

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

Rezni alati (matrice i probojci) za intenzivnu uporabu, alati za probijanje i prosijecanje, alati za obradu drveta, oštrice za odsijecanje materijala manje debljine, alati za valjanje navoja, alati za izvlačenje, duboko izvlačenje i hladno istiskivanje, alati za prešanje u industriji keramike i farmaceutskoj industriji, valjci za hladno valjanje (radni valjci) za valjačke stanove, mjerni instrumenti i uređaji, te kalupi manjih dimenzija u industriji plastike kad se zahtijeva izvrsna otpornost na trošenje.

Put taljenja

 Airmelted

Karakteristike

Dimenziono stabilan, s visokim udjelom ugljika i kroma (12%). Posebno pogodan za kaljenje na zraku. Dobra žilavost.

Korištenje

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

Technički podaci

Oznaka materijala	
1.2601	SEL
~T30402	UNS
X165CrMoV12	EN
~D2	AISI
~Ch12MF	GOST

Kemijski sastav

C	Si	Mn	Cr	Mo	V	W
1,60	0,35	0,30	11,50	0,60	0,30	0,50

Materijal

	Kapacitet tlaka	Dimenzionalna stabilnost u toplinskoj obradi	Žilavost	Abraziv otpora na habanje	Ljepilo za otpornost na habanje
BÖHLER K105	★★	★★	★	★★	★★
BÖHLER K100	★★	★★	★	★★★	★★
BÖHLER K107	★★	★★	★	★★★	★★
BÖHLER K110	★★	★★★	★	★★★	★★
BÖHLER K190 MICROCLEAN®	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
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

Tvrdoća (HB)	max. 250
--------------	----------

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. 600°C, further cooling in air.
-------------	---------------	--

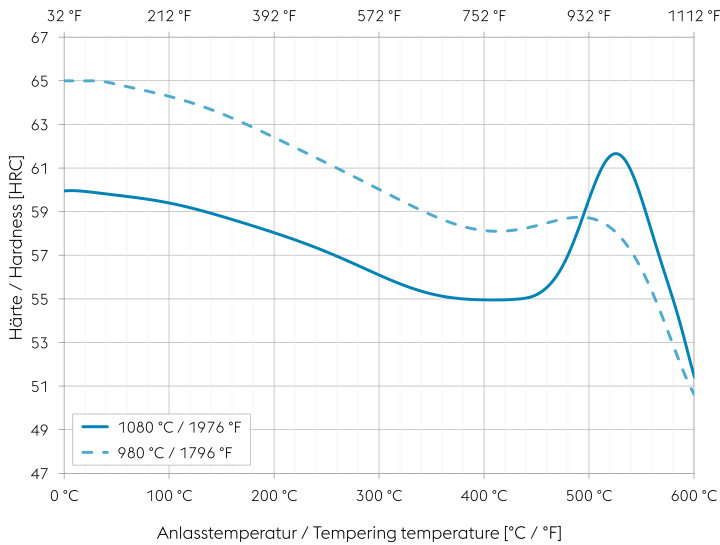
Stress relieving

Temperatura	650 do 700 °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 to 2 hours..
-------------	---------------	---

Hardening and Tempering

Temperatura	980 do 1.010 °C	Oil, salt bath from 428 to 482°F or 932 to 1022°F (220 to 250°C or 500 to 550°C), air, gas. Tools of intricate shape or with sharp edges should preferably be hardened in air or salt bath. Holding time after temperature equalization: 15 to 30 minutes. After hardening, tempering to the desired working hardness, see tempering chart.
-------------	-----------------	---

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.

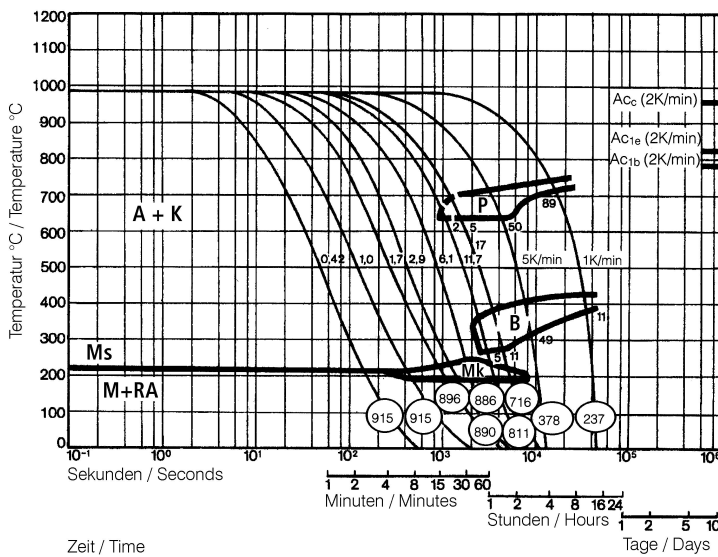
Slow cooling to room temperature after each tempering step is recommended.

