

ČELICI ZA TOPLI RAD

Dostupne varijante proizvoda

Šipkasti proizvodi*

Otvoreno kovanje

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

Opis proizvoda

Alati i matrice za obradu u toplom stanju za teške uvjete rada, uglavnom za obradu lakih slitina: trnovi, matrice, cilindri za izvlačenje metalnih cijevi i šipkastih profila, alati i matrice za izradu komponenti sa šupljinom, vijaka, zakovica, navrtki i svornjaka. Oprema tlačno lijevanje, matrice za oblikovanje, umetci za kalupe, oštrice za rezanje u toplom stanju i matrice za kalupljenje plastike.

Put taljenja

Airmelted

Karakteristike

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

Korištenje

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


Tehnički podaci

Oznaka materijala		Standardi	
1.2367	SEL	4957	EN ISO
X38CrMoV5-3	EN		

Kemijski sastav

C	Si	Mn	Cr	Mo	V
0,38	0,40	0,40	5,00	2,80	0,55

Materijal

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

Isporuka

Annealed

Tvrdoća (HB)	max. 229
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Hardened and Tempered

Tvrdoća (HRC)	30 do 44
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Toplinska obrada

Annealing

Temperatura	750 do 800 °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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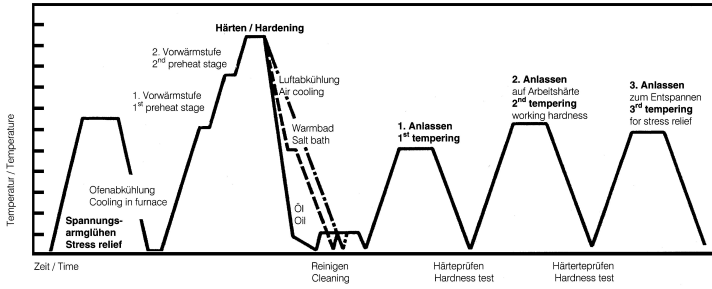
Stress relieving

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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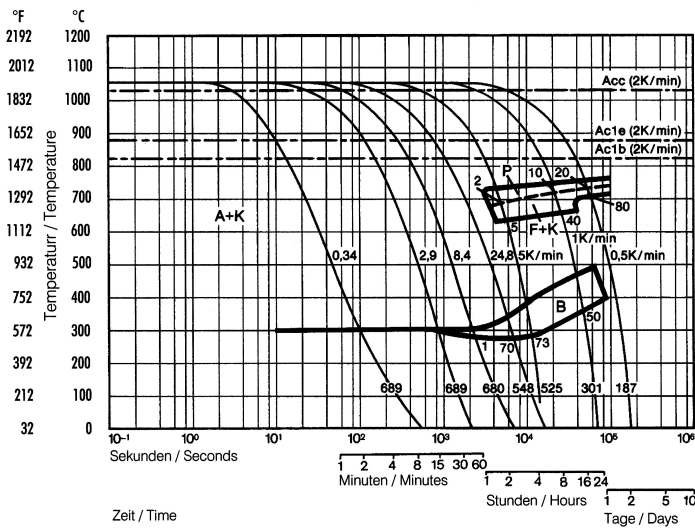
Hardening and Tempering

Temperatura	1.030 do 1.080 °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



