

RIVERHAWK HYDRAULIC TENSIONER NUT APPLICATION GUIDE



Features and Benefits

- Achieve hydraulically precise tension
- Increase clamping uniformity and repeatability
- Reduce assembly time and component damage
- Integral metal seal
- Compact and safe
- Standard and custom designs



1-Hydraulic pressure is applied to the Riverhawk Hydraulic Tensioner Nut.

2-The retainer is threaded down by the wrench to engage the cylinder.

3-When the hydraulic pressure is released, the retainer holds the clamping load.

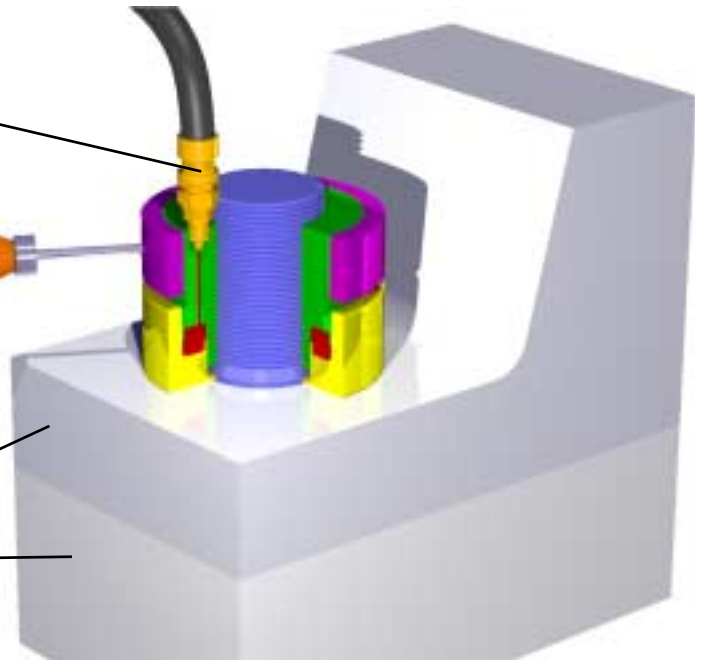


Figure 1 – Cutaway view of Hydraulic Tensioner Nut.

To obtain accurate and reliable tension, replace existing nuts with Riverhawk Hydraulic Tensioner Nuts (HTN). See Figures 1 and 2. Conventional bolt torquing produces load inaccuracies occurring from the twisting of the stud and from friction at the nut face and threads. The HTN eliminates this torquing friction, thereby improving the integrity of the joint.

The compact standard sizes of the Riverhawk HTN are ideal for confined spaces or where envelope restrictions prevail.

Whether you tension one bolt or many bolts at a time, the Riverhawk HTN produces uniform compression of your casings, flanges, bearing housings, or connecting rods. In addition, the improved tensioning repeatability of the HTN will eliminate excessive and erratic bolt loads.

A number of Riverhawk HTN's can be connected together and loaded simultaneously. This multibolt tensioning serves to appreciably shorten assembly or maintenance time. In addition, the HTN allows for a minimal number of operators. All together, this provides for quick and easy installation which relates to cost savings.

The Riverhawk HTN is designed without elastomeric seals. Its unique metal to metal seal design makes the HTN tolerant to harsh environments and particularly suited for applications up to 500° F.

An inherent safety feature in the Riverhawk HTN design is that the forces at play act along the axis of the bolt and not through any hazardous torque arms.

In the event a standard product will not satisfy a given application, Riverhawk can either modify the standard product or custom design a solution.



Figure 2 - Hydraulic Tensioner Nut mounted on a flange.

SELECTION PROCEDURE

These steps will aid in choosing the correct nut size for your application.

1. Establish the Installation Bolt Load.

Proper selection of nuts requires a net force, or Installation Bolt Load. Installation Bolt Load is determined by each unique application. In industry, Installation Bolt Load is expressed in other ways, such as stress, stretch, torque, and rotation angle. All of these result in a net force that the bolt will experience. For net force conversion, contact Riverhawk's website or engineering.

Units: Installation Bolt Load [lb]

2. Estimate the Relaxation Factor.

All bolts, regardless of size and length, exhibit a relaxation as the load is transferred from the hydraulic pressure to the nut. Because of this phenomena, it is essential that a Relaxation Factor be estimated when calculating the required Hydraulic Bolt Load. To obtain this, extra load must be applied so the bolt will relax down to the required load on transfer. This Relaxation Factor can be calculated.

Units: C = Clamp Length [in]

L = Effective Length [in]

D = Nominal Thread Diameter [in]

$$\text{Relaxation Factor}^* = 1.05 + [1 \div (L/D)]$$

*If the Relaxation Factor is less than 1.1, then use a Relaxation Factor of 1.1

3. Calculate the Hydraulic Bolt Load.

This Hydraulic Bolt Load is the maximum load the hydraulic tensioner nut needs to produce.

