



COLD WORK  
TOOL STEEL

## COLD WORK TOOL STEEL

**BÖHLER K340**  
**ISODUR®**



# THE ALL- ROUNDER FOR TOUGH JOBS

## DO YOU WANT TO AVOID GUESSWORK AND INCREASE THE SERVICE LIFE OF YOUR TOOLS?

**BÖHLER K340 ISODUR**, an 8% chromium steel, is produced using the electro-slag remelting (ESR) method. This by voestalpine BÖHLER developed and proven remelting technology, ensures extremely low micro and macro segregations and gives the material the purity and homogeneity necessary for excellent performance in practice.

### Key reasons for the broad application spectrum of BÖHLER K340 ISODUR:

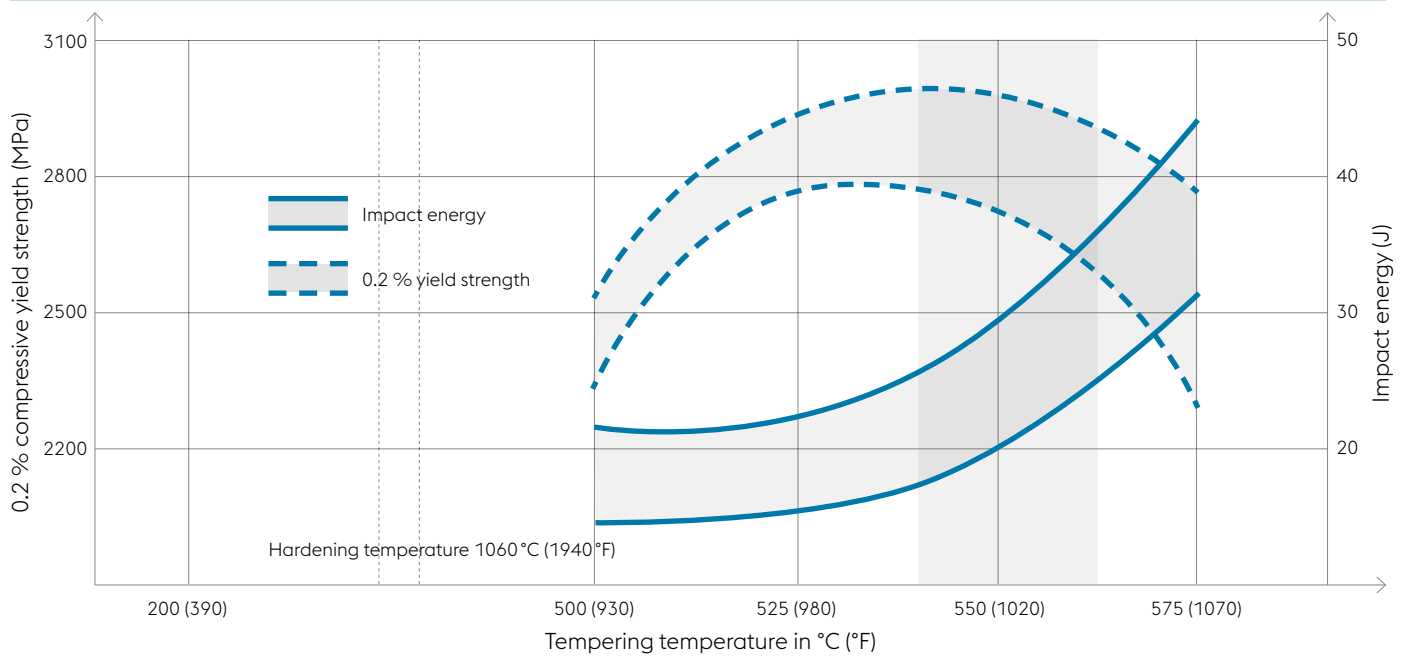
- » Outstanding toughness
- » Excellent compressive strength
- » Very good machinability due to homogeneous structure
- » Smaller dimensional changes

