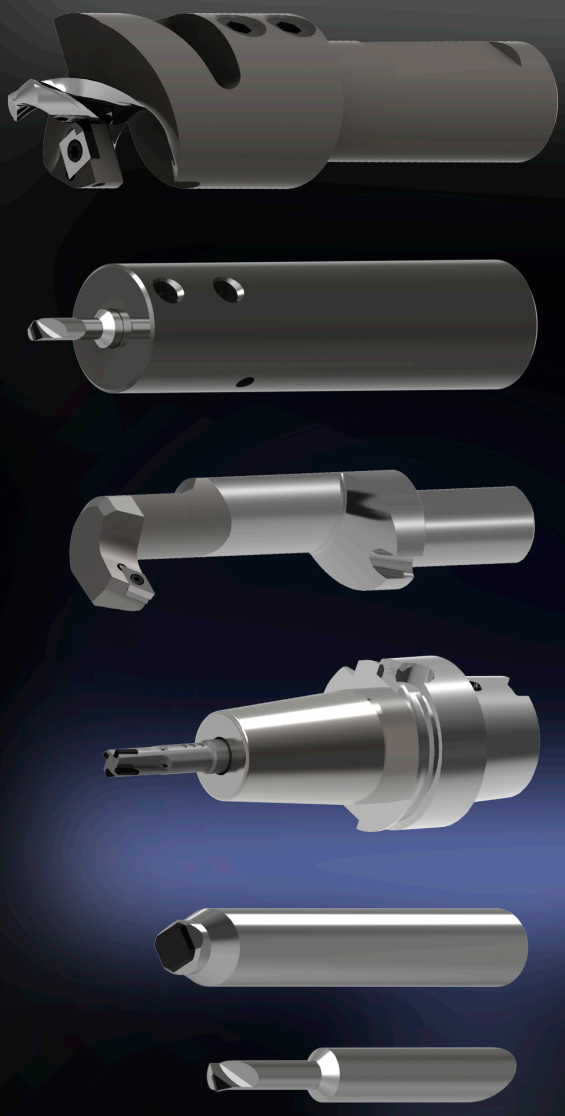
Development
Construction
Diamond and CBN tools
Tool carrier systems

ULTRA-HARD CUTTING MATERIALS
PCBN, PKD, CVD



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Welcome to your premium brands

RIEMKE Tools S.A.

Achieving the best together – that is what we want.
Always providing the best for you – that is what we promise.
The best as a guiding principle – that is what we live by.

Summed up in one sentence this means:

OUR QUALITY – YOUR SATISFACTION

Innovative – individual – owner-managed

As an ISO-certified company under the management of the founder we are happy to be your 'turbocharger' whenever you are looking for **customised tooling solutions from specialists.** We aim to provide you with a quality guarantee for both tool development and service, recommending ourselves as a partner who, based on trust, creates exactly the tool you require to **meet your needs perfectly.**

For distributors and end-users

In this catalogue you can find **ultra-precise cutting tools for metal working:**

- CBN, PCD and CVD inserts
- PCD/CVD milling and drilling systems
- CBN reaming, parting and grooving systems
- CBN, PCD and CVD rotating tools for turning
- Customised tooling systems
- Development/production of special cutting edges/special tools

Sustainable process optimisation and cost reductions – with individual premium products

Partnership at all times

Just like your tooling solutions, our comprehensive service offer as well is precisely tailored to your needs: from the regrinding service which guarantees high accuracy, to the setting procedures and exact fine tuning of your tools – we are here to help.

Expertise for your progress

Employees with many years of experience and outstanding expertise ensure top performance for both products and processes: their in-depth planning knowledge, design skills and experience of production technology in the last resort give **you exactly what you need:** a customised and top-quality solution you can rely on.

Up-to-date machine park

When machines are optimally tuned to each other, maximum efficiency is the result: **RIEMKE Tools S.A.** use only machines of the latest technology which are able to carry out all known manufacturing operations. In addition to numerous special systems, these also include ultra-modern laser machining centres and 7-axis grinding machines with 6-axis robots.

Getting better all the time

In order to ensure that our production – and thus your products – always remains at the highest level, we are committed to the **guiding principle of continuous process improvement.** This finds expression in a strict quality assurance procedure: trained employees meticulously check every single cutting edge before it is dispatched, using state-of-the-art equipment.

Perfectly organised logistics

With our two company sites in Lebach. Germany, and Grevenmacher, Luxembourg, we cover the **entire area of Germany and the Benelux** countries: thanks to sophisticated logistics planning, you will receive tailor-made solutions in a very short space of time – that's a promise!

The quality team at **RIEMKE Tools S.A. SERVICE** is looking forward to hearing from you! sich auf Sie!

Ultra-hard cutting materials

Ultra-hard cutting materials are those which rank in the hardness scale above carbides, cermets and cutting ceramics. They can be subdivided into diamond cutting materials and CBN substrates (cubic boron nitride).

Diamond cutting materials

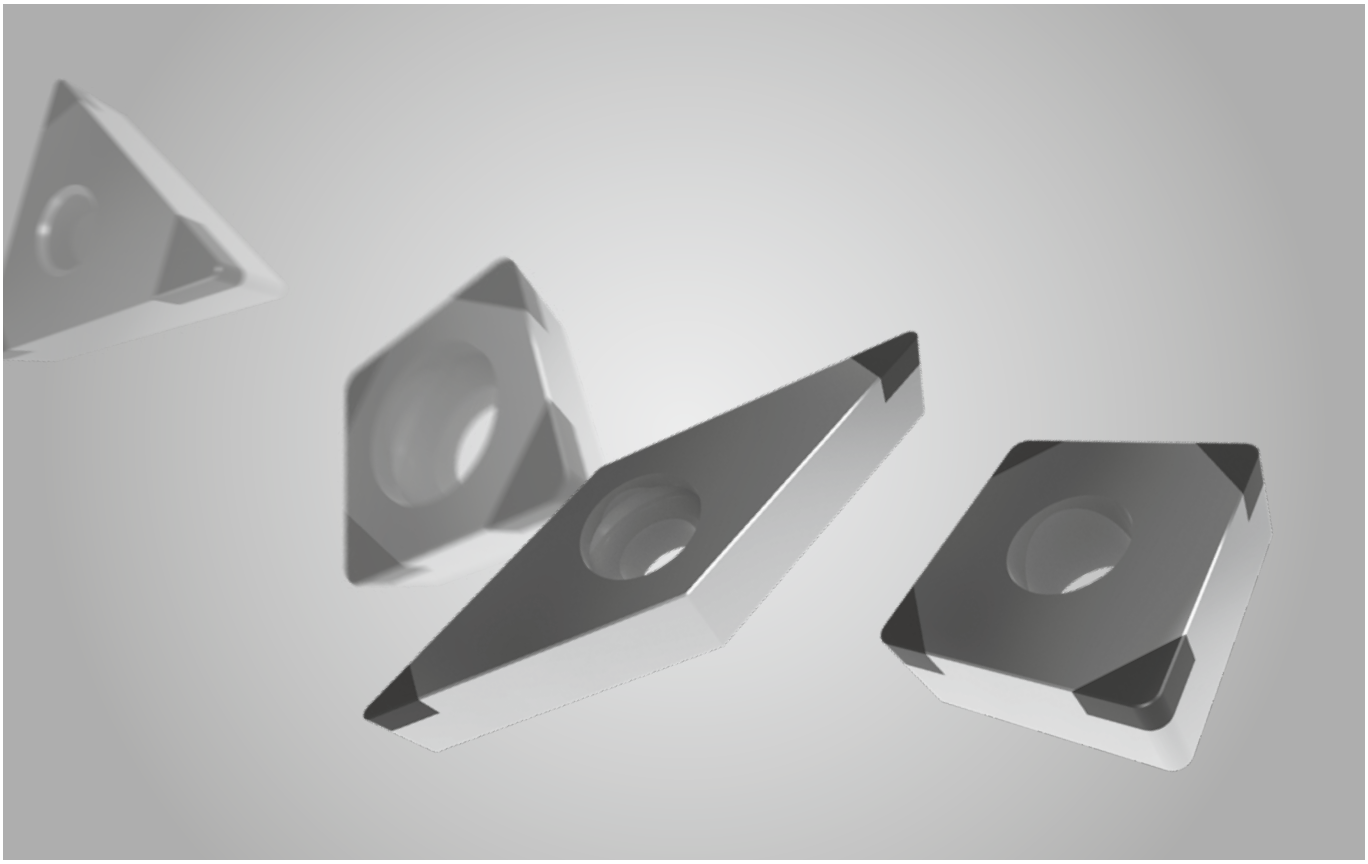
There are two types of diamond cutting materials: monocrystalline and polycrystalline. Monocrystalline diamonds are used for finishing and superfinishing. They achieve optimum surface quality combined with maximum geometric precision of the components. A high chip volume is not an important factor in this kind of machining.

Polycrystalline diamond (PCD), by contrast, is sintered as grains in a metal matrix. Every single grain in itself is monocrystalline; by varying the grains, however, different characteristics can be produced. In addition, a crystalline diamond coating can be deposited from a gas phase, using a CVD (Chemical Vapour Deposition) thick coating process. The thick coating in this context is a coating of 0.3-1mm.

CBN substrates (cubic boron nitride)

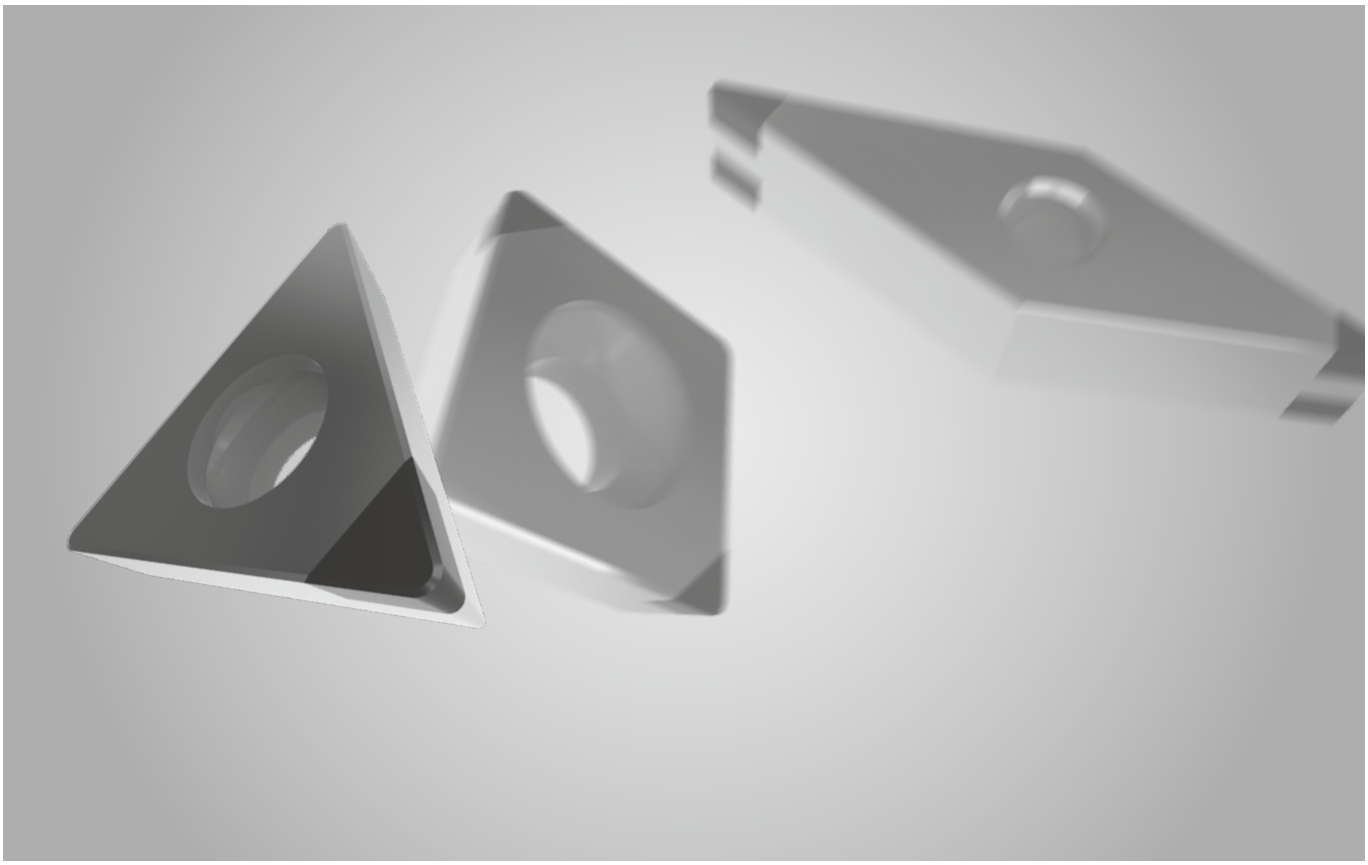
CBN substrates are the second hardest after diamond, with different mechanical and chemical properties depending on the application. This cutting material shows high heat resistance and is ideal for the machining of steels, castings and special alloys.

In order to make the best possible use of the great potential of CBN and diamond cutting materials in production, the right kind of application and machining parameters are crucial.



Our tips for you:

- Choose the right combination of grade and cutting edge geometry, based on the machining task envisaged.
- Adapt the cutting parameters to the overall machining conditions to achieve economical results and/or chip control.
- Take the whole machine environment into account, raising it to the highest possible level of stability to achieve the best possible results.
- The most important factors for your working results are the machine structure, guideways, spindles and clamping systems for the work piece and tools.



