COLD WORK TOOL STEELS

Application Segments

Cold Work

Available Product Variants

Long Products* | Plates

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

Product Description

BÖHLER K460 corresponds to the material 1.2510 (100MnCrW4, O1) and has comparable properties to the popular tool steel 1.2842. Additional alloying with tungsten achieves higher resistance to abrasive wear compared to the tool steel 1.2842. BÖHLER K460 offers the advantage of simple heat treatment with low hardening temperatures and single tempering. However, this characteristic tempering behaviour limits the use of advanced coatings. The material has a good hardening response, but only moderate through hardenability. BÖHLER K460 is used for punching and cutting tools, plastic molds, thread cutting tools and machine knives in the wood, paper and recycling industries.

Process Melting

Airmelted

Properties

- Toughness & Ductility : high
- Wear Resistance : good
- Compressive strength : very high
- Dimensional stability : good
- Grindability : high

Applications

- Cold Forming
- Tool Holders (milling, drilling, turning & chucks)
- Components for the recycling industry
- Fine Blanking, Stamping, Blanking
- Machine knife (for producers)
- Packaging industry
- Standard Parts (Moulds, Plates, Pins, Punches)
- Industrial Knives

Technical data

Material designation	
1.2510	SEL
100MnCrW4	EN
T31501	UNS
O1	AISI
~SKS3	JIS

Standards	
4957	EN ISO
A681	ASTM

Chemical composition (wt. %)

C	Si	Mn	Cr	V	W
0.95	0.25	1.10	0.55	0.10	0.55

Material characteristics

	Compressive strength	Dimensional stability during heat treatment	Toughness	Wear resistance abrasive	Wear resistance adhesive
BÖHLER K460	★★★★	★	★★★★	★★	
BÖHLER K245	★★	★	★★★★★	★	
BÖHLER K455	★★★	★	★★★★★	★	
BÖHLER K720	★★	★	★★★★	★	

Delivery condition

Annealed

Hardness (HB)	max. 220

Heat treatment

Annealing

Temperature	710 to 750 °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.

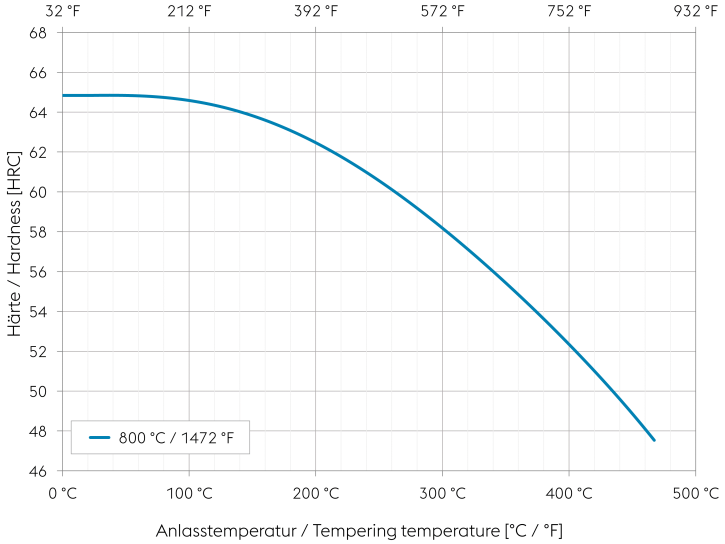
Stress relieving

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.

Hardening and Tempering

Temperature	780 to 820 °C	Quenching: Oil, salt bath (200 to 250 °C | 392 to 482 °F) up to 20 mm (0,787 inch) thickness. || Holding time after temperature equalization: 15 to 30 minutes. || After hardening, tempering to the desired working hardness according to the tempering chart.

Tempering chart



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

Slow heating to tempering temperature immediately after hardening.

