



M7 High Speed Steel

M7 high-speed steel is used for making heavier construction drills where flexibility and extended drill life are extremely important. M7 molybdenum high-speed tool steels are mainly used for cutting tools in all machining operations. This steel exhibits good abrasion-resistance because of its carbon and vanadium contents. It is an excellent choice for premium tools which require an outstanding balance of red hardness, edge toughness and wear-resistance. It is especially suited for machining semi-hard, heat-treated steel at about 300-350 Brinell Hardness.

Common Usage: Drills, End Mills, Pins, and Reamers.

Physical Properties

Density

0.287 lb/in³ (7944 kg/m³)

Specific Gravity

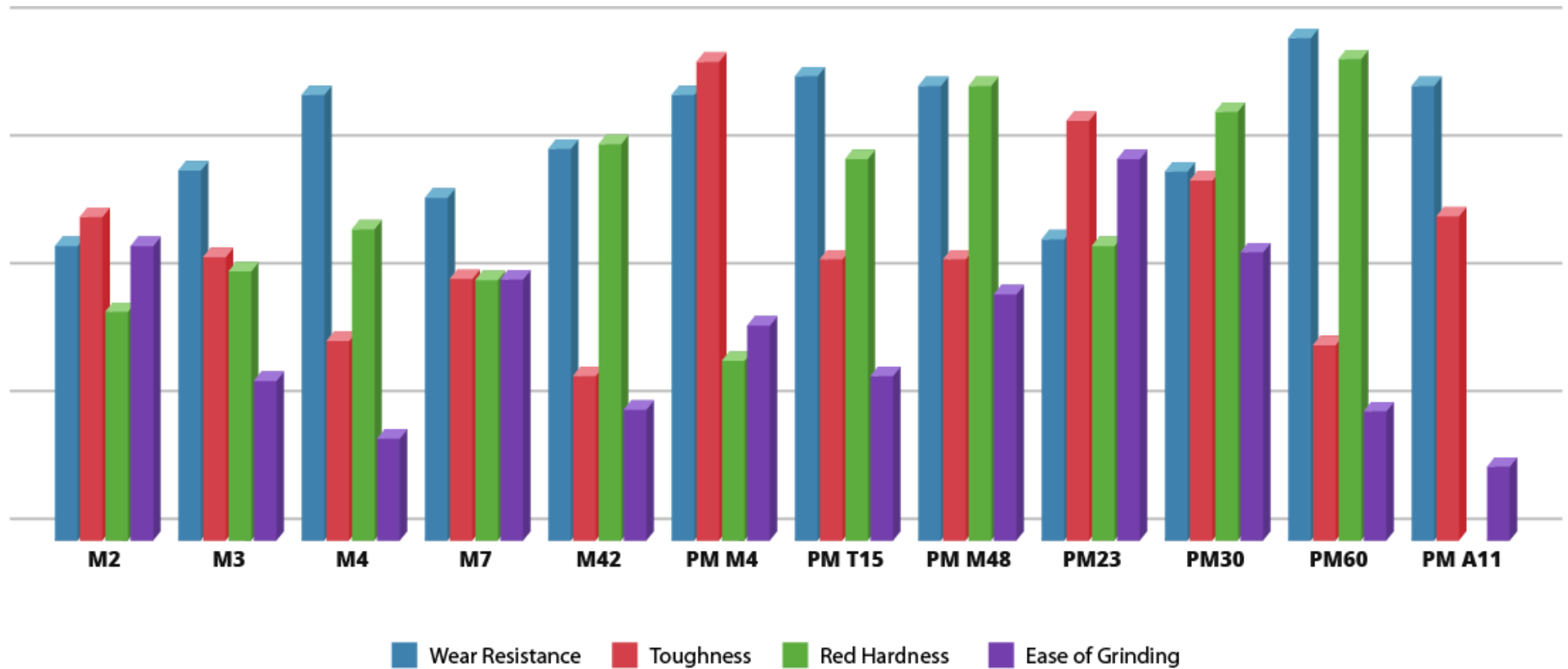
7.94

Modulus Of Elasticity 30×10^6
psi (207 GPa)

Machinability

45-50% of a 1% carbon steel

High Speed Steel Properties Comparison



M7 High Speed Steel Chemical Composition

						MAXIMUM	TYPICAL
Carbon	Chromium	Tungsten	Molybdenum	Vanadium	Cobalt	Annealed	Tempered
C	Cr	W	Mo	V	Co	Hb	HrC
1.02	3.8	1.8	8.6	1.9	-	260	64

M7 High Speed Steel Heat Treating

ANNEALING	PREHEAT	AUSTENITIZING	QUENCH	TEMPERING
Temp	Temp	Temp	Medium	Temp
°F	°F	°F		°F
1575/1650	1500/1550	2125/2175	Salt/Oil/Atm	1025/1050

M7 High Speed Steel Thermal Treatments

Preheating

To minimize distortion and stresses in large or complex tools use a double preheat. Heat at a rate not exceeding 400°F per hour (222°C per hour) to 1100°F (593°C) equalize, then heat to 1450-1550°F (788-843°C). For normal tools, use only the second temperature range as a single preheating treatment.

Austenitizing (High Heat)

Heat rapidly from the preheat.

- Furnace: 2175-2220°F (1191-1216°C)

- Salt: 2180-2200°F (1193-1204°C)

Soak 2 -5 minutes at temperature.

To maximize toughness, use the lowest temperature.

To maximize hot hardness, use the highest temperature.



Pressurized gas, warm oil, or salt. For pressurized gas, a rapid quench rate 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, then cool in still air to 150-125°F (66-51°C).



Temper immediately after quenching. Typical tempering range is 1025-1050°F (551-565°C). Hold at temperature for 2 hours, then air cool to ambient temperature. Double tempering is required. For large cross sections, and especially for blanks from which tools will be cut by wire EDM, triple tempering is strongly recommended.



Annealing must be performed after hot working and before re-hardening

Heat at a rate not exceeding 400°F per hour (222°C per hour) to 1550-1600°F (843-871°C), and hold at temperature for 1 hour per inch (25.4 mm) of 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.

Information provided by Griggs Steel Company