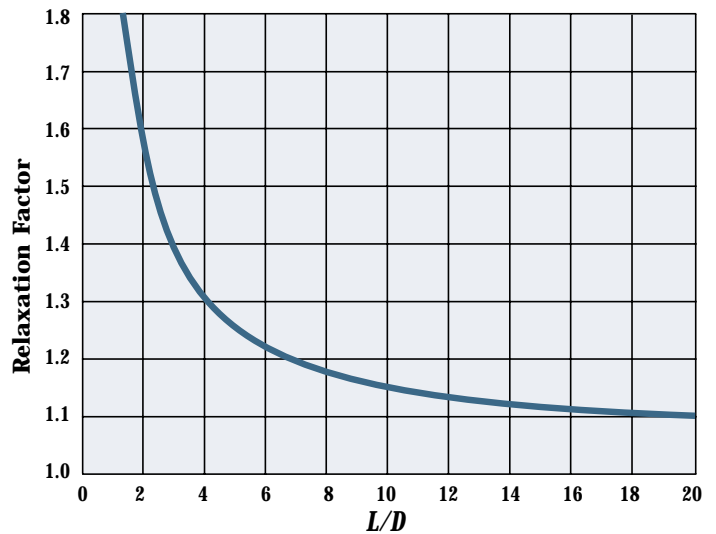
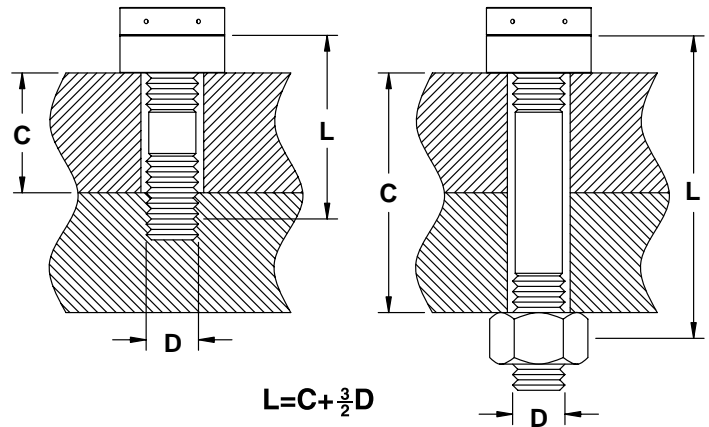
Units: Hydraulic Bolt Load [lb]

$$\text{Hydraulic Bolt Load} = \text{Installation Bolt Load} \times \text{Relaxation Factor}$$

Check, in the Application Data, that the intended hydraulic tensioner nut can produce the calculated Hydraulic Bolt Load.

4. Check the envelope sizes.

The final step in selecting a hydraulic nut would be to verify that the intended hydraulic tensioner nut diameter and nut height will fit into the envelope restrictions of your application.



Example: A 2.00"-8 UN fully threaded stud has a 16 in clamp length. It is intended to be installed with 100,000 lb of installation bolt load.

Installation Bolt Load = 100,000 lb

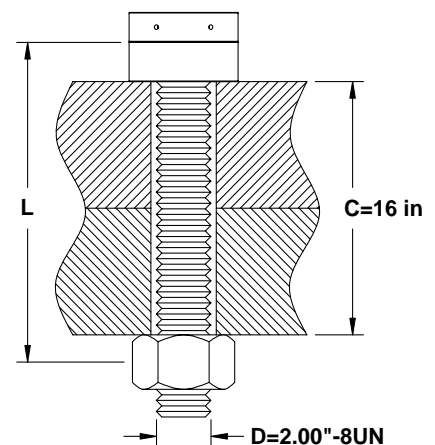
C = 16 in

$L = 16 + (1.5)(2.00) = 19$ in

Relaxation Factor = $1.05 + [1 \div (19/2.00)] = 1.155$

Hydraulic Bolt Load = $100,000 \times 1.155 = 115,500$ lb

By checking in the Application Data, you will see that the Maximum Hydraulic Load a 2.00" Riverhawk HTN can produce is 141,372 lb. The Hydraulic Ram Area for the 2.00" Riverhawk HTN is 4.712 in², so $(115,500 \text{ lb} \div 4.712 \text{ in}^2) = 24,500$ psi of hydraulic pressure would be required. The only remaining check would be to ensure that the 2.00" HTN would fit into the envelope restrictions of your application.

