

Double angle shank cutters are extremely versatile tools. Harvey tool offers a variety of reaches and included angles to provide an answer for even the most difficult of applications. Due to the varying neck lengths and the applications, specific machining parameters must be calculated to avoid breakage.

**Speeds & Feeds calculations:**

1. Determine the correct SFM and Base Chip Load (IPT) for the cutter, material and application (see application descriptions Figure 1)
2. Adjust Chip Load to account for neck length to neck diameter ratio. (see Table 1)
3. Calculate the Speed (RPM) and Linear Feed (IPM)
4. Determine correct number of passes (see Table 2)

Example: Tool #19503 to machine for a **Deburring** application in **4140 steel at 32 Rc**.

1. Using Figure 1 (upper right), determine the type of application you will be performing.  
From Speeds & Feeds chart (next page), SFM is **200** and Base Chip Load (IPT) for **Deburring** is **.00077**.
2. Calculate the neck length to neck diameter ratio for the tool. Calculate adjusted chipload based on values in Table 1.

$$\begin{aligned} \text{Neck Length Ratio} &= (\text{Neck Length} / \text{Neck Diameter}) \\ &= (1.00 / .125) \\ &= 8 \\ \text{Adjusted Chip Load} &= \text{Adjustment Factor} \times \text{Base Chip Load} \\ &= 0.9 \times .00077 \\ &= .000693 \end{aligned}$$

3. Calculate Speed (RPM) and Linear Feed (IPM)

$$\begin{aligned} \text{RPM} &= (\text{SFM} \times 3.82) / \text{Cutter Diameter} \\ &= (200 \times 3.82) / .250 \\ &= 3056 \end{aligned}$$

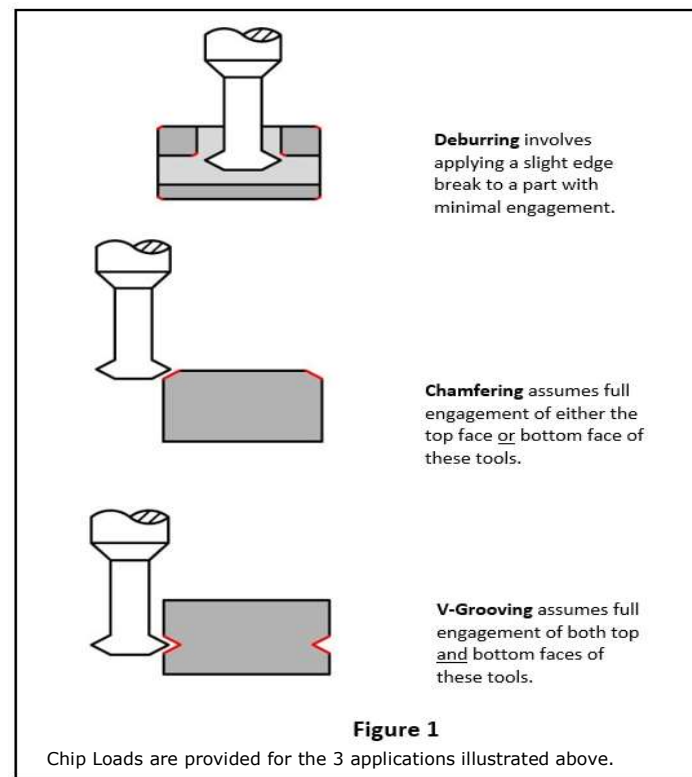
$$\begin{aligned} \text{Linear Feed (IPM)} &= \text{RPM} \times \text{IPT} \times \text{Number of Flutes} \\ &= 3056 \times .000693 \times 4 \\ &= 8.47 \end{aligned}$$

4. From Speeds & Feeds chart (table 2), the number of passes for a **deburring operation in 4140 steel is 1 pass**.

5. Conclusion

In this example, the tool would run at **3056 RPM, 8.47 IPM and make 1 pass**.

