LUKAS

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CBN- and diamond tools for precision machining

Product line marking
Product lines are labelled in the table header with the appropriate tabs. Further information on page **14** and **15**.

Technical information

General

The product group which includes CBN and diamond tools for precision machining is of ever increasing importance in relation to tools consisting of the usual grain types i.e. aluminium oxide and silicon carbide and their further developments e.g. zirconia, mono-crystal and SOL-GEL (SG grain). These super hard grain types include natural and synthetic diamond in „D“ and synthetic cubic boron nitride (CBN) „B“.

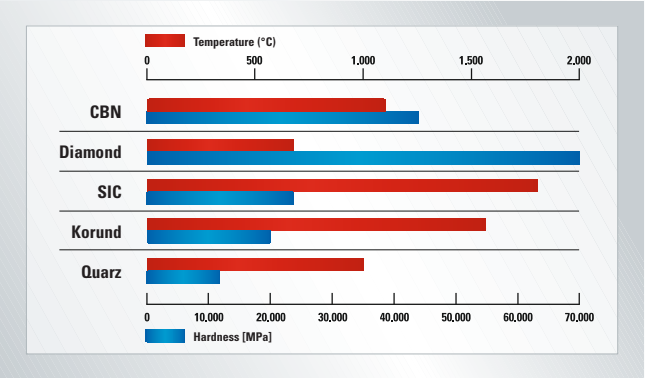
Diamond is used for a wide range of hard materials (exept steel), eg, carbides, oxides, nitrides and even diamond itself. Various types of plastic and rubber can also be economically machined.

Hardness

The ultrahard grain is considerably more expensive than conventional abrasive. Due to the extreme hardness, greater performance can be achieved when used in conjunction with modern manufacturing techniques; this can produce significant cost reductions.

Micro-Hardness – Temperature stability

The extreme differences in micro-hardness can be identified in the adjoining diagram.



Technical Information

Bond
The following bondings are used in the manufacture of LUKAS CBN and diamond tools:

Vitrified bond
Due to the substantial layer of usable abrasive, vitrified bonded wheels give long tool life. They can be easily dressed and require little grinding pressure. These tools are manufactured in a variety of dimensions and in different structures. They must be used with coolant. A fine surface finish can be achieved.

Electro-Plated
An electro-plated bond provides a low cost tool. Electro-plating allows the manufacture of a large variety of profiles. They can be used wet or dry; coolant improves tool life.

Types of grain
Basically, we must differentiate between mono and polycrystalline types of grain. In the case of diamond, it must also be decided whether to use natural or synthetic types. Many applications require a grain coating of nickel or titanium. The physical and chemical properties, including the shape of individual grit particles, are the decisive factors when selecting the most suitable grit type. LUKAS vitrified bonded CBN-/diamond tools are identified by a quality code which contains all data determining the specification. The customer also receives this basic information regarding grit size and CBN-/diamond concentration.

Based on ISO 6106 and the corresponding FEPA standard, the grit sizes have been categorized as stated below. Contrary to the grit size classification of conventional grain, cubic-boron nitride and diamond grain are specified based on the following: the smaller the number, the finer the grit – the larger the number, the coarser the grit.

The prefix "B" specifies CBN, the prefix "D" denotes Diamond; the US equivalents in Standard Mesh are also shown below.

Grit Size based on ISO 6106 resp. FEPA and US-Standard

CBN	Diamond	Grit size µm	US-Standard Mesh
B 46	D 46	38–45	325/400
B 54	D 54	45–53	270/325
B 64	D 64	53–63	230/270
B 76	D 76	63–75	200/230
B 91	D 91	75–90	170/200
B 107	D 107	90–106	140/170
B 126	D 126	106–125	120/140
B 151	D 151	125–150	100/120
B 181	D 181	150–180	80/100
B 213	D 213	180–212	70/80
B 251	D 251	212–250	60/70

When selecting the grit size, it must be remembered that ultrahard abrasive grain gives a coarser surface finish than conventional grit types; this is due to the extremely low wear rate. The most widely used grit sizes lie between 54 and 91 microns.

