

# ČELICI ZA HLADNI RAD

## Dostupne varijante proizvoda

 Šipkasti proizvodi\*

 Ploče

\* ) Presented data refer exclusively to long products. Please observe the detailed explanations at the end of the data sheet (pdf).

## Opis proizvoda

Visokopterećeni alati za kovani novac, matrice za pribor za jelo, alati za dubljenje, oštrice za odsijecanje u hladnom stanju za materijale veće debljine, kalupi za plastiku.

## Put taljenja

 Airmelted

## Karakteristike

- > Žilavost i duktilnost : visok
- > Dimenzionalna stabilnost : dobar

## Korištenje

- > Strojni mjerni noževi (za proizvodnju)
- > Cold Forming
- > Coining
- > Precizno štancanje / štancanje / pečačenje
- > Standardni dijelovi (kalupi, ploče, klinovi, probijači)
- > Opći sklopovi za strojarstvo
- > Sklopovi za reciklažnu djelatnost

## Technički podaci

Oznaka materijala	
~1.2721	SEL
~50NiCr13	EN

## Kemijski sastav

C	Si	Mn	Cr	Mo	Ni
0,55	0,30	0,40	1,00	0,25	3,00

## Materijal

	Kapacitet tlaka	Dimenzionalna stabilnost u toplinskoj obradi	Žilavost	Abraziv otpora na habanje
<b>BÖHLER K605</b>	★★	★★★	★★★★★	★
<b>BÖHLER K305</b>	★★★★★	★★★	★★	★★★★★
<b>BÖHLER K306</b>	★★★★★	★★★	★★★★★	★★★
<b>BÖHLER K313</b>	★★★★★	★★★	★★★	★★★
<b>BÖHLER K320</b>	★★★	★★★	★★★	★★★
<b>BÖHLER K329</b>	★★★	★★★	★★★★★	★★★★★
<b>BÖHLER K600</b>	★	★★★	★★★★★	★
<b>BÖHLER K601</b>	★	★★★	★★★★★	★★

## Isporuka

### Annealed

Tvrdoća (HB)	max. 250
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## Toplinska obrada

### Annealing

Temperatura	610 do 650 °C	Slow controlled cooling in furnace at a rate of 50 to 68°F/hr (10 to 20°C/hr) down to approx. 1112°F (600°C), further cooling in air.
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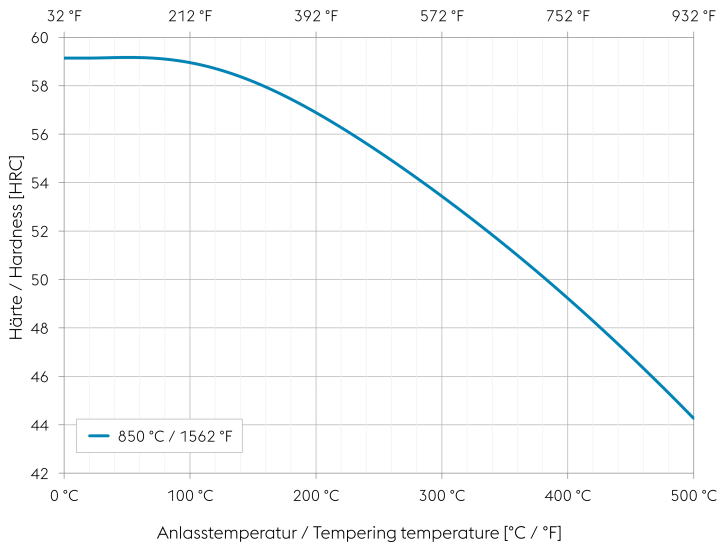
### Stress relieving

Temperatura	650 °C	Slow cooling in furnace. Intended to relieve stresses set up by extensive machining, or in complex shapes. After through heating, hold in neutral atmosphere for 1 - 2 hours.
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### Hardening and Tempering

