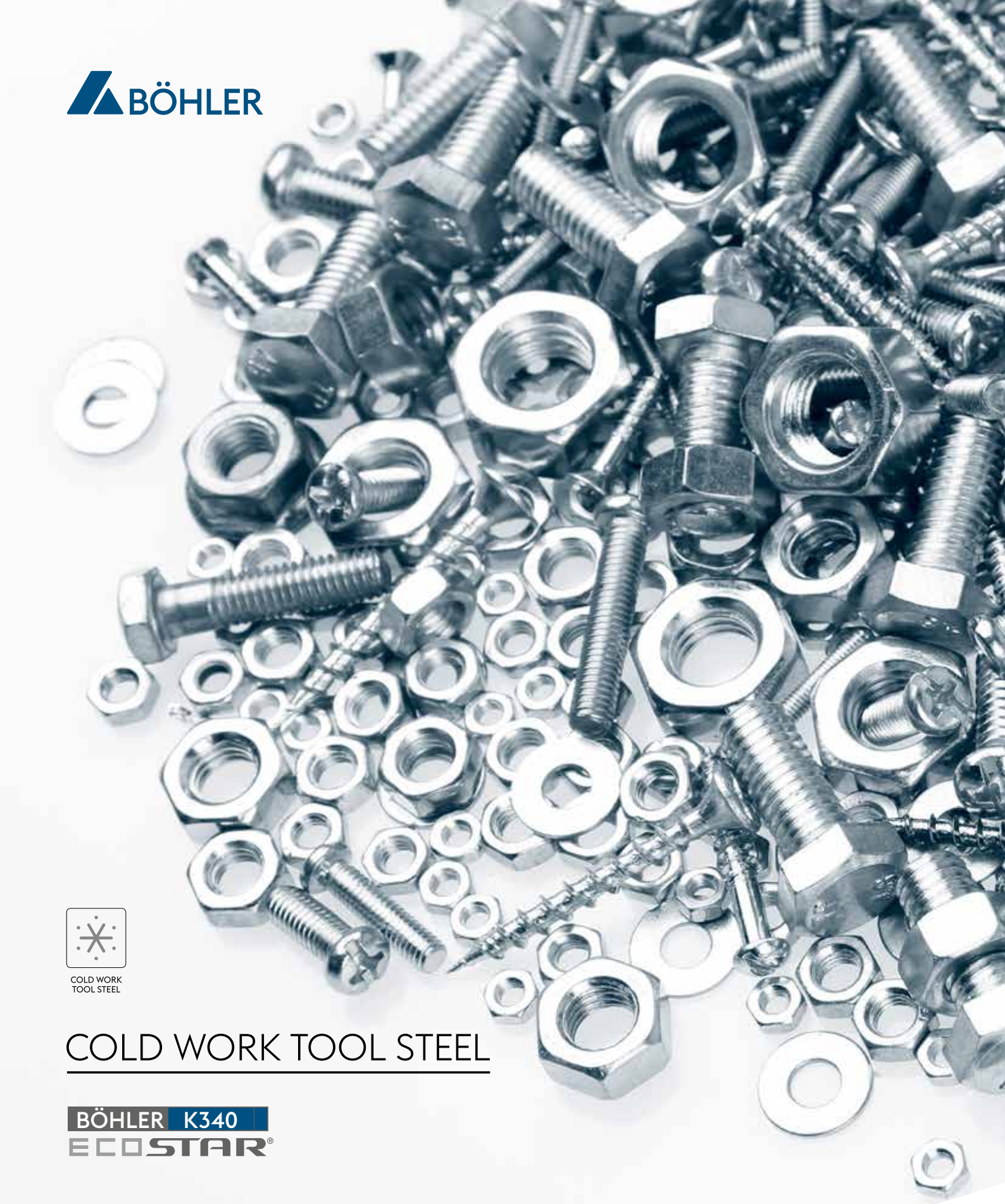
BÖHLER



COLD WORK
TOOL STEEL

COLD WORK TOOL STEEL

BÖHLER K340
ECOSTAR®

voestalpine BÖHLER Edelstahl GmbH & Co KG
www.voestalpine.com/bohler-edelstahl

voestalpine
ONE STEP AHEAD.

THE ALL-ROUNDER FOR INCISIVE RESULTS

ARE YOU SEEKING FOR A UNIVERSAL MATERIAL WITH IMPROVED SERVICE LIFE?

