



MOLDINO

The Edge To Innovation

MMC Hitachi Tool Engineering Europe GmbH

CBN-EHB

**Epoch CBN High Precision Ball End Mill
For High-Accuracy Machining of Hardened Steels**

CBN
Cubic Boron Nitride

D 0.2 - 2
l_n ~ 7.5xD
Radius Tolerance:
D ≤ 0.6 ± 0.003 mm
h4 shank

**Diameter
checked**
Labelled on box
D μm



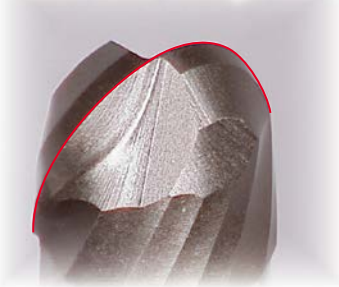
MMC Hitachi Tool Engineering Europe GmbH



CBN-EHB | Epoch CBN High Precision Ball End Mill | Features

Newly designed low cutting force high-strength flute shape

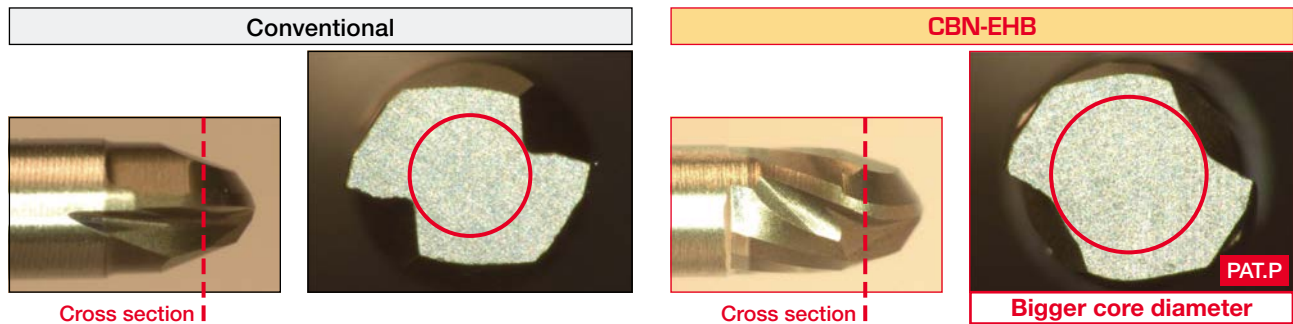
Helix flute design for excellent cutting performance



- ➔ Applications from roughing to finishing
- ➔ High-strength cutting edge to improve tool life
- ➔ New high helix flute design to reduce cutting forces
- ➔ High-rigidity design improves machining accuracy
- ➔ High-quality flute edge improves surface roughness

► **Dedication to high accuracy and long tool life**

Bigger core diameter to increase rigidity and to maintain high accuracy machining



New grinding method for improved surface roughness in finishing



Input of diameter correction value

🇬🇧 To improve final machining accuracy, input the real tool diameter stated on the case into CAM system.

🇩🇪 Zur Verbesserung der finalen Bearbeitungsgenauigkeit, sollte der auf der Verpackung aufgedruckte, tatsächliche Werkzeugdurchmesser im CAM hinterlegt werden.

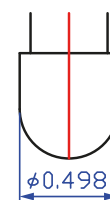
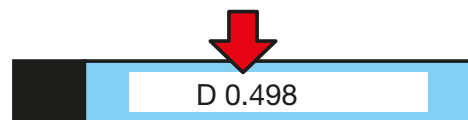
🇮🇹 Per una superiore precisione di esecuzione programmare nel vostro sistema CAM il diametro reale rilevato, che troverete.

🇪🇸 Para mejorar la precisión del mecanizado final, programar en el CAM el diámetro real de la herramienta indicado en la caja.

🇫🇷 Pour améliorer la précision de l'usinage final, saisissez le diamètre réel de l'outil indiqué sur le boîtier dans le système FAO.

🇵🇹 Para melhorar a precisão da maquinação final. Introduzir o diâmetro real da ferramenta no sistema de CAM conforme tabela de medição.

