

ACEROS PARA HERRAMIENTAS DE TRABAJO EN CALIENTE

Formatos disponibles

Productos largos*

Chapas

Forja de matriz abierta

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

Descripción

Acero para herramientas de trabajo en caliente que necesiten elevada resistencia. Principalmente para el procesamiento de aleaciones no ferrosas livianas, como mandriles, troqueles y elementos y matrices de extrusión, matrices de forja de piezas huecas o bulonería, tornillos, tuercas, remaches y pernos. Para moldes de fundición a presión, moldes de inyección, cuchillas de corte en caliente, moldes de plástico.

Método de obtención

Convencional

Propiedades

- > Dureza y Ductilidad : buena
- > Resistencia al desgaste : alto
- > Maquinabilidad : muy alta
- > Dureza en caliente (dureza roja) : alto
- > Pulibilidad : buena
- > Conductividad térmica : buena
- > Micro-limpieza : buena

Aplicaciones

- > Extrusión
- > Fundición por gravedad / a baja presión
- > Moldeo por inyección
- > Forja fría/ conformación en caliente
- > Ingeniería mecánica / construcción de maquinaria en general
- > Forja (caliente / semicaliente)
- > Moldeo por soplado
- > Cuchillas de máquinas (fabricantes)
- > Forja progresiva (Hatebur)
- > Componentes generales de ingeniería mecánica
- > Fundición inyectada
- > Otros componentes de automoción (turbocompresores, anillos de pistones, sensores, etc.)
- > Portaherramientas (fresado, taladrado, torneado y mandriles)

Datos técnicos

Designación		Estándares	
1.2344	SEL	4957	EN ISO
T20813	UNS	G4404	JIS
X40CrMoV5-1	EN		
H13	AISI		
SKD61	JIS		

Composición Química

C	Si	Mn	Cr	Mo	V
0,39	1,10	0,40	5,20	1,30	0,95

Características

	Resistencia a altas temperaturas	Tenacidad a altas temperaturas	Resistencia al desgaste a altas temperaturas
	★★★	★★★	★★★
	★★	★★★	★★
	★★	★★★★	★★
	★★★	★★★★	★★★
	★★★★	★★★	★★★★
	★★★	★★	★★★
	★★★	★★★★★	★★★
	★★★★★	★★★★	★★★★★
	★★	★★★★★	★★
	★★★★	★★★★	★★★★

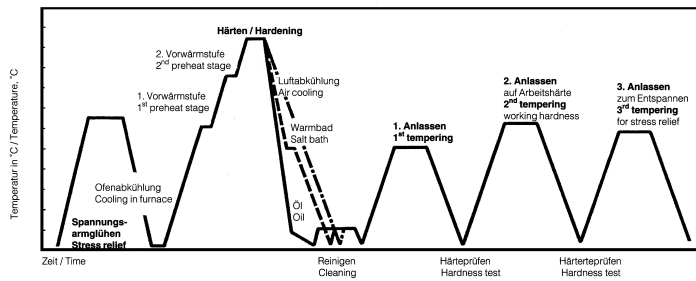
Estado de suministro

recocido	
Dureza (HB)	máx. 229
Endurecido y templado	
Dureza (HRC)	40 a 55 bars hardened and tempered (BHT)
Endurecido y templado	
Dureza (HRC)	30 a 44

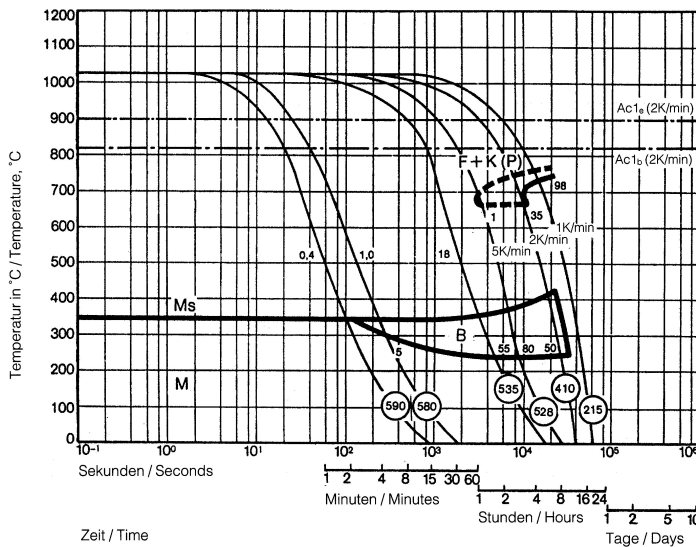
Tratamiento térmico

Recocido		
Temperatura	750 a 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.
Alivio de tensiones		
Temperatura	600 a 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.
Temple y revenido		
Temperatura	1.020 a 1.080 °C	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



