

# KOUDVERVORMSTAAL

## Beschikbare uitvoeringen

Stafstaal\*

Plaat

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

## Product omschrijving

Snijgereedschap voor zware toepassingen (matrijzen en stempels), stansgereedschap, gereedschap voor houtbewerking, schaarmessen, tooling voor het aanbrengen van schroefdraad, dieptrek - en vloeipers gereedschap, persgereedschap voor keramiek en farmaceutische industrie (pellets en pillen), slijtvast meetgereedschap, kunststofmatrijzen waarbij zeer hoge slijtvastheid is benodigd.

## Smeltroute

Airmelted

## Eigenschappen

- > Slijtageweerstand : goed
- > Dimensionale stabiliteit : goed
- > Secundair hardend koudwerkstaal met lage dimensionele verandering : goed

## Toepassingen

- > Machinale messen (voor fabrikanten)
- > Coining
- > Standaardonderdelen (matrijzen, platen, pennen, ponsen)
- > Comp. voor uitrustingen onder de grond (boorgaten, schachten enz.)
- > Algemene componenten voor werktuigbouw
- > Walsen
- > Fijn stanswerk / ponsen / stampen
- > Schroeven en vaten
- > Rollen
- > Thread rolling (NL)
- > Cold Forming
- > Persen van poeders
- > Componenten voor de recyclingindustrie
- > Slijtstukken

## Technische gegevens

Materiaal aanduiding		Normen	
1.2379	SEL	4957	EN ISO
~T30402	UNS		
X153CrMoV12	EN		
D2	AISI		

## Chemische samenstelling

C	Si	Mn	Cr	Mo	V
1,55	0,30	0,30	11,30	0,75	0,75

**Materiaaleigenschappen**

	Drukbelastingcapaciteit	Dimensionale stabiliteit tijdens warmtebehandeling	Taatheid	Slijtvast abrasief	Slijtvaste lijm
<b>BÖHLER K110</b>	★★	★★★	★	★★★	★★
<b>BÖHLER K100</b>	★★	★★	★	★★★	★★
<b>BÖHLER K105</b>	★★	★★	★	★★	★★
<b>BÖHLER K107</b>	★★	★★	★	★★★	★★
<b>BÖHLER K190 MICROCLEAN®</b>	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
<b>BÖHLER K294 MICROCLEAN®</b>	★★★★★	★★★★★	★★★	★★★★★	★★★★★
<b>BÖHLER K340 ECOSTAR®</b>	★★★	★★★	★★	★★	★★
<b>BÖHLER K340 ISODUR®</b>	★★★	★★★★★	★★★	★★★	★★★★★
<b>BÖHLER K346</b>	★★★	★★★	★★★	★★★★★	★★
<b>BÖHLER K353</b>	★★	★★★	★★	★★	★★
<b>BÖHLER K360 ISODUR®</b>	★★★	★★★★★	★★★	★★★★★	★★★★★
<b>BÖHLER K390 MICROCLEAN®</b>	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
<b>BÖHLER K490 MICROCLEAN®</b>	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
<b>BÖHLER K497 MICROCLEAN®</b>	★★★★★	★★★★★	★★★	★★★★★	★★★★★
<b>BÖHLER K888 MATRIX</b>	★★★★★	★★★★★	★★★★★	★★	★★
<b>BÖHLER K890 MICROCLEAN®</b>	★★★★★	★★★★★	★★★★★	★★★	★★★

