ENGRAVING INTO METAL

This article refers to engraving into metals (more than a few thousandths deep) as opposed to engraving on metals–burnishing or dragging. Engraving into metal has its own unique set of challenges, with many variables and options.

Below are some basic concepts and considerations to use when engraving into metals: stainless, brass, aluminum, etc.

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Holding the Engraving Material – Clamps, Vices, Etc.

I was always taught that one of the biggest challenges in engraving is being able to hold the material. One of my mentors, Mark Stanley, always said, “If you can hold it, you can engrave it.” Engraving into metal typically will exceed the holding ability of tape or holding material mats. The holding device should keep the item from moving and, if possible, be easy to use. You want to be able to set and remove material as efficiently as possible without sacrificing your holding integrity or damaging the material.

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Custom Jigs

For highly repetitive work, you may want to consider a custom jig designed specifically for a specific job. A good, efficient jig should allow for quick, easy, and accurate placement of material with minimal effort. So spend some extra time and money creating a simple means for firmly holding and removing the material.

Cutters, Cutting Fluids, and Spindles

Engraving into metal is very rough on cutters. It is recommended that standard engraving cutters designed for cutting metals and end mills be used. For best results, try double-ended, double-fluted end mills. For engraving quality and ease of use, the end mills are far superior. Whatever style cutter you end up using, you should plan on having many duplicates to allow for replacement of broken cutters and for re-sharpening. If this ends up being a major part of your business, you may want to consider purchasing your own cutter sharpener.

For more on cutters go to www.antaresinc.net. Also, try www.brucediamond.com and their model EH8 cutter for stainless steel. If you are using a router try also www.routerbits.com.

It is also recommended that you use a cutting fluid. This will extend the life of your cutters by lubricating the cutting surface and helping to cool them. You will also find that this will help produce a smoother finish on the cut. Many of my customers use Mystic Metal, available from most industrial suppliers.

A collet spindle is also a must for this type of engraving. Standard top load spindles do not offer the necessary support of the cutter down at the bottom of the spindle and will allow the cutter to 'chatter' under heavy engraving loads. This will produce poor engraving quality and reduce the life of your cutters.

Z-Axis Spring Tension

Since stainless is obviously a lot harder than plastic, it will require more pressure to penetrate the surface. For maximum pressure, you will need to tighten the Z-axis spring pressure so that the “threads” of the spring are fully compressed.

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Z Dwell Time

A slower Z Dwell Time is important when engraving stainless. The purpose of slowing the Z Dwell Time is to give the cutter time to fully penetrate the material to the desired depth before making a lateral movement either in the X or Y direction. A one second dwell is a good starting point.

XY Speed

XY Speed describes the actual engraving or cutting speed. To maintain higher quality engraving of stainless as well as add longevity to your cutters, you will want a slow XY speed. The speeds will vary dependent upon the material, the depth of cut, the sharpness and condition of your cutter, etc. Practicing before engraving on a valuable item is always advisable.

Multiple Pass Setup

For a cleaner cut and for less abuse both to your cutters and engraver, it is recommended that you use multiple passes to acquire your final depth rather than trying to do it all in one pass. On stainless, you can safely engrave and acquire a clean cut by using a depth of .004-.005 inches per pass.

A final clean-up pass also helps to clean up burrs generated by cutting deeper on the initial cuts. Clean-up passes typically are no more than one or two thousandths deeper on the final pass. So, for a desired depth of 12 thousandths (.012), set pass number one and two to .005 and pass number three (clean up pass) to .002.

Spindle Motor Speed (Rotational Speed of the Cutter)

This varies depending on cutter size, engraving depth, XY Speed, the type of cutter, and the sharpness of the cutter. Too slow of a speed can increase your chances of damaging or breaking off the tip of the cutter as well as affect the engraving quality. Too fast of a speed setting can actually cause the engraving material to 'fuse' onto the tip of the cutter. This creates a very dull cutter and results in a rough or gummy looking cut in the material.

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Start your spindle motor speed at a medium to slow speed, then listen to the engraver as it cuts the material.
Adjust the speed up and down in small increments while listening to the engraver. Find a setting that sounds as if the engraver is not having to struggle or labor through the cut. This takes a little practice through trial and error, so don't get discouraged if it doesn't seem obvious at first.

And there you go. You are now an engraving-into-metal pro!

More on Engraving into Stainless Steel

Rotary engraving of stainless steel can be a challenging application. However, because stainless is durable, requires little maintenance, is heat resistant, and is inert, it is a frequently specified material.

One aspect of stainless that engravers need to understand is that there are numerous grades, only a few of which are recommended for engraving. Good quality stainless for engraving should possess the following qualities:

- Less than .15% of carbon content
- The addition of manganese, chromium, and sulfur alloys are preferred
- Recommended standard stainless grades for engraving, in priority order, are: 416, 430F, 303, 420F, 430, 304, and 420

For best results in engraving these grades of stainless, the engraver should take into consideration the following:

- Use an industrial computerized engraving machine. If you are doing a lot of metal engraving, it is recommended that you buy an engraver with a collet spindle.
- Quarter round cutters are preferred over traditional half round cutters. Purchase cutters made for engraving stainless. They cut cleaner and tend to last longer
- A “coolant” such as Engravolube, silicone spray, or a light oil (such as 3 in 1) is advised to help minimize heat buildup and friction when applied to the steel being engraved

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- Engraving in multiple passes, .004 at a time is suggested. Alternately, a depth of .008 to .010 and then a clean-pass of .001 or .002 works well. To paint-fill stainless, you should reach a depth of .010" - .012"
- Cutting speeds are relative but, as a rule of thumb, the wider tip size used, the slower R.P.M. used. For example:
    - .020 tip size should be engraved at 20,000-30,000 R.P.M.
    - .030 tip size should be engraved at 12,000-20,000 R.P.M.
    - .040 tip size should be engraved at 8,000-12,000 R.P.M.
- Z down speed and dwell time should be very slow. This will allow the cutter to gradually penetrate the stainless

If you have any questions or would like to contribute information to this or other articles, please contact us by email. Just click here

Happy engraving!