



M42 HIGH SPEED STEEL

COMPOSITION %	C	Cr	Mo	W	Co	V
	1.08	3.90	9.40	1.50	8.0	1.20
STANDARDS	AISA M42, W.Ne.3247, S10-1-8, SKH 59, ISO S12, AFNOR Z110DKCWV 9.8.4.2.1					
CONDITION AS	Soft-annealed			Max 270 HB		
AS SUPPLIED	Cold Drawn			Max 320 HB		
	Cold Rolled			Max 350 HV		

M42 is a conventionally manufactured cobalt alloyed high-speed steel. The various stages of the manufacturing process are chosen and controlled so that an end product is obtained with a good structure in terms of carbide size and distribution. This is a distinct advantage for the finished tool.

M42 is characterised by

- all-round applicability
- good machine-ability
- good performance
- good hot hardness
- good wear resistance

APPLICATIONS

M42 is a high-speed steel suitable for cutting tools such as, twist drills, broaches, taps, milling, cutters, saws, reamers etc. In terms of performance, M42 is a steel to be used in conditions where the demand for hot hardness is of great importance i.e. where high performance is essential.

PROPERTIES

M42 is highly Cobalt alloyed. The composition of M42 makes for a good combination of toughness and hardness. By virtue of these well-balanced properties M42 has come into wide use for all cutting tools.

PHYSICAL PROPERTIES

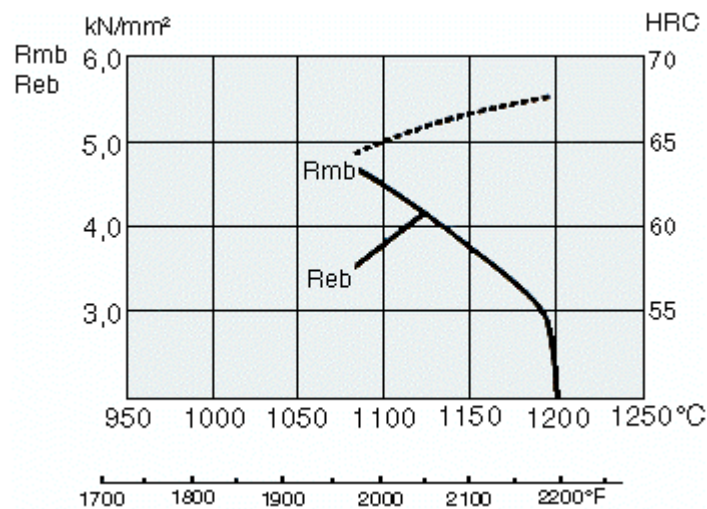
		TEMPERATURE °C / °F		
		20 / 70	400 / 750	600 / 1110
DENSITY	Kg/m ³	8.03	7.93	7.87
	lbs/in ³	.290	.286	.284
MODULUS OF ELASTICITY	kN/mm ³²	225	200	180
	psi	33 · 10 ⁶	29 · 10 ⁶	26 · 10 ⁶
COEFFICIENT OF THERMAL EXPANSION FROM 20°C / 70°F	per °C	-	11.5 · 10 ⁻⁶	11.8 · 10 ⁻⁶
	per °F	-	6.4 · 10 ⁻⁶	6.6 · 10 ⁻⁶
THERMAL CONDUCTIVITY	W/m °C	24	28	27
	Btu/sq. ft. h °F/in.	166	194	187
SPECIFIC HEAT	J/kg °C	420	510	600
	Btu/lb °F	0.10	0.12	0.14

METHODS OF MAKING TOOLS

M42 can be worked in the same way as other high-speed steels by plastic forming, machining, grinding, electrical discharge machining, welding and polishing. In grinding, local heating of the surface, which might alter the temper, must be avoided. Grinding wheel makers can furnish advice on the choice of grinding wheels. Machining is carried out using carbide or high-speed steel tools.

BEND STRENGTH

The bend strength is a measure of the toughness of the material. It will be seen from the diagram that toughness and hardness can be controlled by varying the hardening temperature.



Bend strength of a bar with diameter 5 mm after hardening and tempering to 560°C / 1040°F, 2x1 h.

