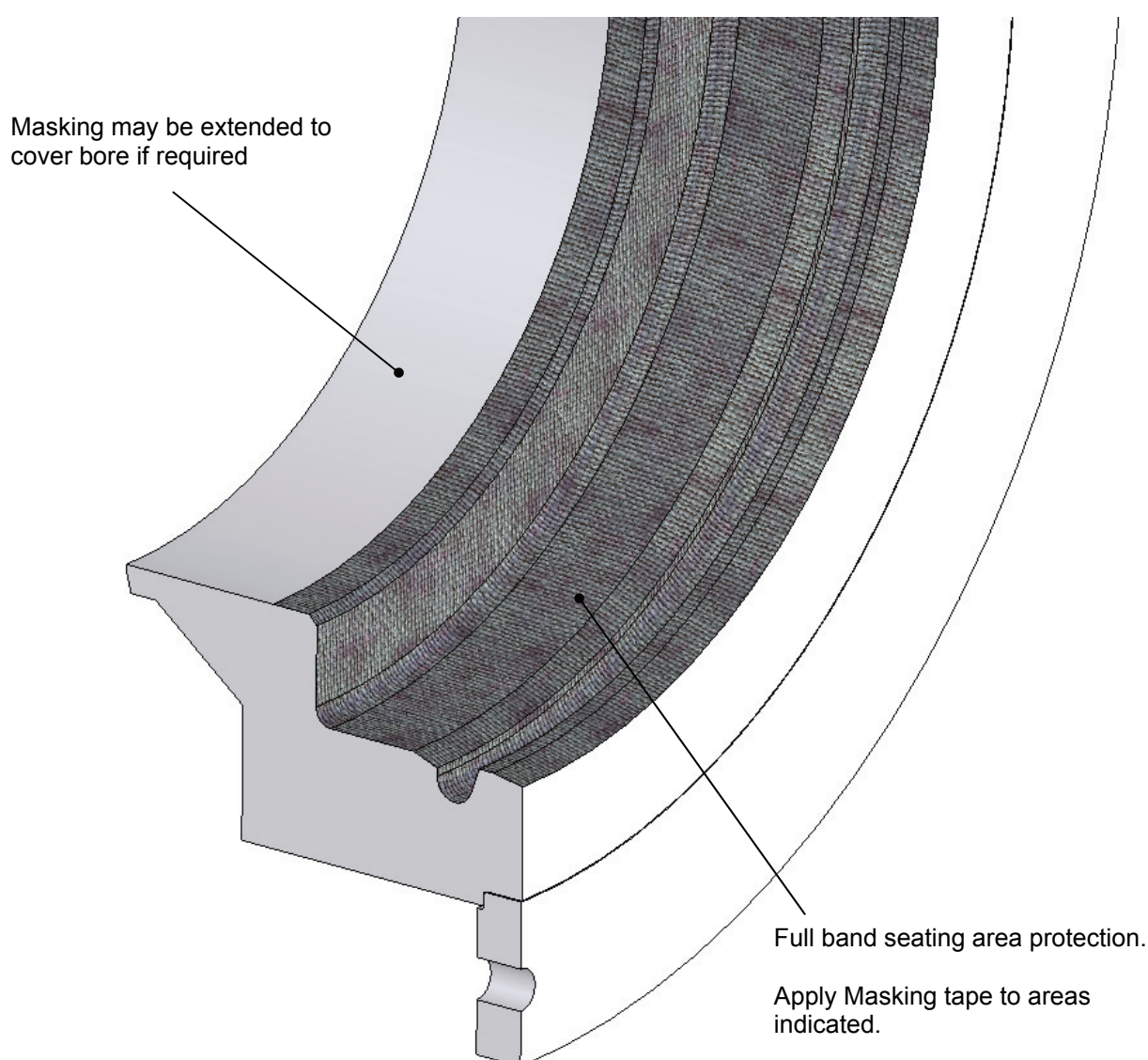


Fig 6.0 - Hub masking area.

