

Installation and Maintenance of the Grayloc[®] Connector

General Information

The Grayloc connector provides a highly reliable, metal-to-metal seal that is both self-energized and pressure-energized. A complete Grayloc connector consists of two hubs, one seal ring, one set of clamps, stud bolts, and spherical-faced nuts.

Assembly and maintenance are easy. Seal rings are designed to be reusable and usually only one connector size is necessary for each pipe size.

The Grayloc hub designation (e.g. 2 GR20 for industrial or B20 for oilfield applications) identifies the appropriate clamp by the first number or letter (2 or B) and the appropriate seal ring by the second number (20).

Grayloc hubs are furnished with hub protectors that should be removed only when the hubs are being welded in place, stress relieved, or when the connection is being assembled.

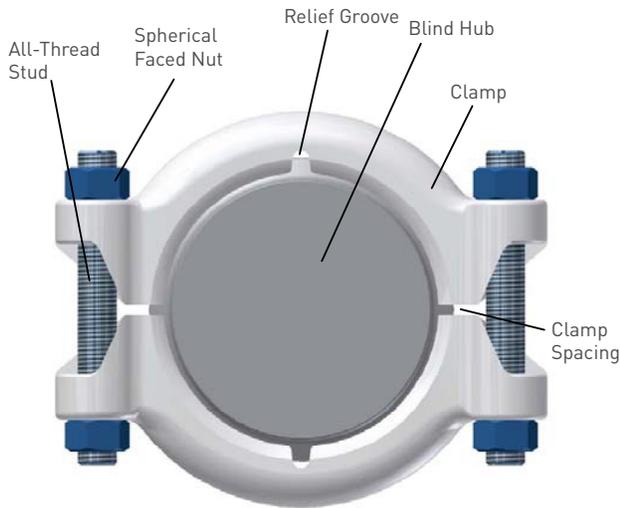
Fabrication

Grayloc hubs may be fabricated to piping or other component equipment using established welding procedures. Initial fit-up and alignment tolerances normally used in the fabrication of ANSI flanges are also acceptable for the Grayloc hub. During welding, care should be taken to protect the hub sealing surfaces from damage such as scratching and weld spatter.

When required, stress relieving of carbon and low alloy steel hubs should be completed in compliance with applicable industry codes and requirements. Hub sealing surfaces must be clean prior to being placed in the furnace.

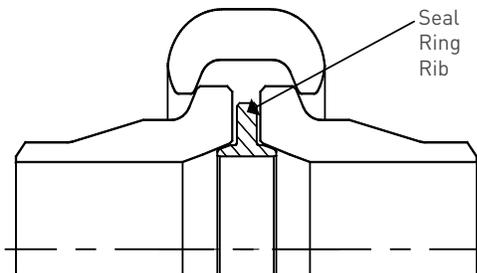


Proper assembly of the Grayloc connector is the key to pressure containment of the connection.



Before Assembly

The Grayloc seal ring does not seat until the connection is fully tightened; therefore, a small clearance, or standoff, between the seal ring rib and hub face should be observed when the seal ring is placed into a mating hub. If no standoff is present, use a new seal ring.



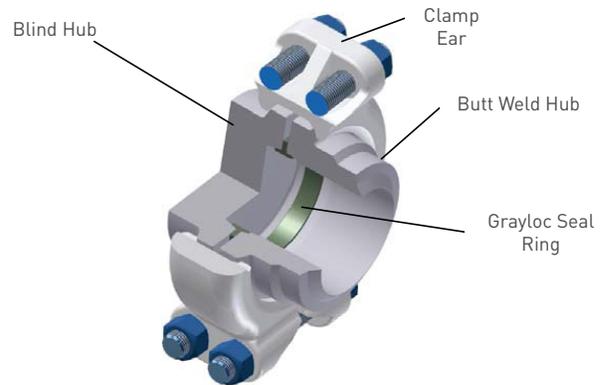
FREE POSITION

Clean all lubricants and foreign matter from the hub sealing surfaces before installation. Use a non-abrasive material to clean the seal rings of all foreign matter. Normally, all seal rings have a coating or plating (PTFE, MoS₂ with Graphite), which acts as a lubricant during make-up. In some applications where uncoated/unplated seal rings are used, a light film of clean lubricant is recommended.

