

# CNC MILL RESOURCES

CNC Milling machines are available at multiple HCPL locations to patrons who have completed a free orientation class. A CNC mill uses Computer Numerical Control along with milling tools to cut away material in a rotary motion. As with drilling, this is possible with a wide array of different tools made in various diameter lengths and levels of hardness. Depending on the material used and the quality of the artwork, CNCs can carve and engrave excellent details. There is no cost to use the CNC mill, but patrons must supply their own materials.

Materials that can be carved include :

- **HARDWOODS:** Maple, Ash, Basswood, Birch, Cherry, Walnut, Poplar, and Oak
- **SOFTWOODS:** Pine, Cedar, Balsa and Fir
- **PLASTICS:** ABS, Delrin (Acetal), Polycarbonate (PC), Acrylic (PMMA), Nylon, HDPE, LDPE, PP, PET, and PVC, Polyethylene and Polyurethanes
- **SYNTHETICS & COMPOSITES:** Renshape and other Polyurethane resins with fillers, as well as foams\*
- **METALS:** Copper, brass, and aluminum

And more. Materials that cannot be carved include Steel, Titanium, Stone, Ceramic, Fiberglass or Carbon Fiber, and FR-4 Circuit Board (contains fiberglass). All materials are subject to staff approval.

Examples of CNC projects and designs can be found on Thingiverse.com, Inventables.com/projects, Cutrocket.com and many other websites.

CNC Mills use CAD (computer-aided design) software to create their milling files. Designs can range from 2D vector files to 3D models. Once you have created your design, you will program the machine toolpaths with a CAM (computer-aided manufacturing) software. This provides the instructions for our mill to follow. We recommend these software to get started:

Carbide Create - <https://carbide3d.com/carbidecreate/> (Free CAD/CAM – easy for beginners)

Tinkercad – <https://www.tinkercad.com/> (free 3D CAD program – easy for beginners)

Fusion 360 – <https://www.autodesk.com/> (free CAD/CAM download for hobbyists/educators)

Inkscape - <https://inkscape.org/en/> (free 2D vector design software, requires some experience)

MeshCam - <http://www.grzsoftware.com/> (commercial CAM software – intermediate)

Once the design is ready, you then send it to the CNC machine interface and prepare your material and machine bits. This may include some trial-and-error, but maker lab staff are available to offer advice. The exact process varies from machine to machine and the details of machine variances are in the hands-on part of the orientation.

Schedule time to use a CNC Mill at HCPL by simply visiting the [Maker Central](#) page and accessing (or creating) your Beanstack account. Signup and attend the CNC Mill orientation to earn your badge then click on “Rewards” within Beanstack for the reservation link. Complete the reservation form and you will receive a confirmation of your schedule request after staff review.



## Carbide Nomad 883 Machine Operating Checklist

- 1. Be Safe**  
Always follow the safety guidelines listed at the beginning of this document. Always wear appropriate safety equipment, especially safety glasses/goggles and hearing protection.
- 2. Check the Machine**  
Check that all screws are tight, rails are in good condition with no nicks or other damage, wiring is in good condition with continuity and securely fastened, and that nothing is frayed or broken and everything is clear and safe.
- 3. Secure the Workpiece**  
Secure the workpiece (the material being milled) right-side up and in the desired orientation to the worksurface using a technique appropriate to the material.
- 4. Clear the Work Area**  
Ensure the work area is clear and the spindle can move without interference.
- 5. Close the Door.**  
You will not be able to connect to or home the machine with the door open.
- 6. Connect to Your Computer**  
To connect the Nomad 883 to your computer: 1) Power up the computer; 2) Connect the USB cable to your computer; 3) Start Carbide Motion on your computer; 4) Press the Power button to turn your Nomad 883 on; 5) In Carbide Motion, connect to the machine; 6) Home the machine.
- 7. Set Job Zero**  
Jog your spindle to the bottom left corner of your material in Carbide Motion, and set the XYZ zero coordinates.
- 8. Double Check the Work Area**  
Ensure that nothing has been left in the work area. Make sure the door is closed.
- 9. Examine and Install the End Mill**  
Examine each end mill prior to use to ensure that it is sharp, in good condition, and not chipped. Install the end mill. Check to make certain that the collet is tight and will not become loose during operation.
- 10. Load the G-code File in Carbide Motion**  
Load the NC or EGC file (the G-code which gives the machine its instructions) which you have already simulated. Follow all prompts for tool changes.
- 11. Monitor the Machine During Operation**  
Ensure there is no build-up of dust, debris, or fumes, and that the material and bit do not become loose. Do not reach into the machine's working envelope or insert any object into it while the machine is operating. The machines will not pause if you attempt to open the door and reach in.
- 12. Finish and Clean Up**  
Once the job is complete, the spindle will automatically stop and return to its parked position. Remove the finished piece. Remove any waste and vacuum the inside of the Nomad 883. Store end mills carefully when not in use to protect the cutting edges. Collets and end mills should be cleaned when they accumulate milling debris.