

## Tema RedLok™ High Pressure Connectors

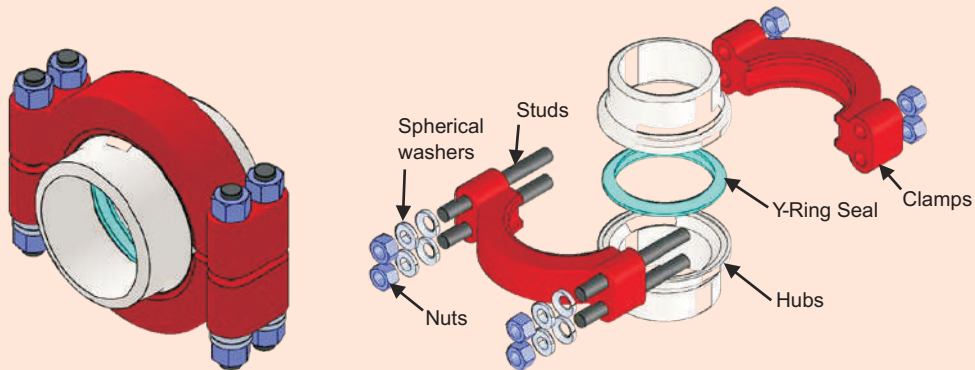


Figure-1: (a) Fully assembled RedLok™ connector (b) Exploded view of RedLok™ connector

RedLok™ clamped connectors are proven alternative to conventional ring flanged connectors.

### ❖ Construction

Tema RedLok™ high pressure connectors are clamped connectors with special pressure energized Y-ring seal designed to meet ASME Sec VIII Div-1/ Div-2 codes. The connector consists of 2 hubs, 1 specially designed Y-ring seal, 1 set of clamps, stud bolts, spherical washers and heavy hex-nuts.

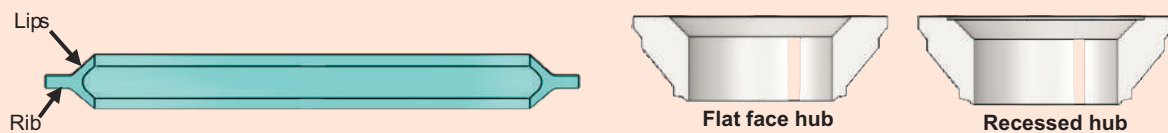


Figure-2: (a) Profile of Y-seal ring (b) Flat face and recessed hubs

Hub face can be either be flat or recessed to accommodate the thickness of rib of seal ring.

### ❖ Design principle

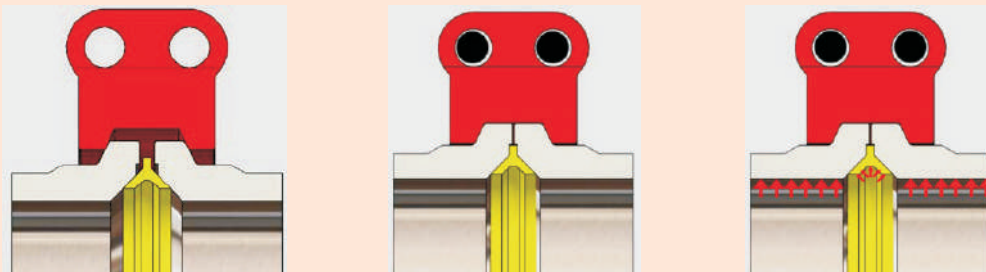


Figure-3: (a) Components assembled prior to bolt tightening (b) After bolts are tightened (c) In service

- The seal ring does not seat fully until the clamp bolts are fully tightened. A small clearance (stand-off 0.2-2 mm) should be observed between the ring rib and hub face when the ring is positioned inside a hub. A lubricant is applied on the seal ring to hub contact face in order to obtain low friction and to prevent galling when the seal ring is sliding down the tapered seat during assembly.
- When the clamp bolts are tightened, the hubs are drawn together by the wedge action of the two clamps compressing on the Y-seal ring to make the first-stage seal. After completion of clamp assembly, the hub faces will establish metal-to-metal contact outside the sealing diameter of Y-seal ring.
- In service the Y-seal ring becomes even more effective as the internal pressure reinforces the metal-to-metal seal.

Tema RedLok™ connectors are 99.9% leak-proof, low on maintenance and high on performance.

RedLok™ connectors have been helium leak tested using sniffer technique with 51.5% tracer gas concentration, test pressure of 1.2kg/cm<sup>2</sup>(g) and acceptable leak rate of  $1 \times 10^{-4}$  std cm<sup>3</sup>/s.



