

EPDB/EPDBP

HITACHI
Inspire the Next

EPOCH SERIES

Sub-Micrograin Carbide Tools for
High-Performance Die/Mold Machining

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High-Precision Ball End Mills for Deep Machining

- Revolutionary neck design for improved breakage resistance and reduced vibration
- Newly developed cutting edge & flute geometry for stability in long overhang machining
- Ideal for precision machining conventionally done by EDM
- TH and CS Coatings for maximum efficiency and tool life
- EPDBP Pencil Neck Series features even greater reach and “Back Draft Effect”



EPDB-CS

INTRODUCTION

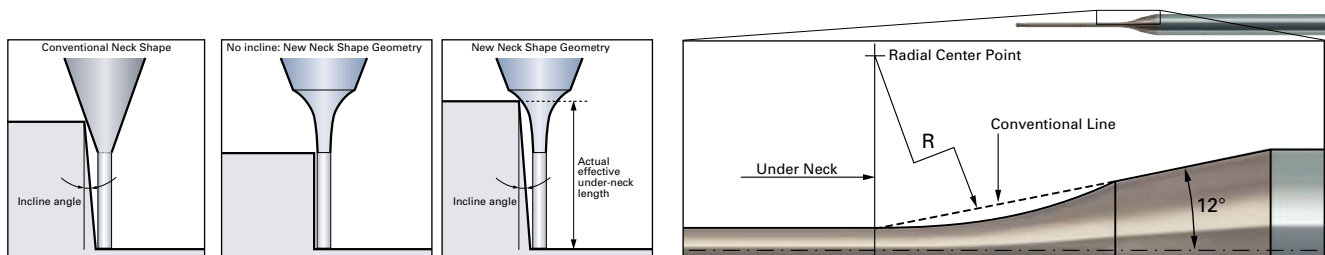
The EPDB/EPDBP Epoch Series Ball End Mills have been designed for cutting deep ribs and slots in molds, as well as machining deep corners and precision features that were previously performed by EDM (electrical discharge machining).

Featuring a revolutionary neck design, these end mills exhibit greater breakage resistance and less vibration during high-speed machining than competitors' tools. New cutting geometries as well as the revolutionary TH and CS Coatings (EPDB only) help to maximize machining performance as well as tool life.

FEATURES

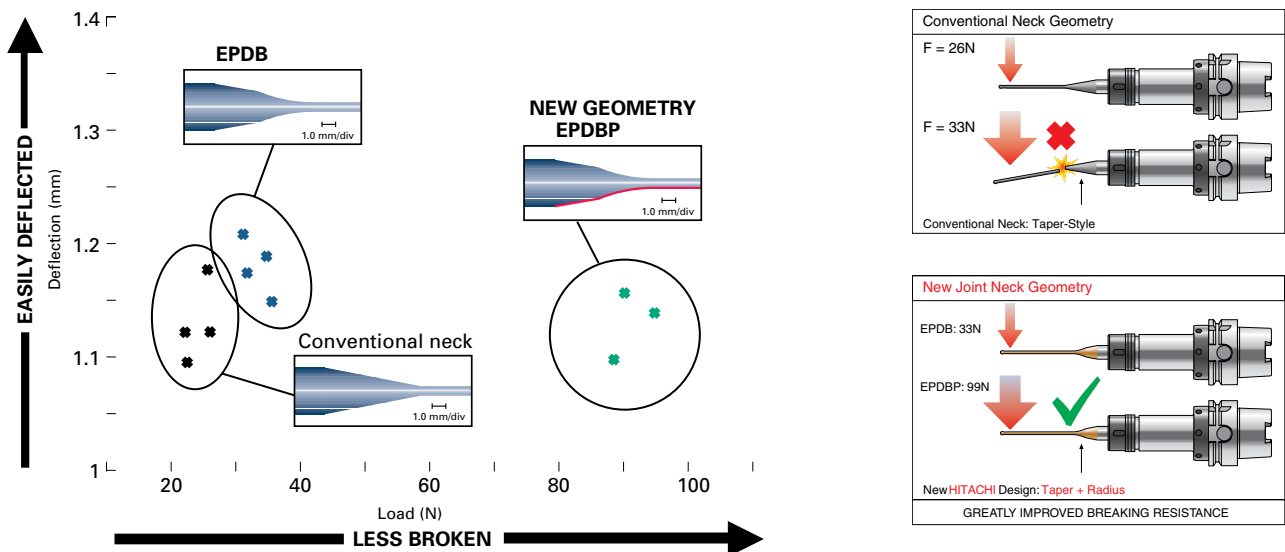
1. New Neck Shape Eliminates Contact Against the Workpiece

The new neck shape of the EPDB/EPDBP End Mills gives them a longer effective reach in mold with draft angles. For example, when machining a draft angle of 1° using an R0.5mm end mill with a 10mm under neck length, the actual effective reach with the new neck shape is 12.03mm, compared to 10.8mm with the conventional neck shape.



2. New Neck Shape Improves Breakage Resistance

As shown in the chart, the neck shape of the EPDB/EPDBP provides increased breakage resistance without taking on the poor deflection capabilities of traditional full radius neck style end mills.

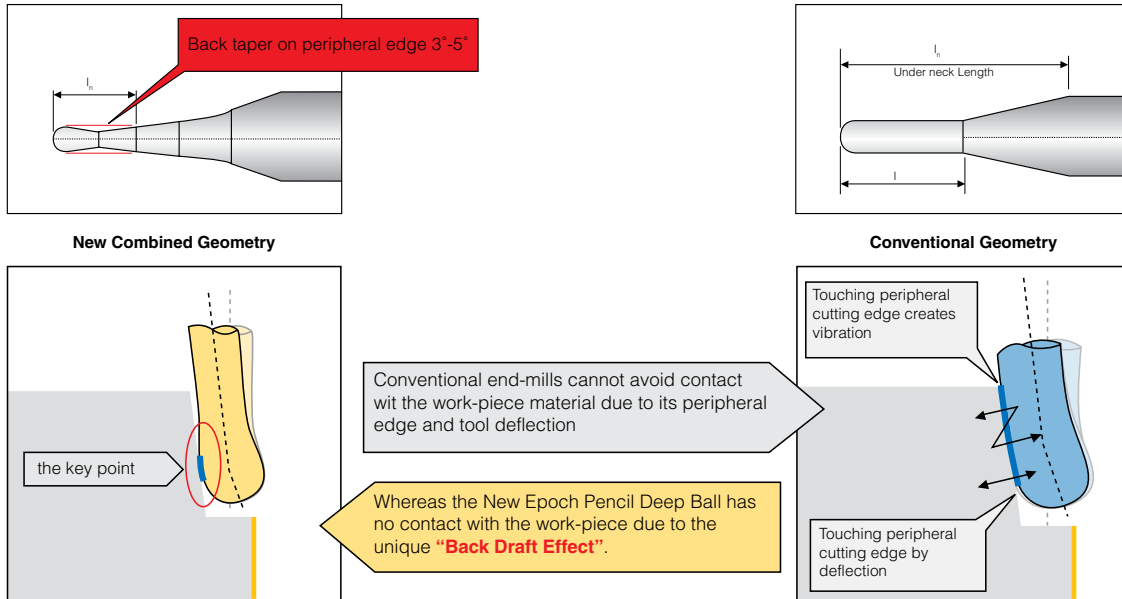


EPDB/EPDBP EPOCH SERIES

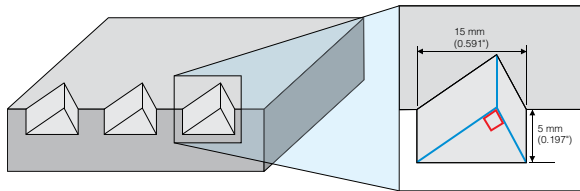


3. Back Taper and Back Draft Effect: EPDBP

The EPDBP End Mills feature a 3° - 5° back taper on their peripheral edges, allowing them to avoid contact with the workpiece (also known as the Back Draft Effect). Conventional end mills cannot avoid contact with the workpiece, leading to tool deflection, chatter and vibration.



Designed for long reach, steep side wall applications, the EPDBP end mills are capable of twice the speed of competitive end mills.



Dia 1 x 10 mm H13

	Competitor	DBP Condition
N rpm	20,000	20,000
v _f mm/min	800 (31.496 ipm)	1,600 (62.992 ipm)
doc mm	0.02 (0.0008")	0.01 (0.0004")
woc mm	0.06 (0.0024")	0.05 (0.0020")

4. Feed Limit Test: EPDB

The neck shape and cutting geometries of the EPDB/EPDBP allows them to perform at much higher feed rates than competitive end mills.

EPDB-2010-12 · R 0.5 x 12 mm

Stavax (52HRC)

N = 20,000 rpm
 doc x woc = 0.1 x 0.1 mm (0.0039" x 0.0039")

Wet cutting

⊙ Excellent

○ Good

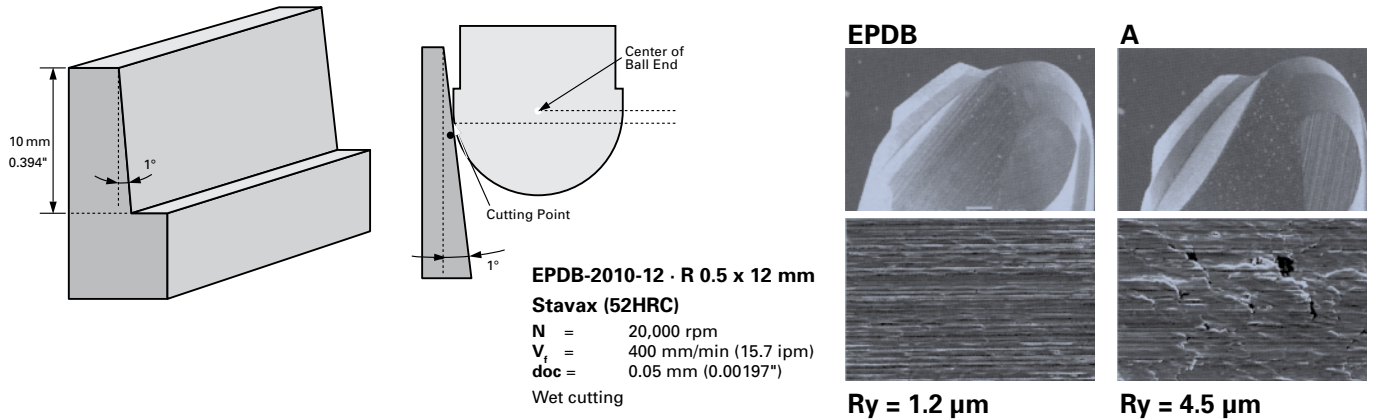
V _f mm/min	800 (32 ipm)	1,000 (39.2 ipm)	1,200-1,600 (47.2-62.8 ipm)	1,800 (70.8 ipm)	2,000 (78.8 ipm)	2,200 (86.4 ipm)	2,400-4,800 (94.5-189 ipm)	5,000 (196.9 ipm)
EPDB	⊙	⊙	⊙ ~ ⊙	○	○	○	○ ~ ○	○
A	⊙	⊙	○ ~ ○	○	○	Broken		
B	⊙	Broken						

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5. Incline Machining Test: EPDB

When machining an incline on hardened die steel, the EPDB showed much better surface finish than competitive end mills.

