Technical Datasheet

CarTech® Micro-Melt® CD#1 Alloy

Type Analysis

Single figures are nominal except where noted.

Carbon	0.70 %	**Manganese**	0.40 %
Silicon	1.00 %	**Chromium**	8.25 %
Nickel	1.50 %	**Molybdenum**	1.40 %
Vanadium	1.00 %	**Nitrogen**	0.09 %
Iron	Balance		

General Information

Description

CarTech Micro-Melt CD#1 alloy is a shock resistant cold work die steel possessing an excellent combination of toughness and wear resistance.

The alloy has a fine, uniform carbide distribution resulting from the Carpenter CarTech Micro-Melt powder metal alloy process. This fine carbide distribution, combined with a low sulfur content, results in excellent polishability of dies or tools manufactured from the alloy.

Applications

CarTech Micro-Melt CD#1 alloy may be considered for many types of cold work tooling applications where a combination of good toughness and wear resistance is required. In addition, it may be considered for coining applications because of the excellent polishability provided by the alloy. Potential applications for this alloy may include:

Coining Dies
Slitter Knives
Blanking Dies
Rotary Shears
Chipper Knives

Properties

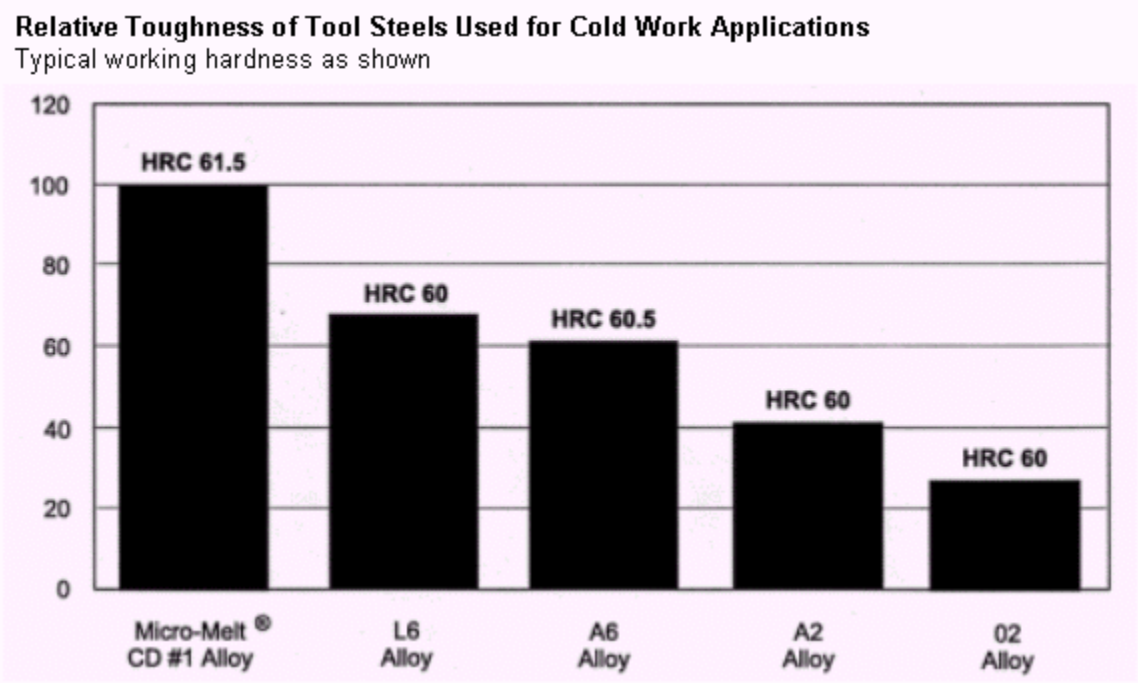
Physical Properties

Density	0.2790	lb/in³
Critical Temperature (AC1)	1483	°F
Critical Temperature (AC3)	1535	°F

Typical Mechanical Properties

Toughness

The relative toughness of Micro-Melt CD#1 alloy compared with other tool steels that have been used for cold work applications is shown in the following figure.



Heat Treatment

Decarburization

Micro-Melt CD#1 alloy, like all carbon-bearing tool steels, is subject to decarburization during thermal processing.

Taking proper precautions should ensure that there is no decarburization during heat treatment.

Salt bath, controlled atmosphere, or vacuum furnaces are acceptable for heat treating this alloy.

Annealing

Suitable precautions should be taken to prevent excessive decarburization or carburization. Heat slowly to 1500/1525°F (816/829°C), hold until the entire mass is heated through, and cool slowly (do not exceed 30°F [16°C] per hour) in the furnace to about 1000°F (538°C), after which the cooling rate may be increased.

The annealed hardness should be maximum BHN 260 (HRC 26).

Hardening

Micro-Melt CD#1 alloy can be heat treated in salt, vacuum, or controlled atmosphere furnaces, with precautions being taken to avoid decarburization during the heat treatment operation. Preheat to 1550/1600°F (843/871°C), then transfer to 1900/1950°F (1038/1066°C). Austenitizing above 1950°F (1066°C) should be avoided due to formation of excessive retained austenite in the tool. Hold 10 minutes per inch of thickness, with a minimum hold time of 10 minutes, up to 25 minutes maximum.

Following austenitizing, parts may be air cooled or oil quenched to room temperature, or salt quenched to 1000°F (538°C) followed by an air cool to room temperature. For vacuum furnace treating, a minimum 2 Bar backfill with inert gas is desired for the quench.