**Leveringsconditie**
**gegloeid**

Hardheid (HB)	max. 250
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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 down to approx. 600°C, further cooling in air.
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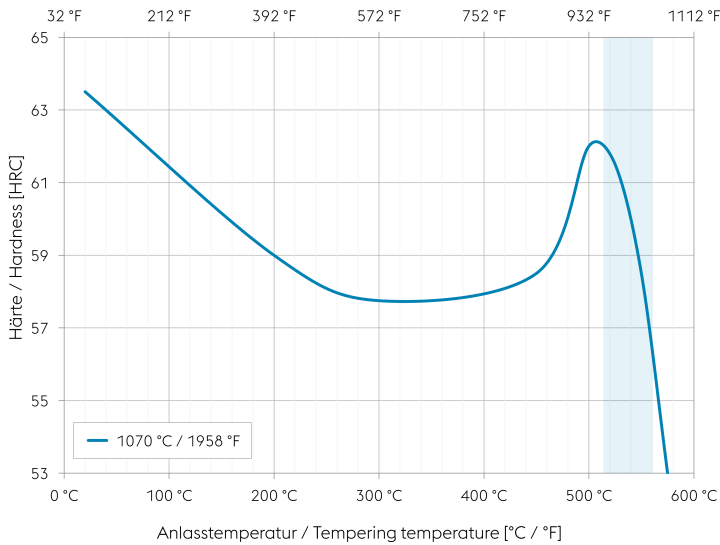
**Stress relieving**

Temperatuur	650 naar 700 °C	Slow cooling in furnace. Intended to relieve stresses set up by extensive machining, or in complex shapes. After through heating, hold in neutral atmosphere for 1 to 2 hours.
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**Harden en ontlaten**

Temperatuur	1.030 naar 1.070 °C	Complex shapes / air, simple shapes / air blast, oil, salt bath from (220 to 250°C or 500 to 550°C) or gas. Holding time after temperature equalization: 15 to 30 minutes. After hardening, tempering to the desired working hardness, see tempering chart.
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**Tempering chart**



**Tempering:**

Specimen size: square 0,787 inch (20 mm)

Slow heating to tempering temperature immediately after hardening. Recommended tempering temperature is indicated by the blue area in the chart.

Time in furnace 1 hour for each 0,787 inch (20 mm) of workpiece thickness but at least 2 hours/cooling in air.

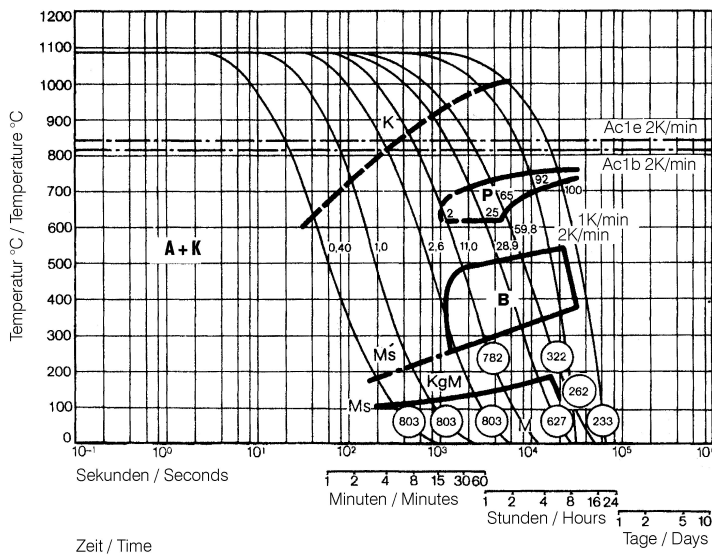
Slow cooling to room temperature after each tempering step is recommended.

Please refer to the tempering chart for guide values for the hardness achievable after tempering.

It is recommended to temper at least three times above the secondary hardness maximum.

Tempering for stress relieving 86 to 122 °F (30 to 50 °C) below the highest tempering temperature.