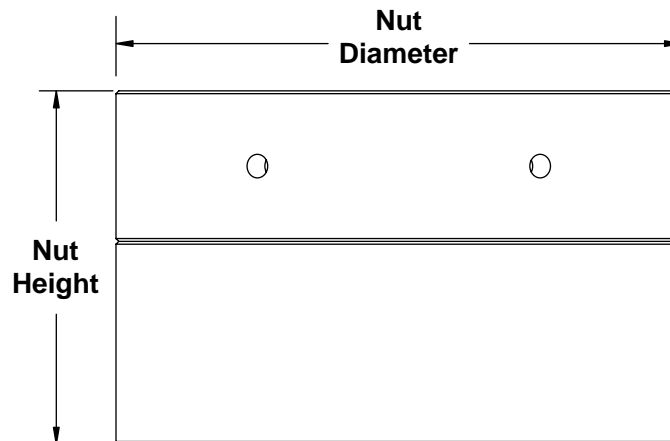


APPLICATION DATA

Nominal Thread Diameter (in)	Hydraulic Ram Area (in ²)	Maximum Hydraulic Bolt Load (lb)	Nut Height (in)	Nut Diameter (in)	Maximum Stroke (in)
1.500	2.651	79,522	2.250	3.000	.225
1.625	3.111	93,327	2.438	3.250	.244
1.750	3.608	108,238	2.625	3.500	.263
1.875	4.142	124,252	2.813	3.750	.281
2.000	4.712	141,372	3.000	4.000	.300
2.250	5.964	178,924	3.375	4.500	.338
2.500	7.363	220,893	3.750	5.000	.375
2.750	8.909	267,281	4.125	5.500	.413
3.000	10.603	318,086	4.500	6.000	.450
3.250	12.444	373,310	4.875	6.500	.488
3.500	14.432	432,951	5.250	7.000	.525
3.750	16.567	497,010	5.625	7.500	.563
4.000	18.850	565,487	6.000	8.000	.600
4.500	23.856	715,694	6.750	9.000	.675
5.000	29.452	883,573	7.500	10.000	.750
5.500	35.637	1,069,123	8.250	11.000	.825
6.000	42.412	1,272,345	9.000	12.000	.900
6.500	49.775	1,493,238	9.750	13.000	.975
7.000	57.727	1,731,803	10.500	14.000	1.050

*The Maximum Hydraulic Bolt Loads are produced when the HTN is pressurized to 30,000 PSI.

*The Maximum Hydraulic Bolt Loads will produce 45,000 PSI tensile stress in nominal thread diameters.



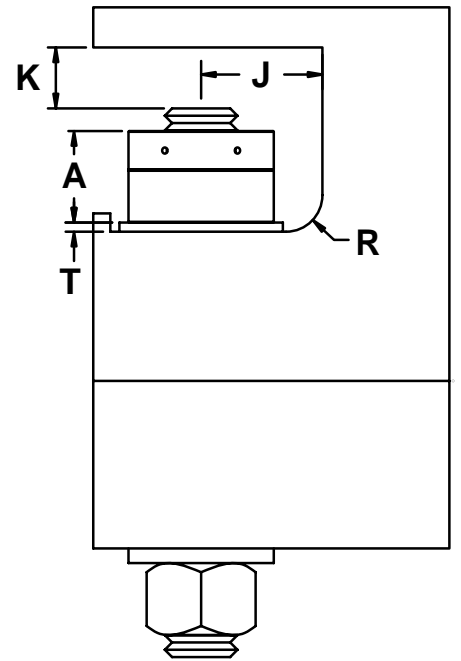
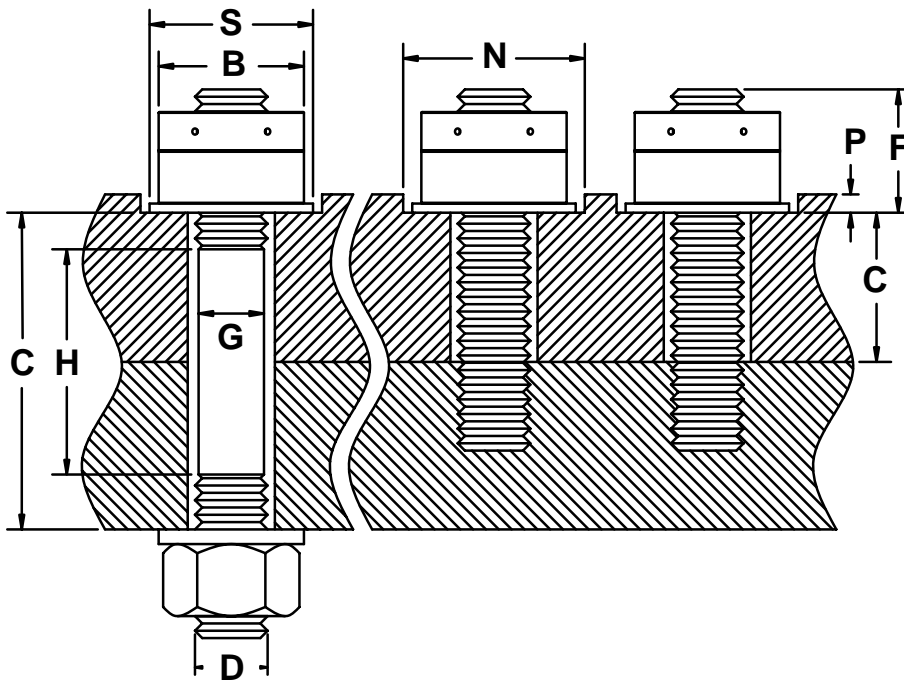
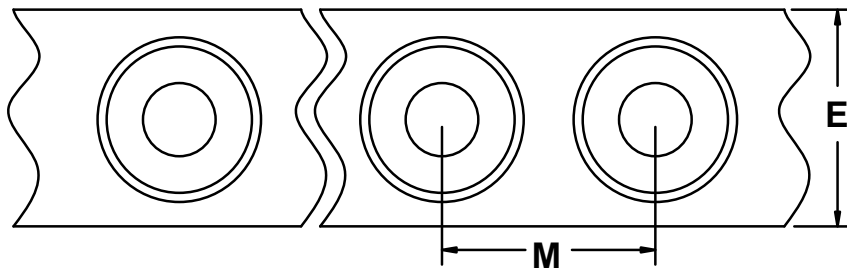
The alloy steels used in Riverhawk HTN's maintain their properties to approximately 500°F. Alternate designs are available for higher temperature applications; consult Riverhawk engineering for details. For all applications, the user should ensure that the hydraulic fluid used is adequate for their application.

