



D2 Cold Work Tool Steel

Technical Data Sheet

D2 is a high carbon, high chromium, air-hardening tool steel. It was formulated to combine excellent abrasion resistance and air-hardening characteristics. D2 has become the tool and die standard against which other tool steels are measured for abrasion resistance, dimensional stability in hardening and air-hardening characteristics.

TYPICAL CHEMISTRY: C 1.55 Mo 0.80 Cr 11.50 V 0.90

MACHINABILITY: When properly annealed, D2 has a machinability rating of 45 as compared to a 1% Carbon Steel rated at 100.

DIMENSIONAL STABILITY: D2 has the minimum distortion in heat treatment as compared to other tool steels. When air quenched from the proper hardening temperature, this grade can be expected to expand or contract approximately .0005 in. per in. Note: Distortion (bending, bowing and twisting) as well as part geometry can add to the variations in movement of a part 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 1650° F. Soak one and one-half hours per inch of thickness. Cool 20° F per hour to 900° F. Cool in furnace to room temperature. Approximate hardness 220 HB Max.
2. **Stress Relief of Unhardened Material:** Heat slowly to 1200 to 1250° F. Soak for two hours per inch of thickness at heat. Soak, slow cool (furnace cool if possible) to room temperature.
3. **Hardening:**
 - a. **Preheat:** Heat to 1250° F. Hold at this temperature until thoroughly soaked.
 - b. **Harden:** Heat to 1850° F. Soak at heat for 45 to 60 minutes per inch of thickness. Soak sufficiently long enough to get all of the alloying elements into solid solution during the austenitizing cycle. Proper response to heat treatment will depend on this. Therefore, for items under one inch in thickness, soaking time should be 45 to 60 minutes minimum.
 - c. **Quench:** Air quench to 150° F. Temper immediately.
 - d. **Temper:** Double tempering is mandatory, three tempers are sometimes preferred. Soak for two hours per inch of thickness at heat. Air cool to room temperature between tempers. Double temper at the range of secondary hardness (900 to 960° F) strongly recommended.

Temper° F	Rockwell "C"	Temper° F	Rockwell "C"
As-quenched	64	800	57
400	60	900/960	58/60
500	58	1000	56
600	58	1100	48

Specimens were air quenched from 1850° F.

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