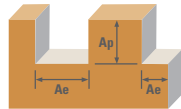


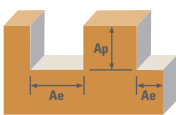
# 3 Flute, 12xD Overall Reach: Square, Ball



M3, M3B 12xD Fractional	Hardness	Profile	Ae x D <sub>1</sub>		Ap x D <sub>1</sub>	Vc (SFM)	RPM	Diameter (D <sub>1</sub> ) (inch)					
			≤ .22	≤ .45				≤ .25	0.0100	0.0156	0.0312	0.0625	0.0938
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile	≤ .22	≤ .45	≤ .25	365	RPM	139430	89378	44689	22309	14865	11619
						(292-438)	Fz	0.000020	0.00003	0.00006	0.00013	0.00019	0.00024
							Feed (ipm)	8.43	8.43	8.43	8.43	8.43	8.43
		Slot	1	≤ .06	≤ .15	290	RPM	110780	71013	35506	17725	11810	9232
						(232-348)	Fz	0.000020	0.00003	0.00006	0.00013	0.00019	0.00024
							Feed (ipm)	6.70	6.70	6.70	6.70	6.70	6.70
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile	≤ .22	≤ .45	≤ .25	210	RPM	80220	51423	25712	12835	8552	6685
						(168-252)	Fz	0.000018	0.00003	0.00006	0.00011	0.00017	0.00022
							Feed (ipm)	4.31	4.31	4.31	4.31	4.31	4.31
		Slot	1	≤ .06	≤ .15	165	RPM	63030	40404	20202	10085	6720	5253
						(132-198)	Fz	0.000018	0.00003	0.00006	0.00011	0.00017	0.00022
							Feed (ipm)	3.39	3.39	3.39	3.39	3.39	3.39
<b>H</b>	<b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	Profile	≤ .22	≤ .45	≤ .25	175	RPM	66850	42853	21426	10696	7127	5571
						(140-210)	Fz	0.000015	0.00002	0.00005	0.00009	0.00014	0.00018
							Feed (ipm)	2.99	2.99	2.99	2.99	2.99	2.99
		Slot	1	≤ .06	≤ .15	140	RPM	53480	34282	17141	8557	5701	4457
						(112-168)	Fz	0.000015	0.00002	0.00005	0.00009	0.00014	0.00018
							Feed (ipm)	2.39	2.39	2.39	2.39	2.39	2.39
<b>K</b>	<b>CAST IRONS (LOW &amp; MEDIUM ALLOY) Gray, Malleable, Ductile</b>	Profile	≤ .22	≤ .45	≤ .25	305	RPM	116510	74686	37343	18642	12421	9709
						(244-366)	Fz	0.000020	0.00003	0.00006	0.00013	0.00019	0.00024
							Feed (ipm)	7.06	7.06	7.06	7.06	7.06	7.06
		Slot	1	≤ .06	≤ .15	245	RPM	93590	59994	29997	14974	9978	7799
						(196-294)	Fz	0.000020	0.00003	0.00006	0.00013	0.00019	0.00024
							Feed (ipm)	5.67	5.67	5.67	5.67	5.67	5.67
<b>M</b>	<b>STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F</b>	Profile	≤ .22	≤ .45	≤ .25	340	RPM	129880	83256	41628	20781	13846	10823
						(272-408)	Fz	0.000020	0.00003	0.00006	0.00013	0.00019	0.00024
							Feed (ipm)	7.85	7.85	7.85	7.85	7.85	7.85
		Slot	1	≤ .06	≤ .15	270	RPM	103140	66115	33058	16502	10996	8595
						(216-324)	Fz	0.000020	0.00003	0.00006	0.00013	0.00019	0.00024
							Feed (ipm)	6.24	6.24	6.24	6.24	6.24	6.24
	<b>STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L</b>	Profile	≤ .22	≤ .45	≤ .25	235	RPM	89770	57545	28772	14363	9570	7481
						(188-282)	Fz	0.000018	0.00003	0.00006	0.00011	0.00017	0.00022
							Feed (ipm)	4.83	4.83	4.83	4.83	4.83	4.83
		Slot	1	≤ .06	≤ .15	185	RPM	70670	45301	22651	11307	7534	5889
						(148-222)	Fz	0.000018	0.00003	0.00006	0.00011	0.00017	0.00022
							Feed (ipm)	3.80	3.80	3.80	3.80	3.80	3.80
<b>STAINLESS STEELS (PH) 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450</b>	Profile	≤ .22	≤ .45	≤ .25	215	RPM	82130	52647	26324	13141	8756	6844	
					(172-258)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015	
						Feed (ipm)	3.13	3.13	3.13	3.13	3.13	3.13	
	Slot	1	≤ .06	≤ .15	170	RPM	64940	41628	20814	10390	6923	5412	
					(136-204)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015	
						Feed (ipm)	2.47	2.47	2.47	2.47	2.47	2.47	

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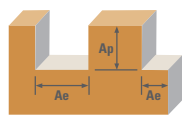
# 3 Flute, 12xD Overall Reach: Square, Ball



