

Donek Drag Knife_Vectric and ShopBot

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Donek Drag Knife Info

Getting Started: Turn off the power to the spindle. Options to do this:

- A. Turn off key at Control Box or on pendant so that the VFD does not show power to it
- B. For Gantry tools with a spindle speed controller, Press on **LO/RE** key on face of VFD



Normally, the VFD is in **RE**(mote) mode so that the software turns on the spindle when you are ready to run the file. In **RE** mode, there is no LO/RE light on the face of the VFD

Don't forget to put the spindle back in RE mode when you are ready to have it turn on for cutting with a router bit.



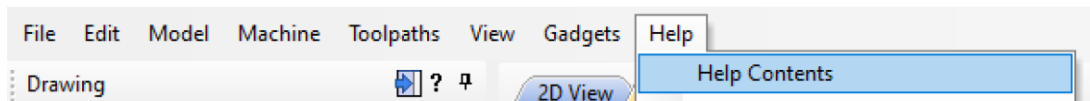
Pressing on the LO/RE button toggles the VFD to **LO**(cal) mode (light turns on.) In this mode, the operator must press on the Green RUN button on the face of the VFD to turn on the spindle.

In LO mode, even if the message screen comes up to ask you if it is OK to turn on the spindle, the spindle will not turn on. (Just don't press the RUN button when using the Drag Knife!)

- C. Unplug router if an option
- D. You can also edit the .sbp file to comment out the command to turn on the spindle (see below), but what if you forget to do that for each file? Best to cut the power to the spindle/router when using the drag knife

In Vectric Software, the information about the Drag Knife is found under GADGETS.

- The fill-in screen there has spots for all the information you need
- Using the HELP that is available in the Vectric software is really (wait for it) HELPFUL



Clicking on Help Contents will open a .pdf. If you scroll down the contents on the left side of the document until you get to GADGETS, then DragKnife Toolpaths, you'll learn more about what each of the boxes means.

- The fill in page will write the toolpath that it needs to run the drag knife. You will still have to write the .sbp file (Save Toolpath) in the Toolpaths screen

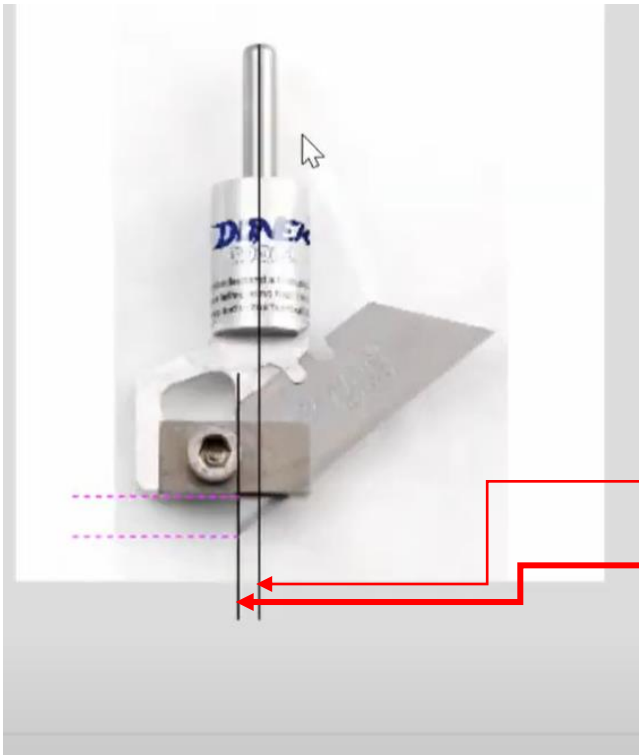
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A good YouTube video on setting up the Drag Knife in Vectric software

[Donek Knife and Aspire 10 - YouTube](https://www.youtube.com/watch?v=hJhMaqDDmFM) (from Donek itself, I think)

<https://www.youtube.com/watch?v=hJhMaqDDmFM>

- A Key bit of information in setting up for using the Drag Knife is to carefully measure the difference between the center of rotation of the knife and the back horizontal edge of the blade at the point of the knife. That is the blade offset number



Drag knife is pulled through the material with the long diagonal edge being pulled along, and the sharp tip of the knife following (dragging along) behind it. The force of the drag pulls the tip into position along the vector.

