

# *A-Star Endmill*

## Endmill series for Aluminum machining

- A wide selection of tools provided for various machining processes
- Advanced flute design and cutting edge technology applied



## Endmill Series for Aluminum Machining

# A-Star Endmill

Aluminum, which is a non-ferrous metal, is softer and easier to cut, compared to other metals. However, a failure to properly evacuate chips that melted at high speeds can cause severe problems. A-Star Endmill features state-of-the-art sharp cutting edges and mirror-like flute surface to reduce cutting force and facilitate smooth chip flow.

**APFE** effectively evacuates chips even at high feeds using U-shaped flutes. The buffed flute surface inhibits build-up edges caused by molten chips. In addition, double relief angles improve productivity by enhancing edge rigidity while the sharp edges enable perfect cutting performance even in finishing. APFE also offers a variety of shapes including balls and flat type to expand the range of applicable workpieces.

**AFE** is a flat endmill that is more economical than other products. The sharp cutting edges and mirror-like flutes not only enable efficient machining but also meet the customer needs, supported by the wide line up.

**RPAE** is a roughing endmill optimized for rough milling applications. The blade design of wave form breaks chips down into smaller pieces and lowers cutting force. This helps to maximize productivity with reduced loads over equipment.

With this wide selection of tools ideally suited for many different machining types, A-Star Endmill Endmill is the solution you've looked for in aluminum machining.

» **Sharp cutting edges optimized for aluminum**

- Lower cutting force
- Improved surface finish

» **Mirror-like flute surface**

- Maximized chip flow
- Reduced chip welding

» **A wide selection of line up**

- Various product shapes including balls and flat type
- Ideal for high feeds, roughing, medium cutting, and finishing



## Features

### APFE

- Streamlined blade design optimized for rough, medium to finish cutting
- Extended tool life due to efficient chip evacuation

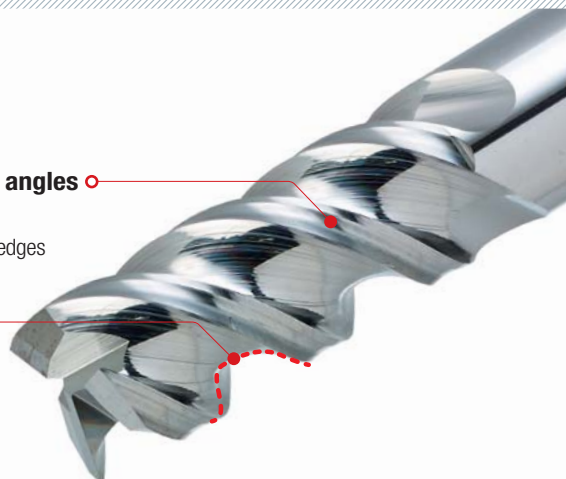


#### Sharp cutting edges and double relief angles

- Reduced cutting force
- Inhibited tool breakage due to reinforced cutting edges

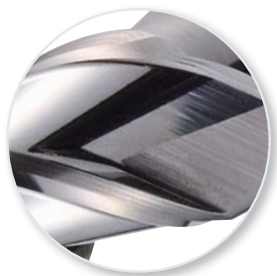
#### U-shaped flutes with mirror-like finishing

- Efficient chip evacuation through wide chip pockets
- Inhibited build-up edges due to mirror-like finishing



### AFE

- More economical compared to other products
- Reduced tool breakage and increased machinability

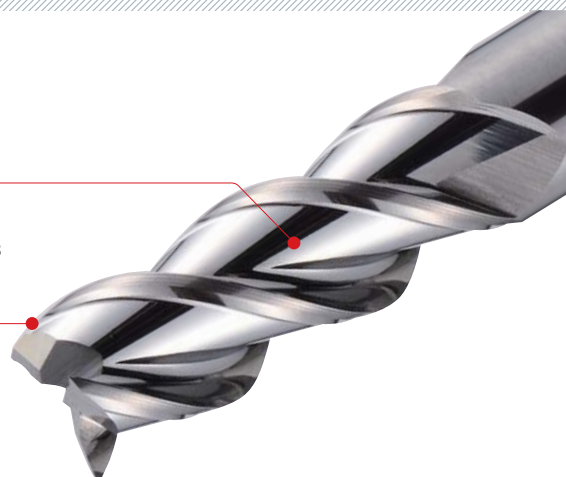


#### Mirror-like flute surface

- Inhibited chip welding
- Reduced cutting force due to less build-up edges

#### Sharp cutting edges

- Long tool life and improved cost efficiency
- Reduced cutting force



### RPAE

- Specially designed cutting edges for roughing
- Improved surface finish due to sharp edges

