

## **My First CNC Router.**

### **Q & A derived from emails received of QHQP Website Contact Form.**

I have included below some of the more detailed answers to questions I have received via my website contact form.

I hope this may be of additional help to the information contained on the CNC Router Project page.

[http://hamrx8.com/CNC\\_Router\\_Project.html](http://hamrx8.com/CNC_Router_Project.html)

**Q...** Can you please send me CAD plans or dxf files of your CNC Router.

**A...** Very sorry but I did not make any CAD Drawings or plans of any kind when building my CNC Router. All I did as I proceeded was to make very rough sketches and these would be of no use to anyone else as they do not represent the final component or dimensions.

Everything I have to give is on my website product page.

[http://hamrx8.com/CNC\\_Router\\_Project.html](http://hamrx8.com/CNC_Router_Project.html)

There is a text file download at the bottom of the above website project page that might be of some additional help to you. I do update this occasionally but I can say there will never be any plans or dimensioned drawing. This was just a one off machine just for my own use.

**Q...** Your air cooled router and your water cooled router, since you have both can you tell me from your experience what is that you like better,

**A...** I really like the water cooled spindle motors but they do require a lot more infrastructure and cost for the cooling system.

The advantage is that they can never get clogged up with dust and machining particles.

So in my opinion for a commercial machine doing a lot of long continuous work, water cooling is the way to go. For a casual use home machine air cooling is a really practical, easy and more than adequate spindle motor to use.

When it comes to noise levels this is somewhat irrelevant. The actual noise of the cutting and additionally if you have a vacuum chip extraction system the noise from all this way surpasses the actual noise of the motor. There is not a lot of noise difference between the actual Air and Water cooled motors when they are running. Consider also that even if you have water cooling there is the + noise of the fan/fans blowing through the coolant radiator. So in total pretty much the same.

So in summery for me if I was to build another machine for personal use I would likely choose an Air Cooled motor just for simplicity.

Both the Air and Water Cooled motors I use are 1.5KW and get their power from a 3 phase Variable Frequency Power Supply Drive (VFD) Its input is 240VAC.

They were purchased from a Chinese supplier of eBay.

I did purchase and keep a spare motor and VFD just so I would never be stuck in the middle of a project while I waited a week or so for a replacement to arrive. Haven't had to use them yet.

**Q...** I can find with the local aluminium suppliers, it is very expensive to buy cut pieces - especially the large sheet for the gantry sides. I have looked through the Australis site but they seem to only have extrusions, fittings, etc.

**A...** For the Aluminium I am fortunate that I have a supplier just 15 minutes drive away and they cut most standard stock to size for only a small cost. Fortunately I have a band saw so usually purchase in 2 to 4 meter lengths and cut it myself.

All the rectangular aluminium is 6060 grade. This can vary between 6012 and 6060 its all much the same. The gantry sides were from 12mm plate grade 5083 H116 Mill Finish. I had two pieces cut 37x20cm for a total cost of A\$41.85 all up.

The company is CAPRAL (Aluminium), [www.capral.com.au](http://www.capral.com.au)

Usually for smaller profiles you have to purchase a full 4M length, but for most of what I use for my router 10mm and 12mm x100mm they cut it for me. The guys at the branch in Bayswater I go to are really helpful.

**Q...** I noticed in your last video of the CNC project you used a laser alignment tool. Could you describe exactly what that is? I'm a newbie so I'm looking to see what works for people and what is involved in including something like that as part of my project.

**A...** Following is the URL link to the company that makes the Laser Centering tool I use.

<http://www.lasercenteredgefinder.com/main.html>

I have found this tool to be invaluable in setting up the X,Y zero point for many of the CNC jobs I do.

**Q...** How strong are the stepper motors you use? Do you think that Holding torque 18.9Kgcm would be ok for machine like yours?

