Speeds & Feeds

Product Table: Miniature End Mills - Ball- Extra Long Length
Characteristics: 4 Flutes
Series: 149xx

Product Notes:

Posted values reflect tools with a reach equal to 5x Diameter. For tools with a greater reach multiple, use the table below to adjust Chip Load and Depths of Cut.

Reach Multiple	Slotting			Roughing			Finishing		
	Chip Load	Depth of Cut		Chip Load	Depth of Cut		Chip Load	Depth of Cut	
		Radial	Axial		Radial	Axial		Radial	Axial
5x	100%	100%	100%	100%	100%	100%	100%	100%	100%
8x	75%	100%	90%	75%	92%	86%	83%	100%	100%
12x	60%	100%	75%	60%	75%	71%	75%	67%	100%
15x	50%	100%	75%	50%	50%	71%	67%	53%	100%
20x	40%	100%	50%	40%	42%	57%	58%	33%	100%
25x	30%	100%	50%	30%	42%	57%	50%	33%	100%

General Notes:

All posted speed and feed parameters are suggested starting values that may be increased given optimal setup conditions. Chip loads reflect uncoated cutters and may be increased 10%-20% if coated. For ferrous materials with hardness ≤ 28 Rc, chip loads can be increased 10%-20%.

If you require additional information, Harvey Tool has a team of technical experts available to assist you through even the most challenging applications. Please contact us at **800-645-5609** or **Harveytech@harveyperformance.com**.

WARNING: Cutting tools may shatter under improper use. Government regulations require use of safety glasses and other appropriate safety equipment in the vicinity of use.

Hardness: ≤ 28 Rc (≤ 271 HBn)

MATERIAL	SFM	Chip Load (IPT) By Cutter Diameter										Depth of Cut	
			.125	.187	.250	.312	.375	.500	.625	.750	1.000	Radial	Axial
ALUMINUM ALLOYS													
Casting (2xx, 5xx, 7xx, 8xx)	750	Slotting	.00110	.00165	.00220	.00275	.00330	.00440	.00550	.00660	.00880	1.00 x Dia	.20 x Dia
		Roughing	.00138	.00206	.00275	.00343	.00413	.00550	.00688	.00825	.01100	.60 x Dia	.35 x Dia
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000	Finishing	.00174	.00260	.00348	.00434	.00521	.00695	.00869	.01043	.01390	.15 x Dia	1.50 x Dia
Casting - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	750	Slotting	.00099	.00148	.00198	.00247	.00297	.00396	.00495	.00594	.00792	1.00 x Dia	.20 x Dia
Casting - 5%-8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	700												
Casting - 8%-12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	650	Roughing	.00124	.00185	.00248	.00309	.00371	.00495	.00619	.00743	.00990	.60 x Dia	.35 x Dia
Casting - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	475												
Wrought - 5%-8% Si (4xxx)	1000	Finishing	.00156	.00234	.00313	.00390	.00469	.00626	.00782	.00939	.01251	.15 x Dia	1.50 x Dia
Wrought - 8%-12% Si (4xxx)	800												
MAGNESIUM ALLOYS	1500	Slotting	.00110	.00165	.00220	.00275	.00330	.00440	.00550	.00660	.00880	1.00 x Dia	.20 x Dia
		Roughing	.00138	.00206	.00275	.00343	.00413	.00550	.00688	.00825	.01100	.60 x Dia	.35 x Dia
ZINC ALLOYS	800	Finishing	.00174	.00260	.00348	.00434	.00521	.00695	.00869	.01043	.01390	.15 x Dia	1.50 x Dia
COPPER ALLOYS													
High Coppers - 90%+ (C1xxxx)	225	Slotting	.00088	.00132	.00176	.00220	.00264	.00352	.00440	.00528	.00704	1.00 x Dia	.20 x Dia
Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)	500												
Phosphor Bronzes (Copper Tin alloys, C5xxxx)	225												
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	500	Roughing	.00110	.00165	.00220	.00275	.00330	.00440	.00550	.00660	.00880	.60 x Dia	.35 x Dia
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	500												
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	225												
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	550	Finishing	.00139	.00208	.00278	.00347	.00417	.00556	.00695	.00834	.01112	.15 x Dia	1.50 x Dia

