COLD WORK TOOL STEELS

Application Segments

Cold Work

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 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

- Wear Resistance : good

Applications

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

Technical data

Material designation	
1.2601	SEL
X165CrMoV12	EN
~T30402	UNS
~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

Heat treatment

Annealing

Temperature	800 to 850 °C	Slow controlled cooling in furnace at a rate of 10 to 20 °C/hr (18 to 36 °F/hr) down to approximately 600 °C (1112 °F) || Further cooling in air.

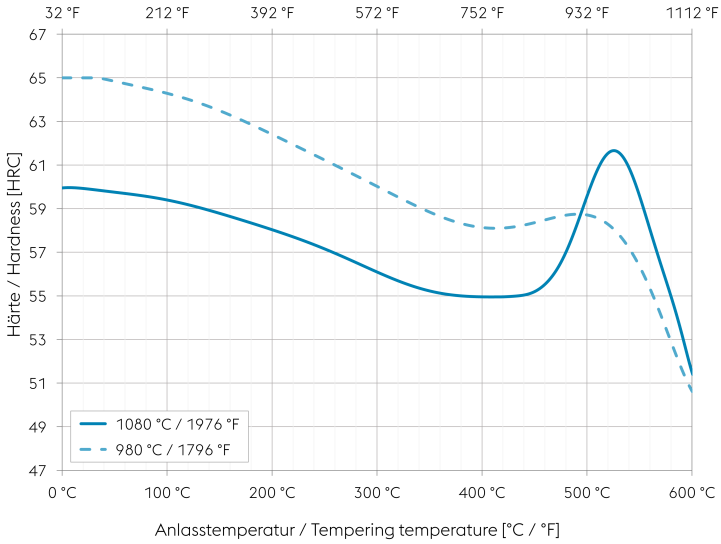
Stress relieving

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	980 to 1,010 °C	Quenching: Oil, salt bath (220 to 250 °C or 500 to 550 °C | 428 to 482 °F or 932 to 1022 °F), gas, air. 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 according to the tempering chart.

Tempering chart



Specimen size: square 20 mm (0,787 inch)

Slow heating to tempering temperature immediately after hardening.

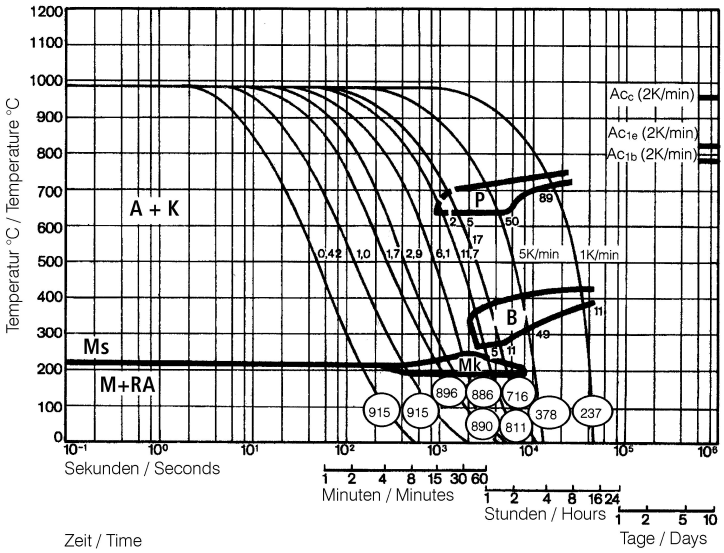
Time in furnace 1 hour for each 20 mm (0,787 inch) of workpiece thickness but at least 2 hours.

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

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

Cooling in air after each tempering step is recommended.

