



**Product Table:** Miniature End Mills - Ball - Long Reach, Stub Flute  
**Characteristics:** 15x Reach Multiple  
**Series:** 356xx, 357xx

MATERIAL		Hardness: ≤ 28 Rc (≤ 271 HBn)																
		SFM	Chip Load (IPT) by Dia			Depth of Cut		Chip Load (IPT) by Cutter Dia						Depth of Cut				
			0.015	0.031	0.047	Radial	Axial	0.093	0.125	0.187	0.250	0.375	0.500	Radial	Axial			
ALUMINUM ALLOYS	750	Slotting	.00010	.00021	.00032	1 x Dia	.06 x Dia	.00037	.00046	.00055	.00074	.00111	.00149	.00223	.00297	1 x Dia	.15 x Dia	
		Roughing	.00013	.00026	.00040	23 x Dia	.25 x Dia	.00046	.00058	.00069	.00093	.00139	.00186	.00278	.00371	45 x Dia	.25 x Dia	
	1000	Finishing	.00024	.00050	.00076	.05 x Dia	1.5 x Dia	.00087	.00110	.00131	.00176	.00263	.00352	.00528	.00704	10 x Dia	1.5 x Dia	
			Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	750	Slotting	.00009	.00019	.00029	1 x Dia	.06 x Dia	.00033	.00042	.00050	.00067	.00100	.00134	.00200	.00267
	Casting - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	700	Slotting		.00009	.00019	.00029	1 x Dia	.06 x Dia	.00033	.00042	.00050	.00067	.00100	.00134	.00200	.00267	1 x Dia
	Casting - 5%-8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)		650	Roughing	.00012	.00024	.00036	23 x Dia	.25 x Dia	.00041	.00052	.00062	.00084	.00125	.00167	.00251	.00334	45 x Dia
	Casting - 8%-12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	475			Slotting	.00009	.00019	.00029	1 x Dia	.06 x Dia	.00033	.00042	.00050	.00067	.00100	.00134	.00200	.00267
	Casting - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)		1000	Finishing	.00022	.00045	.00068	.05 x Dia	1.5 x Dia	.00079	.00099	.00118	.00158	.00237	.00317	.00475	.00634	10 x Dia
	Wrought - 5%-8% Si (4xxx)	800			Slotting	.00010	.00021	.00032	1 x Dia	.06 x Dia	.00037	.00046	.00055	.00074	.00111	.00149	.00223	.00297
	Wrought - 8%-12% Si (4xxx)		1500	Roughing	.00013	.00026	.00040	23 x Dia	.25 x Dia	.00046	.00058	.00069	.00093	.00139	.00186	.00278	.00371	45 x Dia
MAGNESIUM ALLOYS	800	Finishing			.00024	.00050	.00076	.05 x Dia	1.5 x Dia	.00087	.00110	.00131	.00176	.00263	.00352	.00528	.00704	10 x Dia
ZINC ALLOYS			225	Slotting	.00008	.00017	.00026	1 x Dia	.06 x Dia	.00029	.00037	.00044	.00059	.00089	.00119	.00178	.00238	1 x Dia
COPPER ALLOYS	500	Roughing			.00010	.00021	.00032	23 x Dia	.25 x Dia	.00037	.00046	.00055	.00074	.00111	.00149	.00223	.00297	45 x Dia
High Coppers - 90%+ (C1xxx)			500	Finishing	.00009	.00019	.00029	1 x Dia	.06 x Dia	.00033	.00042	.00050	.00067	.00100	.00134	.00200	.00267	1 x Dia
Brass (Copper Zinc alloys, C2xxx, C3xxx, C4xxx, C66400-C69800)	500	Roughing			.00010	.00021	.00032	23 x Dia	.25 x Dia	.00037	.00046	.00055	.00074	.00111	.00149	.00223	.00297	45 x Dia
Phosphor Bronzes (Copper Tin alloys, C5xxx)			500	Finishing	.00009	.00019	.00029	1 x Dia	.06 x Dia	.00033	.00042	.00050	.00067	.00100	.00134	.00200	.00267	1 x Dia
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	225	Slotting			.00009	.00019	.00029	1 x Dia	.06 x Dia	.00033	.00042	.00050	.00067	.00100	.00134	.00200	.00267	1 x Dia
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)			550	Roughing	.00010	.00021	.00032	23 x Dia	.25 x Dia	.00037	.00046	.00055	.00074	.00111	.00149	.00223	.00297	45 x Dia
Copper Nicksels, Nickel Silvers (Copper Nickel alloys, C7xxx)	550	Finishing			.00019	.00040	.00061	.05 x Dia	1.5 x Dia	.00070	.00088	.00105	.00141	.00211	.00282	.00422	.00563	10 x Dia
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)																		

