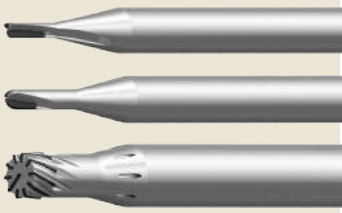
TYcarb Advanced Materials Made in Germany

End Mills
PCD, CVD-D, UltraDiamond, CBN

PCD | CVD-D | Ultra Diamond | CBN-H | CBN-X | CBN-K

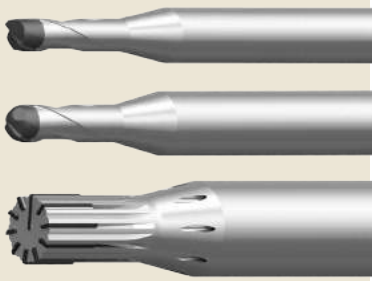
Medical Technology

Microtechnology



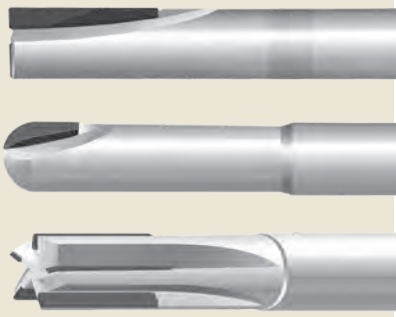
Tool and

Mold Forming

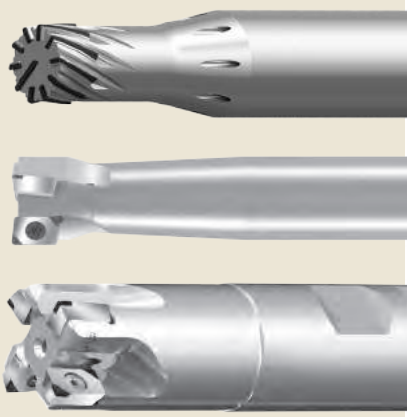


Automotive

Mechanical Engineering



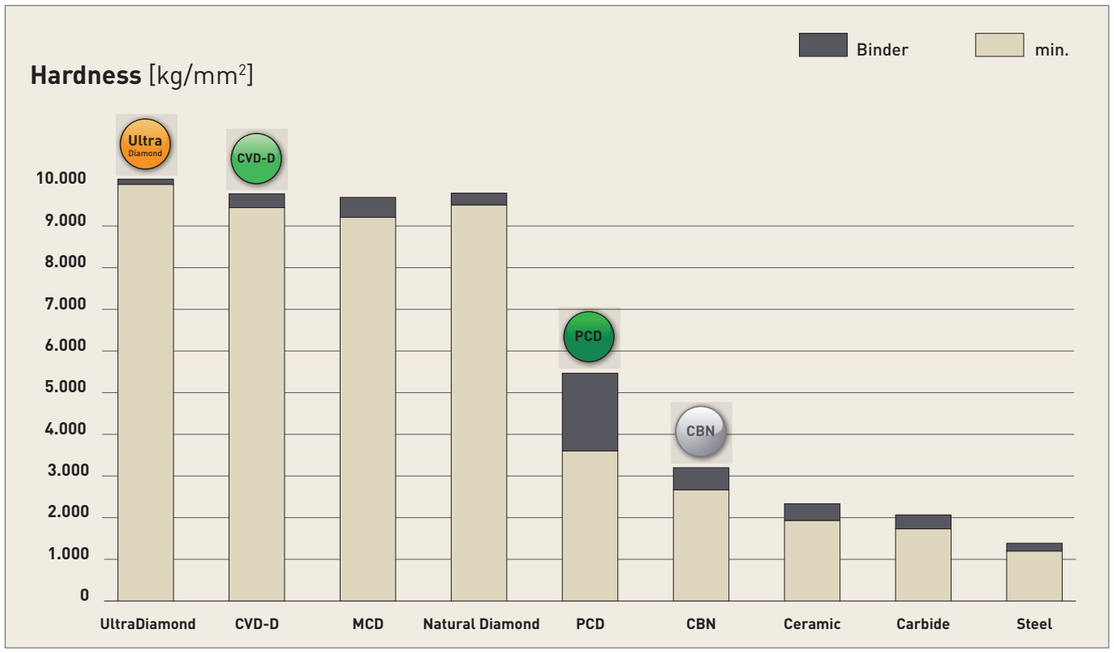
Aerospace



PASSION FOR DIAMOND...

ultrahard cutting materials at a glance

... is not just a slogan for us - we live this passion in our daily dealings with our customers and we are your partner when it comes to diamond or CBN tools.



CVD-Thickfilm Diamond (CVD-D)

The Star among Diamond Cutting Materials

For the machining of hard-brittle materials such as Ceramics, glass, glass-Ceramics, tungsten Carbide, MMC and fiber-reinforced composites such as CFRP and GFRP. Due to the lack of a bonding matrix, the diamond content is much higher than with PCD. In the group of ultra-hard cutting materials, binderless CVD-D is one of the hardest man-made diamond cutting materials.
CVD-D is characterized by high hardness as well as high wear resistance. These properties make CVD-D the perfect cutting material for machining abrasive materials. Compared to PCD, which is damaged by the abrasive particles due to its soft metallic binder phase, the CVD-D cutting edge remains stable due to its binderless anchoring in the diamond matrix.
With the correct use of CVD-D, the tool life can be increased by up to 10 times (and even more) compared to PCD!

Binderless Diamond (UltraDiamond)

The hardest Mono Crystal

Single-crystal elements are laser-cut from diamond blanks in a defined orientation using laser segmentation technology. This new technology makes it possible, in addition to polycrystalline cutting materials such as PCD and CVD-D, to also braze a monocrystal (UltraDiamond) under high vacuum on any tool carrier. Compared to PCD, the tool life can be increased by approx. 15 to 25 times and compared to CVD-D by approx. 2 to 5 times.
The areas of application are similar to PCD and CVD-D, but this monocrystalline cutting material offers a further significant increase in tool life in all applications where PCD and CVD-D reach the limits of economic viability. The UltraDiamond cutting material makes economical machining of very hard, highly brittle materials such as Ceramics, glass, glass-Ceramics and hard metals with low cobalt binder and nickel binder (<10%) possible.

Polycrystalline diamond (PCD)

The well-known Standard Diamond

PCD is a synthetically produced, extremely tough, intergrown mass of diamond particles with a random orientation in a metal matrix. It is produced by sintering selected diamond particles under high pressure and high temperatures.
Graphite serves as a catalyst allowing the PDC crystals to intergrow. PCD has a high thermal conductivity and good heat dissipation away from the cutting edge. In addition, PCD has the highest bending fracture strength of all cutting materials.
PCD is very well suited for machining aluminum with a Si content of up to 12% and/or other abrasive fillers. The thermal hardness is about 750°C. The areas of application are like those of CVD thick-film diamond, but CVD thick film has a higher cost effectiveness with hard-brittle materials or aluminum from a Si content of 12%.

Polycrystalline Cubic Boron Nitride (CBN)

Chemically resistant and stable at high temperatures

of up to 1,400°C. Boron nitride powder is the starting point for the production of CBN, which has been available since the end of the 1960s.It is produced under high pressure and at temperatures of over 1,500°C and the many different substrates are specifically adapted to the final application.
CBN is now considered the second hardest material after diamond cutting materials!
The applications of CBN take place in the automotive industry, aerospace, tool and die and mold making as well as in mechanical engineering. The wide range as cutting and abrasive material includes hardened Steels, cast irons, chilled cast iron, sintered materials, stellites, nickel- and cobalt-based superalloys. In many applications, cubic boron nitride is preferred to diamond cutting materials because it is absolutely stable in air at temperatures up to 1,400°C. Diamond, on the other hand, begins to decompose at a temperature of approx. 750°C.
Compared to PCD, CBN is also characterized by its chemical resistance to ferrous materials.

Our Cutting Materials

and their main applications at a glance

We want to offer you the ideal solution for your application. Therefore, we have developed four main cutting material groups, specially adapted to the requirements of the different materials.

Below you will find an overview of the different groups.

PCD

PCD

is ideally suited for the machining of *

Aluminum <10% Si | Brass | Copper, Copper Alloys | Graphite | Magnesium | PTFE | Tungsten alloy

- continuous cut
- light interrupted cut
- heavy interrupted cut

CVD-D

CVD-D

is ideally suited for the machining of *

Acrylic (PMMA) | Aluminum >10% Si | Carbide | Ceramics | Composites (GFRP/CFRP) | Copper, Copper Alloys | Glass, Glass Ceramic | Magnesium | Plastic | Silver, Gold, Platinum | Titanium | Zirconium

- continuous cut
- light interrupted cut
- heavy interrupted cut

Ultra Diamond

UltraDiamond

is ideally suited for the machining of *

Acrylic (PMMA) | Carbide | Ceramic | Glass, Glass Ceramic

- continuous cut
- light interrupted cut
- heavy interrupted cut

H

CBN-H

is ideally suited for the machining of *

Steel, hardened up to 72 HRC
Sinter Steel, hardened

- continuous cut
- light interrupted cut
- heavy interrupted cut

X

CBN-X

is ideally suited for the machining of *

Powder metallurgical Steel, hardened
Special Alloys such as ASP, CPM, Hardox
Tool Steel, hardened up to 72 HRC

- continuous cut
- light interrupted cut
- heavy interrupted cut

K

CBN-K

is ideally suited for the machining of *

Grey Cast Iron (GG)
Ductile Cast Iron (GGG)

- continuous cut
- light interrupted cut
- heavy interrupted cut

* all other applications can be found in the complete cutting material assignment from page 8

Your Notes

TYCarb Advanced Materials Made in Germany

Our Cutting Material Assignment

about the materials

Benefit from over 25 years of application experience with ultra-hard cutting materials.

In the table you will find our cutting material recommendation for each material.

Green ✓ First choice

Orange ✓ Possible alternative

ISO	Material	PCD	CVD-D	Ultra Diamond	CBN-H	CBN-X	CBN-K
H	**Powder metallurgical Steel,** hardened				✓	✓	
	Special Alloys (ASP,CPM,Hardox)				✓	✓	
	Steel, hardened up to 72 HRC				✓	✓	
	Tool Steel, hardened up to 72 HRC				✓	✓	
P	**Sintered Steel**					✓	✓
	Sintered Steel, hardened				✓	✓	
K	**Grey Cast Iron (GCI)**						✓
	Ductile Cast Iron (DCI)					✓	✓
	Shell Chilled Cast Iron				✓	✓	
S	**Ni-, Co-, Fe- and Cr-Alloys**				✓	✓	
	Titanium Alloys				✓	✓	
M	**Stainless Steel,** hardened				✓	✓	
N	**Acrylic (PMMA)**		✓	✓			
	Aluminum, < 10% Si	✓	✓				
	Aluminum, > 10% Si		✓	✓			
	Brass	✓	✓				
	Carbide G-Grade, < 15% Co		✓	✓			
	Carbide G-Grade, > 15% Co		✓				
	Carbide K-Grade, < 15% Co		✓	✓			
	Carbide K-Grade, > 15% Co		✓				

You cannot find your material in the table?

If you have any further technical questions, please do not hesitate to contact us by phone or e-mail!

Phone: 888.554.7264

Mail: sales@tysontool.com

ISO	Material	PCD	CVD-D	Ultra Diamond	CBN-H	CBN-X	CBN-K
N	Carbide (Green)	✓					
	Carbide with Ni Binder			✓			
	Ceramics		✓	✓			
	Ceramics (Green)	✓					
	Composite such as CFRP/GFRP	✓	✓				
	Copper, Copper Alloys	✓	✓				
	Glass, Glass Ceramic		✓	✓			
	Graphite	✓	✓				
	Magnesium	✓	✓				
	MMC		✓	✓			
	Plastics		✓				
	PEEK	✓	✓				
	Silver, Gold, Platinum		✓	✓			
	Tungsten alloy	✓	✓				
	Zirconium		✓	✓			

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The Machining of Brittle-Hard Materials

Application and explanation of brittle-hard materials

Application range:

- Ceramics
- Glass
- Glass Ceramic
- Carbide
- Zirconium
- Other high hardness and brittle materials

Brittle-Hard Materials

High brittleness is usually found in materials with high hardness, such as diamond, carbides, nitrides, salts and ceramics. In contrast, ductile materials - mostly metals and plastics - have a comparatively high plastic deformability until they finally break.

Brittleness is a material property that describes the failure or fracture behavior. A brittle material can only be plastically deformed to a small extent and is therefore characterized by low ductility. Brittle fracture occurs at low elongation and usually close to the yield point.

With DTS tools you can economically machine almost all brittle-hard materials.

The most common industries and their application range are:

- Mold and tool making → Carbide punches and dies made of solid carbide or ceramics
- Medical industry → Ceramics in the dental field
- Glass industry → Technical and optical glass
- Jewelry industry → Elements for jewelry and watches
- Electrical industry → Components made of glass fiber reinforced materials

Application range:

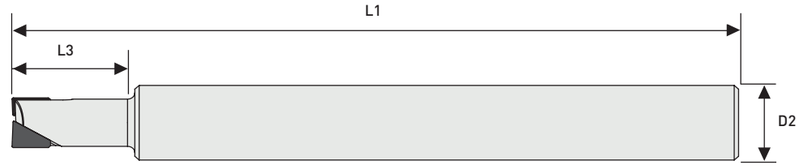
CVD-D Carbide >8% Co, Composites (GFRP,CFRP), Aluminum >10% Si, Copper, Graphite, Intermetallic, MMC (=Metal Matrix Composite),Titanium (Finishing) ...

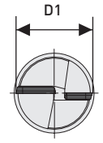
U-Diamond Carbide <10% Co, Carbide with Ni Binder, Glass Materials, highly abrasive materials, sintered ceramic materials ...

You will find further application ranges in the detailed overview from page 8.

Corner End Mills tipped with Diamond

for machining brittle-hard materials | Ø0,90 - 6,00





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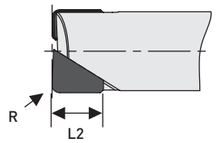

Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	CVD-D Item No.	Ultra Diamond Item No. (New)
0,90	50,00	2,00	2,00	1	0,020	6h5	FS2050-8500	FS1150-8500
1,00	50,00	2,00	2,50	1	0,050	6h5	FS2050-8502	FS1150-8502
	50,00	2,00	2,50	1	0,100	6h5	FS2050-8504	FS1150-8504
	50,00	2,00	4,50	1	0,050	6h5	FS2050-8506	FS1150-8506
1,50	50,00	2,00	3,00	2	0,050	6h5	FS2050-8508	FS1150-8508
	50,00	2,00	3,00	2	0,100	6h5	FS2050-8510	FS1150-8510
2,00	50,00	2,00	4,00	2	0,100	6h5	FS2050-8512	FS1150-8512
	50,00	2,00	4,00	2	0,200	6h5	FS2050-8514	FS1150-8514
3,00	50,00	2,50	6,00	2	0,100	6h5	FS2050-8516	FS1150-8516
	50,00	2,50	6,00	2	0,300	6h5	FS2050-8518	FS1150-8518
4,00	50,00	2,50	8,00	2	0,100	6h5	FS2050-8520	
	50,00	2,50	8,00	2	0,300	6h5	FS2050-8522	
5,00	50,00	3,00	10,00	2	0,200	6h5	FS2050-8524	
	50,00	3,00	10,00	2	0,500	6h5	FS2050-8526	
6,00	50,00	3,00	15,00	2	0,200	6h5	FS2050-8528	
	50,00	3,00	15,00	2	0,300	6h5	FS2050-8530	
	50,00	3,00	15,00	2	0,500	6h5	FS2050-8532	

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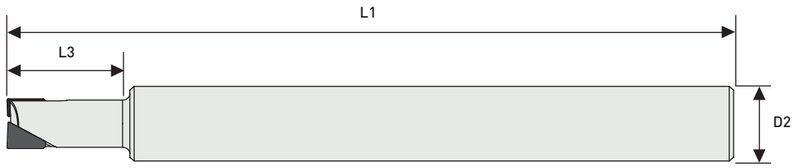
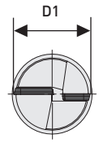
Subject to technical changes.

Corner End Mills tipped with Diamond

for machining brittle-hard materials | Ø8,00 - 12,00





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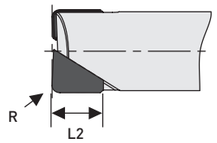


Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	CVD-D Item No.	Ultra Diamond Item No.
8,00	60,00	4,00	20,00	2	0,300	8h5	FS2050-8534	
	60,00	4,00	20,00	2	0,500	8h5	FS2050-8536	
10,00	60,00	5,00	25,00	2	0,300	10h5	FS2050-8538	
	60,00	5,00	25,00	2	0,800	10h5	FS2050-8540	
12,00	70,00	5,00	25,00	2	1,000	12h5	FS2050-8542	

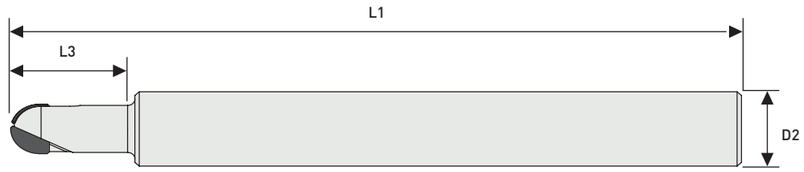
Application range:

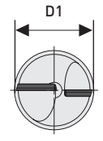
- **CVD-D** Carbide >8% Co, Composites (GFRP,CFRP), Aluminum >10% Si, Copper, Graphite, Intermetallic, MMC (=Metal Matrix Composite),Titanium (Finishing) ...
- **U-Diamond** Carbide <10% Co, Carbide with Ni Binder, Glass Materials, highly abrasive materials, sintered ceramic materials ...

