

EPBT/CEPR-TH

HITACHI
Inspire the Next

EPOCH SERIES

Sub-Micrograin Carbide Tools for High-Performance Machining of Hardened Steels

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High-Precision End Mills for Maximum Efficiency and Tool Life

- TH Coating has excellent hardness and heat resistance properties
- Newly designed flute geometry increases rigidity and improves chip evacuation
- EPBT Ball End Mills feature radius tolerance of $\pm 0.005\text{mm}$ (under $\text{\O}6\text{mm}$)
- CEPR-TH Multi-Flute Square End Mills for high performance side milling & finishing



CEPR-TH

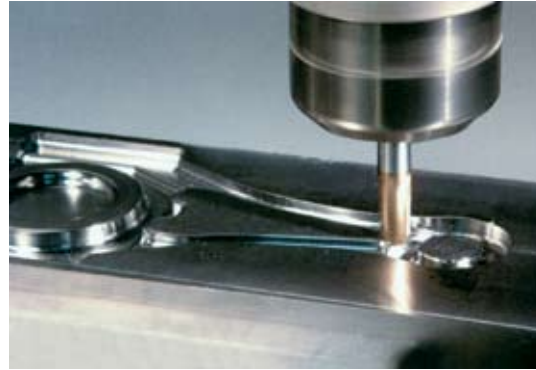
EPBT/CEPR-TH EPOCH SERIES



INTRODUCTION

The Epoch Series EPBT and CEPR-TH end mills achieve extraordinary performance in the cutting of hardened steels. In fact, machining efficiency is more than twice that of competitors' solid carbide end mills.

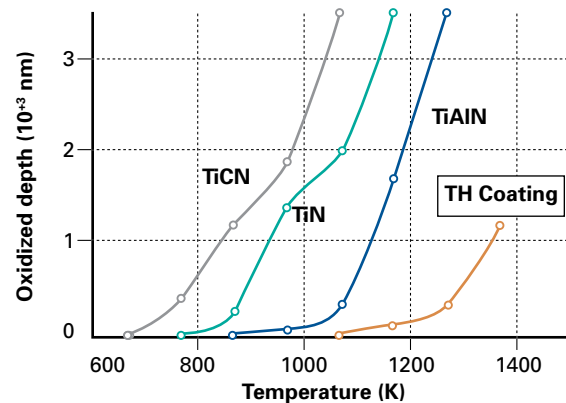
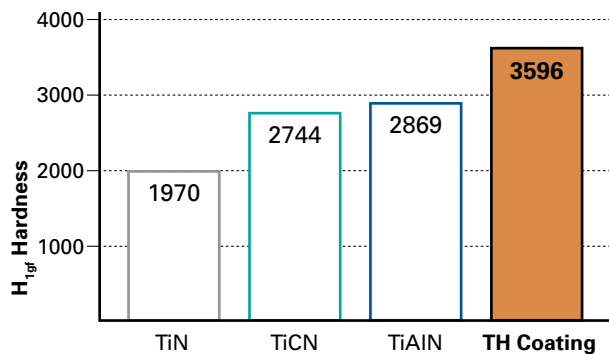
In addition to newly designed tool geometries, these tools feature Hitachi's unique nano-composite TH Coating. Due to the new composite layer (consisting of nano-crystal material), the TH Coating achieves a new level of hardness and heat resistance.



FEATURES

1. TH Coating's Hardness and Oxidation Resistance

As the charts demonstrate, the revolutionary TH Coating has excellent hardness and oxidation resistance compared to conventional coatings. These properties allow the Epoch Series End Mills to offer greater performance in hard steels and show a vast improvement in cutting tool life.



EPBT/CEPR-TH EPOCH SERIES

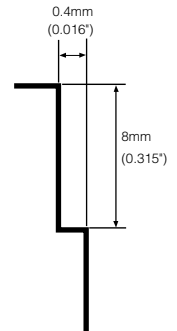


2. Cutting Performance: CEPR-TH

The data below shows that the CEPR-TH achieved double the tool life of competitors' cutting tools in the dry machining of die steel.



Cutting Tool Ø8mm (0.315") 6 Flute CEPR6080-TH
Working Material H13 (52HRC)
Cutting Speed $V_c = 300 - 500 \text{ m/min}$ (984-1640 sfm)
Feed $f_z = 0.07 \text{ mm/tooth}$ (0.0028 in/tooth)
Depth of Cut doc 8mm x woc 0.4mm (0.315" x 0.0158")
Cutting Method Straight down cut, air blow



3. Cutting Performance: EPBT

The EPBT demonstrated minimal flank wear after 33 minutes of pocketing in 58HRC die steel. The competitor's TiAlN coated tool exhibited chipping and could no longer be used.

