SITHERM 2345 Steel

Designation by Standards

Brand Name	Ravne	Mat. No.	DIN	EN	AISI/SAE
SITHERM 2345	UTOPMO4	1.2345	X50CrVMo51	-	Approx. H11

Chemical Composition (in weight %)

C	Si	Mn	Cr	Mo	Ni	V	W	Others
0.51	0.95	0.30	5.00	1.35	-	0.90	-	-

Description

UTOPMO4 is a 5% chromium hot work tool steel designed particularly for applications requiring extreme toughness combined with good red hardness. It provides an extra margin of safest in tools subject to heavy hammer blows, and those tools containing deep recesses or sharp corners. While UTOPMO4 has been designed primarily as a hot work tool steel, it has been used in many cold work applications where extra toughness is required at the sacrifice of some wear resistance.

Applications

UTOPMO4 has been used primarily for tools requiring resistance to softening at elevated temperatures. Such tools include forging dies and punches, die-casting dies, aluminium extrusion dies, hot heading dies, piercing and forming punches, etc.

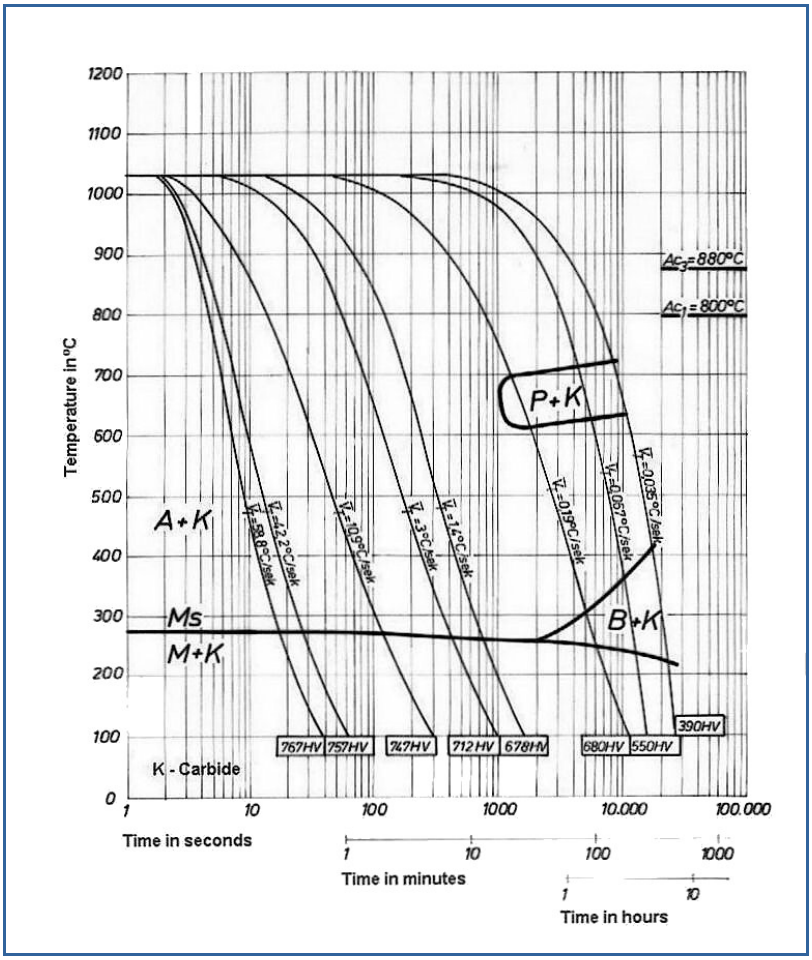
Physical properties (average values) at ambient temperature

Modulus of elasticity [10^3 x N/mm^2]: 215
Density [g/cm^3]: 7.70
Thermal conductivity [W/m.K]: 25.0
Electric resistivity [Ohm mm^2/m]: 0.52
Specific heat capacity[J/g.K]: 0.46

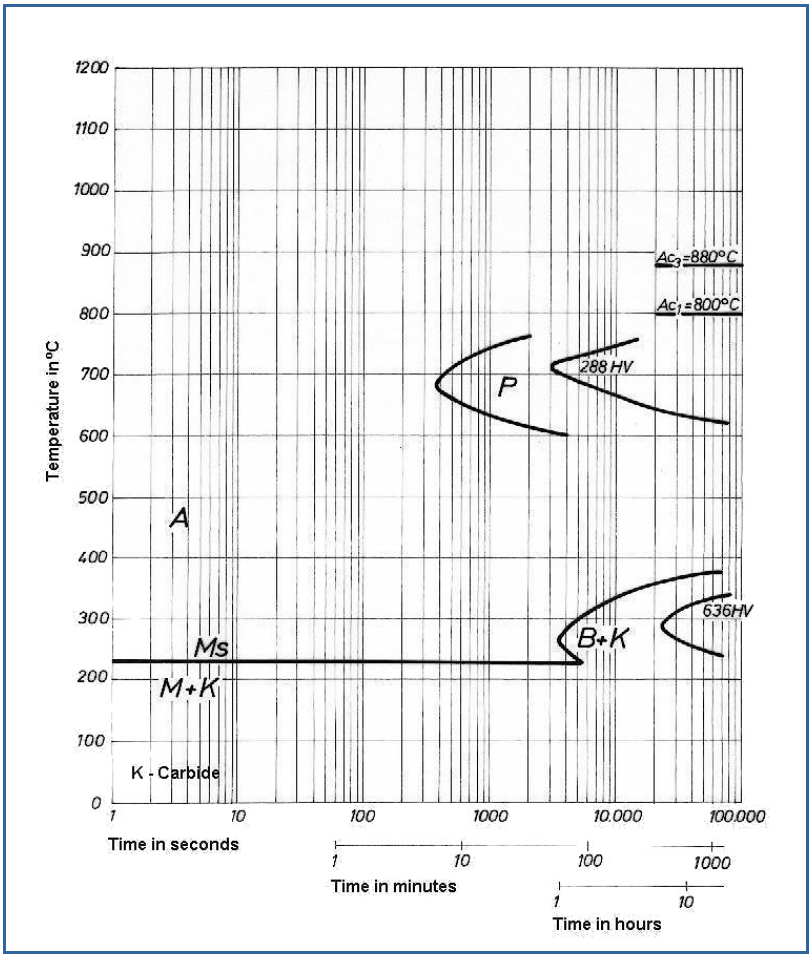
Coefficient of Linear Thermal Expansion 10^{-6} $^oC^{-1}$