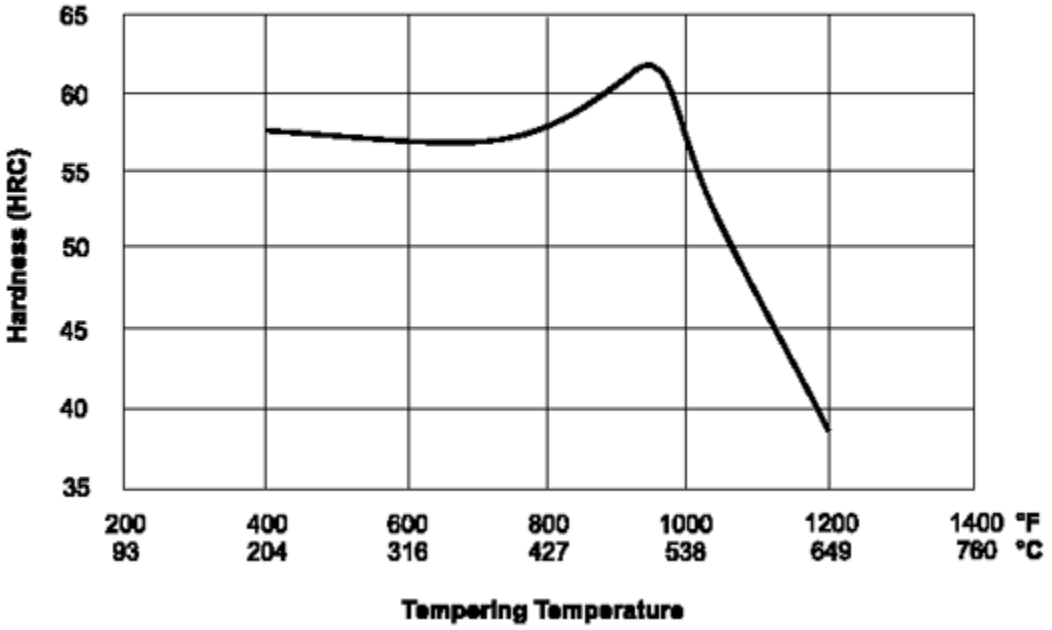
Stress Relieving

To relieve the stresses of machining, heat slowly to 1200/1250°F (649/677°C), hold for a minimum of 1 hour at temperature, cool slowly and uniformly to about 800°F (427°C), then cool in still air.

Tempering

Tools should be tempered immediately after the completion of the quench. Double tempering at 2 hours per temper is suggested. Tools should be cooled to room temperature between tempers. The following table provides some typical hardness values for various austenitizing/tempering temperature combinations.

Hardness vs. Tempering Temperature—Carpenter Micro-Melt CD #1 Alloy



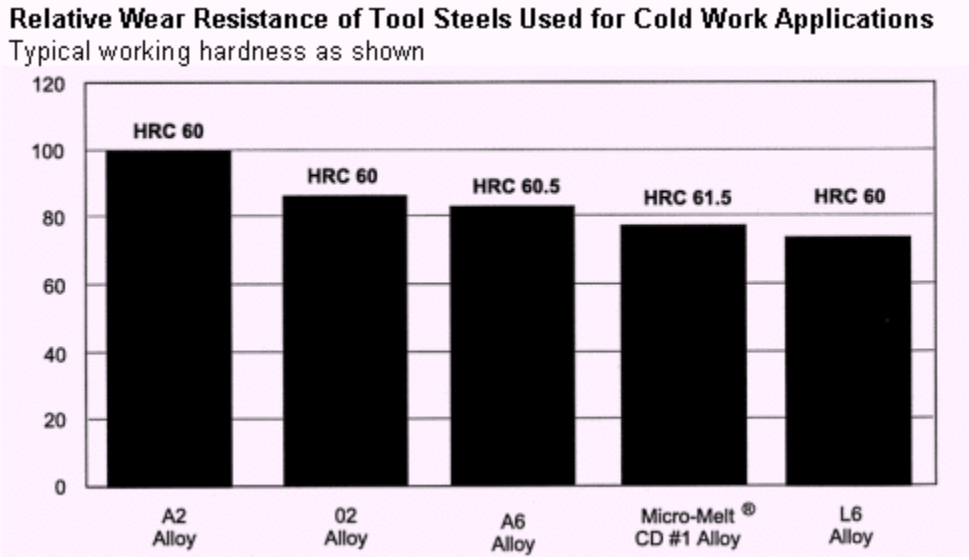
Typical Hardness Values—Carpenter Micro-Melt CD #1 Alloy
All samples were preheated at 1550°F (843°C), austenitized at the 1925°F (1052°C) for 10 minutes, oil quenched, and tempered at the indicated temperature for 2 hours + 2 hours. Hardnesses shown in the figure are representative of those attainable with austenitizing temperatures ranging from 1900°F (1038°C) to 1950°F (1066°C). Vacuum hardening may result in slightly lower hardness values.

Tempering Temperature		1925°F Hardening Temperature
°F	°C	HRC
As-Quenched		61/62
400	204	57/58
600	316	56/57
800	427	57/58
900	482	60/61
925	496	60/61
950	510	61/62
975	524	60/61
1000	538	58/59
1025	552	54/55
1050	566	51/52
1100	593	47/48
1200	649	38/39

Other Information

Wear Resistance

The relative wear resistance of Micro-Melt CD#1 alloy compared with other steels commonly used for cold work applications is shown in the figure below. Wear resistance was measured using a Dry Sand/Rubber Wheel abrasion test, ASTM G65. Results were normalized, with a higher value indicating better wear resistance.



Forms Manufactured

- Bar-Flats
- Bar-Squares
- HIP'd Shapes
- Bar-Rounds
- Billet
- Powder

Technical Articles

- New Shock-Resistant Cold Work Die Steel Combines Toughness and Wear Resistance

Edition Date: 02/01/2001

Visit us on the web at www.cartech.com