OPERATIONAL SAFEGUARDS

- Always wear eye protection.
- Never exceed the maximum pressure of the nut.
- Never exceed the maximum stroke of the nut.
- Always ensure 100% thread engagement between nut and bolt.

APPLICATION CHECKLIST

- 1- Nut height (A) _____
- 2- Nut diameter (B) _____
- 3- Clamp length (C) _____
- 4- Nominal thread diameter (D) _____
- 5- Flange width (E) _____
- 6- Bolt stickout (F) _____
- 7- Bolt body diameter (G) _____
- 8- Bolt body length (H) _____
- 9- Horizontal clearance to obstruction (J) _____
- 10- Vertical clearance to obstruction (K) _____
- 11- Bolt spacing (M) _____
- 12- Counterbore diameter (N) _____
- 13- Counterbore depth (P) _____
- 14- Fillet radius (R) _____
- 15- Washer diameter (S) _____
- 16- Washer thickness (T) _____



- Bolt threads per inch. _____
- Bolt strength. _____
- Highest working temperature. _____
- Desired stroke distance. _____
- How many nuts total. _____
- Flat washers. _____
- Bolt material. _____
- Desired installed bolt load. _____
- Working environment. _____
- How many bolts will be tensioned at once? _____
- Quick disconnects. _____
- Spherical washers. _____

OTHER TENSIONER PRODUCTS AND SYSTEMS



External Stud Tensioner

Riverhawk design provides flexibility and versatility through modular designs that incorporate a wide range of sizes.



Air Driven Hydraulic Pressure Kits

Easy-to-operate units provide instant and reliable hydraulic power using an input air supply of 80 psi to 120 psi.



Hydraulic Bolt/Stud Tensioner

Individually designed and hydraulically operated to provide controllable and accurate pre-loads of bolts and nuts for reliability and ease of installation and removal.



HRT Tensioning System

An enhancement of Riverhawk's line of standard hydraulic nuts and tensioners, the HRT is directly retrofittable to existing installation requirements in a minimal envelope.

Disclaimer

The information contained within this document is based upon certain assumptions about equipment design and operation as foreseen at the time of publication. The equipment designer /user is assumed to be familiar with the equipment and its operation. For this reason the equipment designer must assume responsibility for the proper application of the Riverhawk HTC to the subject equipment.

Riverhawk Company, an engineering driven manufacturer, specializes in hydraulic mechanical technologies. We meet the daily challenges of the rotating equipment industry by offering auxiliary equipment such as air driven and manual hydraulic pressure kits and pusher piston cylinders for the installation of coupling hubs, thrust discs, and compressor wheels. Riverhawk also designs and manufactures hydraulically tensioned studs and nuts, tensioning tools, hydraulic nuts, and plug and ring gages. We also provide source inspections and training seminars. Our equipment is proudly supplied to the top OEMs and end users of the turbomachinery industry. Riverhawk is a member of the American Petroleum Institute (API) and sits on the coupling committee of the American Gear Manufacturers Association (AGMA).

For more information about Riverhawk's Hydraulic Tensioner Nut or any of our other products and services call:



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