

# EPDBP

## High-Precision Ball End Mills for Deep Machining



### FEATURES

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

EPDBP Pencil Neck Series features even greater reach and “Back Draft Effect”

## INTRODUCTION

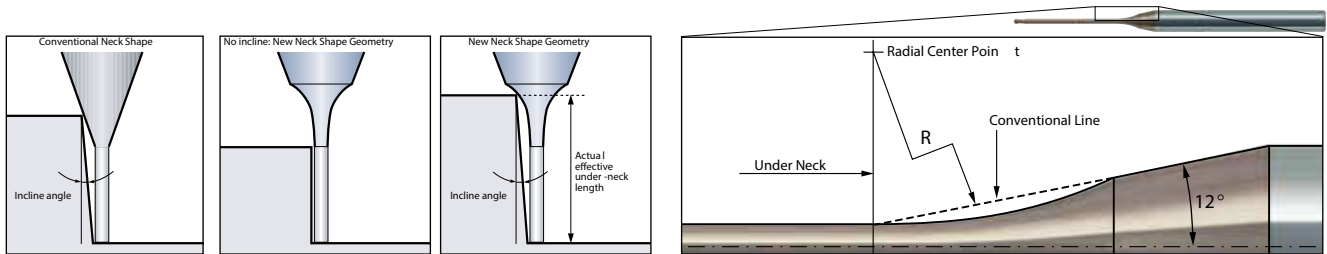
The EPDBP Epoch Series Ball End Mills have been designed for cutting deep ribs and slots in molds, as well as machining deep corners and precision features that were previously performed by EDM (electrical discharge machining).

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 Coatings help to maximize machining performance as well as tool life.

## FEATURES

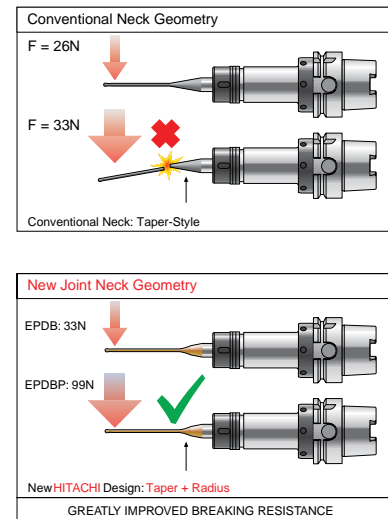
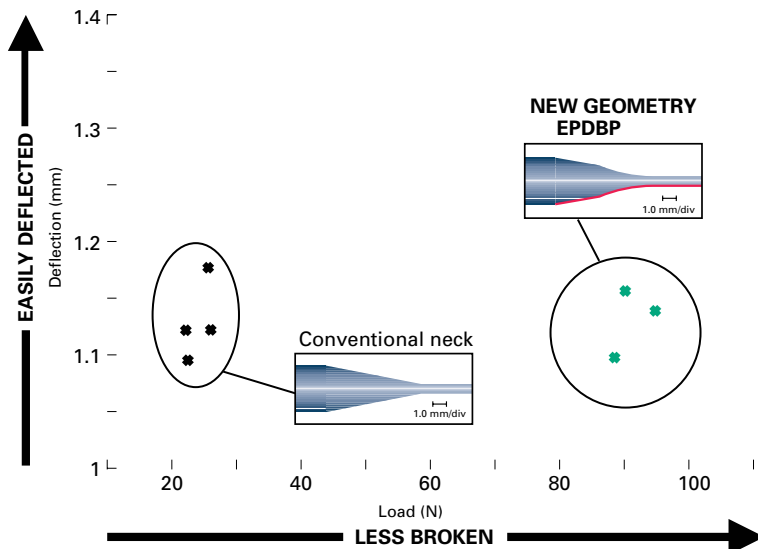
### 1. New Neck Shape Eliminates Contact Against the Workpiece

The new neck shape of the EPDBP End Mills gives them a longer effective reach in mold with draft angles. For example, when machining a draft angle of  $1^\circ$  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.