You will find further application ranges in the detailed overview from page 8.

Ball Nose End Mills tipped with Diamond

for machining brittle-hard materials | Ø0,90 - 6,00





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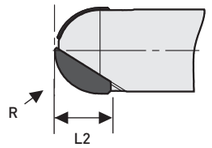

Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	CVD-D Item No.	Ultra Diamond Item No. (New)
0,90	50,00	2,00	2,00	1	0,450	6h5	FS2050-9500	FS1150-9500
1,00	50,00	2,00	2,50	1	0,500	6h5	FS2050-9502	FS1150-9502
	50,00	2,00	3,50	1	0,500	6h5	FS2050-9504	FS1150-9504
	50,00	2,00	4,50	1	0,500	6h5	FS2050-9506	FS1150-9506
1,50	50,00	2,00	3,00	2	0,750	6h5	FS2050-9508	FS1150-9508
	50,00	2,00	5,00	2	0,750	6h5	FS2050-9510	FS1150-9510
2,00	50,00	2,00	4,00	2	1,000	6h5	FS2050-9512	FS1150-9512
	50,00	2,00	8,00	2	1,000	6h5	FS2050-9514	FS1150-9514
3,00	50,00	2,50	6,00	2	1,500	6h5	FS2050-9516	FS1150-9516
	50,00	2,50	12,00	2	1,500	6h5	FS2050-9518	FS1150-9518
4,00	50,00	2,50	8,00	2	2,000	6h5	FS2050-9520	
	50,00	2,50	16,00	2	2,000	6h5	FS2050-9522	
5,00	50,00	3,00	10,00	2	2,500	6h5	FS2050-9524	
	50,00	3,00	20,00	2	2,500	6h5	FS2050-9526	
6,00	50,00	3,00	12,00	2	3,000	6h5	FS2050-9528	
	50,00	3,00	24,00	2	3,000	6h5	FS2050-9530	

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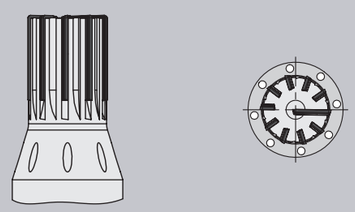
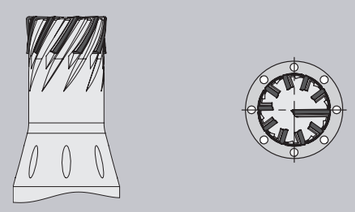
Subject to technical changes.

Multi-Tooth - Corner End Mills tipped with Diamond

for machining brittle-hard materials

Overview:

Diamond Cutting Edge straight grooved	Diamond Cutting Edge twist angle
	
Ø1,0 – Ø10,0 up to 14 teeth	Ø3,0 – Ø6,0 up to 8 teeth
Benefits of the system: ✓ Robust ✓ Precise ✓ Smooth running ✓ With internal cooling ✓ Very high feed rates possbile ✓ For roughing and finishing ✓ Cutting edge over center ✓ Plunging possible	**Benefits of the system:** ✓ Robust ✓ Precise ✓ Very smooth running ✓ Low cutting pressure ✓ With internal cooling ✓ Very high feed rates possbile ✓ For roughing and finishing ✓ Cutting edge over center ✓ Helix milling and plunging possible

Application range:

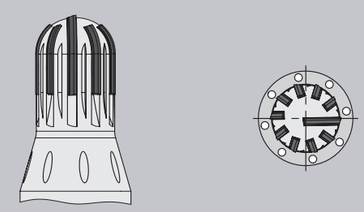
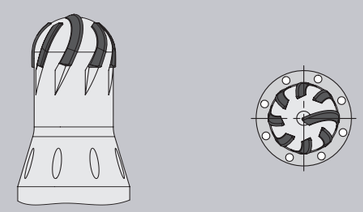
all Multi-Tooth End Mill with internal cooling

- Ceramics
- Glass
- Glass Ceramic
- Carbide
- Aluminum with high Si content
- GFRP / CFRP / MMC
- Other high hardness and brittle materials

Multi-Tooth - Ball Nose End Mills tipped with Diamond

for machining brittle-hard materials

Overview:

Diamond Cutting Edge straight grooved	Diamond Cutting Edge twist angle
	
Ø1,0 – Ø6,0 up to 14 teeth	Ø3,0 – Ø6,0 up to 8 teeth
Benefits of the system: ✓ Robust ✓ Precise ✓ Smooth running ✓ With internal cooling ✓ Very high feed rates possbile ✓ For roughing and finishing ✓ Cutting edge over center ✓ Plunging possible	**Benefits of the system:** ✓ Robust ✓ Precise ✓ Low cutting pressure ✓ Low cutting pressure ✓ With internal cooling ✓ Very high feed rates possbile ✓ For roughing and finishing ✓ Cutting edge over center ✓ Helix milling and plunging possible

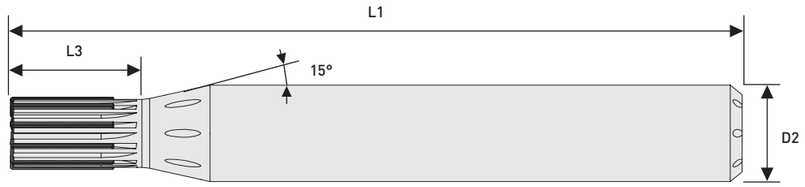
Application range:

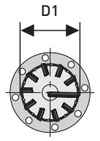
all Multi-Tooth End Mill with internal cooling

- Ceramics
- Glass
- Glass Ceramic
- Carbide
- Aluminum with high Si content
- GFRP / CFRP / MMC
- Other high hardness and brittle materials

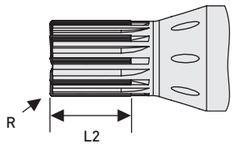
Multi-Tooth - Corner End Mills tipped with Diamond

for machining brittle-hard materials | Ø1,00 - 10,00





over center



Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank with internal cooling

D1	L1	L2	L3	Z	R	D2	Diamant Diamond Item No. (New)
1,00	45,00	3,00	3,00	1	0,030	6h5	FS2050-4500
1,50	45,00	3,00	3,00	2	0,030	6h5	FS2050-4502
2,00	45,00	3,00	3,00	3	0,030	6h5	FS2050-4505
3,00	50,00	3,00	4,50	5	0,050	6h5	FS2050-4515
	50,00	3,00	4,50	5	0,100	6h5	FS2050-4520
4,00	50,00	4,00	6,00	6	0,050	6h5	FS2050-4525
	50,00	4,00	6,00	6	0,100	6h5	FS2050-4530
5,00	50,00	5,00	7,50	7	0,050	8h5	FS2050-4535
	50,00	5,00	7,50	7	0,100	8h5	FS2050-4540
6,00	50,00	4,00	9,00	9	0,050	8h5	FS2050-4545
	50,00	4,00	9,00	9	0,150	8h5	FS2050-4550
8,00	60,00	6,00	12,00	12	0,100	12h5	FS2050-4555
	60,00	6,00	12,00	12	0,200	12h5	FS2050-4560
10,00	70,00	8,00	15,00	14	0,100	12h5	FS2050-4565
	70,00	8,00	15,00	14	0,200	12h5	FS2050-4570

Application range:

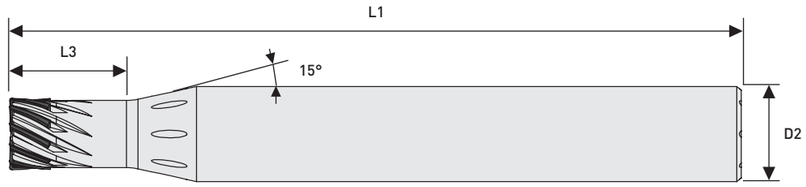
- **Diamond** Carbide >8% Co, GFRP, CFRP, Aluminum >10% Si, Plastics, Sandwich Materials, Copper, Graphite, Glass Materials, Titanium (Finishing) ...

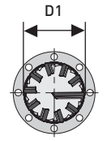
You will find further application ranges in the detailed overview from page 8.

Multi-Tooth - Corner End Mills tipped with Diamond with helix angle

for machining brittle-hard materials | Ø3,00 - 6,00

TYcarb Advanced Materials Made in Germany





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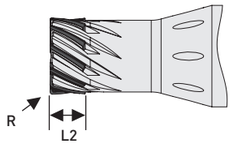

Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank with internal cooling

D1	L1	L2	L3	Z	R	D2	Diamant Diamond Item No. (New)
2,00	50,00	1,90	4,5	3	0,050	6h5	FS2050-4695
3,00	50,00	1,90	4,5	5	0,050	6h5	FS2050-4700
	50,00	1,90	4,5	5	0,100	6h5	FS2050-4705
4,00	50,00	2,50	6,0	5	0,050	6h5	FS2050-4710
	50,00	2,50	6,0	5	0,100	6h5	FS2050-4715
5,00	50,00	3,00	7,5	6	0,050	8h5	FS2050-4720
	50,00	3,00	7,5	6	0,100	8h5	FS2050-4725
6,00	50,00	3,00	9,0	8	0,050	8h5	FS2050-4730
	50,00	3,00	9,0	8	0,150	8h5	FS2050-4735

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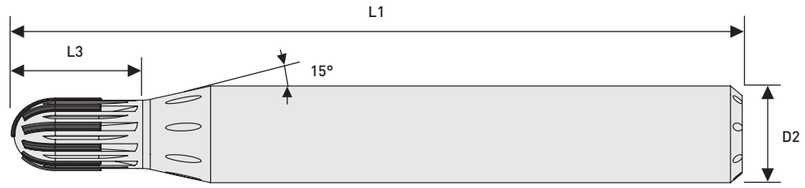
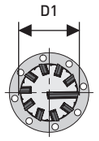
Multi-Tooth - Ball Nose End Mills tipped with Diamond

for machining brittle-hard materials | Ø1,00 - 6,00





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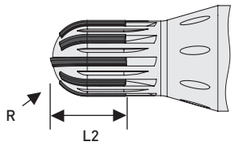


Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank with internal cooling

D1	L1	L2	L3	Z	R	D2	Item No.
1,00	45,00	3,00	3,00	1	0,500	6h5	FS2050-5500
1,50	45,00	3,00	3,00	2	0,750	6h5	FS2050-5502
2,00	45,00	3,00	3,00	2	1,000	6h5	FS2050-5505
3,00	50,00	3,00	4,50	4	1,500	6h5	FS2050-5520
4,00	50,00	4,00	6,00	6	2,000	6h5	FS2050-5530
5,00	50,00	5,00	7,50	7	2,500	8h5	FS2050-5540
6,00	50,00	6,00	9,00	9	3,000	8h5	FS2050-5550

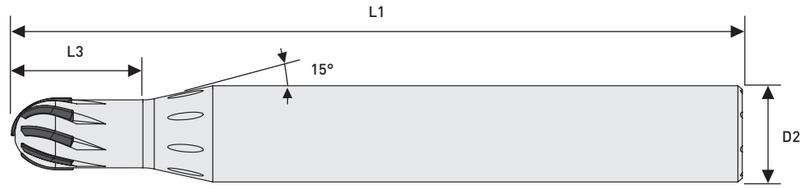
Application range:

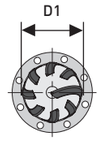
- **Diamond** Carbide >8% Co, GFRP, CFRP, Aluminum >10% Si, Plastics, Sandwich Materials, Copper, Graphite, Glass Materials, Titanium (Finishing) ...

You will find further application ranges in the detailed overview from page 8.

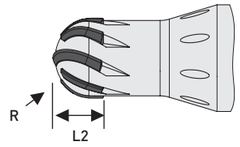
Multi-Tooth - Ball Nose End Mills tipped with Diamond with helix angle

for machining brittle-hard materials | Ø3,00 - 6,00





over center



Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank with internal cooling

D1	L1	L2	L3	Z	R	D2	Item No.
2,00	50,00	1,20	4,5	2	1,000	6h5	FS2050-5700
3,00	50,00	1,90	4,50	4	1,500	6h5	FS2050-5720
4,00	50,00	2,50	6,00	5	2,000	6h5	FS2050-5730
5,00	50,00	3,00	7,50	6	2,500	8h5	FS2050-5740
6,00	50,00	4,00	9,00	8	3,000	8h5	FS2050-5750

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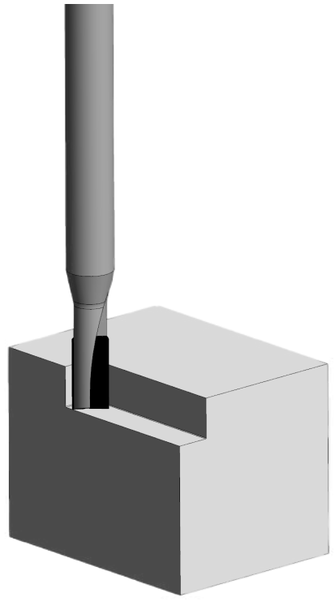
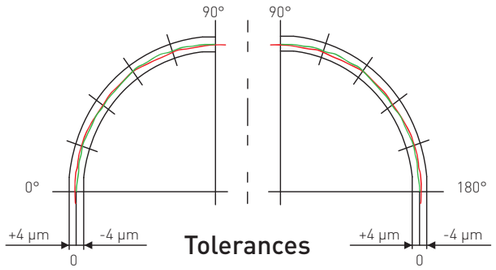
Corner End Mills - tipped with Diamond

Our corner End Mills tipped with diamond are used in series production and for the milling of brittle-hard materials.

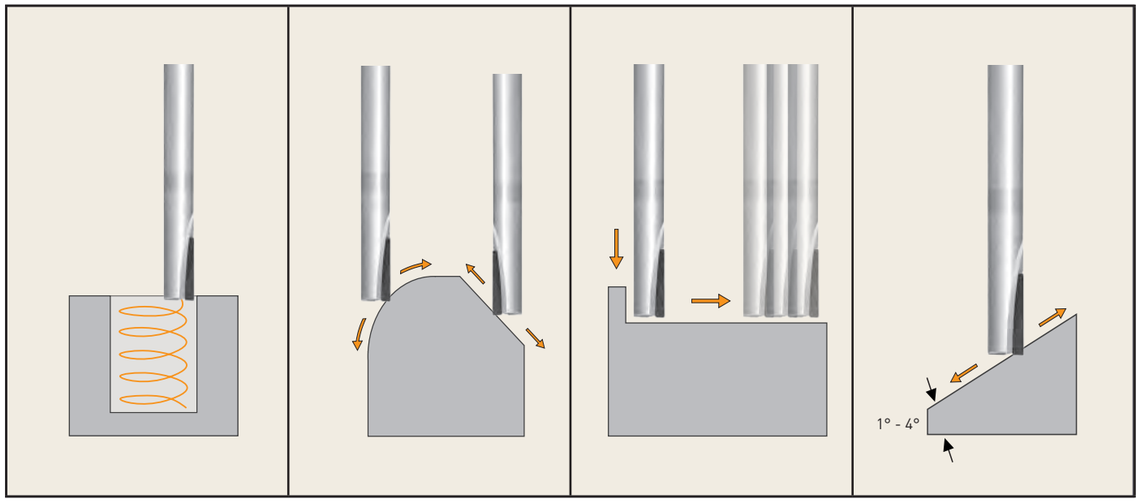
Application range for example:

- Aluminum milling
- Zinc milling
- Brass milling
- Carbide components
- Ceramic components
- Components with the highest surface requirements
- Components with very low tolerances
- Wherever very long tool life is required
- Abrasive materials





Machining Options:

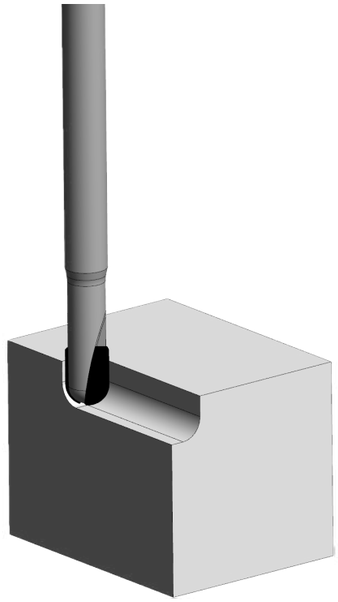


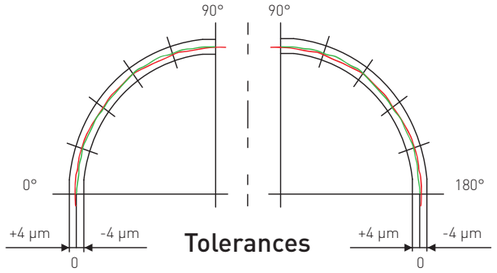
Ball Nose End Mills - tipped with Diamond

Our ball nose End Mills tipped with diamond are used in series production and for the milling of brittle-hard materials.

