File name: TD10093_CNC_Drag_Knife_0312A

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Product Identification: CNC Drag Knife

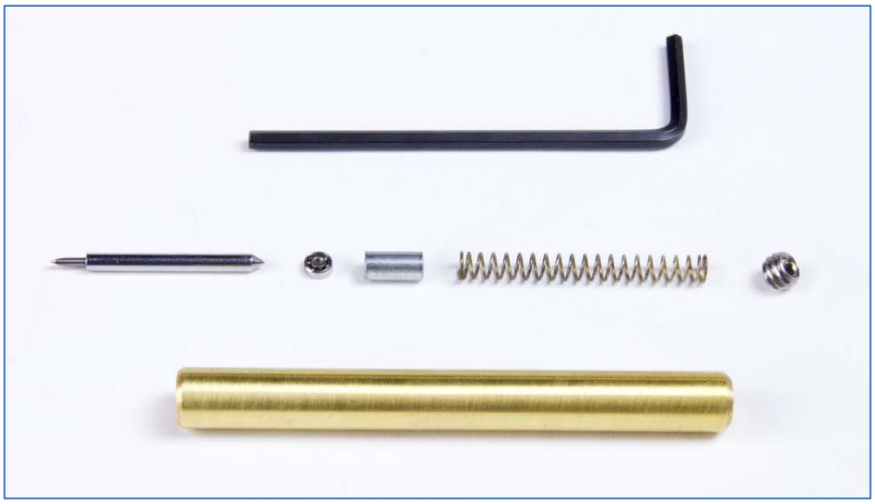
The CNC Drag Knife uses a carbide knife to cut through thin materials like adhesive-backed sign vinyl, cardboard, paper, plastic, and metal sheet. The knife swivels and rotates freely on two ball bearings, cutting as the CNC mill drags it around the design profile. It fits any ¼ inch toolholder or collet.

The CNC Drag Knife comes fully assembled with one 45 degree blade. The 45 degree blade CNC Drag Knife is ideal for cutting sign vinyl. A 60 degree blade is also available and is recommended for other materials. Both the 45 degree and 60 degree blades may be ordered as replacement parts using the part numbers below:

Product Name	Tormach Part Number
CNC Drag Knife	32440
60 Degree Replacement Blade	32441
45 Degree Replacement Blade	32442

The CNC Drag Knife is composed of a 0.250 inch diameter brass housing that holds the following components: carbide knife blade with internal (floating head) ball bearing, external ball bearing, steel spacer, spring, set screw.

A hex wrench is included with the CNC Drag Knife kit and used to set spring preload to adjust knife pressure and cut depth.



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CAUTION: Before using the CNC Drag Knife, verify the CNC mills spindle is turned off and/or the spindle speed is set to 0 RPM.

CAUTION: To avoid damaging the CNC Drag Knife brass housing, do not over tighten the collet on the CNC mill.

Note: Carbide tools are extremely hard, but they are also brittle and can be easily damaged. Take care when handling

Complete instructions for using the CNC Drag Knife are included in the product packaging, providing information on using the drag knife, adjusting the knife pressure and cutting depth, and replacing the blade.

The Following are some "best practice" techniques for utilizing the drag knife as well as additional applications examples.

Adjusting Knife Pressure / Cut Depth

Tormach recommends making a test cut on the final material before using the CNC Drag Knife for the first time. Testing the drag knife will also allow the knife pressure and cut depth to be verified. To verify that the knife pressure is correctly set, use the following procedure:

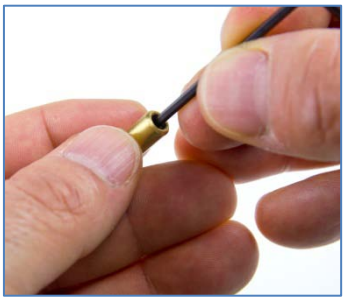
1. Draw and cut a 1 inch diameter circle with a ½ diameter circle centered inside on adhesive backed sign vinyl.
2. Peel away the ½ inch circle and the 1 inch donut. The vinyl should be easy to remove and the material should be easy to remove from the backing and a light scratching will be visible on the surface of the backing

If the pressure is too light, the blade will not completely cut through the vinyl. If the pressure is too heavy, the knife will cut through the wax paper backing.

To adjust the knife pressure, remove the CNC Drag Knife from the collet. Insert the hex wrench into the setscrew located at the end of the brass housing.

- Turn the wrench clockwise to increase knife pressure and turn the wrench counter-clockwise to decrease knife pressure.
- One-two wrench revolutions may be necessary for thicker material.
- ¼ to ½ wrench revolutions are recommended for fine adjustments.

Take care not to over-tighten the set screw.



