UNITED STATES CUTTING TOOL INSTITUTE
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PM 23 High Speed Steel

PM 23 high-speed tool steel is a high alloyed powder metallurgical high-speed steel corresponding to AISI M3:2. This steel is an ASP 2023 equivalent and has a very good abrasive wear-resistance in combination with a high compressive strength. It is suitable for demanding cold work applications like blanking of harder materials such as carbon steel or cold rolled strip steel, and for cutting tools. Its machinability and grindability are superior than that of conventional high-speed steel, along with its dimensional stability after heat treatment has been applied.

Other Known Names: ASP 2023, S790, M3-2

Common Usage: Broaches, Gear Cutters, Knives, Rolls, Taps

Physical Properties

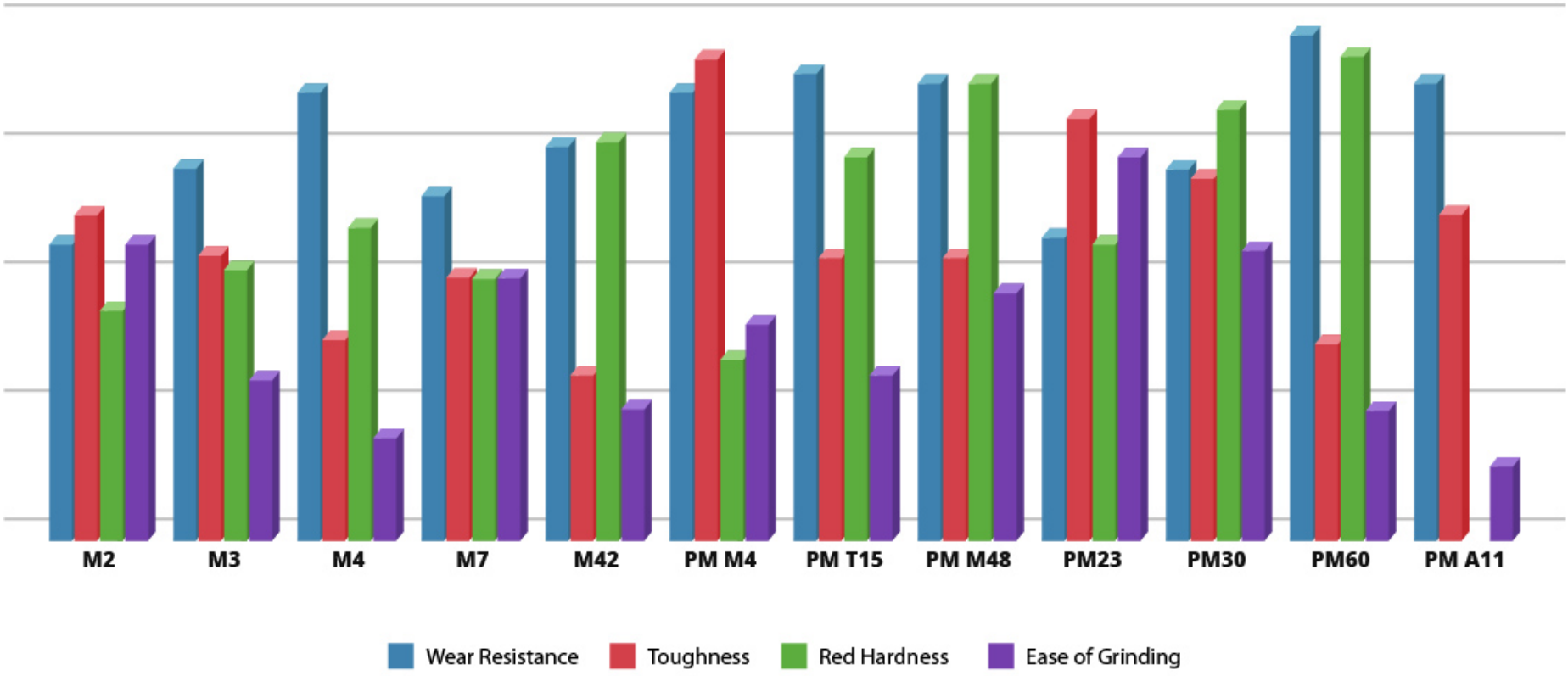
Density

0.287 lb/in^3 (8256 kg/m^3)

Modulus Of Elasticity

33 x 10^6 psi (230 GPa)

High Speed Steel Properties Comparison



PM 23 (ASP 2023 equivalent) High Speed Steel ChemicalComposition

						MAXIMUM	TYPICAL
Carbon	Chromium	Tungsten	Molybdenum	Vanadium	Cobalt	Annealed	Tempered
C	Cr	W	Mo	V	Co	Hb	HrC
1.28	4	6.4	5	3.1	-	260	64

PM 23 High Speed Steel Heat Treating

ANNEALING	PREHEAT	AUSTENITIZING	QUENCH	TEMPERING
Temp	Temp	Temp	Medium	Temp
°F	°F	°F		°F
1575/1625	1550/1600	2125/2175	Salt/Oil/Atm	1040

ASP 2023 High Speed Steel Thermal Treatments

Preheating

840-930°F (450-500°C) and 1560-1650°F (850-900°C).

Austenitizing (High Heat)

Heat rapidly from the preheat, typically by transferring to a second furnace.1920-2160°F (1050-1180°C) according to the desired final hardness.

The tool should be protected against decarburization and oxidation during hardening.

Quenching

Vacuum furnace with high speed gas at sufficient overpressure (2–5 bar).Martempering bath or fluidized bed at approx. 1020°F (550°C).

Forced air/gas.

Quenching should be continued until the temperature of the tool reaches approx. 120°F (50°C). The tool should then be tempered immediately.
For applications where maximum toughness is required use a martempering bath or a furnace with sufficient overpressure.

Tempering

Temper immediately after quenching.

For cold work applications tempering should always be carried out at 1040°F (560°C) irrespective of the austenitizing temperature. Temper three times for one hour at full temperature. The tool should be cooled toroom temperature between the tempers. The retained austenite content will be less than 1% after this tempering cycle.

Annealing

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

Heat ASP 2023 at a rate not exceeding 400°F per hour (222°C per hour) to 1600°F (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 arate not exceeding 30°F per hour (17°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