Always the right tool

For Highest Precision and Safety!

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CBN-/Diamond Grinding Tools, vitrified bonded

Product line marking
Product lines are labelled in the table header with the appropriate tabs. Further information on page **14** and **15**.

Technical Information

Shanks

The various types of CBN mounted points in a vitrified bond are, without exception, supplied with tungsten carbide shanks; carbide has a module of elasticity three times greater than steel.

The elasticity module denotes the extent to which a body deforms under pressure. Carbide has a high module of elasticity and therefore the deflection of the tools resulting from grinding pressure is kept to a minimum.

There are considerable advantages, eg:

- Reduction of spark-out time; this means a shorter grinding cycle
- Considerable improvement in tool life
- Reduction in tooling and setting costs
- Improvement in surface finish of the workpiece
- Improvement in workpiece geometry

The following table illustrates the rigidity of steel and tungsten carbide shank material in relation to diameter and overhang. A 3 mm diameter steel shank with an overhang of 40 mm is used as the base rigidity value of „1“.

Dressing

There are two main reasons for dressing CBN/diamond tools:

1. To achieve geometrical accuracy.
2. To prevent dulling of the abrasive grain and to free the surface from loading, ie, to maintain a free-cutting tool.

These tools must be dressed wet with ample coolant!

Various dressing methods are used depending on the hardness of the tool. The softer wheel qualities can be dressed with either a single point diamond dresser, or a rotary silicon carbide/diamond wheel. Dressing infeeds are typically in the range of 0.2 mm.

The single point diamond dresser cannot be used for the „medium hard“ qualities. Dressing infeed is in the range of 50 – 200 µm. The harder specifications require dressing after only 50 – 500 workpieces depending on ginding parameters used. Dressing infeed is normaly very small, ie, in the range of 2 to 10 microns.

A rotary diamond wheel dresser is used. Very hard qualities which require heavy dressing, need an additional dressing operation to „sharpen“ the tool; a soft silicon carbide rotary dresser is used. The cutting speed should not exceed 10 m/s.

Relative rigidity of steel/tungsten carbide shank

Steel shank 3 mm x 40 mm overhang represents the base rigidity value „1“

over-hang mm	shank 3		6		8		10	
	Steel	TC	Steel	TC	Steel	TC	Steel	TC
10	64	183	1024	2932	3237	9266	7900	22635
20	8	23	128	367	405	1159	988	2828
40	1	2,9	16	46	51	145	123	354

unstable very stable

Technical Information

Selection of Qualities/CBN/Diamond abrasive tools, vitrified bonded

LUKAS vitrified bonded diamond tools are identified by a quality code which contains all data determining the specification. Please see below some typical specifications:

Quality code CBN	Size	Concentration	Characteristic
53.5*	B 46	C 175	medium
29*	B 54	C 150	universal
34.5	B 54	C 170	
71.1	B 54	C 185	
50.3*	B 64	C 200	very hard
70.7	B 76	C 190	hard
57.7*	B 76	C 175	fine
54.8*	B 91	C 140	medium
70.1	B 91	C 185	hard
46.3*	B 151	C 175	medium

Quality code Diamond	Size	Concentration	Characteristic
15 D	D 91	C 120	
15.4 D	D 91	C 165	hard
18 D*	D 151	C 120	

** = widely used specifications*

LFG-bond = Low Force Grinding

We can recommend a suitable quality following receipt of application details.

Special features of the vitrified bond

Concentration

The letter "C" in the specification represents the grit concentration; this can vary quite considerably depending on the application. The concentration denotes thevolume of ultrahard abrasive grain used in the tool; this determines the grinding effectiveness and the price.

The opposite table illustrates the range of concentration; the most popular are shown in bold figures.

