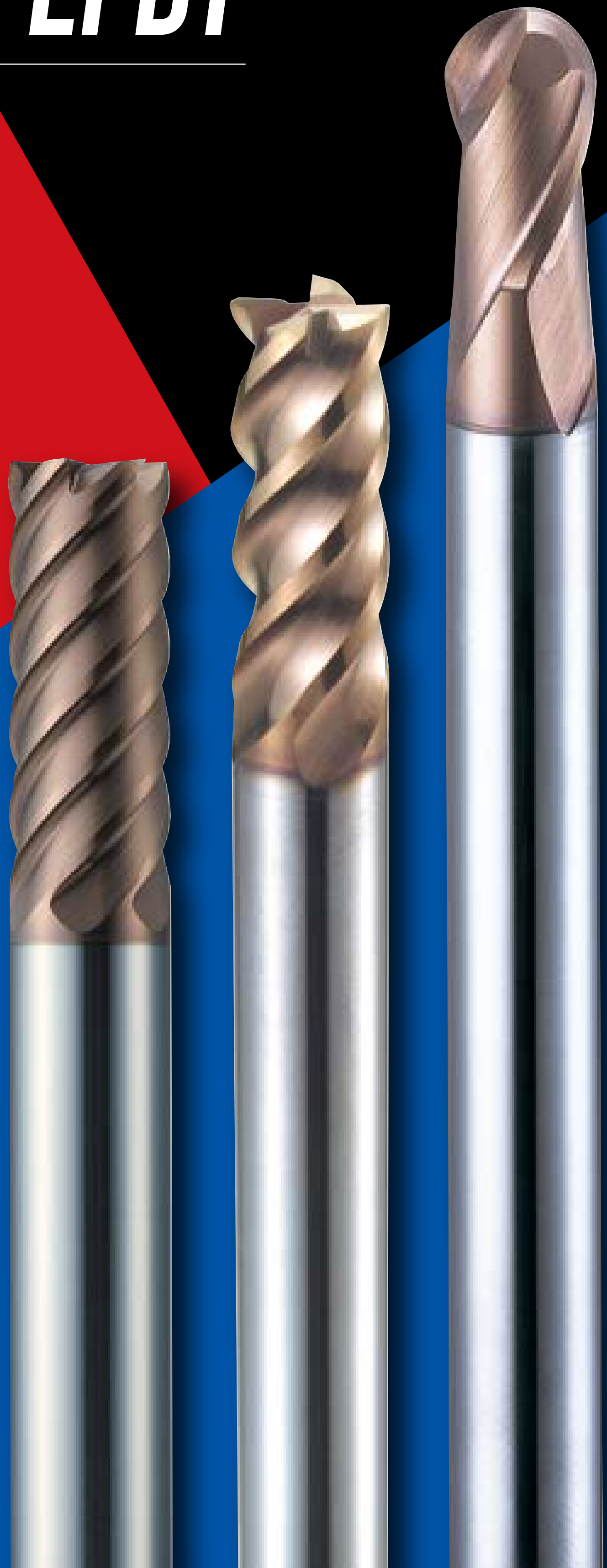
MOLDINO
The Edge To Innovation

EPP-TH
CEP(S/R/L)-TH, EPBT

Epoch TH series



MOLDINO Tool Engineering, Ltd.

New Product News | No.314E-14 | 2026-2

Features

New PVD Nano Technology

Epoch Super Coating TH

Features

01 Nano-composite coating

The new Nano-composite coating material offers extraordinary heat resistance and hardness due to its new composite layer consisting of Nano-crystal material.

02 Suitable for hardened steels

This coating shows extraordinary performance in high speed cutting and high efficient machining of hardened steels.

03 Long tool life, High accuracy machining

Ensures long tool-life and good performance in hardened steel materials (45～60HRC): SKD 11, SKD 61, SKH and SUS 420 type steels. also pre-hardened steels: CENA1, NAK80 etc.

04 Excellent for dry machining

Generates less heat during cutting and is therefore well suited to dry machining conditions.

In the Epoch TH series designed for machining hardened steel,

In the Epoch TH series designed for machining hardened steel,

High speed cutting of hardened steel is achievable.

High Efficient

The tool shows its performance in various materials especially from pre-hardened steels (35HRC) to hardened steels.

Tool-life is drastically improved.

Long Tool Life

TH Coating with excellent oxidation resistant properties has been utilized. Especially for high speed cutting, this tool gives longer tool-life than conventional coatings.

Efficient chip flow.

High Efficient

Power mill design gives efficient chip flow.

Highly accurate finish cutting is achievable.

High Accuracy

With the highly rigid design and thin coating layer highly accurate finish machining is achievable.

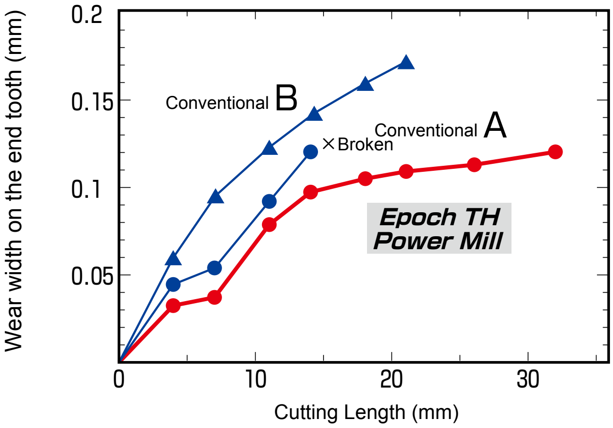
Further versatile Epoch TH series

Cutting Performance

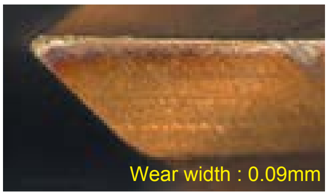
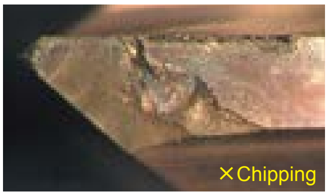
Cutting performance of EPP-TH

