

# WARMWERKSTAAL

## Beschikbare uitvoeringen

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

## Product omschrijving

BÖHLER W350 ISOBLOC - Warmwerkstaal specifiek ontwikkeld voor matrijzen voor drukgieten om hoge taaheid in grote gereedschappen te garanderen.

## Smeltroute

Airmelted + Remelted
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## Eigenschappen

- > Taaheid & Vervormbaarheid : zeer hoog
- > Slijtageweerstand : hoog
- > Bewerkbaarheid : zeer hoog
- > Hete hardheid (rode hardheid) : hoog
- > Polijstbaarheid : zeer hoog
- > Warmtegeleidingsvermogen : zeer hoog
- > Microzuiverheid : hoog

## Toepassingen

- > Extrusie
- > Zwaartekrachtgieten / lagedruk gieten
- > Dieptrekken / warmvormprocedé
- > Smeedwerk (warm / halfwarm)
- > Spuitgieten
- > Progressief smeedwerk (Hatebur)
- > Algemene componenten voor werktuigbouw
- > Spuitgieten
- > Werktuigbouw / machinebouw Algemeen








## Technische gegevens

Materiaal aanduiding		Normen	
BÖHLER patent	Market grade	#207	NADCA
E1850	NADCA		

## Chemische samenstelling

C	Si	Mn	Cr	Mo	V	N
0,38	0,20	0,55	5,00	1,80	0,55	def.

## Materiaaleigenschappen

	Hete kracht	Hete taatheid	Weerstand tegen hete slijtage
	★★★	★★★★★	★★★
	★★	★★★★	★★
	★★	★★★	★★
	★★★	★★★★	★★★
	★★★	★★★	★★★
	★★★★	★★★	★★★★
	★★★	★★	★★★
	★★★★★	★★★★	★★★★★
	★★	★★★★★	★★
	★★★★	★★★★	★★★★

## Leveringsconditie

### gegloeid

Hardheid (HB)	max. 205
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## Warmtebehandeling

### Annealing

Temperatuur	800 naar 850 °C	Slow controlled cooling in furnace at a rate of 10 to 20 °C/hr (50 to 68 °F/hr) down to approx. 600 °C (112 °F), further cooling in air.
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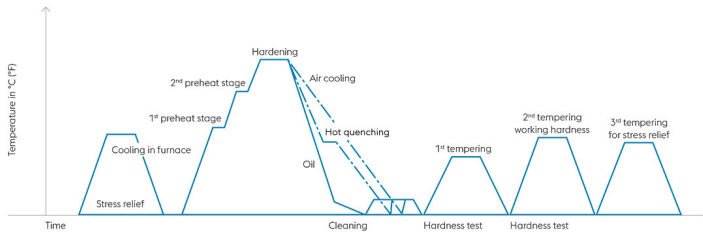
### Stress relieving

Temperatuur	600 naar 670 °C	Slow cooling furnace. To relieve stresses caused by extensive machining, or for complex shapes. Soak for 1 -2 hours after temperature equalisation (in neutral atmosphere).
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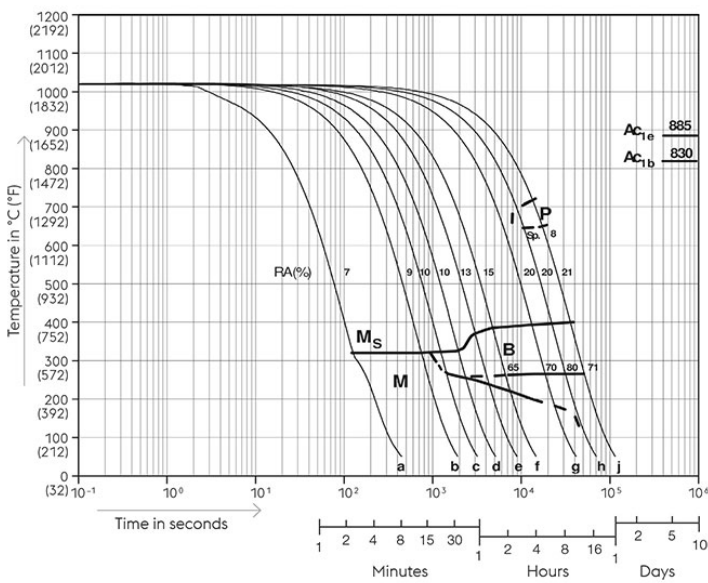
### Harden en ontlaten