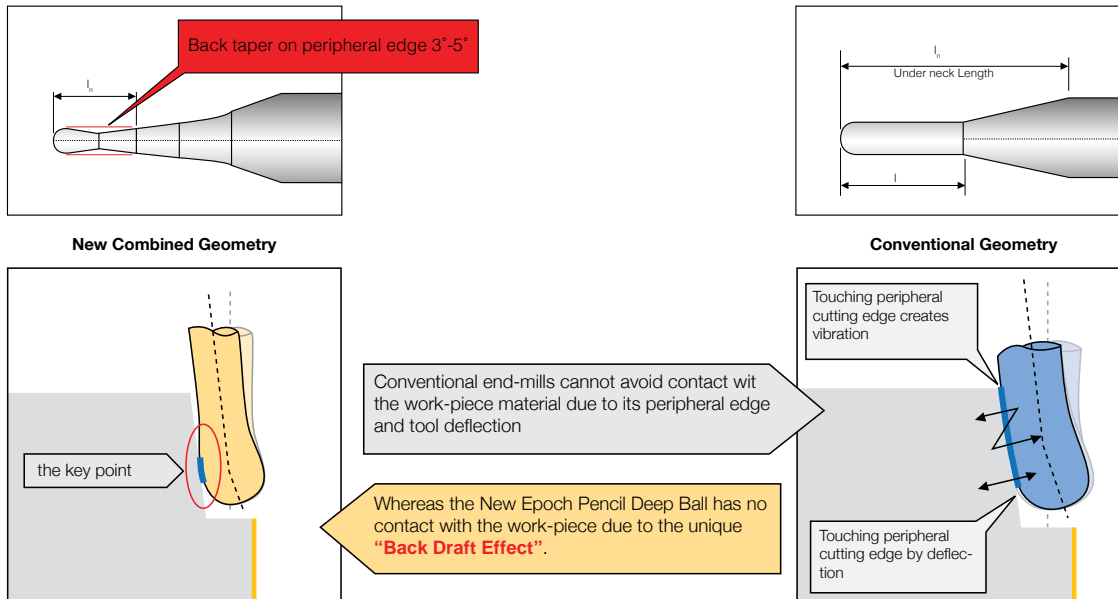
### 2. New Neck Shape Improves Breakage Resistance

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

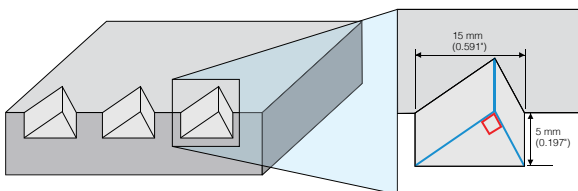


## 3. Back Taper and Back Draft Effect

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.



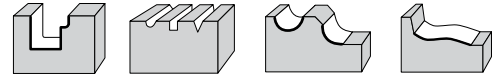
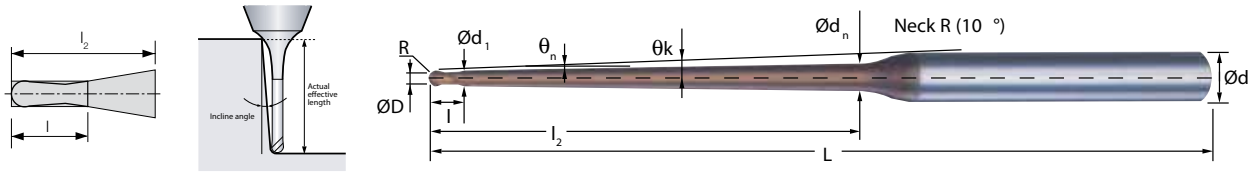
Designed for long reach, steep side wall applications, the EPDBP end mills are capable of twice the speed of competitive end mills.



### Dia 1 x 10 mm H13

	Competitor	EPDBP 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")

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Helix Angle	20°	d	h5
R (R≤0.25)	±0.003	D (R≤0.25)	0/-0.006
R (R>0.25)	±0.005	D (R>0.25)	0/-0.10

