

METRIC
Hi-PerCarb®

Series 135M 5D Metric	Hardness	Vc (m/min)	DC • mm									
			1.5	3	6	8	10	12	16	20		
P CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	105	RPM	22297	11148	5574	4181	3344	2787	2090	1672	
		(84-126)	Fr	0.048	0.095	0.190	0.254	0.317	0.380	0.507	0.634	
			Feed (mm/min)	1060	1060	1060	1060	1060	1060	1060	1060	
	≤ 275 Bhn or ≤ 28 HRc	94	RPM	20035	10017	5009	3756	3005	2504	1878	1503	
		(76-113)	Fr	0.043	0.085	0.171	0.228	0.285	0.341	0.455	0.569	
			Feed (mm/min)	855	855	855	855	855	855	855	855	
	≤ 425 Bhn or ≤ 45 HRc	55	RPM	11633	5816	2908	2181	1745	1454	1091	872	
		(44-66)	Fr	0.036	0.071	0.143	0.190	0.238	0.285	0.381	0.476	
			Feed (mm/min)	415	415	415	415	415	415	415	415	
	M ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	82	RPM	17449	8725	4362	3272	2617	2181	1636	1309
			(66-99)	Fr	0.036	0.072	0.143	0.191	0.239	0.287	0.382	0.478
				Feed (mm/min)	625	625	625	625	625	625	625	625
≤ 375 Bhn or ≤ 40 HRc		50	RPM	10664	5332	2666	1999	1600	1333	1000	800	
		(40-60)	Fr	0.031	0.062	0.124	0.165	0.206	0.248	0.330	0.413	
			Feed (mm/min)	330	330	330	330	330	330	330	330	
≤ 450 Bhn or ≤ 48 HRc		35	RPM	7432	3716	1858	1394	1115	929	697	557	
		(28-42)	Fr	0.022	0.043	0.086	0.115	0.144	0.172	0.230	0.287	
			Feed (mm/min)	160	160	160	160	160	160	160	160	
K STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F		≤ 185 Bhn or ≤ 9 HRc	76	RPM	16157	8078	4039	3029	2424	2020	1515	1212
			(61-91)	Fr	0.031	0.061	0.123	0.163	0.204	0.245	0.327	0.408
				Feed (mm/min)	495	495	495	495	495	495	495	495
	≤ 275 Bhn or ≤ 28 HRc	46	RPM	9694	4847	2424	1818	1454	1212	909	727	
		(37-55)	Fr	0.024	0.047	0.095	0.127	0.158	0.190	0.253	0.316	
			Feed (mm/min)	230	230	230	230	230	230	230	230	
K STAINLESS STEELS (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	24	RPM	5170	2585	1293	969	776	646	485	388	
		(20-29)	Fr	0.023	0.046	0.093	0.124	0.155	0.186	0.248	0.309	
			Feed (mm/min)	120	120	120	120	120	120	120	120	
	≤ 375 Bhn or ≤ 40 HRc	17	RPM	3555	1777	889	666	533	444	333	267	
		(13-20)	Fr	0.021	0.042	0.084	0.113	0.141	0.169	0.225	0.281	
			Feed (mm/min)	75	75	75	75	75	75	75	75	
K CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	91	RPM	19388	9694	4847	3635	2908	2424	1818	1454	
		(73-110)	Fr	0.054	0.108	0.217	0.289	0.361	0.433	0.578	0.722	
			Feed (mm/min)	1050	1050	1050	1050	1050	1050	1050	1050	
	≤ 260 Bhn or ≤ 26 HRc	81	RPM	17126	8563	4282	3211	2569	2141	1606	1284	
		(65-97)	Fr	0.055	0.109	0.218	0.291	0.364	0.437	0.582	0.728	
			Feed (mm/min)	935	935	935	935	935	935	935	935	

