

# COLD WORK TOOL STEELS

## Application Segments

Cold Work

## 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 K497 MICROCLEAN is a cold work tool steel manufactured using powder metallurgy and belongs to the group of 9% vanadium steels. The high carbide content makes this steel highly resistant to wear. It has lower hardness and wear resistance than K294 MICROCLEAN (10% vanadium steel). Nevertheless, this material has better toughness. BÖHLER K497 MICROCLEAN is used in situations where wear resistance is the decisive factor and compressive strength is of secondary importance. This material is not only used in cold work applications, but is also popular at lower hardness levels as a wear resistant alternative in mold making.

## Process Melting

Powder metallurgy

## Properties

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

## Applications

- > Cold Forming
- > Mechanical Engineering
- > Fine Blanking, Stamping, Blanking
- > Components for the recycling industry
- > General Components for Mechanical Engineering

## Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V
1.85	0.85	0.50	5.30	1.30	9.00

Material characteristics

	Compressive strength	Dimensional stability during heat treatment	Toughness	Wear resistance abrasive	Wear resistance adhesive
<b>BÖHLER K497 MICROCLEAN</b>	★★★★★	★★★★★	★★★	★★★★★	★★★★★
<b>BÖHLER K100</b>	★★	★★	★	★★★	★★
<b>BÖHLER K105</b>	★★	★★	★	★★	★★
<b>BÖHLER K107</b>	★★	★★	★	★★★	★★
<b>BÖHLER K110</b>	★★	★★★	★	★★★	★★
<b>BÖHLER K190 MICROCLEAN</b>	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
<b>BÖHLER K294 MICROCLEAN</b>	★★★★★	★★★★★	★★★	★★★★★	★★★★★
<b>BÖHLER K340 ECOSTAR</b>	★★★	★★★	★★	★★	★★
<b>BÖHLER K340 ISODUR</b>	★★★	★★★★★	★★★	★★★	★★★★★
<b>BÖHLER K346</b>	★★★	★★★	★★★	★★★★★	★★
<b>BÖHLER K353</b>	★★	★★★	★★	★★	★★
<b>BÖHLER K360 ISODUR</b>	★★★	★★★★★	★★★	★★★★★	★★★★★
<b>BÖHLER K390 MICROCLEAN</b>	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
<b>BÖHLER K490 MICROCLEAN</b>	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
<b>BÖHLER K888 MATRIX</b>	★★★★★	★★★★★	★★★★★	★★	★★
<b>BÖHLER K890 MICROCLEAN</b>	★★★★★	★★★★★	★★★★★	★★★	★★★

Delivery condition

Annealed	
Hardness (HB)	max. 277

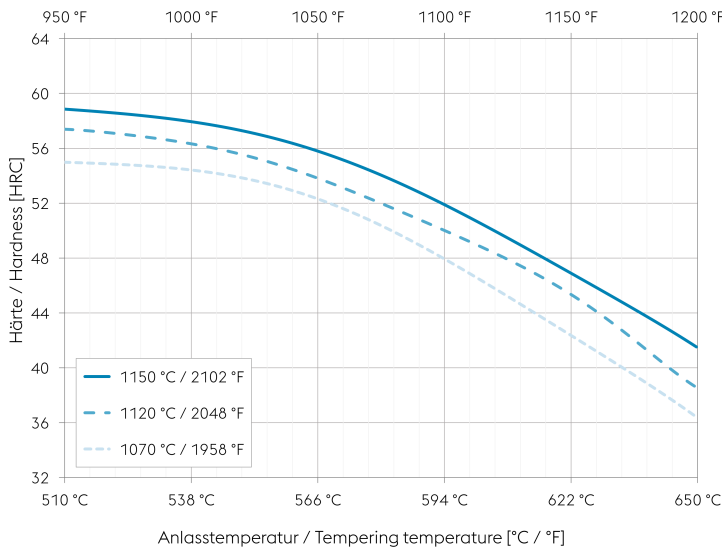
Heat treatment

Soft annealing		
Temperature	870 to 900 °C	Protect steel from scaling and/or decarburization.    Neutral atmosphere    Slow controlled cooling in furnace at a rate of 18 to 36 °F/hr (10 to 20 °C/hr) down to approx. 1000 °F (540 °C)    Further cooling in furnace or air to room temperature.

Stress relieving		
Temperature	595 to 700 °C	After through heating, hold in neutral atmosphere for 2 hours.    Slow cooling in furnace to 500 °C (930 °F)    Further cooling in air    Intended to relieve stresses caused by extensive machining or in complex shapes.

Hardening and Tempering		
Temperature	1,040 to 1,150 °C	Preheating: To minimize distortion during heating for hardening, two preheat steps are recommended. First preheat at 1200 °F (650 °C) and equalize. Second preheat at 1500-1550 °F (820-840 °C) and equalize.    Quenching: gas (N <sub>2</sub>   recommended), salt bath (200 to 250 °C or 500 to 550 °C   392 to 482 °F or 932 to 1022 °F), compressed air.    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.

It is recommended to temper at least three times above the secondary hardness maximum.

Cooling in air to room temperature after each tempering step is recommended.

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

### Physical Properties

<b>Temperature (°C)</b>	<b>20</b>
Density (kg/dm <sup>3</sup> )	7.4
Thermal conductivity (W/(m.K))	-
Specific heat (kJ/kg K)	-
Spec. electrical resistance (Ohm.mm <sup>2</sup> /m)	-
Modulus of elasticity (10 <sup>3</sup> N/mm <sup>2</sup> )	221

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

Temperature (°C)	100	200	300	400	650
Thermal expansion (10 <sup>-6</sup> m/(m.K))	11.1	11.2	11.3	11.5	11.8

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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