

ČELICI ZA TOPLI RAD

Dostupne varijante proizvoda

Šipkasti proizvodi*

Ploče

Otvoreno kovanje

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

Opis proizvoda

Alatni čelik za obradu u toplom stanju namijenjeni za izradu matrica za tlačno lijevanje s visokom žilavošću čak i za teško opterećene alate velikih dimenzija.

Put taljenja

Airmelted + Remelted

Karakteristike

- > Žilavost i duktilnost : vrlo visoka
- > Otpornost na habanje : visok
- > Obradivost : vrlo visoka
- > Tvrdća pri visokim temperaturama : visok
- > Mogućnost poliranja : vrlo visoka
- > Toplinska vodljivost : vrlo visoka
- > Mikro čistoća : visok

Korištenje

- > Visokotlačno lijevanje
- > Opći sklopovi za strojarstvo
- > Istiskivanje
- > Kovanje (vruće / poluvruće)
- > Lijevanje ubrizgavanjem
- > Progresivno kovanje (Hatebur)
- > Gravitacijsko / niskotlačno lijevanje
- > Tlačno otvrdnjavanje / vruće oblikovanje
- > Mehanika Inženjerstvo / izrada strojeva Općenito

Technički podaci

Oznaka materijala		Standardi	
BÖHLER patent	Market grade	#207	NADCA
E1850	NADCA		

Kemijski sastav

C	Si	Mn	Cr	Mo	V	N
0,38	0,20	0,55	5,00	1,80	0,55	def.

Materijal

	Otpornost na toplinu	Vruća žilavost	Otpornost na vruće trošenje
	★★★	★★★★★	★★★
	★★	★★★★	★★
	★★	★★★	★★
	★★★	★★★★	★★★
	★★★	★★★	★★★
	★★★★★	★★★	★★★★★
	★★★	★★	★★★
	★★★★★	★★★★★	★★★★★
	★★	★★★★★	★★
	★★★★★	★★★★★	★★★★★

Isporuka

Annealed

Tvrdoća (HB)	max. 205
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Toplinska obrada

Annealing

Temperatura	750 do 800 °C	Slow controlled cooling in furnace at a rate of 10 to 20 °C/hr (50 to 68 °F/hr) down to approx. 600 °C (112 °F), further cooling in air.
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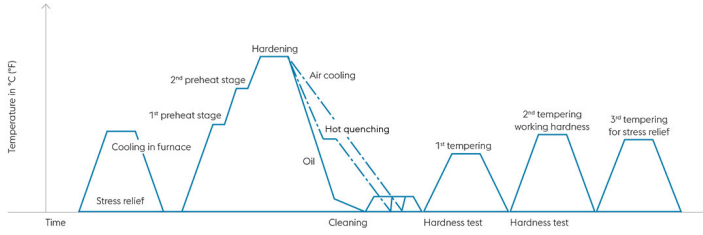
Stress relieving

Temperatura	600 do 670 °C	Slow cooling furnace. To relieve stresses caused by extensive machining, or for complex shapes. Soak for 1 -2 hours after temperature equalisation (in neutral atmosphere).
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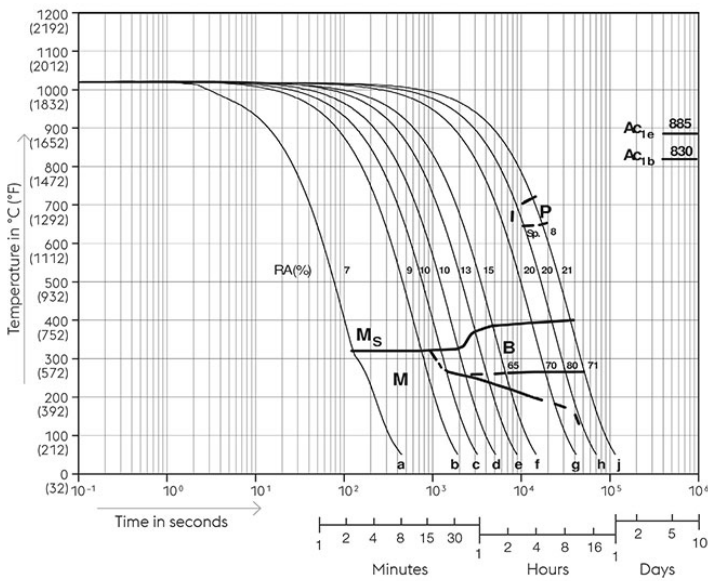
Hardening and Tempering