Hardness: 29-37 Rc (279-344 HBn)

MATERIAL	SFM	Chip Load (IPT) By Cutter Diameter										Depth of Cut	
			.125	.187	.250	.312	.375	.500	.625	.750	1.000	Radial	Axial
CARBON STEELS													
Free-Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx	600	Slotting	.00038	.00057	.00076	.00094	.00113	.00151	.00189	.00227	.00302	1.00 x Dia	.20 x Dia
		Roughing	.00043	.00064	.00085	.00106	.00128	.00170	.00213	.00255	.00340	.60 x Dia	.35 x Dia
		Finishing	.00054	.00081	.00109	.00136	.00163	.00217	.00272	.00326	.00435	.15 x Dia	1.50 x Dia
1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx & 52Lxxx, 6xxx, 8xxx, 9xxx	200	Slotting	.00035	.00052	.00069	.00086	.00104	.00138	.00173	.00207	.00276	1.00 x Dia	.20 x Dia
		Roughing	.00039	.00058	.00078	.00097	.00117	.00156	.00194	.00233	.00311	.60 x Dia	.35 x Dia
		Finishing	.00050	.00074	.00099	.00124	.00149	.00199	.00248	.00298	.00397	.15 x Dia	1.50 x Dia
STAINLESS STEELS													
203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe	450	Slotting	.00038	.00057	.00076	.00094	.00113	.00151	.00189	.00227	.00302	1.00 x Dia	.20 x Dia
		Roughing	.00043	.00064	.00085	.00106	.00128	.00170	.00213	.00255	.00340	.60 x Dia	.35 x Dia
		Finishing	.00054	.00081	.00109	.00136	.00163	.00217	.00272	.00326	.00435	.15 x Dia	1.50 x Dia
201, 202, 203, 205, 301, 302, 304, 304L, 308, 309, 310, 314, 316, 316L, 317, 321, 329, 330, 347, 348, 385, 403, 405, 409, 410, 413, 420, 429, 430, 434, 436, 442, 446, 501, 502	200	Slotting	.00035	.00052	.00069	.00086	.00104	.00138	.00173	.00207	.00276	1.00 x Dia	.20 x Dia
		Roughing	.00039	.00058	.00078	.00097	.00117	.00156	.00194	.00233	.00311	.60 x Dia	.35 x Dia
		Finishing	.00050	.00074	.00099	.00124	.00149	.00199	.00248	.00298	.00397	.15 x Dia	1.50 x Dia
414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7	150	Slotting	.00022	.00032	.00043	.00054	.00065	.00086	.00108	.00130	.00173	1.00 x Dia	.20 x Dia
		Roughing	.00024	.00036	.00049	.00061	.00073	.00097	.00122	.00146	.00194	.60 x Dia	.35 x Dia
		Finishing	.00031	.00046	.00062	.00078	.00093	.00124	.00155	.00186	.00248	.15 x Dia	1.50 x Dia
TOOL STEELS													
A, L, O, P, W series	200	Slotting	.00035	.00052	.00069	.00086	.00104	.00138	.00173	.00207	.00276	1.00 x Dia	.20 x Dia
		Roughing	.00039	.00058	.00078	.00097	.00117	.00156	.00194	.00233	.00311	.60 x Dia	.35 x Dia
		Finishing	.00050	.00074	.00099	.00124	.00149	.00199	.00248	.00298	.00397	.15 x Dia	1.50 x Dia
D, H, M, T, S series	150	Slotting	.00022	.00032	.00043	.00054	.00065	.00086	.00108	.00130	.00173	1.00 x Dia	.20 x Dia
		Roughing	.00024	.00036	.00049	.00061	.00073	.00097	.00122	.00146	.00194	.60 x Dia	.35 x Dia
		Finishing	.00031	.00046	.00062	.00078	.00093	.00124	.00155	.00186	.00248	.15 x Dia	1.50 x Dia
TITANIUM ALLOYS	150	Slotting	.00022	.00032	.00043	.00054	.00065	.00086	.00108	.00130	.00173	1.00 x Dia	.20 x Dia
		Roughing	.00024	.00036	.00049	.00061	.00073	.00097	.00122	.00146	.00194	.60 x Dia	.35 x Dia
		Finishing	.00031	.00046	.00062	.00078	.00093	.00124	.00155	.00186	.00248	.15 x Dia	1.50 x Dia
HIGH TEMP ALLOYS													
Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy	70	Slotting	.00022	.00032	.00043	.00054	.00065	.00086	.00108	.00130	.00173	1.00 x Dia	.20 x Dia
		Roughing	.00024	.00036	.00049	.00061	.00073	.00097	.00122	.00146	.00194	.60 x Dia	.35 x Dia
		Finishing	.00031	.00046	.00062	.00078	.00093	.00124	.00155	.00186	.00248	.15 x Dia	1.50 x Dia

