COLD WORK STEELS

Available Product Variants

Long Products* | Plates

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

Product Description

BÖHLER K110 is a 12% ledeburitic chromium steel and corresponds to material number 1.2379 (X153CrMoV12, D2). This tool steel combines the advantages of conventional 12% ledeburitic chromium steels with those of advanced tool steels. In the group of 12% ledeburitic chromium steels, BÖHLER K110 offers the best combination of wear resistance, compressive strength and toughness, for which reason it is used in virtually all cold work applications. Its advantageous tempering behavior with a pronounced secondary hardness maximum also enables the use of advanced coatings. This also makes BÖHLER K110 suitable for complex tools requiring a high degree of dimensional stability and shape stability.

Process Melting

Airmelted

Properties

- Wear Resistance : good
- Dimensional stability : good
- Secondary hardening cold work steel with low dimensional change : good

Applications

- Machine knife (for producers)
- Coining
- Standard Parts (Molds, Plates, Pins, Punches)
- Comps. for Equip. Below Ground (Boring, Shafts, etc.)
- General Components for Mechanical Engineering
- Rolling
- Fine Blanking, Stamping, Blanking
- Screws and Barrels
- Rolls
- Thread rolling
- Cold Forming
- Powder Pressing
- Components for Recycling Industry
- Wear parts

Technical data

Material designation	
1.2379	SEL
~T30402	UNS
X153CrMoV12	EN
D2	AISI

Standards	
4957	EN ISO

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V
1.55	0.30	0.30	11.30	0.75	0.75

Material characteristics

	Compressive strength	Dimensional stability during heat treatment	Toughness	Wear resistance abrasive	Wear resistance adhesive
BÖHLER K110	★★	★★★	★	★★★	★★
BÖHLER K100	★★	★★	★	★★★	★★
BÖHLER K105	★★	★★	★	★★	★★
BÖHLER K107	★★	★★	★	★★★	★★
BÖHLER K190 MICROCLEAN	★★★★	★★★★★	★★★★	★★★★	★★★★
BÖHLER K294 MICROCLEAN	★★★★★	★★★★★	★★★	★★★★★	★★★★★
BÖHLER K340 ECOSTAR	★★★	★★★	★★	★★	★★
BÖHLER K340 ISODUR	★★★	★★★★	★★★	★★★	★★★★
BÖHLER K346	★★★	★★★	★★★	★★★★	★★
BÖHLER K353	★★	★★★	★★	★★	★★
BÖHLER K360 ISODUR	★★★	★★★★	★★★	★★★★	★★★★
BÖHLER K390 MICROCLEAN	★★★★★	★★★★★	★★★★	★★★★★	★★★★★
BÖHLER K490 MICROCLEAN	★★★★	★★★★★	★★★★	★★★★	★★★★
BÖHLER K497 MICROCLEAN	★★★★★	★★★★★	★★★	★★★★★	★★★★★
BÖHLER K888 MATRIX	★★★★	★★★★★	★★★★★	★★	★★
BÖHLER K890 MICROCLEAN	★★★★	★★★★★	★★★★★	★★★	★★★

Delivery condition

Annealed	
Hardness (HB)	max. 250

Heat treatment

Annealing

Temperature	800 to 850 °C | 1,472 to 1,562 °F	Slow controlled cooling in furnace at a rate of 10 to 20°C/hr down to approx. 600°C, further cooling in air.

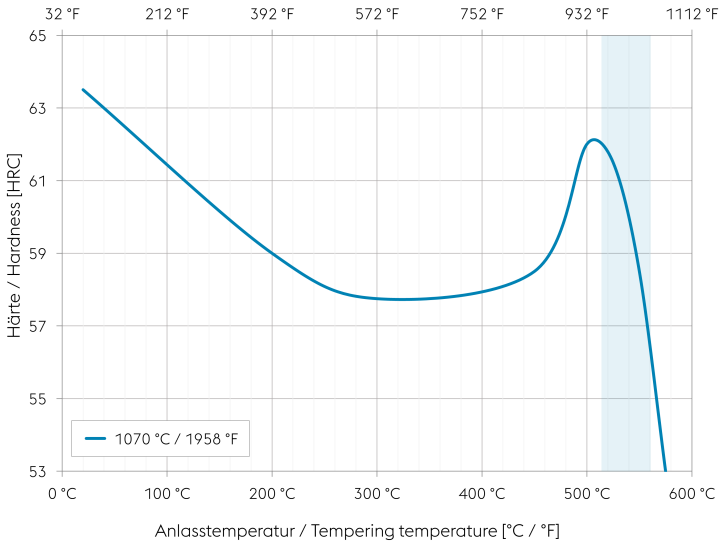
Stress relieving

Temperature	650 to 700 °C | 1,202 to 1,292 °F	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.

