

••• S-5 Shock Resisting Steel

S-5 is a silico-manganese shock resisting steel that offers good ductility and toughness at high hardness levels. It exhibits high strength and adequate abrasion resistance for those applications involving shock or impact loading.

Chemical Composition

Carbon	0.55
Manganese	0.90
Silicon	2.00
Molybdenum	0.25



Typical Applications

Hand and pneumatic chisels, drift pins, forming tools, knock out pins, mandrels, machine parts, nail sets, pipe cutters, rivet sets and busters, screw driver bits, shear blades, spindles, stamps, tool shanks, track tools.

Physical Properties

Critical temperature – (on heating) 1425°F

Specific Gravity – 7.75

Coefficient of Thermal Expansion

100 - 800°F	7.03 x 10 ⁻⁶ in/in/°F
100-1000°F	7.37
100-1200°F	7.61

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Forging

Heating for forging must be done slowly and uniformly. Heat through at 1800 - 1950°F, but avoid prolonged soaking, and reheat as often as necessary, stopping work when the temperature drops below 1600°F. After forging cool slowly in time, mica, dry ashes or furnace. **S-5** should always be annealed after forging.

Annealing

Heat slowly to 1425-1475°F, hold until the entire mass is heated through, and cool slowly in the furnace (40°F or hour) to about 1000°F, after which the cooling rate may be increased. Suitable precautions must be taken to prevent excessive carburization or decarburization.

Strain Relieving

When desirable to relieve the strains of machining, heat slowly to 1050-1250°F, allow to equalize, cool in still air.

Preheat for Hardening

Preheating is generally not necessary, but if employed should be carried out in the range of 1200-1250°F.

Hardening

S-5 is prone to decarburize under improper conditions of heating, and it is important that furnace atmospheres be controlled closely during the hardening operation. A properly maintained lead pot or salt bath will give good results. Care should be exercised so that the tools are thoroughly heated, but soaking at the hardening temperature should be held to a minimum. In most instances, parts should be quenched as soon as they have uniformly reached the hardening temperature. A range of 1600-1650°F is usually used for oil quenched tools, while parts to be water quenched are usually hardened from 1550-1600°F.

Quenching

Depending upon section size & desired hardness, this grade of steel may be quenched in water or oil. In either case, the tools should be allowed to cool to 125-150°F, or where they can be held in the bare hands, & then tempered without undue delay.

Tempering

S-5 is generally tempered in the range of 300-900°F, depending on the hardness desired. Tempering time should be a minimum of 1 hour per inch of cross section. The following may be used as a guide to the hardness that may be expected after oil and water quenching.

As Quenched Tempered	Water Quenched	Oil Quenched
	from 1575°F 62.0 RC	from 1650°F 58.0 RC
200°F	61.0	57.5
300°F	60.0	57.0
400°F	58.0	55.5
500°F	56.0	54.5
600°F	55.0	54.0
700°F	53.0	52.5
800°F	50.0	49.0

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