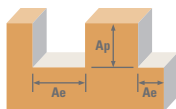


Series 77M, 77MCR Metric		Hardness	Ae Ap		Vc (m/min)	DC • mm										
			Ae x DC	Ap x DC		6	8	10	12	16	20	25				
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc		2.5xD		284 (227-341)	RPM	12208	9156	7325	6104	4578	3662	2930		
				≤ 0.2 ≤ APMX		Fz	0.0413	0.0411	0.0640	0.0711	0.0889	0.1013	0.1050			
						Feed (mm/min)	3529	2634	3282	3038	2849	2597	2154			
				3xD		257 (206-308)	Fz	0.0347	0.0461	0.0717	0.0797	0.0996	0.1135	0.1176		
				≤ 0.15 ≤ APMX		Feed (mm/min)	2965	2955	3676	3405	3192	2910	2412			
						Fz	0.0362	0.0480	0.0747	0.0830	0.1037	0.1182	0.0919			
			4xD		230 (184-276)	Feed (mm/min)	3094	3076	3830	3546	3323	3030	1885			
			≤ 0.1 ≤ APMX			RPM	8068	6051	4841	4034	3025	2420	1936			
			ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc		2.5xD		132 (106-159)	Fz	0.0213	0.0285	0.0512	0.0610	0.0711	0.0827	0.0875
						≤ 0.2 ≤ APMX		Feed (mm/min)	1203	1207	1735	1723	1506	1401	1186	
								Fz	0.0239	0.0319	0.0574	0.0683	0.0797	0.0926	0.0980	
						3xD		138 (111-166)	Feed (mm/min)	1350	1351	1945	1929	1688	1569	1328
	≤ 0.15 ≤ APMX					Fz	0.0249	0.0332	0.0597	0.0711	0.0830	0.0964	0.1021			
						Feed (mm/min)	1406	1406	2023	2008	1758	1633	1384			
		4xD		152 (122-182)		RPM	4087	3065	2452	2044	1533	1226	981			
		≤ 0.1 ≤ APMX			Fz	0.0140	0.0183	0.0294	0.0356	0.0457	0.0560	0.0625				
		TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 375 Bhn or ≤ 40 HRc		2.5xD		83 (66-100)	Feed (mm/min)	401	393	505	509	490	481	429
						≤ 0.2 ≤ APMX		Fz	0.0157	0.0205	0.0330	0.0398	0.0512	0.0627	0.0700	
								Feed (mm/min)	449	440	566	569	549	538	481	
						3xD		86 (69-103)	Fz	0.0163	0.0213	0.0344	0.0415	0.0533	0.0653	0.0729
	≤ 0.15 ≤ APMX		Feed (mm/min)			466	457	590	594	572	560	501				
						RPM	9660	7245	5796	4830	3623	2898	2318			
	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F		≤ 275 Bhn or ≤ 28 HRc		2.5xD		197 (158-236)	Fz	0.0216	0.0285	0.0448	0.0533	0.0635	0.0747	0.0800	
					≤ 0.2 ≤ APMX		Feed (mm/min)	1461	1445	1818	1803	1610	1515	1298		
					Fz	0.0242	0.0319	0.0502	0.0598	0.0711	0.0837	0.0896				
				3xD		204 (163-245)	Feed (mm/min)	1636	1618	2037	2022	1803	1698	1454		
				≤ 0.15 ≤ APMX		Fz	0.0252	0.0332	0.0523	0.0622	0.0741	0.0871	0.0933			
						Feed (mm/min)	1704	1684	2122	2104	1879	1767	1514			
STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L		≤ 275 Bhn or ≤ 28 HRc		2.5xD		130 (104-156)	RPM	6369	4777	3822	3185	2389	1911	1529		
				≤ 0.2 ≤ APMX		Fz	0.0168	0.0221	0.0371	0.0432	0.0584	0.0693	0.0750			
						Feed (mm/min)	749	739	993	963	976	927	803			
				3xD		134 (107-161)	Fz	0.0188	0.0248	0.0416	0.0484	0.0655	0.0777	0.0840		
				≤ 0.15 ≤ APMX		Feed (mm/min)	838	829	1113	1079	1095	1039	899			
						Fz	0.0196	0.0258	0.0433	0.0504	0.0682	0.0809	0.0875			
		4xD		120 (96-144)	Feed (mm/min)	874	863	1158	1124	1140	1082	936				
		≤ 0.1 ≤ APMX			RPM	6104	4578	3662	3052	2289	1831	1465				
		STAINLESS STEELS (PH) 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450	≤ 325 Bhn or ≤ 35 HRc		2.5xD		124 (99-149)	Fz	0.0168	0.0221	0.0371	0.0432	0.0584	0.0693	0.0750	
					≤ 0.2 ≤ APMX		Feed (mm/min)	718	708	952	923	936	888	769		
							Fz	0.0188	0.0248	0.0416	0.0484	0.0655	0.0777	0.0840		
					3xD		129 (103-155)	Feed (mm/min)	803	795	1066	1034	1050	996	861	
≤ 0.15 ≤ APMX					Fz	0.0196	0.0258	0.0433	0.0504	0.0682	0.0809	0.0875				
					Feed (mm/min)	837	827	1110	1077	1093	1037	897				
	4xD		115 (92-138)													