M3, M3B 12xD Fractional	Hardness	Profile	Ae x D <sub>1</sub>		Ap x D <sub>1</sub>	Vc (SFM)		Diameter (D <sub>1</sub> ) (inch)					
			≤ .22	≤ .45				≤ .25	0.0100	0.0156	0.0312	0.0625	0.0938
<b>S</b>	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400</b>	Profile	≤ .22	≤ .45	≤ .25	60	RPM	22920	14692	7346	3667	2443	1910
							Fz	0.000011	0.00002	0.00004	0.00007	0.00011	0.00014
							Feed (ipm)	0.77	0.77	0.77	0.77	0.77	0.77
		Slot	1	≤ .06	≤ .15	45	RPM	17190	11019	5510	2750	1833	1433
							Fz	0.000011	0.00002	0.00004	0.00007	0.00011	0.00014
							Feed (ipm)	0.58	0.58	0.58	0.58	0.58	0.58
	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene</b>	Profile	≤ .22	≤ .45	≤ .25	45	RPM	17190	11019	5510	2750	1833	1433
							Fz	0.000008	0.00001	0.00002	0.00005	0.00007	0.00009
							Feed (ipm)	0.39	0.39	0.39	0.39	0.39	0.39
		Slot	1	≤ .06	≤ .15	35	RPM	13370	8571	4285	2139	1425	1114
							Fz	0.000008	0.00001	0.00002	0.00005	0.00007	0.00009
							Feed (ipm)	0.30	0.30	0.30	0.30	0.30	0.30
<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si</b>	Profile	≤ .22	≤ .45	≤ .25	160	RPM	61120	39179	19590	9779	6516	5093	
						Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015	
						Feed (ipm)	2.33	2.33	2.33	2.33	2.33	2.33	
	Slot	1	≤ .06	≤ .15	130	RPM	49660	31833	15917	7946	5294	4138	
						Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015	
						Feed (ipm)	1.89	1.89	1.89	1.89	1.89	1.89	
<b>TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al</b>	Profile	≤ .22	≤ .45	≤ .25	60	RPM	22920	14692	7346	3667	2443	1910	
						Fz	0.000009	0.00001	0.00003	0.00006	0.00008	0.00011	
						Feed (ipm)	0.62	0.62	0.62	0.62	0.62	0.62	
	Slot	1	≤ .06	≤ .15	45	RPM	17190	11019	5510	2750	1833	1433	
						Fz	0.000009	0.00001	0.00003	0.00006	0.00008	0.00011	
						Feed (ipm)	0.46	0.46	0.46	0.46	0.46	0.46	
<b>N</b>	<b>ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075</b>	Profile	≤ .22	≤ .45	≤ .25	1000	RPM	382000	244872	122436	61120	40725	31833
							Fz	0.000060	0.00009	0.00019	0.00037	0.00056	0.00071
							Feed (ipm)	68.25	68.25	68.25	68.25	68.25	68.25
		Slot	1	≤ .06	≤ .15	800	RPM	305600	195897	97949	48896	32580	25467
							Fz	0.000060	0.00009	0.00019	0.00037	0.00056	0.00071
							Feed (ipm)	54.60	54.60	54.60	54.60	54.60	54.60
<b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>	Profile	≤ .22	≤ .45	≤ .25	515	RPM	196730	126109	63054	31477	20973	16394	
						Fz	0.000045	0.00007	0.00014	0.00028	0.00042	0.00054	
						Feed (ipm)	26.38	26.38	26.38	26.38	26.38	26.38	
	Slot	1	≤ .06	≤ .15	410	RPM	156620	100397	50199	25059	16697	13052	
						Fz	0.000045	0.00007	0.00014	0.00028	0.00042	0.00054	
						Feed (ipm)	21.00	21.00	21.00	21.00	21.00	21.00	
<b>PLASTICS Polycarbonate, PVC, Polypropylene</b>	Profile	≤ .23	≤ .45	≤ .25	1000	RPM	382000	244872	122436	61120	40725	31833	
						Fz	0.000060	0.00009	0.00019	0.00037	0.00056	0.00071	
						Feed (ipm)	68.25	68.25	68.25	68.25	68.25	68.25	
	Slot	1	≤ .06	≤ .15	800	RPM	305600	195897	97949	48896	32580	25467	
						Fz	0.000060	0.00009	0.00019	0.00037	0.00056	0.00071	
						Feed (ipm)	54.60	54.60	54.60	54.60	54.60	54.60	

- Note:**
- Bhn (Brinell)      HRc (Rockwell C)
  - when recommended speed exceeds your capability, use maximum available and recalculate ipm
  - rpm = Vc x 3.82 / D<sub>1</sub>
  - ipm = Fz x 3 x rpm
  - helical ramp at 1 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 D<sub>1</sub> maximum)
  - refer to the KYOCERA SGS Tool Wizard® for complete technical information (www.kyocera-sgstool.com)

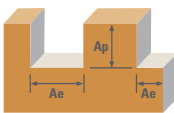
# 3 Flute, 15xD Overall Reach: Square, Ball