01 Slotting of Hardened Steel (50HRC)

Epoch TH Power Mill φ6

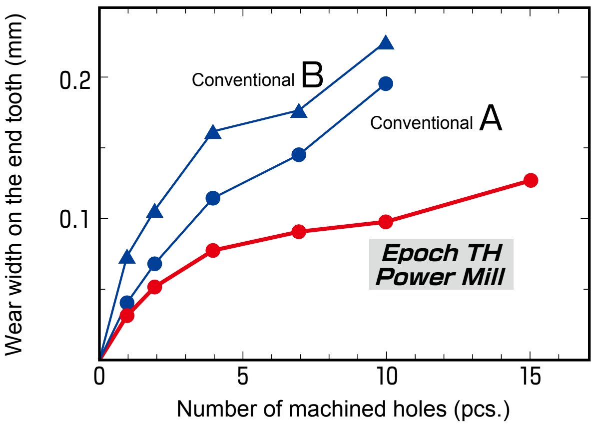


Tool	Epoch TH Power Mill φ6 EPP4060-TH
Work material	SKD61Ⓗ (50HRC)
Revolution	n=3,200min^{-1} (v_c=60m/min)
Feed rate	v_f=450mm/min (f_z=0.035mm/t)
Depth of cut	a_p1.2mm×a_e6mm
Cutting method	Straight slotting, OH=25mm, Air-blow
Machine	Vertical M/C BT40

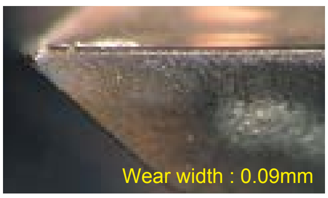
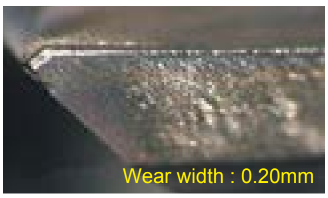
	Epoch TH Power Mill	Conventional A	Conventional B
Wear width (when cutting steel 14 m long)			

02 Pocket expanding of Hardened Steel (50HRC)

Epoch TH Power Mill φ8



Tool	Epoch TH Power Mill φ8 EPP4080-TH
Work material	SKD61Ⓗ (50HRC)
Revolution	n=2,000min^{-1} (v_c=50m/min)
Feed rate	v_f=330mm/min (f_z=0.041mm/t) Helical v_f=450mm/min (f_z=0.056mm/t) Side milling
Depth of cut	a_p5mm×a_e0.2mm Cutting depth 10mm
Cutting method	Pocket expanding dia. 40mm (Helical cutting→Side milling) OH=30mm, Air blow
Machine	Vertical M/C HSK-A63

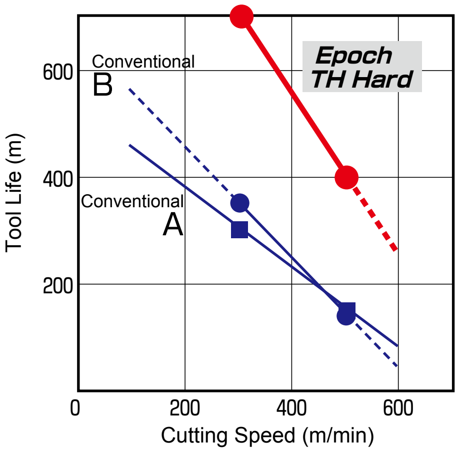
	Epoch TH Power Mill	Conventional A	Conventional B
Wear width (when machining 10 holes)			

Cutting Performance

Cutting performance of CEPR-TH

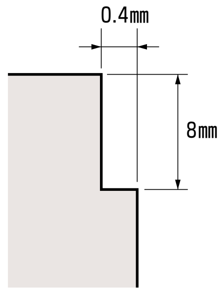
01 High Speed Cutting of Hardened Die Steel (52HRC)

Epoch TH Hard Regular φ8



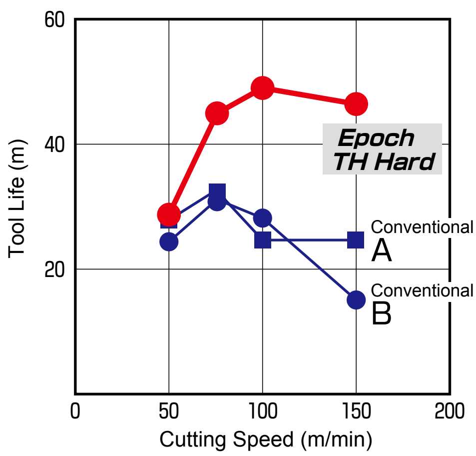
Twice the efficiency was achieved in tool-life and machining time over the competitor's tool.

Tool	Epoch TH Hard 6flutes φ8 CEPR6080-TH
Work material	SKD61（52HRC）
Cutting speed	v_c=300～500m/min
Feed rate	f_z=0.07mm/t
Depth of cut	a_p8mm×a_e0.4mm
Cutting method	Straight down cut, Air blow



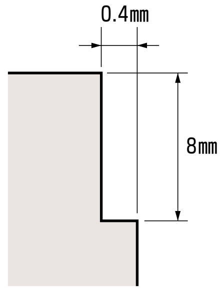
02 High Speed Cutting of Hardened Die Steel (62HRC)

Epoch TH Hard Regular φ8



Even using a low cutting speed of 100 to 150m/min a good performance was achieved

Tool	Epoch TH Hard 6flutes φ8 CEPR6080-TH
Work material	SKD11（62HRC）
Cutting speed	v_c=50～150m/min
Feed rate	f_z=0.05mm/t
Depth of cut	a_p8mm×a_e0.4mm
Cutting method	Straight down cut, Air blow



Field data

Company A

Tool	：CEPR6100-TH（φ10）
Work material	：W=ARK1（58HRC）
Revolution	：n=6,400min^{-1}
Cutting speed	：v_c=201m/min
Feed rate	：v_f=3,840mm/min
Feed per tooth	：f_z=0.1mm/t
Depth of cut	：a_p20mm×a_e0.2mm
Machine	：Vertical M/C、BT40
Coolant	：Oil mist

At a cutting speed of 200m/min smooth cutting was achievable to a cutting length 50m. A length of 50m was only achievable with a competitor's tool at a cutting speed of 125m/min.

