

# HOT WORK TOOL STEELS

## Available Product Variants

- Long Products\*
- Plates
- Open Die Forgings

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

## Product Description

BÖHLER W300 ISODISC is a 5% chromium steel and corresponds to material number 1.2343 (X37CrMoV5-1). 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 W300 ISOBLOC which is a remelted grade with improved cleanliness, homogeneity and toughness.

## Process Melting

- Airmelted

## Properties

- > Toughness & Ductility : good
- > Wear Resistance : good
- > Machinability : very high
- > Hot Hardness (red hardness) : good
- > Polishability : good
- > Thermal conductivity : good
- > Micro-cleanliness : good

## Applications

- > Extrusion
- > High Pressure Die-Casting
- > Progressive Forging (Hatebur)
- > Forging Applications
- > Rolls
- > Hotrunner systems
- > Forging (Hot / Semi-hot)
- > Injection Molding
- > Mechanical Engineering
- > General Components for Mechanical Engineering
- > Shearing / Machine Knives
- > Gravity / Low Pressure Die-Casting
- > Press Hardening / Hot Stamping
- > Fasteners, Bolts, Nuts
- > Machine knife (for producers)
- > Tool Holders (milling, drilling, turning & chucks)

## Technical data

Material designation		Standards	
1.2343	SEL	4957	EN ISO
X37CrMoV5-1	EN	G4404	JIS
T20811	UNS		
H11	AISI		
SKD6	JIS		

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V
0.38	1.10	0.40	5.00	1.20	0.40

Material characteristics

	High temperature strength	High temperature toughness	High temperature wear resistance
<b>BÖHLER W300</b> <b>ISODISC®</b>	★★	★★★	★★
<b>BÖHLER W300</b> <b>ISOBLOC®</b>	★★	★★★★	★★
<b>BÖHLER W302</b> <b>ISODISC®</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>	★★★★	★★★★	★★★★

Delivery condition

<b>Annealed</b>	
Hardness (HB)	max. 229
<b>Hardened and Tempered</b>	
Hardness (HRC)	40 to 55   bars hardened and tempered (BHT)
<b>Hardened and Tempered</b>	
Hardness (HRC)	30 to 44

## Heat treatment

### Annealing

Temperature	750 to 800 °C   1,382 to 1,472 °F	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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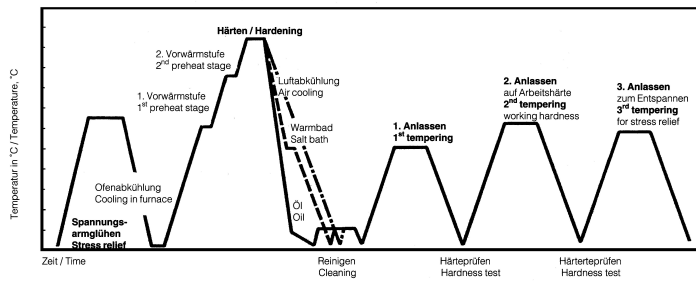
### Stress relieving

Temperature	600 to 670 °C   1,112 to 1,238 °F	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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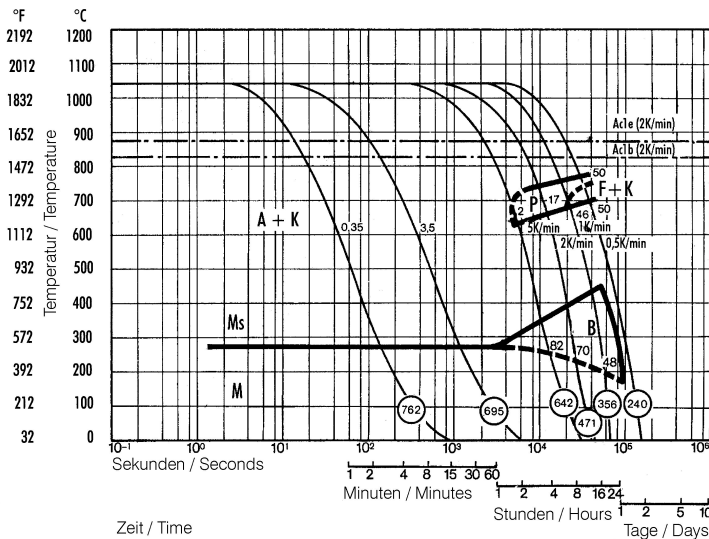
### Hardening and Tempering

Temperature	1,000 to 1,030 °C   1,832 to 1,886 °F	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



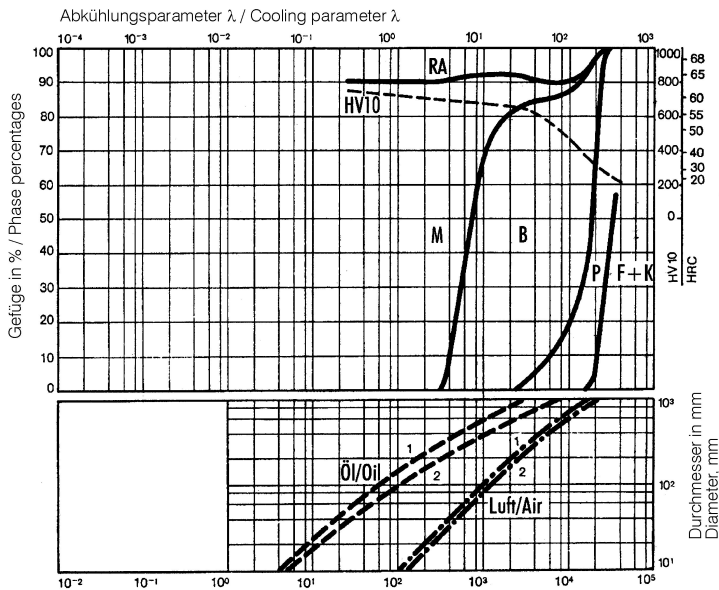
## Continuous cooling CCT curves



Austenitising temperature: 1030°C (1886°F)  
Holding time: 15 minutes

O Vickers hardness  
2...46 phase percentages  
0.35...3.5 cooling parameter, i.e. duration of cooling from 800 - 500°C (1472-932°F) in s x 10<sup>-2</sup>  
5...0.5 K/min cooling rate in K/min in the 800 - 500°C (1472-932°F) range

