

WARMWERKSTAAL

Beschikbare uitvoeringen

Stafstaal*

Plaat

vrijvormsmeden

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

Product omschrijving

Hoogbelaste warmwergereedschappen, vooral voor de bewerking van legeringen van lichte metalen, zoals persdoornen, persmatrijzen en blokrecipiënten voor persen van metalen buizen en extruderpersen, gereedschap voor warme extrusie, gereedschap voor de productie van holle voorwerpen, gereedschap voor de productie van schroeven, moeren, nieten en bouten. Gereedschappen voor drukgieten, mallen voor vervormingspersen, inzetstukken voor mallen, warschaarmessen, kunststofmatrijzen.

Smeltroute

Airmelted + Remelted

Eigenschappen

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

Toepassingen

- > Spuitgieten
- > Bevestigingsmiddelen, bouten en moeren
- > Algemene componenten voor werktuigbouw
- > Dieptrekken / warmvormprocedé
- > Knippen / machinale messen
- > Glasfibre reinforced plastics
- > Extrusie
- > Zwaartekrachtgieten / lagedruk gieten
- > Spuitgieten
- > Progressief smeedwerk (Hatebur)
- > Gereedschapshouders (frezen, boren, draaien en klauwplaten)
- > Smeedwerk (warm / halfwarm)
- > Blaasvormen
- > Machinale messen (voor fabrikanten)
- > Walsen
- > Werktuigbouw / machinebouw Algemeen





Technische gegevens

Materiaal aanduiding		Normen	
1.2344	SEL	4957	EN ISO
T20813	UNS	G4404	JIS
X40CrMoV5-1	EN	#207	NADCA
H13	AISI		
SKD61	JIS		
B1885	NADCA		

Chemische samenstelling

C	Si	Mn	Cr	Mo	V
0,39	0,90	0,40	5,20	1,40	0,95

Materiaaleigenschappen

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

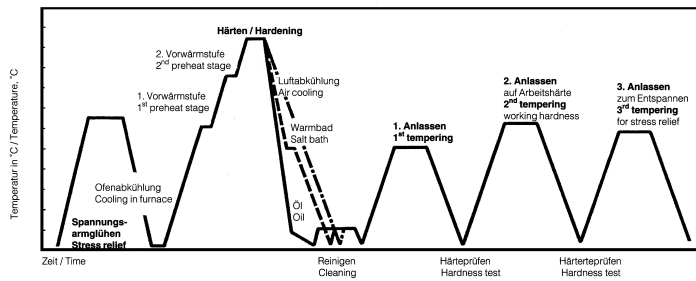
Leveringsconditie

gegloeid	
Hardheid (HB)	max. 229
Hardened and Tempered	
Hardheid (HRC)	40 naar 55 bars hardened and tempered (BHT)
Hardened and Tempered	
Hardheid (HRC)	30 naar 44

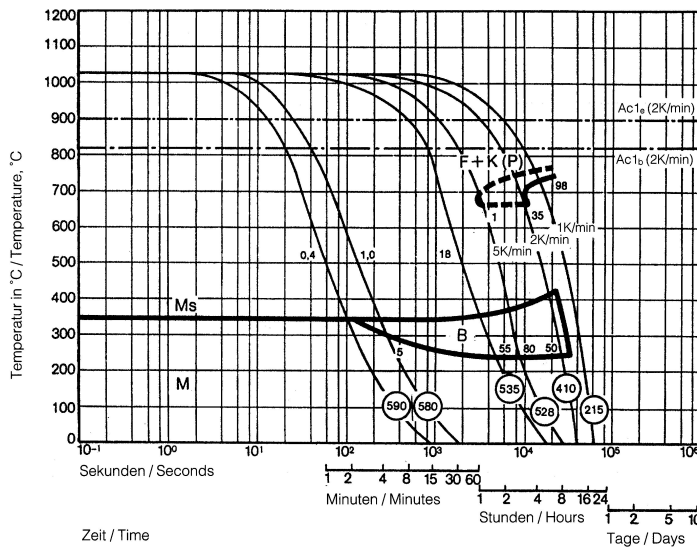
Warmtebehandeling

Annealing		
Temperatuur	750 naar 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		
Temperatuur	600 naar 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.
Harden en ontlaten		
Temperatuur	1.020 naar 1.080 °C	(Die casting equipment: 1020 - 1030 °C [1868 - 1886°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



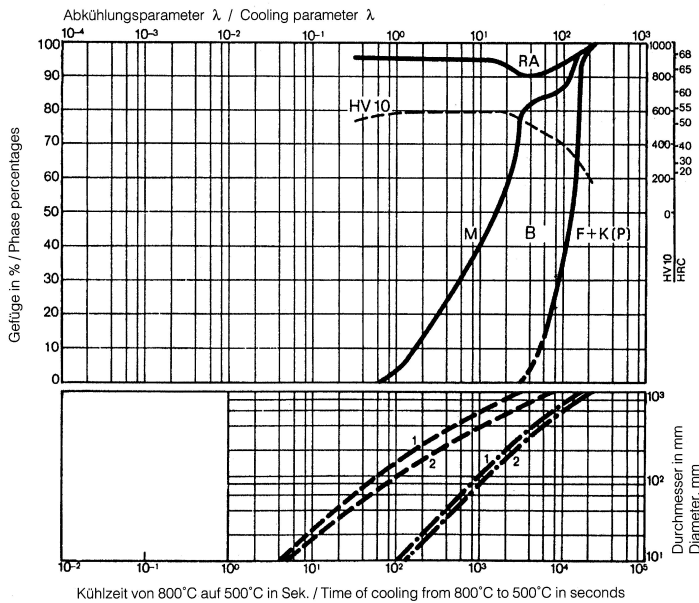
Continuous cooling CCT curves



Austenitising temperature: 1020°C (1868°F)
Holding time: 15 minutes

O Vickers hardness
1...35 phase percentages
0.4...18 cooling parameter, i.e. duration of cooling from 800 - 500°C (1472-932°F) in $s \times 10^{-2}$
5...1 K/min cooling rate in K/min in the 800 - 500°C (1472-932°F) range

