

# COLD WORK STEELS

## Available Product Shapes

Flat Bar	Ground Flat	Long Products	Open Die Forgings	Plates
Round Bar	Round Ground Bar			

## Product Description

Just as mountaineers need the best equipment to conquer the highest peaks, it's essential to use the best materials for your tooling to ensure trouble-free production and achieve outstanding tool life.

### Three reasons why BÖHLER K390 MICROCLEAN is highly cost effective:

Extremely high wear resistance, excellent toughness and very high compressive strength. The high-performance powder-metallurgy steel BÖHLER K390 MICROCLEAN is a reliable solution for your difficult cutting, die-cutting and cold forming operations, and it has a very good track record for applications in the plastics industry.

## Properties

Benefits for tool & die production in comparison to 10V PM

- Good machinability because of uniform mechanical properties
- Excellent grindability even with deep engraving in the tool & die centre
- Uniform low dimensional change during heat treatment
- Non sensitive against overheating or long soak times
- Optimal EDM characteristic due to uniform carbide distribution

Benefits for tool & die use

- Low unit cost due to longer service life
- Safety against failure and cutting-edge fractures

## Applications

- |                                 |   |   |
|---------------------------------|---|---|
| > Machine knife (for producers) | > Rolling   | > Cold Forming                                  |
| > Coining                       | > Fine Blanking, Stamping, Blanking                     | > Powder Pressing                               |
| > Screws and Barrels            | > Thread rolling  | > General Components for Mechanical Engineering |
| > Rolls                         | > Comps. for Equip. Below Ground (Boring, Shafts, etc.) | > Components for Recycling Industry             |
| > Pill punching dies            |   |   |

## Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V	W	Co
2.47	0.55	0.4	4.2	3.8	9	1	2

## Material characteristics

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

## Delivery condition

Annealed	
Hardness	max. 280 HB

## Heat treatment

Stress relieving		
Temperature (°C   °F)	650   1202 to 700   1292	Once heated completely through, soak in neutral atmosphere at temperature for 1 to 2 hours. Slow cooling in furnace.

Hardening and Tempering		
Temperature (°C   °F)	1030   1886 to 1180   2156	Oil, N <sub>2</sub> . Once heated completely through: • 20 - 30 min (hardening temperature 1030 - 1150 °C) • 10 min (hardening temperature 1180 °C) For high toughness, use a low hardening temperature. For high wear resistance, use a high hardening temperature. After hardening, tempering to the desired working hardness, see tempering chart.

## Physical Properties

<b>Temperature (°C   °F)</b>	<b>20   68</b>
Density (kg/dm <sup>3</sup>   lb/in <sup>3</sup> )	7.6   0.27
Thermal conductivity (W/(m.K)   BTU (IT) ft/hr/ft <sup>2</sup> /F)	21.5   12.42
Specific heat (J/(kg.K)   BTU (IT) lb/F)	464   110.82
Spec. electrical resistance (Ohm.mm <sup>2</sup> /m   10 <sup>-4</sup> Ohm.inch <sup>2</sup> /ft)	0.59   2.79
Modulus of elasticity (10 <sup>3</sup> N/mm <sup>2</sup>   10 <sup>3</sup> ksi)	220   31.91

## Thermal Expansions

<b>Temperature (°C   °F)</b>	<b>100   212</b>	<b>200   392</b>	<b>300   572</b>	<b>400   752</b>	<b>500   932</b>	<b>600   1112</b>
Thermal expansion (10 <sup>-6</sup> m/(m.K)   10 <sup>-6</sup> inch/(inch.F))	10.3   5.722	10.67   5.928	11.03   6.128	11.38   6.322	11.7   6.5	11.97   6.65

For more information see [www.voestalpine.com/boehler-edelstahl](http://www.voestalpine.com/boehler-edelstahl)

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ONE STEP AHEAD.