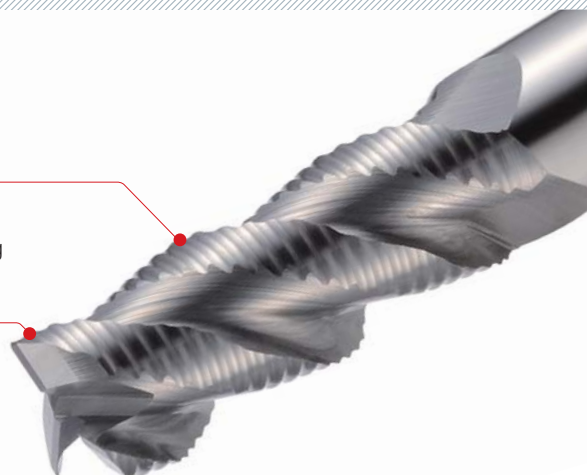


#### Blade design of wave form

- Lower cutting force
- Efficient chip evacuation through chip breaking

#### Sharp cutting edges

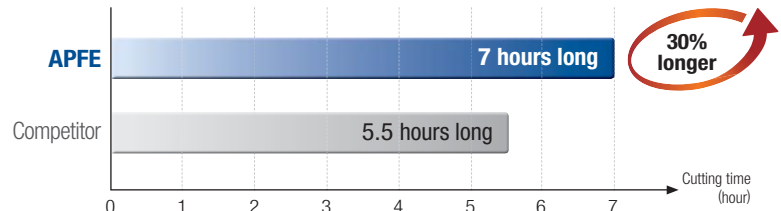
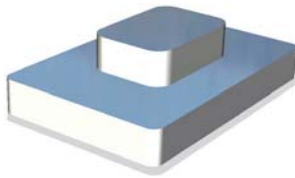
- Lower cutting force
- Reduced loads over equipment.



## Application examples

### A7075

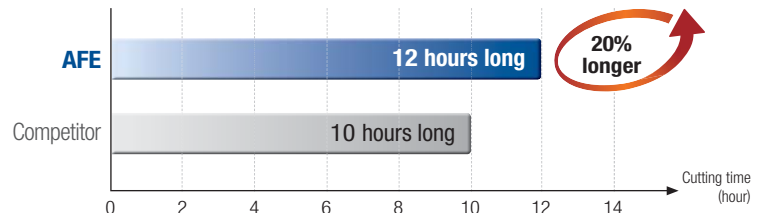
<b>Workpiece Use</b>	Jig
<b>Cutting condition</b>	$vc$ (m/min) = 200, $fz$ (mm/t) = 0.05, $ap$ (mm) = 8, $ae$ (mm) = 2, wet
<b>Tool</b>	APFE3080-060



» More than 30% longer cutting time compared to the competitor

### AI60

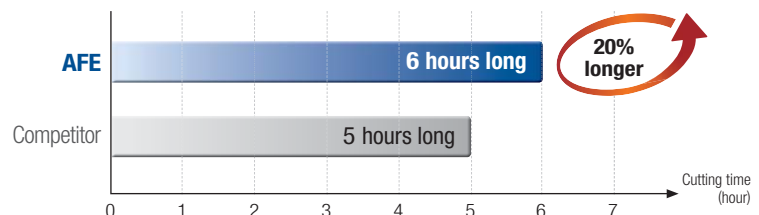
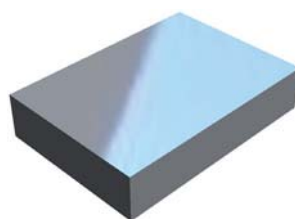
<b>Workpiece Use</b>	Inside milling of smart phones
<b>Cutting condition</b>	$vc$ (m/min) = 65, $fz$ (mm/t) = 0.02, $ap$ (mm) = 1, $ae$ (mm) = 1, wet
<b>Tool</b>	AFE3010-050-V3S6