Measured tool diameter stated on case





CBN-EHB | Recommended Cutting Conditions

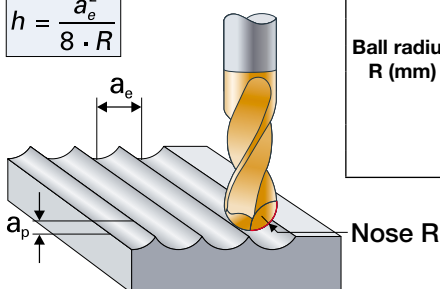
Material		Material Class I – Hardened Steels (50 ~ 55 HRC)											
Parameter		Semi Finishing						Finishing					
D	I _n	a _p	a _e	n	V _c	f _z	V _f	a _p	a _e	n	V _c	f _z	V _f
		mm	mm	min ⁻¹	m/min	mm/t	mm/min	mm	mm	min ⁻¹	m/min	mm/t	mm/min
0.2	0.3	0.007	0.021	42000	26	0.0048	400	0.005	0.005	42000	26	0.0042	350
	0.5	0.006	0.018	42000	26	0.0048	400	0.004	0.004	42000	26	0.0042	350
	1	0.003	0.009	42000	26	0.0048	400	0.002	0.002	42000	26	0.0042	350
	1.5	0.002	0.006	42000	26	0.0048	400	0.001	0.001	42000	26	0.0042	350
0.3	0.5	0.009	0.027	42000	40	0.0072	605	0.006	0.006	42000	40	0.0062	520
	0.75	0.009	0.027	42000	40	0.0072	605	0.006	0.006	42000	40	0.0062	520
	1	0.008	0.024	42000	40	0.0072	605	0.005	0.005	42000	40	0.0062	520
	1.5	0.005	0.015	42000	40	0.0072	605	0.003	0.003	42000	40	0.0062	520
0.4	2	0.003	0.009	42000	40	0.0072	605	0.003	0.003	42000	40	0.0062	520
	0.75	0.012	0.036	42000	53	0.0102	860	0.008	0.008	42000	53	0.0088	740
	1	0.012	0.036	42000	53	0.0102	860	0.008	0.008	42000	53	0.0088	740
	1.5	0.008	0.024	42000	53	0.0102	860	0.005	0.005	42000	53	0.0088	740
0.5	2	0.006	0.018	42000	53	0.0102	860	0.004	0.004	42000	53	0.0088	740
	3	0.004	0.012	42000	53	0.0102	860	0.003	0.003	42000	53	0.0088	740
	1	0.015	0.045	42000	66	0.0128	1075	0.010	0.010	42000	66	0.0111	930
	1.5	0.015	0.045	42000	66	0.0128	1075	0.010	0.010	42000	66	0.0111	930
0.6	2.5	0.008	0.024	42000	66	0.0128	1075	0.005	0.005	42000	66	0.0111	930
	3	0.006	0.018	42000	66	0.0128	1075	0.005	0.005	42000	66	0.0111	930
	1	0.018	0.054	42000	79	0.0162	1360	0.012	0.012	42000	79	0.0140	1175
	1.5	0.018	0.054	42000	79	0.0162	1360	0.012	0.012	42000	79	0.0140	1175
0.8	3	0.009	0.027	42000	79	0.0162	1360	0.006	0.006	42000	79	0.0140	1175
	4	0.006	0.018	42000	79	0.0162	1360	0.004	0.004	42000	79	0.0140	1175
	1.5	0.024	0.072	42000	106	0.0216	1815	0.016	0.016	42000	106	0.0187	1570
	2.5	0.024	0.072	42000	106	0.0216	1815	0.016	0.016	42000	106	0.0187	1570
1	4	0.012	0.036	40000	101	0.0216	1730	0.008	0.008	40000	101	0.0187	1495
	5	0.009	0.027	40000	101	0.0216	1730	0.005	0.005	40000	101	0.0187	1495
	1.5	0.030	0.090	40000	126	0.0300	2400	0.020	0.020	40000	126	0.0260	2080
	2.5	0.030	0.090	40000	126	0.0300	2400	0.020	0.020	40000	126	0.0260	2080
1.5	4	0.020	0.060	36000	113	0.0300	2160	0.013	0.013	36000	113	0.0260	1870
	5	0.015	0.045	32000	101	0.0300	1920	0.010	0.010	32000	101	0.0259	1660
	6	0.012	0.036	32000	101	0.0300	1920	0.008	0.008	32000	101	0.0259	1660
	8	0.008	0.024	30000	94	0.0300	1800	0.005	0.005	30000	94	0.0258	1550
2	2.5	0.045	0.135	27000	127	0.0450	2430	0.030	0.030	27000	127	0.0391	2110
	5	0.045	0.135	27000	127	0.0450	2430	0.030	0.030	27000	127	0.0391	2110
	7.5	0.030	0.090	21000	99	0.0450	1890	0.020	0.020	21000	99	0.0390	1640
	10	0.020	0.060	21000	99	0.0450	1890	0.013	0.013	21000	99	0.0390	1640
2	2.5	0.060	0.180	20000	126	0.0600	2400	0.040	0.040	20000	126	0.0520	2080
	5	0.060	0.180	20000	126	0.0600	2400	0.040	0.040	20000	126	0.0520	2080
	7.5	0.040	0.120	18000	113	0.0600	2160	0.027	0.027	18000	113	0.0519	1870
	10	0.030	0.090	16000	101	0.0600	1920	0.020	0.020	16000	101	0.0519	1660