Range of concentration

C	40	60	100	120	**160**	**200**	220
V*	100	150	250	300	**400**	**500**	550
Vol%	10	15	25	30	**40**	**50**	55

V* = Vol% x 10; this is also used to express concentration

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Selection of mounted point dimensions

Ordering example: CBN-Mounted Point, Quality 50.3, D 11 mm, Shank 8 x 70

* shank length, please see below

Diameter D	In Increments of	Width T	Shank options*/Diameter S
1,8 – 2,0 mm	0,1 mm	3 mm	2 – 3 mm
2,0 – 2,6 mm	0,1 mm	4 mm	2 – 3 mm
3,0 – 5,0 mm	0,1 mm	5 mm	2 – 5 mm
5,1 – 10,0 mm	0,1 mm	as D taken to nearest mm	4 – 10 mm
10,0 – 40,0 mm	1 mm	10 mm	4 – 12 mm

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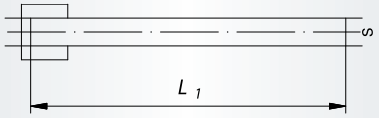
Chart for Tungsten carbide shanks

Ordering example: CBN-Mounted Point, Quality 50.3, D 11 mm, Shank 8 x 70

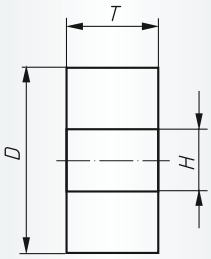


Shanks can be re-used

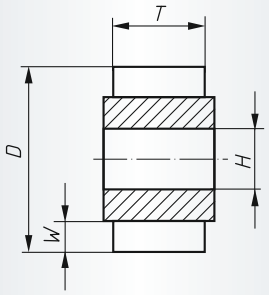
Shank-diameter S	Shank length (blank length) L_1 mm									
2 mm	30	40	50							
2,5 mm	30	40	55							
3 mm	30	40	50	60						
4 mm		40	50	60	70					
5 mm			50	60	70					
6 mm			50	60	70	80	100	120		
8 mm			50	60	70	80	100	120		
10 mm				60	70	80	100	120	130	150
12 mm						80	100	120		150

Bore and facegrinding possible see drawing above.

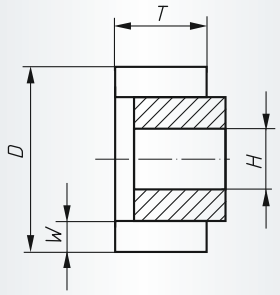
Selection of wheel dimensions and shapes



Type 1
unfinished (as fired)



Type 2
plain steel core



Type 3
steel core, 3 mm recessed

Due to technical reasons, the smallest dimensions for W is 5 mm.

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Dimensions

Ordering example: CBN Wheel, Quality B 54 C 150 29, Type 3: D 35 x 10 mm, H 8 mm

When ordering please specify bore size „H".

Minimum order quantity 10 pieces

Dimension D	In increments of D	Width		
14 to 25 mm	1 mm	10 mm	12 mm	15 mm
25 to 40 mm	5 mm	10 mm	12 mm	15 mm

Notes

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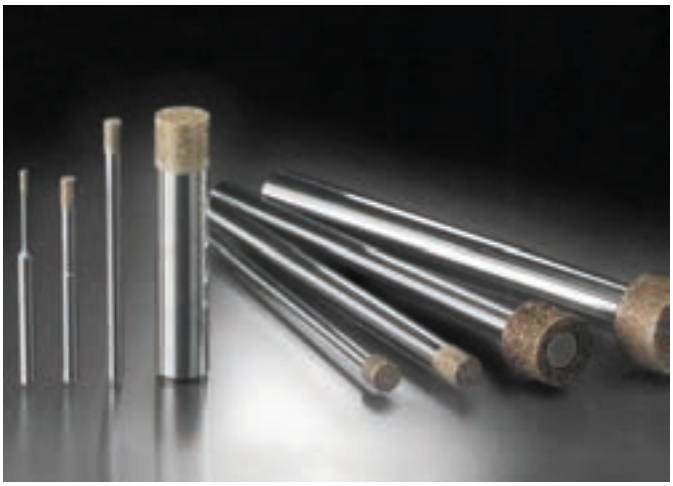
CBN-/Diamond Mounted Points, electro-plated



Product line marking
Product lines are labelled in the table header with the appropriate tabs. Further information on page **14** and **15**.

