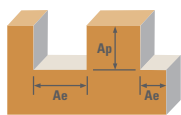


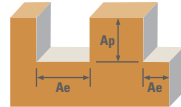
4 Flute: Ball



M4MB 3xD Metric	Hardness	Ae x D ₁	Ap x D ₁	Vc (m/min)	Diameter (D ₁) (mm)							
					0.1	0.5	1	1.5	2	2.5	3	
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile ≤ .10 ≤ .25 ≤ 2	111	RPM	353837	70767	35384	23589	17692	14153	11795
				(89-134)	Fz	0.00030	0.00152	0.00305	0.00457	0.00610	0.00762	0.00915
					Feed (mm/min)	432	432	432	432	432	432	432
				88	RPM	281131	56226	28113	18742	14057	11245	9371
				(71-106)	Fz	0.00030	0.00152	0.00305	0.00457	0.00610	0.00762	0.00915
					Feed (mm/min)	343	343	343	343	343	343	343
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile ≤ .10 ≤ .25 ≤ 2	64	RPM	203577	40715	20358	13572	10179	8143	6786
				(51-77)	Fz	0.00028	0.00139	0.00278	0.00417	0.00556	0.00695	0.00835
					Feed (mm/min)	226	226	226	226	226	226	226
				50	RPM	159954	31991	15995	10664	7998	6398	5332
				(40-60)	Fz	0.00028	0.00139	0.00278	0.00417	0.00556	0.00695	0.00835
					Feed (mm/min)	178	178	178	178	178	178	178
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile ≤ .10 ≤ .25 ≤ 2	53	RPM	169648	33930	16965	11310	8482	6786	5655
				(43-64)	Fz	0.00022	0.00110	0.00220	0.00330	0.00440	0.00550	0.00658
					Feed (mm/min)	149	149	149	149	149	149	149
				43	RPM	135718	27144	13572	9048	6786	5429	4524
				(34-51)	Fz	0.00022	0.00110	0.00220	0.00330	0.00440	0.00550	0.00658
					Feed (mm/min)	119	119	119	119	119	119	119
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile ≤ .10 ≤ .25 ≤ 2	93	RPM	295672	59134	29567	19711	14784	11827	9856
				(74-112)	Fz	0.00031	0.00154	0.00307	0.00461	0.00615	0.00769	0.00922
					Feed (mm/min)	364	364	364	364	364	364	364
				75	RPM	237507	47501	23751	15834	11875	9500	7917
				(60-90)	Fz	0.00031	0.00154	0.00307	0.00461	0.00615	0.00769	0.00922
					Feed (mm/min)	292	292	292	292	292	292	292
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile ≤ .10 ≤ .25 ≤ 2	104	RPM	329602	65920	32960	21973	16480	13184	10987
				(83-124)	Fz	0.00030	0.00152	0.00303	0.00455	0.00607	0.00758	0.00911
					Feed (mm/min)	400	400	400	400	400	400	400
				82	RPM	261742	52348	26174	17449	13087	10470	8725
				(66-99)	Fz	0.00030	0.00152	0.00303	0.00455	0.00607	0.00758	0.00911
					Feed (mm/min)	318	318	318	318	318	318	318
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile ≤ .10 ≤ .25 ≤ 2	72	RPM	227813	45563	22781	15188	11391	9113	7594
				(57-86)	Fz	0.00028	0.00140	0.00280	0.00420	0.00559	0.00699	0.00841
					Feed (mm/min)	255	255	255	255	255	255	255
				56	RPM	179342	35868	17934	11956	8967	7174	5978
				(45-68)	Fz	0.00028	0.00140	0.00280	0.00420	0.00559	0.00699	0.00841
					Feed (mm/min)	201	201	201	201	201	201	201
	STAINLESS STEELS (PH) 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450	≤ 325 Bhn or ≤ 35 HRc	Profile ≤ .10 ≤ .25 ≤ 2	66	RPM	208425	41685	20842	13895	10421	8337	6947
				(52-79)	Fz	0.00020	0.00098	0.00197	0.00295	0.00393	0.00491	0.00592
					Feed (mm/min)	164	164	164	164	164	164	164
				52	RPM	164801	32960	16480	10987	8240	6592	5493
				(41-62)	Fz	0.00020	0.00098	0.00197	0.00295	0.00393	0.00491	0.00592
					Feed (mm/min)	130	130	130	130	130	130	130