Please Note: These Conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. If rpm of machine is lower than these conditions, please reduce rpm and V_f as same ratio.

Ball end mill pitch feed and theoretical cusp height table (µm)

$$h = R - \sqrt{\frac{(2 \cdot R)^2 - a_e^2}{4}}$$

$$h = \frac{a_e^2}{8 \cdot R}$$



		Pitch (a _e mm)									
		0.005	0.01	0.015	0.02	0.03	0.04	0.05	0.06	0.08	0.10
Ball radius R (mm)	0.1	0.031	0.13	0.28	0.50	1.13	2.02	3.18	4.61	8.35	13.40
	0.15	0.021	0.08	0.19	0.33	0.75	1.34	2.10	3.03	5.43	8.58
	0.2	0.016	0.06	0.14	0.25	0.56	1.00	1.57	2.26	4.04	6.35
	0.25	0.013	0.05	0.11	0.20	0.45	0.80	1.25	1.81	3.22	5.05
	0.3	0.010	0.04	0.09	0.17	0.38	0.67	1.04	1.50	2.68	4.20
	0.4	0.008	0.03	0.07	0.13	0.28	0.50	0.78	1.13	2.01	3.14
	0.5	0.006	0.03	0.06	0.10	0.23	0.40	0.63	0.90	1.60	2.51
	0.75	0.004	0.02	0.04	0.07	0.15	0.27	0.42	0.60	1.07	1.67
	1	0.003	0.01	0.03	0.05	0.11	0.20	0.31	0.45	0.80	1.25



