

Hastelloy X (UNS N06002)

A Procurement-Focused White Paper for High-Temperature Fasteners and Chemical Processing Service

In this document

- What to specify (ASTM/ASME/AMS), what to verify (chemistry, condition, traceability).
- How to buy Hastelloy X fasteners without surprises (galling, marking, documentation).
- Where Hastelloy X fits in chemical processing and petrochemical service (high-temperature and SCC considerations).

Intended audience: Procurement, supply chain, and sourcing teams supporting engineering and maintenance organizations.

Prepared by: Nickel Systems (materials and fastener supply).

Disclaimer: This document is informational. Final material selection, design allowables, and code compliance must be validated by the responsible engineer and applicable specifications. "HASTELLOY" is a trademark of Haynes International.

Executive summary

Hastelloy X is a nickel-chromium-iron-molybdenum alloy selected when equipment or fasteners must survive high temperatures in oxidizing (and often mixed) atmospheres while retaining workable strength and fabrication behavior. For procurement, the value is predictable availability in multiple product forms, broad standard coverage, and a long service history in turbine/furnace hot zones. In petrochemical and chemical processing environments, the alloy is also described by the manufacturer as exceptionally resistant to stress-corrosion cracking in certain applications (selection remains environment-specific).

Procurement quick sheet	
UNS / Trade name	UNS N06002 (HASTELLOY X is a Haynes trademark)
What it is	Ni-Cr-Fe-Mo heat-resistant alloy with strong oxidation resistance and good fabricability.
Where it fits	High-temperature fasteners and hot-zone equipment; selected petrochemical/chemical processing conditions (SCC resistance noted by manufacturer).
Typical service driver	Hot oxidizing atmospheres, thermal cycling, sustained load at elevated temperature.
Key risks to manage	Wrong spec/condition; missing traceability; galling during assembly; mismatch to aqueous/chloride corrosion environment; uncontrolled substitutions.

1. What procurement should specify (and why)

Most field issues with high-temperature nickel alloys are procurement-controllable: wrong specification, wrong condition, missing traceability, or an unapproved substitution. Start every RFQ by pinning down the UNS number, the governing product-form specification(s), and the required heat treatment/condition.

Core identification

- UNS: N06002 (often sold as Hastelloy X or Alloy X).
- Confirm trademarked naming if your program requires Haynes-produced HASTELLOY X material.

Common product-form specifications

Product form (common)	Typical standards / specs to cite in RFQ	Procurement notes
Sheet / Plate / Strip	ASTM/ASME B/SB 435; AMS 5536	Common for furnace components, ducting, formed hardware.
Rod / Bar	ASTM/ASME B/SB 572; AMS 5754	Used for machined parts and some fastener stock depending on size.
Pipe / Tube	ASTM/ASME B/SB 622	Chemical processing: high-temp tubing, supports, hot-zone internals.
Fittings	ASTM/ASME B/SB 366	Match fitting spec to pipe/tube spec and heat/lot traceability.
Fasteners (bolts, nuts, studs, washers)	Commonly ordered to program/OEM specs; verify UNS N06002 chemistry and condition	Confirm size range, heat treatment/condition, thread class, surface condition and anti-galling requirements.

If your purchase is under ASME code, request the ASME “SB” versions where applicable (e.g., B/SB 435). Also call out required certification language, testing, and marking rules from your governing specification or drawing.

2. Buying Hastelloy X fasteners: control points

Fastener sourcing adds risk beyond the base material. The same alloy can behave very differently depending on bar stock source, processing route, threading method, surface condition, and assembly practice. Procurement can reduce failures and rework by specifying these control points up front.

Fastener-specific RFQ additions

- Part definition: bolt/stud/nut/washer type, size range, thread standard, thread class, and any prevailing-torque features.
- Mechanical requirements: tensile/yield/elongation (or proof load), hardness limits if required, and elevated-temperature requirements if applicable.
- Condition: solution-annealed/solution heat-treated per the controlling material spec and your drawing requirements.
- Surface condition: finish requirements, scale removal, and whether coating/lubricant is required.
- Traceability: heat/lot traceability preserved through finished fastener; marking requirements and packaging controls.

Galling risk (threads)

Nickel-base alloys are known to be susceptible to galling, especially in stainless-to-stainless or nickel-to-nickel thread pairs under high contact stress. Mitigation typically includes dissimilar pairing where acceptable, controlled surface finish, and use of approved lubricants or coatings.

Procurement action: If the assembly process is not already controlled by engineering, request the installation lubricant/coating requirement be stated on the RFQ or drawing, and ensure your supplier's packaging preserves that condition.

Common procurement mitigations for galling

- Require an anti-seize / thread lubricant approved for the service temperature and environment (engineering-owned decision).
- Avoid like-on-like thread couples when permissible; specify dissimilar nut/bolt material pairing to reduce adhesion tendency.
- Consider anti-galling coatings or surface treatments when repeatedly assembled/disassembled.

