

RIVERHAWK HET SERIES EXTERNAL STUD TENSIONER APPLICATION GUIDE



Features and Benefits

- Modular Design Provides Flexibility
- Accurate and Repeatable Stud Loading
- Faster and Easier Flange Closure
- Standard and Custom Design
- Optional Spring Return



Design

The HET series of standard external tensioners is a light weight, compact and versatile line of tensioners. The HET series operates at a maximum pressure of 20,000 psi and utilizes high strength AISI 4340 steel components for long lasting performance. The HET series was designed with the aid of 3-D solid modeling and finite element analysis.

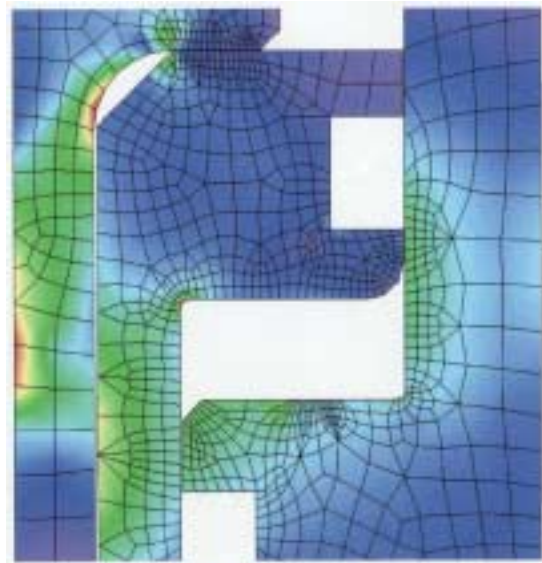
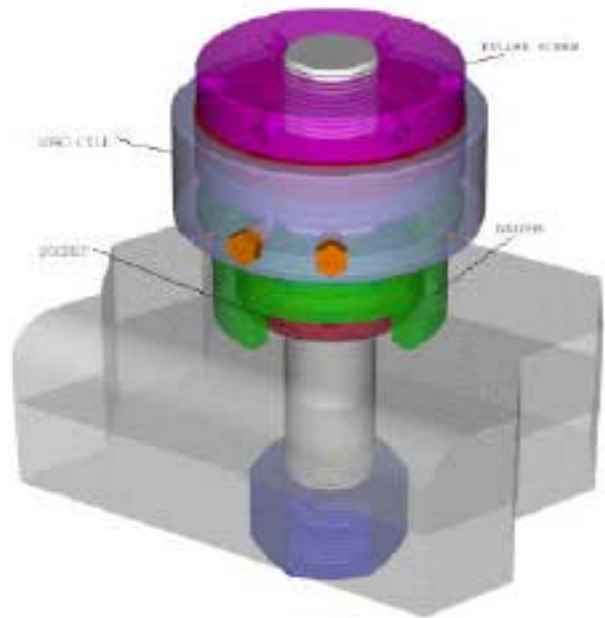
Features

The HET series of standard external tensioners is a modular design which provides the widest range of flexibility possible. Different stud sizes can be accommodated by simply changing the Puller Screw, Bridge and Socket, while utilizing the same Load Cell. The Load Cell is provided with either one or two quick connect nipples to allow fast and easy connections. Whether simply connecting to the oil supply or connecting multiple tensioners in series the HET series is fast and user friendly. All exterior surfaces are knurled to allow for easy handling and larger sizes include eye bolts for additional support.

