

OCELE PRE PRÁCU ZA STUDENA

Dostupné výrobné profily

Tyčové polotovary*
Plechý

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

Popis produktu

Vysokovýkonné strižné nástroje (matrice a razníky), lisovacie nástroje, taktiež nástroje na opracovanie dreva, nože nožníc pre tenkostenné strihy, nástroje k valcovaniu závitov, ťažné, hlbokotažné a pretláčacie nástroje, lisovacie nástroje pre keramický a farmaceutický priemysel. Pracovné valce pre valcovacie stolice viacúčelových profilovacích tratí pre valcovanie za studena, meradlá, malé formy na plasty, od ktorých je požadovaná vysoká odolnosť proti abrazívnemu opotrebeniu.

Spôsob výroby

Konvenčná výroba

Vlastnosti

Ledeburitiká chrómová oceľ s dobrou odolnosťou proti opotrebeniu, húževnatosťou a rozmerovou stálosťou, kaliteľná na vzduchu, vhodná k nitrídácii v kúpeli, v plazme aj v plyne.

Aplikácia

- > Strojové nože (pre výrobcov)
- > Strižanie / Dierovanie / Lisovanie / Presné strižanie
- > Valcovanie profilov
- > Valcovanie
- > Výroba normalizovaných dielov (strižníky, platne, kolíky, razníky)
- > Oteruvzdorné diely
- > Tvárnenie za studena
- > Komponenty pre recykláciu
- > Diely pre všeobecné strojárstvo

Technické údaje

Označenie materiálu	
1.2601	SEL
~T30402	UNS
X165CrMoV12	EN
~D2	AISI
~Ch12MF	GOST

Chemické zloženie

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

Porovnanie vlastnosti materiálu

	Odolnosť proti tlakovému zaťaženiu	Rozmerová stabilita počas tepelného spracovania	Húževnatosť	Odolnosť proti abrazívnemu opotrebovaniu	Odolnosť proti adhezívnemu opotrebovaniu
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®	★★★★★	★★★★★	★★★★★	★★★	★★★

Stav pri dodaní

Žihany

Tvrdosť (HB)	max. 250
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Tepelné spracovanie

Žihanie

Teplota	800 až 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.
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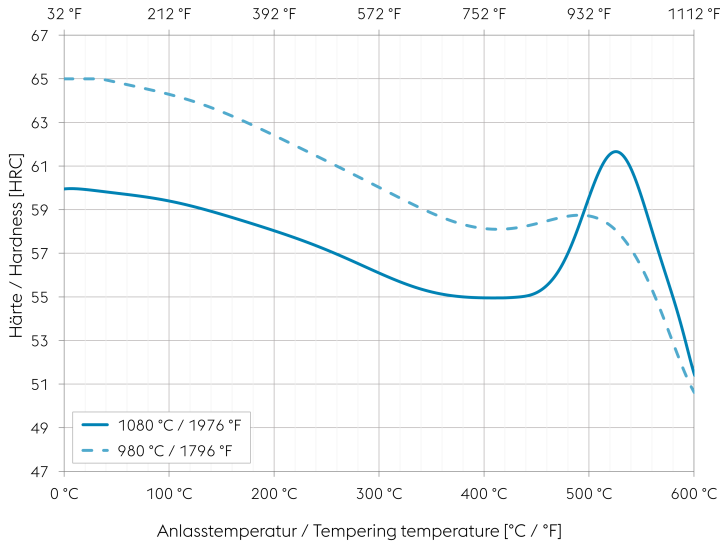
Žihanie na odstránenie prnutí

Teplota	650 až 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..
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Kalenie a popúšťanie

Teplota	980 až 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.
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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.

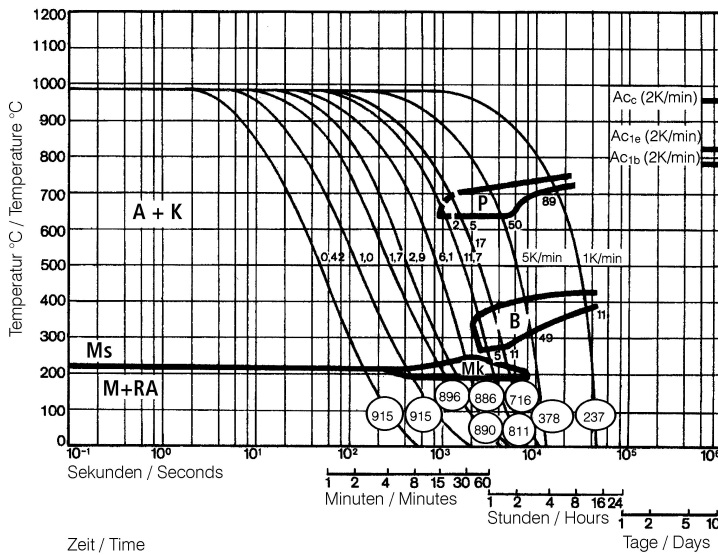
Slow cooling to room temperature after each tempering step is recommended.