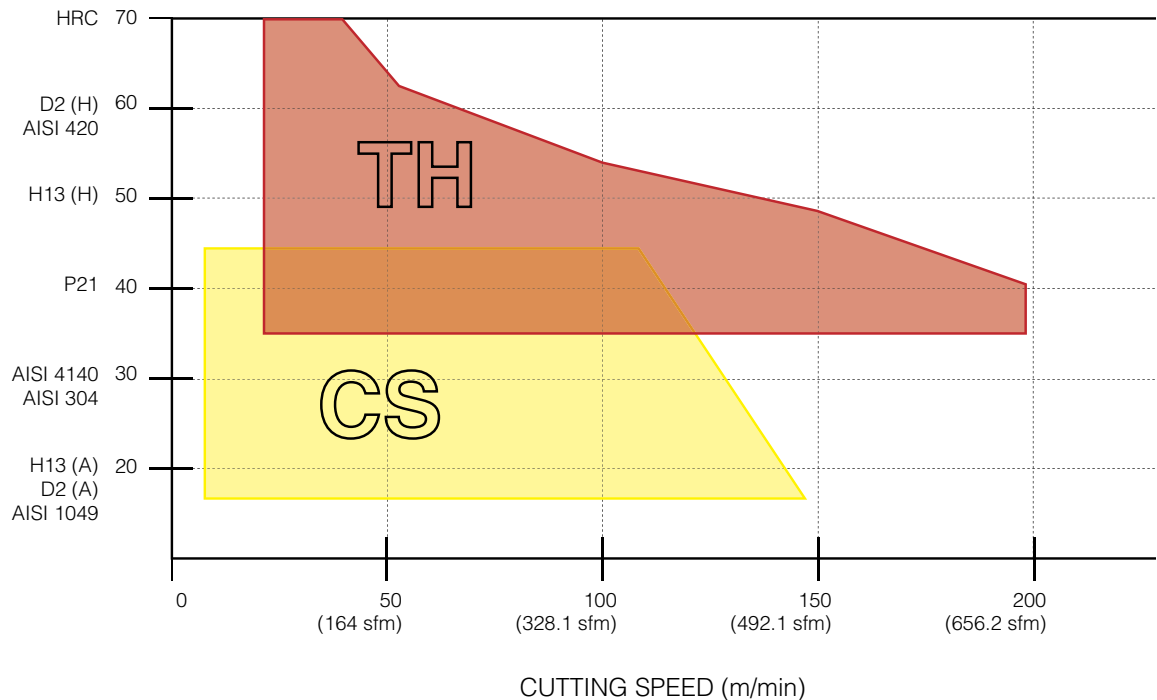


6. Revolutionary CS and TH Coatings

The EPDB is available in both TH and CS Coatings (EPDBP is available in TH Coating only). Coatings should be selected based on the work material and cutting conditions.

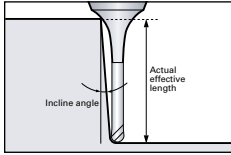
TH Coating is ideal for high speed, high efficiency machining of hardened steels. The nano-composite coating offers extraordinary heat resistance and hardness.

CS Coating is ideal for high precision milling of steels up to 43HRC. The nano-composite coating offers excellent lubricity without reducing hardness.



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EPDB/EPDB-TH
Epoch Deep Ball



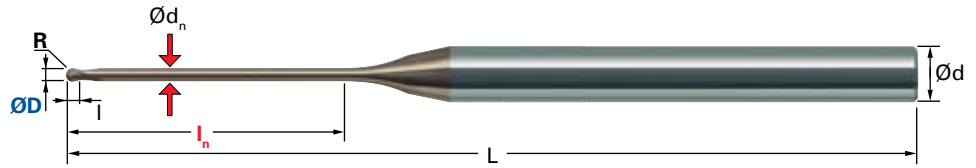
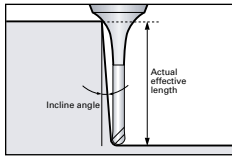
Helix Angle	20°
R	±0.005
D	0/-0.010
d	h5

EPDB / EPDB-TH

Part No. CS Coating	Part No. TH Coating	Flutes	Size							Actual Effective Length in Incline Angles			
			ØD	R	I _n	I	Ød _n	L	Ød	0.5°	1°	2°	3°
EPDB2004-1	EPDB2004-1-TH	2	0.4	0.20	1	0.30	0.37	50	4	1.51	1.79	2.25	2.66
EPDB2004-3	EPDB2004-3-TH	2	0.4	0.20	3	0.30	0.37	50	4	3.81	4.21	4.82	5.35
EPDB2005-4	EPDB2005-4-TH	2	0.5	0.25	4	0.35	0.47	50	4	4.92	5.36	6.04	6.60
EPDB2005-6	EPDB2005-6-TH	2	0.5	0.25	6	0.35	0.47	50	4	7.11	7.62	8.40	9.04
EPDB2006-4	EPDB2006-4-TH	2	0.6	0.30	4	0.40	0.57	50	4	4.92	5.36	6.04	6.60
EPDB2006-8	EPDB2006-8-TH	2	0.6	0.30	8	0.40	0.57	50	4	9.26	9.84	10.70	11.40
EPDB2010-3	EPDB2010-3-TH	2	1.0	0.50	3	0.80	0.96	50	4	3.81	4.21	4.82	5.35
EPDB2010-4	EPDB2010-4-TH	2	1.0	0.50	4	0.80	0.96	50	4	4.92	5.36	6.04	6.60
EPDB2010-6	EPDB2010-6-TH	2	1.0	0.50	6	0.80	0.96	50	4	7.11	7.62	8.40	9.04
EPDB2010-8	EPDB2010-8-TH	2	1.0	0.50	8	0.80	0.96	50	4	9.26	9.84	10.70	11.40
EPDB2010-10	EPDB2010-10-TH	2	1.0	0.50	10	0.80	0.96	50	4	11.40	12.03	12.97	13.72
EPDB2010-12	EPDB2010-12-TH	2	1.0	0.50	12	0.80	0.96	55	4	13.53	14.21	15.21	16.01
EPDB2010-16	EPDB2010-16-TH	2	1.0	0.50	16	0.80	0.96	55	4	17.75	18.52	19.64	21.23
EPDB2010-20	EPDB2010-20-TH	2	1.0	0.50	20	0.80	0.96	60	4	21.94	22.79	24.00	26.54
EPDB2015-8	EPDB2015-8-TH	2	1.5	0.75	8	1.35	1.44	50	4	9.26	9.84	10.70	11.40
EPDB2015-12	EPDB2015-12-TH	2	1.5	0.75	12	1.35	1.44	55	4	13.53	14.21	15.21	16.01
EPDB2015-20	EPDB2015-20-TH	2	1.5	0.75	20	1.35	1.44	60	4	21.94	22.79	24.00	26.54

EPDB/EPDBP EPOCH SERIES

EPDB/EPDB-TH
Epoch Deep Ball
(continued)



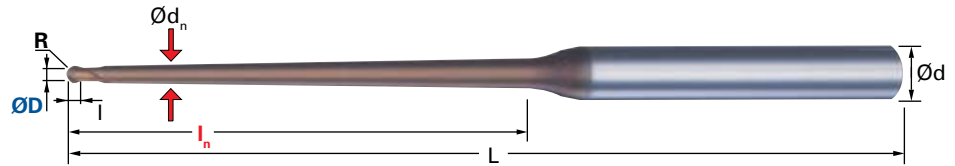
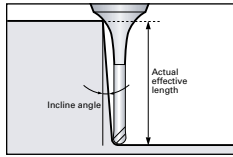
Helix Angle	20°
R	±0.005
D	0/-0.010
d	h5

EPDB / EPDB-TH

Part No. CS Coating	Part No. TH Coating	Flutes	ØD	R	Size			L	Ød	Actual Effective Length in Incline Angles			
					I _n	I	Ød _n			0.5°	1°	2°	3°
EPDB2020-6	EPDB2020-6-TH	2	2.0	1.00	6	1.70	1.92	50	4	7.11	7.62	8.40	9.04
EPDB2020-8	EPDB2020-8-TH	2	2.0	1.00	8	1.70	1.92	50	4	9.26	9.84	10.70	11.40
EPDB2020-10	EPDB2020-10-TH	2	2.0	1.00	10	1.70	1.92	50	4	11.40	12.03	12.97	13.72
EPDB2020-12	EPDB2020-12-TH	2	2.0	1.00	12	1.70	1.92	55	4	13.53	14.21	15.21	16.01
EPDB2020-16	EPDB2020-16-TH	2	2.0	1.00	16	1.70	1.92	55	4	17.75	18.52	19.64	21.23
EPDB2020-20	EPDB2020-20-TH	2	2.0	1.00	20	1.70	1.92	60	4	21.94	22.79	24.00	26.54
EPDB2020-25	EPDB2020-25-TH	2	2.0	1.00	25	1.70	1.92	65	4	27.16	28.09	29.91	-
EPDB2020-30	EPDB2020-30-TH	2	2.0	1.00	30	1.70	1.92	70	4	32.36	33.36	35.89	-
EPDB2030-10	EPDB2030-10-TH	2	3.0	1.50	10	2.50	2.88	55	6	11.40	12.03	12.97	13.72
EPDB2030-25	EPDB2030-25-TH	2	3.0	1.50	25	2.50	2.88	70	6	27.16	28.09	29.91	33.18
EPDB2030-35	EPDB2030-35-TH	2	3.0	1.50	35	2.50	2.88	80	6	37.53	38.60	41.88	46.45
EPDB2040-16	EPDB2040-16-TH	2	4.0	2.00	16	3.00	3.9	60	6	17.75	18.52	19.64	21.23
EPDB2040-35	EPDB2040-35-TH	2	4.0	2.00	36	3.00	3.9	80	6	37.53	38.60	-	-
EPDB2040-50	EPDB2040-50-TH	2	4.0	2.00	50	3.00	3.9	100	6	53.00	54.24	-	-

