HIGH SPEED STEELS

Application Segments

Cutting Tools

Available Product Variants

Long Products

Product Description

The cost-effectiveness of high speed steels is strongly dependent on their alloy components. Strong fluctuations in the raw materials market and resulting price variations have compelled voestalpine BÖHLER Edelstahl to rethink the basic alloy concepts of the high speed steels in our product portfolio. The result is the patented BÖHLER S730 material, which is an economical alternative to the generally applicable standard sort 1.3243 or M35 (BÖHLER S705). Despite its economic advantage, BÖHLER S730 is fully equivalent to the standard 1.3243 in terms of performance.

Process Melting

Airmelted

Properties

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

Applications

- Broaches and Reamers
- Twist Drills and Taps
- End Mills
- Special Cutting Tools
- Gear Cutting, Shaving and Shaping Tools
- Blades for Sawing Machines

Technical data

Material designation	
1.3230	SEL
HS-4-4-2-5 Al	EN

Chemical composition (wt. %)

C	Cr	Mo	V	W	Co	Al
0.95	4.1	4.15	1.95	4.25	4.75	+

Material characteristics

	Compressive strength	Grindability	Red hardness	Toughness	Wear resistance	Edge Stability
BÖHLER S730	★★★	★★★	★★★★	★★	★★	★★★★
BÖHLER S400	★★★	★★★	★★★	★★★	★★	★★
BÖHLER S401	★★	★★★	★★	★★★	★★	★★★
BÖHLER S404	★★	★★★	★★	★★★	★★	★★
BÖHLER S405	★★★	★★★	★★	★★★	★★	★★
BÖHLER S430	★★	★★★	★★	★★★	★★	★★
BÖHLER S500	★★★★	★★★	★★★★	★★	★★★	★★★
BÖHLER S600	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S601	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S607	★★★	★★★	★★★	★★	★★★	★★★
BÖHLER S630	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S705	★★★	★★★	★★★★	★★	★★	★★★★

Delivery condition

Annealed

Hardness (HB)	max. 280 | Drawn max 290 HB
Tensile Strength (N/mm²)	max. 980

Heat treatment

Annealing

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

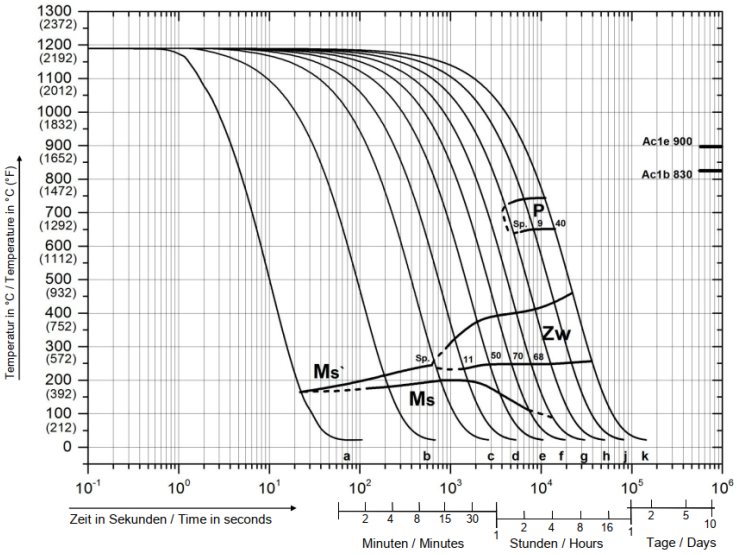
Stress relieving

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, maintain a neutral atmosphere for 1-2 hours.

