HARVEY TOOL

Speeds & Feeds

Product Table: Miniature End Mills - Ball - Tapered Reach (Clearance Cutters)
Characteristics: 2 Flutes
Series: 177xx, 178xx, 188xx, 189xx, 248xx, 249xx, 298xx, 9249xx

Product Notes:

Posted values represent a 5x Reach. Use the table below to adjust Chip Load (IPT) and Depths of Cut for tools with longer reach.

Reach Multiple	SLOTTING					ROUGHING					FINISHING				
	Chip Load	DOC (Dia < .062) Radial	DOC (Dia < .062) Axial	DOC (Dia ≥ .062) Radial	DOC (Dia ≥ .062) Axial	Chip Load	DOC (Dia < .062) Radial	DOC (Dia < .062) Axial	DOC (Dia ≥ .062) Radial	DOC (Dia ≥ .062) Axial	Chip Load	DOC (Dia < .062) Radial	DOC (Dia < .062) Axial	DOC (Dia ≥ .062) Radial	DOC (Dia ≥ .062) Axial
5x	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
8x	75%	100%	88%	100%	90%	75%	93%	86%	92%	86%	83%	100%	100%	100%	100%
10x	67%	100%	88%	100%	90%	67%	83%	86%	83%	86%	79%	75%	100%	80%	100%
12x	60%	100%	75%	100%	75%	60%	77%	71%	75%	71%	75%	63%	100%	67%	100%
15x	50%	100%	75%	100%	75%	50%	50%	71%	50%	71%	67%	50%	100%	53%	100%
18x	45%	100%	63%	100%	60%	45%	47%	63%	50%	57%	63%	38%	100%	40%	100%
20x	40%	100%	50%	100%	50%	40%	43%	57%	42%	57%	58%	25%	100%	33%	100%
25x	30%	100%	50%	100%	50%	30%	43%	57%	42%	57%	50%	25%	100%	33%	100%
30x	25%	100%	38%	100%	40%	25%	37%	43%	33%	43%	42%	25%	100%	27%	100%
40x	25%	100%	38%	100%	40%	25%	33%	43%	30%	43%	42%	13%	100%	20%	100%
50x	20%	100%	25%	100%	25%	20%	27%	29%	25%	29%	33%	13%	100%	13%	100%
60x	20%	100%	25%	100%	25%	20%	20%	29%	20%	29%	33%	13%	100%	13%	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 Dia .015	.031	.047	Depth of Cut Radial	Axial	Chip Load (IPT) By Cutter Dia .062	.078	.093	.125	.187	.250	Depth of Cut Radial	Axial
ALUMINUM ALLOYS		Slotting	.00020	.00042	.00064	1 x Dia	.08 x Dia	.00073	.00092	.00110	.00147	.00221	.00295	1 x Dia	.20 x Dia
Casting (2xx, 5xx, 7xx, 8xx)	750	Roughing	.00025	.00053	.00080	.30 x Dia	.35 x Dia	.00091	.00115	.00137	.00184	.00276	.00369	.60 x Dia	.35 x Dia
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000	Finishing	.00039	.00080	.00121	.08 x Dia	1.5 x Dia	.00139	.00174	.00208	.00280	.00418	.00559	.15 x Dia	1.5 x Dia
Casting - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	750	Slotting	.00018	.00038	.00057	1 x Dia	.08 x Dia	.00066	.00083	.00099	.00133	.00199	.00265	1 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	.00023	.00047	.00072	.30 x Dia	.35 x Dia	.00082	.00104	.00123	.00166	.00248	.00332	.60 x Dia	.35 x Dia
Casting - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	475														
Wrought - 5%-8% Si (4xxx)	1000	Finishing	.00035	.00072	.00109	.08 x Dia	1.5 x Dia	.00125	.00157	.00187	.00252	.00376	.00503	.15 x Dia	1.5 x Dia
Wrought - 8%-12% Si (4xxx)	800														
MAGNESIUM ALLOYS	1500	Slotting	.00020	.00042	.00064	1 x Dia	.08 x Dia	.00073	.00092	.00110	.00147	.00221	.00295	1 x Dia	.20 x Dia
		Roughing	.00025	.00053	.00080	.30 x Dia	.35 x Dia	.00091	.00115	.00137	.00184	.00276	.00369	.60 x Dia	.35 x Dia
ZINC ALLOYS	800	Finishing	.00039	.00080	.00121	.08 x Dia	1.5 x Dia	.00139	.00174	.00208	.00280	.00418	.00559	.15 x Dia	1.5 x Dia
COPPER ALLOYS															
High Coppers - 90%+ (C1xxxx)	225	Slotting	.00016	.00034	.00051	1 x Dia	.08 x Dia	.00059	.00074	.00088	.00118	.00177	.00236	1 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	.00020	.00042	.00064	.30 x Dia	.35 x Dia	.00073	.00092	.00110	.00147	.00221	.00295	.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	.00031	.00064	.00097	.08 x Dia	1.5 x Dia	.00111	.00140	.00166	.00224	.00335	.00447	.15 x Dia	1.5 x Dia