Measure the distance between the

- center of rotation of the knife blade
- and the edge of the blade where the tip is
- That is the blade offset

If you have a Donek knife, you can use the values in the table below

Model:	D1	D2	D3	D4	Creaser
Collet Size:	1/2in	1/2in	1/4in	1/4in	NA
Maximum Depth of Cut:	1/16in	1/4in	1/16in	1/4in	NA
Minimum Cut Radius:	1/16in	1/8in*	1/16in	1/8in*	NA
Approximate** Offset Value:	0.065in (1.65mm)	0.16in (4.0mm)	0.065in (1.65mm)	0.16in (4.0mm)	0.8in (20.3mm)

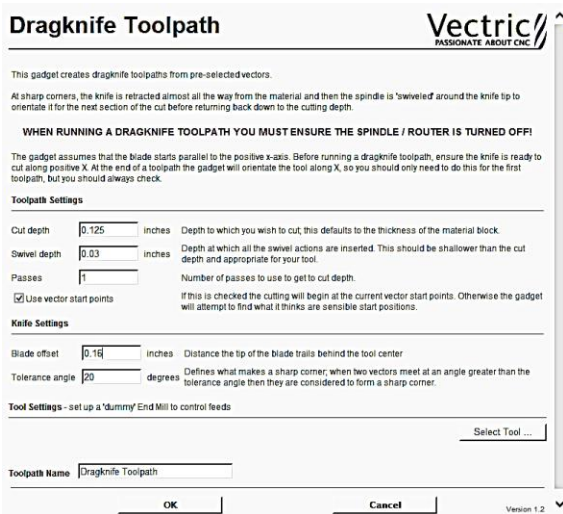
* If you are cutting material thicker than 1/8in, the minimum cut radius on the D2 or D4 increases to the material thickness

** Offset values are approximate because results may vary from machine to machine and material to material. In general, if your blade is overturning at corners, reduce the offset. If it is under turning, increase the offset.

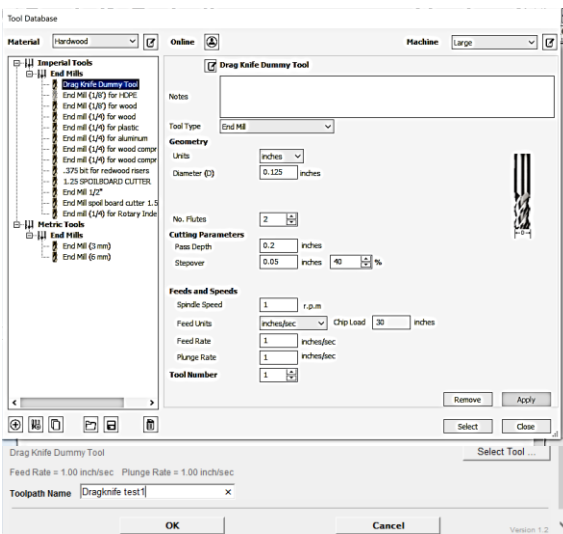
- For the video and type of Donek knife, use the minimum cut radius and approximate Offset value in the Vectric boxes

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In VCarve/Aspire:



- Select the vectors to cut along.
- Open up Gadgets>Drag knife tool path
- Fill in the blanks
 - Cut depth of material (plus maybe a bit more to cut all the way through/allow for uneven bed or bad Z Zeroing)
 - How much of the point to leave in the material when changing direction
 - Number of passes (depends on thickness of material)
 - Click on Vector Start Points
 - Set up a dummy tool in the Tool Library



In Tool Library

- Click on any tool and make a copy of it
- Rename it to mark it as the Drag Knife Tool
- Don't worry about diameter, stepover, etc
- Set the Spindle Speed to 1 (When Running, make sure to turn off spindle as above)
- For ShopBot, set units to Inches per Second
- Set Feed Rate and Plunge rate to something that works (I'm starting out with 1 and 1, but have no idea if that is correct)
- Tool Number 1 and Apply/Select