CBN – cubic boron nitride

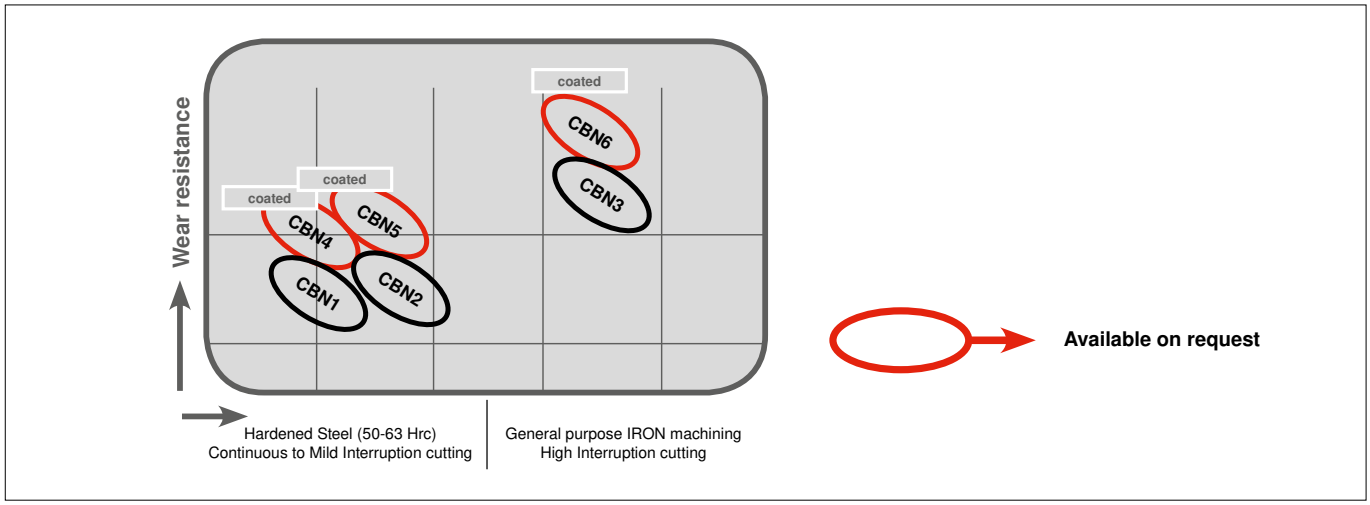
CBN is heat-resistant up to over 1.000° C. Diamond, on the other hand, suffers massive hardness loss at approx. 700° C, which is why it can be ground with CBN when exposed to heat.

With the help of a high-pressure, high-temperature procedure, a dense layer of polycrystalline cubic boron nitride is inseparably deposited on the carbide substrate as a carrier material. Our carbide gives the CBN cutting layer excellent support, even facilitating applications with heavily interrupted cut.

Based on the individual case, various compositions are possible to achieve different mechanical and chemical properties in the cutting material.

Typical applications of CBN inserts:

- Iron materials starting from 45 HRC
- Grey cast iron
- Spheroidal graphite cast iron
- Chrome chilled castings
- Sintered steels
- Cold and hot working steels
- Bearing and spring steels
- Surface-hardened parts



Grade description	Application	Properties
CBN1	○ For hard turning in slightly interrupted cut and hard finish milling of hardened steel (50-63 Hro) in continuous cut ○ Very good resistance to cratering ○ Extremely fine structure to achieve surface roughness in the submicron range ○ Cutting speed: 180 - 300 m/min ○ Feed rate: 0.07 - 0.15 mm/rev.	approx. 45% PCBN Submicron PCBN grain size TiCN binder
CBN2	○ For turning of all common hardened steels with slightly to strongly interrupted cut ○ Optimal balance between toughness and resistance to cratering and clearance face wear ○ Also suitable for plunging when producing valve seat rings ○ Cutting speed: 150 - 240 m/min ○ Feed rate: 0.1 - 0.2 mm/rev.	approx. 65% PCBN Grain size 1.5 µm Primarily TiC binder
CBN3	○ Ideal for applications with long tool life ○ Suitable for the machining of grey cast iron and hard cast iron materials, milling of hardened steel and for the machining of most valve seat ring alloys in strongly interrupted cut ○ First choice for most powder metals containing iron ○ Cutting speed: 50 - 200 m/min ○ Feed rate: 0.05 - 0.2 mm/rev.	approx. 90% PCBN Grain size 4 µm New binder system

PCD – polycrystalline diamond

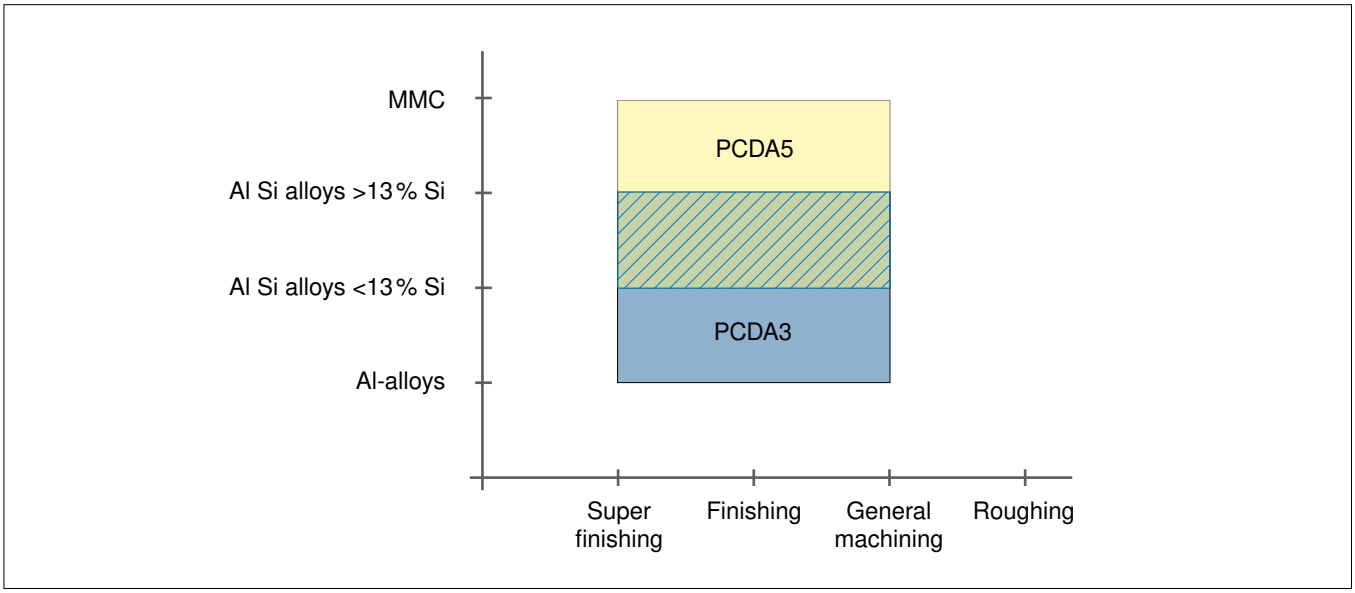
Like monocrystalline diamond. PCD is two to three times harder than carbide and 100 times more abrasion-resistant. As this cutting material, however, is more brittle and more temperature-sensitive (heat resistance up to approx. 650 °C), stable cutting conditions are required.

PCD is a synthesised, extremely tough, interlocked mass of randomly oriented diamond particles in a metal matrix. It is produced by sintering together selected diamond particles at high pressure and temperature. In this way an extremely hard and abrasion-resistant structure is produced.

As a cutting material it is suitable for the manufacture of cutting tools for wood working, plastic and non-ferrous metal machining. PCD cannot be used for steel machining: the carbon from the diamond diffuses into the steel as the temperature rises, so that tool life is strictly limited.

Typical applications of PCD inserts:

- Dry and wet machining of aluminium and aluminium alloys
- Copper, brass, bronze and zinc
- Magnesium alloys
- Silver and gold
- Presintered and sintered carbide
- Plastics and rubber
- Titanium alloys
- Ceramics
- Glass-fibre reinforced (GFC) and carbon-fibre reinforced (CFC) composites



Grade description	Application	Properties
PCDA3	○ Ideal grade for roughing and finishing with only one tool ○ Recommended for alloys with low or medium aluminium content ○ For numerous applications where a balance of toughness and wear resistance is required	Average grain size: 10 µm.
PCDA5	○ Suitable for MMCs, aluminium alloys with high silicon content, high-tensile cast iron and the machining of bimetallic materials ○ Excellent abrasion resistance and good heat resistance ○ Very good wear resistance and cutting edge stability	Grain sizes from 2 – 30 µm.

CVD thickfilm diamond

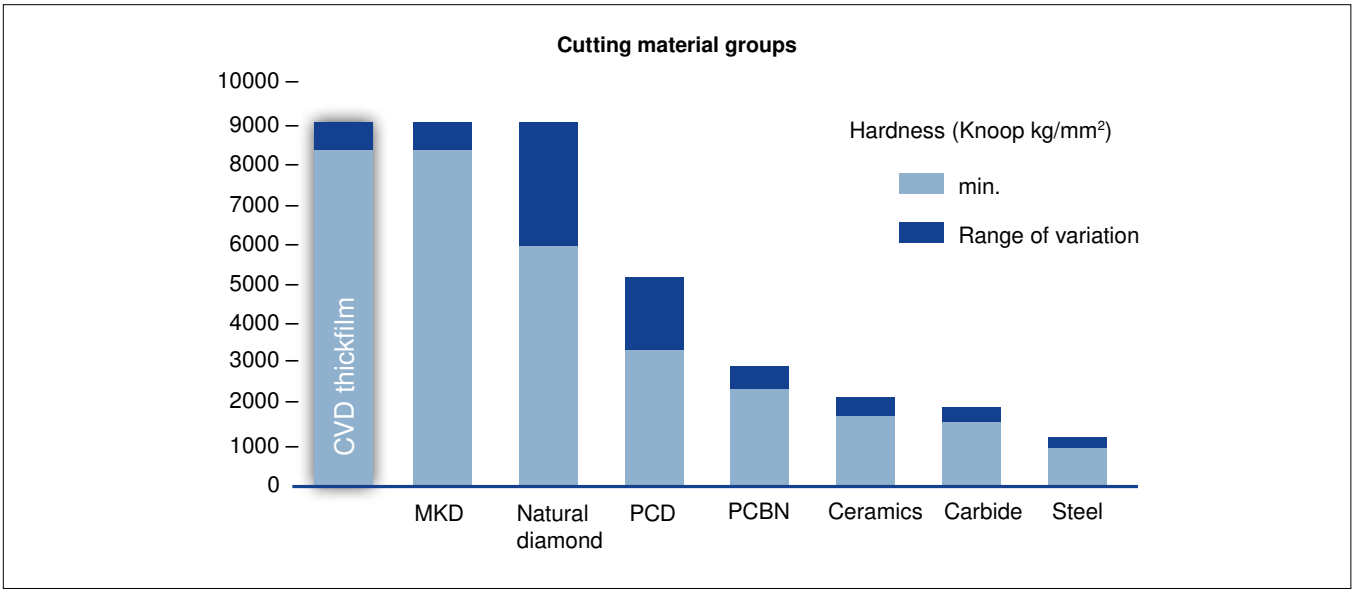
The ultra-hard cutting material CVD has the highest hardness (2.5 x harder than PCD) and the highest wear resistance of all analysed cutting materials.

CVD thickfilm diamond is mainly applied as a cutting material for the machining of aluminium and magnesium alloys and is also preferred for non-ferrous metals. Compared to natural diamond. CVD has the advantage that its characteristics range from reliable to stable, allowing it to achieve a higher repeatability of machining results.

Our CVD inserts are produced by means of chemical vapour deposition. CVD is a pure diamond without a binder phase, making it chemically inert. Due to its high thermal conductivity. CVD is the ideal material for applications with higher operation temperatures.

Typical applications of CVD inserts:

- Aluminium and magnesium alloys
- Particle boards
- Plastic



Grade description	Application	Properties
CVD1	○ Suitable for the machining of metal composites, aluminium alloys, glass-fibre reinforced plastics and particle boards	

Hard turning – a fully effective alternative to cylindrical grinding

Hard turning is a machining method used for hardened work pieces with a hardness ranging from 58 to 62 HRC. It has proved to be a fully effective alternative to more costly and time-consuming grinding operations, and offers the following advantages:

Higher accuracy

Hard turning requires less work piece manipulation, as several operations can be carried out with one set-up and on just one machine. This means greater precision in shaping the work piece, particularly in terms of form accuracy and concentricity.

Greater flexibility

With one standard tool and one set-up a large variety of products of various forms and sizes can be machined. This ensures greater flexibility in production and reduced changeover times.

Increased productivity

Compared to grinding, hard turning removes more material in one operation. This makes the hard turning process up to 4 times faster than cylindrical grinding.

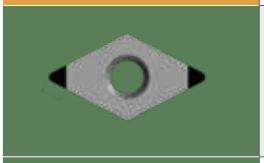
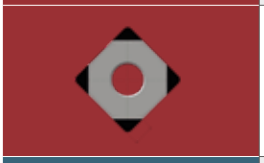
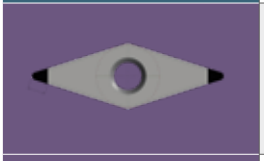
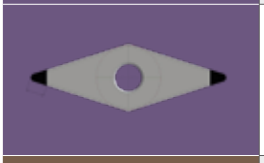
Save costs

With hard turning, you can machine hardened work pieces in one set-up. This reduces the step-by-step machining process carried out on several machines to just one hard turning machine.