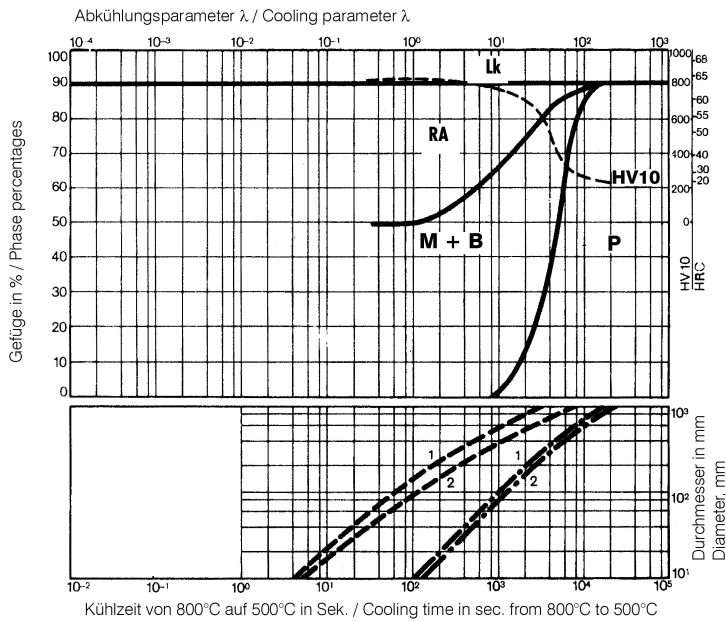
**Continuous cooling CCT curves**



Austenitising temperature: 1080°C / 1976°F  
Holding time: 30 minutes

- O Hardness in HV
- 2...100 phase percentages
- 0,40...59,8 cooling parameters, i. e. Cooling from 800 - 500°C (1472 - 932°F) in  $s \times 10^{-2}$
- 2...1 K/min cooling rate in K/min in the 800 - 500°C (1472 - 932°F) range
- Range of grain boundary martensite formation
- KgM... Grain boundary martensite

**Quantitative phase diagram**

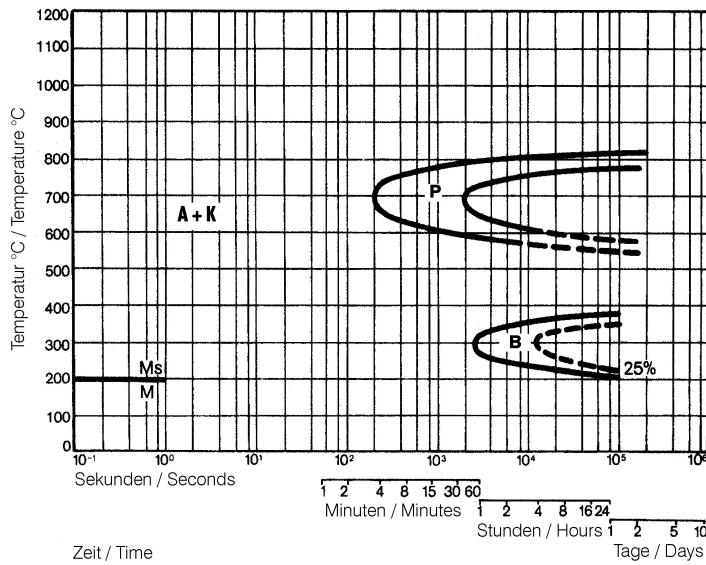


Lk... Ledeburite carbide  
 RA... Residual austenite  
 A... Austenite  
 B... Bainite  
 P... Perlite  
 K... Carbide  
 M... Martensite

