

HIGH SPEED STEELS

Available Product Variants

Long Products	Round Bar	Flat Bar	Plates	Ground Flat
Round Ground Bar				

Product Description

BÖHLER S690 MICROCLEAN – "The simple one"
The tough high-speed steel for challenging machining and cold forming.

Process Melting

Powder metallurgy

Properties

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

Applications

- > Automotive Racing
- > End Mills
- > Special Cutting Tools
- > Broaches and Reamers
- > Fine Blanking, Stamping, Blanking
- > Cold Forming / Coining
- > Powder Pressing

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V	W
1.35	0.6	0.3	4.1	5	4.1	5.9

Material characteristics

	Compressive strength	Grindability	Red hardness	Toughness	Wear resistance	Edge Stability
BÖHLER S690 MICROCLEAN®	★★★	★★★	★★	★★★★★	★★★	★★
BÖHLER S200	★★★	★★	★★★	★★	★★★	★★
BÖHLER S290 MICROCLEAN®	★★★★★	★	★★★★	★★	★★★★★	★★★★
BÖHLER S393 MICROCLEAN®	★★★★	★★★	★★★★	★★★★	★★★★	★★★★
BÖHLER S400	★★★	★★★	★★★	★★★	★★	★★
BÖHLER S401	★★	★★★	★★	★★★	★★	★★★
BÖHLER S404	★★	★★★	★★	★★★	★★	★★
BÖHLER S590 MICROCLEAN®	★★★★	★★★	★★★★	★★★	★★★	★★★
BÖHLER S600	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S607	★★★	★★★	★★★	★★	★★★	★★★
BÖHLER S705	★★★	★★★	★★★★	★★	★★	★★★★
BÖHLER S790 MICROCLEAN®	★★★	★★★	★★	★★★★	★★	★★★

Delivery condition

Annealed

Hardness (HB)	max. 280 drawn execution max. 300 HB
Tensile Strength (N/mm ² ksi)	1,020 148

Heat treatment

Annealing

Temperature	770 to 840 °C 1418 to 1544 °F	Slow cooling in furnace.
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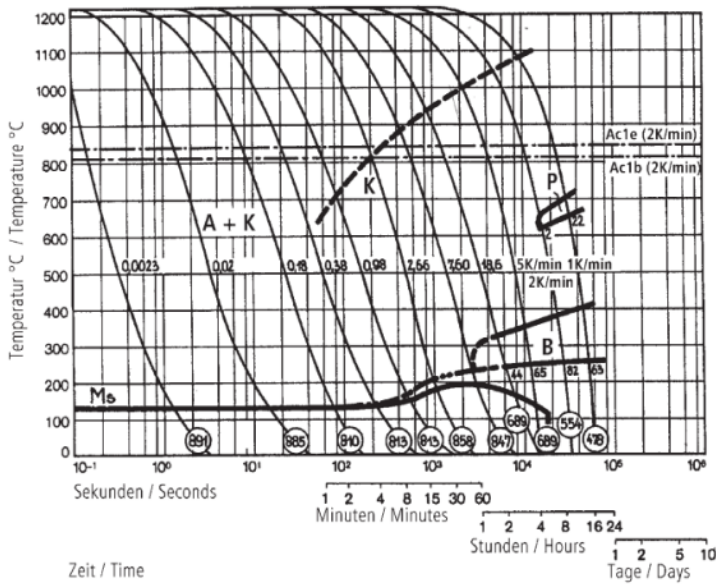
Stress relieving

Temperature	600 to 650 °C 1112 to 1202 °F	Slow cooling 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.
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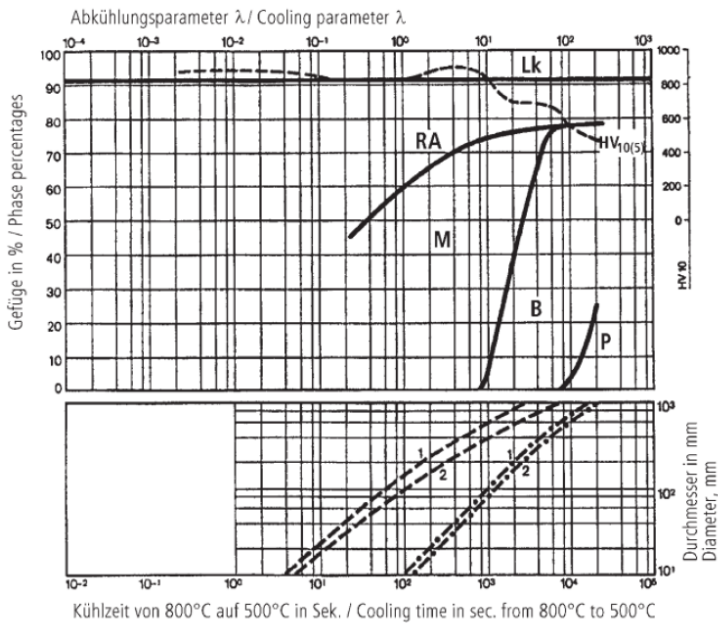
Hardening and Tempering

Temperature	1100 to 1200 °C 2012 to 2192 °F	Oil, air, salt bath (500 - 550°C (930 - 1020°F)), gas.
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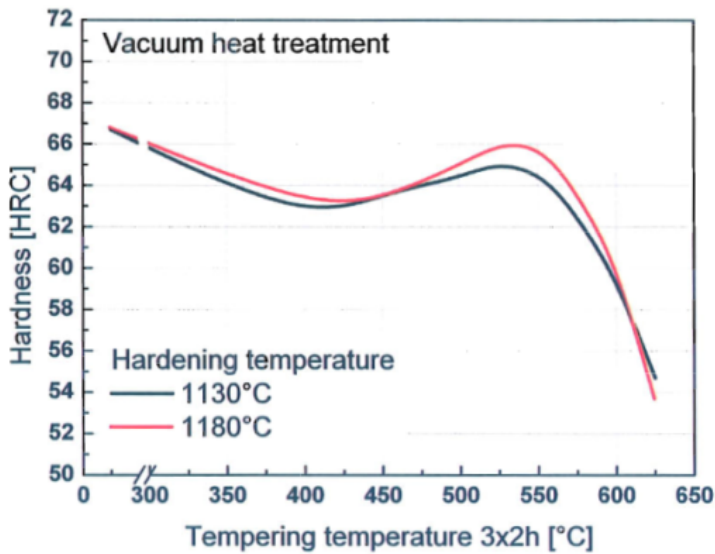
Continuous cooling CCT curves



Quantitative phase diagram



Tempering Chart



Physical Properties

Temperature (°C °F)	20 68
Density (kg/dm ³ lb/in ³)	7.9 0.29
Thermal conductivity (W/(m.K) BTU (IT) ft/hr/ft ² /F)	21 12.13
Specific heat (J/(kg.K) BTU (IT) lb/F)	440 105.09
Spec. electrical resistance (Ohm.mm ² /m 10 ⁻⁴ Ohm.inch ² /ft)	
Modulus of elasticity (10 ³ N/mm ² 10 ³ ksi)	226 32.78

Thermal Expansions

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))	11.5 6.4	11.7 6.5	12.2 6.8	12.4 6.9	12.7 7.1	13 7.2	12.9 7.2

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

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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 ONE STEP AHEAD.