HIGH SPEED STEELS

Application Segments

Cutting Tools

Available Product Variants

Long Products

Product Description

Heavy-duty machining tools
Not only for the machining of steels but also for nonferrous metals such as nickel-base and titanium alloys.
• turning tools
• milling cutters
• woodworking tools
• bimetal strips for saw blades

Tools used under extreme compressive stresses
e. g. precision blanking tools for high-strength materials
• shaping punches
• dies

Process Melting

Powder metallurgy

Properties

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

Applications

- End Mills
- Special Cutting Tools
- Fine Blanking, Stamping, Blanking
- Blades for Sawing Machines
- Gear Cutting, Shaving and Shaping Tools
- Broaches and Reamers

Technical data

Material designation	
~1.3207	SEL
HS10-4-3-10	EN

Chemical composition (wt. %)

C	Cr	Mo	V	W	Co
1.3	4	3.2	3.1	9.3	10

Material characteristics

	Compressive strength	Grindability	Red hardness	Toughness	Wear resistance	Edge Stability
BÖHLER S793 MICROCLEAN	★★★	★★★	★★★★	★★★	★★★	★★★
BÖHLER S290 MICROCLEAN	★★★★★	★	★★★★	★★	★★★★★	★★★★
BÖHLER S390 MICROCLEAN	★★★★	★★★	★★★★	★★★★	★★★★	★★★★
BÖHLER S393 MICROCLEAN	★★★★	★★★	★★★★	★★★★	★★★★	★★★★
BÖHLER S590 MICROCLEAN	★★★★	★★★	★★★★	★★★	★★★	★★★
BÖHLER S690 MICROCLEAN	★★★	★★★	★★	★★★★★	★★★	★★
BÖHLER S790 MICROCLEAN	★★★	★★★	★★	★★★★	★★	★★★
BÖHLER S792 MICROCLEAN	★★★	★★★	★★	★★★★	★★	★★★

Delivery condition

Annealed

Hardness (HB)	max. 300 | drawn max. 320 HB
Tensile Strength (MPa)	max. 1,080

Heat treatment

Annealing

Temperature	870 to 900 °C	4 h, controlled slow cooling in furnace (10 to 20°C/h / (50 to 68°F/h)) to 740°C/2h (1364°F/2 h) cooling in furnace,

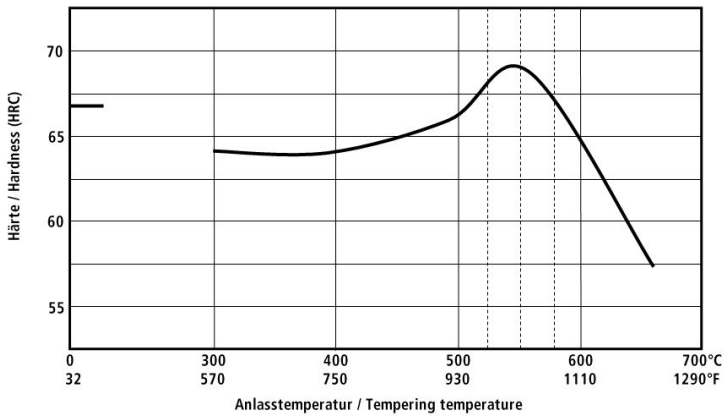
Stress relieving

Temperature	600 to 650 °C	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	1,220 to 1,240 °C	Salt bath, vacuum Preheating: 1st stage ~ 500 °C, 2nd stage ~ 850 °C, 3rd stage ~1050 °C Austenitising: 1220 - 1240 °C, holding time after complete heating 80 seconds, maximum 150 seconds, to avoid material damage due to overheating. Quenching: oil, warm bath (500 - 550 °C), gas
Temperature	550 to 570 °C	Slow heating to tempering temperature immediately after austenitising. Dwell time in the furnace 1 hour per 20 mm material thickness (at least 1 hour) Slow cooling to room temperature between each tempering step 3 tempering cycles recommended Hardness see tempering chart

Tempering Chart



Hardening temperature: 1230°C (2246°F)

Physical Properties

Temperature (°C)	20
Density (kg/dm^3)	8.3
Thermal conductivity (W/(m.K))	19
Specific heat (kJ/kg K)	0.46
Spec. electrical resistance (Ohm.mm^2/m)	0.8
Modulus of elasticity (10^{3}N/mm^2)	217

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

Temperature (°C)	100	200	300	400	500	600	700
Thermal expansion (10^{-6} m/(m.K))	9.6	10	10.1	10.3	10.5	10.7	10.7

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.

voestalpine BÖHLER Edelstahl GmbH & Co KG
Mariazeller Straße 25
8605 Kapfenberg, AT
T. +43/50304/20-0
E. info@bohler-edelstahl.at
https://www.voestalpine.com/bohler-edelstahl/de/

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ONE STEP AHEAD.