

D3

D3 is a high-carbon, high-chromium tool steel with very high wear resistance against abrasive and adhesive wear due to the high volume of hard carbides in the steel matrix, medium toughness, dimensionally stable, high compressive strength, not secondary hardenable. In general, the application of D3 tool steel is similar to D2, but it should be remembered that D3 has better wear resistance and is preferred for such items as shear blades. Due to high wear resistance D3 is slightly more difficult to grind than D2 steels.

Typical application: blanking, punching, piercing, cropping, shearing, trimming, clipping, cutting, stamping, bending, forming, deep-drawing, rim-rolling, spinning and flow-forming tools, shear blades, thread rolling dies, cold extrusion dies, flanging and straightening rolls, plastic moulds for abrasive polymers, etc.

1. Chemical Composition

C	Mn	Si	S	P	Cr	V	W	Fe
2.00-2.35	0.10-0.60	0.10-0.60	≤0.030	≤0.030	11.00-13.50	≤1.00	≤1.00	Rest

2. Physical Properties

Density, g/cm ³	7.87	Coefficient of thermal expansion, $\alpha \times 10^{-6}/K$	100°C	10.80
Modulus of elasticity, GPa	210		200°C	11.70
Thermal conductivity at 20°C, W/mk	16.70		300°C	12.20
Specific heat, J/kg °C	460		400°C	12.60
Hardness, HRC	62		500°C	12.80

3. Heat Treatment

Soft Annealing	Heat uniformly to 1560°F (850°C), then cool very slowly in the furnace at a rate of not more than 50°F (25°C) per hour to 1200°F (650°C) until the furnace is black. This practice will produce a maximum 255HB.
Stress Relieving	To relieve machining stresses for greater accuracy in hardening, first rough machine, then heat to temperature of 1200°F (650°C) and slowly cool to 930°F (500°C), then freely in air.
Hardening	D3 is extremely sensitive to overheating during hardening. Recommended preheating temperature 1200–1450°F (650–780°C), austenitizing temperature: 1700–1750°F (927–954°C). If overheated, D3 tool steel, like other high-carbon, high-chrome tool steels, will not reach its maximum obtainable hardness and will shrink badly. Protection against decarburization and oxidation during hardening is required.
Quenching	For oil, quench until black, about 900°F (482°C), then cool in still air to 150-125°F (66-51°C). For pressurized gas, the furnace should have a minimum quench pressure of 4 bars. A quench rate of approximately 400°F (222°C) per minute to below 1000°F (538°C) is critical to obtain the desired properties.
Tempering	The tempering temperature for D3 may be varied according to desired hardness (100-600°C / 46-63HRC). Nitriding treatment for improved retention of hardness is recommended for certain applications.

Note: All information enclosed in this datasheet is based on our best knowledge and is given as indicative. Other special requirements are subject to prior discussion and approval of Vojay. Please contact us for any additional information or request.