

CarTech® NiMark® Alloy 300

Type Analysis

Single figures are nominal except where noted.

Carbon (Maximum)	0.03 %	Manganese (Maximum)	0.10 %
Phosphorus (Maximum)	0.010 %	Sulfur (Maximum)	0.010 %
Silicon (Maximum)	0.10 %	Nickel	18.50 %
Molybdenum	4.90 %	Cobalt	8.75 %
Titanium	0.65 %	Aluminum	0.10 %
Calcium (Maximum)	0.05 %	Boron (Maximum)	0.003 %
Zirconium (Maximum)	0.03 %	Iron	Balance

General Information

Description

CarTech NiMark® alloy 300 is a low-carbon, nickel-cobalt-molybdenum high temperature alloy capable of attaining yield strengths in excess of 270 ksi (1862 MPa) through simple, low temperature heat treatment at 900°F (482°C).

This alloy exhibits good ductility at high strength levels, excellent notch ductility and is readily welded.

CarTech NiMark alloy 300 is one of a family of "maraging" nickel steels which is martensitic yet ductile in the solution treated condition and attains ultrahigh strength through a single low temperature aging treatment.

Corrosion Resistance

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.

Humidity	Restricted	
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Properties

Physical Properties

Specific Gravity	8.00
Density	0.2890 lb/in ³
Mean CTE (75 to 900°F)	5.60 x 10 ⁻⁶ in/in/°F
Electrical Resistivity (70°F)	232.0 ohm-cir-mil/ft

Typical Mechanical Properties

Longitudinal Charpy V-Notch Impact Properties—NiMark Alloy 300

Test Temperature		Impact Energy	
°F	°C	ft-lb	J
100	38	20	27
0	-18	18	24
-100	-73	16	22
-200	-129	13	18

Typical Elevated Temperature Tensile Strength—NiMark Alloy 300

Test Temperature		Tensile Strength	
°F	°C	ksi	MPa
800	427	240	1655
900	482	210	1448
1000	538	168	1158

Typical Room Temperature Mechanical Properties — NiMark Alloy 300

Bars under 4" (102 mm) diameter, treated 1500°F (816°C) 30 min., air cooled and aged 900°F (482°C) 3 hours, air cooled.

Tensile Strength		Yield Strength		% Reduction of Area	% Elongation in 4D	Hardness Rockwell C
ksi	MPa	ksi	MPa			
294	2027	290	1999	58	11	52

Notched Tensile Strength to Unnotched Tensile Strength > 1
 Fatigue Life — endurance limit
 ksi 125
 MPa 862
 Fracture Toughness (approx.)
 ksi √in. 70
 Transverse Strength similar to longitudinal values while ductility is typically 80% of longitudinal values

Typical Room Temperature Mechanical Properties

Large-Section Sizes — NiMark Alloy 300

Treated 1500°F (816°C) 30 min., air cooled and aged 900°F (482°C) 3 hours, air cooled.

Section Size		Direction of Test	Yield Strength 0.2%		Ultimate Tensile Strength		% Elongation	% Reduction of Area	Rockwell C Hardness
in ²	mm ²		ksi	MPa	ksi	MPa			
12	7742	Transverse	278	1917	287	1979	7.0	28	53
		Longitudinal	281	1937	289	1993	8.0	38	53
9	5806	Transverse	277	1910	288	1986	7.0	28	53
		Longitudinal	280	1931	289	1993	8.0	39	53
6	3871	Transverse	278	1917	287	1979	7.0	29	53
		Longitudinal	277	1910	287	1979	8.0	39	53
4	2581	Transverse	275	1896	280	1931	10.0	56	52
		Longitudinal	285	1965	289	1993	11.0	58	52

Hot Hardness—NiMark Alloy 300

Test Temperature		Hardness BHN
°F	°C	
800	427	495
900	482	450
1000	538	400
1100	593	300
1200	649	190
1300	704	160

Heat Treatment

Annealing

Annealing and solution treating are performed simultaneously by heating to 1500°F ±50°F (816°C ±10.1°C) for a minimum of 30 minutes at temperature, followed by air cooling to room temperature.

CarTech® NiMark® Alloy 300

Age

Usually the alloy is aged at 900°F (482°C) for a minimum of 3 hours followed by air cooling.

Workability

Machinability

NiMark alloy 300 is readily machined in the solution treated (annealed) condition. Limited machining can be performed in the fully treated condition. Annealed hardness is typically 32 Rc.

Weldability

NiMark alloy 300 can be welded using conventional welding methods and electrodes of approximately the same composition as the base material. Preheating is not required.

Other Information

Applicable Specifications

- AMS 6514
- MIL-S-46850

Forms Manufactured

- Bar-Rounds
- Strip
- Wire
- Billet
- Weld Wire

Technical Articles

- [A Designer's Manual On Specialty Alloys For Critical Automotive Components](#)
- [A Guide to Etching Specialty Alloys for Microstructural Evaluation](#)
- [New Requirements for Ferrous-Base Aerospace Alloys](#)
- [Toughness Index for Alloy Comparisons](#)

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