

••• A-6 Cold Work Die Steel

(AISI A6)

WM A-6 is a low temperature, air hardening tool and die steel. It combines the safety in hardening and minimum size change of the air hardening tool steels with the low hardening temperature and good machining characteristics of the oil hardening tool steels. As a result, parts may be machined closer to finished size prior to heat treatment, and grinding allowances greatly reduced.

Chemical Composition

Carbon	0.70
Manganese	2.25
Silicon	0.30
Chromium	1.00
Molybdenum	1.35

Typical Applications

Blanking dies, forming dies, coining dies, trim dies, punches, shear blades, spindles, stripper plates, master hubs, retaining rings, mandrels



Physical Properties

Critical temperature - (on heating) 1390°F

Specific gravity - 7.85

Coefficient of Thermal Expansion

100 - 500°F	6.40 x 10 ⁻⁶ in/in/°F
100 - 800°F	7.50
100 - 1000°F	7.70
100 - 1200°F	7.90

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Forging

Heating for forging must be done slowly and uniformly. Soak through at 1900-2000°F, and reheat as often as necessary, stopping work when the temperature drops below 1600°F. After forging cool slowly in lime, mica, dry ashes or furnace. **WM A-6** should always be annealed after forging.

Annealing

Heat slowly to 1350-1375°F, hold until the entire mass is heated through, and cool slowly in the furnace (20°F per hour) to about 1000°F, after which the cooling rate may be increased. Suitable precautions must be taken to prevent excessive carburization or decarburization.

Strain Relieving

When desirable to relieve the strains of machining, heat slowly to 1050-1250°F, allow to equalize, and then cool in still air.

Preheat for Hardening

Preheating is generally not necessary, but if employed should be carried out in the range of 1200-1250°F.

Hardening

Tools at room temperature or as preheated should be placed in a high heat furnace which is already operating with a slightly oxidizing atmosphere at 1525-1600°F. Parts should be allowed to come naturally to the temperature of the furnace and should then be soaked for twenty minutes, plus an additional five minutes per inch of minimum dimension of the part.

Quenching

WM A-6 is a deep hardening steel, and will reach full hardness by cooling in freely circulating air.

Tempering

A single temper (one hour at heat for small sizes; proportionately longer time for larger sizes) is usually all that is required with tempering carried out in the range of 300-1000F. For most applications the best combination of hardness and toughness is accomplished at 350-400F. The following chart may be used as a guide to the hardness that may be expected after tempering

	Air Cooled from 1550°F
As Hardened	62.0 RC
Tempered	
200 °F	61.5
300 °F	60.5
400 °F	59.0
500 °F	57.5
600 °F	56.0
700 °F	54.5
800 °F	52.5
900 °F	50.5
1000 °F	48.5

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