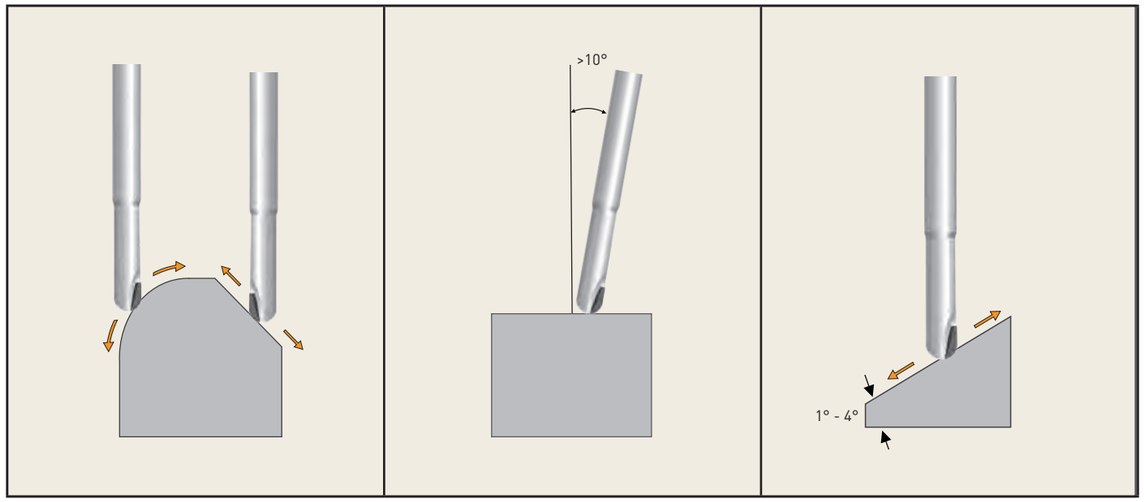
Application range for example:

- Aluminum milling
- Zinc milling
- Brass milling
- Carbide components
- Ceramic components
- Components with the highest surface requirements
- Components with very low tolerances
- Wherever very long tool life is required
- Abrasive materials



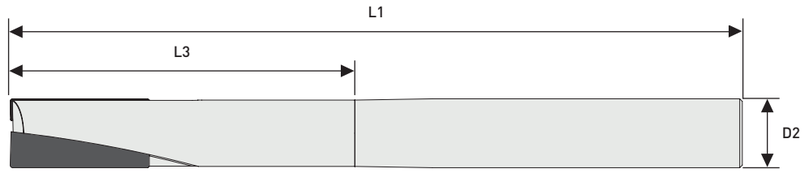


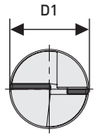
Machining Options:



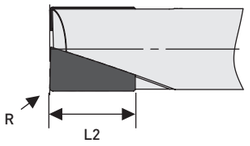
Corner End Mills tipped with Diamond

PCD and CVD-D for general machining | Ø1,00 - 5,00





over center



Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	PCD Item No.	CVD-D Item No.
1,00	38,00	3,00	4,00	1	0,050	4h5	FS1050-4009	FS2050-4009
	50,00	3,00	4,00	1	0,050	4h5	FS1050-4010	FS2050-4010
	50,00	2,00	5,00	1	0,100	6h5		FS2050-4011
	50,00	2,00	10,00	1	0,100	6h5		FS2050-4012
	50,00	2,00	20,00	1	0,100	6h5		FS2050-4013
1,50	38,00	2,00	3,00	2	0,005	4h5		FS2050-4018
	38,00	3,00	4,00	2	0,050	4h5	FS1050-4019	FS2050-4019
	50,00	3,00	4,00	2	0,050	4h5	FS1050-4020	FS2050-4020
	50,00	2,00	5,00	2	0,150	6h5		FS2050-4021
	50,00	2,50	10,00	2	0,150	6h5		FS2050-4022
	50,00	2,00	20,00	2	0,150	6h5		FS2050-4023
2,00	38,00	2,00	3,00	2	0,005	4h5		FS2050-4027
	38,00	4,00	6,00	2	0,005	4h5		FS2050-4028
	38,00	3,00	6,00	2	0,050	4h5	FS1050-4029	FS2050-4029
	50,00	3,00	5,00	2	0,100	4h5	FS1050-4030	FS2050-4030
	50,00	3,00	8,00	2	0,100	4h5	FS1050-4040	FS2050-4040
	50,00	3,00	5,00	2	0,150	6h5		FS2050-4041
	50,00	3,00	10,00	2	0,150	6h5		FS2050-4042
	50,00	3,00	20,00	2	0,150	6h5		FS2050-4043
2,50	38,00	5,00	7,00	2	0,005	4h5		FS2050-4048
	38,00	4,00	6,00	2	0,100	4h5	FS1050-4049	FS2050-4049
	50,00	4,00	6,00	2	0,100	4h5	FS1050-4050	FS2050-4050
	50,00	4,00	10,00	2	0,100	4h5	FS1050-4060	FS2050-4060
3,00	38,00	3,00	5,00	2	0,005	4h5		FS2050-4068
	38,00	6,00	9,00	2	0,005	4h5		FS2050-4069
	50,00	5,00	8,00	2	0,100	6h5	FS1050-4070	FS2050-4070
	50,00	5,00	8,00	2	0,200	6h5	FS1050-4071	FS2050-4071
	50,00	5,00	8,00	2	0,500	6h5	FS1050-4072	FS2050-4072
	60,00	5,00	12,00	2	0,100	6h5	FS1050-4080	FS2050-4080
	75,00	4,00	10,00	2	0,300	6h5		FS2050-4081
	75,00	4,00	15,00	2	0,300	6h5		FS2050-4082
	75,00	4,00	20,00	2	0,300	6h5		FS2050-4083
4,00	38,00	6,00	10,00	2	0,010	4h5		FS2050-4089
	60,00	5,00	10,00	2	0,100	6h5	FS1050-4090	FS2050-4090
	60,00	5,00	10,00	2	0,300	6h5	FS1050-4091	FS2050-4091
	60,00	5,00	10,00	2	0,500	6h5	FS1050-4092	FS2050-4092
	65,00	5,00	16,00	2	0,100	6h5	FS1050-4100	FS2050-4100
	75,00	5,00	10,00	2	0,300	6h5		FS2050-4101
	75,00	5,00	20,00	2	0,300	6h5		FS2050-4102
	75,00	5,00	30,00	2	0,300	6h5		FS2050-4103
5,00	50,00	6,00	12,00	2	0,010	6h5		FS2050-4109
	60,00	6,00	12,00	2	0,200	6h5	FS1050-4110	FS2050-4110
	60,00	6,00	12,00	2	0,500	6h5	FS1050-4111	FS2050-4111
	70,00	6,00	16,00	2	0,200	6h5	FS1050-4120	FS2050-4120
	80,00	6,00	25,00	2	0,200	6h5	FS1050-4130	FS2050-4130
	75,00	6,00	15,00	2	0,500	6h5		FS2050-4131
	75,00	6,00	25,00	2	0,500	6h5		FS2050-4132
	75,00	6,00	35,00	2	0,500	6h5		FS2050-4133

Application range:

- **PCD** Aluminum <10%Si, Brass, Bronze, Ceramics Green, Copper Alloys, Graphite, Titanium (Roughing) ...
- **CVD-D** Aluminum >10% Si, CFRP/MQL, GFRP, Graphite fine, Glass Materials, Carbide >10% Co, Copper, Titanium (Finishing) ...

You will find further application ranges in the detailed overview from page 8.

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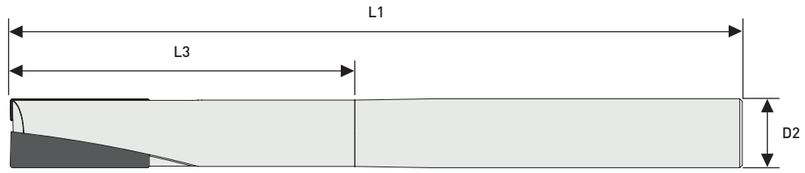
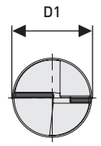
Corner End Mills tipped with Diamond

PCD and CVD-D for general machining | Ø6,00 - 20,00





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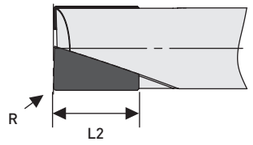

Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	PCD Item No.	CVD-D Item No.
6,00	50,00	8,00	15,00	2	0,010	6h5		FS2050-4139
	65,00	6,00	15,00	2	0,200	6h5	FS1050-4140	FS2050-4140
	65,00	6,00	15,00	2	0,500	6h5	FS1050-4141	FS2050-4141
	65,00	6,00	15,00	2	1,000	6h5	FS1050-4142	FS2050-4142
	75,00	8,00	20,00	2	0,200	6h5	FS1050-4150	FS2050-4150
	85,00	10,00	30,00	2	0,200	6h5	FS1050-4160	FS2050-4160
	100,00	6,00	20,00	2	0,300	6h5		FS2050-4161
	100,00	6,00	30,00	2	0,300	6h5		FS2050-4162
	100,00	6,00	40,00	2	0,300	6h5		FS2050-4163
8,00	70,00	8,00	20,00	2	0,300	8h5	FS1050-4170	FS2050-4170
	70,00	8,00	20,00	2	0,500	8h5	FS1050-4171	FS2050-4171
	70,00	8,00	20,00	2	1,000	8h5	FS1050-4172	FS2050-4172
	85,00	16,00	40,00	2	0,300	8h5	FS1050-4180	FS2050-4180
	100,00	7,00	25,00	2	1,000	8h5		FS2050-4181
	100,00	7,00	40,00	2	1,000	8h5		FS2050-4182
	100,00	7,00	60,00	2	1,000	8h5		FS2050-4183
10,00	75,00	8,00	25,00	2	0,300	10h5	FS1050-4189	FS2050-4189
	75,00	8,00	25,00	2	0,500	10h5	FS1050-4190	FS2050-4190
	75,00	8,00	25,00	2	1,000	10h5	FS1050-4191	FS2050-4191
	105,00	16,00	50,00	2	0,300	10h5	FS1050-4192	FS2050-4192
	105,00	16,00	50,00	2	0,500	10h5	FS1050-4193	FS2050-4193
	105,00	16,00	50,00	2	1,000	10h5	FS1050-4200	FS2050-4200
12,00	80,00	8,00	30,00	2	0,500	12h5	FS1050-4210	FS2050-4210
	80,00	8,00	30,00	2	1,000	12h5	FS1050-4211	FS2050-4211
	105,00	16,00	60,00	2	0,500	12h5	FS1050-4212	FS2050-4212
	105,00	16,00	60,00	2	1,000	12h5	FS1050-4220	FS2050-4220
16,00	105,00	20,00	30,00	2	0,500	16h5	FS1050-4229	FS2050-4229
	105,00	20,00	30,00	2	1,000	16h5	FS1050-4230	FS2050-4230
20,00	105,00	20,00	30,00	2	1,000	20h5	FS1050-4240	FS2050-4240

Application range:

- **PCD** Aluminum <10%Si, Brass, Bronze, Ceramics Green, Copper Alloys, Graphite, Titanium (Roughing) ...
- **CVD-D** Aluminum >10% Si, Carbide >10% Co, CFRP/MQL, Copper, GFRP, Graphite fine, Glass Materials, Titanium (Finishing) ...

You will find further application ranges in the detailed overview from page 8.

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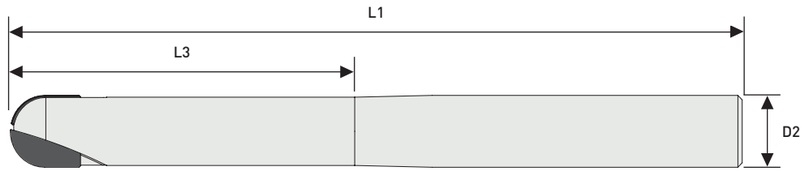
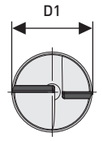
Ball Nose End Mills tipped with Diamond

PCD and CVD-D for general machining | Ø1,00 - 5,00





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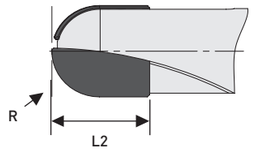

Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	PCD Item No.	CVD-D Item No.
1,00	32,00	1,00	4,00	1	0,500	3h5	FS1050-5009	FS2050-5009
	50,00	3,00	4,00	1	0,500	4h5	FS1050-5010	FS2050-5010
	50,00	2,00	5,00	1	0,500	6h5		FS2050-5011
	50,00	2,00	10,00	1	0,500	6h5		FS2050-5012
	50,00	2,00	20,00	1	0,500	6h5		FS2050-5013
1,50	32,00	2,00	5,00	2	0,750	3h5	FS1050-5019	FS2050-5019
	50,00	3,00	5,00	2	0,750	4h5	FS1050-5020	FS2050-5020
	50,00	2,00	5,00	2	0,750	6h5		FS2050-5021
	50,00	2,00	15,00	2	0,750	6h5		FS2050-5022
	50,00	2,00	20,00	2	0,750	6h5		FS2050-5023
2,00	32,00	3,00	5,00	2	1,000	4h5	FS1050-5028	FS2050-5028
	32,00	3,00	8,00	2	1,000	4h5	FS1050-5029	FS2050-5029
	50,00	3,00	5,00	2	1,000	4h5	FS1050-5030	FS2050-5030
	50,00	3,00	8,00	2	1,000	4h5	FS1050-5040	FS2050-5040
	50,00	3,00	5,00	2	1,000	4h5		FS2050-5041
	50,00	3,00	15,00	2	1,000	6h5		FS2050-5042
	50,00	3,00	20,00	2	1,000	6h5		FS2050-5043
2,50	32,00	3,00	6,00	2	1,250	3h5	FS1050-5048	FS2050-5048
	32,00	3,00	10,00	2	1,250	3h5	FS1050-5049	FS2050-5049
	50,00	3,00	6,00	2	1,250	4h5	FS1050-5050	FS2050-5050
	50,00	3,00	10,00	2	1,250	4h5	FS1050-5060	FS2050-5060
3,00	32,00	4,00	6,00	2	1,500	3h5	FS1050-5068	FS2050-5068
	32,00	4,00	9,00	2	1,500	3h5	FS1050-5069	FS2050-5069
	50,00	5,00	8,00	2	1,500	6h5	FS1050-5070	FS2050-5070
	60,00	5,00	12,00	2	1,500	6h5	FS1050-5080	FS2050-5080
	50,00	4,00	10,00	2	1,500	6h5		FS2050-5081
	50,00	4,00	15,00	2	1,500	6h5		FS2050-5082
	50,00	4,00	20,00	2	1,500	6h5		FS2050-5083
4,00	38,00	5,00	7,00	2	2,000	4h5	FS1050-5088	FS2050-5088
	38,00	5,00	10,00	2	2,000	4h5	FS1050-5089	FS2050-5089
	60,00	5,00	10,00	2	2,000	6h5	FS1050-5090	FS2050-5090
	65,00	5,00	16,00	2	2,000	6h5	FS1050-5100	FS2050-5100
	75,00	5,00	10,00	2	2,000	6h5		FS2050-5101
	75,00	5,00	20,00	2	2,000	6h5		FS2050-5102
	75,00	5,00	30,00	2	2,000	6h5		FS2050-5103
5,00	50,00	6,00	12,00	2	2,500	6h5	FS1050-5108	FS2050-5108
	50,00	6,00	16,00	2	2,500	6h5	FS1050-5109	FS2050-5109
	60,00	6,00	12,00	2	2,500	6h5	FS1050-5110	FS2050-5110
	70,00	6,00	16,00	2	2,500	6h5	FS1050-5120	FS2050-5120
	75,00	6,00	15,00	2	2,500	6h5		FS2050-5121
	75,00	6,00	25,00	2	2,500	6h5		FS2050-5122
	75,00	6,00	35,00	2	2,500	6h5		FS2050-5123

Application range:

- **PCD** Aluminum <10%Si, Brass, Bronze, Ceramics Green, Copper Alloys, Graphite, Titanium (Roughing) ...
- **CVD-D** Aluminum >10% Si, Carbide >10% Co, CFRP/MQL, Copper, GFRP, Graphite fine, Glass Materials, Titanium (Finishing) ...

You will find further application ranges in the detailed overview from page 8.