Temperatura	840 do 870 °C	Air, Oil Holding time after temperature equalization: 15 to 30 minutes. After hardening, tempering to the desired working hardness, see tempering chart.
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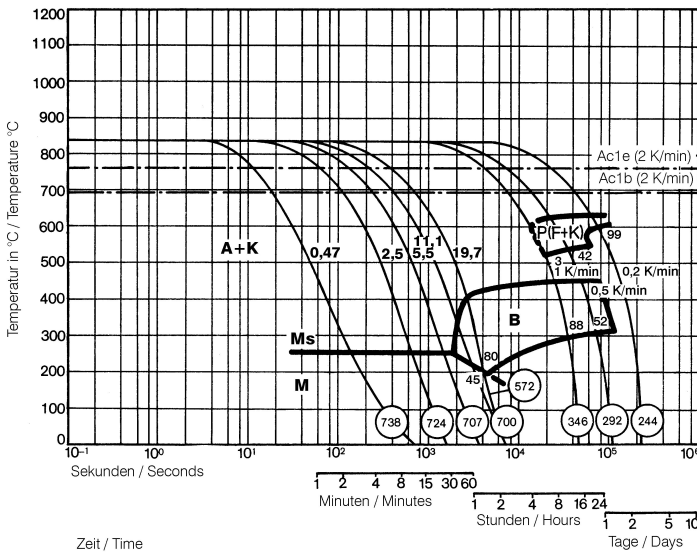
**Tempering chart**



**Tempering:**

Hardening temperature: 850°C  
 Specimen size: square 20 mm

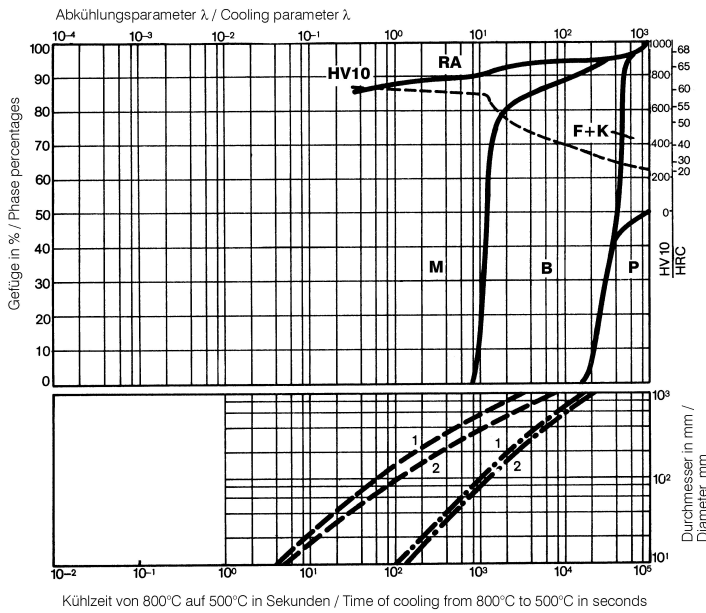
**Continuous cooling CCT curves**



Austenitising temperature: 1544°F (840°C)  
 Holding time: 20 minutes

O Vickers hardness  
 3...99 phase percentages  
 0.47...19.7 cooling parameter, i.e. duration of cooling from 1472 to 932°F (800 to 500°C) in  $s \times 10^{-2}$   
 33,8...32,36°F/min (1...0.2K/min) cooling rate in °F/min (K/min) in the 1472 to 932°F (800 to 500°C) range.

**Quantitative phase diagram**

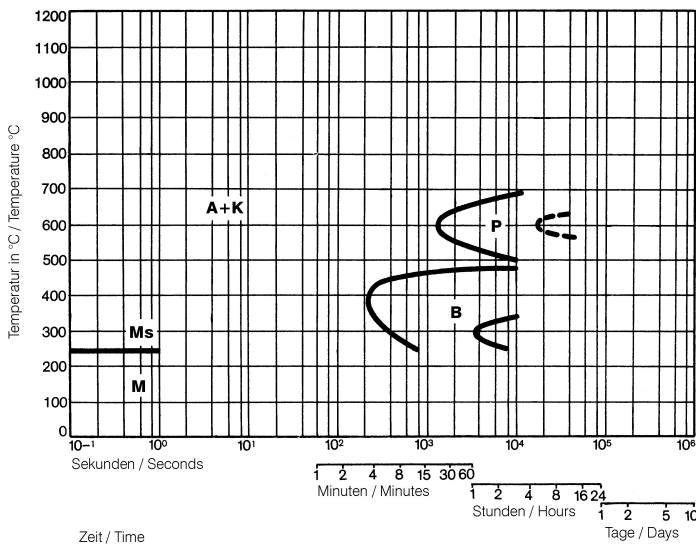


A... Austenite  
 B... Bainite  
 F... Ferrite  
 K... Carbide  
 M... Martensite  
 P... Pearlite  
 RA... Retained austenite