Hardness: 38-45 Rc (353-421 HBn)

SFM		Chip Load (IPT) By Cutter Diameter									Depth of Cut	
		.125	.187	.250	.312	.375	.500	.625	.750	1.000	Radial	Axial
-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-
100	Slotting	.00017	.00026	.00035	.00043	.00052	.00069	.00086	.00104	.00138	1.00 x Dia	.20 x Dia
	Roughing	.00019	.00029	.00039	.00049	.00058	.00078	.00097	.00117	.00156	.60 x Dia	.35 x Dia
	Finishing	.00025	.00037	.00050	.00063	.00075	.00100	.00125	.00150	.00200	.15 x Dia	1.50 x Dia
90	Slotting	.00011	.00016	.00022	.00027	.00032	.00043	.00054	.00065	.00086	1.00 x Dia	.20 x Dia
	Roughing	.00012	.00018	.00024	.00030	.00036	.00049	.00061	.00073	.00097	.60 x Dia	.35 x Dia
	Finishing	.00016	.00023	.00031	.00039	.00047	.00063	.00078	.00094	.00125	.15 x Dia	1.50 x Dia
100	Slotting	.00017	.00026	.00035	.00043	.00052	.00069	.00086	.00104	.00138	1.00 x Dia	.20 x Dia
	Roughing	.00019	.00029	.00039	.00049	.00058	.00078	.00097	.00117	.00156	.60 x Dia	.35 x Dia
	Finishing	.00025	.00037	.00050	.00063	.00075	.00100	.00125	.00150	.00200	.15 x Dia	1.50 x Dia
90	Slotting	.00011	.00016	.00022	.00027	.00032	.00043	.00054	.00065	.00086	1.00 x Dia	.20 x Dia
	Roughing	.00012	.00018	.00024	.00030	.00036	.00049	.00061	.00073	.00097	.60 x Dia	.35 x Dia
	Finishing	.00016	.00023	.00031	.00039	.00047	.00063	.00078	.00094	.00125	.15 x Dia	1.50 x Dia
75	Slotting	.00011	.00016	.00022	.00027	.00032	.00043	.00054	.00065	.00086	1.00 x Dia	.20 x Dia
	Roughing	.00012	.00018	.00024	.00030	.00036	.00049	.00061	.00073	.00097	.60 x Dia	.35 x Dia
	Finishing	.00016	.00023	.00031	.00039	.00047	.00063	.00078	.00094	.00125	.15 x Dia	1.50 x Dia
50	Slotting	.00011	.00016	.00022	.00027	.00032	.00043	.00054	.00065	.00086	1.00 x Dia	.20 x Dia
	Roughing	.00012	.00018	.00024	.00030	.00036	.00049	.00061	.00073	.00097	.60 x Dia	.35 x Dia
	Finishing	.00016	.00023	.00031	.00039	.00047	.00063	.00078	.00094	.00125	.15 x Dia	1.50 x Dia