Speeds & Feeds

**Product Table:** Miniature End Mills - Tapered - Ball
**Characteristics:** 3°-4° Angle per Side, 10x Length of Cut
**Series:** 219xx, 8404xx

| MATERIAL | Hardness: ≤ 28 Rc (≤ 271 HBn) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SFM | Chip Load (IPT) By Cutter Dia | | | | Depth of Cut | | Chip Load (IPT) By Cutter Dia | | | | | | Depth of Cut | |
| | | | .015 | .031 | .047 | Radial | Axial | .062 | .078 | .093 | .125 | .187 | .250 | Radial | Axial |
| **ALUMINUM ALLOYS** | | | | | | | | | | | | | | | |
| Casting (2xx, 5xx, 7xx, 8xx) | 750 | Finishing | .00005 | .00010 | .00016 | .03 x Dia | 10 x Dia | .00018 | .00023 | .00027 | .00036 | .00055 | .00073 | .06 x Dia | 10 x Dia |
| Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx) | 1000 | | | | | | | | | | | | | | |
| Casting - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx) | 750 | Finishing | .00005 | .00009 | .00014 | .03 x Dia | 10 x Dia | .00016 | .00020 | .00024 | .00033 | .00049 | .00066 | .06 x Dia | 10 x Dia |
| Casting - 5%-8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx) | 700 | | | | | | | | | | | | | | |
| Casting - 8%-12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx) | 650 | | | | | | | | | | | | | | |
| Casting - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx) | 475 | | | | | | | | | | | | | | |
| Wrought - 5%-8% Si (4xxx) | 1000 | | | | | | | | | | | | | | |
| Wrought - 8%-12% Si (4xxx) | 800 | | | | | | | | | | | | | | |
| **MAGNESIUM ALLOYS** | 1500 | Finishing | .00005 | .00010 | .00016 | .03 x Dia | 10 x Dia | .00018 | .00023 | .00027 | .00036 | .00055 | .00073 | .06 x Dia | 10 x Dia |
| **ZINC ALLOYS** | 800 | | | | | | | | | | | | | | |
| **COPPER ALLOYS** | | | | | | | | | | | | | | | |
| High Coppers - 90%+ (C1xxxx) | 225 | Finishing | .00004 | .00008 | .00013 | .03 x Dia | 10 x Dia | .00014 | .00018 | .00022 | .00029 | .00044 | .00058 | .06 x Dia | 10 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 | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | |

**Product Notes:**
Use the end diameter of the tool to select the correct Chip Load (IPT)

**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.

| MATERIAL | Hardness: 29-37 Rc (279-344 HBn) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SFM | Chip Load (IPT) By Cutter Dia | | | | Depth of Cut | | Chip Load (IPT) By Cutter Dia | | | | | | Depth of Cut | |
| | | | .015 | .031 | .047 | Radial | Axial | .062 | .078 | .093 | .125 | .187 | .250 | Radial | Axial |
| **CARBON STEELS** | | | | | | | | | | | | | | | |
| Free-Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx | 600 | Finishing | .00002 | .00003 | .00005 | .03 x Dia | 10 x Dia | .00006 | .00007 | .00008 | .00011 | .00017 | .00023 | .06 x Dia | 10 x Dia |
| 1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx & 52Lxxx, 6xxx, 8xxx, 9xxx | 200 | Finishing | .00001 | .00003 | .00005 | .03 x Dia | 10 x Dia | .00005 | .00007 | .00008 | .00010 | .00016 | .00021 | .06 x Dia | 10 x Dia |
| **STAINLESS STEELS** | | | | | | | | | | | | | | | |
| 203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe | 450 | Finishing | .00002 | .00003 | .00005 | .03 x Dia | 10 x Dia | .00006 | .00007 | .00008 | .00011 | .00017 | .00023 | .06 x Dia | 10 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 | Finishing | .00001 | .00003 | .00005 | .03 x Dia | 10 x Dia | .00005 | .00007 | .00008 | .00010 | .00016 | .00021 | .06 x Dia | 10 x Dia |
| 414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7 | 150 | Finishing | .00001 | .00002 | .00003 | .03 x Dia | 10 x Dia | .00003 | .00004 | .00005 | .00007 | .00010 | .00013 | .06 x Dia | 10 x Dia |
| **TOOL STEELS** | | | | | | | | | | | | | | | |
| A, L, O, P, W series | 200 | Finishing | .00001 | .00003 | .00005 | .03 x Dia | 10 x Dia | .00005 | .00007 | .00008 | .00010 | .00016 | .00021 | .06 x Dia | 10 x Dia |
| D, H, M, T, S series | 150 | Finishing | .00001 | .00002 | .00003 | .03 x Dia | 10 x Dia | .00003 | .00004 | .00005 | .00007 | .00010 | .00013 | .06 x Dia | 10 x Dia |
| **TITANIUM ALLOYS** | 150 | Finishing | .00001 | .00002 | .00003 | .03 x Dia | 10 x Dia | .00003 | .00004 | .00005 | .00007 | .00010 | .00013 | .06 x Dia | 10 x Dia |
| **HIGH TEMP ALLOYS** | | | | | | | | | | | | | | | |
| Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy | 70 | Finishing | .00001 | .00002 | .00003 | .03 x Dia | 10 x Dia | .00003 | .00004 | .00005 | .00007 | .00010 | .00013 | .06 x Dia | 10 x Dia |

| Hardness: 38-45 Rc (353-421 HBn) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SFM | Chip Load (IPT) By Cutter Dia | | | | Depth of Cut | | Chip Load (IPT) By Cutter Dia | | | | | | Depth of Cut | |
| | | .015 | .031 | .047 | Radial | Axial | .062 | .078 | .093 | .125 | .187 | .250 | Radial | Axial |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 100 | Finishing | .00001 | .00002 | .00002 | .03 x Dia | 10 x Dia | .00003 | .00003 | .00004 | .00005 | .00008 | .00011 | .06 x Dia | 10 x Dia |
| 90 | Finishing | .00000 | .00001 | .00001 | .03 x Dia | 10 x Dia | .00002 | .00002 | .00002 | .00003 | .00005 | .00007 | .06 x Dia | 10 x Dia |
| 100 | Finishing | .00001 | .00002 | .00002 | .03 x Dia | 10 x Dia | .00003 | .00003 | .00004 | .00005 | .00008 | .00011 | .06 x Dia | 10 x Dia |
| 90 | Finishing | .00000 | .00001 | .00001 | .03 x Dia | 10 x Dia | .00002 | .00002 | .00002 | .00003 | .00005 | .00007 | .06 x Dia | 10 x Dia |
| 75 | Finishing | .00000 | .00001 | .00001 | .03 x Dia | 10 x Dia | .00002 | .00002 | .00002 | .00003 | .00005 | .00007 | .06 x Dia | 10 x Dia |
| 50 | Finishing | .00000 | .00001 | .00001 | .03 x Dia | 10 x Dia | .00002 | .00002 | .00002 | .00003 | .00005 | .00007 | .06 x Dia | 10 x Dia |