Company B

Tool	：CEPR6100-TH（φ10）
Work material	：W=ARK1（58HRC）
Revolution	：n=2,000min^{-1}
Cutting speed	：v_c=62.8m/min
Feed rate	：v_f=150mm/min
Feed per tooth	：f_z=0.0125mm/t
Depth of cut	：a_p20mm×a_e0.02mm Zero-cut
Machine	：Vertical M/C、BT40
Coolant	：Oil mist

With the competitors end mill cutter marks could be seen in the component in an axial direction. With the Epoch TH Hard the surface finish was very smooth with no visible machining marks.

Cutting performance of EPBT

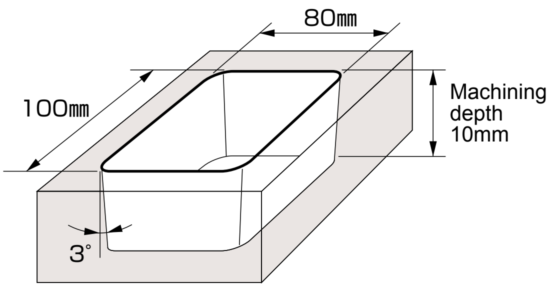
01 Direct Milling of Hardened Steels

Epoch TH Hard Ball RE5

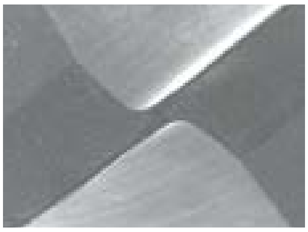
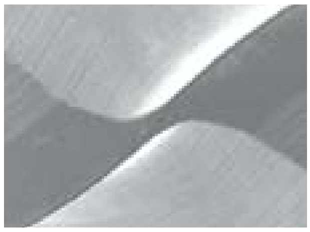
SKD61(H) 50HRC

Pocketing

n=5,700min^{-1} (v_c=180m/min)
v_f=2,050mm/min (f_z=0.18mm/t)
a_p×a_e=1×3mm
Dry (Air Blow) M/C, BT40



Milling time : 24 min

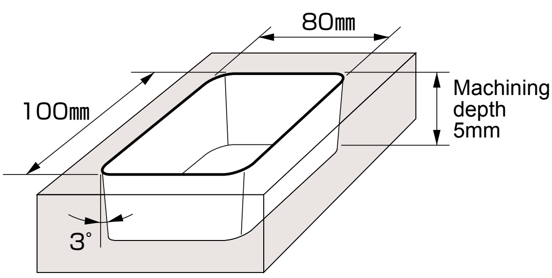
	Epoch TH Hard Ball	Conventional A TiAlN Coating
Center area		
	Flank wear 0.028mm	Flank wear 0.07mm
Boundary area		
	Flank wear 0.028mm	Chipping 0.23mm

Epoch TH Hard Ball RE5

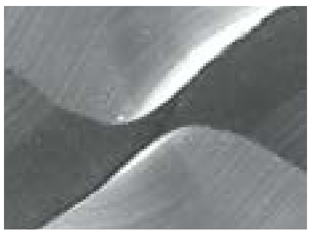
SKD11(H) 58HRC

Pocketing

n=4,500min^{-1} (v_c=140m/min)
v_f=1,080mm/min (f_z=0.12mm/t)
a_p×a_e=0.5×2mm
Dry (Air Blow) M/C, BT40

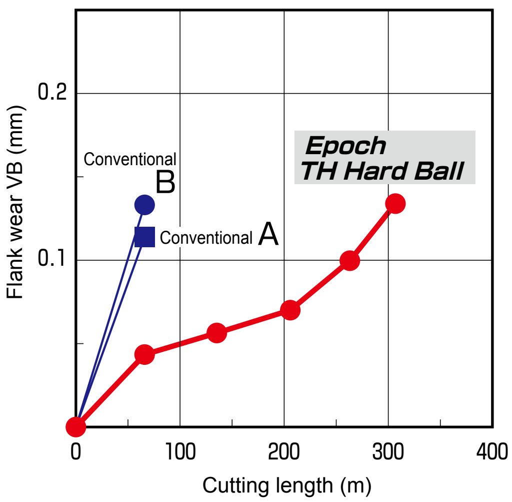


Milling time : 33 min

	Epoch TH Hard Ball	Conventional A TiAlN Coating
Center area		
	Flank wear 0.02mm	Flank wear 0.045mm
Boundary area		
	Flank wear 0.037mm	Chipping 0.25mm

Cutting Performance

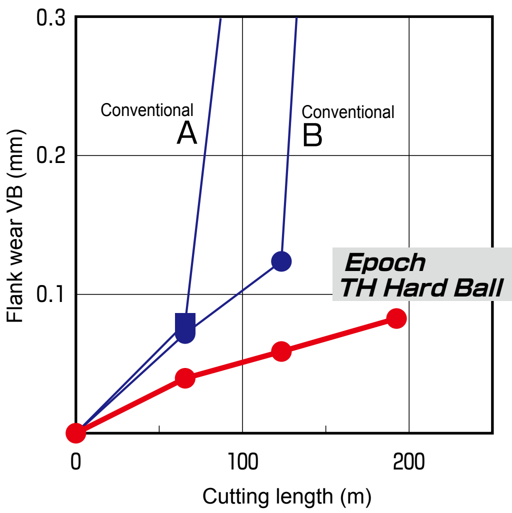
02 High Speed Finish Cutting of Hardened Die Steel (62HRC)



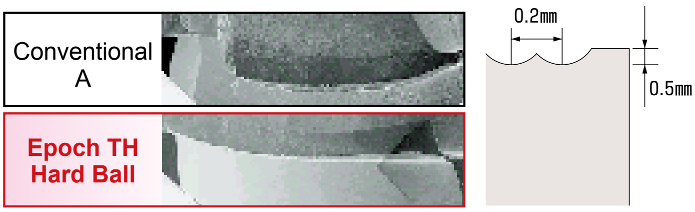
Direct milling of die steel over 60HRC is now possible, whereas it was previously difficult.

Tool	Epoch TH Hard Ball (2flutes) RE5 EPBT2100
Work material	SKD11（62HRC）
Revolution	n=8,000min^{-1}
Feed rate	v_f=1,600mm/min（f_z=0.1mm/t）
Depth of cut	a_p0.4mm×a_e0.2mm
Cutting method	Straight down cut, Air blow

03 High Speed Cutting of Hardened Die Steel (52HRC)



The tool-life has been prolonged 2 times over the conventional tool.



