

COLD WORK TOOL STEELS

Application Segments

Cold Work

Available Product Variants

Long Products*

Plates

Open Die Forgings

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

Product Description

BÖHLER K490 MICROCLEAN is a high-performance cold work tool steel with a balanced property profile, manufactured using powder metallurgy. This powder metallurgical tool steel offers an outstanding combination of high wear resistance, compressive strength, toughness and very good machinability. Thanks to the resulting flexibility, BÖHLER K490 MICROCLEAN is used in virtually all cold work applications, and in many cases this material is the first choice for newly developed tools. The commonly used hardening temperatures of BÖHLER K490 MICROCLEAN also enable shared heat treatment with popular cold work tool steels (1.2379, D2), making it very economical in terms of heat treatment.

Process Melting

Powder metallurgy

Properties

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

Applications

- > Machine knife (for producers)
- > Coining
- > Screws and Barrels
- > Rolls
- > Glasfibre reinforced plastics
- > Rolling
- > Fine Blanking, Stamping, Blanking
- > Wear parts
- > Components for the recycling industry
- > Thread rolling
- > Cold Forming
- > Powder Pressing
- > General Components for Mechanical Engineering
- > Pill punching dies

Chemical composition (wt. %)

| C | Cr | Mo | V | W | Nb |
|------|------|------|------|------|----|
| 1.40 | 6.40 | 1.50 | 3.70 | 3.50 | + |

Material characteristics

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

Delivery condition

Annealed

| | |
|---------------|----------|
| Hardness (HB) | max. 280 |
|---------------|----------|

Heat treatment

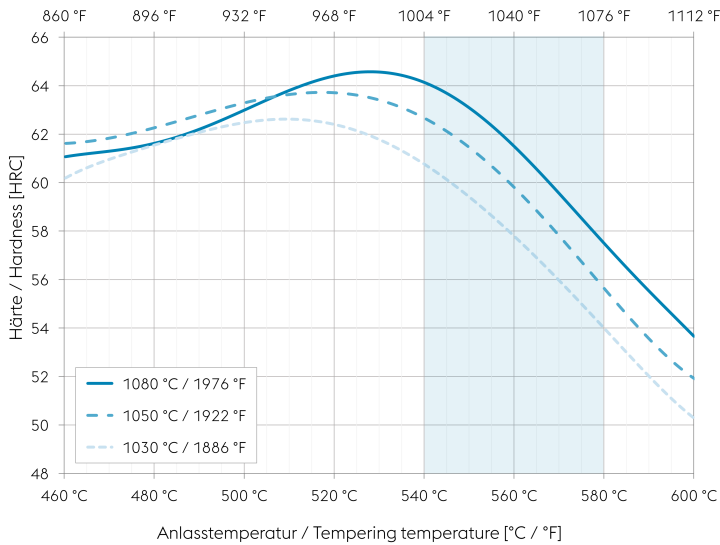
Stress relieving

| | | |
|-------------|---------------|---|
| Temperature | 650 to 700 °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 | 1,030 to 1,080 °C | Quenching: Oil, gas (N ₂). Holding time after temperature equalization: 20 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.

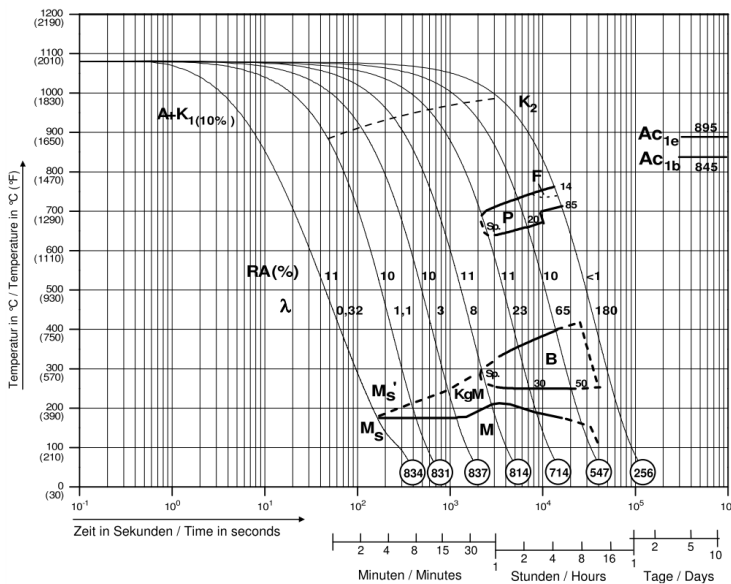
It is recommended to temper at least three times above the secondary hardness maximum.