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

MATERIAL	SFM		Chip Load (IPT) By Cuttter Dia .015	.031	.047	Depth of Cut Radial	Axial	Chip Load (IPT) By Cutter Dia .062	.078	.093	.125	.187	.250	Depth of Cut Radial	Axial
CARBON STEELS		Slotting	.00007	.00014	.00022	1 x Dia	.08 x Dia	.00025	.00032	.00038	.00051	.00076	.00101	1 x Dia	.20 x Dia
Free-Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx	600	Roughing	.00008	.00016	.00025	.30 x Dia	.35 x Dia	.00028	.00036	.00042	.00057	.00085	.00114	.60 x Dia	.35 x Dia
		Finishing	.00012	.00025	.00038	.08 x Dia	1.5 x Dia	.00043	.00055	.00065	.00087	.00131	.00175	.15 x Dia	1.5 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	.00006	.00013	.00020	1 x Dia	.08 x Dia	.00023	.00029	.00034	.00046	.00069	.00093	1 x Dia	.20 x Dia
		Roughing	.00007	.00015	.00023	.30 x Dia	.35 x Dia	.00026	.00033	.00039	.00052	.00078	.00104	.60 x Dia	.35 x Dia
		Finishing	.00011	.00023	.00035	.08 x Dia	1.5 x Dia	.00040	.00050	.00059	.00080	.00120	.00160	.15 x Dia	1.5 x Dia
STAINLESS STEELS		Slotting	.00007	.00014	.00022	1 x Dia	.08 x Dia	.00025	.00032	.00038	.00051	.00076	.00101	1 x Dia	.20 x Dia
203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe	450	Roughing	.00008	.00016	.00025	.30 x Dia	.35 x Dia	.00028	.00036	.00042	.00057	.00085	.00114	.60 x Dia	.35 x Dia
		Finishing	.00012	.00025	.00038	.08 x Dia	1.5 x Dia	.00043	.00055	.00065	.00087	.00131	.00175	.15 x Dia	1.5 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	.00006	.00013	.00020	1 x Dia	.08 x Dia	.00023	.00029	.00034	.00046	.00069	.00093	1 x Dia	.20 x Dia
		Roughing	.00007	.00015	.00023	.30 x Dia	.35 x Dia	.00026	.00033	.00039	.00052	.00078	.00104	.60 x Dia	.35 x Dia
		Finishing	.00011	.00023	.00035	.08 x Dia	1.5 x Dia	.00040	.00050	.00059	.00080	.00120	.00160	.15 x Dia	1.5 x Dia
414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7	150	Slotting	.00004	.00008	.00013	1 x Dia	.08 x Dia	.00014	.00018	.00022	.00029	.00043	.00058	1 x Dia	.20 x Dia
		Roughing	.00004	.00009	.00014	.30 x Dia	.35 x Dia	.00016	.00020	.00024	.00033	.00049	.00065	.60 x Dia	.35 x Dia
		Finishing	.00007	.00014	.00022	.08 x Dia	1.5 x Dia	.00025	.00031	.00037	.00050	.00075	.00100	.15 x Dia	1.5 x Dia
TOOL STEELS	200	Slotting	.00006	.00013	.00020	1 x Dia	.08 x Dia	.00023	.00029	.00034	.00046	.00069	.00093	1 x Dia	.20 x Dia
A, L, O, P, W series		Roughing	.00007	.00015	.00023	.30 x Dia	.35 x Dia	.00026	.00033	.00039	.00052	.00078	.00104	.60 x Dia	.35 x Dia
		Finishing	.00011	.00023	.00035	.08 x Dia	1.5 x Dia	.00040	.00050	.00059	.00080	.00120	.00160	.15 x Dia	1.5 x Dia
D, H, M, T, S series	150	Slotting	.00004	.00008	.00013	1 x Dia	.08 x Dia	.00014	.00018	.00022	.00029	.00043	.00058	1 x Dia	.20 x Dia
		Roughing	.00004	.00009	.00014	.30 x Dia	.35 x Dia	.00016	.00020	.00024	.00033	.00049	.00065	.60 x Dia	.35 x Dia
		Finishing	.00007	.00014	.00022	.08 x Dia	1.5 x Dia	.00025	.00031	.00037	.00050	.00075	.00100	.15 x Dia	1.5 x Dia
TITANIUM ALLOYS	150	Slotting	.00004	.00008	.00013	1 x Dia	.08 x Dia	.00014	.00018	.00022	.00029	.00043	.00058	1 x Dia	.20 x Dia
		Roughing	.00004	.00009	.00014	.30 x Dia	.35 x Dia	.00016	.00020	.00024	.00033	.00049	.00065	.60 x Dia	.35 x Dia
		Finishing	.00007	.00014	.00022	.08 x Dia	1.5 x Dia	.00025	.00031	.00037	.00050	.00075	.00100	.15 x Dia	1.5 x Dia
HIGH TEMP ALLOYS	70	Slotting	.00004	.00008	.00013	1 x Dia	.08 x Dia	.00014	.00018	.00022	.00029	.00043	.00058	1 x Dia	.20 x Dia
Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy		Roughing	.00004	.00009	.00014	.30 x Dia	.35 x Dia	.00016	.00020	.00024	.00033	.00049	.00065	.60 x Dia	.35 x Dia
		Finishing	.00007	.00014	.00022	.08 x Dia	1.5 x Dia	.00025	.00031	.00037	.00050	.00075	.00100	.15 x Dia	1.5 x Dia

