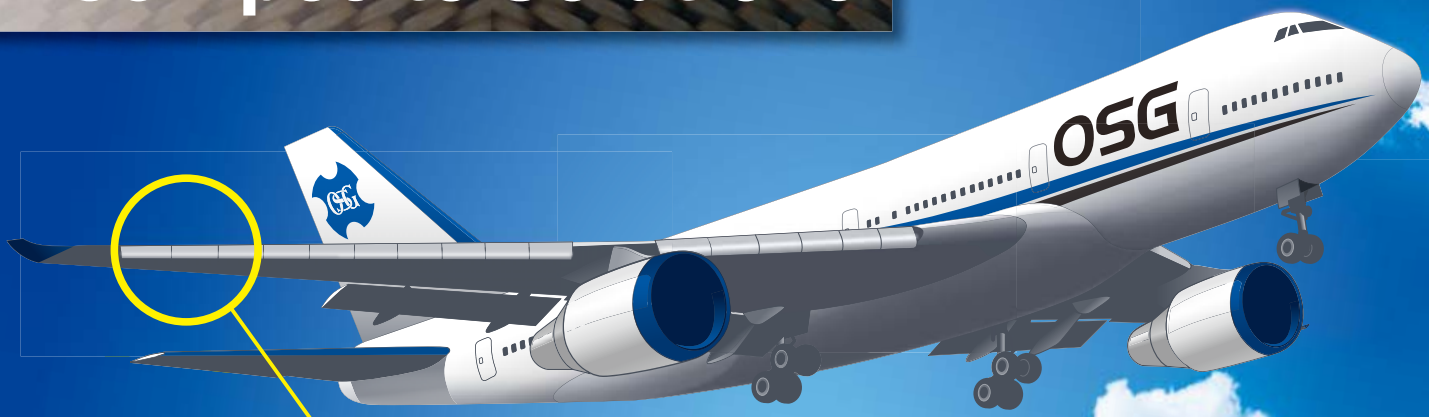
OSG CORPORATION

AEROSPACE
SOLUTIONS
Composite

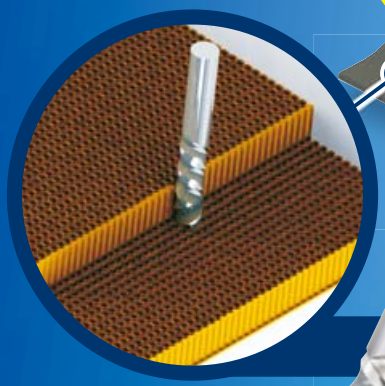
Aerospace

Composite Solutions



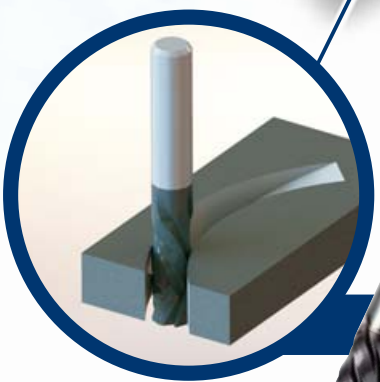
DIA-BNC

Diamond coated,
fine pitch nicked router
(see p.19)



HBC60

2-flute, herringbone
cutter, bright
(see p.36)



DIA-HBC4

Diamond coated, 4-flute,
herringbone cutter
(see p.21)

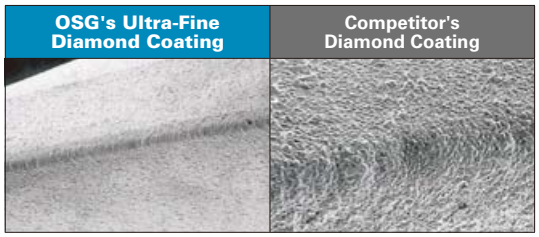
DIA-MFC

Diamond coated router for
high precision finishing
(see p.33)

■ OSG's Ultra-Fine Diamond Coating
—The Industry's Best—

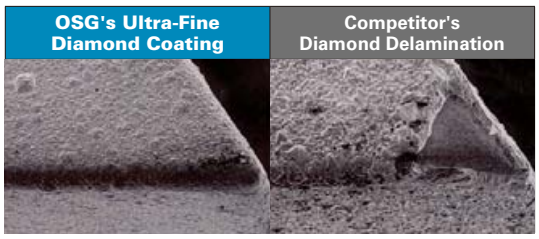
Patented Ultra-Fine Grain Size

OSG's patented ultra-fine diamond coating has a maximum diamond grain size diameter of 2μm. This strictly controlled diameter allows our coating to be super smooth and extremely sharp, which visually is easily distinguishable from our competition.



Elimination of Diamond Delamination

OSG manufactures all diamond products in-house with absolute control. We produce our carbide, design our tools and develop our coatings. The end result is a diamond coated product with consistent tool life, rather than having to endure unpredictable delamination issues like most of our competition.



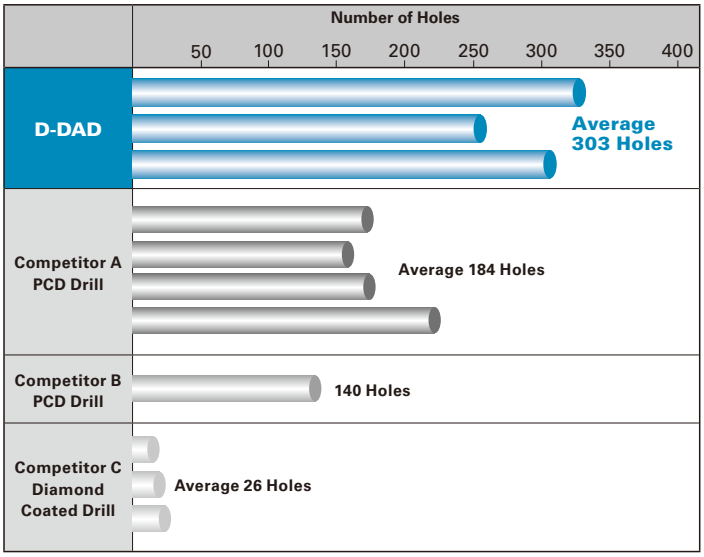
■ D-DAD PAT.P
—High Helix, Double-Angle Drill—

The combination of sharpness, low-resistance design, and outstanding diamond coating technology offers maximum performance on CFRP drilling applications.

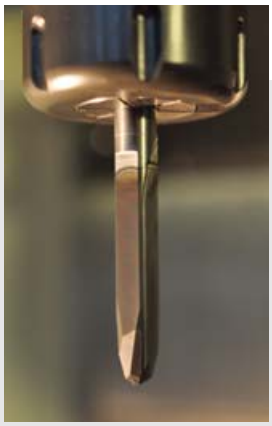
■ Hole Quality Comparison

Special Order Item

Tool	D-DAD(Special)
Tool Dia	6.375mm (.2510")
Work Material	CFRP (Three-layer Stack)
Drilling Speed	60m/min (3,000min^{-1})
Feed	228mm/min (0.076mm/rev)
Depth of Hole	5.7mm (Through)
Coolant	Dry
Machine	Special Machine for Drilling
Tool Life Determinant	Delamination

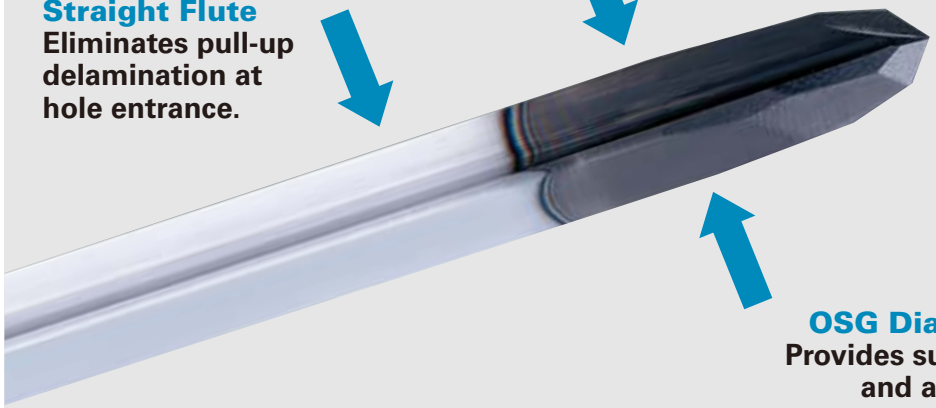


D-STAD / List 7501
Diamond Coated Straight Flute Triple Angle Drill



Triple Angle Geometry (PAT.)
Reduces fiber breakout and push-out delamination at hole exit.

Straight Flute
Eliminates pull-up delamination at hole entrance.

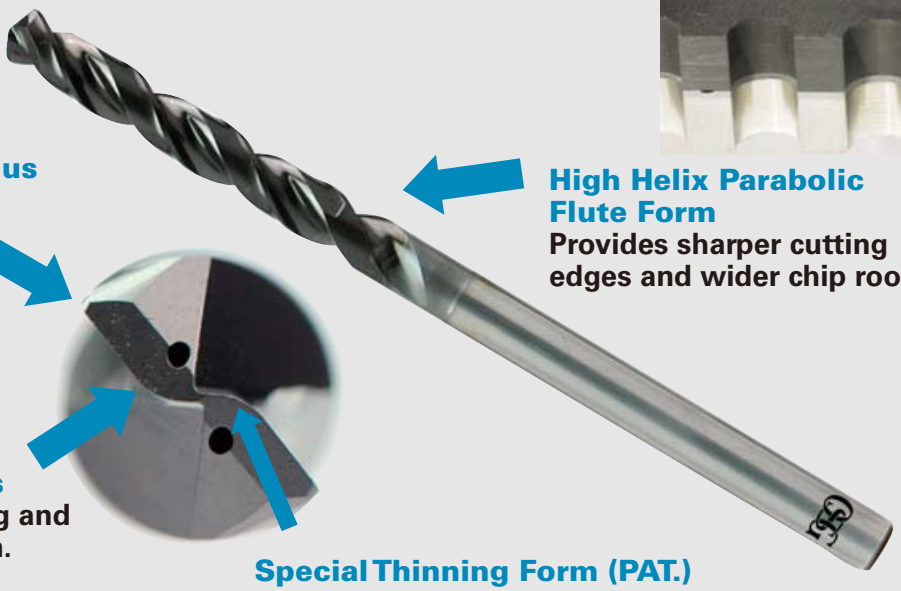


OSG Diamond Coating (PAT.)
Provides superior wear resistance and anti-welding properties.

STCH / List 5732
Ideal for CFRP / Metal Stack Drilling

Corner Radius
Reduces chipping.

High Helix Parabolic Flute Form
Provides sharper cutting edges and wider chip room.

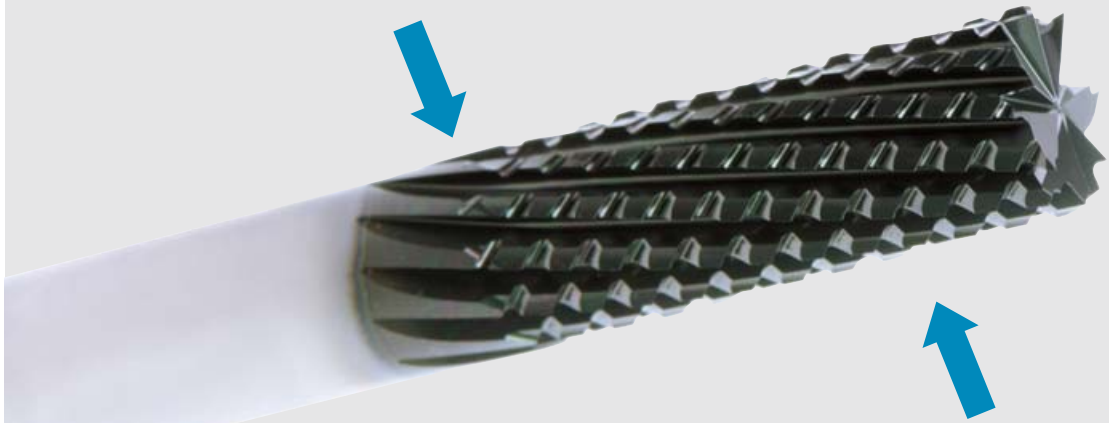


Coolant Holes
Improve cooling and chip evacuation.

Special Thinning Form (PAT.)
For low thrust.

■ DIA-BNC / List 2061
Diamond Coated Router for Multi-Purpose Milling

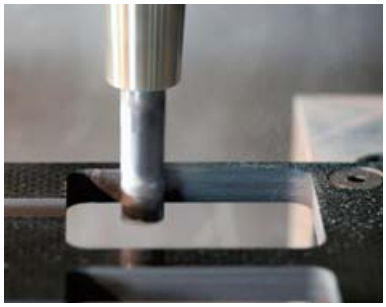
Fine Nick Geometry (PAT.)
- Achieves high efficiency in both roughing and finishing applications.
- Eliminates uncut fibers and delamination.



OSG Diamond Coating (PAT.)
Provides superior wear resistance and anti-welding properties.

Slotting

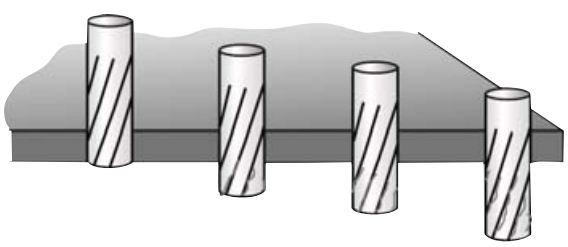
Routing



Pocketing, Plunging & Ramping

*Longer tool life can be achieved through flute management (see below).