MASKING PROCEDURE Continued...

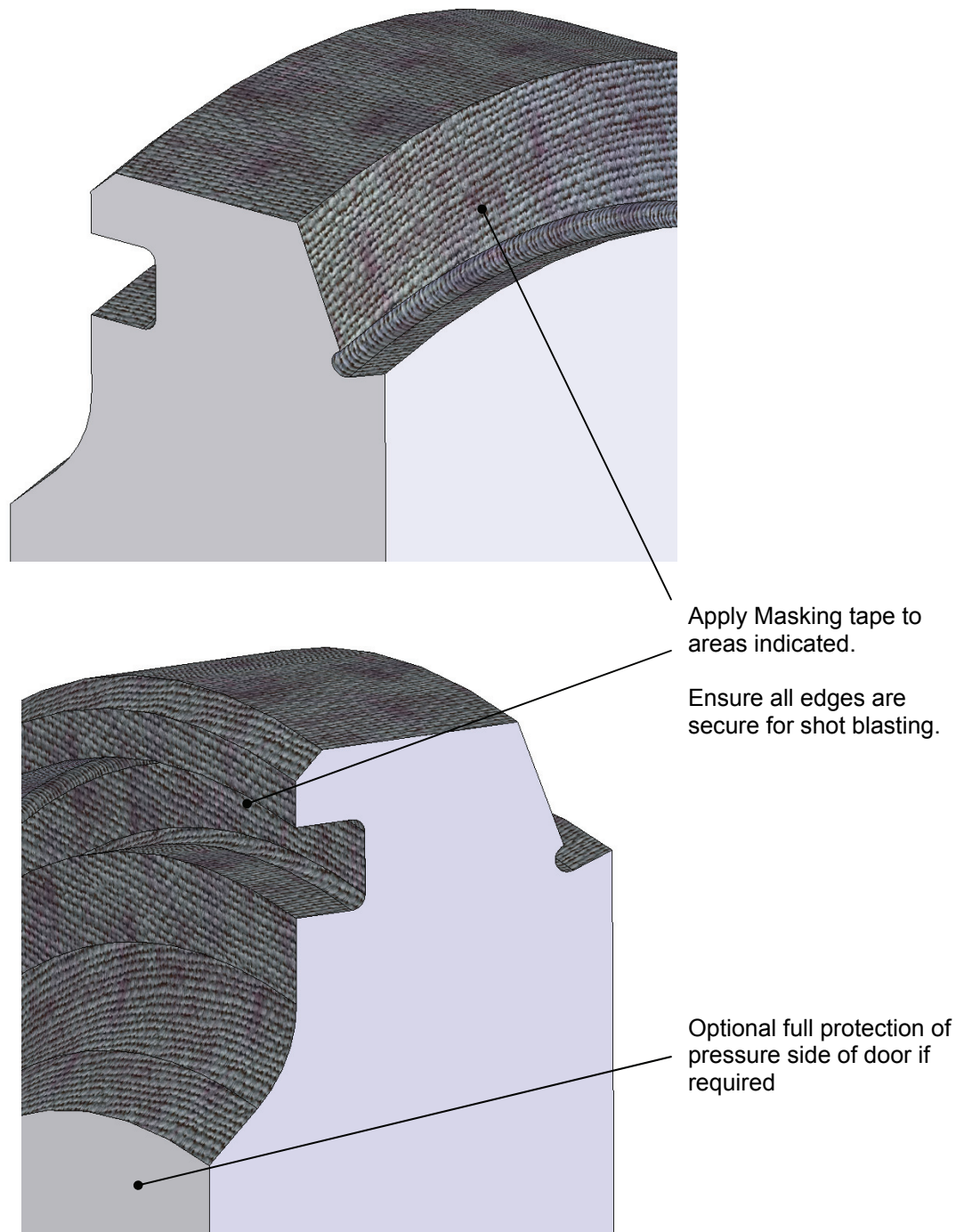


Fig 7.0 - Door Masking Area

IMPORTANT NOTE

When painting the door the hinge bearings and all threaded holes must be protected from shot blast and paint

