

HIGH SPEED STEELS

Available Product Variants

Long Products

Product Description

High-speed steel manufactured in a powder metallurgy process, with good hot hardness, compressive strength, and wear resistance. PM technology gives it good toughness and excellent workability, including the best machinability.

Process Melting

Powder metallurgy

Properties

- > Toughness & Ductility : high
- > Wear Resistance : good
- > Compressive strength : good
- > Edge Stability : good
- > Grindability : high
- > Hot Hardness (red hardness) : good

Applications

- > Gear Cutting, Shaving and Shaping Tools

Chemical composition (wt. %)

C	S	Cr	Mo	V	W
1.3	+	4.15	5	3	6.35

Heat treatment

Annealing

Temperature	870 to 900 °C 1,598 to 1,652 °F	870 to 900°C (1598 to 1652°F) The steel needs to be protected against decarburization. Through heating of the material is followed by controlled, slow furnace cooling at a maximum cooling rate of 10°C (50°F) per hour, down to approx. 700°C (1292°F). Final cooling in air.
-------------	-----------------------------------	--

Stress relieving

Temperature	600 to 650 °C 1,112 to 1,202 °F	Slow cooling furnace. To relieve stresses set up by extensive machining or in tools of intricate shape. After through heating, hold in neutral atmosphere for 1 to 2 hours.
-------------	-----------------------------------	---

Hardening and Tempering

Temperature	1,050 to 1,180 °C 1,922 to 2,156 °F	Salt bath, vacuum Preheating: 1st stage ~ 500 °C, 2nd stage ~ 850 °C, 3rd stage ~1050 °C (for higher austenitising temperature) Austenitising: for cutting applications at higher austenitising temperatures (> 1130 °C), holding time after complete heating 80 seconds, maximum 150 seconds, to avoid material damage due to overtime. Austenitising: for cold work applications at lower austenitising temperatures (< 1100°C). Holding time after complete heating 15 to 30 min Quenching: oil, warm bath (500 - 550 °C), gas.
Temperature	550 to 580 °C 1,022 to 1,076 °F	Slow heating to tempering temperature immediately after austenitising. Dwell time in the furnace 1 hour per 20 mm material thickness (at least 1 hour) Slow cooling to room temperature between each tempering step 3 tempering cycles recommended

Physical Properties

Temperature (°C °F)	20 68
Density (kg/dm ³ lb/in ³)	8 0.29
Thermal conductivity (W/(m.K) BTU/ft h °F)	24 13.87
Specific heat (kJ/kg K BTU/lb °F)	0.42 0.1003
Spec. electrical resistance (Ohm.mm ² /m 10 ⁻⁴ Ohm.inch ² /ft)	0.54 2.55
Modulus of elasticity (10 ³ N/mm ² 10 ³ ksi)	230 33.36

The data contained in this brochure is merely for general information and therefore shall not be binding on the company. We may be bound only through a contract explicitly stipulating such data as binding. Measurement data are laboratory values and can deviate from practical analyses. The manufacture of our products does not involve the use of substances detrimental to health or to the ozone layer.