



INSTRUCTION MANUAL IM-381
For Gas Turbine Tensioned
Studs and Nuts

Applicable Bolting Connections

MS7001 to Flexible Load Coupling

Applicable GE Oil & Gas (Nuovo Pignone) Part Numbers

RPO31760

RTO40684

RPO31763

RAO23423

RCO12095

The Riverhawk Company reserves the right to update this document without dissemination or notice. The latest revision may be obtained by contacting Riverhawk Company or thru www.riverhawk.com.



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Revision C
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1.0 Cautions and Safety Warnings

WARNING

Improper tool use and the failure to follow the correct procedures are the primary root causes of tool failures and personal injuries. A lack of training or experience can lead to incorrect hardware installation or incorrect tool use. Only trained operators with careful, deliberate actions should use hydraulic tensioners. Contact Riverhawk Company with any training needs.

WARNING

Risk of high pressure fluid injection. Riverhawk tools operate under high pressure. Thoroughly inspect all hoses and connections for damage or leaks prior to using this equipment.

CAUTION

Personal injury and equipment damage can occur if the proper health and safety codes and procedures are not followed. Contact the site's health and safety office to determine all applicable safety rules and regulations.

WARNING

Personal protective equipment must be worn at all times. Riverhawk recommends at a minimum, safety glasses, long sleeve shirt, hard hat, heavy work gloves, and steel toe shoes.

CAUTION

It is especially important to check the condition of the conical thread used to tension the stud. Thread damage from previous abuse can lead to failure of the stud or tensioning equipment.

CAUTION

Riverhawk recommends that the tensioner should be returned to Riverhawk for periodic inspections. Replacement of obsolete tensioners is recommended. Functional upgrades are also recommended. The Riverhawk Service Returns Coordinator should be notified 3-6 months prior to a planned outage to schedule an inspection service.

WARNING

A damaged burst disc must be replaced with a with a burst disc of the same design and pressure rating. Do not substitute a damaged burst disc with a different disc type, a different pressure rating, or a foreign object.

WARNING

Do not use the tensioner at any pressure unless the tool is installed on a stud in a flange.



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CAUTION

Do not over stroke the tensioner. Over stroke can cause the piston to lose its seal and leak oil.

CAUTION

Personal injury and equipment damage can occur if the puller screw is not securely engaged with the tapered threads of the stud. Proper engagement is achieved when the puller screw is tight in the stud and the tensioner assembly is free to turn.

WARNING

Whenever possible, the safety cage should be in place to prevent personal injury. When the tensioner is pressurized hands must be kept out of designated areas to avoid any potential for personal injury.

CAUTION

Before threading the puller screw into the stud, carefully check the cleanliness of both the stud's and the puller screw's conical threads. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. This procedure will ease assembly and assure positive mating of the threads before tightening. Do not use "Never Seize" on the conical threads.

CAUTION

Do not tighten the nut while the tool is coming up to pressure; wait until pressure is achieved before attempting to tighten the nut with the spanner ring. If the tool is not properly installed, the tool could jump off the stud while coming up to pressure.

CAUTION

Do not exceed the maximum pressure marked on the tensioner. Excessive pressure can damage the stud and puller screw.

WARNING

FIRE HAZARD: DO NOT heat when tensioner is in place. Personal injury or equipment damage may occur. Use of an Oxy-Acetylene torch is not recommended

2.0 Scope

This document describes the procedure to be used to install the stud and nut sets supplied by the Riverhawk Company for the flange at the gas turbine to the flexible load coupling connection.

The various configurations covered in this manual are listed in Sections 2.1 through 2.2 with differences as related to connective hardware defined. Listed also are the pertinent hardware



drawings (HF-xxxx). These drawings as well as tooling drawings (HT-xxxx) form part of this manual.

2.1 MS7001 Gas Turbine to Flexible Load Coupling

GE OIL & GAS (NUOVO PIGNONE) PART NUMBER	RIVERHAWK P/N
RPO31760	HF-1169
RTO40684	HF-3170

The hydraulic tool used for the installation and removal is the Riverhawk HT-7216 or the obsolete HT-1168.

These hardware drawings depict the complete stud and nut package for the Gas Turbine to the Flexible Load Coupling (2" size, Qty 12).

2.2 Hydraulic Tooling

GE OIL & GAS (NUOVO PIGNONE) PART NUMBER	RIVERHAWK P/N
RPO31763	HT-1168
RAO23423	HT-1168 MTP-3241-3
RCO12095	HT-7216 MTP-3241-3

3.0 Quick Checklist

The following checklist is intended as a summary of the steps needed to use the Riverhawk-supplied equipment. New personnel or those experienced personnel who have not used the Riverhawk equipment recently are encouraged to read the entire manual.

EQUIPMENT INSPECTION

- Check oil level in hydraulic pump.
- Check hydraulic hose for damage.



- Test pump.
- Inspect tensioner for any damage.

NUT AND STUD PREPARATION

- Inspect studs and nuts for any damage.
- Clean the studs and nuts.
- Measure stud lengths. (VERY IMPORTANT)
- Loosely place studs and nuts into the flange. The studs are not centered in the flange.
- Set stick-out dimension on the gas turbine side of the flange.
- Hand tighten nuts on flexible load coupling side of flange.
- Verify stick-out measurement (**VERY IMPORTANT**)

TENSIONING (Bolt Installation)

- Check tensioner drawing for correct parts and part numbers.
- Apply a light coat of clean turbine oil or spray lubricant to the puller screw. **DO NOT USE "NEVER SEIZE" ON THE CONICAL THREADS.**
- Place the spanner ring on the gas turbine side nut.
- Insert a 3/8" hex Allen wrench into the flexible load coupling side of the stud.
- Slide the core tensioner over the nut and spanner ring. Hold the tensioner in place by hand.
- While holding the Allen wrench to prevent the stud from rotating, insert the puller screw through the tensioner and the spanner ring.
- Tighten the puller screw. Then back off puller screw 1/2 a turn.



- Retighten the puller screw and leave tight. **DO NOT BACK OFF PULLER SCREW.**
- Remove the 3/8" hex Allen wrench from the stud.
- Thread the puller nut onto the puller screw. Then, back the nut off two flats or 120 degrees to allow for the stud to stretch.
- Tensioner should be free to rotate. If it is tight against flange, remove the tensioner and check the stud stick-out dimension.
- Whenever possible, place the safety guard over the tensioner assembly and tighten the guard's thumb screws into tensioner body.
- Tension to 50%. Consult manual for the correct pressure.
- Place the pin wrench in spanner ring and tighten nut.
- Release pressure, move to the next stud in the tightening pattern.
- Repeat above steps at final pressure.
- Measure the final stud length and record it on stretch datasheets. Calculate the stretch.
- Torque the nuts' set screws.

DETENSIONING (Stud Removal)

- If present, loosen the windage plugs' set screws and remove the windage plugs from the studs.
- Loosen nuts' set screws
- Inspect and clean studs' conical threads. **Do not continue until ALL debris is removed from the threads!** See instruction manual IM-220. **Do not try to use the tensioner to remove a damaged stud!**
- Apply a light coat of clean turbine oil or spray lubricant to the puller screw. **DO NOT USE "NEVER SEIZE" ON THE CONICAL THREADS.**
- Place the spanner ring on the gas turbine side nut.



- Insert a 3/8" hex Allen wrench into the flexible load coupling side of the stud.
- Slide the core tensioner over the nut and spanner ring. Hold the tensioner in place by hand.
- While holding the Allen wrench to prevent the stud from rotating, insert the puller screw through the tensioner and the spanner ring.
- Tighten the puller screw. Then back off puller screw 1/2 a turn.
- Retighten the puller screw and leave tight. **DO NOT BACK OFF PULLER SCREW.**
- Remove the 3/8" hex Allen wrench from the stud.
- Thread the puller nut onto the puller screw. Then, back the nut off two flats or 120 degrees to allow for the stud to shrink.
- Tensioner should be free to rotate. If it is tight against flange, remove the tensioner and inspect the stud's conical thread for debris.
- Whenever possible, place the safety guard over the tensioner assembly and tighten the guard's thumb screws into tensioner body.
- Apply the final pressure.
- Loosen the nut with the spanner ring and pin wrench.
- Move to next stud in the loosening pattern.