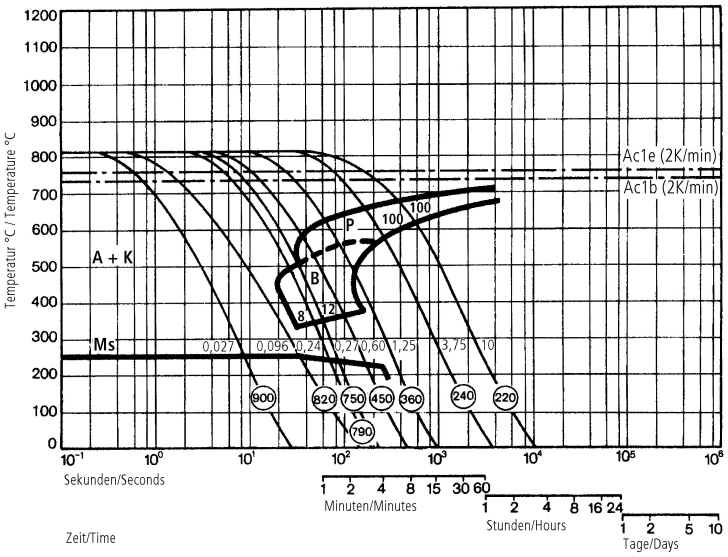
Time in furnace 1 hour for each 20 mm (0,787 inch) of workpiece thickness but at least 2 hours.

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: 810 °C (1490 °F)

Holding time: 15 minutes

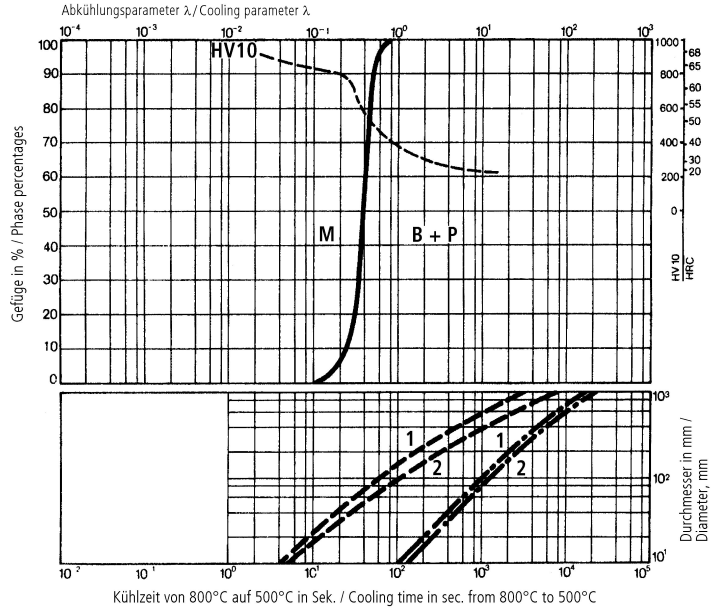
○ Vickers hardness

8...100 phase percentages

0.027...10 cooling parameter λ, i.e. duration of cooling from 800 to 500 °C (1472 to 932 °F) in s x 10^{-2}