Continuous cooling CCT curves



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

O Vickers hardness

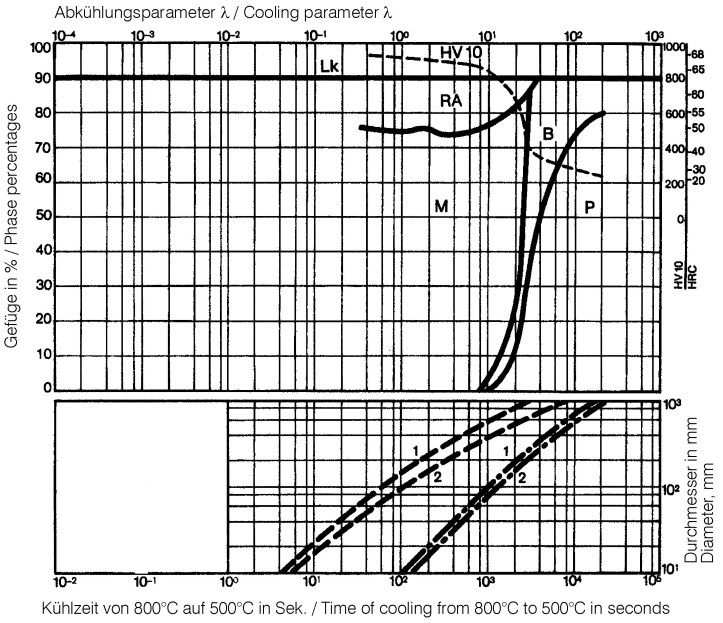
2...89 phase percentages

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

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

A... Austenite
K... Carbide
P... Perlite
B...Bainite
M... Martensite
Mk... Grain boundary martensite
RA... Retained austenite
Ms... Martensite starting temperature

Quantitative phase diagram

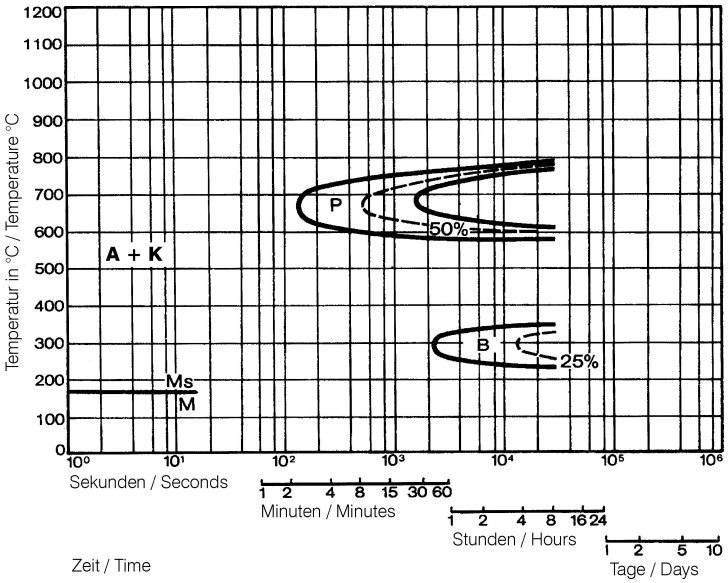


HV10... Vickers Hardness
Lk... Ledeburite carbide
RA... Residual austenite
M... Martensite
B... Bainite
P... Perlite

