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 K390 MICROCLEAN is a high-alloyed, high-performance cold work tool steel manufactured using powder metallurgy. This material has the highest alloy content in the group of cold work tool steels with high vanadium content. The high alloy content gives this material outstanding wear resistance. At the same time, the powder metallurgical manufacturing process creates a uniform matrix with finely distributed primary carbides. Among other things, this leads to good material toughness. BÖHLER K390 MICROCLEAN is a problem solver for applications requiring extremely high wear resistance and compressive strength.

Process Melting

Powder metallurgy

Properties

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

Applications

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

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V	W	Co
2.47	0.55	0.40	4.20	3.80	9.00	1.00	2.00

Material characteristics

	Compressive strength	Dimensional stability during heat treatment	Toughness	Wear resistance abrasive	Wear resistance adhesive
BÖHLER K390 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 K490 MICROCLEAN	★★★★	★★★★★	★★★★	★★★★	★★★★
BÖHLER K497 MICROCLEAN	★★★★★	★★★★★	★★★	★★★★★	★★★★★
BÖHLER K888 MATRIX	★★★★	★★★★★	★★★★★	★★	★★
BÖHLER K890 MICROCLEAN	★★★★	★★★★★	★★★★★	★★★	★★★

Delivery condition

Annealed

Hardness (HB)	max. 280

Heat treatment

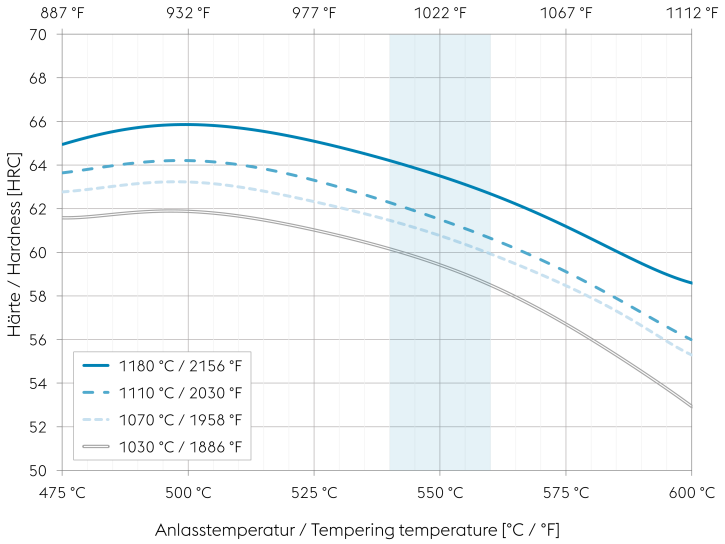
Stress relieving

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 1,180 °C	Quenching: Oil, gas (N_2). || Holding time after temperature equalization: 20 to 30 minutes (hardening temperature 1030 - 1150 °C | 1886 - 2102 °F) and 10 min (hardening temperature 1180 °C | 2156 °F) || Low hardening temperature for high toughness. High hardening temperature for high wear resistance. || 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.

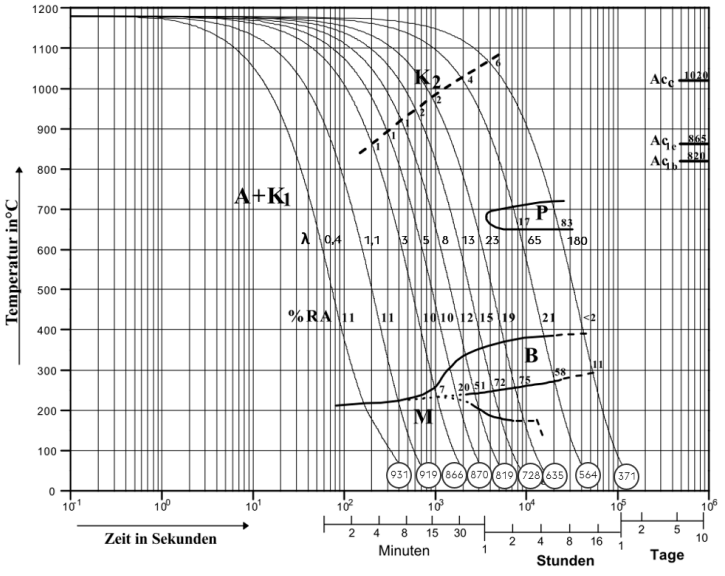
It is recommended to temper at least three times above the secondary hardness maximum.

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: 1180 °C (2155 °F)
Holding time: 5 minutes

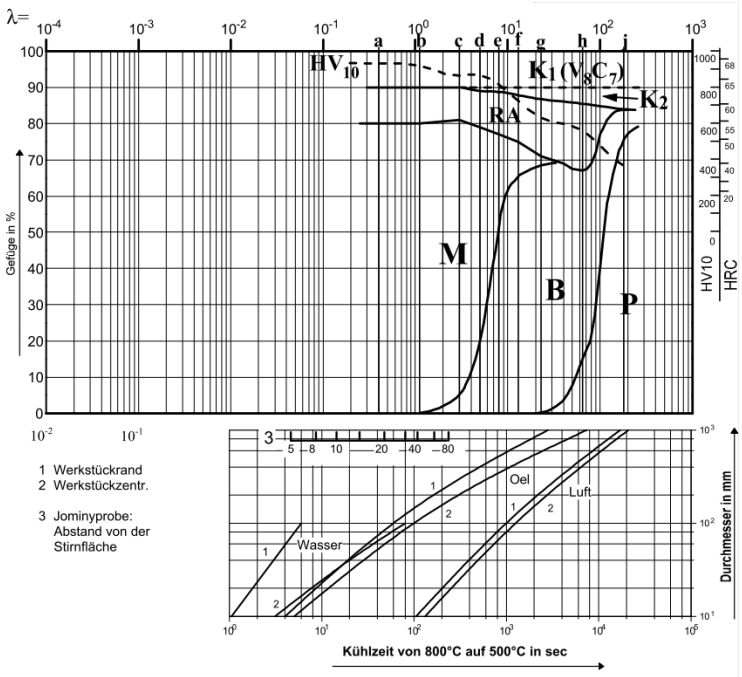
○ Vickers hardness

1...83 phase percentages

0.4...180 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

Quantitative phase diagram



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

1... Edge or face
2... Core
3... Jominy test: distance from the quenched end

Physical Properties

Temperature (°C)	**20**
Density (kg/dm³)	7.6
Thermal conductivity (W/(m.K))	21.5
Specific heat (kJ/kg K)	0.464
Spec. electrical resistance (Ohm.mm²/m)	0.59
Modulus of elasticity (10³N/mm²)	220

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

Temperature (°C)	**100**	**200**	**300**	**400**	**500**	**600**
Thermal expansion (10^{-6} m/(m.K))	10.3	10.67	11.03	11.38	11.7	11.97

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ONE STEP AHEAD.