### BÖHLER K340 ISODUR is particularly suitable for the following application areas:

- » Cutting
- » Blanking
- » Cold forming



### Compressive yield strength and impact energy to tempering temperature



### Chemical composition (nominal in wt.%)

C	Si	Mn	Cr	Mo	V	others
1.10	0.90	0.40	8.30	2.10	0.50	+ Al, Nb





# PROPERTIES AND BENEFITS

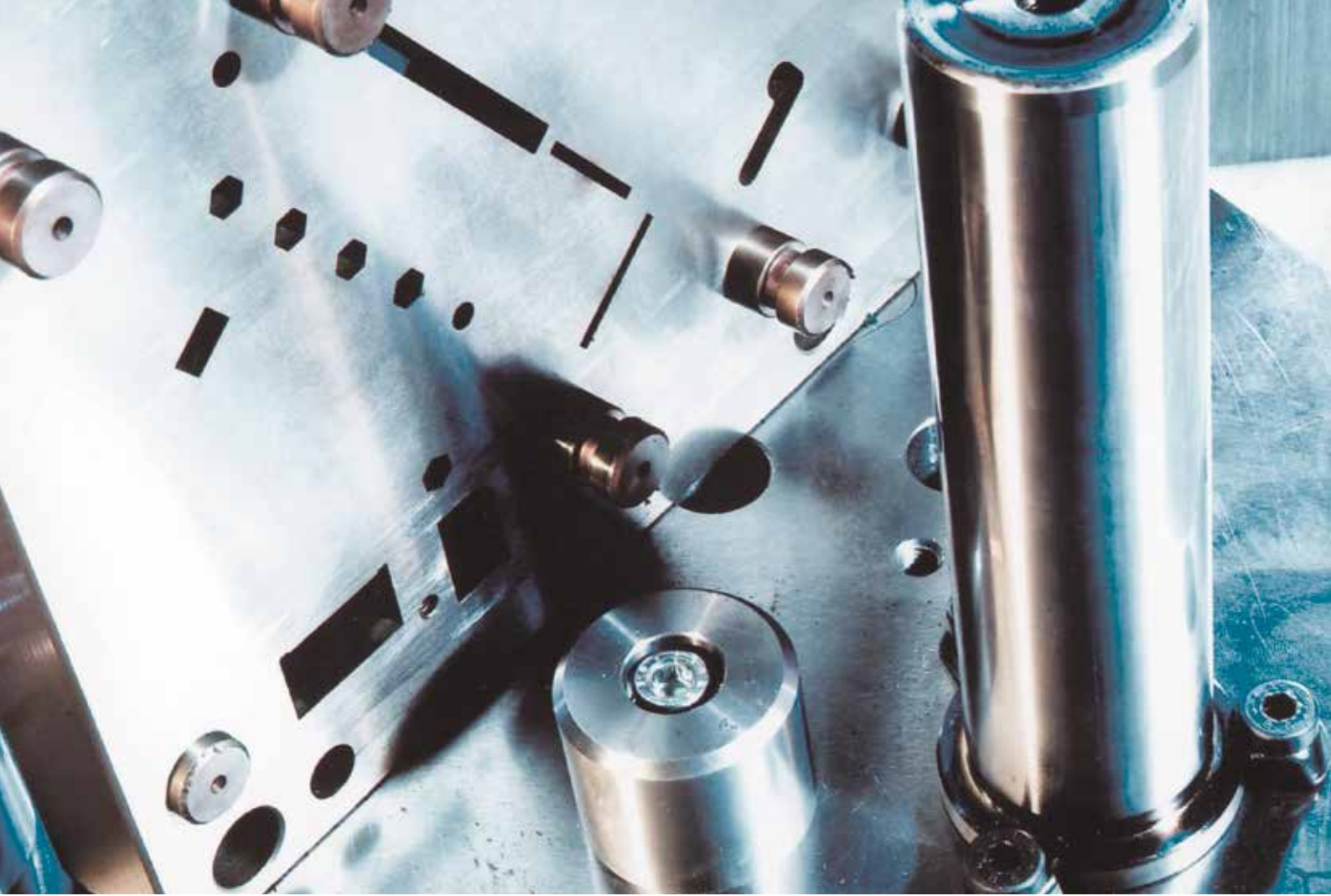
Outstanding performance and material properties make **BÖHLER K340 ISODUR** so cost-effective.