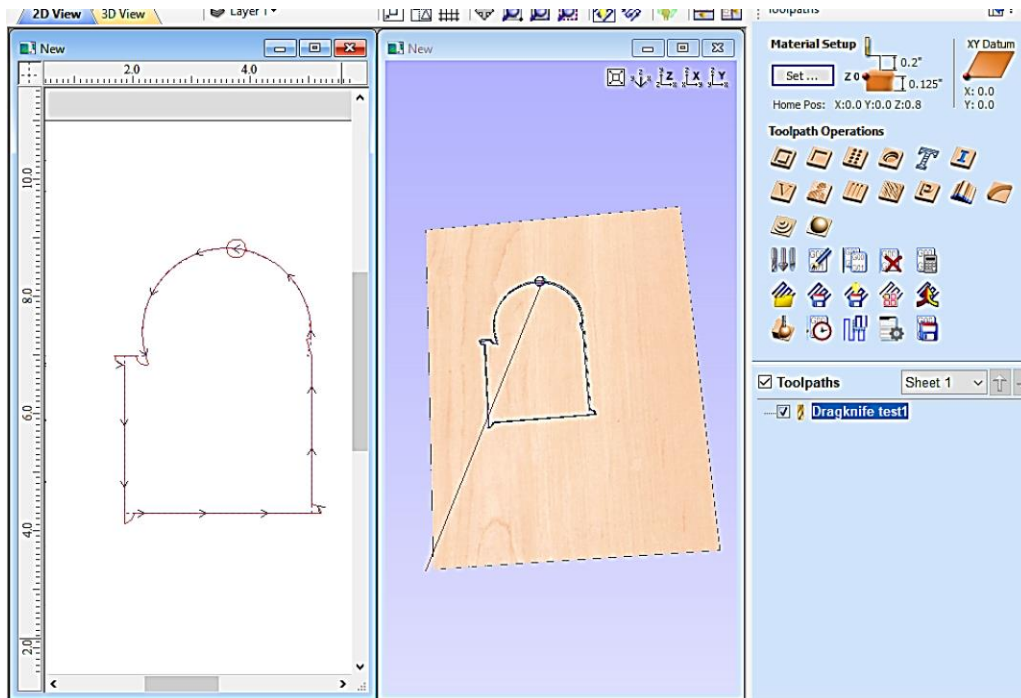
Give it a name that you will recognize later and click OK. Toolpath will show up on Toolpath screen

Look at Video at about 7:25 minutes for discussion of the toolpath and how to change settings as you experiment with the results.

Donek Drag Knife_Vetric and ShopBot

Example of a vector created in VCarve Pro

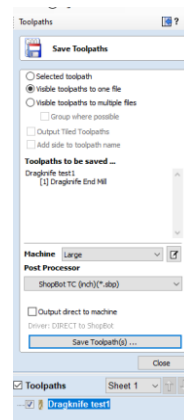
A square and a circle welded together and toolpathed as above using Gadgets>Drag knife toolpath



In the example above, the start point created by using basic shapes and the Weld tool is at the top of the arc. The toolpath simulation shows that the first move of the blade will be to rotate around until it thinks it is aligned with the direction of the cut.

At each vector intersection greater than 20 degrees, the blade lifts until just the point is in the material, then the toolpath continues in an arc until the blade is dragged into the correct alignment and the vector cut can be resumed. The point of the blade then plunges to full depth. If the offset set in the dragknife screen matches the true offset of the blade assembly, the cut should be correct.

Toolpath saved as a ShopBot file (.sbp) in inches.



Donek Drag Knife_Vectric and ShopBot

The first part of the code generated for the ShopBot looks like this:

(FE from the SB Control software command line to read/edit code. It's just a text file)