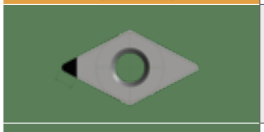
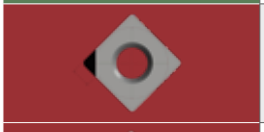
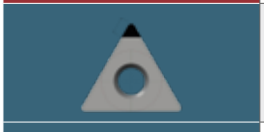
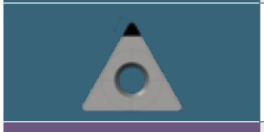
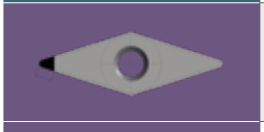
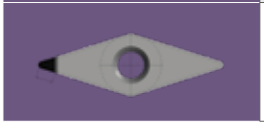
The differences at a glance

Comparison	Grinding	Hard turning
Setting time	long	short
Mounting	multiple	single
Cycle times	long	up to 80% shorter
Metal removal rate	low	high
Productivity	low due to several finishing operations	more effective cutting time as finishing is no longer necessary
Investment	high	low
Environmental compatibility	less environment-friendly due to grinding slurry	clean and dry process

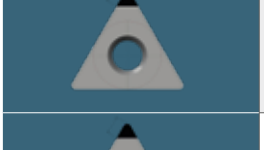
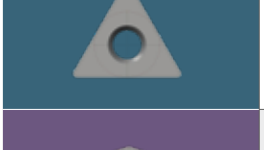
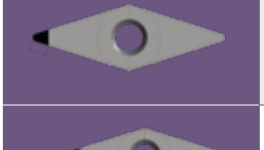
Overview PCBN

	Geometry C	CCGW	16
	Geometry C	CNGA	16
	Geometry D	DCGW	17
	Geometry D	DNGA	17
	Geometry S	SCGW	18
	Geometry S	SNGA	18
	Geometry T	TCGW	19
	Geometry T	TNGA	19
	Geometry V	VCGW	20
	Geometry V	VNGA	20
	Geometry W	WNGA	21

Overview PCD

	Geometry C	CCGW	22
	Geometry C	CPGW	22
	Geometry C	CCGT	22
	Geometry C	CPGT	22
	Geometry C	CCGW	23
	Geometry C	CCGT	23
	Geometry D	DCGW	24
	Geometry D	DCGT	24
	Geometry S	SCGW	25
	Geometry S	SCGT	25
	Geometry T	TCGW	26
	Geometry T	TCGT	26
	Geometry V	VCGW	27
	Geometry V	VCGT	27

Overview CVD

	Geometry C	CCGW	28
	Geometry C	CCGT	29
	Geometry C	CPGW	29
	Geometry C	CPGT	29
	Geometry D	DCGW	30
	Geometry D	DCGT	30
	Geometry S	SCGW	31
	Geometry S	SCGT	31
	Geometry T	TCGW	32
	Geometry T	TCGT	32
	Geometry V	VCGW	33
	Geometry V	VCGT	33

Overview Bor-turn tools

Designation system Inserts

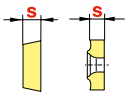
Insert shape

Form	Corner	Index
	85°	A
	82°	B
	55°	K
	80°	C
	55°	D
	75°	E
	50°	F
	86°	M
	35°	V
	120°	H
	90°	L
	135°	O
	108°	P
	90°	S
	60°	T
	–	R
	80°	W

Tolerances

Index	d ± mm	m ± mm	s ± mm
A	0.025	0.005	0.025
F	0.013	0.005	0.025
C	0.025	0.013	0.025
H	0.013	0.013	0.025
E	0.025	0.025	0.025
G**	0.025	0.025	0.13
J	0.05-0.15*	0.005	0.025
K	0.05-0.15*	0.013	0.025
L	0.05-0.15*	0.025	0.025
M	0.05-0.15*	0.05-0.20*	0.13
N	0.05-0.15*	0.05-0.20*	0.025
U	0.08-0.25*	0.13-0.38*	0.13

Insert thickness



Index	thick-ness mm
01	1.59
T1	1.98
02	2.38
T2	2.78
03	3.18
T3	3.97
04	4.76
05	5.56
06	6.35
07	7.94
09	9.52

Corner radius

Index	radius mm
00	0.05
01	0.1
02	0.2
04	0.4
08	0.8
12	1.2
16	1.6

Cutting edge

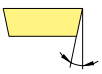
Index	Wiper		Edges
E		without	1
			2
			3
	W	with	4
			6
			8

C	N	G	A	12	04	08	EW2

PCBN-Inserts
PKD-Inserts

C	N	G	A	12	04	08	E1

Clearance angle



Index	corner
A	3°
B	5°
C	7°
D	15°
E	20°
F	25°
G	30°
N	0°
P	11°
O	other

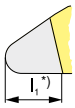
Form of top surface

Index	Form
N	
R	
F	
A	
M	
G	
W	
T	
Q	
U	
B	
H	
C	
J	
X	Special version

Cutting edge length

Type	ISO	L mm	d mm
C	06	6.40	6.35
	09	9.70	9.525
	12	12.90	12.70
	16	16.10	15.875
	19	19.30	19.05
	25	25.80	25.40
	32	32.24	31.75
S	06	6.35	6.35
	09	9.525	9.525
	12	12.70	12.70
	15	15.875	15.875
	19	19.05	19.05
	25	25.40	25.40
	31	31.75	31.75
D	07	7.70	6.35
	11	11.60	9.525
	15	15.50	12.70
V	07	7.000	3.97
	11	11.10	6.35
	16	16.60	9.525
	22	22.10	12.70

Type	ISO	L mm	d mm
T	06	6.90	3.97
	09	9.60	5.56
	11	11.00	6.35
	16	16.50	9.525
	22	22.00	12.70
	27	27.50	15.875
	33	33.00	19.05
W	06	6.50	9.525
	08	8.70	12.70
	10	10.90	15.875
R	06	6.35	6.35
	08	8.00	8.00
	09	9.525	9.525
	10	10.00	10.00
	12	12.00	12.00
	12*	12.70	12.70
	15	15.875	15.875
	16	16.00	16.00
	19	19.05	19.05
	25	25.00	25.00
	25*	25.40	25.40
	31	31.75	31.75
	32	32.00	32.00



* For example:
SL35 = Segment length 3.5 mm
SL60 = Segment length 6.0 mm

Length of segment

1317
1319
1321
1318
1320
1322

1323
1324

CVD1

Grade

For Example:
Full Face
Solid

Special information

-	SL30	-	S01525-10	-	CBN2	-	special information

-	SL30	-	FR-M3	-	PCDA5	-	special information

CBN — **Cutting edge** — **PKD / CVD**

Cutting edge

F sharp	K double chamfered	S chamfered & honed
E honed	T chamfered	P double chamfered & honed

S	-	01525	-	10

Chamfer type

Index	mm	Index	angle
010	0.1	05	5°
013	0.13	10	10°
015	0.15	15	15°
020	0.2	20	20°
025	0.25	25	25°
030	0.3	30	30°
035	0.35	35	35°

Cutting Edge rounding

Index	mm
10	0.010
15	0.015
20	0.020
25	0.025
30	0.030

Cutting edge

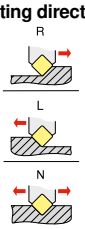
F sharp

Chip breaker

Index	value
10	without
15	smooth
20	roughing
25	special

FR	-	M3	-	

Cutting direction



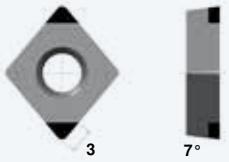
Chip angle

Index	value
	0°
M3	3°
M5	5°
M7	7°
M10	10°
M12	12°
M15	15°

PCBN turning

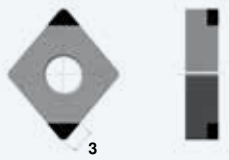
C geometry

CCGW



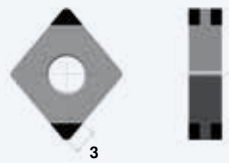
	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
CCGW 060202E2-SL30-S01325	P56482	P56483	P56484	P56482	P56483	P56484
CCGW 060204E2-SL30-S01325	P56485	P56486	P56487	P56485	P56486	P56487
CCGW 060208E2-SL30-S01325	○	○	○	○	○	○
CCGW 09T302E2-SL30-S01325	○	○	○	○	○	○
CCGW 09T302EW2-SL30-S01325	○	○	○	○	○	○
CCGW 09T304E2-SL30-S01325	P56488	P56489	P56490	P56488	P56489	P56490
CCGW 09T304EW2-SL30-S01325	○	○	○	○	○	○
CCGW 09T308E2-SL30-S01325	P56491	P56492	P56493	P56491	P56492	P56493
CCGW 09T308EW2-SL30-S01325	○	○	○	○	○	○
CCGW 120402E2-SL30-S01325	○	○	○	○	○	○
CCGW 120404E2-SL30-S01325	P56494	P56495	P56496	P56494	P56495	P56496
CCGW 120404EW2-SL30-S01325	○	○	○	○	○	○
CCGW 120408E2-SL30-S01325	○	○	○	○	○	○
CCGW 120408EW2-SL30-S01325	○	○	○	○	○	○
CCGW 120412E2-SL30-S01325	○	○	○	○	○	○
CCGW 120412EW2-SL30-S01325	○	○	○	○	○	○

CNGA



	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
CNGA 120402E2-SL30-S02020	○	○	○	○	○	○
CNGA 120402EW2-SL30-S02020	○	○	○	○	○	○
CNGA 120404E2-SL30-S01325	P56497	P56498	○			
CNGA 120404E2-SL30-S02020	○	○	P56499	○	○	○
CNGA 120404EW2-SL30-S02020	○	○	○	○	○	○
CNGA 120408E2-SL30-S01325	P56500	P56501	○			
CNGA 120408E2-SL30-S02020	○	○	P56502	○	○	○
CNGA 120408EW2-SL30-S02020	○	○	○	○	○	○
CNGA 120412E2-SL30-S01325	P56503	P56504	○			
CNGA 120412E2-SL30-S02020	○	○	P56505	○	○	○
CNGA 120412EW2-SL30-S02020	○	○	○	○	○	○

CNGA



	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
CNGA 120402E4-SL30-S02020	○	○	○	○	○	○
CNGA 120402EW4-SL30-S02020	○	○	○	○	○	○
CNGA 120404E4-SL30-S02020	○	○	○	○	○	○
CNGA 120404EW4-SL30-S02020	○	○	○	○	○	○
CNGA 120408E4-SL30-S02020	○	○	○	○	○	○
CNGA 120408EW4-SL30-S02020	○	○	○	○	○	○
CNGA 120412E4-SL30-S02020	○	○	○	○	○	○
CNGA 120412EW4-SL30-S02020	○	○	○	○	○	○

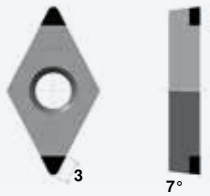
CBN-full face and CBN-tipped inserts available on request, see page 43.

Upon request ○

PCBN turning

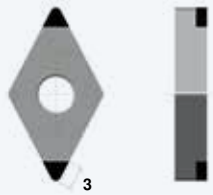
D geometry

DCGW



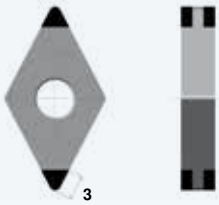
	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
DCGW 070202E2-SL30-S01325	P56506	P56507	P56508	○	○	○
DCGW 070204E2-SL30-S01325	P56509	P56510	P56511	○	○	○
DCGW 070204EW2-SL30-S01325	○	○	○	○	○	○
DCGW 070208E2-SL30-S01325	○	○	○	○	○	○
DCGW 070208EW2-SL30-S01325	○	○	○	○	○	○
DCGW 11T302E2-SL30-S01325	P56512	P56513	P56514	○	○	○
DCGW 11T304E2-SL30-S01325	P56515	P56516	P56517	○	○	○
DCGW 11T304EW2-SL30-S01325	○	○	○	○	○	○
DCGW 11T308E2-SL30-S01325	○	○	○	○	○	○
DCGW 11T308EW2-SL30-S01325	○	○	○	○	○	○

DNGA



	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
DNGA 110402E2-SL30-S02020	○	○	○	○	○	○
DNGA 110404E2-SL30-S02020	○	○	○	○	○	○
DNGA 110408E2-SL30-S02020	○	○	○	○	○	○
DNGA 150402E2-SL30-S02020	○	○	○	○	○	○
DNGA 150404E2-SL30-S02020	○	○	○	○	○	○
DNGA 150404EW2-SL30-S02020	○	○	○	○	○	○
DNGA 150408E2-SL30-S02020	○	○	○	○	○	○
DNGA 150408EW2-SL30-S02020	○	○	○	○	○	○
DNGA 150412E2-SL30-S02020	○	○	○	○	○	○
DNGA 150602E2-SL30-S02020	○	○	○	○	○	○
DNGA 150604E2-SL30-S01325	P56518	P56519	○			
DNGA 150604E2-SL30-S02020	○	○	P56520	○	○	○
DNGA 150604EW2-SL30-S02020	○	○	○	○	○	○
DNGA 150608E2-SL30-S01325	P56521	P56522	○			
DNGA 150608E2-SL30-S02020	○	○	P56523	○	○	○
DNGA 150608EW2-SL30-S02020	○	○	○	○	○	○
DNGA 150612E2-SL30-S01325	P56524	P56525	○			
DNGA 150612E2-SL30-S02020	○	○	P56526	○	○	○

DNGA



	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
DNGA 110402E4-SL30-S02020	○	○	○	○	○	○
DNGA 110404E4-SL30-S02020	○	○	○	○	○	○
DNGA 110408E4-SL30-S02020	○	○	○	○	○	○
DNGA 150402E4-SL30-S02020	○	○	○	○	○	○
DNGA 150404E4-SL30-S02020	○	○	○	○	○	○
DNGA 150404EW4-SL30-S02020	○	○	○	○	○	○
DNGA 150408E4-SL30-S02020	○	○	○	○	○	○
DNGA 150408EW4-SL30-S02020	○	○	○	○	○	○
DNGA 150412E4-SL30-S02020	○	○	○	○	○	○
DNGA 150602E4-SL30-S02020	○	○	○	○	○	○
DNGA 150604E4-SL30-S02020	○	○	○	○	○	○
DNGA 150604EW4-SL30-S02020	○	○	○	○	○	○
DNGA 150608E4-SL30-S02020	○	○	○	○	○	○
DNGA 150608EW4-SL30-S02020	○	○	○	○	○	○
DNGA 150612E4-SL30-S02020	○	○	○	○	○	○

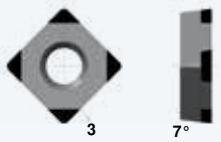
CBN-full face and CBN-tipped inserts available on request, see page 43.