M3, M3B 15xD Fractional	Hardness	Profile	Ae x D <sub>1</sub>		Ap x D <sub>1</sub>	Vc (SFM)	Diameter (D <sub>1</sub> ) (inch)						
			≤ .15	≤ .30			≤ .25	0.0100	0.0156	0.0312	0.0625	0.0938	0.1200
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile	≤ .15	≤ .30	≤ .25	365	RPM	139430	89378	44689	22309	14865	11619
						(292-438)	Fz	0.000017	0.00003	0.00005	0.00011	0.00016	0.00021
						Feed (ipm)	7.23	7.23	7.23	7.23	7.23	7.23	
		Slot	1	≤ .06	≤ .15	290	RPM	110780	71013	35506	17725	11810	9232
						(232-348)	Fz	0.000017	0.00003	0.00005	0.00011	0.00016	0.00021
						Feed (ipm)	5.74	5.74	5.74	5.74	5.74	5.74	
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile	≤ .15	≤ .30	≤ .25	210	RPM	80220	51423	25712	12835	8552	6685
						(168-252)	Fz	0.000015	0.00002	0.00005	0.00010	0.00014	0.00018
						Feed (ipm)	3.70	3.70	3.70	3.70	3.70	3.70	
		Slot	1	≤ .06	≤ .15	165	RPM	63030	40404	20202	10085	6720	5253
						(132-198)	Fz	0.000015	0.00002	0.00005	0.00010	0.00014	0.00018
						Feed (ipm)	2.90	2.90	2.90	2.90	2.90	2.90	
<b>H</b>	<b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	Profile	≤ .15	≤ .30	≤ .25	175	RPM	66850	42853	21426	10696	7127	5571
						(140-210)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015
						Feed (ipm)	2.57	2.57	2.57	2.57	2.57	2.57	
		Slot	1	≤ .06	≤ .15	140	RPM	53480	34282	17141	8557	5701	4457
						(112-168)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015
						Feed (ipm)	2.05	2.05	2.05	2.05	2.05	2.05	
<b>K</b>	<b>CAST IRONS (LOW &amp; MEDIUM ALLOY)</b> Gray, Malleable, Ductile	Profile	≤ .15	≤ .30	≤ .25	305	RPM	116510	74686	37343	18642	12421	9709
						(244-366)	Fz	0.000017	0.00003	0.00005	0.00011	0.00016	0.00021
						Feed (ipm)	6.05	6.05	6.05	6.05	6.05	6.05	
		Slot	1	≤ .06	≤ .15	245	RPM	93590	59994	29997	14974	9978	7799
						(196-294)	Fz	0.000017	0.00003	0.00005	0.00011	0.00016	0.00021
						Feed (ipm)	4.86	4.86	4.86	4.86	4.86	4.86	
<b>M</b>	<b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F, 440F	Profile	≤ .15	≤ .30	≤ .25	340	RPM	129880	83256	41628	20781	13846	10823
						(272-408)	Fz	0.000017	0.00003	0.00005	0.00011	0.00016	0.00021
						Feed (ipm)	6.73	6.73	6.73	6.73	6.73	6.73	
		Slot	1	≤ .06	≤ .15	270	RPM	103140	66115	33058	16502	10996	8595
						(216-324)	Fz	0.000017	0.00003	0.00005	0.00011	0.00016	0.00021
						Feed (ipm)	5.35	5.35	5.35	5.35	5.35	5.35	
	<b>STAINLESS STEELS (DIFFICULT)</b> 304, 304L, 316, 316L	Profile	≤ .15	≤ .30	≤ .25	235	RPM	89770	57545	28772	14363	9570	7481
						(188-282)	Fz	0.000015	0.00002	0.00005	0.00010	0.00014	0.00018
						Feed (ipm)	4.14	4.14	4.14	4.14	4.14	4.14	
		Slot	1	≤ .06	≤ .15	185	RPM	70670	45301	22651	11307	7534	5889
						(148-222)	Fz	0.000015	0.00002	0.00005	0.00010	0.00014	0.00018
						Feed (ipm)	3.26	3.26	3.26	3.26	3.26	3.26	
<b>STAINLESS STEELS (PH)</b> 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450	Profile	≤ .15	≤ .30	≤ .25	215	RPM	82130	52647	26324	13141	8756	6844	
					(172-258)	Fz	0.000011	0.00002	0.00003	0.00007	0.00010	0.00013	
					Feed (ipm)	2.68	2.68	2.68	2.68	2.68	2.68		
	Slot	1	≤ .06	≤ .15	170	RPM	64940	41628	20814	10390	6923	5412	
					(136-204)	Fz	0.000011	0.00002	0.00003	0.00007	0.00010	0.00013	
					Feed (ipm)	2.12	2.12	2.12	2.12	2.12	2.12		

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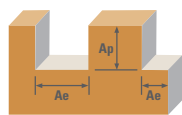
# 3 Flute, 15xD Overall Reach: Square, Ball



M3, M3B 15xD Fractional	Hardness	Profile	Ae x D <sub>1</sub>		Ap x D <sub>1</sub>		Vc (SFM)		Diameter (D <sub>1</sub> ) (inch)							
			≤ .15	≤ .30	≤ .25				0.0100	0.0156	0.0312	0.0625	0.0938	0.1200		
<b>S</b>	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400</b>	Profile	≤ .15	≤ .30	≤ .25		60	RPM	22920	14692	7346	3667	2443	1910		
							(48-72)	Fz	0.000010	0.00002	0.00003	0.00006	0.00009	0.00012		
								Feed (ipm)	0.66	0.66	0.66	0.66	0.66	0.66		
		Slot	1	≤ .06	≤ .15			45	RPM	17190	11019	5510	2750	1833	1433	
								(36-54)	Fz	0.000010	0.00002	0.00003	0.00006	0.00009	0.00012	
									Feed (ipm)	0.50	0.50	0.50	0.50	0.50	0.50	
	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene</b>	Profile	≤ .15	≤ .30	≤ .25			45	RPM	17190	11019	5510	2750	1833	1433	
								(36-54)	Fz	0.000006	0.00001	0.00002	0.00004	0.00006	0.00008	
									Feed (ipm)	0.33	0.33	0.33	0.33	0.33	0.33	
		Slot	1	≤ .06	≤ .15			35	RPM	13370	8571	4285	2139	1425	1114	
								(28-42)	Fz	0.000006	0.00001	0.00002	0.00004	0.00006	0.00008	
									Feed (ipm)	0.26	0.26	0.26	0.26	0.26	0.26	
<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si</b>	Profile	≤ .15	≤ .30	≤ .25			160	RPM	61120	39179	19590	9779	6516	5093		
							(128-192)	Fz	0.000011	0.00002	0.00003	0.00007	0.00010	0.00013		
								Feed (ipm)	1.99	1.99	1.99	1.99	1.99	1.99		
	Slot	1	≤ .06	≤ .15			130	RPM	49660	31833	15917	7946	5294	4138		
							(104-156)	Fz	0.000011	0.00002	0.00003	0.00007	0.00010	0.00013		
								Feed (ipm)	1.62	1.62	1.62	1.62	1.62	1.62		
<b>TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al</b>	Profile	≤ .15	≤ .30	≤ .25			60	RPM	22920	14692	7346	3667	2443	1910		
							(48-72)	Fz	0.000008	0.00001	0.00002	0.00005	0.00007	0.00009		
								Feed (ipm)	0.53	0.53	0.53	0.53	0.53	0.53		
	Slot	1	≤ .06	≤ .15			45	RPM	17190	11019	5510	2750	1833	1433		
							(36-54)	Fz	0.000008	0.00001	0.00002	0.00005	0.00007	0.00009		
								Feed (ipm)	0.40	0.40	0.40	0.40	0.40	0.40		
<b>N</b>	<b>ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075</b>	Profile	≤ .15	≤ .30	≤ .25			1000	RPM	382000	244872	122436	61120	40725	31833	
								(800-1200)	Fz	0.000051	0.00008	0.00016	0.00032	0.00048	0.00061	
									Feed (ipm)	58.50	58.50	58.50	58.50	58.50	58.50	
		Slot	1	≤ .06	≤ .15			800	RPM	305600	195897	97949	48896	32580	25467	
								(640-960)	Fz	0.000051	0.00008	0.00016	0.00032	0.00048	0.00061	
									Feed (ipm)	46.80	46.80	46.80	46.80	46.80	46.80	
	<b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>	Profile	≤ .15	≤ .30	≤ .25				515	RPM	196730	126109	63054	31477	20973	16394
									(412-618)	Fz	0.000038	0.00006	0.00012	0.00024	0.00036	0.00046
										Feed (ipm)	22.61	22.61	22.61	22.61	22.61	22.61
		Slot	1	≤ .06	≤ .15			410	RPM	156620	100397	50199	25059	16697	13052	
								(328-492)	Fz	0.000038	0.00006	0.00012	0.00024	0.00036	0.00046	
									Feed (ipm)	18.00	18.00	18.00	18.00	18.00	18.00	
<b>PLASTICS Polycarbonate, PVC, Polypropylene</b>	Profile	≤ .15	≤ .30	≤ .25				1000	RPM	382000	244872	122436	61120	40725	31833	
								(800-1200)	Fz	0.000051	0.00008	0.00016	0.00032	0.00048	0.00061	
									Feed (ipm)	58.50	58.50	58.50	58.50	58.50	58.50	
	Slot	1	≤ .06	≤ .15			800	RPM	305600	195897	97949	48896	32580	25467		
							(640-960)	Fz	0.000051	0.00008	0.00016	0.00032	0.00048	0.00061		
								Feed (ipm)	46.80	46.80	46.80	46.80	46.80	46.80		

