Powdered Metal

from Diamond Metals Distribution

DIAMOND METALS DISTRIBUTION

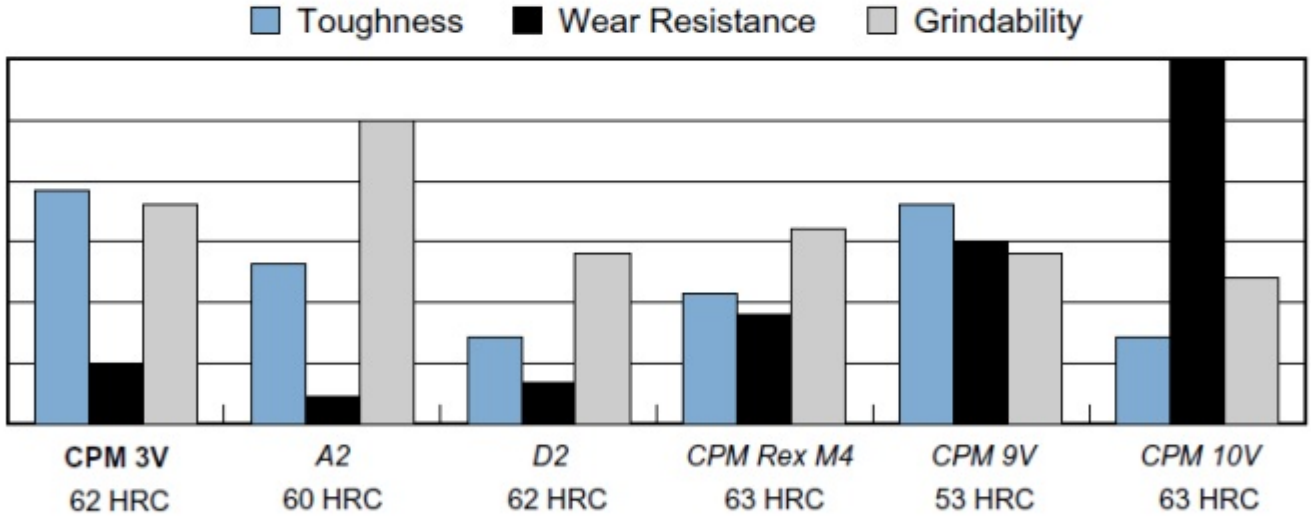
Crucible Industries CPM® 3V® Powder Metal Tool Steel

Typical Composition

C	Mn	Si	Cr	Mo	V
0.80	0.30	1.00	7.50	1.30	2.75

CPM 3V is an air-hardening, powder metal tool steel with a unique chemical composition that results in tooling with an outstanding combination of properties including high impact toughness and good wear resistance. The impact toughness is enhanced by the fine grain size, small carbides, and superior cleanliness of the powder metallurgy (PM) microstructure. CPM 3V should be considered for service in blanking & sizing dies, shear blades, cold and hot forging punches, powder compaction tooling and many other applications where a combination of strength, wear resistance and toughness is required.

Relative Properties



Physical Properties

Density: 0.279 lb/in^3 (7750 kg/m^3)
Specific Gravity: 7.75
Specific Heat: 0.11 Btu/lb/°F
Modulus of Elasticity: 30x10^6 psi (207 GPa)
Thermal Conductivity: 14 Btu/hr·ft·°F (24.2 W/m·K)

Machinability: 50-60% of a 1% carbon steel

Coefficient of Thermal Expansion: (at 58-60 HRC)

Temperature °F	in/in/ °F x 10^{-6}	Temperature °C	mm/mm/ °C x 10^{-6}
70 - 212	7.0	21 - 100	12.6
70 - 800	7.8	21 - 427	14.0

Crucible CPM® 3V®
HEAT TREATING INSTRUCTIONS

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

HARDENING:

