

WM T-J (A-9)

WM T-J was originally developed as a hot work steel, but its exceptional strength and toughness has resulted in wide usage in many cold work applications. **WM T-J** is unique in that it may be successfully applied to both hot and cold work applications.



Chemical Composition

Carbon	0.50
Manganese	0.40
Silicon	1.00
Chromium	5.00
Vanadium	1.00
Molybdenum	1.40
Nickel	1.50

Typical Applications

Solid cold heading dies, die inserts, heading hammers, coining dies, forming dies, forming rolls, die casings, gripper dies.

Physical Properties

Critical temperature - (on heating) 1480°F

Specific gravity - 7.78

Coefficient of Thermal Expansion

100 - 800°F	6.65 x 10 ⁻⁶ in/in/°F
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100 - 1000°F	6.88
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100 - 1200°F	7.06
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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 1700°F. After forging cool slowly in lime, mica, dry ashes or furnace. **WM T-J** should always be annealed after forging.

Annealing

Heat slowly to 1550-1600°F, hold until the entire mass is heated through, and cool slowly in the furnace (25°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

Warm slightly before charging into the preheat furnace, which should be operating at about 1400-1500°F.

Hardening

After thorough preheating, transfer to the hardening furnace, operating from 1750-1850°F, depending on the degree of hardening desired for the application, and the size of the tool.

Quenching

WM T-J is an air hardening steel, and will develop full hardness on cooling in still air. If the scaled surface resulting from air cooling is objectionable, the part may be quenched in oil until it has lost its color (1000-1200°F), and then allowed to cool in still air. Any necessary straightening should be done while cooling in the range of 850-450°F. Parts should be allowed to cool to 150°F, or to where they can be held in the bare hand, and then tempered immediately.

Tempering

Tempering practice may vary with size & application, but is usually performed in the range of maximum secondary hardness or higher. Double tempering is recommended. The following chart may be used as a guide to the hardness that may be expected after tempering.

Tempered	Air Cooled From	
	1800°F	1850°F
300 °F	57.0 RC	58.0 RC
400 °F	54.5	55.5
500 °F	54.0	55.0
600 °F	54.0	54.5
700 °F	54.5	55.5
800 °F	55.0	56.0
900 °F	55.0	57.0
950 °F	55.0	58.0
1000 °F	53.0	55.5
1050 °F	46.5	52.5
1100 °F	40.0	46.5
1150 °F	34.0	40.0
1200 °F	29.0	35.0

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