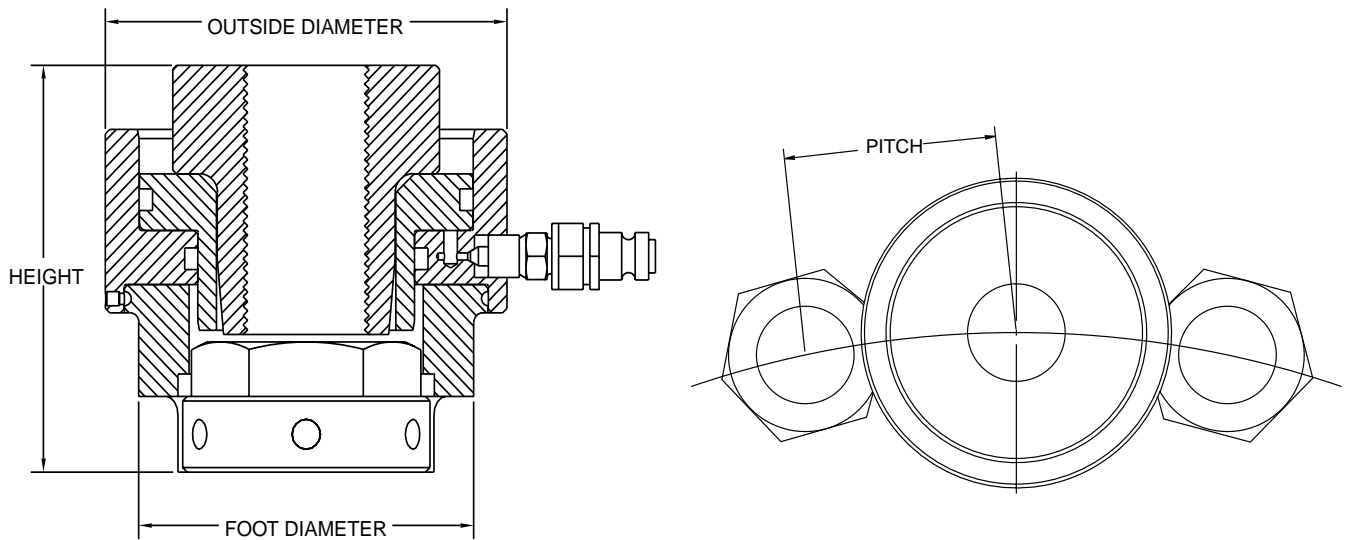
Special Applications

As an option, for additional ease of use, the HET series has been designed to readily incorporate spring retraction. Additionally, Riverhawk can provide your tensioners with any special modifications to meet your specific needs. They include but are not limited to special fittings, special bridges, spanner sockets for 12-pt nuts, or even complete custom designs with multiple cylinders. Riverhawk is uniquely qualified for your special applications because of it's years of experience providing tensioners to the Gas Turbine industry for tensioned rotating coupling hardware.

Hydraulic External Tensioner with Optional Spring Return



DIMENSIONAL DRAWINGS



APPLICATION DATA

Frame	Part Number	Bolt Diameter (inches)	Maximum Load (lb)	Pressure Area (in ²)	Outside Diameter (inches)	Pitch (inches)	Foot Diameter (inches)	Height (inches)	Weight (lb)
1	1HET-0750	3/4	56,700	2.84	3.00	1.94	2.43	4.42	10
	1HET-0875	7/8				2.13	2.60	4.55	10
	1HET-1000	1				2.32	2.77	4.67	10
	1HET-1125	1-1/8				2.45	2.81	4.72	10
2	2HET-1125	1-1/8	99,400	4.97	4.06	2.66	3.22	4.94	15
	2HET-1250	1-1/4				2.86	3.42	4.94	15
	2HET-1375	1-3/8				3.06	3.60	5.06	15
	2HET-1500	1-1/2				3.22	3.69	5.18	15
3	3HET-1500	1-1/2	176,800	8.84	5.41	3.52	4.29	4.99	20
	3HET-1625	1-5/8				3.72	4.48	5.12	20
	3HET-1750	1-3/4				3.91	4.64	5.25	20
	3HET-1875	1-7/8				4.10	4.81	5.39	20
	3HET-2000	2				4.32	5.04	5.45	20
4	4HET-2000	2	327,000	16.35	7.00	4.61	5.61	5.84	34
	4HET-2250	2-1/4				4.96	5.88	6.09	34
	4HET-2500	2-1/2				5.43	6.38	6.34	36
5	5HET-2500	2-1/2	397,600	19.88	8.11	5.59	6.71	6.14	48
	5HET-2750	2-3/4				5.88	6.85	6.39	48
	5HET-3000	3				6.30	7.25	6.64	48
6	6HET-3000	3	615,600	30.78	10.21	6.58	7.82	6.52	76
	6HET-3250	3-1/4				6.96	8.14	6.99	78
	6HET-3500	3-1/2				7.33	8.46	7.02	78
	6HET-3750	3-3/4				7.72	8.81	7.27	80
	6HET-4000	4				8.04	9.00	7.52	78

Note: Metric sizes are available.

At Riverhawk we always strive to improve the products we produce. For that reason the dimensions and specifications contained in this catalog are subject to change without notice. Certified dimensions of ordered material can be furnished upon request.