» More than 20% longer cutting time compared to the competitor

### AI60

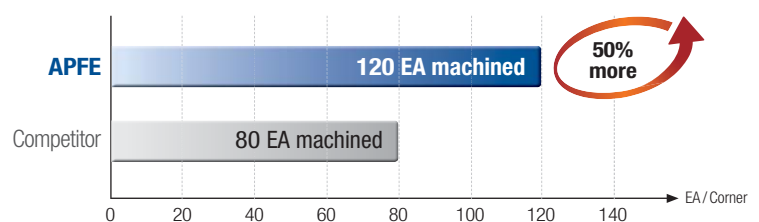
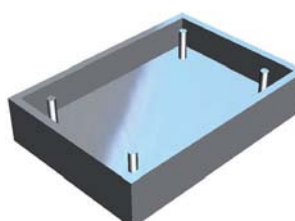
<b>Workpiece Use</b>	Outside milling of smart phones
<b>Cutting condition</b>	$vc$ (m/min) = 170, $fz$ (mm/t) = 0.04, $ap$ (mm) = 10, $ae$ (mm) = 1, wet
<b>Tool</b>	AFE3060-060-V17S6



» More than 20% longer cutting time compared to the competitor

### AI70

<b>Workpiece Use</b>	Roughing aluminum rectangular tubes
<b>Cutting condition</b>	$vc$ (m/min) = 330, $fz$ (mm/t) = 0.05, $ap$ (mm) = 15, $ae$ (mm) = 1.5, wet
<b>Tool</b>	RPAE3100-080

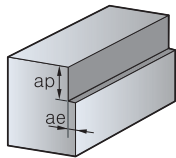


» More than 50% cutting than competitor

## Recommended cutting conditions\_ APFE/AFE (Flat)

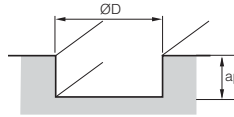
Workpiece Conditions	Shouldering				Slotting			
	Aluminum alloy (A7075)		Aluminum alloy mold (AC4B)		Aluminum alloy (A7075)		Aluminum alloy mold (AC4B)	
Diameter( $\phi$ )	RPM $n$ ( $\text{min}^{-1}$ )	Feed $vf$ (mm/min)	RPM $n$ ( $\text{min}^{-1}$ )	Feed $vf$ (mm/min)	RPM $n$ ( $\text{min}^{-1}$ )	Feed $vf$ (mm/min)	RPM $n$ ( $\text{min}^{-1}$ )	Feed $vf$ (mm/min)
1	40,000	480	40,000	368	40,000	368	40,000	280
2	40,000	880	38,000	680	38,000	680	32,000	440
3	32,000	1,120	25,000	760	25,000	760	21,000	480
4	24,000	1,200	19,000	800	19,000	800	13,000	520
5	19,000	1,280	15,000	880	15,000	800	13,000	560
6	16,000	1,520	13,000	960	13,000	880	11,000	600
8	12,000	1,520	9,500	960	9,500	960	8,000	640
10	9,500	1,520	7,600	960	7,600	960	6,400	640
12	8,000	1,520	6,400	960	6,400	960	5,300	640
16	6,000	1,520	4,800	960	4,800	800	4,000	576
20	4,800	1,200	3,800	800	3,800	776	3,200	528

<Application tip>



### Shouldering depth (ap)

- $ae: \leq 0.2D$  ( $D < 3$ )  
 $\leq 0.5D$  ( $D \geq 3$ )
- $ap: \leq 2.0D$
- Workpiece should be clamped rigidly.  
In case of vibrations, reduce RPM and feed rate by the same ratio.