Flute Management



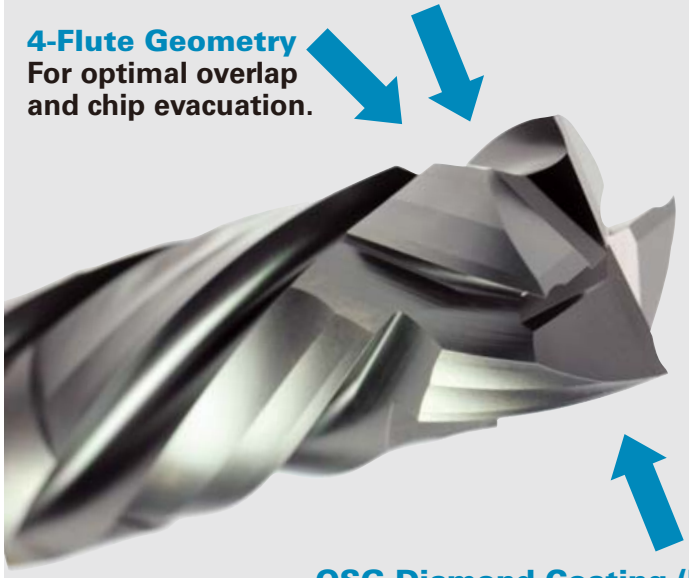
Longer tool life can be achieved by changing milling position of the flute.

■ DIA-HBC4 / List 2066

Diamond Coated Router for High Feed Routing and Finishing in Thick Laminates

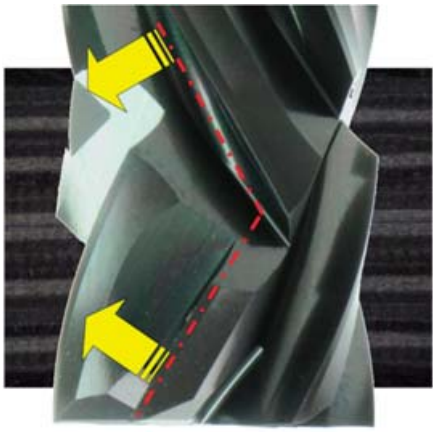
Compression Cutting Mechanism
Reduces delamination and uncut fibers on both top and bottom laminate surface.

4-Flute Geometry
For optimal overlap and chip evacuation.



OSG Diamond Coating (PAT.)
Provides superior wear resistance and anti-welding properties.

Left Hand Helix (Shank Side)
Directs cutting force downward.



Right Hand Helix (End Cut Side)
Directs cutting force upward.

■ HBC60 / List 668

Bright Router for AFRP, GFRP & Honeycombs

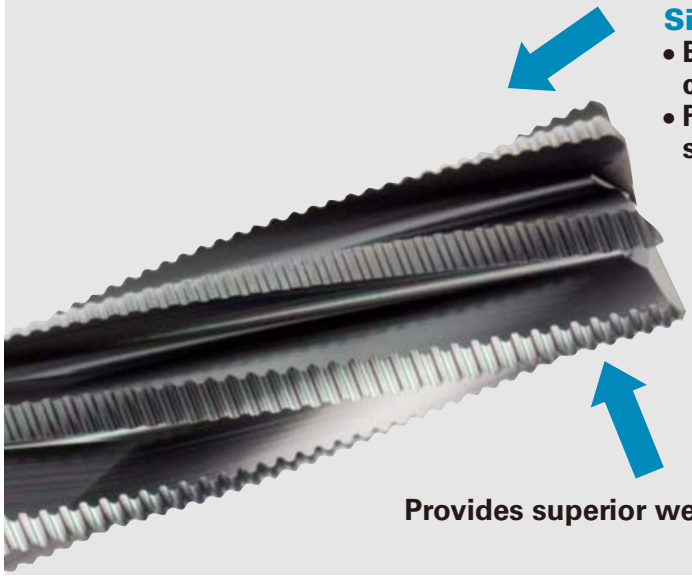
■ DIA-HBC60 / List 2068

Diamond Coated Router for CFRP

Compression Cutting Mechanism
Reduces delamination on both top and bottom laminate with its 60° helix angle.

OSG Diamond Coating (PAT.)
Provides superior wear resistance and anti-welding properties.

■ DIA-REC / List 2680
Diamond Coated Roughing Router



Sine Curved Nick Geometry
- Excels in roughing and semi-finishing of composites with low cutting forces.
- For low rigid fixtures, setups, weak spindles and 5-axis machines.

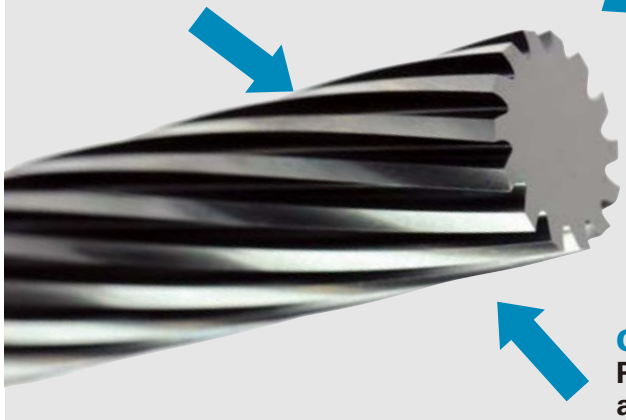
OSG Diamond Coating (PAT.)
Provides superior wear resistance and anti-welding properties.

*Longer tool life can be achieved through flute management (see p.4).

■ DIA-MFC / List 2650
Diamond Coated Finishing Router

Low Helix
Provides higher rake angles than straight flutes to minimize vibration.

Multiple Flutes
For excellent surface finish and high efficiency.



Large Core
Enables greater rigidity.

OSG Diamond Coating (PAT.)
Provides superior wear resistance and anti-welding properties.

*Longer tool life can be achieved through flute management (see p.4).

■ Drill Selection Guide

Tool	Composite Type										Machine Type		
	CFRP	GFRP	AFRP	CFRTP	C/C Composit	Honeycomb (Nomex)	CFRP & Metal Stack (Metal exit)				CNC	Pneumatic	Hand
							CFRP/Al	CFRP/Ti	CFRP/ Inconel®	CFRP/ CRES			
D-STAD AERO-STAD	◎	○	○	○	◎	△	×	×	×	×	◎	◎	○
D-DAD	◎	○	○	○	◎	△	△	×	×	×	◎	◎	×
AERO-LHX	◎	○	○	○	◎	○	×	×	×	×	◎	◎	×
AERO-REAM	○	◎	◎	◎	○	○	×	×	×	×	○	◎	◎
AERO-D-REAM	◎	○	○	○	◎	△	×	×	×	×	○	◎	○
STCH AERO-H	×	×	×	×	○	×	◎ *1	◎ *2	◎ *3	◎ *3	◎	◎	×
AERO-N	×	×	×	×	×	×	×	◎	×	○	◎	◎	×
AERO-S	×	△	△	△	◎	△	◎	×	×	×	◎	◎	×

◎ Best ○ Good △ Fair × Not recommended

*1: Diamond coating recommended *2: Coolant through recommended *3: Coolant through & WXL® coating recommended

■ Router Selection Guide

Tool	Material Type							Machining Style						Machine Type			Material Thickness	
	CFRP	GFRP	AFRP	CFRTP	C/C Composit	Honey-comb	Al	Slotting	Side Milling	Roughing	Finishing	Ramping	Plunging	Hand	CNC	5-Axis	Thin	Thick
DIA-BNC AERO-BNC	◎	△	×	○	○	×	×	◎	◎	○	○	◎	◎	×	◎	◎	◎	◎
DIA-HBC4 AERO-HBC	◎	△	×	◎	◎	△	○	◎	◎	○	○	◎	◎	×	◎	○	×	◎
DIA-HBC60 AERO-HBC60	◎	△	×	◎	○	△	◎	◎	◎	○	○	◎	◎	×	◎	○	△	◎
DIA-DCR DIA-DCE	◎	△	×	×	○	△	×	△	○	△	△	○	△	◎	◎	◎	◎	◎
DIA-REC AERO-REC	◎	△	△	◎	◎	×	○	◎	◎	◎	○	◎	◎	○	◎	◎	◎	◎
DIA-MRC	◎	△	×	◎	◎	×	○	◎	◎	◎	○	◎	◎	×	◎	◎	◎	◎
DIA-MFC AERO-MFR	◎	△	×	○	◎	×	×	△	◎	×	◎	×	×	○	◎	◎	◎	◎
HBC60 AERO-HBC60 (Bright)	△	◎	◎	△	×	◎	◎	◎	◎	○	○	◎	◎	×	◎	○	△	◎
ED-EM ED-ES	◎	◎	◎	×	△	△	×	×	◎	×	◎	△	△	×	◎	◎	◎	◎

◎ Best ○ Good △ Fair × Not recommended

INDEX

Drills

End Mills

Indexable Cutters

Taps

Guide of Icons

1 Tool Material

CARBIDE **Tungsten Carbide**

2 Surface Treatment

WXL **WXL coating**

FX **FX (Multi-Layer TiAlN) coating**

TiAlN **TiAlN coating**

DIA **Diamond coating**

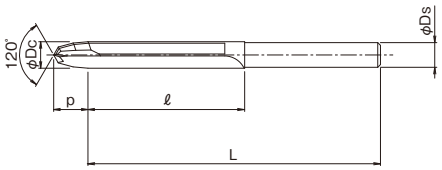
For Drilling

D-STAD / List 7501

AERO-STAD

Diamond Coated Triple Angle Drill (PAT.)

It is a patented diamond coated drill specifically designed to eliminate fiber breakout and delamination issues on both entry and exit of drilled holes.



D-STAD

See page 8 for explanation of icons.

Unit:mm

	EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds	Approx. Length of Drill Point p
			inch	mm				
*	8809078	#40	.0985	2.502	15	65	2.502	4.3
*	8809079	#30	.1290	3.277	20	70	3.277	5.6
	48154001	—	.1575	4.000	30	80	4.000	6.8
*	8809080	#20	.1615	4.102	25	75	4.102	7
	48154002	—	.2362	6.000	40	90	6.000	10.1
	8809081	#11	.1915	4.864	39	89	4.864	8.2
	48154004	1/4	.2500	6.350	38	88	6.350	10.8
	8809082	1/4	.2510	6.375	51	101	6.375	10.8
	48154003	—	.3150	8.000	50	100	8.000	13.5
	8809083	3/8	.3760	9.550	76	126	9.550	16.1

・Tool diameters are oversized to compensate for CFRP shrinkage.
∗=Contact OSG for availability.

List 7501

Unit:inch

EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds	Approx. Length of Drill Point p
		inch	mm				
750109816	#40	.0985	2.50	.6	2.0	.0985	.18
750112916	#30	.1290	3.28	.8		.1290	.23
750116116	#20	.1615	4.10	1.0	3.0	.1615	.29
750119116	#11	.1915	4.86	1.1		.1915	.34
750119216	#11	.1915	4.86	1.9	4.0		
750122116	#2	.2215	5.63	1.3	3.5	.2215	.40
750125116	1/4	.2510	6.38	1.5		.2510	.45
750125216	1/4	.2510	6.38	2.5	5.5		
750131316	5/16	.3135	7.96	1.9	4.0	.3135	.56
750137616	3/8	.3760	9.55	2.3		.3760	.68
750137716	3/8	.3760	9.55	3.8	6.0		
750143816	7/16	.4385	11.14	2.6	4.0	.4385	.79
750150116	1/2	.5010	12.73	3.0	5.0	.5010	.90

・Tool diameters are oversized to compensate for CFRP shrinkage.

■ Recommended Conditions

Work Material		CFRP		
Drilling Speed		50 ~ 80m/min (165 ~ 260 SFM)		
Drill Dia.		RPM (min^{-1})	Feed Rate	
inch	mm		mm/rev	IPR
.0985	2.50	8,000	0.02 ~ 0.06	0.0008 ~ 0.002
.1290	3.28	6,100	0.02 ~ 0.07	0.0008 ~ 0.003
.1615	4.10	4,900	0.03 ~ 0.08	0.0012 ~ 0.003
.1915	4.86	4,100	0.03 ~ 0.08	0.0012 ~ 0.003
.2510	6.38	3,100	0.04 ~ 0.10	0.0016 ~ 0.004
.3760	9.55	2,100	0.05 ~ 0.10	0.0020 ~ 0.004

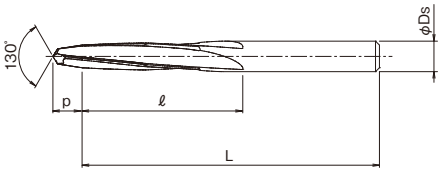
1. Coolant is not needed, but dust collecting system is necessary.
2. Pecking is not needed when drilling 3×Dc or less.
3. Machinability of CFRP changes depending on its character and contents. Please adjust feed rate at the break through area on thin plate.
4. Please reduce feed rate in thin plate drilling to prevent spring back.
5. Drilling speed can be increased up to 200m/min with the use of appropriate cutting oil.

List 7520

AERO-LHX

Diamond Coated Low Helix Drill

It is a diamond coated drill specifically for tough to drill laminates. It is designed to completely eliminate uncut fibers and delamination when other drills are unable to properly cut fibers. The drill features unique geometries combined with our patented diamond coating.



p is approximately 2×Dc.

See page 8 for explanation of icons.

Unit:inch

EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds
		inch	mm			
752009816	#40	.0985	2.50	.6	2.0	.0985
752012916	#30	.1290	3.28	.8		.1290
752016116	#20	.1615	4.10	1.0	3.0	.1615
752016216	#11	.1915	4.86	1.1		.1915
752022116	#2	.2215	5.63	1.3	3.5	.2215
752025116	1/4	.2510	6.38	1.5		.2510
752031316	5/16	.3135	7.96	1.9	4.0	.3135
752037616	3/8	.3760	9.55	2.3		.3760
752043816	7/16	.4385	11.14	2.6		.4385
752050116	1/2	.5010	12.73	3.0	5.0	.5010

・Tool diameters are oversized to compensate for CFRP shrinkage.

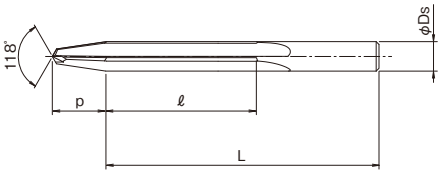
For Reaming

List 257

AERO-REAM

Drill for General Reaming

It is an uncoated drill for general aluminum, CFRP and GFRP applications. It features unique geometries and is designed for efficient NC and hand reaming while minimizing delamination and uncut fibers. The long double angle design reduces thrust and push out exit delamination and the straight flute suppresses pull up delamination at the hole entrance.



p is approximately 1.8×Dc.

CARBIDE

See page 8 for explanation of icons.