The **BÖHLER K340 ECOSTAR** is a conventionally melted, oil-, nitrogen- and air-hardened 8% chromium steel with improved matrix structure and with good dimensional stability. This results in material properties that are particularly well suited to working with combined loading.

The key reasons for using BÖHLER K340 ECOSTAR are:

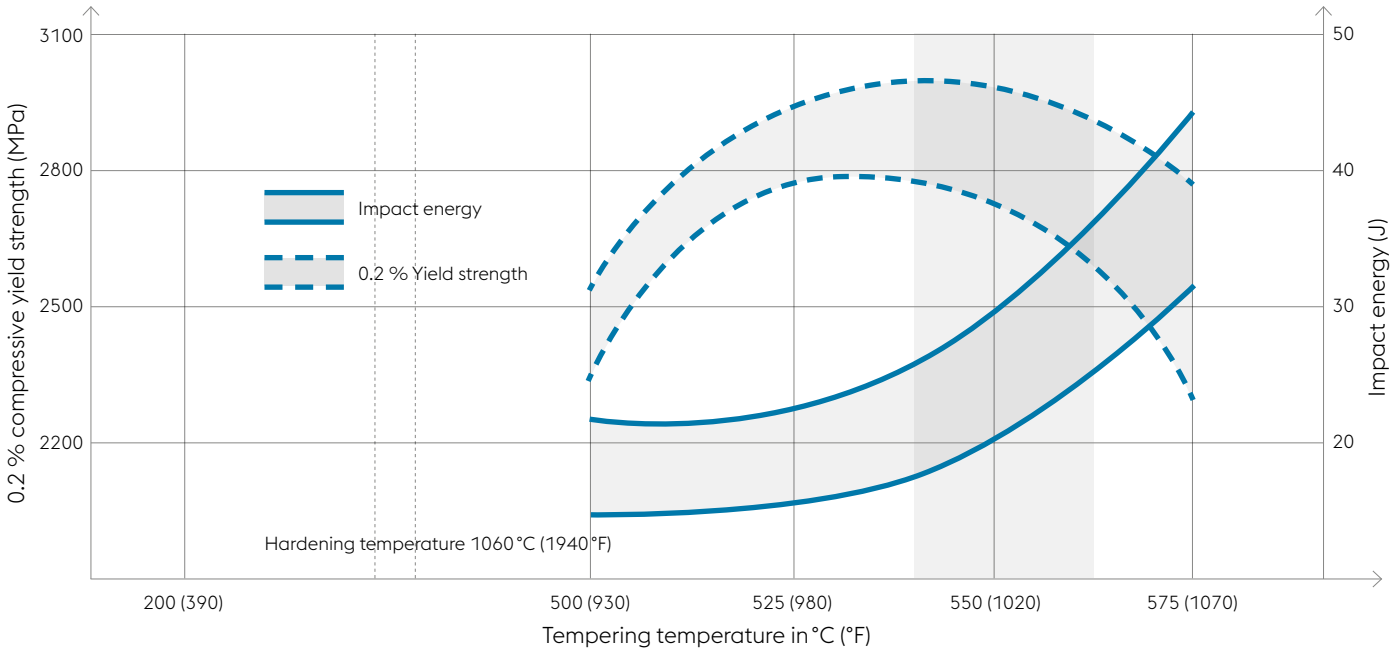
» Outstanding toughness
» Exceptional wear resistance
» Maximum fracture resistance

BÖHLER K340 ECOSTAR is therefore ideal for applications as:

» Cutting
» Stamping
» Cold forming

BÖHLER K340 ECOSTAR is suitable for all common coatings due to the excellent tempering resistance.

Compressive yield strength and impact energy to tempering temperature



Chemical composition (nominal in wt.%)

C	Si	Mn	Cr	Mo	V	others
1.10	0.70	0.40	8.20	2.10	0.50	+ Al, Nb

PROPERTIES AND BENEFITS

The outstanding performance characteristics and material properties of **BÖHLER K340 ECOSTAR** improve the cost-effectiveness of their tools.

