HOT WORK TOOL STEELS

Application Segments

| Hot Work |

Available Product Variants

| Long Products* | Plates | Open Die Forgings |

* Presented data refer exclusivly 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)

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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
BÖHLER W300 ISODISC	★ ★	★ ★ ★	★ ★
BÖHLER W300 ISOBLOC	★ ★	★ ★ ★ ★	★ ★
BÖHLER W302 ISODISC	★ ★ ★	★ ★ ★	★ ★ ★
BÖHLER W302 ISOBLOC	★ ★ ★	★ ★ ★ ★	★ ★ ★
BÖHLER W303 ISODISC	★ ★ ★ ★	★ ★ ★	★ ★ ★ ★
BÖHLER W320 ISODISC	★ ★ ★	★ ★	★ ★ ★
BÖHLER W350 ISOBLOC	★ ★ ★	★ ★ ★ ★ ★	★ ★ ★
BÖHLER W360 ISOBLOC	★ ★ ★ ★ ★	★ ★ ★ ★	★ ★ ★ ★ ★
BÖHLER W400 VMR	★ ★	★ ★ ★ ★ ★	★ ★
BÖHLER W403 VMR	★ ★ ★ ★	★ ★ ★ ★	★ ★ ★ ★

Delivery condition

Annealed

Hardness (HB)	max. 229

Hardened and Tempered

Hardness (HRC)	40 to 55	bars hardened and tempered (BHT)

Hardened and Tempered

Hardness (HRC)	30 to 44

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Heat treatment

Annealing

| Temperature	750 to 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.

Stress relieving

| Temperature	600 to 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.

Hardening and Tempering

Temperature	1,000 to 1,030 °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).

Heat treatment sequence
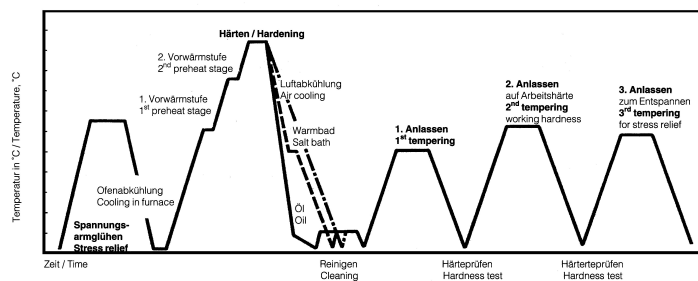
Continuous cooling CCT curves
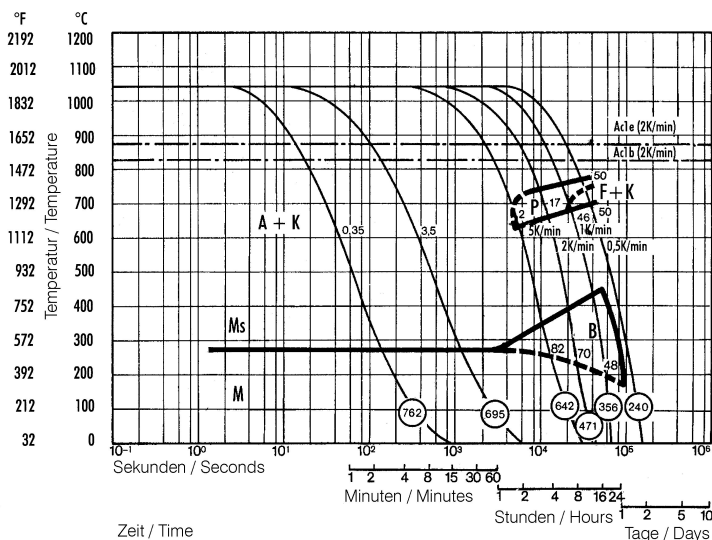
Austenitising temperature: 1030°C (1886°F)
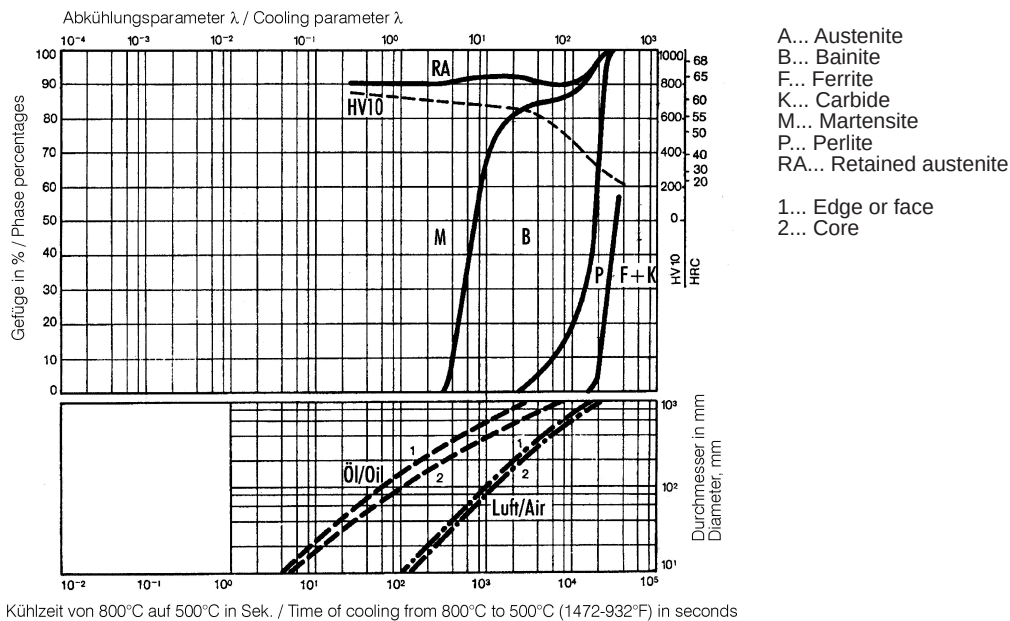Holding time: 15 minutes
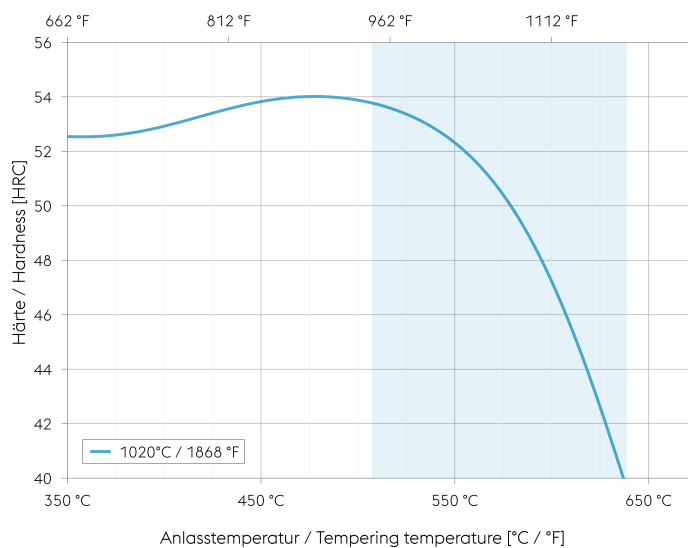
○ Vickers hardness
2...46 phase percentages
0.35...3.5 cooling parameter, i.e. duration of cooling from 800 - 500°C (1472-932°F) in s x 10^{-2}
5...0.5 K/min cooling rate in K/min in the 800 - 500°C (1472-932°F) range

