

# HIGH SPEED STEELS

## Available Product Variants

Long Products

## Product Description

Twist drills, taps, wood working tools.

## Process Melting

Airmelted

## Properties

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

## Applications

- > Special Cutting Tools
- > Twist Drills and Taps

## Technical data

Material designation		
	1.3325	SEL
	m50	AISI

## Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V
0.83	0.5	0.3	4.1	4.3	1.05

## Delivery condition

### Annealed

Hardness (HB) max. 280

## Heat treatment

Annealing		
Temperature	770 to 840 °C   1,418 to 1,544 °F	Controlled slow cooling in furnace (10 to 20°C/h / (50 to 68°F/h) to approx. 600°C (1112°F), air cooling.
Stress relieving		
Temperature	600 to 650 °C   1,112 to 1,202 °F	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	1,100 to 1,130 °C   2,012 to 2,066 °F	Salt bath, vacuum    Preheating: 1st stage ~ 500 °C, 2nd stage ~ 850 °C, 3rd stage ~1050 °C    Austenitising: 1100 - 1130 °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

## Physical Properties

Temperature (°C   °F)	20   68
Density (kg/dm <sup>3</sup>   lb/in <sup>3</sup> )	7.83   0.28
Thermal conductivity (W/(m.K)   BTU/ft h °F)	19   10.98
Specific heat (kJ/kg K   BTU/lb °F)	0.46   0.1099
Spec. electrical resistance (Ohm.mm <sup>2</sup> /m   10 <sup>-4</sup> Ohm.inch <sup>2</sup> /ft)	0.5   2.36
Modulus of elasticity (10 <sup>3</sup> N/mm <sup>2</sup>   10 <sup>3</sup> ksi)	217   31.47

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

Temperature (°C   °F)	100   212	200   392	300   572	400   752	500   932	600   1,112	700   1,292
Thermal expansion (10 <sup>-6</sup> m/(m.K)   10 <sup>-6</sup> inch/inch.°F)	11.5   6.4	11.7   6.5	12.2   6.8	12.4   6.9	12.7   7.1	13   7.2	12.9   7.2

For additional specifications and technical requirements, 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.*

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ONE STEP AHEAD.