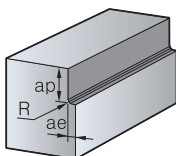
### Slotting depth (ap)

- $ap: \leq D$  (Maximum: 12mm)
- Workpiece should be clamped rigidly.  
In case of vibrations, reduce RPM and feed rate by the same ratio.

## Recommended cutting conditions\_ RPAE/APRE (Roughing)

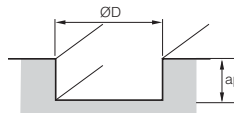
Workpiece Conditions	Shouldering				Slotting			
	Aluminum alloy (A7075)		Aluminum alloy mold (AC4B)		Aluminum alloy (A7075)		Aluminum alloy mold (AC4B)	
Diameter( $\phi$ )	RPM $n$ ( $\text{min}^{-1}$ )	Feed $vf$ (mm/min)	RPM $n$ ( $\text{min}^{-1}$ )	Feed $vf$ (mm/min)	RPM $n$ ( $\text{min}^{-1}$ )	Feed $vf$ (mm/min)	RPM $n$ ( $\text{min}^{-1}$ )	Feed $vf$ (mm/min)
4	20,000	8,000	16,000	6,400	15,000	5,000	12,000	4,000
5	16,000	6,500	12,800	5,200	12,000	4,000	9,600	3,200
6	13,500	6,000	10,800	4,800	10,500	3,800	8,400	3,100
8	10,500	4,700	8,400	3,800	8,000	3,000	6,400	2,400
10	8,500	3,800	6,800	3,100	6,500	2,500	5,200	2,000
12	6,800	3,050	5,500	2,500	5,250	2,000	4,200	1,600
14	5,800	2,600	4,700	2,100	4,500	1,700	3,600	1,400
16	5,200	2,350	4,200	1,900	4,000	1,500	3,200	1,200
18	4,700	2,100	3,800	1,700	3,550	1,300	2,900	1,100
20	4,200	1,900	3,400	1,600	3,200	1,200	2,600	1,000
25	3,400	1,500	2,800	1,200	2,550	1,000	2,100	800

<Application tip>



### Shouldering depth (ap)

- $ap: \leq 1.5D$
- $ae: \leq 0.5D$
- Workpiece should be clamped rigidly.  
In case of vibrations, reduce RPM and feed rate by the same ratio.



### Slotting depth (ap)

- $ap: \leq 1.5D$
- Workpiece should be clamped rigidly.  
In case of vibrations, reduce RPM and feed rate by the same ratio.



# APFE2000/3000

## 2~3 flutes flat Endmill



DC	Tolerance
Ø1 ~ Ø5	0.000 ~ -0.020
Ø6 ~ Ø8	0.000 ~ -0.025
Ø10 ~ Ø20	0.000 ~ -0.030

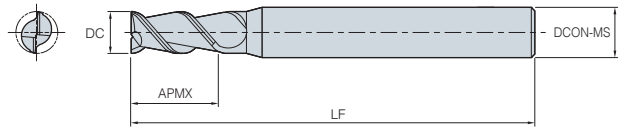


Fig. 1

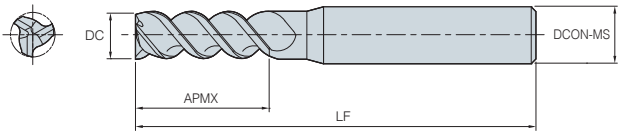


Fig. 2

(mm)

	Designation	DC	DCON-MS	APMX	LF	Fig.
<b>APFE</b> 	2020-050-S4	2	4	6	50	1
	2025-050	2.5	6	8	50	1
	2030-050	3	6	9	50	1
	2040-050	4	6	12	50	1
	2050-050	5	6	15	50	1
	2060-050	6	6	18	50	1
	2080-060	8	8	20	60	1
	2100-075	10	10	30	75	1
	2120-075	12	12	32	75	1
	2160-100	16	16	45	100	1
	2200-100	20	20	45	100	1
<b>APFE</b> 	3020-050-S4	2	4	6	50	2
	3025-050	2.5	6	8	50	2
	3030-050	3	6	9	50	2
	3040-050	4	6	12	50	2
	3050-050	5	6	15	50	2
	3060-050	6	6	18	50	2
	3080-060	8	8	20	60	2
	3100-075	10	10	30	75	2
	3120-075	12	12	32	75	2
	3160-100	16	16	45	100	2
	3200-100	20	20	45	100	2