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Series 135M 5D Metric	Hardness	Vc (m/min)	DC • mm									
			1.5	3	6	8	10	12	16	20		
N ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	194	RPM	41039	20519	10260	7695	6156	5130	3847	3078	
		(155-232)	Fr	0.059	0.118	0.237	0.316	0.395	0.474	0.632	0.790	
			Feed (mm/min)	2430	2430	2430	2430	2430	2430	2430	2430	
	≤ 150 Bhn or ≤ 7 HRc	165	RPM	34899	17449	8725	6544	5235	4362	3272	2617	
		(132-198)	Fr	0.059	0.118	0.237	0.316	0.394	0.473	0.631	0.789	
			Feed (mm/min)	2065	2065	2065	2065	2065	2065	2065	2065	
	Copper Alloys Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	137	RPM	29082	14541	7271	5453	4362	3635	2726	2181
			(110-165)	Fr	0.027	0.053	0.107	0.142	0.178	0.213	0.284	0.355
				Feed (mm/min)	775	775	775	775	775	775	775	775
		≤ 200 Bhn or ≤ 23 HRc	110	RPM	23266	11633	5816	4362	3490	2908	2181	1745
			(88-132)	Fr	0.027	0.054	0.108	0.144	0.181	0.217	0.289	0.361
				Feed (mm/min)	630	630	630	630	630	630	630	630
S SUPER ALLOYS (Nickel , Cobalt, Iron Base) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	12	RPM	2585	1293	646	485	388	323	242	194	
		(10-15)	Fr	0.010	0.019	0.039	0.052	0.064	0.077	0.103	0.129	
			Feed (mm/min)	25	25	25	25	25	25	25	25	
	≤ 400 Bhn or ≤ 43 HRc	6	RPM	1293	646	323	242	194	162	121	97	
		(5-7)	Fr	0.007	0.014	0.028	0.037	0.046	0.056	0.074	0.093	
			Feed (mm/min)	9	9	9	9	9	9	9	9	
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	32	RPM	6786	3393	1696	1272	1018	848	636	509
			(26-38)	Fr	0.021	0.043	0.085	0.114	0.142	0.171	0.228	0.285
				Feed (mm/min)	145	145	145	145	145	145	145	145
		≤ 350 Bhn or ≤ 38 HRc	24	RPM	5170	2585	1293	969	776	646	485	388
			(20-29)	Fr	0.019	0.039	0.077	0.103	0.129	0.155	0.206	0.258
				Feed (mm/min)	100	100	100	100	100	100	100	100
≤ 440 Bhn or ≤ 47 HRc	13	RPM	2714	1357	679	509	407	339	254	204		
	(10-15)	Fr	0.015	0.029	0.059	0.079	0.098	0.118	0.157	0.196		
		Feed (mm/min)	40	40	40	40	40	40	40	40		
H TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 200 Bhn or ≤ 13 HRc	37	RPM	7755	3878	1939	1454	1163	969	727	582	
		(29-44)	Fr	0.031	0.062	0.124	0.165	0.206	0.248	0.330	0.413	
			Feed (mm/min)	240	240	240	240	240	240	240	240	
	≤ 375 Bhn or ≤ 40 HRc	24	RPM	5170	2585	1293	969	776	646	485	388	
		(20-29)	Fr	0.015	0.029	0.058	0.077	0.097	0.116	0.155	0.193	
			Feed (mm/min)	75	75	75	75	75	75	75	75	
	≤ 475 Bhn or ≤ 50 HRc	21	RPM	4524	2262	1131	848	679	565	424	339	
		(17-26)	Fr	0.010	0.020	0.040	0.053	0.066	0.080	0.106	0.133	
			Feed (mm/min)	45	45	45	45	45	45	45	45	

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)
 $rpm = (Vc \times 1000) / (DC \times 3.14)$
 $mm/min = Fr \times rpm$
 reduce speed and feed for materials harder than listed
 refer to the SGS Tool Wizard® for complete technical information (www.kyocera-sgstool.com)