EPDB/EPDBP EPOCH SERIES

EPDBP
Epoch Deep Ball
Pencil Neck



Helix Angle	30°
R	±0.005
D	0/-0.010
d	h5

EPDBP

Size

Actual Effective Length in Incline Angles

Part No.	Flutes	ØD	R	θ	I _n	I	Ød _{n1}	Ød _n	L	Ød	I'	θ2	0.5°	1°	2°	3°
EPDBP2004-4-09-TH	2	0.4	0.20	0.9°	4	0.3	0.37	0.486	50	4	1.25	8.49°	-	4.87	5.72	6.34
EPDBP2004-5-09-TH	2	0.4	0.20	0.9°	5	0.3	0.37	0.518	50	4	1.25	7.89°	-	5.90	6.85	7.53
EPDBP2006-6-09-TH	2	0.6	0.30	0.9°	6	0.4	0.57	0.746	50	4	1.35	7.26°	-	6.92	7.96	8.68
EPDBP2006-8-09-TH	2	0.6	0.30	0.9°	8	0.4	0.57	0.809	50	4	1.35	6.38°	-	8.96	10.18	10.98
EPDBP2006-10-09-TH	2	0.6	0.30	0.9°	10	0.4	0.57	0.872	50	4	1.35	5.69°	-	11.01	12.37	13.25
EPDBP2006-12-09-TH	2	0.6	0.30	0.9°	12	0.4	0.57	0.934	55	4	1.35	5.14°	-	13.05	14.54	15.49
EPDBP2006-15-09-TH	2	0.6	0.30	0.9°	15	0.4	0.57	1.029	55	4	1.35	4.49°	-	16.10	17.78	18.81
EPDBP2010-10-09-TH	2	1.0	0.50	0.9°	10	0.8	0.94	1.229	55	6	2.70	6.88°	-	11.20	12.44	13.28
EPDBP2010-15-09-TH	2	1.0	0.50	0.9°	15	0.8	0.94	1.386	60	6	2.70	5.64°	-	16.28	17.84	18.84
EPDBP2010-20-09-TH	2	1.0	0.50	0.9°	20	0.8	0.94	1.543	65	6	2.70	4.77°	-	21.35	23.18	24.68
EPDBP2010-25-09-TH	2	1.0	0.50	0.9°	25	0.8	0.94	1.700	70	6	2.70	4.13°	-	26.42	28.48	30.83
EPDBP2010-30-09-TH	2	1.0	0.50	0.9°	30	0.8	0.94	1.857	75	6	2.70	3.65°	-	31.49	33.75	36.98
EPDBP2010-35-09-TH	2	1.0	0.50	0.9°	35	0.8	0.94	2.015	80	6	2.70	3.27°	-	36.55	39.00	43.12
EPDBP2015-15-09-TH	2	1.5	0.75	0.9°	15	1.35	1.42	1.849	60	6	3.89	5.36°	-	16.40	17.88	18.86
EPDBP2015-20-09-TH	2	1.5	0.75	0.9°	20	1.35	1.42	2.006	65	6	3.89	4.50°	-	21.47	23.21	24.72
EPDBP2015-30-09-TH	2	1.5	0.75	0.9°	30	1.35	1.42	2.32	75	6	3.89	3.40°	-	31.59	33.78	37.01
EPDBP2020-20-09-TH	2	2.0	1.00	0.9°	20	1.7	1.92	2.495	65	6	4.24	4.20°	-	21.48	23.20	24.68
EPDBP2020-25-09-TH	2	2.0	1.00	0.9°	25	1.7	1.92	2.652	65	6	4.24	3.59°	-	26.54	28.50	30.82
EPDBP2020-30-09-TH	2	2.0	1.00	0.9°	30	1.7	1.92	2.809	70	6	4.24	3.14°	-	31.60	33.77	36.97
EPDBP2020-35-09-TH	2	2.0	1.00	0.9°	35	1.7	1.92	2.966	75	6	4.24	2.79°	-	36.66	39.02	N/A
EPDBP2020-40-09-TH	2	2.0	1.00	0.9°	40	1.7	1.92	3.123	80	6	4.24	2.51°	-	41.72	44.50	N/A
EPDBP2020-50-09-TH	2	2.0	1.00	0.9°	50	1.7	1.92	3.438	90	6	4.24	2.09°	-	51.82	55.58	N/A
EPDBP2030-30-09-TH	2	3.0	1.50	0.9°	30	2.5	2.86	3.724	70	6	6.95	2.54°	-	31.82	33.84	N/A
EPDBP2030-40-09-TH	2	3.0	1.50	0.9°	40	2.5	2.86	4.038	80	6	6.95	2.00°	-	41.92	N/A	N/A
EPDBP2030-50-09-TH	2	3.0	1.50	0.9°	50	2.5	2.86	4.352	90	6	6.95	1.64°	-	52.01	N/A	N/A
EPDBP2030-60-09-TH	2	3.0	1.50	0.9°	60	2.5	2.86	4.667	100	6	6.95	1.39°	-	62.10	N/A	N/A

EPDB/EPDBP EPOCH SERIES



EPDB
Cutting Conditions
Inch



Work Piece Material			Carbon Steels, Alloy Steels(180~250HB) Copper(Cu): N+20% / fz+20%					CS	Tool Steels (25~35HRC)					CS
Radius (mm)	Mill Dia. (mm)	Under Neck Length	doc (in)	woc (in)	N (rpm)	fz (in/tooth)	Vf (in/min)	doc (in)	woc (in)	N (rpm)	fz (in/tooth)	Vf (in/min)		
0.10	0.2	0.5	0.0008	0.002	50,000	0.0002	15.748	0.0007	0.002	50,000	0.0001	14.173		
0.10	0.2	1.5	0.0003	0.001	50,000	0.0002	15.748	0.0003	0.001	50,000	0.0001	14.173		
0.15	0.3	1.0	0.0008	0.002	50,000	0.0002	23.622	0.0007	0.002	50,000	0.0002	21.260		
0.15	0.3	2.0	0.0005	0.001	50,000	0.0002	23.622	0.0004	0.001	50,000	0.0002	21.260		
0.20	0.4	1.0	0.0016	0.005	50,000	0.0004	35.433	0.0014	0.004	50,000	0.0003	31.890		
0.20	0.4	3.0	0.0006	0.002	50,000	0.0003	31.890	0.0006	0.002	50,000	0.0003	28.740		
0.25	0.5	4.0	0.0008	0.002	50,000	0.0004	43.307	0.0007	0.002	50,000	0.0004	38.976		
0.25	0.5	6.0	0.0005	0.002	50,000	0.0004	43.307	0.0005	0.001	40,000	0.0004	31.102		
0.30	0.6	4.0	0.0009	0.003	50,000	0.0005	51.181	0.0009	0.003	43,000	0.0005	39.764		
0.30	0.6	8.0	0.0006	0.002	32,000	0.0005	32.677	0.0005	0.002	29,000	0.0005	26.772		
0.40	0.8	2.0	0.0031	0.009	48,000	0.0007	68.110	0.0028	0.009	36,000	0.0006	46.063		
0.40	0.8	6.0	0.0013	0.004	43,000	0.0007	61.024	0.0011	0.003	32,000	0.0006	40.945		
0.40	0.8	10.0	0.0008	0.002	24,000	0.0007	33.858	0.0007	0.002	21,000	0.0006	26.772		
0.50	1.0	3.0	0.0039	0.012	38,000	0.0009	65.748	0.0035	0.011	29,000	0.0008	45.276		
0.50	1.0	4.0	0.0028	0.008	38,000	0.0009	65.748	0.0025	0.007	29,000	0.0008	45.276		
0.50	1.0	6.0	0.0016	0.005	34,000	0.0009	59.055	0.0014	0.004	29,000	0.0008	45.276		
0.50	1.0	8.0	0.0016	0.005	34,000	0.0009	59.055	0.0014	0.004	29,000	0.0008	45.276		
0.50	1.0	10.0	0.0010	0.003	27,000	0.0009	46.850	0.0009	0.003	20,000	0.0008	31.102		
0.50	1.0	12.0	0.0010	0.003	27,000	0.0009	46.850	0.0009	0.003	20,000	0.0008	31.102		
0.50	1.0	16.0	0.0006	0.002	19,000	0.0009	33.071	0.0005	0.002	17,000	0.0008	26.772		
0.50	1.0	20.0	0.0004	0.001	19,000	0.0009	33.071	0.0004	0.001	17,000	0.0008	26.772		
0.60	1.2	8.0	0.0016	0.005	29,000	0.0010	59.449	0.0014	0.004	21,000	0.0008	38.583		
0.60	1.2	12.0	0.0012	0.004	22,000	0.0010	44.882	0.0011	0.003	17,000	0.0008	31.102		
0.70	1.4	8.0	0.0022	0.006	25,000	0.0012	59.055	0.0019	0.006	18,000	0.0011	38.189		
0.70	1.4	16.0	0.0014	0.004	19,000	0.0012	44.882	0.0012	0.004	14,000	0.0011	29.921		
0.75	1.5	8.0	0.0024	0.007	23,000	0.0013	59.843	0.0021	0.006	17,000	0.0012	39.764		
0.75	1.5	12.0	0.0024	0.007	23,000	0.0013	59.843	0.0021	0.006	17,000	0.0012	39.764		
0.75	1.5	20.0	0.0015	0.004	13,000	0.0013	33.858	0.0013	0.004	11,500	0.0012	26.772		
0.80	1.6	12.0	0.0026	0.008	21,000	0.0014	57.874	0.0023	0.007	16,000	0.0012	39.764		
0.80	1.6	20.0	0.0016	0.005	12,000	0.0014	33.071	0.0014	0.004	11,000	0.0012	27.165		
0.90	1.8	12.0	0.0028	0.008	19,000	0.0015	58.268	0.0025	0.007	14,000	0.0014	38.583		
0.90	1.8	20.0	0.0018	0.005	15,000	0.0015	46.063	0.0016	0.005	11,000	0.0014	30.315		
1.00	2.0	6.0	0.0079	0.024	19,000	0.0017	64.173	0.0071	0.021	14,000	0.0015	42.520		
1.00	2.0	8.0	0.0055	0.017	19,000	0.0017	64.173	0.0050	0.015	14,000	0.0015	42.520		
1.00	2.0	10.0	0.0055	0.017	19,000	0.0017	64.173	0.0050	0.015	14,000	0.0015	42.520		
1.00	2.0	12.0	0.0031	0.009	17,000	0.0017	57.480	0.0028	0.009	13,000	0.0015	39.370		
1.00	2.0	16.0	0.0031	0.009	17,000	0.0017	57.480	0.0028	0.009	13,000	0.0015	39.370		
1.00	2.0	20.0	0.0020	0.006	13,000	0.0017	44.094	0.0018	0.005	10,000	0.0015	30.709		
1.00	2.0	25.0	0.0020	0.006	9,600	0.0017	32.677	0.0018	0.005	8,600	0.0015	26.378		
1.00	2.0	30.0	0.0012	0.004	9,600	0.0017	32.677	0.0011	0.003	8,600	0.0015	26.378		
1.50	3.0	10.0	0.0083	0.025	13,000	0.0031	81.890	0.0074	0.022	9,600	0.0028	54.331		
1.50	3.0	25.0	0.0031	0.009	8,900	0.0031	55.906	0.0028	0.009	6,700	0.0028	37.795		
1.50	3.0	35.0	0.0031	0.009	8,900	0.0031	55.906	0.0028	0.009	6,700	0.0028	37.795		
2.00	4.0	16.0	0.0110	0.033	9,600	0.0039	75.591	0.0099	0.030	7,200	0.0035	51.181		
2.00	4.0	35.0	0.0039	0.012	6,700	0.0039	52.756	0.0035	0.011	5,000	0.0035	35.433		
2.00	4.0	50.0	0.0039	0.012	4,800	0.0039	37.795	0.0035	0.011	4,300	0.0035	30.315		
2.50	5.0	25.0	0.0138	0.041	7,600	0.0047	71.654	0.0124	0.037	5,700	0.0042	48.425		
2.50	5.0	40.0	0.0079	0.024	7,000	0.0047	66.142	0.0071	0.021	5,200	0.0043	44.094		
3.00	6.0	30.0	0.0165	0.050	6,400	0.0055	70.472	0.0149	0.045	4,800	0.0050	47.638		
3.00	6.0	50.0	0.0059	0.018	4,500	0.0055	49.606	0.0053	0.016	3,300	0.0050	32.677		

