GD Engineering

AN SPX BRAND

SPX FLOW CONTROL

Installation, Operation and Maintenance Manual for Vertical Rotalock™ Closure

Retford Road
Worksop
Nottinghamshire
S80 2PY
England
Tel: +44 (0)1909 482323
Fax: +44 (0)1909 477902
Email: info.gd@spx.com
www.gdengineering.co.uk

19191 Hempstead Highway
Houston
Texas
TX 77065-4702
USA
Tel: +1 (1)281 807 2818
Fax: +1 (1)281 894 1332
Email: gd.closures@spx.com

Rev. 09.01

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

CONTENTS

The Rotalock™ 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 VERTICAL CLOSURE COMPONENTS:

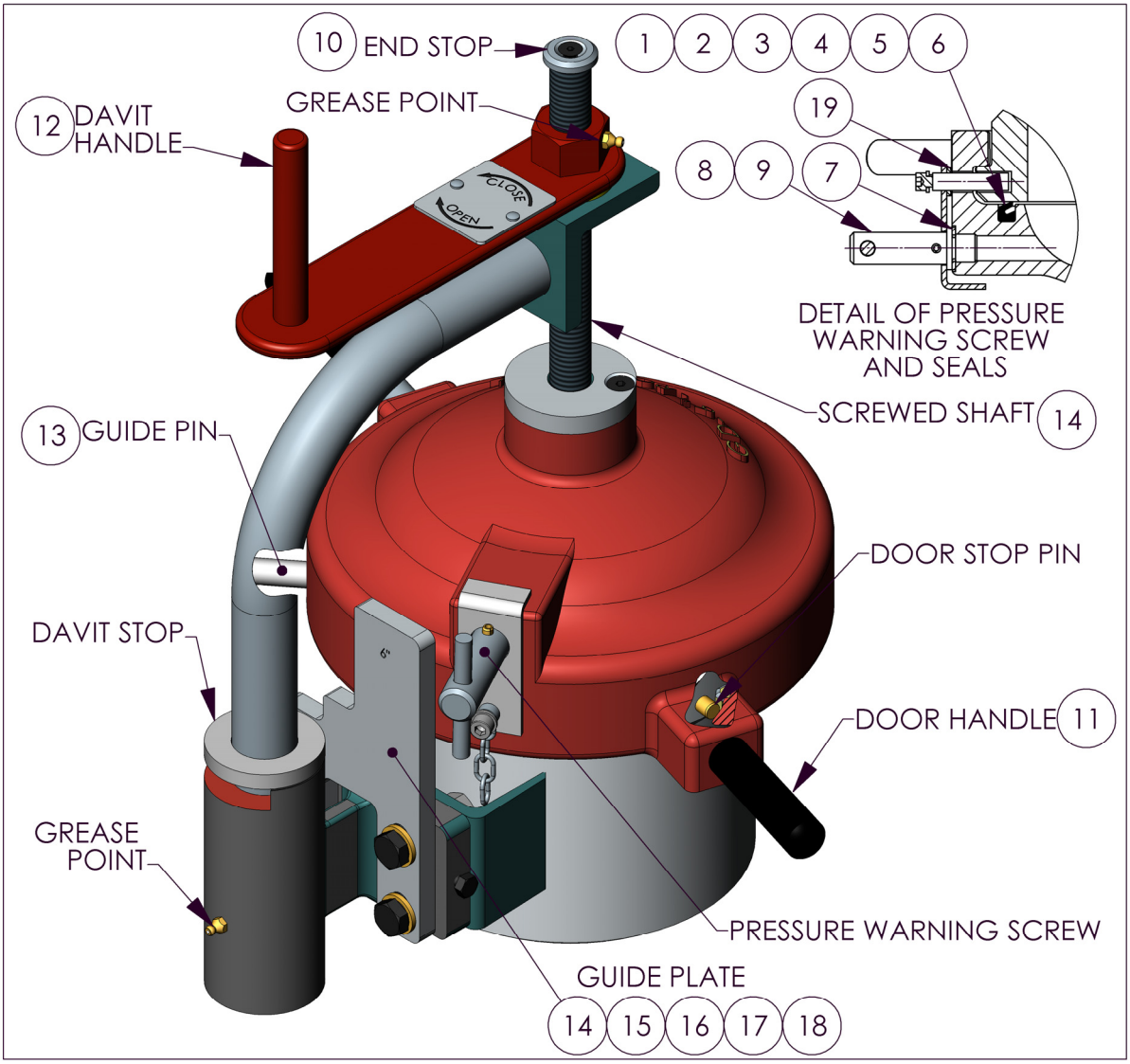


Fig 1.0 Component identification (balloon numbers refer to spare parts, see section 4.2 and figure 4.0)

2.0 INITIAL INSTALLATION

2.1 CLOSURE ORIENTATION

The GD Engineering vertical Rotalock™ closure must be installed truly vertical. The position of the davit attachment bracket on the hub can be in any orientation to suit the users application.

WARNING
DO NOT INSTALL CLOSURES WHICH ARE NOT IN A TRULY VERTICAL 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 Rotalock™ 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: info.gd@processequipment.spx.com

2.2 CLOSURE DOOR REMOVAL

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

IMPORTANT NOTE
The Rotalock™ closure door must always be removed prior to welding the closure to any pressure vessel

1 Remove the Pressure Warning Screw and unlock the closure door (Reference section 3.1 and 3.2 for unlocking and locking procedure).

2 Ensure that the Rotalock™ closure door is adequately supported in an approved sling. On the smaller sizes it will be possible to manually support the door. The door and davit assembly can be lifted out of the davit bracket.

3 The davit support bracket and guide plate can now be unbolted from the closure hub.

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

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)

2 After Hydrostatic testing:

- Ensure that closure internal surfaces (including the seal housing) are thoroughly dried and greased to prevent corrosion.

- It is advisable to inspect the seal for damage. 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.

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.

IMPORTANT NOTE
The closure door and seal must always be removed before any welding is carried out

2.6 MASKING PROCEDURE FOR PAINTING THE ROTALOCK™ 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 pressure warning screw assembly and seal must be removed from the door. (These components are stainless steel and do not require painting).