## EPDBP

Part No.	ØD	R	θ <sub>n</sub>	l <sub>2</sub>	l	Ød <sub>1</sub>	Ød <sub>n</sub>	L	Ød	l'	θ <sub>k</sub>	1°	1.5°	2°	3°
EPDBP2002-2-09-TH	0.20	0.10	0.9°	2.0	0.15	0.17	0.228	50	4	1.10	10.01	2.81	3.14	3.42	3.92
EPDBP2002-2.5-09-TH	0.20	0.10	0.9°	2.5	0.15	0.17	0.244	50	4	1.10	9.60	3.32	3.70	4.01	4.54
EPDBP2004-4-09-TH	0.40	0.20	0.9°	4.0	0.30	0.37	0.486	50	4	1.25	8.49	4.87	5.35	5.72	6.34
EPDBP2004-5-09-TH	0.40	0.20	0.9°	5.0	0.30	0.37	0.518	50	4	1.25	7.89	5.90	6.44	6.85	7.53
EPDBP2006-6-09-TH	0.60	0.30	0.9°	6.0	0.40	0.57	0.746	50	4	1.35	7.26	6.92	7.52	7.96	8.68
EPDBP2006-8-09-TH	0.60	0.30	0.9°	8.0	0.40	0.57	0.809	50	4	1.35	6.38	8.96	9.67	10.18	10.98
EPDBP2006-10-09-TH	0.60	0.30	0.9°	10.0	0.40	0.57	0.872	50	4	1.35	5.70	11.01	11.81	12.37	13.25
EPDBP2006-12-09-TH	0.60	0.30	0.9°	12.0	0.40	0.57	0.934	55	4	1.35	5.14	13.05	13.94	14.54	15.49
EPDBP2006-15-09-TH	0.60	0.30	0.9°	15.0	0.40	0.57	1.029	55	4	1.35	4.49	16.10	17.11	17.78	18.81
EPDBP2010-10-09-TH	1.00	0.50	0.9°	10.0	0.80	0.94	1.229	55	6	2.70	6.88	11.20	11.91	12.44	13.28
EPDBP2010-15-09-TH	1.00	0.50	0.9°	15.0	0.80	0.94	1.386	60	6	2.70	5.64	16.28	17.19	17.84	18.84
EPDBP2010-20-09-TH	1.00	0.50	0.9°	20.0	0.80	0.94	1.543	65	6	2.70	4.77	21.35	22.44	23.18	24.68
EPDBP2010-25-09-TH	1.00	0.50	0.9°	25.0	0.80	0.94	1.700	70	6	2.70	4.14	26.42	27.66	28.48	30.83
EPDBP2010-30-09-TH	1.00	0.50	0.9°	30.0	0.80	0.94	1.875	75	6	2.70	3.65	31.49	32.86	33.75	36.98
EPDBP2010-35-09-TH	1.00	0.50	0.9°	35.0	0.80	0.94	2.015	80	6	2.70	3.27	36.55	38.04	39.00	43.12
EPDBP2015-15-09-TH	1.50	0.75	0.9°	15.0	1.35	1.42	1.849	60	6	3.89	5.36	16.40	17.25	17.88	18.86
EPDBP2015-20-09-TH	1.50	0.75	0.9°	20.0	1.35	1.42	2.006	65	6	3.89	4.50	21.47	22.49	23.21	24.72
EPDBP2015-30-09-TH	1.50	0.75	0.9°	30.0	1.35	1.42	2.320	75	6	3.89	3.40	31.59	32.90	33.78	37.01
EPDBP2020-20-09-TH	2.00	1.00	0.9°	20.0	1.70	1.92	2.495	65	6	4.24	4.20	21.48	22.49	23.20	24.68
EPDBP2020-25-09-TH	2.00	1.00	0.9°	25.0	1.70	1.92	2.652	65	6	4.24	3.60	26.54	27.70	28.50	30.82
EPDBP2020-30-09-TH	2.00	1.00	0.9°	30.0	1.70	1.92	2.809	70	6	4.24	3.14	31.60	32.90	33.77	36.97
EPDBP2020-35-09-TH	2.00	1.00	0.9°	35.0	1.70	1.92	2.966	75	6	4.24	2.79	36.66	38.08	39.02	-
EPDBP2020-40-09-TH	2.00	1.00	0.9°	40.0	1.70	1.92	3.123	80	6	4.24	2.51	41.72	43.25	44.50	-
EPDBP2020-50-09-TH	2.00	1.00	0.9°	50.0	1.70	1.92	3.438	90	6	4.24	2.09	51.82	53.56	55.58	-
EPDBP2030-30-09-TH	3.00	1.50	0.9°	30.0	2.50	2.86	3.724	70	6	6.95	2.54	31.82	33.00	33.84	-
EPDBP2030-40-09-TH	3.00	1.50	0.9°	40.0	2.50	2.86	4.038	80	6	6.95	2.00	41.92	43.34	-	-
EPDBP2030-50-09-TH	3.00	1.50	0.9°	50.0	2.50	2.86	4.352	90	6	6.95	1.64	52.01	53.65	-	-
EPDBP2030-60-09-TH	3.00	1.50	0.9°	60.0	2.50	2.86	4.667	100	6	6.95	1.39	62.10	-	-	-
EPDBP2030-70-09-TH	3.00	1.50	0.9°	70.0	2.50	2.86	4.981	110	6	6.95	1.20	72.19	-	-	-

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## EDPBP Cutting Conditions (Metric)