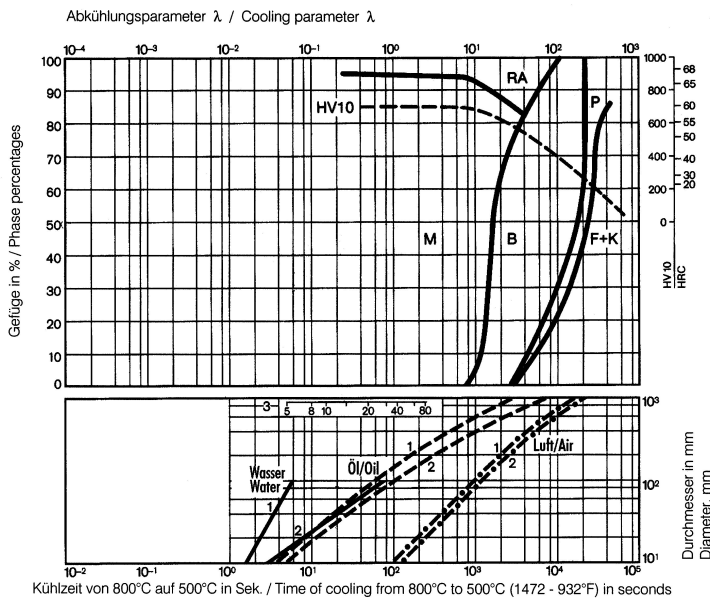
Continuous cooling CCT curves



Austenitising temperature: 1922°F (1050°C)
Holding time: 15 minutes

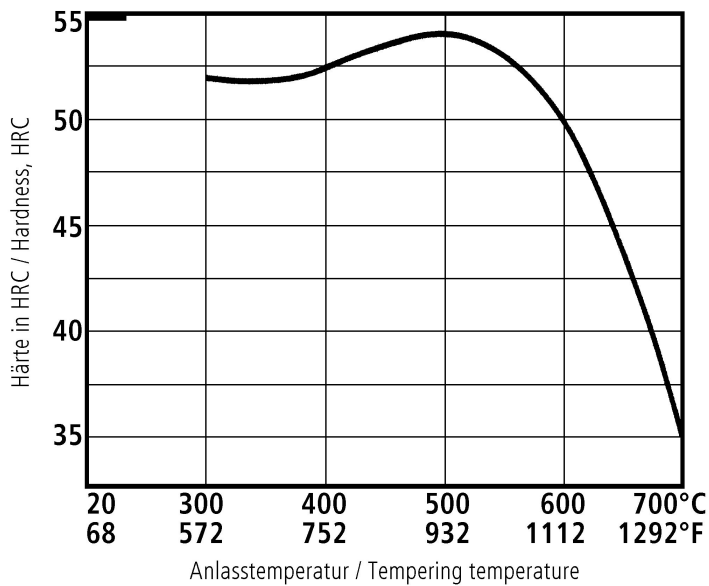
689 - 187 Vickers hardness
1...80 phase percentages
0.34...24.8 cooling parameter, i.e. duration of cooling from 1472 - 932°F (800-500°C) in $s \times 10^{-2}$
41...32.9°F/min (5...0.5 K/min) cooling rate in °F/min (K/min) in the 1472 - 932°F (800-500°C) range

Quantitative phase diagram



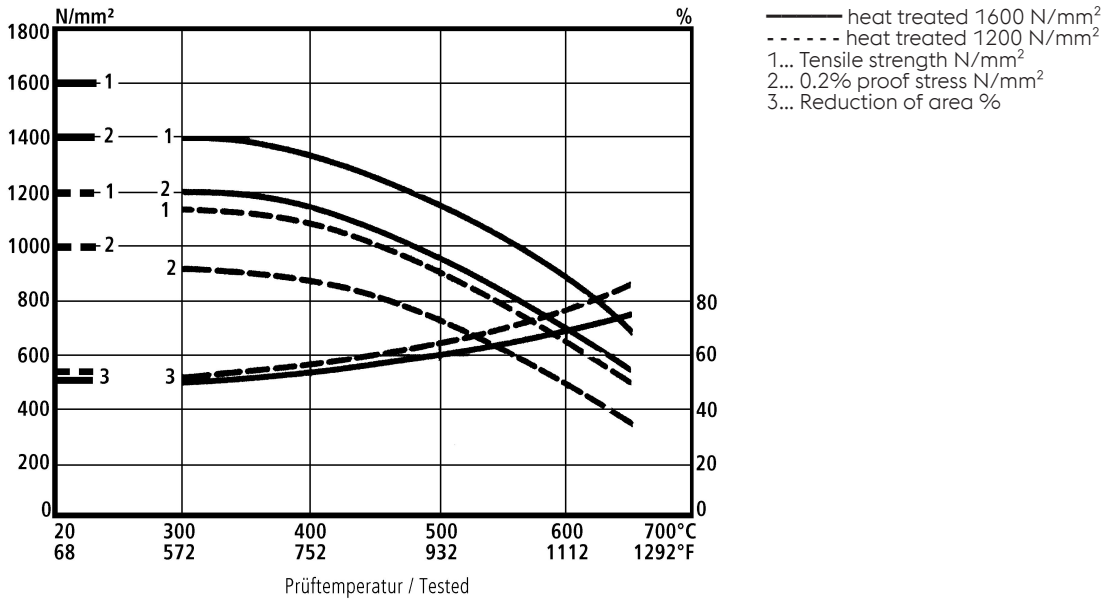
- A... Austenite
 - B... Bainite
 - F... Ferrite
 - K... Carbide
 - M... Martensite
 - P... Pearlite
 - RA... Retained austenite
- - - - Oil cooling
 - · - Air cooling
- 1... Edge or face
 2... Core
 3... Jominy test: distance from end

Tempering chart



Hardening temperature: 1050°C (1922°F)
Specimen size: square 50 mm

Hot strength chart



Fizička svojstva

Temperatura (°C)	20
Gustoća (kg/dm ³)	7,85
Toplinska vodljivost (W/(m.K))	-
Specifični toplinski kapacitet (kJ/kg K)	0,46
Spec. Otpornik (Ohm.mm ² /m)	0,5
Modul elastičnosti (10 ³ N/mm ²)	215

Toplinska ekspanzija

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

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

Open Die Forgings: Product Variant may differ in terms of melting process, technical data, delivery, and surface condition as well as available product dimensions. Please contact the business unit Open Die Forgings of voestalpine BÖHLER Edelstahl GmbH & Co KG.

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ONE STEP AHEAD.