# APFE2000/3000

## 2~3 flutes flat Endmill



DC	Tolerance
Ø1 ~ Ø5	0.000 ~ -0.020
Ø6 ~ Ø8	0.000 ~ -0.025
Ø10 ~ Ø20	0.000 ~ -0.030

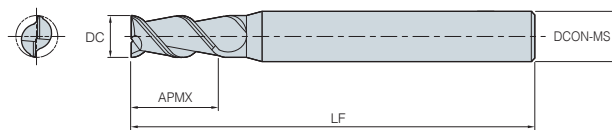


Fig. 1

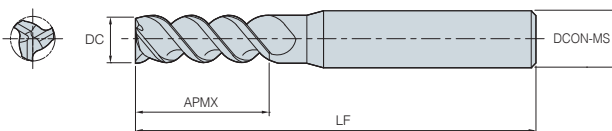


Fig. 2

(mm)

	Designation	DC	DCON-MS	APMX	LF	Fig.
<b>APFE</b> 	2030-060	3	6	11	60	1
	2040-060	4	6	14	60	1
	2050-060	5	6	17	60	1
	2060-065	6	6	22	65	1
	2080-065	8	8	25	65	1
	2100-080	10	10	37	80	1
	2120-080	12	12	40	80	1
	2160-110	16	16	55	110	1
	2200-125	20	20	60	125	1
<b>APFE</b> 	3030-060	3	6	11	60	2
	3040-060	4	6	14	60	2
	3050-060	5	6	17	60	2
	3060-065	6	6	22	65	2
	3080-065	8	8	25	65	2
	3100-080	10	10	37	80	2
	3120-080	12	12	40	80	2
	3160-110	16	16	55	110	2
	3200-125	20	20	60	125	2

# APLFE2000/3000

## 2~3 flutes long flat Endmill



DC	Tolerance
Ø1 ~ Ø5	0.000 ~ -0.020
Ø6 ~ Ø8	0.000 ~ -0.025
Ø10 ~ Ø20	0.000 ~ -0.030

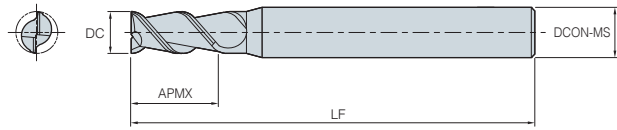


Fig. 1

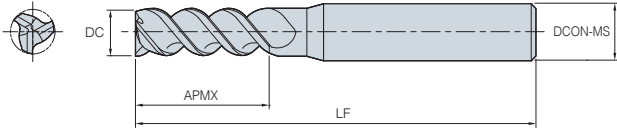


Fig. 2

(mm)

	Designation	DC	DCON-MS	APMX	LF	Fig.
<b>APLFE</b> 	2030-060	3	6	12	60	1
	2040-060	4	6	16	60	1
	2050-060	5	6	20	60	1
	2060-075	6	6	25	75	1
	2080-075	8	8	32	75	1
	2100-100	10	10	45	100	1
	2120-100	12	12	45	100	1
	2160-150	16	16	65	150	1
	2200-150	20	20	75	150	1
<b>APLFE</b> 	3030-060	3	6	12	60	2
	3040-060	4	6	16	60	2
	3050-060	5	6	20	60	2
	3060-075	6	6	25	75	2
	3080-075	8	8	32	75	2
	3100-100	10	10	45	100	2
	3120-100	12	12	45	100	2
	3160-150	16	16	65	150	2
	3200-150	20	20	75	150	2

