



Product Table: Counterbores - Flat Bottom - Long Reach
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 ($\leq 25\%$ 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

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	.00007	.00009	.00011	.00015	.00022	.00029	.00037	.00044	.00051	.00059	.00073	.00088	
				Finishing	.00010	.00013	.00016	.00021	.00032	.00042	.00053	.00063	.00074	.00084	.00106	.00127	
Low Alloy Steel	13XX, 41XX, 43XX, 51XX, 86XX, 93XX	29-37 Rc (279-344 HBn)	200	Full Plunge	.00008	.00010	.00012	.00016	.00024	.00032	.00040	.00048	.00056	.00064	.00080	.00096	
				Finishing	.00011	.00014	.00017	.00023	.00035	.00046	.00058	.00069	.00081	.00092	.00115	.00139	
Tool Steel	A, L, O, P, W series	29-37 Rc (279-344 HBn)	200	Full Plunge	.00007	.00009	.00011	.00015	.00022	.00029	.00037	.00044	.00051	.00059	.00073	.00088	
				Finishing	.00010	.00013	.00016	.00021	.00032	.00042	.00053	.00063	.00074	.00084	.00106	.00127	
	D, H, M, T, S series	38-45 Rc (353-421 HBn)	100	Full Plunge	.00004	.00005	.00005	.00007	.00011	.00015	.00018	.00022	.00026	.00029	.00037	.00044	
				Finishing	.00005	.00007	.00008	.00011	.00016	.00021	.00027	.00032	.00037	.00043	.00053	.00064	
		29-37 Rc (279-344 HBn)	150	Full Plunge	.00005	.00006	.00007	.00009	.00014	.00018	.00023	.00028	.00032	.00037	.00046	.00055	
				Finishing	.00007	.00008	.00010	.00013	.00020	.00026	.00033	.00040	.00046	.00053	.00066	.00079	
38-45 Rc (353-421 HBn)	75	Full Plunge	.00002	.00003	.00003	.00005	.00007	.00009	.00011	.00014	.00016	.00016	.00018	.00023	.00028		
		Finishing	.00003	.00004	.00005	.00007	.00010	.00013	.00017	.00020	.00023	.00027	.00033	.00040			
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	.00008	.00010	.00012	.00016	.00024	.00032	.00040	.00048	.00056	.00064	.00080	.00096	
				Finishing	.00011	.00014	.00017	.00023	.00035	.00046	.00058	.00069	.00081	.00092	.00115	.00139	
Martensitic & Ferritic Stainless Steel	403, 410, 416, 420, 440, 430, 446	29-37 Rc (279-344 HBn)	200	Full Plunge	.00007	.00009	.00011	.00015	.00022	.00029	.00037	.00044	.00051	.00059	.00073	.00088	
				Finishing	.00010	.00013	.00016	.00021	.00032	.00042	.00053	.00063	.00074	.00084	.00106	.00127	
		38-45 Rc (353-421 HBn)	100	Full Plunge	.00004	.00005	.00005	.00007	.00011	.00015	.00018	.00022	.00026	.00029	.00037	.00044	
				Finishing	.00005	.00007	.00008	.00011	.00016	.00021	.00027	.00032	.00037	.00043	.00053	.00064	
PH Stainless Steel	15-5, 17-4, Carpenter 450, Carpenter 465	29-37 Rc (279-344 HBn)	150	Full Plunge	.00005	.00006	.00007	.00009	.00014	.00018	.00023	.00028	.00032	.00037	.00046	.00055	
				Finishing	.00007	.00008	.00010	.00013	.00020	.00026	.00033	.00040	.00046	.00053	.00066	.00079	
		38-45 Rc (353-421 HBn)	90	Full Plunge	.00002	.00003	.00003	.00005	.00007	.00009	.00011	.00014	.00016	.00018	.00023	.00028	
				Finishing	.00003	.00004	.00005	.00007	.00010	.00013	.00017	.00020	.00023	.00027	.00033	.00040	
