

HOT WORK TOOL STEELS

Application Segments

Hot Work

Available Product Variants

Plates

Product Description

BÖHLER W500 is a quenched and tempered hot work tool steel with approx. 1% chromium and 2% nickel and corresponds to material number 1.2714 (56NiCrMoV7). This steel has high hot toughness as well as excellent through hardenability and is therefore well suited for dies up to largest dimensions.

Process Melting

Airmelted

Applications

- > Extrusion
- > Forging Applications
- > Forging (Hot / Semi-hot)
- > Rolling
- > Rolls
- > Tool Holders (milling, drilling, turning & chucks)

Technical data

Material designation		Standards	
1.2714	SEL	4957	EN ISO
55NiCrMoV7	EN	G4404	JIS
~T61206	UNS		
~L6	AISI		
~SKT4	JIS		

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	Ni	V
0.55	0.25	0.75	1.10	0.50	1.70	0.10

Material characteristics

	High temperature strength	High temperature toughness	High temperature wear resistance
BÖHLER W500	★ ★	★ ★ ★ ★	★
BÖHLER W300 ISODISC	★ ★	★ ★ ★	★ ★
BÖHLER W302 ISODISC	★ ★ ★	★ ★ ★	★ ★ ★
BÖHLER W303 ISODISC	★ ★ ★ ★	★ ★ ★	★ ★ ★ ★

Delivery condition

Annealed

Hardness (HB)	max. 248
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Heat treatment

Annealing

Temperature	650 to 700 °C	Holding time 6 to 8 hours. Slow, controlled furnace cooling at 10 to 20°C/h (50 to 68 °F/hr) to approx. 600°C (1112°F), further cooling in air.
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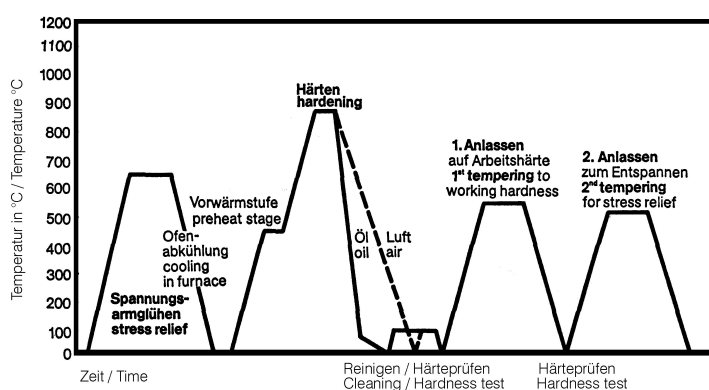
Stress relieving

Temperature	600 to 650 °C	For stress relief after extensive machining or for complicated tools. Holding time depending on tool size after complete heating 2 - 6 hours in neutral atmosphere. Slow furnace cooling.
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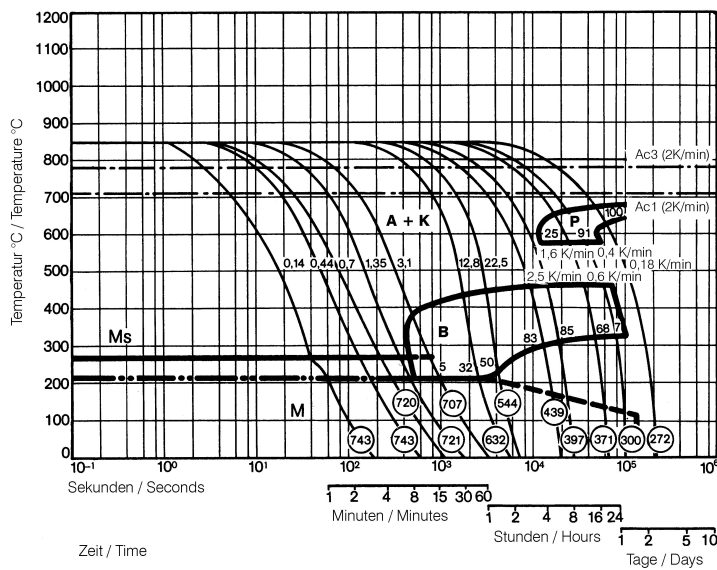
Hardening and Tempering

Temperature	850 to 900 °C	Holding time after temperature equalization: 15 to 30 minutes; Quenching: Oil, salt bath (500 - 550°C [932-1022°F]), air, vacuum; After hardening, tempering to the desired working hardness (see tempering chart).
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Heat treatment sequence