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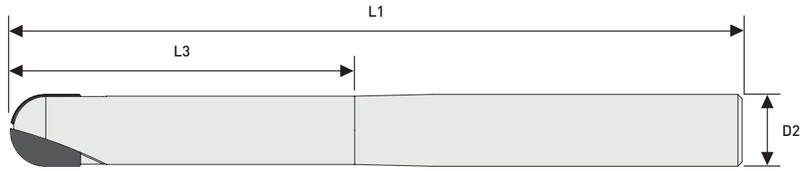
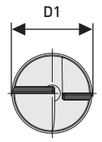
Subject to technical changes.

Ball Nose End Mills tipped with Diamond

PCD and CVD-D for general machining | Ø6,00 - 12,00





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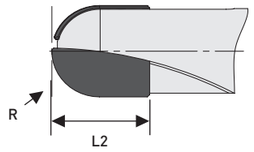


Radius tolerance: ± 0,004 mm
Length tolerance: ± 1,00 mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	PCD Item No.	CVD-D Item No.
6,00	50,00	6,00	15,00	2	3,000	6h5	FS1050-5128	FS2050-5128
	50,00	6,00	20,00	2	3,000	6h5	FS1050-5129	FS2050-5129
	65,00	6,00	15,00	2	3,000	6h5	FS1050-5130	FS2050-5130
	75,00	6,00	20,00	2	3,000	6h5	FS1050-5140	FS2050-5140
	100,00	6,00	20,00	2	3,000	6h5		FS2050-5141
	100,00	6,00	30,00	2	3,000	6h5		FS2050-5142
	100,00	6,00	40,00	2	3,000	6h5		FS2050-5143
8,00	63,00	8,00	20,00	2	4,000	8h5	FS1050-5149	FS2050-5149
	70,00	8,00	20,00	2	4,000	8h5	FS1050-5150	FS2050-5150
	85,00	8,00	40,00	2	4,000	8h5	FS1050-5160	FS2050-5160
	100,00	7,00	25,00	2	4,000	8h5		FS2050-5161
	100,00	7,00	40,00	2	4,000	8h5		FS2050-5162
	100,00	7,00	60,00	2	4,000	8h5		FS2050-5163
10,00	75,00	10,00	25,00	2	5,000	10h5	FS1050-5170	FS2050-5170
	90,00	10,00	40,00	2	5,000	10h5	FS1050-5180	FS2050-5180
12,00	85,00	12,00	30,00	2	6,000	12h5	FS1050-5190	FS2050-5190
	100,00	12,00	45,00	2	6,000	12h5	FS1050-5200	FS2050-5200

Application range:

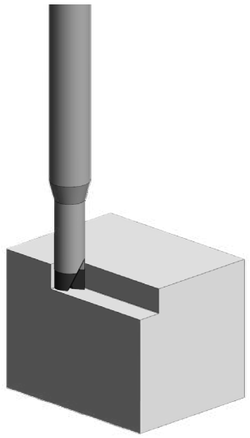
- **PCD** Aluminum <10%Si, Brass, Bronze, Ceramics Green, Copper Alloys, Graphite, Titanium (Roughing) ...
- **CVD-D** Aluminum >10% Si, Carbide >10% Co, CFRP/MQL, Copper, GFRP, Graphite fine, Glass Materials, Titanium (Finishing) ...

You will find further application ranges in the detailed overview from page 8.

Your Notes

Solid CBN Corner End Mills

Our CBN corner End Mills are used for the milling of hardened materials.



Application range for example:

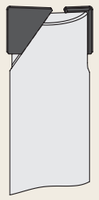
- Steel, hardened up to 72HRC
- Tool Steel hardened
- PM Steel, hardened up to 72HRC
- Components with the highest surface requirements
- Components with very low tolerances

CBN Corner End Mills and their advantages in overview:

Cutting Edge made of Solid CBN, brazed, straight toothed

- ✓ Best surfaces during finishing
- ✓ Very good heat dissipation
- ✓ Very stable
- ✓ Highest speeds possible
- ✓ From Ø 0,30 mm up to Ø 6,00 mm

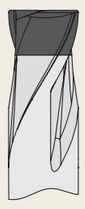
from page 32



Cutting Edge made of CBN, corner tipped, straight toothed

- ✓ Best surfaces
- ✓ Good heat dissipation
- ✓ High speeds possible
- ✓ From Ø 6,00 mm up to Ø 12,00 mm

from page 34



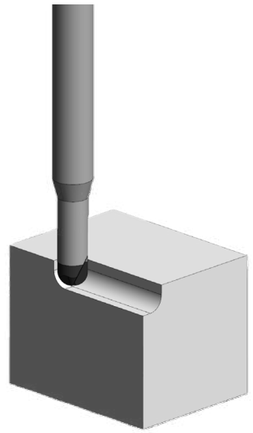
Cutting Edge made of Solid CBN, brazed with helix

- ✓ Best surfaces
- ✓ Ideally suited for roughing and finishing
- ✓ Very good heat dissipation
- ✓ Very stable
- ✓ Highest speeds possible
- ✓ From Ø 0,30 mm up to Ø 6,00 mm

from page 35

Solid CBN Ball Nose End Mills

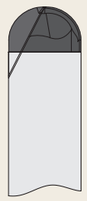
Our CBN ball nose End Mills are used for the milling of hardened materials.



Application range for example:

- Steel, hardened up to 72HRC
- Tool Steel hardened
- PM Steel, hardened up to 72HRC
- Components with the highest surface requirements
- Components with very low tolerances

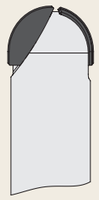
CBN Ball Nose End Mills and their advantages in overview:



Cutting Edge made of Solid CBN, brazed, straight toothed

- ✓ Best surfaces during finishing
- ✓ Very good heat dissipation
- ✓ Very stable
- ✓ Highest speeds possible
- ✓ From Ø 0,20 mm up to Ø 6,00 mm

from page 38



Cutting Edge made of CBN, corner tipped, straight toothed

- ✓ Best surfaces
- ✓ Good heat dissipation
- ✓ High speeds possible
- ✓ From Ø 6,00 mm up to Ø 12,00 mm

from page 39

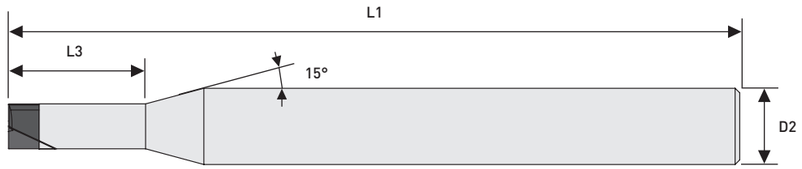
Cutting Edge made of Solid CBN, brazed with helix

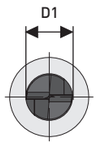
- ✓ Best surfaces
- ✓ Ideally suited for roughing and finishing
- ✓ Very good heat dissipation
- ✓ Very stable
- ✓ Highest speeds possible
- ✓ From Ø 0,20 mm up to Ø 6,00 mm

from page 40

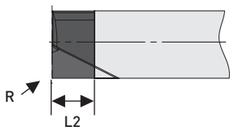
Corner End Mills

Solid CBN tipped | Ø0,30 - 6,00





over center



Blade tolerance: - 0,010
Radius tolerance: ± 0,005
Shank tolerance: - 0,003mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	CBN Item No. (New)
0,30	48,00	0,30	0,90	2	0,03	4h5	FS5940-0204
	48,00	0,30	0,90	2	0,05	4h5	FS5940-0210
0,40	48,00	0,40	1,20	2	0,03	4h5	FS5940-0216
	48,00	0,40	1,20	2	0,05	4h5	FS5940-0222
0,50	48,00	0,50	1,50	2	0,03	4h5	FS5940-0236
	48,00	0,50	1,50	2	0,05	4h5	FS5940-0246
1,00	48,00	1,00	2,00	2	0,03	4h5	FS5940-0262
	48,00	1,00	2,00	2	0,05	4h5	FS5940-0276
	48,00	1,00	2,00	2	0,10	4h5	FS5940-0290
	48,00	1,00	2,00	2	0,20	4h5	FS5940-0304
1,50	48,00	1,50	4,50	2	0,03	4h5	FS5940-0318
	48,00	1,50	4,50	2	0,05	4h5	FS5940-0322
2,00	48,00	1,50	6,00	2	0,03	4h5	FS5940-0334
	48,00	1,50	6,00	2	0,05	4h5	FS5940-0338
	48,00	1,50	6,00	2	0,10	4h5	FS5940-0342
	48,00	1,50	6,00	2	0,20	4h5	FS5940-0346
	48,00	1,50	6,00	2	0,30	4h5	FS5940-0350

D1	L1	L2	L3	Z	R	D2	CBN Item No. (New)
3,00	48,00	2,00	9,00	2	0,20	6h5	FS5940-0020
	48,00	2,00	9,00	2	0,30	6h5	FS5940-0022
	48,00	2,00	9,00	2	0,40	6h5	FS5940-0024
4,00	48,00	2,00	12,00	2	0,03	6h5	FS5940-0026
	48,00	2,00	12,00	2	0,20	6h5	FS5940-0028
	48,00	2,00	12,00	2	0,30	6h5	FS5940-0030
	48,00	2,00	12,00	2	0,50	6h5	FS5940-0032
6,00	58,00	2,00	20,00	2	0,03	6h5	FS5940-0042
	58,00	2,00	20,00	2	0,20	6h5	FS5940-0044
	58,00	2,00	20,00	2	0,30	6h5	FS5940-0046
	58,00	2,00	20,00	2	0,50	6h5	FS5940-0048

Application range

- **CBN:** Steel hardened up to 72HRC, Tool Steel hardened up to 72HRC, Solid Carbide >20%Co, Stellite, Inconel, Cast iron, Titanium, difficult to machine Steels ...

You will find further application ranges in the detailed overview from page 8.

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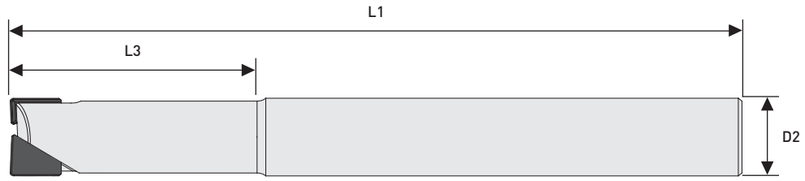
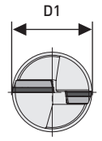
Subject to technical changes.

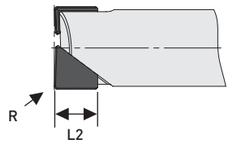
Corner End Mills

CBN edge tipped | Ø6,00 - 12,00





over center



Blade tolerance: - 0,010
Radius tolerance: ± 0,005
Shank tolerance: - 0,003mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	Item No. (CBN, New)
6,00	50,00	4,00	15,00	2	0,200	6h5	FS5950-0045
	50,00	4,00	15,00	2	0,300	6h5	FS5950-0046
8,00	60,00	4,00	20,00	2	0,300	8h5	FS5950-0050
	60,00	5,00	20,00	2	0,500	8h5	FS5950-0051
10,00	60,00	5,00	25,00	2	0,300	10h5	FS5950-0052
	60,00	5,00	25,00	2	0,800	10h5	FS5950-0053
12,00	70,00	5,00	25,00	2	1,000	12h5	FS5950-0054

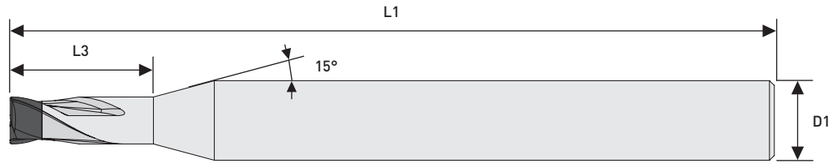
Application range

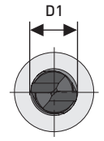
- **CBN**: Steel hardened up to 72HRC, Tool Steel hardened up to 72HRC, Solid Carbide >20%Co, Stellite, Inconel, Cast iron, Titanium, difficult to machine Steels ...

You will find further application ranges in the detailed overview from page 8.

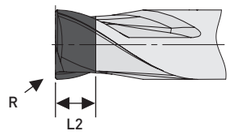
Corner End Mills

Solid CBN tipped with helix angle | Ø0,30 - 0,50





over center



Blade tolerance: - 0,010
Radius tolerance: ± 0,005
Shank tolerance: - 0,003mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	Item No. (CBN, New)
0,30	48,00	0,30	0,90	2	0,03	4h5	FS5940-2202
	48,00	0,30	0,90	2	0,05	4h5	FS5940-2206
	48,00	0,50	1,00	3	0,02	4h5	FS5940-2210
	48,00	0,50	1,00	3	0,05	4h5	FS5940-2214
0,40	48,00	0,40	1,20	2	0,03	4h5	FS5940-2218
	48,00	0,40	1,20	2	0,10	4h5	FS9540-2222
	48,00	0,50	1,20	3	0,05	4h5	FS5940-2226
	48,00	0,50	1,20	3	0,05	4h5	FS5940-2230
0,50	48,00	0,50	1,50	2	0,03	4h5	FS5940-2234
	48,00	0,50	1,50	2	0,10	4h5	FS5940-2238
	48,00	0,50	1,50	3	0,02	4h5	FS5940-2242
	48,00	0,50	1,50	3	0,10	4h5	FS5940-2246
	48,00	0,60	1,80	3	0,02	4h5	FS5940-2250
	48,00	0,60	1,80	3	0,10	4h5	FS5940-2254

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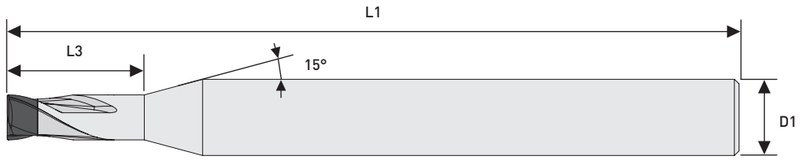
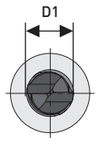
Subject to technical changes.

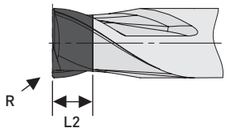
Corner End Mills

Solid CBN tipped with helix angle | Ø0,70 - 6,00





over center



Blade tolerance: - 0,010
Radius tolerance: ± 0,005
Shank tolerance: - 0,003mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	CBN Item No. (New)
0,70	48,00	0,70	2,10	3	0,02	4h6	FS5940-2258
	48,00	0,70	2,10	3	0,10	4h6	FS5940-2262
0,80	48,00	0,80	2,40	3	0,02	4h6	FS5940-2266
	48,00	0,80	2,40	3	0,10	4h6	FS5940-2270
0,90	48,00	0,90	2,70	3	0,02	4h6	FS5940-2274
	48,00	0,90	2,70	3	0,10	4h6	FS5940-2278
1,00	48,00	1,00	3,00	2	0,03	4h6	FS5940-2282
	48,00	1,00	3,00	2	0,10	4h6	FS5940-2294
	48,00	1,00	3,00	2	0,20	4h6	FS5940-2306
	48,00	1,00	3,00	3	0,02	4h6	FS5940-2316
	48,00	1,00	3,00	3	0,10	4h6	FS5940-2328
1,50	48,00	1,50	4,50	2	0,10	4h6	FS5940-2340
	48,00	1,50	4,50	2	0,10	4h6	FS5940-2344
	48,00	1,50	4,50	2	0,20	4h6	FS5940-2348
	48,00	1,50	4,50	3	0,02	4h6	FS5940-2350
	48,00	1,50	9,00	3	0,10	4h6	FS5940-2356
2,00	48,00	1,50	6,00	2	0,03	4h6	FS5940-2358
	48,00	1,50	6,00	2	0,10	4h6	FS5940-2362
	48,00	1,50	6,00	2	0,20	4h6	FS5940-2366
	48,00	1,50	6,00	2	0,30	4h6	FS5940-2370
2,00	48,00	1,50	6,00	3	0,02	4h6	FS5940-2372
	48,00	1,50	6,00	3	0,10	4h6	FS5940-2376
3,00	48,00	2,00	9,00	2	0,20	6h5	FS5940-2020
	48,00	2,00	9,00	2	0,30	6h5	FS5940-2022
	48,00	2,00	9,00	2	0,50	6h5	FS5940-2024
	48,00	1,50	9,00	3	0,02	6h5	FS5940-2026
	48,00	1,50	9,00	3	0,10	6h5	FS5940-2030
	48,00	1,50	9,00	3	0,20	6h5	FS5940-2034
	48,00	1,50	9,00	3	0,50	6h5	FS5940-2038
4,00	48,00	2,00	12,00	2	0,03	6h5	FS5940-2042
	48,00	2,00	12,00	2	0,10	6h5	FS5940-2044
	48,00	2,00	12,00	2	0,20	6h5	FS5940-2046
	48,00	2,00	12,00	2	0,30	6h5	FS5940-2048
	48,00	2,00	12,00	2	0,50	6h5	FS5940-2050
	58,00	2,00	20,00	3	0,05	6h5	FS5940-2052
	58,00	2,00	20,00	3	0,10	6h5	FS5940-2054
	58,00	2,00	20,00	3	0,20	6h5	FS5940-2056
	58,00	2,00	20,00	3	0,50	6h5	FS5940-2058
6,00	58,00	2,00	20,00	2	0,03	6h5	FS5940-2078
	58,00	2,00	20,00	2	0,10	6h5	FS5940-2080
	58,00	2,00	20,00	2	0,20	6h5	FS5940-2082
	58,00	2,00	20,00	2	0,30	6h5	FS5940-2084
	58,00	2,00	20,00	2	0,50	6h5	FS5940-2086
	68,00	2,00	30,00	3	0,05	6h5	FS5940-2088
	68,00	2,00	30,00	3	0,10	6h5	FS5940-2090
	68,00	2,00	30,00	3	0,20	6h5	FS5940-2092
	68,00	2,00	30,00	3	0,50	6h5	FS5940-2094

Application range

CBN: Steel hardened up to 72HRC, Tool Steel hardened up to 72HRC, Solid Carbide >20%Co, Stellite, Inconel, Cast iron, Titanium, difficult to machine Steels ...

