

LEUCO

MAGENTIFY COMPOSITE PROCESSING

COMPOSITE PROCESSING CP 06



Precision tools
for efficient processing
of lightweight materials

www.leuco.com/composite-processing

→ WHY LEUCO?

YOUR EXPERIENCED AND RELIABLE PARTNER FOR PRECISION

EFFICIENT PROCESSING OF MODERN LIGHTWEIGHT MATERIALS

In order to meet the growing demands on the machining of modern lightweight materials such as composites, LEUCO offers solutions that impress with a broad product range, high quality and durable cutting materials.

→ Comprehensive range of products and highest quality standards

LEUCO offers you a complete portfolio for all essential processing steps – from milling, drilling and countersinking to sawing. Our products impress with their innovative tool design, high quality and consistent performance. We know that every detail counts.

→ High level of expertise regarding cutting material

We rely on proven, high-hardness cutting materials such as polycrystalline diamond (PCD) and tungsten carbides with specially developed coatings, e.g. diamond coatings. The result: longer edge life and outstanding cutting quality even with the most demanding materials.

1,200 experts
for composite
processing in
20 subsidiaries

1954
LEUCO has been
established

Leading position in the tool
technology with about **230**
patents and protective briefs



→ Individual solutions and partnership-based cooperation

In close cooperation with our customers, we develop customized tools which are individually adapted to the specific requirements. More than 80 % of our products are individual solutions which are specially designed for your applications. Our experienced experts around the world are at your side as reliable contacts.

→ Global presence and certification

LEUCO is a globally established and certified tool partner for leading companies in the aviation, automotive and other industries. Thanks to our subsidiaries, service locations and close trading partners on all continents, we are always available.

→ Common ground between fiber-reinforced plastics & wood-based materials

When machining fiber-reinforced materials, you benefit from our many years of experience in machining wood-based materials - a material that has always been inhomogeneous!

More than 70 years of experience in providing solutions for the machining of fiber-reinforced materials – tool solutions for many industries.

Hightech production location
for PCD and SC End Mills, drill
bits and countersinks

Production certified
according to
DIN EN ISO 9001
DIN EN ISO 50001

**Innovative,
highly modern
logistics center**

Image: LEUCO Headquarters in Horb am Neckar (Baden-Württemberg/Germany)

→ LIGHTWEIGHT MATERIALS

The majority of the lightweight materials have been designed to match application-specific needs and satisfy the corresponding requirements. Fiber-reinforced materials can be categorized according to the fiber used and the matrix. Sandwich constructions are distinguished by their core layer: honeycomb core or foam core. Other multilayer composites (stacks) combine the advantages of fiber-reinforced materials with those of light metals, for example.

CFRP – carbon-fiber-reinforced plastic

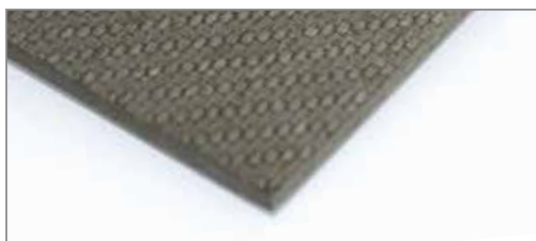
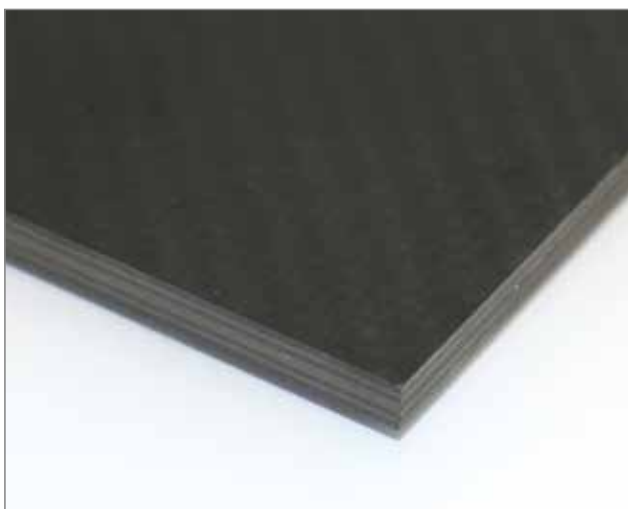
Highest strength and rigidity combined with very low density make CFRP the lightweight construction material of the future. The extreme abrasiveness of the carbon fiber and the dusts generated during processing result in excessive wear of the cutting tools. The mainly thin-walled workpiece geometries require sophisticated tool geometries in addition to hard cutting materials.

CFRC – carbon-fiber-reinforced carbon

CFRC is characterized by high heat resistance and can be cut using high cutting speeds and feeds. Due to the brittle carbon matrix, the fiber-matrix adhesion is significantly worse than with CFRP, which often leads to delamination, cutting edge breakage or fiber protrusion.

GFRP – glass-fiber reinforced plastic

GFRP is used in many applications because this material is relatively cheap, while still significantly improving, thanks to the glass fibers, the technical properties of plastic. Glass fibers are also characterized by high abrasiveness – tools with optimized chip and dust evacuation and DP-tipped edges reduce the heat reliably and increase the edge life.



AFRP – aramid-fiber reinforced plastic

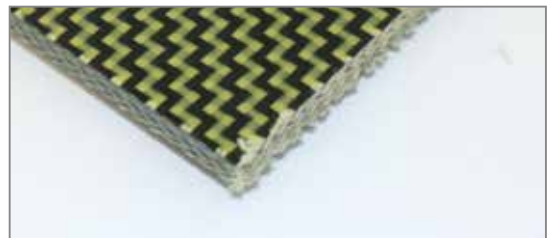
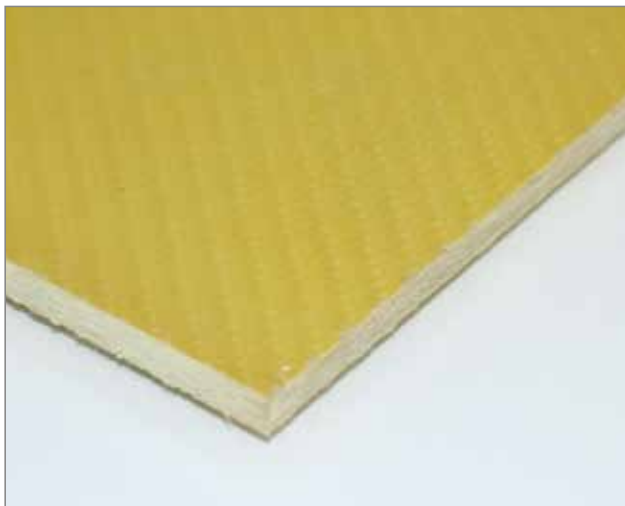
Their low density makes aramid fibers extremely light, and they also feature high tensile strength. Aramid fibers exhibit ductile behavior instead of brittleness. When machining AFRP, extreme fraying of the fibers frequently occurs. However, good results can be achieved if especially adapted saws, drill bits and end mills are used for this material.

Sandwich constructions

The challenge with machining of sandwich constructions is not to destroy the delicate honeycomb or foam cores. LEUCO provides special end mills and drill bits as well as circular saw blades for this purpose.

Stacks

Structural components for the aviation industry are often made from multilayer composites - so-called stacks - which combine materials such as CFRP aluminum, CFRP titanium or various aluminum alloys. These demanding materials require specialized cutting tools. Reliable solutions can be achieved by using step drills, diamond coatings or several tools in one machining process.



→ SECTORS

Each industry segment has specific requirements in terms of choosing the right cutting tool. LEUCO understands the individual needs of the customers and offers tailor-made solutions.



AEROSPACE & DEFENSE

The demand for optimum lightweight construction and efficient production processes is constantly growing in the aviation industry. LEUCO convinces as a competent solution provider regarding the processing of CFRP structures: DP-tipped tools ensure maximum reliability, cost effectiveness and first class processing results whether for milling, drilling or countersinking.



AUTOMOTIVE

E-mobility continues to drive lightweight construction in the automotive industry. Series-produced CFRP body parts for sports cars and glass fiber-reinforced components such as battery housings and trim parts are increasingly in demand. LEUCO offers solutions to meet the high demands on the efficient series production of these components.



GENERAL INDUSTRY & ENERGY GENERATION

Lightweight materials are becoming increasingly important in general industry and energy generation. The expansion of wind power systems requires lightweight, high-strength materials, while composites are used for thermal and electrical insulation in a wide variety of products. The building sector is making increased use of fiber-reinforced plastics. LEUCO supports these diverse applications with a comprehensive product portfolio.



SPORTS & LEISURE

In the sports and leisure sector, lightweight materials such as CFRP and various non-ferrous metals are used to make sports equipment such as bicycles and skis lighter and more efficient. The versatile applications place high demands on specialized tools that are also designed for small-batch production processes.

→ APPLICATIONS

Components made of fiber-reinforced plastics are produced with a near net shape, but reworking is almost always necessary. Machining processes are very often applied for such rework tasks. They have proven to provide higher dimensional accuracy and flexibility compared to water jet cutting and laser processing.

→ Milling

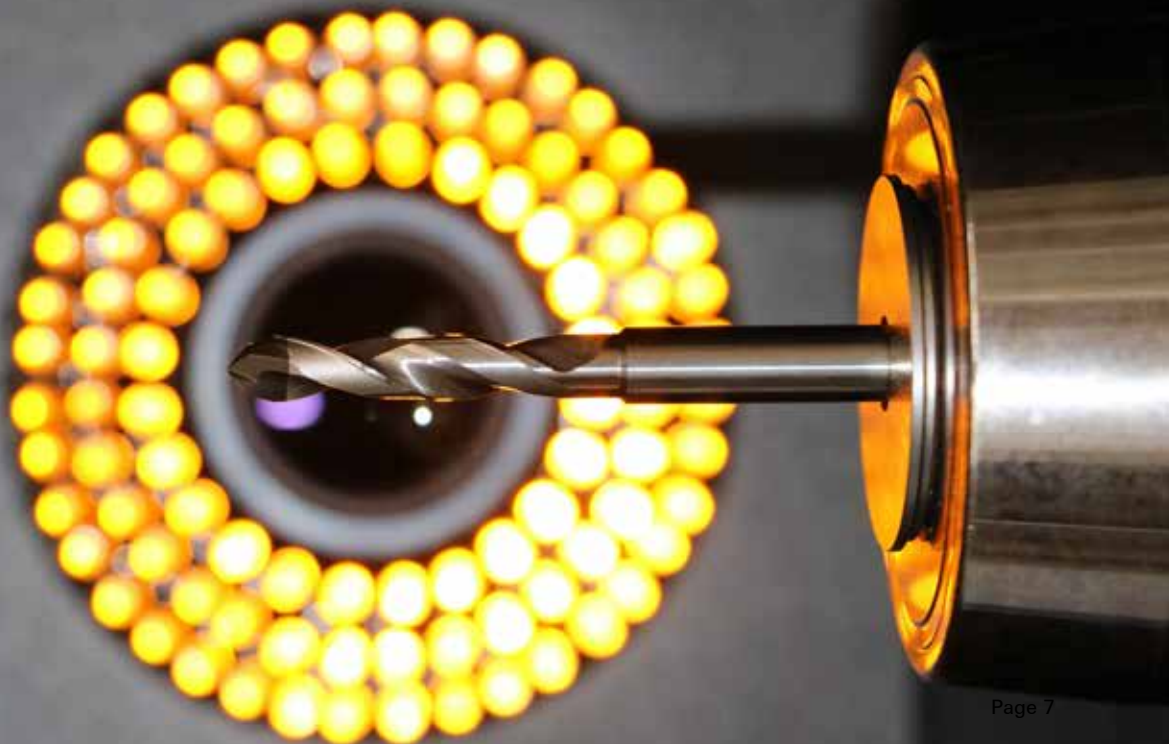
Milling is used to create perfect external and internal contours and functional surfaces. Furthermore, circular milling or wave milling processes can be used to produce holes in the required quality. Frequent problems related to milling are insufficient cutting quality (protruding fibers, delamination, bevel inconsistencies) and short edge life.