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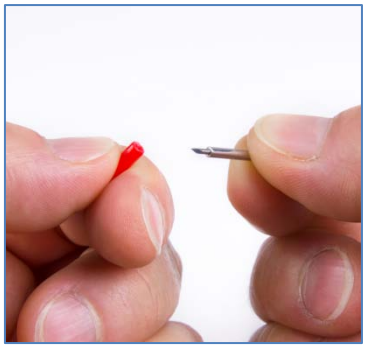
Replacing the Blade:

While the carbide blade included with the drag knife is manufactured to last a long time before it wears out, individual results will vary based on your cutting pressure and the hardness of the material you cut.

To replace the blade:

1. Insert the hex wrench into the setscrew located at the end of the brass housing.

2. Turn the wrench counter-clockwise to completely remove the setscrew.
3. Turn the brass housing upside down, taking care not to misplace any of the internal components as they pass though the opening.
   Note: Tapping the housing on a table or inserting a straight pin or wire through the blade end may be necessary for removing stuck components.
4. Remove the protective rubber cover from the blade end of the replacement blade.



Follow the steps in Option 1 *or* Option 2:

Option 1	Option 2
1. Using your left hand, hold the brass housing upside down (blade end pointing up) and tilted approximately 30 degrees to the left of vertical. 2. Using your right hand, orient the new blade so that it points up (the knife edge will be close to vertical and facing left). 3. Insert the replacement blade into the opening	1. Vertically orient the steel spacer on a level work surface. 2. Place the external ball bearing directly on the top of the steel spacer.

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end of the brass housing (blade end inserted first) approximately ½ inch.

4. Place the cone-shaped end of the replacement blade (opposite the knife end) into the center hole of the external ball bearing and push the ball bearing into the brass housing until it is flush with the end of the housing.

5. Insert the steel spacer into the brass housing in a similar manner and push the end of spacer into the brass housing until it is flush with the end of the housing.
6. With your right hand, insert the long end of the hex wrench down the center of the spring. This gives the spring structure and to keeps it from snagging on the internal threads of the brass housing as it moves down into the housing.
7. Insert the spring and hex wrench into the brass housing and move the blade, ball bearing, and spacer into position (the blade will protrude through the opening in the opposite end of the brass housing).

3. Using your left hand, carefully insert the replacement blade into the external ball bearing (blade end facing up and away from the ball bearing).
4. Using your right hand, slide the brass housing directly over the replacement blade/external ball bearing/steel spacer.
5. Lower the brass housing down over the components until flush with the work surface.

6. Tilt the brass housing slightly to the left or right, and use the tip of one finger to hold the steel spacer in place.

7. Gently tip the brass housing down so that the components drop into place and the tip of the

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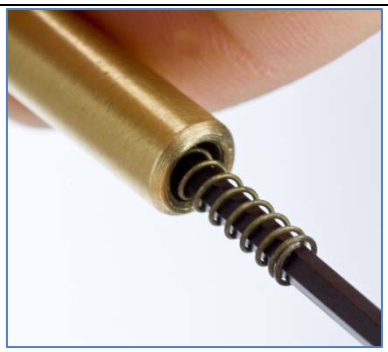

Note: If the bearing catches on the threads inside the brass housing, gently tap the protruding end of the hex wrench against the table or hard work surface.

8. While holding the spring in place, remove the hex wrench from the brass housing and insert the setscrew into the brass housing.
9. Turn the hex wrench clockwise to tighten the setscrew.

replacement blade extrudes from the opening in the knife end.

8. Insert the spring into the brass housing. The spring should slide freely into the brass housing.

Note: If the spring does *not* slide freely into the brass housing, repeat steps 1-7 until the spring is in correct orientation.

10. While holding the spring in place, insert the setscrew into the brass housing.
9. Turn the hex wrench clockwise to tighten the setscrew.

Setup Tips

Make sure that your cut path does not cross any open holes or pockets in your spoilboard—the spring-loaded knife tip will drop into the hole and could be damaged.

Because the orientation of the knife may not start in the correct position, some manual trimming may be required.

Programming Tips

Create your CAD/CAM file (G-Code) using the same software and methods used to create standard 2-D cut files.

To prevent incomplete cuts and ensure sharp, angular, cuts and corners, avoid using radius value less than 0.05 inch. By programming line overruns and ensuring start points are located on straight-line segments, the knife edge will point in the correct direction at the begging of each cut and manual material trimming will be reduced.

In the following example, blue arrows indicate start directions.

