NIAGARA SPECIALTY METALS

DATA SHEET

CPM® CRUWEAR

Typical Composition

C	Cr	W	Mo	V
1.15	7.50	1.00	1.60	2.40

CPM® Cruwear is an air–hardening powder metallurgy tool steel, heat treatable to HRC 60–65. The original conventionally melted CPM® Cruwear was designed as an upgrade to A–2 and D–2, for better wear resistance, greater toughness and higher attainable hardness. CPM® Cruwear was introduced as a way to make the conventionally melted version easier to machine and more resistant to chipping. Compared to the chemistry of D–2, (D–2 = 1.55% carbon, 11.5% chromium, 0.8% vanadium, and 0.9% molybdenum), CPM® Cruwear has less carbon and less chromium, but more vanadium and tungsten. The overall carbide content of CPM® Cruwear is less than D–2 which helps make it tougher than D–2. CPM® Cruwear's higher attainable hardness results from the fact that it contains sufficient tungsten and molybdenum to cause a secondary hardening response. Finally, CPM® Cruwear tempers at a higher range (900–1050°F) than D-2 (400–600°F), so it is more compatible with a wide variety of surface treatments.

Mechanical Properties

Wear Resistance: CPM® Cruwear will offer better wear resistance than that of the AISI D–2, approaching AISI M–2.
Impact Toughness: CPM® Cruwear has greater toughness than the AISI D–2 approaching the AISI A–2.

NOTE: Lowering the hardening temp. reduces the grain size and increases toughness.

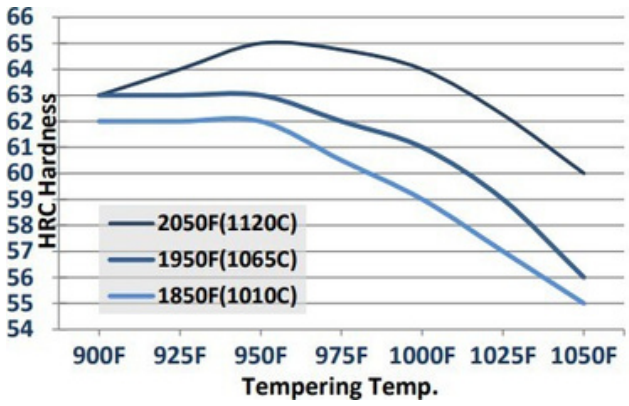
Surface Treatments

Because of its high tempering temperatures (900–1050°F) CPM® Cruwear is suitable for nitriding, PVD coating or similar surface treatments. It will retain its hardness after such processes, making it a more suitable substrate than D–2.

NOTE: CVD coating processes are generally performed at temperatures which exceed the critical temperature and may result in unpredictable dimensional distortion.

Machinability

Machinability of CPM® Cruwear in the annealed condition is similar to D–2 but grindability will be slightly better. Similar grinding equipment and practices are acceptable. "SG" type alumina wheels or CBN wheels have generally given the best performance.



This data sheet is for informational purposes only. Alloy characteristics are subject to change due to chemical composition and/or processing. We do not certify the material's suitability for specific applications.

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Heat Treatment Response (HRC Hardness)			
	Austenitizing Temperature		
Tempering Temperature	1850°F (1010°C)	1950°F (1065°C)	2050°F (1120°C)
As Quenched	63–65	63–65	62–64
900°F (480°C)	61–63	62–64	61–63
950°F (510°C)	61–63	62–64	64–66
1000°F (540°C)	57–59	60–62	63–65
1025°F (550°C)	56–58	58–60	61–63
1050°F (565°C)	54–56	58–60	61–63
Minimum Time at Austenitizing Temperature	45 minutes	30 minutes	20 minutes

Heat Treatment Austenitizing Temperature	HRC	Impact Toughness Ft-lb	(J)	Wear Resistance Adhesive
CPM® Cruwear 1950°F (1065°C)	62	35	(46)	6–7
S–7 1750°F (955°C)	57	125	(165)	1
A–2 1750°F (955°C)	60	40	(53)	2–3
D–2 1850°F (1010°C)	60	21	(28)	3–4
M–2 2050°F (1025°C)	62	20	(27)	8–10

Thermal Treatments

Annealing: Heat to 1550–1650°F (840–900°C), hold 2 hours, slow cool 50°F (25°C) per hour to 1200°F (650°C).
Annealed Hardness: About BHN 225/255.

Stress Relieving

Annealed Parts: Heat to 1100–1300°F (595–705°C), hold 2 hours, then furnace cool or cool in still air.
Hardened Parts: Heat to 25°F (15°C) below the original tempering temperature, hold 2 hours, then furnace cool or cool in still air.

Hardening

It is customary to use two furnaces: one furnace to preheat and the second furnace to austenitize. This ensures that the transition from the pre–heat temperature to the austenitizing temperature occurs fairly rapidly.
Preheat: Heat to 1550–1600°F (840–870°C), Equalize.
Austenitize: 1850–2050°F (1010–1120°C), Hold time at temperature 20–45 minutes.
Quench: Air or positive pressure quench (2 bars minimum) to below 125°F (50°C). Salt bath treatment, if practical will ensure the maximum attainable toughness for a given hardening treatment.
Temper: 900–1050°F (480–565°C). Double tempering is mandatory, and triple tempering is recommended. Cool to room temperature in between tempers. Temper 2 hours minimum each time or at least 1 hour per inch (25mm) of thickness for sections over 2" (50mm) thick.
Size Change: Approx. +0.15%.

Recommended Heat Treatment: For the best combination of toughness and wear resistance, austenitize at 1950°F (1065°C). Temper 3 times at 1000°F (540°C).

Aim hardness: **HRC 62.** 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.

Note: Properties shown throughout this data sheet are typical values. Normal variations in chemistry, size and heat treat conditions may cause deviations from these values.