4.0 General Preparations

Read and understand all instructions before installing and tensioning studs.

Operators should be trained or have previous experience using Riverhawk tensioning equipment. Training will minimize the chance of improper use of the equipment.

The hydraulic tooling including the hydraulic hoses should be inspected prior to use. Inspection guidelines are listed in the later sections of this manual.



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This equipment produces very high hydraulic pressures and very high forces. Operators must exercise caution and wear the appropriate personal protective equipment when handling and operating the hydraulic tooling.

High-pressure oil from the hydraulic pump pressurizes the tensioner which generates a very large force that actually stretches the stud. As the stud is stretched the nut lifts off the flange. The nut is then turned by hand using the supplied spanner ring. Once the nut is tight against the flange, the pressure in the tensioner is released. The hardware is now clamping the flange together.

4.1 Machine Preparation

The flange to be tensioned must be fully closed prior to positioning the studs in the flanges. There must be provisions for turning the shafts of the gas turbine and flexible load coupling. Also, it will be advantageous to remove as many obstructions as possible from the flange area, such as speed probes and conduit.

4.2 Hardware – Balance

The studs are supplied in a single component balanced set for the entire flange. A stud can be exchanged with another in its own set without affected the overall balance of the equipment. Do not exchange a stud from one set with another stud from a different set. When shipped from Riverhawk, the studs are not assigned to any specific hole in the flexible load coupling flange; this is optional and can be done at the installation site. The set size is determined by the relevant GE Oil & Gas order drawing (see section 2.0).

The nuts are supplied in a single component balanced set for the entire flange. A nut can be exchanged with another in its own set without affecting the overall balance of the equipment. Do not exchange a nut from one set with another nut from a different set. When shipped from Riverhawk, the nuts are not assigned to any specific hole in the flexible load coupling flange; this is optional and can be done at the installation site. The set size is determined by the relevant GE Oil & Gas order drawing (see section 2.0).

A weight balance certification is supplied with each order. Store this certification in an appropriate location; it will be needed for the purchase of replacement equipment.

4.3 Tensioner – Care and Handling

When not in use, the tensioner shall be maintained in a clean environment and all caps and plugs for hydraulic openings and fittings must be in place.

Use ISO 32 grade oil.



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When in use, the tensioner shall be protected from sand and grit.

See section 12 for long term storage requirements.

4.4 Hand Tools

Several hand wrenches and micrometers will be required to perform installation and measurement of the studs:

5/8" Wrench

A set of Allen Wrenches (inch series)

7" to 8" Micrometers

4.5 Riverhawk Tools

Hydraulic Tensioner Kits:	HT-7216 Hydraulic Tensioner, 2" HT-1168 Hydraulic Tensioner, 2" (obsolete, replaced by HT-7216)
Hydraulic Pump Kit:	MP-0130 Manual Hand-Operated Hydraulic Pump (recommended) (GE Oil & Gas RPO18101) AP-0532 Air-Operated Hydraulic Pump (GE Oil & Gas RPO18102)
Measuring Tool:	MTP-3241-3 Micrometer, 7"-8"
Stud Cleaning Kit:	GT-4253 Stud Cleaning Kit (recommended)

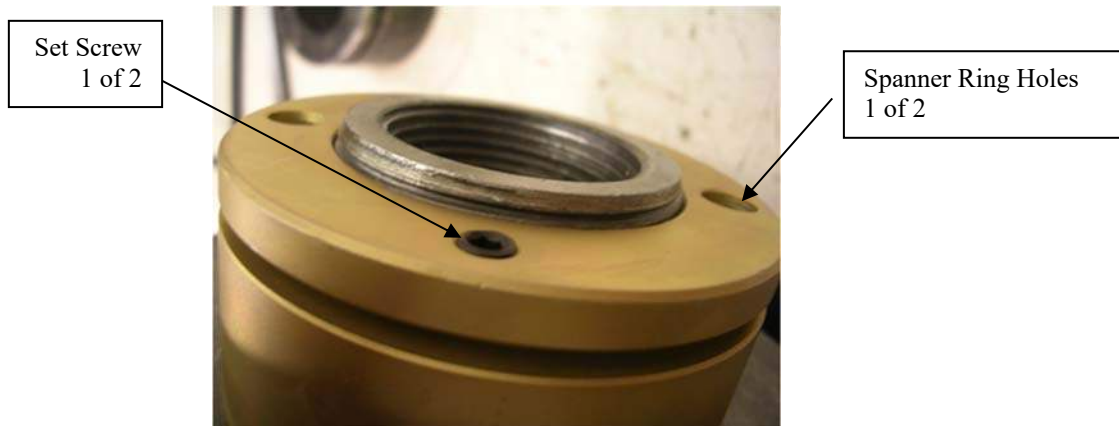
CAUTION

Riverhawk recommends that the tensioners be returned to Riverhawk for periodic inspections. Replacement of obsolete tensioners is recommended. Functional upgrades are also recommended. The Riverhawk Service Returns Coordinator should be notified 3-6 months prior to a planned outage to schedule an inspection service.



5.0 Hardware Set Preparations

5.1 Nut Preparation



Picture 5A – Riverhawk Locknut

If there is any visible damage on a nut, do not use the nut and contact the Riverhawk Company for a replacement nut. Please be prepared to supply the turbine number, weight certification, and digital photographs for evaluation.

5.1.1 Nut Cleaning - New Installations

For new installations, the nuts should come sealed from the factory and will need no cleaning.

Before threading the nut onto the stud, the set screws should be loose and free to turn.

5.1.2 Nut Cleaning - Old Installations

Previously installed nuts require cleaning as follows: Wire brush using a petroleum-based solvent to remove any foreign material on the external surfaces and threads.

Before threading the nut onto the stud, the set screws should be loose and free to turn.

5.2 Stud Preparation

Check the stud for any visible damage. If there is any visible damage, do not use the stud and contact the Riverhawk Company for a replacement stud. Please be prepared to supply the turbine number, weight certification, and digital photographs for evaluation.



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CAUTION

It is especially important to check the condition of the conical thread used to tension the stud. Thread damage from previous abuse can lead to failure of the stud or tensioning equipment.

The conical threads of each stud must be clean of grit and dirt before installation or removal. This ensures the proper seating of the puller screw.

5.2.1 Stud Cleaning - New Installations

For new installations, the studs should come sealed from the factory and will need no cleaning.

5.2.2 Stud Cleaning - Old Installations

Previously installed studs may require cleaning. Clean conical threads should have a bright and shiny appearance. (Reference Riverhawk IM-220)

If cleaning is required, follow these steps:

1. Blow out the threads with compressed air to remove loose debris and dry conical threads. Do not apply a solvent or other cleaning solution to the threads as this may chemically attack the stud.
2. Use Stud Cleaning Kit, GT-4253 or a similar 1" diameter Brass power brush.



Picture 5B - Brass Power Brush

3. Insert the brush into an electric drill and set drill to run in a counterclockwise direction at high speed.
4. Work the drill in a circular motion while moving the brush in and out to clean all of the threads. Try not to hold the brush in one place for too long so as not to remove the stud's protective coating.
5. Blow out the threads with compressed air to remove loosened debris.
6. Visually inspect threads for cleanliness. Threads should be bright and shiny.



7. Use a sharp dental pick or seal pick to lightly scrape the root of the threads to check for debris. Repeat if any dirt can be seen in the threads.
8. Inspect threads for any damage that may have been caused by previous installation.
9. Do **not** apply thread lubricants such as “Never Seize” to the stud’s threads.
10. Finish the cleaning process by rinsing in a volatile solvent such as acetone and allow to dry.