Selection Terminology

1. Establish the Installation Bolt Load:

Proper selection of a tensioner requires a known net force or installation bolt load in pounds (lbs). Installation bolt load is determined for each unique application which can also be expressed in terms of:

- Required Residual (final) Bolt Stress in pounds per square inch (psi)
- Required Final Bolt Stretch in inches (in.)

Calculate the estimated installation bolt load from the above terms given the following:

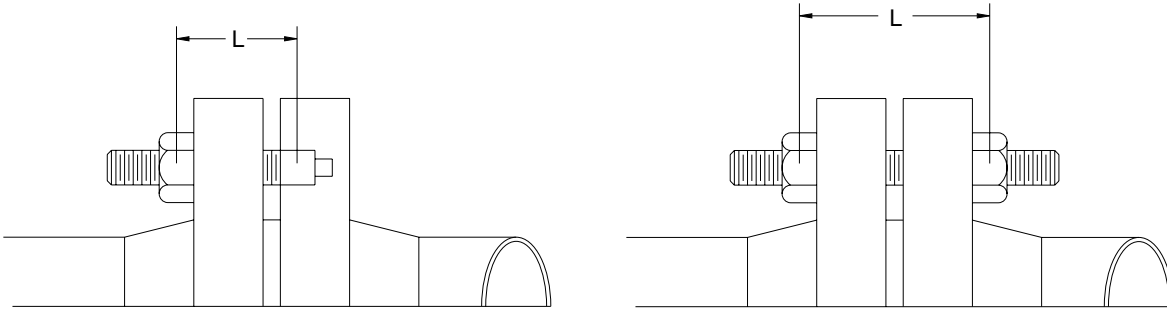
D = Nominal Stud Diameter (inches) **L** = Effective joint thickness in inches. This is typically the flange thickness added to the stud diameter

Area of Stud = The tensile stress area of the stud in the threaded area (in²)

E = Modulus of elasticity, typically 30,000,000 psi for steel

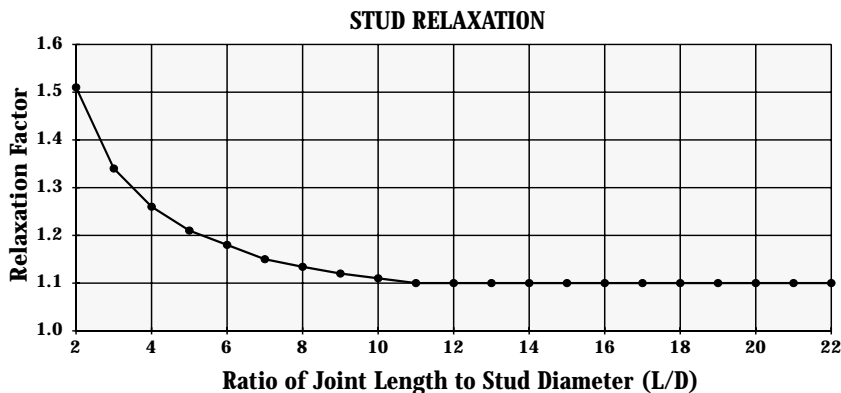
Area = Pressure area of Tensioner Load Cell from the table on the previous page

$$\text{Bolt Load} = \text{Bolt Stress} \times \text{Area of Stud} \text{ --or-- } \text{Bolt Load} = (\text{Bolt Stretch} \times E \times \text{Area of Stud}) \div L$$



2. Estimate the Relaxation Factor:

All bolts, regardless of size and length, exhibit a relaxation as the load is transferred from the tensioner to the nut. 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 estimated using the following graph.



3. Calculate the Required Hydraulic Pressure:

To determine the necessary hydraulic pressure to be applied to the tensioner first find the required bolt load, then area of the load cell, and the stud relaxation factor:

$$\text{Hydraulic Pressure} = (\text{Bolt Load} \times \text{Relaxation Factor}) \div \text{Load Cell Area}$$

Note: Contact Riverhawk Engineering for assistance in evaluating special conditions and requirements.