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.
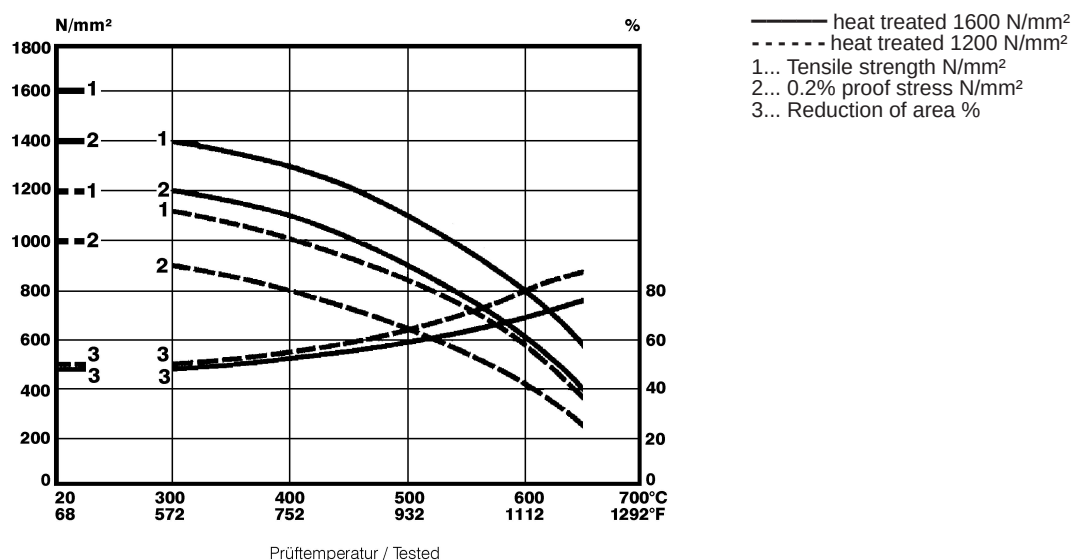
2nd tempering to desired working hardness.

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

heat treated 1600 N/mm²
heat treated 1200 N/mm²
1... Tensile strength N/mm²
2... 0.2% proof stress N/mm²
3... Reduction of area %

Prüftemperatur / Tested

Physical Properties

Temperature (°C)	20
Density (kg/dm³)	7.8
Thermal conductivity (W/(m.K))	24.9
Specific heat (kJ/kg K)	0.46
Spec. electrical resistance (Ohm.mm²/m)	0.52
Modulus of elasticity (10³N/mm²)	215

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

Temperature (°C)	100	200	300	400	500	600	700
Thermal expansion (10^{-6} m/(m.K))	11.5	12	12.2	12.5	12.9	13	13.2

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