20-100^{o}C	20-200^{o}C	20-300^{o}C	20-400^{o}C	20-500^{o}C	20-600^{o}C	20-700^{o}C
11.7	12.5	12.7	13.2	13.4	13.6	13.8

Continuous Cooling Transformation (CCT) Diagram



Time-Temperature Transformation (TTT) Diagram



Soft Annealing

Heat to 760-820^{o}C, cool slowly in furnace. This will produce a maximum Brinell hardness of 250.

Stress Relieving

To relieve machining strains for greater accuracy in hardening, first rough machine, then anneal below the critical 649/677^{o}C a minimum of one hour at temperature, and cool very slowly, followed by finish machining.

Hardening

Harden from a temperature of 1000-1040^{o}C followed by air, oil warm bath (450-550^{o}C) quenching. Hardness after quenching is 54-58 HRC.

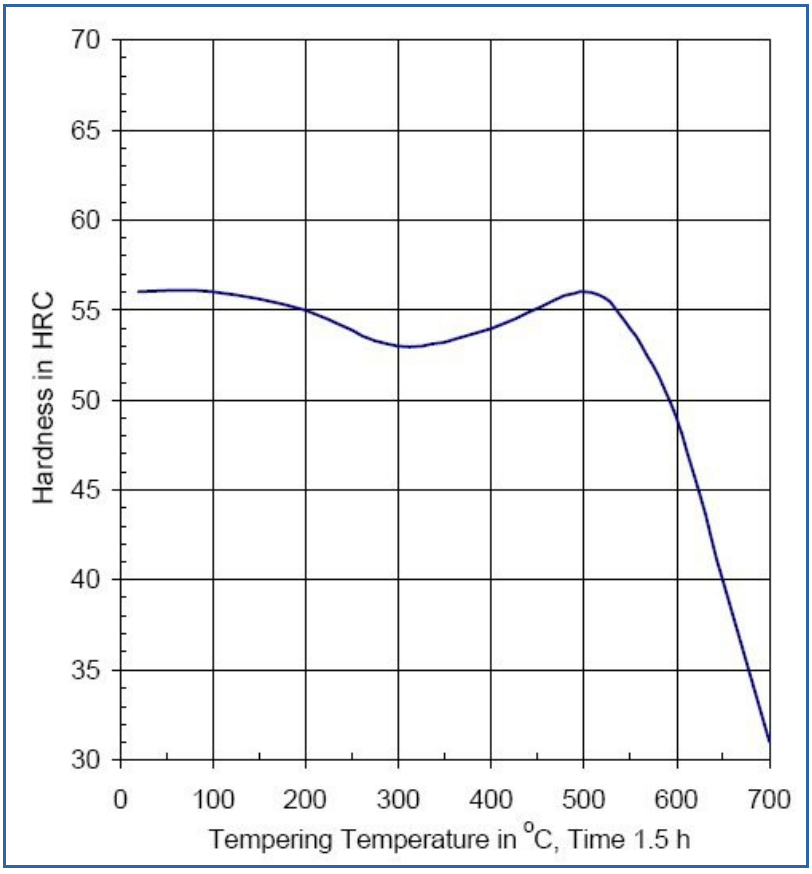
Tempering

Tempering temperature: See the diagram bellow.

Tempering Temperature (^{o}C) vs. Hardness (HRC) vs. Tensile Stregth (N/mm^{2})

100^{o}C	200^{o}C	300^{o}C	400^{o}C	500^{o}C	550^{o}C	600^{o}C	650^{o}C	700^{o}C
56	55	53	54	56	54	49	40	31
2050	1980	1845	1910	2050	1910	1620	1260	995

Tempering Diagram



Forging

Heat slowly and uniformly to a temperature of between 1093/1135^{o}C and forge. Do not work the steel below 927^{o}C. Reheat as often as necessary.

Machinability

The machinability of UTOPMO4 may be rated between 55% and 65% of a 1% carbon water hardening tool steel, or about 40% to 50% of B1112.

Weldability

To salvage tools and dies by welding, preheat to 538^{o}C in a furnace and weld with uncoated arc equipment (atomic hydrogen or heliarc). Keep the temperature of the die above 316^{o}C at all times by reheating until the welding is completed. Upon completion of the

weld, return the work piece to the preheating furnace, equalize, and cool in the furnace. Welding should be performed in the annealed condition. However, if welding is performed in the hardened condition, the tool should be retempered at 538^{o}C after hardening. The electrode material used in the weld rod should be of similar analysis to the base material.

Forms manufactured: Please see the Dimensional Sales Program.

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