DATA SHEET

LATROBE SPECIALTY STEEL COMPANY
Latrobe, PA 15650-0031 USA

Issue 1

Crucible Industries CPM® Rex 76

Powder Metal High-Speed Steel

ASTM M48

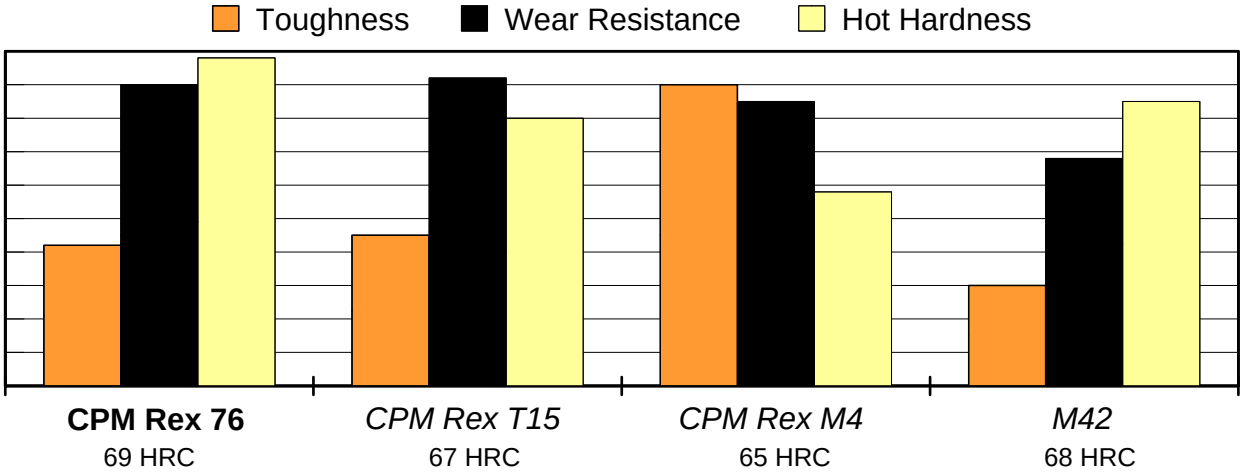
LATROBE SPECIALTY STEEL your source for all Crucible CPM products

Typical Composition

C	Mn	Si	Cr	W	Mo	V	Co
1.50	0.30	0.30	3.75	9.75	5.25	3.10	8.50

CPM Rex 76 is a high-performance high-speed steel that exhibits superior hot (red) hardness compared to T15 and M42 high-speed steels, and wear resistance comparable to that of T15. CPM Rex 76 can be heat treated to 70 HRC, and the high cobalt content 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 powder metallurgy (PM) microstructure maximize the toughness of the steel. CPM Rex 76 offers improved cutting tool life compared to the M-series high-speed steels. Typical applications include form tools, broaches, milling cutters, hobs, and any special cutting tool where high hot hardness is required.

Relative Properties



Physical Properties

Density: 0.298 lb/in^3 (8256 kg/m^3)
Specific Gravity: 8.26
Modulus of Elasticity: 31x10^6 psi (214 GPa)

Machinability: 10-15% of a 1% carbon steel

Coefficient of Thermal Expansion: (66-68 HRC)

Temperature °F	in/in/ °F x 10^{-6}	Temperature °C	mm/mm/ °C x 10^{-6}
70 - 200	5.92	21 - 93	10.66
70 - 400	6.00	21 - 204	10.80
70 - 800	6.33	21 - 427	11.39
70 - 1000	6.52	21 - 649	11.74
70 - 1200	6.75	21 - 816	12.15

CPM® Rex 76
HEAT TREATING INSTRUCTIONS

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

CRITICAL TEMPERATURE

Ac1: 1535°F (835°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 3 to 10 minutes, depending upon the temperature.

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).

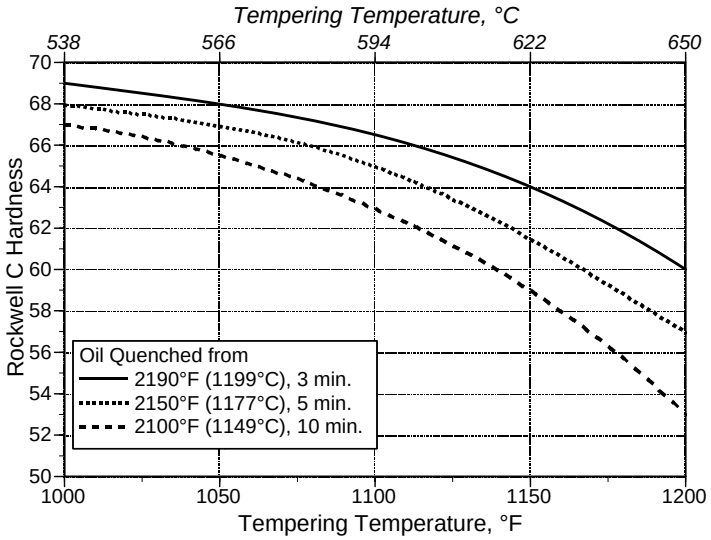
Tempering: *Temper immediately after quenching*. Typical temperature range is 1000-1100°F (538-593°C). Do not temper below 1000°F (538°C). Hold at temperature for 2 hours then air cool to ambient temperature. Triple tempering is required. Quadruple tempering is required when austenitized at 2175°F (1190°C) or higher.

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 311 HBS.

HEAT TREATMENT RESPONSE

As Oil Quenched from	HRC
2100°F (1149°C), 10 minutes	68
2125°F (1165°C), 10 minutes	68
2150°F (1177°C), 5 minutes	67
2175°F (1190°C), 5 minutes	66.5
2190°F (1199°C), 3 minutes	66.5



TOUGHNESS: Lower hardening temperatures (underhardening) provide a finer grain size and increased toughness.

Hardening Temperature °F	Hardening Temperature °C	Tempering Temperature °F	Tempering Temperature °C	Hardness HRC	Charpy Impact C-Notch ft-lbs	Charpy Impact C-Notch J
2190	1200	975	525	70	6	8
2175	1190	1000	540	68.5	10	14
2175	1190	1025	550	68	10	14
2125	1165	1025	550	67	15	20

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