Advantages in tool-making

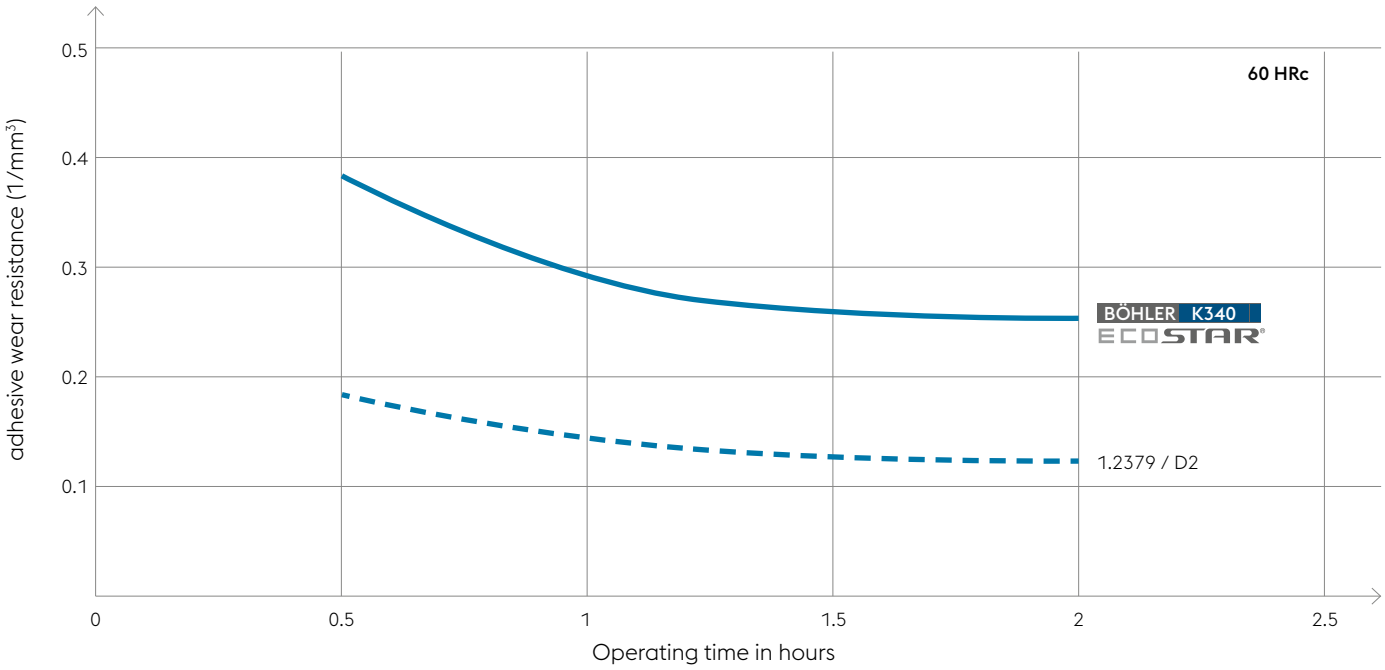
» Good EDM machinabilty
» Good dimensional stability
» Good machinabilty
» Excellent nitridability
» Excellent coatability

Advantages in tool use

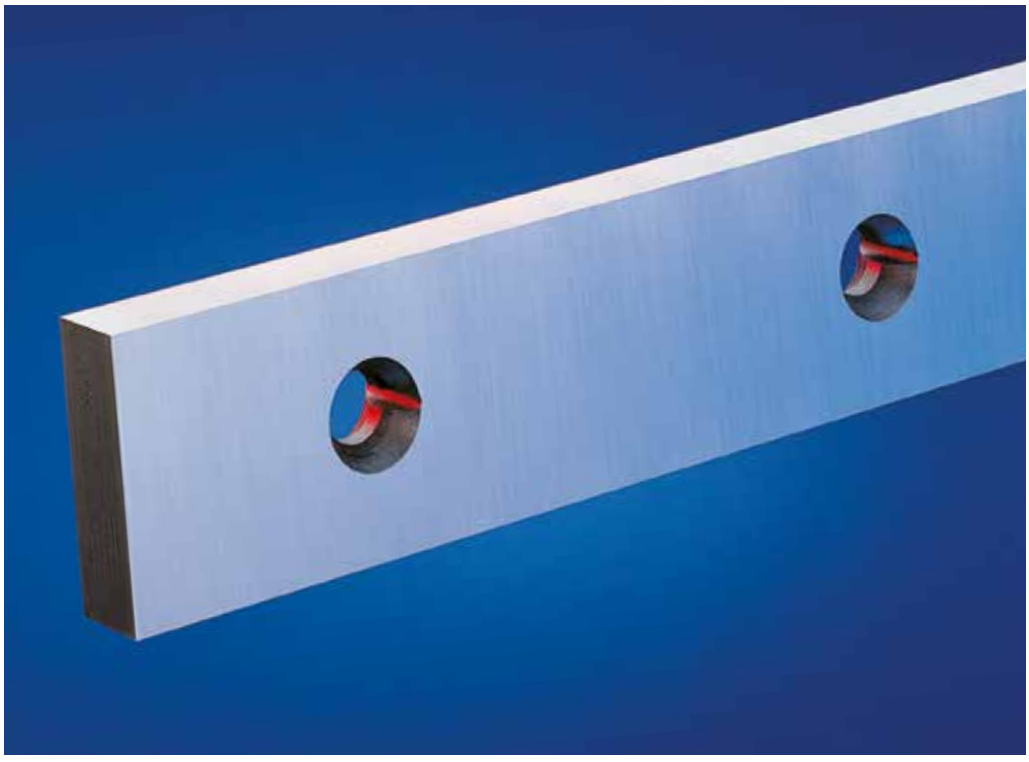
» Excellent adhesive wear resistance
» High compressive strength
» Easy to regrind
» High cutting edge retention
» Consistently high component precision
» Safety against breakage or failure in use
» Reproducible tool parameters