- Note:**
- Bhn (Brinell)      HRc (Rockwell C)
  - when recommended speed exceeds your capability, use maximum available and recalculate ipm
  - rpm = Vc x 3.82 / D<sub>1</sub>
  - ipm = Fz x 3 x rpm
  - helical ramp at 1 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 D<sub>1</sub> maximum)
  - refer to the KYOCERA SGS Tool Wizard® for complete technical information (www.kyocera-sgstool.com)

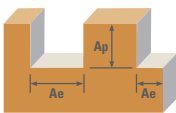
# 3 Flute, 20xD Overall Reach: Square, Ball



M3, M3B 20xD Fractional	Hardness	Profile	Ae x D <sub>1</sub>		Ap x D <sub>1</sub>	Vc (SFM)		Diameter (D <sub>1</sub> ) (inch)					
			≤ .12	≤ .25				≤ .20	0.0100	0.0156	0.0312	0.0625	0.0938
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile	≤ .12	≤ .25	≤ .20	365	RPM	139430	89378	44689	22309	14865	11619
						(292-438)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00016
		Slot	1	≤ .04	≤ .10	290	RPM	110780	71013	35506	17725	11810	9232
						(232-348)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00016
		Profile	≤ .12	≤ .25	≤ .20	210	RPM	80220	51423	25712	12835	8552	6685
						(168-252)	Fz	0.000012	0.00002	0.00004	0.00007	0.00011	0.00014
Slot	1	≤ .04	≤ .10	165	RPM	63030	40404	20202	10085	6720	5253		
				(132-198)	Fz	0.000012	0.00002	0.00004	0.00007	0.00011	0.00014		
Profile	≤ .12	≤ .25	≤ .20	175	RPM	66850	42853	21426	10696	7127	5571		
				(140-210)	Fz	0.000010	0.00001	0.00003	0.00006	0.00009	0.00012		
Slot	1	≤ .04	≤ .10	140	RPM	53480	34282	17141	8557	5701	4457		
				(112-168)	Fz	0.000010	0.00001	0.00003	0.00006	0.00009	0.00012		
Profile	≤ .12	≤ .25	≤ .20	305	RPM	116510	74686	37343	18642	12421	9709		
				(244-366)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00016		
Slot	1	≤ .04	≤ .10	245	RPM	93590	59994	29997	14974	9978	7799		
				(196-294)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00016		
Profile	≤ .12	≤ .25	≤ .20	340	RPM	129880	83256	41628	20781	13846	10823		
				(272-408)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00016		
Slot	1	≤ .04	≤ .10	270	RPM	103140	66115	33058	16502	10996	8595		
				(216-324)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00016		
Profile	≤ .12	≤ .25	≤ .20	235	RPM	89770	57545	28772	14363	9570	7481		
				(188-282)	Fz	0.000012	0.00002	0.00004	0.00007	0.00011	0.00014		
Slot	1	≤ .04	≤ .10	185	RPM	70670	45301	22651	11307	7534	5889		
				(148-222)	Fz	0.000012	0.00002	0.00004	0.00007	0.00011	0.00014		
Profile	≤ .12	≤ .25	≤ .20	215	RPM	82130	52647	26324	13141	8756	6844		
				(172-258)	Fz	0.000008	0.00001	0.00003	0.00005	0.00008	0.00010		
Slot	1	≤ .04	≤ .10	170	RPM	64940	41628	20814	10390	6923	5412		
				(136-204)	Fz	0.000008	0.00001	0.00003	0.00005	0.00008	0.00010		
Profile	≤ .12	≤ .25	≤ .20	215	RPM	82130	52647	26324	13141	8756	6844		
				(172-258)	Fz	0.000008	0.00001	0.00003	0.00005	0.00008	0.00010		
Slot	1	≤ .04	≤ .10	170	RPM	64940	41628	20814	10390	6923	5412		
				(136-204)	Fz	0.000008	0.00001	0.00003	0.00005	0.00008	0.00010		

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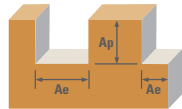
# 3 Flute, 20xD Overall Reach: Square, Ball