Preheating: 1500-1550°F (816-845°C), equalize.
Austenitizing (High Heat): Heat rapidly from the preheat.
For Maximum Wear Resistance:
Furnace or Salt Bath: 2000-2050°F (1093-1121°C)
Soak for 20 minutes minimum at temperature
For Balanced Wear & Toughness:
Furnace or Salt Bath: 1950°F (1066°C)
Soak for 30 minutes minimum at temperature
For Maximum Toughness:
Furnace or Salt Bath: 1875-1900°F (1024-1038°C)
Soak for 35 minutes minimum at temperature
Quenching: Air, pressurized gas, warm oil, or salt.
For pressurized gas, the furnace should have a minimum quench pressure of 4 bars.
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 975-1100°F (524-593°C). Do not temper below 900°F (538°C). Hold at temperature for 1 hour per inch if thickness, 2 hours minimum, then air cool to ambient temperature. Double tempering is required. Triple tempering is recommended when austenitized at 2000°F (1093°C) or above and when tooling will be wire EDM'd from a solid block after heat treatment.

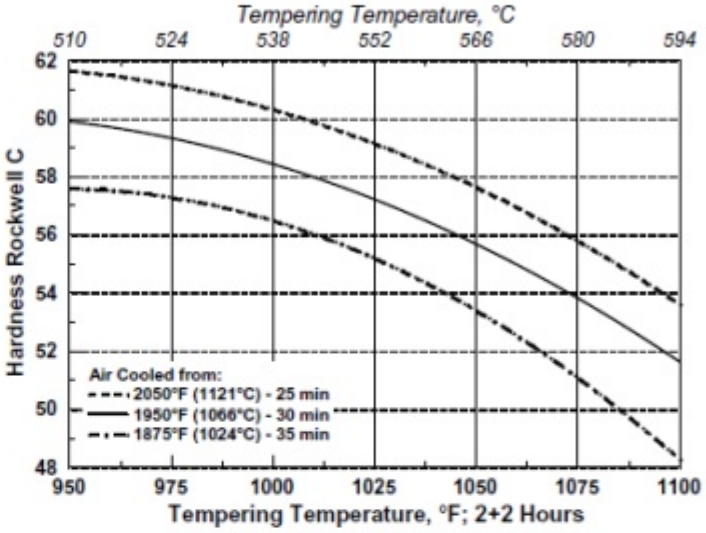
ANNEALING:

Annealing must be performed after hot working and before rehardening.

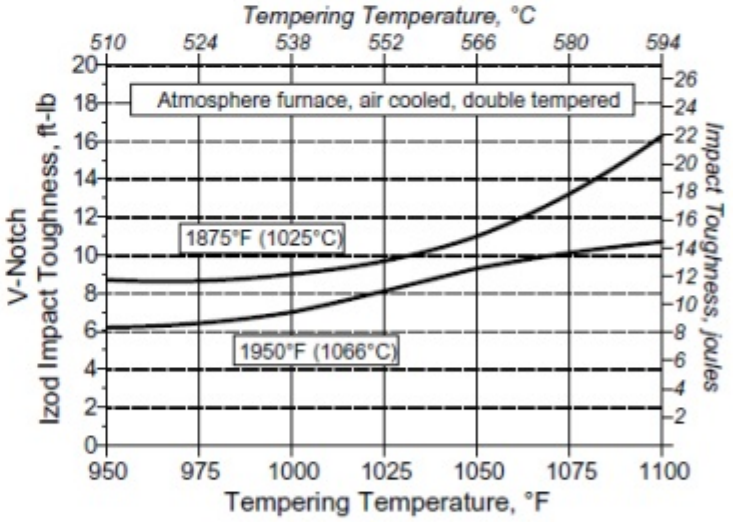
Heat at a rate not exceeding 400°F per hour (222°C per hour) to 1600-1650°F (871-899°C), and hold at temperature for 1 hour per inch of maximum thickness; 2 hours minimum. Then cool slowly with the furnace at a rate not exceeding 50°F per hour (28°C per hour) to 1000°F (538°C). Continue cooling to ambient temperature in the furnace or in air. The resultant hardness should be approximately 241 HBW.

HEAT TREATMENT RESPONSE

As Air Cooled from	HRC
1875°F (1025°C), 35 minutes	59.5
1900°F (1038°C), 30 minutes	59.5
1950°F (1066°C), 30 minutes	61.0
2000°F (1093°C), 25 minutes	62.0
2050°F (1121°C), 25 minutes	63.0



IMPACT TOUGHNESS



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