

# HOT WORK TOOL STEELS

## Application Segments

Hot Work

## 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 W360 ISOBLOC is a material produced by the electroslag remelting process (ESR), which has been specially adapted for use at high tool hardnesses in the range of 51-57 HRC. Although the steel can be classified as a 5% chromium steel, the increased carbon and molybdenum content coupled with state-of-the-art manufacturing technology ensures that BÖHLER W360 ISOBLOC still shows a very good toughness and an exceptionally good thermal resistance, even at high hardness levels. These properties make the steel the perfect choice for smaller components in the die casting sector (e.g., mold inserts, cores, core pins, ejector pins, etc.). The material also is frequently the preferred choice for closed-die and open-die forging tools due to its high wear resistance. Because of this excellent wear resistance and the high toughness, BÖHLER W360 ISOBLOC is also frequently used for cold work applications and as a molding material for plastic injection molds. The Steel also is available as powder material for metal-3D-printing under the brand name BÖHLER W360 AMPO.

## Process Melting

Airmelted + Remelted

## Properties

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

## Applications

- |   |                                      |                                 |
|---|--------------------------------------|---------------------------------|
| > High Pressure Die-Casting                     | > Forging (Hot / Semi-hot)           | > Progressive Forging (Hatebur) |
| > Extrusion                                     | > Fine Blanking, Stamping, Blanking  | > Coining                       |
| > General Components for Mechanical Engineering | > Gravity / Low Pressure Die-Casting | > Injection Molding             |
| > Press Hardening / Hot Stamping                | > Rolling                            | > Shearing / Machine Knives     |
| > Mechanical Engineering                        | > Motorsport industry                | > Cold Forming                  |
| > Fasteners, Bolts, Nuts                        | > Forging Applications               | > Machine knife (for producers) |
| > Powder Pressing                               | > Rolls                              | > Screws and Barrels            |
| > Standard Parts (Molds, Plates, Pins, Punches) | > Pill punching dies                 | > Glasfibre reinforced plastics |

## Technical data

Material designation	
BÖHLER patent	Market grade

## Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V
0.50	0.20	0.25	4.50	3.00	0.60

## Material characteristics

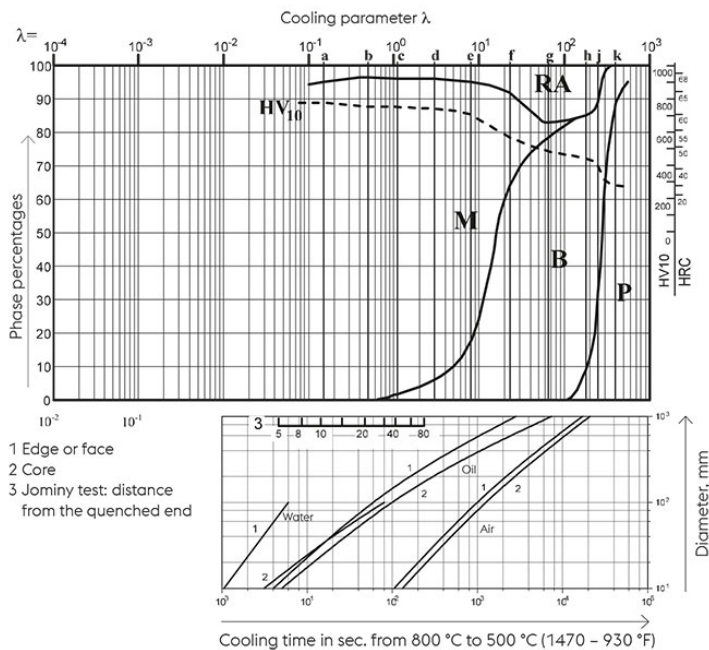
	High temperature strength	High temperature toughness	High temperature wear resistance
<b>BÖHLER W360</b> ISOBLOC	★★★★★	★★★★★	★★★★★
<b>BÖHLER W300</b> ISOBLOC	★★	★★★★★	★★
<b>BÖHLER W300</b> ISODISC	★★	★★★★	★★
<b>BÖHLER W302</b> ISOBLOC	★★★	★★★★★	★★★
<b>BÖHLER W302</b> ISODISC	★★★	★★★★	★★★
<b>BÖHLER W303</b> ISODISC	★★★★★	★★★★	★★★★★
<b>BÖHLER W320</b> ISODISC	★★★	★★	★★★
<b>BÖHLER W350</b> ISOBLOC	★★★	★★★★★★	★★★
<b>BÖHLER W400</b> VMR	★★	★★★★★★	★★
<b>BÖHLER W403</b> VMR	★★★★★	★★★★★	★★★★★

## Delivery condition

Annealed	
Hardness (HB)	max. 205

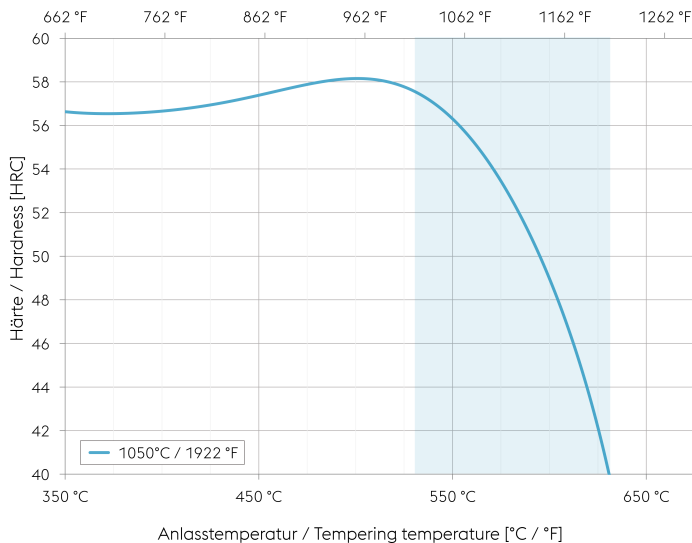


## Quantitative phase diagram



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

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

## Physical Properties

Temperature (°C)	20
Density (kg/dm <sup>3</sup> )	7.8
Thermal conductivity (W/(m.K))	30.8
Specific heat (kJ/kg K)	0.43
Spec. electrical resistance (Ohm.mm <sup>2</sup> /m)	-
Modulus of elasticity (10 <sup>3</sup> N/mm <sup>2</sup> )	212

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

Temperature (°C)	100	200	300	400	500	600
Thermal expansion (10 <sup>-6</sup> m/(m.K))	10.8	11.6	12.1	12.5	12.8	13.3

If other available product variants are listed in addition to long products, please note that these may differ in terms of melting process, technical data, delivery and surface condition as well as available product dimensions. For mandatory technical specifications, other requirements and dimensions, please contact our regional voestalpine BÖHLER sales companies. The data contained in this brochure is merely for general information and therefore shall not be binding on the company. We may be bound only through a contract explicitly stipulating such data as binding. Measurement data are laboratory values and can deviate from practical analyses. The manufacture of our products does not involve the use of substances detrimental to health or to the ozone layer.