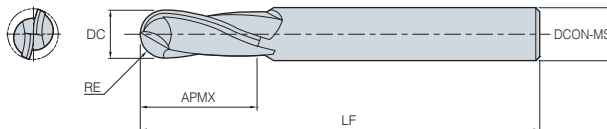


# APBE2000

## 2 flutes ball Endmill



DC	Tolerance
Ø1 ~ Ø5	0.000 - -0.020
Ø6 ~ Ø8	0.000 - -0.025
Ø10 ~ Ø20	0.000 - -0.030



(mm)

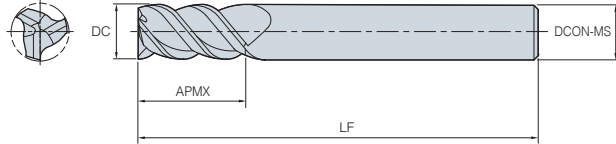
Designation	DC	DCON-MS	APMX	LF	RE
<b>APBE</b>					
2010-050	1	4	2	50	0.5
2015-050	1.5	4	3	50	0.75
2020-050	2	4	4	50	1
2025-050	2.5	4	5	50	1.25
2030-050	3	4	6	50	1.5
2035-050	3.5	4	7	50	1.75
2040-050	4	4	8	50	2
2045-050	4.5	6	9	50	2.25
2050-050	5	6	10	50	2.5
2055-050	5.5	6	11	50	2.75
2060-050	6	6	12	50	3
2080-060	8	8	16	60	4
2100-075	10	10	20	75	5
2120-075	12	12	24	75	6

# AFE3000


## 3 flutes short flat Endmill



DC	Tolerance
Ø1 ~ Ø12	0.000 ~ -0.020
Ø16 ~ Ø20	0.000 ~ -0.030



(mm)

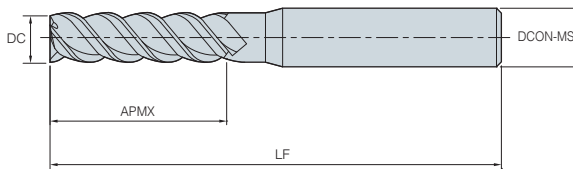
Designation	DC	DCON-MS	APMX	LF
<b>AFE</b>				
 3010-040-V2S6	1	6	2	40
3010-040-V2.5S6	1	6	2.5	40
3015-040-V3S6	1.5	6	3	40
3020-040-V3S6	2	6	3	40
3030-045-V4S6	3	6	4	45
3030-045-V8S6	3	6	8	45
3040-045-V5S6	4	6	5	45
3040-045-V8S6	4	6	8	45
3040-045-V11S6	4	6	11	45
3050-045-V6S6	5	6	6	45
3060-050-V7S6	6	6	7	50
3060-050-V13S6	6	6	13	50
3080-060-V9S8	8	8	9	60
3080-060-V19S8	8	8	19	60
3100-065-V11S10	10	10	11	65
3100-065-V22S10	10	10	22	65
3120-070-V13S12	12	12	13	70
3120-070-V26S12	12	12	26	70
3160-090-V18S16	16	16	18	90
3160-090-V32S16	16	16	32	90
3200-090-V22S20	20	20	22	90
3200-090-V38S20	20	20	38	90

# AFE3000


## 3 flutes flat Endmill



DC	Tolerance
Ø1 ~ Ø12	0.000 ~ -0.020
Ø16 ~ Ø20	0.000 ~ -0.030



(mm)

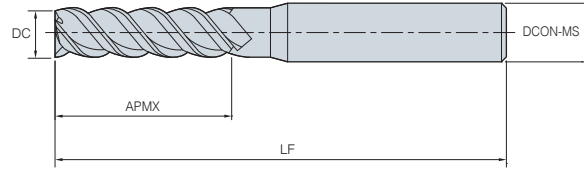
Designation	DC	DCON-MS	APMX	LF
<b>AFE</b> 3010-050-V3S6	1	6	3	50
 3015-050-V5S6	1.5	6	5	50
3020-050-V6S6	2	6	6	50
3030-055-V11S6	3	6	11	55
3040-055-V13S6	4	6	13	55
3050-055-V17S6	5	6	17	55
3060-060-V17S6	6	6	17	60
3080-070-V22S8	8	8	22	70
3100-075-V27S10	10	10	27	75
3120-080-V32S12	12	12	32	80
3160-100-V42S16	16	16	42	100
3200-100-V48S20	20	20	48	100