Quantitative phase diagram

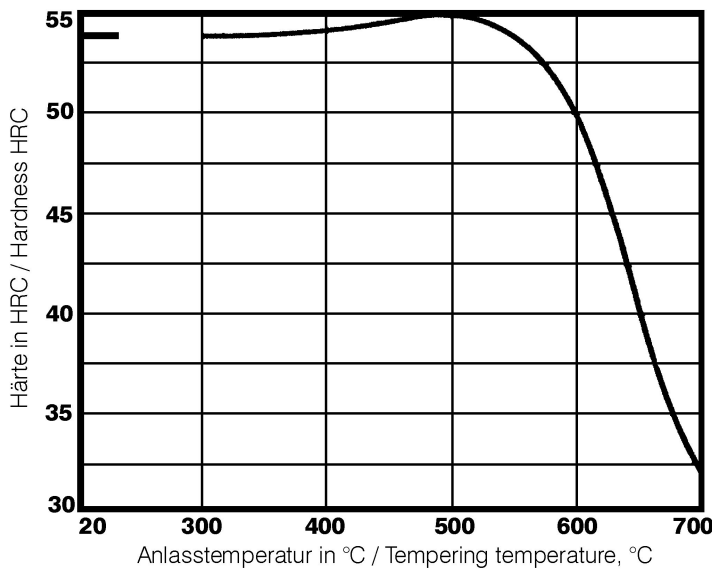


B... Bainite
F... Ferrite
K... Carbide
M... Martensite
P... Perlite
RA... Retained austenite

----- Oil cooling
- · - Air cooling

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.

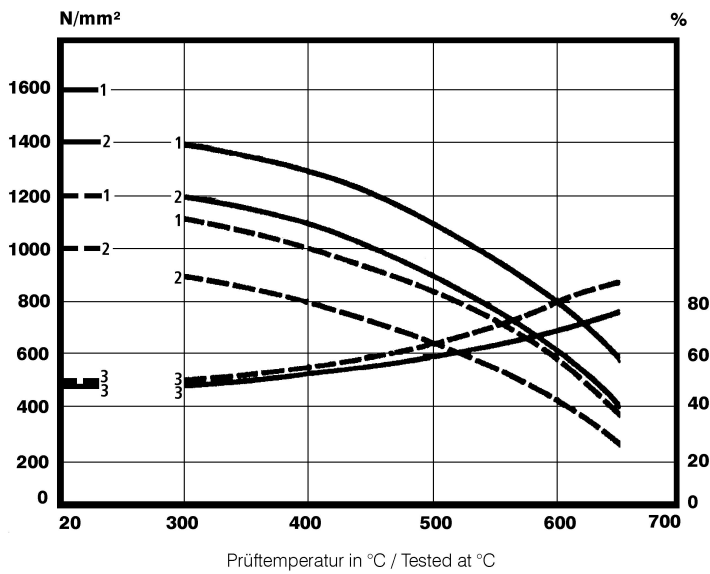
1st tempering approx. 86°F (30°C) above maximum secondary hardness.

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.

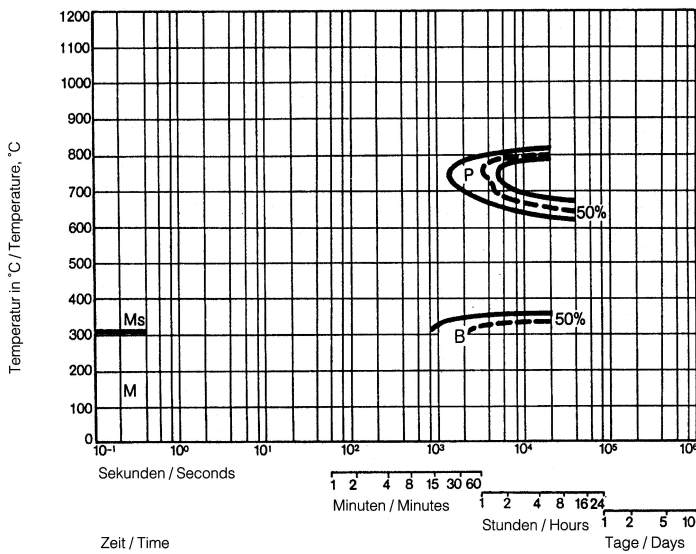
Hardening temperature: 1050°C (1922°F)
Specimen size: square 50 mm

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 %

Isothermal TTT curves



Austenitising temperature: 1020 °C (1868 °F)
 Holding time: 15 minutes

Fysische eigenschappen

Temperatuur (°C)	20
Soortelijk gewicht (kg/dm ³)	7,8
Thermische conductiviteit (W/(m.K))	22,8
Soortelijke warmte (kJ/kg K)	0,47
Specifieke elektrische weerstand (Ohm.mm ² /m)	0,52
Elasticiteitsmodulus (10 ³ N/mm ²)	213

Thermische expansie

Temperatuur (°C)	100	200	300	400	500	600
Thermische expansie (10 ⁻⁶ m/(m.K))	10,75	11	12,11	12,68	14,17	14,34

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