3 Davit bearings and all threaded holes must be suitably protected from ingress of shot blast and paint material.

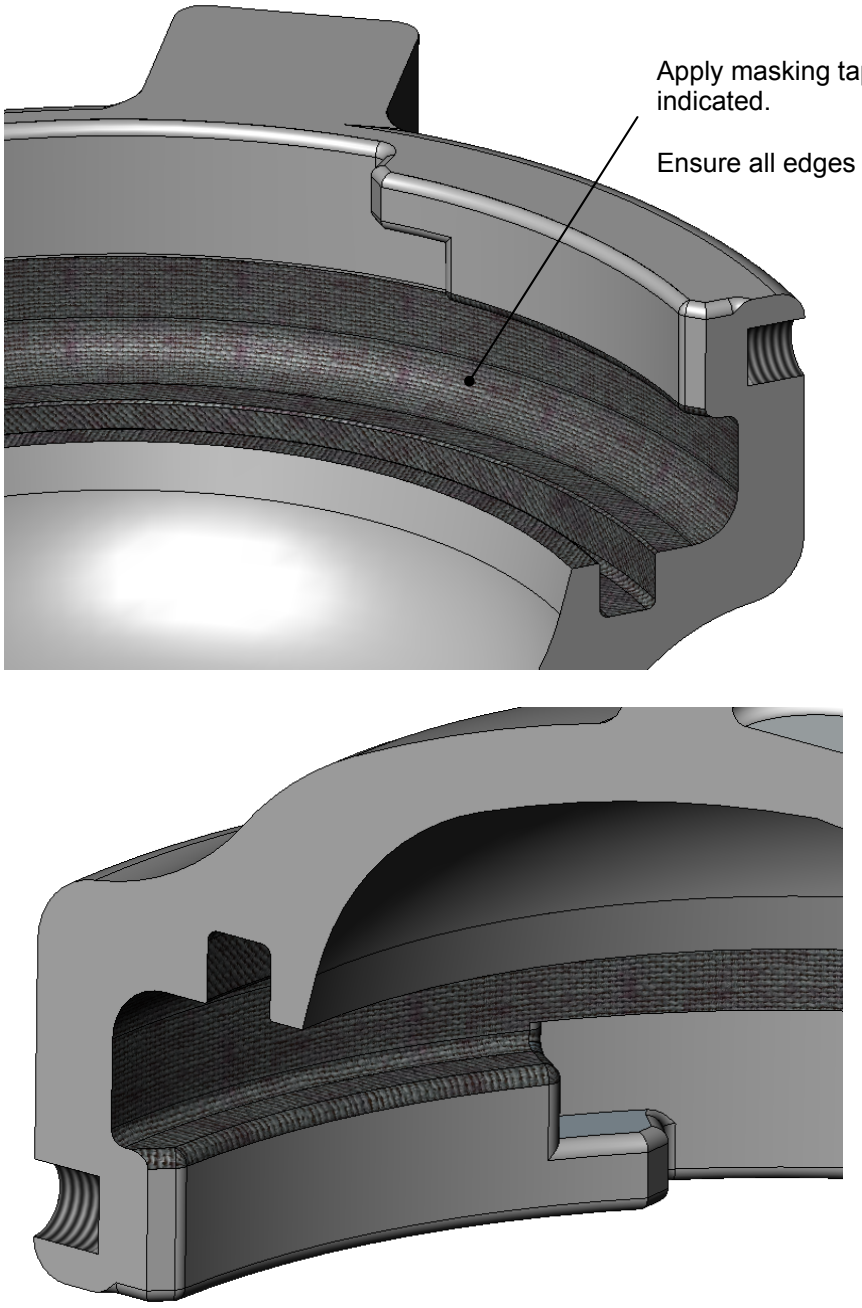
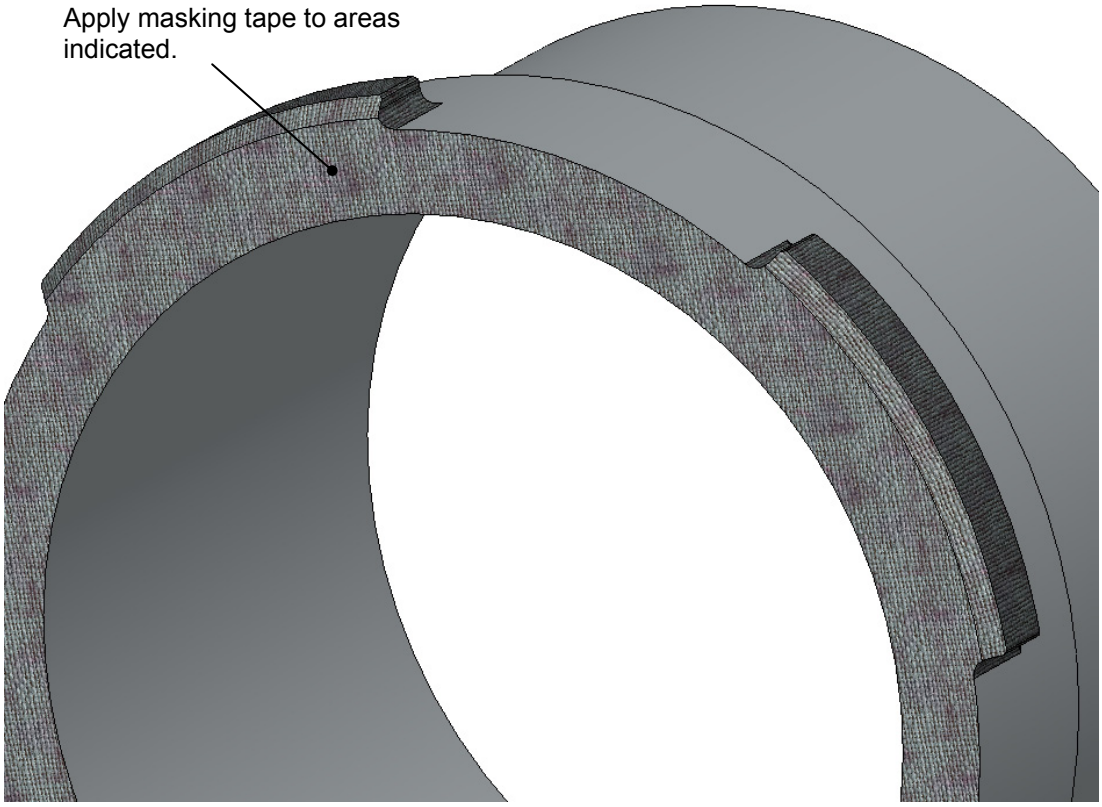