## Advantages for tool & die production

- » Outstanding electrical discharge machining
- » Excellent dimensional stability
- » Very good machinability
- » Very good nitridability
- » Very good coatability

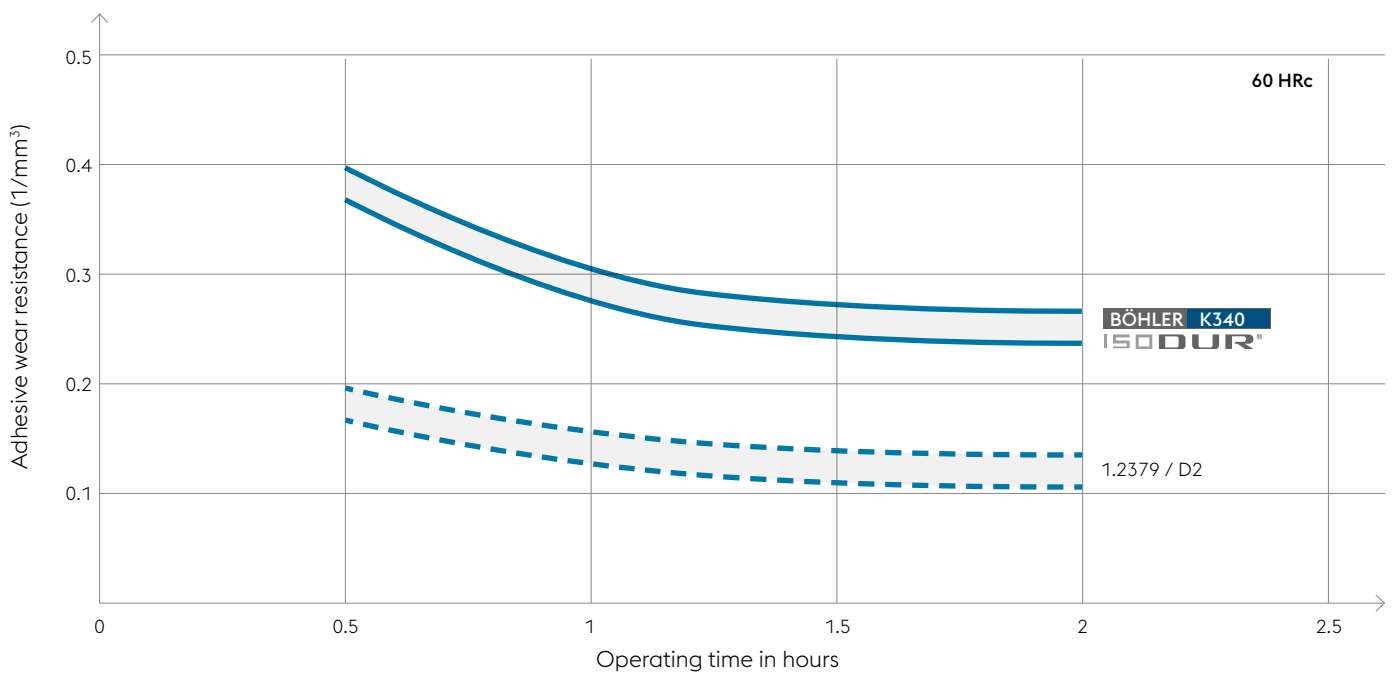
## Advantages in tool & die use

- » Excellent adhesive wear resistance
- » Excellent compressive strength
- » Easy regrinding
- » High cutting edge retention
- » Consistently high component precision
- » Safety against breakage or failure in use
- » Reproducible tool parameters



Alloying with aluminum improves the tribo-system so that surface oxide passivation occurs. This passivation layer reduces the tool's adhesion tendencies in use.