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❖ **Standard sizes and tolerances**

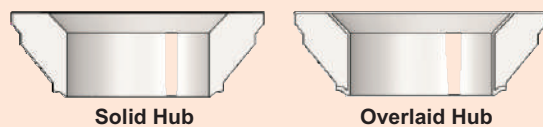
RedLok™ connectors are available in sizes from ½ NPS to 24 NPS for class 900 to 2500, other sizes are available on request. The welding bevel and dimensional tolerances are in accordance with ASME B16.5.

RedLok™ connectors may be subjected to system hydrostatic tests at a pressure of 1.5 times the 38 °C (100 °F) rating rounded off to the next higher 1 bar (25 psi) increment.

❖ **Typical materials (other materials are available on request)**

Metallurgy of connecting pipe	Hub (1, 2, 3)	Clamp (1, 2, 4)	Seal (1, 2, 5)	Stud   Nut & Washer
CS	SA-105, SA-266 Gr 2	SA-105, SA-266 Gr 2	CS	SA-193 Gr B7   SA-194 Gr 2H
LTCS	SA-350 Gr LF2	SA-350 Gr LF2	LTCS	SA-320 Gr L7   SA-194 Gr 7
- - -	SA-182 F11 Cl 2	SA-182 F11 Cl 2	1 ¼Cr – ½Mo	SA-193 Gr B7   SA-194 Gr 2H
AS: 2 ¼Cr–1Mo	SA-182 F22 Cl 3	SA-182 F22 Cl 3	2 ¼Cr–1Mo	SA-193 Gr B16   SA-194 Gr 7
Austenitic SS 304,316,321, 347	SA-182 F304, 316, 321, 347	SA-266 Gr 2, SA-182 F304, 316	SS304, 316, 321, 347	SA-193 Gr B7   SA-194 Gr 2H
Duplex SS, Super Duplex SS	SA-182 F51, SA-182 F55	SA-266 Gr 2	Duplex SS	SA-193 Gr B7   SA-194 Gr 2H
Inconel 625	Inconel 625	SA-266 Gr 2	Inconel 625	SA-193 Gr B16   SA-194 Gr 7

- (1) Hubs and clamps are machined from forgings and seal ring is of single piece construction.
- (2) Hub and clamp forgings are ultrasonically examined prior to machining. Hub, clamp and seal are LPT examined after final machining.
- (3) Hubs are made of metallurgy same as the connecting pipe/ nozzle. When required, the inside surface, gasket face and welding edge of hubs can be weld overlaid with corrosion resistant alloys.



- (4) Clamps being separate from hubs and not in contact with fluid (unlike conventional ring flanges), can be constructed from inexpensive metallurgies.
- (5) Seal ring is made of metallurgy same as the hub to prevent galvanic corrosion. It is coated with light oil to prevent corrosion during transportation & storage and provide lubrication during seal make-up.

❖ **Advantages over conventional ASME B16.5 flanges**

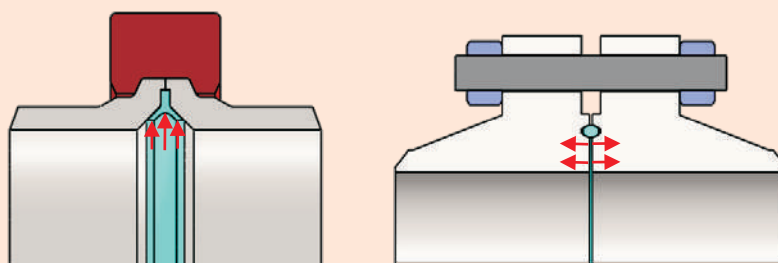


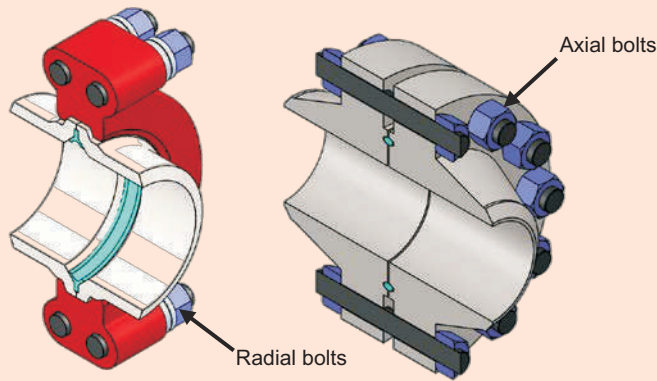
Figure-4: (a) Seal reinforced by pressure in RedLok (b) Seal weakened by pressure in conventional flanges



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- ✓ In RedLok™ connectors, the internal pressure energizes the seal lips reinforcing the seal; whereas in conventional flange joints, the internal pressure acts on the flanges faces thereby reducing the integrity of seal. This makes these connectors the preferred choice for high pressure applications.
- ✓ The connector has only 4 radial bolts to tighten relative to up to 24 axial bolts on a conventional flange. This greatly reduces the maintenance downtime due to quick and easy make-up and breakout of bolted connections.
- ✓ It is easy to align the radial holes in clamps than axial holes in conventional ring flanges. Also, the clamp can be rotated around the hub for easy bolt orientation and tightening.



