

Cincinnati Tool Steel Company

Phone #: (815) 226-8800 (800) 435-0717 Fax #: (815) 226-4388

AISI P20

Mold Steel

P20 is a chrome-moly tool steel made specifically to fill the requirements for the machined cavities and forces used in zinc die casting and plastic molding. It is delivered fully quenched and tempered to approximately Brinell 300. Other hardness levels may be obtained through additional heat treatment.

P20 is the standard mold steel for machine-cut plastic molds and zinc die casting dies.

P20 is usually supplied in the prehardened condition, about 300 Brinell, for injection molds and zinc die casting dies. While in the prehardened condition, P20 can be nitrided for greater wear resistance. It can also be textured in the prehardened state.

P20 is also available at an annealed hardness of about 200 Brinell. It can be hardened or carburized up to a higher hardness of 50/60 RC when used for compression or transfer work.

Prehardened P20 is used in cavities and cores of zinc die-casting dies, in plastic-molding dies, and in other mold parts which do not require high surface hardness or high temperature operation. When carburized, P20 is used for compression, transfer, and other types of molds requiring high surface hardness.

Machinability - In the prehardened condition, P20 has a machinability rating of 65 as compared with a rating of 100 for a 1 percent carbon tool steel.

Dimensional Stability - When quenched in oil from a hardening temperature of 1550F, this grade normally expands 0.003 in./in. However, as with all liquid quenching analyses, dimensional changes during heat treatment are greatly influenced by the size and shape of the piece. Strict observance of good heat treating practice is essential for minimum distortion.

Typical Analysis

Carbon 0.350	Manganese 0.800
Silicon 0.500	Molybdenum 0.450
Chromium 1.700	

Annealing

Heat the piece in a protective atmosphere (preferably a controlled atmosphere furnace) to between 1450 and 1500°F and hold for one hour per inch of greatest thickness. Maintaining atmosphere control, cool at a rate of 30°F per hour to 1000°F. Then air-cool to room temperature. The resulting hardness is Brinell 207 max.

Hardening

Heat to the hardening temperature range of 1550 to 1650°F, using the high side for large pieces. Although not inherently subject to decarburization, wherever possible P20 should be hardened in an atmosphere controlled furnace. Hold at the hardening temperature for one hour per inch of greatest thickness. Quench in oil to 150°F and temper immediately.

Tempering

The tempering temperature varies with the size of the piece and the application. Following are results of tests performed on a 1 in. round specimen quenched in oil from 1555°F. For large sections, the mechanical properties may be somewhat lower requiring an adjustment in tempering temperature.

	Yield				
Tempering	Strength	Tensile			
Temperature	at .2%	Strength	Elongation	Reduction	Hardness
(°F)	offset (psi)	(psi)	(%)	(%)	(Rockwell C)
300	197,000	284,000	11.0	35.0	54
400	215,000	276,500	11.5	36.6	53
500	216,000	262,500	11.5	40.4	52
600	213,000	254,500	12.0	43.7	50
700	207,000	242,000	12.0	46.3	48
800	197,000	224,500	12.0	47.4	46
900	187,000	207,500	13.5	50.8	44
1000	173,000	192,000	14.5	50.6	41
1050	159,500	180,000	16.5	54.1	38
1100	151,000	168,000	16.0	58.3	35
1150	130,000	144,500	17.5	59.3	30
1200	114,500	130,000	18.5	62.3	26

Data shown are typical, and should not be construed as maximum or minimum values for specification or for final design.
Data on any particular piece of material may vary from those herein.