### Adhesive wear resistance



determined by the pin-on-disc test



### Physical properties at 20 °C (68 °F)

<b>Young's modulus at</b>	20 °C	206 x 10 <sup>3</sup> N/mm <sup>2</sup>
	68 °F	29.9 x 10 <sup>3</sup> ksi
<b>Density at</b>	20 °C	7.68 kg/dm <sup>3</sup>
	68 °F	0.277 lbs/in <sup>3</sup>
<b>Specific electrical resistivity at</b>	20 °C	0.64 Ohm.mm <sup>2</sup> /m
	68 °F	385 Ohm circular-mil per ft
<b>Specific heat capacity at</b>	20 °C	490 J/(kg.K)
	68 °F	0.117 Btu/lb °F
<b>Thermal conductivity at</b>	20 °C	17.8 W/(m.K)
	68 °F	10.28 Btu/ft h °F

### Coefficient of thermal expansion between 20 °C (68 °F) and ....°C (°F)

100 °C	200 °C	300 °C	400 °C	500 °C	600 °C	700 °C	
11.2	11.8	12.3	12.7	12.9	13.1	13.1	10 <sup>-6</sup> m/(m.K)
210 °F	390 °F	570 °F	750 °F	930 °F	1110 °F	1290 °F	
6.22	6.55	6.83	7.05	7.16	7.28	7.28	10 <sup>-6</sup> m/in °F





# APPLICATIONS

**BÖHLER K340 ISODUR** performs well in a wide variety of applications due to its well-balanced properties.

## Cutting and stamping

- » Cutting and blanking operations, e.g. dies and punches

## Cold forming

- » Dies for deep drawing and extrusion
- » Coining dies
- » Bending dies
- » Thread forming tools

## Other

- » Machine components (e.g. guide rails)
- » Packaging and pharmaceutical applications

Regarding applications and processing steps that are not expressly mentioned in this data sheet, we kindly ask **to consult us**.

# HEAT TREATMENT RECOMMENDATIONS

## Stress relieving

- » approx. 650 °C (1200 °F)
- » After through-heating, hold in neutral atmosphere for 1 – 2 hours.
- » Slow cooling in furnace

## Hardening

- » 1040 to 1060 °C (1900 – 1940 °F)
- » Oil, nitrogen, salt bath, compressed air, air, vacuum
- » After through-heating, hold for 15 – 30 minutes

## Tempering

- » Slow heating to tempering temperature immediately after hardening
- » Time in furnace 1 hour for each 20 mm (0.79 inch) of workpiece thickness but at least 2 hours
- » Air cooling
- » Obtainable hardness: 57 – 63 HRC

## Repair welding

As with all tool steels, there is a risk of cracking during welding. If welding is absolutely required, please follow the instructions of the welding material manufacturer.

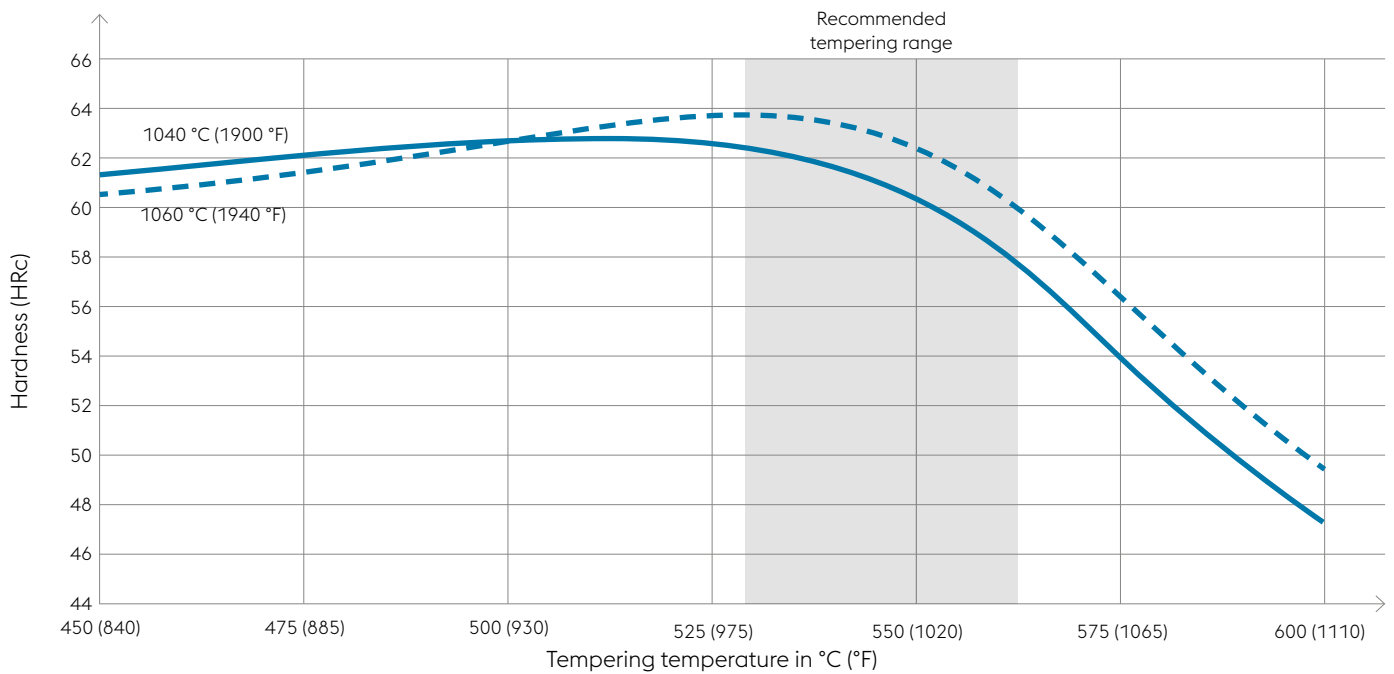
For more information, please ask for our brochure “Welding in Tool Making”.