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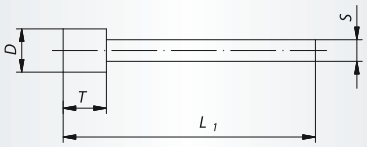
Diamond points cylindrical shape

Ordering example: A34013050126



Packing unit:
1 pc. per type

Description	grit sizes	D mm	T mm	S mm	L_1 mm	Product-Number	recommended for	
DS 01003	D 126	1	3	3	40	A34013050126	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 01503	D 126	1,5	3	3	40	A34013051126	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 02005	D 126	2	5	3	40	A34013052126	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 02505	D 126	2,5	5	3	40	A34013053126	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 03005	D 126	3	5	3	40	A34013054126	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 03505	D 126	3,5	5	3	40	A3401305412601	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 04005	D 126	4	5	3	40	A34013055126	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 04505	D 126	4,5	5	3	40	A3401305512601	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 05006	D 126	5	6	3	40	A34013056126	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 06007	D 126	6	7	3	40	A34013057126	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 08010	D 126	8	10	6	60	A34013058126	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 10010	D 126	10	10	6	60	A34013059126	① ② ③ ④ ⑤ ⑦ ⑨	■
DS 12015	D 126	12	15	6	60	A34013060126	① ② ③ ④ ⑤ ⑦ ⑨	■

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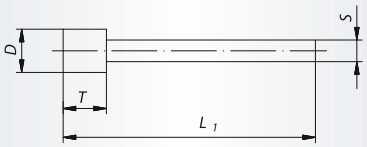
Industry

CBN points, cylindrical shape

Ordering example: A34033050126



Packing unit:
1 pc. per type

Description	grit sizes	D mm	T mm	S mm	L_1 mm	Product-Number	recommended for	
CS 01003	B 126	1	3	3	40	A34033050126	③ ④	■
CS 01503	B 126	1,5	3	3	40	A34033051126	③ ④	■
CS 02005	B 126	2	5	3	40	A34033052126	③ ④	■
CS 02505	B 126	2,5	5	3	40	A34033053126	③ ④	■
CS 03005	B 126	3	5	3	40	A34033054126	③ ④	■
CS 03505	B 126	3,5	5	3	40	A3403305412601	③ ④	■
CS 04005	B 126	4	5	3	40	A34033055126	③ ④	■
CS 04505	B 126	4,5	5	3	40	A3403305512601	③ ④	■
CS 05006	B 126	5	6	3	40	A34033056126	③ ④	■
CS 06007	B 126	6	7	3	40	A34033057126	③ ④	■
CS 08010	B 126	8	10	6	60	A34033058126	③ ④	■
CS 10010	B 126	10	10	6	60	A34033059126	③ ④	■
CS 12015	B 126	12	15	6	60	A34033060126	③ ④	■

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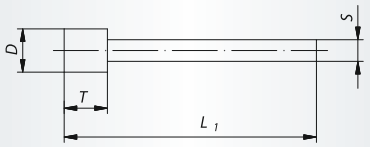
Diamond points using solid carbide shanks, cylindrical shape

Ordering example: A340202305126



Packing unit:
1 pc. per type

Description	grit sizes	D mm	T mm	S mm	L_1 mm	Product-Number	recommended for	
DSH 02303	D 126	2,3	3	2	75	A340202305126	① ② ③ ④ ⑤ ⑦ ⑨	■
DSH 03304	D 126	3,3	4	3	75	A340203303126	① ② ③ ④ ⑤ ⑦ ⑨	■
DSH 04305	D 126	4,3	5	4	75	A340204305126	① ② ③ ④ ⑤ ⑦ ⑨	■
DSH 06307	D 126	6,3	7	6	75	A340206307126	① ② ③ ④ ⑤ ⑦ ⑨	■
DSH 08310	D 126	8,3	10	8	75	A340208310126	① ② ③ ④ ⑤ ⑦ ⑨	■
DSH 10310	D 126	10,3	10	10	75	A340210310126	① ② ③ ④ ⑤ ⑦ ⑨	■

