



## A2 Cold Work Tool Steel

### Technical Data Sheet

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A2 is a 1% carbon, 5% chrome, air-hardening tool steel. A2 is known as a versatile, general purpose grade. A2 has better resistance to abrasion and wear than the "S" series shock resisting tool steels and more toughness and impact strength than the "D" series wear steels. A2 is used for a wide range of tooling applications ranging from general purpose punches and dies to components for plastic injection molding.

**TYPICAL CHEMISTRY:** C 1.00 Mo 1.00 Cr 5.00 V 0.20

**MACHINABILITY:** When properly annealed, A2 has a machinability rating of 60 as compared with 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) as well as part geometry can add to the variations in movement of a part being hardened.

**THERMAL CYCLING:** 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 two hours per inch of thickness. Cool 40° F per hour to 900° F. Air cool to room temperature. Approximate annealed hardness 235 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. 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 1750 to 1800° F. Soak at heat for 45 to 60 minutes per inch of greatest thickness.
  - c. **Quench:** Air quench to 150° F. Temper immediately.
  - d. **Temper:** Double temper is mandatory. Soak for two hours per inch of thickness at heat. Slow cool to room temperature between tempers.

Temper° F	Rockwell "C"	Temper° F	Rockwell "C"
As-quenched	64	900	56
400	60	1000	56
500	56	1100	50
600	56	1200	43
800	56	1300	34

Specimens 1" diameter were quenched from 1775° F.

4. **Stress Relief Temper:** A stress relief temper for hardened material is strongly recommended after significant grinding, or welding, or EDM. Select a temperature that is 25 or 50° F lower than the last tempering temperature used.