- - - Oil cooling
- • - Air cooling

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

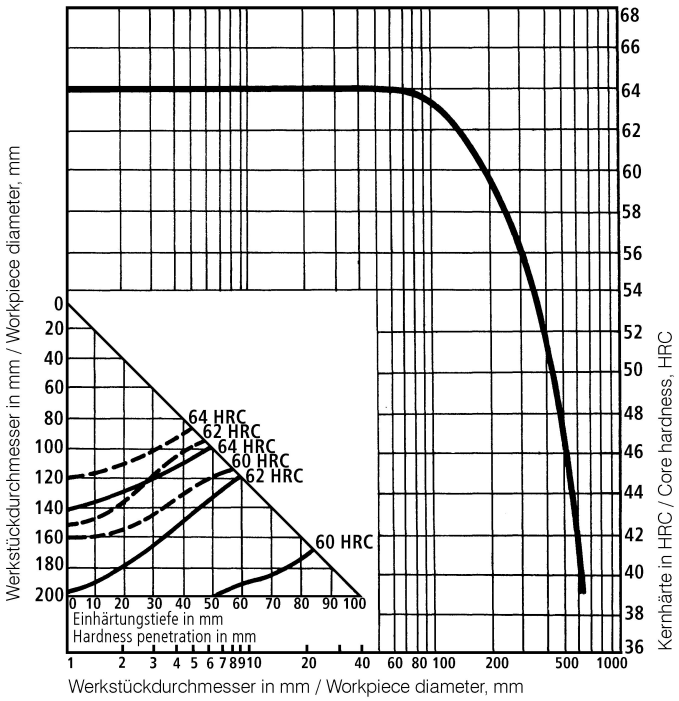
Isothermal TTT curves



Austenitising temperature: 980 °C / 1796 °F
Holding time: 30 minutes

A... Austenite
K... Carbide
P... Perlite
B... Bainite
M... Martensite
Ms... Martensite starting temperature

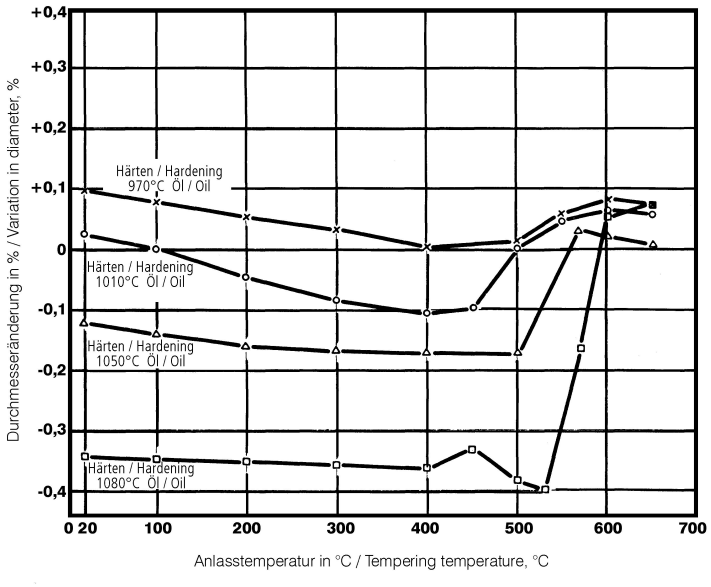
Influence of work diameter on core hardness and hardness penetration



Quenched from: 980 °C / 1796 °F

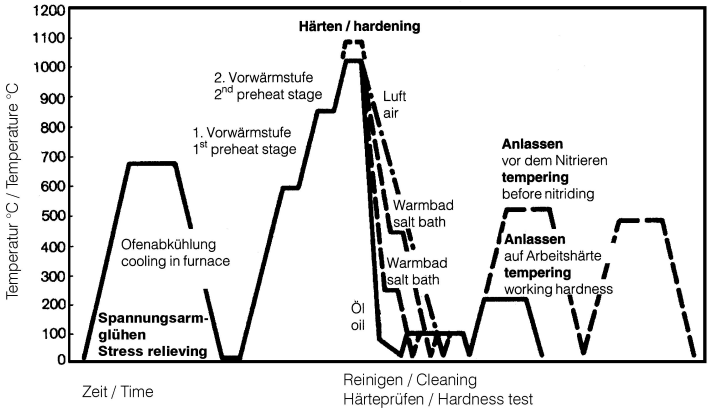
Quenchant:
——— Oil
- - - - - - Air

Variation in size as a function of tempering temperature after hardening



Specimen size: Ø 22 x 5 mm

Heat treatment sequence



Physical Properties

Temperature (°C)	20
Density (kg/dm^3)	7.7
Thermal conductivity (W/(m.K))	20
Specific heat (kJ/kg K)	0.46
Spec. electrical resistance (Ohm.mm^2/m)	0.65
Modulus of elasticity (10^{3}N/mm^2)	210

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

Temperature (°C)	100	200	300	400	500	600
Thermal expansion (10^{-6} m/(m.K))	10.5	11	11	11.5	12	12

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

voestalpine
ONE STEP AHEAD.