

CarTech® No. 879

Identification

UNS Number

• T20819

AISI Number

• H19

Type Analysis

Single figures are nominal except where noted.

Carbon	0.40 %	Manganese	0.30 %
Silicon	0.30 %	Chromium	4.25 %
Molybdenum	0.45 %	Cobalt	4.25 %
Vanadium	2.10 %	Tungsten	4.25 %
Iron	Balance		

General Information

Description

CarTech No. 879 is a hot work tool and die steel known for its exceptional resistance to shock and abrasion at high temperatures.

This steel exhibits good toughness as well as excellent resistance both to heat checking and softening at high temperatures.

Applications

CarTech No. 879 should be considered for applications in hot extrusion dummy blocks for copper or brass, permanent molds for brass casting, hot forging die inserts, hot work dies, hot press dies for both steel and brass, hot punch tools, valve extrusion die rings and inserts, forging dies, and hot extrusion die inserts for steel.

Properties

Physical Properties

Specific Gravity 7.98

Density 0.2880 lb/in³

Mean CTE

68 to 200°F 6.10 x 10⁻⁶ in/in/°F

68 to 400°F 6.10 x 10⁻⁶ in/in/°F

68 to 800°F 6.70 x 10⁻⁶ in/in/°F

68 to 1000°F 6.90 x 10⁻⁶ in/in/°F

68 to 1200°F 7.20 x 10⁻⁶ in/in/°F

Mean coefficient of thermal expansion

Temperature		Coefficient	
From 68°F to	From 20°C to	micro in./in.·°F	microns/m·K
200	100	6.1	11.0
400	200	6.1	11.0
800	425	6.7	12.0
1000	540	6.9	12.4
1200	650	7.2	12.9

Critical Temperature (AC1)

1540 °F

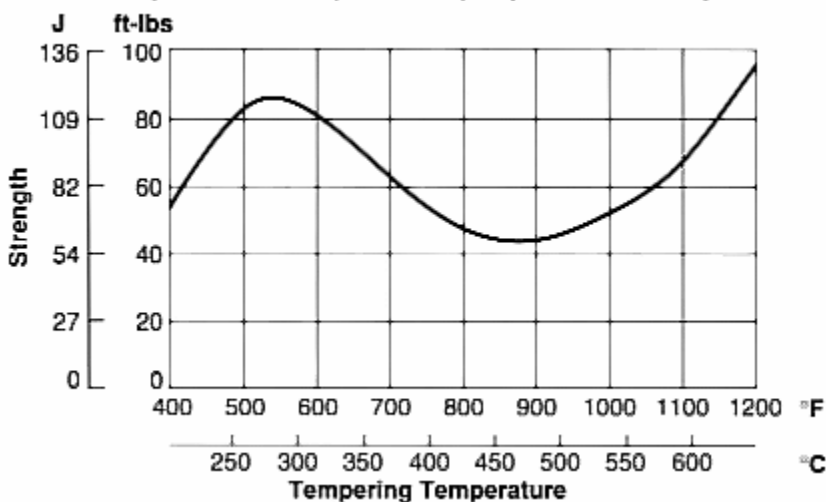
Typical Mechanical Properties

Elevated Temperature Impact Data - Carpenter No. 879

Specimens austenitized at 2200°F (1204°C) air cooled and tempered at 1150°F (621°C) for 2 hours.

Testing Temperature		Charpy Impact (V-Notch)		Rockwell C Hardness
°F	°C	ft-lb	J	
70	21	5	6.8	54
400	204	8	10.8	53
600	316	6	8.1	53
800	427	12	16.3	54
1000	538	9	12.2	53
1200	649	9	12.2	50

Room Temperature Izod (No Notch) Impact Data - Carpenter No. 879



Short Time Elevated Temperature Tensile Data - Carpenter No. 879

Preheated at 1500°F (816°C), austenitized at 2200°F (1204°C), air cooled and tempered at 1225°F (663°C) for 2 hours.

Test Temperature		Tensile Strength		% Elongation (2 in.)	% Reduction of Area	Rockwell C Hardness After Test
°F	°C	ksi	MPa			
800	427	178	25.8	9	36	44.5
1000	538	147	21.3	12	42	44.5
1200	649	110	16.0	16	37	44.0

Heat Treatment

Decarburization

No. 879 displays medium resistance to decarburization during thermal processing. Precautions must be taken to control this condition. Modern furnaces are available which provide environments designed to minimize decarburization.

Normalizing

Do not normalize.

Annealing

Anneal in a controlled atmosphere furnace or with a neutral packing compound. Heat slowly to 1600/1650°F (871/889°C), and hold until the entire mass is heated through. Cool slowly in the furnace (40°F or 22°C per hour) to 1100°F (593°C), then air cool. The annealed hardness is approximately 207-241 Brinell.

Hardening

Preheat slowly and uniformly to 1500/1550°F (816/843°C). Then heat more rapidly to an austenitizing temperature of 2000/2200°F (1093/1204°C). The lower end of the temperature range is only used when a relatively low final hardness is desired. Hold for 2-5

minutes at temperature and harden by cooling in air or oil. A controlled atmosphere or vacuum furnace should be used to minimize decarburization and oxidation.

Tempering

As soon as the hardened steel reaches 125/150°F (52/66°C), temper to the hardness desired as suggested in the chart on the following page. Double tempering is recommended to improve toughness and reduce heat cracking. Time at temperature should be no less than one and a half hours or one hour per inch of section.

Effect of Austenitizing and Tempering Temperature on Hardness - Carpenter No. 879
 Specimens preheated 1550°F (843°C), austenitized, cooled and tempered 2 hours as indicated.

Austenitizing Temperature		As Oil Quenched	Tempered at:			
			1000°F 538°C	1100°F 593°C	1200°F 649°C	1300°F 704°C
°F	°C					
Oil Quenched Series - Rockwell C Hardness						
2000	1093	50	53	50	44	31
2050	1121	52	54	50	44	35
2100	1149	54	56	52	47	40
2150	1177	56	57	54	47	40
2200	1204	58	59	55	49	40
2250	1232	60	60	56	51	42
Air Cooled Series - Rockwell C Hardness						
2000	1093	48	51	49	45	33
2050	1121	50	54	50	47	36
2100	1149	51	55	52	47	36
2150	1177	53	57	54	47	38
2200	1204	54	58	54	48	39
2250	1232	57	60	56	50	40

Workability

Forging

Preforge heating must be slow and uniform. Soak through at 1900/2000°F (1038/1093°C) and reheat when necessary, stopping work when the temperature falls below 1650°F (889°C). After forging, cool slowly in furnace, mica, lime or dry ashes. Anneal as soon as possible after forging and cooling.

Machinability

In the annealed condition, No. 879 possesses a machinability rating of 60% of that of annealed 1% carbon steel and 40% of B1112 steel.

Weldability

Observe the usual precautions for welding high hardenability steels. Preheat at 900/1000°F (482/538°C) and hold temperature above 600°F (316°C). Weld with a shielded arc, then slow cool. Fully anneal before heat treating, machining or forming.

Other Information

Applicable Specifications

- ASTM A681

Forms Manufactured

- Bar-Rounds
- Wire
- Billet

Disclaimer:

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