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.

Recommended tempering temperature range is indicated by the blue area in the chart.

Continuous cooling CCT curves



Austenitising temperature: 1080 °C (1976 °F)
Holding time: 30 minutes

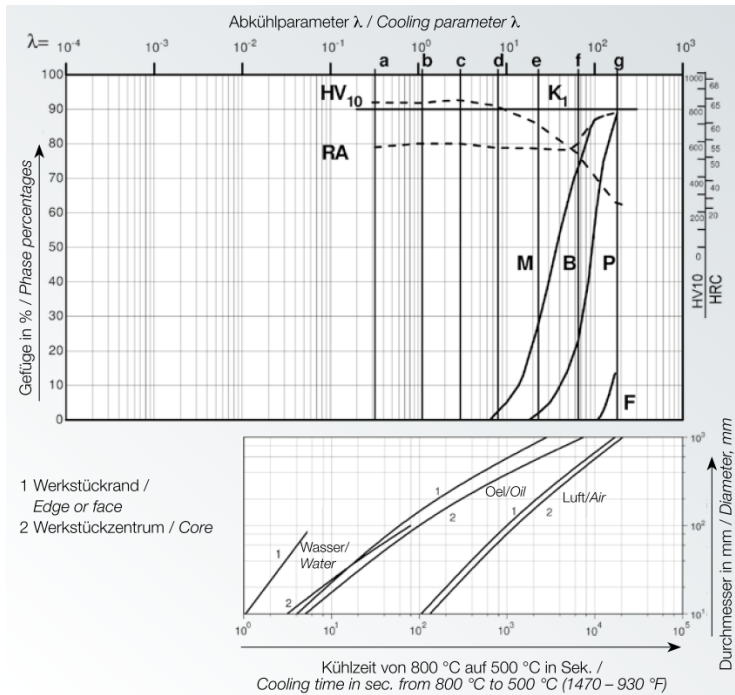
O Vickers hardness

14...85 phase percentages

0.32...180 cooling parameter λ , i.e. duration of cooling from 800 to 500 °C (1472 to 932 °F) in $s \times 10^{-2}$

- A... Austenite
- K... Carbide
- P... Pearlite
- F... Ferrite
- B... Bainite
- M... Martensite
- KgM... Grain boundary martensite
- Ms... Martensite starting temperature

Quantitative phase diagram



HV10... Vickers Hardness
 K... Carbide
 RA... Residual austenite
 M... Martensite
 B... Bainite
 P... Perlite
 F... Ferrite

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

Physical Properties

| | |
|--|------|
| Temperature (°C) | 20 |
| Density (kg/dm ³) | 7.79 |
| Thermal conductivity (W/(m.K)) | 19.6 |
| Specific heat (kJ/kg K) | 0.45 |
| Spec. electrical resistance (Ohm.mm ² /m) | 0.55 |
| Modulus of elasticity (10 ³ N/mm ²) | 223 |

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

| Temperature (°C) | 100 | 200 | 300 | 400 | 500 | 600 | 700 |
|--|------|------|------|------|------|------|------|
| Thermal expansion (10 ⁻⁶ m/(m.K)) | 10.6 | 11.1 | 11.6 | 11.9 | 12.3 | 12.6 | 12.8 |

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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