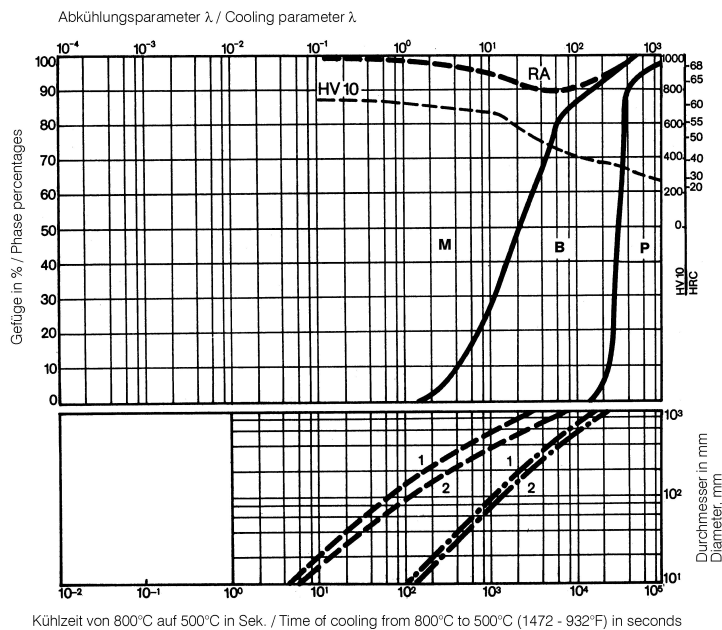
Continuous cooling CCT curves



Austenitising temperature: 850°C (1562°F)
Holding time: 15 minutes

○ Vickers hardness
5...91 phase percentages
0.14...22.5 cooling parameter (λ), i.e. duration of cooling from 800 - 500°C (1472-932°F) in $s \times 10^{-2}$
2.5...0.18 K/min cooling rate in K/min in the 800 - 500°C (1472-932°F) range

Quantitative phase diagram

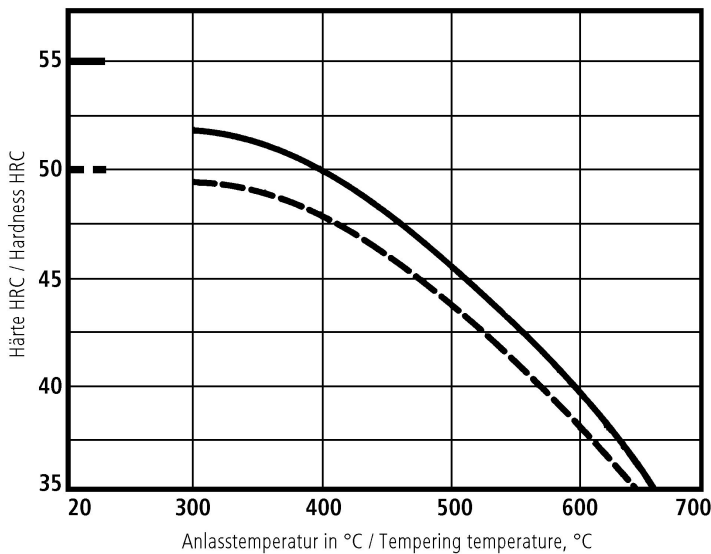


A... Austenite
B... Bainite
K... Carbide
M... Martensite
P... Pearlite
RA... Retained austenite

----- Oil cooling
- - - Air cooling

1... Edge or face
2... Core

Tempering chart



Tempering:

Slow heating to tempering temperature immediately after hardening (time in furnace 1 hour for each 0,787 inch (20 mm) of workpiece thickness but at least 2 hours / cooling in air).

It is recommended to temper at least twice.

A third tempering cycle for the purpose of stress relieving may be advantageous.

1st tempering approx. 86°F (30°C) above maximum secondary hardness.

2nd tempering to desired working hardness. The tempering chart shows average tempered hardness values.

3rd for stress relieving at a temperature 86 to 122°F (30 to 50°C) below highest tempering temperature.

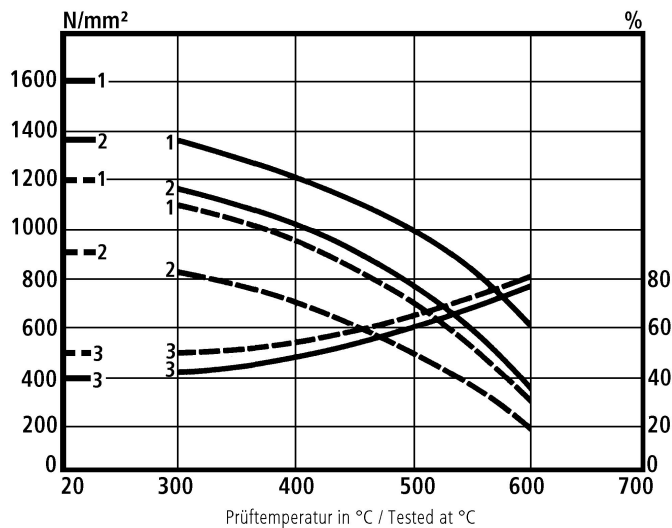
Hardening temperature:

— 850°C (1562°F) / oil

- - - - - 880°C (1616°F) / air

Specimen size: Ø 60 mm

Hot strength chart



— heat treated 1600 N/mm²

- - - - - heat treated 1200 N/mm²

1... Tensile strength N/mm²

2... 0.2% proof stress N/mm²

3... Reduction of area %

Physical Properties

Temperature (°C)	20
Density (kg/dm ³)	7.8
Thermal conductivity (W/(m.K))	36
Specific heat (kJ/kg K)	0.46
Spec. electrical resistance (Ohm.mm ² /m)	0.3
Modulus of elasticity (10 ³ N/mm ²)	215

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

Temperature (°C)	100	200	300	400	500	600	700
Thermal expansion (10 ⁻⁶ m/(m.K))	12.5	13.1	13.4	13.9	14	14.3	14.5

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.

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ONE STEP AHEAD.