Monel K 500 Pipe & Tube (UNS N05500/ WNR 2.4375)

Monel K-500 combines the excellent corrosion resistance characteristic with the added advantages of greater hardness and strength. Its increased properties are obtained by adding aluminum and titanium to the nickel-copper base, and by heating under controlled conditions so that submicroscopic particles of Ni3 are precipitated thoughout the matrix. The thermal processing used to effect precipitation is commonly called age hardening or aging.

Alloy K-500 has approximately twice the tensile strength and tripple the yield strength of Alloy 400. The strength of Alloy K-500 is maintained to 1200°F, but stays ductile and tough down to temperature of -400°F. It also stays non-magnetic to -200°F. Additional characteristics of Alloy K-500 it has outstanding corrosion resistance in a wide range of chemical and marine surroundings, from salts and alkalis, non-oxidizing acids to pure water. It is non-magnetic and spark resistant. It is also recommended that it can be annealed when it is welded and that any weldments be stress relieved prior to aging.

It is spark resistant and non-magnetic to -200°F. However, during processing it is possible to develop a magnetic layer on the surface of the material. During heating aluminum and copper can be selectively oxidized by leaving magnetic nickel rich film on outside. Pickling or bright dipping in acid can remove magnetic film and restore the non-magnetic properties.

It has a greater tendency toward stress-corrosion cracking in some environments than Monel 400. It has approximately three times the yield strength and double the tensile strength when compared with Monel 400. Plus, it can be further strengthened by cold working before precipitation hardening. The strength of it can be maintained to 1200°F but stays ductile and tough down to temperatures of 400°F and its melting range is 2400-2460°F.

Corrosion Resistance
The corrosion resistance of Monel alloy K-500 is subtantially equivalent to that of alloy 400 except that, when in the age-hardened condition, it has a greater tendency toward stress corrosion cracking in some environments. It is resistant to a sour-gas environment. After 6 days of continuous immersionin saturated (3500ppm) hydrogen sulfide solutions at acidic and basic pH's (ranging from 1.0 to 11.0), U-bend specimens of age-hardened sheet show no cracking. There was some tightly adherent black scale.

The combination of very low corrosion rates in high strength and high-velocity sea water makes it particularly suitable for shafts of centrifugal pumps in marine service. In stagnant or slow-moving sea water, fouling may occur followed by pitting, but this pitting slows down aftera fairly rapid initial attack.

Monel K 500 Characteristics

- Excellent resistance to high velocity seawater
- It is resistant to sour-gas environment
- Excellent mechanical properties from sub-zero temperatures up to about 480°C
- Non-magnetic alloy
- Corrosion resistance in an extensive range of chemical and marine environments. From pure water to non-oxidizing mineral acids, salts and alkalis.

Monel K 500 Applications

- Sour-gas service applications
- Doctor blades and scrapers
- Chains, cables, springs, valve trim, fasteners for marine service
- Pump shafts and impellers in marine service
- Oil and gas production safety lifts and valves
- Oil-well tools and instruments like drill collars
- Oil well industry

Monel K-500 Fabrication

It can be readily fabricated by standard commercial methods.

It can be welded by accompanying by the gas-tungsten-arc welding process. It is suggested to be annealed when it is welded and that any weldments be stress relieved prior to aging.

It can be best heavy machined when the material is in the annealed condition or hot-worked and quenched condition. Age-hardened material however can be finish-machined to fine finishes and close tolerances. Therefore, the suggested practice is to machine slightly oversize, age-harden, then finish to size..

Monel K 500 Chemical Composition

Ni	Cu	Al	Ti	C	Mn	Fe	S	Si
63.0-70.0	Remainder	2.30-3.15	.35-.85	.25 max	1.5 max	2.0 max	.01 max	.50 max

Monel K 500 Specifications and Designation

UNS N05500
BS 3072-3076
SAE AMS 4676
MIL-N-24549 DIN 17743, 17752, 17754
Werkstoff Nr.
2.4375 QQ-N-286
NACE MR-01-75

Monel K 500 Physical Properties

Density (kg/dm³)	8.44
Magnetic Permeability (20°C)	<1.005
Curie Temperature (°C)	-90
Young's Modulus (N/mm2)	179 x 103
Specific Heat, 20°C (J.Kg-1.°K-1)	418
Specific Electrical Resistance, 20°C (?Ω.m)	0.62
Thermal conductivity,20°C (W.m-1.°K-1)	17.5
Mean coefficient of thermal expansion, 20-100°C (°K-1)	13.4 x 10-6

Monel K 500 Machining

Its heavy machining is best accomplished when the material is in the annealing condition or hot-worked and quenching condition. Age-hardened material can be finish-machined to close tolerances and fine finished. Therefore, the suggested practice is to machine slightly oversize, age-harden, then finish to size. During aging, a slight permanent contraction takes place, but little warpage occurs because of the low temperature and slow cooling rates involved.

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