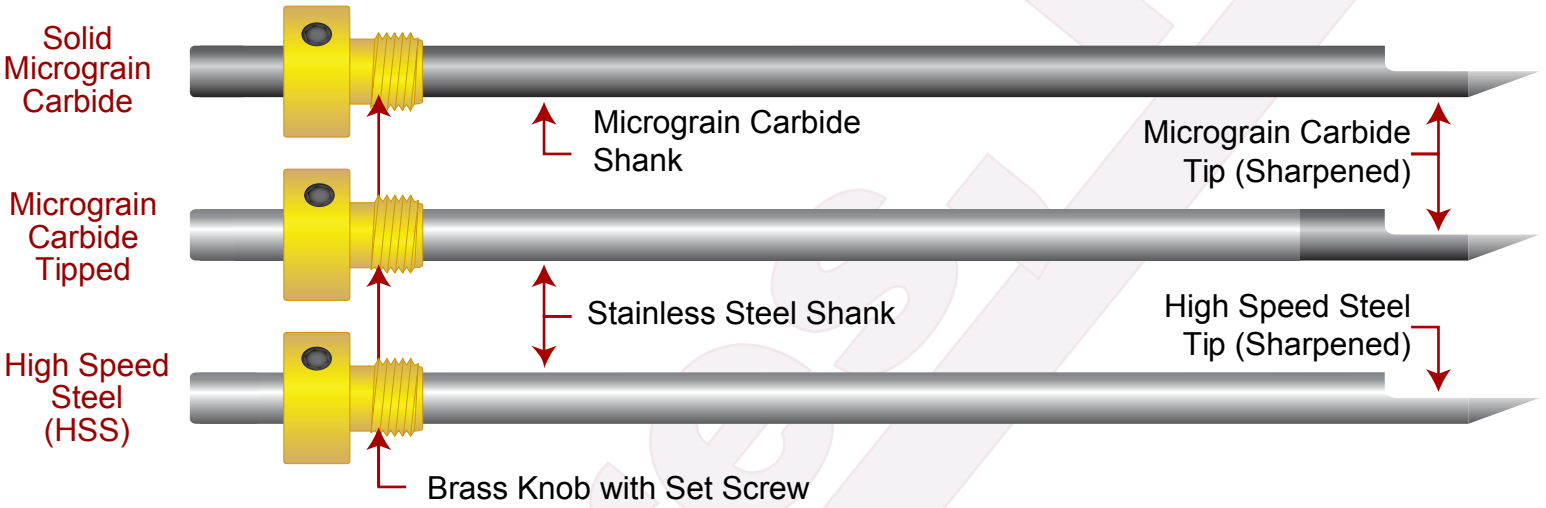
Anatomy of an Engraving Cutter

Cutters is an all-inclusive term used to describe the rotating cutting tools used in the engraving operation. Cutters can be manufactured from high speed steel or carbide and are available in a variety of configurations for specific applications.

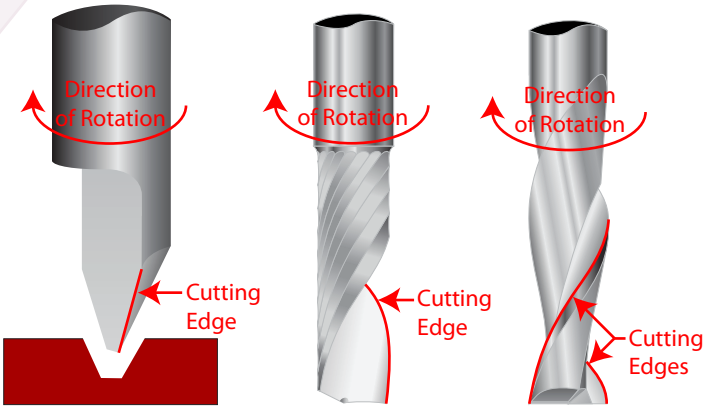
Most standard cutters are available with either a stainless steel shaft or a micrograin carbide shaft (see below). The stainless steel shank is less expensive than the solid carbide shaft. The solid carbide shaft provides more rigidity and is better for engraving in harder materials such as stainless steel. Both of these types of cutters have micrograin carbide tips. Therefore, the cutting edge is of the same quality. All of these cutters are available with a threaded brass knob for top-loading engraving machines. The knob has a set screw to allow adjustment of the vertical position of the cutter and to hold it in place.



Typically, engraving cutters are single-flute tools.

This means they have only one cutting edge. The cutting edge is edge created between the split on the flat of the tool and the cutting angle (highlighted in the picture at right). Note the direction of rotation of the cutter.

