



Product Table: Counterbores - Flat Bottom
Characteristics: 4 Flutes

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 (≤ 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

Material Guide	Hardness	SFM	Operation	Chip Load (IPT) By Cutter Diameter												
				1/16	5/64	3/32	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	
Carbon Steel	10XX, 11XX, 12XX, 12LXX, ASTM A27, ASTM A36	29-37 Rc (279-344 HBn)	600	Full Plunge	.00009	.00011	.00013	.00017	.00026	.00035	.00043	.00052	.00060	.00069	.00086	.00104
				Finishing	.00012	.00016	.00018	.00025	.00037	.00050	.00062	.00075	.00087	.00099	.00124	.00149
Low Alloy Steel	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	29-37 Rc (279-344 HBn)	200	Full Plunge	.00009	.00012	.00014	.00019	.00028	.00038	.00047	.00057	.00066	.00076	.00095	.00113
				Finishing	.00013	.00017	.00020	.00027	.00041	.00054	.00068	.00082	.00095	.00109	.00136	.00163
Tool Steel	A, L, O, P, W series	29-37 Rc (279-344 HBn)	200	Full Plunge	.00009	.00011	.00013	.00017	.00026	.00035	.00043	.00052	.00060	.00069	.00086	.00104
				Finishing	.00012	.00016	.00018	.00025	.00037	.00050	.00062	.00075	.00087	.00099	.00124	.00149
		38-45 Rc (353-421 HBn)	100	Full Plunge	.00004	.00005	.00006	.00009	.00013	.00017	.00022	.00026	.00030	.00035	.00043	.00052
	D, H, M, T, S series	29-37 Rc (279-344 HBn)	150	Full Plunge	.00005	.00007	.00008	.00011	.00016	.00022	.00027	.00032	.00038	.00043	.00054	.00065
				Finishing	.00008	.00010	.00012	.00016	.00023	.00031	.00039	.00047	.00054	.00062	.00078	.00093
		38-45 Rc (353-421 HBn)	75	Full Plunge	.00003	.00003	.00004	.00005	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00032
Austenitic Stainless Steel	Nitronic 50, Nitronic 60, 301, 303, 304, 304L, Incoloy 27-7MO, 316, 316L, 321, 347	29-37 Rc (279-344 HBn)	450	Full Plunge	.00009	.00012	.00014	.00019	.00028	.00038	.00047	.00057	.00066	.00076	.00095	.00113
				Finishing	.00013	.00017	.00020	.00027	.00041	.00054	.00068	.00082	.00095	.00109	.00136	.00163
Martensitic & Ferritic Stainless Steel	403, 410, 416, 420, 440, 430, 446	29-37 Rc (279-344 HBn)	200	Full Plunge	.00009	.00011	.00013	.00017	.00026	.00035	.00043	.00052	.00060	.00069	.00086	.00104
				Finishing	.00012	.00016	.00018	.00025	.00037	.00050	.00062	.00075	.00087	.00099	.00124	.00149
		38-45 Rc (353-421 HBn)	100	Full Plunge	.00004	.00005	.00006	.00009	.00013	.00017	.00022	.00026	.00030	.00035	.00043	.00052
				Finishing	.00006	.00008	.00009	.00013	.00019	.00025	.00031	.00038	.00044	.00050	.00063	.00075
PH Stainless Steel	15-5, 17-4, Carpenter 450, Carpenter 465	29-37 Rc (279-344 HBn)	150	Full Plunge	.00005	.00007	.00008	.00011	.00016	.00022	.00027	.00032	.00038	.00043	.00054	.00065
				Finishing	.00008	.00010	.00012	.00016	.00023	.00031	.00039	.00047	.00054	.00062	.00078	.00093
		38-45 Rc (353-421 HBn)	90	Full Plunge	.00003	.00003	.00004	.00005	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00032
				Finishing	.00004	.00005	.00006	.00008	.00012	.00016	.00020	.00023	.00027	.00031	.00039	.00047
