

# BRZOREZNI ČELICI

## 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

### BÖHLER S790 MICROCLEAN – MICROCLEAN br. 1"

Brzorezni čelik proizveden postupcima praškaste metalurgije, odlikuje se dobrom tvrdoćom u toplom stanju, tlačnom čvrstoćom i otpornošću na trošenje. PM tehnologija daje ovom čeliku dobru žilavost i izvrsnu obradivost, uključujući najbolju strojnu obradivost.

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## Put taljenja

Powder metallurgy

## Karakteristike

- > Žilavost i duktilnost : visok
- > Otpornost na habanje : dobar
- > Tlačna čvrstoća : dobar
- > Stabilnost rubova : dobar
- > Mogućnost brušenja : visok
- > Tvrdoća pri visokim temperaturama : dobar

## Korištenje

- > Automobilske utrke
- > Oblikovanje utiskivanjem praškastih materijala
- > Posebni rezni alati
- > Strugači i razvrtači
- > Valjanje
- > Potrošni dijelovi
- > Hladno oblikovanje / utiskivanje
- > Rezanje / strojni noževi

## Tehnički podaci

Oznaka materijala		Standardi	
1.3345	SEL	4957	EN ISO
HS6-5-3C	EN		

## Kemijski sastav

C	Cr	Mo	V	W
1,3	4,2	5	3	6,3

## Materijal

	Kapacitet tlaka	Brušenje	Vruća tvrdoća	Žilavost	Otpornost na habanje	Točnost rezanja
<b>BÖHLER S790</b> <b>MICROCLEAN®</b>	★★★	★★★	★★	★★★★	★★	★★★
<b>BÖHLER S290</b> <b>MICROCLEAN®</b>	★★★★★	★	★★★★	★★	★★★★★	★★★★
<b>BÖHLER S390</b> <b>MICROCLEAN®</b>	★★★★	★★★	★★★★	★★★★	★★★★	★★★★
<b>BÖHLER S393</b> <b>MICROCLEAN®</b>	★★★★	★★★	★★★★	★★★★	★★★★	★★★★
<b>BÖHLER S590</b> <b>MICROCLEAN®</b>	★★★★	★★★	★★★★	★★★	★★★	★★★
<b>BÖHLER S592</b> <b>MICROCLEAN®</b>	★★★★	★★★	★★★★	★★★	★★★	★★★
<b>BÖHLER S690</b> <b>MICROCLEAN®</b>	★★★	★★★	★★	★★★★★	★★★	★★
<b>BÖHLER S692</b> <b>MICROCLEAN®</b>	★★★	★★★	★★	★★★★★	★★★	★★
<b>BÖHLER S792</b> <b>MICROCLEAN®</b>	★★★	★★★	★★	★★★★	★★	★★★
<b>BÖHLER S793</b> <b>MICROCLEAN®</b>	★★★	★★★	★★★★	★★★	★★★	★★★

## Isporka

### Annealed

Tvrdoća (HB)	max. 280   drawn max. 300 HB
Vlačna čvrstoća (MPa)	max. 1.020
Točka prinosa (N/mm <sup>2</sup> )	max. 1.020

## Toplinska obrada

### Annealing

Temperatura	870 do 900 °C	870 to 900°C (1598 to 1652°F)    The steel needs to be protected against decarburization.    Through heating of the material is followed by controlled, slow furnace cooling at a maximum cooling rate of 10°C (50°F) per hour, down to approx. 700°C (1292°F).    Final cooling in air.
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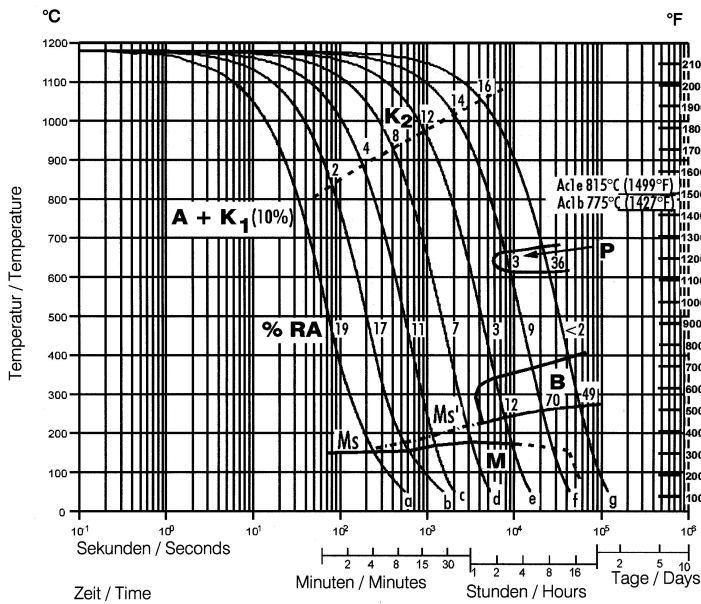
### Stress relieving