EPDB/EPDBP EPOCH SERIES



EPDB
Cutting Conditions
Inch
(continued)



Tool Steels (35~45HRC)					CS	TH	Hardened Steels (45~55HRC)					TH	Hardened Steels (55~70HRC)					TH										
doc (in)	woc (in)	N (rpm)	fz (in/tooth)	Vf (in/min)			doc (in)	woc (in)	N (rpm)	fz (in/tooth)	Vf (in/min)		doc (in)	woc (in)	N (rpm)	fz (in/tooth)	Vf (in/min)											
0.0006	0.002	50,000	0.0001	12.598			0.0005	0.002	50,000	0.0001	11.024		0.0004	0.001	50,000	0.0001	8.661											
0.0003	0.001	50,000	0.0001	12.598			0.0002	0.001	50,000	0.0001	11.024		0.0002	0.001	50,000	0.0001	8.661											
0.0007	0.002	50,000	0.0002	18.898			0.0005	0.002	50,000	0.0002	16.535		0.0004	0.001	50,000	0.0001	13.386											
0.0004	0.001	50,000	0.0002	18.898			0.0003	0.001	48,000	0.0002	15.748		0.0002	0.001	38,400	0.0002	12.598											
0.0013	0.004	50,000	0.0003	28.346			0.0010	0.003	40,000	0.0002	19.685		0.0008	0.002	32,000	0.0002	15.748											
0.0005	0.002	50,000	0.0003	25.591			0.0004	0.001	36,000	0.0002	16.142		0.0003	0.001	28,800	0.0002	12.992											
0.0006	0.002	40,000	0.0003	27.559			0.0005	0.002	29,000	0.0003	17.717		0.0004	0.001	23,200	0.0003	14.173											
0.0004	0.001	31,000	0.0003	21.654			0.0003	0.000	29,000	0.0003	17.717		0.0003	0.001	23,200	0.0003	14.173											
0.0008	0.002	33,000	0.0004	27.165			0.0006	0.002	24,000	0.0004	17.323		0.0005	0.001	19,200	0.0004	13.780											
0.0005	0.001	26,000	0.0004	21.260			0.0004	0.001	24,000	0.0004	17.323		0.0003	0.001	19,200	0.0004	13.780											
0.0025	0.008	28,000	0.0006	31.890			0.0020	0.006	20,000	0.0005	19.685		0.0016	0.005	16,000	0.0005	15.748											
0.0010	0.003	25,000	0.0006	28.346			0.0008	0.002	18,000	0.0005	17.717		0.0006	0.002	14,400	0.0005	14.173											
0.0006	0.002	20,000	0.0006	22.441			0.0005	0.002	18,000	0.0005	17.717		0.0004	0.001	14,400	0.0005	14.173											
0.0031	0.009	22,000	0.0007	30.315			0.0026	0.008	16,000	0.0006	19.291		0.0020	0.006	12,800	0.0006	15.354											
0.0022	0.007	22,000	0.0007	30.315			0.0018	0.005	16,000	0.0006	19.291		0.0014	0.004	12,800	0.0006	15.354											
0.0013	0.004	20,000	0.0007	27.953			0.0010	0.003	14,000	0.0006	16.929		0.0008	0.002	11,200	0.0006	13.780											
0.0013	0.004	20,000	0.0007	27.953			0.0010	0.003	14,000	0.0006	16.929		0.0008	0.002	11,200	0.0006	13.780											
0.0008	0.002	16,000	0.0007	22.047			0.0006	0.002	14,000	0.0006	16.929		0.0005	0.001	11,200	0.0006	13.780											
0.0008	0.002	16,000	0.0007	22.047			0.0006	0.002	14,000	0.0006	16.929		0.0005	0.001	11,200	0.0006	13.780											
0.0005	0.001	16,000	0.0007	22.441			0.0004	0.001	14,000	0.0006	16.929		0.0003	0.001	11,200	0.0006	13.780											
0.0003	0.001	16,000	0.0007	22.441			0.0003	0.001	14,000	0.0006	16.929		0.0002	0.001	11,200	0.0006	13.780											
0.0013	0.004	17,000	0.0008	27.953			0.0010	0.003	12,000	0.0007	17.323		0.0008	0.002	9,600	0.0007	13.780											
0.0009	0.003	13,000	0.0008	21.260			0.0008	0.002	12,000	0.0007	17.323		0.0006	0.002	9,600	0.0007	13.780											
0.0017	0.005	14,000	0.0009	26.378			0.0014	0.004	10,000	0.0008	16.535		0.0011	0.003	8,000	0.0008	13.386											
0.0011	0.003	11,000	0.0009	20.866			0.0009	0.003	10,000	0.0008	16.535		0.0007	0.002	8,000	0.0008	13.386											
0.0019	0.006	13,000	0.0010	27.165			0.0015	0.005	9,600	0.0009	17.323		0.0012	0.004	7,680	0.0009	14.173											
0.0019	0.006	13,000	0.0010	27.165			0.0015	0.005	9,600	0.0009	17.323		0.0012	0.004	7,680	0.0009	14.173											
0.0012	0.004	10,000	0.0010	20.866			0.0010	0.003	9,600	0.0009	17.323		0.0007	0.002	7,680	0.0009	14.173											
0.0020	0.006	13,000	0.0011	28.740			0.0017	0.005	9,000	0.0010	17.323		0.0013	0.004	7,200	0.0010	13.780											
0.0013	0.004	10,000	0.0011	22.047			0.0010	0.003	9,000	0.0010	17.323		0.0008	0.002	7,200	0.0010	13.780											
0.0022	0.007	11,000	0.0012	27.165			0.0018	0.005	8,000	0.0011	17.323		0.0014	0.004	6,400	0.0011	13.780											
0.0014	0.004	8,700	0.0012	21.260			0.0012	0.003	8,000	0.0011	17.323		0.0009	0.003	6,400	0.0011	13.780											
0.0063	0.019	11,000	0.0014	29.528			0.0051	0.015	8,000	0.0012	18.898		0.0039	0.012	6,400	0.0012	14.961											
0.0044	0.013	11,000	0.0014	29.528			0.0036	0.011	8,000	0.0012	18.898		0.0028	0.008	6,400	0.0012	14.961											
0.0044	0.013	11,000	0.0014	29.528			0.0036	0.011	8,000	0.0012	18.898		0.0028	0.008	6,400	0.0012	14.961											
0.0025	0.008	10,000	0.0014	27.165			0.0020	0.006	7,200	0.0012	16.929		0.0016	0.005	5,760	0.0012	13.780											
0.0025	0.008	10,000	0.0014	27.165			0.0020	0.006	7,200	0.0012	16.929		0.0016	0.005	5,760	0.0012	13.780											
0.0016	0.005	7,800	0.0014	21.260			0.0013	0.004	7,200	0.0012	16.929		0.0010	0.003	5,760	0.0012	13.780											
0.0016	0.005	7,800	0.0014	21.260			0.0013	0.004	7,200	0.0012	17.323		0.0010	0.003	5,760	0.0012	13.780											
0.0009	0.003	7,800	0.0014	21.260			0.0008	0.002	7,200	0.0012	17.323		0.0006	0.002	5,760	0.0012	13.780											
0.0066	0.020	7,400	0.0025	37.402			0.0054	0.016	5,300	0.0022	23.228		0.0041	0.012	4,240	0.0022	18.504											
0.0025	0.008	5,200	0.0025	25.984			0.0020	0.006	4,800	0.0022	21.260		0.0016	0.005	3,840	0.0022	16.929											
0.0025	0.008	5,200	0.0025	25.984			0.0020	0.006	4,800	0.0022	21.260		0.0016	0.005	3,840	0.0022	16.929											
0.0088	0.026	5,600	0.0031	35.433			0.0072	0.021	4,000	0.0028	22.047		0.0055	0.017	3,200	0.0028	17.717											
0.0031	0.009	3,900	0.0031	24.409			0.0026	0.008	3,600	0.0028	19.685		0.0020	0.006	2,880	0.0028	15.748											
0.0031	0.009	3,900	0.0031	24.409			0.0026	0.008	3,600	0.0028	19.685		0.0020	0.006	2,880	0.0028	15.748											
0.0110	0.033	4,500	0.0038	33.858			0.0090	0.027	3,200	0.0033	21.260		0.0069	0.021	2,560	0.0033	16.929											
0.0063	0.019	4,000	0.0038	30.315			0.0051	0.015	2,900	0.0033	19.291		0.0039	0.012	2,320	0.0033	15.354											
0.0132	0.040	3,700	0.0044	32.677			0.0107	0.032	2,700	0.0039	20.866		0.0083	0.025	2,160	0.0039	16.535											
0.0047	0.014	2,600	0.0044	22.835			0.0038	0.012	2,400	0.0039	18.504		0.0030	0.009	1,920	0.0039	14.961											