Unit:inch

EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds
		inch	mm			
2570980	#40	.0980	2.49	.570	3	.0980
2571094	7/64	.1094	2.78	.637		.1094
2571250	1/8	.1250	3.18	.728		.1250
2571280	#30	.1280	3.25	1.257	6	.1280
2571285	#30	.1285	3.26	.748	3	.1285
2571286	#30	.1285	3.26	1.262	6	
2571299	—	.1299	3.30	.756	3	.1299
2571406	9/64	.1406	3.57	.818		.1406
2571440	#27	.1440	3.66	.838		.1440
2571562	5/32	.1562	3.97	.909		.1562
2571570	#22	.1570	3.99	.914		.1570
2571610	#20	.1610	4.09	.937		.1610
2571616	#20	.1610	4.09	1.581	6	
2571630	—	.1630	4.14	.949	3	.1630
2571719	11/64	.1719	4.37	1.000		.1719
2571870	—	.1870	4.75	1.088		.1870
2571875	3/16	.1875	4.76	1.091		.1875
2571900	—	.1900	4.83	1.866	4	.1900
2571906	—	.1900	4.83		6	
2571910	#11	.1910	4.85	1.876	3	.1910
2571916	#11	.1910	4.85		4	
2571920	—	.1920	4.88	1.885		.1920
2571930	—	.1930	4.90	1.895		.1930
2571935	#10	.1935	4.92	1.900		.1935
2571940	—	.1940	4.93	1.905		.1940
2572010	#7	.2010	5.11	1.974		.2010
2572031	13/64	.2031	5.16	1.994		.2031
2572040	#6	.2040	5.18	2.003		.2040
2572055	#5	.2055	5.22	2.018		.2055
2572180	—	.2180	5.54	2.141		.2180
2572188	7/32	.2188	5.56	2.149		.2188
2572186	7/32	.2188	5.56	2.141	6	

Unit:inch

EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds
		inch	mm			
2572210	#2	.2210	5.61	2.170	4	.2210
2572280	#1	.2280	5.79	2.239		.2280
2572344	15/64	.2344	5.95	2.302		.2344
2572500	1/4	.2500	6.35	2.141		.2500
2572506	1/4	.2500	6.35	2.455	6	
2572510	—	.2510	6.38	2.465	4	.2510
2572516	—	.2510	6.38		6	
2572520	—	.2520	6.40	2.475	4	.2520
2572530	—	.2530	6.43	2.484		.2530
2572656	17/64	.2656	6.75	2.608		.2656
2572812	9/32	.2812	7.14	2.761		.2812
2572969	19/64	.2969	7.54	2.916		.2969
2573120	—	.3120	7.93	1.816		.3120
2573125	5/16	.3125	7.94	1.819		.3125
2573135	—	.3135	7.96	1.825		.3135
2573280	21/64	.3280	8.33	1.909		.3280
2573438	11/32	.3438	8.73	2.002		.3438
2573500	—	.3500	8.89	2.037		.3500
2573594	23/64	.3594	9.13	2.092		.3594
2573750	3/8	.3750	9.53	2.183		.3750
2573756	3/8	.3750	9.53	2.933	6	
2573906	25/64	.3900	9.91	3.050		.3900
2574066	13/32	.4060	10.31	3.175		.4060
2574376	7/16	.4375	11.11	3.421		.4375
2575006	1/2	.5000	12.70	3.910		.5000

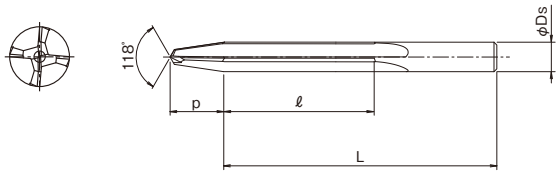
For Reaming

List 7500

AERO-D-REAM

Diamond Coated Drill for Reaming CFRP

It is a diamond coated version of List 257 (AERO-REAM) for CFRP.



p is approximately 1.8×Dc.

CARBIDE DIA

See page 8 for explanation of icons.

Unit:inch

EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds
		inch	mm			
750009816	#40	.0985	2.50	.573	3	.0985
750012616	#30	.1280	3.25	.748		.1280
750012716	#30	.1280	3.25	1.257	6	
750012816	#30	.1285	3.26	.748	3	.1285
750012916	#30	.1285	3.26	1.257	6	
750016116	#20	.1615	4.10	.940	3	.1615
750016216	#20	.1615	4.10	1.581	6	
750018716	3/16	.1875	4.76	1.841		.1875
750019016	#11	.1900	4.83	1.866	4	.1900
750019116	#11	.1900	4.83		6	
750019216	#11	.1910	4.85		4	.1910
750019316	#11	.1910	4.85		6	
750019416	#11	.1915	4.86	1.115	3	.1915
750019516	#11	.1915	4.86	1.881	4	
750019716	#11	.1915	4.86		6	
750021816	7/32	.2180	5.54	2.141		.2180
750022116	#2	.2215	5.63	2.175	4	.2215
750025016	1/4	.2500	6.35	2.455		.2500
750025116	1/4	.2500	6.35		6	
750025216	1/4	.2505	6.36		4	.2505
750025316	1/4	.2510	6.38	1.461	3	.2510
750025416	1/4	.2510	6.38	2.465	4	
750025516	1/4	.2510	6.38		6	
750031216	5/16	.3125	7.94	1.819	4	.3125
750031316	5/16	.3125	7.94	2.444	6	
750031416	5/16	.3135	7.96	1.824	4	.3135
750031516	5/16	.3135	7.96	2.452	6	
750037516	3/8	.3750	9.53	2.183	4	.3750
750037616	3/8	.3750	9.53	2.933	6	
750037716	3/8	.3760	9.55	2.188	4	.3760
750037816	3/8	.3760	9.55	2.940	6	
750043816	7/16	.4385	11.14	2.552	4	.4385
750050116	1/2	.5010	12.73	3.918	6	.5010

・Tool diameters are oversized to compensate for CFRP shrinkage.

For CFRP Stack Materials

STCH / List 5732

AERO-H

High Helix Drill for General Purpose Stacks

A high helix carbide drill for drilling CFRP/Metal stacks. It features a high helix for sharp cutting edges and a special flute form to assist in chip evacuation.

STCH

CARBIDE FX

See page 8 for explanation of icons.

Unit:mm

	EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds
			inch	mm			
*	8809111	#11	.1915	4.864	32	83	4.851
*	8809112	1/4	.2510	6.375	50	101	6.375

・Tool diameters are oversized to compensate for CFRP shrinkage.
*=Contact OSG for availability.

List 5732

CARBIDE TiAlN

See page 8 for explanation of icons.

Unit:inch

EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds
		inch	mm			
573219111	#11	.1915	4.86	2	4	.1915
573225111	1/4	.2510	6.38			.2510
573237611	3/8	.3760	9.55			.3760
573250111	1/2	.5010	12.73	4	6	.5010

・Tool diameters are oversized to compensate for CFRP shrinkage.

For CFRP Stack Materials

List 7532

AERO-H

Diamond Coated High Helix Drill for General Purpose Stacks

It is a diamond coated version of STCH (List 5732).

CARBIDE DIA

See page 8 for explanation of icons.

Unit:inch

EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds
		inch	mm			
753209816	#40	.0985	2.50	.6	2	.0985
753212916	#30	.1290	3.28	.8	3	.1290
753216116	#20	.1615	4.10	1.0	4	.1615
753219116	#11	.1915	4.86	1.1		.1915
753222116	#2	.2215	5.63	1.3		.2215
753225116	1/4	.2510	6.38	1.5		.2510
753231316	5/16	.3135	7.96	1.9		.3135
753237616	3/8	.3760	9.55	2.3	6	.3760
753243816	7/16	.4385	11.14	2.6		.4385
753250116	1/2	.5010	12.73	3.0		.5010

・Tool diameters are oversized to compensate for CFRP shrinkage.

List 7534

AERO-N

Diamond Coated Low Helix Drill for Stacks

It is a diamond coated carbide drill specifically designed for drilling CFRP/ Titanium stack applications. It features a special point geometry with enhanced flute form for optimal chip evacuation to minimize "washout" or "reverse countersink" effect.

CARBIDE DIA

See page 8 for explanation of icons.

Unit:inch

EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds
		inch	mm			
753419116	#11	.1915	4.864	2	4	.1915
753425116	1/4	.2510	6.375			.2510
753437616	3/8	.3760	9.550			.3760

・Tool diameters are oversized to compensate for CFRP shrinkage.

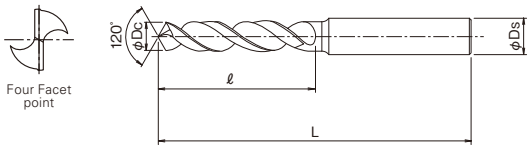
For CFRP/Al

List 7530

AERO-S

High Helix Drill for CFRP/Aluminum Stacks

It features a high helix flute for sharp cutting edges and good chip evacuation. OSG's special diamond coating is very effective in CFRP/Aluminum stack applications. The thin web and wide flute show low thrust, good chip evacuation and low burr height.



See page 8 for explanation of icons.

Unit:inch

EDP No.	Size	Drill Dia. Dc		Flute Length ℓ	Overall Length L	Shank Dia. Ds
		inch	mm			
753009816	#40	.0985	2.50	.6	2	.0985
753012916	#30	.1290	3.28	.8	3	.1290
753016116	#20	.1615	4.10	1.0	4	.1615
753019116	#11	.1915	4.86	1.1		.1915
753022116	#2	.2215	5.63	1.3		.2215
753025116	1/4	.2510	6.38	1.5		.2510
753031316	5/16	.3135	7.96	1.9		.3135
753037616	3/8	.3760	9.55	2.3	6	.3760
753043816	7/16	.4385	11.14	2.6		.4385
753050116	1/2	.5010	12.73	3.0		.5010

・Tool diameters are oversized to compensate for CFRP shrinkage.

Special Drilling Tools - Made upon Request

Spacematic Drill / Countersink

Carbide drill and countersink with internal thread and 60° cone seat straight shank style. Application: Spacematic Drill motors with 1" stroke.

Drivematic Drill / Countersink

Carbide drill and countersink with solid shank used in aerospace drivematic drill riveting machines.

Dagger Drill

Designed to produce holes without delamination around the hole or fraying the composite materials.

Threaded Hex Shank Adapter Drill

Carbide adapter drill manufactured to NAS 907 construction with 135° split points. Used for general to medium duty drilling in low tensile strength materials in confined areas.

NAS 937 Jobbers Length Double Margin Step Drill

Carbide drill with 135° split point. Used for drilling close tolerance holes in low tensile strength materials. Can also be supplied in taper and screw machine lengths, or special lengths.

Nutplate Drill / Countersink

Carbide drill and countersink with 135° split point. External thread and 60° cone seat straight shank style with pin spanner wrench holes. Application: Nutplate and motors with nutplate pressure foot attachments.

PCD Brazed Countersink

Available with steel body and carbide tip or carbide body with PCD tip. Both types feature replaceable pilots.

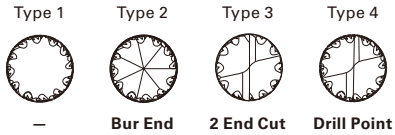
For Trimming

DIA-BNC / List 2061

AERO-BNC

Diamond Coated Fine Nicked Router

It is a diamond coated fine nicked router specifically designed for CFRP trimming. This router features a patented cutting geometry coupled with OSG's patented diamond coating. The patented nick & flute form eliminate uncut fibers and delamination.



DIA-BNC

See page 8 for explanation of icons.

Unit:mm

EDP No.		Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	No. of Flutes Z	Type	Helix
	Euro Stock	inch	mm						
□	—	1/8	3.175	10	60	3.175	6	3	Right
8809001	—	.1575	4	12	62	4			
8809002	48108001	.2362	6	18	68	6	8	2	
□	48108011	.2362	6					3	
* 8809012	—	.2362	6		88		10	1	Left
□	—	1/4	6.35	19	69	6.35	8	3	Right
8809003	48108002	.3150	8	24	74	8	10	2	
□	48108012	.3150	8					3	
* 8809013	—	.3150	8		94		14	1	Left
□	—	3/8	9.525	28	78	9.525	12	3	Right
8809004	48108003	.3937	10	30	80	10		2	
□	48108013	.3937	10					3	
8809005	48108004	.4724	12	36	86	12	14	2	
□	48108014	.4724	12					3	
□	—	1/2	12.7	38	88	12.7			

□ = Special order item.
* = Contact OSG for availability.

List 2061

Unit:inch

EDP No.	Mill Dia. Dc	Length of Cut ℓ	Overall Length L	Shank Dia. Ds	No. of Flutes Z	Type	Corner Radius r	Helix
20610116	1/8	1/4	1 1/2	1/8	6	2	—	Right
20611116	1/8	3/8				3		
20612116	1/8	1/2			8			
20610216	3/16	3/8	2	3/16	6	2		
20611216	3/16	9/16				3		
20612216	3/16	3/4			8			
20610316	1/4	1/2	2 1/2	1/4		2		
20613416	1/4	3/4						
20612416	1/4				12			
20612316	1/4				10			
20611316	1/4					3		
20613216	1/4	1	3		8	2		
20614316	1/4				10			
※20614400	1/4				12			
20614416	1/4							
20617316	1/4						.03	
20613316	1/4				10	3	—	
20616316	1/4				8	4		

※ The item is uncoated.

