

Tool-less[®] Hinged Closure Installation, Operation, & Maintenance

CAUTION!

Operating closures can be extremely hazardous and safety precautions must be exercised. Proper installation and maintenance of Tube Turns Tool-less[®] Closures have a direct bearing on the safety of the operator. All instructions should be read carefully by personnel engaged in installation, operation, and maintenance.

ORIENTATION

The "H" type closure is designed for installation and operation in the horizontal plane (door swings in and out). The standard hinge orientation is left hand such that the door swings open from right to left. Right hand hinging is also available and must be specified at time of order. The "H" type closure, regardless of left hand or right hand orientation, must be installed truly horizontal.

The "V" type closure is designed for installation and operation in the vertical plane (door raises and lowers for opening and closing, respectively). "V" type closures up to size 24" are provided with lifting davits that mechanically raise and lower the door. Larger sizes are provided with lifting lugs, requiring an external lifting source.

WELDING

The closure should be joined to a pipe end or vessel nozzle with a circumferential butt-weld, employing the standard technique most appropriate to the particular installation. The closure hub is equivalent to a short, thin, close tolerance, pipe nipple and all precautions that are normally required in fabrications of this type must be taken.

The welding of nozzles, sight glass frames, structural attachments, etc. to the closure should be done at the factory prior to final machining. If it is necessary to make field welds on the vessel in the vicinity of the closure, they should be made before the closure is attached to the pipe or vessel.

ATTENTION!

The closure door, seal, and locking ring assembly must be removed before welding and post weld heat treatment.

POST WELD HEAT TREATMENT

When the closure attachment weld must be post weld heat treated, local heat treatment is recommended. Careful control is required during this operation to assure the closure is not warped. The use of proven procedures is required.

Section VIII, ASME Boiler and Pressure Vessel Code, recommends the following stress relieving temperatures and holding times for mild carbon and low alloy steels:

Metal Temperature (Deg. F)	Holding Time (Hr./in. of Thickness)
1100	1
1050	2
1000	3
950	5
900	10

(Use of a lower temperature and a corresponding increase in holding time tends to minimize possibilities of distorting the closure components.)

ATTENTION!

The closure door, seal, and locking ring assembly must be removed before welding and post weld heat treatment.

OPERATION

CAUTION!

Do not attempt to open the closure until all incoming pressure lines have been closed off and the pipe or vessel has been relieved of all internal pressure. Opening under pressure may result in injury to persons and damage to property.

All closures are equipped with a pressure warning screw assembly that prevents the door from being opened while under internal pressure. The pressure warning screw assembly comprises of a pressure warning screw (PWS), safety interlock segment, and connecting arm. The PWS, when loosened under gaseous pressure, will generate a whistling noise to alert the operator that the closure is under pressure. If the pressurizing media is a liquid, the pressure warning screw will leak. The safety interlock segment is connected to the pressure warning screw via the connecting arm and prevents the locking ring from being unlocked while the pressure warning screw is installed.

Opening the closure may be performed safely using the following steps:

- 1) Loosen pressure warning screw (if any pressure or residual fluid is detected, re-tighten the pressure warning screw and do not attempt to continue opening the closure). Ensure all fluid is completely drained before continuing.
- 2) Completely remove pressure warning screw assembly from door.
- 3) Insert actuator handle (attached to closure) into crank from the bottom and rotate 180° counterclockwise. Actuator crank will "snap" as rotation is completed (locking ring completely collapsed).
- 4) Pull hinge handle (permanently attached to hinge) outward and swing head away from hub.
- 5) Lightly lubricate all sealing and contact surfaces with Vaseline or silicone grease shortly after to prevent corrosion of these critical surfaces.

Steps 1 & 2

Loosen PWS and remove assembly

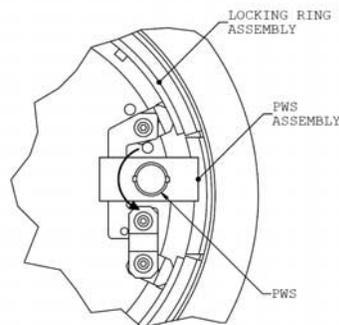


Figure 1

Steps 3 & 4

Insert handle and rotate 180° PWS CCW. Swing door out from hub

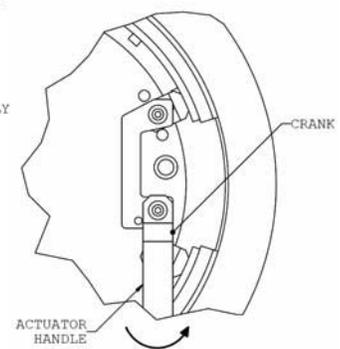


Figure 2

CAUTION!