You will find further application ranges in the detailed overview from page 8.

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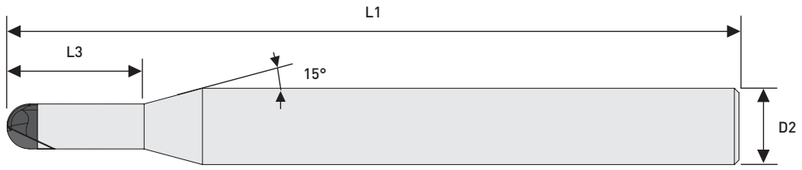
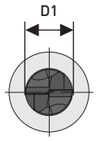
Subject to technical changes.

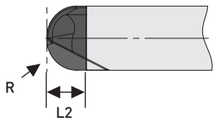
Ball Nose End Mills

Solid CBN tipped | Ø0,20 - 6,00





over center



Blade tolerance: - 0,010
Radius tolerance: ± 0,005
Shank tolerance: - 0,003mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	Item No.
0,20	48,00	0,20	0,60	2	0,10	4h5	FS5940-1202
0,30	48,00	0,30	0,90	2	0,10	4h5	FS5940-1206
0,40	48,00	0,40	1,20	2	0,20	4h5	FS5940-1210
0,50	48,00	0,50	1,50	2	0,25	4h5	FS5940-1214
0,60	48,00	0,60	1,80	2	0,30	4h5	FS5940-1218
0,80	48,00	0,80	2,40	2	0,40	4h5	FS5940-1222
1,00	48,00	1,00	3,00	2	0,50	4h5	FS5940-1226
1,50	48,00	1,50	4,50	2	0,75	4h5	FS5940-1238
2,00	48,00	1,50	6,00	2	1,00	4h5	FS5940-1250
3,00	48,00	2,00	9,00	2	1,50	6h5	FS5940-1028
4,00	48,00	2,50	12,00	2	2,00	6h5	FS5940-1030
6,00	48,00	3,50	20,00	2	3,00	6h5	FS5940-1034

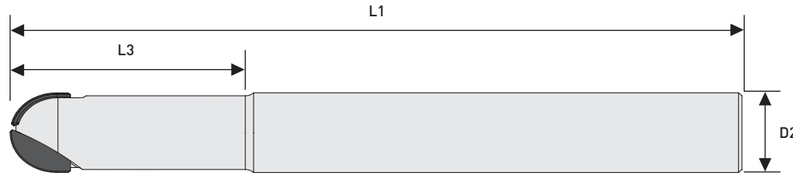
Application range

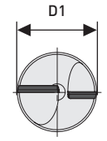
CBN: Steel hardened up to 72HRC, Tool Steel hardened up to 72HRC, Solid Carbide >20%Co, Stellite, Inconel, Cast iron, Titanium, difficult to machine Steels ...

You will find further application ranges in the detailed overview from page 8.

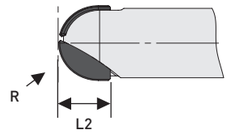
Ball Nose End Mills

CBN edge tipped | Ø6,00 - 12,00





over center



Blade tolerance: - 0,010
Radius tolerance: ± 0,005
Shank tolerance: - 0,003mm
Carbide shank

D1	L1	L2	L3	Z	R	D2	Item No.
6,00	50,00	4,00	12,00	2	3,00	6h5	FS5950-1035
8,00	63,00	5,00	20,00	2	4,00	8h5	FS5950-1036
10,00	90,00	6,00	25,00	2	5,00	10h5	FS5950-1038
12,00	85,00	7,00	30,00	2	6,00	12h5	FS5950-1040

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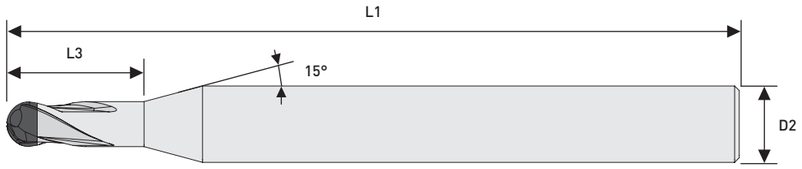
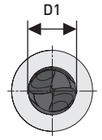
Subject to technical changes.

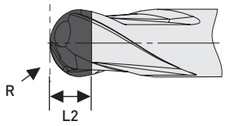
Ball Nose End Mills

Solid CBN tipped with helix angle | Ø0,20 - 6,00





over center



Blade tolerance: - 0,010
Radius tolerance: ± 0,005
Shank tolerance: - 0,003mm
Carbide shank

CBN

D1	L1	L2	L3	Z	R	D2	Item No.
0,20	48,00	0,20	0,60	2	0,10	4h5	FS5940-3202
0,30	48,00	0,30	0,90	2	0,15	4h5	FS5940-3206
0,40	48,00	0,40	1,20	2	0,20	4h5	FS5940-3210
0,50	48,00	0,50	1,50	2	0,25	4h5	FS5940-3214
0,60	48,00	0,60	1,80	2	0,30	4h5	FS5940-3218
0,80	48,00	0,80	2,40	2	0,40	4h5	FS5940-3222
1,00	48,00	1,00	3,00	2	0,50	4h5	FS5940-3226
1,50	48,00	1,50	4,50	2	0,75	4h5	FS5940-3246
2,00	48,00	2,00	6,00	2	1,00	4h5	FS5940-3258
1,00	48,00	1,00	2,00	3	0,50	6h5	FS5940-3016
1,50	48,00	1,50	3,00	3	0,75	6h5	FS5940-3024
2,00	48,00	1,50	4,00	3	1,00	6h5	FS5940-3032
3,00	48,00	2,00	9,00	2	1,50	6h5	FS5940-3034
3,00	48,00	2,00	6,00	3	1,50	6h5	FS5940-3036
4,00	48,00	2,50	12,00	2	2,00	6h5	FS5940-3038
6,00	58,00	3,50	20,00	2	3,00	6h5	FS5940-3042

Application range

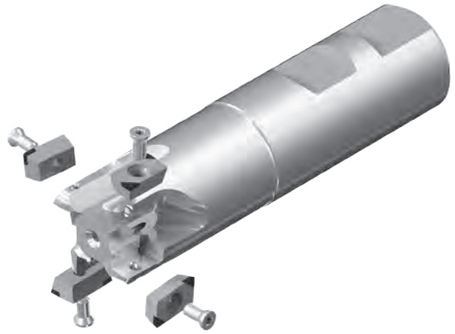
● **CBN:** Steel hardened up to 72HRC, Tool Steel hardened up to 72HRC, Solid Carbide >20%Co, Stellite, Inconel, Cast iron, Titanium, difficult to machine Steels ...

You will find further application ranges in the detailed overview from page 8.

Your Notes

End Mill with Indexable Inserts

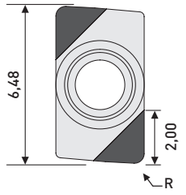
Highly economical milling system from ø10 - ø25mm, developed for use with Diamond and CBN inserts.
The system can be clamped in collet, Weldon and especially in Hydraulic Expansion chucks.



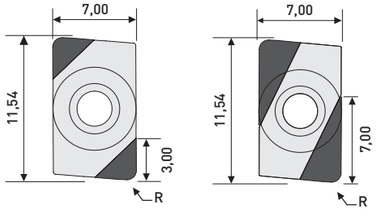
Due to multiple cutting edges, the inserts are particularly economical in use.

Short and long cutting edges available

AOEX 04...



AOEX 07...



Radius:

- R 0,2 mm
- R 0,4 mm
- R 0,8 mm
- R 1,2 mm
- R 1,6 mm
- Special versions possible

Available cutting materials for the machining of...

PCD
Aluminum
Brass
Plastics
Carbide
Copper
GFRP / CFRP
Ceramics
Other non-ferrous materials

CVD-D

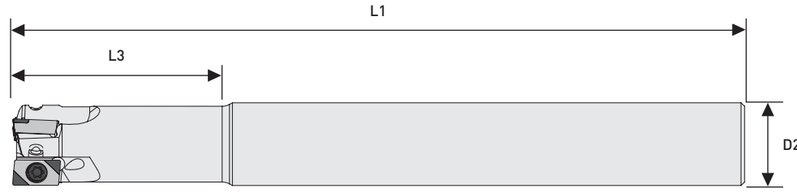
H
Steel, hardened
Tool Steel, hardened
PM Steel up to 72HRC
Carbide-Steel Composite
Stellite
Grey Cast Iron
Ductile Cast Iron
Inconel

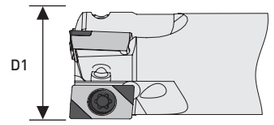
X

K
Ni-, Co-, Fe- and Cr-Alloys

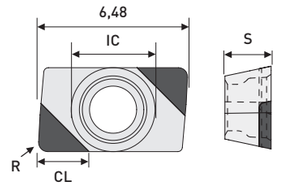
Face and Corner End Mills

for indexable inserts | Ø10,00 - 14,00





D1	D2	L1	L3	z	n max	Item No.	Screws	Key
10,00	10h6	100,00	28,00	2	36.000	FW7060-0050	01-SP9090-0186	01-SP9091-0090
12,00	12h6	100,00	30,00	3	36.000	FW7060-0055	01-SP9090-0188	01-SP9091-0090
14,00	12h6	120,00	32,00	3	36.000	FW7060-0060	01-SP9090-0188	01-SP9091-0090



CL 2,00 mm
2-edge tipped

ISO Code	IC	S	R	PCD Item No.	CVD-D Item No.	CBN-H Item No.	CBN-X Item No. (New)	CBN-K Item No.
AOEX 040202	3,65	2,38	0,20	MI1010-0020	MI2010-0020	MI5010-0020	MI5910-0020	MI5510-0020
AOEX 040204	3,65	2,38	0,40	MI1010-0025	MI2010-0025	MI5010-0025	MI5910-0025	MI5510-0025
AOEX 040208	3,65	2,38	0,80	MI1010-0030	MI2010-0030	MI5010-0030	MI5910-0030	MI5510-0030

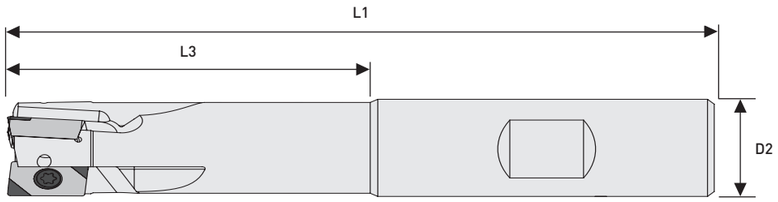
Application range:

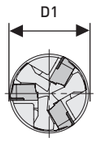
- **PCD** Aluminum < 10% Si, Brass, Graphite coarse-grained, Plastics, Zinc ...
- **CVD-D** Aluminum > 10% Si, Carbide > 8% Co, Copper, GFRP/CFRP, Glass Materials, Graphite fine-grained, Titanium (Finishing) ...
- **CBN-H** Steel, hardened up to 72 HRC ...
- **CBN-X** Tool Steel up to 72 HRC, Stellite, powder metallurgical Steel, Stainless Steel hardened, Ni-, Co-, Fe- and Cr-Alloys ...
- **CBN-K** Grey Cast Iron (GG), Ductile Cast Iron (GGG) ...

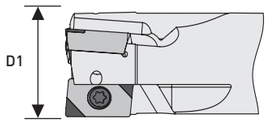
Subject to technical changes.

90° Weldon End Mill

for indexable inserts | Ø16,00 - 25,00







Cylindrical shank with weldon surface
with inner coolant
90° up to 7mm

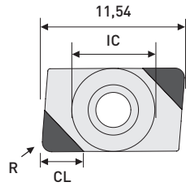
D1	D2	L1	L3	Z	n max	Item No.
16,00	16h6	80,00	30,00	2	32.000	FW7060-0100
	16h6	90,00	40,00	2	32.000	FW7060-0105
20,00	20h6	95,00	40,00	3	28.000	FW7060-0110
	20h6	105,00	50,00	3	28.000	FW7060-0115
25,00	25h6	110,00	50,00	3	24.000	FW7060-0120
	25h6	135,00	75,00	3	24.000	FW7060-0125
	25h6	110,00	50,00	4	24.000	FW7060-0130
	25h6	135,00	75,00	4	24.000	FW7060-0135

Application range:

- **PCD** Aluminum < 10% Si, Brass, Graphite coarse-grained, Plastics, Zinc ...
- **CVD-D** Aluminum > 10% Si, Carbide > 8% Co, Copper, GFRP/CFRP, Glass Materials, Graphite fine-grained, Titanium (Finishing) ...
- **CBN-H** Steel, hardened up to 72 HRC ...
- **CBN-X** Tool Steel up to 72 HRC, Stellite, powder metallurgical Steel, Stainless Steel hardened, Ni-, Co-, Fe- and Cr-Alloys ...
- **CBN-K** Grey Cast Iron (GG), Ductile Cast Iron (GGG) ...

You will find further application ranges in the detailed overview from page 8.

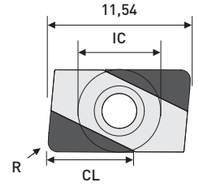
for face milling



CL 3,00 mm
2-edge tipped

ISO Code	IC	S	R	PCD Item No.	CVD-D Item No.	CBN-H Item No.	CBN-X Item No. (New)	CBN-K Item No.
AOEX 07T302	7,00	3,97	0,20	MI1010-0050	MI2010-0050	MI5010-0050	MI5910-0050	MI5510-0050
AOEX 07T304	7,00	3,97	0,40	MI1010-0055	MI2010-0055	MI5010-0055	MI5910-0055	MI5510-0055
AOEX 07T308	7,00	3,97	0,80	MI1010-0060	MI2010-0060	MI5010-0060	MI5910-0060	MI5510-0060
AOEX 07T312	7,00	3,97	1,20	MI1010-0064	MI2010-0064	MI5010-0064	MI5910-0064	MI5510-0064
AOEX 07T316	7,00	3,97	1,60	MI1010-0065	MI2010-0065	MI5010-0065	MI5910-0065	MI5510-0065

for corner milling



CL 7,00 mm
2-edge tipped

ISO Code	IC	S	R	PCD Item No.	CVD-D Item No.	CBN-H Item No.	CBN-X Item No. (New)	CBN-K Item No.
AOEX 07T302	7,00	3,97	0,20	MI1025-0050	MI2025-0050	MI5025-0050	MI5925-0050	MI5525-0050
AOEX 07T304	7,00	3,97	0,40	MI1025-0055	MI2025-0055	MI5025-0055	MI5925-0055	MI5525-0055
AOEX 07T308	7,00	3,97	0,80	MI1025-0060	MI2025-0060	MI5025-0060	MI5925-0060	MI5525-0060
AOEX 07T312	7,00	3,97	1,20	MI1025-0064	MI2025-0064	MI5025-0064	MI5925-0064	MI5525-0064
AOEX 07T316	7,00	3,97	1,60	MI1025-0065	MI2025-0065	MI5025-0065	MI5925-0065	MI5525-0065

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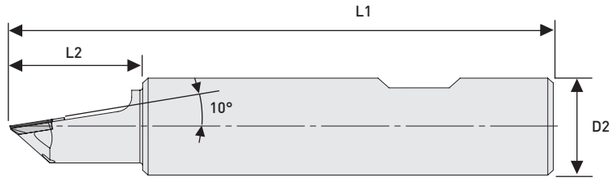
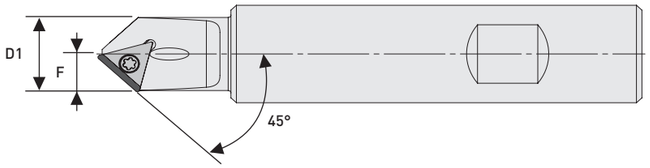
Subject to technical changes.