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



Austenitising temperature: 1796°F (980°C)
Holding time: 30 minutes

O Vickers hardness

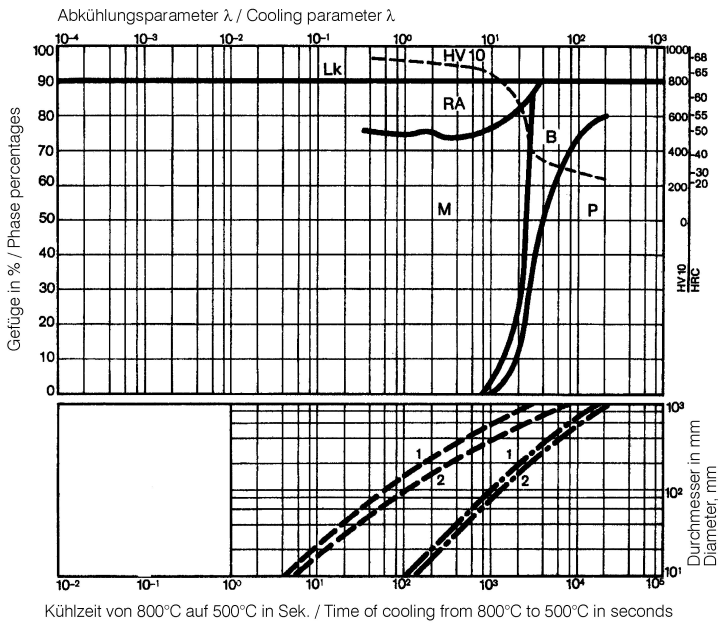
2...50 phase percentages

0.42...17 cooling parameter (λ), i.e. duration of cooling from 1472 to 932°F (800 to 500°C) in $s \times 10^{-2}$

41...33,8°F/min (5...1K/min) cooling rate in °F/min (K/min) in the 1472 to 932°F (800 to 500°C) range

Mk... Grain boundary martensite

Quantitative phase diagram

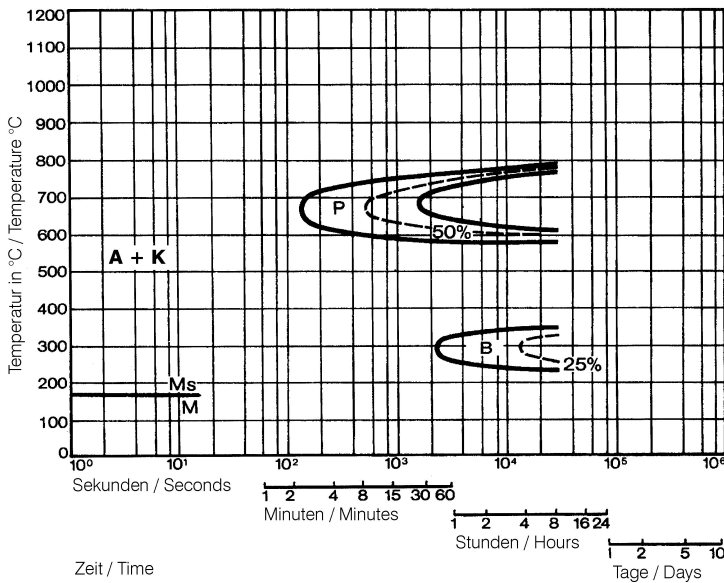


Lk... Ledeburite carbide
RA... Residual austenite
A... Austenite
B... Bainite
P... Perlite
K... Carbide
M... Martensite

