Alloy K-500

NiWire Industries
www.niwire.com

UNS N05500

Alloy K-500 (UNS N05500), the age-hardenable alloy, which contains aluminum and titanium, combines the excellent corrosion resistance features of Alloy 400 with the added benefits of increased strength, hardens, and maintaining its strength up to 600 °C. Alloy K-500 has low magnetic permeability and is nonmagnetic to −134 °C. Capable of precipitating γ ′, Ni3 (Al,Ti) with 2.7Al-0.6Ti alloy addition, Alloy K-500 adds an age-hardening component to the good solution-strengthening and work-hardening characteristics already available with the nominal 30% Cu in alloy 400. The composition of these alloys can be adjusted to decrease the Curie temperature to below room temperature.

Specification

NiWire's production follows:

BS3072NA18 (plate, sheet), BS3073NA18 (strip), BS3075NA18 (wire), BS3076NA18 (bar, rod), BS3074NA18 (seamless pipe, tube)
ASTM B865 (rod, bar)
AMS 4676 (bar, forging)

Chemical Composition

Composition limits. 63.0 min Ni + Co; 0.25 max C; 1.5 max Mn; 2.0 max Fe; 0.01 max S; 0.5 max Si; 2.30 to 3.15 Al; 0.35 to 0.85 Ti; 27.0 to 33.0 Cu

Applications

Typical uses: pump shafts, impellers, medical blades and scrapers, oil well drill collars, and other completion tools, electronic components, springs and valve trains. This alloy is primarily used in marine and oil and gas industrial applications.

Mechanical Properties

Poisson's ratio: 0.32
Elastic modulus: Tension, 179 GPa (26 × 106 psi); torsion, 66 GPa (9.5 × 106 psi)
Impact strength: Aged bar, Charpy V-notch: 50 J (36.9 ft · lbf) at 20 °C (68 °F); 42 J (30 ft · lbf) at –196 °C (–320 °F)
Fatigue strength: Rod, rotating beam: annealed, 262 MPa (38 ksi); hot rolled, 296 MPa (43 ksi); hot rolled and aged, 352 MPa (52 ksi).

Typical tensile properties, compressive properties, and hardness of Alloy K-500:

Property	Hot rolled	Age hardened
Tensile strength, Mpa (ksi)	690 (100)	1041 (151)
Yield strength (0.2% offset) Mpa (ksi)	324 (47)	765 (111)
Elongation	42.5	30.0
Hardness, HB	165	300

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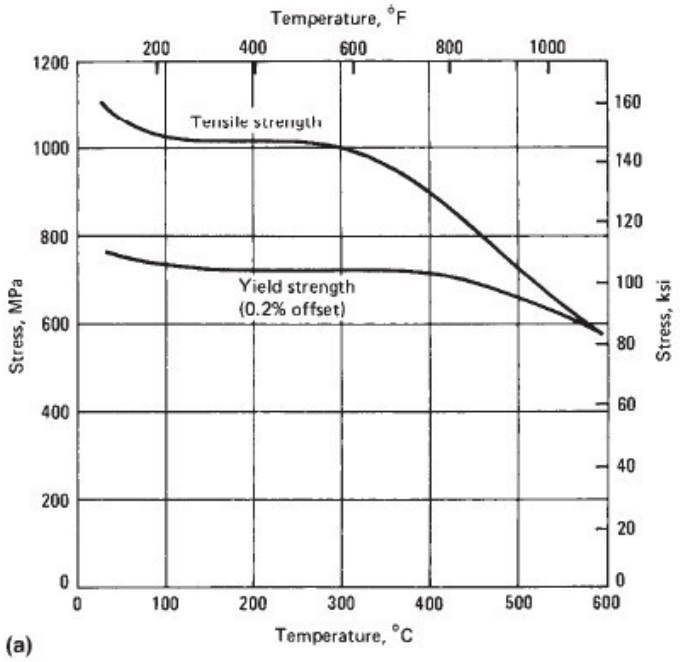
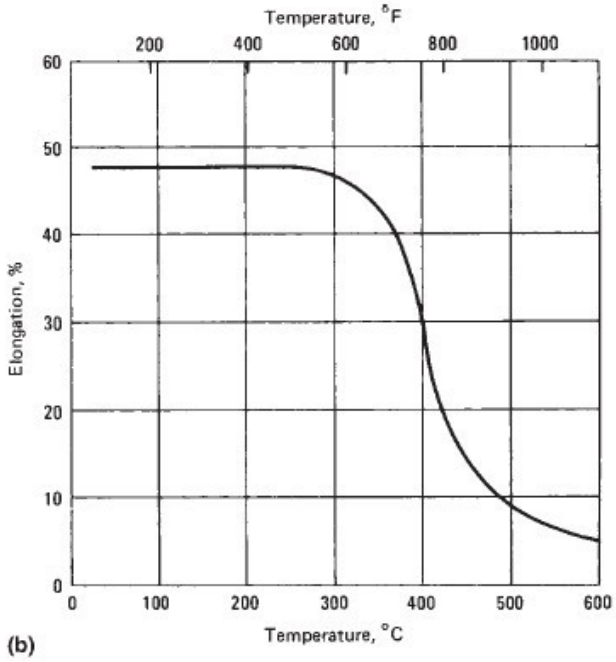
High-temperature tensile properties of hot-finished, age-hardened Alloy K-500:

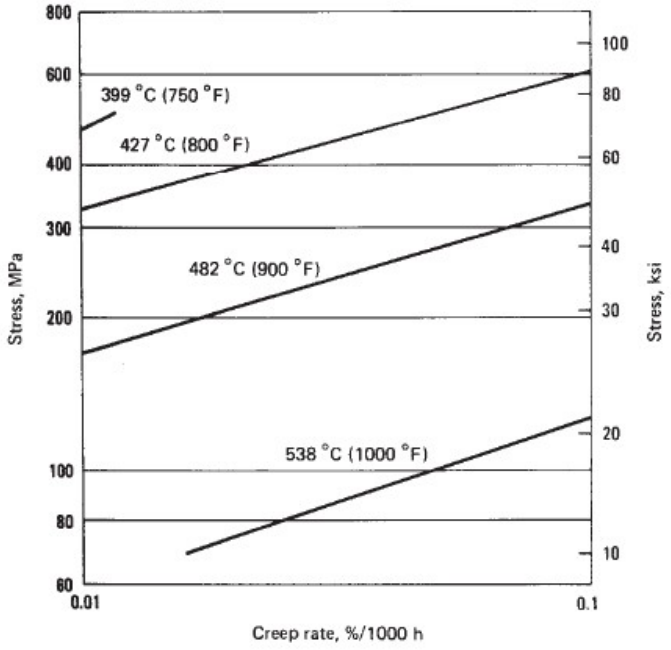


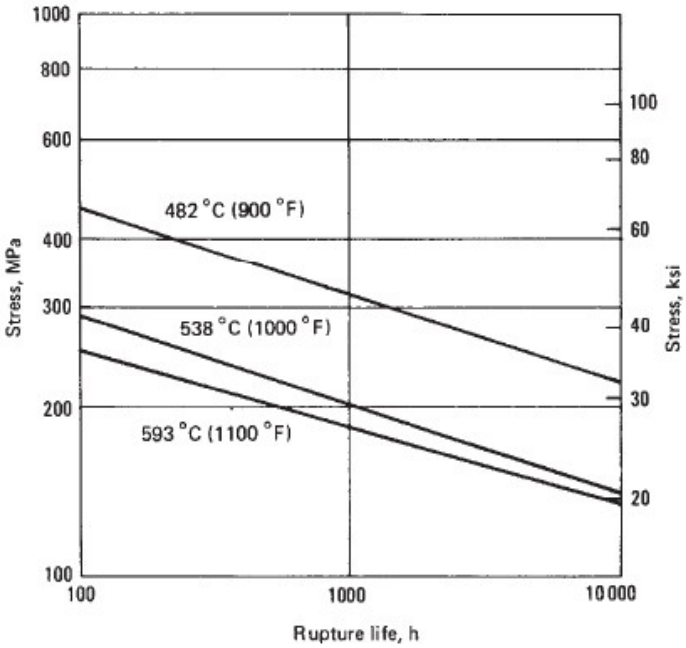


(a) Tensile and yield strength

(b) Elongation

Creep properties of Alloy K-500 (cold drawn and aged) & Stress-rupture life of Alloy K-500 (hot-finished and aged)





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Physical Properties

Density: 8.47 g/cm3 (0.305 lb/in.3) at 20 °C (68 °F)
Liquidus temperature: 1350 °C (2460 °F)
Solidus temperature: 1315 °C (2400 °F)
Specific heat: 419 J/kg · K (0.097 Btu/lb · °F) at 21 °C (70 °F)
Electrical conductivity: Volumetric, 2.8% IACS at 21 °C (70 °F)
Magnetic permeability: Annealed and age hardened material, 1.0018 at a field strength of 15.9 kA/m
Curie temperature: –134 °C (–210 °F)

Thermal and electrical properties of Alloy K-500 as a function of temperature:

Temperature		Mean linear expansion(a)		Thermal conductivity		Electrical resistivity, nΩ · m
°C	°F	µm/m · K	µin./in. · °F	W/m·K	Btu/ft· h· °F	
–196	–320	11.2	6.2	…	…	550
–157	–250	11.7	6.5	12.4	7.2	…
–129	–200	12.2	6.8	13.3	7.7	…
–73	–100	13.0	7.2	14.9	8.6	…
21	70	…	…	17.4	10.0	615
93	200	13.7	7.6	19.6	11.3	618
204	400	14.6	8.1	22.5	13.0	628
316	600	14.9	8.3	25.7	14.8	640
427	800	15.3	8.5	28.6	16.5	648
538	1000	15.7	8.7	31.7	18.3	653
649	1200	16.4	9.1	34.6	20.0	658
760	1400	16.7	9.3	37.8	21.8	665
871	1600	17.3	9.6	40.7	23.5	678
(a) From 21 °C (70 °F) to temperature shown						

Chemical Properties

General corrosion behavior: The corrosion resistance of Alloy K-500 is essentially the same as that of Alloy 400 except that, in the age-hardened condition, Alloy K-500 is more susceptible to stress-corrosion cracking in some environments.