

# YÜKSEK HIZ ÇELİKLERİ

## Mevcut Ürün Şekilleri

Uzun Ürünler\*

Levhalar

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

## Ürün Tanımı

### BÖHLER S790 MICROCLEAN – "The 1<sup>st</sup> MICROCLEAN"

High-speed steel manufactured in a powder metallurgy process, with good hot hardness, compressive strength, and wear resistance. PM technology gives it good toughness and excellent workability, including the best machinability.

## Erime rotası

Powder metallurgy

## Özellikler

- > Tokluk ve Süneklik : yüksek
- > Aşınma Direnci : iyi
- > Basınç Dayanımı : iyi
- > Kenar Stabilitesi : iyi
- > Öğütülebilirlik : yüksek
- > Sıcak Sertlik (kırmızı sertlik) : iyi

## Uygulamalar

- > Motor Sporları
- > Broaches and Reamers
- > Cold Forming / Coining
- > Powder Pressing
- > Rolling
- > Shearing / Machine Knives
- > Special Cutting Tools
- > Wear parts

## Teknik veriler

| Malzeme Tanımı |     | Standartlar |        |
|----------------|-----|-------------|--------|
| 1.3345         | SEL | 4957        | EN ISO |
| HS6-5-3C       | EN  |             |        |

## Kimyasal Bileşim

| C    | Cr  | Mo | V | W   |
|------|-----|----|---|-----|
| 1,29 | 4,2 | 5  | 3 | 6,3 |

## Malzeme özellikleri

|   | Basınç Dayanımı | Öğütülebilirlik | Sıcak sertlik | Sertlik | Aşınma direnci | Kesilme direnci |
|---|-----------------|-----------------|---------------|---------|----------------|-----------------|
| <b>BÖHLER S290</b><br><b>MICROCLEAN</b> | ★★★★★           | ★               | ★★★★★         | ★★      | ★★★★★          | ★★★★★           |
| <b>BÖHLER S390</b><br><b>MICROCLEAN</b> | ★★★★★           | ★★★             | ★★★★★         | ★★★★★   | ★★★★★          | ★★★★★           |
| <b>BÖHLER S393</b><br><b>MICROCLEAN</b> | ★★★★★           | ★★★             | ★★★★★         | ★★★★★   | ★★★★★          | ★★★★★           |
| <b>BÖHLER S590</b><br><b>MICROCLEAN</b> | ★★★★★           | ★★★             | ★★★★★         | ★★★     | ★★★            | ★★★             |
| <b>BÖHLER S690</b><br><b>MICROCLEAN</b> | ★★★             | ★★★             | ★★            | ★★★★★   | ★★★            | ★★              |
| <b>BÖHLER S793</b><br><b>MICROCLEAN</b> | ★★★             | ★★★             | ★★★★★         | ★★★     | ★★★            | ★★★             |

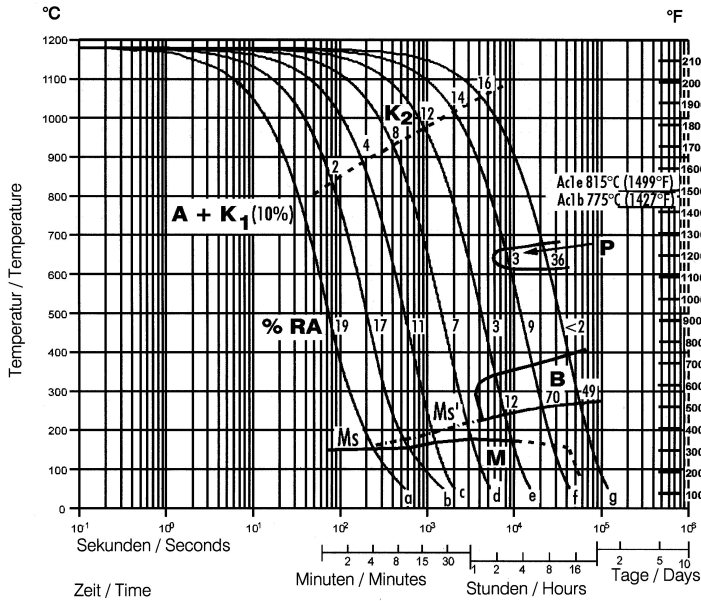
## Teslimat durumu

| Annealed                           |                               |
|------------------------------------|-------------------------------|
| Sertlik (HB)                       | maks. 280   drawn max. 300 HB |
| Akma dayanımı (N/mm <sup>2</sup> ) | maks. 1.020                   |

