M35

M35 is a medium-alloyed high-speed tool steel with 5% Co added, which results in high red hardness and tempering resistance. This grade is particularly suitable for conditions involving thermal stresses and discontinuous cutting.

Typical applications: heavy-duty milling cutters of all kinds, highly stressed twist drills and taps, profile knives, machining of high-strength materials, broaches, taps, reamers, hobs, saws, etc.

1. Chemical Composition

C	Mn	Si	S	P	Cr	V	W	Mo	Co
0.88-0.96	0.20-0.40	0.25-0.45	≤0.030	≤0.030	3.80-4.50	1.70-2.00	6.00-6.70	4.70-5.20	4.50-5.50

2. Physical Properties

Density, g/cm^3	8.15
Modulus of elasticity, GPa	230
Thermal conductivity at 20°C, W/mk	27.40
Thermal conductivity at 350°C, W/mk	27.20
Hardness, HRC	67

Coefficient of thermal expansion, a x 10^{-6} /K	100°C	9.70
	200°C	10.50
	300°C	11.00
	500°C	11.50
	700°C	12.50

3. Heat Treatment

Heat Treatment	Temperature, °C	Cooling / Quenching	Remarks
Soft annealing	820-860 °C	Furnace	Furnace cooling to 600°C at a rate 10-20°C/hour, farther cooling in air. Maximum hardness 280 HB.
Stress relieving	600-650 °C	Furnace	Heat in a neutral atmosphere for 1 to 2 hours after reaching a temperature of 1110 to 1200°F (600 to 650°C), followed by slow cooling in the furnace.
Hardening	1190-1230 °C	Air, oil, or salt bath 500-550°C	Preheat in multiple steps and equalize surface and core temperatures: 1) 400°C; 2) 850°C; 3) 1050°C; and then to the appropriate hardening temperature. The third preheat is only required for complex geometries.
Tempering	540 - 570 °C	Air	Tempering °C: 100 200 300 400 500 550 600 650 700 HRC: 63 63 61 62 64 65 63 55 46 It is recommended to temper at least two times. For the purpose of stress relieving third tempering circle can be made.

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.