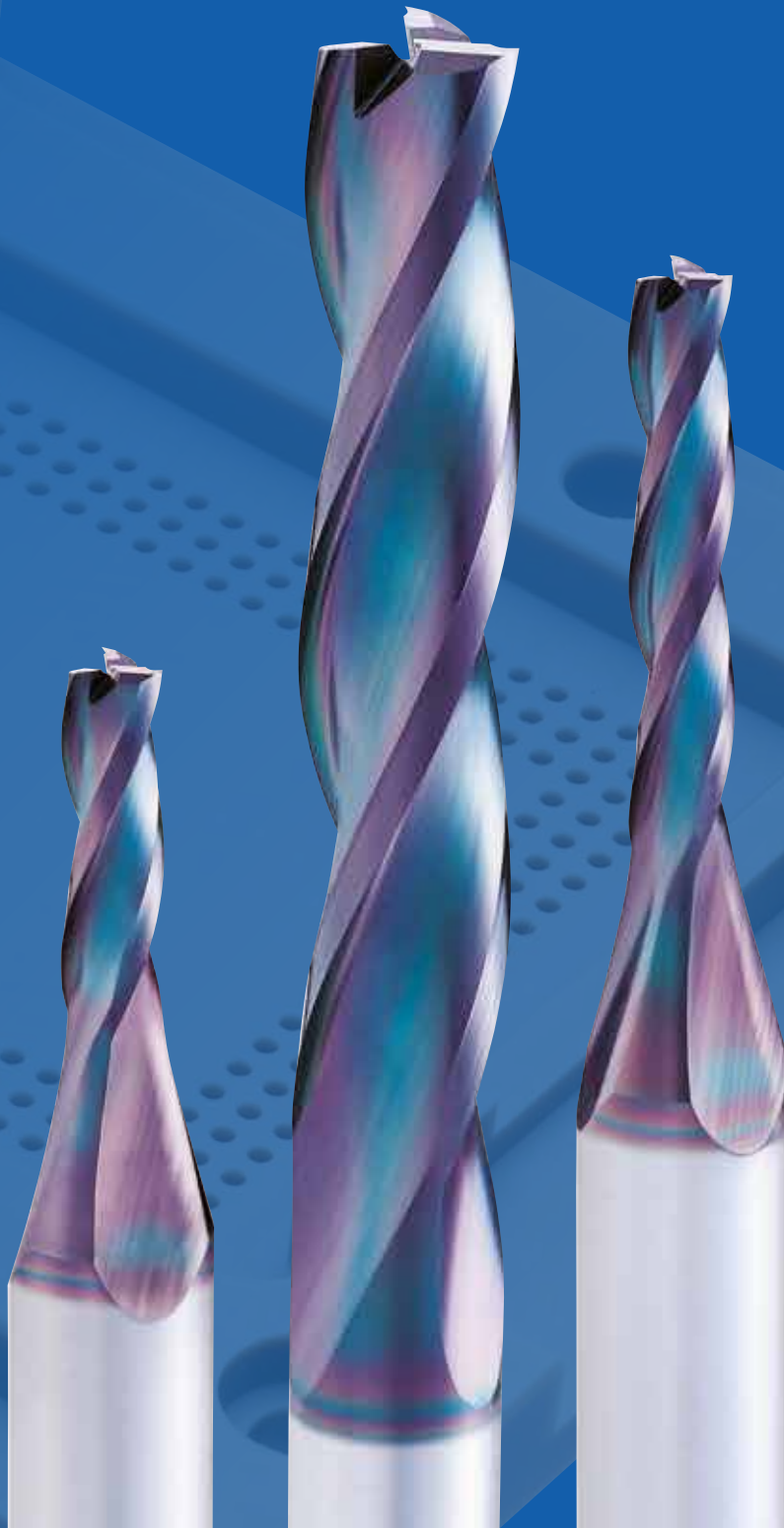




DLC coated carbide end mill for super engineering plastics

SEP-EL



KEY FEATURES & BENEFITS

SEP-EL

Suitable for micro features and strict precision requirement of resin applications

DLC-IGUSS Coating

- Thick DLC coating that suppresses wear on the cutting edge and provides excellent adhesion resistance.
- Achieves both high durability and good machining accuracy in a wide range of resins, including super engineering plastics that have both heat resistance and high mechanical strength.