## Isıl işlem

| Annealing                  |                      |  |
|----------------------------|----------------------|--|
| Sıcaklık                   | 870 kadar 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.   |
| Stress relieving           |                      |  |
| Sıcaklık                   | 600 kadar 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.  |
| Sertleştirme ve Temperleme |                      |  |
| Sıcaklık                   | 1.050 kadar 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. |
| Sıcaklık                   | 560 kadar 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  |

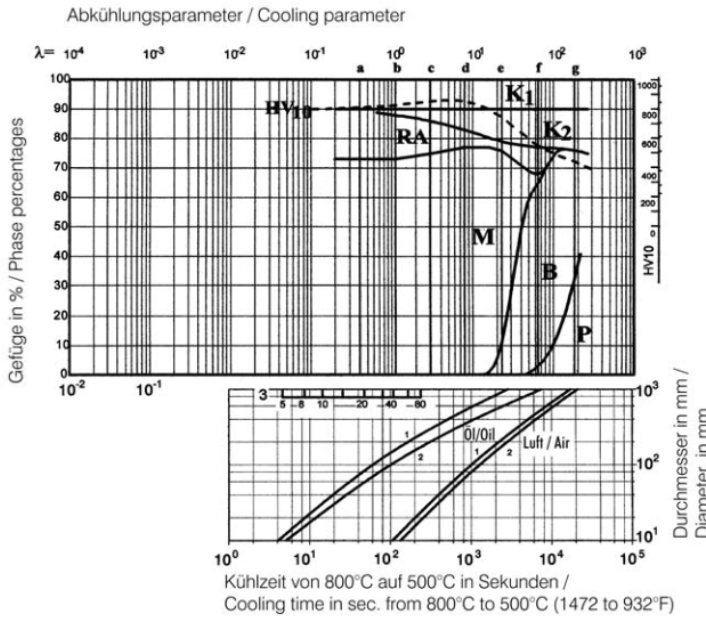
Continuous cooling CCT curves



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

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

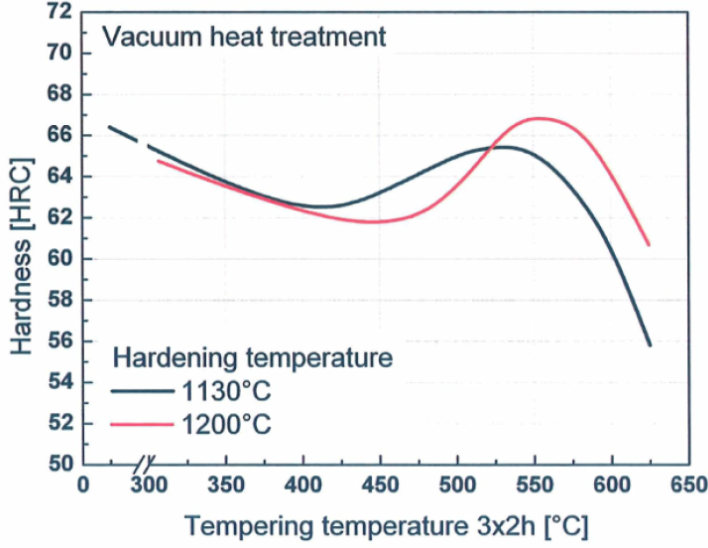
Quantitative phase diagram



- 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



Holding time 3 x 2 hours  
Specimen size: square 25 mm

## Fiziksel özellikler

|   |      |
|---|------|
| Sıcaklık (°C)   | 20   |
| Yoğunluk (kg/dm <sup>3</sup> )                          | 8    |
| Termal iletkenlik (W/(m.K))                             | 24   |
| Özgül ısı kapasitesi (kJ/kg K)                          | 0,42 |
| Spes. elektrik direnci (Ohm.mm <sup>2</sup> /m)         | 0,54 |
| Elastikiyet modülü (10 <sup>3</sup> N/mm <sup>2</sup> ) | 230  |

## Termal genleşmeler

| Sıcaklık (°C)                              | 100  | 200  | 300  | 400  | 500  | 600 | 700  |
|--|------|------|------|------|------|-----|------|
| Termal genleşme (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.