Temperatuur	1.010 naar 1.020 °C	Holding time after temperature equalization: 15 to 30 minutes; In order to prevent coarsening of the grain, hardening must be carried out at the recommended temperature. For big dimensions it's recommended to reduce the temperature to 1010 °C (1850 °F); Quenching: oil, salt bath (500 - 550°C [932 - 1022 °F]), air, inert gas in vacuum; After hardening, required tempering treatment to achieve desired working hardness (see tempering chart).
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## Heat treatment sequence



## Continuous cooling CCT curves

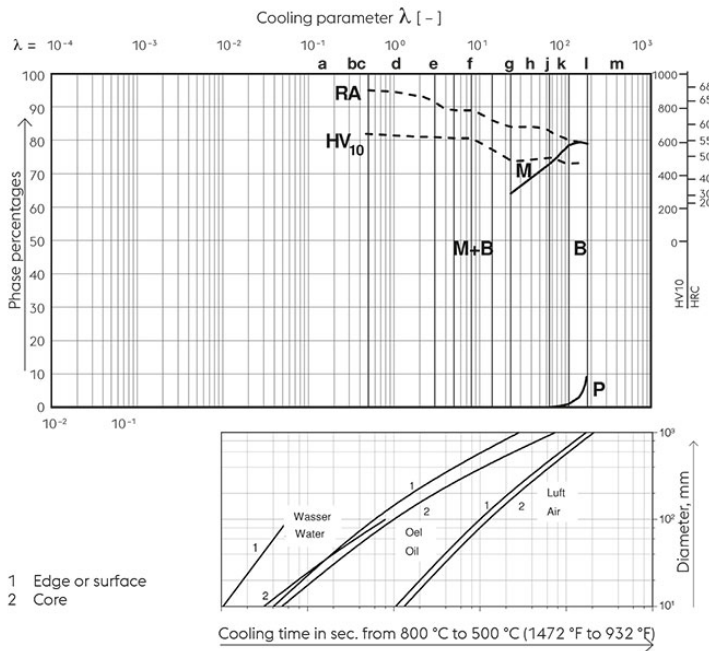


Austenitising temperature: 1020°C (1868°F)  
 Holding time: 15 minutes  
 5...100 phase percentages  
 0.5...180 cooling parameter, i.e. duration of cooling from 800 - 500°C (1472-932°F) in s x 10<sup>-2</sup>

Table:  
 Sample λ HV10

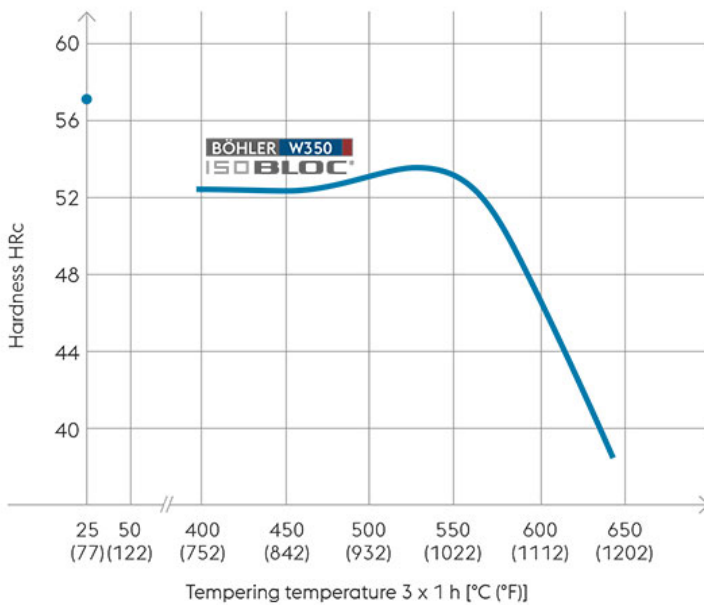
a	0,50	630
b	3	616
c	5	606
d	8	606
e	14	517
f	23	478
g	65	497
h	110	454
j	180	459

**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.

Hardening temperature: 1020°C (1868°F)  
Specimen size: square 20 mm

## Fysische eigenschappen

Temperatuur (°C)	20
Soortelijk gewicht (kg/dm <sup>3</sup> )	7,8
Thermische conductiviteit (W/(m.K))	28,8
Soortelijke warmte (kJ/kg K)	0,46
Specifieke elektrische weerstand (Ohm.mm <sup>2</sup> /m)	-
Elasticiteitsmodus (10 <sup>3</sup> N/mm <sup>2</sup> )	214

## Thermische expansie

Temperatuur (°C)	100	200	300	400	500	600	700
Thermische expansie (10 <sup>-6</sup> m/(m.K))	11,14	11,94	12,42	12,85	13,21	13,51	13,58

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