Temperatura	1.010 do 1.020 °C	Holding time after temperature equalization: 15 to 30 minutes; In order to prevent coarsening of the grain, hardening must be carried out at the recommended temperature. For big dimensions it's recommended to reduce the temperature to 1010 °C (1850 °F); Quenching: oil, salt bath (500 - 550°C [932 - 1022 °F]), air, inert gas in vacuum; After hardening, required tempering treatment to achieve desired working hardness (see tempering chart).
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Heat treatment sequence



Continuous cooling CCT curves

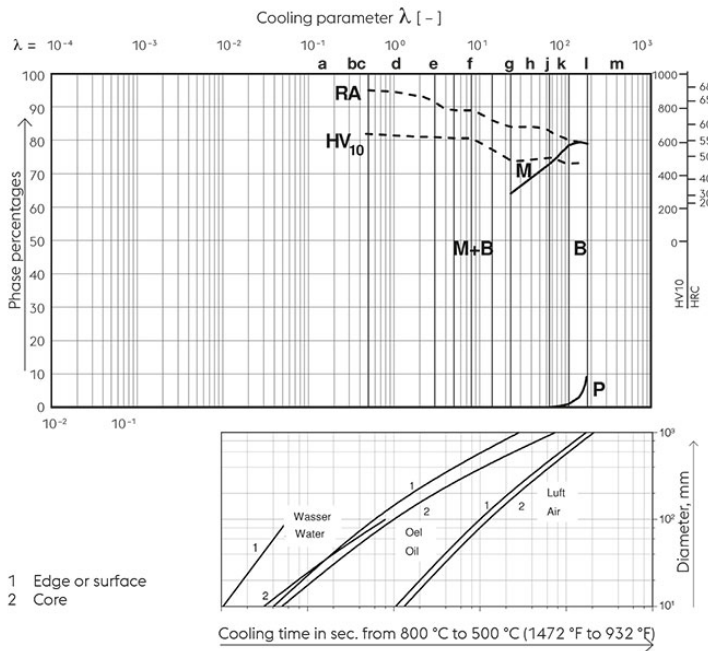


Austenitising temperature: 1020°C (1868°F)
 Holding time: 15 minutes
 5...100 phase percentages
 0.5...180 cooling parameter, i.e. duration of cooling from 800 - 500°C (1472-932°F) in $s \times 10^{-2}$

Table:

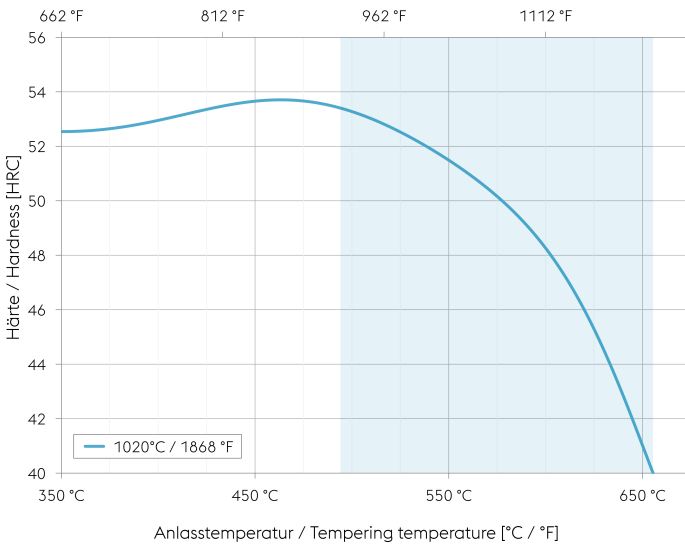
Sample	λ	HV10	Sample	λ	HV10
a	0,5	630	f	23	478
b	3	616	g	65	497
c	5	606	h	110	454
d	8	606	j	180	459
e	14	517			

Quantitative phase diagram



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

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.

Recommended tempering temperature range is indicated by the blue area in the chart.

Hardening temperature: 1020 °C (1868 °F)
Specimen size: square 20 mm

Fizička svojstva

Temperatura (°C)	20
Gustoća (kg/dm ³)	7,8
Toplinska vodljivost (W/(m.K))	28,8
Specifični toplinski kapacitet (kJ/kg K)	0,46
Spec. Otpornik (Ohm.mm ² /m)	-
Modul elastičnosti (10 ³ N/mm ²)	214

Toplinska ekspanzija

Temperatura (°C)	100	200	300	400	500	600	700
Toplinska ekspanzija (10 ⁻⁶ m/(m.K))	11,1	11,9	12,4	12,9	13,2	13,5	13,6

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