Nickel Alloy	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	29-37 Rc (279-344 HBn)	70	Full Plunge	.00005	.00007	.00008	.00011	.00016	.00022	.00027	.00032	.00038	.00043	.00054	.00065
				Finishing	.00008	.00010	.00012	.00016	.00023	.00031	.00039	.00047	.00054	.00062	.00078	.00093
		38-45 Rc (353-421 HBn)	50	Full Plunge	.00003	.00003	.00004	.00005	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00032
				Finishing	.00004	.00005	.00006	.00008	.00012	.00016	.00020	.00023	.00027	.00031	.00039	.00047
Titanium Alloy	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	29-37 Rc (279-344 HBn)	150	Full Plunge	.00005	.00007	.00008	.00011	.00016	.00022	.00027	.00032	.00038	.00043	.00054	.00065
				Finishing	.00008	.00010	.00012	.00016	.00023	.00031	.00039	.00047	.00054	.00062	.00078	.00093
		38-45 Rc (353-421 HBn)	75	Full Plunge	.00003	.00003	.00004	.00005	.00008	.00011	.00013	.00016	.00019	.00022	.00027	.00032
				Finishing	.00004	.00005	.00006	.00008	.00012	.00016	.00020	.00023	.00027	.00031	.00039	.00047
Wrought Aluminum Alloy	2014, 5062, 6061, 7050, 7075, 7475	≤ 28 Rc (≤ 271 HBn)	1000	Full Plunge	.00027	.00034	.00041	.00055	.00082	.00110	.00137	.00165	.00192	.00220	.00275	.00330
				Finishing	.00043	.00054	.00065	.00087	.00130	.00174	.00217	.00261	.00304	.00348	.00435	.00521
				800	Full Plunge	.00025	.00031	.00037	.00050	.00074	.00099	.00124	.00149	.00173	.00198	.00248
Finishing	.00039	.00049	.00058		.00078	.00117	.00156	.00195	.00235	.00273	.00313	.00391	.00469			
Cast Aluminum Alloy	319.0, 328.0, 355.0, 360.0, 380.0, 383.0, 390.0, 520.0, 535.0	≤ 28 Rc (≤ 271 HBn)	750	Full Plunge	.00027	.00034	.00041	.00055	.00082	.00110	.00137	.00165	.00192	.00220	.00275	.00330
				Finishing	.00043	.00054	.00065	.00087	.00130	.00174	.00217	.00261	.00304	.00348	.00435	.00521
	3% - 5% Si (3XX, A3XX, C3XX, 4XX, A4XX, B4XX)	750	Full Plunge	.00025	.00031	.00037	.00050	.00074	.00099	.00124	.00149	.00173	.00198	.00248	.00297	
			700	Full Plunge	.00025	.00031	.00037	.00050	.00074	.00099	.00124	.00149	.00173	.00198	.00248	.00297
				650	Finishing	.00039	.00049	.00058	.00078	.00117	.00156	.00195	.00235	.00273	.00313	.00391
12% - 16% Si (3XX, A3XX, C3XX, 4XX, A4XX, B4XX)	475	Finishing	.00039		.00049	.00058	.00078	.00117	.00156	.00195	.00235	.00273	.00313	.00391	.00469	
		Copper Alloy	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	≤ 28 Rc (≤ 271 HBn)	225-500	Full Plunge	.00022	.00027	.00033	.00044	.00066	.00088	.00110	.00132	.00154	.00176
Finishing	.00034					.00043	.00052	.00070	.00104	.00139	.00174	.00209	.00243	.00278	.00348	.00417
Magnesium Alloys		≤ 28 Rc (≤ 271 HBn)	1500	Full Plunge	.00027	.00034	.00041	.00055	.00082	.00110	.00137	.00165	.00192	.00220	.00275	.00330
				Zinc Alloys	800	Finishing	.00043	.00054	.00065	.00087	.00130	.00174	.00217	.00261	.00304	.00348

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, Valor Holemaking has a team of technical experts available to assist you through even the most challenging applications. Please contact us at **866-840-1505** or **Valortech@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.