

HIGH SPEED STEELS

Product Description

BÖHLER S290 MICROCLEAN – "The hard stuff"

The unusual alloy point of this bridge material between carbide and high-speed steel gives it a hardness of up to 70 HRC. In addition to its hot hardness and good wear resistance, its compressive strength is one of the most important properties of this powder-metallurgical high-speed steel class.

Process Melting

Powder metallurgy

Properties

- > Toughness & Ductility: good
- > Wear Resistance: very high
- > Compressive strength: very high
- > Edge Stability: very high
- > Grindability: good
- > Hot Hardness (red hardness): very high

Applications

- > Cold Forming / Coining
- > Powder Pressing
- > Fine Blanking, Stamping, Blanking
- > Special Cutting Tools
- > Gear Cutting, Shaving and Shaping Tools
- > Wear parts

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V	W	Co
2	0.5	0.3	3.8	2.5	5.1	14.3	11

Material characteristics

	Compressive strength	Grindability	Red hardness	Toughness	Wear resistance	Edge Stability
BÖHLER S290 MICROCLEAN®	★★★★★	★	★★★★	★★	★★★★★	★★★★
BÖHLER S200	★★★	★★	★★★	★★	★★★	★★
BÖHLER S390 MICROCLEAN®	★★★★	★★★	★★★★	★★★★	★★★★	★★★★
BÖHLER S400	★★★	★★★	★★★	★★★	★★	★★
BÖHLER S401	★★	★★★	★★	★★★	★★	★★★
BÖHLER S404	★★	★★★	★★	★★★	★★	★★
BÖHLER S500	★★★★	★★★	★★★★	★★	★★★	★★★
BÖHLER S590 MICROCLEAN®	★★★★	★★★	★★★★	★★★	★★★	★★★
BÖHLER S600	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S607	★★★	★★★	★★★	★★	★★★	★★★
BÖHLER S690 MICROCLEAN®	★★★	★★★	★★	★★★★★	★★★	★★
BÖHLER S705	★★★	★★★	★★★★	★★	★★	★★★★
BÖHLER S790 MICROCLEAN®	★★★	★★★	★★	★★★★	★★	★★★