Tool	Epoch TH Hard Ball (2flutes) RE5 EPBT2100
Work material	HPM38（52HRC）
Revolution	n=8,000min^{-1}
Feed rate	v_f=1,600mm/min（f_z=0.1mm/t）
Depth of cut	a_p0.5mm×a_e0.2mm
Cutting method	Straight down cut, Air blow

Field data

Company C

Tool	: EPBT2100（RE5×ϕ10）
Work material	: W=YXR7（60HRC）
Revolution	: n=4,700min^{-1}
Feed rate	: v_f=1,200mm/min
Feed per tooth	: f_z=0.13mm/t
Depth of cut	: a_p0.3mm×a_e0.5mm
Machine	: High speed M/C
Coolant	: Oil mist

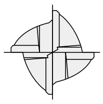
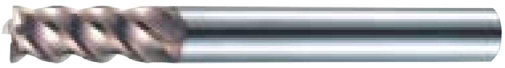
Takes only 25min for the machining of a pocket in an automotive part. There was almost no wear and the machining operation could be completed.

Company D

Tool	: EPBT2100（RE5×ϕ10）
Work material	: W=SKD11（58HRC）
Revolution	: n=13,000min^{-1}
Feed rate	: v_f=400mm/min
Feed per tooth	: f_z=0.015mm/t
Depth of cut	: a_p0.01mm×a_e0.03mm
Machine	: High speed M/C
Coolant	: Oil mist

The cutting process with the conventional end-mill was not stable and chipping was evident in the rake face. The TH hard ball is able to achieve stable cutting with much lower tool wear.

Epoch TH Power Mill - Regular

Tolerance on dia.:Right Table　　Tolerance on shank：h6

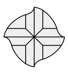
(mm)

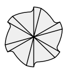
Tool dia.	Tolerance on dia.
3～6	$^{0}_{-0.015}$
7～20	$^{-0}_{-0.02}$

EPP4○○○○-TH

Item code	Stock	Size (mm)				No. of flutes
		Tool dia.	Flute length	Overall length	Shank dia.	
EPP4030-TH	●	3	8	60	6	4
EPP4040-TH	●	4	11	60	6	4
EPP4050-TH	●	5	13	60	6	4
EPP4060-TH	●	6	13	60	6	4
EPP4070-TH	●	7	16	70	8	4
EPP4080-TH	●	8	19	75	8	4
EPP4090-TH	●	9	19	80	10	4
EPP4100-TH	●	10	22	80	10	4
EPP4110-TH	●	11	22	100	12	4
EPP4120-TH	●	12	26	100	12	4
EPP4130-TH	●	13	26	100	12	4
EPP4140-TH	●	14	26	110	16	4
EPP4150-TH	●	15	26	110	16	4
EPP4160-TH	●	16	32	110	16	4
EPP4170-TH	●	17	32	110	16	4
EPP4180-TH	●	18	32	125	20	4
EPP4190-TH	●	19	32	125	20	4
EPP4200-TH	●	20	38	125	20	4

Epoch TH Hard - Short


4Flutes
ϕ5
or less


6Flutes
ϕ6

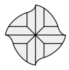
Tolerance on dia.：$^{0}_{-0.015}$　　Tolerance on shank：h6

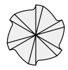
CEPS○○○○-TH

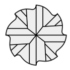
Item code	Stock	Size (mm)				No. of flutes
		Tool dia.	Flute length	Overall length	Shank dia.	
CEPS4010-TH	●	1	2	60	6	4
CEPS4015-TH	●	1.5	3	60	6	4
CEPS4020-TH	●	2	4	60	6	4
CEPS4025-TH	●	2.5	5	60	6	4
CEPS4030-TH	●	3	6	60	6	4
CEPS4040-TH	●	4	8	60	6	4
CEPS4050-TH	●	5	10	60	6	4
CEPS6060-TH	●	6	12	60	6	6

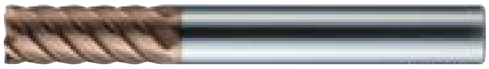
●：Stocked items.

Epoch TH Hard - Regular


4Flutes
ϕ5.5
or less


6Flutes
ϕ6～24


8Flutes
ϕ25
or more



Tolerance on dia.:Right Table　　Tolerance on shank：h6

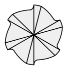
(mm)

Tool dia.	Tolerance on dia.
1～6	$^{0}_{-0.015}$
6.5～32	$^{-0}_{-0.02}$

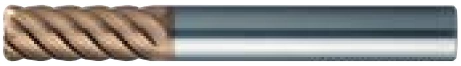
CEPR○○○○-TH

Item code	Stock	Size (mm)				No. of flutes
		Tool dia.	Flute length	Overall length	Shank dia.	
CEPR4010-TH	●	1	3.5	60	6	4
CEPR4015-TH	●	1.5	5	60	6	4
CEPR4020-TH	●	2	7	60	6	4
CEPR4025-TH	●	2.5	8	60	6	4
CEPR4030-TH	●	3	10	60	6	4
CEPR4035-TH	●	3.5	12	60	6	4
CEPR4040-TH	●	4	12	60	6	4
CEPR4045-TH	●	4.5	15	60	6	4
CEPR4050-TH	●	5	15	60	6	4
CEPR4055-TH	●	5.5	15	60	6	4
CEPR6060-TH	●	6	15	60	6	6
CEPR6065-TH	●	6.5	20	75	8	6
CEPR6070-TH	●	7	20	75	8	6
CEPR6075-TH	●	7.5	20	75	8	6
CEPR6080-TH	●	8	20	75	8	6
CEPR6085-TH	●	8.5	25	80	10	6
CEPR6090-TH	●	9	25	80	10	6
CEPR6095-TH	●	9.5	25	80	10	6
CEPR6100-TH	●	10	25	80	10	6
CEPR6105-TH	●	10.5	30	100	12	6
CEPR6110-TH	●	11	30	100	12	6
CEPR6115-TH	●	11.5	30	100	12	6
CEPR6120-TH	●	12	30	100	12	6
CEPR6130-TH	●	13	35	105	16	6
CEPR6140-TH	●	14	35	105	16	6
CEPR6150-TH	●	15	40	110	16	6
CEPR6160-TH	●	16	40	110	16	6
CEPR6170-TH	●	17	40	120	20	6
CEPR6180-TH	●	18	40	120	20	6
CEPR6190-TH	●	19	45	125	20	6
CEPR6200-TH	●	20	45	125	20	6
CEPR6220-TH	●	22	45	135	20	6
CEPR6240-TH	●	24	50	140	25	6
CEPR8250-TH	●	25	50	140	25	8
CEPR8260-TH	●	26	50	140	25	8
CEPR8280-TH	●	28	55	145	25	8
CEPR8300-TH	●	30	60	165	32	8
CEPR8320-TH	●	32	70	175	32	8