This eliminates the possibility of mismatch of bolt holes that could occur between ASME B16.5 flange welded to the equipment at shops vs piping flange welded at site.

- ✓ Bolt bending in the assembly is prevented by providing spherical washers.
- ✓ Large reduction in connector diameter and length results in significantly light weight connector than corresponding ASME B16.5 flange making them safer and easier to handle at site.
- ✓ When the application demands undisturbed fluid flow, the seal ring can be designed to be flush with flange inside diameter.

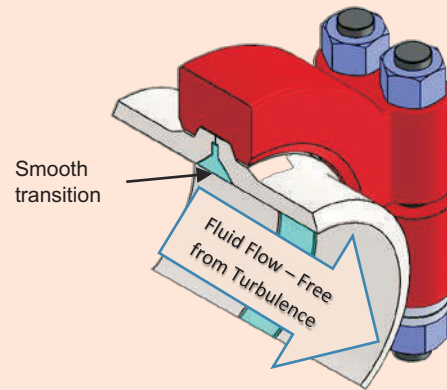


Figure-5: Seal ID flush with flange ID

#### ❖ Assembly procedure

1. Closely inspect all components prior to assembly. Particular attention should be given to scratches on the sealing face, cracks on the bolt threads and gouges on close-fitting parts.
2. Hub and Y-seal ring tapered seating surfaces must be clean and free from foreign matter.
3. Spray light oil on hub sealing face. Ensure no solid particles are present in the lubricant.
4. Seal shall rock against hub face before bolt tightening (required stand-off: 0.2-2 mm). If no stand-off is present, use a new seal ring.

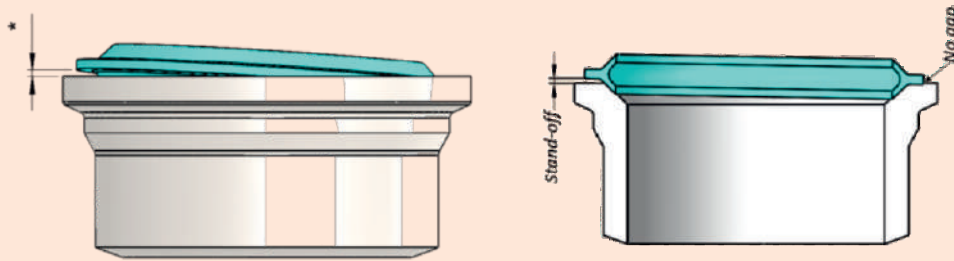
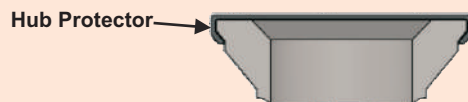


Figure-6: Standoff required between seal ring and hub face prior to assembly

5. Hubs should be aligned prior to seal ring installation. Do not attempt to correct badly misaligned piping by clamping force alone.
6. Clean the threads of studs and nuts. Check whether nuts run freely by hand, along the working length of the studs. Lubricate studs with grease.
7. Assemble clamps around hubs, install studs, spherical washers and nuts.
8. Stud-bolts should be uniformly tightened to specified torque values, keeping spacing between clamp halves approximately equal. It is recommended to position clamps vertically to prevent moisture collecting within the assembly.
9. Assembly completion can be established when:
  - a. Hubs are completely face to face with the rib of the seal ring where standard hubs are used and completely face to face with each other where recessed hubs are used.
  - b. Bolts are tightened to the specified torque value.

**⚠ Caution**

- To prevent damage to sealing faces of hubs, hubs are supplied with hub protectors. The protector should be removed only when the connector is to be assembled.



- Prevent damage to sealing faces of hubs from chains, weld spatter, earth clamps, etc.
- If the pipe to hub weld is heat treated at site, restore the surface finish of seats after heat treatment by polishing (maximum roughness 32AARH).
- Exceeding the specified bolt loads may cause clamp/hub distortions.

All data contained herein may be subject to change without notice. For further information on the RedLok™ connector, please contact us:

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