

3 Flute Drills

Series 103 Fractional	Hardness	Vc (sfm)	DC • in							
			1/8	1/4	3/8	1/2	5/8	3/4		
P CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	295	RPM	9015	4508	3005	2254	1803	1503	
		(236-354)	Fr	0.0026	0.0051	0.0077	0.0102	0.0128	0.0153	
			Feed (ipm)	23.0	23.0	23.0	23.0	23.0	23.0	
	≤ 300 Bhn or ≤ 32 HRc	260	RPM	7946	3973	2649	1986	1589	1324	
		(208-312)	Fr	0.0023	0.0045	0.0068	0.0091	0.0113	0.0136	
			Feed (ipm)	18.0	18.0	18.0	18.0	18.0	18.0	
	≤ 425 Bhn or ≤ 45 HRc	150	RPM	4584	2292	1528	1146	917	764	
		(120-180)	Fr	0.0013	0.0026	0.0039	0.0052	0.0065	0.0079	
			Feed (ipm)	6.0	6.0	6.0	6.0	6.0	6.0	
	P ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	230	RPM	7029	3514	2343	1757	1406	1171
			(184-276)	Fr	0.0019	0.0038	0.0058	0.0077	0.0096	0.0115
				Feed (ipm)	13.5	13.5	13.5	13.5	13.5	13.5
≤ 375 Bhn or ≤ 40 HRc		145	RPM	4431	2216	1477	1108	886	739	
		(116-174)	Fr	0.0019	0.0038	0.0058	0.0077	0.0096	0.0115	
			Feed (ipm)	8.5	8.5	8.5	8.5	8.5	8.5	
≤ 425 Bhn or ≤ 45 HRc		115	RPM	3514	1757	1171	879	703	586	
		(92-138)	Fr	0.0005	0.0010	0.0015	0.0020	0.0026	0.0031	
			Feed (ipm)	1.8	1.8	1.8	1.8	1.8	1.8	
P TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc	85	RPM	2598	1299	866	649	520	433
			(68-102)	Fr	0.0013	0.0026	0.0039	0.0052	0.0065	0.0079
				Feed (ipm)	3.4	3.4	3.4	3.4	3.4	3.4
	≤ 375 Bhn or ≤ 40 HRc	65	RPM	1986	993	662	497	397	331	
		(52-78)	Fr	0.0007	0.0013	0.0020	0.0026	0.0033	0.0039	
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	
K CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	250	RPM	7640	3820	2547	1910	1528	1273	
		(200-300)	Fr	0.0026	0.0052	0.0079	0.0105	0.0131	0.0157	
			Feed (ipm)	20.0	20.0	20.0	20.0	20.0	20.0	
	≤ 330 Bhn or ≤ 36 HRc	195	RPM	5959	2980	1986	1490	1192	993	
		(156-234)	Fr	0.0026	0.0052	0.0078	0.0104	0.0130	0.0156	
			Feed (ipm)	15.5	15.5	15.5	15.5	15.5	15.5	
N ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	540	RPM	16502	8251	5501	4126	3300	2750	
		(432-648)	Fr	0.0032	0.0064	0.0096	0.0128	0.0161	0.0193	
			Feed (ipm)	53.0	53.0	53.0	53.0	53.0	53.0	
	≤ 150 Bhn or ≤ 88 HRb	455	RPM	13905	6952	4635	3476	2781	2317	
		(364-546)	Fr	0.0032	0.0065	0.0097	0.0129	0.0162	0.0194	
			Feed (ipm)	45.0	45.0	45.0	45.0	45.0	45.0	
N COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	305	RPM	9321	4660	3107	2330	1864	1553	
		(244-366)	Fr	0.0019	0.0039	0.0058	0.0077	0.0097	0.0116	
			Feed (ipm)	18.0	18.0	18.0	18.0	18.0	18.0	
	≤ 200 Bhn or ≤ 23 HRc	160	RPM	4890	2445	1630	1222	978	815	
		(128-192)	Fr	0.0016	0.0033	0.0049	0.0065	0.0082	0.0098	
			Feed (ipm)	8.0	8.0	8.0	8.0	8.0	8.0	
H TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	(40-60)	Fr	1.3	1.3	1.3	1.3	1.3	1.3	
			RPM	1528	764	509	382	306	255	
			Fr	0.0007	0.0013	0.0020	0.0026	0.0033	0.0039	
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)
 rpm = Vc x 3.82 / DC
 ipm = 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-sgstool.com)

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Series 103M Metric	Hardness	Vc (m/min)	DC • mm							
			3	6	10	12	16	20		
P CARBON STEELS 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	
	P 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	
P TOOL STEELS 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	
K CAST IRONS 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 ALUMINUM ALLOYS 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	
	N COPPER ALLOYS 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 TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 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-sgtool.com)