HIGH SPEED STEELS

Application Segments

Cutting Tools

Product Description

S130 “The HSS-Light”

This new generation of high-speed steel combines reduced alloying with enhanced performance in machining and beyond.

Process Melting

Airmelted

Properties

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

Applications

- Twist Drills and Taps

Technical data

Material designation	
HS 1-1-1 Al	Market grade
1.3320	SEL

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V	W	Al
0.7	0.8	0.3	5	1	1	1	+

Material characteristics

	Compressive strength	Grindability	Red hardness	Toughness	Wear resistance	Edge Stability
BÖHLER S130	★	★★★★	★	★★★★	★	★
BÖHLER S404	★★	★★★	★★	★★★	★★	★★
BÖHLER S430	★★	★★★	★★	★★★	★★	★★
BÖHLER S401	★★	★★★	★★	★★★	★★	★★★
BÖHLER S500	★★★★	★★★	★★★★	★★	★★★	★★★
BÖHLER S600	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S630	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S607	★★★	★★★	★★★	★★	★★★	★★★
BÖHLER S705	★★★	★★★	★★★★	★★	★★	★★★★
BÖHLER S730	★★★	★★★	★★★★	★★	★★	★★★★
BÖHLER S200	★★★	★★	★★★	★★	★★★	★★

Delivery condition

Annealed

Hardness (HB)	max. 262
Tensile Strength (MPa)	max. 890

Heat treatment

Annealing

Temperature	770 to 840 °C	Controlled slow cooling in furnace (10 - 20°C / h / (50 - 68°F 7 h) to approx. 600°C (1110°F), air cooling.

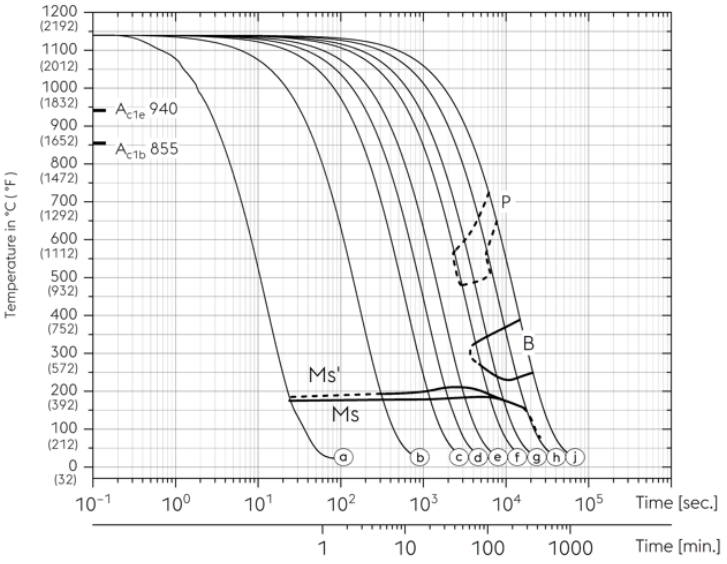
Stress relieving

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.

Hardening and Tempering

Temperature	1,080 to 1,180 °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 (>1100 °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	530 to 550 °C	Slow heating to tempering temperature immediately after austenitising. || Dwell time in the furnace at least 2 hours || Slow cooling to room temperature after each tempering step|| Tempering behind the secondary hardening peak || 3 tempering cycles recommended || Hardness see tempering chart



Probe | | Sample	λ	Härte | | Hardness (HV10)	Probe | | Sample	λ	Härte | | Hardness (HV10)
a	0,06	770	f	16	775
b	0,8	770	g	23	730
c	3	785	h	40	595
d	5	795	j	65	500
e	8	780			

Austenitising temperature: 1140 °C (2084 °F)

Holding time: 360seconds

◯ Vickers hardness

a ... j cooling parameter λ, i.e. duration of cooling from 800 to 500 °C (1472 to 932 °F) in s x 10^{-2}

A… Austenite

K… Carbide

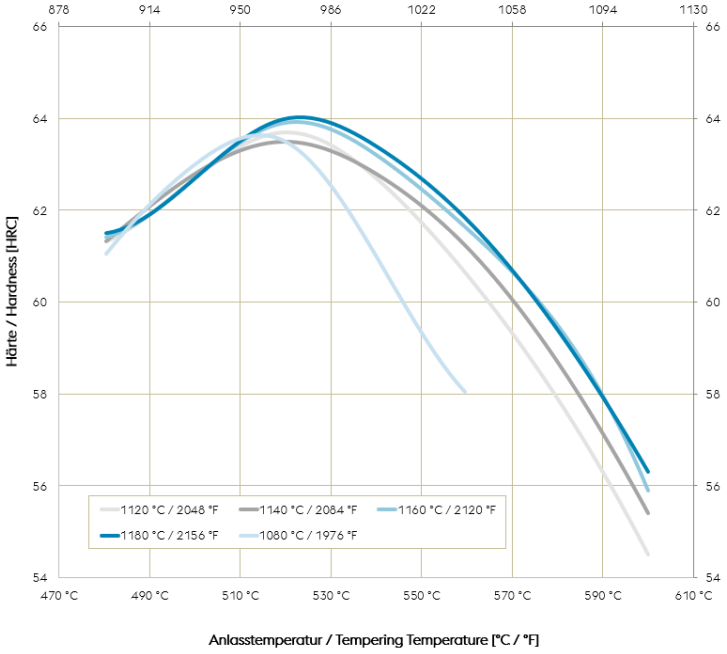
P… Perlite

B... Bainite

M… Martensite

Ms… Martensite starting temperature

Tempering Chart



Holdingtime 3x2 hours

Specimensize: square 25mm

Austenitising in vacuum

Physical Properties

Temperature (°C)	20
Density (kg/dm³)	7.74
Thermal conductivity (W/(m.K))	25.2
Specific heat (kJ/kg K)	0.451
Spec. electrical resistance (Ohm.mm²/m)	0.47
Modulus of elasticity (10³N/mm²)	-

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

Temperature (°C)	100	200	300	400	500	600	700
Thermal expansion (10^{-6} m/(m.K))	11.5	12.2	12.6	12.9	13.2	13.4	13.6

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ONE STEP AHEAD.