Technical Datasheet

CarTech® Alloy 925

Identification

UNS Number

• N09925

Type Analysis

Single figures are nominal except where noted.

Carbon (Maximum)	0.03 %	**Manganese (Maximum)**	1.00 %
Sulfur (Maximum)	0.030 %	**Silicon (Maximum)**	0.50 %
Chromium	19.50 to 23.50 %	**Nickel**	38.00 to 46.00 %
Molybdenum	2.50 to 3.50 %	**Copper**	1.50 to 3.00 %
Titanium	1.90 to 2.40 %	**Columbium/Niobium (Maximum)**	0.50 %
Aluminum	0.10 to 0.50 %	**Iron (Minimum)**	22.00 %

General Information

Description

CarTech Alloy 925 is an age-hardenable Ni-Fe-Cr alloy designed to resist corrosion while providing high strength. A combination of copper, titanium, molybdenum, and aluminum, in conjunction with nickel, provides excellent resistance to stress-corrosion cracking, pitting and crevice corrosion, and oxidizing and reducing environments.

Applications

The excellent corrosion resistance of CarTech Alloy 925 makes it a good candidate where high strength and corrosion resistance is desired. Applications that may be considered include down-hole and surface gas well components, shafting products, and fasteners.

Corrosion Resistance

Carpenter Alloy 925 exhibits a high resistance to all forms of corrosion in both oxidizing and reducing environments. The alloy has been particularly useful in “sour” gas wells at both high temperatures and high pressures where it resists environmental cracking in a solution of 5% NaCl plus 0.5% acetic acid saturated with H2S.

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

Properties

Physical Properties

Density	0.2920	lb/in³

Mean Specific Heat		
70°F	0.1040	Btu/lb/°F
200°F	0.1090	Btu/lb/°F
400°F	0.1160	Btu/lb/°F
600°F	0.1220	Btu/lb/°F
800°F	0.1290	Btu/lb/°F
1000°F	0.1360	Btu/lb/°F
1200°F	0.1430	Btu/lb/°F
1400°F	0.1500	Btu/lb/°F
1600°F	0.1570	Btu/lb/°F

Mean Specific Heat

Temperature	Btu/lb/°F	kJ/Kg/K
70°F / 20°C	0.104	.435
200°F / 100°C	0.109	.456
400°F / 200°C	0.116	.486
600°F / 300°C	0.122	.507
800°F / 400°C	0.129	.532
1000°F / 500°C	0.136	.561
1200°F / 600°C	0.143	.586
1400°F / 700°C	0.150	.611
1600°F / 800°C	0.157	.641

Mean CTE		
77 to 200°F	7.80	x 10^{-6} in/in/°F
77 to 400°F	8.10	x 10^{-6} in/in/°F
77 to 600°F	8.40	x 10^{-6} in/in/°F
77 to 800°F	8.50	x 10^{-6} in/in/°F
77 to 1000°F	8.70	x 10^{-6} in/in/°F
77 to 1200°F	9.00	x 10^{-6} in/in/°F
77 to 1400°F	9.50	x 10^{-6} in/in/°F

Mean Coefficient of Thermal Expansion

Temperature 77°F / 25°C to	10^{-6} in/in/°F	10^{-6} cm/cm/°C
200°F / 93°C	7.8	13.2
400°F / 200°C	8.1	14.2
600°F / 320°C	8.4	14.7
800°F / 430°C	8.5	15.0
1000°F / 540°C	8.7	15.3
1200°F / 650°C	9.0	15.7
1400°F / 760°C	9.5	16.3
1600°F / 870°C	---	17.2

Thermal Conductivity		
73°F	83.10	BTU-in/hr/ft²/°F
212°F	89.20	BTU-in/hr/ft²/°F
392°F	99.20	BTU-in/hr/ft²/°F
572°F	110.0	BTU-in/hr/ft²/°F
752°F	120.9	BTU-in/hr/ft²/°F
932°F	133.8	BTU-in/hr/ft²/°F
1112°F	153.7	BTU-in/hr/ft²/°F
1292°F	166.7	BTU-in/hr/ft²/°F
1472°F	195.8	BTU-in/hr/ft²/°F
1652°F	192.3	BTU-in/hr/ft²/°F
1832°F	170.7	BTU-in/hr/ft²/°F
2012°F	180.2	BTU-in/hr/ft²/°F

Thermal Conductivity

Temperature	BTU-in/hr/ft²/°F	W/m/K
73°F / 23°C	83.1	12.0
212°F / 100°C	89.2	12.9
392°F / 200°C	99.2	14.3
572°F / 300°C	110.0	15.9
752°F / 400°C	120.9	17.4
932°F / 500°C	133.8	19.3
1110°F / 600°C	153.7	22.2
1290°F / 700°C	166.7	24.0
1470°F / 800°C	195.8	28.2
1650°F / 900°C	192.3	27.7
1830°F / 1000°C	170.7	24.6
2010°F / 1100°C	180.2	26.0

Poisson's Ratio	0.293	
Modulus of Elasticity (E) (70°F)	28.9	x 10^3 ksi
Electrical Resistivity	701.0	ohm-cir-mil/ft
Melting Range	2390 to 2490	°F

Typical Mechanical Properties

Charpy V-Notch Impact Strength – Carpenter Alloy 925

Solution treated and aged condition

Orientation	Test Temperature	Impact Strength	
		ft•lbs	Joules
Longitudinal	-75°F / -60°C	73	99

Note: Orientation is L-R

Elevated Temperature Tensile Properties - Carpenter 925 Alloy

Test Temperature		0.2% Yield Strength		Ultimate Tensile Strength		% Elongation In 4D	% Reduction Of Area
°F	°C	Ksi	MPa	ksi	MPa		
75	24	119	822	169	1167	28	45
300	149	110	757	158	1090	25	43
350	177	109	754	157	1079	26	45
450	232	109	752	153	1058	24	43

Tensile Strength – Carpenter Alloy 925

Solution treated and aged condition

0.2% Yield Strength		Ultimate Tensile Strength		% Elongation in 4D	% Reduction of Area	Rockwell C Hardness
ksi	MPa	ksi	MPa			
120	827	168	1158	27	44	33

Heat Treatment

Carpenter Alloy 925 may be supplied as bar in the solution annealed condition, solution annealed + aged condition, or as unannealed billet. The material is solution treated in the range 1800-1900ºF for 30 minutes to 4 hours, then water quenched. The material is aged at 1365ºF for eight hours then furnace cooled to 1150ºF for six hours and air cooled.

Workability

Hot Working

Carpenter Alloy 925 may be hot worked using furnace temperatures from 1600-2150ºF. Hot working should be performed in the 1600-1800ºF range for maximum strength and corrosion resistance.

Machinability

Carpenter Alloy 925 has good machinability in both the solution treated and aged condition. Tools and techniques that minimize work hardening should be used. Rough machining between the solution treatment and aging treatment provides the best finished part results.

Weldability

Carpenter Alloy 925 should be welded using gas-tungsten-arc welding (GTAW) with matching composition filler material.

Other Information

Applicable Specifications

Carpenter Alloy 925 has been approved to NACE MR0175.

- NACE MR0175

Forms Manufactured

- Bar-Rounds
- Billet
- Hollow Bar

Edition Date: 3/25/10

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