COLD WORK TOOL STEELS

Application Segments

Cold Work

Available Product Variants

Long Products

Product Description

BÖHLER K888 MATRIX - This MATRIX steel offers an excellent combination of high toughness and high compressive strength. MATRIX materials have high toughness, which is a critical factor in many applications. However, the hardness achievable with commonly used MATRIX steels often limits the potential applications. BÖHLER K888 MATRIX breaks through this barrier and offers the best of both worlds of matrix steels and high alloy tool steels. BÖHLER K888 MATRIX is a unique problem solver in situations where high compressive strength and toughness are required. Its advantageous tempering behavior with a pronounced secondary hardness maximum also enables the use of advanced coatings.

Process Melting

Powder metallurgy

Properties

- Toughness & Ductility : very high
- Hardness : very high
- Compressive strength : very high
- Machinability : very high
- Dimensional stability : very high

Applications

- Fine Blanking, Stamping, Blanking
- Powder Pressing
- General Components for Mechanical Engineering
- Standard Parts (Molds, Plates, Pins, Punches)
- Cold Forming
- Pill punching dies
- Machine knife (for producers)
- Coining
- Rolling
- Components for the recycling industry

Technical data

Material designation	
BÖHLER patent	Market grade

Chemical composition (wt. %)

C	Si	Cr	Mo	V	W	Co
0.60	0.85	4.40	2.80	1.10	2.45	3.80

Material characteristics

	Compressive strength	Dimensional stability during heat treatment	Toughness	Wear resistance abrasive	Wear resistance adhesive
BÖHLER K888 MATRIX	★★★★	★★★★★	★★★★★	★★	★★
BÖHLER K110	★★	★★★	★	★★★	★★
BÖHLER K294 MICROCLEAN	★★★★★	★★★★★	★★★	★★★★★	★★★★★
BÖHLER K340 ISODUR	★★★	★★★★	★★★	★★★	★★★★
BÖHLER K346	★★★	★★★	★★★	★★★★	★★
BÖHLER K353	★★	★★★	★★	★★	★★
BÖHLER K360 ISODUR	★★★	★★★★	★★★	★★★★	★★★★
BÖHLER K390 MICROCLEAN	★★★★★	★★★★★	★★★★	★★★★★	★★★★★
BÖHLER K490 MICROCLEAN	★★★★	★★★★★	★★★★	★★★★	★★★★
BÖHLER K497 MICROCLEAN	★★★★★	★★★★★	★★★	★★★★★	★★★★★
BÖHLER K890 MICROCLEAN	★★★★	★★★★★	★★★★★	★★★	★★★

Delivery condition

Annealed

Hardness (HB)	max. 280

Heat treatment

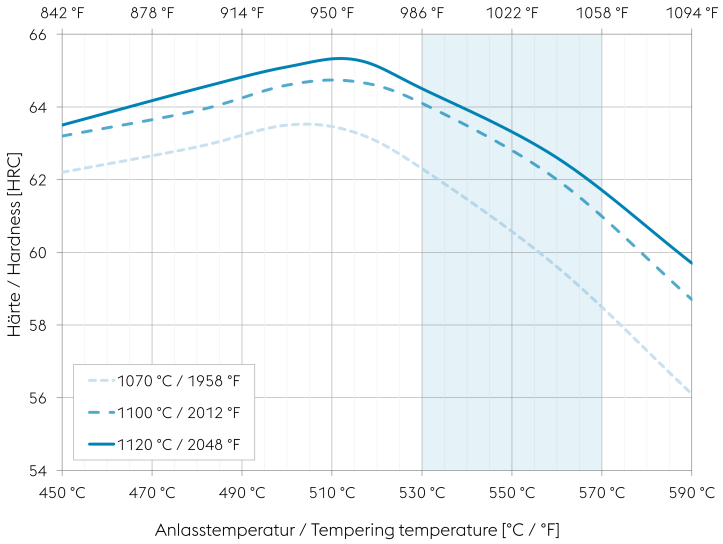
Stress relieving

Temperature	650 to 700 °C	After through heating, hold in neutral atmosphere for 1-2 hours. || Slow cooling in furnace || Intended to relieve stresses caused by extensive machining or in complex shapes.

Hardening and Tempering

Temperature	1,070 to 1,120 °C	Quenching: Oil, gas (N_2) || Holding time after temperature equalization: 20-30 minutes (hardening temperature 1070 to 1100 °C | 1958 to 2012 °F) or 10 minutes (hardening temperature 1120 °C (2048 °F) || After hardening, tempering to the desired working hardness according to the tempering chart.

Tempering Chart



Slow heating to tempering temperature immediately after hardening.