Epoch TH Hard - Corner Radius



6Flutes
φ6~20



Tolerance on dia.:Right Table　　Tolerance on shank：h6

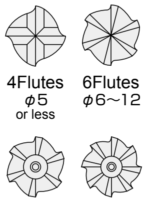
(mm)

Tool dia.	Tolerance on dia.
6	0 −0.015
8~20	−0 −0.02

CEPR6○○○-○○-TH

Item code	Stock	Size (mm)					No. of flutes
		Tool dia.	Corner radius	Flute length	Overall length	Shank dia.	
CEPR6060-03-TH	●	6	0.3	15	60	6	6
CEPR6060-05-TH	●		0.5	15	60	6	6
CEPR6060-10-TH	●		1.0	15	60	6	6
CEPR6080-03-TH	●	8	0.3	20	75	8	6
CEPR6080-05-TH	●		0.5	20	75	8	6
CEPR6080-10-TH	●		1.0	20	75	8	6
CEPR6100-05-TH	●	10	0.5	25	80	10	6
CEPR6100-10-TH	●		1.0	25	80	10	6
CEPR6100-15-TH	●		1.5	25	80	10	6
CEPR6100-20-TH	●		2.0	25	80	10	6
CEPR6120-05-TH	●	12	0.5	30	100	12	6
CEPR6120-10-TH	●		1.0	30	100	12	6
CEPR6120-15-TH	●		1.5	30	100	12	6
CEPR6120-20-TH	●		2.0	30	100	12	6
CEPR6160-10-TH	●	16	1.0	40	110	16	6
CEPR6160-20-TH	●		2.0	40	110	16	6
CEPR6200-10-TH	●	20	1.0	45	125	20	6
CEPR6200-20-TH	●		2.0	45	125	20	6
CEPR6200-30-TH	●		3.0	45	125	20	6

Epoch TH Hard - Long



4Flutes φ5 or less　6Flutes φ6~12
6Flutes φ14~22　8Flutes φ25

Tolerance on dia.:Right Table　　Tolerance on shank：h6

(mm)

Tool dia.	Tolerance on dia.
3~6	0 −0.015
7~25	−0 −0.02

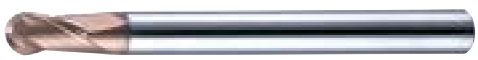
CEPL○○○○-TH

Item code	Stock	Size (mm)				No. of flutes
		Tool dia.	Flute length	Overall length	Shank dia.	
CEPL4030-TH	●	3	15	60	6	4
CEPL4040-TH	●	4	20	65	6	4
CEPL4050-TH	●	5	25	70	6	4
CEPL6060-TH	●	6	25	70	6	6
CEPL6070-TH	●	7	35	90	8	6
CEPL6080-TH	●	8	35	90	8	6
CEPL6090-TH	●	9	45	100	10	6
CEPL6100-TH	●	10	45	100	10	6
CEPL6110-TH	●	11	55	120	12	6
CEPL6120-TH	●	12	55	120	12	6
CEPL6140-TH	●	14	55	125	16	6
CEPL6160-TH	●	16	65	135	16	6
CEPL6180-TH	●	18	65	145	20	6
CEPL6200-TH	●	20	75	155	20	6
CEPL6220-TH	●	22	75	165	20	6
CEPL8250-TH	●	25	90	180	25	8

Epoch TH Hard Ball

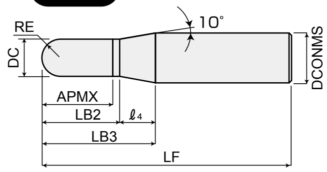
Tolerance on *R*：RE0.5~RE6：±0.005　Helix Angle：30°
RE8~RE10：±0.01

2Flutes

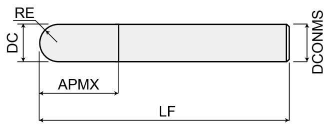


Tolerance on shank：h5

A type　※Without neck recess



B type

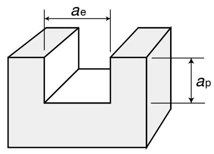


EPBT2○○○(-○)

Item Code	Stock	Size(mm)								Type
		Ball radius	Tool dia.	Flute length				Overall length	Shank dia.	
		RE	DC	APMX	LB2	LB3	ℓ4	LF	DCONMS	
EPBT2010	●	0.5	1	1.5	2.5	11	8.5	50	4	A
EPBT2015	●	0.75	1.5	2.5	3.5	10.6	7.1	50	4	A
EPBT2020	●	1	2	3	4	15.3	11.3	50	6	A
EPBT2025	●	1.25	2.5	4	5	14.9	9.9	50	6	A
EPBT2030	●	1.5	3	4.5	5.5	14	8.5	70	6	A
EPBT2040-4	●	2	4	6	—	—	—	70	4	B
EPBT2040	●	2	4	6	7	12.7	5.7	70	6	A
EPBT2050	●	2.5	5	7.5	8.5	11.3	2.8	80	6	A
EPBT2060	●	3	6	9	—	—	—	90	6	B
EPBT2080	●	4	8	12	—	—	—	100	8	B
EPBT2100	●	5	10	15	—	—	—	100	10	B
EPBT2120	●	6	12	18	—	—	—	110	12	B
EPBT2160	●	8	16	24	—	—	—	140	16	B
EPBT2200	●	10	20	30	—	—	—	160	20	B

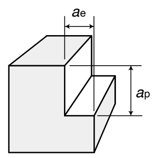
●：Stocked items.