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

Quantitative phase diagram

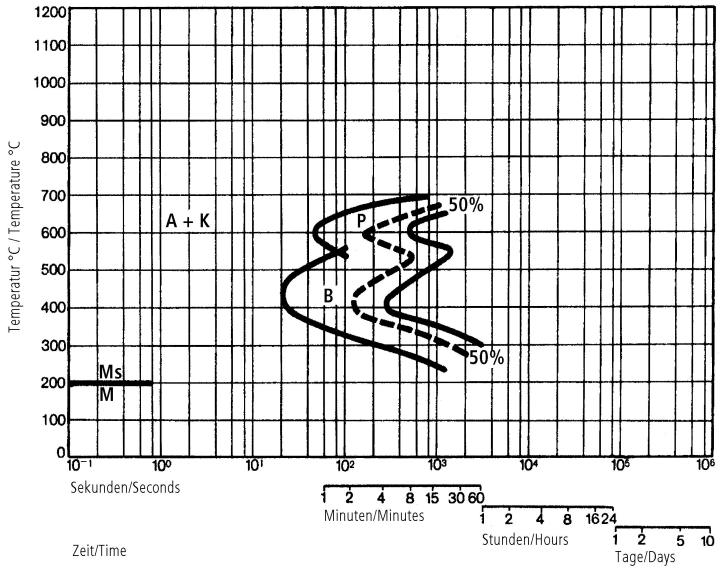


HV10… Vickers Hardness
M... Martensite
B... Bainite
P... Perlite

- - - Oil cooling
- • - Air cooling

1... Edge or face
2... Core

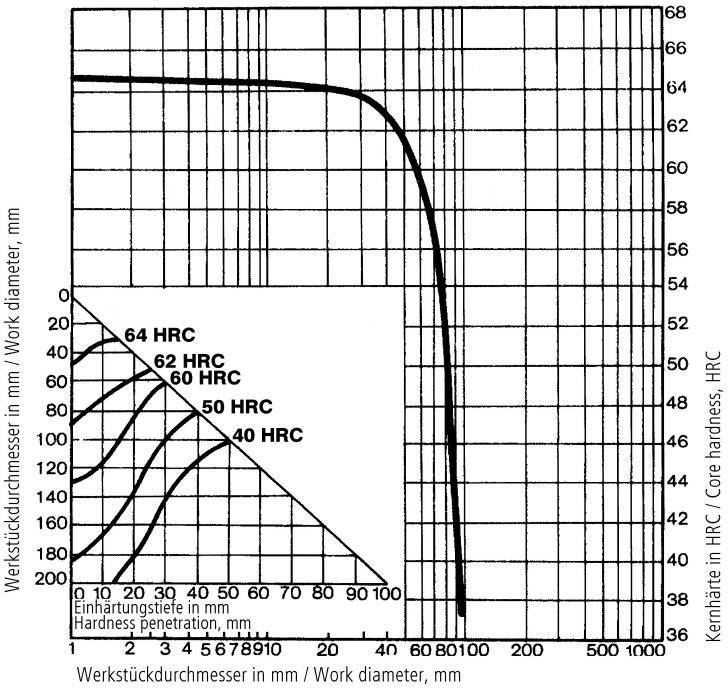
Isothermal TTT curves



Austenitising temperature: 810 °C / 1490 °F
Holding time: 15 minutes

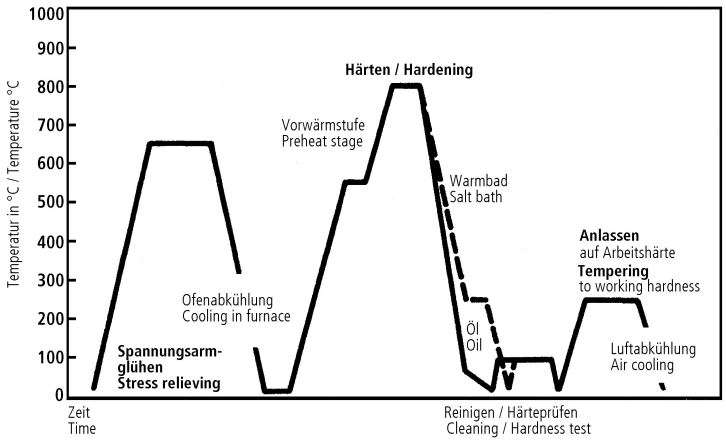
A… Austenite
K… Carbide
P… Perlite
B... Bainite
M… Martensite
Ms… Martensite starting temperature

Influence of work diameter on core hardness and hardness penetration



Quenched from: 800 °C / 1472 °F
Agent: Oil

Heat treatment sequence



Physical Properties

Temperature (°C)	**20**
Density (kg/dm³)	7.85
Thermal conductivity (W/(m.K))	30
Specific heat (kJ/kg K)	0.46
Spec. electrical resistance (Ohm.mm²/m)	0.35
Modulus of elasticity (10³N/mm²)	210

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

Temperature (°C)	100	200	300	400	500
Thermal expansion (10^{-6} m/(m.K))	11.5	12	12.2	12.5	12.8

voestalpine BÖHLER Edelstahl GmbH & Co KG
Mariazeller Straße 25
8605 Kapfenberg, AT
T. +43/50304/20-0
E. info@bohler-edelstahl.at
https://www.voestalpine.com/bohler-edelstahl/de/

voestalpine
ONE STEP AHEAD.