



## M2 High Speed Steel

### Technical Data Sheet

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M2 is a general purpose molybdenum high speed steel. This grade is characterized by balanced combination of abrasion resistance, toughness and good red hardness. Due to its comparatively low carbon content, M2 has an excellent combination of toughness properties and abrasion resistance when properly hardened and tempered. M2 is used in a wide used for all kinds of cutting tool, knife and punch and die applications.

**TYPICAL CHEMISTRY:** C 0.83 Cr 4.15 Mo 5.00 V 1.90 W 6.35

**MACHINABILITY:** When properly annealed, M2 has a machinability rating of 65 percent when compared to a 1% Carbon Steel rated at 100.

**DIMENSIONAL STABILITY:** When air quenched from the proper hardening temperature, this grade can be expected to expand approximately .001 in. per in. Note: Distortion (bending, bowing and twisting) and part geometry can add to the variations in movement of a part that is being hardened.

**THERMAL CYCLING:** In order to avoid decarburization, this grade should be annealed and/or hardened in a controlled neutral atmosphere, vacuum, or neutral salt furnace environment.

1. **Anneal:** Heat to 1600° F, soak thoroughly at heat. Furnace cool 25° F per hour to 900° F, air cool to room temperature. Approximate annealed hardness 241 Maximum Brinell.
2. **Stress Relief of Unhardened Material:** Heat slowly to 1200 to 1250° F. Soak for two hours per inch of thickness at heat. Slow cool (furnace cool if possible) to room temperature.
3. **Hardening:**
  - a. **Preheat:** Heat slowly to 1550° F, soak thoroughly, heat to 1850° F, soak thoroughly.
  - b. **Harden:** Soak time in the furnace varies from a few minutes to a 15 minutes, depending tool size, heat capacity of the furnace, and the size of the charge.
    - Heat to 2150 to 2200° F for max. toughness and minimum distortion.
    - Heat to 2250 to 2275° F for max. hardness and abrasion resistance.
  - c. **Quench:** For full hardness, oil quench to 150-200° F. Air quench to 150° F. When quenching in hot salt maintain the quench just above the Ms temperature. After equalizing withdraw parts from the hot salt and air cooled to 150° F.
  - d. **Temper:** Double temper is mandatory, three tempers are sometimes preferred. Soak for 2 hours per inch of thickness. Air cool to room temperature between tempers. The best tempering range for hardness, strength and toughness is 1000 to 1050° F.

Temper° F	Rockwell "C"	Temper° F	Rockwell "C"
As-quenched	64	900	64
400	63	1000	65.5
500	62.5	1050	63.5
600	62.5	1100	61.5
700	62.5	1150	60
800	63.5	1200	53

Specimens 1" dia. were air quenched from 2250° F.

The values shown in this data sheet are to be used as a guide for estimating purposes only.