**Please note:**

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: 29-37 Rc (279-344 HBn)															
		SFM	Chip Load (IPT) by Dia			Depth of Cut		Chip Load (IPT) by Cutter Dia						Depth of Cut			
			0.015	0.031	0.047	Radial	Axial	0.093	0.125	0.187	0.250	0.375	0.500	Radial	Axial		
CARBON STEELS	600	Slotting	.00004	.00007	.00011	1 x Dia	.06 x Dia	.00013	.00016	.00019	.00026	.00038	.00051	.00077	.00102	1 x Dia	.15 x Dia
		Roughing	.00004	.00008	.00012	23 x Dia	.25 x Dia	.00014	.00018	.00021	.00029	.00043	.00057	.00086	.00115	45 x Dia	.25 x Dia
		Finishing	.00008	.00016	.00024	.05 x Dia	1.5 x Dia	.00027	.00034	.00041	.00055	.00082	.00110	.00165	.00220	10 x Dia	1.5 x Dia
	200	Slotting	.00003	.00007	.00010	1 x Dia	.06 x Dia	.00012	.00015	.00017	.00023	.00035	.00047	.00070	.00093	1 x Dia	.15 x Dia
		Roughing	.00004	.00007	.00011	23 x Dia	.25 x Dia	.00013	.00016	.00020	.00026	.00039	.00052	.00079	.00105	45 x Dia	.25 x Dia
		Finishing	.00007	.00014	.00022	.05 x Dia	1.5 x Dia	.00025	.00031	.00037	.00050	.00075	.00101	.00151	.00201	10 x Dia	1.5 x Dia
STAINLESS STEELS	450	Slotting	.00004	.00007	.00011	1 x Dia	.06 x Dia	.00013	.00016	.00019	.00026	.00038	.00051	.00077	.00102	1 x Dia	.15 x Dia
		Roughing	.00004	.00008	.00012	23 x Dia	.25 x Dia	.00014	.00018	.00021	.00029	.00043	.00057	.00086	.00115	45 x Dia	.25 x Dia
		Finishing	.00008	.00016	.00024	.05 x Dia	1.5 x Dia	.00027	.00034	.00041	.00055	.00082	.00110	.00165	.00220	10 x Dia	1.5 x Dia
200	Slotting	.00003	.00007	.00010	1 x Dia	.06 x Dia	.00012	.00015	.00017	.00023	.00035	.00047	.00070	.00093	1 x Dia	.15 x Dia	
	Roughing	.00004	.00007	.00011	23 x Dia	.25 x Dia	.00013	.00016	.00020	.00026	.00039	.00052	.00079	.00105	45 x Dia	.25 x Dia	
	Finishing	.00007	.00014	.00022	.05 x Dia	1.5 x Dia	.00025	.00031	.00037	.00050	.00075	.00101	.00151	.00201	10 x Dia	1.5 x Dia	
TOOL STEELS	200	Slotting	.00003	.00007	.00010	1 x Dia	.06 x Dia	.00012	.00015	.00017	.00023	.00035	.00047	.00070	.00093	1 x Dia	.15 x Dia
		Roughing	.00004	.00007	.00011	23 x Dia	.25 x Dia	.00013	.00016	.00020	.00026	.00039	.00052	.00079	.00105	45 x Dia	.25 x Dia
		Finishing	.00007	.00014	.00022	.05 x Dia	1.5 x Dia	.00025	.00031	.00037	.00050	.00075	.00101	.00151	.00201	10 x Dia	1.5 x Dia
D, H, M, T, S series	150	Slotting	.00002	.00004	.00006	1 x Dia	.06 x Dia	.00007	.00009	.00011	.00015	.00022	.00029	.00044	.00058	1 x Dia	.15 x Dia
		Roughing	.00002	.00005	.00007	23 x Dia	.25 x Dia	.00008	.00010	.00012	.00016	.00025	.00033	.00049	.00066	45 x Dia	.25 x Dia
		Finishing	.00004	.00009	.00014	.05 x Dia	1.5 x Dia	.00016	.00020	.00023	.00031	.00047	.00063	.00094	.00126	10 x Dia	1.5 x Dia
TITANIUM ALLOYS	150	Slotting	.00002	.00004	.00006	1 x Dia	.06 x Dia	.00007	.00009	.00011	.00015	.00022	.00029	.00044	.00058	1 x Dia	.15 x Dia
		Roughing	.00002	.00005	.00007	23 x Dia	.25 x Dia	.00008	.00010	.00012	.00016	.00025	.00033	.00049	.00066	45 x Dia	.25 x Dia
		Finishing	.00004	.00009	.00014	.05 x Dia	1.5 x Dia	.00016	.00020	.00023	.00031	.00047	.00063	.00094	.00126	10 x Dia	1.5 x Dia
HIGH TEMP ALLOYS	70	Slotting	.00002	.00004	.00006	1 x Dia	.06 x Dia	.00007	.00009	.00011	.00015	.00022	.00029	.00044	.00058	1 x Dia	.15 x Dia
		Roughing	.00002	.00005	.00007	23 x Dia	.25 x Dia	.00008	.00010	.00012	.00016	.00025	.00033	.00049	.00066	45 x Dia	.25 x Dia
		Finishing	.00004	.00009	.00014	.05 x Dia	1.5 x Dia	.00016	.00020	.00023	.00031	.00047	.00063	.00094	.00126	10 x Dia	1.5 x Dia