Fig 2.0 Door masking areas

MASKING PROCEDURE continued…..



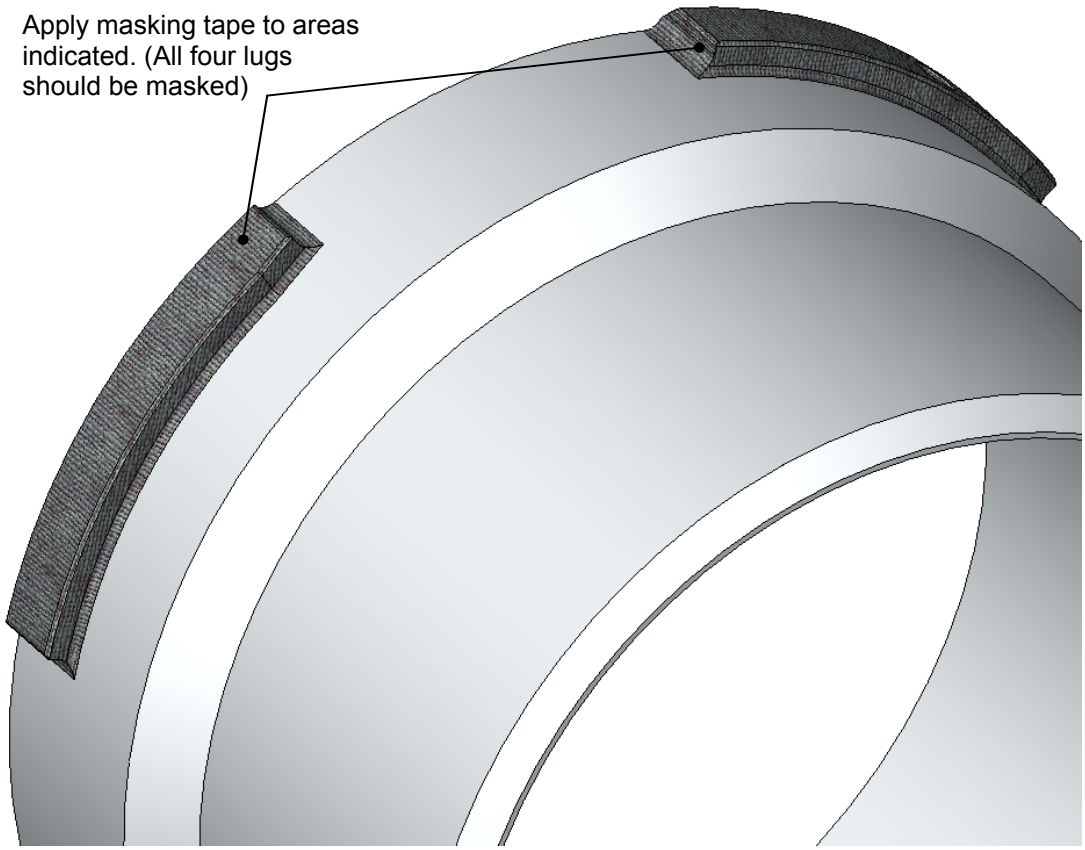


Fig 3.0 hub masking areas

2.7 CLOSURE DOOR RE-INSTALLATION

Once you are ready to re-install the Rotalock 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. It will be possible to manually handle the smaller closures.