CBN-EHB | Recommended Cutting Conditions

Material		Material Class II – Hardened Steels (55 ~ 62 HRC)											
Parameter		Semi Finishing						Finishing					
D	I _n	a _p	a _e	n	V _c	f _z	V _f	a _p	a _e	n	V _c	f _z	V _f
		mm	mm	min ⁻¹	m/min	mm/t	mm/min	mm	mm	min ⁻¹	m/min	mm/t	mm/min
0.2	0.3	0.007	0.021	42000	26	0.0042	350	0.005	0.005	42000	26	0.0035	295
	0.5	0.006	0.018	42000	26	0.0042	350	0.004	0.004	42000	26	0.0035	295
	1	0.003	0.009	42000	26	0.0042	350	0.002	0.002	42000	26	0.0035	295
	1.5	0.002	0.006	42000	26	0.0042	350	0.001	0.001	42000	26	0.0035	295
0.3	0.5	0.009	0.027	42000	40	0.0062	520	0.006	0.006	42000	40	0.0053	445
	0.75	0.009	0.027	42000	40	0.0062	520	0.006	0.006	42000	40	0.0053	445
	1	0.008	0.024	42000	40	0.0062	520	0.005	0.005	42000	40	0.0053	445
	1.5	0.005	0.015	42000	40	0.0062	520	0.003	0.003	42000	40	0.0053	445
0.4	2	0.003	0.009	42000	40	0.0062	520	0.003	0.003	42000	40	0.0053	445
	0.75	0.012	0.036	42000	53	0.0088	740	0.008	0.008	42000	53	0.0075	630
	1	0.012	0.036	42000	53	0.0088	740	0.008	0.008	42000	53	0.0075	630
	1.5	0.008	0.024	42000	53	0.0088	740	0.005	0.005	42000	53	0.0075	630
0.5	2	0.006	0.018	42000	53	0.0088	740	0.004	0.004	42000	53	0.0075	630
	3	0.004	0.012	42000	53	0.0088	740	0.003	0.003	42000	53	0.0075	630
	1	0.015	0.045	42000	66	0.0111	930	0.010	0.010	42000	66	0.0094	790
	1.5	0.015	0.045	42000	66	0.0111	930	0.010	0.010	42000	66	0.0094	790
0.6	2.5	0.008	0.024	42000	66	0.0111	930	0.005	0.005	42000	66	0.0094	790
	3	0.006	0.018	42000	66	0.0111	930	0.005	0.005	42000	66	0.0094	790
	1	0.018	0.054	42000	79	0.0140	1180	0.012	0.012	42000	79	0.0119	1000
	1.5	0.018	0.054	42000	79	0.0140	1180	0.012	0.012	42000	79	0.0119	1000
0.8	3	0.009	0.027	42000	79	0.0140	1180	0.006	0.006	42000	79	0.0119	1000
	4	0.006	0.018	42000	79	0.0140	1180	0.004	0.004	42000	79	0.0119	1000
	1.5	0.024	0.072	42000	106	0.0187	1570	0.016	0.016	42000	106	0.0158	1330
	2.5	0.024	0.072	42000	106	0.0187	1570	0.016	0.016	42000	106	0.0158	1330
1	4	0.012	0.036	40000	101	0.0188	1500	0.008	0.008	40000	101	0.0158	1265
	5	0.009	0.027	40000	101	0.0188	1500	0.005	0.005	40000	101	0.0158	1265
	1.5	0.030	0.090	40000	126	0.0260	2080	0.020	0.020	40000	126	0.0220	1760
	2.5	0.030	0.090	40000	126	0.0260	2080	0.020	0.020	40000	126	0.0220	1760
1.5	4	0.020	0.060	36000	113	0.0260	1870	0.013	0.013	36000	113	0.0219	1580
	5	0.015	0.045	32000	101	0.0259	1660	0.010	0.010	32000	101	0.0220	1410
	6	0.012	0.036	32000	101	0.0259	1660	0.008	0.008	32000	101	0.0220	1410
	8	0.008	0.024	30000	94	0.0258	1550	0.005	0.005	30000	94	0.0220	1320
2	2.5	0.045	0.135	27000	127	0.0391	2110	0.030	0.030	27000	127	0.0330	1780
	5	0.045	0.135	27000	127	0.0391	2110	0.030	0.030	27000	127	0.0330	1780
	7.5	0.030	0.090	21000	99	0.0390	1640	0.020	0.020	21000	99	0.0331	1390
	10	0.020	0.060	21000	99	0.0390	1640	0.013	0.013	21000	99	0.0331	1390
2	2.5	0.060	0.180	20000	126	0.0520	2080	0.040	0.040	20000	126	0.0440	1760
	5	0.060	0.180	20000	126	0.0520	2080	0.040	0.040	20000	126	0.0440	1760
	7.5	0.040	0.120	18000	113	0.0519	1870	0.027	0.027	18000	113	0.0439	1580
	10	0.030	0.090	16000	101	0.0519	1660	0.020	0.020	16000	101	0.0441	1410

Please Note: These Conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. If rpm of machine is lower than these conditions, please reduce rpm and V_f as same ratio.



