Technical Datasheet

CarTech® O6

Identification

UNS Number

• T31506

AISI Number

• Type O6

Type Analysis

Single figures are nominal except where noted.

Carbon	1.45 %	**Manganese**	0.85 %
Silicon	1.00 %	**Molybdenum**	0.25 %
Iron	Balance		

General Information

Description

CarTech 06 is an oil-hardening tool steel designed for cold work applications. It is designed to have free graphite in the microstructure. This free graphite is responsible for the excellent machinability characteristics of this grade.

CarTech 06 is available in decarb-free flats. These decarb-free flats have a microinch finish of under 150 on all four sides, eliminating the need for bar bark removal.

Applications

CarTech 06 is suggested for use in many applications such as:

Blanking dies
Drawing dies
Forming dies
Punches
Hobs for nonferrous metals
Gauges
Cams
Bushings
Mandrels
Piercing dies
Pneumatic hammers
Spinning tools
Stamps
Taps
Edging and metal forming rolls
Jewelers' anvils
Rotary slitting cutters
Marking tools
Wear plates

Properties

Physical Properties

Density	0.2770	lb/in³

Mean CTE	
77 to 482°F	6.90 x 10 -6 in/in/°F
77 to 572°F	7.10 x 10 -6 in/in/°F
77 to 662°F	7.30 x 10 -6 in/in/°F
77 to 752°F	7.50 x 10 -6 in/in/°F
77 to 842°F	7.60 x 10 -6 in/in/°F
77 to 932°F	7.70 x 10 -6 in/in/°F

Coefficient of Thermal Expansion: The following figures are the average coefficients between room temperature and the specified elevated temperature of Carpenter 06 in the annealed condition:

Temperature Range		Coefficient	
77° F to	25° C to	10^{-6}/° F	10^{-6}/° C
482	250	6.9	12.48
572	300	7.1	12.86
662	350	7.3	13.17
752	400	7.5	13.43
842	450	7.6	13.65
932	500	7.7	13.86

Heat Treatment

Decarburization

Carpenter 06 is subject to surface decarburization. It should be heat treated from neutral salt baths or properly adjusted controlled-atmosphere furnaces. Endothermic atmospheres should be held to a dew point between 20°F and 30°F. The use of exothermic atmospheres, such as found in older type furnaces which are manually adjusted, is not recommended. If such furnaces must be used, it is suggested that Carpenter 06 be packed in commercially available neutral packing compounds.

Normalizing

May be normalized by heating to 1600°F (871°C) and cooling in air.

Annealing

Heat to 1410/1450°F (766/788°C) and hold to equalize the temperature. Cool at 20°F per hour to 1100°F (593°C) and remove from the furnace. Precautions should be taken to minimize decarburization.

Hardening

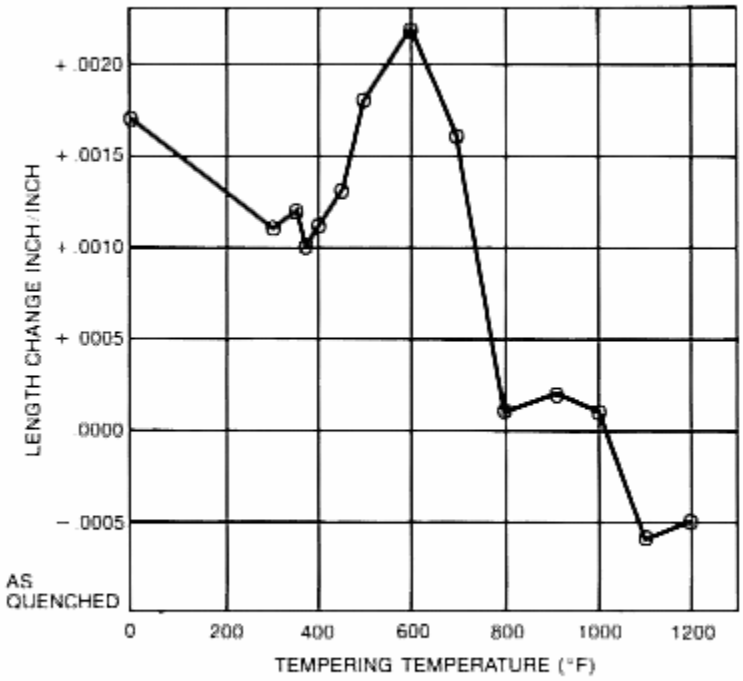
Preheat at 1200/1250°F (649/677°C), then heat to 1450/1500°F (788/816°C) until it uniformly matches the color of the thermocouple in the furnace. Soak an additional 5 minutes per inch of thickness and then quench in oil. Use the lower part of the hardening range for smaller sections and the higher temperatures for larger sections. The use of a controlled-atmosphere furnace or pack hardening to protect the surface from decarburization is required.

Deformation (Size Change) in Hardening

Carpenter 06 has moderate deformation during hardening and tempering. Its average behavior is shown as follows:

SIZE CHANGE OF 06

Austenitized in salt at 1475°F (802°C) for 25 min., oil quenched, and tempered for 1 hr. at temperature



Note: Size change samples were ¾" round by 2" long. In larger sample sizes, expansion characteristics may vary from the data shown.

Tempering

The effect of tempering at various temperatures or the hardness of Carpenter 06 is shown in the hyperlink entitled "Effect of Tempering Temperatures."

Tempering: The following table lists the effect of tempering at various temperatures on Carpenter 06:

Oil Quenched from 1475°F (802°C)
Tempered 1 hour at temperature

Tempering Temperature		Rockwell C Hardness
°F	°C	
as hardened		65.0
250	121	64.0
300	149	63.0
350	177	62.0
375	190	61.0
400	204	61.0
450	232	60.0
500	260	59.5
600	316	58.5
700	371	56.0
800	427	51.0
900	482	47.0
1000	538	42.5
1100	593	37.5
1200	604	31.0

Workability

Forging

Preheat slowly to 1500°F (816°C), soak thoroughly, and heat slowly to 1800/1950°F (982/1066°C), (steel temperature), then proceed with forging. Do not forge lower than 1500°F (816°C). Air cool after forging.

Other Information

Applicable Specifications

- ASTM A681
- QQ-T-570

Forms Manufactured

- Bar-Rounds

Edition Date: 08/01/1988