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-disk test



APPLICATIONS

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

Cutting and stamping
» Cutting and blanking operations: e.g. punch and dies

Industrial and machine knives
» Knives for the recycling industry (plastics, rubber)
» Knives for wood-working

Cold forming
» Tools for deep drawing or extrusion
» Coining tools
» Bending tools
» Thread forming tools

Other
» Machine components (e.g. guide strips)

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

HEAT TREATMENT RECOMMENDATIONS

CHOOSE THE RIGHT HEAT TREATMENT FOR OPTIMAL RESULTS.

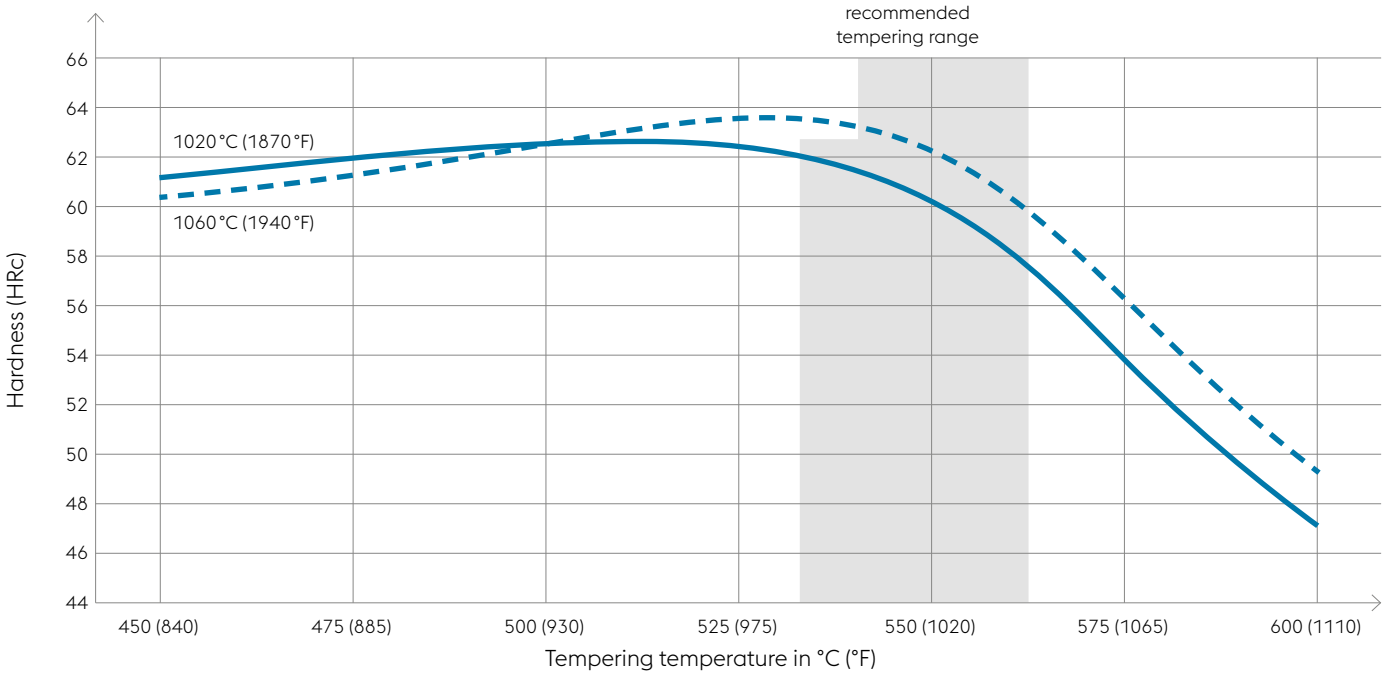
Stress relieving
» approx. 650 °C (1200 °F)
» After through-heating, hold in neutral atmosphere for 1 – 2 hours.
» Slow cooling in furnace; intended to relieve stresses set up by extensive machining, or in complex shapes

