



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	Radial Depth of Cut	Axial Depth of Cut	Chip Load	Radial Depth of Cut	Axial Depth of Cut	Chip Load	Radial Depth of Cut	Axial Depth of Cut
5x	100%	100%	100%	75%	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](mailto: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.

MATERIAL	Hardness: ≤ 28 Rc (≤ 271 HBn)												
	SFM	Chip Load (IPT) By Cutter Diameter									Depth of Cut		
		.125	.187	.250	.312	.375	.500	.625	.750	1.000	Radial	Axial	
<b>ALUMINUM ALLOYS</b>													
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												
<b>MAGNESIUM ALLOYS</b>	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
<b>ZINC ALLOYS</b>	800	Finishing	.00174	.00260	.00348	.00434	.00521	.00695	.00869	.01043	.01390	.15 x Dia	1.50 x Dia
<b>COPPER ALLOYS</b>													
High Coppers - 90%+ (C1xxx)	225	Slotting	.00088	.00132	.00176	.00220	.00264	.00352	.00440	.00528	.00704	1.00 x Dia	20 x Dia
Brass (Copper Zinc alloys, C2xxx, C3xxx, C4xxx, C66400-C69800)	500												
Phosphor Bronzes (Copper Tin alloys, C5xxx)	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, C7xxx)	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

MATERIAL	Hardness: 29-37 Rc (279-344 HBn)												
	SFM	Chip Load (IPT) By Cutter Diameter									Depth of Cut		
		.125	.187	.250	.312	.375	.500	.625	.750	1.000	Radial	Axial	
<b>CARBON STEELS</b>													
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, 20xx, 30xx, 40xx & 4Lxx, 50xx & 5Lxx, 50xxx & 50Lxx, 51xxx & 51Lxx, 52xxx & 52Lxx, 60xx, 80xx, 90xx	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
<b>STAINLESS STEELS</b>													
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
<b>TOOL STEELS</b>													
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
<b>TITANIUM ALLOYS</b>													
	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
<b>HIGH TEMP ALLOYS</b>													
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

MATERIAL	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	
		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
		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
		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
		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
		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