

PRECISION AIRFRAME TOOLING FOR PRODUCTION AND MAINTENANCE

ATI has more than 70 years experience in designing and manufacturing airframe fabrication tools. ATI serves a wide range of customers including airlines, the military, commercial manufacturers, airframe and sheet metal mechanics, and maintenance and repair operations, or "MROs". The majority of the company's products are designed and



ATI TOOLS

manufactured in City of Industry, California. The broad assortment of ATI tools are used for hole location, drilling, deburring, hole preparation, and fastener installation and removal. The focus of this brochure is threaded, tamperproof fasteners and related products.

Let's take a look.

HI-LOK® AND OTHER TAMPERPROOF AVIATION FASTENERS

Hi-Lok® fasteners are among the most commonly used lightweight, tamperproof fasteners in the aviation industry. A registered trademark of Hi-Shear Corporation, Hi-Lok® fasteners' unique advantages are twofold. First, Hi-Lok® fasteners yield very consistent clamp force when properly installed, a critical requirement when securing aviation panels. Second, the Hi-Lok® fastener's "frangible" (or "breakaway") collar shears off upon reaching required torque, yielding a tamperproof mechanical connection. Hi-Lok® fasteners are most often used in aviation wing assemblies. Hi-Shear

Corporation, including its branded Hi-Lok® and Hi-Lite™ products, has played a dominant role in aviation for more than 70 years.

Another widely used fastener is Alcoa's Eddie Bolt®. Eddie Bolts® are typically used in similar applications as Hi-Loks®. The key difference between the Eddie Bolt® and the Hi-Lok® fastener is that the Eddie Bolt's® collar edges deform during installation instead of detaching completely, thereby reducing the risk of foreign object damage (FOD).



Shown: Installing the Hi-Lok® fastener with the "Roller Clutch" wrench.



Shown: Hi-Lok® fasteners completely installed.

COMMON HI-LOK® FASTENER CONFIGURATIONS



Hi-Lok® fasteners come in a variety of styles to suit the application.

INSTALLING A HI-LOK® FASTENER

The Hi-Lok® Roller Clutch Wrench is excellent for use in tight spaces. It works like a ratchet, but has a roller clutch mechanism that provides immediate engagement throughout its range. It also has a thru-hole that provides access for a hex wrench that may be needed to stop the pin from rotating during installation.



ATI Square Drive Hi-Lok® "Roller Clutch" Wrenches

Installation Procedure – A Hi-Lok® Roller Clutch Wrench or Hi-Lok® ratchet and Hi-Lok® socket are used along with a hex wrench to install Hi-Loks®.

With these tools, the operator tightens the collar until the collar's hex nut shears (or "franges") off. During tightening, the hex wrench is used to secure the pin. It fits into the pin via the thru-hole in the wrench. →



To complete installation, the operator collects the hex nut and removes it to minimize the risk of FOD.



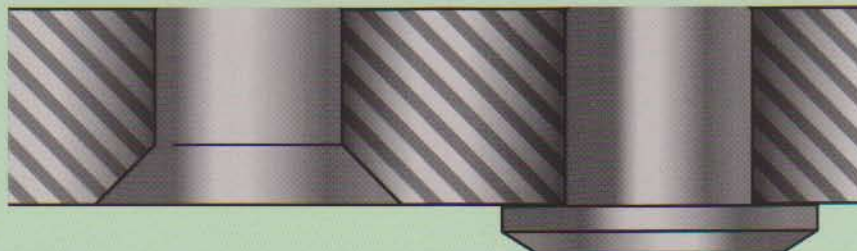
ATI Hi-Lok® Installation "Roller Clutch" Wrench Kit

