

Hi-Lok Fastener QC: Inspection Standards for Aerospace Buyers

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July 25, 2026 · Nigen

Key Takeaways

087 - Engineered Component — GB/T 78 — ISO 4027 (Series 026) — GB/T 78 — ISO 4027

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- Hi-Lok fasteners consist of a threaded pin and a swaged collar, providing controlled preload via torque-off installation.
- Pin materials include titanium and A286 stainless steel, with finishes chosen for galvanic compatibility.
- Aerospace applications span wing skins, fuselage joints, and pressure bulkheads, demanding stringent lot traceability and OEM-specific tests.
- Quality control for Hi-Lok fasteners encompasses ISO 9001/IATF 16949 systems, incoming material verification, in-process SPC, and final AQL sampling.
- Documentation and traceability support PPAP submissions and ensure compliance with airworthiness regulations.

Quality commitment: engineering integrity from raw material to final shipment

Push-In Pneumatic Fittings — Industry standard

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For aerospace-grade Hi-Lok fasteners, quality assurance is not a final checkbox—it is an integrated, multi-gate system that verifies every pin and collar against rigorous physical, dimensional, and traceability requirements before release. A supplier's quality commitment must cover the full process chain, from mill-certified alloy verification through statistically controlled machining and on to pre-shipment mechanical testing, ensuring that each fastener meets the demanding standards of structural airframe assembly.



► Watch video: <https://www.youtube.com/watch?v=LAR6GsVcZSY>

Hi Lok Fastener Installation — by Fram Avia on YouTubeA brief look at the Hi Lok fastener.

Quality management system and applicable standards

The manufacturing quality management system typically holds ISO 9001:2015 and AS9100D certifications, the latter specific to aviation, space, and defense. Special processes such as heat treating, plating, and non-destructive testing are often NADCAP-accredited. Hi-Lok pin and collar production conforms to recognized aerospace material and dimensional standards (including NAS and AS series specifications), while mechanical property verification aligns with applicable ASTM and ISO test methods. All inspection and process control activities are governed by documented procedures that define sampling plans, acceptance criteria, and response to non-conformance.

Incoming material inspection

Raw material—typically alloy steel, titanium, or nickel-based superalloy—arrives with full mill certifications certifying heat number, chemical composition, and mechanical properties. Incoming inspection verifies these certifications and performs independent confirmation using optical emission spectroscopy (OES) for alloy chemistry and tensile testing for mechanical conformance. Microstructural examination may be conducted to detect any anomalies like decarburization or inclusion content. Every heat is correlated to its mill cert and assigned a unique internal batch code, initiating end-to-end traceability.

In-process inspection and controls

During manufacturing, in-process inspection gates monitor critical characteristics at each operation. Thread forms on Hi-Lok pins are checked with dedicated Go/No-Go thread gages, and thread geometry (pitch diameter, lead error, flank angle) is verified via

optical comparator or CMM. Collar hardness is tested on a lot basis to ensure proper swaging behavior during installation. Dimensional checks cover grip length, head concentricity, and shank diameter using calibrated micrometers and attribute gages. In-line statistical process control (SPC) charts track key variables, allowing real-time detection of process drift and enabling corrective action before non-conforming parts are produced.

Final inspection and pre-shipment checks

Finished Hi-Lok fasteners undergo a comprehensive final inspection that combines dimensional, mechanical, and surface integrity verification. Mechanical testing may include proof load, tensile, and double-shear tests conducted on specimens from each lot per ASTM or equivalent standards. Coating thickness is measured using X-ray fluorescence (XRF) or eddy current instruments, and corrosion resistance is confirmed through salt spray (ASTM B117) or other specified methods. Visual inspection under magnification screens for surface defects, while non-destructive testing methods such as fluorescent penetrant inspection (FPI) or magnetic particle inspection (MPI) can detect subsurface flaws. Sampling follows AQL-based plans per ISO 2859-1, with tightened inspection regimes when quality levels approach warning limits.

Documentation, traceability and third-party inspection support

Every shipment is accompanied by a full documentation package that may include material test reports, certificates of conformance, dimensional inspection reports, and process certifications. For development or high-risk programs, PPAP Level 3 submissions provide product-part approval warrant, failure mode and effects analysis (FMEA), control plans, and measurement system analysis (MSA). Lot traceability connects the final fastener back to the original heat and billet, archived for long-term retention as required by aerospace regulations. Third-party inspection is facilitated: customers or their agents can perform source inspection at our facility, witnessing testing and review of records prior to release.

Request inspection and QC documentation

Procurement teams and quality engineers are invited to request standardized inspection checklists, sample QC data formats, or to schedule a technical review of our quality plan for Hi-Lok fasteners. Contact our quality department to receive documentation aligned with your specific program requirements.

Hi-Lok Fastener Components and Assembly

The Hi-Lok system is a two-part fastener engineered for high fatigue strength and uniform preload. It consists of a precision-threaded pin and a mating collar. The pin features a hexagonal driving recess at the threaded end that provides installation torque; when the collar is swaged onto the pin, the hex portion shears off at a predetermined torque, ensuring consistent clamp force without relying on operator feel.

