

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

Za povećanje produktivnosti u visokotehnoj proizvodnji alata neophodna je uporaba odgovarajućih materijala visoke otpornosti na trošenje izrađenih postupcima praškaste metalurgije. Presudni faktori su žilavost, otpornost na trošenje, tlačna čvrstoća i sposobnost pridržavanja oštrice. Ovi su faktori iznimno uspješno kombinirani u čeliku BÖHLER K190 MICROCLEAN.

Put taljenja

Powder metallurgy

Karakteristike

- > Žilavost i duktilnost : visok
- > Dobra žilavost znači sigurnost od pucanja kalupa koji se koriste : dobar
- > Ravnomjerno visoka čvrstoća i žilavost, čak i s velikim dimenzijama : dobar
- > Otpornost na habanje : visok
- > Tlačna čvrstoća : visok
- > Dimenzionalna stabilnost : vrlo visoka
- > Izvrsna homogenost i izotropija : vrlo visoka
- > Fina struktura karbida : dobar
- > Homogena mikrostruktura : dobar

Korištenje

- > Valjanje
- > Vijci i cijevi
- > Potrošni dijelovi
- > Cold Forming
- > Sklopovi za reciklažnu djelatnost
- > Opći sklopovi za strojarstvo
- > Precizno štancanje / štancanje / pečačenje
- > Valjci

Technički podaci

Oznaka materijala	
~1.2380	SEL
~ X230CrVMo13 4	EN

Kemijski sastav

C	Si	Mn	Cr	Mo	V
2,30	0,60	0,30	12,50	1,10	4,00

Materijal

	Kapacitet tlaka	Dimenzionalna stabilnost u toplinskoj obradi	Žilavost	Abraziv otpora na habanje	Ljepilo za otpornost na habanje
BÖHLER K190 MICROCLEAN®	★★★★	★★★★★	★★★★	★★★★	★★★★
BÖHLER K100	★★	★★	★	★★★	★★
BÖHLER K105	★★	★★	★	★★	★★
BÖHLER K107	★★	★★	★	★★★	★★
BÖHLER K110	★★	★★★	★	★★★	★★
BÖHLER K294 MICROCLEAN®	★★★★★	★★★★★	★★★	★★★★★	★★★★★
BÖHLER K340 ECOSTAR®	★★★	★★★	★★	★★	★★
BÖHLER K340 ISODUR®	★★★	★★★★	★★★	★★★	★★★★
BÖHLER K346	★★★	★★★	★★★	★★★★	★★
BÖHLER K353	★★	★★★	★★	★★	★★
BÖHLER K360 ISODUR®	★★★	★★★★	★★★	★★★★	★★★★
BÖHLER K390 MICROCLEAN®	★★★★★	★★★★★	★★★★	★★★★★	★★★★★
BÖHLER K490 MICROCLEAN®	★★★★	★★★★★	★★★★	★★★★	★★★★
BÖHLER K497 MICROCLEAN®	★★★★★	★★★★★	★★★	★★★★★	★★★★★
BÖHLER K888 MATRIX	★★★★	★★★★★	★★★★★	★★	★★
BÖHLER K890 MICROCLEAN®	★★★★	★★★★★	★★★★★	★★★	★★★

Isporuka
Annealed

Tvrdća (HB)

max. 260

Toplinska obrada

Annealing

Temperatura	800 do 850 °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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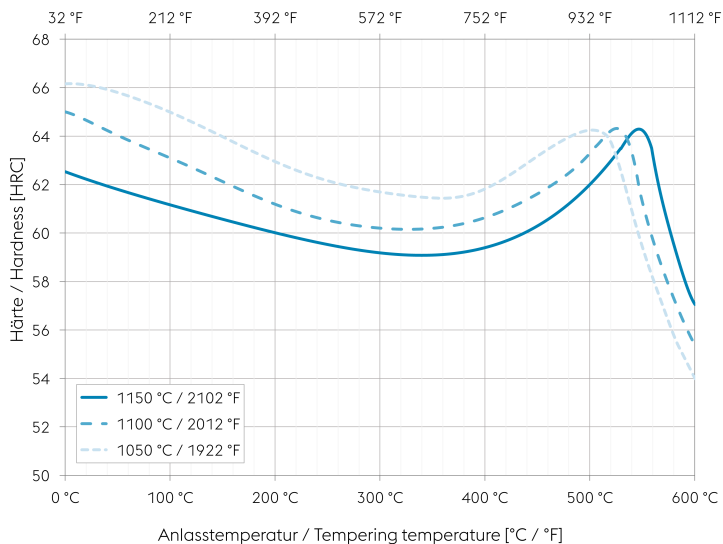
Stress relieving

Temperatura	650 do 700 °C	After through-heating, soak for 1 to 2 hours in neutral atmosphere. Slow cooling in furnace
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Hardening and Tempering

Temperatura	1.050 do 1.150 °C	From a neutral atmosphere at 1050 – 1150°C / quench in oil, salt-bath at 200 – 250 °C or at 500 – 550 °C, in air or in gas. A sufficiently high cooling rate must be ensured. Holding time after through-heating: 20 to 30 minutes, soaking time depends on the size of the work-piece and furnace parameters. Vacuum hardening is recommended. Average hardness after quenching prior to tempering see austenitising chart. We recommend hardening from the lower end of the hardening temperature range where high toughness is required and/or where the tool is of complicated geometry. Where high wear resistance is of the utmost importance we recommend hardening from the top end of the hardening temperature range given. After hardening, tempering to the desired working hardness, see tempering chart.
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Tempering Chart



Tempering:

Specimen size: square 0,787 inch (20 mm)

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.