Nickel Alloy	Hastelloy C-22, Inconel 625, Waspaloy, René 41, Inconel 718, Incoloy 20	29-37 Rc (279-344 HBn)	70	Full Plunge	.00005	.00006	.00007	.00009	.00014	.00018	.00023	.00028	.00032	.00037	.00046	.00055	
				Finishing	.00007	.00008	.00010	.00013	.00020	.00026	.00033	.00040	.00046	.00053	.00066	.00079	
		38-45 Rc (353-421 HBn)	50	Full Plunge	.00002	.00003	.00003	.00005	.00007	.00009	.00011	.00014	.00016	.00018	.00023	.00028	
				Finishing	.00003	.00004	.00005	.00007	.00010	.00013	.00017	.00020	.00023	.00027	.00033	.00040	
Titanium Alloy	Ti 3Al-2.5V, Ti 6Al-4V, Ti 10V-2Fe-3Al	29-37 Rc (279-344 HBn)	150	Full Plunge	.00005	.00006	.00007	.00009	.00014	.00018	.00023	.00028	.00032	.00037	.00046	.00055	
				Finishing	.00007	.00008	.00010	.00013	.00020	.00026	.00033	.00040	.00046	.00053	.00066	.00079	
		38-45 Rc (353-421 HBn)	75	Full Plunge	.00002	.00003	.00003	.00005	.00007	.00009	.00011	.00014	.00016	.00018	.00023	.00028	
				Finishing	.00003	.00004	.00005	.00007	.00010	.00013	.00017	.00020	.00023	.00027	.00033	.00040	
Wrought Aluminum Alloy	2014, 5062, 6061, 7050, 7075, 7475	≤ 28 Rc (≤ 271 HBn)	1000	Full Plunge	.00023	.00029	.00035	.00047	.00070	.00094	.00117	.00140	.00163	.00187	.00234	.00281	
				Finishing	.00037	.00046	.00055	.00074	.00111	.00148	.00184	.00222	.00258	.00295	.00369	.00443	
				8% - 12% Si (4XXX)	800	Finishing	.00033	.00041	.00049	.00066	.00099	.00133	.00166	.00199	.00232	.00266	.00332
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	.00023	.00029	.00035	.00047	.00070	.00094	.00117	.00140	.00163	.00187	.00234	.00281	
				Finishing	.00037	.00046	.00055	.00074	.00111	.00148	.00184	.00222	.00258	.00295	.00369	.00443	
	3% - 5% Si (3XX, A3XX, C3XX, 4XX, A4XX, B4XX)	≤ 28 Rc (≤ 271 HBn)	750	750	Full Plunge	.00021	.00026	.00031	.00042	.00063	.00084	.00105	.00126	.00147	.00168	.00210	.00252
					750	Full Plunge	.00021	.00026	.00031	.00042	.00063	.00084	.00105	.00126	.00147	.00168	.00210
			700	700	Full Plunge	.00021	.00026	.00031	.00042	.00063	.00084	.00105	.00126	.00147	.00168	.00210	.00252
					650	Finishing	.00033	.00041	.00049	.00066	.00099	.00133	.00166	.00199	.00232	.00266	.00332
12% - 16% Si (3XX, A3XX, C3XX, 4XX, A4XX, B4XX)	≤ 28 Rc (≤ 271 HBn)	475	475	Finishing	.00033	.00041	.00049	.00066	.00099	.00133	.00166	.00199	.00232	.00266	.00332	.00399	
				475	Finishing	.00033	.00041	.00049	.00066	.00099	.00133	.00166	.00199	.00232	.00266	.00332	.00399
Copper Alloy	Cu-ETP, CuBe2, CuZn30, CuZn36Pb3, CuZn10, CuSn5	≤ 28 Rc (≤ 271 HBn)	225-500	Full Plunge	.00019	.00023	.00028	.00037	.00056	.00075	.00093	.00112	.00131	.00150	.00187	.00224	
				Finishing	.00029	.00037	.00044	.00059	.00088	.00118	.00147	.00177	.00207	.00236	.00295	.00355	
Magnesium Alloys		≤ 28 Rc (≤ 271 HBn)	1500	Full Plunge	.00023	.00029	.00035	.00047	.00070	.00094	.00117	.00140	.00163	.00187	.00234	.00281	
				800	Finishing	.00037	.00046	.00055	.00074	.00111	.00148	.00184	.00222	.00258	.00295	.00369	.00443
Zinc Alloys		≤ 28 Rc (≤ 271 HBn)	800	Finishing	.00037	.00046	.00055	.00074	.00111	.00148	.00184	.00222	.00258	.00295	.00369	.00443	

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.