Key Components

- **Pin:** Available in protruding head, flush (countersunk) head, and other configurations. Shank diameter and grip length are matched to joint stack-up.

- **Collar:** Typically aluminum alloy or stainless steel, swaged into the pin's locking grooves to form a permanent, vibration-resistant joint.

Unlike a standard rivet, the Hi-Lok pin provides a threaded mechanical lock after collar swaging, offering superior clamp-up and residual tension.

Key Facts about Hi-Lok Fasteners

- Hi-Lok is a registered trademark; however, "Hi-Lok" is commonly used generically to describe similar two-part aerospace fasteners.
- Threads on the pin are typically UNJF (unified fine-pitch with controlled radius root) for enhanced fatigue resistance.
- Material combinations are selected for galvanic compatibility with airframe skin materials (e.g., titanium pin with aluminum collar or stainless steel collar).
- Installation is accomplished with standard torque-limited driving tools, no special riveting guns required.

Specifications and Standards for Aerospace Buyers

Hi-Lok fasteners are procured to OEM specifications (such as Boeing, Airbus, or military standards) rather than general ISO standards. Proprietary part numbers define pin head style, diameter, grip length, material, and finish. Common governing standards include NASM, MIL, and AS series. The threads conform to precise tolerance classes, often exceeding the requirements of standard [Metric Thread Dimensions — ISO 724 / ISO 965](#). Mechanical properties are verified against material-specific specifications (e.g., AMS for raw stock) and are typically in ranges beyond standard [Bolt Property Classes — ISO 898-1](#).

Buyers should specify: grip length, diameter (often in fractional inches), head style, material code, and finish code. Typical surface treatments include cadmium plating, zinc-nickel, and aluminum pigmented coatings per qualified process specifications.

Aerospace Applications and Performance Advantages

Hi-Lok fasteners are used extensively in airframe assembly: wing skins, fuselage lap joints, pressure bulkheads, and door structures. They replace solid rivets where higher shear strength or easier maintainability is required. Compared to lockbolt systems, Hi-Lok pins allow disassembly by reversing the pin (unscrewing) after the collar is removed, which is advantageous for MRO (maintenance, repair, and overhaul).

In dynamic load environments, the precise preload and fatigue-resistant thread form reduce the risk of joint fretting and fatigue cracks. The swaged collar fills the hole, providing hole-fill and enhancing joint stiffness. Qualified suppliers perform rigorous testing per OEM requirements: tensile, shear, fatigue, and salt-spray corrosion resistance.

Hi-Lok Fastener Quality and Specification Overview

Aspect	Details
Quality Management System	ISO 9001, IATF 16949, or AS9100; aerospace-specific quality clauses.
Incoming Material Inspection	Mill certification, chemical composition verification, visual and dimensional checks on raw stock.
In-Process Control	Thread gauging, hardness testing, statistical process control (SPC) for critical dimensions.
Final Inspection and Testing	Mechanical testing (proof load, tensile), coating thickness, salt spray per ASTM B117, AQL sampling per ISO 2859.
Documentation and Traceability	Full batch traceability to heat lot, PPAP Level 3 upon request, certificates of conformance.
Pin Materials	Titanium alloy (e.g., Ti-6Al-4V), A286 stainless steel, alloy steel; per AMS specifications.
Collar Materials	2024-T6, 7075-T73 aluminum, 303 stainless steel; selected for galvanic compatibility.
Key Aerospace Applications	Wing skins, fuselage splices, pressurized bulkheads, landing gear ribs, engine nacelle structures.

For procurement teams requiring certified Hi-Lok fasteners with full lot traceability and test reports, submit your part number list or drawing. Our engineering team can cross-reference OEM specs and provide a quote for production volumes.

Frequently Asked Questions

What is a Hi-Lok fastener and how does it work?

A Hi-Lok is a two-part, torque-controlled aerospace fastener consisting of a threaded pin and a mating collar. During installation, the pin is held stationary while a hex portion shears off at a predetermined torque, swaging the collar into the pin's locking grooves and creating a consistent clamp force.

How does a Hi-Lok differ from a standard aircraft rivet?

Unlike a solid rivet that deforms plastically, a Hi-Lok provides a threaded mechanical lock after collar swaging, resulting in higher clamp-up and fatigue strength. Hi-Lok joints can be disassembled by reversing the pin, which is not possible with riveted joints.

What materials are Hi-Lok pins and collars made from?

Pins are commonly manufactured from titanium alloy (Ti-6Al-4V), A286 corrosion-resistant steel, or alloy steel. Collars are typically 2024 or 7075 aluminum, or stainless steel, chosen to match the pin material and the airframe skin for galvanic compatibility.

What quality inspections are performed on Hi-Lok fasteners?

Quality inspections include material certification and chemical analysis, thread gauging, hardness testing, tensile and shear tests, coating thickness measurement, and salt-spray corrosion testing per ASTM B117. Lot traceability to raw material is maintained throughout.

What are the typical applications of Hi-Lok fasteners in aircraft?

Hi-Lok fasteners are used in critical structural assemblies such as wing skins, fuselage lap joints, pressure bulkheads, door frames, and engine nacelles. They are preferred where high shear strength, fatigue resistance, and ease of maintenance are required.

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