2.7 CLOSURE DOOR RE-INSTALLATION

When ready to re-install the Bandlock closure door following initial installation, vessel fabrication or routine maintenance, the following procedure should be followed:

- 1 Ensure that the closure door is adequately supported in an approved sling (some larger BL2 doors may have a lifting eye bolt provided). Refit the hinge pins (Fig 4.0 item 2) and tighten their retaining screws (Fig 4.0 item 1).
- 2 It is important that the door height is checked immediately after re-installation of the door (reference section 2.8 - Door vertical height adjustment).
- 3 Ensure that all machined surfaces are corrosion protected (reference section 4.0 - Maintenance).
- 4 Expand the locking band to its locked position; refit the locking segment and pressure warning screw.
- 5 Strictly adhering to the above procedure will ensure ease of re-alignment of the closure door following installation. However, particular attention should be paid to section 2.8 of this manual – Door vertical height adjustment.

IMPORTANT NOTE

During re-installation kindly reference section 4.2 – Torque Settings

2.8 DOOR VERTICAL HEIGHT ADJUSTMENT

- 1 Remove seal (reference section 4.1) and PWS assembly.
- 2 With the door open, contract locking band and close the door.
- 3 Check the gap between the hub and door in 12 o'clock and 6 o'clock positions (Fig 8.0) using feeler gauges.
- 4 Adjust gaps using adjuster screw (Fig 1.0) until gap at top and bottom is equal.
- 5 Section 4.4 can be completed to record this activity.
- 6 The seal should be inspected before returning to the seal groove. If there are any cuts, cracks, abrasions, bubbling or the sealing lip has lost its flare, then the seal should be replaced.
- 7 Ensure that all machined surfaces are clean and lubricated with general purpose grease before re-assembly.

NOTE

Sideways adjustment of the door is factory set and should not require site re-adjustment. If for any reason the door brackets have been moved, contact the GD Service department for further re-setting instructions.