Example of code starts at Line 11

```
11 | !Home Position Information = Bottom Left Corner, Material Surface
12 | 'Home X = 0.000000 Home Y = 0.000000 Home Z = 0.800000
13 | 'Rapid clearance gap or Safe Z = 0.200
14 | 'UNITS:Inches
15 | '
16 | IF %(25)=1 THEN GOTO UNIT_ERROR 'check to see software is set to standar
17 | SA 'Set program to absolute coordinate mode
18 | CN, 90
19 | 'New Path
20 | 'Toolpath Name = Dragknife test1
21 | 'Tool Name = Dragknife End Mill
22 |
23 | &PWSafeZ = 0.200
24 | &PWZorigin = Material Surface
25 | &PWSMaterial = 0.125
26 | '&ToolName = "Dragknife End Mill"
27 | &Tool =1 'Tool number to change to
28 | C9 'Change tool
29 | TR,0 'Set spindle RPM
30 | C6 'Spindle on
31 | PAUSE 2
32 | '
33 | MS,1.0,1.0
34 | JZ,0.800000
35 | J3,3.911186,8.827079,0.200000
36 | M3,3.911186,8.827079,-0.030000
37 | CG, ,3.591189,8.826009,-0.160000,0.000000,T,1
38 | M3,3.591189,8.826009,-0.125000
39 | M3,3.571951,8.825880,-0.125000
40 | M3,3.552610,8.825491,-0.125000
41 | M3,3.533173,8.824838,-0.125000
42 | M3,3.513643,8.823916,-0.125000
43 | M3,3.494025,8.822722,-0.125000
44 | M3,3.474325,8.821252,-0.125000
45 | M3,3.454546,8.819502,-0.125000
46 | M3,3.434696,8.817469,-0.125000
```

READING THE CODE

Note, anything with an apostrophe (') in front of it is a comment that the software ignores.

An Ampersand (&) followed by text is a variable. Most variables were set in the Job Setup and Tool Library from Vectric

Line 29: TR, 0 sets spindle speed to 0 (only important with a tool that has a spindle speed controller: aka gantry tool)

Line 30: C6 runs a subroutine to turn on spindle

Line 31: PAUSE 2 has the software pause for 2 seconds to let the spindle come up to speed

Line 33: MS sets the Move Speed as determined in tool library (ips)

Line 34: J3 command Jogs the blade above the material to the start position in X, Y and Z

Line 36: M3 command

Plunges just the tip into the material

Line 37: CG starts an arc to rotate tip in material to align blade

Line 38 M3 plunges to full depth and starts cut

Further Notes for those who are interested in reading code:

- A **JZ** command tells the ShopBot to Jog (faster positioning speed) the Z to a safe Z position set in the Vectric file under Material Setup on the Toolpathing side of the CAD/CAM software
- A **J3** command tells the ShopBot to Jog to the next location in 3 axes: X, Y and Z. The next 3 numbers are the X location, the Y location, and the Z location, in that order. The J3 command at the start of a file quickly positions the ShopBot at the start point of the cut above the material before it starts the plunge into the material.
- The next **M3** command starts the plunge into the material. Compare Lines 35 and 36 above. The X and Y locations are the same, the Z value differs.
 - Since the CAD file was set up to Zero the Z at the Material Surface (see Line 24), all Z values that plunge into the material are negative values.
 - (Would the Z value be negative if the Z was set to the Table surface?)

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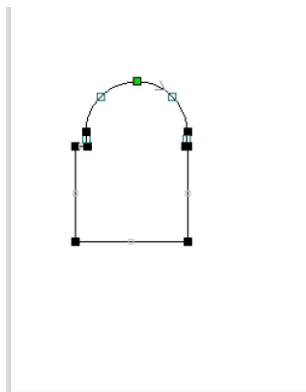
TROUBLESHOOTING

- Make sure the blade is sharp
- Make sure material that is being cut is held down correctly.
 - A cutting mat for fabric or vinyl cutting may be a good idea. Some mats for vinyl cutting have a sticky substance on them to help hold thin materials in place
 - A vacuum hold down may help hold material in place while cutting
- It can help to select the start point of the vectors to keep a misaligned blade from dragging through material until it pulls (drags) itself into the correct orientation
 - Rumor has it that the best vector to start with runs along the X axis
 - You can edit .sbp files to add a PAUSE before the first plunge so that you can manually align the blade to the first cut (see below)

Changing The Start Point: In the first example above, the start point is at the top of the arc. The toolpath simulation shows that the first move of the blade will be to rotate around until it thinks it is aligned with the direction of the cut.

You can change the start point of a vector by putting the vector in NODE mode (N on keyboard to toggle between) and changing the start point to a better location.

