

# HIGH SPEED STEELS

## Application Segments

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Cutting Tools

## Available Product Variants

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Long Products

## Product Description

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### **BÖHLER S601 – "The high-speed steel"**

Ideal for mills, spiral bits, and taps, broaches, cold-work tools. BÖHLER S601 is the most commonly used high-speed steel and is the starting material for our customers who deal with high-speed steel.

## Process Melting

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Airmelted

## Properties

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

## Applications

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- > Blades for Sawing Machines
- > Powder Pressing
- > Wear parts
- > Cold Forming / Coining
- > Rolling
- > Fine Blanking, Stamping, Blanking
- > Shearing / Machine Knives

## Technical data

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Material designation		Standards	
1.3339	SEL	4957	EN ISO
HS6-5-2	EN	G4403	JIS
M2	AISI		
SKH51	JIS		

**Chemical composition (wt. %)**

C	Si	Mn	Cr	Mo	V	W
0.85	0.35	0.25	4.1	5	1.9	6.4

**Material characteristics**

	Compressive strength	Grindability	Red hardness	Toughness	Wear resistance	Edge Stability
BÖHLER S601	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S200	★★★	★★	★★★	★★	★★★	★★
BÖHLER S400	★★★	★★★	★★★	★★★	★★	★★
BÖHLER S401	★★	★★★	★★	★★★	★★	★★★
BÖHLER S404	★★	★★★	★★	★★★	★★	★★
BÖHLER S430	★★	★★★	★★	★★★	★★	★★
BÖHLER S500	★★★★	★★★	★★★★	★★	★★★	★★★
BÖHLER S600	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S607	★★★	★★★	★★★	★★	★★★	★★★
BÖHLER S630	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S705	★★★	★★★	★★★★	★★	★★	★★★★
BÖHLER S730	★★★	★★★	★★★★	★★	★★	★★★★

**Delivery condition**

**Annealed**

Hardness (HB)	max. 280
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**Heat treatment**

**Annealing**

Temperature	770 to 840 °C	Controlled slow cooling in furnace (10 - 20°C / h (50 - 68°F / h)) to approx. 600°C (1110°F), air cooling.
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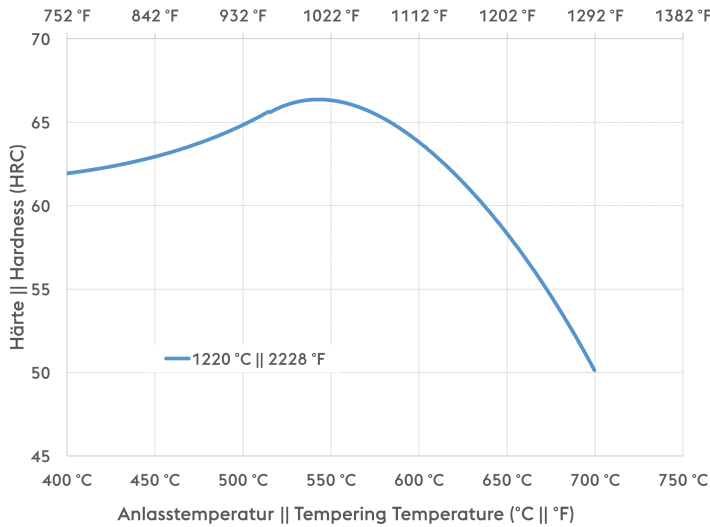
**Stress relieving**

Temperature	600 to 650 °C	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	1,190 to 1,230 °C	Salt bath, vacuum    Preheating: 1st stage ~ 500 °C, 2nd stage ~ 850 °C, 3rd stage ~1050 °C    Austenitising: 1190 - 1230 °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    3 tempering cycles recommended    Hardness see tempering chart

### Tempering Chart



Hardening temperature: 1220°C (2228°F)

Holding time 3 x 2 hours  
Specimen size: square 25 mm

### Physical Properties

Temperature (°C)	20
Density (kg/dm <sup>3</sup> )	8.1
Thermal conductivity (W/(m.K))	19
Specific heat (kJ/kg K)	0.46
Spec. electrical resistance (Ohm.mm <sup>2</sup> /m)	0.54
Modulus of elasticity (10 <sup>3</sup> N/mm <sup>2</sup> )	217

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

Temperature (°C)	100	200	300	400	500	600	700
Thermal expansion (10 <sup>-6</sup> m/(m.K))	11.5	11.7	12.2	12.4	12.7	13	12.9

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@boehler-edelstahl.at  
<https://www.voestalpine.com/boehler-edelstahl/de/>

ONE STEP AHEAD.