HIGH SPEED STEELS

Application Segments

Cutting Tools

Available Product Variants

Long Products

Product Description

BÖHLER S401 – "The conventional"
This grade is part of the family of molybdenum-alloyed high-speed steels and its winning performance is matched by its good cost effectiveness.

Process Melting

Airmelted

Properties

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

Applications

- Twist Drills and Taps
- Thread rolling
- Broaches and Reamers

Technical data

Material designation	
1.3346	SEL
HS2-9-1	EN
T11301	UNS
M1	AISI

Standards	
A600	ASTM

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V	W
0.84	0.4	0.3	3.8	8.6	1.2	1.8

Material characteristics

	Compressive strength	Grindability	Red hardness	Toughness	Wear resistance	Edge Stability
BÖHLER S401	★★	★★★	★★	★★★	★★	★★★
BÖHLER S200	★★★	★★	★★★	★★	★★★	★★
BÖHLER S400	★★★	★★★	★★★	★★★	★★	★★
BÖHLER S404	★★	★★★	★★	★★★	★★	★★
BÖHLER S405	★★★	★★★	★★	★★★	★★	★★
BÖHLER S430	★★	★★★	★★	★★★	★★	★★
BÖHLER S500	★★★★	★★★	★★★★	★★	★★★	★★★
BÖHLER S600	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S607	★★★	★★★	★★★	★★	★★★	★★★
BÖHLER S630	★★★	★★★	★★★	★★	★★	★★★
BÖHLER S705	★★★	★★★	★★★★	★★	★★	★★★★
BÖHLER S730	★★★	★★★	★★★★	★★	★★	★★★★

Delivery condition

Annealed

Hardness (HB)	max. 280

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.

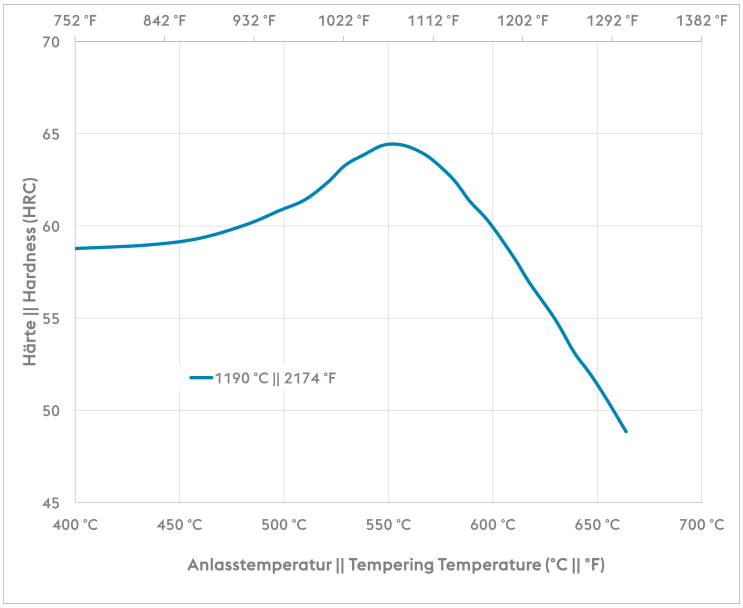
Stress relieving

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	1,170 to 1,210 °C	Salt bath, vacuum || Preheating: 1st stage ~ 500 °C, 2nd stage ~ 850 °C, 3rd stage ~1050 °C || Austenitising: 1170 - 1210 °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



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

Physical Properties

Temperature (°C)	20
Density (kg/dm^3)	8
Thermal conductivity (W/(m.K))	19
Specific heat (kJ/kg K)	0.46
Spec. electrical resistance (Ohm.mm^2/m)	0.6
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))	11	11.5	11.9	12.3	12.4	12.5	12.5

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voestalpine
ONE STEP AHEAD.