45° End Mill for Chamfering

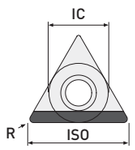
for indexable inserts





Steel Shank with Weldon surface
with internal cooling

Dmin	Dmax	D1	D2	L1	L2	F	Item No. New
0,40	20,00	15,20	20h6	99,00	24,00	7,60	FW8560-0200



entire edge

ISO Code	IC	S	R	PCD Item No. New	CVD-D Item No. New	CBN-H Item No. New	CBN-X Item No. New	CBN-K Item No. New
TXGW 11T104	6,35	1,98	0,40	MI1020-0105	MI2020-0105	MI5020-0105	MI5520-0105	MI5920-0105

Application range:

- **PCD** Aluminum < 10% Si, Brass, Graphite coarse-grained, Plastics, Zinc ...
- **CVD-D** Aluminum > 10% Si, Carbide > 8% Co, Copper, GFRP/CFRP, Glass Materials, Graphite fine-grained, Titanium (Finishing) ...
- **CBN-H** Steel, hardened up to 72 HRC ...
- **CBN-X** Tool Steel up to 72 HRC, Stellite, powder metallurgical Steel, Stainless Steel hardened, Ni-, Co-, Fe- and Cr-Alloys ...
- **CBN-K** Grey Cast Iron (GG), Ductile Cast Iron (GGG) ...

You will find further application ranges in the detailed overview from page 8.

Your Notes

TYcarb Advanced Materials Made in Germany

Cutting Parameters

for our PCD Corner End Mills

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

TVCarb Advanced Materials Made in Germany

Material	PCD Corner End Mills											
	Ø1,00 - 2,50						Ø3,00 - 5,00					
	n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
Acryl (PMMA)	12.000	96.000	0,002	0,02	0,01	0,60	8.000	96.000	0,002	0,03	0,01	1,50
Al Si <6%, Zinc	10.000	96.000	0,002	0,025	0,01	0,60	8.000	96.000	0,002	0,08	0,01	1,50
AlSi >6 - 12%	9.000	96.000	0,002	0,015	0,01	0,60	8.000	96.000	0,002	0,06	0,01	1,50
AlSi >10%	8.000	80.000	0,002	0,012	0,01	0,50	6.000	72.000	0,002	0,05	0,01	1,00
Brass	18.000	96.000	0,002	0,02	0,01	0,50	12.000	96.000	0,002	0,05	0,01	1,00
Composite (CFRP,GFRP)	30.000	80.000	0,002	0,01	0,01	0,50	20.000	64.000	0,006	0,03	0,01	1,20
Copper	18.000	96.000	0,002	0,02	0,01	0,60	12.000	96.000	0,002	0,05	0,01	1,50
Gold, Silver, Platinum	18.000	96.000	0,002	0,02	0,01	0,60	12.000	96.000	0,002	0,05	0,01	1,50
Graphite	24.000	96.000	0,002	0,02	0,01	0,60	18.000	96.000	0,002	0,03	0,01	1,50
Laminates	30.000	80.000	0,002	0,01	0,01	0,50	21.600	56.000	0,006	0,03	0,01	1,20
PA66- Gf/GF30	18.000	96.000	0,002	0,02	0,01	0,60	15.000	80.000	0,002	0,03	0,01	1,50
PEEK	18.000	80.000	0,002	0,015	0,01	0,50	15.000	96.000	0,002	0,03	0,01	1,50
PTFE, POM	22.000	96.000	0,002	0,02	0,01	0,60	18.000	96.000	0,002	0,035	0,01	1,50
Titanium	15.000	48.000	0,002	0,01	0,01	0,10	12.000	24.000	0,003	0,01	0,01	0,30
Tungsten Copper	14.000	80.000	0,002	0,012	0,01	0,30	10.000	80.000	0,002	0,03	0,01	1,00
Zirconium	on request											

Material	PCD Corner End Mills												Cooling				
	Ø6,00 - 10,00						Ø12,00 - 20,00										
	n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]						
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	Dry	Air	Emulsion	Oil	MQL
Acryl (PMMA)	5.000	64.000	0,002	0,10	0,01	3,00	5.000	32.000	0,002	0,18	0,01	12,00		2. Choice	1. Choice		
Al Si <6%, Zinc	6.000	72.000	0,002	0,15	0,01	3,00	8.000	48.000	0,002	0,20	0,01	12,00			1. Choice	3. Choice	2. Choice
AlSi >6 - 12%	5.000	64.000	0,002	0,12	0,01	3,00	5.000	40.000	0,002	0,20	0,01	12,00			1. Choice	3. Choice	2. Choice
AlSi >10%	5.000	36.000	0,002	0,10	0,01	2,00	5.000	24.000	0,002	0,18	0,01	6,00			1. Choice	3. Choice	2. Choice
Brass	7.000	72.000	0,002	0,08	0,01	3,00	5.000	64.000	0,002	0,12	0,01	12,00			1. Choice	3. Choice	2. Choice
Composite (CFRP,GFRP)	20.000	48.000	0,03	0,10	0,03	3,00	6.000	28.000	0,05	0,20	0,03	15,00		1. Choice	2. Choice		
Copper	7.000	72.000	0,002	0,08	0,01	3,00	5.000	64.000	0,002	0,10	0,01	12,00			1. Choice	3. Choice	2. Choice
Gold, Silver, Platinum	7.000	72.000	0,002	0,08	0,01	3,00	5.000	64.000	0,002	0,12	0,01	12,00			1. Choice	3. Choice	2. Choice
Graphite	15.000	80.000	0,002	0,12	0,01	3,00	12.000	64.000	0,002	0,15	0,01	12,00		1. Choice	2. Choice		
Laminates	18.000	48.000	0,03	0,10	0,03	3,00	6.000	28.000	0,05	0,20	0,03	15,00	2. Choice	1. Choice			
PA66- Gf/GF30	12.000	48.000	0,002	0,08	0,01	3,00	9.600	24.000	0,002	0,15	0,01	12,00		2. Choice	1. Choice		
PEEK	12.000	56.000	0,002	0,06	0,01	3,00	12.000	28.000	0,002	0,12	0,01	12,00		2. Choice	1. Choice		
PTFE, POM	14.000	56.000	0,002	0,08	0,01	3,00	14.400	28.000	0,002	0,18	0,01	12,00		2. Choice	1. Choice		
Titanium	10.000	17.600	0,004	0,10	0,01	1,00	4.800	9.600	0,004	0,18	0,01	2,00		3. Choice	1. Choice		2. Choice
Tungsten Copper	6.000	64.000	0,002	0,06	0,01	2,00	4.000	48.000	0,002	0,10	0,01	6,00			1. Choice	3. Choice	2. Choice
Zirconium	on request												on request				

Cutting Parameters

for our PCD Ball Nose End Mills

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

TVcarb Advanced Materials Made in Germany

Material	PCD Ball Nose End Mills											
	Ø1,00 - 2,50						Ø3,00 - 5,00					
	n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
Acryl (PMMA)	22.000	96.000	0,002	0,02	0,01	0,40	18.000	96.000	0,002	0,03	0,01	1,50
Al Si <6%, Zinc	36.000	96.000	0,002	0,025	0,01	0,40	30.000	96.000	0,002	0,08	0,01	1,50
AlSi >6 - 12%	36.000	96.000	0,002	0,015	0,01	0,40	30.000	96.000	0,002	0,06	0,01	1,50
AlSi >10%	30.000	80.000	0,002	0,012	0,01	0,25	24.000	72.000	0,002	0,05	0,01	1,00
Brass	18.000	96.000	0,002	0,02	0,01	0,40	12.000	96.000	0,002	0,05	0,01	1,50
Composite (CFRP,GFRP)	30.000	80.000	0,002	0,01	0,01	0,40	22.000	64.000	0,006	0,03	0,01	2,00
Copper	18.000	96.000	0,002	0,02	0,01	0,40	12.000	96.000	0,002	0,05	0,01	1,50
Gold, Silver, Platinum	18.000	96.000	0,002	0,02	0,01	0,40	12.000	96.000	0,002	0,05	0,01	1,50
Graphite	24.000	96.000	0,002	0,02	0,01	0,40	18.000	96.000	0,002	0,03	0,01	5,00
Laminates	30.000	80.000	0,002	0,01	0,01	0,40	22.000	56.000	0,006	0,03	0,01	5,00
PA66- Gf/GF30	18.000	96.000	0,002	0,02	0,01	0,30	15.000	80.000	0,002	0,03	0,01	1,00
PEEK	18.000	80.000	0,002	0,015	0,01	0,40	15.000	96.000	0,002	0,03	0,01	1,50
PTFE, POM	22.000	96.000	0,002	0,02	0,01	0,40	18.000	96.000	0,002	0,035	0,01	1,50
Titanium	15.000	48.000	0,002	0,01	0,01	0,20	12.000	24.000	0,003	0,01	0,01	0,30
Tungsten Copper	15.000	80.000	0,002	0,012	0,01	0,25	10.000	80.000	0,002	0,03	0,01	1,00
Zirconium	on request											

Material	PCD Ball Nose End Mills												Cooling				
	Ø6,00 - 10,00						Ø12,00 - 20,00										
	n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]						
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	Dry	Air	Emulsion	Oil	MQL
Acryl (PMMA)	15.000	64.000	0,002	0,10	0,01	2,00	12.000	32.000	0,002	0,18	0,01	4,00		2. Choice	1. Choice		
Al Si <6%, Zinc	22.000	72.000	0,002	0,15	0,01	3,00	15.000	48.000	0,002	0,20	0,01	5,00			1. Choice	3. Choice	2. Choice
AlSi >6 - 12%	22.000	64.000	0,002	0,12	0,01	3,00	15.000	40.000	0,002	0,20	0,01	5,00			1. Choice	3. Choice	2. Choice
AlSi >10%	18.000	36.000	0,002	0,10	0,01	2,00	12.000	24.000	0,002	0,18	0,01	3,00			1. Choice	3. Choice	2. Choice
Brass	8.000	72.000	0,002	0,08	0,01	3,00	5.000	64.000	0,002	0,12	0,01	3,00			1. Choice	3. Choice	2. Choice
Composite (CFRP,GFRP)	20.000	48.000	0,03	0,10	0,03	3,00	6.000	28.000	0,05	0,20	0,03	4,00		1. Choice	2. Choice		
Copper	8.000	72.000	0,002	0,08	0,01	3,00	5.000	64.000	0,002	0,10	0,01	3,00			1. Choice	3. Choice	2. Choice
Gold, Silver, Platinum	8.000	72.000	0,002	0,08	0,01	3,00	5.000	64.000	0,002	0,12	0,01	3,00			1. Choice	3. Choice	2. Choice
Graphite	15.000	80.000	0,002	0,12	0,01	3,00	12.000	64.000	0,002	0,15	0,01	4,00		1. Choice	2. Choice		
Laminates	20.000	48.000	0,03	0,10	0,03	1,00	6.000	28.000	0,05	0,20	0,03	2,00	2. Choice	1. Choice			
PA66- Gf/GF30	12.000	48.000	0,002	0,08	0,01	1,00	10.000	24.000	0,002	0,15	0,01	3,00		2. Choice	1. Choice		
PEEK	12.000	56.000	0,002	0,06	0,01	2,00	12.000	28.000	0,002	0,12	0,01	4,00		2. Choice	1. Choice		
PTFE, POM	15.000	56.000	0,002	0,08	0,01	2,00	15.000	28.000	0,002	0,18	0,01	4,00		2. Choice	1. Choice		
Titanium	10.000	18.000	0,004	0,10	0,01	0,80	5.000	10.000	0,004	0,18	0,01	1,00		3. Choice	1. Choice		2. Choice
Tungsten Copper	6.000	64.000	0,002	0,06	0,01	1,00	4.000	48.000	0,002	0,10	0,01	2,00			1. Choice	3. Choice	2. Choice
Zirconium	on request												on request				

Subject to technical changes.

Cutting Parameters

for our CVD-D Corner End Mills

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

TYcarb Advanced Materials Made in Germany

Material	CVD-D Corner End Mills																					
	Ø0,90 - 2,50						Ø3,00 - 5,00						Ø6,00 - 10,00						Ø12,00 - 20,00						Cooling				
	n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]						
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	Dry	Air	Emulsion	Oil	MQL
Acryl PMMA)	18.000	120.000	0,002	0,02	0,01	0,60	15.000	120.000	0,002	0,03	0,01	1,50	12.000	80.000	0,002	0,10	0,01	3,00	10.000	40.000	0,002	0,18	0,01	12,00		2. Choice	1. Choice		
Al Si <6%, Zinc	30.000	120.000	0,002	0,025	0,01	0,60	25.000	120.000	0,002	0,08	0,01	1,50	18.000	90.000	0,002	0,15	0,01	3,00	12.000	60.000	0,002	0,20	0,01	12,00			1. Choice	3. Choice	2. Choice
AlSi >6 - 12%	30.000	120.000	0,002	0,015	0,01	0,60	25.000	120.000	0,002	0,06	0,01	1,50	18.000	80.000	0,002	0,12	0,01	3,00	12.000	50.000	0,002	0,2	0,01	12,00			1. Choice	3. Choice	2. Choice
AlSi >10%	25.000	100.000	0,002	0,012	0,01	0,50	20.000	90.000	0,002	0,05	0,01	1,00	15.000	45.000	0,002	0,10	0,01	2,00	10.000	30.000	0,002	0,18	0,01	6,00			1. Choice	3. Choice	2. Choice
Brass	15.000	120.000	0,002	0,02	0,01	0,50	10.000	120.000	0,002	0,05	0,01	1,00	6.000	90.000	0,002	0,08	0,01	3,00	4.000	80.000	0,002	0,12	0,01	12,00			1. Choice	3. Choice	2. Choice
Carbide	on request												on request												on request				
Composite (CFRP,GFRP)	25.000	100.000	0,002	0,01	0,01	0,50	18.000	80.000	0,006	0,03	0,01	1,20	16.000	60.000	0,03	0,10	0,03	3,00	5.000	35.000	0,05	0,2	0,03	15,00		1. Choice	2. Choice		
Copper	15.000	120.000	0,002	0,02	0,01	0,60	10.000	120.000	0,002	0,05	0,01	1,50	6.000	90.000	0,002	0,08	0,01	3,00	4.000	80.000	0,002	0,1	0,01	12,00			1. Choice	3. Choice	2. Choice
Gold, Silver, Platinum	15.000	120.000	0,002	0,02	0,01	0,60	10.000	120.000	0,002	0,05	0,01	1,50	6.000	90.000	0,002	0,08	0,01	3,00	4.000	80.000	0,002	0,12	0,01	12,00			1. Choice	3. Choice	2. Choice
Graphite	20.000	120.000	0,002	0,02	0,01	0,60	15.000	120.000	0,002	0,03	0,01	1,50	12.000	100.000	0,002	0,12	0,01	3,00	10.000	80.000	0,002	0,15	0,01	12,00		1. Choice	2. Choice		
Laminates	25.000	100.000	0,002	0,01	0,01	0,50	18.000	70.000	0,006	0,03	0,01	1,20	16.000	60.000	0,03	0,10	0,03	3,00	5.000	35.000	0,05	0,2	0,03	15,00	2. Choice	1. Choice			
PA66- Gf/GF30	15.000	120.000	0,002	0,02	0,01	0,60	12.000	100.000	0,002	0,03	0,01	1,50	10.000	60.000	0,002	0,08	0,01	3,00	8.000	30.000	0,002	0,15	0,01	12,00		2. Choice	1. Choice		
PEEK	15.000	100.000	0,002	0,015	0,01	0,50	12.000	120.000	0,002	0,03	0,01	1,50	10.000	70.000	0,002	0,06	0,01	3,00	10.000	35.000	0,002	0,12	0,01	12,00		2. Choice	1. Choice		
PTFE, POM	18.000	120.000	0,002	0,02	0,01	0,6	15.000	120.000	0,002	0,035	0,01	1,5	12.000	70.000	0,002	0,08	0,01	3,00	12.000	35.000	0,002	0,18	0,01	12,00		2. Choice	1. Choice		
Titanium	12.000	60.000	0,002	0,01	0,01	0,10	10.000	30.000	0,003	0,01	0,01	0,30	8.000	22.000	0,004	0,10	0,01	1,00	4.000	12.000	0,004	0,18	0,01	2,00		3. Choice	1. Choice		2. Choice
Tungsten Copper	12.000	100.000	0,002	0,012	0,01	0,30	8.000	100.000	0,002	0,03	0,01	1,00	5.000	80.000	0,002	0,06	0,01	2,00	3.000	60.000	0,002	0,1	0,01	6,00			1. Choice	3. Choice	2. Choice
Zirconium	on request												on request												on request				

Subject to technical changes.