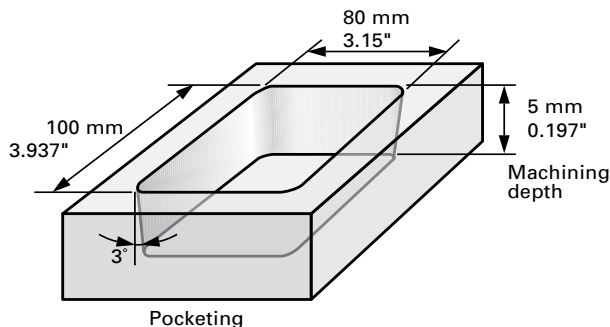
EPBT2100

D2 (58HRC)

Pocketing

N = 4,500 rpm
 V_c = 140 m/min (460 sfm)
 V_f = 1,080 mm/min (43 ipm)
 f_z = 0.12 mm/tooth (0.005")
doc x woc = 0.5 x 2 mm (0.020" x 0.079")

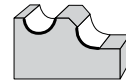
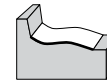
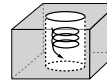
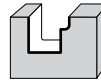
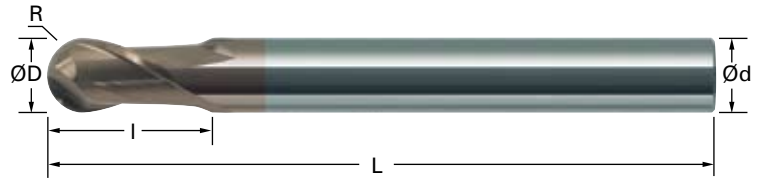
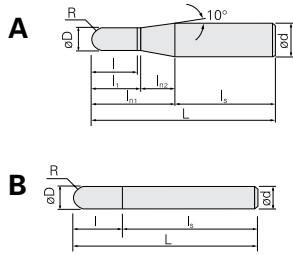
Dry (Air Blow) M/C ISO 40 taper
Milling time: 33 min



	Epoch TH Hard Ball	A: TiAlN Coating
Center area	<p>0.02 mm (0.0008") Flank wear</p>	<p>0.045 mm (0.0018") Flank wear</p>
Boundary area	<p>0.037 mm (0.0015") Flank wear</p>	<p>0.25 mm (0.0098") Chipping</p>

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EPBT
Epoch Ball Nose Style



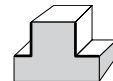
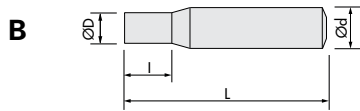
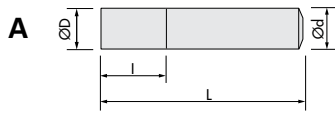
D 0/-0.2

EPBT - METRIC

Part No.	Flutes	ØD	R	I	I ₁	I _{n1}	I _{n2}	L	Ød	Type
EPBT2010	2	1	0.5	1.5	2.5	11	8.5	50	4	A
EPBT2020	2	2	1.0	3.0	4.0	15.3	11.3	50	6	A
EPBT2030	2	3	1.5	4.5	5.5	14	8.5	70	6	A
EPBT2040	2	4	2.0	6.0	7.0	12.7	5.7	70	6	A
EPBT2060	2	6	3.0	9.0				90	6	B
EPBT2080	2	8	4.0	12.0				100	8	B
EPBT2100	2	10	5.0	15.0				100	10	B
EPBT2120	2	12	6.0	18.0				110	12	B

EPBT/CEPR-TH EPOCH SERIES

CEPR-TH
Epoch Square Multi-Flute Style



D 0/-0.2

CEPR-TH - METRIC

Part No.	Flutes	ØD	I	L	Ød	Type
CEPR4010-TH	4	1	3.5	60	6	A
CEPR4020-TH	4	2	7.0	60	6	A
CEPR4030-TH	4	3	10.0	60	6	A
CEPR4040-TH	4	4	12.0	60	6	A
CEPR4050-TH	4	5	15.0	60	6	A
CEPR6060-TH	6	6	15.0	60	6	B
CEPR6080-TH	6	8	20.0	75	8	B
CEPR6100-TH	6	10	25.0	80	10	B
CEPR6120-TH	6	12	30.0	100	12	B

