DATA SHEET

LATROBE SPECIALTY STEEL COMPANY
Latrobe, PA 15650-0031 USA

Issue 2

Crucible Industries CPM® 9V® Powder Metal Tool Steel

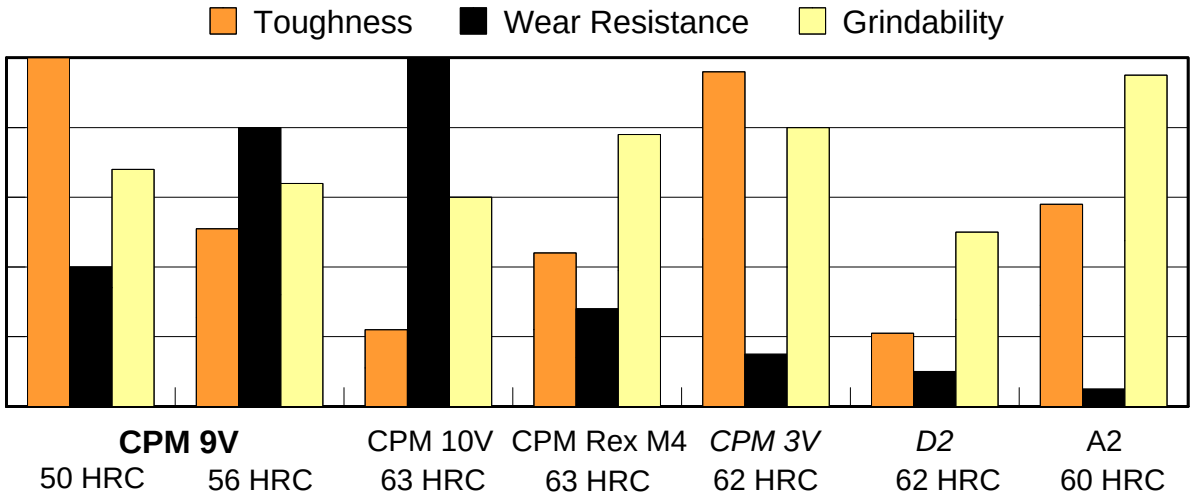
LATROBE SPECIALTY STEEL your source for all Crucible CPM products

Typical Composition

C	Mn	Si	Cr	Mo	V
1.90	0.50	0.90	5.25	1.30	9.10

CPM 9V is a powder metal tool steel that provides very high wear resistance in combination with high impact toughness. A large volume of hard vanadium carbides provides the high wear resistance. CPM 9V contains less carbon and vanadium than CPM 10V, which results in a lower attainable hardness, slightly lower wear resistance, but a significant increase in toughness. The lower carbon content also enables CPM 9V to be used in warm and hot work applications where resistance to thermal fatigue cracking is important. CPM 9V may be used in unique tooling applications for improved toughness compared to CPM 10V and high-speed steels, and improved wear resistance compared to D2 and other tool steels. CPM 9V is widely used for plastic injection feed screws, non-return valves, shear blades, and forging dies.

Relative Properties



Physical Properties

Density: 0.267 lb/in^3 (7418 kg/m^3)
Specific Gravity: 7.41
Modulus of Elasticity: 32x10^6 psi (221 GPa)

Machinability: 35-40% of a 1% carbon steel

Coefficient of Thermal Expansion:

Temperature °F	in/in/ °F x 10^{-6}	Temperature °C	mm/mm/ °C x 10^{-6}
70 - 212	5.96	21 - 100	10.71
70 - 300	6.10	21 - 149	10.97
70 - 400	6.20	21 - 204	11.15
70 - 500	6.39	21 - 260	11.49
70 - 800	6.55	21 - 427	11.77
70 - 1000	6.85	21 - 538	12.31

Crucible CPM® 9V®
HEAT TREATING INSTRUCTIONS

(See Tech-Topics Bulletin 102 for a more thorough explanation of heat treating.)

CRITICAL TEMPERATURE

Ac1: 1590°F (866°C)

HARDENING:

Preheating: 1500-1550°F (816-845°C), equalize.
Austenitizing (High Heat): Heat rapidly from the preheat, typically by transferring to a second furnace.
For Higher Wear Resistance:
Furnace or Salt Bath: 2050 (1121°C)
Soak for 20 minutes minimum at temperature
For Balance of Wear Resistance and Toughness:
Furnace or Salt Bath: 1950-2000°F (1066-1093°C)
Soak for 25 minutes minimum at temperature
For Maximum Toughness and minimum distortion in cooling:
Furnace: 1900°F (1038°C)
Salt Bath: 1875°F (1025°C)
Soak for 45 minutes minimum at temperature
Quenching: Air, pressurized gas, warm oil, or salt.

Warm oil or salt bath quenching will give maximum hardening response.

For pressurized gas, the furnace should have a minimum quench pressure of 4 bars. *The quench rate to below 1000°F (538°C) is critical to obtain the desired properties.*

For oil, quench until black, about 900°F (482°C), then cool in still air to 150-125°F (66-51°C).

For salt maintained at 1000-1100°F (538-593°C), equalize in the salt, then cool in still air to 150-125°F (66-51°C).

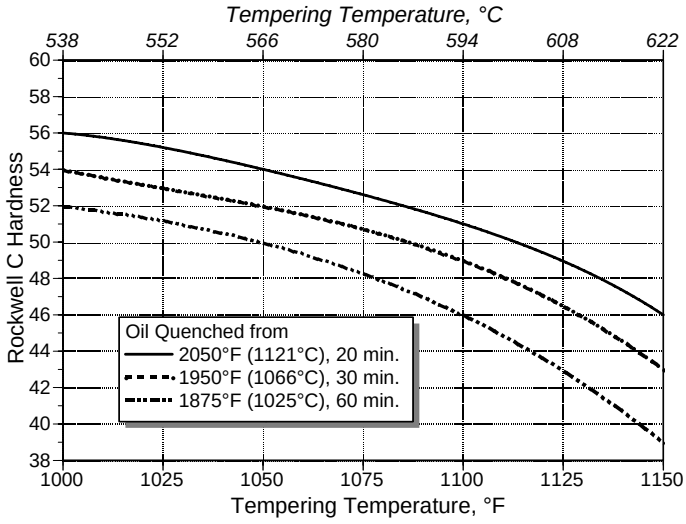
Tempering: *Temper immediately after quenching*. Typical temperature range is 1000-1100°F (538-593°C). Do not temper below 1000°F (538°C). Hold at temperature for 2 hours then air cool to ambient temperature. Double tempering is required. Triple tempering is required when austenitized above 2050°F (1121°C).

ANNEALING: Annealing must be performed after hot working and before rehardening.

Heat at a rate not exceeding 400°F per hour (222°C per hour) to 1600 -1650°F (871 - 899°C), and hold at temperature for 1 hour per inch of maximum thickness; 2 hours minimum. Then cool slowly with the furnace at a rate not exceeding 30°F per hour (17°C per hour) to 1000°F (538°C). Continue cooling to ambient temperature in the furnace or in air. The resultant hardness should be a maximum of 277 HBW.

HEAT TREATMENT RESPONSE

As Oil Quenched from	HRC
1875°F (1025°C), 60 minutes	53
1950°F (1066°C), 30 minutes	56
2050°F (1121°C), 20 minutes	58
2150°F (1177°C), 10 minutes	61



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Crucible Industries

The data presented herein are typical values, and do not warrant suitability for any specific application or use of this material. Normal variations in the chemical composition, the size of the product, and heat treatment parameters may result in different values for the various physical and mechanical properties.

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