5.3 Stud Length Measurement

Measure and record the initial lengths of the studs. The following suggestions will improve your results.

- **Plan to start and finish any flange in the same day.**
- **Studs and flange must be at the same temperature.**
- **Number each stud with a marker for later stretch measurement tracking.**
- **Mark the location of measurement on stud end with a permanent marker.**
- **Measure each stud to nearest 0.001 inch (.01 mm).**
- **Record each measurement on the supplied record sheets.**
- **Do not allow the measuring instruments to sit in the sun.**
- **The same person should make all measurements.**

6.0 Stud and Nut Assembly

Refer to the hardware assembly drawing (HF-xxxx) listed in Section 2.0 of this manual.

1. Assemble the cylindrical nut to the internal, conical thread end of the stud.
2. Slide the stud and cylindrical nut assembly into the flange as shown in Figure 6A.
3. Adjust the nut/stud assembly so that the stud sticks out (protrudes) from the face of the nut the amount shown. Best practice is to verify the stud stick-out dimension with the hardware set drawing for your application (see section 2). If you don’t have a hardware set drawing, contact Riverhawk Company.



SETTING THE STUD STICK-OUT IS CRITICAL FOR PROPER TENSIONER OPERATION. A metal stick-out gage may be provided with the tensioner to assist the operator in setting the protrusion dimension.

4. Install the other nut on the backside.

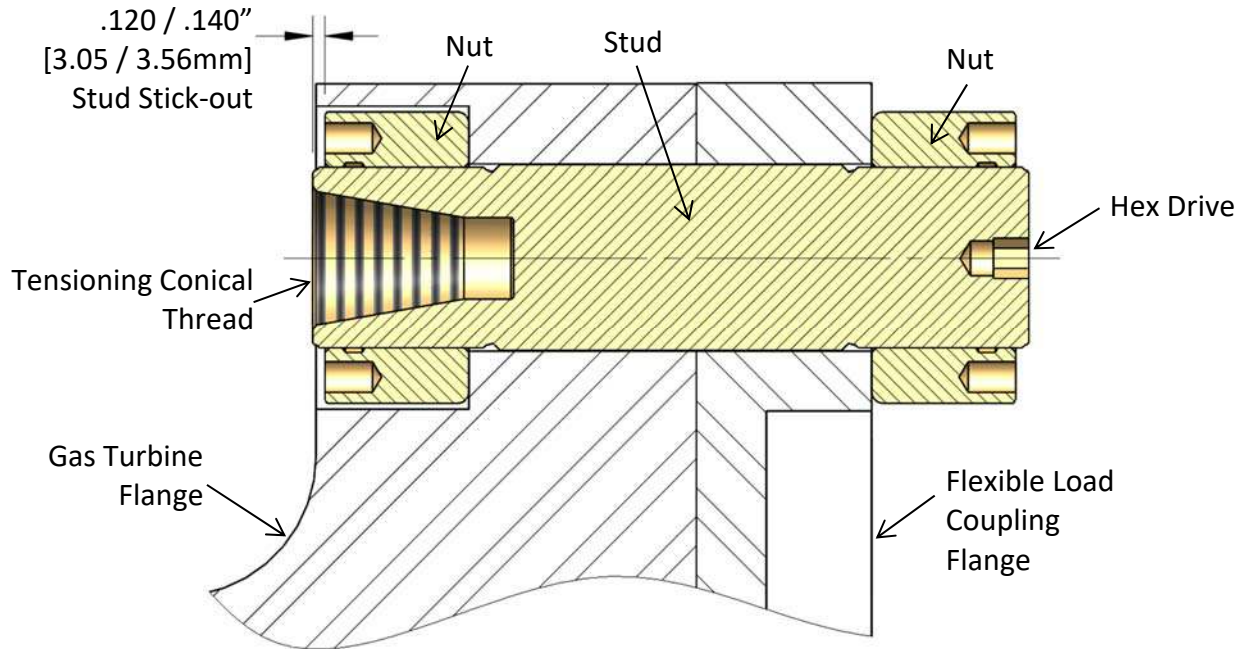


Figure 6A – Cross-section View of Gas Turbine to Flexible Load Coupling Bolted Flange Connection

5. Insert a 3/8" hex Allen wrench into the stud's hex drive on the flexible load coupling side to hold the stud stationary.
6. Hand-tighten the nut on the flexible load coupling side to a snug fit.
7. Recheck the stud stick-out length. If the stick-out length does not match the hardware drawing, loosen the nuts and adjust the nuts' position as necessary.

7.0 Hydraulic Tensioner Equipment Inspection



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7.1 Hydraulic Tensioner Inspection

CAUTION

Riverhawk recommends that the tensioner be returned to Riverhawk for periodic inspections. Replacement of obsolete tensioners is recommended. Functional upgrades are also recommended. The Riverhawk Service Returns Coordinator should be notified 3-6 months prior to a planned outage to schedule an inspection service.

Do **not** bleed the air from the hydraulic line and tensioner at this time. See section 8 for bleeding instructions on when to bleed the air from the hydraulic line.

WARNING

To avoid failure, ensure safety, and proper operation, the tensioner assembly must be installed on a stud in the flange before pressurizing the tensioner. Do not use the tensioner at any pressure unless the tool is installed on a stud in a flange.

Check puller screw usage life with Riverhawk service bulletin SB-08001.

Clean puller screw and check for any debris and dents.

Puller screw should be free to rotate and move back and forth inside the hydraulic tensioner.

Seam between cylinders must be closed tightly.

Inspect the tensioners' safety guard for any signs of damage including cracked welds. Any guards modified in the field should be replaced. Bent guards should be replaced.

Inspect the outside of the tensioner for discoloration patterns that may indicate submersion and internal damage.

Perform an inventory of the loose equipment supplied with the tensioner. An inventory list is provided on the tensioner's technical drawing (for example Riverhawk HT-xxxx). Replacement parts are available from Riverhawk.

7.1.1 Hydraulic Tensioner's Burst Disc Replacement

The hydraulic tensioner's burst disc is a key element in the overall safe use of the hydraulic tensioner.

Each tensioner is shipped from our factory with one burst disc already installed in the tensioner and with another spare disc for field replacement. Extra burst discs are available from Riverhawk for replacement purposes.



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To replace a damaged burst disc:

1. Remove the hydraulic port's dispersion nut, compression ring, and damaged burst disc.
2. Discard the damaged burst disc.
3. Clean the dispersion nut, compression ring, new burst disc, and the hydraulic port with a solvent to ensure a dirt-free installation.
4. Reassemble new burst disc, compression ring, and dispersion nut into the same hydraulic port.

Warning

A damaged burst disc must be replaced with a with a burst disc of the same design and pressure rating. Do not substitute a damaged burst disc with a different disc type, a different pressure rating, or a foreign object.

7.1.2 Hydraulic Pump Kit Inspection

Refer to the Hydraulic Pump Kit Instruction Manual, IM-293 (GE VENDOC 373A4058). The latest revision may be obtained by contacting Riverhawk Company or thru www.riverhawk.com.

7.1.3 Hydraulic Hose Inspection

Check the hydraulic hose for any damage including bent hose ends and split outer lining. If any damaged is found, replace the hose immediately by contacting the Riverhawk Company.

7.2 Hydraulic Fittings

Information on the correct assembly of the hydraulic pump's and hydraulic hose's hydraulic fittings can be found in Appendix B1.

8.0 Hydraulic Tensioner Equipment Assembly

Refer to the hardware assembly drawing (HF-xxxx) listed in Section 2.0 of this manual and the tensioner assembly drawing (HT-xxxx) listed in Section 4.5 of this manual to determine which side of the flange the tensioner must be located on in order to use the tensioner properly.