Hardening
» 1020 to 1060 °C (1870 – 1940 °F)
» Oil, salt bath, compressed air, air, vaccum, nitrogen
» After through-heating, hold for 15 to 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
» Cooling in air
» Obtainable hardness: 57 – 63 HRC

Cryogenic treatment
» Vacuum hardening: 1050 °C (1920 °F) / 30 min / N_2, 5 bar
» Subzero cooling: –70 °C (–95 °F), 2 Hours
» Tempering: 3 x 2 Hours

Tempering chart



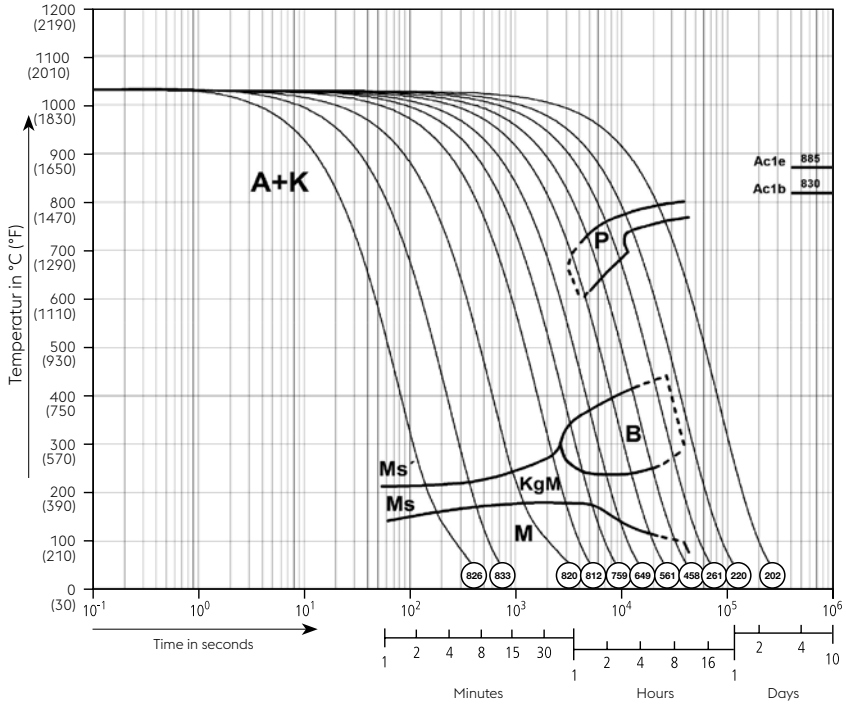
Specimen size: square 20 mm (0.79 inch)
Hardened in vacuum, N_2 cooling 5 bar
Tempering: 3 x at the same tempering temperature