Upon request ○

PCBN turning

S geometry

SCGW



	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
SCGW 09T302E4-SL30-S01325	○	○	○	○	○	○
SCGW 09T304E4-SL30-S01325	○	○	○	○	○	○
SCGW 09T308E4-SL30-S01325	○	○	○	○	○	○
SCGW 120402E4-SL30-S01325	○	○	○	○	○	○
SCGW 120404E4-SL30-S01325	○	○	○	○	○	○
SCGW 120408E4-SL30-S01325	○	○	○	○	○	○
SCGW 120412E4-SL30-S01325	○	○	○	○	○	○

SNGA

	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
SNGA 120404E4-SL30-S01325	○	○	○	○	○	○
SNGA 120404E4-SL30-S02020	○	○	○	○	○	○
SNGA 120408E4-SL30-S01325	○	○	○	○	○	○
SNGA 120408E4-SL30-S02020	○	○	○	○	○	○
SNGA 120412E4-SL30-S02020	○	○	○	○	○	○

SNGA

	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
SNGA 120404E8-SL30-S01325	○	○	○	○	○	○
SNGA 120404E8-SL30-S02020	○	○	○	○	○	○
SNGA 120408E8-SL30-S01325	○	○	○	○	○	○
SNGA 120408E8-SL30-S02020	○	○	○	○	○	○
SNGA 120412E8-SL30-S02020	○	○	○	○	○	○

Upon request ○

PCBN turning

T geometry

TCGW

	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
TCGW 090202E3-SL30-S01325	○	○	○	○	○	○
TCGW 090204E3-SL30-S01325	○	○	○	○	○	○
TCGW 090208E3-SL30-S01325	○	○	○	○	○	○
TCGW 110202E3-SL30-S01325	○	○	○	○	○	○
TCGW 110204E3-SL30-S01325	P56527	P56528	P56529	○	○	○
TCGW 110208E3-SL30-S01325	P56530	P56531	P56532	○	○	○
TCGW 16T302E3-SL30-S01325	○	○	○	○	○	○
TCGW 16T304E3-SL30-S01325	P56533	P56534	P56535	○	○	○
TCGW 16T308E3-SL30-S01325	P56536	P56537	P56538	○	○	○

TNGA

	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
TNGA 160402E3-SL30-S02020	○	○	○	○	○	○
TNGA 160404E3-SL30-S01325	P56539	P56540	○			
TNGA 160404E3-SL30-S02020	○	○	P56541	○	○	○
TNGA 160408E3-SL30-S01325	P56542	P56543	○			
TNGA 160408E3-SL30-S02020	○	○	P56544	○	○	○
TNGA 160412E3-SL30-S01325	P56545	P56546	○			
TNGA 160412E3-SL30-S02020	○	○	P56547	○	○	○

TNGA

	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
TNGA 160402E6-SL30-S02020	○	○	○	○	○	○
TNGA 160404E6-SL30-S01325	○	○	○	○	○	○
TNGA 160404E6-SL30-S02020	○	○	○	○	○	○
TNGA 160408E6-SL30-S01325	○	○	○	○	○	○
TNGA 160408E6-SL30-S02020	○	○	○	○	○	○
TNGA 160412E6-SL30-S01325	○	○	○	○	○	○
TNGA 160412E6-SL30-S02020	○	○	○	○	○	○

Upon request ○

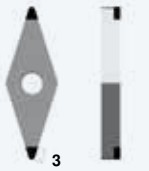
PCBN turning

V geometry

VCGW

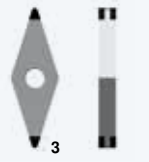
	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
VCGW 070202E2-SL30-S01325	○	○	○	○	○	○
VCGW 070204E2-SL30-S01325	○	○	○	○	○	○
VCGW 110302E2-SL30-S01325	○	○	○	○	○	○
VCGW 110304E2-SL30-S01325	P56548	P56549	○	○	○	○
VCGW 110304E2-SL30-S02020	○	○	P56550	○	○	○
VCGW 110308E2-SL30-S01325	○	○	○	○	○	○
VCGW 160402E2-SL30-S01325	○	○	○	○	○	○
VCGW 160404E2-SL30-S01325	P56551	P56552	○	○	○	○
VCGW 160404E2-SL30-S02020	○	○	P56553	○	○	○
VCGW 160408E2-SL30-S01325	P56554	P56555	○	○	○	○
VCGW 160408E2-SL30-S02020	○	○	P56556	○	○	○
VCGW 160412E2-SL30-S01325	○	○	○	○	○	○

VNGA



	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
VNGA 160402E2-SL30-S02020	○	○	○	○	○	○
VNGA 160404E2-SL30-S01325	○	○	○	○	○	○
VNGA 160404E2-SL30-S02020	○	○	○	○	○	○
VNGA 160408E2-SL30-S01325	○	○	○	○	○	○
VNGA 160408E2-SL30-S02020	○	○	○	○	○	○
VNGA 160412E2-SL30-S01325	○	○	○	○	○	○
VNGA 160412E2-SL30-S02020	○	○	○	○	○	○

VNGA



	Uncoated			Coated		
	CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
	H	H	K	H	H	K
VNGA 160402E4-SL30-S02020	○	○	○	○	○	○
VNGA 160404E4-SL30-S01325	○	○	○	○	○	○
VNGA 160404E4-SL30-S02020	○	○	○	○	○	○
VNGA 160408E4-SL30-S01325	○	○	○	○	○	○
VNGA 160408E4-SL30-S02020	○	○	○	○	○	○
VNGA 160412E4-SL30-S01325	○	○	○	○	○	○
VNGA 160412E4-SL30-S02020	○	○	○	○	○	○

Upon request ○

PCBN turning

W geometry

WNGA		Uncoated			Coated		
		CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
		H	H	K	H	H	K
 3	WNGA 080402E3-SL30-S02020	○	○	○	○	○	○
	WNGA 080404E3-SL30-S01325	○	○	○	○	○	○
	WNGA 080404E3-SL30-S02020	○	○	○	○	○	○
	WNGA 080404EW3-SL30-S02020	○	○	○	○	○	○
	WNGA 080408E3-SL30-S01325	○	○	○	○	○	○
	WNGA 080408E3-SL30-S02020	○	○	○	○	○	○
	WNGA 080408EW3-SL30-S02020	○	○	○	○	○	○
	WNGA 080412E3-SL30-S01325	○	○	○	○	○	○
	WNGA 080412E3-SL30-S02020	○	○	○	○	○	○

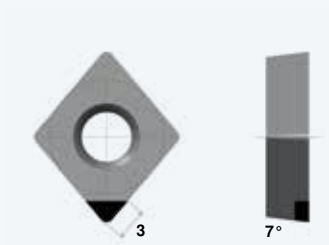
WNGA		Uncoated			Coated		
		CBN1	CBN2	CBN3	CBN4	CBN5	CBN6
		H	H	K	H	H	K
 3	WNGA 080402E6-SL30-S02020	○	○	○	○	○	○
	WNGA 080404E6-SL30-S01325	○	○	○	○	○	○
	WNGA 080404E6-SL30-S02020	○	○	○	○	○	○
	WNGA 080404EW6-SL30-S02020	○	○	○	○	○	○
	WNGA 080408E6-SL30-S01325	○	○	○	○	○	○
	WNGA 080408E6-SL30-S02020	○	○	○	○	○	○
	WNGA 080408EW6-SL30-S02020	○	○	○	○	○	○
	WNGA 080412E6-SL30-S01325	○	○	○	○	○	○
	WNGA 080412E6-SL30-S02020	○	○	○	○	○	○

Upon request ○

PCD turning

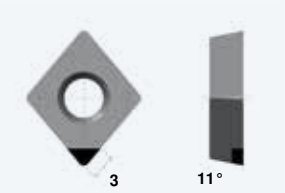
C geometry

CCGW



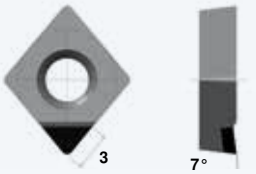
	Uncoated	
	PKDA3	PKDA5
	N	N
CCGW 060202E1-SL30-FN	P56558	P56559
CCGW 060204E1-SL30-FN	P56560	P56561
CCGW 060208E1-SL30-FN	○	○
CCGW 09T302E1-SL30-FN	○	○
CCGW 09T304E1-SL30-FN	P56562	P56563
CCGW 09T308E1-SL30-FN	P56564	P56565
CCGW 09T312E1-SL30-FN	○	○
CCGW 120402E1-SL30-FN	○	○
CCGW 120404E1-SL30-FN	○	○
CCGW 120408E1-SL30-FN	P56566	P56567
CCGW 120412E1-SL30-FN	○	○

CPGW



	Uncoated	
	PKDA3	PKDA5
	N	N
CPGW 060202E1-SL30-FN	○	○
CPGW 060204E1-SL30-FN	○	○
CPGW 060208E1-SL30-FN	○	○
CPGW 09T302E1-SL30-FN	○	○
CPGW 09T304E1-SL30-FN	○	○
CPGW 09T308E1-SL30-FN	○	○
CPGW 120404E1-SL30-FN	○	○
CPGW 120408E1-SL30-FN	○	○
CPGW 120412E1-SL30-FN	○	○

CCGT



	Uncoated	
	PKDA3	PKDA5
	N	N
CCGT 060202E1-SL30-FN-M7	P56568	P56569
CCGT 060204E1-SL30-FN-M7	P56570	P56571
CCGT 060208E1-SL30-FN-M7	○	○
CCGT 09T302E1-SL30-FN-M7	○	○
CCGT 09T304E1-SL30-FN-M7	P56572	P56573
CCGT 09T308E1-SL30-FN-M7	P56574	P56575
CCGT 09T312E1-SL30-FN-M7	○	○
CCGT 120402E1-SL30-FN-M7	○	○
CCGT 120404E1-SL30-FN-M7	○	○
CCGT 120408E1-SL30-FN-M7	P56576	P56577

CPGT

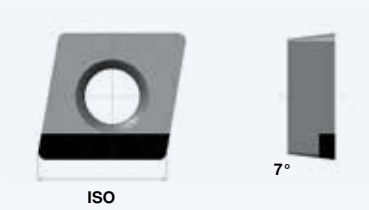
	Uncoated	
	PKDA3	PKDA5
	N	N
CPGT 060202E1-SL30-FN-M7	○	○
CPGT 060204E1-SL30-FN-M7	○	○
CPGT 060208E1-SL30-FN-M7	○	○

Upon request ○

PCD turning

C geometry

CCGW

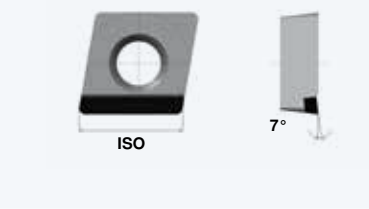


	Uncoated	
	PKDA3	PKDA5
	N	N
CCGW 060202E1-SL60-FR	○	○
CCGW 060204E1-SL60-FR	○	○
CCGW 060208E1-SL60-FR	○	○
CCGW 09T304E1-SL90-FR	○	○
CCGW 09T308E1-SL90-FR	○	○
CCGW 09T312E1-SL90-FR	○	○
CCGW 120402E1-SL120-FR	○	○
CCGW 120404E1-SL120-FR	○	○
CCGW 120408E1-SL120-FR	○	○

CCGW

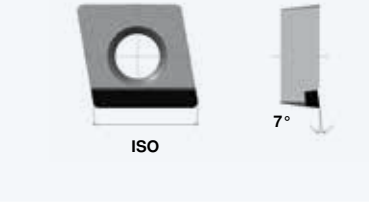
	Uncoated	
	PKDA3	PKDA5
	N	N
CCGW 060202E1-SL60-FL	○	○
CCGW 060204E1-SL60-FL	○	○
CCGW 060208E1-SL60-FL	○	○
CCGW 09T304E1-SL90-FL	○	○
CCGW 09T308E1-SL90-FL	○	○
CCGW 09T312E1-SL90-FL	○	○
CCGW 120402E1-SL120-FL	○	○
CCGW 120404E1-SL120-FL	○	○
CCGW 120408E1-SL120-FL	○	○

CCGT



	Uncoated	
	PKDA3	PKDA5
	N	N
CCGT 060202E1-SL60-FR-M7	○	○
CCGT 060204E1-SL60-FR-M7	○	○
CCGT 060208E1-SL60-FR-M7	○	○
CCGT 09T304E1-SL90-FR-M7	○	○
CCGT 09T308E1-SL90-FR-M7	○	○
CCGT 09T312E1-SL90-FR-M7	○	○
CCGT 120402E1-SL120-FR-M7	○	○
CCGT 120404E1-SL120-FR-M7	○	○
CCGT 120408E1-SL120-FR-M7	○	○

CCGT



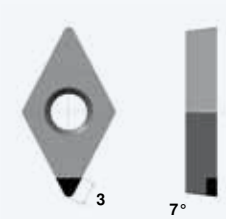
	Uncoated	
	PKDA3	PKDA5
	N	N
CCGT 060202E1-SL60-FL-M7	○	○
CCGT 060204E1-SL60-FL-M7	○	○
CCGT 060208E1-SL60-FL-M7	○	○
CCGT 09T304E1-SL90-FL-M7	○	○
CCGT 09T308E1-SL90-FL-M7	○	○
CCGT 09T312E1-SL90-FL-M7	○	○
CCGT 120402E1-SL120-FL-M7	○	○
CCGT 120404E1-SL120-FL-M7	○	○
CCGT 120408E1-SL120-FL-M7	○	○

Upon request ○

PCD turning

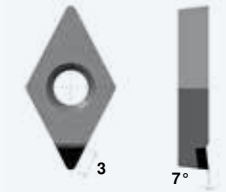
D geometry

DCGW



	Uncoated	
	PKDA3	PKDA5
	N	N
DCGW 070201E1-SL30-FN	○	○
DCGW 070202E1-SL30-FN	P56578	P56579
DCGW 070204E1-SL30-FN	P56580	P56581
DCGW 070208E1-SL30-FN	○	○
DCGW 11T301E1-SL30-FN	○	○
DCGW 11T302E1-SL30-FN	P56582	P56583
DCGW 11T304E1-SL30-FN	P56584	P56585
DCGW 11T308E1-SL30-FN	P56586	P56587
DCGW 11T312E1-SL30-FN	○	○

DCGT



	Uncoated	
	PKDA3	PKDA5
	N	N
DCGT 070201E1-SL30-FN-M7	○	○
DCGT 070202E1-SL30-FN-M7	P56588	P56589
DCGT 070204E1-SL30-FN-M7	P56590	P56591
DCGT 070208E1-SL30-FN-M7	○	○
DCGT 11T301E1-SL30-FN-M7	○	○
DCGT 11T302E1-SL30-FN-M7	P56592	P56593
DCGT 11T304E1-SL30-FN-M7	P56594	P56595
DCGT 11T308E1-SL30-FN-M7	P56596	P56597
DCGT 11T312E1-SL30-FN-M7	○	○

Upon request ○

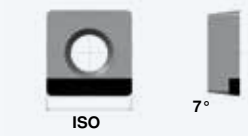
PCD turning

S geometry

SCGW

	Uncoated	
	PKDA3	PKDA5
	N	N
SCGW 09T302E1-SL30-FN	○	○
SCGW 09T304E1-SL30-FN	○	○
SCGW 09T308E1-SL30-FN	○	○
SCGW 09T312E1-SL30-FN	○	○
SCGW 120404E1-SL30-FN	○	○
SCGW 120408E1-SL30-FN	○	○
SCGW 120412E1-SL30-FN	○	○

SCGW



	Uncoated	
	PKDA3	PKDA5
	N	N
SCGW 09T304E1-SL90-FN	○	○
SCGW 09T308E1-SL90-FN	○	○
SCGW 09T312E1-SL90-FN	○	○
SCGW 120404E1-SL120-FN	○	○
SCGW 120408E1-SL120-FN	○	○
SCGW 120412E1-SL120-FN	○	○