EPBT/CEPR-TH EPOCH SERIES



EPBT
Cutting Conditions
Roughing
Inch



Work Material (Hardness)	Cutting Range	Depth of cut	Cutting Cond.	Tool Dia. (mm)							
				1	2	3	4	6	8	10	12
Tool Steel (25-35HRC)	High Speed	doc=0.06-0.08D woc=0.3D	Vc (sfm)	250	300	300	300	340	340	340	340
			N (rpm)	79600	47700	31800	23900	18000	13500	10800	9000
			fz (in/t)	0.0008	0.001	0.002	0.003	0.004	0.006	0.007	0.007
			Vf (in/min)	130	110	130	130	160	160	150	130
	General	doc=0.06-0.08D woc=0.3D	Vc (sfm)	60	120	150	150	180	180	180	180
			N (rpm)	19100	19100	15900	11900	9500	7200	5700	4800
			fz (in/t)	0.0008	0.001	0.002	0.003	0.004	0.006	0.007	0.007
			Vf (in/min)	30	50	60	70	80	90	80	70
Pre-hardened steel (35-45HRC)	High Speed	doc=0.06-0.08D woc=0.3D	Vc (sfm)	250	300	300	300	340	340	340	340
			N (rpm)	79600	47700	31800	23900	18000	13500	10800	9000
			fz (in/t)	0.0008	0.001	0.002	0.002	0.004	0.005	0.006	0.007
			Vf (in/min)	130	110	130	110	130	140	140	120
	General	doc=0.06-0.08D woc=0.3D	Vc (sfm)	60	120	150	150	180	180	180	180
			N (rpm)	19100	19100	15900	11900	9500	7200	5700	4800
			fz (in/t)	0.0008	0.001	0.002	0.002	0.004	0.005	0.006	0.007
			Vf (in/min)	30	50	60	60	70	70	70	60
Hardened steel (45-55HRC)	High Speed	doc=0.05-0.06D woc=0.25D	Vc (sfm)	240	240	260	260	280	280	280	280
			N (rpm)	76400	38200	27600	20700	14900	11100	8900	7400
			fz (in/t)	0.0014	0.001	0.002	0.002	0.004	0.005	0.006	0.006
			Vf (in/min)	120	90	90	100	110	100	100	90
	General	doc=0.05-0.06D woc=0.25D	Vc (sfm)	60	100	120	120	140	140	140	140
			N (rpm)	19100	15900	12700	9500	7400	5600	4500	3700
			fz (in/t)	0.0004	0.001	0.002	0.002	0.003	0.004	0.005	0.006
			Vf (in/min)	20	30	40	40	50	50	50	40
Hardened steel (55-65HRC)	High Speed	doc=0.03-0.04D woc=0.25D	Vc (sfm)	180	180	200	200	240	240	240	240
			N (rpm)	57300	28600	21200	15900	12700	9500	7600	6400
			fz (in/t)	0.0004	0.001	0.002	0.002	0.003	0.004	0.005	0.006
			Vf (in/min)	50	50	70	60	80	70	80	70
	General	doc=0.03-0.04D woc=0.25D	Vc (sfm)	60	80	100	100	120	120	120	120
			N (rpm)	19100	12700	10600	8000	6400	4800	3800	3200
			fz (in/t)	0.0004	0.001	0.001	0.002	0.003	0.004	0.005	0.005
			Vf (in/min)	20	20	30	30	40	30	40	30
Hardened steel (65-70 HRC)	High Speed	doc=0.02-0.03D woc=0.2D	Vc (sfm)	120	120	120	120	160	160	160	160
			N (rpm)	38200	19100	12700	9500	8500	6400	5100	4200
			fz (in/t)	0.0004	0.001	0.002	0.002	0.003	0.004	0.005	0.006
			Vf (in/min)	30	30	40	40	50	50	50	50
	General	doc=0.02-0.03D woc=0.2D	Vc (sfm)	50	50	50	50	80	80	80	80
			N (rpm)	15900	8000	5300	4000	4200	3200	2500	2100
			fz (in/t)	0.0004	0.001	0.001	0.002	0.003	0.004	0.005	0.005
			Vf (in/min)	10	10	10	20	20	20	20	20