→ Drilling and countersinking

Drilling and countersinking are mainly used for preparing joints such as riveted joints, for example. Problems occur when the drill bit enters and exits the material. Pressure and tensile forces of the drill separate the individual composite layers from each other, thus causing delamination or chipping.

→ Sawing

Sawing is used for similar purposes as peripheral milling. It can replace trimming with a milling cutter and is highly effective and economical for straight dividing cuts.



→ HONEYCOMB PANEL MACHINING

MILLING - 3 VARIANTS

1.1.

Pre-trimming

with wear-resistant PCD tool
to separate/
trim the top layers
80461706; 80461707
→ p. 31

1.2.

Re-milling = longer edge life

with a sharp solid
tungsten carbide tool for
clean cutting of the
honeycomb core
187840; 187841
→ p. 29

2.

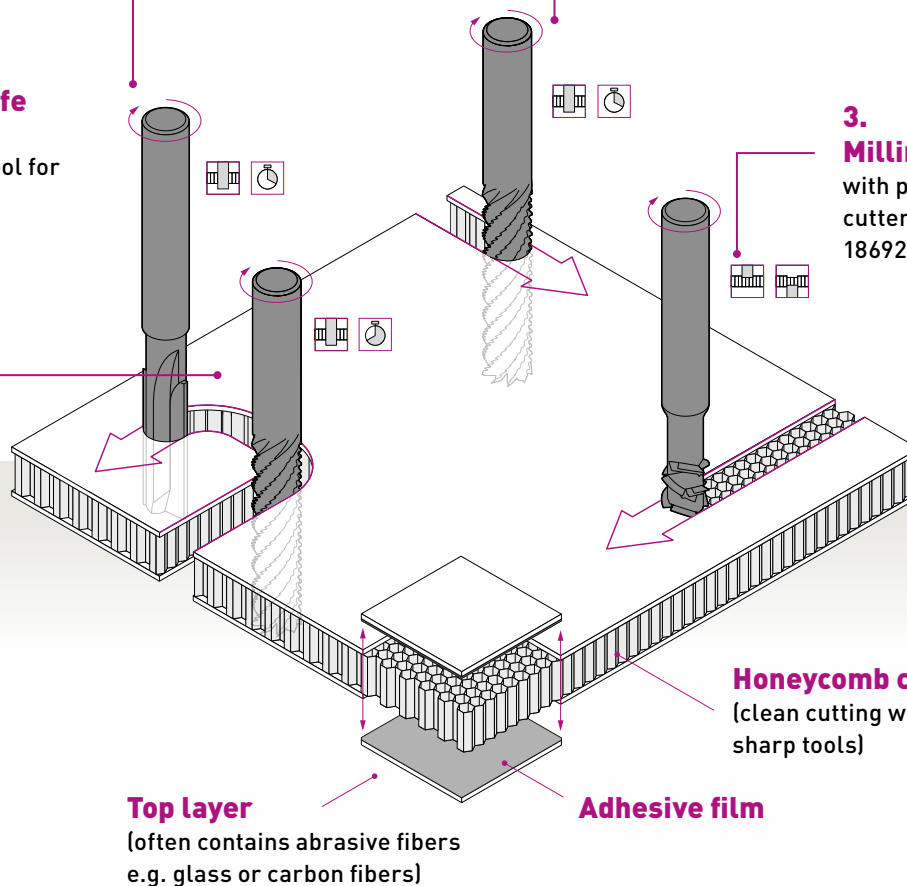
Finish milling = shorter edge life

with SC End Mill
187840; 187841
→ p. 29

3.

Milling of top layer

with p-System grooving
cutter
186924; 186925



SAWING AND DRILLING

Sizing saw blades

HW, g5-System

192796

DP, nn-System DP Flex

192446

→ p. 41

Panel sizing saw blade

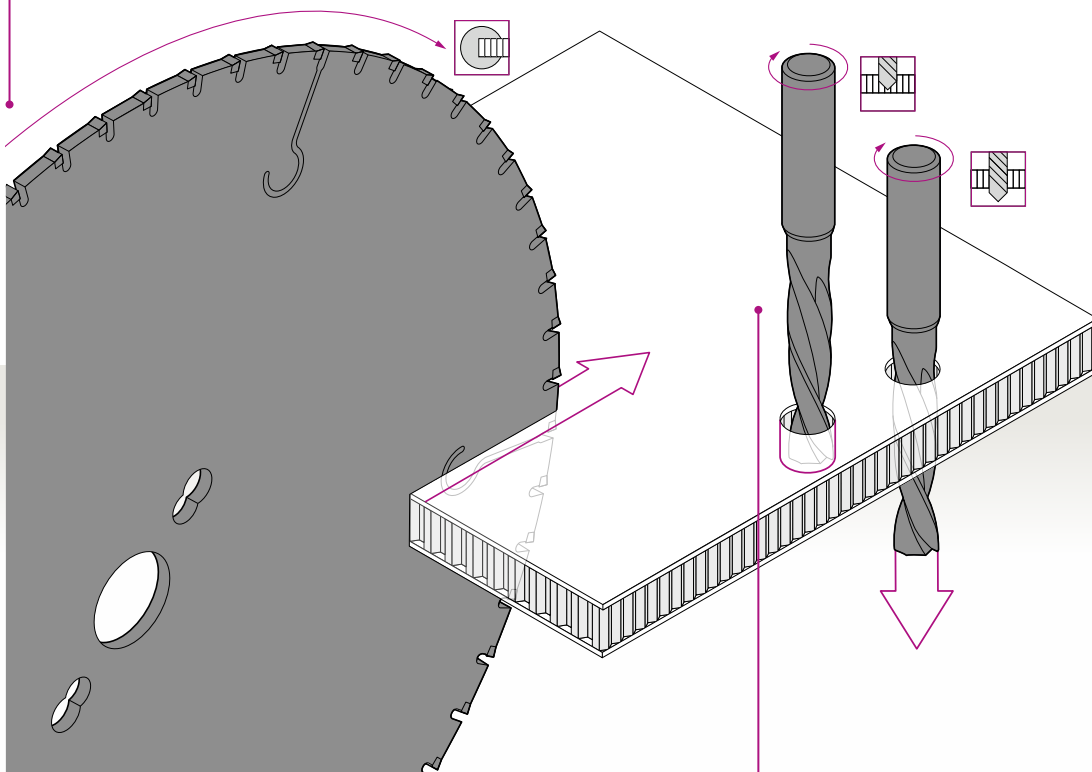
HW, g5-System

192814

→LEUCO offers tailor-made cutting tools for the precise processing of honeycomb panels.

PCD tools meet the requirements regarding the abrasive top layers while SC tools have been developed especially for the sensitive honeycomb cores.

Moreover, universal tools are available which reliably process both materials without causing material fraying or loss of quality.



High Performance Drill SC

186634

→ p. 15

→ COATINGS

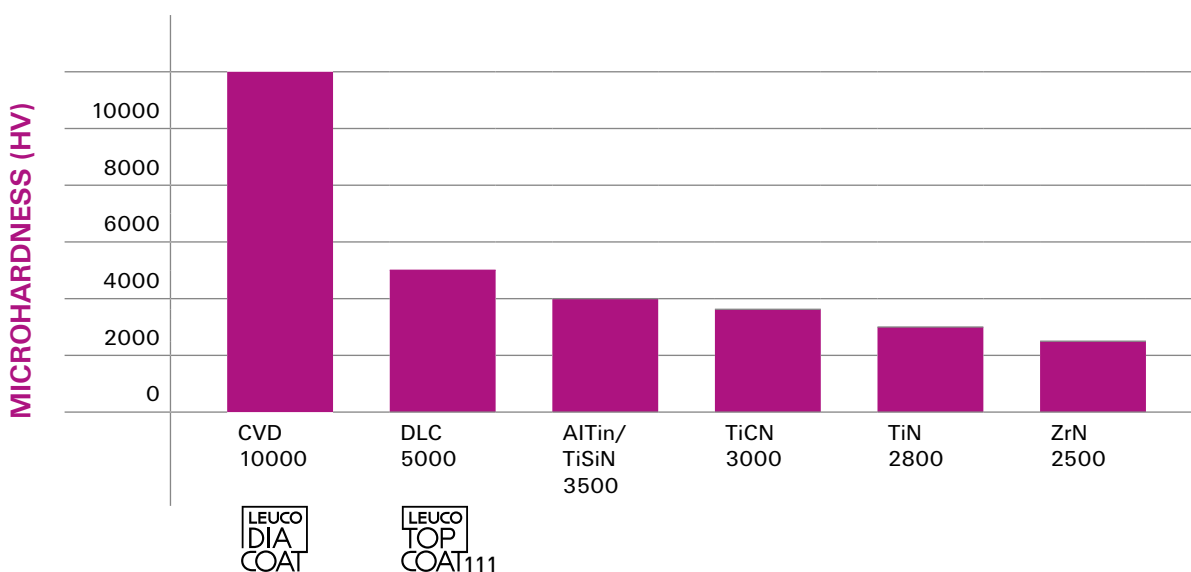
State-of-the-art coating technologies for durable tools

The aerospace industry places high demands on cutting tools, as modern composite materials such as glass and carbon fiber-reinforced materials are very abrasive and are sometimes combined with light metals such as aluminium and titanium.