SCGT

	Uncoated	
	PKDA3	PKDA5
	N	N
SCGT 09T302E1-SL30-FN-M7	○	○
SCGT 09T304E1-SL30-FN-M7	P56599	P56599
SCGT 09T308E1-SL30-FN-M7	P56601	P56601
SCGT 09T312E1-SL30-FN-M7	○	○
SCGT 120404E1-SL30-FN-M7	○	○
SCGT 120408E1-SL30-FN-M7	○	○
SCGT 120412E1-SL30-FN-M7	○	○

SCGT

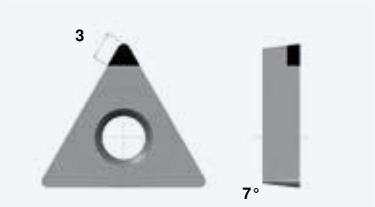
	Uncoated	
	PKDA3	PKDA5
	N	N
SCGT 09T304E1-SL90-FN-M7	○	○
SCGT 09T308E1-SL90-FN-M7	○	○
SCGT 09T312E1-SL90-FN-M7	○	○
SCGT 120404E1-SL120-FN-M7	○	○
SCGT 120408E1-SL120-FN-M7	○	○
SCGT 120412E1-SL120-FN-M7	○	○

Upon request ○

PCD turning

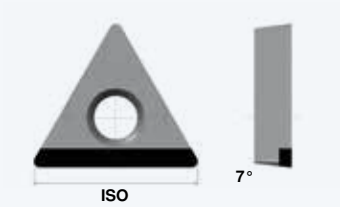
T geometry

TCGW



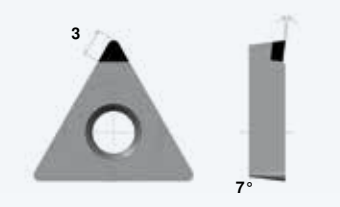
	Uncoated	
	PKDA3	PKDA5
	N	N
TCGW 090202E1-SL30-FN	○	○
TCGW 090204E1-SL30-FN	○	○
TCGW 090208E1-SL30-FN	○	○
TCGW 110202E1-SL30-FN	○	○
TCGW 110204E1-SL30-FN	P56602	P56603
TCGW 110208E1-SL30-FN	○	○
TCGW 16T302E1-SL30-FN	○	○
TCGW 16T304E1-SL30-FN	P56604	P56605
TCGW 16T308E1-SL30-FN	P56606	P56607
TCGW 16T312E1-SL30-FN	○	○

TCGW



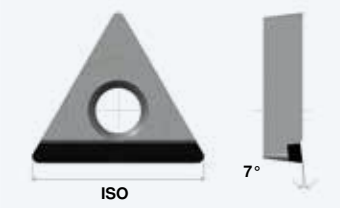
	Uncoated	
	PKDA3	PKDA5
	N	N
TCGW 090202E1-SL90-FN	○	○
TCGW 090204E1-SL90-FN	○	○
TCGW 090208E1-SL90-FN	○	○
TCGW 110202E1-SL110-FN	○	○
TCGW 110204E1-SL110-FN	○	○
TCGW 110208E1-SL110-FN	○	○
TCGW 16T302E1-SL160-FN	○	○
TCGW 16T304E1-SL160-FN	○	○
TCGW 16T308E1-SL160-FN	○	○
TCGW 16T312E1-SL160-FN	○	○

TCGT



	Uncoated	
	PKDA3	PKDA5
	N	N
TCGT 090202E1-SL30-FN-M7	○	○
TCGT 090204E1-SL30-FN-M7	○	○
TCGT 090208E1-SL30-FN-M7	○	○
TCGT 110202E1-SL30-FN-M7	P56608	P56609
TCGT 110204E1-SL30-FN-M7	P56610	P56611
TCGT 110208E1-SL30-FN-M7	○	○
TCGT 16T302E1-SL30-FN-M7	○	○
TCGT 16T304E1-SL30-FN-M7	P56612	P56613
TCGT 16T308E1-SL30-FN-M7	P56614	P56615
TCGT 16T312E1-SL30-FN-M7	○	○

TCGT



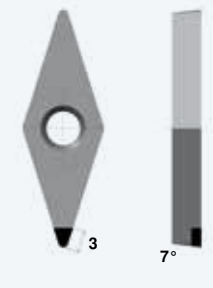
	Uncoated	
	PKDA3	PKDA5
	N	N
TCGT 090202E1-SL90-FN-M7	○	○
TCGT 090204E1-SL90-FN-M7	○	○
TCGT 090208E1-SL90-FN-M7	○	○
TCGT 110202E1-SL110-FN-M7	○	○
TCGT 110204E1-SL110-FN-M7	○	○
TCGT 110208E1-SL110-FN-M7	○	○
TCGT 16T302E1-SL160-FN-M7	○	○
TCGT 16T304E1-SL160-FN-M7	○	○
TCGT 16T308E1-SL160-FN-M7	○	○
TCGT 16T312E1-SL160-FN-M7	○	○

Upon request ○

PCD turning

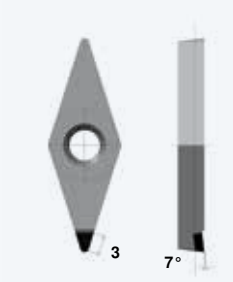
V geometry

VCGW



	Uncoated	
	PKDA3	PKDA5
	N	N
VCGW 070201E1-SL30-FN	○	○
VCGW 070202E1-SL30-FN	○	○
VCGW 070204E1-SL30-FN	○	○
VCGW 070208E1-SL30-FN	○	○
VCGW 110301E1-SL30-FN	○	○
VCGW 110302E1-SL30-FN	P56616	P56617
VCGW 110304E1-SL30-FN	P56618	P56619
VCGW 110308E1-SL30-FN	○	○
VCGW 160401E1-SL30-FN	○	○
VCGW 160402E1-SL30-FN	○	○
VCGW 160404E1-SL30-FN	P56620	P56621
VCGW 160408E1-SL30-FN	○	○
VCGW 160412E1-SL30-FN	○	○

VCGT

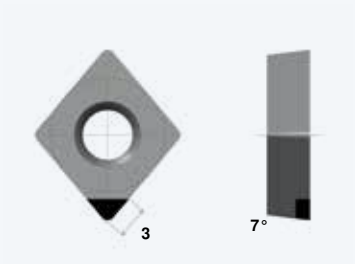


	Uncoated	
	PKDA3	PKDA5
	N	N
VCGT 070201E1-SL30-FN-M7	○	○
VCGT 070202E1-SL30-FN-M7	○	○
VCGT 070204E1-SL30-FN-M7	○	○
VCGT 070208E1-SL30-FN-M7	○	○
VCGT 110301E1-SL30-FN-M7	○	○
VCGT 110302E1-SL30-FN-M7	P56622	P56623
VCGT 110304E1-SL30-FN-M7	P56624	P56625
VCGT 110308E1-SL30-FN-M7	○	○
VCGT 160401E1-SL30-FN-M7	○	○
VCGT 160402E1-SL30-FN-M7	P56626	P56627
VCGT 160404E1-SL30-FN-M7	P56628	P56629
VCGT 160408E1-SL30-FN-M7	P56630	P56631
VCGT 160412E1-SL30-FN-M7	○	○

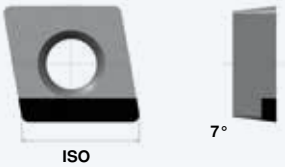
Upon request ○

CVD turning

C geometry

CCGW		Uncoated CVD05
		N
	CCGW 060202E1-SL30-FN	○
	CCGW 060204E1-SL30-FN	○
	CCGW 060208E1-SL30-FN	○
	CCGW 09T302E1-SL30-FN	○
	CCGW 09T304E1-SL30-FN	○
	CCGW 09T308E1-SL30-FN	○
	CCGW 09T312E1-SL30-FN	○
	CCGW 120402E1-SL30-FN	○
	CCGW 120404E1-SL30-FN	○
	CCGW 120408E1-SL30-FN	○
	CCGW 120412E1-SL30-FN	○

CCGW		Uncoated CVD05
		N
	CCGW 060202E1-SL60-FR	○
	CCGW 060204E1-SL60-FR	○
	CCGW 060208E1-SL60-FR	○
	CCGW 09T304E1-SL90-FR	○
	CCGW 09T308E1-SL90-FR	○
	CCGW 09T312E1-SL90-FR	○
	CCGW 120402E1-SL120-FR	○
	CCGW 120404E1-SL120-FR	○
	CCGW 120408E1-SL120-FR	○

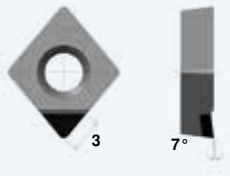
CCGW		Uncoated CVD05
		N
	CCGW 060202E1-SL60-FL	○
	CCGW 060204E1-SL60-FL	○
	CCGW 060208E1-SL60-FL	○
	CCGW 09T304E1-SL90-FL	○
	CCGW 09T308E1-SL90-FL	○
	CCGW 09T312E1-SL90-FL	○
	CCGW 120402E1-SL120-FL	○
	CCGW 120404E1-SL120-FL	○
	CCGW 120408E1-SL120-FL	○

Upon request ○

CVD turning

C geometry

CCGT



	Uncoated CVD05
	N
CCGT 060202E1-SL30-FN-M7	○
CCGT 060204E1-SL30-FN-M7	○
CCGT 060208E1-SL30-FN-M7	○
CCGT 09T302E1-SL30-FN-M7	○
CCGT 09T304E1-SL30-FN-M7	○
CCGT 09T308E1-SL30-FN-M7	○
CCGT 09T312E1-SL30-FN-M7	○
CCGT 120402E1-SL30-FN-M7	○
CCGT 120404E1-SL30-FN-M7	○
CCGT 120408E1-SL30-FN-M7	○

CCGT

	Uncoated CVD05
	N
CCGT 060202E1-SL60-FR-M7	○
CCGT 060204E1-SL60-FR-M7	○
CCGT 060208E1-SL60-FR-M7	○
CCGT 09T304E1-SL90-FR-M7	○
CCGT 09T308E1-SL90-FR-M7	○
CCGT 09T312E1-SL90-FR-M7	○
CCGT 120402E1-SL120-FR-M7	○
CCGT 120404E1-SL120-FR-M7	○
CCGT 120408E1-SL120-FR-M7	○

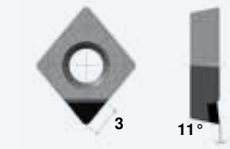
CCGT

	Uncoated CVD05
	N
CCGT 060202E1-SL60-FL-M7	○
CCGT 060204E1-SL60-FL-M7	○
CCGT 060208E1-SL60-FL-M7	○
CCGT 09T304E1-SL90-FL-M7	○
CCGT 09T308E1-SL90-FL-M7	○
CCGT 09T312E1-SL90-FL-M7	○
CCGT 120402E1-SL120-FL-M7	○
CCGT 120404E1-SL120-FL-M7	○
CCGT 120408E1-SL120-FL-M7	○

CPGW

	Uncoated CVD05
	N
CPGW 060202E1-SL30-FN	○
CPGW 060204E1-SL30-FN	○
CPGW 060208E1-SL30-FN	○
CPGW 09T302E1-SL30-FN	○
CPGW 09T304E1-SL30-FN	○
CPGW 09T308E1-SL30-FN	○
CPGW 120404E1-SL30-FN	○
CPGW 120408E1-SL30-FN	○
CPGW 120412E1-SL30-FN	○

CPGT



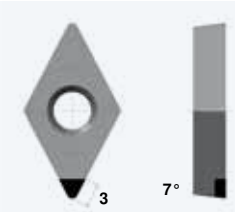
	Uncoated CVD05
	N
CPGT 060202E1-SL30-FN-M7	○
CPGT 060204E1-SL30-FN-M7	○
CPGT 060208E1-SL30-FN-M7	○

Upon request ○

CVD turning

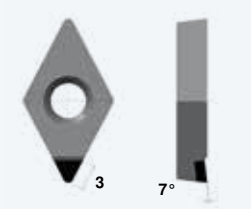
D geometry

DCGW



	Uncoated CVD05
	N
DCGW 070201E1-SL30-FN	○
DCGW 070202E1-SL30-FN	○
DCGW 070204E1-SL30-FN	○
DCGW 070208E1-SL30-FN	○
DCGW 11T301E1-SL30-FN	○
DCGW 11T302E1-SL30-FN	○
DCGW 11T304E1-SL30-FN	○
DCGW 11T308E1-SL30-FN	○
DCGW 11T312E1-SL30-FN	○

DCGT



	Uncoated CVD05
	N
DCGT 070201E1-SL30-FN-M7	○
DCGT 070202E1-SL30-FN-M7	○
DCGT 070204E1-SL30-FN-M7	○
DCGT 070208E1-SL30-FN-M7	○
DCGT 11T301E1-SL30-FN-M7	○
DCGT 11T302E1-SL30-FN-M7	○
DCGT 11T304E1-SL30-FN-M7	○
DCGT 11T308E1-SL30-FN-M7	○
DCGT 11T312E1-SL30-FN-M7	○

Upon request ○

CVD turning

S geometry

SCGW	Uncoated CVD05
	N
SCGW 09T302E1-SL30-FN	○
SCGW 09T304E1-SL30-FN	○
SCGW 09T308E1-SL30-FN	○
SCGW 09T312E1-SL30-FN	○
SCGW 120404E1-SL30-FN	○
SCGW 120408E1-SL30-FN	○
SCGW 120412E1-SL30-FN	○

SCGW	Uncoated CVD05
	N
SCGW 09T304E1-SL90-FN	○
SCGW 09T308E1-SL90-FN	○
SCGW 09T312E1-SL90-FN	○
SCGW 120404E1-SL120-FN	○
SCGW 120408E1-SL120-FN	○
SCGW 120412E1-SL120-FN	○

SCGT	Uncoated CVD05
	N
SCGT 09T302E1-SL30-FN-M7	○
SCGT 09T304E1-SL30-FN-M7	○
SCGT 09T308E1-SL30-FN-M7	○
SCGT 09T312E1-SL30-FN-M7	○
SCGT 120404E1-SL30-FN-M7	○
SCGT 120408E1-SL30-FN-M7	○
SCGT 120412E1-SL30-FN-M7	○

