

Custom Pen Making

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Tool List

The following is a recommended list of tools for one particular size of custom pen making. This is the size you learned to make in the class. There are general finished size guidelines, but no hard and fast rules. Wherever possible, the source of the tool is included.

1. Lathe—Wood lathe, 10” swing minimum. [Lathes](#)
2. Scrolling chuck: There are many options here. [Record Power SC3](#), You want to ensure you have “spigot” jaws. These are used when making a rectangular blank round to fit into a collet chuck OR if you have a round blank that does not fit into your largest collet .
3. Collet Chuck: [Collet Chuck & Collets](#)
4. 20mm collet: [Collet Chuck & Collets](#) This is required for blanks poured in molds over 3/4”
5. Floating tailstock tap and die holder: [Niche 7 Piece Set](#). Along with the base kit, you need to purchase the 1.5’ die holder and 3/4” tap holder.
6. Drill bit set (imperial, letter, and number): Harbor freight sells a 119 bit set that has 99% of the bits you need. Purchase either the Titanium Nitride coated or the Cobalt steel.
7. M12, M13, or M14 triple start tap and die pair: [Taps & Dies](#) . A triple lead tap and die is the perfect choice for custom pens. It cuts 3 threads at once, meaning with each rotation of the cap, it will travel 3x’s the distance. This results in a cap taking 2 full revolutions to turn as opposed to 6+ full revolutions.
8. Section tap and Die set (M10x1 recommended) [Taps & Dies](#)
9. Nib housing tap: Recommend Jowo #6. [Taps & Dies](#)
10. Normal lathe tools: HSS or Carbide (or combination) [Turning Tools](#)
11. Mandrels to hold your work for finishing and polishing: [Mandrel Set](#)
12. Tenon Cutter – Hinze designed [tenon cutter](#)

Getting Started

To begin, you need a blank. I recommend using rods casted using 3/4" molds like [Top Choice XL Blanks](#). And [Diamond Cast Kitless Blanks](#). They are the perfect size at 8.5" long and 3/4" around. You may also use standard commercially available acrylic blanks sized at 3/4" square by 5 1/4" long. You will need 2 total at that size.

Material should be among the following: Polyester Resin, Alupalite, Epoxy, Ebonite, or Acrylic Acetate. Do not use In-lace Acrylester, tru-stone, sim-stone, or other overly brittle material. Additionally, wood is not a good choice as it will not take and hold threads. Any of the "no-no" materials would need to be sleeved with one of the good materials and threads cut into the sleeved material. This is a little advanced for this guide.

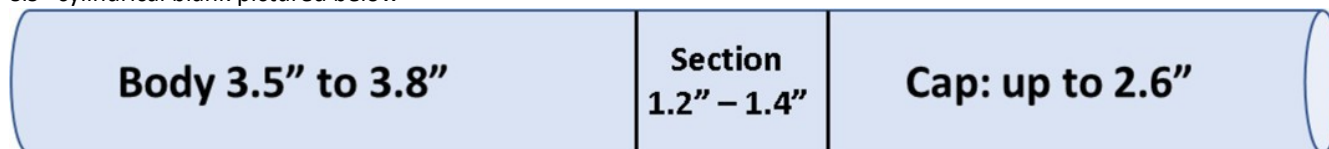
Sizing parts for your pen

Body: The body should be approximately 3.5" to 3.8" long. This will result in a pen about or a little bigger than, a [Jr. Gent / Jr. George](#).

Section: approximately 1.2 to 1.25" long. If this is too long, you have to create a cap that is overly large or if too small, the nib won't have room to be tapped and hold a cartridge/cartridge converter.