Epoch TH Power Mill EPP4-TH



<Slotting>

Work material	Alloy steels (200~250HB) SKD61,SKD11				Alloy steels (25~35HRC) SCM440				Pre-hardened steels (35~45HRC) NAK80				Hardened steels (45~55HRC) SKD61,SKT4			
Cutting range	High Speed		General		General				General				General			
Depth of cut (mm)	a_p≦0.5DC a_e=1DC		a_p≦1DC a_e=1DC		a_p≦0.5DC a_e=1DC				a_p≦0.5DC a_e=1DC				a_p≦0.2DC a_e=1DC			
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)			Revolution n (min^{-1})	Feed rate vf (mm/min)			Revolution n (min^{-1})	Feed rate vf (mm/min)		
φ3	8,500	820	6,400	490	6,400	440			5,800	360			5,300	240		
φ4	6,400	920	4,800	550	4,800	500			4,400	410			4,000	280		
φ5	5,100	980	3,800	580	3,800	530			3,500	430			3,200	290		
φ6	4,200	1,010	3,200	610	3,200	550			2,900	450			2,700	310		
φ8	3,200	1,090	2,400	650	2,400	590			2,200	480			2,000	330		
φ10	2,500	950	1,900	580	1,900	520			1,800	440			1,600	290		
φ12	2,100	880	1,600	540	1,600	480			1,500	400			1,300	260		
φ16	1,600	770	1,200	460	1,200	410			1,100	340			1,000	230		
φ20	1,300	750	1,000	460	1,000	420			900	330			800	200		



<Side milling>

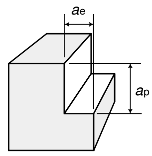
Work material	Alloy steels (200~250HB) SKD61,SKD11				Alloy steels (25~35HRC) SCM440				Pre-hardened steels (35~45HRC) CENA1,NAK80				Hardened steels (45~55HRC) SKD61,SKT4			
Cutting range	High Speed		General		High Speed		General		High Speed		General		High Speed		General	
Depth of cut (mm)	a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.15DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.1DC		a_p=1.5DC a_e=0.05DC		a_p=1.5DC a_e=0.07DC		a_p=1.5DC a_e=0.02DC		a_p=1.5DC a_e=0.05DC	
Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)	Revolution n (min^{-1})	Feed rate vf (mm/min)
φ3	16,000	1,800	9,600	860	14,000	1,400	9,600	770	12,000	1,100	8,500	610	11,000	860	7,400	460
φ4	12,000	1,900	7,200	920	10,000	1,400	7,200	830	8,800	1,100	6,400	660	8,000	900	5,600	500
φ5	9,600	2,100	5,700	1,000	8,300	1,600	5,700	900	7,000	1,200	5,100	720	6,400	990	4,500	550
φ6	8,000	2,200	4,800	1,080	6,900	1,700	4,800	970	5,800	1,300	4,200	750	5,300	1,040	3,700	580
φ8	6,000	2,400	3,600	1,150	5,200	1,900	3,600	1,040	4,400	1,400	3,200	820	4,000	1,120	2,800	630
φ10	4,800	2,200	2,900	1,070	4,100	1,700	2,900	960	3,500	1,300	2,500	740	3,200	1,030	2,200	570
φ12	4,000	2,100	2,400	1,000	3,500	1,600	2,400	900	2,900	1,200	2,100	700	2,700	980	1,900	550
φ16	3,000	1,700	1,800	810	2,600	1,300	1,800	730	2,200	1,000	1,600	570	2,000	780	1,400	440
φ20	2,400	1,400	1,400	670	2,100	1,100	1,400	600	1,800	860	1,300	500	1,590	670	1,110	370

【Note】

①Use a highly rigid and accurate machine as possible.
②Use the appropriate coolant for the work material and machining shape.
③These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
④If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Recommended Cutting Conditions

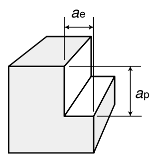
Epoch TH Hard CEPS-TH CEPR-TH CEPR-CR-TH



＜Side milling＞

Work material	Tool steels (25~35HRC) SKD		Pre-hardened steels (35~45HRC) CENA1,NAK80		Hardened steels (45~55HRC) SKD61, SKT4		Hardened steels (55~65HRC) SKD11, SKH51		Hardened steels (65~70HRC) SKH, HAP	
High Speed										
Depth of cut (mm)	ap=1.5DC	ae=0.1DC	ap=1.5DC	ae=0.05DC	ap=1.5DC	ae=0.03DC	ap=1.5DC	ae=0.02DC	ap=1.5DC	ae=0.02DC
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)
φ1	50,000	1,680	50,000	1,500	50,000	1,320	48,000	1,150	32,000	690
φ2	40,000	2,910	40,000	2,600	32,000	1,830	24,000	1,250	16,000	750
φ3	27,000	3,180	27,000	2,840	21,000	1,940	16,000	1,340	11,000	830
φ4	20,000	3,360	20,000	3,000	16,000	2,110	12,000	1,440	8,000	860
φ6	13,000	4,910	13,000	4,390	11,000	3,270	8,000	2,160	5,300	1,290
φ8	10,000	5,040	10,000	4,500	8,000	3,170	6,000	2,160	4,000	1,300
φ10	8,000	4,840	8,000	4,320	6,400	3,040	4,800	2,070	3,200	1,240
φ12	6,600	4,440	6,600	3,960	5,300	2,800	4,000	1,920	2,700	1,170
φ16	5,000	4,200	5,000	3,750	4,000	2,640	3,000	1,800	2,000	1,080
φ20	4,000	4,030	4,000	3,600	3,200	2,530	2,400	1,730	1,600	1,040
φ25	3,200	4,590	3,200	4,100	2,500	2,820	1,900	1,950	1,300	1,200
φ30	2,700	4,110	2,700	3,670	2,100	2,510	1,600	1,740	1,100	1,080
General										
Depth of cut (mm)	ap=1.5DC	ae=0.1DC	ap=1.5DC	ae=0.1DC	ap=1.5DC	ae=0.06DC	ap=1.5DC	ae=0.04DC	ap=1.5DC	ae=0.04DC
Tool dia. DC (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)
φ1	15,000	500	15,000	320	15,000	280	15,000	250	13,000	200
φ2	15,000	1,090	15,000	680	13,000	520	9,600	350	6,400	210
φ3	13,000	1,530	11,000	810	8,000	520	6,400	380	4,200	220
φ4	10,000	1,680	8,000	840	6,000	550	4,800	400	3,200	240
φ6	6,400	2,420	5,300	1,250	4,200	870	3,200	600	2,100	360
φ8	4,800	2,420	4,000	1,260	3,200	890	2,400	600	1,600	360
φ10	3,800	2,300	3,200	1,210	2,500	830	1,900	570	1,300	350
φ12	3,200	2,150	2,700	1,130	2,100	780	1,600	540	1,100	330
φ16	2,400	2,070	2,000	1,080	1,600	760	1,200	520	800	310
φ20	1,900	1,920	1,600	1,010	1,300	720	1,000	500	600	270
φ25	1,500	2,110	1,300	1,140	1,000	770	800	560	510	320
φ30	1,300	2,000	1,100	1,060	800	670	600	460	420	290