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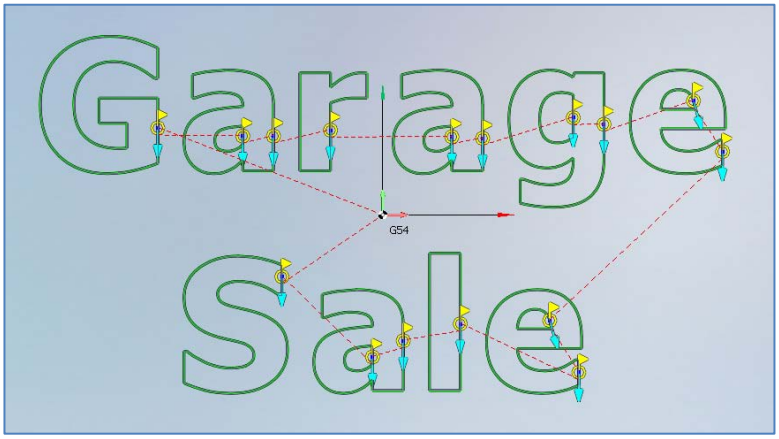
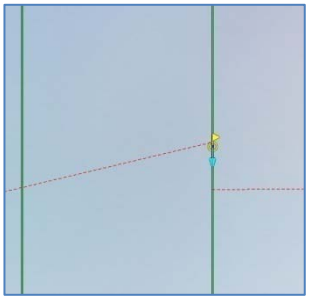


Zooming in on one of the start/end points, note that the tool path cut overruns the start point by about 0.1 inch. If using CAM software, use “Lead in, Lead out”, “Additional approach,” “Along Curve” or similar functionality.



Application Notes

The CNC Drag Knife can be used for a variety of milling applications. Following are suggested tool types and mill settings for a variety of end materials.

Application: Sign Vinyl

Tool Diameter	0.001 inch
Clearance Plane	0.250 inch
Plunge Rate	10 IPM
Feed Rate	60-120 IPM
Spindle Speed	0 RPM
Total Cut Depth	0.030 inch
Entry/Exit	Vertical

Sign vinyl is designed to be cut into lettering and graphics for application onto any smooth, non-porous surface (metal, plastic, glass, painted wood) using a simple "transfer tape" process.

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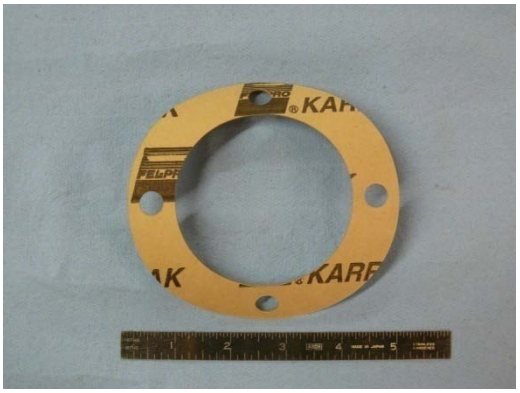
Secure your sign vinyl to the spoilboard with vacuum pressure, single or double-sided tape, or temporary spray adhesive. Insert the CNC Drag Knife in your 1/4" collet (router/mill) and set your bit height / Z = 0 level.

Application: Gaskets

Using a 60 degree replacement blade and adjusting knife for higher pressure.

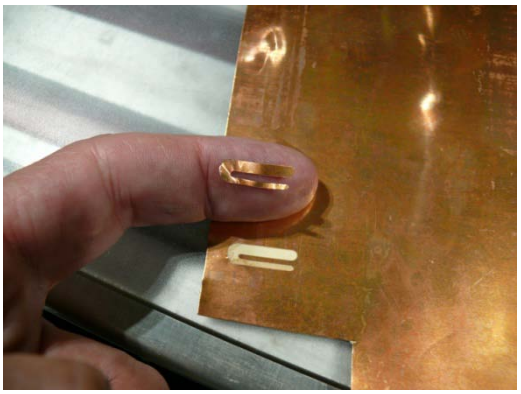
Tool Diameter	0.001 inch
Clearance Plane	0.250 inch
Plunge Rate	10 IPM
Feed Rate	90 IPM
Spindle Speed	0 RPM
Total Cut Depth	0.003 inch
Entry/Exit	Vertical



Application: Copper Traces

Using a 60 degree replacement blade and adjusting knife for higher pressure.

Tool Diameter	0.001 inch
Clearance Plane	0.250 inch
Plunge Rate	10 IPM
Feed Rate	15 IPM
Spindle Speed	0 RPM
Total Cut Depth	0.003 inch
Entry/Exit	Vertical



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Application: Brass Shims

Using a 60 degree replacement blade and adjusting knife for higher pressure.

Tool Diameter	0.001 inch
Clearance Plane	0.250 inch
Plunge Rate	10 IPM
Feed Rate (inner circle)	15 IPM
Feed Rate (outer circle)	25 IPM
Spindle Speed	0 RPM
Total Cut Depth	0.002 inch
Entry/Exit	Vertical

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