# AFE3000

## 3 flutes long flat Endmill



DC	Tolerance
Ø1 ~ Ø12	0.000 ~ -0.020
Ø16 ~ Ø20	0.000 ~ -0.030



(mm)

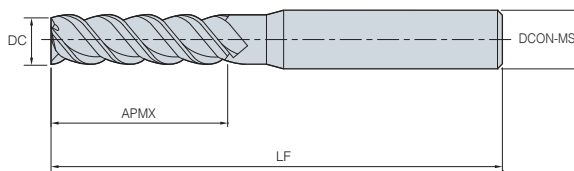
	Designation	DC	DCON-MS	APMX	LF
AFE 3	3010-060-V4S6	1	6	4	60
	3010-060-V6S6	1	6	6	60
	3015-060-V6S6	1.5	6	6	60
	3015-060-V8S6	1.5	6	8	60
	3015-060-V10S6	1.5	6	10	60
	3020-060-V8S6	2	6	8	60
	3020-060-V10S6	2	6	10	60
	3020-060-V12S6	2	6	12	60
	3030-065-V15S6	3	6	15	65
	3030-070-V20S6	3	6	20	70
	3030-075-V25S6	3	6	25	75
	3030-080-V30S6	3	6	30	80
	3040-065-V16S6	4	6	16	65
	3040-070-V20S6	4	6	20	70
	3040-075-V26S6	4	6	26	75
	3040-080-V30S6	4	6	30	80
	3060-060-V22S6	6	6	22	60
	3060-070-V25S6	6	6	25	70
	3060-075-V30S6	6	6	30	75
	3060-080-V35S6	6	6	35	80
	3060-090-V42S6	6	6	42	90
	3060-100-V50S6	6	6	50	100
	3080-080-V28S8	8	8	28	80
	3080-080-V30S8	8	8	30	80
	3080-085-V35S8	8	8	35	85
	3080-090-V40S8	8	8	40	90
	3080-095-V45S8	8	8	45	95
	3080-100-V50S8	8	8	50	100
	3080-105-V55S8	8	8	55	105
	3080-110-V65S8	8	8	65	110
	3100-090-V32S10	10	10	32	90
	3100-090-V35S10	10	10	35	90
	3100-090-V40S10	10	10	40	90
3100-100-V45S10	10	10	45	100	
3100-100-V50S10	10	10	50	100	

# AFE3000

## 3 flutes long flat Endmill



DC	Tolerance
Ø1 ~ Ø12	0.000 ~ -0.020
Ø16 ~ Ø20	0.000 ~ -0.030



(mm)

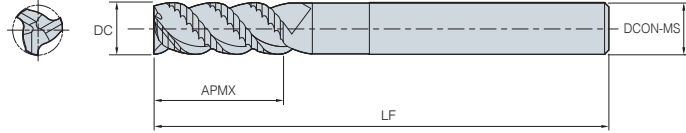
Designation	DC	DCON-MS	APMX	LF
<b>AFE</b>				
3100-110-V55S10	10	10	55	110
3100-110-V60S10	10	10	60	110
3100-120-V65S10	10	10	65	120
3120-095-V40S12	12	12	40	95
3120-100-V45S12	12	12	45	100
3120-100-V50S12	12	12	50	100
3120-110-V55S12	12	12	55	110
3120-110-V60S12	12	12	60	110
3120-120-V65S12	12	12	65	120
3120-120-V70S12	12	12	70	120
3120-135-V75S12	12	12	75	135
3160-105-V52S16	16	16	52	105
3160-110-V55S16	16	16	55	110
3160-130-V65S16	16	16	65	130
3160-150-V75S16	16	16	75	150
3160-160-V85S16	16	16	85	160
3160-180-V95S16	16	16	95	180
3160-190-V105S16	16	16	105	190
3160-200-V115S16	16	16	115	200
3200-110-V55S20	20	20	55	110
3200-130-V65S20	20	20	65	130
3200-150-V75S20	20	20	75	150
3200-160-V85S20	20	20	85	160
3200-180-V95S20	20	20	95	180
3200-190-V105S20	20	20	105	190
3200-200-V115S20	20	20	115	200
3200-220-V125S20	20	20	125	220