Cutting Parameters

for our CVD-D Ball Nose End Mills

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

TVcarb Advanced Materials Made in Germany

Material	CVD-D Ball Nose End Mills											
	Ø0,90 - 2,50						Ø3,00 - 5,00					
	n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
Acryl (PMMA)	18.000	120.000	0,002	0,02	0,01	0,40	15.000	120.000	0,002	0,03	0,01	1,50
Al Si <6%, Zinc	30.000	120.000	0,002	0,025	0,01	0,40	25.000	120.000	0,002	0,08	0,01	1,50
AlSi >6 - 12%	30.000	120.000	0,002	0,015	0,01	0,40	25.000	120.000	0,002	0,06	0,01	1,50
AlSi >10%	25.000	100.000	0,002	0,012	0,01	0,25	20.000	90.000	0,002	0,05	0,01	1,00
Brass	15.000	120.000	0,002	0,02	0,01	0,40	10.000	120.000	0,002	0,05	0,01	1,50
Carbide	on request											
Composite (CFRP,GFRP)	25.000	100.000	0,002	0,01	0,01	0,40	18.000	80.000	0,006	0,03	0,01	2,00
Copper	15.000	120.000	0,002	0,02	0,01	0,40	10.000	120.000	0,002	0,05	0,01	1,50
Gold, Silver, Platinum	15.000	120.000	0,002	0,02	0,01	0,40	10.000	120.000	0,002	0,05	0,01	1,50
Graphite	20.000	120.000	0,002	0,02	0,01	0,40	15.000	120.000	0,002	0,03	0,01	5,00
Laminates	25.000	100.000	0,002	0,01	0,01	0,40	18.000	70.000	0,006	0,03	0,01	5,00
PA66- Gf/GF30	15.000	120.000	0,002	0,02	0,01	0,30	12.000	100.000	0,002	0,03	0,01	1,00
PEEK	15.000	100.000	0,002	0,015	0,01	0,40	12.000	120.000	0,002	0,03	0,01	1,50
PTFE, POM	18.000	120.000	0,002	0,02	0,01	0,40	15.000	120.000	0,002	0,035	0,01	1,50
Titanium	12.000	60.000	0,002	0,01	0,01	0,20	10.000	30.000	0,003	0,01	0,01	0,30
Tungsten Copper	12.000	100.000	0,002	0,012	0,01	0,25	8.000	100.000	0,002	0,03	0,01	1,00
Zirconium	on request											

CVD-D Ball Nose End Mills												Cooling				
Ø6,00 - 10,00						Ø12,00 - 20,00										
n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]						
min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	Dry	Air	Emulsion	Oil	MQL
12.000	80.000	0,002	0,10	0,01	2,00	10.000	40.000	0,002	0,18	0,01	4,00		2. Choice	1. Choice		
18.000	90.000	0,002	0,15	0,01	3,00	12.000	60.000	0,002	0,20	0,01	5,00			1. Choice	3. Choice	2. Choice
18.000	80.000	0,002	0,12	0,01	3,00	12.000	50.000	0,002	0,20	0,01	5,00			1. Choice	3. Choice	2. Choice
15.000	45.000	0,002	0,10	0,01	2,00	10.000	30.000	0,002	0,18	0,01	3,00			1. Choice	3. Choice	2. Choice
6.000	90.000	0,002	0,08	0,01	3,00	4.000	80.000	0,002	0,12	0,01	3,00			1. Choice	3. Choice	2. Choice
on request												on request				
16.000	60.000	0,03	0,10	0,03	3,00	5.000	35.000	0,05	0,20	0,03	4,00		1. Choice	2. Choice		
6.000	90.000	0,002	0,08	0,01	3,00	4.000	80.000	0,002	0,10	0,01	3,00			1. Choice	3. Choice	2. Choice
6.000	90.000	0,002	0,08	0,01	3,00	4.000	80.000	0,002	0,12	0,01	3,00			1. Choice	3. Choice	2. Choice
12.000	100.000	0,002	0,12	0,01	3,00	10.000	80.000	0,002	0,15	0,01	4,00		1. Choice	2. Choice		
16.000	60.000	0,03	0,10	0,03	1,00	5.000	35.000	0,05	0,20	0,03	2,00	2. Choice	1. Choice			
10.000	60.000	0,002	0,08	0,01	1,00	8.000	30.000	0,002	0,15	0,01	3,00		2. Choice	1. Choice		
10.000	70.000	0,002	0,06	0,01	2,00	10.000	35.000	0,002	0,12	0,01	4,00		2. Choice	1. Choice		
12.000	70.000	0,002	0,08	0,01	2,00	12.000	35.000	0,002	0,18	0,01	4,00		2. Choice	1. Choice		
8.000	22.000	0,004	0,10	0,01	0,80	4.000	12.000	0,004	0,18	0,01	1,00		3. Choice	1. Choice		2. Choice
5.000	80.000	0,002	0,06	0,01	1,00	3.000	60.000	0,002	0,10	0,01	2,00			1. Choice	3. Choice	2. Choice
on request												on request				

Subject to technical changes.

Cutting Parameters

for our UltraDiamond Corner End Mills

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

TYcarb Advanced Materials Made in Germany

Material	UltraDiamond Corner End Mills											
	Ø0,90 - 1,50						Ø2,00 - 3,00					
	n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
Acryl (PMMA)	18.000	120.000	0,002	0,02	0,01	0,30	15.000	120.000	0,002	0,03	0,01	0,50
Carbide <10% Co	on request											
Carbide with Ni Binder												
Gold, Silver	15.000	120.000	0,002	0,02	0,01	0,10	10.000	120.000	0,002	0,05	0,01	0,30
Platinum	15.000	120.000	0,002	0,02	0,01	0,10	10.000	120.000	0,002	0,05	0,01	0,30
Titanium	12.000	60.000	0,002	0,01	0,01	0,10	10.000	30.000	0,003	0,01	0,01	0,20
Tungsten Copper	12.000	100.000	0,002	0,012	0,01	0,10	8.000	100.000	0,002	0,03	0,01	0,30
Zirconium	on request											

UltraDiamond Corner End Mills													Cooling				
													Dry	Air	Emulsion	Oil	MQL
															1. Choice	2. Choice	3.Choice
													on request				
															1. Choice	2. Choice	3.Choice
															1. Choice	2. Choice	3.Choice
															1. Choice		2. Choice
															1. Choice	2. Choice	3.Choice
													on request				

Subject to technical changes.

Cutting Parameters

for our UltraDiamond Ball Nose End Mills

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

TYcarb Advanced Materials Made in Germany

Material	UltraDiamond Ball Nose End Mills											
	Ø0,90 - 1,50						Ø2,00 - 3,00					
	n [min⁻¹]		F_z [mm/rev]		a_p [mm]		n [min⁻¹]		F_z [mm/rev]		a_p [mm]	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
Acryl (PMMA)	18.000	120.000	0,002	0,02	0,01	0,20	15.000	120.000	0,002	0,03	0,01	0,50
Carbide <10% Co	on request											
Carbide with Ni Binder												
Gold, Silver	15.000	120.000	0,002	0,02	0,01	0,08	10.000	120.000	0,002	0,05	0,01	0,20
Platinum	15.000	120.000	0,002	0,02	0,01	0,08	10.000	120.000	0,002	0,05	0,01	0,20
Titanium	12.000	60.000	0,002	0,01	0,01	0,05	10.000	30.000	0,003	0,01	0,01	0,10
Tungsten Copper	12.000	100.000	0,002	0,012	0,01	0,08	8.000	100.000	0,002	0,03	0,01	0,20
Zirconium	on request											

Material	UltraDiamond Ball Nose End Mills												Cooling				
													Dry	Air	Emulsion	Oil	MQL
Acryl (PMMA)															1. Choice	2. Choice	3.Choice
Carbide <10% Co													on request				
Carbide with Ni Binder																	
Gold, Silver															1. Choice	2. Choice	3.Choice
Platinum															1. Choice	2. Choice	3.Choice
Titanium															1. Choice		2. Choice
Tungsten Copper															1. Choice	2. Choice	3.Choice
Zirconium													on request				

Cutting Parameters

for our CBN Corner End Mills

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Cooling

1.Choice: Air | 2.Choice: Emulsion

TYCarb Advanced Materials Made in Germany

		CBN Corner End Mills															
		Steel up to 55HRC								Steel and Tool Steel up to 60HRC							
		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]	
Ø	z	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
0,3	2	50.000	60.000	180	440	0,002	0,005	0,02	0,03	50.000	60.000	100	320	0,002	0,005	0,02	0,03
0,4	2	45.000	55.000	300	550	0,002	0,005	0,03	0,04	45.000	55.000	150	420	0,002	0,005	0,03	0,04
0,5	3	45.000	55.000	500	850	0,003	0,011	0,03	0,07	45.000	55.000	500	720	0,003	0,011	0,03	0,07
1,0	2	38.000	45.000	700	1.100	0,005	0,032	0,05	0,35	38.000	45.000	700	1.050	0,005	0,032	0,05	0,35
1,5	3	28.000	35.000	700	1.100	0,01	0,032	0,05	0,50	28.000	35.000	700	1050	0,01	0,032	0,05	0,50
2,0	2	19.000	23.000	700	1.100	0,01	0,042	0,10	0,60	19.000	23.000	700	1.050	0,01	0,042	0,10	0,60
3,0	3	14.000	18.000	700	1.100	0,01	0,042	0,10	0,80	14.000	18.000	700	1.050	0,01	0,042	0,10	0,80
4,0	2	11.000	13.000	800	1.150	0,02	0,055	0,20	1,00	11.000	13.000	800	1.150	0,02	0,055	0,20	1,00
5,0	3	11.000	13.000	800	1.150	0,02	0,055	0,20	1,50	11.000	13.000	800	1.150	0,02	0,055	0,20	1,50
6,0	2	9.000	12.000	900	1.250	0,02	0,06	0,20	3,00	9.000	12.000	900	1.250	0,02	0,06	0,20	3,00
8,0	2	7.000	12000	600	2.000	0,04	0,08	0,20	4,00	7.000	12.000	600	1.100	0,04	0,08	0,20	4,00
10,0	2	5.000	10.000	400	2.400	0,05	0,10	0,20	5,00	5.000	10.000	400	900	0,05	0,10	0,20	5,00
12,0	2	4.000	9.000	240	2.160	0,05	0,20	0,20	6,00	4.000	9.000	240	700	0,05	0,20	0,2	6,00
12,0	3	2.000	9.000	240	3.200	0,05	0,30	0,20	12,00	2.000	9.000	240	3.200	0,05	0,30	0,20	12,00
14,0	3	2.000	8.000	240	2.800	0,05	0,30	0,20	14,00	2.000	8.000	240	2.800	0,05	0,30	0,20	14,00
16,0	2	1.500	7.000	120	1.600	0,05	0,50	0,20	16,00	1.500	7.000	120	1.600	0,05	0,50	0,20	16,00
20,0	3	1.400	6.000	160	2.100	0,05	0,50	0,20	20,00	1.400	6.000	160	2.100	0,05	0,50	0,20	20,00
25,0	3	1.000	4.500	120	1.600	0,05	0,50	0,20	25,00	1.000	4.500	120	1.600	0,05	0,50	0,20	25,00
25,0	4	1.000	4.500	160	2.100	0,05	0,50	0,20	25,00	1.000	4.500	160	2.100	0,05	0,50	0,20	25,00

CBN Corner End Mills																	
Steel and Tool Steel up to 68HRC								Carbide									
n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]			
min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.		
50.000	60.000	80	270	0,001	0,003	0,02	0,03										
45.000	55.000	120	320	0,002	0,005	0,03	0,04										
45.000	55.000	400	620	0,002	0,005	0,03	0,07										
38.000	45.000	500	850	0,003	0,012	0,05	0,35										
28.000	35.000	600	900	0,008	0,022	0,05	0,50										
19.000	23.000	600	930	0,008	0,022	0,10	0,60										
14.000	18.000	600	950	0,01	0,032	0,10	0,80										
11.000	13.000	700	1.050	0,01	0,032	0,20	1,00										
11.000	13.000	700	1.050	0,015	0,035	0,20	1,50										
9.000	12.000	800	1.150	0,015	0,035	0,20	3,00	on request									
6.000	10.000	500	1.000	0,03	0,08	0,20	4,00										
5.000	8.000	400	900	0,04	0,10	0,20	5,00										
3.000	6.000	250	650	0,05	0,18	0,20	6,00										
3.000	6.000	240	1.800	0,05	0,20	0,20	12,00										
2.000	5.000	240	1.500	0,05	0,20	0,20	14,00										
1.500	4.000	120	800	0,05	0,25	0,20	16,00										
1.400	3.500	160	1.000	0,05	0,30	0,20	20,00										
1.000	3000	120	900	0,05	0,30	0,20	25,00										
1.000	3.000	160	1. 200	0,05	0,30	0,20	25,00										

Cutting Parameters

for our CBN Corner End Mills with Helix

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Cooling

1.Choice: Air | 2.Choice: Emulsion

TVCarb Advanced Materials Made in Germany

		CBN Corner End Mills Helix															
		Steel up to 55HRC								Steel and Tool Steel up to 60HRC							
		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]	
Ø	z	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
0,3	2	50.000	60.000	180	440	0,003	0,016	0,02	0,03	50.000	60.000	100	320	0,003	0,016	0,02	0,03
0,3	3	50.000	60.000	180	550	0,003	0,016	0,02	0,03	50.000	60.000	100	380	0,003	0,016	0,02	0,03
0,4	2	45.000	55.000	300	550	0,005	0,022	0,03	0,04	45.000	55.000	150	420	0,005	0,022	0,03	0,04
0,4	3	45.000	55.000	300	630	0,005	0,022	0,03	0,04	45.000	55.000	160	530	0,005	0,022	0,03	0,04
0,5	2	45.000	55.000	500	750	0,005	0,022	0,03	0,07	45.000	55.000	500	750	0,005	0,022	0,03	0,07
0,5	3	45.000	55.000	500	850	0,005	0,022	0,03	0,07	45.000	55.000	500	850	0,005	0,022	0,03	0,07
0,6	3	45.000	55.000	500	850	0,005	0,022	0,03	0,07	45.000	55.000	500	850	0,005	0,022	0,03	0,07
0,7	3	42.000	48.000	500	850	0,005	0,022	0,03	0,07	42.000	48.000	500	850	0,005	0,022	0,03	0,07
0,8	3	42.000	48.000	500	880	0,005	0,022	0,04	0,08	42.000	48.000	500	880	0,005	0,022	0,04	0,08
0,9	3	42.000	48.000	500	880	0,008	0,035	0,04	0,08	42.000	48.000	500	880	0,008	0,035	0,04	0,08
1,0	2	38.000	45.000	700	1.100	0,01	0,042	0,05	0,35	38.000	45.000	700	1.050	0,01	0,042	0,05	0,35
1,0	3	38.000	45.000	700	1.100	0,01	0,042	0,05	0,35	38.000	45.000	700	1.050	0,01	0,042	0,05	0,35
1,5	2	28.000	35.000	700	1.100	0,02	0,065	0,05	0,50	28.000	35.000	700	1.050	0,02	0,065	0,05	0,50
1,5	3	28.000	35.000	700	1.100	0,02	0,065	0,05	0,50	28.000	35.000	700	1.050	0,02	0,065	0,05	0,50
2,0	2	19.000	23.000	700	1.100	0,03	0,16	0,10	0,60	19.000	23.000	700	1.050	0,03	0,16	0,10	0,6
2,0	3	19.000	23.000	700	1.100	0,03	0,16	0,10	0,60	19.000	23.000	700	1.050	0,03	0,16	0,10	0,60
3,0	2	14.000	18.000	700	1.100	0,03	0,16	0,10	0,80	14.000	18.000	700	1.050	0,03	0,16	0,10	0,80
3,0	3	14.000	18.000	700	1100	0,03	0,16	0,10	0,80	14.000	18.000	700	1.050	0,03	0,16	0,10	0,80
4,0	2	11.000	13.000	800	1.150	0,05	0,25	0,20	1,00	11.000	13.000	800	1.200	0,05	0,25	0,20	1,00
4,0	3	11.000	1.3000	800	1.150	0,05	0,25	0,20	1,00	11.000	13.000	800	1.200	0,05	0,25	0,20	1,00
5,0	2	11.000	13.000	800	1.150	0,05	0,25	0,20	1,50	11.000	13.000	800	1.200	0,05	0,25	0,20	1,50
5,0	3	11.000	13.000	800	1.150	0,05	0,25	0,20	1,50	11.000	13.000	800	1.200	0,05	0,25	0,20	1,50
6,0	2	9.000	12.000	900	1.300	0,05	0,25	0,20	2,00	9.000	12.000	900	1.300	0,05	0,25	0,20	2,00
6,0	3	9.000	12.000	900	1.300	0,05	0,25	0,20	2,00	9.000	12.000	900	1.300	0,05	0,25	0,20	2,00