Do not place hand between the hub and door while opening or closing the door.

Closing the closure may be performed properly using the following steps:

- 1) Wipe off all sealing and contact surfaces and lightly re-coat with Vaseline or silicone grease. Ensure all deposits and corrosion has been removed.
- 2) Visually inspect seal for any damage including tears, excessive wear, swell, etc. If breaks or tears are present, the seal must be replaced to ensure seal reliability during operation.
- 3) Ensure seal groove in door is free from corrosion. Re-lubricate if necessary.
- 4) Push hinge handle (permanently attached to hinge) inward and carefully swing head into hub. Ensure door is completely seated against hub.
- 5) Insert actuator handle (attached to closure) into crank from the top and rotate 180° clockwise. Actuator crank will “snap” as rotation is completed (locking ring completely expanded and locked).
- 6) Insert pressure warning screw into threaded hole in door while placing safety interlock assembly into the locking ring gap.
- 7) Tighten the pressure warning screw to approximately 10 ft-lb.

CAUTION!

Do not place hand between the hub and door while opening or closing the door.

DISASSEMBLY & RE-ASSEMBLY

Door removal may be performed efficiently using the following steps:

- 1) Remove the pressure warning screw assembly and collapse the locking ring (see OPERATION section for ‘opening’ procedure).
- 2) Safely support the door in sling. Sling must suspend door in a balanced manner in order to perform the next step safely.
- 3) Remove hinge pins from upper and lower hub hinge arms (hinge arms welded to hub).
- 4) Door is ready to be removed from hub.

Door Re-installation may be performed efficiently using the following steps:

- 1) Strap door in sling and properly position door with respect to hub for re-installation.
- 2) Insert hinge pins in upper and lower hub hinge arms (hinge arms welded to hub). Make sure both pins pass through hinge beam bushings as well, properly supporting the weight of the door.
- 3) Expand the locking ring and install the pressure warning screw assembly (see OPERATION section for ‘closing’ procedure).
- 4) See DOOR ADJUSTMENT section for proper door alignment

PAINT PREPARATION

Perform the following steps before blasting and painting:

- 1) Mask off the entire locking ring assembly, pressure warning assembly, and tapered door surface
- 2) Protect bushings and holes from shot blasting grit
- 3) Once painted, apply a thin layer of anti-seize compound to unpainted door/hub surfaces (except door/hub sealing surfaces) for smooth operation and rust prevention.

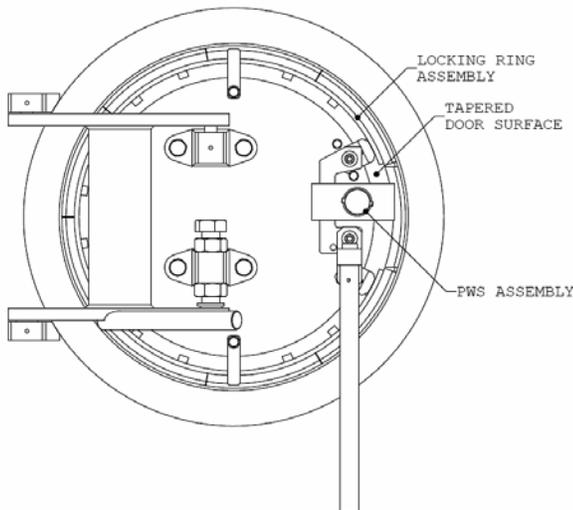


Figure 3 – Areas required to be masked

DOOR ADJUSTMENT

Door Centralization is essential for proper functioning of the closure. A properly centered door should resemble *Figure 4* whereby the door and hub centers are coincident. If the door is not centered as shown in *Figure 5*, vertical/horizontal adjustment must be made.

Vertical Adjustment may be performed using the following steps:

- 1) Place door in hub
- 2) Loosen the adjustable hinge bolt locknut (upper)
- 3) Tighten the adjustable hinge bolt hex nut (lower) until the door is jacked to the right height
- 4) Re-tighten the adjustable hinge bolt locknut (upper)

Horizontal Adjustment may be performed using the following steps:

- 1) Place door in hub
- 2) Position shims between the door and hub at 5 & 7 o'clock (door may need to be adjusted vertically to do so)
- 3) Loosen (do not remove) head hinge bolts such that door is free to rest on the shims placed between the door and hub (door may require vertical adjustment during the process)
- 4) Re-tighten head hinge bolts