Neck Length/Neck Diameter Ratio	0 - 28 Rc			29 - 37 Rc			38 - 45 Rc		
	Deburring	Front/Back Chamfer	V-Groove	Deburring	Front/Back Chamfer	V-Groove	Deburring	Front/Back Chamfer	V-Groove
2x - 8x	1	2	3	1	3	4	1	4	5
9x - 14x	1	3	4	1	4	5	1	6	7
15x - 20x	1	4	5	1	5	6	1	7	8



Neck Length/Neck Diameter Ratio	Adjustment Factor
3x	110%
5x	100%
8x	90%
10x	80%
14x	75%
18x	65%



MATERIAL	Hardness: ≤ 28 Rc (≤ 271 HBn)											Depth of Cut Passes			
	SFM	Chip Load (IPT) By Cutter Diameter													
		0.062	0.078	0.093	0.125	0.187	0.250	0.312	0.375	0.437	0.500		0.625	0.750	
<b>ALUMINUM ALLOYS</b>															
Deburring		.00049	.00062	.00074	.00099	.00148	.00198	.00273	.00329	.00383	.00438	.00548	.00657	see table 2	
Castings (2xx, 5xx, 7xx, 8xx)	750	Front/Back Chamfer	.00041	.00051	.00061	.00083	.00123	.00165	.00228	.00274	.00319	.00365	.00456	.00548	see table 2
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000	V-Groove	.00031	.00039	.00046	.00062	.00093	.00124	.00171	.00205	.00239	.00274	.00342	.00411	see table 2
Castings - 3%-5% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	750	Deburring	.00044	.00056	.00066	.00089	.00133	.00178	.00246	.00296	.00345	.00394	.00493	.00591	see table 2
Castings - 5%-8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	700	Deburring	.00044	.00056	.00066	.00089	.00133	.00178	.00246	.00296	.00345	.00394	.00493	.00591	see table 2
Castings - 8%-12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	650	Front/Back Chamfer	.00037	.00046	.00055	.00074	.00111	.00149	.00205	.00246	.00287	.00329	.00411	.00493	see table 2
Castings - 12%-16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	475	Front/Back Chamfer	.00037	.00046	.00055	.00074	.00111	.00149	.00205	.00246	.00287	.00329	.00411	.00493	see table 2
Wrought - 5%-8% Si (4xxx)	1000	V-Groove	.00028	.00035	.00041	.00056	.00083	.00111	.00154	.00185	.00215	.00246	.00308	.00370	see table 2
Wrought - 8%-12% Si (4xxx)	800	V-Groove	.00028	.00035	.00041	.00056	.00083	.00111	.00154	.00185	.00215	.00246	.00308	.00370	see table 2
<b>MAGNESIUM ALLOYS</b>															
Deburring	1500	Deburring	.00049	.00062	.00074	.00099	.00148	.00198	.00273	.00329	.00383	.00438	.00548	.00657	see table 2
Front/Back Chamfer		Front/Back Chamfer	.00041	.00051	.00061	.00083	.00123	.00165	.00228	.00274	.00319	.00365	.00456	.00548	see table 2
<b>ZINC ALLOYS</b>															
V-Groove	800	V-Groove	.00031	.00039	.00046	.00062	.00093	.00124	.00171	.00205	.00239	.00274	.00342	.00411	see table 2
<b>COPPER ALLOYS</b>															
High Coppers - 90%+ (C1xxxx)	225	Deburring	.00039	.00049	.00059	.00079	.00118	.00158	.00219	.00263	.00306	.00350	.00438	.00526	see table 2
Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)	500	Deburring	.00039	.00049	.00059	.00079	.00118	.00158	.00219	.00263	.00306	.00350	.00438	.00526	see table 2
Phosphor Bronzes (Copper Tin alloys, C5xxxx)	225	Deburring	.00039	.00049	.00059	.00079	.00118	.00158	.00219	.00263	.00306	.00350	.00438	.00526	see table 2
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	500	Front/Back Chamfer	.00033	.00041	.00049	.00066	.00099	.00132	.00182	.00219	.00255	.00292	.00365	.00438	see table 2
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	500	Front/Back Chamfer	.00033	.00041	.00049	.00066	.00099	.00132	.00182	.00219	.00255	.00292	.00365	.00438	see table 2
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	225	Deburring	.00039	.00049	.00059	.00079	.00118	.00158	.00219	.00263	.00306	.00350	.00438	.00526	see table 2
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	550	V-Groove	.00025	.00031	.00037	.00050	.00074	.00099	.00137	.00164	.00191	.00219	.00274	.00329	see table 2