3-flute specification*

- Achieves high-efficiency machining



*2-flute for outer dia. 0.5 mm

Cutting edge design that emphasizes on sharpness

- Suppresses heat generation and enables high-quality resin processing
- Sharp corner edge type for excellent cutting performance

Flute shape optimized for resin processing

- Low helix flute form suppresses burr generation

Excellent cutting edge diameter accuracy

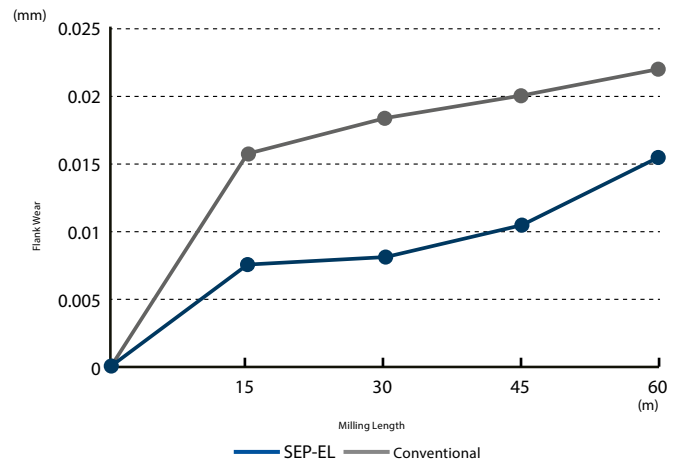
- Supports strict machining dimensional accuracy All sizes have a cutting edge diameter tolerance of 0.015 mm

Long tool life with DLC-IGUSS coating

Extension of tool life leads to waste reduction and contributes to resource conservation. In addition, longer tool life reduces power consumption by reducing tool change time.

DLC-IGUSS coating is used to enable long tool life.

Tool	SEP-EL Ø3x9
Work Material	PET-based Resin (Thermoplastic Resin)
Milling method	Side milling
Cutting Speed	100m/min (10.600 min ⁻¹)
Feed	1.590mm/min (0,05 mm/t)
Depth of Cut	ap = 2mm ae = 1,5mm
Coolant	Air Blow
Machine	Vertical Machining Center (BT30)



Tool specifications that combine cutting performance and chip evacuation capability

Sharp cutting edge specification ensures good machined surface without chattering.

Tool	SEP-EL Ø1x5
Work Material	PEEK (Thermoplastic Resin)
Milling method	Side milling
Cutting Speed	94m/min (30.000 min ⁻¹)
Feed	4.500mm/min (0,05 mm/t)
Depth of Cut	ap = 5mm ae = 0,2mm
Coolant	Air Blow
Machine	Vertical Machining Center (BT30)

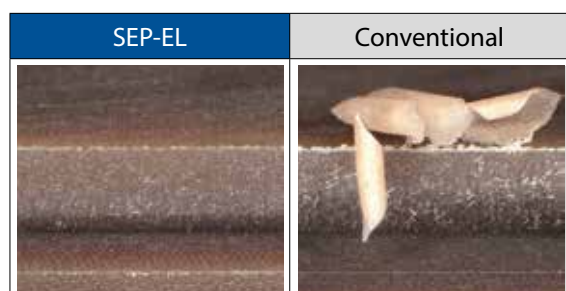
Milling Surface



Flute specification optimized for resin processing to reduce the occurrence of burrs.

Tool	SEP-EL Ø3x9
Work Material	PET-based Resin (Thermoplastic Resin)
Milling method	Side milling
Cutting Speed	100m/min (10.600 min ⁻¹)
Feed	1.590mm/min (0,05 mm/t)
Depth of Cut	ap = 2mm ae = 1.5mm
Coolant	Air Blow
Machine	Vertical Machining Center (BT30)

Condition of machined surface after milling 60 m

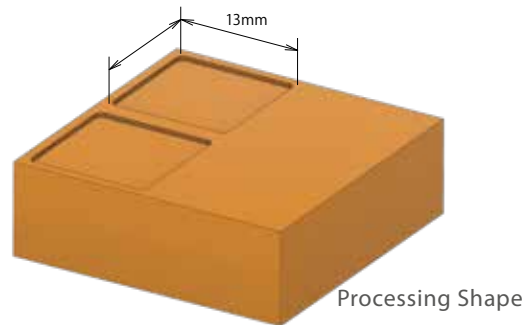


CUTTING DATA

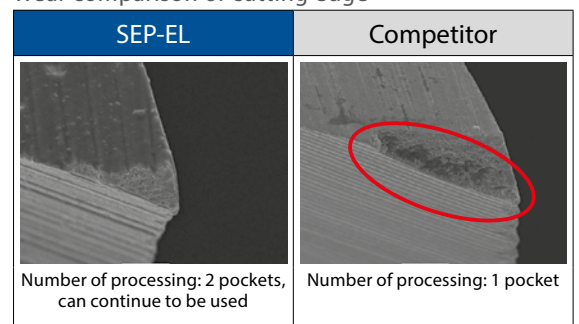
High Efficiency - Long Tool Life

High efficiency and long tool life in high heat-resistant thermoplastic resin processing