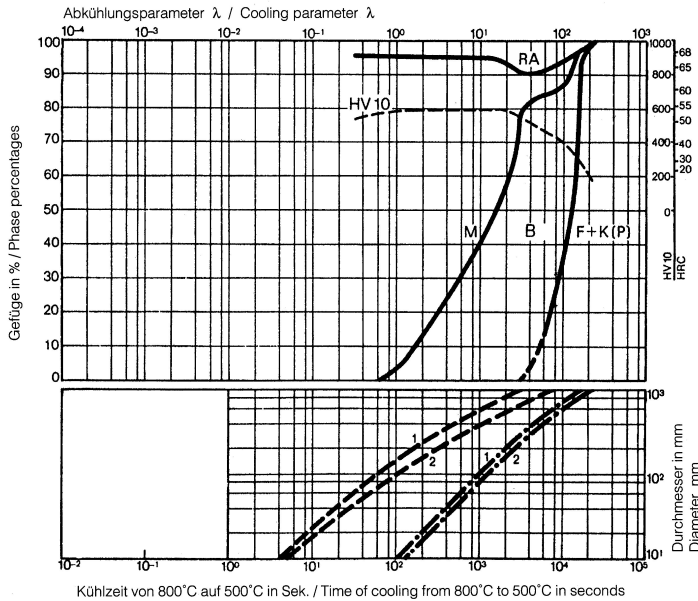
Continuous cooling CCT curves



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 x 10⁻²
5...1 K/min cooling rate in K/min in the 800 - 500°C (1472-932°F) range

Quantitative phase diagram

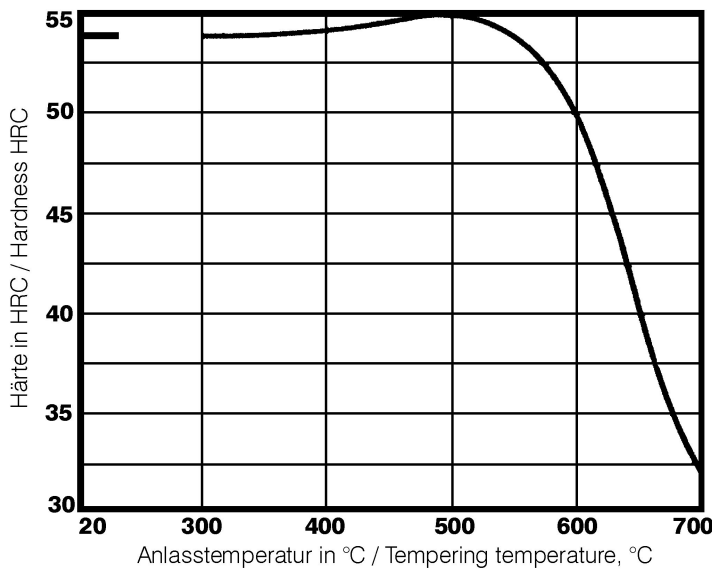


B... Bainite
F... Ferrite
K... Carbide
M... Martensite
P... Perlite
RA... Retained austenite

----- 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.

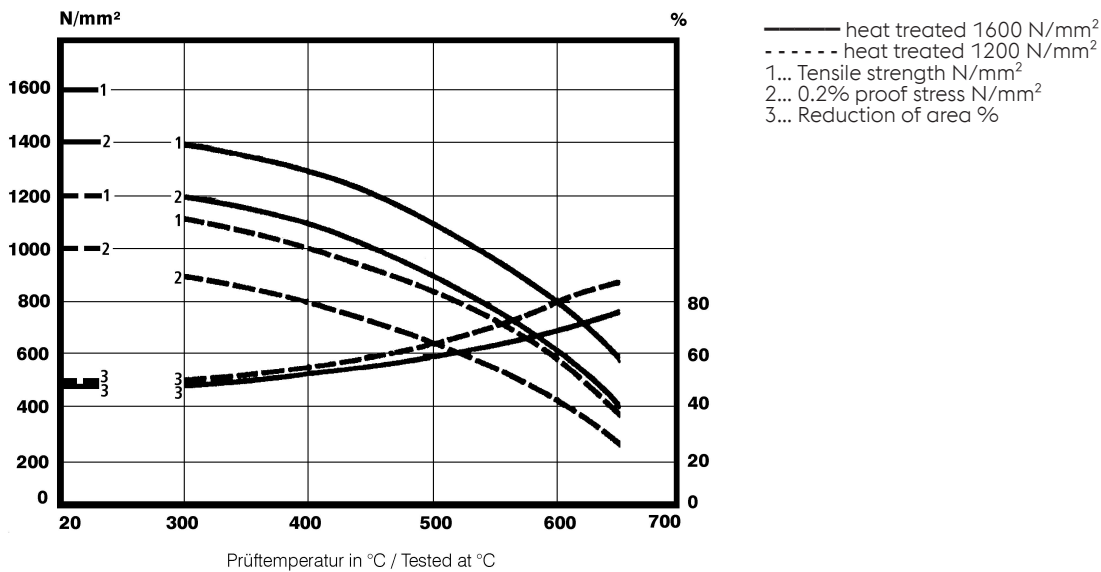
1st tempering approx. 86°F (30°C) above maximum secondary hardness.

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



Propiedades físicas

Temperatura (°C)	20
Densidad (kg/dm ³)	7,8
Conductividad térmica (W/(m.K))	24,3
Calor específico (kJ/kg K)	0,46
Resistencia eléctrica específica (Ohm.mm ² /m)	0,52
Módulo de elasticidad (10 ³ N/mm ²)	215

Expansión térmica

Temperatura (°C)	100	200	300	400	500	600	700
Expansión térmica (10 ⁻⁶ m/(m.K))	11,5	12	12,2	12,5	12,9	13	13,2

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

Open Die Forgings: Product Variant may differ in terms of melting process, technical data, delivery, and surface condition as well as available product dimensions. Please contact the business unit Open Die Forgings of voestalpine BÖHLER Edelstahl GmbH & Co KG.

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.

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.

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

voestalpine

ONE STEP AHEAD.