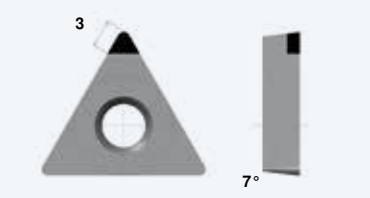
SCGT	Uncoated CVD05
	N
SCGT 09T304E1-SL90-FN-M7	○
SCGT 09T308E1-SL90-FN-M7	○
SCGT 09T312E1-SL90-FN-M7	○
SCGT 120404E1-SL120-FN-M7	○
SCGT 120408E1-SL120-FN-M7	○
SCGT 120412E1-SL120-FN-M7	○

CVD turning

T geometry

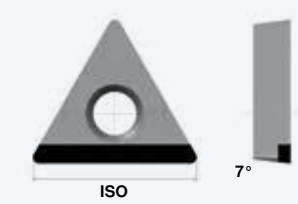
TCGW

	Uncoated CVD05
	N
TCGW 090202E1-SL30-FN	○
TCGW 090204E1-SL30-FN	○
TCGW 090208E1-SL30-FN	○
TCGW 110202E1-SL30-FN	○
TCGW 110204E1-SL30-FN	○
TCGW 110208E1-SL30-FN	○
TCGW 16T302E1-SL30-FN	○
TCGW 16T304E1-SL30-FN	○
TCGW 16T308E1-SL30-FN	○
TCGW 16T312E1-SL30-FN	○



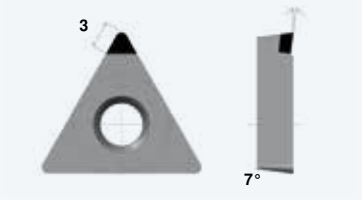
TCGW

	Uncoated CVD05
	N
TCGW 090202E1-SL90-FN	○
TCGW 090204E1-SL90-FN	○
TCGW 090208E1-SL90-FN	○
TCGW 110202E1-SL110-FN	○
TCGW 110204E1-SL110-FN	○
TCGW 110208E1-SL110-FN	○
TCGW 16T302E1-SL160-FN	○
TCGW 16T304E1-SL160-FN	○
TCGW 16T308E1-SL160-FN	○
TCGW 16T312E1-SL160-FN	○



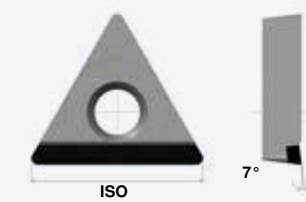
TCGT

	Uncoated CVD05
	N
TCGT 090202E1-SL30-FN-M7	○
TCGT 090204E1-SL30-FN-M7	○
TCGT 090208E1-SL30-FN-M7	○
TCGT 110202E1-SL30-FN-M7	○
TCGT 110204E1-SL30-FN-M7	○
TCGT 110208E1-SL30-FN-M7	○
TCGT 16T302E1-SL30-FN-M7	○
TCGT 16T304E1-SL30-FN-M7	○
TCGT 16T308E1-SL30-FN-M7	○
TCGT 16T312E1-SL30-FN-M7	○



TCGT

	Uncoated CVD05
	N
TCGT 090202E1-SL90-FN-M7	○
TCGT 090204E1-SL90-FN-M7	○
TCGT 090208E1-SL90-FN-M7	○
TCGT 110202E1-SL110-FN-M7	○
TCGT 110204E1-SL110-FN-M7	○
TCGT 110208E1-SL110-FN-M7	○
TCGT 16T302E1-SL160-FN-M7	○
TCGT 16T304E1-SL160-FN-M7	○
TCGT 16T308E1-SL160-FN-M7	○
TCGT 16T312E1-SL160-FN-M7	○

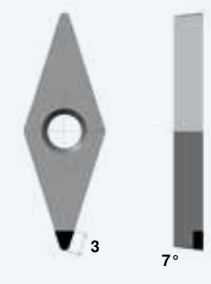


Upon request ○

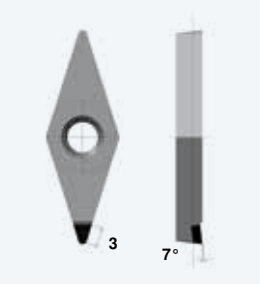
CVD turning

V geometry

VCGW	Uncoated CVD05
	N
VCGW 070201E1-SL30-FN	O
VCGW 070202E1-SL30-FN	O
VCGW 070204E1-SL30-FN	O
VCGW 070208E1-SL30-FN	O
VCGW 110301E1-SL30-FN	O
VCGW 110302E1-SL30-FN	O
VCGW 110304E1-SL30-FN	O
VCGW 110308E1-SL30-FN	O
VCGW 160401E1-SL30-FN	O
VCGW 160402E1-SL30-FN	O
VCGW 160404E1-SL30-FN	O
VCGW 160408E1-SL30-FN	O
VCGW 160412E1-SL30-FN	O



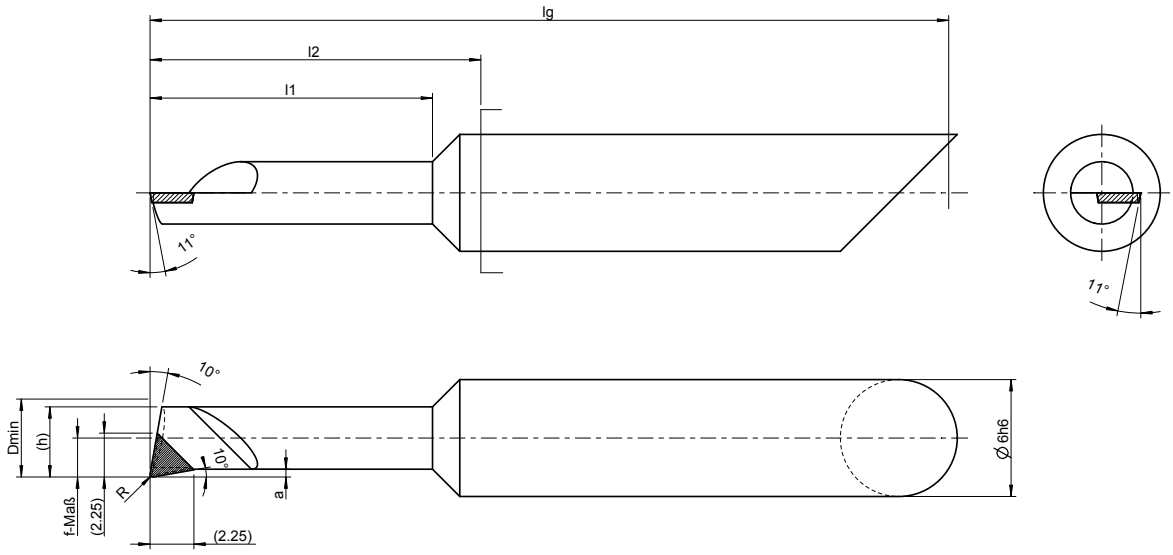
VCGT	Uncoated CVD05
	N
VCGT 070201E1-SL30-FN-M7	O
VCGT 070202E1-SL30-FN-M7	O
VCGT 070204E1-SL30-FN-M7	O
VCGT 070208E1-SL30-FN-M7	O
VCGT 110301E1-SL30-FN-M7	O
VCGT 110302E1-SL30-FN-M7	O
VCGT 110304E1-SL30-FN-M7	O
VCGT 110308E1-SL30-FN-M7	O
VCGT 160401E1-SL30-FN-M7	O
VCGT 160402E1-SL30-FN-M7	O
VCGT 160404E1-SL30-FN-M7	O
VCGT 160408E1-SL30-FN-M7	O
VCGT 160412E1-SL30-FN-M7	O



Upon request ○

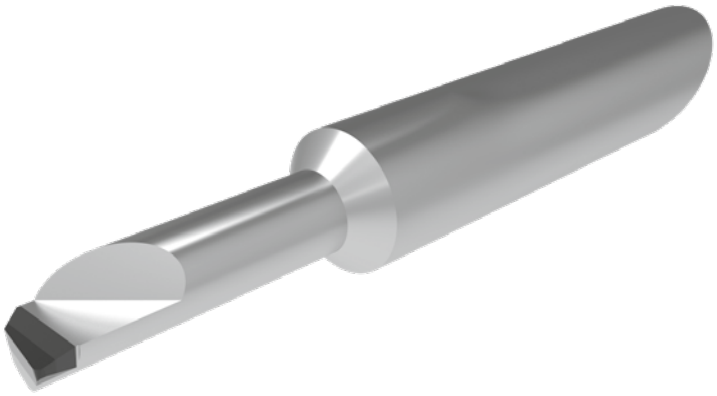
Bor-turn tools

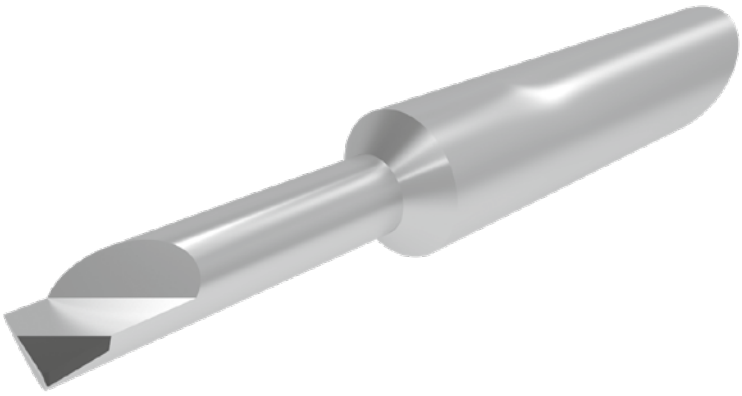
Designation system



CVD

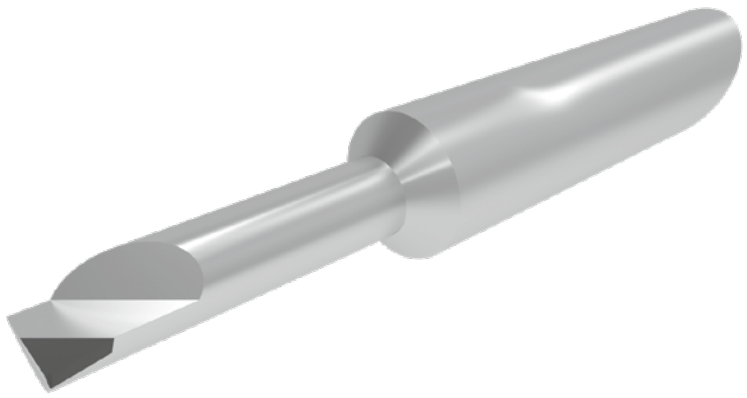
BTT = Bor-turn-tool	ø Shank diameter e.g. 06 = 6 mm	ø Dmin. e.g. 040 = 4 mm	Working length L1 e.g. 065 = 6.5 mm	Working length L2 e.g. 090 = 9 mm	Corner radius e.g. 02 = r 0.2 mm	R = Right L = Left	CVD grade
BTT	6	040	065	090	02	R	CVD1





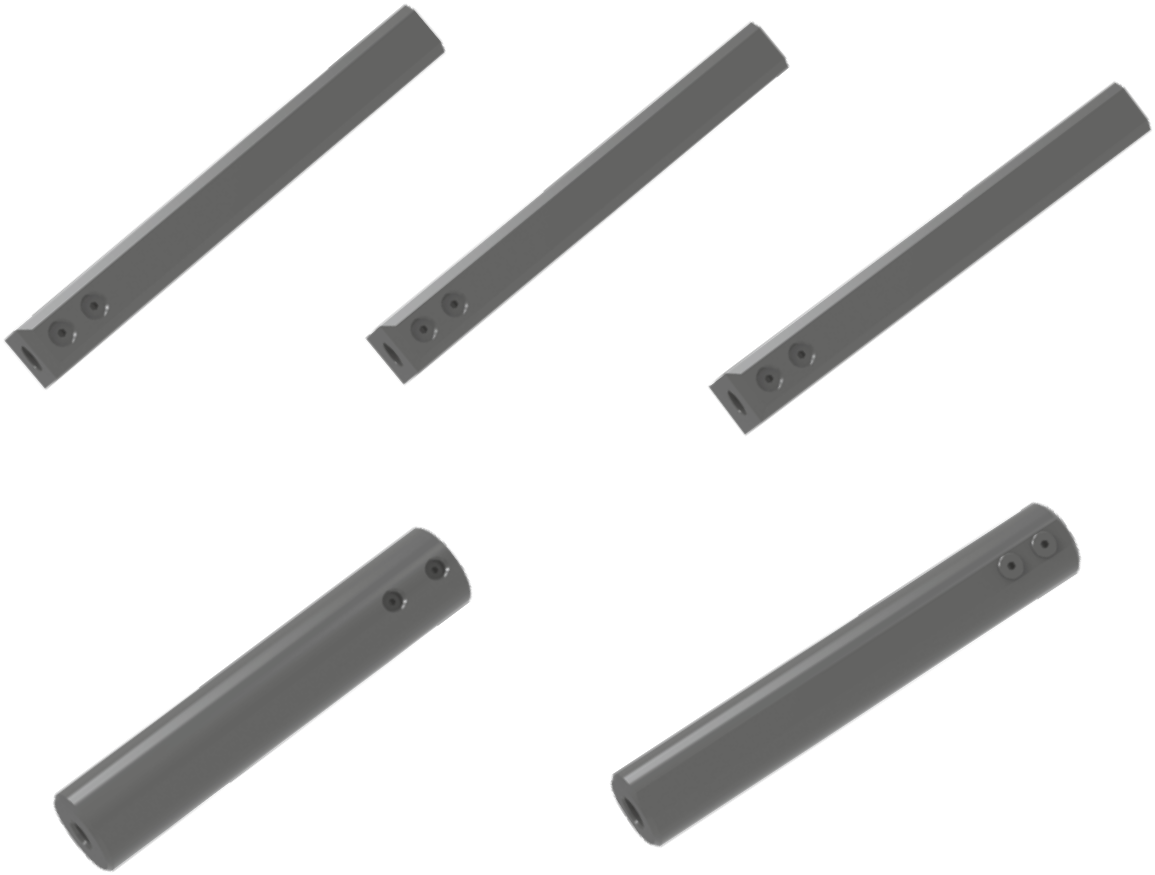
Bor-turn tools CVD

Order number	Designation	Dmin	L1	L2	a	Dimen-sion f	h	R	Lg
S55210	BTT6-010-030	1.00	3.00	7.00	0.10	0.50	0.90	0.10	31.00
S55211	BTT6-015-045	1.50	4.50	8.00	0.15	0.75	1.35	0.10	32.00
S55214	BTT6-020-080	2.00	8.00	11.00	0.20	1.00	1.80	0.10	35.00
S55217	BTT6-025-100	2.50	10.00	13.00	0.25	1.25	2.25	0.10	37.00
S55220	BTT6-030-115	3.00	11.50	14.00	0.30	1.50	2.70	0.15	38.00
S55223	BTT6-035-130	3.50	13.00	16.00	0.35	1.75	3.15	0.15	40.00
S55226	BTT6-040-145	4.00	14.50	17.00	0.40	2.00	3.60	0.15	41.00
S55229	BTT6-045-160	4.50	16.00	18.00	0.40	2.25	4.10	0.20	42.00
S55232	BTT6-050-180	5.00	18.00	20.00	0.45	2.50	4.55	0.20	44.00
S55235	BTT6-055-200	5.50	20.00	22.00	0.45	2.75	5.05	0.20	46.00
S55238	BTT6-060-225	6.00	22.50	24.00	0.50	3.00	5.50	0.20	48.00
S55239	BTT6-070-250	7.00	25.00	25.00	0.50	3.00	6.50	0.20	50.00



Tool holders

Designation	Tip height	Length	Width	Height
BTT6-1612	8.00	100.00	12.00	16.00
BTT6-2012	10.00	100.00	12.00	20.00
BTT6-2212	12.00	100.00	12.00	22.00
BTT6-16rund	8.00	100.00	–	–
BTT6-20rund	10.00	100.00	–	–



Regrinding service for cutting inserts

Tool service: economical restoration of cutting inserts

Our experience shows that up to 70% of worn inserts can be reground. We would be happy to support you by showing you the possibilities of increasing the economic efficiency of your inserts.