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8.1 Assembly of Tensioner

The tensioner used in this application is designed for no special lifting instructions. Do not drop any part of the tensioner on the operator or other nearby personnel.

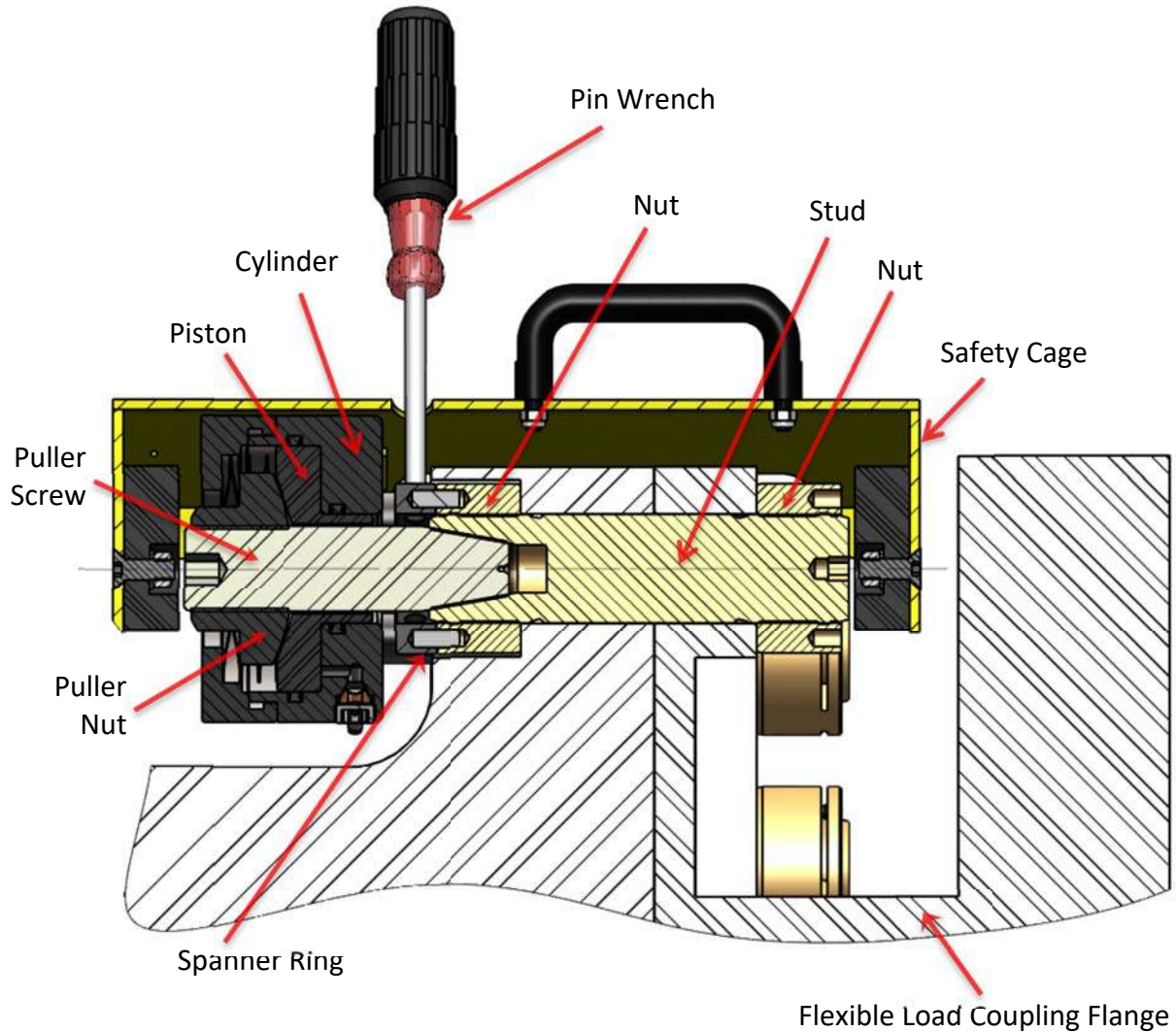


Figure 8A – Cross-section View of HT-7216 on MS7001 to Flexible Load Coupling Flange



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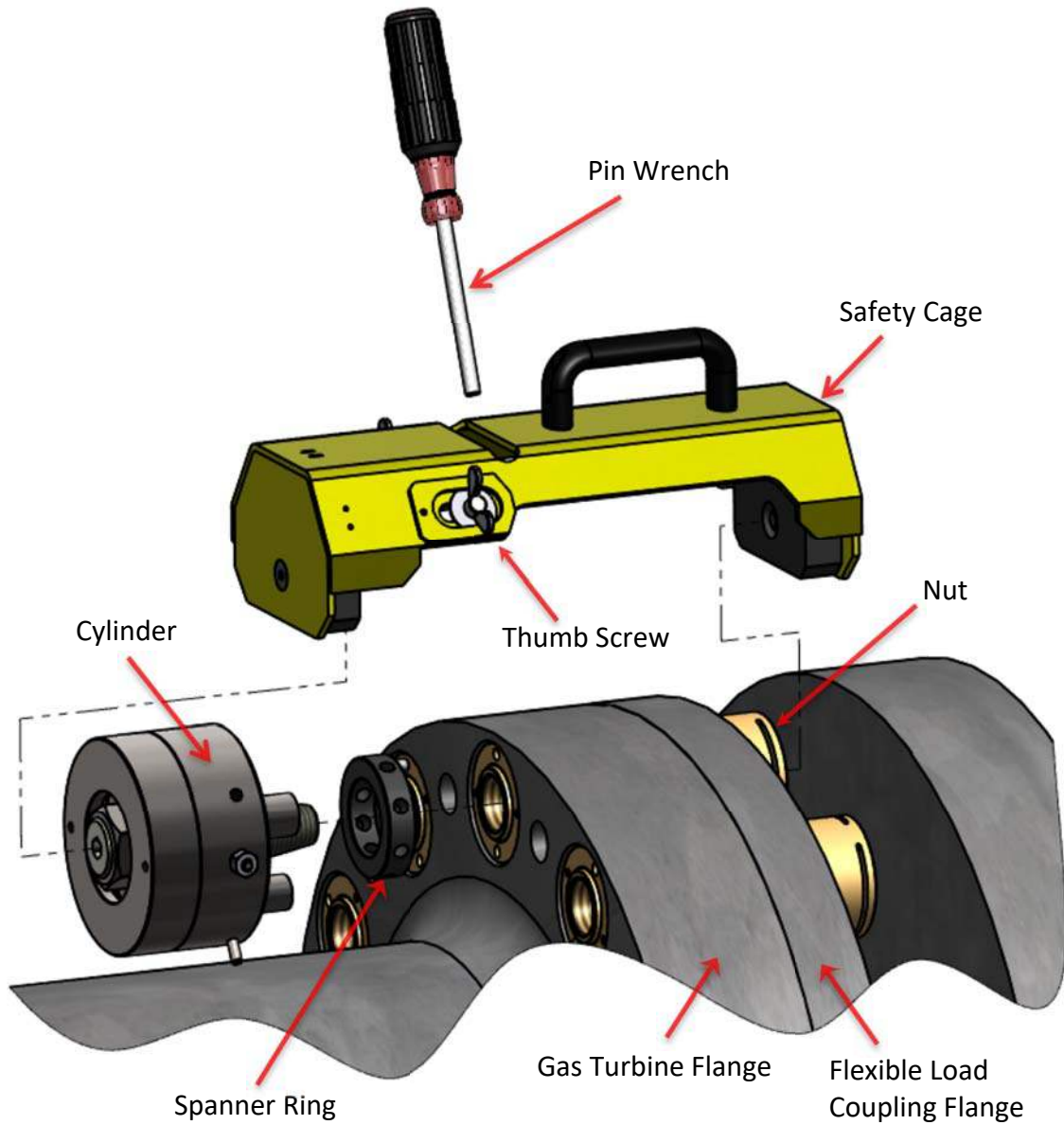