EPBT/CEPR-TH EPOCH SERIES



EPBT
Cutting Conditions
Roughing
Metric



Work Material (Hardness)	Cutting Range	Depth of cut	Cutting Cond.	Tool Dia. (mm)							
				1	2	3	4	6	8	10	12
Tool Steel (25-35HRC)	High Speed	doc=0.06-0.08D woc=0.3D	Vc (m/min)	250	300	300	300	340	340	340	340
			N (rpm)	79600	47700	31800	23900	18000	13500	10800	9000
			fz (mm/t)	0.020	0.030	0.050	0.070	0.110	0.150	0.180	0.190
			Vf (mm/min)	3180	2860	3180	3350	3960	4050	3890	3420
	General	doc=0.06-0.08D woc=0.3D	Vc (m/min)	60	120	150	150	180	180	180	180
			N (rpm)	19100	19100	15900	11900	9500	7200	5700	4800
			fz (mm/t)	0.020	0.030	0.050	0.070	0.110	0.150	0.180	0.190
			Vf (mm/min)	760	1150	1590	1670	2090	2160	2050	1820
Pre-hardened steel (35-45HRC)	High Speed	doc=0.06-0.08D woc=0.3D	Vc (m/min)	250	300	300	300	340	340	340	340
			N (rpm)	79600	47700	31800	23900	18000	13500	10800	9000
			fz (mm/t)	0.020	0.030	0.050	0.060	0.090	0.130	0.160	0.170
			Vf (mm/min)	3180	2860	3180	2870	3240	3510	3460	3060
	General	doc=0.06-0.08D woc=0.3D	Vc (m/min)	60	120	150	150	180	180	180	180
			N (rpm)	19100	19100	15900	11900	9500	7200	5700	4800
			fz (mm/t)	0.020	0.030	0.050	0.060	0.090	0.130	0.160	0.170
			Vf (mm/min)	760	1150	1590	1430	1710	1870	1820	1630
Hardened steel (45-55HRC)	High Speed	doc=0.05-0.06D woc=0.25D	Vc (m/min)	240	240	260	260	280	280	280	280
			N (rpm)	76400	38200	27600	20700	14900	11100	8900	7400
			fz (mm/t)	0.020	0.030	0.040	0.060	0.090	0.120	0.140	0.150
			Vf (mm/min)	3060	2290	2210	2480	2680	2660	2490	2220
	General	doc=0.05-0.06D woc=0.25D	Vc (m/min)	60	100	120	120	140	140	140	140
			N (rpm)	19100	15900	12700	9500	7400	5600	4500	3700
			fz (mm/t)	0.010	0.020	0.040	0.050	0.080	0.110	0.130	0.140
			Vf (mm/min)	380	640	1020	950	1180	1230	1170	1040
Hardened steel (55-65HRC)	High Speed	doc=0.03-0.04D woc=0.25D	Vc (m/min)	180	180	200	200	240	240	240	240
			N (rpm)	57300	28600	21200	15900	12700	9500	7600	6400
			fz (mm/t)	0.010	0.020	0.040	0.050	0.080	0.100	0.130	0.140
			Vf (mm/min)	1150	1140	1700	1590	2030	1900	1980	1790
	General	doc=0.03-0.04D woc=0.25D	Vc (m/min)	60	80	100	100	120	120	120	120
			N (rpm)	19100	12700	10600	8000	6400	4800	3800	3200
			fz (mm/t)	0.010	0.020	0.030	0.050	0.070	0.090	0.120	0.130
			Vf (mm/min)	380	510	640	800	900	860	910	830
Hardened steel (65-70 HRC)	High Speed	doc=0.02-0.03D woc=0.2D	Vc (m/min)	120	120	120	120	160	160	160	160
			N (rpm)	38200	19100	12700	9500	8500	6400	5100	4200
			fz (mm/t)	0.010	0.020	0.040	0.050	0.080	0.100	0.130	0.140
			Vf (mm/min)	760	760	1020	950	1360	1280	1330	1180
	General	doc=0.02-0.03D woc=0.2D	Vc (m/min)	50	50	50	50	80	80	80	80
			N (rpm)	15900	8000	5300	4000	4200	3200	2500	2100
			fz (mm/t)	0.010	0.020	0.030	0.050	0.070	0.090	0.120	0.130
			Vf (mm/min)	320	320	320	400	590	580	600	550