--- Oil cooling  
 - · - Air cooling

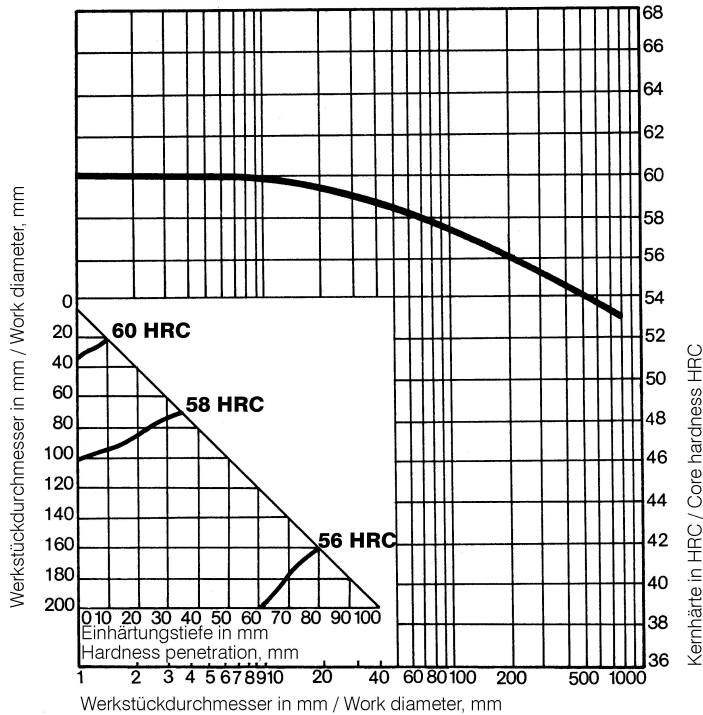
1... Edge or face  
 2... Core

**Isothermal TTT curves**



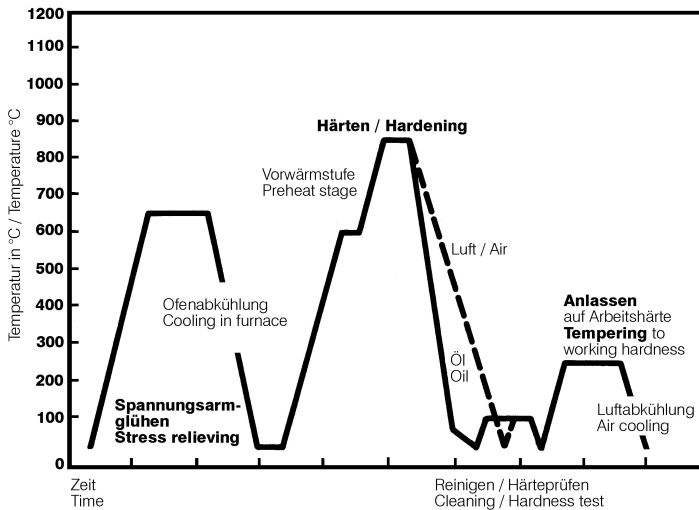
Austenitising temperature: 840°C / 1544°F  
 Holding time: 20 minutes

**Influence of work diameter on core hardness and hardness penetration**



Quenched from: 850°C / 1562°F  
Agent: Oil

**Heat treatment sequence**



## Fizička svojstva

Temperatura (°C)	20
Gustoća (kg/dm <sup>3</sup> )	7,85
Toplinska vodljivost (W/(m.K))	28
Specifični toplinski kapacitet (kJ/kg K)	0,46
Spec. Otpornik (Ohm.mm <sup>2</sup> /m)	0,3
Modul elastičnosti (10 <sup>3</sup> N/mm <sup>2</sup> )	210

## Toplinska ekspanzija

Temperatura (°C)	100	200	300	400	500
Toplinska ekspanzija (10 <sup>-6</sup> m/(m.K))	11	12,5	13	13,5	14

**Long Products:** For additional specifications and technical requirements, please contact our regional voestalpine BÖHLER sales companies.

**Sheet & Plates:** Product Variant may differ in terms of melting process, technical data, delivery, and surface condition as well as available product dimensions. Please contact voestalpine BÖHLER Bleche GmbH & Co KG.

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