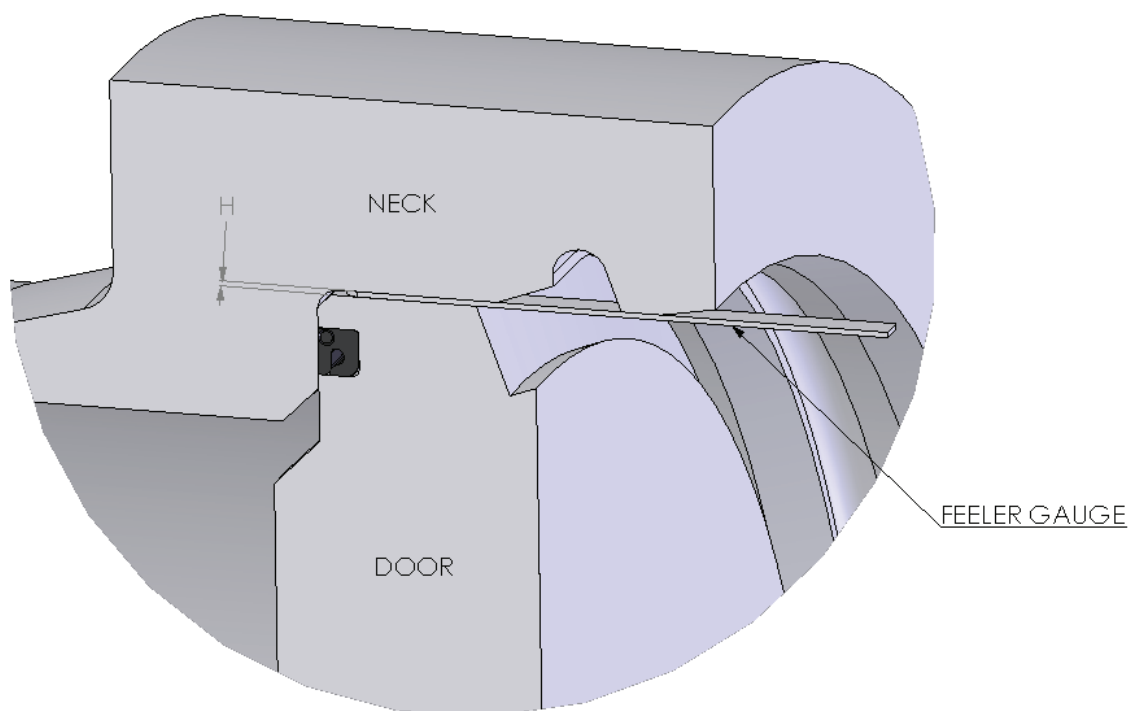


Fig 8.0 – Door Centralisation

3.0 BANDLOCK™2 OPERATION

3.1 DOOR UNLOCKING AND OPENING

- 1 Before attempting to open the closure, check that the vessel isolating procedures have been fully adhered too. Ensure the vessel is fully drained, vented and isolated from any pressure source.
- 2 Slacken off the pressure warning screw without attempting to remove it, any residual pressure in the vessel will be indicated when vented through the milled groove cut in the pressure warning screw threads. Should an indication be given, re-check the status of all valve isolations.
- 3 When completely satisfied that the closure is safe to open, remove the pressure warning screw and its integral locking plate (reference Fig. 3.0) from the closure.

Note: A slight rocking movement is required after the bolt has cleared the threads to enable the band locking segment to move from its seating.

- 4 Locate the universal handle into the drive link (reference Fig. 2.0) attached to the locking mechanism. Make sure that the universal handle is positively located in the hole provided. Rotate the universal handle anti-clockwise through approximately 180°. This will actuate the drive link and horseshoe mechanism and progressively contract the band onto the door recess. The universal handle should then be removed.

WARNING

DO NOT allow the band to 'snap' into position. Owing to the natural spring of the locking band it is necessary to retain a firm grip on the universal handle during the unlocking / locking sequence of operation

Keep full control of the handles radial movement to achieve a steady expansion or contraction of the band. Failure to adhere to the correct operation could cause the handle to be propelled from the drive link assembly during normal operational use

- 5 Insert the universal handle into the bottom of the hinge assembly in the location hole provided and swing the door open.
- 6 The door is mounted on a double pivot mechanism, which gives a degree of straight-line movement and allows the door to be rotated for access to seal and band.

MAINTENANCE NOTE

The Bandlock closure **MUST** always have sealing faces and machined areas of the closure hub and door protected by application of general purpose grease immediately after opening - even short periods left unprotected will result in sealing and machined faces becoming corroded or pitted. Immediate adequate protection is the best way of gaining prolonged service life

3.2 DOOR CLOSING AND LOCKING

Prior to Closing and Locking out the Door:

- 1 Ensure that the rust preventative coating on sealing and machined surfaces that may have become contaminated with product or corrosion deposits is fully removed and the surface areas wiped clean.
- 2 Ensure that the door seal is inspected for material splits, tears, blisters or any chemical damage or degradation.
- 3 Ensure that the primary seal groove in the door is clean and free from debris.
- 4 Lightly smear seal and mating faces with a thin film of general purpose grease for corrosion protection.
- 5 Ensure that the locking band is fully contracted onto the door shoulder.
- 6 Swing the door inwards until the hinge side of the band is touching the hinge and then align the door by means of the universal handle so that the door enters squarely into the closure hub.
- 7 Using the universal handle and applying an inward force on the door, compress the seal, which allows clearance between the band and hub face. Having located the universal handle (reference Fig. 2.0) in the drive link, rotate this in a clockwise direction until the locking band expands into the hub recess. The locking mechanism is designed to give 'over-centre' locking.