EPBT/CEPR-TH EPOCH SERIES



EPBT
Cutting Conditions
Finishing
Inch



Work Material (Hardness)	Cutting Range	Depth of cut	Cutting Cond.	Tool Dia. (mm)							
				1	2	3	4	6	8	10	12
Tool Steel (25-35HRC)	High Speed	doc=0.05-0.1D woc=0.02-0.6D	Vc (sfm)	250	300	300	300	300	350	350	350
			N (rpm)	79600	47700	31800	23900	15900	13900	11100	9300
			fz (in/t)	0.002	0.002	0.003	0.004	0.004	0.005	0.005	0.006
			Vf (in/min)	310	230	180	170	140	130	110	100
	General	doc=0.05-0.1D woc=0.02-0.6D	Vc (sfm)	60	120	180	180	180	200	200	200
			N (rpm)	19100	19100	19100	14300	9500	8000	6400	5300
			fz (in/t)	0.002	0.002	0.003	0.004	0.004	0.005	0.005	0.006
			Vf (in/min)	80	90	110	100	80	80	70	60
Pre-hardened steel (35-45HRC)	High Speed	doc=0.05-0.1D woc=0.02-0.6D	Vc (sfm)	250	300	300	300	300	350	350	350
			N (rpm)	79600	47700	31800	23900	15900	13900	11100	9300
			fz (in/t)	0.002	0.002	0.003	0.004	0.004	0.005	0.005	0.006
			Vf (in/min)	310	230	180	170	140	130	110	100
	General	doc=0.05-0.1D woc=0.02-0.6D	Vc (sfm)	60	120	180	180	180	200	200	200
			N (rpm)	19100	19100	19100	14300	9500	8000	6400	5300
			fz (in/t)	0.002	0.002	0.003	0.004	0.004	0.005	0.005	0.006
			Vf (in/min)	80	90	110	100	80	80	70	60
Hardened steel (45-55HRC)	High Speed	doc=0.05-0.08D woc=0.02-0.4D	Vc (sfm)	250	250	250	250	280	280	280	280
			N (rpm)	79600	39800	26500	19900	14900	11100	8900	7400
			fz (in/t)	0.002	0.002	0.002	0.003	0.004	0.005	0.005	0.006
			Vf (in/min)	250	160	130	130	130	100	90	80
	General	doc=0.05-0.08D woc=0.02-0.4D	Vc (sfm)	60	120	130	130	150	150	150	150
			N (rpm)	19100	19100	13800	10300	8000	6000	4800	4000
			fz (in/t)	0.002	0.002	0.002	0.003	0.004	0.005	0.005	0.006
			Vf (in/min)	60	80	70	60	70	60	50	40
Hardened steel (55-65HRC)	High Speed	doc=0.04-0.06D woc=0.02-0.4D	Vc (sfm)	200	200	200	200	250	250	250	250
			N (rpm)	63700	31800	21200	15900	13300	9900	8000	6600
			fz (in/t)	0.001	0.002	0.002	0.003	0.004	0.004	0.005	0.005
			Vf (in/min)	150	130	100	100	100	90	80	70
	General	doc=0.04-0.06D woc=0.02-0.4D	Vc (sfm)	60	120	120	120	150	150	150	150
			N (rpm)	19100	19100	12700	9500	8000	6000	4800	4000
			fz (in/t)	0.001	0.002	0.002	0.003	0.004	0.004	0.005	0.005
			Vf (in/min)	50	80	60	60	60	50	50	40
Hardened steel (65-70 HRC)	High Speed	doc=0.02-0.04D woc=0.02-0.03D	Vc (sfm)	150	150	150	150	200	200	200	200
			N (rpm)	47700	23900	15900	11900	10600	8000	6400	5300
			fz (in/t)	0.001	0.002	0.002	0.003	0.004	0.004	0.005	0.005
			Vf (in/min)	110	90	80	70	80	70	60	50
	General	doc=0.02-0.04D woc=0.02-0.03D	Vc (sfm)	60	90	90	90	120	120	120	120
			N (rpm)	19100	14300	9500	7200	6400	4800	3800	3200
			fz (in/t)	0.001	0.002	0.002	0.003	0.004	0.004	0.005	0.005
			Vf (in/min)	50	60	40	50	50	40	40	30