Unit:inch

EDP No.	Mill Dia. Dc	Length of Cut ℓ	Overall Length L	Shank Dia. Ds	No. of Flutes Z	Type	Corner Radius r	Helix
20616416	1/4	1	3	1/4	12	4	—	Right
20615316	1/4	1 1/4	4			1		
20615216	1/4				8	2		
20610416	5/16	1	2 1/2	5/16	10	3		
20610516	3/8	3/4		3/8	12	2		
20612516	3/8	1 1/8	3				.03	
20616816	3/8					3	—	
20611516	3/8					4		
20616516	3/8	1 1/4	4			2		
20614516	3/8	1 1/2				3		
20613516	3/8					1		
20615516	3/8	2				2	.03	
20611716	1/2	1	3	1/2	14	3	—	
20613716	1/2				12	4		
20610716	1/2				14			
20615716	1/2							
20612716	1/2	2	4		16	2		

■ Recommended Conditions

Work Material		CFRP		
Milling Speed		100 ~ 180m/min (300 ~ 600 SFM)		
Mill Dia.		RPM (min^{-1})	Feed Rate	
inch	mm		mm/rev	IPR
1/8	3.175	10,000 ~ 18,000	0.04 ~ 0.05	0.0016 ~ 0.0020
.1575	4	8,000 ~ 14,300	0.05 ~ 0.06	0.0020 ~ 0.0024
3/16	4.763	6,700 ~ 12,000	0.05 ~ 0.06	0.0020 ~ 0.0024
.2362	6	5,300 ~ 9,500	0.1 ~ 0.12	0.004 ~ 0.005
1/4	6.35	5,000 ~ 9,000	0.1 ~ 0.12	0.004 ~ 0.005
5/16	7.938	4,000 ~ 7,200	0.16 ~ 0.2	0.006 ~ 0.008
.3150	8	4,000 ~ 7,200	0.16 ~ 0.25	0.006 ~ 0.01
3/8	9.525	3,300 ~ 6,000	0.24 ~ 0.3	0.009 ~ 0.012
.3937	10	3,200 ~ 5,700	0.24 ~ 0.3	0.009 ~ 0.012
.4724	12	2,600 ~ 4,800	0.3 ~ 0.5	0.012 ~ 0.02
1/2	12.7	2,500 ~ 4,500	0.3 ~ 0.5	0.012 ~ 0.02

1. The above conditions are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

■ Feed Reduction

Material Thickness	Feed Reduction
≦0.25Dc	× 80%
0.25Dc ~ 0.5Dc	× 150%
0.5Dc ~ 1Dc	× 120%
1Dc ~ 2Dc	× 80%
2Dc ~ 3Dc	× 50%

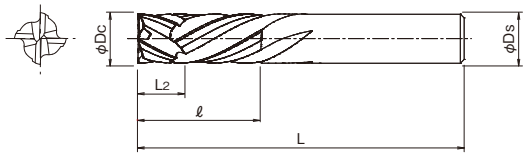
For Trimming

DIA-HBC4 / List 2066

AERO-HBC

Diamond Coated Herringbone Router

It is a diamond coated herringbone style router for high feed rates and excellent surface finishes. The router features a compression cutting mechanism, which neutralizes cutting forces to prevent delamination on both top and bottom laminates.



L2 is approximately the same as Dc.
L2 of DIA-HBC (UK) is approximately 1.25xDc.

DIA-HBC4

See page 8 for explanation of icons.

Unit:mm

EDP No.		Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds
	Euro Stock	inch	mm			
□	—	1/8	3.175	10	60	3.175
□	—	.1575	4	12	62	4
8809022	48109001	.2362	6	15	65	6
□	—	.2362	6	18	68	
□	—	1/4	6.35	19	69	6.35
8809023	48109002	.3150	8	20	70	8
□	—	.3150	8	24	74	
□	—	3/8	9.525	28	78	9.525
8809024	48109003	.3937	10	25	75	10
□	—	.3937	10	30	80	
—	48109004	.4724	12	30	100	12
□	—	.4724	12	36	86	12
□	—	1/2	12.7	38	88	12.7

□ = Special order item.

List 2066

Unit:inch

EDP No.	Mill Dia. Dc	Length of Cut ℓ	Overall Length L	Shank Dia. Ds
20660116	1/8	3/8	1 1/2	1/8
20660316	1/4	3/4	2 1/2	1/4
20660516	3/8	1 1/8	3	3/8
20660716	1/2			1/2

■ Recommended Conditions

Work Material		CFRP		
Milling Speed		100 ~ 180m/min (300 ~ 600 SFM)		
Mill Dia.		RPM (min-1)	Feed Rate	
inch	mm		mm/rev	IPR
1/8	3.175	10,000 ~ 18,000	0.04 ~ 0.05	0.0016 ~ 0.0020
.1575	4	8,000 ~ 14,300	0.05 ~ 0.06	0.0020 ~ 0.0024
3/16	4.763	6,700 ~ 12,000	0.05 ~ 0.06	0.0020 ~ 0.0024
.2362	6	5,300 ~ 9,500	0.10 ~ 0.12	0.004 ~ 0.005
1/4	6.35	5,000 ~ 9,000	0.10 ~ 0.12	0.004 ~ 0.005
5/16	7.938	4,000 ~ 7,200	0.16 ~ 0.2	0.006 ~ 0.008
.3150	8	4,000 ~ 7,200	0.16 ~ 0.25	0.006 ~ 0.01
3/8	9.525	3,300 ~ 6,000	0.24 ~ 0.3	0.009 ~ 0.012
.3937	10	3,200 ~ 5,700	0.24 ~ 0.3	0.009 ~ 0.012
.4724	12	2,600 ~ 4,800	0.3 ~ 0.5	0.012 ~ 0.02
1/2	12.7	2,500 ~ 4,500	0.3 ~ 0.5	0.012 ~ 0.02

1. The above conditions are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

■ Feed Reduction

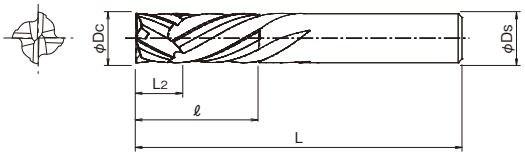
Material Thickness	Feed Reduction
≦0.25Dc	× 80%
0.25Dc ~ 0.5Dc	× 150%
0.5Dc ~ 1Dc	× 120%
1Dc ~ 2Dc	× 80%
2Dc ~ 3Dc	× 50%

List 2064

AERO-HBC45

45° Helix Herringbone Router

It features a compression cutting mechanism to prevent delamination. Its 45° helix and sharp cutting edges are good for AFRP, GFRP and Honeycomb applications.



See page 8 for explanation of icons.

Unit:inch

EDP No.	Mill Dia. Dc	Compression Length L2	Length of Cut ℓ	Overall Length L	Shank Dia. Ds
20642516	1/4	1/4	3/4	3	1/4
20643516	3/8	3/8			3/8
20643616	3/8		2	4	
20645016	1/2	1/2	1	3	1/2
20645116	1/2		2	4	

■ Recommended Conditions

Work Material		CFRP		
Milling Speed		100 ~ 180m/min (300 ~ 600 SFM)		
Mill Dia.		RPM (min-1)	Feed Rate	
inch	mm		mm/rev	IPR
1/4	6.35	5,000 ~ 9,000	0.1 ~ 0.12	0.004 ~ 0.005
3/8	9.525	3,300 ~ 6,000	0.24 ~ 0.3	0.009 ~ 0.012
1/2	12.7	2,500 ~ 4,500	0.3 ~ 0.5	0.012 ~ 0.02

1. The above conditions are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

■ Feed Reduction

Material Thickness	Feed Reduction
≦0.25Dc	× 80%
0.25Dc ~ 0.5Dc	× 150%
0.5Dc ~ 1Dc	× 120%
1Dc ~ 2Dc	× 80%
2Dc ~ 3Dc	× 50%

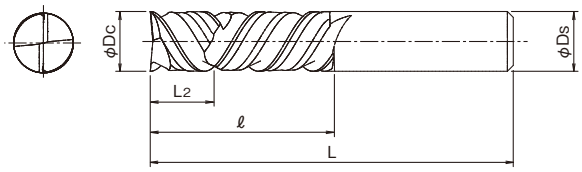
For Trimming

DIA-HBC60 / List 2068

AERO-HBC60

Diamond Coated 60° Helix Herringbone Router

It features a compression cutting mechanism to neutralize cutting forces and prevent delimitation. Its diamond coating and cutting edges are suitable for CFRP and GFRP.



L2 is approximately 0.75×Dc.

DIA-HBC60

See page 8 for explanation of icons.

Unit:mm

	EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	Helix Angle
		inch	mm				
*	8809191	.2362	6	18	68	6	Right 60° & Left 60°
*	8809193	.3150	8	24	74	8	
*	8809195	.3937	10	30	80	10	

*=Contact OSG for availability.

List 2068

Unit:inch

EDP No.	Mill Dia. Dc	Length of Cut ℓ	Overall Length L	Shank Dia. Ds	Helix Angle
20682516	1/4	3/4	3	1/4	Right 60° & Left 60°
20683516	3/8			3/8	
20683616	3/8	2	4		
20685016	1/2	1	3	1/2	
20685116	1/2	2	4		

■ Recommended Conditions

Work Material		CFRP		
Milling Speed		100 ~ 180m/min (300 ~ 600 SFM)		
Mill Dia.		RPM (min-1)	Feed Rate	
inch	mm		mm/rev	IPR
1/8	3.175	10,000 ~ 18,000	0.02 ~ 0.03	0.0008 ~ 0.0012
.2362	6	5,300 ~ 9,500	0.05 ~ 0.06	0.0020 ~ 0.0024
1/4	6.35	5,000 ~ 9,000	0.05 ~ 0.06	0.0020 ~ 0.0024
.3150	8	4,000 ~ 7,200	0.08 ~ 0.13	0.003 ~ 0.005
3/8	9.525	3,300 ~ 6,000	0.12 ~ 0.15	0.005 ~ 0.006
.3937	10	3,200 ~ 5,700	0.12 ~ 0.15	0.005 ~ 0.006
1/2	12.7	2,500 ~ 4,500	0.15 ~ 0.25	0.006 ~ 0.010

1. The above conditions are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

■ Feed Reduction

Material Thickness	Feed Reduction
≦0.25Dc	× 80%
0.25Dc ~ 0.5Dc	× 150%
0.5Dc ~ 1Dc	× 120%
1Dc ~ 2Dc	× 80%
2Dc ~ 3Dc	× 50%

DIA-CNC

High Efficiency Coarse Nicked Router

It can achieve high efficiency and long tool life in applications from trimming to routing. The special design prevents galling of the cutting edge in soft composite materials.

CARBIDE DIA

See page 8 for explanation of icons.

Unit:mm

EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	No.of Flutes Z	End Cutting Teeth
	inch	mm					
□	1/8	3.175	10	60	3.175	4	2
□	.1575	4	12	62	4		
□	.2362	6	18	68	6	6	
□	1/4	6.35	19	69	6.35		
□	.3150	8	24	74	8		
□	3/8	9.525	28	78	9.525		
□	.3937	10	30	80	10		
□	.4724	12	36	86	12	8	
□	1/2	12.7	38	88	12.7		

□ = Special order item.

■ Recommended Conditions

Work Material		CFRP		
Milling Speed		100 ~ 180m/min (300 ~ 600 SFM)		
Mill Dia.		RPM (min^{-1})	Feed Rate	
inch	mm		mm/rev	IPR
1/8	3.175	10,000 ~ 18,000	0.04 ~ 0.05	0.0016 ~ 0.0020
.1575	4	8,000 ~ 14,300	0.05 ~ 0.06	0.0020 ~ 0.0024
.2362	6	5,300 ~ 9,500	0.1 ~ 0.12	0.004 ~ 0.005
1/4	6.35	5,000 ~ 9,000	0.1 ~ 0.12	0.004 ~ 0.005
.3150	8	4,000 ~ 7,200	0.16 ~ 0.25	0.006 ~ 0.01
3/8	9.525	3,300 ~ 6,000	0.24 ~ 0.3	0.009 ~ 0.012
.3937	10	3,200 ~ 5,700	0.24 ~ 0.3	0.009 ~ 0.012
.4724	12	2,600 ~ 4,800	0.3 ~ 0.5	0.012 ~ 0.02
1/2	12.7	2,500 ~ 4,500	0.3 ~ 0.5	0.012 ~ 0.02

1. The above conditions are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

For Trimming and Routing

DIA-DCR

Diamond Coated Cross Fluted Router with End Cut

It is ideal for a variety of polymer base, metal base and ceramic base composite materials. The shallow and sharp flute design makes this router efficient in CNC machining and hand trimming.

See page 8 for explanation of icons.

Unit:mm

EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	End Cutting Teeth
	inch	mm				
8809061	1/8	3.175	11	38.1	3.175	2
8809062	1/4	6.35	19	50.8	6.35	
□	3/8	9.525	25	63.5	9.525	
□	1/2	12.7		76.2	12.7	

□= Special order item.

DIA-DCR-N

Diamond Coated Cross Fluted Router without End Cut
It has the same specification as DIA-DCR, but has no end cutting teeth.

See page 8 for explanation of icons.

Unit:mm

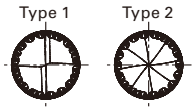
EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	End Cutting Teeth
	inch	mm				
□	1/8	3.175	11	38.1	3.175	None
□	1/4	6.35	19	50.8	6.35	
□	3/8	9.525	25	63.5	9.525	
□	1/2	12.7		76.2	12.7	

□ = Special order item.

For Trimming and Routing

DIA-DCE

Diamond Coated Cross Flute Router with End Cut
It is a metric version of DIA-DCR.



CARBIDE DIA

See page 8 for explanation of icons.

Unit:mm

	EDP No.	Mill Dia. Dc inch	Mill Dia. Dc mm	Length of Cut ℓ	Overall Length L	Shank Dia. Ds	End Cutting Teeth
	□	.0787	2	8	45	4	Type 1
	□	.0984	2.5	10			
	□	.1181	3		60	6	
	□	.1378	3.5	12			
	□	.1575	4	16			
	□	.1771	4.5				
	□	.1969	5	19			
	□	.2362	6				
*	8809201	.2362	6				Type 2
	□	.2756	7	22	65	8	Type 1
	□	.3150	8	26	70		
*	8809203	.3150	8				Type 2
	□	.3543	9		75	10	Type 1
	□	.3937	10	32	80		
*	8809205	.3937	10				Type 2
	□	.4724	12	38	90	12	Type 1

□ = Special order item.
＊ = Contact OSG for availability.

DIA-DCE-N

Diamond Coated Cross Flute Router without End Cut
It has the same specification as DIA-DCE, but has no end cutting teeth.

CARBIDE DIA

See page 8 for explanation of icons.

Unit:mm

EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	End Cutting Teeth
	inch	mm				
□	.0787	2	8	45	4	None
□	.0984	2.5	10			
□	.1181	3		60	6	
□	.1378	3.5	12			
□	.1575	4	16			
□	.1771	4.5				
□	.1969	5	19			
□	.2362	6				
□	.2762	7	22	65	8	
□	.3150	8	26	70		
□	.3543	9		75	10	
□	.3937	10	32	80		
□	.4724	12	38	90	12	

□ = Special order item.