continued on next page



Series 77M, 77MCR		Ae		Vc (m/min)	DC • mm								
Metric	Hardness	Ae x DC	Ap x DC		6	8	10	12	16	20	25		
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	 HSM	2.5xD	218 (174-262)	RPM	10722	8041	6433	5361	4021	3217	2573
				≤ 0.2 ≤ APMX		Fz	0.0239	0.0315	0.0474	0.0559	0.0762	0.0880	0.0925
			 HSM	3xD	225 (180-270)	Fz	0.0268	0.0353	0.0531	0.0626	0.0854	0.0986	0.1036
				≤ 0.15 ≤ APMX		Feed (mm/min)	2011	1987	2391	2349	2404	2220	1866
			 HSM	4xD	202 (162-242)	Fz	0.0279	0.0368	0.0553	0.0652	0.0889	0.1027	0.1079
				≤ 0.1 ≤ APMX		Feed (mm/min)	2094	2071	2490	2447	2502	2312	1944
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	 HSM	2.5xD	130 (104-156)	Fz	0.0168	0.0221	0.0371	0.0432	0.0584	0.0693	0.0750
				≤ 0.2 ≤ APMX		Feed (mm/min)	749	739	993	963	976	927	803
			 HSM	3xD	134 (107-161)	Fz	0.0188	0.0248	0.0416	0.0484	0.0655	0.0777	0.0840
				≤ 0.15 ≤ APMX		Feed (mm/min)	838	829	1113	1079	1095	1039	899
			 HSM	4xD	120 (96-144)	Fz	0.0196	0.0258	0.0433	0.0504	0.0682	0.0809	0.0875
				≤ 0.1 ≤ APMX		Feed (mm/min)	874	863	1158	1124	1140	1082	936
S	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	 HSM	2.5xD	41 (33-49)	RPM	2017	1513	1210	1008	756	605	484
				≤ 0.2 ≤ APMX		Fz	0.0140	0.0183	0.0294	0.0356	0.0457	0.0560	0.0625
			 HSM	3xD	43 (34-52)	Fz	0.0157	0.0205	0.0330	0.0398	0.0512	0.0627	0.0700
				≤ 0.15 ≤ APMX		Feed (mm/min)	222	217	280	281	271	266	237
			 HSM	4xD	38 (30-46)	Fz	0.0163	0.0213	0.0344	0.0415	0.0533	0.0653	0.0729
				≤ 0.1 ≤ APMX		Feed (mm/min)	230	226	291	293	282	277	247
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	 HSM	2.5xD	26 (21-31)	Fz	0.0114	0.0152	0.0243	0.0305	0.0381	0.0480	0.0550
				≤ 0.2 ≤ APMX		Feed (mm/min)	102	102	130	136	127	128	118
			 HSM	3xD	27 (22-32)	Fz	0.0128	0.0171	0.0273	0.0342	0.0427	0.0538	0.0616
				≤ 0.15 ≤ APMX		Feed (mm/min)	114	114	146	152	143	144	132
			 HSM	4xD	24 (19-29)	Fz	0.0133	0.0178	0.0284	0.0356	0.0445	0.0560	0.0642
				≤ 0.1 ≤ APMX		Feed (mm/min)	119	119	152	159	149	150	137
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	 HSM	2.5xD	88 (70-106)	RPM	4352	3264	2611	2176	1632	1306	1045	
			≤ 0.2 ≤ APMX		Fz	0.0191	0.0254	0.0397	0.0483	0.0635	0.0747	0.0800	
		 HSM	3xD	91 (73-109)	Fz	0.0213	0.0285	0.0445	0.0541	0.0711	0.0837	0.0896	
			≤ 0.15 ≤ APMX		Feed (mm/min)	649	651	813	824	812	765	655	
		 HSM	4xD	82 (66-98)	Fz	0.0222	0.0296	0.0463	0.0563	0.0741	0.0871	0.0933	
			≤ 0.1 ≤ APMX		Feed (mm/min)	676	676	846	858	847	796	682	
TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 420 Bhn or ≤ 45 HRc	 HSM	2.5xD	52 (42-62)	Fz	0.0163	0.0254	0.0397	0.0483	0.0635	0.0747	0.0800	
			≤ 0.2 ≤ APMX		Feed (mm/min)	291	340	425	431	425	400	342	
		 HSM	3xD	54 (43-65)	Fz	0.0182	0.0285	0.0445	0.0541	0.0711	0.0837	0.0896	
			≤ 0.15 ≤ APMX		Feed (mm/min)	325	381	476	482	476	448	384	
		 HSM	4xD	48 (38-58)	Fz	0.0190	0.0296	0.0463	0.0563	0.0741	0.0871	0.0933	
			≤ 0.1 ≤ APMX		Feed (mm/min)	339	396	495	502	496	466	399	

Bhn (Brinell) HRc (Rockwell C) HSM (High Speed Machining)
 rpm = (Vc x 1000) / (DC x 3.14)
 mm/min = Fz x 7 x rpm
 reduce speed and feed for materials harder than listed
 reduce feed and Ae when finish milling (.02 x DC maximum)
 feed rates listed have chip thinning adjustments included where applicable
 refer to the SGS Tool Wizard® for complete technical information (www.kyocera-sgtool.com)