EPBT/CEPR-TH EPOCH SERIES



EPBT
Cutting Conditions
Finishing
Metric

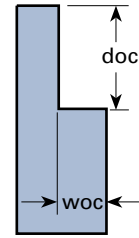


Work Material (Hardness)	Cutting Range	Depth of cut	Cutting Cond.	Tool Dia. (mm)							
				1	2	3	4	6	8	10	12
Tool Steel (25-35HRC)	High Speed	doc=0.05-0.1D woc=0.02-0.6D	Vc (m/min)	250	300	300	300	300	350	350	350
			N (rpm)	79600	47700	31800	23900	15900	13900	11100	9300
			fz (mm/t)	0.050	0.060	0.070	0.090	0.110	0.120	0.130	0.140
			Vf (mm/min)	7960	5720	4450	4300	3500	3340	2890	2600
	General	doc=0.05-0.1D woc=0.02-0.6D	Vc (m/min)	60	120	180	180	180	200	200	200
			N (rpm)	19100	19100	19100	14300	9500	8000	6400	5300
			fz (mm/t)	0.050	0.060	0.070	0.090	0.110	0.120	0.130	0.140
			Vf (mm/min)	1910	2290	2670	2570	2090	1920	1660	1480
Pre-hardened steel (35- 45HRC)	High Speed	doc=0.05-0.1D woc=0.02-0.6D	Vc (m/min)	250	300	300	300	300	350	350	350
			N (rpm)	79600	47700	31800	23900	15900	13900	11100	9300
			fz (mm/t)	0.050	0.060	0.070	0.090	0.110	0.120	0.130	0.140
			Vf (mm/min)	7960	5720	4450	4300	3500	3340	2890	2600
	General	doc=0.05-0.1D woc=0.02-0.6D	Vc (m/min)	60	120	180	180	180	200	200	200
			N (rpm)	19100	19100	19100	14300	9500	8000	6400	5300
			fz (mm/t)	0.050	0.060	0.070	0.090	0.110	0.120	0.130	0.140
			Vf (mm/min)	1910	2290	2670	2570	2090	1920	1660	1480
Hardened steel (45- 55HRC)	High Speed	doc=0.05-0.08D woc=0.02-0.4D	Vc (m/min)	250	250	250	250	280	280	280	280
			N (rpm)	79600	39800	26500	19900	14900	11100	8900	7400
			fz (mm/t)	0.040	0.050	0.060	0.080	0.110	0.120	0.130	0.140
			Vf (mm/min)	6370	3980	3180	3180	3280	2660	2310	2070
	General	doc=0.05-0.08D woc=0.02-0.4D	Vc (m/min)	60	120	130	130	150	150	150	150
			N (rpm)	19100	19100	13800	10300	8000	6000	4800	4000
			fz (mm/t)	0.040	0.050	0.060	0.080	0.110	0.120	0.130	0.140
			Vf (mm/min)	1530	1910	1660	1650	1760	1440	1250	1120
Hardened steel (55- 65HRC)	High Speed	doc=0.04-0.06D woc=0.02-0.4D	Vc (m/min)	200	200	200	200	250	250	250	250
			N (rpm)	63700	31800	21200	15900	13300	9900	8000	6600
			fz (mm/t)	0.030	0.050	0.060	0.080	0.100	0.110	0.120	0.130
			Vf (mm/min)	3820	3180	2540	2540	2660	2180	1920	1720
	General	doc=0.04-0.06D woc=0.02-0.4D	Vc (m/min)	60	120	120	120	150	150	150	150
			N (rpm)	19100	19100	12700	9500	8000	6000	4800	4000
			fz (mm/t)	0.030	0.050	0.060	0.080	0.100	0.110	0.120	0.130
			Vf (mm/min)	1150	1910	1520	1520	1600	1320	1150	1040
Hardened steel (65-70 HRC)	High Speed	doc=0.02-0.04D woc=0.02-0.03D	Vc (m/min)	150	150	150	150	200	200	200	200
			N (rpm)	47700	23900	15900	11900	10600	8000	6400	5300
			fz (mm/t)	0.030	0.050	0.060	0.080	0.100	0.110	0.120	0.130
			Vf (mm/min)	2860	2390	1910	1900	2120	1760	1540	1380
	General	doc=0.02-0.04D woc=0.02-0.03D	Vc (m/min)	60	90	90	90	120	120	120	120
			N (rpm)	19100	14300	9500	7200	6400	4800	3800	3200
			fz (mm/t)	0.030	0.050	0.060	0.080	0.100	0.110	0.120	0.130
			Vf (mm/min)	1150	1430	1140	1150	1280	1060	910	830

