

NIMONIC 105

UNS N13021

Ni–Co–Cr–Mo–Al alloy

High creep strength for turbine blades and hot rotating components.

01 PRODUCT INTRODUCTION

NIMONIC 105 is a wrought nickel-cobalt-chromium superalloy with molybdenum solid-solution strengthening and a high volume fraction of gamma-prime from aluminum and titanium. It was developed for turbine blades and other rotating hot-section components requiring creep and rupture strength. The alloy requires controlled melting, forging and multi-stage heat treatment; mechanical properties cannot be separated from grain structure and processing history. Final selection should consider product form, heat treatment, atmosphere, design temperature, stress, thermal cycling and the governing aerospace specification.

02 ENGINEERING POSITION

Core advantage	High creep and rupture strength in turbine hot sections
Applications	Turbine blades · hot rotating parts · aerospace engine components
Material class	Ni–Co–Cr–Mo–Al alloy

03 COMMON INDUSTRY USE

Industry focus	Turbine blades · hot rotating parts · aerospace engine components
Design note	Use grade-specific creep, rupture, fatigue and heat-treatment data.

Composition & Physical Data

04 CHEMICAL COMPOSITION

Ni	Balance	Co	18–22%
Cr	14–15.7%	Mo	4.5–5.5%
Al	4.5–4.9%	Ti	1.0–1.5%
C	0.12–0.18%	B	0.003–0.010%

05 PHYSICAL PROPERTIES

Density	8.01 g/cm ³
Condition	Solution treated / aged by grade
Data status	Typical reference; specification controls acceptance

06 MATERIAL IDENTITY

Common name	NIMONIC 105
UNS	N13021
Alloy family	Ni–Co–Cr–Mo–Al alloy
Source basis	Published alloy data and governing aerospace specifications

Mechanical & High-Temperature Performance

07 MECHANICAL PROPERTIES

Strength basis	Product form, grain structure, solution treatment and aging determine properties.
Design data	Use specification minimums and approved creep/rupture curves.

08 SERVICE PERFORMANCE

Primary service	High creep and rupture strength in turbine hot sections
Oxidation	Review scale stability, thermal cycling and atmosphere.
Creep / rupture	Use long-term data at actual stress and temperature.
Fatigue	Assess strain range, dwell time, surface condition and notches.

09 APPLICATIONS

Typical use	Turbine blades · hot rotating parts · aerospace engine components
Critical review	Confirm weldability, strain-age cracking, coatings and inspection requirements.

Fabrication, Welding & Heat Treatment

10 FORMING & MACHINING

Forming	Use superalloy practice and account for rapid work hardening.
Machining	Rigid setup, sharp tooling, positive feeds and coolant are recommended.

11 WELDING GUIDANCE

Processes	Use qualified aerospace welding procedures.
Filler metal	Select grade-compatible filler and verify hot-service compatibility.
Heat input	Control restraint, interpass temperature and dilution.
Cleanliness	Remove sulfur, oxides, grease and iron contamination.

12 HEAT TREATMENT

Multi-stage solution and aging treatment is essential; use the exact aerospace specification.

Quality control	Confirm WPS/PQR, heat-treatment records, NDE and traceability.
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Product Forms, Standards & Procurement

13 PRODUCT FORMS

Forms	Sheet · plate · bar · wire · forgings · welded fabrications
Condition	Solution treated or aged according to grade and specification

14 RFQ INFORMATION

Material	NIMONIC 105 · UNS N13021 · governing specification
Dimensions	Form, thickness, tolerances, length and quantity
Testing	Chemistry, tensile, hardness, grain size, NDE and special tests
Documents	EN 10204 3.1 MTR, heat traceability and compliance certificates

15 TECHNICAL DISCLAIMER

Values shown are nominal or typical references and may vary by product form, section size, heat treatment and governing specification. They do not replace design calculations, creep or fatigue qualification, applicable aerospace requirements or the certified material test report.

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