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

SFM		Chip Load (IPT) By Cutter Dia .015	.031	.047	Depth of Cut Radial	Axial	Chip Load (IPT) By Cutter Dia .062	.078	.093	.125	.187	.250	Depth of Cut Radial	Axial
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	Slotting	.00003	.00007	.00010	1 x Dia	.08 x Dia	.00011	.00014	.00017	.00023	.00035	.00046	1 x Dia	.20 x Dia
	Roughing	.00004	.00007	.00011	.30 x Dia	.35 x Dia	.00013	.00016	.00019	.00026	.00039	.00052	.60 x Dia	.35 x Dia
	Finishing	.00006	.00011	.00017	.08 x Dia	1.5 x Dia	.00020	.00025	.00030	.00040	.00060	.00081	.15 x Dia	1.5 x Dia
90	Slotting	.00002	.00004	.00006	1 x Dia	.08 x Dia	.00007	.00009	.00011	.00014	.00022	.00029	1 x Dia	.20 x Dia
	Roughing	.00002	.00005	.00007	.30 x Dia	.35 x Dia	.00008	.00010	.00012	.00016	.00024	.00033	.60 x Dia	.35 x Dia
	Finishing	.00003	.00007	.00011	.08 x Dia	1.5 x Dia	.00012	.00016	.00019	.00025	.00038	.00050	.15 x Dia	1.5 x Dia
100	Slotting	.00003	.00007	.00010	1 x Dia	.08 x Dia	.00011	.00014	.00017	.00023	.00035	.00046	1 x Dia	.20 x Dia
	Roughing	.00004	.00007	.00011	.30 x Dia	.35 x Dia	.00013	.00016	.00019	.00026	.00039	.00052	.60 x Dia	.35 x Dia
	Finishing	.00006	.00011	.00017	.08 x Dia	1.5 x Dia	.00020	.00025	.00030	.00040	.00060	.00081	.15 x Dia	1.5 x Dia
90	Slotting	.00002	.00004	.00006	1 x Dia	.08 x Dia	.00007	.00009	.00011	.00014	.00022	.00029	1 x Dia	.20 x Dia
	Roughing	.00002	.00005	.00007	.30 x Dia	.35 x Dia	.00008	.00010	.00012	.00016	.00024	.00033	.60 x Dia	.35 x Dia
	Finishing	.00003	.00007	.00011	.08 x Dia	1.5 x Dia	.00012	.00016	.00019	.00025	.00038	.00050	.15 x Dia	1.5 x Dia
75	Slotting	.00002	.00004	.00006	1 x Dia	.08 x Dia	.00007	.00009	.00011	.00014	.00022	.00029	1 x Dia	.20 x Dia
	Roughing	.00002	.00005	.00007	.30 x Dia	.35 x Dia	.00008	.00010	.00012	.00016	.00024	.00033	.60 x Dia	.35 x Dia
	Finishing	.00003	.00007	.00011	.08 x Dia	1.5 x Dia	.00012	.00016	.00019	.00025	.00038	.00050	.15 x Dia	1.5 x Dia
50	Slotting	.00002	.00004	.00006	1 x Dia	.08 x Dia	.00007	.00009	.00011	.00014	.00022	.00029	1 x Dia	.20 x Dia
	Roughing	.00002	.00005	.00007	.30 x Dia	.35 x Dia	.00008	.00010	.00012	.00016	.00024	.00033	.60 x Dia	.35 x Dia
	Finishing	.00003	.00007	.00011	.08 x Dia	1.5 x Dia	.00012	.00016	.00019	.00025	.00038	.00050	.15 x Dia	1.5 x Dia