D6 Cold Work Tool Steel

Properties

Dimensionally stable ledeburitic 12% chromium steel, possessing superior wear resistance, suitable for air hardening.

Application

Blanking, punching, shearing etc.: Punches for high duty and complicated progressive and integral cutting dies, mainly for industries making electrical equipment, fittings, cardboard, preserve cans, and watches; saw teeth cutting dies, scraping and trimming tools for maximum production runs, all types of high duty punches, high performance shear blades for cutting sheet of up to 4 mm thickness, deburring tools, and cutters for wire nail manufacture.

Machining: Broaches, cutters for steel wool production, high duty woodworking tools.

Chipless shaping: Thread rolling dies, flanging and beading dies, punches and dies for cold nut manufacture; tools for spinning, pressing, deep drawing, and cold extrusion of light alloys and steel; master hobs for making synthetic resin. molding dies, knurling tools, wire drawing dies, mandrels and dies for tube and rod drawing, mandrels for the cold pilger rolling of steel tubes, hammers and reducing dies for needle manufacture.

Wear resisting tools and components: Press tools for the processing of highly abrasive ceramic materials, liner plates for the brick industry and for making refractories, press tools for the pharmaceutical industry, automatic lathe guide sleeves, guide bars in centerless grinding machines, cone pulleys and rings for wire drawing machines, sand- blast nozzles, and tools for the powder metal industry.

Measuring tools

Hot work tools: High duty hammer cores for the manufacture of scythes and sickles, and for fast hitting hammers used to forge hard or high alloy steels; tyre mill finishing rolls, hot drawing rings etc.

Chemical composition

C	Si	Mn	Cr	W
2.00 – 2.20	0.70 – 0.90	0.20 -0.40	11.50 – 12.50	0.60 – 0.90

Standards: DIN 1.2436

Hot forming

Forging:

1050 to 850°C

Slow cooling in furnace or thermoinsulating material.

Heat treatment

Annealing:

800 to 850°C

Slow controlled cooling in furnace at a rate of 10 to 20°C/hr down to approx. 600°C, further cooling in air.

Hardness after annealing: max. 250 HB

Stress relieving:

650 to 700°C

Slow cooling in furnace. Intended to relieve stresses set up by extensive machining, or in complex shapes.

After through heating, hold in neutral atmosphere for 1 - 2 hours.

Hardening:

950 to 980°C

Oil, salt bath (220 to 250°C or 500 to 550°C), air plast, still air. Holding time after temperature equalization:

15 to 30 minutes.

Obtainable hardness: 64 - 66 HRC.

Special treatment: Hardening 1020°C and tempering at 500°C. Obtainable hardness approx. 61 HRC (e.g. if followed by nitriding).

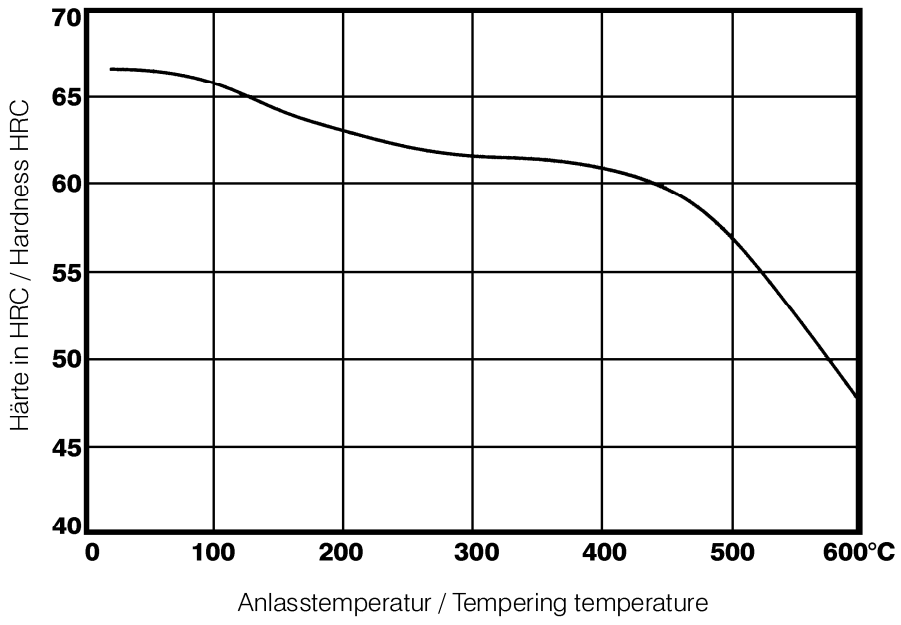
Tempering:

Slow heating to tempering temperature immediately after hardening/time in furnace 1 hour for each 20 mm of workpiece thickness but at least 2 hours/cooling in air.

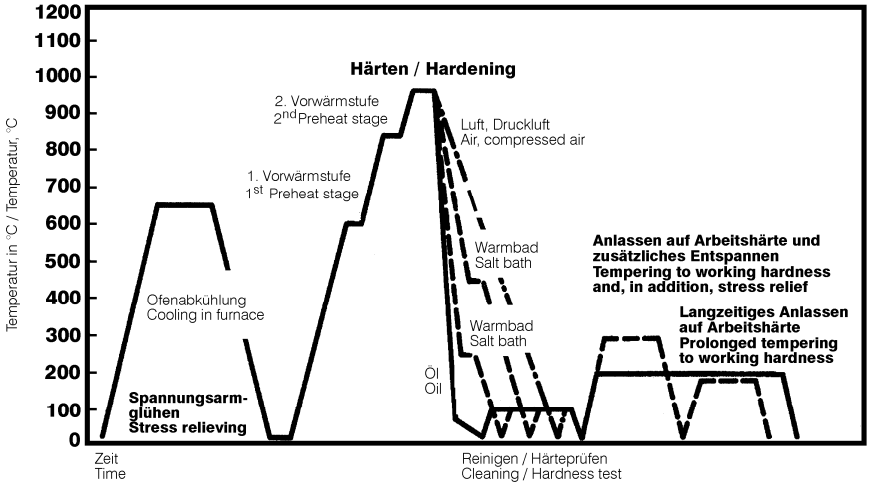
For average hardness figures to be obtained please refer to the tempering chart.

For certain cases we recommend to reduce tempering temperature and increase holding time.

Tempering chart



Heat treatment sequence



Repair welding

There is a general tendency for tool steels to develop cracks after welding.

If welding cannot be avoided, the instructions of the appropriate welding electrode manufacturer should be sought and followed.