

# SICAK İŞ TAKIM ÇELİKLERİ

## Mevcut Ürün Şekilleri

Uzun Ürünler\*

Levhalar

Açık Kalıpta Dövme

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

## Ürün Tanımı

BÖHLER W302 ISODISC is a 5% chromium steel and corresponds to material number 1.2344 (X40CrMoV5-1). This common tool steel has good hot toughness as well as a high hot hardness and a high resistance against heat-checkings. The combination of these properties makes it a standard choice in extrusion, forging and low-pressure die casting. This material is also available as W302 ISOBLOC which is a remelted grade with improved cleanliness, homogeneity and toughness.

## Erime rotası

Airmelted

## Özellikler

- > Tokluk ve Süneklik : iyi
- > Aşınma Direnci : yüksek
- > İşlenebilirlik : çok yüksek
- > Sıcak Sertlik (kırmızı sertlik) : yüksek
- > Cilalanabilirlik : iyi
- > Termal iletkenlik : iyi
- > Mikro temizlik : iyi

## Uygulamalar

- > Ekstrüzyon
- > Yerçekimi / Düşük Basıncı Döküm
- > Enjeksiyon kalıplama
- > Pres Sertleştirme / Sıcak Damgalama
- > Makine Mühendisliği / Makine İmalatı, Genel
- > Dövme (Sıcak / Yarı Sıcak)
- > Blow Molding
- > Machine knife (for producers)
- > Progressive Forging (Hatebur)
- > Makine Mühendisliği için Genel Parçalar
- > Yüksek Basıncı Döküm
- > Diğer Otomotiv bileşenleri (Turboşarjlar, Piston Halkaları, Sensörler vb.)
- > Takım Tutucular (frezeleme, delme, tornalama & Aynalar)

## Teknik veriler

Malzeme Tanımı		Standartlar	
1.2344	SEL	4957	EN ISO
T20813	UNS	G4404	JIS
X40CrMoV5-1	EN		
H13	AISI		
SKD61	JIS		

**Kimyasal Bileşim**

C	Si	Mn	Cr	Mo	V
0,39	1,10	0,40	5,20	1,30	0,95

**Malzeme özellikleri**

	Sıcak güç	Sıcak tokluk	Sıcak aşınma direnci
<b>BÖHLER W302</b> <b>ISODISC®</b>	★★★	★★★	★★★
<b>BÖHLER W300</b> <b>ISODISC®</b>	★★	★★★	★★
<b>BÖHLER W300</b> <b>ISOBLOC®</b>	★★	★★★★	★★
<b>BÖHLER W302</b> <b>ISOBLOC®</b>	★★★	★★★★	★★★
<b>BÖHLER W303</b> <b>ISODISC®</b>	★★★★	★★★	★★★★
<b>BÖHLER W320</b> <b>ISODISC®</b>	★★★	★★	★★★
<b>BÖHLER W350</b> <b>ISOBLOC®</b>	★★★	★★★★★	★★★
<b>BÖHLER W360</b> <b>ISOBLOC®</b>	★★★★★	★★★★	★★★★★
<b>BÖHLER W400</b> <b>VMR®</b>	★★	★★★★★	★★
<b>BÖHLER W403</b> <b>VMR®</b>	★★★★	★★★★	★★★★

**Teslimat durumu**

<b>Annealed</b>	
Sertlik (HB)	maks. 229
<b>Hardened and Tempered</b>	
Sertlik (HRC)	40 kadar 55   bars hardened and tempered (BHT)
<b>Hardened and Tempered</b>	
Sertlik (HRC)	30 kadar 44

## Isıl İşlem

### Annealing

Sıcaklık	750 kadar 800 °C	Holding time 6 to 8 hours. Slow, controlled furnace cooling at 10 to 20°C/h (50 to 68 °F/hr) to approx. 600°C (1112°F), further cooling in air.
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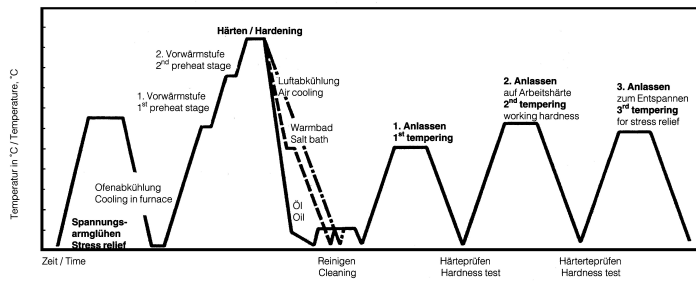
### Stress relieving

