

COLD WORK TOOL STEELS

Available Product Variants

Long Products*

Plates

*) Presented data refer exclusively to long products. Please observe the detailed explanations at the end of the data sheet (pdf).

Product Description

BÖHLER K600 corresponds to the material 1.2767 (45NiCrMo16). With its high nickel content, this material offers a very good combination of through hardenability and toughness. This results in a high resistance to impact and shock loads. BÖHLER K600 is used for a wide range of tools where high toughness is required. The material is used for forming and bending tools, cold shear blades for thick materials and for reinforcement rings. Due to its good polishability, BÖHLER K600 is also used for embossing tools, plastic molds and mold inserts for injection molding.

Process Melting

Airmelted

Properties

- > Toughness & Ductility : very high
- > Dimensional stability : good

Applications

- > Machine knife (for producers)
- > Cold Forming
- > Coining
- > Fine Blanking, Stamping, Blanking
- > Standard Parts (Molds, Plates, Pins, Punches)
- > General Components for Mechanical Engineering
- > Components for the recycling industry

Technical data

Material designation		Standards	
1.2767	SEL	4957	EN ISO
45NiCrMo16	EN		
SKT6	JIS		

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	Ni
0.48	0.23	0.40	1.30	0.25	4.00

Material characteristics

	Compressive strength	Dimensional stability during heat treatment	Toughness	Wear resistance abrasive
BÖHLER K600	★	★★★	★★★★★	★
BÖHLER K305	★★★★★	★★★	★★	★★★★★
BÖHLER K306	★★★★★	★★★	★★★★★	★★★
BÖHLER K313	★★★★★	★★★	★★★	★★★
BÖHLER K320	★★★	★★★	★★★	★★★
BÖHLER K329	★★★	★★★	★★★★★	★★★★★
BÖHLER K601	★	★★★	★★★★★	★★
BÖHLER K605	★★	★★★	★★★★★	★

Delivery condition

Annealed

Hardness (HB)	max. 285
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Heat treatment

Annealing

Temperature	610 to 650 °C	Slow controlled cooling in furnace at a rate of 10 to 20 °C/hr (18 to 36 °F/hr) down to approximately 600 °C (1112 °F) Further cooling in air.
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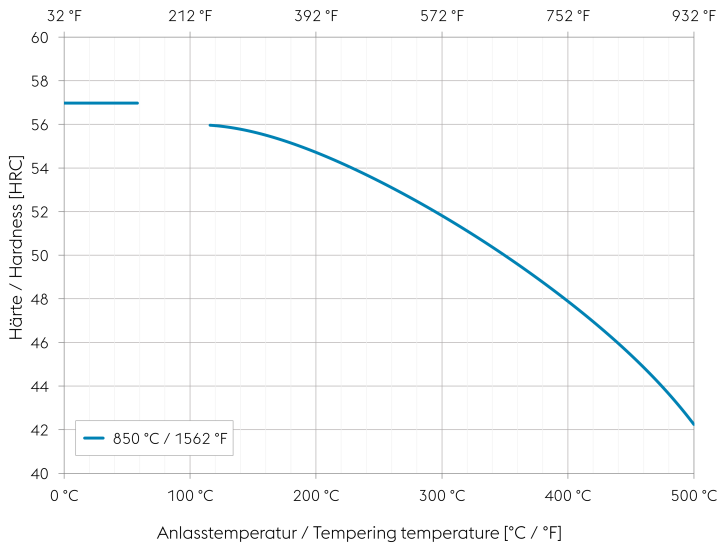
Stress relieving

Temperature	650 °C	After through heating, hold in neutral atmosphere for 1-2 hours. Slow cooling in furnace Intended to relieve stresses caused by extensive machining or in complex shapes.
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Hardening and Tempering

Temperature	840 to 870 °C	Quenching: Oil, salt bath (300 to 400 °C 572 to 752 °F), air Holding time after temperature equalization: 15 to 30 minutes. After hardening, tempering to the desired working hardness according to the tempering chart.
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Tempering chart



Specimen size: square 20 mm (0,787 inch)

Slow heating to tempering temperature immediately after hardening.