CBN Corner End Mills Helix																	
Steel and Tool Steel up to 68HRC										Carbide							
n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]	
min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
50.000	60.000	80	270	0,002	0,011	0,02	0,03								
50.000	60.000	80	330	0,002	0,011	0,02	0,03								
45.000	55.000	120	330	0,003	0,016	0,03	0,04								
45.000	55.000	120	380	0,003	0,016	0,03	0,04								
45.000	55.000	400	650	0,003	0,016	0,03	0,07								
45.000	55.000	400	780	0,003	0,016	0,03	0,07								
45.000	55.000	400	780	0,006	0,022	0,03	0,07								
42.000	48.000	400	780	0,006	0,022	0,03	0,07								
42.000	48.000	500	850	0,006	0,022	0,04	0,08								
42.000	48.000	500	850	0,006	0,032	0,04	0,08								
38.000	45.000	500	850	0,01	0,042	0,05	0,35								
38.000	45.000	500	950	0,01	0,042	0,05	0,35								
28.000	35.000	600	950	0,02	0,064	0,05	0,50								
28.000	35.000	600	1.100	0,02	0,064	0,05	0,50								
19.000	23.000	600	930	0,035	0,12	0,10	0,60								
19.000	23.000	600	1.100	0,035	0,12	0,10	0,60								
14.000	18.000	600	940	0,04	0,12	0,10	0,80								
14.000	18.000	600	1.100	0,04	0,12	0,10	0,80								
11.000	13.000	700	1.100	0,06	0,22	0,20	1,00								
11.000	13.000	700	1.100	0,06	0,22	0,20	1,00								
11.000	13.000	700	1.100	0,06	0,22	0,20	1,50								
11.000	13.000	700	1.150	0,06	0,22	0,20	1,50								
9.000	12.000	800	1.200	0,06	0,25	0,20	2,00								
9.000	12.000	800	1.200	0,06	0,25	0,20	2,00								

on request

Cutting Parameters

for our CBN Ball Nose End Mills

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Cooling

1.Choice: Air | 2.Choice: Emulsion

TVCarb Advanced Materials Made in Germany

		CBN Ball Nose End Mills															
		Steel up to 55HRC								Steel and Tool Steel up to 60HRC							
		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]	
Ø	Z	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
0,2	2	50.000	60.000	130	330	0,002	0,005	0,003	0,005	50.000	60.000	100	210	0,002	0,005	0,003	0,005
0,3	2	50.000	60.000	270	630	0,002	0,005	0,003	0,006	50.000	60.000	150	360	0,002	0,005	0,003	0,006
0,4	2	45.000	55.000	400	930	0,002	0,006	0,004	0,01	45.000	55.000	300	660	0,002	0,006	0,004	0,01
0,5	2	45.000	55.000	500	1.100	0,003	0,01	0,005	0,012	45.000	55.000	400	920	0,003	0,01	0,005	0,012
0,6	2	38.000	45.000	800	1.350	0,003	0,012	0,005	0,022	38.000	45.000	700	1.150	0,003	0,012	0,005	0,022
0,8	2	38.000	45.000	800	1.350	0,003	0,012	0,005	0,032	38.000	45.000	700	1.150	0,003	0,012	0,005	0,032
1,0	3	32.000	38.000	1.000	1.650	0,006	0,032	0,005	0,032	32.000	38.000	1050	1.650	0,005	0,02	0,005	0,032
1,2	2	32.000	38.000	1.000	1.650	0,006	0,032	0,006	0,034	32.000	38.000	950	1.550	0,006	0,022	0,006	0,034
1,4	2	28.000	32.000	1.100	1.850	0,006	0,032	0,006	0,035	28.000	32.000	1.100	1.650	0,007	0,022	0,006	0,035
1,5	2	28.000	32.000	1.100	1.850	0,006	0,032	0,006	0,035	28.000	32.000	1.100	1.650	0,008	0,03	0,006	0,035
1,6	2	24.000	28.000	1.100	1.850	0,006	0,035	0,006	0,035	24.000	28.000	1.100	1.650	0,008	0,032	0,006	0,035
1,8	2	24.000	28.000	1.200	2.100	0,006	0,035	0,006	0,035	24.000	28.000	1.200	1.850	0,01	0,032	0,006	0,035
2,0	2	20.000	22.000	1.300	2.100	0,01	0,042	0,008	0,05	20.000	22.000	1.300	2.100	0,01	0,04	0,008	0,05
3,0	2	14.000	16.000	1.100	1.550	0,01	0,042	0,01	0,055	14.000	16.000	1.100	1.600	0,01	0,042	0,01	0,055
4,0	2	11.000	15.000	1.000	1.300	0,02	0,055	0,02	0,075	11.000	15.000	900	1.250	0,018	0,05	0,02	0,075
5,0	2	11.000	15.000	1.000	1.300	0,02	0,055	0,02	0,075	11.000	15.000	900	1.250	0,018	0,052	0,02	0,075
6,0	2	9.000	12.000	1.000	1.300	0,02	0,06	0,05	0,10	9.000	12.000	900	1.300	0,02	0,055	0,05	0,10
8,0	2	7.000	11.000	700	1.100	0,03	0,12	0,05	0,15	7.000	10.000	700	1.100	0,03	0,12	0,05	0,15
10,0	2	6.000	10.000	500	900	0,03	0,18	0,06	0,20	5.000	8.000	500	900	0,03	0,18	0,06	0,20
12,0	2	4.000	8.000	400	700	0,05	0,25	0,08	0,25	4.000	6.000	400	700	0,05	0,25	0,08	0,25

		CBN Ball Nose End Mills															
		Steel and Tool Steel up to 68HRC								Carbide							
		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]	
Ø	Z	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
0,2	2	50.000	60.000	50	160	0,001	0,003	0,003	0,005								
0,3	2	50.000	60.000	80	260	0,001	0,003	0,003	0,006								
0,4	2	45.000	55.000	150	420	0,002	0,005	0,004	0,01								
0,5	2	45.000	55.000	200	620	0,002	0,005	0,005	0,012								
0,6	2	38.000	45.000	400	780	0,003	0,01	0,005	0,022								
0,8	2	38.000	45.000	400	780	0,003	0,012	0,005	0,032								
1,0	3	32.000	38.000	500	1.250	0,005	0,022	0,005	0,032								
1,2	2	32.000	38.000	500	1.050	0,005	0,022	0,006	0,034								
1,4	2	28.000	32.000	650	1.150	0,006	0,022	0,006	0,035								
1,5	2	28.000	32.000	650	1.150	0,006	0,022	0,006	0,035								
1,6	2	24.000	28.000	650	1.150	0,006	0,025	0,006	0,035								
1,8	2	24.000	28.000	800	1.350	0,006	0,025	0,006	0,035								
2,0	2	20.000	22.000	800	1.350	0,006	0,025	0,008	0,05								
3,0	2	14.000	16.000	700	1.050	0,01	0,03	0,01	0,055								
4,0	2	11.000	15.000	500	850	0,01	0,04	0,02	0,075								
5,0	2	11.000	15.000	500	850	0,015	0,04	0,02	0,075								
6,0	2	9.000	12.000	500	900	0,015	0,045	0,05	0,10								
8,0	2	6.000	9.000	500	1.000	0,02	0,05	0,05	0,15								
10,0	2	5.000	8.000	400	900	0,05	0,08	0,06	0,20								
12,0	2	3.000	5.500	250	650	0,05	0,10	0,08	0,25								

on request

Cutting Parameters

for our CBN Ball Nose End Mills with Helix

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Cooling

1.Choice: Air | 2.Choice: Emulsion

TVCarb Advanced Materials Made in Germany

		CBN Ball Nose End Mills Helix															
		Steel up to 55HRC								Steel and Tool Steel up to 60HRC							
		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]	
Ø	z	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
0,3	2	50.000	60.000	180	440	0,003	0,016	0,02	0,03	50.000	60.000	100	320	0,003	0,016	0,02	0,03
0,3	3	50.000	60.000	180	550	0,003	0,016	0,02	0,03	50.000	60.000	100	380	0,003	0,016	0,02	0,03
0,4	2	45.000	55.000	300	550	0,005	0,022	0,03	0,04	45.000	55.000	150	420	0,005	0,022	0,03	0,04
0,4	3	45.000	55.000	300	630	0,005	0,022	0,03	0,04	45.000	55.000	160	530	0,005	0,022	0,03	0,04
0,5	2	45.000	55.000	500	750	0,005	0,022	0,03	0,07	45.000	55.000	500	750	0,005	0,022	0,03	0,07
0,5	3	45.000	55.000	500	850	0,005	0,022	0,03	0,07	45.000	55.000	500	850	0,005	0,022	0,03	0,07
0,6	3	45.000	55.000	500	850	0,005	0,022	0,03	0,07	45.000	55.000	500	850	0,005	0,022	0,03	0,07
0,7	3	42.000	48.000	500	850	0,005	0,022	0,03	0,07	42.000	48.000	500	850	0,005	0,022	0,03	0,07
0,8	3	42.000	48.000	500	880	0,005	0,022	0,04	0,08	42.000	48.000	500	880	0,005	0,022	0,04	0,08
0,9	3	42.000	48.000	500	880	0,008	0,035	0,04	0,08	42.000	48.000	500	880	0,008	0,035	0,04	0,08
1,0	2	38.000	45.000	700	1100	0,01	0,042	0,05	0,35	38.000	45.000	700	1.050	0,01	0,042	0,05	0,35
1,0	3	38.000	45.000	700	1100	0,01	0,042	0,05	0,35	38.000	45.000	700	1.050	0,01	0,042	0,05	0,35
1,5	2	28.000	35.000	700	1.100	0,02	0,065	0,05	0,50	28.000	35.000	700	1.050	0,02	0,065	0,05	0,50
1,5	3	28.000	35.000	700	1.100	0,02	0,065	0,05	0,50	28.000	35.000	700	1.050	0,02	0,065	0,05	0,50
2,0	2	19.000	23.000	700	1.100	0,03	0,16	0,10	0,60	19.000	23.000	700	1.050	0,03	0,16	0,10	0,6
2,0	3	19.000	23.000	700	1.100	0,03	0,16	0,10	0,60	19.000	23.000	700	1.050	0,03	0,16	0,10	0,60
3,0	2	14.000	18.000	700	1.100	0,03	0,16	0,10	0,80	14.000	18..000	700	1.050	0,03	0,16	0,10	0,80
3,0	3	14.000	18.000	700	1.100	0,03	0,16	0,10	0,80	14.000	18.000	700	1.050	0,03	0,16	0,10	0,80
4,0	2	11.000	13.000	800	1.150	0,05	0,25	0,20	1,00	11.000	13.000	800	1.200	0,05	0,25	0,20	1,00
4,0	3	11.000	13.000	800	1.150	0,05	0,25	0,20	1,00	11.000	13.000	800	1.200	0,05	0,25	0,20	1,00
5,0	2	11.000	13.000	800	1.150	0,05	0,25	0,20	1,50	11.000	13.000	800	1.200	0,05	0,25	0,20	1,50
5,0	3	11.000	13.000	800	1.150	0,05	0,25	0,20	1,50	11.000	13.000	800	1.200	0,05	0,25	0,20	1,50
6,0	2	9.000	12.000	900	1.300	0,05	0,25	0,20	2,00	9.000	12.000	900	1.300	0,05	0,25	0,20	2,00
6,0	3	9.000	12.000	900	1.300	0,05	0,25	0,20	2,00	9.000	12.000	900	1.300	0,05	0,25	0,20	2,00

CBN Ball Nose End Mills Helix																	
Steel and Tool Steel up to 68HRC										Carbide							
n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]		n [min⁻¹]		V_f [mm/min]		a_p [mm]		a_e [mm]	
min.	max.	min	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
50.000	60.000	80	270	0,002	0,011	0,02	0,03								
50.000	60.000	80	330	0,002	0,011	0,02	0,03								
45.000	55.000	120	330	0,003	0,016	0,03	0,04								
45.000	55.000	120	380	0,003	0,016	0,03	0,04								
45.000	55.000	400	650	0,003	0,016	0,03	0,07								
45.000	55.000	400	780	0,003	0,016	0,03	0,07								
45.000	55.000	400	780	0,006	0,022	0,03	0,07								
42.000	48.000	400	780	0,006	0,022	0,03	0,07								
42.000	48.000	500	850	0,006	0,022	0,04	0,08								
42.000	48.000	500	850	0,006	0,032	0,04	0,08								
38.000	45.000	500	850	0,01	0,042	0,05	0,35								
38.000	45.000	500	950	0,01	0,042	0,05	0,35								
28.000	35.000	600	950	0,02	0,064	0,05	0,50								
28.000	35.000	600	1.100	0,02	0,064	0,05	0,50								
19.000	23.000	600	930	0,035	0,12	0,10	0,60								
19.000	23.000	600	1.100	0,035	0,12	0,10	0,60								
14.000	18.000	600	940	0,04	0,12	0,10	0,80								
14.000	18.000	600	1.100	0,04	0,12	0,10	0,80								
11.000	13.000	700	1.100	0,06	0,22	0,20	1,00								
11.000	13.000	700	1.100	0,06	0,22	0,20	1,00								
11.000	13.000	700	1.100	0,06	0,22	0,20	1,50								
11.000	13.000	700	1.150	0,06	0,22	0,20	1,50								
9.000	12.000	800	1.200	0,06	0,25	0,20	2,00								
9.000	12.000	800	1.200	0,06	0,25	0,20	2,00								

on request

Cutting Parameters

for our End Mills with Indexable Inserts and Weldon

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Material	End Mills with Indexable Inserts and Weldon											
	PCD						CVD-D					
	V_c [m/min]		a_p [mm]		F_z [mm/rev]		V_c [m/min]		a_p [mm]		F_z [mm/rev]	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
Acryl (PMMA)							100	5.000	0,01	5,00*	0,01	0,20
Aluminum <10%Si	300	3.000	0,01	6,00*	0,005	0,30						
Aluminum >10%Si							200	5.000	0,01	5,00*	0,01	0,20
Brass							150	5.000	0,01	5,00*	0,01	0,20
Carbide	on request											
CFRP / MMC (Carbon fiber/Aluminum composite)							100	900	0,01	6,50*	0,05	0,30
Copper							150	2.000	0,01	4,00*	0,01	0,20
GFRP							100	900	0,01	6,50*	0,01	0,30
Gold, Silver, Platinum							100	3.000	0,01	5,00*	0,01	0,20
Graphite, coarse-grained	100	1.500	0,01	6,50*	0,01	0,30						
Graphite, fine-grained							80	2.000	0,01	6,50*	0,01	0,30
Laminates							80	1.600	0,01	6,60*	0,01	0,30
PTFE, POM	150	5.000	0,01	6,50*	0,01	0,30						
Titanium							50	220	0,01	2,00	0,01	0,16
Tungsten Copper							150	1.800	0,01	4,00*	0,01	0,18
Zirconium	on request											

* depending on the cutting edge length

End Mills with Indexable Inserts and Weldon	Cooling				
	Dry	Air	Emulsion	Oil	MQL
			1. Choice	2. Choice	3. Choice
			1. Choice	2. Choice	3. Choice
			1. Choice	2. Choice	3. Choice
			1. Choice	2. Choice	3. Choice
	on request				
	3. Choice	1. Choice	2. Choice		
			1. Choice	2. Choice	3. Choice
		2. Choice	1. Choice		
			1. Choice	2. Choice	3. Choice
	2. Choice	1. Choice			
	2. Choice	1. Choice			
	3. Choice	1. Choice	2. Choice		
			1. Choice		
			1. Choice	2. Choice	3. Choice
			1. Choice	2. Choice	3. Choice
	on request				

Cutting Parameters

for our End Mills with Indexable Inserts and Weldon

Vc X 3.28 = SFM

Ap / 25.4 = DOC inches

F / 25.4 = inch per revolution

Material	End Mills with Indexable Inserts and Weldon											
	CBN-H						CBN-X					
	V_c [m/min]		a_p [mm]		F_z [mm/rev]		V_c [m/min]		a_p [mm]		F_z [mm/rev]	
	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.
Carbide-Steel Composite	on request											
Ductile Cast Iron (GGG)												
Grey Cast Iron (GG)												
Steel up to 55 HRC	80	400	0,01	1,00	0,005	0,20						
Steel up to 60 HRC	80	360	0,01	0,80	0,008	0,18						
Steel up to 72 HRC	80	340	0,01	0,50	0,006	0,15						
Tool Steel up to 72HRC							60	360	0,01	0,60	0,005	0,15

Material	End Mills with Indexable Inserts and Weldon												Cooling				
	CBN-K																
	V_c [m/min]		a_p [mm]		F_z [mm/rev]												
	min.	max.	min.	max.	min.	max.							Dry	Air	Emulsion	Oil	MQL
Carbide-Steel Composite													on request				
Ductile Cast Iron (GGG)	200	1.200	0,01	2,00	0,01	0,30							3. Choice	1. Choice	2. Choice		
Grey Cast Iron (GG)	300	2.000	0,01	2,00	0,01	0,40							3. Choice	1. Choice	2. Choice		
Steel up to 55 HRC													2. Choice	1. Choice			3. Choice
Steel up to 60 HRC													2. Choice	1. Choice			3. Choice
Steel up to 72 HRC													2. Choice	1. Choice			3. Choice
Tool Steel up to 72HRC													2. Choice	1. Choice			3. Choice

Your Notes

Copyright and Safety Instructions

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Safety Instructions:

- Tools equipped with ultra-hard cutting edges are very sharp laser cut tools.
- Careful handling of the tools during unpacking and their use is recommended.
- Wearing protective gloves reduces the risk of injury.
- Material chipping and tool breakage may occur during machining, wearing safety glasses is recommended.
- Balanced holders are recommended for speeds above 10,000 rpm.
- We do not accept any responsibility for tools that have been modified, reground or used incorrectly and beyond their normal service life.
- Protective goggles are recommended when using tools, sparks may also occur, make sure that no fire can occur.

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