# MONEL® 400, UNS N04400

## Strip, Coil, Foil, Wire, AMS 4544, QQN 2810D, ASTM B127

### Applications

Marine engineering, chemical equipment, hydrocarbon processing, valves, pumps, fittings, fasteners, heat exchangers, flexible metal hose

### Description

Monel® 400 is a ductile Nickel-Copper alloy with resistance to a wide variety of corrosive conditions. This alloy is most frequently applied in a range of environments going from mildly oxidizing through neutral and to moderately reducing conditions. Additional application area of this material is in marine environments and other non-oxidizing chloride solutions. Like with commercially pure Nickel, Monel® 400 is low in strength in the annealed condition, for this reason a variety of tempers are used to achieve higher strength levels.

### Chemistry Typical

Nickel + Cobalt: 63.0 - 70.0
Manganese: 2.0 max
Silicon: 0.50 max
Cobalt: 1.00 max
Iron: 2.5 max
Sulfur: 0.024 max
Carbon: 0.30 max
Copper: Balance

### Physical Properties

Density: 0.319 lbs/in³, 8.8 g/cm³

Electrical Resistivity: 51.0 microhm-cm @ 68 °F

Thermal Conductivity: BTU/hr/ft²/ft/°F (W/m•K):
212 ºF (100 ºC): 14.0 (24.1)

Mean Coefficient of Thermal Expansion: in/in/°F,(µm/m•C):
32 - 212 °F (0 - 100 ºC): 7.7 x $10^{-6}$ (13.9)

Modulus of Elasticity: ksi (MPa) in Tension
26 x $10^3$ (179 x $10^3$)

Magnetic Permeability: Annealed: moderately

Melting Point: 2460 °F (1350 °C)

## Forms

Coil – Strip, Foil, Ribbon
Wire – Profile, Round, Flat, Square

## Mechanical Properties at Room Temperature

**Properties: Annealed**

Gauges: > .003 inches
Ultimate Tensile Strength: 70 - 85 KSI (483 - 586 MPA)
Yield Strength (0.2% offset): 28 KSI min (193 MPA min)
Elongation: 35% min
Hardness: Rb 68 max

Gauges: ≤ .003″
Ultimate Tensile Strength: Report
Yield Strength (0.2% offset): 28 - 48 KSI (193 - 331 MPa)
Elongation: Report
Hardness: Report

**Spring Temper:**
Ultimate Tensile Strength: 100 KSI min (690 MPa min)
Yield Strength (0.2% offset): 90 KSI min (620 MPa min)
Elongation: 2% min

**Properties: Tempered**
Monel® 400 can be cold rolled to various tempers. Contact Ulbrich Technical Service for additional information.

## Additional Properties

**Corrosion Resistance**
Refer to NACE (National Associate of Corrosion Engineers) for recommendations.

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**Finishes**

#1 – Hot rolled annealed and descaled. It is available in strip, foil and ribbon. It is used for applications where a smooth decorative finish is not required.
#2D – Dull finish produced by cold rolling, annealing and descaling. Used for deep drawn parts and those parts that need to retain lubricants in the forming process.
#2B – Smooth finish produced by cold rolling, annealing and descaling. A light cold rolling pass is added after anneal with polished rolls giving it a brighter finish than 2D.
#BA – Bright annealed cold rolled and bright annealed
#CBA – Course bright annealed cold rolled matte finish and bright anneal
#2 – Cold Rolled
#2BA – Smooth finish produced by cold rolling and bright annealing. A light pass using highly polished rolls produces a glossy finish. A 2BA finish may be used for lightly formed applications where a glossy finish is desired in the formed part.
Polished – Various grit finish for specific polish finished requirements.

** Not all finishes are available in all alloys – Contact Ulbrich Sales for more information.*

**Wire Finishes**

XC – Extra Clean Bright Annealed or Bright Annealed and Cold Rolled
Grease – Ultra bright finish (for decorative applications)
Soap – Soap coating on tempered wire to act as lubricant.

** Contact Wire Sales for custom wire finishes.*

**Heat Treatment**

Monel® 400 is non hardenable by heat treatment.

**Welding**

For best results refer to: SSINA's "Welding of Stainless Steels and Other Joining Methods".