EPBT/CEPR-TH EPOCH SERIES



CEPR-TH
Cutting Conditions
Side Milling
Inch

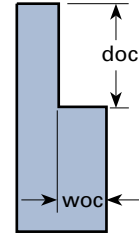


Work Material (Hardness)	Cutting Range	Depth of cut	Cutting Cond.	Tool Dia. (mm)									
				1	2	3	4	6	8	10	12	16	20
Tool Steel (25-35HRC)	High Speed	doc=1.5-2D woc=0.1D	Vc (sfm)	250	250	250	280	280	280	280	280	280	280
			N (rpm)	79600	39800	26500	22300	14900	11100	8900	7400	5600	4500
			fz (in/t)	0.0003	0.001	0.001	0.002	0.002	0.003	0.004	0.004	0.005	0.007
			Vf (in/min)	100	110	120	150	210	210	210	190	170	180
	General	doc=1.5-2D woc=0.1D	Vc (sfm)	60	120	120	140	140	140	140	140	140	140
			N (rpm)	19100	19100	12700	11100	7400	5600	4500	3700	2800	2200
			fz (in/t)	0.0003	0.001	0.001	0.002	0.003	0.003	0.004	0.004	0.005	0.007
			Vf (in/min)	20	50	60	70	110	110	110	100	90	90
Pre-hardened steel (35-45HRC)	High Speed	doc=1.5-2D woc=0.1D	Vc (sfm)	250	250	250	260	260	260	260	260	260	
			N (rpm)	79600	39800	26500	20700	13800	10300	8300	6900	5200	4100
			fz (in/t)	0.0003	0.001	0.001	0.001	0.002	0.003	0.004	0.004	0.004	0.006
			Vf (in/min)	100	100	110	120	180	180	180	160	140	150
	General	doc=0.5-2D woc=0.1D	Vc (sfm)	60	100	100	120	120	120	120	120	120	120
			N (rpm)	19100	15900	10600	9500	6400	4800	3800	3200	2400	1900
			fz (in/t)	0.0002	0.0004	0.001	0.001	0.002	0.002	0.003	0.003	0.003	0.004
			Vf (in/min)	20	30	30	40	60	60	60	50	50	50
Hardened steel (45-55HRC)	High Speed	doc=1.5-2D woc=0.03D	Vc (sfm)	200	200	200	230	230	230	230	230	230	
			N (rpm)	63700	31800	21200	18300	12200	9200	7300	6100	4600	3700
			fz (in/t)	0.0003	0.001	0.001	0.001	0.002	0.003	0.003	0.004	0.004	0.005
			Vf (in/min)	70	70	80	100	140	140	140	130	110	110
	General	doc=1.5-2D woc=0.06D	Vc (sfm)	60	80	80	100	100	100	100	100	100	100
			N (rpm)	19100	12700	8500	8000	5300	4000	3200	2700	2000	1600
			fz (in/t)	0.0002	0.004	0.001	0.001	0.001	0.002	0.002	0.002	0.003	0.004
			Vf (in/min)	20	20	20	30	40	40	40	40	30	30
Hardened steel (55-65HRC)	High Speed	doc=1-1.5D woc=0.02D	Vc (sfm)	150	150	150	180	180	180	180	180	180	
			N (rpm)	47700	23900	15900	14300	9500	7200	5700	4800	3600	2900
			fz (in/t)	0.0002	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004	0.005
			Vf (in/min)	50	50	50	70	100	100	90	90	80	80
	General	doc=1-1.5D woc=0.04D	Vc (sfm)	60	60	60	80	80	80	80	80	80	80
			N (rpm)	19100	9500	6400	6400	4200	3200	2500	2100	1600	1300
			fz (in/t)	0.0002	0.0004	0.001	0.001	0.001	0.002	0.002	0.002	0.003	0.003
			Vf (in/min)	10	10	20	20	30	30	30	30	20	20
Hardened steel (65-70 HRC)	High Speed	doc=1-1.5D woc=0.02D	Vc (sfm)	100	100	100	130	130	130	130	130	130	
			N (rpm)	31800	15900	10600	10300	6900	5200	4100	3400	2600	2100
			fz (in/t)	0.0002	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003	0.004
			Vf (in/min)	30	30	30	40	70	70	60	60	50	50
	General	doc=1-1.5D woc=0.04D	Vc (sfm)	40	40	40	60	60	60	60	60	60	60
			N (rpm)	12700	6400	4200	4800	3200	2400	1900	1600	1200	1000
			fz (in/t)	0.0002	0.0003	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.003
			Vf (in/min)	10	10	10	10	20	20	20	20	20	20