M3, M3B 20xD Fractional	Hardness	Profile	Ae x D <sub>1</sub>		Ap x D <sub>1</sub>	Vc (SFM)		Diameter (D <sub>1</sub> ) (inch)					
			≤ .12	≤ .25				≤ .20	0.0100	0.0156	0.0312	0.0625	0.0938
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	Profile	≤ .12	≤ .25	≤ .20	60	RPM	22920	14692	7346	3667	2443	1910
						(48-72)	Fz	0.000007	0.00001	0.00002	0.00005	0.00007	0.00009
							Feed (ipm)	0.50	0.50	0.50	0.50	0.50	0.50
		Slot	1	≤ .04	≤ .10	45	RPM	17190	11019	5510	2750	1833	1433
						(36-54)	Fz	0.000007	0.00001	0.00002	0.00005	0.00007	0.00009
							Feed (ipm)	0.37	0.37	0.37	0.37	0.37	0.37
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	Profile	≤ .12	≤ .25	≤ .20	45	RPM	17190	11019	5510	2750	1833	1433
						(36-54)	Fz	0.000005	0.00001	0.00002	0.00003	0.00005	0.00006
							Feed (ipm)	0.25	0.25	0.25	0.25	0.25	0.25
		Slot	1	≤ .04	≤ .10	35	RPM	13370	8571	4285	2139	1425	1114
						(28-42)	Fz	0.000005	0.00001	0.00002	0.00003	0.00005	0.00006
							Feed (ipm)	0.19	0.19	0.19	0.19	0.19	0.19
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	Profile	≤ .12	≤ .25	≤ .20	160	RPM	61120	39179	19590	9779	6516	5093	
					(128-192)	Fz	0.000008	0.00001	0.00003	0.00005	0.00008	0.00010	
						Feed (ipm)	1.50	1.50	1.50	1.50	1.50	1.50	
	Slot	1	≤ .04	≤ .10	130	RPM	49660	31833	15917	7946	5294	4138	
					(104-156)	Fz	0.000008	0.00001	0.00003	0.00005	0.00008	0.00010	
						Feed (ipm)	1.22	1.22	1.22	1.22	1.22	1.22	
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	Profile	≤ .12	≤ .25	≤ .20	60	RPM	22920	14692	7346	3667	2443	1910	
					(48-72)	Fz	0.000006	0.00001	0.00002	0.00004	0.00005	0.00007	
						Feed (ipm)	0.40	0.40	0.40	0.40	0.40	0.40	
	Slot	1	≤ .04	≤ .10	45	RPM	17190	11019	5510	2750	1833	1433	
					(36-54)	Fz	0.000006	0.00001	0.00002	0.00004	0.00005	0.00007	
						Feed (ipm)	0.30	0.30	0.30	0.30	0.30	0.30	
ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	Profile	≤ .12	≤ .25	≤ .20	1000	RPM	382000	244872	122436	61120	40725	31833	
					(800-1200)	Fz	0.000038	0.00006	0.00012	0.00024	0.00036	0.00046	
						Feed (ipm)	43.88	43.88	43.88	43.88	43.88	43.88	
	Slot	1	≤ .04	≤ .10	800	RPM	305600	195897	97949	48896	32580	25467	
					(640-960)	Fz	0.000038	0.00006	0.00012	0.00024	0.00036	0.00046	
						Feed (ipm)	35.10	35.10	35.10	35.10	35.10	35.10	
COPPER ALLOYS Alum Bronze, C110, Muntz Brass	Profile	≤ .12	≤ .25	≤ .20	515	RPM	196730	126109	63054	31477	20973	16394	
					(412-618)	Fz	0.000029	0.00004	0.00009	0.00018	0.00027	0.00034	
						Feed (ipm)	16.96	16.96	16.96	16.96	16.96	16.96	
	Slot	1	≤ .04	≤ .10	410	RPM	156620	100397	50199	25059	16697	13052	
					(328-492)	Fz	0.000029	0.00004	0.00009	0.00018	0.00027	0.00034	
						Feed (ipm)	13.50	13.50	13.50	13.50	13.50	13.50	
PLASTICS Polycarbonate, PVC, Polypropylene	Profile	≤ .12	≤ .25	≤ .20	1000	RPM	382000	244872	122436	61120	40725	31833	
					(800-1200)	Fz	0.000038	0.00006	0.00012	0.00024	0.00036	0.00046	
						Feed (ipm)	43.88	43.88	43.88	43.88	43.88	43.88	
	Slot	1	≤ .04	≤ .10	800	RPM	305600	195897	97949	48896	32580	25467	
					(640-960)	Fz	0.000038	0.00006	0.00012	0.00024	0.00036	0.00046	
						Feed (ipm)	35.10	35.10	35.10	35.10	35.10	35.10	

- Note:**
- Bhn (Brinell)      HRc (Rockwell C)
  - when recommended speed exceeds your capability, use maximum available and recalculate ipm
  - rpm = Vc x 3.82 / D<sub>1</sub>
  - ipm = Fz x 3 x rpm
  - helical ramp at 1 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 D<sub>1</sub> maximum)
  - refer to the KYOCERA SGS Tool Wizard® for complete technical information (www.kyocera-sgstool.com)

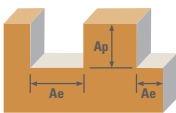
# 3 Flute, 25xD Overall Reach: Square, Ball



