



**Product Table:** Counterbores - Flat Bottom

**Characteristics:** 4 Flutes

**Series:** 233xx, 234xx

**Product Notes:**

Chip Loads are given 2 ways:

**Full Plunge** refers to vertically machining into solid material with no pilot hole

**Finishing** refers to vertically machining with an existing pilot hole greater than or equal to 50% of the Counterbore cutter diameter ( $\leq 25\%$  on wall)

Full Plunge machining may require a peck cycle for proper chip evacuation

For Ferrous materials, pecking to a depth of 2x diameter is advised

For Non-Ferrous materials, pecking to a depth of 3x diameter is advised

**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  $\leq 28$  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: $\leq 28$ Rc ( $\leq 271$ HBn)															
		SFM	Chip Load (IPT) By Cutter Diameter														
			.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.437	.500	.625	.750	
<b>ALUMINUM ALLOYS</b>		750	Full Plunge	.00014	.00021	.00027	.00034	.00041	.00055	.00082	.00110	.00137	.00165	.00192	.00220	.00275	.00330
Casting (2xx, 5xx, 7xx, 8xx)		1000	Finishing	.00022	.00033	.00043	.00054	.00065	.00087	.00130	.00174	.00217	.00261	.00304	.00348	.00435	.00521
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)				750	Full Plunge	.00012	.00019	.00025	.00031	.00037	.00050	.00074	.00099	.00124	.00149	.00173	.00198
Casting - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)		700	Full Plunge	.00012		.00019	.00025	.00031	.00037	.00050	.00074	.00099	.00124	.00149	.00173	.00198	.00248
Casting - 5%-8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)		650		Full Plunge	.00012	.00019	.00025	.00031	.00037	.00050	.00074	.00099	.00124	.00149	.00173	.00198	.00248
Casting - 8%-12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)		475	Finishing		.00019	.00029	.00039	.00049	.00058	.00078	.00117	.00156	.00209	.00273	.00348	.00435	.00548
Casting - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)		1000		Finishing	.00019	.00029	.00039	.00049	.00058	.00078	.00117	.00156	.00209	.00273	.00348	.00435	.00548
Wrought - 5%-8% Si (4xxx)		800	Finishing		.00019	.00029	.00039	.00049	.00058	.00078	.00117	.00156	.00209	.00273	.00348	.00435	.00548
Wrought - 8%-12% Si (4xxx)		1500		Full Plunge	.00014	.00021	.00027	.00034	.00041	.00055	.00082	.00110	.00137	.00165	.00192	.00220	.00275
<b>MAGNESIUM ALLOYS</b>		800	Finishing		.00022	.00033	.00043	.00054	.00065	.00087	.00130	.00174	.00217	.00261	.00304	.00348	.00435
<b>ZINC ALLOYS</b>		225		Full Plunge	.00011	.00017	.00022	.00027	.00033	.00044	.00066	.00088	.00110	.00132	.00154	.00176	.00220
<b>COPPER ALLOYS</b>		500	Full Plunge		.00011	.00017	.00022	.00027	.00033	.00044	.00066	.00088	.00110	.00132	.00154	.00176	.00220
High Coppers - 90%+ (C1xxx)		225		Full Plunge	.00011	.00017	.00022	.00027	.00033	.00044	.00066	.00088	.00110	.00132	.00154	.00176	.00220
Brass (Copper Zinc alloys, C2xxx, C3xxx, C4xxx, C66400-C69800)		500	Full Plunge		.00011	.00017	.00022	.00027	.00033	.00044	.00066	.00088	.00110	.00132	.00154	.00176	.00220
Phosphor Bronzes (Copper Tin alloys, C5xxx)		500		Full Plunge	.00011	.00017	.00022	.00027	.00033	.00044	.00066	.00088	.00110	.00132	.00154	.00176	.00220
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)		500	Full Plunge		.00011	.00017	.00022	.00027	.00033	.00044	.00066	.00088	.00110	.00132	.00154	.00176	.00220
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)		500		Full Plunge	.00011	.00017	.00022	.00027	.00033	.00044	.00066	.00088	.00110	.00132	.00154	.00176	.00220
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxx)		225	Finishing		.00017	.00026	.00034	.00043	.00052	.00070	.00104	.00139	.00174	.00209	.00243	.00278	.00348
Cast Copper Alloys (C8300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)		550		Finishing	.00017	.00026	.00034	.00043	.00052	.00070	.00104	.00139	.00174	.00209	.00243	.00278	.00348