CBN-EHB | Recommended Cutting Conditions

Material		Material Class III – Hardened Steels (62 ~ 64 HRC)											
Parameter		Semi Finishing						Finishing					
D	I _n	a _p	a _e	n	V _c	f _z	V _f	a _p	a _e	n	V _c	f _z	V _f
		mm	mm	min ⁻¹	m/min	mm/t	mm/min	mm	mm	min ⁻¹	m/min	mm/t	mm/min
0.2	0.3	0.0050	0.015	42000	26	0.0035	295	0.005	0.005	42000	26	0.0029	245
	0.5	0.0040	0.012	42000	26	0.0035	295	0.004	0.004	42000	26	0.0029	245
	1	0.0020	0.006	42000	26	0.0035	295	0.002	0.002	42000	26	0.0029	245
	1.5	0.0010	0.003	42000	26	0.0035	295	0.001	0.001	42000	26	0.0029	245
0.3	0.5	0.0070	0.021	42000	40	0.0053	445	0.006	0.006	42000	40	0.0043	360
	0.75	0.0070	0.021	42000	40	0.0053	445	0.006	0.006	42000	40	0.0043	360
	1	0.0060	0.018	42000	40	0.0053	445	0.005	0.005	42000	40	0.0043	360
	1.5	0.0040	0.012	42000	40	0.0053	445	0.003	0.003	42000	40	0.0043	360
0.4	2	0.0020	0.006	42000	40	0.0053	445	0.003	0.003	42000	40	0.0043	360
	0.75	0.0100	0.030	42000	53	0.0075	630	0.008	0.008	42000	53	0.0061	510
	1	0.0100	0.030	42000	53	0.0075	630	0.008	0.008	42000	53	0.0061	510
	1.5	0.0070	0.021	42000	53	0.0075	630	0.005	0.005	42000	53	0.0061	510
0.5	2	0.0050	0.015	42000	53	0.0075	630	0.004	0.004	42000	53	0.0061	510
	3	0.0030	0.009	42000	53	0.0075	630	0.003	0.003	42000	53	0.0061	510
	1	0.0120	0.036	42000	66	0.0094	790	0.010	0.010	42000	66	0.0077	650
	1.5	0.0120	0.036	42000	66	0.0094	790	0.010	0.010	42000	66	0.0077	650
0.6	2.5	0.0060	0.018	42000	66	0.0094	790	0.005	0.005	42000	66	0.0077	650
	3	0.0050	0.015	42000	66	0.0094	790	0.005	0.005	42000	66	0.0077	650
	1	0.0150	0.045	42000	79	0.0119	1000	0.012	0.012	42000	79	0.0097	815
	1.5	0.0150	0.045	42000	79	0.0119	1000	0.012	0.012	42000	79	0.0097	815
0.8	3	0.0070	0.021	42000	79	0.0119	1000	0.006	0.006	42000	79	0.0097	815
	4	0.0040	0.012	42000	79	0.0119	1000	0.004	0.004	42000	79	0.0097	815
	1.5	0.0200	0.060	42000	106	0.0158	1330	0.016	0.016	42000	106	0.0130	1090
	2.5	0.0200	0.060	42000	106	0.0158	1330	0.016	0.016	42000	106	0.0130	1090
1	4	0.0100	0.030	40000	101	0.0159	1270	0.008	0.008	40000	101	0.0130	1040
	5	0.0070	0.021	40000	101	0.0159	1270	0.005	0.005	40000	101	0.0130	1040
	1.5	0.0240	0.072	40000	126	0.0220	1760	0.020	0.020	40000	126	0.0180	1440
	2.5	0.0240	0.072	40000	126	0.0220	1760	0.020	0.020	40000	126	0.0180	1440
1.5	4	0.0160	0.048	36000	113	0.0219	1580	0.013	0.013	36000	113	0.0181	1300
	5	0.0120	0.036	32000	101	0.0220	1410	0.010	0.010	32000	101	0.0180	1150
	6	0.0095	0.029	32000	101	0.0220	1410	0.008	0.008	32000	101	0.0180	1150
	8	0.0060	0.019	30000	94	0.0220	1320	0.005	0.005	30000	94	0.0180	1080
2	2.5	0.0360	0.108	27000	127	0.0330	1780	0.030	0.030	27000	127	0.0270	1460
	5	0.0360	0.108	27000	127	0.0330	1780	0.030	0.030	27000	127	0.0270	1460
	7.5	0.0240	0.072	21000	99	0.0331	1390	0.020	0.020	21000	99	0.0269	1130
	10	0.0160	0.048	21000	99	0.0331	1390	0.013	0.013	21000	99	0.0269	1130
2	2.5	0.0480	0.144	20000	126	0.0440	1760	0.040	0.040	20000	126	0.0360	1440
	5	0.0480	0.144	20000	126	0.0440	1760	0.040	0.040	20000	126	0.0360	1440
	7.5	0.0320	0.096	18000	113	0.0439	1580	0.027	0.027	18000	113	0.0361	1300
	10	0.0240	0.072	16000	101	0.0441	1410	0.020	0.020	16000	101	0.0359	1150

Please Note: These Conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. If rpm of machine is lower than these conditions, please reduce rpm and V_f as same ratio.