Tool	SEP-EL Ø3x9	Non-coated competitor Ø3 - 2 flutes
Work Material	Polyimide-based Resin (Thermoplastic Resin)	
Milling method	Pocket milling	
Cutting Speed	66m/min (7.000 min ⁻¹)	
Feed	735mm/min (0,035 mm/t)	490mm/min (0,035 mm/t)
Depth of Cut	ap = 0,6mm ae = 0,3mm	
Coolant	Air Blow	
Machine	Vertical Machining Center (HSK-32)	



Wear comparison of cutting edge



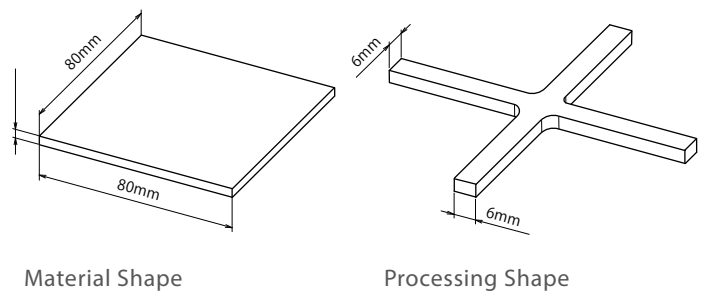
Processing efficiency is enhanced by the SEP-EL's 3-flute specification. Wear is suppressed and there is no change in the shape of the cutting edge, allowing for continuous use.

*Outer diameter 1mm or above

Long Tool Life

Achieves excellent durability in high-strength thermoplastic resin processing

Tool	SEP-EL Ø3x9
Work Material	Polyetherimide Resin (PEI) Glass Fiber 30wt% (Thermoplastic Resin)
Milling method	Side milling
Cutting Speed	57m/min (6.000 min ⁻¹)
Feed	500mm/min (0,028 mm/t)
Depth of Cut	ap = 1mm ae = 3mm
Coolant	Air Blow
Machine	Vertical Machining Center (BT-30)



Material Shape

Processing Shape

Cutting edge condition after machining 4 workpieces

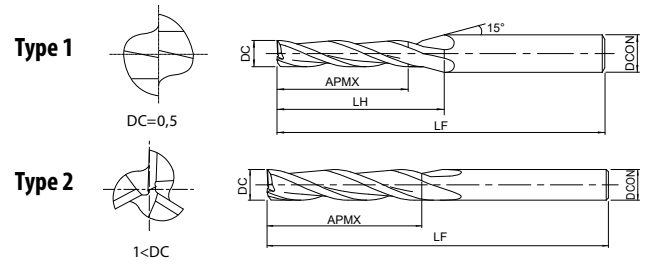


Conventionally, tools were changed after 2 workpieces. The SEP-EL, however, exhibited minimal wear and can continue to be used even after processing 4 workpieces.



SEP-EL

Milling | Solid carbide



- DLC coated carbide end mill for super engineering plastics
- 2-3 flutes, sharp corner edge
- 12 sizes



DC<6 0~-0,015
6=DC -0,005~-0,02

3XD Cutting length

EDP	DC	APMX	DCON	LF	LH	ZEFP	Type
8470005	0,5	1,5	4	45	8,7	2	1
8470010	1	3	4	45	9,4	3	1
8470020	2	6	4	45	11,2	3	1
8470030	3	9	6	55	16,9	3	1
8470040	4	12	6	55	18,1	3	1
8470060	6	18	6	60	-	3	2

5XD Cutting length

8471005	0,5	2,5	4	45	9,7	2	1
8471010	1	5	4	45	11,4	3	1
8471020	2	10	4	50	15,2	3	1
8471030	3	15	6	55	22,9	3	1
8471040	4	20	6	60	26,1	3	1
8471060	6	30	6	75	-	3	2

Milling | Solid carbide



CUTTING CONDITIONS

Milling | Solid carbide | Cutting conditions

SEP-EL

3xD cutting length

Slot Milling

Vc (m/min)	Thermoplastic Resin (Natural Grade)		Thermosetting Resin Thermoplastic Resin (Fiber Reinforced Grade)			
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)		
60 ~ 70			50 ~ 70			
DC X APMX						
0,5 X 1,5	38.200	1.530	31.800	1.270		
1 X 3	19.100	2.290	15.900	1.910		
2 X 6	9.500	1.430	8.000	1.200		
3 X 9	6.400	1.150	5.300	950		
4 X 12	5.600	1.340	4.800	1.010		
6 X 18	3.700	1.110	3.400	920		
Depth of cut	<table border="1"> <tr><td>ap</td></tr> <tr><td>1D</td></tr> </table>				ap	1D
ap						
1D						

The table above is for when using air-blow.