HEAT TREATMENT RECOMMENDATIONS

Continuous cooling CCT curves

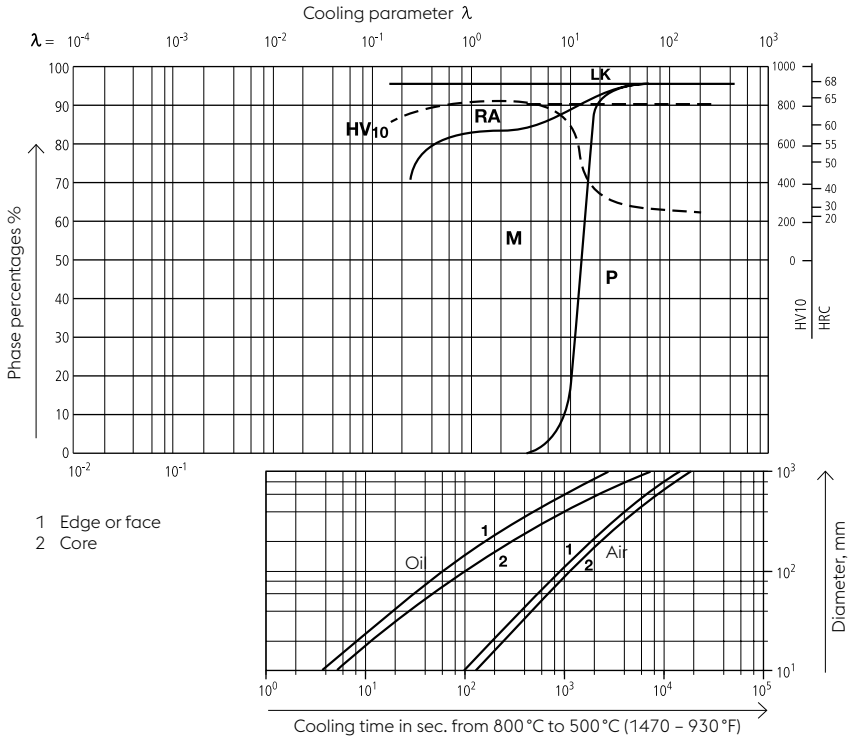
Austenitizing temperature: 1060 °C (1940 °F)
Holding time: 30 minutes

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



Quantitative phase diagram

LK Ledeburitic carbides
RA Retained austenite
M Martensite
P Perlite



MACHINING GUIDELINES

Turning with sintered carbide

Depth of cut, mm (inches)	0.5 – 1 (.02 – .04)	1 – 4 (.04 – .16)	4 – 8 (.16 – .31)	over 8 (.31)
Feed, mm/U (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)
ISO grade	HC-P15, HC-P25	HC-P25, HC-M35	HW-P30, HC-M35	HW-P40
Cutting speed v_c m/min (f.p.m)				
BOEHLERIT LC P15 T / ISO P15	230 – 350 (755 – 1150)	190 – 250 (625 – 820)	140 – 190 (469 – 625)	110 – 150 (360 – 490)
BOEHLERIT LC P25 T / ISO P25	190 – 310 (625 – 1015)	150 – 220 (490 – 720)	110 – 170 (360 – 560)	60 – 130 (195 – 425)
BOEHLERIT LC P240 F / ISO P35	150 – 220 (490 – 720)	130 – 180 (425 – 590)	80 – 120 (260 – 395)	60 – 90 (195 – 295)

Condition is soft annealed, guidelines

Milling with inserted tooth cutter

Feed, mm/tooth (inches/tooth)	up to 0.2 (.008)	0.2 – 0.4 (.008 – .016)
Cutting speed v_c m/min (f.p.m)		
BOEHLERIT LC 225 T / ISO P25	140 – 250 (460 – 820)	90 – 200 (295 – 655)
BOEHLERIT LC 230 E / ISO P30	110 – 220 (360 – 720)	70 – 150 (230 – 490)
BOEHLERIT LC M45 M / ISO M40	110 – 220 (360 – 720)	70 – 150 (230 – 490)