### Tempering chart



Specimen size: square 20 mm (0.79 inch)  
 Vacuum hardened, N<sub>2</sub> cooling 5 bar  
 Tempering: 3 x 2 hours



#### Cryogenic treatment

Recommended when especially high dimensional stability is required.

#### Surface treatment

To minimize friction and to increase wear resistance, **BÖHLER K340 ISODUR** can be surface treated with standard wear resistant coatings.

#### Nitriding

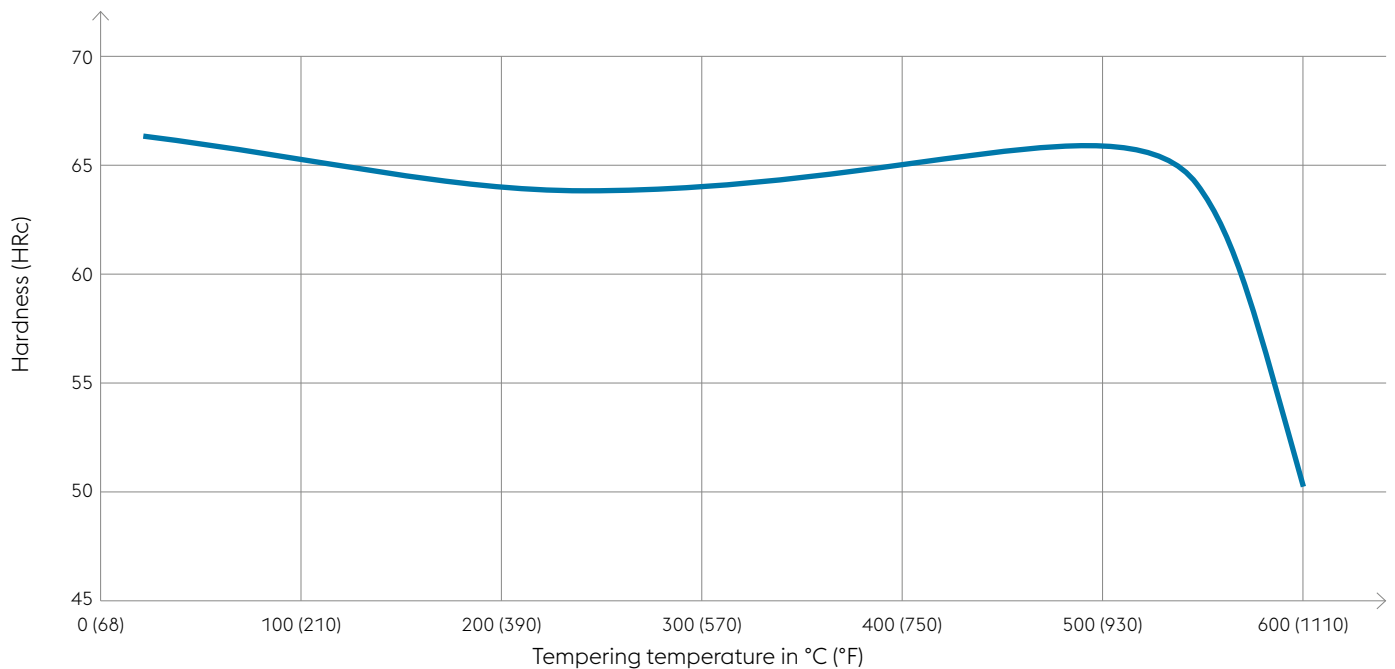
The specific alloy composition of **BÖHLER K340 ISODUR** enables easy nitriding, which ensures optimal solutions for individual applications.