EPDB/EPDBP EPOCH SERIES



EPDB
Cutting Conditions
Metric



Work Piece Material			Carbon Steels, Alloy Steels(180~250HB) Copper(Cu): N+20% / fz+20%					CS	Tool Steels (25~35HRC)					CS
Radius (mm)	Mill Dia. (mm)	Under Neck Length	d _{oc} (mm)	w _{oc} (mm)	N (rpm)	f _z (mm/ tooth)	V _f (mm/ min)	d _{oc} (mm)	w _{oc} (mm)	N (rpm)	f _z (mm/ tooth)	V _f (mm/ min)		
0.10	0.2	0.5	0.020	0.06	50,000	0.004	400	0.018	0.054	50,000	0.004	360		
0.10	0.2	1.5	0.008	0.024	50,000	0.004	400	0.007	0.022	50,000	0.004	360		
0.15	0.3	1.0	0.021	0.063	50,000	0.006	600	0.019	0.057	50,000	0.005	540		
0.15	0.3	2.0	0.012	0.036	50,000	0.006	600	0.011	0.032	50,000	0.005	540		
0.20	0.4	1.0	0.040	0.12	50,000	0.009	900	0.036	0.108	50,000	0.008	810		
0.20	0.4	3.0	0.016	0.048	50,000	0.008	810	0.014	0.043	50,000	0.007	730		
0.25	0.5	4.0	0.020	0.060	50,000	0.011	1,100	0.018	0.054	50,000	0.001	990		
0.25	0.5	6.0	0.013	0.039	50,000	0.011	1,100	0.012	0.035	40,000	0.001	790		
0.30	0.6	4.0	0.024	0.072	50,000	0.013	1,300	0.022	0.065	43,000	0.012	1,010		
0.30	0.6	8.0	0.015	0.045	32,000	0.013	830	0.014	0.041	29,000	0.012	680		
0.40	0.8	2.0	0.080	0.240	48,000	0.018	1,730	0.072	0.216	36,000	0.016	1,170		
0.40	0.8	6.0	0.032	0.096	43,000	0.018	1,550	0.029	0.086	32,000	0.016	1,040		
0.40	0.8	10.0	0.020	0.060	24,000	0.018	860	0.018	0.054	21,000	0.016	680		
0.50	1.0	3.0	0.100	0.300	38,000	0.022	1,670	0.090	0.270	29,000	0.020	1,150		
0.50	1.0	4.0	0.070	0.210	38,000	0.022	1,670	0.063	0.189	29,000	0.020	1,150		
0.50	1.0	6.0	0.040	0.120	34,000	0.022	1,500	0.036	0.108	29,000	0.020	1,150		
0.50	1.0	8.0	0.040	0.120	34,000	0.022	1,500	0.036	0.108	29,000	0.020	1,150		
0.50	1.0	10.0	0.025	0.075	27,000	0.022	1,190	0.023	0.068	20,000	0.020	790		
0.50	1.0	12.0	0.025	0.075	27,000	0.022	1,190	0.023	0.068	20,000	0.020	790		
0.50	1.0	16.0	0.015	0.045	19,000	0.022	840	0.014	0.041	17,000	0.020	680		
0.50	1.0	20.0	0.010	0.030	19,000	0.022	840	0.009	0.027	17,000	0.020	680		
0.60	1.2	8.0	0.040	0.120	29,000	0.026	1,510	0.036	0.108	21,000	0.023	980		
0.60	1.2	12.0	0.030	0.090	22,000	0.026	1,140	0.027	0.081	17,000	0.023	790		
0.70	1.4	8.0	0.055	0.165	25,000	0.030	1,500	0.050	0.149	18,000	0.027	970		
0.70	1.4	16.0	0.035	0.105	19,000	0.030	1,140	0.032	0.095	14,000	0.027	760		
0.75	1.5	8.0	0.060	0.180	23,000	0.033	1,520	0.054	0.162	17,000	0.030	1,010		
0.75	1.5	12.0	0.060	0.180	23,000	0.033	1,520	0.054	0.162	17,000	0.030	1,010		
0.75	1.5	20.0	0.038	0.114	13,000	0.033	860	0.034	0.103	11,500	0.030	680		
0.80	1.6	12.0	0.065	0.195	21,000	0.035	1,470	0.059	0.176	16,000	0.032	1,010		
0.80	1.6	20.0	0.040	0.120	12,000	0.035	840	0.036	0.108	11,000	0.032	690		
0.90	1.8	12.0	0.070	0.210	19,000	0.039	1,480	0.063	0.189	14,000	0.035	980		
0.90	1.8	20.0	0.045	0.135	15,000	0.039	1,170	0.041	0.122	11,000	0.035	770		
1.00	2.0	6.0	0.200	0.600	19,000	0.043	1,630	0.180	0.540	14,000	0.039	1,080		
1.00	2.0	8.0	0.140	0.420	19,000	0.043	1,630	0.126	0.378	14,000	0.039	1,080		
1.00	2.0	10.0	0.140	0.420	19,000	0.043	1,630	0.126	0.378	14,000	0.039	1,080		
1.00	2.0	12.0	0.080	0.240	17,000	0.043	1,460	0.072	0.216	13,000	0.039	1,000		
1.00	2.0	16.0	0.080	0.240	17,000	0.043	1,460	0.072	0.216	13,000	0.039	1,000		
1.00	2.0	20.0	0.050	0.150	13,000	0.043	1,120	0.045	0.135	10,000	0.039	780		
1.00	2.0	25.0	0.050	0.150	9,600	0.043	830	0.045	0.135	8,600	0.039	670		
1.00	2.0	30.0	0.030	0.090	9,600	0.043	830	0.027	0.081	8,600	0.039	670		
1.50	3.0	10.0	0.210	0.630	13,000	0.080	2,080	0.189	0.567	9,600	0.072	1,380		
1.50	3.0	25.0	0.080	0.240	8,900	0.080	1,420	0.072	0.216	6,700	0.072	960		
1.50	3.0	35.0	0.080	0.240	8,900	0.080	1,420	0.072	0.216	6,700	0.072	960		
2.00	4.0	16.0	0.280	0.840	9,600	0.100	1,920	0.252	0.756	7,200	0.090	1,300		
2.00	4.0	35.0	0.100	0.300	6,700	0.100	1,340	0.090	0.270	5,000	0.090	900		
2.00	4.0	50.0	0.100	0.300	4,800	0.100	960	0.090	0.270	4,300	0.090	770		
2.50	5.0	25.0	0.350	1.050	7,600	0.120	1,820	0.315	0.945	5,700	0.108	1,230		
2.50	5.0	40.0	0.200	0.600	7,000	0.120	1,680	0.180	0.540	5,200	0.108	1,120		
3.00	6.0	30.0	0.420	1.260	6,400	0.140	1,790	0.378	1.134	4,800	0.126	1,210		
3.00	6.0	50.0	0.150	0.450	4,500	0.140	1,260	0.135	0.405	3,300	0.126	830		

EPDB/EPDBP EPOCH SERIES



EPDB
Cutting Conditions
Metric
(continued)



Tool Steels (35~45HRC)					Hardened Steels (45~55HRC)					Hardened Steels (55~70HRC)				
		CS		TH					TH					TH
doc (mm)	woc (mm)	N (rpm)	fz (mm/ tooth)	Vf (mm/ min)	doc (mm)	woc (mm)	N (rpm)	fz (mm/ tooth)	Vf (mm/ min)	doc (mm)	woc (mm)	N (rpm)	fz (mm/ tooth)	Vf (mm/ min)
0.016	0.048	50,000	0.003	320	0.013	0.039	50,000	0.003	280	0.010	0.030	50,000	0.002	220
0.006	0.019	50,000	0.003	320	0.005	0.016	50,000	0.003	280	0.004	0.012	50,000	0.002	220
0.017	0.050	50,000	0.005	480	0.014	0.041	50,000	0.004	420	0.011	0.032	50,000	0.003	340
0.001	0.029	50,000	0.005	480	0.008	0.023	48,000	0.004	400	0.006	0.018	38,400	0.004	320
0.032	0.096	50,000	0.007	720	0.026	0.078	40,000	0.006	500	0.020	0.060	32,000	0.006	400
0.013	0.038	50,000	0.006	650	0.010	0.031	36,000	0.006	410	0.008	0.024	28,800	0.006	330
0.016	0.048	40,000	0.009	700	0.013	0.039	29,000	0.008	450	0.010	0.030	23,200	0.008	360
0.010	0.031	31,000	0.009	550	0.008	0.025	29,000	0.008	450	0.007	0.020	23,200	0.008	360
0.019	0.058	33,000	0.010	690	0.016	0.047	24,000	0.009	440	0.012	0.036	19,200	0.009	350
0.012	0.036	26,000	0.010	540	0.001	0.029	24,000	0.009	440	0.008	0.023	19,200	0.009	350
0.064	0.192	28,000	0.014	810	0.052	0.156	20,000	0.013	500	0.040	0.120	16,000	0.013	400
0.026	0.077	25,000	0.014	720	0.021	0.062	18,000	0.013	450	0.016	0.048	14,400	0.013	360
0.016	0.048	20,000	0.014	570	0.013	0.039	18,000	0.013	450	0.010	0.030	14,400	0.013	360
0.080	0.240	22,000	0.018	770	0.065	0.195	16,000	0.015	490	0.050	0.150	12,800	0.015	390
0.056	0.168	22,000	0.018	770	0.046	0.137	16,000	0.015	490	0.035	0.105	12,800	0.015	390
0.032	0.096	20,000	0.018	710	0.026	0.078	14,000	0.015	430	0.020	0.060	11,200	0.015	350
0.032	0.096	20,000	0.018	710	0.026	0.078	14,000	0.015	430	0.020	0.060	11,200	0.015	350
0.020	0.060	16,000	0.018	560	0.016	0.049	14,000	0.015	430	0.013	0.038	11,200	0.015	350
0.020	0.060	16,000	0.018	560	0.016	0.049	14,000	0.015	430	0.013	0.038	11,200	0.015	350
0.012	0.036	16,000	0.018	570	0.001	0.029	14,000	0.015	430	0.008	0.023	11,200	0.015	350
0.008	0.024	16,000	0.018	570	0.007	0.020	14,000	0.015	430	0.005	0.015	11,200	0.015	350
0.032	0.096	17,000	0.021	710	0.026	0.078	12,000	0.018	440	0.020	0.060	9,600	0.018	350
0.024	0.072	13,000	0.021	540	0.020	0.059	12,000	0.018	440	0.015	0.045	9,600	0.018	350
0.044	0.132	14,000	0.024	670	0.036	0.107	10,000	0.021	420	0.028	0.083	8,000	0.021	340
0.028	0.084	11,000	0.024	530	0.023	0.068	10,000	0.021	420	0.018	0.053	8,000	0.021	340
0.048	0.144	13,000	0.026	690	0.039	0.117	9,600	0.023	440	0.030	0.090	7,680	0.023	360
0.048	0.144	13,000	0.026	690	0.039	0.117	9,600	0.023	440	0.030	0.090	7,680	0.023	360
0.030	0.091	10,000	0.026	530	0.025	0.074	9,600	0.023	440	0.019	0.057	7,680	0.023	360
0.052	0.156	13,000	0.028	730	0.042	0.127	9,000	0.025	440	0.033	0.098	7,200	0.025	350
0.032	0.096	10,000	0.028	560	0.026	0.078	9,000	0.025	440	0.020	0.060	7,200	0.025	350
0.056	0.168	11,000	0.031	690	0.046	0.137	8,000	0.027	440	0.035	0.105	6,400	0.027	350
0.036	0.108	8,700	0.031	540	0.029	0.088	8,000	0.027	440	0.023	0.068	6,400	0.027	350
0.160	0.480	11,000	0.034	750	0.130	0.390	8,000	0.030	480	0.100	0.300	6,400	0.030	380
0.112	0.336	11,000	0.034	750	0.091	0.273	8,000	0.030	480	0.070	0.210	6,400	0.030	380
0.112	0.336	11,000	0.034	750	0.091	0.273	8,000	0.030	480	0.070	0.210	6,400	0.030	380
0.064	0.192	10,000	0.034	690	0.052	0.156	7,200	0.030	430	0.040	0.120	5,760	0.030	350
0.064	0.192	10,000	0.034	690	0.052	0.156	7,200	0.030	430	0.040	0.120	5,760	0.030	350
0.040	0.120	7,800	0.034	540	0.033	0.098	7,200	0.030	430	0.025	0.075	5,760	0.030	350
0.040	0.120	7,800	0.035	540	0.033	0.098	7,200	0.030	440	0.025	0.075	5,760	0.030	350
0.024	0.072	7,800	0.035	540	0.020	0.059	7,200	0.030	440	0.015	0.045	5,760	0.030	350
0.168	0.504	7,400	0.064	950	0.137	0.410	5,300	0.056	590	0.105	0.315	4,240	0.056	470
0.064	0.192	5,200	0.064	660	0.052	0.156	4,800	0.056	540	0.040	0.120	3,840	0.056	430
0.064	0.192	5,200	0.064	660	0.052	0.156	4,800	0.056	540	0.040	0.120	3,840	0.056	430
0.224	0.672	5,600	0.080	900	0.182	0.546	4,000	0.070	560	0.140	0.420	3,200	0.070	450
0.080	0.240	3,900	0.080	620	0.065	0.195	3,600	0.070	500	0.050	0.150	2,880	0.070	400
0.080	0.240	3,900	0.080	620	0.065	0.195	3,600	0.070	500	0.050	0.150	2,880	0.070	400
0.280	0.840	4,500	0.096	860	0.228	0.683	3,200	0.084	540	0.175	0.525	2,560	0.084	430
0.160	0.480	4,000	0.096	770	0.130	0.390	2,900	0.084	490	0.100	0.300	2,320	0.084	390
0.336	1.008	3,700	0.112	830	0.273	0.819	2,700	0.098	530	0.210	0.630	2,160	0.098	420
0.120	0.360	2,600	0.112	580	0.098	0.293	2,400	0.098	470	0.075	0.225	1,920	0.098	380