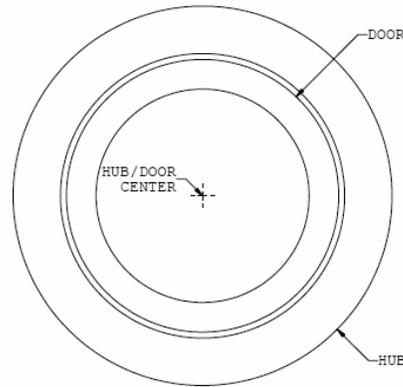


Figure 4 – Centered

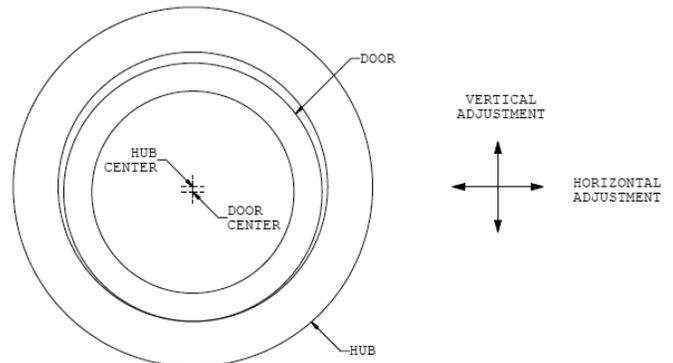


Figure 5 – Non-Centered

GASKET INSTALLATION

There are three important aspects to the installation procedure: 1) Cleaning, 2) Lubrication, 3) Installation.

- 1) **Clean** the door seal groove from all foreign material and corrosion before installing the seal. Foreign material such as grease, oil, dirt, etc can be removed with a clean cloth and, if required, a solvent. Corrosion can be removed manually with a fine emery paper or wire brush. **DO NOT USE POWER TOOLS ON THE GROOVE/SEALING SURFACES.**
- 2) **Lubricate** the door seal with a thin coat of Vaseline or silicone grease. Too much lubricant on the seal or in the seal groove will prevent proper seating of the seal in the seal groove.

- 3) **Install** the door seal by pushing it into the seal groove at the 12, 3, 6, & 9 O'clock positions per the orientation indicated in *Figure 6*. The seal should be equally distributed about each quadrant. Firmly press in the remaining portions of the seal such that the entire seal is properly seated in the seal groove.

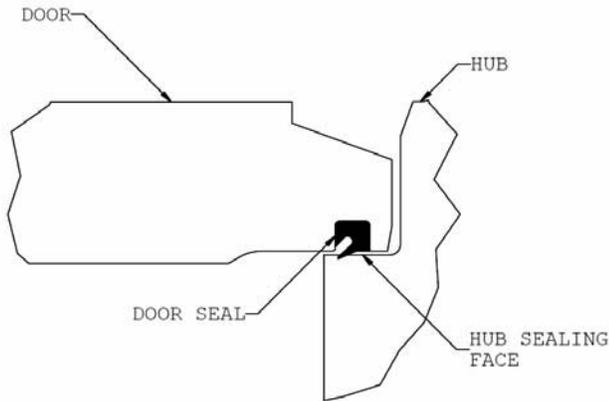


Figure 6 – Seal shown in groove

Closures are shipped with the door seal and o-ring (pressure warning screw seal) already installed.

Maintenance

Locking Ring Maintenance shall include the following:

- 1) Clean surfaces of the locking segments making contact with the head and hub. This may be done easily by opening the door and removing the locking ring assembly.
- 2) Coat contact surfaces with anti-seize compound for optimal performance and rust prevention (heavy grease may be used if the latter is not available).

Door Maintenance shall include the following:

- 1) Clean the sealing surface ensuring no debris or corrosion is present. Corrosion may be removed by hand sanding only. Lubricate the surface with a light coat of silicon grease.
- 2) Clean the tapered surface (making contact with the locking ring segments) ensuring no debris or corrosion is present. Corrosion may be removed by hand sanding only. Lubricate the surface with anti-seize compound (heavy grease may be used if the latter is not available).
- 3) Check for pressure warning screw threaded hole/sealing face for damage. Lubricate the sealing face with silicon grease.

Hub Maintenance shall include the following:

- 1) Clean the sealing surface ensuring no debris or corrosion is present. Corrosion may be removed by hand sanding only. Lubricate the surface with a light coat of silicon grease.
- 2) Clean the tapered surface (making contact with the locking ring segments) and fillet groove ensuring no debris or corrosion is present. Corrosion may be removed by hand sanding only. Lubricate the surface with anti-seize compound (heavy grease may be used if the latter is not available).

