

# H13 TOOL STEEL (X40CRMOV5-1)

H13 toolsteel exhibits high strength at elevated temperatures, it also has high hot wear resistance, good toughness, thermal conductivity and resistant to hot cracking, limited water cooling possible. Applications: Standard material for hot forming tools, extrusion tools, forging dies, pressure casting tools, hot shear knives, tools for plastic industry. Also available in EFS and ESR condition where better properties are required.

Colour Code	Stocked Sizes	
Yellow/Green/Blue	Rounds Flats	20 mm - 523 mm Dia 120 mm x 70 mm - 176 mm x 105 mm
	<b>Condition of Delivery</b>	
	Soft annealed to max. 229 HB	

## Related Specifications

Germany	DIN 1.2344
USA	AISI H13

## Chemical Composition

	%
Carbon	0.40
Chromium	5.30
Molybdenum	1.40
Vanadium	1.00

## Physical Properties

Thermal expansion coefficient	$\left[ \frac{10^{-6} \text{ m}}{\text{m K}} \right]$	20-100°C	20-300°C	20-500°C	20-700°C
		10,8	12,3	13,0	13,5
Thermal conductivity	$\left[ \frac{\text{W}}{\text{m K}} \right]$	20°C	350°C	700°C	
		25,6	28,4	29,4	

## Heat Treatment

### Soft Annealing

Temperature	750 - 800°C
Cooling	furnace
Hardness	max 229 HB

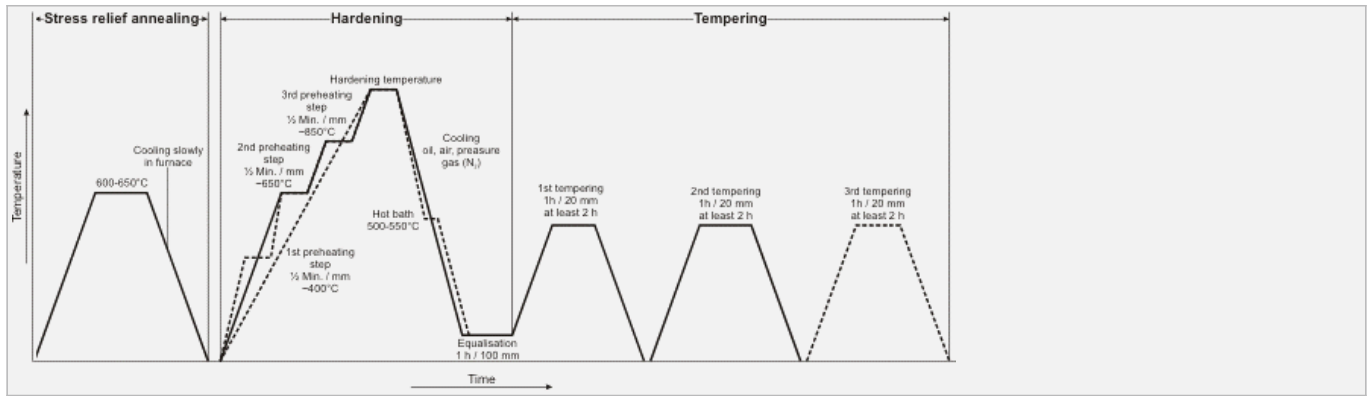
### Stress Relief Annealing

Temperature	600 - 650°C
Cooling	furnace

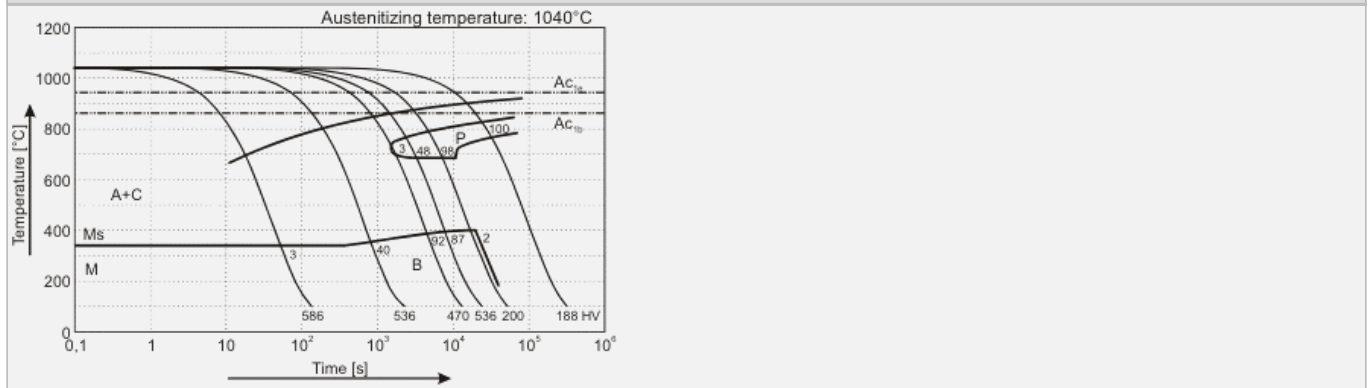
### Hardening

Temperature	1020 - 1060°C
Cooling	oil, pressure gas (N <sub>2</sub> ) air or hot bath 500 - 550°C
Hardness	see tempering diagram

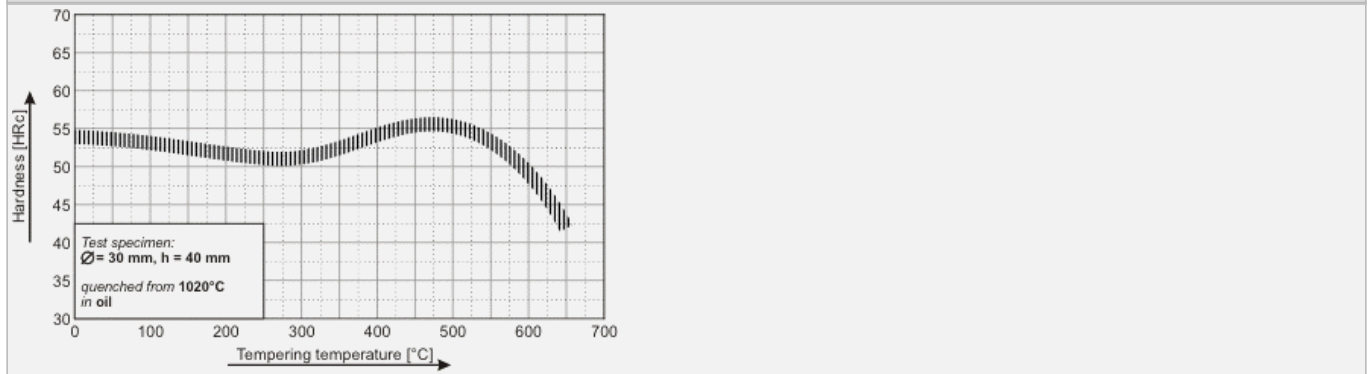
## Thermal Cycle Diagram



**Continuous Cooling Transformation Diagram (CCT)**



**Tempering Diagram**



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