Figure 8B – View of HT-7216 on MS7001 to Flexible Load Coupling Flange

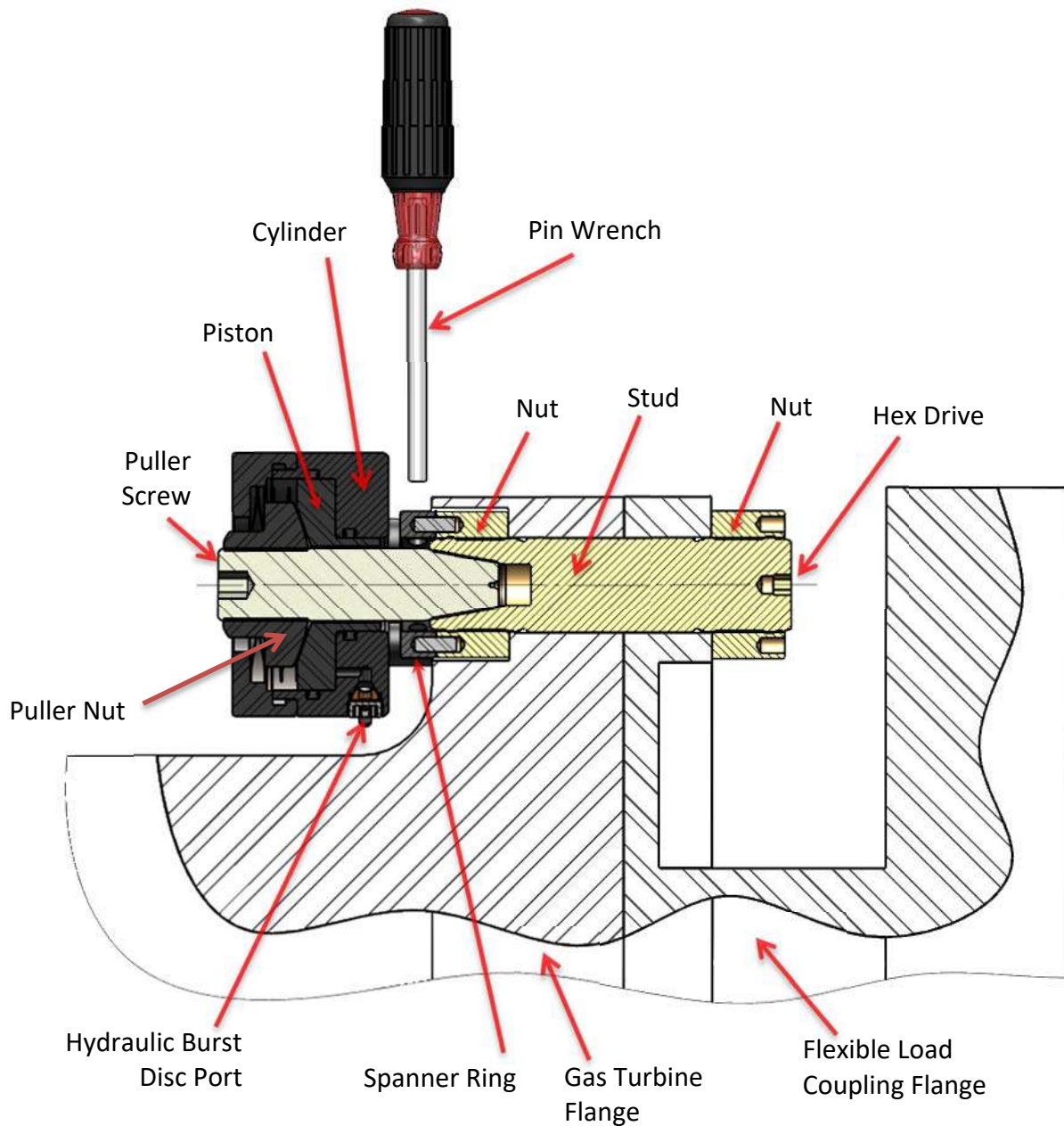


Figure 8C – Cross-section View of HT-1168 on MS7001 to Flexible Load Coupling Flange

Note: The HT-1168 tensioner is supplied with no safety guard. This tensioner is intended to be used while the gas turbine casing is closed. An operator who follows the instructions and operates the tool correctly is protected by the turbine casing, the turbine's output shaft's flange, the output shaft, and other equipment near the flange that restrict the tensioner's movement.



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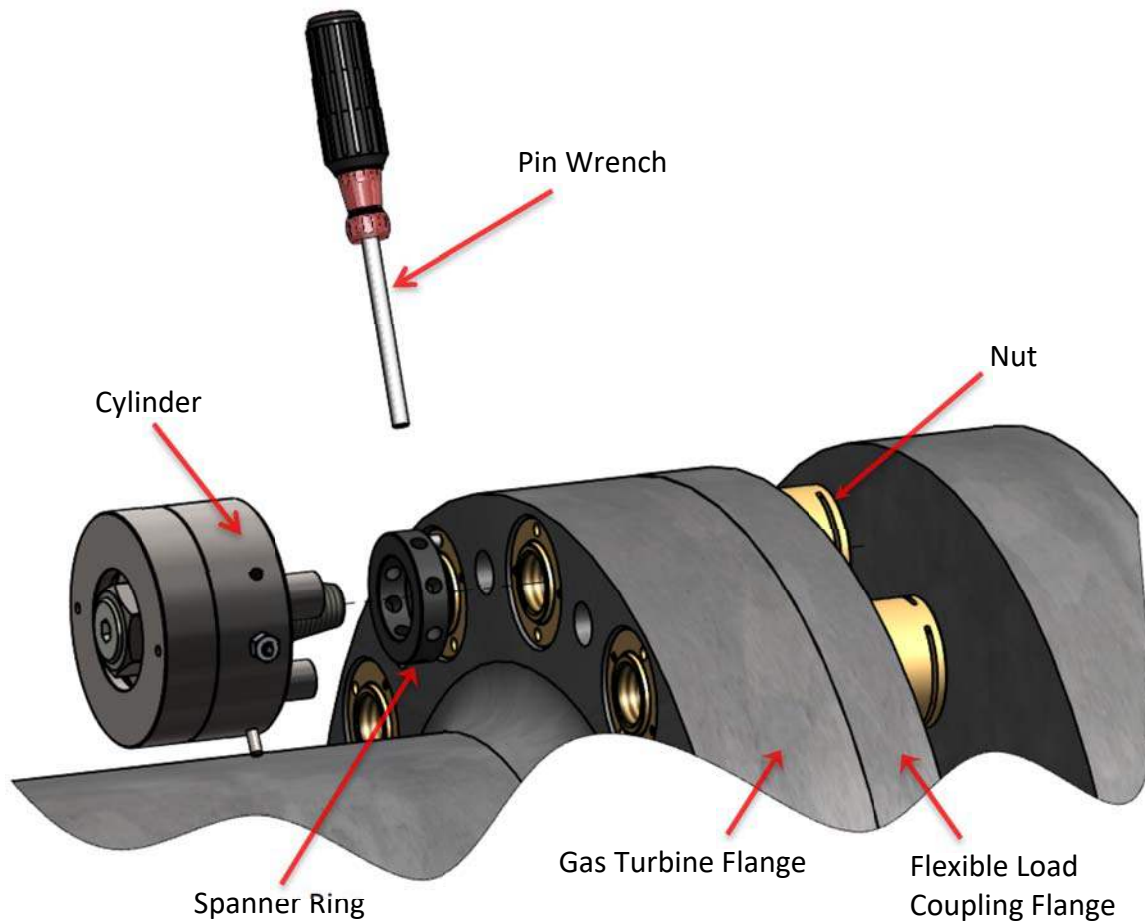


Figure 8B – View of HT-1168 on MS7001 to Flexible Load Coupling Flange

Note: The HT-1168 tensioner is supplied with no safety guard. This tensioner is intended to be used while the gas turbine casing is closed. An operator who follows the instructions and operates the tool correctly is protected by the turbine casing, the turbine's output shaft's flange, the output shaft, and other equipment near the flange that restrict the tensioner's movement.

