CPM CRU-WEAR is an air-hardening tool steel, heat treatable to HRC 60-65. Designed as an CPM upgrade to conventional Cru-Wear and D2, it offers better wear resistance, much greater toughness and higher attainable hardness. Both D2 and CPM CRU-WEAR contain carbides for wear resistance, but CPM CRU-WEAR has more vanadium carbides than D2. Vanadium carbides are harder than chromium carbides and are much more effective in providing wear resistance. CPM CRU-WEAR’s higher attainable hardness results from the fact that it contains sufficient tungsten and molybdenum to cause a secondary hardening response, (up to HRC 65), which does not occur in D2. CPM CRU-WEAR tempers at a higher range (900-1050°F) than D2 (400-600°F), so it is more compatible with a wide variety of surface treatments. Finally, because CPM CRU-WEAR is made as CPM, it will resist chipping and breakage more so than most conventionally made tool steels.

**Tool Steel Comparagraph**

![Graph showing toughness and wear resistance](image)

**Typical Applications**

- Stamping or Forming Tools
- Punches and Dies
- Rolls
- Blanking Dies
- Thread Rolling Dies
- Coining Dies
- Lamination Dies
- Trim Dies
- Industrial Knives and Slitters
- Shear Blades
- Fineblanking Tools
- Scrap Choppers
- Wear Parts
- Tire Shredders
- Plastic Injection Feeder Screws and Tips

*Note: These are some typical applications. Your specific application should not be undertaken without independent study and evaluation for suitability.*

**Physical Properties**

- **Elastic Modulus**: 30 X 10^6 psi (207 GPa)
- **Density**: 0.28 lbs./in^3 (7.8 g/cm^3)
- **Thermal Conductivity**
  - at 200°F (95°C): 13.6 BTU/hr-ft-°F
  - at 200°F (95°C): 23.5 W/m-°K
  - at 200°F (95°C): 0.056 cal/cm-s-°C
- **Coefficient of Thermal Expansion**
  - 70-600°F (20-325°C): 6.2x10^-6 (11.2x10^-6)

**Mechanical Properties**

**Wear Resistance**

CPM CRU-WEAR offers better wear resistance than AISI D2, approaching that of AISI M2.

**Impact Toughness**

CPM CRU-WEAR has much greater toughness than most conventionally made tool steel.

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

**Machinability**

Machinability of CPM CRU-WEAR in the annealed condition is similar to D2 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.

Crucible Industries LLC

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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 bar 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.

Thermal Treatments

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