Here‘s how it works:

1. Simply place the used inserts back into the same package at the machine or tool crib where you would take out the new insert. This makes it clear whether or not all inserts and cutting edges have been used.
2. When you have collected a sufficient amount of inserts, send them to us. The inserts will then be processed as a specific customer order.
3. Upon arrival, your inserts will be inspected by us in our regrinding centre to ascertain how much regrinding they would need. If regrinding is not possible, the inserts will be returned to you without being reground.
4. Reground inserts are marked by us for easy recognition.
5. Reground inserts are packaged in boxes, marked accordingly and then returned to you with their own label.

Your benefits

Your inserts will be reground only on the rake angle, clearance angle and chamfer so that you can reuse the existing tool holders. Also, the inner circle diameter will remain the same so that high production consistency and reliability are ensured.

When is regrinding worthwhile?

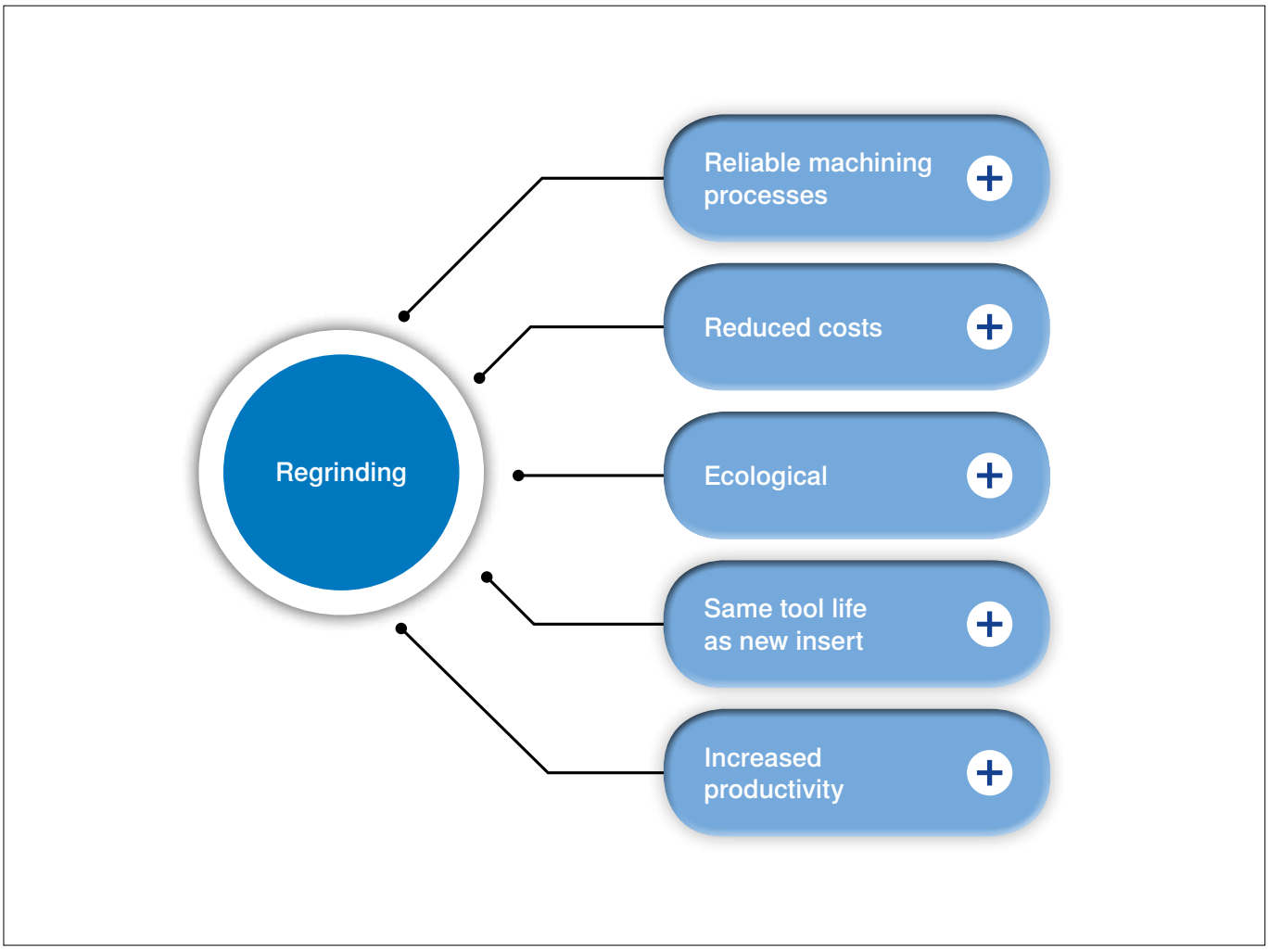
Problem-free regrinding of an insert is possible when the clearance face of the insert is worn to a defined degree. Normally this is between 0.4 and 0.6 mm wear of the clearance face. However, if the upper limit is exceeded, there is the risk of cutting edge breakage which may become costly for both the tool and the machine.

The following conditions indicate a degree of clearance face wear where regrinding the inserts would be worthwhile:

- Achieve a defined number of machined work pieces
- End of the defined tool life
- Dimensional tolerance of the work piece is exceeded
- Potentially unclean work piece surfaces

For the environment

Thanks to regrinding, you will save a high share of energy costs which would otherwise have been necessary for the production of a new cutting insert blank. Join us along the way towards more ecological and environmentally-oriented production methods.

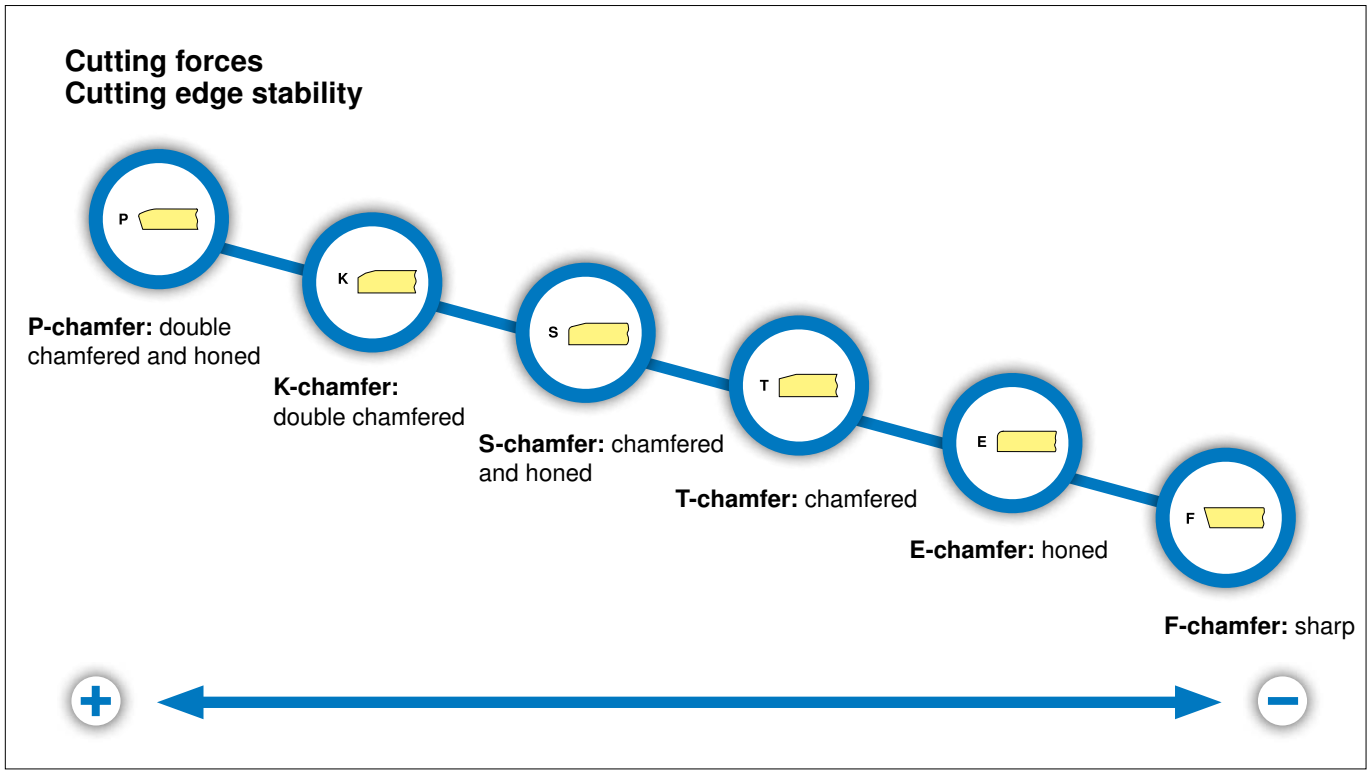


Technical appendix – cutting edge type and chamfer angle

The combination of corner radius and cutting edge type has a decisive impact on tool life, surface quality and dimensional accuracy of the component which has to be machined. It is important to choose the most suitable chamfer size and cutting edge type for the given application.

Types of cutting edges

For our CBN insert range, the following cutting edge types are available:



The three most common types are:

E chamfer:

- Recommended for the finishing of heat-resistant super alloys
- Feed rate has to be greater than edge hone so that cutting is possible and friction is avoided

T chamfer:

- The T chamfer is a common geometry recommended for low average chip thickness
- Preferred choice for cast iron
- Good alternative to S chamfers for hard turning when reduced cutting forces and close tolerances are required

S chamfer:

- First choice for hard turning
- More stable cutting edge than the T chamfer with higher resistance to edge chipping and breakage, meaning a more controllable tool life
- Ensures constant surface quality
- Feed rate has to be greater than the edge hone

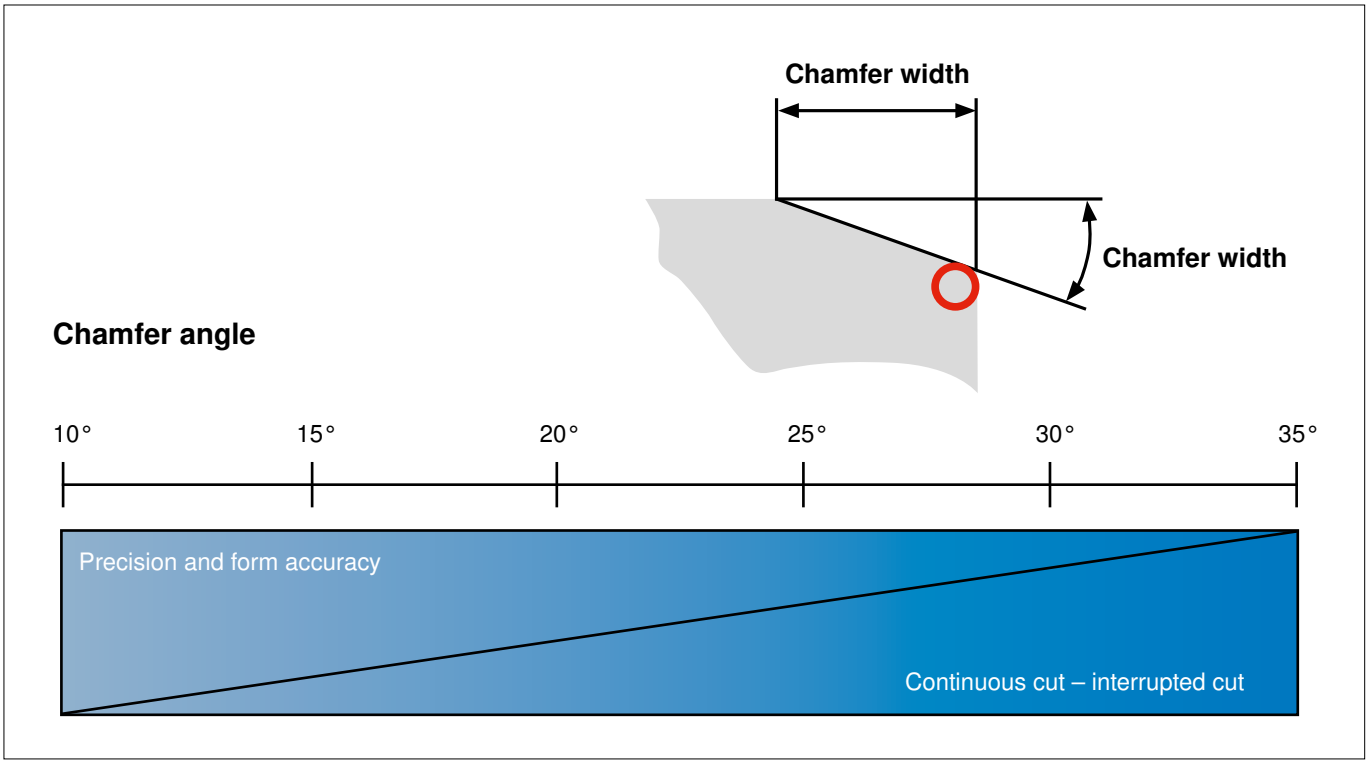
Chamfer angle and width

Generally speaking, the cutting edge stability of a CBN insert increases together with the chamfer angle and width, but the cutting forces and the temperature rise as well. A broad chamfer distributes the cutting forces over a larger area.