If you are not experienced in using the Node Editing Tools (and what the cursor looks like when it is on a Node vs. on a Span) read the Vectric Help about it.



The original drawing (created from a rectangle and a circle with the **Weld Tool**) put the start point at the top of the arc. See the green dot at the top of the arc?

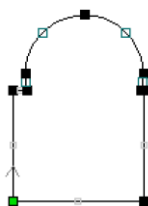
Use the **N** key on the keyboard to toggle back and forth between

- **Node mode** to see nodes and spans and
- **Select mode** (pink)

In Node mode, the easiest way to change an existing node (point) to the Start Point is to put the cursor on the location of the new start point, and press **P**. The green point should now be at the new location.

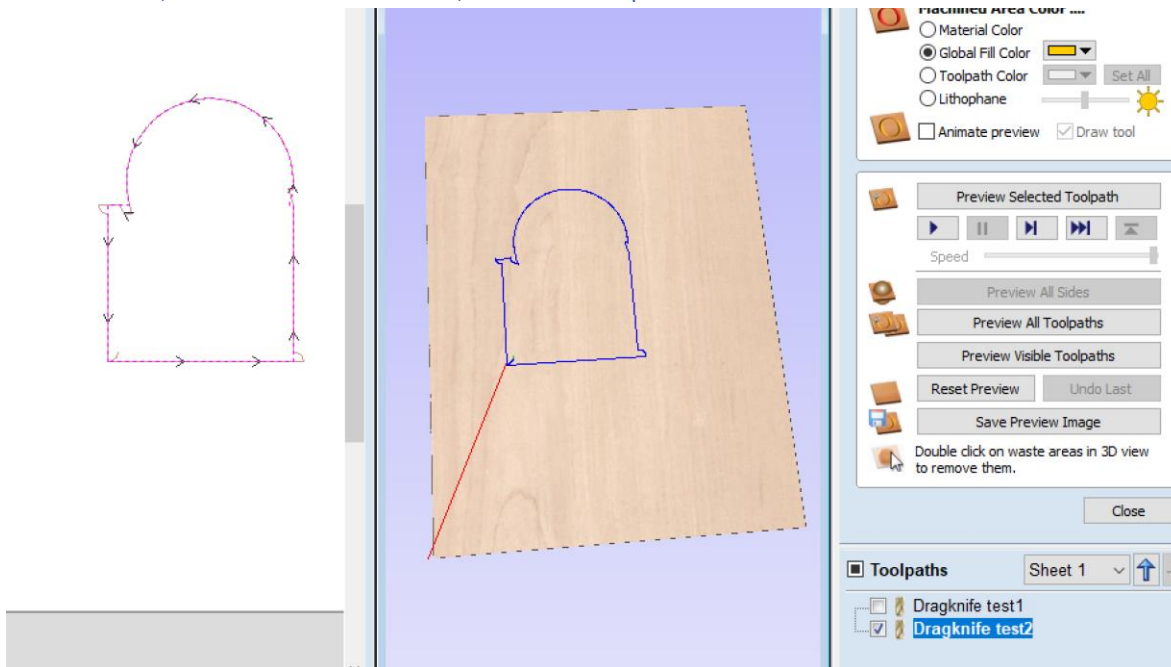
To create a completely new Start Point, put the cursor when you want a new point to be, and press **I** to insert a point on a span. Then put the cursor on the new point, and press **P** to make it the new start point.

The Vectric HELP .pdf has more info on using the Node and Span menus from NODE mode.



Donek Drag Knife_Vetric and ShopBot

Same Vectors, Different Start Point, Better Toolpath



This drawing has a better start point at the lower left corner, and the blade will start its path along the X axis (preferred.)