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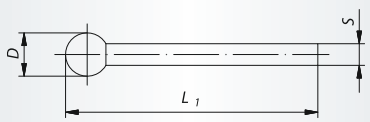
Diamond points, spherical shape

Ordering example: A34013090126



Packing unit:
1 pc. per type

Description	grit sizes	D mm	S mm	L_1 mm	Product-Number	recommended for	
DSK 02020	D 126	2	3	40	A34013090126	① ② ③ ④ ⑤ ⑦ ⑨	■
DSK 03030	D 126	3	3	40	A34013091126	① ② ③ ④ ⑤ ⑦ ⑨	■
DSK 04040	D 126	4	3	40	A34013092126	① ② ③ ④ ⑤ ⑦ ⑨	■
DSK 05050	D 126	5	3	40	A34013093126	① ② ③ ④ ⑤ ⑦ ⑨	■
DSK 06060	D 126	6	3	40	A34013094126	① ② ③ ④ ⑤ ⑦ ⑨	■
DSK 08080	D 126	8	6	60	A34013095126	① ② ③ ④ ⑤ ⑦ ⑨	■

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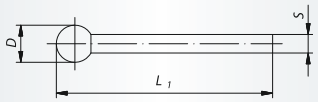
Industry

CBN points, spherical shape

Ordering example: A34033090126



Packing unit:
1 pc. per type

Description	grit sizes	D mm	S mm	L_1 mm	Product-Number	recommended for	
CSK 0202	B 126	2	3	40	A34033090126	③ ④	■
CSK 0303	B 126	3	3	40	A34033091126	③ ④	■
CSK 0404	B 126	4	3	40	A34033092126	③ ④	■
CSK 0505	B 126	5	3	40	A34033093126	③ ④	■
CSK 0606	B 126	6	3	40	A34033094126	③ ④	■
CSK 0808	B 126	8	6	60	A34033095126	③ ④	■

MADE IN GERMANY DEUTSCHES WERKZEUG

Diamond Files, electro-plated

Product line marking
Product lines are labelled in the table header with the appropriate tabs. Further information on page **14** and **15**.

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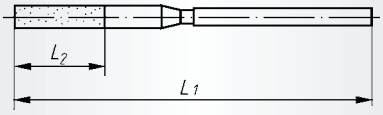
Industry

Diamond files for off-hand filing machines

Ordering example: A34003122126



Packing unit:
1 pc. per type

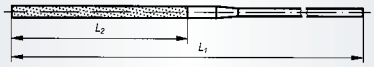
Description	Available profiles	A summary of available shapes	grit sizes	Cross section mm	L_2 mm	L_1 mm	Product-Number	recommended for	
DF 3122	flat, one side coated		D 126	4 x 1	15	50	A34003122126	① ② ③ ④ ⑤ ⑦ 9	■
DF 3130	round		D 126	4	15	50	A34003130126	① ② ③ ④ ⑤ ⑦ 9	■