EPDB/EPDBP EPOCH SERIES



EPDBP
Cutting Conditions
Inch



Work Piece Material			Carbon Steels, Alloy Steels(180~250HB) Copper(Cu): N+20% / fz+20%					TH	Tool Steels (25~35HRC)					TH
Radius (mm)	Mill Dia. (mm)	Under Neck Length	doc (inch)	woc (inch)	N (rpm)	fz (inch/ tooth)	Vf (inch/ min)	doc (inch)	woc (inch)	N (rpm)	fz (inch/ tooth)	Vf (inch/ min)		
0.10	0.2	1.0	0.0007	0.0020	50000	0.001	97.441	0.0006	0.0018	45,000	0.001	87.697		
0.10	0.2	1.5	0.0004	0.0011	49500	0.001	86.820	0.0003	0.0010	44,550	0.001	78.138		
0.10	0.2	2.0	0.0003	0.0008	49500	0.001	84.189	0.0002	0.0007	44,550	0.001	75.770		
0.10	0.2	2.5	0.0002	0.0005	44000	0.001	74.835	0.0001	0.0004	39,600	0.001	67.351		
0.20	0.4	2.0	0.0014	0.0041	44000	0.001	114.331	0.0012	0.0037	39,600	0.001	102.898		
0.20	0.4	3.0	0.0008	0.0024	39600	0.001	92.608	0.0007	0.0021	35,640	0.001	83.347		
0.20	0.4	4.0	0.0004	0.0011	39600	0.001	89.802	0.0003	0.0010	35,640	0.001	80.821		
0.20	0.4	5.0	0.0003	0.0008	35200	0.001	79.824	0.0002	0.0007	31,680	0.001	71.841		
0.30	0.6	2.0	0.0022	0.0065	44000	0.001	114.331	0.0019	0.0058	39,600	0.001	102.898		
0.30	0.6	4.0	0.0014	0.0041	39600	0.001	92.608	0.0012	0.0037	35,640	0.001	83.347		
0.30	0.6	6.0	0.0008	0.0024	39600	0.001	89.802	0.0007	0.0021	35,640	0.001	80.821		
0.30	0.6	8.0	0.0008	0.0024	35200	0.001	79.824	0.0007	0.0021	31,680	0.001	71.841		
0.30	0.6	10.0	0.0006	0.0018	35200	0.001	69.846	0.0005	0.0016	31,680	0.001	62.861		
0.30	0.6	12.0	0.0004	0.0012	26400	0.001	52.384	0.0004	0.0011	23,760	0.001	47.146		
0.30	0.6	15.0	0.0002	0.0007	22000	0.001	43.654	0.0002	0.0006	19,800	0.001	39.288		
0.40	0.8	4.0	0.0024	0.0073	44000	0.002	142.913	0.0022	0.0066	39,600	0.002	128.622		
0.40	0.8	6.0	0.0018	0.0053	39600	0.001	115.760	0.0016	0.0048	35,640	0.001	104.184		
0.40	0.8	8.0	0.0010	0.0031	39600	0.001	112.252	0.0009	0.0028	35,640	0.001	101.027		
0.40	0.8	12.0	0.0008	0.0024	35200	0.001	99.780	0.0007	0.0021	31,680	0.001	89.802		
0.40	0.8	16.0	0.0007	0.0021	26400	0.001	65.480	0.0006	0.0019	23,760	0.001	58.932		
0.50	1.0	6.0	0.0022	0.0065	35640	0.002	125.021	0.0019	0.0058	32,076	0.002	112.519		
0.50	1.0	8.0	0.0022	0.0065	35640	0.002	125.021	0.0019	0.0058	32,076	0.002	112.519		
0.50	1.0	10.0	0.0014	0.0041	35640	0.002	121.232	0.0012	0.0037	32,076	0.002	109.109		
0.50	1.0	15.0	0.0011	0.0033	31680	0.002	107.762	0.0010	0.0030	28,512	0.002	96.986		
0.50	1.0	20.0	0.0008	0.0024	23760	0.001	70.719	0.0007	0.0021	21,384	0.001	63.647		
0.50	1.0	25.0	0.0007	0.0020	19800	0.001	58.932	0.0006	0.0018	17,820	0.001	53.039		
0.50	1.0	30.0	0.0007	0.0020	19800	0.001	58.932	0.0006	0.0018	17,820	0.001	53.039		
0.50	1.0	35.0	0.0004	0.0012	19800	0.001	58.932	0.0004	0.0011	17,820	0.001	53.039		
0.75	1.5	8.0	0.0028	0.0083	27720	0.002	97.238	0.0025	0.0074	24,948	0.002	87.514		
0.75	1.5	10.0	0.0028	0.0083	27720	0.002	97.238	0.0025	0.0074	24,948	0.002	87.514		
0.75	1.5	12.0	0.0028	0.0083	27720	0.002	97.238	0.0025	0.0074	24,948	0.002	87.514		
0.75	1.5	15.0	0.0018	0.0053	27720	0.002	94.292	0.0016	0.0048	24,948	0.002	84.862		
0.75	1.5	20.0	0.0016	0.0047	24640	0.002	83.815	0.0014	0.0043	22,176	0.002	75.433		
0.75	1.5	30.0	0.0011	0.0033	24640	0.002	83.815	0.0010	0.0030	22,176	0.002	75.433		
1.00	2.0	8.0	0.0059	0.0177	23100	0.003	150.059	0.0053	0.0159	20,790	0.003	135.053		
1.00	2.0	12.0	0.0035	0.0106	20790	0.003	121.548	0.0032	0.0096	18,711	0.003	109.393		
1.00	2.0	16.0	0.0035	0.0106	20790	0.003	121.548	0.0032	0.0096	18,711	0.003	109.393		
1.00	2.0	20.0	0.0028	0.0083	20790	0.003	117.865	0.0025	0.0074	18,711	0.003	106.078		
1.00	2.0	25.0	0.0028	0.0083	18480	0.003	104.769	0.0025	0.0074	16,632	0.003	94.292		
1.00	2.0	30.0	0.0018	0.0053	18480	0.003	104.769	0.0016	0.0048	16,632	0.003	94.292		
1.00	2.0	35.0	0.0018	0.0053	13860	0.002	68.754	0.0016	0.0048	12,474	0.002	61.879		
1.00	2.0	40.0	0.0014	0.0041	13860	0.002	68.754	0.0012	0.0037	12,474	0.002	61.879		
1.00	2.0	50.0	0.0007	0.0020	11550	0.002	57.295	0.0006	0.0018	10,395	0.002	51.566		
1.50	3.0	8.0	0.0126	0.0378	17600	0.003	114.331	0.0113	0.0340	15,840	0.003	102.898		
1.50	3.0	16.0	0.0087	0.0260	15840	0.003	92.608	0.0078	0.0234	14,256	0.003	83.347		
1.50	3.0	20.0	0.0059	0.0177	15840	0.003	92.608	0.0053	0.0159	14,256	0.003	83.347		
1.50	3.0	30.0	0.0035	0.0106	15840	0.003	89.802	0.0032	0.0096	14,256	0.003	80.821		
1.50	3.0	40.0	0.0028	0.0083	14080	0.003	79.824	0.0025	0.0074	12,672	0.003	71.841		
1.50	3.0	50.0	0.0020	0.0059	10560	0.002	52.384	0.0018	0.0053	9,504	0.002	47.146		
1.50	3.0	60.0	0.0012	0.0035	10560	0.002	52.384	0.0011	0.0032	9,504	0.002	47.146		

EPDB/EPDBP EPOCH SERIES



EPDBP
Cutting Conditions
Inch
(continued)



