

CarTech® CTS® BDZ1 Alloy

Identification

DIN Number

• 1.4037

Type Analysis

Single figures are nominal except where noted.

Carbon	0.60 to 0.75 %	Manganese (Maximum)	1.00 %
Phosphorus (Maximum)	0.025 %	Sulfur (Maximum)	0.010 %
Silicon (Maximum)	1.00 %	Chromium	12.50 to 13.50 %
Molybdenum (Maximum)	0.75 %	Iron	Balance

General Information

Description

CarTech CTS BDZ1 alloy is a martensitic steel chemically balanced and processed to provide a uniform, fine carbide structure. This structure has been suitable for the manufacture of thin sections and fine blanking operations. The alloy can achieve a tempered hardness capability into the low HRC 60's.

Applications

CarTech CTS BDZ1 alloy is an excellent candidate for razor and utility blade applications, which demand high hardness and edge retention.

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.

Nitric Acid	Moderate	Sulfuric Acid	Restricted
Phosphoric Acid	Restricted	Acetic Acid	Restricted
Sodium Hydroxide	Moderate	Salt Spray (NaCl)	Restricted
Humidity	Good		

Properties

Physical Properties

Density 0.2800 lb/in³

Heat Treatment

Carpenter CTS BDZ1 alloy is subject to decarburization during thermal processing, and precautions must be taken to control this condition.

Annealing

Carpenter CTS BDZ1 alloy should be annealed in a neutral atmosphere. Heat uniformly to 1550/1600F (843/871C), then cool very slowly in the furnace until the furnace is black. The furnace can then be turned off and allowed to cool naturally. Fully annealed hardness is HRB 100 maximum.

Hardening

Preheat to 1400/1500F (760/816C) then increase temperature to 1900/1950F (1038/1066C), soak for 15 to 30 minutes, quench in warm oil or cool in air. Do not overheat.

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Tempering

Carpenter CTS BDZ1 alloy can be tempered over a range of temperatures from 300F (149C) to 800F (427C), soaked at least one hour then air cooled to room temperature. The specific tempering treatment chosen will depend upon a number of factors including the austenitizing temperature utilized, application of a refrigeration treatment and the desired combination of final hardness, toughness and corrosion resistance (See hardness table). To remove peak stresses, yet retain peak hardness, temper at 300F (149C) to 350F (177C). Tempering at temperatures of 800F (427C) and higher will reduce toughness and corrosion resistance.

Sub-Zero Cooling

After hardening, the alloy may be refrigerated at -100/-120F (-73/-84C) for at least one hour then warmed to room temperature prior to tempering to minimize retained austenite. Refrigeration is most effective when performed within two hours after the austenitizing treatment.

Effects of Austenitizing Temperature, Cold-Treatment and Tempering Treatment on Hardness—Carpenter CTS BDZ1 Alloy

0.090"-thick (2.29 mm) Strip

(1 of 2 tables)

Austenitizing Temperature*	Sub-Zero Treatment	Tempering Treatment	Hardness (HRC)
1850F (1010C), 20 Min., AC	-	300F (149C), 2 Hrs., AC	56
	-	400F (204C), 2 Hrs., AC	55.5
	-	500F (260C), 2 Hrs., AC	55.5
	-	600F (316C), 2 Hrs., AC	56
	-	700F (371C), 2 Hrs., AC	57
	-	800F (427C), 2 Hrs., AC	59.5
	-100F (-73C), 1-Hr., AW	300F (149C), 2 Hrs., AC	56
	-100F (-73C), 1-Hr., AW	400F (204C), 2 Hrs., AC	55.5
	-100F (-73C), 1-Hr., AW	500F (260C), 2 Hrs., AC	55
	-100F (-73C), 1-Hr., AW	600F (316C), 2 Hrs., AC	56.5
	-100F (-73C), 1-Hr., AW	700F (371C), 2 Hrs., AC	58
	-100F (-73C), 1-Hr., AW	800F (427C), 2 Hrs., AC	58.5
1900F (1038C), 20 Min., AC	-	300F (149C), 2 Hrs., AC	57
	-	400F (204C), 2 Hrs., AC	57
	-	500F (260C), 2 Hrs., AC	57
	-	600F (316C), 2 Hrs., AC	58
	-	700F (371C), 2 Hrs., AC	60
	-	800F (427C), 2 Hrs., AC	62.5
	-100F (-73C), 1-Hr., AW	300F (149C), 2 Hrs., AC	57.5
	-100F (-73C), 1-Hr., AW	400F (204C), 2 Hrs., AC	57.5
	-100F (-73C), 1-Hr., AW	500F (260C), 2 Hrs., AC	58
	-100F (-73C), 1-Hr., AW	600F (316C), 2 Hrs., AC	59
	-100F (-73C), 1-Hr., AW	700F (371C), 2 Hrs., AC	61.5
	-100F (-73C), 1-Hr., AW	800F (427C), 2 Hrs., AC	62.5