Polycrystalline diamond (PCD) is a proven choice, but carbide tools are also used due to size and geometry constraints. CVD diamond coatings are used to maximize the edge life and the performance of these tools. These coatings offer outstanding hardness, abrasion and heat resistance

which makes them ideal for the processing of abrasive materials.

Thanks to ongoing technological developments in adhesive strength and process stability, diamond coatings offer customized solutions for a wide range of applications. In addition to the type of coating, the thickness of the coating is also individually adapted to the specific requirements.



The unique properties of the CVD diamond coating "LEUCO DIACOAT / LEUCO RX" make it an ideal coating for carbide drills, reamers, countersinks and end mills. The DIACOAT / RX coating can be applied in a thickness of 3-17µm, depending on the type of material.

For applications that require tools made of HSS (high-speed steel) or are designed for metal matrix alloys, LEUCO offers the DLC coating (diamond-like coating) LEUCO TOPCOAT 111 / LEUCO BX. The TOPCOAT 111 / BX combines high hardness and high lubricity and is suitable for both composite materials and non-ferrous metals.

→ COATED DRILL BITS

LEUCO offers customized solutions for drilling composite materials, depending on the material and application. The LEUCO drill bit portfolio

- | takes into account the heterogeneous structure of materials, which can lead to layer detachment or delamination due to uneven loading of the fibers.
- | minimizes tool wear due to abrasive fibres and reduces tool and dimensional deviation costs
- | keeps the heat generated by friction at a low level in order to soften the matrix as little as possible and not impair other material properties.

In addition to PCD drill bits for high volume production, we offer **CVD diamond-tipped drill bits** which are specially tailored to the application.

FACETED DRILL BITS

- | Double or quadruple faceted drills with 90° or 90+30° point angle
- | Gradually expands the hole and minimizes delamination in CFRP and GFRP
- | Ideally suited for the use on CNC machines
Optionally with internal cooling to improve the heat dissipation and chip evacuation

DRILL REAMERS

- | Available in standard diameters of 2, 3 or 4 mm with straight or slightly spiral cutting edges, coated or uncoated
- | The long and progressive friction surface gradually expands the hole and minimizes delamination in CFRP and GFRP.
- | Optimized for the use on specific machines

BORING COUNTERSINKS

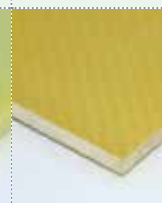
- | Combine drilling and countersinking processes in one tool for higher efficiency. Countersink diameter up to 30 mm available
- | Several stages and internal cooling available
- | Optimized tip geometry



→ Advantage of CVD-coated drill bits:

A high degree of geometrical freedom and the option of combining drilling and countersinking steps enable a tool design that is perfectly matched to the application for maximum efficiency.

→ DRILL BITS & COUNTERSINKS

	PRODUCT	MATERIAL		
		FIGURE		
		CFRP	GFRP	AFRP
				
CD010 High Performance Drill SC		+	+	
CD020 Drill Bit 90/30 SC				+
CD030 DP Drill 120/60		+		+
CD040 Solid-DP Drill 130/60				+
CD050 FullNib-DP Drill 90/30			++	+
CD060 Cone Countersink DP		+	+	+
CD070 Counterbore 120/60+90 DP		++	++	+
CC010 Countersink DP - integral Pilot		++	++	
CC020 Countersink DP - interchangeable pilot		++	++	



Recommended by
LEUCO

++

very well suited

+

suitable

✓

possible

MATERIAL			APPLICATION		MACHINE			PAGE
Block materials	Sandwich honeycomb core	Honeycomb	Drilling	Countersinking	CNC machines / gantries	Automatic drill feed units	Hand-operated machines	
								
++	++		✓		✓	✓	✓	15
++	++	+	✓		✓	✓		17
+	++	+	✓		✓			17
+	++	+	✓		✓			18
+	++	+	✓		✓			18
+	+			✓	✓	✓	✓	19
+	+	+	✓	✓	✓			19
				✓			✓	20
				✓			✓	21

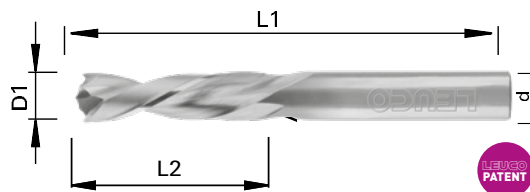
→ DRILL BITS

Drill bit type	Drill Bit SC	Drill Bit SC with CVD diamond coating	DP Drill	Solid-DP Drill	FullNib-DP Drill
					
Diameter range	< 1 - 20 mm	< 1 - 20 mm	4 - 20 mm	4 - 20 mm	< 1 - 4 mm
Drill bit geometry	+ maximum degree of geometrical freedom	+ maximum degree of geometrical freedom	- least geometrical freedom, only straight rake faces possible	- limited geometrical freedom, as the cutting edge geometry must lie within the DP plate	o high geometrical freedom, limited only by the height of the complete DP drill bit
Number of teeth	2, 3, more	2, 3, more	2	2	2, 3, more
Sharpening cycles	1 - 2	0	2 - 4	2 - 4	2 - 4
Minimizes delamination	+	+	o	o	+
Maintains bore tolerance	-	-	+	+	+
Vibration absorption	+	-	o	+	o
Purchase costs	low	middle	middle	high	high
Total costs / bore incl. sharpening cycles	high	middle	middle	low	low

135692

→ CD010 High Performance Drill SC

- Best results on CNC and gantry machines but also suitable for ADUs and MDUs
- Ideally suited for AFRP and natural fiber reinforced plastics, honeycomb and sandwich materials or block materials
- Patented tip geometry which differs from the conventional "W"-shaped Kevlar drill bits due to its very sharp cutting edges and two spurs
- The tip geometry only generates minimal cutting forces
- Due to this, a very good quality at the entry and exit area of the drill can be achieved



D1	α	L2	L1	d	Z	R/L	Ident-No.	LKZ
2	30 POS	17	50	6	2	RH	187001	C
2,1	30 POS	17	50	6	2	RH	187002	C
2,2	30 POS	17	50	6	2	RH	187003	C
2,3	30 POS	17	50	6	2	RH	187004	C
2,4	30 POS	17	50	6	2	RH	187005	C
2,5	30 POS	20	50	6	2	RH	187006	C
2,6	30 POS	20	50	6	2	RH	187007	C
2,7	30 POS	20	50	6	2	RH	187008	C
2,8	30 POS	20	50	6	2	RH	187009	C
2,9	30 POS	20	50	6	2	RH	187010	C
3	30 POS	20	50	6	2	RH	186584	L
3,1	30 POS	20	50	6	2	RH	186585	C
3,2	30 POS	20	50	6	2	RH	186586	L
3,3	30 POS	20	50	6	2	RH	186587	L
3,4	30 POS	20	50	6	2	RH	186588	C
3,5	30 POS	20	50	6	2	RH	186589	C
3,6	30 POS	20	50	6	2	RH	186590	C
3,7	30 POS	20	50	6	2	RH	186591	C
3,8	30 POS	20	50	6	2	RH	186592	C
3,9	30 POS	20	50	6	2	RH	186593	C
4	30 POS	26	57,5	6	2	RH	186594	L
4,1	30 POS	26	57,5	6	2	RH	186595	C
4,2	30 POS	26	57,5	6	2	RH	186596	L
4,3	30 POS	26	57,5	6	2	RH	186597	C
4,4	30 POS	26	57,5	6	2	RH	186598	C
4,5	30 POS	26	57,5	6	2	RH	186599	C
4,6	30 POS	26	57,5	6	2	RH	186600	C
4,7	30 POS	26	57,5	6	2	RH	186601	C
4,8	30 POS	26	57,5	6	2	RH	186602	C
4,9	30 POS	26	57,5	6	2	RH	186603	C
5	30 POS	31	70	6	2	RH	186604	L
5,1	30 POS	31	70	6	2	RH	186605	C
5,2	30 POS	31	70	6	2	RH	186606	L
5,3	30 POS	31	70	6	2	RH	186607	C
5,4	30 POS	31	70	6	2	RH	186608	C
5,5	30 POS	31	70	6	2	RH	186609	C
5,6	30 POS	31	70	6	2	RH	186610	C
5,7	30 POS	31	70	6	2	RH	186611	C
5,8	30 POS	31	70	6	2	RH	186612	C
5,9	30 POS	31	70	6	2	RH	186613	C
6	30 POS	31	70	6	2	RH	186614	L
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Continuation see next page

CD010 High Performance Drill SC (continued)

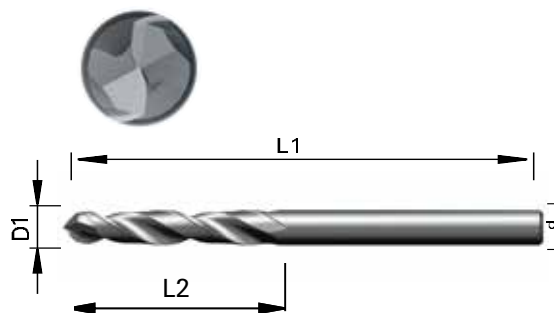
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6,2	30 POS	31	70	8	2	RH	186616	L
6,3	30 POS	31	70	8	2	RH	186617	C
6,4	30 POS	31	70	8	2	RH	186618	C
6,5	30 POS	31	70	8	2	RH	186619	C
6,6	30 POS	31	70	8	2	RH	186620	C
6,7	30 POS	31	70	8	2	RH	186621	C
6,8	30 POS	31	70	8	2	RH	186622	C
6,9	30 POS	31	70	8	2	RH	186623	C
7	30 POS	31	70	8	2	RH	186624	L
7,1	30 POS	31	70	8	2	RH	186625	C
7,2	30 POS	31	70	8	2	RH	186626	C
7,3	30 POS	31	70	8	2	RH	186627	C
7,4	30 POS	31	70	8	2	RH	186628	C
7,5	30 POS	31	70	8	2	RH	186629	C
7,6	30 POS	31	70	8	2	RH	186630	C
7,7	30 POS	31	70	8	2	RH	186631	C
7,8	30 POS	31	70	8	2	RH	186632	C
7,9	30 POS	31	70	8	2	RH	186633	C
8	30 POS	31	70	8	2	RH	186634	L
8,1	30 POS	31	70	10	2	RH	186635	C
8,2	30 POS	31	70	10	2	RH	186636	L
8,3	30 POS	31	70	10	2	RH	186637	C
8,4	30 POS	31	70	10	2	RH	186638	C
8,5	30 POS	31	70	10	2	RH	186639	L
8,6	30 POS	31	70	10	2	RH	186640	C
8,7	30 POS	31	70	10	2	RH	186641	C
8,8	30 POS	31	70	10	2	RH	186642	C
8,9	30 POS	31	70	10	2	RH	186643	C
9	30 POS	31	70	10	2	RH	186644	L
9,1	30 POS	31	70	10	2	RH	186645	C
9,2	30 POS	31	70	10	2	RH	186646	C
9,3	30 POS	31	70	10	2	RH	186647	C
9,4	30 POS	31	70	10	2	RH	186648	C
9,5	30 POS	31	70	10	2	RH	186649	C
9,6	30 POS	31	70	10	2	RH	186650	C
9,7	30 POS	31	70	10	2	RH	186651	C
9,8	30 POS	31	70	10	2	RH	186652	C
9,9	30 POS	31	70	10	2	RH	186653	C
10	30 POS	31	70	10	2	RH	186654	L
11	30 POS	36	80	12	2	RH	186655	C
12	30 POS	36	80	12	2	RH	186656	C
13	30 POS	41	90	14	2	RH	186657	C
14	30 POS	41	90	14	2	RH	186658	C
15	30 POS	41	90	16	2	RH	186659	C
16	30 POS	41	90	16	2	RH	186660	C
17	30 POS	46	100	18	2	RH	187011	C
18	30 POS	46	100	18	2	RH	187012	C
19	30 POS	46	100	20	2	RH	187013	C
20	30 POS	46	100	20	2	RH	187014	C
21	30 POS	51	110	25	2	RH	187015	C
22	30 POS	51	110	25	2	RH	187016	C
23	30 POS	51	110	25	2	RH	187017	C
24	30 POS	51	110	25	2	RH	187018	C
25	30 POS	51	110	25	2	RH	187019	C
[mm]	[°]	[mm]	[mm]	[mm]				