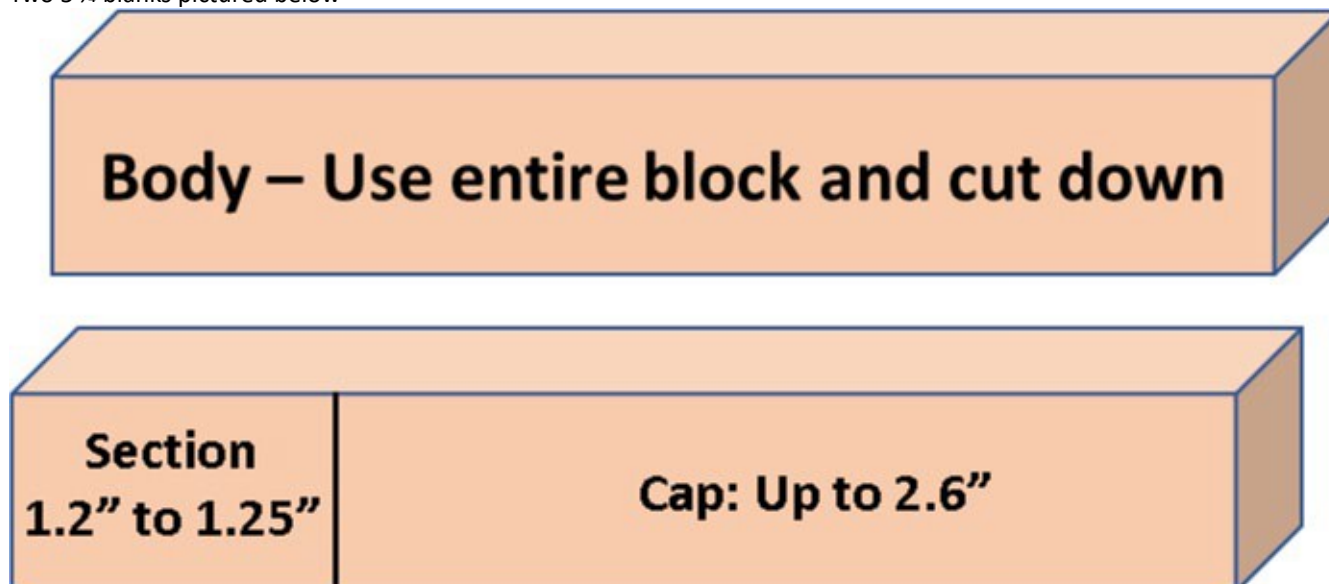
Cap: If you make the body and section first, you can insert the nib and measure the minimum length required to fit the nib inside the cap, then add 1/4" to 1/2" for top clearance. The resulting cap will be anywhere from 2.2" to 2.5" long (give or take either direction).