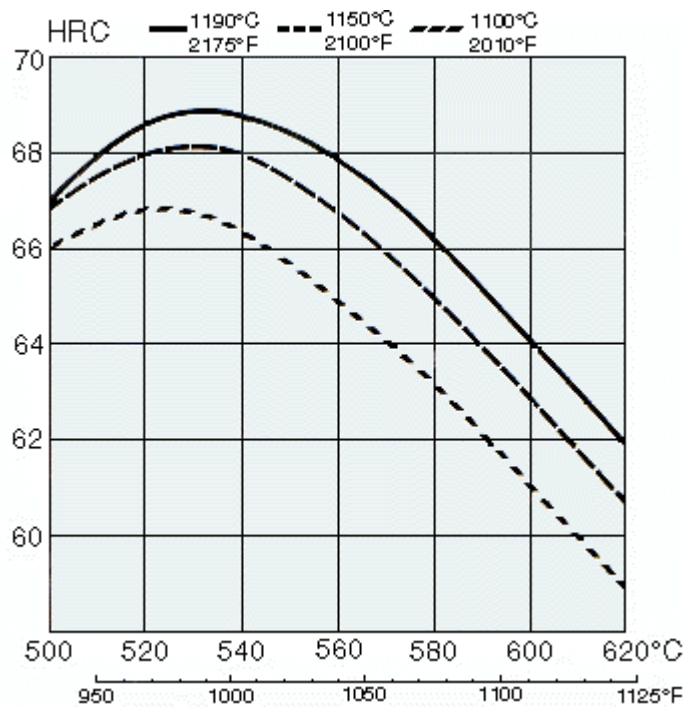
Rmb = Ultimate bend strength kN/mm², ± 10%

Reb = Bend yield strength kN/mm², ± 5%

HRC = Hardness ± 1 HRC

HEAT TREATMENT

- Soft-annealing 850°C – 900°C / 1560°F – 1650°F, slow cooling 10°C / 18°F/h to 700°C / 1290°F, hardness max 20 Brinell.
- Stress relieving 600°C – 700°C / 1120°F – 1290°F, approx. 2 hours at temperature, slow cooling to 500°C / 930°F.
- Hardening with preheating in two steps 450°C – 500°C / 840°F – 930°F, 850°C – 900°C / 1560°F – 1650°F and austenitizing at 1050°C – 1190°C / 1920°F – 2175°F. Quenching to about 550°C / 1022°F then cool in air to hand warm
- Tempering at 560°C / 1040°F or higher 3 times for at least 1 hour at full temperature is recommended.



Hardness after hardening, step quenching and tempering 2x1 h of a sample 25 mm Ø.

SURFACE TREATMENT

M42 can be nitrided (a small diffusion zone of 2–20 µm is recommended) or steam - tempered if so desired. M42 is good as substrate material for PVD and CVD coating.

GUIDELINES FOR HARDENING

TOOL	M42	
	Hardening	Tempering twice
Single- edge cutting tools, tool bits, form tools, etc.	1190°C 2175°F	550°C 1020°F
Rotating multi-edge cutting tools, hobs miling cutters, broaches, taps, etc.	1150°C – 1180°C 2100°F – 2155°F	560°C – 580°C 1040°F – 1075°F
Tools for cold work applications, punching, blanking, forming, cold extrusion, etc.	1050°C – 1150°C 1920°F – 2100°F	560°C – 590°C 1040°F – 1095°F

MANUFACTURING PROGRAMME

FROM	Dimensional range Th x W x L	
	mm	inches
Coils Ø	1 – 22	0.039 – 0.866
Round bars Ø	1 – 150	0.039 – 5.906
Forged bars Ø	max dia 400	max dia 15.748
Flat bars	3 – 7, 5x50 – 380	0.118 – 0.295x1.969 14.961
Square bars	4.5 – 130	0.177 – 5.118
Profiles Ø		
Sheets	0.8 – 10x600x860x 800 – 2500	0.031 – 0.394x23.622 – 33.858x31.496 – 98.425
Discs	0.8 – 10 max dia 800	0.031 – 0.394 max dia 31.496
Bimetal edge	0.6 – 3x1 –10	0.024 – 0.118x0.039 – 0.394

The surface condition is drawn, shot blasted, ground, rolled, cold rolled, hot rolled, peeled, rough-machined depending on dimensions and requirements.