Hardening and Tempering

Temperature	1,030 to 1,070 °C | 1,886 to 1,958 °F	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.

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.

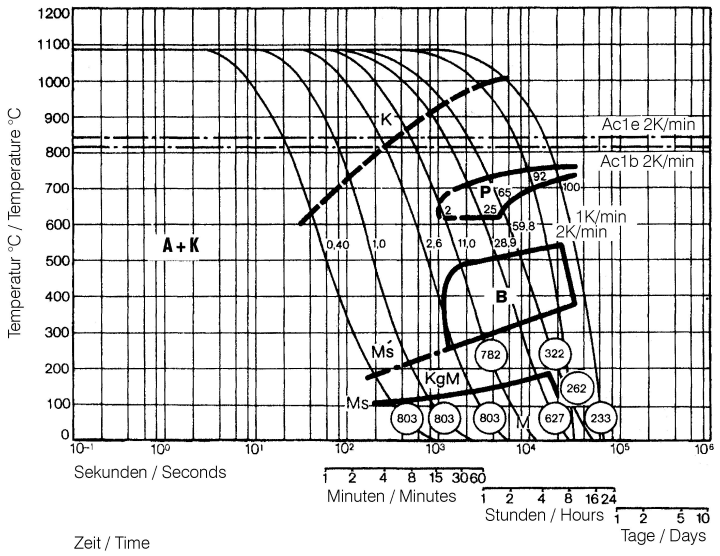
Slow cooling to room temperature after each tempering step is recommended.

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.

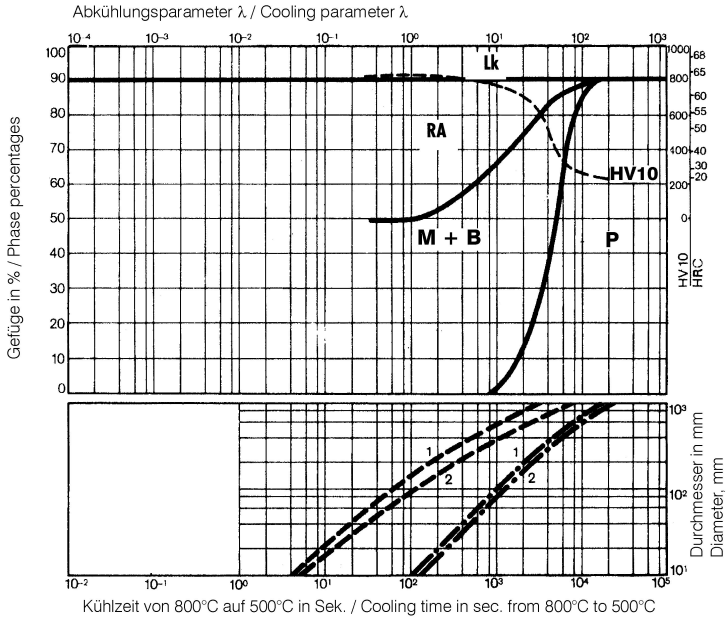
Continuous cooling CCT curves



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 x 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

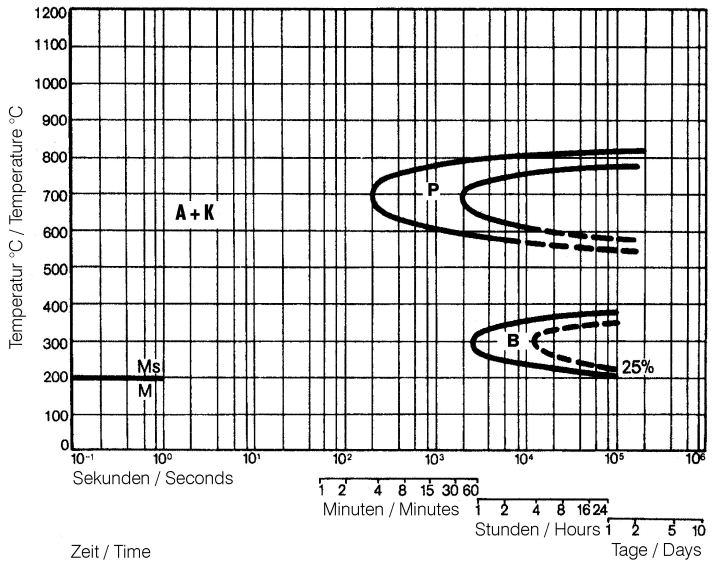


Lk... Ledeburite carbide
RA... Residual austenite
A... Austenite
B... Bainite
P... Perlite
K... Carbide
M... Martensite