Assembly sequence is as follows:

1. Open the hydraulic return valve on the pump to allow hydraulic fluid to be pushed back from the puller tool into the pump reservoir. (This is automatic on the air-operated hydraulic pump)
2. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. Do not use "Never Seize" on the conical threads.
3. Place spanner ring on the nut on the gas turbine side of the flange. The spanner ring's drive pins should be placed into the matching holes in the nut.
4. Insert a 3/8" Allen wrench on the flexible load coupling side of the stud to hold the stud stationary and tighten the puller screw into the stud.
5. Slide the core tensioner over the nut and spanner ring. Hold the tensioner in place by hand while installing the puller screw.
6. Insert the puller screw through the piston of the tensioner and the spanner ring. Thread the puller screw into the stud's tapered thread and tighten.
7. **Be sure not to cross-thread the assembly.**
8. Back-off the puller screw 1/2 turn and retighten. **PULLER SCREW MUST BE HAND TIGHT BEFORE TENSIONING. DO NOT OVER TORQUE.**
9. Tighten the puller nut and then back nut off two flats or 120 degrees to allow for the stud to stretch.
10. At this point the Tensioner Assembly **MUST BE FREE TO ROTATE** and the puller screw is tight in the stud. If not, recheck the nut and verify the correct stud stick-out length.
11. Whenever the area surrounding the tensioner allows, place the guard over the tensioner assembly and tighten the guard's thumb screws into tensioner body.

CAUTION

Do not over stroke the tensioner. Over stroke can cause the piston to lose its seal and leak oil.

CAUTION

Personal injury and equipment damage can occur if the puller screw is not securely engaged with the tapered threads of the stud. Proper engagement is achieved when the puller screw is tight in the stud and the tensioner assembly is free to turn.

8.2 Bleeding the Hydraulic System

Attach hose to pump and slowly bleed hose into catch reservoir. When a steady stream of oil is seen from the hose, immediately attach hose to tensioner cylinder. Bleeding of tensioner was completed at the factory and does not require further bleeding.



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WARNING

To avoid failure, ensure safety, and proper operation, the tensioner assembly must be installed on a stud in the flange before pressurizing the tensioner. Do not use the tensioner at any pressure unless the tool is installed on a stud in a flange.

Note: The hose is stiff; use of this tooling can be simplified by temporarily installing the tensioner on one stud prior to final tightening of fittings. This will reduce the tendency for the fittings to loosen during use.

9.0 Stud Tensioning

The studs will be tensioned in two steps, at approximately 50% pressure and at final pressure. Follow the tensioning sequence for each flange joint as defined on the data sheets found at the end of this manual.

9.1 Tensioning at 50% pressure

After the tensioner is properly installed apply hydraulic pressure to the tool. Bring the pressure to the 50% level in accordance with the following table.

WARNING

The safety guard must be in place during operation. Keep hands out of designated areas at all times when the tensioner is pressurized otherwise personal injury can occur.

CAUTION

Before threading the puller screw into the stud, carefully check the cleanliness of both the stud's and the puller screw's conical threads. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. This procedure will ease assembly and assure positive mating of the threads before tightening. Do not use "Never Seize" on the conical threads.

CAUTION

Do not exceed the maximum pressure marked on the tensioner. Excessive pressure can damage the stud and puller screw.

CAUTION

Do not tighten the nut while the tool is coming up to pressure; wait until pressure is achieved before attempting to tighten the nut with the spanner ring. If the tool is not properly installed, the tool could jump off the stud while coming up to pressure.



<u>Flange Position</u>	<u>Stud Size</u>	<u>50% Pressure</u>	<u>50% Stretch</u>
Gas Turbine to Flexible Load Coupling	2" [51 mm]	9000 psi [620 bar]	Do not measure Do not use

9.1.1 Tightening of Nuts

Turn the cylindrical nut on the gas turbine side using the spanner ring and pin wrench until it bottoms on the flange.

9.2 Removing the Tensioner from an Installed Stud

Tensioner removal is to be accomplished as follows:

1. Release the tensioner pressure by opening the valve on the pump. Leave valve open. (This is automatic on the air-operated hydraulic pump)
2. Loosen the thumb screws and remove the guard from the assembly.
3. Remove the puller nut from the puller screw.
4. While supporting the tensioner by hand, unscrew the puller screw using a 1/2" Allen wrench. (Older tensioners may require a 3/8" hex Allen wrench.) It may be necessary to initially use a break bar to help loosen the puller screw.
5. Remove the puller screw.
6. Slide the tensioner off of the nut and spanner ring.
7. Remove the spanner ring from the nut.
8. Move the tool to the next stud to be tensioned, following the bolting pattern as defined on the supplied data sheets.

9.3 Tensioning at Final Pressure

After the tensioner is properly installed a second time, apply hydraulic pressure to the tool. Bring the pressure to the final pressure in accordance with the following table. After all of the studs have been tensioned, measure the final stud length. The final pressure and required stretch values are listed in the following table.

WARNING

The safety cage must be in place during operation. Keep hands out of designated areas at all times when the tensioner is pressurized otherwise personal injury can occur.



CAUTION

Before threading the puller screw into the stud, carefully check the cleanliness of both the stud's and the puller screw's conical threads. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. This procedure will ease assembly and assure positive mating of the threads before tightening. Do not use "Never Seize" on the conical threads.

CAUTION

Do not exceed the maximum pressure marked on the tensioner. Excessive pressure can damage the stud and puller screw.

CAUTION

Do not tighten the nut while the tool is coming up to pressure; wait until pressure is achieved before attempting to tighten the nut with the spanner ring. If the tool is not properly installed, the tool could jump off the stud while coming up to pressure.

<u>Flange Position</u>	<u>Stud Size</u>	<u>Final Pressure</u>	<u>Final Stretch</u>
Gas Turbine to Flexible Load Coupling	2" [51 mm]	19000 psi [1310 bar]	0.013" - 0.015" [0.33 mm - 0.38 mm]

9.3.1 Tightening of Nuts

Turn the cylindrical nut on the gas turbine side using the spanner ring and pin wrench until it bottoms on the flange. Then apply torque to turn the nut an approximate additional 10 degrees. This will aid in achieving the desired stretch.

Excessive stretch variations or low stretch values can be corrected by uninstalling all or selected studs to the pressure values stated in the table above. Have final stretch values approved by the supervisor responsible for the installation.

10.0 Thread Locking

Once pulling and tensioning is completed all stud nuts must be locked in position. Riverhawk hardware employs a reusable mechanical locking device.





Picture 10A – Riverhawk Locknut

Mechanical lock nuts have two set screws located in the top face. During the initial steps of the installation procedure, before the nut was threaded onto the stud, the set screws should have been loosened and free to turn.

After tensioning the stud to its final pressure and the nut on the gas turbine side has been seated, torque the set screws to the values specified in the following table. When seated and torqued to the values specified, the load created by the set screw displaces the thread of the nut in the area of the web creating the desired locking action.

<u>Stud Size</u>	<u>Set Screw Size</u>	<u>Torque</u>
2" [51 mm]	1/4"-28 UN	65in·lbs - 87in·lbs [7.3N·m – 9.8N·m]

11.0 Stud and Nut Removal

11.1 Handling of the Tensioner

The tensioner used in this application is designed for no special lifting instructions. Do not drop any part of the tensioner on the operator or other nearby personnel.



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11.2 Stud and Nut Removal

WARNING

Whenever possible, the safety cage should be in place to prevent personal injury. Keep hands out of designated areas at all times when the tensioner is pressurized otherwise personal injury can occur.

