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 ISOBLOC is a 5% chromium steel and corresponds to material number 1.2343 (X37CrMoV5-1). Produced via the electroslag remelting process (ESR), this tool steel has very high hot toughness as well as good hot hardness and very good resistance against heat-checkings. The combination of these properties makes it a top performer in high- and low-pressure die casting as well as in closed-die and open-die forging. In addition, this material has very good polishability and is therefore also often used as a molding material for plastic injection molds.

Process Melting

Airmelted + Remelted

Properties

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

Applications

- High Pressure Die-Casting
- Progressive Forging (Hatebur)
- Injection Moulding
- Industrial Knives
- Screws and Barrels
- Rolls
- Glasfibre reinforced plastics
- Forging (Hot / Semi-hot)
- Hot Extrusion
- Press Hardening / Hot Stamping
- Tool Holders (milling, drilling, turning & chucks)
- Blow Molding
- Mechanical Engineering
- Roll Forming
- Gravity / Low Pressure Die-Casting
- Fasteners, Bolts, Nuts
- Rolling
- Standard Parts (Moulds, Plates, Pins, Punches)
- Machine knife (for producers)
- Hotrunner systems
- Cold Rolling incl. Sendzimir Rolls

Technical data

Material designation	
1.2343	SEL
X37CrMoV5-1	EN
T20811	UNS
H11	AISI
D1830	NADCA
SKD6	JIS

Standards	
4957	EN ISO
#207	NADCA
G4404	JIS

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V
0.38	0.90	0.40	5.20	1.30	0.45

Material characteristics

	High temperature strength	High temperature toughness	High temperature wear resistance	Machinability in as supplied condition	Polishability
BÖHLER W300 ISOBLOC	★★	★★★★	★★	★★★★★	★★★★
BÖHLER W300 ISODISC	★★	★★★	★★	★★★★★	★★★
BÖHLER W302 ISODISC	★★★	★★★	★★★	★★★★★	★★★
BÖHLER W302 ISOBLOC	★★★	★★★★	★★★	★★★★★	★★★★
BÖHLER W303 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

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.

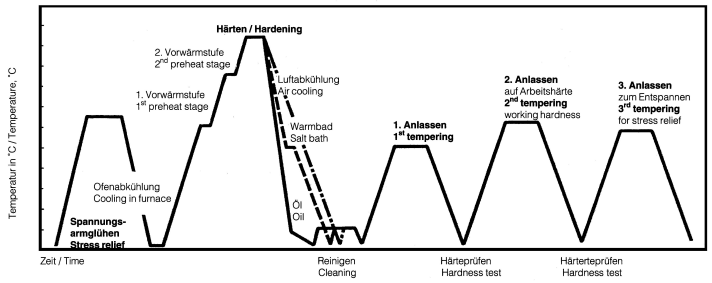
Stress relieving

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.

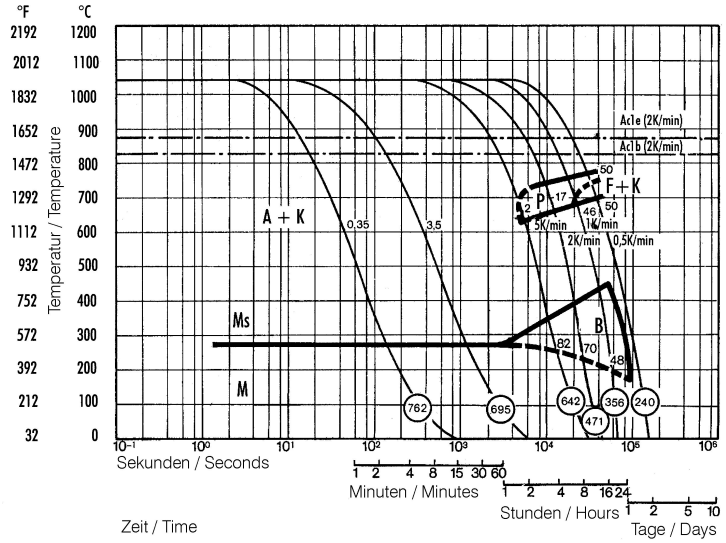
Hardening and Tempering

Temperature	1,000 to 1,030 °C	(Die casting equipment: 1000 - 1010 °C [1832 - 1850°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).