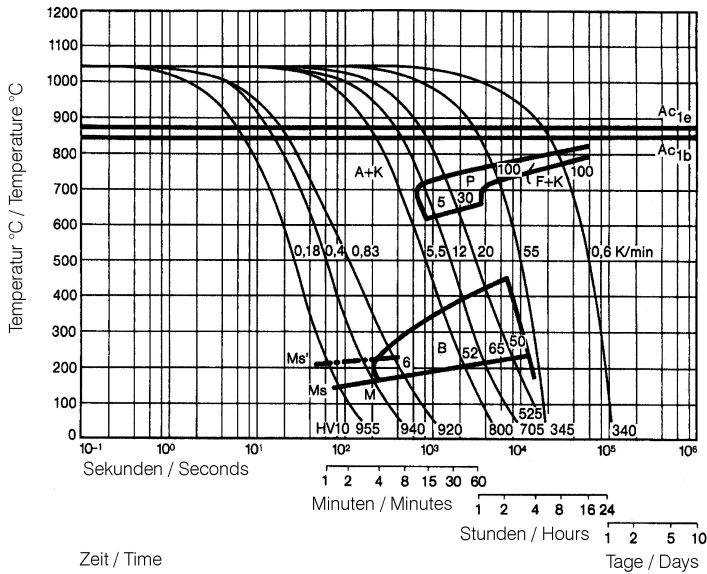
Slow cooling to room temperature after each tempering step is recommended.

Please refer to the tempering chart for guide values for the hardness achievable after tempering.

It is recommended to temper at least three times above the secondary hardness maximum.

Tempering for stress relieving 86 to 122 °F (30 to 50 °C) below the highest tempering temperature.

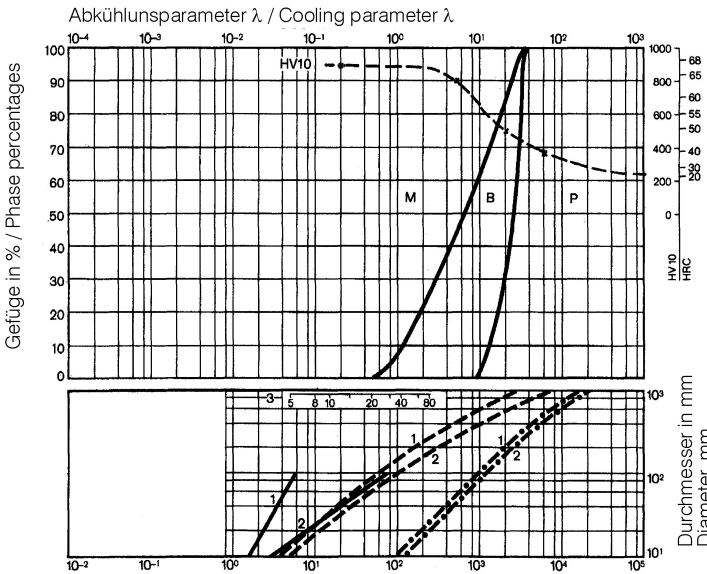
Continuous cooling CCT curves



Austenitizing temperature: 1050°C / 1922°F
Holding time: 10 minutes

5...100 phase percentages
0,18...50 cooling parameter, i.e. duration of cooling from 800 - 500° C (1472°F - 932°F) in $s \times 10^{-2}$
0.6 K/min. cooling rate in the 800 - 500° C (1472°F - 932°F) range

Quantitative phase diagram



Ms'... range of grain boundary martensite
LK... Ledeburitic carbides
A... Austenite
M... Martensite
P... Pearlite
B... Bainite

— Water
- - - Oil
- - - - Air

1... Edge or face
2... Core
3... Jominy test: distance from the quenched end

Kühlzeit von 800°C auf 500°C in Sek. / Cooling time in sec. from 800°C to 500°C

Fizička svojstva

Temperatura (°C)	20
Gustoća (kg/dm ³)	7,6
Toplinska vodljivost (W/(m.K))	21,5
Specifični toplinski kapacitet (kJ/kg K)	-
Spec. Otpornik (Ohm.mm ² /m)	0,59
Modul elastičnosti (10 ³ N/mm ²)	-

Toplinska ekspanzija

Temperatura (°C)	100	200	300	400	500	600	700
Toplinska ekspanzija (10 ⁻⁶ m/(m.K))	12,2	12,5	13	13,2	13,7	14	13,7

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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