For Trimming and Routing

DIA-DCE-D

Diamond Coated Cross Flute Router with End Cut Drill Point
It has the same specification as DIA-DCE, but has drill point at the end.

See page 8 for explanation of icons.

Unit:mm

EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	End Cutting Teeth
	inch	mm				
☐	.0787	2	8	45	4	135° Drill Point
☐	.0984	2.5	10			
☐	.1181	3		60	6	
☐	.1378	3.5	12			
☐	.1575	4	16			
☐	.1771	4.5				
☐	.1969	5	19			
☐	.2362	6				
☐	.2762	7	22	65	8	
☐	.3150	8	26	70		
☐	.3543	9		75	10	
☐	.3937	10	32	80		
☐	.4724	12	38	90	12	

☐ = Special order item.

DIA-REC / List 2680

AERO-REC

Diamond Coated Roughing Router

It is a diamond coated roughing router for roughing and semi-finishing of composites. It shows extremely low cutting forces and is good for low rigid fixtures and 5-axis machines. It can be used in combination with DIA-MFC for finishing.

CARBIDE DIA

DIA-REC

See page 8 for explanation of icons.

Unit:mm

	EDP No.	Mill Dia. Dc inch	Mill Dia. Dc mm	Length of Cut ℓ	Overall Length L	Shank Dia. Ds	No.of Flutes Z
□		1/8	3.175	10	60	3.175	3
□		.1575	4	12	62	4	
*	8809161	.2362	6	18	68	6	4
□		1/4	6.35	19	69	6.35	
□		.3150	8	24	74	8	
*	8809163	.3150	8				6
□		3/8	9.525	28	78	9.525	4
□		.3937	10	30	80	10	
*	8809165	.3937	10				6
□		.4724	12	36	86	12	4
□		1/2	12.7	38	88	12.7	

□ = Special order item.
＊ = Contact OSG for availability.

List 2680

Unit:inch

EDP No.	Mill Dia. Dc	Length of Cut ℓ	Overall Length L	Shank Dia. Ds	No. of Flutes Z
26809316	15/64	3/4	2 1/2	1/4	4
26805316	1/4	1/2			
26800316	1/4	3/4			
26809416	5/16	15/16	3	3/8	6
26809516	23/64	1 1/8			
26805516	3/8	3/4			
26800516	3/8	1 1/8			
26809616	7/16	1 15/16		1/2	8
26809716	31/64	1 1/2			
26805716	1/2	1			
26800716	1/2	1 1/2			

■ Recommended Conditions

Work Material		CFRP		
Milling Speed		100 ~ 180m/min (300 ~ 600 SFM)		
Mill Dia.		RPM (min^{-1})	Feed Rate	
inch	mm		mm/rev	IPR
1/8	3.175	10,000 ~ 18,000	0.04 ~ 0.05	0.0016 ~ 0.0020
.157	4	8,000 ~ 14,300	0.05 ~ 0.06	0.0020 ~ 0.0024
.236	6	5,300 ~ 9,500	0.1 ~ 0.12	0.004 ~ 0.005
1/4	6.35	5,000 ~ 9,000	0.1 ~ 0.12	0.004 ~ 0.005
5/16	7.938	4,000 ~ 7,200	0.16 ~ 0.2	0.006 ~ 0.008
.315	8	4,000 ~ 7,200	0.16 ~ 0.25	0.006 ~ 0.01
3/8	9.525	3,300 ~ 6,000	0.24 ~ 0.3	0.009 ~ 0.012
.394	10	3,200 ~ 5,700	0.24 ~ 0.3	0.009 ~ 0.012
.472	12	2,600 ~ 4,800	0.42 ~ 0.7	0.017 ~ 0.028
1/2	12.7	2,500 ~ 4,500	0.42 ~ 0.7	0.017 ~ 0.028

1. The conditions listed left are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

■ Feed Reduction

Material Thickness	Feed Reduction
≦0.25Dc	× 80%
0.25Dc ~ 0.5Dc	× 150%
0.5Dc ~ 1Dc	× 120%
1Dc ~ 2Dc	× 80%
2Dc ~ 3Dc	× 50%

For General Purpose Routing

DIA-MRC

General Purpose Router with Corner Radius

Ideal for a wide variety of CFRP, CFRP / CFRP composites and CFRTP. The end cutting teeth feature a corner radius. A large range of radius sizes is available.

See page 8 for explanation of icons.

Unit:mm

EDP No.	Mill Dia. Dc		Coner Radius	Length of Cut	Overall Length	Shank Dia.	No.of Flutes
	inch	mm	r	ℓ	L	Ds	Z
□	1/8	3.175	R0.4	10	60	3.175	4
□	.1575	4	R0.4	12	62	4	
□	.1575	4	R0.7				
□	.2362	6	R0.4	18	68	6	
□	.2362	6	R0.7				
□	.2362	6	R1				
□	1/4	6.35	R0.4	19	69	6.35	
□	1/4	6.35	R0.7				
□	1/4	6.35	R1				
□	.3150	8	R0.4	24	74	8	
□	.3150	8	R0.7				
□	.3150	8	R1				
□	3/8	9.525	R0.4	28	78	9.525	
□	3/8	9.525	R0.7				
□	3/8	9.525	R1				
□	.3937	10	R0.4	30	80	10	
□	.3937	10	R0.7				
□	.3937	10	R1				
□	.4724	12	R0.4	36	86	12	
□	.4724	12	R0.7				
□	.4724	12	R1				
□	1/2	12.7	R0.4	38	88	12.7	
□	1/2	12.7	R0.7				
□	1/2	12.7	R1				

□= Special order item.

■ Recommended Conditions

Work Material		CFRP		
Milling Speed		100 ~ 180m/min (300 ~ 600 SFM)		
Mill Dia.		RPM	Feed Rate	
inch	mm	(min^{-1})	mm/rev	IPR
1/8	3.175	10,000 ~ 18,000	0.04 ~ 0.05	0.0016 ~ 0.0020
.1575	4	8,000 ~ 14,300	0.05 ~ 0.06	0.0020 ~ 0.0024
3/16	4.763	6,700 ~ 12,000	0.05 ~ 0.06	0.0020 ~ 0.0024
.2362	6	5,300 ~ 9,500	0.10 ~ 0.12	0.004 ~ 0.005
1/4	6.35	5,000 ~ 9,000	0.10 ~ 0.12	0.004 ~ 0.005
.3150	8	4,000 ~ 7,200	0.16 ~ 0.25	0.006 ~ 0.010
3/8	9.525	3,300 ~ 6,000	0.24 ~ 0.30	0.009 ~ 0.012
.3937	10	3,200 ~ 5,700	0.24 ~ 0.30	0.009 ~ 0.012
.4724	12	2,600 ~ 4,800	0.30 ~ 0.50	0.012 ~ 0.020
1/2	12.7	2,500 ~ 4,500	0.30 ~ 0.50	0.012 ~ 0.020

1. The above conditions are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

DIA-COE

Diamond Coated Low Spiral One Flute Router

Ideal for machining CFRP, CFRP / CFRP, and CFRTP materials. Simultaneously reducing the cutting edge length and increasing the chip pocket prevents movement and deflection of the workpiece and provides excellent chip evacuation.

CARBIDE DIA

See page 8 for explanation of icons.

Unit:mm

EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	No. of Flutes Z
	inch	mm				
☐	.0787	2	8	45	4	1
☐	.0984	2.5	10			
☐	.1181	3		60	6	
☐	.1378	3.5	12			
☐	.1575	4	16			
☐	.1771	4.5				
☐	.1969	5	19			
☐	.2362	6				
☐	.2762	7	22	65	8	
☐	.3150	8	26	70		
☐	.3543	9		75	10	
☐	.3937	10	32	80		
☐	.4724	12	38	90	12	

☐ = Special order item.

For Routing, Multi-Flute

DIA-MFC / List 2650

AERO-MFR

Diamond Coated Multi-Flute Finishing Router

It is a highly rigid multi-fluted finishing router designed for high precision and accuracy requirements. It can be used for finishing in combination with DIA-REC.

CARBIDE DIA

DIA-MFC

See page 8 for explanation of icons.

Unit:mm

	EDP No.	Mill Dia. Dc inch	Mill Dia. Dc mm	Length of Cut ℓ	Overall Length L	Shank Dia. Ds	No. of Flutes Z	Helix
	□	1/8	3.175	10	60	3.175	6	Right
	□	.1575	4	12	62	4		
	□	.2362	6	18	68	6	8	
*	8809171	.2362	6		80			Left
	□	1/4	6.35	19	69	6.35		Right
	□	.3150	8	24	74	8	10	
*	8809173	.3150	8		90			Left
	□	3/8	9.525	28	78	9.525	12	Right
	□	.3937	10	30	80	10		
*	8809175	.3937	10		100			Left
	□	.4724	12	36	86	12	14	Right
	□	1/2	12.7	38	88	12.7		

□ = Special order item.
＊ = Contact OSG for availability.

List 2650

Unit:inch

EDP No.	Mill Dia. Dc	Length of Cut ℓ	Overall Length L	Shank Dia. Ds	No. of Flutes Z	Helix
26500316	1/4	3/4	2 1/2	1/4	8	Right
26501316	1/4	1	3			
26500616	3/8	1 1/8		3/8	12	
26501516	3/8	1 1/2				
26500716	1/2		4	1/2	14	
26501716	1/2	2				

■ Recommended Conditions

Work Material		CFRP		
Milling Speed		100 ~ 180m/min (300 ~ 600 SFM)		
Mill Dia.		RPM	Feed Rate	
inch	mm	(min⁻¹)	mm/rev	IPR
1/8	3.175	10,000 ~ 18,000	0.06 ~ 0.12	0.002 ~ 0.005
.1575	4	8,000 ~ 14,000	0.09 ~ 0.12	0.004 ~ 0.005
.2362	6	5,300 ~ 9,500	0.16 ~ 0.24	0.006 ~ 0.009
1/4	6.35	5,000 ~ 9,000	0.24 ~ 0.4	0.009 ~ 0.016
.3150	8	4,000 ~ 7,000	0.3 ~ 1	0.012 ~ 0.039
3/8	9.525	3,300 ~ 6,000	0.48 ~ 1.2	0.019 ~ 0.047
.3937	10	3,200 ~ 5,700	0.48 ~ 1.2	0.019 ~ 0.047
.4724	12	2,600 ~ 4,500	0.7 ~ 1.4	0.028 ~ 0.055
1/2	12.7	2,500 ~ 4,000	0.7 ~ 1.4	0.028 ~ 0.055

1. The conditions listed left are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

■ Feed Reduction

Material Thickness	Feed Reduction
≦0.25Dc	× 80%
0.25Dc ~ 0.5Dc	× 150%
0.5Dc ~ 1Dc	× 120%
1Dc ~ 2Dc	× 80%
2Dc ~ 3Dc	× 50%

DIA-TRE

Diamond Coated Cross Flute Router

It is a router for trimming thin laminates. The cross flute shape of the cutting edge suppresses the occurrence of burrs.

CARBIDE DIA

See page 8 for explanation of icons.

Unit:mm

EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	End Cutting Teeth
	inch	mm				
□	.0591	1.5	3	45	4	None
□	.0709	1.8	3.6			
□	.0787	2	4			
□	.0984	2.5	5			
□	.1181	3	6			

□ = Special order item.

■ Recommended Conditions

Work Material		CFRP				
Mill Dia.		Milling Speed		RPM	Feed Rate	
inch	mm	m/min	SFM	(min^{-1})	mm/rev	IPR
.0591	1.5	40 ~ 200	130 ~ 650	20,000	0.01 ~ 0.1	0.0004 ~ 0.004
.0787	2	40 ~ 200	130 ~ 650	20,000	0.02 ~ 0.15	0.001 ~ 0.006
.1181	3	80 ~ 200	260 ~ 650	20,000	0.05 ~ 0.2	0.002 ~ 0.008

1. The above conditions are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

For Trimming Laminates

DIA-TRE-D

Diamond Coated Cross Flute Router with Drill Point
It has the same specification as DIA-TRE, but has drill point at the end.

See page 8 for explanation of icons.

Unit:mm

EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	End Cutting Teeth
	inch	mm				
☐	.0591	1.5	3	45	4	135° Drill Point
☐	.0709	1.8	3.6			
☐	.0787	2	4			
☐	.0984	2.5	5			
☐	.1181	3	6			

☐ = Special order item.

■ Recommended Conditions

Work Material		CFRP				
Mill Dia.		Milling Speed		RPM	Feed Rate	
inch	mm	m/min	SFM	(min^{-1})	mm/rev	IPR
.0591	1.5	40 ~ 200	130 ~ 650	20,000	0.01 ~ 0.1	0.0004 ~ 0.004
.0787	2	40 ~ 200	130 ~ 650	20,000	0.02 ~ 0.15	0.001 ~ 0.006
.1181	3	80 ~ 200	260 ~ 650	20,000	0.05 ~ 0.2	0.002 ~ 0.008

1. The above conditions are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

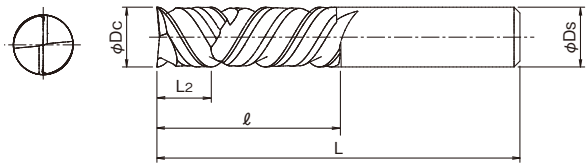
For Routing Honeycomb

HBC60 / List 668

AERO-HBC60 (Bright)

60° Helix Herringbone Router

It features a compression cutting mechanism to neutralize cutting forces and prevent delamination. Its high helix and sharp cutting edges are ideal for AFRP, GFRP and Honeycomb applications.



L2 is approximately 0.75×Dc.

CARBIDE

HBC60

See page 8 for explanation of icons.

Unit:mm

	EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds
		inch	mm			
*	8809181	.2362	6	18	68	6
*	8809183	.3150	8	24	74	8
*	8809185	.3937	10	30	80	10
*	8809187	.4724	12	36	86	12

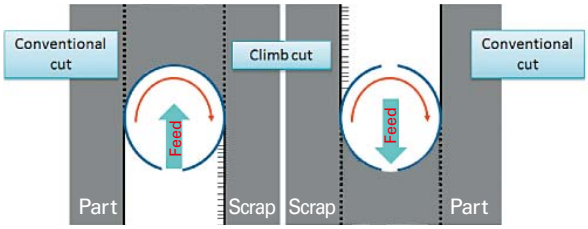
*=Contact OSG for availability.