M3, M3B 25xD Fractional	Hardness	Ae x D <sub>1</sub>		Ap x D <sub>1</sub>	Vc (SFM)	Diameter (D <sub>1</sub> ) (inch)							
		≤ .12	≤ .25			≤ .20	0.0100	0.0156	0.0312	0.0625	0.0938	0.1200	
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile 	≤ .12	≤ .25	≤ .20	365	RPM	139430	89378	44689	22309	14865	11619
						(292-438)	Fz	0.000010	0.00002	0.00003	0.00006	0.00009	0.00012
							Feed (ipm)	4.22	4.22	4.22	4.22	4.22	4.22
		Slot 	1	≤ .04	≤ .10	290	RPM	110780	71013	35506	17725	11810	9232
						(232-348)	Fz	0.000010	0.00002	0.00003	0.00006	0.00009	0.00012
							Feed (ipm)	3.35	3.35	3.35	3.35	3.35	3.35
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile 	≤ .12	≤ .25	≤ .20	210	RPM	80220	51423	25712	12835	8552	6685
						(168-252)	Fz	0.000009	0.00001	0.00003	0.00006	0.00008	0.00011
							Feed (ipm)	2.16	2.16	2.16	2.16	2.16	2.16
		Slot 	1	≤ .04	≤ .10	165	RPM	63030	40404	20202	10085	6720	5253
						(132-198)	Fz	0.000009	0.00001	0.00003	0.00006	0.00008	0.00011
							Feed (ipm)	1.69	1.69	1.69	1.69	1.69	1.69
<b>H</b>	<b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	Profile 	≤ .12	≤ .25	≤ .20	175	RPM	66850	42853	21426	10696	7127	5571
						(140-210)	Fz	0.000007	0.00001	0.00002	0.00005	0.00007	0.00009
							Feed (ipm)	1.50	1.50	1.50	1.50	1.50	1.50
		Slot 	1	≤ .04	≤ .10	140	RPM	53480	34282	17141	8557	5701	4457
						(112-168)	Fz	0.000007	0.00001	0.00002	0.00005	0.00007	0.00009
							Feed (ipm)	1.20	1.20	1.20	1.20	1.20	1.20
<b>K</b>	<b>CAST IRONS (LOW &amp; MEDIUM ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ .12	≤ .25	≤ .20	305	RPM	116510	74686	37343	18642	12421	9709
						(244-366)	Fz	0.000010	0.00002	0.00003	0.00006	0.00009	0.00012
							Feed (ipm)	3.53	3.53	3.53	3.53	3.53	3.53
		Slot 	1	≤ .04	≤ .10	245	RPM	93590	59994	29997	14974	9978	7799
						(196-294)	Fz	0.000010	0.00002	0.00003	0.00006	0.00009	0.00012
							Feed (ipm)	2.84	2.84	2.84	2.84	2.84	2.84
<b>M</b>	<b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F, 440F	Profile 	≤ .12	≤ .25	≤ .20	340	RPM	129880	83256	41628	20781	13846	10823
						(272-408)	Fz	0.000010	0.00002	0.00003	0.00006	0.00009	0.00012
							Feed (ipm)	3.93	3.93	3.93	3.93	3.93	3.93
		Slot 	1	≤ .04	≤ .10	270	RPM	103140	66115	33058	16502	10996	8595
						(216-324)	Fz	0.000010	0.00002	0.00003	0.00006	0.00009	0.00012
							Feed (ipm)	3.12	3.12	3.12	3.12	3.12	3.12
	<b>STAINLESS STEELS (DIFFICULT)</b> 304, 304L, 316, 316L	Profile 	≤ .12	≤ .25	≤ .20	235	RPM	89770	57545	28772	14363	9570	7481
						(188-282)	Fz	0.000009	0.00001	0.00003	0.00006	0.00008	0.00011
							Feed (ipm)	2.41	2.41	2.41	2.41	2.41	2.41
		Slot 	1	≤ .04	≤ .10	185	RPM	70670	45301	22651	11307	7534	5889
						(148-222)	Fz	0.000009	0.00001	0.00003	0.00006	0.00008	0.00011
							Feed (ipm)	1.90	1.90	1.90	1.90	1.90	1.90
<b>STAINLESS STEELS (PH)</b> 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450	Profile 	≤ .12	≤ .25	≤ .20	215	RPM	82130	52647	26324	13141	8756	6844	
					(172-258)	Fz	0.000006	0.00001	0.00002	0.00004	0.00006	0.00008	
						Feed (ipm)	1.56	1.56	1.56	1.56	1.56	1.56	
	Slot 	1	≤ .04	≤ .10	170	RPM	64940	41628	20814	10390	6923	5412	
					(136-204)	Fz	0.000006	0.00001	0.00002	0.00004	0.00006	0.00008	
						Feed (ipm)	1.24	1.24	1.24	1.24	1.24	1.24	

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# 3 Flute, 25xD Overall Reach: Square, Ball