**Quantitative phase diagram**

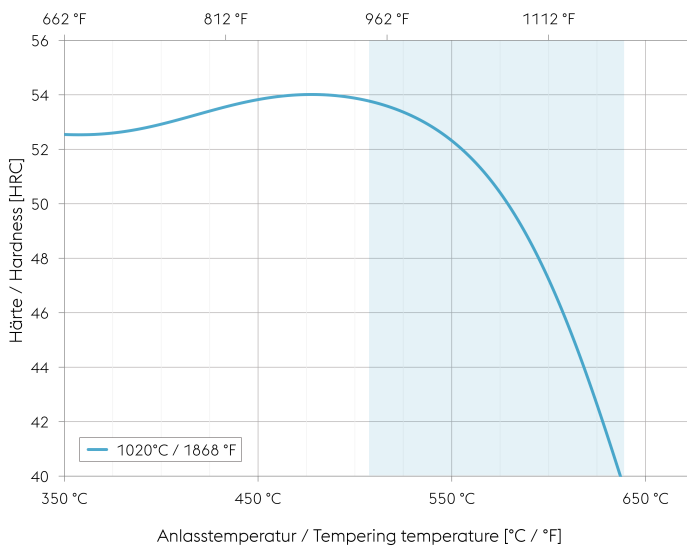


A... Austenite  
B... Bainite  
F... Ferrite  
K... Carbide  
M... Martensite  
P... Perlite  
RA... Retained austenite

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

Kühlzeit von 800°C auf 500°C in Sek. / Time of cooling from 800°C to 500°C (1472-932°F) in seconds

**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.

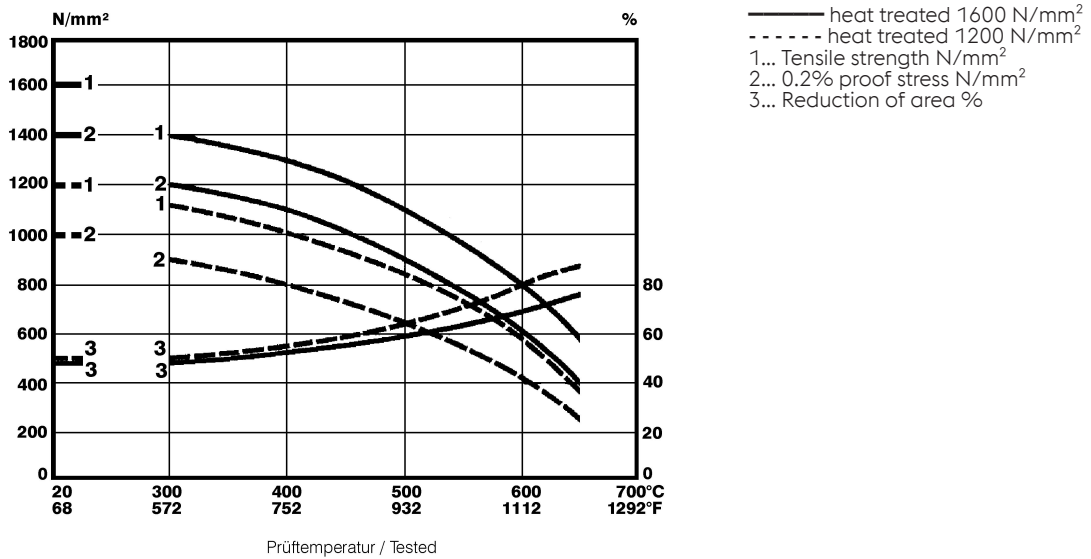
The tempering chart shows average tempered hardness values.

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

Recommended tempering temperature range is indicated by the blue area in the chart.

Hardening temperature: 1020°C (1868°F)  
Specimen size: square 50 mm

Hot strength chart



Physical Properties

Temperature (°C   °F)	20   68
Density (kg/dm <sup>3</sup>   lb/in <sup>3</sup> )	7.8   0.28
Thermal conductivity (W/(m.K)   BTU/ft h °F)	24.9   14.39
Specific heat (kJ/kg K   BTU/lb °F)	0.46   0.1099
Spec. electrical resistance (Ohm.mm <sup>2</sup> /m   10 <sup>-4</sup> Ohm.inch <sup>2</sup> /ft)	0.52   2.46
Modulus of elasticity (10 <sup>3</sup> N/mm <sup>2</sup>   10 <sup>3</sup> ksi)	215   31.18

Thermal Expansions between 20°C | 68°F and ...

Temperature (°C   °F)	100   212	200   392	300   572	400   752	500   932	600   1,112	700   1,292
Thermal expansion (10 <sup>-6</sup> m/(m.K)   10 <sup>-6</sup> inch/inch.°F)	11.5   6.4	12   6.7	12.2   6.8	12.5   6.9	12.9   7.2	13   7.2	13.2   7.3

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

**Open Die Forgings:** Product Variant may differ in terms of melting process, technical data, delivery, and surface condition as well as available product dimensions. Please contact the business unit Open Die Forgings of voestalpine BÖHLER Edelstahl GmbH & Co KG.

**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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