ATI Comprehensive Frangible Collar Installation Kit



COMMON PIN HEAD

100° REDUCED FLUSH HEAD

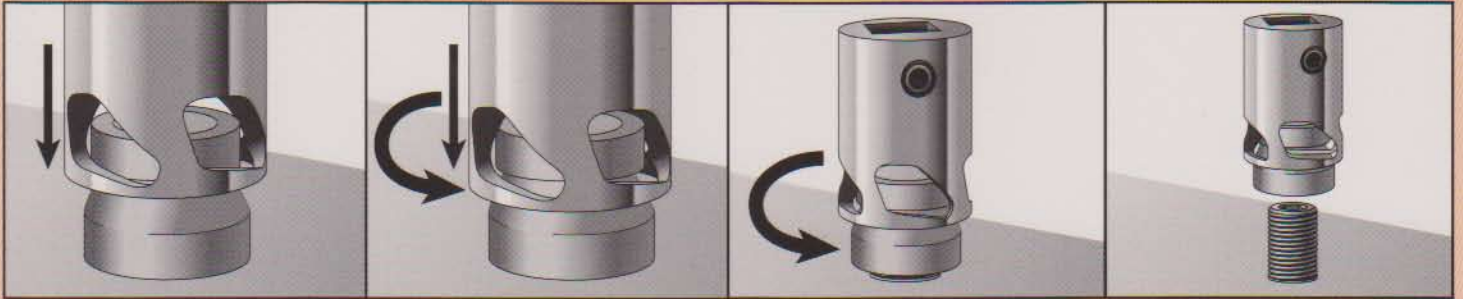


PROTRUDING SHEAR HEAD

REMOVING A HI-LOK® FASTENER

Removing a frangible collar can be a challenge. The pin and collar are mechanically connected and tamperproof, so standard tools won't work. Also, the removal process must avoid scratching the skin of the aircraft. ATI offers specialized sockets and pliers for removing frangible collars. Let's take a look:

Removal Procedure – The Hi-Lok® collar must be clamped and unscrewed and the pin tapped out to completely remove the assembly. A variety of tools can be used, but repeatability and scratching can be a problem.



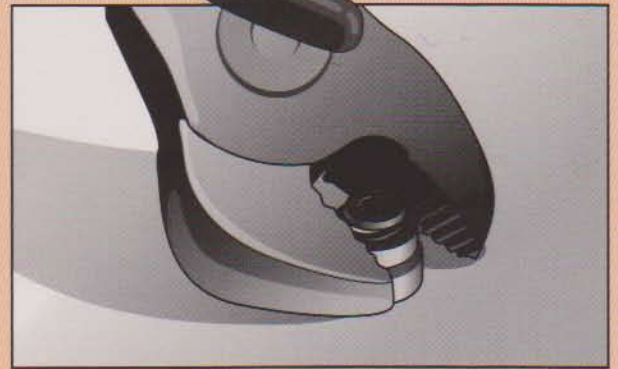
Recently, ATI developed a Hi-Lok® removal socket that has internal teeth that bite into the collar material. Using a Hi-Lok® ratchet or Hi-Lok® Roller Clutch Wrench, the operator places the socket over the collar and turns the ratchet. The socket's teeth dig into the collar material with sufficient force to gain a hold of the collar so that it can be unscrewed. Again, a hex wrench may be used to stop the pin from rotating as needed.

Pliers – Another way to remove Hi-Lok® fasteners is by using pliers that are designed for the purpose. The jaws of the Hi-Lok® Removal Pliers are knurled to enable a good grip on the collar. Then the user applies “elbow grease” to remove the collar.



Kits – ATI offers Frangible Collar Removal Kits that work on a variety of commonly used sizes of threaded, tamperproof fasteners.

ATI
Hi-Lok®
Frangible
Collar
Removal Kit



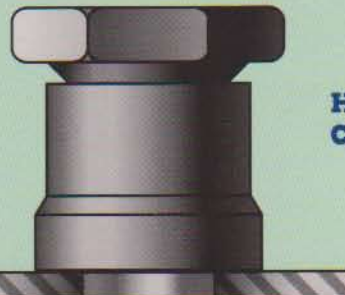
Hi-Lok® Removal Pliers jaws are knurled to enable a good grip on the collar.

FASTENERS AND COLLARS

HI-LOK®
COLLAR



HI-LITE®
COLLAR



ANATOMY OF A THREADED, TAMPERPROOF FASTENING SYSTEM

Threaded, tamperproof fastening systems are typically made up of a threaded pin and special fastener that mate together during installation. The fastener's collar transforms at a predefined torque to yield a consistently torqued and tamperproof final configuration. The following graphics show the details of the Hi-Lok® fastening system through the installation process.

HI-LOK® FASTENERS:

Hi-Lok® fasteners consist of two parts: a threaded pin and a frangible nut, or "collar". When proper torque is reached during installation, the external hex portion of the collar franges off, leaving the main body of the collar in place. The final assembly is properly torqued and tamperproof.

WHAT'S IN THE PIN:

A hexagonal recess is located at the threaded end of the pin and is designed to accept a hex wrench that may be needed to stop the pin from rotating during installation.

MATERIALS AND CONFIGURATIONS:

Hi-Lok® pins are made from 7075-T6 aluminum, steel, titanium and chrome steel. Collars are manufactured from 2024 aluminum, steel and inconel (chromium/Iron alloy). Hi-Lok® pins are available in countersunk, shear, or tension-head pins.

