

## CNC Sign Vinyl Drag Knife Bit

Your CNC Sign Vinyl Drag Knife bit fits in any 1/4" collet, just like a regular end mill. The spring-loaded bit holds a tiny carbide knife that swivels as your CNC machine drags it around the profile of your design, allowing your CNC machine to cut adhesive backed sign vinyl, sandblast mask, paper, cardboard, and plastics.

### Using Your CNC Sign Vinyl Drag Knife Bit:

***IMPORTANT NOTE:*** START OUT BY WORKING ON A PRACTICE PIECE TO GET A FEEL FOR HOW YOUR NEW BIT WILL FUNCTION BEFORE YOU START CUTTING VALUABLE MATERIAL.

1. Create your G-code file for cutting with your drag knife bit in the same way you would create any other cut file. Program your CAD/CAM software to profile cut the vectors in your design file 0.030" deep using a 0.001 diameter end mill. Enter and exit the cuts vertically (no spiral, sloped or tangent entry/exit.) Movement between cuts should be done 0.250" above the part. A good starting feed rate is 2 inches per second.

***IMPORTANT NOTE:*** MAKE SURE YOUR SPINDLE SPEED IS SET TO 0 RPM AND/OR YOUR ROUTER IS TURNED OFF!!!

Tool Type	End Mill
Tool Diameter	0.001"
Clearance Plane	0.250"
Feed Rate	2 ips
Spindle Speed	0 rpm
Total Cut Depth	0.030"
Depth per Cut	0.030"
Entry/Exit	Vertical

2. Clamp a piece of MDF to the table of your CNC machine. Your CNC Sign Vinyl Drag Knife Bit is designed to compensate for tables that are not perfectly flat. To ensure that your bit is not accidentally damaged, make sure the total height variance from highest point to lowest point on the MDF is less than 0.030". If necessary, surface your table and/or the MDF before continuing on to the next step.
3. Mount your sign vinyl (leaving the wax paper backing on) to the MDF. If your project is small, you may be able to hold the vinyl in place by simply taping down the edges with masking tape. To keep larger pieces of vinyl from curling up, coat the MDF with a **TEMPORARY** spray adhesive. (Make sure you don't get overspray on any delicate parts of your machine.) This will make the surface of the MDF tacky like a Post-It note. Press the vinyl into place and you are ready to start cutting.
4. Insert your CNC Sign Vinyl Drag Knife Bit into your spindle's chuck and tighten the collet.

**IMPORTANT NOTE: OVER TIGHTENING THE COLLET COULD DAMAGE THE BRASS HOUSING OF YOUR BIT!**

5. Set your bit height ( $Z = 0$ ) by lowering your Z axis until the tip of the blade just barely touches the vinyl. (If your machine includes an electrical sensor/touch plate for setting  $Z=0$ , run your zeroing routine just like you would with any other bit.) After setting the height, remember to raise the machine to a safe Z level.
6. If you are using your CNC Sign Vinyl Drag Knife Bit for the first time or you plan to cut vinyl that is significantly thicker/thinner than the last project you worked on, refer to the "Adjusting Knife Pressure/Cut Depth" directions that follow for more information.
7. Cut your CAD/CAM file. When you're done cutting vinyl, store your bit in a clean, dry place. Sawdust and moisture can damage the precision bearings inside your CNC Sign Vinyl Drag Knife Bit. Refer to the "Introduction to Sign Making" directions that follow for more information on how to work with sign vinyl after it has been cut.

**Adjusting Knife Pressure / Cut Depth**

If you are using your CNC Sign Vinyl Drag Knife Bit for the first time or you plan to cut vinyl that is significantly thicker/thinner than the last project you worked on you may need to adjust the knife pressure to achieve a quality cut. Your CNC Sign Vinyl Drag Knife Bit contains an adjustable spring mechanism that precisely regulates the pressure applied to its carbide blade, allowing your machine to cut through the thin layer of sign vinyl without cutting through the wax paper backing.

1. To verify that your blade pressure is set correctly for the type of vinyl you will be cutting, draw and cut a 1/2" diameter circle centered inside a 1" diameter circle.
2. Peel away the 1/2" circle and the 1" doughnut. If your CNC Sign Vinyl Drag Knife Bit is cutting to the correct depth, the vinyl should be easy to remove and the 1/2" circle cut will be

lightly scratched into the surface of the wax paper backing. (Look closely, this can be hard to see if your shop is not brightly lit.)