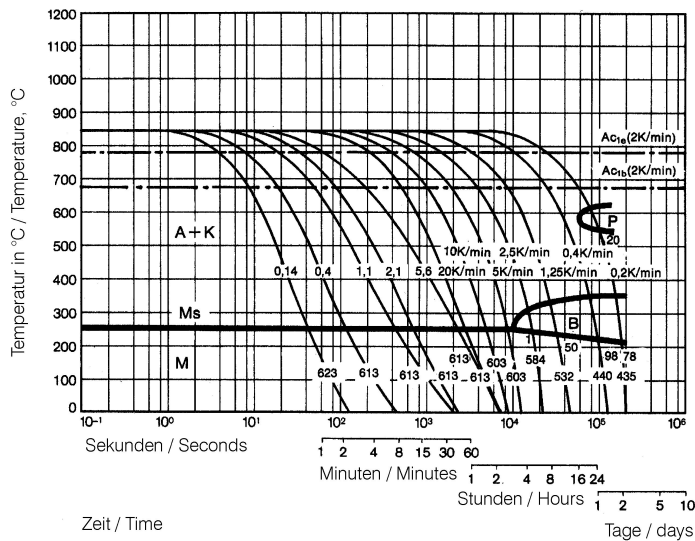
Time in furnace 1 hour for each 20 mm (0,787 inch) of workpiece thickness but at least 2 hours.

Please refer to the tempering chart for guide values for the achievable hardness after tempering.

Tempering for stress relieving 30 to 50 °C (86 to 122 °F) below the highest tempering temperature.

Cooling in air after each tempering step is recommended.

Continuous cooling CCT curves



Austenitising temperature: 840 °C (1544 °F)
Holding time: 15 minutes

O Vickers hardness

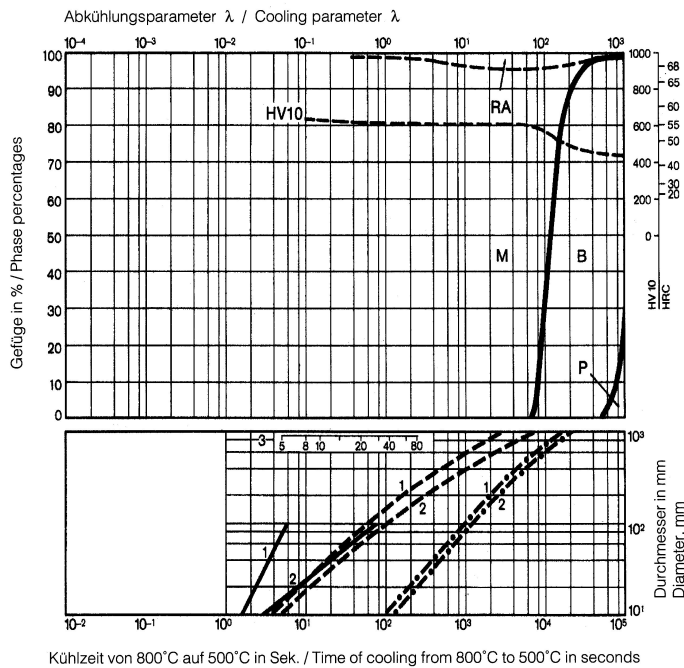
1...98 phase percentages

0.14...5.6 cooling parameter λ , i.e. duration of cooling from 800 to 500 °C (1472 to 932 °F) in $s \times 10^{-2}$

20...0.2 K/min ... cooling rate in the range of 800 to 500 °C (1472 to 932 °F)

- A... Austenite
- K... Carbide
- P... Pearlite
- B... Bainite
- M... Martensite
- Ms... Martensite starting temperature

Quantitative phase diagram

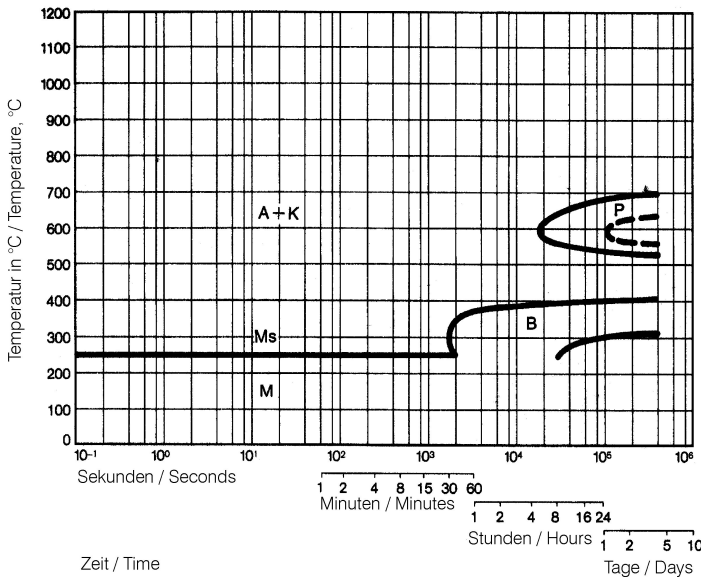


HV10... Vickers Hardness
 RA... Residual austenite
 M... Martensite
 B... Bainite
 P... Pearlite

