

SOUTHERLY ALLOY

Inconel X-750 Bar and Rod | UNS N07750 | Werkstoff Nr. 2.4669 | NiCr15Fe7TiAl | GH4145

ASTM B637 / ASME SB637 — Precipitation-Hardenable Nickel Alloy Bars, Forgings, and Forging Stock

Product Description

Inconel X-750 bar and rod carries UNS N07750 from 6 to 300 mm diameter under ASTM B637. Three heat-treatment Types sit in that one standard, and the Type fixes the acceptance level: Type 2 develops the highest strength, Type 3 trades a little strength for ductility, and Type 1 holds stability at the top of the temperature range. Wire leaves in No. 1 or spring temper for springs, fasteners, and seals, and a long-cycle spring route covers service above the cold-drawn ceiling. Bar ships solution treated and pickled, takes no cold work to reach strength, and machines to a good surface in the aged condition.

Chemical Composition

Element	Content (UNS N07750)	Element	Content (UNS N07750)
Nickel plus Cobalt (Ni + Co)	70.00% min.	Silicon (Si)	0.50% max.
Chromium (Cr)	14.00–17.00%	Copper (Cu)	0.50% max.
Iron (Fe)	5.00–9.00%	Cobalt (Co)	1.00% max.
Titanium (Ti)	2.25–2.75%	Carbon (C)	0.08% max.
Aluminum (Al)	0.40–1.00%	Tantalum (Ta)	0.05% max.
Niobium + Tantalum (Nb + Ta)	0.70–1.20%	Sulfur (S)	0.010% max.
Manganese (Mn)	1.00% max.		

ASTM B637, AMS 5542, AMS 5582, and AMS 5698 print one composition table for UNS N07750, and titanium, aluminum, and niobium together drive the precipitation reaction.

Minimum Room-Temperature Mechanical Properties

Product Form	Condition	Tensile Strength, min.	Yield Strength (0.2%), min.	Elongation, min.	Hardness
Bar and rod, ASTM B637 Type 2	Solution treated at 982 °C, aged	≥170 ksi (1170 MPa)	≥115 ksi (790 MPa)	18%	302–363 HB
Bar and rod, ASTM B637 Type 3	Solution treated at 1093 °C, aged	≥160 ksi (1103 MPa)	≥100 ksi (689 MPa)	20%	267–363 HB
Bar and rod, ASTM B637 Type 1	Solution treated at 1149 °C, stabilised, aged	≥140 ksi (965 MPa)	≥90 ksi (620 MPa)	8%	262 HB min.
No. 1 temper wire, AMS 5698	Cold drawn, aged at 732 °C for 16 h	165–220 ksi (1138–1517 MPa)	—	—	—
Spring temper wire, AMS 5699	Cold drawn, aged at 649 °C for 4 h	180–250 ksi (1241–1793 MPa)	—	—	—
Spring temper wire, long cycle	Solution treated, stabilised, aged	145–190 ksi (1000–1310 MPa)	—	—	—

All three bar Types ship solution treated, and the aging cycle is named on the purchase order because it fixes the acceptance level. Wire leaves in the cold-drawn tempers above and takes a tensile window rather than a single floor. A dash means the document sets no requirement for that cell.

Physical Properties (typical values)

Property	Value
Density	Approx. 8.28 g/cm ³
Melting range	Approx. 1393–1427 °C
Curie temperature	Approx. –143 °C hot rolled; –125 °C fully heat treated
Modulus of elasticity / rigidity at 20 °C	Approx. 214 / 76 GPa; Poisson's ratio 0.29
Thermal conductivity at 20 °C	Approx. 12.0 W/m-K
Specific heat at 20 °C	Approx. 431 J/kg-K
Electrical resistivity at 20 °C	Approx. 1.22 μΩ-m
Thermal expansion, 20–100 °C	Approx. 12.6 μm/m-K
Strengthening route	Precipitation hardening only

Values are typical for the annealed condition at room temperature. The Curie point sits far below zero, so the alloy stays essentially non-magnetic in service.

Applicable Standards

Standard / Designation	Scope
ASTM B637 / ASME SB637	Bars, forgings, and forging stock for moderate or high temperature service
AMS 5667	Bars, forgings, and rings, equalized and precipitation hardenable
AMS 5668 / AMS 5670 / AMS 5671 / AMS 5747	Bars, forgings, and rings by melting route and solution treatment
AMS 5669	Alloy bars, consumable electrode or vacuum induction melted
AMS 5698	Wire, No. 1 temper, precipitation hardenable
AMS 5699	Wire, spring temper, precipitation hardenable
NACE MR0175 / ISO 15156-3	Sour service qualification where the order requires it
BS HR 505 / GE B14H41	British and gas turbine designations
UNS N07750 · W.Nr. 2.4669 · NiCr15Fe7TiAl; GB/T 14992 GH4145 · JIS NCF 750	Material and national designations
ASTM B168 / ASTM B163	These documents do not cover UNS N07750

The grade is welded with matching fillers under an inert gas shield, and the joint takes the same aging treatment as the parent metal.

Typical Supply Dimensions

Product Form	Typical Supply Range
Round bar	6–300 mm diameter to ASTM B637
Hex and square bar	8–80 mm across flats
Flat bar	3–150 mm thick, up to 300 mm wide
Cold-drawn bar	6–100 mm diameter, closer tolerance by agreement
Centerless-ground bar	Tight diameter and straightness for shafting
No. 1 temper wire	0.5–12 mm diameter in coils to AMS 5698
Spring temper wire	0.5–8 mm diameter in coils to AMS 5699
Forged bar and ring	Sections above the agreed bar range to ASTM B637

Sizes above the agreed bar range leave ASTM B637 and ship as forged bar or rings. Cut lengths carry the tolerance of the ordered condition.

Surface Finishes

Surface Condition	Typical Use
Solution treated and pickled	Standard delivery for high-temperature service
Hot-worked	As-rolled or as-forged surface for parts that will be machined
Cold drawn	Close diameter control with a brighter surface
Peeled	Uniform diameter with a machined skin for further turning
Centerless ground	Tight diameter and straightness for shafting
Polished	Reduced roughness for product-contact and visible parts
Bright annealed	Scale-free surface for instrument and clean circuits

Southerly Alloy — nickel alloy bar, rod, pipe, tube, plate and fittings · www.southerly-alloy.com · Values are for reference; the mill test certificate prevails for final acceptance.