Tool Steels (35~45HRC)					Hardened Steels (45~55HRC)					Hardened Steels (55~70HRC)				
TH					TH					TH				
doc (inch)	woc (inch)	N (rpm)	fz (inch/ tooth)	Vf (inch/ min)	doc (inch)	woc (inch)	N (rpm)	fz (inch/ tooth)	Vf (inch/ min)	doc (inch)	woc (inch)	N (rpm)	fz (inch/ tooth)	Vf (inch/ min)
0.0005	0.0016	42500	0.001	74.542	0.0004	0.0013	37500	0.001	58.465	0.0004	0.0012	35000	0.001	47.746
0.0003	0.0009	42075	0.001	73.797	0.0002	0.0007	37125	0.001	57.880	0.0002	0.0006	34650	0.001	47.269
0.0002	0.0007	42075	0.001	62.616	0.0002	0.0005	37125	0.001	55.249	0.0002	0.0005	34650	0.001	44.199
0.0001	0.0004	37400	0.001	55.658	0.0001	0.0003	33000	0.001	49.110	0.0001	0.0003	30800	0.001	39.288
0.0011	0.0033	37400	0.001	87.463	0.0009	0.0027	33000	0.001	68.598	0.0008	0.0025	30800	0.001	56.022
0.0006	0.0019	33660	0.001	78.717	0.0005	0.0015	29700	0.001	61.739	0.0005	0.0014	27720	0.001	50.420
0.0003	0.0009	33660	0.001	66.790	0.0002	0.0007	29700	0.001	58.932	0.0002	0.0006	27720	0.001	47.146
0.0002	0.0007	29920	0.001	59.369	0.0002	0.0005	26400	0.001	52.384	0.0002	0.0005	24640	0.001	41.907
0.0017	0.0052	37400	0.001	87.463	0.0014	0.0042	33000	0.001	68.598	0.0013	0.0039	30800	0.001	56.022
0.0011	0.0033	33660	0.001	78.717	0.0009	0.0027	29700	0.001	61.739	0.0008	0.0025	27720	0.001	50.420
0.0006	0.0019	33660	0.001	66.790	0.0005	0.0015	29700	0.001	58.932	0.0005	0.0014	27720	0.001	47.146
0.0006	0.0019	29920	0.001	59.369	0.0005	0.0015	26400	0.001	52.384	0.0005	0.0014	24640	0.001	41.907
0.0005	0.0014	29920	0.001	55.128	0.0004	0.0012	26400	0.001	44.901	0.0004	0.0011	24640	0.001	34.923
0.0003	0.0009	22440	0.001	41.346	0.0003	0.0008	19800	0.001	33.676	0.0002	0.0007	18480	0.001	26.192
0.0002	0.0006	18700	0.001	34.455	0.0002	0.0005	16500	0.001	28.063	0.0001	0.0004	15400	0.001	21.827
0.0020	0.0059	37400	0.001	109.329	0.0016	0.0048	33000	0.001	85.748	0.0015	0.0044	30800	0.001	70.028
0.0014	0.0043	33660	0.001	98.396	0.0012	0.0035	29700	0.001	77.173	0.0011	0.0032	27720	0.001	63.025
0.0008	0.0025	33660	0.001	83.487	0.0007	0.0020	29700	0.001	73.665	0.0006	0.0018	27720	0.001	58.932
0.0006	0.0019	29920	0.001	74.211	0.0005	0.0015	26400	0.001	65.480	0.0005	0.0014	24640	0.001	52.384
0.0006	0.0017	22440	0.001	51.683	0.0005	0.0014	19800	0.001	42.094	0.0004	0.0013	18480	0.001	32.740
0.0017	0.0052	30294	0.002	106.268	0.0014	0.0042	26730	0.002	83.347	0.0013	0.0039	24948	0.001	68.067
0.0017	0.0052	30294	0.002	106.268	0.0014	0.0042	26730	0.002	83.347	0.0013	0.0039	24948	0.001	68.067
0.0011	0.0033	30294	0.001	90.166	0.0009	0.0027	26730	0.001	79.559	0.0008	0.0025	24948	0.001	63.647
0.0009	0.0026	26928	0.001	80.148	0.0007	0.0021	23760	0.001	70.719	0.0007	0.0020	22176	0.001	56.575
0.0006	0.0019	20196	0.001	55.817	0.0005	0.0015	17820	0.001	45.462	0.0005	0.0014	16632	0.001	35.359
0.0005	0.0016	16830	0.001	46.514	0.0004	0.0013	14850	0.001	37.885	0.0004	0.0012	13860	0.001	29.466
0.0005	0.0016	16830	0.001	46.514	0.0004	0.0013	14850	0.001	37.885	0.0004	0.0012	13860	0.001	29.466
0.0003	0.0009	16830	0.001	46.514	0.0003	0.0008	14850	0.001	37.885	0.0002	0.0007	13860	0.001	29.466
0.0022	0.0066	23562	0.002	82.653	0.0018	0.0054	20790	0.002	64.826	0.0017	0.0050	19404	0.001	52.941
0.0022	0.0066	23562	0.002	82.653	0.0018	0.0054	20790	0.002	64.826	0.0017	0.0050	19404	0.001	52.941
0.0022	0.0066	23562	0.002	82.653	0.0018	0.0054	20790	0.002	64.826	0.0017	0.0050	19404	0.001	52.941
0.0014	0.0043	23562	0.001	70.129	0.0012	0.0035	20790	0.001	61.879	0.0011	0.0032	19404	0.001	49.503
0.0013	0.0038	20944	0.001	62.337	0.0010	0.0031	18480	0.001	55.003	0.0009	0.0028	17248	0.001	44.003
0.0009	0.0026	20944	0.001	62.337	0.0007	0.0021	18480	0.001	55.003	0.0007	0.0020	17248	0.001	44.003
0.0047	0.0142	19635	0.003	114.795	0.0038	0.0115	17325	0.003	90.035	0.0035	0.0106	16170	0.002	73.529
0.0028	0.0085	17672	0.003	103.316	0.0023	0.0069	15593	0.003	81.032	0.0021	0.0064	14553	0.002	66.176
0.0028	0.0085	17672	0.003	103.316	0.0023	0.0069	15593	0.003	81.032	0.0021	0.0064	14553	0.002	66.176
0.0022	0.0066	17672	0.002	87.662	0.0018	0.0054	15593	0.002	77.349	0.0017	0.0050	14553	0.002	61.879
0.0022	0.0066	15708	0.002	77.922	0.0018	0.0054	13860	0.002	68.754	0.0017	0.0050	12936	0.002	55.003
0.0014	0.0043	15708	0.002	77.922	0.0012	0.0035	13860	0.002	68.754	0.0011	0.0032	12936	0.002	55.003
0.0014	0.0043	11781	0.002	54.267	0.0012	0.0035	10395	0.002	44.199	0.0011	0.0032	9702	0.002	34.377
0.0011	0.0032	11781	0.002	54.267	0.0009	0.0027	10395	0.002	44.199	0.0008	0.0025	9702	0.002	34.377
0.0005	0.0016	9818	0.002	45.222	0.0004	0.0013	8663	0.002	36.833	0.0004	0.0012	8085	0.002	28.648
0.0101	0.0302	14960	0.003	87.463	0.0082	0.0246	13200	0.003	68.598	0.0076	0.0227	12320	0.002	56.022
0.0069	0.0208	13464	0.003	78.717	0.0056	0.0169	11880	0.003	61.739	0.0052	0.0156	11088	0.002	50.420
0.0047	0.0142	13464	0.003	78.717	0.0038	0.0115	11880	0.003	61.739	0.0035	0.0106	11088	0.002	50.420
0.0028	0.0085	13464	0.002	66.790	0.0023	0.0069	11880	0.002	58.932	0.0021	0.0064	11088	0.002	47.146
0.0022	0.0066	11968	0.002	59.369	0.0018	0.0054	10560	0.002	52.384	0.0017	0.0050	9856	0.002	41.907
0.0016	0.0047	8976	0.002	41.346	0.0013	0.0038	7920	0.002	33.676	0.0012	0.0035	7392	0.002	26.192
0.0009	0.0028	8976	0.002	41.346	0.0008	0.0023	7920	0.002	33.676	0.0007	0.0021	7392	0.005	74.211

