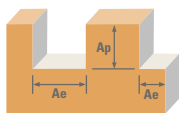













Series Z5, Z5CR Fractional	Hardness	Profile Ae x DC	Slot Ap x DC	Vc (sfm)	DC • in								
					1/8	1/4	3/8	1/2	5/8	3/4	1		
<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	555 (444-666)	RPM	16961	8480	5654	4240	3392	2827	2120
						Fz	0.00046	0.0012	0.0023	0.0031	0.0034	0.0037	0.0043
						Feed (ipm)	39.0	50.9	65.0	65.7	57.7	52.3	45.6
	Slot 	1	≤ 1	440 (352-528)	RPM	13446	6723	4482	3362	2689	2241	1681	
					Fz	0.00046	0.0012	0.0023	0.0031	0.0034	0.0037	0.0043	
					Feed (ipm)	30.9	40.3	51.5	52.1	45.7	41.5	36.1	
<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	315 (252-378)	RPM	9626	4813	3209	2407	1925	1604	1203
						Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
						Feed (ipm)	16.4	21.7	27.3	27.7	25.0	22.5	19.3
	Slot 	1	≤ 1	250 (200-300)	RPM	7640	3820	2547	1910	1528	1273	955	
					Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032	
					Feed (ipm)	13.0	17.2	21.6	22.0	19.9	17.8	15.3	
<b>CAST IRONS (LOW &amp; MEDIUM ALLOY)</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.5	≤ 1.5	445 (356-534)	RPM	13599	6800	4533	3400	2720	2267	1700
						Fz	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039
						Feed (ipm)	28.6	37.4	47.6	47.6	42.2	38.5	33.1
	Slot 	1	≤ 1	355 (284-426)	RPM	10849	5424	3616	2712	2170	1808	1356	
					Fz	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039	
					Feed (ipm)	22.8	29.8	38.0	38.0	33.6	30.7	26.4	
<b>CAST IRONS (HIGH ALLOY)</b> Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.5	≤ 1.5	340 (272-408)	RPM	10390	5195	3463	2598	2078	1732	1299
						Fz	0.00031	0.0008	0.0016	0.0021	0.0023	0.0025	0.0029
						Feed (ipm)	16.1	21.8	27.7	27.3	23.9	21.6	18.8
	Slot 	1	≤ 1	270 (216-324)	RPM	8251	4126	2750	2063	1650	1375	1031	
					Fz	0.00031	0.0008	0.0016	0.0021	0.0023	0.0025	0.0029	
					Feed (ipm)	12.8	17.3	22.0	21.7	19.0	17.2	15.0	
<b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	490 (392-588)	RPM	14974	7487	4991	3744	2995	2496	1872
						Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
						Feed (ipm)	25.5	33.7	42.4	43.1	38.9	34.9	29.9
	Slot 	1	≤ 1	390 (312-468)	RPM	11918	5959	3973	2980	2384	1986	1490	
					Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032	
					Feed (ipm)	20.3	26.8	33.8	34.3	31.0	27.8	23.8	
<b>STAINLESS STEELS (DIFFICULT)</b> 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	340 (272-408)	RPM	10390	5195	3463	2598	2078	1732	1299
						Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
						Feed (ipm)	14.0	18.2	24.2	23.4	20.8	19.0	16.2
	Slot 	1	≤ 1	270 (216-324)	RPM	8251	4126	2750	2063	1650	1375	1031	
					Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025	
					Feed (ipm)	11.1	14.4	19.3	18.6	16.5	15.1	12.9	
<b>STAINLESS STEELS (PH)</b> 13-8 PH, 15-5PH, 17-4 PH, CUSTOM 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.5	≤ 1.5	310 (248-372)	RPM	9474	4737	3158	2368	1895	1579	1184
						Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
						Feed (ipm)	12.8	16.6	22.1	21.3	18.9	17.4	14.8
	Slot 	1	≤ 1	250 (200-300)	RPM	7640	3820	2547	1910	1528	1273	955	
					Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025	
					Feed (ipm)	10.3	13.4	17.8	17.2	15.3	14.0	11.9	

continued on next page

# FRACTIONAL Z-Carb-HPR



Series Z5, Z5CR Fractional	Hardness	Profile 	Ae x DC	Ap x DC	Vc (sfm)	DC • in							
						1/8	1/4	3/8	1/2	5/8	3/4	1	
<b>S</b>	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400</b>	Profile 	≤ 0.5	≤ 1.5	80 (64-96)	RPM	2445	1222	815	611	489	407	306
						Fz	0.00025	0.00068	0.00128	0.00170	0.00187	0.00204	0.00238
						Feed (ipm)	3.1	4.2	5.2	5.2	4.6	4.2	3.6
		Slot 	1	≤ 1	65 (52-78)	RPM	1986	993	662	497	397	331	248
						Fz	0.00025	0.00068	0.00128	0.00170	0.00187	0.00204	0.00238
						Feed (ipm)	2.5	3.4	4.2	4.2	3.7	3.4	3.0
	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene</b>	Profile 	≤ 0.5	≤ 1.5	62 (50-74)	RPM	1895	947	632	474	379	316	237
						Fz	0.00018	0.00048	0.00090	0.00120	0.00130	0.00140	0.00170
						Feed (ipm)	1.7	2.3	2.8	2.8	2.5	2.2	2.0
		Slot 	1	≤ 1	50 (40-60)	RPM	1528	764	509	382	306	255	191
						Fz	0.00018	0.00048	0.00090	0.00120	0.00130	0.00140	0.00170
						Feed (ipm)	1.4	1.8	2.3	2.3	2.0	1.8	1.6
<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si</b>	Profile 	≤ 0.5	≤ 1.5	215 (172-258)	RPM	6570	3285	2190	1643	1314	1095	821	
					Fz	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028	
					Feed (ipm)	9.9	13.1	16.4	16.4	14.5	13.1	11.5	
	Slot 	1	≤ 1	170 (136-204)	RPM	5195	2598	1732	1299	1039	866	649	
					Fz	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028	
					Feed (ipm)	7.8	10.4	13.0	13.0	11.4	10.4	9.1	
<b>TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al</b>	Profile 	≤ 0.5	≤ 1.5	75 (60-90)	RPM	2292	1146	764	573	458	382	287	
					Fz	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028	
					Feed (ipm)	3.4	4.6	5.7	5.7	5.0	4.6	4.0	
	Slot 	1	≤ 1	60 (48-72)	RPM	1834	917	611	458	367	306	229	
					Fz	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028	
					Feed (ipm)	2.8	3.7	4.6	4.6	4.0	3.7	3.2	
<b>H</b> <b>TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2</b>	Profile 	≤ 0.5	≤ 1.5	185 (148-222)	RPM	5654	2827	1885	1413	1131	942	707	
					Fz	0.00028	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026	
					Feed (ipm)	7.9	9.9	13.2	12.7	11.3	10.4	9.2	
	Slot 	1	≤ 1	145 (116-174)	RPM	4431	2216	1477	1108	886	739	554	
					Fz	0.00028	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026	
					Feed (ipm)	6.2	7.8	10.3	10.0	8.9	8.1	7.2	

Bhn (Brinell)      HRC (Rockwell C)

rpm = Vc x 3.82 / DC

ipm = 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](http://www.kyocera-sgstool.com))