Hardening and Tempering

Temperature	1,150 to 1,190 °C	Salt bath, vacuum || Preheating: 1st stage ~ 500 °C, 2nd stage ~ 850 °C, 3rd stage ~1050 °C (for higher austenitising temperature) || Austenitising: for cutting applications at higher austenitising temperatures (>1130 °C), holding time after complete heating 80 seconds, maximum 150 seconds, to avoid material damage due to overtime. || Austenitising: for cold work applications at lower austenitising temperatures (<1100°C). Holding time after complete heating 15 to 30 min || Quenching: oil, warm bath (500 - 550 °C), gas.
Temperature	520 to 560 °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 temperature depending on Austenitising temperature

Continuous cooling CCT curves

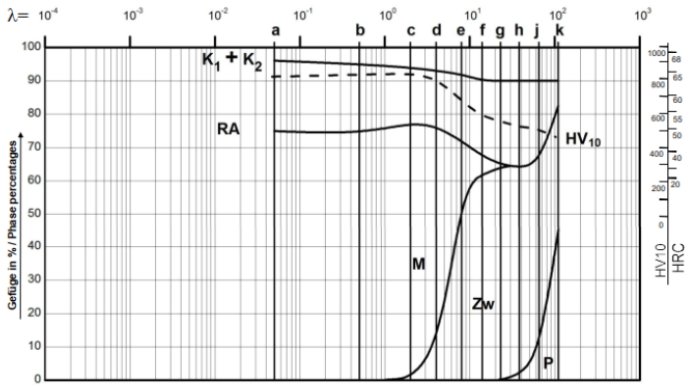


Austenitising temperature: 1190°C (2174°F)
Holding time: 180 seconds

A....Austenite
Zw....Bainite
P....Perlite
M....Martensite

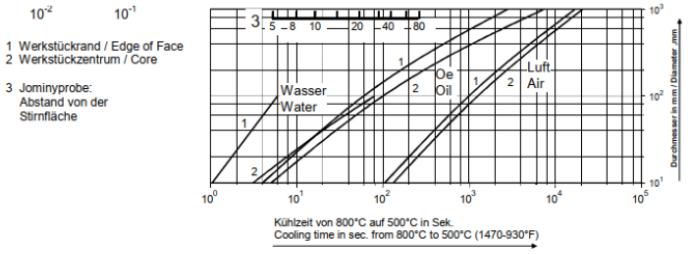
Sample	λ	HV10	Sample	λ	HV10
a	0,05	812	f	14,0	585
b	0,5	830	g	23,0	555
c	2,0	845	h	38,0	520
d	4,0	820	j	65,0	510
e	8,0	690	k	110,0	460

Quantitative phase diagram

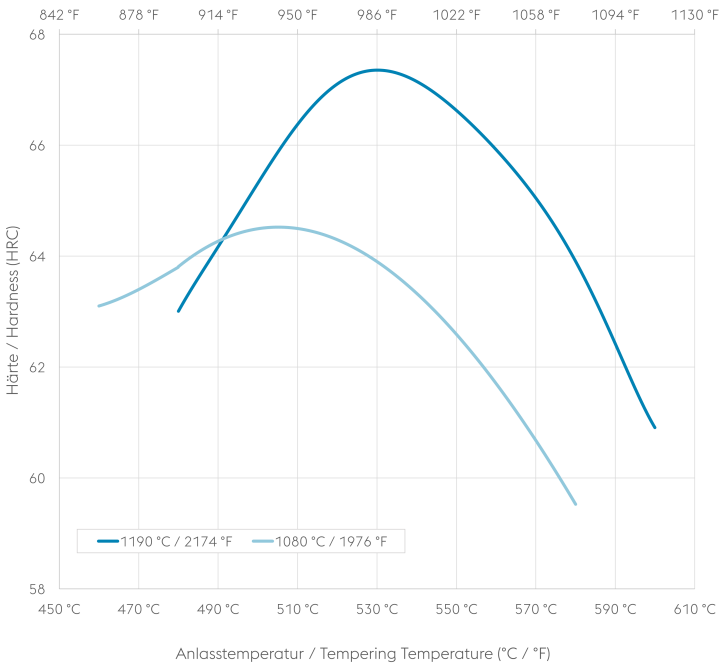


A....Austenite
Zw....Bainite
K....Carbide
P....Perlite
M....Martensite
RA...Retained Austenite

1....Edge or Face
2....Core
3....Jominy test: distance from quenched end



Tempering Chart



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

Physical Properties

Temperature (°C)	**20**
Density (kg/dm³)	7.93
Thermal conductivity (W/(m.K))	19
Specific heat (kJ/kg K)	0.43
Spec. electrical resistance (Ohm.mm²/m)	0.57
Modulus of elasticity (10³N/mm²)	218

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ONE STEP AHEAD.