						Carbon steels Alloy Steel 180 250HB	Stainless steels Tool steels 25 35HRC	Pre-harden steels 35 45HRC	Hardened steels 45 55HRC	Hardened steels 55 65HRC					
Ratio to standard depth of cut						100%	90%	80%	65%	60%					
R	Mill dia.	Under neck length	Neck Angle	Standæd Step Down	Standæd Step Over	N (RPM)	Vf (mm/ min)	N (RPM)	Vf (mm/ min)	N (RPM)	Vf (mm/ min)	N (RPM)	Vf (mm/ min)	N (RPM)	Vf (mm/ min)
0.1	0.2	2.0	0.9	0.007	0.021	32,000	461	27,200	392	22,400	323	20,800	266	20,800	233
0.1	0.2	2.5	0.9	0.004	0.012	26,000	333	22,100	283	18,200	204	16,900	189	16,900	162
0.2	0.4	4.0	0.9	0.009	0.027	32,000	922	27,200	783	22,400	645	20,800	532	20,800	466
0.2	0.4	5.0	0.9	0.007	0.021	26,000	666	22,100	566	18,200	408	16,900	379	16,900	324
0.3	0.6	6.0	0.9	0.020	0.060	32,000	1,382	27,200	1,175	22,400	968	20,800	799	20,800	699
0.3	0.6	8.0	0.9	0.020	0.060	26,000	998	22,100	849	18,200	612	16,900	568	16,900	487
0.3	0.6	10.0	0.9	0.015	0.045	26,000	874	22,100	743	18,200	535	16,900	497	16,900	426
0.3	0.6	12.0	0.9	0.010	0.030	26,000	874	22,100	743	18,200	535	16,900	497	16,900	426
0.3	0.6	15.0	0.9	0.006	0.018	22,400	753	19,040	640	15,680	461	14,560	367	14,560	367
0.5	1.0	10.0	0.9	0.035	0.105	20,800	1,872	17,680	1,591	14,560	1,310	13,520	1,082	13,520	946
0.5	1.0	15.0	0.9	0.028	0.084	16,640	1,331	14,144	1,132	11,648	874	10,816	757	10,816	649
0.5	1.0	20.0	0.9	0.020	0.060	16,640	1,331	14,144	1,132	11,648	874	10,816	757	10,816	649
0.5	1.0	25.0	0.9	0.017	0.051	14,560	1,165	12,376	990	10,192	764	9,464	662	9,464	568
0.5	1.0	30.0	0.9	0.017	0.051	12,480	874	10,608	743	8,736	568	8,112	487	8,112	406
0.5	1.0	35.0	0.9	0.010	0.030	10,400	728	8,840	619	7,280	473	6,760	406	6,760	338
0.75	1.5	15.0	0.9	0.045	0.135	13,568	1,832	11,533	1,557	9,498	1,282	8,819	1,058	8,819	926
0.75	1.5	20.0	0.9	0.040	0.120	11,024	1,323	9,370	1,124	7,717	810	7,166	752	7,166	645
0.75	1.5	30.0	0.9	0.028	0.084	11,024	1,323	9,370	1,124	7,717	810	7,166	752	7,166	645
1.0	2.0	20.0	0.9	0.070	0.210	12,160	2,189	10,336	1,860	8,512	1,532	7,904	1,265	7,904	1,107
1.0	2.0	25.0	0.9	0.070	0.210	9,880	1,581	8,398	1,344	6,916	968	6,422	899	6,422	771
1.0	2.0	30.0	0.9	0.045	0.135	9,880	1,581	8,398	1,344	6,916	968	6,422	899	6,422	771
1.0	2.0	35.0	0.9	0.045	0.135	9,880	1,581	8,398	1,344	6,916	968	6,422	899	6,422	771
1.0	2.0	40.0	0.9	0.035	0.105	9,880	1,581	8,398	1,344	6,916	968	6,422	899	6,422	771
1.0	2.0	50.0	0.9	0.017	0.051	8,512	1,192	7,235	1,013	5,958	775	5,533	664	5,533	553
1.5	3.0	30.0	0.9	0.090	0.270	10,176	2,748	8,650	2,335	7,123	1,496	6,614	1,389	6,614	1,191
1.5	3.0	40.0	0.9	0.070	0.210	8,268	1,984	7,028	1,687	5,788	1,215	5,374	1,129	5,374	967
1.5	3.0	50.0	0.9	0.050	0.150	8,268	1,984	7,028	1,687	5,788	1,215	5,374	1,129	5,374	967
1.5	3.0	60.0	0.9	0.030	0.090	7,123	1,710	6,055	1,453	4,986	1,047	4,630	972	4,630	833
1.5	3.0	70.0	0.9	0.020	0.060	6,233	1,496	5,298	1,271	4,363	916	4,051	851	4,051	729