Temperatura	600 do 650 °C	Slow cooling furnace.    To relieve stresses set up by extensive machining or in tools of intricate shape.    After through heating, hold in neutral atmosphere for 1 to 2 hours.
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### Hardening and Tempering

Temperatura	1.050 do 1.200 °C	Salt bath, vacuum    Preheating: 1st stage ~ 500 °C, 2nd stage ~ 850 °C, 3rd stage ~1050 °C (for higher austenitising temperature)    Austenitising: for cutting applications at higher austenitising temperatures (> 1130 °C), holding time after complete heating 80 seconds, maximum 150 seconds, to avoid material damage due to overtime.    Austenitising: for cold work applications at lower austenitising temperatures (< 1100°C). Holding time after complete heating 15 to 30 min    Quenching: oil, warm bath (500 - 550 °C), gas.
Temperatura	560 do 580 °C	Slow heating to tempering temperature immediately after austenitising.    Dwell time in the furnace 1 hour per 20 mm material thickness (at least 1 hour)    Slow cooling to room temperature between each tempering step    3 tempering cycles recommended    Hardness see tempering chart

Continuous cooling CCT curves

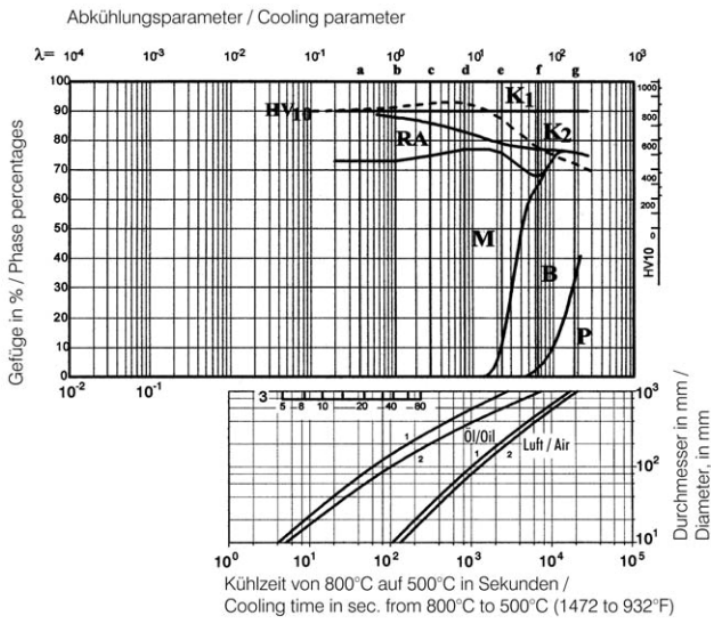


Austenitising temperature: 1180°C (2156°F)  
Holding time: 180 seconds

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

Sample	λ	HV10	Sample	λ	HV10
a	0,4	811	e	23,0	751
b	1,1	827	f	65,0	560
c	3,0	854	g	180,0	448
d	8,0	855			

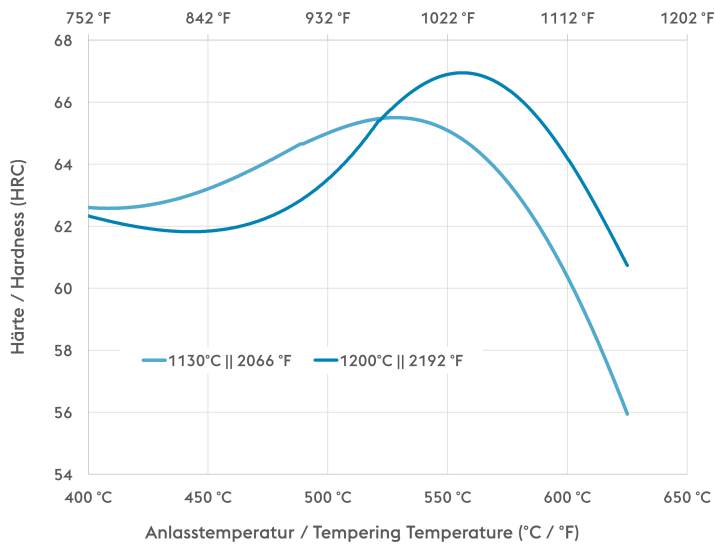
Quantitative phase diagram



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

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

## Tempering Chart



## Fizička svojstva

Temperatura (°C)	20
Gustoća (kg/dm <sup>3</sup> )	8
Toplinska vodljivost (W/(m.K))	24
Specifični toplinski kapacitet (kJ/kg K)	0,42
Spec. Otpornik (Ohm.mm <sup>2</sup> /m)	0,54
Modul elastičnosti (10 <sup>3</sup> N/mm <sup>2</sup> )	230

## Toplinska ekspanzija

Temperatura (°C)	100	200	300	400	500	600	700
Toplinska ekspanzija (10 <sup>-6</sup> m/(m.K))	11,5	11,7	12,2	12,4	12,7	13	12,9

**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.