First lines of ShopBot Code generated with this drawing and toolpath

```
23 &PWSafeZ = 0.200
24 &PWZorigin = Material Surface
25 &PWWMaterial = 0.125
26 '&ToolName = "Dragknife End Mill"
27 &Tool =1          'Tool number to change to
28 C9              'Change tool
29 TR,0           'Set spindle RPM
30 C6              'Spindle on
31 PAUSE 2
32 '
33 MS,1.0,1.0
34 JZ,0.800000
35 J3,1.840916,4.294615,0.200000
36 M3,1.840916,4.294615,-0.125000
37 M3,5.200916,4.294615,-0.125000
38 M3,5.200916,4.294615,-0.030000
39 CG, ,5.040916,4.454615,-0.160000,0.000000,T,-1
40 M3,5.040916,4.454615,-0.125000
41 M3,5.040916,6.994616,-0.125000
42 M3,4.956139,7.269773,-0.125000
43 M3,4.956139,7.269773,-0.030000
44 CG, ,5.024323,7.275473,0.047111,-0.152907,T,1
45 M3,5.024323,7.275473,-0.125000
46 M3,5.025362,7.283294,-0.125000
47 M3,5.026754,7.304224,-0.125000
48 M3,5.027839,7.325160,-0.125000
49 M3,5.028619,7.346095,-0.125000
50 M3,5.029093,7.367022,-0.125000
51 M3,5.029263,7.387935,-0.125000
52 M3,5.029134,7.407174,-0.125000
```

Same TR and C6 lines as above
Move Speed as above in ips

Line 35: J3 command jogs above material to the start position for first plunge

Line 36: M3 command plunges full depth into material to start cut

Line 37: M3 command cuts to end of first vector

Line 38: M3 command lifts up so point of blade is still in material

Line 39: CG command creates an arc to swing blade into alignment for next cut. It is the dragging of the tip of the blade in the arc that sets the alignment of the blade

Line 40: M3 command plunges into material to start next cut at full depth

Donek Drag Knife_Vectric and ShopBot

Editing ShopBot Parts files (.sbp) to allow a moment to manually align the knife blade

If the drag knife is not aligned to the first vector (horizontal edge first) when it makes its first plunge, the knife may drag through the material until it gets itself sorted out. It's easy to add a couple of lines of code to a file to give yourself the opportunity to manually align the knife prior to the first plunge and cut.

Use **FE** from the ShopBot control menu (or any text editing program like notepad, etc.) to open the .sbp file. Remember to **Save** it (or Save As) after making the edits. The example below shows one way to edit the file above.

```
--
23 &PWSafeZ = 0.200
24 &PWZorigin = Material Surface
25 &PWMaterial = 0.125
26 '&ToolName = "Dragknife End Mill"
27 &Tool =1           'Tool number to change to
28 C9                'Change tool
29 TR,0              'Set spindle RPM
30 'C6                'Spindle on
31 'PAUSE 2
32 '
33 MS,1.0,1.0
34 JZ,0.800000|
35 J3,1.840916,4.294615,0.200000
36 'align blade to direction of cut
37 PAUSE
38 M3,1.840916,4.294615,-0.125000
39 M3,5.200916,4.294615,-0.125000
40 M3,5.200916,4.294615,-0.030000
41 CG, ,5.040916,4.454615,-0.160000,0.000000,T,-1
42 M3,5.040916,4.454615,-0.125000
43 M3,5.040916,6.994616,-0.125000
44 M3,4.956139,7.269773,-0.125000
45 M3,4.956139,7.269773,-0.030000
46 CG, ,5.024323,7.275473,0.047111,-0.152907,T,1
47 M3,5.024323,7.275473,-0.125000
48 M3,5.025362,7.283294,-0.125000
49 M3,5.026754,7.304224,-0.125000
```

Lines 30 and 31 had an apostrophe added to the front to “comment” out the subroutine to turn on the spindle and pausing for 2 seconds to let it come up to speed. This is not necessary IF THE POWER TO THE SPINDLE HAS BEEN TURNED OFF or you don't mind the extra 2 seconds waiting for the non-running spindle to come up to speed.

Lines added to the code

Hit ENTER after line 35 to create a blank line

Line 36: added a comment that will be displayed on screen to remind operator to align the blade to the direction of the first cut (horizontal edge leading)

Remember to start comment with an apostrophe (')

Line 37: added a PAUSE to stop the movement of the ShopBot until the blade is aligned. Hit any key to resume after the PAUSE

(Option: add a whole number after the PAUSE if you want the ShopBot to Pause for a certain number of seconds, then resume on its own. See Line 31.)