LUKAS

Industry

Diamond needle files

Ordering example: A34003140091



Packing unit:
1 pc. per type

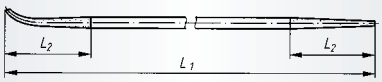
Description	Available profiles	A summary of available shapes	grit sizes	Cross section mm	L_2 mm	L_1 mm	Product-Number	recommended for	
DF 3140	flat		D 91	5,0 x 1,4	70	140	A34003140091	① ② ③ ④ ⑤ ⑦ 9	■
DF 3140	flat		D 126	5,0 x 1,4	70	140	A34003140126	① ② ③ ④ ⑤ ⑦ 9	■
DF 3142	triangular		D 91	3,5 x 3,5	70	140	A34003142091	① ② ③ ④ ⑤ ⑦ 9	■
DF 3142	triangular		D 126	3,5 x 3,5	70	140	A34003142126	① ② ③ ④ ⑤ ⑦ 9	■
DF 3143	square		D 126	2,5 x 2,5	70	140	A34003143126	① ② ③ ④ ⑤ ⑦ 9	■
DF 3144	half-round		D 126	5,2 x 1,9	70	140	A34003144126	① ② ③ ④ ⑤ ⑦ 9	■
DF 3145	round		D 126	3	70	140	A34003145126	① ② ③ ④ ⑤ ⑦ 9	■
DF 3146	knife		D 126	5,0 x 1,4	70	140	A34003146126	① ② ③ ④ ⑤ ⑦ 9	■

MADE IN GERMANY DEUTSCHES WERKZEUG

Industry

Diamond files, Rifflers

Ordering example: A34003110126



Packing unit:
1 pc. per type

Description	Available profiles	A summary of available shapes	grit sizes	Cross section mm	L_2 mm	L_1 mm	Product-Number	recommended for	
DF 3110	bird tongue		D 126	4 x 2	25	150	A34003110126	① ② ③ ④ ⑤ ⑦ ⑨	■
DF 3111	flat		D 126	3 x 1,5	25	150	A34003111126	① ② ③ ④ ⑤ ⑦ ⑨	■
DF 3112	square		D 126	2 x 2	25	150	A34003112126	① ② ③ ④ ⑤ ⑦ ⑨	■
DF 3113	triangular		D 126	3	25	150	A34003113126	① ② ③ ④ ⑤ ⑦ ⑨	■

Material classification

1 STEELS AND CAST STEELS
Rm up to 800 N/mm²

- common structural steels
- free cutting steels
- case hardened steels
- fine grained structural steels
- extruded steels
- toughened structural steels
- boiler plate
- nitrided steels
- cast steels
- heat treated steels
- heat resistant structural steels

2 ALLOYED, TEMPERED STEELS
Rm 800 up to 1200 N/mm²

- case hardened steels
- spring steels
- fine grained structural steels
- nitrided steels
- heat treated steels
- wear resistant steels
- bearing steels

3 TOOL STEELS Rm up to 1300 N/mm²

- 60 - 65 HRC
- high-speed steels
- non-alloyed tool steels
- cold working tool steels
- hot working tool steels

4 RUST, ACID AND HEAT RESISTANT STEELS AND CAST STEELS

- austenitic
- ferritic
- ferritic-austenitic
- heat-resistant
- martensitic
- stainless, sulpherized

5 CAST IRON

6 ALUMINIUM, MAGNESUIM AND COPPER ALLOYS

- over 300 HB
- 200-300 HB
- up to 200 HB
- over 15% Si
- 10-15% Si
- 0,5-10% Si
- below 0,5% Si

7 TITANIUM AND NICKEL ALLOYS

- Rm 900 up to 1500 N/mm²
- Rm up to 900 N/mm²

8 PLASTICS, WOOD, RUBBER

9 GLASS / CARBIDES

10 STONE / TILES / GAS CEMENT

11 CONCRETE / REINFORCED CONCRETE

12 CERAMIC / FLOOR TILES

13 MARBLE

14 GRANITE

15 FRESHLY POURED CONCRETE

16 ASPHALT

● **best suitable**
○ **suitable**

■ **delivery ex-stock**
▲ **delivery on request**

Safety Symbols

(Depending on the product these symbols may vary)


Wear eye protection


Wear hearing protection


Wear a respirator


Read the instructions


Wear gloves


Only permitted with a back-up pad


Not permitted for wet grinding


Not permitted for face grinding


Do not use if damaged


Not permitted for hand-held or manually-guided grinding