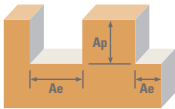
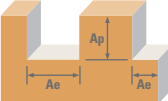


Series Z5MCR Metric		Hardness			Vc (m/min)	DC • mm								
			Ae x DC	Ap x DC		6	8	10	12	16	20	25		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	169 (135-203)	RPM	8967	6725	5380	4484	3363	2690	2152
						Fz	0.029	0.049	0.061	0.074	0.087	0.099	0.108	
						Feed (mm/min)	1291	1650	1650	1668	1463	1327	1157	
		Slot 	1	≤ 1	134 (107-161)	RPM	7109	5332	4265	3555	2666	2133	1706	
						Fz	0.029	0.049	0.061	0.074	0.087	0.099	0.108	
						Feed (mm/min)	1024	1308	1308	1322	1160	1052	917	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	96 (77-115)	RPM	5089	3817	3054	2545	1909	1527	1221
						Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080	
						Feed (mm/min)	550	692	692	702	635	570	489	
		Slot 	1	≤ 1	76 (61-91)	RPM	4039	3029	2424	2020	1515	1212	969	
						Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080	
						Feed (mm/min)	436	549	549	557	504	452	388	
TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	56 (45-68)	RPM	2989	2242	1793	1495	1121	897	717	
					Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.065		
					Feed (mm/min)	251	335	335	323	287	263	233		
	Slot 	1	≤ 1	44 (35-53)	RPM	2343	1757	1406	1171	879	703	562		
					Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.065		
					Feed (mm/min)	197	262	262	253	225	206	183		
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	149 (119-179)	RPM	7917	5938	4750	3958	2969	2375	1900
						Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080	
						Feed (mm/min)	855	1077	1077	1092	988	887	760	
		Slot 	1	≤ 1	119 (95-143)	RPM	6301	4726	3781	3151	2363	1890	1512	
						Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080	
						Feed (mm/min)	680	857	857	869	786	706	605	
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	104 (83-124)	RPM	5493	4120	3296	2747	2060	1648	1318
						Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063	
						Feed (mm/min)	461	615	615	593	527	483	412	
		Slot 	1	≤ 1	82 (66-99)	RPM	4362	3272	2617	2181	1636	1309	1047	
						Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063	
						Feed (mm/min)	366	489	489	471	419	384	327	
STAINLESS STEELS (PH) 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.5	≤ 1.5	94 (76-113)	RPM	5009	3756	3005	2504	1878	1503	1202	
					Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063		
					Feed (mm/min)	421	561	561	541	481	441	376		
	Slot 	1	≤ 1	76 (61-91)	RPM	4039	3029	2424	2020	1515	1212	969		
					Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063		
					Feed (mm/min)	339	452	452	436	388	355	303		
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.5	≤ 1.5	136 (109-163)	RPM	7190	5392	4314	3595	2696	2157	1726
						Fz	0.026	0.045	0.056	0.067	0.079	0.091	0.098	
						Feed (mm/min)	949	1208	1208	1208	1070	978	841	
		Slot 	1	≤ 1	108 (87-130)	RPM	5736	4302	3441	2868	2151	1721	1377	
						Fz	0.026	0.045	0.056	0.067	0.079	0.091	0.098	
						Feed (mm/min)	757	964	964	964	853	780	671	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.5	≤ 1.5	104 (83-124)	RPM	5493	4120	3296	2747	2060	1648	1318
						Fz	0.020	0.034	0.043	0.050	0.059	0.067	0.073	
						Feed (mm/min)	554	703	703	692	606	549	478	
		Slot 	1	≤ 1	82 (66-99)	RPM	4362	3272	2617	2181	1636	1309	1047	
						Fz	0.020	0.034	0.043	0.050	0.059	0.067	0.073	
						Feed (mm/min)	440	558	558	550	482	436	380	

continued on next page

Z-Carb-HPR

Series Z5MCR Metric	Hardness			Vc (m/min)	DC • mm									
		Ae x DC	Ap x DC		6	8	10	12	16	20	25			
S	HIGH TEMP ALLOYS (NICKEL , COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	 ≤ 300 Bhn or ≤ 32 HRc	Profile	≤ 0.5	≤ 1.5	24 (20-29)	RPM	1293	969	776	646	485	388	310
						Fz	0.0160	0.0272	0.0340	0.0409	0.0478	0.0531	0.0599	
						Feed (mm/min)	103	132	132	132	116	103	93	
			1	≤ 1	20 (16-24)	RPM	1050	788	630	525	394	315	252	
						Fz	0.0160	0.0272	0.0340	0.0409	0.0478	0.0531	0.0599	
						Feed (mm/min)	84	107	107	107	94	84	75	
	HIGH TEMP ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	 ≤ 400 Bhn or ≤ 43 HRc	Profile	≤ 0.5	≤ 1.5	19 (15-23)	RPM	1002	751	601	501	376	301	240
						Fz	0.0112	0.0192	0.0239	0.0284	0.0333	0.0371	0.0420	
						Feed (mm/min)	56	72	72	71	63	56	50	
			1	≤ 1	15 (12-18)	RPM	808	606	485	404	303	242	194	
						Fz	0.0112	0.0192	0.0239	0.0284	0.0333	0.0371	0.0420	
						Feed (mm/min)	45	58	58	57	50	45	41	
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	 ≤ 350 Bhn or ≤ 38 HRc	Profile	≤ 0.5	≤ 1.5	66 (52-79)	RPM	3474	2605	2084	1737	1303	1042	834
						Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.070	
						Feed (mm/min)	333	417	417	417	367	333	292	
			1	≤ 1	52 (41-62)	RPM	2747	2060	1648	1373	1030	824	659	
						Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.070	
						Feed (mm/min)	264	330	330	330	290	264	231	
	TITANIUM ALLOYS (DIFFICULT) Ti10V2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	 ≤ 420 Bhn or ≤ 45 HRc	Profile	≤ 0.5	≤ 1.5	23 (18-27)	RPM	1212	909	727	606	454	364	291
						Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.071	
						Feed (mm/min)	116	145	145	145	128	116	103	
			1	≤ 1	18 (15-22)	RPM	969	727	582	485	364	291	233	
						Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.071	
						Feed (mm/min)	93	116	116	116	102	93	83	

Bhn (Brinell) HRc (Rockwell C)

rpm = (Vc x 1000) / (DC x 3.14)

mm/min = Fz x 5 x rpm

ramp up to 5 degrees using slotting speed and feed rates. Do not plunge.

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-sgstool.com)