3. Hastelloy X in chemical processing: what procurement should know

Hastelloy X is primarily positioned as a heat- and oxidation-resistant alloy, but it is also cited by the manufacturer as exceptionally resistant to stress-corrosion cracking in certain petrochemical applications. Procurement teams supporting chemical processing should treat this as a starting point, then verify compatibility with the actual chemistry (including chlorides, reducing acids, oxidizing acids, and temperature gradients).

Good-fit scenarios

- High-temperature process hardware where oxidation resistance and strength retention dominate (hot internals, furnace/thermal oxidizer hardware).
- Petrochemical applications where SCC resistance is a key driver and where the environment aligns with documented performance.
- Mixed-atmosphere service (oxidizing/reducing/neutral) associated with thermal equipment rather than fully aqueous corrosion duty.

Scenarios to escalate to engineering

- Aqueous chloride exposure with tensile stress (classic SCC risk area) unless validated for the specific condition.
- Strong acid service where corrosion-first Hastelloy grades may be preferred (e.g., C-family or G-family alloys depending on chemistry).
- Any service governed by NACE/AMPP or customer corrosion allowables that explicitly restrict material families or require testing.

Procurement action: Include the service description in the RFQ (max temperature, phases present, chlorides, and whether it is cyclic). Ask the supplier to flag any specification or condition concerns and to propose compliant alternates only with written engineering approval.

4. Quality, traceability, and documentation requirements

For high-temperature nickel alloys, quality paperwork is not optional: it is the primary control mechanism that keeps the supply chain aligned to engineering intent. Use this section as your default procurement language and tailor to your program requirements.

- **Mill Test Report (MTR):** Chemistry to the governing spec, heat number, product form, and traceability statement.
- **Mechanical test reports:** As required by the product-form spec (and any drawing requirements).
- **Heat treatment certification:** Statement of solution treatment/anneal and cooling method per spec.
- **Positive Material Identification (PMI):** Optional but recommended for critical fasteners or field-replacements; specify method and sampling plan if required.
- **Marking and packaging:** Maintain heat/lot identity through finished goods and delivery. Prevent mix-ups (especially with visually similar nickel alloys).
- **Change control:** No substitutions (including alternate mills) without written approval if your program requires it.

RFQ checklist (copy/paste)

- Material: UNS N06002 (Hastelloy X / Alloy X).
- Product form: (bar, plate, wire, studs, nuts, washers, fittings, tube).
- Specification(s): ASTM/ASME and/or AMS as applicable (e.g., B/SB 435, B/SB 572, AMS 5536, AMS 5754, B/SB 622, B/SB 366).
- Condition / heat treatment: solution-annealed/solution heat-treated per spec (state explicitly).
- Dimensions & tolerances: include thread standard/class for fasteners.
- Quality documentation: MTRs with heat/lot traceability; test reports (chemistry/mechanics); optional PMI, NDE, hardness.
- Packaging/marketing: heat/lot identification preserved through delivery; part marking per drawing/spec.
- Intended environment (for supplier review): max temperature, atmosphere (oxidizing/reducing/carburizing), and whether aqueous chlorides are present.
- Compliance: any ASME code, customer flowdowns, DFARS/ITAR, or special cleanliness requirements.

References

#	Reference	Source
1	Nickel Systems, "Hastelloy X Heat Resistant" (materials page). Accessed February 16, 2026.	nickel-systems.com /materials/hastelloy-x/
2	Nickel Systems, "HASTELLOY X alloy - Technical Data Sheet (Haynes-produced material)" (PDF). Accessed February 16, 2026.	nickel-systems.com /wp-content/uploads /2025/06 /Hastelloy-X-Technical-Data-Sheet.pdf
3	Haynes International, "HASTELLOY X alloy" (alloy brochure PDF). Accessed February 16, 2026.	haynesintl.com /wp-content/uploads /2023/09 /x-brochure.pdf
4	Haynes International, "HASTELLOY X alloy" (web page). Accessed February 16, 2026.	haynesintl.com /en/alloys /alloy-portfolio/high-temperature-alloys /hastelloy-x/
5	Haynes International, "Fabrication and Welding Brochure" (PDF). Accessed February 16, 2026.	haynesintl.com /wp-content/uploads /2024/08 /Fabrication-and-Welding-Brochure.pdf
6	ASTM International, "ASTM B435" scope page (rolled plate/sheet/strip; heat-resisting and general corrosive service). Accessed February 16, 2026.	astm.org /b0435-22.html
7	ASTM International, "ASTM B572" scope page (rod; heat-resisting and general-corrosive service). Accessed February 16, 2026.	astm.org /b0572-06r16.html
8	ASM (Orange Coast Chapter), "Nickel-Base Alloys for High Performance Fasteners" (PDF) - notes nickel-base alloys are subject to galling and mitigation methods. Accessed February 16, 2026.	asmorangecoast.com /uploads/8 /3/9 /4/8394388 /smc-nickel_base_alloys_for_high_performan ce_fastener.pdf
9	NASA, "Fastener Design Manual" (PDF) - lubricant temperature limitations and fastener best practices. Accessed February 16, 2026.	ntrs.nasa.gov /api/citations /19900009424/downloads /19900009424.pdf

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