#### PVD

The material is suitable for all commonly used PVD coatings.

# HEAT TREATMENT AND SURFACE TREATMENT RECOMMENDATIONS

## Effect of cryogenic treatment on hardness and tempering characteristics



Vacuum hardening: 1050 °C (1920 °F) / 30 min / N<sub>2</sub>, 5 bar

Cryogenic treatment: -70 °C (-90 °F), 2 hours

Tempering: 3 x 2 hours

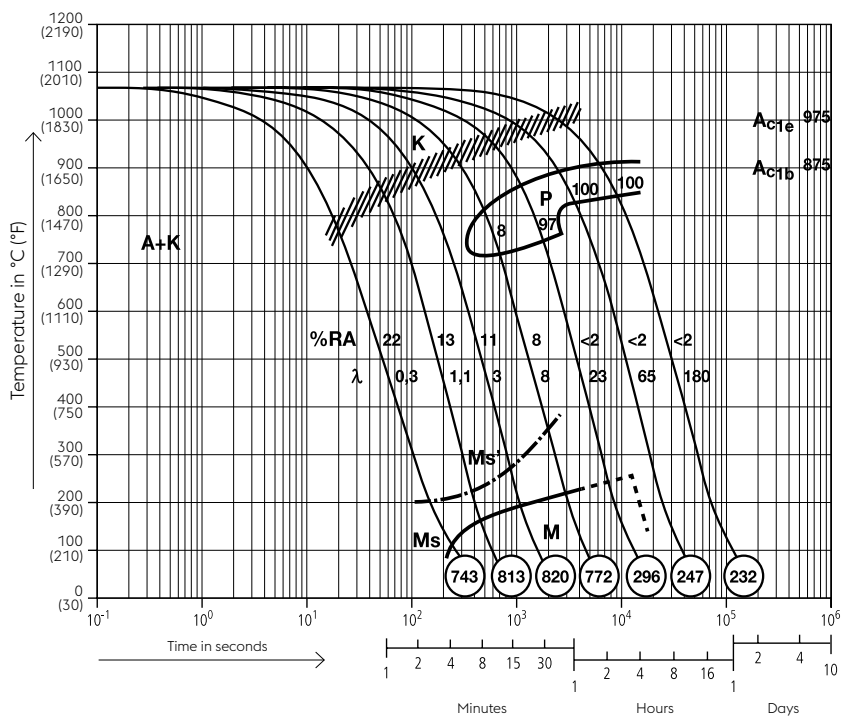


# HEAT TREATMENT RECOMMENDATIONS

## CCT chart for continuous cooling

Austenitizing temperature: 1060 °C (1940 °F)  
 Holding time: 30 minutes

8...100 Phase percentages in %  
 0.3...180 cooling parameter  $\lambda$ , i.e. duration of cooling from 800 – 500 °C (1470 – 930 °F) in  $s \times 10^{-2}$