8.5" cylindrical blank pictured below

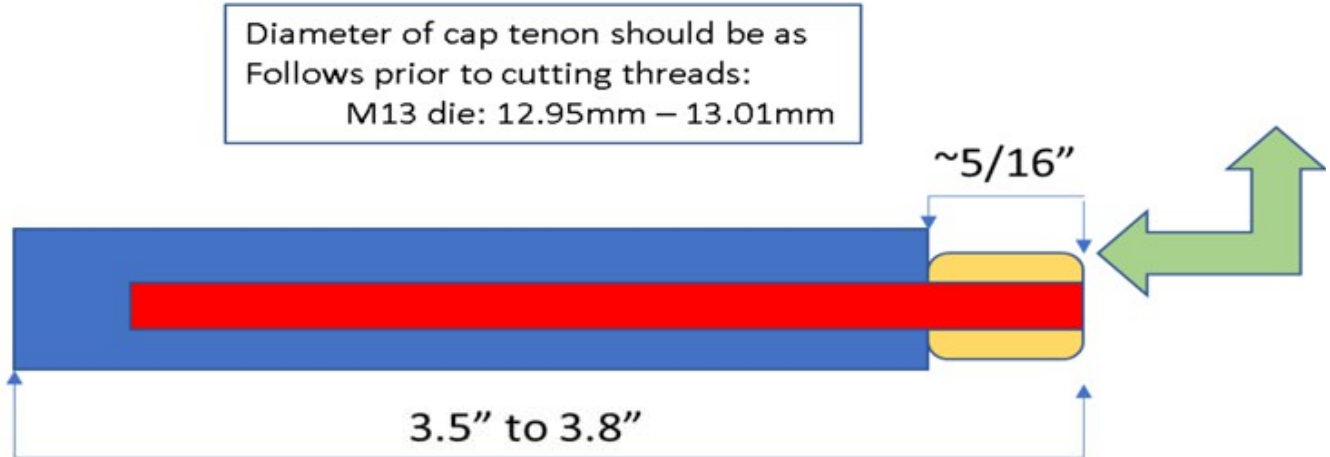


Or

Two 5 1/4 blanks pictured below



Making the pen body



Body drilling/Tapping as follows:

- Bore 3"
- Tap M10x1

Note: you can bore the entire length with 9mm or 'T' bit.

The diagram above details a basic schematic for the steps necessary to form the rough body. The written steps below will describes in detail what needs to occur. These operations are done on a rounded blank mounted in a collet chuck. Mounting in a collet will keep it as concentric as possible when removing and re-mounting. This work can be done in a scrolling chuck, it may not be quite as accurate. Remember though, we're making pens, not parts for the space shuttle. Accuracy is quite relative here:

1.Face the blank so that the end is flat and then center drill the blank so you can support cutting the tenon with a live center.

2.We need to cut a tenon to prepare for cutting the cap threads. The tenon needs to be approximately 5/16" (between .290" and .312") long. Cut the tenon to the diameter required for the die. Use the chart below as a guide for the various tenon sizes. You do have some wiggle room. Never cut the tenon oversize, this will stress the die and if too large will cause chipping. Cut the tenon no less than the following:

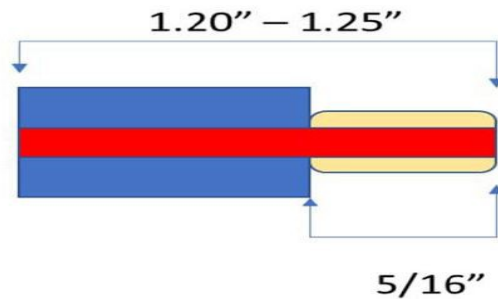
Die Size	Ideal Dia (MM)	Ideal Dia (IN)	Min Dia	Min Dia (MM)	Max Dia	Max Dia (IN)
M9	9mm	0.352	8.90	0.350	8.97	0.353
M10	10mm	0.391	9.90	0.390	9.97	0.392
M11	11mm	0.431	10.90	0.429	10.97	0.432
M12	12mm	0.471	11.90	0.468	11.98	.472
M13	13mm	0.509	12.90	0.507	12.98	0.511
M14	14mm	0.549	13.90	0.547	13.98	0.550

Making the pen Body (Cont..)

1. At the end of the tenon, a relief needs to be cut to allow the die to fully thread to the end. The relief should be about 3/32" to 1/16" wide. This can be cut with a thin parting tool or other similar tool. It should be slightly deeper than the depth of the thread pitch, in almost all instances, this means about 1mm (0.04") below the tenon surface.
2. Chamfer the start of the tenon to 60 degrees to allow the die to slip over to start.
3. Load the die into the die holder with the etched size facing out. Using lubricant (cooking spray, cutting oil, WD40, etc) cut the threads all the way to the shoulder and back the die off.
4. Flip the die in the die holder so that the letters are facing inward. Be careful NOT TO CROSS THREAD. This will ruin the tenon. Chase the threads all the way to the shoulder.
5. Inspect the relief, if there appears to be threads cut in the relief, trim them off with the thin cutting tool.
6. We need to bore the body to a depth of 3 inches to accommodate the cartridge converter. The size of the bore is dependent on the size of the thread being tapped for the section. The chart below (figure 1.2) details some common sizes:
7. Load the appropriate tap into the floating tap holder and tap in a distance no less than 3/8" and no more than 1".
8. Once bored, and taped you've completed preliminary work on the body and it can be removed from the chuck.