Epoch TH Hard - Long CEPL-TH

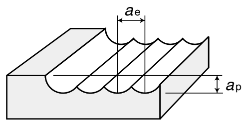


＜Side milling (Finishing)＞

Work material	Cast irons (150~200HB) FC250		Carbon steels (180~220HB) SS400, S50C		Alloy steels (200~250HB) SCM440, SNCM		Stainless steels / Tool steels (25~35HRC) SUS304, SKD		Pre-hardened steels (35~45HRC) HPM1, NAK55		Hardened steels (45~55HRC) SKD61, SKT4		Hardened steels (55~65HRC) SKD11, SKH51	
Depth of cut (mm)	ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC		ap=3DC ae=0.01DC	
Tool Dia. DC (mm)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)	Revolution n (min⁻¹)	Feed rate vf (mm/min)
3	7,960	960	7,960	960	6,370	760	6,370	760	5,310	420	5,310	320	4,240	250
4	5,970	1,190	5,970	1,190	4,770	950	4,770	950	3,980	400	3,980	320	3,180	250
5	4,700	1,220	4,700	1,220	3,820	990	3,820	990	3,180	380	3,180	320	2,550	260
6	3,980	1,910	3,980	1,910	3,180	1,530	3,180	1,530	2,650	640	2,650	480	2,120	380
8	2,980	1,880	2,980	1,880	2,390	1,510	2,390	1,510	1,990	600	1,990	480	1,590	380
10	2,390	1,720	2,390	1,720	1,910	1,380	1,910	1,380	1,590	570	1,590	480	1,270	380
12	1,990	1,550	1,990	1,550	1,590	1,240	1,590	1,240	1,320	550	1,320	480	1,060	380
16	1,490	1,300	1,490	1,300	1,190	1,040	1,190	1,040	990	480	990	420	800	340
20	1,190	1,140	1,190	1,140	950	910	950	910	800	430	800	380	640	310
25	950	1,200	950	1,200	760	970	760	970	640	460	640	410	510	330

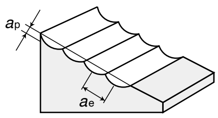
【Note】 Upon usage, please refer to notes below table on page 9.

Epoch TH Hard Ball **EPBT**



＜Roughing＞

Work material	Tool steels (25~35HRC) SKD				Pre-hardened steels (35~45HRC) CENA1,NAK80				Hardened steels (45~55HRC) SKD61, SKT4				Hardened steels (55~65HRC) SKD11, SKH51				Hardened steels (65~70HRC) SKH, HAP			
Cutting range	High Speed		General		High Speed		General		High Speed		General		High Speed		General		High Speed		General	
Depth of cut (mm)	a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.1DC a_e=0.3DC		a_p=0.08DC a_e=0.24DC		a_p=0.1DC a_e=0.3DC		a_p=0.05DC a_e=0.15DC		a_p=0.07DC a_e=0.21DC		a_p=0.05DC a_e=0.15DC		a_p=0.07DC a_e=0.21DC	
Ball radius RE ×Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
R0.5×1	50,000	1,800	20,000	720	50,000	1,600	20,000	640	50,000	1,500	20,000	540	50,000	1,300	20,000	470	38,000	990	16,000	370
R1×2	48,000	3,170	20,000	1,320	48,000	2,780	20,000	1,160	38,000	1,980	16,000	750	29,000	1,390	13,000	560	19,000	910	8,000	350
R1.5×3	32,000	3,260	16,000	1,630	32,000	2,880	16,000	1,440	25,000	2,100	11,000	830	19,000	1,440	8,500	580	13,000	990	5,300	360
R2×4	24,000	3,360	12,000	1,680	24,000	2,930	12,000	1,460	19,000	2,170	8,000	820	14,000	1,460	6,400	600	10,000	1,040	4,000	370
R3×6	16,000	3,360	8,000	1,680	16,000	2,940	8,000	1,470	13,000	2,240	5,300	820	9,600	1,500	4,200	590	6,400	1,000	2,700	380
R4×8	12,000	3,600	6,000	1,800	12,000	3,020	6,000	1,510	10,000	2,320	4,000	840	7,200	1,510	3,200	600	4,800	1,010	2,000	380
R5×10	10,000	3,600	4,800	1,730	10,000	3,120	4,800	1,500	7,600	2,170	3,200	820	5,700	1,480	2,500	590	3,800	990	1,600	370
R6×12	8,000	3,100	4,000	1,550	8,000	2,690	4,000	1,340	6,400	1,970	2,700	750	4,800	1,340	2,100	530	3,200	900	1,300	330
R8×16	6,000	2,580	3,000	1,290	6,000	2,220	3,000	1,110	4,800	1,630	2,000	610	3,600	1,110	1,600	440	2,400	740	1,000	280
R10×20	4,800	2,060	2,400	1,030	4,800	1,780	2,400	890	3,800	1,290	1,600	490	2,900	890	1,300	360	1,900	590	800	220