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

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

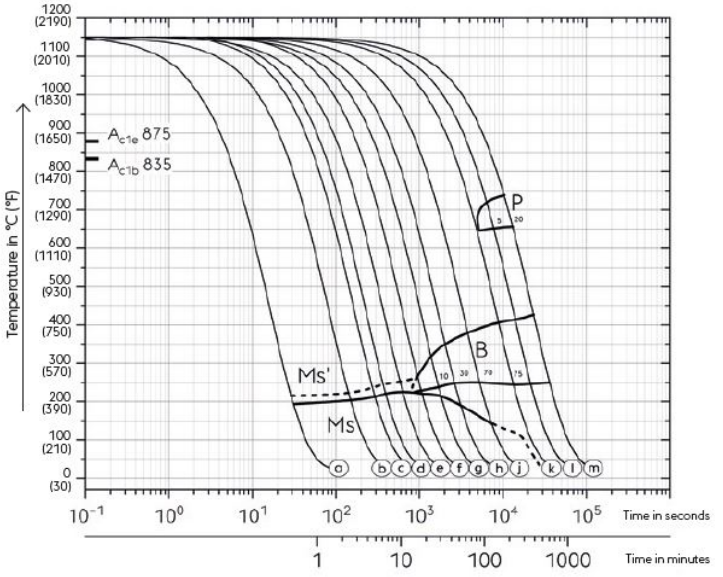
It is recommended to temper at least three times above the secondary hardness maximum.

Cooling in air to room temperature after each tempering step is recommended.

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

Recommended tempering temperature range is indicated by the blue area in the chart.

Continuous cooling CCT curves



Austenitizing temperature: 1150 °C / 2102 °F

Soak time: 180 sec

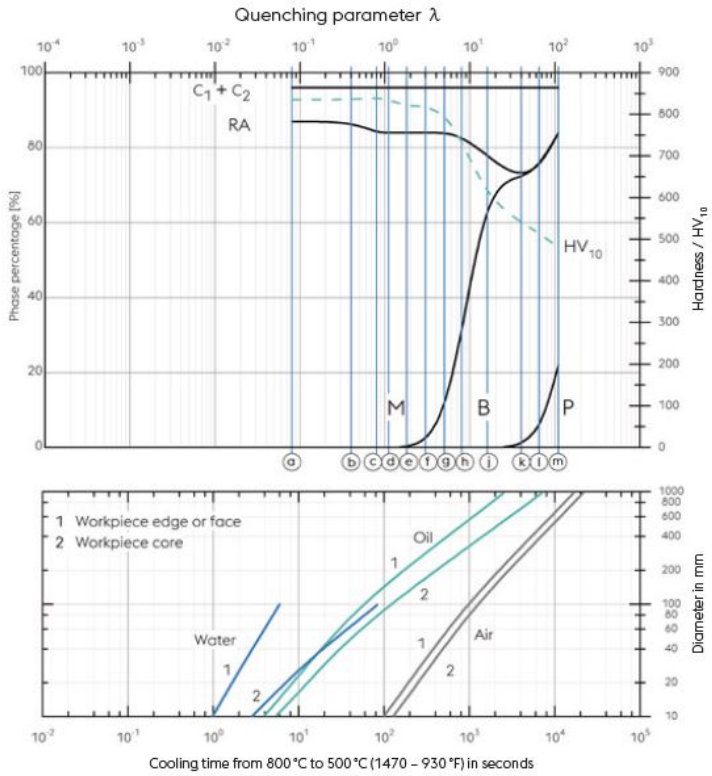
5...75 Phase proportion in %

0.08...110.00... Quenching parameter λ, i.e. quenching time from 800 to 500 °C (1470 – 930 °F) in s x 10^{-2}

P...Perlite
B...Bainite
Ms... Martensite starting temperature
M...Martensite

Sample	λ	HV_{10}	Sample	λ	HV_{10}
a	0.08	835	g	5.00	800
b	0.40	835	h	8.00	740
c	0.80	840	j	16.00	600
d	1.10	835	k	40.00	540
e	1,80	820	l	65.00	515
f	3.00	820	m	110.00	480

Quantitative phase diagram



C1...Carbide content not dissolved during austenitization

C2...Start of carbide precipitation during quenching from the austenitization temperature

RA...Retained austenite

A...Austenite

M...Martensite

P...Perlite

B...Bainite

Physical Properties

Temperature (°C)	**20**
Density (kg/dm³)	7.86
Thermal conductivity (W/(m.K))	20.8
Specific heat (kJ/kg K)	0.442
Spec. electrical resistance (Ohm.mm²/m)	0.5
Modulus of elasticity (10³N/mm²)	218

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

Temperature (°C)	**100**	**200**	**300**	**400**	**500**	**600**	**700**
Thermal expansion (10⁻⁶ m/(m.K))	10.7	11.5	11.9	12.5	12.5	12.8	12.7

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ONE STEP AHEAD.