This increases the stability of the cutting edge so that higher feed rates become possible. When process stability and consistent tool life are a priority, it is recommended to choose a large chamfer.

When surface quality and dimensional accuracy are the most important factor, a small chamfer provides the best machining results. The cutting forces, temperature and vibration are reduced.

As hard turning is normally a finishing operation, it is necessary to find the optimal cutting edge type. This ensures high-quality components and stable production processes while prolonging tool life.



Technical appendix – CBN inserts

CBN insert types

Solid CBN inserts

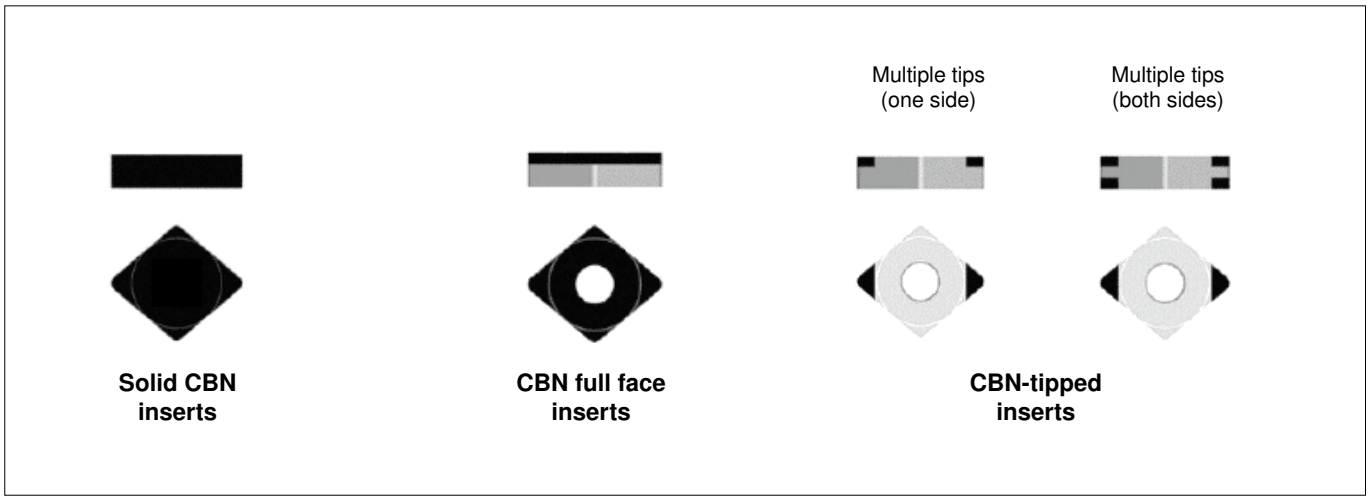
- Inserts consist exclusively of CBN
- No varying material combinations
- Best possible thermal conductivity
- Suitable for maximum machining temperatures

CBN full face inserts

- The inserts consist of a presintered carbide-CBN-connection
- No brazed connection, reduced delamination
- Improved thermal conductivity
- Suitable for higher machining temperatures than tipped inserts
- Enables larger depths of cut than tipped inserts of the same size

CBN-tipped inserts

- Requires one base insert per tool
- CBN segments are brazed onto the insert
- The base insert must have a seat where the CBN segment can be held in place
- Brazed connections are the main weak point, brazing must be carefully executed and monitored
- Main advantage: reduced costs



Technical appendix – selecting the right geometry

Both the insert geometry and the cutting edge type are extremely important when it comes to hard turning, as they have a decisive effect on tool life and productivity.

Our CBN range includes inserts with standard corner radii as well as wiper inserts.

The standard corner radius generates minimum cutting forces with very low stability requirements. Wiper inserts offer an unbeatable combination of high productivity and excellent surface quality.

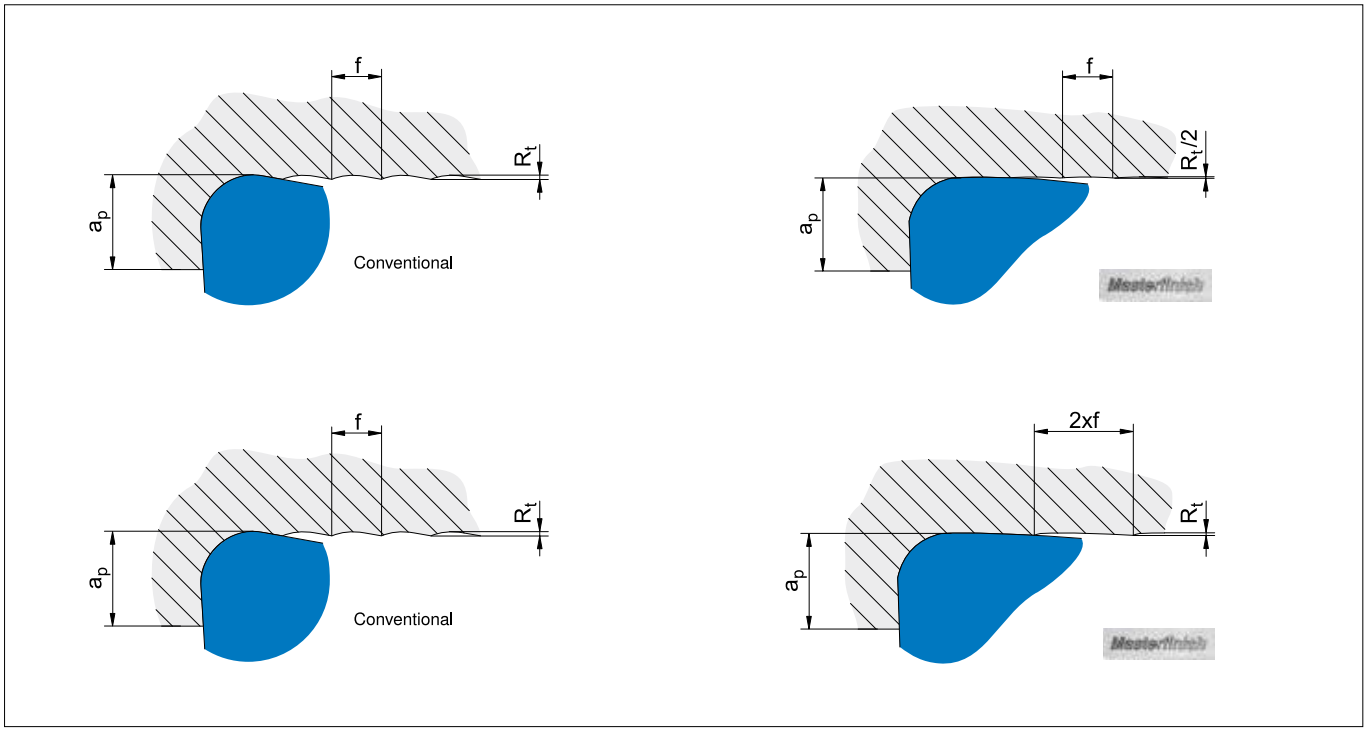
Wiper geometry

Our wiper geometry is based on a combination of various radii and was specifically developed for hard turning.

Wiper inserts offer two possibilities of process optimisation:

- Improved surface quality for standard cutting data
- Proven surface quality with notably higher feed rates

Standard corner radius



The corner radius is an important factor when it comes to performance:

- A small corner radius 0.2/0.4 mm offers better chip control
- A large corner radius 0.8/1.2 mm provides better surface quality and thinner chips so that the level of crater wear is reduced in hard turning operations.
- When combined with a low depth of cut, a large corner radius results in reduced forces when the tool enters and exits the material.

In general, a large corner radius provides higher cutting edge stability and ultimately longer tool life. Try using the largest possible corner radius possible for your machining conditions.

Designation system for conversion from metric to inch

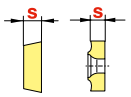
Tolerances

Index	d ±		m ±		s ±	
	mm	inch	mm	inch	mm	inch
A	0.025	.0010	0.005	.0002	0.025	.001
F	0.013	.0005	0.005	.0002	0.025	.001
C	0.025	.0010	0.013	.0005	0.025	.001
H	0.013	.0005	0.013	.0005	0.025	.001
E	0.025	.0010	0.025	.0010	0.025	.001
G**	0.025	.0010	0.025	.0010	0.13	.0005
J	0.05-0.15*	.002-.006*	0.005	.0002	0.025	.001
K	0.05-0.15*	.002-.006*	0.013	.0005	0.025	.001
L	0.05-0.15*	.002-.006*	0.025	.0010	0.025	.001
M	0.05-0.15*	.002-.006*	0.05-0.20*	.003-008*	0.13	.0005
N	0.05-0.15*	.002-.006*	0.05-0.20*	.003-.008*	0.025	.001
U	0.08-0.25*	.003-.010*	0.13-0.38*	.005-.015*	0.13	.0005

** Standard

* depends on the insert size

Insert thickness



Index		Thickness	
mm	inch	mm	inch
01	1	1.59	1/16
T1		1.98	5/64
02		2.38	3/32
T2		2.78	7/64
03	2	3.18	1/8
T3		3.97	5/32
04	3	4.76	3/16
05		5.56	7/32
06	4	6.35	1/4
07	5	7.94	5/16
09	6	9.52	3/8

CBN

Cutting edge

F sharp	K double chamfered	S chamfered & honed
E honed	T chamfered	P double chamfered & honed

S	-	01525	-	10

Chamfer type

Index	mm	Index	radius
010	0.1	05	5°
013	0.13	10	10°
015	0.15	15	15°
020	0.2	20	20°
025	0.25	25	25°
030	0.3	30	30°
035	0.35	35	35°

Cutting Edge rounding

Index	mm
10	0.010
15	0.015
20	0.020
25	0.025
30	0.030

Corner radius

Index		radius	
mm	inch	mm	inch
00	X0	0.05	.0015
01	0	0.1	.004
02	.5	0.2	.008
04	1	0.4	1/64
08	2	0.8	1/32
12	3	1.2	3/64
16	4	1.6	1/16

Designation system for conversion from metric to inch

Cutting edge length

Type	ISO	ANSI	L		d	
			mm	inch	mm	inch
C	06	2	6.40	.250	6.35	.250
	09	3	9.70	.382	9.525	.375
	12	4	12.90	.508	12.70	.500
	16	5	16.10	.634	15.875	.625
	19	6	19.30	.760	19.05	.750
	25	8	25.80	1.016	25.40	1.000
	32	12	32.24	1.269	31.75	1.250
S	06	2	6.35	.250	6.35	.250
	09	3	9.525	.375	9.525	.375
	12	4	12.70	.500	12.70	.500
	15	5	15.875	.625	15.875	.625
	19	6	19.05	.750	19.05	.750
	25	8	25.40	1.000	25.40	1.000
	31	10	31.75	1.250	31.75	1.250
D	07	2	7.70	.303	6.35	.250
	11	3	11.60	.457	9.525	.375
	15	4	15.50	.610	12.70	.500
V	07	–	7.000	.275	3.97	.156
	11	2	11.10	.437	6.35	.250
	16	3	16.60	.653	9.525	.375
	22	4	22.10	.870	12.70	.500

Type	ISO	ANSI	L		d	
			mm	inch	mm	inch
T	06	1.2	6.90	.272	3.97	.156
	09	1.8	9.60	.378	5.56	.219
	11	2	11.00	.433	6.35	.250
	16	3	16.50	.650	9.525	.375
	22	4	22.00	.866	12.70	.500
	27	5	27.50	1.083	15.875	.625
	33	6	33.00	.1299	19.05	.750
W	06	3	6.50	.256	9.525	.375
	08	4	8.70	.331	12.70	.500
	10	5	10.90	.429	15.875	.625
R	06	2	6.35	.250	6.35	.250
	08	–	8.00	.315	8.00	.315
	09	3	9.525	.375	9.525	.375
	10	–	10.00	.394	10.00	.394
	12	–	12.00	.472	12.00	.472
	12*	4	12.70	.488	12.70	.488
	15	5	15.875	625	15.875	.652
	16	–	16.00	.630	16.00	.630
	19	6	19.05	.750	19.05	.750
	25	8	25.00	.984	25.00	.984
	25*	–	25.40	1.000	25.40	1.000
	31	31	31.75	1.250	31.75	1.250
	32	–	32.00	1.260	32.00	1.260

Inquiry form/Order form for PCBN/PCD/CVD Inserts

General data

☐ Inquiry
☐ Bestellung

Inquiry number: _____ Date: _____

Order number: _____

Company: _____ Contact person: _____

Address: _____ Phone: _____

_____ E-mail: _____

Workpiece data

Type:	☐ Turning	☐ Milling	☐ Other: _____
Application:	☐ Continuous	☐ Lightly interrupted	☐ Heavy interrupted
Material:	☐ Steel	☐ Cast Iron	☐ Other: _____
	☐ Hard	☐ Hard/Soft	
Cooling:	☐ Yes	☐ No	

Material Designation: _____

Cutting speed Vc: _____ m/min Material number: _____

Schnitttiefe ap: _____ mm Feedrate f: _____ mm/U

Hardening process: _____

Hardness: _____ HRC Hardening depth: _____ mm

Insert data

Insert designation: _____

Type: ☐ PCBN ☐ PCD ☐ CVD ☐ Other: _____

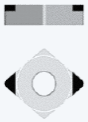
Competitor name: _____ Competitor grade: _____

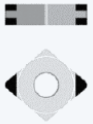
Coating: ☐ Yes ☐ No

Lot Size: _____ _____ _____ _____ _____

Type of tip: ☐  ☐  ☐

☐ Singel tip 

☐ Multiple tips (one side) 

☐ Multiple tips (both sides) 

☐ Full Face 

☐ Solid 

☐ 3 mm (Standard)

☐ _____ mm

Chip breaker: 

☐ 0°

☐ _____ °

Edge preparation: ☐ F (Sharp) ☐ E (With honing)

☐ T (Chamfered) ☐ S (Chamfered + Honing)

Value for chamfer: _____ mm x _____ ° Value for honing: R = _____ mm

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Notes


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