**Product Table:** Double Angle Shank Cutters - Pointed  
**Series:** 162, 191, 192, 195, 268, 275, 297, 391, 451, 473, 660, 661, 716, 717, 726, 7623, 7710, 7719, 7723, 7728, 7733, 7910, 7920, 8069, 8070, 8071, 8072, 8073, 8074, 8076, 8217, 8218, 8221, 8222, 8224, 8260, 8305, 8335, 8557, 8578, 8719, 9036, 9056, 9099, 9107, 9170, 9181, 9208, 9217, 9255, 9343, 9375, 9468, 9469, 9636, 9637, 9655, 9675, 9699, 9744, 9810, 9834, 9844, 9849, 9858, 9894

**Product notes:**

Chip Loads are given 3 ways:  
 Deburring: Generating an Edge Break of .005"-.008"  
 Front/Back Chamfer: Full chamfer generation using front or back of the cutter head  
 V-Groove: Assumes engagement on the point, front and back of the cutter head

Depth of Cut is shown as number of Passes with each pass resulting in a descending stepover

Chip Loads within table pertain to machining on one side (from tool centerline) of the cutter head.  
 For machining on two sides, reduce Chip Loads to 60%-80% depending on contact length and finish

Chip Loads represent 4 flute values.  
 For 2 flutes, increase chip loads by 20% (chip load x 1.20)  
 For 6 flutes, reduce chip loads by 20% (chip load x .80)

For number of passes, see table 2 on page 1  
 Included angles less than 60°, add a pass to front/back chamfer and V-Groove operations

