

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 K890 MICROCLEAR is a high-performance cold work tool steel manufactured using powder metallurgy. It features good toughness, very high compressive strength and excellent fatigue strength. This favorable combination of properties can avoid chipping damages to tools. BÖHLER K890 MICROCLEAR is not only used in cold work applications, but also in mold making.

Process Melting

Powder metallurgy

Properties

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

Applications

- > Machine knife (for producers)
- > Coining
- > General Components for Mechanical Engineering
- > Fine Blanking, Stamping, Blanking
- > Rolling
- > Powder Pressing
- > Components for the recycling industry
- > Cold Forming
- > Wear parts
- > Pill punching dies

Chemical composition (wt. %)

| C | Si | Mn | Cr | Mo | V | W | Co |
|------|------|------|------|------|------|------|------|
| 0.85 | 0.55 | 0.40 | 4.35 | 2.80 | 2.10 | 2.55 | 4.50 |

Material characteristics

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

Delivery condition

Annealed

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

Heat treatment

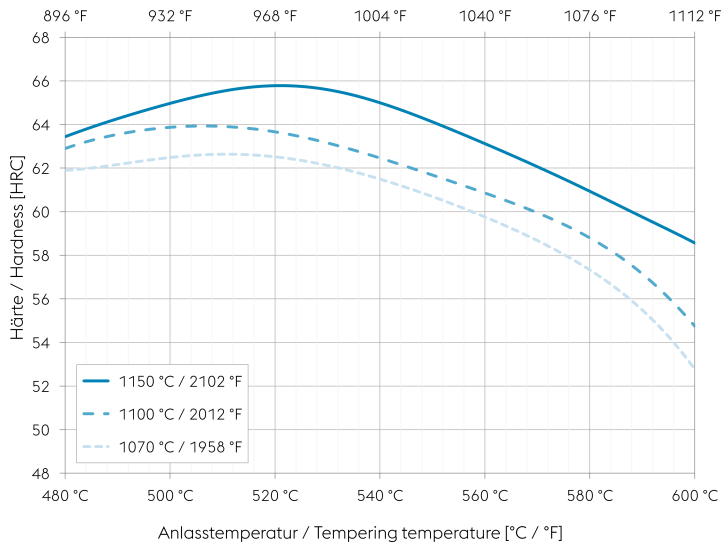
Stress relieving

| | | |
|-------------|---------------|---|
| 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. |
|-------------|---------------|---|

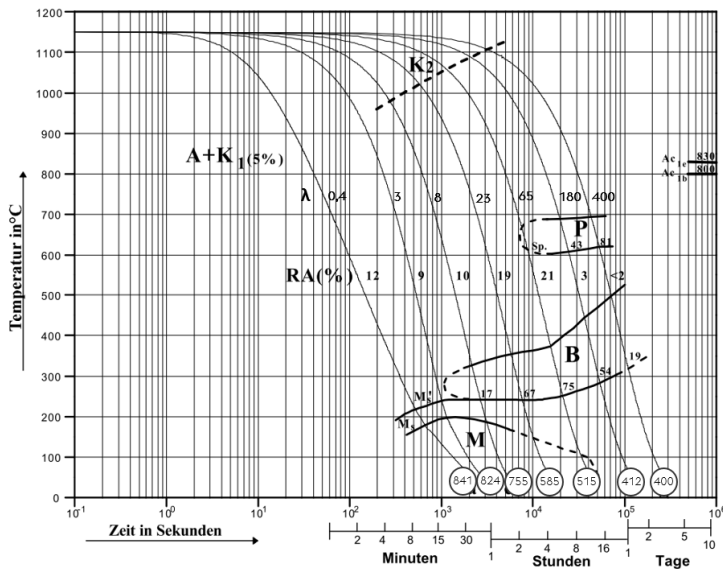
Hardening and Tempering

| | | |
|-------------|-------------------|---|
| Temperature | 1,070 to 1,150 °C | Quenching: Oil, gas (N ₂) Holding time after temperature equalization: 20-30 minutes (hardening temperature 1070 to 1100 °C 1958 to 2012 °F) or 6 minutes (hardening temperature 1150 °C (2102 °F) After hardening, tempering to the desired working hardness according to the tempering chart. |
|-------------|-------------------|---|

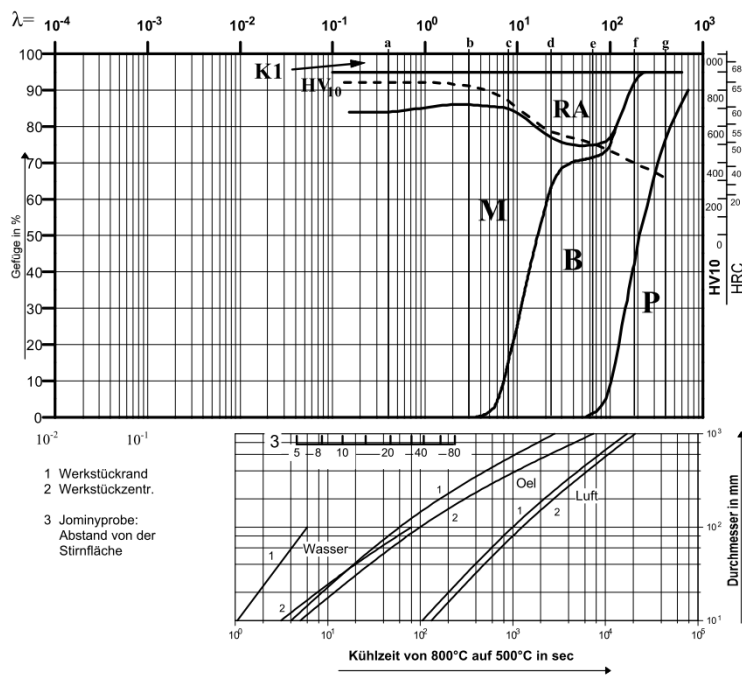
Tempering chart



Continuous cooling CCT curves



Quantitative phase diagram



HV10... Vickers Hardness

K... Carbide

RA... Residual austenite

M... Martensite

B... Bainite

P... Pearlite

1... Edge or face

2... Core

3... Jominy test: distance from quenched face

Physical Properties

| | |
|--|------|
| Temperature (°C) | 20 |
| Density (kg/dm ³) | 7.85 |
| Thermal conductivity (W/(m.K)) | 22.5 |
| Specific heat (kJ/kg K) | 0.45 |
| Spec. electrical resistance (Ohm.mm ² /m) | 0.5 |
| Modulus of elasticity (10 ³ N/mm ²) | 218 |

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

| | | | | | | | |
|--|------|-----|------|------|------|------|------|
| Temperature (°C) | 100 | 200 | 300 | 400 | 500 | 600 | 700 |
| Thermal expansion (10 ⁻⁶ m/(m.K)) | 10.5 | 11 | 11.3 | 11.7 | 12.1 | 12.4 | 12.9 |

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.