Other dimensions and configurations on request.

135192

→ **CD020 Drill Bit 90/30 SC**

- Can be used on CNC and gantry machines or ADUs (automatic drilling units)
- Very well suited for UD laminates for example CFRP
- Optimized, faceted tip geometry for chip-free through holes
- Long edge life due to reduced cutting forces and micrograin carbide
- Optionally available with adapted CVD diamond coating



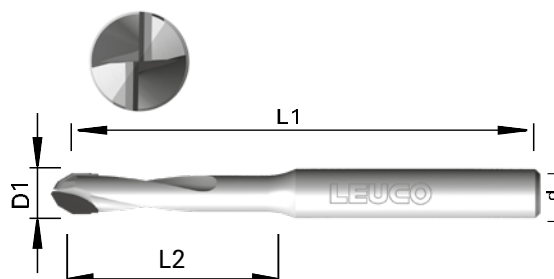
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6	30 POS	30	70	6	2	RH	187818	L
8	30 POS	35	80	8	2	RH	187825	L
10	30 POS	40	90	10	2	RH	187827	L
[mm]	[°]	[mm]	[mm]	[mm]				

Intermediate dimensions available continuously from diameter 2.0 mm to 12.0 mm

235142

→ **CD030 DP Drill 120/60**

- Can be used on CNC and gantry machines
- Well suited for GFRP, mineral and other abrasive materials
- Faceted tip geometry with standard DP cutting edges
- Long edge life and resistance against vibration, therefore also suitable for instable workpiece clamping



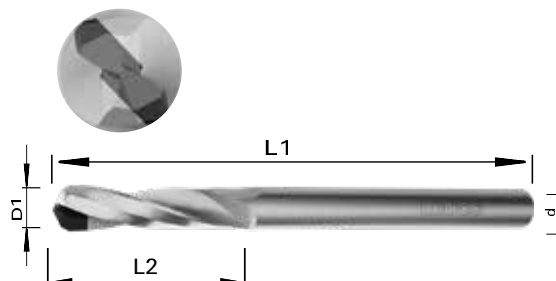
D1	α	L2	L1	d	Z	R/L	Ident-No.	LKZ
4	7 POS	20	50	4	2	RH	187175	L
5	7 POS	20	60	6	2	RH	187176	L
6	7 POS	25	60	6	2	RH	187177	L
8	7 POS	30	70	8	2	RH	187178	L
10	7 POS	35	80	10	2	RH	187179	L
[mm]	[°]	[mm]	[mm]	[mm]				

Intermediate dimensions available continuously from diameter 4.0 mm to 20.0 mm

235122

→ **CD040 Solid-DP Drill 130/60**

- | Can be used on CNC and gantry machines
- | Universal tool for a variety of materials: fiber reinforced plastics, aluminum, stacks or CMC and ceramic
- | Solid continuous DP cutting edge and faceted tip geometry
- | Compared to standard DP cutting edges, greater geometric freedom and therefore higher performance is possible
- | Very robust design, insensitive to vibrations



D1	α	L2	L1	d	Z	R/L	Ident-No.	LKZ
4	20 POS	26	60	4	2	RH	187180	L
6	20 POS	26	70	6	2	RH	187181	L
8	20 POS	31	70	8	2	RH	187182	L
[mm]	[°]	[mm]	[mm]	[mm]				

Intermediate dimensions available continuously from diameter 4.0 mm to 20.0 mm

235112

→ **CD050 FullNib-DP Drill 90/30**

- | Can be used on CNC and gantry machines
- | Very well suited for UD laminates for example CFRP
- | Optimized, faceted tip geometry for chip-free through holes
- | The complete DP drill bit offers maximum freedom when choosing the drill bit geometry
- | Therefore a number of teeth higher than two is possible
- | Very small diameters are possible



D1	α	L2	L1	d	Z	R/L	Ident-No.	LKZ
3,3	30 POS	27	59	4	2	RH	187183	L
5	30 POS	27,5	76	6	2	RH	187184	C
[mm]	[°]	[mm]	[mm]	[mm]				

Intermediate dimensions available continuously up to diameter 12.0 mm

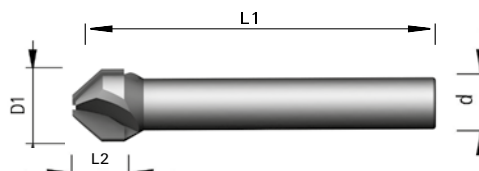
Recommended especially for diameters up to 4.0 mm

→ COUNTERSINK

234119

→ CD060 Cone Countersink DP

Countersinks with shank for the use on CNC machines or robots



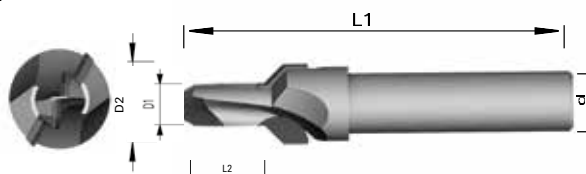
D	D2	α	L2	L1	d	Z	R / L	Ident-Nr.	LKZ
6,3		90	2,65	45	5	2	RH	80497734	C
8,3		90	3,20	50	6	3	RH	80497735	C
10,4		90	3,90	50	6	3	RH	80497736	C
12,4		90	4,50	56	8	3	RH	80497721	L
16,5		90	6,00	60	10	3	RH	80497737	C
20,5		90	7,75	63	10	3	RH	80497722	L
[mm]	[mm]	[°]	[mm]	[mm]	[mm]				

Other dimensions and configurations on request

235342

→ CD070 Counterbore 120/60+90 DP

- Best results on CNC and gantry machines but also suitable for ADUs and MDUs
- For drilling and countersinking in one pass (one-shot)
- Reduce the processing times by combining several passes
- Plunging tip available in DP, Solid DP, complete DP or SC according to the requirements



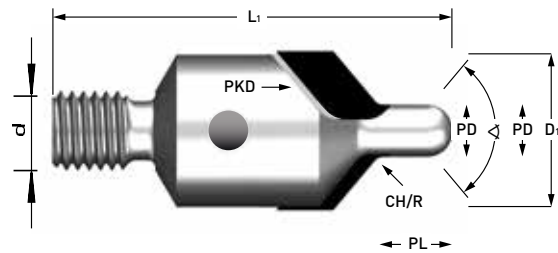
D	D2	α	L2	L1	d	Z	R / L	Ident-Nr.	LKZ
12,05	16		45	120	12	2+2	RH	187163	C
8,2	14		45	120	12	2+2	RH	187164	C
8,55	16		14	80	12	2+2	RH	187165	C
[mm]	[mm]	[°]	[mm]	[mm]	[mm]				

Plunging tip available in DP, Solid DP, complete DP or SC according to the requirements

234121

→ CC010 Countersink DP - integral Pilot

- Counterbore with thread interface (metric/imperial) for the use in hand-held machines (MDU) with stop holder
- For subsequent countersinking of bores
- For optimal riveted joints in the aerospace sector
- Suitable for all fiber reinforced plastics, aluminum and other light metals
- Designed with fixed pilot
- With two or three cutting edges by default
- Tool design according to the application is a frequent practice
- DP-tipping for long edge life and economic efficiency
- Fixed pilots matched to the bore diameter increase machining quality and process stability



D1	PD	α	PL	L1	d	Z	R / L	Ident-Nr.	LKZ
0.375 (3/8)	0.159	100	0.181	1.181	1/4-28 UNF	2	RH	1740162	L
0.500 (1/2)	0.191	100	0.236	1.260	1/4-28 UNF	2	RH	80488388	C
0.500 (1/2)	0.159	100	0.236	1.260	1/4-28 UNF	3	RH	80478364	L
0.500 (1/2)	0.250 (1/4)	130	0.236	1.260	1/4-28 UNF	2	RH	80488389	L
0.500 (1/2)	0.1875 (3/16)	130	0.236	1.260	1/4-28 UNF	3	RH	80367658	L
0.562	0.189	100	0.190	1.211	1/4-28 UNF	3	RH	1741091	C
0.625 (5/8)	0.200	100	0.217	1.260	1/4-28 UNF	2	RH	1738410	L
0.625 (5/8)	0.190	100	0.250 (1/4)	1.378	1/4-28 UNF	3	RH	80369286	L
0.625 (5/8)	0.164	130	0.250 (1/4)	1.378	1/4-28 UNF	3	RH	80369280	C
0.750 (3/4)	0.346	100	0.382	1.783	3/8-24 UNF	2	RH	1741487	C
0.875 (7/8)	0.375 (3/8)	100	0.250 (1/4)	1.378	3/8-24 UNF	3	RH	80369289	C
[inch]	[inch]	[°]	[inch]	[inch]	[inch]				