WARNING

DO NOT allow the band to 'snap' into position. Owing to the natural spring of the locking band it is necessary to retain a firm grip on the universal handle during the unlocking / locking sequence of operation

Keep full control of the handles radial movement to achieve a steady expansion or contraction of the band. Failure to adhere to the correct operation could cause the handle to be propelled from the drive link assembly during normal operational use

- 8 The locking segment can now be refitted; on no account should this plate be forced or altered to fit - if proper fitting cannot be achieved then the locking band or seal is not properly located. Check that all surfaces are clean and corrosion free. Adjust if necessary only after thorough cleaning.
- 9 Screw home the pressure warning screw containing the metal bonded seal and tighten (reference section 4.2 Torque setting).

3.3 STORAGE

Bandlock™ 2 Closure:

If it is necessary to store the closure / vessel (even for a short period of time) it is strongly recommended to generously coat the closure hub, sealing face and all internal machined areas with 'Waxoyl' or other similar protective substance. Remove the seal from the closure door and again liberally coat all machined areas. Refit the door seal to prevent ingress of dirt. You should also consider the use of desiccant bags in the vessel to prevent moisture build-up.

Following storage and prior to refitting the seal, remove protective finish in seal groove and seal faces and re-apply a thin layer of general purpose grease.

Rubber Products (seals)

Shelf Life:

| Material | Primary Storage Period Years | Extended Period (after re-inspection) Years |
|----------|---------------------------------|--|
| HNBR | 3 | 1 |
| Nitrile | 3 | 1 |
| Viton | 5 | 2 |

Seal Storage Conditions

Temperature

Storage temperatures should not exceed 25°C. Lower temperatures are not permanently harmful to rubbers.

Light

Rubber products (seals) should be protected from direct sunlight and strong artificial light with ultraviolet content, preferably by packing in an opaque container or by screening storage areas away from harmful ultraviolet rays.

Oxygen and Ozone

Wherever possible rubber products should be protected from circulating air by wrapping, storage in airtight containers or other suitable means.

Deformation

Rubber products should be stored in a relaxed condition, free from tension, compression or other deformation. Seals must not be hung from single point supports likely to produce deformation of the seal shape.

4.0 LOCKING BAND MECHANISM ADJUSTMENT

Should it become difficult to engage the locking band, segment or pressure warning screw, it may be necessary to adjust the locking band.

- 1 Expand the locking band outwards to its fully 'locked' position and fit the locking segment incorporating pressure warning screw. Both the band and locking segment should engage easily allowing the pressure warning screw to be hand tightened. If difficulties are experienced in hand tightening the pressure warning screw, the following procedure should be adhered to.
- 2 Adjust the eccentric stop (Fig 2.0) such that it provides a running fit for the locking band lug (Fig 2.0) between the adjusted eccentric stop and the fixed position of support screw.
- 3 Secure the eccentric stop by tightening hexagon socket countersunk head screw.
- 4 Re-check band operation by expanding and contracting locking band (with segment/locking plate removed). Adjust as necessary using steps 1 to 3 above.

NOTE:

It is advised, before final adjustment to lightly smear the locking band internal and external sliding faces with a thin film of general purpose grease

4.1 SEAL REPLACEMENT

Should it be necessary to remove the door seal from the closure, this can be achieved simply by prising the seal out of the groove with a flat bladed tool under the seal lip, making sure the seal and the seal groove is not damaged.