2 Fasten the davit support bracket and guide plate back in position via the 4 off M10 bolts.

3 The door with davit arm attached can be lowered onto the davit support bracket.

4 Ensure that all machined surfaces are corrosion protected (reference section 4.0 - Maintenance).

5 The door can now be lowered onto the hub via the davit arm screw. (Reference section 3.1 and 3.2 for unlocking and locking procedure).

3.0 ROTALOCK™ 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.

3 Unscrew Pressure warning screw (P.W.S.), if any fluid is seen or heard to escape retighten P.W.S. and ensure all pressure has been vented in vessel before continuing.

4 Remove P.W.S, which releases locking pin. Door is now free to rotate.

5 Turn door anti-clockwise until guide pin (13) comes up to first stop on guide plate.

6 Rotate davit handle (12) clockwise to raise door. Once the guide pin is clear of first stop on guide plate the door can be rotated anti clockwise up to second stop on guide plate.

7 Rotate davit handle clockwise until the screwed shaft boss makes contact with underside of angle bracket on davit arm. Door can now be swung anti-clockwise up to davit stop.

8 The door is now fully open; inspect seal for signs of damage.

MAINTENANCE NOTE

The Rotalock closure **MUST** always have sealing faces and machined areas of the closure hub and door rustproof protected 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

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 Swing door in line with hub. Align guide pin with guide plate.

6 Rotate davit handle anti-clockwise to lower door until guide pin meets stop on guide plate.

7 Rotate door clockwise it will be stopped by doorstop pin. Lower door again on davit while applying slight pressure to rotate door clockwise. Once clear of stop pin door can be rotated fully clockwise to the locked position.

8 Replace P.W.S., ensuring lock pin engages with hole on hub, screw P.W.S. home, do not use excessive force to tighten up. The closure is now fully closed and locked. The closure is now fully closed and locked.

9 Replace P.W.S., ensuring lock pin engages with hole on hub, screw P.W.S. home, do not use excessive force to tighten up.

10 The closure is now fully closed and locked.

3.3 STORAGE

Rotalock™ 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.

Rubber Products (seals)
Shelf Life:

Material	Primary Storage Period Years	Extended Period (after re-inspection) Years
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 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 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. 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

4.1 MAINTENANCE ACTIVITIES:

1 Ensure front face of hub, seal and locking lugs are well lubricated with grease.

2 Periodically grease door and davit shafts at grease points indicated in Fig 1.0, use good general-purpose grease, e.g. Castrol Spheerol LMM, BP Energrease Universal.

3 Inspect door seal (item 1 to 6) for signs of wear or damage, replace where necessary. **DO NOT** use sharp objects to assist in replacement of seal.

4 Inspect P.W.S. 'bonded' seal (Item 7.) for signs of wear or damage, replace where necessary.

5 Periodically check security of all bolted connections on davit arm assembly.

6 Inspect lugs on door and hub for signs of any major structural damage, contact GD Engineering if any part of lug is damaged or missing.

