

COLD WORK STEELS

Available Product Variants

[Long Products*](#)
[Plates](#)

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

Product Description

BÖHLER K105 is a 12% ledeburitic chromium steel and corresponds to material number 1.2601 (X165CrMoV12). This commonly used tool steel is highly resistant to abrasive wear. Compared to modern cold work tool steels, BÖHLER K105 has the advantage of simple heat treatment with lower hardening temperatures and single tempering. The improved tempering resistance of BÖHLER K105 compared to the conventional tool steel 1.2080 also enables nitriding treatment of tools.

Process Melting

[Airmelted](#)

Properties

- Dimensionally stable, high carbon, high-chromium (12%) steel.
- Particularly suitable for air hardening.
- Good toughness.

Applications

- > Machine knife (for producers)
- > Fine Blanking, Stamping, Blanking
- > Rolls
- > Rolling
- > Standard Parts (Molds, Plates, Pins, Punches)
- > Wear parts
- > Cold Forming
- > Components for Recycling Industry
- > General Components for Mechanical Engineering

Technical data

Material designation	
1.2601	SEL
~T30402	UNS
X165CrMoV12	EN
~D2	AISI
~Ch12MF	GOST

Chemical composition (wt. %)

C	Si	Mn	Cr	Mo	V	W
1.60	0.35	0.30	11.50	0.60	0.30	0.50

Material characteristics

	Compressive strength	Dimensional stability during heat treatment	Toughness	Wear resistance abrasive	Wear resistance adhesive
BÖHLER K105	★★	★★	★	★★	★★
BÖHLER K100	★★	★★	★	★★★	★★
BÖHLER K107	★★	★★	★	★★★	★★
BÖHLER K110	★★	★★★	★	★★★	★★
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
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Heat treatment

Annealing

Temperature	800 to 850 °C 1,472 to 1,562 °F	Slow controlled cooling in furnace at a rate of 50 to 68°F/hr (10 to 20°C/hr) down to approx. 600°C, further cooling in air.
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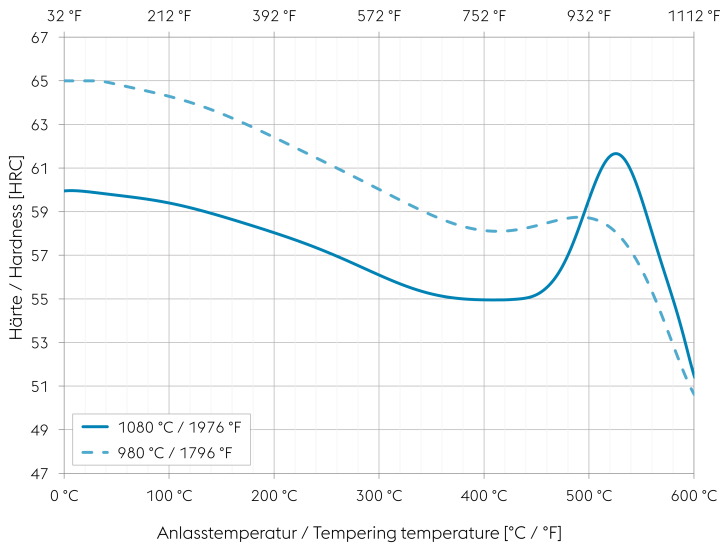
Stress relieving

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..
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Hardening and Tempering

Temperature	980 to 1,010 °C 1,796 to 1,850 °F	Oil, salt bath from 428 to 482°F or 932 to 1022°F (220 to 250°C or 500 to 550°C), air, gas. Tools of intricate shape or with sharp edges should preferably be hardened in air or salt bath. 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.

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

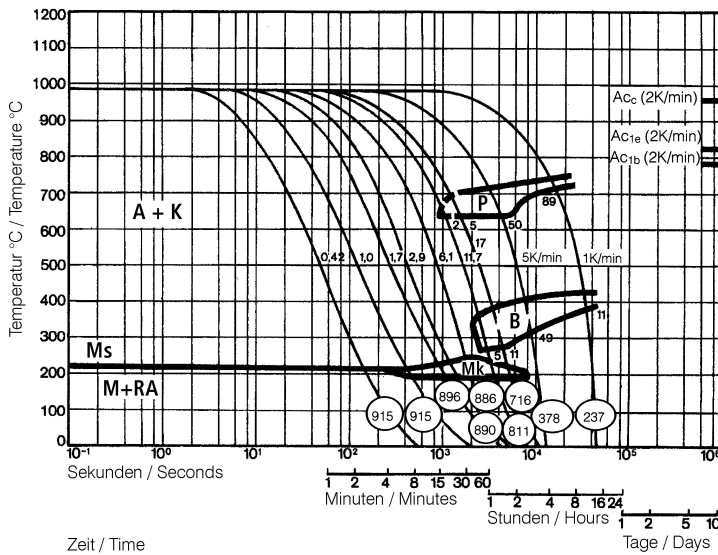
Slow cooling to room temperature after each tempering step is recommended.