*If utilized, application of the sub-zero treatment should be applied within 2 hours after hardening.

Effects of Austenitizing Temperature, Cold-Treatment and Tempering Treatment on Hardness – Carpenter CTS BDZ1 Alloy
0.090”-thick (2.29 mm) Strip
 (2 of 2 tables)

Austenitizing Temperature*	Sub-Zero Treatment	Tempering Treatment	Hardness (HRC)
1925F (1052C), 20 Min., AC	-	300F (149C), 2 Hrs., AC	61
	-	400F (204C), 2 Hrs., AC	59
	-	500F (260C), 2 Hrs., AC	57.5
	-	600F (316C), 2 Hrs., AC	57.5
	-	700F (371C), 2 Hrs., AC	58
	-	800F (427C), 2 Hrs., AC	58
	-100F (-73C), 1-Hr., AW	300F (149C), 2 Hrs., AC	62
	-100F (-73C), 1-Hr., AW	400F (204C), 2 Hrs., AC	60
	-100F (-73C), 1-Hr., AW	500F (260C), 2 Hrs., AC	58.5
	-100F (-73C), 1-Hr., AW	600F (316C), 2 Hrs., AC	58
	-100F (-73C), 1-Hr., AW	700F (371C), 2 Hrs., AC	58
-100F (-73C), 1-Hr., AW	800F (427C), 2 Hrs., AC	58.5	
1950F (1066C), 20 Min., AC	-	300F (149C), 2 Hrs., AC	61
	-	400F (204C), 2 Hrs., AC	59
	-	500F (260C), 2 Hrs., AC	57
	-	600F (316C), 2 Hrs., AC	57.5
	-	700F (371C), 2 Hrs., AC	57
	-	800F (427C), 2 Hrs., AC	58
	-100F (-73C), 1-Hr., AW	300F (149C), 2 Hrs., AC	62
	-100F (-73C), 1-Hr., AW	400F (204C), 2 Hrs., AC	60
	-100F (-73C), 1-Hr., AW	500F (260C), 2 Hrs., AC	58.5
	-100F (-73C), 1-Hr., AW	600F (316C), 2 Hrs., AC	58.5
	-100F (-73C), 1-Hr., AW	700F (371C), 2 Hrs., AC	59
-100F (-73C), 1-Hr., AW	800F (427C), 2 Hrs., AC	60	

*If utilized, application of the sub-zero treatment should be applied within 2 hours after hardening.

Workability

Hot Working

Carpenter CTS BDZ1 alloy should be handled like a high-speed tool steel. Preheat to 1400/1500F (760/816C), then heat slowly and uniformly to 2000/2200F (1093/1204C). Do not forge below 1700F (927C), and reheat as often as necessary. Cool in a furnace heated to about 1550F (843C), soak uniformly at this temperature, then shut off the heat and cool slowly in the furnace. Anneal after forging. Cool to room temperature before annealing.

Machinability

For most machining operations, Carpenter CTS BDZ1 alloy is most readily machined when in the annealed condition. Because of its high carbon content, it machines similarly to high-speed steels.

Other Information

Forms Manufactured

- Plate
- Strip

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