



W1 Water Hardening Tool Steel

Technical Data Sheet

W1, water-hardening is a cold work tool steel. This steel grade depends on its relatively high carbon content for its useful properties. W1 Water Hardening is known for its easy machining characteristic, ability to develop a keen cutting edge, high surface case hardness, and its soft, ductile, inner core.

MACHINABILITY: When properly annealed, W1 has a machinability rating of 100 when compared to a 1% Carbon Steel rated at 100.

TYPICAL CHEMISTRY: Carbon 0.70/1.30 %

DIMENSIONAL STABILITY: When water quenched from the proper hardening temperature, this grade can be expected to expand approximately .002 to .004 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 1375 to 1400° F, soak until uniformly heated, approximately., one-half hour per inch. Furnace cool 50° F per hour to 975° F, air cool to room temperature. Approximate annealed hardness 200 Max. Brinell.
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 1200° F, hold at this temperature until thoroughly soaked.
 - b. **Harden:** Heat to 1425 to 1475° F. Soak at heat for 30 minutes per inch of thickness. Temperatures on the high side of the range will increase the depth of the case.
 - c. **Quench:** This material may be water quenched, but brine quenching is preferred. Water or brine quench to 150 to 200° F. Oil quenching is sometimes used for light sections and where maximum hardness is not required.
 - d. **Temper:** Normally water hardening steels need be single tempered only. However, double tempering may sometimes be preferred. Soak at heat for two hours per inch of thickness for each temper. Air cool to room temperature between tempers.

Water Quenched from °F	Depth of Chill 64ths.	Tempering Temperature ° F	Rockwell "C" Hardness
1450	8.5	As-quenched	67
1450	8.5	300	64
1450	8.5	400	61
1450	8.5	500	59
1450	8.5	600	55

3/4" diameter specimens, three inches long were tested.

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