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: 1796°F (980°C)
Holding time: 30 minutes

O Vickers hardness

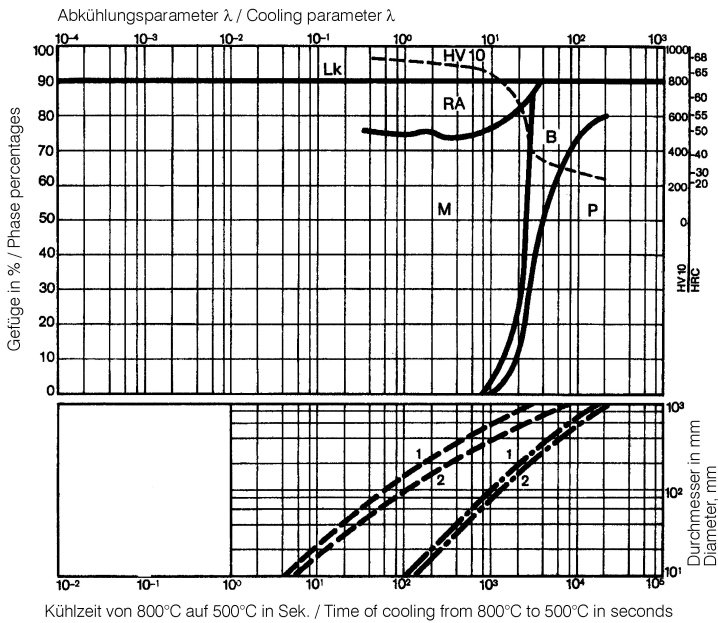
2...50 phase percentages

0.42...17 cooling parameter (λ), i.e. duration of cooling from 1472 to 932°F (800 to 500°C) in $s \times 10^{-2}$

41...33,8°F/min (5...1K/min) cooling rate in °F/min (K/min) in the 1472 to 932°F (800 to 500°C) range

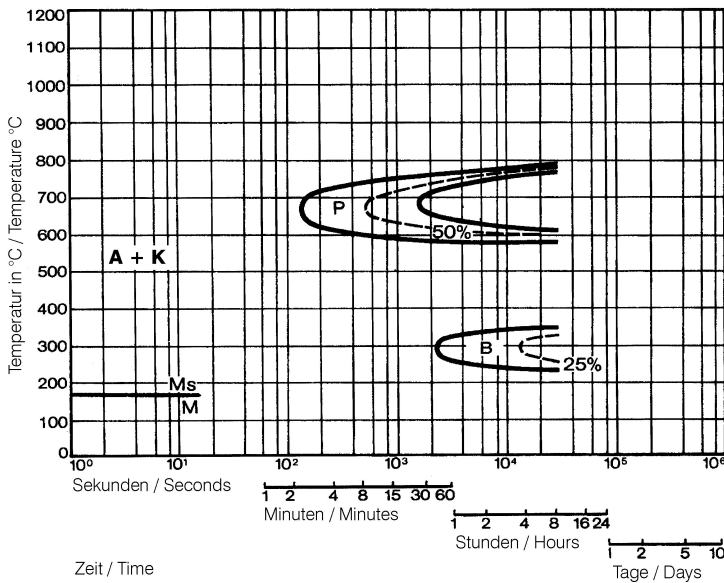
Mk... Grain boundary martensite

Quantitative phase diagram



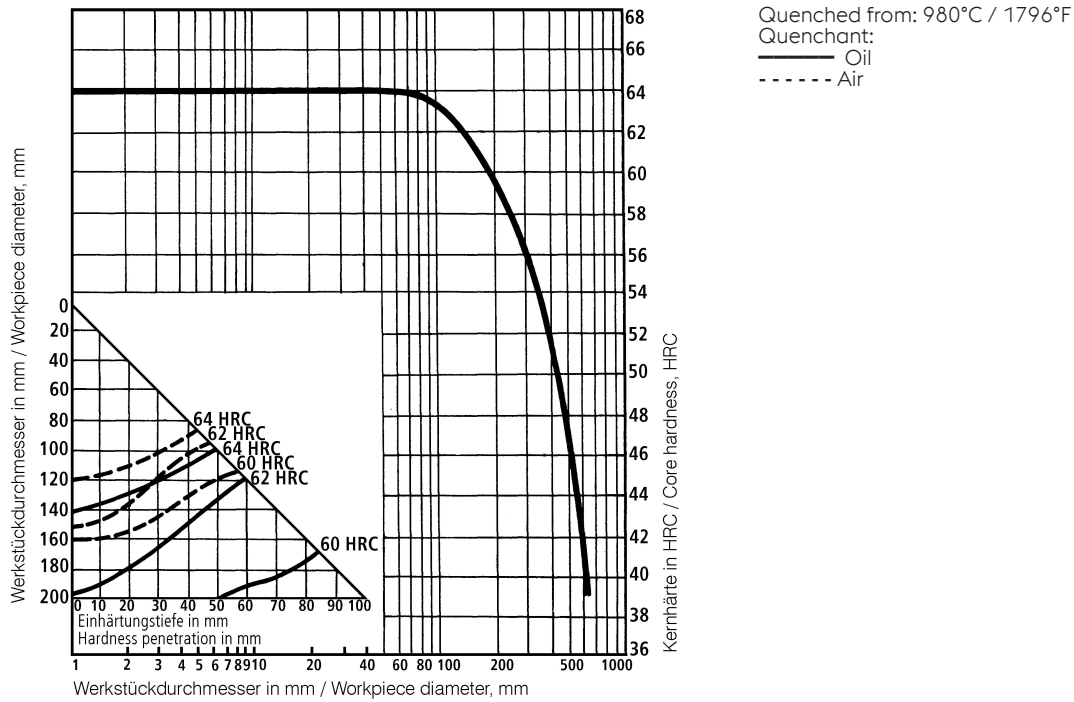
- Lk... Ledeburite carbide
- RA... Residual austenite
- A... Austenite
- B... Bainite
- P... Pearlite
- K... Carbide
- M... Martensite
- Oil cooling
- · - Air cooling
- 1... Edge or face
- 2... Core