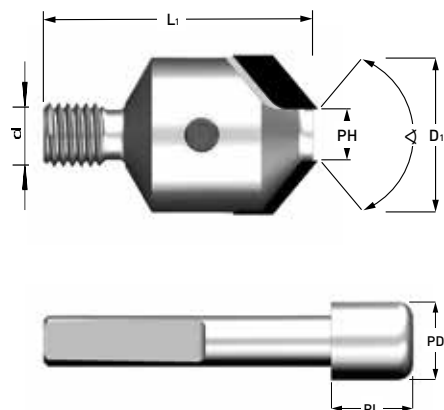
Customer-specific tool design

Metric or imperial dimensions are possible

234121

→ CC020 Countersink DP - interchangeable pilot

- Counterbore with thread (metric/imperial) for the use in hand-held machines (MDU) with stop holder
- For subsequent countersinking of bores
- For optimal riveted joints in the aerospace sector
- Suitable for all fiber reinforced plastics, aluminum and other light metals
- Designed with interchangeable pilot
- With two or three cutting edges by default
- Different interchangeable pilots are available for the same tool body
- DP-tipping for long edge life and economic efficiency
- The interchangeable pilot allows countersinking of different bore diameters with one tool body



D1	PH	$\angle$	d	Z	R / L	Ident-Nr.	LKZ
21	5	100	M8x1	3	RH	80458957	C
[mm]	[mm]	[°]	[mm]				

Customer-specific tool design

Metric or imperial dimensions are possible

Interchangeable pilot according customer's specification
in HW or steel

D1	PH	$\angle$	d	Z	R / L	Ident-Nr.	LKZ
0.500 (1/2)	0.125 (1/8)	100	1/4-28 UNF	3	RH	1729321	C
0.625 (5/8)	0.1875 (3/16)	100	1/4-28 UNF	2	RH	80366369	C
[inch]	[inch]	[°]	[inch]				

Customer-specific tool design

Metric or imperial dimensions are possible

Interchangeable pilot according customer's specification
in HW or steel

PRECISE TOOLS. PRECISE COMPONENTS.



- Long edge life (PCD)
- Rivet countersinks without any chatter marks and delamination in the common composites for the aerospace industry, such as CFRP, GFRP and stacks etc.



Individually configurable at LEUCO

For use in hand-helds | Comply with the aerospace standards

→ COUNTERSINKS UPON CUSTOMER REQUEST

Dimensions

Countersink angle [A]

☐ 130° ☐ 100°

No. of PCD cutting edges

☐ 2 ☐ 3

Total length [L1]



Diameter [D1]

☐ 3/8" ☐ 10 mm

☐ 1/2" ☐ 12 mm

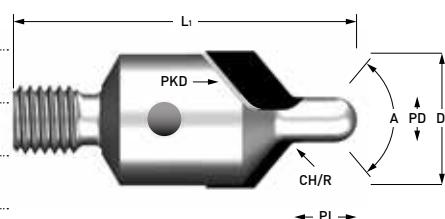
☐ 0,55" ☐ 14 mm

☐ 5/8" ☐ 17 mm

☐ 3/4" ☐ 19 mm

☐ 7/8" ☐ 22 mm

☐ ☐



Pilot

Pilot version

☐ brazed ☐ changeable

☐ Radius [R]

☐ Chamfer [CH]

☐ Sharp-edged*

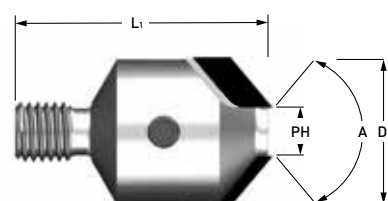
☐ Delivery with pilot⁽¹⁾

☐ Delivery without pilot⁽²⁾

Pilot dimension or bore diameter

Diameter [D2], [PD]⁽¹⁾ or [PH]⁽²⁾

Length [PL]⁽¹⁾



Interface

Machine interfacing

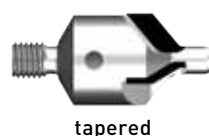
☐ M6x1 ☐ 1/4"-28UNF-2A

☐ M8x1 ☐ 3/8"-24UNF-2A

☐ 7/16"-20UNF-2A

☐ tapered 120°

☐ cylindrical*



tapered



cylindrical*

Basic body

☐ Standard steel

☐ High speed steel HSS*

☐ Tungsten carbide (HW)*

Tightening type

☐ Tightening bore

☐ Spanner flat*

Quantities



SCAN ME.



Countersinks can also be requested using the online form.

→ **THANK YOU!**

*Special design

→ END MILLS



Recommended
by LEUCO

++

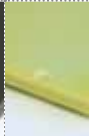
very well suited

+

suitable

✓

possible

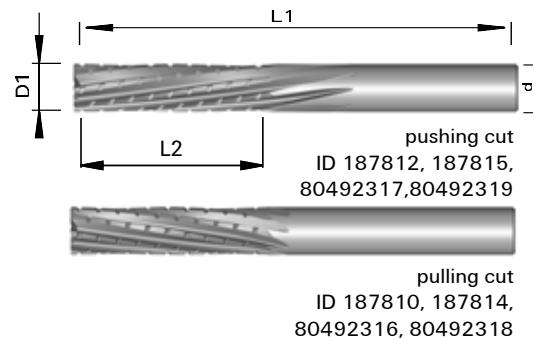
PRODUCT	FIGURE	MATERIAL		
		CFRP	GFRP	AFRP
				
CM010 Multit-Tooth End Mill SC		++	++	+
CM140 Multit-Tooth End Mill SC - CVD coated				
CM150 Multit-Tooth End Mill SC - CVD coated "Nicked"		+	+	
CM160 Roughing End Mill – CVD coated		++	++	
CM170 Compression End Mill SC - CVD coated		++	++	
CM180 End Mill SC				
CM020 Honeycomb End Mill SC - DLC coated				
CM030 Two-Flute End Mill DP				
CM040 Ball End Mill DP		+	++	
CM190 Chamfering End Mill DP		++	++	
CM050 Multit-Tooth End Mill DP "UniType"				
CM060 Multi-Tooth End Mill DP "ProType"			+	
CM070 Spiral End Mill DP		++	+	
CM080 Roughing End Mill DP		++	++	
CM090 Multi-Tooth Compression End Mill DP		++	+	
CM130 Disc Milling Cutter DP		+	+	+

MATERIAL			APPLICATION							MACHINE		PAGE
Block materials	Sandwich honeycomb core	Honeycomb	Dividing	Trimming	Grooving	Copying shaping	Roughing	Finishing	Vibration-sensitive application	CNC machines / gantries	Robot	
												
+	+		✓	✓	✓		✓	✓	+	✓	✓	26
+	+		✓	✓	✓		✓	✓				27
	+		✓	✓	✓		✓	✓				27
+	+		✓	✓	✓		✓		+	✓	✓	28
+	++	+	✓	✓			✓	✓		✓		28
	+	+	✓	✓	✓		✓	✓	+	✓	✓	29
	+		✓	✓	✓		✓	✓	+	✓	✓	29
++			✓	✓	✓			✓		✓		30
			✓	✓	✓	✓		✓		✓		31
+	+		✓	✓	✓		✓	✓	+	✓		31
												32
	+		✓	✓	✓			✓				32
+			✓	✓	✓		✓	✓	+	✓		33
++			✓	✓	✓		✓			✓	✓	34
			✓	✓				✓		✓	✓	34
+	+	+	✓	✓	✓			✓		✓		35

→ END MILLS

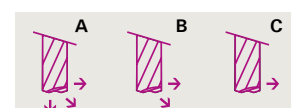
→ 136168 CM010 Mult-Tooth End Mill SC

- I Can be used on CNC and gantry machines or robots
- I For plunge cutting with feed in the direction of the Z, X or Y axis
- I Available for pushing and pulling cut
- I Special tool geometry for smooth running, even with thin components and difficult workpiece clamping
- I Reduced cutting forces thanks to chip breakers and very sharp cutting edges ensure the best machining quality
- I Long edge life due to micrograin carbide



D	D2	↙	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
6			10 POS	28	75	6	8	A	RH	187810	L
6			-10 NEG	28	75	6	8	A	RH	187812	L
8			10 POS	32	75	6	8	A	RH	187814	L
8			-10 NEG	32	75	6	8	A	RH	187815	L
10			10 POS	32	75	10	8	A	RH	80492316	L
10			-10 NEG	32	75	10	8	A	RH	80492317	L
12			10 POS	32	85	12	8	A	RH	80492318	L
12			-10 NEG	32	85	12	8	A	RH	80492319	L
[mm]	[mm]	[°]	[°]	[mm]	[mm]	[mm]					

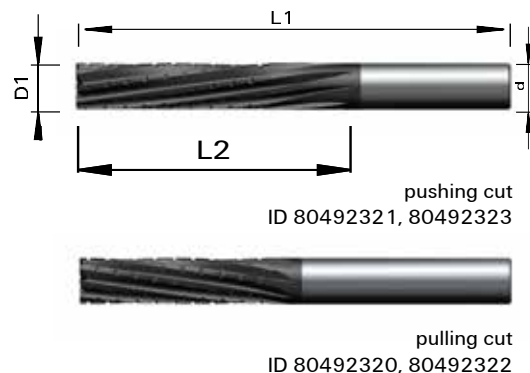
Other dimensions and configurations on request



536168

→ CM140 Multi-Tooth End Mill SC - CVD coated

- Can be used on CNC and gantry machines
- For plunge cutting with feed in the direction of the Z, X or Y axis
- Available for pushing and pulling cut
- CVD diamond-tipped
- Special tool geometry for smooth running, even with thin components and difficult workpiece clamping
- Reduced cutting forces thanks to chip breakers and very sharp cutting edges ensure the best machining quality
- Very long edge life due to CVD diamond coating



D	D2	α	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
6			10 POS	28	75	6	8	A	RH	80492320	L
6			-10 NEG	28	75	6	8	A	RH	80492321	L
8			10 POS	32	75	6	8	A	RH	80492322	L
8			-10 NEG	32	75	6	8	A	RH	80492323	L
[mm]	[mm]	[°]	[°]	[mm]	[mm]	[mm]	[mm]				

Other dimensions and configurations on request

536168

→ CM150 Multi-Tooth End Mill SC - CVD coated "Nicked"

- Can be used on CNC and gantry machines or robots
- Suitable for roughing and finishing of all fiber reinforced plastics, graphite and other materials
- Design with low, one-sided spiral angle and chip breakers facing in the opposite direction enables cutting in any direction
- Robust tool design
- Universal application
- Suitable for roughing and finishing



D	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
6	15 POS	20	65	6	10	A	RH	80503585	L
8	15 POS	25	75	8	12	A	RH	80503586	L
[mm]	[mm]	[°]	[mm]	[mm]	[mm]				

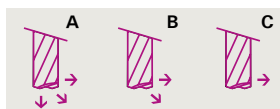
Other dimensions and configurations on request

