

S7 Shock-Resisting Tool Steel Technical Data Sheet

S7 is a shock-resisting tool steel with excellent impact properties. Because it is an air-hardening steel, it is safe and stable in heat treatment. S7's most important characteristic is its versatility. It is used widely for medium cold work tools and dies, for plastic injection molding inserts, shear blades, medium hot work dies, master hobs, and for component parts of many products. S7 is the benchmark shock-resisting tool steel.

Typical Chemistry

C	Si	Mn	Cr	Mo
0.50	0.25	0.70	3.25	1.40

Machinability

When properly annealed, S7 has a machinability rating of 70 as 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 being hardened.

Thermal Cycling

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

1. Anneal: Heat to 1530°F, soak for one hour per inch of thickness. Cool 25°F per hour to 1000°F. Air cool to room temperature. Approximate annealed hardness 260 HB max.

2. Stress Relief of unhardened material: Heat slowly to 1200-1250°F. Soak for one hour per inch of thickness at heat. 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 1700-1780°F, soak at heat for 20 minutes for first inch then 15 minutes for each additional inch of thickness.
- c) **Quench:** Circulated air/inert gas or inert gas positive pressure quench down to 150°F.
- d) **Temper:** Double temper is mandatory. Soak for one hour per inch of thickness for each temper or a minimum of two hours with the tool at heat. Air cool to room temperature between tempers. For cold work applications, the normal tempering range is 400-500°F. For hot work applications, a tempering temperature of 900-1000°F is suggested. Never temper S7 under 400°F.

See reverse for tempering temperatures.

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Temper°F	Rockwell°C	Temper°F	Rockwell°C
As-quenched	58/60	800	53
400	57	900	52
500	55	1000	51
600	53	1100	45
700	53	1200	38

1" diameter specimens, three inches long were air-hardened from 1725°F.

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

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