Tap Size	Drill Bit
M9x.75	8.25MM or 21/64
M10x1	9mm OR 'T' bit
M10x.75	10.25 OR 'U' Bit
7/32 -32	'Y' Bit

Making the Section—Jowo #6 nib housing

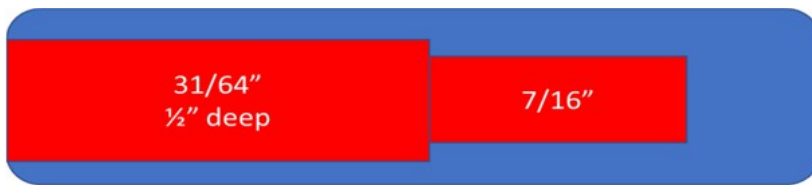


1. Mount the section with the front (portion the nib screws into, facing the chuck).
2. Face the end of the blank and center drill to accommodate a live center supporting the work while cutting the tenon.
3. Mark the tenon length at 5/16" of an inch.
4. Cut a tenon to accommodate the appropriate sized tap. The chart (figure 1.1) will guide you in the acceptable diameter.. Also cut the a relief as you did with the cap tenon to accommodate the threads.
5. Using lubricant (cooking spray, cutting oil, WD40, etc) mount the die in the die holder and cut the threads.
6. If the die being used is double sided (generally all American made dies are and Chinese dies are not), flip it around and re-chase the threads to the end.
7. Inspect the relief, if any threads are present in that area, trim them flat.
8. Next, drill a 7.1mm through hole (letter 'K' bit).
9. Flip the die around in the collet.
10. Using an 'N' bit, drill in a distance of 0.58" as measured from the shoulder of the drill bit, not the tip.
11. Using an 'R' bit, drill in a distance of 3/32" as measured from the shoulder of the drill bit, not the tip.
12. Install the JOWO tap (M7.4 x .5) into the tap holder and tap threads for the nib housing. No more than a 1.4" to 5/14" of thread is necessary to secure the nib.
13. Clean out any lubricant using a paper towel and test fit the nib.
- 14.

Common issue with nib fit:

- Distance bored with N but is slightly shallow. Re-chuck the bit and take a tiny bit out.
- Distance bored with N bit is too far (threads won't engage). Trim some length off the front and re-fit until threads catch. Note, you may need to use the 'R' bit to increase the depth to countersink the nib.
- Countersink 'R' bit was not drilled deep enough.

Dimensioning the Cap



Overall depth dependent on clearance required by nib.

With the Nib installed in the section, screw the section into the body. Measure using Vernier calipers, the distance from the shoulder of the body to just beyond the tip of the nib. This is the distance you need to bore for clearance inside the cap. The cap should be at least another $1/4''$ to $1/2''$ longer than that clearance dimension. You want to keep the cap in proportion to the body. The Golden Means ratio is a good guideline, or simplified, the cap should be $1/3$ rd of the body length +/-

Mount cap blank into the chuck with the top of the cap facing the chuck.

1. Bore the blank to the depth measured for nib clearance using the "1st step" bit listed in figure 1.3 for the tap required.

2. Bore the blank with the "Tap Bit" to a depth of 1.5 inches

3. Tap the hole using the specified tap. You need between $3/8''$ and $1''$ of thread cut to accommodate the tenon.

Tap	1st Step	Tap Bit
M11 x .08 x 3L	'V'	'Y'
M12 x .08 x 3L	13/32	11.2 or 7/16
M13 x .08 x 3L	7/16	12.2mm or 31/64
M14 x .08 x 3L	7/16	13.2 or 17/32

Finishing the pen

The outside of the body should have a diameter at its widest between .057 and .059, The cap should be between 0.6 and 0.63 depending on how much of a lip you like on the cap. Dimensioning the pen and shaping it should be unique to you, every maker has their own unique style, this is your opportunity to find yours.

I recommend sanding from 220 through 400 with [Abranet](#) or [sandpaper](#), then using [ZONA paper](#) and then top off with a [plastic polish](#).