Also available with plunge tip

D	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
0.250 (1/4)	15 POS	1	2.5	0.250 (1/4)	10	A	RH	80503589	C
0.375 (3/8)	15 POS	1.375 (1-1/8)	3	0.375 (3/8)	12	A	RH	80390996	C
[inch]	[mm]	[°]	[inch]	[inch]	[inch]				

Other dimensions and configurations on request

Also available with plunge tip

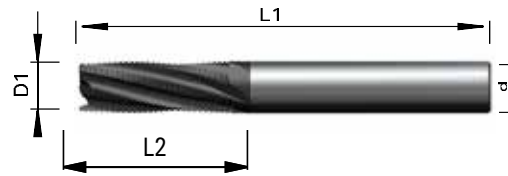


Delivery status: ● available from stock ○ Delivery time upon request | LKZ: Warehouse identification
 R/L: RH right LH left | : tip angle/countersink angle/step angle | α : spiral angle/shear angle

536168

→ CM160 Roughing End Mill – CVD coated

- Can be used on CNC and gantry machines or robots
- Suitable for roughing of different materials, especially CFRP, with a very high feed rate



D	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
6	15 POS	20	65	6	4	A	RH	80503587	L
8	15 POS	25	75	8	6	A	RH	80503588	L
[mm]	[°]	[mm]	[mm]	[mm]					

Other dimensions and configurations on request

D	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
0.250 (1/4)	15 POS	1	2.5	0.250 (1/4)	4	A	RH	80503590	C
0.375 (3/8)	15 POS	1.375 (1-1/8)	3	0.375 (3/8)	6	A	RH	80435519	C
[inch]	[°]	[inch]	[inch]	[inch]					

Other dimensions and configurations on request

536156 / 536166

→ CM170 Compression End Mill SC - CVD coated

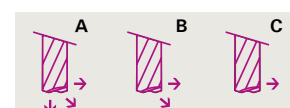
- Can be used on CNC and gantry machines or robots
- Suitable for CFRP, GFRP and honeycomb and sandwich panels
- Low helix angle and fine rough toothing ensure smooth running even in thin materials
- Highly efficient roughing due to high feed rates, tool life and universal use of the tool



D	D2	α	L2	L3	L1	d	Z		R/L	Ident-No.	LKZ
6		30 POS/NEG	28	5	65	6	2+2	A	RH	S	
8		30 POS/NEG	32	7	75	8	3+3	A	RH	S	
[mm]	[mm]	[°]		[mm]	[mm]	[mm]					

Other dimensions and configurations on request

Also available with plunge tip



136154

→ **CM180 End Mill SC**

- | Can be used on CNC and gantry machines or robots
- | Suitable for the processing of AFRP and natural fiber reinforced plastic which tend to fray
- | Very sharp cutting edges
- | Alternating, very high helix angles
- | Fine-grain tungsten carbide
- | Effectively minimizes fiber protrusions



D	D2	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
6			55 POS/NEG	28	75	6	2	A	RH	80502237	L
8			55 POS/NEG	32	75	8	2	A	RH	80502238	L
[mm]	[mm]	[°]	[°]	[mm]	[mm]	[mm]	[mm]				

Weitere Abmessungen und Konfigurationen auf Anfrage
Auch mit Einbohrschneide erhältlich

136154

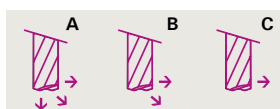
→ **CM020 Honeycomb End Mill SC - DLC coated**

- | Can be used on CNC and gantry machines or robots
- | Suitable for sandwich laminates with CFRP/GFRP top layers and honeycomb core
- | Micrograin carbide with DLC coating
- | Extremely sharp cutting edges ensure a clean separation of the honeycomb core
- | Suitable for top layer cutting and for dividing cuts



D	D2	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
6			40	32	76,2	6	8	A	RH	187840	L
8			40	32	76,2	8	8	A	RH	187841	L
[mm]	[mm]	[°]	[°]	[mm]	[mm]	[mm]					

Other dimensions and configurations on request



236154/236152

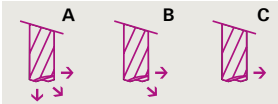
➔CM030 Two-Flute End Mill DP

- | Can be used on CNC and gantry machines
- | For plunge cutting with feed in the direction of the Z, X or Y axis
- | As standard with alternating shear angle
- | Also available with shear angle on one side or neutral shear angle
- | Smooth running due to alternating shear angle



D	D2	↙	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
3			0 STRAIGHT	4	50	3	2	A	RH	80474039	L
4			3 POS/NEG	6	65	4	2	A	RH	186926	L
5			3 POS/NEG	8	65	6	2	A	RH	187192	C
6			3 POS/NEG	10	65	6	2	A	RH	186927	L
6			0 STRAIGHT	26	75	6	2	A	RH	80461706	L
8			3 POS/NEG	12	65	8	2	A	RH	186928	L
8			0 STRAIGHT	12	65	8	2	A	RH	80472304	C
8			0 STRAIGHT	26	75	8	2	A	RH	80461707	L
10			5 POS/NEG	15	75	10	2	A	RH	187193	L
12			5 POS/NEG	18	75	12	2	A	RH	187194	L
12			0 STRAIGHT	25	70	12	2	A	RH	80463025	C
12			3 POS/NEG	40	95	12	2	A	RH	80431652	C
20			5 POS/NEG	15	100	20	2	A	RH	80468392	L
[mm]	[mm]	[°]	[°]	[mm]	[mm]	[mm]					

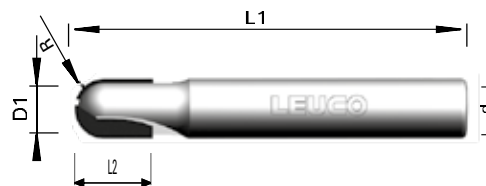
Other dimensions and configurations on request



236354

→ **CM040 Ball End Mill DP**

- | Can be used on CNC and gantry machines
- | Suitable for line-by-line milling, copying shaping or grooving
- | As standard with alternating shear angle
- | Also available with shear angle on one side or neutral shear angle
- | With shear angle on one side or shorter edge length according to customer requirements
- | Smooth running due to alternating shear angle



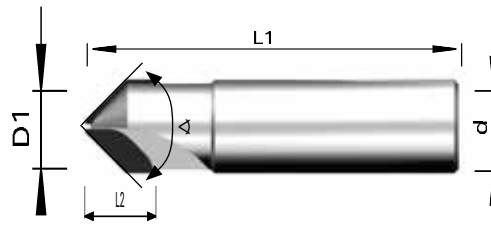
R	D1	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
1,5	3		0 STRAIGHT	3	50	3	2	A	RH	187171	C
2	4		3 POS/NEG	6	65	4	2	A	RH	186931	C
2,5	5		3 POS/NEG	8	65	6	2	A	RH	187172	C
3	6		3 POS/NEG	10	65	6	2	A	RH	186932	L
4	8		3 POS/NEG	12	65	8	2	A	RH	186933	L
5	10		5 POS/NEG	15	65	10	2	A	RH	187173	L
6	12		5 POS/NEG	18	75	12	2	A	RH	187170	L
[mm]	[mm]	[°]	[°]	[mm]	[mm]	[mm]					

With shear angle on one side or shorter edge length according to customer requirements
Other dimensions and configurations on request

236452

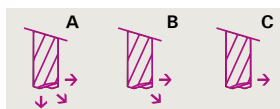
→ **CM190 Chamfering End Mill DP**

- | Can be used on CNC and gantry machines
- | Suitable for the milling of V grooves and for chamfering
- | Designed for CFRP and GFRP and stacks in the aerospace sector
- | Various tip angles possible
- | With or without face cutting edge
- | Long edge life and form stability in abrasive materials



D	D2	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
0.500 (1/2)	0.200	60	0 STRAIGHT	0.457	3	0.500 (1/2)	2	B	RH	1736710	L
0.750 (3/4)	0.100	90	0 STRAIGHT	0.551	3	0.750 (3/4)	2	B	RH	1740481	L
[inch]	[inch]	[°]	[°]	[inch]	[inch]	[inch]					

Other dimensions and configurations on request



Delivery status: ● available from stock ○ Delivery time upon request | LKZ: Warehouse identification
R/L: RH right LH left | $\angle$: tip angle/countersink angle/step angle | α : spiral angle/shear angle

236164

→ CM050 Mult-Tooth End Mill DP "UniType"

- Can be used on CNC and gantry machines or robots
- Can be used for almost all machining types and materials
- Long edge length for universal use and milling of 3D contours
- Smooth running due to high number of teeth and alternating shear angles
- Low heat input due to special chip breaker geometry and large gullets



D	D2	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
6			2,0 POS/NEG	15	60	6	3	A	RH	187283	L
8			3,0 POS/NEG	20	70	8	4	A	RH	187284	L
10			2,5 POS/NEG	25	80	10	4	A	RH	80502642	L
12			3,0 POS/ NEG	30	85	12	4	A	RH	80466827	L
[mm]	[mm]	[°]	[°]	[mm]	[mm]	[mm]					

Also possible with faceted plunge tip

Other dimensions and configurations on request

D	D2	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
0.25 (1/4)			2,0 POS/NEG	0.625 (3/8)	3	0.25 (1/4)	3	A	RH	80494750	L
0.375 (3/8)			2,5 POS/NEG	1	3	0.375 (3/8)	4	A	RH	80494751	L
[inch]	[inch]	[°]	[°]	[inch]	[inch]	[inch]					

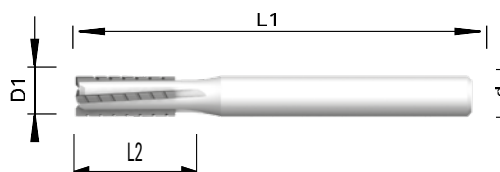
Also possible with faceted plunge tip

Other dimensions and configurations on request

236162/236168

→ CM060 Multi-Tooth End Mill DP "ProType"

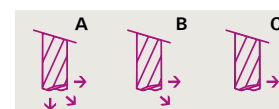
- Can be used on CNC and gantry machines or robots
- Particularly suited for finishing of CFRP or graphite
- Also well suited for thin CFRP components
- Long edge length for universal use and milling of 3D contours
- Large number of teeth in combination with division of cut for extremely smooth, low-vibration running
- Designed with positive, negative or neutral shear angles, according to the requirements