EPBT/CEPR-TH EPOCH SERIES



CEPR-TH
Cutting Conditions
Side Milling
Metric



Work Material (Hardness)	Cutting Range	Depth of cut	Cutting Cond.	Tool Dia. (mm)										
				1	2	3	4	6	8	10	12	16	20	
Tool Steel (25-35HRC)	High Speed	doc=1.5-2D woc=0.1D	Vc (m/min)	250	250	250	280	280	280	280	280	280	280	280
			N (rpm)	79600	39800	26500	22300	14900	11100	8900	7400	5600	4500	
			fz (mm/t)	0.008	0.018	0.029	0.042	0.060	0.080	0.100	0.110	0.130	0.170	
			Vf (mm/min)	2550	2870	3070	3750	5360	5330	5340	4880	4370	4590	
	General	doc=1.5-2D woc=0.1D	Vc (m/min)	60	120	120	140	140	140	140	140	140	140	140
			N (rpm)	19100	19100	12700	11100	7400	5600	4500	3700	2800	2200	
			fz (mm/t)	0.008	0.018	0.029	0.042	0.065	0.085	0.100	0.110	0.130	0.170	
			Vf (mm/min)	610	1380	1470	1860	2890	2860	2700	2440	2180	2240	
Pre-hardened steel (35-45HRC)	High Speed	doc=1.5-2D woc=0.1D	Vc (m/min)	250	250	250	260	260	260	260	260	260	260	
			N (rpm)	79600	39800	26500	20700	13800	10300	8300	6900	5200	4100	
			fz (mm/t)	0.008	0.016	0.026	0.038	0.055	0.075	0.090	0.100	0.110	0.150	
			Vf (mm/min)	2550	2550	2760	3150	4550	4640	4480	4140	3430	3690	
	General	doc=0.5-2D woc=0.1D	Vc (m/min)	60	100	100	120	120	120	120	120	120	120	
			N (rpm)	19100	15900	10600	9500	6400	4800	3800	3200	2400	1900	
			fz (mm/t)	0.005	0.011	0.018	0.026	0.040	0.055	0.065	0.070	0.080	0.105	
			Vf (mm/min)	380	700	760	990	1540	1580	1480	1340	1150	1200	
Hardened steel (45-55HRC)	High Speed	doc=1.5-2D woc=0.03D	Vc (m/min)	200	200	200	230	230	230	230	230	230	230	
			N (rpm)	63700	31800	21200	18300	12200	9200	7300	6100	4600	3700	
			fz (mm/t)	0.007	0.014	0.023	0.033	0.050	0.065	0.080	0.090	0.100	0.130	
			Vf (mm/min)	1780	1780	1950	2420	3660	3590	3500	3290	2760	2890	
	General	doc=1.5-2D woc=0.06D	Vc (m/min)	60	80	80	100	100	100	100	100	100	100	
			N (rpm)	19100	12700	8500	8000	5300	4000	3200	2700	2000	1600	
			fz (mm/t)	0.005	0.010	0.016	0.023	0.035	0.045	0.055	0.060	0.070	0.090	
			Vf (mm/min)	380	510	540	740	1110	1080	1060	970	840	860	
Hardened steel (55-65HRC)	High Speed	doc=1-1.5D woc=0.02D	Vc (m/min)	150	150	150	180	180	180	180	180	180	180	
			N (rpm)	47700	23900	15900	14300	9500	7200	5700	4800	3600	2900	
			fz (mm/t)	0.006	0.013	0.021	0.030	0.045	0.060	0.070	0.080	0.090	0.120	
			Vf (mm/min)	1140	1240	1340	1720	2570	2590	2390	2300	1940	2090	
	General	doc=1-1.5D woc=0.04D	Vc (m/min)	60	60	60	80	80	80	80	80	80	80	
			N (rpm)	19100	9500	6400	6400	4200	3200	2500	2100	1600	1300	
			fz (mm/t)	0.004	0.009	0.015	0.021	0.030	0.040	0.050	0.055	0.065	0.080	
			Vf (mm/min)	310	340	380	540	760	770	750	690	620	620	
Hardened steel (65-70 HRC)	High Speed	doc=1-1.5D woc=0.02D	Vc (m/min)	100	100	100	130	130	130	130	130	130	130	
			N (rpm)	31800	15900	10600	10300	6900	5200	4100	3400	2600	2100	
			fz (mm/t)	0.005	0.012	0.019	0.027	0.040	0.055	0.065	0.070	0.080	0.110	
			Vf (mm/min)	640	760	810	1110	1660	1720	1600	1430	1250	1390	
	General	doc=1-1.5D woc=0.04D	Vc (m/min)	40	40	40	60	60	60	60	60	60	60	
			N (rpm)	12700	6400	4200	4800	3200	2400	1900	1600	1200	1000	
			fz (mm/t)	0.004	0.008	0.013	0.019	0.030	0.040	0.045	0.050	0.055	0.075	
			Vf (mm/min)	200	200	220	360	580	580	510	480	400	450	



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Hitachi Metals America, LTD.
Material Trading Division, Cutting Tools Group
41800 W. Eleven Mile Road, Suite 100
Novi, MI 48375

Tel. 800.333.1514
Fax 248.465.6020
email info@hitachitoolusa.com
www.hitachitoolusa.com