

ČELICI ZA TOPLI RAD

Dostupne varijante proizvoda

Šipkasti proizvodi

Opis proizvoda

Alatni čelik za obradu u toplom stanju, proizveden postupkom pretaljivanja u vakuumu, s visokom otpornošću na temperiranje što ga čini maksimalno otpornim na toplinski umor.

Put taljenja

Airmelted + VAR

Karakteristike

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

Korištenje

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

Tehnički podaci

Oznaka materijala		Standardi	
~1.2367	SEL	#207	NADCA
~X38CrMoV5-3	EN		
C1885	NADCA		

Kemijski sastav

C	Si	Mn	Cr	Mo	V
0,38	0,20	0,25	5,00	2,80	0,65

Materijal

	Otpornost na toplinu	Vruća žilavost	Otpornost na vruće trošenje
BÖHLER W403 VMR®	★★★★	★★★★	★★★★
BÖHLER W300 ISOBLOC®	★★	★★★★	★★
BÖHLER W300 ISODISC®	★★	★★★	★★
BÖHLER W302 ISOBLOC®	★★★	★★★★	★★★
BÖHLER W302 ISODISC®	★★★	★★★	★★★
BÖHLER W303 ISODISC®	★★★★	★★★	★★★★
BÖHLER W350 ISOBLOC®	★★★	★★★★★	★★★
BÖHLER W360 ISOBLOC®	★★★★★	★★★★	★★★★★
BÖHLER W400 VMR®	★★	★★★★★	★★

Isporuka

Annealed

Tvrdoća (HB)	max. 205
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Toplinska obrada

Annealing

Temperatura	800 do 850 °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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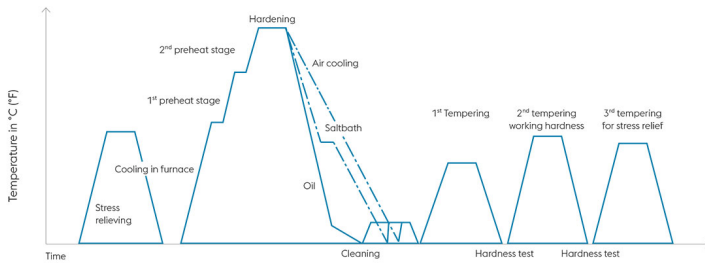
Stress relieving

Temperatura	600 do 670 °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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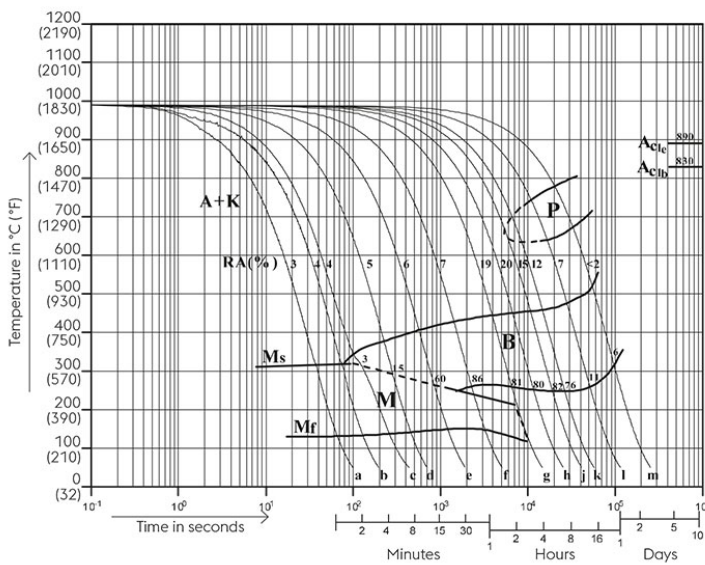
Hardening and Tempering

Temperatura	1.020 do 1.030 °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; Quenching: oil, salt bath (500 - 550°C [930 to 1020 °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

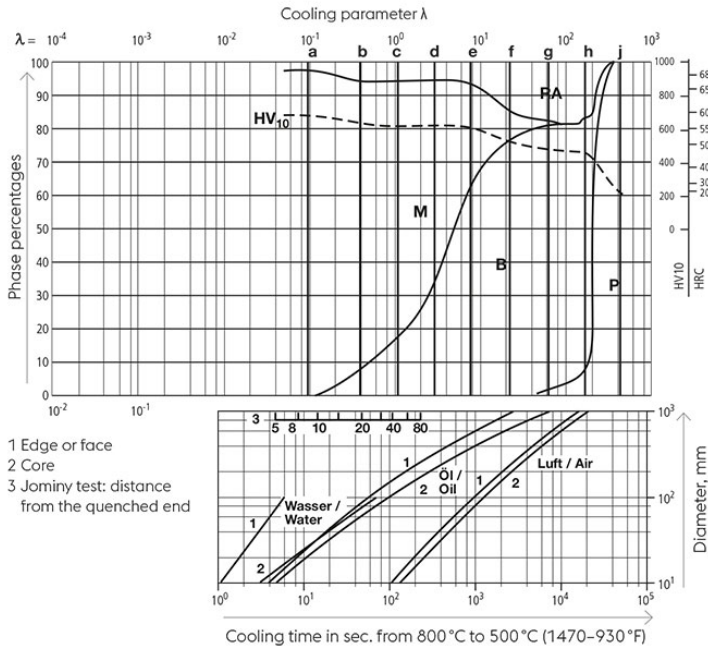


Austenitising temperature: 1025°C (1877°F)
 Holding time: 15 minutes
 5...100 phase percentages
 0.5...180 cooling parameter, i.e. duration of cooling from 800 - 500°C (1472-932°F) in $s \times 10^{-2}$

Table:
 Sample λ HV10

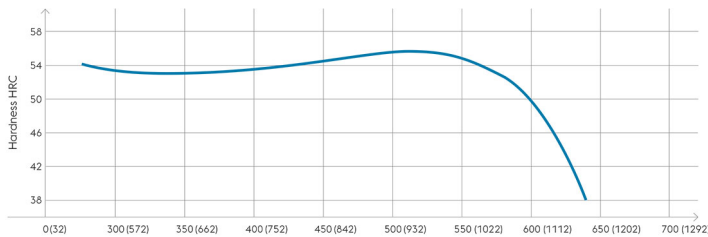
a	0,1	686
b	0,4	643
c	1,1	619
d	3	624
e	8	615
f	23	529
g	65	494
h	180	465
j	400	234

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.

Hardening temperature: 1030°C (1886°F)
Specimen size: square 20 mm

Fizička svojstva

Temperatura (°C)	20
Gustoća (kg/dm ³)	7,85
Toplinska vodljivost (W/(m.K))	29,8
Specifični toplinski kapacitet (kJ/kg K)	0,47
Spec. Otpornik (Ohm.mm ² /m)	-
Modul elastičnosti (10 ³ N/mm ²)	211

Toplinska ekspanzija

Temperatura (°C)	100	200	300	400	500	600
Toplinska ekspanzija (10 ⁻⁶ m/(m.K))	10,63	10,83	12	12,92	14,13	14,34

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

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