Pressure Warning Screw Maintenance shall include the following:

- 1) Check screw threads for damage. Clean debris from threads and slot. Lubricate the threads with anti-seize compound.
- 2) Remove and inspect the O-ring for damage or wear. Replace if necessary

Door Seal Maintenance shall include the following:

- 1) Inspect the door seal for damage. If noticeable damage is present, the seal must be replaced to ensure safety and reliability.
- 2) To replace the door seal, see section GASKET INSTALLATION.

Seal Replacement frequency will depend upon such factors as operating pressure and temperature, shrinkage and swelling caused by product absorption, the corrosiveness of the product in the system and frequency of operation.

Common Seal Materials used for seal are discussed below. Technical information as to properties and usages of lip seal material are based on data and recommendations of the manufacturers of the materials.

Buna-N is used for general service. Resistant to petroleum-base hydraulic and lubricating oils; animal and vegetable oils; gases such as butane, propane, acetylene, and natural gas, aromatic and non-aromatic fuels such as gasoline, kerosene, diesel fuel and fuel oils; anhydrous ammonia, and water. Temperature limits **-40 °F to 250 °F**; special compounds suitable for **-76 °F**.

Fluoroelastomer (FKM) is generally used for high-temperature services. Resistant to synthetic lubricants, petroleum-base products, some chlorinated solvents, benzene, toluene, and many acids and alkalis. Temperature limits **-40 °F to 400 °F**

ATTENTION!

Determination of the compatibility, of the O-ring material is the responsibility of the purchaser.

Storage

Closures are recommended to be stored inside in a protective environment, away from humidity and moisture (to prevent corrosion). If the closure is stored outside, it should be covered and sealed with a plastic tarp.

Seals must be stored in sealed bags and away from fluorescent light. Shelf lives for Buna-N and Viton are 7 years and 10 years, respectively.

Spares Parts

Start-Up & Commissioning requires the following spares:

- 1) One door seal per closure
- 2) Two pressure warning screw O-ring per closure

Operation

- 1) Two* door seals per closure
- 2) Four* pressure warning screw O-rings per closure

*These recommendations are for normal service; spare quantities may require adjustment based on service and operating conditions.

For Spare Parts Orders, supply the following information:

- 1) Quantity required
- 2) Description
- 3) Part number
- 4) Size and pressure class
- 5) Closure serial number

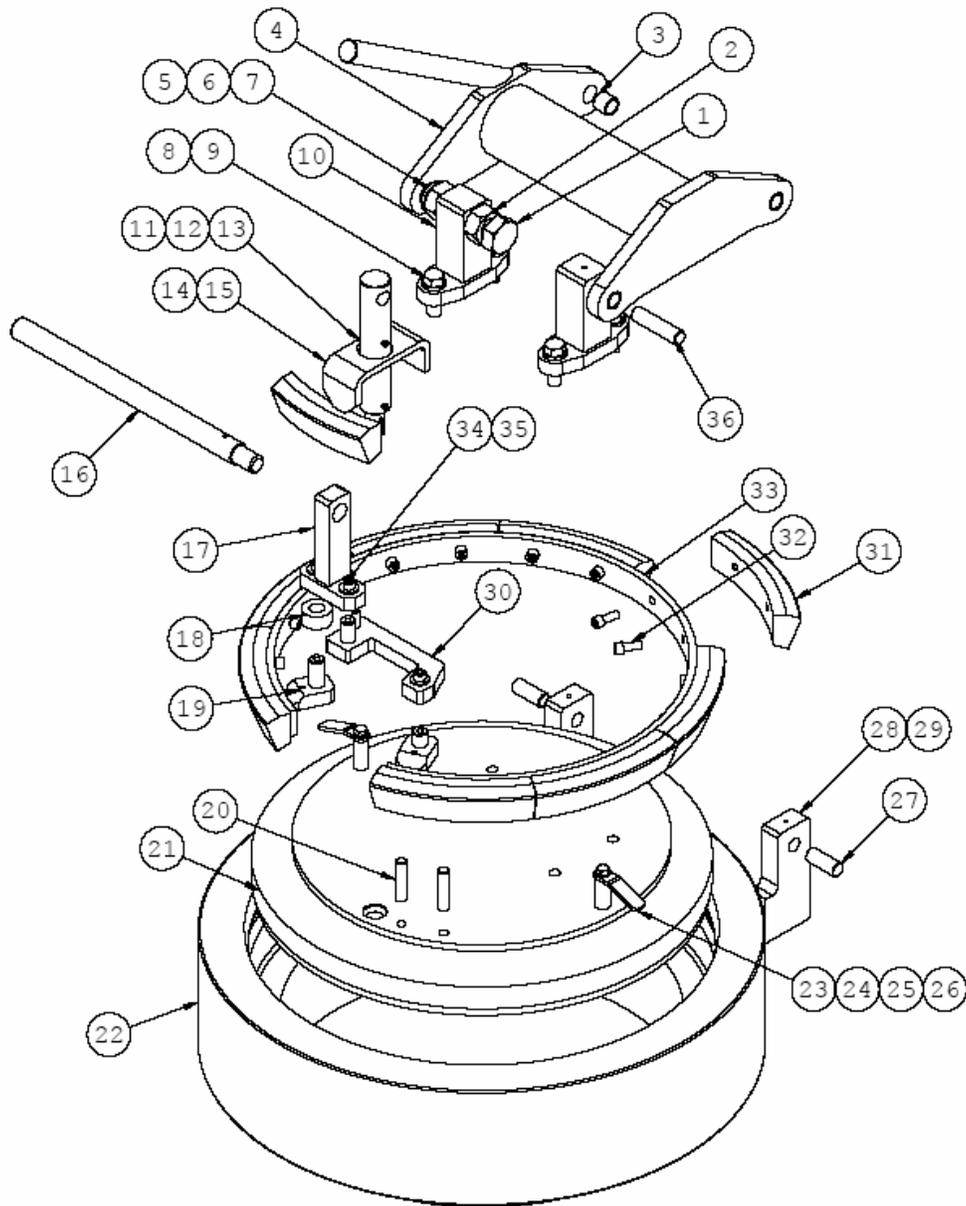
Example:

Qty: 8
 Material: Buna-N Door Seal
 Part No.: 37
 Size & Class: 8" CL600
 Type: H
 Serial No.: TL00109

Tool-less® Closure Parts List

- | | | | |
|-----------------------------|------------------------------|-------------------------|---------------------------|
| 1. Hinge Bolt | 11. Pressure Warning Screw | 21. Door | 31. Locking Segment |
| 2. Hinge Bolt Jam Nut | 12. PWS Spring Pin | 22. Hub | 32. Ring Segment Screw |
| 3. Hinge Plain Bushing | 13. PWS O-Ring | 23. Holding Clip | 33. Connecting Band |
| 4. Hinge Beam | 14. Safety Interlock Segment | 24. Holding Clip Spacer | 34. Actuator Ear Screw |
| 5. Hinge Bolt Hex Nut | 15. PWS Connecting Arm | 25. Holding Clip Screw | 35. Actuator Ear Screw |
| 6. Hinge Bolt Thrust Washer | 16. Crank Handle | 26. Holding Clip Washer | 36. Head Hinge Pin |
| 7. Hinge Thrust Bushing | 17. Crank | 27. Hub Hinge Pin | 37. Door Seal (Not Shown) |
| 8. Head Hinge Arm Screw | 18. Crank Spacer | 28. Hub Hinge Arm | |
| 9. Head Hinge Arm Washer | 19. Actuator Ear | 29. Hinge Pin Set Screw | |
| 10. Hinge Arm | 20. Ear Stop Stud | 30. Actuator U-Plate | |

12" – 72" Type 'H' Horizontal



**Tool-less® Closure
Parts List**

**8" – 24" Type 'V'
Vertical**

- | | | | |
|-----------------------------|-------------------------|------------------------------|----------------------------|
| 1. Wrench Handle | 11. Crank Spacer | 21. Davit Arm Flange Bushing | 31. Davit Post Support Pin |
| 2. Wrench Handle Washer | 12. Actuator Ear | 22. Davit Post Washer | 32. Davit Arm |
| 3. Davit Post | 13. Ear Stop Stud | 23. Davit Post Mount | 33. Door Seal (Not Shown) |
| 4. Pressure Warning Screw | 14. Door | 24. Locking Segment | |
| 5. PWS Spring Pin | 15. Hub | 25. Actuator U-Plate | |
| 6. PWS O-Ring | 16. Holding Clip | 26. Ring Segment Screw | |
| 7. Safety Interlock Segment | 17. Holding Clip Spacer | 27. Connecting Band | |
| 8. PWS Connecting Arm | 18. Holding Clip Screw | 28. Actuator Ear Screw | |
| 9. Crank Handle | 19. Holding Clip Washer | 29. Actuator Ear Washer | |
| 10. Crank | 20. Davit Arm Mount | 30. Davit Post Holding Pin | |