List 668

Unit:inch

EDP No.	Mill Dia. Dc	Length of Cut ℓ	Overall Length L	Shank Dia. Ds
6682501	1/4	3/4	3	1/4
6683751	3/8			3/8
6683752	3/8	2	4	
6685001	1/2	1	3	1/2
6685002	1/2	2	4	

■ Conventional Cut vs. Climb Cut



■ Feed Reduction

Material Thickness	Feed Reduction
≦ 2Dc	× 100%
2Dc ~ 3Dc	× 80%

■ Recommended Conditions

Work Material		AFRP, GFRP and Honeycomb		
Milling Speed		300~600 m/min (1,000~2,000 SFM)		
Mill Dia.		RPM	Feed Rate	
inch	mm	(min⁻¹)	mm/rev	IPR
.2362	6	20,000 ~ 30,000	0.02 ~ 0.06	0.001 ~ 0.002
1/4	6.35	20,000 ~ 30,000	0.02 ~ 0.06	0.001 ~ 0.002
.3150	8	15,000 ~ 24,000	0.02 ~ 0.06	0.001 ~ 0.002
3/8	9.525	12,000 ~ 20,000	0.02 ~ 0.07	0.001 ~ 0.003
.3937	10	12,000 ~ 19,000	0.02 ~ 0.07	0.001 ~ 0.003
.4724	12	10,000 ~ 16,000	0.02 ~ 0.1	0.001 ~ 0.004
1/2	12.7	10,000 ~ 15,000	0.02 ~ 0.1	0.001 ~ 0.004

1. The above conditions are based on approximately 1xDc thickness of part under rigid work holding.
2. Conventional cut is recommended at part side for good surface finish.
3. Milling speed can be increased by 20-50% with the use of appropriate cutting oil.
4. Please provide appropriate measures against dust (such as vacuum dust collection).
5. Depending on the workpiece thickness and form as well as work holding, vibration may occur. When it occurs, please adjust RPM and feed rate.

For Routing Honeycomb

DCE

Cross Flute Router
It is ideal for CFRP, GFRP, AFRP and Honeycomb and for hand trimming.

Contact OSG for availability.

CARBIDE

See page 8 for explanation of icons.

Unit:mm

EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	End Cutting Teeth
	inch	mm				
8809211	.2362	6	19	60	6	Bur End
8809213	.3150	8	26	70	8	
8809215	.3937	10	32	80	10	

Electroplated Diamond Tools

ED-EM

Electroplated Diamond Router
It is ideal for machining all composites such as CFRP, GFRP, AFRP, and CFRP/CFRP.

Unit:mm

EDP No.	Mill Dia. Dc		Length of Cut ℓ	Overall Length L	Shank Dia. Ds	Grid Size
	inch	mm				
□	1/8	3.175	10	55	3.175	#60
□	.1575	4	12	57	4	
8809042	.2362	6	18	63	6	
□	1/4	6.35	19	64	6.35	
8809043	.3150	8	24	70	8	
□	3/8	9.525	28	73	9.525	
8809044	.3937	10	30	75	10	
□	.4724	12	36	81	12	
□	1/2	12.7	38	83	12.7	

□ = Special order item.

■ Recommended Conditions

Work Material		CFRP		
Milling Speed		200 ~ 300m/min (650 ~ 980 SFM)		
Mill Dia.		RPM (min^{-1})	Feed Rate	
inch	mm		mm/rev	IPR
1/8	3.175	20,000	0.003 ~ 0.012	0.0001 ~ 0.0005
.1575	4	20,000	0.005 ~ 0.015	0.0002 ~ 0.0006
.2362	6	13,000	0.005 ~ 0.025	0.0002 ~ 0.001
1/4	6.35	13,000	0.005 ~ 0.032	0.0002 ~ 0.0013
.3150	8	10,000	0.005 ~ 0.035	0.0002 ~ 0.0014
3/8	9.525	8,500	0.005 ~ 0.04	0.0002 ~ 0.0016
.3937	10	8,000	0.005 ~ 0.04	0.0002 ~ 0.0016
.4724	12	7,000	0.005 ~ 0.045	0.0002 ~ 0.0018
1/2	12.7	6,500	0.005 ~ 0.045	0.0002 ~ 0.0018

1. When the depth of cut is large, please reduce feed rate. The following table shows approximate reduction rate of feed rate.
2. When machining brittle material such as CF/CF composite and ceramics, please reduce feed rate to the minimum amount on the table. If chipping occurs on cutting edge, please reduce the depth of cut and feed rate further.

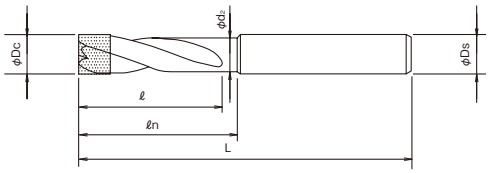
Radial Depth of Cut ar (mm)	Feed Rate Reduction Rate
0.1 × Dc	100%
0.2 × Dc	70%
0.5 × Dc	40%
1 × Dc	20%

Electroplated Diamond Tools

ED-DS

Electroplated Diamond Drill

It is ideal for machining ceramic based composite materials and brittle materials such as CFRP/CFRP composites. It can be used in various applications ranging from drilling through and blind holes to side and contour grinding.



Unit:mm

EDP No.	Drill Dia. Dc		Length of Cut ℓ	OverallLength L	Shank Dia. Ds	Neck Length ℓn	Neck Dia. d2	Length of Electroplating	Grid Size
	inch	mm							
8599720	.0787	2	7	39	3	8.5	1.6	8.5	#100
8599725	.0984	2.5	9	41		10.5	2.1	10.5	
8599730	.1181	3	11	43		12.5	2.6	12.5	
8599735	.1378	3.5	15	47	4	16.5	3.1	10	
8599740	.1575	4	17	49		18.5	3.6		
8599745	.1771	4.5	19	63	6	21	4.1		
□	.1910	4.851	21	65	4.851	23	4.45		
8599750	.1969	5			6		4.6		
8599755	.2180	5.5	23	67		25	5.1		
8599760	.2362	6	25	69		27.4	5.6		
□	1/4	6.35	28	72	6.35	30	5.95		
8599765	.2560	6.5			8		6.1		
8599770	.2762	7					6.6		
8599775	.2953	7.5	31	75		33	7.1		
8599780	.3150	8	34	78		36.4	7.6		
8599785	.3346	8.5		84	10	36	8.1		
8599790	.3543	9	37	87		39	8.6		
8599795	.3740	9.5					9.1		
□	3/8	9.525	40	90	9.525	42	9.13		
8599800	.3937	10			10	42.4	9.6		
8599805	.4130	10.5		97	12	42	10.1		
8599810	.4330	11					10.6		
8599815	.4530	11.5	44	101		46	11.1		
8599820	.4724	12				46.4	11.6		
8599825	.4921	12.5	48	105		51	12.1		
8599830	.5118	13					12.6		

□ = Special order item.

■ Recommended Conditions

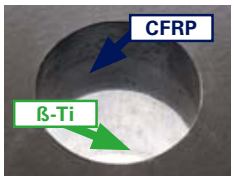
Work Material		CFRP		
Drilling Speed		50 ~ 200m/min (160 ~ 650 SFM)		
Drill Dia.		RPM (min^{-1})	Feed Rate	
inch	mm		mm/rev	IPR
.0787	2	16,000	0.0003 ~ 0.005	0.00001 ~ 0.0002
.1575	4	8,000	0.0003 ~ 0.005	0.00001 ~ 0.0002
.1910	4.851	6,500	0.0003 ~ 0.005	0.00001 ~ 0.0002
.2362	6	5,500	0.0005 ~ 0.007	0.00002 ~ 0.0003
1/4	6.35	5,000	0.0005 ~ 0.007	0.00002 ~ 0.0003
.3150	8	4,000	0.0007 ~ 0.009	0.00003 ~ 0.0004
3/8	9.525	3,000	0.0009 ~ 0.01	0.00004 ~ 0.0004
.3937	10	2,800	0.0009 ~ 0.012	0.00004 ~ 0.0005
.4724	12	2,500	0.0009 ~ 0.012	0.00004 ~ 0.0005
.5118	13	2,300	0.001 ~ 0.013	0.00004 ~ 0.0005

1. When machining brittle material such as CF/CF composite and ceramics, please reduce feed rate to the minimum amount on the table. If chipping occurs on cutting edge, please reduce the depth of cut and feed rate further.

Special Milling Tools - Made upon Request

Circular Milling Tool

The circular milling tool excels in hole machining utilizing helical interpolation. This tool can produce excellent quality holes in CFRP/Ti and CFRP/AL stack materials with an extremely high level of hole circularity. Chipping and burr formation in both metallic and composite structures are also reduced.



Hole Produced by Circular Interpolation

Stack Material (CFRP/ß-Ti)

Diamond coating and WXL® coating are available.

Replaceable Tip Reamer & Carbide Tipped Core Drill

Both tools are specially designed for final hole size finishing in composites and stack materials.

Replaceable Head Reamer

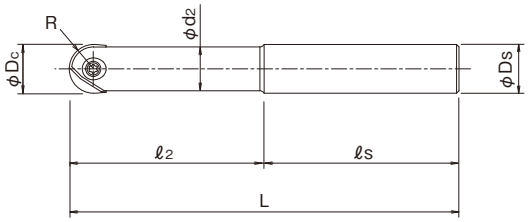
Carbide Brazed Core Drill

Ball Nose Cutter for Finishing

PFB / List 78014 / List 52100

Indexable Finishing Ball End Mill

The high precision mounting of the insert into the body enables a superior milling surface and long tool life.



PFB / List 78014

Steel Shank

Unit:mm

EDP No.	Designation	Tool Dia. Dc	Tool Rad. R	Overall Length L	Neck Length ℓ2	L/D Ratio	No. of Teeth Z	Shank Dia. Ds	Shank Length ℓs	Neck Dia. d2
7801400	PFB-R080SS08-S120	8	4	120	36	4.5	2	8	84	7
7801401	PFB-R100SS10-S130	10	5	130	45			10	85	9
7801402	PFB-R120SS12-S130	12	6		54			12	76	11
7801403	PFB-R160SS16-S140	16	8	140	64	4		16		14
7801404	PFB-R200SS20-S160	20	10	160	80			20	80	18
7801405	PFB-R250SS25-S160	25	12.5		75	3		25	85	22
7801406	PFB-R300SS32-S170	30	15	170	90			32	80	27

Carbide Shank ——— Short Type

Unit:mm

EDP No.	Designation	Tool Dia. Dc	Tool Rad. R	Overall Length L	Neck Length ℓ2	L/D Ratio	No. of Teeth Z	Shank Dia. Ds	Shank Length ℓs	Neck Dia. d2
7801430	PFB-R080SS08-S100CS	8	4	100	20	2.5	2	8	80	7
7801431	PFB-R100SS10-S100CS	10	5		25			10	75	9
7801432	PFB-R120SS12-S110CS	12	6	110	30			12	80	11
7801433	PFB-R160SS16-S140CS	16	8	140	40			16	100	14
7801434	PFB-R200SS20-S160CS	20	10	160	50			20	110	18
7801435	PFB-R250SS25-S160CS	25	12.5		62.5			25	97.5	22
7801436	PFB-R300SS32-S170CS	30	15	170	75			32	95	27

Carbide Shank ——— Long Type

Unit:mm

EDP No.	Designation	Tool Dia. Dc	Tool Rad. R	Overall Length L	Neck Length ℓ2	L/D Ratio	No. of Teeth Z	Shank Dia. Ds	Shank Length ℓs	Neck Dia. d2
7801420	PFB-R080SS08-LL140CS	8	4	140	56	7	2	8	84	7
7801421	PFB-R100SS10-LL150CS	10	5	150	70			10	80	9
7801422	PFB-R120SS12-LL160CS	12	6	160	84			12	76	11
7801423	PFB-R160SS16-LL200CS	16	8	200	96	6		16	104	14
7801424	PFB-R200SS20-LL240CS	20	10	240	120			20	120	18
7801425	PFB-R250SS25-LL260CS	25	12.5	260	137.5	5.5		25	122.5	22
7801426	PFB-R300SS32-LL290CS	30	15	290	165			32	125	27

List 52100

Steel Shank

Unit:inch

EDP No.	Designation	Tool Dia. Dc	Tool Rad. R	Overall Length L	Neck Length ℓ2	L/D Ratio	No. of Teeth Z	Shank Dia. Ds	Shank Length ℓs	Neck Dia. d2
52100001	PFB-R0375SS0375-S550	.375	.1875	5.5	1.688	4.5	2	.375	4.312	.335
52100002	PFB-R0500SS0500-S550	.500	.2500		2.250			.500	3.250	.460
52100003	PFB-R0625SS0625-S550	.625	.3125		2.500	4		.625	3.000	.585
52100004	PFB-R0750SS0750-S600	.750	.3750	6	3.000			.750		.710
52100005	PFB-R1000SS1000-S650	1.000	.5000	6.5		3		1.000	3.500	.960

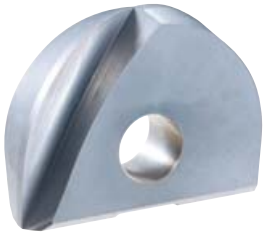
Carbide Shank

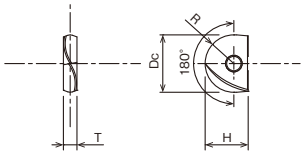
Unit:inch

EDP No.	Designation	Tool Dia. Dc	Tool Rad. R	Overall Length L	Neck Length ℓ2	L/D Ratio	No. of Teeth Z	Shank Dia. Ds	Shank Length ℓs	Neck Dia. d2
52100011	PFB-R0375SS0375-LL650CS	.375	.1875	6.5	2.625	7	2	.375	3.875	.335
52100012	PFB-R0500SS0500-LL700CS	.500	.2500	7	3.500			.500	3.500	.460
52100013	PFB-R0625SS0625-LL750CS	.625	.3125	7.5	3.750	6		.625	3.750	.585
52100014	PFB-R0750SS0750-LL900CS	.750	.3750	9	4.500			.750	4.500	.710
52100015	PFB-R1000SS1000-LL1050CS	1.000	.5000	10.5	5.500	5.5		1.000	5.000	.960

Ball Nose Cutter for Finishing

PFB Inserts

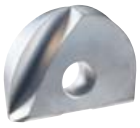




PFB / List 78014

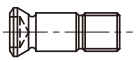
■ Inserts

Unit:mm

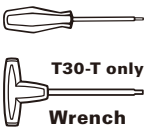
Appearance	Designation	Specifications	No. of Cutting Edges	Range	Insert Size				EDP No.
					Dc	R	T	H	XC4505
	PFB080-D	Spiral Type (Diamond Coated)	2	180°	8	4	2.4	7	7820020
	PFB100-D				10	5	2.6	8.5	7820021
	PFB120-D				12	6	3	10	7820022
	PFB160-D				16	8	4	12	7820023
	PFB200-D				20	10	5	15	7820024
	PFB250-D				25	12.5	6	18.5	7820025
	PFB300-D				30	15	7	22.5	7820026

■ Accessories

Unit:mm

	EDP No.	Designation	Applicable Insert Dc	Recommended Tightening Torque
 Clamping Screw	7808123	FS25669RB	8	1N·m
	7808117	FS30686RB	10	1.2N·m
	7808118	FS35610RB	12	2N·m
	7808119	FS40613RB	16	3N·m
	7808120	FS50615RB	20	5N·m
	7808121	FS60620RB	25	5N·m
	7808122	FS80624RB	30	6N·m

Unit:mm

	EDP No.	Designation	Applicable Insert Dc
 T30-T only Wrench	7808204	T 7-D	8
	7808205	T 8-D	10
	7808207	T10-D	12
	7808208	T15-D	16
	7808209	T20-D	20, 25
	7808212	T30-T	30

Note: Wrench sold separately.