D	D2	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
6			-3 NEG	15	60	6	4	A	RH	187287	L
8			-3 NEG	20	70	8	5	A	RH	187288	L
6			3 POS	15	60	6	4	A	RH	187289	C
6			0 STRAIGHT	15	60	6	4	A	RH	187290	C
8			3 POS	20	70	8	5	A	RH	187291	C
8			0 STRAIGHT	20	70	8	5	A	RH	187292	C
10			0 STRAIGHT	25	75	10	7	A	RH	187294	C
[mm]	[mm]	[°]	[°]	[mm]	[mm]	[mm]					

Also possible with faceted plunge tip

Other dimensions and configurations on request



236128

→ CM070 Spiral End Mill DP

- Can be used on CNC and gantry machines
- Standard tools (ID 80474998-80475001) in diameters 6.0 mm and 8.0 mm
- With pushing cut and chip breaker for composites
- With pulling cut without chip breaker for NF metals (aluminum, titanium, ...)
- Constant hook angle along the entire edge length
- Large spiral angles and number of teeth are possible also for small diameters
- Plunge cuts into the material only possible in helix or ramping motion
- Smooth running and cutting surface free of tool marks due to continuous, spiral DP edges
- Can be resharpened up to 3 times

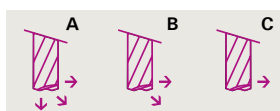


D	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
6		-7 NEG	12	70	6	3	A	RH	80474998	L
6		7 POS	12	70	6	3	A	RH	80475000	L
8		-7 NEG	16	80	8	4	A	RH	80474999	L
8		7 POS	16	80	8	4	A	RH	80475001	L
8		20 POS	8	80	8	3	B	RH	187198	C
10		8 POS	30	80	10	4	B	RH	187199	C
[mm]	[°]	[°]	[mm]	[mm]	[mm]					

Face cutting edge or plunge tip and other dimensions and configurations on request

D	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
0.1875 (3/16)		8 POS	0.630	2.500 (2 1/2")	0.250 (1/4)	3	C	RH	80468652	C
0.500 (1/2)		15 NEG	20	81	0.500 (1/2)	4	B	RH	187200	C
[inch]	[°]	[°]	[inch]	[inch]	[inch]					

Face cutting edge or plunge tip and other dimensions and configurations on request

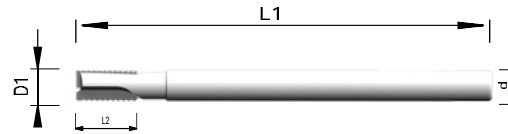


Delivery status: ● available from stock ○ Delivery time upon request | LKZ: Warehouse identification
R/L: RH right LH left | $\angle$: tip angle/countersink angle/step angle | α : spiral angle/shear angle

236154 / 236168

→ CM080 Roughing End Mill DP

- Can be used on CNC and gantry machines or robots
- Wave profile for roughing with low cutting pressure
- Design with a high number of teeth for highest feed rates



D	D2	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
4			3 POS/NEG	8	55	4	2	A	RH	187295	C
8			-5 NEG	8	60	8	4	B	RH	187296	C
8			3 POS	17	65	8	4	A	RH	80463398	C
10			-5 NEG	10	80	10	5	A	RH	187297	C
20			-3 NEG	31	100	20	4	A	RH	80463343	C
[mm]	[mm]	[°]	[°]	[mm]	[mm]	[mm]					

Other dimensions and configurations on request

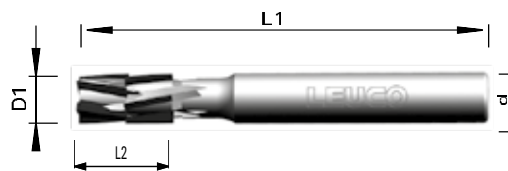
D	D2	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
0.500 (1/2)			3 POS	0.875 (7/8)	3	0.500 (1/2)	4	A	RH	80470541	C
[inch]	[inch]	[°]	[°]	[inch]	[inch]	[inch]					

Other dimensions and configurations on request

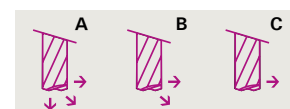
236166

→ CM090 Multi-Tooth Compression End Mill DP

- Can be used on CNC and gantry machines or robots
- Optimal solution for top layers in honeycomb, sandwich or other panel materials which are difficult to process
- Compression milling cutter for delamination-free cutting quality at the top and bottom edge
- High feed rates thanks to a high number of teeth
- Very well suited for finishing

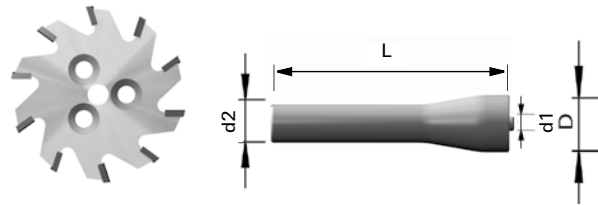


D	$\angle$	α	L2	L1	d	Z		R/L	Ident-No.	LKZ
6		10 POS/NEG	13	65	6	3+3	B	RH	186929	L
8		10 POS/NEG	15	65	8	5+5	B	RH	186930	L
10		10 POS/NEG	17	75	10	5+5	B	RH	187195	C
12		10 POS/NEG	18	75	12	7+7	B	RH	187196	C
[mm]	[°]	[°]	[mm]	[mm]	[mm]					



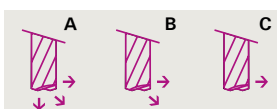
237431
→ **CM130 Disc Milling Cutter DP**

- I Can be used on CNC and gantry machines
- I Suitable for grooving and dividing
- I Economic alternative to conventional milling for straight cuts



D	B	b	D1	d	Z	Zahnform	NL	Ident-No.	LKZ	R/L
50	2	3	6	6	5+5	F	3/4/16	187174	C	
Werkzeugaufnahme										
D	d1	L2		d2	L1	NL	Ident-No.	LKZ		
24	6	2		16	102		3/M4/16	187329	C	
[mm]	[mm]	[mm]		[mm]	[mm]	[mm]				

Other dimensions and configurations on request



Delivery status: ● available from stock ○ Delivery time upon request | LKZ: Warehouse identification
R/L: RH right LH left | : tip angle/countersink angle/step angle | α: spiral angle/shear angle

→ MICRO DRILL BITS & END MILLS

LEUCO can offer you various individual micro tools
for drilling and cutting of composites. Talk to us about your specific requirements!

→ Micro drill bit

- | Z2, Z3, Z4 with adapted helix angles
- | Different tool tip versions, for example in Z6/Z7
- | Individual selection of the tungsten carbide grades and the CVD coatings

→ Micro cutter

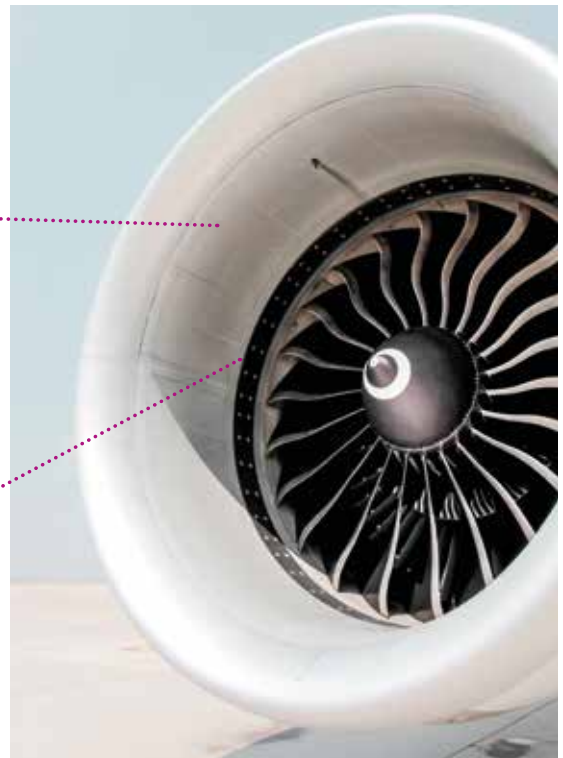
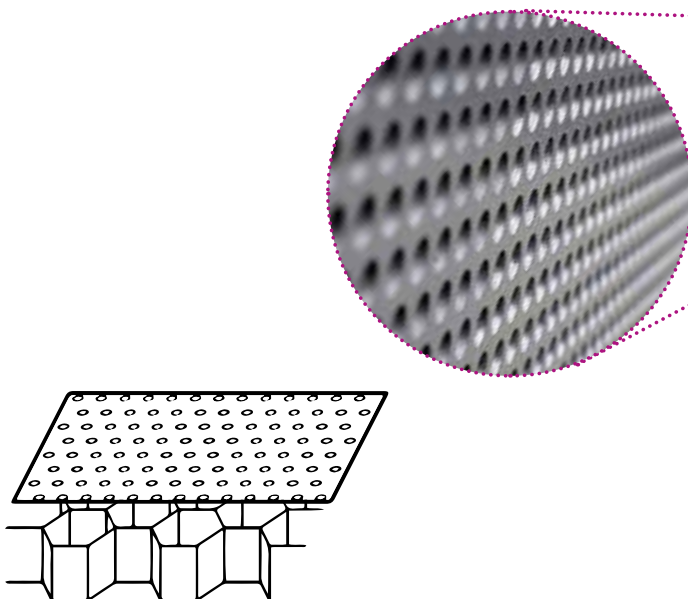
- | Helical Z2 cutters and cutters with a high number of teeth with division of cut in Z6/Z7
- | Tool tips available with different grinds, helical directions and helical angles
- | Individual selection of the tungsten carbide grades and the CVD coatings



→ Application example –

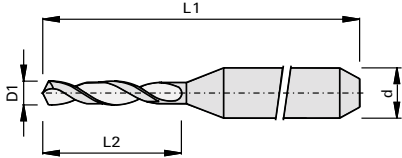
Acoustic drilling in the engine area

- | Application for curved surfaces
- | Drilling on honeycomb ridge and honeycomb core
- | No chip evacuation into the honeycomb core
- | Burr-free tool entry over a long time





YOUR CHECKLIST



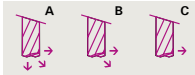
for micro drill bit:

D1	$\varnothing$	α	L2	L1	d	Z	R/L	CVD yes/no	pcs.
X	X	X	X	X	X	X	X		X
[mm]	[°]	[°]	[mm]	[mm]	[mm]				

for micro end mill:

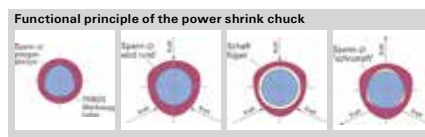
D1	α	L2	L1	d	Z	R/L	CVD yes/no	Geometry?	Direction A, B, C?	pcs.
X	X	X	X	X	X	X	X			X
[mm]	[°]	[mm]	[mm]	[mm]						