Sıcaklık	600 kadar 670 °C	For stress relief after extensive machining or for complicated tools. Holding time depending on tool size after complete heating 2 - 6 hours in neutral atmosphere. Slow furnace cooling.
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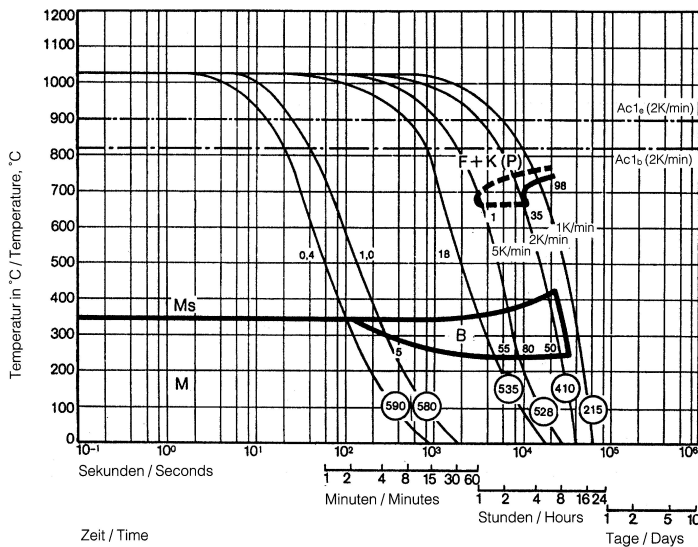
### Sertleştirme ve Temperleme

Sıcaklık	1.020 kadar 1.080 °C	Holding time after temperature equalization: 15 to 30 minutes; Quenching: Oil, salt bath (500 - 550°C [932-1022°F]), air, vacuum; After hardening, tempering to the desired working hardness (see tempering chart).
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## Heat treatment sequence



## Continuous cooling CCT curves



Austenitising temperature: 1020°C (1868°F)  
Holding time: 15 minutes

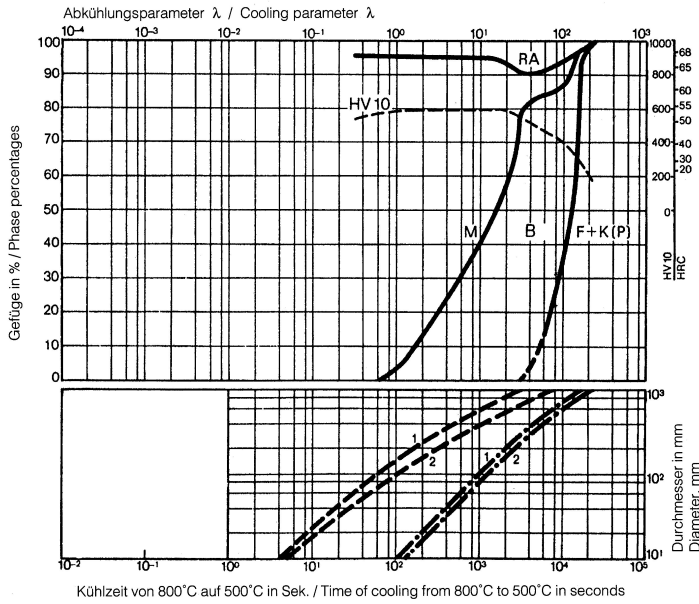
O Vickers hardness

1...35 phase percentages

0.4...18 cooling parameter, i.e. duration of cooling from 800 - 500°C (1472-932°F) in  $s \times 10^{-2}$