List 52100

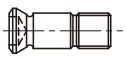
■ Inserts

Unit:inch

Appearance	Designation	Specification	No. of Cutting Edges	Range	Insert Size				EDP No.
					Dc	R	T	H	XC4505
	PFB0375-D	Spiral Type (Diamond Coated)	2	180°	.375	.1875	2.6	8.5	52101001
	PFB0500-D				.500	.2500	3	10	52101002
	PFB0625-D				.625	.3125	4	12	52101003
	PFB0750-D				.750	.3750	5	15	52101004
	PFB1000-D				1.000	.5000	6	18.5	52101005

■ Accessories

Unit:inch

	EDP No.	Designation	Applicable Insert Dc	Rec'd Tightening Torque
 Clamping Screw	7808117	FS30686RB	.375	1.2N·m
	7808118	FS35610RB	.500	2N·m
	7808119	FS40613RB	.625	3N·m
	7808120	FS50615RB	.750	5N·m
	7808121	FS60620RB	1.000	

Unit:inch

	EDP No.	Designation	Applicable Insert Dc
 Wrench	7808205	T 8-D	.375
	7808207	T10-D	.500
	7808208	T15-D	.625
	7808209	T20-D	.750, 1

Note: Wrench sold separately.

■ Recommended Conditions

Work Material	Milling Speed Vc		Rule of Thumb of Cutting Amount	Feed per Tooth						
				fz (mm/t)				fz (inch/t)		
	m/min	SFM	ap (mm)	Ø8	Ø10,12	Ø16,20	Ø25,30	Ø.375, .500	Ø.625, .750	Ø1.000
CFRP	400 (300~500)	1,310 (980~1,640)	0.03Dc	0.11	0.13	0.17	0.2	.005	.007	.008

The above is a general recommendation. Please adjust accordingly based on actual machining condition.

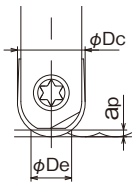
Ball Nose Cutter for Finishing

PFB / List 78014 / List 52100

■ Actual Cutting Diameter Based on Cutting Depth (ØDe)

Depth of Cut ap (mm)	Dc (mm)							Depth of Cut ap (inch)	Dc (inch)						
	8	10	12	16	20	25	30		.315	.375	.500	.625	.750	1.000	1.181
0.1	1.8	2.0	2.2	2.5	2.8	3.2	3.5	.004	.07	.08	.09	.10	.11	.13	.14
0.2	2.5	2.8	3.1	3.6	4.0	4.5	4.9	.008	.10	.11	.12	.14	.16	.18	.19
0.3	3.0	3.4	3.7	4.3	4.9	5.4	6.0	.012	.12	.13	.15	.17	.19	.21	.24
0.4	3.5	3.9	4.3	5.0	5.6	6.3	6.9	.016	.14	.15	.17	.20	.22	.25	.27
0.5	3.9	4.4	4.8	5.6	6.2	7.0	7.7	.020	.15	.17	.19	.22	.24	.28	.30
0.8	4.8	5.4	6.0	7.0	7.8	8.8	9.7	.031	.19	.21	.24	.28	.31	.35	.38
1.0		6.0	6.6	7.7	8.7	9.8	10.8	.039		.24	.26	.30	.34	.39	.43
1.5		7.1	7.9	9.3	10.5	11.9	13.1	.059		.28	.31	.37	.41	.47	.52
2.0			8.9	10.6	12.0	13.6	15.0	.079			.35	.42	.47	.54	.59
2.5				11.6	13.2	15.0	16.6	.098				.46	.52	.59	.65
3.0					14.3	16.2	18.0	.118					.56	.64	.71
3.5					15.2	17.3	19.3	.138					.60	.68	.76
4.0						18.3	20.4	.157						.72	.80
4.5							21.4	.177							.84
5.0							22.4	.197							.88

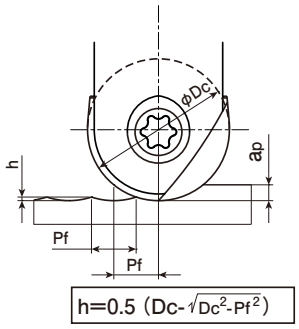
■ How to determine actual cutting diameter:



$$De=2\sqrt{a_p(D_c-a_p)}$$

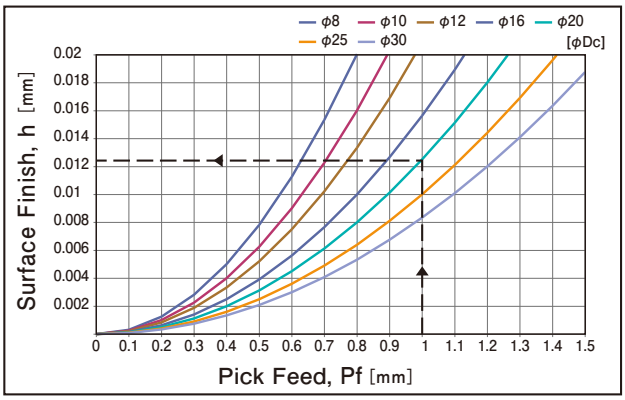
■ Recommended Pick Feed & Surface Roughness

Tool Dia. Dc		Pick Feed Pf		Surface Finish h	
mm	inch	mm	inch	mm	inch
8	—	0.5	.0197	0.008	.00031
10	.375	0.6	.0236	0.009	.00035
12	.500	0.7	.0275	0.010	.00039
16	.625	0.8	.0315	0.010	.00039
20	.750	1.0	.0400	0.012	.00047
25	1.000	1.2	.0472	0.014	.00055
30	—	1.3	.0512	0.014	.00055



$h=0.5\ (Dc-\sqrt{Dc^2-Pf^2})$

Dc＝20 mm
Pf ＝ 1 mm
→h＝ 0.0125mm



Special Threading Tools - Made upon Request

Electroplated Thread Mill (Thermosetting Plastics)

The Electroplated Thread Mill is for grinding internal threads on composites.

Thread Mill & Tap (Thermoplastics)

Tapping and thread milling of composites is uncommon. Some composites are capable of being tapped or thread milled, in such cases, OSG can offer special-made tooling for these applications.

D-STAD / List 7501

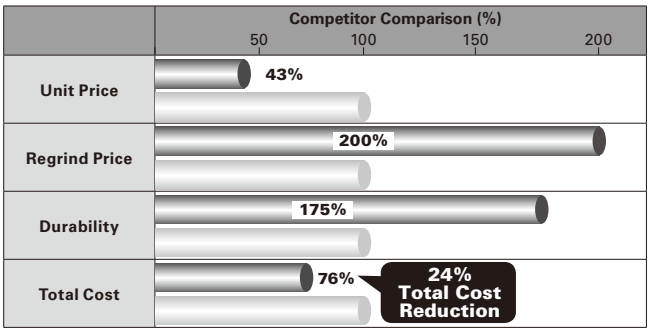
AERO-STAD

OSG's diamond coated drill vs. a competitor's PCD twist drill

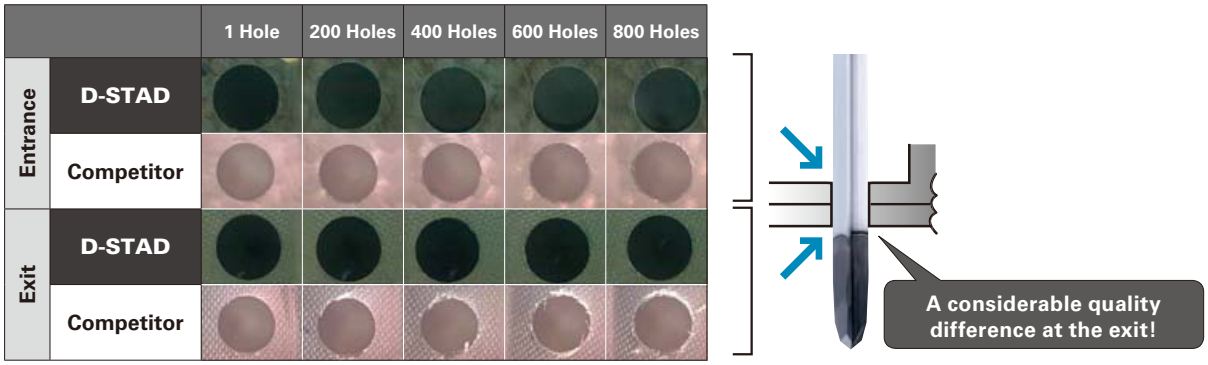
Patented triple angle geometry to reduce push-out exit delamination. Straight-fluted to eliminate pull-up entrance delamination.

Tool	D-STAD	Competitor's PCD Twist Drill
Size	**6.375**mm	
Work Material	**CFRP**	
Drilling Speed	**100**m/min **(4,996**min^{-1}**)**	
Feed	**300**mm/min **(0.06**mm/rev**)**	
Depth of Hole	**19**mm **(Through)**	
Coolant	**Water Soluble**	

■ **D-STAD vs. competitor's PCD twist drill**



■ **Hole quality comparison**



Tool life determinant: Delamination

D-STAD / List 7501

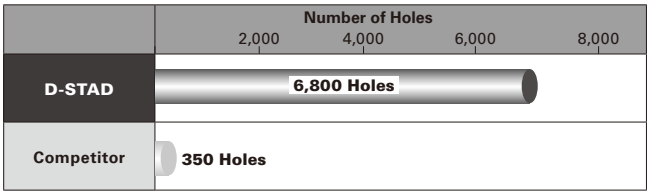
AERO-STAD

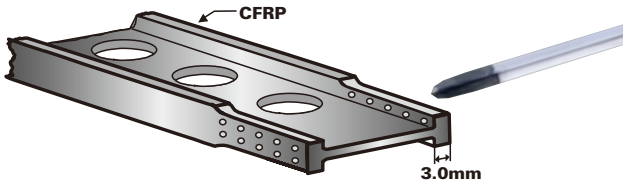
OSG's diamond coated drill vs. a competitor's diamond coated drill

D-STAD demonstrated 19 times greater tool life versus the competitor's diamond coated tool.

Tool	D-STAD	Competitor's Diamond Coated Drill
Size	**6.375**mm	
Work Material	**CFRP**	
Drilling Speed	**120**m/min **(600**min^{-1}**)**	
Feed	**152**mm/min **(0.025**mm/rev**)**	
Depth of Cut	**3**mm	
Coolant	**Dry**	

■ **Comparison in number of drilled holes**





Machining Data

List 7520

Triple angle geometry reduces push-out exit delamination

AERO-LHX

When drilling CFRP, hole quality can be easily distinguishable from the first few holes. The figure on the right illustrates the first hole drilled by a variety of drill designs. As can be seen, the LHX showed the best quality when drilling this particular carbon fiber laminate.

Tool	**List 7520**
Size	**.2510"**
Work Material	**CFRP**
Drilling Speed	**3,000** RPM
Feed	**.001** IPR
Depth of Hole	**.25"**
Coolant	**Dry**
Machine	**Vertical Machining Center**
Quality Criteria	**Uncut Fibers**

	Entrance	Exit
List 7520		
Competitor A		
Competitor B		
Competitor C		
Competitor D		
Competitor E		

STCH / List 5732

Excellent hole quality achieved by TiAlN coated drill

AERO-H

STCH was able to machine over 120 holes in various stack materials without delamination.

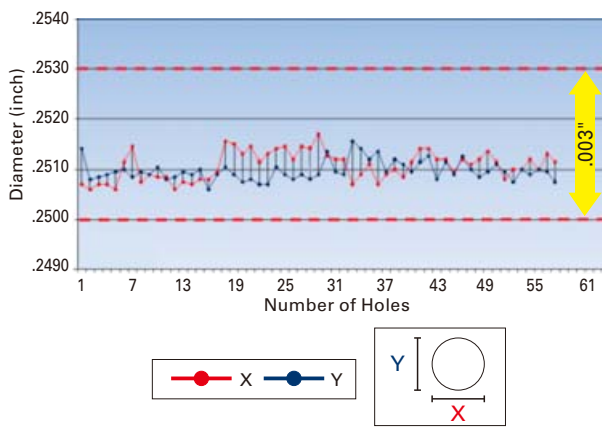
List 7534

High precision drilling

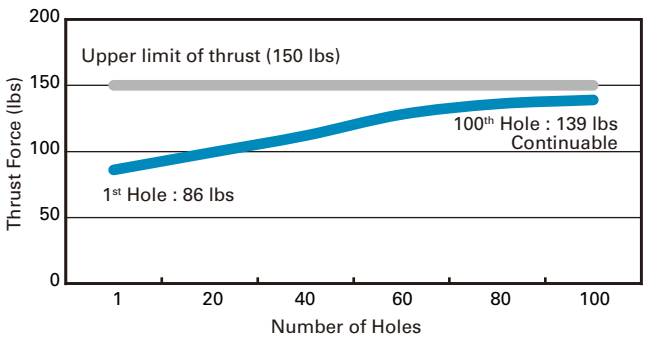
AERO-N

List 7534 is capable of high precision drilling with low thrust force.

