

DATA SHEET



**LATROBE SPECIALTY
STEEL COMPANY**

Latrobe, PA 15650-0031 USA

Issue 1

Crucible Industries **CPM® Rex® 45 (HS*)** Powder Metal High-Speed Steel

LATROBE SPECIALTY STEEL your source for all Crucible CPM products

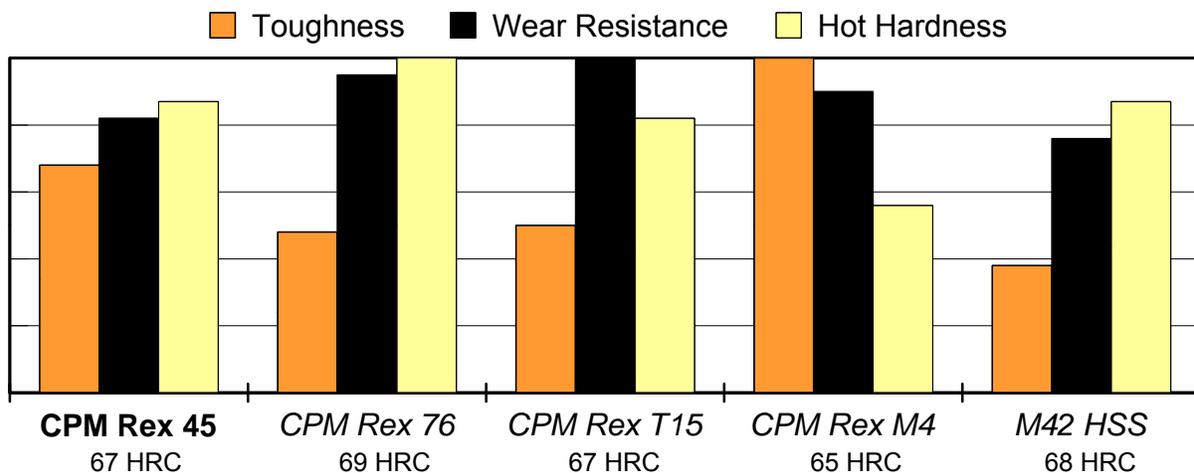
Typical Composition

C	Mn	Si	Cr	W	Mo	V	Co
1.30	0.30	0.50	4.05	6.25	5.00	3.05	8.00

*0.22 Sulfur is added to large diameter rounds ($\geq 2 \frac{9}{16}$ ") for improved machinability

CPM Rex 45 super high-speed steel is based upon the chemical composition of ASTM M3-2 high-speed steel, but with the addition of 8% cobalt. CPM Rex 45 can be heat treated to 68 HRC. The high cobalt content enhances the attainable hardness and enables the steel to maintain high hardness at elevated service temperatures. Vanadium carbides provide the high wear resistance and the fine grain size, small carbides, and superior cleanliness of the CPM microstructure maximize the toughness of the steel. CPM Rex 45 offers improved cutting tool life compared to the M-series high speed steels and improved toughness compared to all of the other super high-speed steels, such as M42, M48, and T15. Typical applications include form tools, end mills, broaches, milling cutters, hobs, shaper cutters, taps, and any special cutting tool where high hot hardness is required.

Relative Properties



Physical Properties

Density: 0.291 lb/in³ (8050 kg/m³)
 Specific Gravity: 8.05
 Modulus of Elasticity: 31x10⁶ psi (214 GPa)

Machinability: 30-35% 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
68 - 750	6.3	20 - 399	11.3
68 - 1000	6.4	20 - 538	11.5

Crucible CPM Rex 45 HEAT TREATING INSTRUCTIONS

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

CRITICAL TEMPERATURE

Ac1: 1500°F (816°C)

HARDENING:

Preheating: 1500-1550°F (816-845°C), equalize.

A second preheat at 1850-1900°F (1010-1040°C) is recommended for vacuum hardening.

Austenitizing (High Heat): Heat rapidly from the preheat. Soak for 5 to 10 minutes, depending upon the temperature.

Furnace: 2125-2200°F (1163-1204°C)

Salt Bath: 2100-2190°F (1149-1199°C)

Quenching: Pressurized gas, warm oil, or salt. For pressurized gas, the furnace should have a minimum quench pressure of 4 bars. A quench rate of approximately 400 °F (222°C) per minute 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).

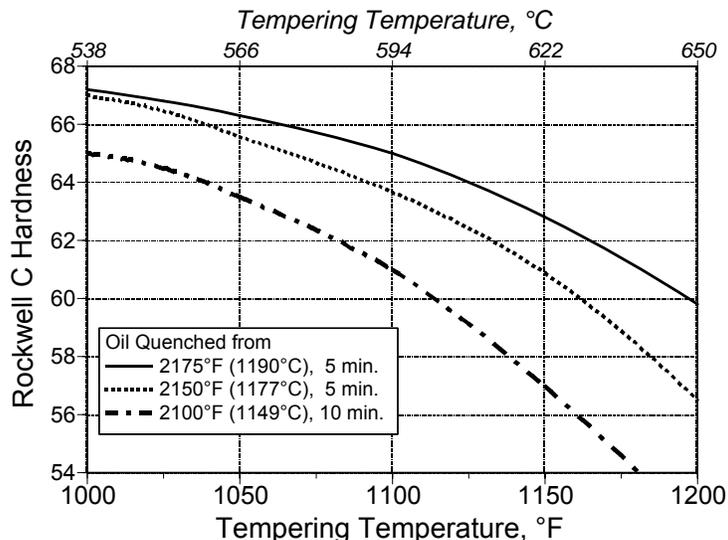
Tempering: Temper immediately after quenching. Typical temperature range is 1000-1100°F (538-593°C). Do not temper below 1000°F (538°C). Hold at temperature for 2 hours then air cool to ambient temperature. Triple tempering is required.

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 1575-1600°F (857-871°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 a maximum of 285 HBW.

HEAT TREATMENT RESPONSE

As Oil Quenched from	HRC
2100°F (1149°C), 10 minutes	66
2150°F (1177°C), 5 minutes	67
2175°F (1190°C), 5 minutes	67
2200°F (1204°C), 5 minutes	65.5



SIZE CHANGE DURING HARDENING

For the typical hardening treatment of oil or pressurized-gas quenching from 2175°F (1190°C) followed by double tempering at 1025°F (551°C), the typical longitudinal size change is a growth of 0.002 inches per inch (0.051 mm per mm).

STRESS RELIEVING

Annealed parts: Heat to 1100-1300°F (595-705°C), hold for 2 hours, then furnace or still air cool.

Hardened parts: Heat to 25°F (15°C) below the original tempering temperature or 1000°F (540°C) minimum, hold 2 hours, then furnace or still air cool.



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.

Latrobe, PA Phone: 724-537-7711
FAX: 724-532-6316

Vienna, OH Phone: 800-321-6446
FAX: 330-609-2054

Marlborough, MA Phone: 800-444-4447
FAX: 508-481-6581

WEB: www.latrobesteel.com