

# 3 Flute Drills

Series 103M Metric	Hardness	Vc (m/min)	DC • mm							
			3	6	10	12	16	20		
P  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	90	RPM	9533	4766	2860	2383	1787	1430	
		(72-108)	Fr	0.062	0.124	0.206	0.248	0.330	0.413	
			Feed (mm/min)	590	590	590	590	590	590	
	≤ 300 Bhn or ≤ 32 HRc	79	RPM	8402	4201	2520	2100	1575	1260	
		(63-95)	Fr	0.055	0.110	0.183	0.219	0.292	0.365	
			Feed (mm/min)	460	460	460	460	460	460	
	≤ 425 Bhn or ≤ 45 HRc	46	RPM	4847	2424	1454	1212	909	727	
		(37-55)	Fr	0.032	0.064	0.107	0.128	0.171	0.213	
			Feed (mm/min)	155	155	155	155	155	155	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	70	RPM	7432	3716	2230	1858	1394	1115
			(56-84)	Fr	0.046	0.093	0.155	0.186	0.248	0.309
				Feed (mm/min)	345	345	345	345	345	345
≤ 375 Bhn or ≤ 40 HRc		44	RPM	4686	2343	1406	1171	879	703	
		(35-53)	Fr	0.046	0.092	0.153	0.184	0.245	0.306	
			Feed (mm/min)	215	215	215	215	215	215	
≤ 450 Bhn or ≤ 48 HRc		35	RPM	3716	1858	1115	929	697	557	
		(28-42)	Fr	0.012	0.024	0.040	0.048	0.065	0.081	
			Feed (mm/min)	45	45	45	45	45	45	
K  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	76	RPM	8078	4039	2424	2020	1515	1212	
		(61-91)	Fr	0.063	0.126	0.210	0.253	0.337	0.421	
			Feed (mm/min)	510	510	510	510	510	510	
	≤ 330 Bhn or ≤ 36 HRc	59	RPM	6301	3151	1890	1575	1181	945	
		(48-71)	Fr	0.052	0.105	0.175	0.209	0.279	0.349	
			Feed (mm/min)	330	330	330	330	330	330	
N  <b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	165	RPM	17449	8725	5235	4362	3272	2617	
		(132-198)	Fr	0.078	0.156	0.260	0.312	0.416	0.520	
			Feed (mm/min)	1360	1360	1360	1360	1360	1360	
	≤ 150 Bhn or ≤ 7 HRc	139	RPM	14703	7351	4411	3676	2757	2205	
		(111-166)	Fr	0.078	0.156	0.261	0.313	0.417	0.521	
			Feed (mm/min)	1150	1150	1150	1150	1150	1150	
	<b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	93	RPM	9856	4928	2957	2464	1848	1478
			(74-112)	Fr	0.047	0.094	0.157	0.189	0.252	0.315
				Feed (mm/min)	465	465	465	465	465	465
		≤ 200 Bhn or ≤ 23 HRc	49	RPM	5170	2585	1551	1293	969	776
			(39-59)	Fr	0.039	0.077	0.129	0.155	0.206	0.258
				Feed (mm/min)	200	200	200	200	200	200
H  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc	26	RPM	2747	1373	824	687	515	412	
		(21-31)	Fr	0.031	0.062	0.103	0.124	0.165	0.206	
			Feed (mm/min)	85	85	85	85	85	85	
	≤ 375 Bhn or ≤ 40 HRc	20	RPM	2100	1050	630	525	394	315	
		(16-24)	Fr	0.017	0.033	0.056	0.067	0.089	0.111	
			Feed (mm/min)	35	35	35	35	35	35	
	≤ 475 Bhn or ≤ 50 HRc	15	RPM	1616	808	485	404	303	242	
		(12-18)	Fr	0.015	0.031	0.052	0.062	0.083	0.103	
			Feed (mm/min)	25	25	25	25	25	25	

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 rpm = (Vc x 1000) / (DC x 3.14)  
 mm/min = Fr x rpm  
 reduce speed and feed 30 percent when using uncoated drills  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard® for complete technical information (www.kyocera-sgstoool.com)