# APRE3000


## 3 flutes roughing Endmill



DC	Tolerance
Ø1 ~ Ø8	0.000 ~ -0.070
Ø8.5 ~ Ø25	0.000 ~ -0.010



(mm)

Designation	DC	DCON-MS	APMX	LF
<b>APRE</b>				
 3040-050	4	6	8	50
3050-050	5	6	13	50
3060-050	6	6	15	50
3065-060	6.5	8	16	60
3070-060	7	8	16	60
3075-060	7.5	8	20	60
3080-060	8	8	20	60
3085-075	8.5	10	20	75
3090-075	9	10	20	75
3095-075	9.5	10	22	75
3100-075	10	10	25	75
3110-075	11	12	30	75
3120-075	12	12	30	75
3130-075	13	14	30	75
3140-075	14	16	32	75
3150-075	15	16	32	75
3160-100	16	16	35	100
3170-100	17	20	35	100
3180-100	18	20	35	100
3200-100	20	20	45	100
3250-105	25	25	50	105

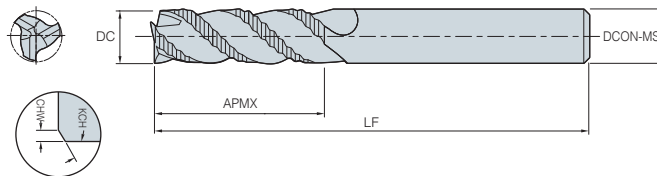


# RPAE3000


## 3 flutes wave roughing Endmill



DC	Tolerance
Ø6 ~ Ø10	0.000 ~ -0.058
Ø11 ~ Ø18	0.000 ~ -0.070
Ø20 ~ Ø25	0.000 ~ -0.084



(mm)

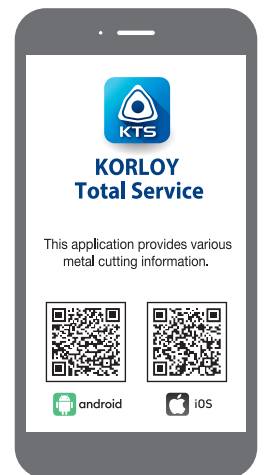
Designation	DC	DCON-MS	APMX	LF	KCH	CHW
<b>RPAE</b>						
 3060-063	6	6	18	63	45°	0.3
3070-063	7	8	23	63	45°	0.3
3080-063	8	8	23	63	45°	0.3
3090-080	9	10	30	80	45°	0.3
3100-080	10	10	30	80	45°	0.3
3110-080	11	12	32	80	45°	0.5
3120-080	12	12	32	80	45°	0.5
3140-080	14	14	32	80	45°	0.5
3160-105	16	16	48	105	45°	0.5
3180-105	18	18	48	105	45°	0.5
3200-105	20	20	50	105	45°	0.5
3250-105	25	25	50	105	45°	0.5

### ⚠ For the safe metalcutting

- Use safety supplies such as protective gloves to prevent possible injury while touching the edge of tools.
- Use safety glasses or safety cover to hedge possible dangers. Inappropriate usage or excessive cutting condition may lead tool's breakage or even the fragment's scattering.
- Clamp the workpiece tightly enough to prevent its movement while its machining.
- Properly manage the tool change phase because the inordinately used tool can be easily broken under the excessive cutting load or severe wear, and it may threat the operator's safety.
- Use safety cover because chips evacuated during cutting are hot and sharp and may cause burns and cuts. To remove chips safely, stop machining, put on protective gloves, and use a hook or other tools.
- Prepare for fire prevention measures as the use of the non-water soluble cutting oil may cause fire.
- Use safety cover and other safety supplies because the spare parts or the inserts can be pulled out due to centrifugal force while high speed machining.



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