- 1 With the seal removed, the seal groove should be wiped clean of all loose impediments and corrosion deposits. A thin layer of general purpose grease should be applied to the seal groove prior to replacing the seal.
- 2 To refit the seal, present the seal to the groove with the energised lip of the seal protruding outwards (reference Fig. 9.0) and press the seal into the door seal groove at the top (12 o' clock position). Then press the seal into the bottom 6 o'clock ensuring that the seal is central in the groove. The seal should then be fitted at the 3 o'clock and again at the 9 o'clock position before working the seal evenly into the door seal groove.
- 3 Following hydrostatic testing it is advisable to inspect the seal for damage. This is particularly important for closures with a design pressure of 425Barg (#2500) and above. The seal must be replaced if damaged.

NOTE:

The seal is of predetermined length and must not be altered. If surplus seal seems evident it should be worked into the groove. Lubrication of the seal groove will assist in this operation and general seal replacement

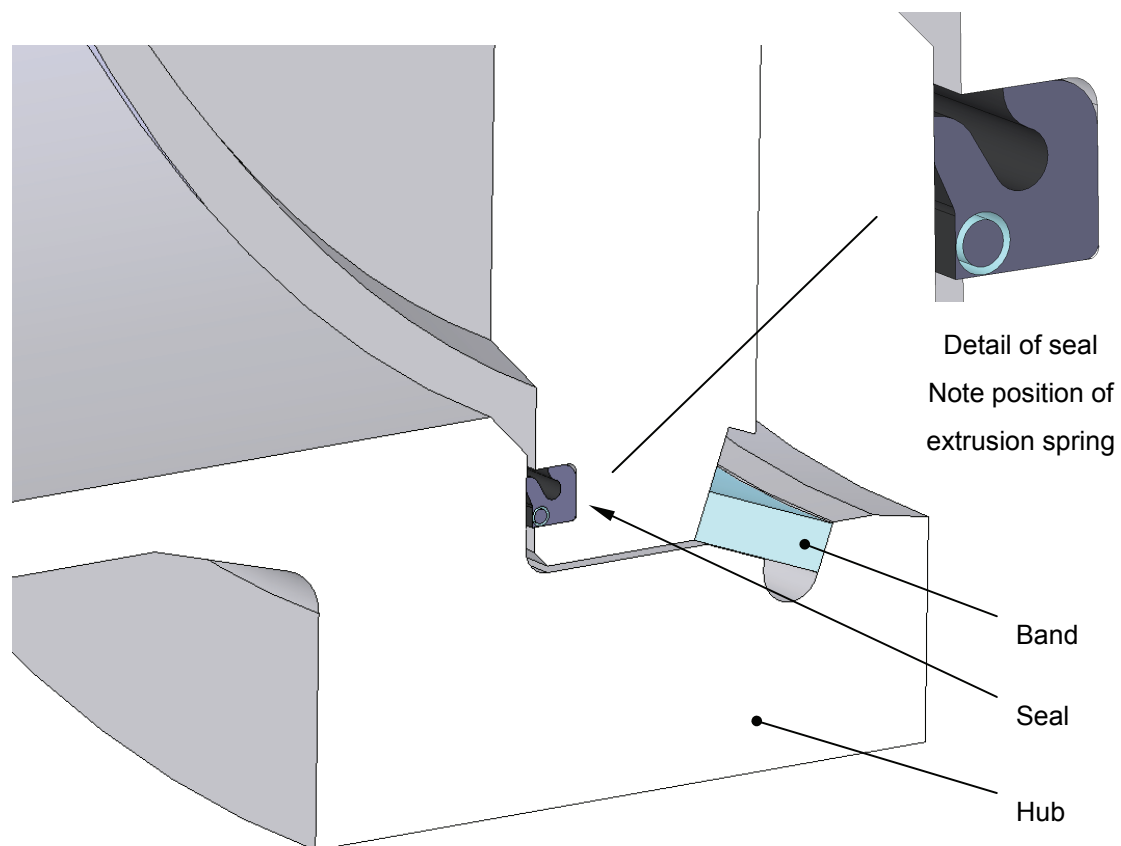


Fig 9.0 – Seal detail.