3. Determine if your knife pressure is too light or too heavy. If the knife pressure is too light, the blade will not cut completely through the vinyl. The vinyl may stretch or tear when you attempt to peel it away, and the blade will not leave scratch marks in the wax paper backing. If the knife pressure is too heavy, the blade will cut through the wax paper backing.
4. To adjust the knife pressure, remove the CNC Sign Vinyl Drag Knife Bit from your router collet. Insert the hex wrench (included with these directions) into the setscrew located in the end of the bit's brass housing. Turn the wrench counter-clockwise to decrease knife pressure for thinner vinyl. Turn the wrench clockwise to increase pressure for thicker vinyl. If your knife pressure needs significant adjustment, increase/decrease the pressure 1-2 wrench revolutions. For fine adjustments, increase/decrease the pressure by 1/4 - 1/2 of a wrench revolution.
5. Insert the CNC Sign Vinyl Drag Knife Bit back in your router collet. **DO NOT FORGET TO RESET YOUR Z = 0 POINT.** Perform an additional test cut, as described in Step 1. Repeat Steps 2 – 5 until you are satisfied with the cut depth.

#### **Replacing the Blade in Your CNC Sign Vinyl Drag Knife Bit:**






Your CNC Sign Vinyl Drag Knife Bit uses replaceable carbide blades. We recommend 45° blades for cutting sign vinyl and 60° blades for cutting thicker materials, including paper, cardboard, and thin plastics. Replacement blades for your CNC Sign Vinyl Drag Knife Bit are available in the Replacement Blades, Tips, Pens, etc. section of our website:

<http://www.WidgetWorksUnlimited.com>

1. To replace the blade in your CNC Sign Vinyl Drag Knife Bit, insert the hex wrench (included with the bit) into the setscrew located in the end of the bit's brass housing. Turn the wrench counter-clockwise to remove the setscrew.
2. Turn the bit upside-down, making sure that you don't lose any of the small parts that come out of the brass housing. You may need to push the parts out of the housing by inserting a straight pin or thin wire through the opening in the opposite end (where the blade normally protrudes.)
3. To reassemble the bit, hold the brass housing upside-down (with the blade end pointing up) in your left hand. Tilt the top of the brass housing approximately 30 degrees left of vertical. With your right hand, hold the new blade at the opening in the end of the brass housing. Orient the new blade so that it points up (the sharp beveled edge will be close to vertical and will be facing left) and insert the tip of the new blade into the brass housing about 1/2".

4. Place the cone shaped end of the blade, (opposite the cutting end) into the center hole of the ball bearing. Push the blade/bearing into the brass housing until the bearing is flush with the end of the housing. Follow the bearing with the steel spacer tube in a similar manner.
5. Insert the long end of the hex wrench down the center of the spring. The wrench will keep the spring from bending and snagging on the internal threads of the brass housing as you insert it.
6. With the brass housing still tilted 30 degrees left of vertical, insert the spring/hex wrench and move the blade/bearing/spacer tube into position. The blade will protrude through the opening in the end of the brass housing. Occasionally the bearing will catch on the threads inside the brass housing instead of sliding smoothly into place. To free a bearing that sticks, gentle tap the protruding end of the hex wrench against a table.
7. Remove the hex wrench from the brass housing while holding the spring in place. Insert the setscrew and tighten it a few turns using the hex wrench. Refer to the "Adjusting Knife Pressure/Cut Depth" directions for information on how to recalibrate the blade pressure.

## Introduction to Sign Making:

	<p><b>Step 1: Weed Out Unwanted Sign Vinyl</b> Remove the unwanted pieces of vinyl that lie in between and around your letters/graphic. Using the tip of an X-acto knife, prick the unwanted vinyl about 1/8" inside the cut line and then lift the edge of the vinyl up. With your free hand, pull the vinyl off the rest of the way and set it aside.</p>
	<p><b>Step 2: Apply Transfer Tape to the Sign Vinyl</b> Apply "transfer" tape to the sign vinyl/wax paper using a rubber squeegee. Lower the tape onto the vinyl slowly, smoothing out the tape as you go to avoid wrinkles and air bubbles. Squeegee over the entire sign again, this time with more pressure, to help the transfer tape adhere to the vinyl.</p>
	<p><b>Step 3: Remove the Wax Paper Backing</b> Remove the wax paper backing from the transfer tape/sign vinyl. The transfer tape keeps all the parts of the graphic aligned relative to each other and transfers the sign vinyl from the wax paper backing to the finished part in one easy step.</p>
	<p><b>Step 4: Transfer the Sign Vinyl to Your Sign</b> Apply the transfer tape/sign vinyl to you sign blank or base material. Squeegee the transfer tape/sign vinyl onto the blank as described in Step 2 - making sure that you avoid wrinkles and air bubbles.</p>
	<p><b>Step 5: Remove the Transfer Tape</b> Starting at one corner, peel off the transfer tape to reveal your sign vinyl graphics. Pull the transfer tape diagonally toward the opposite corner, folding the tape back onto itself as you pull.</p>