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



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

O Vickers hardness

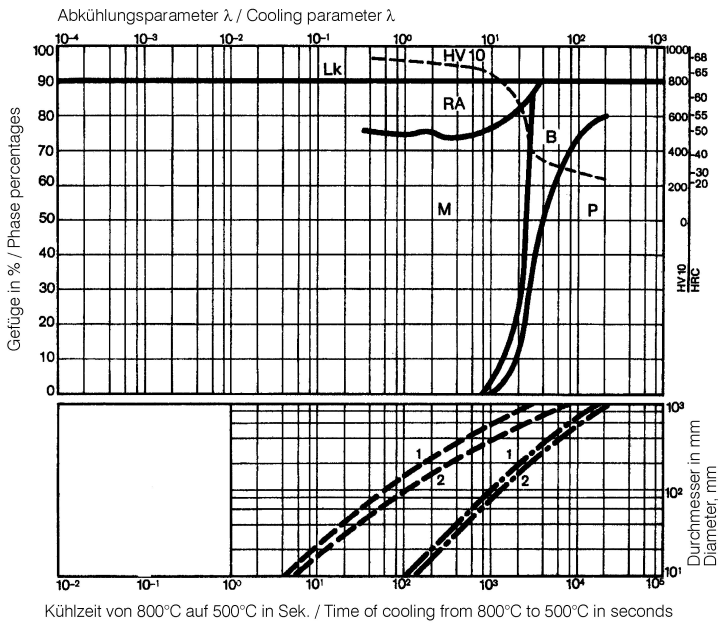
2...50 phase percentages

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

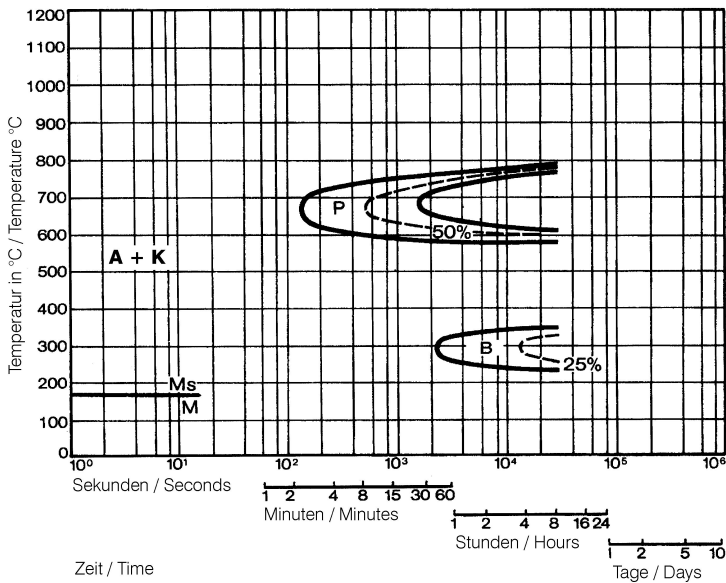


Lk... Ledeburite carbide
 RA... Residual austenite
 A... Austenite
 B... Bainite
 P... Perlite
 K... Carbide
 M... Martensite