4.2 SPARES. (Refer to Fig 1.0 for part number identification)

1. 4” SEAL	NITRILE	3100-0001-05	VITON	3100-0001-03
2. 6” SEAL	NITRILE	3100-0002-05	VITON	3100-0002-03
3. 8” SEAL	NITRILE	3100-0003-05	VITON	3100-0003-03
4. 10” SEAL	NITRILE	3100-0004-05	VITON	3100-0004-03
5. 12” SEAL	NITRILE	3100-0005-05	VITON	3100-0005-03
6. 14” SEAL	NITRILE	3100-0006-05	VITON	3100-0006-03
7. DOWTY SEAL	NITRILE	3299-0068-05	VITON	3299-0068-03
8. P.W.S. ASSEMBLY		2030-0441 (For 4”, 6” and 8”)		
9. P.W.S. ASSEMBLY		2030-0442 (For 10”, 12” and 14”)		
10. END STOP		2416-0203		
11. DOOR HANDLE		2196-0227 (& cover)		3152-0011
12. DAVIT HANDLE		2196-0226		
13. GUIDE PIN		4131-0007		
14. 6” GUIDE PLATE		2195-0337		
15. 8” GUIDE PLATE		2195-0338		
16. 10” GUIDE PLATE		2195-0339		
17. 12” GUIDE PLATE		2195-0340		
18. 14” GUIDE PLATE		2195-0341		
19. ‘V’ SEAL		3153-0482		

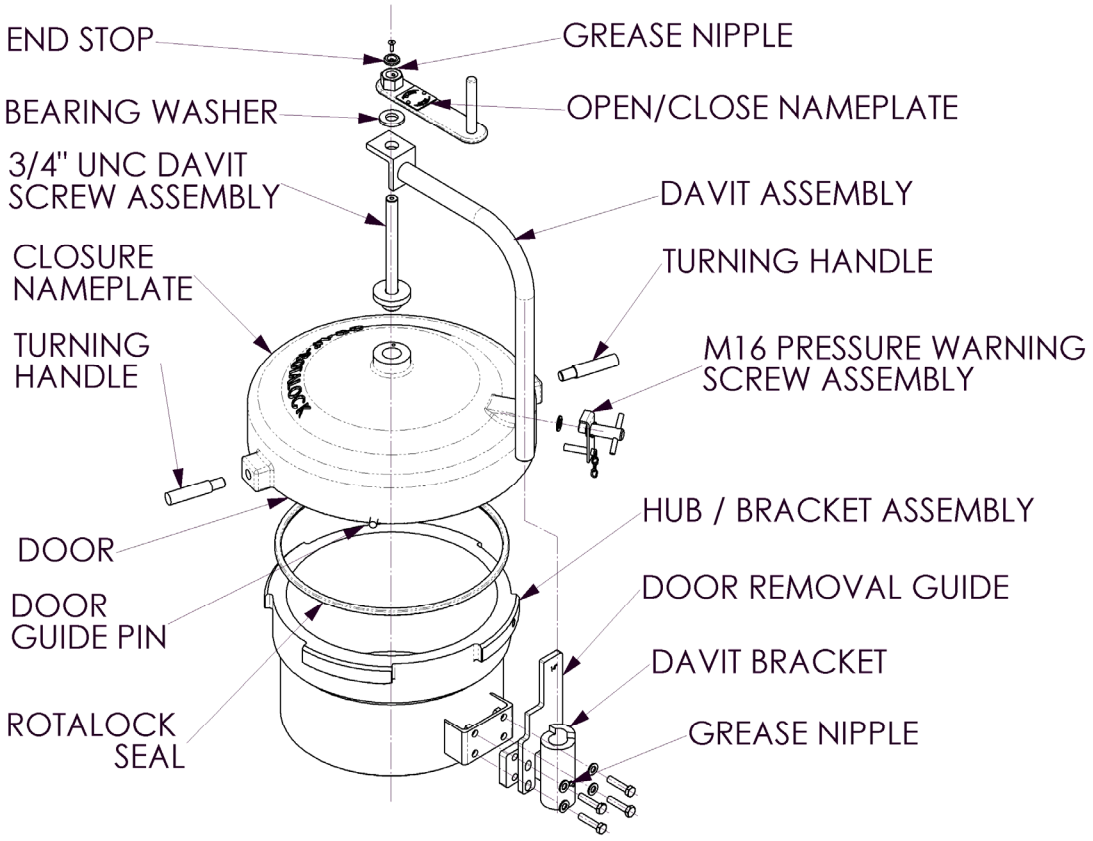


Fig 4.0 Exploded view of Rotalock Vertical Closure