CAUTION

Do not exceed the maximum pressure marked on the tensioner. Excessive pressure can damage the stud and puller screw.

CAUTION

Do not tighten the nut while the tool is coming up to pressure; wait until pressure is achieved before attempting to tighten the nut with the spanner ring. If the tool is not properly installed, the tool could jump off the stud while coming up to pressure.

Refer to the hardware assembly drawing (HF-xxxx) listed in Section 2.0 of this manual and the tensioner assembly drawing (HT-xxxx) listed in Section 4.5 of this manual to determine how the tensioner must be assembled on the flexible load coupling for its correct operation.

Section 8.0 contains diagrams of the tensioner equipment.

CAUTION

Before threading the puller screw into the stud, carefully check the cleanliness of both the stud's and the puller screw's conical threads. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. This procedure will ease assembly and assure positive mating of the threads before tightening. Do not use "Never Seize" on the conical threads.

Disassembly sequence is as follows:

1. If present, remove the windage plugs from the studs by loosening the plug's set screws with an Allen wrench and then unscrew the plug from the stud. It may be necessary to use a second Allen wrench to stop the windage plug from rotating. Do not misplace the set screws.
2. Using shop air and a wire brush, such as one supplied with Riverhawk stud cleaning kit GT-4253, clean the internal tapered thread of the stud to remove any debris/deposits which may have accumulated during service as described in section 5.2.2. Do not continue until ALL debris is removed from the threads.

WARNING

Do not use a hydraulic tensioner to remove a stud with damaged conical threads.



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3. With an Allen wrench, loosen the nut's two locking set screws but do not remove them from the nut.



Picture 11A - Loosening of a nut's set screws

4. Connect the hydraulic hose from the hydraulic pump to the tensioner. **Do not pressurize** the tensioner at this time or you may cause damage to the tensioner.
5. Open the hydraulic return valve on the pump to allow hydraulic fluid to be pushed back from the puller tool into the pump reservoir. (This is automatic on the air-operated hydraulic pump)
6. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. Do not use "Never Seize" on the conical threads.
7. Place spanner ring on the nut on the gas turbine side of the flange. The spanner ring's drive pins should be placed into the matching holes in the nut.
8. Insert a 3/8" Allen wrench on the flexible load coupling side of the stud to hold the stud stationary and tighten the puller screw into the stud.
9. Slide the core tensioner over the nut and spanner ring. Hold the tensioner in place by hand while installing the puller screw.
10. Insert the puller screw through the piston of the tensioner and the spanner ring. Thread the puller screw into the stud's tapered thread and tighten.
11. **Be sure not to cross-thread the assembly.**
12. Back-off the puller screw 1/2 turn and retighten. **PULLER SCREW MUST BE HAND TIGHT BEFORE TENSIONING. DO NOT OVER TORQUE.**
13. Tighten the puller nut and then back nut off two flats or 120 degrees to allow for the stud to shrink.



14. At this point the Tensioner Assembly **MUST BE FREE TO ROTATE** and the puller screw is tight in the stud. If not, recheck the nut and verify the correct stud stick-out length.
15. Whenever the area surrounding the tensioner allows, place the guard over the tensioner assembly and tighten the guard's thumb screws into tensioner body.

CAUTION

Do not over stroke the tensioner. Over stroke can cause the piston to lose its seal and leak oil.

CAUTION

Personal injury and equipment damage can occur if the puller screw is not securely engaged with the tapered threads of the stud. Proper engagement is achieved when the puller screw is tight in the stud and the tensioner assembly is free to turn.

16. Connect the hydraulic pump to the tensioner and apply the appropriate hydraulic pressure per this table.

<u>Flange Position</u>	<u>Stud Size</u>	<u>Final Pressure</u>
Gas Turbine to Flexible Load Coupling	2" [51 mm]	19000 psi [1310 bar]

17. Turn the spanner ring with the pin wrench. Loosen and turn the nut approximately 3/4 of a turn.
18. Release the hydraulic pressure and move the tool to the next stud to be removed.

11.3 Removing the Tensioner from a Stud

Tensioner removal is to be accomplished as follows:

1. Release the tensioner pressure by opening the valve on the pump. Leave valve open. (This is automatic on the air-operated hydraulic pump)
2. Loosen the thumb screws and remove the guard from the assembly.
3. Remove the puller nut from the puller screw.
4. While supporting the tensioner by hand, unscrew the puller screw using a 1/2" Allen wrench. (Older tensioners may require a 3/8" hex Allen wrench.) It may be necessary to initially use a break bar to help loosen the puller screw.
5. Remove the puller screw.
6. Slide the tensioner off of the nut and spanner ring.



7. Remove the spanner ring from the nut.
8. Move the tool to the next stud to be removed, following the bolting pattern as defined on the supplied data sheets.

12.0 Storage Instructions

Follow these directions to properly store your hydraulic tensioner and hydraulic pump kit for long term storage and shipment.

If any damage is observed, contact the Riverhawk Company to schedule a maintenance inspection.

12.1 Hydraulic Pump Kit Storage

Refer to the Hydraulic Pump Kit Instruction Manual, IM-293. The latest revision may be obtained by contacting Riverhawk Company or thru www.riverhawk.com.

12.2 Hydraulic Tensioner Storage

Check the tensioner for any damage.

1. Clean puller screw and check for any debris and dents.
2. Puller screw should be free to rotate and move back and forth in the tensioner assembly.
3. Seam between the cylinder and its end cap is closed tightly.
4. Inspect tensioner guard for any signs of damage. Bent guards should be replaced. Missing rubber pads must be replaced.

If any damage is observed, contact the Riverhawk Company to schedule a maintenance inspection.

Place protective red plastic cap into the hydraulic port.

Coat the hydraulic tensioner with a light coat of oil and place the tensioner into the original shipping container.

12.3 Store shipping container

Secure the hydraulic pump and hydraulic tensioner into the original shipping containers using the supplied wood braces.



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Seal the original shipping container and store under shelter and protected from moisture, sand, and grit.

13.0 Frequently Asked Questions

This section contains some frequently asked questions and problems. If the steps listed here do not solve your problem, contact the Riverhawk Company thru our website, email, or phone call.

Q: Can I rent a hydraulic tensioner kit?

A: Yes, Riverhawk has rental tensioner kits available for most of our hydraulic tensioners.

Q: A tensioner has pulled itself out of the stud's conical threads. Can I continue using a tensioner on this stud?

A: No. Both the tensioner and the stud may have been damaged and must be removed from the work area. If the stud is tensioned, a Nut Buster repair kit, from Riverhawk, must be used to remove the damaged stud by drilling out the nut. Leaving a damaged stud in place will lead to a safety hazard on future outages.

Riverhawk can supply a replacement stud and nut based on the initial weight certification supplied with the hardware set (see section 4.2). The damaged tensioner should also be returned to Riverhawk for inspection and repair.

If a stud must be left in place, paint the damaged stud with a generous amount of indelible, bright-colored paint. Notify the appropriate GE Oil & Gas Safety and Service personnel. Record the location of the damaged stud in the services notes for the machine.

Q: The hydraulic tensioner has been taken up to its final pressure. The final stretch length is short of the final stretch target. What is the next step?

A: Do not increase the hydraulic pressure. Check if the hydraulic pump is set to the right pressure. Install the tensioner and re-pressurize the tensioner to the final pressure then recheck the stretch measurement. If the stretch value is still short, remove the stud from the hole and re-measure the stud's initial length then try to install the stud again.



Q: The hydraulic tensioner has been taken up to its final pressure. The final stretch length is larger than the final stretch target. What is the next step?

A: Remove the stud from the bolt hole. Check if the hydraulic pump is set to the right pressure. Re-measure the stud's initial length then try to install the stud again.