Delivery condition

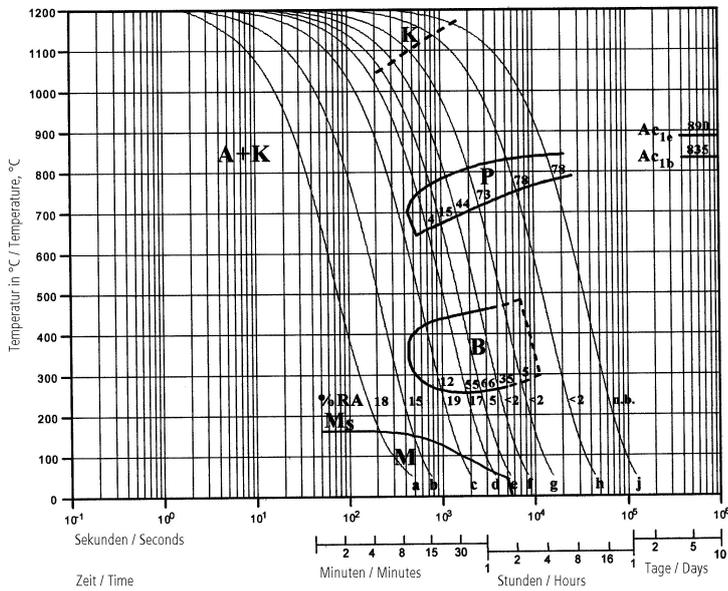
Annealed	
Hardness (HB)	max. 350

Heat treatment

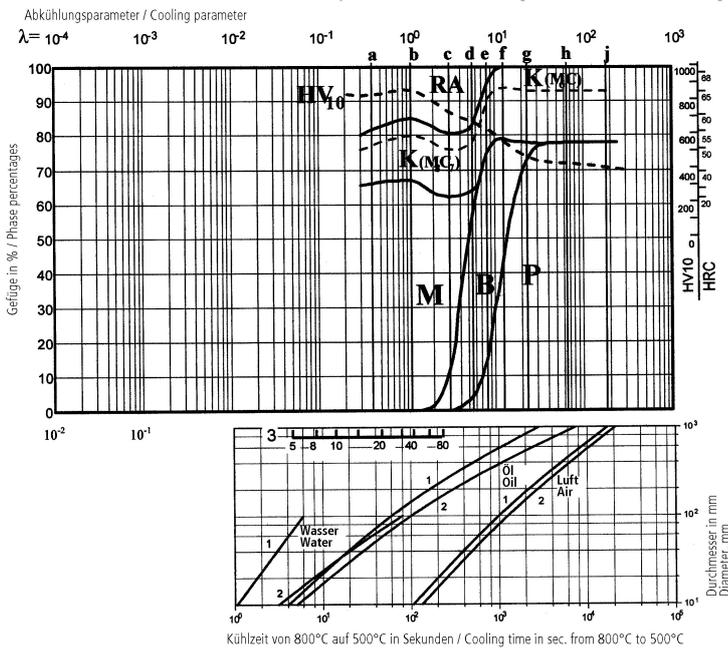
Stress relieving		
Temperature	600 to 650 °C 1112 to 1202 °F	Slow cooling in furnace. To relieve stresses set up by extensive machining or in tools of intricate shape. After through heating, hold in neutral atmosphere for 1 to 2 hours.

Hardening and Tempering		
Temperature	1150 to 1210 °C 2102 to 2210 °F	1150 to 1210°C (2102 to 2210°F), salt bath. 1150 to 1190°C (2102 to 2174°F), gas. Upper temperature range for parts of simple shape, lower for parts of complex shape. For cold working tools also lower temperatures are of importance for higher toughness. Soaking time after heating up the whole section of a workpiece 80 seconds minimum is required for dissolving sufficient carbides. Maximum soaking time 150 seconds to avoid detriments by oversoaking. In practice instead of soaking time the time of exposure from placing the workpiece into the salt bath after preheating until removing (including the stages of heating to the specified surface temperature and of heating to the temperature throughout the whole section) is used. "see immersion time diagrams". Vacuum hardening is also possible. The time in the vacuum furnace depends on the relevant workpiece size and furnace parameters.

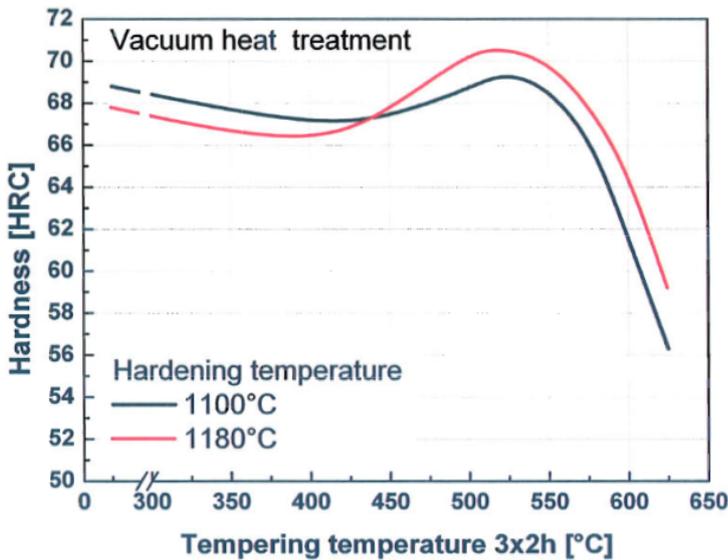
Continuous cooling CCT curves



Quantitative phase diagram



Tempering Chart



Physical Properties

Temperature (°C °F)	20 68
Density (kg/dm ³ lb/in ³)	8.3 0.3
Thermal conductivity (W/(m.K) BTU (IT) ft/hr/ft ² /F)	19 10.98
Specific heat (J/(kg.K) BTU (IT) lb/F)	410 97.93
Spec. electrical resistance (Ohm.mm ² /m 10 ⁻⁴ Ohm.inch ² /ft)	0.56 2.65
Modulus of elasticity (10 ³ N/mm ² 10 ³ ksi)	242 35.1

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

Temperature (°C °F)	100 212	200 392	300 572	400 752	500 932	600 1112	700 1292
Thermal expansion (10 ⁻⁶ m/(m.K) 10 ⁻⁶ inch/(inch.F))	9.6 5.3	10 5.6	10.3 5.7	10.6 5.9	10.9 6.1	11.2 6.2	11.6 6.4

For more information see <https://www.voestalpine.com/bohler-edelstahl/de/>

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ONE STEP AHEAD.