----- Oil cooling
 - · - Air cooling

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

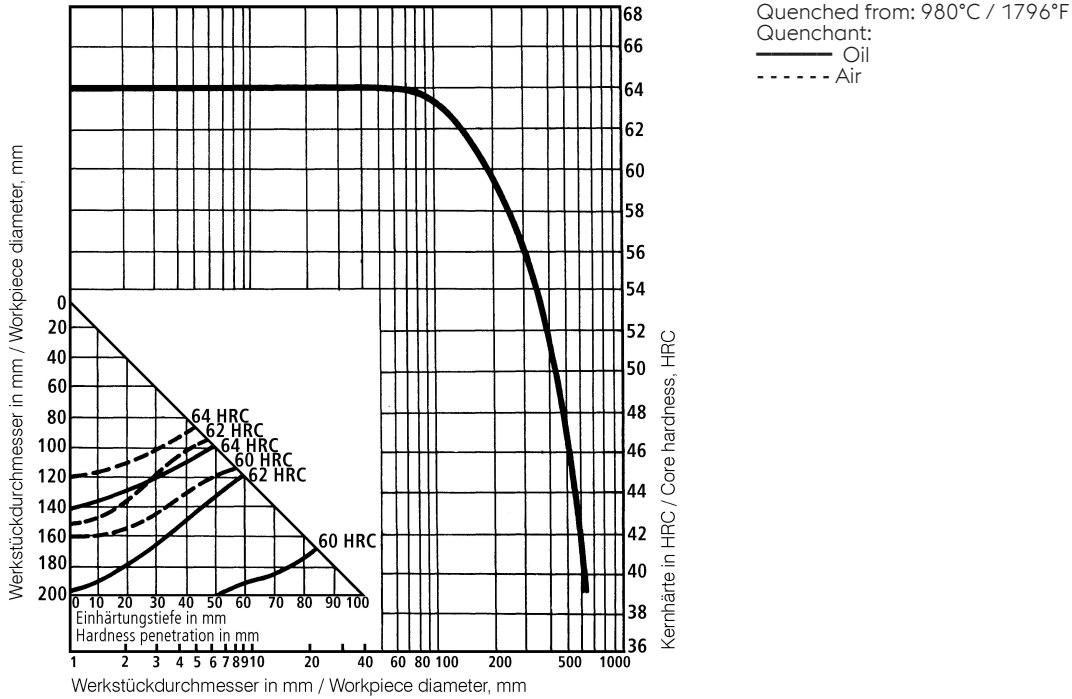
Isothermal TTT curves



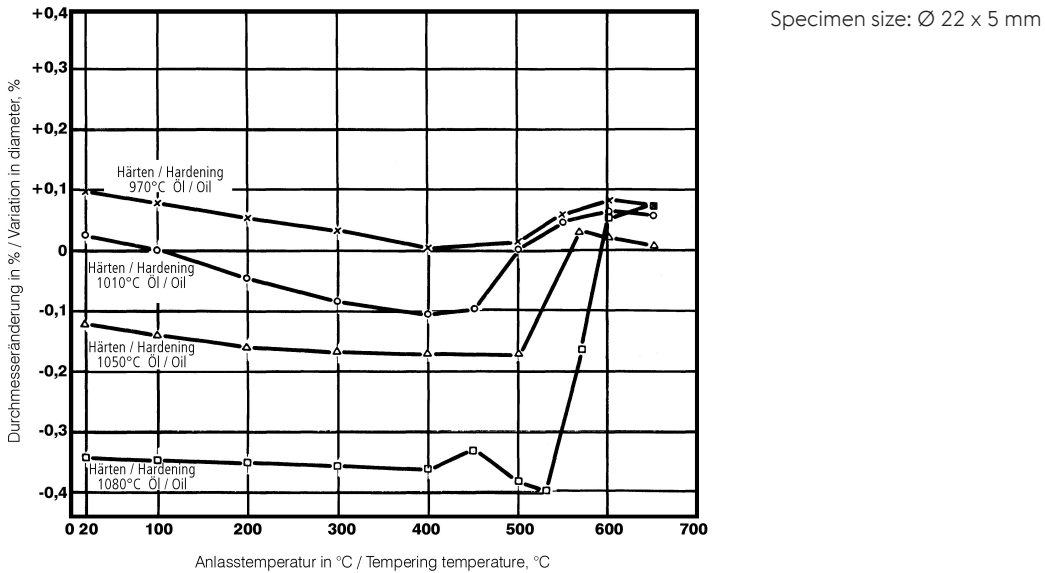
Austenitising temperature: 980°C / 1796°F
 Holding time: 30 minutes

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

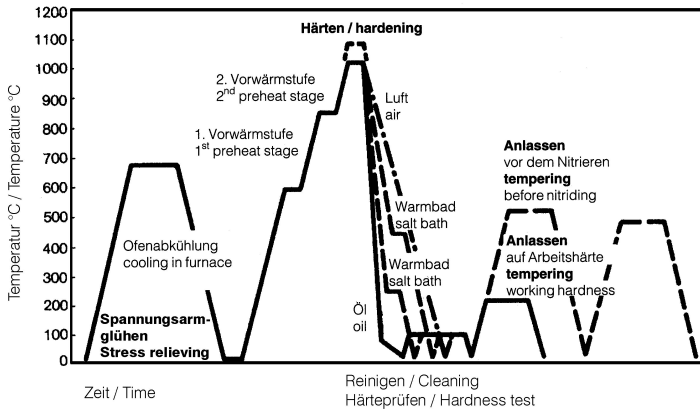
Influence of work diameter on core hardness and hardness penetration



Variation in size as a function of tempering temperature after hardening



Heat treatment sequence



Fyzikálne vlastnosti

Teplota (°C)	20
Hustota (kg/dm ³)	7,7
Tepelná vodivosť (W/(m.K))	20
Merná tepelná kapacita (kJ/kg K)	0,46
Merný elektrický odpor (Ohm.mm ² /m)	0,65
Modul pružnosti (10 ³ N/mm ²)	210

Tepelná rozťažnosť

Teplota (°C)	100	200	300	400	500	600
Tepelná rozťažnosť (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.

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ONE STEP AHEAD.