a_p: Finishing cut amount
a_e: Pick feed

＜Finishing＞

Work material	Tool steels (25~35HRC) SKD				Pre-hardened steels (35~45HRC) CENA1,NAK80				Hardened steels (45~55HRC) SKD61, SKT4				Hardened steels (55~65HRC) SKD11, SKH51				Hardened steels (65~70HRC) SKH, HAP			
Cutting range	High Speed		General		High Speed		General		High Speed		General		High Speed		General		High Speed		General	
Depth of cut (mm)	a_p=0.05〜0.1 a_e=0.02DC		a_p=0.05〜0.1 a_e=0.02DC		a_p=0.05〜0.1 a_e=0.02DC		a_p=0.05〜0.1 a_e=0.02DC		a_p=0.05〜0.1 a_e=0.02DC		a_p=0.05〜0.1 a_e=0.02DC		a_p=0.05〜0.1 a_e=0.02DC		a_p=0.05〜0.1 a_e=0.02DC		a_p=0.05〜0.1 a_e=0.02DC		a_p=0.05〜0.1 a_e=0.02DC	
Ball radius RE ×Tool dia. DC (mm)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)	Revolution n (min^{-1})	Feed rate v_f (mm/min)
R0.5×1	50,000	5,000	20,000	2,000	50,000	5,000	20,000	2,000	50,000	4,000	20,000	1,600	50,000	2,500	15,000	750	48,000	2,400	15,000	750
R1×2	32,000	3,840	20,000	2,400	32,000	3,840	20,000	2,400	32,000	3,200	20,000	2,000	32,000	2,880	15,000	1,350	24,000	2,160	14,000	1,260
R1.5×3	25,000	3,500	17,000	2,380	25,000	3,500	17,000	2,380	24,000	2,880	14,000	1,680	21,000	2,520	13,000	1,560	16,000	1,920	10,000	1,200
R2×4	22,000	3,740	13,000	2,210	22,000	3,740	13,000	2,210	20,000	3,200	10,000	1,600	16,000	2,400	9,600	1,440	12,000	1,800	7,200	1,080
R3×6	16,000	3,520	8,500	1,870	16,000	3,520	8,500	1,870	13,000	2,730	6,900	1,450	11,000	2,200	6,400	1,280	8,000	1,600	4,800	960
R4×8	12,000	2,880	6,400	1,540	12,000	2,880	6,400	1,540	10,000	2,300	5,200	1,200	8,000	1,760	4,800	1,060	6,000	1,320	3,600	790
R5×10	10,000	2,600	5,100	1,330	10,000	2,600	5,100	1,330	8,000	2,000	4,100	1,030	6,400	1,540	3,800	910	4,800	1,150	2,900	700
R6×12	8,000	2,160	4,200	1,130	8,000	2,160	4,200	1,130	6,600	1,720	3,500	910	5,300	1,330	3,200	800	4,000	1,000	2,400	600
R8×16	6,000	1,680	3,200	900	6,000	1,680	3,200	900	5,000	1,350	2,600	700	4,000	1,040	2,400	620	3,000	780	1,800	470
R10×20	4,800	1,340	2,500	700	4,800	1,340	2,500	700	4,000	1,080	2,100	570	3,200	830	1,900	490	2,400	620	1,400	360

【Note】

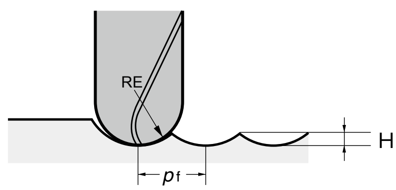
① Use a highly rigid and accurate machine as possible.
② "a_e" (pick feed) figures in the above table are for general guidance. When making an actual selection, please refer to the cusp height table on below.
③ Use the appropriate coolant for the work material and machining shape.
④ These conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions.
⑤ If the rpm available is lower than that recommended please reduce the feed rate to the same ratio.

Theoritical cusp height in end milling (μm)

		Pick Feed：p_f (mm)							
		0.05	0.075	0.1	0.15	0.2	0.3	0.4	0.5
Ball radius RE (mm)	0.5	0.63	1.41	2.51	5.66	10.10	23.03	41.74	66.99
	1.0	0.31	0.70	1.25	2.82	5.01	11.31	20.20	31.75
	2.0	0.16	0.35	0.63	1.41	2.50	5.63	10.03	15.69
	3.0	0.10	0.23	0.42	0.94	1.67	3.75	6.67	10.43
	4.0	0.08	0.18	0.31	0.70	1.25	2.81	5.00	7.82
	5.0	0.06	0.14	0.25	0.56	1.00	2.25	4.00	6.25
	6.0	0.05	0.12	0.21	0.47	0.83	1.88	3.33	5.21
	8.0	0.04	0.09	0.16	0.35	0.63	1.41	2.50	3.91
	10.0	0.03	0.07	0.13	0.28	0.50	1.13	2.00	3.13

Pick feed and Cusp height

$$H = RE - \sqrt{RE^2 - p_f^2/4} \fallingdotseq p_f^2/8RE$$



MOLDINO

The Edge To Innovation

The diagrams and table data are examples of test results, and are not guaranteed values.

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⚠ Attentions on Safety

1. Cautions regarding handling

(1) When removing the tool from its case (packaging), be careful that the tool does not pop out or is dropped. Be particularly careful regarding contact with the tool flutes.

(2) When handling tools with sharp cutting flutes, be careful not to touch the cutting flutes directly with your bare hands.

2. Cautions regarding mounting

(1) Before use, check the outside appearance of the tool for scratches, cracks, etc. and that it is firmly mounted in the collet chuck, etc.

(2) If abnormal chattering, etc. occurs during use, stop the machine immediately and remove the cause of the chattering.

3. Cautions during use

(1) Before use, confirm the dimensions and direction of rotation of the tool and milling work material.

(2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.

(3) Cutting tools are made of a hard material. During use, they may break and fly off. In addition, cutting chips may also fly off. Since there is a danger of injury to workers, fire, or eye damage from such flying pieces, a safety cover should be attached when work is performed and safety equipment such as safety goggles should be worn to create a safe environment for work.

(4) There is a risk of fire or inflammation due to sparks, heat due to breakage, and cutting chips. Do not use where there is a risk of fire or explosion. **Please caution of fire while using oil base coolant, fire prevention is necessary.**

(5) Do not use the tool for any purpose other than that for which it is intended.

4. Cautions regarding regrinding

(1) If regrinding is not performed at the proper time, there is a risk of the tool breaking. Replace the tool with one in good condition, or perform regrinding.

(2) Grinding dust will be created when regrinding a tool. When regrinding, be sure to attach a safety cover over the work area and wear safety clothes such as safety goggles, etc.

(3) This product contains the specified chemical substance cobalt and its inorganic compounds. When performing regrinding or similar processing, be sure to handle the processing in accordance with the local laws and regulations regarding prevention of hazards due to specified chemical substances.

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