MATERIAL		Hardness: 29-37 Rc (279-344 HBn)															
		SFM	Chip Load (IPT) By Cutter Diameter														
			.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.437	.500	.625	.750	
<b>CARBON STEELS</b>		600	Full Plunge	.00005	.00007	.00009	.00012	.00014	.00019	.00028	.00038	.00047	.00057	.00066	.00076	.00095	.00113
Free-Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx		200	Full Plunge	.00004	.00006	.00009	.00011	.00013	.00017	.00026	.00035	.00043	.00052	.00060	.00069	.00086	.00104
1030 - 1095, 1140 - 1151, 13xx, 15xx, 20xx, 30xx, 40xx & 4Lxx, 5xxx & 5Lxx, 50xxx & 50Lxx, 51xxx & 51Lxx, 52xxx & 52Lxx, 6xxx, 8xxx, 9xxx				Finishing	.00006	.00009	.00012	.00016	.00018	.00025	.00037	.00050	.00062	.00075	.00087	.00099	.00124
<b>STAINLESS STEELS</b>		450	Full Plunge	.00005	.00007	.00009	.00012	.00014	.00019	.00028	.00038	.00047	.00057	.00066	.00076	.00095	.00113
203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe		200	Full Plunge	.00004	.00006	.00009	.00011	.00013	.00017	.00026	.00035	.00043	.00052	.00060	.00069	.00086	.00104
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				Finishing	.00006	.00009	.00012	.00016	.00018	.00025	.00037	.00050	.00062	.00075	.00087	.00099	.00124
414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7		150	Full Plunge	.00003	.00004	.00005	.00007	.00008	.00011	.00016	.00022	.00027	.00032	.00038	.00043	.00054	.00065
<b>TOOL STEELS</b>		200	Full Plunge	.00004	.00006	.00009	.00011	.00013	.00017	.00026	.00035	.00043	.00052	.00060	.00069	.00086	.00104
A, L, O, P, W series				Finishing	.00006	.00009	.00012	.00016	.00018	.00025	.00037	.00050	.00062	.00075	.00087	.00099	.00124
D, H, M, T, S series		150	Full Plunge	.00003	.00004	.00005	.00007	.00008	.00011	.00016	.00022	.00027	.00032	.00038	.00043	.00054	.00065
<b>TITANIUM ALLOYS</b>		150	Full Plunge	.00003	.00004	.00005	.00007	.00008	.00011	.00016	.00022	.00027	.00032	.00038	.00043	.00054	.00065
Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discology, Incoloy				Finishing	.00004	.00006	.00008	.00010	.00012	.00016	.00023	.00031	.00039	.00047	.00054	.00062	.00078
<b>HIGH TEMP ALLOYS</b>		70	Full Plunge	.00003	.00004	.00005	.00007	.00008	.00011	.00016	.00022	.00027	.00032	.00038	.00043	.00054	.00065
Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discology, Incoloy		70	Full Plunge	.00003	.00004	.00005	.00007	.00008	.00011	.00016	.00022	.00027	.00032	.00038	.00043	.00054	.00065
<b>TOOL STEELS</b>				Finishing	.00004	.00006	.00008	.00010	.00012	.00016	.00023	.00031	.00039	.00047	.00054	.00062	.00078

MATERIAL		Hardness: 38-45 Rc (353-421 HBn)															
		SFM	Chip Load (IPT) By Cutter Diameter														
			.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.437	.500	.625	.750	
<b>CARBON STEELS</b>		600	Full Plunge	.00002	.00003	.00004	.00005	.00006	.00009	.00013	.00017	.00022	.00026	.00030	.00035	.00043	.00052
Free-Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx		200	Full Plunge	.00002	.00003	.00004	.00005	.00006	.00009	.00013	.00017	.00022	.00026	.00030	.00035	.00043	.00052
1030 - 1095, 1140 - 1151, 13xx, 15xx, 20xx, 30xx, 40xx & 4Lxx, 5xxx & 5Lxx, 50xxx & 50Lxx, 51xxx & 51Lxx, 52xxx & 52Lxx, 6xxx, 8xxx, 9xxx				Finishing	.00003	.00005	.00006	.00008	.00009	.00013	.00019	.00025	.00031	.00038	.00044	.00050	.00063
<b>STAINLESS STEELS</b>		450	Full Plunge	.00002	.00003	.00004	.00005	.00006	.00009	.00013	.00017	.00022	.00026	.00030	.00035	.00043	.00052
203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe		200	Full Plunge	.00002	.00003	.00004	.00005	.00006	.00009	.00013	.00017	.00022	.00026	.00030	.00035	.00043	.00052
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				Finishing	.00003	.00005	.00006	.00008	.00009	.00013	.00019	.00025	.00031	.00038	.00044	.00050	.00063
414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7		150	Full Plunge	.00001	.00002	.00003	.00003	.00004	.00005	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00032
<b>TOOL STEELS</b>		200	Full Plunge	.00001	.00002	.00003	.00003	.00004	.00005	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00032
A, L, O, P, W series				Finishing	.00002	.00003	.00004	.00005	.00006	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00032
D, H, M, T, S series		150	Full Plunge	.00001	.00002	.00003	.00003	.00004	.00005	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00032
<b>TITANIUM ALLOYS</b>		150	Full Plunge	.00001	.00002	.00003	.00003	.00004	.00005	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00032
Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discology, Incoloy				Finishing	.00002	.00003	.00004	.00005	.00006	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00031
<b>HIGH TEMP ALLOYS</b>		70	Full Plunge	.00001	.00002	.00003	.00003	.00004	.00005	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00032
Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discology, Incoloy		70	Full Plunge	.00001	.00002	.00003	.00003	.00004	.00005	.00008	.00011	.00013	.				