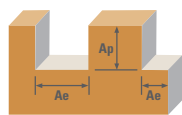


M3, M3B 25xD Fractional	Hardness	Profile	Ae x D <sub>1</sub>		Ap x D <sub>1</sub>	Vc (SFM)		Diameter (D <sub>1</sub> ) (inch)					
			≤ .12	≤ .25				≤ .20	0.0100	0.0156	0.0312	0.0625	0.0938
<b>S</b>	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400</b>	Profile	≤ .12	≤ .25	≤ .20	60	RPM	22920	14692	7346	3667	2443	1910
						(48-72)	Fz	0.000006	0.00001	0.00002	0.00004	0.00005	0.00007
							Feed (ipm)	0.39	0.39	0.39	0.39	0.39	0.39
		Slot	1	≤ .04	≤ .10	45	RPM	17190	11019	5510	2750	1833	1433
						(36-54)	Fz	0.000006	0.00001	0.00002	0.00004	0.00005	0.00007
							Feed (ipm)	0.29	0.29	0.29	0.29	0.29	0.29
	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene</b>	Profile	≤ .12	≤ .25	≤ .20	45	RPM	17190	11019	5510	2750	1833	1433
						(36-54)	Fz	0.000004	0.00001	0.00001	0.00002	0.00004	0.00005
							Feed (ipm)	0.19	0.19	0.19	0.19	0.19	0.19
		Slot	1	≤ .04	≤ .10	35	RPM	13370	8571	4285	2139	1425	1114
						(28-42)	Fz	0.000004	0.00001	0.00001	0.00002	0.00004	0.00005
							Feed (ipm)	0.15	0.15	0.15	0.15	0.15	0.15
<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si</b>	Profile	≤ .12	≤ .25	≤ .20	160	RPM	61120	39179	19590	9779	6516	5093	
					(128-192)	Fz	0.000006	0.00001	0.00002	0.00004	0.00006	0.00008	
						Feed (ipm)	1.16	1.16	1.16	1.16	1.16	1.16	
	Slot	1	≤ .04	≤ .10	130	RPM	49660	31833	15917	7946	5294	4138	
					(104-156)	Fz	0.000006	0.00001	0.00002	0.00004	0.00006	0.00008	
						Feed (ipm)	0.95	0.95	0.95	0.95	0.95	0.95	
<b>TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al</b>	Profile	≤ .12	≤ .25	≤ .20	60	RPM	22920	14692	7346	3667	2443	1910	
					(48-72)	Fz	0.000004	0.00001	0.00001	0.00003	0.00004	0.00005	
						Feed (ipm)	0.31	0.31	0.31	0.31	0.31	0.31	
	Slot	1	≤ .04	≤ .10	45	RPM	17190	11019	5510	2750	1833	1433	
					(36-54)	Fz	0.000004	0.00001	0.00001	0.00003	0.00004	0.00005	
						Feed (ipm)	0.23	0.23	0.23	0.23	0.23	0.23	
<b>N</b>	<b>ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075</b>	Profile	≤ .12	≤ .25	≤ .20	1000	RPM	382000	244872	122436	61120	40725	31833
						(800-1200)	Fz	0.000030	0.00005	0.00009	0.00019	0.00028	0.00036
							Feed (ipm)	34.13	34.13	34.13	34.13	34.13	34.13
		Slot	1	≤ .04	≤ .10	800	RPM	305600	195897	97949	48896	32580	25467
						(640-960)	Fz	0.000030	0.00005	0.00009	0.00019	0.00028	0.00036
							Feed (ipm)	27.30	27.30	27.30	27.30	27.30	27.30
	<b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>	Profile	≤ .12	≤ .25	≤ .20	515	RPM	196730	126109	63054	31477	20973	16394
						(412-618)	Fz	0.000022	0.00003	0.00007	0.00014	0.00021	0.00027
							Feed (ipm)	13.19	13.19	13.19	13.19	13.19	13.19
		Slot	1	≤ .04	≤ .10	410	RPM	156620	100397	50199	25059	16697	13052
						(328-492)	Fz	0.000022	0.00003	0.00007	0.00014	0.00021	0.00027
							Feed (ipm)	10.50	10.50	10.50	10.50	10.50	10.50
<b>PLASTICS Polycarbonate, PVC, Polypropylene</b>	Profile	≤ .12	≤ .25	≤ .20	1000	RPM	382000	244872	122436	61120	40725	31833	
					(800-1200)	Fz	0.000030	0.00005	0.00009	0.00019	0.00028	0.00036	
						Feed (ipm)	34.13	34.13	34.13	34.13	34.13	34.13	
	Slot	1	≤ .04	≤ .10	800	RPM	305600	195897	97949	48896	32580	25467	
					(640-960)	Fz	0.000030	0.00005	0.00009	0.00019	0.00028	0.00036	
						Feed (ipm)	27.30	27.30	27.30	27.30	27.30	27.30	

- Note:**
- Bhn (Brinell)      HRc (Rockwell C)
  - when recommended speed exceeds your capability, use maximum available and recalculate ipm
  - rpm = Vc x 3.82 / D<sub>1</sub>
  - ipm = Fz x 3 x rpm
  - helical ramp at 1 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 D<sub>1</sub> maximum)
  - refer to the KYOCERA SGS Tool Wizard® for complete technical information (www.kyocera-sgstool.com)



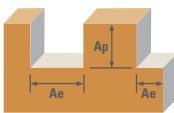
# 4 Flute, 8xD Overall Reach: Square, Ball



M4, M4B 8xD Fractional	Hardness	Profile	Ae x D <sub>1</sub>		Ap x D <sub>1</sub>	Vc (SFM)		Diameter (D <sub>1</sub> ) (inch)					
			≤ .25	≤ .50				≤ .30	0.0100	0.0156	0.0312	0.0625	0.0938
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile	≤ .25	≤ .50	≤ .30	365	RPM	139430	89378	44689	22309	14865	11619
						(292-438)	Fz	0.000021	0.00003	0.00006	0.00013	0.00019	0.00025
		Slot	1	≤ .07	≤ .17	290	RPM	110780	71013	35506	17725	11810	9232
						(232-348)	Fz	0.000021	0.00003	0.00006	0.00013	0.00019	0.00025
		Profile	≤ .25	≤ .50	≤ .30	210	RPM	80220	51423	25712	12835	8552	6685
						(168-252)	Fz	0.000018	0.00003	0.00006	0.00011	0.00017	0.00022
Slot	1	≤ .07	≤ .17	165	RPM	63030	40404	20202	10085	6720	5253		
				(132-198)	Fz	0.000018	0.00003	0.00006	0.00011	0.00017	0.00022		
Profile	≤ .25	≤ .50	≤ .30	175	RPM	66850	42853	21426	10696	7127	5571		
				(140-210)	Fz	0.000015	0.00002	0.00005	0.00009	0.00014	0.00018		
Slot	1	≤ .07	≤ .17	140	RPM	53480	34282	17141	8557	5701	4457		
				(112-168)	Fz	0.000015	0.00002	0.00005	0.00009	0.00014	0.00018		
Profile	≤ .25	≤ .50	≤ .30	305	RPM	116510	74686	37343	18642	12421	9709		
				(244-366)	Fz	0.000021	0.00003	0.00006	0.00013	0.00019	0.00025		
Slot	1	≤ .07	≤ .17	245	RPM	93590	59994	29997	14974	9978	7799		
				(196-294)	Fz	0.000021	0.00003	0.00006	0.00013	0.00019	0.00025		
Profile	≤ .25	≤ .50	≤ .30	340	RPM	129880	83256	41628	20781	13846	10823		
				(272-408)	Fz	0.000021	0.00003	0.00006	0.00013	0.00019	0.00025		
Slot	1	≤ .07	≤ .17	270	RPM	103140	66115	33058	16502	10996	8595		
				(216-324)	Fz	0.000021	0.00003	0.00006	0.00013	0.00019	0.00025		
Profile	≤ .25	≤ .50	≤ .30	235	RPM	89770	57545	28772	14363	9570	7481		
				(188-282)	Fz	0.000018	0.00003	0.00006	0.00011	0.00017	0.00022		
Slot	1	≤ .07	≤ .17	185	RPM	70670	45301	22651	11307	7534	5889		
				(148-222)	Fz	0.000018	0.00003	0.00006	0.00011	0.00017	0.00022		
Profile	≤ .25	≤ .50	≤ .30	215	RPM	82130	52647	26324	13141	8756	6844		
				(172-258)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015		
Slot	1	≤ .07	≤ .17	170	RPM	64940	41628	20814	10390	6923	5412		
				(136-204)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015		
Profile	≤ .25	≤ .50	≤ .30	215	RPM	82130	52647	26324	13141	8756	6844		
				(172-258)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015		
Slot	1	≤ .07	≤ .17	170	RPM	64940	41628	20814	10390	6923	5412		
				(136-204)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015		