DO NOT use sharp objects to assist in the removal of closure seals
This would result in further damage to the closure

IMPORTANT NOTE:

It is false economy to neglect the requirements for regular and thorough routine cleaning, checking and surface protection. Damage to the seal faces will cause leakage problems.

If you are in any doubt about the installation, maintenance or operation of this equipment, please contact the GD Engineering Service Department.
TEL +44 (0)1909 482323 email: gd@spx.com

4.2 TORQUE SETTINGS

Recommended torque settings for the Bandlock closure, stainless steel door bolts and pressure warning screws.

DOOR BOLTING

| FASTENER SIZE | TORQUE SETTINGS Nm / lbf.ft |
|---------------|--------------------------------|
| M8 | 17 / 12.5 |
| M10 | 33 / 24.3 |
| M12 | 57/42 |
| M16 | 85 / 62.7 |
| M20 | 160 / 118 |
| M24 | 250/184.4 |
| M30 | 320/236 |

PRESSURE WARNING SCREW (PWS)

| PWS Size | RECOMMENDED TORQUE SETTINGS Nm / lbf.ft. |
|----------|---|
| M16 | 31 / 23 |
| M24 | 74 / 54.6 |

4.3 MAINTENANCE ACTIVITY DETAILS

In order to maintain the Bandlock™2 closure in good working condition and to prevent operational difficulties, the following activities should be performed periodically as part of a routine maintenance schedule.

MECHANICAL MAINTENANCE - BANDLOCK™2 CLOSURE

4.3.1 Locking Band (reference Fig. 1.0)

- a) Clean the locking band.
- b) Check for any distortion within the band and the lugs to the band. Ensure that the retaining clips are correctly installed.
- c) Lightly lubricate the locking band with general purpose grease.

4.3.2 Door / Closure Hub (reference Fig. 3.0)

- a) Check that the sealing surface of the door is clean and free from mechanical damage and corrosion, refurbish as necessary.
- b) Check that the sliding surfaces of the door/band interface are clean and free from mechanical damage and corrosion, refurbish as necessary.
- c) Visually inspect for thread wear and corrosion in the pressure warning screw hole.
- d) Check for damage to the pressure warning screw seal face.
- e) Check gap between the hub and the door in the top and bottom positions, (ref section 2.8). These gaps should be equal.
- f) Lightly lubricate the locking band groove and all machined surfaces with general purpose grease.

4.3.3 Pressure Warning Screw (reference Fig. 3.0)

- a) Check for thread wear, corrosion and straightness of the pressure warning screw and check the condition of the pressure warning screw seal and replace if necessary.

4.3.4 Locking Mechanism (reference Fig. 2.0)

- a) Expand the locking band outwards to its 'locked' position and fit the locking segment and integral pressure warning screw.

With the pressure warning screw in position, check that the gap between the ends of the locking band and segment are approximately 1/16" (1.5mm) each side.

If it is necessary to reset the gap, adjust the two eccentric stops (reference Fig. 2.0) such that they make contact with the edges of the locking band lugs whilst leaving a gap of approximately 1/16" (1.5mm) each side.

- b) Secure stops by tightening hexagon socket countersunk screws.

4.3.5 Hinges (reference Fig. 1.0)

- a) Check the freedom of movement of the hinge pins and bearings. Check there is no excessive wear.

4.3.6 Seal

- a) Check the condition of the door seal and change out if necessary ensuring that the seal is within its shelf life, as quoted on the seal packaging.
- b) Lightly lubricate the seal and its mating faces with general purpose grease.

NOTE:

Shelf life is specified as date to be used within, and then dependant of operational use, refer to section 3.3 – Storage.

Leak Testing

- a) Upon completion of all remedial work, and in accordance with client operational procedures we recommend that a leak and pressure test is performed to verify closure integrity.

IMPORTANT NOTE:

In order to protect product integrity no unauthorised modifications or alterations must be carried out without the prior approval of GD Engineering.
Any such modifications/alterations may affect the product warranty.