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4 Flute: Ball



M4MB 3xD Metric	Hardness	Profile Ae x D ₁	Ap x D ₁	Vc (m/min)	Diameter (D ₁) (mm)							
					0.1	0.5	1	1.5	2	2.5	3	
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	Profile ≤ .10 ≤ .25 ≤ 2	1	18	RPM	58165	11633	5816	3878	2908	2327	1939
					Fz	0.00016	0.00080	0.00160	0.00240	0.00320	0.00400	0.00481
					Feed (mm/min)	37	37	37	37	37	37	37
		Slot 1 ≤ .15 ≤ .35	14	RPM	43624	8725	4362	2908	2181	1745	1454	
				Fz	0.00016	0.00080	0.00160	0.00240	0.00320	0.00400	0.00481	
				Feed (mm/min)	28	28	28	28	28	28	28	
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	Profile ≤ .10 ≤ .25 ≤ 2	1	14	RPM	43624	8725	4362	2908	2181	1745	1454
					Fz	0.00011	0.00056	0.00112	0.00168	0.00225	0.00281	0.00332
					Feed (mm/min)	20	20	20	20	20	20	20
		Slot 1 ≤ .15 ≤ .35	11	RPM	33930	6786	3393	2262	1696	1357	1131	
				Fz	0.00011	0.00056	0.00112	0.00168	0.00225	0.00281	0.00332	
				Feed (mm/min)	15	15	15	15	15	15	15	
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	Profile ≤ .10 ≤ .25 ≤ 2	1	49	RPM	155107	31021	15511	10340	7755	6204	5170	
				Fz	0.00020	0.00098	0.00197	0.00295	0.00393	0.00491	0.00589	
				Feed (mm/min)	122	122	122	122	122	122	122	
	Slot 1 ≤ .15 ≤ .35	40	RPM	126024	25205	12602	8402	6301	5041	4201		
			Fz	0.00020	0.00098	0.00197	0.00295	0.00393	0.00491	0.00589		
			Feed (mm/min)	99	99	99	99	99	99	99		
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	Profile ≤ .10 ≤ .25 ≤ 2	1	18	RPM	58165	11633	5816	3878	2908	2327	1939	
				Fz	0.00013	0.00066	0.00131	0.00197	0.00262	0.00328	0.00395	
				Feed (mm/min)	30	30	30	30	30	30	30	
	Slot 1 ≤ .15 ≤ .35	14	RPM	43624	8725	4362	2908	2181	1745	1454		
			Fz	0.00013	0.00066	0.00131	0.00197	0.00262	0.00328	0.00395		
			Feed (mm/min)	23	23	23	23	23	23	23		
ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	Profile ≤ .10 ≤ .25 ≤ 2	1	305	RPM	969416	193883	96942	64628	48471	38777	32314	
				Fz	0.00093	0.00467	0.00933	0.01400	0.01867	0.02334	0.02801	
				Feed (mm/min)	3620	3620	3620	3620	3620	3620	3620	
	Slot 1 ≤ .15 ≤ .35	244	RPM	775533	155107	77553	51702	38777	31021	25851		
			Fz	0.00093	0.00467	0.00933	0.01400	0.01867	0.02334	0.02801		
			Feed (mm/min)	2896	2896	2896	2896	2896	2896	2896		
COPPER ALLOYS Alum Bronze, C110, Muntz Brass	Profile ≤ .10 ≤ .25 ≤ 2	1	157	RPM	499249	99850	49925	33283	24962	19970	16642	
				Fz	0.00069	0.00343	0.00687	0.01030	0.01374	0.01717	0.02061	
				Feed (mm/min)	1372	1372	1372	1372	1372	1372	1372	
	Slot 1 ≤ .15 ≤ .35	125	RPM	397461	79492	39746	26497	19873	15898	13249		
			Fz	0.00069	0.00343	0.00687	0.01030	0.01374	0.01717	0.02061		
			Feed (mm/min)	1092	1092	1092	1092	1092	1092	1092		
PLASTICS Polycarbonate, PVC, Polypropylene	Profile ≤ .10 ≤ .25 ≤ 2	1	305	RPM	969416	193883	96942	64628	48471	38777	32314	
				Fz	0.00093	0.00467	0.00933	0.01400	0.01867	0.02334	0.02801	
				Feed (mm/min)	3620	3620	3620	3620	3620	3620	3620	
	Slot 1 ≤ .15 ≤ .35	244	RPM	775533	155107	77553	51702	38777	31021	25851		
			Fz	0.00093	0.00467	0.00933	0.01400	0.01867	0.02334	0.02801		
			Feed (mm/min)	2896	2896	2896	2896	2896	2896	2896		

Note:

- Bhn (Brinell) HRc (Rockwell C)
- when recommended speed exceeds your capability, use maximum available and recalculate ipm
- rpm = (Vc x 1000) / (D₁ x 3.14)
- mm/min = Fz x 4 x rpm
- helical ramp at 2 degrees or less, using slotting speed and feed rates (plunging is not recommended)
- reduce speed and feed for materials harder than listed
- reduce feed and Ae when finish milling (.02 x D₁ maximum)
- refer to the KYOCERA SGS Tool Wizard® for complete technical information (www.kyocera-sgstool.com)

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02640.....	38	02695.....	40	02750.....	48	02806.....	50	02905.....	51	02960.....	55	03015.....	53
02641.....	38	02696.....	40	02751.....	48	02807.....	50	02906.....	51	02961.....	55	03016.....	55
02642.....	38	02697.....	40	02752.....	48	02808.....	50	02907.....	51	02962.....	55	03017.....	55
02643.....	38	02698.....	40	02753.....	48	02809.....	50	02908.....	51	02963.....	55	03018.....	55
02644.....	38	02699.....	40	02754.....	48	02811.....	51	02909.....	51	02964.....	55	03019.....	55
02645.....	38	02700.....	40	02755.....	48	02819.....	50	02910.....	51	02965.....	55	03020.....	55
02646.....	38	02701.....	40	02756.....	48	02829.....	53	02911.....	51	02966.....	55	03021.....	55