— Water cooling
 - - - Oil cooling
 - · - Air cooling

1... Edge or face
 2... Core
 3... Jominy test: distance from end

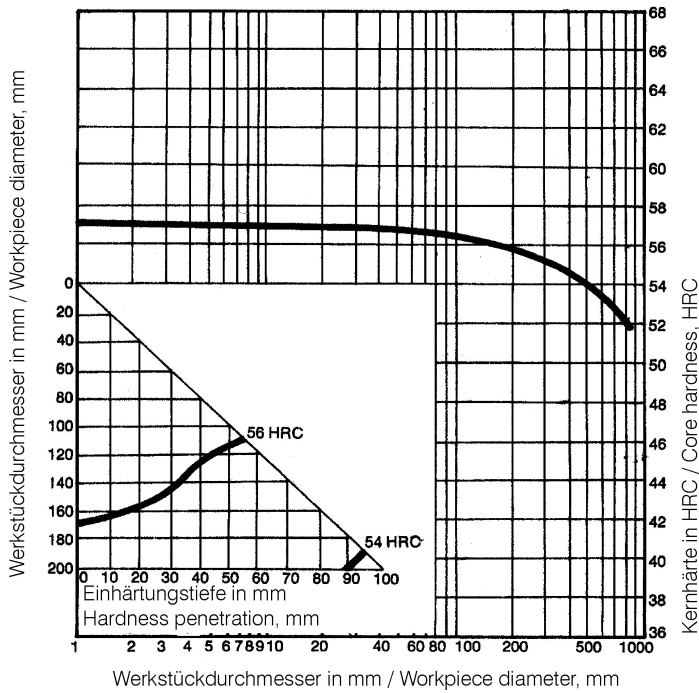
Isothermal TTT curves



Austenitising temperature: 840 °C / 1544 °F
 Holding time: 15 minutes

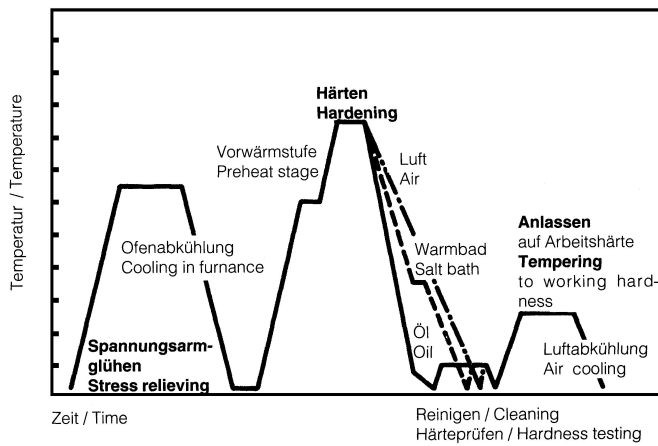
A... Austenite
 K... Carbide
 P... Pearlite
 B... Bainite
 M... Martensite
 Ms... Martensite starting temperature

Influence of work diameter on core hardness and hardness penetration



Quenched from: 850 °C / 1562 °F
Quenchant: Oil

Heat treatment sequence



Physical Properties

Temperature (°C)	20
Density (kg/dm ³)	7.85
Thermal conductivity (W/(m.K))	28
Specific heat (kJ/kg K)	0.46
Spec. electrical resistance (Ohm.mm ² /m)	0.3
Modulus of elasticity (10 ³ N/mm ²)	210

Thermal Expansions between 20°C | 68°F and ...

Temperature (°C)	100	200	300	400	500
Thermal expansion (10 ⁻⁶ m/(m.K))	11	12.5	13	13.5	14

Long Products: For additional specifications and technical requirements, please contact our regional voestalpine BÖHLER sales companies.

Sheet & Plates: Product Variant may differ in terms of melting process, technical data, delivery, and surface condition as well as available product dimensions. Please contact voestalpine BÖHLER Bleche GmbH & Co KG.

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