**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)											Depth of Cut Passes			
	SFM	Chip Load (IPT) By Cutter Diameter													
		0.062	0.078	0.093	0.125	0.187	0.250	0.312	0.375	0.437	0.500		0.625	0.750	
<b>CARBON STEELS</b>															
Free-Machining/Low Carbon steels, 10xx - 1029 & all 10Lxx, 11xx - 1139 & all 11Lxx, 12xx - 1215 & all 12Lxx	600	Deburring	.00021	.00026	.00031	.00042	.00063	.00084	.00118	.00142	.00165	.00189	.00236	.00284	see table 2
		Front/Back Chamfer	.00017	.00022	.00026	.00035	.00052	.00070	.00098	.00118	.00138	.00158	.00197	.00236	see table 2
		V-Groove	.00013	.00016	.00020	.00026	.00039	.00053	.00074	.00089	.00103	.00118	.00148	.00177	see table 2
1030 - 1095, 1140 - 1151, 13xx, 15xx, 20xx, 30xx, 40xx & 4xLxx, 50xx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx & 52Lxxx, 60xx, 80xx, 90xx	200	Deburring	.00019	.00024	.00029	.00038	.00057	.00077	.00108	.00130	.00151	.00173	.00216	.00259	see table 2
		Front/Back Chamfer	.00016	.00020	.00024	.00032	.00048	.00064	.00090	.00108	.00126	.00144	.00180	.00216	see table 2
		V-Groove	.00012	.00015	.00018	.00024	.00036	.00048	.00067	.00081	.00094	.00108	.00135	.00162	see table 2
<b>STAINLESS STEELS</b>															
203 EZ, 303 (all types), 416, 416Se, 416 Plus X, 420F, 420FSe, 430F, 430FSe, 440F, 440FSe	450	Deburring	.00021	.00026	.00031	.00042	.00063	.00084	.00118	.00142	.00165	.00189	.00236	.00284	see table 2
		Front/Back Chamfer	.00017	.00022	.00026	.00035	.00052	.00070	.00098	.00118	.00138	.00158	.00197	.00236	see table 2
		V-Groove	.00013	.00016	.00020	.00026	.00039	.00053	.00074	.00089	.00103	.00118	.00148	.00177	see table 2
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	Deburring	.00019	.00024	.00029	.00038	.00057	.00077	.00108	.00130	.00151	.00173	.00216	.00259	see table 2
		Front/Back Chamfer	.00016	.00020	.00024	.00032	.00048	.00064	.00090	.00108	.00126	.00144	.00180	.00216	see table 2
		V-Groove	.00012	.00015	.00018	.00024	.00036	.00048	.00067	.00081	.00094	.00108	.00135	.00162	see table 2
414, 431, 440A, 440B, 440C, 13-8, 15-5, 15-7, 17-4, 17-7	150	Deburring	.00012	.00015	.00018	.00024	.00036	.00048	.00067	.00081	.00094	.00108	.00135	.00162	see table 2
		Front/Back Chamfer	.00010	.00012	.00015	.00020	.00030	.00040	.00056	.00068	.00079	.00090	.00113	.00135	see table 2
		V-Groove	.00007	.00009	.00011	.00015	.00022	.00030	.00042	.00051	.00059	.00068	.00084	.00101	see table 2
<b>TOOL STEELS</b>															
A, L, O, P, W series	200	Deburring	.00019	.00024	.00029	.00038	.00057	.00077	.00108	.00130	.00151	.00173	.00216	.00259	see table 2
		Front/Back Chamfer	.00016	.00020	.00024	.00032	.00048	.00064	.00090	.00108	.00126	.00144	.00180	.00216	see table 2
		V-Groove	.00012	.00015	.00018	.00024	.00036	.00048	.00067	.00081	.00094	.00108	.00135	.00162	see table 2
D, H, M, T, S series	150	Deburring	.00012	.00015	.00018	.00024	.00036	.00048	.00067	.00081	.00094	.00108	.00135	.00162	see table 2
		Front/Back Chamfer	.00010	.00012	.00015	.00020	.00030	.00040	.00056	.00068	.00079	.00090	.00113	.00135	see table 2
		V-Groove	.00007	.00009	.00011	.00015	.00022	.00030	.00042	.00051	.00059	.00068	.00084	.00101	see table 2
<b>TITANIUM ALLOYS</b>															
Deburring	150	Deburring	.00012	.00015	.00018	.00024	.00036	.00048	.00067	.00081	.00094	.00108	.00135	.00162	see table 2
		Front/Back Chamfer	.00010	.00012	.00015	.00020	.00030	.00040	.00056	.00068	.00079	.00090	.00113	.00135	see table 2
		V-Groove	.00007	.00009	.00011	.00015	.00022	.00030	.00042	.00051	.00059	.00068	.00084	.00101	see table 2
<b>HIGH TEMP ALLOYS</b>															
Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Incoloy	70	Deburring	.00012	.00015	.00018	.00024	.00036	.00048	.00067	.00081	.00094	.00108	.00135	.00162	see table 2
		Front/Back Chamfer	.00010	.00012	.00015	.00020	.00030	.00040	.00056	.00068	.00079	.00090	.00113	.00135	see table 2
		V-Groove	.00007	.00009	.00011	.00015	.00022	.00030	.00042	.00051	.00059	.00068	.00084	.00101	see table 2

MATERIAL	Hardness: 38-45 Rc (353-421 HBn)											Depth of Cut Passes			
	SFM	Chip Load (IPT) By Cutter Diameter													
		0.062	0.078	0.093	0.125	0.187	0.250	0.312	0.375	0.437	0.500		0.625	0.750	
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-	-	-	-	-	-	-	-	-
			-	-	-	-	-								