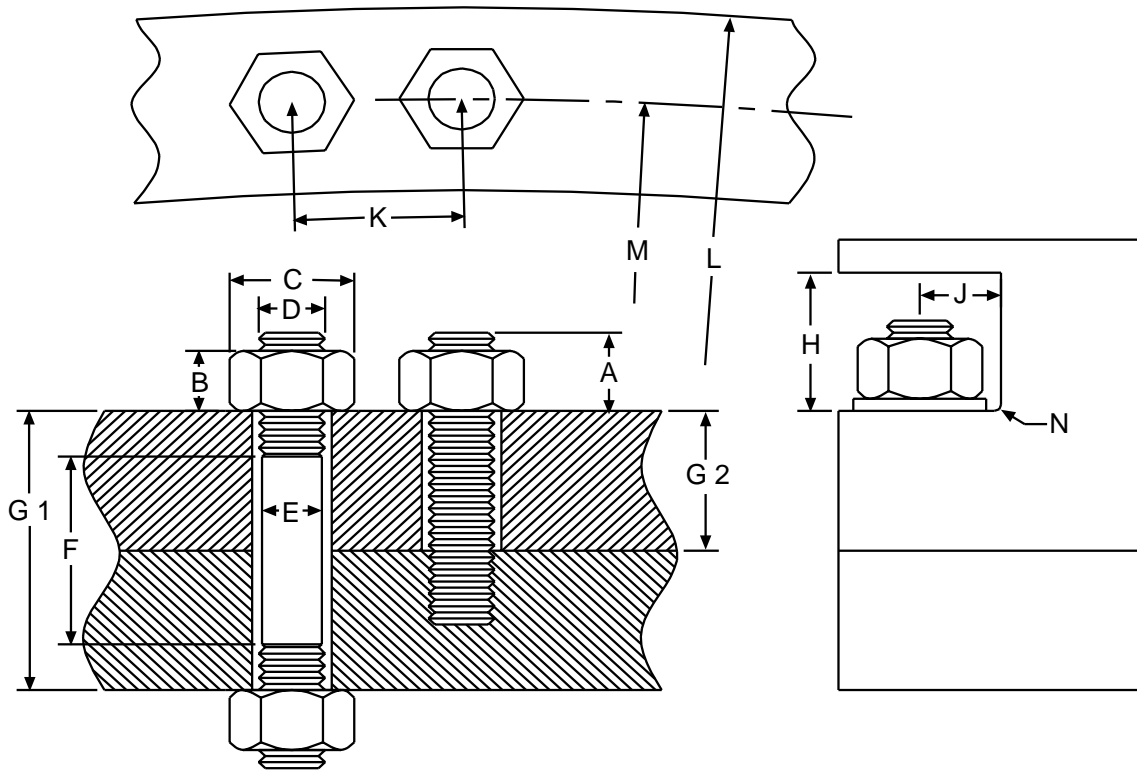
For Reference Only: If tightening torque is the only information that is available the Residual stress can be calculated. However, the coefficient of friction can vary significantly with lubrication and surface conditions.

Where: **c**=Coefficient of Friction (.1-.3) **D**=Bolt Diameter (in.)
A=Area of stud (in.) **T**=Tightening Torque (in-lb)

$$\text{Bolt Stress} = T \div (c \times D \times A)$$

APPLICATION CHECKLIST

Stud stick out (A) _____ Thickness clamped flange(s) (G1, G2) _____
 Nut height (B) _____ Vertical clearance to obstruction (H) _____
 Nut diameter (C) _____ Horizontal clearance to obstruction (J) _____
 Nominal stud diameter (D) _____ Diametrical clearance or angle (K) _____
 Stud body diameter (E) _____ Flange diameter or width (L) _____
 Stud body length (F) _____ Bolt circle diameter or width (M) _____
 Casing Radius (N) _____



Number of stud threads per inch. _____ Stud material. _____
 Stud strength. _____ Desired retained stress in stud. _____
 Desired installation pressure. _____
 Internal diameter if nut fits in a counterbore (or spot face diameter). _____
 Depth if nut fits in a counterbore (or spot face depth). _____
 Chemicals in contact with studs. _____ Actuation temperature. _____
 Service temperature. _____ Desired stroke or amount of flange compression. _____
 Will studs be loaded individually or several at a time? _____
 If several, how far will studs be apart? _____ How many studs? _____

Note: If the stud stick out is less than one times the stud diameter contact Riverhawk engineering.

OTHER TENSIONER PRODUCTS AND SYSTEMS



Hydraulic Tensioner Nut

Precision tension applied hydraulically to casings, flanges, bearing housings or connecting rods – lowering costs for parts and labor.



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 for Internal Threads

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 providing the best choice for high-temperature applications.

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 HET 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 HET Series External Stud Tensioners or any of our other products and services call:



215 Clinton Road, New Hartford, NY 13413
Phone: 315-768-4855 Fax: 315-768-4941
sales@riverhawk.com <http://www.riverhawk.com>