

MONEL® 401

UNS N04401 · W.Nr. 2.0842

Low-resistivity Ni–Cu alloy

A ductile nickel-copper alloy developed for precision electrical and electronic applications.

01 PRODUCT INTRODUCTION

MONEL 401 is a ductile nickel-copper alloy developed for specialized electrical and electronic applications where low electrical resistivity is important. It is commonly supplied as strip, coil, foil and wire for wire-wound resistors, bimetal contacts, resistance heaters and precision circuits. The alloy combines a resistivity of approximately 294 micro-ohm·m at room temperature with useful corrosion resistance in a range of atmospheric and chemical environments. Its annealed strength is modest, while cold working can increase strength up to the limits appropriate for the product. Confirm electrical resistance, temper, dimensional tolerance and surface requirements on the purchase specification.

02 ENGINEERING POSITION

Core advantage	Low-resistance electrical service with resistance to a range of corrosive conditions
Applications	Wire-wound resistors · bimetal contacts · electrical resistance heaters · precision foil circuits · electronic components
Material class	Low-resistivity 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	Wire-wound resistors · bimetal contacts · electrical resistance heaters · precision foil circuits · electronic components
Identity	MONEL® 401 · UNS N04401

Composition & Physical Data

Official limiting composition and typical physical constants.

04 CHEMICAL COMPOSITION

WEIGHT %

Ni + Co	40.0–45.0%	Cu	Balance
Mn	≤ 2.25%	Fe	≤ 0.75%
Si	≤ 0.25%	Co	≤ 0.25%
C	≤ 0.10%	S	≤ 0.015%

SOURCE CONTROL

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

05 TYPICAL PHYSICAL PROPERTIES

ROOM TEMPERATURE

Density	8.88 g/cm ³	Melting range	Approx. 1280°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 401
UNS / W.Nr.	N04401 / 2.0842
Alloy family	Low-resistivity Ni–Cu alloy
Product standard	ASTM B168-type strip and sheet requirements · product-form specifications

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

Annealed tensile strength is approximately 441 MPa with yield strength around 134 MPa; values depend on product form and cold work.

08 SERVICE PERFORMANCE

Primary service	Low-resistance electrical service with resistance to a range of corrosive conditions
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	Wire-wound resistors · bimetal contacts · electrical resistance heaters · precision foil circuits · electronic 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

Anneal around 760°C when recovery from cold work is required; confirm the supplier procedure for the product form.

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 B168-type strip and sheet requirements · product-form specifications

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® 401 · UNS N04401 · 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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