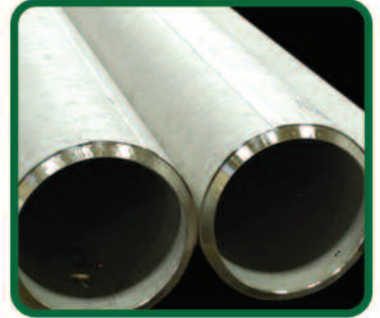
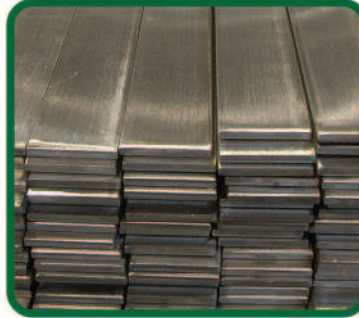
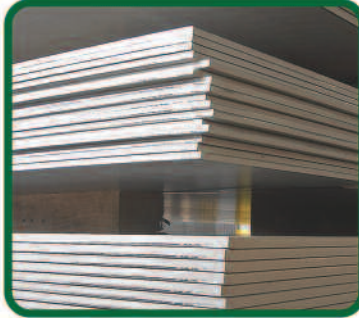
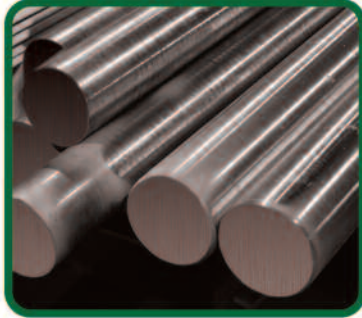




MONEL 400 SPECIFICATIONS: UNS N04400



MONEL 400 (UNS N04400)

Penn Stainless inventory now includes Monel 400 (UNS N04400) in sheet, sheet coil, plate, round bar, processed flat bar and tubular products.

GENERAL PROPERTIES

Monel 400 is a nickel-copper solid solution alloy that can only be hardened by cold working and demonstrates resistance to numerous corrosive conditions. It has a low corrosion rate in rapidly flowing brackish or sea water and also has excellent resistance to stress corrosion cracking in most fresh waters. Monel 400 is highly resistant to sea water and steam at high temperatures, salt and caustic solutions, and hydrochloric and hydrofluoric acids when they are de-aerated. Along with outstanding corrosion resistance, Monel 400 has great mechanical properties at sub-zero temperatures and can be used in temperatures up to 1000oF (1832oC). It is most frequently used in environments ranging from mildly oxidizing through neutral and also in moderately reducing conditions. Its resistance to a variety of corrosive conditions also led to its common use in marine applications and other non-oxidizing chloride solutions. Monel 400 is low in strength in the annealed condition; therefore, numerous tempers are used in order to increase its strength.

APPLICATIONS

Monel 400 is commonly used in mildly oxidizing through neutral environments as well as in moderately reducing conditions. Due to its excellent resistance to numerous corrosive conditions it is also frequently used in marine applications and non-oxidizing chloride solutions. Examples of applications that call for the use of Monel 400 include:

- Feed water and steam generator tubing in power plants
- Brine heaters and evaporator bodies in salt plants
- Marine engineering
- Crude oil distillation towers
- Process vessels and piping
- Splash zone sheathing in offshore structures
- Sulfuric and hydrochloric acid alkylation plants
- Plants for uranium refining and isotope separation in the production of nuclear fuel
- Boiler feed water heaters and other heat exchangers

STANDARDS MONEL 400

ASTM/ASMEUNS N04400
 EURONORMFeNi35Cr20Cu4Mo2
 DIN2.4660

MONEL 400 (UNS N04400) CAN BE PROCESSED BY PENN STAINLESS UTILIZING THE FOLLOWING METHODS:

- SHEAR CUTTING
- PLASMA CUTTING
- HQ PLASMA CUTTING
- DYNAMIC WATER JET CUTTING
- LASER CUTTING
- SAW CUTTING
- GAUER PROCESSING
- MACHINE CUTTING



PRODUCT OFFERING:

- SHEET
- PLATE
- PERFORATED
- FLATE & EXPANDED
- ROUND BAR
- SQUARE BAR
- HEX BAR
- ROLLED FLAT BAR
- S/E PROCESSED BAR
- THREADED ROD
- HALF ROUND
- TUBULAR PRODUCTS (WELDED & SEAMLESS)
- STRUCTURALS

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CORROSION RESISTANCE

- More corrosion resistant than commercially pure nickel under reducing conditions
- More corrosion resistant than refined copper under oxidizing conditions
- Resistant to most alkalis, salts, organic substances, and atmospheric conditions
- Used in reducing acids like sulfuric and hydrochloric
- Demonstrates outstanding resistance to stress corrosion cracking
- Has a low corrosion rate in rapidly flowing brackish or sea water

WELDABILITY

- Welding procedures are similar to those used for austenitic stainless steels
- Preheating and post weld treatment are generally not required
- Material must be free of scaling for best weld
- Cleaning of joint area is necessary to avoid embrittlement from lubrication and paints

HEAT TREATMENT

- Anneal cycle typically ranges from 1400 to 1800°F (760 to 980°C)
- Annealing should be performed in a sulfur compound-free atmosphere as sulfur will embrittle material at the annealed temperature range
- A high percentage of Monel 400 is used without final heat treatment in order to increase the strength of the material

CHEMICAL PROPERTIES

Type	C	Mn	S	Si	Ni	Cu	Fe
Monel 400	0.30 max	2.0 max	0.24 max	0.50 max	63.0 max	min: 28.0 max: 34.0	2.50 max

MECHANICAL PROPERTIES

Test Temperatures	Ultimate Tensile Strength Min psi (MPa)	0.2% Offset Yield Strength Min psi (MPa)	% Elongation in 2" Min
70°F (21°C)	82,000 (565)	31,000 (215)	48
200°F (93°C)	80,000 (550)	30,000 (205)	47
400°F (204°C)	75,000 (520)	26,000 (180)	45
600°F (316°C)	73,000 (505)	25,000 (175)	46
800°F (427°C)	70,000 (480)	23,000 (160)	48
1000°F (538°C)	53,000 (370)	21,000 (145)	40

PHYSICAL PROPERTIES

	Monel 400	
Density	lbs/in ³	g/cm ³
at 68°F (20°C)	.319	8.83
Coefficient of Thermal Expansion	Btu-ft / h-ft ² - °F	W/m - °K
200°F (93°C)	14	24.1
400°F (204°C)	16.1	27.8
600°F (316°C)	18.9	31.0
800°F (427°C)	19.8	34.3
1000°F (538°C)	22	38.1
Electrical Resistivity	51 microhm - cm	
Specific Heat	Btu/lb - °F	Joules/kg - °K
at 68°F (20°C)	20	430
Specific Gravity	8.83	