----- Oil cooling
- · - Air cooling

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

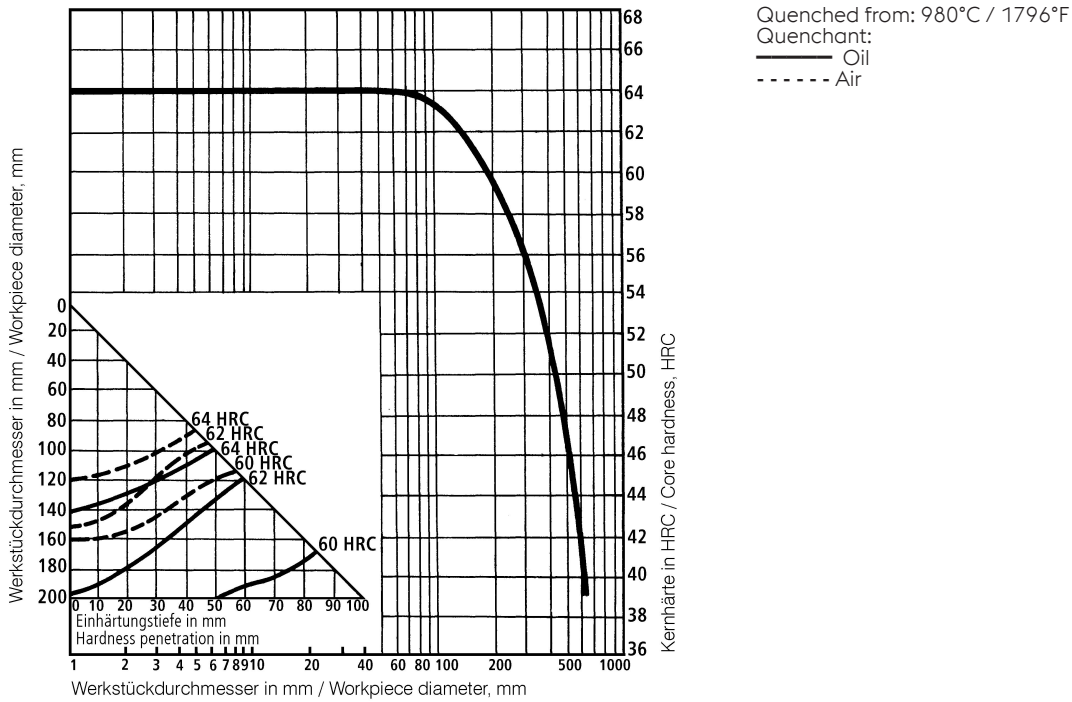
Isothermal TTT curves



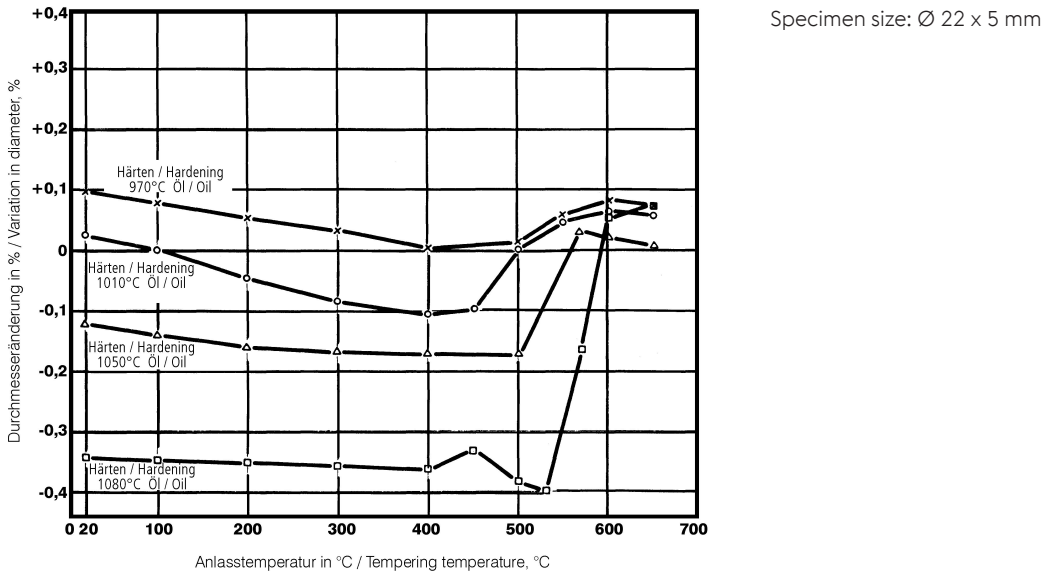
Austenitising temperature: 980°C / 1796°F
Holding time: 30 minutes

A... Austenite
B... Bainite
P... Perlite
K... Carbide
M... Martensite

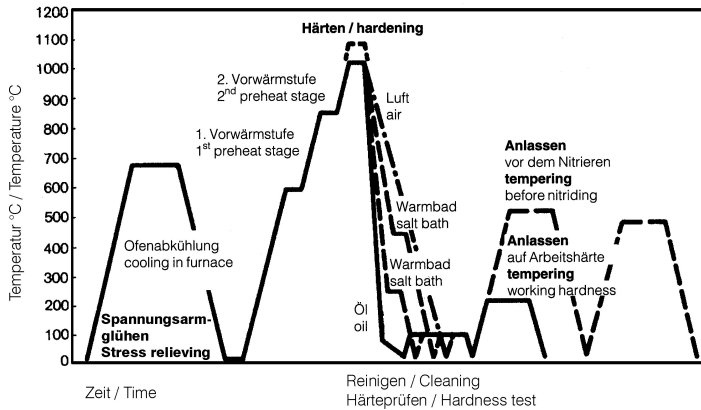
Influence of work diameter on core hardness and hardness penetration



Variation in size as a function of tempering temperature after hardening



Heat treatment sequence



Fizička svojstva

Temperatura (°C)	20
Gustoća (kg/dm ³)	7,7
Toplinska vodljivost (W/(m.K))	20
Specifični toplinski kapacitet (kJ/kg K)	0,46
Spec. Otpornik (Ohm.mm ² /m)	0,65
Modul elastičnosti (10 ³ N/mm ²)	210

Toplinska ekspanzija

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

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.

The data contained in this brochure is merely for general information and therefore shall not be binding on the company. We may be bound only through a contract explicitly stipulating such data as binding. Measurement data are laboratory values and can deviate from practical analyses. The manufacture of our products does not involve the use of substances detrimental to health or to the ozone layer.

voestalpine BÖHLER Edelstahl GmbH & Co KG
 Mariazeller Straße 25
 8605 Kapfenberg, AT
 T. +43/50304/20-0
 E. info@bohler-edelstahl.at
<https://www.voestalpine.com/bohler-edelstahl/de/>

ONE STEP AHEAD.