■ **Variance of hole expansion**



■ **Transition of thrust force of CFRP/Ti, total 1.3"**



The thrust force after drilling 100 holes was 1,391 lbs, still lower than limit.

Machining Data

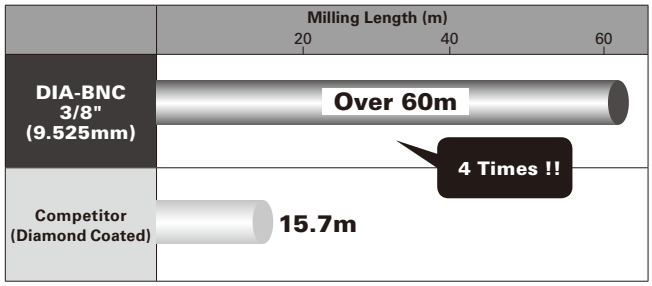
DIA-BNC / List 2061

Stringer end trimming

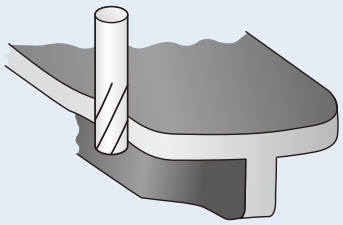
AERO-BNC

DIA-BNC was able to achieve four times the durability versus the competitor.

■ **Comparison of durability**



CFRP Stringer end trim

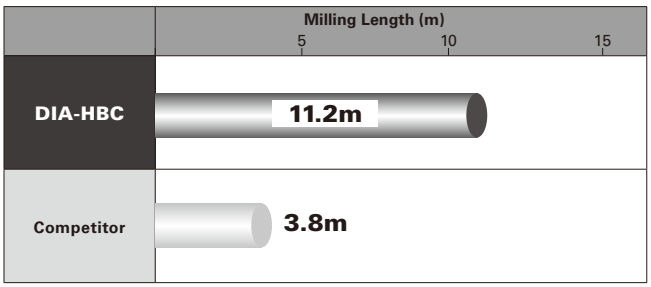


DIA-HBC

Herringbone end mill for CFRP routing

With a herringbone flute design, the DIA-HBC is capable of finishing CFRP without delamination. OSG's patented diamond coating contributes to long tool life and excellent surface finish.

Tool	**DIA-HBC (Special)**
Size	**9.525**mm
Work Material	**CFRP**
Milling Method	**Routing**
Milling Speed	**96**m/min **(3,200**min^{-1}**)**
Feed	**348**mm/min **(0.1**mm/rev**)**
Coolant	**Dry**
Machine	**Vertical Machining Center**
Tool Life	**Resin Welding**



DIA-HBC4 / List 2066

CFRP high feed milling

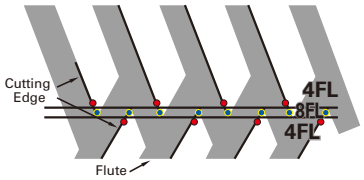
AERO-HBC

DIA-HBC4 demonstrated excellent performance and surface finish at high feed rates. This 4-flute herringbone design was able to mill up to 480 IPM without leaving streak marks on the material.

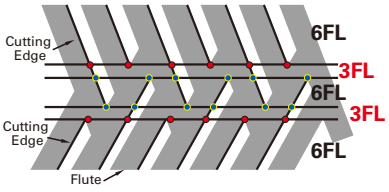
Tool	Herringbone Router - Diamond Coated	
	DIA-HBC4	Competitor
Size	.500"	
Number of Flutes	4	6
Work Material	CFRP	
Milling Method	Side Milling	
Milling Speed	6,000 RPM	
Feed	Various (24 to 480 IPM)	
Depth of Cut	ap=.250" ae=.125"	
Coolant	Dry	
Machine	Vertical Machining Center	

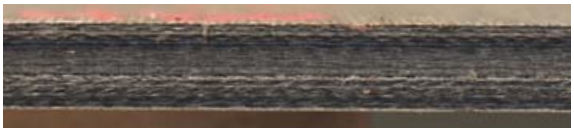
■ **Performance highlights**

DIA-HBC4
Clean milling at
480 IPM

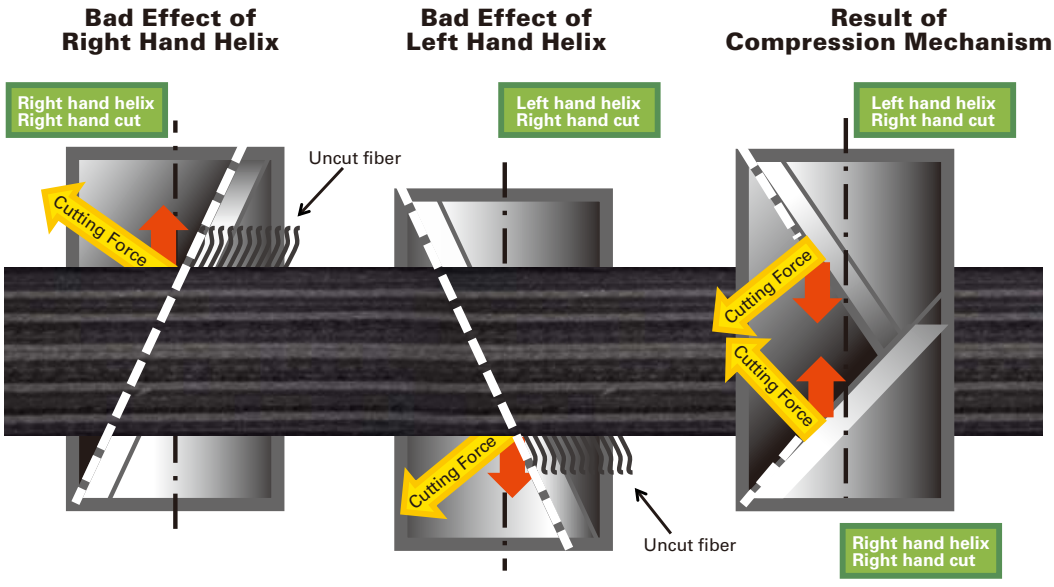


Competitor
Streaking and
Torn/Uncut Fibers





Compression Mechanism



Machining Data

DIA-REC / List 2680

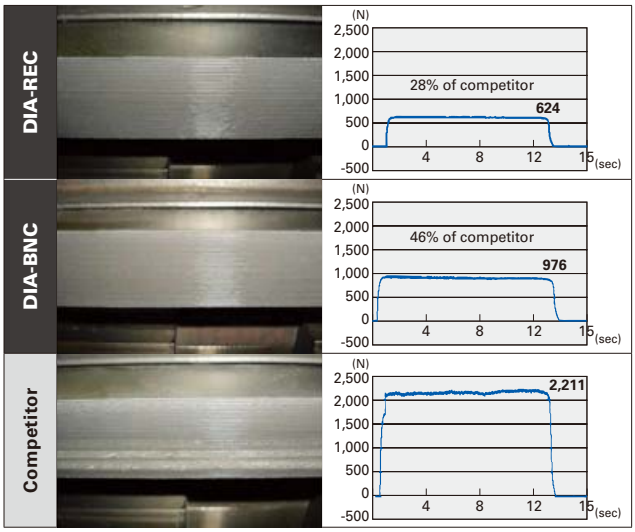
AERO-REC

Highly efficient roughing with low cutting force

Due to the roughing nick profile DIA-REC can reduce cutting force over competitor herringbone 6-flute and our DIA-BNC.

Tool	DIA-REC	DIA-BNC	Competitor Herringbone (6-Flute)
Size	.3937"		
Work Material	CFRP		
Milling Speed	656 SFM		
Feed	15.7 IPM		
Depth of Cut	ap=1" ae=.3937"		
Coolant	Dry		

■ **Comparison of surface finish and cutting force**



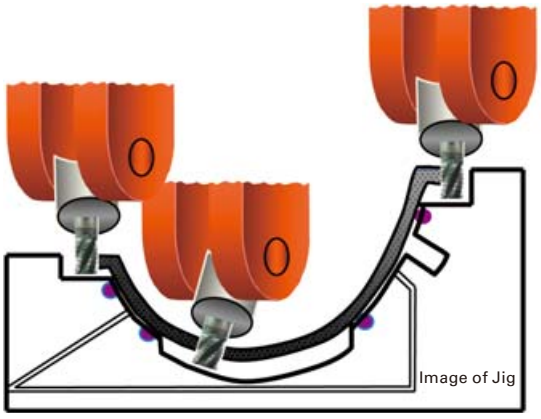
DIA-REC / List 2680

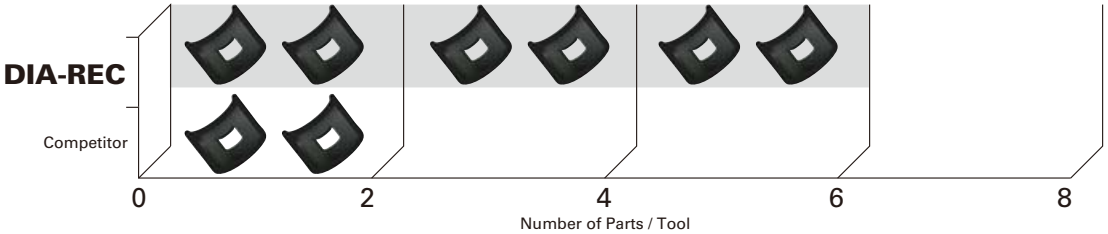
AERO-REC

Long tool life in CFRP panel milling

DIA-REC can complete 6 parts per cutter and shows 3 times longer tool life than competitor.

Tool	DIA-REC	Competitor
Size	3/8"	
Work Material	CFRP (Panel)	
Milling Speed	6,500 RPM	
Feed	60 IPM	
Depth of Cut	aa=.375" ar=.250"	
Coolant	Dry	
Machine	5-axis Machine	





DIA-MFC / List 2650

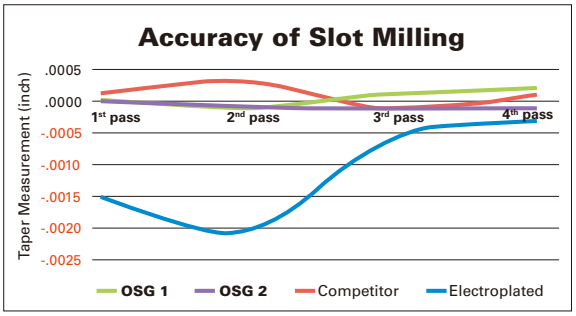
AERO-MFR

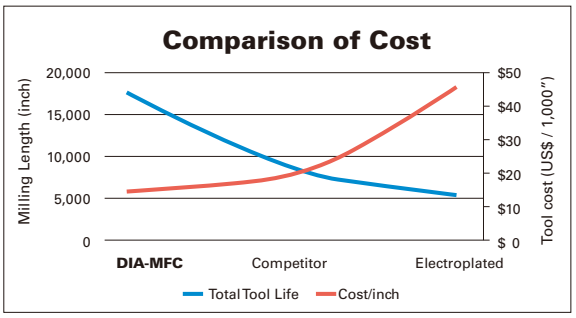
Excellent for tight tolerance and high precision applications

The DIA-MFC showed the best accuracy versus a competitor diamond coated finishing router as well as other electroplated products.

Tool	DIA-MFC (Special)	Competitor	Electroplated
Work Material	Carbon / Carbon Composite		
Size	5/16"		
Milling Method	Slotting		
Milling Speed	**2,700** RPM		**9,795** RPM
Feed	**50** IPM		
Depth of Cut	ap=.400"		
Coolant	Dry		

DIA-MFC showed 3.2 times longer tool life and 66% lower tool cost than a diamond electroplated router.



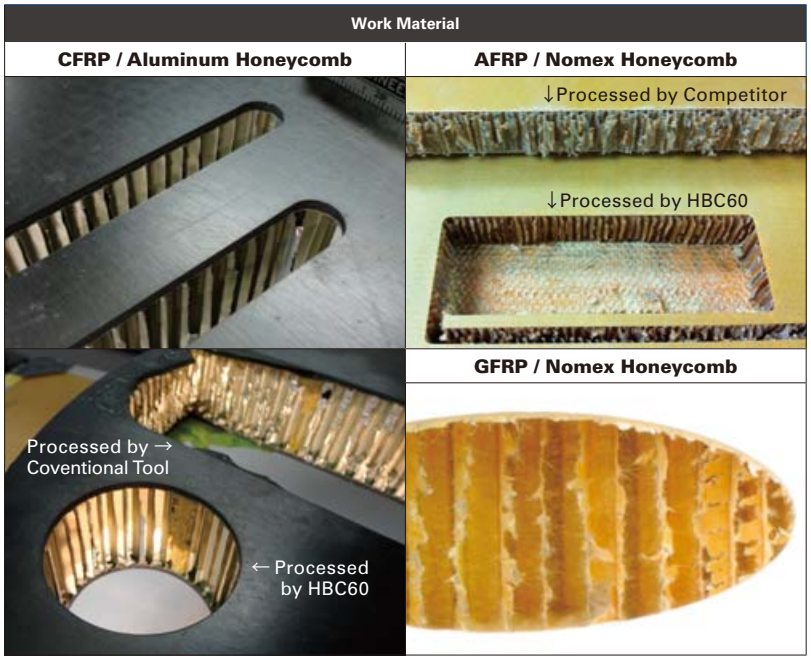


HBC60 / List 668

AERO-HBC60(Bright)

HBC60 vs. conventional tool / competitor

Surface processed by the HBC60 was much smoother than conventional tool / competitor.



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