**A...** The specification of the Stepper Motors I used is 3A 263 Oz-in (18.9Kgcm = 262.4 Ozin)

**Q...** Where can I purchase the main components like Linear bearings, Motors and electronics etc.

**A...** There is a text file download at the bottom of the website project page that contains most of the information and links.

[http://hamrx8.com/CNC\\_Router\\_Project.html](http://hamrx8.com/CNC_Router_Project.html)

**Q...** Do you still have the cnc machine? not sure how old the videos and web pages are? If I could trouble you for costings? I am trying to build a machine but keep changing my mind, on design, size, I am going crazy changing things all the time.

**A...** Yes I still have the CNC and use it quite frequently, most days this week in fact.

I finished building it about this time last year 2011 just on 12 months ago.

I never calculated an accurate cost but estimate for the main parts and aluminium it would have been around \$2500. The computer, controller and Stepper motors probably another \$1500.

I had your same problem as you for about 2 years researching and thinking about where to start before I committed myself to actually making it.

First I purchased the linear rails, bearings and ball screws as a kit on eBay. I just took a wild guess as to the size I wanted to make it. Once this was done and I had them sitting in front of me I was committed and started one step at a time from the base up. I figured out the details as I went along, purchasing the aluminium and other parts as needed. From start to finish it probably took me 3+ months before I had the router exactly the way I wanted and as good as I could make it.

My only advice is that once you get started moving forward with the construction is so worth it and to then be using the CNC to make things like the Acrylic Clocks I am currently making is so fulfilling.

**Q...** I am building a mill and was quite impressed by your design and workmanship. I was wondering what the traverse speeds are with your design, and what you had set up the stepper drivers for (full/half micro step). Thank you, and keep up the great work. I hope mine comes out as nice as yours.

**A...** Thank you very much for your comment.

I set the Motors in MACH3:

X and Y Velocity mm/min 1000

Z Velocity mm/min 800

Acceleration for both is 400

I have misplaced what I set the switch for full/half micro step and without removing the computer cover and looking at the board I can not be sure, however I believe it is Half micro step.

**Q...** I have one question about your incredible cnc machine... what are the maximum workable dimensions. (work area on which your machine can work)?

**A...** The CNC Router can work to Y580mm, X400mm, Z100mm

I have routed some jobs very close to that, however I have to to remove the clear acrylic sides around the table when going to the maximum.

**Q...** First, very nice machine. I just have a couple questions if you don't mind. What size motors did u use and which company did you go with on them? I was looking at getting a geckodrive G540 and possibly add a 4th axis later. I can get them pre wired at [cncrouterparts.com](http://cncrouterparts.com) for about \$520. The geckodrive is supposed to be bulletproof but is it really needed? Lastly, I see you changed the gantry sides to the new offset ones, why did you do that? I would think it would put undo pressure on the bearings.

**A...** Thank you for your comment regarding my router.

To answer your question the item description as I purchased via eBay follows.

3 Axis Board 3A + 263 Oz-in Stepper Motor + PSU CNC Kit (Stepper Motors to have 0.25inch diameter Shafts, at both ends.) I have found these motors to me more than adequate.

Cut and past the following link into your browser this is almost identical to the kit I purchased. I asked for Double Ended Shafts on the Motors. That way I could put a manual wheel on the opposite motor end for manual adjustment, makes it easier to setup the work Zero Point. The eBay company I purchased from made the motors especially for me. XORIES

I used offset gantry sides so that I could machine using mostly the entire length Y axis of the table. Straight gantry sides reduce 100mm of the usable machining length due to the motor hang over at the front. Also considering the centre of balance the offset sides place this more in line with the bearings due to the weight of the motor. In practice it is easier on the bearings. Also from all the research I did the majority of Routers both home built and commercial use a similar approach.

That's it for now.

I apologise if there are any spelling mistakes and the format is a bit hard to read, just wanted to get this available for download to help. Most of it is just cut and pasted from the original emails.

Occasionally I will add to this document.

Regards to all.

Graham