EPDB/EPDBP EPOCH SERIES



EPDBP
Cutting Conditions
Metric



Work Piece Material			Carbon Steels, Alloy Steels(180~250HB) Copper(Cu): N+20% / fz+20%					TH	Tool Steels (25~35HRC)					TH
Radius (mm)	Mill Dia. (mm)	Under Neck Length	d _{oc} (mm)	w _{oc} (mm)	N (rpm)	f _z (mm/ tooth)	V _f (mm/ min)	d _{oc} (mm)	w _{oc} (mm)	N (rpm)	f _z (mm/ tooth)	V _f (mm/ min)		
0.10	0.2	1.0	0.017	0.051	50000	0.025	2475	0.015	0.046	45,000	0.025	2228		
0.10	0.2	1.5	0.009	0.027	49500	0.022	2205	0.008	0.024	44,550	0.022	1985		
0.10	0.2	2.0	0.007	0.021	49500	0.022	2138	0.006	0.019	44,550	0.022	1925		
0.10	0.2	2.5	0.004	0.012	44000	0.022	1901	0.004	0.011	39,600	0.022	1711		
0.20	0.4	2.0	0.035	0.105	44000	0.033	2904	0.032	0.095	39,600	0.033	2614		
0.20	0.4	3.0	0.020	0.060	39600	0.030	2352	0.018	0.054	35,640	0.030	2117		
0.20	0.4	4.0	0.009	0.027	39600	0.029	2281	0.008	0.024	35,640	0.029	2053		
0.20	0.4	5.0	0.007	0.021	35200	0.029	2028	0.006	0.019	31,680	0.029	1825		
0.30	0.6	2.0	0.055	0.165	44000	0.033	2904	0.050	0.149	39,600	0.033	2614		
0.30	0.6	4.0	0.035	0.105	39600	0.030	2352	0.032	0.095	35,640	0.030	2117		
0.30	0.6	6.0	0.02	0.060	39600	0.029	2281	0.018	0.054	35,640	0.029	2053		
0.30	0.6	8.0	0.02	0.060	35200	0.029	2028	0.018	0.054	31,680	0.029	1825		
0.30	0.6	10.0	0.015	0.045	35200	0.025	1774	0.014	0.041	31,680	0.025	1597		
0.30	0.6	12.0	0.01	0.030	26400	0.025	1331	0.009	0.027	23,760	0.025	1198		
0.30	0.6	15.0	0.006	0.018	22000	0.025	1109	0.005	0.016	19,800	0.025	998		
0.40	0.8	4.0	0.062	0.186	44000	0.041	3630	0.056	0.167	39,600	0.041	3267		
0.40	0.8	6.0	0.045	0.135	39600	0.037	2940	0.041	0.122	35,640	0.037	2646		
0.40	0.8	8.0	0.026	0.078	39600	0.036	2851	0.023	0.070	35,640	0.036	2566		
0.40	0.8	12.0	0.02	0.060	35200	0.036	2534	0.018	0.054	31,680	0.036	2281		
0.40	0.8	16.0	0.018	0.054	26400	0.032	1663	0.016	0.049	23,760	0.032	1497		
0.50	1.0	6.0	0.055	0.165	35640	0.045	3176	0.050	0.149	32,076	0.045	2858		
0.50	1.0	8.0	0.055	0.165	35640	0.045	3176	0.050	0.149	32,076	0.045	2858		
0.50	1.0	10.0	0.035	0.105	35640	0.043	3079	0.032	0.095	32,076	0.043	2771		
0.50	1.0	15.0	0.028	0.084	31680	0.043	2737	0.025	0.076	28,512	0.043	2463		
0.50	1.0	20.0	0.02	0.060	23760	0.038	1796	0.018	0.054	21,384	0.038	1617		
0.50	1.0	25.0	0.017	0.051	19800	0.038	1497	0.015	0.046	17,820	0.038	1347		
0.50	1.0	30.0	0.017	0.051	19800	0.038	1497	0.015	0.046	17,820	0.038	1347		
0.50	1.0	35.0	0.01	0.030	19800	0.038	1497	0.009	0.027	17,820	0.038	1347		
0.75	1.5	8.0	0.07	0.210	27720	0.045	2470	0.063	0.189	24,948	0.045	2223		
0.75	1.5	10.0	0.07	0.210	27720	0.045	2470	0.063	0.189	24,948	0.045	2223		
0.75	1.5	12.0	0.07	0.210	27720	0.045	2470	0.063	0.189	24,948	0.045	2223		
0.75	1.5	15.0	0.045	0.135	27720	0.043	2395	0.041	0.122	24,948	0.043	2156		
0.75	1.5	20.0	0.04	0.120	24640	0.043	2129	0.036	0.108	22,176	0.043	1916		
0.75	1.5	30.0	0.028	0.084	24640	0.043	2129	0.025	0.076	22,176	0.043	1916		
1.00	2.0	8.0	0.15	0.450	23100	0.083	3812	0.135	0.405	20,790	0.083	3430		
1.00	2.0	12.0	0.09	0.270	20790	0.074	3087	0.081	0.243	18,711	0.074	2779		
1.00	2.0	16.0	0.09	0.270	20790	0.074	3087	0.081	0.243	18,711	0.074	2779		
1.00	2.0	20.0	0.07	0.210	20790	0.072	2994	0.063	0.189	18,711	0.072	2694		
1.00	2.0	25.0	0.07	0.210	18480	0.072	2661	0.063	0.189	16,632	0.072	2395		
1.00	2.0	30.0	0.045	0.135	18480	0.072	2661	0.041	0.122	16,632	0.072	2395		
1.00	2.0	35.0	0.045	0.135	13860	0.063	1746	0.041	0.122	12,474	0.063	1572		
1.00	2.0	40.0	0.035	0.105	13860	0.063	1746	0.032	0.095	12,474	0.063	1572		
1.00	2.0	50.0	0.017	0.051	11550	0.063	1455	0.015	0.046	10,395	0.063	1310		
1.50	3.0	8.0	0.32	0.960	17600	0.083	2904	0.288	0.864	15,840	0.083	2614		
1.50	3.0	16.0	0.22	0.660	15840	0.074	2352	0.198	0.594	14,256	0.074	2117		
1.50	3.0	20.0	0.15	0.450	15840	0.074	2352	0.135	0.405	14,256	0.074	2117		
1.50	3.0	30.0	0.09	0.270	15840	0.072	2281	0.081	0.243	14,256	0.072	2053		
1.50	3.0	40.0	0.07	0.210	14080	0.072	2028	0.063	0.189	12,672	0.072	1825		
1.50	3.0	50.0	0.05	0.150	10560	0.063	1331	0.045	0.135	9,504	0.063	1198		
1.50	3.0	60.0	0.03	0.090	10560	0.063	1331	0.027	0.081	9,504	0.063	1198		

EPDB/EPDBP EPOCH SERIES



EPDBP
Cutting Conditions
Metric
(continued)



Tool Steels (35~45HRC)					TH	Hardened Steels (45~55HRC)					TH	Hardened Steels (55~70HRC)					TH
doc (mm)	woc (mm)	N (rpm)	fz (mm/tooth)	Vf (mm/min)		doc (mm)	woc (mm)	N (rpm)	fz (mm/tooth)	Vf (mm/min)		doc (mm)	woc (mm)	N (rpm)	fz (mm/tooth)	Vf (mm/min)	
0.014	0.041	42500	0.022	1893		0.011	0.033	37500	0.020	1485		0.010	0.031	35000	0.017	1213	
0.007	0.022	42075	0.022	1874		0.006	0.018	37125	0.020	1470		0.005	0.016	34650	0.017	1201	
0.006	0.017	42075	0.019	1590		0.005	0.014	37125	0.019	1403		0.004	0.013	34650	0.016	1123	
0.003	0.001	37400	0.019	1414		0.003	0.008	33000	0.019	1247		0.002	0.007	30800	0.016	998	
0.028	0.084	37400	0.030	2222		0.023	0.068	33000	0.026	1742		0.021	0.063	30800	0.023	1423	
0.016	0.048	33660	0.030	1999		0.013	0.039	29700	0.026	1568		0.012	0.036	27720	0.023	1281	
0.007	0.022	33660	0.025	1697		0.006	0.018	29700	0.025	1497		0.005	0.016	27720	0.022	1198	
0.006	0.017	29920	0.025	1508		0.005	0.014	26400	0.025	1331		0.004	0.013	24640	0.022	1064	
0.044	0.132	37400	0.030	2222		0.036	0.107	33000	0.026	1742		0.033	0.099	30800	0.023	1423	
0.028	0.084	33660	0.030	1999		0.023	0.068	29700	0.026	1568		0.021	0.063	27720	0.023	1281	
0.016	0.048	33660	0.025	1697		0.013	0.039	29700	0.025	1497		0.012	0.036	27720	0.022	1198	
0.016	0.048	29920	0.025	1508		0.013	0.039	26400	0.025	1331		0.012	0.036	24640	0.022	1064	
0.012	0.036	29920	0.023	1400		0.001	0.029	26400	0.022	1141		0.009	0.027	24640	0.018	887	
0.008	0.024	22440	0.023	1050		0.007	0.020	19800	0.022	855		0.006	0.018	18480	0.018	665	
0.005	0.014	18700	0.023	875		0.004	0.012	16500	0.022	713		0.004	0.011	15400	0.018	554	
0.050	0.149	37400	0.037	2777		0.040	0.121	33000	0.033	2178		0.037	0.112	30800	0.029	1779	
0.036	0.108	33660	0.037	2499		0.029	0.088	29700	0.033	1960		0.027	0.081	27720	0.029	1601	
0.021	0.062	33660	0.032	2121		0.017	0.051	29700	0.032	1871		0.016	0.047	27720	0.027	1497	
0.016	0.048	29920	0.032	1885		0.013	0.039	26400	0.032	1663		0.012	0.036	24640	0.027	1331	
0.014	0.043	22440	0.029	1313		0.012	0.035	19800	0.027	1069		0.011	0.032	18480	0.023	832	
0.044	0.132	30294	0.045	2699		0.036	0.107	26730	0.040	2117		0.033	0.099	24948	0.035	1729	
0.044	0.132	30294	0.045	2699		0.036	0.107	26730	0.040	2117		0.033	0.099	24948	0.035	1729	
0.028	0.084	30294	0.038	2290		0.023	0.068	26730	0.038	2021		0.021	0.063	24948	0.032	1617	
0.022	0.067	26928	0.038	2036		0.018	0.055	23760	0.038	1796		0.017	0.050	22176	0.032	1437	
0.016	0.048	20196	0.035	1418		0.013	0.039	17820	0.032	1155		0.012	0.036	16632	0.027	898	
0.014	0.041	16830	0.035	1182		0.011	0.033	14850	0.032	962		0.010	0.031	13860	0.027	748	
0.014	0.041	16830	0.035	1182		0.011	0.033	14850	0.032	962		0.010	0.031	13860	0.027	748	
0.008	0.024	16830	0.035	1182		0.007	0.020	14850	0.032	962		0.006	0.018	13860	0.027	748	
0.056	0.168	23562	0.045	2099		0.046	0.137	20790	0.040	1647		0.042	0.126	19404	0.035	1345	
0.056	0.168	23562	0.045	2099		0.046	0.137	20790	0.040	1647		0.042	0.126	19404	0.035	1345	
0.056	0.168	23562	0.045	2099		0.046	0.137	20790	0.040	1647		0.042	0.126	19404	0.035	1345	
0.036	0.108	23562	0.038	1781		0.029	0.088	20790	0.038	1572		0.027	0.081	19404	0.032	1257	
0.032	0.096	20944	0.038	1583		0.026	0.078	18480	0.038	1397		0.024	0.072	17248	0.032	1118	
0.022	0.067	20944	0.038	1583		0.018	0.055	18480	0.038	1397		0.017	0.050	17248	0.032	1118	
0.120	0.360	19635	0.074	2916		0.098	0.293	17325	0.066	2287		0.090	0.270	16170	0.058	1868	
0.072	0.216	17672	0.074	2624		0.059	0.176	15593	0.066	2058		0.054	0.162	14553	0.058	1681	
0.072	0.216	17672	0.074	2624		0.059	0.176	15593	0.066	2058		0.054	0.162	14553	0.058	1681	
0.056	0.168	17672	0.063	2227		0.046	0.137	15593	0.063	1965		0.042	0.126	14553	0.054	1572	
0.056	0.168	15708	0.063	1979		0.046	0.137	13860	0.063	1746		0.042	0.126	12936	0.054	1397	
0.036	0.108	15708	0.063	1979		0.029	0.088	13860	0.063	1746		0.027	0.081	12936	0.054	1397	
0.036	0.108	11781	0.059	1378		0.029	0.088	10395	0.054	1123		0.027	0.081	9702	0.045	873	
0.028	0.084	11781	0.059	1378		0.023	0.068	10395	0.054	1123		0.021	0.063	9702	0.045	873	
0.014	0.041	9818	0.059	1149		0.011	0.033	8663	0.054	936		0.010	0.031	8085	0.045	728	
0.256	0.768	14960	0.074	2222		0.208	0.624	13200	0.066	1742		0.192	0.576	12320	0.058	1423	
0.176	0.528	13464	0.074	1999		0.143	0.429	11880	0.066	1568		0.132	0.396	11088	0.058	1281	
0.120	0.360	13464	0.074	1999		0.098	0.293	11880	0.066	1568		0.090	0.270	11088	0.058	1281	
0.072	0.216	13464	0.063	1697		0.059	0.176	11880	0.063	1497		0.054	0.162	11088	0.054	1198	
0.056	0.168	11968	0.063	1508		0.046	0.137	10560	0.063	1331		0.042	0.126	9856	0.054	1064	
0.040	0.120	8976	0.059	1050		0.033	0.098	7920	0.054	855		0.030	0.090	7392	0.045	665	
0.024	0.072	8976	0.059	1050		0.020	0.059	7920	0.054	855		0.018	0.054	7392	0.128	1885	



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