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# 4 Flute, 8xD Overall Reach: Square, Ball



M4, M4B 8xD Fractional	Hardness	Profile	Ae x D <sub>1</sub>		Ap x D <sub>1</sub>	Vc (SFM)		Diameter (D <sub>1</sub> ) (inch)					
			≤ .25	≤ .50				≤ .30	0.0100	0.0156	0.0312	0.0625	0.0938
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	Profile	≤ .25	≤ .50	≤ .30	60	RPM	22920	14692	7346	3667	2443	1910
						(48-72)	Fz	0.000011	0.00002	0.00004	0.00007	0.00011	0.00014
							Feed (ipm)	1.05	1.05	1.05	1.05	1.05	1.05
		Slot	1	≤ .07	≤ .17	45	RPM	17190	11019	5510	2750	1833	1433
						(36-54)	Fz	0.000011	0.00002	0.00004	0.00007	0.00011	0.00014
							Feed (ipm)	0.79	0.79	0.79	0.79	0.79	0.79
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	Profile	≤ .25	≤ .50	≤ .30	45	RPM	17190	11019	5510	2750	1833	1433
						(36-54)	Fz	0.000008	0.00001	0.00002	0.00005	0.00007	0.00009
							Feed (ipm)	0.53	0.53	0.53	0.53	0.53	0.53
		Slot	1	≤ .07	≤ .17	35	RPM	13370	8571	4285	2139	1425	1114
						(28-42)	Fz	0.000008	0.00001	0.00002	0.00005	0.00007	0.00009
							Feed (ipm)	0.41	0.41	0.41	0.41	0.41	0.41
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	Profile	≤ .25	≤ .50	≤ .30	160	RPM	61120	39179	19590	9779	6516	5093	
					(128-192)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015	
						Feed (ipm)	3.16	3.16	3.16	3.16	3.16	3.16	
	Slot	1	≤ .07	≤ .17	130	RPM	49660	31833	15917	7946	5294	4138	
					(104-156)	Fz	0.000013	0.00002	0.00004	0.00008	0.00012	0.00015	
						Feed (ipm)	2.57	2.57	2.57	2.57	2.57	2.57	
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	Profile	≤ .25	≤ .50	≤ .30	60	RPM	22920	14692	7346	3667	2443	1910	
					(48-72)	Fz	0.000009	0.00001	0.00003	0.00006	0.00009	0.00011	
						Feed (ipm)	0.84	0.84	0.84	0.84	0.84	0.84	
	Slot	1	≤ .07	≤ .17	45	RPM	17190	11019	5510	2750	1833	1433	
					(36-54)	Fz	0.000009	0.00001	0.00003	0.00006	0.00009	0.00011	
						Feed (ipm)	0.63	0.63	0.63	0.63	0.63	0.63	
ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	Profile	≤ .25	≤ .50	≤ .30	1000	RPM	382000	244872	122436	61120	40725	31833	
					(800-1200)	Fz	0.000061	0.00009	0.00019	0.00038	0.00057	0.00073	
						Feed (ipm)	92.63	92.63	92.63	92.63	92.63	92.63	
	Slot	1	≤ .07	≤ .17	800	RPM	305600	195897	97949	48896	32580	25467	
					(640-960)	Fz	0.000061	0.00009	0.00019	0.00038	0.00057	0.00073	
						Feed (ipm)	74.10	74.10	74.10	74.10	74.10	74.10	
N	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	Profile	≤ .25	≤ .50	≤ .30	515	RPM	196730	126109	63054	31477	20973	16394
						(412-618)	Fz	0.000045	0.00007	0.00014	0.00028	0.00043	0.00055
							Feed (ipm)	35.80	35.80	35.80	35.80	35.80	35.80
	Slot	1	≤ .07	≤ .17	410	RPM	156620	100397	50199	25059	16697	13052	
					(328-492)	Fz	0.000045	0.00007	0.00014	0.00028	0.00043	0.00055	
						Feed (ipm)	28.50	28.50	28.50	28.50	28.50	28.50	
PLASTICS Polycarbonate, PVC, Polypropylene	Profile	≤ .25	≤ .50	≤ .30	1000	RPM	382000	244872	122436	61120	40725	31833	
					(800-1200)	Fz	0.000061	0.00009	0.00019	0.00038	0.00057	0.00073	
						Feed (ipm)	92.63	92.63	92.63	92.63	92.63	92.63	
	Slot	1	≤ .07	≤ .17	800	RPM	305600	195897	97949	48896	32580	25467	
					(640-960)	Fz	0.000061	0.00009	0.00019	0.00038	0.00057	0.00073	
						Feed (ipm)	74.10	74.10	74.10	74.10	74.10	74.10	

**Note:**

- Bhn (Brinell)      HRc (Rockwell C)
- when recommended speed exceeds your capability, use maximum available and recalculate ipm
- rpm = Vc x 3.82 / D<sub>1</sub>
- ipm = Fz x 4 x rpm
- helical ramp at 1 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 D<sub>1</sub> maximum)
- refer to the KYOCERA SGS Tool Wizard® for complete technical information (www.kyocera-sgstool.com)