

MONEL® R-405

UNS N04405 · W.Nr. 2.4360

Free-machining Ni–Cu alloy

MONEL 400 chemistry modified for improved machinability and automatic screw-machine production.

01 PRODUCT INTRODUCTION

MONEL R-405 is the free-machining version of MONEL 400, with sulfur intentionally controlled at a higher range to promote chip breaking and improve automatic screw-machine productivity. It is suited to precision-machined fittings, valve parts, instrument components and small shafts where dimensional repeatability matters. The nickel-copper base retains the familiar resistance of MONEL 400 in seawater, brine, hydrofluoric acid and caustic environments, but the sulfur addition makes welding and some hot-working operations less straightforward. Use R-405 when machining efficiency is the primary requirement, and verify joining, surface finish and service chemistry separately.

02 ENGINEERING POSITION

Core advantage	Similar corrosion environments to MONEL 400 where machinability is a primary requirement
Applications	Precision machined fittings · valve parts · fasteners · shafts · instrument components
Material class	Free-machining Ni–Cu alloy

SELECTION NOTE

Confirm media, temperature, velocity, crevice geometry, heat treatment and code requirements before final specification.

03 COMMON INDUSTRY USE

Industry focus	Precision machined fittings · valve parts · fasteners · shafts · instrument components
Identity	MONEL® R-405 · UNS N04405

Composition & Physical Data

Official limiting composition and typical physical constants.

04 CHEMICAL COMPOSITION

WEIGHT %

Ni	≥ 63.0%	Cu	28.0–34.0%
Fe	≤ 2.5%	Mn	≤ 2.0%
C	≤ 0.30%	Si	≤ 0.50%
S	0.025–0.060%	Al	—

SOURCE CONTROL

Use the applicable ASTM or ASME product specification and certified MTR for acceptance.

05 TYPICAL PHYSICAL PROPERTIES

ROOM TEMPERATURE

Density	8.80 g/cm ³	Melting range	1300–1350°C
Specific heat	Approx. 430–460 J/kg·°C	Condition	Annealed / aged
Magnetism	Low permeability	Data status	Typical reference

06 MATERIAL IDENTITY

Common name	MONEL® alloy R-405
UNS / W.Nr.	N04405 / 2.4360
Alloy family	Free-machining Ni–Cu alloy
Product standard	ASTM B164 · rod, bar and wire product forms

ACCEPTANCE RULE

Physical and chemistry references do not replace the certified material test report.

Mechanical & Service Performance

Condition-dependent strength and corrosion-selection guidance.

07 MECHANICAL PROPERTIES

Strength and elongation are product-form and condition dependent; use the certified ASTM product specification for acceptance values.

08 SERVICE PERFORMANCE

Primary service	Similar corrosion environments to MONEL 400 where machinability is a primary requirement
Water / chlorides	MONEL alloys are widely used in seawater and chloride-containing service; assess crevices and flow conditions.
Reducing media	Hydrofluoric and non-oxidizing acids require concentration and temperature review.
Oxidizing media	Avoid broad assumptions; oxidizing acid conditions may require a different nickel alloy.
Temperature	Use grade-specific creep, rupture and allowable-stress data at elevated temperature.

09 TYPICAL APPLICATIONS

Industries	Precision machined fittings · valve parts · fasteners · shafts · instrument components
Critical review	Review galvanic coupling, seawater velocity, sulfides, erosion and stress state as applicable.

IMPORTANT

Official values are representative. Critical service requires code compliance, certified material data and suitable corrosion review.

Fabrication, Welding & Heat Treatment

Practical controls for maintaining alloy performance.

10 FORMING & MACHINING

Cold forming	Good ductility in annealed conditions; account for work hardening in heavy forming.
Machining	Rigid setup, sharp tooling, positive feed and coolant help control work hardening.
Hot working	Use product-specific temperature windows and avoid prolonged reheating.

11 WELDING GUIDANCE

Processes	GTAW, GMAW and SMAW may be used with qualified procedures.
Filler metal	Select a filler compatible with MONEL grade and service environment.
R-405 note	R-405 is optimized for machining; do not assume it is interchangeable with MONEL 400 for welding.
Cleanliness	Remove oil, grease, oxides and iron contamination before welding.

12 HEAT TREATMENT

Use machining-friendly condition; do not assume R-405 is interchangeable with MONEL 400 for welding.

QUALITY CONTROL Confirm WPS/PQR, filler metal, surface cleaning, NDE, heat treatment and traceability.

Product Forms, Standards & Procurement

A practical specification and quotation checklist.

13 REFERENCE STANDARDS

ASTM B164 · rod, bar and wire product forms

14 COMMON PRODUCT FORMS

Forms	Plate · sheet · strip · bar · wire · pipe · tube · fittings · forgings
Condition	Annealed, stress relieved, cold worked or age hardened by grade

15 RFQ INFORMATION

Material	MONEL® R-405 · UNS N04405 · governing ASTM/ASME specification
Dimensions	Form, OD/ID, wall or thickness, tolerances, length and quantity
Testing	Chemistry, tensile, hardness, PMI, NDE and customer-specific tests
Documents	EN 10204 3.1 MTR, heat traceability and compliance certificates

16 TECHNICAL DISCLAIMER

Values shown are typical or specification-level references and may vary by product form, thickness, heat treatment and governing standard. They do not replace engineering design calculations, corrosion review, applicable codes or the certified material test report.

Source basis	Special Metals technical literature and applicable ASTM / ASME product standards
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