

# 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 K245 corresponds to the material 1.2101 (62SiMnCr4). This cold work tool steel is essentially a spring steel optimized for cold work, with very good toughness and spring properties. BÖHLER K245 offers the advantage of simple heat treatment with very low hardening temperatures and single tempering. However, this characteristic tempering behaviour limits the use of advanced coatings. BÖHLER K245 is especially suitable for thin-walled tools such as screwdrivers, hole punches, center punches, ejector pins, punches and cutting tools.

#### **Process Melting**

Airmelted

#### **Properties**

- > Toughness & Ductility : very high
- > Compressive strength : good
- > Dimensional stability : good
- > Tensile strength / Yield strength : high

## Applications

> Cold Forming

- Standard Parts (Molds, Plates, Pins, Punches) > Components for the recycling industry

> General Components for Mechanical Engineering

#### **Technical data**

Material designation	
1.2101	SEL
62SiMnCr4	EN





# Chemical composition (wt. %)

С	Si	Mn	Cr
0.63	1.10	1.10	0.60

# **Material characteristics**

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

# **Delivery condition**

Annealed	
Hardness (HB)	max. 235

## 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.
Stross relieving		
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 T	empering	
Temperature	830 to 860 °C	Quenching: Oil, salt bath (for small sizes).    Holding time after temperature equalization: 15 to 30 minutes.    After hardening, tempering to the desired working hardness according to the

Temperature	830 to 860 °C	Quenching: Oil, salt bath (for small sizes).    Holding time after temperature equalization 30 minutes.    After hardening, tempering to the desired working hardness according to 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.

1. Tempering at 200 to 250 °C (392 to 482 °F) to working hardness

2. Partial tempering at 500 to 550 °C (932 to 1022 °F) to spring hardness

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

Slow cooling to room temperature after each tempering step is recommended.

#### Continuous cooling CCT curves



Austenitising temperature: 845 °C / 1553 °F

Holding time: 15 minutes

O Vickers hardness

2...100 phase percentages

0.42...14.6 cooling parameter  $\lambda,$  i.e. duration of cooling from 800 to 500 °C (1472 to 932 °F) in s x  $10^{-2}$ 

A... Austenite P... Perlite B...Bainite

M... Martensite Ms... Martensite starting temperature

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# Quantitative phase diagram



Kühlzeit von 800°C auf 500°C in Sekunden / Time of cooling from 800°C to 500°C in seconds

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

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

## Heat treatment sequence



# **Physical Properties**

Temperature (°C)	20
Density (kg/dm³)	7.7
Thermal conductivity (W/(m.K))	30
Specific heat (kJ/kg K)	0.46
Spec. electrical resistance (Ohm.mm²/m)	0.35
Modulus of elasticity (10 <sup>3</sup> N/mm <sup>2</sup> )	210





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

Temperature (°C)	100	200	300	400	500
Thermal expansion ( $10^{-6}$ m/(m.K))	12.4	12.1	12.6	12.8	13

If other available product variants are listed in addition to long products, please note that these may differ in terms of melting process, technical data, delivery and surface condition as well as available product dimensions. For mandatory technical specifications, other requirements and dimensions, please contact our regional voestalpine BÖHLER sales companies. The data contained in this brochure is merely for general information and therefore shall not be binding on the company. We may be bound only through a contract explicitly stipulating such data as binding. Measurement data are laboratory values and can deviate from practical analyses. The manufacture of our products does not involve the use of substances detrimental to health or to the ozone layer.

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