MATERIAL		Hardness: 38-45 Rc (353-421 HBn)																	
		SFM	Chip Load (IPT) by Dia			Depth of Cut		Chip Load (IPT) by Cutter Dia						Depth of Cut					
			0.015	0.031	0.047	Radial	Axial	0.093	0.125	0.187	0.250	0.375	0.500	Radial	Axial				
CARBON STEELS	600	Slotting	-	-	-	1 x Dia	.06 x Dia	-	-	-	-	-	-	-	-	-	-		
		Roughing	-	-	-	23 x Dia	.25 x Dia	-	-	-	-	-	-	-	-	-	-	-	
		Finishing	-	-	-	.05 x Dia	1.5 x Dia	-	-	-	-	-	-	-	-	-	-	-	
	200	Slotting	-	-	-	1 x Dia	.06 x Dia	-	-	-	-	-	-	-	-	-	-	-	
		Roughing	-	-	-	23 x Dia	.25 x Dia	-	-	-	-	-	-	-	-	-	-	-	-
		Finishing	-	-	-	.05 x Dia	1.5 x Dia	-	-	-	-	-	-	-	-	-	-	-	-
STAINLESS STEELS	450	Slotting	-	-	-	1 x Dia	.06 x Dia	-	-	-	-	-	-	-	-	-	-		
		Roughing	-	-	-	23 x Dia	.25 x Dia	-	-	-	-	-	-	-	-	-	-	-	
		Finishing	-	-	-	.05 x Dia	1.5 x Dia	-	-	-	-	-	-	-	-	-	-	-	
200	Slotting	-	-	-	1 x Dia	.06 x Dia	-	-	-	-	-	-	-	-	-	-	-		
	Roughing	-	-	-	23 x Dia	.25 x Dia	-	-	-	-	-	-	-	-	-	-	-	-	
	Finishing	-	-	-	.05 x Dia	1.5 x Dia	-	-	-	-	-	-	-	-	-	-	-	-	
TOOL STEELS	200	Slotting	-	-	-	1 x Dia	.06 x Dia	-	-	-	-	-	-	-	-	-	-		
		Roughing	-	-	-	23 x Dia	.25 x Dia	-	-	-	-	-	-	-	-	-	-	-	
		Finishing	-	-	-	.05 x Dia	1.5 x Dia	-	-	-	-	-	-	-	-	-	-	-	
D, H, M, T, S series	150	Slotting	-	-	-	1 x Dia	.06 x Dia	-	-	-	-	-	-	-	-	-	-		
		Roughing	-	-	-	23 x Dia	.25 x Dia	-	-	-	-	-	-	-	-	-	-	-	
		Finishing	-	-	-	.05 x Dia	1.5 x Dia	-	-	-	-	-	-	-	-	-	-	-	
TITANIUM ALLOYS	150	Slotting	-	-	-	1 x Dia	.06 x Dia	-	-	-	-	-	-	-	-	-	-		
		Roughing	-	-	-	23 x Dia	.25 x												