International Association of Penturners

Working with Brass and Aluminum

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Introduction

This is a general guide for working with brass and aluminum on a woodworking lathe. It's based on my research with a machinist, and my own experience after turning several brass and aluminum pens and a few bucket handles from brass. Different brass alloys have different machining and hardness characteristics and color. I use C360 brass, based on my own experimentation and the advice of a master machinist who knows a lot more about metallurgy than I do. It turns well with woodworking tools and the color matches most gold kits fairly close.

I buy it in ¾" round stock. Square stock it would be difficult to turn corners off, and it is a lot more material to remove. I buy it by the foot. Most places sell it to the nearest 12". You can sometimes buy it in 6" lengths. ½" round stock can be used for some of the smaller pens but on the larger pens the cap section is often close to or larger than ½". You can find both brass and aluminum online.

Cutting the Stock to Length

A table saw with a carbide blade, bandsaw with a fine-tooth blade or a hacksaw will work to cut brass and aluminum. However I use this saw: 6 in. 5.5 Amp Cut-Off Saw (harborfreight.com). Mark the length of the blank as you would for wood or acrylic, then cut to length.

Drilling the Blank

Brass is slightly easier to turn than aluminum but needs more care when drilling. Drill bits need to be modified. The cutting edge at the tip needs a few strokes on a stone to grind it flat. Otherwise, the edge will grab and screw itself into the brass. The two pictures below are two drill bits I own. They are the same kind of bit and the same diameter. The one on the left is unmodified. The one on the right has been modified to drill brass. You can see the light reflecting off the (slightly) flat cutting edge.

Here are some great links, one with instructions and another video on the process.

Instructions: Drilling Brass: the easy and safe way YouTube: Modify a Twist Drill for Drilling Brass.

The modified drill bit can still be used on other materials, especially plastic which has the same tendency for the bit to grab. I have a set of dedicated bits for drilling brass for each pen kit that I use to make brass pens. I do this because that way I don't grab an unmodified bit by accident. In the pictures above a close look will show the bit on the right is slightly colored by brass, the one on the left is not. Aluminum can be drilled using standard or modified bits. Do not use brad-point or pilot point bits to drill brass or aluminum.

Drilling brass or aluminum on your lathe

This is easier and more reliable than a drill press. It is easier to control the feed rate of the bit using the tail stock quill, especially when the drill bit is exiting the end of the blank. You also generally get finer control of speed of the blank on a VS lathe. Drill a pilot hole with a drill bit that is just a bit larger than the web on the final drill bit. The web is the width of the cutting edges across the tip of the bit when viewing the bit from the cutting end. It is not the diameter of the bit. I have settled on a ¼" pilot hole. You don't need anything larger than that, and after the pilot hole is drilled, you can move to the final drill bit.

You can use this pilot hole to align the blank after drilling the final hole part way through and then flipping the blank so that the drill bit is not exiting the blank. This reduces the tendency for the bit to grab exiting the blank. If you choose to just drill all the way through in one pass, chip out at the end of the blank is not a major concern with drilling metal. You should not need cutting lubricant, except for if you want to reduce heat. This can help later with turning because too much heat can harden brass.

Gluing in the Tubes and Squaring the Blank

Once the blank is drilled, use standard techniques to glue in the tubes. Squaring should be done with a squaring jig on a sander. End mills are grabby, especially on aluminum and can leave an uneven end.

Turning the Blank

Brass and aluminum can be worked with standard HSS tools, but the tools need to be kept sharp. Carbide tools are ideal. I have a tool with an HSS bit someone made for me just for turning brass and aluminum. The tool has a replaceable tip. The bar is ¾ stock that is 11" long from the end of the bar to where the handle starts.

Mass is important. A heavier tool will work better – that's why I prefer the tool shown below to my carbide tools. If you have a way to use a cross slide vise and can mount bits in one, that will work even better because the bit is locked down. Feed rate is important, trying to take too much metal off in one pass will result in chatter and an uneven blank. You must use scrapers (such as a carbide tool) instead of gouges or chisels, especially on brass.

This is necessary for the same reason that drill bits need to be modified for brass. The edge of a gouge or skew chisel is very similar to an unmodified drill bit and will grab brass. This will damage you, the tool, or both.

You can also use parting or carbide tools since those are essentially scrapers. However, a parting tool and carbide tools should be presented at or below the midpoint of the blank.

If it is presented above the blank it can act like a skew chisel and grab the brass. Turning metal is both easier and more difficult than turning wood or acrylic. It is a harder material, and you are using a scraper. Both mean it is more difficult to get into trouble, but it is harder to address problems when they occur.

For your first time or two turning metal, I suggest doing it in a series of stepped cuts across the blank with a parting tool. Just feed the tool straight in a few 16ths at a time, then move down the blank and repeat until you get the feel of working with metal and how it responds.

Potential Problems

If the blank surface gets too uneven (lumpy) and you are having problems fixing it with a turning tool you can use coarse sandpaper or a file to smooth it out. Another potential problem is excessive tool chatter which leaves marks on the blank. If you get chatter, you are likely trying to remove too much material at once.

These can be removed with the sandpaper, file or again a light touch with a tool. An out of round blank the only way to fix this is with a turning tool. I will typically address this with a parting tool to get part of the out-of-round section round again and then use the stepped technique to get the blank back to round.

You can also use a file, coarse sandpaper or even an angle grinder to turn the blank, but those are coarse and will leave a rough finish.

Assembly and Finishing

A properly turned blank will be very smooth and quite shiny, not needing anything after turning other than cleaning. I use a high grit polishing pad to de-gloss my blanks and give them a satin look. It more closely matches most of the finish on the kits, and the satin hides wear over time better than something highly polished. You can apply a surface finish such as CA, but this is not necessary, and I don't do this. Occasional polishing with a metal polish is all that is needed. The pen kit is assembled as normal. Refer to the instructions for your chosen kit.