CBN-EHB | Recommended Cutting Conditions

Material		Material Class IV – Hardened Steels (64 ~ 70 HRC)											
Parameter		Semi Finishing						Finishing					
D	I _n	a _p	a _e	n	V _c	f _z	V _f	a _p	a _e	n	V _c	f _z	V _f
		mm	mm	min ⁻¹	m/min	mm/t	mm/min	mm	mm	min ⁻¹	m/min	mm/t	mm/min
0.2	0.3	0.005	0.015	42000	26	0.0029	245	0.005	0.005	42000	26	0.0022	185
	0.5	0.004	0.012	42000	26	0.0029	245	0.004	0.004	42000	26	0.0022	185
	1	0.002	0.006	42000	26	0.0029	245	0.002	0.002	42000	26	0.0022	185
	1.5	0.001	0.003	42000	26	0.0029	245	0.001	0.001	42000	26	0.0022	185
0.3	0.5	0.006	0.018	42000	40	0.0043	360	0.006	0.006	42000	40	0.0034	285
	0.75	0.006	0.018	42000	40	0.0043	360	0.006	0.006	42000	40	0.0034	285
	1	0.005	0.015	42000	40	0.0043	360	0.005	0.005	42000	40	0.0034	285
	1.5	0.003	0.009	42000	40	0.0043	360	0.003	0.003	42000	40	0.0034	285
0.4	2	0.002	0.006	42000	40	0.0043	360	0.003	0.003	42000	40	0.0034	285
	0.75	0.008	0.024	42000	53	0.0061	515	0.008	0.008	42000	53	0.0048	405
	1	0.008	0.024	42000	53	0.0061	515	0.008	0.008	42000	53	0.0048	405
	1.5	0.005	0.015	42000	53	0.0061	515	0.005	0.005	42000	53	0.0048	405
0.5	2	0.004	0.012	42000	53	0.0061	515	0.004	0.004	42000	53	0.0048	405
	3	0.002	0.006	42000	53	0.0061	515	0.003	0.003	42000	53	0.0048	405
	1	0.010	0.030	42000	66	0.0077	650	0.010	0.010	42000	66	0.0060	505
	1.5	0.010	0.030	42000	66	0.0077	650	0.010	0.010	42000	66	0.0060	505
0.6	2.5	0.005	0.015	42000	66	0.0077	650	0.005	0.005	42000	66	0.0060	505
	3	0.004	0.012	42000	66	0.0077	650	0.005	0.005	42000	66	0.0060	505
	1	0.012	0.036	42000	79	0.0097	815	0.012	0.012	42000	79	0.0076	640
	1.5	0.012	0.036	42000	79	0.0097	815	0.012	0.012	42000	79	0.0076	640
0.8	3	0.006	0.018	42000	79	0.0097	815	0.006	0.006	42000	79	0.0076	640
	4	0.003	0.009	42000	79	0.0097	815	0.004	0.004	42000	79	0.0076	640
	1.5	0.016	0.048	42000	106	0.0130	1090	0.016	0.016	42000	106	0.0101	850
	2.5	0.016	0.048	42000	106	0.0130	1090	0.016	0.016	42000	106	0.0101	850
1	4	0.008	0.024	40000	101	0.0130	1040	0.008	0.008	40000	101	0.0101	810
	5	0.006	0.018	40000	101	0.0130	1040	0.005	0.005	40000	101	0.0101	810
	1.5	0.020	0.060	40000	126	0.0180	1440	0.020	0.020	40000	126	0.0140	1120
	2.5	0.020	0.060	40000	126	0.0180	1440	0.020	0.020	40000	126	0.0140	1120
1.5	4	0.013	0.039	36000	113	0.0181	1300	0.013	0.013	36000	113	0.0140	1010
	5	0.010	0.030	32000	101	0.0180	1150	0.010	0.010	32000	101	0.0141	900
	6	0.008	0.024	32000	101	0.0180	1150	0.008	0.008	32000	101	0.0141	900
	8	0.005	0.016	30000	94	0.0180	1080	0.005	0.005	30000	94	0.0140	840
2	2.5	0.030	0.090	27000	127	0.0270	1460	0.030	0.030	27000	127	0.0209	1130
	5	0.030	0.090	27000	127	0.0270	1460	0.030	0.030	27000	127	0.0209	1130
	7.5	0.020	0.060	21000	99	0.0269	1130	0.020	0.020	21000	99	0.0210	880
	10	0.013	0.039	21000	99	0.0269	1130	0.013	0.013	21000	99	0.0210	880
2	2.5	0.040	0.120	20000	126	0.0360	1440	0.040	0.040	20000	126	0.0280	1120
	5	0.040	0.120	20000	126	0.0360	1440	0.040	0.040	20000	126	0.0280	1120
	7.5	0.027	0.081	18000	113	0.0361	1300	0.027	0.027	18000	113	0.0281	1010
	10	0.020	0.060	16000	101	0.0359	1150	0.020	0.020	16000	101	0.0281	900

Please Note: These Conditions are for general guidance; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. If rpm of machine is lower than these conditions, please reduce rpm and V_f as same ratio.



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