Heat treatment sequence



Continuous cooling CCT curves

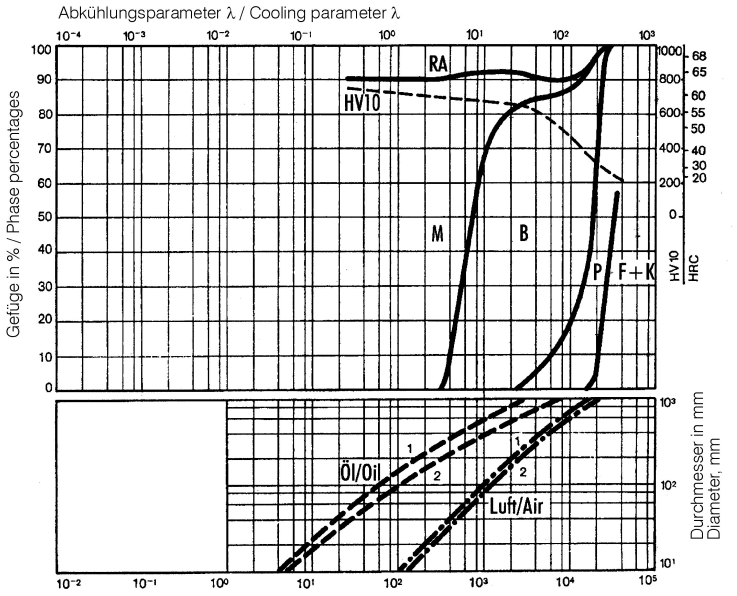


Austenitising temperature: 1030°C (1886°F)
Holding time: 15 minutes

◯ 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

Numbers in circles = Vickers hardness

Quantitative phase diagram

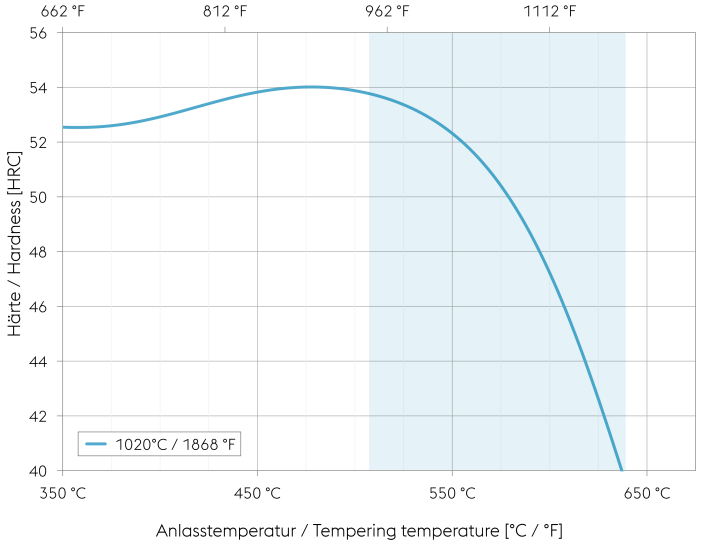


Kühlzeit von 800°C auf 500°C in Sek. / Time of cooling from 800°C to 500°C (1472-932°F) in seconds

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

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.

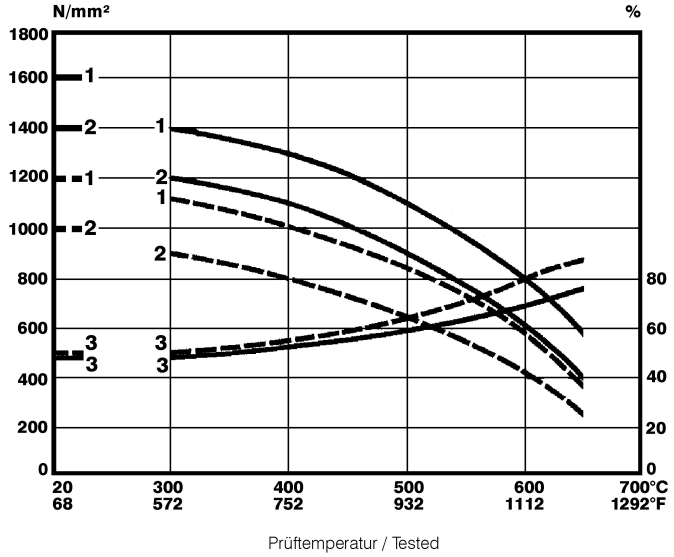
The tempering chart shows average tempered hardness values.

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

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 %

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)	211

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

Temperature (°C)	**100**	**200**	**300**	**400**	**500**	**600**
Thermal expansion (10⁻⁶ m/(m.K))	10.4	10.7	11.9	12.6	13.3	13.6

voestalpine BÖHLER Edelstahl GmbH & Co KG
Mariazeller Straße 25
8605 Kapfenberg, AT
T. +43/50304/20-0
E. info@bohler-edelstahl.at
https://www.voestalpine.com/bohler-edelstahl/de/

voestalpine
ONE STEP AHEAD.