Q: The tensioner is at its final pressure, but the nut cannot be loosened.

A: If the nuts cannot be loosened at the final pressure, continually increasing the pressure will not help and can be dangerous and in some cases make it harder to remove the nut. Check the nut to see if its set screws have been loosened. Check for and remove any corrosion around the nut's threads.

Q: How do I clean the conical threads on a stud?

A: The conical threads are best cleaned using a spiral wound brass brush in a drill as described in section 5.2.2

Q: During the initial steps of removing a tensioned stud, the stick-out length is found to be wrong.

A: Do not proceed. Contact Riverhawk for assistance. With the wrong stick-out length, the hydraulic tensioner has a limited stroke and may not work properly and can be damaged.

Q: The hydraulic pump appears to be leaking.

A: Check the hose connection to the hydraulic pump. If the 1/4" high pressure fitting is not assembled correctly as shown in section 7.2, it may look like the pump is leaking. If the problem continues, it may be necessary to return the pump kit to the Riverhawk factory. Contact Riverhawk for guidance.

Q: The hydraulic hose has a collar on it that can't be moved by hand

A: The hydraulic fitting is shown in section 7.2. The collar is sometimes held in place with a thread locking compound. This prevents the collar from moving too easily. It may be necessary to adjust this collar with a set of vise-grip pliers. Be careful to not strip the threads off the tube or hose end.



14.0 Revision History

Revision Letter	Effective Date	Description
C	Sep 30, 2024	Added 1/2" hex size option for puller screws
B	Jul 19, 2022	Revised figures 6A in section 6.0; Inserted appendix B1
A	Apr 5, 2022	Updated EC Declaration of Conformity; Added UKCA Declaration of Conformity
-	Apr 4, 2016	Released



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Appendix A1

EC Declaration of Conformity

Manufacturer: Riverhawk Company
Address: 215 Clinton Road
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The hydraulic pump and bolt tensioning tool described in this manual are used for installing and applying tension to large bolts that are specifically designed by Riverhawk Company to be tensioned hydraulically.

All applicable sections of European Directive 2006/42/EC for machinery have been applied and fulfilled in the design and manufacture of the hydraulic pump and bolt tensioning tool described in this manual. Reference also ISO 12100:2010, ISO 4413:2010, and ISO 4414:2010.

Furthermore, this equipment has been manufactured under the Riverhawk quality system per EN ISO 9001:2015

Consult the Declaration of Conformance included with the shipment of this equipment that identifies the authorized Riverhawk representative, applicable serial numbers, and appropriate signature.



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Appendix A2

UKCA Declaration of Conformity

Manufacturer: Riverhawk Company
Address: 215 Clinton Road
New Hartford, NY 13413, USA

The hydraulic pump and bolt tensioning tool described in this manual are used for installing and applying tension to large bolts that are specifically designed by Riverhawk Company to be tensioned hydraulically.

All applicable sections of Supply of Machinery (Safety) 2008 have been applied and fulfilled in the design and manufacture of the hydraulic pump and bolt tensioning tool described in this manual. Reference also ISO 12100:2010, ISO 4413:2010, and ISO 4414:2010.

Furthermore, this equipment has been manufactured under the Riverhawk quality system per EN ISO 9001:2015

Consult the Declaration of Conformance included with the shipment of this equipment that identifies the authorized Riverhawk representative, applicable serial numbers, and appropriate signature.



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Appendix B1 - Hydraulic Fittings

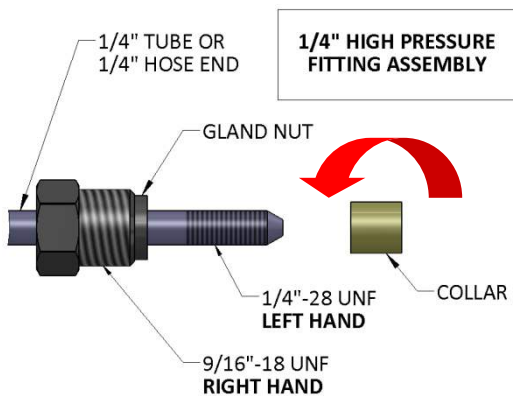


Illustration 1

Riverhawk tensioners use a 1/4" High Pressure port to connect its hydraulic hoses. The hose connector is made from a three piece assembly: a gland nut, a collar, and a 1/4" tube or 1/4" hose end. (See Illustration 1)

To assembly the fitting, slide the gland nut over the 1/4" tube or 1/4" hose end. Turn the collar counter-clockwise (**left hand** thread) on to the tube or hose end as shown in Illustration 1.

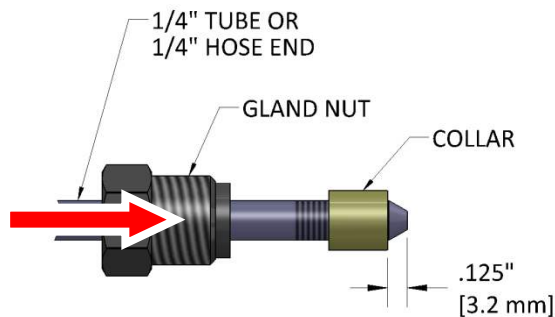


Illustration 2

The collar should be placed .125" (3.2 mm) from the tip of the cone. (See Illustration 2) It may be necessary to adjust this collar with a set of vise-grip pliers. Be careful to not strip the threads off the tube or hose end.

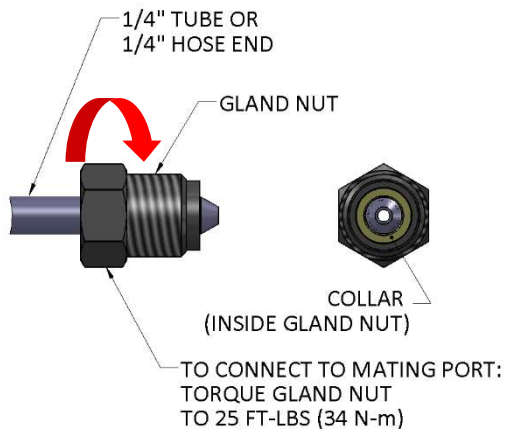


Illustration 3

Slide the gland nut down over the collar. (See Illustration 3) Insert the 1/4" tube or 1/4" hose end into tensioner or hydraulic pump. While firmly holding the tube or hose end to stop it from rotating, turn the gland nut clockwise (**right hand** thread) and torque the gland nut to 25 FT-LBS (34 N-m).

Tips:

- Make sure all parts are clean and free from debris.
- Protect the cone on the end of the 1/4" tube or 1/4" hose end from scratches as this is the sealing surface.
- Replace red plastic caps when finished to protect the threads and cone.



Appendix C1

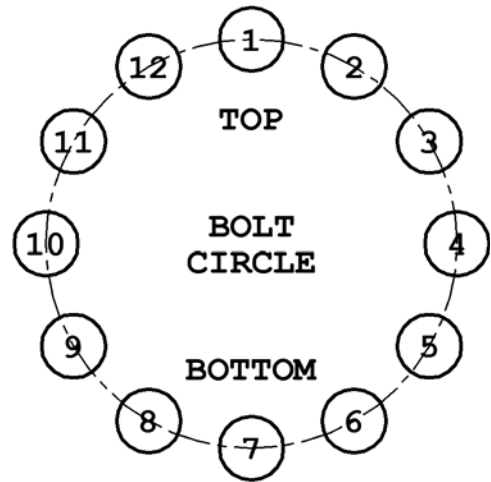
STRETCH RECORD SHEET FOR
THE GAS TURBINE TO FLEXIBLE LOAD COUPLING

TURBINE NUMBER:

DATE:

TECHNICIAN:

SUPERVISOR:



HOLE NUMBER	STARTING LENGTH	FINAL LENGTH	FINAL STRETCH
1			
7			
2			
8			
3			
9			
4			
10			
5			
11			
6			
12			



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