

CarTech® K500 Alloy

Identification

UNS Number

• N05500

DIN Number

• 2.4375

Type Analysis

Single figures are nominal except where noted.

Carbon (Maximum)	0.17 %	Manganese (Maximum)	1.50 %
Sulfur (Maximum)	0.006 %	Silicon (Maximum)	0.50 %
Nickel (Minimum)	63.00 %	Copper	30.00 %
Titanium (Maximum)	0.85 %	Aluminum (Maximum)	3.15 %
Iron (Maximum)	2.00 %		

General Information

Description

CarTech K500 alloy is an age hardenable nickel-copper alloy which combines high strength with excellent resistance to many corrosion environments. CarTech K500 alloy has similar corrosion resistance to Nickel-Copper 400, but with greater strength and hardness capabilities arising from Ni₃ (Ti, Al) precipitation.

Applications

Typical applications include fasteners, shafts, pump and valve components and various other components for chemical processing, oil and gas, and marine applications.

Corrosion Resistance

CarTech K500 alloy is resistant to most alkalis, salts, waters (including saline or brackish), food products, organic substances and atmospheric conditions at normal and elevated temperatures. This alloy is not useful in highly oxidizing acids, such as nitric and nitrous.

Oxidizing impurities such as ferric chloride, ferric sulfate, chromates, nitrates, peroxides, and cupric salts can cause attack in a medium which would otherwise be relatively mild for the alloy.

Important Note: *The following 4-level rating scale is intended for comparative purposes only. Corrosion testing is recommended; factors which affect corrosion resistance include temperature, concentration, pH, impurities, aeration, velocity, crevices, deposits, metallurgical condition, stress, surface finish and dissimilar metal contact.*

Nitric Acid	Restricted	Sulfuric Acid	Good
Phosphoric Acid	Good	Hydrochloric Acid	Moderate
Sodium Hydroxide	Excellent	Salt Spray (NaCl)	Good
Sea Water	Good	Sour Oil/Gas	Good
Humidity	Good		

Properties

Physical Properties

Density 0.3060 lb/in³

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Mean CTE

77 to 200°F	7.41 x 10 ⁻⁶ in/in/°F
77 to 400°F	7.94 x 10 ⁻⁶ in/in/°F
77 to 600°F	7.99 x 10 ⁻⁶ in/in/°F
77 to 800°F	8.27 x 10 ⁻⁶ in/in/°F
77 to 1000°F	8.58 x 10 ⁻⁶ in/in/°F
77 to 1200°F	8.86 x 10 ⁻⁶ in/in/°F
77 to 1400°F	9.40 x 10 ⁻⁶ in/in/°F

Mean coefficient of thermal expansion (Solution Annealed + Aged Condition)

Temperature Range		Coefficient of Expansion	
77°F to	25°C to	(10 ⁶ /°F)	(10 ⁶ /°C)
200°F	93°C	7.41	13.3
400°F	204°C	7.94	14.3
600°F	316°C	7.99	14.4
800°F	427°C	8.27	14.9
1000°F	538°C	8.58	15.4
1200°F	649°C	8.86	15.9
1400°F	760°C	9.4	16.9

Typical Mechanical Properties

Typical Room Temperature Mechanical Properties – CarTech K500 Alloy Cold-Worked

Condition	0.2% Yield Strength		Ultimate Tensile strength		% Elongation in 4D	% Reduction of Area
	ksi	MPa	ksi	MPa		
0% CW	45	312	100	691	46	70
5% CW	68	469	107	735	38	67
15% CW	103	712	120	828	25	63
25% CW	136	938	139	959	14	57
28% CW	143	984	144	994	13	57

Typical Room Temperature Mechanical Properties – CarTech K500 Alloy Cold-Worked + Aged

Condition	0.2% Yield Strength		Ultimate Tensile strength		% Elongation in 4D	% Reduction of Area	Hardness HRC
	ksi	MPa	ksi	MPa			
0% CW + Age ¹	117	803	166	1146	25	47	33
5% CW + Age ¹	125	860	170	1172	23	49	36
15% CW + Age ¹	143	988	181	1245	19	46	37
25% CW + Age ¹	162	1118	193	1329	16	42	39
28% CW + Age ¹	168	1161	197	1358	15	38	39

1. Aged at 1100F/16 hr, Furnace Cool to 1000F/6 hr, Furnace Cool to 900F, Air Cool.

Typical Room Temperature Mechanical Properties – CarTech K500 Alloy Bar, Various Conditions

Condition	0.2% Yield Strength		Ultimate Tensile strength		% Elongation in 4D	% Reduction of Area	Hardness
	ksi	MPa	ksi	MPa			
Hot Finished	60	414	116	800	44	65	85 HRB
Hot Finished and Aged ²	116	801	165	1138	25	46	28 HRC
Hot Finished, Annealed ¹	46	315	92	636	39	62	80 HRB
Hot Finished, Annealed ¹ and Aged ²	106	733	152	1048	23	40	25 HRC
Cold Draw, Annealed ¹	40	275	92	634	40	64	80 HRB
Cold Draw, Annealed ¹ and Aged ²	95	655	147	1013	25	42	25 HRC

1. Annealed at 1600F / Water Quench

2. Aged at 1100F/16 hr., Furnace Cool to 1000F/6 hr., Furnace Cool to 900F, Air Cool.

Heat Treatment

Annealing

Solution Annealing is commonly carried out at temperatures in the range of 1600 – 1900oF followed by a rapid quench to avoid formation of detrimental phases. Time at temperature should be kept to a minimum to avoid excessive grain growth.

Age

Material is commonly aged by holding at 1100°F for 16 hours, followed by a furnace cool at 15°F to 25°F per hour to 900°F. Once the material reaches 900°F, material can be air cooled or quenched.

Modified aging cycles can be utilized but are dependent upon starting condition, desired properties, and process limitations.

Workability

Hot Working

The maximum recommended hot working temperature for CarTech K500 alloy is 2100°F. The recommended hot working range is from 1600°F to 2100°F. Material should be water quenched from hot working temperatures to avoid precipitation of second phases which may result in degraded properties and/or result in splitting or tearing.

Cold Working

CarTech K500 alloy can be cold-worked using standard procedures.

Joining

CarTech K500 alloy may be joined by conventional processes. It is preferred that welding be completed prior to age hardening. Several filler metal options are commercially available, depending on requirements of the weldment.

Other Information

Applicable Specifications

- AMS 4676
- QQ-N-286 Revision E, F, and G
- ASTM B865

Forms Manufactured

- Bar
- Wire

Disclaimer:

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