When applying lubricant, take special care to ensure that no solid or foreign particles are present in the lubricant. Also take care to prevent mechanical damage to the seal ring and the hub sealing surfaces.

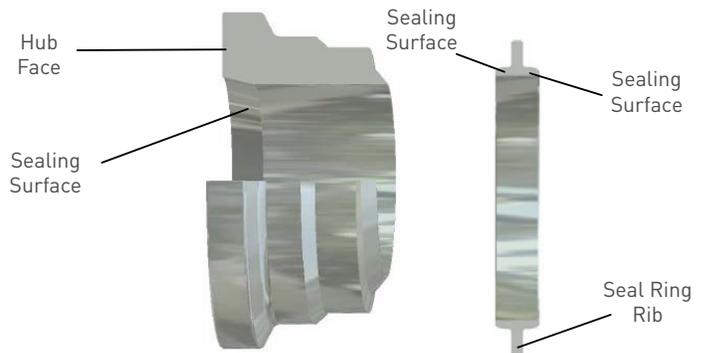
Before assembly, the hubs must be aligned to allow engagement of the seal ring lips to the hub sealing

surfaces. This will ensure proper engagement of the hub and clamp segments. For misaligned systems, it may be necessary to apply external loads to the mating piping (using jacks, come-a-longs, etc.) to align the hubs prior to assembly.



Assembly

1. Align the hubs so that the seal ring can be installed.
2. Install the seal ring in the sealing surface of the hubs. The seal ring should rock slightly; i.e., the seal ring rib should not be able to fully contact the hub face. If it does not rock, use a new seal ring.

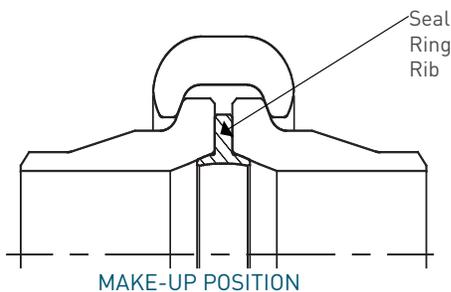


3. Apply lubrication to the hub-clamp contact area to reduce friction during assembly. Position the clamps around the hubs.
4. Lubrication of the bolting, the spherical faces of the nuts, and clamp ears is recommended. Insert the stud bolts into the bolt holes of the clamp ears. The stud-bolts should be installed to ensure that the spherically faced nuts fit into the spherical seats of the clamp ears.

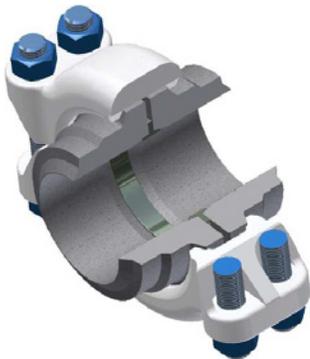
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5. Tighten the bolting in a criss-cross pattern (i.e., bolt #1, #3, #2, #4), while keeping the spacing between the clamp halves approximately equal.
6. Torque the bolting to the recommended values shown in this bulletin. The clamp should be jarred (i.e. a sound blow to the back of the clamp with a soft hammer) and the bolting re-tightened. This should be repeated until bolt torque does not change after jarring (torque, jar, torque, jar, etc).

After proper assembly, the hub faces will fully contact the seal ring rib.

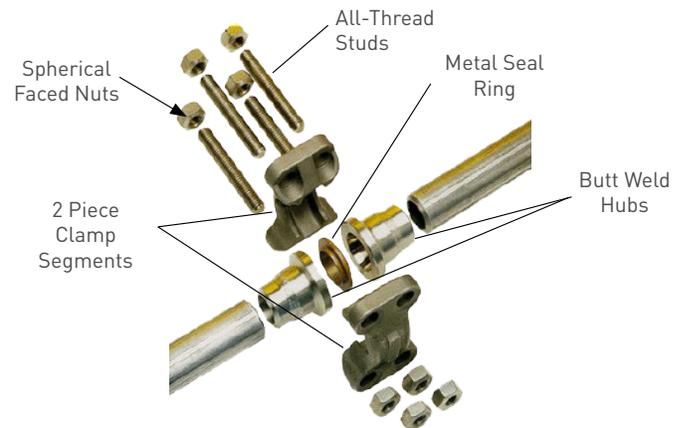


For extreme misalignment and/or extreme piping loads, torque values 1-½ to 2 times the table values are recommended. Do not exceed 2 times the recommended torque values, as this may result in permanent damage from distortion to the connector components.