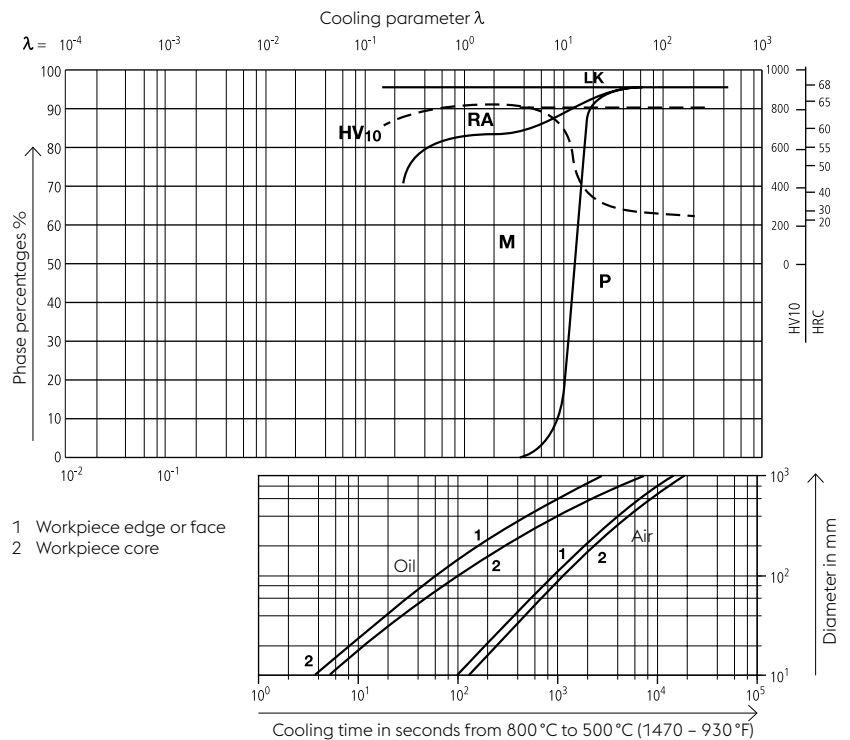






## Quantitative phase diagram

- LK Ledeburitic carbide
- RA Retained austenite
- M Martensite
- P Perlite



# MACHINING RECOMMENDATIONS

## Turning with carbide tools

Cutting depth, mm (inches)	0.5 - 1 (.02 - .04)	1 - 4 (.04 - .16)	4 - 8 (.16 - .31)	over 8 (.31)
Feed, mm/rev. (inches/rev.)	0.1 - 0.3 (.004 - .012)	0.2 - 0.4 (.008 - .016)	0.3 - 0.6 (.012 - .024)	0.5 - 1.5 (.020 - .060)
Cutting speed $v_c$ m/min (f.p.m)				
LCP15T	200 - 330 (655 - 1080)	190 - 250 (625 - 820)	140 - 190 (460 - 625)	110 - 150 (360 - 490)
LCP25T	170 - 250 (560 - 820)	150 - 220 (490 - 720)	110 - 170 (360 - 560)	60 - 130 (195 - 425)
LC240F	150 - 200 (490 - 655)	120 - 160 (395 - 525)	60 - 100 (195 - 330)	50 - 90 (165 - 295)

Heat treatment: annealed (guideline values)

## Milling with insert cutter heads

Feed, mm/tooth (inches/tooth)	0.05 - 0.2 (.002 - .008)	0.2 - 0.4 (.008 - .016)
Cutting speed $v_c$ m/min (f.p.m)		
BCP25M	140 - 250 (460 - 820)	90 - 200 (295 - 655)
BCP30M	110 - 220 (360 - 720)	70 - 150 (230 - 490)

Heat treatment: annealed (guideline values)



Grinding method	Tyrolit grinding disk	Abrasive
Segmental flat grinding	89A461H8AV217	Corundum
Circumferential surface grinding	up to Ø 250: 93A601H8AV217 over Ø 250: 93A601G7AV217 all Ø: B126C50B VIB-Star	Corundum Corundum Boron nitride
Diaform reciprocal profile grinding	80A120J9AV17P8	Corundum
Reciprocal profile grinding with stationary machines	97A120H6V111	Corundum
Profile grinding	C1202F8AV18P8	Silicon carbide
Internal cylindrical grinding	97A802K6V112 B126C75B54	Corundum Boron nitride
External cylindrical grinding between centers	up to Ø 400: CS66A802HH6VB over Ø 400: CS66A802HH6VB all Ø: B126C50B-BIB-Star	Corundum Corundum Boron nitride
Dry tool grinding	B126C75B - AMIGO	Boron nitride
Wet tool grinding	BL1263PD - Startec-Basic	Boron nitride

Condition: hardened and tempered

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.



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ONE STEP AHEAD.