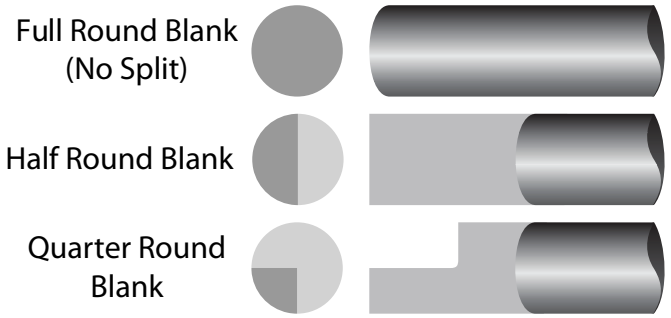
Router tools may have one or multiple cutting edges. The cutting edges are the edges created by the flute and the clearance grind. All of Antares tools are bottom cutting, so the bottom edge of the tool cuts as well.

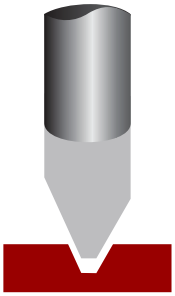


Cutters can be classified as half-rounds or quarter-rounds. This refers to how the blank carbide shafts are split during the manufacturing process.

Half-round cutters are made from blanks that have been "split" or "halved" approximately on center through a grinding process. This tool has a cross-section that is half of a cylinder and is the choice for most engraving cutter applications.

Quarter-round tools are half-round tools that have a secondary split at 90 degrees to the original flat producing a tool that has a cross-section that is one quarter of a cylinder.

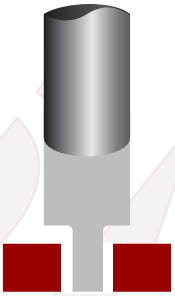




While there is a seemingly infinite number of cutter sizes and shapes, engraving tools fall into two basic categories - conical and parallel.

Conical cutters have an angled cutting edge and produce a “vee” shaped, flat-bottomed cut.

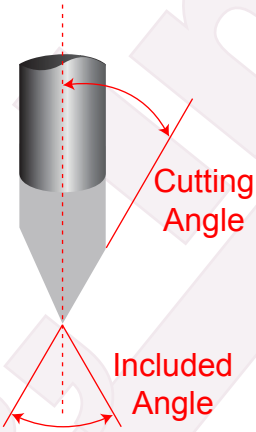
Parallel cutters have a straight cutting edge that is parallel to the cutter’s axis of rotation and produce a cut with straight walls and a flat bottom. The width of the cut can be as large as the diameter of the shaft (i.e. 11/64” parallel tool can be made to cut up to .171” wide)

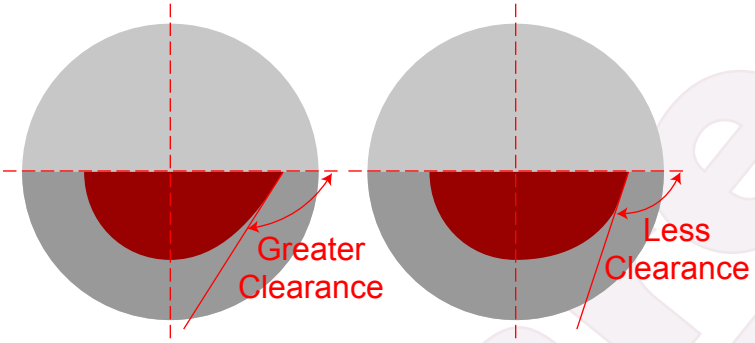


Cutting Angle and Included Angle

The **cutting angle** is the angle formed between the cutter's axis of rotation and its cutting edge. This determines the "V" shape of the groove produced by conical cutters.

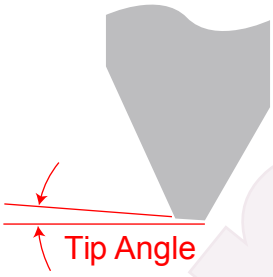
The **included angle** is double the cutting angle.





Clearance Angle

The **clearance angle** refers to the angle of the cutting edge with respect to the face of the cutter. This angle allows for chip clearance, determines how fine the cutting edge is and is selected based on material properties.

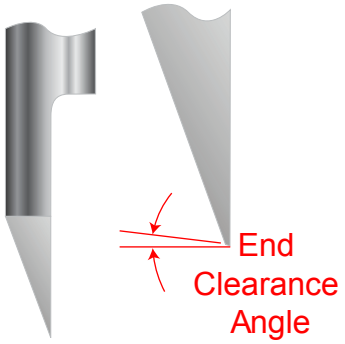


Tip Angle

The **tip angle** is the angle at the tip of the cutter. Sometimes called the tip-off. Determines the width of the flat at the bottom of the cut.

End Clearance Angle

The **end clearance angle** is the angle on the back side of the tip that provide clearance for the tip.



Tip-Off or Tip Width

The **tip-off** refers to the flat on the tip of an engraving cutter that determines how wide the cutter will cut. When we refer to tip width or tip size, we are describing the width the cutter produces at the bottom of the cut.

Tip widths are most accurately measured by doubling the dimension from the cutter's centerline to the cutting edge. In the sharpening process, material is removed from the back of the tool to provide clearance, therefore the dimension across the tip will be smaller than the cut produced. For example, a .030” cutter for flexible engraving stock will only measure about .025”.