Disassembly

Vent and verify that all pressure has been removed from the line before disassembling the Grayloc connector. The nuts should not be completely removed from the studs during the initial disassembly of the clamp. Loosen the bolting and all clamp segments to allow



the safe release of any trapped pressure. If the clamp segments remain in place around the hubs, then both clamp segments must be loosened by jarring (i.e. a sound blow to the inside of the clamp ear with a soft hammer). The bolting can then be safely removed after release of any trapped pressure.

Maintenance

Special maintenance is not required for a Grayloc connector that has been properly assembled. However, when disassembling a connector, check the seal ring for standoff prior to reassembly and visually inspect the hub seats for uniformity and freedom from burrs and deep scratches. These irregularities on seal surfaces could cause leakage.

Remove scale, rust, burrs, or deep scratches from hub seal surfaces by lightly polishing with fine steel wool or crocus cloth around the seat. To ensure uniform blending of re-worked surfaces, polish around the seat circumferences.

Never lap the hub seal surfaces with a seal ring; this practice will damage both the seal ring and hub seal surface and prevent an effective seal.

The connector should not be tightened while under pressure loading or severe mechanical loads. Consult Grayloc Products prior to any welding on a Grayloc clamp or seal ring.

All components of the Grayloc assembly should be obtained only from Grayloc Products or one of its authorized licensees. The performance and reliability of Grayloc connectors can be assured only when Grayloc components are used. A complete Grayloc Products Catalog is available upon request.

Average Torque Values for Two-Piece, Four-Bolt Grayloc Clamps*

Stud Bolt Size	Stud Bolt Length (Inches)	Nut Size Across Flats (Inches)	Clamp Size	Average Torque	
				ft-lbs	Nm
1/2-13 UNC-2	3 1/2	7/8	1	17	23
5/8-11 UNC-2	5	1-1/16	1 1/2	35	48
3/4-10 UNC-2	5 1/4, 6	1-1/4	2, 2 1/2-3	55	75
7/8-9 UNC-2	7, 6 3/4	1-7/16	4, C, B	90	122
1-8 UNC-2	8 1/2	1-5/8	5, D, E	140	190
1-1/8-8 UN-2	9 3/8	1-13/16	6, F	205	279
1-1/4-8 UN-2	10 1/2	2	8	290	394
1-1/8-8 UN-2	11 3/4	1-13/16	XF	330	449
1-3/8-8 UN-2	11	2-3/16	X8, G, XG	390	530
1-5/8-8 UN-2	14 1/4, 14 1/8, 17	2-7/16	H, 10H, X14	630	857
1-3/4-8 UN-2	16, 19 1/2	2-3/4	X10H, 12M, X16	870	1,183
1-7/8-8 UN-2	21 1/2	2-15/16	X18	1,170	1,591
2-8 UN-2	16 1/2, 18 1/2, 24 3/4	3-1/8	P, 2P, X12M, X20	1,300	1,768
2-1/4-8 UN-2	27, 20 3/4, 24	3-1/2	X24, 30, 3V	1,870	2,543
2-1/2 UN-2	22, 31, 29 1/2, 20	3-7/8	S, U, 32, 36, 3W, 5P	2,570	3,495
2-3/4-8 UN-2	28 3/4	4-1/4	Y	3,500	4,760
3-8 UN-2	41	4-5/8	Z	5,100	6,915
3-1/4-8 UN-2	35 1/2	5	2Y, 40	7,100	9,656

*Using lubricated bolting. Double all torque values if using un-lubricated bolting.

- For more information visit oceanneering.com/grayloc or contact us at graylocproducts@oceanneering.com