Isothermal TTT curves

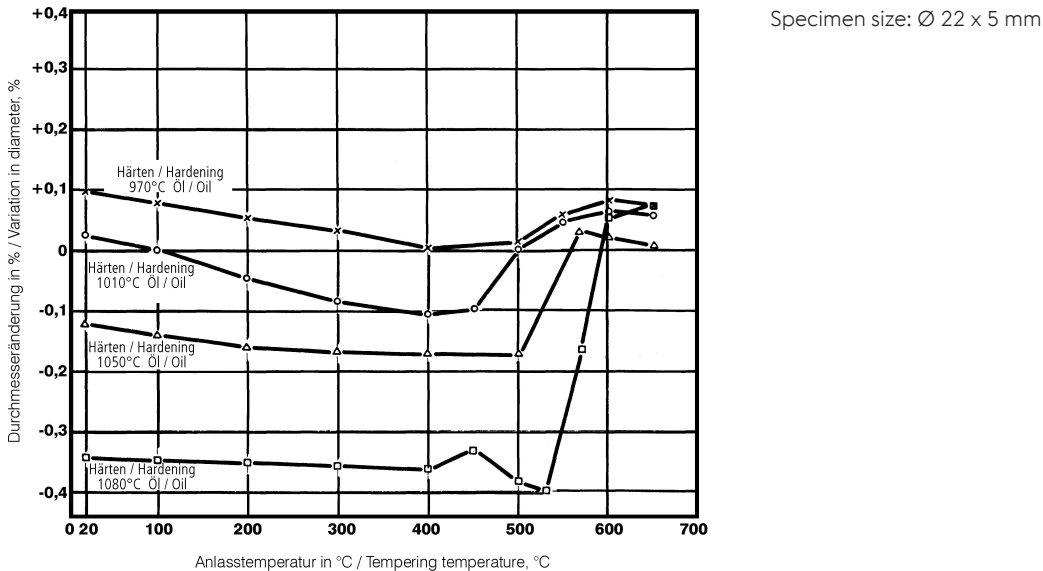


- Austenising temperature: 980°C / 1796°F
- Holding time: 30 minutes
- A... Austenite
- B... Bainite
- P... Pearlite
- K... Carbide
- M... Martensite

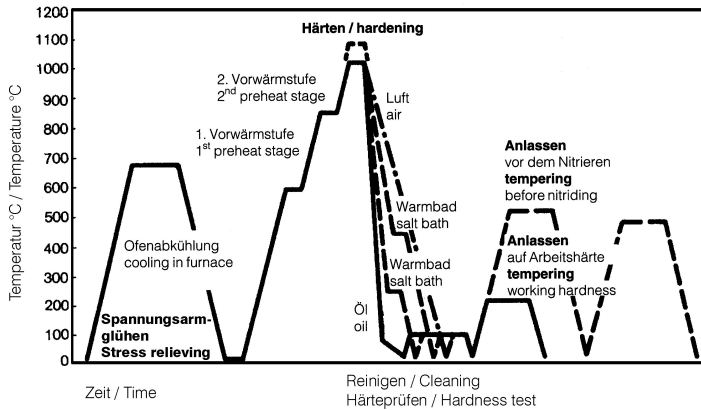
Influence of work diameter on core hardness and hardness penetration



Variation in size as a function of tempering temperature after hardening



Heat treatment sequence



Physical Properties

Temperature (°C °F)	20 68
Density (kg/dm ³ lb/in ³)	7.7 0.28
Thermal conductivity (W/(m.K) BTU/ft h °F)	20 11.56
Specific heat (kJ/kg K BTU/lb °F)	0.46 0.1099
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)	210 30.46

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

Temperature (°C °F)	100 212	200 392	300 572	400 752	500 932	600 1,112
Thermal expansion (10 ⁻⁶ m/(m.K) 10 ⁻⁶ inch/inch. °F)	10.5 5.8	11 6.1	11 6.1	11.5 6.4	12 6.7	12 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.