DATA SHEET

CPM® 9V®

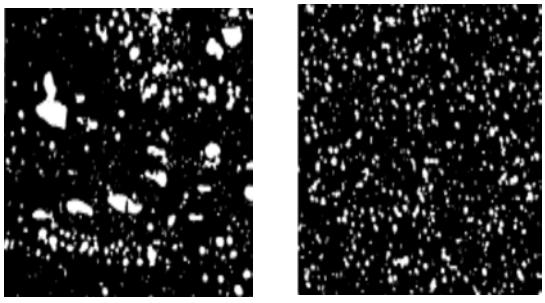
Typical Composition

C	Mn	Si	Cr	W	Mo	V
0.55	0.40	0.50	4.50	2.15	2.75	1.00

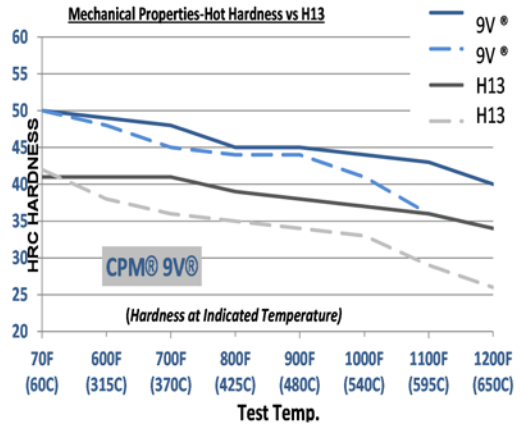
CPM® 9V® is made by the Crucible® Particle Metallurgy process. Its composition is a modification of CPM® 10V® with lower carbon and vanadium to improve toughness and heat check resistance. These enhanced properties permit CPM® 9V® to perform well in problem applications where high carbon, high chromium tool steels, such as CPM® 10V® or the high speed steels, lack sufficient toughness or heat check resistance, or where lower alloy tool steels and hot work tool steels lack sufficient wear resistance.

The CPM® process produces very homogeneous, high quality steel characterized by superior dimensional stability, grindability, and toughness compared to steels produced by conventional processes.

The *typical applications* for CPM® 9V® include forming rolls, punches, rolling mill rolls, dies, header tooling, slitter knives, extrusion tooling, shear blades, pelletizer blades, granulator blades, plasticizing components: Non-return Valves and Screws.



CONVENTIONAL STEEL CPM® STEEL



NIAGARA SPECIALTY METALS

Crucible Industries®

DATA SHEET

Thermal Treatments

Critical Temperature: 1590°F (865°C).

Forging: 2000-2100°F (1095-1150°) Do not forge below 1700°F (930°C). Slow Cool.

Annealing: Heat to 1650°F (900°C), hold 2 hours, slow cool no faster than 30°F (15°C) per hour to 1000°F(540°C), then furnace cool or cool in still air to room temperature.

Annealed Hardness: About BHN 223-255

Stress Relieving

Annealed Parts: Heat to 1100-1300°F (595-700°C), hold 2 hours, then furnace cool or cool in still air.

Hardened Parts: Heat to 25-30°F (15°C) below original tempering temperature, hold 2 hours, then furnace cool or cool in still air.

Straightening: Best done warm 400-800°F (200-430°C).

Hardening

Preheat: Heat to 1550-1600°F (845-870°C) Equalize. Second pre-heat stage at 1850-1900°F (1010-1040°C) suggested for vacuum or atmosphere hardening.

Austenitize: 1850-2150°F (1025-1175°C), hold time at temperature 30-45 minutes.

Quench: Air or positive pressure quench (2 bar minimum) to below 125°F (50°C), or salt or interrupted oil quench to about 1000°F (540°C), then air cool to below 125°F (50°C). Salt bath treatment, if practical, will ensure maximum attainable toughness for a given hardening treatment. Vacuum or atmosphere quench rate through 1850-1300°F (1010-705°C) range is critical to achieve optimum heat treat response.

Temper: Double temper at 1000°F (540°C) minimum. 2 hours minimum each time.

Size Change: +0.01%

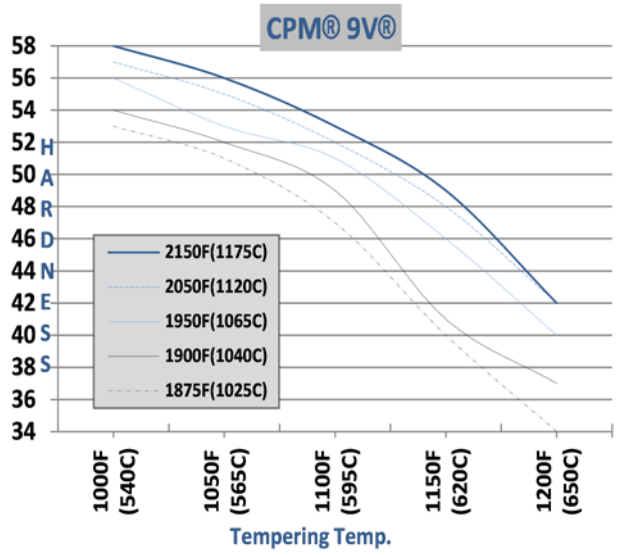
Recommended Heat Treatment: For the best combination of toughness and wear resistance, austenitize 9V® at 2050°F (1120°C), hold 30-45 minutes, and quench. Temper 3 times at 1025°F (550°C).

Aim hardness: 54-56 HRC. Higher austenitizing temperatures can be used to obtain higher hardness, at a slight decrease in impact resistance. The lower austenitizing temperatures provide the best impact toughness.

Surface Treatments

Because of its high tempering temperatures (>1000°F) CPM® 9V® is suitable for nitriding, PVD coating or similar surface treatments. CVD coating processes generally exceed the critical temperature and may result in non-predictable dimensional changes.

Heat Treat Response HRC Hardness						
Austenitizing Temp.						
Tempering Temp.	1875°F (1025C)	1900°F (1040C)	1950°F (1065)	2050°F (1120C)	2100°F (1150C)	2150°F (1175C)
As Quenched	53	54	56	58	59	61
1000°F(540°C)	52	53	54	56	57	58
Optimum for Maximum Toughness and Effective Stress Relieving						
1025°F(550°C)	51	52	53	55	56	57
1050°F(565°C)	50	51	52	53	55	56
1100°F(595°C)	46	47	49	51	52	53
1150°F(620°C)	39	40	43	46	48	49
1200°F(650°C)	33	34	37	40	42	43
Min.Time	60 Min.	45 Min.	30 Min.	20 Min.	15 Min.	10 Min.
Min. # of Tempers	2	2	2	2	3	3



Toughness

Depending on the hardness requirement, lowering the hardening temperature (under hardening) increases toughness.

Machinability and Grindability

In the annealed condition, the machinability of CPM® 9V® is comparable to that of M2. Similar grinding equipment and practices used for high speed steels are recommended. “SG” type alumina wheels or CBN wheels have generally given the best performance with CPM® steels.