----- Oil cooling  
 - · - Air cooling

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

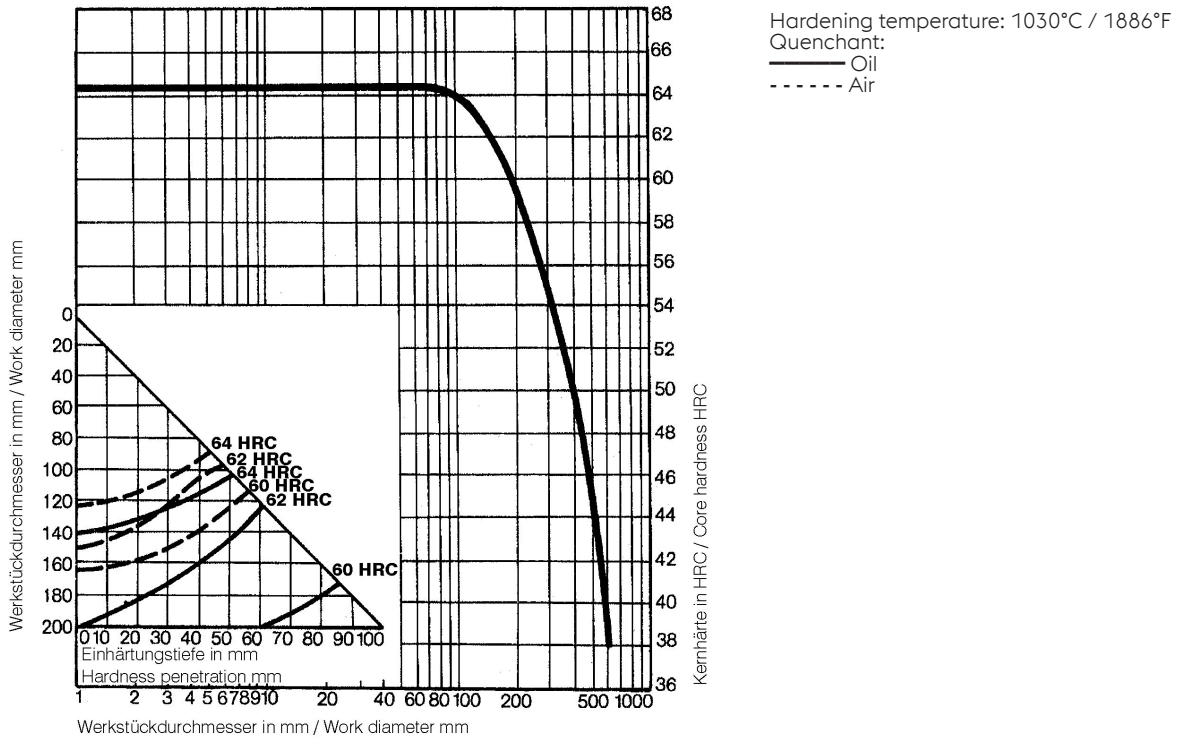
**Isothermal TTT curves**



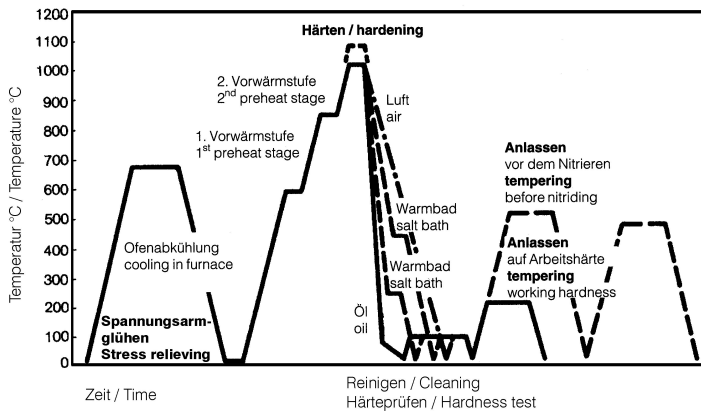
Austenitising temperature: 1020°C / 1868°F  
 Holding time: 30 minutes

A... Austenite  
 B... Bainite  
 P... Pearlite  
 K... Carbide  
 M... Martensite

**Influence of work diameter on core hardness and hardness penetration**



**Heat treatment sequence**



## Fysische eigenschappen

Temperatuur (°C)	20
Soortelijk gewicht (kg/dm <sup>3</sup> )	7,67
Thermische conductiviteit (W/(m.K))	23,9
Soortelijke warmte (kJ/kg K)	0,47
Specifieke elektrische weerstand (Ohm.mm <sup>2</sup> /m)	0,65
Elasticiteitsmodulus (10 <sup>3</sup> N/mm <sup>2</sup> )	200

## Thermische expansie

Temperatuur (°C)	100	200	300	400	500	600	700
Thermische expansie (10 <sup>-6</sup> m/(m.K))	11	11,4	11,9	12,2	12,7	12,8	12,1

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

**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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