- - - - - - Oil cooling
- • - Air cooling

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

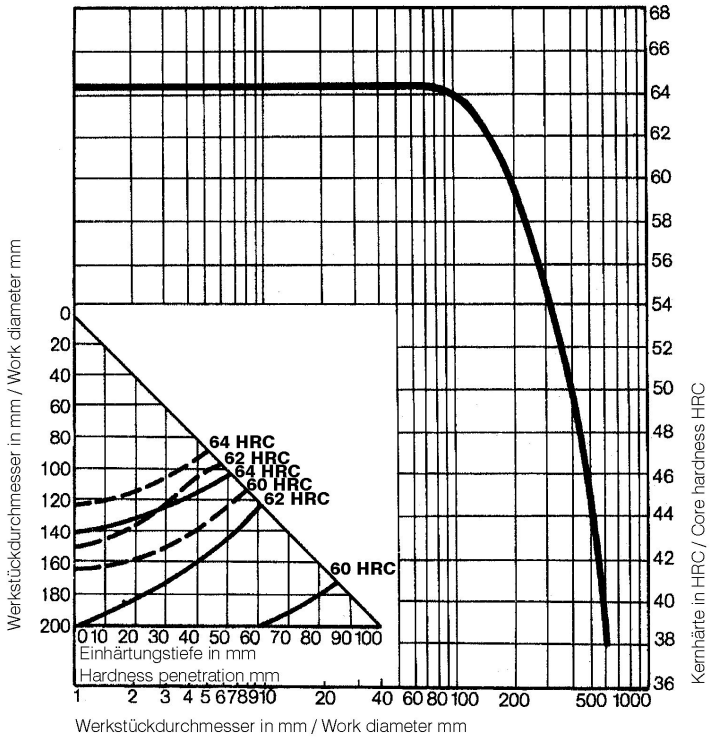
Isothermal TTT curves



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

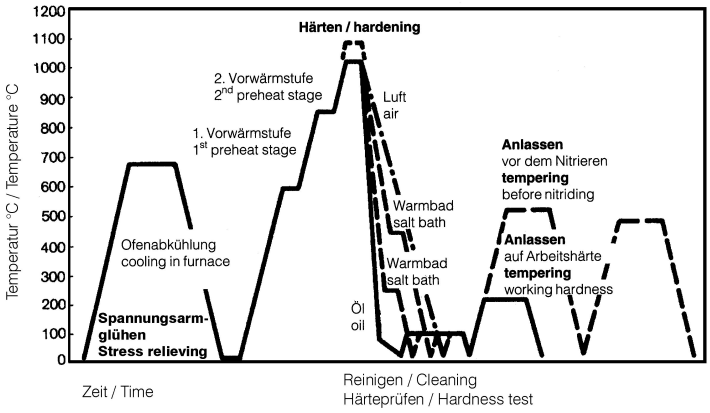
A... Austenite
B... Bainite
P... Perlite
K... Carbide
M... Martensite

Influence of work diameter on core hardness and hardness penetration



Hardening temperature: 1030°C / 1886°F
Quenchant:
——— Oil
- - - - - - Air

Heat treatment sequence



Physical Properties

Temperature (°C | °F)	20 | 68
Density (kg/dm^3 | lb/in^3)	7.67 | 0.28
Thermal conductivity (W/(m.K) | BTU/ft h °F)	23.9 | 13.81
Specific heat (kJ/kg K | BTU/lb °F)	0.47 | 0.1123
Spec. electrical resistance (Ohm.mm^2/m | 10^{-4} Ohm.inch^2/ft)	0.65 | 3.07
Modulus of elasticity (10^{3}N/mm^2 | 10^{3}ksi)	200 | 29.01

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

Temperature (°C | °F)	100 | 212	200 | 392	300 | 572	400 | 752	500 | 932	600 | 1,112	700 | 1,292
Thermal expansion (10^{-6} m/(m.K) | 10^{-6} inch/inch.°F)	11 | 6.1	11.4 | 6.3	11.9 | 6.6	12.2 | 6.8	12.7 | 7.1	12.8 | 7.1	12.1 | 6.7

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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ONE STEP AHEAD.