5...1 K/min cooling rate in K/min in the 800 - 500°C (1472-932°F) range

**Quantitative phase diagram**

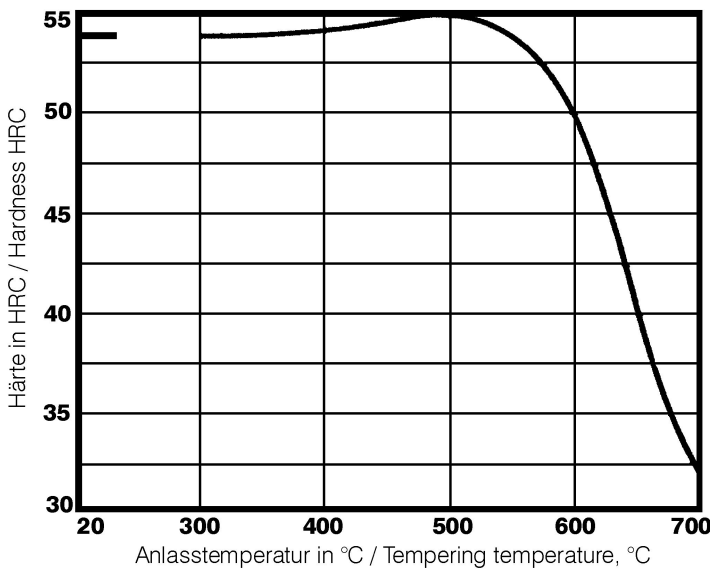


B... Bainite  
F... Ferrite  
K... Carbide  
M... Martensite  
P... Perlite  
RA... Retained austenite

----- Oil cooling  
- · - Air cooling

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

**Tempering chart**



**Tempering:**

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. It is recommended to temper at least twice. A third tempering cycle for the purpose of stress relieving may be advantageous.

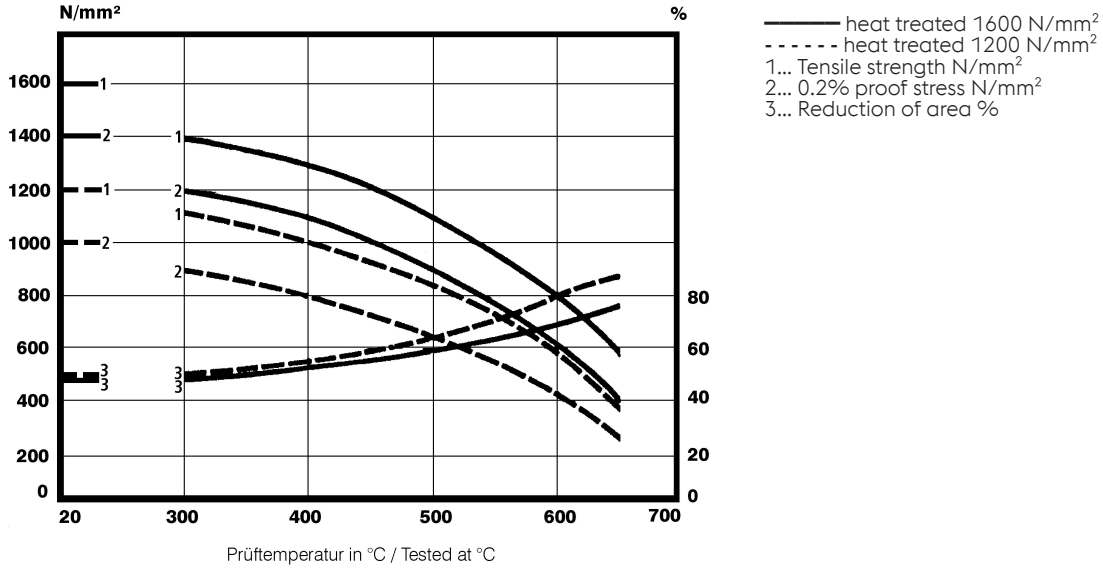
1st tempering approx. 86°F (30°C) above maximum secondary hardness.

2nd tempering to desired working hardness. The tempering chart shows average tempered hardness values.

3rd for stress relieving at a temperature 86 to 122 °F (30 to 50°C) below highest tempering temperature.

Hardening temperature: 1050°C (1922°F)  
Specimen size: square 50 mm

## Hot strength chart



## Fiziksel özellikler

Sıcaklık (°C)	20
Yoğunluk (kg/dm <sup>3</sup> )	7,8
Termal iletkenlik (W/(m.K))	24,3
Özgül ısı kapasitesi (kJ/kg K)	0,46
Spes. elektrik direnci (Ohm.mm <sup>2</sup> /m)	0,52
Elastikiyet modülü (10 <sup>3</sup> N/mm <sup>2</sup> )	215

## Termal genleşmeler

Sıcaklık (°C)	100	200	300	400	500	600	700
Termal genleşme (10 <sup>-6</sup> m/(m.K))	11,5	12	12,2	12,5	12,9	13	13,2

**Long Products:** For additional specifications and technical requirements, please contact our regional voestalpine BÖHLER sales companies.

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ONE STEP AHEAD.