R/L: RH right LH left | : tip angle/countersink angle/step angle | α : spiral angle/shear angle



→ CLAMPING DEVICES

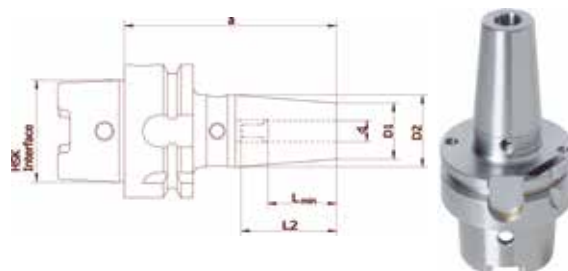
Clamping system		Concentric accuracy	Rigidity	Calming	Imbalance	Handling	Description and information
Collet chuck		+ 0.02-0.06 mm	++	++	++	++	Clamping elements with moderate concentric accuracy, but often standard in many application areas. Alternative modern and accurate clamping elements offer a lot of advantages which have a significant effect on the edge life and the machining accuracy.
Hydro clamping system "ps-System"		++ < 0.006 mm	++	+++	++	+++	The high-precision hydraulic extension chuck "ps-System" stands for simple handling on CNC stationary machines. In the case of the ps-System, the clamping of the shank is made via pressurization of the hydraulic fluid. No additional device is necessary to clamp the tools. Due to the hydraulic clamping, the hydro-expansion chuck has a vibration-absorbing effect.
Heat-shrinking chucks		+++ < 0.003 mm	+++	++	+++	+	The heat-shrinking chuck clamps the shaft by means of the thermal expansion of the hot-working steel. This is particularly suitable when large holding forces and small tolerances are required. Low interference contours mean good accessibility in the case of 5 axis applications. The very low unbalance of the clamping elements prevents the machine spindle from damage.
TRIBOS power shrink chuck		+++ < 0.003 mm	++	++	++	+	In the TRIBOS power shrink chuck, the shank is adapted by the polygonal section of the chuck. When an external force is applied, it is pressed into a round form. Afterwards the shank is inserted and the external force is removed. As soon as the force to the chuck is released, it returns to the polygonal form and clamps the shank. The low weight and the minimum unbalance of the chuck prevent damage on the machine spindle. The power shrink chuck is very slim which increases the accessibility for 5 axis applications.



+++ very good
++ good
+ moderate

→ 933297 CS010 Heat-shrinking chuck HSK 50A and HSK 63A

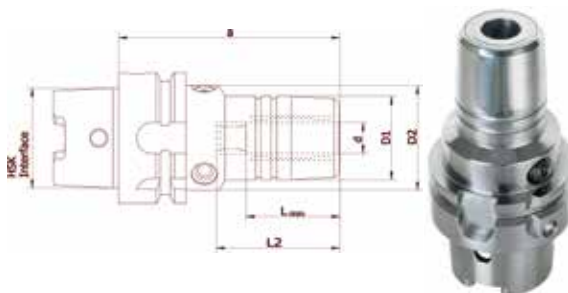
- For precise clamping of shank-type tools with cylindrical shank.
- Increased process safety, long edge life and high machining quality thanks to high concentricity and repeating accuracy combined with highest rigidity.



d	D1	D2	Interface	a	L2	Lmin		Ident-No.	LKZ
6	21	27	HSK50A	80	36	26	0,570	187201	o
8	21	27	HSK50A	80	36	26	0,570	187202	o
10	24	32	HSK50A	85	41	31	0,650	187203	o
12	24	32	HSK50A	90	46	36	0,660	187204	o
6	21	27	HSK63A	80	36	26	0,870	187205	o
8	21	27	HSK63A	80	36	26	0,830	187206	o
10	24	32	HSK63A	85	41	31	0,900	187207	o
12	24	32	HSK63A	90	46	36	0,920	187208	o
[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[kg]		

→ 933240 CS011 Hydro expansion chuck HSK50A and HSK 63A

- For precise clamping of shank-type tools with cylindrical shank.
- Minimization of setup-times thanks to easy and quick tool change.
- Increased process safety, long edge life and high machining quality thanks to very high concentricity and repeating accuracy.
- Vibration-absorbing due to hydraulic clamping.



d	D1	D2	Interface	a	L2	Lmin		Ident-No.	LKZ
12	32	40	HSK50A	85	46	36	0,800	187209	o
12	32	50	HSK63A	85	46	36	1,175	187210	o
[mm]	[mm]	[mm]		[mm]	[mm]	[mm]	[kg]		

→ SAW BLADES



**Recommended
by LEUCO**

++

very well suited

+

suitable

✓

possible

	MATERIAL						APPLICATION			MACHINE	
	CFRP	GFRP	AFRP	Block material	Sandwich	Honeycomb panel	Material thickness < 5 mm	Material thickness > 5 mm	Profiles	CNC / stationary	Table saw
											
DIAREX sizing saw blades DP 			+	+	+	+	✓	✓		✓	
Sizing saw blades DP "HR" – nn-System DP flex 	+	++		+	++	++	✓			✓	✓
Sizing saw blades DP "G5" 	+	+	+	+	+	+				✓	
Sizing saw blades DP "TR-F-FA" Pos-Neg 	+	+	+	+	+	+					✓

202180

→ DIAREX sizing saw blades DP

Design and benefits

- Excellent cutting quality on the upper side thanks to prescoring effect and reduced cutting pressure.
- Special fine-grained DP grade.
- Resharpener area 2 mm.

BEST SOLUTION
for materials of a thickness of 5.0 mm or higher as well as for profiles and large volumes.

HR-FA



D	B	b	d	Z	Zahnform	Ident-No.	LKZ
250	3,2	2,2	30	50	HR-FA	192956	L
303	3,2	2,2	30	65	HR-FA	192958	L
350	3,2	2,2	30	65	HR-FA	192962	L
[mm]	[mm]	[mm]	[mm]				

Other dimensions and configurations on request.

202289

→ Sizing saw blades DP "HR" – nn-System DP flex

Design and benefits

- Hardly perceivable noise.
- Reduced cutting pressure due to hollow back geometry, enabling best cutting quality without chipping when the saw blade enters and exits the material.
- Resharpener up to max. 2 times.
- Also available with smaller diameters from 50.0 mm.

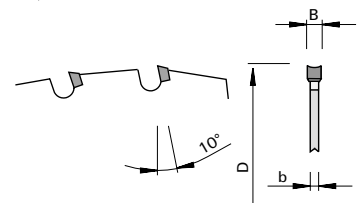
BEST SOLUTION
for lower volumes of material up to a thickness of 5.0 mm.

nn/system



D	B	b	d	Z	Zahnform	Ident-No.	LKZ
110	2,5	2	22	24	HR	192551	C
180	2,5	2	30	36	HR	192432	L
250	2,5	2	30	50	HR	192440	L
303	2,5	2	30	60	HR	192444	L
303	2,5	2	30	95	HR	193238	L
350	2,5	2	30	72	HR	192446	L
[mm]	[mm]	[mm]	[mm]				

Other dimensions and configurations on request.



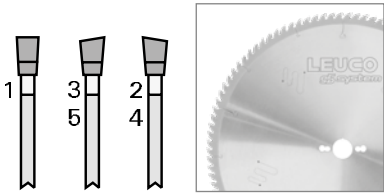
202080

→ Sizing saw blades DP "G5"

g5 system®

Design and benefits

- I Reduced cutting pressure thanks to "aggressive" cutting geometry.
- I Noise reduction by laser ornaments, both during idling and cutting.
- I Resharpener area 3.5 mm.



D	B	b	d	Z		Ident-No.	LKZ
303	3,2	2,2	30	100	G5	189633	C
350	3,2	2,2	30	100	G5	189634	C
[mm]	[mm]	[mm]	[mm]				

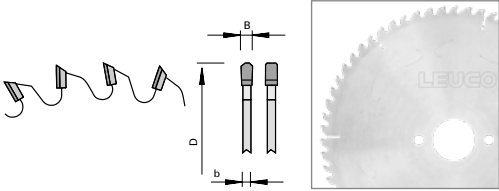
Other dimensions and configurations on request.

202380

→ Sizing saw blades DP "TR-F-FA" pos.-neg.

Design and benefits

- I For sizing cuts in CFRP, GFRP, fiber cement boards, resin-impregnated panel material.
- I Asymmetric gullet geometry.
- I Tooth configuration: triple chip - flat with chamfer, with alternating positive-negative hook angle.
- I Low cutting pressure /resharpener area 3.5 mm.



D	B	b	d	Z		Ident-No.	LKZ
303	3,2	2,2	30	56	TR-F-FA	189560	C
350	3,5	2,5	30	63	TR-F-FA	189561	C
[mm]	[mm]	[mm]	[mm]				

Other dimensions and configurations on request.

→ EXAMPLES OF CUSTOMER PROJECTS

SOLUTIONS IN PRACTICE

ECONOMICAL!

The LEUCO Multi-Tooth End Mill DP "UniType" (left) and Multi-Tooth End Mill DP "ProType" (right and in the middle) are designed especially for thin-walled composite components. When milling fiber-reinforced plastics (FRP), users benefit from the long edge life and high milling quality.



PRECISELY MATCHED!

The combined processing of CF-PEEK with a PCD roughing end mill for the first and a PCD finishing end mill for the second operation produced the desired fine finish with a roughness of less than $3.2 \mu\text{m}$ plus long edge life.

VISIBLY GOOD!

The PCD ball end mill cuts visible edges of paneling or structural parts in sports cars or electric vehicles without chipping and with very long edge life. The advantage for the manufacturer of these parts is a reliably consistent milling quality.



Tip!
Subscribe to the our
YouTube channel!



THIS IS LEUCO **MAGENTIFY COMPOSITE PROCESSING**

LEUCO is one of the world's leading suppliers of machine tools for wood, plastic and composite material processing, and is based in Horb am Neckar (Germany/Baden-Württemberg). Customers have a full range of carbide- and diamond-tipped cutters, drill bits, countersinks and clamping devices.

LEUCO tooling solutions are based on decades of experience in machining fibrous wood and fiber-reinforced materials. They are characterized by their cost-effectiveness and innovative designs. Numerous patents for cutters, drill bits and saw blades underline the inventiveness and the technical know-how.

LEUCO has subsidiaries and 1,200 employees in Belarus, Belgium, China, Great Britain, France, Japan, Malaysia, Poland, Russia, Singapore, Switzerland, South Africa, Thailand, Ukraine and USA. In more than 60 other countries, more than 90 dealers are available for advice and sales.

**MORE THAN
70 YEARS OF EXPERIENCE
IN PROVIDING SOLUTIONS
FOR THE MACHINING
OF FIBER-REINFORCED
MATERIALS.**

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