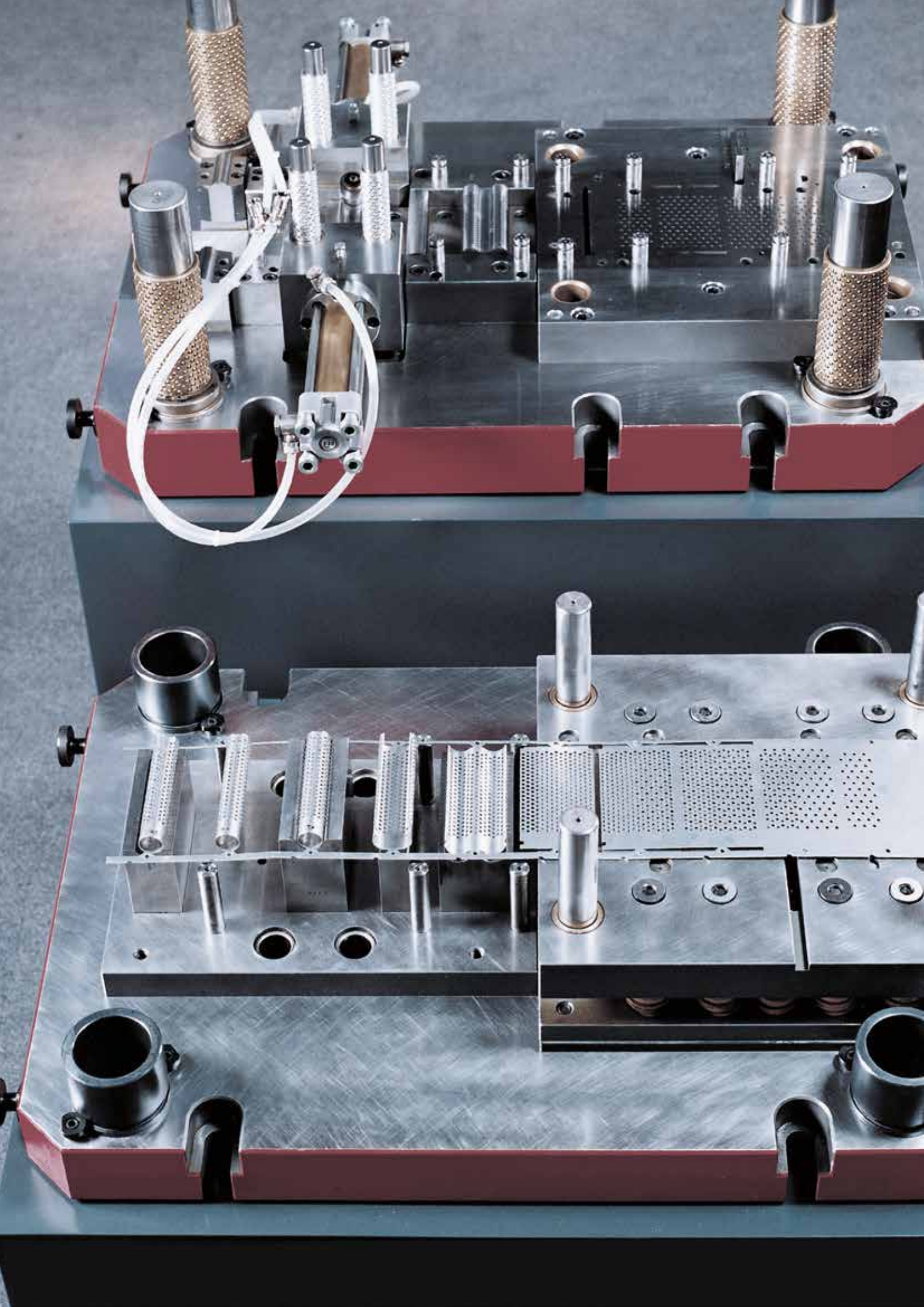
Condition is soft annealed, guidelines

Grinding process	Tyrolit grinding wheel	Abrasive
Surface grinding with segments	89A461H8AV217	Corundum
Face grinding around the circumference	up to Ø 250: 93A601H8AV217 over Ø 250: 93A601G7AV217 all Ø: BM120R50B54	Corundum Corundum Boron nitride
Form grinding with a diaform pendulum grinding machine	88A1202I9AV43P8	Corundum
Form grinding with a static pendulum grinding machine	90A120H6V111	Corundum
Deep form grinding	C1202F8AV18P8	Silicon carbide
Internal circular grinding	89A802K6V111 BM120R75B54	Corundum Boron nitride
Cylindrical surface grinding between spikes	up to Ø 400: 89A602K5AV217 over Ø 400: 89A602J6AV217 all Ø: BM120R75B54	Corundum Corundum Boron nitride
Dry grinding of tools	BM120R75B75	Boron nitride
Wet grinding of tools	BM120R75B76	Boron nitride

Condition: hardened and tempered

REPAIR WELDING

If welding is required, the instructions of the welding material manufacturer should be followed.



PHYSICAL PROPERTIES

Physical properties at 20 °C (68 °F)

Modulus of elasticity at	20 °C 68 °F	206 x 10^3 N/mm^2 29.9 x 10^6 psi
Density at	20 °C 68 °F	7.68 kg/dm^3 0.277 lbs/in^3
Electrical resistivity at	20 °C 68 °F	0.64 Ohm.mm^2/m 385 Ohm circular-mil per ft
Specific heat capacity at	20 °C 68 °F	490 J/(kg.K) 0.117 Btu/lb °F
Thermal conductivity at	20 °C 68 °F	17.8 W/(m.K) 10.28 Btu/ft^2 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^{-6} 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^{-6} in/in °F

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