3xD cutting length

Side Milling

Vc (m/min)	Thermoplastic Resin (Natural Grade)		Thermosetting Resin Thermoplastic Resin (Fiber Reinforced Grade)					
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)				
100 ~ 150			60 ~ 70					
DC X APMX								
0,5 X 1,5	40.000	2.400	38.200	2.290				
1 X 3	31.800	3.820	19.100	2.290				
2 X 6	20.700	3.730	9.500	2.000				
3 X 9	14.900	3.580	7.400	2.220				
4 X 12	11.900	3.570	5.600	1.680				
6 X 18	8.000	2.880	3.700	1.330				
Depth of cut	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>3D</td><td>0,2D</td></tr> </table>				ap	ae	3D	0,2D
ap	ae							
3D	0,2D							

The table above is for when using air-blow.

3xD cutting length

Plunging

Vc (m/min)	Thermoplastic Resin (Natural Grade)		Thermosetting Resin Thermoplastic Resin (Fiber Reinforced Grade)			
	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)		
50 ~ 70			50 ~ 70			
DC X APMX						
0,5 X 1,5	31.800	320	31.800	320		
1 X 3	15.900	480	15.900	480		
2 X 6	9.500	360	8.000	300		
3 X 9	6.400	290	5.300	240		
4 X 12	5.600	340	4.800	250		
6 X 18	3.700	280	3.400	230		
Depth of cut	<table border="1"> <tr><td>ap</td></tr> <tr><td>1D</td></tr> </table>				ap	1D
ap						
1D						

The table above is for when using air-blow.

1. Use a rigid and precise machine and holder.
2. Please adjust the speed and feed when the cutting depth is large or when machines with low rigidity are used. The feed rate can be increased if the shape of the workpiece and method of fixation are rigid.
3. Reduce speed and feed as well as depth of cut when high precision is required.
4. When the chips wind around the end mill, reduce the speed and feed.
5. Please remove cutting chips to prevent them from getting caught or entangled.
6. For higher quality processing, the use of a water-soluble cutting fluid is recommended (excluding nylon and Bakelite).
7. Please step feed when processing by plunging.


CUTTING CONDITIONS

Milling | Solid carbide | Cutting conditions

SEP-EL

5xD cutting length


Side Milling

	Thermoplastic Resin (Natural Grade)		Thermosetting Resin Thermoplastic Resin (Fiber Reinforced Grade)									
	Vc (m/min)	50 ~ 100		50 ~ 70								
DC X APMX	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)								
0,5 X 2,5	31.800	1.910	31.800	1.910								
1 X 5	19.100	2.290	19.100	2.290								
2 X 10	12.700	1.910	9.500	2.000								
3 X 15	9.500	1.710	7.400	2.220								
4 X 20	8.000	1.920	5.600	1.680								
6 X 30	5.300	1.270	3.700	1.330								
Depth of cut	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>5D</td><td>0,05D</td></tr> </table>		ap	ae	5D	0,05D	<table border="1"> <tr><td>ap</td><td>ae</td></tr> <tr><td>5D</td><td>0,1D</td></tr> </table>		ap	ae	5D	0,1D
ap	ae											
5D	0,05D											
ap	ae											
5D	0,1D											

The table above is for when using air-blow.

5xD cutting length

Plunging

	Thermoplastic Resin (Natural Grade)		Thermosetting Resin Thermoplastic Resin (Fiber Reinforced Grade)			
	Vc (m/min)	50 ~ 70		50 ~ 70		
DC X APMX	S (min ⁻¹)	F (mm/min)	S (min ⁻¹)	F (mm/min)		
0,5 X 2,5	31.800	320	31.800	320		
1 X 5	15.900	480	15.900	480		
2 X 10	9.500	360	8.000	300		
3 X 15	6.400	290	5.300	240		
4 X 20	5.600	340	4.800	250		
6 X 30	3.700	280	3.400	230		
Depth of cut	<table border="1"> <tr><td>ap</td></tr> <tr><td>1D</td></tr> </table>				ap	1D
ap						
1D						

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shaping your dreams

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