

WM T-J (A-9)

WM T-J is the basic 5% chromium hot work steel, modified by the addition of 1.5% nickel, and higher carbon content. The nickel addition is intended to increase the toughness to compensate for the higher carbon. The exceptional properties of WM T-J have led to wide usage in both hot and cold work applications.

Chemical Composition:

Carbon	.50%
Manganese	.40%
Silicon	1.00%
Chromium	5.00%
Vanadium	1.00%
Molybdenum	1.40%
Nickel	1.50%

Typical Applications

Punches, piercing tools, mandrels, extrusion tooling, forging dies, gripper dies, die casings heading dies, hammers, coining and forming 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
100-1000°F	6.88
100-1200°F	7.06

Thermal Practice

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 1650 °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 furnace, which should be operating at 1400-1500°F.

HARDENING – **WM T-J** is a steel having very high hardenability and should be hardened by cooling in still air. The use of a salt bath or controlled atmosphere furnace is desirable to minimize decarburization, and if not available pack hardening in spent pitch coke is suggested. The temperature employed is usually 1800-1850°F, depending on size. 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 and 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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